

Supplementary Information for

Tunable molecular editing of indoles with fluoroalkyl carbenes

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Table of Contents

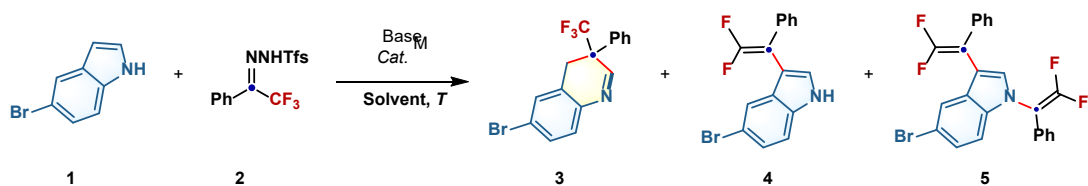
1. General Information	S1
2. Optimization of Reaction Condition	S2
2.1 Reaction Development	S2
2.2 Optimization of Cyclopropanation	S3
3. Preparation of Starting Material	S4
4. Substrate Scope	S5
4.1 General Procedure of Carbon-Atom Insertion into Indole Skeletons	S5
4.2 General Procedures of Two-step, One-pot Process to Access Tetrahydroquinolines	S5
4.3 Gram-Scale Reaction and Synthetic Derivatization of compound 3	S6
4.4 General Procedures of C–H <i>gem</i> -Difluoroolefination	S8
4.5 General Procedure of Tandem Cyclopropanation and N–H <i>gem</i> -Difluoroolefination	S8
4.6 General Procedure of Cyclopropanation	S9
4.7 Gram-Scale Reaction and Synthetic Derivatization of compound 108	S9
5. Mechanistic Considerations	S11
5.1 Control Experiment	S11
5.3 Computational Details	S11
6. New Compounds Characterization	S69
7. X-ray crystallography	S146
8. NMR Spectra	S152
9. Supplementary References	S414

1. General Information

All reagents were purchased from commercial sources and used without treatment, unless otherwise indicated. The products were purified by column chromatography over silica gel. NMR spectra were recorded on a Bruker Advance 600 (^1H : 600 MHz, ^{13}C : 150 MHz, ^{19}F : 564 MHz) and Bruker Advance 500 (^1H : 500 MHz, ^{13}C : 125 MHz, ^{19}F : 470 MHz) at ambient temperature. ^1H and ^{13}C NMR spectra were reported as chemical shifts in parts per million (ppm) downfield from tetramethylsilane, using the residual undeuterated solvent (CHCl_3 at 7.26 ppm ^1H NMR, 77.00 ppm ^{13}C NMR) or tetramethylsilane as reference. ^{19}F NMR spectra were reported as chemical shifts in parts per million (ppm) using CFCl_3 (0 ppm) in CDCl_3 as reference. Coupling constants were reported in hertz (Hz). The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet. High-resolution mass spectra (HRMS) were recorded on Bruker microTof by using ESI method.

2. Optimization of Reaction Condition

2.1 Reaction Development

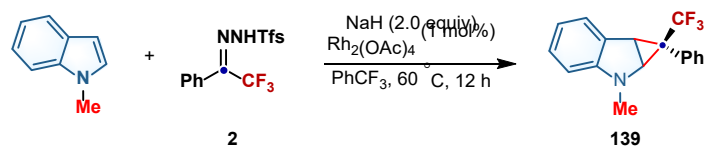


Entry	1:2 ratio	Cat. M (x mol%)	Base (y equiv)	Solvent	T (°C)	3 yield (%) [*]	4 yield (%) [*]	5 yield (%) [*]
1	2:1	Pd(OAc) ₂ (5)	NaH (2)	PhCF ₃	60	n.d.	trace	trace
2	2:1	Cu(OAc) ₂ (5)	NaH (2)	PhCF ₃	60	26	10	trace
3	2:1	Rh ₂ (OAc) ₄ (1)	NaH (2)	PhCF ₃	60	52	10	trace
4	2:1	AgOAc (10)	NaH (2)	PhCF ₃	60	66	n.d.	n.d.
5	2:1	Tp ^{(CF₃)₂} Ag(thf) (10)	NaH (2)	PhCF ₃	60	73	n.d.	trace
6	2:1	Tp ^{Br₃} Ag(thf) (10)	NaH (2)	PhCF ₃	60	77	n.d.	n.d.
7	2:1	Tp ^{Br₃} Ag(thf) (10)	NaH (3)	PhCF ₃	60	85	n.d.	n.d.
8	3:1	Tp ^{Br₃} Ag(thf) (10)	NaH (3)	PhCF ₃	80	96	n.d.	n.d.
9	1:3	Tp ^{Br₃} Ag(thf) (10)	NaH (6)	PhCF ₃	80	trace	n.d.	90
10	1:3	Tp ^{Br₃} Ag(thf) (10)	NaH (6)	PhCF ₃	60	n.d.	n.d.	88
11	1:3	Tp ^{Br₃} Ag(thf) (10)	Cs ₂ CO ₃ (6)	PhCF ₃	60	30	trace	60
12	1:3	Tp ^{Br₃} Ag(thf) (10)	Et ₃ N (6)	PhCF ₃	60	6	n.d.	4
13	1:3	Tp ^{Br₃} Ag(thf) (10)	DIPEA (6)	PhCF ₃	60	n.d.	40	n.d.
14	1:3	Tp ^{Br₃} Ag(thf) (10)	NaH (6)	CHCl ₃	60	n.d.	n.d.	10
15	1:3	Tp ^{Br₃} Ag(thf) (10)	NaH (6)	DCE	60	trace	n.d.	98
16	1:2	Tp ^{Br₃} Ag(thf) (10)	DIPEA (4)	PhCF ₃	25	n.d.	60	10
17	1:2	Cu(OAc) ₂ (5)	DIPEA (4)	PhCF ₃	25	trace	12	n.d.
18	1:2	Pd(OAc) ₂ (5)	DIPEA (4)	PhCF ₃	25	n.d.	70	trace
19	1:2	Rh ₂ (esp) ₂ (1)	DIPEA (4)	PhCF ₃	25	n.d.	88	5
20	1:2	Rh ₂ (OAc) ₄ (1)	DIPEA (4)	PhCF ₃	25	n.d.	92	trace

Supplementary Table 1. Optimization of molecular editing of *N*-unprotected indoles with fluoroalkyl carbenes generated from fluoroalkyl *N*-triflylhydrazone. Reactions were performed on 0.3 mmol scales. ^{*}Yield of the isolated product.

General Procedure: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-triflylhydrazones **2**, base, 5-bromo-1*H*-indole, the corresponding catalyst, and dry solvent (3 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, the reaction was continued for an additional *t* h at *T* °C. When the reaction was completed, and filtered through a short pad of silica gel with DCM as an eluent. After removal of the solvent under vacuum, the yields of product were determined by isolated.

2.2 Optimization of Cyclopropanation



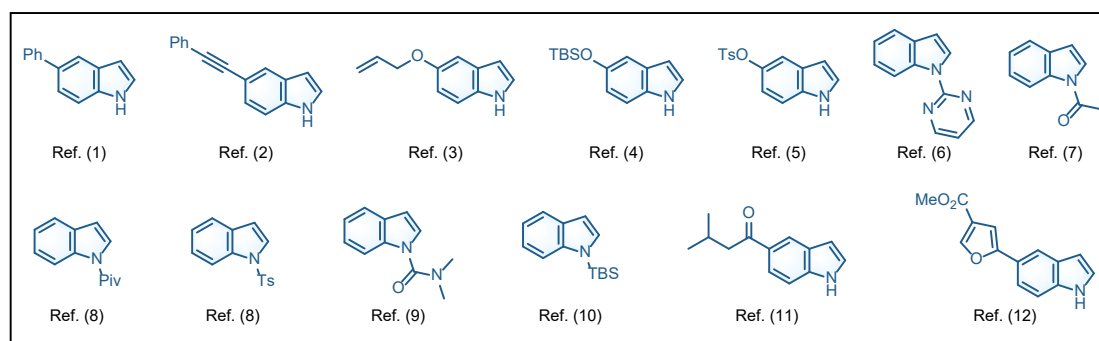
Entry	deviation from standard conditions	yield*
1	none	97%
2	TP ^{Br3} Ag instead of Rh ₂ (OAc) ₄	92%
3	Pd(OAc) ₂ instead of Rh ₂ (OAc) ₄	65%
4	Cs ₂ CO ₃ instead of NaH	85%
5	DCM instead of PhCF ₃	81%
6	DCE instead of PhCF ₃	79%
7	40 °C instead of 60 °C	71%

Supplementary Table 2. Reaction conditions: *N*-Methylindole (0.6 mmol), **1** (0.3 mmol), Base (2.0 equiv), Cat. [M], and solvent (3 mL) under an argon atmosphere for 12 hours. *Yield of the isolated product.

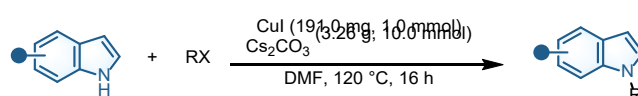
General Procedure: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-trifosylhydrazones **1** (0.3 mmol), base (2.0 equiv), *N*-methylindole (2.0 equiv), the corresponding catalyst, and dry solvent (3 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, the reaction was continued for an additional 12 h at 60 °C. When the reaction was completed, and filtered through a short pad of silica gel with DCM as an eluent. After removal of the solvent under vacuum, the yields of product **139** were determined by isolated.

3. Preparation of Starting Material

Indoles employed in this work were either commercially available, (used as received from commercial sources) or prepared according to literature procedures as described below.

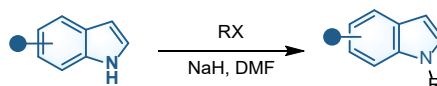


General Preparation of *N*-Aryl-Protected Indoles¹³



General Procedure I: A mixture of indoles (7.0 mmol, 1.4 equiv), aryl halides (5.0 mmol, 1.0 equiv), CuI (1.0 mmol, 20.0 mol%), Cs₂CO₃ (10.0 mmol, 2.0 equiv) in DMF (10 mL) was vigorously stirred at 120 °C under nitrogen atmosphere for 16 h. After cooling the mixture to ambient temperature, the reaction mixture was diluted with EtOAc and washed with brine. The aqueous phase was extracted with EtOAc, and dried over anhydrous Na₂SO₄. After filtration and evaporation of the solvents in vacuo, the crude product was purified by column chromatography on silica gel (petroleum ether) to give the corresponding *N*-aryl-protected indoles.

General Preparation of *N*-Alkyl-Protected Indoles¹³

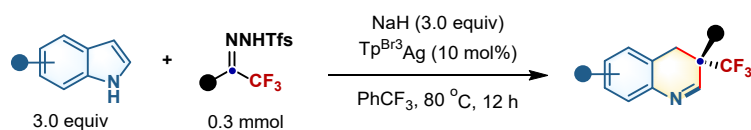


General Procedure II: To a suspended solution of NaH (15.0 mmol, 60 wt% dispersion in mineral oil, 1.5 equiv) in DMF (5 mL), indoles (10.0 mmol, 1.0 equiv) in DMF (5 mL) was added dropwise at 0 °C. The heterogeneous mixture was stirred at 0 °C for 15 min and 1 h at ambient temperature. The mixture was then cooled to 0 °C, treated with alkyl halides (13.0 mmol, 1.3 equiv), and allowed to warm to room temperature. After 30 min, the reaction mixture was cooled to 0 °C, quenched with saturated NH₄Cl, and extracted with EtOAc. The organic layers was washed with brine, dried over anhydrous Na₂SO₄ and concentrated in vacuo. The resulting oil was purified by column chromatography on silica gel (petroleum ether) afforded the corresponding *N*-alkyl-protected indoles.

N-Triftosylhydrazones were prepared according to literature procedure¹⁴.

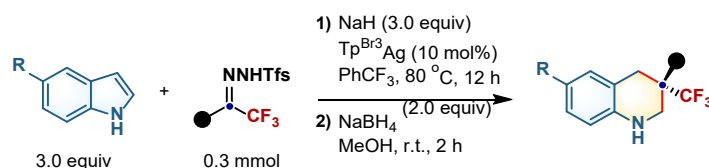
4. Substrate Scope

4.1 General Procedure of Carbon-Atom Insertion into Indole Skeletons



General Procedure A: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-triflylhydrazones (0.3 mmol, 1.0 equiv), NaH (36.0 mg, 0.9 mmol, 3.0 equiv, 60 wt% dispersion in mineral oil), indoles (0.9 mmol, 3.0 equiv), $\text{Tp}^{\text{Br}^3}\text{Ag}$ (36.0 mg, 10 mol%) (or $\text{Rh}_2(\text{esp})_2$ (1 mol%)) and dry PhCF_3 (3.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, the reaction was continued for an additional 12 h at 80 °C. When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the residue was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to obtain the quinolines products.

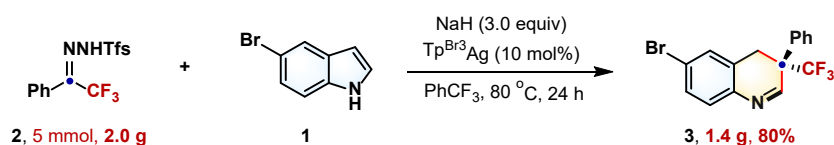
4.2 General Procedure of Two-step, One-pot Process to Access Tetrahydroquinolines



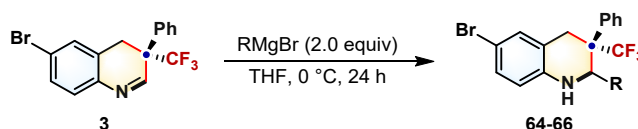
General Procedure B : (1) To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-triflylhydrazones (0.3 mmol, 1.0 equiv), NaH (36.0 mg, 0.9 mmol, 3.0 equiv, 60 wt% dispersion in mineral oil), indoles (0.9 mmol, 3.0 equiv), $\text{Tp}^{\text{Br}^3}\text{Ag}$ (36.0 mg, 10 mol%) and dry PhCF_3 (3.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, the reaction was continued for an additional 12 h at 80 °C. When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the residue was used in next step without further purification.

(2) According to literature procedures¹⁵, the residue of step (1) in methanol (3.0 ml) was stirred at ambient temperature before NaBH_4 (22.7 mg, 0.6 mmol, 2.0 equiv) was added in one portion. The mixture was stirred for additional 1-2 h. When the reaction was completed, a saturated aqueous solution of sodium bicarbonate (0.1 ml) was added and extracted with EtOAc. The combined organic layers were washed with brine, dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to afford the tetrahydroquinolines.

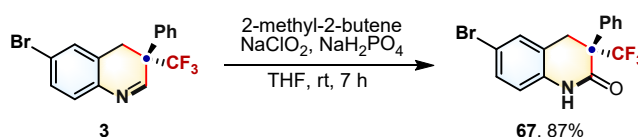
4.3 Gram-Scale Reaction and Synthetic Derivatization of compound 3



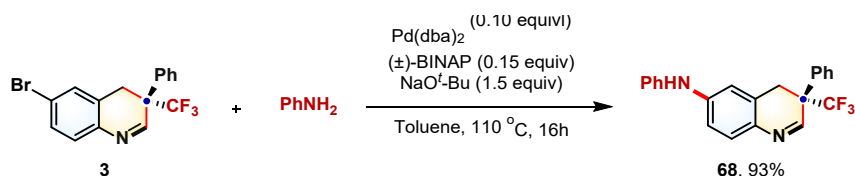
Gram-Scale Experiment: To an oven-dried 250 mL Schlenk tube equipped with a Teflon-coated magnetic stir bar were added *N*-trifosylhydrazones **2** (2.0 g, 5.0 mmol, 1.0 equiv), NaH (0.4 g, 2.0 equiv, 60 wt% dispersion in mineral oil), and dry PhCF_3 (50 mL) inside a glove box with nitrogen atmosphere. The reaction mixture was stirred at ambient temperature, and 5-bromo-1*H*-indole (1.96 g, 10.0 mmol, 2.0 equiv), $\text{Tp}^{\text{Br}^3}\text{Ag}$ (0.6 g, 10 mol%) were added in follow 15 min. After transfer out of the glove box, the reaction was continued for an additional 24 h at 80 °C. When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the residue was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to obtain the product **3** (1.4 g, 80%) as a white solid.



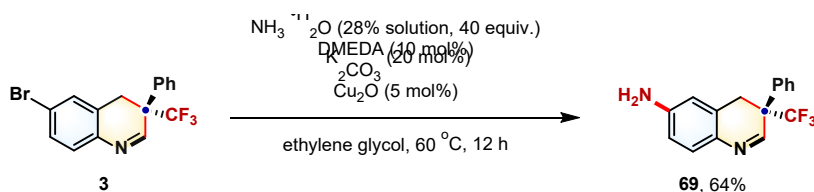
General Procedure C: According to literature procedures¹⁶, compound **3** (105.9 mg, 0.3 mmol) was dissolved in dry THF (3.0 mL) and RMgBr (0.3 mL of a 1.0 M solution in THF, 0.3 mmol, 1.0 equiv) was added in at 0 °C under inert gas atmosphere. The reaction mixture was stirred at 0 °C for additional 12 h. The reaction was quenched with saturated NH_4Cl , extracted with EtOAc and the combined organic layers were washed with brine, dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by flash chromatography on silica gel (using petroleum ether/EtOAc as eluent) to afford the corresponding products.



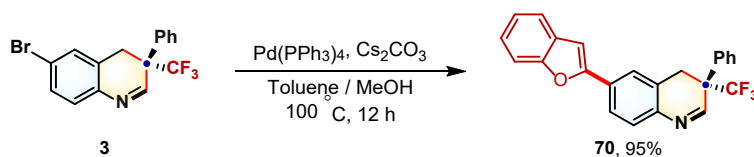
General Procedure D: According to literature procedures¹⁵, 2-methyl-2-butene (330 μL , 3.0 mmol, 10.0 equiv) and sodium chlorite (80%, 169.5 mg, 1.5 mmol, 5.0 equiv) was added to a solution of compound **3** (105.9 mg, 0.3 mmol) in THF (3.0 mL). The mixture was stirred for 10 min before an aqueous solution of sodium dihydrogen phosphate (1 M, 450 μL , 0.45 mmol, 1.5 equiv) was added dropwise at ambient temperature. When the reaction was completed, removing the solvent before EtOAc was added. The organic phase was washed with aqueous solution of sodium thiosulfate (10%) and brine, dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The crude product was purified by flash chromatography on silica gel (using petroleum ether/EtOAc as eluent) to afford the product **67** (87%).



Procedure E: According to literature procedures¹⁷, to a round bottom flask was equipped with Pd(dba)_2 (17.4 mg, 10 mol%), $(\pm)\text{-BINAP}$ (27.9 mg, 15 mol%) and NaOt-Bu (0.45 mmol, 1.5 equiv) and placed under inert atmosphere. A solution of **3** (0.3 mmol, 1.0 equiv) in dry toluene was added followed by the aniline (0.33 mmol, 1.1 equiv). The resulting mixture was stirred and heated at 110 °C until the reaction was completed (16 h). The reaction mixture was then allowed to cool to ambient temperature, diluted with DCM (5 mL) and the solids were removed by filtration through Celite. The solids were washed with DCM (2×5 mL) and the filtrate was evaporated under reduced pressure to afford the crude product. The crude was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to obtain the product **68** (93%).

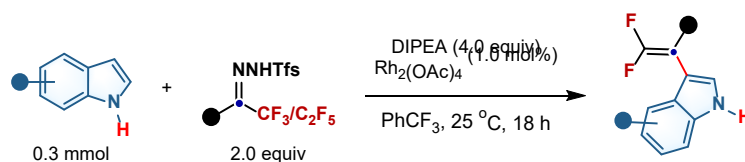


Procedure F: According to literature procedures¹⁸, to a round bottom flask was equipped with Cu_2O (3.6 mg, 0.025 mmol, 5 mol%), **3** (0.3 mmol), $\text{NH}_3 \cdot \text{H}_2\text{O}$ (0.62 mL, 10 mmol, 20 equiv, 28% solution), K_2CO_3 (14 mg, 0.1 mmol, 20 mol%), DMEDA (5.4 μL , 0.05 mmol, 10 mol%) and ethylene glycol (1 mL). The resulting mixture was stirred and heated at 60 °C until the reaction was completed (16 h). The reaction mixture was extracted with EtOAc (4×5 mL), and the combined organic phases were washed with brine (10 mL), dried over MgSO_4 , filtrated and concentrated under reduced pressure to afford the crude. The crude was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to obtain the product **69** (64%).

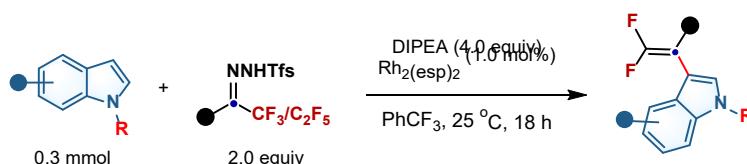


Procedure G: According to literature procedures¹⁹, to a round bottom flask was equipped with **3** (0.3 mmol), benzofuran-2-ylboronic acid (0.45 mmol, 1.5 equiv), $\text{Pd(PPh}_3)_4$ (0.03 mmol, 10 mol%), and Cs_2CO_3 (0.42 mmol, 1.4 equiv), which toluene (2.0 mL) and methanol (0.5 mL) were subsequently added into. Then, the reaction mixture was heated at 100 °C until the reaction was completed (12 h). The reaction mixture was then cooled to ambient temperature and quenched with saturated NH_4Cl solution. Aqueous phase was extracted with EtOAc (10 mL $\times 3$), and the combined organic phases were washed with brine (10 mL), dried over Na_2SO_4 , filtrated and concentrated under reduced pressure to afford the crude furan or benzofuran derivatives. The crude was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to obtain the product **70** (95%).

4.4 General Procedures of C–H *gem*-Difluoroolefination

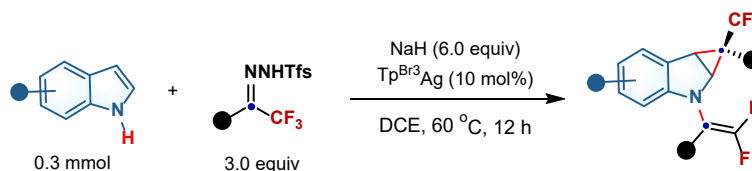


General Procedure H: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-trifosylhydrazones (0.6 mmol, 2.0 equiv), dry PhCF_3 (3.0 mL) and DIPEA (1.2 mmol, 4.0 equiv) inside a glove box with nitrogen atmosphere. Then, *N*-unprotected indoles (0.3 mmol, 1.0 equiv) and $\text{Rh}_2(\text{OAc})_4$ (1 mol%) were added and the vial was sealed. After transfer out of the glove box, the reaction was continued for an additional 18 h at 25 °C. When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with trimethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the residue was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to obtain the *gem*-difluoroolefination products.



General Procedure I: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-trifosylhydrazones (0.6 mmol, 2.0 equiv), dry PhCF_3 (3.0 mL) and DIPEA (1.2 mmol, 4.0 equiv) inside a glove box with nitrogen atmosphere. Then, *N*-protected indoles (0.3 mmol, 1.0 equiv) and $\text{Rh}_2(\text{esp})_2$ (1 mol%) were added and the vial was sealed. After transfer out of the glove box, the reaction was continued for an additional 18 h at 25 °C. When the reaction was completed, and filtered through a short pad of silica gel with DCM as an eluent. After removal of the solvent under vacuum, the residue was purified by flash chromatography on silica gel (using petroleum ether/EtOAc as eluent) to obtain the *gem*-difluoroolefination products.

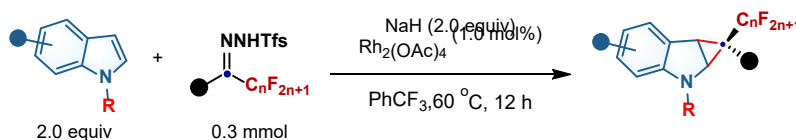
4.5 General Procedure of Tandem Cyclopropanation and N–H *gem*-Difluoroolefination



General Procedure J: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-trifosylhydrazones (0.9 mmol, 3.0 equiv), NaH (108.0 mg, 1.8 mmol, 3.0 equiv, 60 wt% dispersion in mineral oil), indoles (0.3 mmol, 1.0 equiv), $\text{Tp}^{\text{Br}^3}\text{Ag}$ (10 mol%) and dry DCE (3.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, the reaction was continued for an additional 12 h at 80 °C. When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After

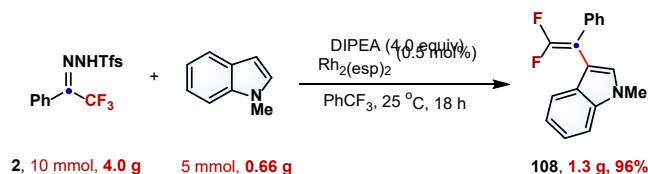
removal of the solvent under vacuum, the residue was purified by flash chromatography on silica gel (pre-neutralized with trimethylamine, using petroleum ether/EtOAc as eluent) to obtain the corresponding products.

4.6 General Procedure of Cyclopropanation

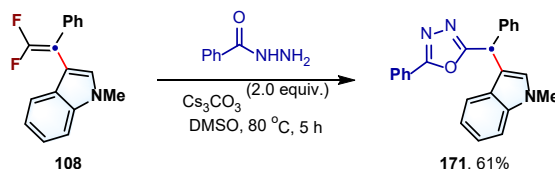


General Procedure K: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-triflylhydrazones (0.3 mmol, 1.0 equiv), dry PhCF₃ (3.0 mL) and NaH (2.0 equiv, 60 wt% dispersion in mineral oil) inside a glove box with nitrogen atmosphere. Then, *N*-protected indoles (0.6 mmol, 2.0 equiv) and Rh₂(OAc)₄ (1 mol%) were added and the vial was sealed. After transfer out of the glove box, the reaction was continued for an additional 12 h at 60 °C. When the reaction was completed, and filtered through a short pad of silica gel with DCM as an eluent. After removal of the solvent under vacuum, the residue was purified by flash chromatography on silica gel (using petroleum ether/EtOAc as eluent) to obtain the cyclopropanation products.

4.7 Gram-Scale Reaction and Synthetic Derivatization of compound **108**



Gram-Scale Experiment: An oven-dried 250 mL Schlenk tube containing a stir bar was charged with *N*-triflylhydrazones (3.96 g, 10 mmol, 2.0 equiv), dry PhCF₃ (50.0 mL) and DIPEA (7.0 mL, 2 mmol, 4.0 equiv) in an argon-filled glovebox. Then, *N*-protected indoles (0.66 g, 5.0 mmol, 1.0 equiv) and Rh₂(esp)₂ (0.5 mol%) were added and the vial was sealed. After transfer out of the glove box, the reaction was continued for an additional 18 h at 25 °C. When the reaction was completed, and filtered through a short pad of silica gel with DCM as an eluent. After removal of the solvent under vacuum, the residue was purified by flash chromatography on silica gel (using petroleum ether/EtOAc as eluent) to obtain the *gem*-difluoroolefin products **108** (1.3 g, 96%) as an orange oil.



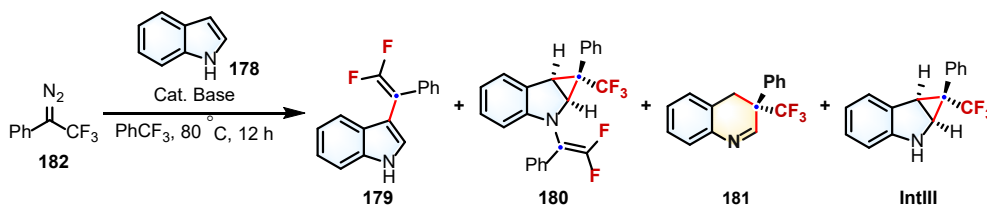
Procedure L: According to literature procedures²⁰, a screw capped reaction vial was charged with benzoyl hydrazine (49.0 mg, 1.2 equiv, 0.36 mmol) and Cs₂CO₃ (196 mg, 2.0 equiv, 0.6 mmol). Then the reaction vial was repeatedly purged with argon, and added DMSO (3.0 mL) and compound **108** (81 mg, 1.0 equiv, 0.3 mmol) with syringe. The mixture was stirred at 80 °C for 5h. When the reaction was completed, the reaction was allowed to cool to ambient temperature. After completion of the reaction, the mixture was diluted with EtOAc, washed with brine, dried over anhydrous Na₂SO₄, filtered and the

solvent was evaporated under reduced pressure to leave a crude product, which was purified by flash column chromatography on basic (using petroleum ether/EtOAc as eluent) to afford the product **171** (61%).

5. Mechanistic Considerations

5.1 Control Experiment

5.1.1 Diazo As Carbene Precursors Instead of *N*-Triftosylhydrazones

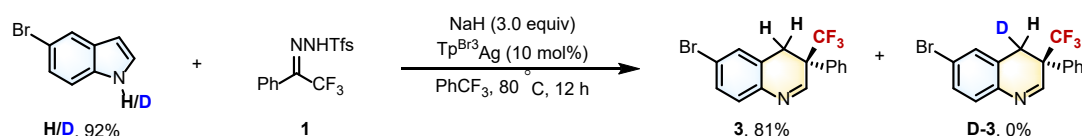


Entry	178 : 182	Cat. M (x mol%)	Base (3.0 equiv)	179 yield (%)*	180 yield (%)*	181 yield (%)*	IntIII yield (%)*
1	3 : 1	Tp ^{Br3} Ag (thf) (10)	--	0%	22%	0%	30%
2	3 : 1	Tp ^{Br3} Ag (thf) (10)	NaH	0%	0%	80%	0%
3	3 : 1	Tp ^{Br3} Ag (thf) (10)	DIPEA	40%	0%	<10%	0%
4	3 : 1	Rh ₂ (OAc) ₄ (1)	DIPEA	51%	10%	5%	0%
5	1 : 1	Tp ^{Br3} Ag (thf) (10)	NaH	0%	20%	10%	26%

Supplementary Table 3. Reaction conditions: Indole **178**, **182**, base (3.0 equiv), Cat. [M], and PhCF₃ (3 mL) under an argon atmosphere for 12 h at 80 °C. Reactions were performed on 0.3 mmol scales. *Yields were analyzed by ¹H NMR spectroscopy with dibromomethane as an internal standard.

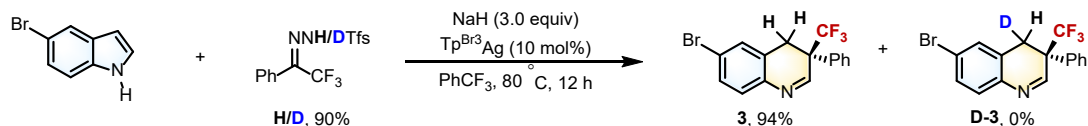
General Procedure: To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added base (0.9 mmol, 3.0 equiv), indole **178**, corresponding Catalyst, and dry PhCF₃ (2.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, (1-diazo-2,2,2-trifluoroethyl)benzene in PhCF₃ (1.0 mL) was added dropwise under stirring in 2 h under argon atmosphere via a syringe pump at ambient temperature. Then the reaction was then continued for additional 12 h at 80 °C. When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the yields of product was analyzed by ¹H NMR spectroscopy with dibromomethane as an internal standard.

5.1.2 Deuterium-Labeling Experiments

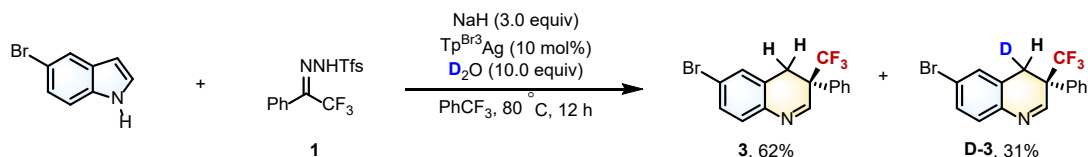


(a) To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-triftosylhydrazones **1** (118.8 mg, 0.3 mmol, 1.0 equiv), NaH (36.0 mg, 0.9 mmol, 3.0 equiv, 60 wt% dispersion in mineral oil), deuterium 5-bromo-1H-indole (176.4 mg, 0.9 mmol, 3.0 equiv), Tp^{Br3}Ag (36.0 mg, 10 mol%) and dry PhCF₃ (3.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, the reaction was continued for an additional 12 h at 80 °C. When

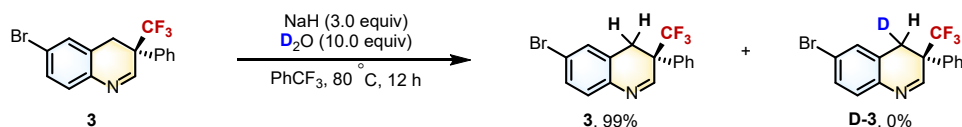
the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the yields of product **3** and **D-3** was analyzed by ^1H NMR spectroscopy with dibromomethane as an internal standard..



(b) To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added deuterium *N*-trifosylhydrazones **D-1** (118.8 mg, 0.3 mmol, 1.0 equiv), NaH (36.0 mg, 0.9 mmol, 3.0 equiv, 60 wt% dispersion in mineral oil), 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol, 3.0 equiv), $\text{Tp}^{\text{Br}^3}\text{Ag}$ (36.0 mg, 10 mol%) and dry PhCF_3 (3.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, the reaction was continued for additional 12 h at 80°C . When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the yields of product **3** and **D-3** was analyzed by ^1H NMR spectroscopy with dibromomethane as an internal standard..



(c) To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added *N*-trifosylhydrazones **1** (118.8 mg, 0.3 mmol, 1.0 equiv), NaH (36.0 mg, 0.9 mmol, 3.0 equiv, 60 wt% dispersion in mineral oil), 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol, 3.0 equiv), $\text{Tp}^{\text{Br}^3}\text{Ag}$ (36.0 mg, 10 mol%) and dry PhCF_3 (3.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, D_2O (60.0 μL , 10.0 equiv) was added into the reaction mixture and the reaction was then continued for additional 12 h at 80°C . When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the yields of product **3** and **D-3** was analyzed by ^1H NMR spectroscopy with dibromomethane as an internal standard..



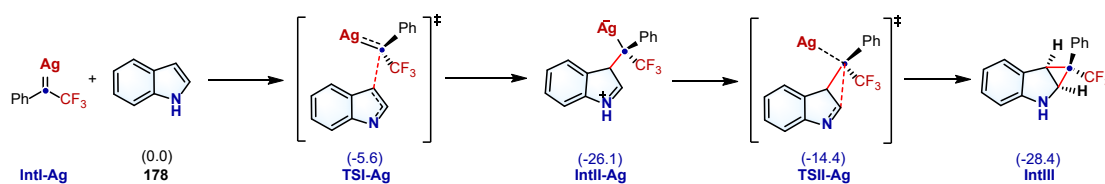
(d) To an oven-dried screw-cap reaction tube equipped with a Teflon-coated magnetic stir bar were added compound **3** (105.9 mg, 0.3 mmol, 1.0 equiv), NaH (36.0 mg, 0.9 mmol, 3.0 equiv, 60 wt% dispersion in mineral oil), $\text{Tp}^{\text{Br}^3}\text{Ag}$ (36.0 mg, 10 mol%) and dry PhCF_3 (3.0 mL) inside a glove box with nitrogen atmosphere. After transfer out of the glove box, D_2O (60.0 μL , 10.0 equiv) was added into the reaction mixture and the reaction was then continued for additional 12 h at 80°C . When the reaction was completed, and filtered through a short pad of silica gel (pre-neutralized with triethylamine) with DCM as an eluent. After removal of the solvent under vacuum, the yields of product **3** and **D-3** was analyzed by ^1H NMR spectroscopy with dibromomethane as an internal standard.

5.3 Computational Details

Theoretical methodology:

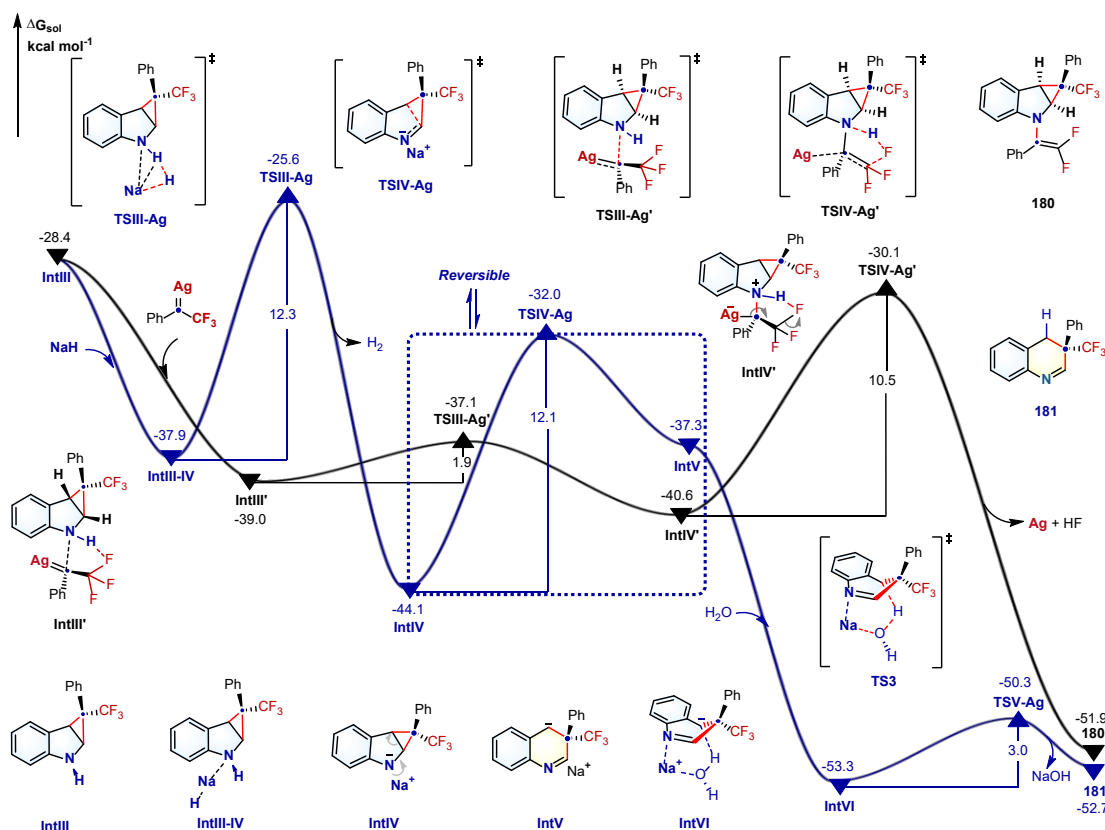
All of the DFT calculations conducted in this study were carried out with Gaussian16 package²¹. DFT method B3LYP^{22,23} with a standard 6-31G(d,p)²⁴⁻²⁶ basis set (SDD²⁷ basis set for Ag and Br atoms) was used for the geometry optimizations in solution phase (solvent = dichloromethane) with SMD solvent model²⁸. As the dielectric constant of dichloromethane (DCM) is similar to the actual solvent (trifluorotoluene) that was used in the experimental condition. Intrinsic Reaction Coordinate (IRC)^{29,30} calculations were performed followed by subsequent optimization of the end points with the previously mentioned optimization method. Gibbs free and other energies have been assessed through single-point solvation energy calculations evaluated at B3LYP-D3(BJ)³¹/6-31+G(d,p)^{32,33} level (SDD for Ag and Br) with the SMD implicit continuum solvent model (solvent = dichloromethane). Computed structures were illustrated using CYLview visualization software³⁴.

Silver-catalyzed cyclopropanation of indoles:



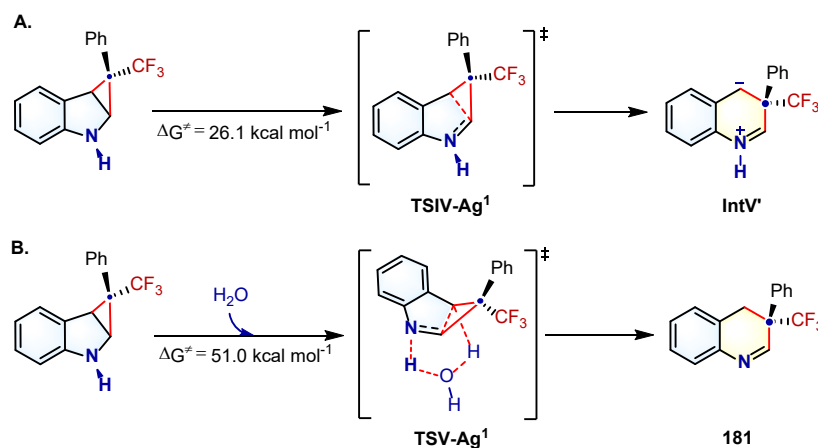
Supplementary Fig. 1. Reaction pathway for silver-catalyzed cyclopropanation of indoles in stepwise mechanism, values in parentheses represent relative gibbs free energies and the unit is kcal mol⁻¹.

Silver-catalyzed skeletal- or peripheral editing:



Supplementary Fig. 2. Proposed reaction pathway for silver-catalyzed skeletal- or peripheral editing. Curve in blue represent carbon-atom insertion process, and the curve in black represent difunctionalization of indoles.

Other possible reaction pathways of ring-opening process:



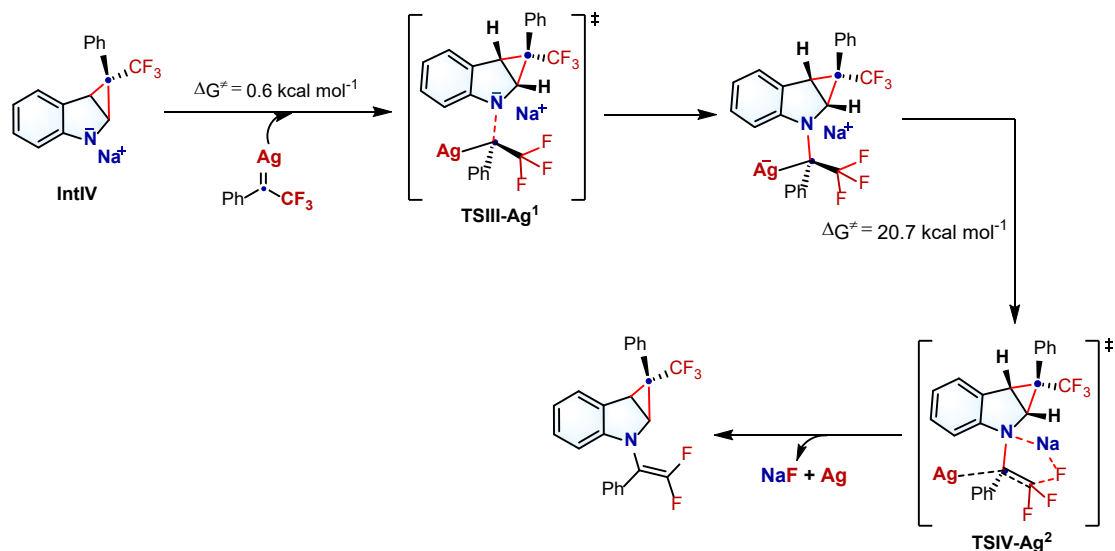
Supplementary Fig. 3. A. Ring-opening process with reservation of N-ligated H atom. B. C-C insertion through direct 1,3-H transfer with assistance of water.

Abstraction of N-ligated H atom in cyclopropane **IntIII** by NaH is premise for a kinetically favorable ring opening process. On the one hand, calculation has demonstrated that elimination of H atom enhances C2-C3 bond polarity, thus the bond is easier to break. In comparison, when ring-opening occurs directly from cyclopropane **IntIII** that reserved the H atom, the C2-C3 bond polarity is smaller and becomes harder to break ($\Delta G^\ddagger = 26.1 \text{ kcal mol}^{-1}$ vs $\Delta G^\ddagger = 12.1 \text{ kcal mol}^{-1}$; $2.51 \text{ \AA}$ vs $2.53 \text{ \AA}$); On the other hand, the sodium cation in formed intermediate **IntIV** could stabilize the carbanion while in

unstable zwitterionic intermediate **IntV'**, there is no such stabilization and the **IntV'** is easier back to cyclopropane intermediate **IntIII**.

We have also calculated the carbon-atom insertion process through direct 1,3-proton transfer with assistance of one molecular of water. The process is kinetically unfavorable ($\Delta G^\ddagger = 51.0 \text{ kcal mol}^{-1}$).

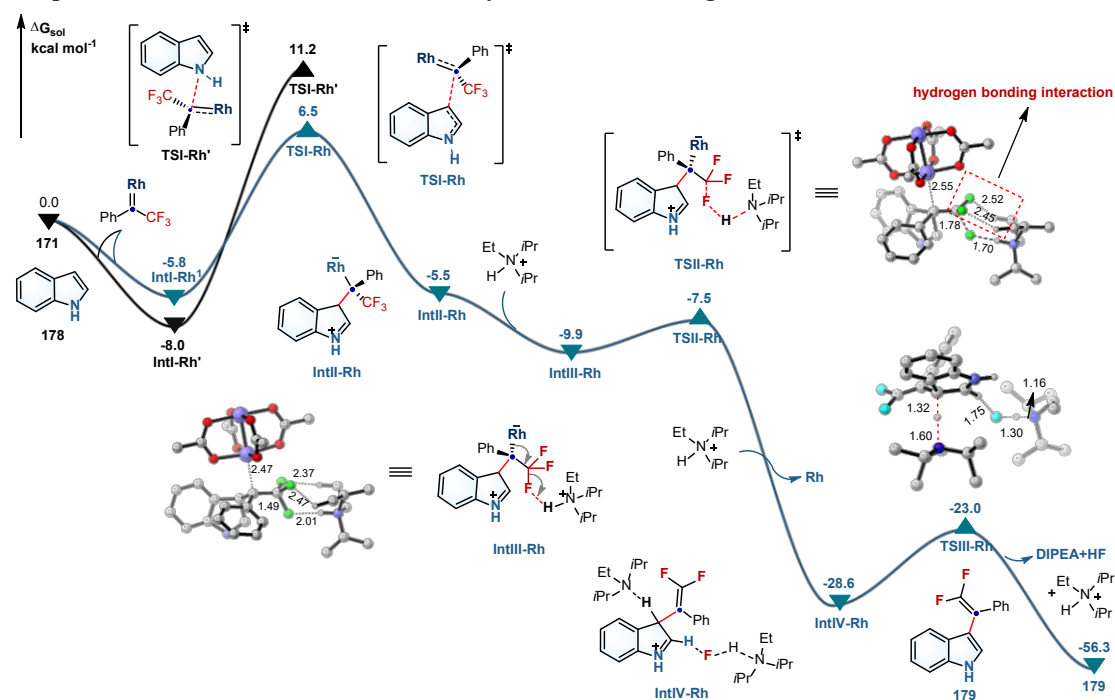
Other possible pathways for difunctionalized product formation:



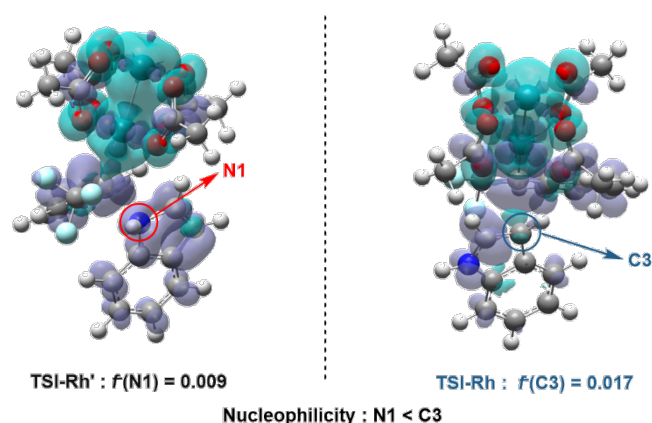
Supplementary Fig. 4. Silver-catalyzed difunctionalization of indoles from **N-Na⁺** adduct.

We have also calculated the difunctionalization of indoles from **N-Na⁺** adduct **IntIV**, which is kinetically unfavorable with the difunctionalization of indoles from cyclopropane intermediate **IntIII** ($\Delta G^\ddagger = 20.7 \text{ kcal mol}^{-1}$ vs $\Delta G^\ddagger = 10.5 \text{ kcal mol}^{-1}$), thus this pathway is excluded.

Proposed reaction mechanism of Rh-catalyzed skeletal-editing of indoles.



Supplementary Fig. 5. Rhodium-catalyzed *gem*-difluoroolefination of indoles.



Supplementary Fig. 6. Fukui function analysis for **TSI-Rh** and **TSI-Rh'**.

For rhodium-catalyzed skeletal-editing of indoles, the DFT calculations were performed and start with Indole **178**, which involves a tandem Friedel-Crafts-type addition and β -F elimination sequence. Rhodium carbene adds electrophilically onto the C3 position of indole **178** to give a dearomatized zwitterion intermediate **IntII-Rh** via transition state **TSI-Rh**, with an energy barrier of 12.3 kcal mol⁻¹. Subsequently, one molecule of DIPEAH⁺ assisted β -F elimination of intermediate **IntII-Rh** via **TSII-Rh** occurs and generates **InIV-Rh**, which requires a relatively low activation free energy ($\Delta G^\ddagger = 2.4$ kcal mol⁻¹). The geometry-optimized structures analysis indicates that a strong hydrogen-bonding interaction exists (C–H $\cdots$ F, N–H $\cdots$ F) in **TSII-Rh**, which is beneficial to stabilize the transition state and reduce the energy barrier of β -F elimination, as demonstrated by the small changes in bond length from **IntII-Rh** to **TSII-Rh** (0.02 Å, 0.29 Å, and 0.15 Å, respectively). The **InIV-Rh** is deprotonated via **TSIII-Rh** ($\Delta G^\ddagger = 5.6$ kcal mol⁻¹) with the help of DIPEA to yield the final *gem*-difluoroolefination product **179** with the release of rhodium catalyst. For comparison, the electrophilic addition of the Rh-carbene intermediate **IntI-Rh** onto the N1 position of indole **178** was also calculated, which required a relatively higher activation free energy ($\Delta G^\ddagger = 19.2$ kcal mol⁻¹) than that of indole C3-H ($\Delta G^\ddagger = 12.3$ kcal mol⁻¹) and was thus excluded. This is most likely because the indole C3 position (green) is more nucleophilic than the N1 position (purple), as demonstrated by the Fukui Function analysis of transition states **TSI-Rh** and **TSI-Rh'** (0.017 vs 0.009)^{35,36}. Finally, the β -F elimination and cyclopropanation pathways were compared. The results show that the relative free energy of each intermediate and transition state in the β -F elimination pathway is lower than in cyclopropanation pathway.

The calculations demonstrated that the β -F elimination is the most favorable pathway in this process, in which the weakly coordinating DIPEA plays a critical role in β -F elimination and deprotonation through hydrogen-bonding interactions. This result is consistent with the experimental observation that only C3-H *gem*-difluoroolefination product was obtained.

Cartesian coordinates of the stationary points located:

IntI-Ag

Zero-point correction=

0.222724 (Hartree/Particle)

Thermal correction to Energy=	0.266182
Thermal correction to Enthalpy=	0.267126
Thermal correction to Gibbs Free Energy=	0.126630
Sum of electronic and zero-point Energies=	-1680.958846
Sum of electronic and thermal Energies=	-1680.915388
Sum of electronic and thermal Enthalpies=	-1680.914444
Sum of electronic and thermal Free Energies=	-1681.054940

C	-0.50994800	-2.13878600	-2.21053200
C	-1.85051200	-2.25384700	-2.60500600
C	-2.51139800	-1.35648200	-1.78147900
N	-1.61079200	-0.76110500	-0.96239800
N	-0.36137300	-1.24905300	-1.23884600
Br	-4.38428900	-0.97719900	-1.77621900
Br	-2.59677800	-3.38308300	-3.94955300
Br	0.97981500	-3.12381300	-2.89356300
C	0.13633300	3.09454100	-0.80718300
C	-1.01683700	3.81586300	-0.47058000
C	-1.89734000	2.83867800	-0.03107100
N	-1.29200500	1.62943100	-0.10970000
N	-0.02406300	1.79583100	-0.59134500
Br	-3.67967200	3.10818300	0.60059300
Br	-1.31504300	5.69580000	-0.59400700
Br	1.77585000	3.78788300	-1.50651700
C	0.36235700	-1.02940000	2.81889900
C	-0.83643700	-1.34813200	3.47425400
C	-1.81186400	-0.89535900	2.60128100
N	-1.21147300	-0.34740700	1.51564700
N	0.14716200	-0.43397900	1.65654500
Br	-3.70480800	-1.00427400	2.84786600
Br	-1.07566600	-2.19455000	5.16788800
Br	2.13894400	-1.37927000	3.44626600
B	-1.85794300	0.21872800	0.22154900
Ag	1.57894900	0.05075900	-0.50023300
C	4.65009700	0.46905000	0.16545700
C	4.20870500	1.10924800	1.36816600
C	5.11201600	1.55796500	2.31506500
C	6.48270900	1.34336900	2.11522400
C	6.95244300	0.69314000	0.96197000
C	6.06245600	0.27557300	-0.00847700
H	3.14367500	1.26009700	1.50719000
H	4.76362100	2.06414100	3.20921700
H	7.19301400	1.68290800	2.86353000
H	8.01651300	0.52638800	0.83112700

H	6.44031000	-0.22316200	-0.89134000
C	3.66238900	0.07614600	-0.76667200
H	-3.02335100	0.31661200	0.39189900
C	4.14785000	-0.37711700	-2.13169600
F	3.14540900	-0.42651100	-3.03548200
F	5.09012200	0.43283000	-2.67408900
F	4.66925500	-1.62601400	-2.04593200

Intl-Ag'

Zero-point correction=	0.347549 (Hartree/Particle)
Thermal correction to Energy=	0.393403
Thermal correction to Enthalpy=	0.394348
Thermal correction to Gibbs Free Energy=	0.253119
Sum of electronic and zero-point Energies=	-1935.148405
Sum of electronic and thermal Energies=	-1935.102551
Sum of electronic and thermal Enthalpies=	-1935.101606
Sum of electronic and thermal Free Energies=	-1935.242835

F	2.11101300	1.76255500	-2.78661400
F	3.80223200	2.92668300	-2.13071200
C	3.13686300	1.76835000	-1.91811500
C	3.57426600	1.93058800	0.54482100
C	2.67272700	1.56288200	-0.48595500
C	3.06493900	1.97464600	1.88011300
H	2.01859000	1.73603700	2.03382800
C	3.87100300	2.33807000	2.94408600
H	3.46223700	2.38978100	3.94762900
C	4.96012300	2.23979400	0.35038700
H	5.39575400	2.19449600	-0.63776000
C	5.22559000	2.61581400	2.71849300
H	5.86578800	2.87887800	3.55579000
C	5.76897200	2.55213000	1.42745800
H	6.82498600	2.74410900	1.27134100
F	3.96988400	0.74552100	-2.27435200
C	8.40556000	0.37941900	-1.13770200
C	9.07202500	-0.14938000	-0.01269700
C	8.47059500	-1.10755100	0.79373400
C	7.17275200	-1.55025100	0.48182000
C	6.51763700	-0.99931300	-0.65723000
C	7.12219600	-0.03713700	-1.47610600
H	8.90616700	1.11913200	-1.75593200
H	10.07526100	0.19594800	0.22004400
H	8.99590400	-1.51139100	1.65504500

H	6.61098800	0.36167300	-2.34723800
C	6.26162000	-2.49412700	1.06891300
C	5.12471700	-2.48602500	0.30333900
H	4.21246000	-3.05594500	0.40727300
N	5.27347800	-1.59036500	-0.73865100
H	6.43436800	-3.10893300	1.94086800
H	4.56182900	-1.35665000	-1.41215800
C	0.05092700	-1.32900700	2.57194600
C	-1.02901300	-1.90353000	3.25814100
C	-2.11916600	-1.59659000	2.45957100
N	-1.69335400	-0.88824500	1.38338000
N	-0.33767800	-0.72032000	1.46286300
Br	-3.94145400	-2.06622000	2.78750900
Br	-1.00880200	-2.87850600	4.89659700
Br	1.90099900	-1.39367500	3.06312100
C	-0.38018000	-1.59326800	-2.58825700
C	-1.52326600	-2.31970000	-2.95080600
C	-2.46166200	-1.94397800	-2.00265200
N	-1.89660400	-1.05565900	-1.14720800
N	-0.59795400	-0.83952400	-1.52126500
Br	-4.26890600	-2.55032200	-1.88733200
Br	-1.74118400	-3.53657600	-4.40179200
Br	1.32891700	-1.63014900	-3.44718900
C	-1.64036400	3.12403300	-0.13778000
C	-3.02728100	3.30560000	-0.05843500
C	-3.52149200	2.01371800	0.04969300
N	-2.48549500	1.13988200	0.03457300
N	-1.31772300	1.83892500	-0.08205600
Br	-5.35513500	1.50489600	0.19673800
Br	-4.00808200	4.93935200	-0.08988000
Br	-0.29768400	4.47490800	-0.30448400
B	-2.49501000	-0.41331200	0.13823100
Ag	0.74980900	0.76899000	-0.29494600
H	-3.61508600	-0.76970200	0.25043300

TSI-Ag

Zero-point correction=	0.347886 (Hartree/Particle)
Thermal correction to Energy=	0.395024
Thermal correction to Enthalpy=	0.395968
Thermal correction to Gibbs Free Energy=	0.251708
Sum of electronic and zero-point Energies=	-1935.144541
Sum of electronic and thermal Energies=	-1935.097403
Sum of electronic and thermal Enthalpies=	-1935.096459

Sum of electronic and thermal Free Energies= -1935.240719

F	2.12056800	-1.97834700	1.70174000
F	1.61722900	-2.95660300	-0.18426100
C	2.59501800	-2.26823900	0.46452700
C	3.77296200	-1.07403100	-1.46824400
C	2.88520800	-1.01322200	-0.33189200
C	3.72380700	0.00767700	-2.39348000
H	3.03832400	0.82452700	-2.19382300
C	4.50888200	0.02658100	-3.53697700
H	4.44270500	0.86168000	-4.22742300
C	4.68528500	-2.13170100	-1.75392000
H	4.76461000	-2.97639300	-1.08481800
C	5.38250200	-1.03568500	-3.79703700
H	5.99701200	-1.02687600	-4.69272200
C	5.46229400	-2.11169100	-2.90596800
H	6.13710700	-2.93711600	-3.11173800
F	3.59479400	-3.17466400	0.67624100
C	7.12543900	2.24233900	-1.00889000
C	5.93965500	2.95527000	-0.75128500
C	4.91403200	2.39702100	0.01038500
C	5.08320100	1.10525200	0.52800300
C	6.29145800	0.41383800	0.26100100
C	7.32204000	0.95653500	-0.50469500
H	7.90677200	2.70414700	-1.60513500
H	5.82663100	3.95958100	-1.14912300
H	4.00615000	2.95534000	0.21369800
H	8.23883100	0.40671600	-0.69338200
C	4.25863800	0.22218600	1.32270400
C	5.04396900	-0.90957000	1.58317800
H	4.82650000	-1.76775200	2.19931600
N	6.21463800	-0.81552900	0.91674900
H	3.35984400	0.48741400	1.85606100
H	6.93863200	-1.52302800	0.91766000
C	-0.31084900	3.17034400	-0.20860100
C	-1.43112400	3.84578300	0.28730300
C	-2.29404900	2.82247300	0.65016800
N	-1.71313700	1.63165800	0.37928600
N	-0.46859500	1.85238800	-0.14975800
Br	-4.02693500	3.02383400	1.42574200
Br	-1.71300700	5.72643400	0.42301200
Br	1.27444000	3.95123500	-0.93251500
C	-0.33528900	-0.75813400	3.38291500
C	-0.97733800	-1.99728900	3.23752100

C	-1.73832100	-1.82704200	2.09183600
N	-1.53410400	-0.57829600	1.60820100
N	-0.66132000	0.08895600	2.42278500
Br	-2.93735700	-3.08731100	1.29574100
Br	-0.84358000	-3.55261300	4.33823700
Br	0.87827900	-0.22574200	4.77432800
C	-1.24180200	-1.47807600	-2.53960300
C	-2.59775700	-1.38386200	-2.89021500
C	-3.17331600	-0.76261700	-1.79405000
N	-2.21069100	-0.52207100	-0.86994800
N	-1.00697500	-0.96580300	-1.34252600
Br	-5.01731600	-0.30489000	-1.57705300
Br	-3.45581300	-1.97761100	-4.48931100
Br	0.16968100	-2.23521400	-3.59103100
B	-2.31214800	0.19884300	0.49986300
Ag	1.11374000	0.21857200	-0.34412400
H	-3.46117000	0.29291400	0.79053200

IntII-Ag

Zero-point correction=	0.349645 (Hartree/Particle)
Thermal correction to Energy=	0.396617
Thermal correction to Enthalpy=	0.397561
Thermal correction to Gibbs Free Energy=	0.254813
Sum of electronic and zero-point Energies=	-1935.178615
Sum of electronic and thermal Energies=	-1935.131644
Sum of electronic and thermal Enthalpies=	-1935.130699
Sum of electronic and thermal Free Energies=	-1935.273447

C	-0.50994800	-2.13878600	-2.21053200
C	-1.85051200	-2.25384700	-2.60500600
C	-2.51139800	-1.35648200	-1.78147900
N	-1.61079200	-0.76110500	-0.96239800
N	-0.36137300	-1.24905300	-1.23884600
Br	-4.38428900	-0.97719900	-1.77621900
Br	-2.59677800	-3.38308300	-3.94955300
Br	0.97981500	-3.12381300	-2.89356300
C	0.13633300	3.09454100	-0.80718300
C	-1.01683700	3.81586300	-0.47058000
C	-1.89734000	2.83867800	-0.03107100
N	-1.29200500	1.62943100	-0.10970000
N	-0.02406300	1.79583100	-0.59134500
Br	-3.67967200	3.10818300	0.60059300
Br	-1.31504300	5.69580000	-0.59400700

Br	1.77585000	3.78788300	-1.50651700
C	0.36235700	-1.02940000	2.81889900
C	-0.83643700	-1.34813200	3.47425400
C	-1.81186400	-0.89535900	2.60128100
N	-1.21147300	-0.34740700	1.51564700
N	0.14716200	-0.43397900	1.65654500
Br	-3.70480800	-1.00427400	2.84786600
Br	-1.07566600	-2.19455000	5.16788800
Br	2.13894400	-1.37927000	3.44626600
B	-1.85794300	0.21872800	0.22154900
Ag	1.57894900	0.05075900	-0.50023300
C	4.65009700	0.46905000	0.16545700
C	4.20870500	1.10924800	1.36816600
C	5.11201600	1.55796500	2.31506500
C	6.48270900	1.34336900	2.11522400
C	6.95244300	0.69314000	0.96197000
C	6.06245600	0.27557300	-0.00847700
H	3.14367500	1.26009700	1.50719000
H	4.76362100	2.06414100	3.20921700
H	7.19301400	1.68290800	2.86353000
H	8.01651300	0.52638800	0.83112700
H	6.44031000	-0.22316200	-0.89134000
C	3.66238900	0.07614600	-0.76667200
H	-3.02335100	0.31661200	0.39189900
C	4.14785000	-0.37711700	-2.13169600
F	3.14540900	-0.42651100	-3.03548200
F	5.09012200	0.43283000	-2.67408900
F	4.66925500	-1.62601400	-2.04593200

TSII-Ag

Zero-point correction=	0.348572 (Hartree/Particle)
Thermal correction to Energy=	0.395334
Thermal correction to Enthalpy=	0.396278
Thermal correction to Gibbs Free Energy=	0.253766
Sum of electronic and zero-point Energies=	-1935.160041
Sum of electronic and thermal Energies=	-1935.113279
Sum of electronic and thermal Enthalpies=	-1935.112335
Sum of electronic and thermal Free Energies=	-1935.254847

F	2.60993100	-2.65468000	2.06702400
F	1.89635500	-3.02816300	0.03244700
C	2.98543000	-2.64212000	0.75988100
C	3.84897700	-1.11155200	-1.10776700

C	3.50584200	-1.30243600	0.33765700
C	3.61531400	0.11693900	-1.75797500
H	3.19375400	0.94374700	-1.19497700
C	3.91277700	0.29526900	-3.10932800
H	3.71470000	1.25427100	-3.57999900
C	4.41591500	-2.15031200	-1.87503700
H	4.63209200	-3.10561100	-1.41119800
C	4.44959100	-0.75521200	-3.85779300
H	4.67580600	-0.61995000	-4.91152000
C	4.69520000	-1.97911000	-3.23212300
H	5.12165000	-2.80433300	-3.79626800
F	3.84663500	-3.71537000	0.64275400
C	6.19160100	3.09202400	0.32551600
C	4.92590600	3.30271300	0.88881400
C	4.14028900	2.22129900	1.31035800
C	4.64643300	0.93556700	1.16146300
C	5.93649600	0.74656700	0.63225100
C	6.72310800	1.80527500	0.18864900
H	6.78171700	3.94487100	0.00302800
H	4.55169600	4.31558400	1.00281700
H	3.15751700	2.38777600	1.74181700
H	7.71240400	1.64234800	-0.22682500
C	4.09344000	-0.41355300	1.51391000
C	5.23695300	-1.29956000	1.30178200
N	6.24620400	-0.62090500	0.70617300
C	-0.98046100	-2.46898700	-1.76949600
C	-2.20046100	-3.07878600	-1.44327600
C	-2.81484000	-2.15351500	-0.61404200
N	-2.00273900	-1.08075300	-0.47079400
N	-0.85039100	-1.28495900	-1.18431700
Br	-4.52126600	-2.30905300	0.23116900
Br	-2.87821900	-4.76718600	-2.01959300
Br	0.35246300	-3.13439100	-2.96910900
C	-0.15423700	2.80439700	-1.32657500
C	-1.32268400	3.16249500	-2.01354200
C	-2.26209300	2.25769400	-1.54607800
N	-1.67288800	1.43495400	-0.64648900
N	-0.35137300	1.77232300	-0.51746000
Br	-4.09845900	2.14015100	-2.06262600
Br	-1.57547900	4.57137200	-3.27546600
Br	1.54649300	3.67649400	-1.43302300
C	-0.43403800	0.09580400	3.31135300
C	-1.58745400	0.67910500	3.85271500
C	-2.42361200	0.82218800	2.75717200

N	-1.79399000	0.34874000	1.65541400
N	-0.54853600	-0.10085600	2.00442400
Br	-4.18060100	1.57330400	2.75310600
Br	-1.93820100	1.15212200	5.66741200
Br	1.14507800	-0.40153700	4.27143100
B	-2.31201300	0.29392900	0.19053200
Ag	1.05179400	-0.30094600	0.14912700
H	-3.48664200	0.44681100	0.20827900
H	5.37060500	-2.31084200	1.65229800
H	3.50465200	-0.49386900	2.41982400
H	7.04629400	-1.05602900	0.26420900

IntIII

Zero-point correction=	0.241916 (Hartree/Particle)
Thermal correction to Energy=	0.257343
Thermal correction to Enthalpy=	0.258287
Thermal correction to Gibbs Free Energy=	0.198851
Sum of electronic and zero-point Energies=	-970.950505
Sum of electronic and thermal Energies=	-970.935078
Sum of electronic and thermal Enthalpies=	-970.934134
Sum of electronic and thermal Free Energies=	-970.993570

F	-4.65434200	2.38578800	2.24125700
F	-2.82059000	1.53362100	1.43104200
C	-4.03473600	2.03563900	1.09063700
C	-4.14765000	0.60297800	-0.96961400
C	-4.84759000	1.05782100	0.27801600
C	-3.39601400	-0.58886900	-0.98297900
H	-3.41721300	-1.24270700	-0.11857100
C	-2.70809700	-0.98508700	-2.14540100
H	-2.23749100	-1.96363700	-2.19002400
C	-4.20381600	1.37511800	-2.13252500
H	-4.77883300	2.29626200	-2.13188900
C	-2.76576700	-0.18098600	-3.30109400
H	-2.24211700	-0.49081700	-4.19965400
C	-3.51727200	0.98890300	-3.29019400
H	-3.57461100	1.60636000	-4.18133200
F	-3.80277000	3.17893600	0.40383600
C	-7.51566700	-2.89662100	-1.31116200
C	-6.81176000	-3.33381600	-0.18503300
C	-6.21657900	-2.40433800	0.67690300
C	-6.33576000	-1.04859800	0.39459100
C	-7.09180600	-0.61819800	-0.71474000

C	-7.66876800	-1.53549900	-1.59252400
H	-7.96669700	-3.62661500	-1.97719400
H	-6.72093300	-4.39594100	0.01876700
H	-5.66334500	-2.74123300	1.54958300
H	-8.23815200	-1.20570100	-2.45637700
C	-5.79603800	0.15684700	1.08792800
C	-6.35595500	1.32970200	0.30615200
N	-7.18726500	0.77591800	-0.72390600
H	-6.70865700	2.23725600	0.78508500
H	-5.70804800	0.18426700	2.16824600
H	-7.30351600	1.26994900	-1.59733100

IntIII-IV

Zero-point correction=	0.248140 (Hartree/Particle)
Thermal correction to Energy=	0.266686
Thermal correction to Enthalpy=	0.267630
Thermal correction to Gibbs Free Energy=	0.200090
Sum of electronic and zero-point Energies=	-1133.871546
Sum of electronic and thermal Energies=	-1133.853001
Sum of electronic and thermal Enthalpies=	-1133.852056
Sum of electronic and thermal Free Energies=	-1133.919596

F	1.86388300	-2.82910400	-0.84166900
F	2.86637500	-1.01768800	-1.51033500
C	2.15396700	-1.55160400	-0.49057400
C	1.23509800	0.67014900	0.23437000
C	0.91952800	-0.73956200	-0.18399500
C	1.35206600	1.69283900	-0.71678600
H	1.17239500	1.47346400	-1.76456300
C	1.69504400	2.98645300	-0.32300700
H	1.78168100	3.77149100	-1.06860200
C	1.48212700	0.96065100	1.58358400
H	1.41878700	0.16746800	2.32371700
C	1.92770000	3.27119300	1.02494400
H	2.19221900	4.27946800	1.33030200
C	1.82260900	2.25597200	1.97782200
H	2.01009900	2.46939500	3.02615200
F	2.98898000	-1.62086400	0.57365600
C	-3.45646100	1.69976600	-0.52674000
C	-3.02102600	1.48839300	-1.83813100
C	-1.99306100	0.57510200	-2.10870800
C	-1.41813800	-0.12148900	-1.05083800
C	-1.88804200	0.07491100	0.25754600

C	-2.89572600	0.99153100	0.54449800
H	-4.24802500	2.41687300	-0.33099000
H	-3.47631000	2.04235700	-2.65318500
H	-1.64207300	0.42430200	-3.12543900
H	-3.24199400	1.15026600	1.56220200
C	-0.31372700	-1.12190900	-1.01649800
C	-0.21669300	-1.54138900	0.43750200
N	-1.26440400	-0.83565300	1.16986100
H	-0.03265600	-2.56514800	0.74259900
H	-0.18366100	-1.82904100	-1.82775400
H	-0.94490000	-0.40158100	2.03548500
Na	-3.19175200	-2.22428300	1.66808300
H	-4.63019300	-3.41976300	2.38733100

TSIII-Ag

Zero-point correction=	0.243587 (Hartree/Particle)
Thermal correction to Energy=	0.261496
Thermal correction to Enthalpy=	0.262440
Thermal correction to Gibbs Free Energy=	0.196519
Sum of electronic and zero-point Energies=	-1133.852947
Sum of electronic and thermal Energies=	-1133.835039
Sum of electronic and thermal Enthalpies=	-1133.834095
Sum of electronic and thermal Free Energies=	-1133.900015

F	-2.21171900	2.42842900	-1.20891100
F	-2.98365900	0.42366500	-1.54598100
C	-2.29445100	1.18843700	-0.66015100
C	-1.05470100	-0.76750900	0.28061900
C	-0.94920900	0.60446700	-0.32736000
C	-1.06435900	-1.90746400	-0.53597000
H	-0.94082300	-1.79680300	-1.60881800
C	-1.22994400	-3.17704500	0.01812700
H	-1.23401800	-4.05111700	-0.62707100
C	-1.22734200	-0.92295800	1.66241900
H	-1.23022400	-0.04761900	2.30366400
C	-1.39209300	-3.32300200	1.39825300
H	-1.51884600	-4.31155700	1.83078300
C	-1.39157200	-2.19328000	2.21878000
H	-1.52087700	-2.29834900	3.29231100
F	-3.08718300	1.30678700	0.43597000
C	3.74638200	-1.16564200	-0.57377700
C	3.21676700	-1.28055900	-1.86471700
C	2.03744500	-0.59967200	-2.19909200

C	1.41186200	0.18676500	-1.23855800
C	1.97007200	0.33674100	0.05644800
C	3.13812500	-0.36248100	0.39608200
H	4.65627300	-1.70335900	-0.31910700
H	3.71338600	-1.90242400	-2.60356200
H	1.61261100	-0.69423600	-3.19554100
H	3.57265800	-0.27363400	1.38857600
C	0.17102100	1.00584300	-1.29921400
C	0.10211600	1.64570000	0.08347900
N	1.26200500	1.24590800	0.84576400
H	-0.25098000	2.66147800	0.22994000
H	-0.10933900	1.52679400	-2.20927500
H	1.09272600	0.99168600	2.12703300
Na	2.33053800	2.64873600	2.42581000
H	1.08983600	1.00173500	3.16490100

IntIV

Zero-point correction=	0.230987 (Hartree/Particle)
Thermal correction to Energy=	0.248066
Thermal correction to Enthalpy=	0.249011
Thermal correction to Gibbs Free Energy=	0.184923
Sum of electronic and zero-point Energies=	-1132.714421
Sum of electronic and thermal Energies=	-1132.697342
Sum of electronic and thermal Enthalpies=	-1132.696397
Sum of electronic and thermal Free Energies=	-1132.760486

F	2.62509500	-2.45712800	0.23305100
F	2.86775000	-1.04400800	-1.40481500
C	2.44781200	-1.15800100	-0.11535300
C	0.83736500	0.75236800	-0.28399200
C	1.03486000	-0.69425400	0.06943000
C	0.27411100	1.14991700	-1.50326800
H	-0.03116200	0.39535600	-2.21987300
C	0.09882300	2.50421900	-1.80244800
H	-0.33718900	2.79130400	-2.75492300
C	1.24637000	1.75002300	0.62269800
H	1.72560200	1.45805300	1.55422900
C	0.48386800	3.48547800	-0.88678300
H	0.34657600	4.53691900	-1.12140200
C	1.06793100	3.10687400	0.32720500
H	1.40233700	3.86206300	1.03353100
F	3.33656300	-0.44114600	0.62720900
C	-4.00194300	-0.31421200	-0.19530600

C	-3.61362700	-1.01892400	-1.34132400
C	-2.31172000	-1.54562300	-1.42376700
C	-1.42825100	-1.35793300	-0.37181800
C	-1.82698100	-0.67987500	0.82697800
C	-3.13330200	-0.13255200	0.88652500
H	-5.01158000	0.08579900	-0.13162800
H	-4.31083900	-1.15501000	-2.16252500
H	-1.99764800	-2.08479900	-2.31542800
H	-3.48927700	0.35704900	1.79393700
C	-0.02402200	-1.79049600	-0.16864200
C	0.27586900	-1.32317300	1.25959000
N	-0.86472600	-0.63694000	1.79882500
H	0.87709200	-1.91069700	1.94946200
H	0.33505000	-2.72785400	-0.58231800
Na	-1.04395700	1.62981100	1.98798300

TSIV-Ag

Zero-point correction=	0.228952 (Hartree/Particle)
Thermal correction to Energy=	0.246082
Thermal correction to Enthalpy=	0.247027
Thermal correction to Gibbs Free Energy=	0.182477
Sum of electronic and zero-point Energies=	-1132.694754
Sum of electronic and thermal Energies=	-1132.677624
Sum of electronic and thermal Enthalpies=	-1132.676679
Sum of electronic and thermal Free Energies=	-1132.741229

F	1.78221500	-2.89566200	-0.61891300
F	2.77889000	-1.15116900	-1.44396400
C	2.06502700	-1.59104200	-0.37846800
C	1.24204900	0.69348600	0.14838800
C	0.82304500	-0.74814900	-0.14170300
C	1.39549600	1.61264600	-0.89621600
H	1.17344900	1.30324800	-1.91331400
C	1.82120900	2.91654600	-0.63856700
H	1.93720200	3.61914200	-1.45932900
C	1.52419900	1.10203500	1.45774800
H	1.41053100	0.39481600	2.27414300
C	2.09515500	3.31857800	0.67146600
H	2.42063900	4.33523300	0.87387300
C	1.94525100	2.40766600	1.71956000
H	2.15652300	2.71234000	2.74103100
F	2.90506600	-1.57349100	0.68662400
C	-3.75673700	1.26189300	-0.48308200

C	-3.41414100	0.94927300	-1.81466000
C	-2.27715700	0.19652900	-2.08950200
C	-1.44336400	-0.26758100	-1.05019500
C	-1.85948900	-0.03748400	0.31326300
C	-2.98950000	0.77823300	0.57168000
H	-4.62035400	1.88925200	-0.27832400
H	-4.02387200	1.32546700	-2.63171200
H	-2.00110400	-0.00820300	-3.12214000
H	-3.24334000	1.04774700	1.59846100
C	-0.24212500	-1.02930900	-1.16511300
C	-0.12758500	-1.43347300	0.78813900
N	-1.24433700	-0.82564500	1.25776500
H	0.17295800	-2.37513800	1.24253500
H	-0.00171800	-1.60172900	-2.05615300
Na	-3.15219100	-1.55080500	2.20331200

IntV

Zero-point correction=	0.229544 (Hartree/Particle)
Thermal correction to Energy=	0.247201
Thermal correction to Enthalpy=	0.248145
Thermal correction to Gibbs Free Energy=	0.182001
Sum of electronic and zero-point Energies=	-1132.702057
Sum of electronic and thermal Energies=	-1132.684400
Sum of electronic and thermal Enthalpies=	-1132.683456
Sum of electronic and thermal Free Energies=	-1132.749600

F	-0.88928900	2.97478000	-0.83505800
F	-2.30482600	1.55375700	-1.67035400
C	-1.56924500	1.83366000	-0.56775800
C	-1.55292900	-0.55073300	0.15032900
C	-0.64103000	0.67280500	-0.18554200
C	-1.87058400	-1.48595000	-0.84066100
H	-1.45191600	-1.36519100	-1.83552500
C	-2.69648300	-2.57527100	-0.55756700
H	-2.93122800	-3.29179400	-1.34031800
C	-2.08191500	-0.72888800	1.43515500
H	-1.84572300	-0.01493800	2.21936400
C	-3.21487200	-2.74802400	0.72817600
H	-3.85099200	-3.59980600	0.95252300
C	-2.90237400	-1.82127900	1.72513700
H	-3.29712000	-1.94765800	2.72983700
F	-2.44990200	2.14185700	0.41974900
C	3.95020100	-1.57704900	-0.18905100

C	3.59658400	-1.44296200	-1.55992300
C	2.45427400	-0.77988700	-1.94508500
C	1.54494100	-0.21213400	-0.98306700
C	1.96346400	-0.28857600	0.40523800
C	3.14042200	-0.98693200	0.76804300
H	4.83344500	-2.13783700	0.10020500
H	4.23878300	-1.88327300	-2.31942800
H	2.20234200	-0.70126000	-3.00075600
H	3.38380700	-1.08995500	1.82834800
C	0.36218300	0.44001300	-1.28977100
C	0.20313600	1.10769900	1.00264500
N	1.33705900	0.54060900	1.32262300
H	-0.16702600	1.89294600	1.65922200
H	0.08579500	0.65310700	-2.31751900
Na	3.28381300	1.50262600	2.02353300

IntVI

Zero-point correction=	0.254425 (Hartree/Particle)
Thermal correction to Energy=	0.274663
Thermal correction to Enthalpy=	0.275607
Thermal correction to Gibbs Free Energy=	0.204055
Sum of electronic and zero-point Energies=	-1209.136455
Sum of electronic and thermal Energies=	-1209.116217
Sum of electronic and thermal Enthalpies=	-1209.115273
Sum of electronic and thermal Free Energies=	-1209.186825

F	0.46355000	2.98528300	0.45547800
F	1.99617000	1.91338000	1.56212500
C	1.34134100	1.95484800	0.37763500
C	1.78392500	-0.44945100	-0.08562400
C	0.65742600	0.61972500	0.05401000
C	2.17447900	-1.21074000	1.02206700
H	1.66725500	-1.06840900	1.97136400
C	3.19285900	-2.15942500	0.91423800
H	3.48102100	-2.74164800	1.78545000
C	2.43916500	-0.65720200	-1.30665500
H	2.15319000	-0.07735700	-2.17972000
C	3.83555600	-2.36423400	-0.30884900
C	3.45338100	-1.61031000	-1.42045400
H	3.94451300	-1.76295500	-2.37776800
F	2.25384400	2.30888800	-0.56301200
C	-3.39110400	-2.48824100	-0.09746500
C	-3.12583500	-2.27276900	1.27891100

C	-2.16202600	-1.37780400	1.69348700
C	-1.36448500	-0.64482800	0.75438000
C	-1.66588300	-0.85829500	-0.64282400
C	-2.67372000	-1.76638100	-1.03815800
H	-4.14426900	-3.20631700	-0.40642700
H	-3.69024200	-2.82961800	2.02350900
H	-1.97644100	-1.23184800	2.75555300
H	-2.86522500	-1.88943900	-2.10306100
C	-0.40207100	0.31902100	1.09157400
C	-0.13601300	0.78866400	-1.23902300
N	-1.13167000	0.02095400	-1.58154400
H	0.16104800	1.56374300	-1.94443800
H	-0.17698800	0.52174900	2.13509600
H	-1.89221800	1.76989500	0.78622000
H	4.62310900	-3.10756700	-0.39611600
O	-2.72002100	2.25769800	0.52495900
H	-3.33283300	2.10739100	1.26089400
Na	-3.13037400	1.26733600	-1.43765600

TSV-Ag

Zero-point correction=	0.250722 (Hartree/Particle)
Thermal correction to Energy=	0.270178
Thermal correction to Enthalpy=	0.271122
Thermal correction to Gibbs Free Energy=	0.200906
Sum of electronic and zero-point Energies=	-1209.132220
Sum of electronic and thermal Energies=	-1209.112764
Sum of electronic and thermal Enthalpies=	-1209.111820
Sum of electronic and thermal Free Energies=	-1209.182035

F	0.34226300	3.06782300	0.45622300
F	1.92361500	2.03113100	1.52898800
C	1.24146400	2.06248200	0.36456600
C	1.68309300	-0.35077200	-0.09780600
C	0.57431500	0.71354800	0.06183800
C	2.15529100	-1.07287800	1.00667500
H	1.72525600	-0.91719400	1.98952600
C	3.18343300	-2.00572500	0.86083000
H	3.53080700	-2.55777500	1.72938500
C	2.28016200	-0.57323200	-1.34789500
H	1.94754300	-0.01842300	-2.21957000
C	3.76099000	-2.22923900	-0.38975700
C	3.30617200	-1.50752000	-1.49421900
H	3.74990800	-1.66704500	-2.47266600

F	2.11757400	2.41670600	-0.60592300
C	-2.90199700	-2.90591200	-0.19370100
C	-2.54593600	-2.83381100	1.15536200
C	-1.74131000	-1.78756500	1.61958700
C	-1.27497000	-0.80947400	0.74244800
C	-1.63930700	-0.88907300	-0.61703100
C	-2.45707900	-1.92542600	-1.08139300
H	-3.52632900	-3.71863600	-0.55204200
H	-2.89526000	-3.59191200	1.85018500
H	-1.47382400	-1.73256600	2.67151500
H	-2.72370300	-1.95694200	-2.13416300
C	-0.46957400	0.39186300	1.15992000
C	-0.23220900	0.86015000	-1.23231800
N	-1.24089300	0.12451200	-1.53115400
H	0.04474300	1.64343500	-1.93736100
H	-0.00263200	0.25252100	2.13602800
H	-1.18246500	1.23833700	1.22123700
H	4.55881900	-2.95759900	-0.50216700

181

Zero-point correction=	0.255955 (Hartree/Particle)
Thermal correction to Energy=	0.276166
Thermal correction to Enthalpy=	0.277111
Thermal correction to Gibbs Free Energy=	0.205585
Sum of electronic and zero-point Energies=	-1209.140278
Sum of electronic and thermal Energies=	-1209.120066
Sum of electronic and thermal Enthalpies=	-1209.119121
Sum of electronic and thermal Free Energies=	-1209.190647

F	0.34226300	3.06782300	0.45622300
F	1.92361500	2.03113100	1.52898800
C	1.24146400	2.06248200	0.36456600
C	1.68309300	-0.35077200	-0.09780600
C	0.57431500	0.71354800	0.06183800
C	2.15529100	-1.07287800	1.00667500
H	1.72525600	-0.91719400	1.98952600
C	3.18343300	-2.00572500	0.86083000
H	3.53080700	-2.55777500	1.72938500
C	2.28016200	-0.57323200	-1.34789500
H	1.94754300	-0.01842300	-2.21957000
C	3.76099000	-2.22923900	-0.38975700
C	3.30617200	-1.50752000	-1.49421900
H	3.74990800	-1.66704500	-2.47266600

F	2.11757400	2.41670600	-0.60592300
C	-2.90199700	-2.90591200	-0.19370100
C	-2.54593600	-2.83381100	1.15536200
C	-1.74131000	-1.78756500	1.61958700
C	-1.27497000	-0.80947400	0.74244800
C	-1.63930700	-0.88907300	-0.61703100
C	-2.45707900	-1.92542600	-1.08139300
H	-3.52632900	-3.71863600	-0.55204200
H	-2.89526000	-3.59191200	1.85018500
H	-1.47382400	-1.73256600	2.67151500
H	-2.72370300	-1.95694200	-2.13416300
C	-0.46957400	0.39186300	1.15992000
C	-0.23220900	0.86015000	-1.23231800
N	-1.24089300	0.12451200	-1.53115400
H	0.04474300	1.64343500	-1.93736100
H	-0.00263200	0.25252100	2.13602800
H	-1.18246500	1.23833700	1.22123700
H	4.55881900	-2.95759900	-0.50216700

IntIII'

Zero-point correction=	0.461463 (Hartree/Particle)
Thermal correction to Energy=	0.519050
Thermal correction to Enthalpy=	0.519994
Thermal correction to Gibbs Free Energy=	0.349091
Sum of electronic and zero-point Energies=	-2542.414279
Sum of electronic and thermal Energies=	-2542.356692
Sum of electronic and thermal Enthalpies=	-2542.355747
Sum of electronic and thermal Free Energies=	-2542.526651

F	-1.89863100	0.93341500	1.58243000
F	-1.76131600	2.88232500	2.53456700
C	-2.00844400	2.26258000	1.35795500
C	-1.18448500	4.06722400	-0.16834000
C	-1.04018200	2.74039300	0.29478500
C	-0.29902200	4.50647800	-1.20648100
H	0.42949100	3.80075300	-1.59234000
C	-0.36875300	5.79008500	-1.71512000
H	0.30372000	6.10492100	-2.50591500
C	-2.14070600	5.01255600	0.33681700
H	-2.82170100	4.73276800	1.12983600
C	-1.31533900	6.68495800	-1.19613100
H	-1.37008900	7.69546300	-1.59070700
C	-2.19302700	6.29637900	-0.17060000

H	-2.91272600	7.00685300	0.22215500
F	-3.31446700	2.47183800	1.03968800
C	0.30139300	-2.20725600	2.05131300
C	1.37883300	-2.55181400	2.88339500
C	2.48652100	-2.19088800	2.13475600
N	2.06986800	-1.67111300	0.95518900
N	0.70360300	-1.67966600	0.90680000
Br	4.32904200	-2.36598000	2.61783600
Br	1.34423000	-3.34862400	4.61861300
Br	-1.56554200	-2.46600100	2.41061200
C	3.53956700	2.24856000	0.81245100
C	4.85377900	1.97623500	0.41191300
C	4.78436000	0.67951300	-0.07711900
N	3.51311800	0.22953500	0.03909600
N	2.73587500	1.21508600	0.58675300
Br	6.21796900	-0.33795000	-0.82216900
Br	6.38530600	3.10740700	0.52521300
Br	2.88645500	3.85424300	1.62196300
C	0.62320400	-0.39606300	-2.96656100
C	1.09346800	-1.60311700	-3.49732200
C	1.99968500	-2.04746300	-2.54598300
N	2.05302500	-1.15456300	-1.53132000
N	1.18784200	-0.12794600	-1.79419600
Br	3.02324000	-3.65761800	-2.60614900
Br	0.61463200	-2.43608200	-5.14366800
Br	-0.64543200	0.79506200	-3.75537700
B	2.92746100	-1.18670300	-0.24815400
Ag	0.47886100	1.39085000	-0.19362000
H	3.83572300	-1.93128900	-0.42079800
F	-7.77500500	2.65315000	-0.53568400
F	-8.96632400	1.30013700	0.68184300
C	-7.69906400	1.72201100	0.44917100
C	-6.66260100	-0.42924100	1.20834100
C	-6.77753500	0.58312800	0.10342000
C	-7.55085300	-1.51060900	1.28957500
H	-8.30245700	-1.64511200	0.51770000
C	-7.47320300	-2.41210300	2.35224800
H	-8.16597000	-3.24743300	2.40281200
C	-5.70239900	-0.25828300	2.21602100
H	-5.01890900	0.58421800	2.16704100
C	-6.51022700	-2.23860600	3.35008800
H	-6.45201300	-2.93825800	4.17930500
C	-5.62640000	-1.15835600	3.28147400
H	-4.88469800	-1.00982100	4.06156600

F	-7.30031400	2.37657800	1.56809400
C	-4.66087800	-3.39895000	-2.13312000
C	-5.98585800	-3.35845900	-2.58181100
C	-6.76007500	-2.20507500	-2.39056800
C	-6.19009300	-1.10847100	-1.75340000
C	-4.84202400	-1.14408700	-1.34239200
C	-4.06847000	-2.29426800	-1.50851200
H	-4.07171500	-4.30026100	-2.27974700
H	-6.41899600	-4.22572300	-3.07116100
H	-7.79483500	-2.17426300	-2.72171000
H	-3.03296500	-2.32539700	-1.18224800
C	-6.75216700	0.22459700	-1.39254000
C	-5.58888600	0.97727700	-0.77422100
N	-4.44591500	0.10275500	-0.84156600
H	-5.40364400	2.03022200	-0.95566700
H	-7.47444400	0.71194700	-2.03835100
H	-3.77213700	0.12916900	-0.08623300

TSIII-Ag'

Zero-point correction=	0.461374 (Hartree/Particle)
Thermal correction to Energy=	0.518021
Thermal correction to Enthalpy=	0.518965
Thermal correction to Gibbs Free Energy=	0.350626
Sum of electronic and zero-point Energies=	-2542.412802
Sum of electronic and thermal Energies=	-2542.356155
Sum of electronic and thermal Enthalpies=	-2542.355211
Sum of electronic and thermal Free Energies=	-2542.523550

F	-1.59650300	0.79511900	2.05259200
F	-1.20130300	2.91010900	2.39185400
C	-1.89022000	2.04157500	1.61434200
C	-1.97880600	3.36772500	-0.52847300
C	-1.47117400	2.24609100	0.17297700
C	-1.49651300	3.58467100	-1.85928000
H	-0.78784700	2.87324000	-2.26964400
C	-1.90950900	4.67079800	-2.60920100
H	-1.53133800	4.81719800	-3.61553100
C	-2.90856500	4.32364600	0.00200000
H	-3.29227200	4.21264200	1.00687700
C	-2.81844200	5.58438200	-2.05715200
H	-3.14380200	6.43945000	-2.64264100
C	-3.31011900	5.41039300	-0.75447500
H	-4.00642100	6.13134700	-0.33884700

F	-3.21364100	2.21123400	1.88985200
C	0.49153400	-2.01952300	2.50291600
C	1.52950100	-1.79973000	3.42227700
C	2.57379300	-1.36578100	2.62227600
N	2.15719900	-1.33222700	1.33422500
N	0.85486600	-1.74132500	1.26204000
Br	4.34641200	-0.89582700	3.16623900
Br	1.52767000	-2.05171400	5.31541900
Br	-1.26942700	-2.68568500	2.88180600
C	3.12084500	2.60331200	0.16196500
C	4.46126400	2.41438800	-0.20016400
C	4.57970400	1.03606900	-0.30375500
N	3.38641500	0.46679000	-0.01223500
N	2.47612400	1.44846600	0.26980500
Br	6.14757800	0.05702400	-0.78499400
Br	5.81350000	3.73288200	-0.47047000
Br	2.23569600	4.26530000	0.50363000
C	0.70963200	-1.15624600	-2.80066200
C	1.37812800	-2.35517000	-3.07554800
C	2.28324200	-2.47222000	-2.03144800
N	2.15068900	-1.40914700	-1.20619700
N	1.16032700	-0.59290500	-1.68451700
Br	3.52778200	-3.89289600	-1.75339100
Br	1.12188100	-3.54102400	-4.54624900
Br	-0.65470000	-0.33543400	-3.85585400
B	2.98750100	-1.03721400	0.04940900
Ag	0.16403000	1.05436000	-0.39382000
H	3.98463600	-1.68364200	0.05148400
F	-7.26890400	2.73345800	-0.72227400
F	-8.74716300	1.22834800	-0.19145200
C	-7.49881000	1.67167500	0.09133200
C	-6.69248100	-0.57481700	0.86339200
C	-6.46611700	0.58589100	-0.06455100
C	-7.52196400	-1.64284200	0.49525700
H	-7.97754200	-1.65313500	-0.49015200
C	-7.76126800	-2.69060200	1.38591300
H	-8.40374900	-3.51467000	1.08880600
C	-6.11809600	-0.56530200	2.14309600
H	-5.48638800	0.26746800	2.44053900
C	-7.17732000	-2.67977300	2.65543400
H	-7.36299300	-3.49635700	3.34751200
C	-6.35689300	-1.61389000	3.03405100
H	-5.90832900	-1.59460200	4.02344800
F	-7.53653600	2.15521100	1.35663200

C	-3.57268800	-3.08027300	-1.89581800
C	-4.64945200	-2.95484800	-2.78204200
C	-5.47359800	-1.82137600	-2.73948200
C	-5.19771400	-0.82563600	-1.80830000
C	-4.08624500	-0.94187900	-0.95132300
C	-3.27372100	-2.07555000	-0.96837500
H	-2.94975600	-3.96985300	-1.93013500
H	-4.85581000	-3.74586700	-3.49681300
H	-6.32474900	-1.73219000	-3.40908400
H	-2.42466200	-2.16736700	-0.29846200
C	-5.90104400	0.44876000	-1.49009400
C	-5.06506600	1.08921300	-0.40144000
N	-3.93877600	0.21528100	-0.16334800
H	-4.86516900	2.15434100	-0.36263600
H	-6.36731500	1.03500100	-2.27411200
H	-3.65948100	0.07167200	0.79996500

IntIV'

Zero-point correction=	0.465333 (Hartree/Particle)
Thermal correction to Energy=	0.521535
Thermal correction to Enthalpy=	0.522480
Thermal correction to Gibbs Free Energy=	0.357278
Sum of electronic and zero-point Energies=	-2542.420534
Sum of electronic and thermal Energies=	-2542.364331
Sum of electronic and thermal Enthalpies=	-2542.363387
Sum of electronic and thermal Free Energies=	-2542.528589

F	2.46685500	0.01610000	-2.64197200
F	1.70420000	2.03666900	-3.00596700
C	2.57780200	1.32955900	-2.27507400
C	2.50374500	2.90021100	-0.25750800
C	2.34911700	1.48920100	-0.78589100
C	2.13211200	3.17302700	1.07302500
H	1.71754800	2.37951200	1.68523600
C	2.25553000	4.45115400	1.61160300
H	1.95909000	4.62795500	2.64143100
C	2.98731400	3.97217900	-1.03225900
H	3.28588800	3.81835500	-2.06166000
C	2.72703600	5.50501300	0.82630400
H	2.80773800	6.50556700	1.24037900
C	3.08236100	5.25918500	-0.49814100
H	3.44682500	6.06818500	-1.12474400
F	3.83155600	1.68596600	-2.72978200

C	-0.18789600	-2.64022800	-1.37028700
C	-1.22615100	-3.24819900	-2.08867800
C	-2.35658800	-2.58362200	-1.63933600
N	-1.98944300	-1.65718800	-0.72261700
N	-0.63017600	-1.68623300	-0.56193800
Br	-4.16105400	-2.87258200	-2.19536000
Br	-1.12340900	-4.66602800	-3.36036500
Br	1.67090300	-3.10791400	-1.42234500
C	-2.46108800	2.48813600	-1.54397300
C	-3.84932000	2.57326400	-1.38352800
C	-4.17865700	1.38911800	-0.74182800
N	-3.05469000	0.66099500	-0.54700600
N	-1.98471300	1.35172200	-1.04599100
Br	-5.92178700	0.83837000	-0.19186100
Br	-5.01710700	3.97728200	-1.92971600
Br	-1.30838100	3.78052000	-2.34473400
C	-1.28046800	0.46680500	3.16158000
C	-1.88017200	-0.66263000	3.74185900
C	-2.51400100	-1.27148200	2.67013100
N	-2.28860700	-0.53921100	1.55354200
N	-1.50834900	0.54033600	1.86070600
Br	-3.54050600	-2.88386300	2.68612100
Br	-1.86178300	-1.22087100	5.56786900
Br	-0.28719600	1.83643100	4.06671200
B	-2.89243200	-0.72613000	0.13565600
Ag	0.19363400	0.90723700	-0.54348600
H	-3.96486100	-1.22456800	0.22942300
F	7.38553900	2.10460500	-0.26262500
F	8.34912700	0.19817200	0.15911200
C	7.30866800	0.76848000	-0.47513600
C	5.86332900	-1.28274900	-0.23903400
C	5.99154500	0.19332000	0.02060900
C	6.22351000	-2.22567500	0.73209300
H	6.55602200	-1.89139200	1.70920600
C	6.15765300	-3.58826600	0.44557900
H	6.43712600	-4.31203700	1.20498800
C	5.45497400	-1.72288000	-1.50747400
H	5.20549900	-0.99754300	-2.27755600
C	5.74127400	-4.02203400	-0.81528700
H	5.69620700	-5.08395400	-1.03727900
C	5.39225000	-3.08856700	-1.79264300
H	5.08347500	-3.41866800	-2.77986500
F	7.46989800	0.56627300	-1.79674500
C	2.15407200	-1.20729900	2.95482700

C	3.24877500	-0.96427500	3.78904900
C	4.36147200	-0.26236900	3.32007400
C	4.35422000	0.20657200	2.00743900
C	3.22999000	-0.00637000	1.21118700
C	2.12890400	-0.73099700	1.63930600
H	1.30283300	-1.76653000	3.32784800
H	3.23877600	-1.33522500	4.80906200
H	5.22127800	-0.09248800	3.96053000
H	1.27558700	-0.92406000	0.99929000
C	5.41065800	0.91758500	1.24379400
C	4.83008000	1.14621000	-0.12125000
N	3.44209800	0.54491000	-0.16276200
H	4.92368100	2.07304100	-0.66358700
H	6.01393800	1.68132100	1.72131500
H	3.45615800	-0.26972300	-0.79214300

TSIV-Ag'

Zero-point correction=	0.460664 (Hartree/Particle)
Thermal correction to Energy=	0.516732
Thermal correction to Enthalpy=	0.517676
Thermal correction to Gibbs Free Energy=	0.354866
Sum of electronic and zero-point Energies=	-2542.418005
Sum of electronic and thermal Energies=	-2542.351937
Sum of electronic and thermal Enthalpies=	-2542.350993
Sum of electronic and thermal Free Energies=	-2542.511802

F	-2.46267500	1.02692800	-2.79315800
F	-1.70960900	-0.88549700	-3.40985600
C	-2.32838900	-0.23911300	-2.46564600
C	-2.30229100	-2.24123400	-1.03676200
C	-2.43133200	-0.74051200	-1.15907400
C	-1.48921100	-2.83228200	-0.05840100
H	-0.91787700	-2.20696700	0.61999100
C	-1.40818600	-4.22207000	0.05444700
H	-0.77338600	-4.66210000	0.81808800
C	-3.04461300	-3.07465500	-1.89580200
H	-3.70531700	-2.61796200	-2.62528000
C	-2.13679400	-5.03948700	-0.81183700
H	-2.07148400	-6.12023900	-0.72486300
C	-2.95500800	-4.46166300	-1.78670600
H	-3.53203100	-5.09094500	-2.45821200
F	-4.33737000	-0.44886400	-2.88355500
C	1.29426400	2.95849300	-2.04099400

C	2.59039100	3.31606900	-2.43409900
C	3.39807700	2.44579400	-1.72049100
N	2.61879000	1.64084100	-0.96124900
N	1.30165900	1.95757600	-1.16779300
Br	5.30470000	2.35195000	-1.77769300
Br	3.12587200	4.68555900	-3.64819100
Br	-0.32694900	3.78693200	-2.62708000
C	2.13088200	-2.30715300	-2.04764400
C	3.10829200	-2.97612100	-1.29458600
C	3.53826800	-2.01082400	-0.39851400
N	2.85173300	-0.86589100	-0.62252000
N	1.96426700	-1.05530300	-1.64697400
Br	4.87047300	-2.19228200	0.96085100
Br	3.72826600	-4.77313200	-1.46935100
Br	1.15607800	-3.00384700	-3.54353100
C	0.64907200	0.25358800	2.75268800
C	1.65818400	0.88006900	3.49502800
C	2.65786700	1.10363100	2.56096600
N	2.25303200	0.63353500	1.35847300
N	0.99151300	0.11161900	1.47683000
Br	4.34308900	1.94724400	2.86776300
Br	1.67206200	1.30720400	5.35386800
Br	-1.01386700	-0.40710900	3.42385600
B	3.05571800	0.53000400	0.02860500
Ag	-0.34194100	0.26953200	-0.55890700
H	4.20472400	0.67822200	0.28155700
F	-6.10644100	-2.90726800	1.53820000
F	-7.85209100	-1.62293900	1.70468100
C	-6.81782800	-1.94605400	0.89953400
C	-6.78473200	0.34338800	-0.12586000
C	-5.97824200	-0.72669500	0.56476900
C	-7.46363100	1.30159200	0.64182600
H	-7.35157500	1.30264700	1.72150800
C	-8.28000900	2.24928900	0.02541700
H	-8.79803600	2.98888500	0.62920600
C	-6.95098800	0.33421500	-1.51760600
H	-6.42268300	-0.39460200	-2.12232200
C	-8.43161900	2.24530800	-1.36413500
H	-9.06564400	2.98514000	-1.84465400
C	-7.76581800	1.28848800	-2.13190600
H	-7.87931200	1.27951400	-3.21213700
F	-7.33607100	-2.51272300	-0.21098400
C	-3.08440400	3.35314400	0.80445000
C	-3.69173400	3.19661000	2.05376700

C	-4.30498100	1.98888600	2.39628800
C	-4.28541100	0.93855500	1.48006800
C	-3.64822900	1.10059000	0.24579800
C	-3.06212500	2.30508600	-0.12308800
H	-2.62359700	4.30048800	0.54214400
H	-3.69788100	4.02303700	2.75782200
H	-4.79387400	1.86695100	3.35789600
H	-2.59821700	2.44369400	-1.08815800
C	-4.87556700	-0.41813400	1.58692300
C	-4.53191000	-1.08002100	0.28243100
N	-3.73183800	-0.13626900	-0.56229000
H	-4.25010200	-2.11641800	0.20319700
H	-4.85854300	-0.95725400	2.52767000
H	-4.26392300	-0.07424600	-1.56839100

180

Zero-point correction=	0.469812 (Hartree/Particle)
Thermal correction to Energy=	0.546797
Thermal correction to Enthalpy=	0.547741
Thermal correction to Gibbs Free Energy=	0.352569
Sum of electronic and zero-point Energies=	-2542.449329
Sum of electronic and thermal Energies=	-2542.382345
Sum of electronic and thermal Enthalpies=	-2542.381401
Sum of electronic and thermal Free Energies=	-2542.546573

F	2.91479300	-0.61524800	-2.25221700
F	1.91048800	1.31133200	-2.53100700
C	2.59181800	0.54660800	-1.68533100
C	3.00840700	2.39741000	-0.10334300
C	3.06752600	0.95313400	-0.48289100
C	2.50306700	2.80143400	1.14178200
H	2.10842600	2.05917600	1.82928500
C	2.50490100	4.15022600	1.49410200
H	2.10528500	4.45594900	2.45631300
C	3.52707100	3.35820900	-0.98464000
H	3.93821200	3.03911700	-1.93737000
C	3.01641100	5.10434400	0.61113500
H	3.02077400	6.15409700	0.88897500
C	3.52769000	4.70616000	-0.62557900
H	3.93772100	5.44382500	-1.30891600
F	7.20578700	1.35564500	2.41166600
F	8.54432500	-0.09335400	1.49081600
C	7.47552600	0.69545900	1.25693900

C	6.55396400	-0.82932600	-0.52040800
C	6.28830000	-0.10713600	0.77135000
C	6.85238200	-2.19560800	-0.54666600
H	6.85034500	-2.76215500	0.37808700
C	7.14661500	-2.83604300	-1.75247700
H	7.37183800	-3.89830200	-1.75513500
C	6.57697700	-0.10743600	-1.72442800
H	6.38221100	0.95942100	-1.71440700
C	7.15967600	-2.11549300	-2.94563200
H	7.39538800	-2.61248800	-3.88192900
C	6.88107000	-0.74562000	-2.92951300
H	6.92064200	-0.16789000	-3.84919900
F	7.85613100	1.62868900	0.35598500
C	2.38874100	-3.39357800	0.73954800
C	3.28059600	-3.84672900	1.71094400
C	4.32366700	-3.01721600	2.14111700
C	4.45016100	-1.74634400	1.59669300
C	3.51948300	-1.27759100	0.64376600
C	2.50046300	-2.11339500	0.18187900
H	1.59029100	-4.04315200	0.39355500
H	3.17567400	-4.84488900	2.12351400
H	5.02967600	-3.36253000	2.89129700
H	1.81625600	-1.81885700	-0.60261700
C	5.41908400	-0.66570700	1.90936000
C	4.93832300	0.52134400	1.10550900
N	3.78051600	0.07545900	0.35298700
H	4.90088100	1.52975100	1.49555800
H	5.79275500	-0.54973400	2.92073200

TSIV-Ag¹

Zero-point correction=	0.241916 (Hartree/Particle)
Thermal correction to Energy=	0.257343
Thermal correction to Enthalpy=	0.258287
Thermal correction to Gibbs Free Energy=	0.198851
Sum of electronic and zero-point Energies=	-970.950505
Sum of electronic and thermal Energies=	-970.935078
Sum of electronic and thermal Enthalpies=	-970.934134
Sum of electronic and thermal Free Energies=	-970.993570

F	4.28237400	1.58898700	-2.73589900
F	2.51195900	1.00534500	-1.61441700
C	3.70621000	1.63168600	-1.51567400
C	3.85180100	0.99971400	0.89309200

C	4.58568600	0.99493900	-0.44269700
C	3.21781000	-0.16619400	1.35841000
H	3.34391800	-1.09353600	0.81254000
C	2.50704300	-0.14695900	2.57493100
H	2.09477500	-1.06618300	2.97940900
C	3.80139100	2.15745800	1.66591100
H	4.31057000	3.04961100	1.31689700
C	2.43713300	1.04289300	3.32505200
H	1.88483400	1.05549300	4.25874200
C	3.09513600	2.18237800	2.87350200
H	3.05678900	3.09730600	3.45612200
F	3.45894200	2.93051000	-1.24033800
C	7.63837100	-2.09632400	2.05082800
C	6.94748900	-2.92879100	1.14647200
C	6.16677800	-2.38334800	0.14148100
C	6.03067200	-0.98296700	0.02039100
C	6.80285200	-0.16580300	0.89634800
C	7.57434500	-0.71763200	1.93086100
H	8.24001700	-2.53871500	2.83836900
H	7.01809200	-4.00698600	1.24849500
H	5.61980100	-3.02965100	-0.53926000
H	8.12980100	-0.07061700	2.60375000
C	5.22665369	-0.24233637	-0.90264592
C	5.93157731	1.51909437	-0.47910608
N	6.82703900	1.16008700	0.50910000
H	6.25187831	2.25628037	-1.20382808
H	4.99929669	-0.62761537	-1.88852592
H	7.63965600	1.72077500	0.71122900

TSV-Ag^I

Zero-point correction=	0.262029 (Hartree/Particle)
Thermal correction to Energy=	0.279320
Thermal correction to Enthalpy=	0.280264
Thermal correction to Gibbs Free Energy=	0.216750
Sum of electronic and zero-point Energies=	-1047.311392
Sum of electronic and thermal Energies=	-1047.294101
Sum of electronic and thermal Enthalpies=	-1047.293156
Sum of electronic and thermal Free Energies=	-1047.356670

F	-2.21171900	2.42842900	-1.20891100
F	-2.98365900	0.42366500	-1.54598100
C	-2.29445100	1.18843700	-0.66015100
C	-1.05470100	-0.76750900	0.28061900

C	-0.94920900	0.60446700	-0.32736000
C	-1.06435900	-1.90746400	-0.53597000
H	-0.94082300	-1.79680300	-1.60881800
C	-1.22994400	-3.17704500	0.01812700
H	-1.23401800	-4.05111700	-0.62707100
C	-1.22734200	-0.92295800	1.66241900
H	-1.23022400	-0.04761900	2.30366400
C	-1.39209300	-3.32300200	1.39825300
H	-1.51884600	-4.31155700	1.83078300
C	-1.39157200	-2.19328000	2.21878000
H	-1.52087700	-2.29834900	3.29231100
F	-3.08718300	1.30678700	0.43597000
C	3.74638200	-1.16564200	-0.57377700
C	3.21676700	-1.28055900	-1.86471700
C	2.03744500	-0.59967200	-2.19909200
C	1.41186200	0.18676500	-1.23855800
C	1.97007200	0.33674100	0.05644800
C	3.13812500	-0.36248100	0.39608200
H	4.65627300	-1.70335900	-0.31910700
H	3.71338600	-1.90242400	-2.60356200
H	1.61261100	-0.69423600	-3.19554100
H	3.57265800	-0.27363400	1.38857600
C	0.17102100	1.00584300	-1.29921400
C	0.10211600	1.64570000	0.08347900
N	1.26200500	1.24590800	0.84576400
H	-0.25098000	2.66147800	0.22994000
H	-0.10933900	1.52679400	-2.20927500
H	1.09272600	0.99168600	2.12703300
Na	2.33053800	2.64873600	2.42581000
H	1.08983600	1.00173500	3.16490100

TSI-Ag'

Zero-point correction=	0.347536 (Hartree/Particle)
Thermal correction to Energy=	0.393396
Thermal correction to Enthalpy=	0.394340
Thermal correction to Gibbs Free Energy=	0.253171
Sum of electronic and zero-point Energies=	-1935.148438
Sum of electronic and thermal Energies=	-1935.102577
Sum of electronic and thermal Enthalpies=	-1935.101633
Sum of electronic and thermal Free Energies=	-1935.242802

F	2.11128500	1.76267300	-2.78762600
F	3.80357900	2.92529500	-2.13188100

C	3.13705300	1.76767700	-1.91901000
C	3.57369000	1.93089400	0.54404800
C	2.67245000	1.56289700	-0.48689100
C	3.06376800	1.97611700	1.87907700
H	2.01723700	1.73809500	2.03249800
C	3.86947800	2.34008800	2.94313700
H	3.46026900	2.39274700	3.94645000
C	4.95974800	2.23936500	0.35000400
H	5.39583300	2.19304300	-0.63789400
C	5.22427600	2.61711400	2.71794600
H	5.86420000	2.88058500	3.55532600
C	5.76823400	2.55215800	1.42721800
H	6.82441300	2.74351400	1.27145700
F	3.96909800	0.74395500	-2.27484100
C	8.40521700	0.38049600	-1.13695300
C	9.07123400	-0.14719500	-0.01116000
C	8.46985300	-1.10529600	0.79538300
C	7.17253200	-1.54902500	0.48278700
C	6.51783900	-0.99920100	-0.65704800
C	7.12237000	-0.03709800	-1.47603800
H	8.90578200	1.12014300	-1.75529800
H	10.07408500	0.19893100	0.22208200
H	8.99478300	-1.50829300	1.65732100
H	6.61162900	0.36088600	-2.34783200
C	6.26166000	-2.49321800	1.06977400
C	5.12532700	-2.48641600	0.30334400
H	4.21342900	-3.05698000	0.40690500
N	5.27418800	-1.59123900	-0.73905000
H	6.43424000	-3.10740000	1.94220100
C	-0.38046600	-1.59436500	-2.58789200
C	-1.52318900	-2.32195900	-2.94926200
C	-2.46146700	-1.94599000	-2.00109800
N	-1.89667600	-1.05647500	-1.14670900
N	-0.59833300	-0.83980200	-1.52150300
Br	-4.26829100	-2.55335800	-1.88455700
Br	-1.74080900	-3.54035700	-4.39901700
Br	1.32829100	-1.63063000	-3.44751800
C	-1.64103600	3.12383400	-0.13954300
C	-3.02800000	3.30514600	-0.06044000
C	-3.52195200	2.01322100	0.04838200
N	-2.48576000	1.13960400	0.03395700
N	-1.31812800	1.83883100	-0.08297000
Br	-5.35550000	1.50412600	0.19565800
Br	-4.00915200	4.93866600	-0.09289800

Br	-0.29862700	4.47490200	-0.30682600
C	0.05186100	-1.32800300	2.57185000
C	-1.02800800	-1.90131700	3.25915300
C	-2.11840500	-1.59466000	2.46081500
N	-1.69280000	-0.88757900	1.38371100
N	-0.33697900	-0.72020700	1.46235300
Br	-3.94075200	-2.06305200	2.79019700
Br	-1.00743100	-2.87459100	4.89861900
Br	1.90218500	-1.39319100	3.06201100
B	-2.49491000	-0.41351900	0.13849900
Ag	0.74947100	0.76918900	-0.29610900
H	-3.61488100	-0.77008600	0.25118700
H	4.56278200	-1.35829700	-1.41307000

TSIII-Ag¹

Zero-point correction=	0.448582 (Hartree/Particle)
Thermal correction to Energy=	0.506764
Thermal correction to Enthalpy=	0.507708
Thermal correction to Gibbs Free Energy=	0.339367
Sum of electronic and zero-point Energies=	-2704.167067
Sum of electronic and thermal Energies=	-2704.108885
Sum of electronic and thermal Enthalpies=	-2704.107941
Sum of electronic and thermal Free Energies=	-2704.276282

F	-1.24141400	2.31540100	-0.81046400
F	-1.19758400	2.91720800	-2.90625600
C	-1.75170800	2.01348700	-2.06390700
C	-2.12935700	-0.02084400	-3.49873000
C	-1.39520700	0.61120600	-2.46456300
C	-1.71771700	-1.33044100	-3.91516400
H	-0.86717500	-1.77975900	-3.41300000
C	-2.37250300	-2.01377700	-4.92169800
H	-2.03591800	-3.00324300	-5.21572800
C	-3.25508600	0.55052200	-4.18430300
H	-3.59768800	1.54503100	-3.93306100
C	-3.47192300	-1.42411500	-5.56716300
H	-3.98643800	-1.95972000	-6.35934600
C	-3.90039600	-0.14329300	-5.19652300
H	-4.74381100	0.31342900	-5.70502200
F	-3.06891900	2.32614900	-1.95935600
C	0.44213100	2.29306200	2.13869200
C	1.53014200	3.17103100	2.12227700
C	2.53316900	2.41131200	1.53923200

N	2.04970500	1.18421500	1.22973500
N	0.73452600	1.11258600	1.60593800
Br	4.33996700	2.94087600	1.23285100
Br	1.62413000	4.96513700	2.75667400
Br	-1.32374100	2.61939000	2.82197700
C	3.58950700	0.44624900	-2.70240200
C	4.89745700	0.11727700	-2.32698100
C	4.79449600	-0.13757400	-0.96711200
N	3.50935200	0.04254600	-0.57513100
N	2.76080700	0.39551500	-1.66590700
Br	6.21128800	-0.67594800	0.19251300
Br	6.45576000	0.04341200	-3.42218700
Br	2.95779300	0.92594400	-4.44082300
C	0.80687400	-2.97840600	0.15132700
C	1.29336600	-3.42747800	1.38814900
C	2.06054700	-2.36613600	1.84159300
N	2.02054800	-1.36789900	0.92585400
N	1.22839600	-1.75092500	-0.12426400
Br	3.01397000	-2.26094300	3.49235000
Br	1.00431400	-5.11108300	2.23483800
Br	-0.27658800	-3.95816100	-1.08268400
B	2.88905100	-0.08961900	0.84880600
Ag	0.50995100	0.00093900	-1.78645100
H	3.78513900	-0.19032200	1.62185100
F	-6.74011200	0.47568200	-2.43957500
F	-8.25791900	0.36237500	-0.88604100
C	-6.96836700	0.71083100	-1.12245400
C	-6.25727200	0.24808900	1.23350600
C	-6.01005400	-0.02376700	-0.22354500
C	-7.12769100	-0.56073000	1.97698900
H	-7.59402400	-1.41995600	1.50474100
C	-7.39829800	-0.26813900	3.31532200
H	-8.07371300	-0.90438600	3.88048000
C	-5.67205700	1.36378800	1.84980100
H	-5.00850700	2.00382900	1.27646600
C	-6.80532500	0.84067200	3.92405800
H	-7.01565900	1.06860100	4.96533400
C	-5.94400300	1.65838800	3.18745200
H	-5.48933500	2.52941400	3.65203100
F	-6.89649400	2.05477600	-0.95281300
C	-3.30729200	-3.49649300	2.15127900
C	-4.44215300	-4.15869900	1.65209400
C	-5.24966700	-3.54606000	0.68135000
C	-4.89979900	-2.29022900	0.20749700

C	-3.72077800	-1.62305800	0.67551700
C	-2.93834700	-2.23857500	1.68313200
H	-2.70776200	-3.97466100	2.92102300
H	-4.70382200	-5.14135800	2.03266200
H	-6.14263300	-4.04686700	0.31620800
H	-2.06162200	-1.74595300	2.09975700
C	-5.54812700	-1.38768500	-0.77087700
C	-4.59887000	-0.19850400	-0.81308300
N	-3.50552800	-0.40677500	0.08937400
H	-4.39625900	0.34112600	-1.73035200
H	-6.05821900	-1.77613600	-1.64638100
Na	-1.40573200	0.39270700	0.56916800

TSIV-Ag²

Zero-point correction=	0.451591 (Hartree/Particle)
Thermal correction to Energy=	0.509973
Thermal correction to Enthalpy=	0.510917
Thermal correction to Gibbs Free Energy=	0.340876
Sum of electronic and zero-point Energies=	-2704.175960
Sum of electronic and thermal Energies=	-2704.117577
Sum of electronic and thermal Enthalpies=	-2704.116633
Sum of electronic and thermal Free Energies=	-2704.286675

F	2.73919500	-0.55055900	-2.37720800
F	1.73019300	1.38613900	-2.57438700
C	2.43466500	0.61608500	-1.77604800
C	2.79040800	2.34108900	-0.06120700
C	2.82339500	0.91168300	-0.51049900
C	2.19373000	2.72541200	1.14925000
H	1.69490700	1.98548200	1.76870100
C	2.24355200	4.05696200	1.55964300
H	1.77420300	4.35157400	2.49361900
C	3.45049500	3.29259000	-0.85568500
H	3.92145600	2.94911600	-1.78011400
C	2.89043300	5.00810300	0.76595000
H	2.92937400	6.04511500	1.08745800
C	3.48954900	4.62374600	-0.43551200
H	4.00076200	5.36232900	-1.04675600
F	4.36663000	1.52322900	-3.03533500
C	-1.43329000	-2.33075900	-2.15636300
C	-2.58034600	-3.12929300	-2.05851100
C	-3.34788900	-2.47711200	-1.10599900
N	-2.68510200	-1.37271400	-0.68133400

N	-1.48556700	-1.29104200	-1.33680100
Br	-5.05946200	-3.02129200	-0.45793500
Br	-2.99740700	-4.72572100	-3.01327300
Br	0.05762800	-2.59315000	-3.32692700
C	-2.02430100	2.87738900	-1.22208900
C	-3.39540300	3.10403100	-1.41132000
C	-3.99179200	1.97395800	-0.87724300
N	-3.02715300	1.14500800	-0.40508000
N	-1.80075700	1.71518400	-0.62506800
Br	-5.86465100	1.60195200	-0.80496100
Br	-4.24447900	4.61361900	-2.20919000
Br	-0.58572500	4.02649000	-1.72097400
C	-0.78931000	-0.36448200	3.02612100
C	-1.94657200	-0.40063200	3.81443900
C	-2.97465400	-0.35006800	2.88620800
N	-2.44483400	-0.28994900	1.63938200
N	-1.07874800	-0.29690300	1.73382100
Br	-4.84581500	-0.35171300	3.26644500
Br	-2.08084700	-0.50242900	5.71311900
Br	1.01902100	-0.41368100	3.63962500
B	-3.18610300	-0.24383000	0.27092300
Ag	0.12380100	0.23583300	-0.27612500
H	-4.33467400	-0.42580700	0.47609000
F	6.64268900	1.32724300	2.79895800
F	8.19890900	0.03285200	1.99878900
C	7.11855500	0.76689100	1.66024300
C	6.60077000	-0.72783000	-0.29039700
C	6.07197600	-0.08210600	0.96232800
C	6.81568500	-2.11127700	-0.37442700
H	6.53959900	-2.74673200	0.45864100
C	7.37934400	-2.68137300	-1.51821700
H	7.53402400	-3.75516600	-1.56211200
C	6.98469100	0.07927700	-1.37726800
H	6.80830100	1.14815300	-1.34638400
C	7.77010200	-1.87335500	-2.58907100
H	8.23703700	-2.31329900	-3.46553800
C	7.58094100	-0.48821900	-2.51030100
H	7.90224800	0.15743100	-3.32426200
F	7.55604800	1.78499200	0.88494400
C	2.27982300	-3.52436000	0.44102900
C	3.11575300	-3.98611900	1.45746200
C	4.09148500	-3.13734600	1.99368100
C	4.21539000	-1.84449600	1.50043000
C	3.34989900	-1.37249300	0.48857400

C	2.38705500	-2.22212800	-0.06426300
H	1.52448300	-4.18284900	0.02236000
H	3.01348400	-5.00028000	1.82960000
H	4.74460900	-3.48181100	2.79091100
H	1.73436100	-1.91290800	-0.86832500
C	5.09510400	-0.73747800	1.95163000
C	4.64890500	0.45381300	1.13286100
N	3.60851000	-0.01103400	0.23383800
H	4.51598600	1.44384900	1.54631100
H	5.33563700	-0.64643800	3.00526300
Na	4.99005800	-0.34704000	-3.12658500

IntI-Rh'

Zero-point correction=	0.453709 (Hartree/Particle)
Thermal correction to Energy=	0.493585
Thermal correction to Enthalpy=	0.494529
Thermal correction to Gibbs Free Energy=	0.375738
Sum of electronic and zero-point Energies=	-2106.042404
Sum of electronic and thermal Energies=	-2106.002528
Sum of electronic and thermal Enthalpies=	-2106.001584
Sum of electronic and thermal Free Energies=	-2106.120375

Rh	0.89441100	0.08324100	0.10473900
Rh	2.78986000	-1.44285900	-0.31384200
C	1.34991600	-0.22247800	-4.20948600
H	0.30481300	-0.02962000	-4.45864600
H	1.71919500	-1.09124400	-4.75692800
H	1.93965900	0.65050300	-4.51265900
C	1.51911500	-0.42791100	-2.72387300
O	2.45056700	-1.19196200	-2.33724900
O	0.71275600	0.21741100	-1.96342300
C	4.46908200	2.53429300	-0.04465800
H	4.02565200	3.39667600	-0.54785000
H	5.43013100	2.28282700	-0.49509400
H	4.62989600	2.80646300	1.00447400
C	3.53200200	1.35286800	-0.10181200
O	2.29184400	1.60912100	0.09187400
O	4.03125900	0.20829000	-0.31178600
C	-0.74066000	-3.94465600	-0.13055700
H	-1.57636700	-3.75633200	-0.81017800
H	-1.15502600	-4.05993300	0.87669000
H	-0.22540700	-4.86216000	-0.41582000
C	0.21380100	-2.77698000	-0.14098100

O	-0.31041700	-1.61425600	0.01373900
O	1.44739700	-3.01251900	-0.28433200
C	2.39712300	-1.17702100	3.97842400
H	2.31312900	-0.21247500	4.48497700
H	3.35494200	-1.64522600	4.20833600
H	1.58792600	-1.81693200	4.34698400
C	2.23819900	-0.99785200	2.48868500
O	3.03328500	-1.62410600	1.72561900
O	1.28547000	-0.23027800	2.11551100
F	-1.50707500	-0.25603500	2.04679000
F	-1.01588400	1.66828700	2.92437700
C	-1.44820700	1.06201100	1.78833100
C	-0.64702800	2.76613000	0.14129300
C	-0.54190800	1.41693400	0.61171200
C	-0.04799000	3.10577200	-1.10702900
H	0.44308300	2.32671000	-1.67282900
C	-0.12896100	4.39476500	-1.61323300
H	0.31633600	4.62757800	-2.57547400
C	-1.31447900	3.80793900	0.85981400
H	-1.76987700	3.60405300	1.81907800
C	-0.77799200	5.39321400	-0.88126700
H	-0.83130500	6.40496100	-1.27339800
C	-1.36284400	5.09660300	0.35759100
H	-1.86046500	5.87758600	0.92372700
F	-2.72800500	1.45628100	1.57510500
C	-6.03704400	-1.34901900	1.41823900
C	-7.02562700	-1.10470500	0.44058900
C	-6.68087500	-0.85142000	-0.88113900
C	-5.32115800	-0.84511400	-1.24504400
C	-4.34027100	-1.10011600	-0.24164300
C	-4.68538800	-1.34844200	1.09300800
H	-6.33802300	-1.53796700	2.44502800
H	-8.07265000	-1.11257100	0.73127100
H	-7.44989300	-0.66104200	-1.62555700
H	-3.92303400	-1.52164900	1.84620800
C	-4.60821800	-0.62997400	-2.47401300
C	-3.27209600	-0.75907900	-2.18820600
H	-2.41111600	-0.67356100	-2.83611000
N	-3.10225600	-1.03882900	-0.84735600
H	-5.03387000	-0.40897300	-3.44319800
H	-2.20370900	-1.21802000	-0.40643200

TSI-Rh'

Zero-point correction=	0.454397 (Hartree/Particle)
Thermal correction to Energy=	0.492931
Thermal correction to Enthalpy=	0.493875
Thermal correction to Gibbs Free Energy=	0.381629
Sum of electronic and zero-point Energies=	-2106.017072
Sum of electronic and thermal Energies=	-2105.978538
Sum of electronic and thermal Enthalpies=	-2105.977594
Sum of electronic and thermal Free Energies=	-2106.089841

Rh	0.81251500	0.04310600	0.09540700
Rh	3.15872000	-0.48444900	-0.46652900
C	0.75381500	-3.11933900	-2.90847700
H	-0.16650800	-3.60369000	-2.57495900
H	1.53055800	-3.86335100	-3.09226800
H	0.54046700	-2.60164300	-3.85085100
C	1.22068600	-2.10358000	-1.89127800
O	2.47037300	-1.94728400	-1.75312400
O	0.30849000	-1.46260800	-1.26655000
C	1.92539500	2.63082800	-3.20226600
H	0.93930200	2.67738600	-3.66933200
H	2.69555700	2.44347100	-3.95220500
H	2.12205800	3.60255400	-2.73507500
C	1.95254300	1.56356200	-2.13318900
O	0.88609700	1.42512300	-1.44592300
O	3.03106800	0.90915000	-1.98644200
C	2.14991400	-2.94858100	2.95768800
H	1.25822800	-3.58103800	2.97192400
H	2.16329600	-2.37457000	3.89077800
H	3.04744400	-3.56618200	2.90726000
C	2.09430000	-1.98863400	1.79176600
O	0.97912500	-1.38863900	1.60555000
O	3.14718700	-1.83623000	1.10481400
C	3.34225800	2.66903400	2.46798300
H	2.69372600	3.54727400	2.42796500
H	4.37770700	2.95175100	2.27255100
H	3.27518500	2.25050700	3.47848000
C	2.87642500	1.62949300	1.47504800
O	3.76673500	0.99518000	0.82848700
O	1.61690100	1.45942800	1.38596800
F	-0.70854500	0.83253900	2.84540200
F	-0.74003500	2.66675300	1.64331100
C	-1.32330800	1.47038800	1.81858700
C	-2.08236900	1.17394100	-0.58648800
C	-1.26986500	0.65331200	0.53490200

C	-2.10623800	0.44548800	-1.79581000
H	-1.53245100	-0.46983600	-1.86422200
C	-2.83661400	0.89514900	-2.89135000
H	-2.84562300	0.31067500	-3.80724100
C	-2.81174700	2.38368400	-0.53248800
H	-2.82356800	2.98211400	0.36883900
C	-3.53573300	2.10289100	-2.82489900
H	-4.09229000	2.46197600	-3.68616000
C	-3.51065300	2.84766700	-1.64519000
H	-4.04703300	3.79028400	-1.58328500
F	-2.58074500	1.74220800	2.30907500
C	-6.08556700	-0.23265000	0.90571700
C	-6.38459600	-1.37039300	0.14790400
C	-5.38444600	-2.27999200	-0.20210100
C	-4.07771400	-2.02636300	0.21717500
C	-3.78992700	-0.86863100	0.96723000
C	-4.77809500	0.03899600	1.32584200
H	-6.87872400	0.45851100	1.17359900
H	-7.40843400	-1.55049400	-0.16630900
H	-5.61848100	-3.17138300	-0.77637000
H	-4.55997900	0.92316400	1.90683500
C	-2.83748900	-2.77766200	0.08957200
C	-1.86504500	-2.10351800	0.72665600
H	-0.82104800	-2.31990500	0.87509300
N	-2.36716100	-0.85148800	1.24557400
H	-2.71794900	-3.72638500	-0.41681000
H	-2.13678300	-0.73043100	2.23321000

IntI-Rh^I

Zero-point correction=	0.453290 (Hartree/Particle)
Thermal correction to Energy=	0.493481
Thermal correction to Enthalpy=	0.494426
Thermal correction to Gibbs Free Energy=	0.372993
Sum of electronic and zero-point Energies=	-2106.039241
Sum of electronic and thermal Energies=	-2105.999050
Sum of electronic and thermal Enthalpies=	-2105.998105
Sum of electronic and thermal Free Energies=	-2106.119538

Rh	1.06014600	0.12811000	0.10227800
Rh	2.97957200	-1.30501800	-0.48964700
C	0.15977700	-1.64109600	-3.75978800
H	0.78940000	-2.29212600	-4.36686700
H	-0.09068400	-0.73634200	-4.32174700

H	-0.77993000	-2.15057800	-3.52459400
C	0.86087900	-1.26754800	-2.47707800
O	1.99910300	-1.77051700	-2.24800000
O	0.22943700	-0.45957400	-1.70681500
C	3.90030500	2.63961400	-2.01143200
H	4.73401500	2.32223400	-2.63888800
H	4.27916400	3.29453400	-1.21907300
H	3.17908500	3.21313300	-2.59878600
C	3.22797100	1.44567300	-1.37864200
O	2.08011900	1.66025600	-0.85251800
O	3.84402000	0.33932000	-1.39477000
C	0.21272500	-3.82865600	1.67578400
H	-0.85798600	-3.85179800	1.46043400
H	0.33137900	-3.68787000	2.75603200
H	0.67851500	-4.77261700	1.38994300
C	0.87244600	-2.67455100	0.96158500
O	0.22117400	-1.57265100	0.94617500
O	2.01795700	-2.86783700	0.45509100
C	3.88931100	0.36591300	3.38835300
H	3.37265500	-0.17678200	4.18760500
H	3.78318400	1.43441800	3.59069500
H	4.94231200	0.08168100	3.38860000
C	3.24656200	0.01941700	2.06771700
O	3.86206600	-0.77680400	1.29735200
O	2.10616500	0.55296800	1.84224700
F	-0.49611800	0.29860600	2.77954600
F	-0.26081800	2.45164000	2.80881000
C	-0.80909200	1.41935300	2.12147600
C	-0.89238300	2.51905700	-0.12344000
C	-0.37786200	1.43302500	0.65842000
C	-0.76479400	2.46081100	-1.54236200
H	-0.30660900	1.58731600	-1.98380200
C	-1.25892000	3.47571900	-2.34904100
H	-1.16895900	3.40092900	-3.42819000
C	-1.53126800	3.67152600	0.43480500
H	-1.63628200	3.77259200	1.50621400
C	-1.86828100	4.59318900	-1.77219600
H	-2.24614000	5.39178000	-2.40440400
C	-1.99642100	4.68905600	-0.37941200
H	-2.46548500	5.56199400	0.06354000
F	-2.17203200	1.54211400	2.23428300
C	-7.56508000	-0.24316800	0.22612000
C	-7.73856300	-1.32941800	-0.65811200
C	-6.66478600	-2.12520600	-1.03821500

C	-5.38435000	-1.83740100	-0.52986000
C	-5.23398200	-0.73525600	0.36286200
C	-6.31424000	0.06812200	0.74774000
H	-8.42460600	0.35994100	0.50521400
H	-8.73067900	-1.54434100	-1.04560100
H	-6.81043800	-2.95971500	-1.71940400
H	-6.18008200	0.90267200	1.43064400
C	-4.08023100	-2.41911800	-0.69209500
C	-3.21135400	-1.68359100	0.07529400
H	-2.14560000	-1.78816200	0.22694600
N	-3.90225500	-0.67189000	0.71220800
H	-3.82241000	-3.27633500	-1.29884000
H	-3.48518100	0.01217600	1.32575800

TSI-Rh

Zero-point correction=	0.454019 (Hartree/Particle)
Thermal correction to Energy=	0.492597
Thermal correction to Enthalpy=	0.493541
Thermal correction to Gibbs Free Energy=	0.381505
Sum of electronic and zero-point Energies=	-2106.027450
Sum of electronic and thermal Energies=	-2105.988873
Sum of electronic and thermal Enthalpies=	-2105.987929
Sum of electronic and thermal Free Energies=	-2106.099964

Rh	0.81731400	-0.01348400	0.08136600
Rh	3.22682000	-0.15143600	-0.47568300
C	1.13422200	0.41563700	-4.23868900
H	1.97688300	0.13370600	-4.87127100
H	0.90796600	1.47502800	-4.40479600
H	0.24675100	-0.16093600	-4.51123300
C	1.47066600	0.20830500	-2.78027400
O	2.68919900	0.07646300	-2.46843000
O	0.48058600	0.20579000	-1.96583800
C	2.41185100	4.01647300	0.33740600
H	3.26004900	4.42277000	-0.21616900
H	2.58158900	4.18656900	1.40676100
H	1.48964500	4.53022000	0.05816100
C	2.28387800	2.53027900	0.09698400
O	1.12881800	2.02410100	0.29764300
O	3.32680300	1.90143400	-0.25836300
C	1.73432200	-4.21121600	-0.65960900
H	1.15881600	-4.42271600	-1.56766700
H	1.19428000	-4.64315800	0.18765800

H	2.71818900	-4.67332200	-0.74748400
C	1.86077100	-2.71434400	-0.48453000
O	0.78490800	-2.08705500	-0.19417000
O	3.00542600	-2.19928600	-0.65057500
C	2.95222700	-0.55872000	3.81868500
H	2.44580700	-1.45214500	4.19679500
H	2.56403400	0.29835000	4.37740300
H	4.02712000	-0.64834200	3.97952400
C	2.64165900	-0.38616700	2.34973600
O	3.61746900	-0.37277600	1.53777600
O	1.40685300	-0.26755900	2.05114500
F	-1.08388100	-1.75387800	1.97366900
F	-1.25303500	0.17607800	2.95600400
C	-1.64515400	-0.53064000	1.86606000
C	-1.90547000	1.51752900	0.41808800
C	-1.23890300	0.21673800	0.60362100
C	-1.58989300	2.29052600	-0.72651400
H	-0.89481100	1.88662400	-1.45105500
C	-2.15480300	3.54284800	-0.93591500
H	-1.89416200	4.10796600	-1.82656700
C	-2.83117500	2.07271800	1.33689500
H	-3.12089400	1.52650400	2.22369300
C	-3.04121200	4.08189300	0.00235600
H	-3.47214500	5.06706100	-0.15308900
C	-3.37113600	3.34148400	1.13792900
H	-4.06267400	3.74634400	1.87123300
F	-2.98783600	-0.73749500	2.01397900
C	-6.56520700	-0.90654300	-0.54551000
C	-6.00113000	0.26193200	-1.08401800
C	-4.62585500	0.37536000	-1.29092700
C	-3.80255400	-0.70469000	-0.95118200
C	-4.39910600	-1.87281000	-0.41997300
C	-5.76817100	-1.99937400	-0.20349400
H	-7.63915900	-0.96306600	-0.39540300
H	-6.64996800	1.09299500	-1.34433400
H	-4.20365700	1.28414700	-1.70636400
H	-6.19829600	-2.90710500	0.20890700
C	-2.36241800	-0.93810200	-0.99518700
C	-2.18867600	-2.27133000	-0.57036400
H	-1.26142000	-2.81694100	-0.48114400
N	-3.37128900	-2.79596800	-0.20426000
H	-1.66231000	-0.44979500	-1.65714700
H	-3.48878000	-3.70555900	0.22185500

IntII-Rh

Zero-point correction=	0.455678 (Hartree/Particle)
Thermal correction to Energy=	0.494325
Thermal correction to Enthalpy=	0.495270
Thermal correction to Gibbs Free Energy=	0.382620
Sum of electronic and zero-point Energies=	-2106.045954
Sum of electronic and thermal Energies=	-2106.007307
Sum of electronic and thermal Enthalpies=	-2106.006363
Sum of electronic and thermal Free Energies=	-2106.119013

Rh	0.77146100	-0.06198400	0.10724200
Rh	3.16119100	-0.27044400	-0.51984900
C	0.90780900	-0.36285100	-4.23596200
H	1.67568800	-0.86427300	-4.82736000
H	0.81442000	0.66818400	-4.59620900
H	-0.05765200	-0.85559900	-4.37172800
C	1.29669600	-0.33364800	-2.77465000
O	2.52988400	-0.40298200	-2.49914500
O	0.33925300	-0.21252700	-1.93251100
C	2.30721600	3.96251000	-0.41718500
H	3.10079200	4.27214200	-1.09977900
H	2.55949100	4.31693100	0.58887200
H	1.35525500	4.41318700	-0.70427800
C	2.19127400	2.45577900	-0.38637500
O	1.06035800	1.98223200	-0.04070000
O	3.22964100	1.78503900	-0.68150600
C	1.78669200	-4.32482300	0.16036600
H	1.10969700	-4.73401900	-0.59760400
H	1.37780000	-4.57691100	1.14342400
H	2.77048200	-4.78010600	0.04253500
C	1.87033000	-2.82135600	0.01146100
O	0.78774500	-2.17022300	0.22186200
O	2.98680400	-2.32496900	-0.31037600
C	3.06878300	0.12719200	3.78402200
H	2.37333400	-0.43294800	4.41343900
H	3.00154100	1.18253000	4.07135100
H	4.09131900	-0.21664400	3.94748100
C	2.68387000	-0.00870100	2.32778200
O	3.62908400	-0.12434500	1.48495100
O	1.43697300	0.02819800	2.06987500
F	-1.48482400	-1.49717900	2.14875900
F	-1.12346300	0.52384800	2.87171000
C	-1.78708500	-0.17683200	1.93269900

C	-1.83259500	1.68272600	0.22173000
C	-1.48101700	0.24209600	0.51747400
C	-1.78477000	2.15181700	-1.10888500
H	-1.45300400	1.48533300	-1.89766600
C	-2.11580000	3.46304900	-1.44089800
H	-2.06472300	3.77900900	-2.48001100
C	-2.22213300	2.61482300	1.20472900
H	-2.28177400	2.32477800	2.24497600
C	-2.50025800	4.36998300	-0.44951900
H	-2.75932300	5.39370900	-0.70465900
C	-2.54280600	3.93308700	0.87347700
H	-2.83942000	4.61751100	1.66424100
F	-3.11820700	-0.07916400	2.27850300
C	-6.53556700	-1.30024100	-0.63109600
C	-6.09906800	0.02737800	-0.72595900
C	-4.74033000	0.36023400	-0.67846500
C	-3.80801700	-0.66312100	-0.52243600
C	-4.27926900	-1.97942500	-0.43295900
C	-5.61823900	-2.34241500	-0.48384600
H	-7.59688800	-1.52371900	-0.67206100
H	-6.83266500	0.81996400	-0.83825300
H	-4.42562300	1.39345500	-0.75552100
H	-5.93594300	-3.37791400	-0.41243500
C	-2.28197800	-0.69909400	-0.45343400
C	-2.02983100	-2.15290100	-0.27819100
H	-1.05252900	-2.61395700	-0.16952600
N	-3.14545700	-2.82479900	-0.29170400
H	-1.86395800	-0.48495200	-1.45271800
H	-3.20039300	-3.83536500	-0.20094600

IntIII-Rh

Zero-point correction=	0.735759 (Hartree/Particle)
Thermal correction to Energy=	0.787316
Thermal correction to Enthalpy=	0.788260
Thermal correction to Gibbs Free Energy=	0.649585
Sum of electronic and zero-point Energies=	-2477.276483
Sum of electronic and thermal Energies=	-2477.224926
Sum of electronic and thermal Enthalpies=	-2477.223982
Sum of electronic and thermal Free Energies=	-2477.362658

Rh	1.42115800	-0.49680100	0.02535700
Rh	3.39203500	-1.92440400	-0.11471700
C	4.90625600	2.04022000	0.63636300

H	4.44334700	2.97152000	0.30518000
H	5.88175700	1.90800800	0.16484500
H	5.05723300	2.09991500	1.72042200
C	4.01232800	0.86097600	0.33894300
O	4.57556300	-0.26023400	0.14471100
O	2.75400600	1.07363300	0.32938900
C	2.24610500	-1.86173400	4.04928500
H	1.70232800	-2.79953200	4.21163000
H	1.70751900	-1.05747800	4.55276700
H	3.24687700	-1.97535800	4.47078100
C	2.32792100	-1.60069600	2.56519000
O	1.41748100	-0.86766400	2.05583200
O	3.28329000	-2.15413600	1.93097100
C	2.45615000	-0.74787300	-4.18109400
H	3.43819500	-0.97961700	-4.59588200
H	2.14312600	0.25458700	-4.48152100
H	1.73135500	-1.46335400	-4.58647200
C	2.47016500	-0.87501300	-2.67647900
O	1.55673800	-0.24785300	-2.03569000
O	3.36663200	-1.61163900	-2.16285800
C	0.01832900	-4.57352500	-0.55284900
H	0.60930400	-5.45463400	-0.80534100
H	-0.72847200	-4.38798300	-1.32958700
H	-0.51415200	-4.75544000	0.38700500
C	0.90505800	-3.36170400	-0.39063000
O	2.16016300	-3.55376500	-0.35652200
O	0.31968500	-2.23483700	-0.28582500
F	-1.66035200	-0.58029900	-1.10237900
F	-1.65149400	-0.87572500	1.05707600
C	-1.51857700	0.00488800	0.08413900
C	-0.52896900	1.76602400	1.55959300
C	-0.58528900	1.06990100	0.21968900
C	0.56487000	2.59072500	1.87983000
H	1.39735200	2.65856200	1.19300700
C	0.61993500	3.27895300	3.09236600
H	1.48246400	3.90277200	3.31197200
C	-1.56606100	1.66370800	2.50821000
H	-2.43652500	1.05948800	2.28886700
C	-0.40861200	3.15507200	4.02723400
H	-0.36014200	3.68437800	4.97465200
C	-1.49950900	2.33858700	3.72737300
H	-2.31241500	2.23122700	4.44100300
F	-3.20455800	0.58518800	0.13631200

C	1.75516000	5.46501700	-1.83217600
C	2.37341700	4.22008900	-2.00375400
C	1.69508900	3.01967000	-1.75518100
C	0.37634100	3.08138000	-1.31783900
C	-0.22346200	4.34258400	-1.19392300
C	0.42118400	5.54892000	-1.42699400
H	2.31077400	6.37563500	-2.03164200
H	3.40431100	4.18409000	-2.34254300
H	2.18064900	2.06345600	-1.89047800
H	-0.08433400	6.50242400	-1.31543000
C	-0.67289700	2.01863500	-1.02947800
C	-1.88794400	2.86887800	-0.81491000
H	-2.86746100	2.49210700	-0.54829000
N	-1.58862000	4.13276000	-0.85631000
H	-0.81519000	1.38339500	-1.91160500
H	-4.63182400	-0.29609200	-0.16738900
N	-5.52265800	-0.79055100	-0.40836300
C	-5.83165400	-0.37010400	-1.83025700
H	-6.70041600	-0.93549900	-2.16735800
C	-5.14716500	-2.27844200	-0.26881900
C	-6.56412300	-0.26612700	0.60163900
H	-6.43181500	-0.89834000	1.47965500
C	-6.25919500	-3.24323900	-0.66968300
H	-5.83662000	-4.25256600	-0.68223500
H	-7.08345400	-3.24823100	0.04818500
H	-6.66014500	-3.05068700	-1.66819300
C	-6.21194200	1.17224100	0.98861300
H	-6.86664800	1.48707200	1.80607400
H	-5.17544600	1.25497000	1.32305200
H	-6.36866600	1.86900100	0.15793400
C	-8.00971500	-0.38328000	0.11839100
H	-8.23261000	0.31956700	-0.68916500
H	-8.27730800	-1.38900800	-0.21067100
H	-8.66304400	-0.12946200	0.95832400
C	-4.60746400	-2.56653400	1.13334300
H	-3.87808200	-1.81868600	1.45035700
H	-5.40028700	-2.63845600	1.88320800
H	-4.09681000	-3.53346300	1.11032700
H	-4.31582500	-2.38455600	-0.96859800
C	-4.65457000	-0.52870400	-2.78545900
H	-4.41777700	-1.57330400	-3.00135900
H	-4.91821800	-0.05255900	-3.73460800
H	-3.75970600	-0.04086100	-2.39250600
H	-6.12028300	0.68108600	-1.77306900

H	-2.24540100	4.88317100	-0.65458500
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IntIII-Rh

Zero-point correction=	0.734774 (Hartree/Particle)
Thermal correction to Energy=	0.786035
Thermal correction to Enthalpy=	0.786979
Thermal correction to Gibbs Free Energy=	0.646210
Sum of electronic and zero-point Energies=	-2477.268060
Sum of electronic and thermal Energies=	-2477.216799
Sum of electronic and thermal Enthalpies=	-2477.215855
Sum of electronic and thermal Free Energies=	-2477.358824

Rh	1.22005800	-0.55845600	-0.02130500
Rh	2.85420400	-2.36924700	0.17813800
C	4.84822400	1.12926400	1.70044700
H	4.71414900	2.14601000	1.32633100
H	5.86934900	0.78711600	1.52530700
H	4.67278200	1.14125800	2.78210000
C	3.85825700	0.18522100	1.05981200
O	4.22131400	-1.01846400	0.90591800
O	2.71866900	0.66951800	0.74556300
C	0.81134200	-2.16584100	3.97670900
H	1.45180900	-1.56319400	4.63028900
H	0.94079900	-3.21430300	4.25098400
H	-0.22213800	-1.85107600	4.13004900
C	1.23204800	-1.94081200	2.54337600
O	0.63067700	-1.01261600	1.90737200
O	2.16868000	-2.67473400	2.09690300
C	3.23264200	-0.84275800	-3.85788800
H	4.25908900	-1.17548200	-4.01926200
H	3.11582200	0.19943600	-4.16171500
H	2.57354400	-1.45351100	-4.48528300
C	2.83849400	-1.03213100	-2.41166800
O	1.92208600	-0.25929000	-1.95744400
O	3.42449600	-1.95103900	-1.76738400
C	-0.70029200	-4.24319100	-1.35215700
H	-0.19788200	-5.11017000	-1.78348000
H	-1.36317400	-3.78473900	-2.08903400
H	-1.30705200	-4.58647100	-0.50645200
C	0.31441300	-3.23868200	-0.85305300
O	1.45852500	-3.68781800	-0.54246100
O	-0.07177700	-2.02814700	-0.76131700
F	-1.47591500	-0.00839500	-1.85151800

F	-1.98134400	-0.42283700	0.24287400
C	-1.58711300	0.53024200	-0.62157700
C	-0.54266400	1.99835300	1.15005100
C	-0.39869600	1.30582000	-0.18617800
C	0.58834400	2.56232400	1.77246800
H	1.55750200	2.44801200	1.30958100
C	0.49767700	3.21149200	3.00286200
H	1.39638200	3.62860200	3.44904700
C	-1.76902800	2.12323000	1.83722500
H	-2.67863700	1.73278800	1.40096100
C	-0.72278300	3.31012800	3.66983000
H	-0.79003900	3.80833200	4.63231700
C	-1.85547100	2.75452300	3.07763000
H	-2.81900900	2.82201000	3.57619500
F	-2.86547200	1.27483700	-0.78370200
C	3.16375000	5.18720500	-1.02893500
C	3.59738600	3.87157400	-1.23153000
C	2.69300300	2.80984000	-1.35719400
C	1.33213200	3.08305000	-1.27238600
C	0.93124600	4.41691000	-1.11348900
C	1.80160500	5.48877500	-0.97502300
H	3.89122900	5.98649500	-0.93233400
H	4.66208700	3.66992100	-1.29692400
H	3.03363300	1.79552700	-1.50687900
H	1.44862900	6.50762400	-0.85276200
C	0.09284300	2.21840700	-1.41328000
C	-0.96760900	3.25715900	-1.48781800
H	-2.02867000	3.09191600	-1.59915000
N	-0.48520600	4.44277200	-1.20197900
H	0.14332800	1.56493400	-2.28630500
H	-4.44474200	0.08583700	-0.41130100
N	-5.31297100	-0.46823300	-0.37694400
C	-5.60718200	-0.82431100	-1.82399200
H	-6.52907600	-1.40411700	-1.83644200
C	-4.92399700	-1.69021800	0.49642800
C	-6.36685800	0.49538500	0.21875400
H	-6.18865700	0.45104900	1.29321300
C	-5.98153100	-2.78974800	0.52397500
H	-5.54137800	-3.66149000	1.01685900
H	-6.86272900	-2.50805100	1.10520200
H	-6.30129500	-3.11617100	-0.46843300
C	-6.08025100	1.92194200	-0.25686800
H	-6.74116700	2.60780000	0.28006200
H	-5.05021500	2.22629200	-0.05308600

H	-6.27968300	2.05441800	-1.32458800
C	-7.80967200	0.08154800	-0.06890800
H	-8.08299100	0.22395300	-1.11776300
H	-8.03182500	-0.94826300	0.21384200
H	-8.46576000	0.72634600	0.52266900
C	-4.51071000	-1.25520300	1.90278400
H	-3.81428600	-0.41382900	1.89769500
H	-5.36538400	-1.01841500	2.54264500
H	-3.98511100	-2.09223700	2.37101900
H	-4.03105400	-2.06021600	-0.01074000
C	-4.47519400	-1.56260500	-2.52623100
H	-4.33708100	-2.58097400	-2.15591300
H	-4.73230400	-1.63876500	-3.58675800
H	-3.52518900	-1.02833300	-2.45360400
H	-5.80243800	0.12435200	-2.32725200
H	-1.04867000	5.27154900	-1.04709900

IntIV-Rh

Zero-point correction=	0.783200 (Hartree/Particle)
Thermal correction to Energy=	0.827385
Thermal correction to Enthalpy=	0.828329
Thermal correction to Gibbs Free Energy=	0.701732
Sum of electronic and zero-point Energies=	-1713.014727
Sum of electronic and thermal Energies=	-1712.970541
Sum of electronic and thermal Enthalpies=	-1712.969597
Sum of electronic and thermal Free Energies=	-1713.096194

F	3.27417100	0.07343700	-2.12045000
F	2.57206800	-1.60378900	-3.30979300
C	2.49570400	-1.00510200	-2.13726500
C	0.94755400	-2.65321500	-1.15039200
C	1.77021800	-1.41642500	-1.09406800
C	0.90815000	-3.52454700	-0.04825800
H	1.51699100	-3.32013000	0.82756800
C	0.13578600	-4.68445700	-0.08213900
H	0.13059400	-5.35137700	0.77462600
C	0.18959700	-2.97816900	-2.28768900
H	0.19575200	-2.31596600	-3.14617900
C	-0.60985500	-4.99765200	-1.21848600
H	-1.20601100	-5.90425800	-1.24808300
C	-0.57699100	-4.14126200	-2.32010300
H	-1.15292800	-4.37642500	-3.20987200
C	4.53801800	-1.39379000	3.43522200

C	5.11883200	-1.34859500	2.16115700
C	4.35021500	-1.11044400	1.01694800
C	2.98201200	-0.92384700	1.17193600
C	2.42662600	-0.98129600	2.45519700
C	3.16494000	-1.20802000	3.60883600
H	5.16259200	-1.57846900	4.30255200
H	6.18816700	-1.50226400	2.06067600
H	4.81060200	-1.07564800	0.03531000
H	2.70844500	-1.24262400	4.59248000
C	1.86838700	-0.60681300	0.19161500
C	0.65847700	-0.62191900	1.06263100
H	-0.39142500	-0.39159500	0.77085900
N	1.02508800	-0.78025700	2.30703700
H	1.93298500	0.48957100	-0.06863400
N	1.55995500	2.79541300	-0.40336900
C	2.79505300	3.55095700	-0.11715500
H	2.68855200	4.62298000	-0.34807000
C	1.22580600	2.75683200	-1.86152600
C	0.43895800	3.10867500	0.52874700
H	-0.33987200	2.36945800	0.31823600
C	1.26657900	4.10103600	-2.61936300
H	1.11440500	3.91187800	-3.68755500
H	0.48623800	4.79454700	-2.29694300
H	2.22800500	4.61191800	-2.52193400
C	0.85331100	2.88686000	1.99491600
H	-0.04385700	2.76532300	2.61111500
H	1.47356000	1.99358500	2.11515700
H	1.40898800	3.73260900	2.41176800
C	-0.19140100	4.51111200	0.40007000
H	0.55345800	5.30650700	0.50678800
H	-0.70420600	4.65273900	-0.55347700
H	-0.93610500	4.65780500	1.19074100
C	-0.10557500	2.04757900	-2.14216300
H	-0.24895400	1.14076800	-1.55021000
H	-0.96314200	2.69950100	-1.94750500
H	-0.14877900	1.77470600	-3.20168400
H	2.01130500	2.13595400	-2.30474800
C	4.04334400	3.01803200	-0.82156800
H	4.00277600	3.12219600	-1.90903300
H	4.91760600	3.57976100	-0.47690800
H	4.21162000	1.96255600	-0.58975200
H	2.97565500	3.49180600	0.95825500
H	0.37593500	-0.73910600	3.08591100
F	-1.76591900	0.39133400	0.35903900

H	-3.08028700	0.19450600	0.43776800
N	-4.20348100	0.08454000	0.57283700
C	-4.34843800	-0.32482900	2.01114600
H	-5.40559100	-0.34446500	2.28488800
C	-4.72743100	1.48566000	0.27803700
C	-4.65789000	-0.99691500	-0.40710100
H	-4.86106700	-0.46026400	-1.33581800
C	-6.24778500	1.62013900	0.33603200
H	-6.50763400	2.67910500	0.24604100
H	-6.74054600	1.09850700	-0.48917200
H	-6.67360700	1.26595200	1.27914100
C	-3.49945900	-1.96403900	-0.66900200
H	-3.77172900	-2.64395500	-1.48088500
H	-2.59435700	-1.42224200	-0.94667400
H	-3.27399000	-2.58126100	0.20751400
C	-5.93156600	-1.73779900	0.01008300
H	-5.76924900	-2.38896100	0.87363100
H	-6.76633200	-1.07087000	0.23302600
H	-6.24176100	-2.38020300	-0.81932500
C	-4.14128700	1.99604000	-1.04129600
H	-3.06894900	1.79357200	-1.07956400
H	-4.62282400	1.55396200	-1.91896400
H	-4.29434200	3.07729100	-1.10443800
H	-4.29327700	2.09246800	1.07599000
C	-3.54026000	0.55640100	2.96234300
H	-4.01000900	1.52571900	3.14731800
H	-3.45545700	0.05346100	3.93030900
H	-2.54116200	0.72258100	2.55090900
H	-3.97836400	-1.35104000	2.06810400

TSIII-Rh

Zero-point correction=	0.780844 (Hartree/Particle)
Thermal correction to Energy=	0.823724
Thermal correction to Enthalpy=	0.824668
Thermal correction to Gibbs Free Energy=	0.705435
Sum of electronic and zero-point Energies=	-1713.011806
Sum of electronic and thermal Energies=	-1712.968925
Sum of electronic and thermal Enthalpies=	-1712.967981
Sum of electronic and thermal Free Energies=	-1713.087214

F	-3.61143200	0.46551300	-1.92656900
F	-2.77352100	2.23731900	-2.85962100
C	-2.66374800	1.40183500	-1.84221300

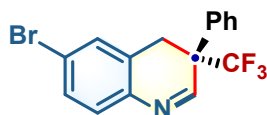
C	-0.78831600	2.60874600	-0.85654900
C	-1.76590300	1.48009000	-0.85779600
C	-0.59415900	3.37279700	0.30662800
H	-1.16454800	3.14789900	1.20319000
C	0.29244600	4.44753100	0.31377800
H	0.41723500	5.03483300	1.21849900
C	-0.06670000	2.95092300	-2.01052000
H	-0.19739200	2.37096200	-2.91781600
C	1.00081000	4.78117900	-0.84178700
H	1.68521900	5.62381500	-0.83861600
C	0.81667200	4.02968800	-2.00262400
H	1.36202300	4.28144800	-2.90712500
C	-4.55667400	0.55822700	3.59675600
C	-5.11996300	0.78330600	2.33135600
C	-4.33587300	0.80433800	1.17729100
C	-2.95990600	0.60176000	1.30154700
C	-2.42048200	0.40476900	2.58479300
C	-3.18517800	0.36477700	3.74692300
H	-5.19606300	0.54214500	4.47293600
H	-6.18961000	0.94683600	2.24969200
H	-4.78803200	0.98347100	0.20875800
H	-2.73991500	0.20170200	4.72317300
C	-1.83133300	0.52019500	0.31574600
C	-0.65614000	0.42298400	1.16093900
H	0.39323800	0.31813700	0.85124200
N	-1.02331000	0.29738400	2.42846300
H	-1.81995600	-0.72103900	-0.12533700
N	-1.69103400	-2.21504700	-0.68605600
C	-2.95265500	-2.97852600	-0.45280200
H	-2.83065500	-4.00698000	-0.81500600
C	-1.42084000	-1.97870300	-2.15966300
C	-0.53455500	-2.78924500	0.10251800
H	0.25906000	-2.03697000	0.05250400
C	-1.61745500	-3.18515800	-3.09639200
H	-1.49796100	-2.83565200	-4.12714800
H	-0.88553400	-3.97863000	-2.93816700
H	-2.61433700	-3.62565100	-3.02674000
C	-0.89524100	-2.98173900	1.58619800
H	0.03083900	-3.02785600	2.16782100
H	-1.50451800	-2.17234200	1.99281700
H	-1.42841400	-3.91996200	1.76615600
C	0.04288200	-4.11613300	-0.42375500
H	-0.71702200	-4.89974000	-0.50165300
H	0.53598300	-4.01452800	-1.39069300

H	0.79886100	-4.47274600	0.28360600
C	-0.04948400	-1.33496300	-2.40807700
H	0.23016800	-0.58457700	-1.66733200
H	0.75174100	-2.07897300	-2.42886600
H	-0.06178000	-0.85470800	-3.39146400
H	-2.18206200	-1.24909500	-2.44184000
C	-4.22603900	-2.38091900	-1.04558900
H	-4.20119500	-2.28049700	-2.13252600
H	-5.05830700	-3.04862700	-0.80115200
H	-4.45294300	-1.40451700	-0.61599800
H	-3.09280800	-3.04506600	0.62630200
H	-0.37592600	0.11044700	3.18362400
F	1.84319100	-0.46089000	0.25844400
H	3.12815300	-0.34257800	0.39212000
N	4.27223000	-0.30700300	0.55733400
C	4.41554400	-0.10646700	2.03822200
H	5.46751800	-0.18130700	2.32349700
C	4.72874200	-1.67810200	0.07822700
C	4.79666200	0.87309100	-0.25728200
H	4.97562100	0.46413800	-1.25378100
C	6.23891900	-1.90443900	0.12925900
H	6.44302400	-2.95489600	-0.09901900
H	6.77156900	-1.30564600	-0.61478700
H	6.66859600	-1.70204800	1.11442100
C	3.69966100	1.93525700	-0.37702000
H	4.01815400	2.70725100	-1.08269400
H	2.76588300	1.49509700	-0.72860100
H	3.50406400	2.43221100	0.57926800
C	6.10802800	1.47286800	0.25994600
H	5.97594800	2.00216600	1.20788000
H	6.90239900	0.73494700	0.38540800
H	6.46029000	2.20876400	-0.46901000
C	4.13859100	-1.97390400	-1.30409800
H	3.07974500	-1.70734300	-1.32240900
H	4.65707700	-1.44364200	-2.10873600
H	4.23579500	-3.04336300	-1.51271300
H	4.25181100	-2.36541800	0.78110300
C	3.54789700	-1.06343800	2.85409300
H	3.95939200	-2.07487600	2.90309600
H	3.47897200	-0.69664200	3.88253600
H	2.54616200	-1.11116000	2.41918500
H	4.09783300	0.92023700	2.23361800

Zero-point correction=	0.228685 (Hartree/Particle)
Thermal correction to Energy=	0.243500
Thermal correction to Enthalpy=	0.244444
Thermal correction to Gibbs Free Energy=	0.185593
Sum of electronic and zero-point Energies=	-870.546454
Sum of electronic and thermal Energies=	-870.531640
Sum of electronic and thermal Enthalpies=	-870.530695
Sum of electronic and thermal Free Energies=	-870.589547

F	0.47991000	2.62092100	0.57619400
F	-1.61406200	2.77640000	0.01784900
C	-0.61831600	1.93086100	0.27716800
C	-2.00923700	-0.06142800	-0.04902100
C	-0.69726700	0.59514100	0.22542600
C	-2.07291600	-1.17311600	-0.90679000
H	-1.16259500	-1.54015900	-1.36947600
C	-3.28867900	-1.80006600	-1.17484700
H	-3.31537200	-2.65259700	-1.84777200
C	-3.20083000	0.39252700	0.54182400
H	-3.17451900	1.23845900	1.22059200
C	-4.46629400	-1.33484300	-0.58641800
H	-5.41303200	-1.82554300	-0.79299400
C	-4.41570600	-0.23669400	0.27354500
H	-5.32352500	0.12909500	0.74500900
C	4.58351000	-0.31147200	-0.65299900
C	3.83681400	0.77622600	-1.15064100
C	2.48758600	0.92094200	-0.85485600
C	1.85659900	-0.03968400	-0.04270900
C	2.62989500	-1.13362400	0.43706800
C	3.99019600	-1.28131700	0.14533800
H	5.63799600	-0.39400200	-0.89956000
H	4.32871500	1.51511400	-1.77662200
H	1.93065300	1.76580700	-1.24456500
H	4.55829600	-2.12538300	0.52585400
C	0.50509100	-0.23299100	0.44512900
C	0.52285100	-1.40795700	1.16920800
H	-0.28517500	-1.90262900	1.68830600
N	1.78767500	-1.94256200	1.17105500
H	2.05240600	-2.80115700	1.62890200

6. New Compounds Characterization



(3) 6-bromo-3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinoline

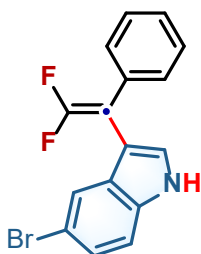
Prepared according to **General procedure A** using *N*-triftoylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **3** (102.0 mg, 96% yield) as a white solid; mp: 100-102 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.33 (s, 1H), 7.37-7.32 (m, 3H), 7.31-7.27 (m, 3H), 7.23-7.26 (m, 1H), 7.21 (d, *J* = 8.5 Hz, 1H), 3.41 (d, *J* = 16.5 Hz, 1H), 3.36 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 158.1 (q, *J* = 2.0 Hz), 140.9, 132.4, 131.2, 130.9, 128.9, 128.7, 128.6, 127.6, 126.5 (q, *J* = 281.3 Hz), 125.6, 121.8, 49.3 (q, *J* = 25.0 Hz), 29.6 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.81.

HRMS (ESI) *m/z* calcd. for C₁₆H₁₂BrF₃N⁺ [*M* + *H*]⁺ 354.0100, found 354.0093.



(4) 5-Bromo-3-(2,2-difluoro-1-phenylvinyl)-1*H*-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **4** (91.8 mg, 92% yield) as a colorless oil.

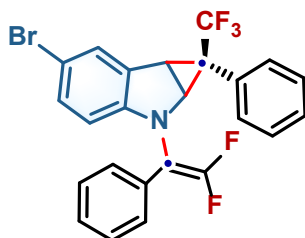
¹H NMR (500 MHz, CDCl₃) δ 8.21 (s, 1H), 7.34-7.28 (m, 5H), 7.25-7.21 (m, 3H), 7.16 (s, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 153.7 (dd, *J* = 290.0, 292.5 Hz), 134.6, 133.9 (t, *J* = 3.8 Hz), 129.0 (t, *J* = 3.8 Hz), 128.4, 128.3 (d, *J* = 2.5 Hz), 127.5, 125.7 (t, *J* = 3.8 Hz), 125.3, 122.6 (d, *J* = 2.5 Hz), 113.3, 112.7, 108.9 (t, *J* = 3.8 Hz), 89.5 (t, *J* = 20.6 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -85.6 (d, *J* = 32.9 Hz), -89.5 (d, *J* = 32.9 Hz).

IR (Film): 3466, 3055, 2983, 1707, 1445, 1265, 906, 723, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₆H₉F₃N⁻ [*M*-*H*]⁻: 272.0693; Found: 272.0695.



(5)

5-bromo-2-(2,2-difluoro-1-phenylvinyl)-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

Prepared according to **General Procedure J** using *N*-triftoylhydrazone (356.4 mg, 0.9 mmol) derived

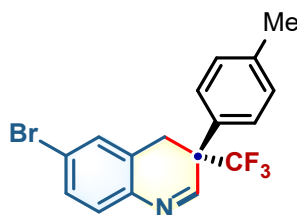
from 2,2,2-trifluoro-1-phenylethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **5** (144.4 mg, 98% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.57 (d, *J* = 1.9 Hz, 1H), 7.42-7.32 (m, 3H), 7.27-7.15 (m, 7H), 7.02 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.03 (dd, *J* = 8.5, 2.3 Hz, 1H), 4.31 (d, *J* = 7.2 Hz, 1H), 3.66 (d, *J* = 7.2 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 155.5 (t, *J* = 296.3 Hz), 147.0, 133.2, 131.1, 130.5, 129.7 (dd, *J* = 5.0, 2.5 Hz), 128.8, 128.7, 128.6, 128.3 (d, *J* = 6.3 Hz), 128.1, 127.8 (dd, *J* = 5.0, 2.5 Hz), 127.7, 127.6, 127.0, 125.6 (q, *J* = 273.8 Hz), 111.3, 110.3 (d, *J* = 2.5 Hz), 100.8 (dd, *J* = 32.5, 16.3 Hz), 51.3, 29.8 (q, *J* = 2.5 Hz), 27.7 (q, *J* = 31.3 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -67.62, -84.79 (d, *J* = 29.3 Hz), -95.21 (d, *J* = 29.3 Hz).

HRMS (ESI) *m/z* calcd for C₂₄H₁₆BrF₃N⁺ [M+H]⁺: 492.0381; Found: 492.0380.



(6) 6-Bromo-3-(*p*-tolyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

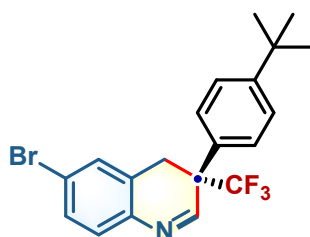
Prepared according to **General procedure A** using *N*-triftosylhydrazine (123.0 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(*p*-tolyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **6** (100.5 mg, 91% yield) as a white solid; mp: 130-133 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.32 (s, 1H), 7.33 (dd, *J* = 8.5, 2.0 Hz, 1H), 7.26-7.20 (m, 4H), 7.08 (d, *J* = 8.0 Hz, 2H), 3.38 (d, *J* = 16.5 Hz, 1H), 3.33 (d, *J* = 16.5 Hz, 1H), 2.26 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 158.4 (q, *J* = 2.5 Hz), 140.9, 138.9, 131.2, 130.9, 129.5, 129.3, 128.6, 127.5, 126.5 (q, *J* = 280.0 Hz), 125.7, 121.8, 49.0 (q, *J* = 25.0 Hz), 29.7, 21.0.

¹⁹F NMR (470 MHz, CDCl₃) δ -71.99.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄BrF₃N⁺ [M + H]⁺ 368.0256, found 368.0250.



(7) 6-Bromo-3-(4-(*tert*-butyl)phenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

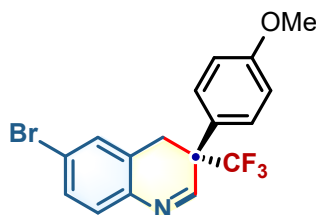
Prepared according to **General procedure A** using *N*-triftosylhydrazine (135.6 mg, 0.3 mmol) derived from 1-(4-(*tert*-butyl)phenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **7** (109.5 mg, 89% yield) as a white solid; mp: 160-163 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.30 (s, 1H), 7.34 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.30-7.26 (m, 2H), 7.26-7.23 (m, 3H), 7.22 (d, *J* = 8.5 Hz, 1H), 3.39 (d, *J* = 16.5 Hz, 1H), 3.34 (d, *J* = 16.5 Hz, 1H), 1.25 (s, 9H).

¹³C NMR (125 MHz, CDCl₃) δ 158.2 (q, *J* = 2.5 Hz), 151.8, 140.9, 131.2, 131.0, 129.3, 128.7, 127.2, 126.6 (q, *J* = 281.3 Hz), 125.7, 121.8, 49.0 (q, *J* = 25.0 Hz), 34.5, 31.1, 29.6.

¹⁹F NMR (470 MHz, CDCl₃) δ -71.79.

HRMS (ESI) m/z calcd. for $C_{20}H_{20}BrF_3N^+$ $[M + H]^+$ 410.0726, found 410.0721.



(8) 6-bromo-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

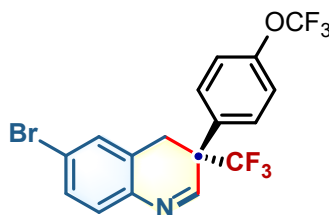
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **8** (37.6 mg, 98% yield) as a white solid; mp: 104-105 °C.

1H NMR (500 MHz, $CDCl_3$) δ 8.31 (s, 1H), 7.36-7.32 (m, 1H), 7.27-7.23 (m, 3H), 7.21 (d, J = 8.0 Hz, 1H), 6.82-6.77 (m, 2H), 3.74 (s, 3H), 3.37 (d, J = 16.0 Hz, 1H), 3.31 (d, J = 16.0 Hz, 1H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 159.8, 158.4 (q, J = 2.5 Hz), 140.9, 131.3, 130.9, 128.9, 128.6, 126.5 (q, J = 280.5 Hz), 125.8, 124.0, 121.8, 114.2, 55.2, 48.8 (q, J = 25.5 Hz), 29.7 (q, J = 2.0 Hz).

^{19}F NMR (470 MHz, $CDCl_3$) δ -72.22.

HRMS (ESI) m/z calcd. for $C_{17}H_{14}BrF_3NO^+$ $[M + H]^+$ 384.0205, found 384.0198.



(9) 6-Bromo-3-(4-(trifluoromethoxy)phenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

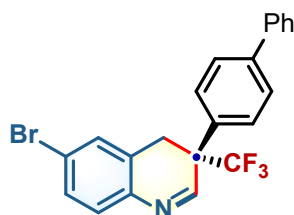
Prepared according to **General procedure A** using *N*-triftosylhydrazone (144.0 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethoxy)phenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **9** (97.2 mg, 74% yield) as a white solid; mp: 119-120 °C.

1H NMR (500 MHz, $CDCl_3$) δ 8.30 (s, 1H), 7.41-7.35 (m, 3H), 7.27-7.25 (m, 1H), 7.24 (d, J = 8.5 Hz, 1H), 7.13 (d, J = 8.5 Hz, 2H), 3.43 (d, J = 16.5 Hz, 1H), 3.32 (d, J = 16.0 Hz, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 157.2 (q, J = 2.5 Hz), 149.5, 140.8, 131.6, 131.0, 130.9, 129.3, 128.8, 126.2 (q, J = 281.3 Hz), 125.1, 122.2, 120.9, 120.3 (q, J = 256.3 Hz), 49.9 (q, J = 25.0 Hz), 29.8.

^{19}F NMR (470 MHz, $CDCl_3$) δ -57.79, -71.87.

HRMS (ESI) m/z calcd. for $C_{17}H_{11}BrF_6NO^+$ $[M + H]^+$ 437.9923, found 437.9920.



(10) 3-([1,1'-biphenyl]-4-yl)-6-bromo-3-(trifluoromethyl)-3,4-dihydroquinoline

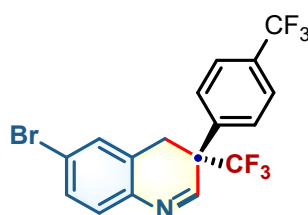
Prepared according to **General procedure A** using *N*-trifosylhydrazone (141.6 mg, 0.3 mmol) derived from 1-([1,1'-biphenyl]-4-yl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **10** (111.0 mg, 86% yield) as a white solid; mp: 148-150 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.36 (s, 1H), 7.52-7.48 (m, 4H), 7.44-7.37 (m, 4H), 7.37-7.30 (m, 2H), 7.29-7.26 (m, 1H), 7.24 (d, *J* = 8.5 Hz, 1H), 3.43 (d, *J* = 16.5 Hz, 1H), 3.38 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 158.0 (q, *J* = 2.5 Hz), 141.7, 140.9, 139.8, 131.4, 131.3, 131.0, 128.8, 128.7, 128.1, 127.7, 127.4, 127.0, 126.5 (q, *J* = 282.0 Hz), 125.6, 121.9, 49.2 (q, *J* = 25.0 Hz), 29.7 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.76.

HRMS (ESI) *m/z* calcd. for C₂₂H₁₆BrF₃N⁺ [*M* + *H*]⁺ 430.0413, found 430.0407.



(11) 6-Bromo-3-(trifluoromethyl)-3-(4-(trifluoromethyl)phenyl)-3,4-dihydroquinoline

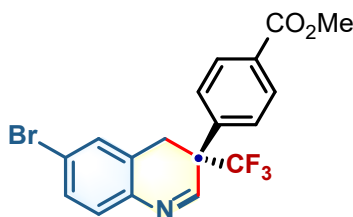
Prepared according to **General procedure A** using *N*-trifosylhydrazone (139.2 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethyl)phenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **11** (72.3 mg, 57% yield) as a white solid; mp: 106-108 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.33 (s, 1H), 7.56 (d, *J* = 8.5 Hz, 2H), 7.49 (d, *J* = 8.0 Hz, 2H), 7.37 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.27-7.25 (m, 1H), 7.24 (d, *J* = 8.0 Hz, 1H), 3.45 (d, *J* = 16.5 Hz, 1H), 3.35 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 156.9 (q, *J* = 2.5 Hz), 140.8, 136.5, 131.6, 131.2 (q, *J* = 32.5 Hz), 130.9, 128.8, 128.2, 126.1 (q, *J* = 280.5 Hz), 125.8 (q, *J* = 4.5 Hz), 124.9, 123.6 (q, *J* = 271.5 Hz), 122.3, 49.3 (q, *J* = 25.5 Hz), 29.7 (q, *J* = 1.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -63.03, -71.62.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₁BrF₆N⁺ [*M* + *H*]⁺ 421.9974, found 421.9969.



(12) Methyl 4-(6-bromo-3-(trifluoromethyl)-3,4-dihydroquinolin-3-yl)benzoate

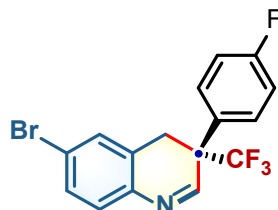
Prepared according to **General procedure A** using *N*-trifosylhydrazone (136.2 mg, 0.3 mmol) derived from methyl 4-(2,2,2-trifluoroacetyl)benzoate and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **12** (76.5 mg, 62% yield) as a white solid; mp: 160-161 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.33 (d, *J* = 1.5 Hz, 1H), 7.97-7.93 (m, 2H), 7.44 (d, *J* = 8.5 Hz, 2H), 7.35 (ddd, *J* = 8.5, 2.0, 0.5 Hz, 1H), 7.26-7.24 (m, 1H), 7.22 (d, *J* = 8.0 Hz, 1H), 3.87 (s, 3H), 3.43 (d, *J* = 16.5 Hz, 1H), 3.36 (d, *J* = 16.5 Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 166.2, 157.3, 140.9, 137.4, 131.5, 130.9, 130.8, 129.9, 128.7, 127.8, 126.2 (q, $J = 281.3$ Hz), 125.1, 122.1, 52.3, 49.4 (q, $J = 25.0$ Hz), 29.8.

^{19}F NMR (470 MHz, CDCl_3) δ -71.56.

HRMS (ESI) m/z calcd. for $\text{C}_{18}\text{H}_{14}\text{BrF}_3\text{NO}_2^+ [\text{M} + \text{H}]^+$ 412.0155, found 412.0148.



(13) 6-Bromo-3-(4-fluorophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

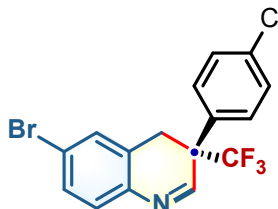
Prepared according to **General procedure A** using *N*-trifosylhydrazone (124.2 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-fluorophenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **13** (98.1 mg, 88% yield) as a white solid; mp: 116-117 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.31 (d, $J = 0.5$ Hz, 1H), 7.38-7.29 (m, 3H), 7.26-7.23 (m, 1H), 7.22 (d, $J = 8.0$ Hz, 1H), 7.00-6.94 (m, 2H), 3.40 (d, $J = 16.0$ Hz, 1H), 3.30 (d, $J = 16.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 162.7 (d, $J = 249.0$ Hz), 157.7 (q, $J = 2.5$ Hz), 140.9, 131.4, 130.9, 129.5 (d, $J = 8.8$ Hz), 128.6, 128.1 (d, $J = 3.5$ Hz), 126.3 (q, $J = 281.3$ Hz), 125.3, 122.0, 115.9 (d, $J = 21.3$ Hz), 48.8 (q, $J = 25.0$ Hz), 29.7 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -72.08, (-112.04)-(-112.10) (m).

HRMS (ESI) m/z calcd. for $\text{C}_{16}\text{H}_{11}\text{BrF}_4\text{N}^+ [\text{M} + \text{H}]^+$ 372.0006, found 372.0001.



(14) 6-Bromo-3-(4-chlorophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

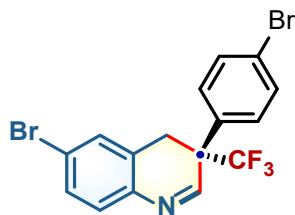
Prepared according to **General procedure A** using *N*-trifosylhydrazone (129.0 mg, 0.3 mmol) derived from 1-(4-chlorophenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **14** (99.0 mg, 85% yield) as a white solid; mp: 119-121 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.30 (d, $J = 0.5$ Hz, 1H), 7.35 (dd, $J = 8.0, 1.0$ Hz, 1H), 7.30-7.26 (m, 2H), 7.26-7.23 (m, 3H), 7.22 (d, $J = 8.0$ Hz, 1H), 3.39 (d, $J = 16.0$ Hz, 1H), 3.29 (d, $J = 16.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 157.4 (q, $J = 2.5$ Hz), 140.8, 135.1, 131.5, 130.90, 130.86, 129.0, 128.7, 126.2 (q, $J = 281.3$ Hz), 125.2, 122.1, 48.9 (q, $J = 25.0$ Hz), 29.7.

^{19}F NMR (470 MHz, CDCl_3) δ -71.92.

HRMS (ESI) m/z calcd. for $\text{C}_{16}\text{H}_{11}\text{BrClF}_3\text{N}^+ [\text{M} + \text{H}]^+$ 387.9710, found 387.9702.



(15) 6-Bromo-3-(4-bromophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

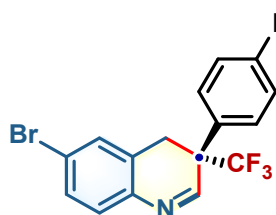
Prepared according to **General procedure A** using *N*-triftosylhydrazone (142.5 mg, 0.3 mmol) derived from 1-(4-bromophenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **15** (107.7 mg, 83% yield) as a white solid; mp: 125-127 °C.

¹H NMR (600 MHz, CDCl₃) δ 8.32 (d, *J* = 1.2 Hz, 1H), 7.56 (d, *J* = 8.4 Hz, 2H), 7.48 (d, *J* = 8.4 Hz, 2H), 7.37 (dd, *J* = 8.4, 1.8 Hz, 1H), 7.27-7.25 (m, 1H), 7.24 (d, *J* = 8.4 Hz, 1H), 3.45 (d, *J* = 16.2 Hz, 1H), 3.35 (dd, *J* = 16.2, 1.2 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 157.3 (q, *J* = 2.5 Hz), 140.8, 132.0, 131.5, 131.4, 130.9, 129.3, 128.7, 126.2 (q, *J* = 281.3 Hz), 125.2, 123.4, 122.1, 48.9 (q, *J* = 25.0 Hz), 29.6.

¹⁹F NMR (470 MHz, CDCl₃) δ -71.89.

HRMS (ESI) *m/z* calcd. for C₁₆H₁₁Br₂F₃N⁺ [*M* + *H*]⁺ 431.9205, found 431.9199.



(16) 6-Bromo-3-(4-iodophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

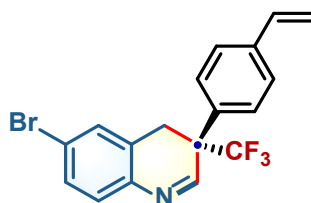
Prepared according to **General procedure A** using *N*-triftosylhydrazone (156.6 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-iodophenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **16** (112.2 mg, 78% yield) as a white solid; mp: 129-130 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.28 (s, 1H), 7.64-7.59 (m, 2H), 7.36 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.25-7.23 (m, 1H), 7.22 (d, *J* = 8.0 Hz, 1H), 7.08 (d, *J* = 8.5 Hz, 2H), 3.39 (d, *J* = 16.0 Hz, 1H), 3.28 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 157.3 (q, *J* = 2.5 Hz), 140.8, 137.9, 132.2, 131.5, 130.9, 129.5, 128.7, 126.1 (q, *J* = 281.3 Hz), 125.2, 122.1, 95.2, 49.1 (q, *J* = 25.0 Hz), 29.6 (q, *J* = 2.5 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.87.

HRMS (ESI) *m/z* calcd. for C₁₆H₁₁BrF₃IN⁺ [*M* + *H*]⁺ 479.9066, found 479.9060.



(17) 6-bromo-3-(trifluoromethyl)-3-(4-vinylphenyl)-3,4-dihydroquinoline

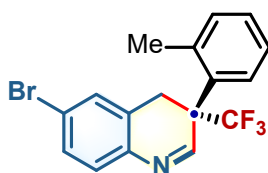
Prepared according to **General procedure A** using *N*-triftosylhydrazone (126.6 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-vinylphenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **17** (76.5 mg, 67% yield) as a white solid; mp: 103-105 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.32 (s, 1H), 7.36-7.32 (m, 1H), 7.32-7.27 (m, 4H), 7.26-7.24 (m, 1H), 7.21 (d, *J* = 8.0 Hz, 1H), 6.62 (dd, *J* = 17.5, 11.0 Hz, 1H), 5.71 (d, *J* = 17.5 Hz, 1H), 5.26 (d, *J* = 11.0 Hz, 1H), 3.40 (d, *J* = 16.0 Hz, 1H), 3.34 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 158.0 (q, *J* = 2.5 Hz), 140.9, 138.1, 135.7, 131.7, 131.3, 130.9, 128.6, 127.9, 126.5, 126.4 (q, *J* = 281.3 Hz), 125.6, 121.9, 115.3, 49.2 (q, *J* = 25.0 Hz), 29.7 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.85.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₄BrF₃N⁺ [*M* + *H*]⁺ 380.0256, found 380.0252.



(18) 6-Bromo-3-(*o*-tolyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

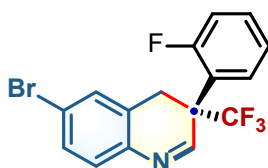
Prepared according to **General procedure A** using *N*-triftosylhydrazone (123.0 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(*o*-tolyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **18** (165.6 mg, 50% yield) as a white solid; mp: 103-105 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.45 (s, 1H), 7.40- 7.35 (m, 1H), 7.33-7.28 (m, 2H), 7.17-7.11 (m, 3H), 7.09-7.05 (m, 1H), 3.55 (d, *J* = 16.5 Hz, 1H), 3.33 (d, *J* = 16.5 Hz, 1H), 2.42 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 158.9, 141.3, 138.1, 133.3, 131.2, 130.6, 130.4, 129.2, 128.8, 127.9, 126.9 (q, *J* = 281.3 Hz), 126.2, 126.0, 121.4, 50.0 (q, *J* = 25.0 Hz), 30.0 (q, *J* = 2.5 Hz), 24.2 (q, *J* = 1.8 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.73.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄BrF₃N⁺ [*M* + *H*]⁺ 368.0256, found 368.0250.



(19) 6-bromo-3-(2-fluorophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

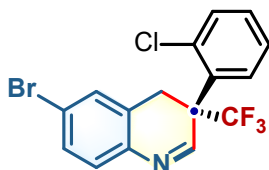
Prepared according to **General procedure A** using *N*-triftosylhydrazone (124.2 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(2-fluorophenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **19** (57.9 mg, 52% yield) as a white solid; mp: 149-151 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.43 (d, *J* = 8.5 Hz, 1H), 7.36-7.32 (m, 2H), 7.32-7.28 (m, 1H), 7.28-7.23 (m, 1H), 7.20-7.16 (m, 1H), 7.06 (td, *J* = 8.0, 1.0 Hz, 1H), 7.04-6.98 (m, 1H), 3.57 (d, *J* = 16.0 Hz, 1H), 3.32 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 161.7 (d, *J* = 250.5 Hz), 157.8-157.6 (m), 141.0, 131.4, 131.1 (d, *J* = 10.0 Hz), 130.7, 130.0 (d, *J* = 3.8 Hz), 128.3, 126.2 (q, *J* = 282.5 Hz), 125.7, 124.2 (d, *J* = 3.8 Hz), 121.5, 119.0 (d, *J* = 11.3 Hz), 117.1 (d, *J* = 23.8 Hz), 47.9 (q, *J* = 26.3 Hz), 28.2-28.0 (m).

¹⁹F NMR (470 MHz, CDCl₃) δ (-72.56)-(-72.63) (m), (-105.33)-(-105.51) (m).

HRMS (ESI) m/z calcd. for C₁₆H₁₁BrF₄N⁺ [M + H]⁺ 372.0006, found 372.0001.



(20) 6-bromo-3-(2-chlorophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

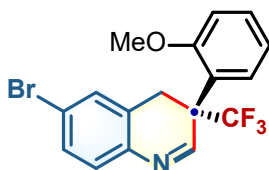
Prepared according to **General procedure A** using *N*-trifosylhydrazone (129.0 mg, 0.3 mmol) derived from 1-(2-chlorophenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **20** (75.6 mg, 65% yield) as a white solid; mp: 133-135 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.46 (s, 1H), 7.48-7.43 (m, 1H), 7.36-7.32 (m, 2H), 7.32-7.30 (m, 1H), 7.26-7.18 (m, 3H), 3.66 (d, *J* = 16.5 Hz, 1H), 3.33 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 157.2, 141.2, 134.4, 132.4, 131.3, 130.8, 130.6, 130.5, 130.2, 128.3, 126.9, 126.4 (q, *J* = 282.5 Hz), 125.6, 121.3, 49.5 (q, *J* = 25.0 Hz), 29.6 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.12.

HRMS (ESI) m/z calcd. for C₁₆H₁₁BrClF₃N⁺ [M + H]⁺ 387.9710, found 387.9702.



(21) 6-bromo-3-(2-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

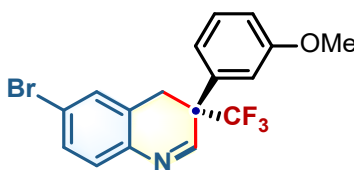
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(2-methoxyphenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **21** (20.1 mg, 53% yield) as a white solid; mp: 148-150 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.39 (s, 1H), 7.32-7.26 (m, 3H), 7.26-7.21 (m, 1H), 7.15-7.11 (m, 1H), 6.90 (dt, *J* = 8.0, 1.0 Hz, 1H), 6.86 (d, *J* = 8.0 Hz, 1H), 3.79 (s, 3H), 3.53 (d, *J* = 16.0 Hz, 1H), 3.27 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 159.4, 158.7, 141.4, 131.0, 130.6, 130.3, 129.6, 127.8, 126.6 (q, *J* = 282.0 Hz), 126.4, 120.9, 120.8, 120.7, 113.0, 55.9, 48.2 (q, *J* = 25.5 Hz), 28.9 (q, *J* = 2.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -72.23.

HRMS (ESI) m/z calcd. for C₁₇H₁₄BrF₃NO⁺ [M + H]⁺ 384.0205, found 384.0198.



(22) 6-bromo-3-(3-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived

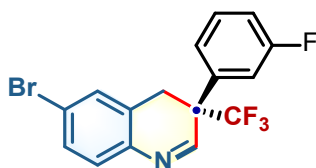
from 2,2,2-trifluoro-1-(3-methoxyphenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **22** (102.6 mg, 89% yield) as a white solid; mp: 126-128 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.29 (d, *J* = 1.0 Hz, 1H), 7.34 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.25-7.23 (m, 1H), 7.23-7.17 (m, 2H), 6.92 (d, *J* = 8.0 Hz, 1H), 6.90-6.85 (m, 1H), 6.80 (dd, *J* = 8.0, 2.0 Hz, 1H), 3.74 (s, 3H), 3.39 (d, *J* = 16.0 Hz, 1H), 3.32 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 159.6, 157.8, 140.9, 133.9, 131.3, 130.9, 129.7, 128.6, 126.4 (q, *J* = 280.5 Hz), 125.6, 121.9, 120.0, 114.5, 113.6, 55.2, 49.3 (q, *J* = 25.0 Hz), 29.9 (q, *J* = 2.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -71.64.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄BrF₃NO⁺ [*M* + *H*]⁺ 384.0205, found 384.0198.



(23) 6-bromo-3-(3-fluorophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

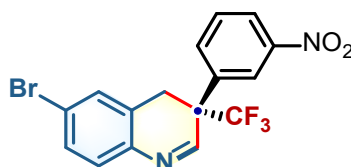
Prepared according to **General procedure A** using *N*-trifosylhydrazone (124.2 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(3-fluorophenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **23** (79.2 mg, 71% yield) as a white solid; mp: 125-127 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.28 (s, 1H), 7.38-7.34 (m, 1H), 7.29-7.22 (m, 3H), 7.13 (d, *J* = 8.0 Hz, 1H), 7.10-7.05 (m, 1H), 7.01-6.96 (m, 1H), 3.41 (d, *J* = 16.5 Hz, 1H), 3.30 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 162.7 (d, *J* = 246.3 Hz), 157.1 (q, *J* = 2.5 Hz), 140.8, 134.8 (d, *J* = 7.5 Hz), 131.5, 130.9, 130.3 (d, *J* = 7.5 Hz), 128.7, 126.2 (q, *J* = 281.3 Hz), 125.2, 123.4 (d, *J* = 1.3 Hz), 122.1, 116.2 (d, *J* = 20.0 Hz), 115.1 (d, *J* = 23.8 Hz), 49.2 (q, *J* = 25.0 Hz), 29.9 (q, *J* = 2.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -71.74, (-111.12)-(-111.18) (m).

HRMS (ESI) *m/z* calcd. for C₁₆H₁₁BrF₄N⁺ [*M* + *H*]⁺ 372.0006, found 372.0001.



(24) 6-bromo-3-(3-nitrophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

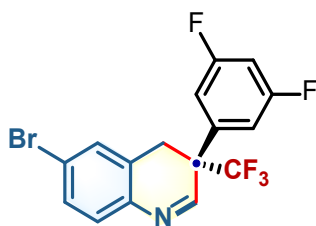
Prepared according to **General procedure A** using *N*-trifosylhydrazone (132.3 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(3-nitrophenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **24** (45.6 mg, 38% yield) as a pale yellow solid; mp: 186-187 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.36 (d, *J* = 0.5 Hz, 1H), 8.26 (s, 1H), 8.17 (dd, *J* = 8.0, 1.0 Hz, 1H), 7.70 (d, *J* = 8.0 Hz, 1H), 7.51 (t, *J* = 8.0 Hz, 1H), 7.38 (dd, *J* = 8.0, 1.0 Hz, 1H), 7.29 (s, 1H), 7.25 (d, *J* = 8.0 Hz, 1H), 3.49 (d, *J* = 16.4 Hz, 1H), 3.38 (d, *J* = 16.4 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 156.2 (q, *J* = 2.0 Hz), 148.5, 140.7, 134.7, 133.6, 131.8, 131.0, 129.9, 128.9, 126.0 (q, *J* = 281.3 Hz), 124.6, 124.2, 122.9, 122.5, 49.1 (q, *J* = 25.0 Hz), 29.8 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.72.

HRMS (ESI) *m/z* calcd. for C₁₆H₁₁BrF₃N₂⁺ [*M* + *H*]⁺ 398.9951, found 398.9946.



(25) 6-bromo-3-(3,5-difluorophenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

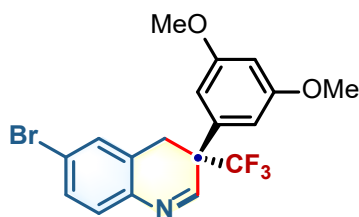
Prepared according to **General procedure A** using *N*-trifosylhydrazone (129.6 mg, 0.3 mmol) derived from 1-(3,5-difluorophenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **25** (99.6 mg, 85% yield) as a white solid; mp: 166-168 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.23 (s, 1H), 7.39 (dd, *J* = 8.5, 1.0 Hz, 1H), 7.28-7.24 (m, 2H), 6.92-6.85 (m, 2H), 6.75 (tt, *J* = 8.5, 2.0 Hz, 1H), 3.42 (d, *J* = 16.5 Hz, 1H), 3.24 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 162.9 (dd, *J* = 247.5, 12.5 Hz), 156.2 (q, *J* = 2.5 Hz), 140.7, 136.1 (t, *J* = 8.75 Hz), 131.7, 131.0, 128.9, 125.9 (q, *J* = 281.3 Hz), 124.7, 122.4, 111.3 (dd, *J* = 21.3, 6.3 Hz), 104.9 (t, *J* = 25.0 Hz), 49.1 (q, *J* = 25.0 Hz), 30.0 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.65, (-107.63)-(-107.71) (m).

HRMS (ESI) *m/z* calcd. for C₁₆H₁₀BrF₅N⁺ [M + H]⁺ 389.9911, found 389.9907.



(26) 6-bromo-3-(3,5-dimethoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

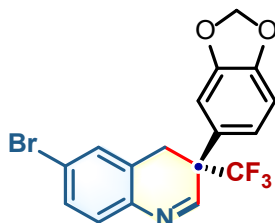
Prepared according to **General procedure A** using *N*-trifosylhydrazone (136.8 mg, 0.3 mmol) derived from 1-(3,5-dimethoxyphenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **26** (106.8 mg, 86% yield) as a white solid; mp: 126-128 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.25 (s, 1H), 7.35 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.25-7.20 (m, 2H), 6.47 (d, *J* = 1.5 Hz, 2H), 6.35 (t, *J* = 2.0 Hz, 1H), 3.72 (s, 6H), 3.37 (d, *J* = 16.5 Hz, 1H), 3.28 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 160.8, 157.6 (q, *J* = 2.0 Hz), 140.9, 134.5, 131.3, 130.9, 128.6, 126.4 (q, *J* = 281.3 Hz), 125.6, 121.9, 106.6, 100.0, 55.3, 49.4 (q, *J* = 25.0 Hz), 30.0.

¹⁹F NMR (470 MHz, CDCl₃) δ -71.47.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₆BrF₃NO₂⁺ [M + H]⁺ 414.0311, found 414.0307.



(27) 3-(benzo[d][1,3]dioxol-5-yl)-6-bromo-3-(trifluoromethyl)-3,4-dihydroquinoline

Prepared according to **General procedure A** using *N*-trifosylhydrazone (132.0 mg, 0.3 mmol) derived

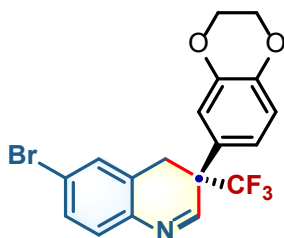
from 1-(benzo[d][1,3]dioxol-5-yl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **27** (115.8 mg, 97% yield) as a white solid; mp: 149-151 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.26 (s, 1H), 7.39-7.30 (m, 1H), 7.28-7.19 (m, 2H), 6.83 (s, 1H), 6.78 (d, *J* = 8.0 Hz, 1H), 6.68 (d, *J* = 8.0 Hz, 1H), 5.92 (s, 2H), 3.36 (d, *J* = 16.0 Hz, 1H), 3.25 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 158.0, 148.13, 148.06, 140.9, 131.3, 130.9, 128.6, 126.5 (q, *J* = 280.5 Hz), 125.63, 125.59, 121.9, 121.6, 108.3, 108.0, 101.5, 49.0 (q, *J* = 25.7 Hz), 30.0.

¹⁹F NMR (564 MHz, CDCl₃) δ -72.08.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₂BrF₃NO₂⁺ [*M* + *H*]⁺ 397.9998, found 397.9992.



(28)

6-bromo-3-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-3-(trifluoromethyl)-3,4-dihydroquinoline

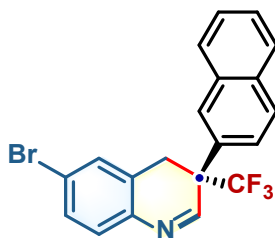
Prepared according to **General procedure A** using *N*-triftosylhydrazone (136.2 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **28** (114.7 mg, 93% yield) as a white solid; mp: 157-161 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.26 (s, 1H), 7.35 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.26-7.24 (m, 1H), 7.22 (d, *J* = 8.5 Hz, 1H), 6.85 (d, *J* = 1.5 Hz, 1H), 6.81-6.77 (m, 1H), 6.74 (d, *J* = 8.5 Hz, 1H), 4.20 (s, 4H), 3.35 (d, *J* = 16.0 Hz, 1H), 3.26 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 158.0 (q, *J* = 2.0 Hz), 144.1, 143.5, 140.9, 131.2, 131.0, 128.6, 126.5 (q, *J* = 282.0 Hz), 125.7, 125.1, 121.8, 120.8, 117.4, 116.9, 64.3, 64.2, 48.8 (q, *J* = 25.5 Hz), 29.8 (q, *J* = 2.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -72.08.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₄BrF₃NO₂⁺ [*M* + *H*]⁺ 412.0155, found 412.0147.



(29) 6-Bromo-3-(naphthalen-2-yl)-3-(trifluoromethyl)-3,4-dihydroquinoline

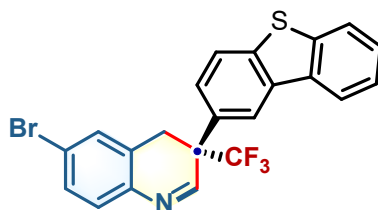
Prepared according to **General procedure A** using *N*-triftosylhydrazone (133.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(naphthalen-2-yl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **29** (69.0 mg, 57% yield) as a white solid; mp: 154-156 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.44 (s, 1H), 7.81-7.73 (m, 4H), 7.50-7.43 (m, 3H), 7.30 (dd, *J* = 8.5, 2.0 Hz, 1H), 7.26-7.24 (m, 1H), 7.22 (d, *J* = 8.5 Hz, 1H), 3.52-3.43 (m, 2H).

¹³C NMR (150 MHz, CDCl₃) δ 158.2, 140.9, 133.0, 132.7, 131.3, 130.9, 129.7, 128.7, 128.6, 128.2,

127.8, 127.4, 127.0, 126.61, 126.55 (q, $J = 285.0$ Hz), 125.5, 124.3, 122.0, 49.6 (q, $J = 24.0$ Hz), 29.8.
 ^{19}F NMR (564 MHz, CDCl_3) δ -71.45.

HRMS (ESI) m/z calcd. for $\text{C}_{20}\text{H}_{14}\text{BrF}_3\text{N}^+$ $[\text{M} + \text{H}]^+$ 404.0256, found 404.0251.



(30) 6-bromo-3-(dibenzo[*b,d*]thiophen-2-yl)-3-(trifluoromethyl)-3,4-dihydroquinoline

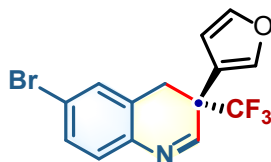
Prepared according to **General procedure A** using *N*-trifosylhydrazone (150.6 mg, 0.3 mmol) derived from 1-(dibenzo[*b,d*]thiophen-2-yl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **30** (114.6 mg, 83% yield) as a white solid; mp: 136-138 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.46 (s, 1H), 8.14-8.07 (m, 2H), 7.83-7.78 (m, 1H), 7.77 (d, $J = 8.5$ Hz, 1H), 7.49-7.40 (m, 3H), 7.31 (dd, $J = 8.0, 1.5$ Hz, 1H), 7.28-7.25 (m, 1H), 7.23 (d, $J = 8.0$ Hz, 1H), 3.53-3.43 (m, 2H).

^{13}C NMR (125 MHz, CDCl_3) δ 157.9 (q, $J = 2.5$ Hz), 140.9, 140.1, 139.8, 135.8, 134.8, 131.4, 130.9, 128.6, 127.2, 126.5 (q, $J = 281.3$ Hz), 125.6, 125.5, 124.6, 123.2, 122.9, 122.0, 121.6, 120.9, 49.4 (q, $J = 25.0$ Hz), 30.2 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -71.62.

HRMS (ESI) m/z calcd. for $\text{C}_{22}\text{H}_{14}\text{BrF}_3\text{NS}^+$ $[\text{M} + \text{H}]^+$ 459.9977, found 459.9973.



(31) 6-bromo-3-(furan-3-yl)-3-(trifluoromethyl)-3,4-dihydroquinoline

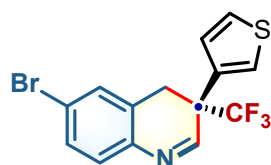
Prepared according to **General procedure A** using *N*-trifosylhydrazone (115.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(furan-3-yl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **31** (63.0 mg, 61% yield) as a white solid; mp: 120-122 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.05 (s, 1H), 7.43-7.39 (m, 1H), 7.34 (t, $J = 1.5$ Hz, 1H), 7.28-7.25 (m, 2H), 7.24-7.22 (m, 1H), 6.34 (s, 1H), 3.37 (d, $J = 16.0$ Hz, 1H), 3.07 (d, $J = 16.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 155.5 (q, $J = 2.5$ Hz), 143.8, 141.5, 140.4, 131.4, 131.0, 129.0, 126.3 (q, $J = 281.3$ Hz), 125.3, 122.2, 117.4, 109.0, 44.9 (q, $J = 26.3$ Hz), 29.9 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -73.14.

HRMS (ESI) m/z calcd. for $\text{C}_{13}\text{H}_{10}\text{BrF}_3\text{NO}^+$ $[\text{M} + \text{H}]^+$ 343.9892, found 343.9887.



(32) 6-bromo-3-(thiophen-3-yl)-3-(trifluoromethyl)-3,4-dihydroquinoline

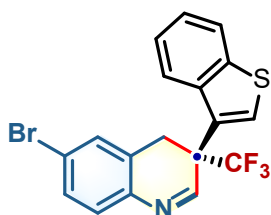
Prepared according to **General procedure A** using *N*-triftosylhydrazone (120.6 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(thiophen-3-yl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **32** (56.1 mg, 52% yield) as a white solid; mp: 112-114 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.19 (s, 1H), 7.38 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.28 (dd, *J* = 5.0, 3.0 Hz, 1H), 7.26-7.23 (m, 2H), 7.18-7.15 (m, 1H), 7.06-7.03 (m, 1H), 3.42 (d, *J* = 16.0 Hz, 1H), 3.23 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 156.4 (q, *J* = 2.0 Hz), 140.6, 132.2, 131.3, 131.0, 128.9, 126.6, 126.2 (q, *J* = 281.3 Hz), 126.1, 125.5, 124.9, 122.1, 47.8 (q, *J* = 26.3 Hz), 30.3 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -72.41.

HRMS (ESI) *m/z* calcd. for C₁₄H₁₀BrF₃NS⁺ [*M* + *H*]⁺ 359.9664, found 359.9657.



(33) 3-(benzo[*b*]thiophen-3-yl)-6-bromo-3-(trifluoromethyl)-3,4-dihydroquinoline

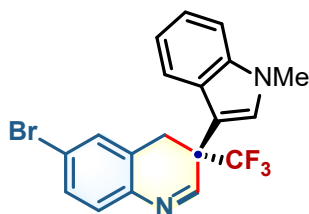
Prepared according to **General procedure A** using *N*-triftosylhydrazone (135.6 mg, 0.3 mmol) derived from 1-(benzo[*b*]thiophen-3-yl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **33** (88.5 mg, 72% yield) as a white solid; mp: 129-131 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.39 (s, 1H), 7.88 (d, *J* = 8.0 Hz, 1H), 7.84-7.80 (m, 1H), 7.44 (s, 1H), 7.40-7.31 (m, 3H), 7.28-7.25 (m, 1H), 7.23 (d, *J* = 8.5 Hz, 1H), 3.64 (d, *J* = 17.0 Hz, 1H), 3.44 (d, *J* = 17.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 156.4, 140.6, 140.2, 136.7, 131.3, 130.7, 129.1, 127.9, 126.7, 126.4 (q, *J* = 282.3 Hz), 125.6, 124.6, 124.5, 123.6 (q, *J* = 2.0 Hz), 123.3, 122.1, 48.6 (q, *J* = 25.0 Hz) 29.4.

¹⁹F NMR (470 MHz, CDCl₃) δ -70.95.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₂BrF₃NS⁺ [*M* + *H*]⁺ 409.9820, found 409.9814.



(34) 6-bromo-3-(1-methyl-1*H*-indol-3-yl)-3-(trifluoromethyl)-3,4-dihydroquinoline

Prepared according to **General procedure A** using *N*-triftosylhydrazone (134.7 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(1-methyl-1*H*-indol-3-yl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **34** (58.5 mg, 48% yield) as a white solid; mp: 224-226 °C.

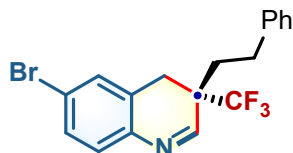
¹H NMR (500 MHz, CDCl₃) δ 8.39 (s, 1H), 7.70 (d, *J* = 8.0 Hz, 1H), 7.33 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.28-7.18 (m, 4H), 7.17-7.12 (m, 1H), 6.92 (s, 1H), 3.68 (s, 3H), 3.52 (d, *J* = 16.5 Hz, 1H), 3.41 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 157.5 (q, *J* = 2.0 Hz), 140.4, 137.4, 131.0, 130.9, 129.2, 128.9, 127.0

(q, $J = 282.5$ Hz), 126.2, 125.9, 122.1, 121.7, 120.8 (q, $J = 2.5$ Hz), 120.0, 109.8, 105.2, 46.7 (q, $J = 26.3$ Hz), 33.0, 29.2.

^{19}F NMR (470 MHz, CDCl_3) δ -72.04.

HRMS (ESI) m/z calcd. for $\text{C}_{19}\text{H}_{15}\text{BrF}_3\text{N}_2^+$ $[\text{M} + \text{H}]^+$ 407.0365, found 407.0360.



(35) 6-bromo-3-phenethyl-3-(trifluoromethyl)-3,4-dihydroquinoline

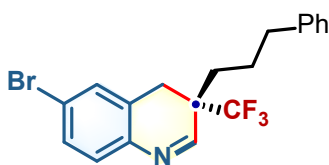
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.2 mg, 0.3 mmol) derived from 1,1,1-trifluoro-4-phenylbutan-2-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **35** (52.8 mg, 46% yield) as a white solid; mp: 87-89 °C.

^1H NMR (500 MHz, CDCl_3) δ 7.83 (s, 1H), 7.43 (d, $J = 8.0$ Hz, 1H), 7.29 (d, $J = 8.5$ Hz, 1H), 7.27-7.21 (m, 3H), 7.20-7.15 (m, 1H), 7.04 (d, $J = 7.0$ Hz, 2H), 3.19 (d, $J = 17.0$ Hz, 1H), 2.86 (d, $J = 17.0$ Hz, 1H), 2.64-2.49 (m, 2H), 2.04-1.94 (m, 1H), 1.93-1.83 (m, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 157.4 (q, $J = 2.5$ Hz), 140.4, 140.3, 131.3, 131.1, 129.2, 128.6, 128.1, 127.3 (q, $J = 281.3$ Hz), 126.4, 125.6, 122.1, 45.8 (q, $J = 25.0$ Hz), 32.7, 30.2, 27.8 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -72.93.

HRMS (ESI) m/z calcd. for $\text{C}_{18}\text{H}_{16}\text{BrF}_3\text{N}^+$ $[\text{M} + \text{H}]^+$ 382.0413, found 382.0407.



(36) 6-bromo-3-(3-phenylpropyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

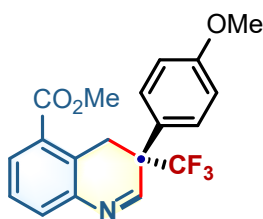
Prepared according to **General procedure A** using *N*-triftosylhydrazone (131.4 mg, 0.3 mmol) derived from 1,1,1-trifluoro-5-phenylpentan-2-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **36** (60.6 mg, 51% yield) as a white solid; mp: 95-97 °C.

^1H NMR (500 MHz, CDCl_3) δ 7.74 (s, 1H), 7.41 (dd, $J = 8.5, 1.5$ Hz, 1H), 7.26 (d, $J = 8.5$ Hz, 1H), 7.25-7.21 (m, 3H), 7.20-7.14 (m, 1H), 7.05 (d, $J = 7.0$ Hz, 2H), 3.11 (d, $J = 16.5$ Hz, 1H), 2.77 (d, $J = 16.5$ Hz, 1H), 2.58-2.45 (m, 2H), 1.74-1.66 (m, 1H), 1.66-1.57 (m, 3H).

^{13}C NMR (125 MHz, CDCl_3) δ 157.9 (q, $J = 2.5$ Hz), 140.8, 140.4, 131.2, 131.0, 129.1, 128.4, 128.2, 127.3 (q, $J = 281.3$ Hz), 126.1, 125.7, 122.0, 45.5 (q, $J = 25.0$ Hz), 35.8, 30.0, 27.7 (q, $J = 2.0$ Hz), 25.2.

^{19}F NMR (470 MHz, CDCl_3) δ -73.01.

HRMS (ESI) m/z calcd. for $\text{C}_{19}\text{H}_{18}\text{BrF}_3\text{N}^+$ $[\text{M} + \text{H}]^+$ 396.0569, found 396.0562.



(37) methyl 3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline-5-carboxylate

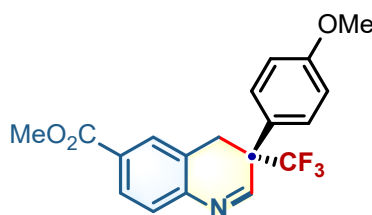
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and methyl 1*H*-indole-4-carboxylate (157.5 mg, 0.9 mmol) afforded **37** (60.9 mg, 56% yield) as a white solid; mp: 147-149 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.43 (s, 1H), 7.81 (dd, *J* = 7.5, 1.0 Hz, 1H), 7.50 (d, *J* = 7.5 Hz, 1H), 7.33-7.28 (m, 2H), 7.28-7.23 (m, 1H), 6.78-6.73 (m, 2H), 4.61 (d, *J* = 17.0 Hz, 1H), 3.95 (s, 3H), 3.71 (s, 3H), 3.24 (d, *J* = 17.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 167.1, 159.62, 159.5 (q, *J* = 2.5 Hz), 142.8, 131.1, 130.6, 129.1, 128.6, 127.2, 126.6 (q, *J* = 281.3 Hz), 126.5, 124.6, 113.9, 55.1, 52.2, 48.3 (q, *J* = 25.0 Hz), 26.2 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -72.45.

HRMS (ESI) *m/z* calcd. for C₁₉H₁₇F₃NO₃⁺ [*M* + *H*]⁺ 364.1155, found 364.1151.



(38) methyl 3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinoline-6-carboxylate

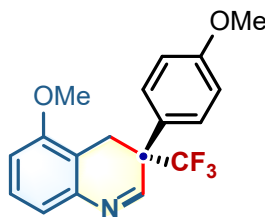
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and methyl 1*H*-indole-5-carboxylate (157.5 mg, 0.3 mmol) afforded **38** (75.0 mg, 75% yield) as a white solid; mp: 160-162 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.44 (s, 1H), 7.89 (d, *J* = 8.0 Hz, 1H), 7.81 (s, 1H), 7.40 (d, *J* = 8.0 Hz, 1H), 7.37-7.32 (m, 2H), 7.29-7.23 (m, 3H), 3.88 (s, 3H), 3.45 (ABq, *J* = 16.0 Hz, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 166.3, 160.4 (q, *J* = 2.5 Hz), 145.2, 132.3, 129.8, 129.7, 129.4, 128.9, 128.7, 127.7, 126.9, 126.5 (q, *J* = 281.3 Hz), 123.7, 53.4, 52.2, 49.5 (q, *J* = 25.0 Hz), 29.7 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.87.

HRMS (ESI) *m/z* calcd. for C₁₉H₁₇F₃NO₃⁺ [*M* + *H*]⁺ 364.1155, found 364.1151.



(39) 5-methoxy-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

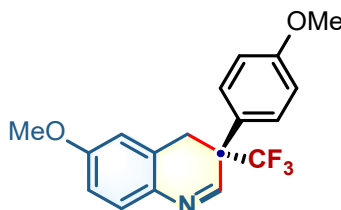
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 4-methoxy-1*H*-indole (132.3 mg, 0.9 mmol) afforded **39** (55.2 mg, 55% yield) as a white solid; mp: 95-97 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.33 (s, 1H), 7.31-7.26 (m, 2H), 7.16 (t, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 8.0 Hz, 1H), 6.79-6.74 (m, 3H), 3.85 (s, 3H), 3.77 (d, *J* = 16.5 Hz, 1H), 3.72 (s, 3H), 2.97 (d, *J* = 16.5 Hz, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ 159.6, 158.3, 156.2, 142.6, 128.9, 127.7, 126.8 (q, $J = 281.3$ Hz), 125.1, 119.6, 113.9, 111.9, 110.7, 55.8, 55.1, 48.4 (q, $J = 25.5$ Hz), 22.6.

^{19}F NMR (564 MHz, CDCl_3) δ -72.27.

HRMS (ESI) m/z calcd. for $\text{C}_{18}\text{H}_{17}\text{F}_3\text{NO}_2^+$ $[\text{M} + \text{H}]^+$ 336.1206, found 336.1201.



(40) 6-methoxy-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

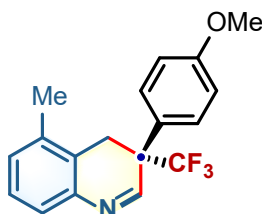
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-methoxy-1*H*-indole (132.3 mg, 0.9 mmol) afforded **40** (86.4 mg, 86% yield) as a white solid; mp: 97-99 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.16 (s, 1H), 7.30 (d, $J = 8.5$ Hz, 2H), 7.27 (d, $J = 9.0$ Hz, 1H), 6.81-6.76 (m, 2H), 6.71 (dd, $J = 8.5, 2.5$ Hz, 1H), 6.63 (d, $J = 2.0$ Hz, 1H), 3.76 (s, 3H), 3.73 (s, 3H), 3.38 (d, $J = 16.0$ Hz, 1H), 3.29 (d, $J = 16.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 159.6, 159.4, 155.1 (q, $J = 2.5$ Hz), 136.0, 128.9, 128.4, 126.8 (q, $J = 281.3$ Hz), 125.3, 124.8, 114.1, 114.0, 112.2, 55.4, 55.1, 48.8 (q, $J = 25.0$ Hz), 30.4.

^{19}F NMR (564 MHz, CDCl_3) δ -72.22.

HRMS (ESI) m/z calcd. for $\text{C}_{18}\text{H}_{17}\text{F}_3\text{NO}_2^+$ $[\text{M} + \text{H}]^+$ 336.1206, found 336.1201.



(41) 3-(4-methoxyphenyl)-5-methyl-3-(trifluoromethyl)-3,4-dihydroquinoline

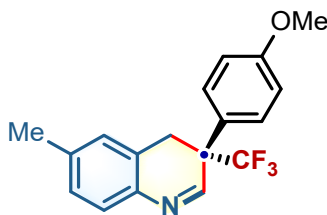
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 4-methyl-1*H*-indole (117.9 mg, 0.9 mmol) afforded **41** (50.7 mg, 53% yield) as a white solid; mp: 90-91 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.30 (s, 1H), 7.28-7.23 (m, 2H), 7.20 (d, $J = 7.5$ Hz, 1H), 7.11 (t, $J = 7.5$ Hz, 1H), 7.02 (d, $J = 7.5$ Hz, 1H), 6.79-6.75 (m, 2H), 3.72 (s, 3H), 3.48 (d, $J = 16.5$ Hz, 1H), 3.12 (d, $J = 16.5$ Hz, 1H), 2.31 (s, 3H).

^{13}C NMR (150 MHz, CDCl_3) δ 159.6, 157.3, 141.9, 135.2, 130.3, 128.7, 127.2, 126.8 (q, $J = 280.5$ Hz), 125.1, 125.0, 122.0, 114.0, 55.1, 48.9 (q, $J = 25.5$ Hz), 26.5, 18.8.

^{19}F NMR (564 MHz, CDCl_3) δ -72.19.

HRMS (ESI) m/z calcd. for $\text{C}_{18}\text{H}_{17}\text{F}_3\text{NO}^+$ $[\text{M} + \text{H}]^+$ 320.1257, found 320.1251.



(42) 3-(4-methoxyphenyl)-6-methyl-3-(trifluoromethyl)-3,4-dihydroquinoline

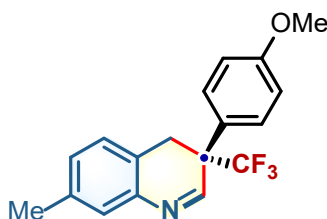
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-methyl-1*H*-indole (117.9 mg, 0.9 mmol) afforded **42** (77.4 mg, 81% yield) as a white solid; mp: 92-94 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.24 (s, 1H), 7.29 (d, *J* = 8.5 Hz, 2H), 7.22 (d, *J* = 7.8 Hz, 1H), 7.00 (d, *J* = 7.8 Hz, 1H), 6.89 (s, 1H), 6.77 (d, *J* = 8.8 Hz, 2H), 3.72 (s, 3H), 3.36 (d, *J* = 16.0 Hz, 1H), 3.28 (d, *J* = 16.0 Hz, 1H), 2.27 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 159.6, 156.7 (q, *J* = 2.5 Hz), 139.8, 138.5, 128.9, 128.7, 128.6, 126.9, 126.8 (q, *J* = 281.3 Hz), 124.8, 123.4, 114.0, 55.1, 49.0 (q, *J* = 25.0 Hz), 30.0, 21.2.

¹⁹F NMR (470 MHz, CDCl₃) δ -72.20.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₇F₃NO⁺ [*M* + *H*]⁺ 320.1257, found 320.1251.



(43) 3-(4-methoxyphenyl)-7-methyl-3-(trifluoromethyl)-3,4-dihydroquinoline

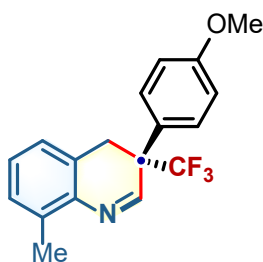
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 6-methyl-1*H*-indole (117.9 mg, 0.9 mmol) afforded **43** (89.1 mg, 93% yield) as a white solid; mp: 85-87 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.29 (s, 1H), 7.31-7.26 (m, 2H), 7.15 (s, 1H), 6.98 (d, *J* = 7.5 Hz, 1H), 6.96-6.92 (m, 1H), 6.79-6.75 (m, 2H), 3.71 (s, 3H), 3.38-3.27 (m, 2H), 2.28 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 159.6, 157.8 (q, *J* = 2.5 Hz), 141.8, 137.8, 129.1, 128.9, 127.7, 126.7 (q, *J* = 280.5 Hz), 124.7, 120.5, 114.0, 55.1, 49.1 (q, *J* = 25.5 Hz), 29.5 (q, *J* = 2.0 Hz), 21.0.

¹⁹F NMR (564 MHz, CDCl₃) δ -72.24.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₇F₃NO⁺ [*M* + *H*]⁺ 320.1257, found 320.1251.



(44) 3-(4-methoxyphenyl)-8-methyl-3-(trifluoromethyl)-3,4-dihydroquinoline

Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived

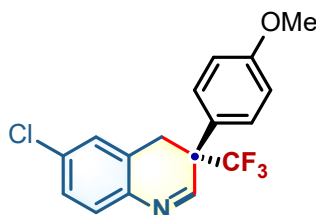
from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 7-methyl-1*H*-indole (117.9 mg, 0.9 mmol) afforded **44** (79.5 mg, 83% yield) as a white solid; mp: 96-97 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.33 (s, 1H), 7.30-7.26 (m, 2H), 7.07-6.98 (m, 2H), 6.93 (d, *J* = 6.5 Hz, 1H), 6.79-6.74 (m, 2H), 3.72 (s, 3H), 3.38-3.28 (m, 2H), 2.41 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 159.5, 156.5 (q, *J* = 2.5 Hz), 140.3, 135.2, 129.7, 129.0, 128.0, 126.8 (q, *J* = 280.5 Hz), 125.6, 124.7, 123.5, 113.9, 55.1, 48.5 (q, *J* = 25.5 Hz), 30.1, 17.3.

¹⁹F NMR (564 MHz, CDCl₃) δ -72.41.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₇F₃NO⁺ [*M* + *H*]⁺ 320.1257, found 320.1251.



(45) 6-chloro-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

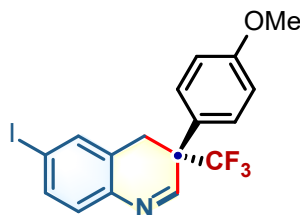
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-chloro-1*H*-indole (136.4 mg, 0.9 mmol) afforded **45** (92.4 mg, 91% yield) as a white solid; mp: 117-119 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.30 (s, 1H), 7.29-7.26 (m, 2H), 7.26-7.24 (m, 1H), 7.20-7.16 (m, 1H), 7.11-7.08 (m, 1H), 6.81-6.77 (m, 2H), 3.73 (s, 3H), 3.37 (d, *J* = 16.0 Hz, 1H), 3.31 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 159.8, 158.3, 140.5, 133.7, 128.9, 128.3, 128.2, 128.1, 126.6 (q, *J* = 280.5 Hz), 125.5, 124.1, 114.2, 55.1, 48.8 (q, *J* = 25.5 Hz), 29.9 (q, *J* = 2.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -72.22.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄BClF₃NO⁺ [*M* + *H*]⁺ 340.0711, found 340.0705.



(46) 6-iodo-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

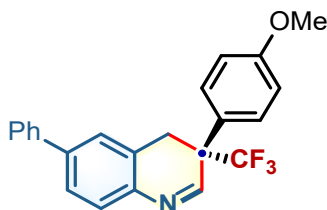
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-iodo-1*H*-indole (218.7 mg, 0.9 mmol) afforded **46** (125.1 mg, 97% yield) as a white solid; mp: 126-128 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.31 (s, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.45 (s, 1H), 7.25 (d, *J* = 8.5 Hz, 2H), 7.07 (d, *J* = 8.5 Hz, 1H), 6.82-6.76 (m, 2H), 3.73 (s, 3H), 3.35 (d, *J* = 16.0 Hz, 1H), 3.28 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 159.7, 158.5 (q, *J* = 2.5 Hz), 141.5, 137.3, 136.8, 128.9, 128.7, 126.5 (q, *J* = 281.3 Hz), 125.9, 124.0, 114.1, 93.5, 55.1, 48.7 (q, *J* = 25.0 Hz), 29.4.

¹⁹F NMR (470 MHz, CDCl₃) δ -72.21.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄F₃INO⁺ [*M* + *H*]⁺ 432.0067, found 432.0031.



(47) 3-(4-methoxyphenyl)-6-phenyl-3-(trifluoromethyl)-3,4-dihydroquinoline

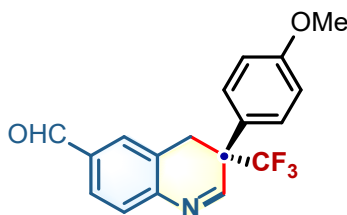
Prepared according to **General procedure A** using *N*-trifosylhydrazone (39.6 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-phenyl-1*H*-indole (173.7 mg, 0.9 mmol) afforded **47** (81.0 mg, 77% yield) as a white solid; mp: 124-125 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.34 (s, 1H), 7.51 (d, *J* = 7.0 Hz, 2H), 7.46-7.35 (m, 6H), 7.35-7.28 (m, 2H), 7.28-7.18 (m, 3H), 3.51-3.41 (m, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 157.4 (q, *J* = 2.5 Hz), 141.3, 141.2, 140.0, 133.0, 128.8, 128.7, 128.6, 127.7, 127.6, 127.5, 126.9, 126.7, 126.6 (q, *J* = 281.3 Hz), 123.9, 49.6 (q, *J* = 25.0 Hz), 30.1.

¹⁹F NMR (470 MHz, CDCl₃) δ -71.74.

HRMS (ESI) *m/z* calcd. for C₂₃H₁₉F₃NO⁺ [*M* + *H*]⁺ 382.1413, found 382.1406.



(48) 3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinoline-6-carbaldehyde

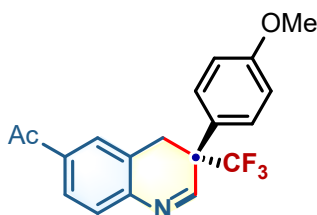
Prepared according to **General procedure A** using *N*-trifosylhydrazone (39.6 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1*H*-indole-5-carbaldehyde (130.5 mg, 0.9 mmol) afforded **48** (57.3 mg, 63% yield) as a white solid; mp: 137-139 °C.

¹H NMR (500 MHz, CDCl₃) δ 9.92 (s, 1H), 8.51 (s, 1H), 7.72 (d, *J* = 8.0 Hz, 1H), 7.68 (s, 1H), 7.59-7.49 (m, 1H), 7.40-7.33 (m, 2H), 7.30-7.23 (m, 3H), 3.50 (ABq, *J* = 16.0 Hz, 2H).

¹³C NMR (150 MHz, CDCl₃) δ 191.2, 161.3, 146.3, 135.8, 132.2, 130.7, 129.0, 128.8, 128.5, 127.72, 127.65, 126.4 (q, *J* = 280.5 Hz), 124.8, 49.6 (q, *J* = 25.5 Hz), 29.8 (q, *J* = 2.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -71.90.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₅F₃NO₂⁺ [*M* + *H*]⁺ 334.1049, found 334.1042.



(49) 1-(3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinolin-6-yl)ethan-1-one

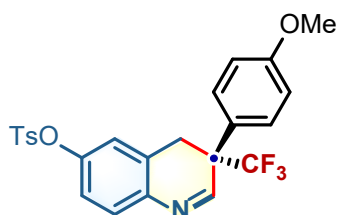
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 1-(1*H*-indol-5-yl)ethan-1-one (143.1 mg, 0.9 mmol) afforded **49** (90.6 mg, 87% yield) as a white solid; mp: 108-109 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.43 (s, 1H), 7.80 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.74 (s, 1H), 7.42 (d, *J* = 8.0 Hz, 1H), 7.26 (d, *J* = 8.5 Hz, 2H), 6.81-6.74 (m, 2H), 3.72 (s, 3H), 3.47-3.36 (m, 2H), 2.55 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 197.1, 160.8, 159.7, 145.3, 136.6, 128.9, 128.8, 127.9, 127.0, 126.5 (q, *J* = 281.3 Hz), 124.2, 123.9, 114.1, 55.1, 49.0 (q, *J* = 25.0 Hz), 29.8 (q, *J* = 2.0 Hz), 26.6.

¹⁹F NMR (470 MHz, CDCl₃) δ -72.28.

HRMS (ESI) *m/z* calcd. for C₁₉H₁₇F₃NO₂⁺ [*M* + *H*]⁺ 348.1206, found 348.1201.



(50) 3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinolin-6-yl 4-methylbenzenesulfonate

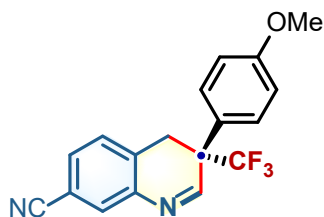
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 1*H*-indol-5-yl 4-methylbenzenesulfonate (258.3 mg, 0.9 mmol) afforded **50** (81.3 mg, 57% yield) as a white solid; mp: 129-130 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.30 (s, 1H), 7.59 (d, *J* = 8.0 Hz, 2H), 7.26-7.19 (m, 5H), 6.86 (d, *J* = 1.5 Hz, 1H), 6.82-6.77 (m, 2H), 6.74 (dd, *J* = 8.5, 2.0 Hz, 1H), 3.75 (s, 3H), 3.30 (ABq, *J* = 16.0 Hz, 2H), 2.44 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 159.7, 158.8 (q, *J* = 2.5 Hz), 148.7, 145.5, 140.6, 132.0, 129.7, 128.9, 128.5, 128.1, 126.5 (q, *J* = 281.3 Hz), 125.5, 124.0, 122.1, 121.8, 114.1, 55.2, 48.6 (q, *J* = 25.0 Hz), 29.9, 21.7.

¹⁹F NMR (470 MHz, CDCl₃) δ -72.26.

HRMS (ESI) *m/z* calcd. for C₂₄H₂₁F₃NO₄S⁺ [*M* + *H*]⁺ 476.1138, found 476.1135.



(51) 3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline-7-carbonitrile

Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 1*H*-indole-6-carbonitrile (127.8 mg, 0.9 mmol) afforded **51** (63.3 mg, 64% yield) as a white solid; mp: 134-136 °C.

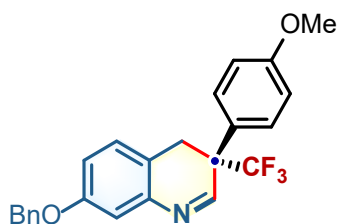
¹H NMR (500 MHz, CDCl₃) δ 8.41 (s, 1H), 7.62 (d, *J* = 1.5 Hz, 1H), 7.44 (dd, *J* = 7.5, 1.5 Hz, 1H), 7.25-7.21 (m, 3H), 6.82-6.76 (m, 2H), 3.74 (s, 3H), 3.47-3.37 (m, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 160.5 (q, *J* = 2.5 Hz), 159.9, 142.4, 131.9, 130.3, 129.5, 129.0, 128.8,

126.3 (q, $J = 281.3$ Hz), 123.5, 118.1, 114.3, 112.2, 55.2, 48.7 (q, $J = 25.0$ Hz), 30.1 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -72.32.

HRMS (ESI) m/z calcd. for $\text{C}_{18}\text{H}_{14}\text{F}_3\text{N}_2\text{O}^+$ $[\text{M} + \text{H}]^+$ 331.1053, found 331.1048.



(52) 7-(benzyloxy)-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

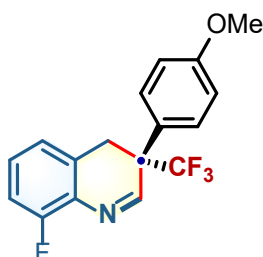
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 6-(benzyloxy)-1*H*-indole (200.7 mg, 0.9 mmol) afforded **52** (101.1 mg, 82% yield) as a white solid; mp: 129-130 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.31 (s, 1H), 7.40-7.33 (m, 4H), 7.32-7.25 (m, 3H), 7.01-6.97 (m, 2H), 6.79-6.74 (m, 3H), 4.99 (s, 2H), 3.71 (s, 3H), 3.35-3.25 (m, 2H).

^{13}C NMR (150 MHz, CDCl_3) δ 159.6, 158.6, 158.5 (q, $J = 2.5$ Hz), 142.7, 136.7, 128.9, 128.6, 128.0, 127.5, 126.7 (q, $J = 280.5$ Hz), 124.6, 115.8, 115.1, 114.0, 113.2, 70.1, 55.1, 49.2 (q, $J = 25.5$ Hz), 29.1.

^{19}F NMR (564 MHz, CDCl_3) δ -72.15.

HRMS (ESI) m/z calcd. for $\text{C}_{24}\text{H}_{21}\text{F}_3\text{NO}_2^+$ $[\text{M} + \text{H}]^+$ 412.1519, found 412.1512.



(53) 8-fluoro-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

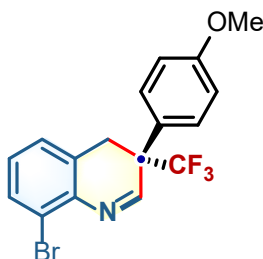
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 7-fluoro-1*H*-indole (121.5 mg, 0.9 mmol) afforded **53** (76.5 mg, 79% yield) as a white solid; mp: 101-102 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.37 (s, 1H), 7.28 (d, $J = 8.8$ Hz, 2H), 7.11 (td, $J = 7.9, 5.3$ Hz, 1H), 6.96 (t, $J = 9.1$ Hz, 1H), 6.91 (d, $J = 7.5$ Hz, 1H), 6.82-6.77 (m, 2H), 3.73 (s, 3H), 3.44-3.33 (m, 2H).

^{13}C NMR (125 MHz, CDCl_3) δ 159.8, 158.8 (q, $J = 2.5$ Hz), 157.4 (d, $J = 253.8$ Hz), 130.2 (d, $J = 2.0$ Hz), 129.3 (d, $J = 8.8$ Hz), 129.0, 126.6 (q, $J = 280.0$ Hz), 126.1, 124.0, 123.3 (d, $J = 3.8$ Hz), 115.4 (d, $J = 20.0$ Hz), 114.1, 55.2, 48.8 (q, $J = 25.0$ Hz), 29.6.

^{19}F NMR (564 MHz, CDCl_3) δ -72.32, (-125.33)-(-125.39) (m).

HRMS (ESI) m/z calcd. for $\text{C}_{17}\text{H}_{14}\text{F}_4\text{NO}^+$ $[\text{M} + \text{H}]^+$ 324.1006, found 324.1001.



(54) 8-bromo-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

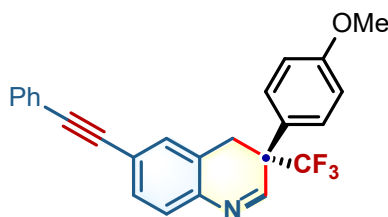
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 7-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **54** (87.6 mg, 76% yield) as a white solid; mp: 100-101 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.42 (s, 1H), 7.46 (d, *J* = 8.0 Hz, 1H), 7.26 (d, *J* = 8.5 Hz, 2H), 7.07 (d, *J* = 7.5 Hz, 1H), 6.99 (t, *J* = 7.7 Hz, 1H), 6.77 (d, *J* = 9.0 Hz, 2H), 3.72 (s, 3H), 3.42-3.32 (m, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 159.7, 159.4 (q, *J* = 2.5 Hz), 139.8, 132.3, 129.3, 128.9, 127.3, 126.5 (q, *J* = 281.3 Hz), 126.1, 123.8, 123.0, 114.1, 55.1, 48.9 (q, *J* = 25.0 Hz), 30.3 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -72.30.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄BrF₃NO⁺ [*M* + *H*]⁺ 384.0205, found 384.0198.



(55) 3-(4-methoxyphenyl)-6-(phenylethynyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

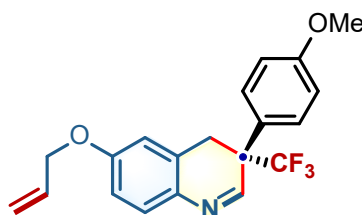
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-(phenylethynyl)-1*H*-indole (195.3 mg, 0.9 mmol) afforded **55** (104.4 mg, 86% yield) as a white solid; mp: 116-117 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.33 (s, 1H), 7.52-7.48 (m, 2H), 7.38 (dd, *J* = 8.0, 1.0 Hz, 1H), 7.36-7.30 (m, 4H), 7.30-7.25 (m, 3H), 6.81-6.76 (m, 2H), 3.72 (s, 3H), 3.42-3.31 (m, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 159.7, 158.6 (q, *J* = 2.5 Hz), 141.7, 131.6, 131.5, 131.1, 128.9, 128.5, 128.4, 127.0, 126.7 (q, *J* = 281.3 Hz), 124.2, 124.0, 123.3, 122.9, 114.1, 90.6, 88.8, 55.1, 48.9 (q, *J* = 25.0 Hz), 29.8 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -72.22.

HRMS (ESI) *m/z* calcd. for C₂₅H₁₉F₃NO⁺ [*M* + *H*]⁺ 406.1413, found 406.1408



(56) 6-(allyloxy)-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived

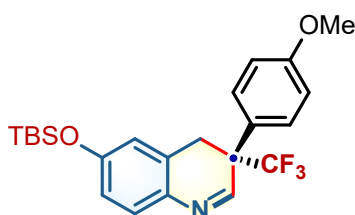
from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-(allyloxy)-1*H*-indole (155.7 mg, 0.9 mmol) afforded **56** (93.0 mg, 86% yield) as a white solid; mp: 109-110 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.17 (s, 1H), 7.29 (d, *J* = 8.5 Hz, 2H), 7.27-7.23 (m, 1H), 6.78 (d, *J* = 9.0 Hz, 2H), 6.72 (d, *J* = 8.5 Hz, 1H), 6.65 (s, 1H), 6.06-6.95 (m, 1H), 5.38 (d, *J* = 17.0 Hz, 1H), 5.28 (d, *J* = 10.5 Hz, 1H), 4.53-4.44 (m, 2H), 3.73 (s, 3H), 3.37 (d, *J* = 16.0 Hz, 1H), 3.28 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 159.6, 158.4, 155.2 (q, *J* = 2.5 Hz), 136.1, 132.8, 128.9, 128.3, 126.8 (q, *J* = 281.3 Hz), 125.3, 124.7, 117.9, 114.8, 114.0, 113.0, 68.9, 55.1, 47.7 (q, *J* = 25.0 Hz), 30.3 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -72.23.

HRMS (ESI) *m/z* calcd. for C₂₀H₁₉F₃NO₂⁺ [*M* + *H*]⁺ 362.1362, found 362.1359.



(57) 6-((*tert*-butyldimethylsilyl)oxy)-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

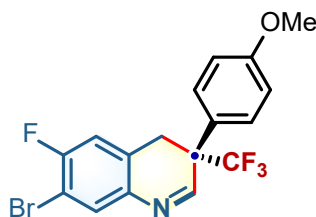
Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-((*tert*-butyldimethylsilyl)oxy)-1*H*-indole (222.3 mg, 0.9 mmol) afforded **57** (84.9 mg, 65% yield) as a white solid; mp: 126-127 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.17 (s, 1H), 7.28 (d, *J* = 8.5 Hz, 2H), 7.20 (d, *J* = 8.5 Hz, 1H), 6.79-6.75 (m, 2H), 6.65 (dd, *J* = 8.5, 2.5 Hz, 1H), 6.59-6.56 (m, 1H), 3.72 (s, 3H), 3.35 (d, *J* = 16.0 Hz, 1H), 3.26 (d, *J* = 16.0 Hz, 1H), 0.95 (s, 9H), 0.17 (s, 3H), 0.16 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 159.5, 155.6, 155.4, 136.5, 129.0, 128.2, 126.8 (q, *J* = 281.3 Hz), 125.2, 124.7, 119.7, 119.1, 113.9, 55.1, 48.7 (q, *J* = 25.0 Hz), 30.1, 25.6, 18.2, -4.45, -4.47.

¹⁹F NMR (470 MHz, CDCl₃) δ -72.26.

HRMS (ESI) *m/z* calcd. for C₂₃H₂₉F₃NO₂Si⁺ [*M* + *H*]⁺ 436.1914, found 436.1907.



(58) 7-bromo-6-fluoro-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

Prepared according to **General procedure A** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 6-bromo-5-fluoro-1*H*-indole (192.6 mg, 0.9 mmol) afforded **58** (68.7 mg, 57% yield) as a white solid; mp: 98-100 °C.

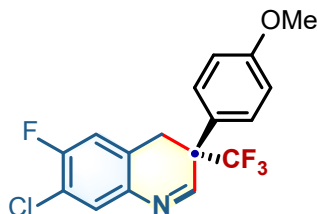
¹H NMR (500 MHz, CDCl₃) δ 8.29 (s, 1H), 7.55 (d, *J* = 6.5 Hz, 1H), 7.26-7.22 (m, 2H), 6.89 (d, *J* = 8.0 Hz, 1H), 6.82-6.78 (m, 2H), 3.74 (s, 3H), 3.31 (s, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 159.8, 158.7 (q, *J* = 2.5 Hz), 158.2 (d, *J* = 249.2 Hz), 139.1 (d, *J* = 3.8

Hz), 131.9, 128.8, 126.5 (q, $J = 281.3$ Hz), 125.1 (d, $J = 7.5$ Hz), 123.8, 115.9 (d, $J = 23.8$ Hz), 114.2, 107.6 (d, $J = 21.3$ Hz), 55.2, 48.6 (q, $J = 25.0$ Hz), 29.8.

^{19}F NMR (470 MHz, CDCl_3) δ -72.26, (-106.80)-(-106.86) (m).

HRMS (ESI) m/z calcd. for $\text{C}_{17}\text{H}_{13}\text{BrF}_4\text{NO}^+ [\text{M} + \text{H}]^+$ 402.0111, found 402.0104.



(59) 7-chloro-6-fluoro-3-(4-methoxyphenyl)-3-(trifluoromethyl)-3,4-dihydroquinoline

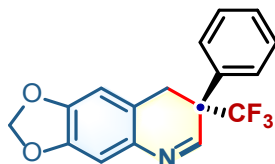
Prepared according to **General procedure A** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 6-chloro-5-fluoro-1*H*-indole (152.1 mg, 0.9 mmol) afforded **59** (66.3 mg, 62% yield) as a white solid; mp: 95-96 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.30 (s, 1H), 7.40 (d, $J = 7.0$ Hz, 1H), 7.25 (d, $J = 9.0$ Hz, 2H), 6.91 (d, $J = 8.5$ Hz, 1H), 6.80 (d, $J = 8.8$ Hz, 2H), 3.74 (s, 3H), 3.32 (s, 2H).

^{13}C NMR (125 MHz, CDCl_3) δ 159.8, 158.7 (q, $J = 2.5$ Hz), 157.2 (d, $J = 251.0$ Hz), 138.8 (d, $J = 2.5$ Hz), 129.1, 128.8, 126.5 (q, $J = 281.3$ Hz), 124.3 (d, $J = 7.5$ Hz), 123.8, 119.9 (d, $J = 17.5$), 116.0 (d, $J = 23.8$ Hz), 114.2, 55.2, 48.6 (q, $J = 25.0$ Hz), 29.7.

^{19}F NMR (470 MHz, CDCl_3) δ -72.26, (-114.73)-(-114.80) (m).

HRMS (ESI) m/z calcd. for $\text{C}_{17}\text{H}_{13}\text{ClF}_4\text{NO}^+ [\text{M} + \text{H}]^+$ 358.0616, found 358.0607.



(60) 7-phenyl-7-(trifluoromethyl)-7,8-dihydro-[1,3]dioxolo[4,5-g]quinoline

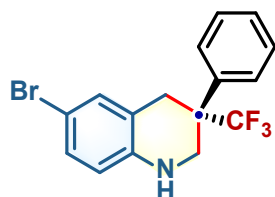
Prepared according to **General procedure A** using *N*-trifosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5*H*-[1,3]dioxolo[4,5-*f*]indole (144.9 mg, 0.9 mmol) afforded **60** (87.0 mg, 91% yield) as a white solid; mp: 169-171 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.21 (s, 1H), 7.41-7.34 (m, 2H), 7.31-7.26 (m, 3H), 6.85 (s, 1H), 6.56 (s, 1H), 5.90 (d, $J = 18.0$ Hz, 2H), 3.35 (d, $J = 16.0$ Hz, 1H), 3.27 (d, $J = 16.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 155.5, 147.2, 147.1, 136.8, 132.9, 128.7, 128.6, 127.7, 126.7 (q, $J = 281.3$ Hz), 117.2, 108.1, 107.9, 101.4, 49.3 (q, $J = 25.0$ Hz), 30.0 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -71.72.

HRMS (ESI) m/z calcd. for $\text{C}_{17}\text{H}_{13}\text{F}_3\text{NO}_2^+ [\text{M} + \text{H}]^+$ 320.0893, found 320.0887.



(61) 6-bromo-3-phenyl-3-(trifluoromethyl)-1,2,3,4-tetrahydroquinoline

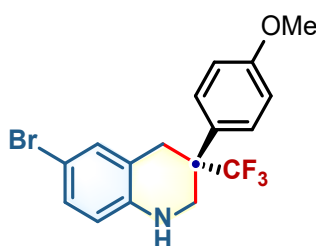
Prepared according to **General procedure B** using *N*-trifosylhydrazone (136.2 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-bromo-1*H*-indole (118.1 mg, 0.9 mmol) afforded **61** (97.0 mg, 91% yield) as a white solid; mp: 135-136 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.43 (d, *J* = 7.5 Hz, 2H), 7.33-7.23 (m, 3H), 7.18 (s, 1H), 6.98 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.23 (d, *J* = 8.5 Hz, 1H), 3.92 (d, *J* = 12.0 Hz, 1H), 3.83 (s, br, 1H), 3.65 (d, *J* = 12.0 Hz, 1H), 3.44 (dd, *J* = 16.5, 2.5 Hz, 1H), 3.38 (d, *J* = 16.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 141.6, 133.7, 131.9, 130.1, 128.5, 128.3, 128.2, 127.0 (q, *J* = 281.3 Hz), 120.0, 116.0, 109.4, 44.8 (q, *J* = 25.0 Hz), 44.6 (q, *J* = 2.0 Hz), 31.0 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -73.97.

HRMS (ESI) *m/z* calcd. for C₁₆H₁₄BrF₃N⁺ [*M* + *H*]⁺ 356.0256, found 356.0254.



(62) 6-bromo-3-(4-methoxyphenyl)-3-(trifluoromethyl)-1,2,3,4-tetrahydroquinoline

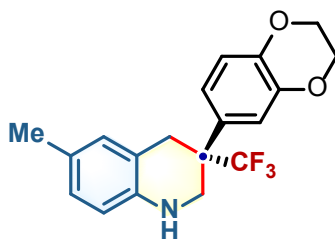
Prepared according to **General procedure B** using *N*-trifosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **62** (95.1 mg, 82% yield) as a white solid; mp: 146-148 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.36-7.31 (m, 2H), 7.17 (d, *J* = 1.5 Hz, 1H), 6.98 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.84-6.79 (m, 2H), 6.23 (d, *J* = 8.5 Hz, 1H), 3.91-3.77 (m, 2H), 3.74 (s, 3H), 3.61 (d, *J* = 12.0 Hz, 1H), 3.42-3.32 (m, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 159.1, 141.5, 131.9, 130.0, 129.4, 127.0 (q, *J* = 280.0 Hz), 125.4, 120.0, 115.9, 113.8, 109.3, 55.1, 44.5 (q, *J* = 3.8 Hz), 44.2 (q, *J* = 25.0 Hz), 31.1 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -74.16.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₆BrF₃NO⁺ [*M* + *H*]⁺ 386.0362, found 386.0360.



(63)

3-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-6-methyl-3-(trifluoromethyl)-1,2,3,4-tetrahydroquinoline

Prepared according to **General procedure B** using *N*-trifosylhydrazone (136.2 mg, 0.3 mmol) derived from 1-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (176.4 mg, 0.9 mmol) afforded **63** (86.9 mg, 83% yield) as a white solid; mp: 157-159 °C.

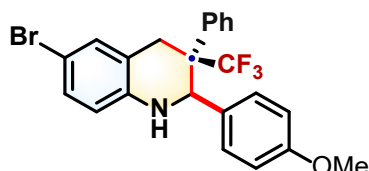
¹H NMR (500 MHz, CDCl₃) δ 6.96 (s, 1H), 6.91 (d, *J* = 8.5 Hz, 1H), 6.86 (s, 1H), 6.74 (t, *J* = 8.5 Hz, 2H), 6.31 (d, *J* = 8.0 Hz, 1H), 4.15 (s, 4H), 3.77 (d, *J* = 12.0 Hz, 1H), 3.56 (d, *J* = 12.0 Hz, 1H),

3.38-3.28 (m, 2H). 2.19 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 143.2, 143.1, 140.1, 123.0, 127.8, 127.4, 127.3, 127.2 (q, *J* = 281.3 Hz), 121.4, 118.2, 117.6, 117.0, 115.0, 64.21, 64.15, 44.8-44.6 (m), 44.6 (q, *J* = 25.0 Hz), 31.2-31.0 (m), 20.4.

¹⁹F NMR (470 MHz, CDCl₃) δ -74.22.

HRMS (ESI) *m/z* calcd. for C₁₉H₁₉F₃NO₂⁺ [M + H]⁺ 350.1362, found 350.1360.



(64) 6-bromo-2-(4-methoxyphenyl)-3-phenyl-3-(trifluoromethyl)-1,2,3,4-tetrahydroquinoline

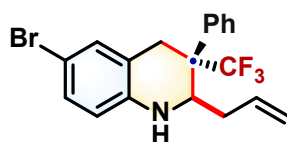
Prepared according to **General procedure C** using **3** (105.9 mg, 0.3 mmol) and 4-Methoxyphenylmagnesium bromide (0.3 mL of a 1.0 M solution in THF, 0.3 mmol) afforded **64** (120.3 mg, 87% yield) as a white solid; mp: 158-159 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.30 (d, *J* = 2.0 Hz, 1H), 7.27-7.22 (m, 1H), 7.22-7.15 (m, 4H), 7.12 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.92-6.86 (m, 2H), 6.71-6.64 (m, 2H), 6.36 (d, *J* = 8.5 Hz, 1H), 4.87 (s, 1H), 4.00 (s, 1H), 3.72 (s, 3H), 3.55 (d, *J* = 17.5 Hz, 1H), 3.40 (d, *J* = 17.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 159.3, 142.8, 134.7, 131.2, 131.0, 130.0, 129.9, 128.7, 128.0, 127.7, 127.5 (q, *J* = 283.8 Hz), 121.4, 115.6, 113.1, 109.8, 58.6, 55.1, 50.4 (q, *J* = 21.3 Hz), 31.7.

¹⁹F NMR (470 MHz, CDCl₃) δ -68.10.

HRMS (ESI) *m/z* calcd. for C₂₃H₂₀BrF₃NO⁺ [M + H]⁺ 462.0675, found 462.0673.



Major : Minor = 12:1

(65) 2-allyl-6-bromo-3-phenyl-3-(trifluoromethyl)-1,2,3,4-tetrahydroquinoline

Prepared according to **General procedure C** using **3** (105.9 mg, 0.3 mmol) and allylmagnesiumbromide (0.3 mL of a 1.0 M solution in THF, 0.3 mmol) afforded **65** (109.0 mg, 92% yield) as a white solid; mp: 148-150 °C.

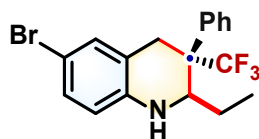
¹H NMR (500 MHz, CDCl₃) **major**: δ 7.46 (d, *J* = 7.5 Hz, 2H), 7.40-7.30 (m, 3H), 7.22 (s, 1H), 7.12 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.47 (d, *J* = 8.5 Hz, 1H), 5.64-5.56 (m, 1H), 5.17 (d, *J* = 17.0 Hz, 1H), 5.07 (d, *J* = 10.5 Hz, 1H), 4.65-4.58 (m, 1H), 4.16 (d, *J* = 1.5 Hz, 1H), 3.42 (d, *J* = 17.0 Hz, 1H), 3.29 (d, *J* = 17.0 Hz, 1H), 0.91-0.82 (m, 2H). **minor**: δ 7.43 (d, *J* = 7.5 Hz, 2H), 7.30-7.25 (m, 3H), 7.22 (s, 1H), 7.00 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.21 (d, *J* = 8.5 Hz, 1H), 6.13-6.03 (m, 1H), 5.32-5.22 (m, 2H), 4.57-4.51 (m, 1H), 3.36 (d, *J* = 7.0 Hz, 2H), 1.00-0.92 (m, 2H).

¹³C NMR (125 MHz, CDCl₃) **major**: δ 141.5, 136.0, 134.9, 131.3, 130.0, 128.4, 128.2, 127.8, 127.2 (q, *J* = 283.8 Hz), 121.0, 118.5, 115.7, 109.6, 55.8, 47.9 (q, *J* = 23.8 Hz), 29.8, 26.9. **minor** : δ 140.5, 135.9, 135.6, 131.5, 130.2, 128.4, 128.0, 127.4, 126.1 (q, *J* = 285.0 Hz), 119.0, 117.6, 115.7, 109.3,

57.2, 46.0 (q, $J = 23.8$ Hz), 29.3 (q, $J = 2.0$ Hz), 26.2 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) **major**: δ -70.13. **minor** : δ -68.10.

HRMS (ESI) m/z calcd. for $\text{C}_{19}\text{H}_{18}\text{BrF}_3\text{N}^+$ $[\text{M} + \text{H}]^+$ 396.0596, found 396.0595.



Major : Minor = 5:1

(66) 6-bromo-2-ethyl-3-phenyl-3-(trifluoromethyl)-1,2,3,4-tetrahydroquinoline

Prepared according to **General procedure C** using **3** (105.9 mg, 0.3 mmol) and ethylmagnesium bromide (0.3 mL of a 1.0 M solution in THF, 0.3 mmol) afforded **66** (109.2 mg, 95% yield) as a white solid; mp: 110-112 °C.

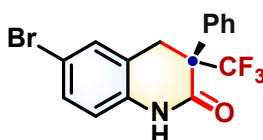
^1H NMR (500 MHz, CDCl_3) **major**: δ 7.46-7.36 (m, 4H), 7.36-7.31 (m, 1H), 7.25-7.22 (m, 1H), 7.12 (dd, $J = 8.5, 2.0$ Hz, 1H), 6.47 (d, $J = 8.5$ Hz, 1H), 4.32 (d, $J = 2.5$ Hz, 1H), 3.89-3.83 (m, 1H), 3.41 (d, $J = 17.5$ Hz, 1H), 3.33 (d, $J = 17.5$ Hz, 1H), 1.21-1.08 (m, 2H), 0.89 (t, $J = 7.3$ Hz, 3H). **minor**: δ 7.46-7.36 (m, 4H), 7.25-7.22 (m, 2H), 7.00 (dd, $J = 8.5, 2.0$ Hz, 1H), 6.20 (d, $J = 8.5$ Hz, 1H), 4.08 (d, $J = 3.5$ Hz, 1H), 3.80-3.74 (m, 1H), 3.42 (d, $J = 17.5$ Hz, 1H), 3.33 (d, $J = 17.5$ Hz, 1H), 1.55-1.45 (m, 2H), 1.02 (t, $J = 7.3$ Hz, 3H).

^{13}C NMR (125 MHz, CDCl_3) **major**: δ 141.0, 137.4, 131.4, 129.9, 128.6, 128.0, 127.4 (q, $J = 283.8$ Hz), 127.1, 121.4, 116.5, 109.4, 55.1, 48.4 (q, $J = 23.8$ Hz), 29.0 (q, $J = 2.0$ Hz), 22.7, 10.9.

minor: 140.3, 137.0, 131.5, 130.0, 128.3, 127.8, 127.6 (q, $J = 282.3$ Hz), 126.9, 119.3, 116.4, 109.1, 56.8, 48.9 (q, $J = 23.8$ Hz), 26.1 (q, $J = 2.0$ Hz), 23.7 (q, $J = 2.0$ Hz), 11.0.

^{19}F NMR (470 MHz, CDCl_3) **major**: δ -70.63. **minor**: -67.17.

HRMS (ESI) m/z calcd. for $\text{C}_{18}\text{H}_{18}\text{BrF}_3\text{N}^+$ $[\text{M} + \text{H}]^+$ 384.0596, found 384.0594.



(67) 6-bromo-3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinolin-2(1H)-one

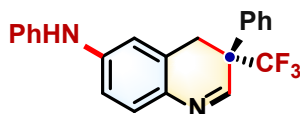
Prepared according to **General procedure D** using **3** (105.9 mg, 0.3 mmol) afforded **67** (96.3 mg, 87% yield) as a white solid; mp: 170-172 °C.

^1H NMR (500 MHz, CDCl_3) δ 9.50 (s, 1H), 7.48-7.42 (m, 2H), 7.37 (s, 1H), 7.31-7.26 (m, 3H), 7.23-7.18 (m, 1H), 6.66 (d, $J = 8.5$ Hz, 1H), 3.66 (d, $J = 16.0$ Hz, 1H), 3.61 (d, $J = 16.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 167.3, 134.6, 131.1, 131.0, 129.5, 129.2, 128.8, 128.1, 124.9 (q, $J = 281.3$ Hz), 122.7, 117.0, 116.3, 54.7 (q, $J = 25.0$ Hz), 30.6 (q, $J = 2.0$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -70.81.

HRMS (ESI) m/z calcd. for $\text{C}_{16}\text{H}_{12}\text{BrF}_3\text{NO}^+$ $[\text{M} + \text{H}]^+$ 370.0049, found 370.0045.



(68) N,3-diphenyl-3-(trifluoromethyl)-3,4-dihydroquinolin-6-amine

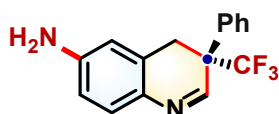
Prepared according to **General procedure E** using **3** (105.9 mg, 0.3 mmol) and aniline (102.1 mg, 0.33 mmol) afforded **68** (102.0 mg, 93% yield) as a white solid; mp: 138-140 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.15 (s, 1H), 7.41-7.36 (m, 2H), 7.28-7.18 (m, 6H), 7.01 (d, *J* = 8.0 Hz, 2H), 6.95 (t, *J* = 7.5 Hz, 1H), 6.79 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.74-6.71 (m, 1H), 5.86 (s, 1H), 3.36 (d, *J* = 16.0 Hz, 1H), 3.26 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 153.9 (q, *J* = 2.5 Hz), 143.6, 141.8, 135.6, 133.3, 129.3, 128.6, 128.5, 128.3, 127.7, 126.7 (q, *J* = 281.3 Hz), 125.0, 121.9, 118.9, 115.6, 115.4, 49.4 (q, *J* = 25.0 Hz), 30.3 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.73.

HRMS (ESI) *m/z* calcd. for C₂₂H₁₈F₃N₂⁺ [*M* + *H*]⁺ 367.1417, found 367.1415.



(69) 3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinolin-6-amine

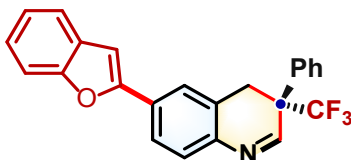
Prepared according to **General procedure F** using **3** (105.9 mg, 0.3 mmol) and NH₃·H₂O (28% solution, 40.0 equiv) afforded **69** (55.7 mg, 64% yield) as a white solid; mp: 125-127 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.08 (d, *J* = 0.5 Hz, 1H), 7.41-7.36 (m, 2H), 7.29-7.21 (m, 3H), 7.13 (d, *J* = 8.0 Hz, 1H), 6.45 (dd, *J* = 8.0, 2.0 Hz, 1H), 6.36 (d, *J* = 1.0 Hz, 1H), 3.71 (s, br., 2H), 3.35 (d, *J* = 16.0 Hz, 1H), 3.24 (d, *J* = 16.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 153.0 (q, *J* = 2.5 Hz), 146.6, 134.4, 133.4, 128.5, 128.4, 127.7, 126.8 (q, *J* = 280.0 Hz), 125.0, 114.2, 113.7, 49.4 (q, *J* = 25.0 Hz), 30.3 (q, *J* = 2.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -71.78.

HRMS (ESI) *m/z* calcd. for C₁₆H₁₄F₃N₂⁺ [*M* + *H*]⁺ 291.1104, found 291.1100.



(70) 6-(benzofuran-2-yl)-3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinoline

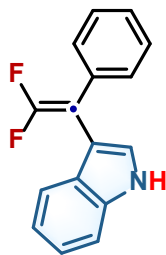
Prepared according to **General procedure G** using **3** (105.9 mg, 0.3 mmol) and benzofuran-2-ylboronic acid (72.9 mg, 0.45 mmol) afforded **70** (111.5 mg, 95% yield) as a white solid; mp: 160-162 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.35 (s, 1H), 7.65 (d, *J* = 7.5 Hz, 1H), 7.59 (s, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.48 (d, *J* = 8.0 Hz, 1H), 7.42-7.37 (m, 3H), 7.29-7.17 (m, 5H), 6.94 (s, 1H), 3.50-3.40 (m, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 157.9, 154.9 (q, *J* = 2.5 Hz), 142.0, 132.8, 130.4, 129.0, 128.8, 128.7, 127.7, 127.5, 126.6 (q, *J* = 278.8 Hz), 124.59, 124.57, 124.4, 124.2, 123.1, 121.0, 111.1, 102.1, 49.6 (q, *J* = 25.0 Hz), 30.0.

¹⁹F NMR (470 MHz, CDCl₃) δ -71.74.

HRMS (ESI) *m/z* calcd. for C₂₄H₁₇F₃NO⁺ [*M* + *H*]⁺ 392.1257, found 392.1255.



(71) 3-(2,2-Difluoro-1-phenylvinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **71** (66.6 mg, 87% yield) as a pink oil.

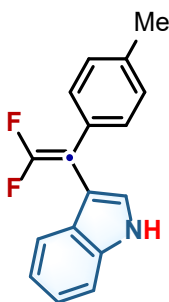
¹H NMR (500 MHz, CDCl₃) δ 8.08 (s, 1H), 7.36 (d, *J* = 7.0 Hz, 2H), 7.33-7.27 (m, 4H), 7.17 (t, *J* = 7.5 Hz, 1H), 7.13 (d, *J* = 1.5 Hz, 1H), 7.10 (d, *J* = 8.0 Hz, 1H), 7.00 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 288.0, 291.0 Hz), 135.9, 134.3 (t, *J* = 4.5 Hz), 129.2 (t, *J* = 3.8 Hz), 128.3, 127.3, 126.6 (d, *J* = 3.0 Hz), 124.6 (t, *J* = 3.8 Hz), 122.3, 120.2 (d, *J* = 1.5 Hz), 120.0, 111.2, 109.0 (t, *J* = 3.5 Hz), 89.6 (t, *J* = 20.3 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -86.4 (d, *J* = 33.8 Hz), -90.3 (d, *J* = 33.8 Hz).

IR (Film): 3474, 3053, 2983, 1706, 1457, 1263, 1095, 902, 722, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₆H₁₀F₂N⁺ [M-H]⁺: 254.0787; Found: 254.0787.



(72) 3-(2,2-Difluoro-1-(*p*-tolyl)vinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (246.0 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(*p*-tolyl)ethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **72** (73.8 mg, 92% yield) as a yellow oil.

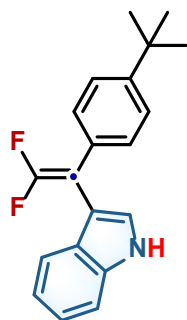
¹H NMR (600 MHz, CDCl₃) δ 8.08 (s, 1H), 7.33 (d, *J* = 7.8 Hz, 1H), 7.26-7.24 (m, 2H), 7.19-7.11 (m, 5H), 7.02-6.99 (m, 1H), 2.34 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.6 (dd, *J* = 288.0, 291.0 Hz), 137.1, 135.9, 131.3 (t, *J* = 3.8 Hz), 129.00 (t, *J* = 3.5 Hz), 128.97, 126.6 (d, *J* = 3.0 Hz), 124.5 (t, *J* = 3.8 Hz), 122.3, 120.2 (d, *J* = 1.5 Hz), 119.9, 111.2, 109.2 (t, *J* = 3.8 Hz), 89.4 (t, *J* = 21.0 Hz), 21.2.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.9 (d, *J* = 33.8 Hz), -90.7 (d, *J* = 33.8 Hz).

IR (Film): 3470, 3036, 2932, 1706, 1456, 1264, 905, 724, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂N⁺ [M-H]⁺: 268.0943; Found: 268.0944.



(73) 3-(1-(4-(*tert*-Butyl)phenyl)-2,2-difluorovinyl)-1*H*-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (271.2 mg, 0.6 mmol) derived from 1-(4-(*tert*-butyl)phenyl)-2,2,2-trifluoroethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **73** (78.0 mg, 84% yield) as a yellow oil.

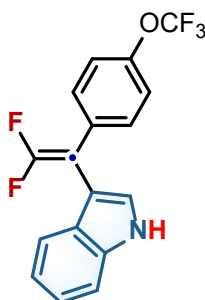
¹H NMR (500 MHz, CDCl₃) δ 8.08 (s, 1H), 7.34-7.28 (m, 5H), 7.19-7.12 (m, 3H), 7.03 (t, *J* = 7.5 Hz, 1H), 1.31 (s, 9H).

¹³C NMR (125 MHz, CDCl₃) δ 153.6 (dd, *J* = 288.8, 292.5 Hz), 150.2, 135.9, 131.3 (t, *J* = 3.8 Hz), 128.7 (t, *J* = 3.8 Hz), 126.7 (d, *J* = 2.5 Hz), 125.2, 124.6 (t, *J* = 3.2 Hz), 122.3, 120.2 (d, *J* = 2.5 Hz), 119.9, 111.2, 109.2 (t, *J* = 3.2 Hz), 89.2 (t, *J* = 20.5 Hz), 34.5, 31.3.

¹⁹F NMR (470 MHz, CDCl₃) δ -86.3 (d, *J* = 34.5 Hz), -90.3 (d, *J* = 34.5 Hz).

IR (Film): 3472, 3055, 2965, 1706, 1456, 1263, 906, 728, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₂₀H₁₈F₂N⁺ [M-H]⁺: 310.1413; Found: 310.1415.



(74) 3-(2,2-Difluoro-1-(4-(trifluoromethoxy)phenyl)vinyl)-1*H*-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (288.0 mg, 1 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethoxy)phenyl) ethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **74** (90.6 mg, 89% yield) as an orange-red oil.

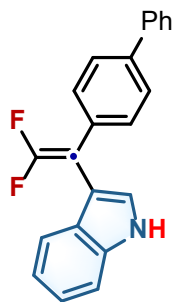
¹H NMR (600 MHz, CDCl₃) δ 8.15 (s, 1H), 7.38-7.34 (m, 3H), 7.21-7.18 (m, 1H), 7.16-7.13 (m, 3H), 7.09 (d, *J* = 8.4 Hz, 1H), 7.05-7.02 (m, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.8 (dd, *J* = 288.0, 292.5 Hz), 148.3, 136.0, 133.0 (t, *J* = 3.8 Hz), 130.5 (t, *J* = 3.8 Hz), 126.4 (d, *J* = 3.0 Hz), 124.7 (t, *J* = 3.8 Hz), 122.5, 120.7, 120.5 (q, *J* = 255.0 Hz), 120.2, 120.0 (d, *J* = 3.0 Hz), 111.3, 108.6 (t, *J* = 3.0 Hz), 88.7 (dd, *J* = 19.5, 21.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -57.8, -85.5 (d, *J* = 32.0 Hz), -89.6 (d, *J* = 32.0 Hz).

IR (Film): 3473, 3051, 2993, 1707, 1508, 1253, 902, 722, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₉F₅NO⁺ [M-H]⁺: 338.0610; Found: 338.0612.



(75) 3-(1-([1,1'-Biphenyl]-4-yl)-2,2-difluorovinyl)-1H-indole

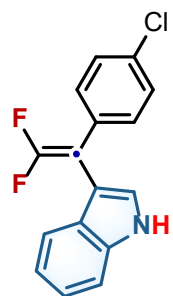
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (283.2 mg, 0.6 mmol) derived from 1-([1,1'-biphenyl]-4-yl)-2,2,2-trifluoroethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **75** (89.4 mg, 90% yield) as a pale yellow solid (mp: 144-146 °C).

¹H NMR (500 MHz, CDCl₃) δ 8.09 (s, 1H), 7.60-7.58 (m, 4H), 7.43-7.40 (m, 4H), 7.35-7.31 (m, 2H), 7.20-7.16 (m, 3H), 7.03 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.8 (dd, *J* = 289.5, 292.5 Hz), 140.5, 140.0, 136.0, 133.3 (t, *J* = 3.8 Hz), 129.5 (t, *J* = 3.8 Hz), 128.8, 127.4, 127.0, 126.9, 126.6 (d, *J* = 3.0 Hz), 124.7 (t, *J* = 3.8 Hz), 122.4, 120.2 (d, *J* = 3.0 Hz), 120.0, 111.3, 108.9 (t, *J* = 3.8 Hz), 89.3 (t, *J* = 20.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.7 (d, *J* = 33.0 Hz), -89.6 (d, *J* = 33.0 Hz).

HRMS (ESI) *m/z* calcd for C₂₂H₁₄F₂N⁺ [M-H]⁺: 330.1100; Found: 330.1101.



(76) 3-(1-(4-Chlorophenyl)-2,2-difluorovinyl)-1H-indole

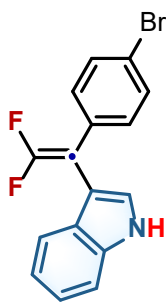
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (258.0 mg, 0.6 mmol) derived from 1-(4-chlorophenyl)-2,2,2-trifluoroethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **76** (76.2 mg, 88% yield) as a yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 8.27 (s, 1H), 7.39 (d, *J* = 8.0 Hz, 1H), 7.32-7.27 (m, 4H), 7.22-7.18 (m, 2H), 7.08 (d, *J* = 8.0 Hz, 1H), 7.03 (t, *J* = 7.2 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 288.0, 292.5 Hz), 136.0, 133.1, 132.8 (t, *J* = 4.5 Hz), 130.4 (t, *J* = 3.0 Hz), 128.5, 126.4 (d, *J* = 1.5 Hz), 124.6 (t, *J* = 3.8 Hz), 122.5, 120.1, 120.0 (d, *J* = 1.5 Hz), 111.3, 108.5 (t, *J* = 3.0 Hz), 88.9 (t, *J* = 20.8 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.7 (d, *J* = 33.9 Hz), -89.6 (d, *J* = 33.9 Hz).

HRMS (ESI) *m/z* calcd for C₁₆H₉ClF₂N⁺ [M-H]⁺: 288.0397; Found: 288.0410.



(77) 3-(1-(4-Bromophenyl)-2,2-difluorovinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (284.4 mg, 0.6 mmol) derived from 1-(4-bromophenyl)-2,2,2-trifluoroethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **77** (84.0 mg, 84% yield) as a yellow oil.

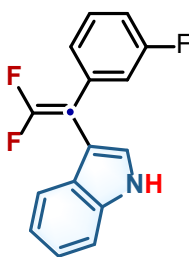
¹H NMR (500 MHz, CDCl₃) δ 8.24 (s, 1H), 7.44 (d, *J* = 8.5 Hz, 2H), 7.37 (d, *J* = 8.0 Hz, 1H), 7.24-7.18 (m, 4H), 7.08 (d, *J* = 8.0 Hz, 1H), 7.03 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 289.5, 292.5 Hz), 136.0, 133.3 (t, *J* = 4.5 Hz), 131.4, 130.7 (t, *J* = 3.8 Hz), 126.4 (d, *J* = 3.0 Hz), 124.6 (t, *J* = 3.8 Hz), 122.5, 121.3, 120.1, 120.0 (d, *J* = 3.0 Hz), 111.3, 108.4 (t, *J* = 3.0 Hz), 88.9 (dd, *J* = 21.0, 22.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.5 (d, *J* = 32.2 Hz), -89.5 (d, *J* = 32.2 Hz).

IR (Film): 3472, 3057, 2983, 1704, 1488, 1267, 906, 721, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₆H₉BrF₂N⁺ [M-H]⁺: 331.9892; Found: 331.9893.



(78) 3-(2,2-Difluoro-1-(3-fluorophenyl)vinyl)-1H-indole

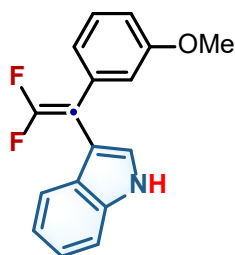
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (248.4 mg, 1 mmol) derived from 2,2,2-trifluoro-1-(3-fluorophenyl)ethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **78** (66.6 mg, 82% yield) as a pale yellow solid.

¹H NMR (500 MHz, CDCl₃) δ 8.24 (s, 1H), 7.38 (d, *J* = 8.0 Hz, 1H), 7.30-7.25 (m, 1H), 7.22-7.19 (m, 2H), 7.17-7.15 (m, 1H), 7.12-7.05 (m, 2H), 7.05-7.02 (m, 1H), 7.00-6.96 (m, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 162.6 (d, *J* = 251.3 Hz), 153.9 (dd, *J* = 290.0, 293.8 Hz), 136.5-136.3 (m), 136.0, 129.7 (d, *J* = 8.8 Hz), 126.5 (d, *J* = 2.5 Hz), 124.8 (q, *J* = 3.3 Hz), 124.6 (t, *J* = 3.8 Hz), 122.5, 120.2, 120.0 (d, *J* = 2.5 Hz), 116.2-116.0 (m), 114.3 (d, *J* = 21.2 Hz), 111.3, 108.4 (t, *J* = 3.2 Hz), 89.2-88.1 (m).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.1 (d, *J* = 31.2 Hz), -88.7 (d, *J* = 31.2 Hz), (-113.26)-(-113.30) (m).

HRMS (ESI) *m/z* calcd for C₁₆H₉F₃N⁺ [M-H]⁺: 272.0693; Found: 272.0695.



(79) 3-(2,2-Difluoro-1-(3-methoxyphenyl)vinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (255.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(3-methoxyphenyl)ethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **79** (76.8 mg, 90% yield) as a yellow oil.

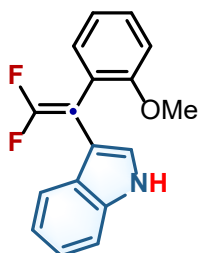
¹H NMR (500 MHz, CDCl₃) δ 8.14 (s, 1H), 7.31 (d, *J* = 8.5 Hz, 1H), 7.37 (d, *J* = 7.8 Hz, 1H), 7.18-7.12 (m, 3H), 7.01 (t, *J* = 7.8 Hz, 1H), 6.97-6.94 (m, 2H), 6.84-6.82 (m, 1H), 3.74 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 159.4, 153.7 (dd, *J* = 288.0, 291.0 Hz), 135.9, 135.7 (t, *J* = 3.8 Hz), 129.2, 126.5 (d, *J* = 3.0 Hz), 124.6 (t, *J* = 3.0 Hz), 122.3, 121.8 (t, *J* = 3.8 Hz), 120.1 (d, *J* = 1.5 Hz), 120.0, 115.0 (t, *J* = 3.8 Hz), 112.8, 111.2, 108.8 (t, *J* = 3.0 Hz), 89.6 (t, *J* = 20.3 Hz), 55.2.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.0 (d, *J* = 33.2 Hz), -89.6 (d, *J* = 33.2 Hz).

IR (Film): 3471, 3051, 2951, 1705, 1487, 1254, 904, 722, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂NO⁺ [M-H]⁺: 284.0892; Found: 284.0893.



(80) 3-(2,2-Difluoro-1-(2-methoxyphenyl)vinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (255.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(2-methoxyphenyl)ethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **80** (39.0 mg, 46% yield) as a yellow oil.

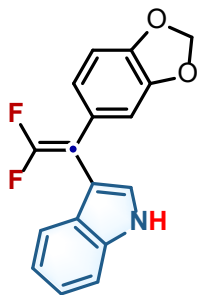
¹H NMR (600 MHz, CDCl₃) δ 8.16 (s, 1H), 7.35-7.33 (m, 2H), 7.26-7.23 (m, 1H), 7.20-7.18 (m, 1H), 7.16-7.14 (m, 1H), 7.10 (d, *J* = 8.4 Hz, 1H), 7.00-6.93 (m, 3H), 3.78 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 157.5, 152.9 (dd, *J* = 287.5, 291.3 Hz), 135.9, 131.7 (t, *J* = 1.9 Hz), 129.3, 126.3 (d, *J* = 2.5 Hz), 123.7 (t, *J* = 5.0 Hz), 123.2 (dd, *J* = 2.5, *J* = 3.8 Hz), 122.1, 120.6, 120.1 (d, *J* = 2.5 Hz), 119.8, 111.3, 111.1, 109.8 (t, *J* = 3.2 Hz), 85.4 (dd, *J* = 22.5, 25.0 Hz), 55.74.

¹⁹F NMR (564 MHz, CDCl₃) δ -87.7 (d, *J* = 33.8 Hz), -88.0 (d, *J* = 33.8 Hz).

IR (Film): 3473, 3059, 2983, 1718, 1493, 1265, 902, 721, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂NO⁺ [M-H]⁺: 284.0892; Found: 284.0893.



(81) 3-(1-(Benzo[d][1,3]dioxol-5-yl)-2,2-difluorovinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (264.0 mg, 1 mmol) derived from 1-(benzo[d][1,3]dioxol-5-yl)-2,2,2-trifluoroethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **81** (64.2 mg, 72% yield) as a light yellow oil.

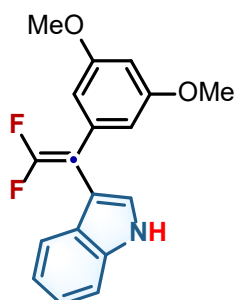
¹H NMR (500 MHz, CDCl₃) δ 8.18 (s, 1H), 7.36 (d, *J* = 8.0 Hz, 1H), 7.20-7.14 (m, 3H), 7.36 (t, *J* = 7.5 Hz, 1H), 6.86-6.83 (m, 2H), 6.76 (d, *J* = 8.0 Hz, 1H), 5.94 (s, 2H).

¹³C NMR (125 MHz, CDCl₃) δ 153.6 (dd, *J* = 288.8, 291.3 Hz), 147.6, 146.8, 136.0, 128.0 (t, *J* = 4.4 Hz), 126.5 (d, *J* = 3.8 Hz), 124.5 (t, *J* = 3.8 Hz), 122.9 (t, *J* = 3.8 Hz), 122.3, 120.2 (d, *J* = 1.3 Hz), 120.0, 111.2, 109.6 (t, *J* = 3.8 Hz), 109.2 (t, *J* = 3.2 Hz), 108.11, 101.1, 89.3 (t, *J* = 20.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -87.2 (d, *J* = 37.6 Hz), -90.7 (d, *J* = 37.6 Hz).

IR (Film): 3470, 3051, 2896, 1707, 1488, 1267, 1040, 906, 719, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₀F₂NO₂⁻ [M-H]⁻: 298.0685; Found: 298.0686.



(82) 3-(1-(3,5-Dimethoxyphenyl)-2,2-difluorovinyl)-1H-indole

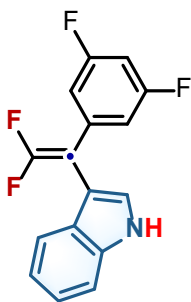
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (273.6 mg, 0.6 mmol) derived from ethyl 1-(3,5-dimethoxyphenyl)-2,2,2-trifluoroethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **82** (46.8 mg, 50% yield) as a light yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 8.19 (s, 1H), 7.32 (d, *J* = 8.5 Hz, 1H), 7.22-7.14 (m, 3H), 7.03 (t, *J* = 7.5 Hz, 1H), 6.55 (s, 2H), 6.42 (s, 1H), 3.71 (s, 6H).

¹³C NMR (150 MHz, CDCl₃) δ 160.5, 153.6 (dd, *J* = 288.0, 291.0 Hz), 136.4 (t, *J* = 3.8 Hz), 135.9, 126.5 (d, *J* = 3.0 Hz), 124.6 (t, *J* = 3.8 Hz), 122.3, 120.2 (d, *J* = 3.8 Hz), 120.0, 111.2, 108.8 (t, *J* = 3.0 Hz), 107.6 (t, *J* = 4.5 Hz), 99.6, 89.7 (t, *J* = 20.4 Hz), 55.3.

¹⁹F NMR (564 MHz, CDCl₃) δ -85.8 (d, *J* = 33.8 Hz), -88.9 (d, *J* = 33.8 Hz).

HRMS (ESI) *m/z* calcd for C₁₈H₁₆F₂NO₂⁺ [M+H]⁺: 316.1143; Found: 316.1143.



(83) 3-(1-(3,5-Difluorophenyl)-2,2-difluorovinyl)-1H-indole

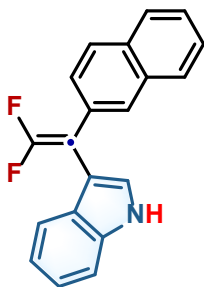
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (259.2 mg, 0.6 mmol) derived from ethyl 1-(3,5-difluorophenyl)-2,2,2-trifluoroethanone and indole (35.1 mg, 0.3 mmol) afforded **83** (42.0 mg, 48% yield) as a light yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 8.30 (s, 1H), 7.42 (d, *J* = 8.0 Hz, 1H), 7.25-7.21 (m, 2H), 7.14 (d, *J* = 8.0 Hz, 1H), 7.08-7.05 (m, 1H), 6.92-6.90 (m, 2H), 6.76-6.71 (m, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 162.8 (dd, *J* = 13.8, 246.3 Hz), 154.1 (dd, *J* = 290.0, 295.0 Hz), 137.9-137.6 (m), 136.0, 126.4 (d, *J* = 25.0 Hz), 124.8 (t, *J* = 3.2 Hz), 122.7, 120.4, 119.8, 112.1-111.8 (m), 111.4, 107.8 (t, *J* = 3.5 Hz), 102.9 (t, *J* = 25.0 Hz), 88.7 (t, *J* = 20.5 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -83.5 (d, *J* = 28.2 Hz), -87.0 (d, *J* = 28.2 Hz), -110.1 (t, *J* = 9.4 Hz).

HRMS (ESI) *m/z* calcd for C₁₆H₈F₄N⁺ [M-H]⁺: 290.0598; Found: 290.0600.



(84) 3-(2,2-Difluoro-1-(naphthalen-2-yl)vinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (267.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(naphthalen-2-yl) ethan-1-one and indole (35.1 mg, 0.3 mmol) afforded **84** (73.8 mg, 81% yield) as a yellow solid (mp: 97-99 °C).

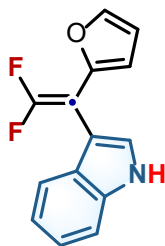
¹H NMR (600 MHz, CDCl₃) δ 8.00 (s, 1H), 7.83 (s, 1H), 7.79-7.77 (m, 1H), 7.74 (d, *J* = 9.0 Hz, 1H), 7.71-7.69 (m, 1H), 7.45-7.40 (m, 3H), 7.28 (d, *J* = 7.8 Hz, 1H), 7.16-7.09 (m, 3H), 6.97-6.94 (m, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.9 (dd, *J* = 289.5, 292.5 Hz), 135.9, 133.2, 132.5, 131.8 (t, *J* = 3.8 Hz), 128.3 (t, *J* = 3.8 Hz), 128.0, 127.8, 127.6, 127.0 (t, *J* = 3.8 Hz), 126.6 (d, *J* = 3.0 Hz), 126.15, 126.11, 124.8 (t, *J* = 3.8 Hz), 122.3, 120.2 (d, *J* = 2.2 Hz), 120.0, 111.3, 109.0 (t, *J* = 3.0 Hz), 89.8 (t, *J* = 20.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.8 (d, *J* = 33.8 Hz), -90.1 (d, *J* = 33.8 Hz).

IR (Film): 3467, 3418, 3060, 2961, 1704, 1416, 1235, 902, 734, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₂₀H₁₂F₂N⁺ [M-H]⁺: 304.0943; Found: 304.0942.



(85) 3-(2,2-Difluoro-1-(furan-2-yl)vinyl)-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (229.8 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(furan-2-yl)ethanone and indole (35.1 mg, 0.3 mmol) afforded **85** (63.6 mg, 87% yield) as a yellow solid.

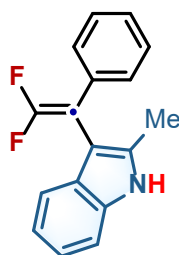
¹H NMR (500 MHz, CDCl₃) δ 8.16 (s, 1H), 7.40 (d, *J* = 1.5 Hz, 1H), 7.36 (d, *J* = 8.0 Hz, 1H), 7.30 (d, *J* = 8.0 Hz, 1H), 7.24-7.20 (m, 2H), 7.12-7.09 (m, 1H), 6.41 (dd, *J* = 1.5 Hz, *J* = 3.0 Hz, 1H), 6.31 (d, *J* = 3.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 153.8 (dd, *J* = 288.3, 297.9 Hz), 147.6 (dd, *J* = 5.0, 7.5 Hz), 142.1 (t, *J* = 3.2 Hz), 135.8, 126.6 (d, *J* = 2.5 Hz), 124.6 (t, *J* = 3.2 Hz), 122.4, 120.2, 119.8 (d, *J* = 1.3 Hz), 111.3, 111.2, 109.5 (t, *J* = 5.6 Hz), 105.9 (t, *J* = 3.2 Hz), 82.6 (dd, *J* = 20.0, 27.5 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -83.9 (d, *J* = 23.5 Hz), -86.6 (d, *J* = 23.5 Hz).

IR (Film): 3469, 3057, 2985, 1708, 1457, 1263, 906, 721, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₄H₈F₂NO⁺ [M-H]⁺: 244.0579; Found: 244.0579.



(86) 3-(2,2-Difluoro-1-phenylvinyl)-2-methyl-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 2-methyl-1H-indole (39.4 mg, 0.3 mmol) afforded **86** (43.2 mg, 54% yield) as an orange oil.

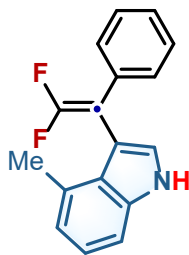
¹H NMR (600 MHz, CDCl₃) δ 7.91 (s, 1H), 7.34 (d, *J* = 7.8 Hz, 2H), 7.30-7.27 (m, 3H), 7.24-7.21 (m, 1H), 7.13-7.10 (m, 2H), 6.99 (t, *J* = 7.6 Hz, 1H), 2.26 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 286.5, 295.5 Hz), 135.3, 134.3 (dd, *J* = 3.8, 5.3 Hz), 134.0 (dd, *J* = 1.0, 3.0 Hz), 128.6 (dd, *J* = 3.0, 4.5 Hz), 128.3, 128.2 (d, *J* = 3.0 Hz), 127.0, 121.4, 119.8, 119.0, 110.3, 105.4 (dd, *J* = 2.0, 4.5 Hz), 88.6 (dd, *J* = 18.0, 21.0 Hz), 12.3 (d, *J* = 1.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -84.4 (d, *J* = 31.0 Hz), -89.0 (d, *J* = 31.0 Hz).

IR (Film): 3458, 3063, 2926, 1704, 1459, 1265, 1232, 906, 726, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂N⁺ [M-H]⁺: 268.0943; Found: 268.0946.



(87) 3-(2,2-Difluoro-1-phenylvinyl)-4-methyl-1*H*-indole

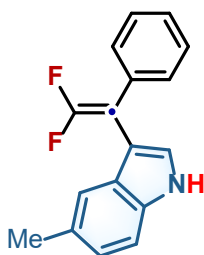
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 4-methyl-1*H*-indole (39.4 mg, 0.3 mmol) afforded **87** (53.4 mg, 66% yield) as a orange oil.

¹H NMR (500 MHz, CDCl₃) δ 8.23 (s, 1H), 7.34 (d, *J* = 8.5 Hz, 2H), 7.30-7.25 (m, 3H), 7.22-7.17 (m, 2H), 7.11 (t, *J* = 7.5 Hz, 1H), 6.83 (d, *J* = 7.0 Hz, 1H), 2.29 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 154.0 (dd, *J* = 283.5, 297.0 Hz), 136.4, 135.6 (dd, *J* = 1.5, 4.5 Hz), 131.0, 128.3, 128.2 (dd, *J* = 4.5, 6.0 Hz), 126.9, 125.9 (d, *J* = 1.5 Hz), 124.6 (dd, *J* = 2.0, 4.0 Hz), 122.6, 121.5, 109.1, 108.6 (d, *J* = 6.0 Hz), 89.9 (dd, *J* = 16.5, 21.0 Hz), 19.1.

¹⁹F NMR (564 MHz, CDCl₃) δ -82.8 (d, *J* = 30.0 Hz), -86.6 (d, *J* = 30.0 Hz).

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂N⁺ [M-H]⁺: 268.0943; Found: 268.0945.



(88) 3-(2,2-Difluoro-1-phenylvinyl)-5-methyl-1*H*-indole

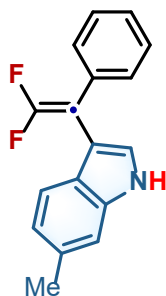
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-methyl-1*H*-indole (39.4 mg, 0.3 mmol) afforded **88** (68.4 mg, 85% yield) as a orange oil.

¹H NMR (500 MHz, CDCl₃) δ 7.92 (s, 1H), 7.36 (d, *J* = 8.0 Hz, 2H), 7.31-7.24 (m, 3H), 7.19 (d, *J* = 8.5 Hz, 1H), 7.04-6.99 (m, 2H), 6.93 (s, 1H), 2.32 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 153.7 (dd, *J* = 287.5, 291.3 Hz), 134.5 (t, *J* = 3.8 Hz), 134.2, 129.3, 129.1 (t, *J* = 3.8 Hz), 128.2, 127.3, 126.8 (d, *J* = 3.0 Hz), 124.8 (t, *J* = 3.2 Hz), 123.9, 119.7 (d, *J* = 2.5 Hz), 110.9, 108.5 (t, *J* = 3.2 Hz), 89.5 (t, *J* = 20.0 Hz), 21.4.

¹⁹F NMR (470 MHz, CDCl₃) δ -86.0 (d, *J* = 34.0 Hz), -90.2 (d, *J* = 34.0 Hz).

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂N⁺ [M-H]⁺: 268.0943; Found: 268.0946.



(89) 3-(2,2-Difluoro-1-phenylvinyl)-6-methyl-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 6-methyl-1H-indole (39.4 mg, 0.3 mmol) afforded **89** (66.6 mg, 83% yield) as a orange oil.

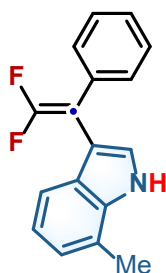
¹H NMR (600 MHz, CDCl₃) δ 7.97 (s, 1H), 7.36 (d, *J* = 8.4 Hz, 2H), 7.31 (t, *J* = 7.5 Hz, 2H), 7.28-7.25 (m, 1H), 7.12 (s, 1H), 7.07 (d, *J* = 1.8 Hz, 1H), 6.96 (d, *J* = 7.8 Hz, 1H), 6.84 (d, *J* = 7.8 Hz, 1H), 2.42 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.6 (dd, *J* = 289.5, 292.5 Hz), 136.4, 134.4 (t, *J* = 3.8 Hz), 132.2, 129.2 (t, *J* = 3.0 Hz), 128.2, 127.3, 124.4 (d, *J* = 3.0 Hz), 124.0 (t, *J* = 3.8 Hz), 121.8, 119.8 (d, *J* = 4.5 Hz), 111.1, 108.9 (t, *J* = 3.0 Hz), 89.7 (t, *J* = 20.3 Hz), 21.6.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.6 (d, *J* = 35.0 Hz), -90.6 (d, *J* = 35.0 Hz).

IR (Film): 3473, 3057, 2922, 1706, 1446, 1267, 902, 722, 648 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂N⁺ [M-H]⁺: 268.0943; Found: 268.0946.



(90) 3-(2,2-Difluoro-1-phenylvinyl)-7-methyl-1H-indole

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 7-methyl-1H-indole (39.4 mg, 0.3 mmol) afforded **90** (77.5 mg, 76% yield) as a orange oil.

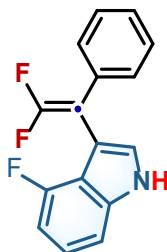
¹H NMR (600 MHz, CDCl₃) δ 8.14 (s, 1H), 7.38-7.36 (m, 2H), 7.33-7.30 (m, 2H), 7.29-7.26 (m, 1H), 7.21 (d, *J* = 1.8 Hz, 1H), 7.00-6.98 (m, 1H), 6.96-6.93 (m, 2H), 2.49 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 288.0, 291.0 Hz), 135.6, 134.4 (t, *J* = 4.5 Hz), 129.2 (t, *J* = 3.0 Hz), 128.2, 127.3, 126.2 (d, *J* = 3.0 Hz), 124.3 (t, *J* = 3.8 Hz), 122.9, 120.3, 120.2, 117.9 (d, *J* = 2.0 Hz), 109.6 (t, *J* = 3.8 Hz), 89.7 (t, *J* = 20.3 Hz), 16.5.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.5 (d, *J* = 33.8 Hz), -90.4 (d, *J* = 33.8 Hz).

IR (Film): 3479, 3055, 2987, 1706, 1267, 904, 722, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₂F₂N⁺ [M-H]⁺: 268.0943; Found: 268.0946.



(91) 3-(2,2-Difluoro-1-phenylvinyl)-4-fluoro-1H-indole

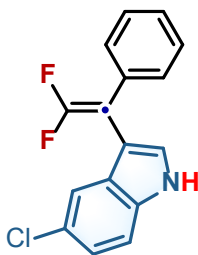
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 4-fluoro-1*H*-indole (40.5 mg, 0.3 mmol) afforded **91** (54.6 mg, 63% yield) as a orange oil.

¹H NMR (600 MHz, CDCl₃) δ 8.22 (s, 1H), 7.35 (d, *J* = 8.4 Hz, 2H), 7.29 (t, *J* = 7.6 Hz, 2H), 7.23 (t, *J* = 7.6 Hz, 1H), 7.14 (d, *J* = 7.8 Hz, 1H), 7.11-7.07 (m, 2H), 6.71 (dd, *J* = 7.8 Hz, *J* = 10.8 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 156.5 (d, *J* = 247.5 Hz), 154.0 (dd, *J* = 288.0, 294.0 Hz), 138.6 (d, *J* = 10.5 Hz), 135.1 (dd, *J* = 2.5, 5.0 Hz), 128.5 (t, *J* = 3.8 Hz), 128.1, 127.0, 124.7, 123.1 (d, *J* = 8.0 Hz), 115.9 (dd, *J* = 3.0, 19.5 Hz), 107.3 (d, *J* = 4.0 Hz), 107.2 (dt, *J* = 2.0, 5.0 Hz), 105.6 (d, *J* = 19.0 Hz), 89.1 (t, *J* = 20.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.3 (dd, *J* = 31.0, 7.0 Hz), -89.6 (d, *J* = 31.0 Hz), (-122.30)-(-122.34) (m).

HRMS (ESI) *m/z* calcd for C₁₆H₉F₃N⁺ [M-H]⁺: 272.0693; Found: 272.0695.



(92) 5-Chloro-3-(2,2-difluoro-1-phenylvinyl)-1H-indole

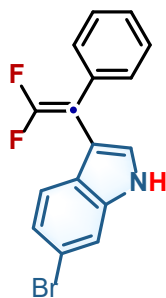
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-chloro-1*H*-indole (45.3 mg, 0.3 mmol) afforded **92** (79.2 mg, 92% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 8.23 (s, 1H), 7.35-7.28 (m, 6H), 7.21 (d, *J* = 2.5 Hz, 1H), 7.13 (dd, *J* = 2.0 Hz, *J* = 8.5 Hz, 1H), 7.08 (s, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 289.5, 292.5 Hz), 134.4, 133.9 (t, *J* = 3.8 Hz), 129.1 (t, *J* = 3.8 Hz), 128.4, 127.7 (d, *J* = 3.0 Hz), 127.6, 125.9 (t, *J* = 3.5 Hz), 125.8, 122.8, 119.6 (d, *J* = 3.0 Hz), 112.2, 109.1 (t, *J* = 3.8 Hz), 89.2 (t, *J* = 20.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.8 (d, *J* = 32.5 Hz), -89.7 (d, *J* = 32.5 Hz). ¹

HRMS (ESI) *m/z* calcd for C₁₆H₉ClF₂N⁺ [M-H]⁺: 288.0397; Found: 288.0397.



(93) 6-Bromo-3-(2,2-difluoro-1-phenylvinyl)-1H-indole

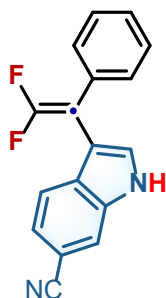
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 6-bromo-1*H*-indole (58.2 mg, 0.3 mmol) afforded **93** (93.0 mg, 93% yield) as a orange oil.

¹H NMR (600 MHz, CDCl₃) δ 8.20 (s, 1H), 7.52 (d, *J* = 1.8 Hz, 1H), 7.35-7.28 (m, 5H), 7.20-7.18 (m, 1H), 7.10 (dd, *J* = 1.8 Hz, *J* = 8.4 Hz, 1H), 6.91 (d, *J* = 8.4 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 289.5, 292.5 Hz), 136.8, 133.9 (t, *J* = 4.0 Hz), 129.1 (t, *J* = 3.8 Hz), 128.3, 127.5, 125.5 (d, *J* = 3.0 Hz), 125.1 (t, *J* = 4.5 Hz), 123.4, 121.5 (d, *J* = 3.0 Hz), 116.0, 114.1, 109.4 (t, *J* = 3.0 Hz), 89.2 (t, *J* = 20.3 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -86.2 (d, *J* = 33.8 Hz), -89.9 (d, *J* = 33.8 Hz).

HRMS (ESI) *m/z* calcd for C₁₆H₉BrF₂N⁺ [M-H]⁺: 331.9891; Found: 331.9891.



(94) 3-(2,2-Difluoro-1-phenylvinyl)-1H-indole-6-carbonitrile

Prepared according to **General Procedure H** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 6-carbonitrile -1*H*-indole (42.6 mg, 0.3 mmol) afforded **94** (46.2 mg, 55% yield) as a orange oil.

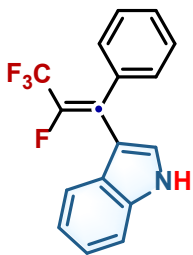
¹H NMR (500 MHz, CDCl₃) δ 8.77 (s, 1H), 7.76 (s, 1H), 7.46 (dd, *J* = 1.0, 2.5 Hz, 1H), 7.37-7.30 (m, 5H), 7.23 (dd, *J* = 1.5, 8.5 Hz, 1H), 7.12 (d, *J* = 8.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.8 (dd, *J* = 289.5, 292.5 Hz), 134.9, 133.6 (d, *J* = 3.8 Hz), 129.7 (d, *J* = 3.0 Hz), 129.0 (t, *J* = 3.0 Hz), 128.5, 128.3 (t, *J* = 3.8 Hz), 127.7, 122.8, 121.1, 120.4, 116.2, 110.0, 104.7, 88.9 (t, *J* = 21.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.7 (d, *J* = 31.5 Hz), -89.2 (d, *J* = 31.5 Hz).

IR (Film): 3469, 3057, 2987, 1708, 1458, 1265, 904, 726, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₉F₂N₂⁺ [M-H]⁺: 279.0745; Found: 279.0747.



(95) (E)-3-(2,3,3,3-Tetrafluoro-1-phenylprop-1-en-1-yl)-1H-indole

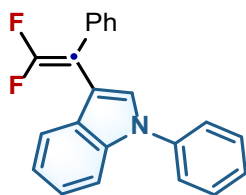
Prepared according to **General Procedure H** using *N*-triftoylhydrazone (267.6 mg, 0.6 mmol) derived from 2,2,3,3,3-pentafluoro-1-phenylpropan-1-one and indole (35.1 mg, 0.3 mmol) afforded **95** (71.4 mg, 78% yield) as a white solid. (mp:88-89 °C).

¹H NMR (500 MHz, CDCl₃) δ 8.25 (s, 1H), 7.42-7.36 (m, 3H), 7.33-7.27 (m, 4H), 7.16 (t, *J* = 7.5 Hz, 1H), 6.97 (t, *J* = 7.5 Hz, 1H), 6.78 (d, *J* = 8.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 139.9 (dq, *J* = 256.3, 37.5 Hz), 135.9, 134.4 (d, *J* = 6.3 Hz), 129.7, 129.5 (d, *J* = 5.0 Hz), 128.7, 128.2, 127.5 (d, *J* = 10.0 Hz), 125.8, 123.4 (dq, *J* = 10.0, 2.0 Hz), 122.6, 120.9 (d, *J* = 5.0 Hz), 120.6, 120.1 (dq, *J* = 272.0, 41.5 Hz), 111.3.

¹⁹F NMR (470 MHz, CDCl₃) δ -63.0 (d, *J* = 10.5 Hz), -127.9 (q, *J* = 0.5 Hz).

HRMS (ESI) *m/z* calcd for C₁₇H₁₀F₄N⁺ [M-H]⁺: 304.0755; Found: 304.0756.



(96) 3-(2,2-Difluoro-1-phenylvinyl)-1-phenyl-1H-indole

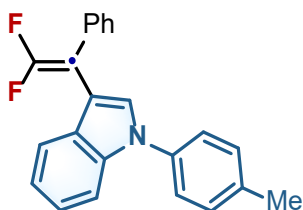
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-phenyl-1H-indole (58.2 mg, 0.3 mmol) afforded **96** (70.8 mg, 71% yield) as a light yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 7.55 (d, *J* = 8.5 Hz, 1H), 7.53-7.48 (m, 4H), 7.43 (d, *J* = 8.5 Hz, 2H), 7.37-7.27 (m, 5H), 7.21-7.18 (m, 1H), 7.14 (d, *J* = 8.0 Hz, 1H), 7.05 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 153.7 (dd, *J* = 290.0, 292.5 Hz), 139.3, 136.1, 134.2 (t, *J* = 4.4 Hz), 129.6, 129.2 (t, *J* = 3.2 Hz), 128.3, 128.2 (t, *J* = 3.8 Hz), 127.9 (d, *J* = 2.5 Hz), 127.4, 126.7, 124.4, 122.7, 120.6 (d, *J* = 2.0 Hz), 120.5, 110.7, 110.0 (t, *J* = 3.8 Hz), 89.4 (t, *J* = 20.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -85.9 (d, *J* = 32.9 Hz), -89.9 (d, *J* = 32.9 Hz).

HRMS (ESI) *m/z* calcd for C₂₂H₁₆F₂N⁺ [M+H]⁺: 332.1245; Found: 332.1247.



(97) 3-(2,2-Difluoro-1-phenylvinyl)-1-(p-tolyl)-1H-indole

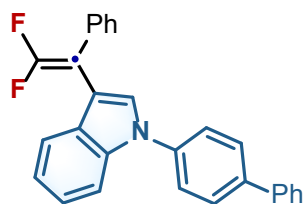
Prepared according to **General Procedure I** *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(3-chlorophenyl)-1*H*-indole (68.4 mg, 0.3 mmol) afforded **97** (93.0 mg, 90% yield) as a light yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 7.52 (d, *J* = 8.5 Hz, 1H), 7.43 (d, *J* = 7.5 Hz, 2H), 7.39-7.28 (m, 8H), 7.21-7.16 (m, 1H), 7.12 (d, *J* = 8.0 Hz, 1H), 7.04 (t, *J* = 7.5 Hz, 1H), 2.42 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 289.5, 291.0 Hz), 136.73, 136.66, 136.2, 134.2 (t, *J* = 4.5 Hz), 130.2, 129.3 (t, *J* = 3.0 Hz), 128.30, 128.27, 127.7 (d, *J* = 3.0 Hz), 127.4, 124.3, 122.5, 120.5 (d, *J* = 3.0 Hz), 120.3, 110.7, 109.6 (t, *J* = 3.8 Hz), 89.5 (t, *J* = 20.5 Hz), 21.0.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.0 (d, *J* = 33.8 Hz), -90.1 (d, *J* = 33.8 Hz).

HRMS (ESI) *m/z* calcd for C₂₃H₁₈F₂N⁺ [M+H]⁺: 346.1402; Found: 346.1403.



(98) 1-([1,1'-Biphenyl]-4-yl)-3-(2,2-difluoro-1-phenylvinyl)-1*H*-indole

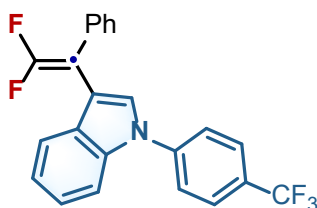
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-([1,1'-biphenyl]-4-yl)-1*H*-indole (80.4 mg, 0.3 mmol) afforded **98** (103.8 mg, 85% yield) as a light yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 7.73 (d, *J* = 8.5 Hz, 2H), 7.65-7.58 (m, 5H), 7.50-7.29 (m, 9H), 7.25-7.22 (m, 1H), 7.15 (d, *J* = 8.0 Hz, 1H), 7.07 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.8 (dd, *J* = 288.0, 291.0 Hz), 140.1, 139.7, 138.5, 136.1, 134.2 (t, *J* = 3.8 Hz), 129.3 (t, *J* = 3.8 Hz), 128.9, 128.34, 128.30, 128.1, (t, *J* = 4.5 Hz), 128.0 (d, *J* = 2.5 Hz), 127.6, 127.5, 127.1, 124.6, 122.7, 120.62 (d, *J* = 3.0 Hz), 120.59, 110.7, 110.1 (t, *J* = 3.0 Hz), 89.4 (t, *J* = 20.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.8 (d, *J* = 33.8 Hz), -89.9 (d, *J* = 33.8 Hz).

HRMS (ESI) *m/z* calcd for C₂₈H₂₁F₂N⁺ [M+H]⁺: 408.1558; Found: 408.1560.



(99) 3-(2,2-Difluoro-1-phenylvinyl)-1-(4-(trifluoromethyl)phenyl)-1*H*-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(4-(trifluoromethyl)phenyl)-1*H*-indole (78.6 mg, 0.3 mmol) afforded **99** (61.2 mg, 51% yield) as a light yellow oil.

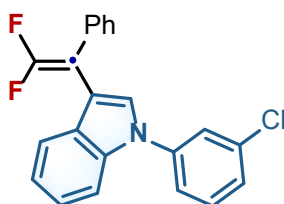
¹H NMR (500 MHz, CDCl₃) δ 7.79 (d, *J* = 8.5 Hz, 2H), 7.65 (d, *J* = 8.5 Hz, 2H), 7.59 (d, *J* = 8.5 Hz, 1H), 7.43-7.30 (m, 6H), 7.27-7.24 (m, 1H), 7.15 (d, *J* = 7.5 Hz, 1H), 7.09 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 153.8 (dd, *J* = 288.8, 292.5 Hz), 142.3, 135.7, 133.9 (t, *J* = 3.8 Hz), 129.2 (t, *J* = 3.2 Hz), 128.4, 128.3 (t, *J* = 1.9 Hz), 127.6, 127.5 (t, *J* = 4.0 Hz), 127.0 (q, *J* = 3.8 Hz), 124.1, 123.9 (q, *J* = 272.0 Hz), 123.3, 121.1, 120.9 (t, *J* = 2.5 Hz), 111.3 (t, *J* = 3.2 Hz), 110.5, 89.1 (t, *J*

= 20.6 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -62.3, -85.4 (d, *J* = 32.9 Hz), -89.3 (d, *J* = 32.9 Hz).

HRMS (ESI) *m/z* calcd for C₂₃H₁₅F₅N⁺ [M+H]⁺: 400.1119; Found: 400.1120.



(100) 1-(3-Chlorophenyl)-3-(2,2-difluoro-1-phenylvinyl)-1*H*-indole

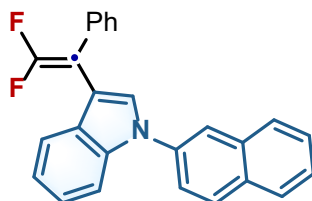
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(3-chlorophenyl)-1*H*-indole (68.4 mg, 0.3 mmol) afforded **100** (76.8 mg, 70% yield) as a light yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 7.56-7.52 (m, 2H), 7.44-7.39 (m, 4H), 7.36-7.28 (m, 5H), 7.25-7.21 (m, 1H), 7.13 (d, *J* = 8.0 Hz, 1H), 7.06 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 153.8 (dd, *J* = 288.9, 292.5 Hz), 140.4, 135.8, 135.3, 134.0 (t, *J* = 3.8 Hz), 130.7, 129.2 (t, *J* = 3.8 Hz), 128.4, 128.1 (d, *J* = 3.0 Hz), 127.7 (t, *J* = 3.8 Hz), 127.5, 126.8, 124.4, 123.0, 122.4, 120.9, 120.7 (d, *J* = 3.0 Hz), 110.7 (t, *J* = 4.5 Hz), 110.5, 89.2 (t, *J* = 21.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -85.5 (d, *J* = 32.9 Hz), -89.5 (d, *J* = 32.9 Hz).

HRMS (ESI) *m/z* calcd for C₂₂H₁₆ClF₂N⁺ [M+H]⁺: 366.0856; Found: 366.0858.



(101) 3-(2,2-Difluoro-1-phenylvinyl)-1-(naphthalen-2-yl)-1*H*-indole

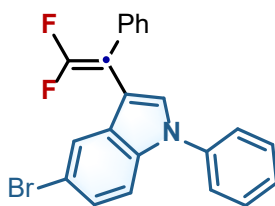
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(naphthalen-2-yl)-1*H*-indole (73.2 mg, 0.3 mmol) afforded **101** (93.6 mg, 82% yield) as a white solid (mp: 171-173 °C).

¹H NMR (600 MHz, CDCl₃) δ 7.97 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 1.8 Hz, 1H), 7.90 (d, *J* = 7.8 Hz, 1H), 7.86 (d, *J* = 7.8 Hz, 1H), 7.66-7.62 (m, 2H), 7.56-7.50 (m, 2H), 7.47-7.44 (m, 3H), 7.36 (t, *J* = 7.8 Hz, 2H), 7.31 (t, *J* = 7.2 Hz, 1H), 7.23 (t, *J* = 7.2 Hz, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 7.08 (t, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.8 (dd, *J* = 289.5, 292.5 Hz), 136.7, 136.2, 134.2 (t, *J* = 3.8 Hz), 133.8, 131.9, 129.7, 129.3 (t, *J* = 3.8 Hz), 128.4, 128.3, 128.0 (d, *J* = 2.5 Hz), 127.9, 127.7, 127.5, 127.0, 126.2, 123.1, 122.8, 122.1, 120.6, 110.7, 110.2 (t, *J* = 3.0 Hz), 89.4 (t, *J* = 20.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.7 (d, *J* = 32.8 Hz), -89.8 (d, *J* = 32.8 Hz).

HRMS (ESI) *m/z* calcd for C₂₆H₁₉F₂N⁺ [M+H]⁺: 382.1402; Found: 382.1403.



(102) 5-Bromo-3-(2,2-difluoro-1-phenylvinyl)-1-phenyl-1H-indole

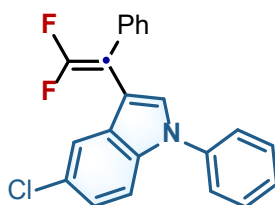
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-bromo-1-phenyl-1*H*-indole (81.6 mg, 0.3 mmol) afforded **102** (98.4 mg, 80% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.54-7.50 (m, 2H), 7.48-7.45 (m, 2H), 7.41-7.27 (m, 10H).

¹³C NMR (125 MHz, CDCl₃) δ 153.7 (dd, *J* = 291.0, 294.0 Hz), 138.8, 134.8, 133.7 (t, *J* = 4.0 Hz), 129.8, 129.5 (d, *J* = 2.5 Hz), 129.2 (t, *J* = 3.8 Hz), 129.1 (t, *J* = 3.8 Hz), 128.5, 127.7, 127.2, 125.6, 124.4, 123.0 (d, *J* = 2.5 Hz), 113.8, 112.2, 109.6 (t, *J* = 3.8 Hz), 89.9 (d, *J* = 20.0 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -85.1 (d, *J* = 32.0 Hz), -89.1 (d, *J* = 32.0 Hz).

HRMS (ESI) *m/z* calcd for C₂₂H₁₃BrF₂N⁺ [M-H]⁺: 408.0205; Found: 408.0207.



(103) 5-Chloro-3-(2,2-difluoro-1-phenylvinyl)-1-phenyl-1H-indole

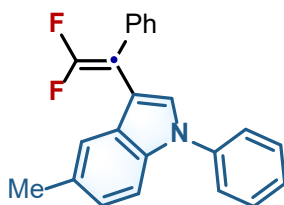
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-chloro-1-phenyl-1*H*-indole (68.4 mg, 0.3 mmol) afforded **103** (82.2 mg, 75% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.54-7.50 (m, 2H), 7.48-7.44 (m, 3H), 7.41-7.30 (m, 7H), 7.15 (dd, *J* = 2.0 Hz, *J* = 8.5 Hz, 1H), 7.11 (s, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 288.0, 292.5 Hz), 138.9, 134.5, 133.7 (t, *J* = 4.5 Hz), 129.8, 129.4 (t, *J* = 3.8 Hz), 129.1 (t, *J* = 3.8 Hz), 128.9 (d, *J* = 3.0 Hz), 128.4, 127.7, 127.1, 126.3, 124.4, 123.0, 119.9 (d, *J* = 3.0 Hz), 111.8, 109.6 (t, *J* = 3.8 Hz), 89.0 (t, *J* = 20.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -85.3 (d, *J* = 32.0 Hz), -89.3 (d, *J* = 32.0 Hz).

HRMS (ESI) *m/z* calcd for C₂₂H₁₃ClF₂N⁺ [M-H]⁺: 364.0710; Found: 364.0712.



(104) 3-(2,2-Difluoro-1-phenylvinyl)-5-methyl-1-phenyl-1H-indole

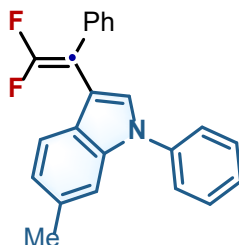
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-methyl-1-phenyl-1*H*-indole (62.4 mg, 0.3 mmol) afforded **104** (94.2 mg, 91% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.45-7.41 (m, 7H), 7.33-7.25 (m, 5H), 7.03-7.01 (m, 1H), 6.98 (s, 1H), 2.34 (s, 3H).

^{13}C NMR (150 MHz, CDCl_3) δ 153.7 (dd, $J = 289.5, 292.5$ Hz), 139.4, 134.4, 134.3 (t, $J = 3.8$ Hz), 129.9, 129.6, 129.2 (t, $J = 3.8$ Hz), 128.3, 128.22 (t, $J = 1.5$ Hz), 128.16, (t, $J = 3.8$ Hz), 127.4, 126.5, 124.3, 124.1, 120.1 (d, $J = 2.0$ Hz), 110.4, 109.6 (t, $J = 3.0$ Hz), 89.4 (t, $J = 20.5$ Hz), 21.4.

^{19}F NMR (564 MHz, CDCl_3) δ -85.4 (d, $J = 33.8$ Hz), -89.7 (d, $J = 33.8$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{23}\text{H}_{18}\text{F}_2\text{N}^+$ $[\text{M}+\text{H}]^+$: 346.1401; Found: 346.1402.



(105) 3-(2,2-Difluoro-1-phenylvinyl)-6-methyl-1-phenyl-1H-indole

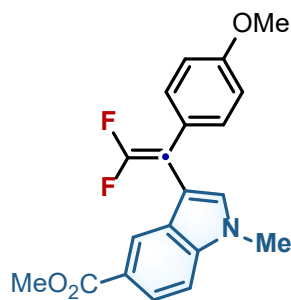
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 6-methyl-1-phenyl-1*H*-indole (62.4 mg, 0.3 mmol) afforded **105** (87.0 mg, 87% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 7.53-7.49 (m, 4H), 7.42 (d, $J = 8.0$ Hz, 2H), 7.38-7.33 (m, 4H), 7.32-7.27 (m, 2H), 7.00 (d, $J = 8.5$ Hz, 1H), 6.89 (d, $J = 8.5$ Hz, 1H), 2.42 (s, 3H).

^{13}C NMR (150 MHz, CDCl_3) δ 153.7 (dd, $J = 289.5, 292.5$ Hz), 139.4, 136.4, 134.2 (t, $J = 3.8$ Hz), 132.6, 129.6, 129.3 (t, $J = 3.0$ Hz), 128.3, 127.6 (t, $J = 3.8$ Hz), 127.4, 126.6, 125.7 (d, $J = 3.0$ Hz), 124.5, 122.3, 120.2 (d, $J = 1.5$ Hz), 110.5, 109.8, (t, $J = 3.5$ Hz), 89.5 (t, $J = 20.5$ Hz), 21.8.

^{19}F NMR (564 MHz, CDCl_3) δ -86.0 (d, $J = 33.8$ Hz), -90.1 (d, $J = 33.8$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{23}\text{H}_{18}\text{F}_2\text{N}^+$ $[\text{M}+\text{H}]^+$: 346.1401; Found: 346.1402.



(106) methyl 3-(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-1-methyl-1H-indole-5-carboxylate

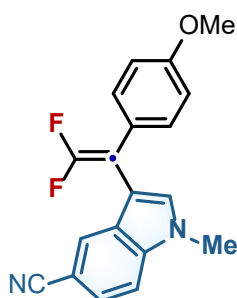
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (255.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and methyl 1-methyl-1*H*-indole-5-carboxylate (56.7 mg, 0.3 mmol) afforded **106** (71.8 mg, 67% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 7.97 (s, 1H), 7.93 (dd, $J = 8.5, 1.0$ Hz, 1H), 7.34 (d, $J = 8.5$ Hz, 1H), 7.28 (d, $J = 8.0$ Hz, 2H), 7.08 (s, 1H), 6.87 (d, $J = 8.5$ Hz, 2H), 3.87 (s, 3H), 3.83 (s, 3H), 3.82 (s, 3H).

^{13}C NMR (125 MHz, CDCl_3) δ 168.0, 158.9, 153.41 (dd, $J = 290.0, 287.5$ Hz), 139.2, 130.4 (t, $J = 2.5$ Hz), 130.2 (t, $J = 2.5$ Hz), 126.7 (d, $J = 1.3$ Hz), 126.5 (t, $J = 2.5$ Hz), 123.3, 123.2 (d, $J = 2.5$ Hz), 121.7, 113.8, 109.7 (t, $J = 2.5$ Hz), 109.1, 88.4 (t, $J = 21.3$ Hz), 58.5, 55.3, 33.1.

^{19}F NMR (470 MHz, CDCl_3) δ -86.70 (d, $J = 32.9$ Hz), -90.55 (d, $J = 32.9$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{20}\text{H}_{18}\text{F}_2\text{NO}_3^+$ $[\text{M} + \text{H}]^+$: 358.1249; Found: 358.1247.



(107) 3-(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-1-methyl-1H-indole-5-carbonitrile

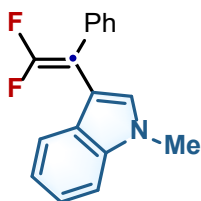
Prepared according to **General Procedure I** using *N*-trifosylhydrazone (255.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 1-methyl-1*H*-indole-5-carbonitrile (46.8 mg, 0.3 mmol) afforded **107** (51.5 mg, 53% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.45-7.39 (m, 2H), 7.37 (d, *J* = 8.5 Hz, 1H), 7.26-7.22 (m, 2H), 7.21 (s, 1H), 6.91-6.86 (m, 2H), 3.85 (s, 3H), 3.84 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 159.1, 153.52 (dd, *J* = 289.5,), 138.3, 131.1 (t, *J* = 3.0 Hz), 130.2 (t, *J* = 3.0 Hz), 126.8 (d, *J* = 3.0 Hz), 126.0 (d, *J* = 1.5 Hz), 125.6 (t, *J* = 4.5 Hz), 124.8, 120.6, 114.0, 110.3, 109.1 (t, *J* = 3.0 Hz), 102.7, 88.3 (t, *J* = 21.0 Hz), 55.2, 33.1.

¹⁹F NMR (564 MHz, CDCl₃) δ -87.4 (d, *J* = 33.8 Hz), -90.6 (d, *J* = 33.8 Hz).

HRMS (ESI) *m/z* calcd for C₁₉H₁₅F₂N₂O⁺ [*M* + *H*]⁺: 325.1147; Found: 325.1145.



(108) 3-(2,2-Difluoro-1-phenylvinyl)-1-methyl-1H-indole

Prepared according to **General Procedure I** using *N*-trifosylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **108** (79.2 mg, 98% yield) as an orange oil.

¹H NMR (500 MHz, CDCl₃) δ 7.37 (d, *J* = 8.5 Hz, 2H), 7.33-7.27 (m, 4H), 7.20 (t, *J* = 7.5 Hz, 1H), 7.07 (d, *J* = 8.0 Hz, 1H), 7.05 (s, 1H), 6.99 (t, *J* = 7.8 Hz, 1H), 3.76 (s, 3H).

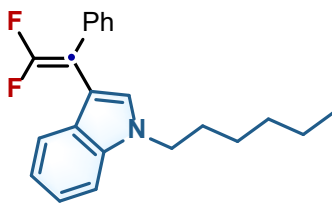
¹³C NMR (125 MHz, CDCl₃) δ 153.6 (dd, *J* = 288.8, 291.3 Hz), 136.9, 134.5 (t, *J* = 3.8 Hz), 129.2 (t, *J* = 3.2 Hz), 129.1 (t, *J* = 3.8 Hz), 128.2, 127.3, 127.1 (d, *J* = 3.8 Hz), 121.8, 120.3 (d, *J* = 2.5 Hz), 119.5, 109.3, 107.4 (t, *J* = 3.2 Hz), 89.7 (t, *J* = 20.0 Hz), 32.8.

¹⁹F NMR (470 MHz, CDCl₃) δ -86.9 (d, *J* = 35.0 Hz), -91.0 (d, *J* = 35.0 Hz).

IR (Film): 3470, 3036, 2932, 1706, 1456, 1264, 905, 724, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₄F₂N⁺ [*M*+*H*]⁺: 270.1089; Found: 270.1091.

The spectral data are consistent with those reported in the literature³⁷.



(109) 3-(2,2-Difluoro-1-phenylvinyl)-1-hexyl-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-hexyl-1*H*-indole (60.6 mg, 0.3 mmol) afforded **109** (95.4 mg, 94% yield) as a light yellow oil.

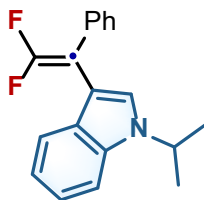
¹H NMR (500 MHz, CDCl₃) δ 7.39-7.36 (m, 2H), 7.34-7.26 (m, 4H), 7.20-7.17 (m, 1H), 7.10 (d, *J* = 0.5 Hz, 1H), 7.07 (d, *J* = 8.0 Hz, 1H), 7.00-6.96 (m, 1H), 4.10 (t, *J* = 7.0 Hz, 2H), 1.86-1.81 (m, 2H), 1.37-1.24 (m, 6H), 0.89-0.85 (m, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.6 (dd, *J* = 288.0, 291.0 Hz), 136.1, 134.6 (t, *J* = 3.8 Hz), 129.3 (t, *J* = 3.8 Hz), 128.3 (t, *J* = 3.8 Hz), 128.2, 127.3, 127.2 (d, *J* = 1.5 Hz), 121.6, 120.4 (d, *J* = 3.0 Hz), 119.4, 109.5, 107.2 (d, *J* = 3.0 Hz), 89.8 (t, *J* = 20.5 Hz), 46.5, 31.4, 30.1, 26.6, 22.5, 14.0.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.8 (d, *J* = 35.5 Hz), -91.1 (d, *J* = 35.5 Hz).

HRMS (ESI) *m/z* calcd for C₂₂H₂₄F₂N⁺ [*M*+*H*]⁺: 340.1871; Found: 340.1873.

The spectral data are consistent with those reported in the literature³⁷.



(110) 1-(Cyclopropylmethyl)-3-(2,2-difluoro-1-phenylvinyl)-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-isopropyl-1*H*-indole (51.6 mg, 0.3 mmol) afforded **110** (84.6 mg, 94% yield) as a colorless oil.

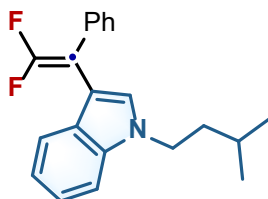
¹H NMR (500 MHz, CDCl₃) δ 7.39-7.36 (m, 3H), 7.33-7.25 (m, 3H), 7.22 (s, 1H), 7.20-7.16 (m, 1H), 7.06 (d, *J* = 8.0 Hz, 1H), 6.98 (t, *J* = 7.5 Hz, 1H), 4.71-4.63 (m, 1H), 1.51 (d, *J* = 6.5 Hz, 6H).

¹³C NMR (125 MHz, CDCl₃) δ 153.6 (dd, *J* = 288.8, 291.2 Hz), 135.7, 134.6 (t, *J* = 3.8 Hz), 129.3 (t, *J* = 3.2 Hz), 128.2, 127.3, 127.2, 124.1 (t, *J* = 3.8 Hz), 121.5, 120.4 (d, *J* = 2.5 Hz), 119.4, 109.6, 107.5 (d, *J* = 3.2 Hz), 89.9 (t, *J* = 20.2 Hz), 47.2, 22.3.

¹⁹F NMR (470 MHz, CDCl₃) δ -86.8 (d, *J* = 35.5 Hz), -91.1 (d, *J* = 35.5 Hz).

HRMS (ESI) *m/z* calcd for C₁₉H₁₈F₂N⁺ [*M*+*H*]⁺: 298.1402; Found: 298.1402.

The spectral data are consistent with those reported in the literature³⁷.



(111) 3-(2,2-Difluoro-1-phenylvinyl)-1-(prop-2-yn-1-yl)-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived

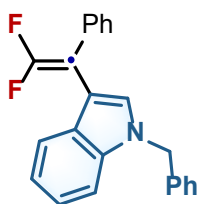
from 2,2,2-trifluoro-1-phenylethan-1-one and 1-isopentyl-1*H*-indole (56.4 mg, 0.3 mmol) afforded **111** (91.2 mg, 93% yield) as a light yellow oil.

¹H NMR (500 MHz, CDCl₃) δ 7.36 (d, *J* = 7.0 Hz, 2H), 7.31-7.21 (m, 4H), 7.17-7.14 (m, 1H), 7.08-7.06 (m, 2H), 6.96 (t, *J* = 7.5 Hz, 1H), 4.04 (t, *J* = 7.5 Hz, 2H), 1.71-1.65 (m, 2H), 1.61-1.53 (m, 1H), 0.93 (d, *J* = 6.5 Hz, 6H).

¹³C NMR (150 MHz, CDCl₃) δ 153.6 (dd, *J* = 288.0, 291.0 Hz), 136.1, 134.5 (t, *J* = 4.5 Hz), 129.3 (t, *J* = 3.0 Hz), 128.2, 128.0 (t, *J* = 3.8 Hz), 127.3, 127.2 (d, *J* = 3.0 Hz), 121.6, 120.4 (d, *J* = 3.0 Hz), 119.4, 109.5, 107.3 (t, *J* = 3.0 Hz), 89.8 (t, *J* = 20.2 Hz), 44.6, 38.9, 25.7, 22.4.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.7 (d, *J* = 33.8 Hz), -90.9 (d, *J* = 33.8 Hz).

HRMS (ESI) *m/z* calcd for C₂₁H₂₂F₂N⁺ [M+H]⁺: 326.1715; Found: 326.1715.



(112) 1-Benzyl-3-(2,2-difluoro-1-phenylvinyl)-1*H*-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazine (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-benzyl-1*H*-indole (62.4 mg, 0.3 mmol) afforded **112** (94.2 mg, 91% yield) as light yellow oil.

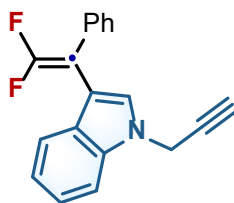
¹H NMR (600 MHz, CDCl₃) δ 7.40-7.36 (m, 2H), 7.33-7.24 (m, 7H), 7.15-7.07 (m, 5H), 6.98 (t, *J* = 8.0 Hz, 1H), 5.27 (s, 2H).

¹³C NMR (150 MHz, CDCl₃) δ 153.6 (dd, *J* = 289.5, 292.5 Hz), 137.1, 136.5, 134.4 (t, *J* = 3.8 Hz), 129.2 (t, *J* = 3.8 Hz), 128.8, 128.6 (t, *J* = 3.8 Hz), 128.2, 127.7, 127.4, 127.3, 126.7, 122.0, 120.4 (d, *J* = 2.5 Hz), 119.7, 109.8, 108.1 (d, *J* = 3.8 Hz), 89.7 (t, *J* = 20.0 Hz), 50.1.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.4 (d, *J* = 33.8 Hz), -90.6 (d, *J* = 33.8 Hz).

HRMS (ESI) *m/z* calcd for C₂₃H₁₈F₂N⁺ [M+H]⁺: 346.1401; Found: 346.1401.

The spectral data are consistent with those reported in the literature³⁷.



(113) 3-(2,2-Difluoro-1-phenylvinyl)-1-(prop-2-yn-1-yl)-1*H*-indole

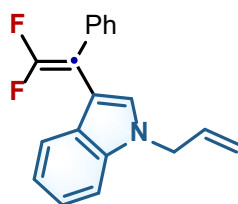
Prepared according to **General Procedure I** using *N*-triftoylhydrazine (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(prop-2-yn-1-yl)-1*H*-indole (46.8 mg, 0.3 mmol) afforded **113** (79.2 mg, 90% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.40-7.36 (m, 3H), 7.34-7.26 (m, 3H), 7.24-7.21 (m, 2H), 7.08 (d, *J* = 8.5 Hz, 1H), 7.04-7.00 (m, 1H), 4.86 (d, *J* = 2.5 Hz, 2H), 2.41 (t, *J* = 2.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 288.0, 291.0 Hz), 135.9, 134.3 (t, *J* = 3.8 Hz), 129.2 (t, *J* = 3.8 Hz), 128.3, 127.6, 127.5 (t, *J* = 4.0 Hz), 127.4, 122.2, 120.6 (d, *J* = 1.5 Hz), 120.1, 109.5, 108.5 (t, *J* = 3.0 Hz), 89.5 (t, *J* = 20.2 Hz), 77.3, 73.9, 35.9.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.3 (d, *J* = 33.8 Hz), -90.4 (d, *J* = 33.8 Hz).

HRMS (ESI) m/z calcd for $C_{19}H_{14}F_2N^+$ $[M+H]^+$: 294.1088; Found: 294.1088.



(114) 1-Allyl-3-(2,2-difluoro-1-phenylvinyl)-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (237.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-allyl-1H-indole (47.4 mg, 0.3 mmol) afforded **114** (85.2 mg, 96% yield) as a colorless oil.

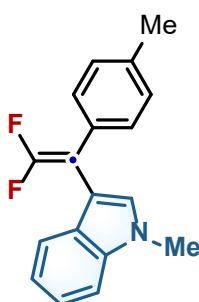
1H NMR (600 MHz, $CDCl_3$) δ 7.39-7.36 (m, 2H), 7.33-7.30 (m, 3H), 7.28-7.26 (m, 1H), 7.19-7.16 (m, 1H), 7.10 (d, J = 0.6 Hz, 1H), 7.07 (d, J = 7.8 Hz, 1H), 7.00-6.97 (m, 1H), 6.02-5.95 (m, 1H), 5.22-5.19 (m, 1H), 5.13-5.09 (m, 1H), 4.71-4.69 (m, 2H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 153.6 (dd, J = 288.0, 291.0 Hz), 136.3, 134.4 (t, J = 3.8 Hz), 133.1, 129.2 (t, J = 3.8 Hz), 128.23, 128.16 (t, J = 3.8 Hz), 127.30, 127.26, 121.9, 120.4 (d, J = 3.0 Hz), 119.6, 117.6, 109.7, 107.8 (t, J = 3.0 Hz), 89.7 (t, J = 20.0 Hz), 48.9.

^{19}F NMR (564 MHz, $CDCl_3$) δ -86.6 (d, J = 33.8 Hz), -90.8 (d, J = 33.8 Hz).

HRMS (ESI) m/z calcd for $C_{19}H_{16}F_2N^+$ $[M+H]^+$: 296.1245; Found: 296.1245.

The spectral data are consistent with those reported in the literature³⁷.



(115) 3-(2,2-Difluoro-1-(*p*-tolyl)vinyl)-1-methyl-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (246.0 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(*p*-tolyl)ethan-1-one and 1-methyl-1H-indole (39.5 mg, 0.3 mmol) afforded **115** (79.8 mg, 94% yield) as a white solid (mp: 78-80 °C).

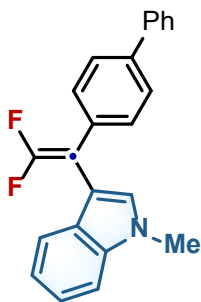
1H NMR (600 MHz, $CDCl_3$) δ 7.30 (d, J = 8.4 Hz, 1H), 7.27-7.25 (m, 2H), 7.22-7.18 (m, 1H), 7.13-7.09 (m, 3H), 7.04 (d, J = 0.6 Hz, 1H), 7.01-6.98 (m, 1H), 3.76 (s, 3H), 2.34 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 153.5 (dd, J = 288.8, 291.5 Hz), 137.0, 136.8, 131.5 (t, J = 4.5 Hz), 129.1 (t, J = 3.2 Hz), 128.9, 127.1 (d, J = 2.5 Hz), 121.8, 120.38, 120.36, 119.4, 109.3, 107.6 (t, J = 3.2 Hz), 89.5 (t, J = 20.0 Hz), 32.8, 21.2.

^{19}F NMR (564 MHz, $CDCl_3$) δ -87.4 (d, J = 36.5 Hz), -91.3 (d, J = 36.5 Hz).

HRMS (ESI) m/z calcd for $C_{18}H_{16}F_2N^+$ $[M+H]^+$: 284.1245; Found: 284.1247.

The spectral data are consistent with those reported in the literature³⁷.



(116) 3-(1-([1,1'-Biphenyl]-4-yl)-2,2-difluorovinyl)-1-methyl-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (283.2 mg, 0.6 mmol) derived from 1-([1,1'-biphenyl]-4-yl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **116** (96.0 mg, 93% yield) as a colorless oil.

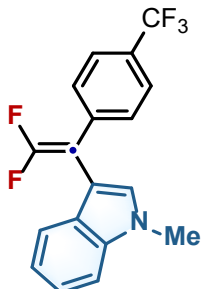
¹H NMR (500 MHz, CDCl₃) δ 7.58 (d, *J* = 7.5 Hz, 2H), 7.54 (d, *J* = 8.5 Hz, 2H), 7.44-7.39 (m, 4H), 7.31 (t, *J* = 8.0 Hz, 2H), 7.21 (d, *J* = 8.0 Hz, 1H), 7.15 (d, *J* = 8.0 Hz, 1H), 7.05 (s, 1H), 7.01 (t, *J* = 7.5 Hz, 1H), 3.73 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.6 (dd, *J* = 289.5, 292.5 Hz), 140.5, 140.0, 136.9, 133.5 (t, *J* = 4.5 Hz), 129.6 (t, *J* = 3.8 Hz), 129.2 (t, *J* = 3.8 Hz), 128.8, 127.3, 127.1 (d, *J* = 3.0 Hz), 127.0, 126.9, 121.9, 120.3 (d, *J* = 2.0 Hz), 119.6, 109.4, 107.2 (t, *J* = 3.0 Hz), 89.4 (t, *J* = 20.0 Hz), 32.8.

¹⁹F NMR (564 MHz, CDCl₃) δ -86.2 (d, *J* = 33.8 Hz), -90.2 (d, *J* = 33.8 Hz).

IR (Film): 3057, 2989, 1703, 1267, 904, 721, 649 cm⁻¹.

HRMS (ESI) *m/z* calcd for C₂₃H₁₈F₂N⁺ [M+H]⁺: 346.1402; Found: 346.1401.



(117) 3-(2,2-Difluoro-1-(4-(trifluoromethyl)phenyl)vinyl)-1-methyl-1H-indole

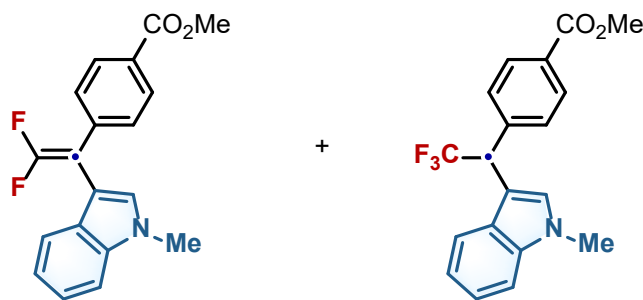
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (278.4 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethyl)phenyl)ethan-1-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **117** (91.2 mg, 90% yield) as a light yellow liquid.

¹H NMR (500 MHz, CDCl₃) δ 7.55 (d, *J* = 8.0 Hz, 2H), 7.46 (d, *J* = 8.0 Hz, 2H), 7.32 (d, *J* = 8.0 Hz, 1H), 7.24-7.20 (m, 1H), 7.06-7.00 (m, 3H), 3.77 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 153.9 (dd, *J* = 290.0, 295.0 Hz), 138.4 (t, *J* = 3.8 Hz), 136.9, 129.4 (t, *J* = 3.8 Hz), 129.29 (t, *J* = 3.8 Hz), 129.27 (q, *J* = 32.6 Hz), 126.9 (d, *J* = 2.5 Hz), 125.2 (q, *J* = 3.8 Hz), 124.1 (q, *J* = 270.0 Hz), 122.1, 120.0 (d, *J* = 2.5 Hz), 119.8, 109.5, 106.4 (t, *J* = 3.8 Hz), 89.1 (dd, *J* = 18.8, 21.3 Hz), 32.9.

¹⁹F NMR (470 MHz, CDCl₃) δ -62.5, -84.6 (d, *J* = 30.0 Hz), -89.0 (d, *J* = 30.0 Hz).

HRMS (ESI) *m/z* calcd for C₁₈H₁₁F₅N⁻ [M-H]⁻: 336.0817; Found: 336.0818.



118 (major) : **118'** (minor) = 4 : 1

(118) Methyl 4-(2,2-difluoro-1-(1-methyl-1*H*-indol-3-yl)vinyl)benzoate

(118') Methyl 4-(2,2,2-trifluoro-1-(1-methyl-1*H*-indol-3-yl)ethyl)benzoate

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (272.4 mg, 0.6 mmol) derived from methyl 4-(2,2,2-trifluoroacetyl)benzoate and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **118** (63.0 mg, 64% yield) and **118'** (16.8 mg, 16% yield) as a yellow oil.

¹H NMR (600 MHz, CDCl₃) **Major**: δ 7.99 (d, *J* = 8.4 Hz, 2H), 7.46-7.42 (m, 2H), 7.32 (d, *J* = 8.4 Hz, 1H), 7.23-7.19 (m, 1H), 7.07 (s, 1H), 7.04-6.98 (m, 2H), 3.89 (s, 3H), 3.78 (s, 3H).

Minor: δ 7.99 (d, *J* = 8.4 Hz, 2H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.31-7.29 (m, 1H), 7.23-7.19 (m, 2H), 7.14 (s, 1H), 7.04-6.98 (m, 1H), 5.02 (q, *J* = 9.6 Hz, 1H), 3.87 (s, 3H), 3.77 (s, 3H).

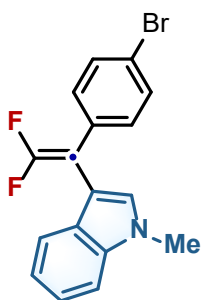
¹³C NMR (150 MHz, CDCl₃) **Major**: δ 166.9, 154.0 (dd, *J* = 291.5 Hz, 296.0 Hz), 139.4 (t, *J* = 4.5 Hz), 136.9, 129.9, 129.3 (t, *J* = 3.5 Hz), 127.02, 126.4 (t, *J* = 277.5 Hz), 122.3, 120.1 (d, *J* = 1.5 Hz), 119.7, 118.7, 109.6, 106.5 (t, *J* = 3.0 Hz), 89.6 (t, *J* = 20.5 Hz), 52.19, 33.0.

Minor: δ 166.7, 140.7, 136.8, 129.6, 129.4, 129.0, 127.7, 127.07, 122.1, 119.8, 118.7, 107.8, 106.4 (t, *J* = 3.0 Hz), 89.7 (t, *J* = 20.5 Hz), 52.16, 47.7 (q, *J* = 28.5 Hz), 33.0.

¹⁹F NMR (564 MHz, CDCl₃) δ -87.0 (d, *J* = 9.6 Hz), -84.7 (d, *J* = 30.5 Hz), -88.7 (d, *J* = 30.5 Hz).

HRMS (ESI) *m/z* calcd for C₁₉H₁₅F₂NO₂⁺ [M+H]⁺: 327.1071; Found: 327.1073.

HRMS (ESI) *m/z* calcd for C₁₉H₁₆F₃NO₂⁺ [M+H]⁺: 347.1133; Found: 347.1135.



(119) 3-(1-(4-Bromophenyl)-2,2-difluorovinyl)-1-methyl-1*H*-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (284.4 mg, 0.6 mmol) derived from 1-(4-bromophenyl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **119** (97.2 mg, 93% yield) as a light yellow liquid.

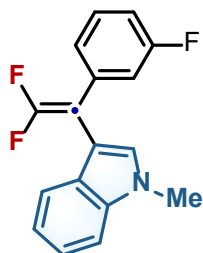
¹H NMR (500 MHz, CDCl₃) δ 7.44-7.41 (m, 2H), 7.30 (d, *J* = 8.5 Hz, 1H), 7.23-7.19 (m, 3H), 7.07-6.99 (m, 3H), 3.75 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 153.5 (dd, *J* = 288.8, 292.5 Hz), 136.8, 133.4 (t, *J* = 4.4 Hz), 131.4, 130.8 (t, *J* = 3.2 Hz), 129.2 (t, *J* = 3.2 Hz), 126.9 (d, *J* = 2.5 Hz), 122.0, 121.2, 120.1 (d, *J* = 1.3 Hz), 119.7, 109.4, 106.6 (t, *J* = 3.2 Hz), 89.0 (t, *J* = 20.0 Hz), 32.9.

¹⁹F NMR (470 MHz, CDCl₃) δ -85.9 (d, *J* = 32.9 Hz), -90.0 (d, *J* = 32.9 Hz).

HRMS (ESI) *m/z* calcd for C₁₇H₁₁BrF₂N⁺ [M-H]⁺: 346.0048; Found: 346.0050.

The spectral data are consistent with those reported in the literature³⁷.



(120) 3-(2,2-Difluoro-1-(3-fluorophenyl)vinyl)-1-methyl-1H-indole

Prepared according to **General Procedure I** *N*-triftoylhydrazone (248.4 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(3-fluorophenyl)ethan-1-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **120** (81.0 mg, 94% yield) as a colorless oil.

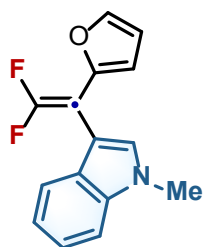
¹H NMR (500 MHz, CDCl₃) δ 7.28 (dt, *J* = 8.5, 1.0 Hz, 1H), 7.24-7.18 (m, 2H), 7.15-7.13 (m, 1H), 7.10-7.07 (m, 2H), 7.02-6.99 (m, 2H), 6.96-6.92 (m, 1H), 3.71 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 162.7 (d, *J* = 245.0 Hz), 153.7 (dd, *J* = 288.0, 292.5 Hz), 136.9, 136.8-136.7 (m), 129.6 (d, *J* = 7.5 Hz), 129.2 (t, *J* = 3.8 Hz), 127.0 (d, *J* = 3.0 Hz), 124.9 (q, *J* = 3.5 Hz), 121.9, 120.1 (d, *J* = 1.5 Hz), 119.7, 116.1 (dt, *J* = 22.5, 3.5 Hz), 114.2 (d, *J* = 21.2 Hz), 109.4, 106.6 (t, *J* = 3.0 Hz), 89.1 (td, *J* = 20.5, 2.0 Hz), 32.8.

¹⁹F NMR (564 MHz, CDCl₃) δ -85.5 (d, *J* = 33.8 Hz), -89.3 (d, *J* = 33.8 Hz), (-113.1)-(-113.2) (m).

IR (Film): 3053, 2985, 1705, 1613, 1584, 1263, 904, 721, 649, cm⁻¹.

HRMS (ESI) *m/z* calcd for C₁₇H₁₃F₃N⁺ [M+H]⁺: 288.0995; Found: 288.0999.



(121) 3-(2,2-Difluoro-1-(furan-2-yl)vinyl)-1-methyl-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (231.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(furan-2-yl)ethan-1-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **121** (49.8 mg, 64% yield) as a colorless oil.

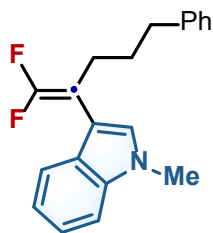
¹H NMR (600 MHz, CDCl₃) δ 7.41 (d, *J* = 1.8 Hz, 1H), 7.34 (d, *J* = 7.8 Hz, 1H), 7.28-7.23 (m, 2H), 7.15 (s, 1H), 7.09 (t, *J* = 7.6 Hz, 1H), 6.43 (dd, *J* = 1.8 Hz, *J* = 3.0 Hz, 1H), 6.33 (d, *J* = 3.0 Hz, 1H), 3.81 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 153.7 (dd, *J* = 288.0, 297.0 Hz), 147.7 (dd, *J* = 4.5, 7.5 Hz), 142.0 (t, *J* = 2.2 Hz), 136.7, 129.1 (t, *J* = 3.8 Hz), 127.0 (d, *J* = 1.5 Hz), 122.0, 119.9 (d, *J* = 1.5 Hz), 119.7, 111.1, 109.45, 109.44 (t, *J* = 6.0 Hz), 104.1 (t, *J* = 3.0 Hz), 82.7 (dd, *J* = 19.0, 27.0 Hz), 32.9.

¹⁹F NMR (564 MHz, CDCl₃) δ -84.4 (d, *J* = 24.4 Hz), -87.0 (d, *J* = 24.4 Hz).

IR (Film): 3059, 2983, 1707, 1475, 1261, 908, 718, 649 cm⁻¹.

HRMS (ESI) m/z calcd for $C_{15}H_{12}F_2NO^+$ $[M+H]^+$: 260.0881; Found: 260.0882.



(122) 3-(1,1-Difluoro-5-phenylpent-1-en-2-yl)-1-methyl-1H-indole

Prepared according to **General Procedure I** using *N*-triftoylhydrazone (262.8 mg, 0.6 mmol) derived from 1,1,1-trifluoro-4-phenylbutan-2-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **122** (41.1 mg, 44% yield) as a colorless oil.

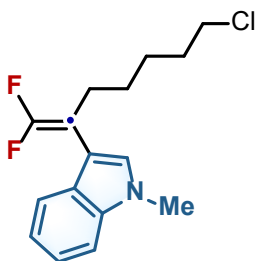
1H NMR (600 MHz, $CDCl_3$) δ 7.55 (d, J = 8.4 Hz, 1H), 7.31 (d, J = 8.4 Hz, 1H), 7.25-7.21 (m, 3H), 7.16-7.09 (m, 4H), 6.94 (s, 1H), 3.76 (s, 3H), 2.61 (t, J = 7.8 Hz, 2H), 2.50-2.46 (m, 2H), 1.75-1.70 (m, 2H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 153.3 (dd, J = 286.0, 288.0 Hz), 142.1, 136.8, 128.4, 128.2, 127.7 (dd, J = 3.0, 4.5 Hz), 126.8, 125.7, 121.8, 120.0 (d, J = 4.5 Hz), 119.5, 109.4, 107.3 (dd, J = 2.2, 4.5 Hz), 85.7 (dd, J = 15.5, 25.5 Hz), 35.3, 32.8, 29.6 (t, J = 2.5 Hz), 28.0 (d, J = 1.5 Hz).

^{19}F NMR (564 MHz, $CDCl_3$) δ -89.9 (d, J = 46.8 Hz), -93.9 (dt, J = 46.8, 3.0 Hz).

IR (Film): 3059, 2991, 1732, 1479, 1261, 902, 717, 649 cm^{-1} .

HRMS (ESI) m/z calcd for $C_{20}H_{20}F_2N^+$ $[M+H]^+$: 312.1558; Found: 312.1553.



(123) 3-(8-Chloro-1,1-difluorooct-1-en-2-yl)-1-methyl-1H-indole

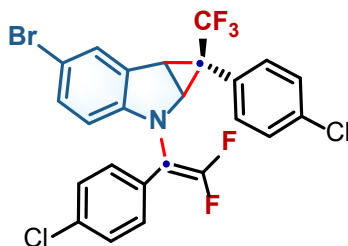
Prepared according to **General Procedure I** using *N*-triftoylhydrazone (262.8 mg, 0.6 mmol) derived from 8-chloro-1,1,1-trifluorooctan-2-one and 1-methyl-1*H*-indole (39.5 mg, 0.3 mmol) afforded **123** (47.7 mg, 51% yield) as a colorless oil.

1H NMR (500 MHz, $CDCl_3$) δ 7.56 (d, J = 8.0 Hz, 1H), 7.31 (d, J = 8.5 Hz, 1H), 7.26-7.23 (m, 1H), 7.15-7.12 (m, 1H), 6.99 (s, 1H), 3.78 (s, 3H), 3.47 (t, J = 6.5 Hz, 2H), 2.45-2.41 (m, 2H), 1.73-1.67 (m, 2H), 1.42-1.31 (m, 6H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 153.2 (dd, J = 286.0, 288.0 Hz), 136.8, 127.7 (dd, J = 2.0, 4.5 Hz), 126.8, 121.8, 120.0 (d, J = 3.8 Hz), 119.5, 109.4, 107.4 (dd, J = 2.5, 5.0 Hz), 85.8 (dd, J = 15.0, 24.0 Hz), 45.0, 32.8, 32.5, 28.20, 28.18, 27.7 (t, J = 2.5 Hz), 26.5.

^{19}F NMR (470 MHz, $CDCl_3$) δ -90.2 (d, J = 46.5 Hz), -94.3 (d, J = 46.5 Hz).

HRMS (ESI) m/z calcd for $C_{17}H_{21}ClF_2N^+$ $[M+H]^+$: 312.1325; Found: 312.1326.



(124)

5-bromo-1-(4-chlorophenyl)-2-(1-(4-chlorophenyl)-2,2-difluorovinyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

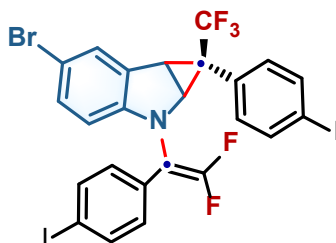
Prepared according to **General Procedure J** using *N*-triftoylhydrazone (387.0 mg, 0.9 mmol) derived from 1-(4-chlorophenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **124** (164.3 mg, 98% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.56 (d, *J* = 2.0 Hz, 1H), 7.37-7.32 (m, 2H), 7.18-7.09 (m, 6H), 7.05 (dd, *J* = 8.5, 1.5 Hz, 1H), 6.03 (dd, *J* = 8.5, 2.0 Hz, 1H), 4.26 (d, *J* = 7.0 Hz, 1H), 3.65 (d, *J* = 7.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 157.8 (t, *J* = 297.0 Hz), 146.7, 134.8, 134.7, 134.4 (d, *J* = 1.5 Hz), 130.9, 129.2, 129.0 (t, *J* = 4.5 Hz), 128.4, 128.2, 128.1 (dd, *J* = 6.0, 2.5 Hz), 127.3, 125.5, 125.3 (q, *J* = 273.0 Hz), 111.8, 110.6 (d, *J* = 1.5 Hz), 100.3 (dd, *J* = 33.0, 18.0 Hz), 51.6, 29.8 (q, *J* = 3.0 Hz), 27.2 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -67.67, -84.29 (d, *J* = 28.2 Hz), -93.90 (d, *J* = 28.2 Hz).

HRMS (ESI) *m/z* calcd for C₂₄H₁₄BrCl₂F₅N⁺ [M+H]⁺: 559.9601; Found: 559.9592.



(125)

5-bromo-2-(2,2-difluoro-1-(4-iodophenyl)vinyl)-1-(4-iodophenyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

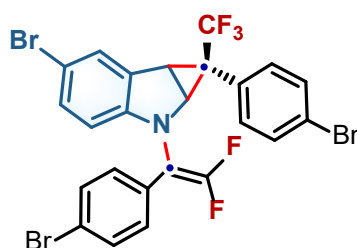
Prepared according to **General Procedure J** using *N*-triftoylhydrazone (469.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-iodophenyl)ethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **125** (216.2 mg, 97% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.69 (d, *J* = 8.0 Hz, 2H), 7.55 (s, 1H), 7.51 (d, *J* = 8.0 Hz, 2H), 7.05 (dd, *J* = 8.5, 1.0 Hz, 1H), 6.92 (d, *J* = 8.0 Hz, 4H), 6.03 (d, *J* = 8.0 Hz, 1H), 4.26 (d, *J* = 7.0 Hz, 1H), 3.64 (d, *J* = 7.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 155.8 (t, *J* = 297.5 Hz), 146.7, 138.1, 137.1, 134.8, 130.9, 129.3 (t, *J* = 3.8 Hz), 129.2 (dd, *J* = 6.0, 2.5 Hz), 128.4, 127.2, 126.7, 125.1 (q, *J* = 273.8 Hz), 111.9, 110.7, 100.5 (dd, *J* = 31.3, 16.3 Hz), 95.0, 94.6, 51.6, 29.7 (q, *J* = 2.5 Hz), 27.5 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.61, -83.76 (d, *J* = 26.3 Hz), -93.35 (d, *J* = 26.3 Hz).

HRMS (ESI) *m/z* calcd for C₂₄H₁₄BrF₅I₂N⁺ [M+H]⁺: 743.8314; Found: 743.8312.



(126)

5-bromo-1-(4-bromophenyl)-2-(1-(4-bromophenyl)-2,2-difluorovinyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

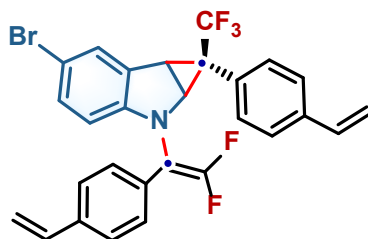
Prepared according to **General Procedure J** using *N*-triftosylhydrazone (427.5 mg, 0.9 mmol) derived from 1-(4-bromophenyl)-2,2,2-trifluoroethan-1-one (58.8 mg, 0.3 mmol) afforded **126** (178.5 mg, 92% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.56 (d, *J* = 1.5 Hz, 1H), 7.50 (d, *J* = 8.5 Hz, 2H), 7.31 (d, *J* = 8.5 Hz, 2H), 7.10-7.02 (m, 5H), 6.04 (dd, *J* = 8.5, 1.5 Hz, 1H), 4.27 (d, *J* = 7.0 Hz, 1H), 3.66 (d, *J* = 7.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 155.7 (t, *J* = 297.5 Hz), 146.7, 134.7, 132.1, 131.1, 130.9, 129.2 (t, *J* = 5.0 Hz), 128.6 (dd, *J* = 6.0, 2.5 Hz), 128.4, 127.2, 126.0, 125.2 (q, *J* = 273.8 Hz), 123.0, 122.9, 111.9, 110.7 (d, *J* = 1.3 Hz), 100.3 (dd, *J* = 31.3, 17.5 Hz), 51.6, 29.8 (q, *J* = 3.8 Hz), 27.3 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.61, -84.03 (d, *J* = 27.3 Hz), -93.62 (d, *J* = 27.3 Hz).

HRMS (ESI) *m/z* calcd for C₂₄H₁₄Br₃F₅N⁺ [M+H]⁺: 647.8591; Found: 647.8588.



(127)

5-bromo-2-(2,2-difluoro-1-(4-vinylphenyl)vinyl)-1-(trifluoromethyl)-1-(4-vinylphenyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

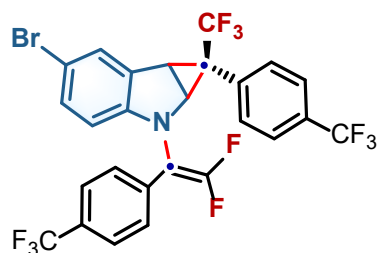
Prepared according to **General Procedure J** using *N*-triftosylhydrazone (379.8 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-vinylphenyl)ethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **127** (90.0 mg, 54% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.56 (d, *J* = 1.5 Hz, 1H), 7.40 (d, *J* = 8.0 Hz, 2H), 7.22 (d, *J* = 8.0 Hz, 2H), 7.19-7.14 (m, 4H), 7.01 (dd, *J* = 8.5, 1.5 Hz, 1H), 6.71 (dd, *J* = 17.5, 11.0 Hz, 1H), 6.61 (dd, *J* = 17.5, 11.0 Hz, 1H), 6.03 (dd, *J* = 8.5, 1.5 Hz, 1H), 5.79 (d, *J* = 17.5 Hz, 1H), 5.69 (d, *J* = 17.5 Hz, 1H), 5.31 (d, *J* = 11.0 Hz, 1H), 5.22 (d, *J* = 11.0 Hz, 1H), 4.30 (d, *J* = 7.0 Hz, 1H), 3.64 (d, *J* = 7.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 155.6 (t, *J* = 296.3 Hz), 147.1, 137.9, 137.5, 136.3, 135.9, 133.3 (d, *J* = 1.3 Hz), 130.6, 129.0 (dd, *J* = 6.0, 2.5 Hz), 128.3, 127.9 (dd, *J* = 5.0, 2.5 Hz), 127.5, 126.6, 126.5, 125.6, 125.5 (q, *J* = 273.8 Hz), 115.1, 114.4, 111.4, 110.5 (d, *J* = 1.3 Hz), 100.8 (dd, *J* = 32.5, 16.3 Hz), 51.6, 29.8 (q, *J* = 2.5 Hz), 27.5 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.61, -84.52 (d, *J* = 28.2 Hz), -94.53 (d, *J* = 28.2 Hz).

HRMS (ESI) m/z calcd for $C_{28}H_{20}BrF_5N^+$ $[M+H]^+$: 544.0694; Found: 544.0690.



(128)

5-bromo-2-(2,2-difluoro-1-(4-(trifluoromethyl)phenyl)vinyl)-1-(trifluoromethyl)-1-(4-(trifluoromethyl)phenyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

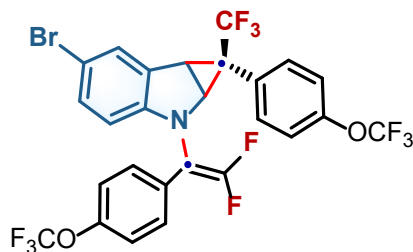
Prepared according to **General Procedure J** using *N*-triftosylhydrazone (417.6 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethyl)phenyl)ethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **128** (178.7 mg, 95% yield) as a colorless oil.

¹H NMR (500 MHz, $CDCl_3$) δ 7.58 (d, J = 2.0 Hz, 1H), 7.25-7.20 (m, 6H), 7.06 (dd, J = 8.5, 2.0 Hz, 1H), 7.02 (d, J = 8.0 Hz, 2H), 6.03 (dd, J = 8.5, 2.0 Hz, 1H), 4.28 (d, J = 7.0 Hz, 1H), 3.68 (d, J = 7.0 Hz, 1H).

¹³C NMR (150 MHz, $CDCl_3$) δ 155.9 (t, J = 297.0 Hz), 149.3, 146.7, 134.6, 131.0, 129.3-129.1 (m), 128.4, 128.3-128.1 (m), 128.1-127.9 (m), 127.2, 125.6, 125.3 (q, J = 273.0 Hz), 121.3, 120.4 (q, J = 255.0 Hz), 120.3 (q, J = 255.0 Hz), 120.1, 111.9, 110.5, 100.0 (dd, J = 31.5, 16.5 Hz), 51.53, 29.9 (q, J = 3.0 Hz), 27.2 (q, J = 31.5 Hz).

¹⁹F NMR (564 MHz, $CDCl_3$) δ -57.85, -57.87, -67.62, -84.17 (d, J = 28.2 Hz), -93.8 (d, J = 28.2 Hz).

HRMS (ESI) m/z calcd for $C_{26}H_{14}BrF_{11}N^+$ $[M+H]^+$: 628.0128; Found: 628.0125.



(129)

5-bromo-2-(2,2-difluoro-1-(4-(trifluoromethoxy)phenyl)vinyl)-1-(4-(trifluoromethoxy)phenyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

Prepared according to **General Procedure J** using *N*-triftosylhydrazone (432.0 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethoxy)phenyl)ethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **119** (166.1 mg, 84% yield) as a colorless oil.

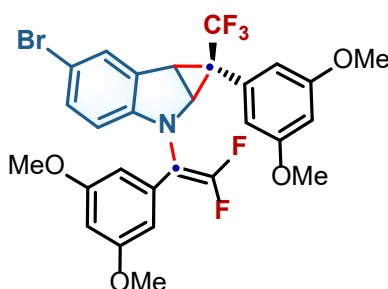
¹H NMR (500 MHz, $CDCl_3$) δ 7.58 (d, J = 2.0 Hz, 1H), 7.25-7.17 (m, 6H), 7.06 (dd, J = 8.5, 2.0 Hz, 1H), 7.02 (d, J = 8.0 Hz, 2H), 6.03 (dd, J = 8.5, 2.0 Hz, 1H), 4.28 (d, J = 7.0 Hz, 1H), 3.68 (d, J = 7.0 Hz, 1H).

¹³C NMR (150 MHz, $CDCl_3$) δ 155.9 (t, J = 296.9 Hz), 149.3, 146.7, 134.6 (d, J = 1.5 Hz), 131.0, 129.2 (dd, J = 6.0, 3.5 Hz), 128.4, 128.3 (dd, J = 6.0, 3.0 Hz), 128.0, 127.2, 125.5, 125.3 (q, J = 273.0 Hz), 121.3, 120.4 (q, J = 255.0 Hz), 120.3 (q, J = 255.0 Hz), 120.1, 111.9, 110.5 (d, J = 3.0 Hz), 100.0

(dd, $J = 32.6, 17.4$ Hz), 51.5, 29.9 (q, $J = 3.0$ Hz), 27.2 (q, $J = 32.0$ Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -57.85, -57.87, -67.62, -84.16 (d, $J = 27.6$ Hz), -93.75 (d, $J = 27.6$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{26}\text{H}_{14}\text{BrF}_{11}\text{NO}_2^+$ $[\text{M}+\text{H}]^+$: 660.0027; Found: 660.0025.



(130)

5-bromo-1-(3,5-dimethoxyphenyl)-2-(1-(3,5-dimethoxyphenyl)-2,2-difluorovinyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

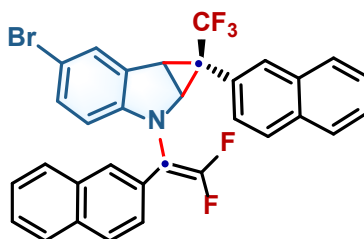
Prepared according to **General Procedure J** using *N*-triftosylhydrazone (410.4 mg, 0.9 mmol) derived from 1-(3,5-dimethoxyphenyl)-2,2,2-trifluoroethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **130** (132.0 mg, 72% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 7.56 (s, 1H), 7.04 (d, $J = 7.5$ Hz, 1H), 6.43 (s, 1H), 6.36 (s, 2H), 6.32 (s, 2H), 6.28 (s, 1H), 6.07 (d, $J = 7.0$ Hz, 1H), 4.29 (d, $J = 7.0$ Hz, 1H), 3.75 (s, 6H), 3.65 (s, 6H), 3.62 (d, $J = 7.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 161.0, 159.9, 155.4 (t, $J = 296.0$ Hz), 146.9, 131.7 (dd, $J = 6.3, 1.3$ Hz), 130.6, 128.8, 128.2, 127.8, 125.5 (q, $J = 272.5$ Hz), 111.2, 111.1, 110.7 (d, $J = 2.5$ Hz), 106.1 (dd, $J = 5.0, 2.5$ Hz), 101.2, 100.9 (dd, $J = 32.5, 16.3$ Hz), 100.4, 55.4, 55.2, 51.4, 29.6 (q, $J = 2.5$ Hz), 28.0 (q, $J = 31.3$ Hz).

^{19}F NMR (470 MHz, CDCl_3) δ -67.50, -84.35 (d, $J = 28.2$ Hz), -93.76 (d, $J = 28.2$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{28}\text{H}_{24}\text{BrF}_5\text{NO}_4^+$ $[\text{M}+\text{H}]^+$: 612.0803; Found: 612.0801.



(131)

5-bromo-2-(2,2-difluoro-1-(naphthalen-2-yl)vinyl)-1-(naphthalen-2-yl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

Prepared according to **General Procedure J** using *N*-triftosylhydrazone (401.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(naphthalen-2-yl)ethan-1-one and 5-bromo-1*H*-indole (58.8 mg, 0.3 mmol) afforded **131** (131.2 mg, 74% yield) as a colorless oil.

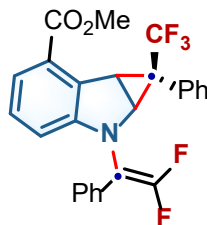
^1H NMR (500 MHz, CDCl_3) δ 7.88-7.82 (m, 2H), 7.82-7.72 (m, 5H), 7.71-7.65 (m, 2H), 7.58-7.50 (m, 2H), 7.50-7.43 (m, 2H), 7.37-7.29 (m, 2H), 6.96 (dd, $J = 8.5, 2.0$ Hz, 1H), 6.03 (dd, $J = 8.5, 2.0$ Hz, 1H), 4.47 (d, $J = 7.0$ Hz, 1H), 3.79 (d, $J = 7.0$ Hz, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ 155.9 (t, $J = 297.0$ Hz), 147.3, 133.5, 133.1 (d, $J = 3.0$ Hz), 133.0, 132.8, 130.7, 129.8, 128.7, 128.4, 128.2, 128.0, 127.67, 127.65, 127.62, 127.58, 127.55, 127.5, 127.3

(dd, $J = 6.0, 1.5$ Hz), 126.9, 126.7, 126.5, 125.8, 124.8 (q, $J = 273.0$ Hz), 124.8-124.6 (m), 124.5, 111.4, 110.5 (d, $J = 1.5$ Hz), 101.3 (dd, $J = 31.5, 16.5$ Hz), 51.9, 30.1 (q, $J = 1.5$ Hz), 27.9 (q, $J = 31.5$ Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -67.31, -84.32 (d, $J = 28.8$ Hz), -94.60 (d, $J = 28.8$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{32}\text{H}_{20}\text{BrF}_5\text{N}^+$ $[\text{M}+\text{H}]^+$: 592.0694; Found: 592.0690.



(132) **methyl**
2-(2,2-difluoro-1-phenylvinyl)-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole-6-carboxylate

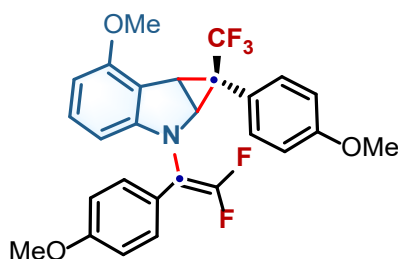
Prepared according to **General Procedure J** using *N*-triftoylhydrazone (356.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and methyl 1*H*-indole-4-carboxylate (52.5 mg, 0.3 mmol) afforded **132** (93.3 mg, 66% yield) as a colorless oil.

^1H NMR (600 MHz, CDCl_3) δ 7.45 (d, $J = 7.8$ Hz, 1H), 7.41-7.32 (m, 4H), 7.25-7.20 (m, 3H), 7.18-7.08 (m, 3H), 6.98 (t, $J = 7.8$ Hz, 1H), 6.33 (dd, $J = 7.8, 1.8$ Hz, 1H), 4.30 (d, $J = 7.2$ Hz, 1H), 4.24 (d, $J = 7.2$ Hz, 1H), 4.06 (s, 3H).

^{13}C NMR (150 MHz, CDCl_3) δ 167.1, 155.7 (t, $J = 297.0$ Hz), 149.0, 133.0, 129.9 (dd, $J = 6.0, 3.0$ Hz), 128.8, 128.7, 128.4, 128.2, 127.9-127.7 (m), 127.68, 127.65, 127.6, 127.3, 125.8 (q, $J = 273.0$ Hz), 121.0, 112.8 (d, $J = 1.5$ Hz), 101.0 (dd, $J = 31.5, 16.5$ Hz), 52.2, 51.4, 31.3 (q, $J = 3.0$ Hz), 27.5 (q, $J = 31.5$ Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -67.68, -84.52 (d, $J = 28.8$ Hz), -95.01 (d, $J = 28.8$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{26}\text{H}_{19}\text{F}_5\text{NO}_2^+$ $[\text{M}+\text{H}]^+$: 472.1330; Found: 472.1323.



(133)
2-(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-6-methoxy-1-(4-methoxyphenyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

Prepared according to **General Procedure J** using *N*-triftosylhydrazone (383.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 4-methoxy-1*H*-indole (44.1 mg, 0.3 mmol) afforded **133** (95.1 mg, 63% yield) as a colorless oil.

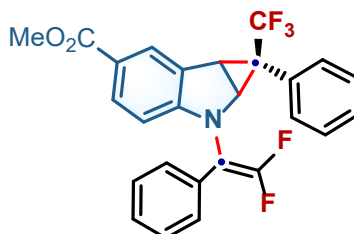
^1H NMR (500 MHz, CDCl_3) δ 7.18 (d, $J = 7.8$ Hz, 2H), 7.12 (d, $J = 8.3$ Hz, 2H), 6.90-6.84 (m, 1H), 6.66 (d, $J = 8.6$ Hz, 2H), 6.31 (d, $J = 8.2$ Hz, 1H), 5.81 (d, $J = 6.3$ Hz, 1H), 4.20 (d, $J = 7.0$ Hz, 1H), 3.95 (s, 3H), 3.82 (s, 3H), 3.70 (s, 3H), 3.69 (d, $J = 7.0$ Hz, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ 159.6, 159.3, 157.1, 155.4 (t, $J = 294.0$ Hz), 149.8, 134.2, 129.2 (t, $J =$

3.0 Hz), 128.8, 126.1 (q, $J = 271.5$), 122.5 (dd, $J = 6.0, 1.5$ Hz), 119.9, 114.1, 113.3, 113.1, 102.3 (d, $J = 1.5$ Hz), 101.5, 100.9 (dd, $J = 31.5, 16.5$ Hz), 55.4, 55.3, 55.0, 51.4, 27.6, 26.7 (q, 31.5 Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -67.55, -87.11 (d, $J = 33.8$ Hz), -97.17 (d, $J = 33.8$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{27}\text{H}_{23}\text{F}_5\text{NO}_3^+$ $[\text{M}+\text{H}]^+$: 504.1593; Found: 504.1587.



(134) **methyl**
2-(2,2-difluoro-1-phenylvinyl)-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[*b*]indole-5-carboxylate

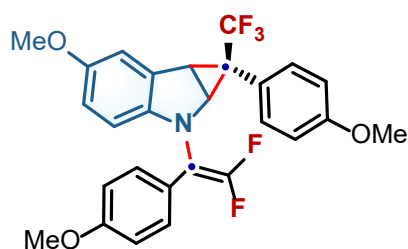
Prepared according to **General Procedure J** using *N*-triftoylhydrazone (356.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and methyl 1*H*-indole-5-carboxylate (52.5 mg, 0.3 mmol) afforded **134** (121.1 mg, 76% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 8.15 (d, $J = 1.5$ Hz, 1H), 7.66 (dd, $J = 8.5, 1.5$ Hz, 1H), 7.41-7.33 (m, 3H), 7.26-7.22 (m, 2H), 7.18 (d, $J = 7.5$ Hz, 2H), 7.16-7.11 (m, 3H), 6.14 (dd, $J = 8.5, 2.5$ Hz, 1H), 4.31 (d, $J = 7.0$ Hz, 1H), 3.87 (s, 3H), 3.70 (d, $J = 7.0$ Hz, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ 166.9, 155.2 (t, $J = 297.0$ Hz), 151.5, 133.2, 130.4, 129.4 (dd, $J = 6.0, 3.0$ Hz), 128.91, 128.88, 128.4, 127.9 (t, $J = 4.0$ Hz), 127.8, 127.4, 126.8, 125.5 (q, $J = 274.5$ Hz), 125.4, 121.4, 108.0 (d, $J = 1.5$ Hz), 100.3 (dd, $J = 33.0, 18.0$ Hz), 51.8, 51.0, 29.6 (q, $J = 3.0$ Hz), 27.8 (q, $J = 31.5$ Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -67.67, -83.71 (d, $J = 28.2$ Hz), -94.79 (d, $J = 28.2$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{26}\text{H}_{19}\text{F}_5\text{NO}_2^+$ $[\text{M}+\text{H}]^+$: 472.1330; Found: 472.1323.



(135)
2-(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-5-methoxy-1-(4-methoxyphenyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[*b*]indole

Prepared according to **General Procedure J** using *N*-triftoylhydrazone (383.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-methoxy-1*H*-indole (44.1 mg, 0.3 mmol) afforded **135** (138.8 mg, 92% yield) as a colorless oil.

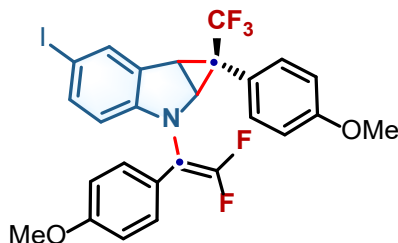
^1H NMR (500 MHz, CDCl_3) δ 7.19-7.16 (m, 2H), 7.14 (d, $J = 8.5$ Hz, 2H), 7.04 (d, $J = 2.5$ Hz, 1H), 6.91-6.87 (m, 2H), 6.71-6.65 (m, 2H), 6.50 (dd, $J = 8.5, 2.5$ Hz, 1H), 6.07 (dd, $J = 8.5, 2.5$ Hz, 1H), 4.26 (d, $J = 7.0$ Hz, 1H), 3.81 (s, 3H), 3.75 (s, 3H), 3.70 (s, 3H), 3.60 (d, $J = 7.0$ Hz, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ 159.6, 159.2, 155.3 (t, $J = 294.0$ Hz), 153.6, 142.4, 134.3, 129.3 (t, $J = 4.0$ Hz), 126.6, 126.0 (q, $J = 273.0$ Hz), 122.5 (dd, $J = 6.0, 1.5$ Hz), 119.4, 114.1, 113.11, 113.06, 111.6,

109.7 (d, $J = 3.0$ Hz), 101.4 (dd, $J = 31.5, 16.5$ Hz), 55.9, 55.3, 55.0, 51.7, 30.3 (q, $J = 3.0$ Hz), 27.3 (q, $J = 31.5$ Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -67.72, -87.85 (d, $J = 36.1$ Hz), -97.96 (d, $J = 36.1$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{27}\text{H}_{23}\text{F}_5\text{NO}_3^+ [\text{M}+\text{H}]^+$: 504.1593; Found: 504.1587.



(136)

2-(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-5-iodo-1-(4-methoxyphenyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

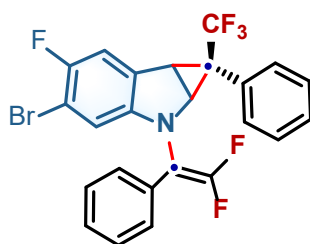
Prepared according to **General Procedure J** using *N*-triftoylhydrazone (383.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 5-iodo-1*H*-indole (72.9 mg, 0.3 mmol) afforded **136** (122.2 mg, 68% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 7.71 (d, $J = 1.5$ Hz, 1H), 7.18 (dd, $J = 8.5, 1.5$ Hz, 1H), 7.16-7.12 (m, 2H), 7.09 (d, $J = 8.5$ Hz, 2H), 6.91-6.86 (m, 2H), 6.71-6.66 (m, 2H), 5.94 (dd, $J = 8.5, 2.0$ Hz, 1H), 4.23 (d, $J = 7.0$ Hz, 1H), 3.82 (s, 3H), 3.72 (s, 3H), 3.58 (d, $J = 7.0$ Hz, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ 159.8, 159.4, 147.8, 136.3, 134.3, 133.9, 132.8-132.7 (m), 129.2 (t, $J = 3.0$ Hz), 128.2, 125.7 (q, $J = 273.0$ Hz), 121.7-121.6 (m), 118.8, 114.4, 114.3, 113.3, 111.0 (d, $J = 3.0$ Hz), 100.4 (dd, $J = 31.5, 16.5$ Hz), 55.3, 55.0, 51.1, 29.6 (q, $J = 1.5$ Hz), 26.9 (q, $J = 31.5$ Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -67.90, -86.45 (d, $J = 33.8$ Hz), -97.00 (d, $J = 33.8$ Hz).

HRMS (ESI) m/z calcd for $\text{C}_{26}\text{H}_{20}\text{F}_5\text{INO}_2^+ [\text{M}+\text{H}]^+$: 600.0453; Found: 600.0452.



(137)

4-bromo-2-(2,2-difluoro-1-phenylvinyl)-5-fluoro-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

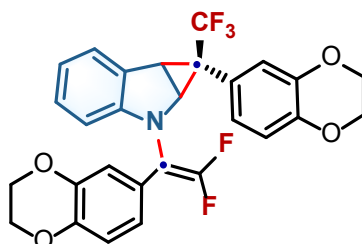
Prepared according to **General Procedure J** using *N*-triftoylhydrazone (356.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 6-bromo-5-fluoro-1*H*-indole (63.9 mg, 0.3 mmol) afforded **137** (128.3 mg, 84% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 7.43-7.33 (m, 3H), 7.26-7.15 (m, 8H), 6.30 (dd, $J = 5.5, 2.0$ Hz, 1H), 4.31 (d, $J = 7.0$ Hz, 1H), 3.63 (d, $J = 7.0$ Hz, 1H).

^{13}C NMR (125 MHz, CDCl_3) δ 155.8 (t, $J = 296.3$ Hz), 153.2 (d, $J = 236.3$ Hz), 145.0, 133.1, 129.6 (dd, $J = 5.0, 2.5$ Hz), 128.9, 128.8, 128.6, 127.9, 127.7 (dd, $J = 5.0, 3.8$ Hz), 126.8, 126.0 (d, $J = 7.5$ Hz), 125.4 (q, $J = 273.8$ Hz), 113.3 (d, $J = 25.0$ Hz), 112.7 (d, $J = 3.8$ Hz), 107.9 (d, $J = 23.8$ Hz), 100.9 (dd, $J = 32.5, 16.3$ Hz), 51.9, 29.9 (q, $J = 2.5$ Hz), 28.0 (q, $J = 31.3$ Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.76, -84.36 (d, *J* = 27.7 Hz), -94.22 (d, *J* = 27.7 Hz), (-118.72)-(-118.78) (m).

HRMS (ESI) *m/z* calcd for C₂₄H₁₅BrF₆N⁺ [M+H]⁺: 510.0287; Found: 510.0286.



(138)

1-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-2-(1-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-2,2-difluorovinyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

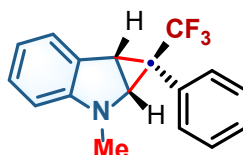
Prepared according to **General Procedure J** using *N*-triftoylhydrazone (408.6 mg, 0.9 mmol) derived from 1-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-2,2,2-trifluoroethan-1-one and indole (35.2 mg, 0.3 mmol) afforded **138** (130.2 mg, 82% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.40 (d, *J* = 7.5 Hz, 1H), 6.95 (t, *J* = 7.0 Hz, 1H), 6.84 (d, *J* = 8.5 Hz, 1H), 6.8-6.70 (m, 4H), 6.64-6.56 (m, 2H), 6.19 (dd, *J* = 8.0, 2.5 Hz, 1H), 4.29-4.24 (m, 4H), 4.22 (d, *J* = 7.5 Hz, 1H), 4.17-4.12 (m, 4H), 3.60 (d, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 155.1 (t, *J* = 295.5 Hz), 148.0, 143.8, 143.6, 143.4, 142.7, 127.5, 126.4, 125.9 (q, *J* = 273.0 Hz), 125.4, 125.2, 123.3 (dd, *J* = 6.0, 1.5 Hz), 122.2, 121.2 (t, *J* = 4.0 Hz), 120.2, 119.3, 117.6, 116.9 (t, *J* = 4.0 Hz), 116.3, 108.8 (d, *J* = 1.5 Hz), 100.4 (dd, *J* = 31.5, 16.5 Hz), 64.4, 64.27, 64.25, 64.0, 50.7, 30.2 (q, *J* = 3.0 Hz), 26.8 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -67.62, -86.13 (d, *J* = 32.7 Hz), -96.53 (d, *J* = 32.7 Hz).

HRMS (ESI) *m/z* calcd for C₂₈H₂₁F₅NO₄⁺ [M+H]⁺: 530.1385; Found: 530.1385.



(139) 2-methyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

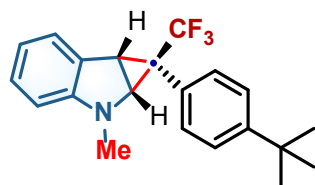
Prepared according to **General procedure K** using *N*-triftoylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **139** (84.0 mg, 97% yield) as a colorless oil;

¹H NMR (500 MHz, CDCl₃) δ 7.30 (d, *J* = 7.0 Hz, 1H), 7.13-7.04 (m, 5H), 6.88 (t, *J* = 7.5 Hz, 1H), 6.59 (t, *J* = 7.5 Hz, 1H), 6.02 (d, *J* = 8.0 Hz, 1H), 4.18 (d, *J* = 7.0 Hz, 1H), 3.58 (d, *J* = 7.0 Hz, 1H), 3.04 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 149.2, 133.3, 128.2, 127.9, 127.6, 127.4, 126.5 (q, *J* = 272.5 Hz), 125.3, 124.9, 116.7, 105.5, 50.6 (q, *J* = 3.8 Hz), 33.2, 30.0 (q, *J* = 2.5 Hz), 26.1 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -66.69.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₅F₃N⁺ [M + H]⁺: 290.1151, found 290.1150.



(140)

1-(4-(*tert*-butyl)phenyl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

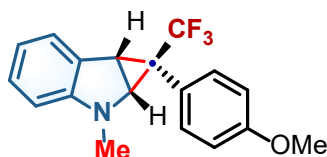
Prepared according to **General procedure K** using *N*-triftosylhydrazone (135.6 mg, 0.3 mmol) derived from 1-(4-(*tert*-butyl)phenyl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **140** (79.8 mg, 77% yield) as a colorless oil;

¹H NMR (500 MHz, CDCl₃) δ 7.25 (d, *J* = 7.5 Hz, 1H), 7.03 (d, *J* = 8.0 Hz, 2H), 6.96 (d, *J* = 8.0 Hz, 2H), 6.82 (t, *J* = 7.5 Hz, 1H), 6.54 (t, *J* = 7.5 Hz, 1H), 5.97 (d, *J* = 8.0 Hz, 1H), 4.10 (d, *J* = 7.0 Hz, 1H), 3.51 (d, *J* = 7.0 Hz, 1H), 2.98 (s, 3H), 1.12 (s, 9H).

¹³C NMR (125 MHz, CDCl₃) δ 150.7, 149.4, 132.9, 127.4, 126.7 (q, *J* = 272.5 Hz), 125.6, 125.2, 124.9, 124.3, 116.6, 105.6, 50.5 (q, *J* = 3.8 Hz), 34.4, 33.2, 31.2, 29.9 (q, *J* = 2.5 Hz), 25.7 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -66.68.

HRMS (ESI) *m/z* calcd. for C₂₁H₂₃F₃N⁺ [*M* + *H*]⁺ 346.1777, found 346.1776.



(141) 1-(4-methoxyphenyl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

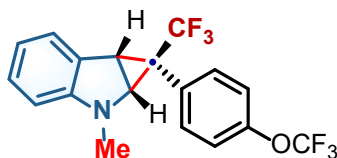
Prepared according to **General procedure K** using *N*-triftosylhydrazone (127.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **141** (70.8 mg, 74% yield) as a colorless oil;

¹H NMR (500 MHz, CDCl₃) δ 7.31 (d, *J* = 7.5 Hz, 1H), 7.05-7.00 (m, 2H), 6.91 (td, *J* = 8.0, 1.0 Hz, 1H), 6.66-6.57 (m, 3H), 6.07 (d, *J* = 8.0 Hz, 1H), 4.16 (d, *J* = 7.0 Hz, 1H), 3.67 (s, 3H), 3.56 (d, *J* = 7.0 Hz, 1H), 3.06 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 159.1, 149.5, 134.4, 127.5, 126.7 (q, *J* = 272.5 Hz), 125.2, 125.0, 120.1, 116.6, 113.0, 105.6, 55.0, 50.7 (q, *J* = 3.0 Hz), 33.2, 30.0 (q, *J* = 3.0 Hz), 25.4 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.98.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₇F₃NO⁺ [*M* + *H*]⁺ 320.1257, found 320.1256.



(142)

2-methyl-1-(4-(trifluoromethoxy)phenyl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

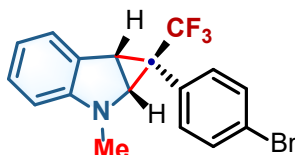
Prepared according to **General procedure K** using *N*-triftosylhydrazone (144.0 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethoxy)phenyl)ethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **142** (93.9 mg, 84% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.31 (d, *J* = 7.0 Hz, 1H), 7.12 (d, *J* = 8.5 Hz, 2H), 6.95-6.88 (m, 3H), 6.62 (t, *J* = 7.5 Hz, 1H), 6.07 (d, *J* = 8.0 Hz, 1H), 4.21 (d, *J* = 7.0 Hz, 1H), 3.61 (d, *J* = 7.0 Hz, 1H), 3.06 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 149.2, 148.8, 134.8, 127.8, 126.9, 126.2 (q, *J* = 273.0 Hz), 125.3, 124.5, 120.3 (q, *J* = 255.0 Hz), 119.7, 117.1, 105.9, 51.1 (q, *J* = 3.0 Hz), 33.5, 30.2 (q, *J* = 3.0 Hz), 25.4 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -57.84, -66.67.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₄F₆NO⁺ [*M* + *H*]⁺ 374.0974, found 374.0975.



(143) 1-(4-bromophenyl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

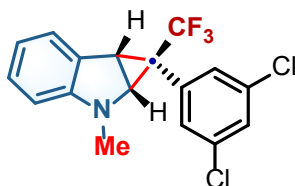
Prepared according to **General procedure K** using *N*-trifosylhydrazone (142.5 mg, 0.3 mmol) derived from 1-(4-bromophenyl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **143** (88.2 mg, 80% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.31 (d, *J* = 7.5 Hz, 1H), 7.23 (d, *J* = 8.0 Hz, 2H), 6.99 (d, *J* = 8.0 Hz, 2H), 6.94 (t, *J* = 7.5 Hz, 1H), 6.63 (t, *J* = 7.5 Hz, 1H), 6.10 (d, *J* = 8.0 Hz, 1H), 4.20 (d, *J* = 7.0 Hz, 1H), 3.60 (d, *J* = 7.0 Hz, 1H), 3.06 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 149.2, 134.9, 130.8, 127.8, 127.4, 126.1 (q, *J* = 272.5 Hz), 125.3, 124.5, 122.3, 117.0, 106.0, 51.0 (q, *J* = 3.8 Hz), 33.4, 30.1 (q, *J* = 3.8 Hz), 25.5 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -66.70.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄BrF₃N⁺ [*M* + *H*]⁺ 368.0256 found 368.0255.



(144)

1-(3,5-dichlorophenyl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

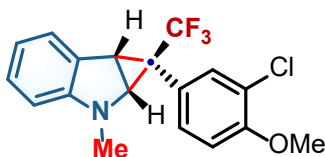
Prepared according to **General procedure K** using *N*-trifosylhydrazone (139.5 mg, 0.3 mmol) derived from 1-(3,5-dichlorophenyl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **144** (101.1 mg, 94% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.34 (d, *J* = 7.4 Hz, 1H), 7.11 (s, 1H), 7.02-6.95 (m, 3H), 6.68 (t, *J* = 7.4 Hz, 1H), 6.16 (d, *J* = 8.0 Hz, 1H), 4.21 (d, *J* = 7.2 Hz, 1H), 3.62 (d, *J* = 7.2 Hz, 1H), 3.09 (s, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 149.0, 133.7, 131.8, 131.7, 128.4, 128.1, 125.9 (q, *J* = 274.0 Hz), 125.4, 124.1, 117.5, 106.2, 51.2 (q, *J* = 3.0 Hz), 33.5, 30.4 (q, *J* = 3.0 Hz), 25.5 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.42.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₃Cl₂F₃N⁺ [*M* + *H*]⁺ 358.0372, found 358.0371.



(145)

1-(3-chloro-4-methoxyphenyl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

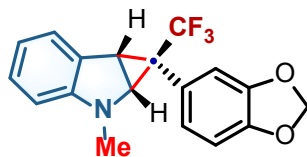
Prepared according to **General procedure K** using *N*-trifosylhydrazone (138.0 mg, 0.3 mmol) derived from 1-(3-chloro-4-methoxyphenyl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **145** (103.8 mg, 98% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.32 (d, *J* = 7.3 Hz, 1H), 7.15 (s, 1H), 6.96-6.92 (m, 2H), 6.66-6.61 (m, 2H), 6.11 (d, *J* = 7.9 Hz, 1H), 4.18 (d, *J* = 7.2 Hz, 1H), 3.76 (s, 3H), 3.58 (d, *J* = 7.2 Hz, 1H), 3.08 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 154.6, 149.3, 134.8, 132.8, 127.8, 126.4 (q, *J* = 271.5 Hz), 125.3, 124.6, 121.23, 121.20, 117.0, 111.0, 105.9, 55.8, 50.9 (q, *J* = 3.0 Hz), 33.3, 30.2 (q, *J* = 3.0 Hz), 25.2 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.84.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₆ClF₃NO⁺ [*M* + *H*]⁺ 354.0867, found 354.0866.



(146)

1-(benzo[d][1,3]dioxol-5-yl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

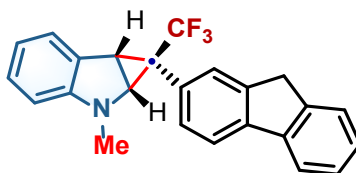
Prepared according to **General procedure K** using *N*-trifosylhydrazone (132.0 mg, 0.3 mmol) derived from 1-(benzo[d][1,3]dioxol-5-yl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **146** (90.0 mg, 90% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.31 (d, *J* = 7.0 Hz, 1H), 6.96 (t, *J* = 7.5 Hz, 1H), 6.67-6.58 (m, 3H), 6.55 (d, *J* = 8.0 Hz, 1H), 6.14 (d, *J* = 8.0 Hz, 1H), 5.83-5.79 (m, 2H), 4.16 (d, *J* = 7.0 Hz, 1H), 3.57 (d, *J* = 7.0 Hz, 1H), 3.08 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 149.4, 147.2, 146.7, 127.6, 127.2, 126.5 (q, *J* = 272.5 Hz), 125.3, 124.8, 121.5, 116.8, 113.1, 107.5, 105.7, 100.8, 50.9 (q, *J* = 3.8 Hz), 33.3, 30.2 (q, *J* = 2.5 Hz), 25.6 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -66.99.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₅F₃NO₂⁺ [*M* + *H*]⁺ 334.1049, found 334.1047.



(147) 1-(9*H*-fluoren-2-yl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

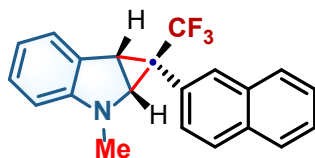
Prepared according to **General procedure K** using *N*-triftosylhydrazone (145.2 mg, 0.3 mmol) derived from 1-(9*H*-fluoren-2-yl)-2,2,2-trifluoroethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **147** (105.3 mg, 93% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.58 (d, *J* = 7.5 Hz, 1H), 7.45 (d, *J* = 7.8 Hz, 1H), 7.40 (d, *J* = 7.3 Hz, 1H), 7.30 (d, *J* = 7.3 Hz, 1H), 7.27-7.22 (m, 2H), 7.19 (t, *J* = 7.1 Hz, 1H), 7.08 (d, *J* = 7.8 Hz, 1H), 6.79 (t, *J* = 7.6 Hz, 1H), 6.55 (t, *J* = 7.4 Hz, 1H), 5.95 (d, *J* = 7.9 Hz, 1H), 4.17 (d, *J* = 7.2 Hz, 1H), 3.72-3.55 (m, 3H), 3.02 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 149.3, 143.4, 142.3, 141.33, 141.25, 131.9, 129.9, 127.6, 126.7, 126.64 (q, *J* = 272.5 Hz), 126.61, 125.3, 124.92, 124.89, 121.4, 119.9, 118.8, 116.6, 105.6, 50.8 (q, *J* = 3.8 Hz), 36.6, 33.2, 30.1 (q, *J* = 3.8 Hz), 26.1 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -66.56.

HRMS (ESI) *m/z* calcd. for C₂₄H₁₉F₃N⁺ [*M* + *H*]⁺ 378.1464, found 378.1466.



(148) 2-methyl-1-(naphthalen-2-yl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

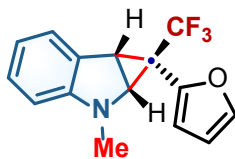
Prepared according to **General procedure K** using *N*-triftosylhydrazone (133.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(naphthalen-2-yl)ethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **148** (68.1 mg, 67% yield) as a colorless oil.

¹H NMR (600 MHz, CDCl₃) δ 7.71-7.65 (m, 2H), 7.63 (s, 1H), 7.57 (d, *J* = 8.4 Hz, 1H), 7.42-7.36 (m, 3H), 7.23 (d, *J* = 8.4 Hz, 1H), 6.81 (td, *J* = 7.8, 1.2, 1H), 6.60 (t, *J* = 7.2 Hz, 1H), 5.97 (d, *J* = 7.8 Hz, 1H), 4.29 (d, *J* = 7.2 Hz, 1H), 3.69 (d, *J* = 7.2 Hz, 1H), 3.10 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 149.3, 133.3, 132.8, 132.7, 130.3, 127.8, 127.6, 127.5, 127.0, 126.6 (q, *J* = 273.0 Hz), 126.1, 125.8, 125.6, 125.4, 124.8, 116.8, 105.8, 50.9 (q, *J* = 3.0 Hz), 33.3, 30.2 (q, *J* = 3.0 Hz), 26.2 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.46.

HRMS (ESI) *m/z* calcd. for C₂₁H₁₇F₃N⁺ [*M* + *H*]⁺ 340.1308, found 340.1305.



(149) 1-(furan-2-yl)-2-methyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

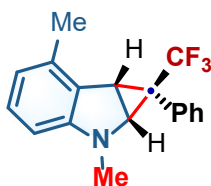
Prepared according to **General procedure K** using *N*-triftosylhydrazone (115.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(furan-2-yl)ethan-1-one and 1-methyl-1*H*-indole (78.6 mg, 0.6 mmol) afforded **149** (67.8 mg, 81% yield) as a colorless oil.

¹H NMR (600 MHz, CDCl₃) δ 7.31 (d, *J* = 7.8 Hz, 1H), 7.21-7.18 (m, 1H), 7.01 (td, *J* = 7.8, 0.6 Hz, 1H), 6.66 (t, *J* = 7.2 Hz, 1H), 6.19 (d, *J* = 7.8 Hz, 1H), 6.04 (dd, *J* = 3.0, 1.8 Hz, 1H), 5.84 (d, *J* = 3.6 Hz, 1H), 4.19 (d, *J* = 7.2 Hz, 1H), 3.60 (d, *J* = 7.2 Hz, 1H), 3.00 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 149.5, 143.4, 142.5, 128.0, 125.8 (q, *J* = 271.5 Hz), 125.2, 124.8, 117.1, 113.6, 110.1, 105.7, 49.7, 32.4, 30.6 (q, *J* = 3.0 Hz), 20.0 (q, *J* = 33.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.50.

HRMS (ESI) m/z calcd. for $C_{15}H_{13}F_3NO^+$ $[M + H]^+$ 280.0944, found 280.0942.



(150) 2,6-dimethyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

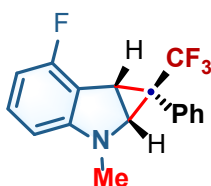
Prepared according to **General procedure K** using *N*-trifosylhydrazine (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1,4-dimethyl-1*H*-indole (87.0 mg, 0.6 mmol) afforded **150** (74.4 mg, 82% yield) as a colorless oil.

1H NMR (500 MHz, $CDCl_3$) δ 7.14-7.05 (m, 5H), 6.82 (t, $J = 7.5$ Hz, 1H), 6.44 (d, $J = 7.5$ Hz, 1H), 5.90 (d, $J = 8.0$ Hz, 1H), 4.20 (d, $J = 7.5$ Hz, 1H), 3.56 (d, $J = 7.5$ Hz, 1H), 3.06 (s, 3H), 2.49 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 149.2, 134.5, 133.1, 128.4, 127.9, 127.7, 127.5, 126.6 (q, $J = 272.5$ Hz), 123.9, 118.0, 103.1, 50.7 (q, $J = 3.8$ Hz), 33.3, 28.7 (q, $J = 3.8$ Hz), 26.3 (q, $J = 32.5$ Hz), 18.7.

^{19}F NMR (470 MHz, $CDCl_3$) δ -66.67.

HRMS (ESI) m/z calcd. for $C_{18}H_{17}F_3N^+$ $[M + H]^+$ 304.1308, found 304.1305.



(151) 6-fluoro-2-methyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

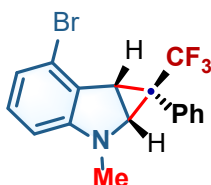
Prepared according to **General procedure K** using *N*-trifosylhydrazine (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 4-fluoro-1-methyl-1*H*-indole (89.4 mg, 0.6 mmol) afforded **151** (67.2 mg, 73% yield) as a colorless oil.

1H NMR (600 MHz, $CDCl_3$) δ 7.18-7.13 (m, 5H), 6.84 (td, $J = 8.1, 5.7$ Hz, 1H), 6.32 (t, $J = 8.7$ Hz, 1H), 5.83 (d, $J = 7.9$ Hz, 1H), 4.23 (d, $J = 7.3$ Hz, 1H), 3.73 (d, $J = 7.3$ Hz, 1H), 3.08 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 160.5 (d, $J = 243.0$ Hz), 151.9 (d, $J = 7.5$ Hz), 132.9, 129.3 (d, $J = 9.0$ Hz), 128.2, 128.1, 127.7, 126.3 (q, $J = 273.0$ Hz), 111.2 (d, $J = 21.0$ Hz), 103.6 (d, $J = 21.0$ Hz), 101.5 (d, $J = 3.0$ Hz), 51.0 (q, $J = 3.0$ Hz), 33.4, 26.5 (q, $J = 3.0$ Hz), 26.2 (q, $J = 31.5$ Hz).

^{19}F NMR (564 MHz, $CDCl_3$) δ -66.93, (-121.35)-(-121.39) (m).

HRMS (ESI) m/z calcd. for $C_{17}H_{14}F_4N^+$ $[M + H]^+$ 308.1057, found 308.1059.



(152) 6-bromo-2-methyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

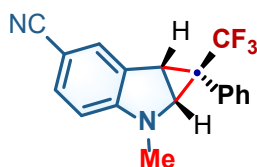
Prepared according to **General procedure K** using *N*-trifosylhydrazine (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 4-bromo-1-methyl-1*H*-indole (126.0 mg, 0.6 mmol) afforded **152** (84.9 mg, 77% yield) as a colorless oil; mp.

¹H NMR (500 MHz, CDCl₃) δ 7.20-7.10 (m, 5H), 6.77-6.70 (m, 2H), 5.98-5.92 (m, 1H), 4.21 (d, *J* = 7.0 Hz, 1H), 3.66 (d, *J* = 7.0 Hz, 1H), 3.06 (s, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 150.1, 133.1, 129.1, 128.2, 128.0, 127.7, 126.3 (q, *J* = 271.5 Hz), 125.6, 120.1, 119.5, 104.2, 50.1 (q, *J* = 3.0 Hz), 33.3, 40.0 (q, *J* = 3.0 Hz), 26.3 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.98.

HRMS (ESI) *m/z* calcd. for C₁₇H₁₄BrF₃N⁺ [*M* + *H*]⁺ 368.0256, found 368.0259.



(153)

2-methyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole-5-carbonitrile

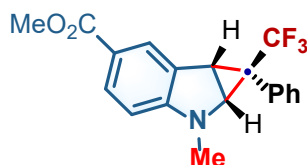
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-methyl-1*H*-indole-5-carbonitrile (93.6 mg, 0.6 mmol) afforded **153** (83.7 mg, 89% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.54 (d, *J* = 1.5 Hz, 1H), 7.17 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.16-7.11 (m, 3H), 7.09-7.04 (m, 2H), 6.01 (d, *J* = 8.5 Hz, 1H), 4.27 (d, *J* = 7.0 Hz, 1H), 3.60 (d, *J* = 7.0 Hz, 1H), 3.10 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 151.8, 133.0, 132.9, 128.9, 128.5, 127.9, 127.1, 125.9 (q, *J* = 272.5 Hz), 125.6, 120.5, 105.2, 98.6, 50.5 (q, *J* = 3.8 Hz), 32.9, 29.1 (q, *J* = 3.8 Hz), 26.5 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.12.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₄F₃N₂⁺ [*M* + *H*]⁺ 315.1104, found 315.1101.



(154)

methyl

2-methyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole-5-carboxylate

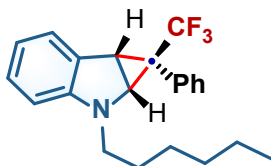
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and methyl 1-methyl-1*H*-indole-5-carboxylate (113.4 mg, 0.6 mmol) afforded **154** (90.6 mg, 87% yield) as a colorless oil.

¹H NMR (600 MHz, CDCl₃) δ 8.01 (s, 1H), 7.65 (d, *J* = 8.4 Hz, 1H), 7.10 (s, 5H), 5.99 (d, *J* = 8.4 Hz, 1H), 4.24 (d, *J* = 7.2 Hz, 1H), 3.84 (s, 3H), 3.60 (d, *J* = 7.2 Hz, 1H), 3.08 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 167.2, 152.5, 133.1, 130.7, 128.2, 127.7, 127.5, 127.1, 126.1 (q, *J* = 271.5 Hz), 124.7, 118.3, 104.3, 51.5, 50.7 (q, *J* = 3.0 Hz), 32.8, 29.4 (q, *J* = 3.0 Hz), 26.6 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.98.

HRMS (ESI) *m/z* calcd. for C₁₉H₁₇F₃NO₂⁺ [*M* + *H*]⁺ 348.1206, found 348.1202.



(155) 2-hexyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

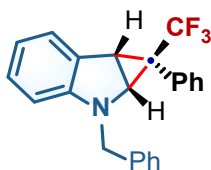
Prepared according to **General procedure K** using *N*-trifosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-hexyl-1*H*-indole (120.6 mg, 0.6 mmol) afforded **155** (98.1 mg, 91% yield) as a colorless oil.

¹H NMR (600 MHz, CDCl₃) δ 7.34 (d, *J* = 7.2 Hz, 1H), 7.17-7.13 (m, 2H), 7.12-7.08 (m, 3H), 6.90 (td, *J* = 7.8, 1.2 Hz, 1H), 6.62 (td, *J* = 7.8, 0.6 Hz, 1H), 6.12 (d, *J* = 7.8 Hz, 1H), 4.28 (d, *J* = 7.2 Hz, 1H), 3.61 (d, *J* = 7.2 Hz, 1H), 3.43-3.35 (m, 1H), 3.33-3.26 (m, 1H), 1.79-1.66 (m, 2H), 1.43-1.30 (m, 6H), 0.94 (t, *J* = 7.0 Hz, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 149.4, 133.4, 128.3, 127.8, 127.4, 127.3, 126.5 (q, *J* = 273.0 Hz), 125.4, 125.2, 116.8, 106.3, 50.2 (q, *J* = 3.0 Hz), 47.7, 31.7, 30.1 (q, *J* = 3.0 Hz), 28.6, 26.9, 26.1 (q, *J* = 31.5 Hz), 22.6, 14.0.

¹⁹F NMR (564 MHz, CDCl₃) δ -66.67.

HRMS (ESI) *m/z* calcd. for C₂₂H₂₅F₃N⁺ [*M* + *H*]⁺ 360.1934, found 360.1933.



(156) 2-benzyl-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

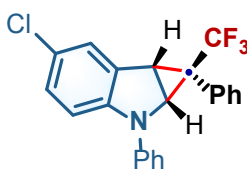
Prepared according to **General procedure K** using *N*-trifosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-benzyl-1*H*-indole (124.2 mg, 0.6 mmol) afforded **156** (65.7 mg, 60% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.37-7.27 (m, 4H), 7.27-7.22 (m, 2H), 7.12-7.05 (m, 5H), 6.85 (t, *J* = 7.5 Hz, 1H), 6.63 (t, *J* = 7.5 Hz, 1H), 6.11 (d, *J* = 8.0 Hz, 1H), 4.61 (d, *J* = 16.0 Hz, 1H), 4.48 (d, *J* = 16.0 Hz, 1H), 4.24 (d, *J* = 7.5 Hz, 1H), 3.60 (d, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 149.3, 137.6, 133.5, 128.7, 128.1, 127.9, 127.6, 127.48, 127.47, 127.4, 126.4 (q, *J* = 273.0 Hz), 125.5, 125.2, 117.4, 106.6, 51.29, 50.1 (q, *J* = 3.0 Hz), 30.1 (q, *J* = 3.0 Hz), 26.6 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.76.

HRMS (ESI) *m/z* calcd. for C₂₃H₁₉F₃N⁺ [*M* + *H*]⁺ 336.1464, found 336.1466.



(157) 5-chloro-1,2-diphenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

Prepared according to **General procedure K** using *N*-trifosylhydrazone (118.8 mg, 0.3 mmol) derived

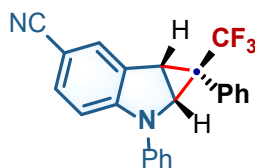
from 2,2,2-trifluoro-1-phenylethan-1-one and 5-chloro-1-phenyl-1*H*-indole (136.2 mg, 0.6 mmol) afforded **157** (113.1 mg, 98% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.46-7.39 (m, 3H), 7.37 (d, *J* = 8.0 Hz, 2H), 7.16-7.04 (m, 6H), 6.88 (d, *J* = 8.5 Hz, 1H), 6.67 (d, *J* = 8.5 Hz, 1H), 4.64 (d, *J* = 7.0 Hz, 1H), 3.66 (d, *J* = 7.0 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 142.9, 142.1, 133.0, 129.6, 128.8, 128.2, 127.8, 127.5, 127.0, 126.1 (q, *J* = 272.5 Hz), 126.0, 123.7, 122.9, 118.7, 110.5, 49.7 (q, *J* = 3.8 Hz), 28.7 (q, *J* = 2.5 Hz), 27.7 (q, *J* = 32.5 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.07.

HRMS (ESI) *m/z* calcd. for C₂₂H₁₆ClF₃N⁺ [*M* + *H*]⁺ 386.0918, found 386.0911.



(158) 1,2-diphenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole-5-carbonitrile

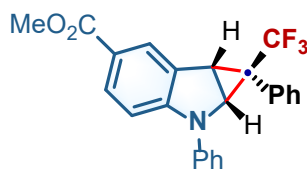
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-phenyl-1*H*-indole-5-carbonitrile (130.8 mg, 0.6 mmol) afforded **158** (59.7 mg, 53% yield) as a colorless oil.

¹H NMR (600 MHz, CDCl₃) δ 7.68 (d, *J* = 1.2 Hz, 1H), 7.49-7.45 (m, 2H), 7.36 (d, *J* = 7.8 Hz, 2H), 7.24-7.18 (m, 2H), 7.16-7.12 (m, 1H), 7.12-7.07 (m, 4H), 6.71 (d, *J* = 8.4 Hz, 1H), 4.70 (d, *J* = 7.2 Hz, 1H), 3.72 (d, *J* = 7.2 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 147.7, 140.7, 133.0, 132.6, 129.78, 129.75, 128.6, 128.0, 127.8, 126.5, 125.8 (q, *J* = 270.0 Hz), 124.7, 124.6, 120.0, 109.2, 101.3, 49.9 (q, *J* = 3.8 Hz), 28.5 (q, *J* = 3.8 Hz), 27.6 (q, *J* = 31.3 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.24.

HRMS (ESI) *m/z* calcd. for C₂₃H₁₆F₃N₂⁺ [*M* + *H*]⁺ 377.1260, found 377.1265.



(159)

methyl

1,2-diphenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole-5-carboxylate

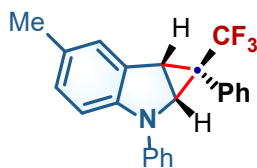
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and methyl 1-phenyl-1*H*-indole-5-carboxylate (150.6 mg, 0.6 mmol) afforded **159** (94.5 mg, 77% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 8.15 (s, 1H), 7.67 (d, *J* = 8.5 Hz, 1H), 7.46 (t, *J* = 7.5 Hz, 2H), 7.41 (d, *J* = 7.5 Hz, 2H), 7.21-7.12 (m, 3H), 7.12-7.03 (m, 3H), 6.73 (d, *J* = 8.5 Hz, 1H), 4.68 (d, *J* = 7.0 Hz, 1H), 3.88 (s, 3H), 3.72 (d, *J* = 7.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 166.8, 148.0, 141.3, 133.0, 130.2, 129.6, 128.2, 127.8, 127.7, 127.0, 126.9, 125.9 (q, *J* = 273.0 Hz), 123.8, 120.8, 119.6, 108.4, 51.7, 49.8 (q, *J* = 3.0 Hz), 28.7 (q, *J* = 3.0 Hz), 27.8 (q, *J* = 31.5 Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -67.07.

HRMS (ESI) m/z calcd. for $\text{C}_{24}\text{H}_{19}\text{F}_3\text{NO}_2^+$ $[\text{M} + \text{H}]^+$ 410.1362, found 410.1355.



(160) 5-methyl-1,2-diphenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

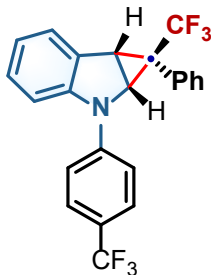
Prepared according to **General procedure K** using *N*-trifosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 5-methyl-1-phenyl-1*H*-indole (124.2 mg, 0.6 mmol) afforded **160** (106.2 mg, 97% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 7.47-7.41 (m, 4H), 7.32 (d, J = 7.5 Hz, 1H), 7.14 (d, J = 7.5 Hz, 2H), 7.12-7.03 (m, 4H), 6.62 (s, 1H), 6.59 (d, J = 7.5 Hz, 1H), 4.62 (d, J = 7.0 Hz, 1H), 3.66 (d, J = 7.0 Hz, 1H), 2.16 (s, 3H).

^{13}C NMR (125 MHz, CDCl_3) δ 144.5, 142.6, 137.4, 133.2, 129.4, 128.6, 127.9, 127.5, 126.2 (q, J = 272.5 Hz), 125.7, 124.2, 122.3, 120.2, 118.7, 110.5, 49.5 (q, J = 3.8 Hz), 28.7 (q, J = 2.5 Hz), 27.8 (q, J = 31.3 Hz), 21.7.

^{19}F NMR (470 MHz, CDCl_3) δ -66.85.

HRMS (ESI) m/z calcd. for $\text{C}_{29}\text{H}_{13}\text{F}_3\text{N}^+$ $[\text{M} + \text{H}]^+$ 366.1464, found 366.1462.



(161)

1-phenyl-1-(trifluoromethyl)-2-(4-(trifluoromethyl)phenyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

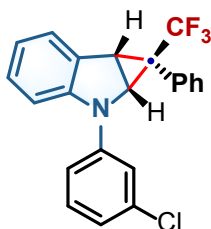
Prepared according to **General procedure K** using *N*-trifosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(4-(trifluoromethyl)phenyl)-1*H*-indole (156.6 mg, 0.6 mmol) afforded **161** (113.1 mg, 90% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 7.67 (d, J = 9.0 Hz, 2H), 7.52-7.46 (m, 3H), 7.11-7.00 (m, 5H), 6.97 (td, J = 8.0, 1.5 Hz, 1H), 6.85-6.80 (m, 2H), 4.60 (d, J = 7.5 Hz, 1H), 3.71 (d, J = 7.5 Hz, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ 145.3, 143.2, 132.9, 128.2, 127.74, 127.71, 127.6, 127.0, 126.8 (q, J = 3.0 Hz), 126.4, 126.0 (q, J = 273.0 Hz), 124.3 (q, J = 270.0 Hz), 123.7 (q, J = 32.5 Hz), 120.4, 117.5, 110.4, 48.3 (q, J = 3.0 Hz), 28.8 (q, J = 3.0 Hz), 28.6 (q, J = 31.5 Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -61.75, -67.06.

HRMS (ESI) m/z calcd. for $\text{C}_{23}\text{H}_{16}\text{F}_6\text{N}^+$ $[\text{M} + \text{H}]^+$ 420.1181, found 420.1180.



(162) 2-(3-chlorophenyl)-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

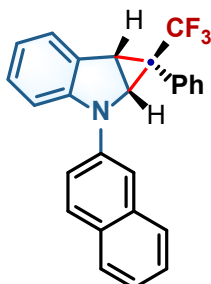
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(3-chlorophenyl)-1*H*-indole (136.2 mg, 0.6 mmol) afforded **162** (102.9 mg, 89% yield) as a colorless oil;

¹H NMR (500 MHz, CDCl₃) δ 7.45 (d, *J* = 7.4 Hz, 1H), 7.39 (s, 1H), 7.35 (t, *J* = 8.0 Hz, 1H), 7.29 (d, *J* = 8.1 Hz, 1H), 7.12-7.01 (m, 6H), 6.95 (t, *J* = 7.7 Hz, 1H), 6.82-6.75 (m, 2H), 4.58 (d, *J* = 7.3 Hz, 1H), 3.69 (d, *J* = 7.3 Hz, 1H).

¹³C NMR (125 MHz, CDCl₃) δ 143.7, 143.6, 135.2, 133.0, 130.5, 128.1, 127.7, 127.6, 127.3, 127.1, 126.3, 126.1 (q, *J* = 272.5 Hz), 122.4, 120.0, 118.3, 116.5, 110.2, 48.9 (q, *J* = 3.8 Hz), 28.9 (q, *J* = 2.5 Hz), 28.2 (q, *J* = 32.5 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -66.99.

HRMS (ESI) *m/z* calcd. for C₂₂H₁₆ClF₃N⁺ [*M* + *H*]⁺ 386.0918, found 386.0911.



(163) 2-(naphthalen-2-yl)-1-phenyl-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

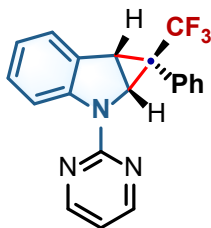
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(naphthalen-2-yl)-1*H*-indole (145.8 mg, 0.6 mmol) afforded **163** (101.1 mg, 84% yield) as a white solid; mp: 101-103 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.92 (d, *J* = 8.5 Hz, 1H), 7.88-7.84 (m, 2H), 7.78-7.75 (m, 1H), 7.69 (dd, *J* = 9.0, 2.5 Hz, 1H), 7.57-7.52 (m, 1H), 7.50 (d, *J* = 7.5 Hz, 1H), 7.48-7.42 (m, 1H), 7.23-7.17 (m, 2H), 7.14-7.03 (m, 3H), 7.03-6.97 (m, 1H), 6.92 (d, *J* = 8.0 Hz, 1H), 6.86-6.81 (m, 1H), 4.77 (d, *J* = 7.5 Hz, 1H), 3.77 (d, *J* = 7.5 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 144.1, 140.1, 134.2, 133.2, 129.8, 129.3, 128.1, 127.7, 127.6, 127.4, 127.2, 127.0, 126.8, 126.3 (q, *J* = 273.0 Hz), 126.2, 124.5, 119.5, 119.2, 114.6, 109.9, 49.2 (q, *J* = 3.0 Hz), 29.1 (q, *J* = 3.0 Hz), 27.8 (q, *J* = 31.5 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -66.74.

HRMS (ESI) *m/z* calcd. for C₂₆H₁₉F₃N⁺ [*M* + *H*]⁺ 402.1464, found 402.1463.



(164) 1-phenyl-2-(pyrimidin-2-yl)-1-(trifluoromethyl)-1,1a,2,6b-tetrahydrocyclopropa[b]indole

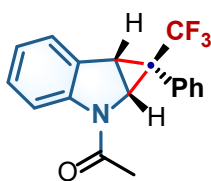
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(pyrimidin-2-yl)-1*H*-indole (117.0 mg, 0.6 mmol) afforded **164** (91.2 mg, 68% yield) as a colorless oil;

¹H NMR (500 MHz, CDCl₃) δ 8.58 (d, *J* = 4.5 Hz, 2H), 7.99 (d, *J* = 8.5 Hz, 1H), 7.45 (d, *J* = 7.5 Hz, 1H), 7.04 (t, *J* = 7.5 Hz, 2H), 7.00 (d, *J* = 7.5 Hz, 2H), 6.98-6.94 (m, 2H), 6.91 (t, *J* = 7.5 Hz, 1H), 6.86-6.81 (m, 1H), 5.31 (d, *J* = 7.0 Hz, 1H), 3.62 (d, *J* = 7.0 Hz, 1H).

¹³C NMR (150 MHz, CDCl₃) δ 159.4, 157.7, 142.7, 132.9, 128.3, 128.1, 127.7, 127.6, 127.5, 125.9 (q, *J* = 273.0 Hz), 125.3, 121.6, 115.6, 113.0, 45.8 (q, *J* = 3.0 Hz), 30.7 (q, *J* = 31.5 Hz), 28.2 (q, *J* = 3.0 Hz).

¹⁹F NMR (564 MHz, CDCl₃) δ -67.25.

HRMS (ESI) *m/z* calcd. for C₂₀H₁₅F₃N₃⁺ [*M* + *H*]⁺ 354.1213, found 354.1212.



(165) 1-(1-phenyl-1-(trifluoromethyl)-1a,6b-dihydrocyclopropa[b]indol-2(1*H*)-yl)ethan-1-one

d.r. = 5:1

Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(1*H*-indol-1-yl)ethan-1-one (95.4 mg, 0.6 mmol) afforded **165** (72.3 mg, 76% yield) as a colorless oil;

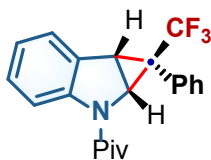
¹H NMR (500 MHz, CDCl₃) **major** : δ 7.77 (d, *J* = 7.5 Hz, 1H), 7.40 (d, *J* = 7.0 Hz, 1H), 7.17-6.93 (m, 7H), 4.60 (d, *J* = 7.5 Hz, 1H), 3.63 (d, *J* = 7.5 Hz, 1H), 2.56 (s, 3H). **minor** : δ 7.46 (d, *J* = 6.5 Hz, 1H), 7.17-6.93 (m, 7H), 6.72 (d, *J* = 7.0 Hz, 1H), 5.13 (d, *J* = 7.0 Hz, 1H), 3.51 (d, *J* = 7.0 Hz, 1H), 2.33 (s, 1H).

¹³C NMR (150 MHz, CDCl₃) **major** : δ 168.5, 142.5, 132.4, 128.5, 128.2, 128.1, 127.6, 126.5, 125.12 (q, *J* = 273.0 Hz), 125.11, 123.7, 116.9, 45.6 (q, *J* = 3.0 Hz), 31.8 (q, *J* = 33.0 Hz), 29.2 (q, *J* = 3.0 Hz), 24.4.

minor : δ 169.2, 140.6, 132.8, 129.6, 128.4, 128.3, 128.1, 127.1, 126.4, 125.3 (q, *J* = 271.5 Hz), 123.1, 113.2, 44.3 (q, *J* = 3.0 Hz), 32.1 (q, *J* = 36.0 Hz), 27.4-27.2 (m), 25.0,

¹⁹F NMR (564 MHz, CDCl₃) δ -67.65.

HRMS (ESI) *m/z* calcd. for C₁₈H₁₅F₃NO⁺ [*M* + *H*]⁺ 318.1100, found 318.1094.



(166) 2,2-dimethyl-1-(1-phenyl-1-(trifluoromethyl)-1a,6b-dihydrocyclopropa[b]indol-2(1H)-yl)propan-1-one

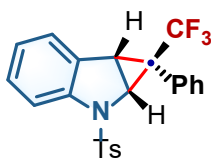
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(1*H*-indol-1-yl)-2,2-dimethylpropan-1-one (120.6 mg, 0.6 mmol) afforded **166** (66.9 mg, 62% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.84 (d, *J* = 8.0 Hz, 1H), 7.39 (d, *J* = 7.5 Hz, 1H), 7.16-7.04 (m, 5H), 7.03-6.93 (m, 2H), 5.06 (d, *J* = 7.5 Hz, 1H), 3.68 (d, *J* = 7.5 Hz, 1H), 1.61 (s, 9H).

¹³C NMR (150 MHz, CDCl₃) δ 176.8, 143.8, 132.4, 128.3, 128.0, 127.8, 127.3, 126.7, 125.4 (q, *J* = 273.0 Hz), 124.9, 123.6, 118.0, 45.6 (q, *J* = 3.0 Hz), 40.7, 30.9 (q, *J* = 31.5 Hz), 29.7 (q, *J* = 3.8 Hz), 28.2.

¹⁹F NMR (564 MHz, CDCl₃) δ -67.26.

HRMS (ESI) *m/z* calcd. for C₂₁H₂₁F₃NO⁺ [*M* + *H*]⁺ 360.1570, found 360.1569.



(167) 1-phenyl-2-tosyl-1-(trifluoromethyl)-1a,2,6b-tetrahydrocyclopropa[b]indole

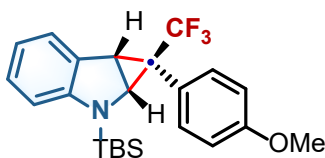
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-tosyl-1*H*-indole (162.6 mg, 0.6 mmol) afforded **167** (60.6 mg, 47% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.66 (d, *J* = 8.0 Hz, 2H), 7.31 (d, *J* = 7.5 Hz, 1H), 7.25-7.20 (m, 3H), 7.19 (d, *J* = 6.0 Hz, 2H), 7.15-7.07 (m, 3H), 7.00-6.95 (m, 1H), 6.95-6.91 (m, 1H), 4.79 (d, *J* = 7.0 Hz, 1H), 3.40 (d, *J* = 7.0 Hz, 1H), 2.37 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 144.5, 141.2, 135.1, 133.0, 129.8, 128.5, 128.3, 127.9, 127.7, 126.9, 126.3, 125.5, 125.1 (q, *J* = 273.0 Hz), 123.8, 114.8, 47.3 (q, *J* = 4.5 Hz), 29.8 (q, *J* = 31.5 Hz), 28.6 (q, *J* = 3.0 Hz), 21.5.

¹⁹F NMR (564 MHz, CDCl₃) δ -68.06.

HRMS (ESI) *m/z* calcd. for C₂₃H₁₉F₃NO₂S⁺ [*M* + *H*]⁺ 430.1083, found 430.1086.



(168)

2-(tert-butyldimethylsilyl)-1-(4-methoxyphenyl)-1-(trifluoromethyl)-1a,2,6b-tetrahydrocyclopropa[b]indole

Prepared according to **General procedure K** using *N*-triftosylhydrazone (144.0 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-(4-(trifluoromethoxy)phenyl)ethan-1-one and 1-(tert-butyldimethylsilyl)-1*H*-indole (138.6 mg, 0.6 mmol) afforded **168** (121.8 mg, 97% yield) as a

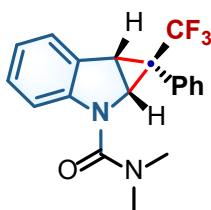
colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.30 (d, *J* = 7.0 Hz, 1H), 7.07-7.03 (m, 2H), 6.82-6.77 (m, 1H), 6.66-6.59 (m, 3H), 6.35 (d, *J* = 8.0 Hz, 1H), 4.23 (d, *J* = 7.0 Hz, 1H), 3.67 (s, 3H), 3.53 (d, *J* = 7.0 Hz, 1H), 0.96 (s, 9H), 0.57 (s, 3H), 0.33 (s, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 158.9, 150.6, 134.5, 128.4, 126.9, 126.6 (q, *J* = 273.0 Hz), 125.3, 120.0, 117.8, 112.8, 111.1, 54.9, 49.2 (q, *J* = 3.0 Hz), 30.8 (q, *J* = 3.0 Hz), 26.7, 25.1 (q, *J* = 31.5 Hz), 20.6, -3.7, -4.1.

¹⁹F NMR (564 MHz, CDCl₃) δ -66.68.

HRMS (ESI) *m/z* calcd. for C₂₃H₂₉F₃NOSi⁺ [*M* + *H*]⁺ 420.1965, found 420.1963.



(169)

***N,N*-dimethyl-1-phenyl-1-(trifluoromethyl)-1a,6b-dihydrocyclopropa[*b*]indole-2(1*H*)-carboxamide**

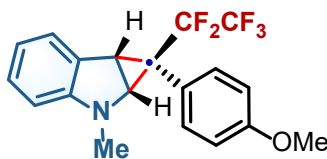
Prepared according to **General procedure K** using *N*-triftosylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and *N,N*-dimethyl-1*H*-indole-1-carboxamide (112.8 mg, 0.6 mmol) afforded **169** (65.4 mg, 63% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 7.40 (d, *J* = 7.5 Hz, 1H), 7.21 (d, *J* = 7.0 Hz, 2H), 7.14-7.04 (m, 3H), 6.96 (t, *J* = 7.5 Hz, 1H), 6.87 (t, *J* = 7.5 Hz, 1H), 6.62 (d, *J* = 8.0 Hz, 1H), 4.89 (d, *J* = 7.5 Hz, 1H), 3.56 (d, *J* = 7.5 Hz, 1H), 2.86 (s, 6H).

¹³C NMR (125 MHz, CDCl₃) δ 158.8, 143.0, 133.1, 128.2, 127.7, 127.6, 127.43, 127.36, 125.7, 125.5 (q, *J* = 273.8 Hz), 121.7, 113.7, 47.3 (q, *J* = 3.8 Hz), 38.6, 29.7 (q, *J* = 31.3 Hz), 28.7 (q, *J* = 3.8 Hz).

¹⁹F NMR (470 MHz, CDCl₃) δ -67.53.

HRMS (ESI) *m/z* calcd. for C₁₉H₁₈F₃N₂O⁺ [*M* + *H*]⁺ 347.1366, found 347.1362.



(170) 1-(4-methoxyphenyl)-2-methyl-1-(perfluoroethyl)-1a,2,6b-tetrahydrocyclopropa[*b*]indole

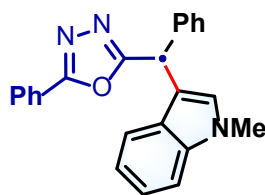
Prepared according to **General procedure K** using *N*-triftosylhydrazone (142.8 mg, 0.3 mmol) derived from 2,2,3,3,3-pentafluoro-1-(4-methoxyphenyl)propan-1-one and 1-methyl-1*H*-indole (235.8 mg, 0.6 mmol) afforded **170** (91.8 mg, 83% yield) as a colorless oil.

¹H NMR (600 MHz, CDCl₃) δ 7.30 (d, *J* = 7.8 Hz, 1H), 7.22-6.76 (m, 3H), 6.76-6.36 (m, 3H), 6.05 (d, *J* = 7.8 Hz, 1H), 4.22 (dd, *J* = 7.2, 1.8 Hz, 1H), 3.66 (s, 3H), 3.63 (dd, *J* = 7.2, 1.8 Hz, 1H), 3.05 (s, 3H).

¹³C NMR (125 MHz, CDCl₃) δ 159.0, 149.5, 134.7, 127.6, 125.3, 125.0, 119.6, 119.4 (qt, *J* = 286.3, 40.0 Hz), 116.6, 115.7 (tq, *J* = 253.8, 36.3 Hz), 112.7, 105.4, 54.9, 50.0-50.8 (m), 33.05, 30.6-30.4 (m), 23.0 (t, *J* = 21.3 Hz).

^{19}F NMR (564 MHz, CDCl_3) δ -80.14, -114.23 (d, J = 268.5 Hz), -117.12 (d, J = 268.5 Hz).

HRMS (ESI) m/z calcd. for $\text{C}_{19}\text{H}_{17}\text{F}_5\text{NO}^+ [\text{M} + \text{H}]^+$ 370.1225, found 370.1224.



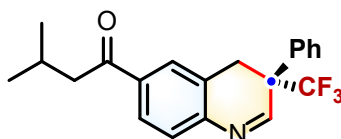
(171) 2-((1-Methyl-1H-indol-3-yl)(phenyl)methyl)-5-phenyl-1,3,4-oxadiazole

Prepared according to **Procedure L** using 3-(2,2-difluoro-1-phenylvinyl)-1-methyl-1H-indole (80.7 mg, 0.3 mmol) and benzoyl hydrazine (49 mg, 0.36 mmol) afforded **171** (66.8 mg, 61% yield) as a colorless oil.

^1H NMR (500 MHz, CDCl_3) δ 8.02-7.99 (m, 2H), 7.51-7.44 (m, 6H), 7.35-7.26 (m, 4H), 7.24-7.21 (m, 1H), 7.08-7.03 (m, 1H), 7.03 (s, 1H), 6.04 (s, 1H), 3.77 (s, 3H).

^{13}C NMR (125 MHz, CDCl_3) δ 167.5, 165.0, 138.5, 137.2, 131.6, 128.9, 128.8, 128.3, 128.2, 127.5, 126.9, 126.7, 124.0, 122.0, 119.5, 119.3, 111.7, 109.4, 40.7, 32.9.

HRMS (ESI) m/z calcd for $\text{C}_{24}\text{H}_{18}\text{N}_3\text{O}^+ [\text{M}-\text{H}]^+$: 364.1455; Found: 364.1461.



(172) 3-methyl-1-(3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinolin-6-yl)butan-1-one

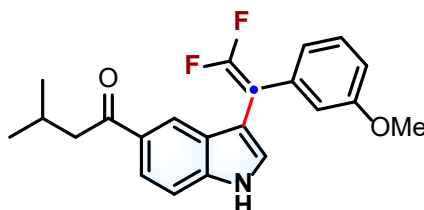
Prepared according to **General Procedure A** using *N*-triftoylhydrazone (118.8 mg, 0.3 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and 1-(1H-indol-5-yl)-3-methylbutan-1-one (180.9 mg, 0.9 mmol) afforded **172** (77.5 mg, 72% yield) as a white solid; mp: 115-116 °C..

^1H NMR (500 MHz, CDCl_3) δ 8.44 (s, 1H), 7.78 (d, J = 8.0 Hz, 1H), 7.73 (s, 1H), 7.41 (d, J = 8.0 Hz, 1H), 7.37-7.32 (m, 2H), 7.30-7.23 (m, 3H), 3.46 (ABq, J = 16.0 Hz, 2H), 2.82-2.70 (m, 2H), 2.30-2.18 (m, 1H), 0.97 (d, J = 7.0 Hz, 3H), 0.95 (d, J = 7.0 Hz, 3H).

^{13}C NMR (150 MHz, CDCl_3) δ 199.1, 160.4, 145.1, 136.9, 132.4, 128.9, 128.7, 128.4, 127.8, 127.7, 127.1, 126.5 (q, J = 280.5 Hz), 124.0, 113.5, 49.6 (q, J = 25.5 Hz), 47.5, 29.8, 25.0, 22.7.

^{19}F NMR (564 MHz, CDCl_3) δ -71.85.

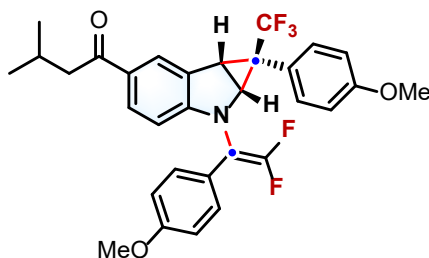
HRMS (ESI) m/z calcd for $\text{C}_{21}\text{H}_{21}\text{F}_3\text{NO}^+ [\text{M}+\text{H}]^+$: 360.1570; Found: 360.1571.



(173) 1-(3-(2,2-difluoro-1-(3-methoxyphenyl)vinyl)-1H-indol-5-yl)-3-methylbutan-1-one

Prepared according to **General procedure H** using *N*-triftoylhydrazone (255.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(3-methoxyphenyl)ethan-1-one and 1-(1H-indol-5-yl)-3-methylbutan-1-one (60.3 mg, 0.3 mmol) afforded **173** (93.0 mg, 84% yield) as a red oil.

¹H NMR (500 MHz, CDCl₃) δ 8.74 (s, 1H), 7.87 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.66 (s, 1H), 7.40 (d, *J* = 8.5 Hz, 1H), 7.34-7.31 (m, 1H), 7.29 (t, *J* = 8.0 Hz, 1H), 6.99 (d, *J* = 7.5 Hz, 1H), 6.94 (s, 1H), 6.89 (dd, *J* = 8.0, 2.0 Hz, 1H), 3.76 (s, 3H), 2.65 (d, *J* = 7.0 Hz, 2H), 2.19-2.08 (m, 1H), 0.92 (d, *J* = 7.0 Hz, 6H).
¹³C NMR (125 MHz, CDCl₃) δ 200.6, 159.6, 153.7 (dd, *J* = 291.3, 290.0 Hz), 138.5, 135.3 (t, *J* = 5.0 Hz), 130.1 (d, *J* = 2.5 Hz), 129.4, 126.0 (d, *J* = 2.5 Hz), 125.8-125.6 (m), 122.6, 122.4, 121.9 (t, *J* = 2.5 Hz), 115.2 (t, *J* = 2.5 Hz), 113.1, 111.4, 110.6, 89.3 (t, *J* = 20.0 Hz), 55.2, 47.4, 25.8, 22.7.
¹⁹F NMR (470 MHz, CDCl₃) δ -85.84 (dd, *J* = 32.4, 4.2 Hz), -89.13 (dd, *J* = 32.4, 4.2 Hz).
HRMS (ESI) *m/z* calcd for C₂₂H₂₂F₂NO₂⁺ [*M*+*H*]⁺: 370.1613; Found: 370.1610.



(174) 1-(1,3-bis(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-1*H*-indol-5-yl)-3-methylbutan-1-one

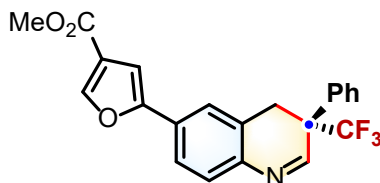
Prepared according to **General procedure J** using *N*-trifosylhydrazone (383.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and 1-(1*H*-indol-5-yl)-3-methylbutan-1-one (60.3 mg, 0.3 mmol) afforded **174** (80.2 mg, 48% yield) as a colorless oil.

¹H NMR (500 MHz, CDCl₃) δ 8.09 (s, 1H), 7.60 (d, *J* = 8.5 Hz, 1H), 7.17 (d, *J* = 8.0 Hz, 2H), 7.08 (d, *J* = 8.5 Hz, 2H), 6.91 (d, *J* = 8.5 Hz, 2H), 6.64 (d, *J* = 8.5 Hz, 2H), 6.15 (dd, *J* = 8.5, 2.5 Hz, 1H), 4.28 (d, *J* = 7.0 Hz, 1H), 3.83 (s, 3H), 3.69 (s, 3H), 3.65 (d, *J* = 7.0 Hz, 1H), 2.81-2.68 (m, 2H), 2.33-2.19 (m, 1H), 0.99 (d, *J* = 7.0 Hz, 3H), 0.98 (d, *J* = 7.0 Hz, 3H).

¹³C NMR (150 MHz, CDCl₃) δ 198.6, 160.0, 159.5, 151.5, 134.3, 129.53, 129.48, 129.3 (t, *J* = 3.0 Hz), 126.0, 125.8, 125.7 (q, *J* = 274.5 Hz), 121.3 (dd, *J* = 6.0, 3.0 Hz), 118.7, 114.44, 114.39, 113.3, 107.9 (d, *J* = 3.0 Hz), 99.9 (dd, *J* = 31.5, 16.5 Hz), 55.4, 55.0, 50.8, 47.2, 29.6, 25.6, 22.8.

¹⁹F NMR (564 MHz, CDCl₃) δ -67.93, -85.32 (d, *J* = 32.1 Hz), -96.57 (d, *J* = 32.1 Hz).

HRMS (ESI) *m/z* calcd for C₃₁H₂₉F₅NO₃⁺ [*M*+*H*]⁺: 558.2062; Found: 558.2058.



(175) methyl 5-(3-phenyl-3-(trifluoromethyl)-3,4-dihydroquinolin-6-yl)furan-3-carboxylate

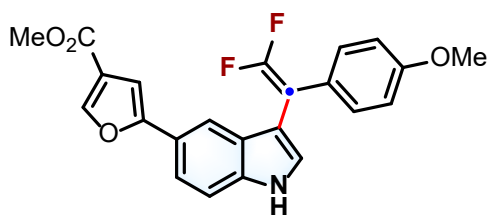
Prepared according to **General Procedure A** using *N*-trifosylhydrazone (356.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-phenylethan-1-one and methyl 5-(1*H*-indol-5-yl)furan-3-carboxylate (216.9 mg, 0.9 mmol) afforded **175** (96.9 mg, 81% yield) as a white solid; mp: 141-142°C.

¹H NMR (500 MHz, CDCl₃) δ 8.34 (s, 1H), 8.00 (s, 1H), 7.49 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.42 (s, 1H), 7.40-7.36 (m, 3H), 7.30-7.21 (m, 3H), 6.94 (s, 1H), 3.85 (s, 3H), 3.44 (s, 2H).

¹³C NMR (150 MHz, CDCl₃) δ 163.3, 158.0, 154.4, 147.0, 141.8, 132.8, 129.7, 128.8, 128.7, 127.7, 127.6, 126.6 (q, *J* = 280.5 Hz), 124.3, 123.8, 123.6, 121.1, 105.2, 51.7, 49.6 (q, *J* = 25.5 Hz), 30.1.

¹⁹F NMR (564 MHz, CDCl₃) δ -71.82.

HRMS (ESI) m/z calcd for $C_{22}H_{17}F_3NO_3^+$ $[M+H]^+$: 400.1155; Found: 400.1154.



(176) methyl 5-(3-(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-1H-indol-5-yl)furan-3-carboxylate

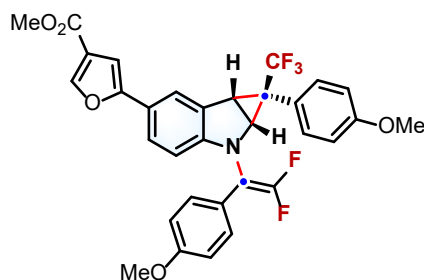
Prepared according to **General procedure H** using *N*-trifosylhydrazone (255.6 mg, 0.6 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and methyl 5-(1H-indol-5-yl)furan-3-carboxylate (72.3 mg, 0.3 mmol) afforded **176** (106.8 mg, 87% yield) as a red oil.

1H NMR (500 MHz, $CDCl_3$) δ 8.39 (s, 1H), 7.96 (s, 1H), 7.52 (d, J = 8.0 Hz, 1H), 7.47 (s, 1H), 7.41 (d, J = 8.0 Hz, 1H), 7.31 (d, J = 8.0 Hz, 2H), 7.22 (s, 1H), 6.89 (d, J = 8.0 Hz, 2H), 6.77 (s, 1H), 3.85 (s, 3H), 3.83 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 163.8, 158.9, 156.5, 153.5 (dd, J = 291.0, 289.5 Hz), 146.2, 135.9, 130.2 (t, J = 3.0 Hz), 126.9-126.8 (d, J = 2.0 Hz), 126.4 (t, J = 3.0 Hz), 125.4 (t, J = 3.0 Hz), 122.4, 120.7, 119.2, 116.1, 113.8, 111.7, 110.1 (t, J = 3.0 Hz), 102.8, 88.7 (t, J = 21.0 Hz), 55.3, 51.6.

^{19}F NMR (564 MHz, $CDCl_3$) δ -86.78 (d, J = 35.5 Hz), -90.64 (d, J = 35.5 Hz).

HRMS (ESI) m/z calcd for $C_{23}H_{18}F_2NO_4^+$ $[M+H]^+$: 410.1198; Found: 410.1196.



(177) methyl 5-(1,3-bis(2,2-difluoro-1-(4-methoxyphenyl)vinyl)-1H-indol-5-yl)furan-3-carboxylate

Prepared according to **General procedure J** using *N*-trifosylhydrazone (383.4 mg, 0.9 mmol) derived from 2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-one and methyl 5-(1H-indol-5-yl)furan-3-carboxylate (72.3 mg, 0.3 mmol) afforded **177** (96.7 mg, 54% yield) as a colorless oil.

1H NMR (500 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.75 (d, J = 1.5 Hz, 1H), 7.26-7.23 (m, 1H), 7.18 (d, J = 7.5 Hz, 2H), 7.12 (d, J = 8.5 Hz, 2H), 6.89 (d, J = 8.5 Hz, 2H), 6.78 (s, 1H), 6.66 (d, J = 8.5 Hz, 2H), 6.17 (dd, J = 8.5, 2.5 Hz, 1H), 4.27 (d, J = 7.0 Hz, 1H), 3.86 (s, 3H), 3.82 (s, 3H), 3.69 (s, 3H), 3.65 (d, J = 7.0 Hz, 1H).

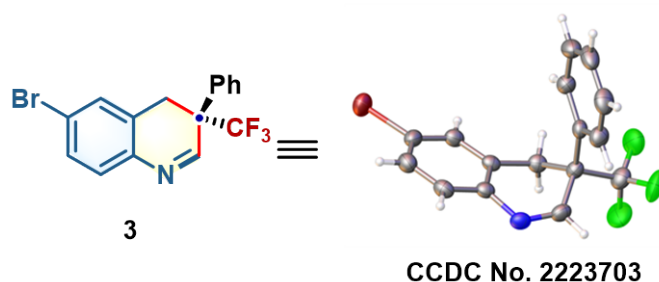
^{13}C NMR (150 MHz, $CDCl_3$) δ 163.7, 159.8, 159.4, 155.7, 155.0 (t, J = 296.0 Hz), 148.0, 145.9, 134.3, 129.3 (t, J = 3.0 Hz), 126.1, 124.2, 124.0 (q, J = 273.0 Hz), 121.8 (dd, J = 6.0, 2.0 Hz), 121.7, 121.4, 120.9, 119.0, 114.3, 113.2, 109.1, 102.3, 100.4 (dd, J = 33.0, 19.5 Hz), 55.3, 55.0, 51.6, 51.1, 29.9, 27.3 (q, J = 33.0 Hz).

^{19}F NMR (564 MHz, $CDCl_3$) δ -67.84, -86.40 (d, J = 33.8 Hz), -97.14 (d, J = 33.8 Hz)

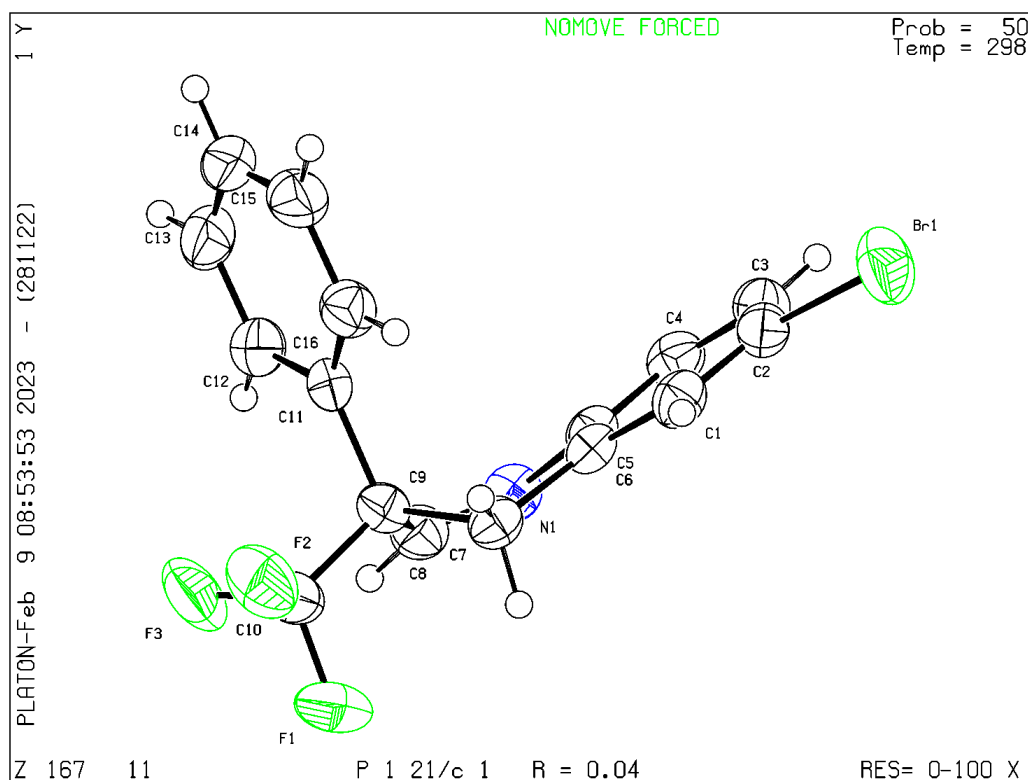
HRMS (ESI) m/z calcd for $C_{32}H_{25}F_5NO_5^+$ $[M+H]^+$: 598.1647; Found: 598.1645.

7. X-ray crystallography

(a) Crystal Structure of **3** (CCDC No. 2223703)



The X-ray structure of compound **3**

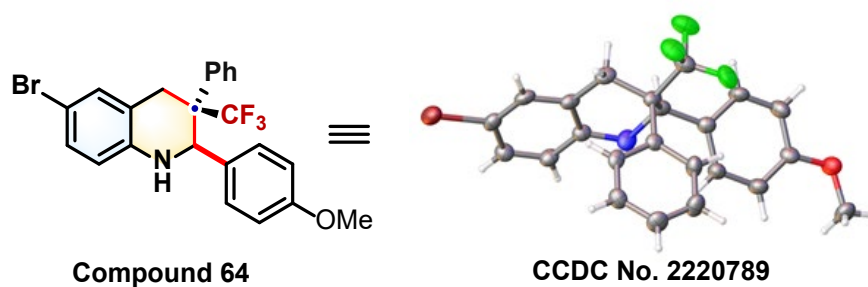


The X-ray structure of **3** (CCDC **2223703**, 50% probability ellipsoids).

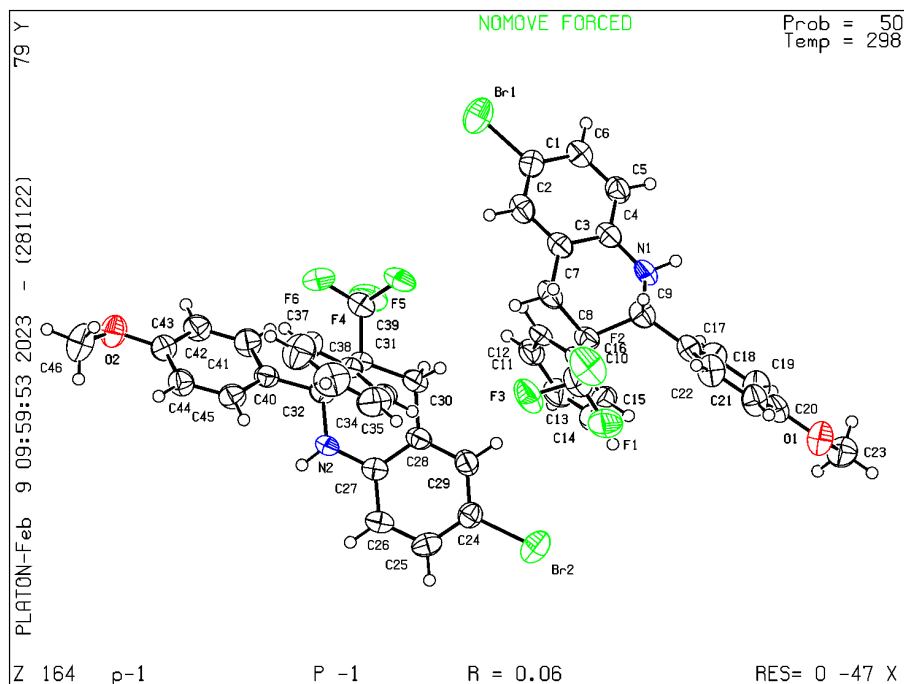
Empirical formula	C ₁₆ H ₁₁ BrF ₃ N
Temperature	298 (2) K
Wavelength	0.71073 Å
Crystal system	monoclinic
Space group	P2 ₁ /c
Unit cell dimensions	a = 13.2505 (11) Å b = 6.2444 (5) Å c = 17.704 (2) Å alpha = 90 deg.

	Beta = 103.454 (10) deg.
	Gamma = 90 deg.
Volume	1424.6 (2) Å ³
Z	4
Calculated density	1.651 Mg/m ³
Absorption coefficient	2.910 mm ⁻¹
F(000)	704.0
Crystal size	0.24 x 0.22 x 0.2 mm
Theta range for data collection	6.962 to 58.728 deg.
Reflections collected / unique	6405/3301 [R(int) = 0.0310]
Data / restraints / parameters	3301/0/190
Goodness-of-fit on F ²	0.999
Final R indices [I>2sigma(I)]	R _I = 0.0429, wR ₂ = 0.0737
Rindices (all data)	R _I = 0.0918, wR ₂ = 0.0891
Largest diff. peak/hole / e Å ⁻³	0.33/-0.44

(b) Crystal Structure of 64 (CCDC No. 2220789)



The X-ray structure of compound 64

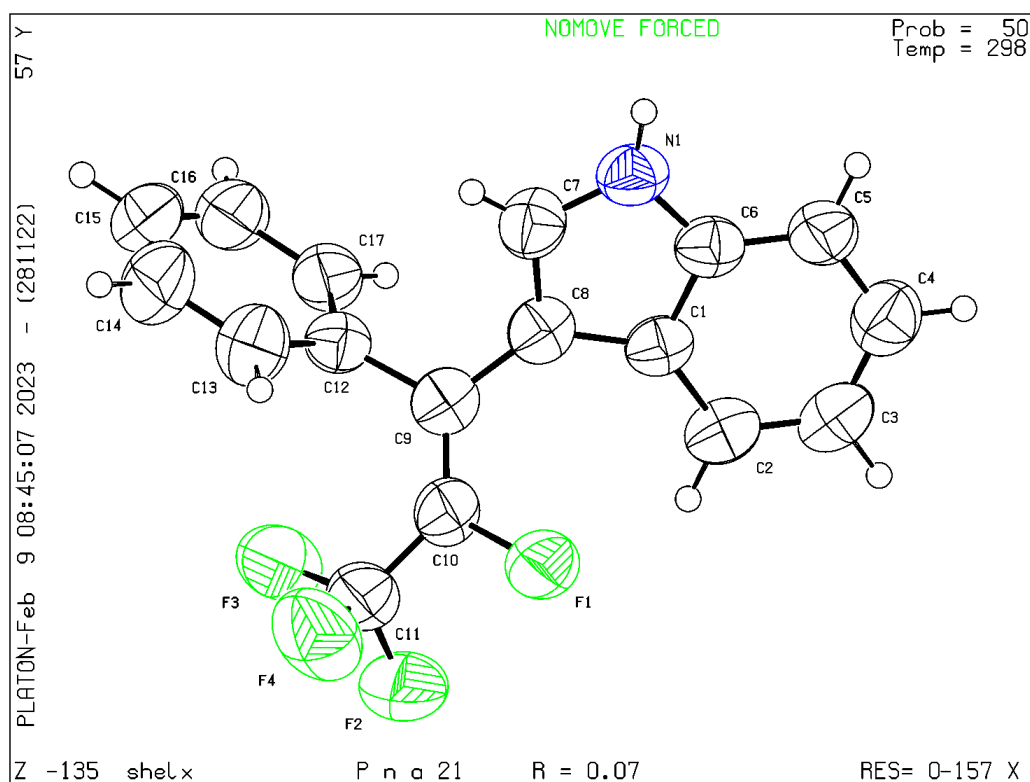
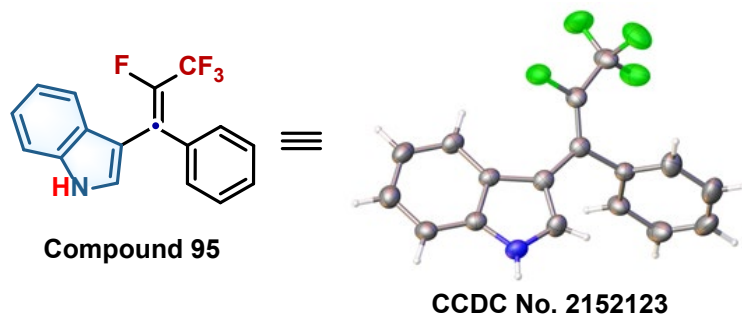


The X-ray structure of **64** (CCDC 2220789, 50% probability ellipsoids).

Empirical formula	C ₂₃ H ₁₉ BrF ₃ NO
Temperature	298 (2) K
Wavelength	0.71073 Å
Crystal system	triclinic
Space group	P-1
Unit cell dimensions	a = 9.5932 (11) Å b = 11.3695 (11) Å c = 19.7147 (19) Å alpha = 80.452 (8) deg. beta = 89.559 (9) deg. gamma = 70.013 (10) deg.
Volume	1990.0 (4) Å ³
Z	4
Calculated density	1.543 Mg/m ³
Absorption coefficient	2.107 mm ⁻¹
F(000)	936.0
Crystal size	0.24 x 0.22 x 0.2 mm
Theta range for data collection	6.794 to 58.8 deg.
Reflections collected / unique	15763/9169 [R(int) = 0.0598]
Data / restraints / parameters	9169/0/531
Goodness-of-fit on F ²	0.953
Final R indices [I>2sigma(I)]	R ₁ = 0.0623, wR ₂ = 0.0743
R indices (all data)	R ₁ = 0.1949, wR ₂ = 0.1045
Largest diff. peak/hole / e Å ⁻³	0.33/-0.47

Note that: The CheckCif has a B-level alert “Missing # of FCF Reflection(s) Below Theta(Min). 18 Note”, which was caused by the high beamstop theta(min) limit set.

(c) Crystal Structure of 95 (CCDC No. 2152123)

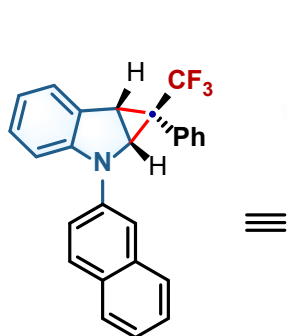


The X-ray structure of **95** (CCDC **2152123** 50% probability ellipsoids).

Empirical formula	C ₁₇ H ₁₁ F ₄ N
Temperature	293(2) K
Wavelength	0.71073 Å
Crystal system	orthorhombic
Space group	Pna2 ₁
Unit cell dimensions	a = 5.7099(11) Å b = 27.756(6) Å

	$c = 9.2042(17) \text{ \AA}$
	$\alpha = 90 \text{ deg.}$
	$\beta = 90 \text{ deg.}$
	$\gamma = 90 \text{ deg.}$
Volume	$1458.7(5) \text{ \AA}^3$
Z	4
Calculated density	1.390 Mg/m^3
Absorption coefficient	0.117 mm^{-1}
F(000)	624.0
Crystal size	$0.24 \times 0.22 \times 0.2 \text{ mm}$
Theta range for data collection	$7.268 \text{ to } 49.996 \text{ deg.}$
Reflections collected / unique	4990/2426 [$R(\text{int}) = 0.0517$]
Data / restraints / parameters	2426/42/185
Goodness-of-fit on F^2	1.038
Final R indices [$I > 2\sigma(I)$]	$R_1 = 0.0687, wR_2 = 0.1480$
Rindices (all data)	$R_1 = 0.1259, wR_2 = 0.1862$
Largest diff. peak/hole / $e \text{ \AA}^{-3}$	0.22/-0.16

(d) Crystal Structure of 163 (CCDC No. 2194938)

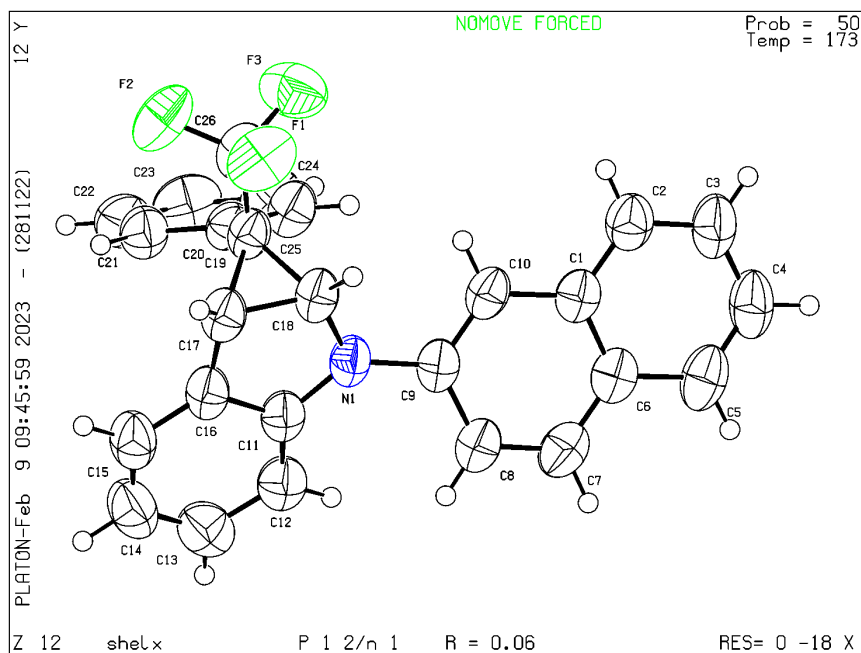


Compound 163

≡



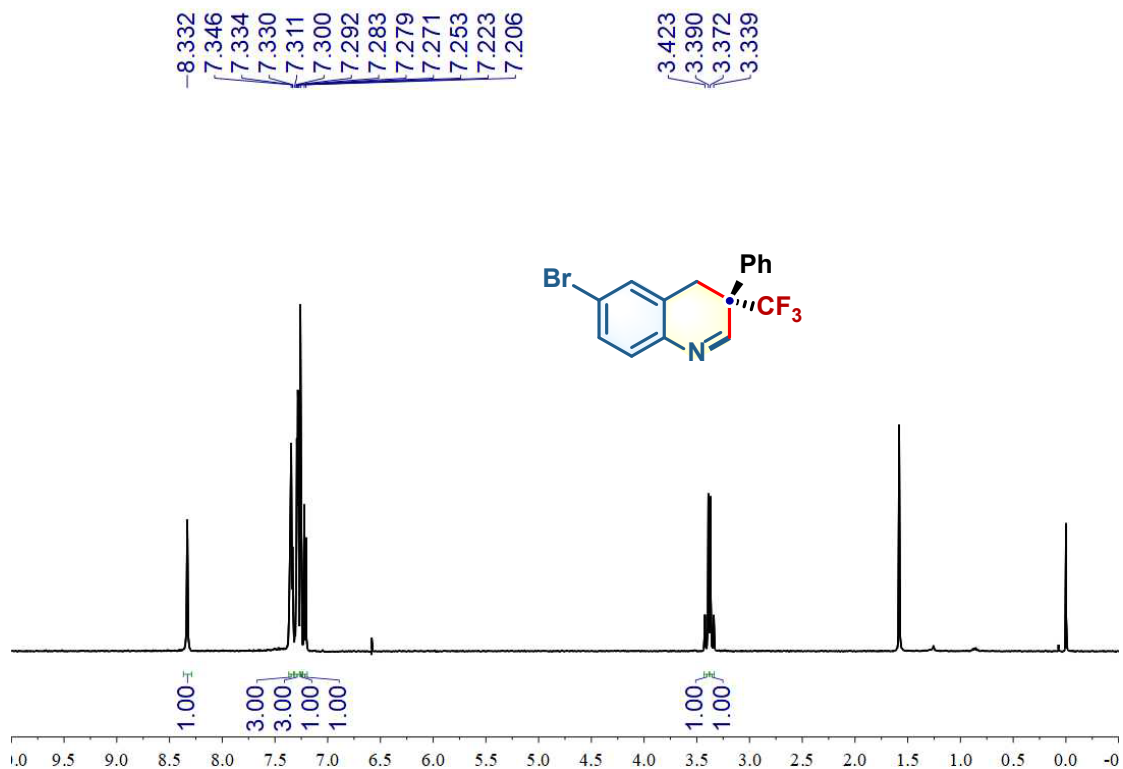
CCDC No. 2194938



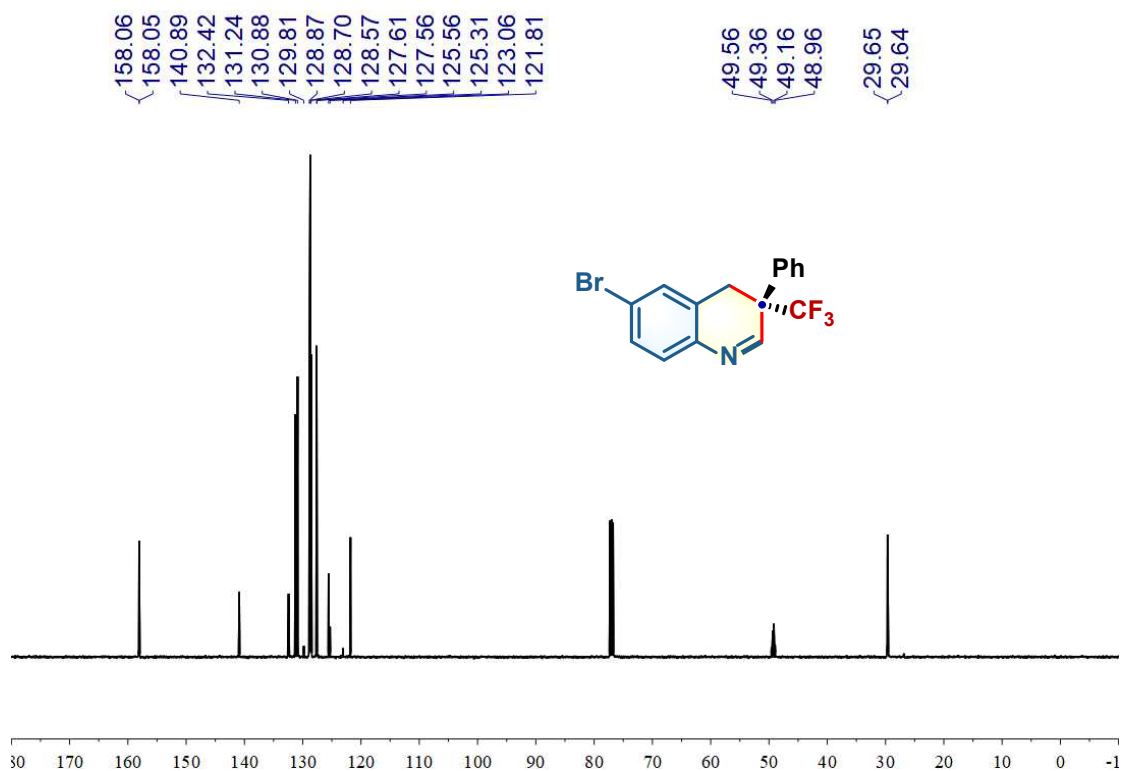
The X-ray structure of **163** (CCDC **2194938** 50% probability ellipsoids).

Empirical formula	C ₂₆ H ₁₈ F ₃ N
Temperature	173.02 K
Wavelength	0.71073 Å
Crystal system	monoclinic
Space group	P2/n
Unit cell dimensions	a = 13.5987 (14) Å b = 10.8791 (10) Å c = 14.1825 (12) Å alpha = 90 deg. beta = 108.631 (10) deg. gamma = 90 deg.
Volume	1988.2 (3) Å ³
Z	4
Calculated density	1.341 Mg/m ³
Absorption coefficient	0.097 mm ⁻¹
F(000)	832.0
Crystal size	0.24 x 0.22 x 0.2 mm
Theta range for data collection	6.968 to 58.656 deg.
Reflections collected / unique	9109/4574 [R(int) = 0.0308]
Data / restraints / parameters	4574/1/271
Goodness-of-fit on F ²	1.014
Final R indices [I > 2sigma(I)]	R ₁ = 0.0567, wR ₂ = 0.1398
R indices (all data)	R ₁ = 0.1206, wR ₂ = 0.1786
Largest diff. peak/hole / e Å ⁻³	0.32/-0.17

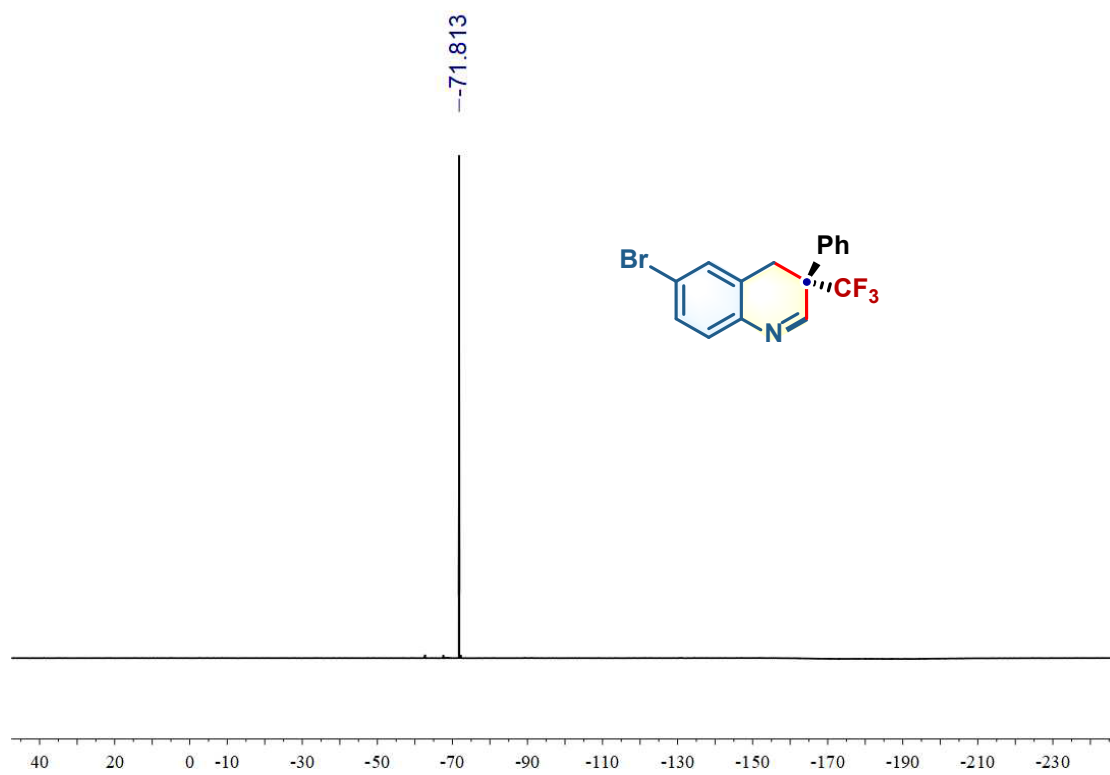
8. NMR Spectra



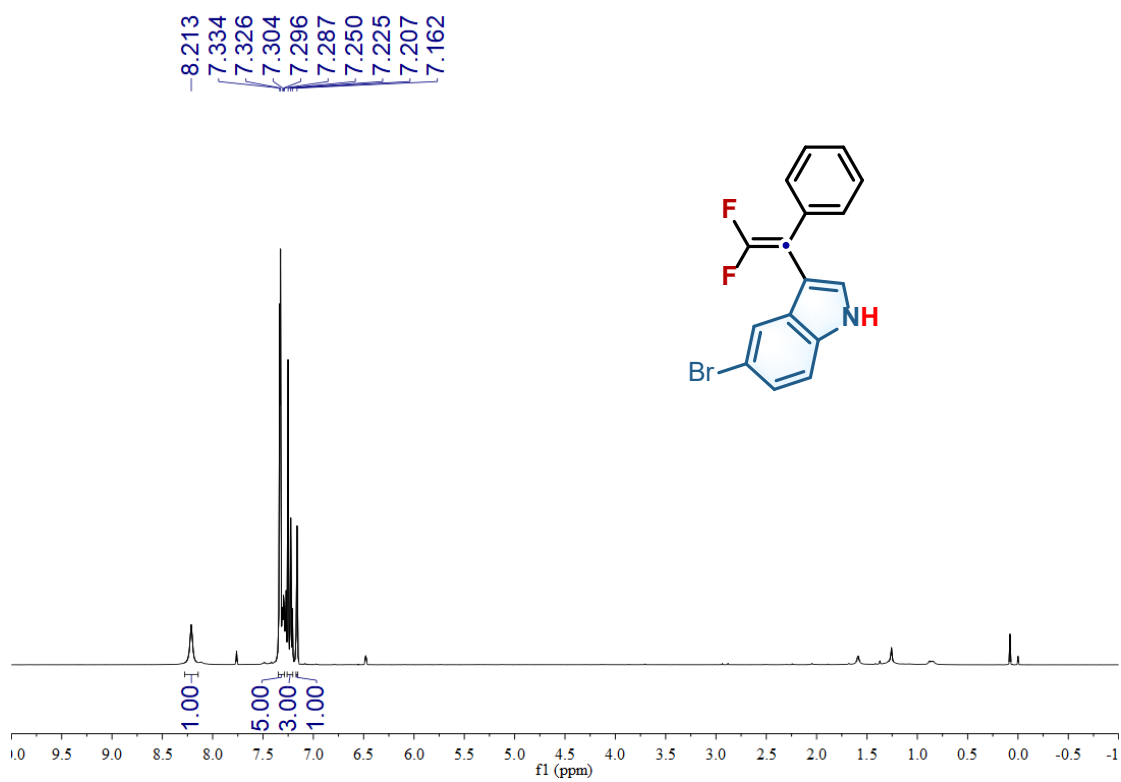
Supplementary Fig. 7. ¹H NMR (500 MHz, CDCl₃) spectrum of 3



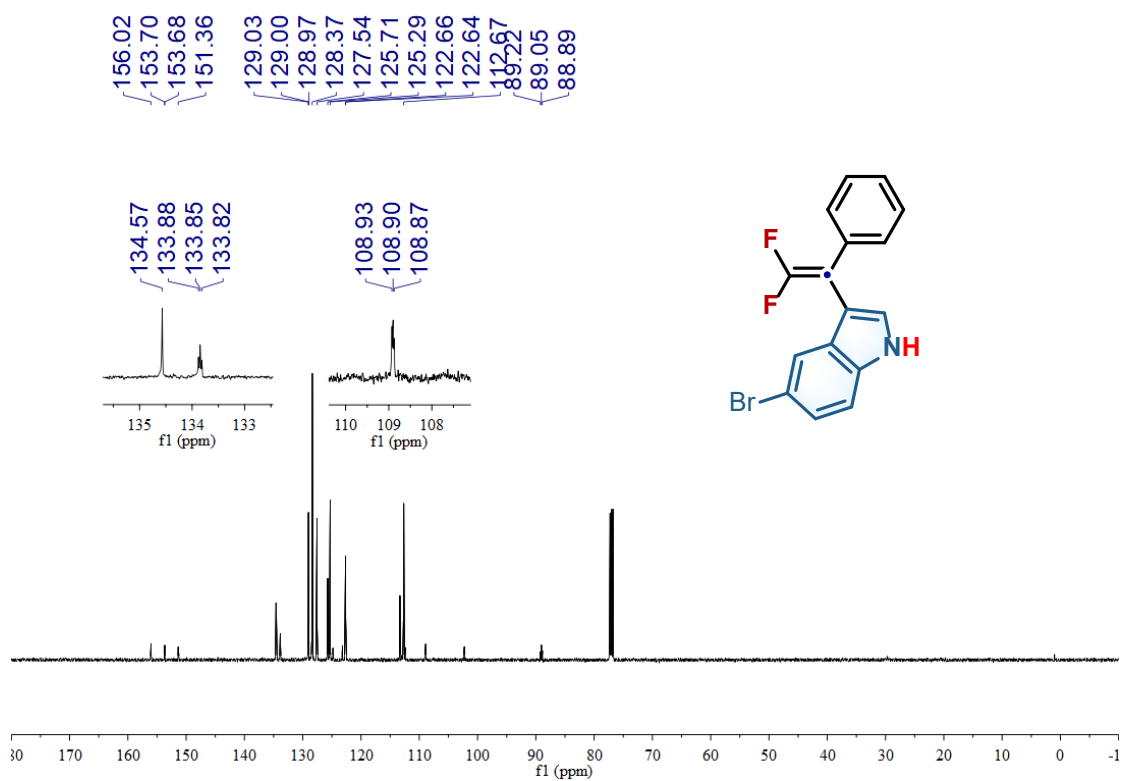
Supplementary Fig. 8. ¹³C NMR (125 MHz, CDCl₃) spectrum of 3



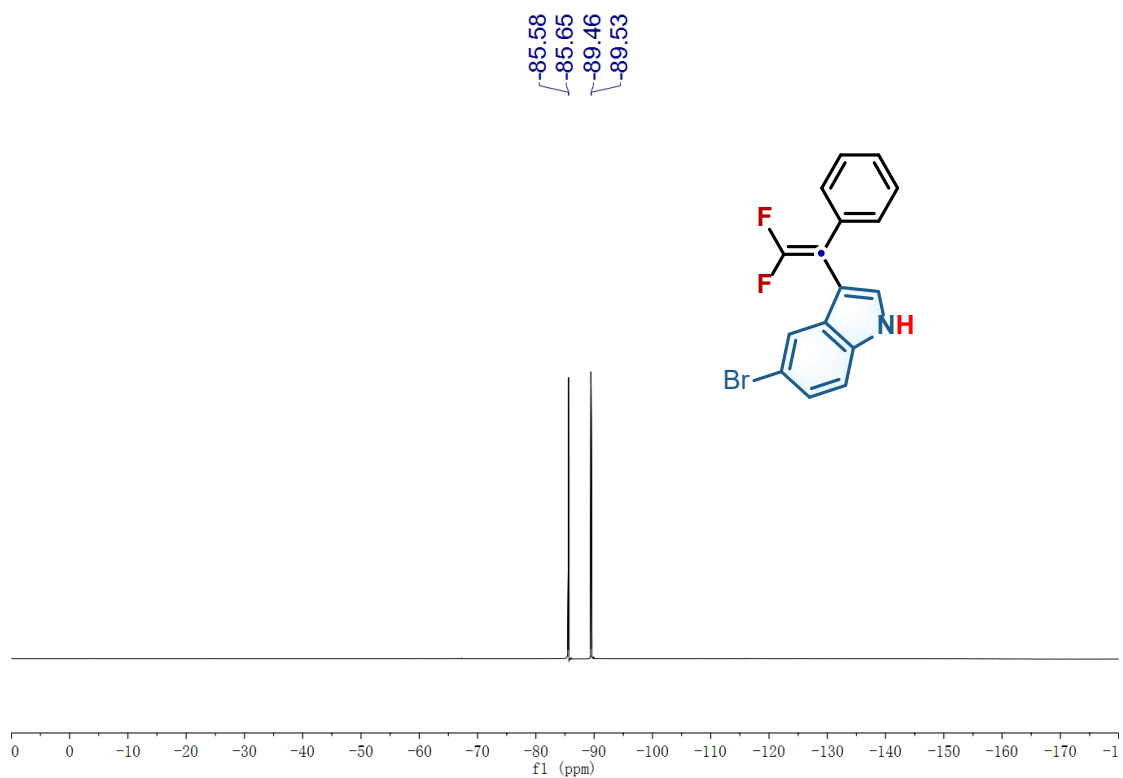
Supplementary Fig. 9. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 3



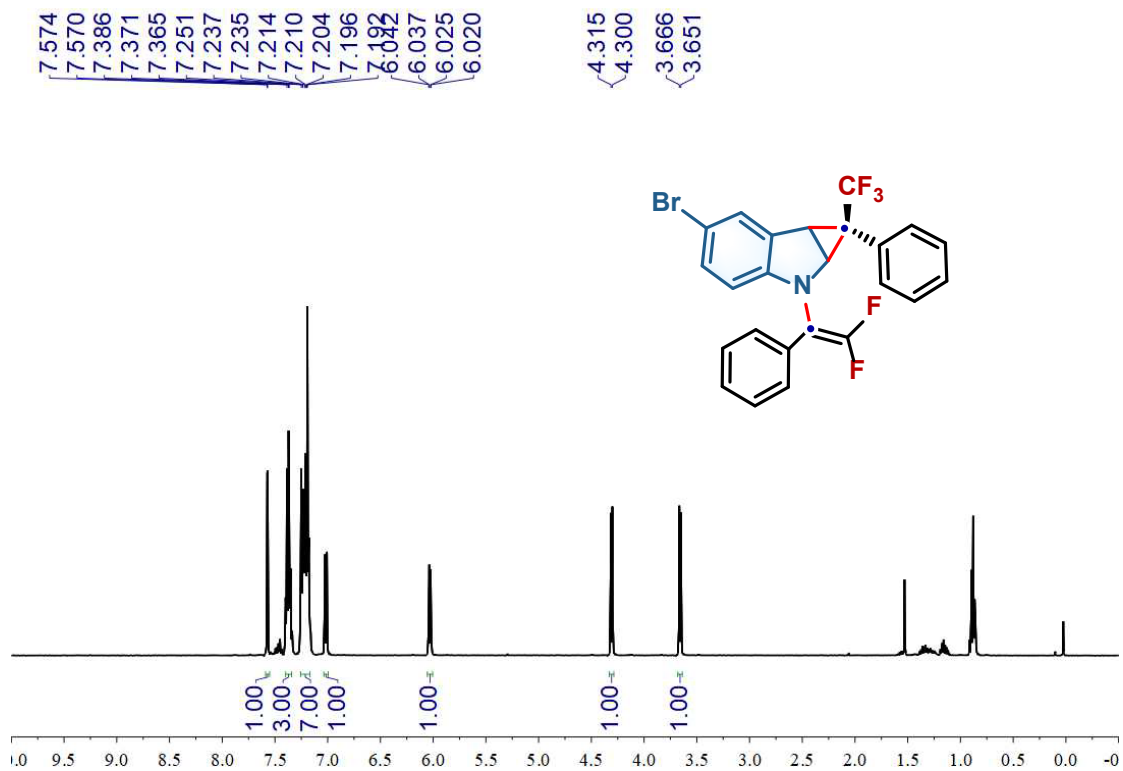
Supplementary Fig. 10. ^1H NMR (500 MHz, CDCl_3) spectrum of 4



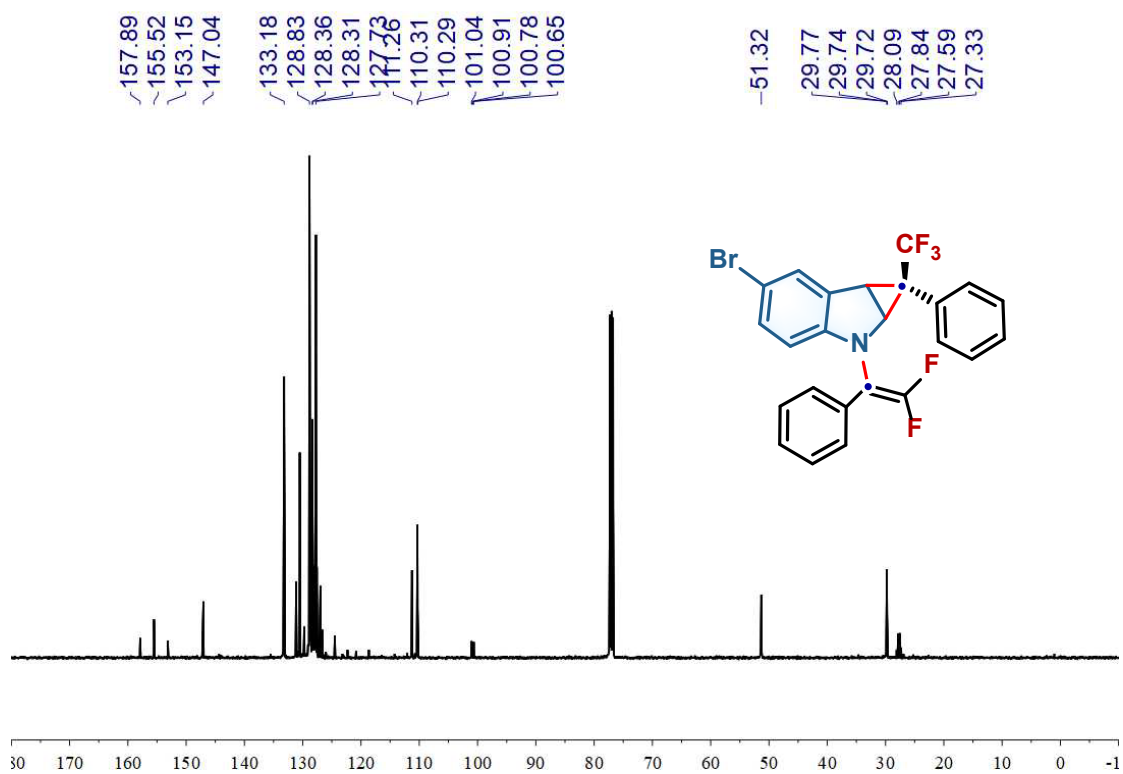
Supplementary Fig. 11. ¹³C NMR (125 MHz, CDCl₃) spectrum of **4**



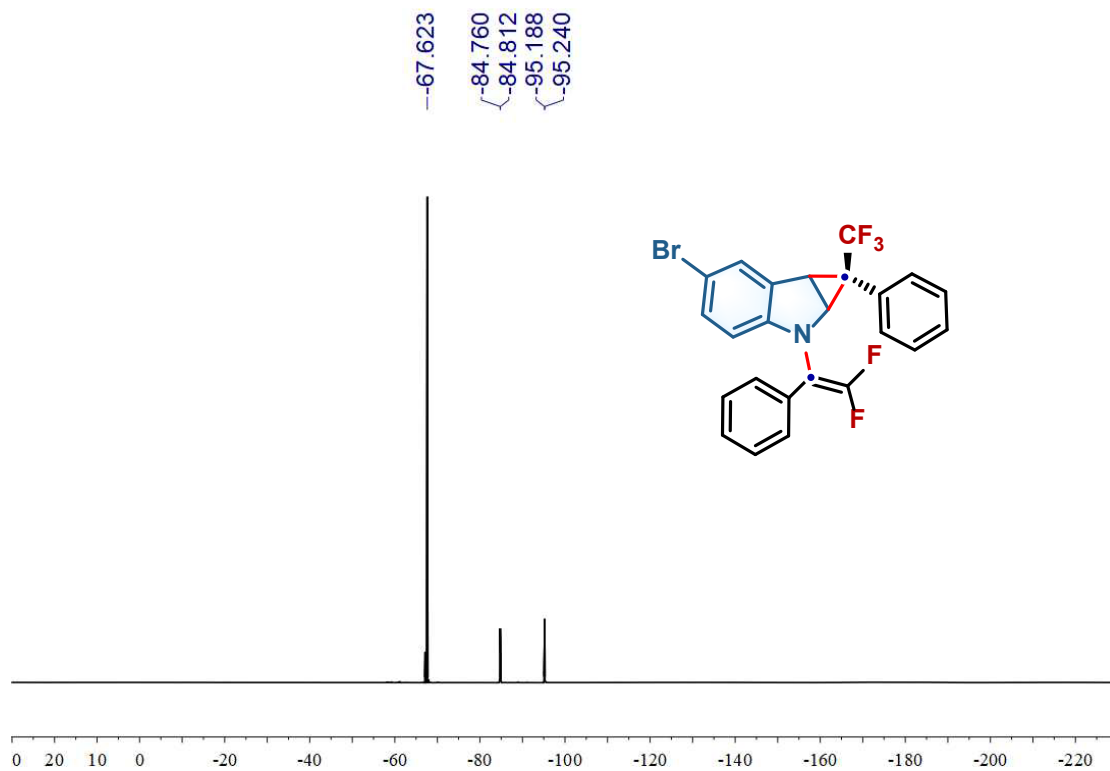
Supplementary Fig. 12. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **4**



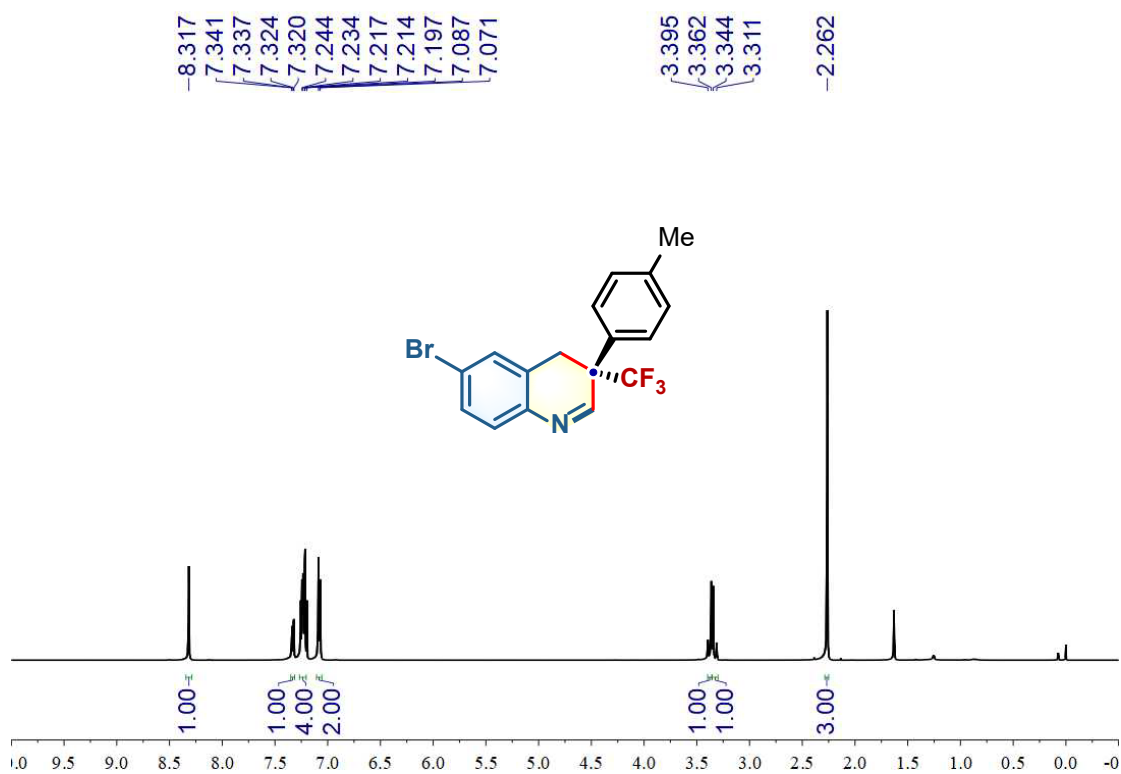
Supplementary Fig. 13. ¹H NMR (500 MHz, CDCl₃) spectrum of **5**



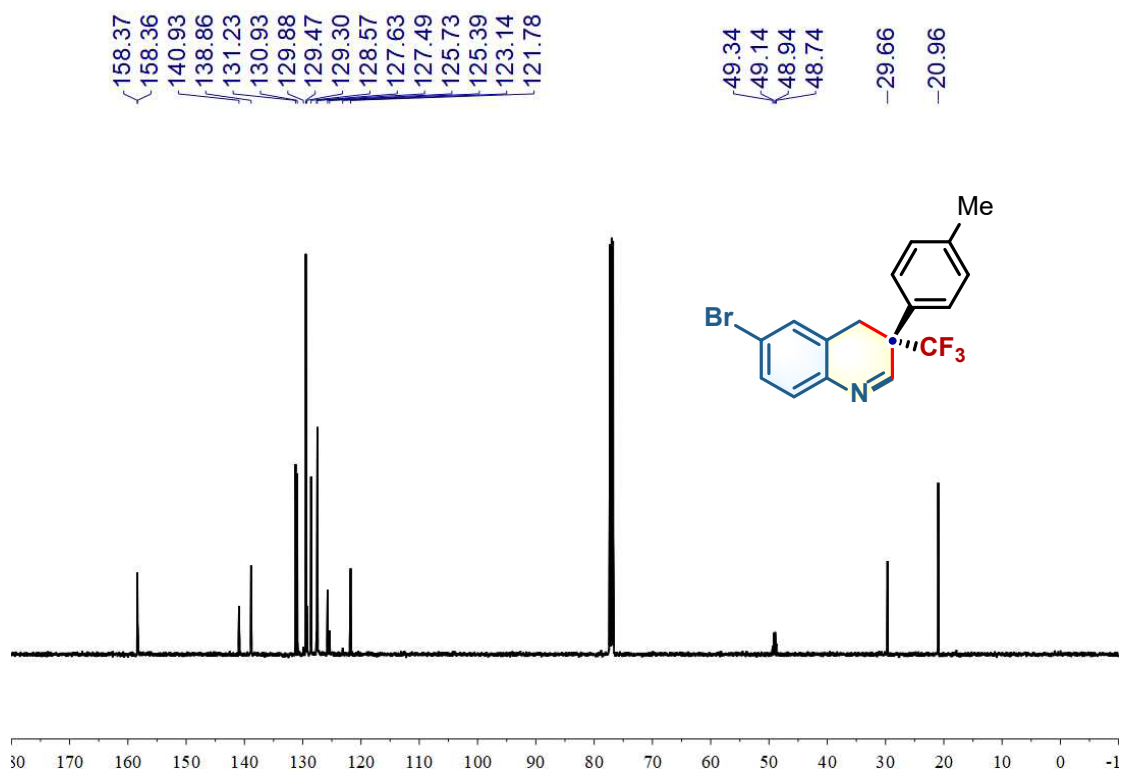
Supplementary Fig. 14. ¹³C NMR (125 MHz, CDCl₃) spectrum of **5**



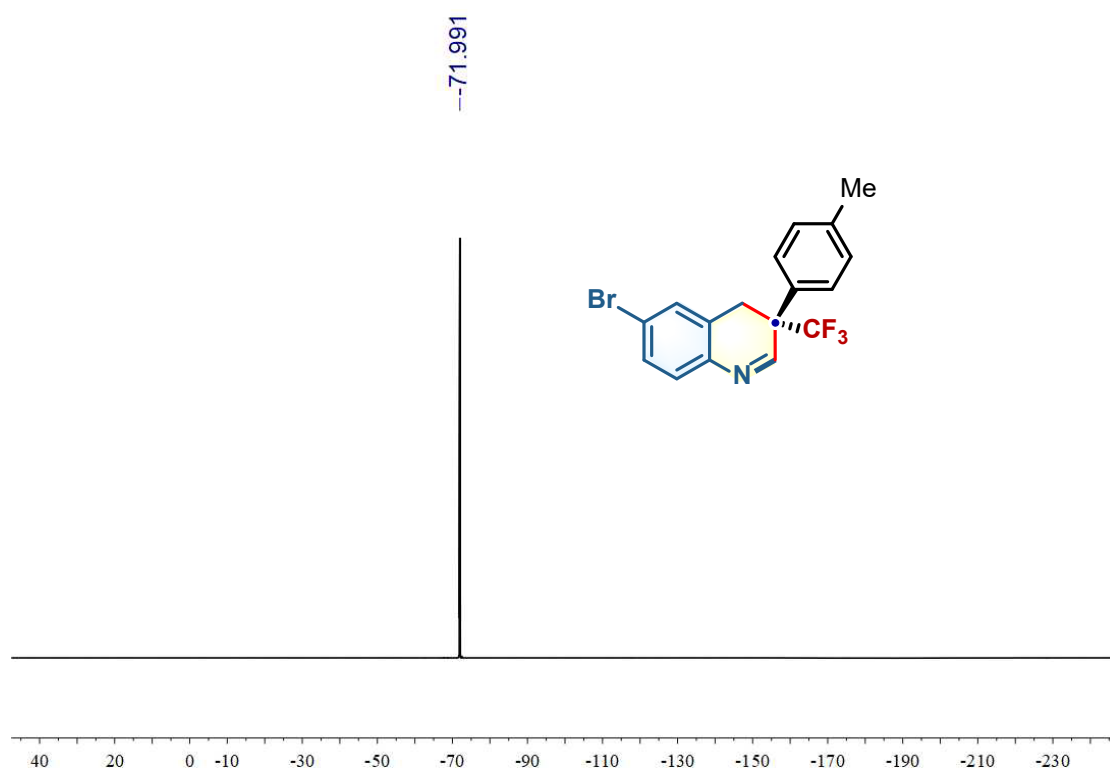
Supplementary Fig. 15. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 5



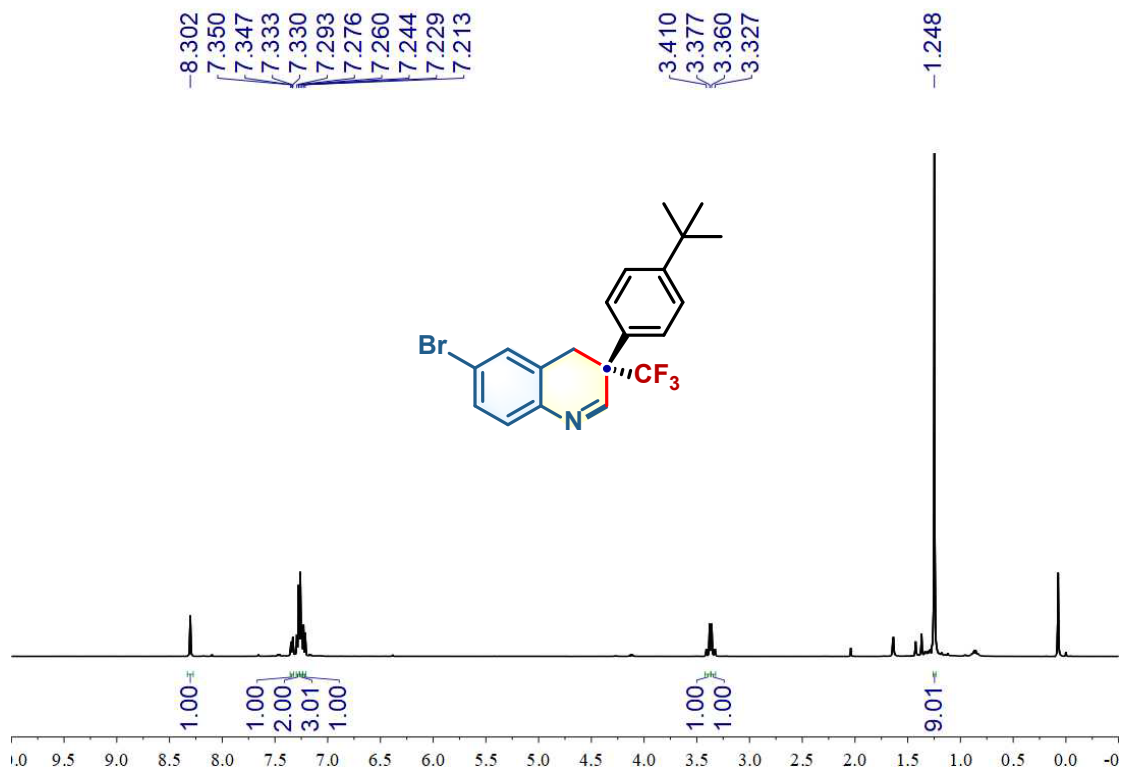
Supplementary Fig. 16. ^1H NMR (500 MHz, CDCl_3) spectrum of 6



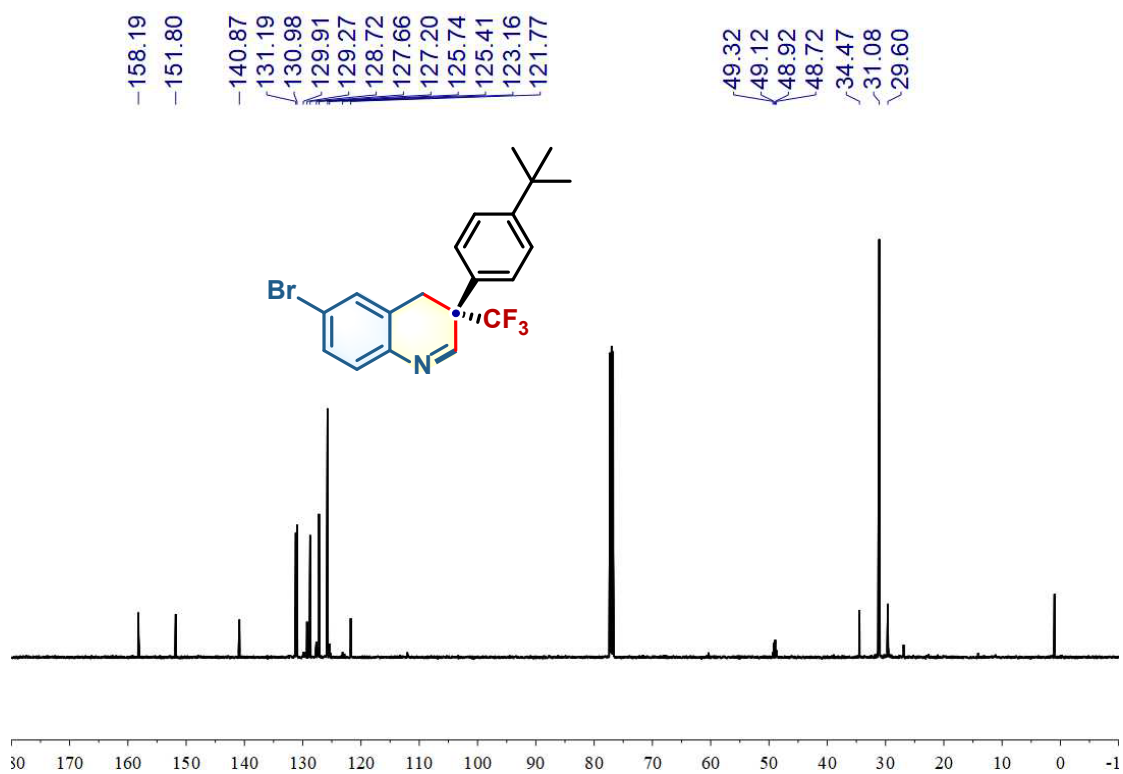
Supplementary Fig. 17. ¹³C NMR (125 MHz, CDCl₃) spectrum of 6



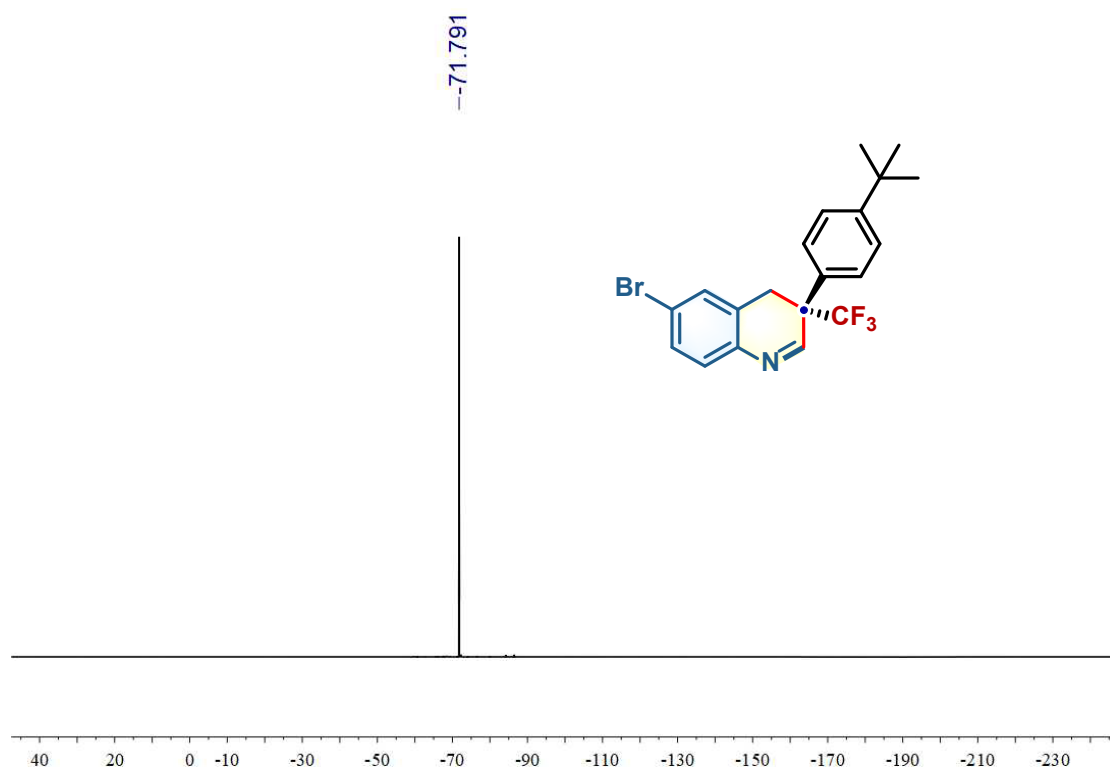
Supplementary Fig. 18. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 6



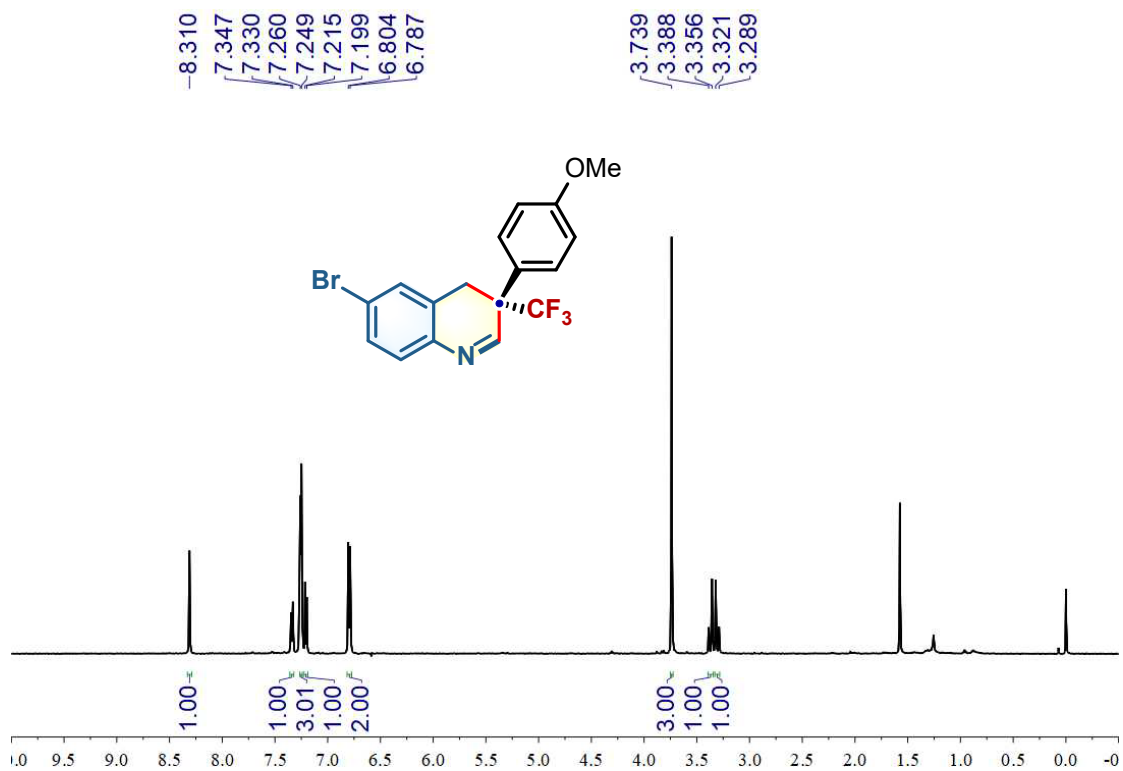
Supplementary Fig. 19. ¹H NMR (500 MHz, CDCl₃) spectrum of 7



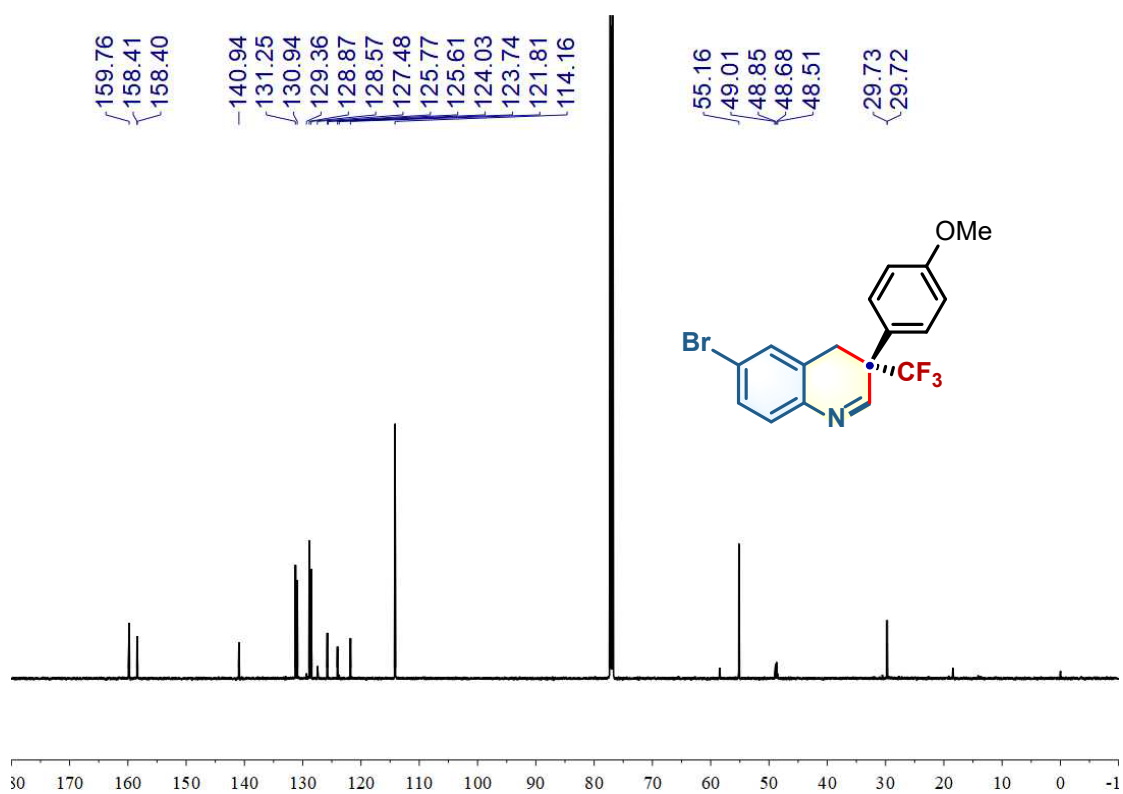
Supplementary Fig. 20. ¹³C NMR (125 MHz, CDCl₃) spectrum of 7



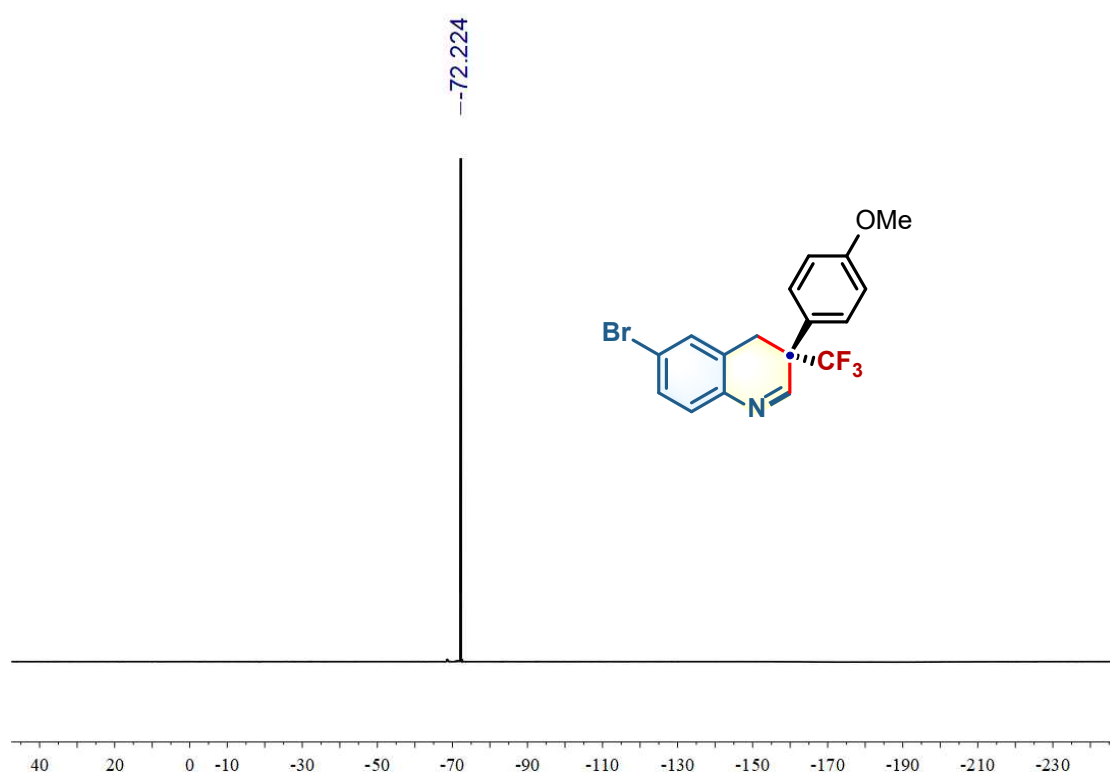
Supplementary Fig. 21. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 7



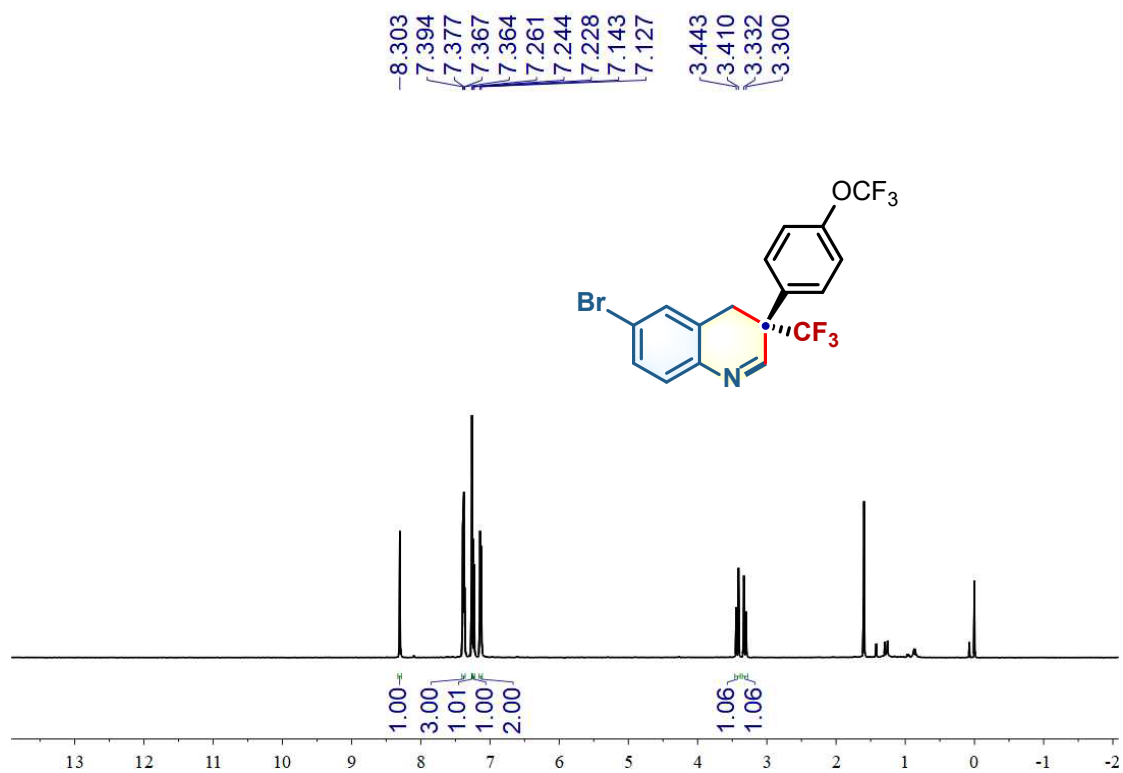
Supplementary Fig. 22. ^1H NMR (500 MHz, CDCl_3) spectrum of 8



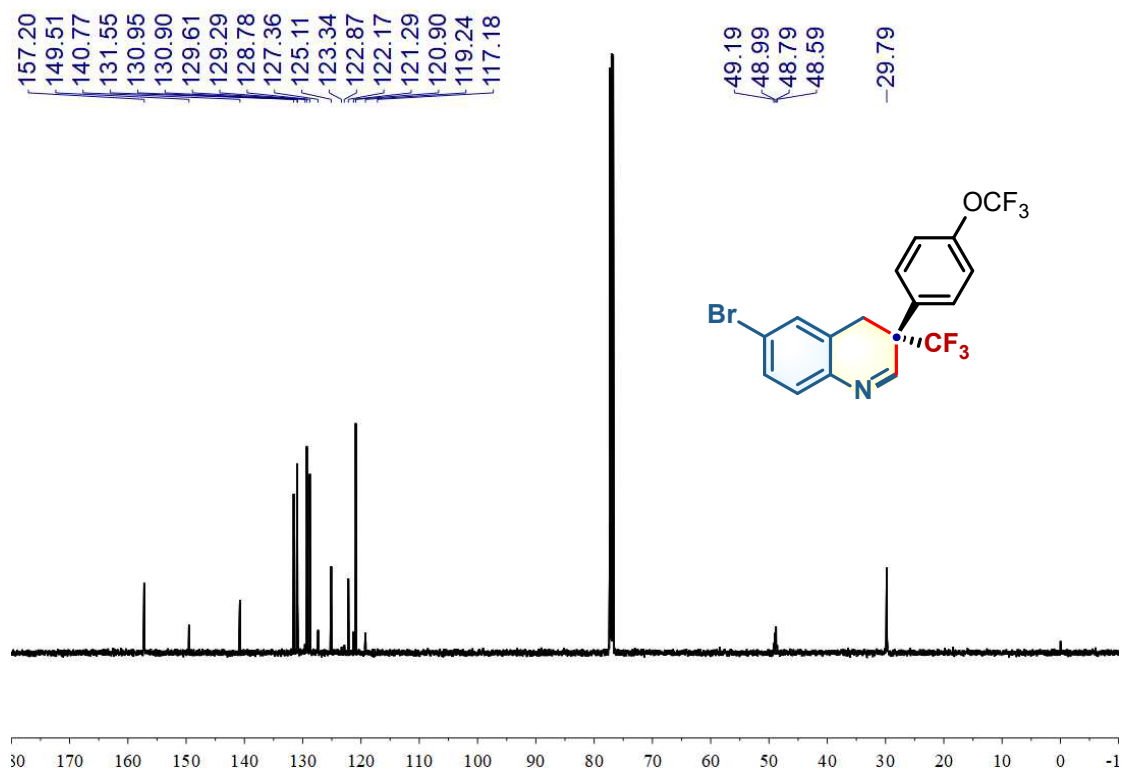
Supplementary Fig. 23. ^{13}C NMR (150 MHz, CDCl_3) spectrum of **8**



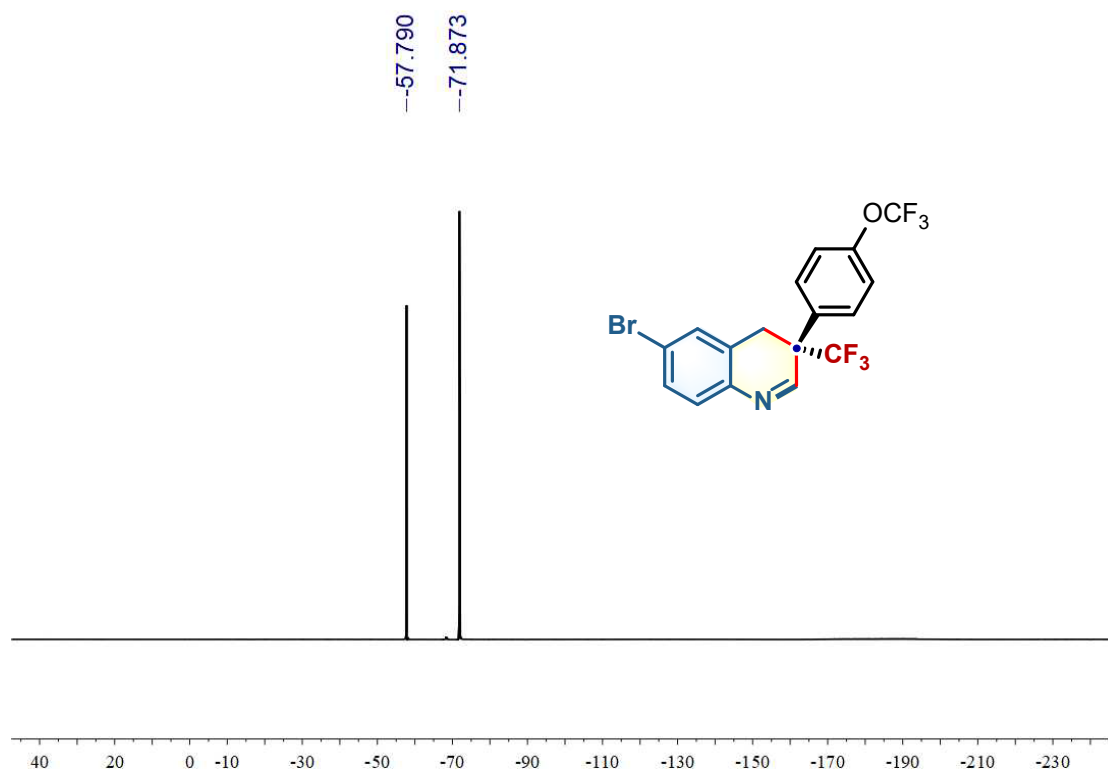
Supplementary Fig. 24. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **8**



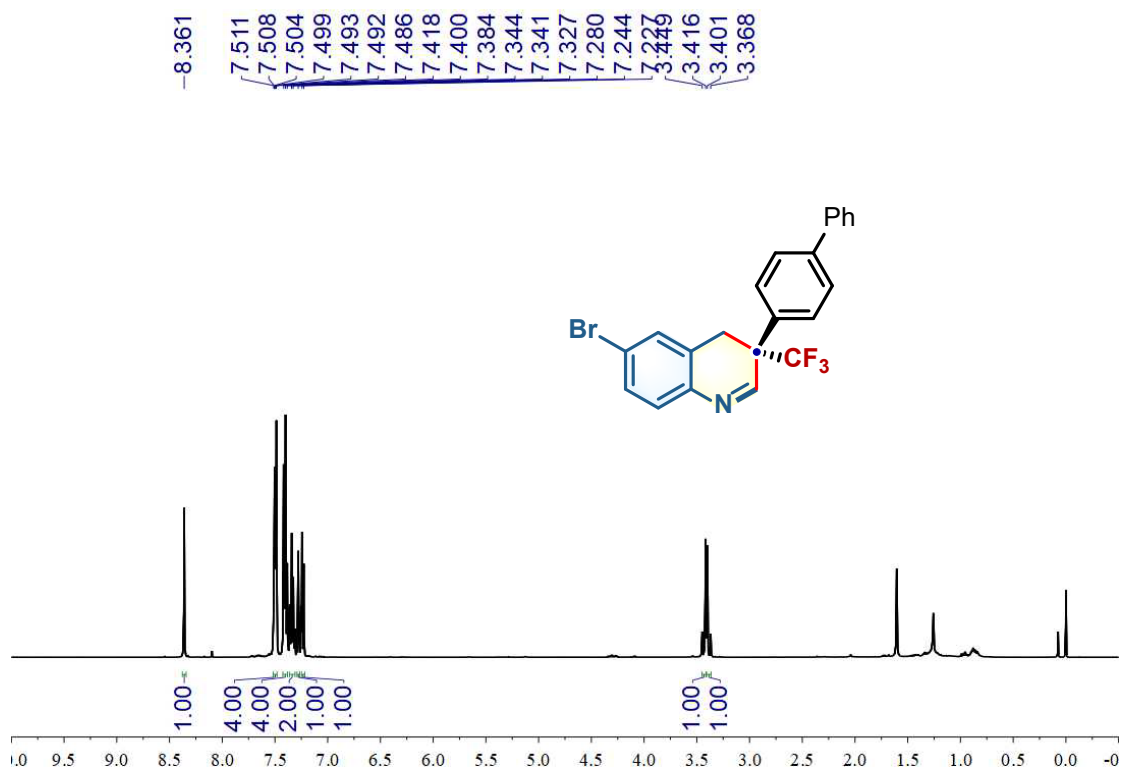
Supplementary Fig. 25. ¹H NMR (500 MHz, CDCl₃) spectrum of **9**



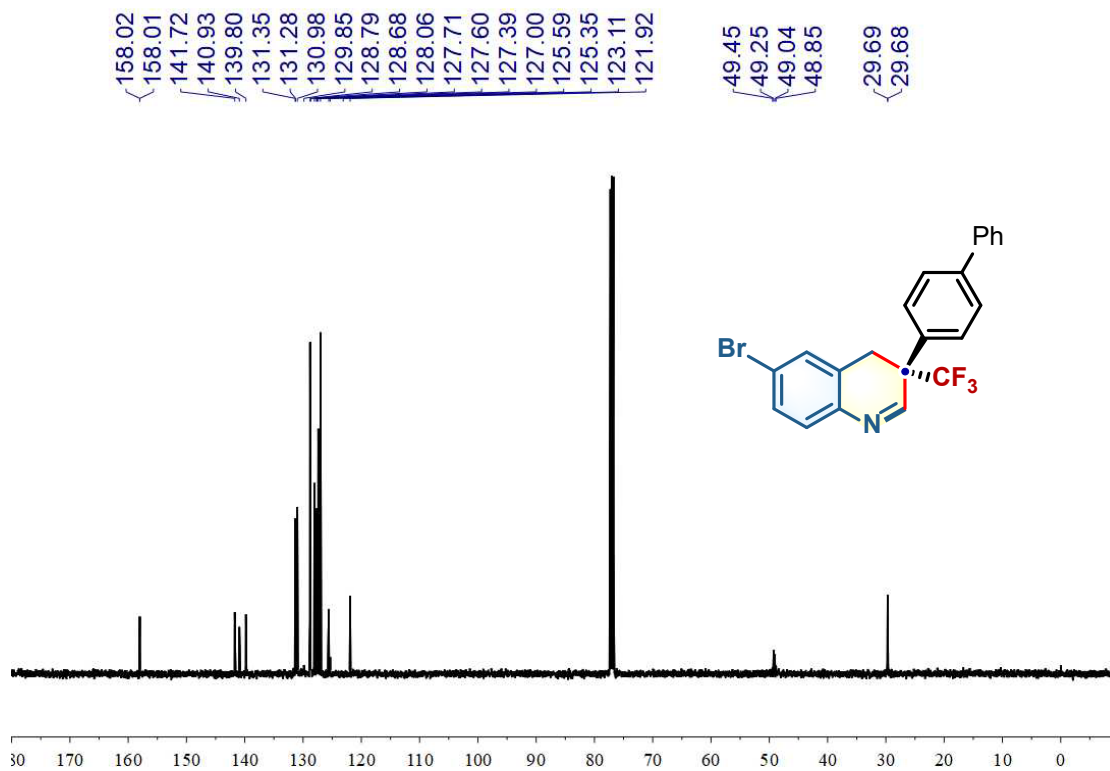
Supplementary Fig. 26. ¹³C NMR (125 MHz, CDCl₃) spectrum of **9**



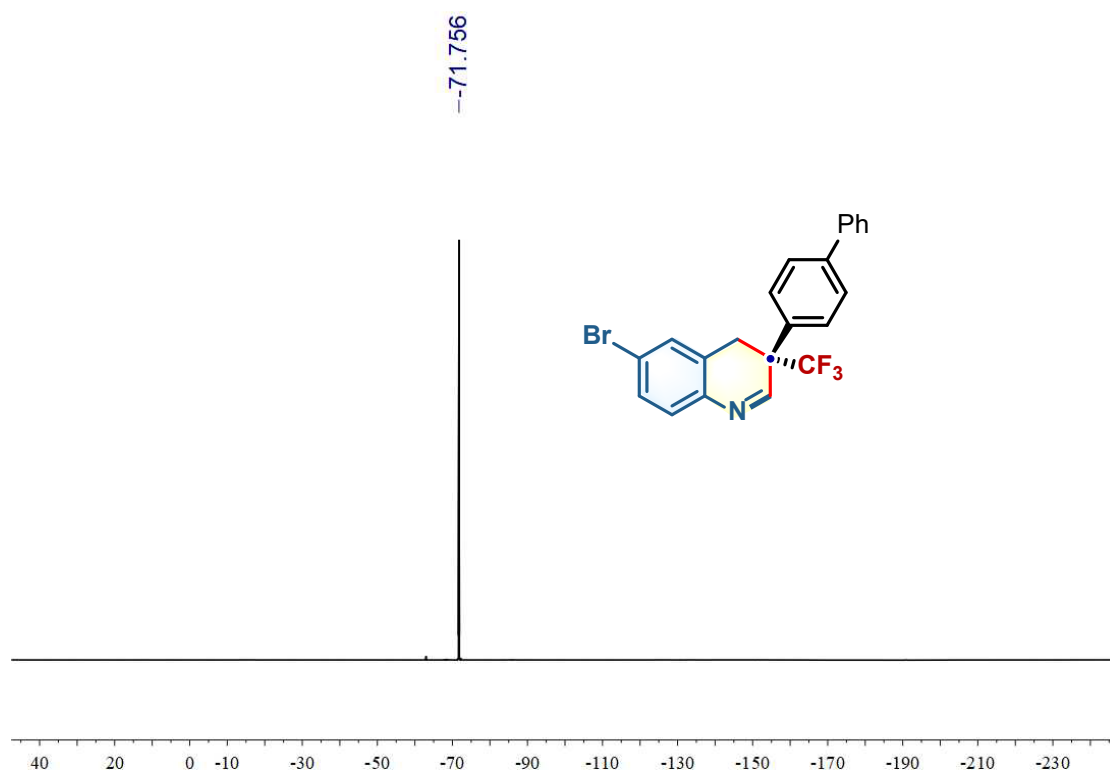
Supplementary Fig.27. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 9



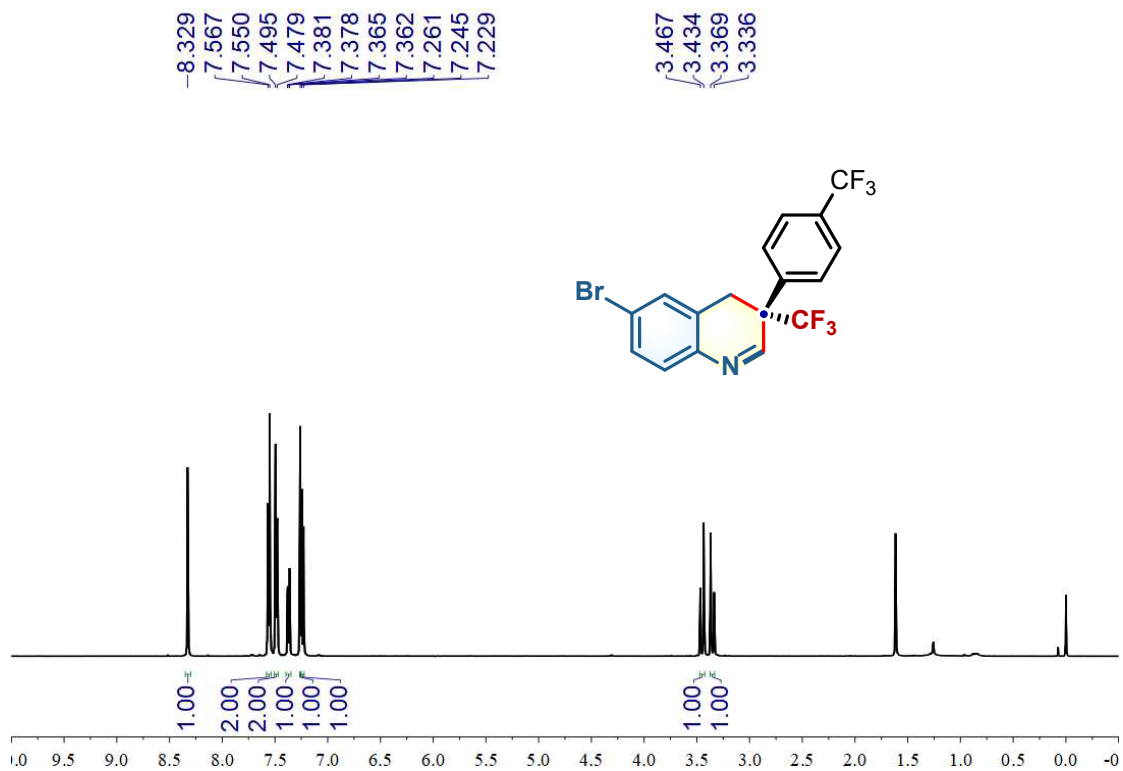
Supplementary Fig. 28. ^1H NMR (500 MHz, CDCl_3) spectrum of 10



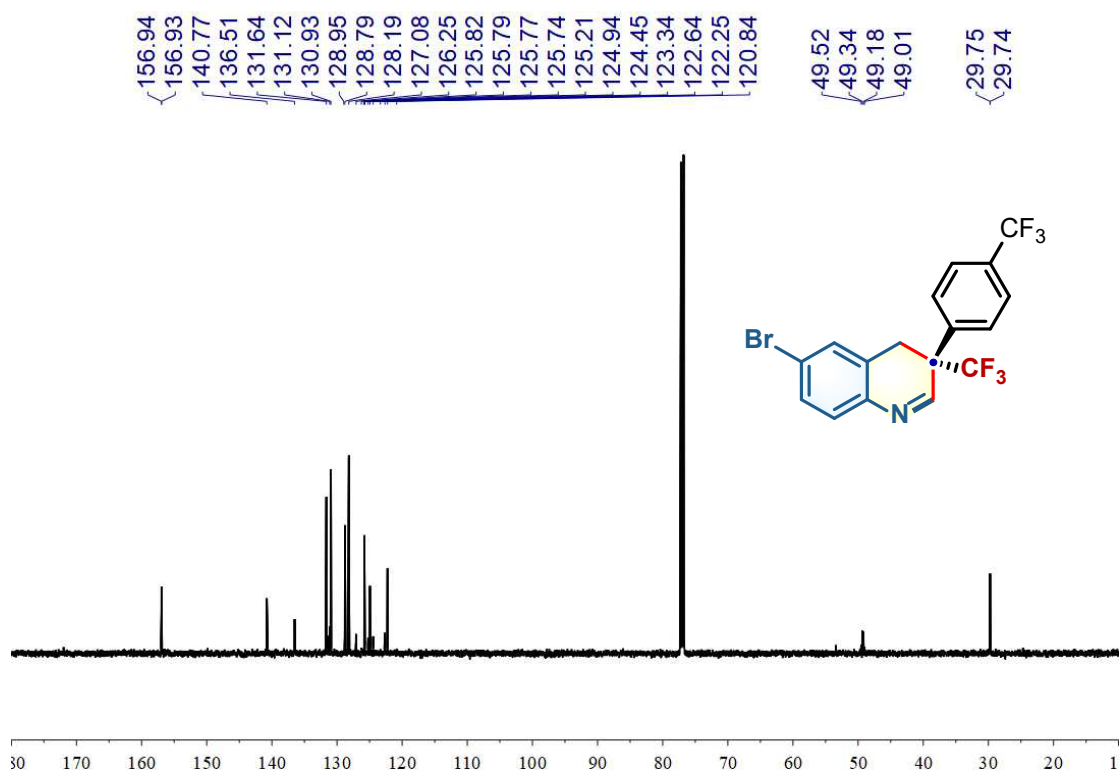
Supplementary Fig. 29. ¹³C NMR (125 MHz, CDCl₃) spectrum of **10**



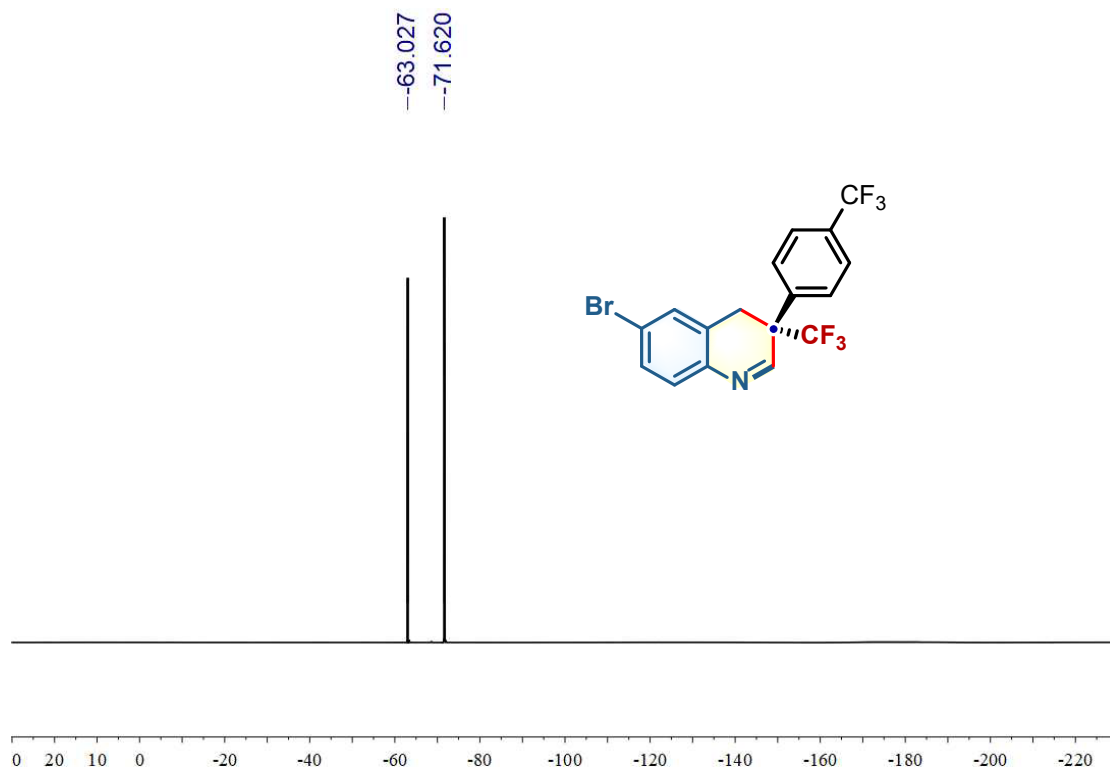
Supplementary Fig. 30. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **10**



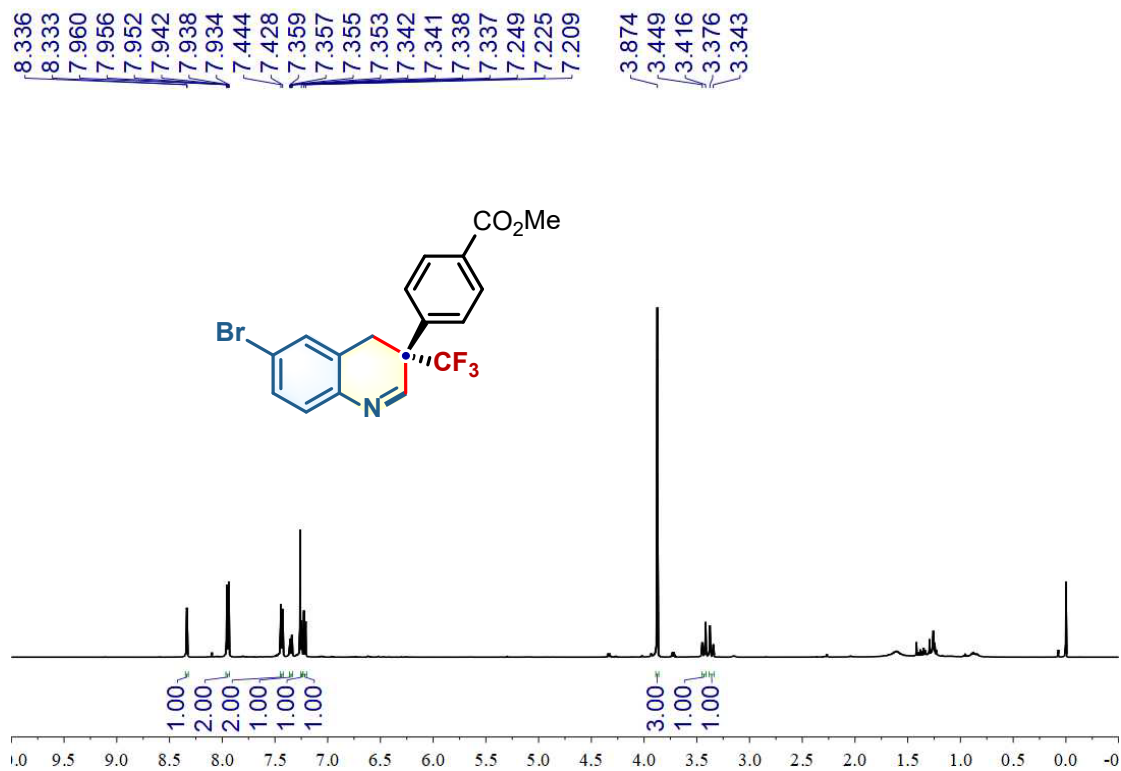
Supplementary Fig. 31. ¹H NMR (500 MHz, CDCl₃) spectrum of **11**



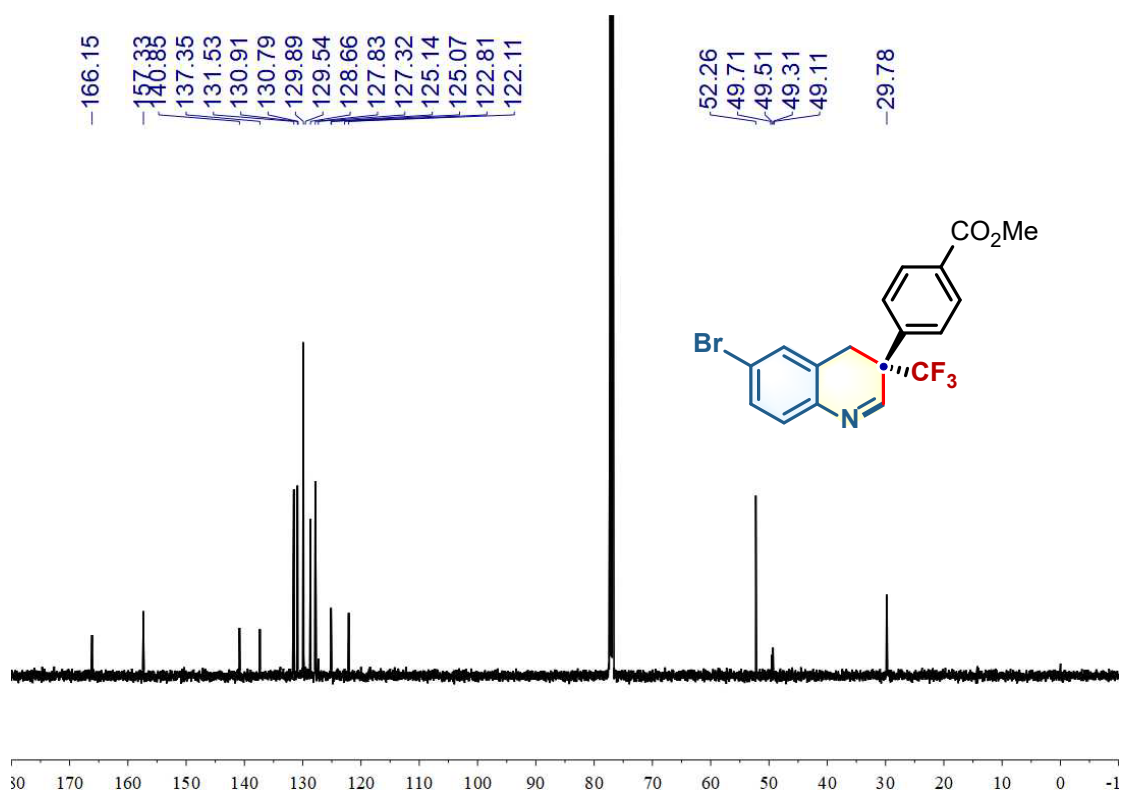
Supplementary Fig. 32. ¹³C NMR (150 MHz, CDCl₃) spectrum of **11**



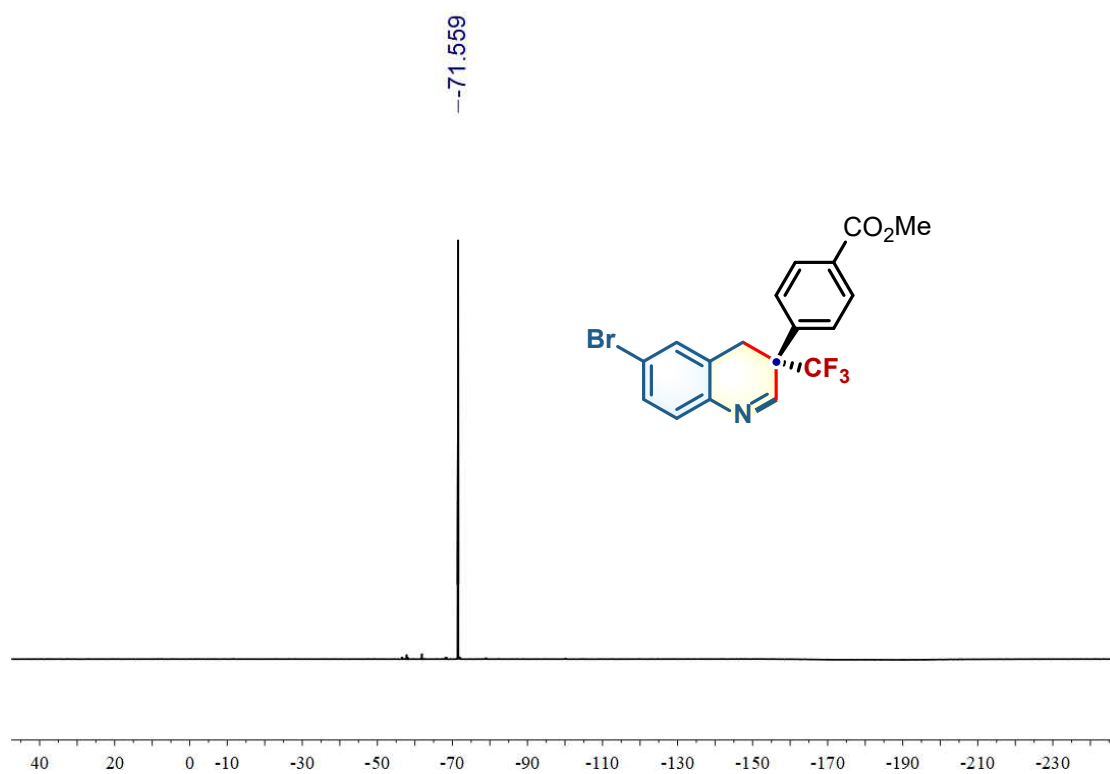
Supplementary Fig. 33. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 11



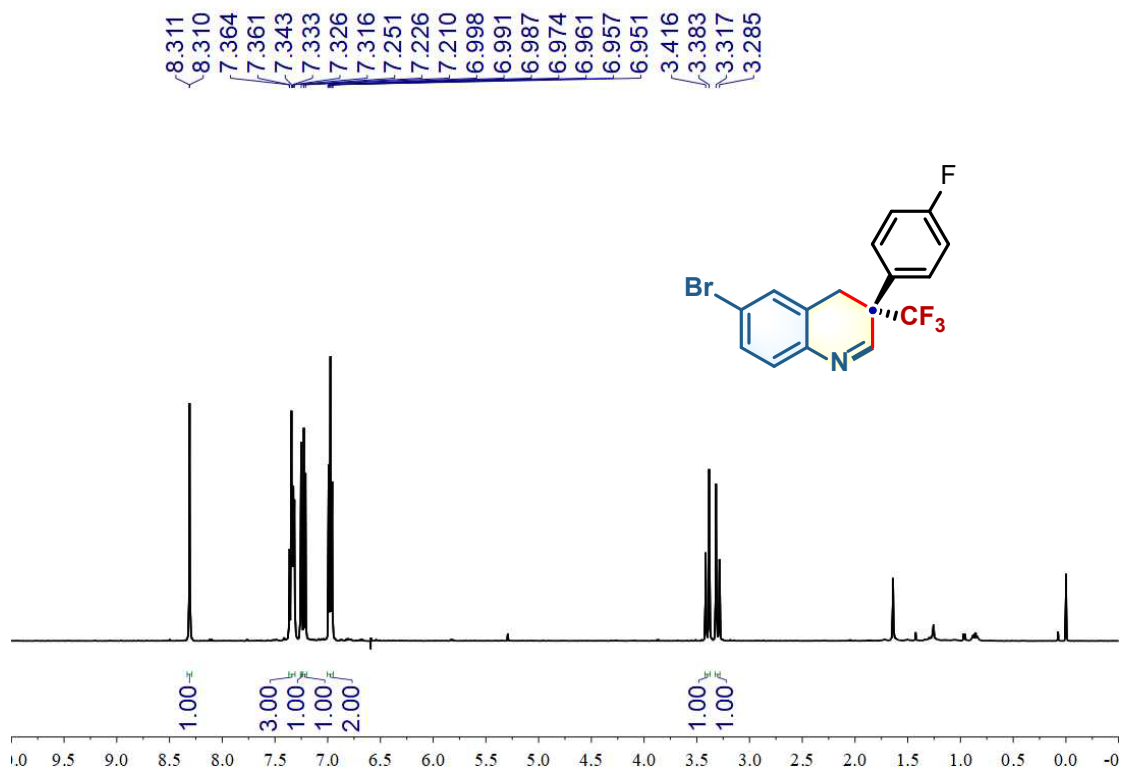
Supplementary Fig. 34. ^1H NMR (500 MHz, CDCl_3) spectrum of 12



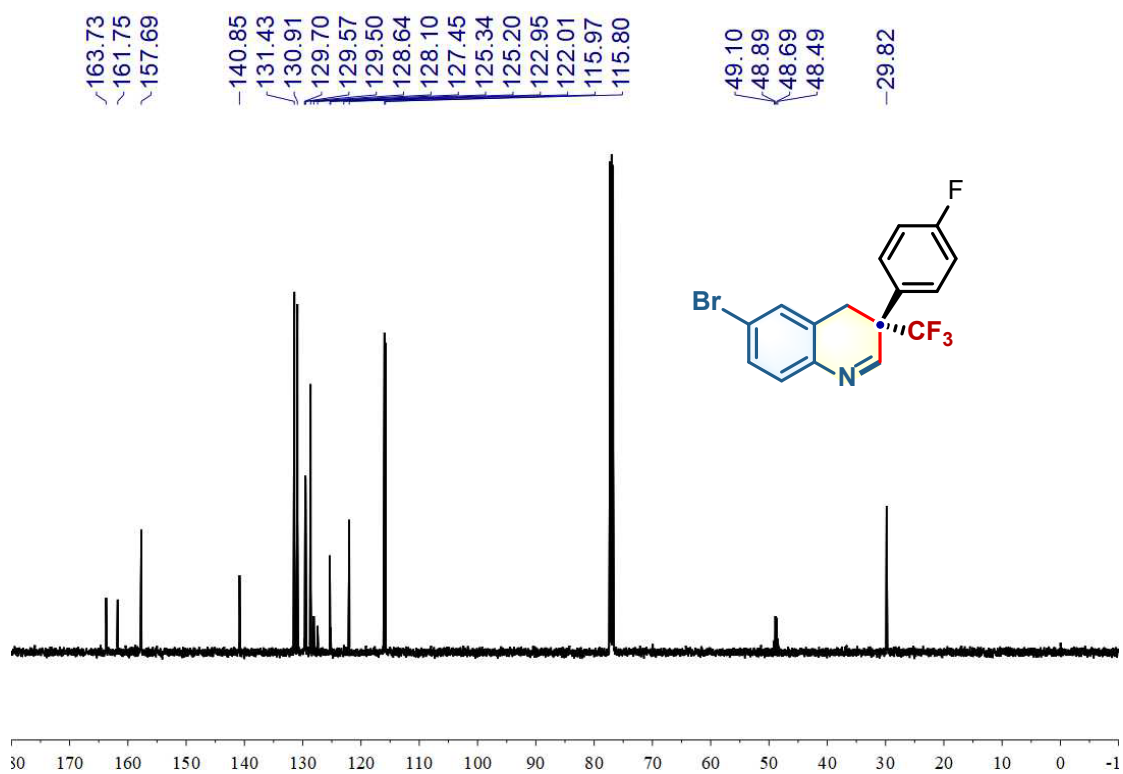
Supplementary Fig. 35. ¹³C NMR (125 MHz, CDCl₃) spectrum of 12



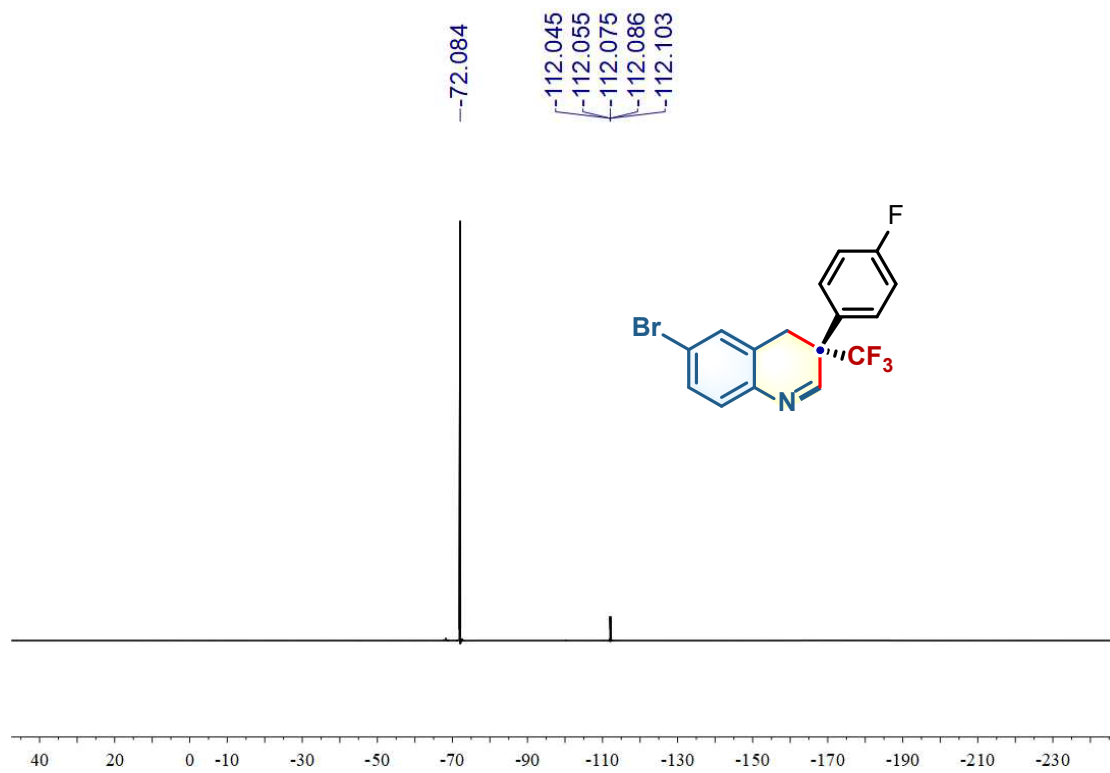
Supplementary Fig. 36. ¹³F NMR (470 MHz, CDCl₃) spectrum of 12



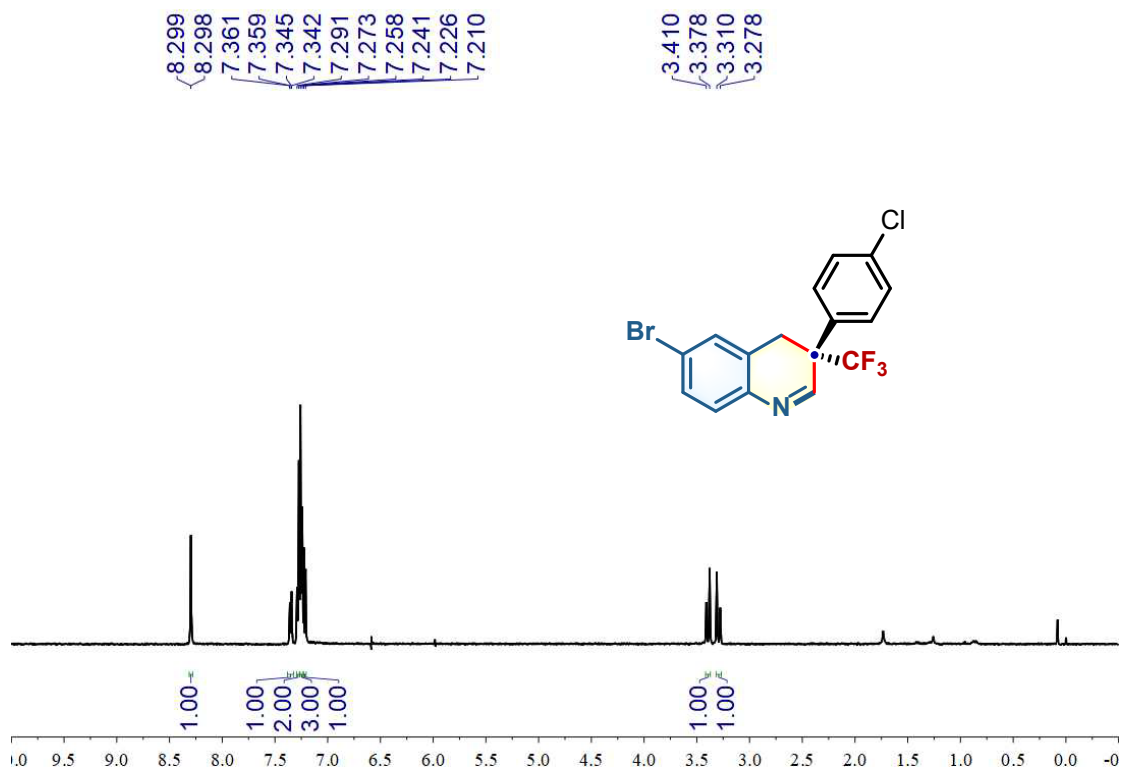
Supplementary Fig. 37. ¹H NMR (500 MHz, CDCl₃) spectrum of 13



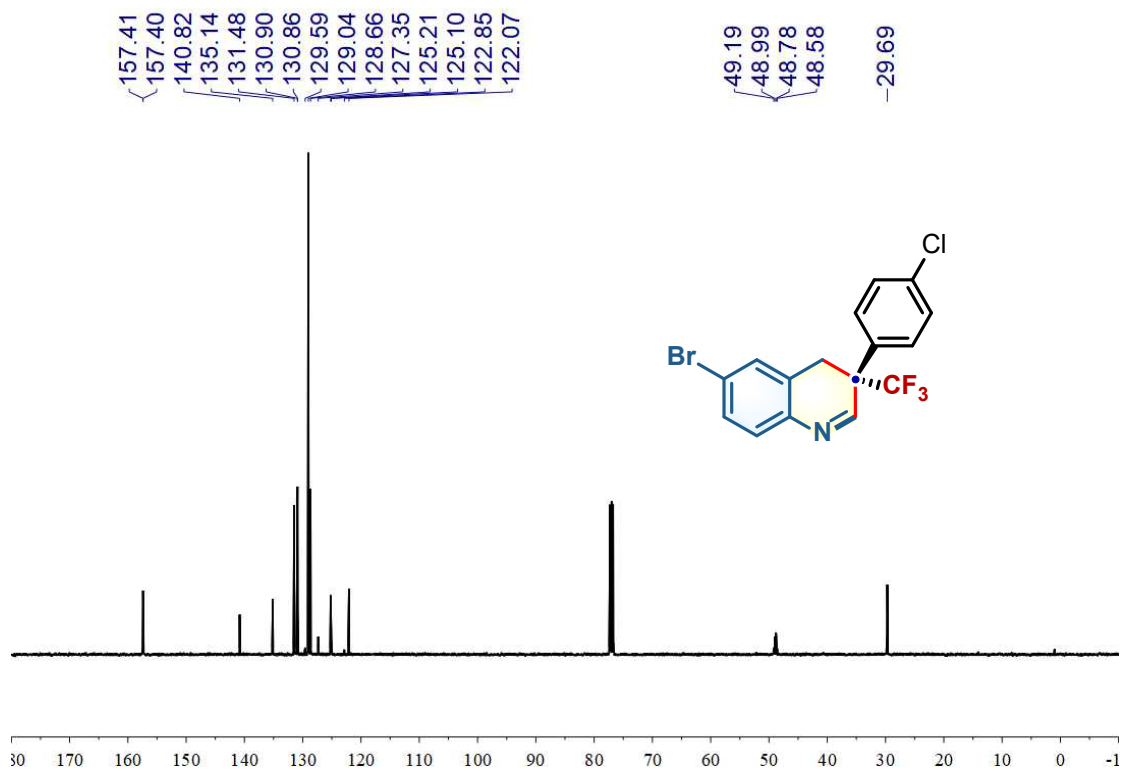
Supplementary Fig. 38. ¹³C NMR (125 MHz, CDCl₃) spectrum of 13



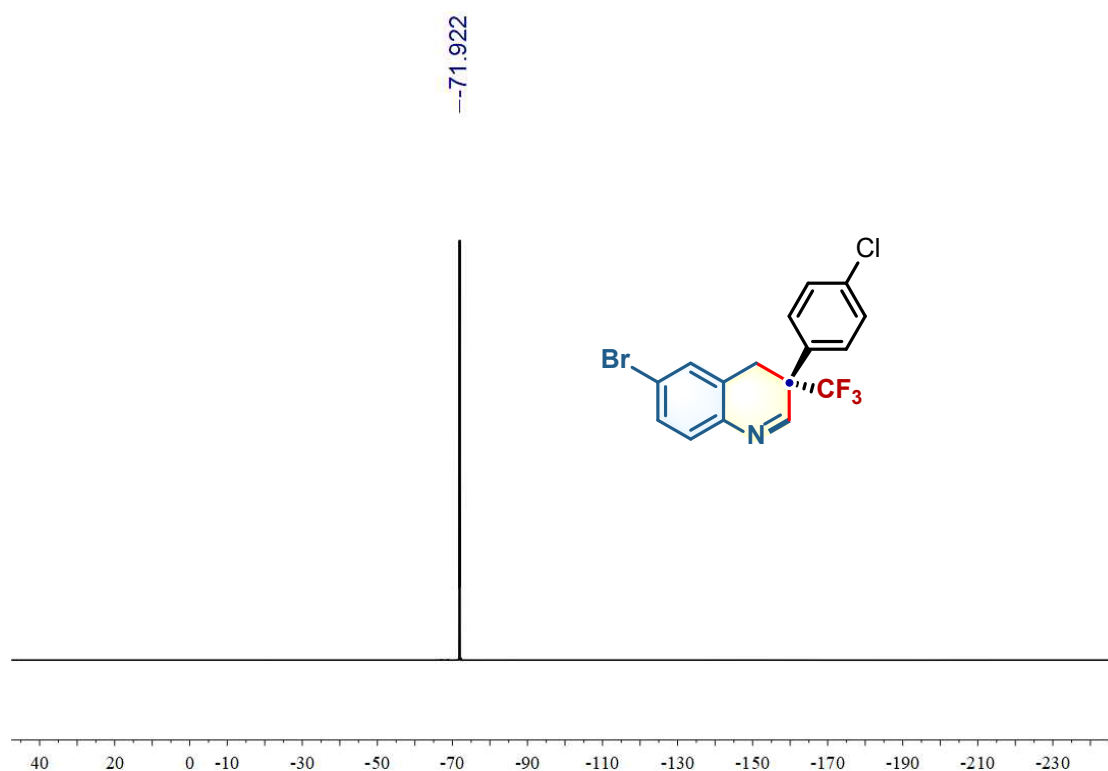
Supplementary Fig.39. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 13



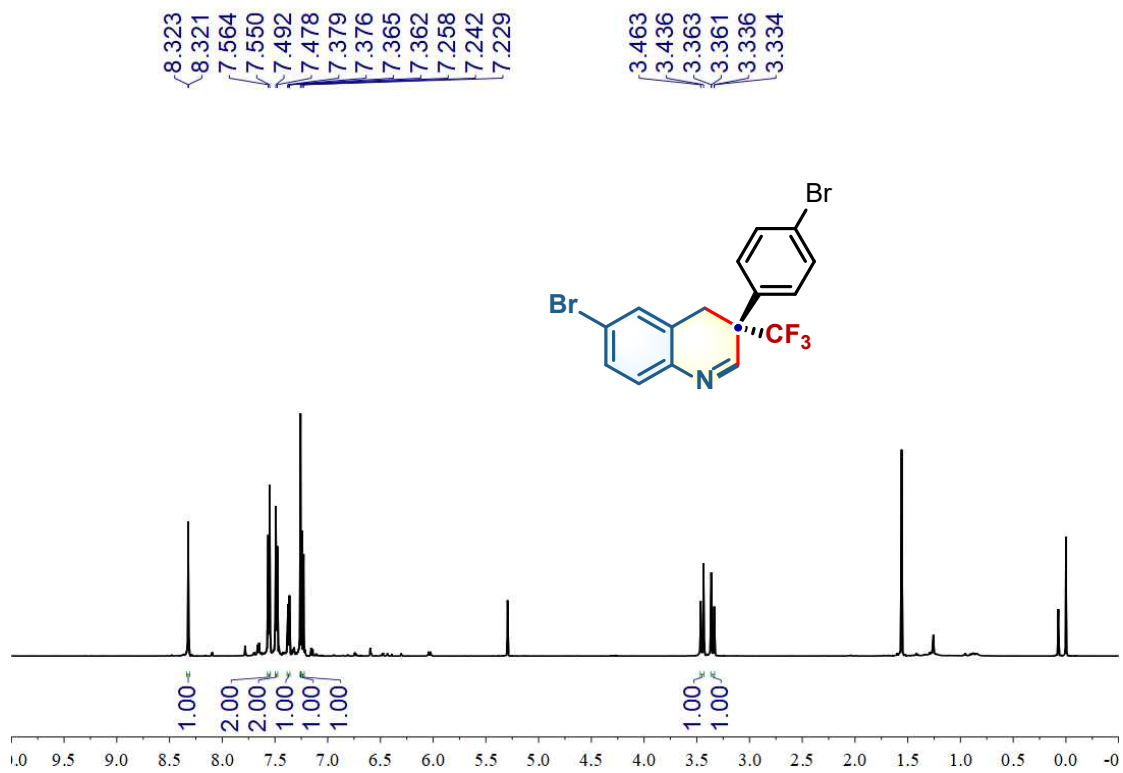
Supplementary Fig. 40. ^1H NMR (500 MHz, CDCl_3) spectrum of 14



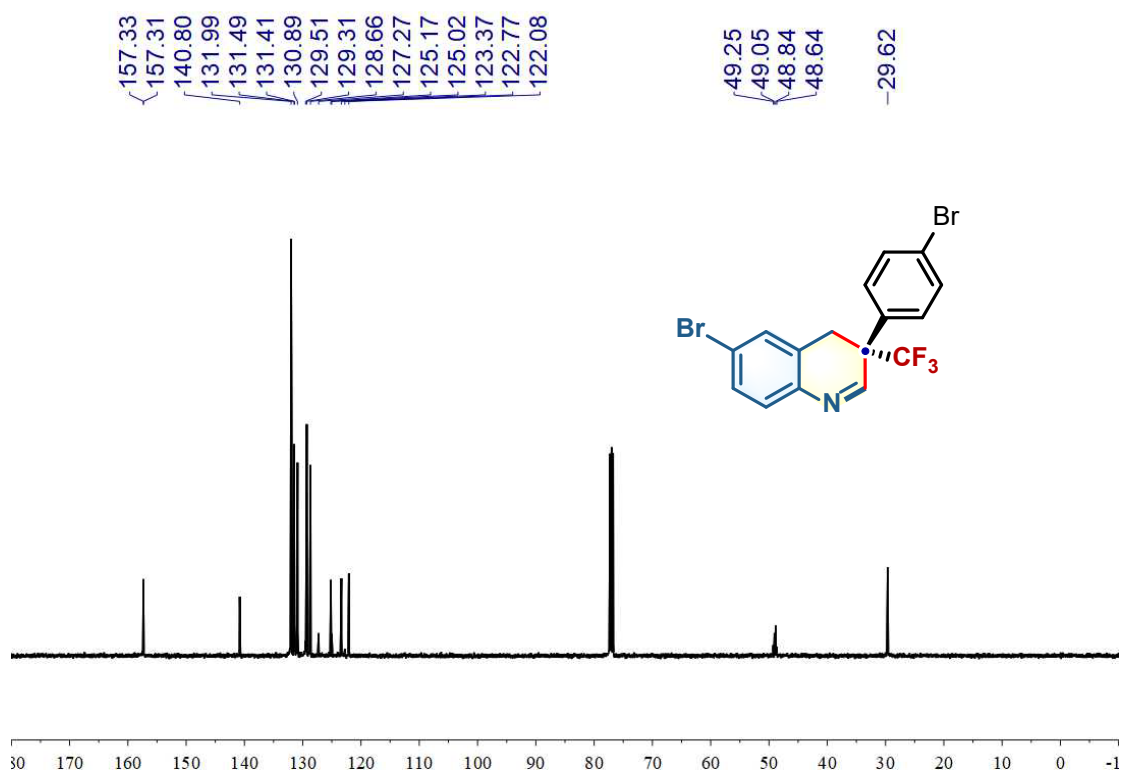
Supplementary Fig.41. ^{13}C NMR (125 MHz, CDCl_3) spectrum of 14



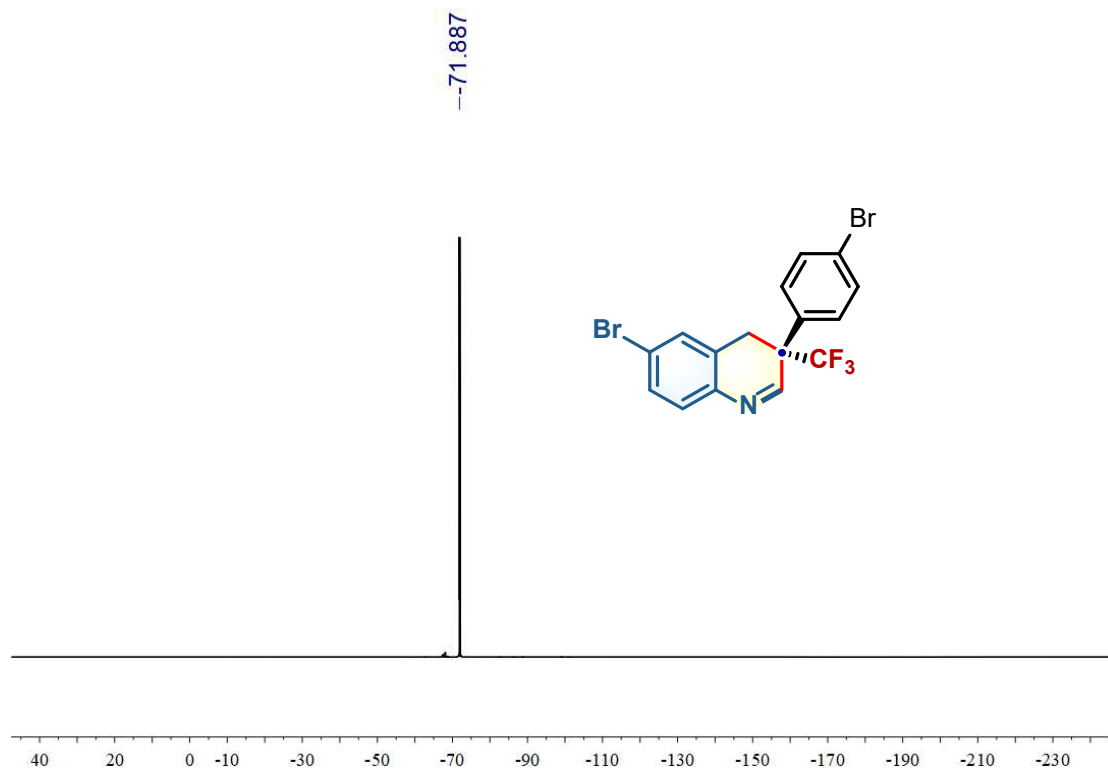
Supplementary Fig. 42. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 14



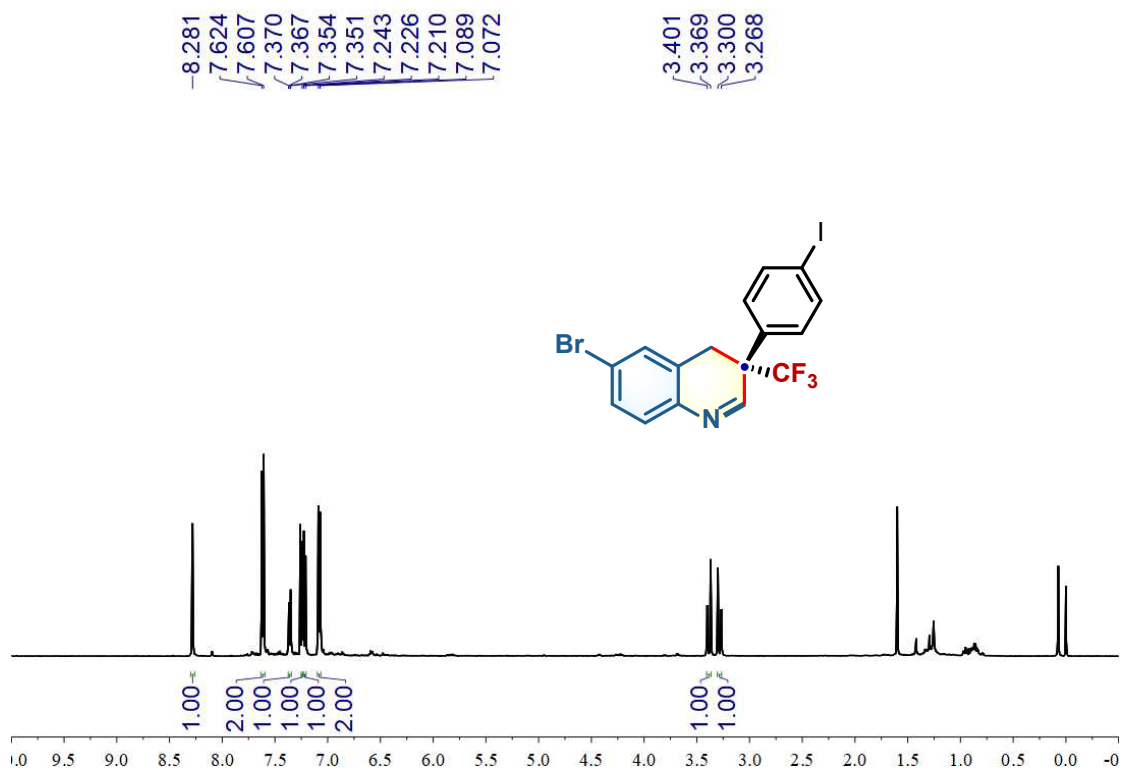
Supplementary Fig. 43. ¹H NMR (600 MHz, CDCl₃) spectrum of **15**



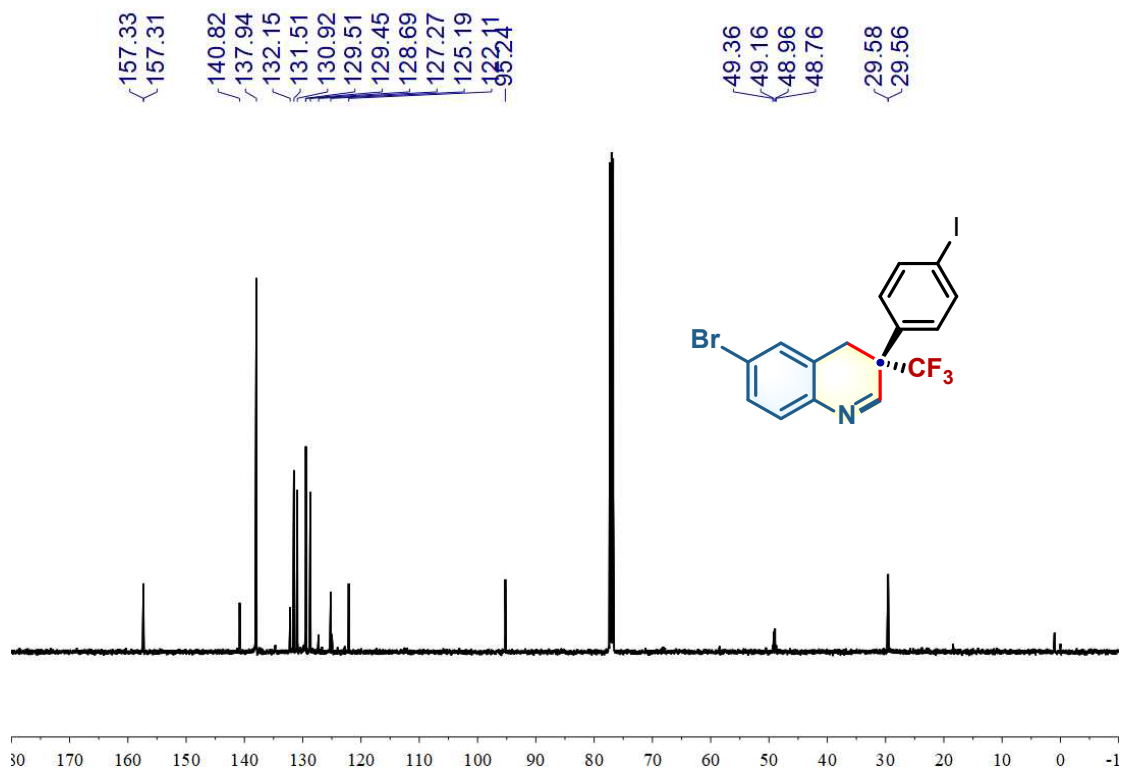
Supplementary Fig. 44. ¹³C NMR (125 MHz, CDCl₃) spectrum of **15**



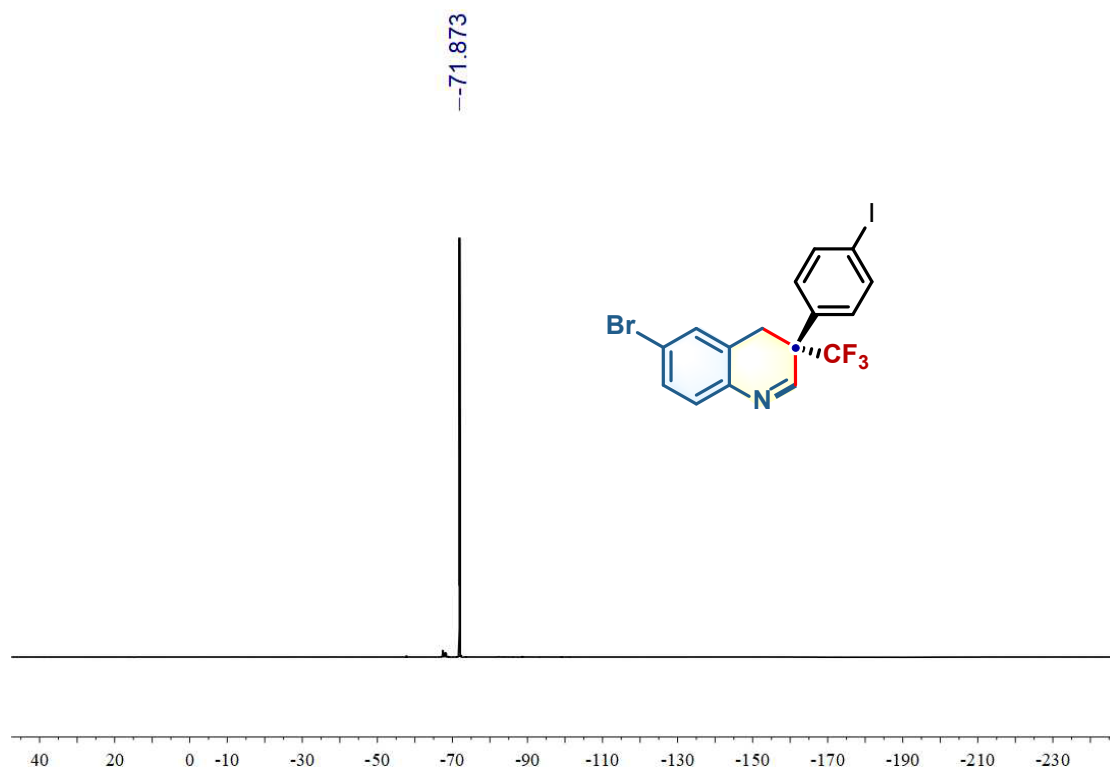
Supplementary Fig. 45. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **15**



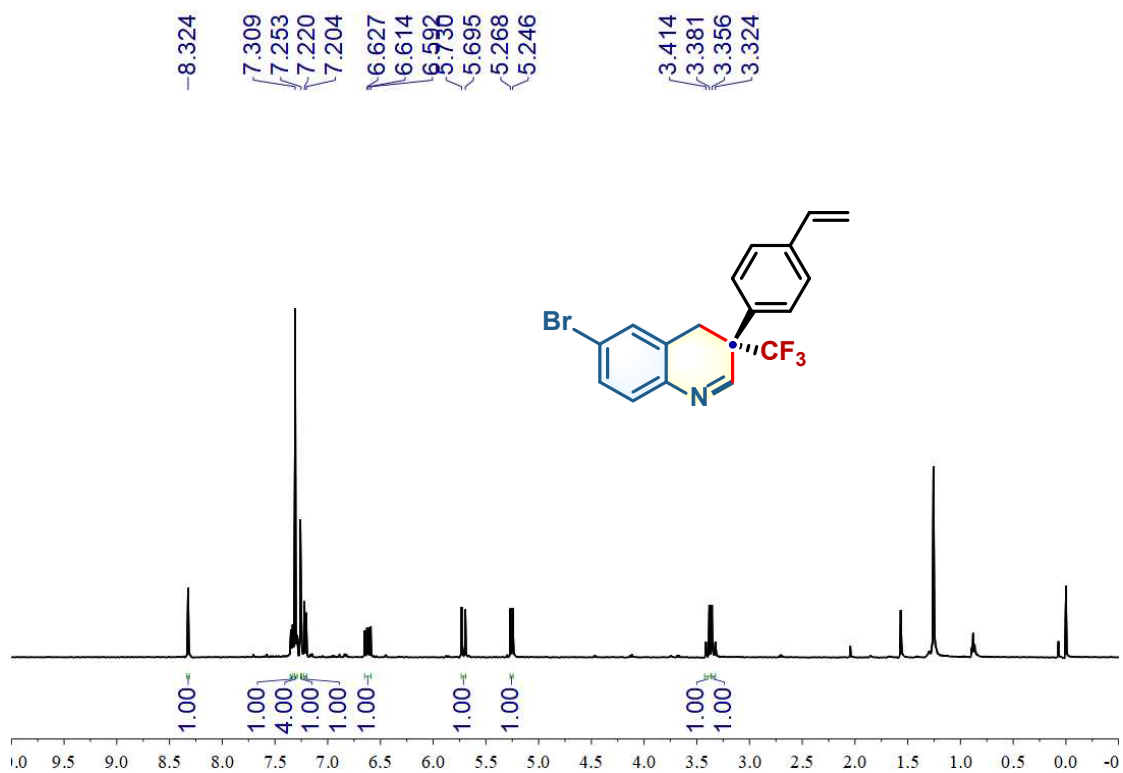
Supplementary Fig. 46. ^1H NMR (500 MHz, CDCl_3) spectrum of **16**



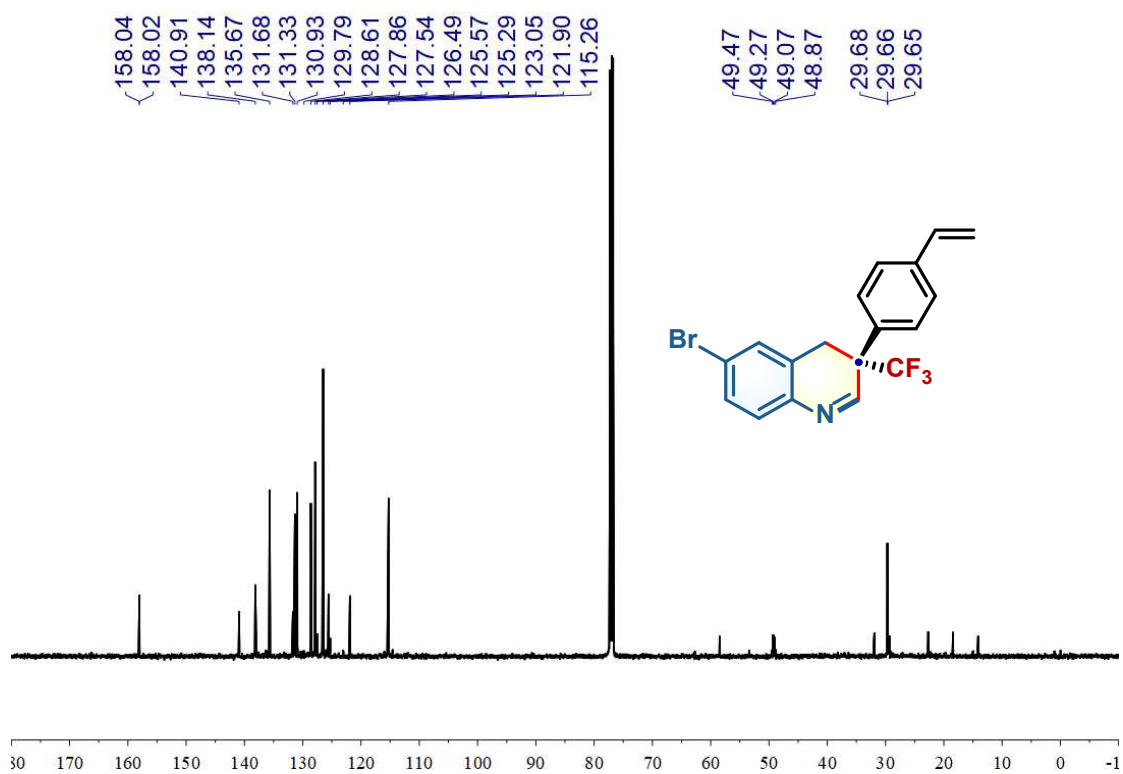
Supplementary Fig. 47. ¹³C NMR (125 MHz, CDCl₃) spectrum of 16



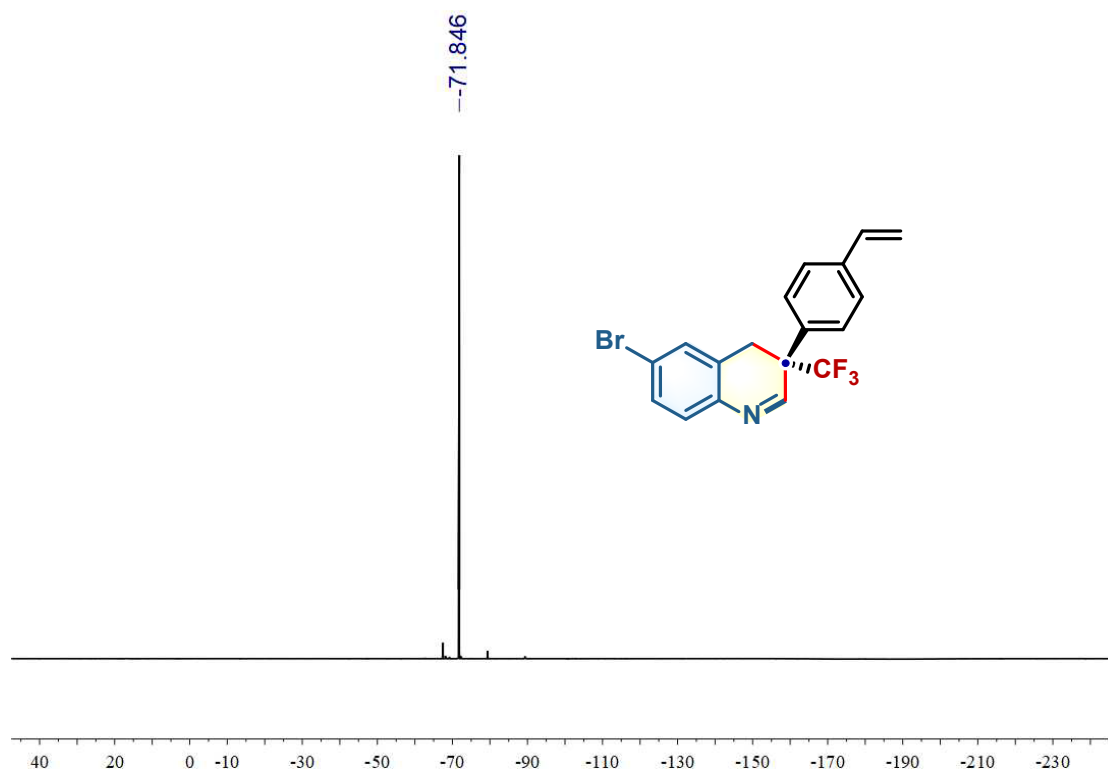
Supplementary Fig. 48. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 16



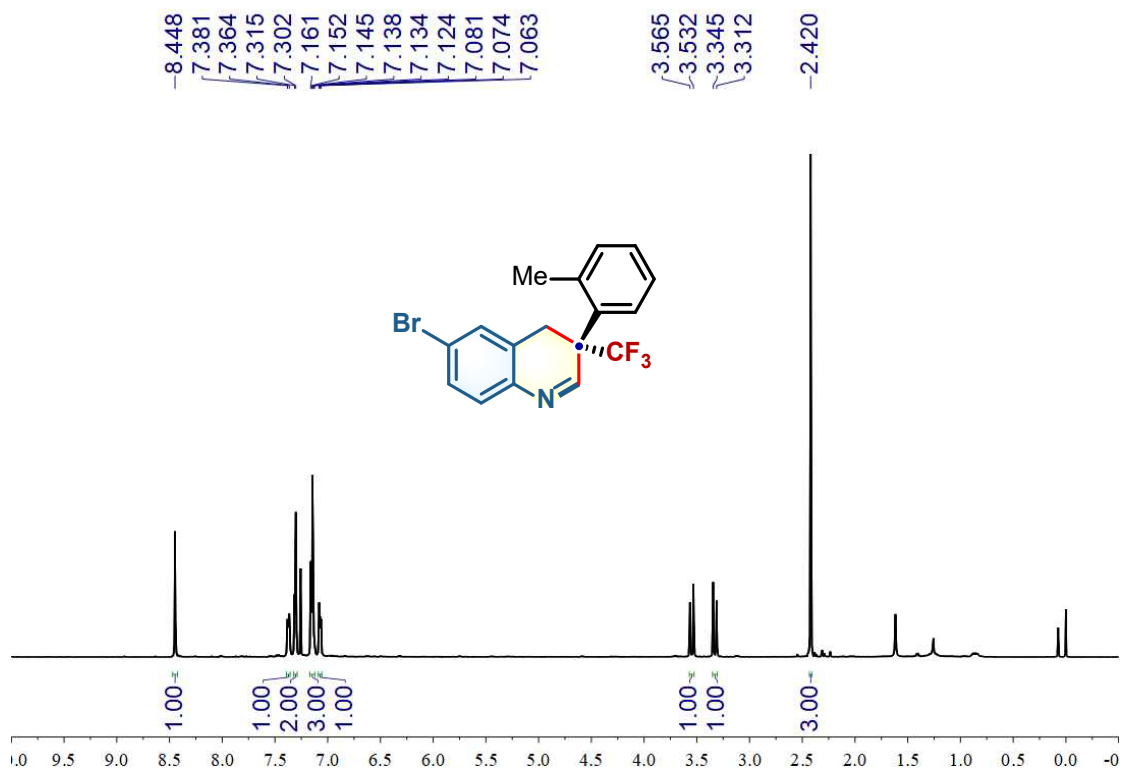
Supplementary Fig.49. ¹H NMR (500 MHz, CDCl₃) spectrum of 17



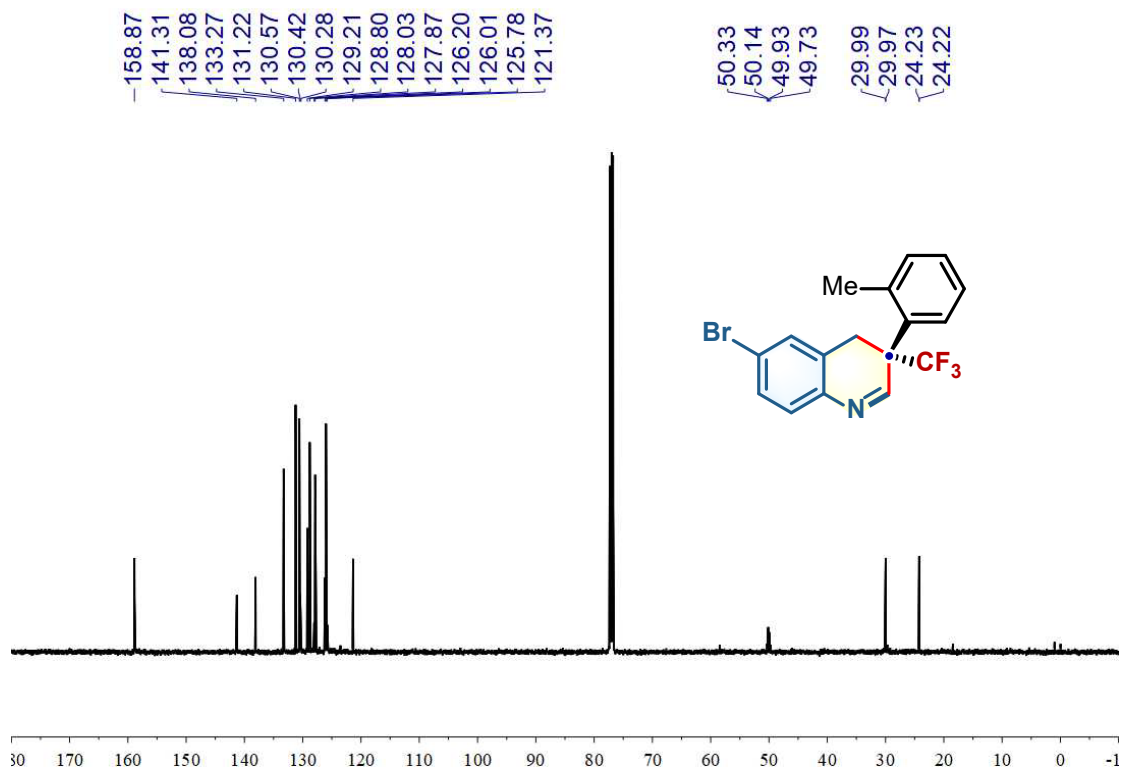
Supplementary Fig. 50. ¹³C NMR (125 MHz, CDCl₃) spectrum of 17



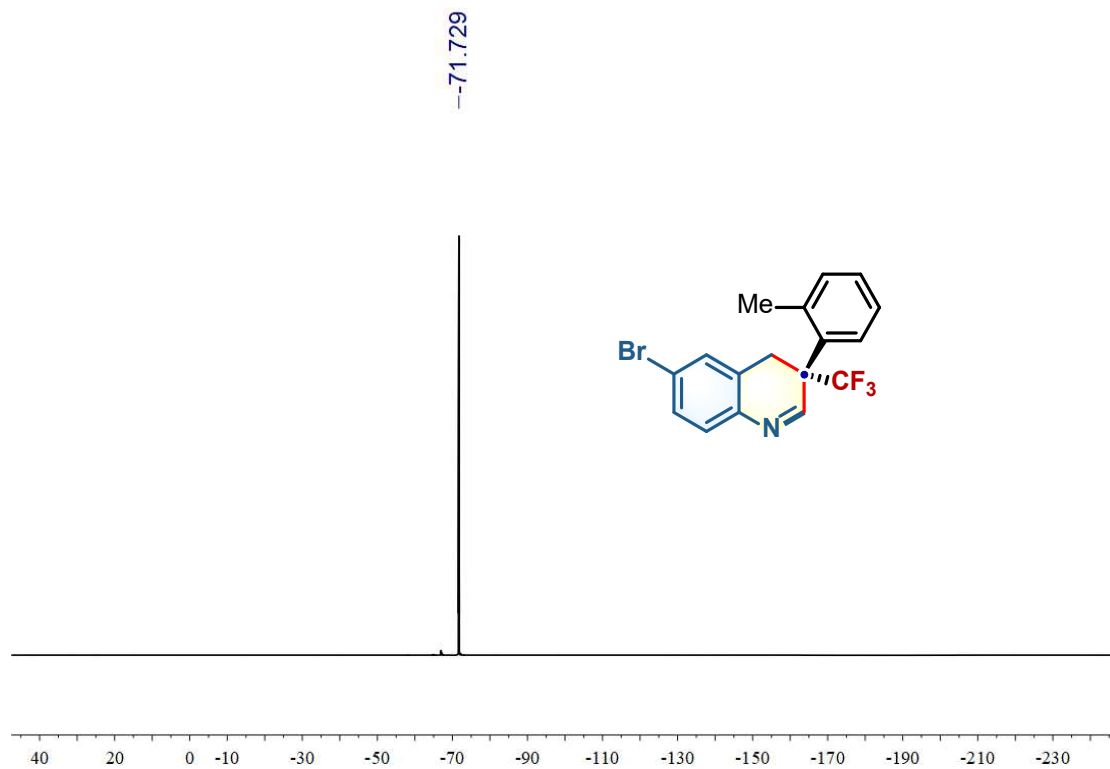
Supplementary Fig. 51. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 17



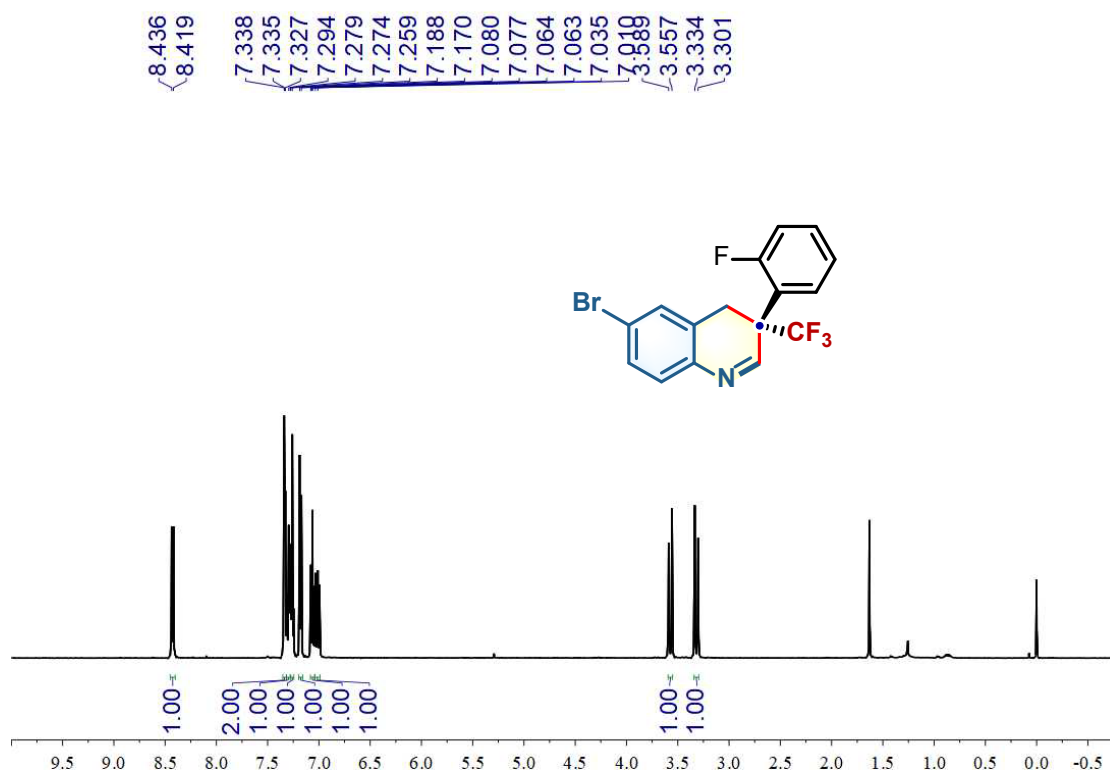
Supplementary Fig. 52. ^1H NMR (500 MHz, CDCl_3) spectrum of 18



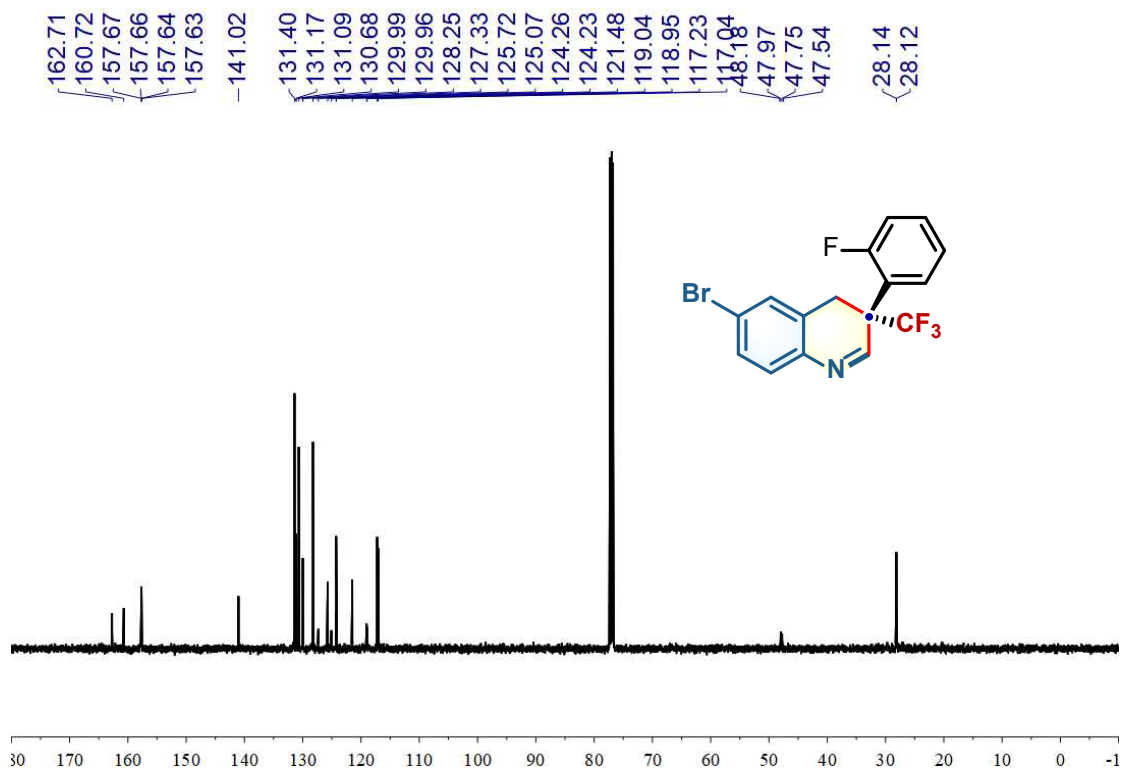
Supplementary Fig. 53. ¹³C NMR (125 MHz, CDCl₃) spectrum of 18



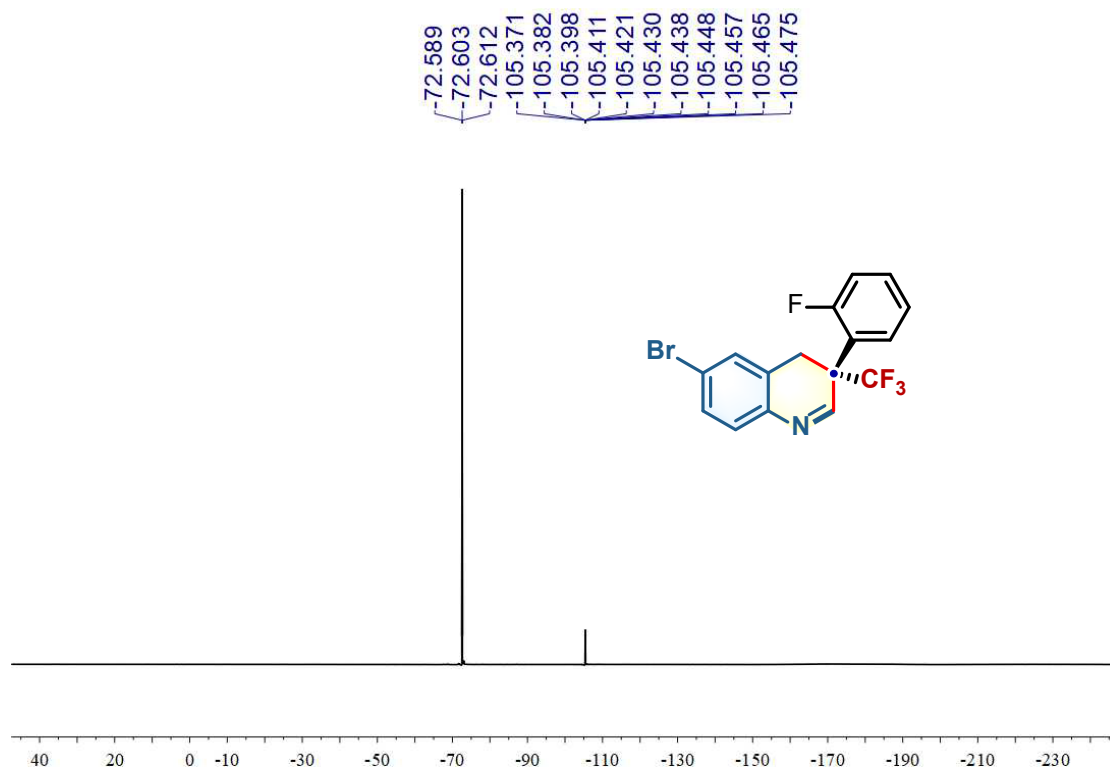
Supplementary Fig. 54. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 18



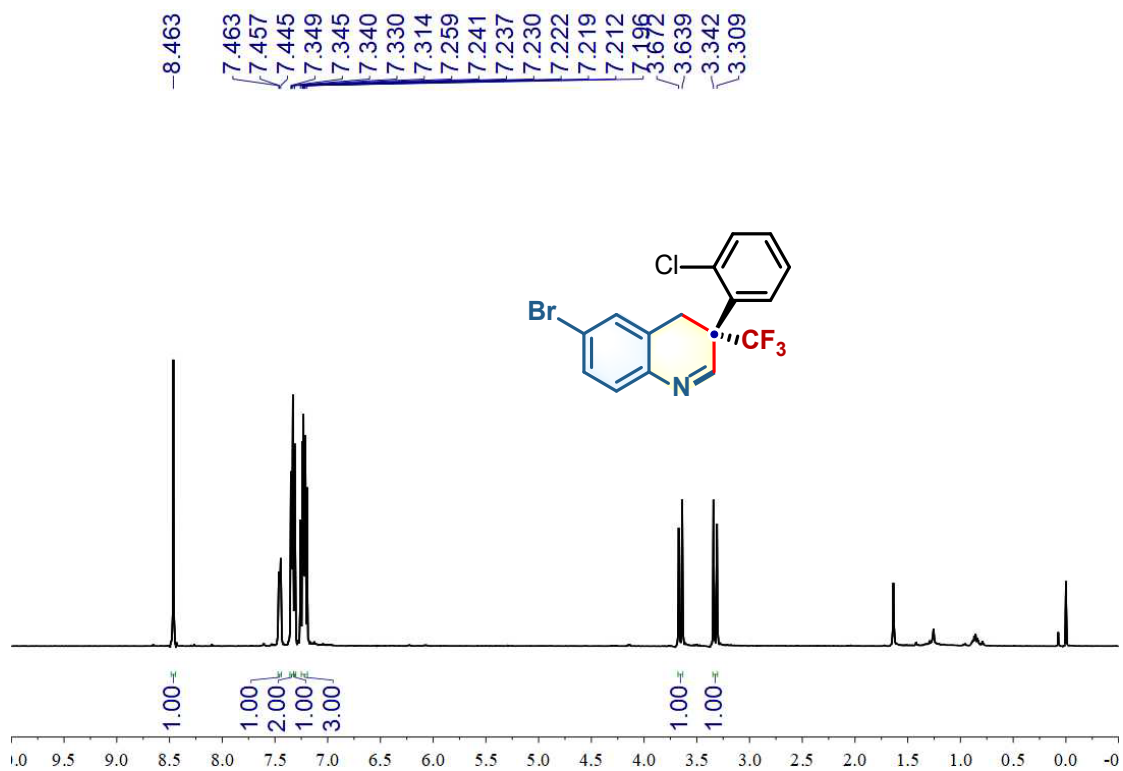
Supplementary Fig. 55. ¹H NMR (500 MHz, CDCl₃) spectrum of **19**



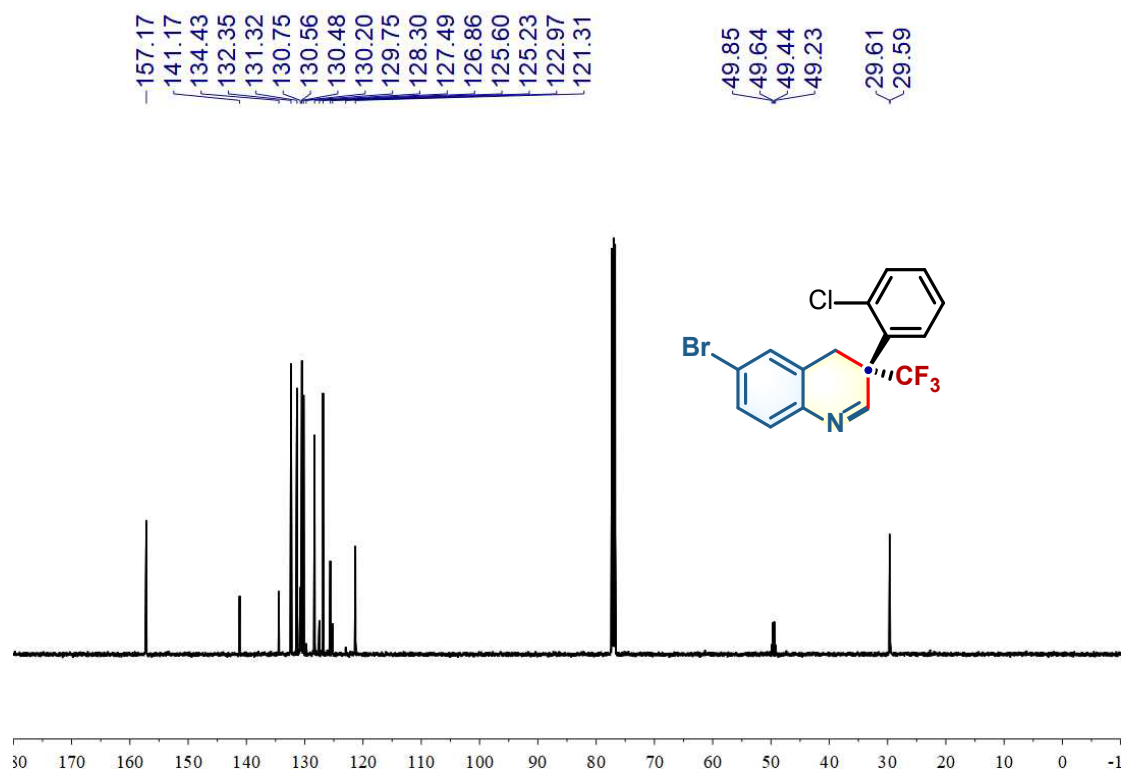
Supplementary Fig. 56. ¹³C NMR (125 MHz, CDCl₃) spectrum of **19**



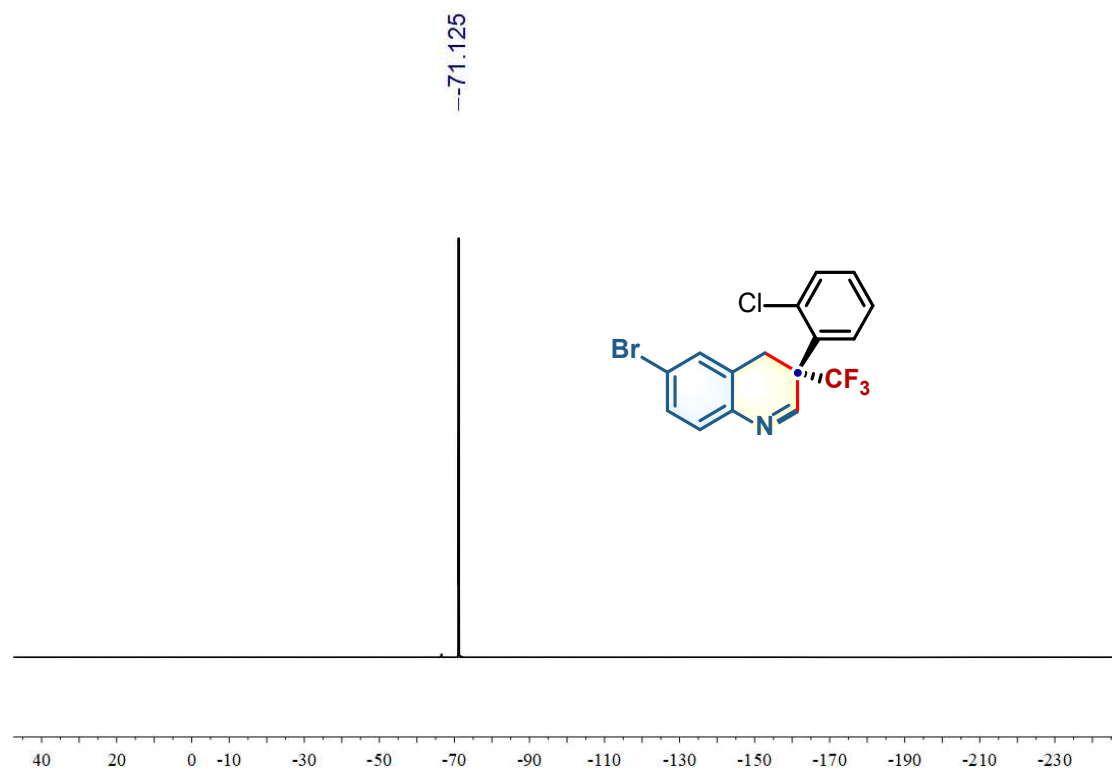
Supplementary Fig. 57. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **19**



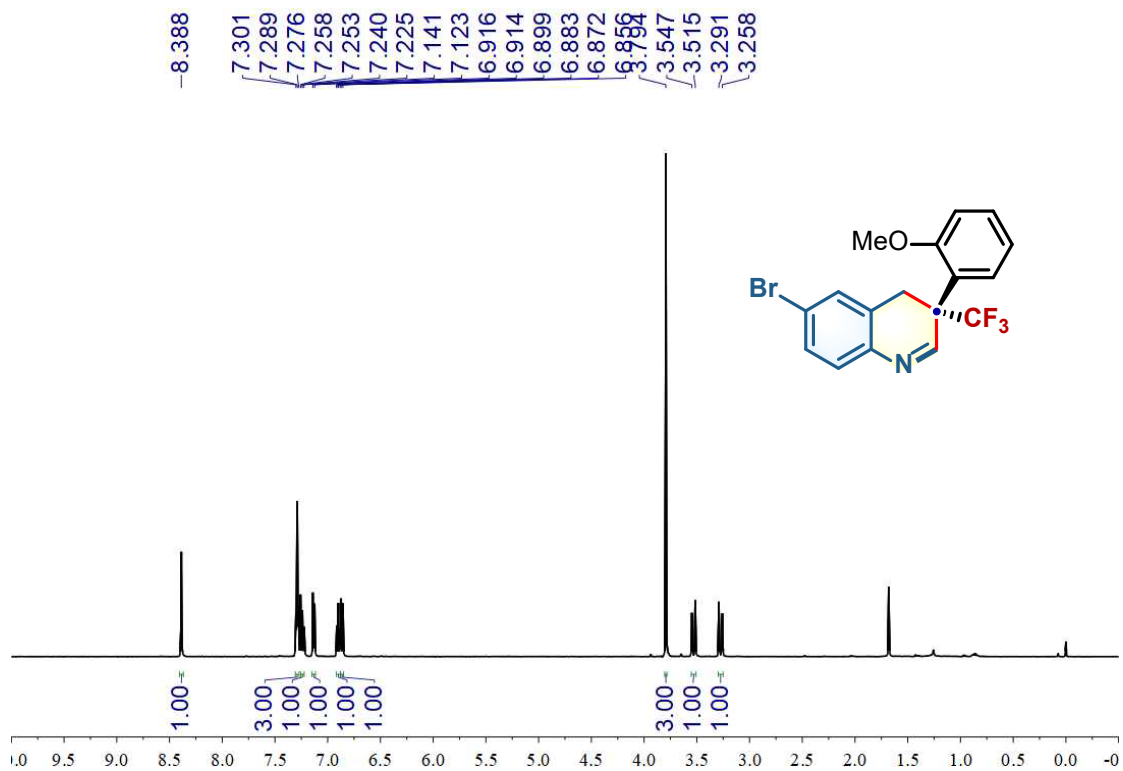
Supplementary Fig. 58. ¹H NMR (500 MHz, CDCl₃) spectrum of **20**



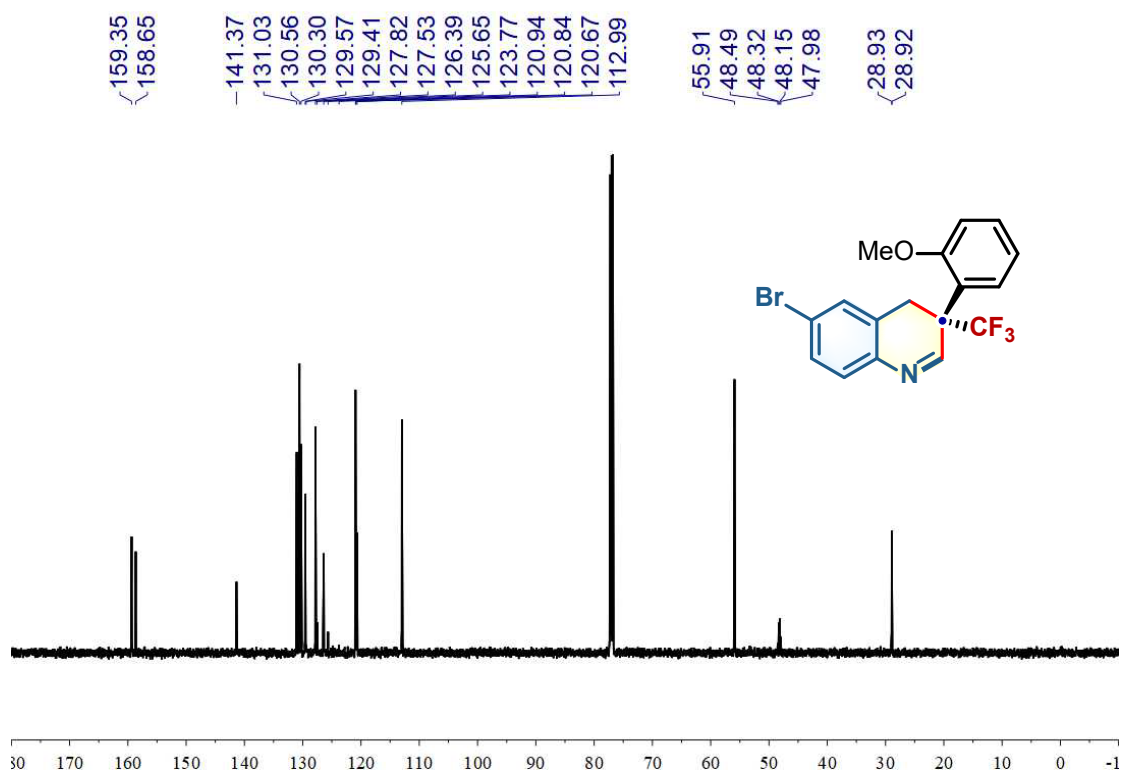
Supplementary Fig. 59. ¹³C NMR (125 MHz, CDCl₃) spectrum of **20**



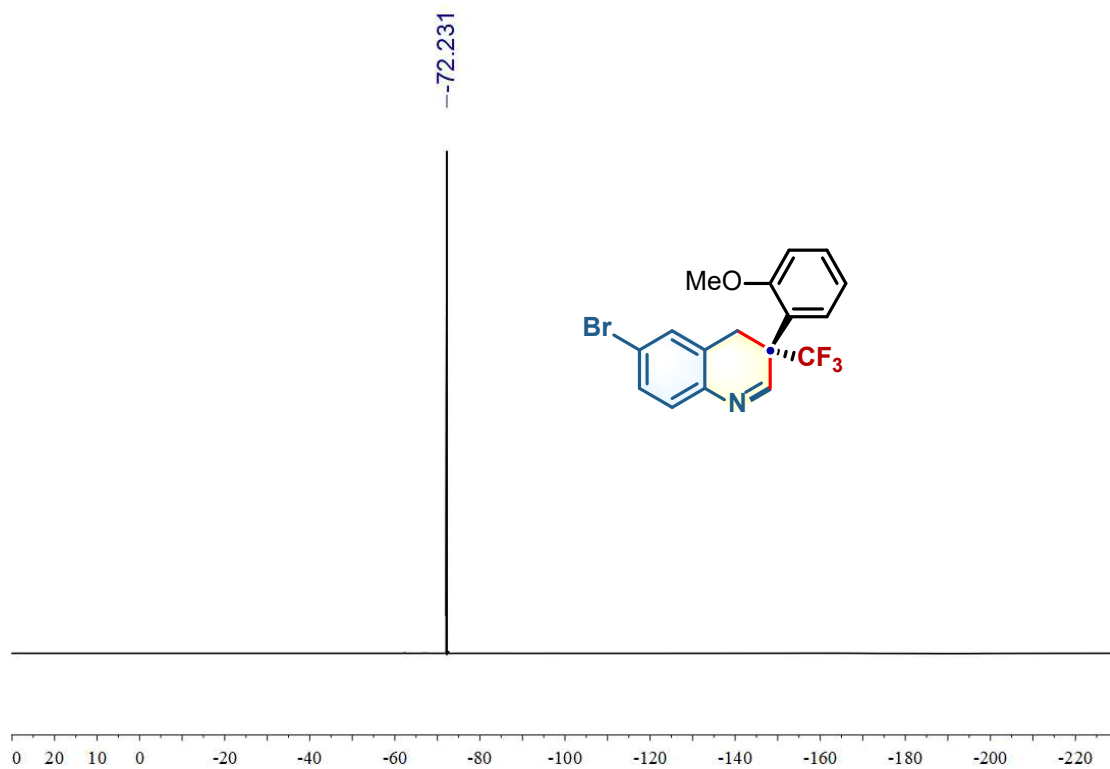
Supplementary Fig. 60. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **20**



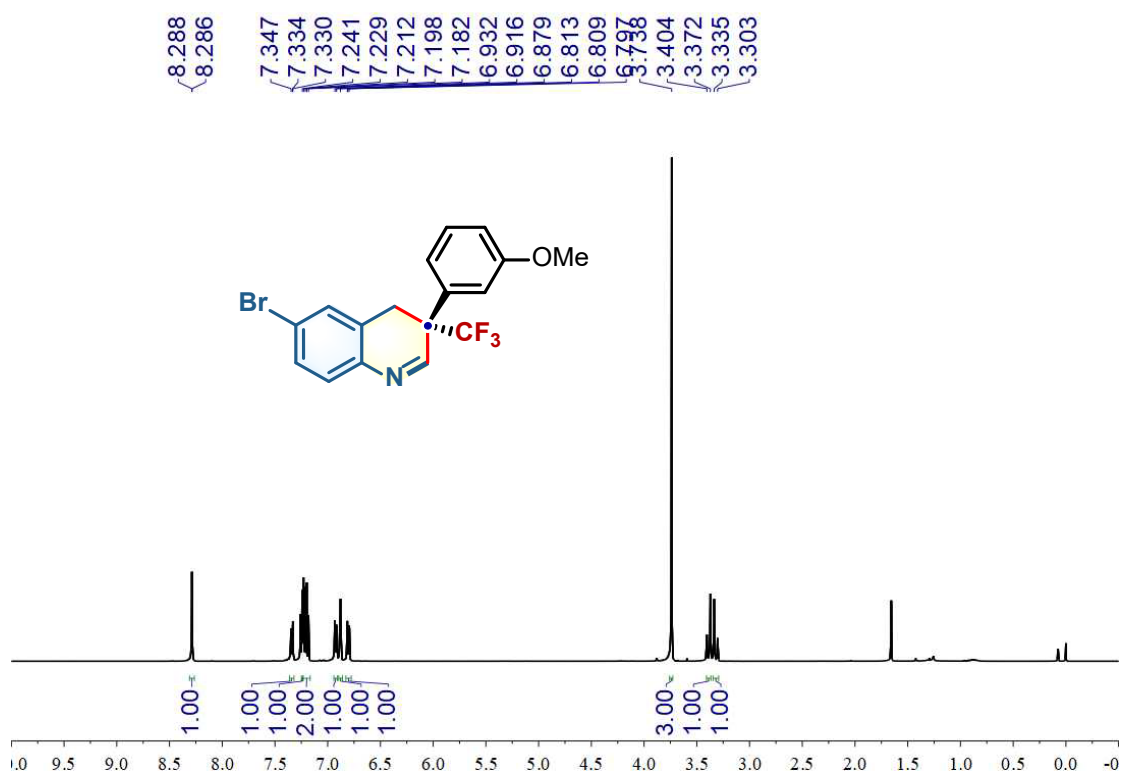
Supplementary Fig. 61. ¹H NMR (500 MHz, CDCl₃) spectrum of 21



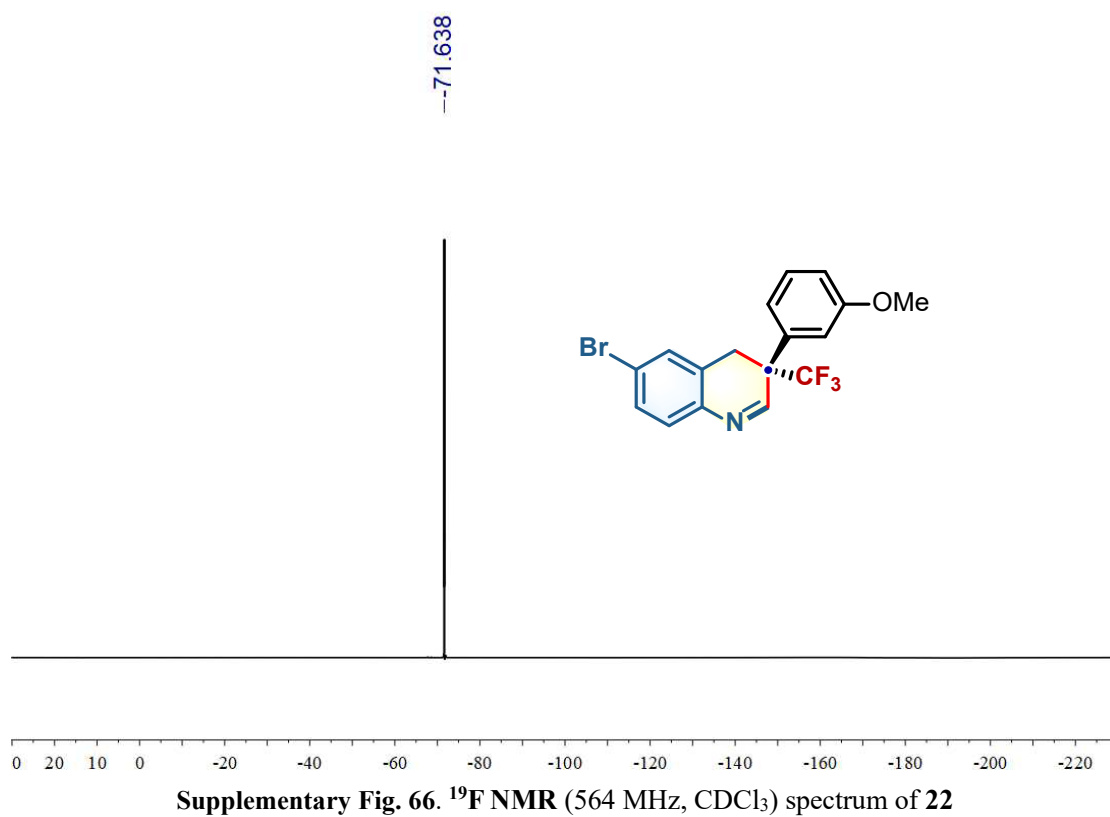
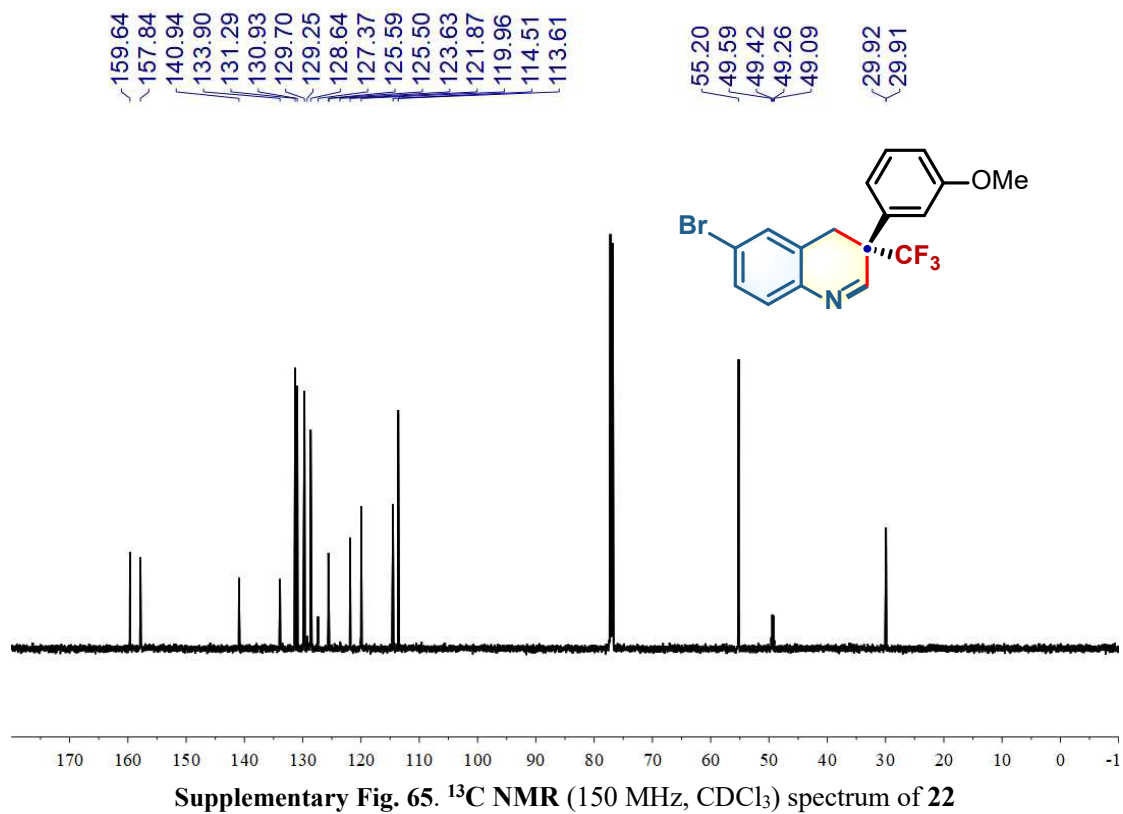
Supplementary Fig. 62. ¹³C NMR (150 MHz, CDCl₃) spectrum of 21

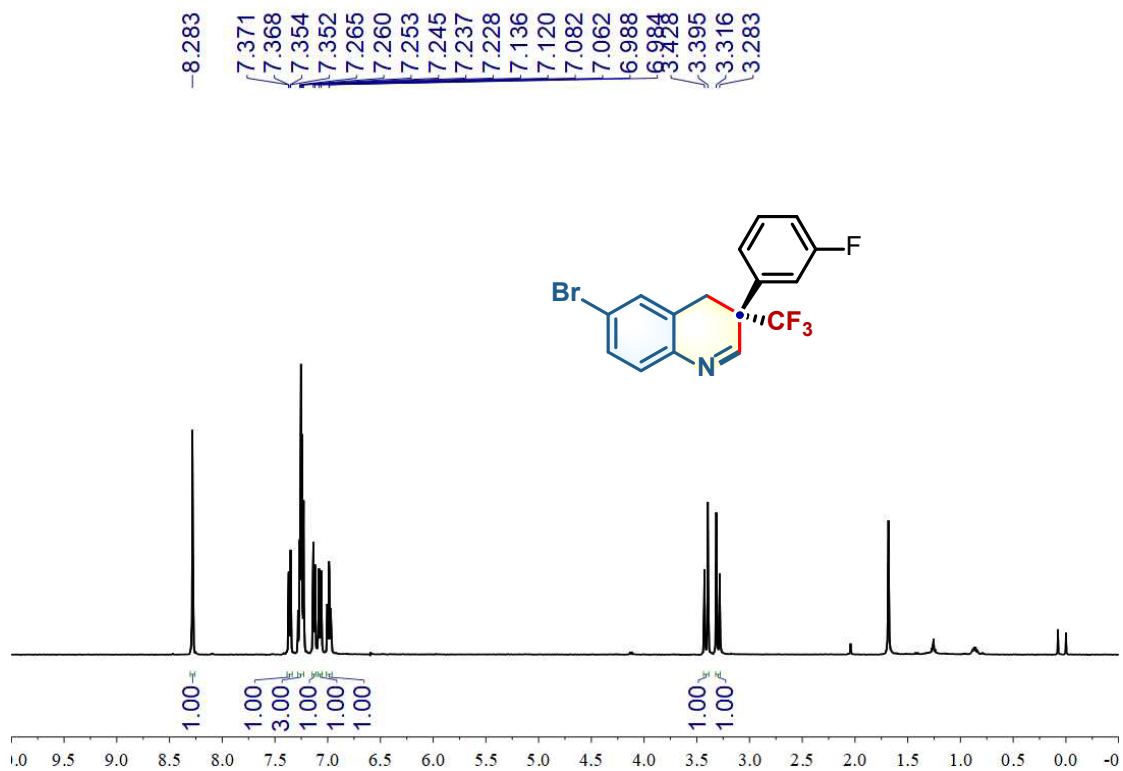


Supplementary Fig. 63. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **21**

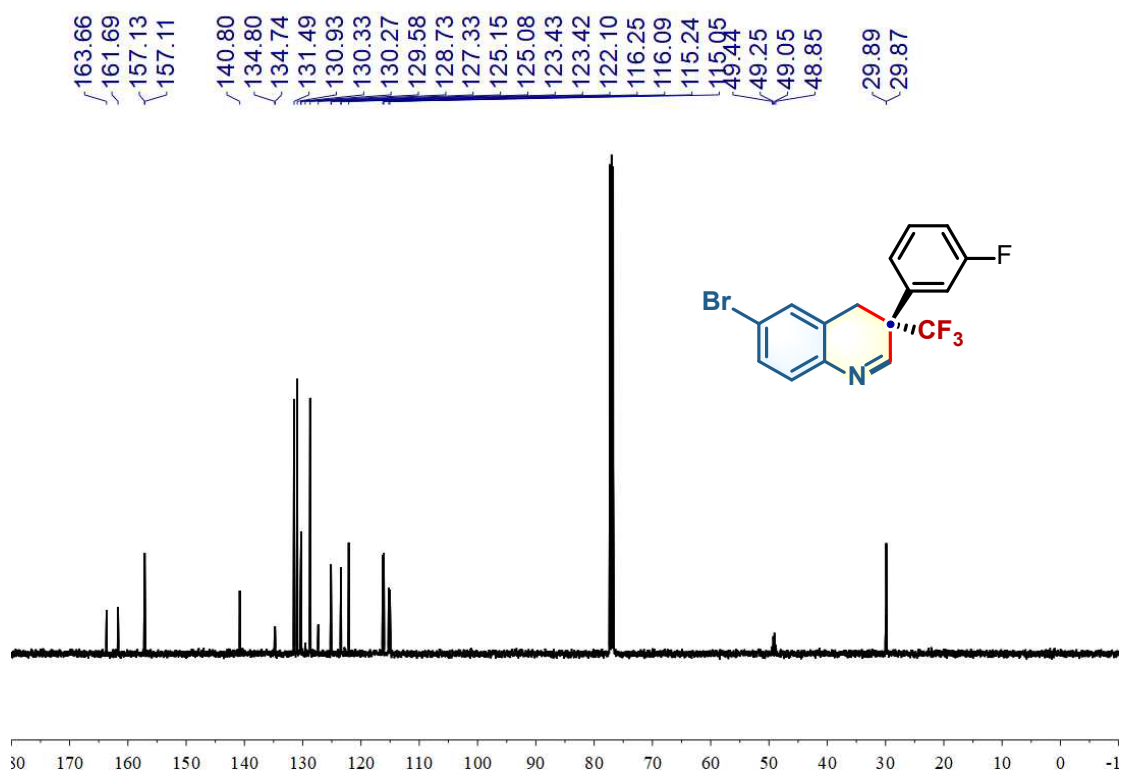


Supplementary Fig. 64. ^1H NMR (500 MHz, CDCl_3) spectrum of **22**

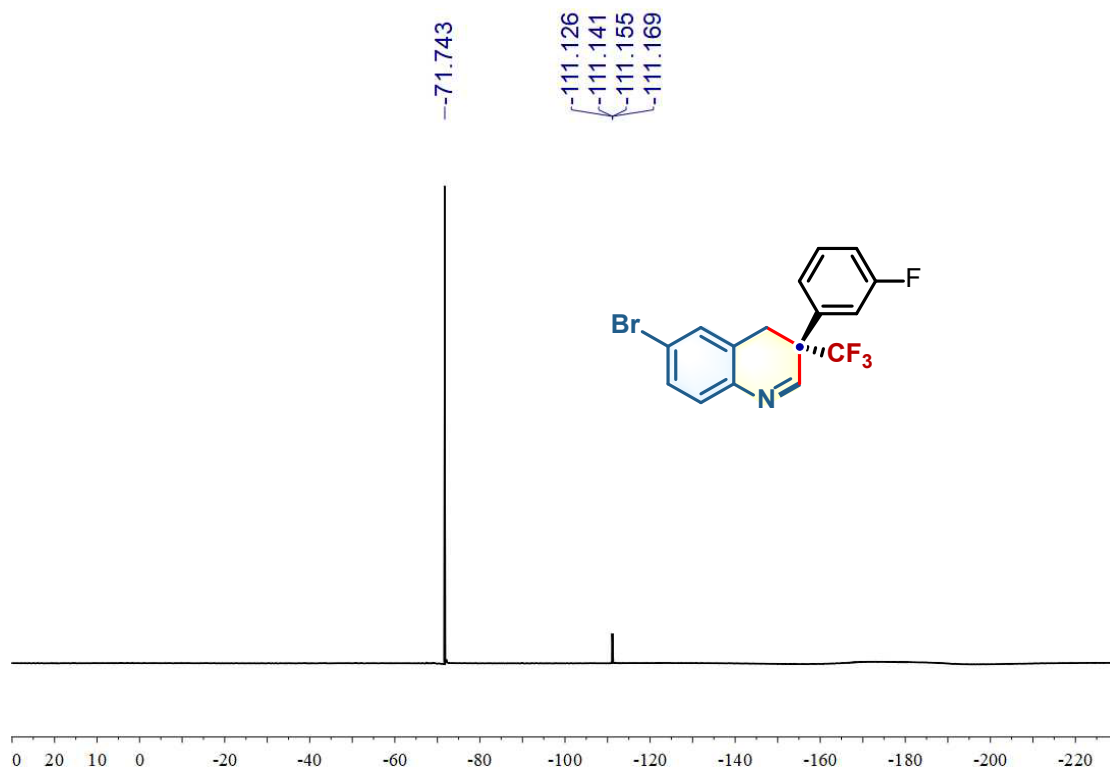




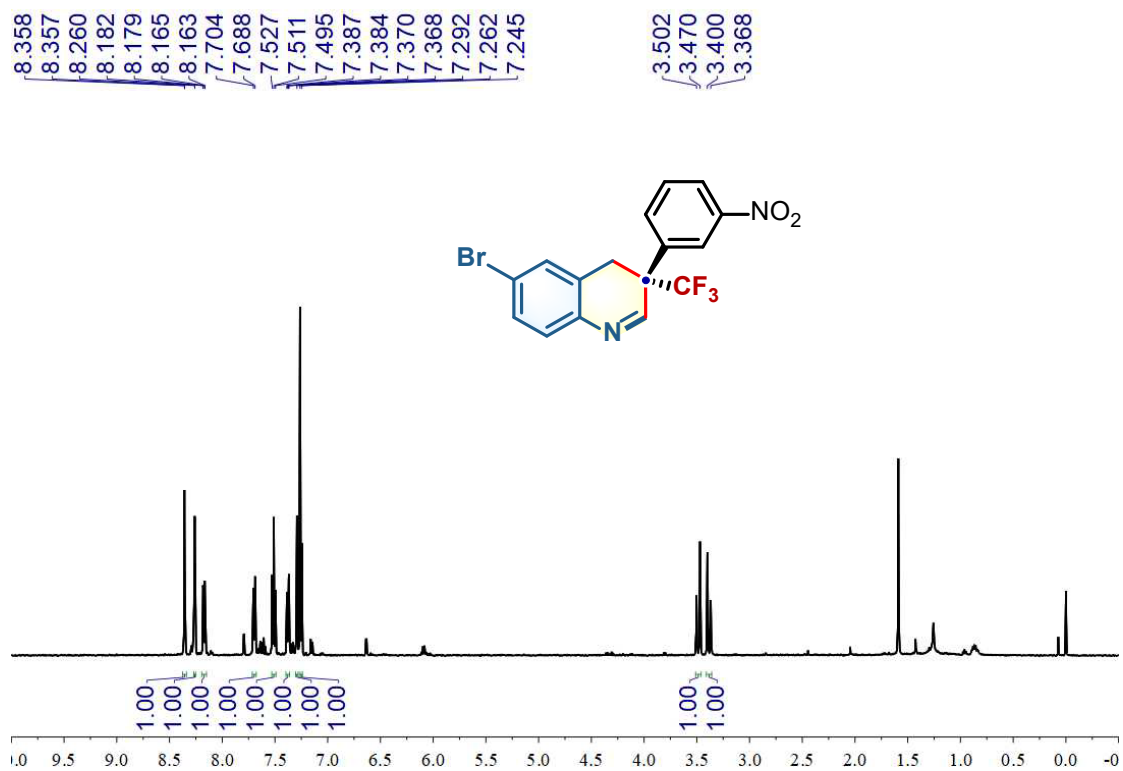
Supplementary Fig. 67. ¹H NMR (500 MHz, CDCl₃) spectrum of **23**



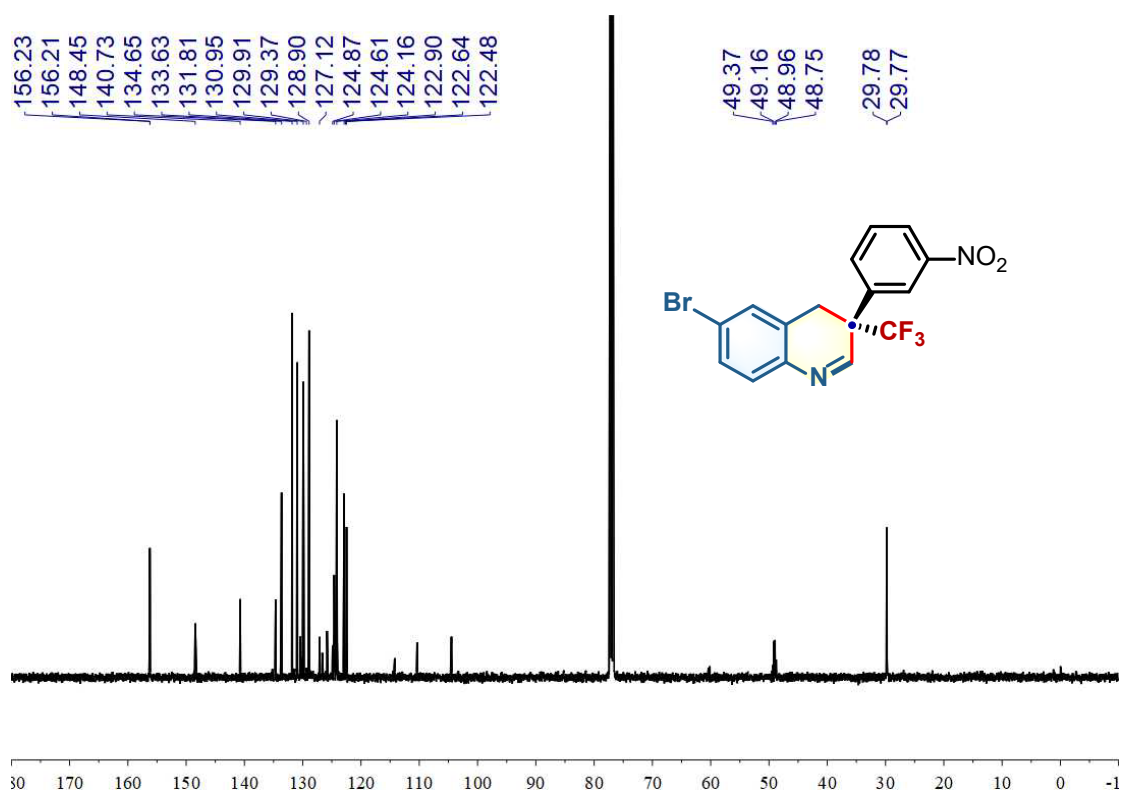
Supplementary Fig. 68. ¹³C NMR (125 MHz, CDCl₃) spectrum of **23**



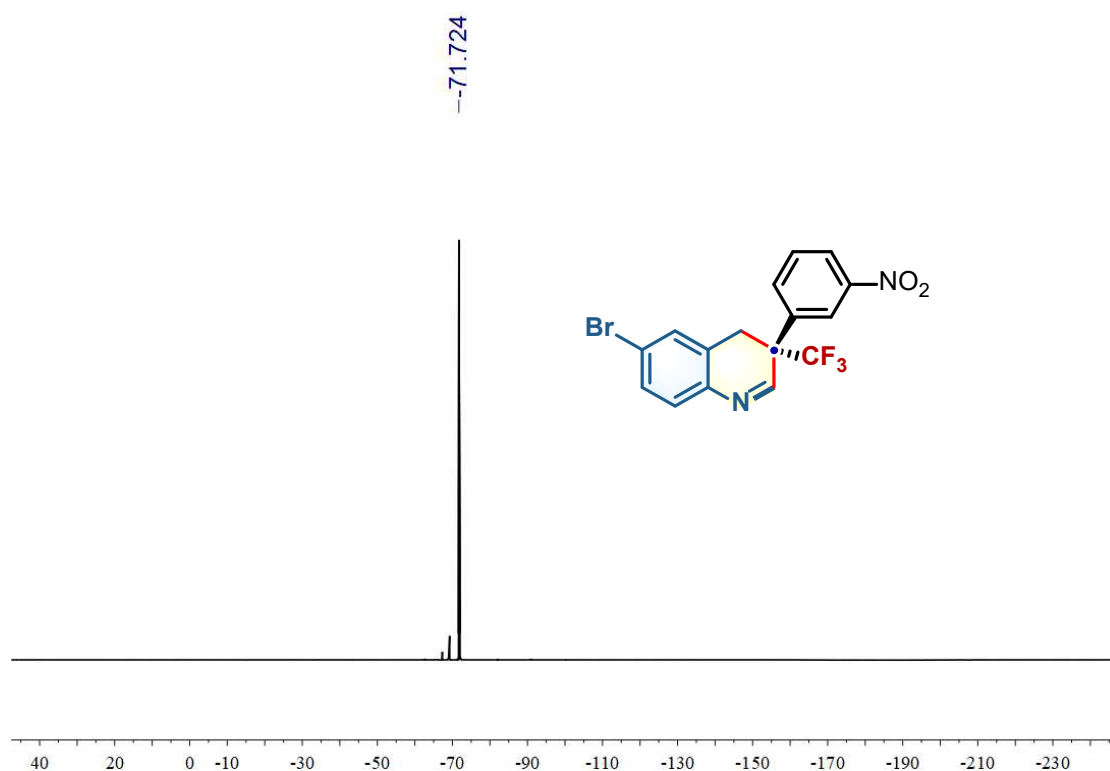
Supplementary Fig. 69. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **23**



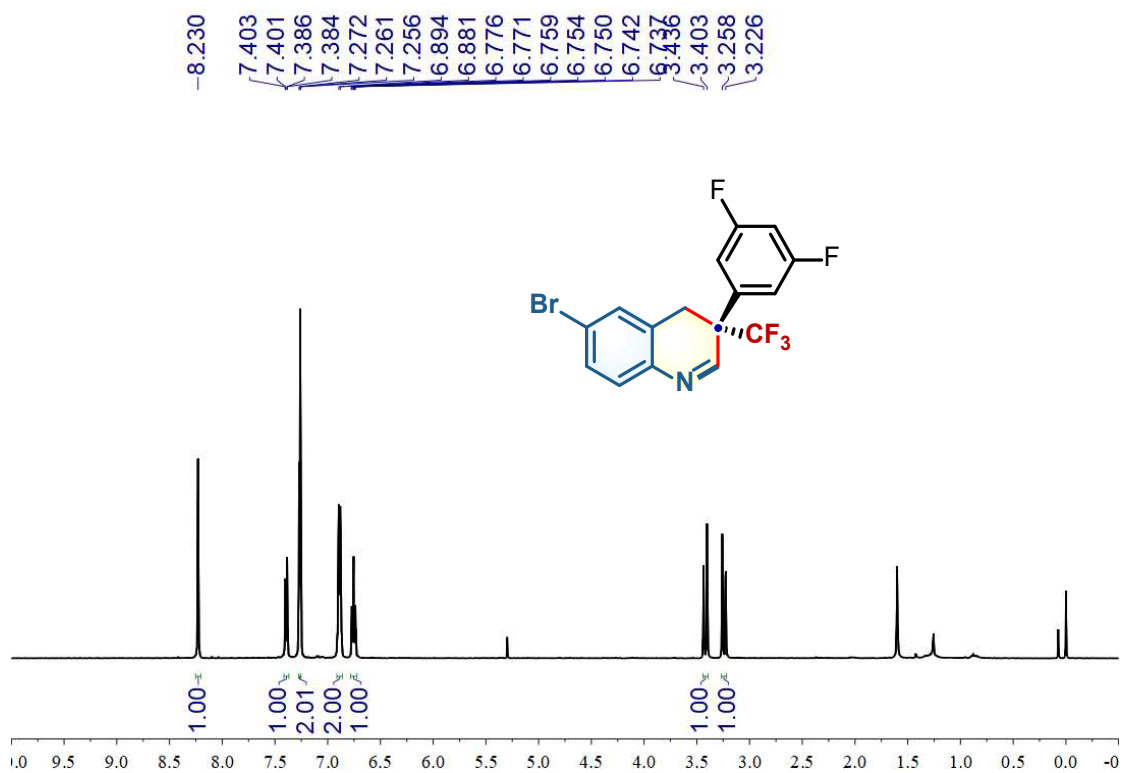
Supplementary Fig. 70. ^1H NMR (500 MHz, CDCl_3) spectrum of **24**



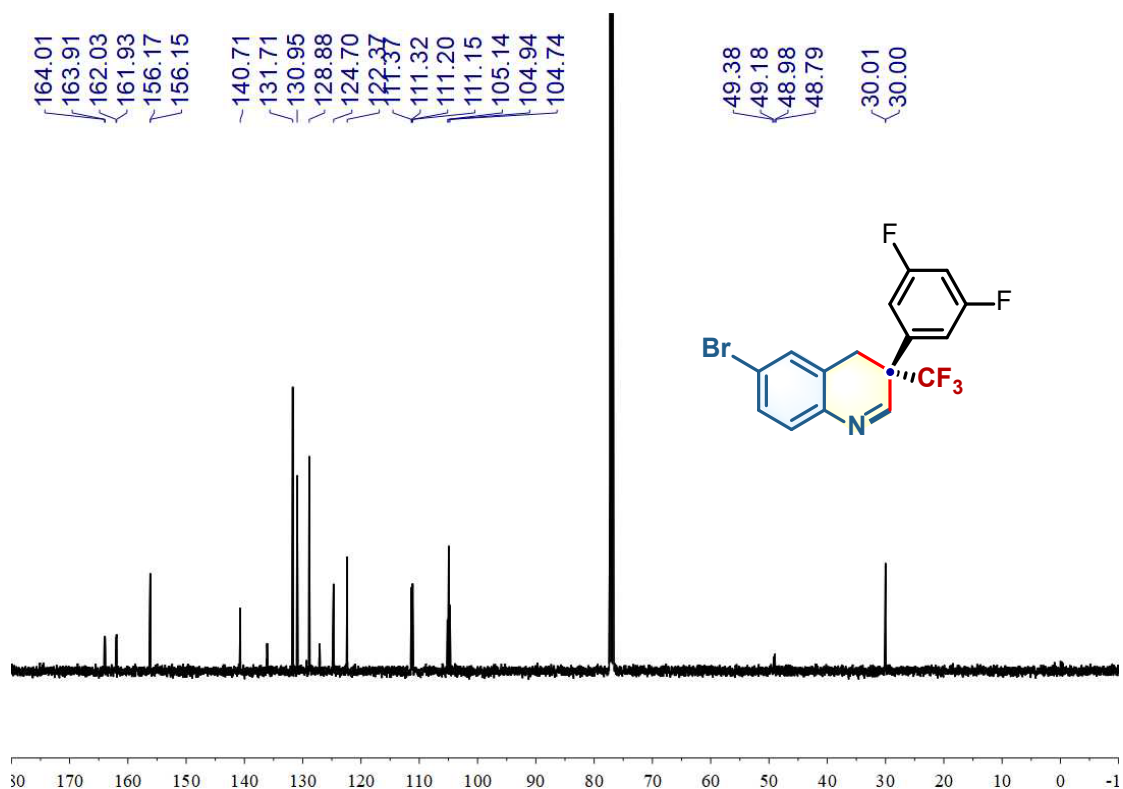
Supplementary Fig. 71. ¹³C NMR (125 MHz, CDCl₃) spectrum of **24**



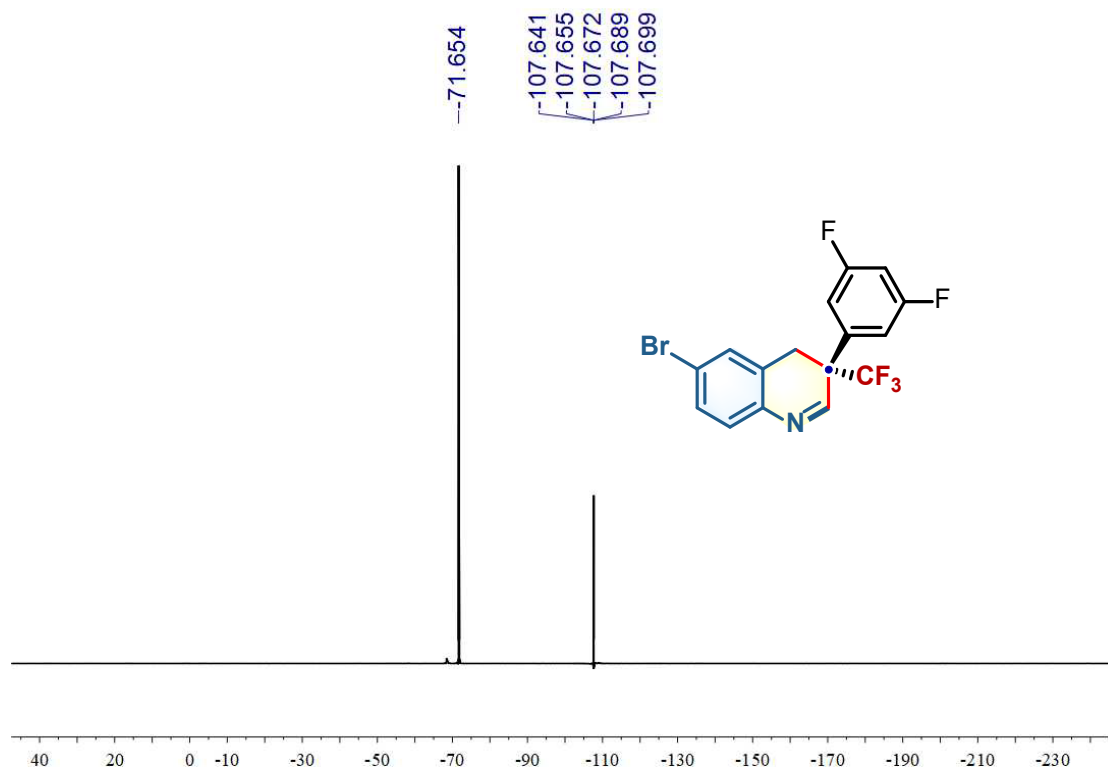
Supplementary Fig. 72. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **24**



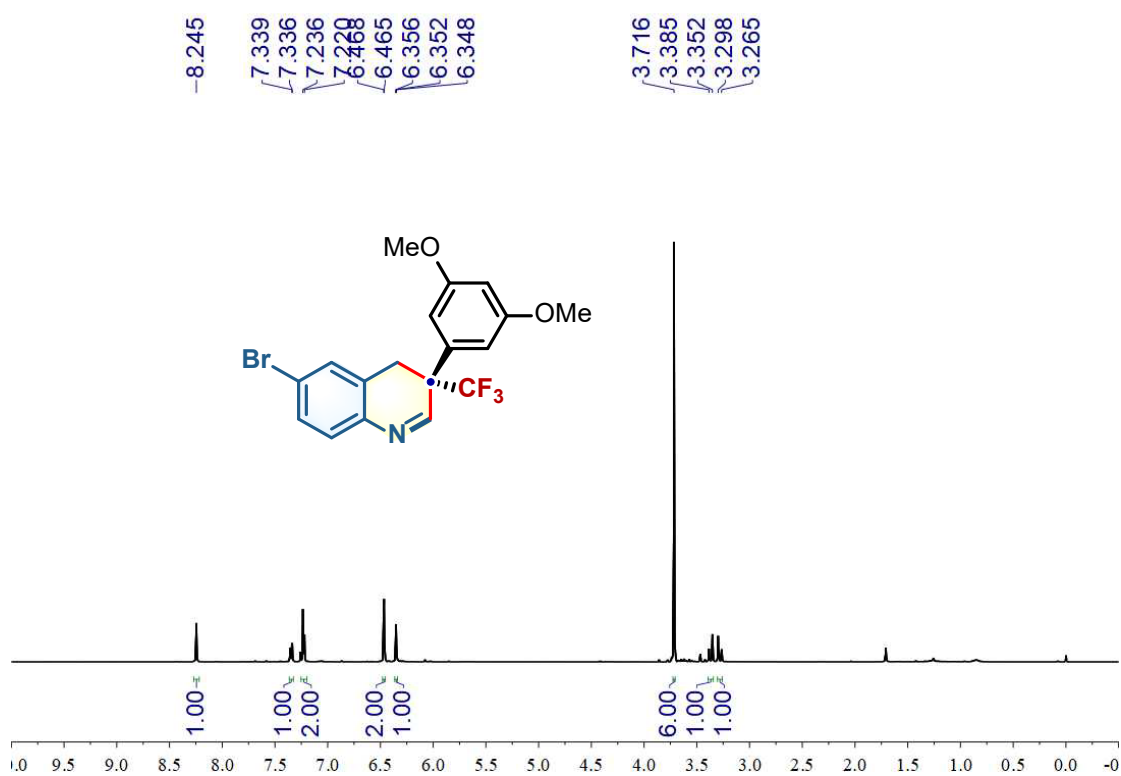
Supplementary Fig. 73. ¹H NMR (500 MHz, CDCl₃) spectrum of **25**



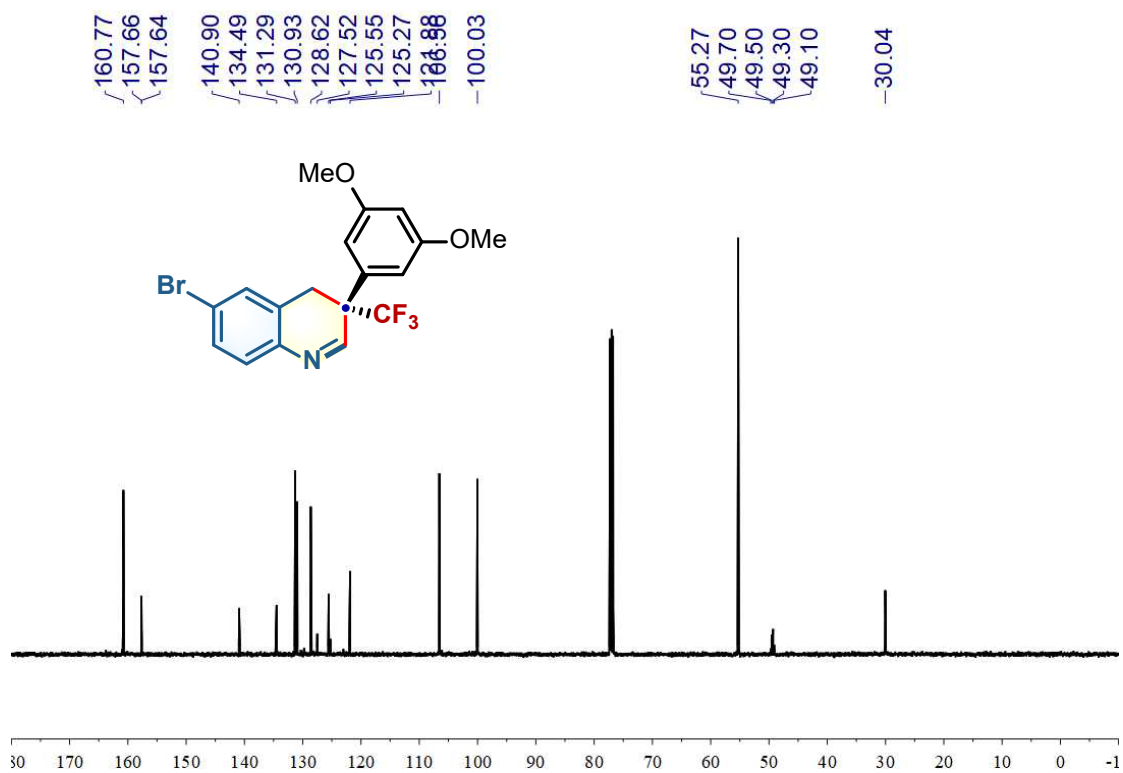
Supplementary Fig. 74. ¹³C NMR (125 MHz, CDCl₃) spectrum of **25**



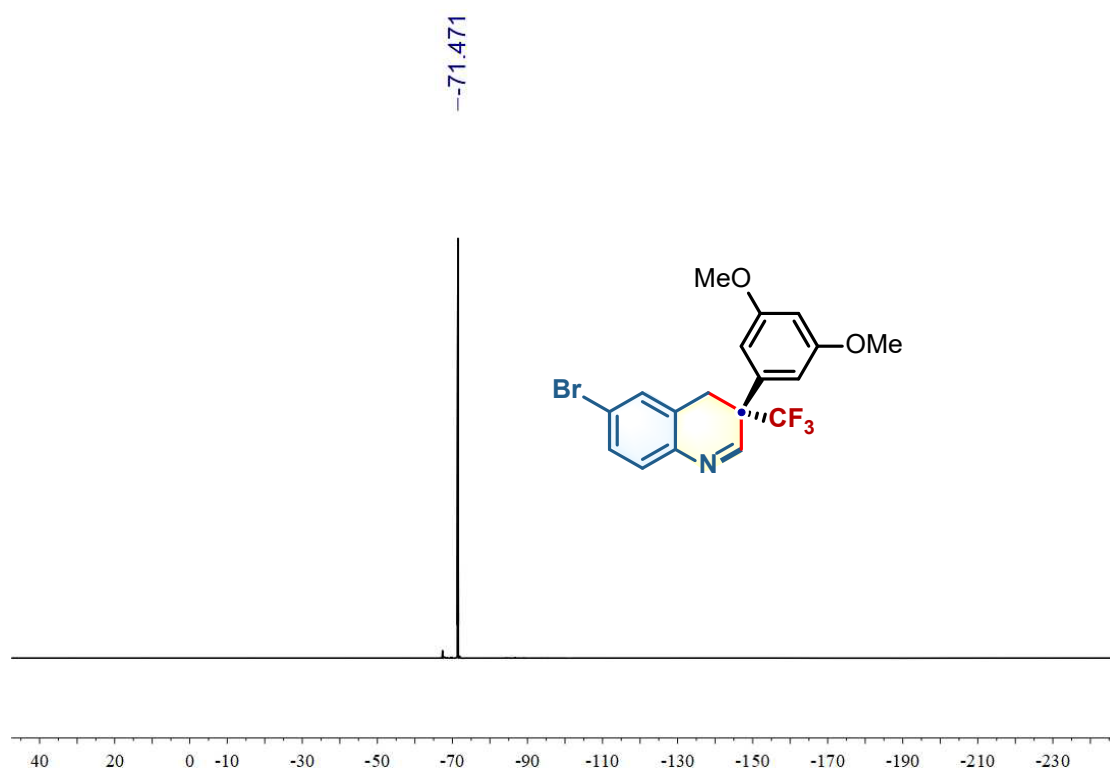
Supplementary Fig. 75. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **25**



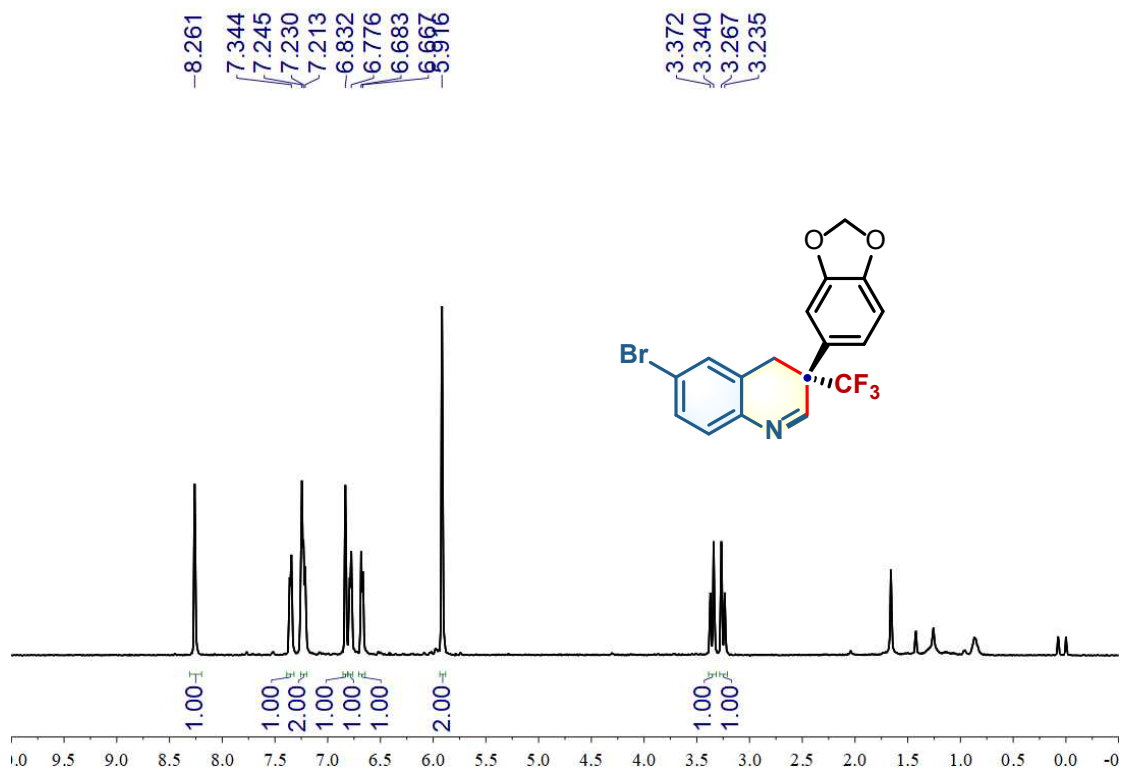
Supplementary Fig. 76. ^1H NMR (500 MHz, CDCl_3) spectrum of **26**



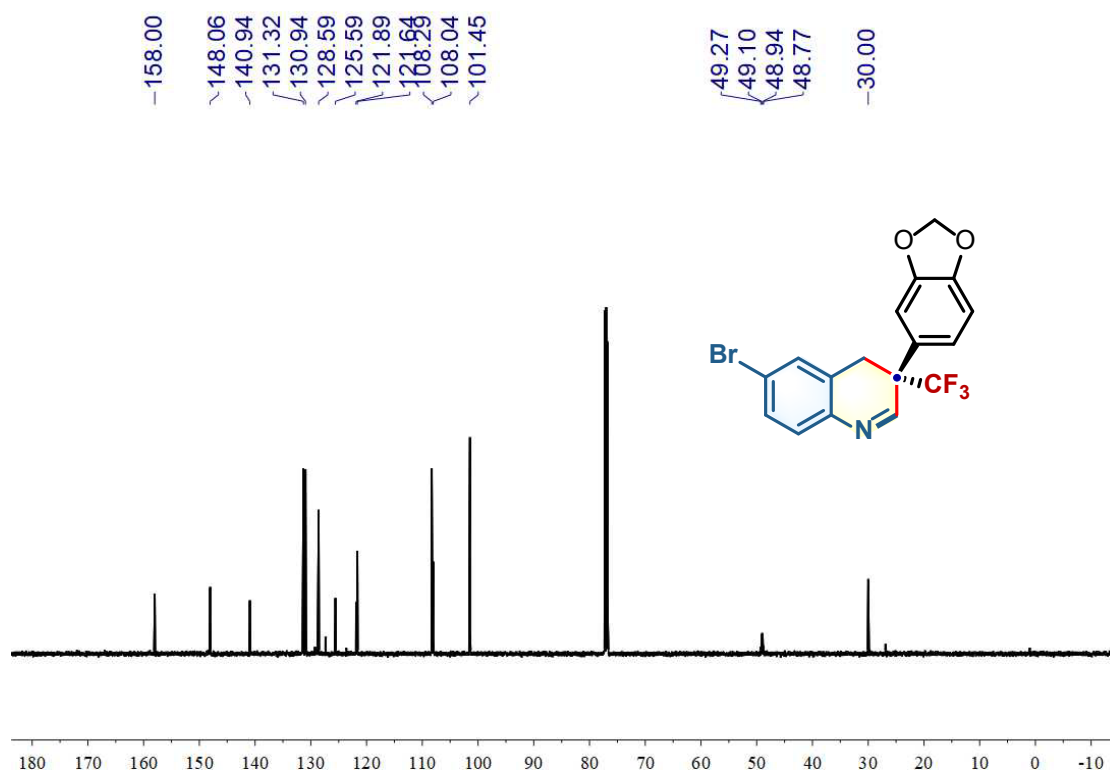
Supplementary Fig. 77. ¹³C NMR (125 MHz, CDCl₃) spectrum of **26**



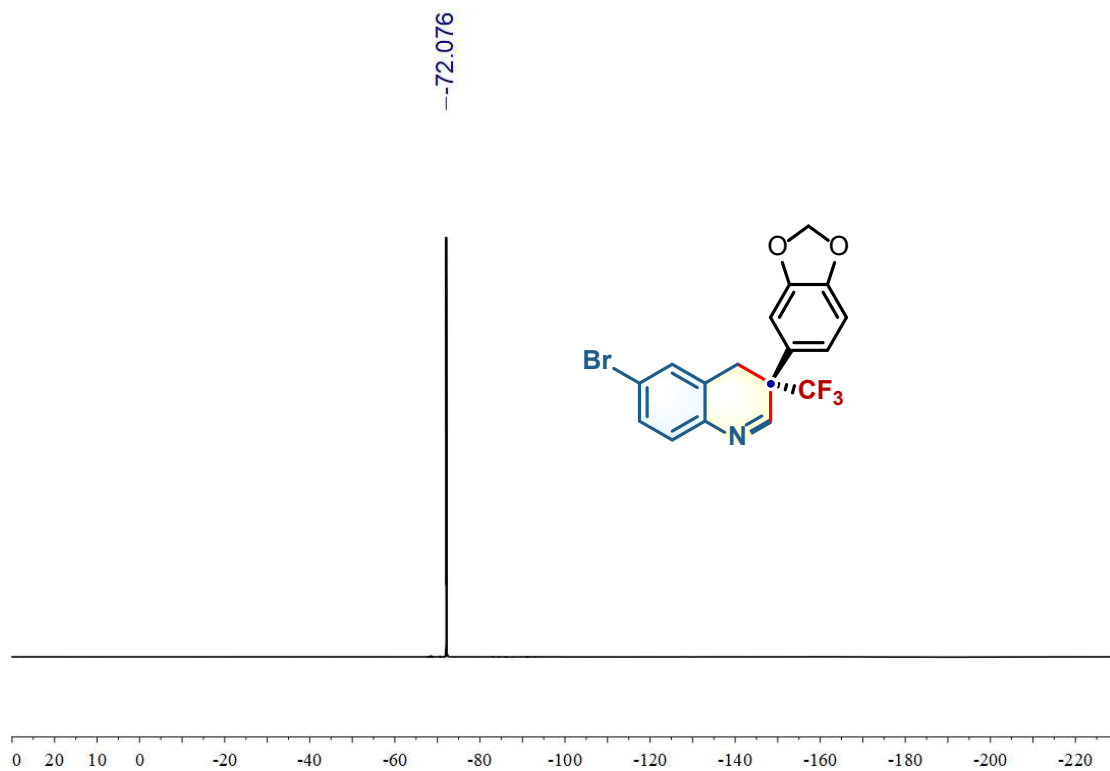
Supplementary Fig. 78. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **26**



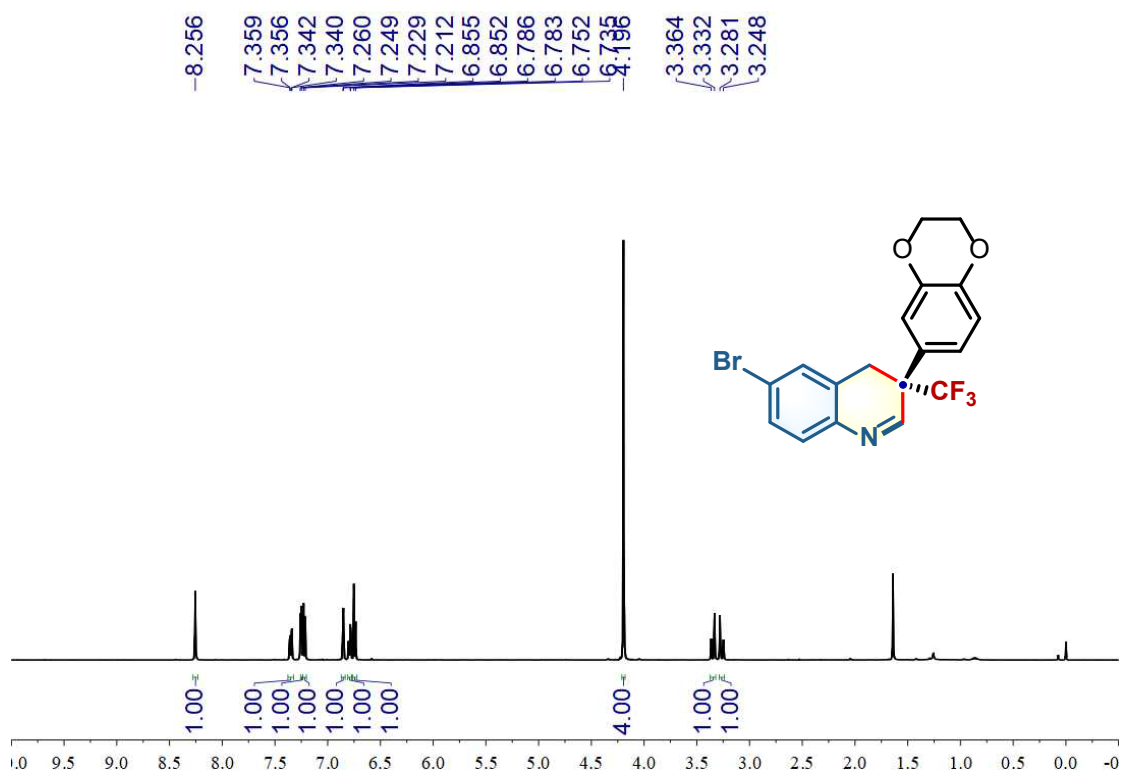
Supplementary Fig. 79. ¹H NMR (500 MHz, CDCl₃) spectrum of 27



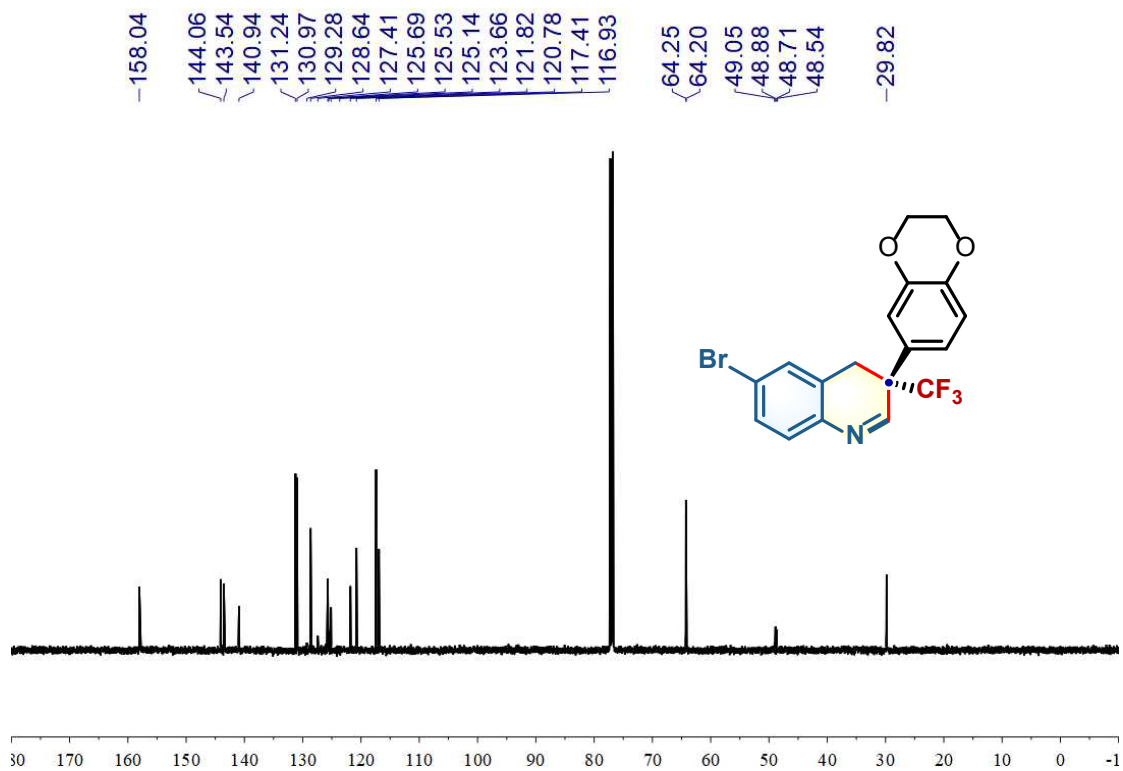
Supplementary Fig. 80. ¹³C NMR (150 MHz, CDCl₃) spectrum of 27



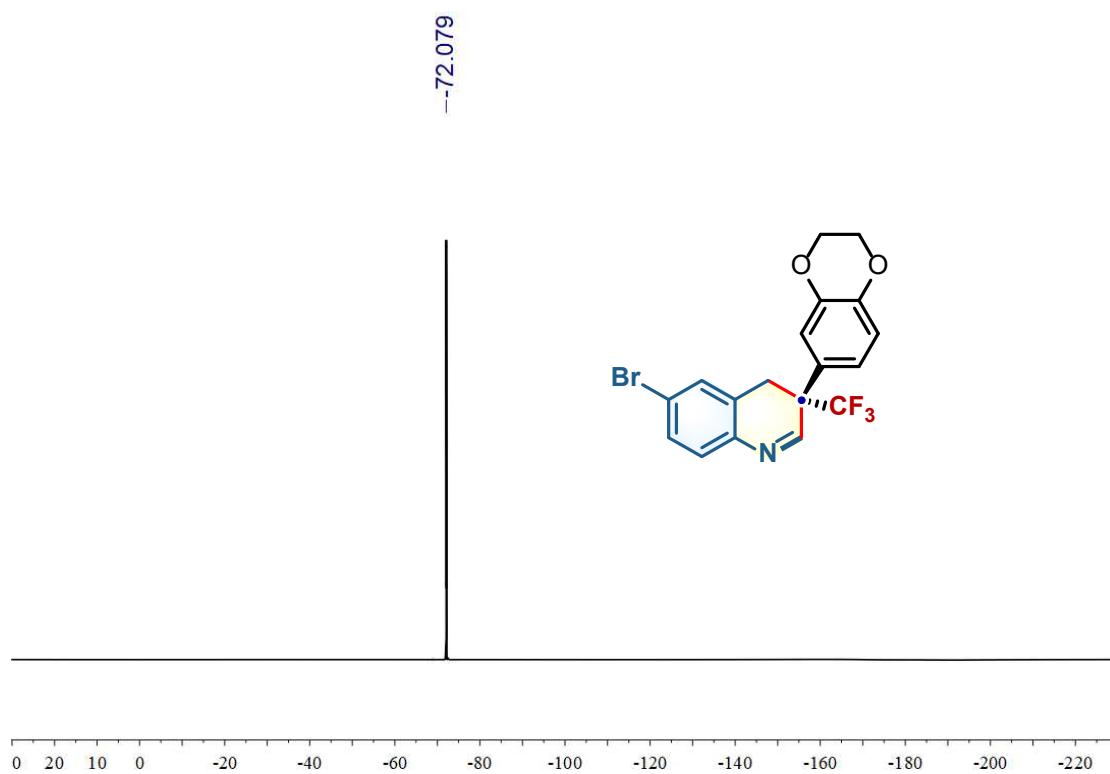
Supplementary Fig. 81. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 27



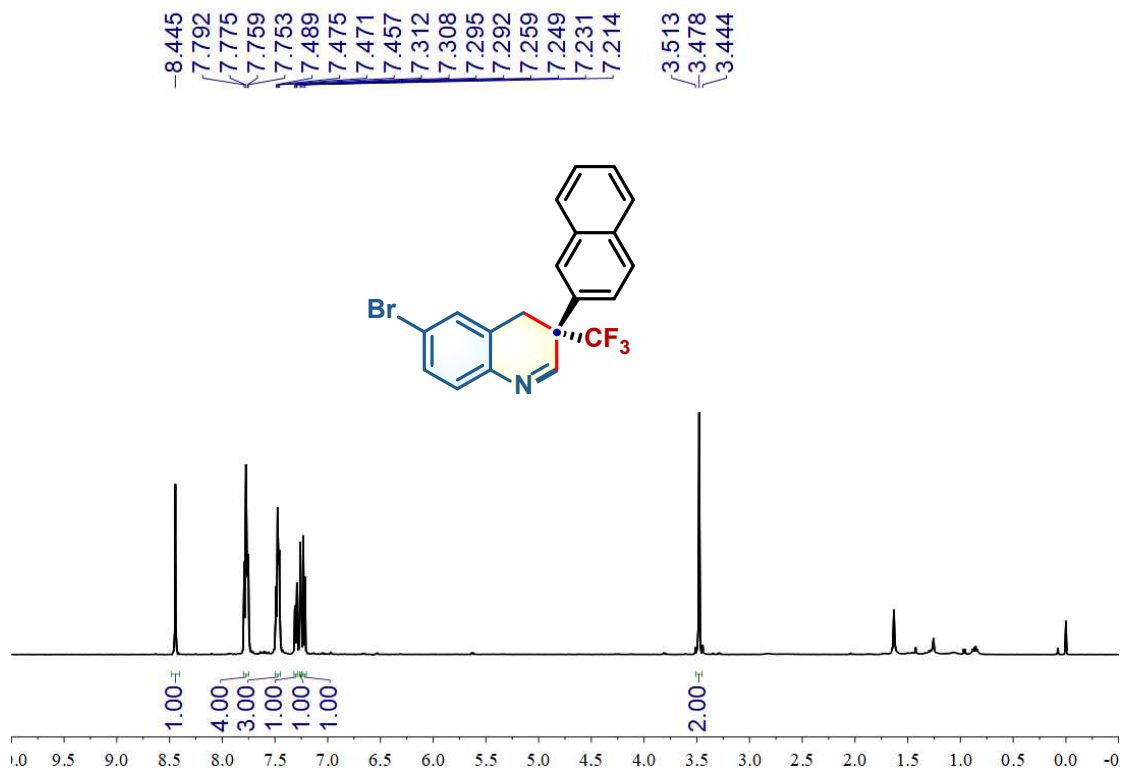
Supplementary Fig. 82. ^1H NMR (500 MHz, CDCl_3) spectrum of 28



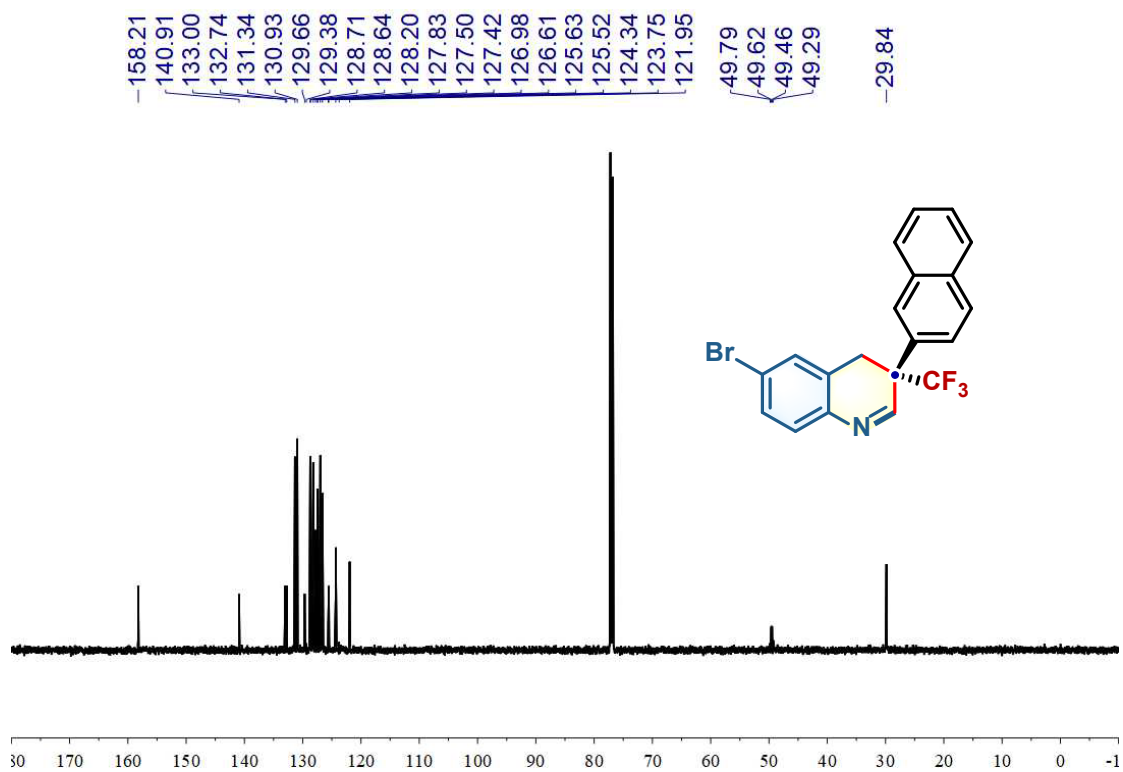
Supplementary Fig. 83. ¹³C NMR (150 MHz, CDCl₃) spectrum of **28**



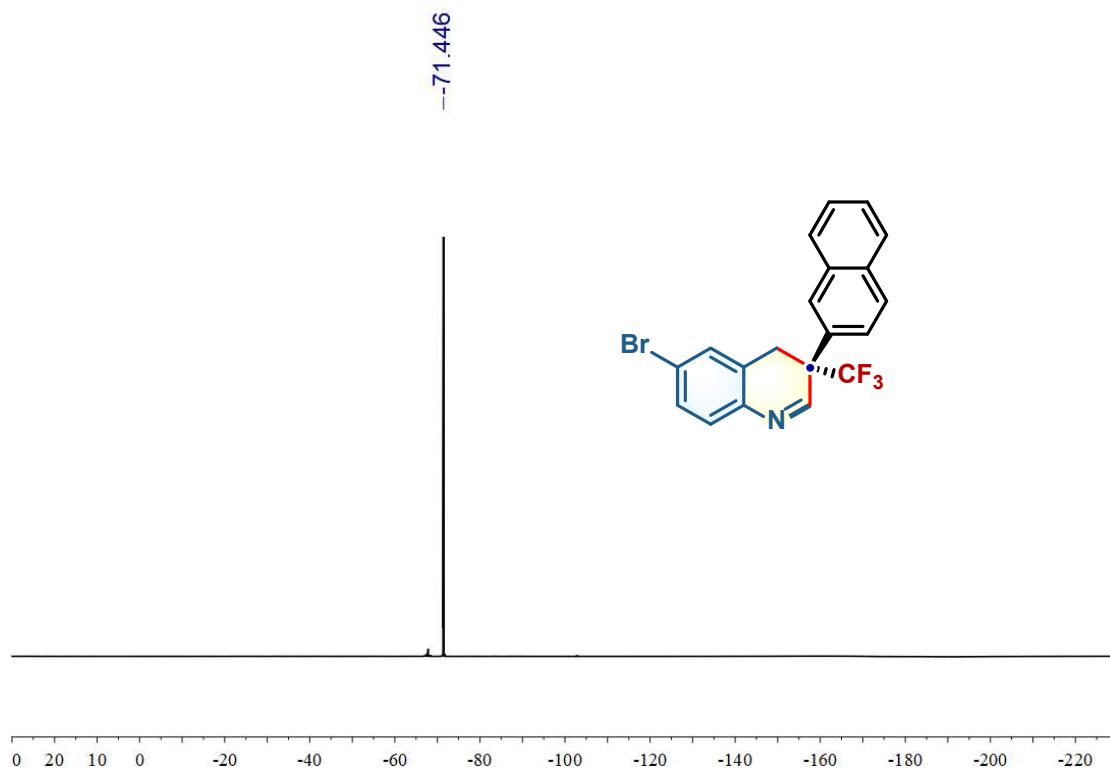
Supplementary Fig. 84. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **28**



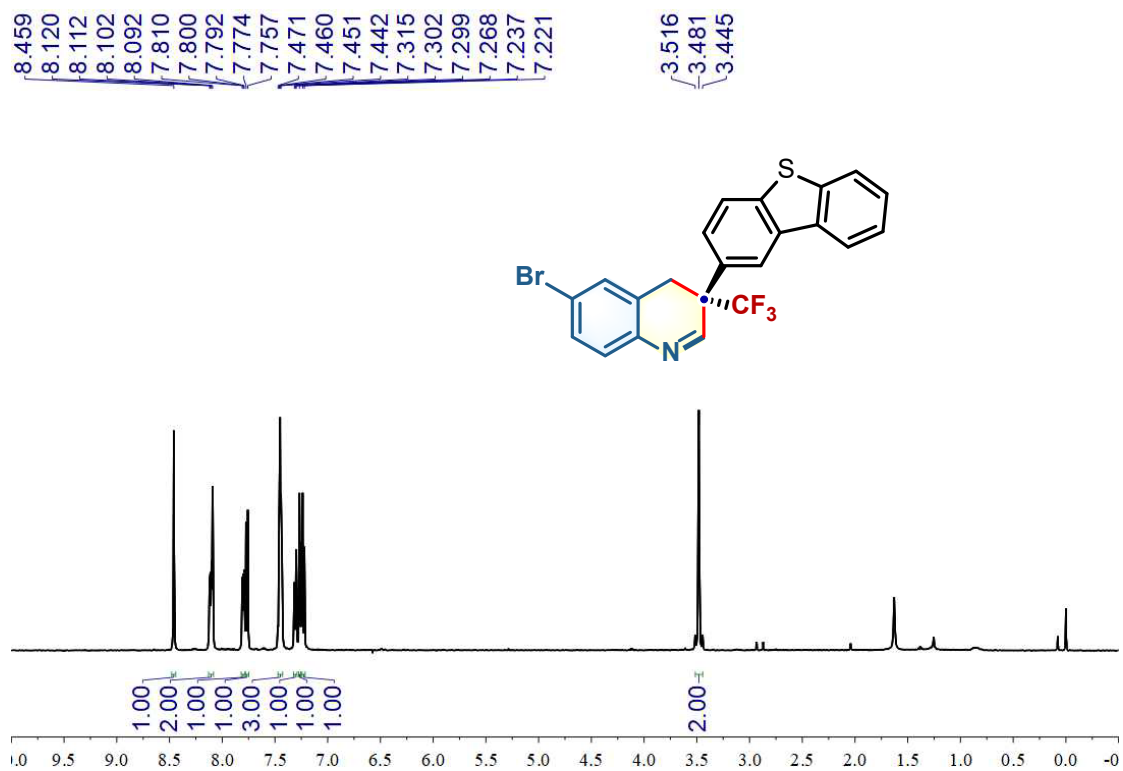
Supplementary Fig. 85. ¹H NMR (500 MHz, CDCl₃) spectrum of 29



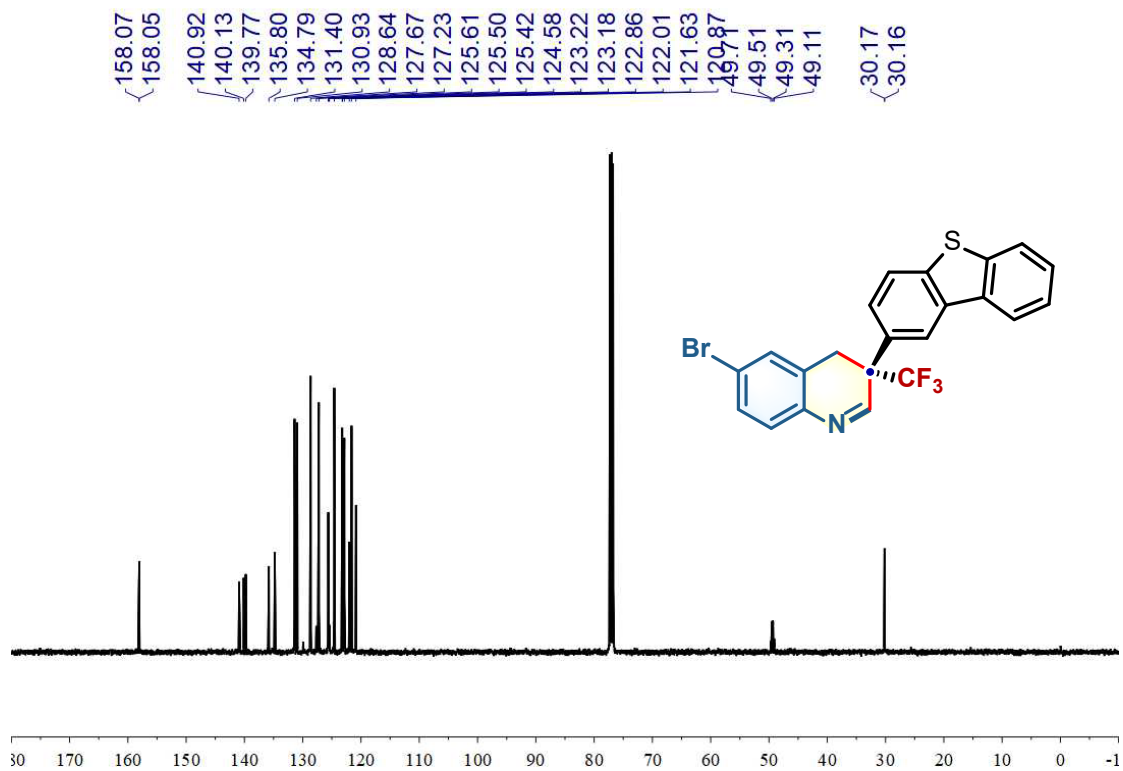
Supplementary Fig. 86. ¹³C NMR (150 MHz, CDCl₃) spectrum of 29



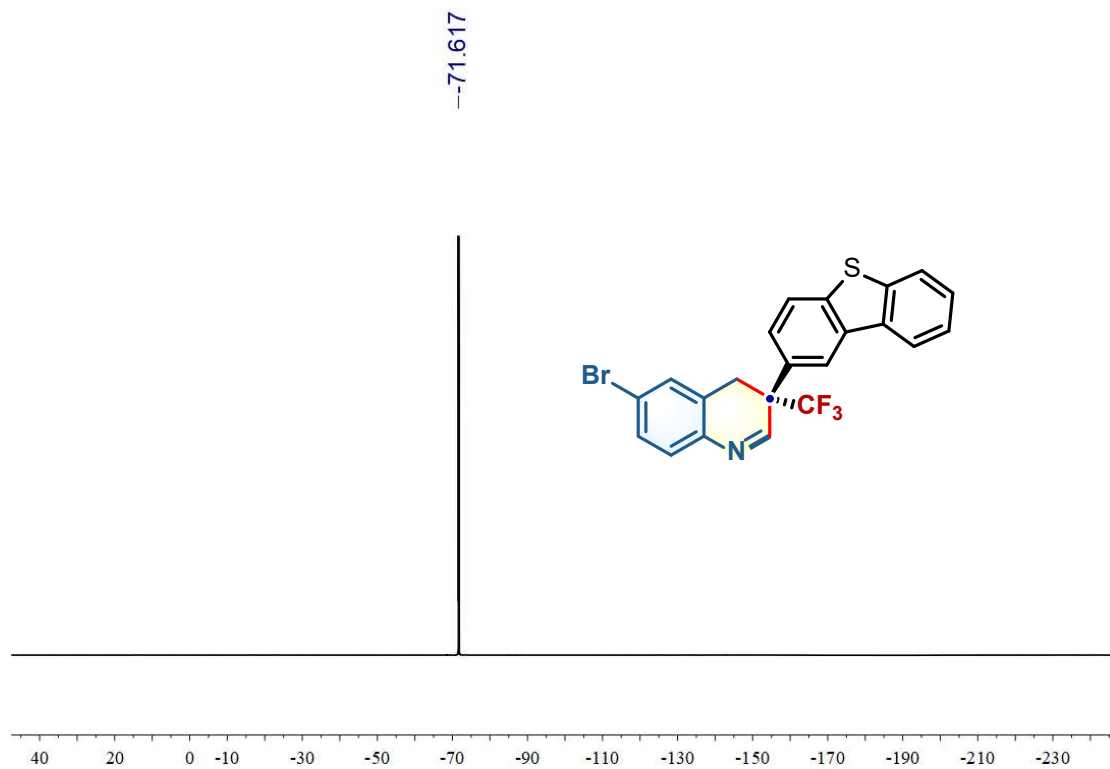
Supplementary Fig. 87. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **29**



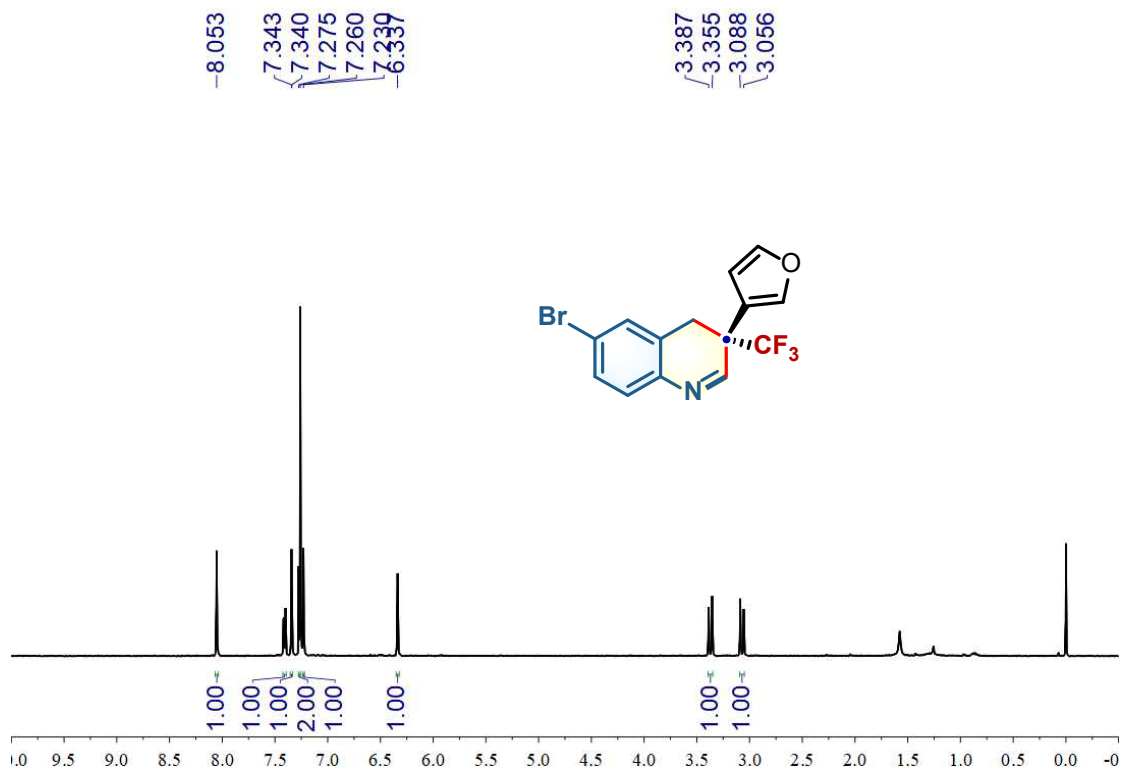
Supplementary Fig. 88. ^1H NMR (500 MHz, CDCl_3) spectrum of **30**



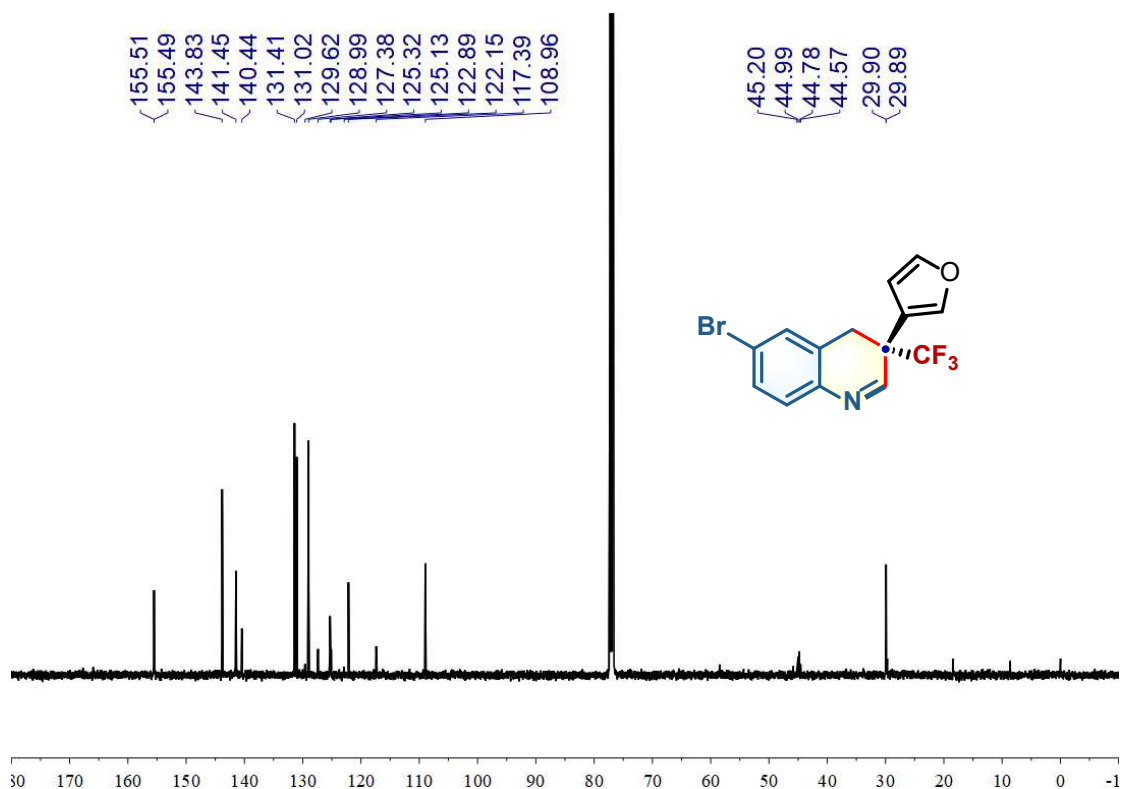
Supplementary Fig. 89. ¹³C NMR (125 MHz, CDCl₃) spectrum of 30



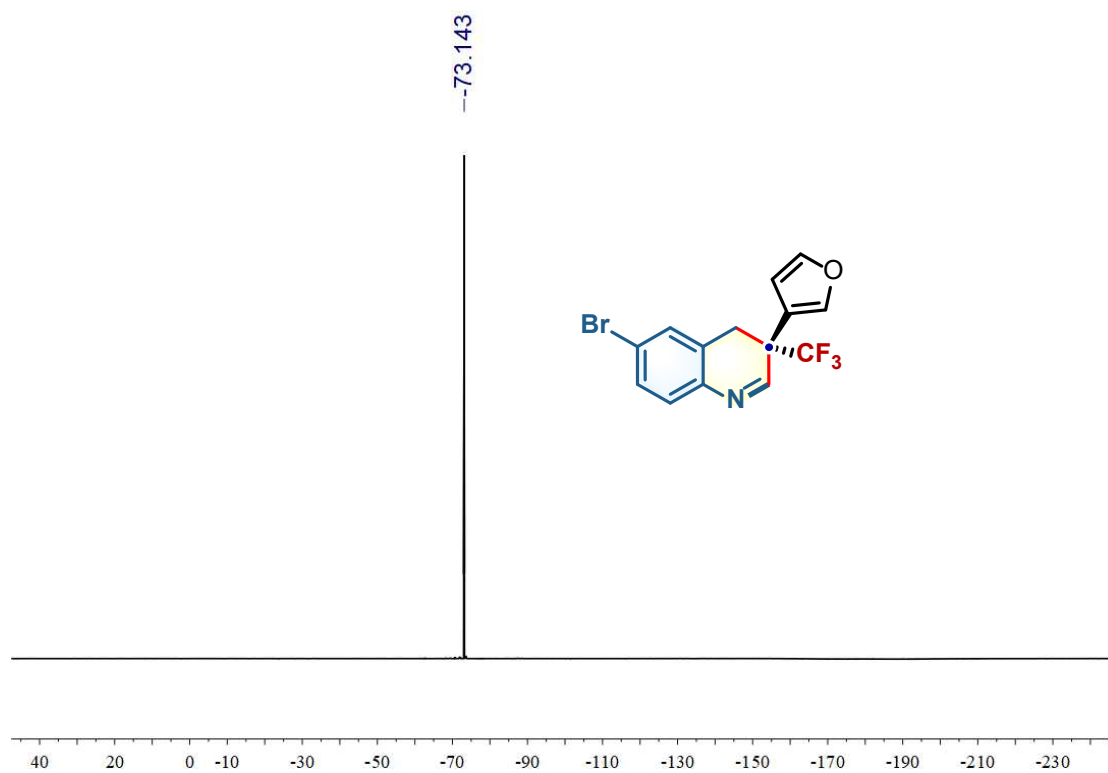
Supplementary Fig. 90. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 30



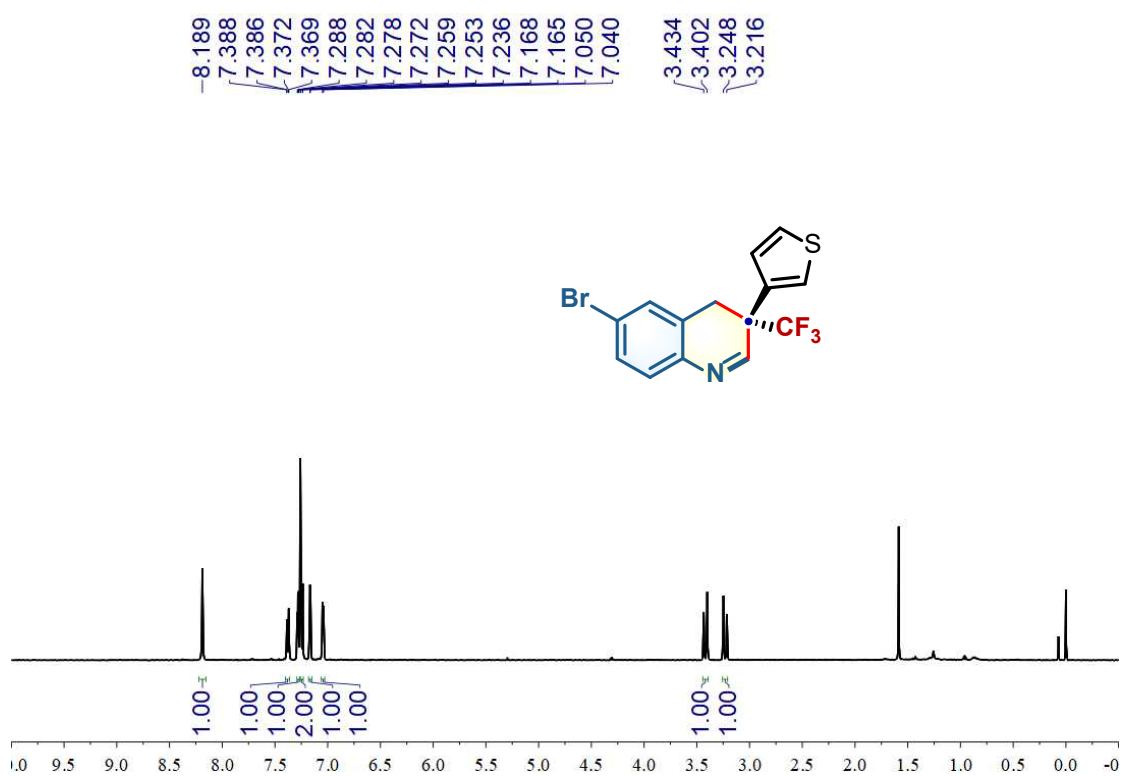
Supplementary Fig. 91. ¹H NMR (500 MHz, CDCl₃) spectrum of **31**



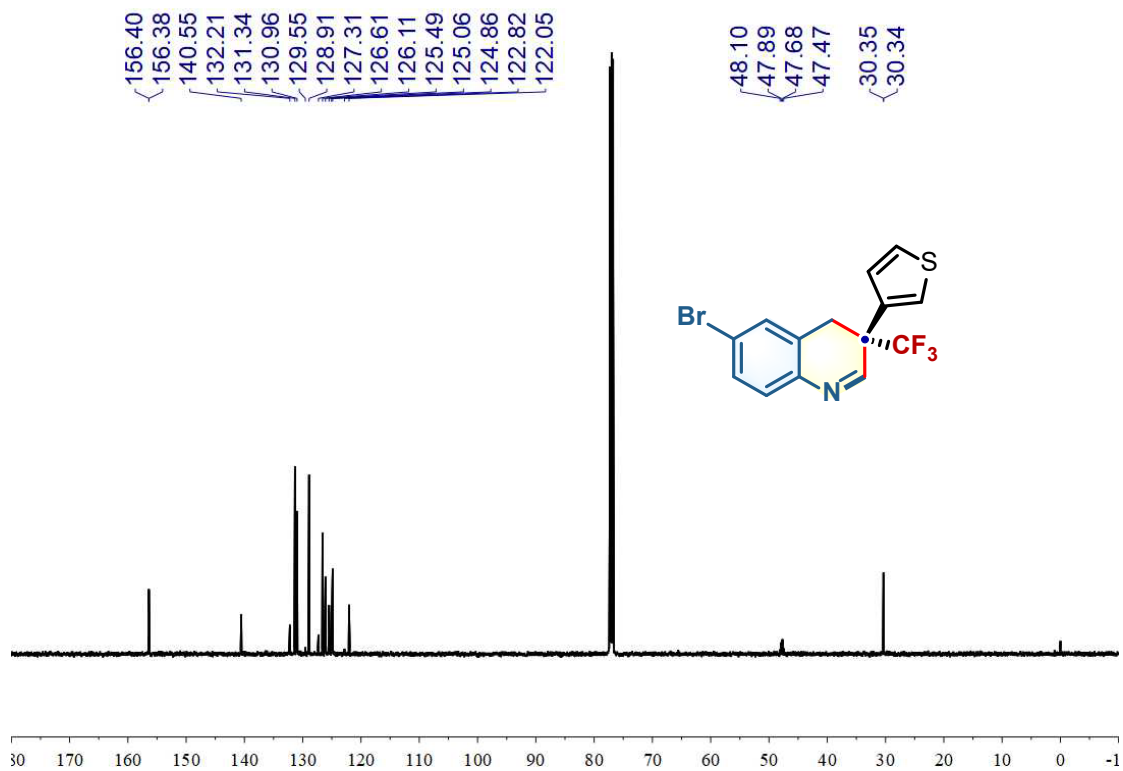
Supplementary Fig. 92. ¹³C NMR (125 MHz, CDCl₃) spectrum of **31**



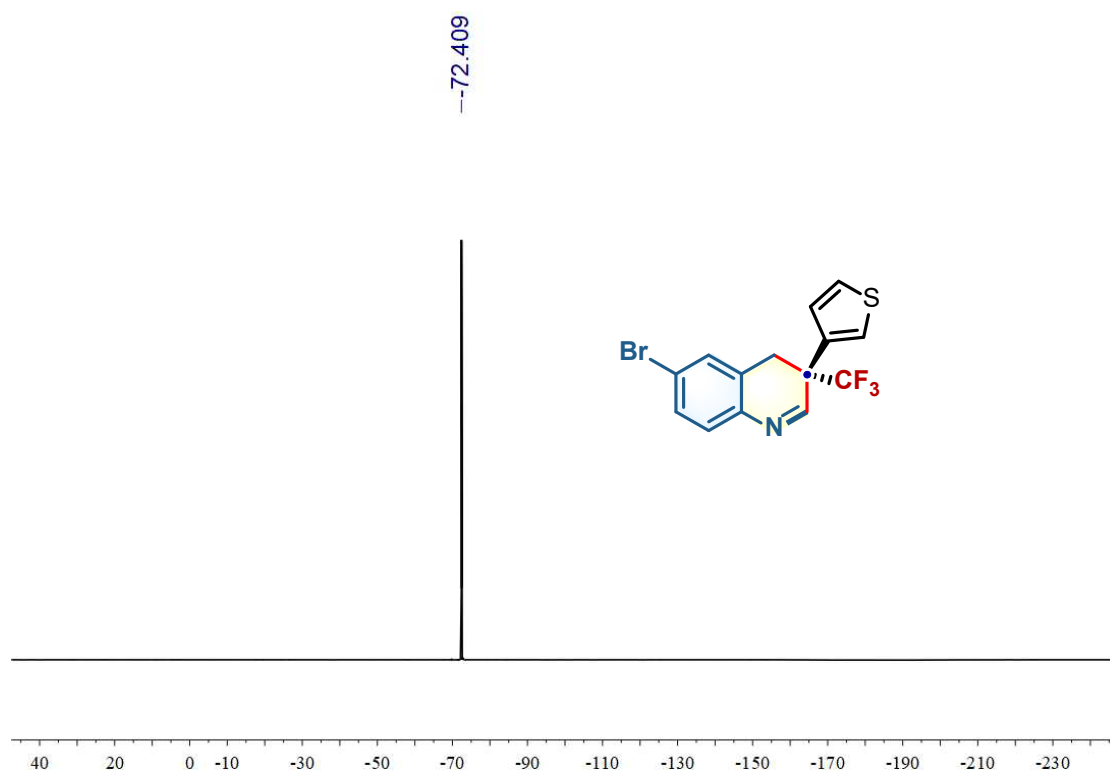
Supplementary Fig. 93. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **31**



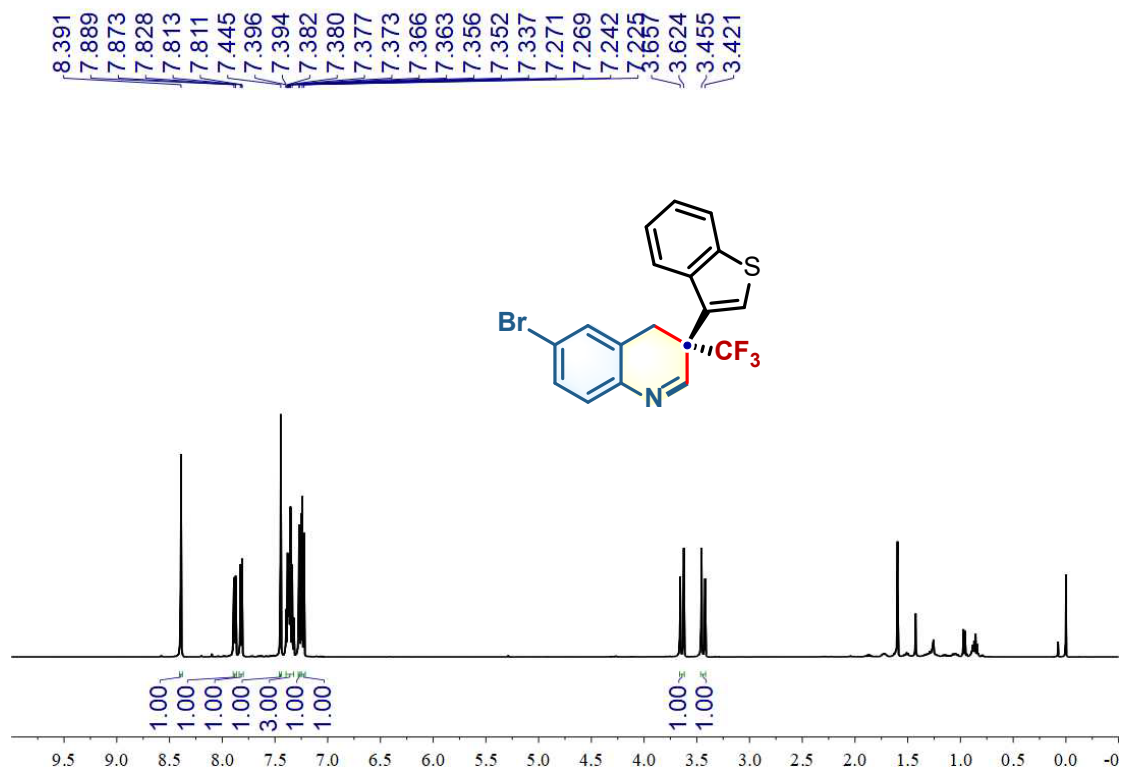
Supplementary Fig. 94. ^1H NMR (500 MHz, CDCl_3) spectrum of **32**



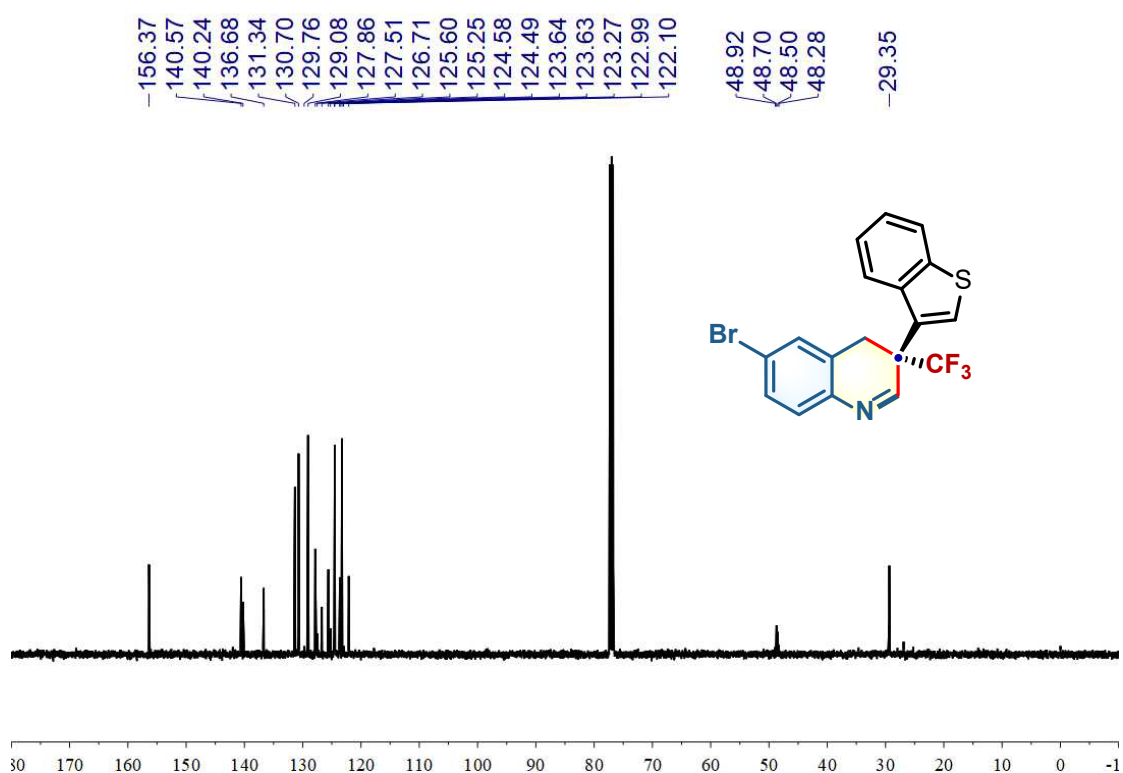
Supplementary Fig. 95. ¹³C NMR (125 MHz, CDCl₃) spectrum of 32



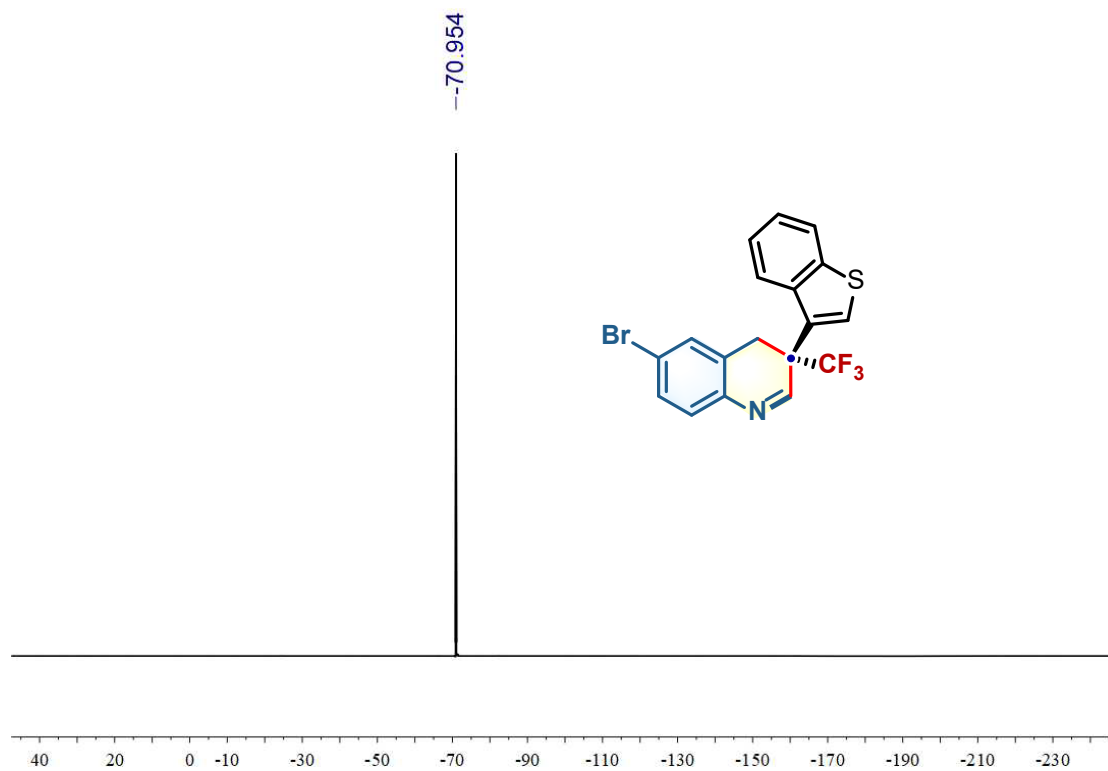
Supplementary Fig. 96. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 32



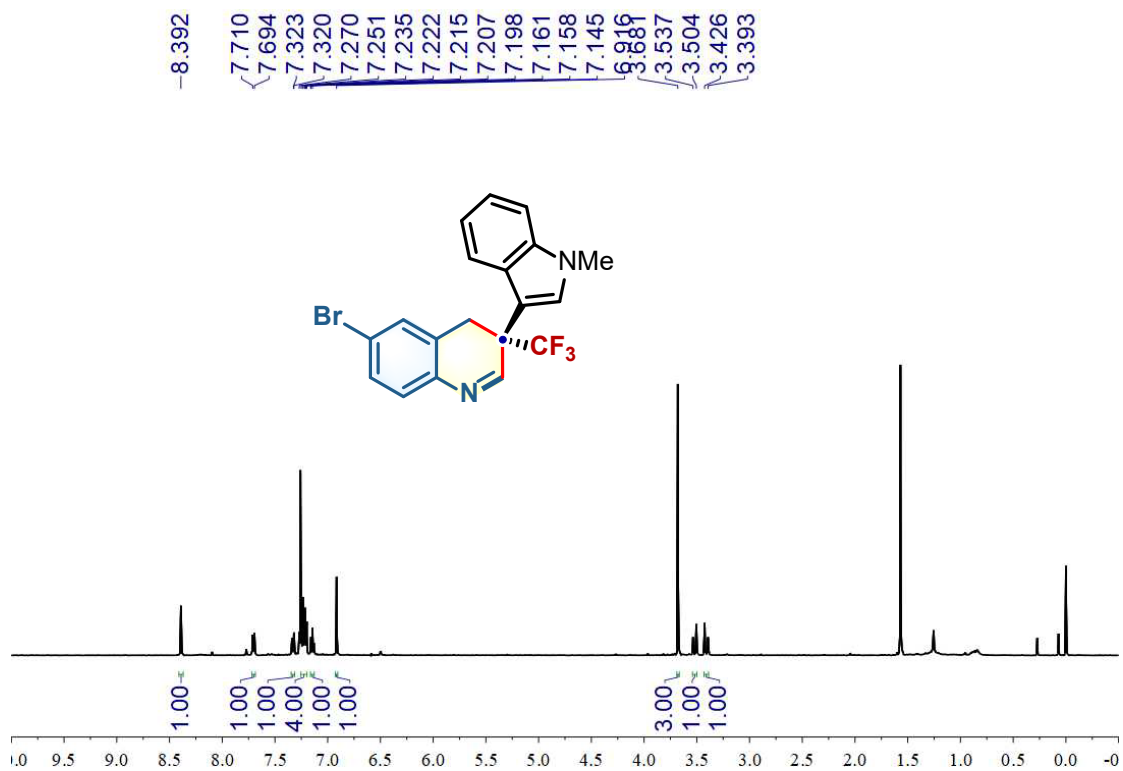
Supplementary Fig. 97. ¹H NMR (500 MHz, CDCl₃) spectrum of 33



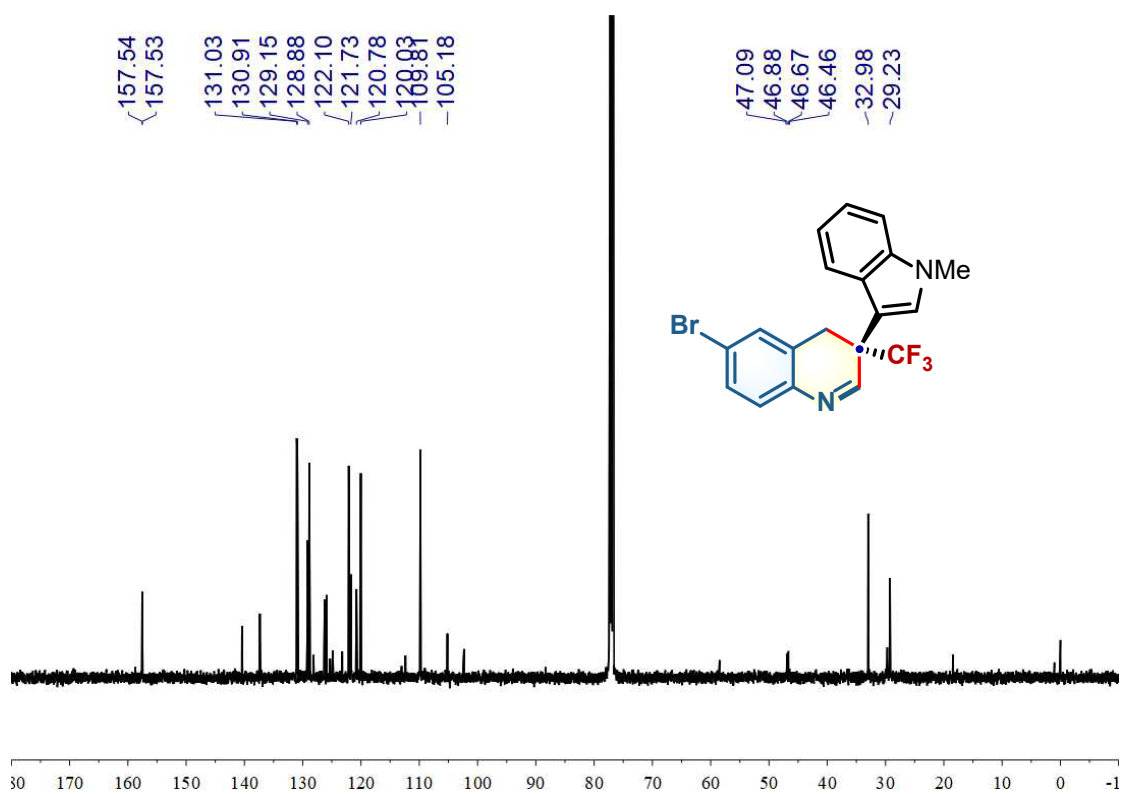
Supplementary Fig. 98. ¹³C NMR (125 MHz, CDCl₃) spectrum of 33



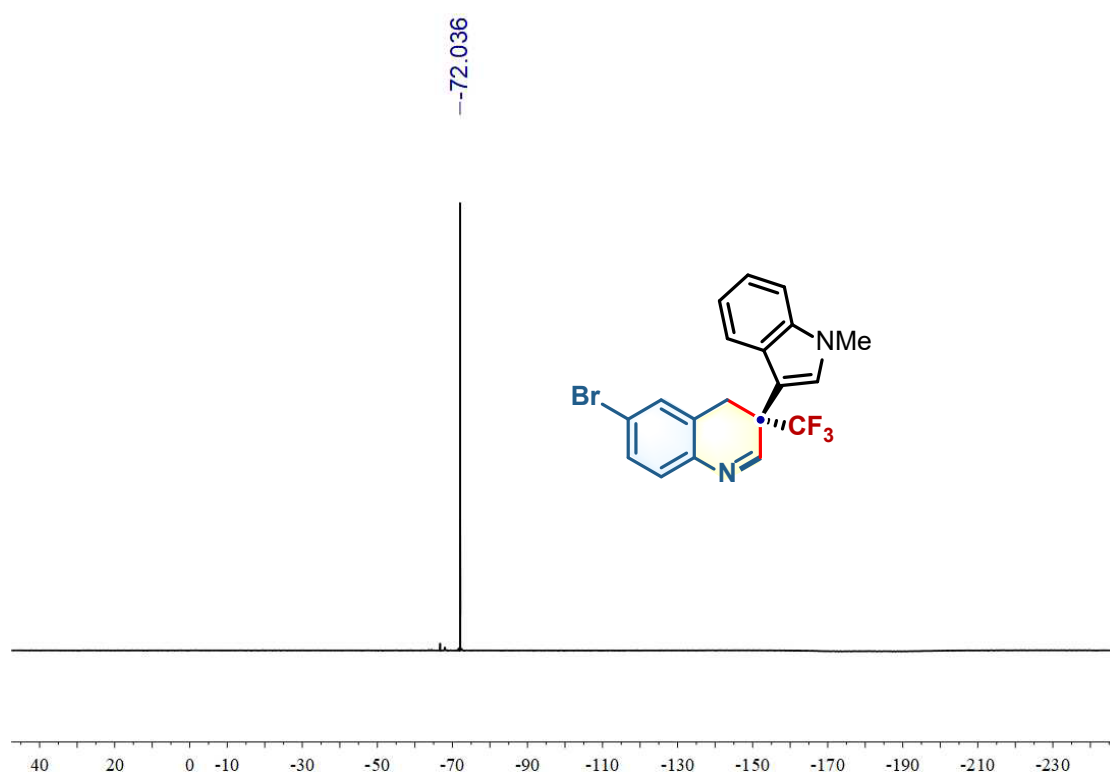
Supplementary Fig. 99. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **33**



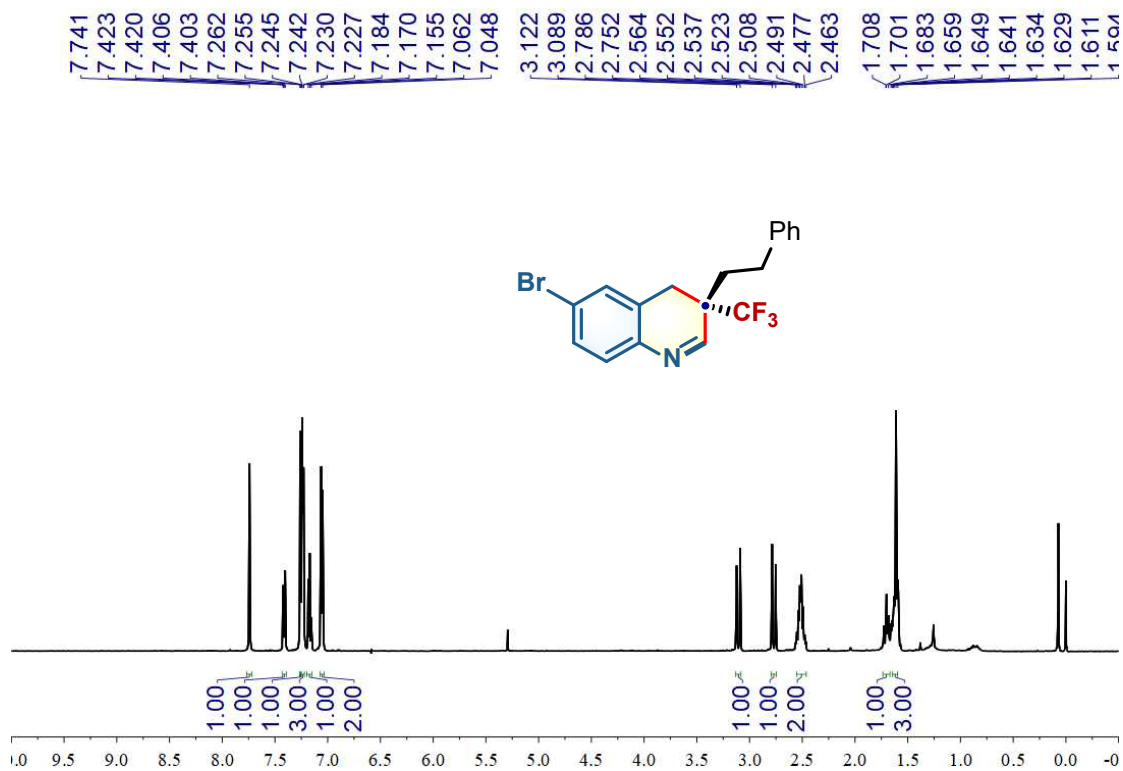
Supplementary Fig. 100. ^1H NMR (500 MHz, CDCl_3) spectrum of **34**



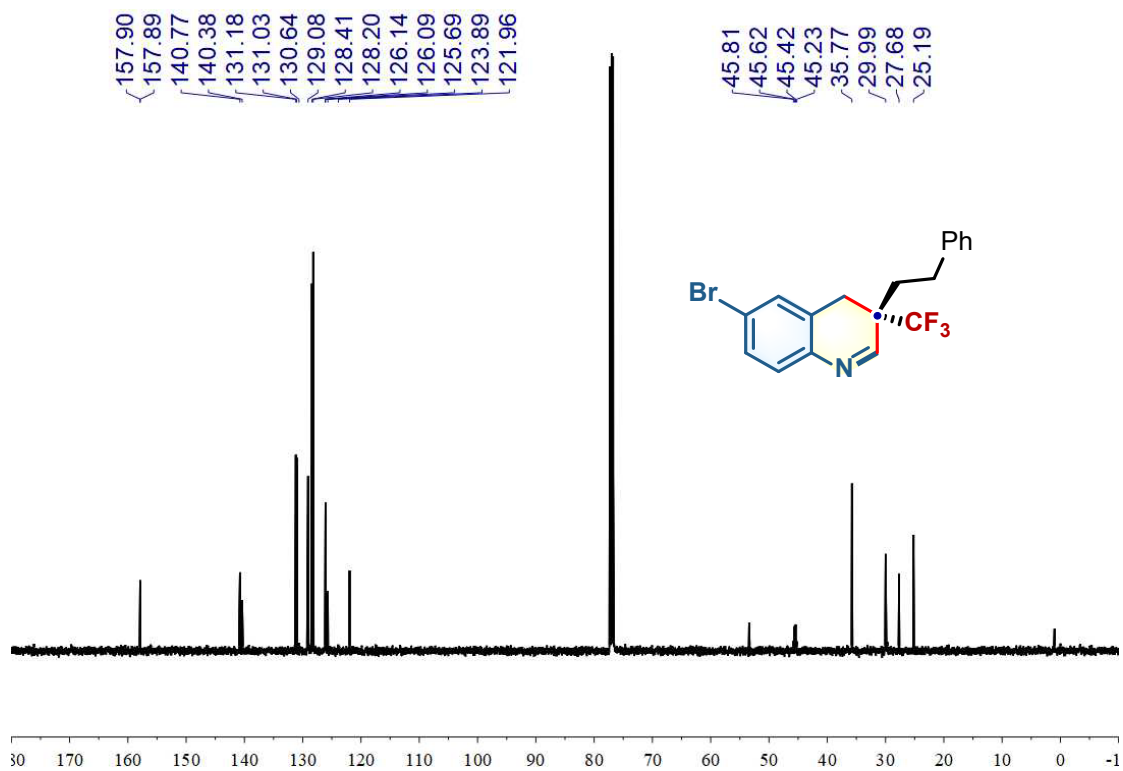
Supplementary Fig. 101. ¹³C NMR (125 MHz, CDCl₃) spectrum of **34**



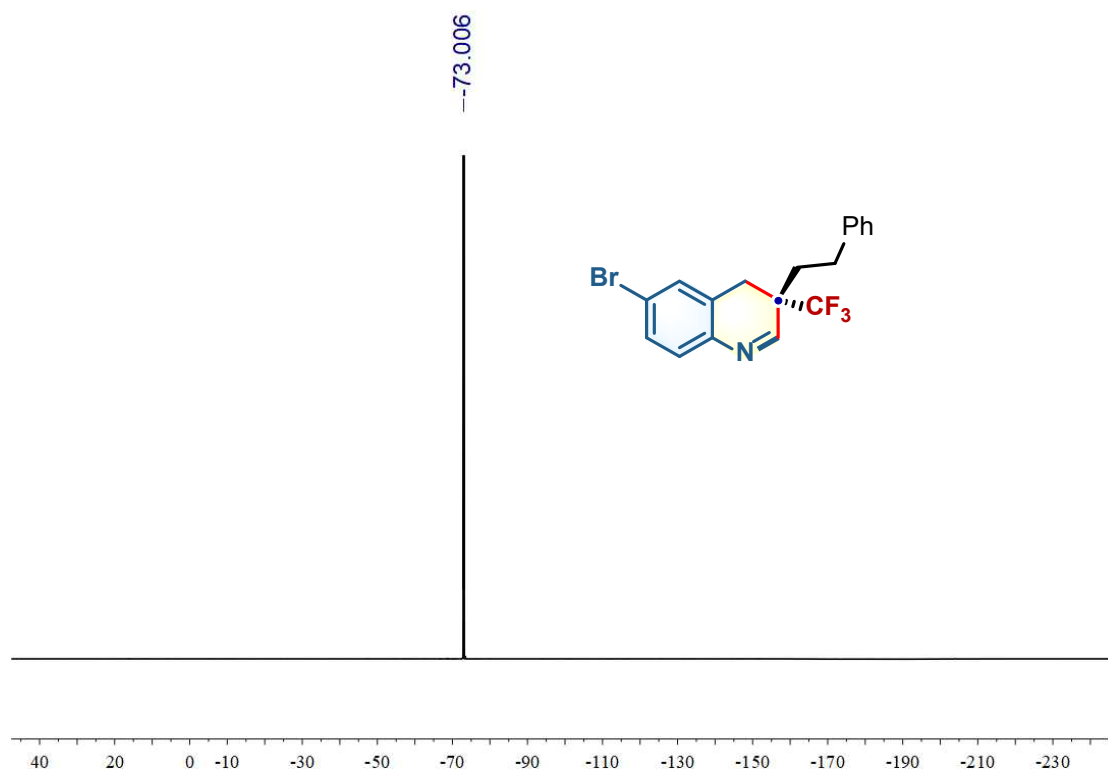
Supplementary Fig. 102. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **34**



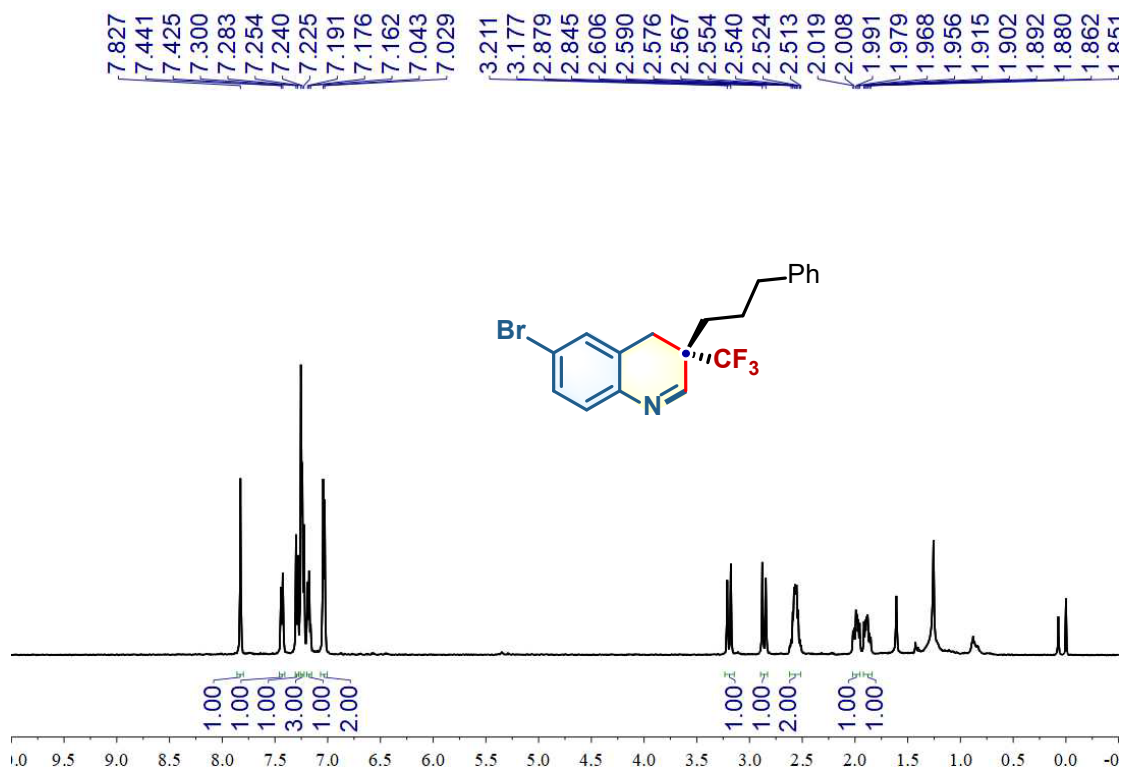
Supplementary Fig. 103. ¹H NMR (500 MHz, CDCl₃) spectrum of **35**



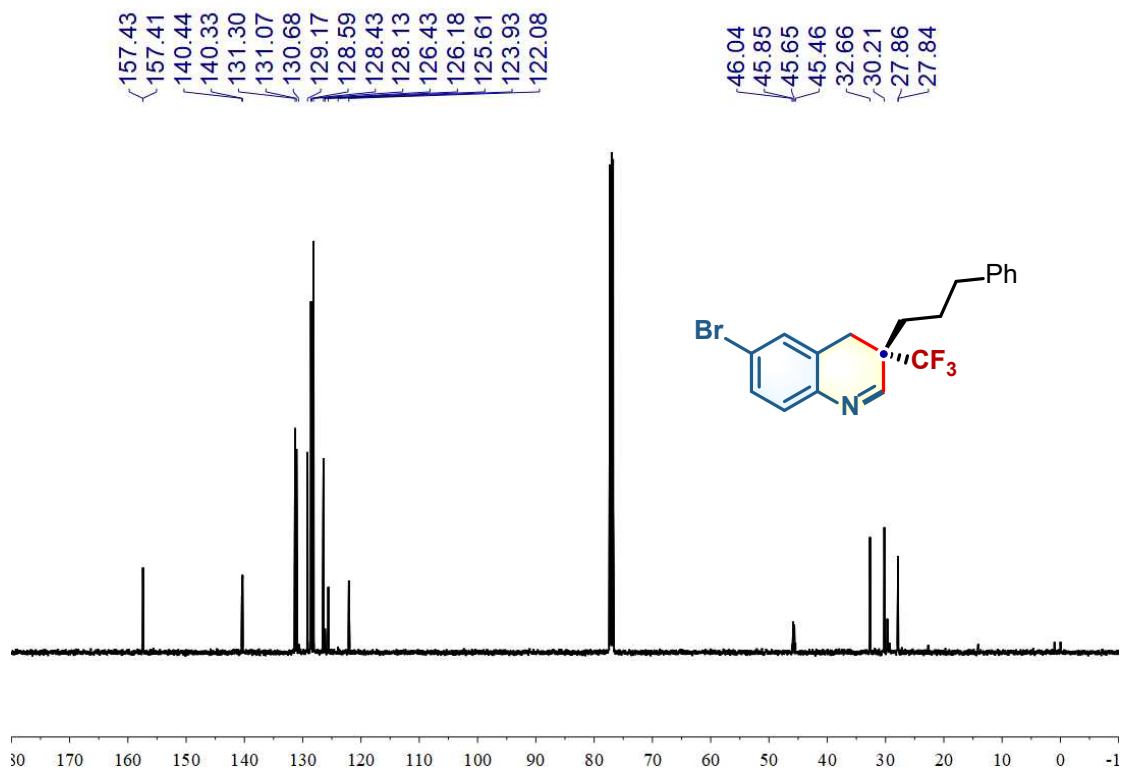
Supplementary Fig. 104. ¹³C NMR (125 MHz, CDCl₃) spectrum of **35**



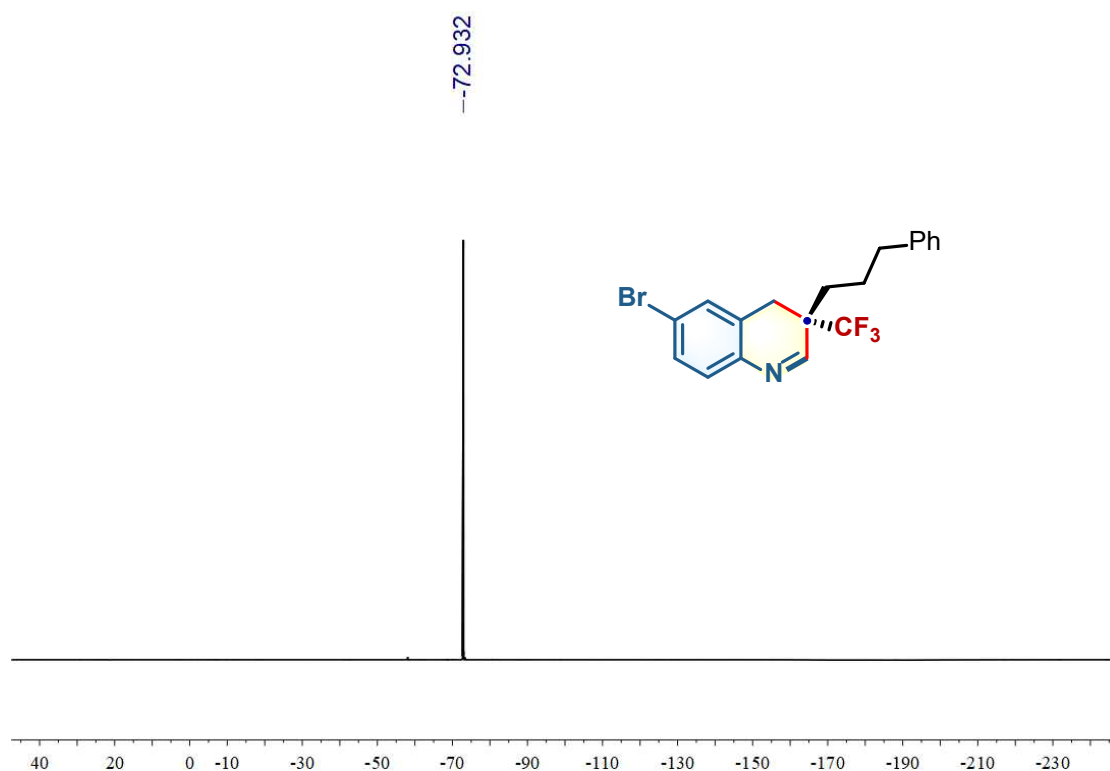
Supplementary Fig. 105. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **35**



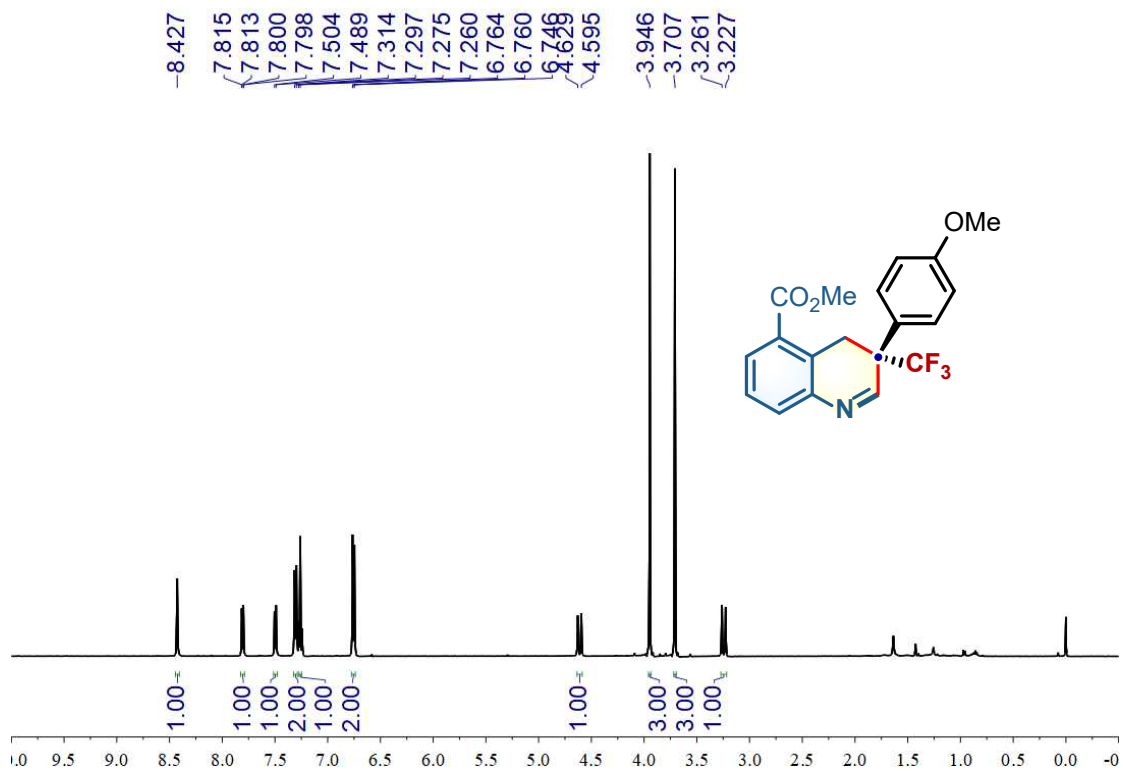
Supplementary Fig. 106. ^1H NMR (500 MHz, CDCl_3) spectrum of **36**



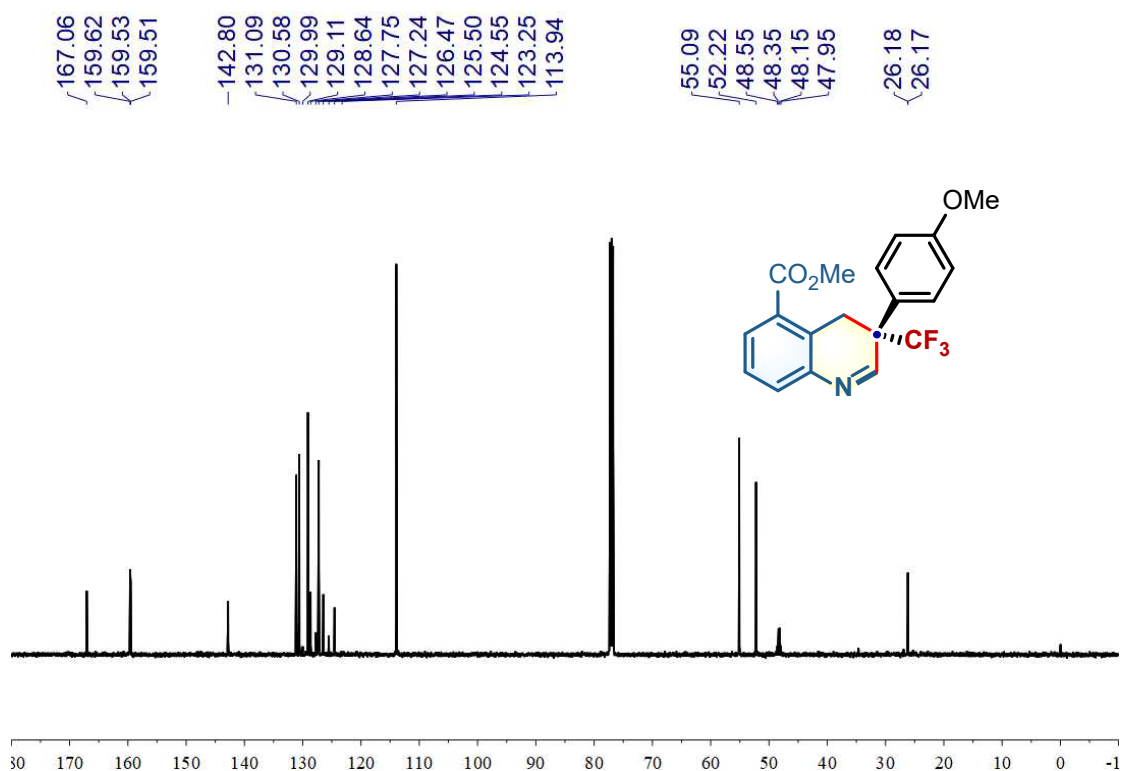
Supplementary Fig. 107. ¹³C NMR (125 MHz, CDCl₃) spectrum of **36**



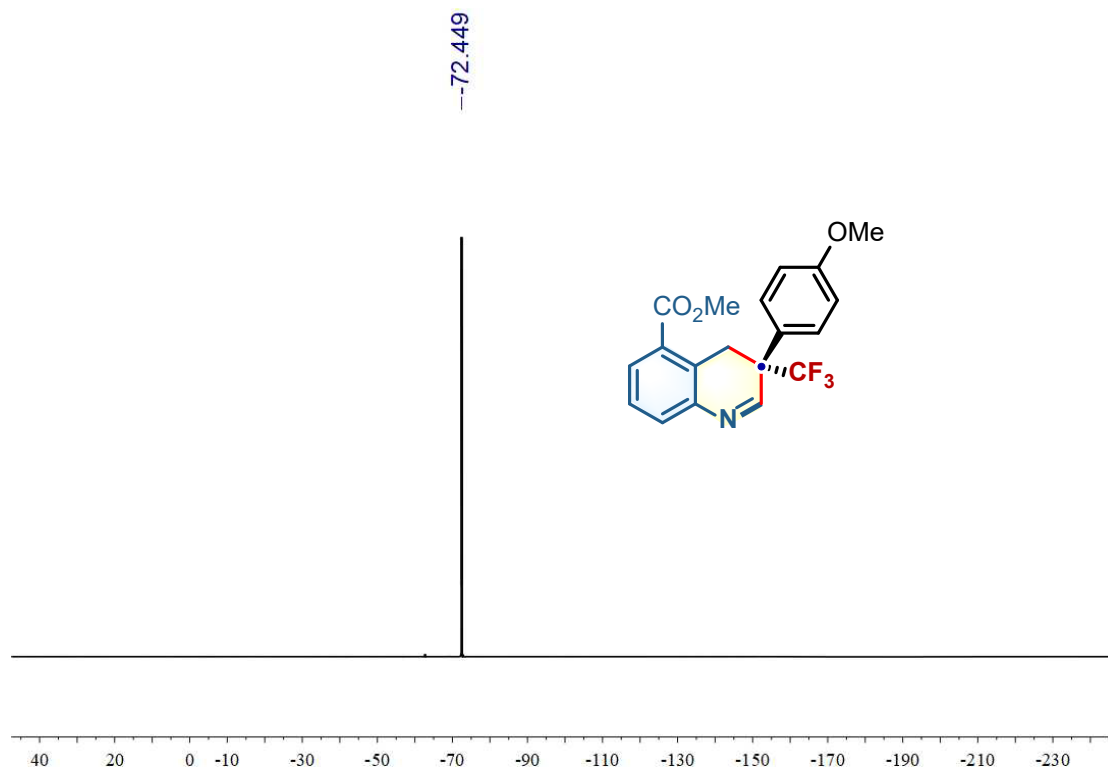
Supplementary Fig. 108. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **36**



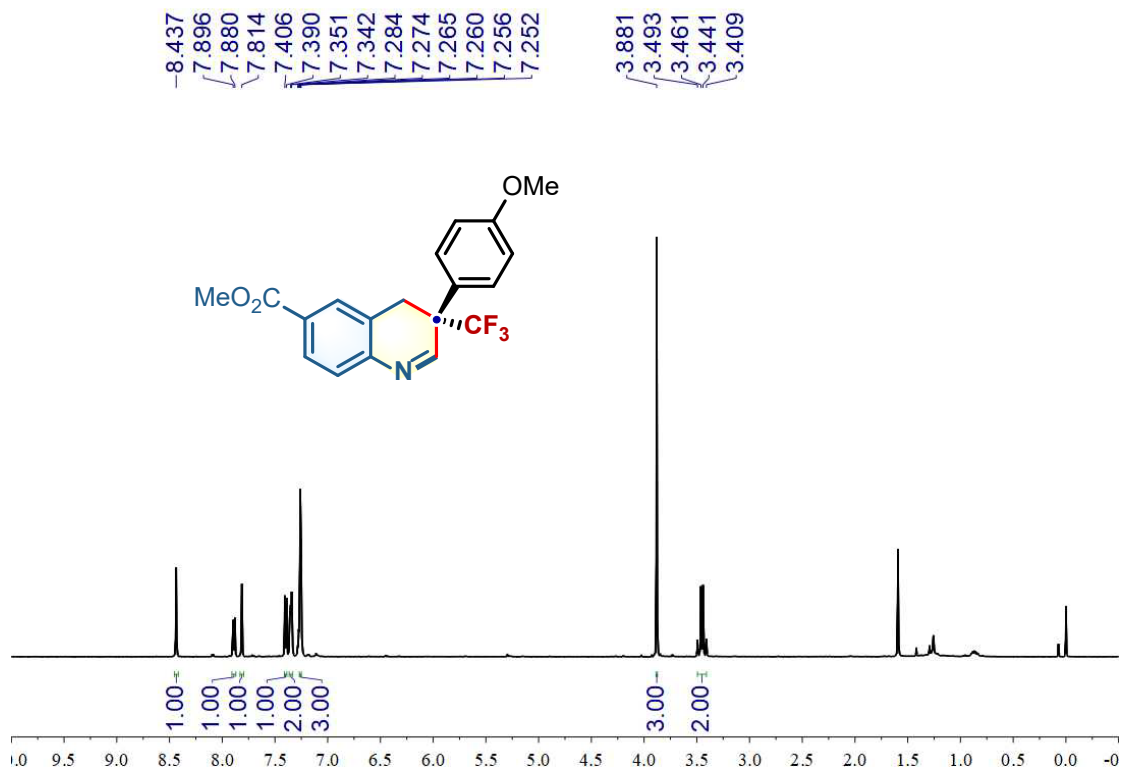
Supplementary Fig. 109. ¹H NMR (500 MHz, CDCl₃) spectrum of 37



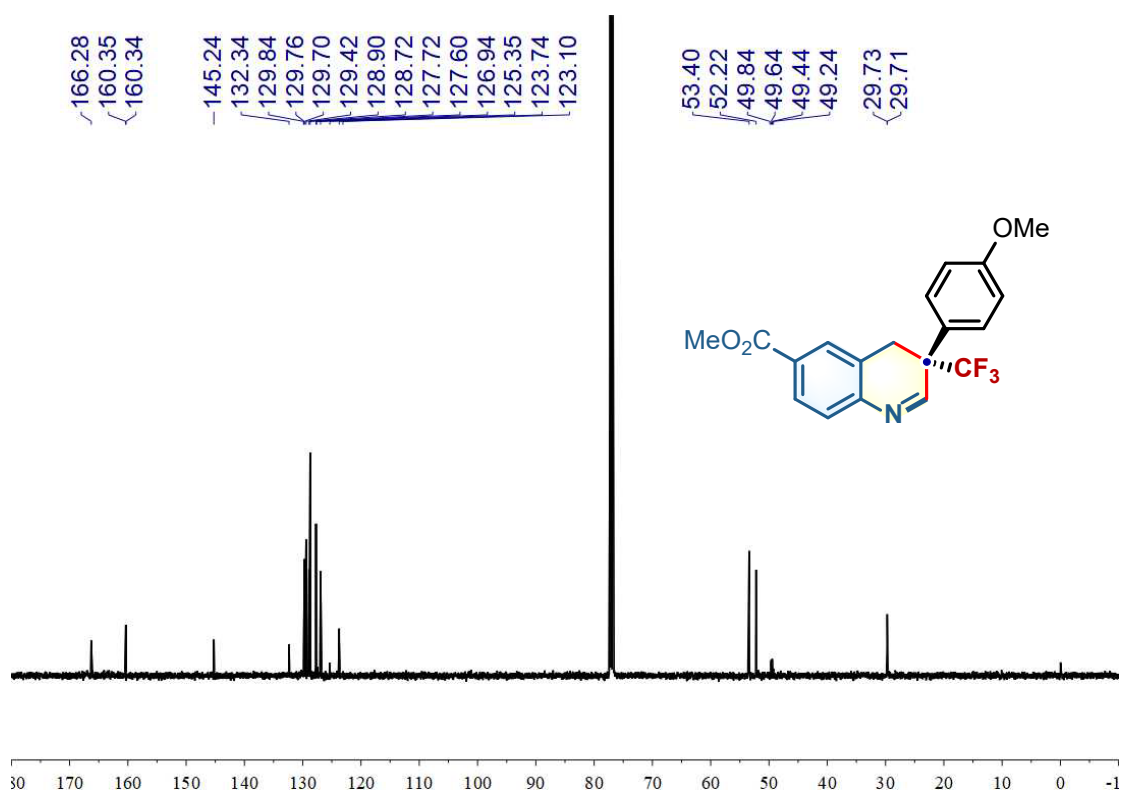
Supplementary Fig. 110. ¹³C NMR (125 MHz, CDCl₃) spectrum of 37



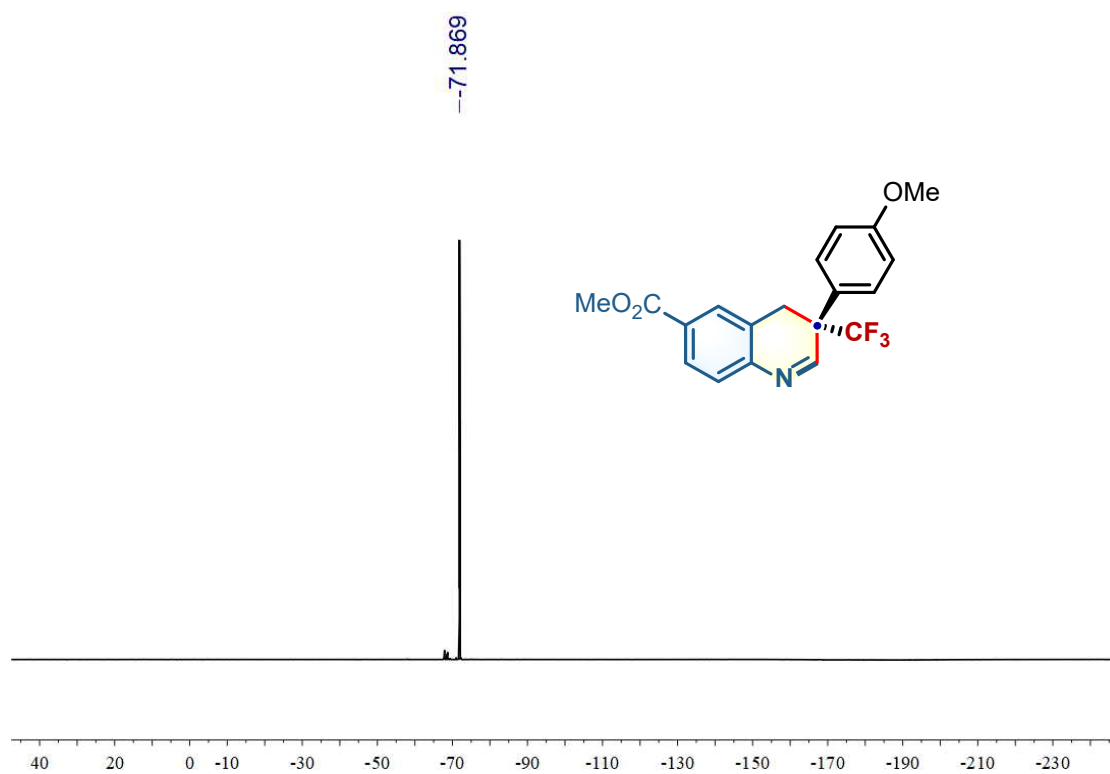
Supplementary Fig. 111. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **37**



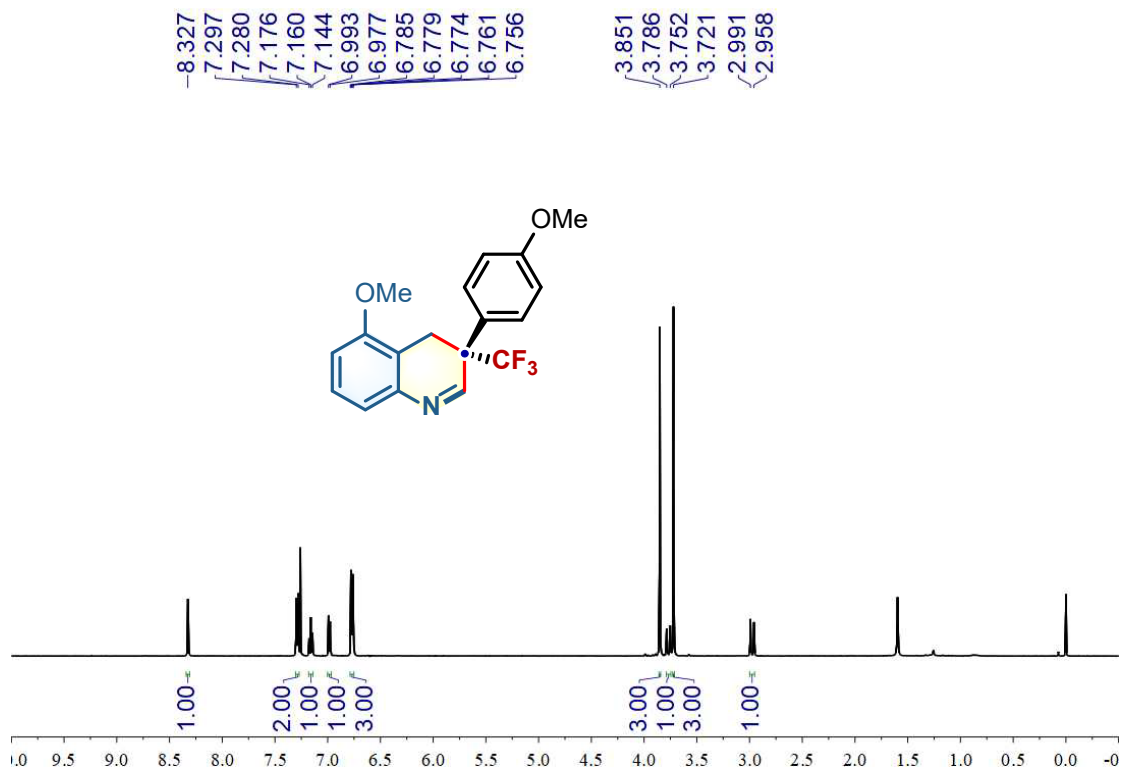
Supplementary Fig. 112. ^1H NMR (500 MHz, CDCl_3) spectrum of **38**



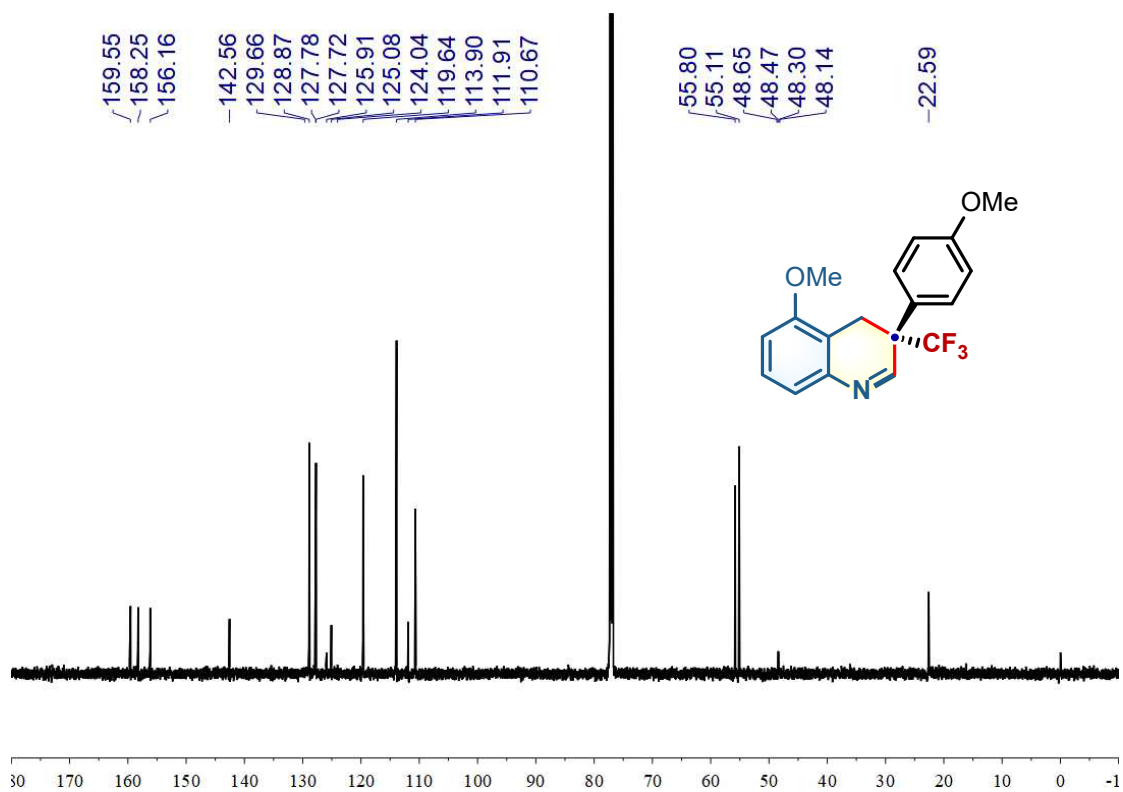
Supplementary Fig. 113. ^{13}C NMR (125 MHz, CDCl_3) spectrum of **38**



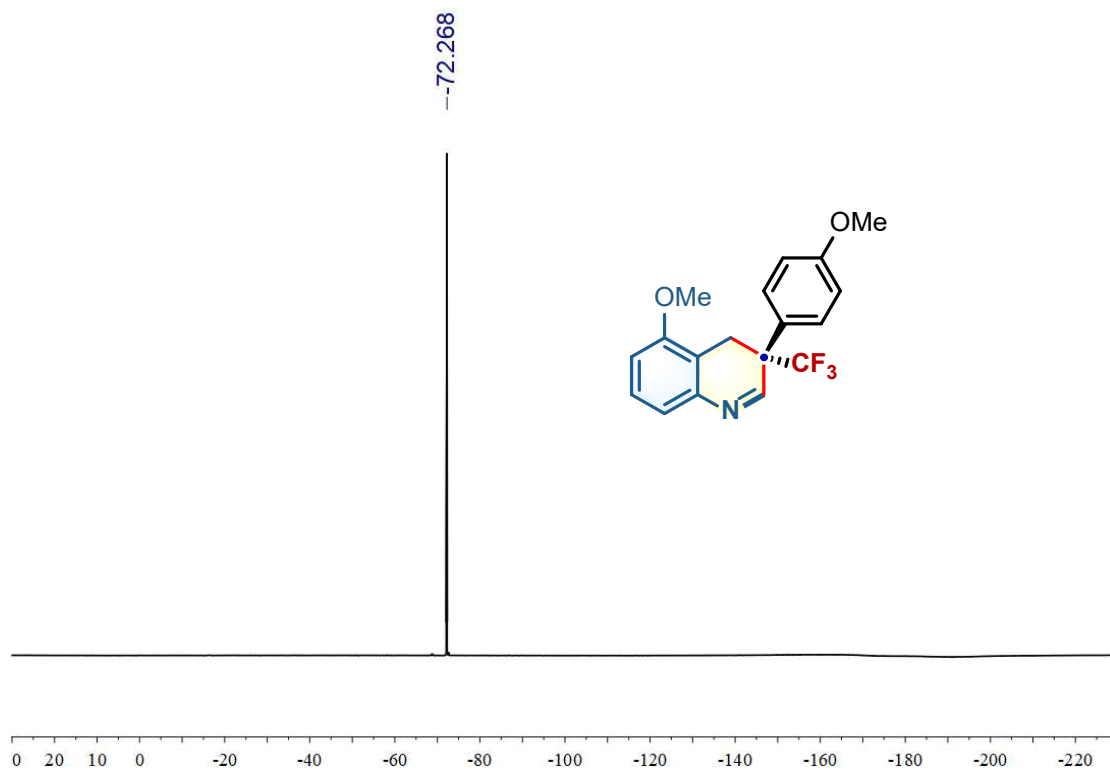
Supplementary Fig. 114. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **38**



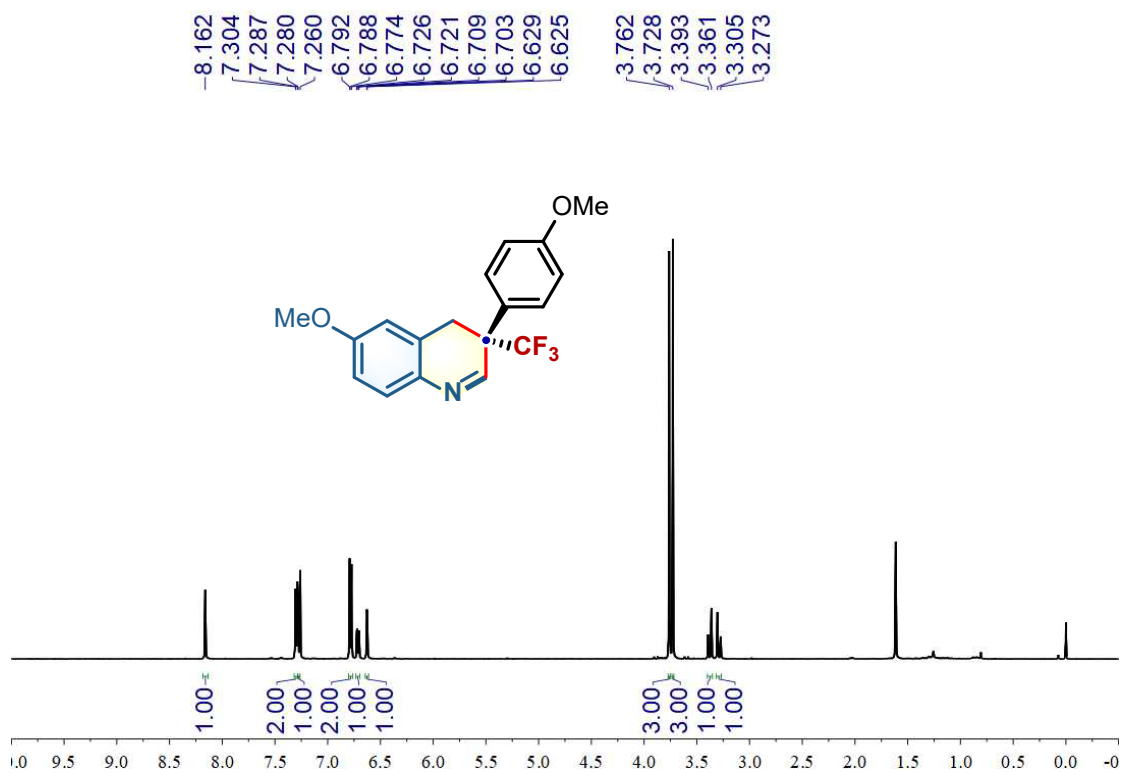
Supplementary Fig. 115. ¹H NMR (500 MHz, CDCl₃) spectrum of **39**



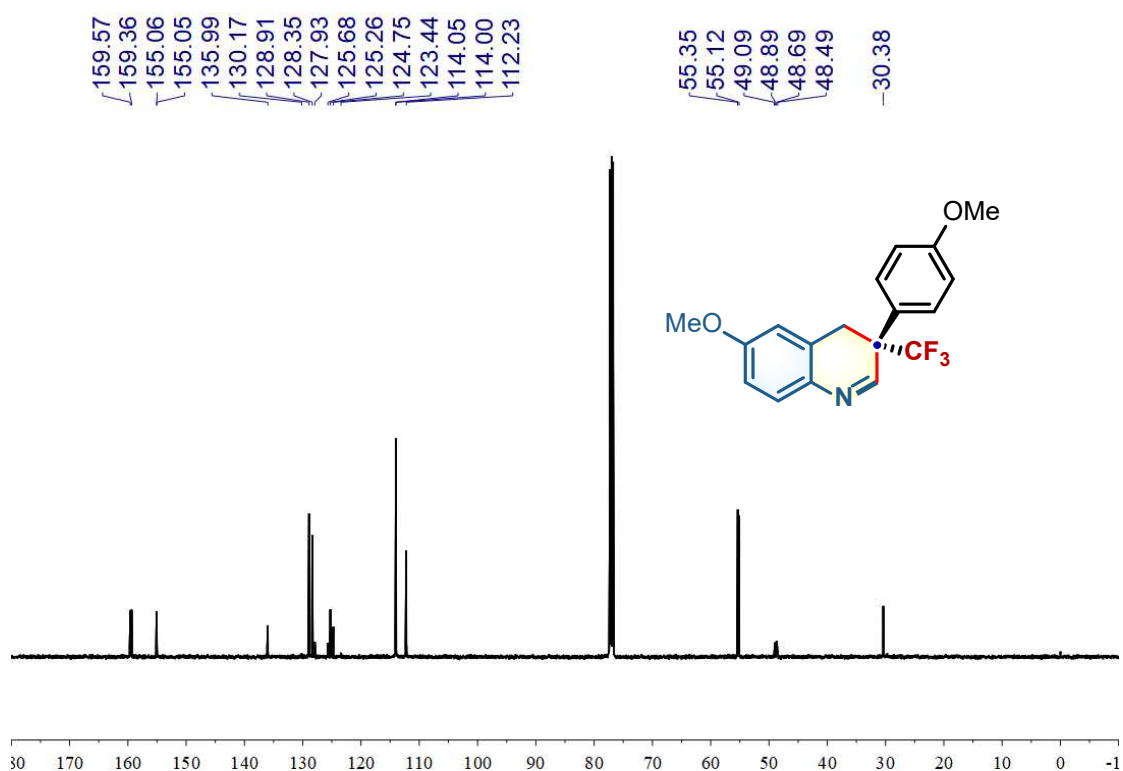
Supplementary Fig. 116. ¹³C NMR (150 MHz, CDCl₃) spectrum of **39**



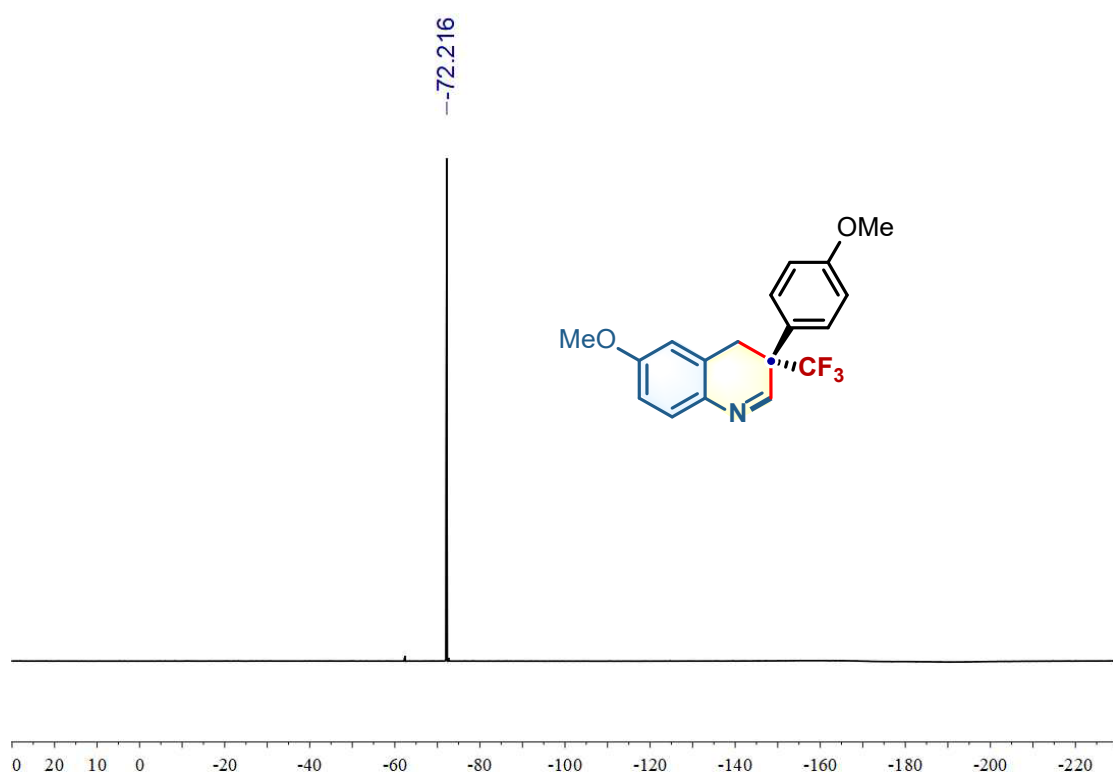
Supplementary Fig. 117. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **39**



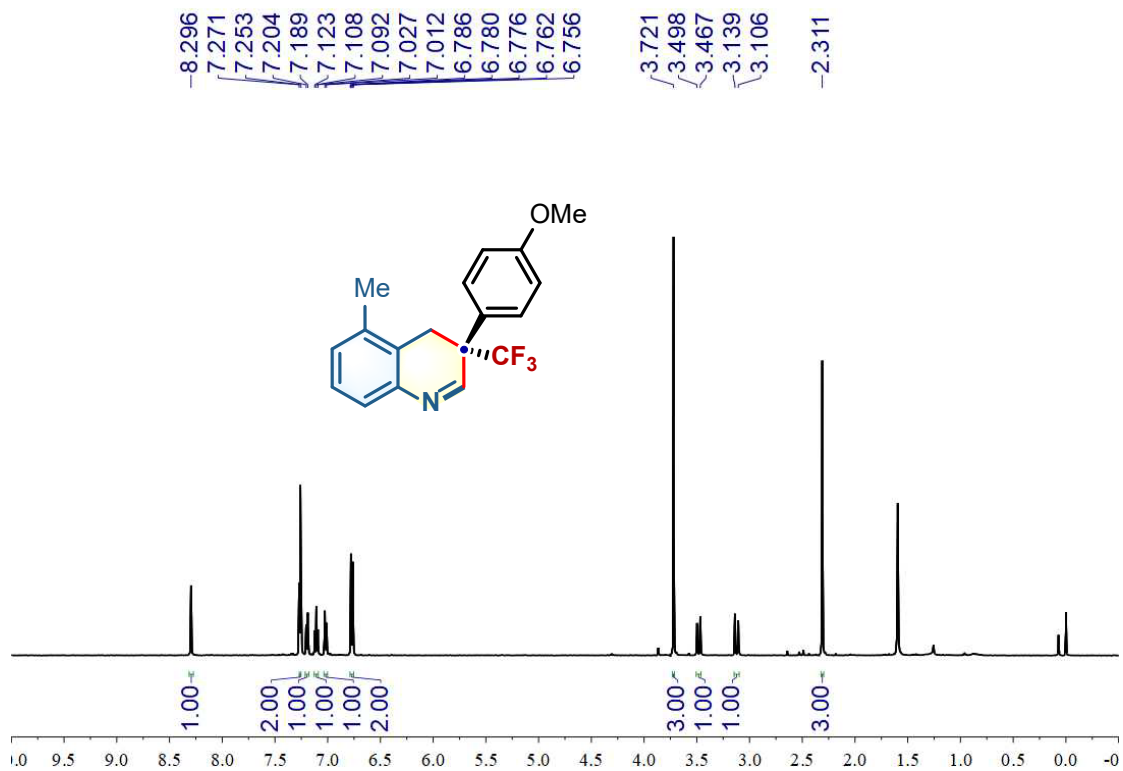
Supplementary Fig. 118. ^1H NMR (500 MHz, CDCl_3) spectrum of **40**



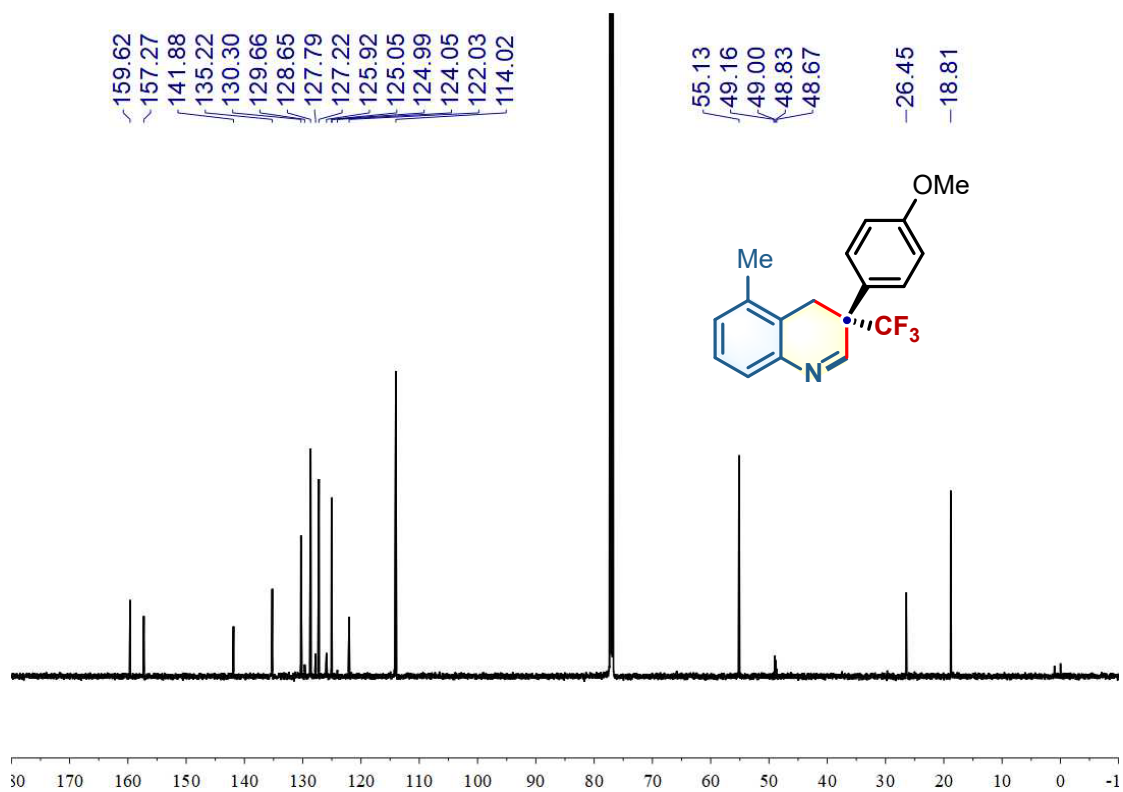
Supplementary Fig. 119. ¹³C NMR (125 MHz, CDCl₃) spectrum of 40



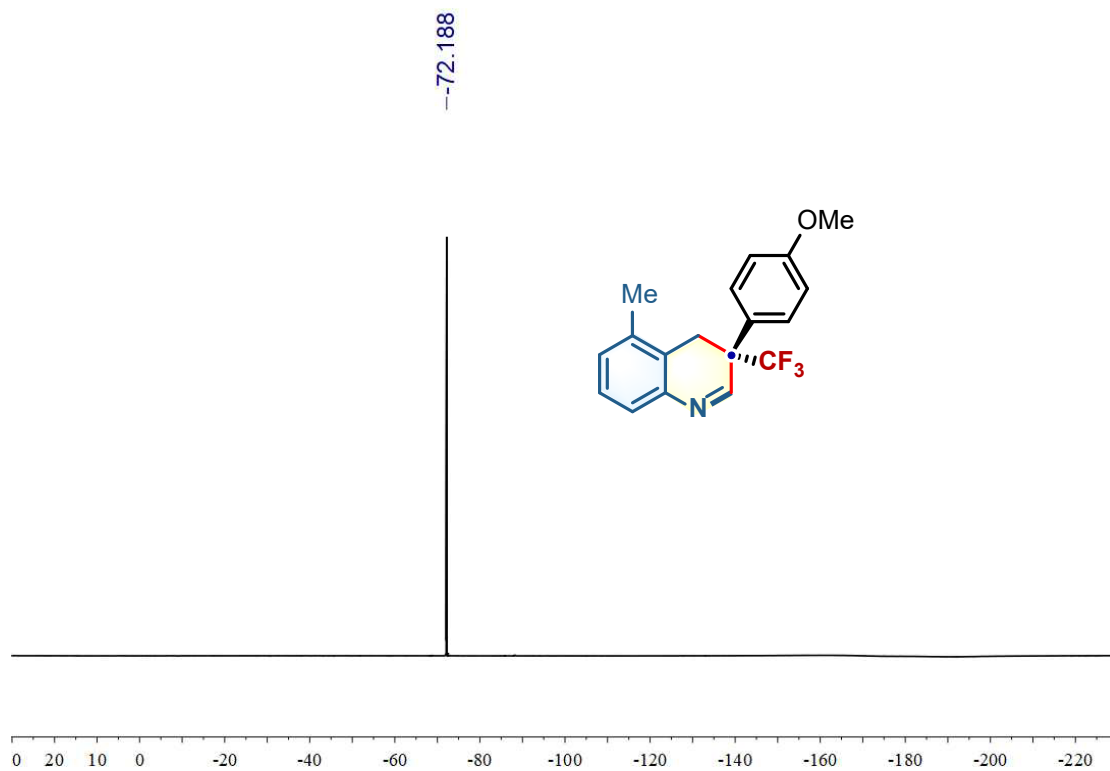
Supplementary Fig. 120. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 40



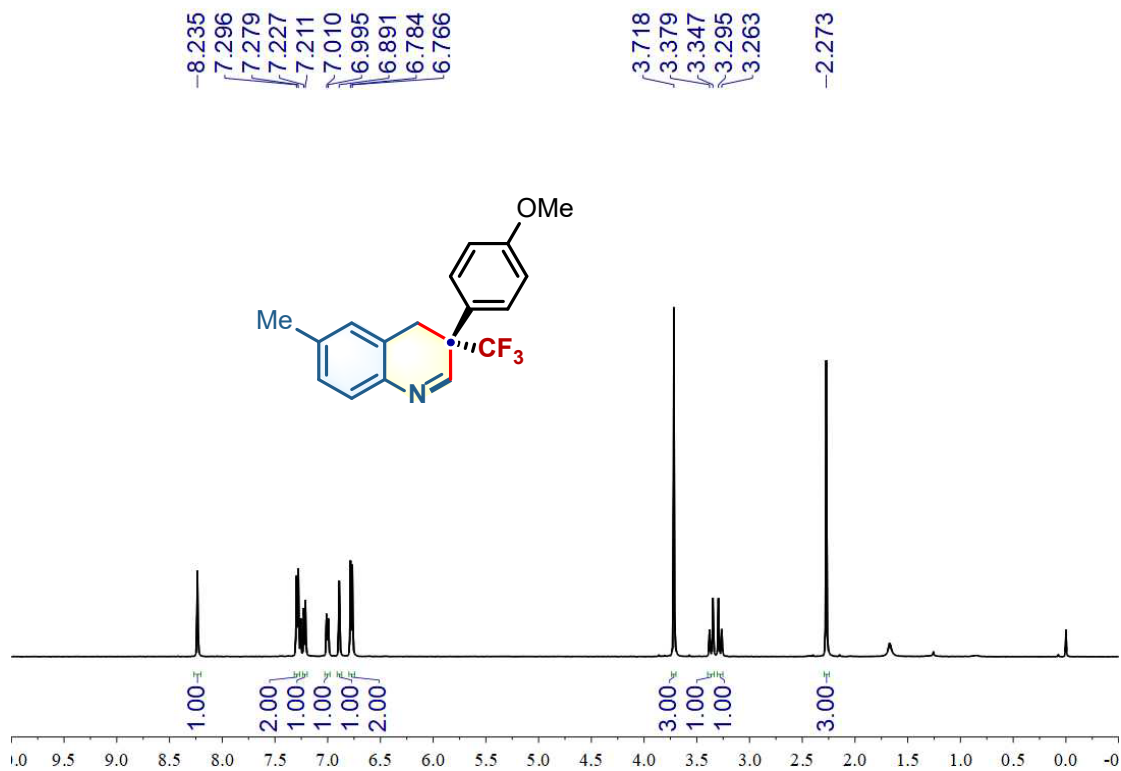
Supplementary Fig. 121. ¹H NMR (500 MHz, CDCl₃) spectrum of **41**



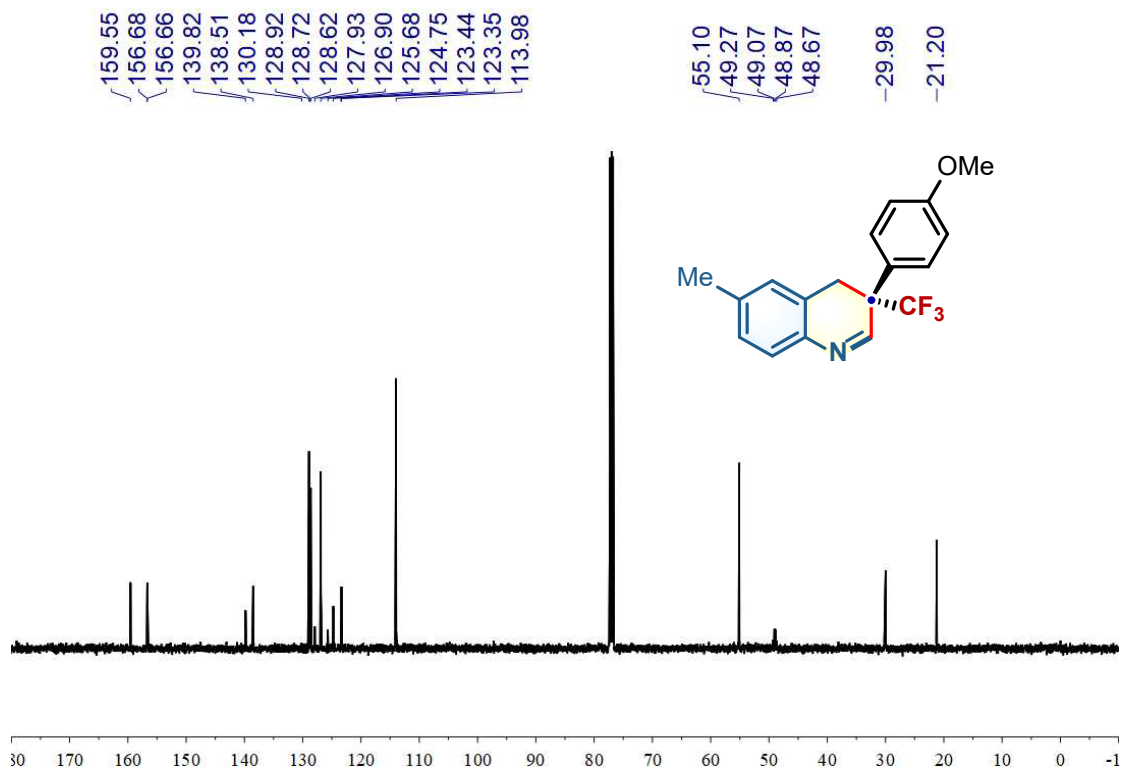
Supplementary Fig. 122. ¹³C NMR (150 MHz, CDCl₃) spectrum of **41**



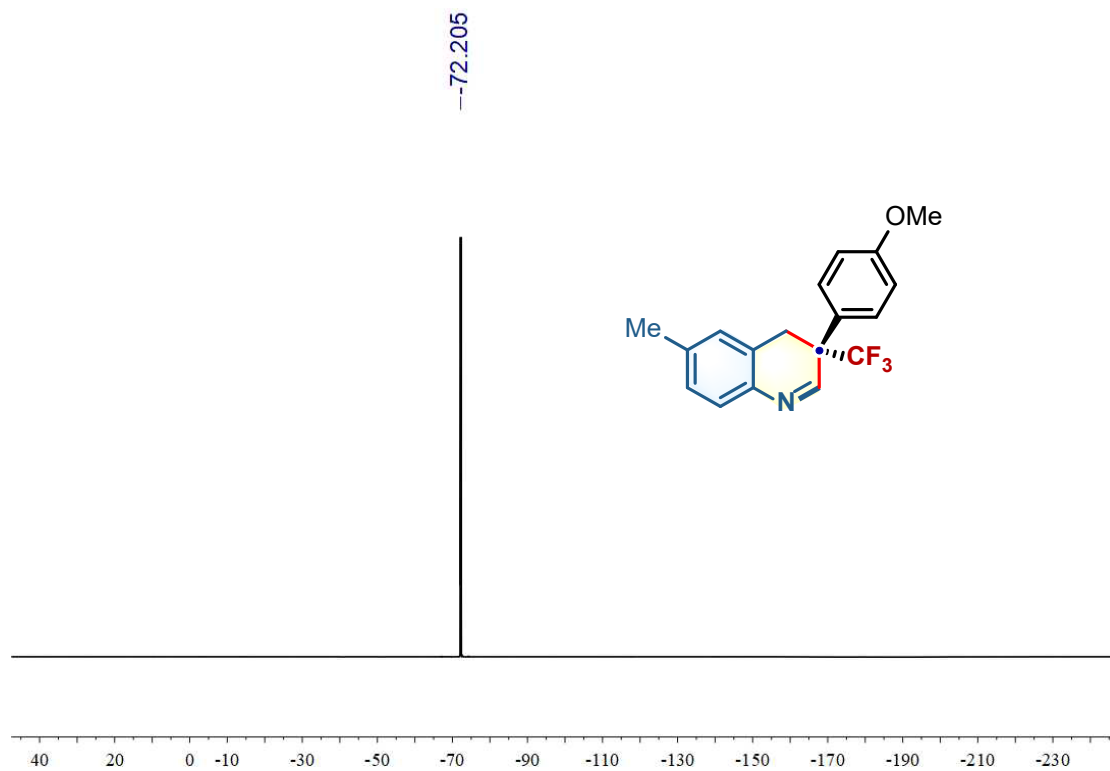
Supplementary Fig. 123. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **41**



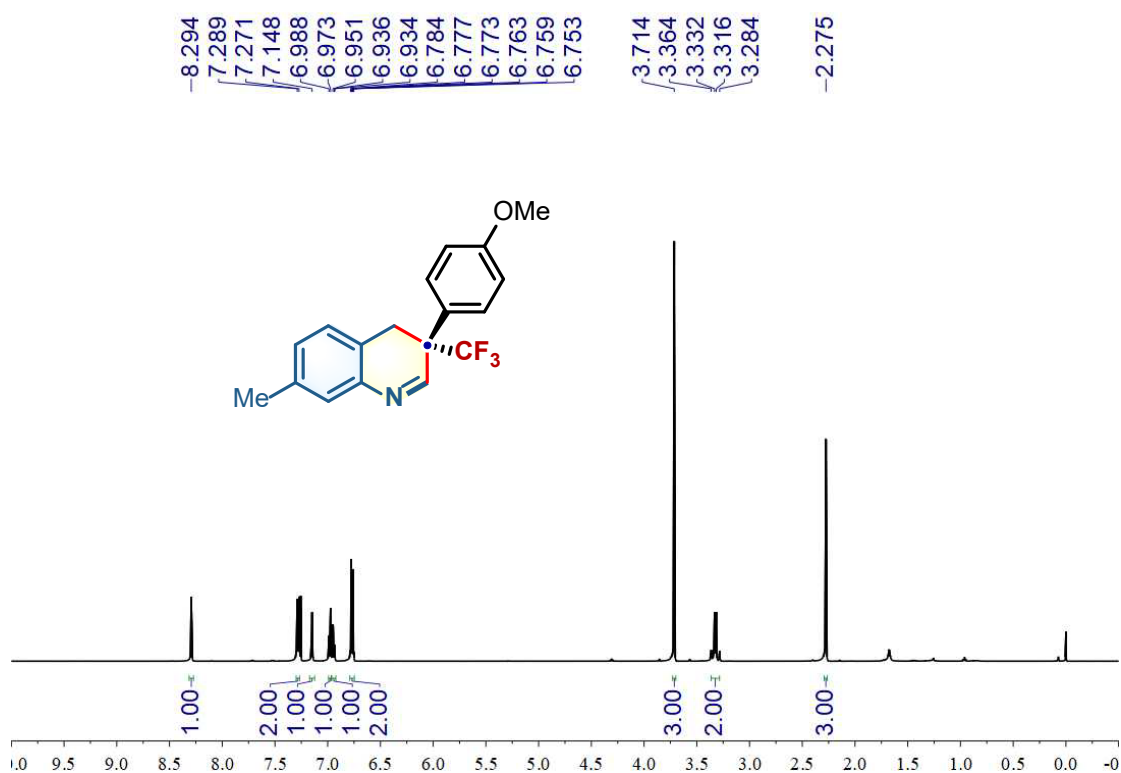
Supplementary Fig. 124. ^1H NMR (500 MHz, CDCl_3) spectrum of **42**



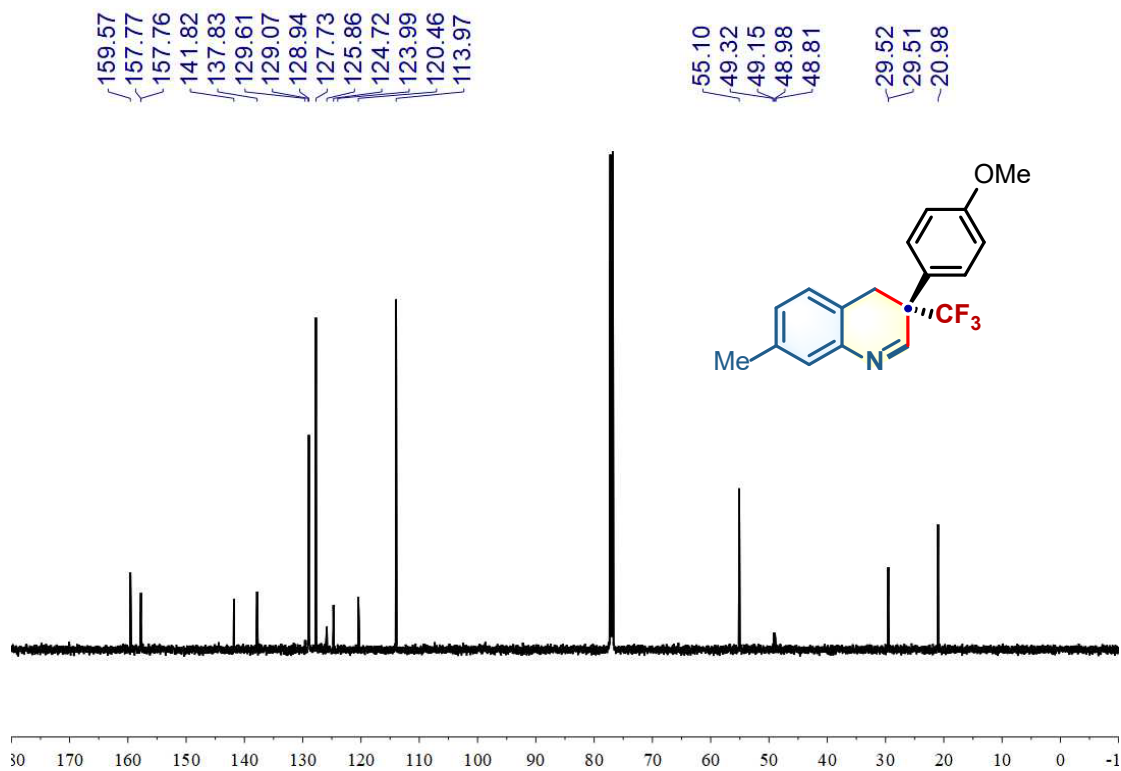
Supplementary Fig. 125. ¹H NMR (125 MHz, CDCl₃) spectrum of **42**



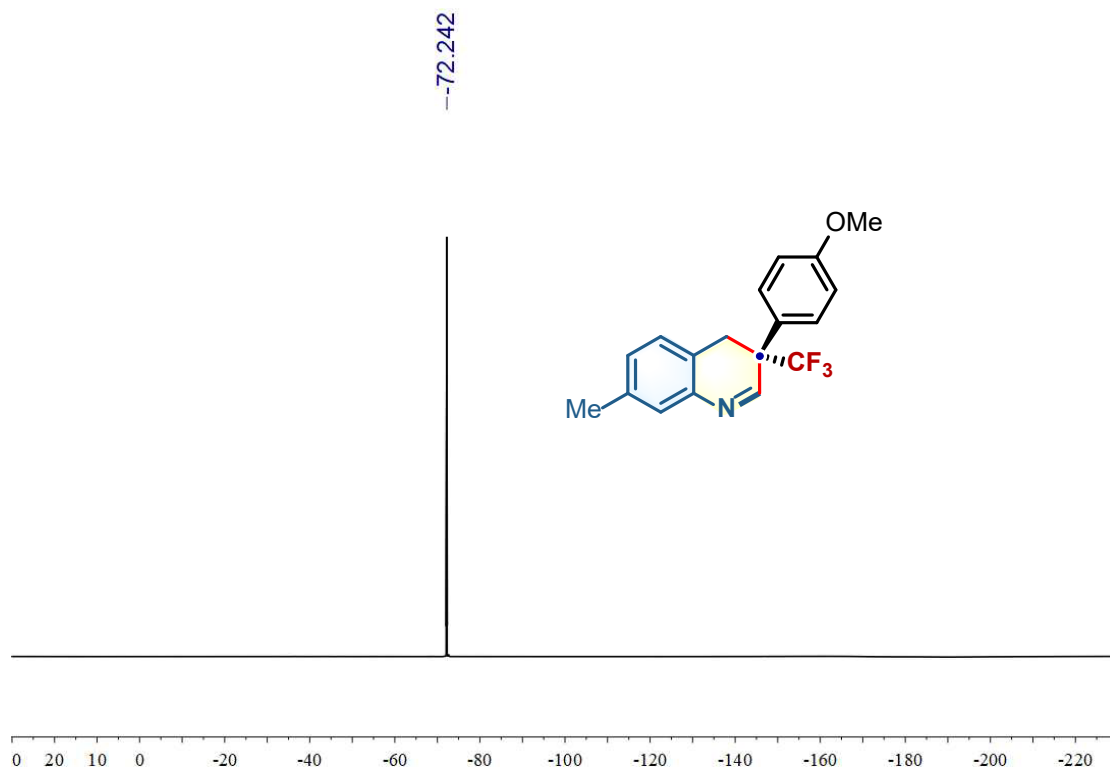
Supplementary Fig. 126. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **42**



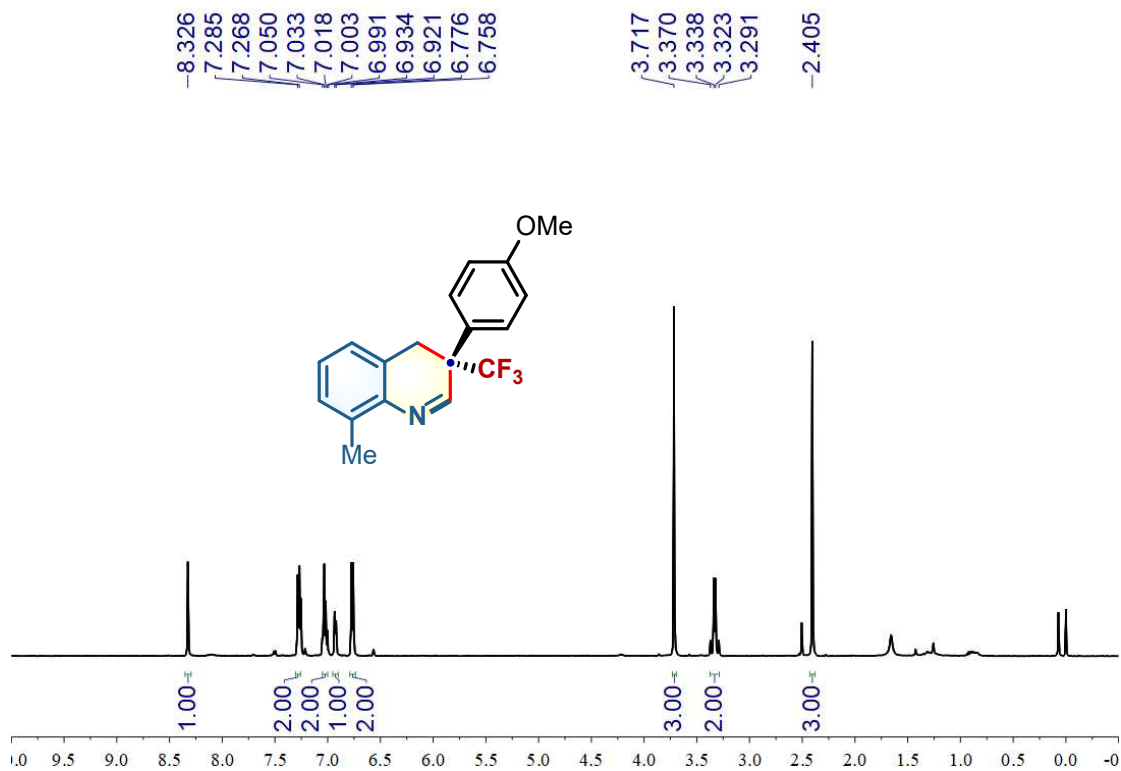
Supplementary Fig. 127. ¹H NMR (500 MHz, CDCl₃) spectrum of **43**



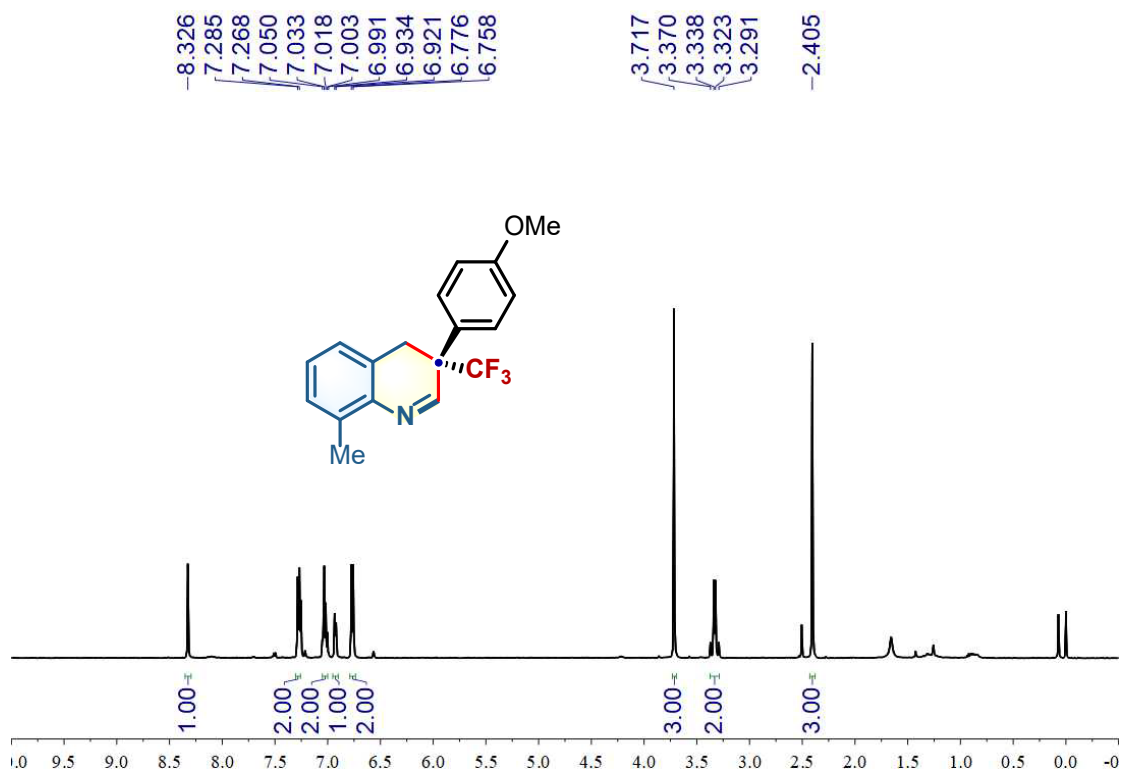
Supplementary Fig. 128. ¹³C NMR (150 MHz, CDCl₃) spectrum of **43**



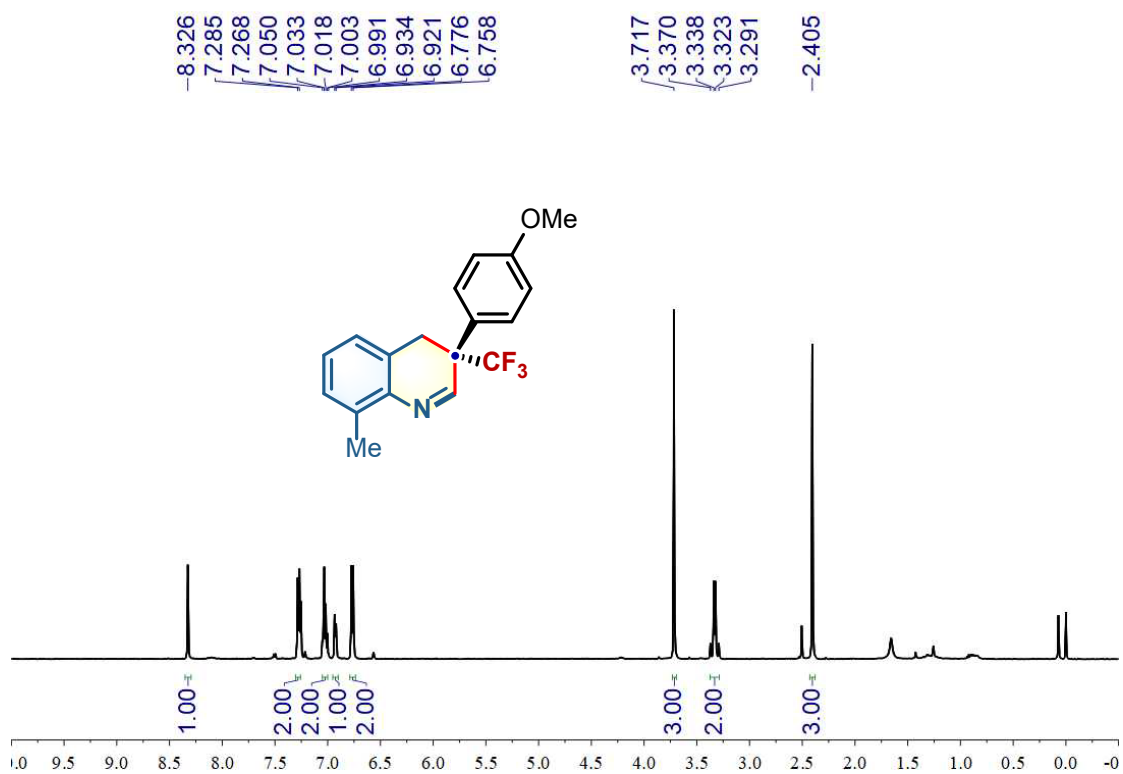
Supplementary Fig. 129. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **43**



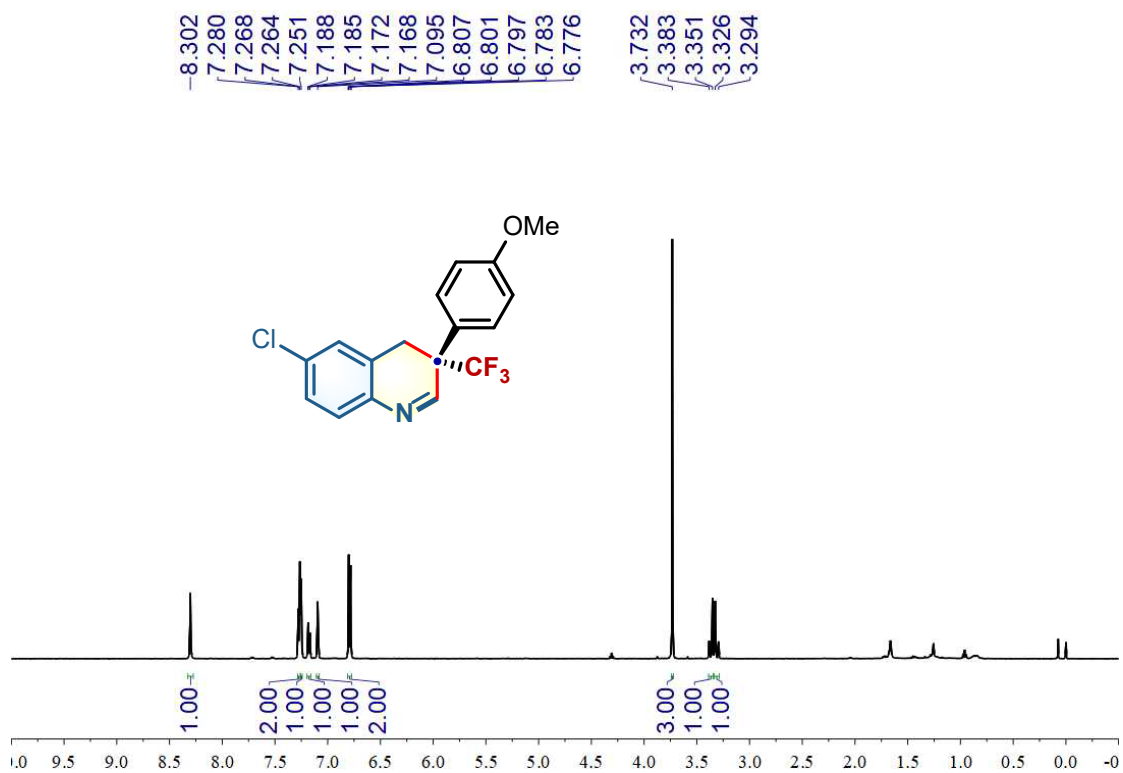
Supplementary Fig. 130. ^1H NMR (500 MHz, CDCl_3) spectrum of **44**



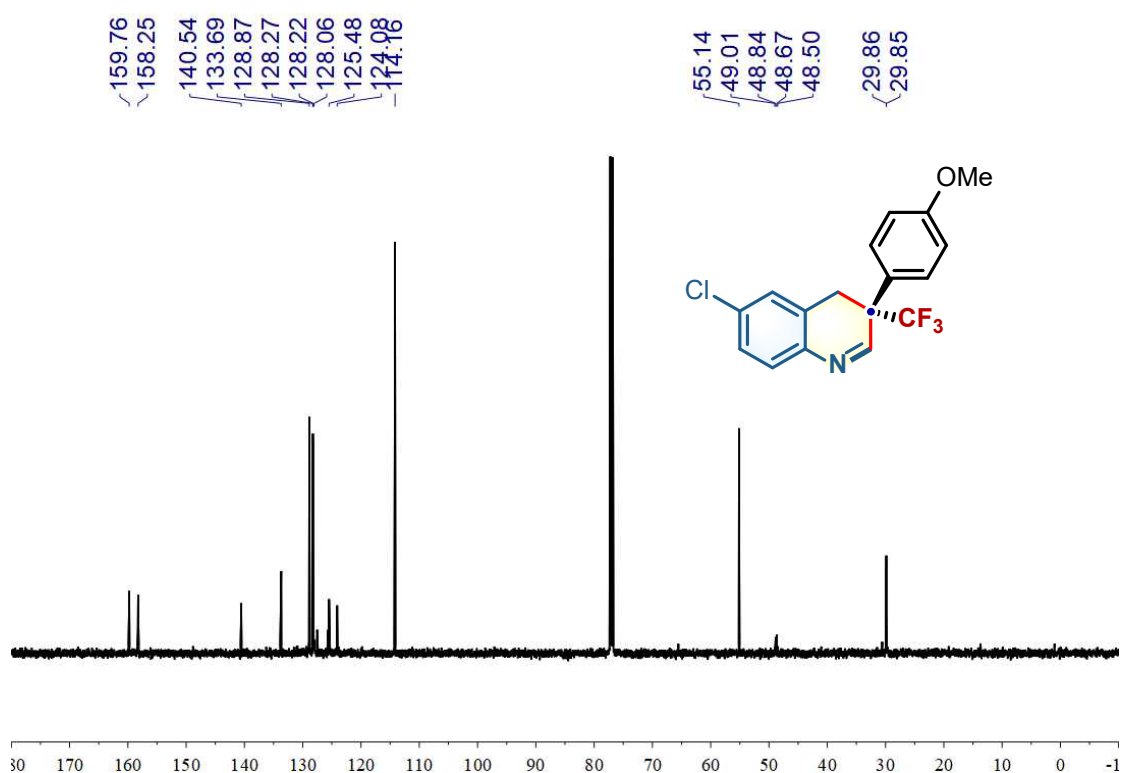
Supplementary Fig. 131. ¹³C NMR (150 MHz, CDCl₃) spectrum of **44**



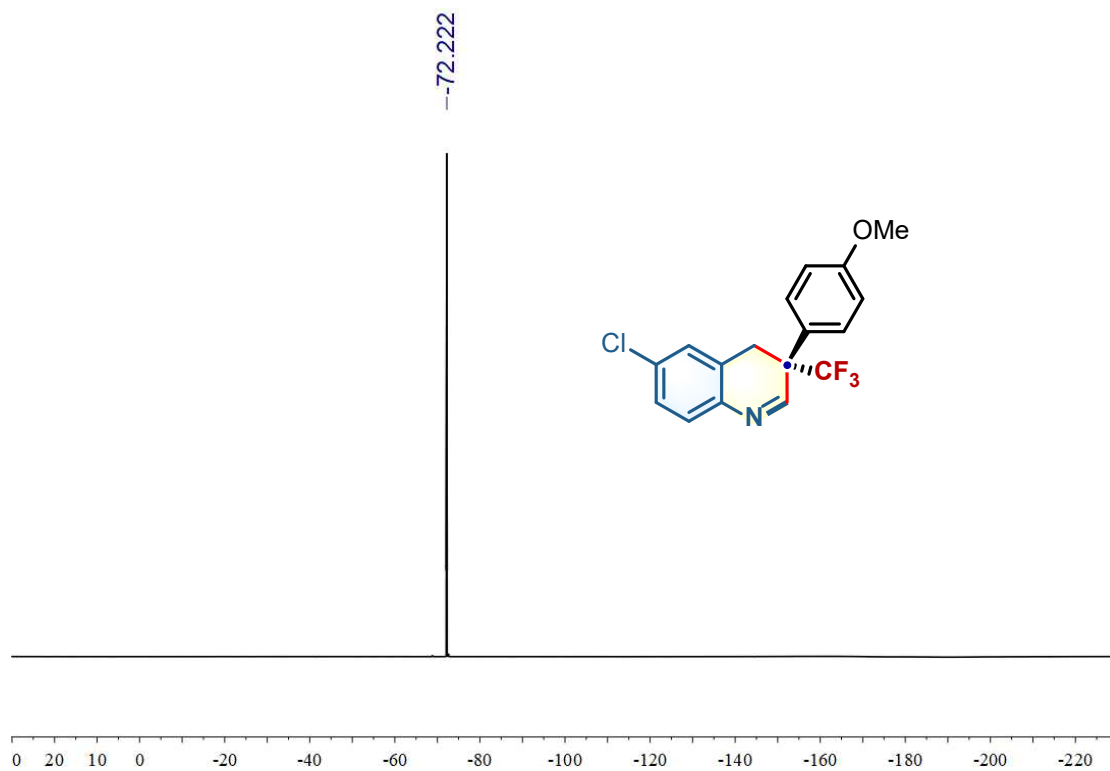
Supplementary Fig. 132. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **44**



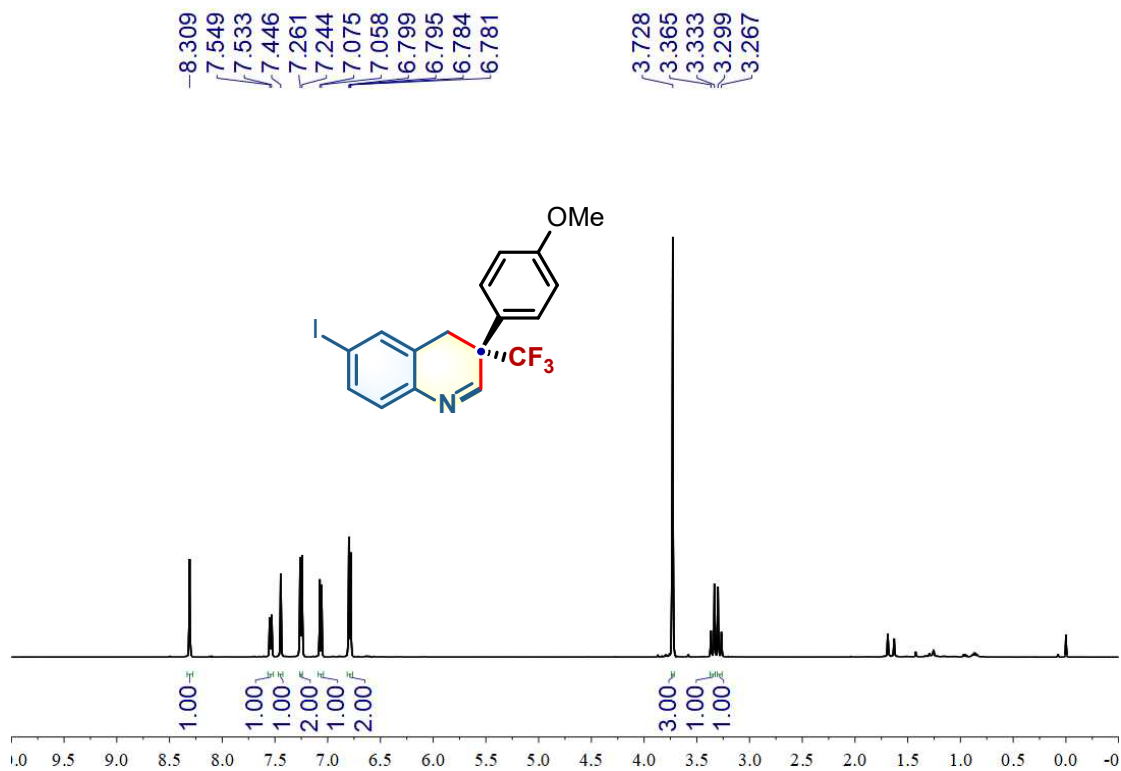
Supplementary Fig. 133. ¹H NMR (500 MHz, CDCl₃) spectrum of **45**



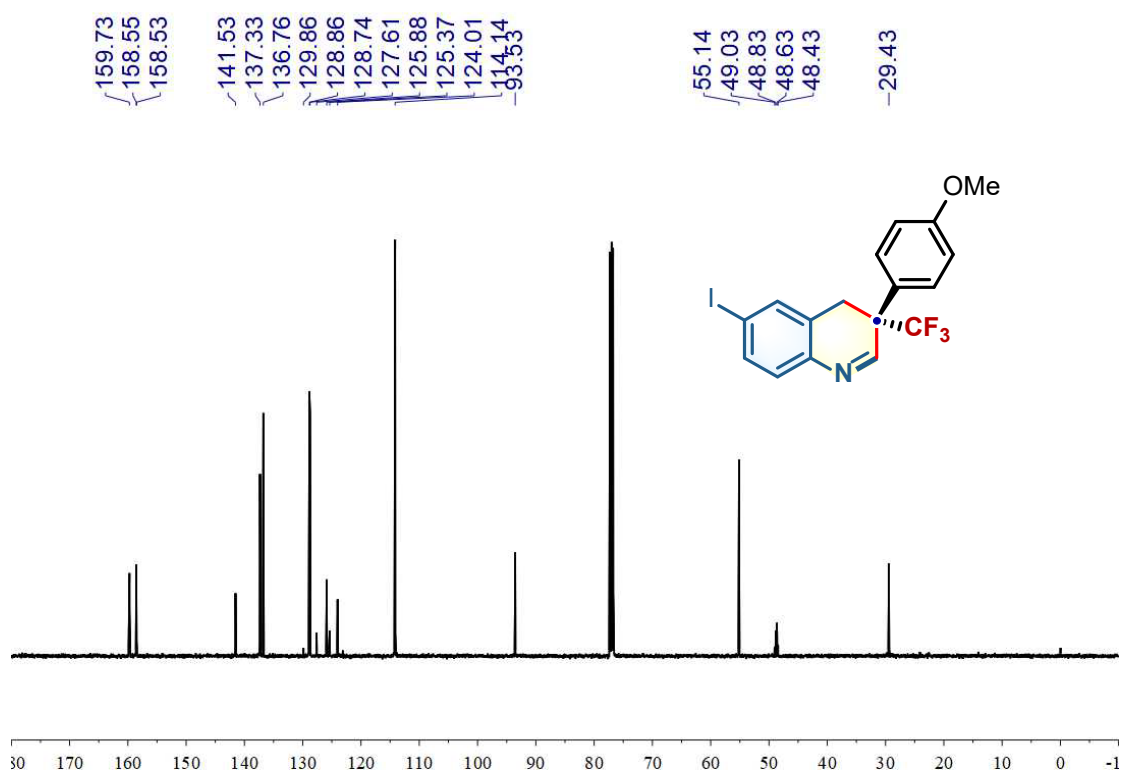
Supplementary Fig. 134. ¹³C NMR (150 MHz, CDCl₃) spectrum of **45**



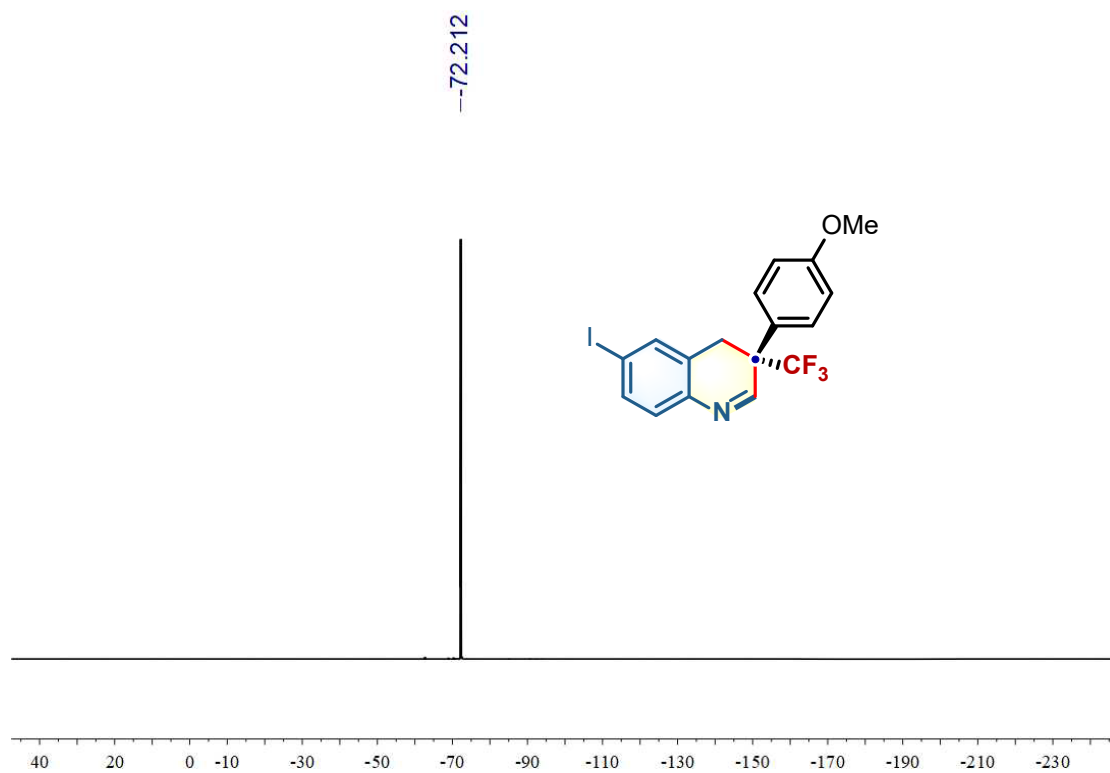
Supplementary Fig. 135. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 45



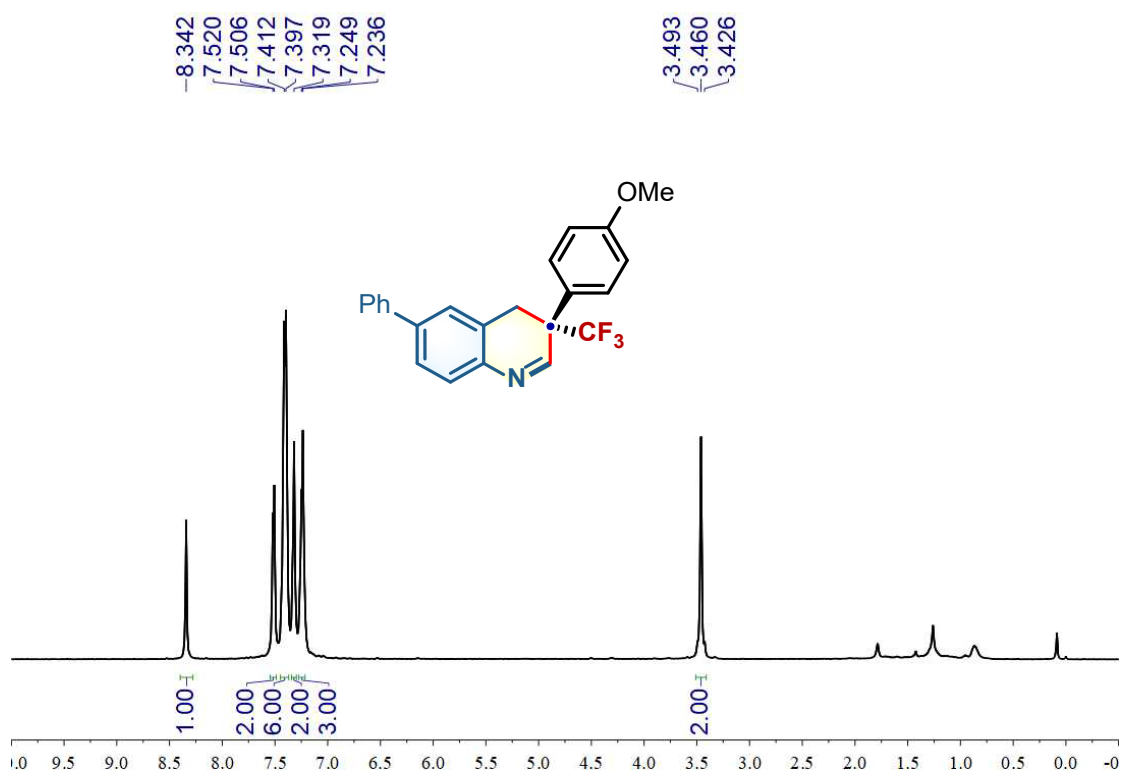
Supplementary Fig. 136. ^1H NMR (500 MHz, CDCl_3) spectrum of 46



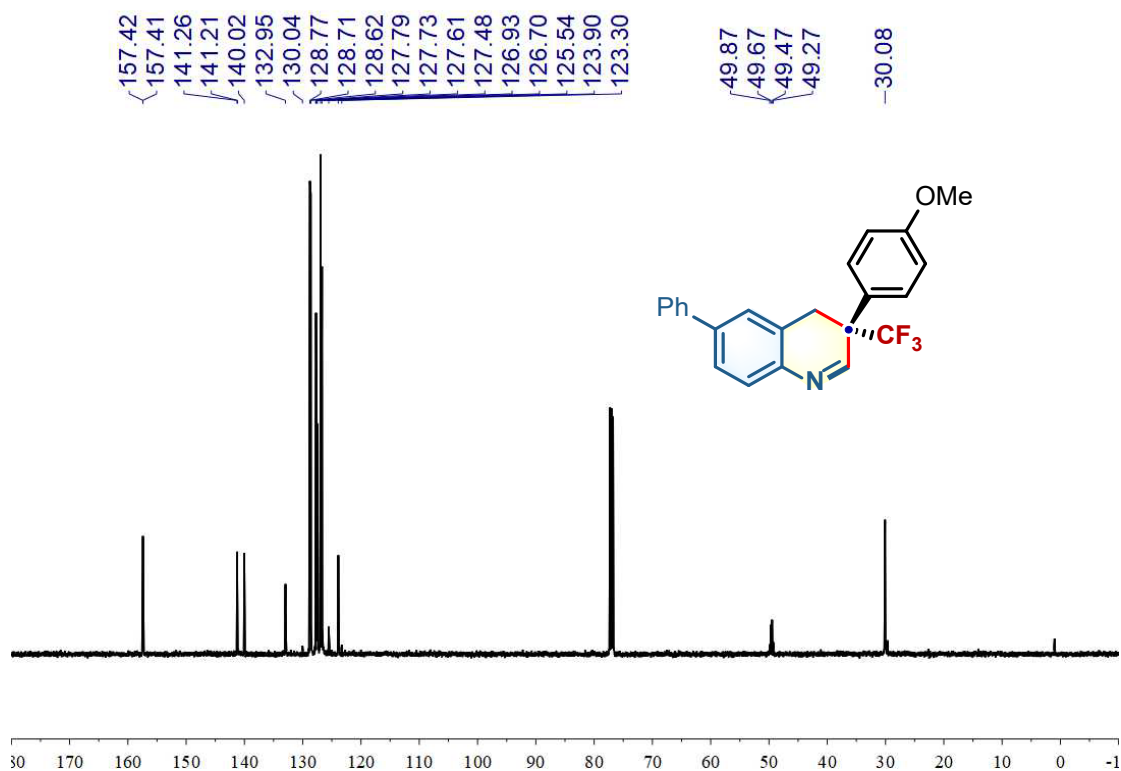
Supplementary Fig. 137. ¹³C NMR (125 MHz, CDCl₃) spectrum of 46



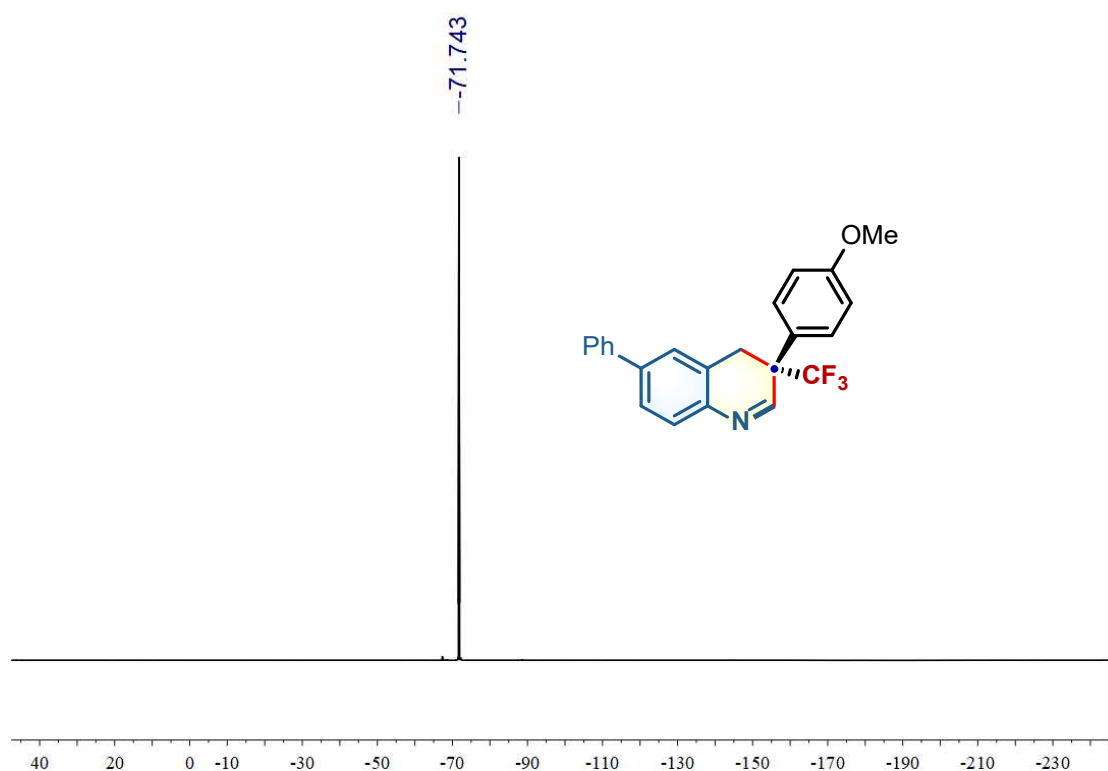
Supplementary Fig. 138. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 46



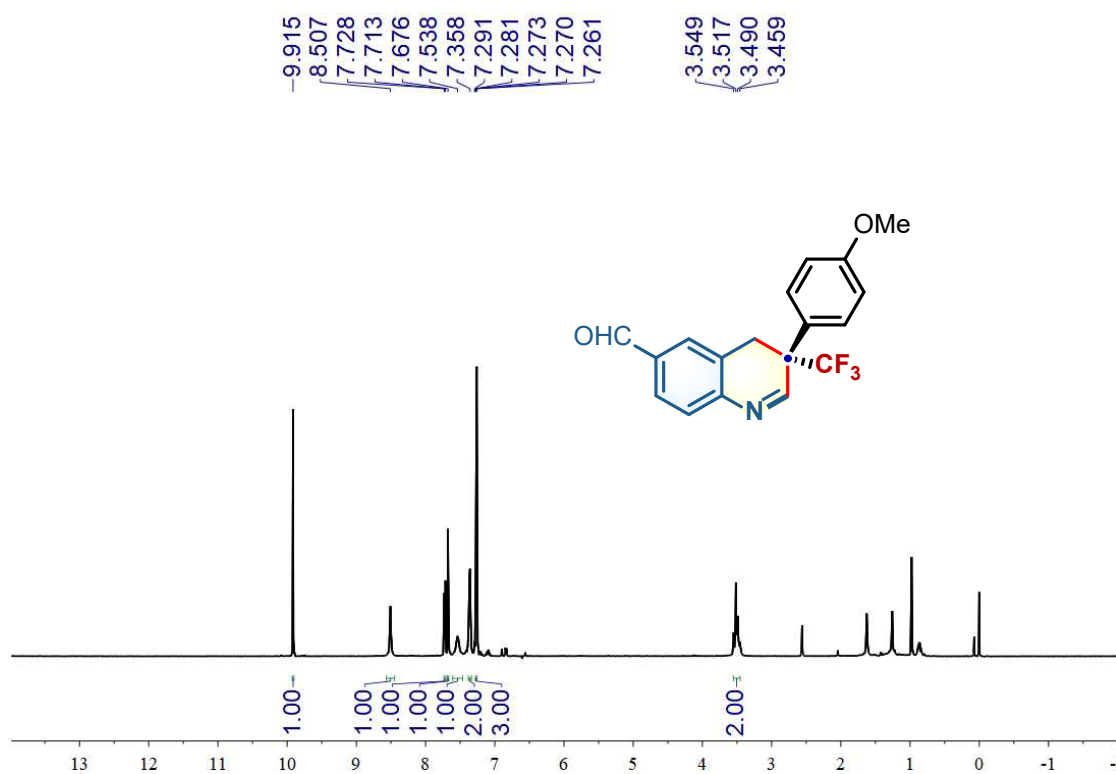
Supplementary Fig. 139. ¹H NMR (500 MHz, CDCl₃) spectrum of **47**



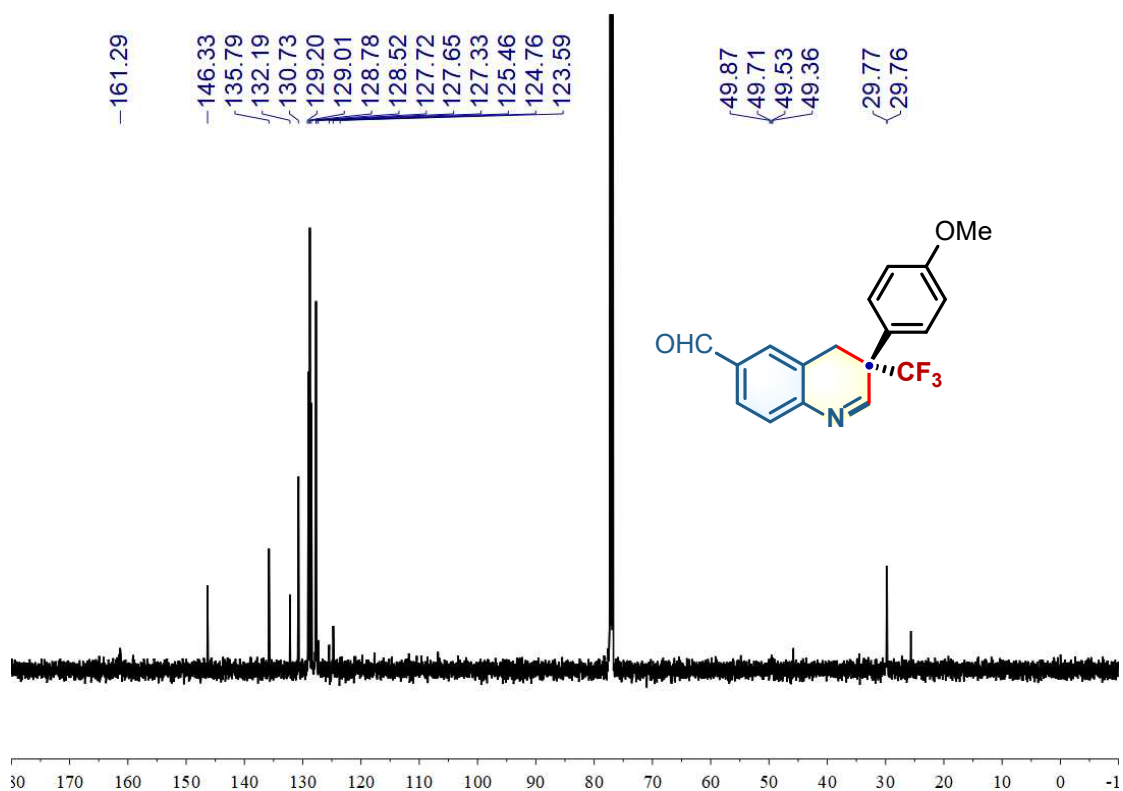
Supplementary Fig. 140. ¹³C NMR (125 MHz, CDCl₃) spectrum of **47**



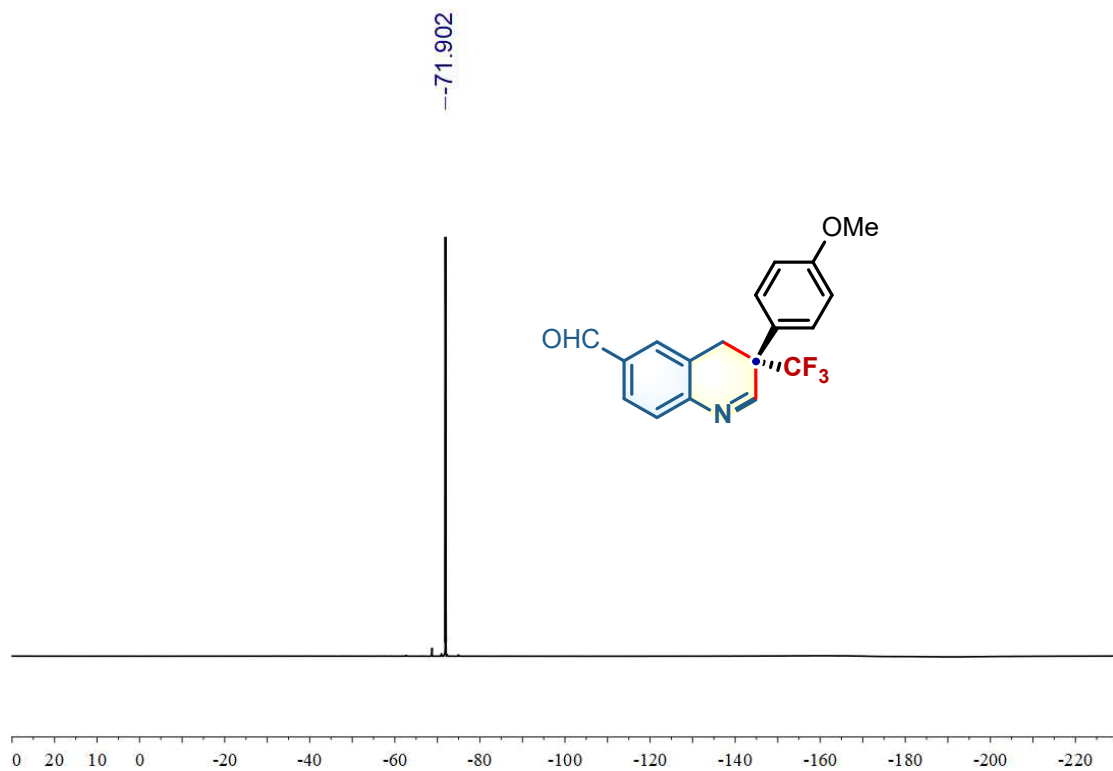
Supplementary Fig. 141. ^{13}F NMR (470 MHz, CDCl_3) spectrum of 47



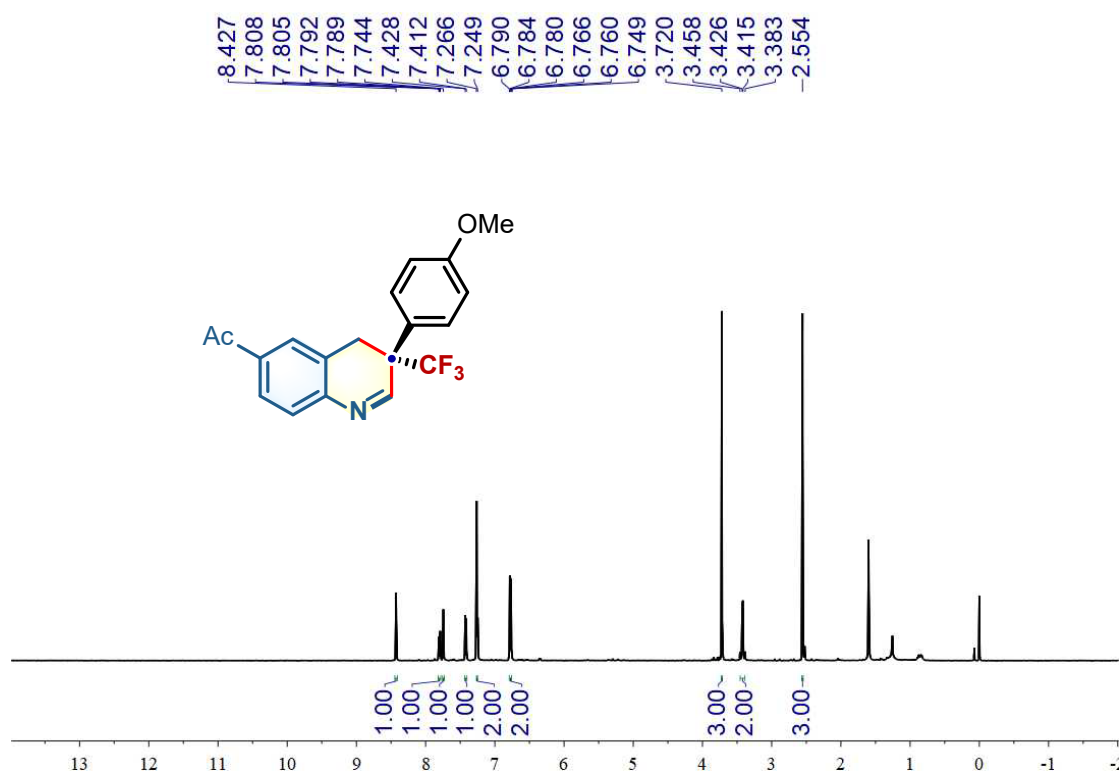
Supplementary Fig. 142. ^1H NMR (500 MHz, CDCl_3) spectrum of 48



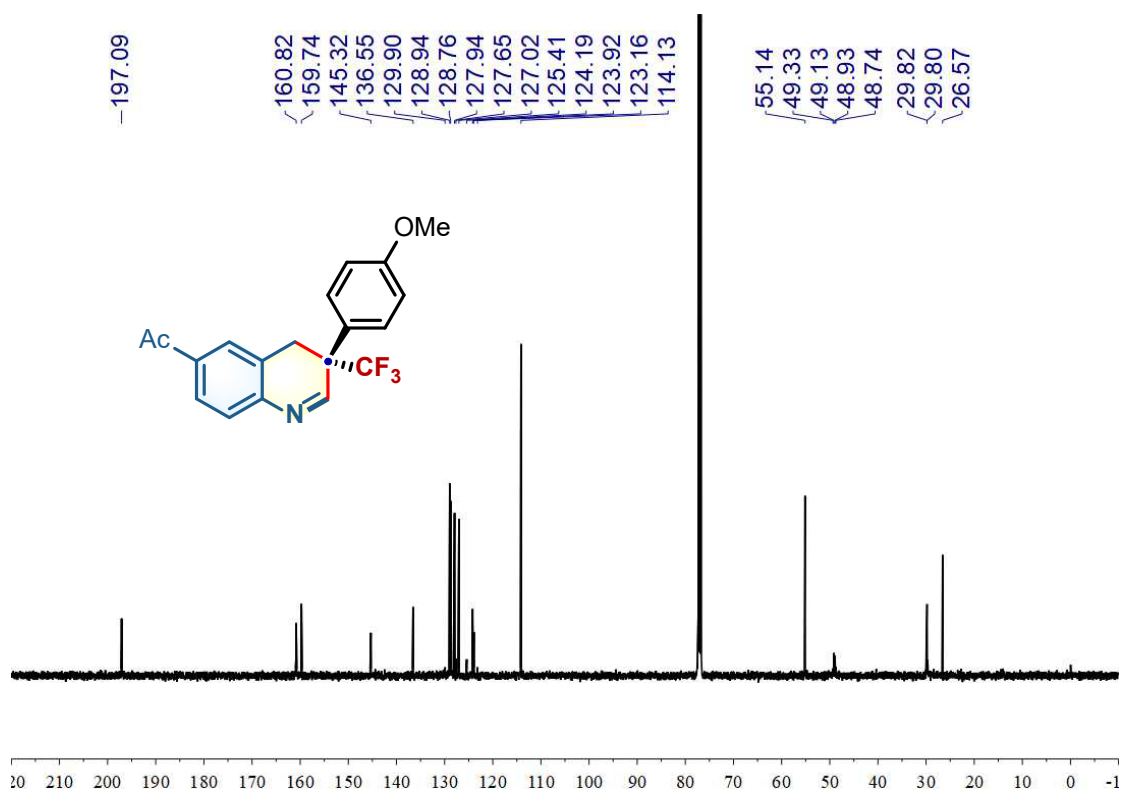
Supplementary Fig. 143. ¹³C NMR (150 MHz, CDCl₃) spectrum of **48**



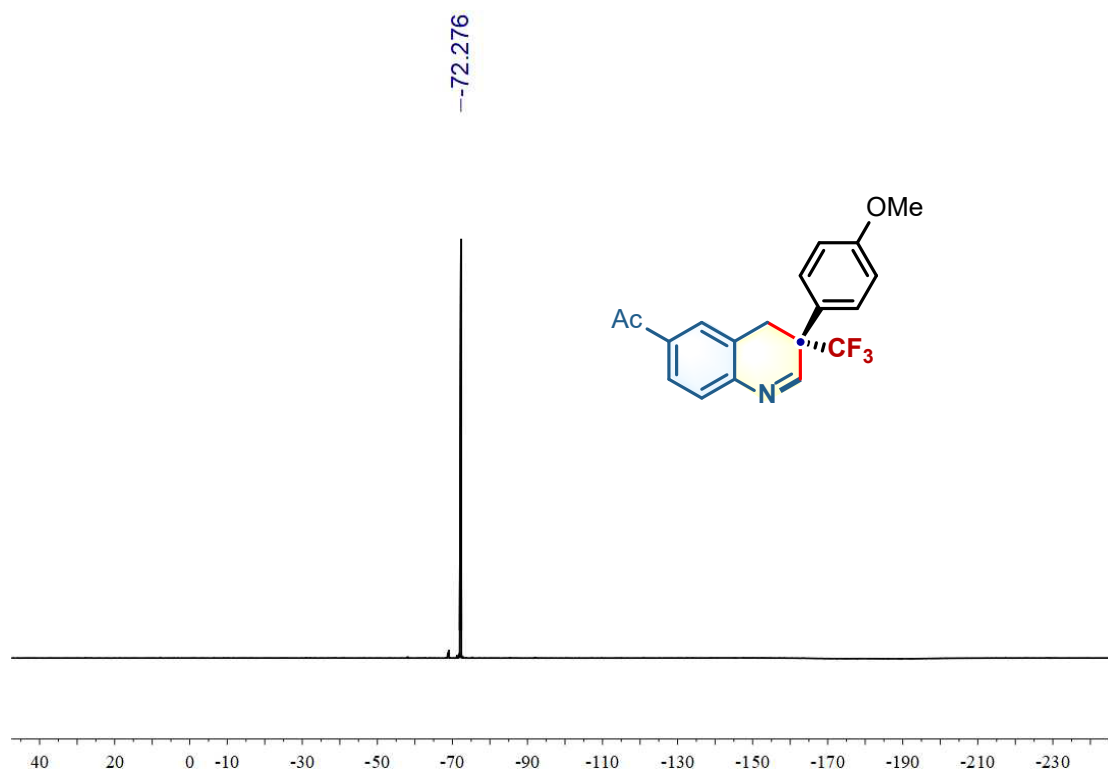
Supplementary Fig. 144. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **48**



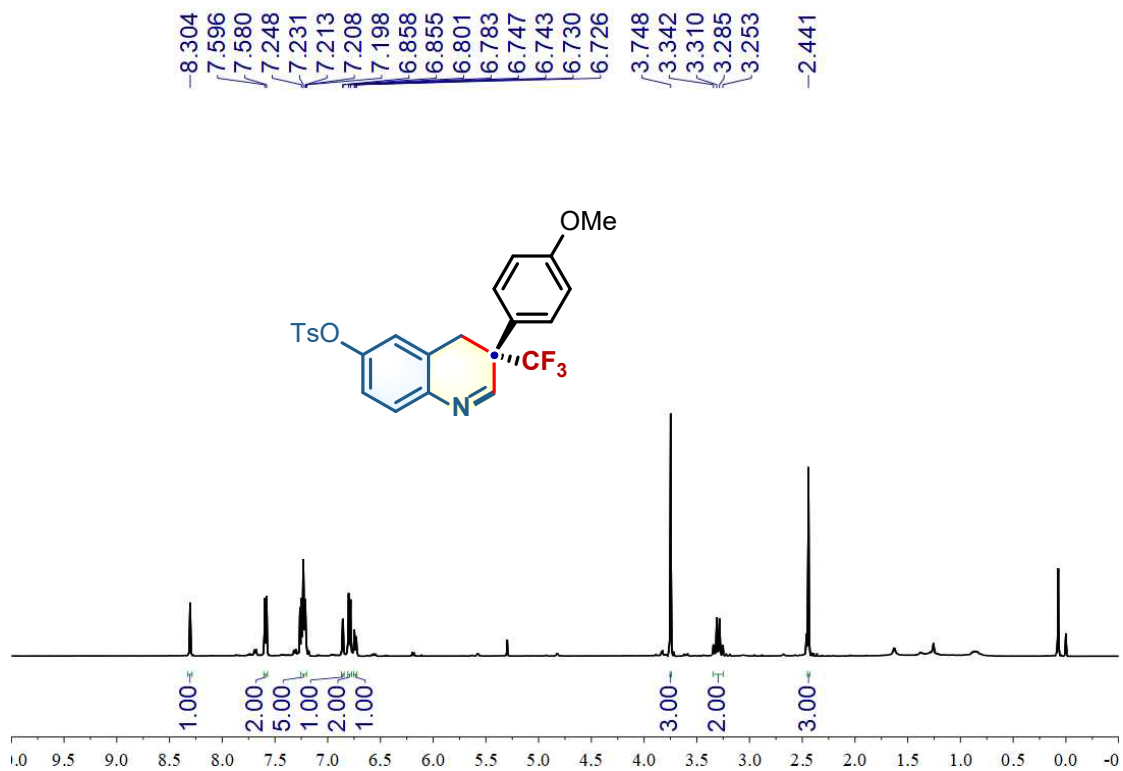
Supplementary Fig. 145. ¹H NMR (500 MHz, CDCl₃) spectrum of **49**



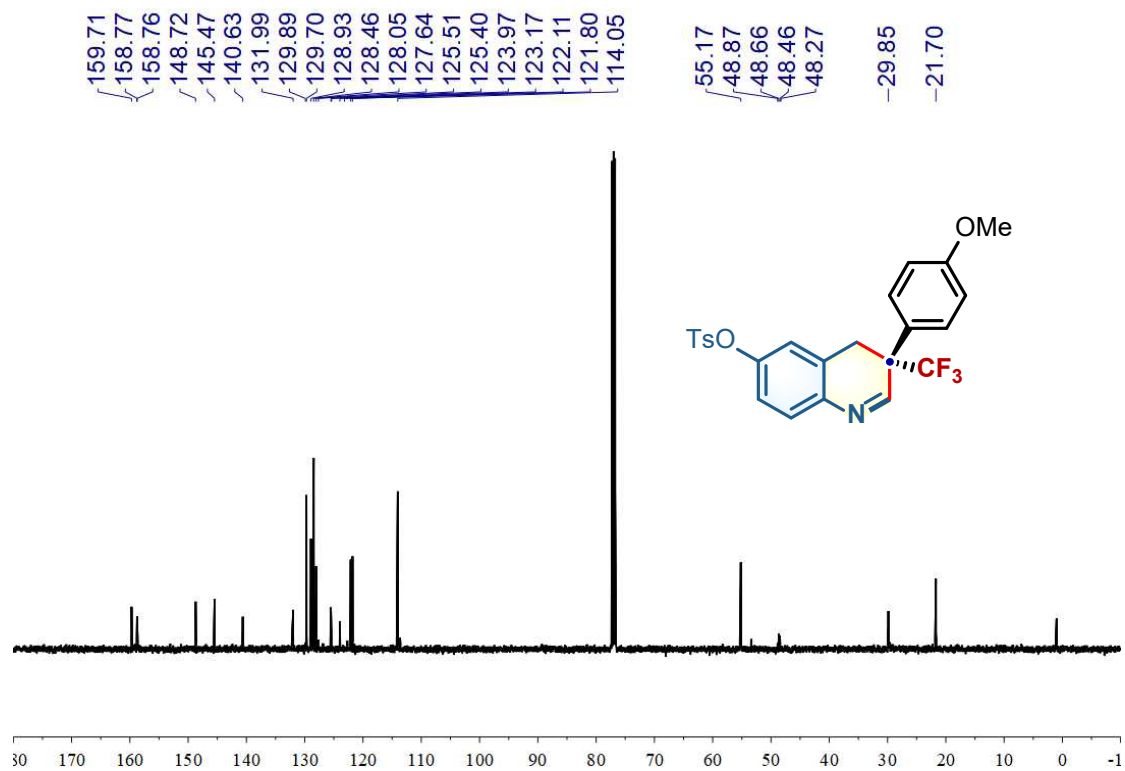
Supplementary Fig. 146. ¹³C NMR (125 MHz, CDCl₃) spectrum of **49**



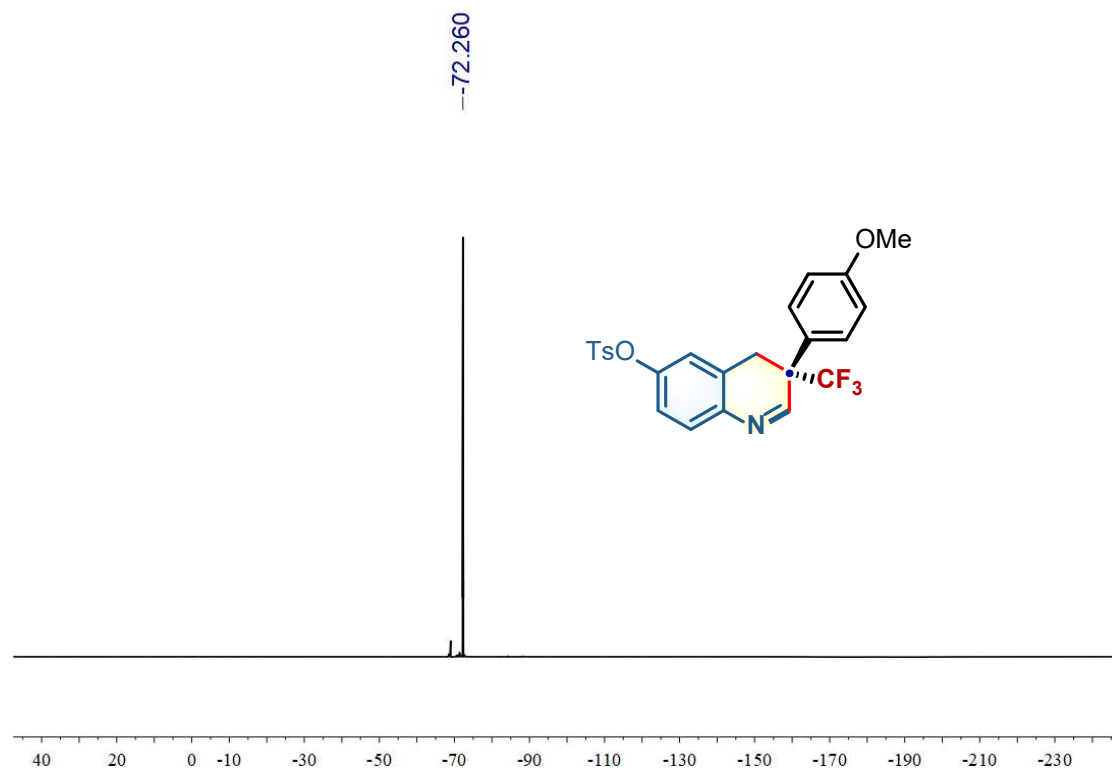
Supplementary Fig. 147. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **49**



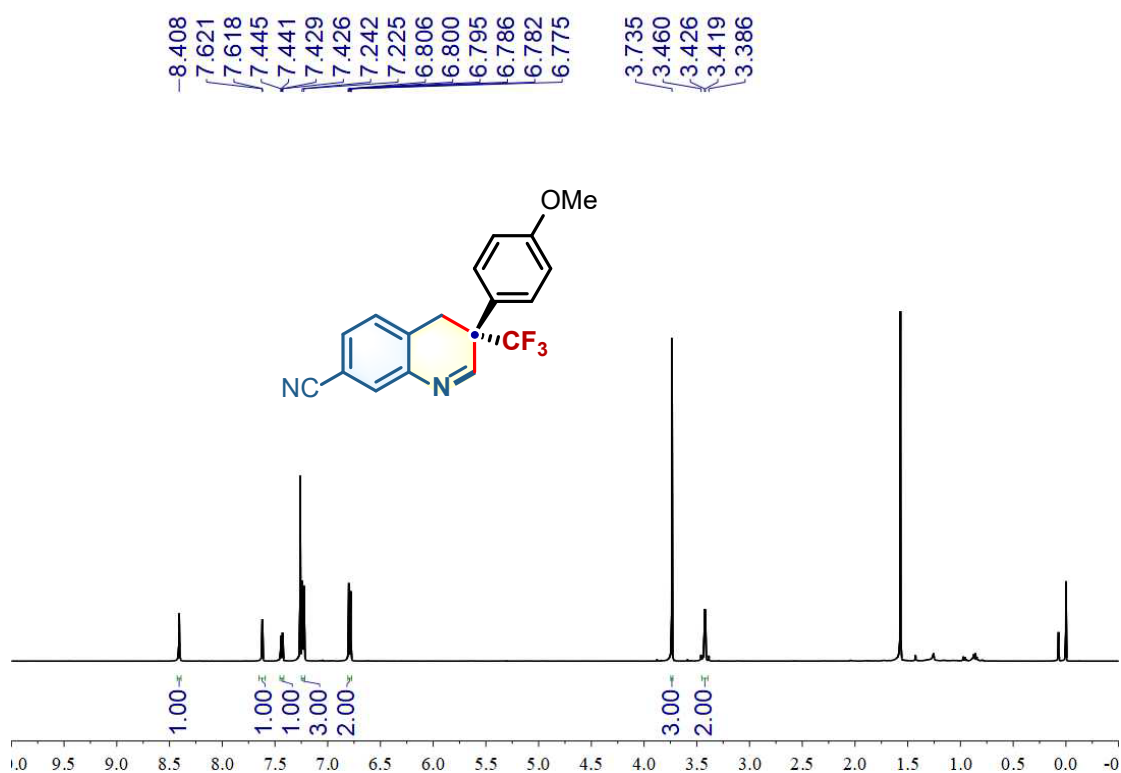
Supplementary Fig. 148. ^1H NMR (500 MHz, CDCl_3) spectrum of **50**



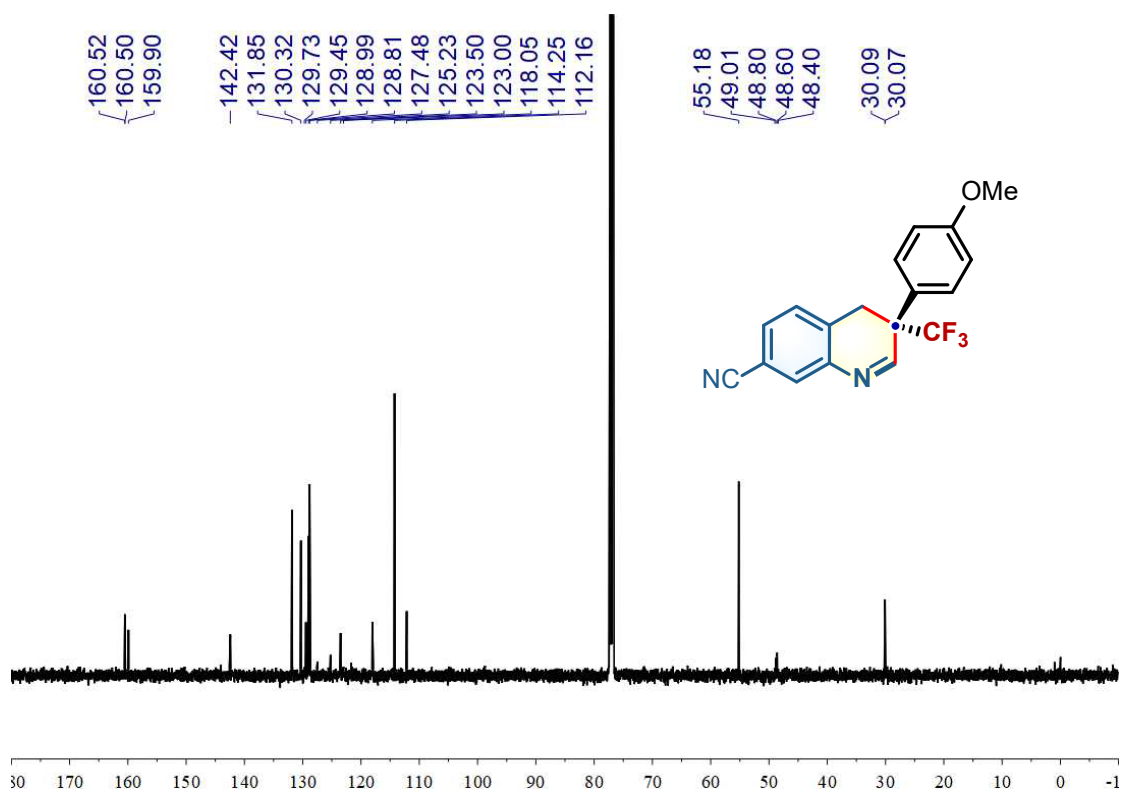
Supplementary Fig. 149. ¹³C NMR (125 MHz, CDCl₃) spectrum of **50**



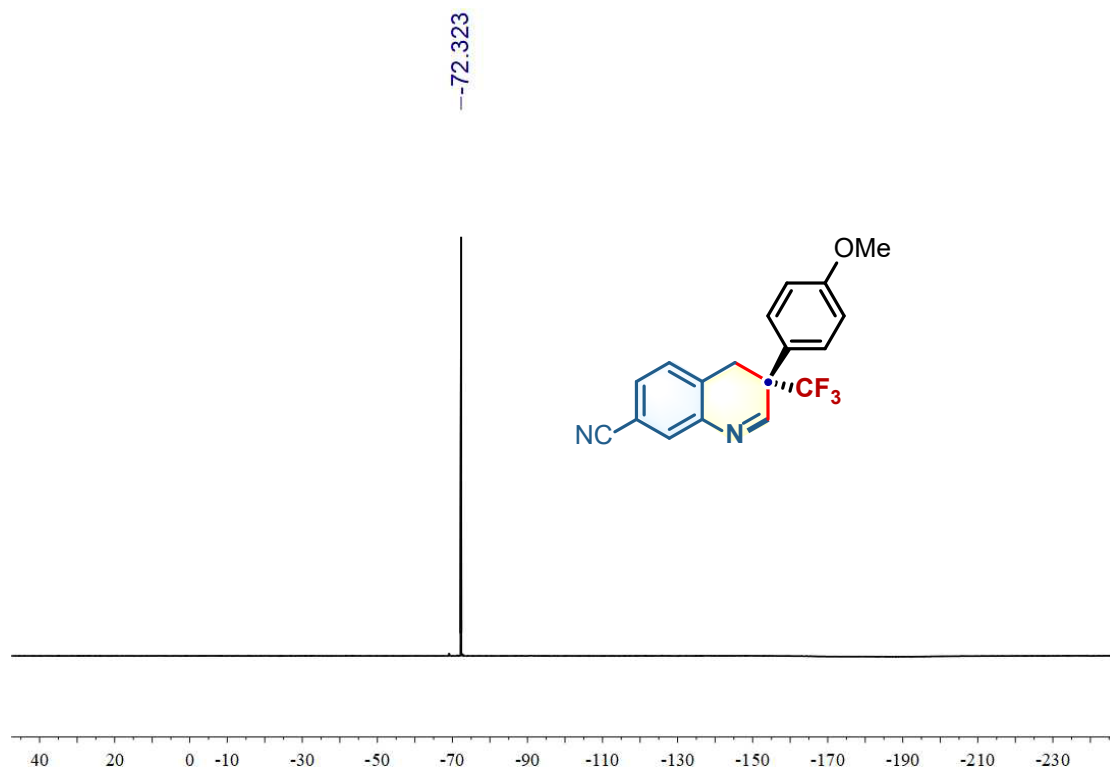
Supplementary Fig. 150. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **50**



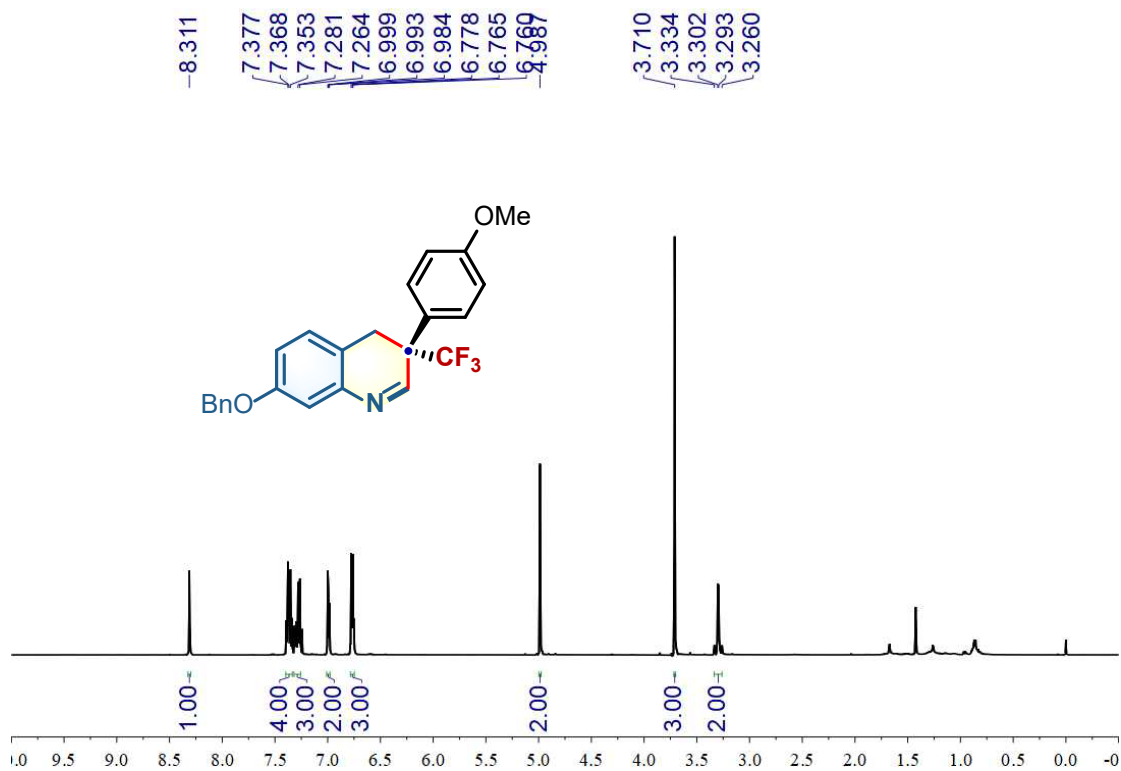
Supplementary Fig. 151. ¹H NMR (500 MHz, CDCl₃) spectrum of **51**



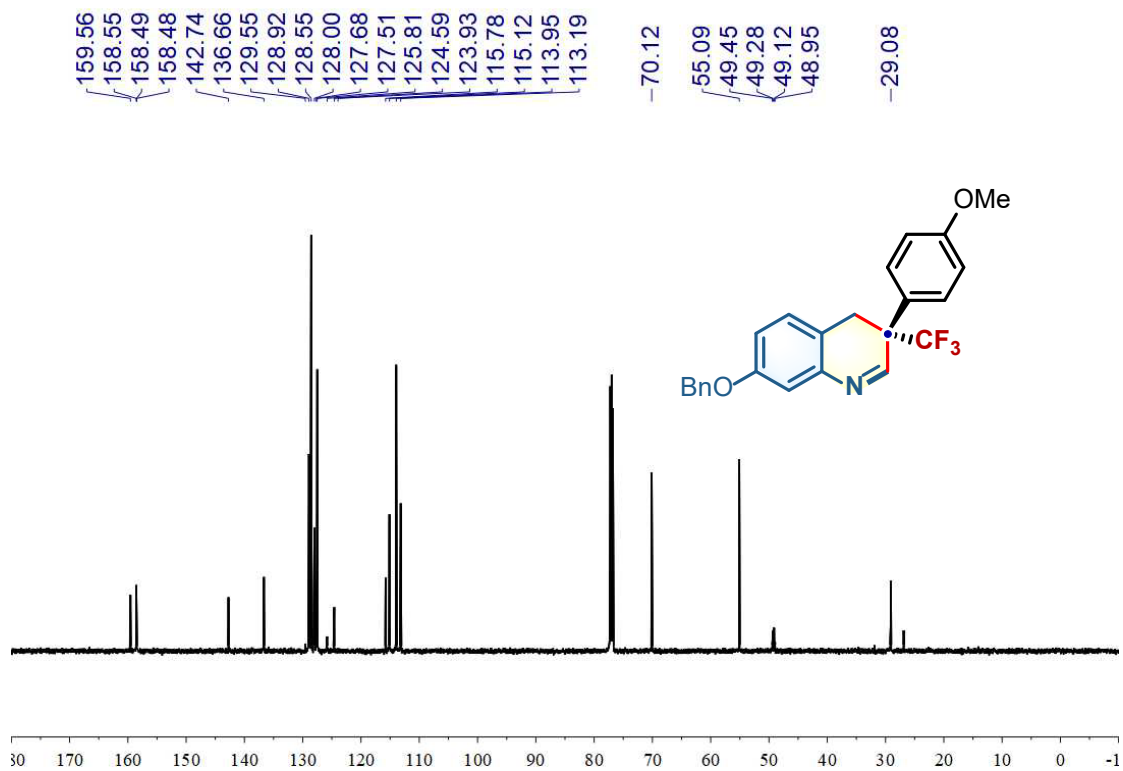
Supplementary Fig. 152. ¹³C NMR (125 MHz, CDCl₃) spectrum of **51**



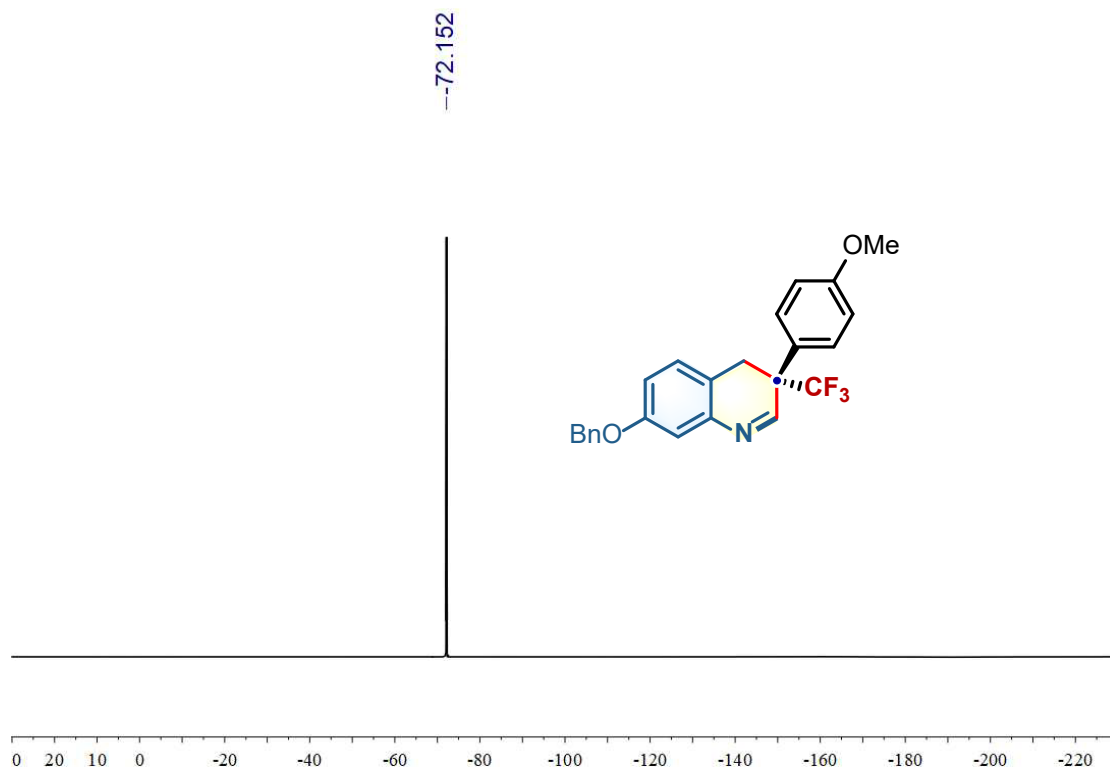
Supplementary Fig. 153. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **51**



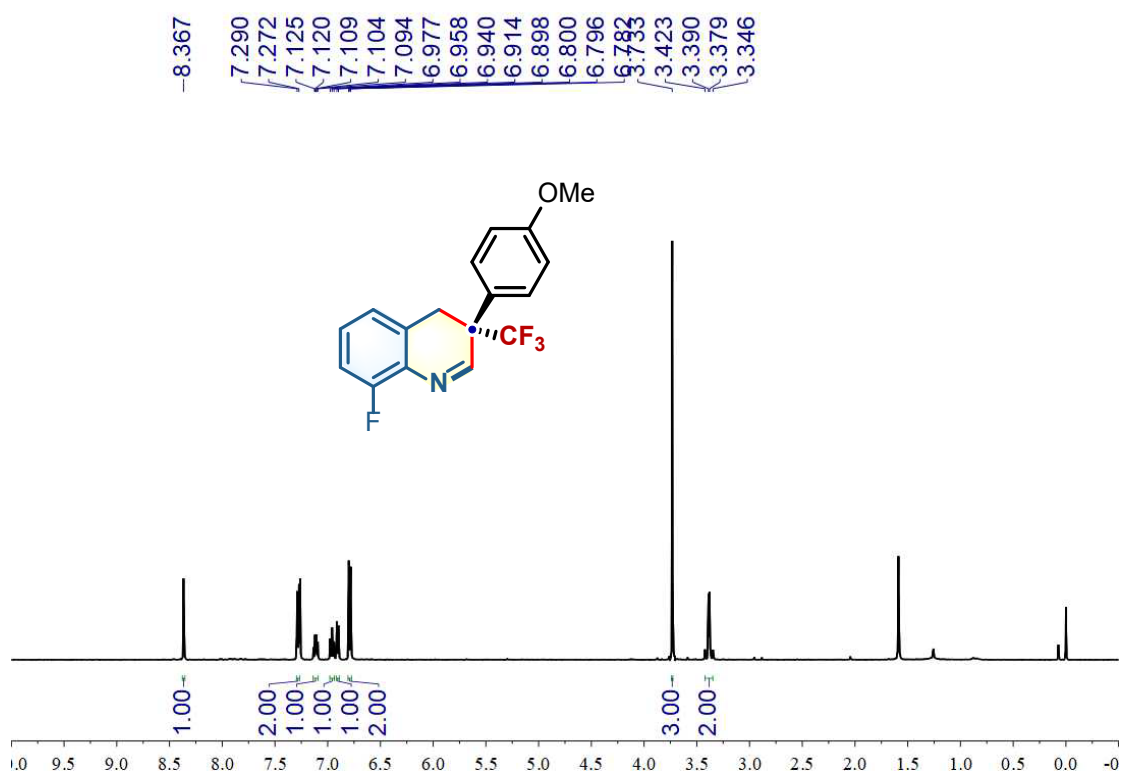
Supplementary Fig. 154. ^1H NMR (500 MHz, CDCl_3) spectrum of **52**



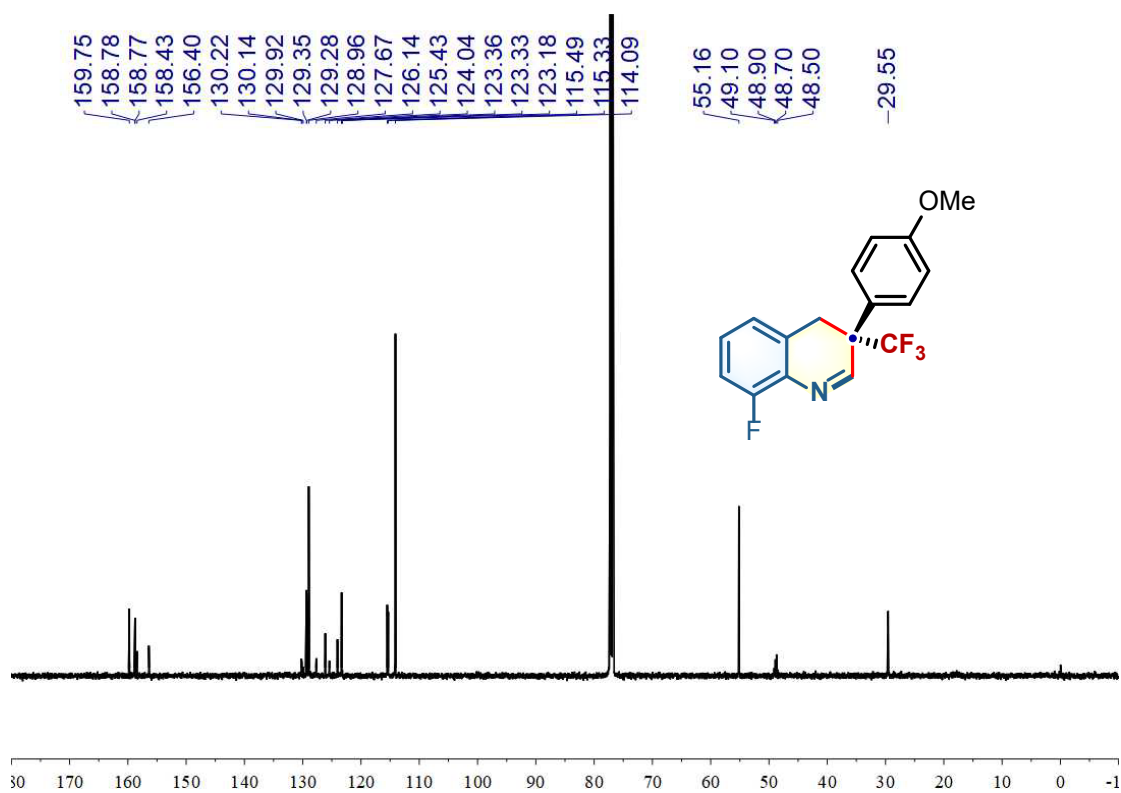
Supplementary Fig. 155. ¹³C NMR (150 MHz, CDCl₃) spectrum of **52**



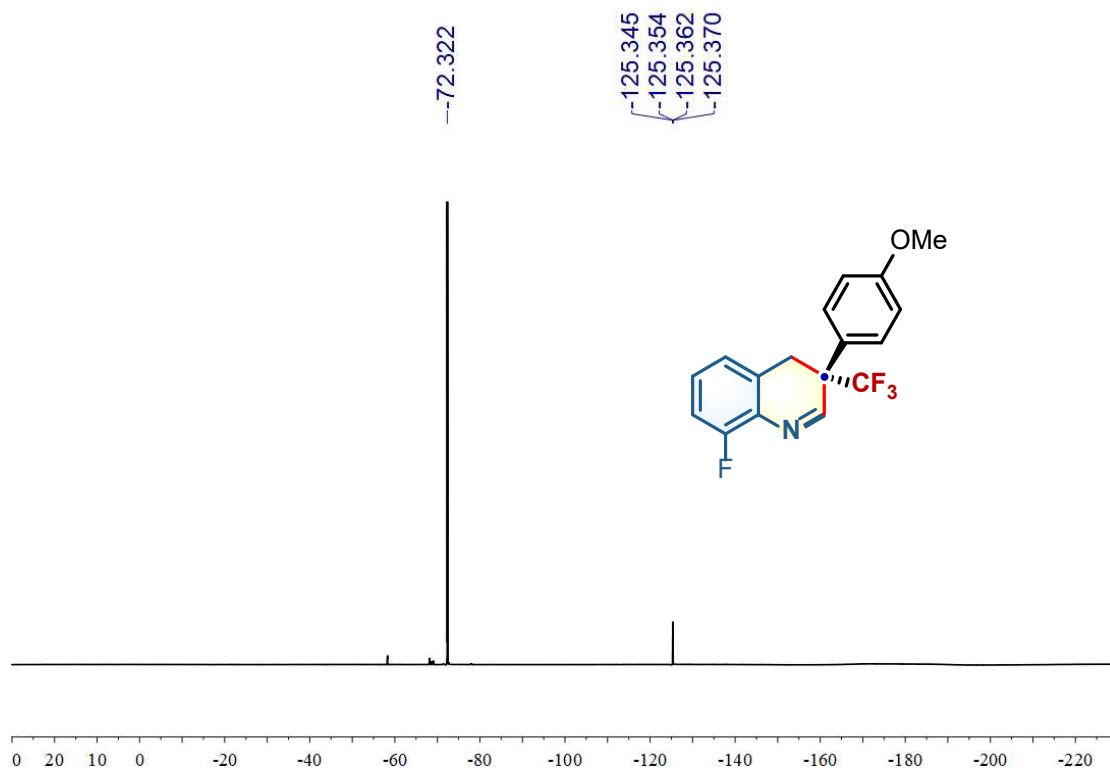
Supplementary Fig. 156. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **52**



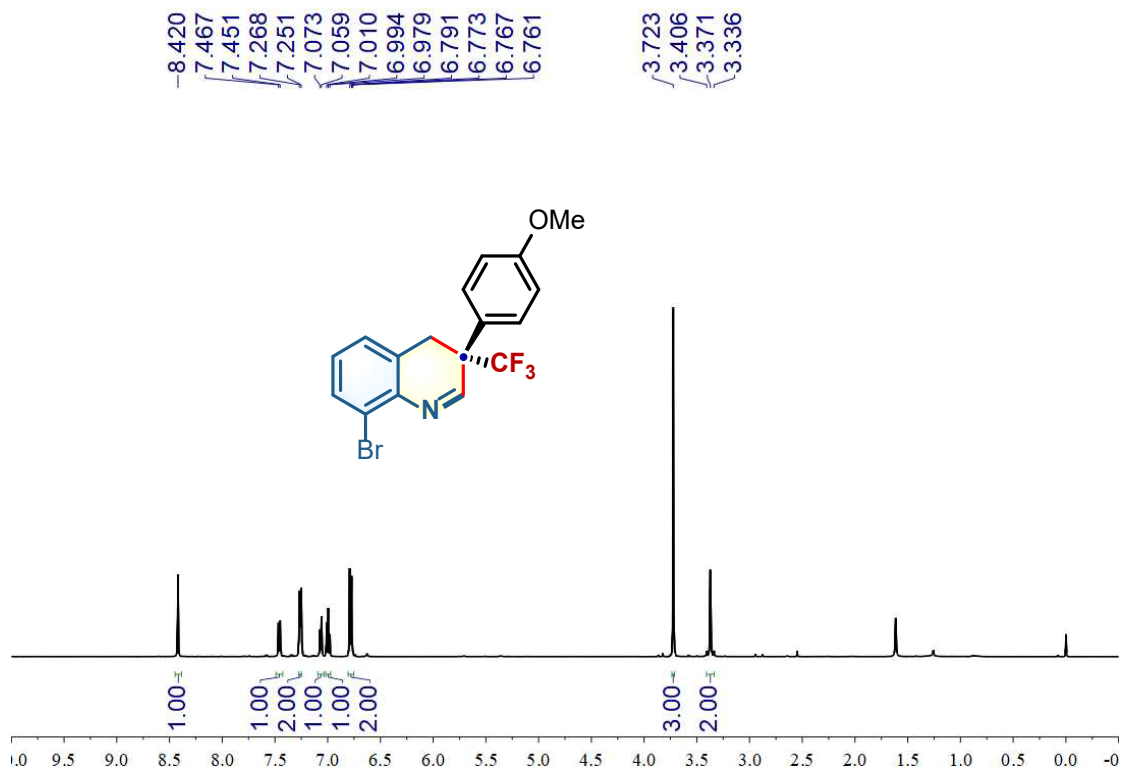
Supplementary Fig. 157. ¹H NMR (500 MHz, CDCl₃) spectrum of **53**



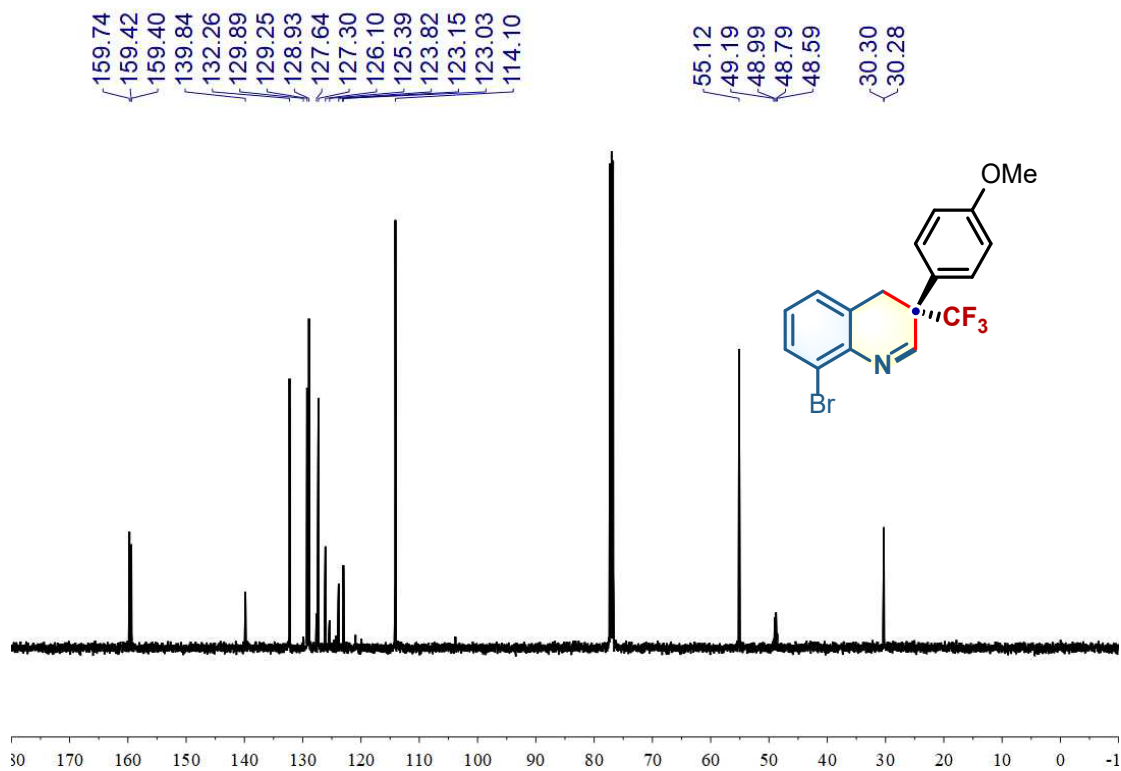
Supplementary Fig. 158. ¹³C NMR (125 MHz, CDCl₃) spectrum of **53**



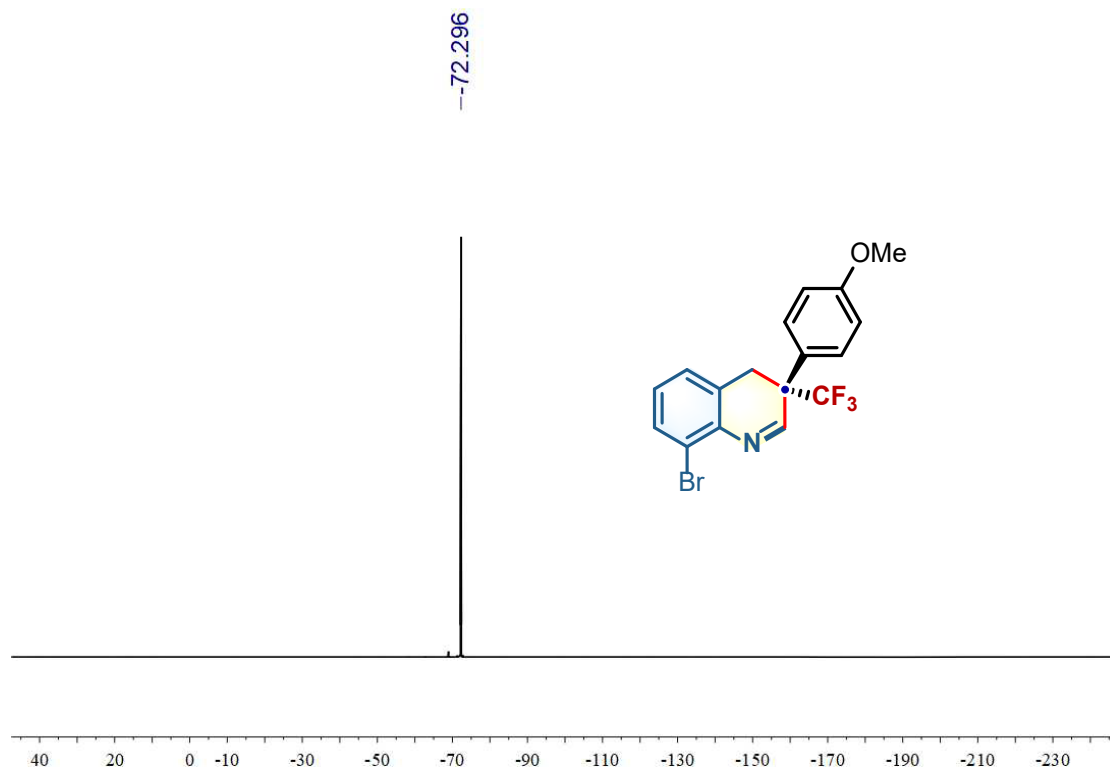
Supplementary Fig. 159. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **53**



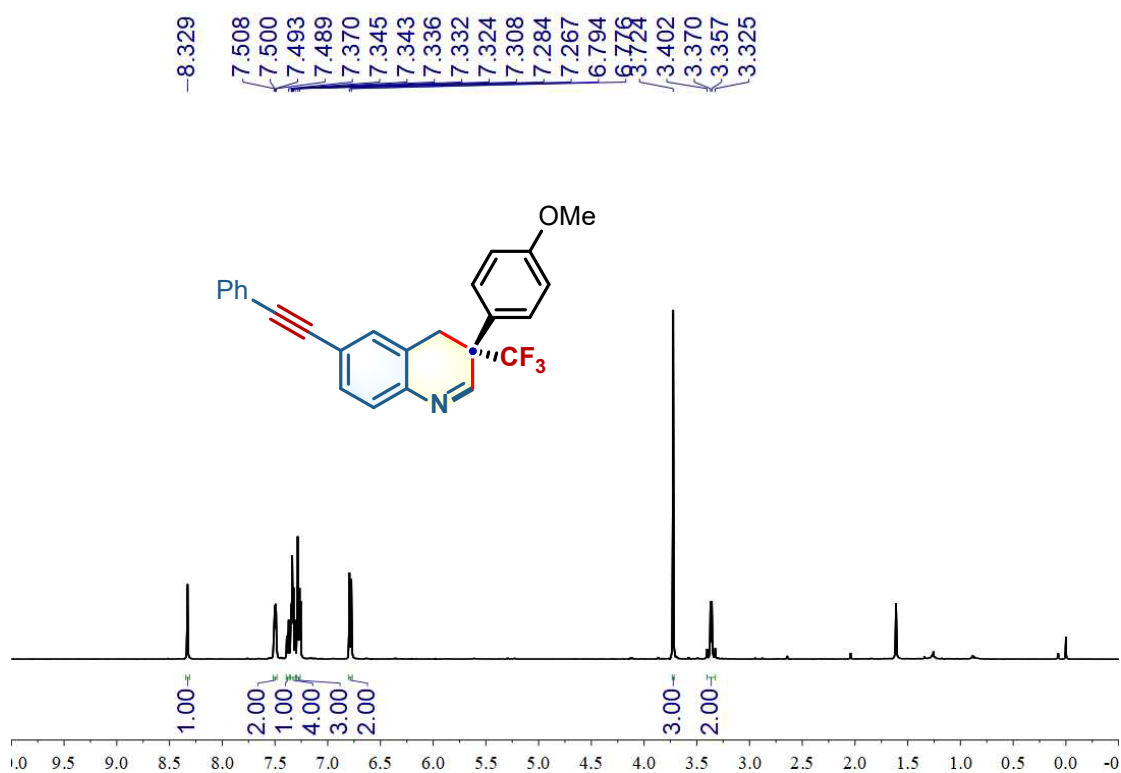
Supplementary Fig. 160. ^1H NMR (500 MHz, CDCl_3) spectrum of **54**



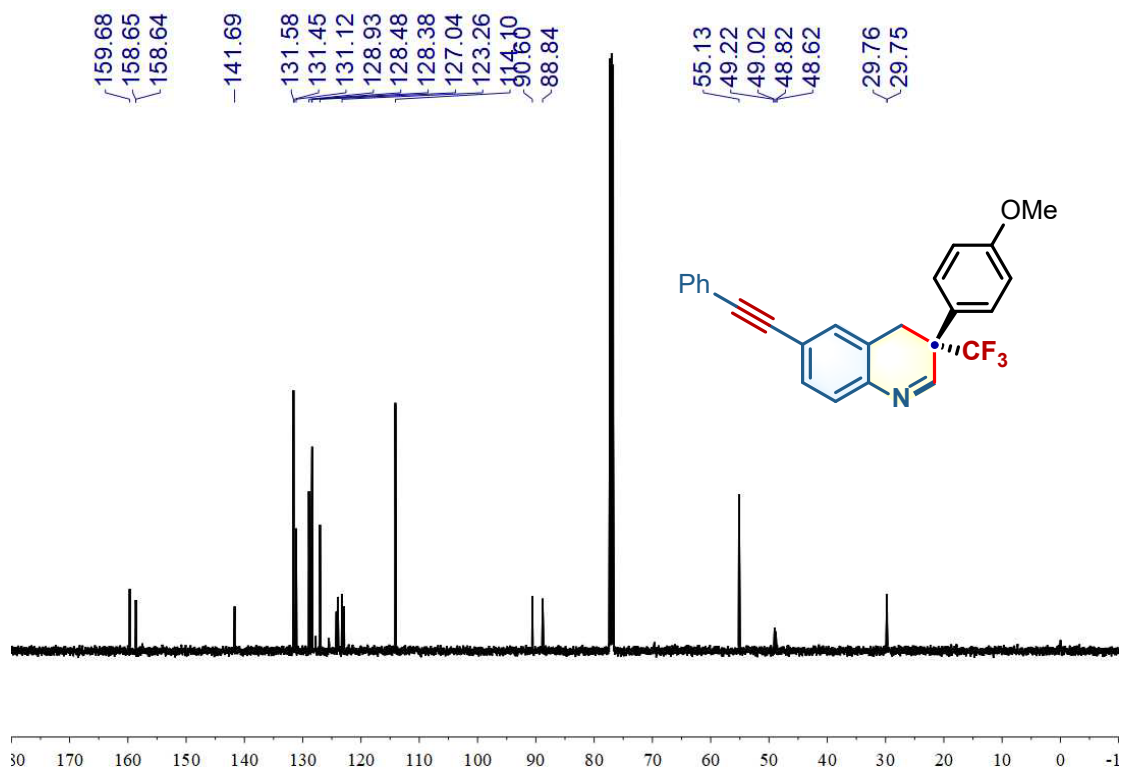
Supplementary Fig. 161. ¹³C NMR (125 MHz, CDCl₃) spectrum of **54**



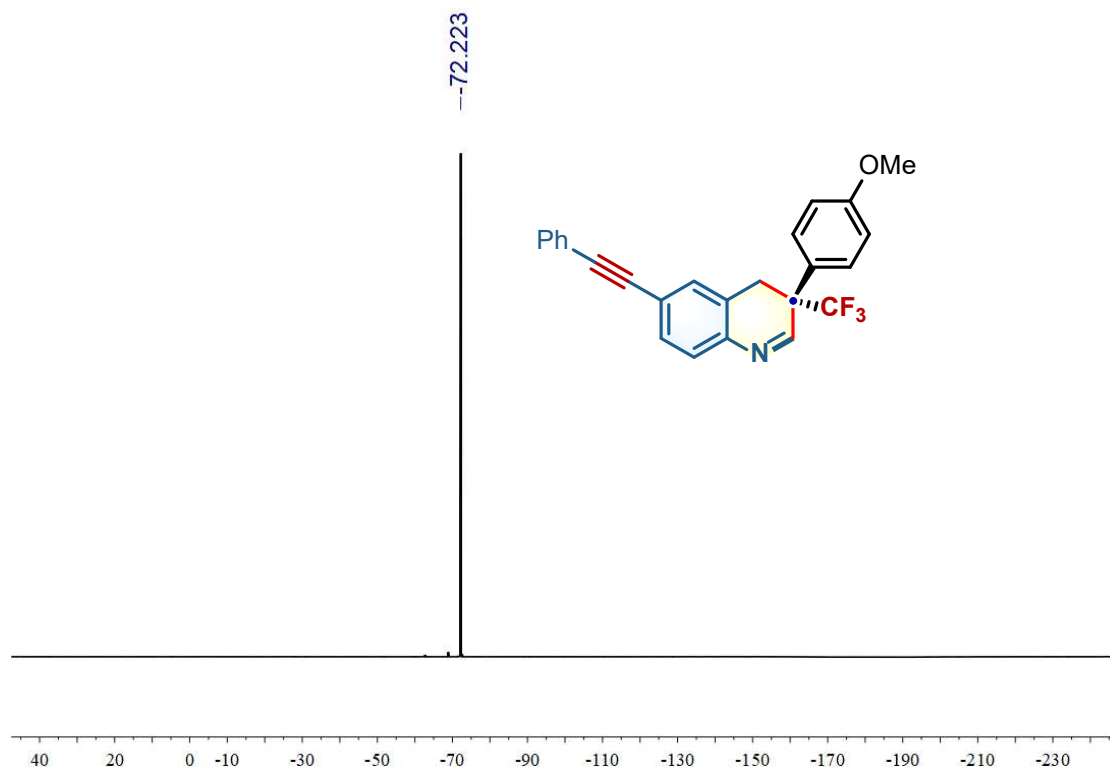
Supplementary Fig. 162. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **54**



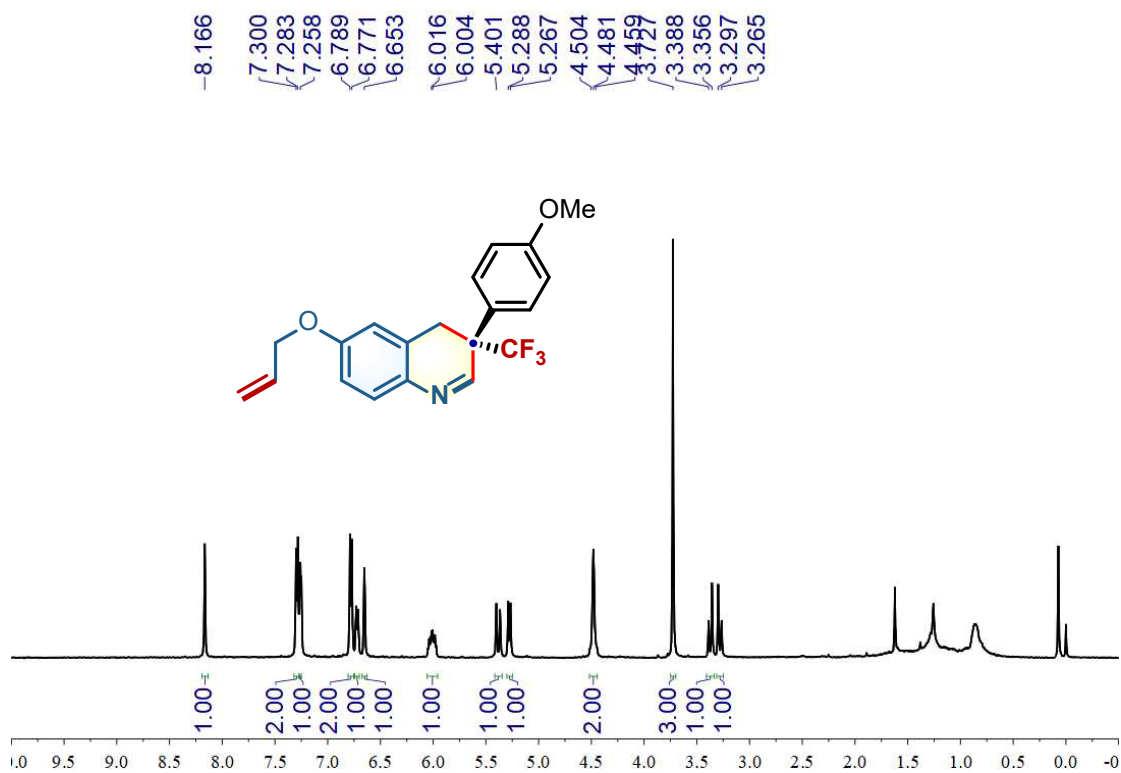
Supplementary Fig. 163. ¹H NMR (500 MHz, CDCl₃) spectrum of **55**



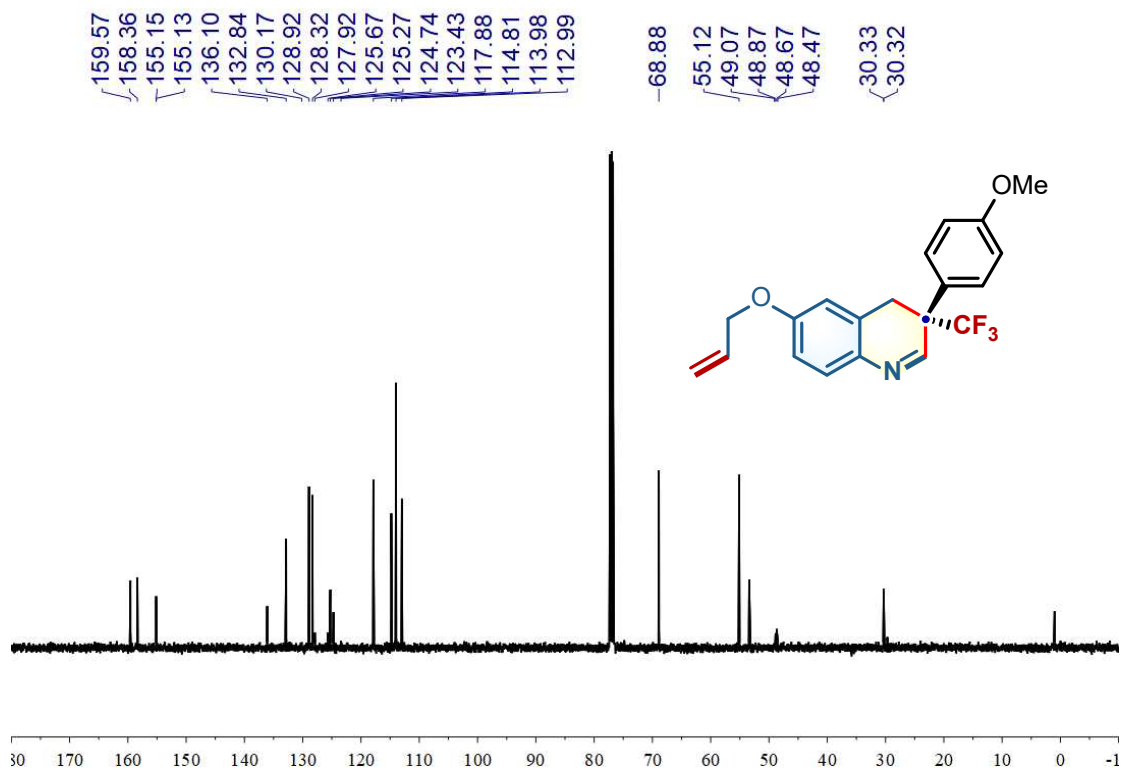
Supplementary Fig. 164. ¹³C NMR (125 MHz, CDCl₃) spectrum of **55**



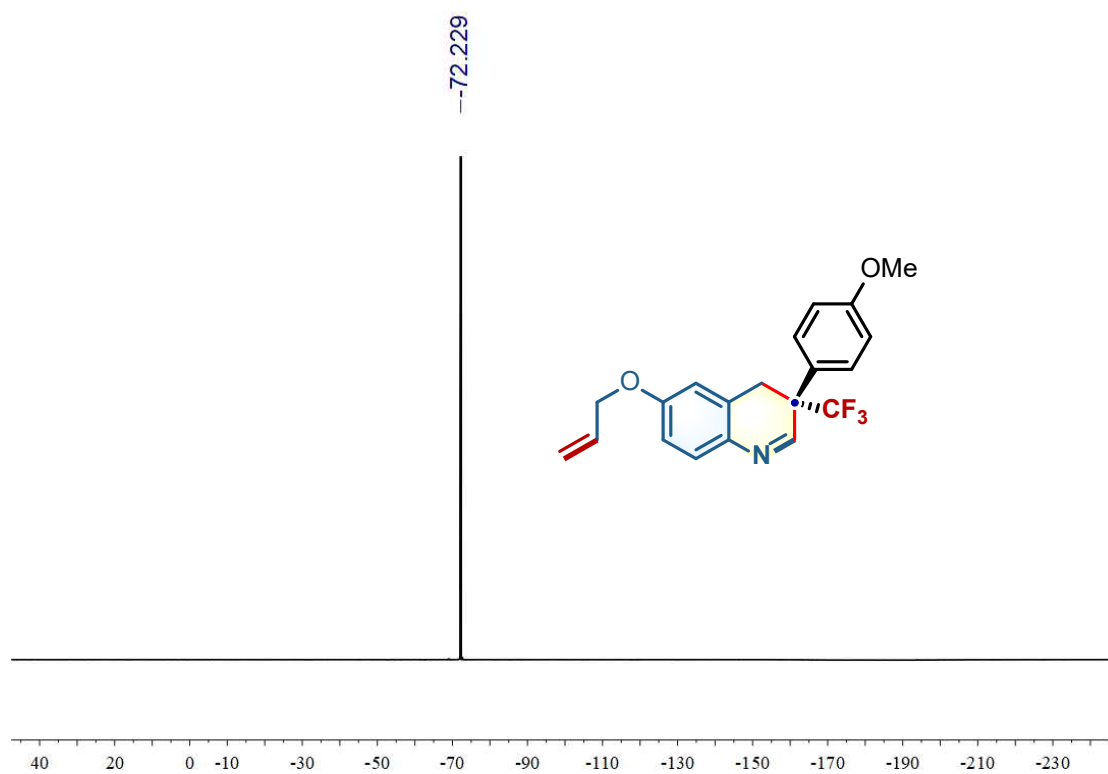
Supplementary Fig. 165. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **55**



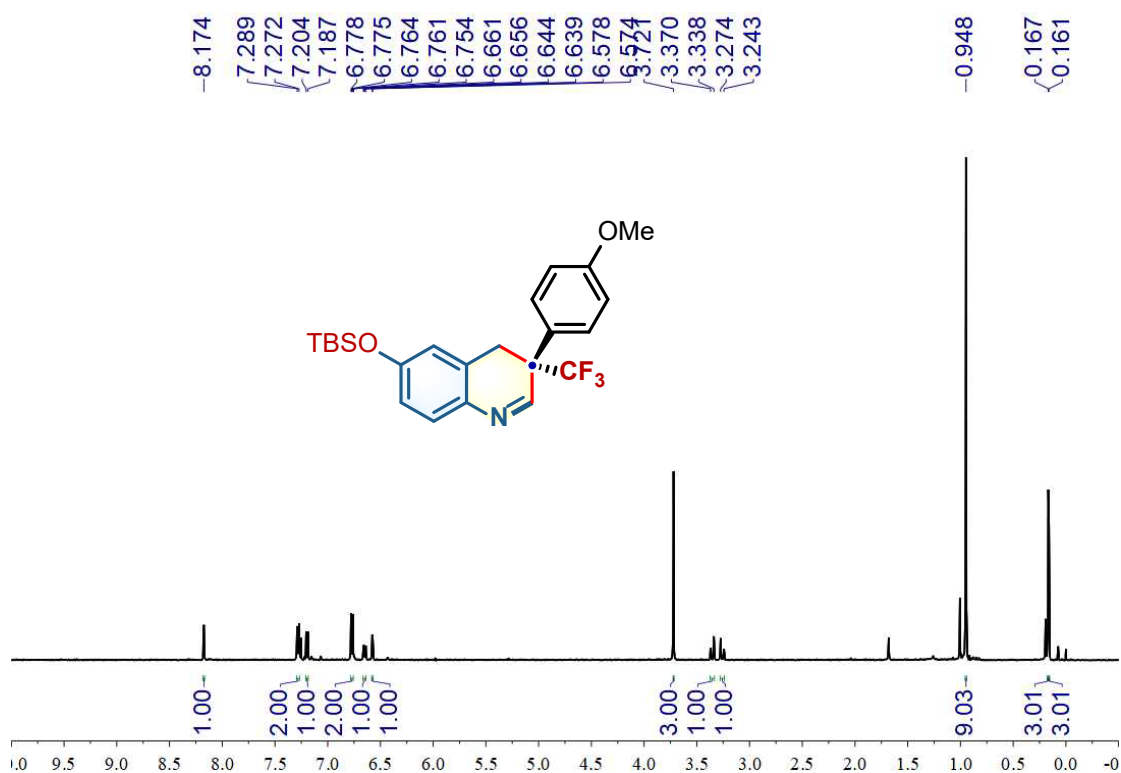
Supplementary Fig. 166. ^1H NMR (500 MHz, CDCl_3) spectrum of **56**



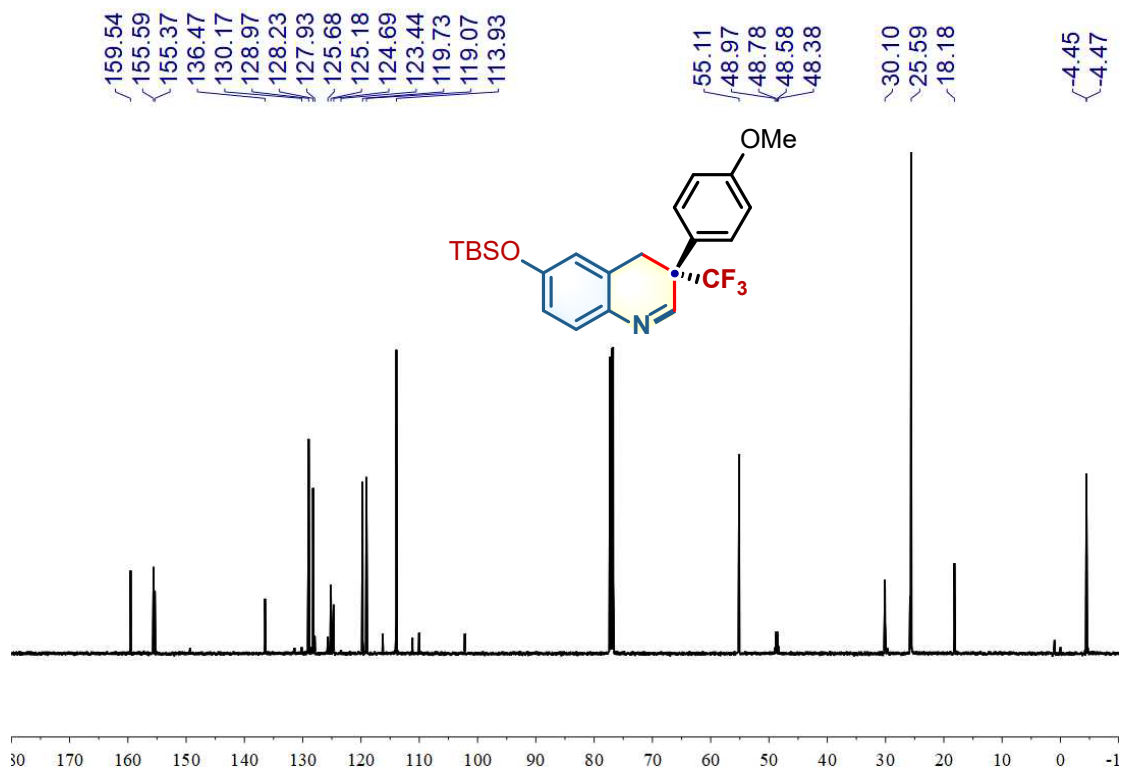
Supplementary Fig. 167. ¹³C NMR (125 MHz, CDCl₃) spectrum of **56**



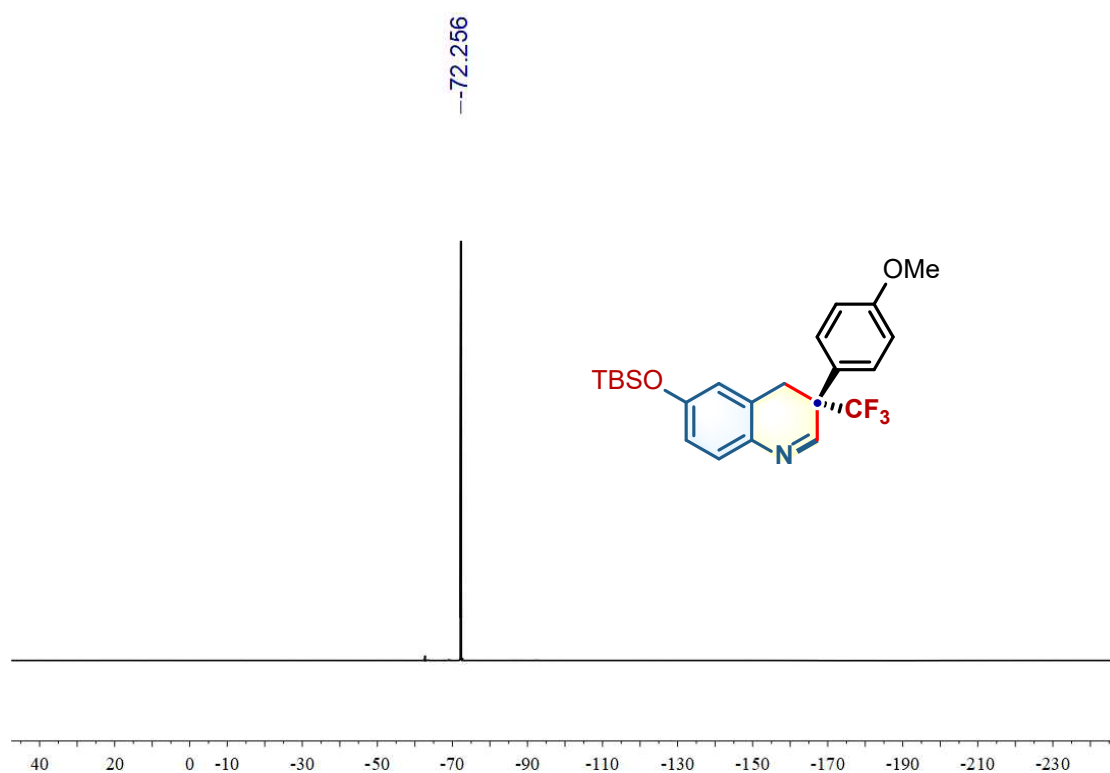
Supplementary Fig. 168. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **56**



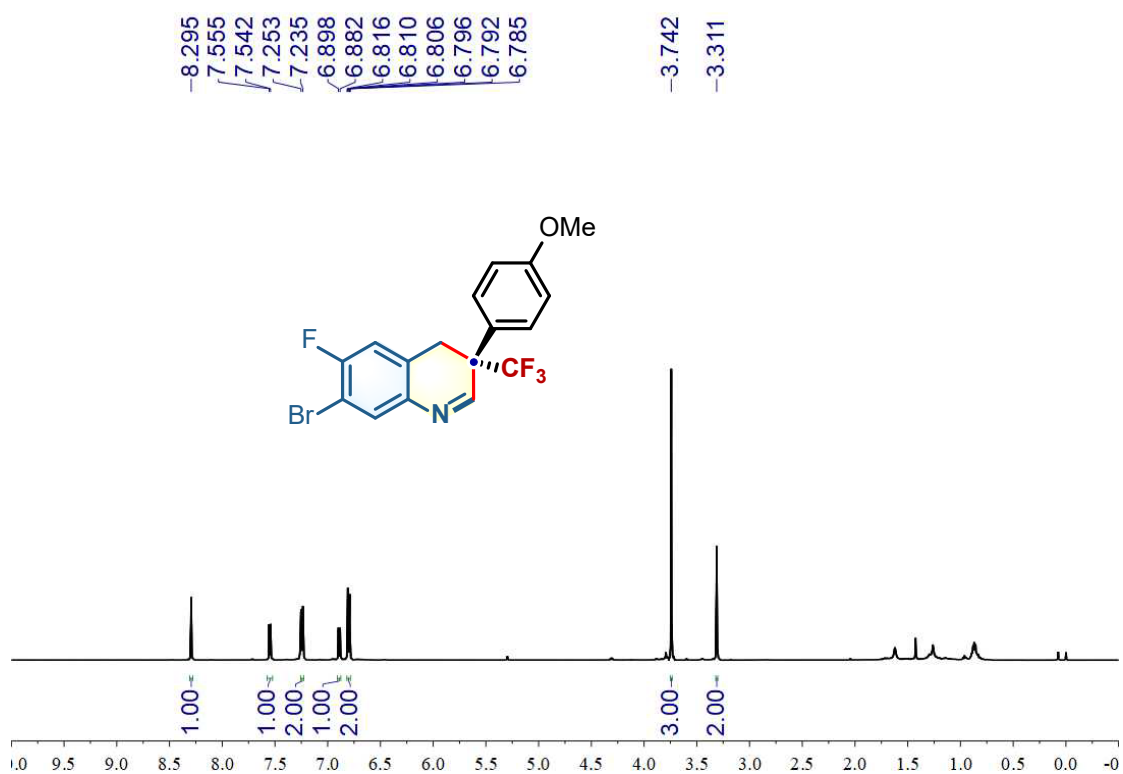
Supplementary Fig. 169. ¹H NMR (500 MHz, CDCl₃) spectrum of **57**



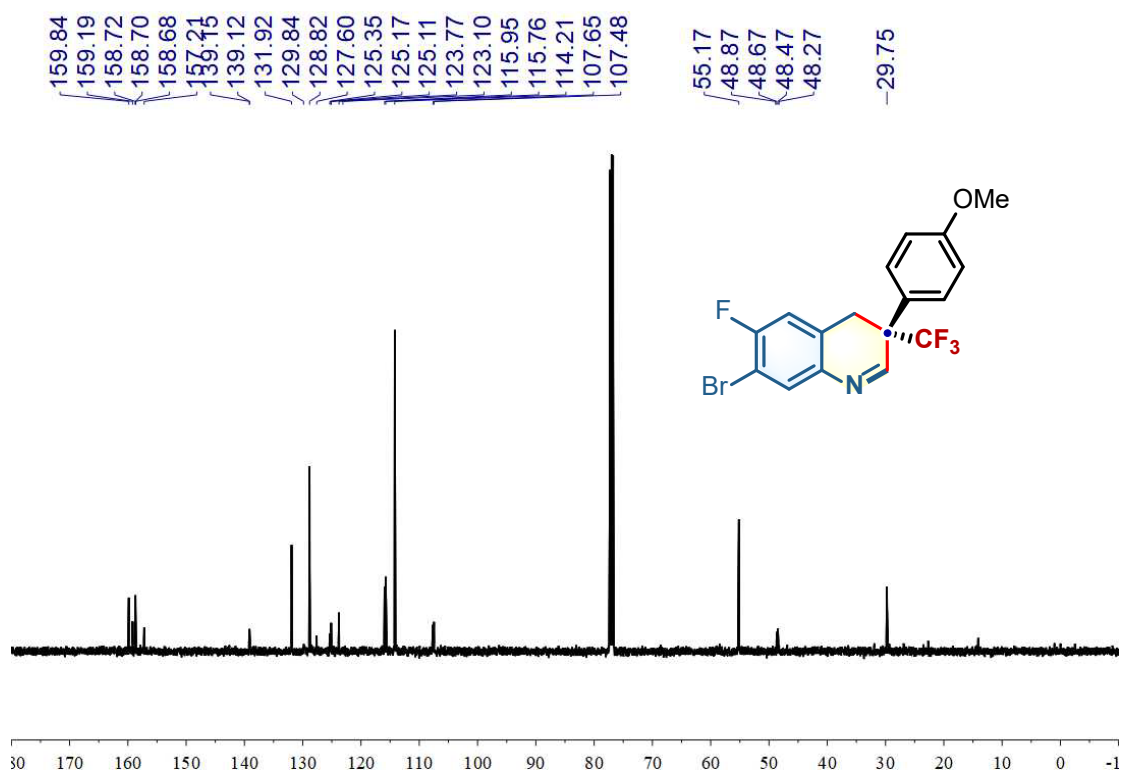
Supplementary Fig. 170. ¹³C NMR (125 MHz, CDCl₃) spectrum of **57**



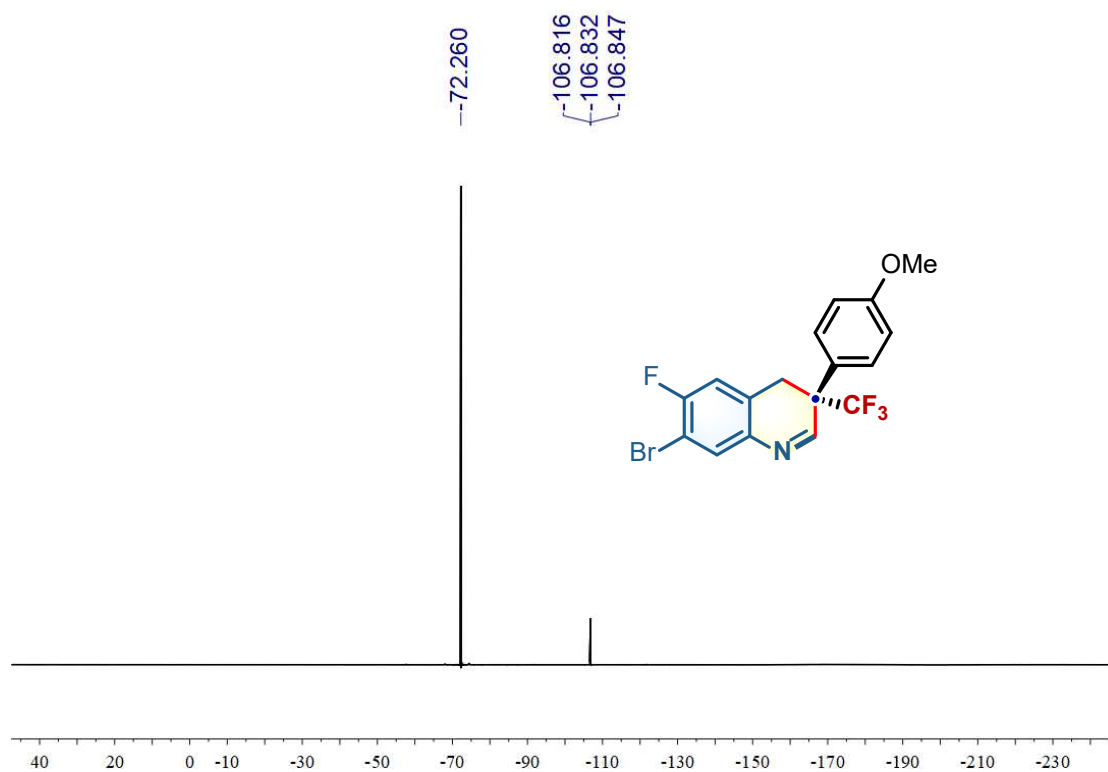
Supplementary Fig. 171. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **57**



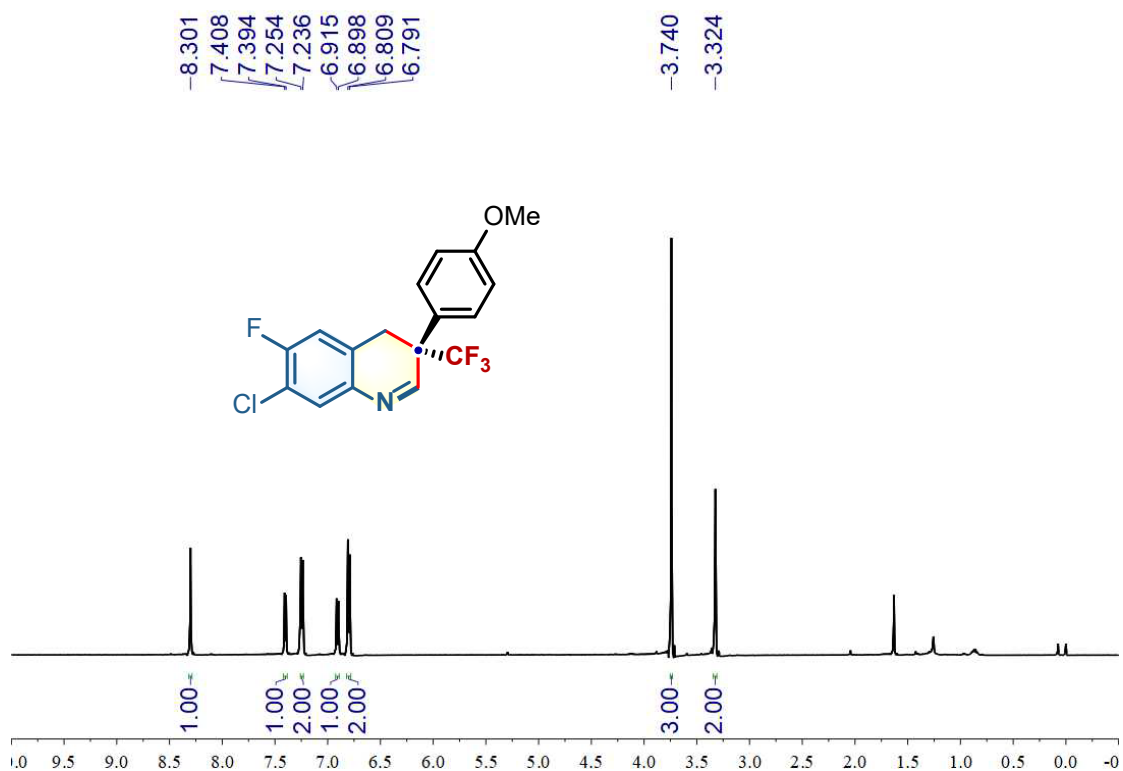
Supplementary Fig. 172. ^1H NMR (500 MHz, CDCl_3) spectrum of **58**



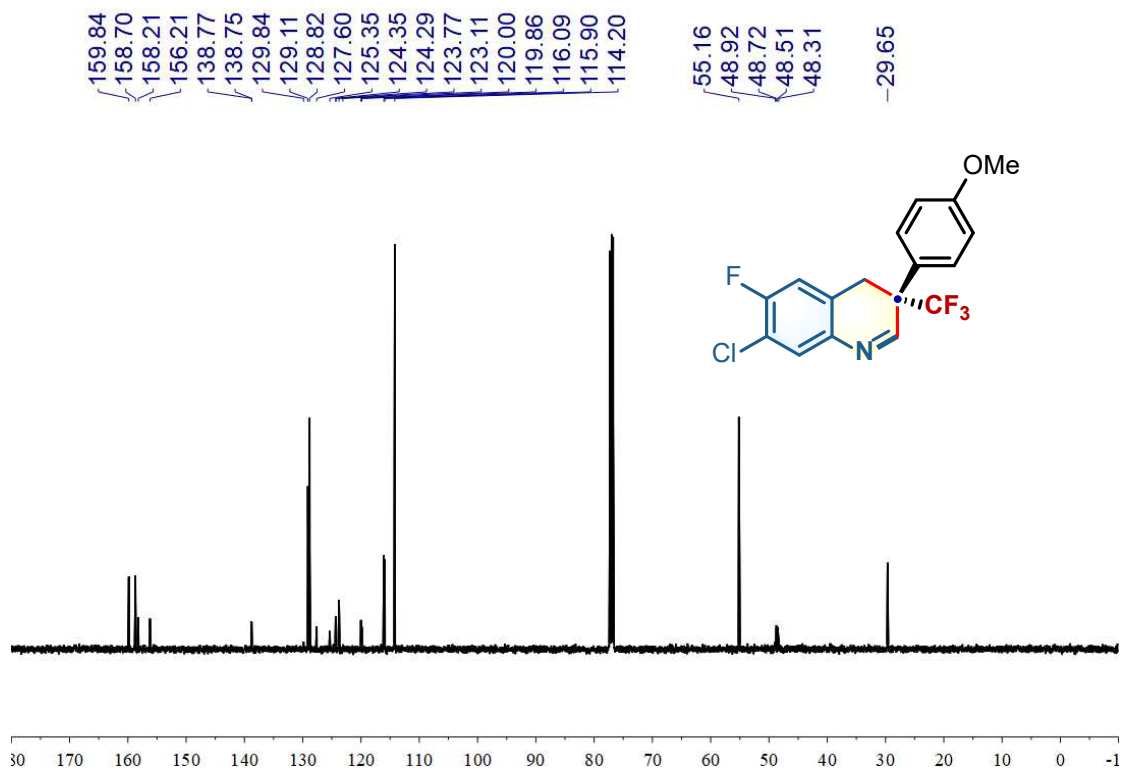
Supplementary Fig. 173. ¹³C NMR (125 MHz, CDCl₃) spectrum of **58**



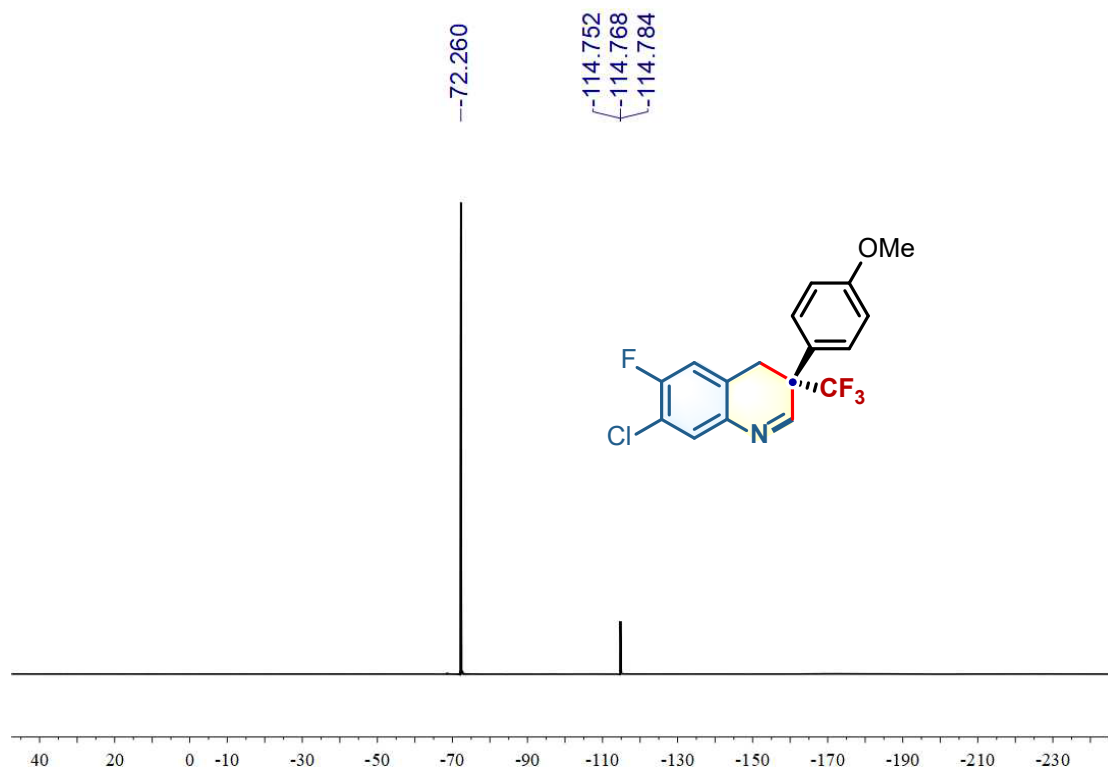
Supplementary Fig. 174. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **58**



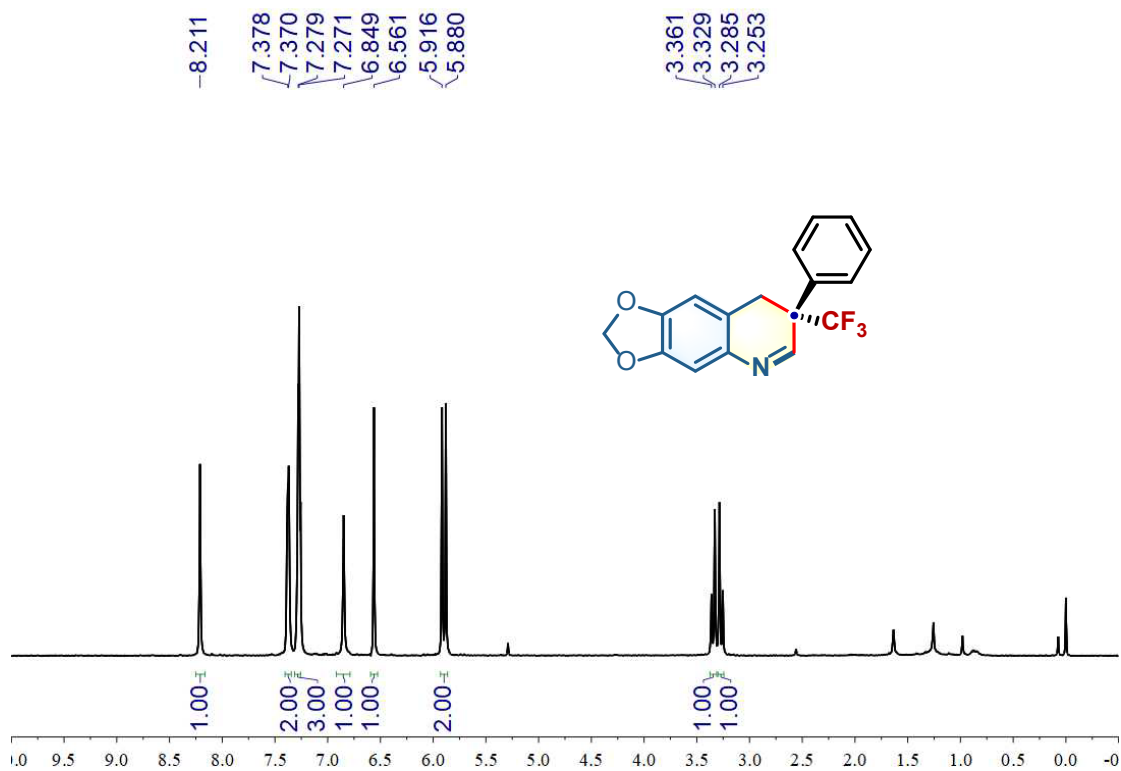
Supplementary Fig. 175. ¹H NMR (500 MHz, CDCl₃) spectrum of **59**



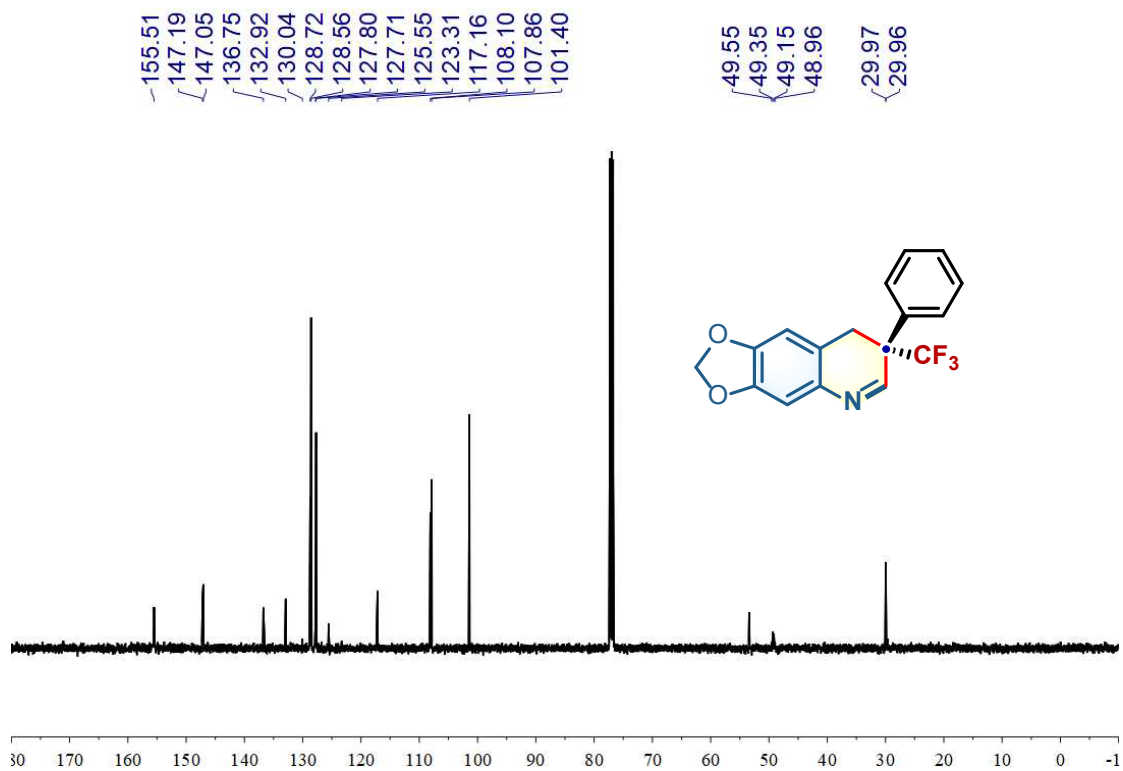
Supplementary Fig. 176. ¹³C NMR (125 MHz, CDCl₃) spectrum of **59**



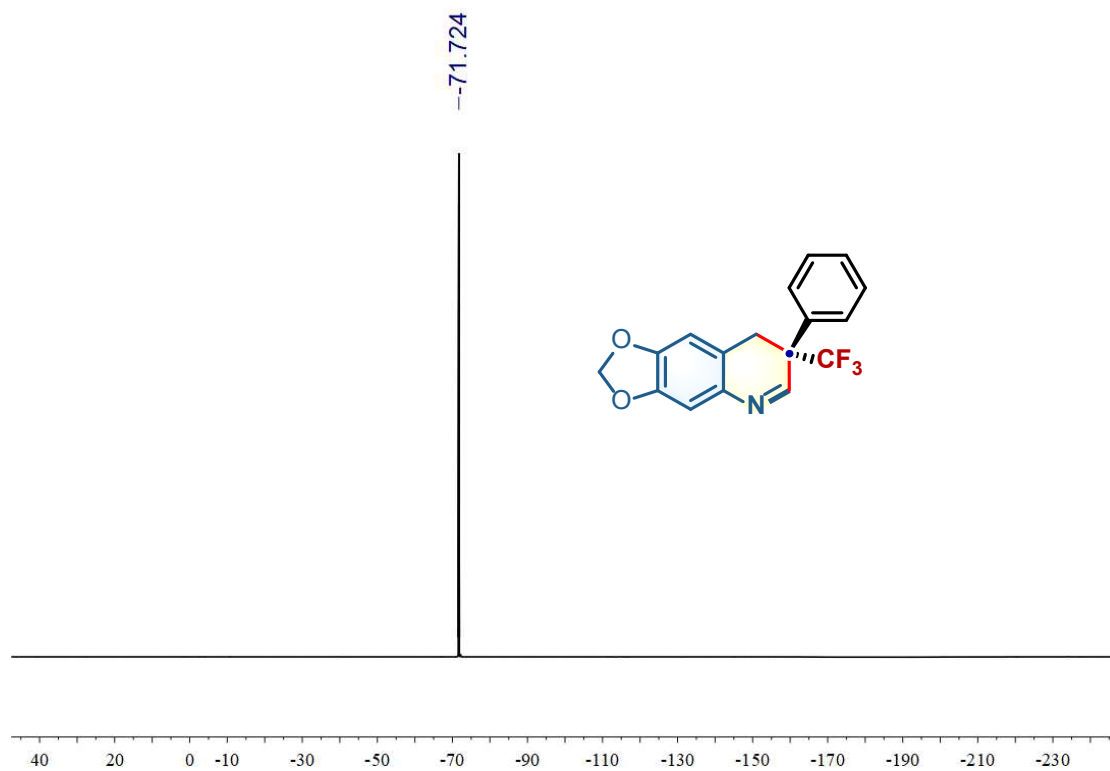
Supplementary Fig. 177. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **59**



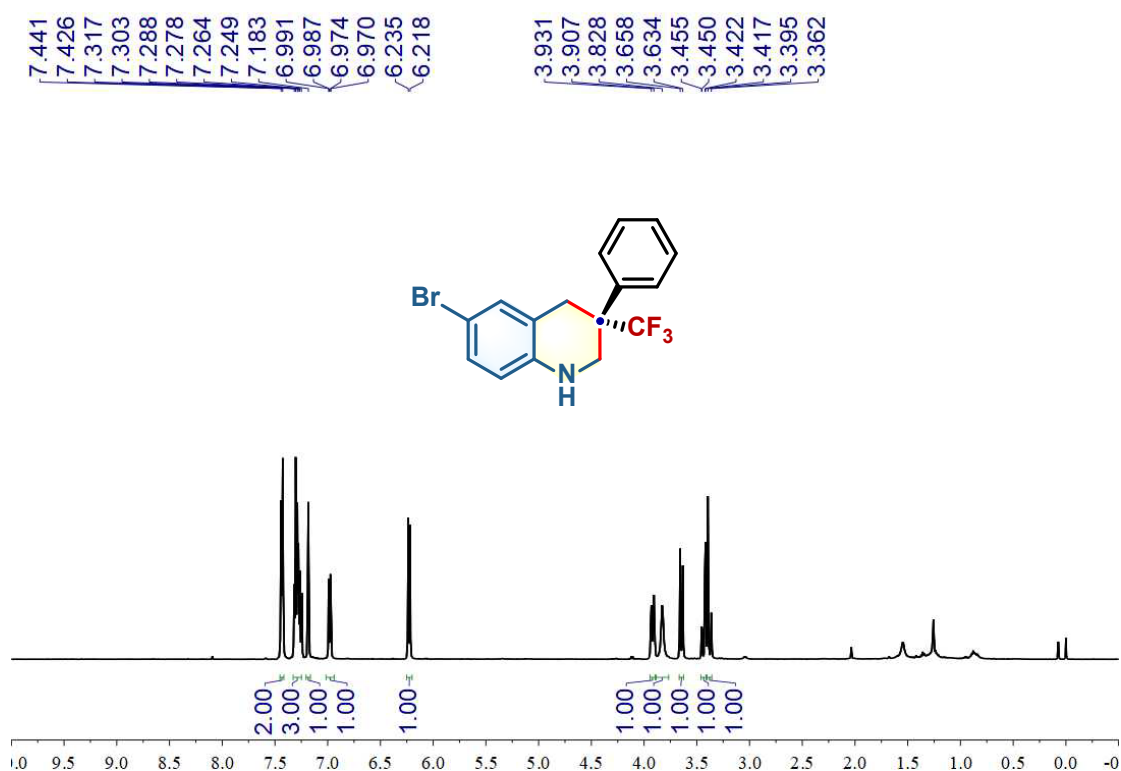
Supplementary Fig.178. ^1H NMR (500 MHz, CDCl_3) spectrum of **60**



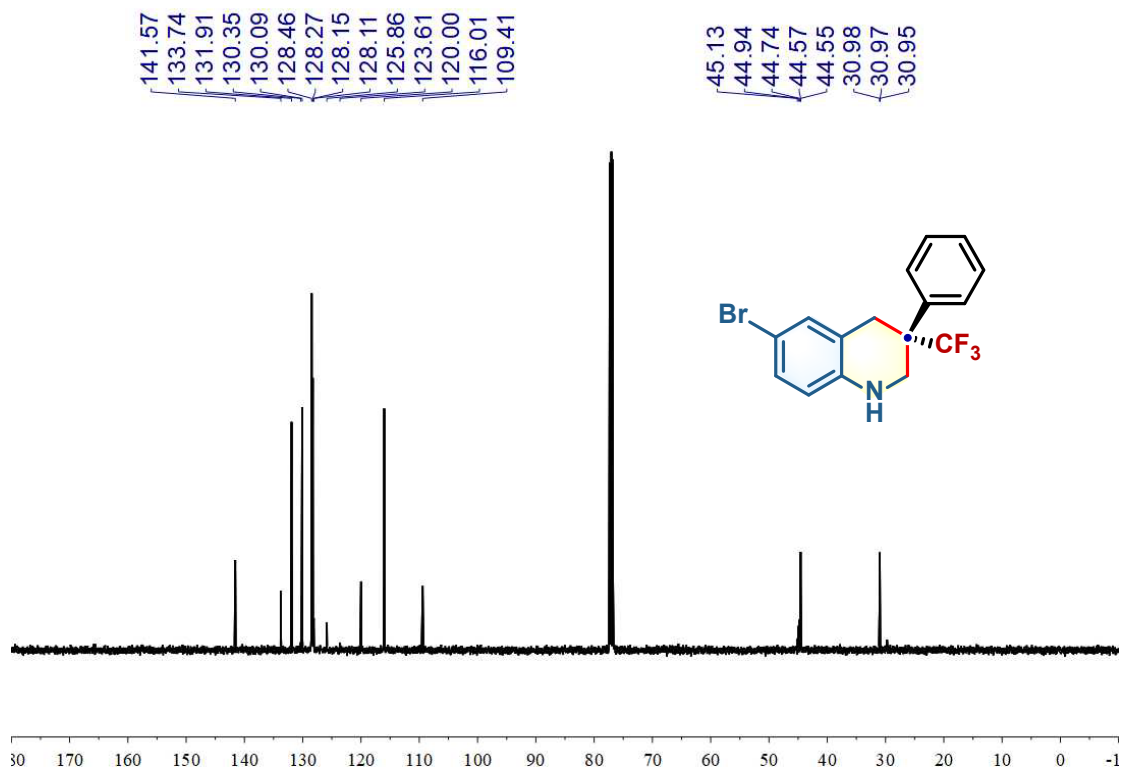
Supplementary Fig. 179. ¹³C NMR (125 MHz, CDCl₃) spectrum of **60**



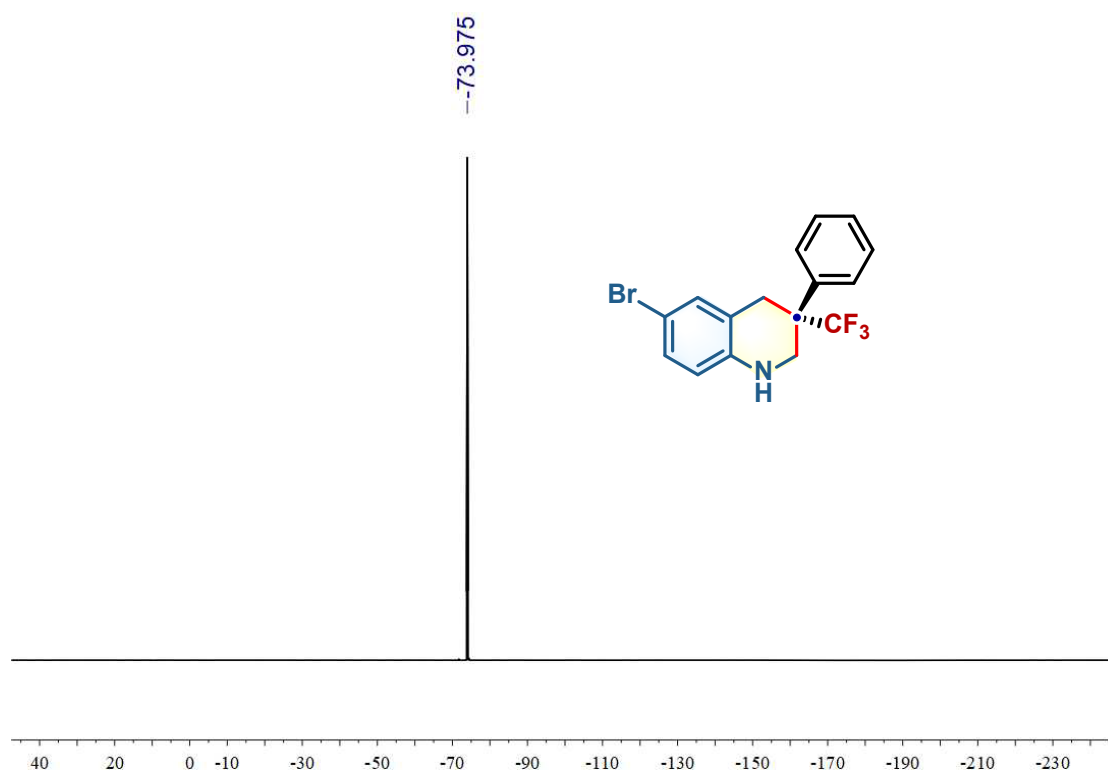
Supplementary Fig. 180. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **60**



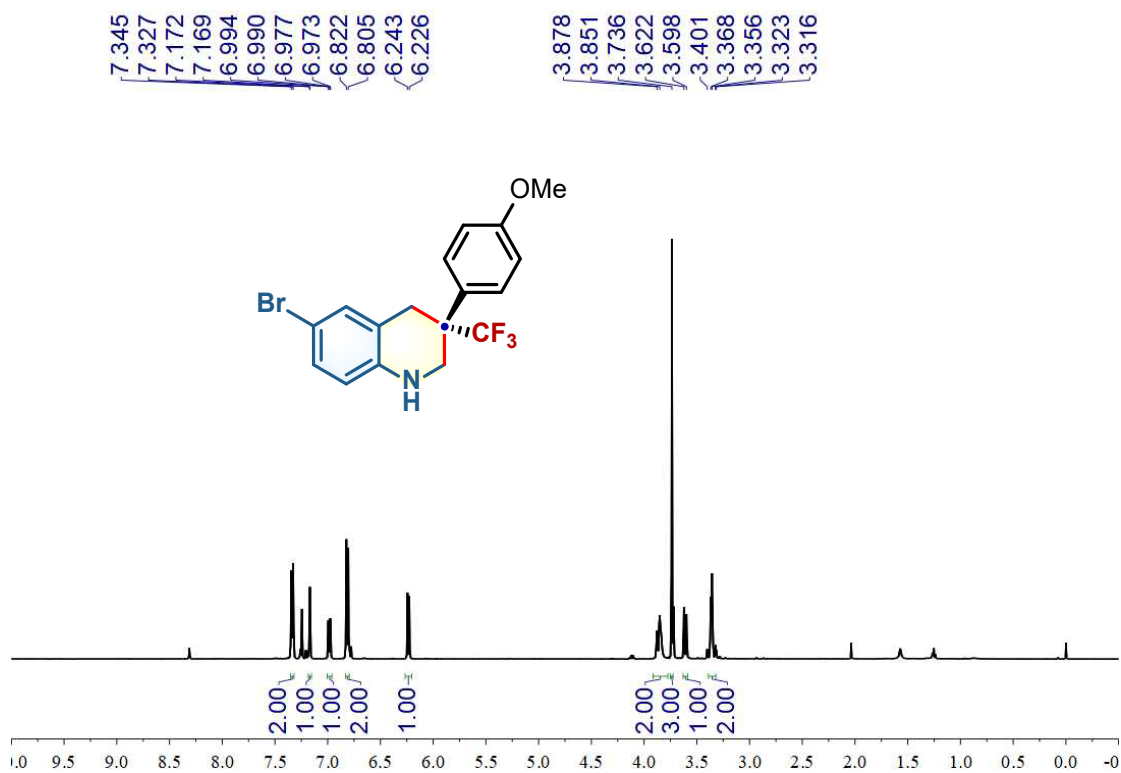
Supplementary Fig. 181. ¹H NMR (500 MHz, CDCl₃) spectrum of **61**



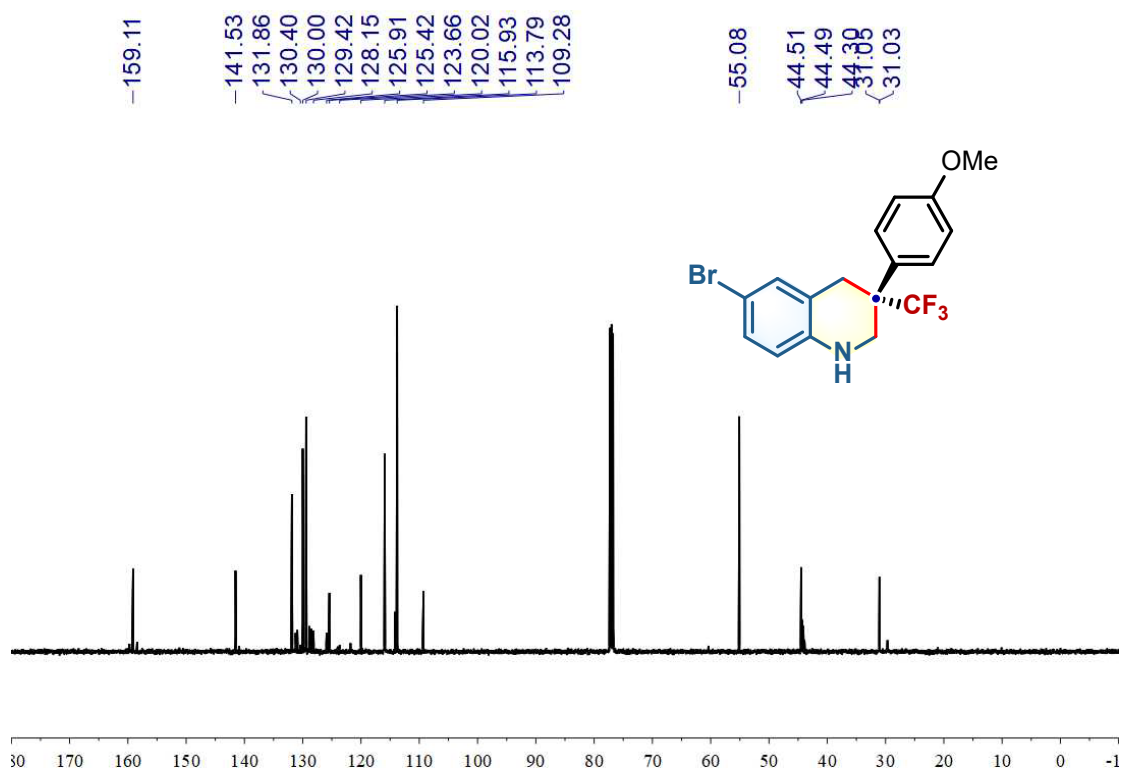
Supplementary Fig. 182. ¹³C NMR (125 MHz, CDCl₃) spectrum of **61**



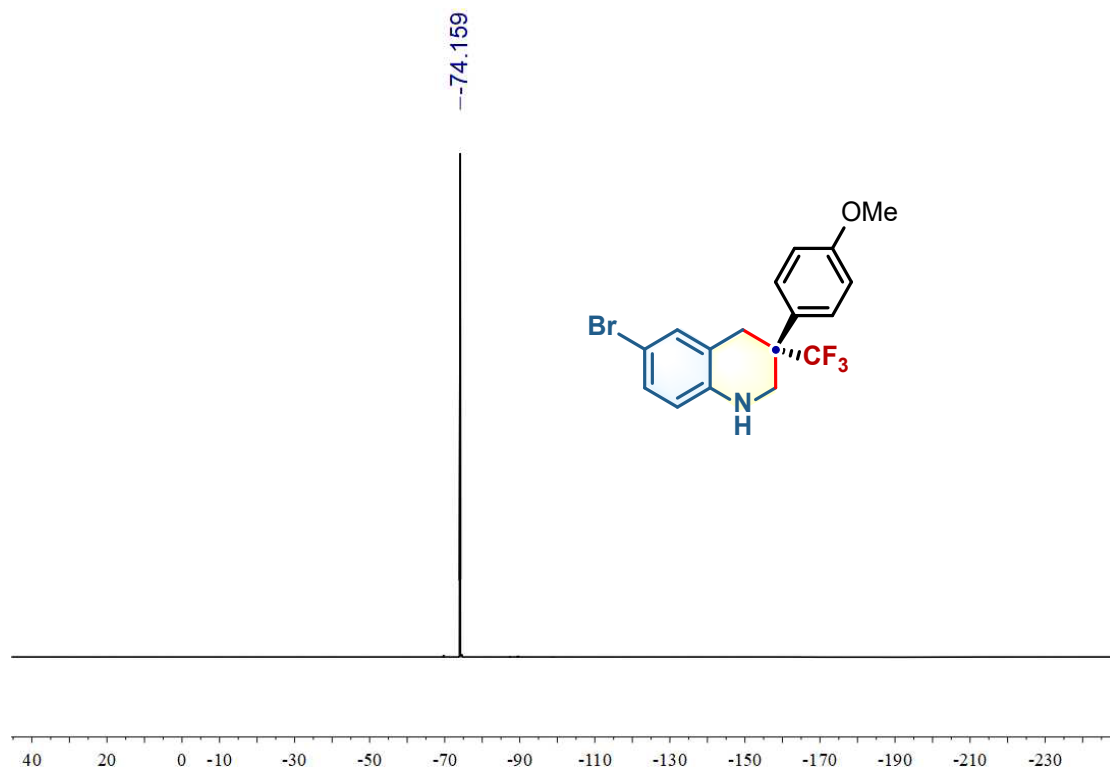
Supplementary Fig. 183. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **61**



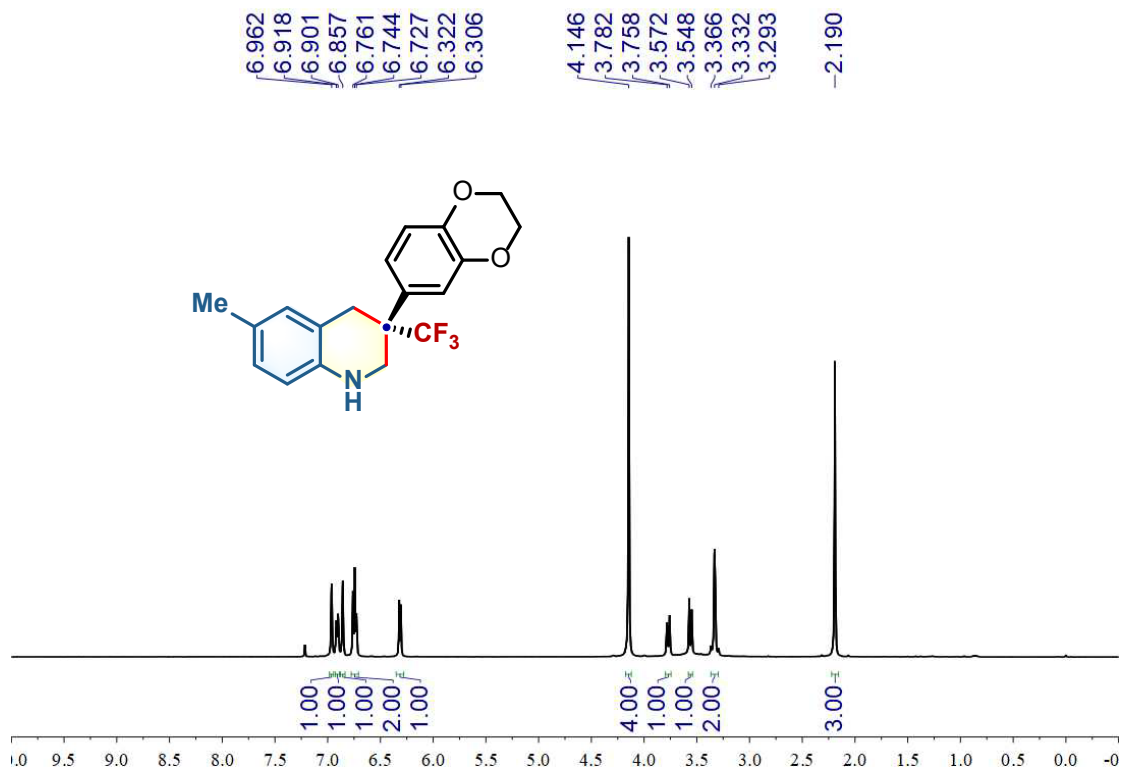
Supplementary Fig. 184. ^1H NMR (500 MHz, CDCl_3) spectrum of **62**



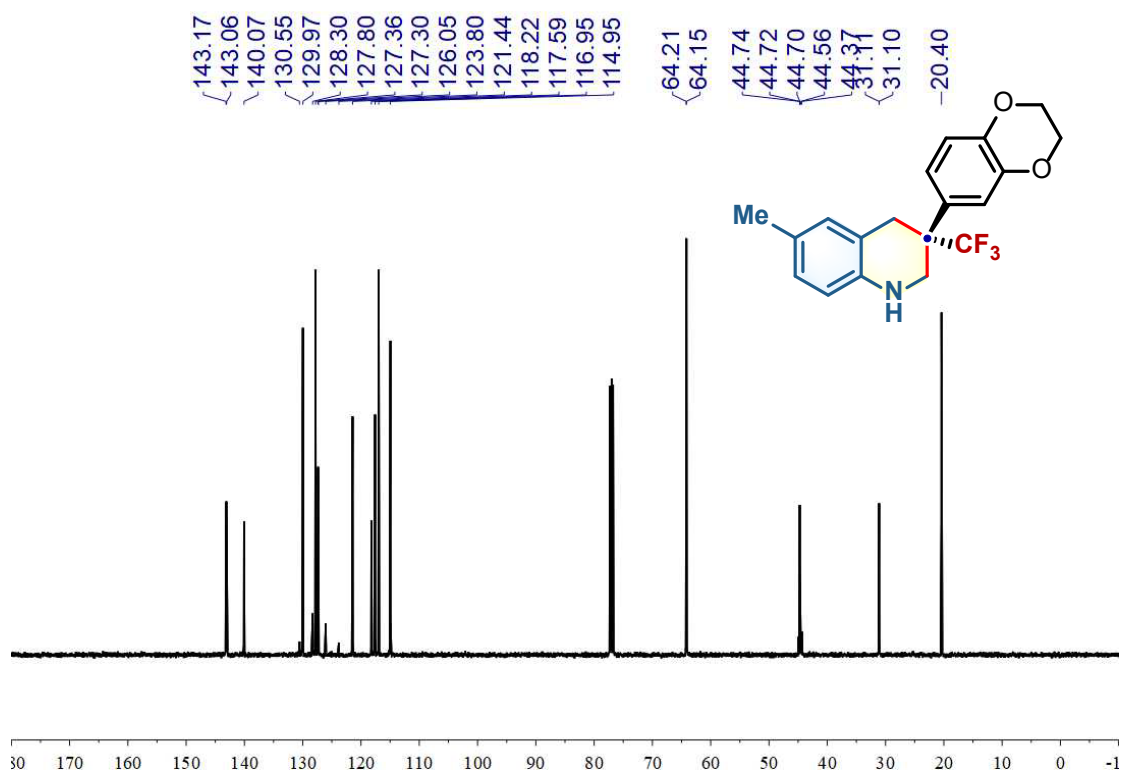
Supplementary Fig.185. ^{13}C NMR (125 MHz, CDCl_3) spectrum of **62**



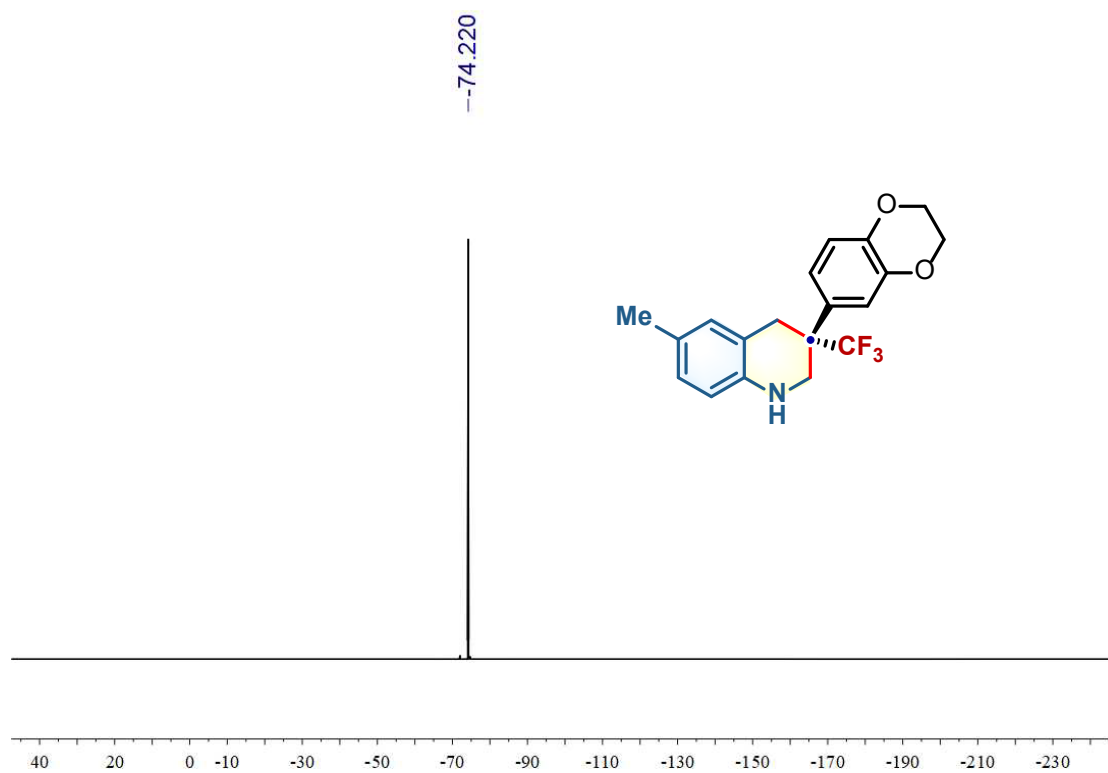
Supplementary Fig. 186. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **62**



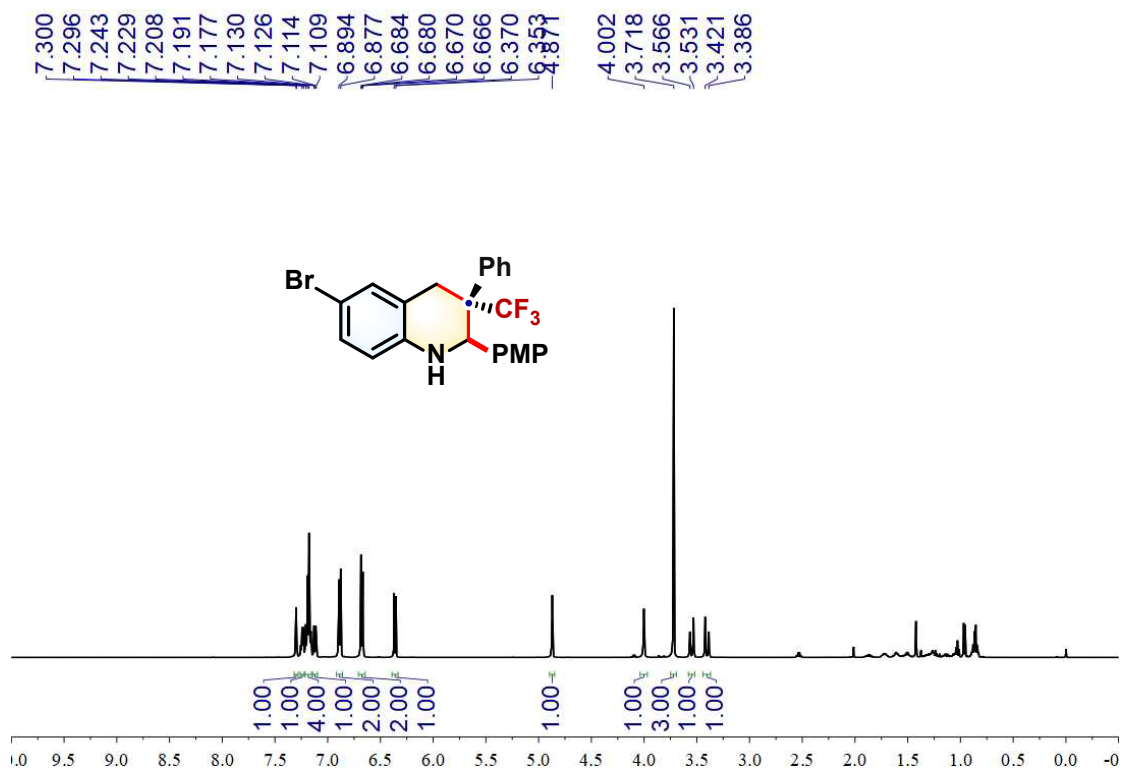
Supplementary Fig. 187. ¹H NMR (500 MHz, CDCl₃) spectrum of **63**



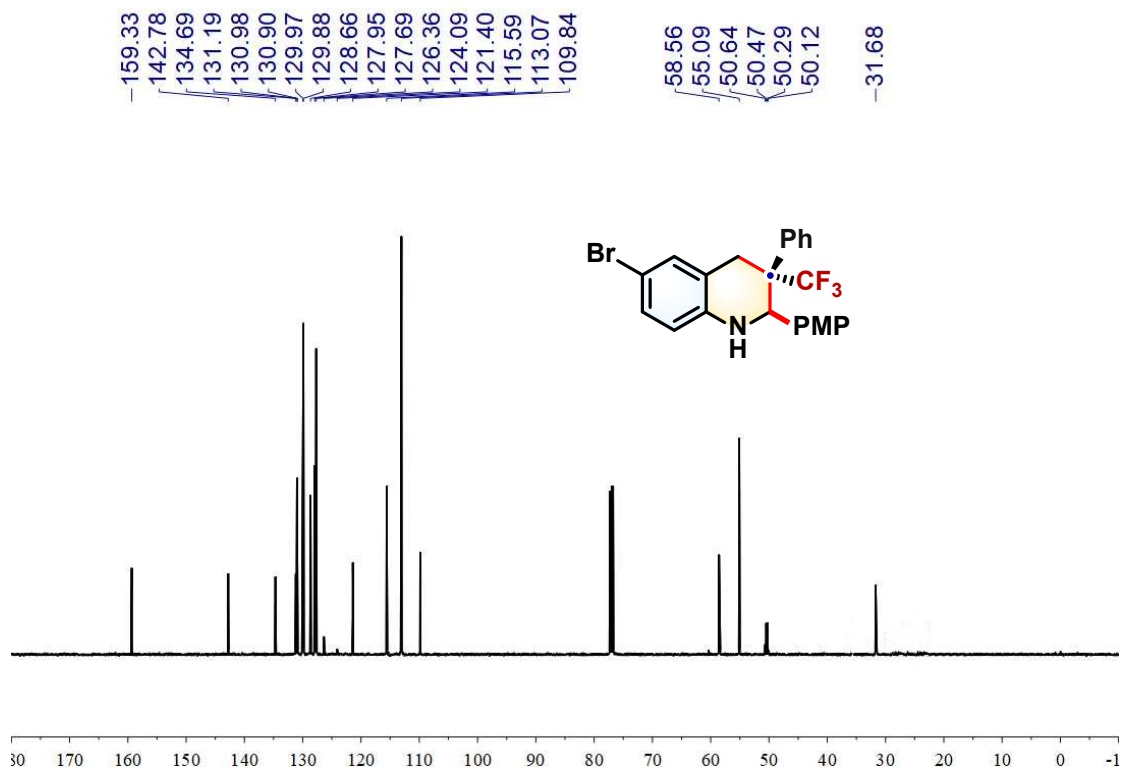
Supplementary Fig. 188. ¹³C NMR (125 MHz, CDCl₃) spectrum of **63**



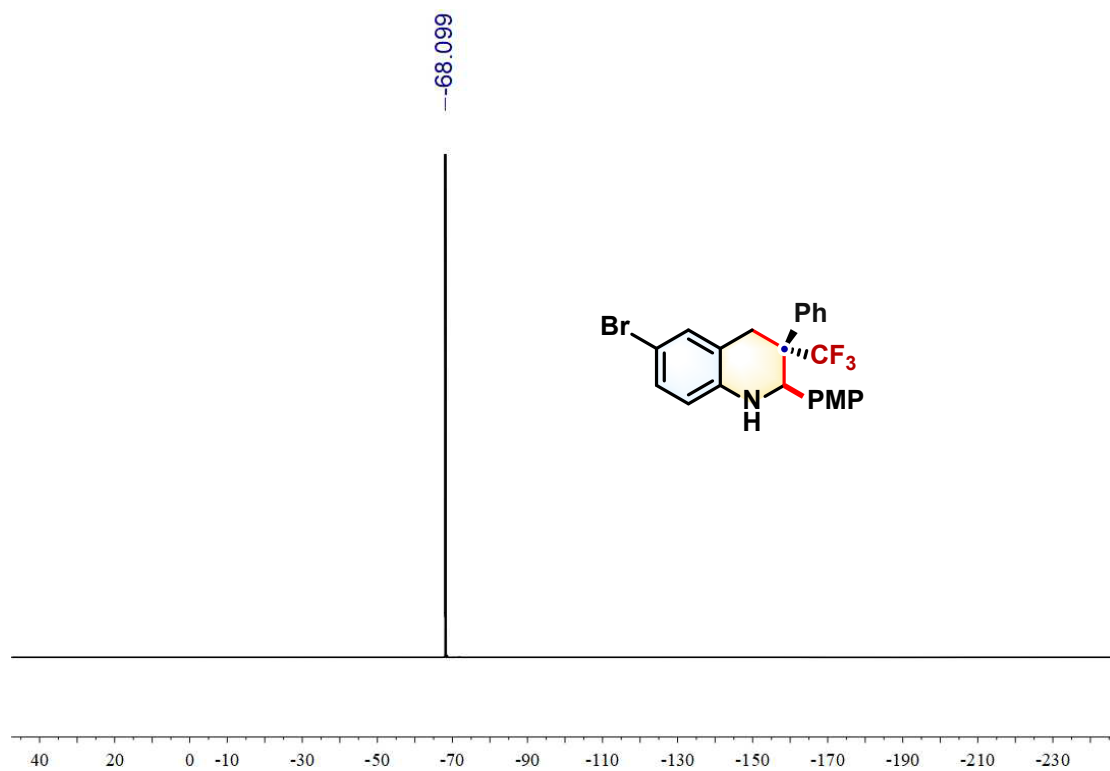
Supplementary Fig. 189. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **63**



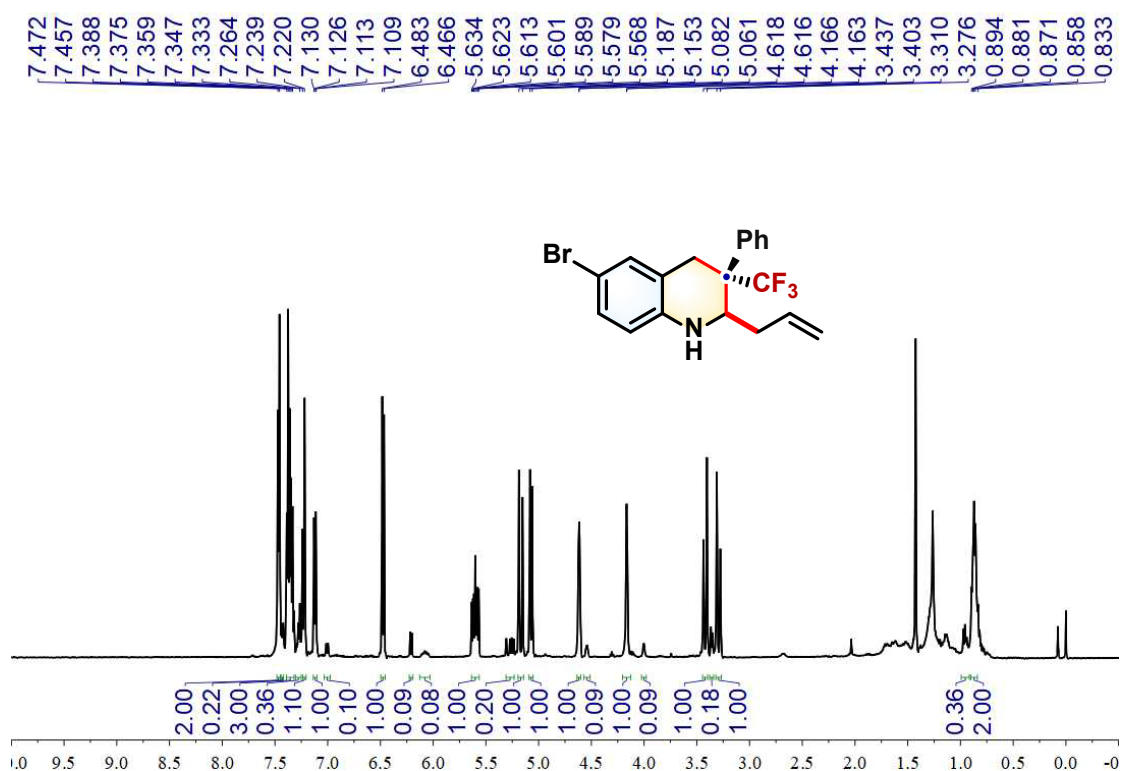
Supplementary Fig. 190. ^1H NMR (500 MHz, CDCl_3) spectrum of **64**



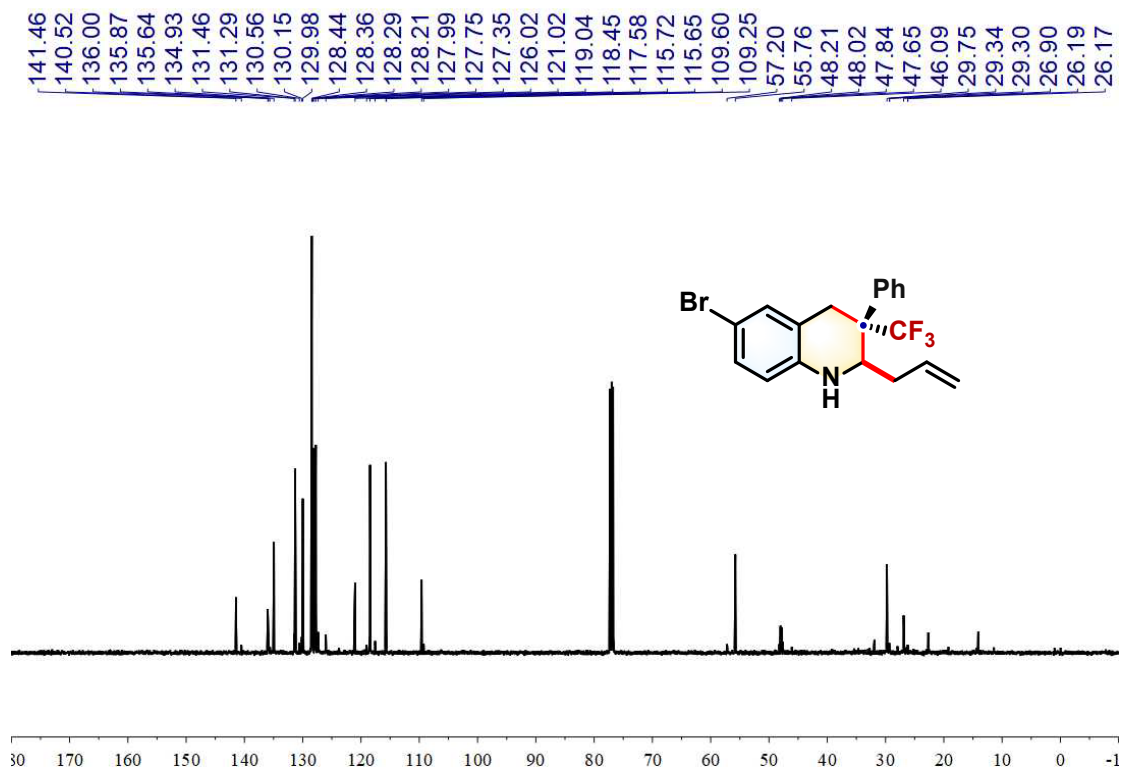
Supplementary Fig. 191. ¹³C NMR (125 MHz, CDCl₃) spectrum of **64**



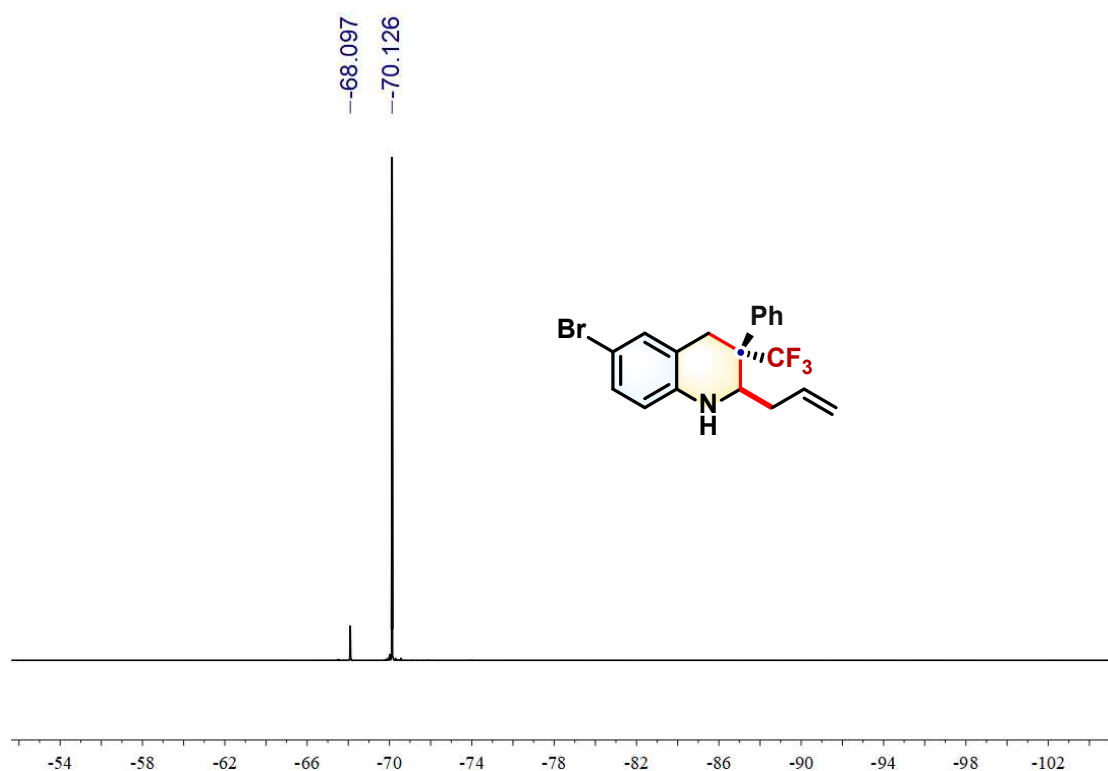
Supplementary Fig. 192. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **64**



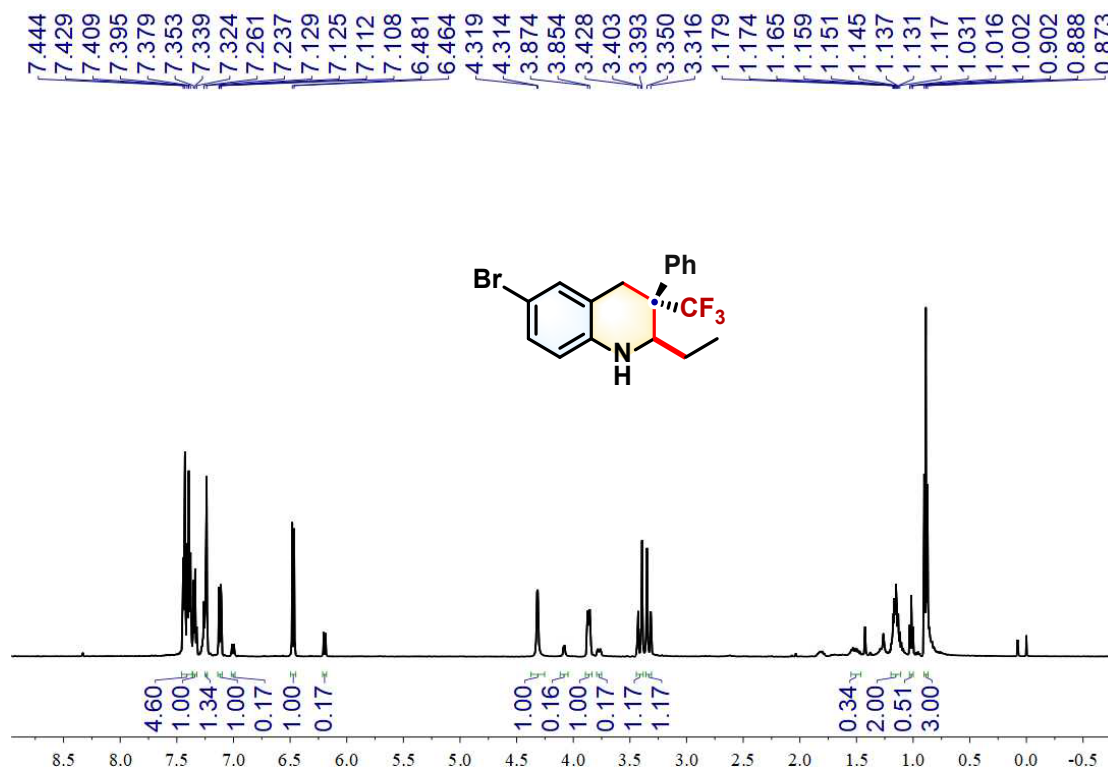
Supplementary Fig. 193. ¹H NMR (500 MHz, CDCl₃) spectrum of **65**



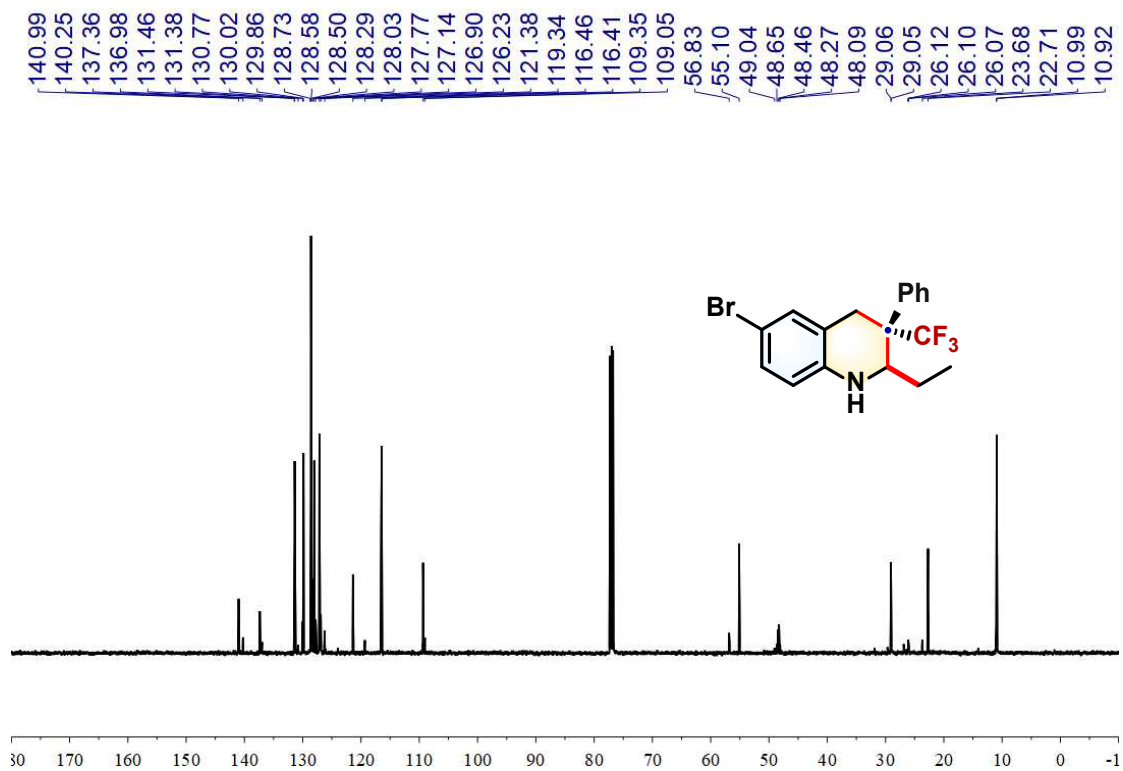
Supplementary Fig. 194. ¹³C NMR (125 MHz, CDCl₃) spectrum of **65**



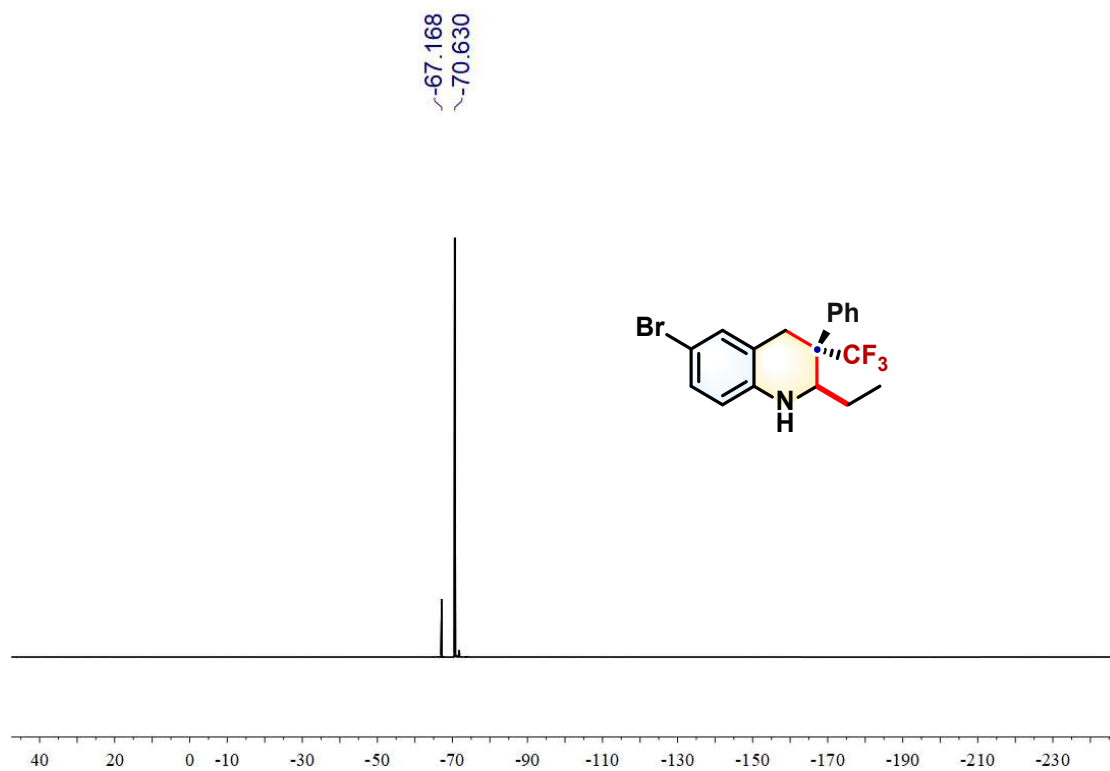
Supplementary Fig. 195. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **65**



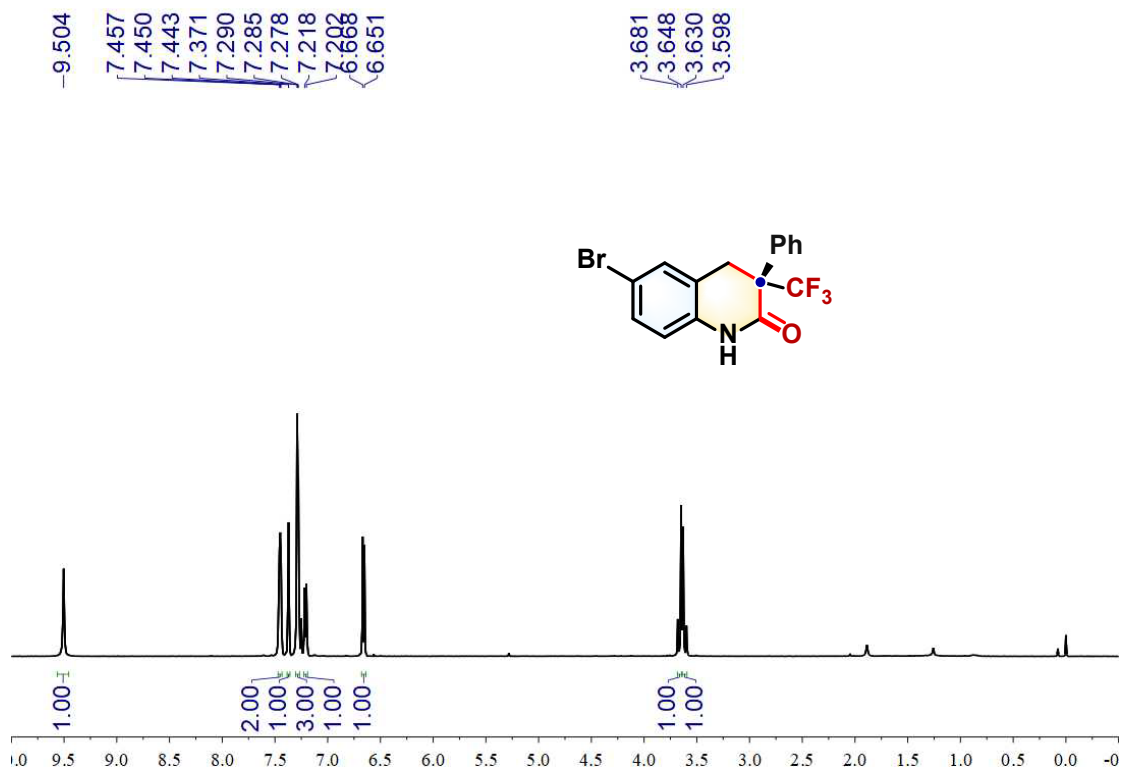
Supplementary Fig. 196. ¹H NMR (500 MHz, CDCl₃) spectrum of **66**



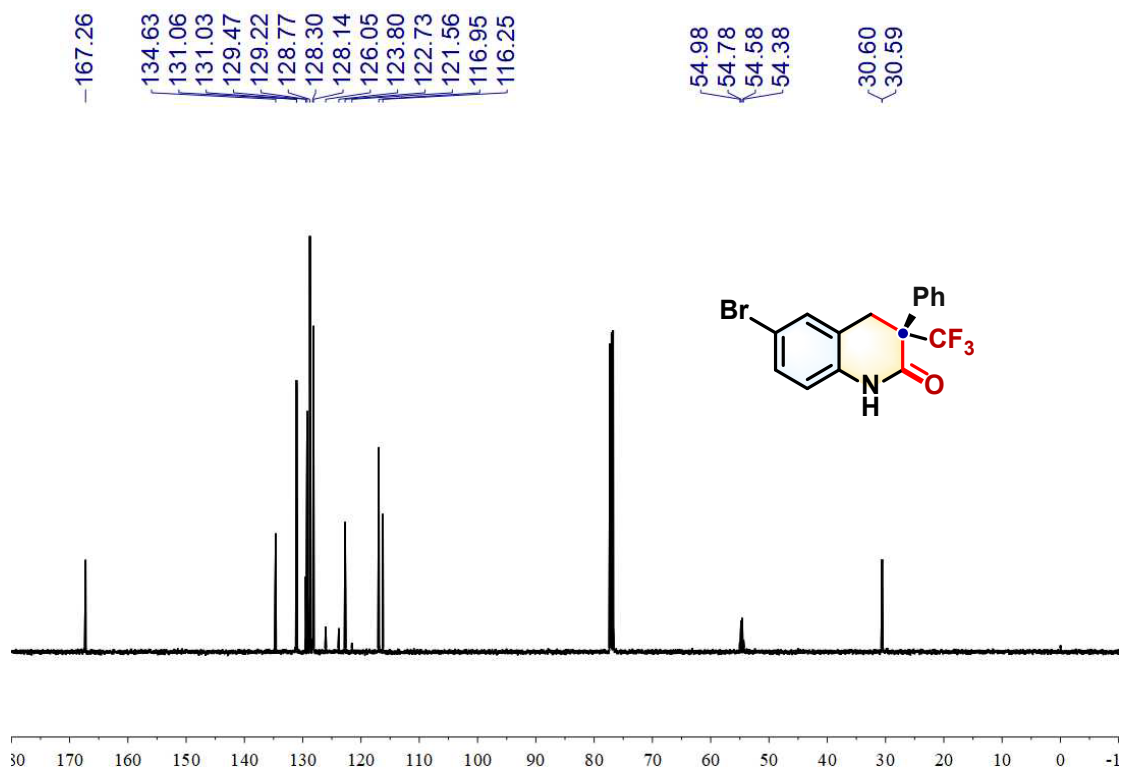
Supplementary Fig. 197. ¹³C NMR (125 MHz, CDCl₃) spectrum of **66**



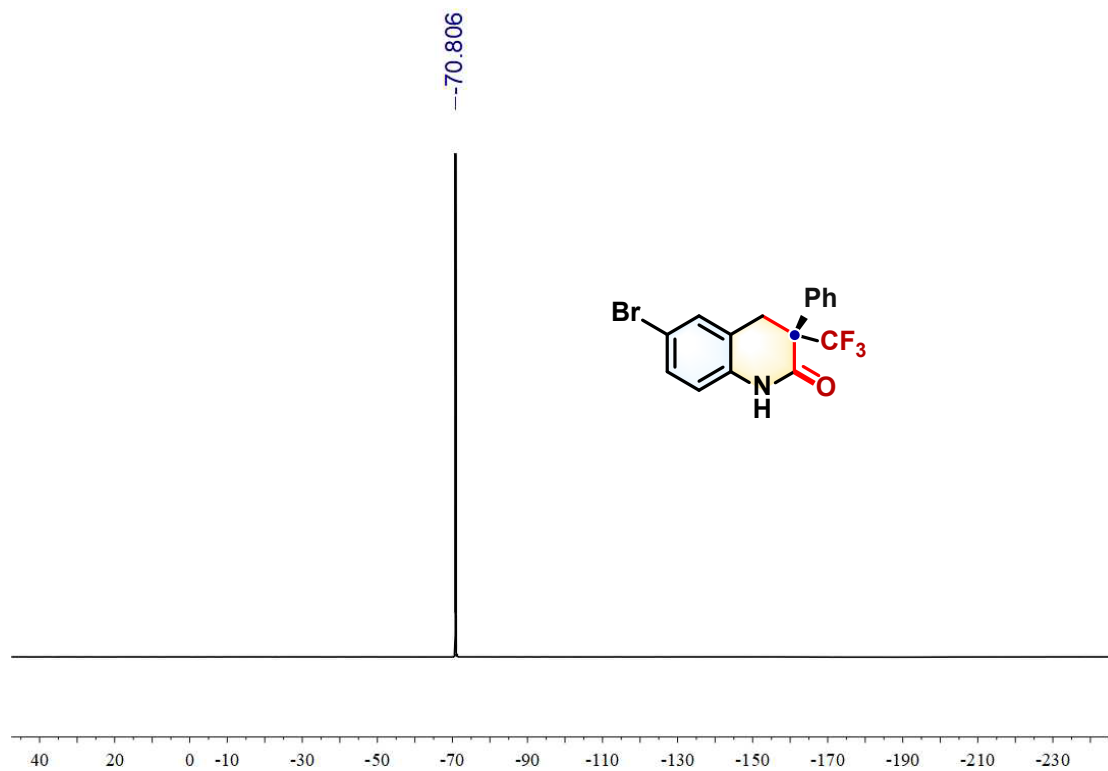
Supplementary Fig. 198. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **66**



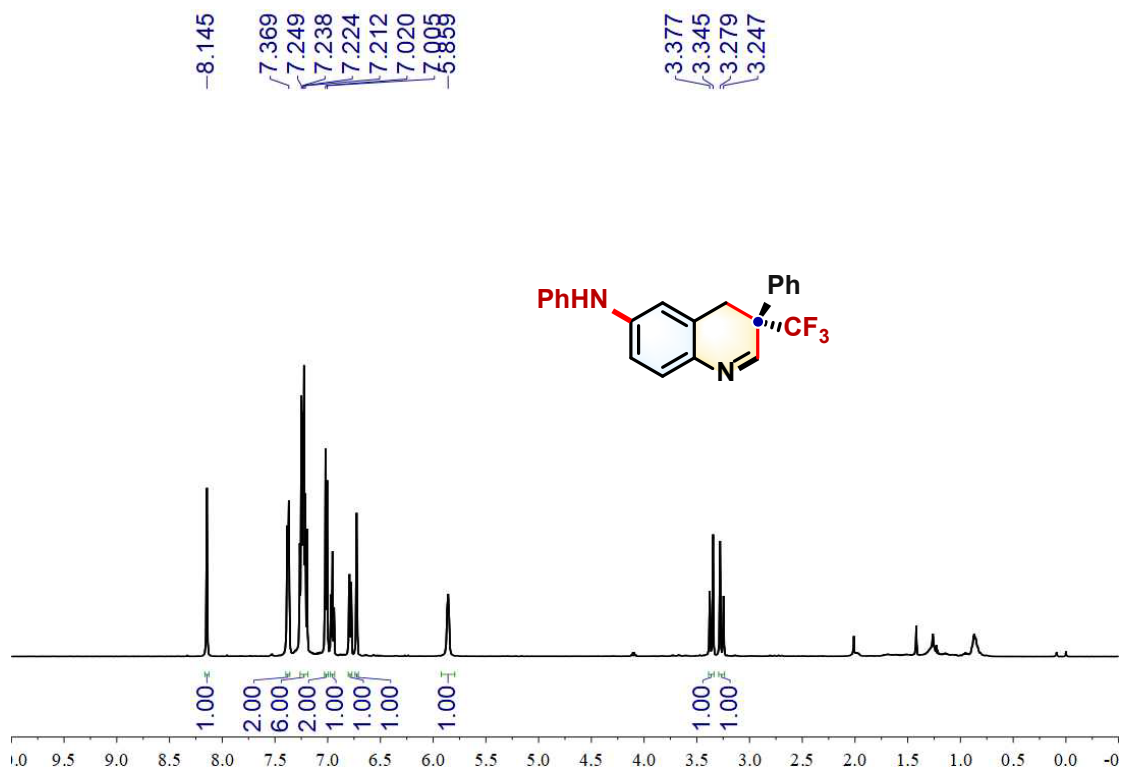
Supplementary Fig. 199. ¹H NMR (500 MHz, CDCl₃) spectrum of **67**



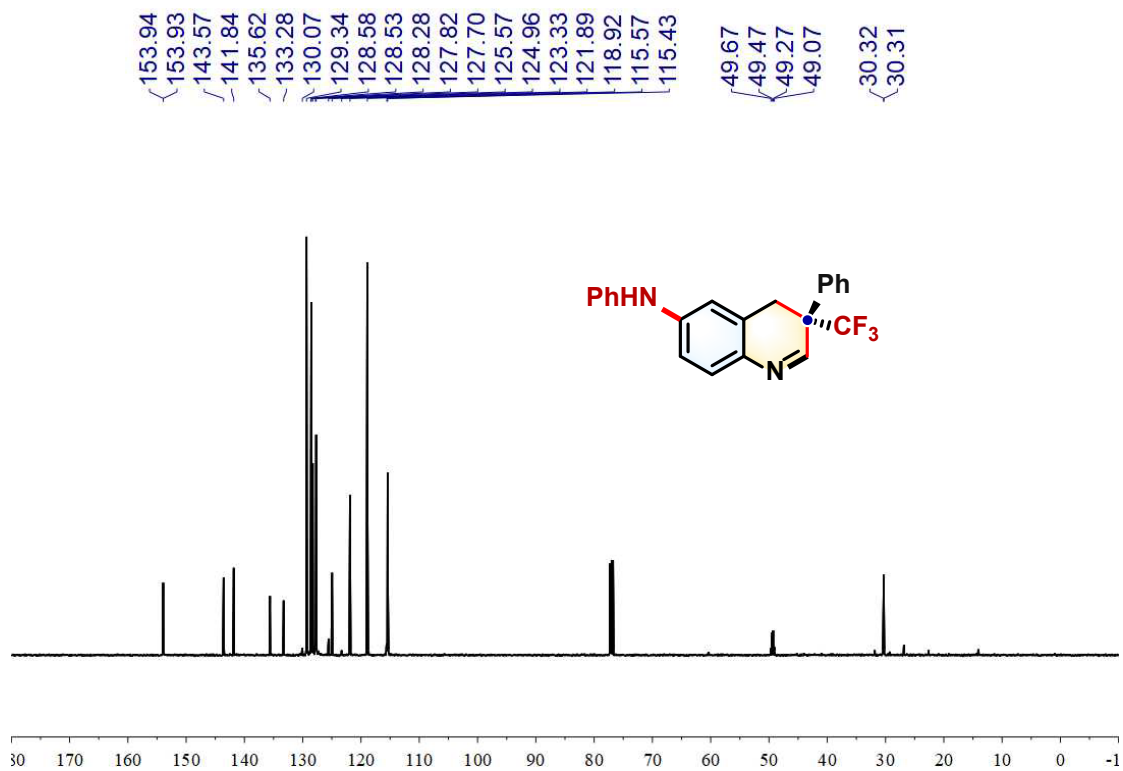
Supplementary Fig. 200. ¹³C NMR (125 MHz, CDCl₃) spectrum of **67**



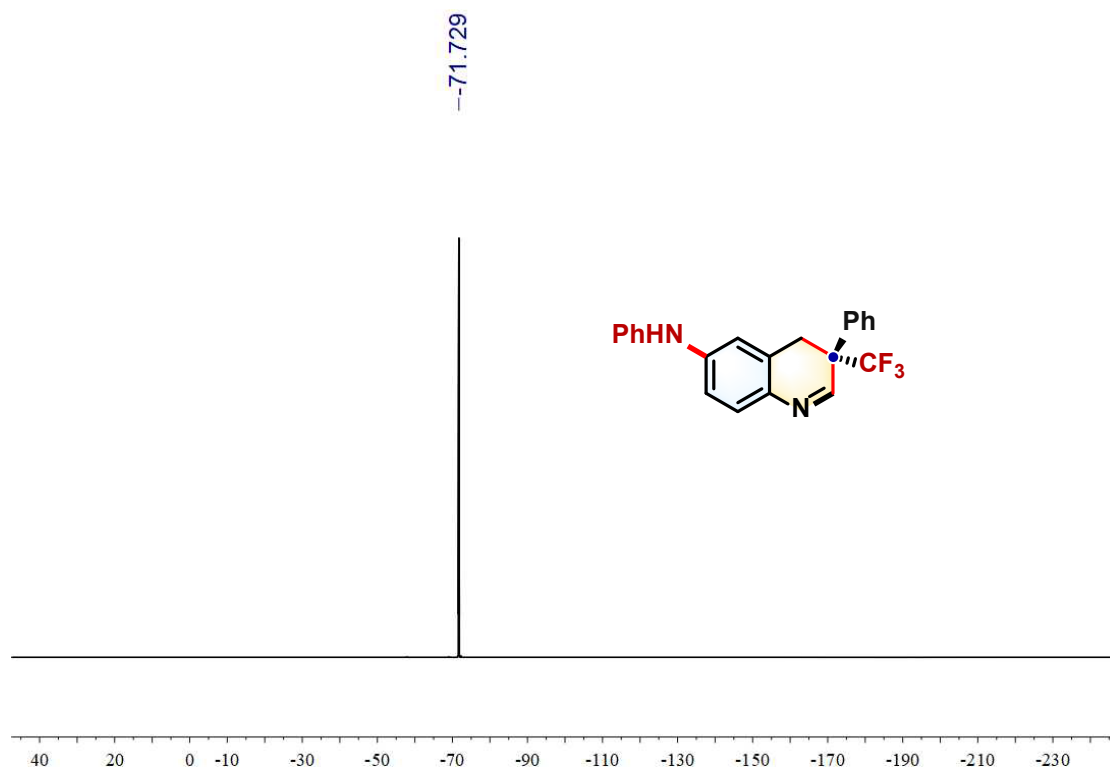
Supplementary Fig. 201. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **67**



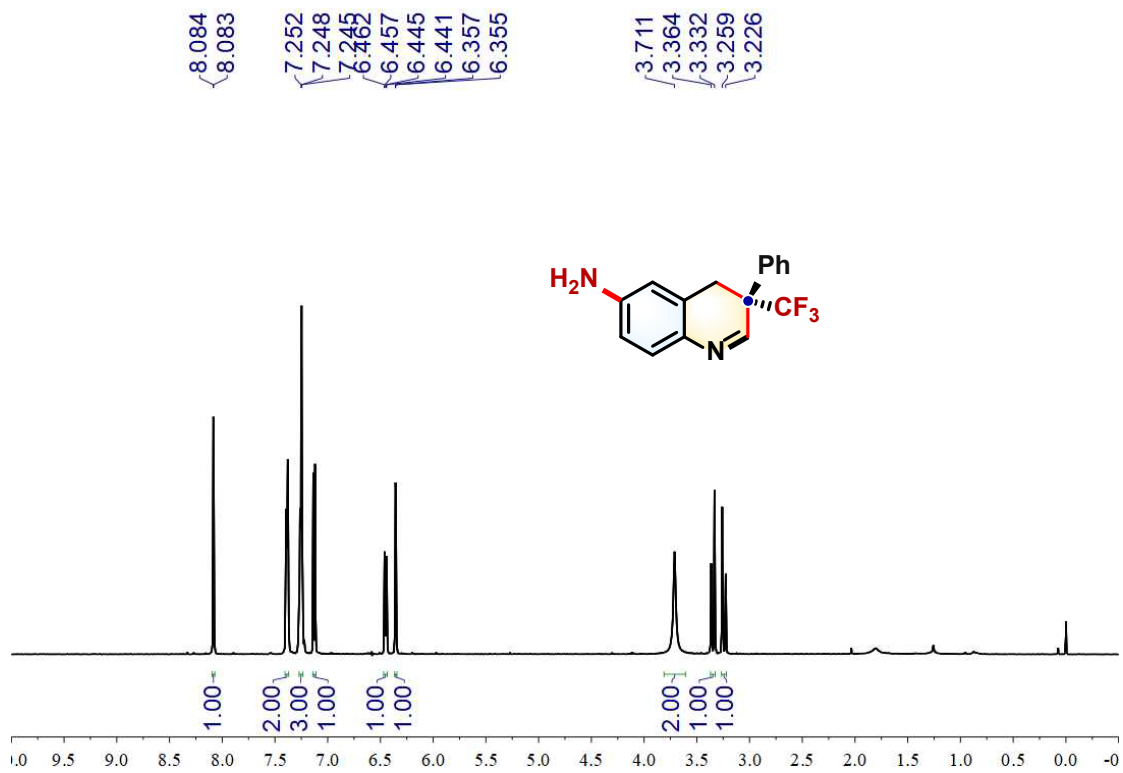
Supplementary Fig. 202. ^1H NMR (500 MHz, CDCl_3) spectrum of **68**



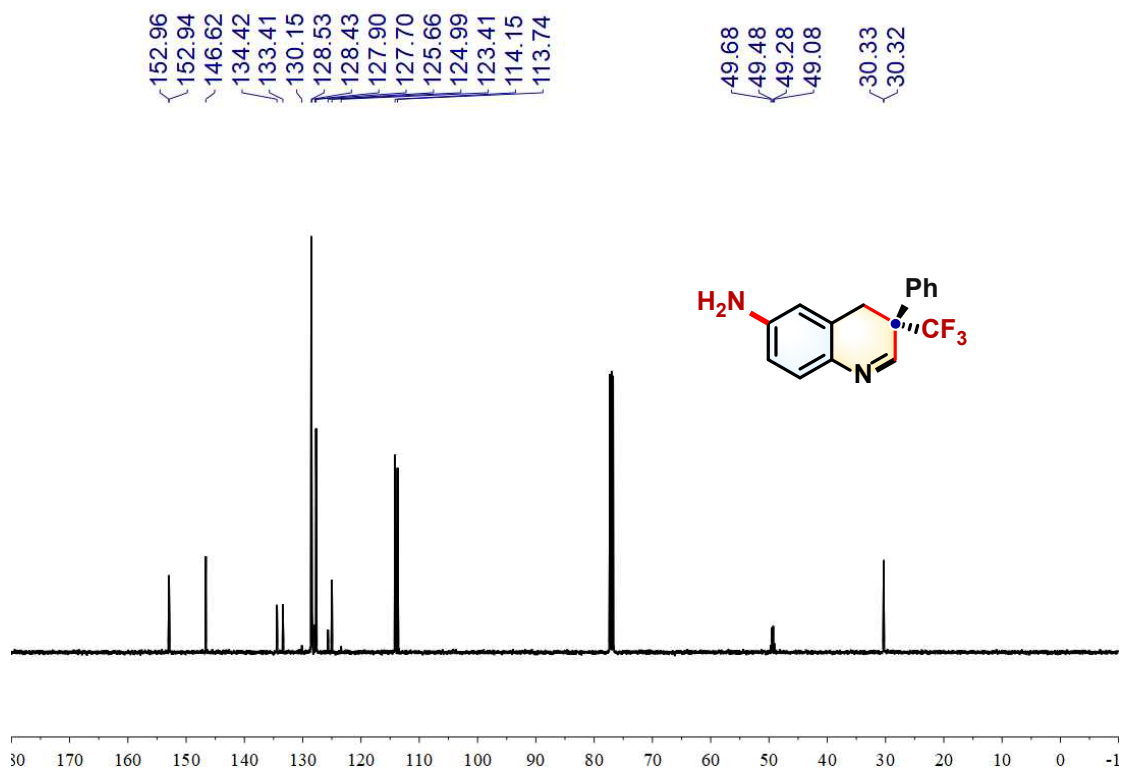
Supplementary Fig. 203. ¹³C NMR (125 MHz, CDCl₃) spectrum of **68**



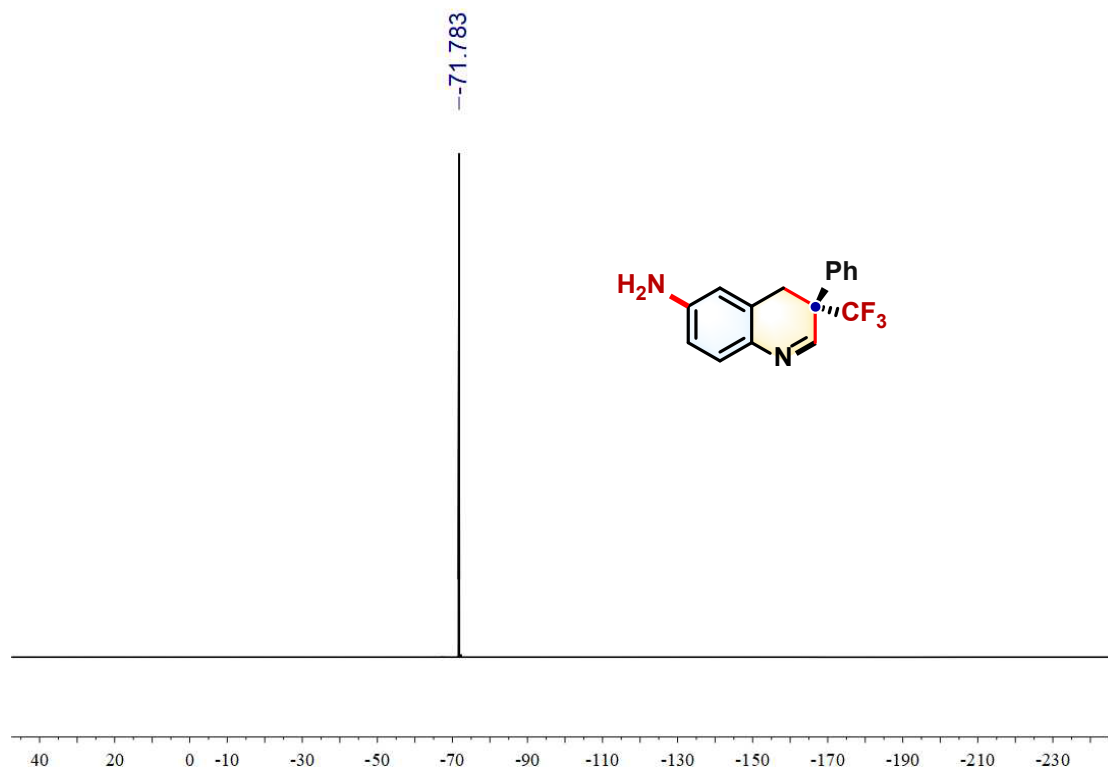
Supplementary Fig. 204. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **68**



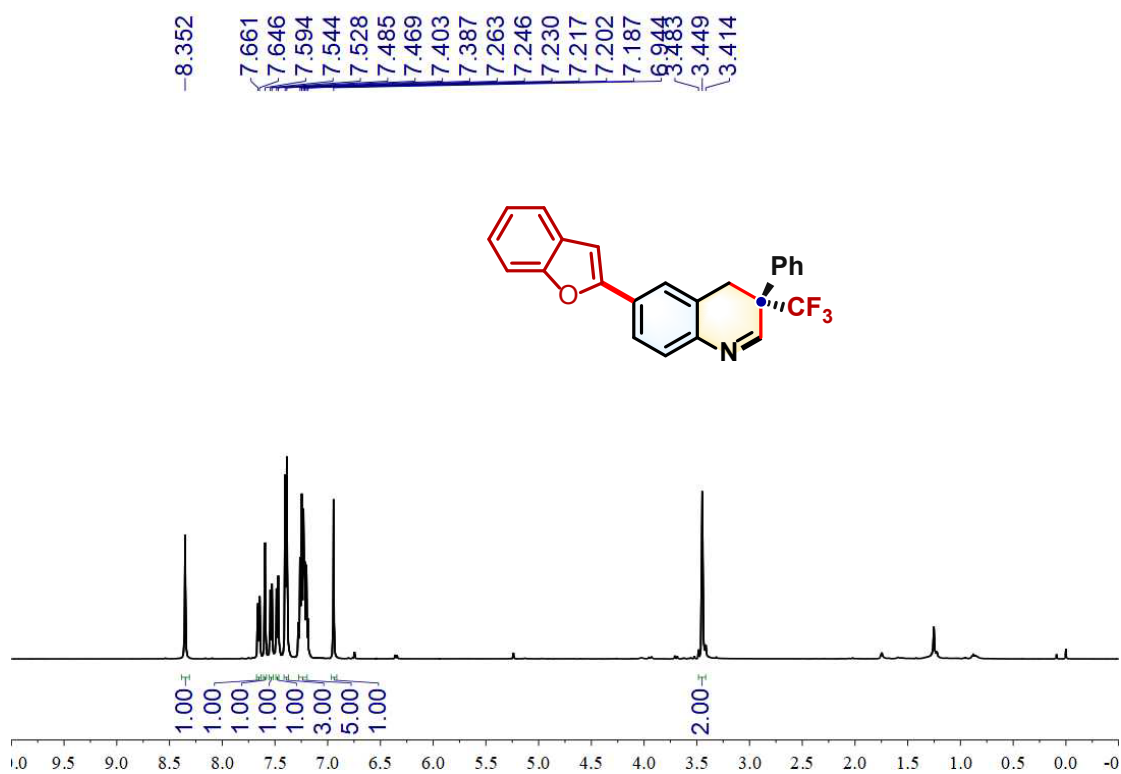
Supplementary Fig. 205. ¹H NMR (500 MHz, CDCl₃) spectrum of **69**



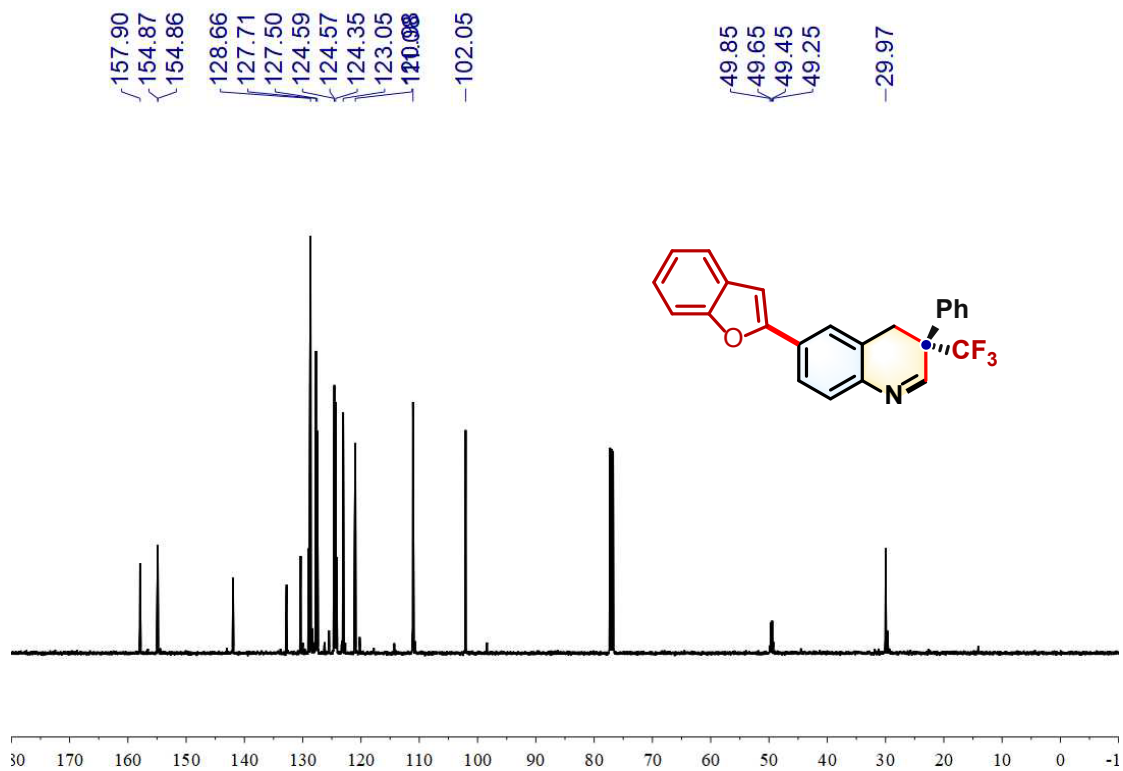
Supplementary Fig. 206. ¹³C NMR (125 MHz, CDCl₃) spectrum of **69**



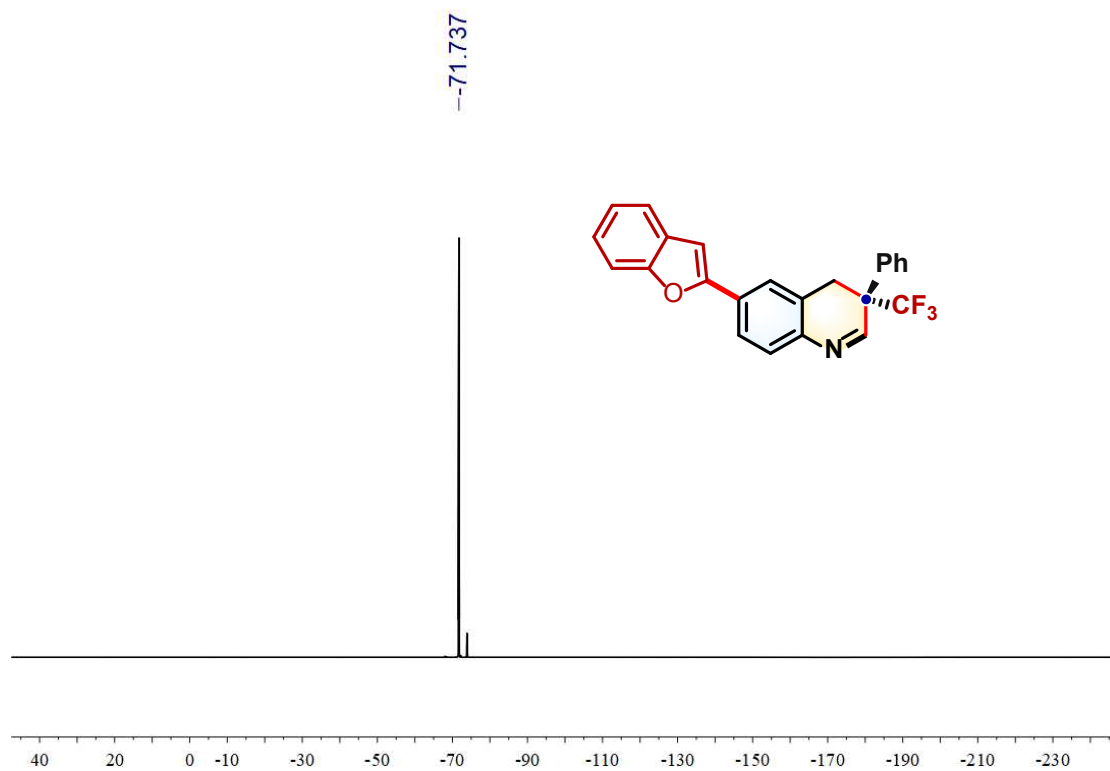
Supplementary Fig. 207. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **69**



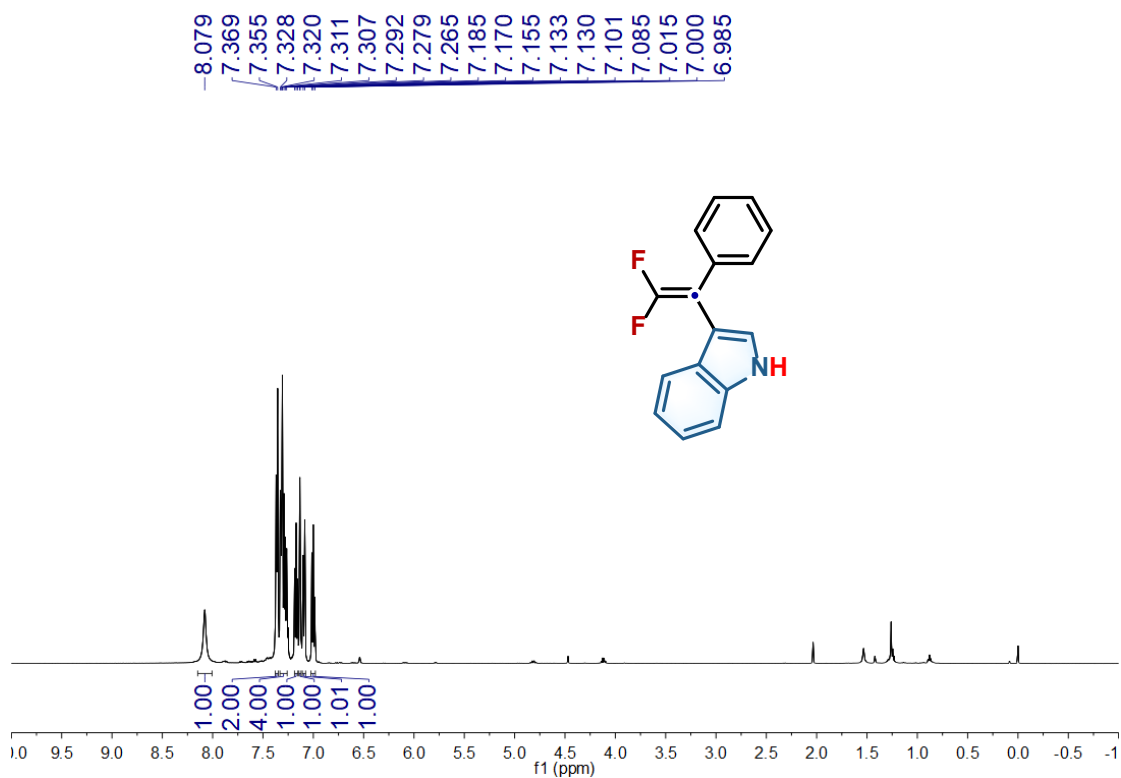
Supplementary Fig. 208. ^1H NMR (500 MHz, CDCl_3) spectrum of **70**



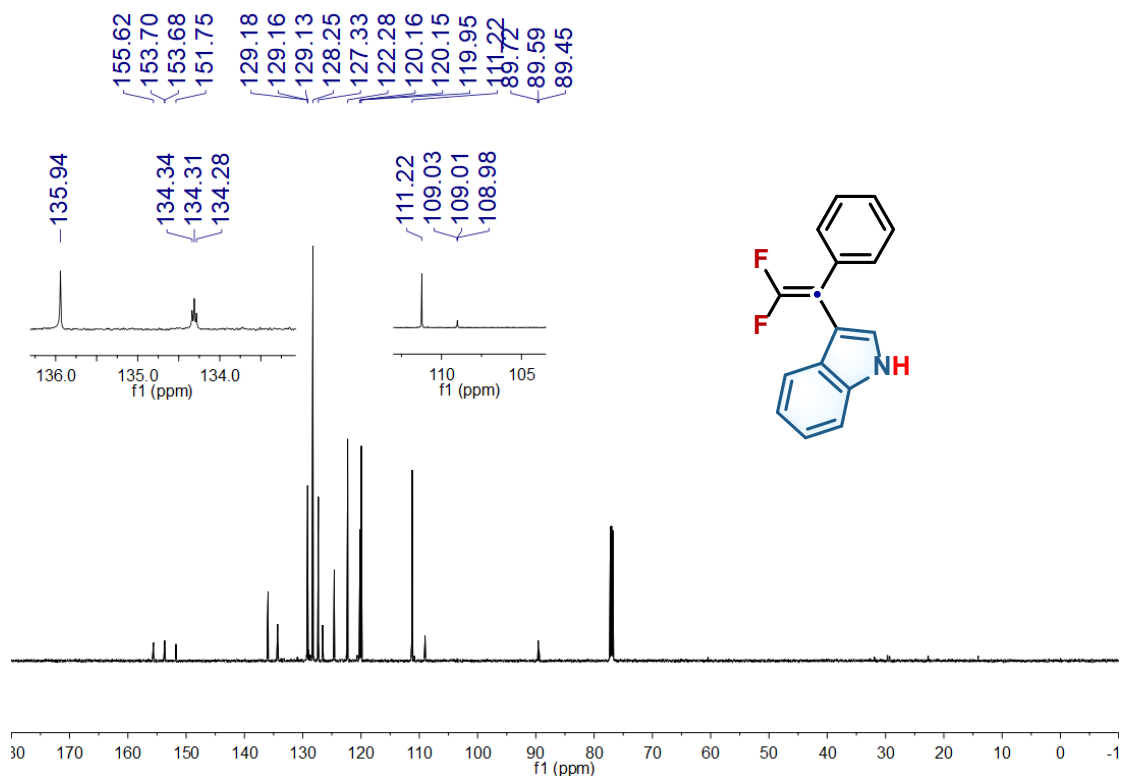
Supplementary Fig. 209. ¹³C NMR (125 MHz, CDCl₃) spectrum of 70



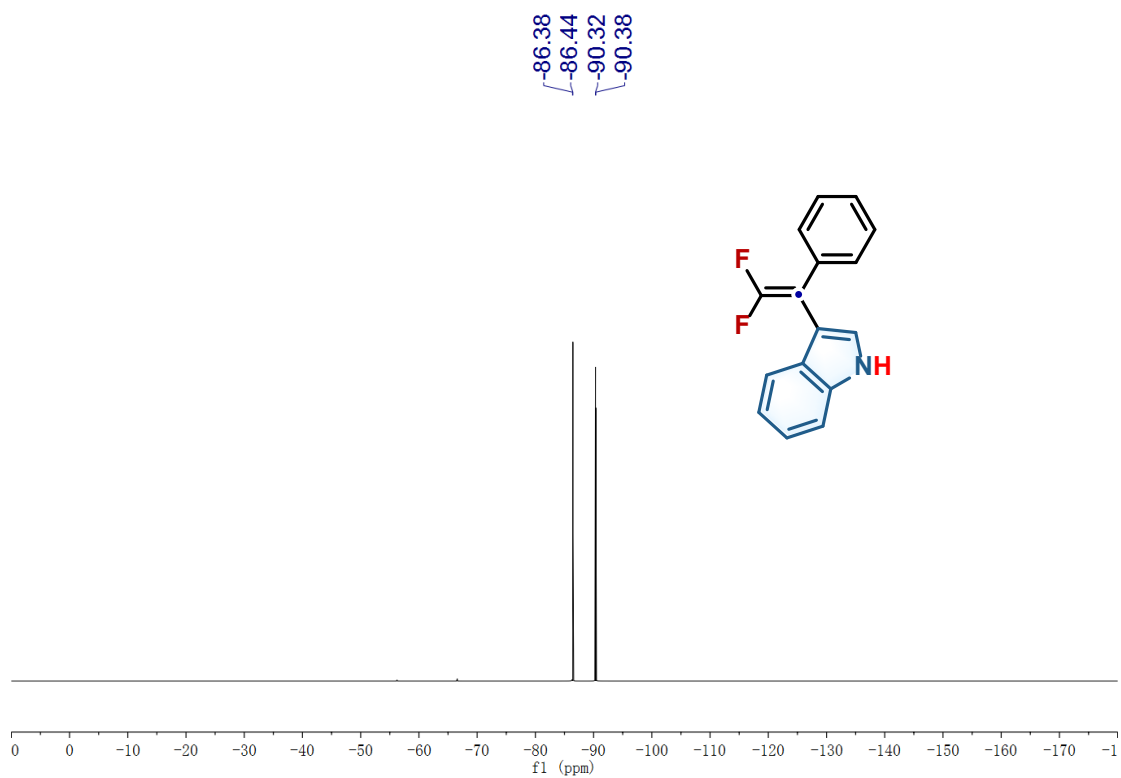
Supplementary Fig. 210. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 70



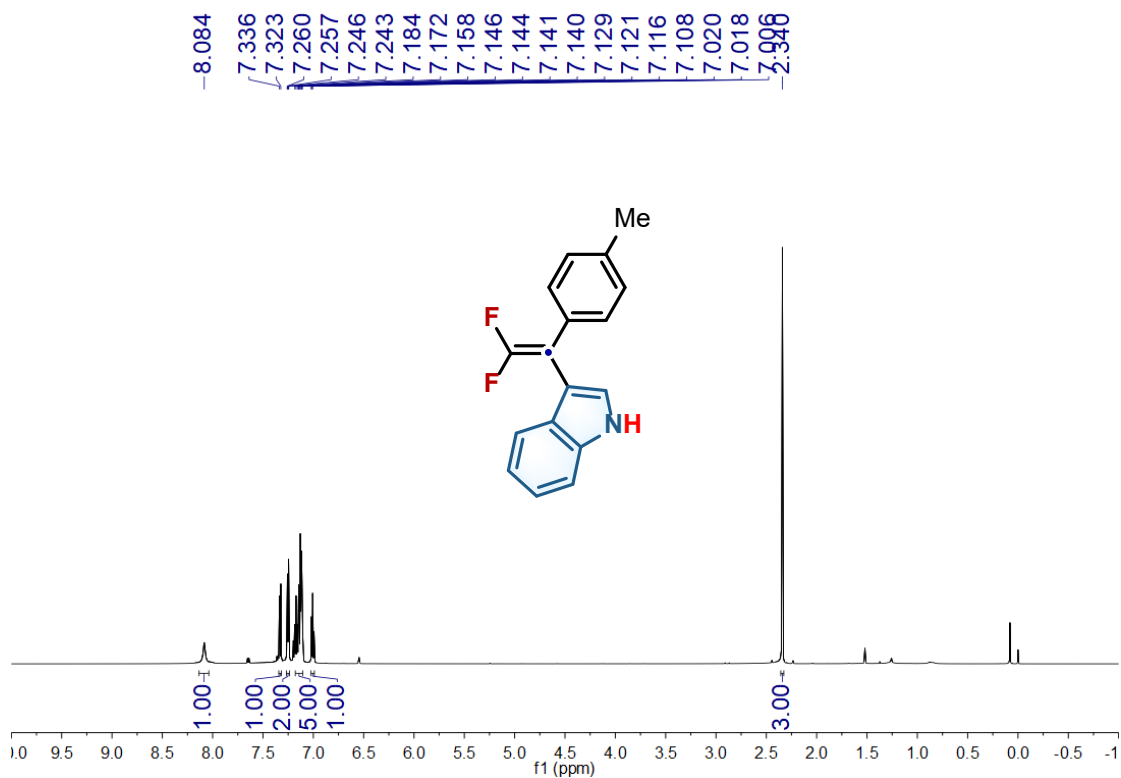
Supplementary Fig. 211. ¹H NMR (500 MHz, CDCl₃) spectrum of 71



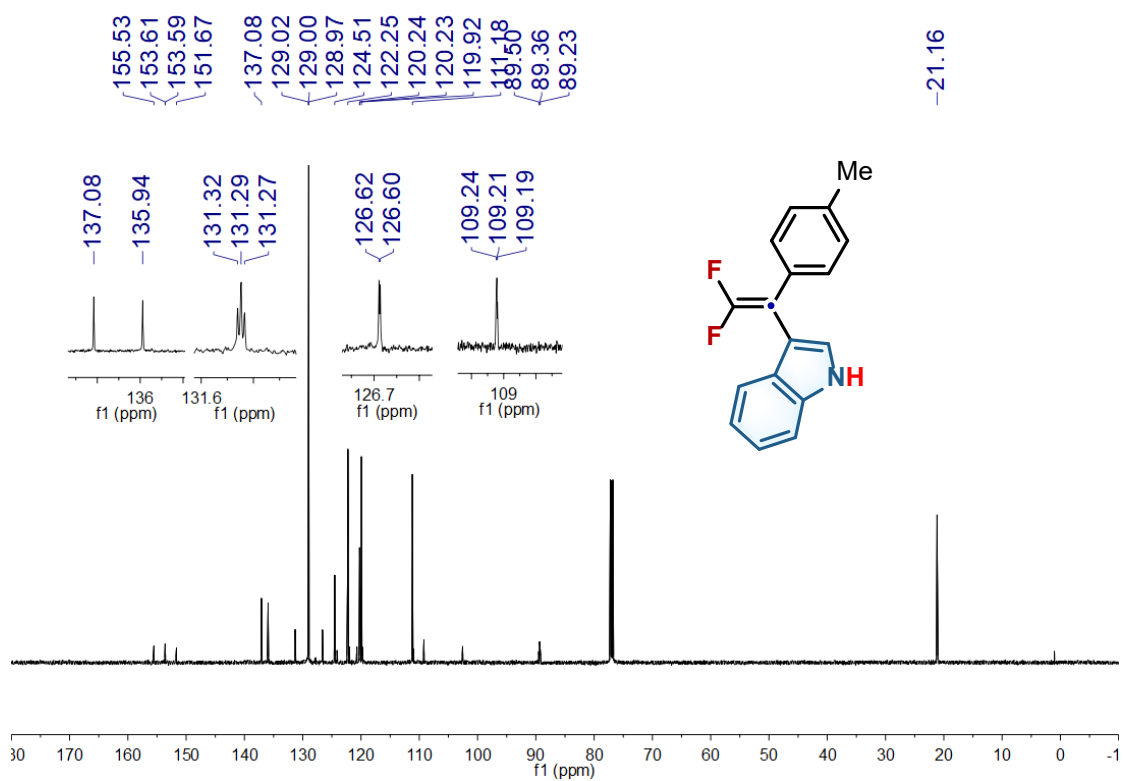
Supplementary Fig. 212. ¹³C NMR (150 MHz, CDCl₃) spectrum of 71



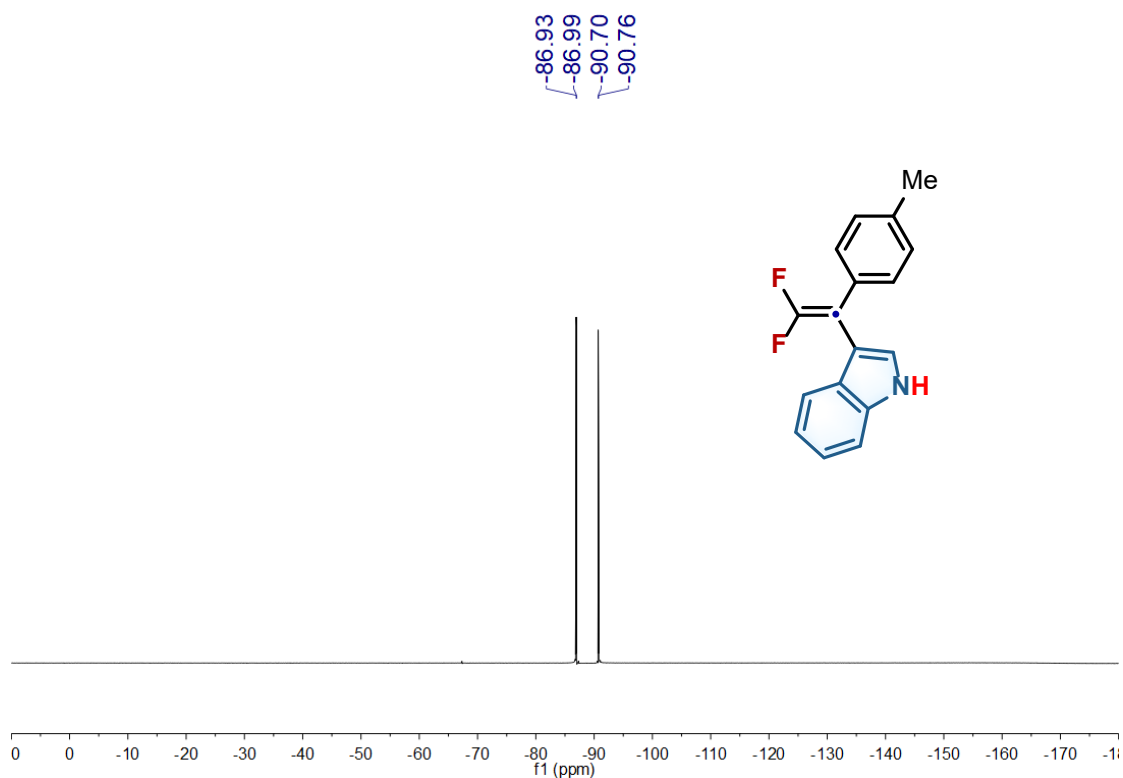
Supplementary Fig. 213. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 71



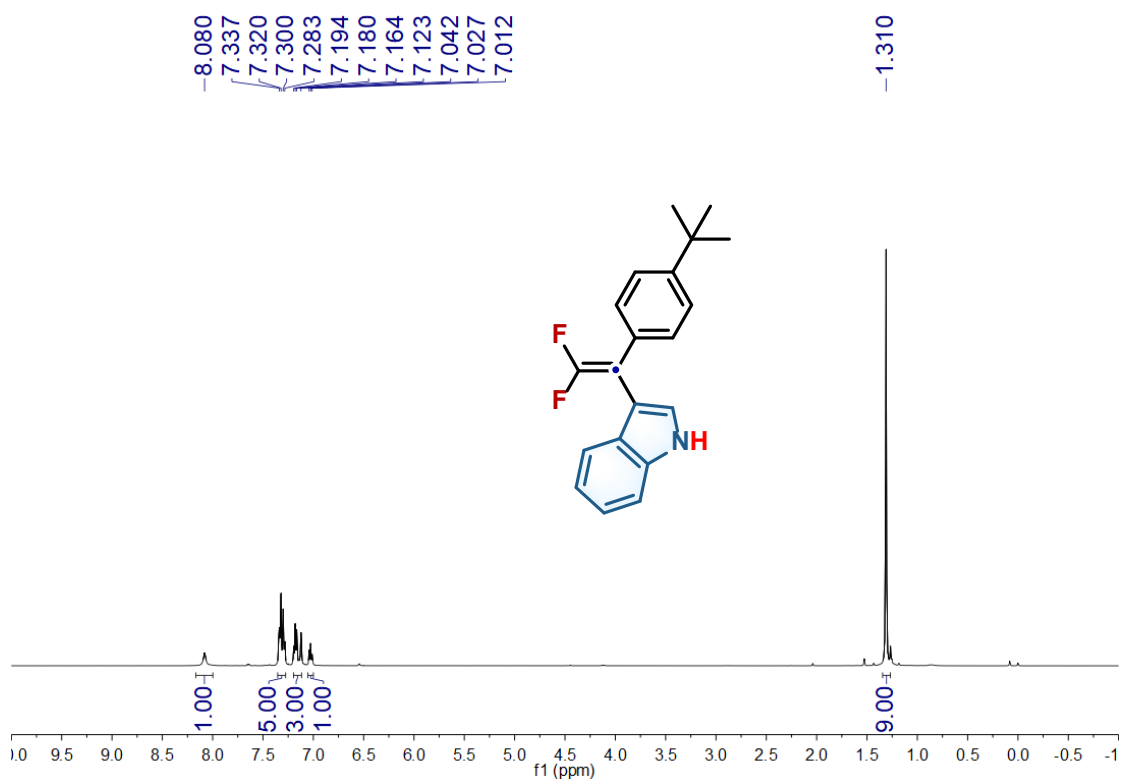
Supplementary Fig. 214. ¹H NMR (600 MHz, CDCl₃) spectrum of 72



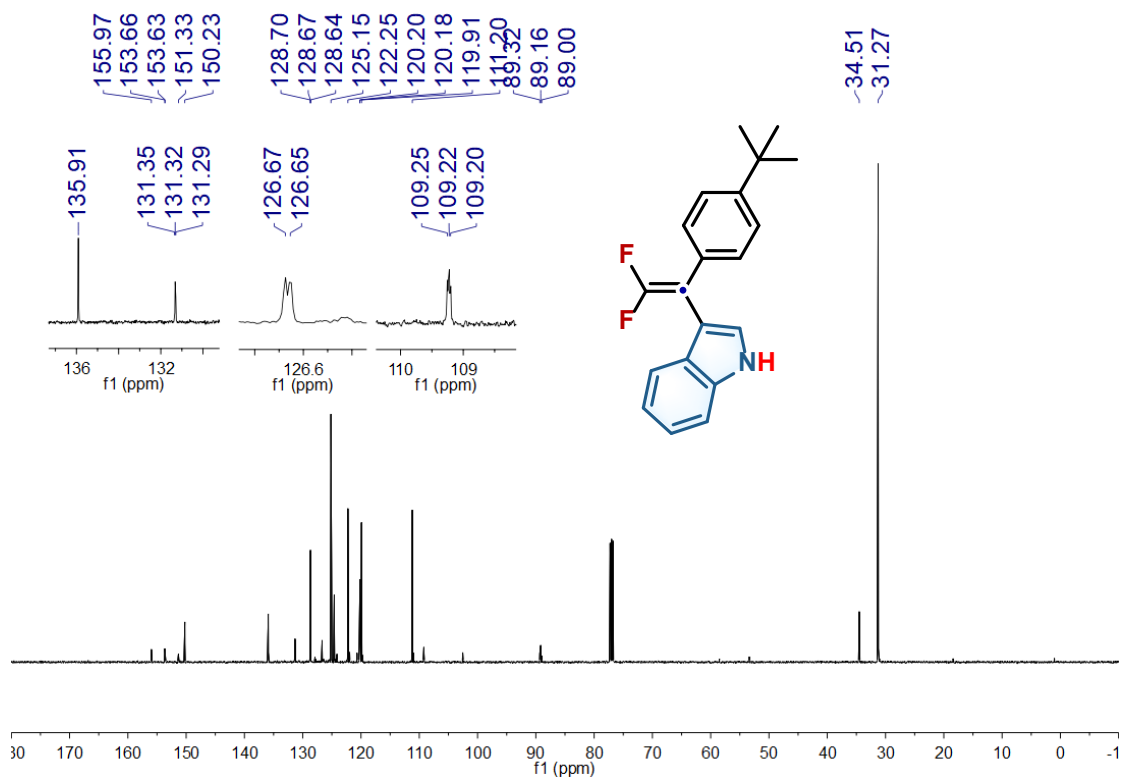
Supplementary Fig. 215. ¹³C NMR (150 MHz, CDCl₃) spectrum of 72



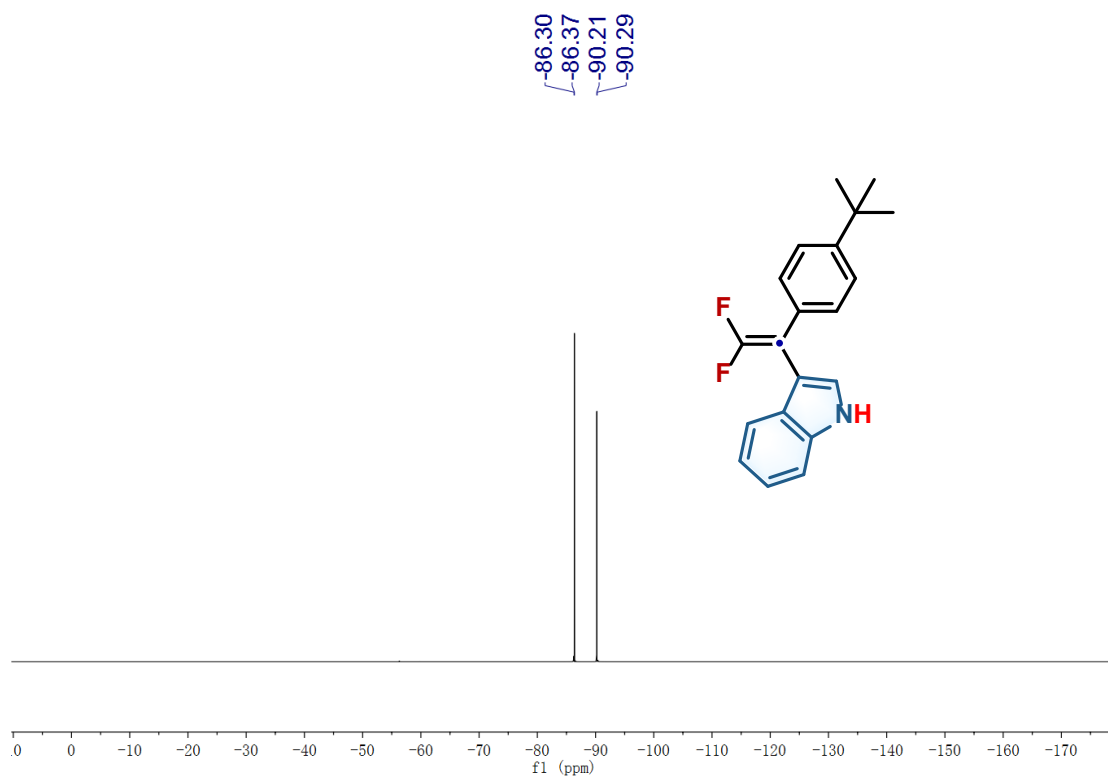
Supplementary Fig. 216. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 72



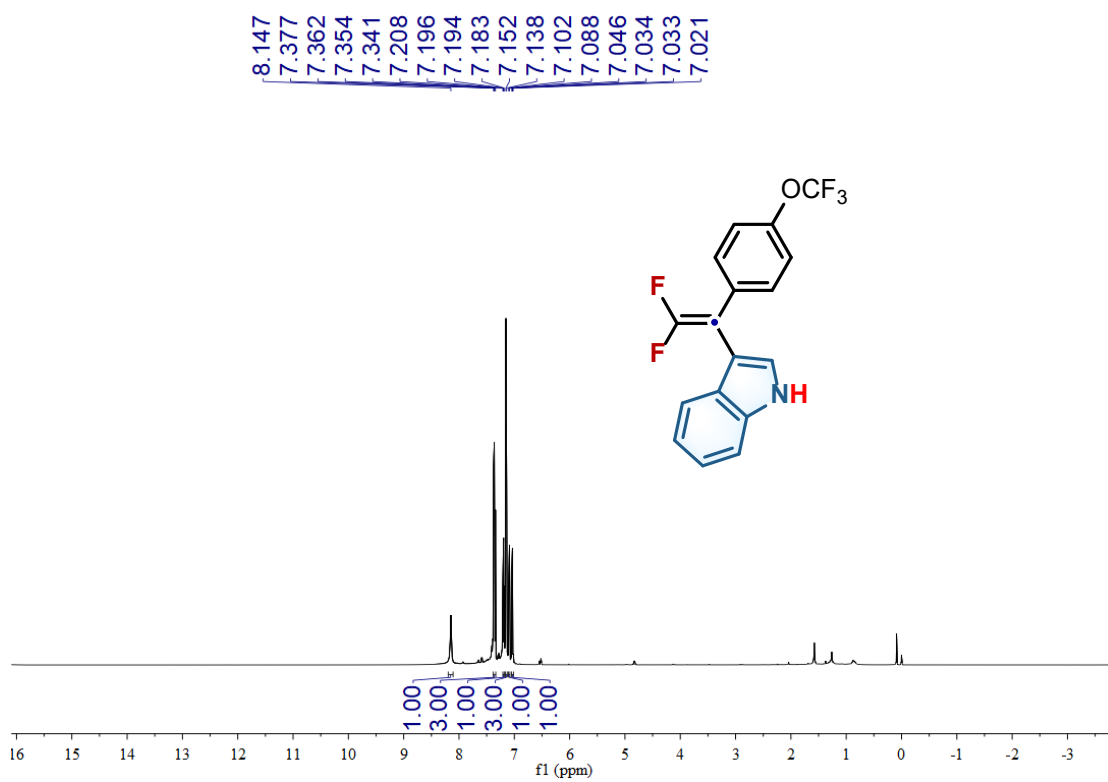
Supplementary Fig. 217. ¹H NMR (500 MHz, CDCl₃) spectrum of 73



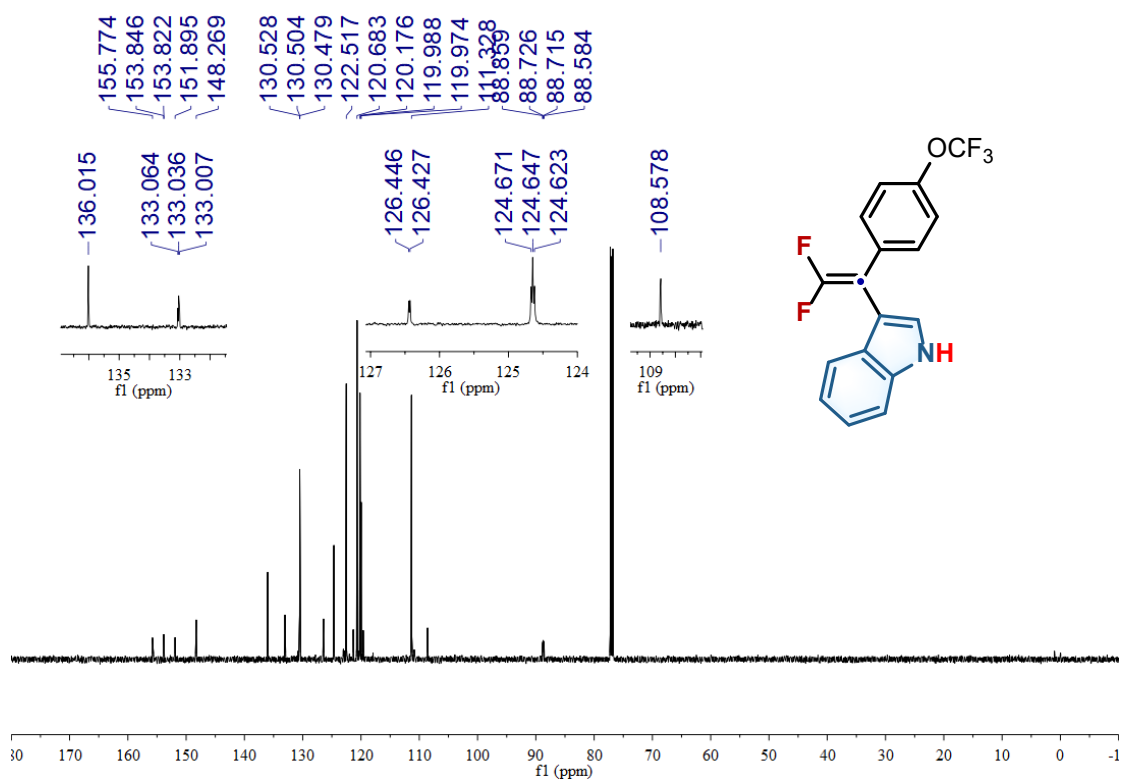
Supplementary Fig. 218. ¹³C NMR (125 MHz, CDCl₃) spectrum of 73



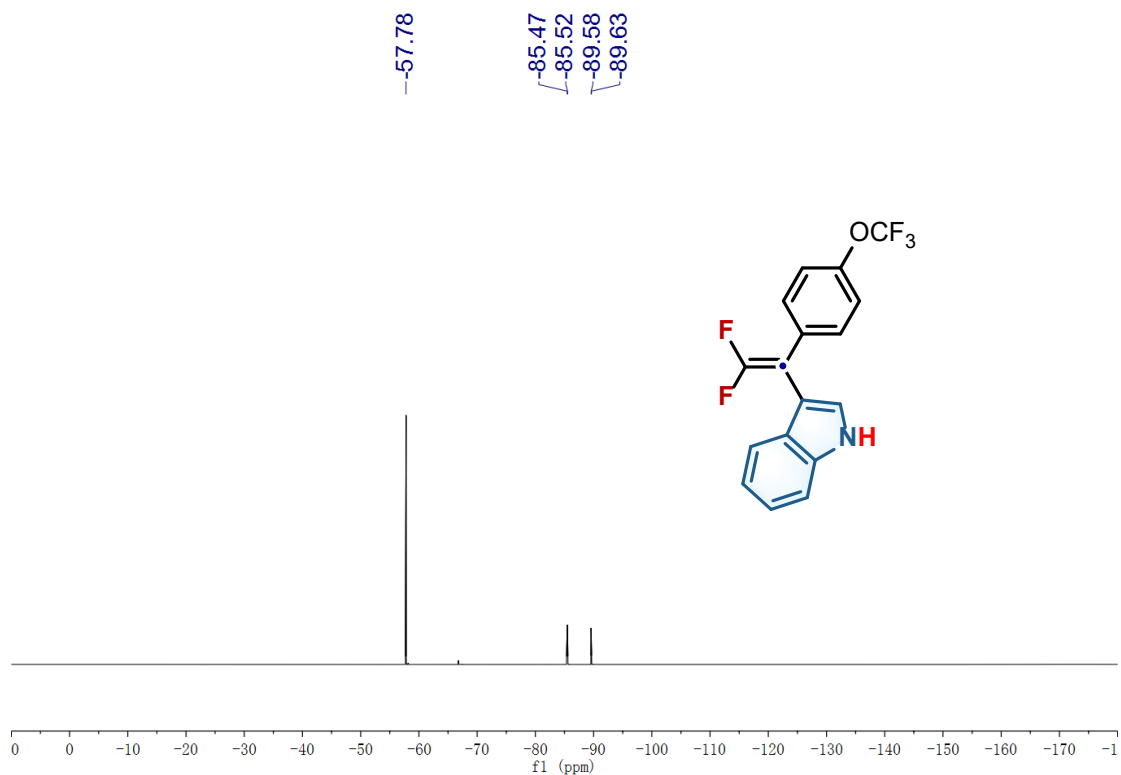
Supplementary Fig. 219. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 73



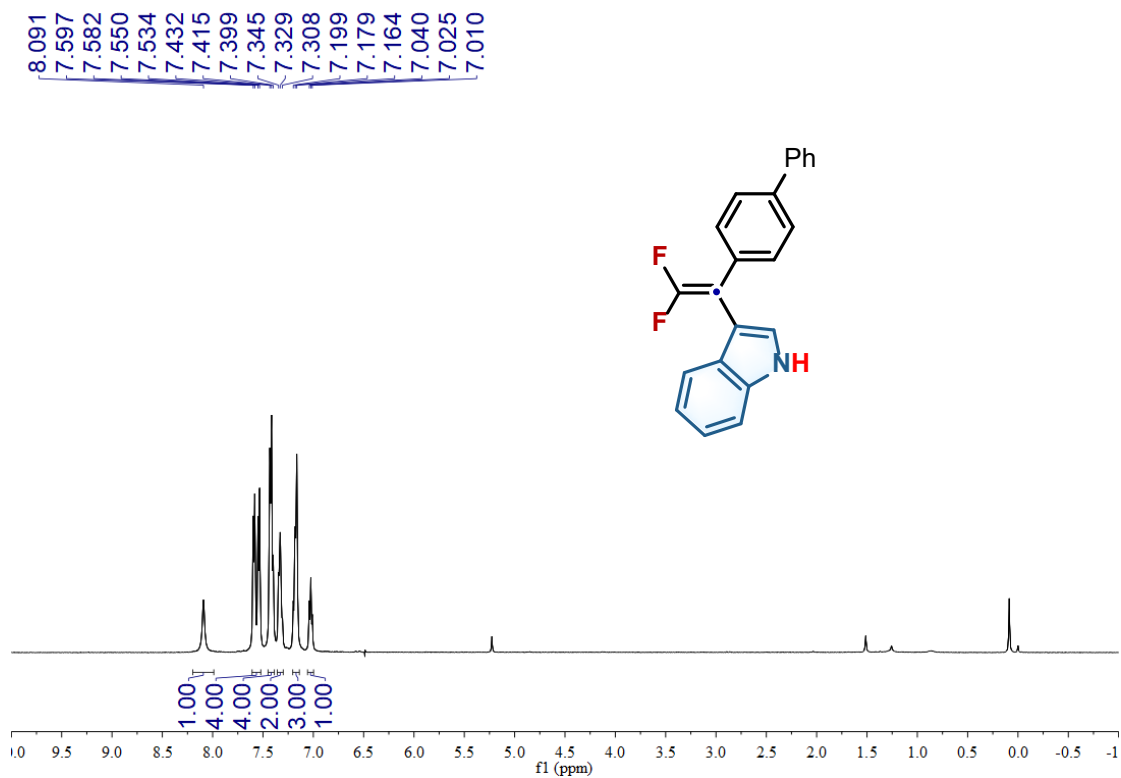
Supplementary Fig. 220. ¹H NMR (600 MHz, CDCl₃) spectrum of 74



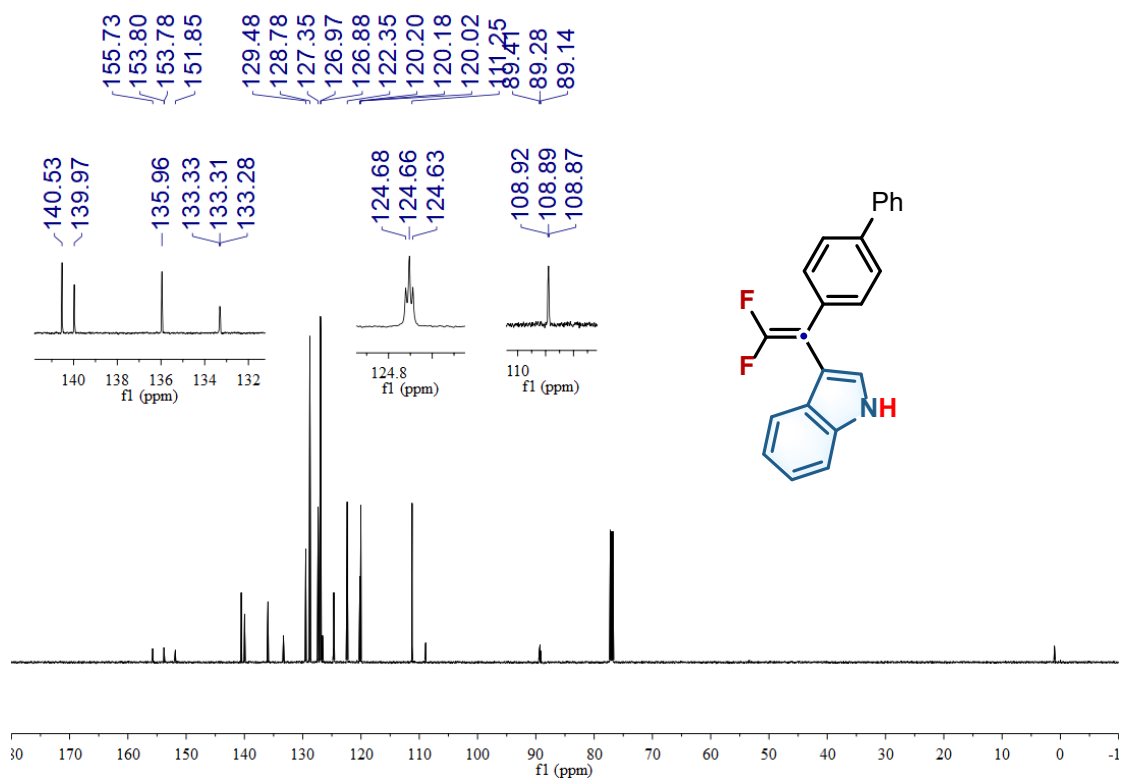
Supplementary Fig. 221. ¹³C NMR (150 MHz, CDCl₃) spectrum of 74



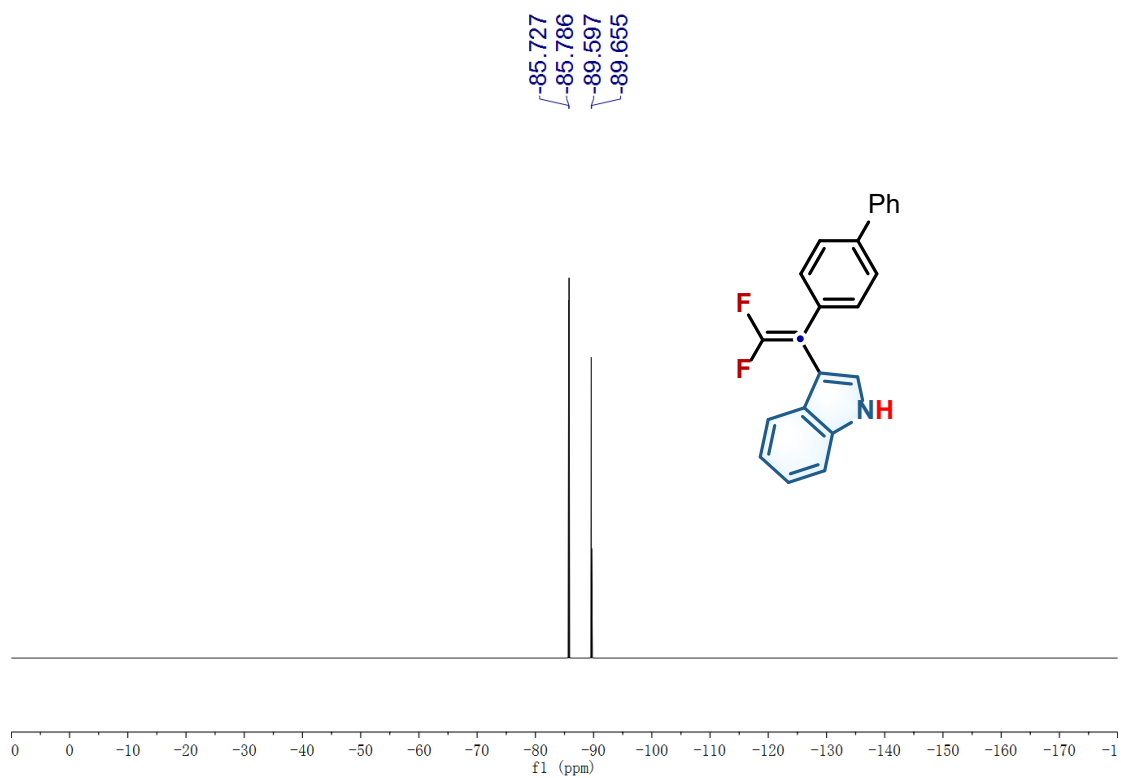
Supplementary Fig. 222. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 74



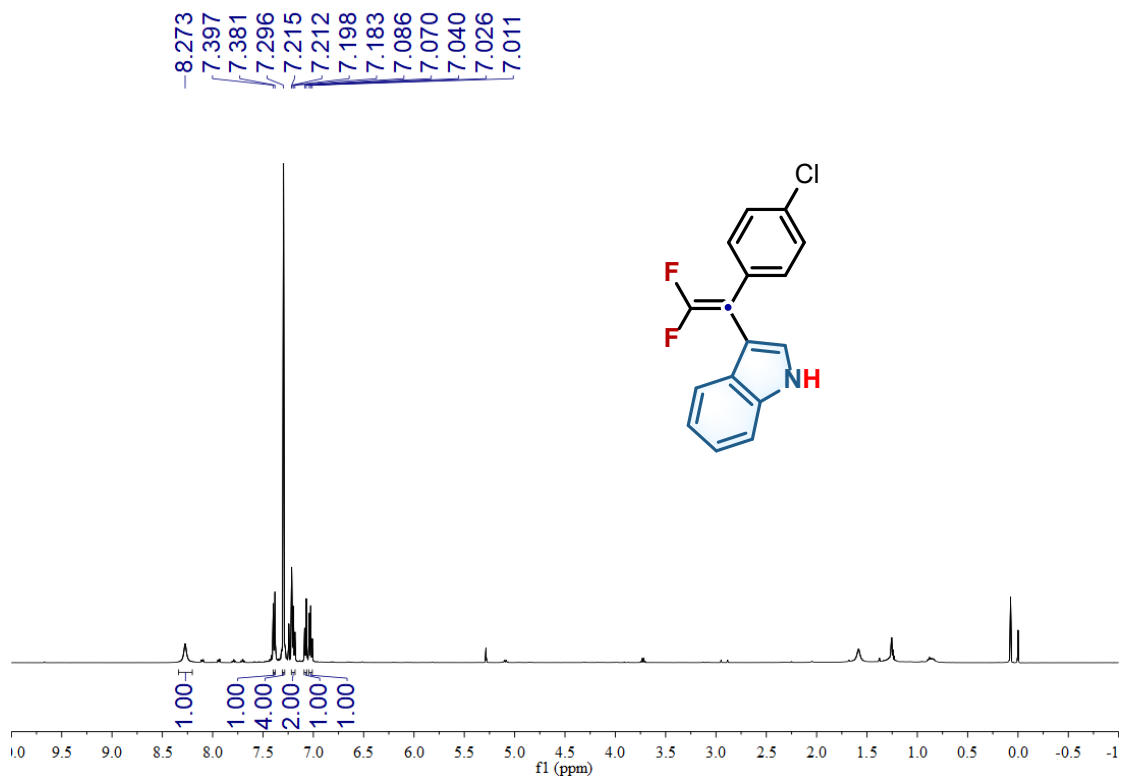
Supplementary Fig. 223. ¹H NMR (500 MHz, CDCl₃) spectrum of 75



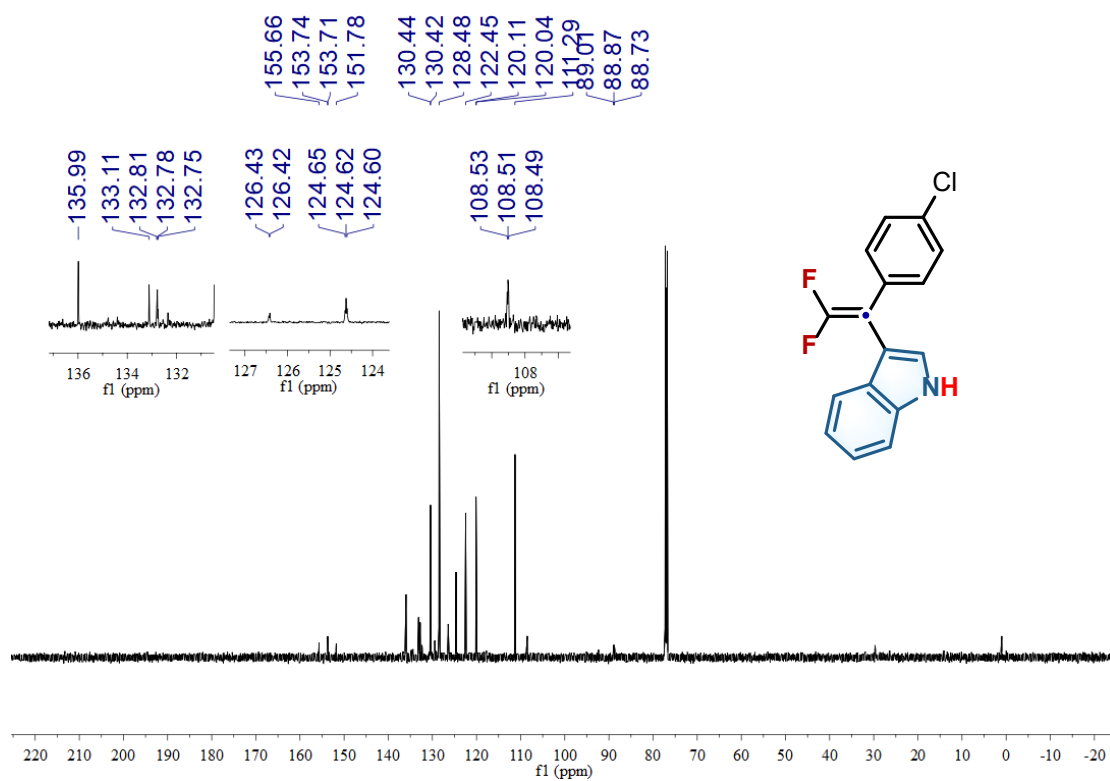
Supplementary Fig. 224. ¹³C NMR (150 MHz, CDCl₃) spectrum of 75



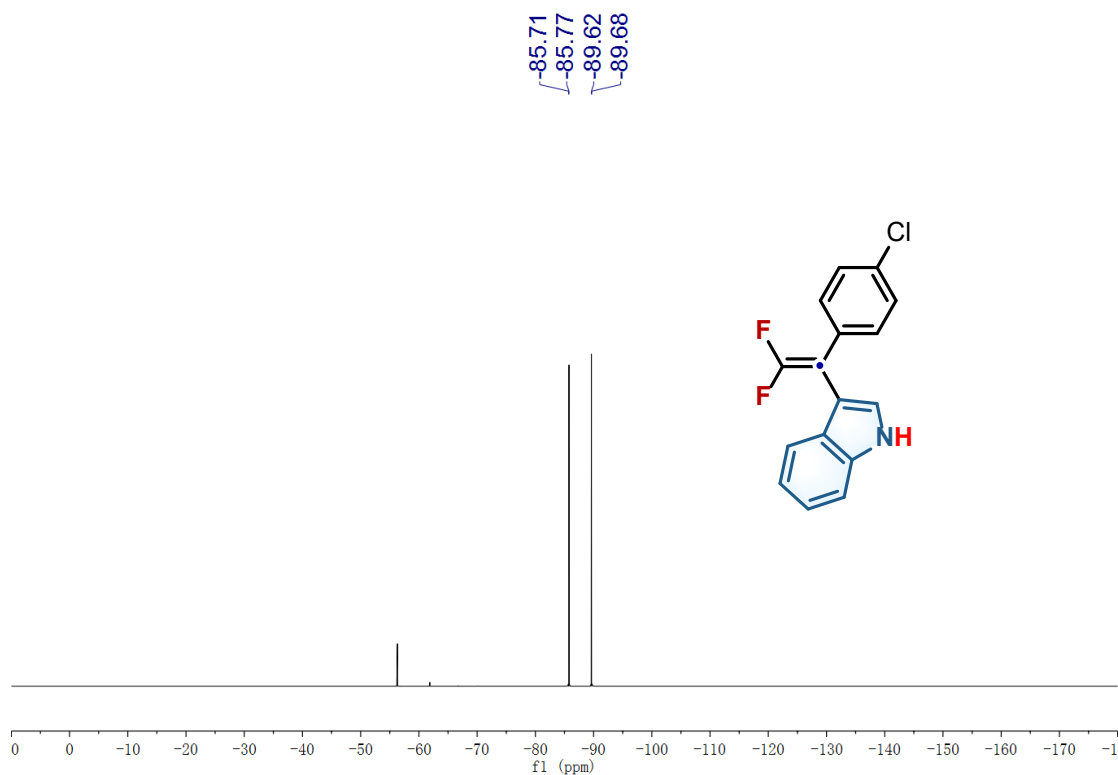
Supplementary Fig. 225. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 75



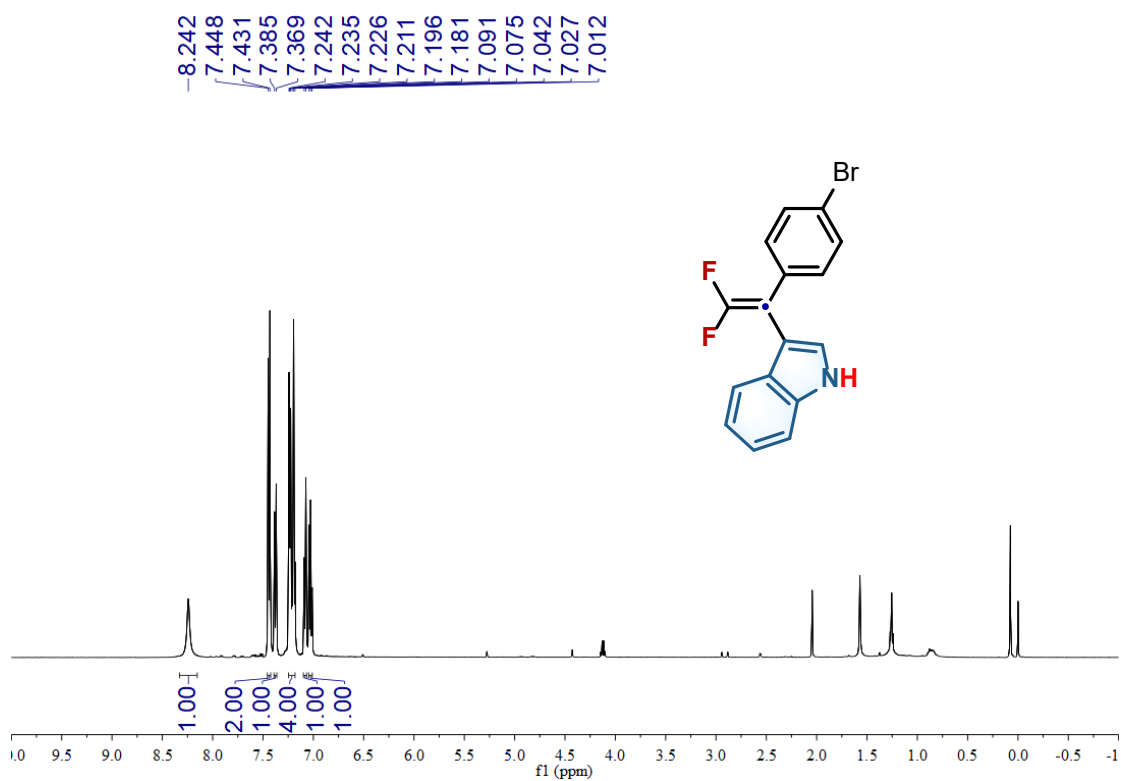
Supplementary Fig. 226. ¹H NMR (500 MHz, CDCl₃) spectrum of 76



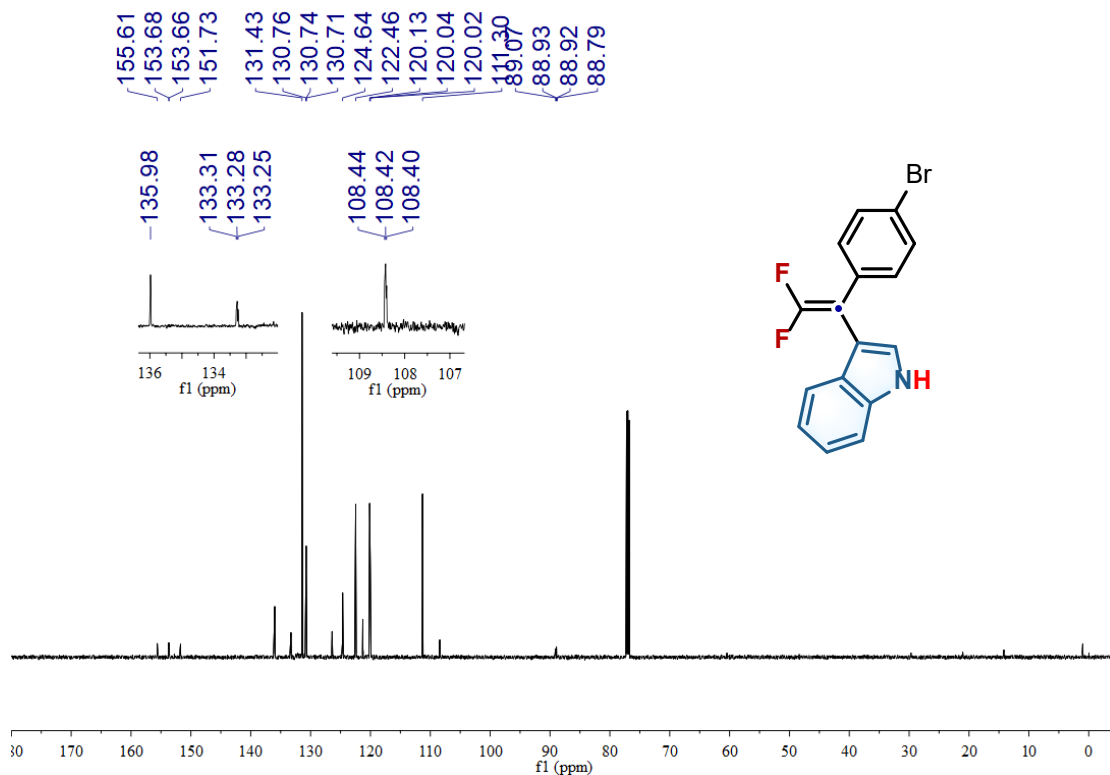
Supplementary Fig. 227. ¹³C NMR (150 MHz, CDCl₃) spectrum of 76



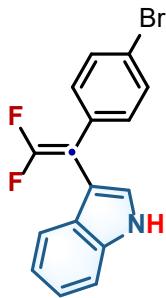
Supplementary Fig. 228. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 76



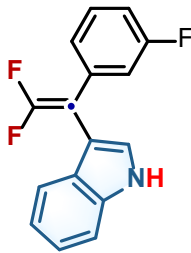
Supplementary Fig. 229. ¹H NMR (500 MHz, CDCl₃) spectrum of 77



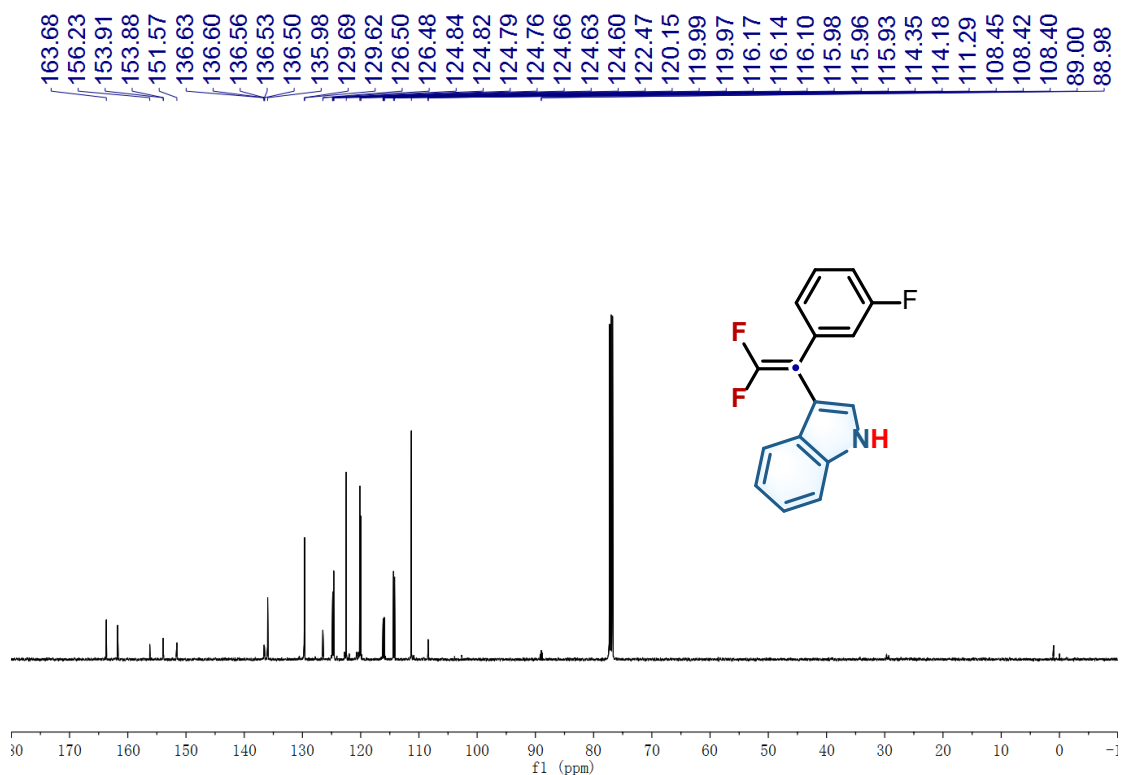
Supplementary Fig. 230. ¹³C NMR (150 MHz, CDCl₃) spectrum of 77



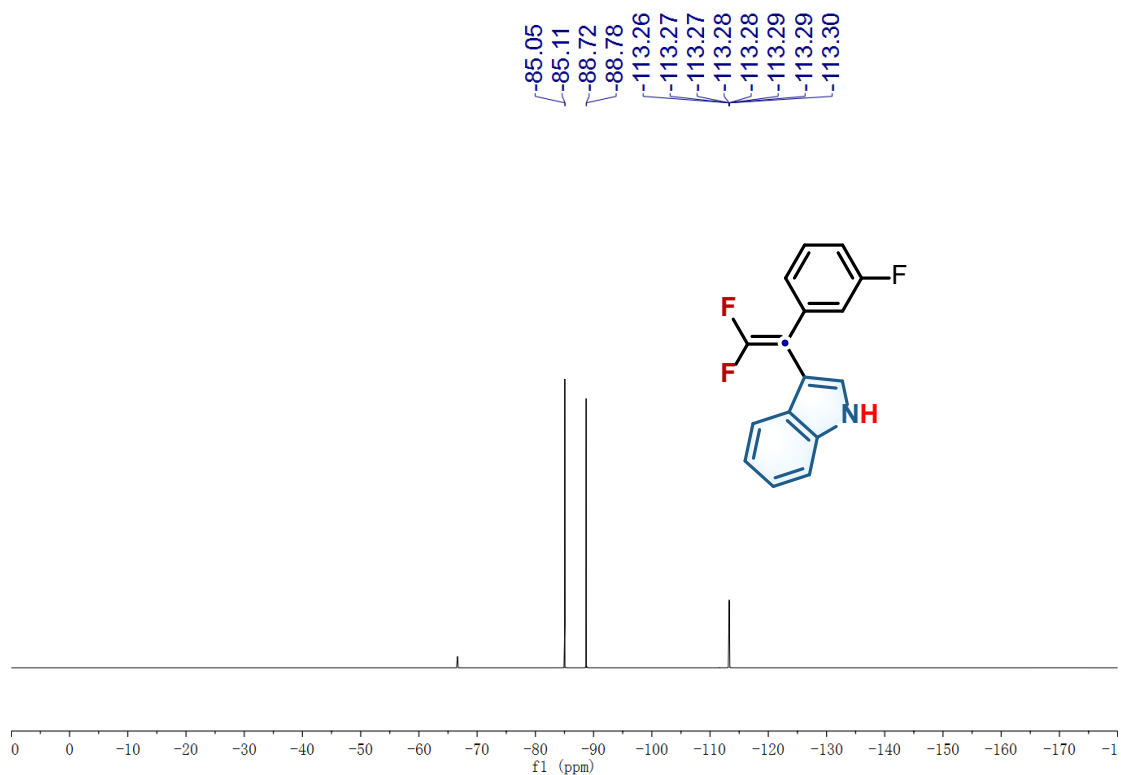
–8.236
7.394
7.378
7.297
7.284
7.281
7.269
7.265
7.253
7.217
7.215
7.211
7.209
7.204
7.202
7.187
7.185
7.166
7.164
7.150
7.148
7.121
7.105
7.096
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7.076
7.074
7.050
7.048
7.034
7.019
6.996
6.979
6.975



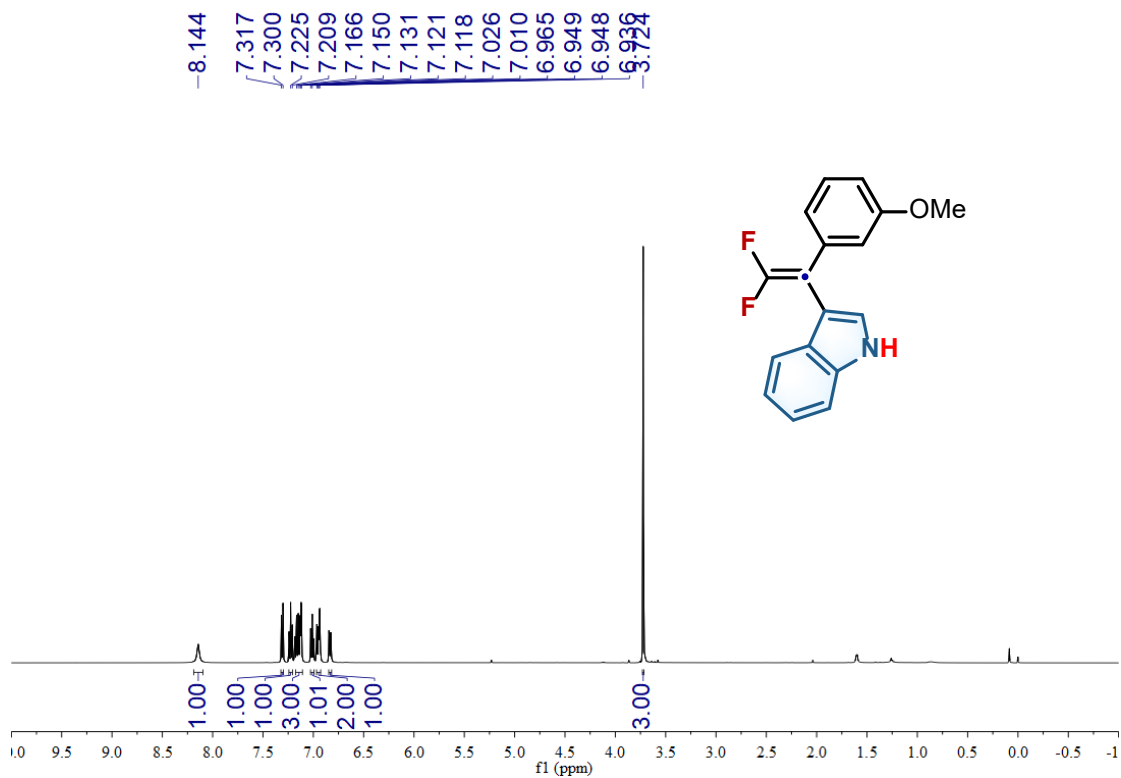
S264



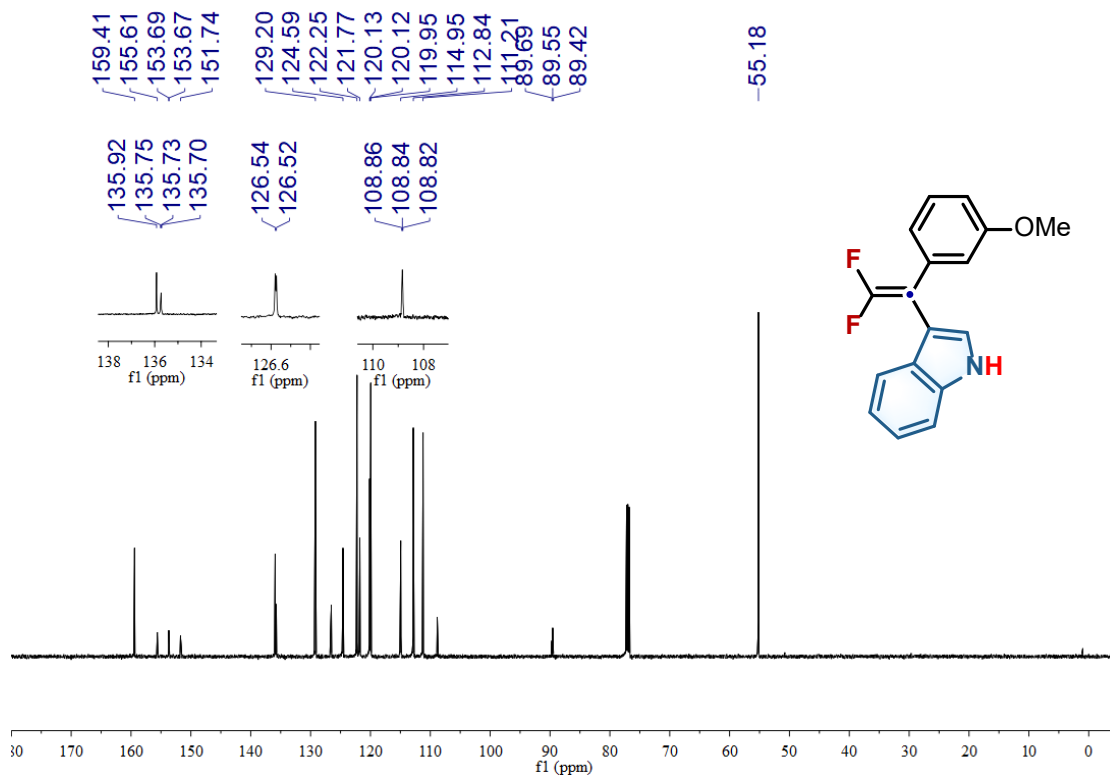
Supplementary Fig. 233. ¹³C NMR (125 MHz, CDCl₃) spectrum of 78



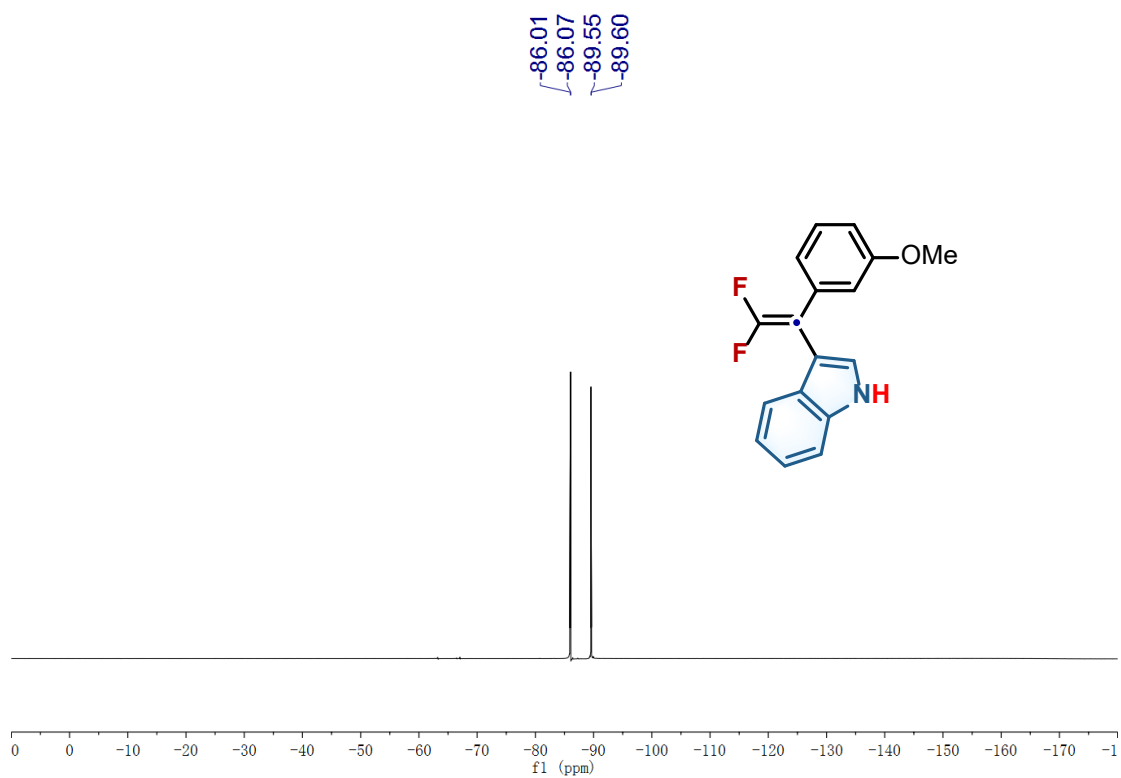
Supplementary Fig. 234. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 78



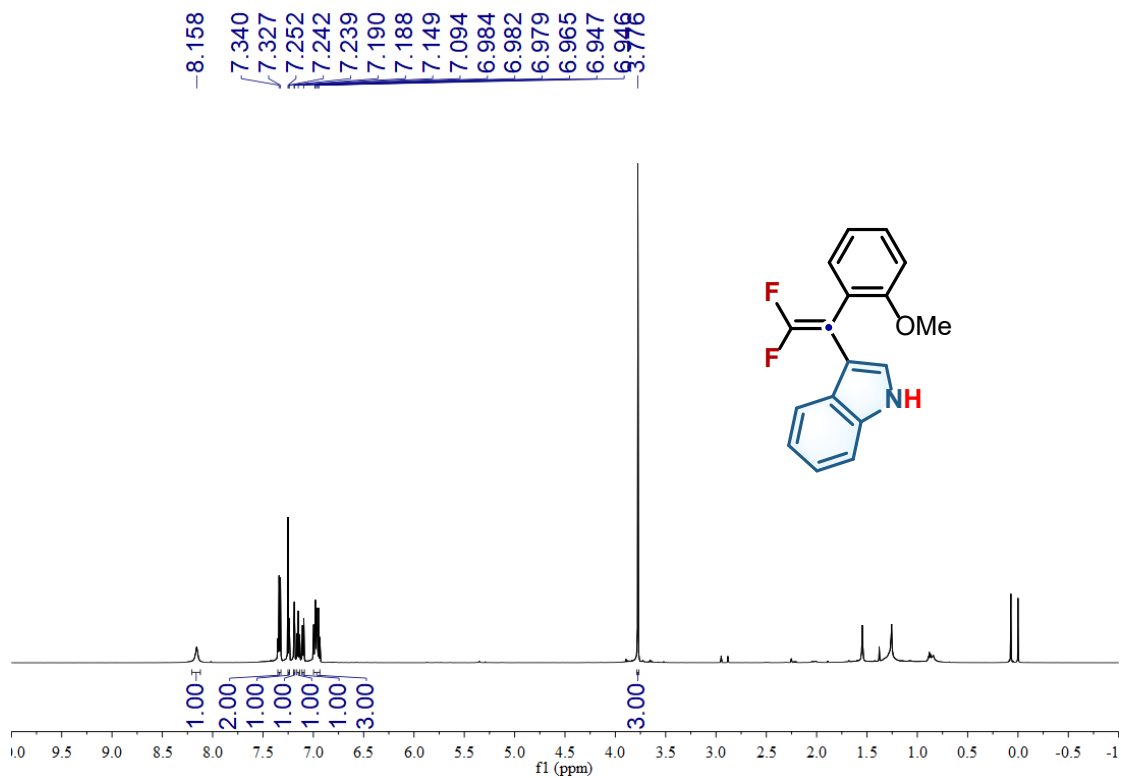
Supplementary Fig. 235. ¹H NMR (500 MHz, CDCl₃) spectrum of 79



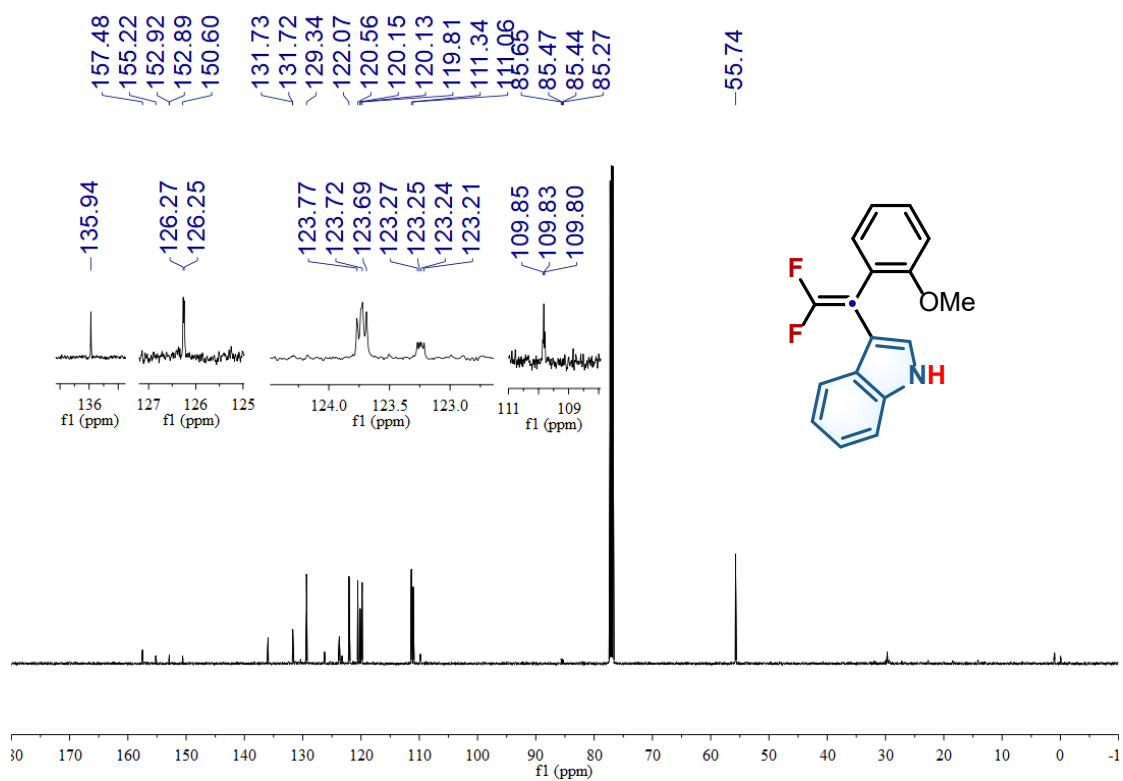
Supplementary Fig. 236. ¹³C NMR (150 MHz, CDCl₃) spectrum of 79



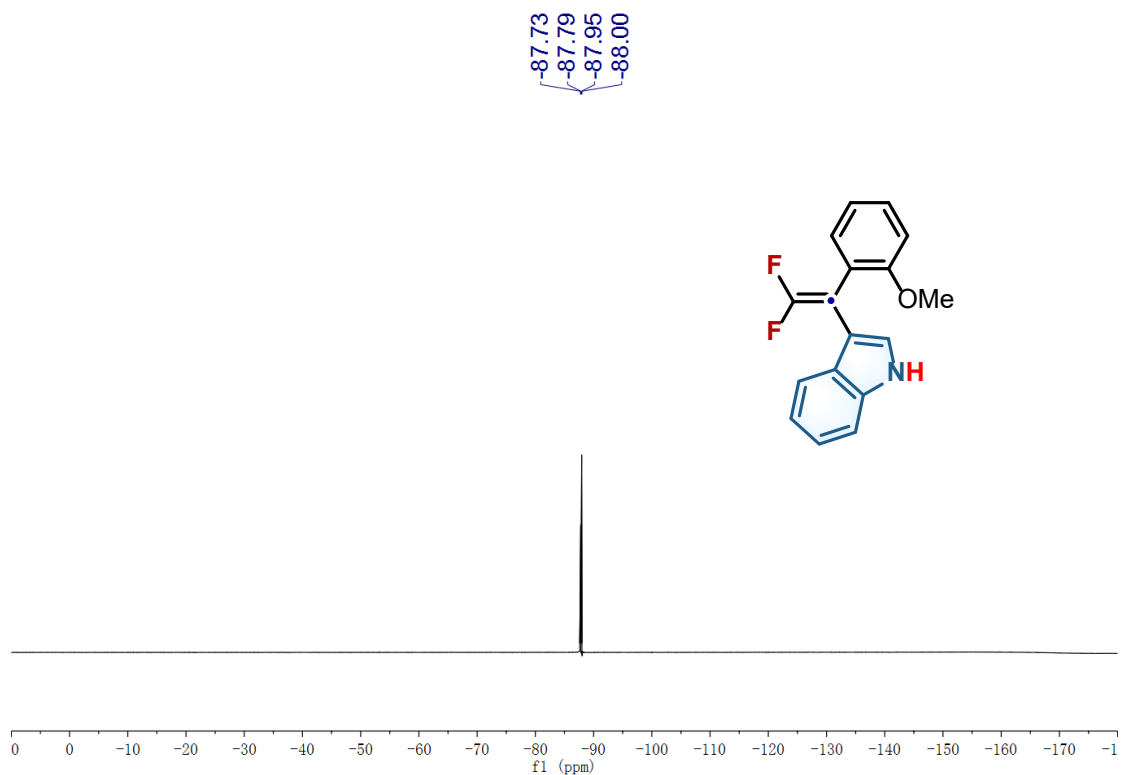
Supplementary Fig. 237. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 79



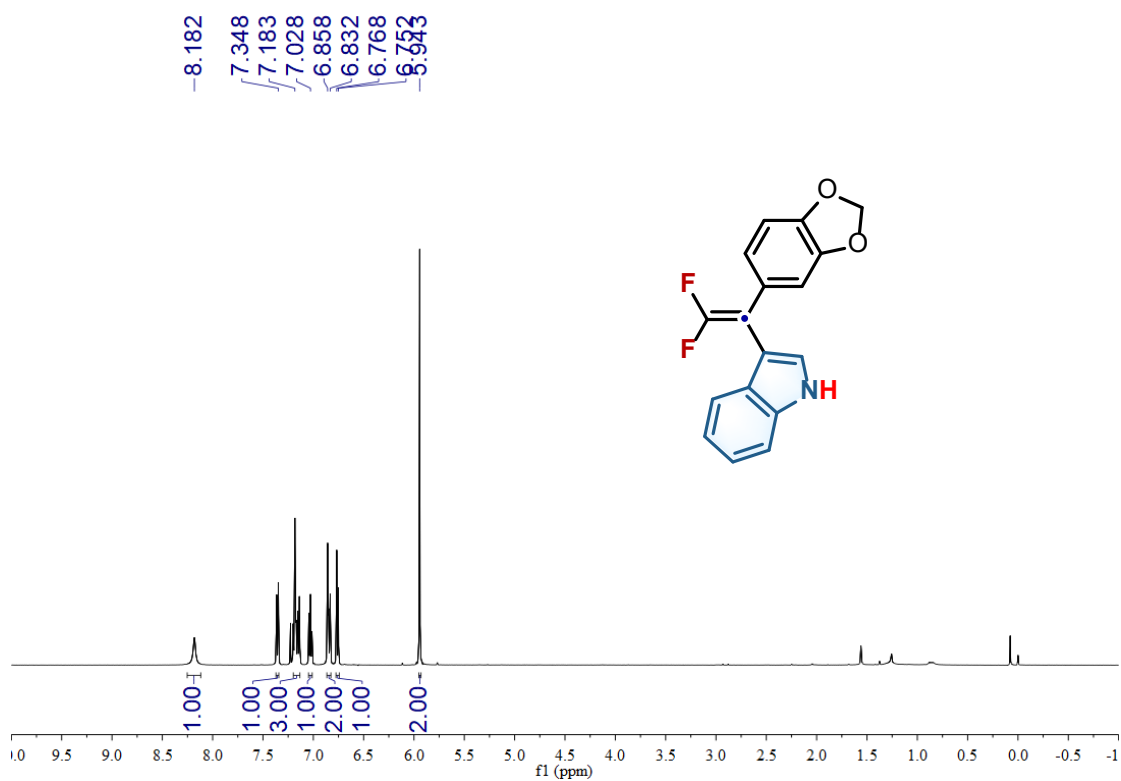
Supplementary Fig. 238. ¹H NMR (600 MHz, CDCl₃) spectrum of 80



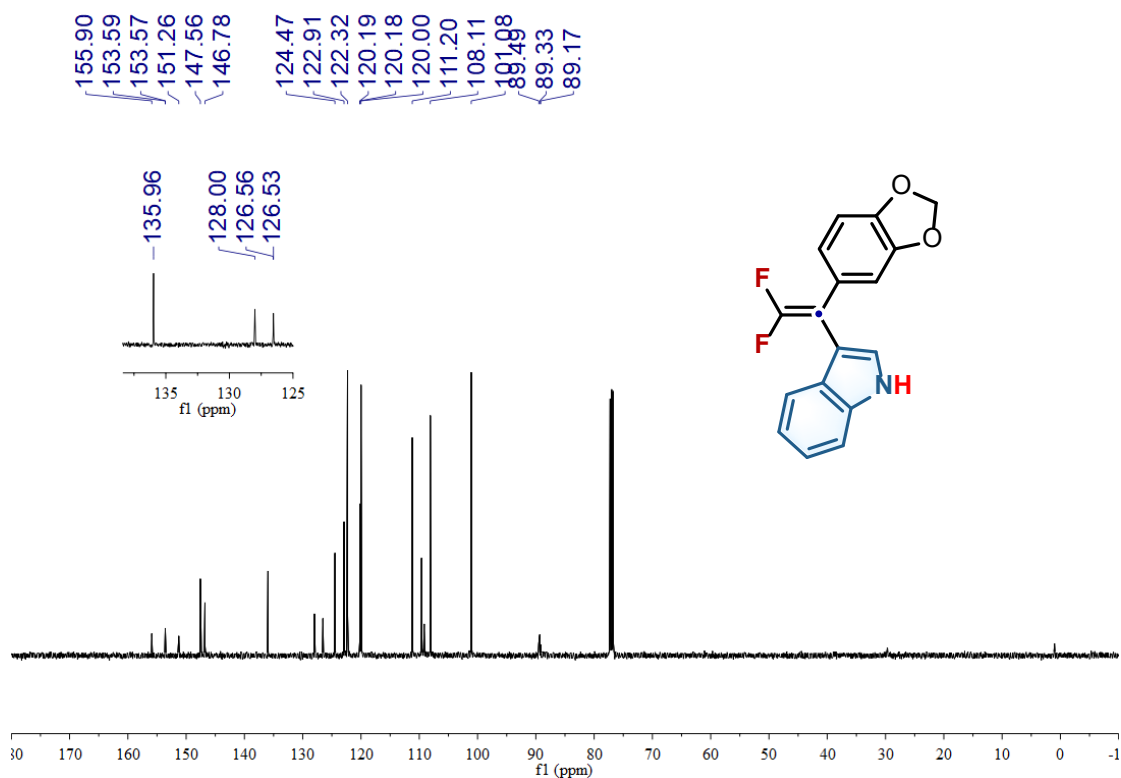
Supplementary Fig. 239. ¹³C NMR (125 MHz, CDCl₃) spectrum of **80**



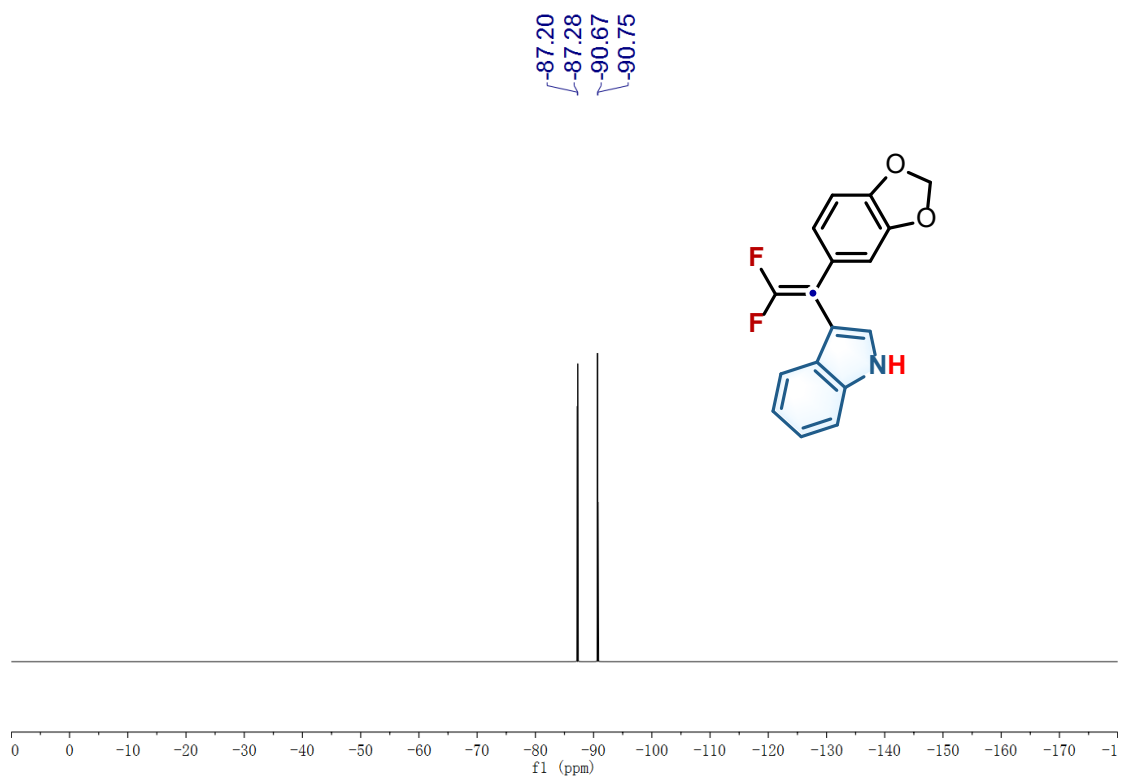
Supplementary Fig. 240. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **80**



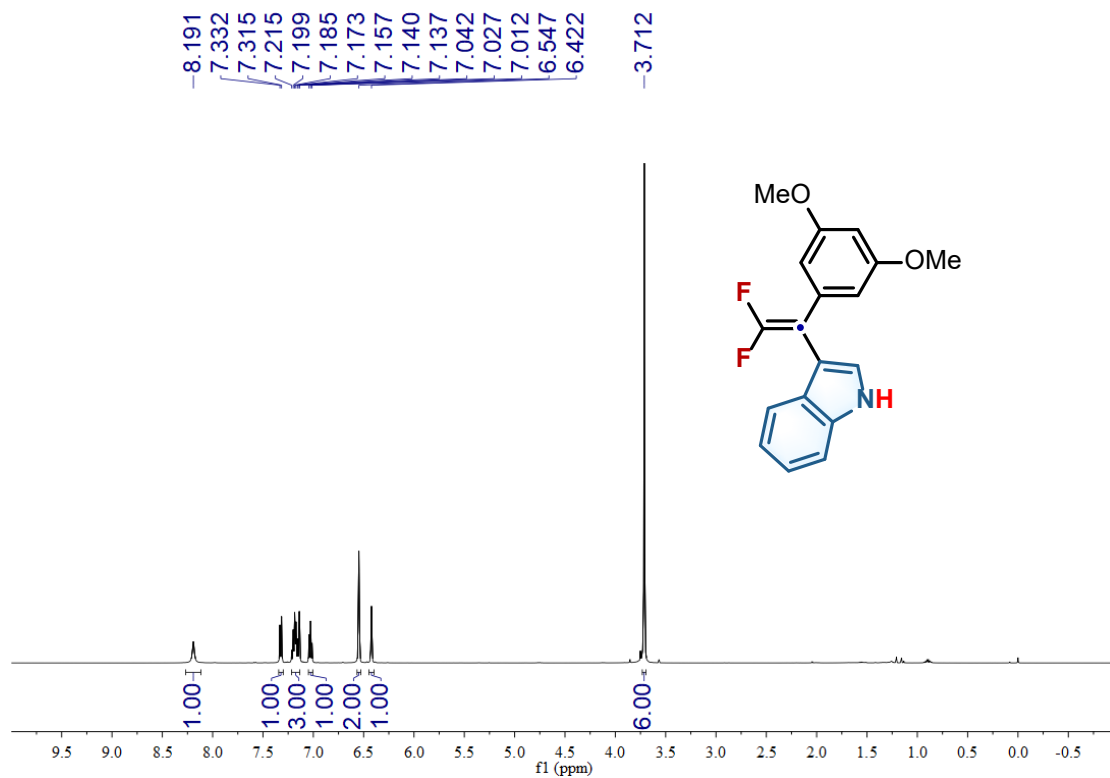
Supplementary Fig. 241. ¹H NMR (500 MHz, CDCl₃) spectrum of **81**



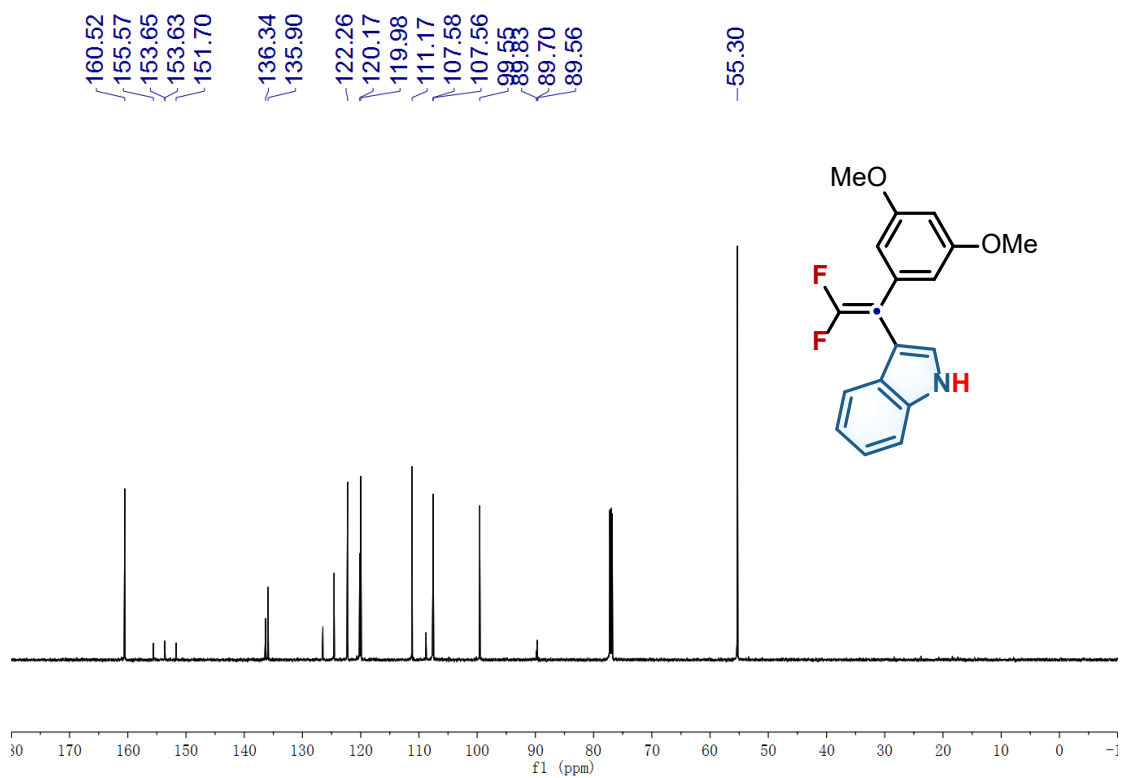
Supplementary Fig. 242. ¹³C NMR (125 MHz, CDCl₃) spectrum of **81**



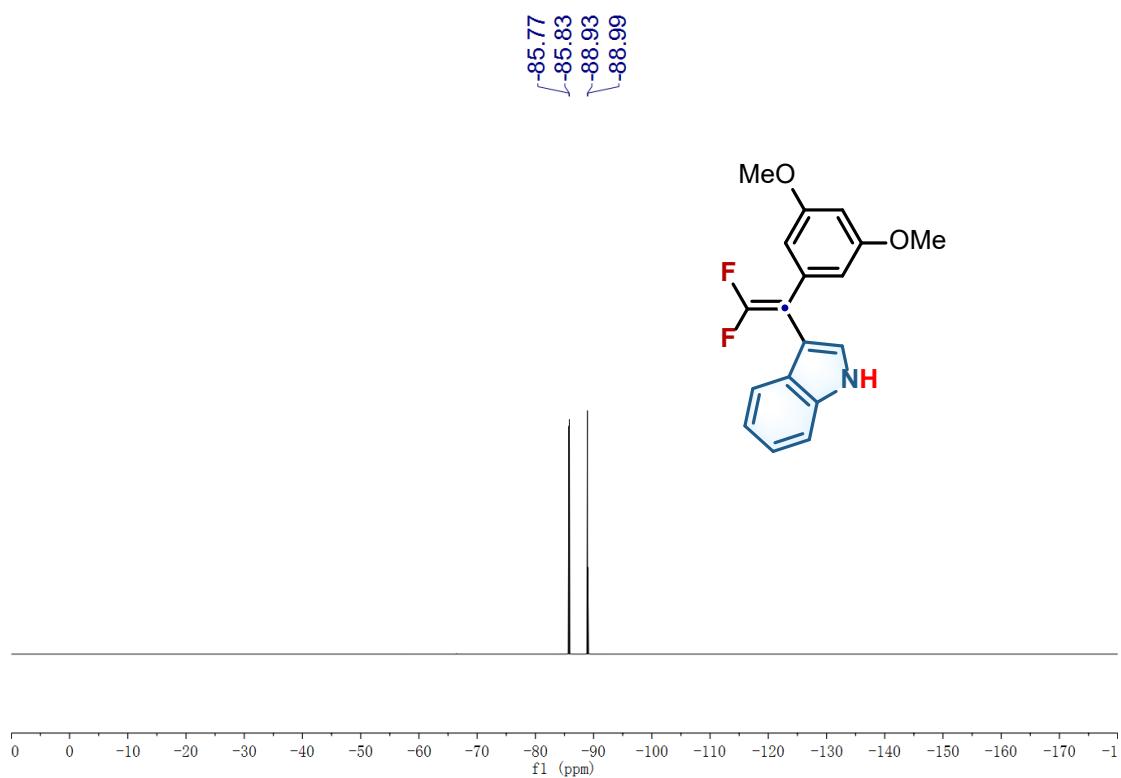
Supplementary Fig. 243. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **81**



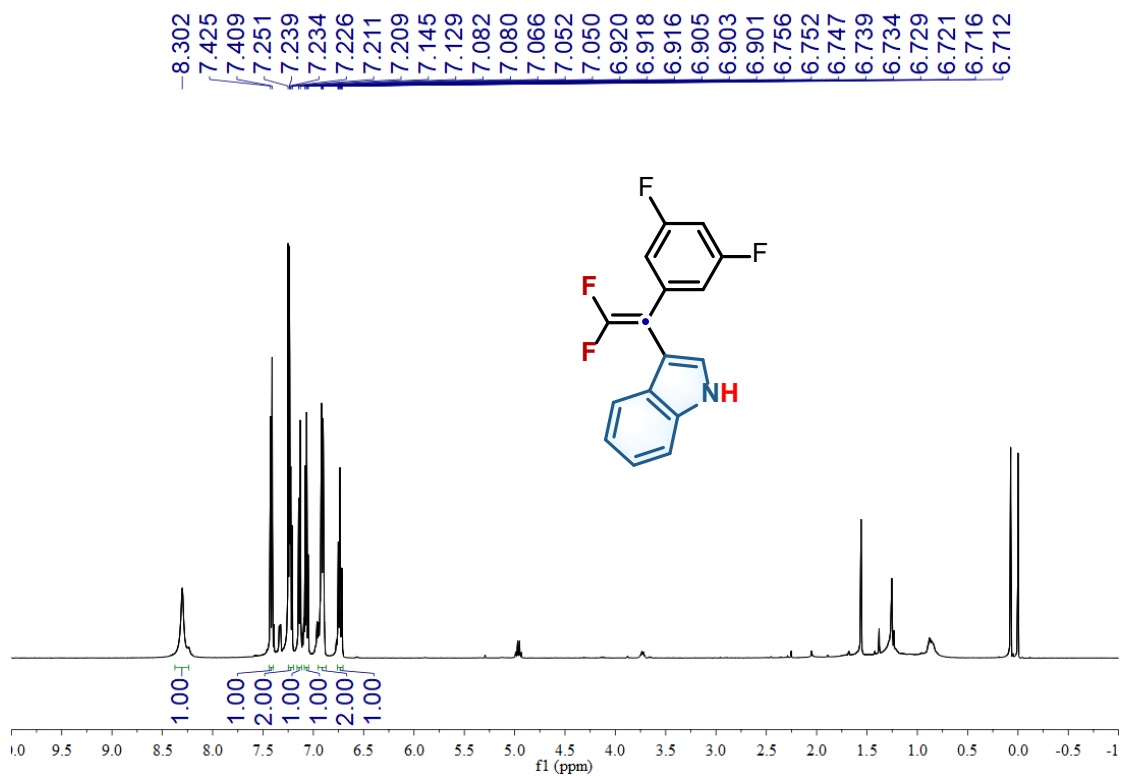
Supplementary Fig. 244. ¹H NMR (500 MHz, CDCl₃) spectrum of **82**



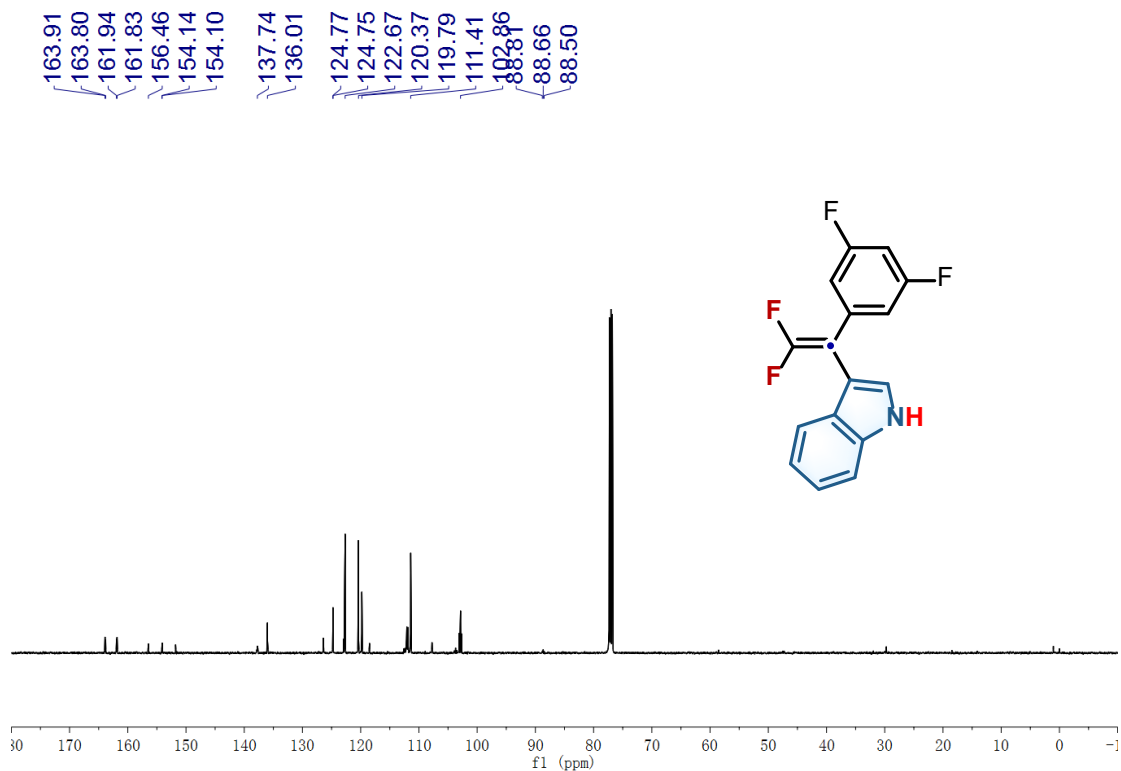
Supplementary Fig. 245. ¹³C NMR (150 MHz, CDCl₃) spectrum of **82**



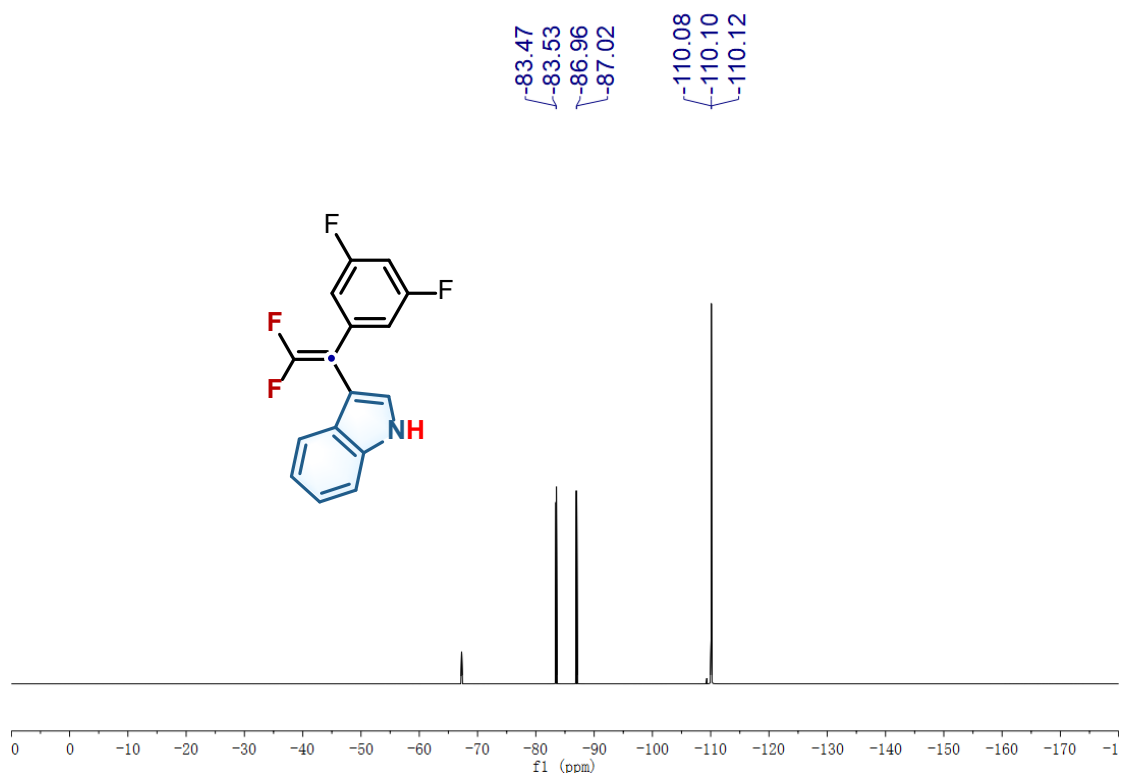
Supplementary Fig. 246. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **82**



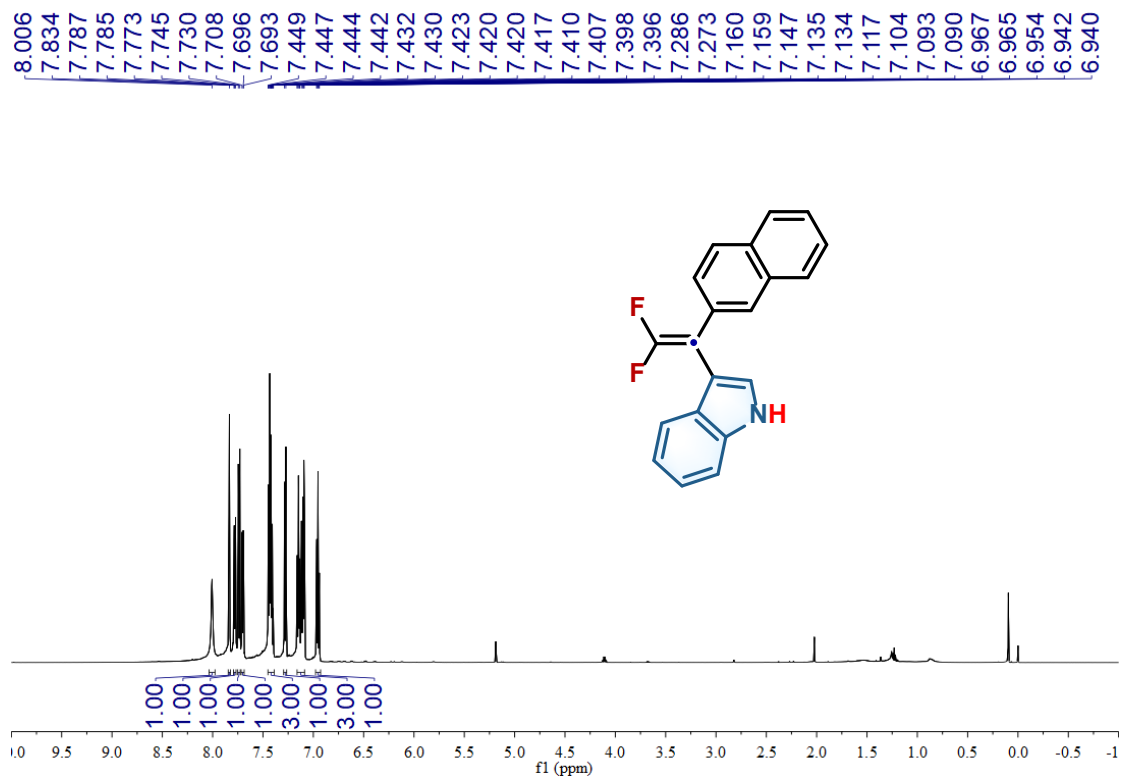
Supplementary Fig. 247. ¹H NMR (500 MHz, CDCl₃) spectrum of **83**



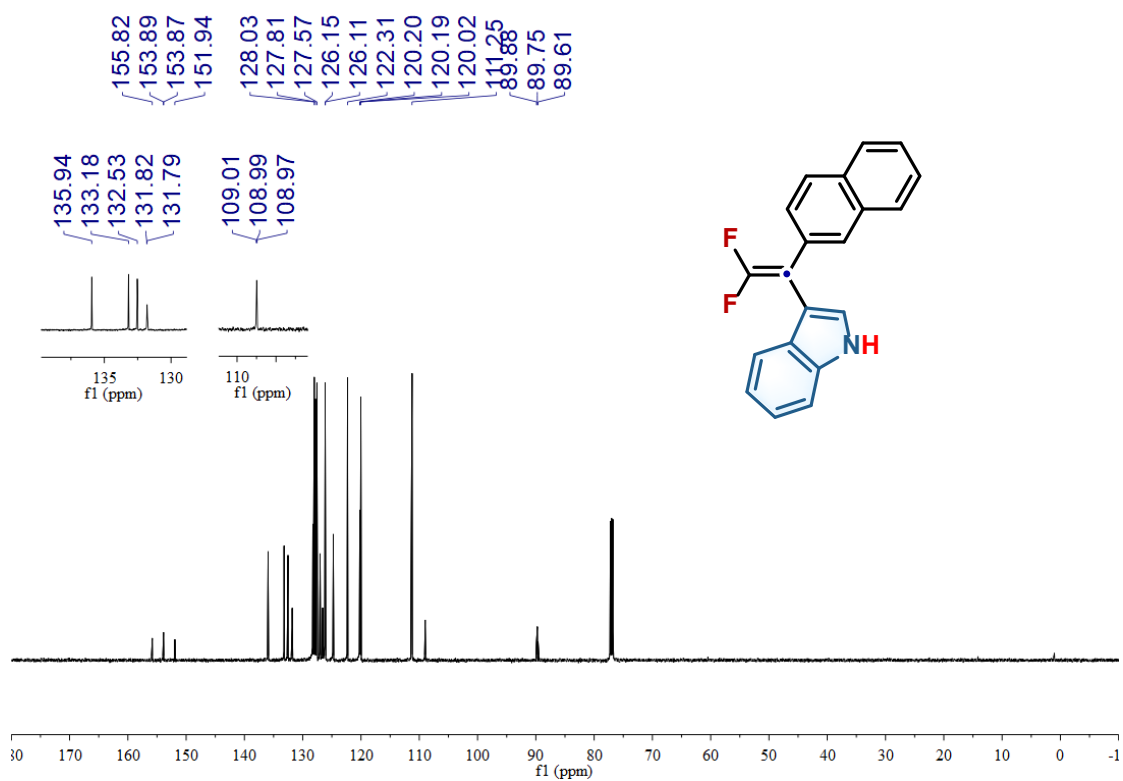
Supplementary Fig. 248. ¹³C NMR (125 MHz, CDCl₃) spectrum of **83**



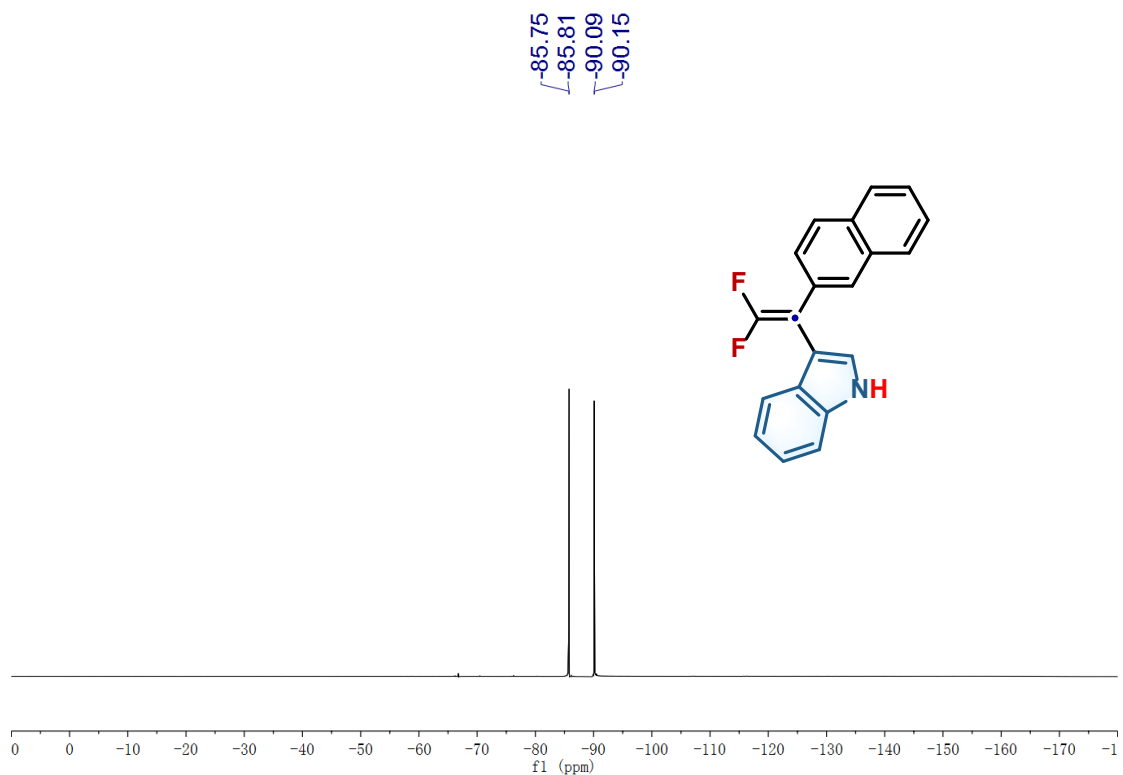
Supplementary Fig. 249. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **83**



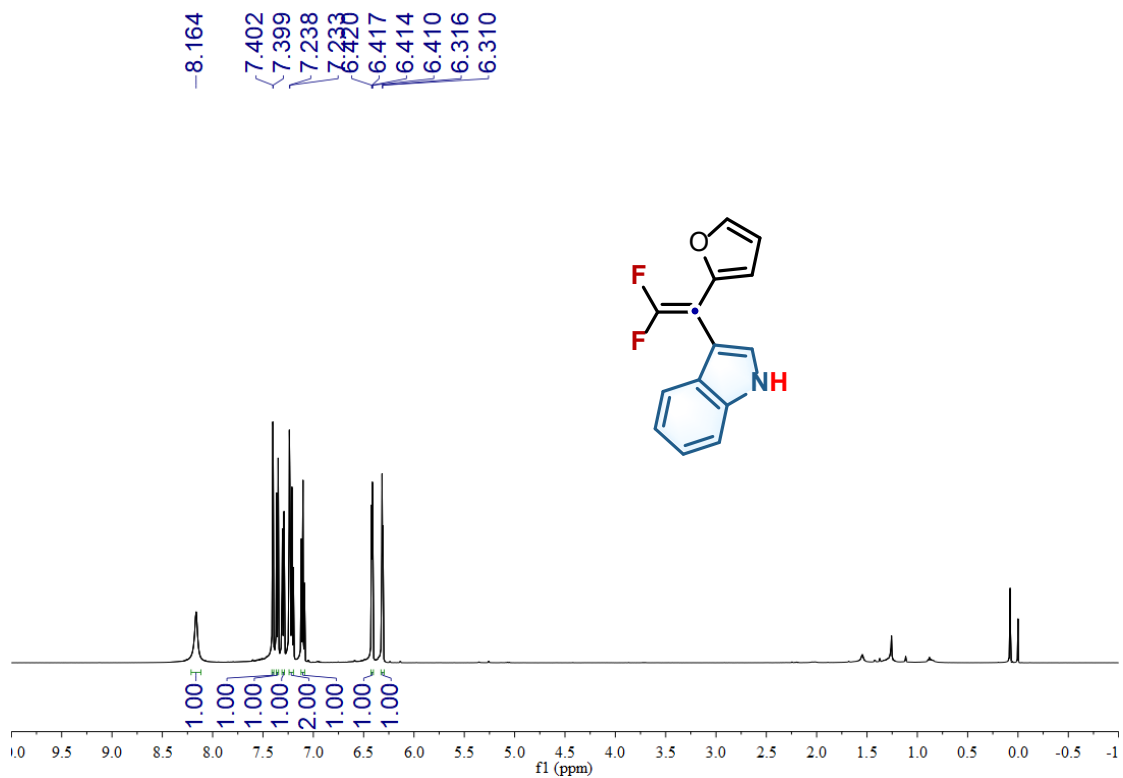
Supplementary Fig. 250. ^1H NMR (600 MHz, CDCl_3) spectrum of **84**



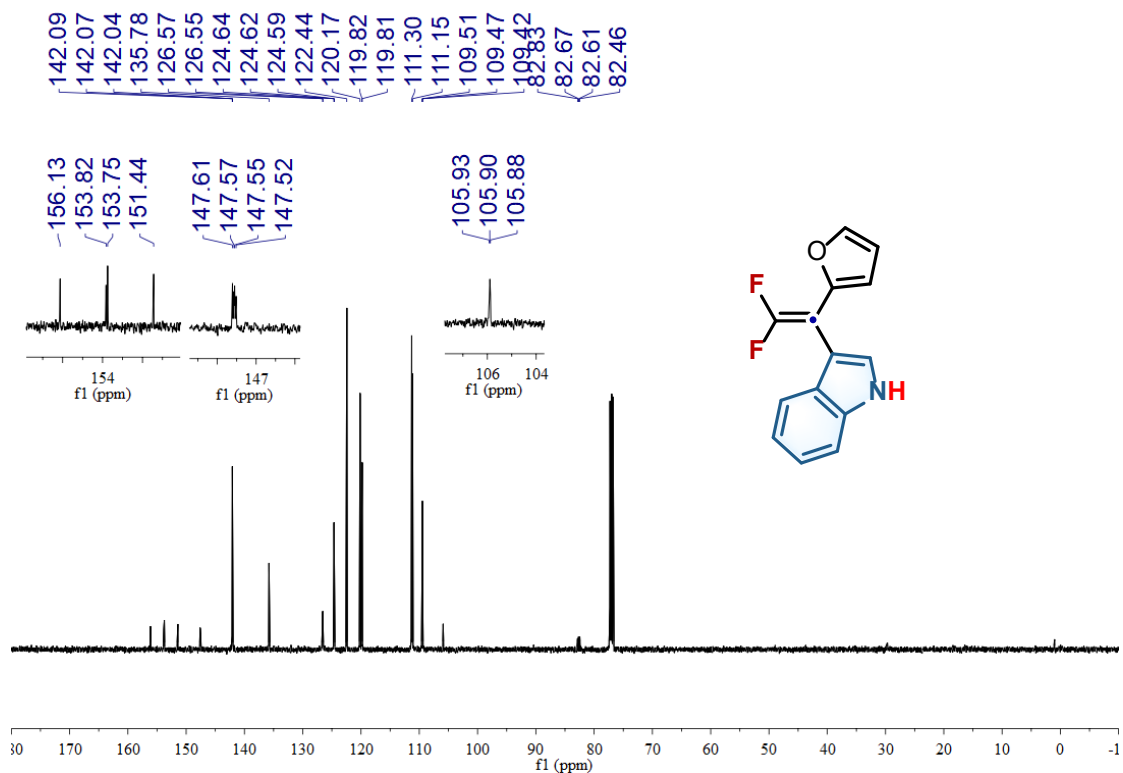
Supplementary Fig. 251. ¹³C NMR (150 MHz, CDCl₃) spectrum of **84**



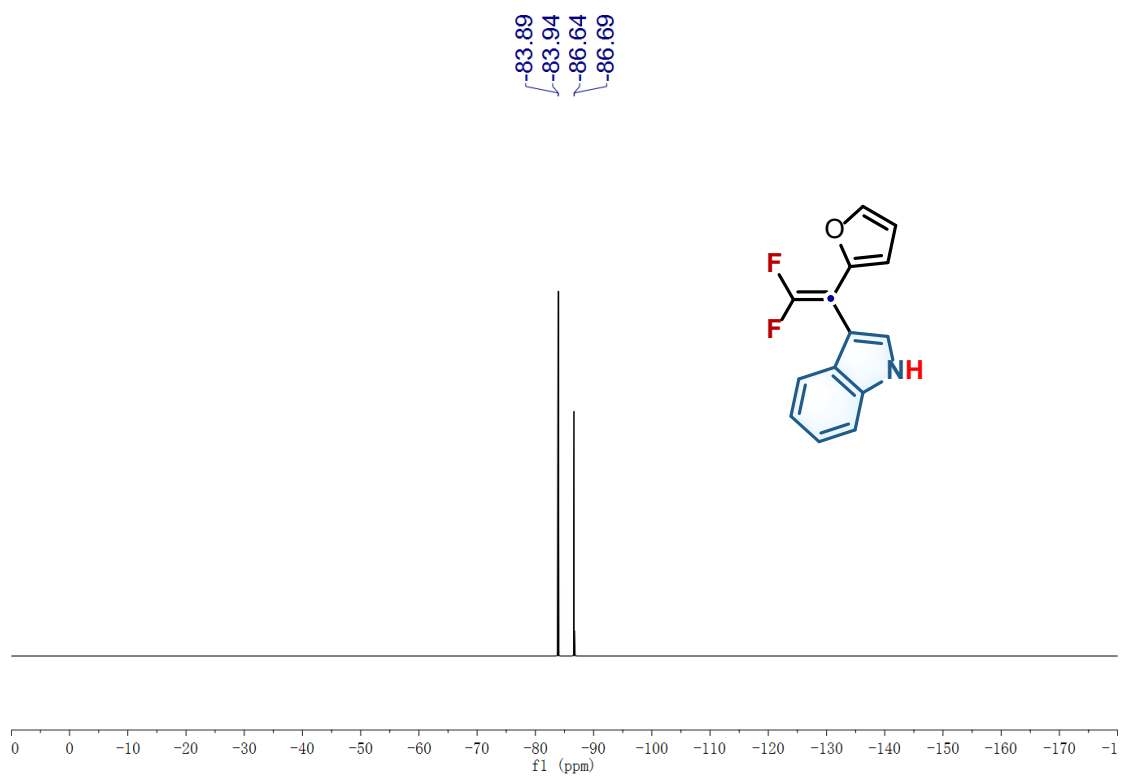
Supplementary Fig. 252. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **84**



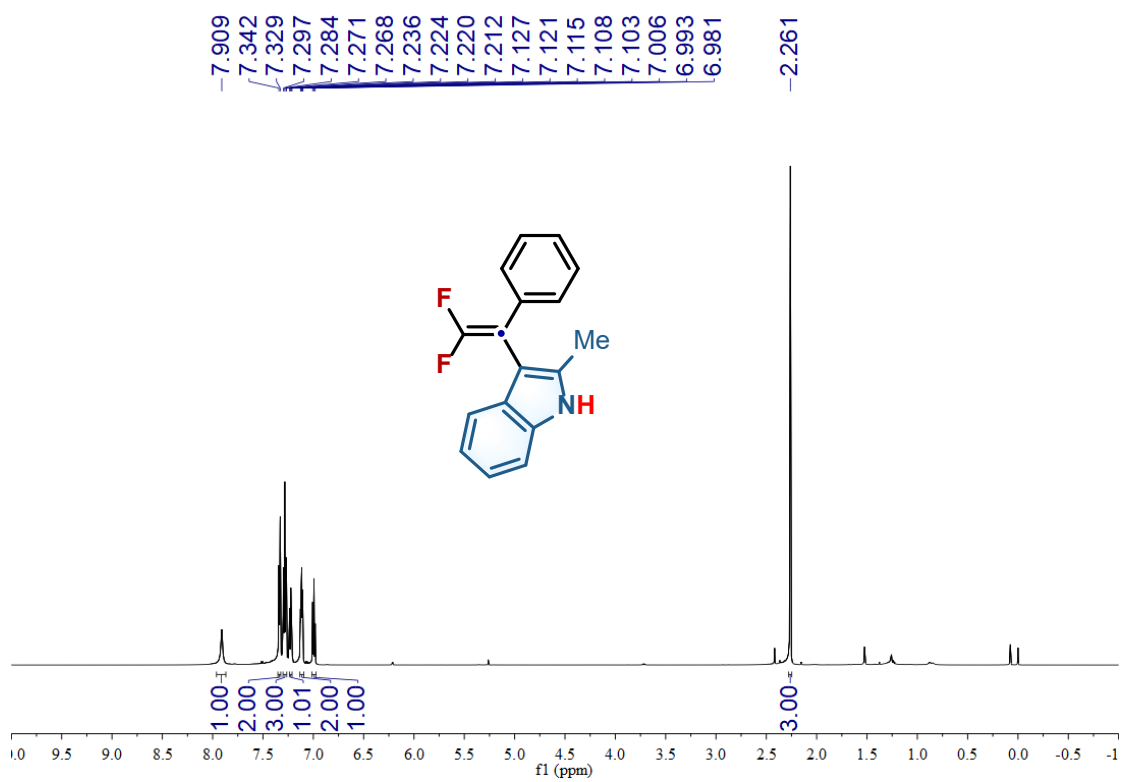
Supplementary Fig. 253. ¹H NMR (500 MHz, CDCl₃) spectrum of **85**



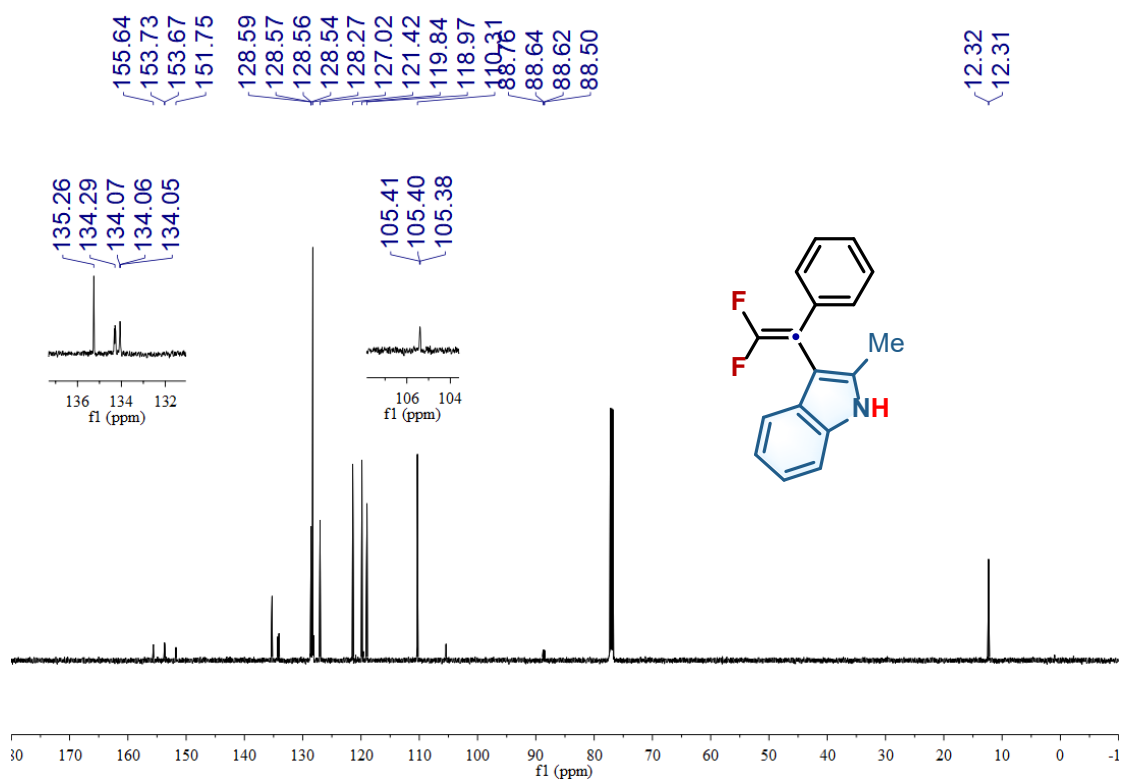
Supplementary Fig. 254. ¹³C NMR (125 MHz, CDCl₃) spectrum of **85**



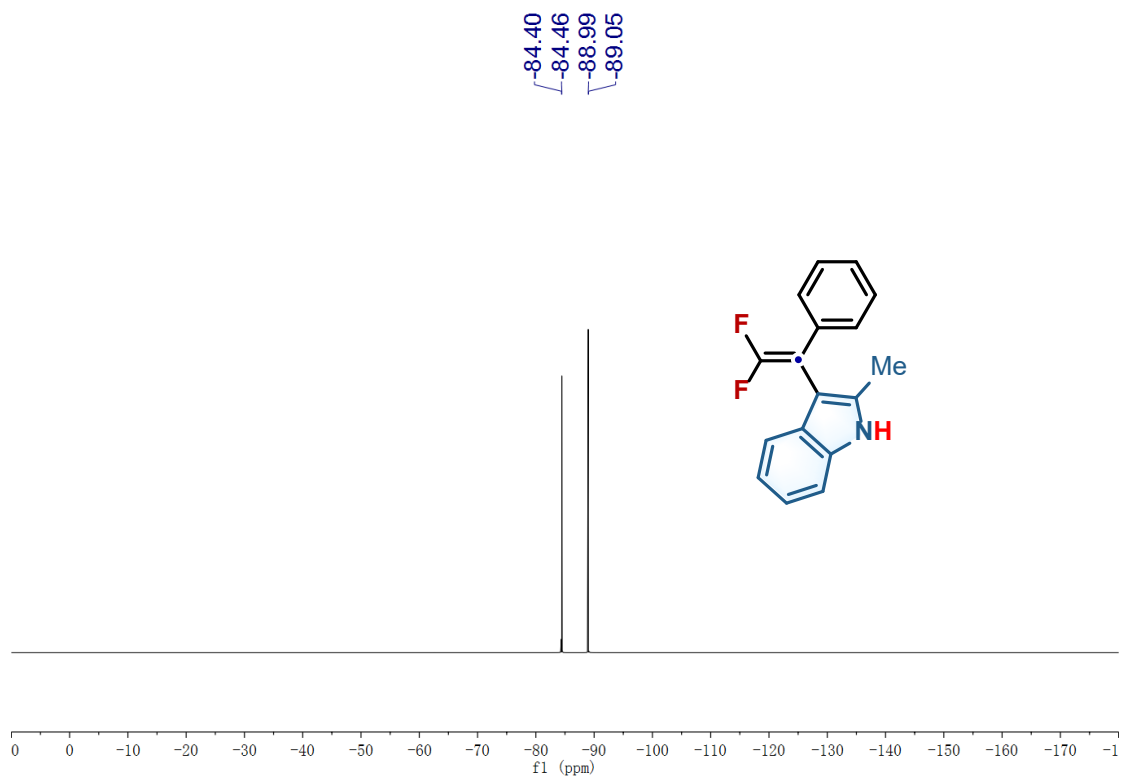
Supplementary Fig. 255. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **85**



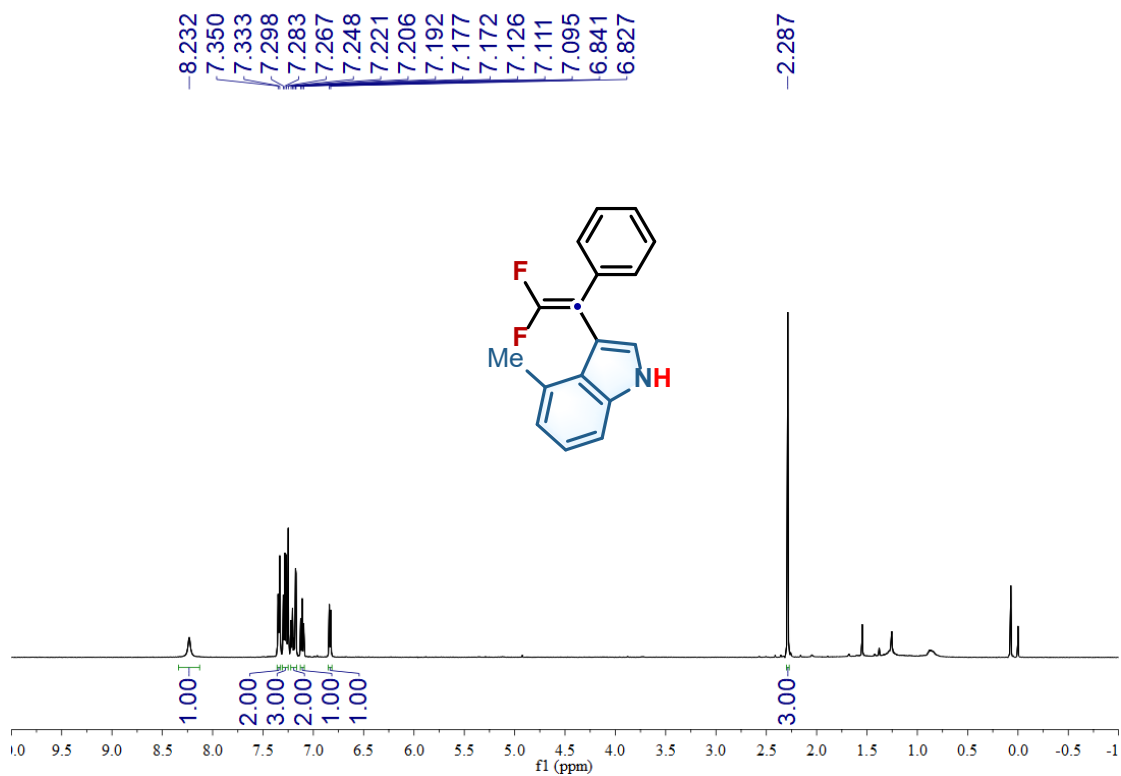
Supplementary Fig. 256. ¹H NMR (600 MHz, CDCl₃) spectrum of **86**



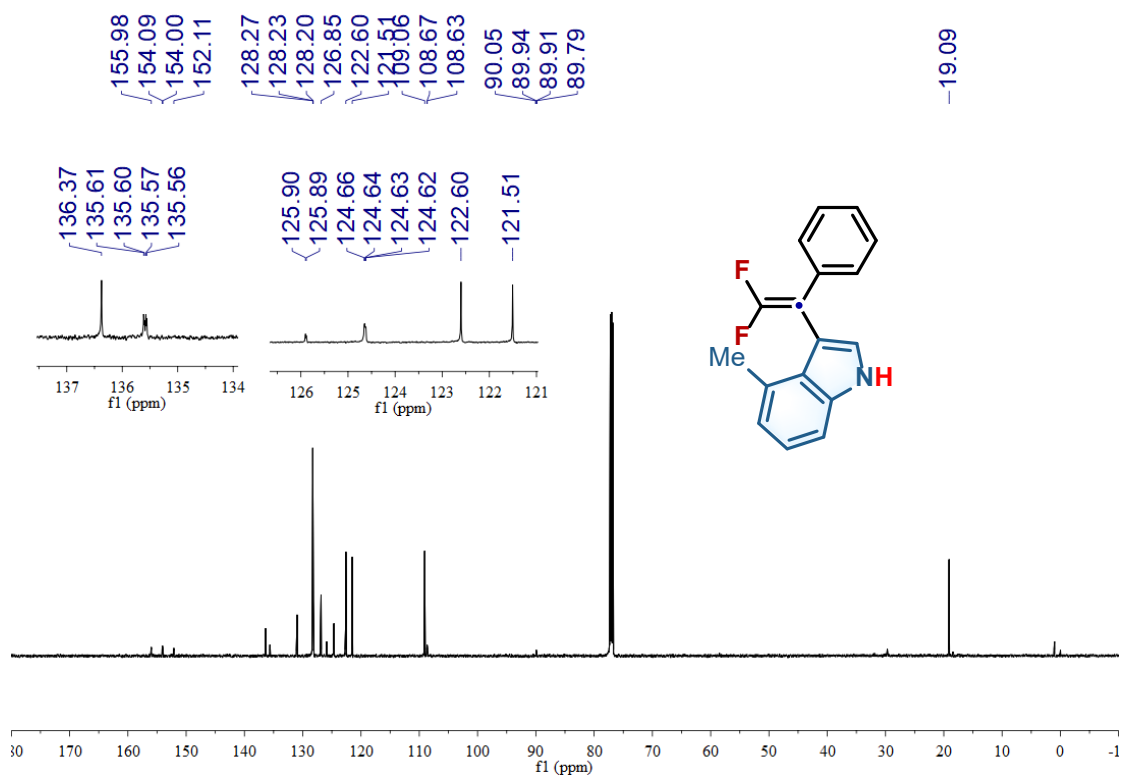
Supplementary Fig. 257. ¹³C NMR (150 MHz, CDCl₃) spectrum of 86



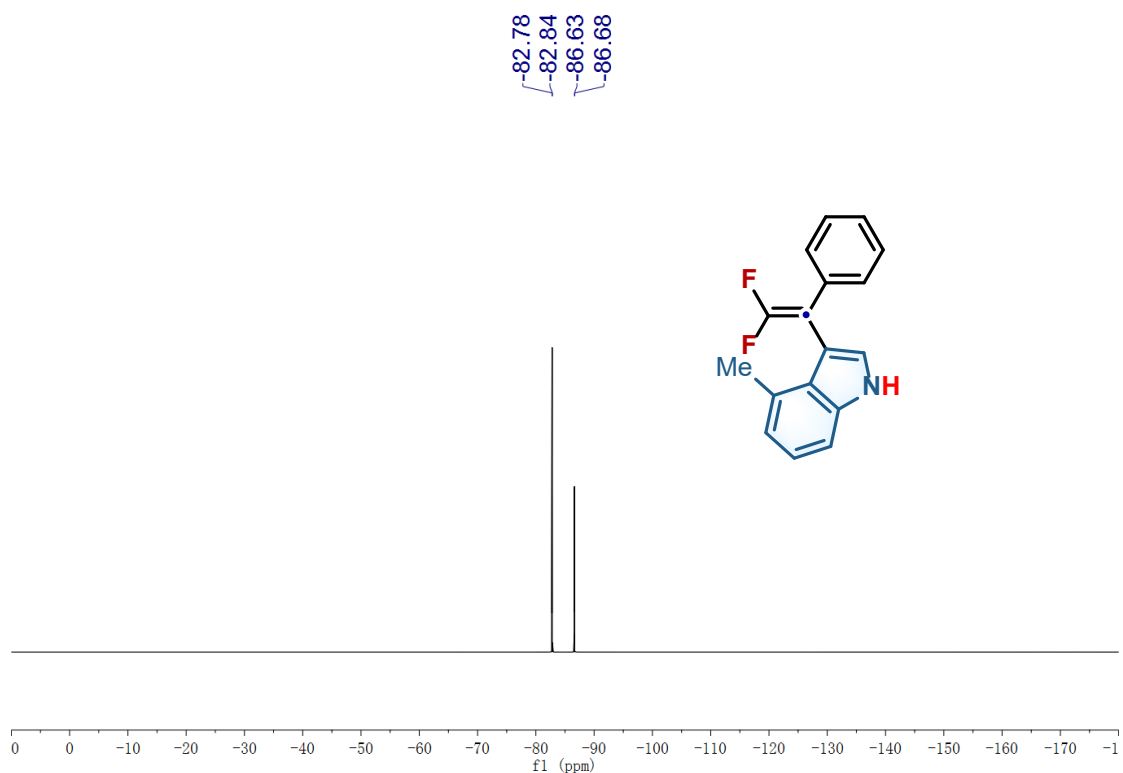
Supplementary Fig. 258. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 86



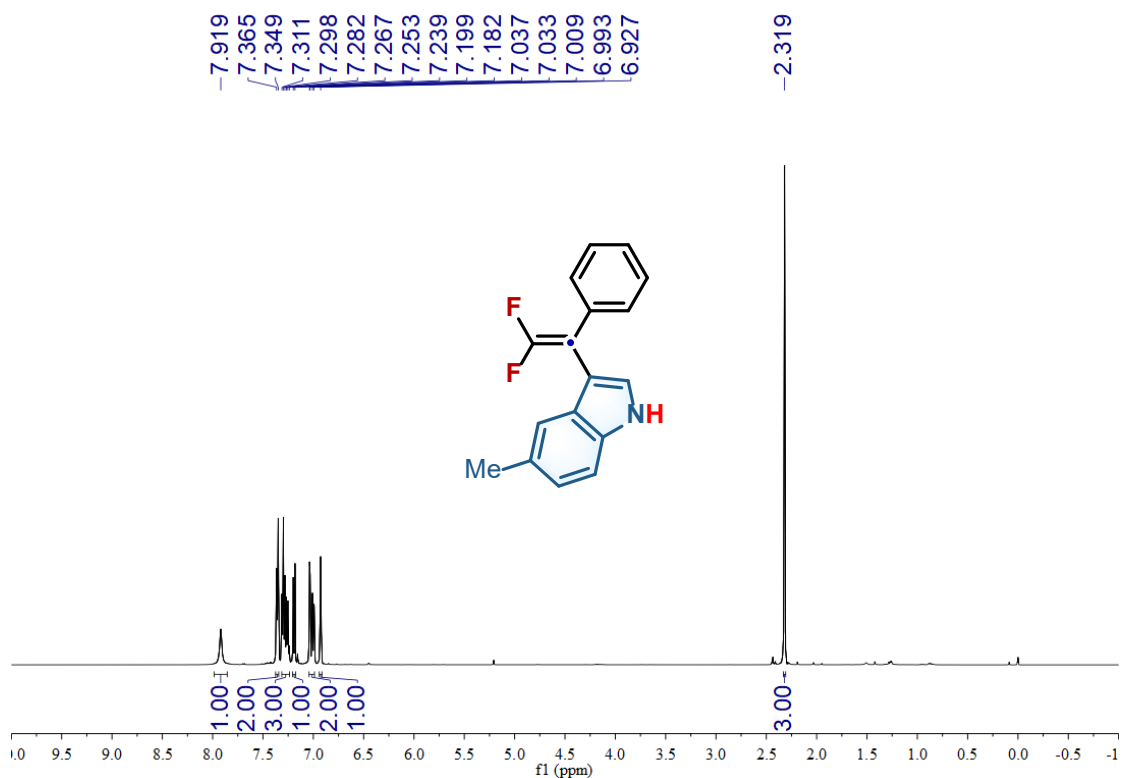
Supplementary Fig. 259. ¹H NMR (500 MHz, CDCl₃) spectrum of **87**



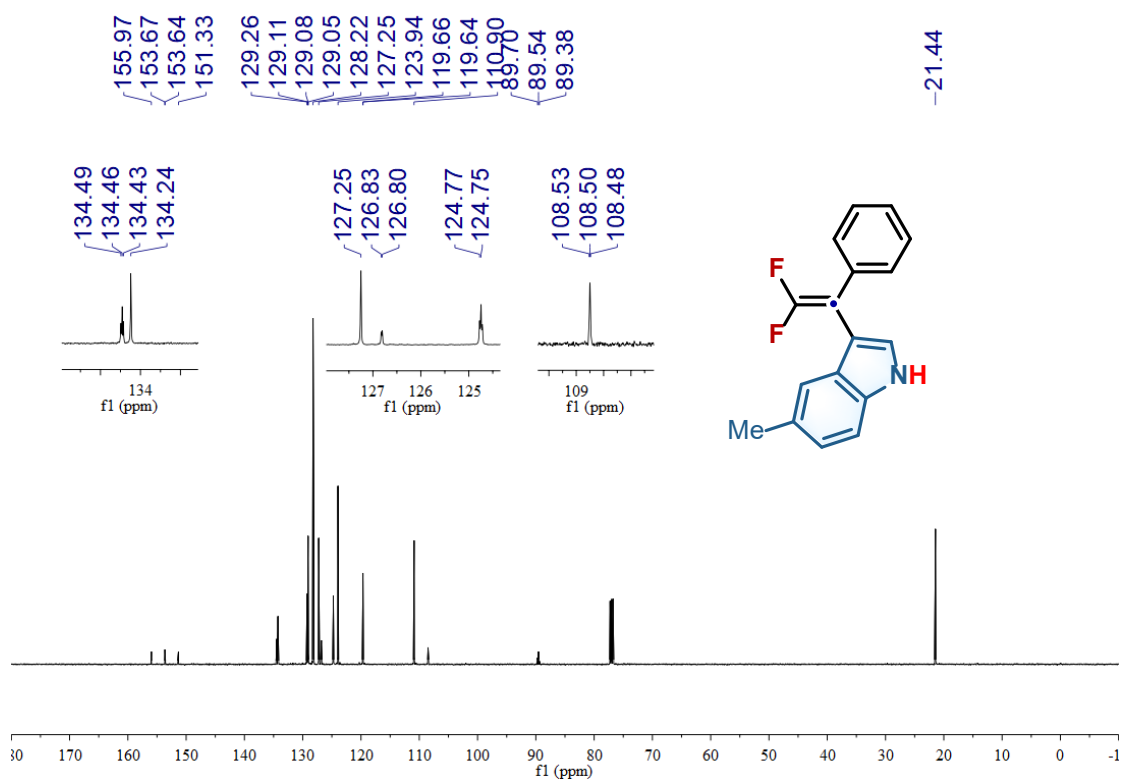
Supplementary Fig. 260. ¹³C NMR (150 MHz, CDCl₃) spectrum of **87**



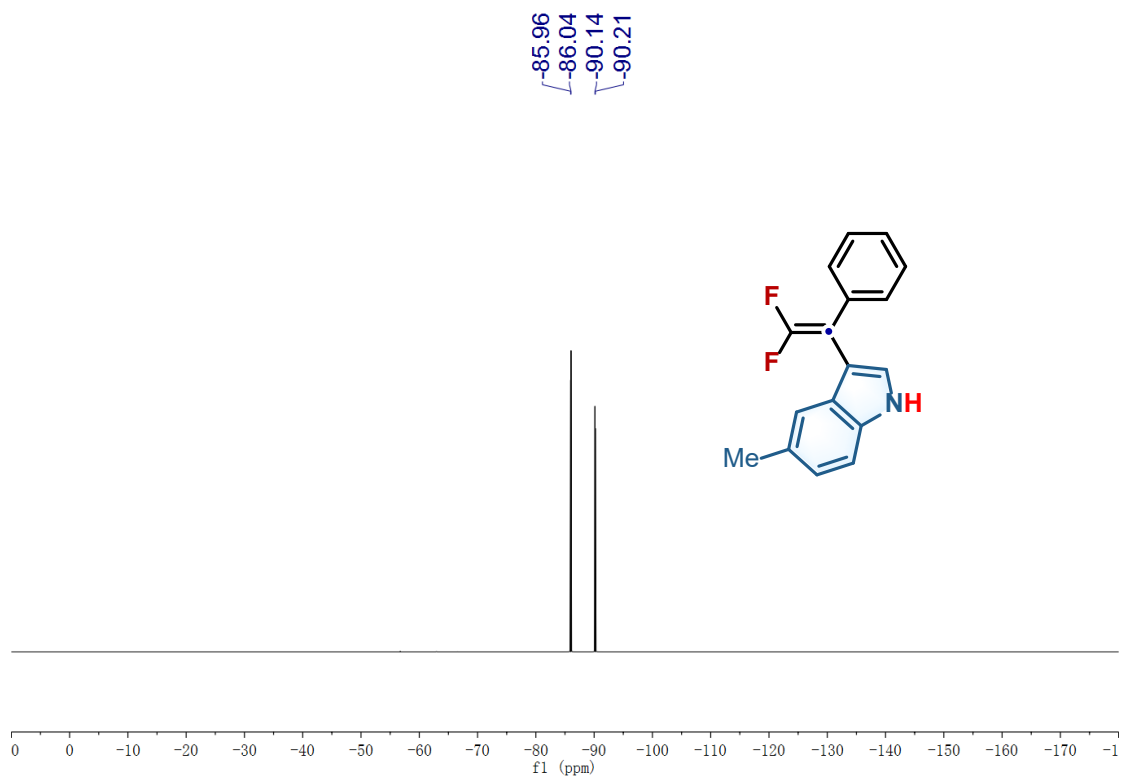
Supplementary Fig. 261. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **87**



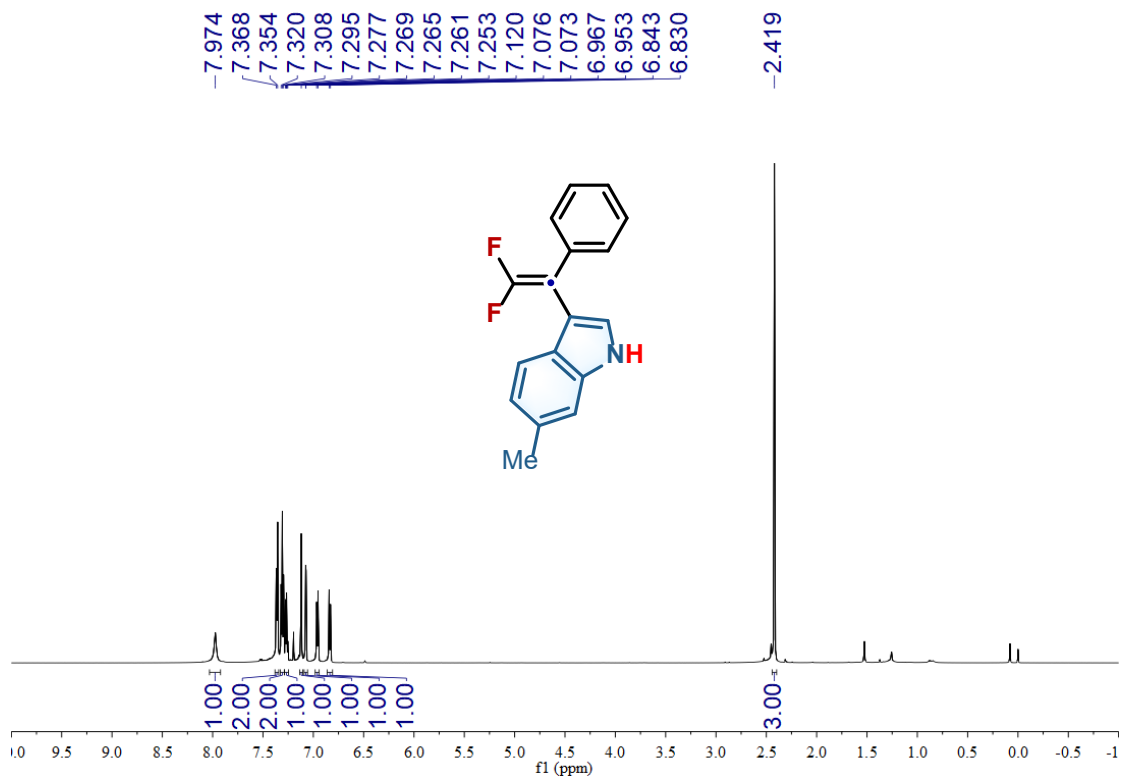
Supplementary Fig. 262. ^1H NMR (500 MHz, CDCl_3) spectrum of **88**



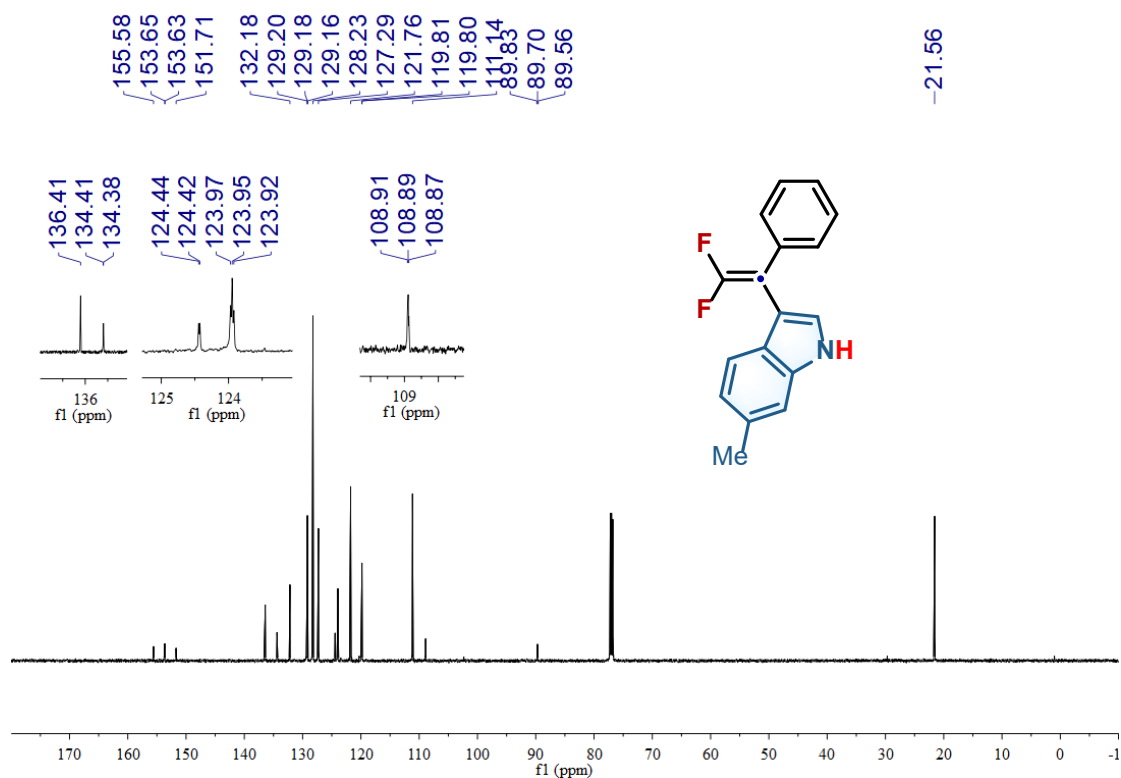
Supplementary Fig. 263. ¹³C NMR (125 MHz, CDCl₃) spectrum of **88**



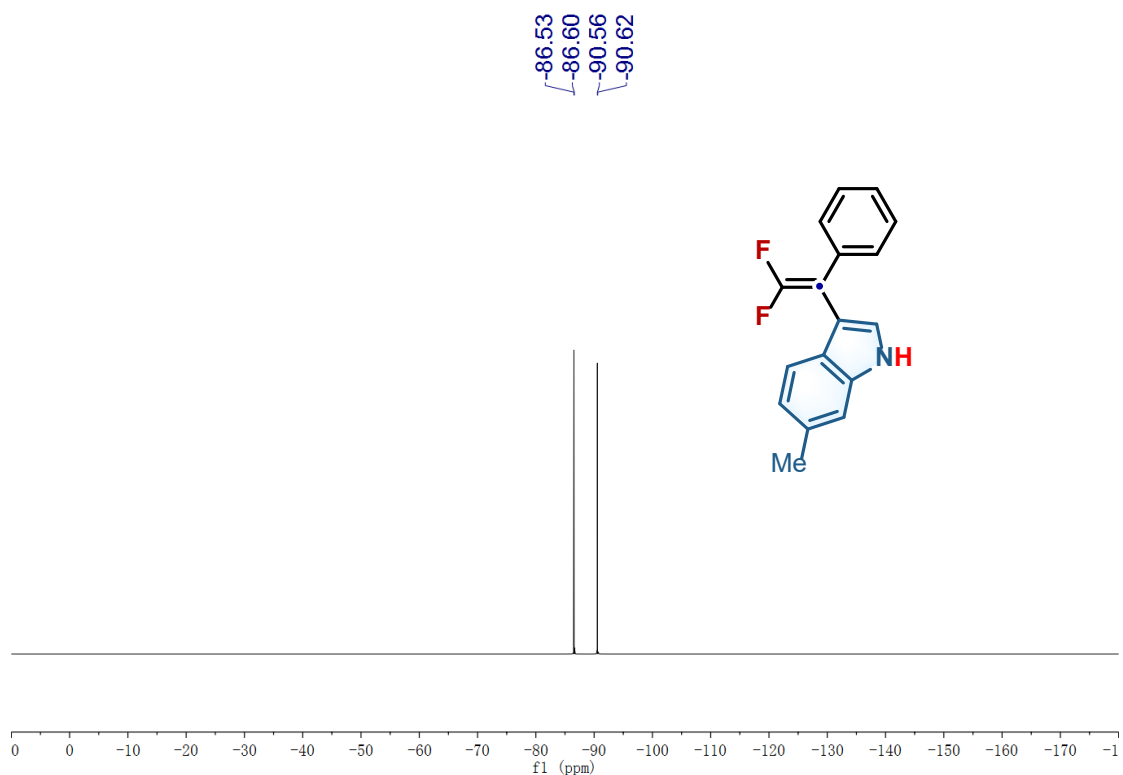
Supplementary Fig. 264. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **88**



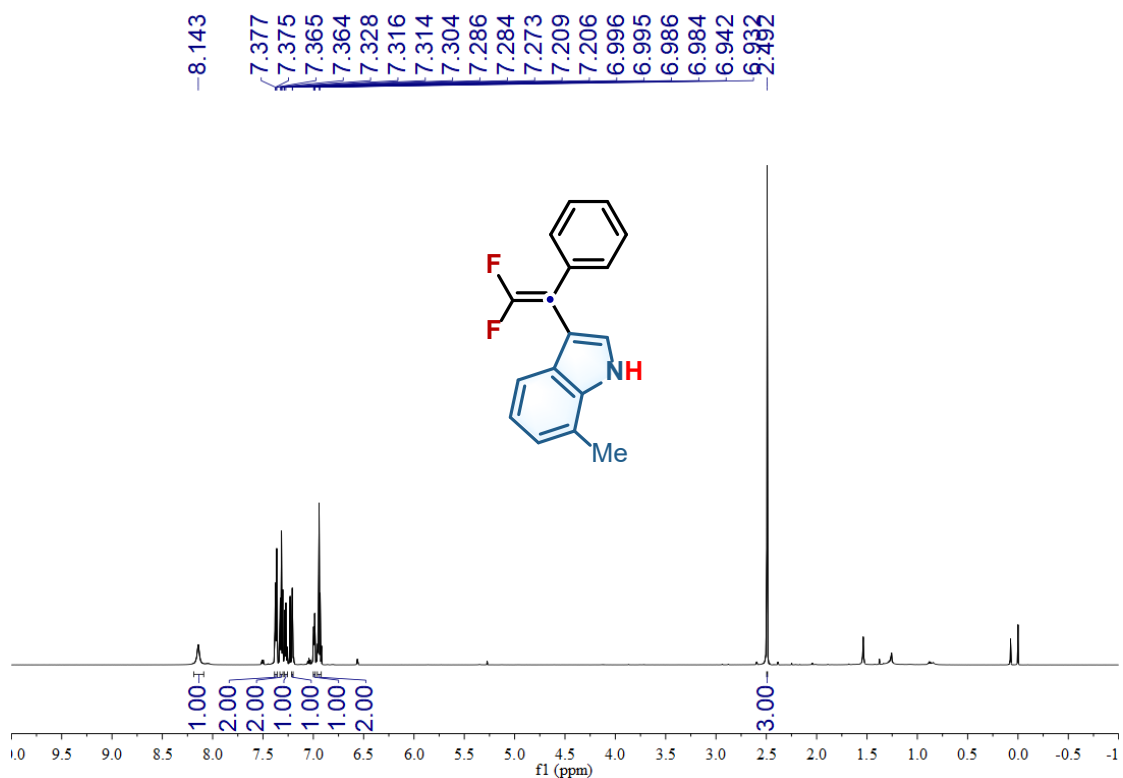
Supplementary Fig. 265. ¹H NMR (600 MHz, CDCl₃) spectrum of **89**



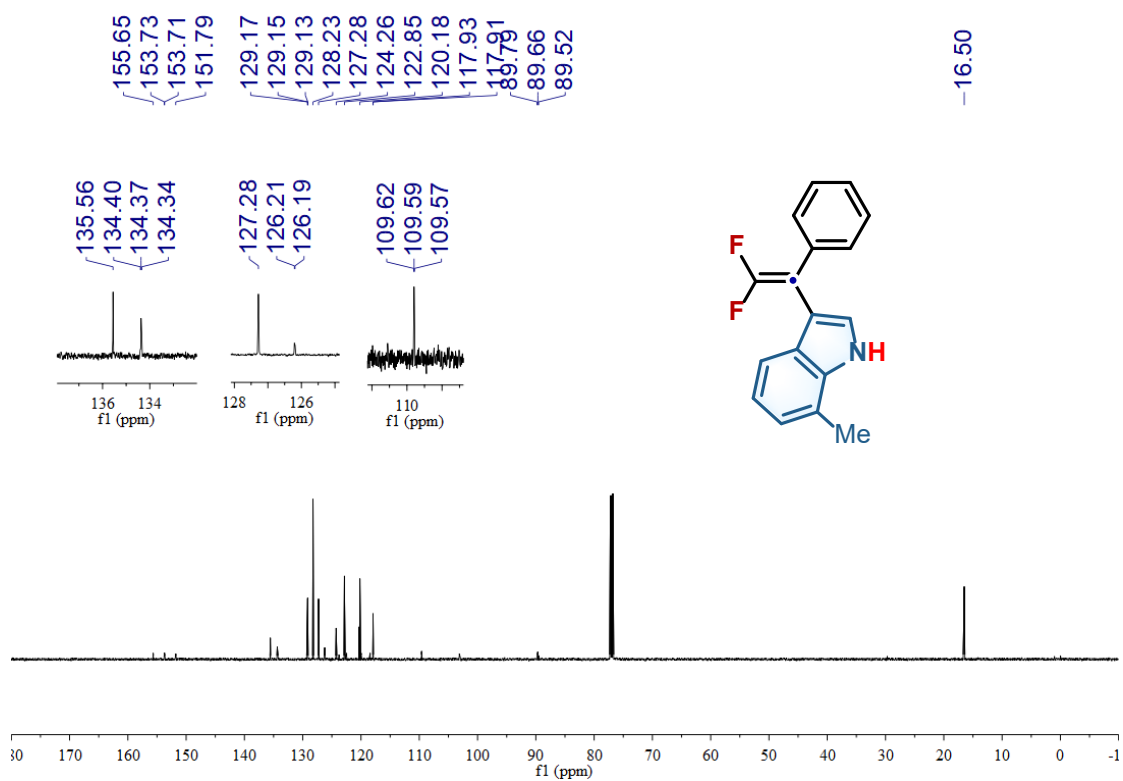
Supplementary Fig. 266. ¹³C NMR (150 MHz, CDCl₃) spectrum of **89**



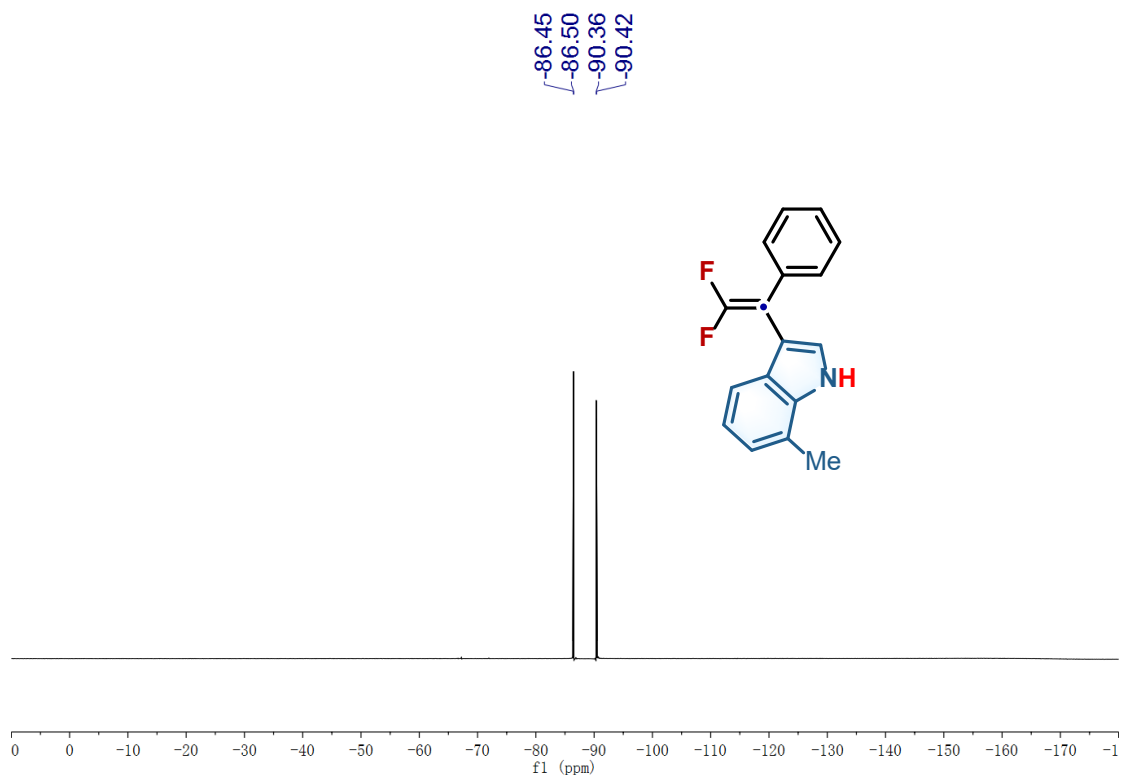
Supplementary Fig. 267. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **89**



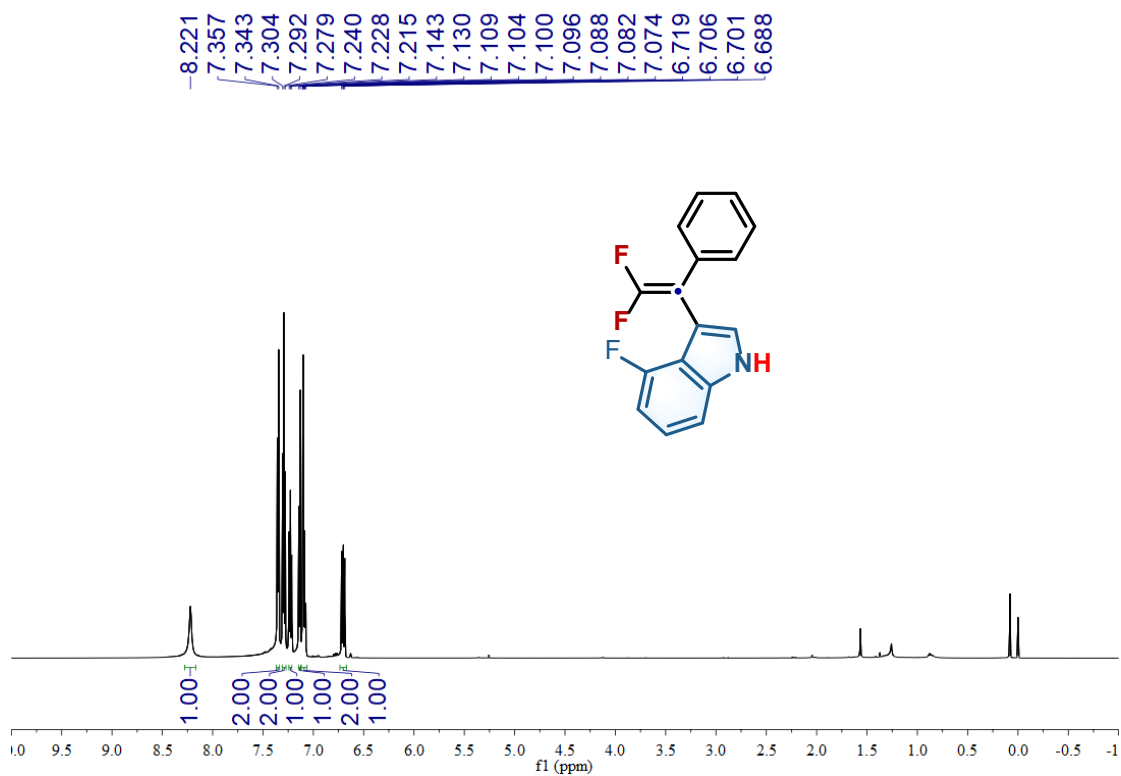
Supplementary Fig. 268. ^1H NMR (600 MHz, CDCl_3) spectrum of **90**



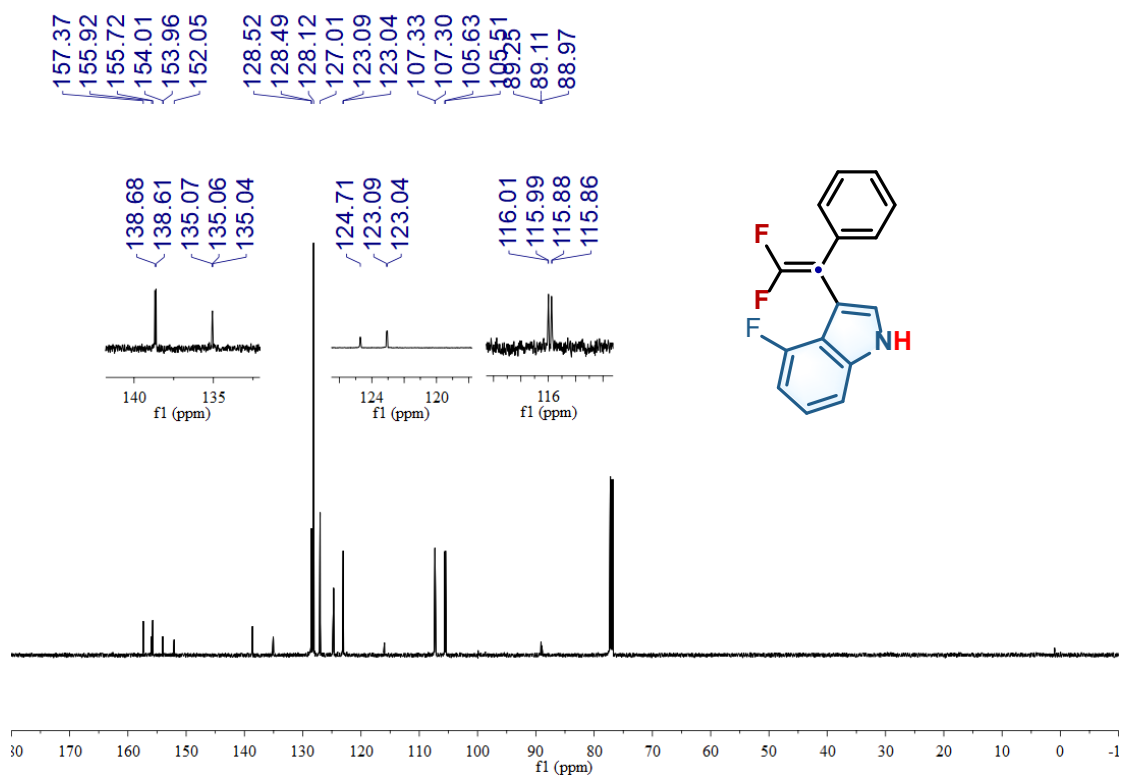
Supplementary Fig. 269. ¹³C NMR (150 MHz, CDCl₃) spectrum of **90**



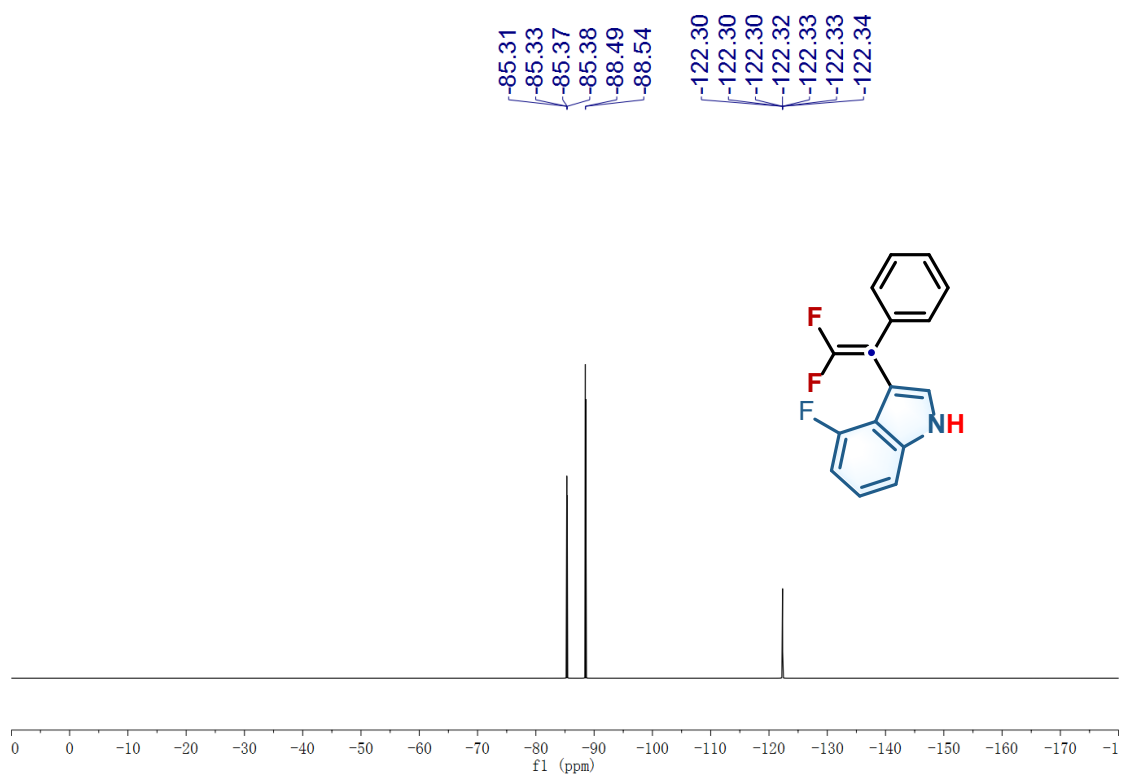
Supplementary Fig. 270. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **90**



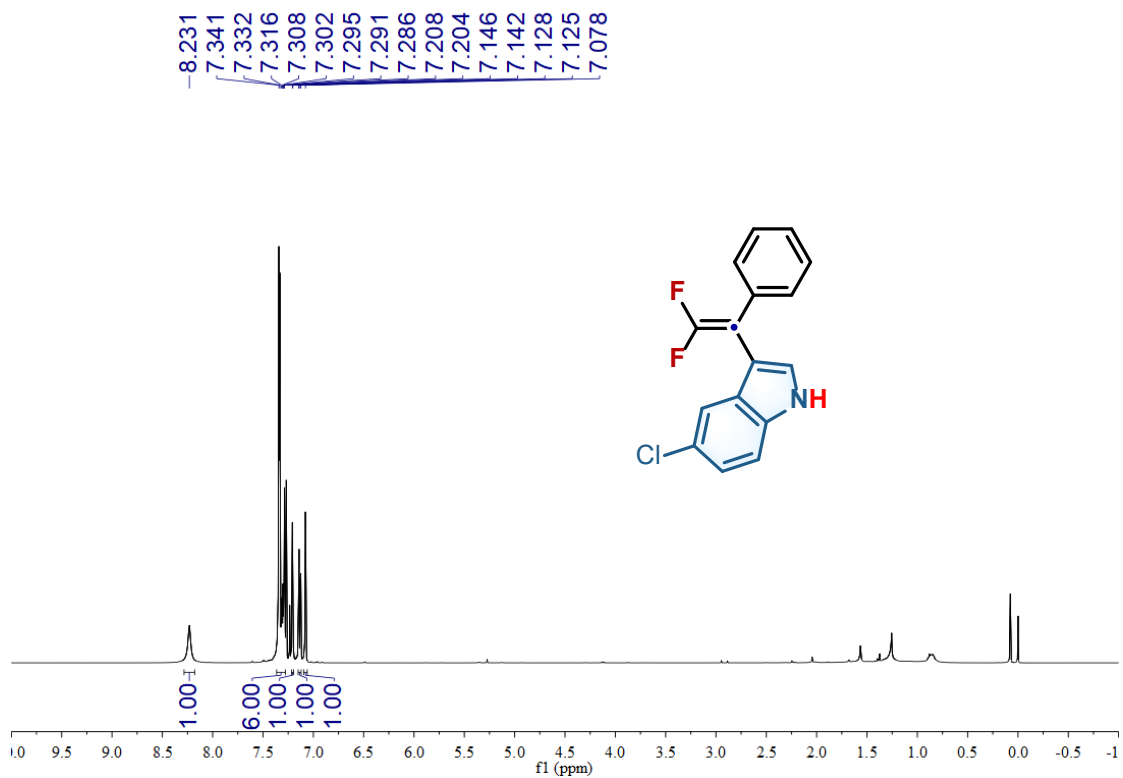
Supplementary Fig. 271. ¹H NMR (600 MHz, CDCl₃) spectrum of 91



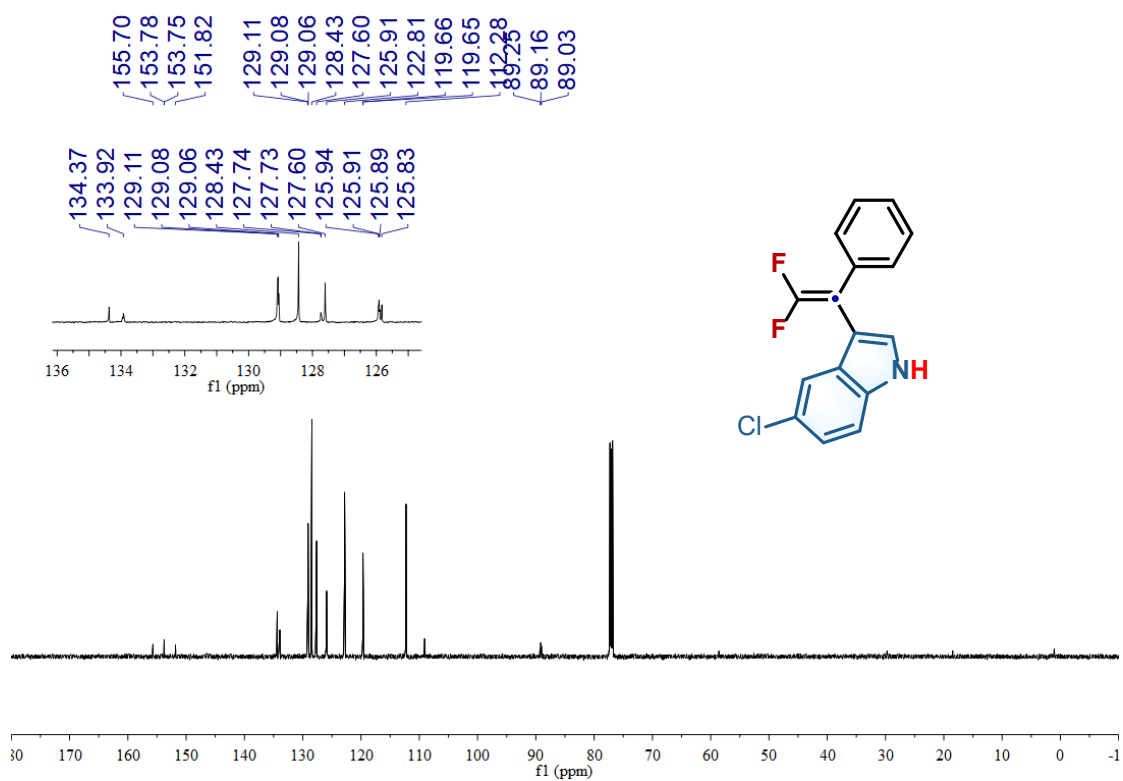
Supplementary Fig. 272. ¹³C NMR (150 MHz, CDCl₃) spectrum of 91



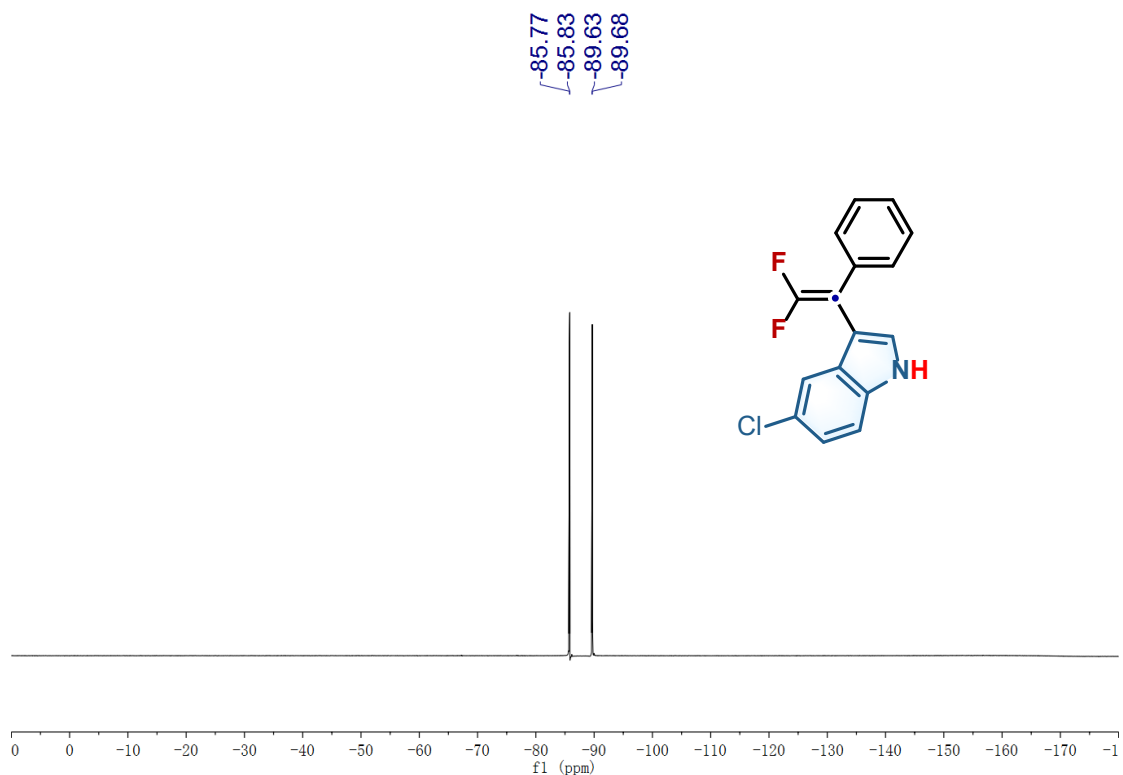
Supplementary Fig. 273. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **91**



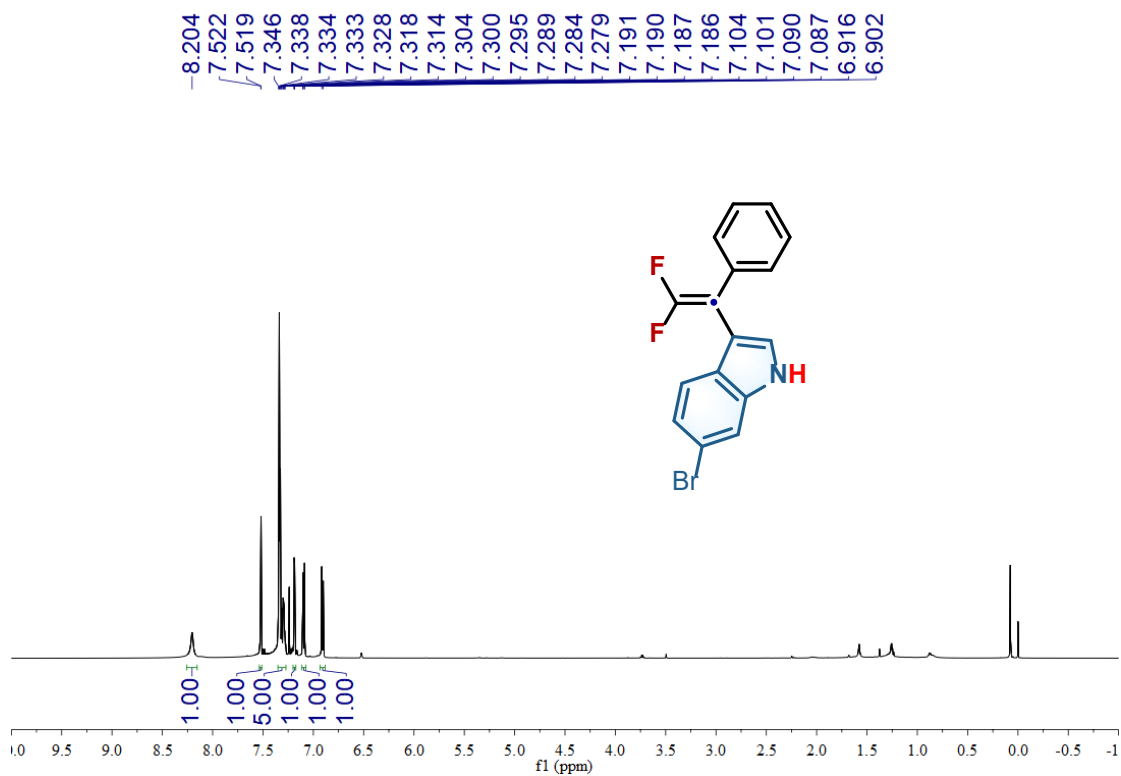
Supplementary Fig. 274. ¹H NMR (500 MHz, CDCl₃) spectrum of **92**



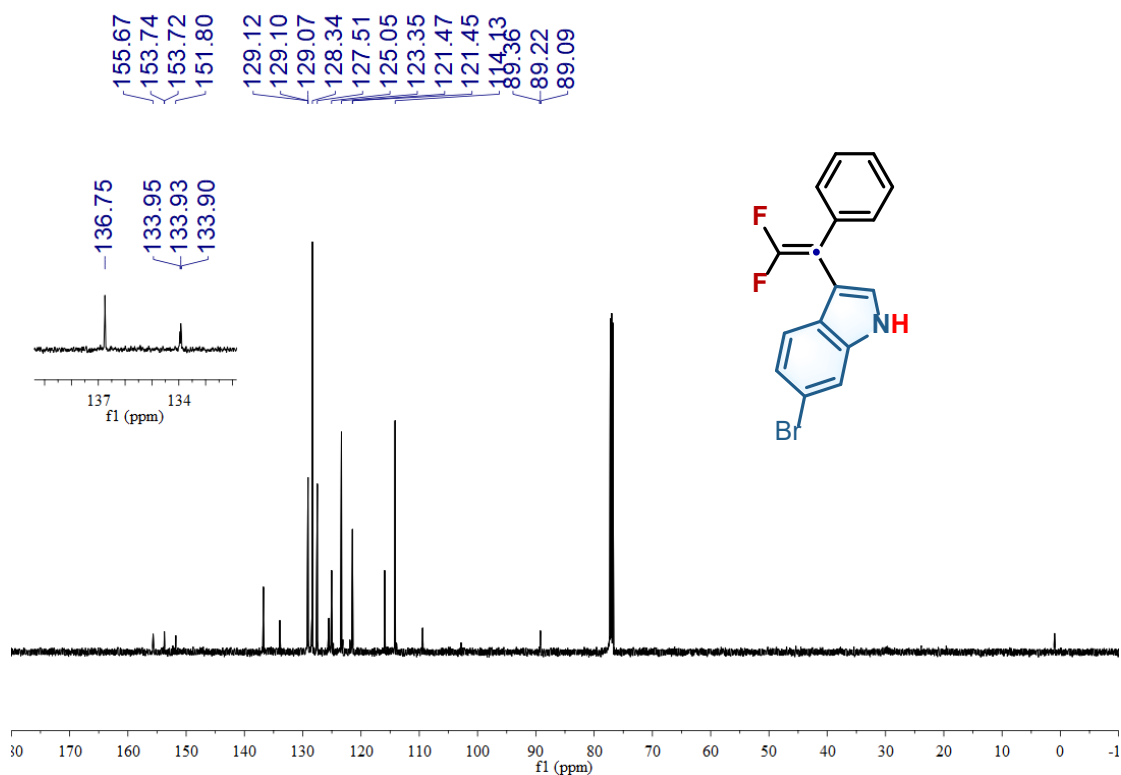
Supplementary Fig. 275. ¹³C NMR (150 MHz, CDCl₃) spectrum of **92**



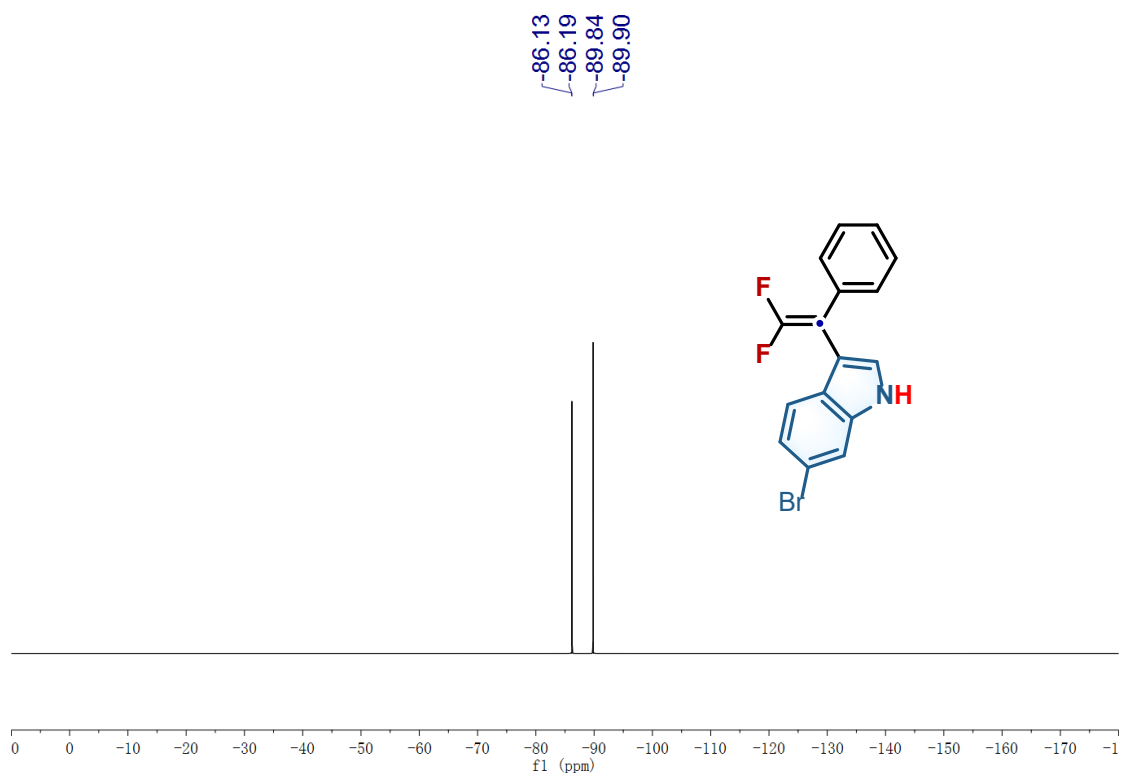
Supplementary Fig. 276. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **92**



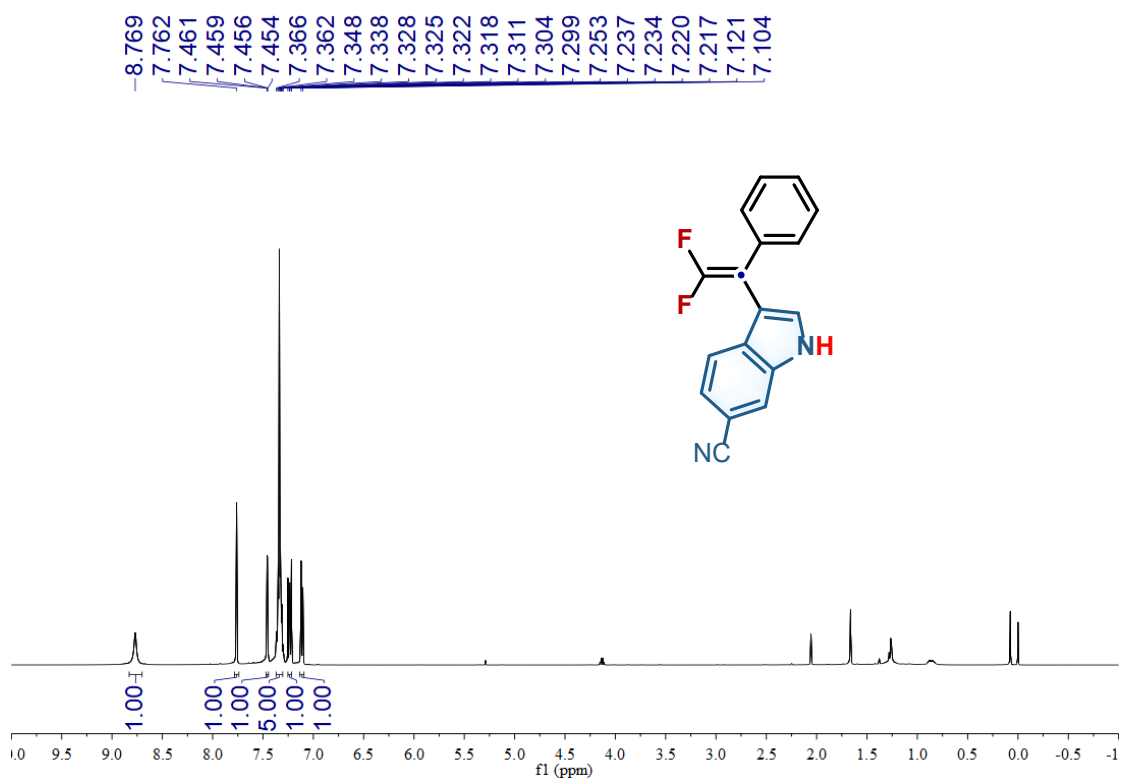
Supplementary Fig. 277. ¹H NMR (600 MHz, CDCl₃) spectrum of **93**



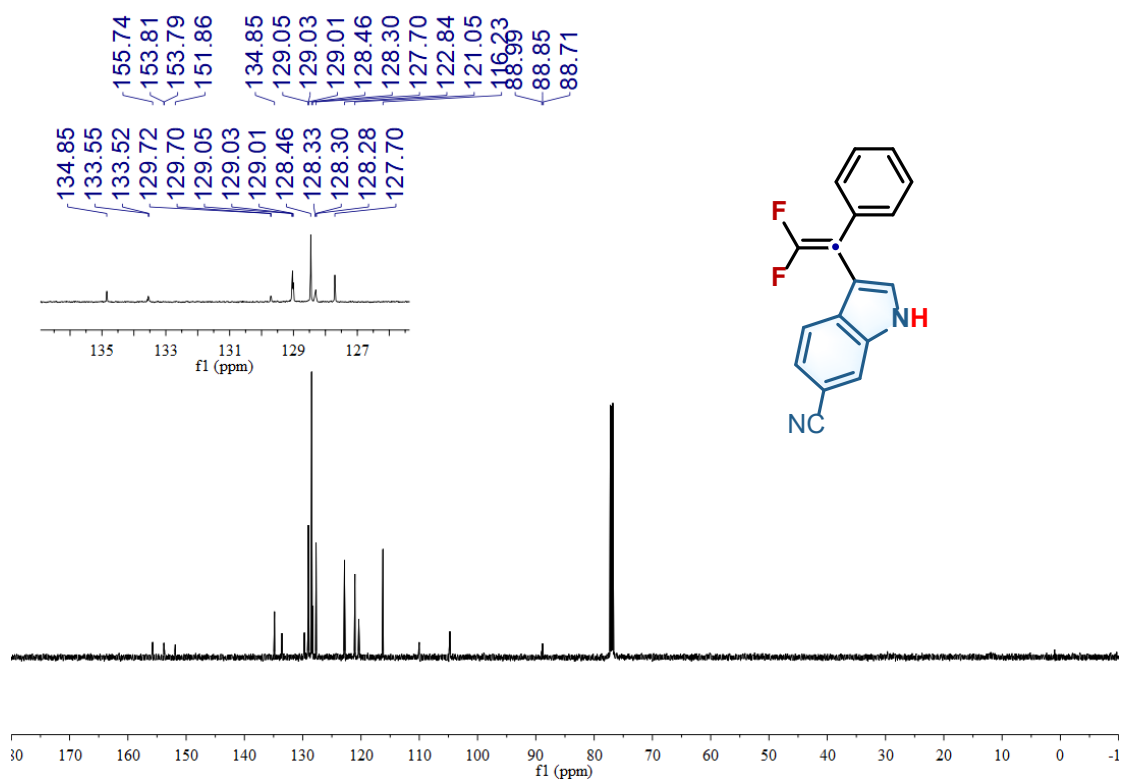
Supplementary Fig. 278. ¹³C NMR (150 MHz, CDCl₃) spectrum of **93**



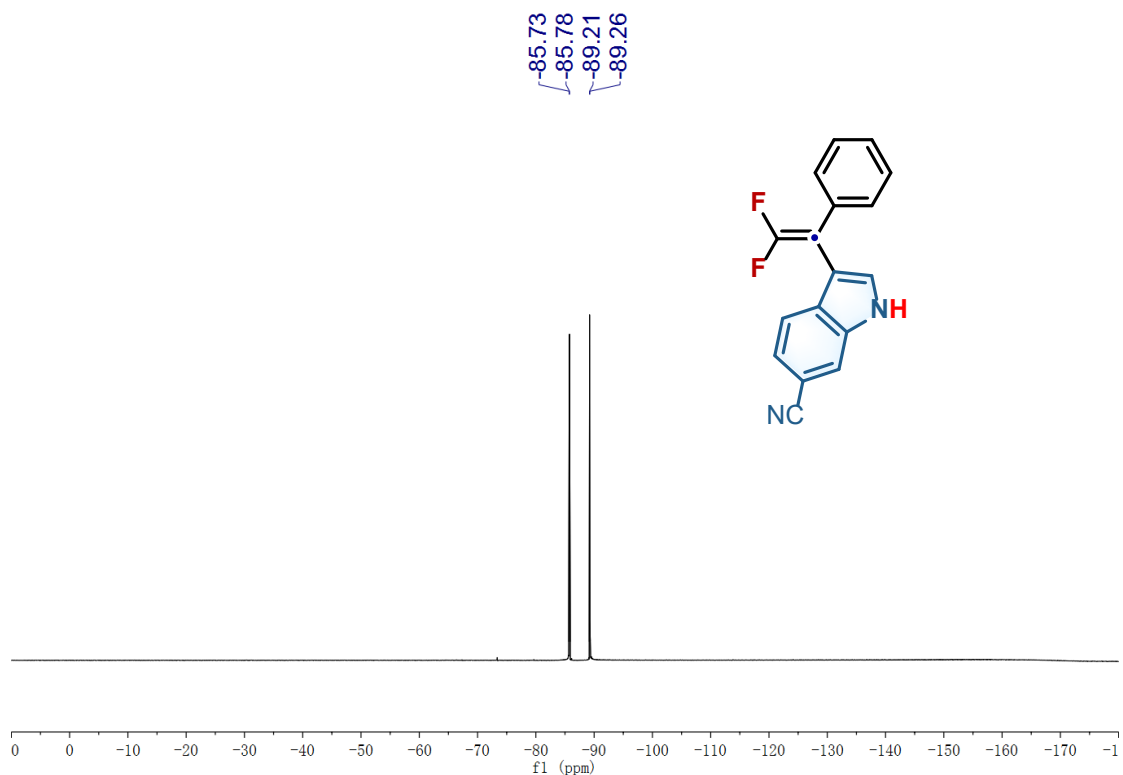
Supplementary Fig. 279. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **93**



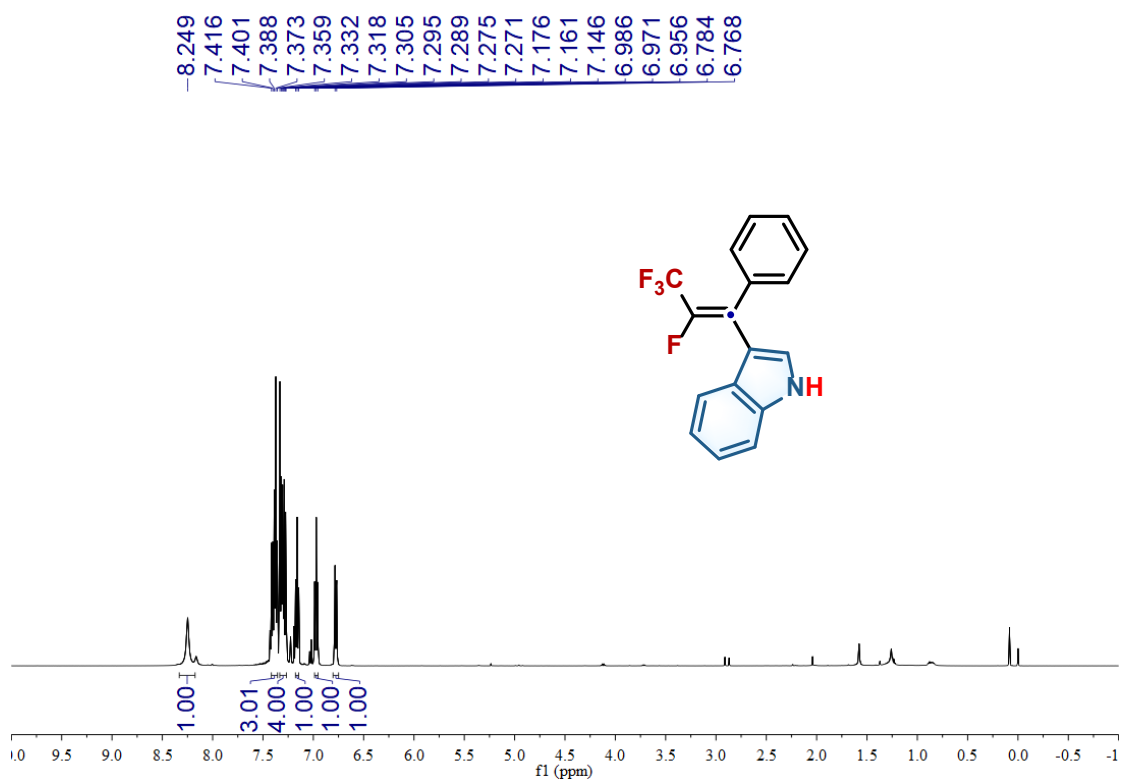
Supplementary Fig. 280. ^1H NMR (500 MHz, CDCl_3) spectrum of **94**



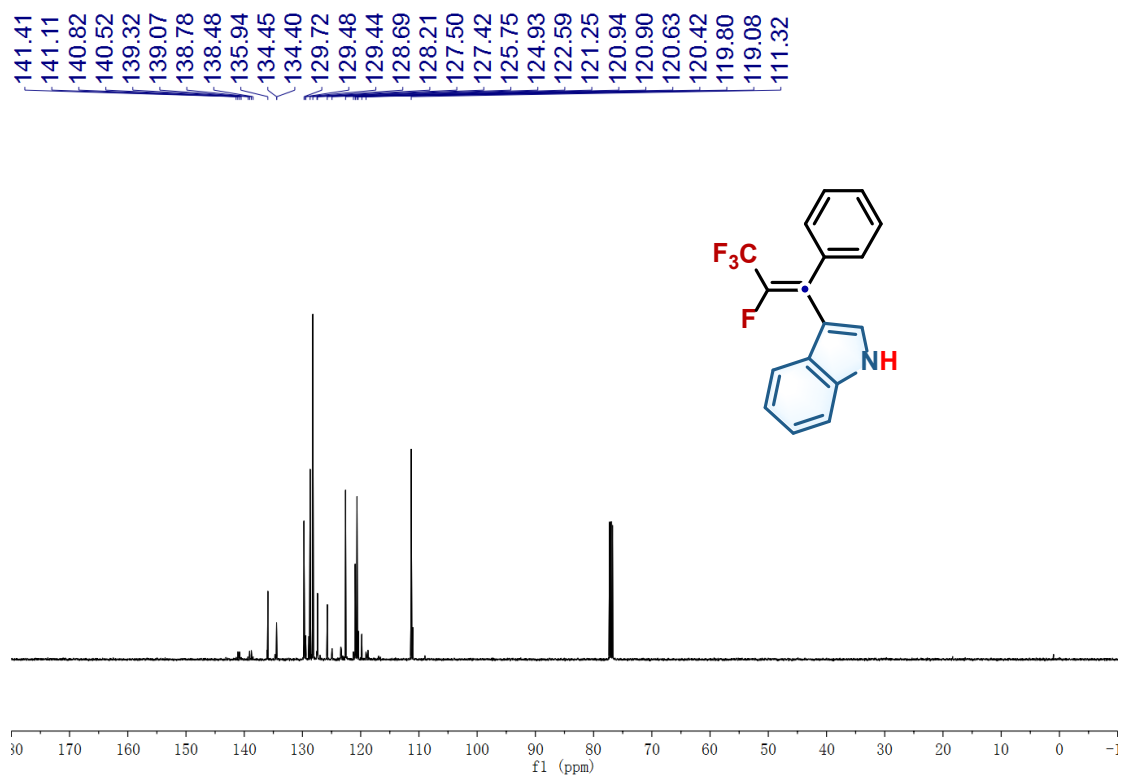
Supplementary Fig. 281. ¹³C NMR (150 MHz, CDCl₃) spectrum of **94**



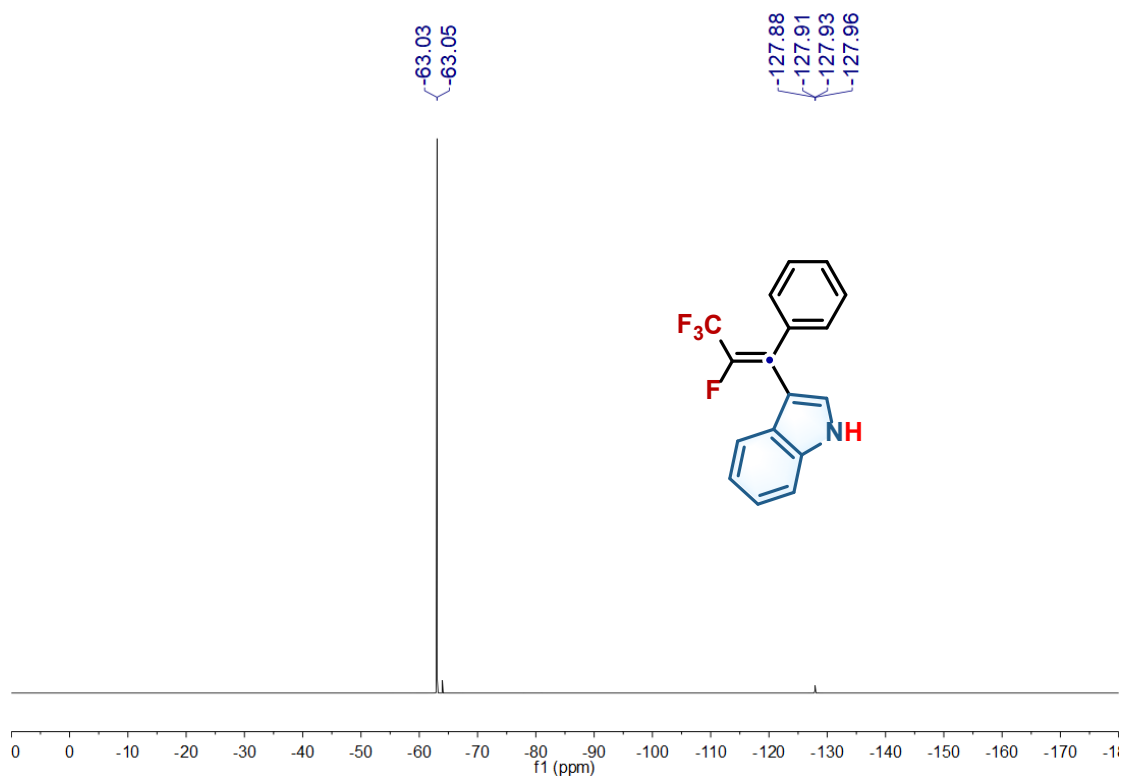
Supplementary Fig. 282. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **94**



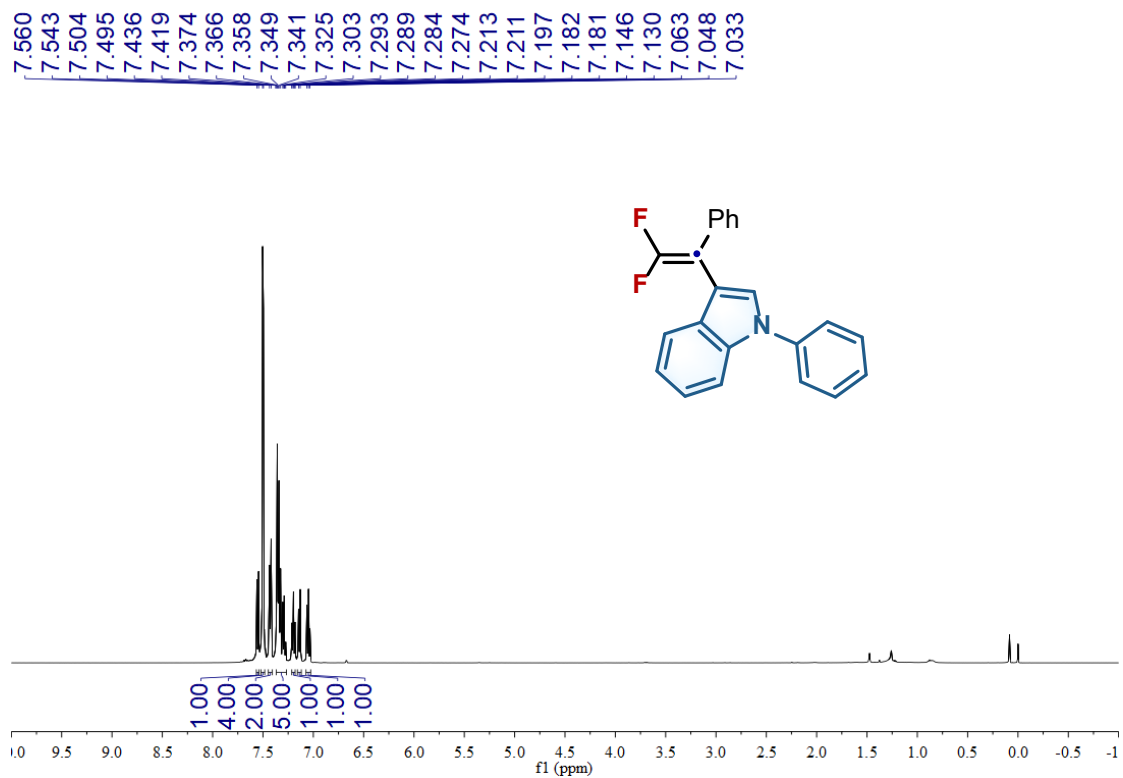
Supplementary Fig. 283. ¹H NMR (500 MHz, CDCl₃) spectrum of 95



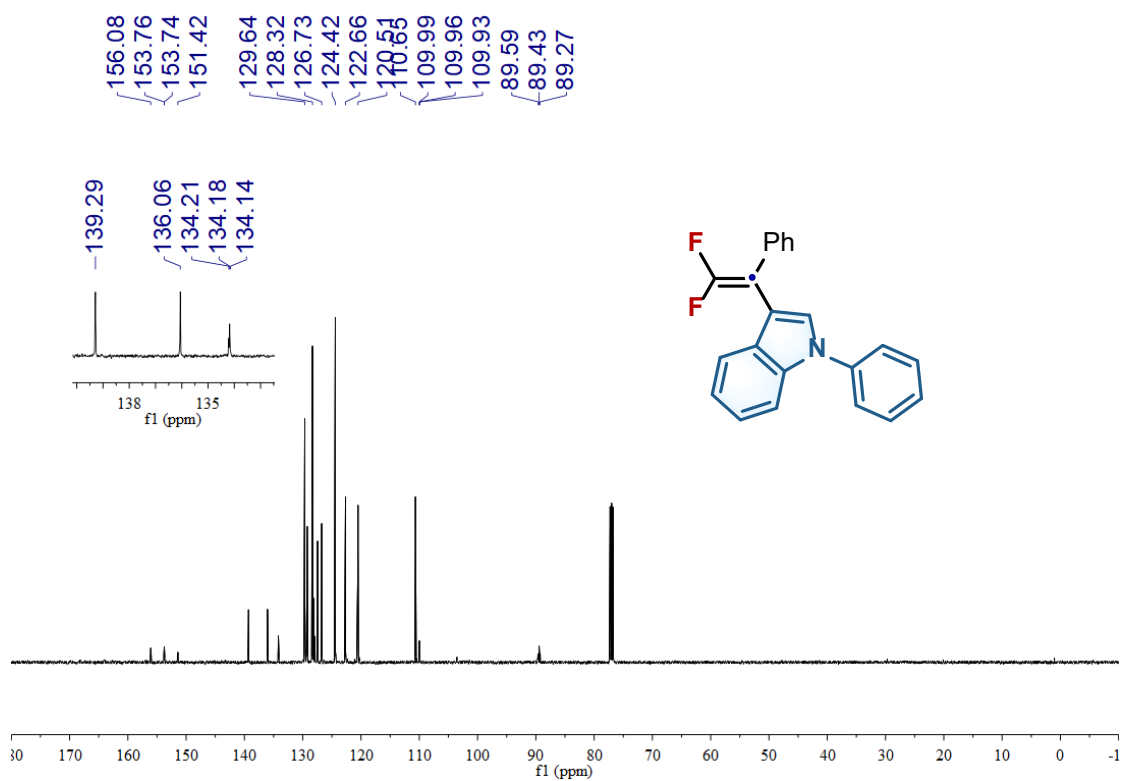
Supplementary Fig. 284. ¹³C NMR (125 MHz, CDCl₃) spectrum of 95



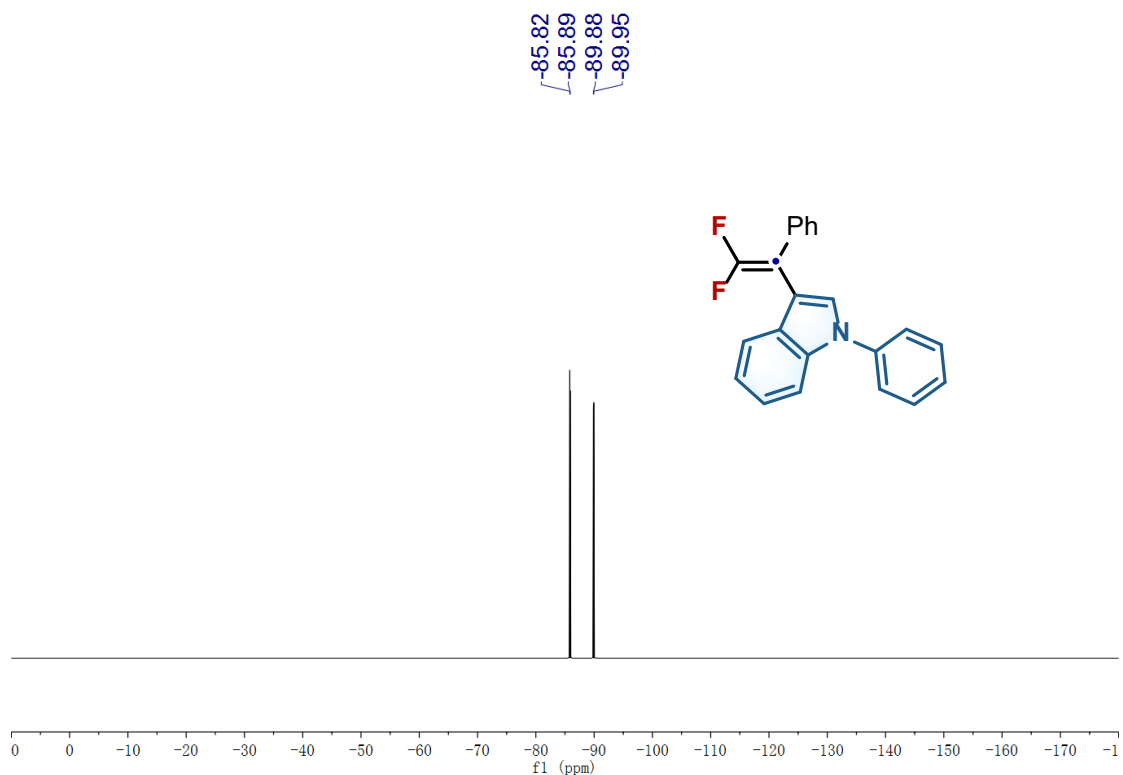
Supplementary Fig. 285. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **95**



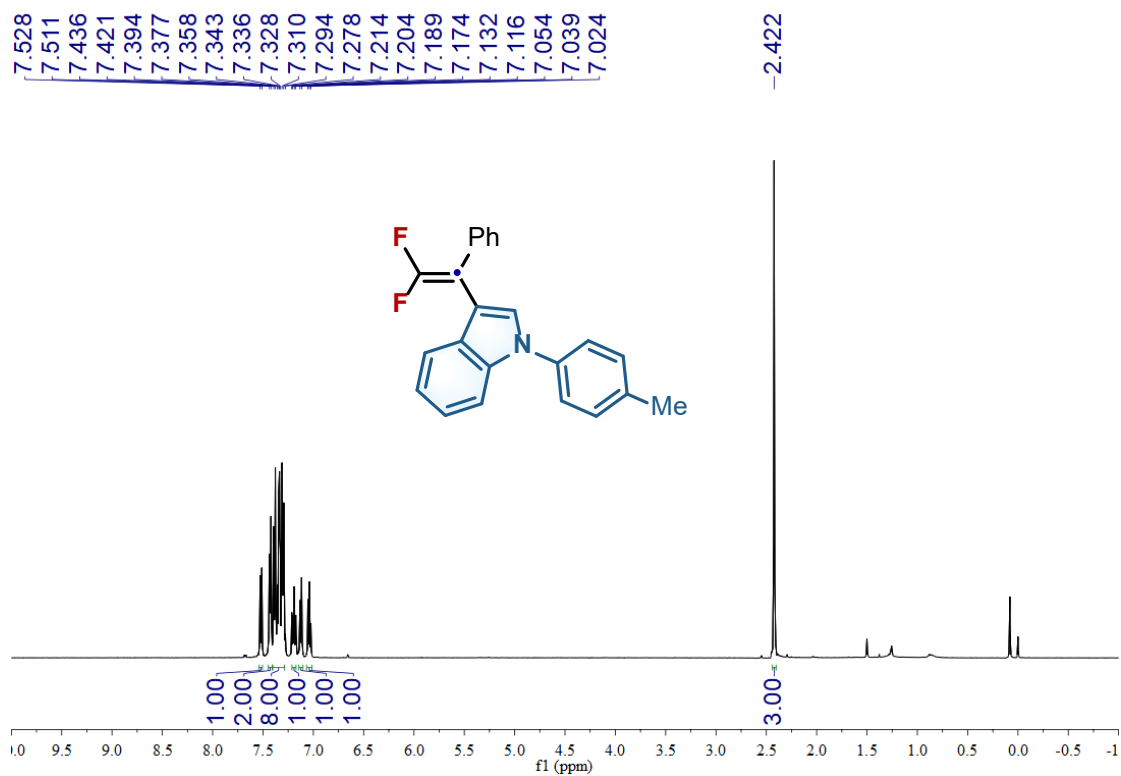
Supplementary Fig. 286. ¹H NMR (500 MHz, CDCl₃) spectrum of **96**



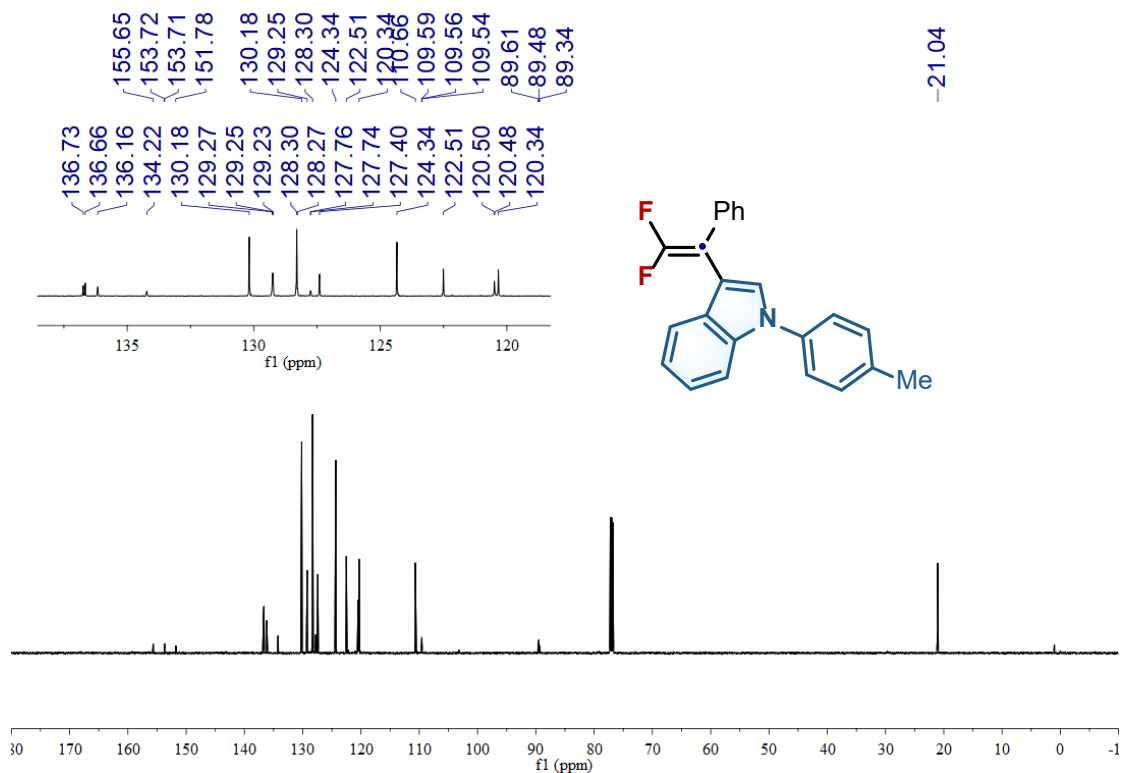
Supplementary Fig. 287. ¹³C NMR (125 MHz, CDCl₃) spectrum of **96**



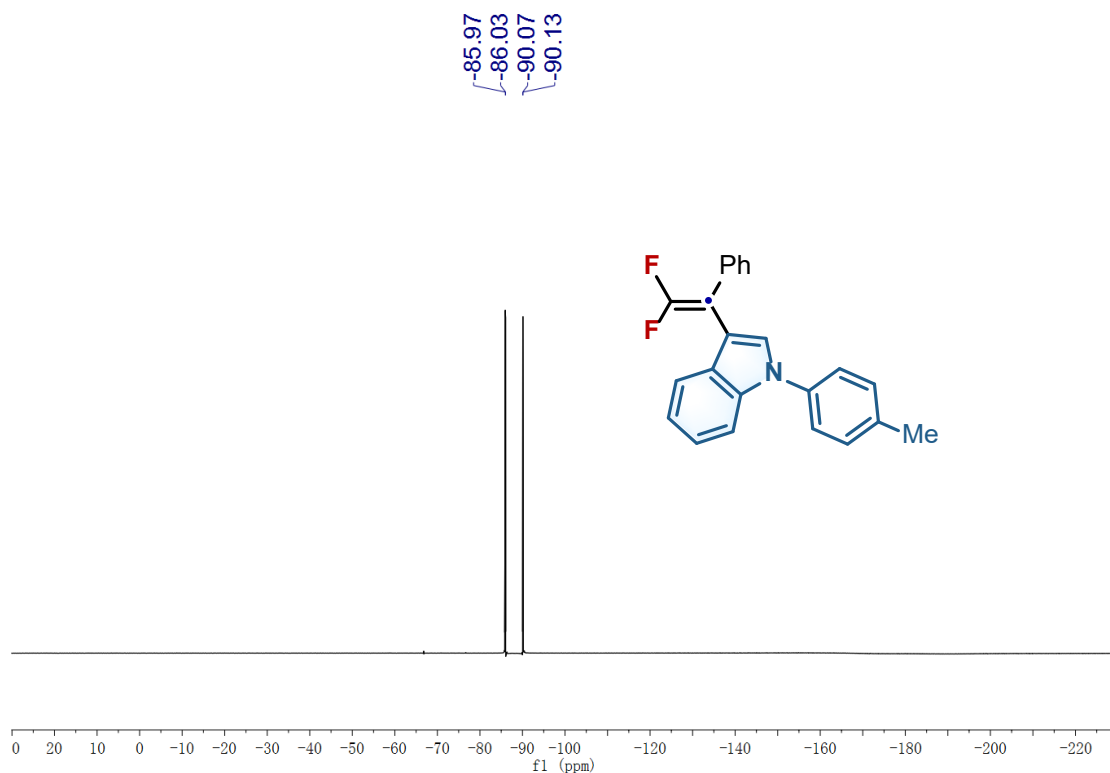
Supplementary Fig. 288. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **96**



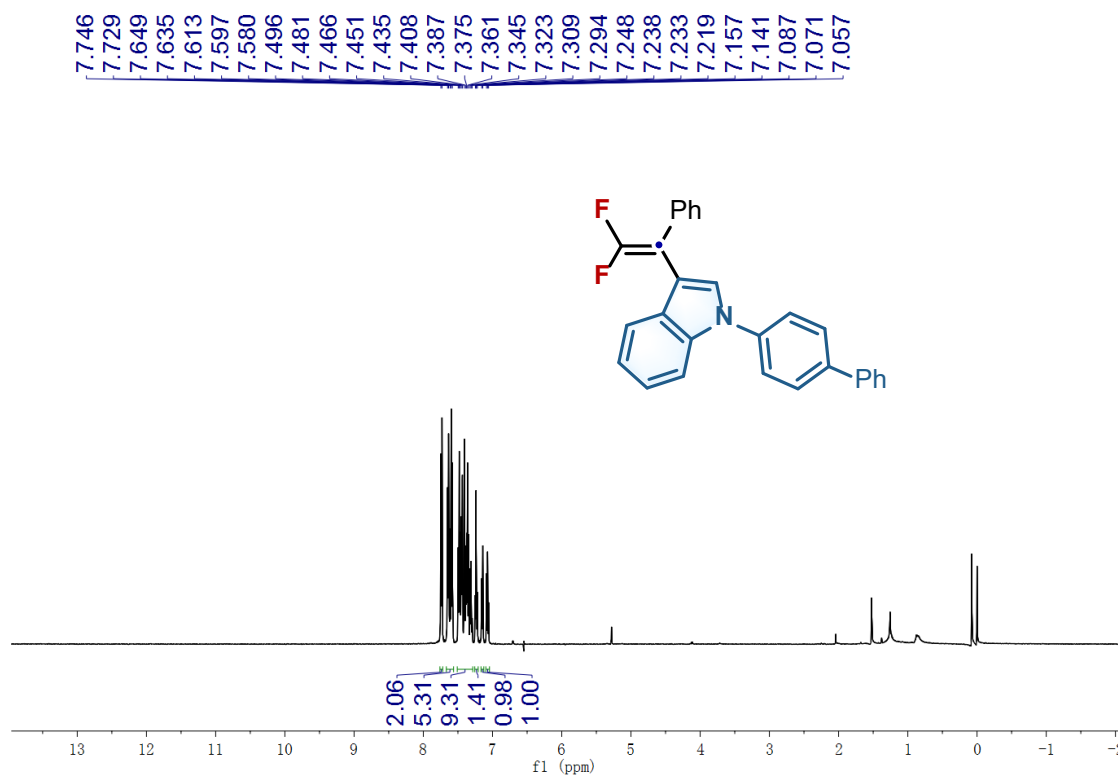
Supplementary Fig. 289. ¹H NMR (500 MHz, CDCl₃) spectrum of 97



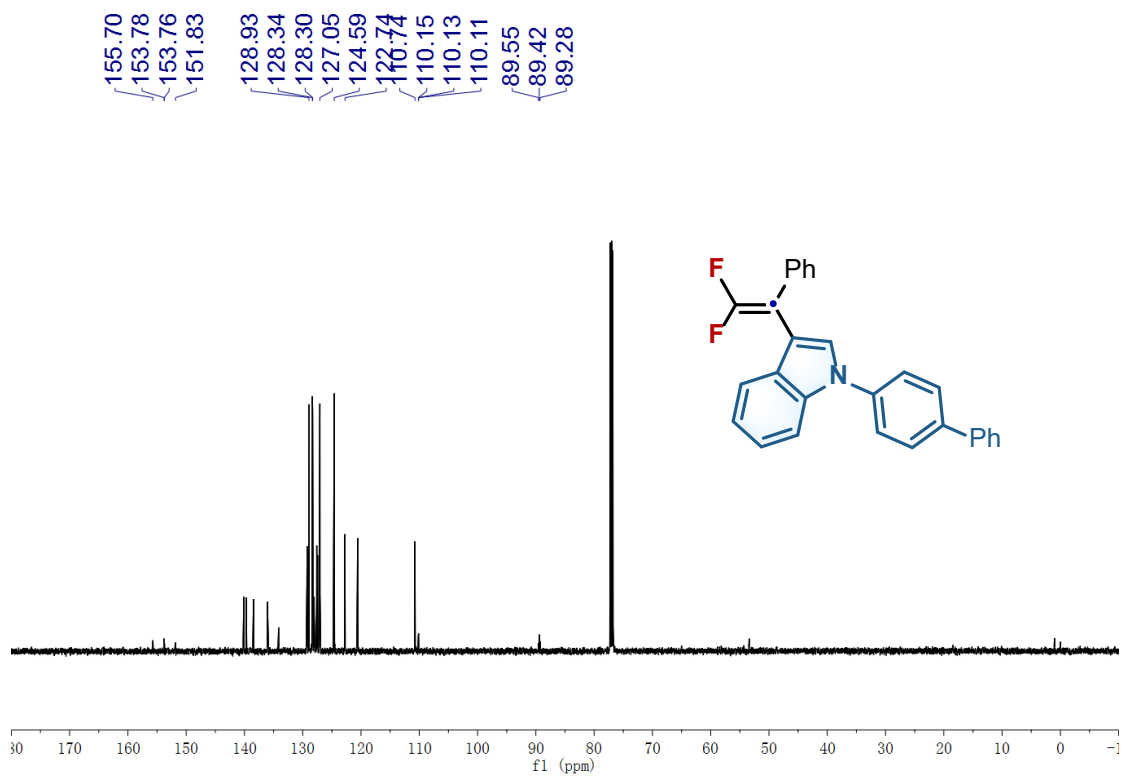
Supplementary Fig. 290. ¹³C NMR (150 MHz, CDCl₃) spectrum of 97



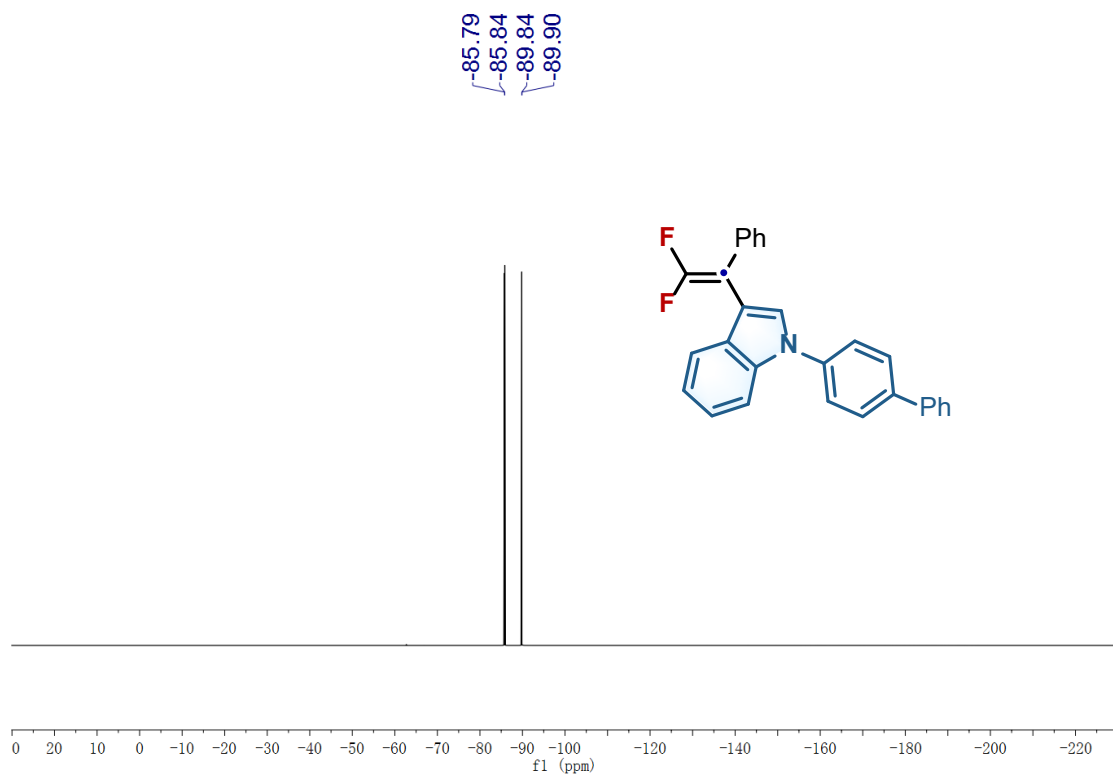
Supplementary Fig. 291. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 97



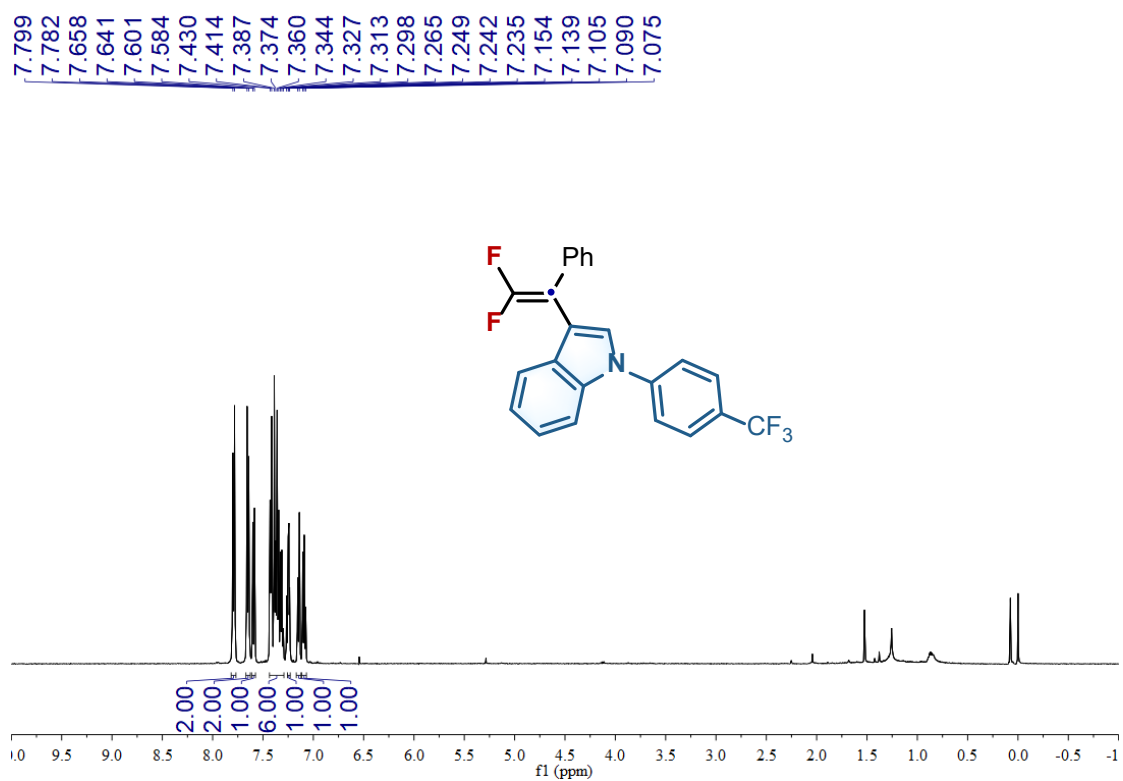
Supplementary Fig. 292. ¹H NMR (500 MHz, CDCl₃) spectrum of 98



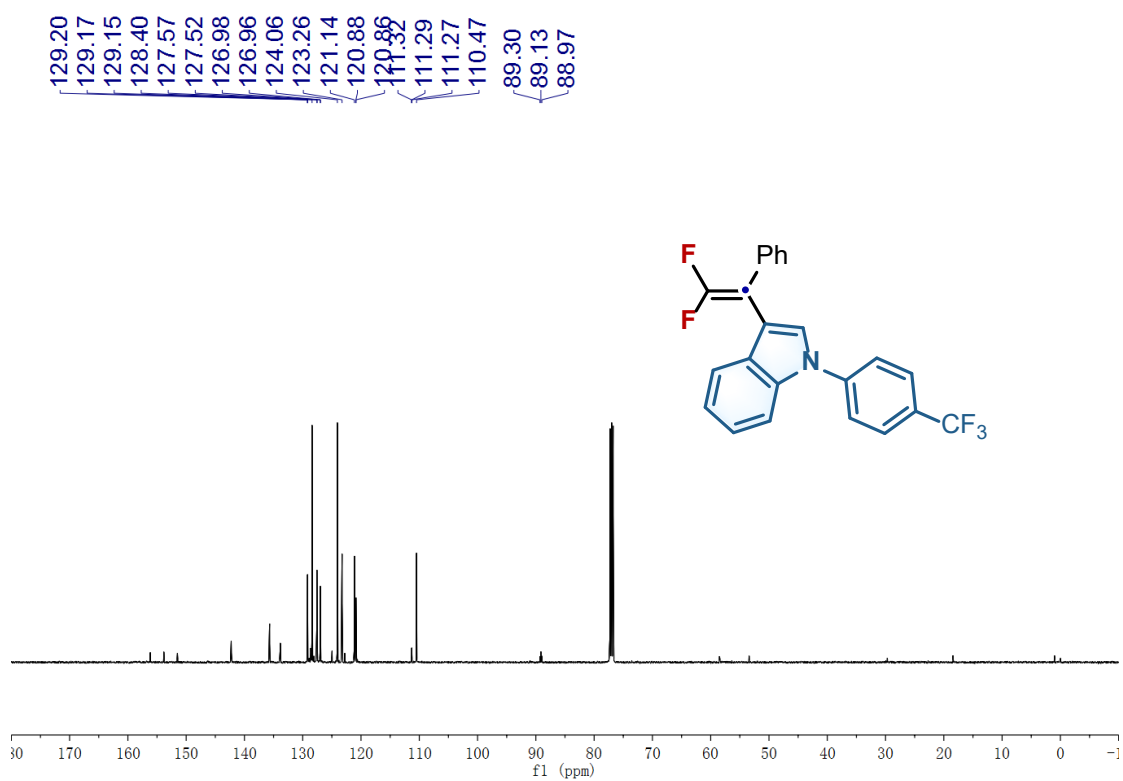
Supplementary Fig. 293. ¹³C NMR (150 MHz, CDCl₃) spectrum of **98**



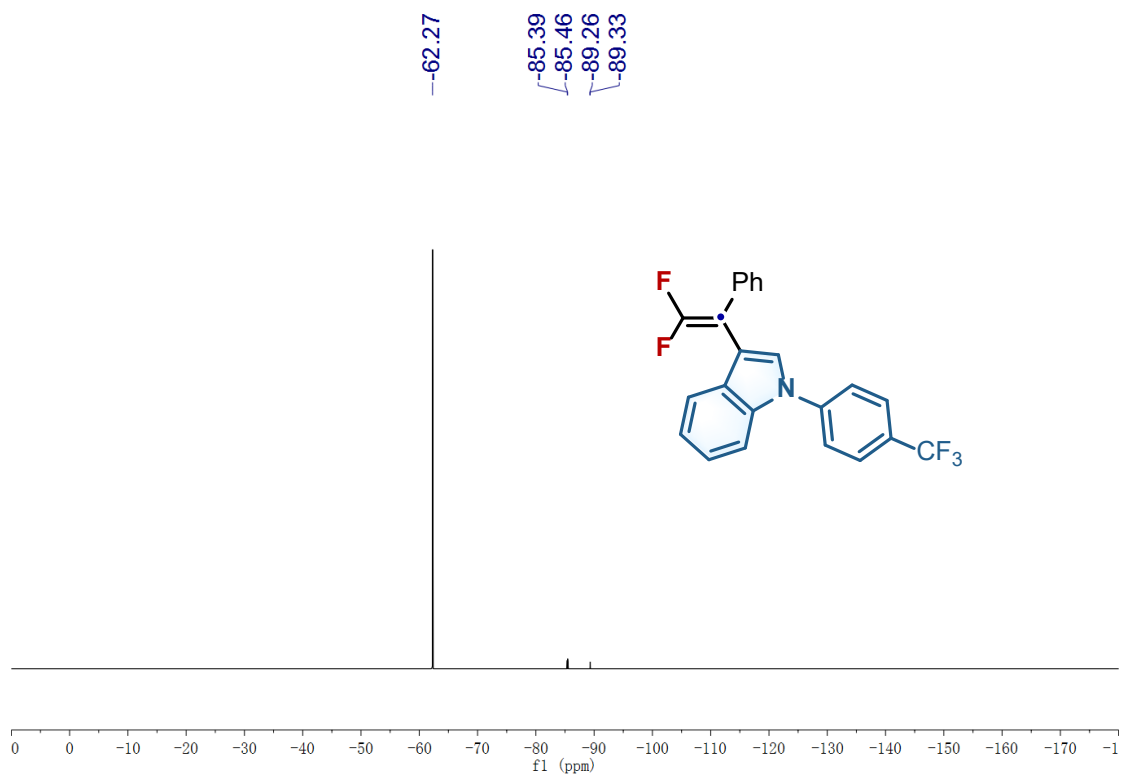
Supplementary Fig. 294. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **98**



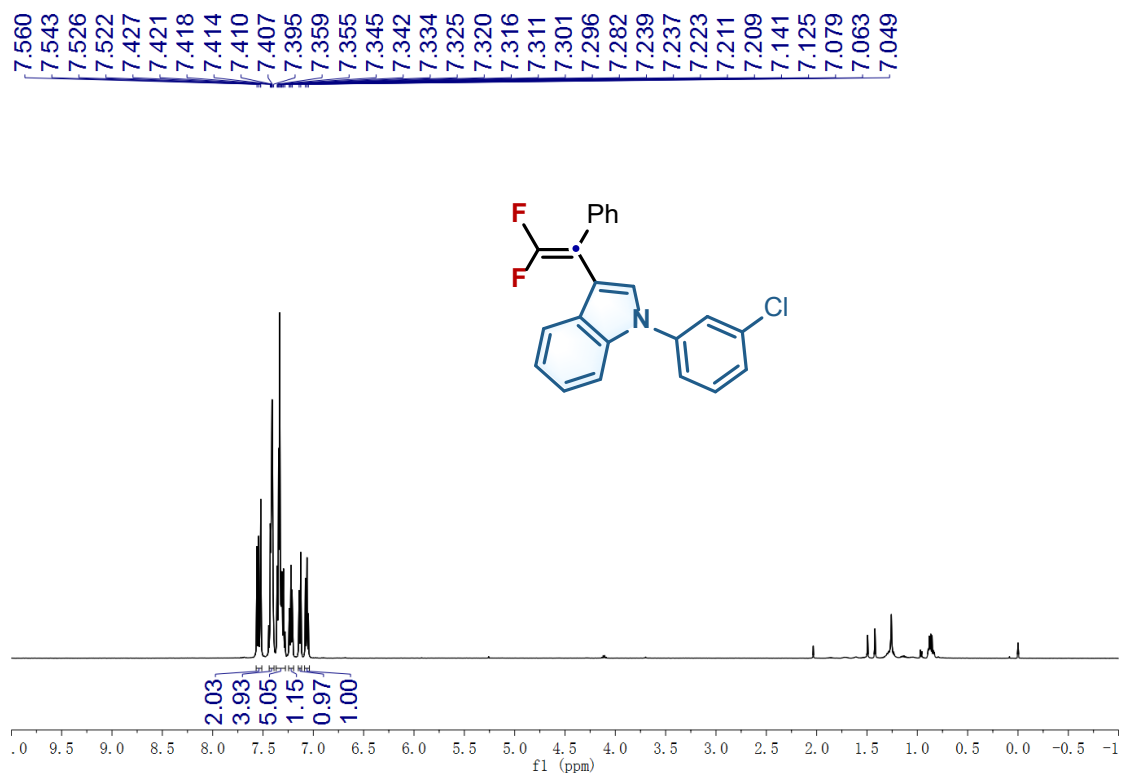
Supplementary Fig. 295. ¹H NMR (500 MHz, CDCl₃) spectrum of **99**



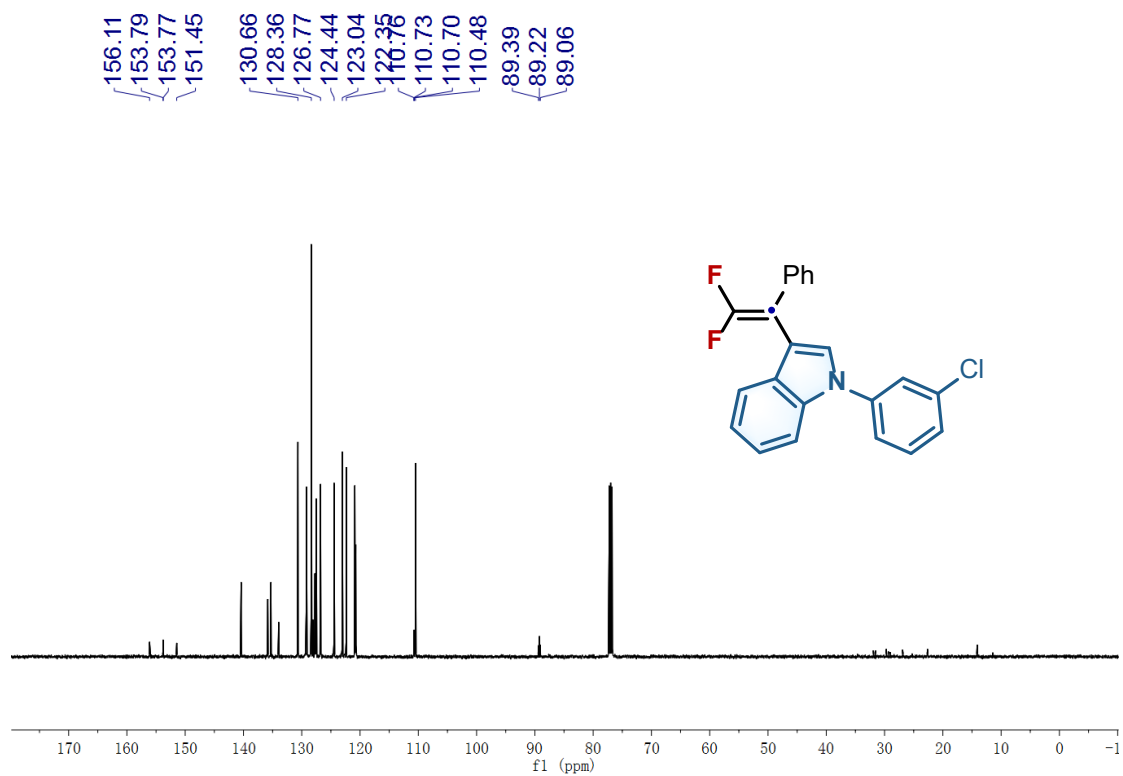
Supplementary Fig. 296. ¹³C NMR (125 MHz, CDCl₃) spectrum of **99**



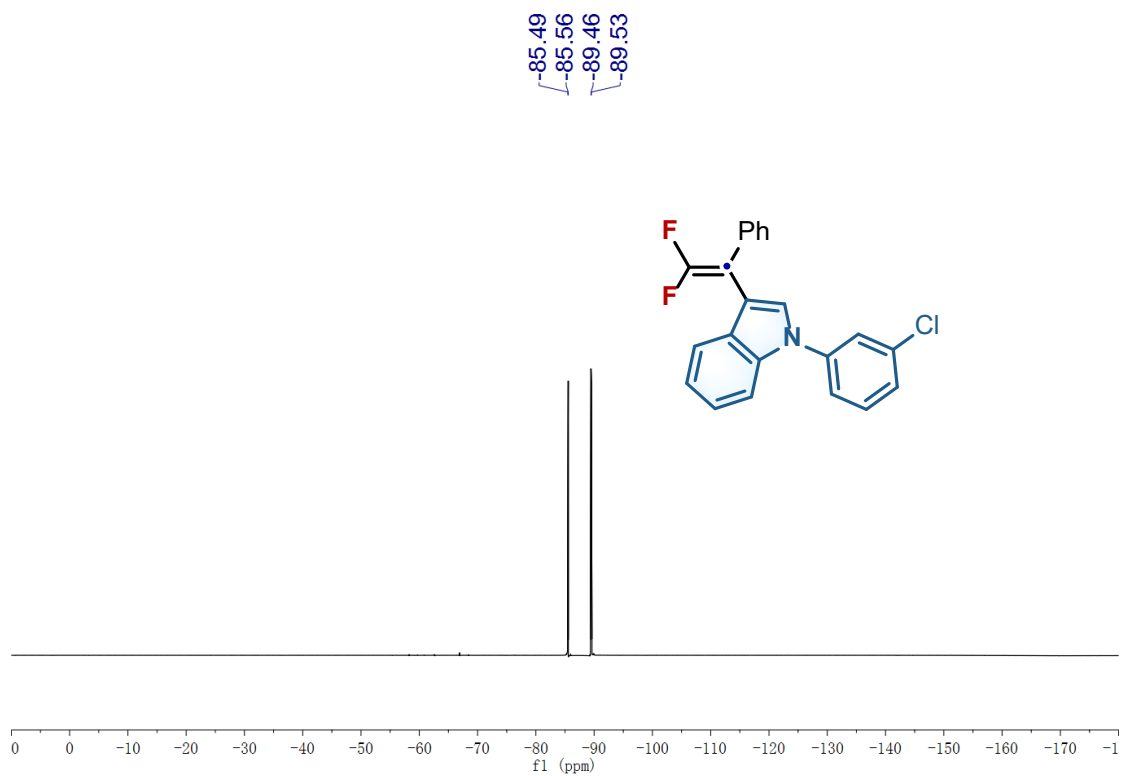
Supplementary Fig. 297. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 99



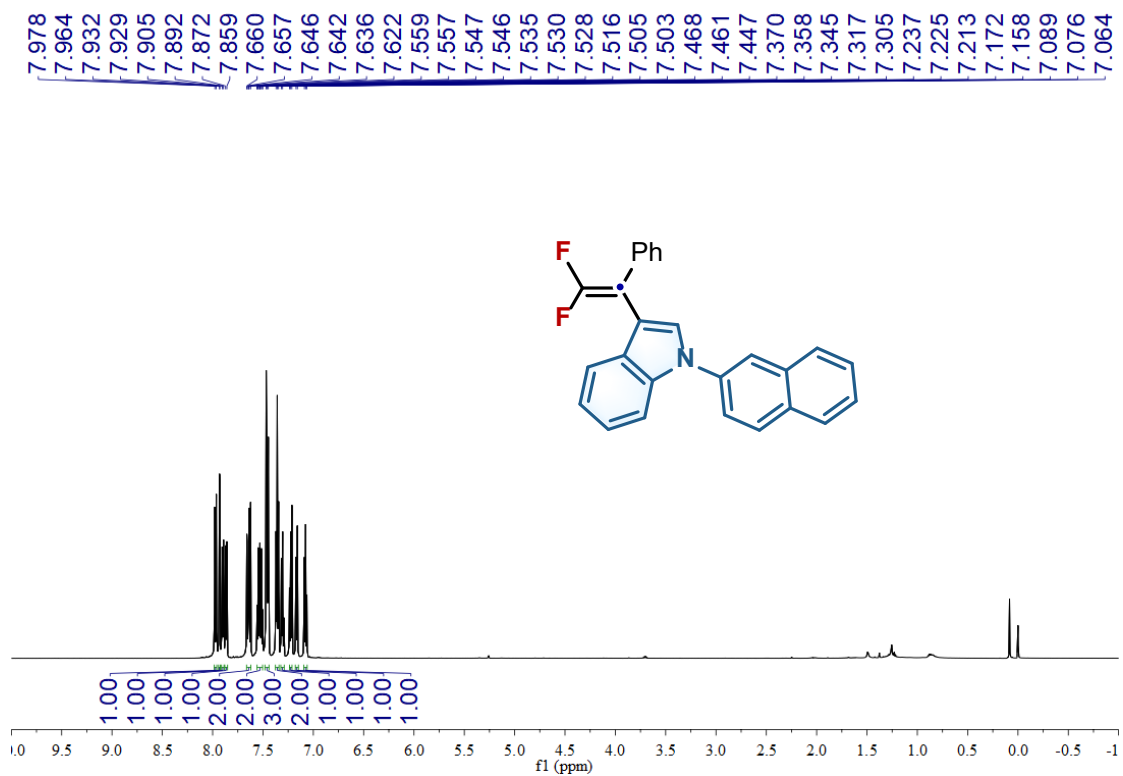
Supplementary Fig. 298. ¹H NMR (500 MHz, CDCl₃) spectrum of 100



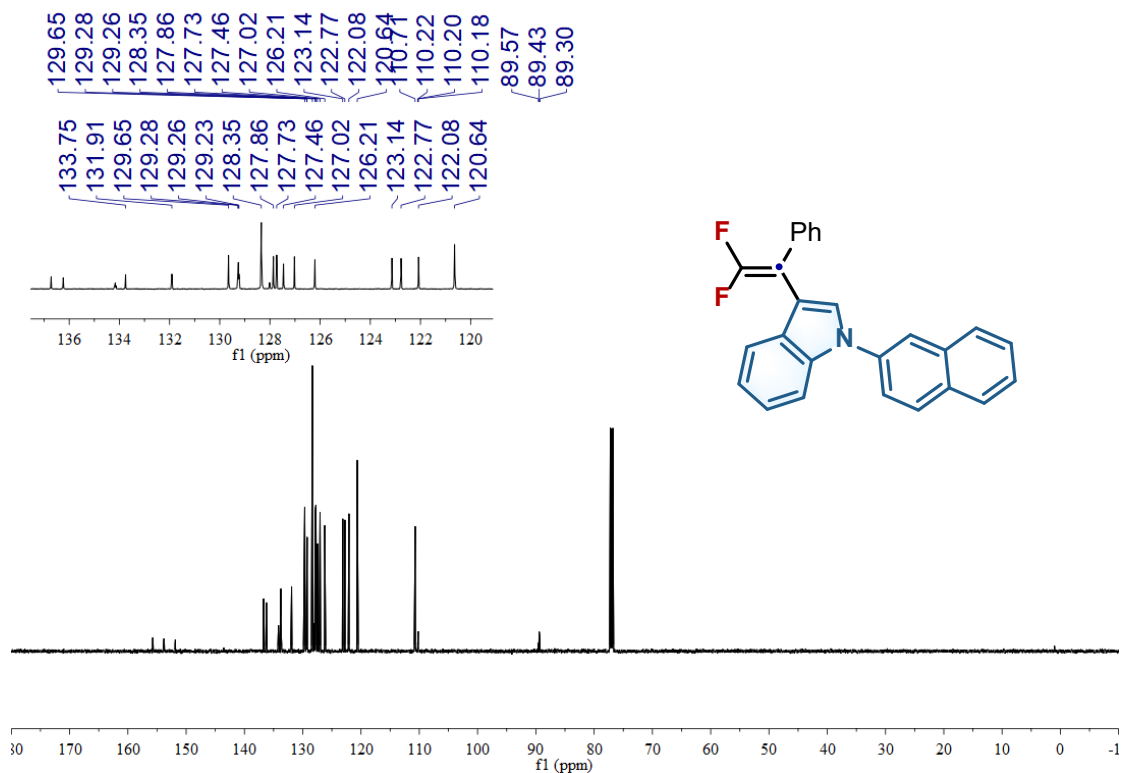
Supplementary Fig. 299. ¹³C NMR (125 MHz, CDCl₃) spectrum of **100**



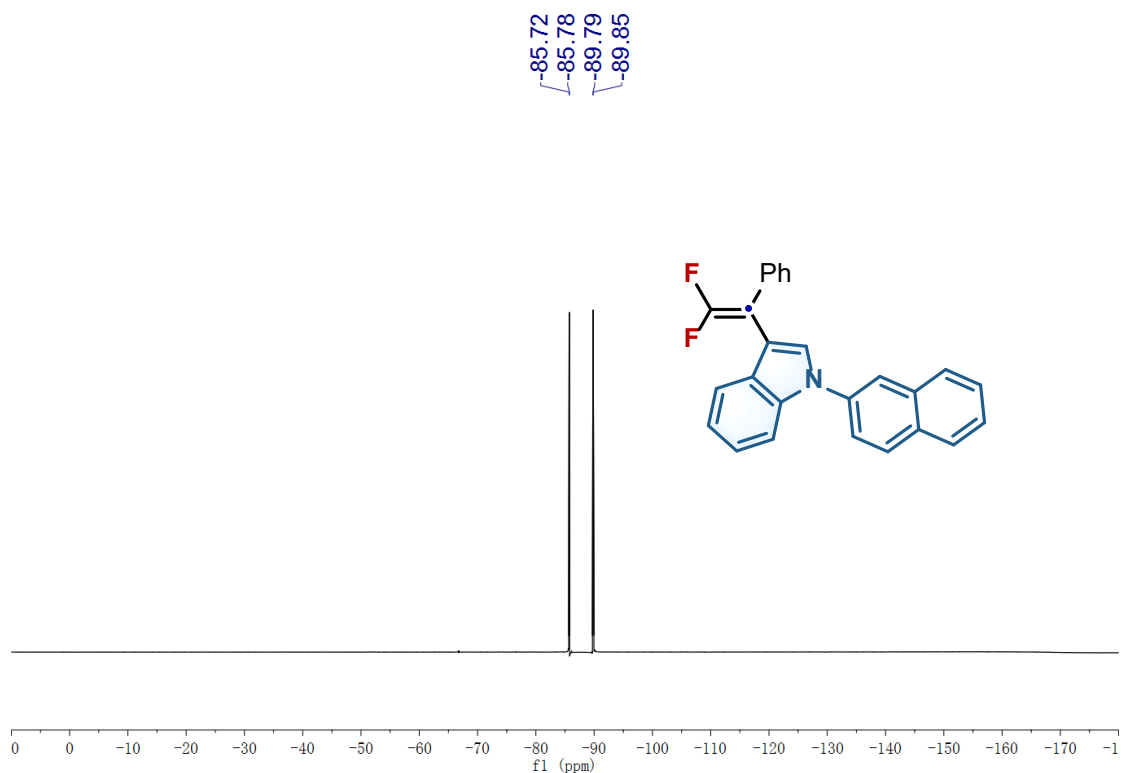
Supplementary Fig. 300. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **100**



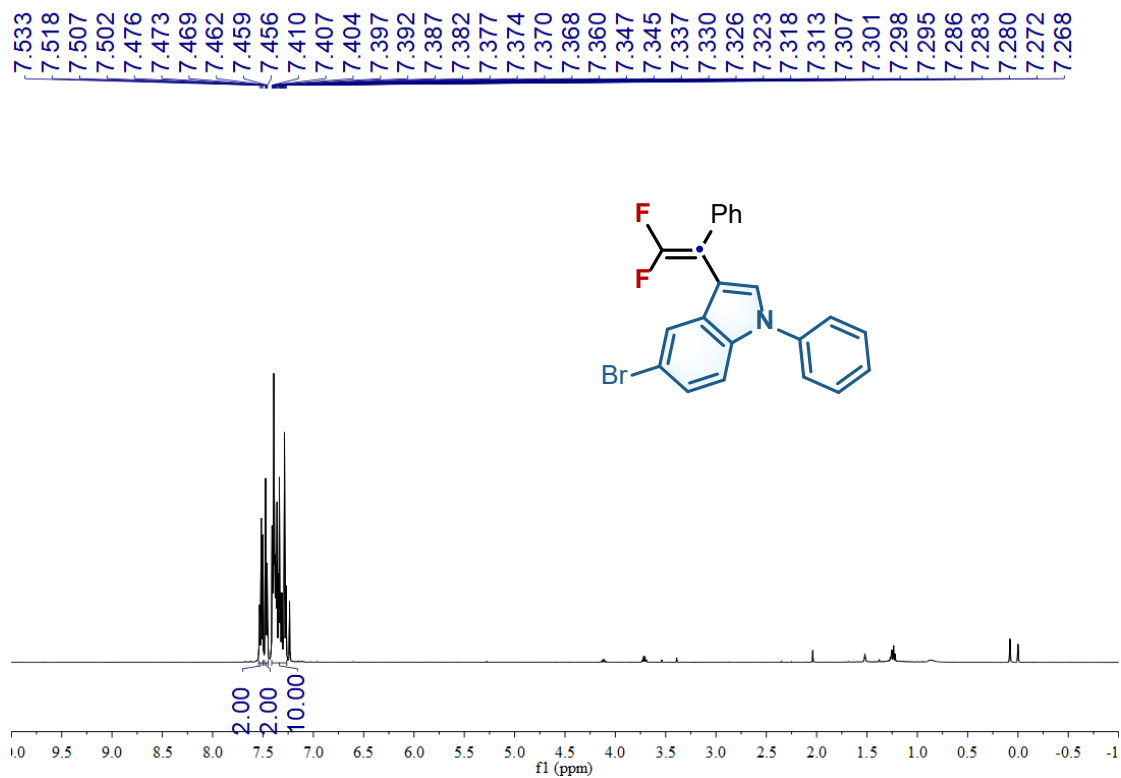
Supplementary Fig. 301. ¹H NMR (600 MHz, CDCl₃) spectrum of 101



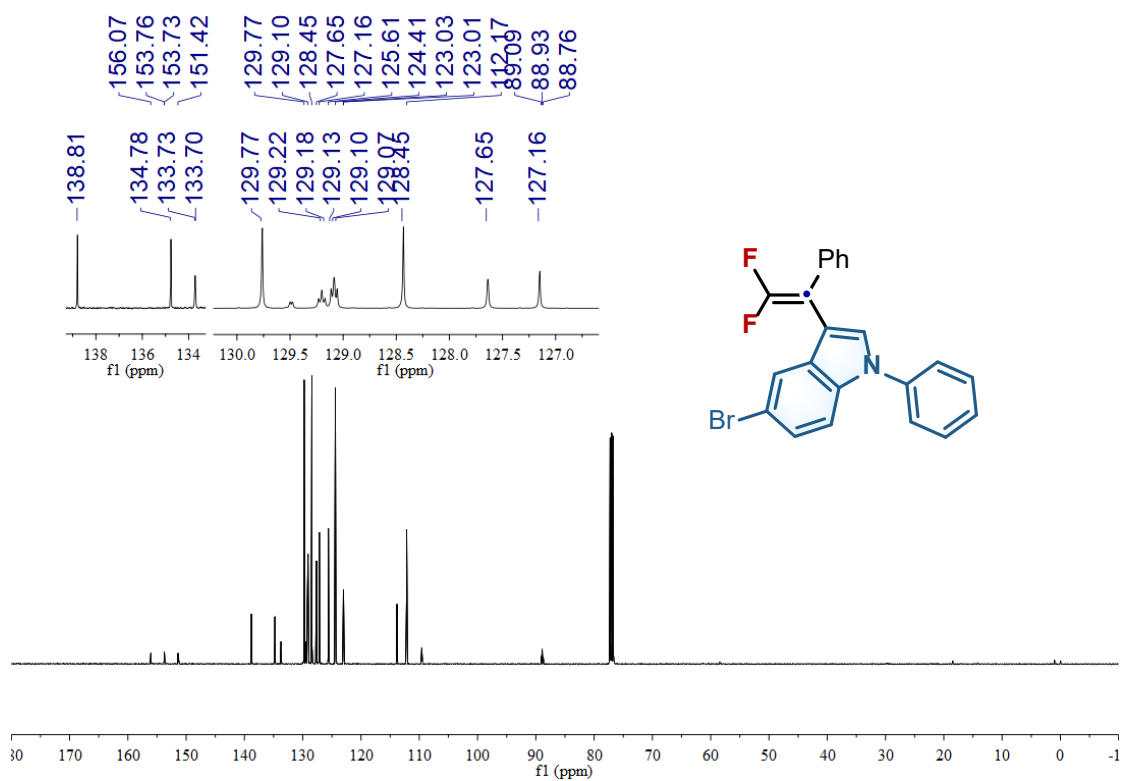
Supplementary Fig. 302. ¹³C NMR (150 MHz, CDCl₃) spectrum of 101



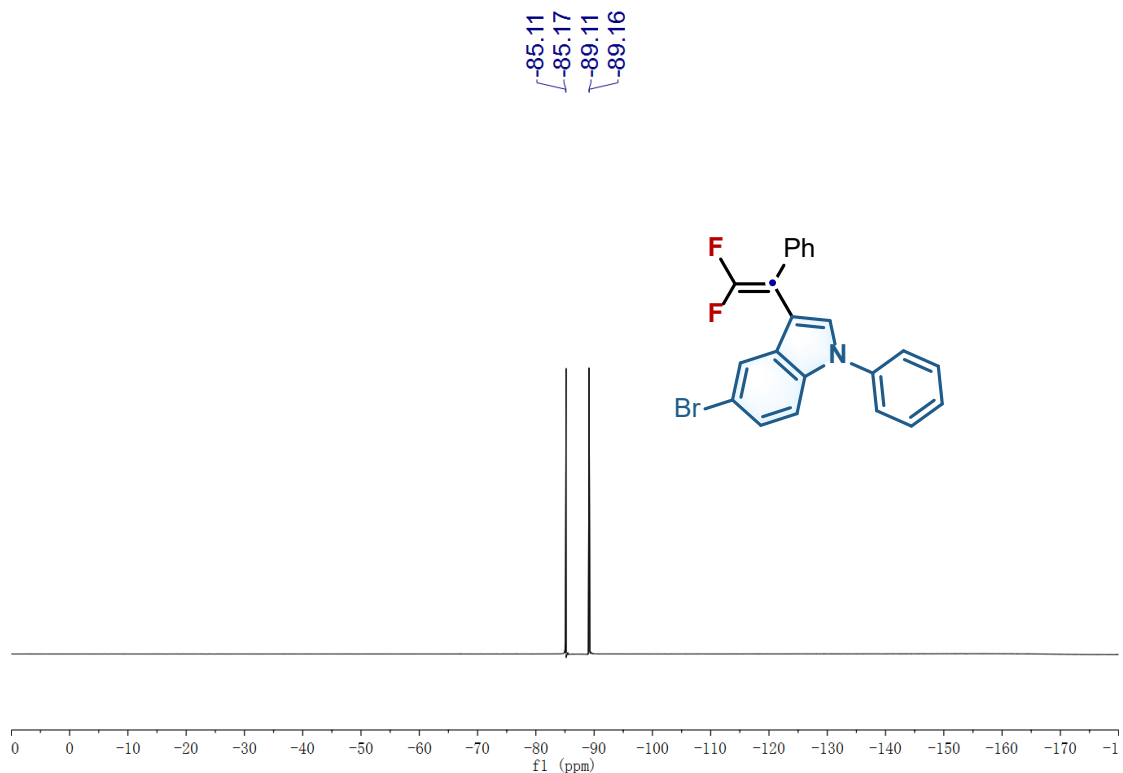
Supplementary Fig. 303. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **101**



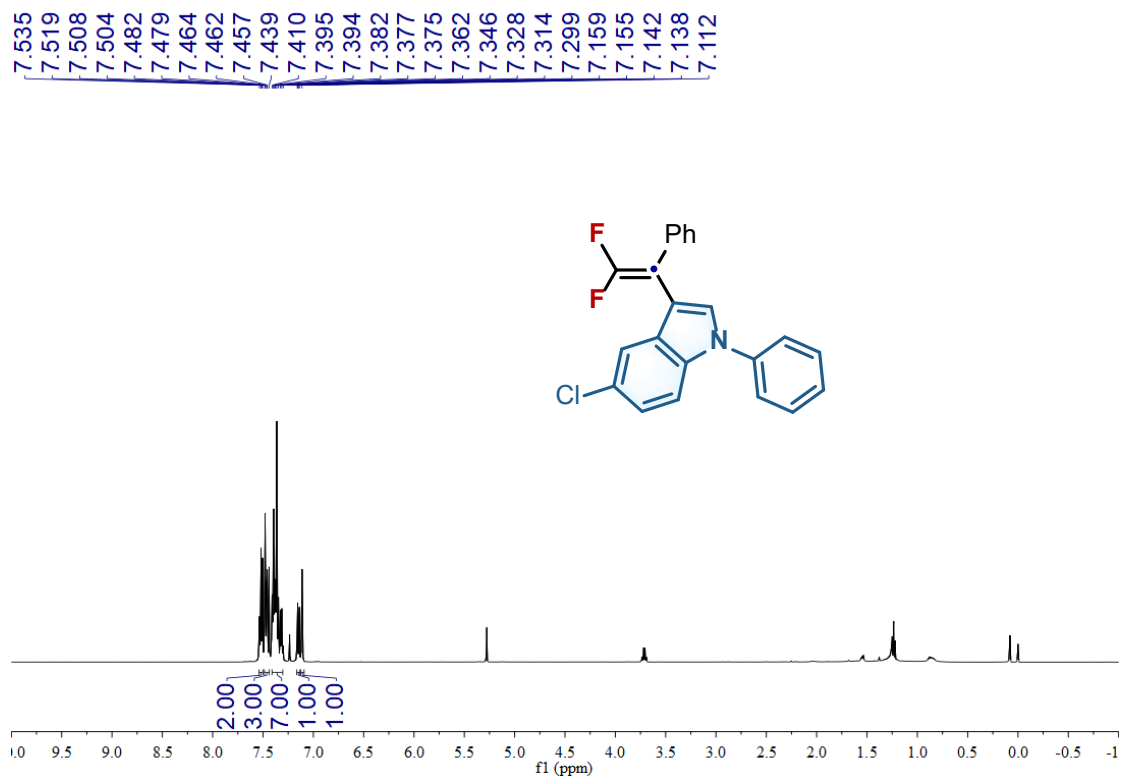
Supplementary Fig. 304. ¹H NMR (500 MHz, CDCl₃) spectrum of **102**



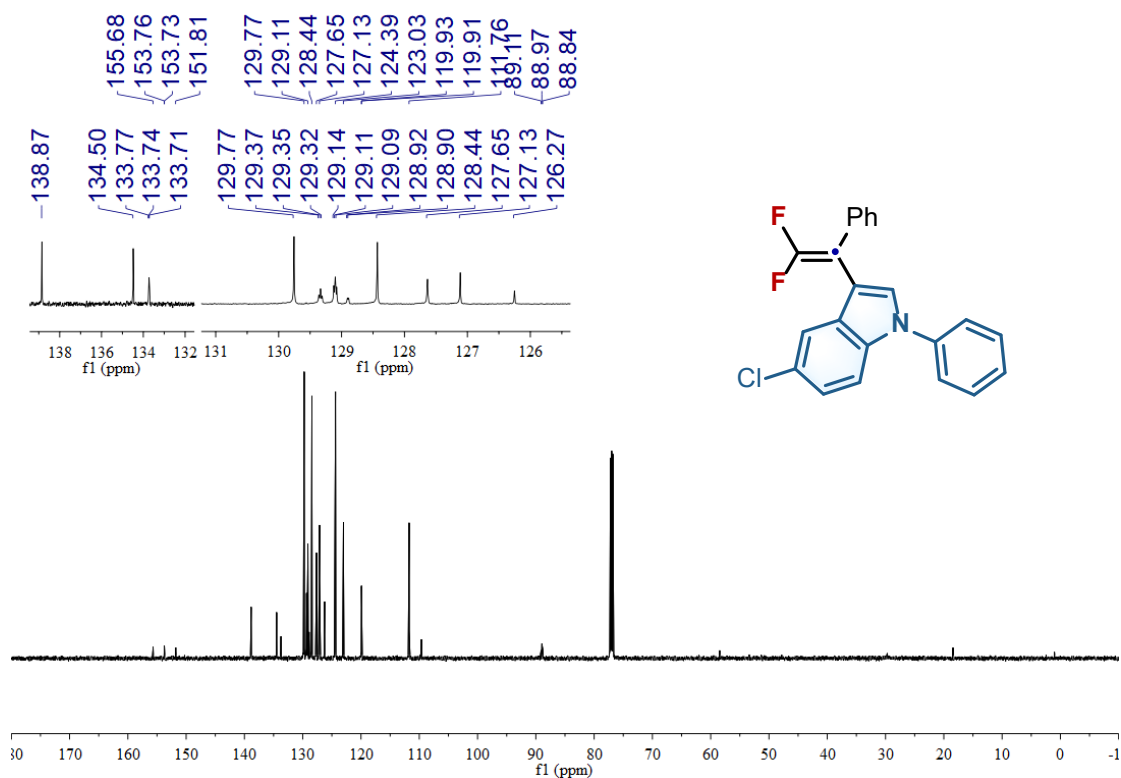
Supplementary Fig. 305. ¹³C NMR (125 MHz, CDCl₃) spectrum of **102**



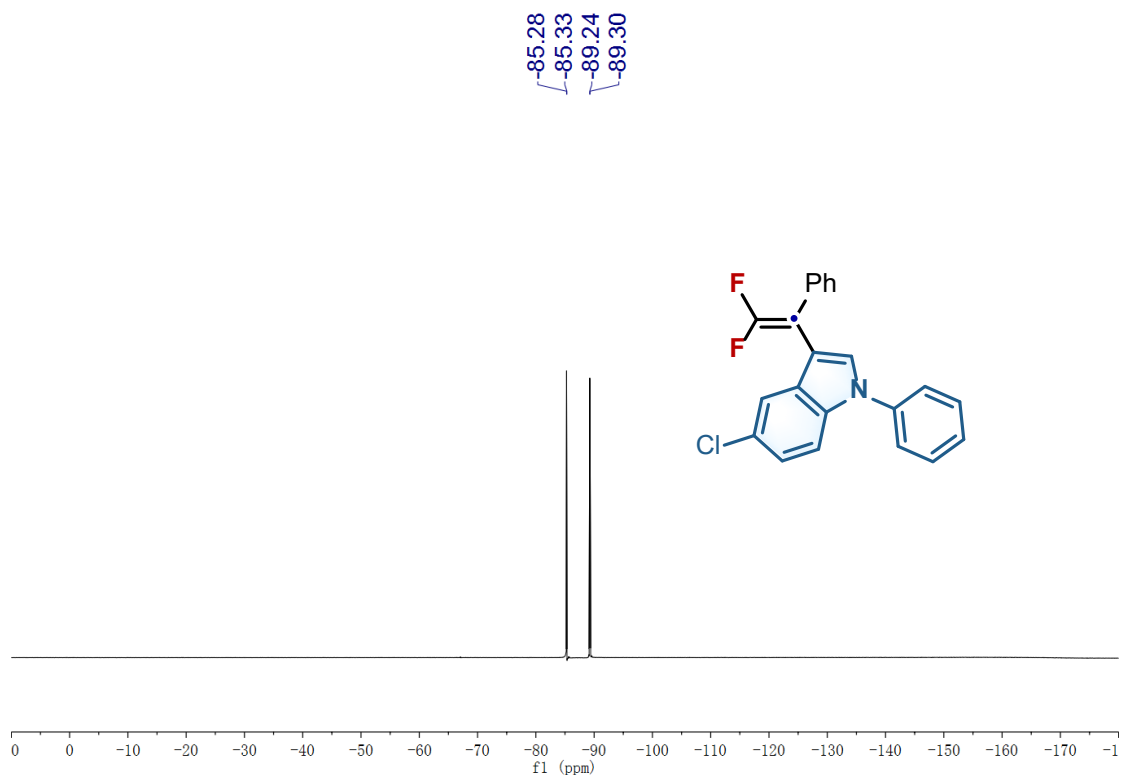
Supplementary Fig. 306. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **102**



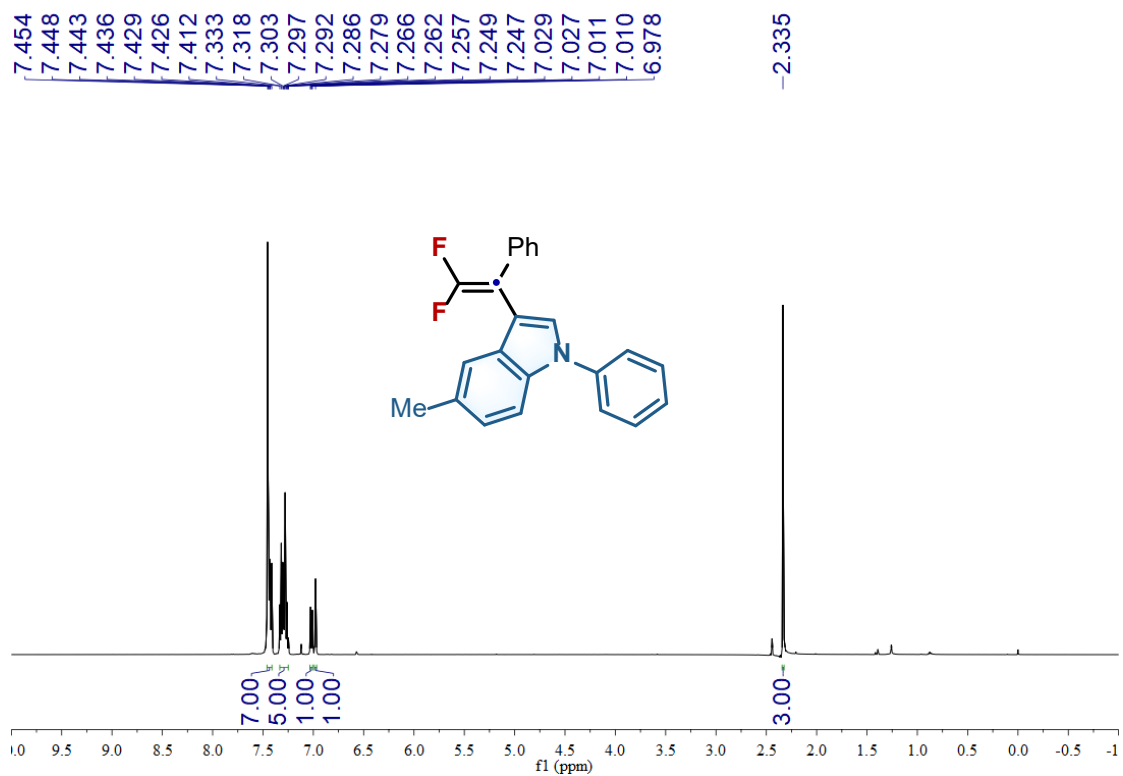
Supplementary Fig. 307. ¹H NMR (500 MHz, CDCl₃) spectrum of **103**



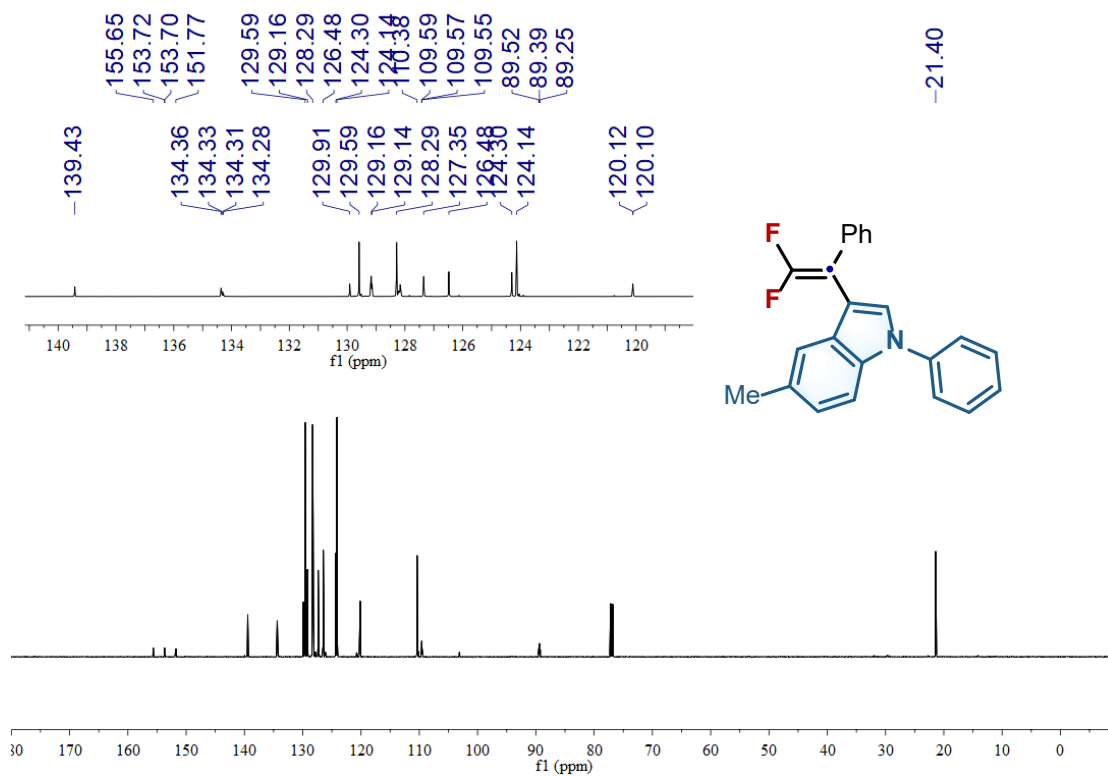
Supplementary Fig. 308. ¹³C NMR (150 MHz, CDCl₃) spectrum of **103**



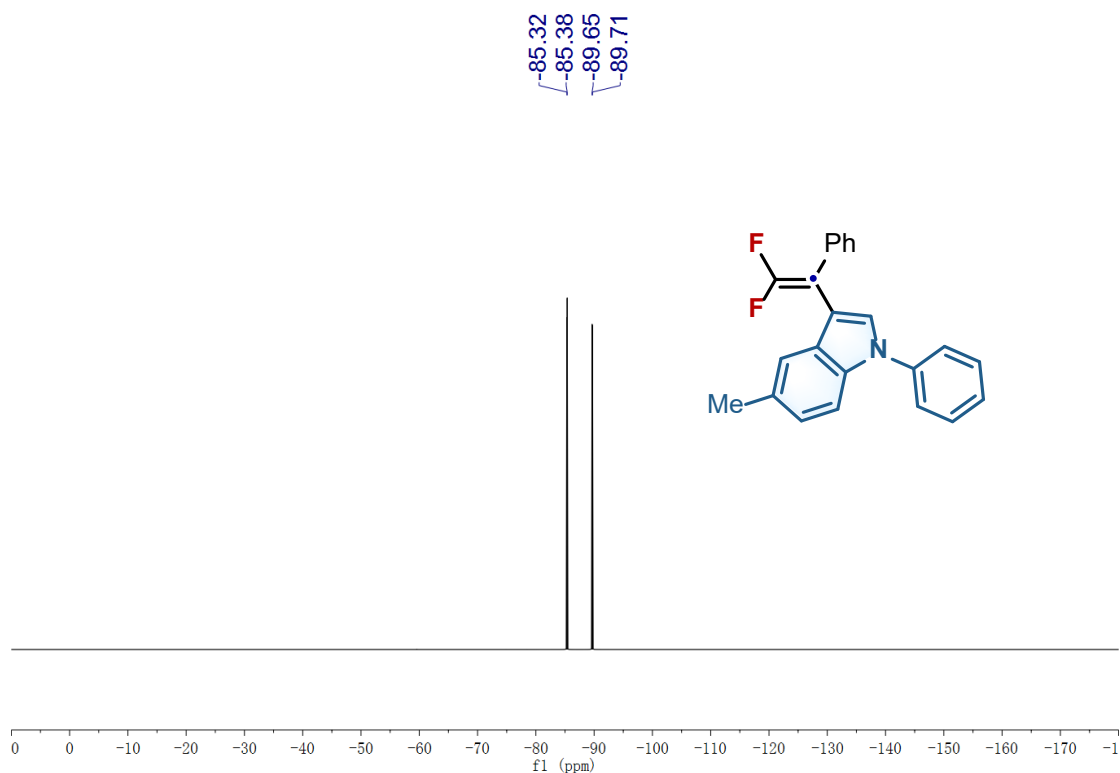
Supplementary Fig. 309. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **103**



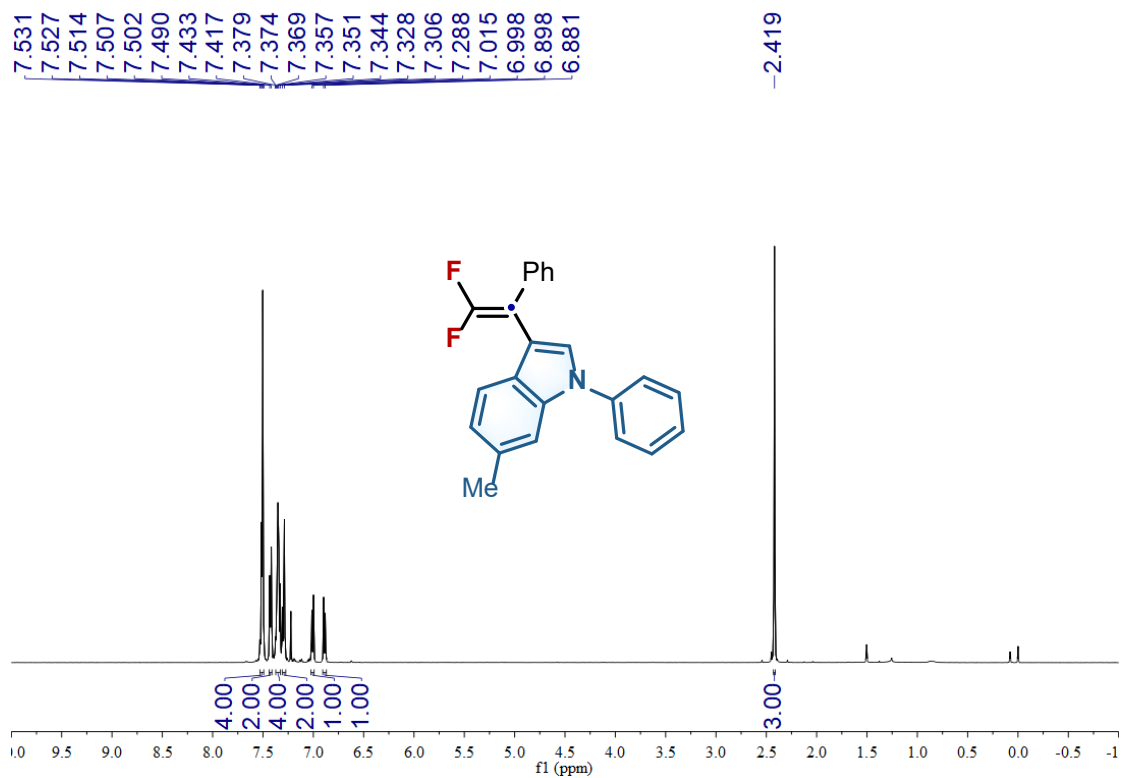
Supplementary Fig. 310. ¹H NMR (500 MHz, CDCl₃) spectrum of **104**



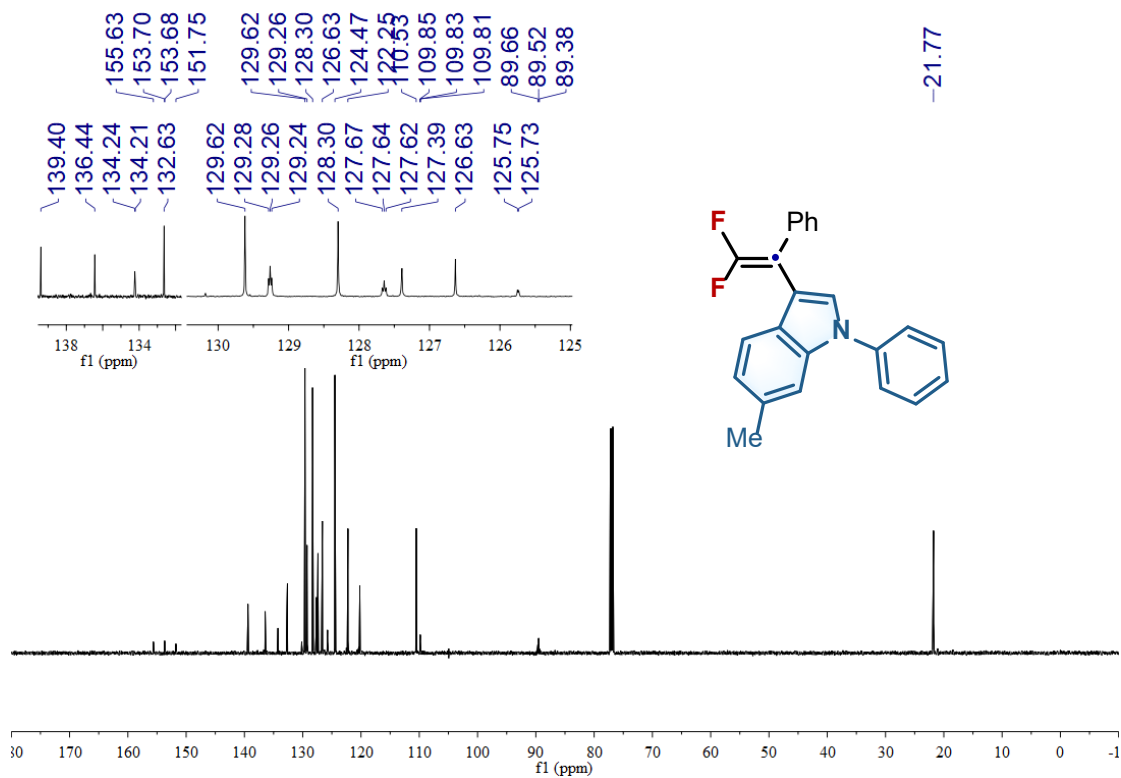
Supplementary Fig. 311. ¹³C NMR (150 MHz, CDCl₃) spectrum of **104**



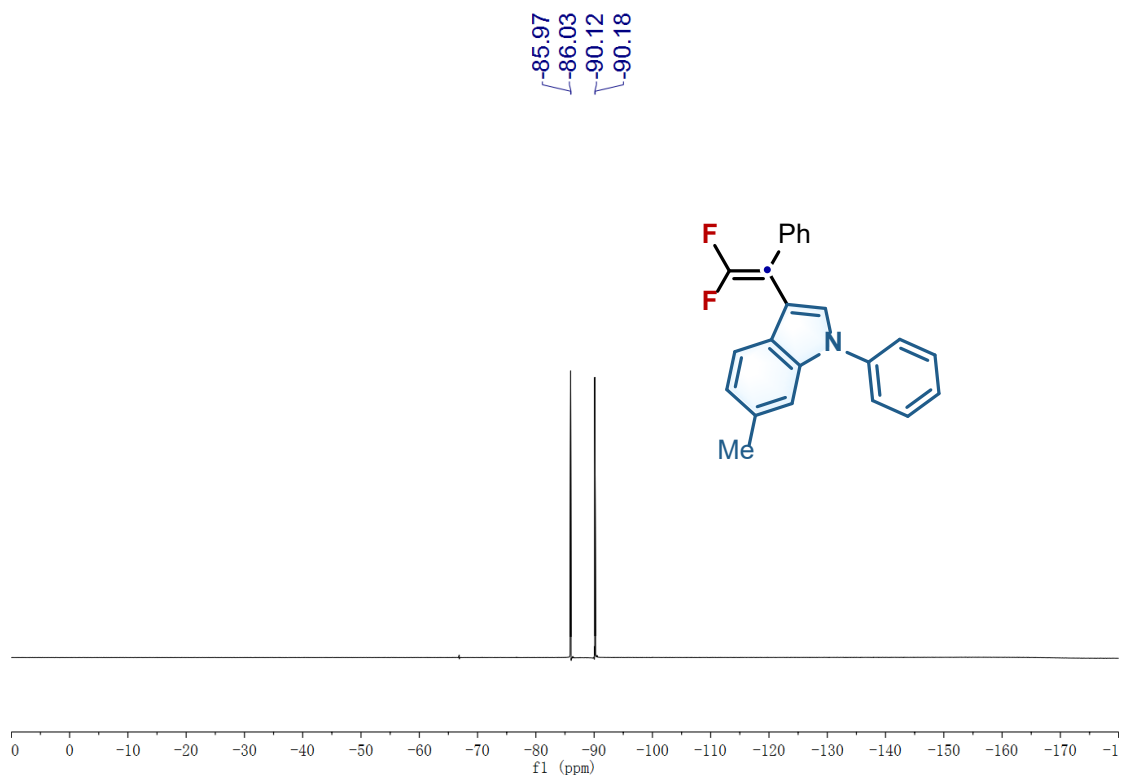
Supplementary Fig. 312. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **104**



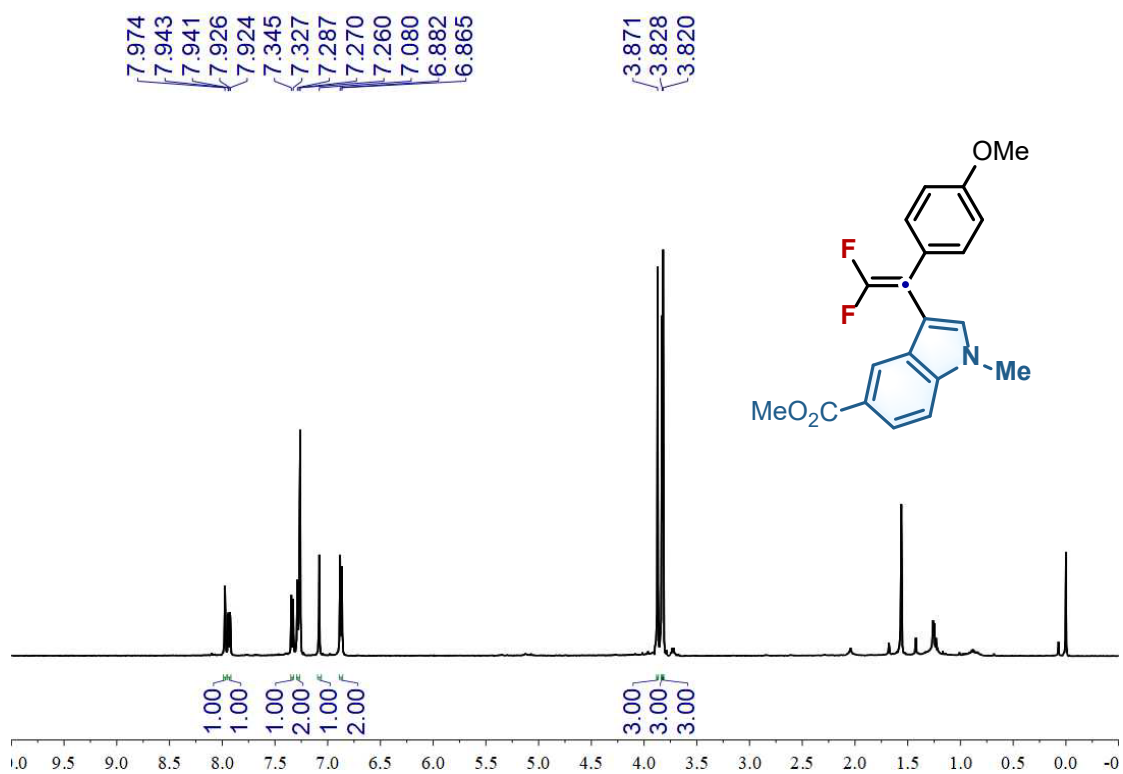
Supplementary Fig. 313. ¹H NMR (500 MHz, CDCl₃) spectrum of 105



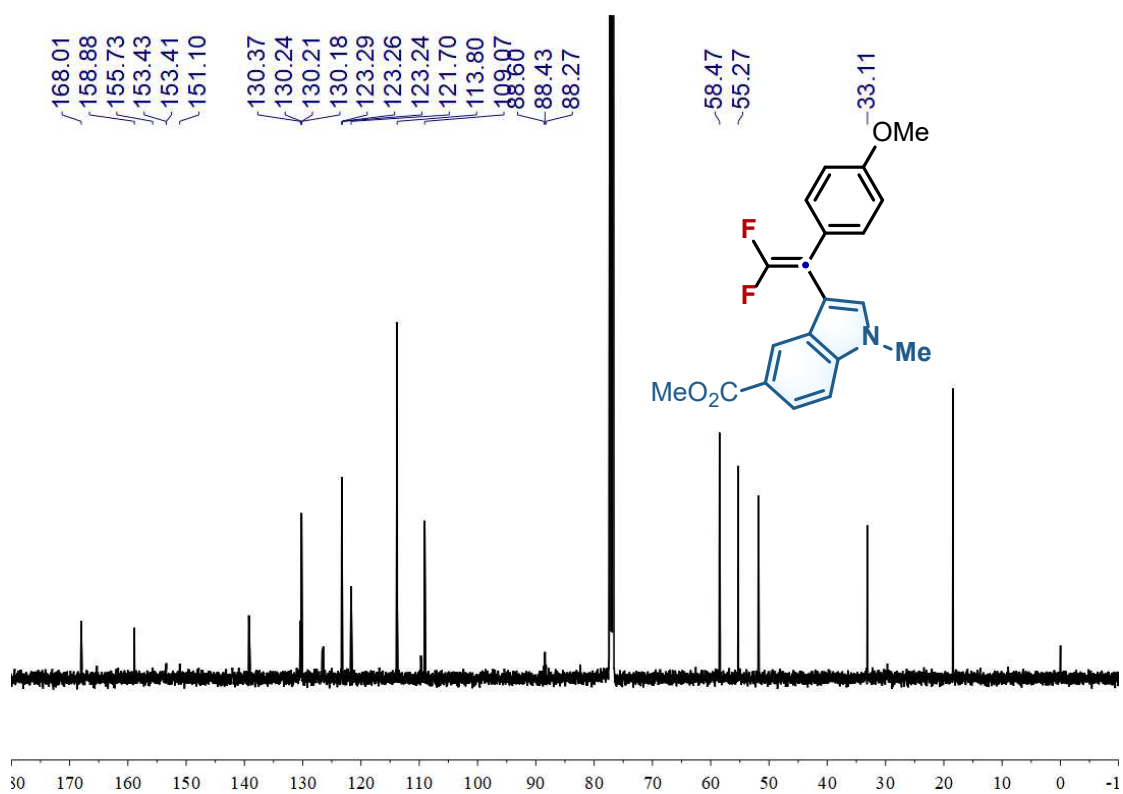
Supplementary Fig. 314. ¹³C NMR (150 MHz, CDCl₃) spectrum of 105



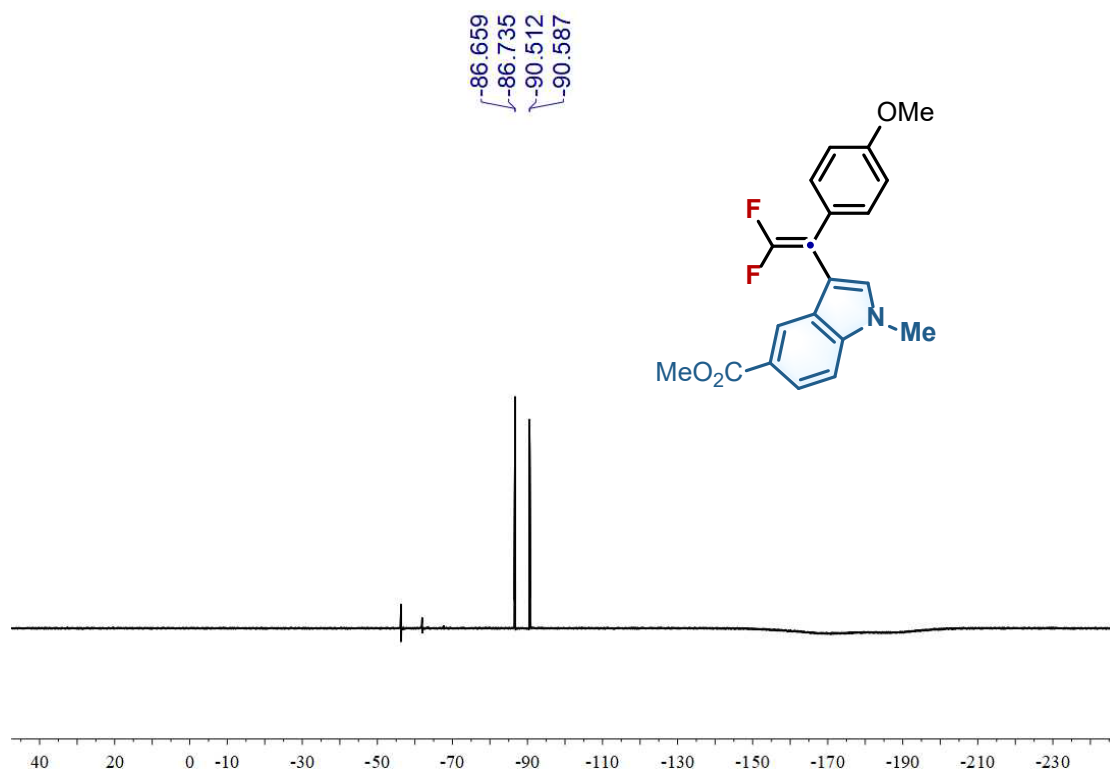
Supplementary Fig. 315. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **105**



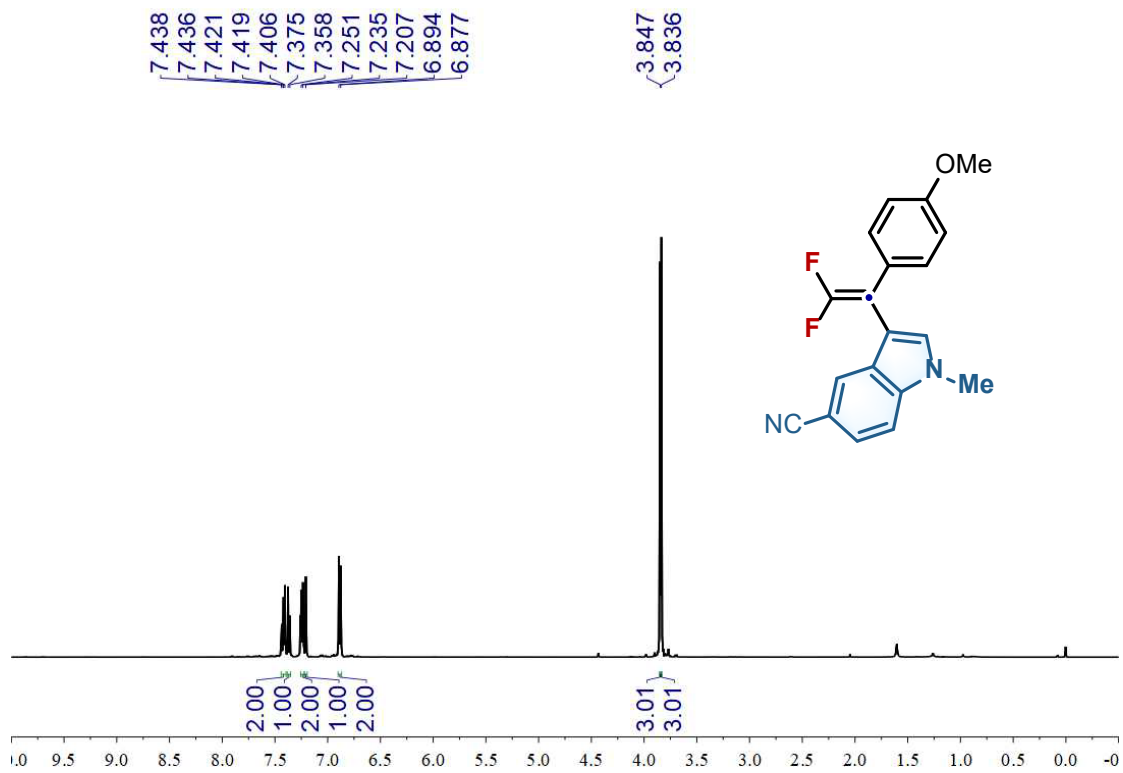
Supplementary Fig. 316. ¹H NMR (500 MHz, CDCl₃) spectrum of **106**



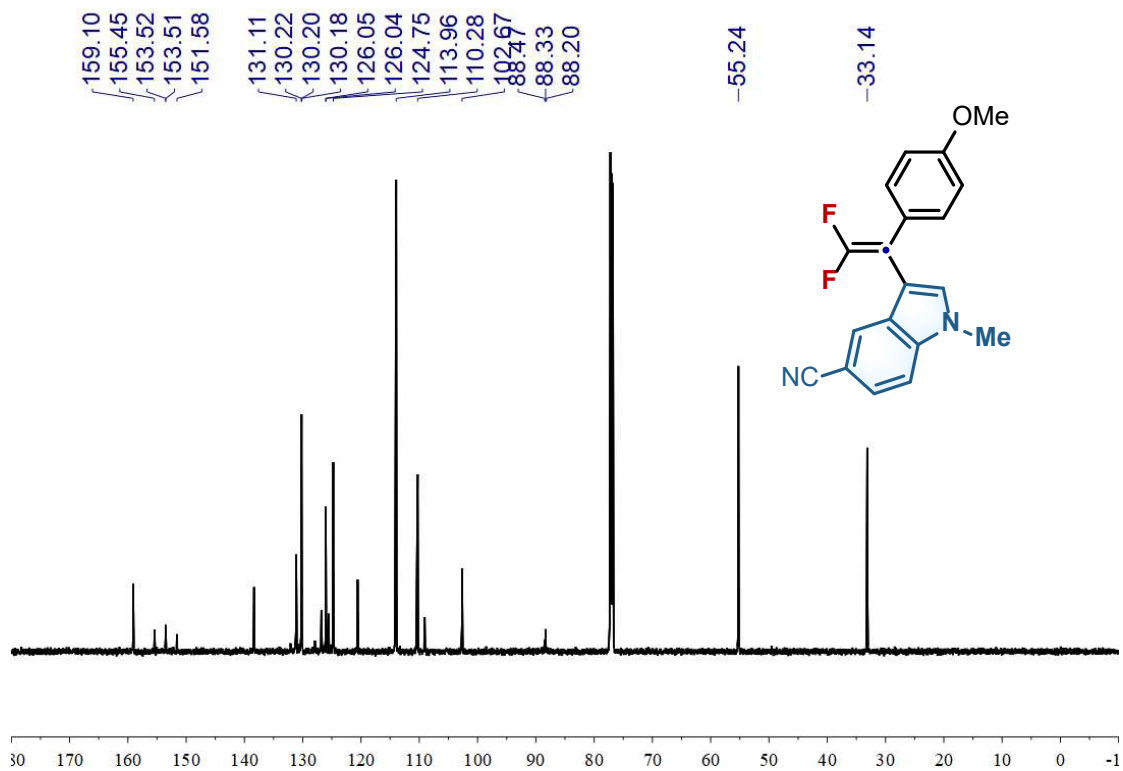
Supplementary Fig. 317. ¹³C NMR (125 MHz, CDCl₃) spectrum of **106**



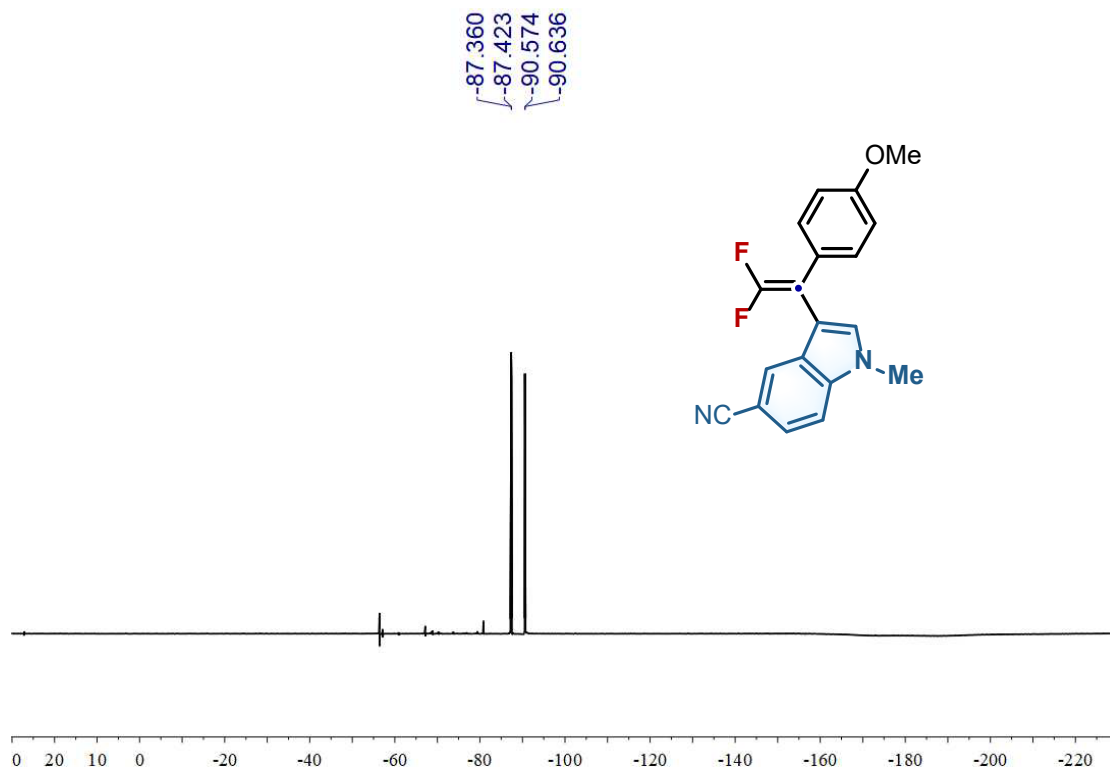
Supplementary Fig. 318. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **106**



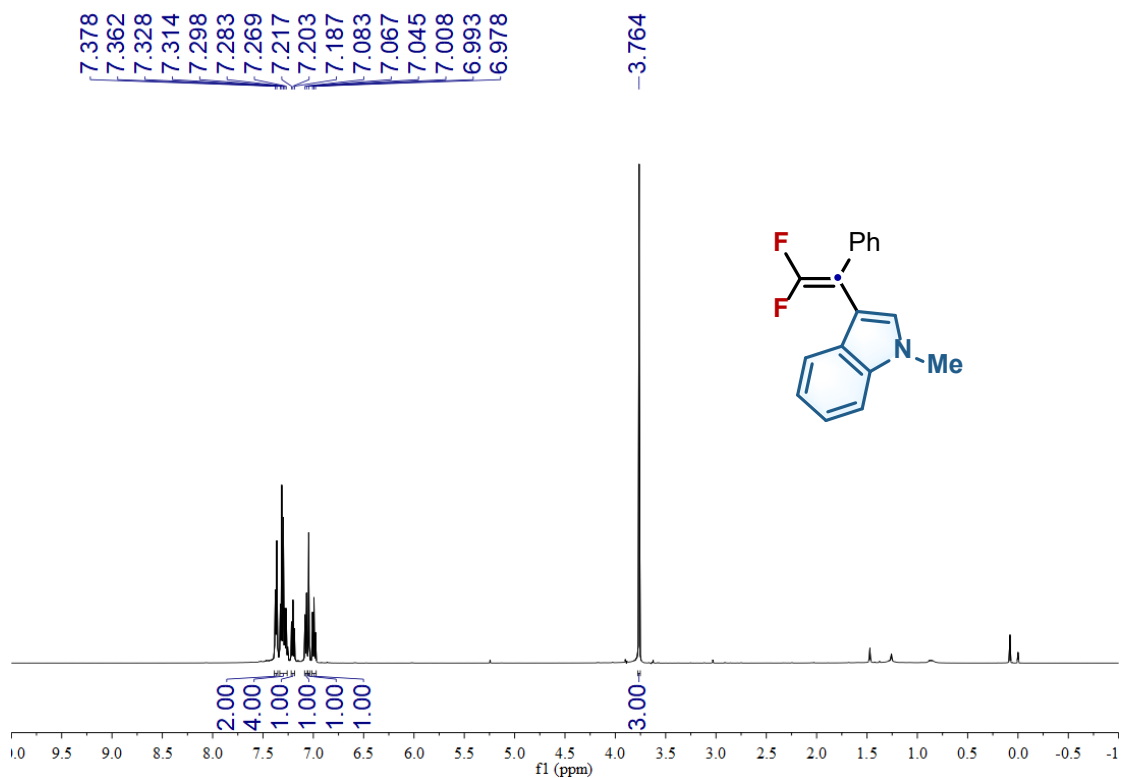
Supplementary Fig. 319. ¹H NMR (500 MHz, CDCl₃) spectrum of **107**



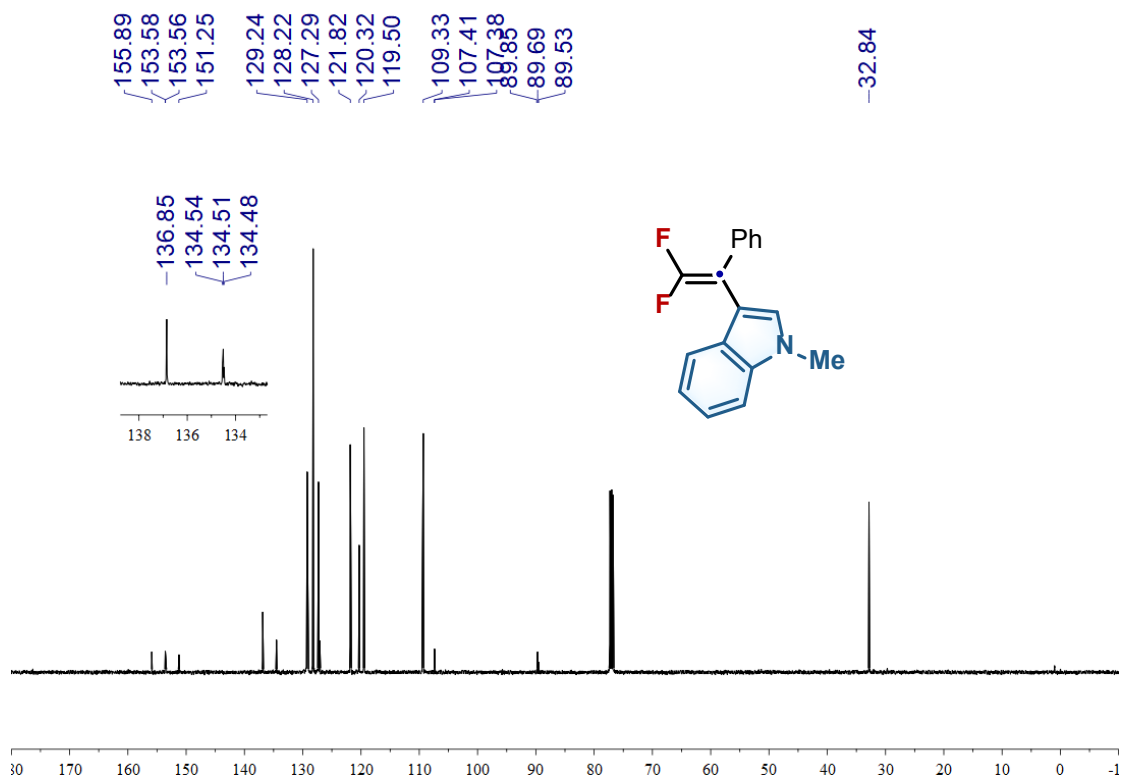
Supplementary Fig. 320. ¹³C NMR (150 MHz, CDCl₃) spectrum of **107**



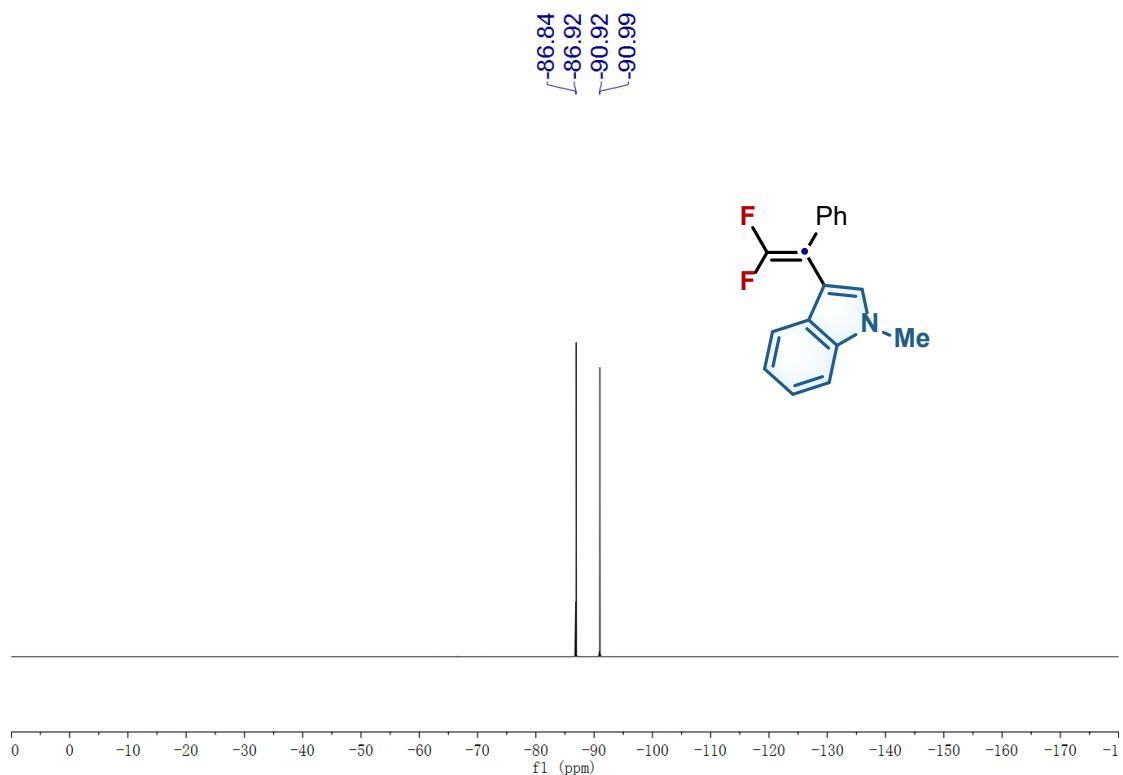
Supplementary Fig. 321. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 107



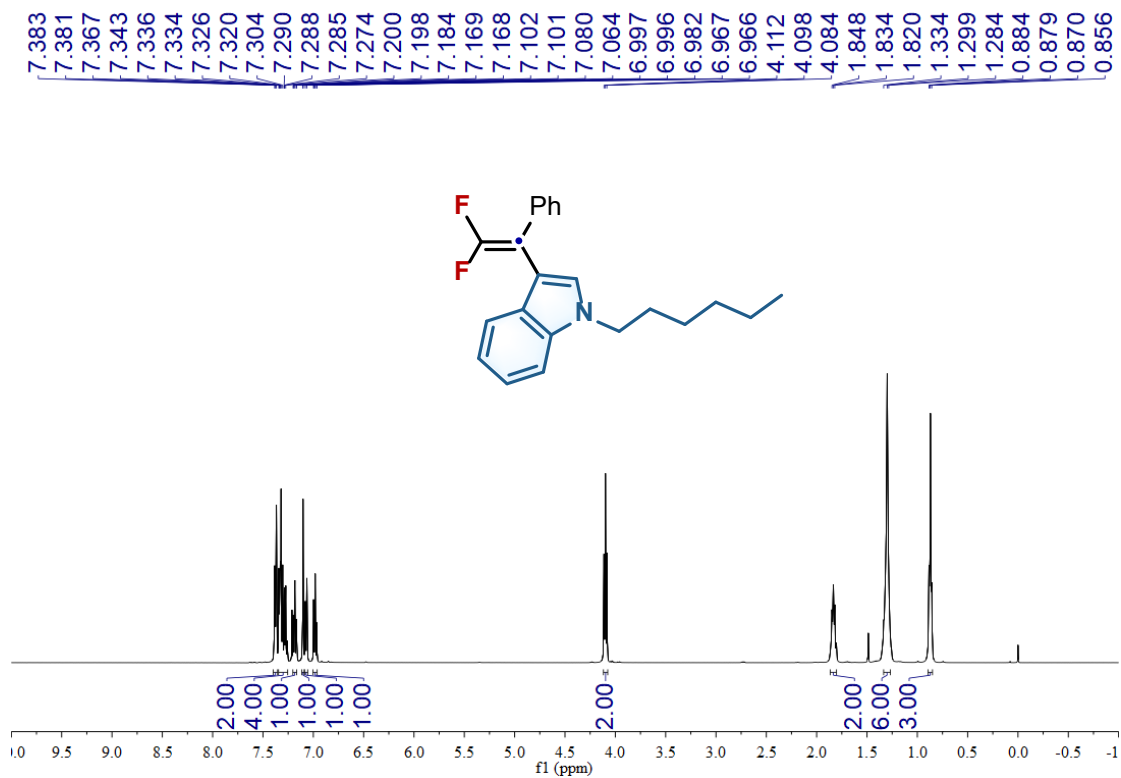
Supplementary Fig. 322. ¹H NMR (500 MHz, CDCl₃) spectrum of 108



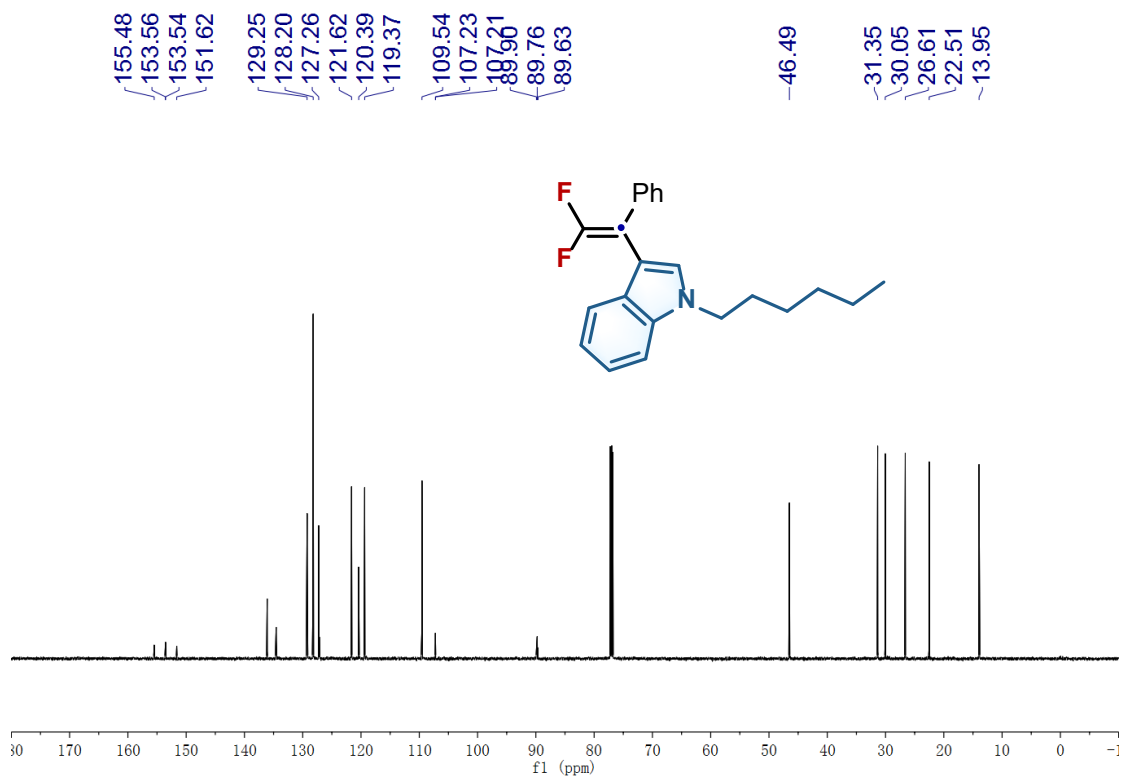
Supplementary Fig. 323. ¹³C NMR (125 MHz, CDCl₃) spectrum of 108



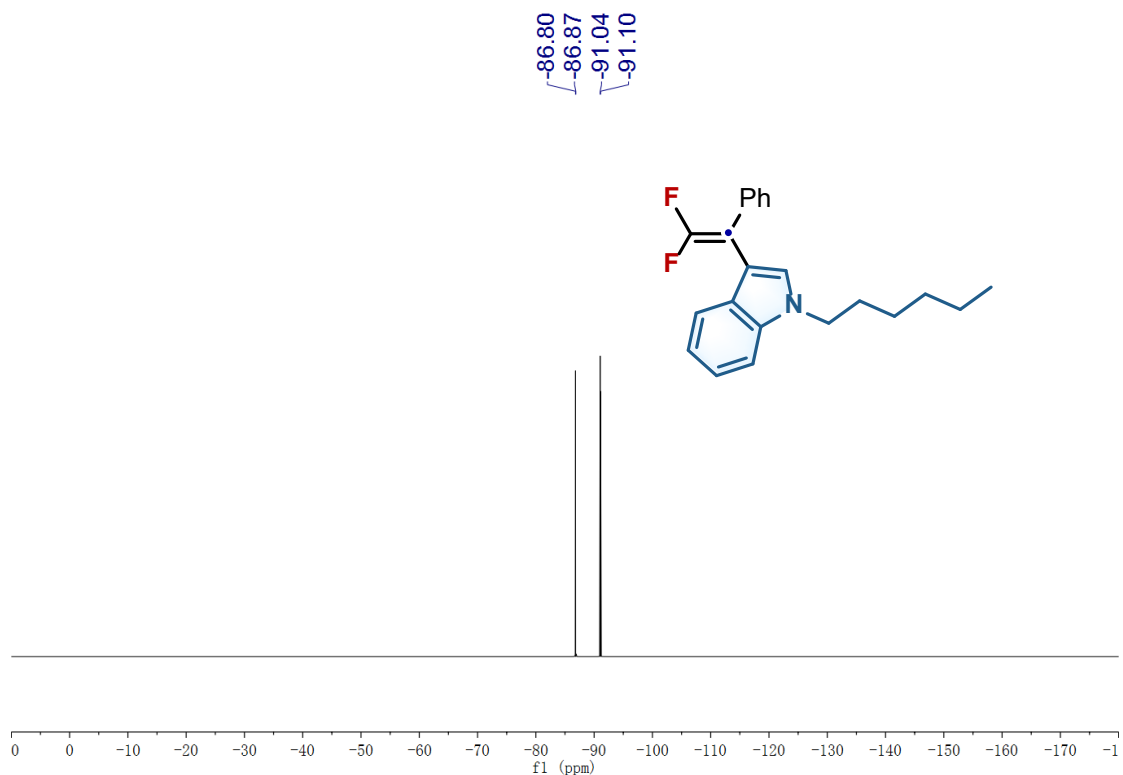
Supplementary Fig. 324. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 108



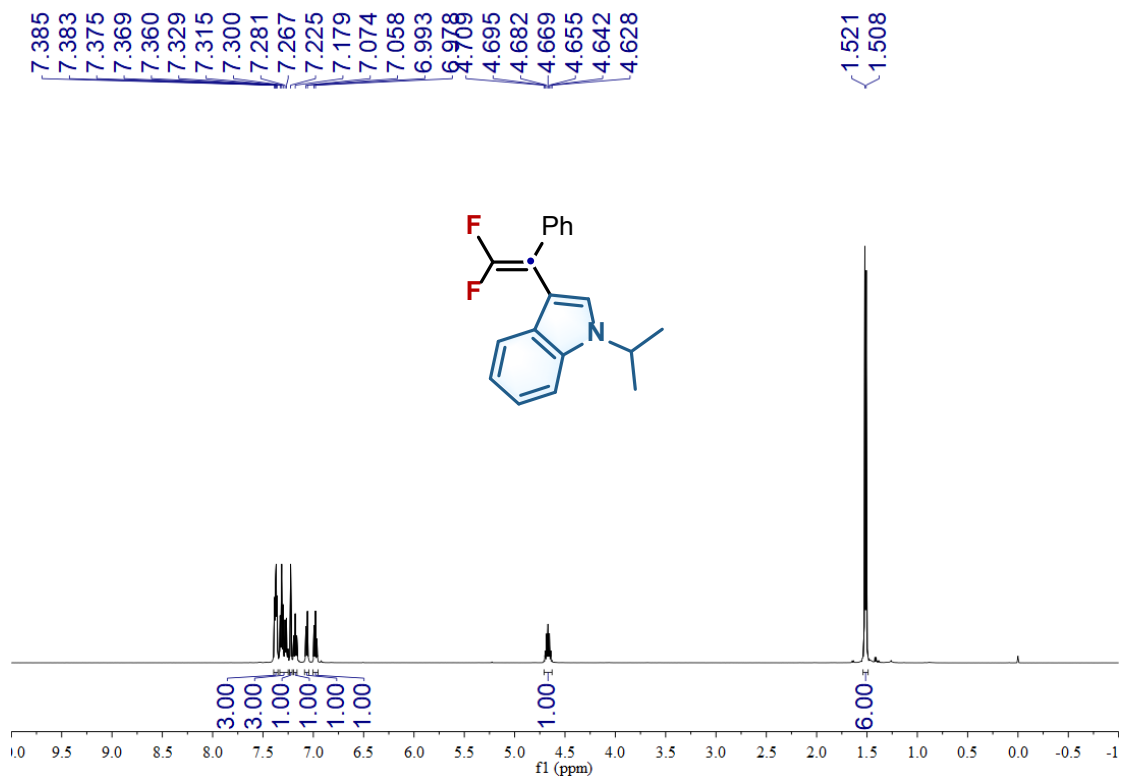
Supplementary Fig. 325. ¹H NMR (500 MHz, CDCl₃) spectrum of 109



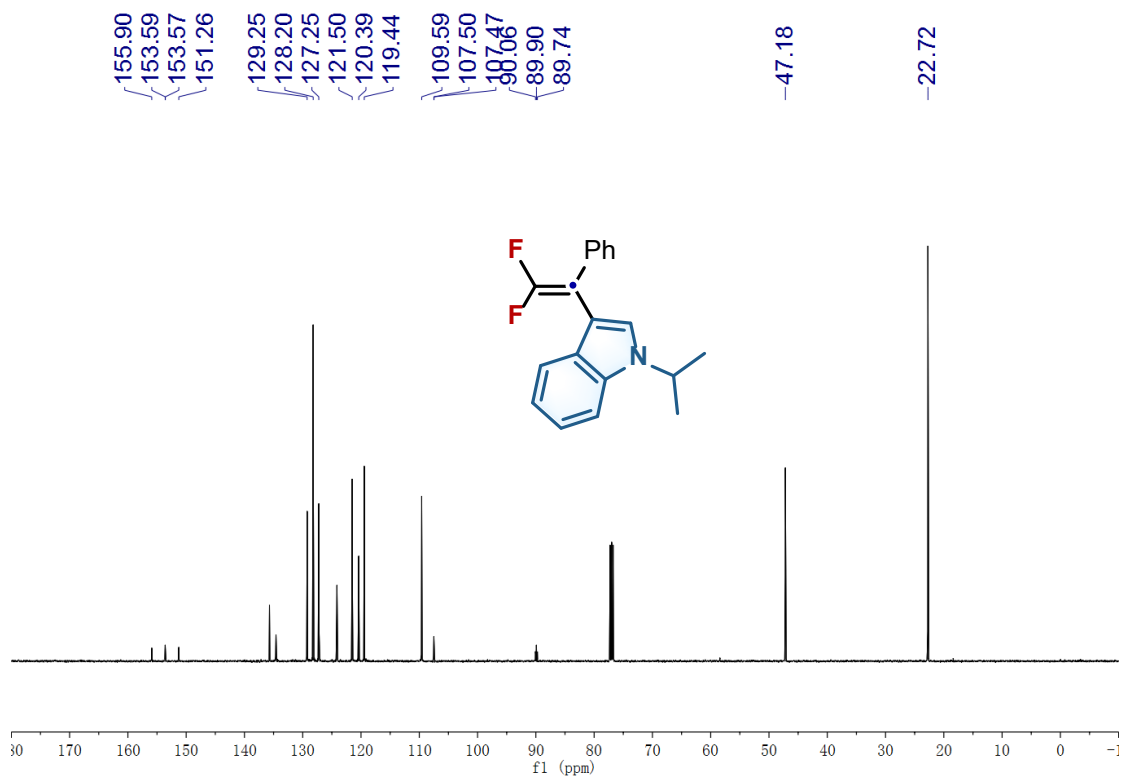
Supplementary Fig. 326. ¹³C NMR (150 MHz, CDCl₃) spectrum of 109



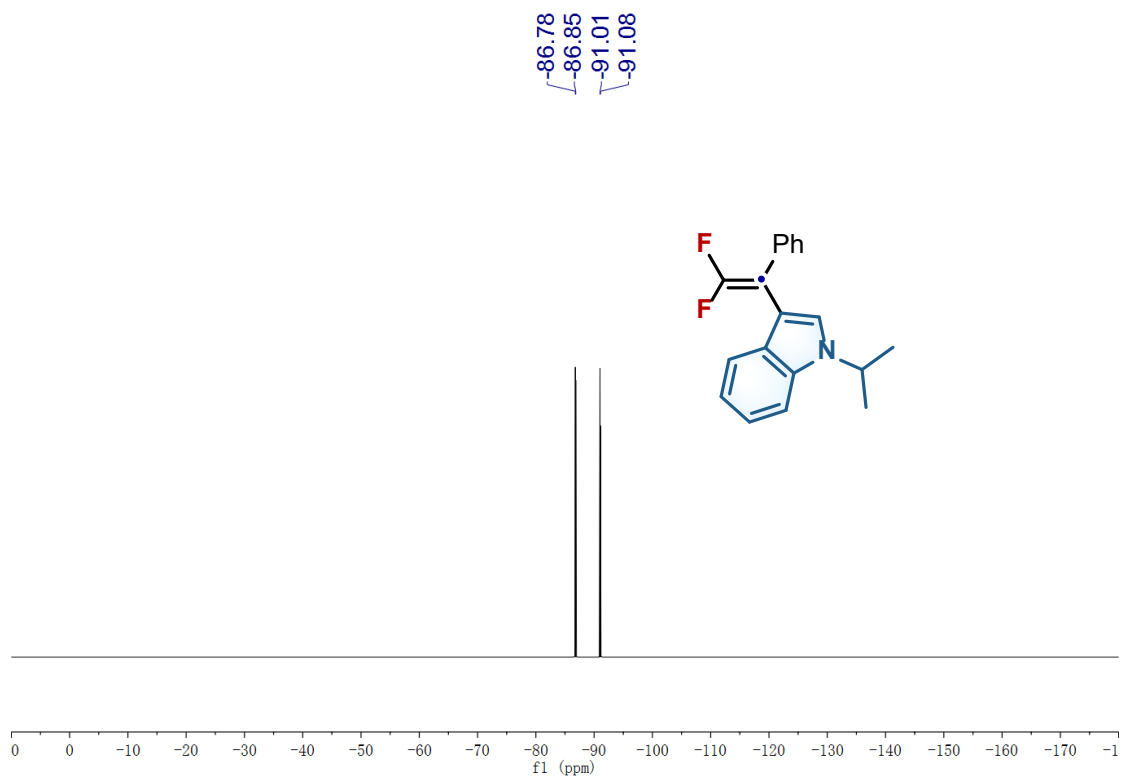
Supplementary Fig. 327. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **109**



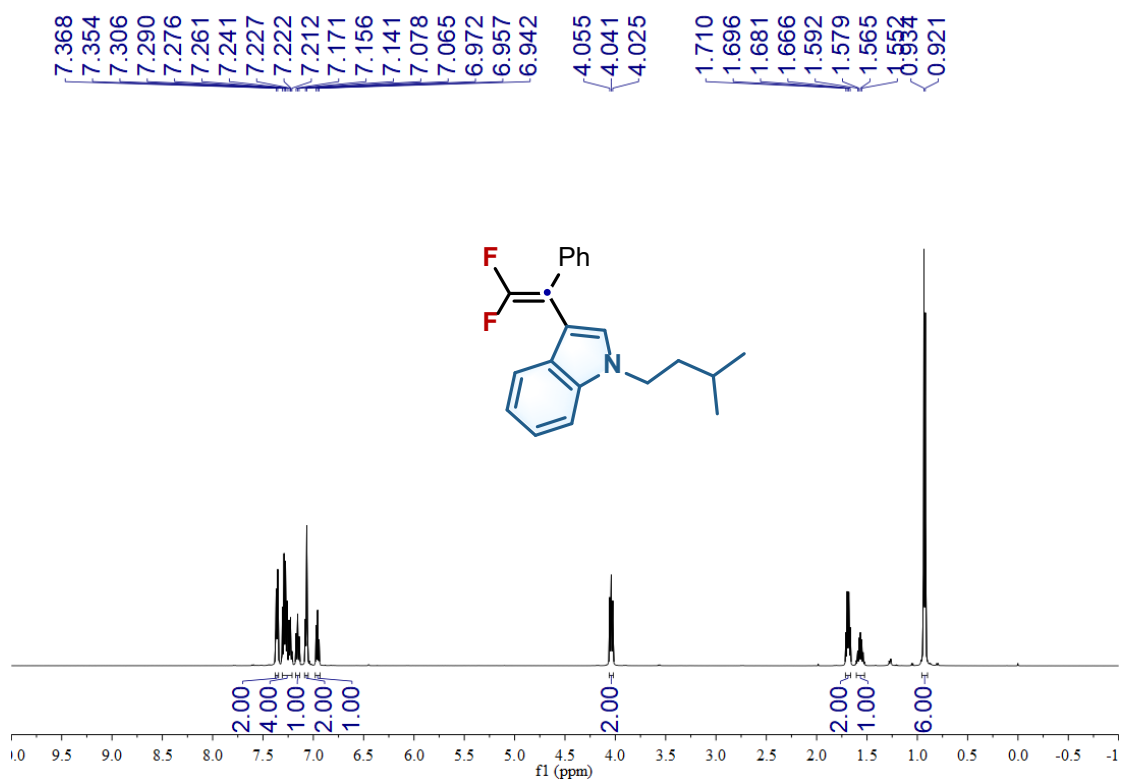
Supplementary Fig. 328. ¹H NMR (500 MHz, CDCl₃) spectrum of **110**



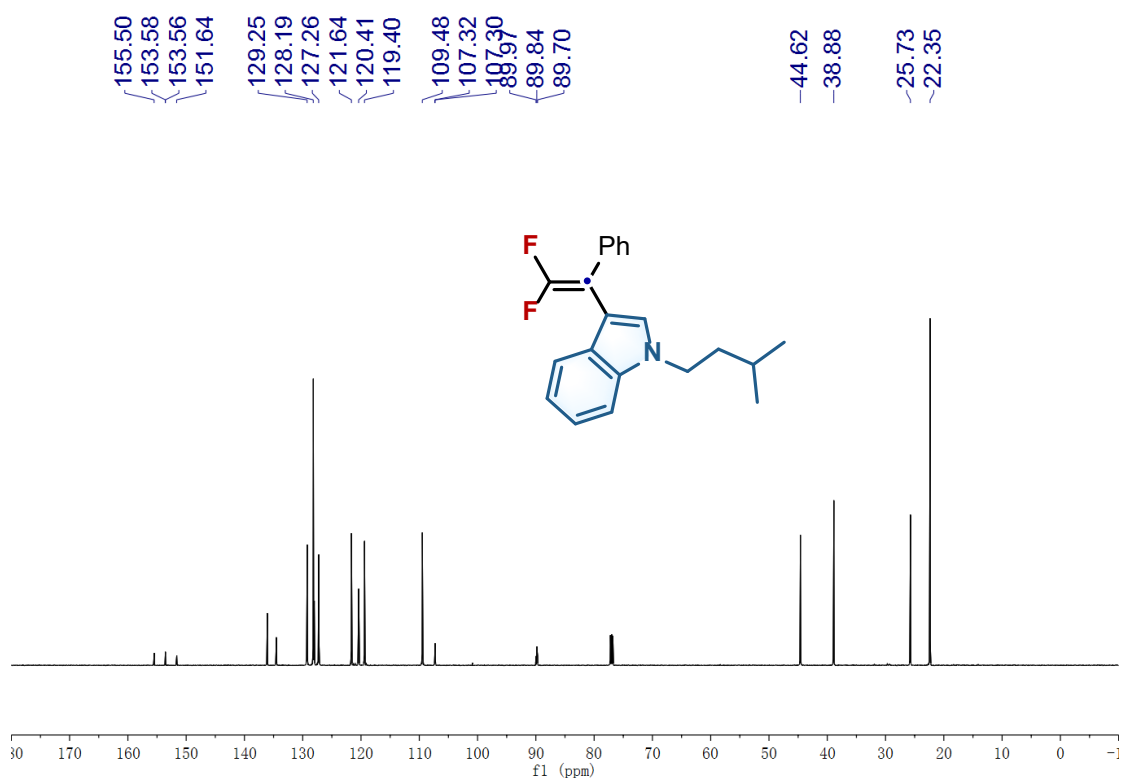
Supplementary Fig. 329. ¹³C NMR (125 MHz, CDCl₃) spectrum of 110



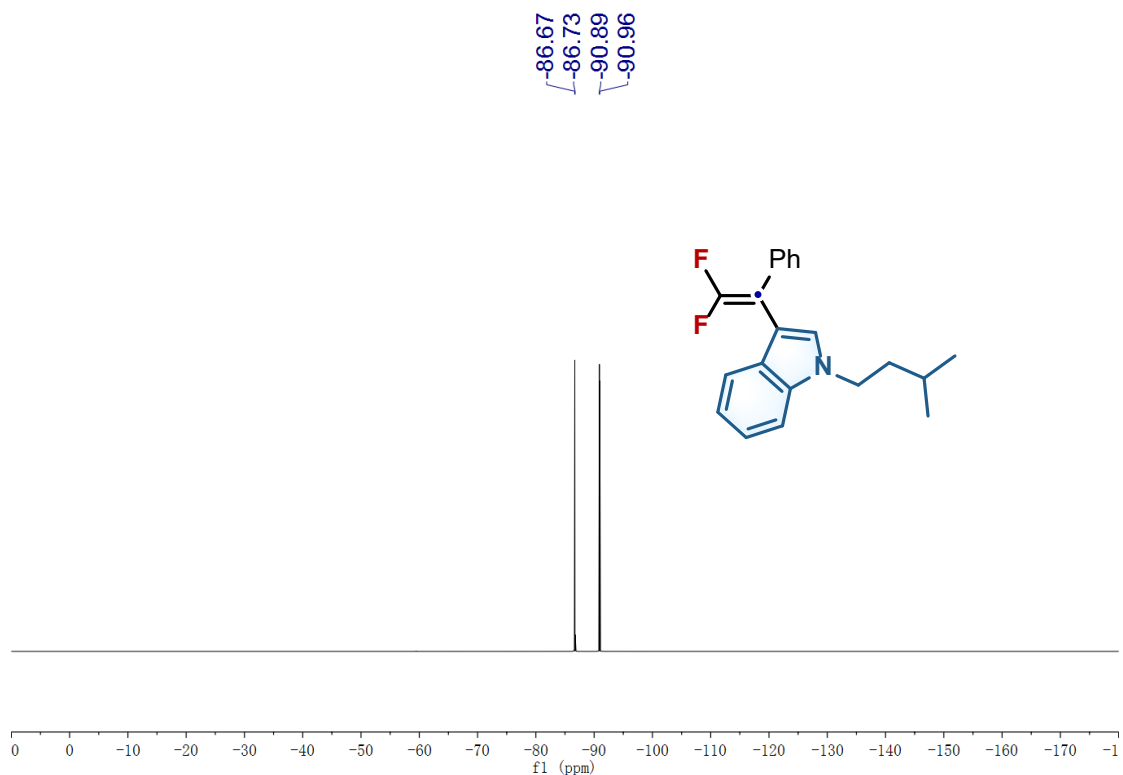
Supplementary Fig. 330. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 110



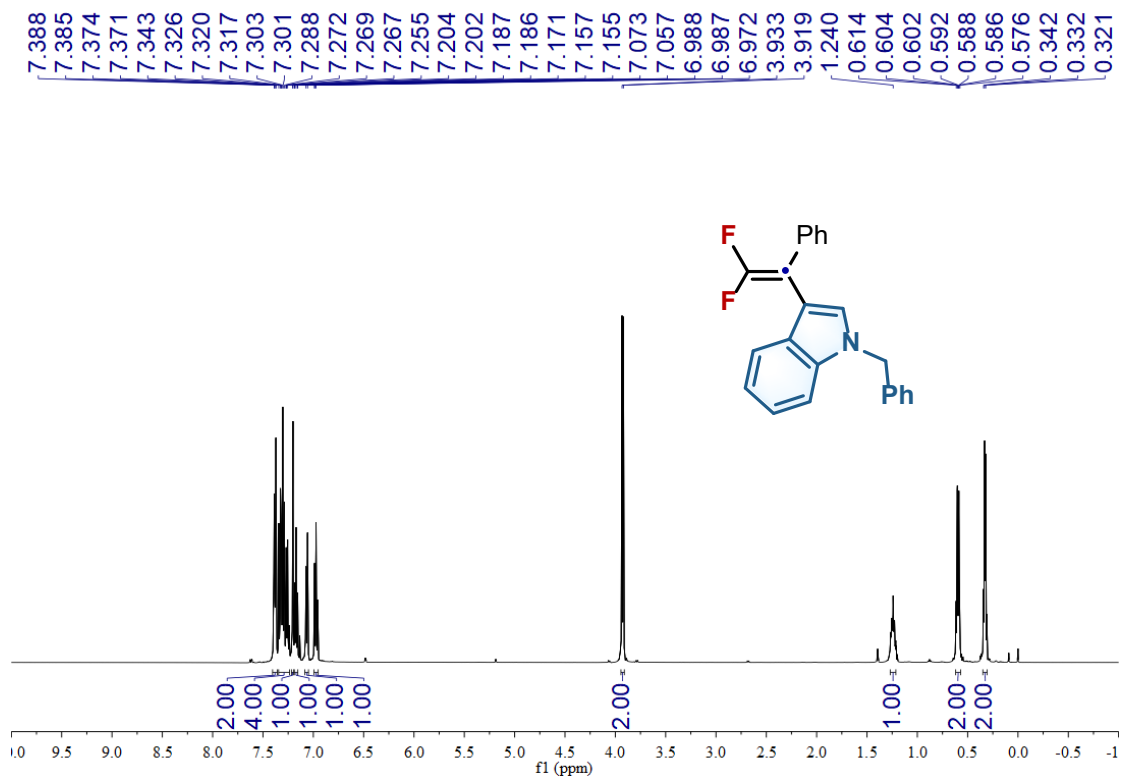
Supplementary Fig. 331. ¹H NMR (500 MHz, CDCl₃) spectrum of 111



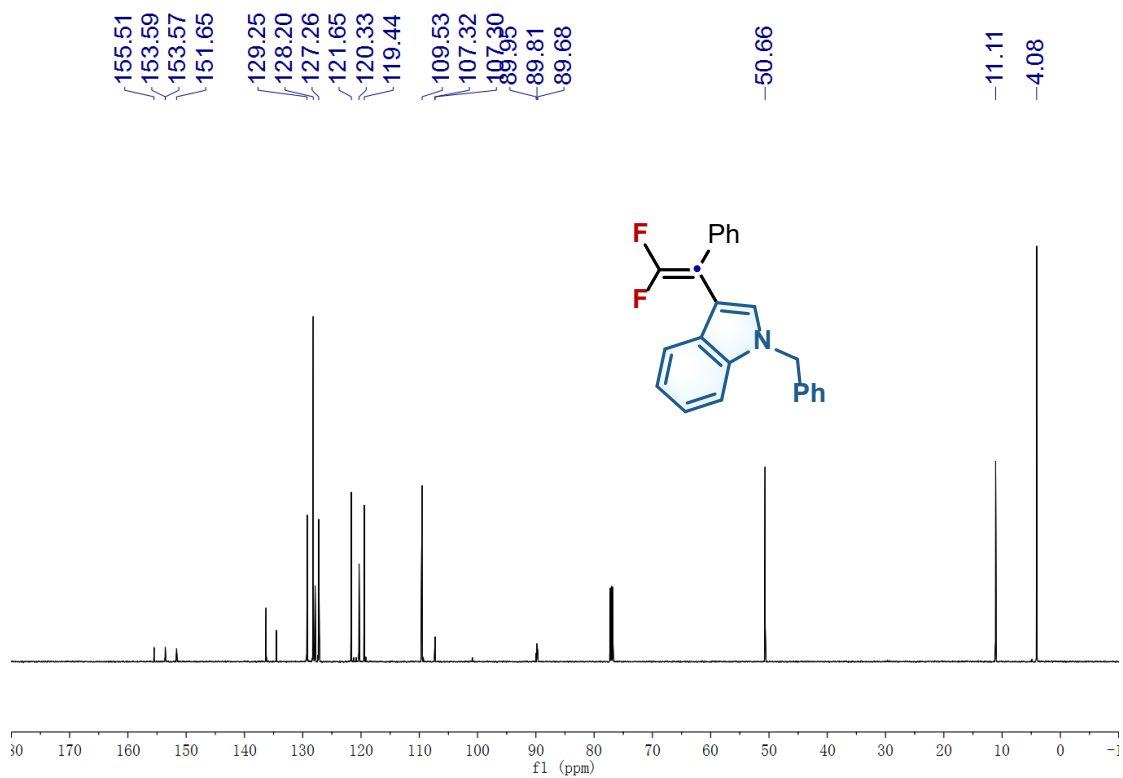
Supplementary Fig. 332. ¹³C NMR (150 MHz, CDCl₃) spectrum of 111



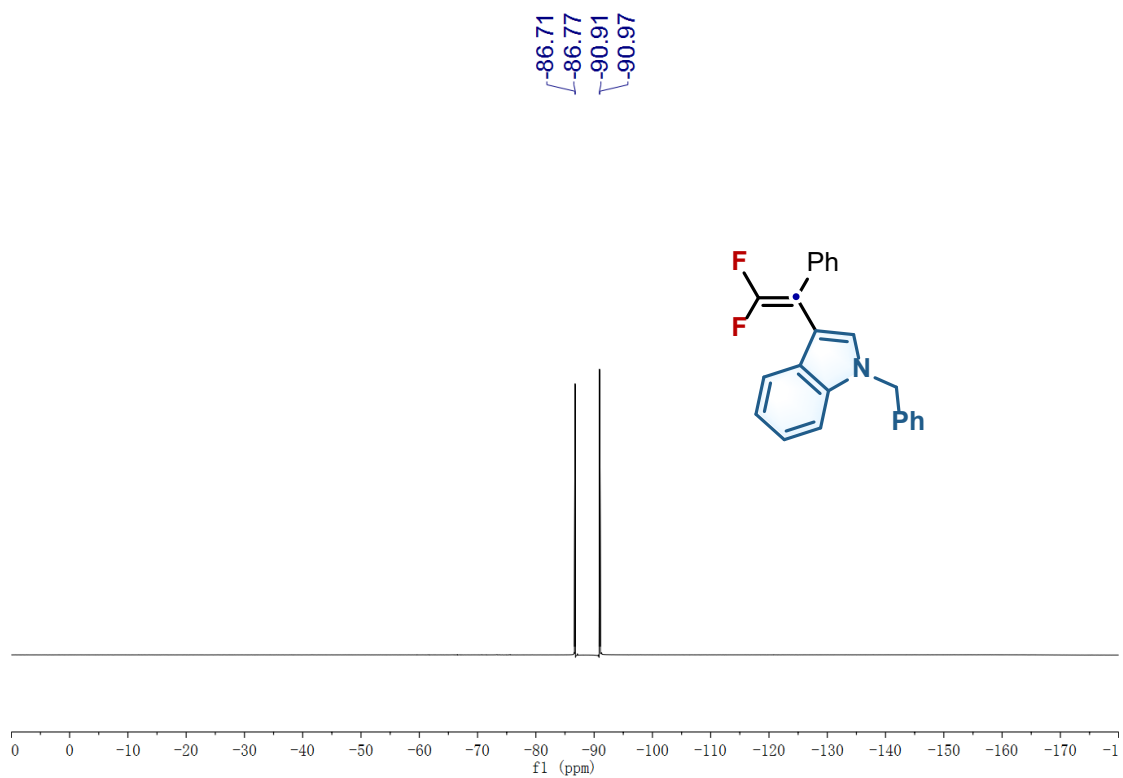
Supplementary Fig. 333. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **111**



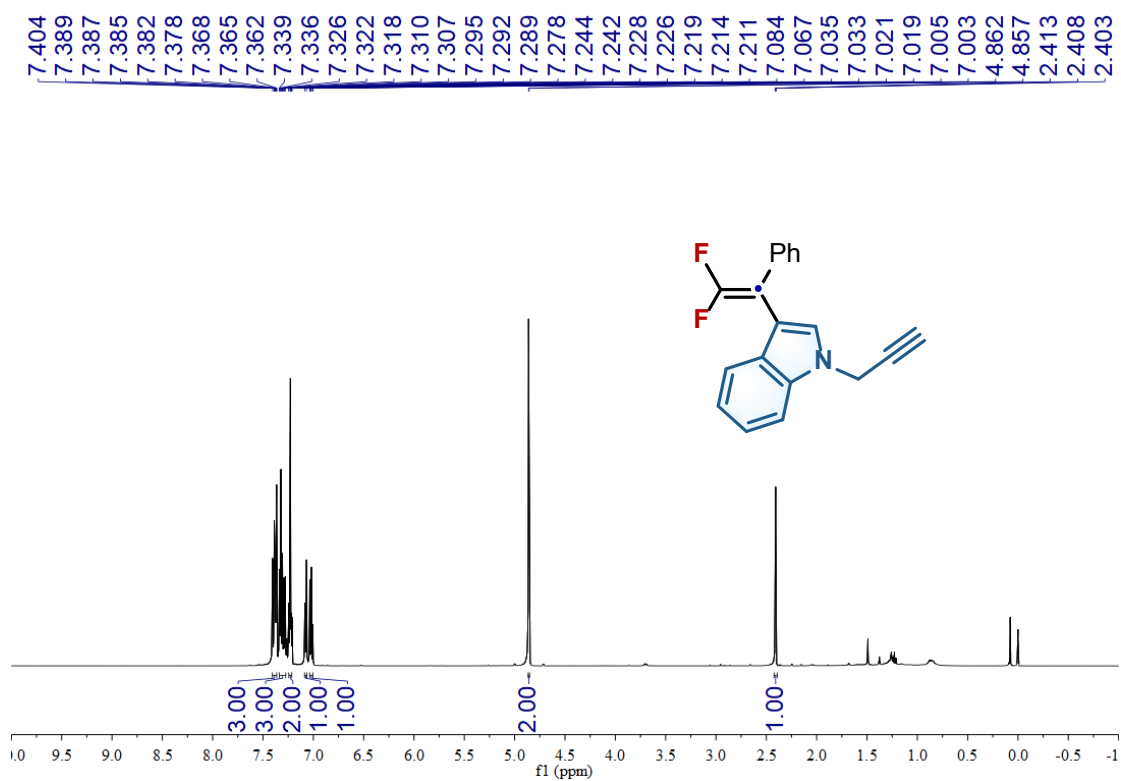
Supplementary Fig. 334. ¹H NMR (500 MHz, CDCl₃) spectrum of **112**



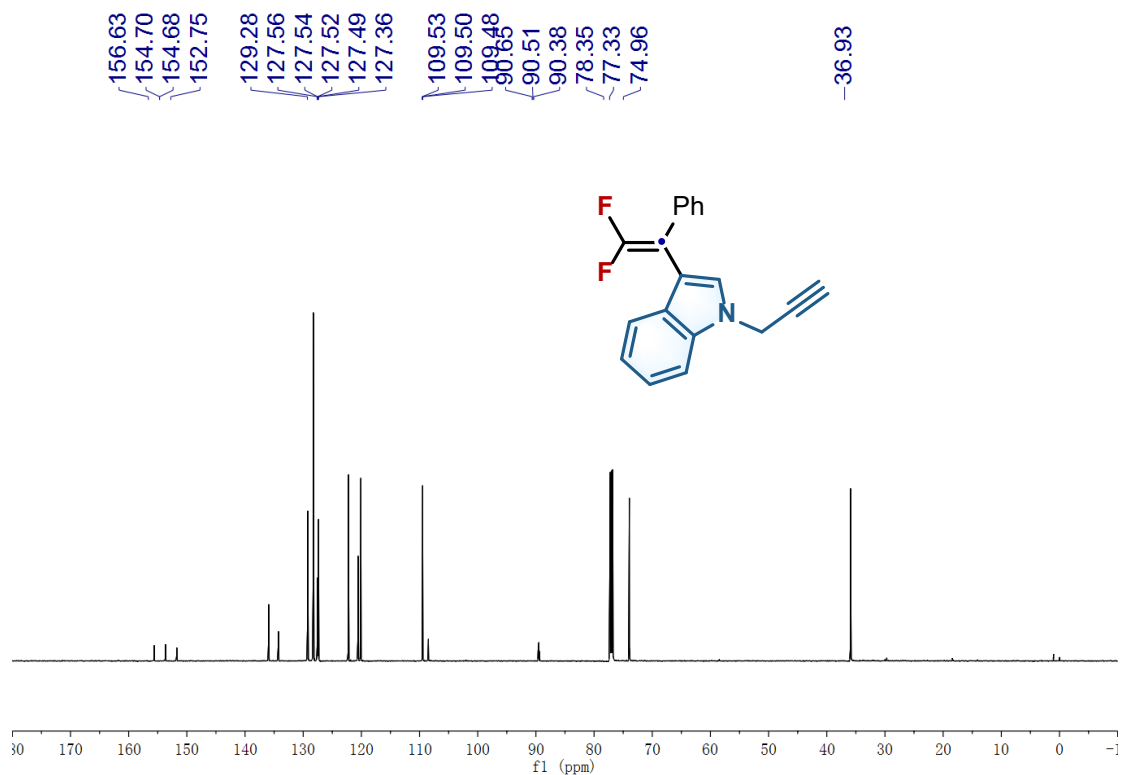
Supplementary Fig. 335. ¹³C NMR (150 MHz, CDCl₃) spectrum of 112



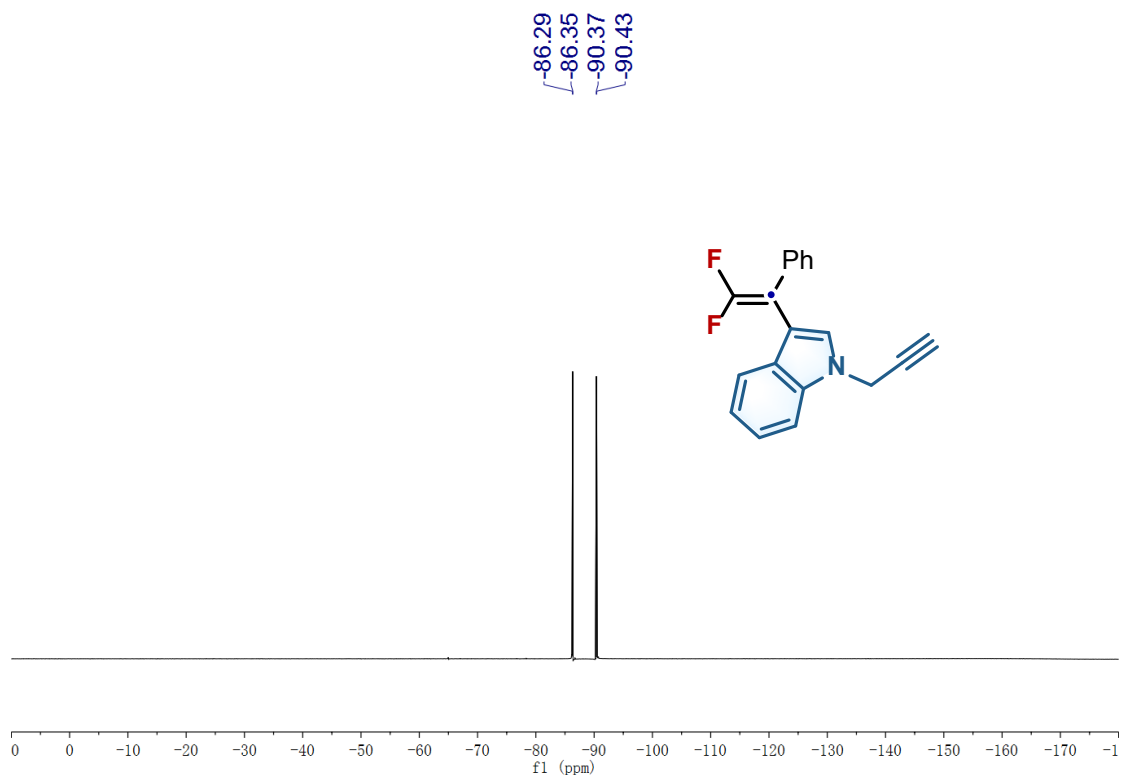
Supplementary Fig. 336. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 112



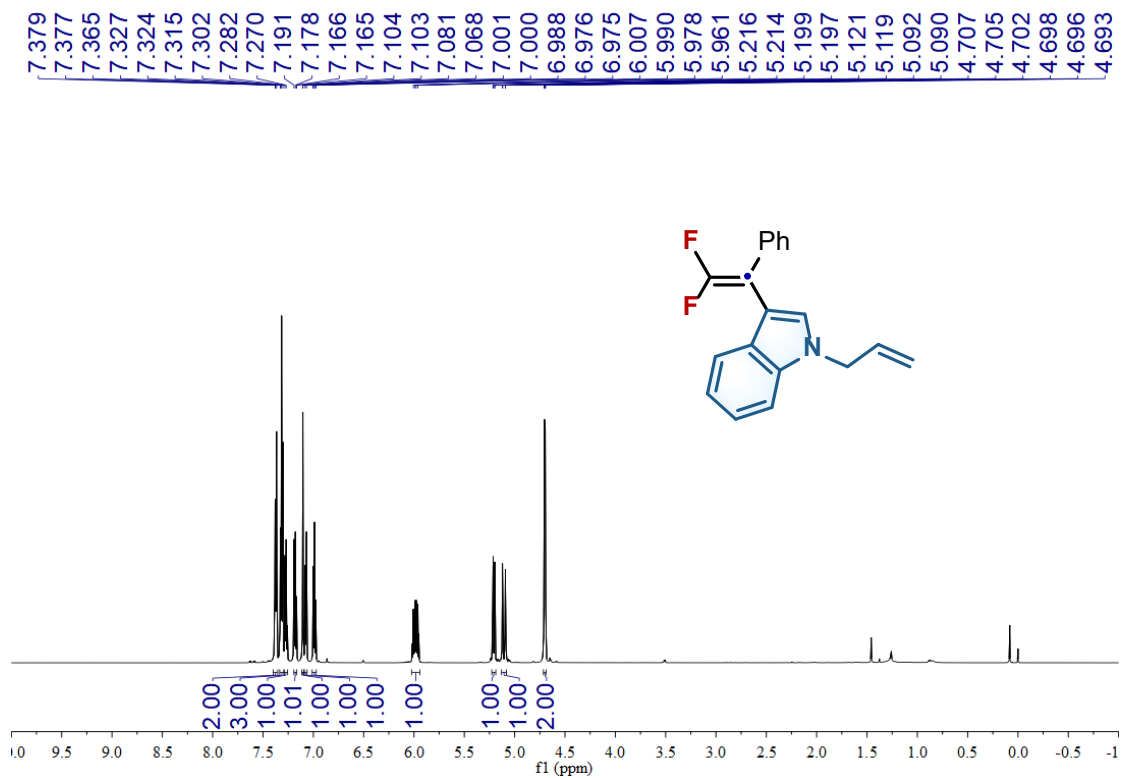
Supplementary Fig. 337. ¹H NMR (500 MHz, CDCl₃) spectrum of 113



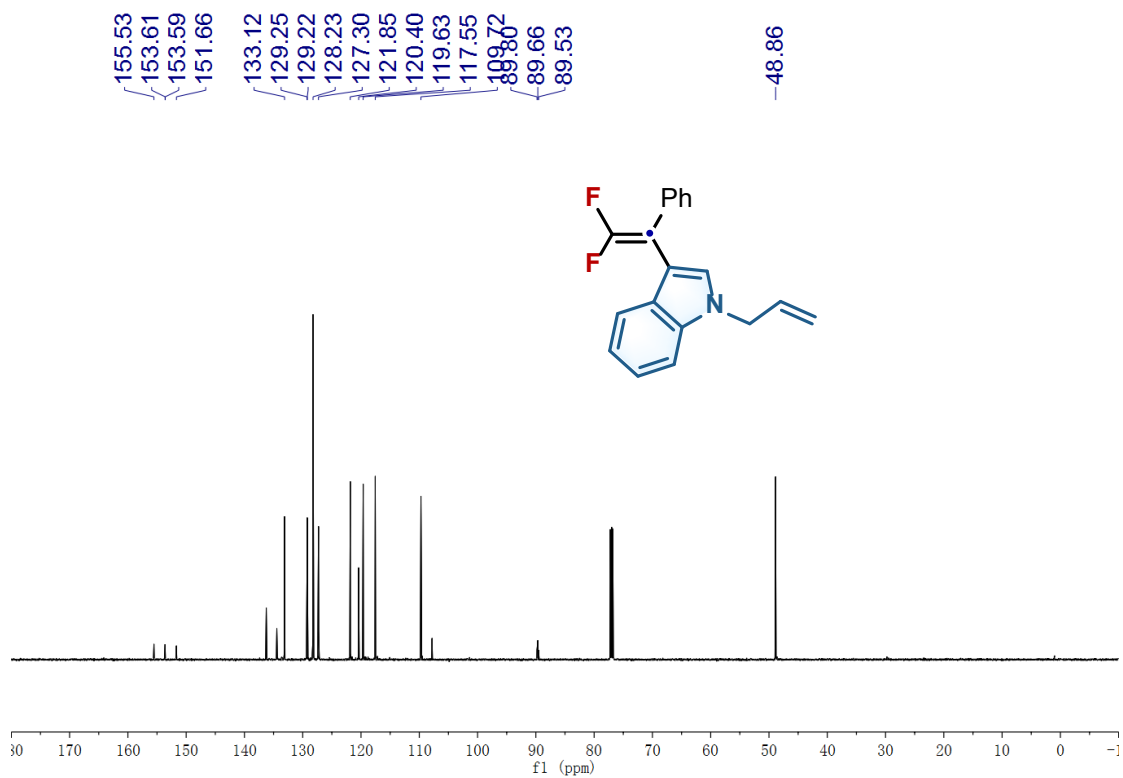
Supplementary Fig. 338. ¹³C NMR (150 MHz, CDCl₃) spectrum of 113



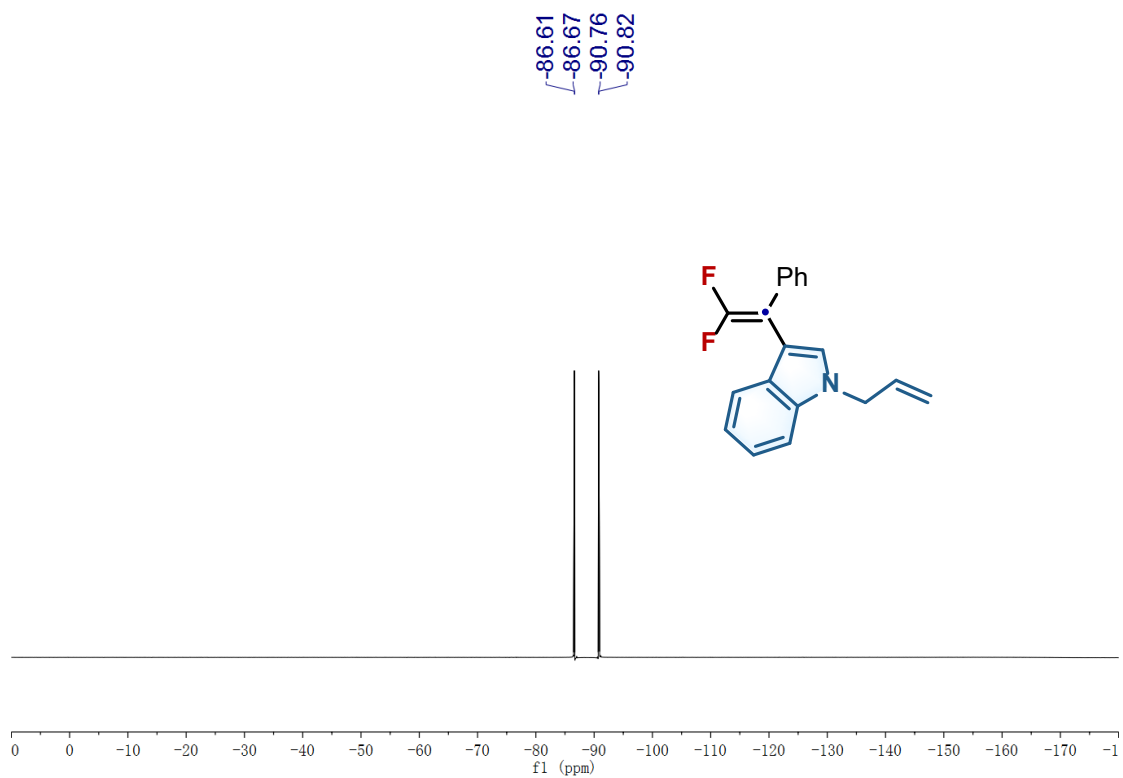
Supplementary Fig. 339. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 113



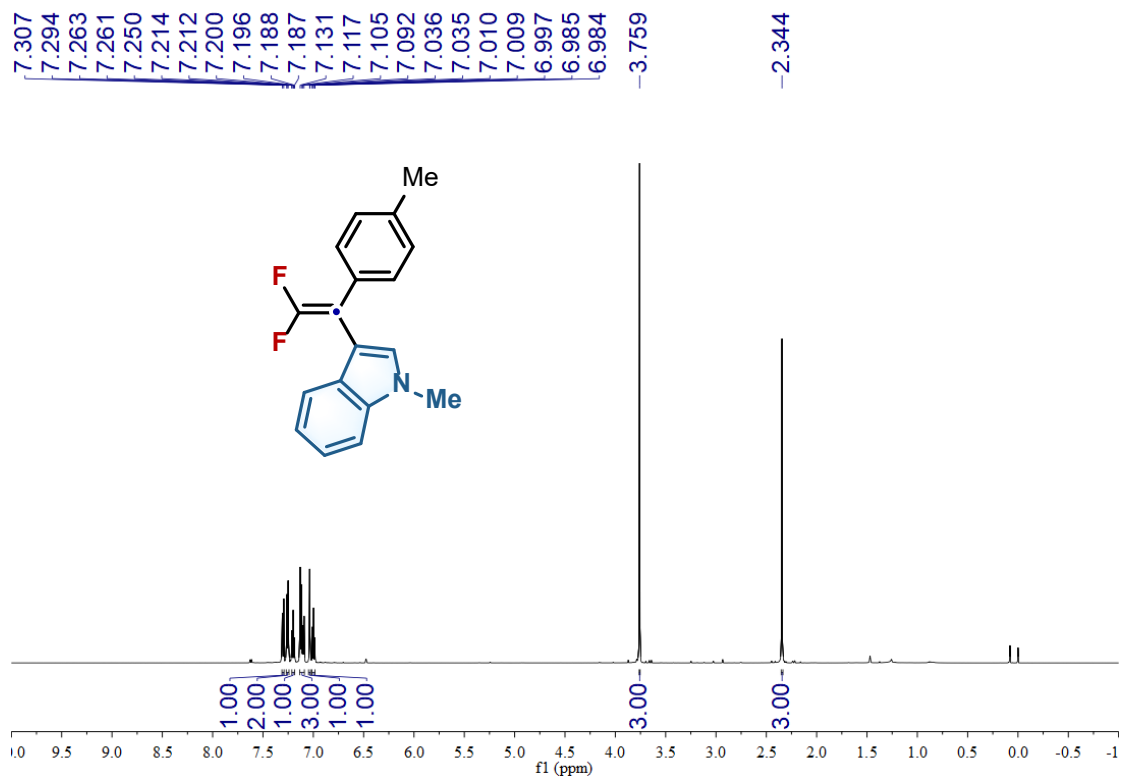
Supplementary Fig. 340. ¹H NMR (600 MHz, CDCl₃) spectrum of 114



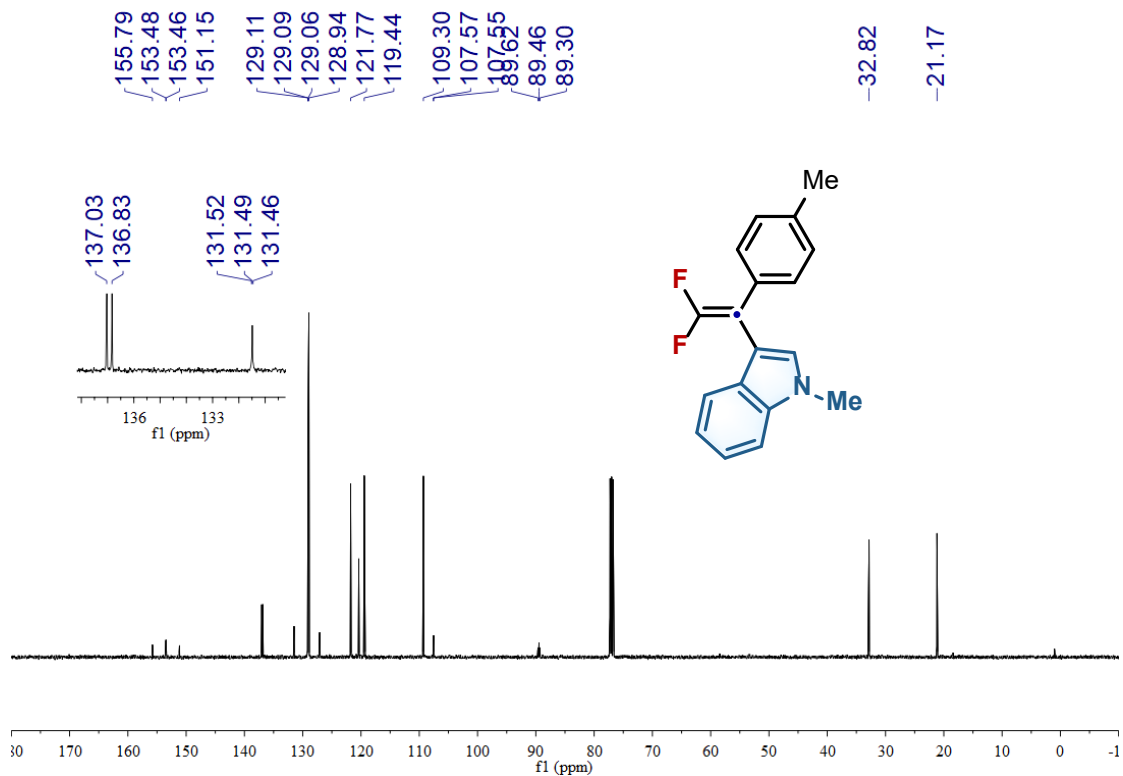
Supplementary Fig. 341. ¹³C NMR (150 MHz, CDCl₃) spectrum of 114



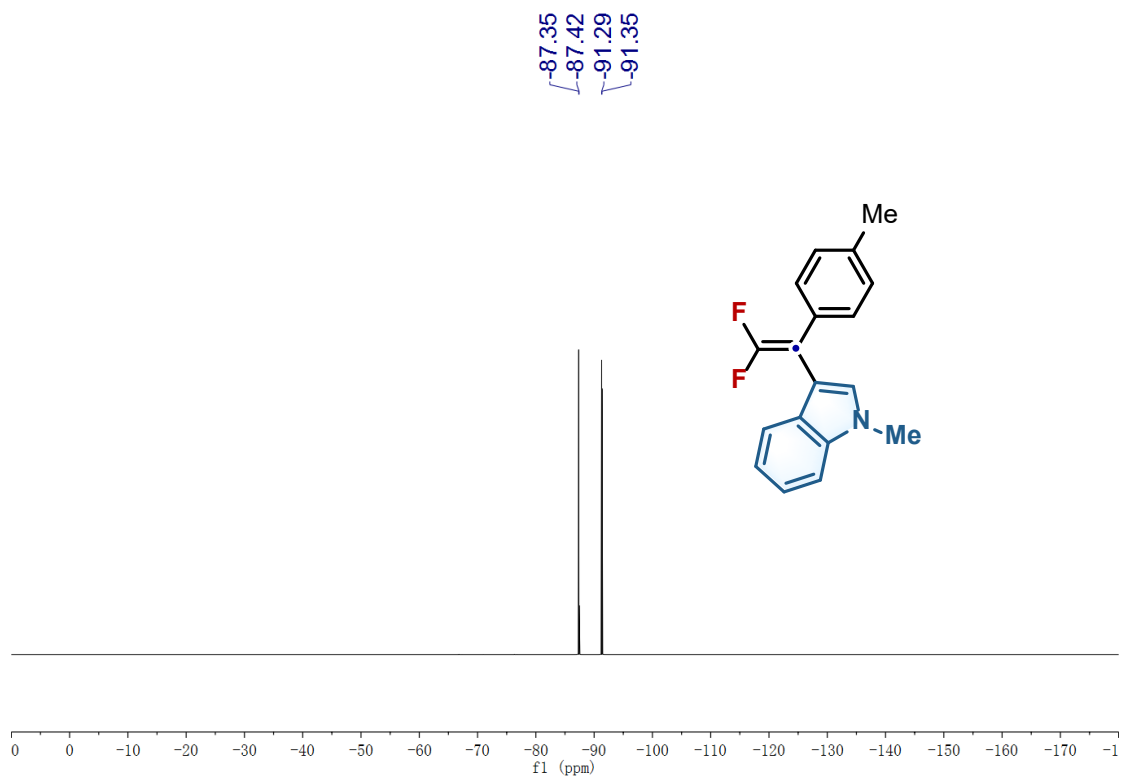
Supplementary Fig. 342. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 114



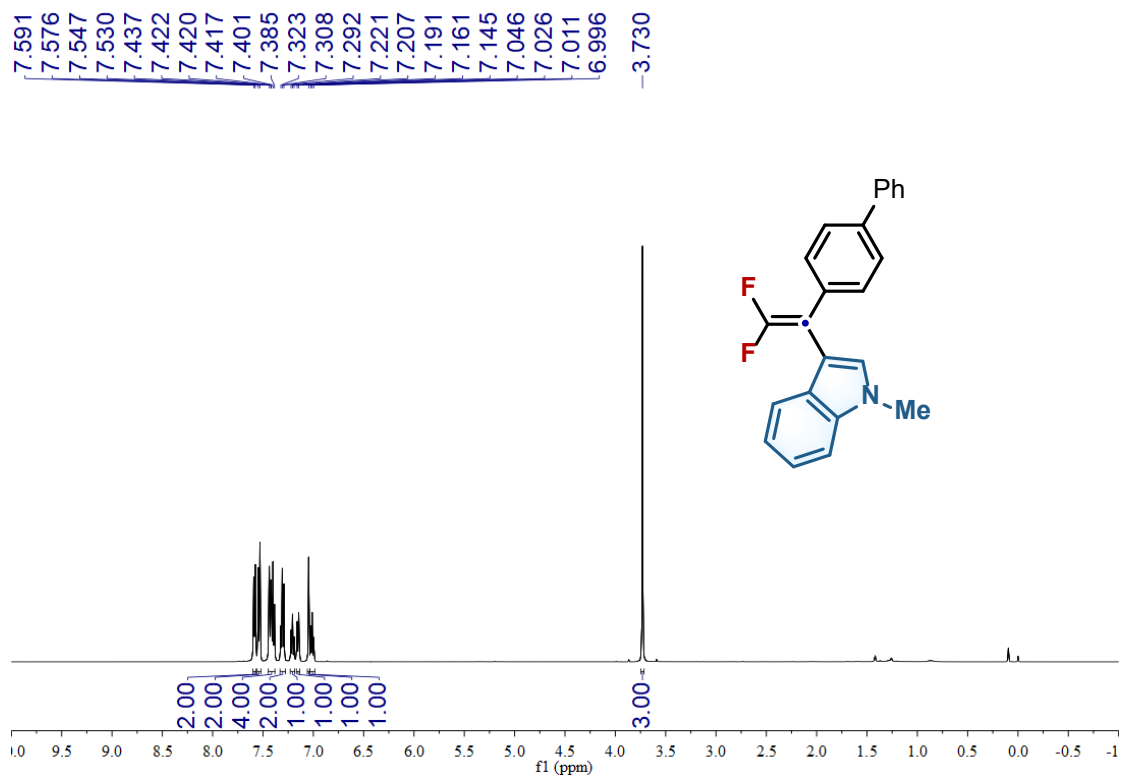
Supplementary Fig. 343. ¹H NMR (600 MHz, CDCl₃) spectrum of **115**



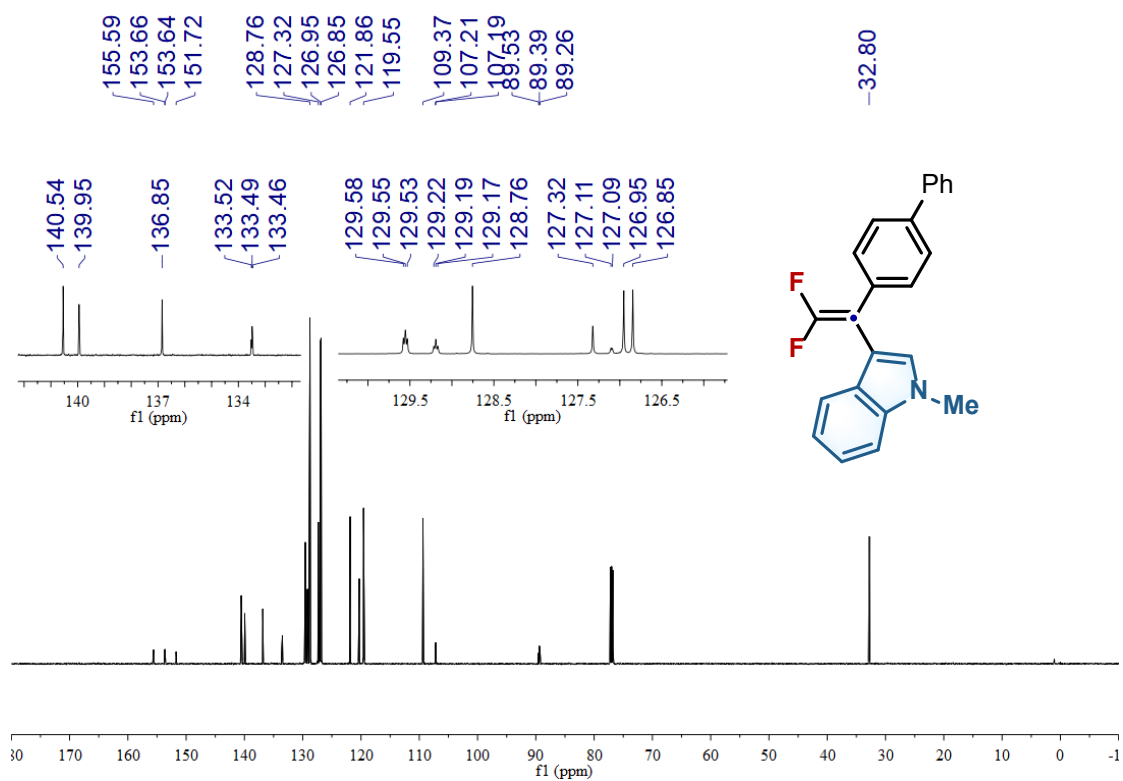
Supplementary Fig. 344. ¹³C NMR (125 MHz, CDCl₃) spectrum of **115**



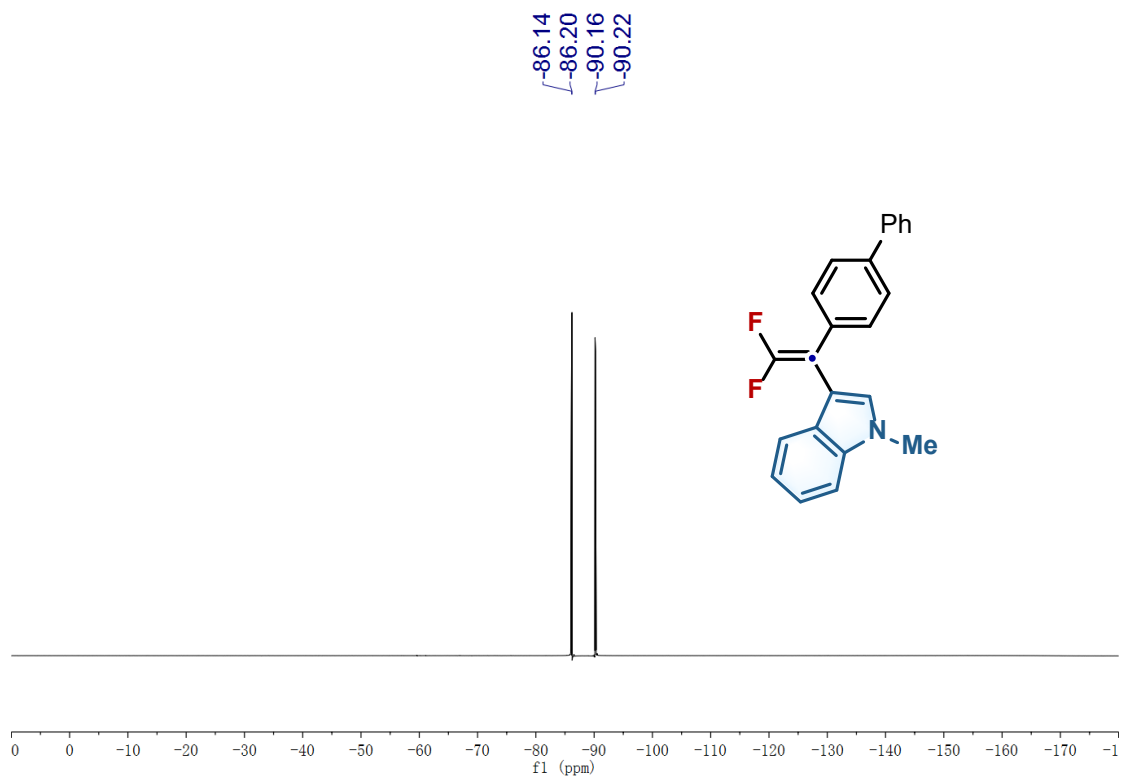
Supplementary Fig. 345. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 115



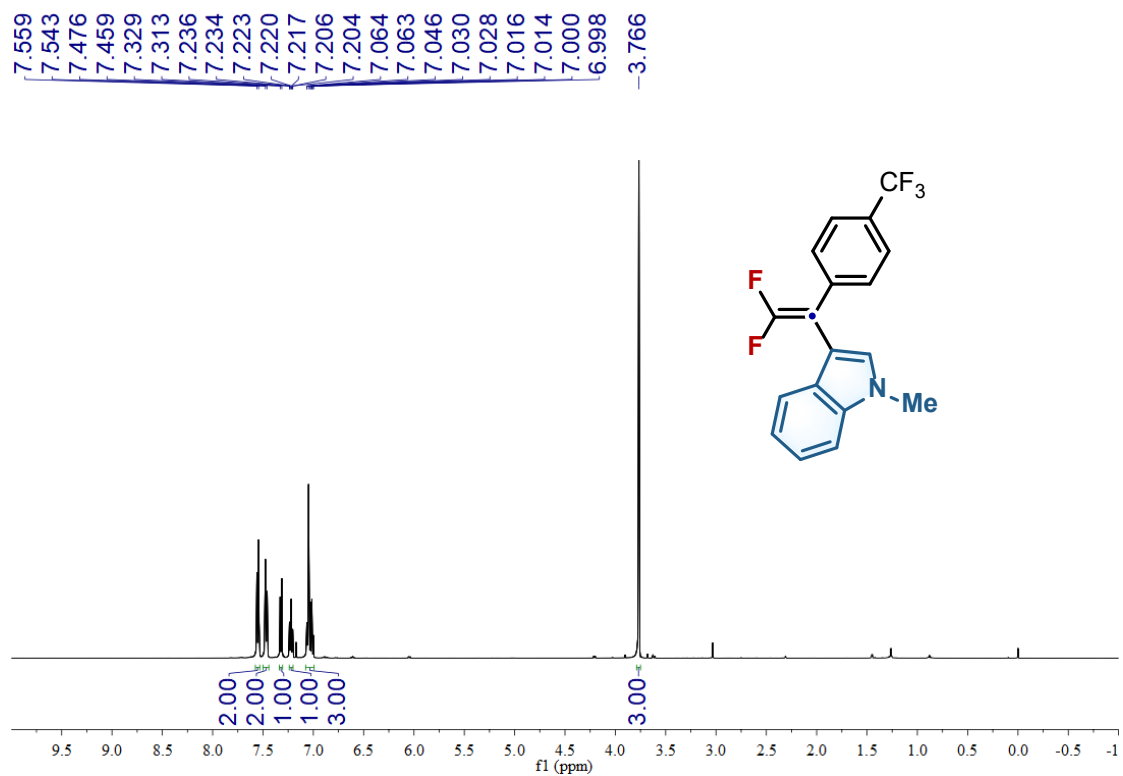
Supplementary Fig. 346. ¹H NMR (500 MHz, CDCl₃) spectrum of 116



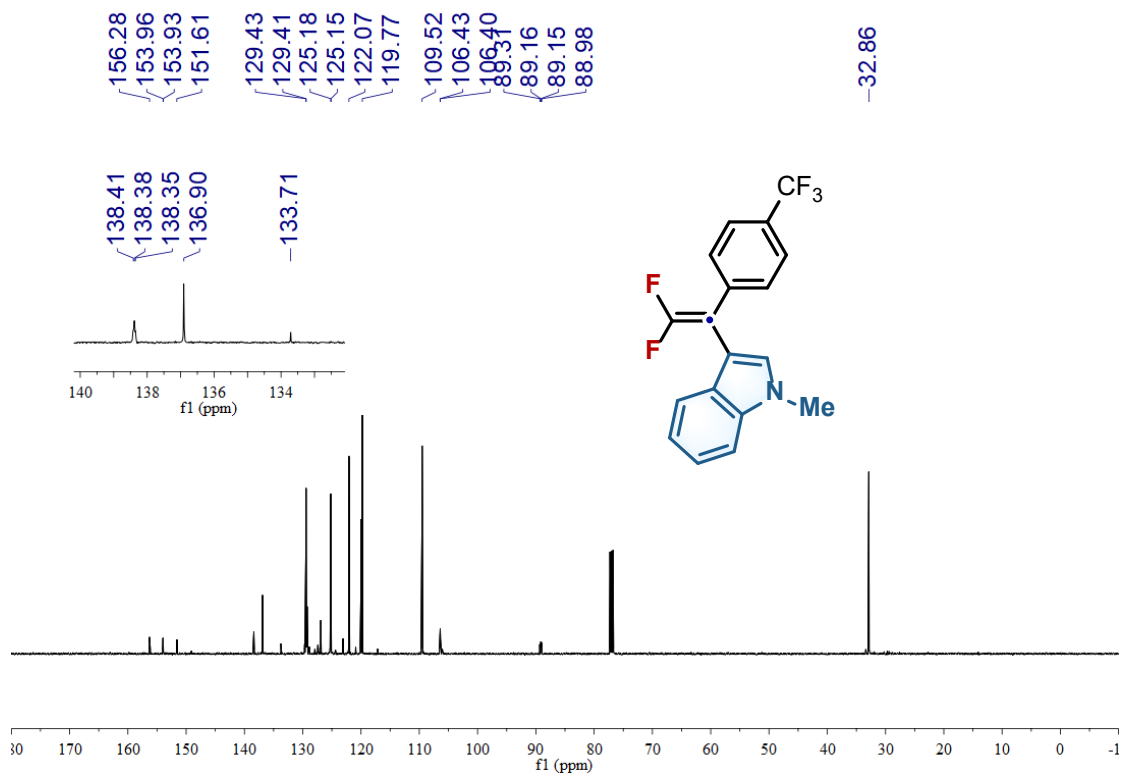
Supplementary Fig. 347. ¹³C NMR (150 MHz, CDCl₃) spectrum of 116



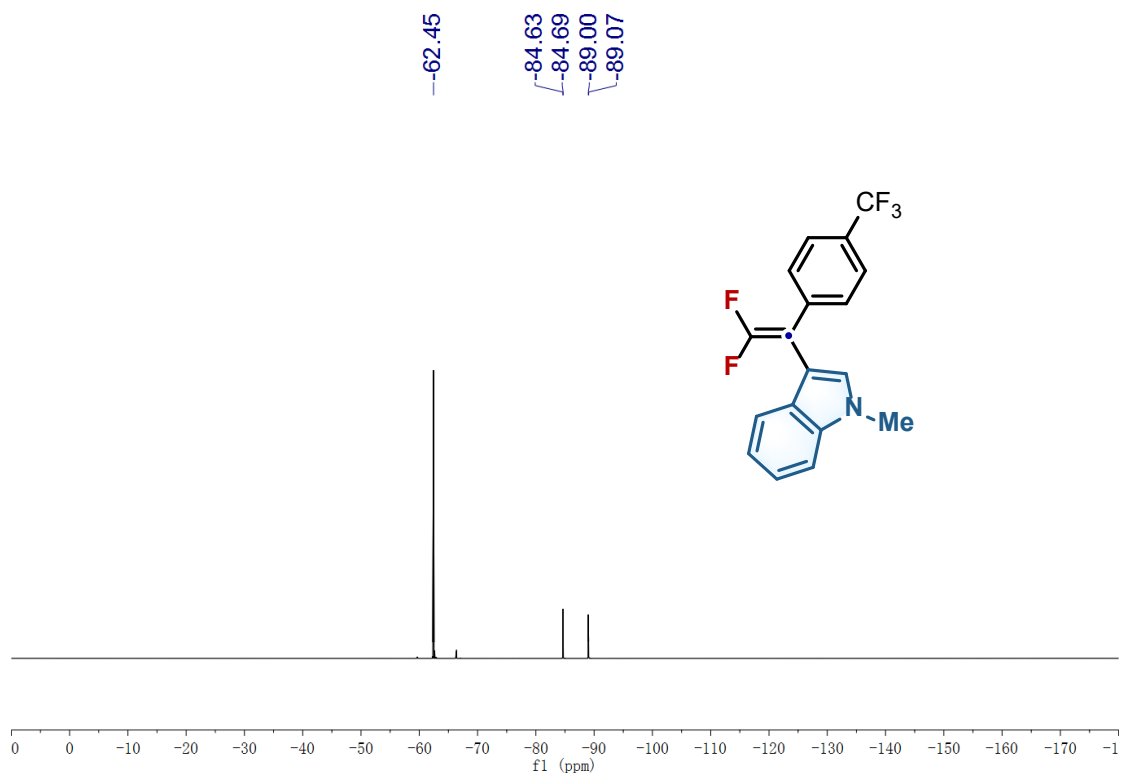
Supplementary Fig. 348. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 116



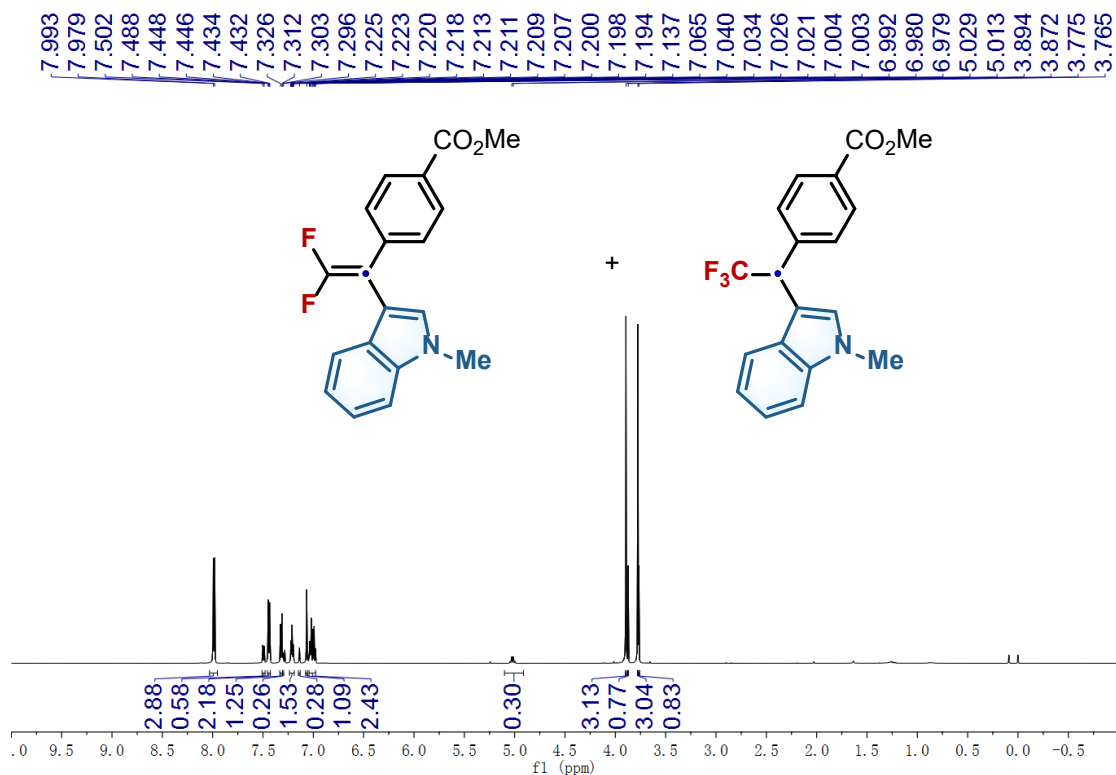
Supplementary Fig. 349. ¹H NMR (500 MHz, CDCl₃) spectrum of 117



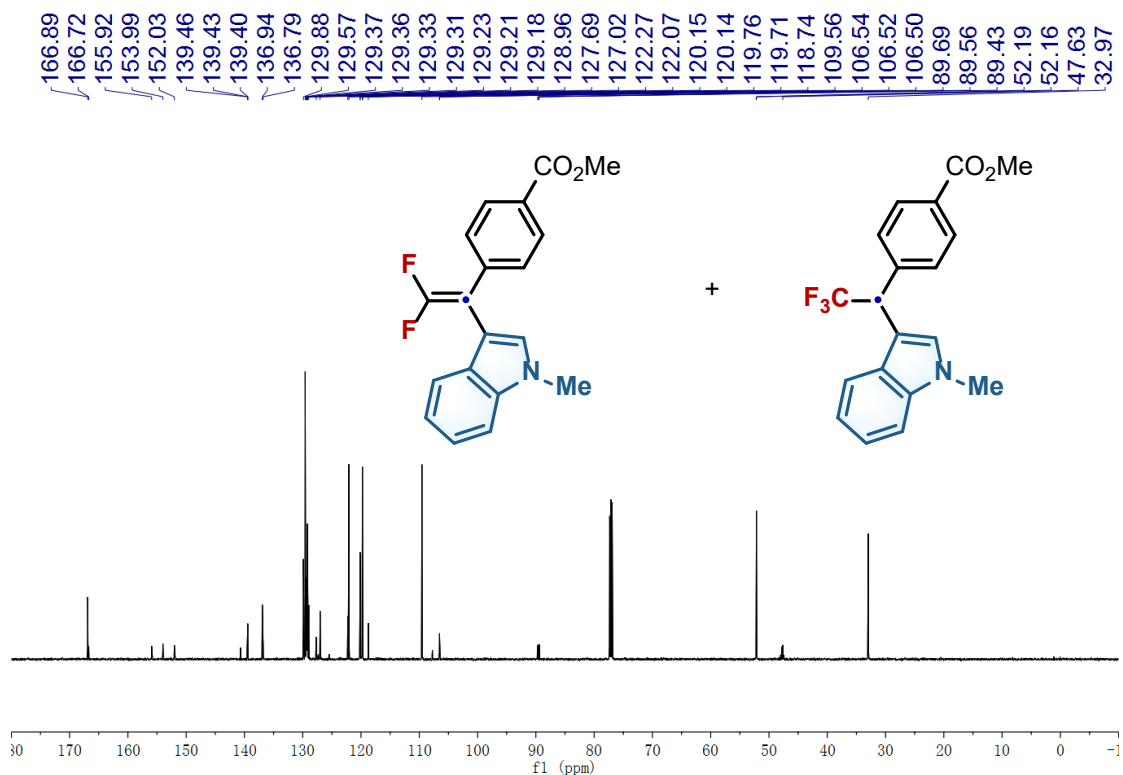
Supplementary Fig. 350. ¹³C NMR (125 MHz, CDCl₃) spectrum of 117



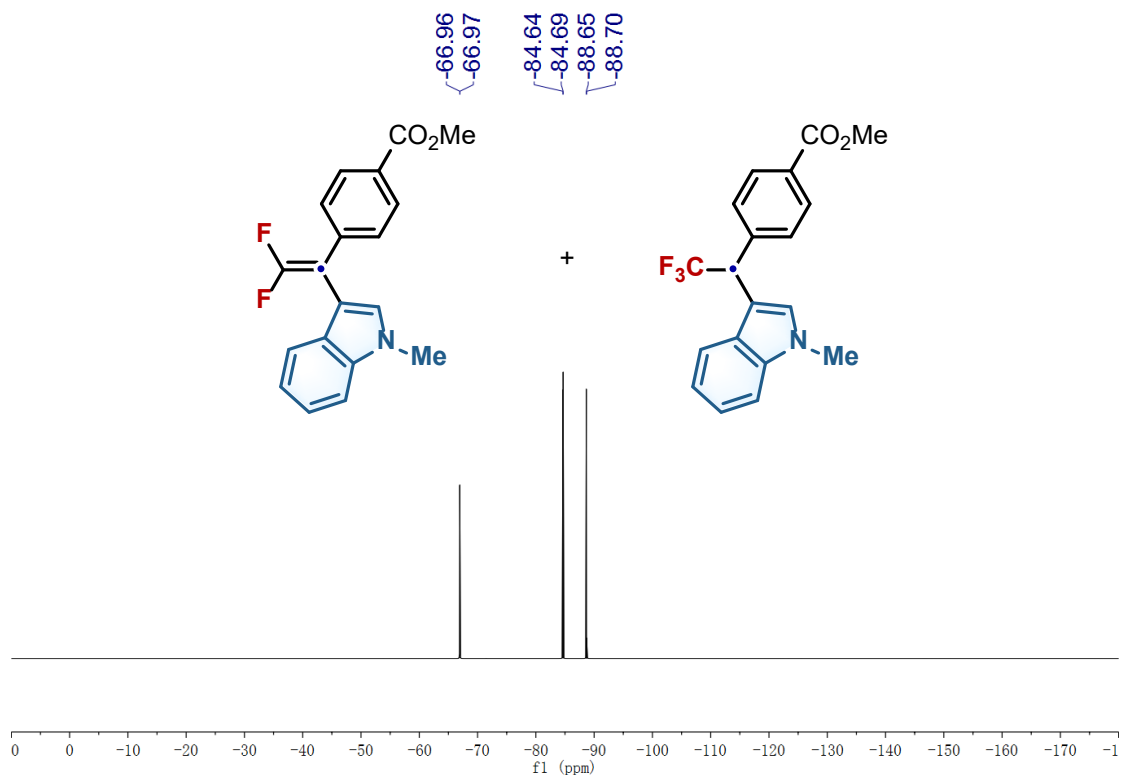
Supplementary Fig. 351. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **117**



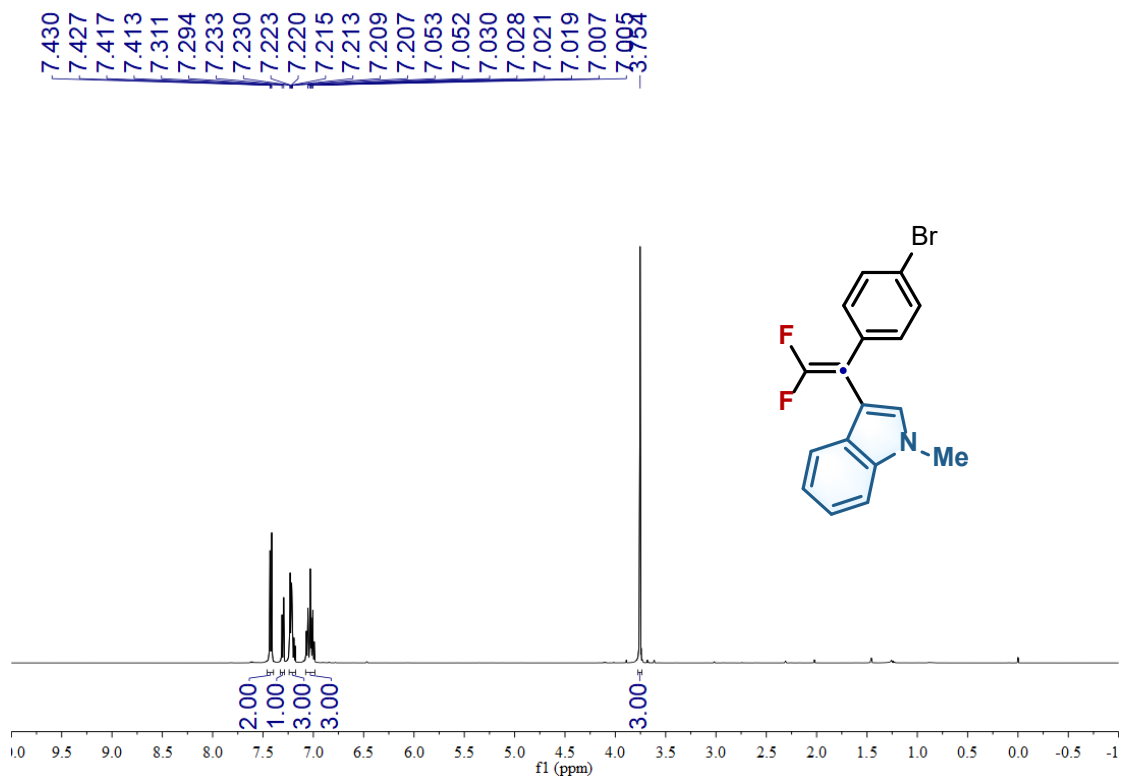
Supplementary Fig. 352. ^1H NMR (600 MHz, CDCl_3) spectrum of **118** and **118'**



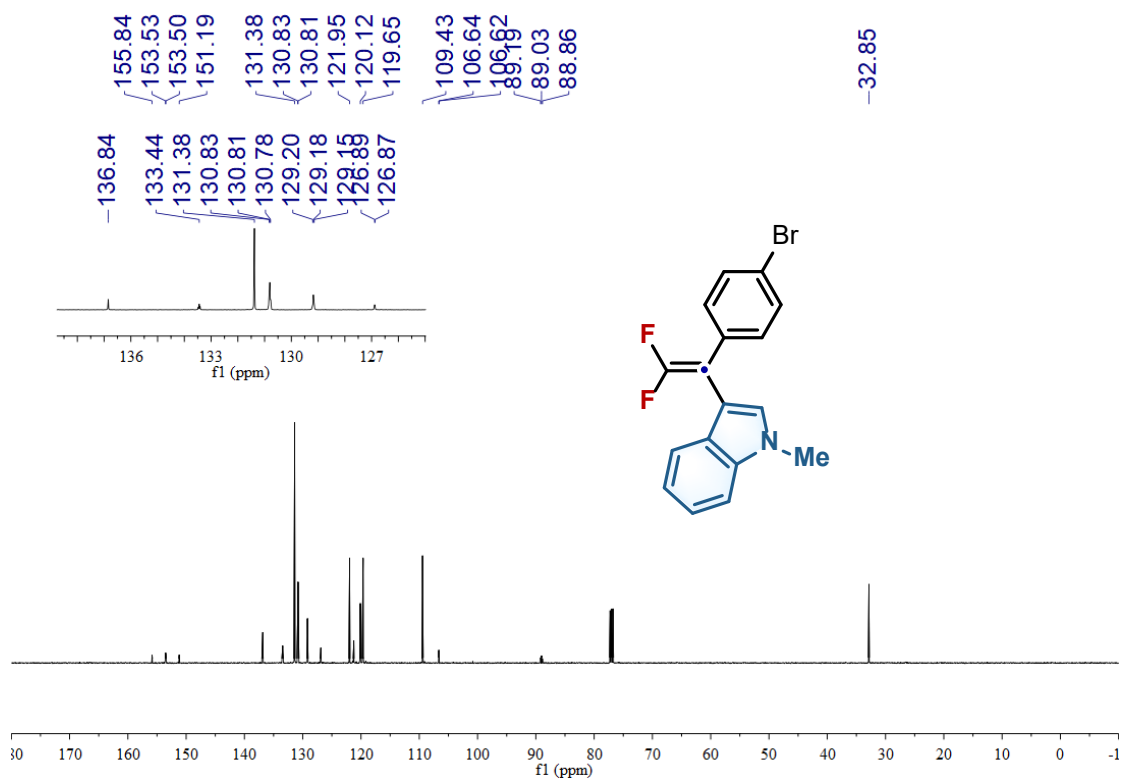
Supplementary Fig. 353. ¹³C NMR (150 MHz, CDCl₃) spectrum of **118** and **118'**



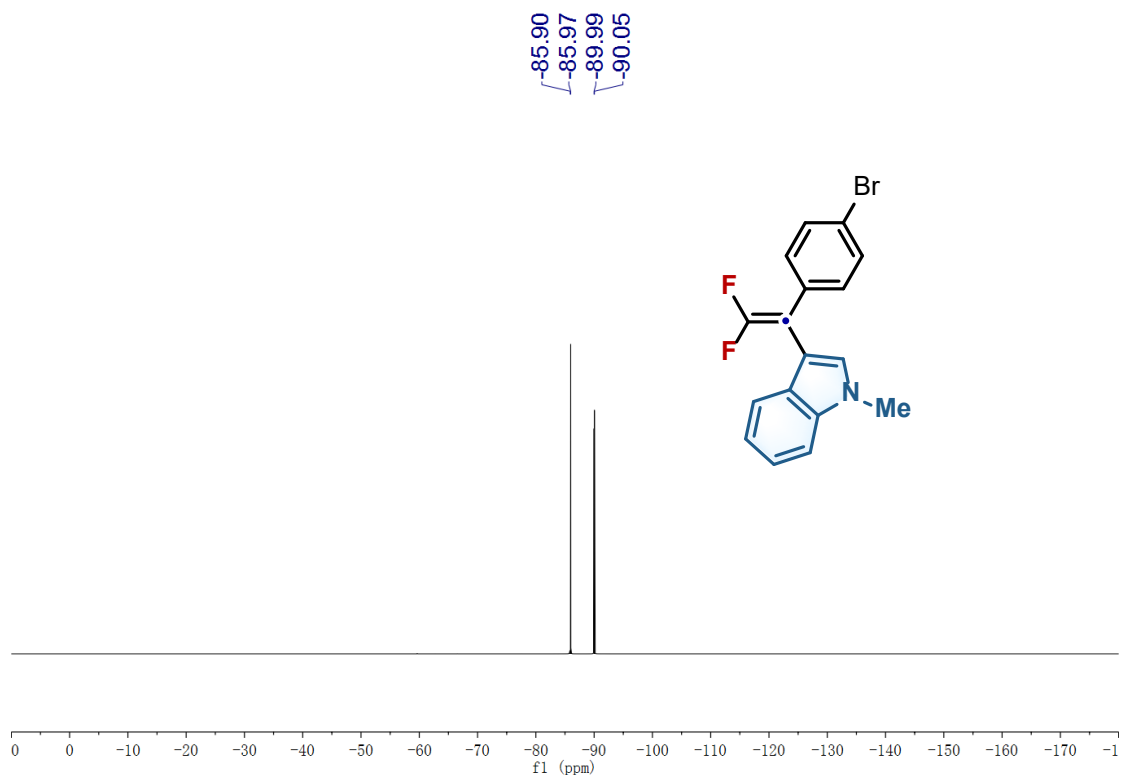
Supplementary Fig. 354 ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **118** and **118'**



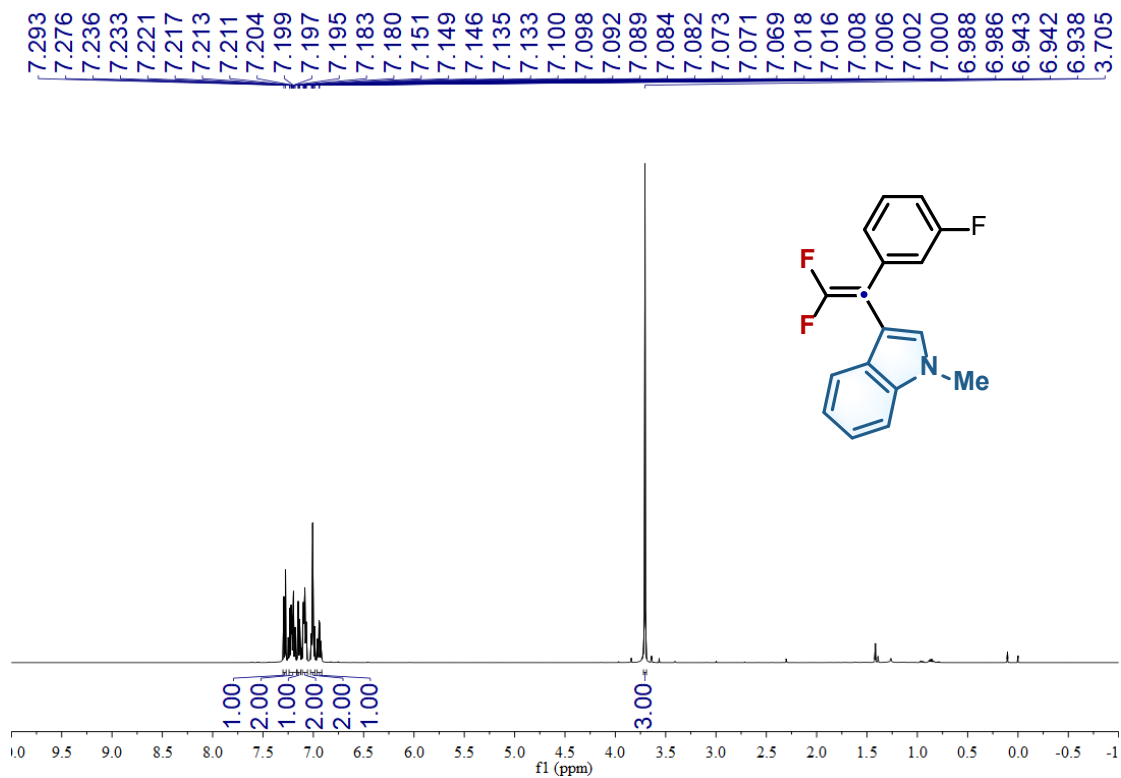
Supplementary Fig. 355. ¹H NMR (500 MHz, CDCl₃) spectrum of 119



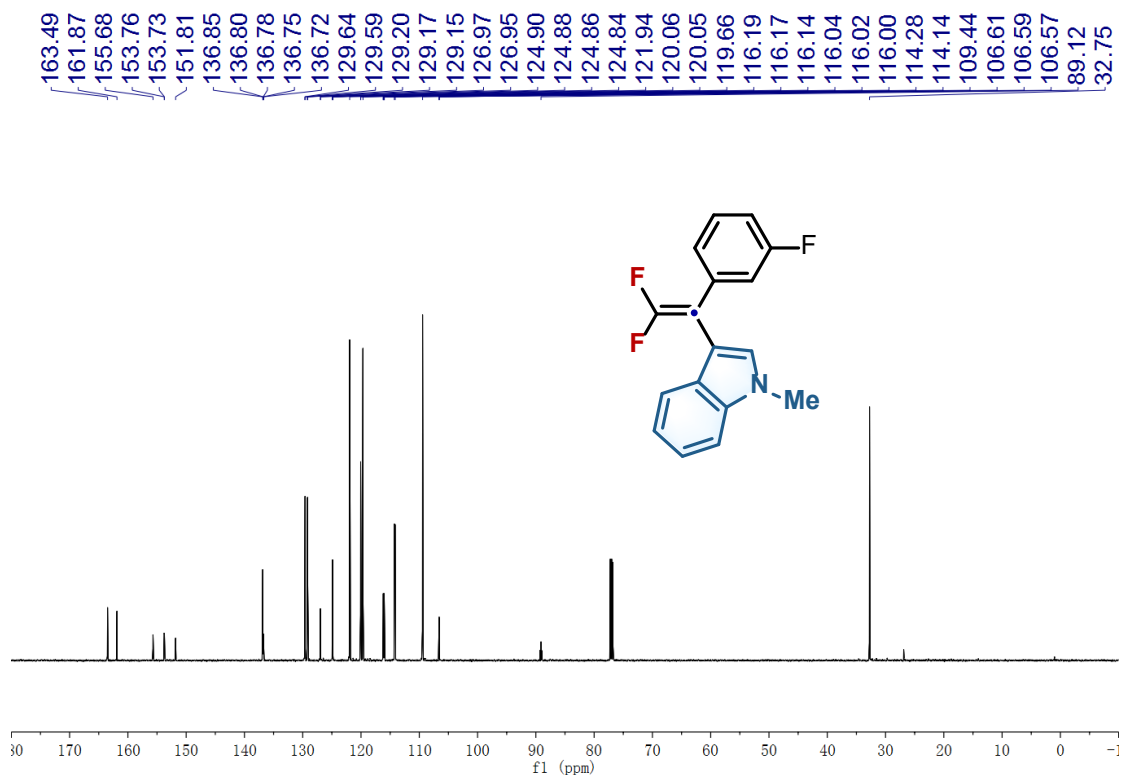
Supplementary Fig. 356. ¹³C NMR (125 MHz, CDCl₃) spectrum of 119



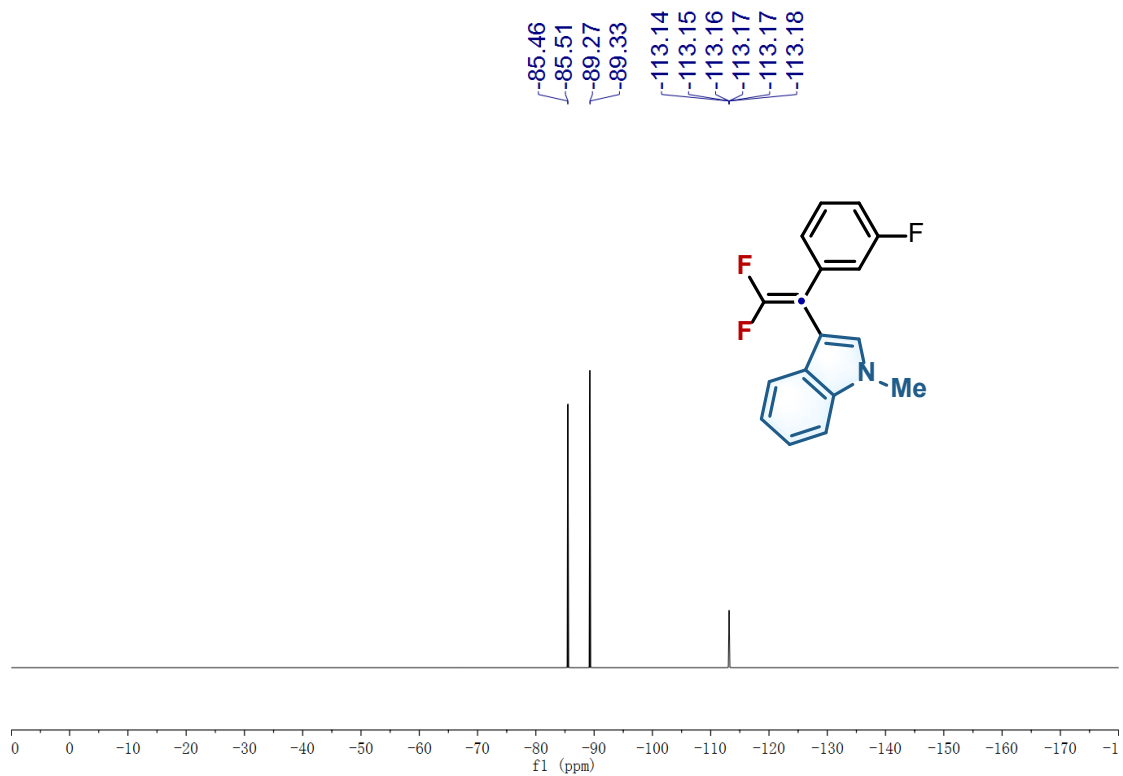
Supplementary Fig. 357. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 119



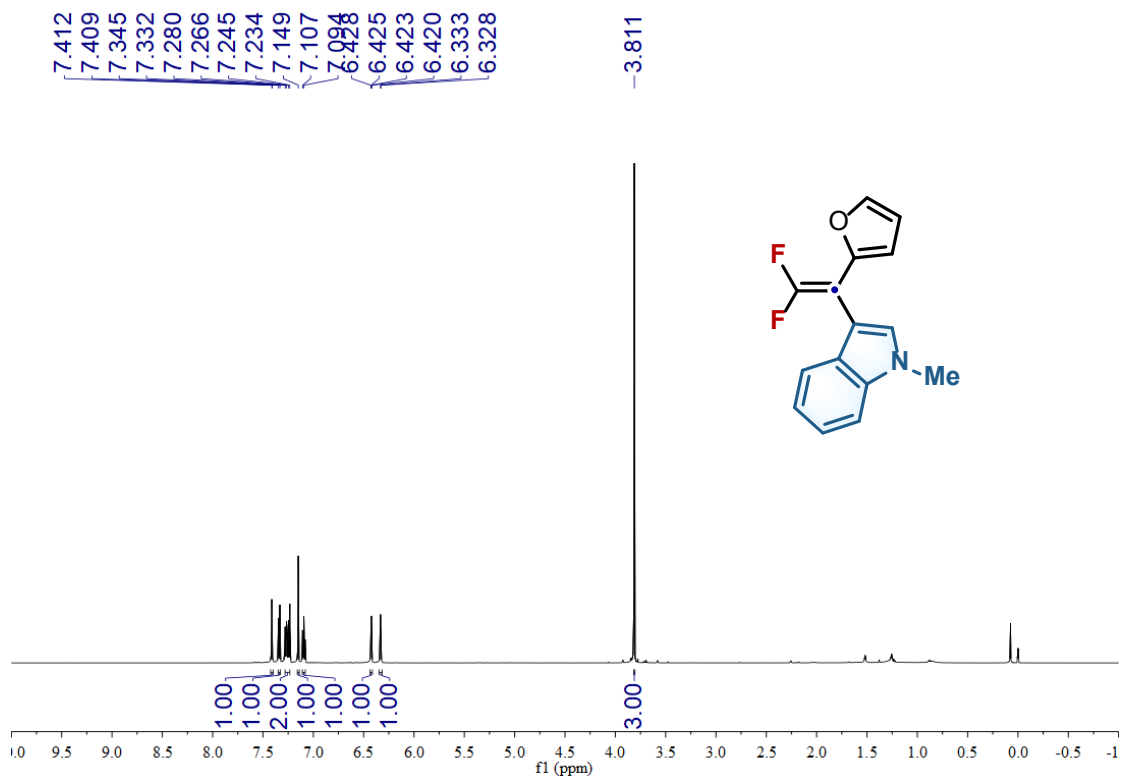
Supplementary Fig. 358. ¹H NMR (500 MHz, CDCl₃) spectrum of 120



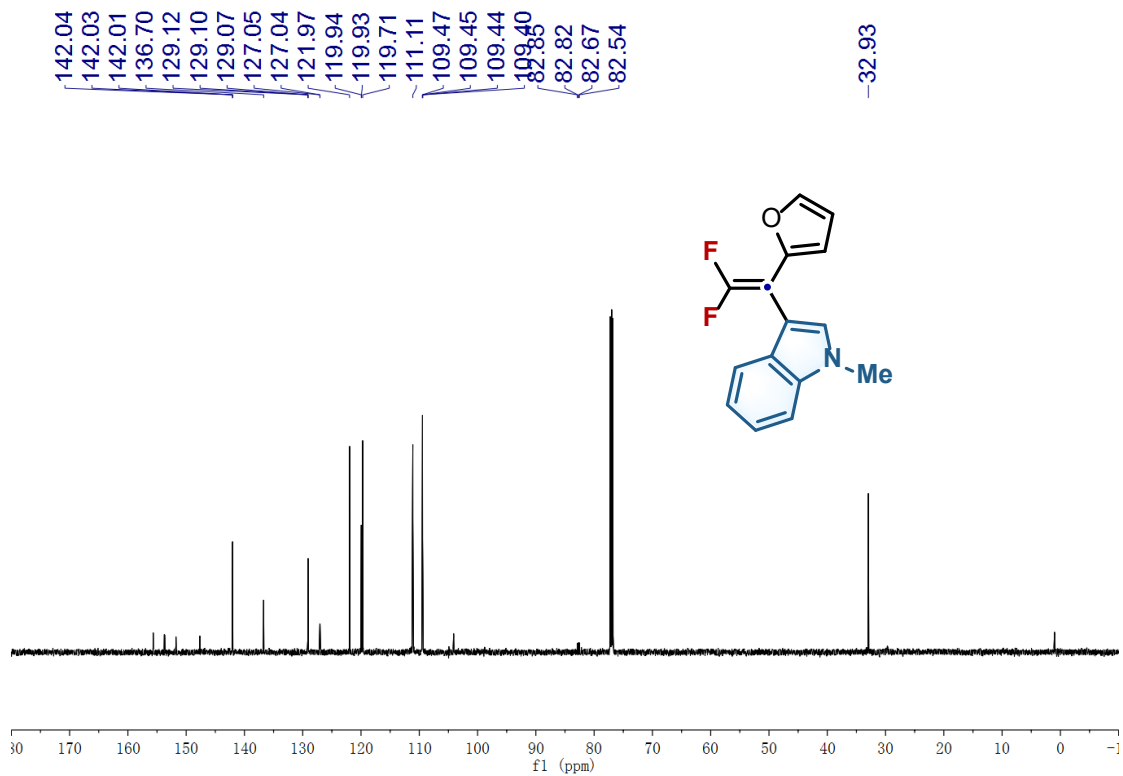
Supplementary Fig. 359. ¹³C NMR (150 MHz, CDCl₃) spectrum of 120



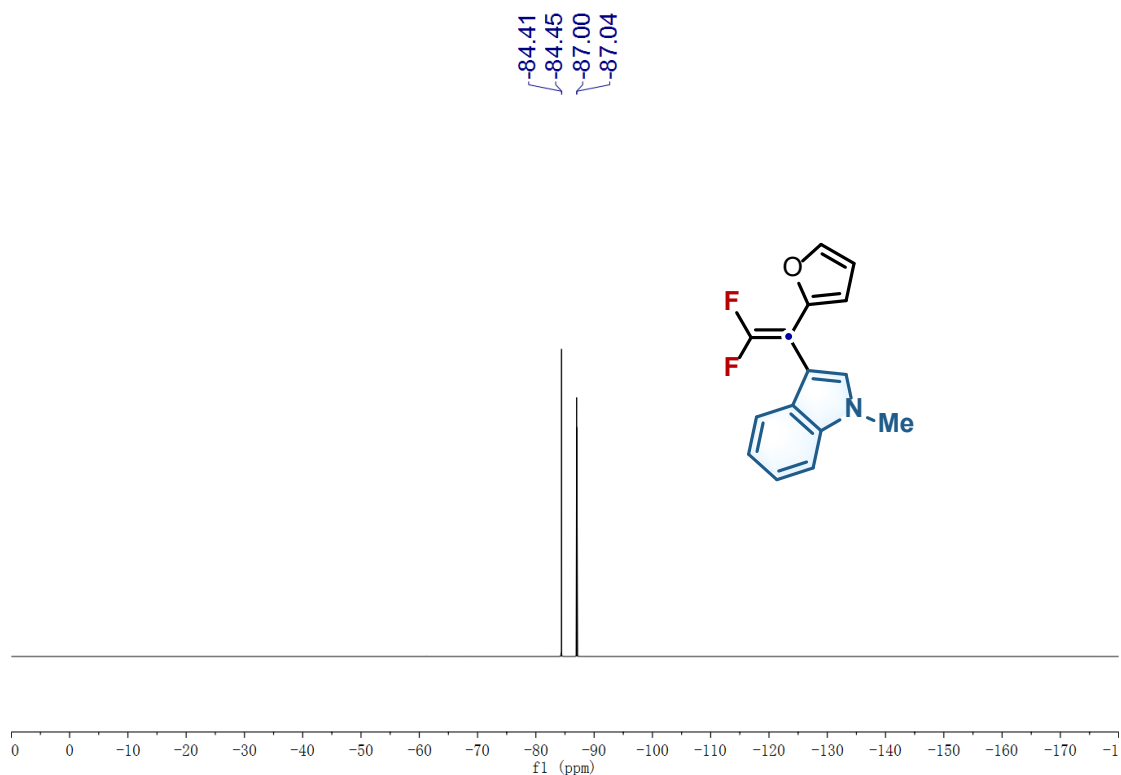
Supplementary Fig. 360. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 120



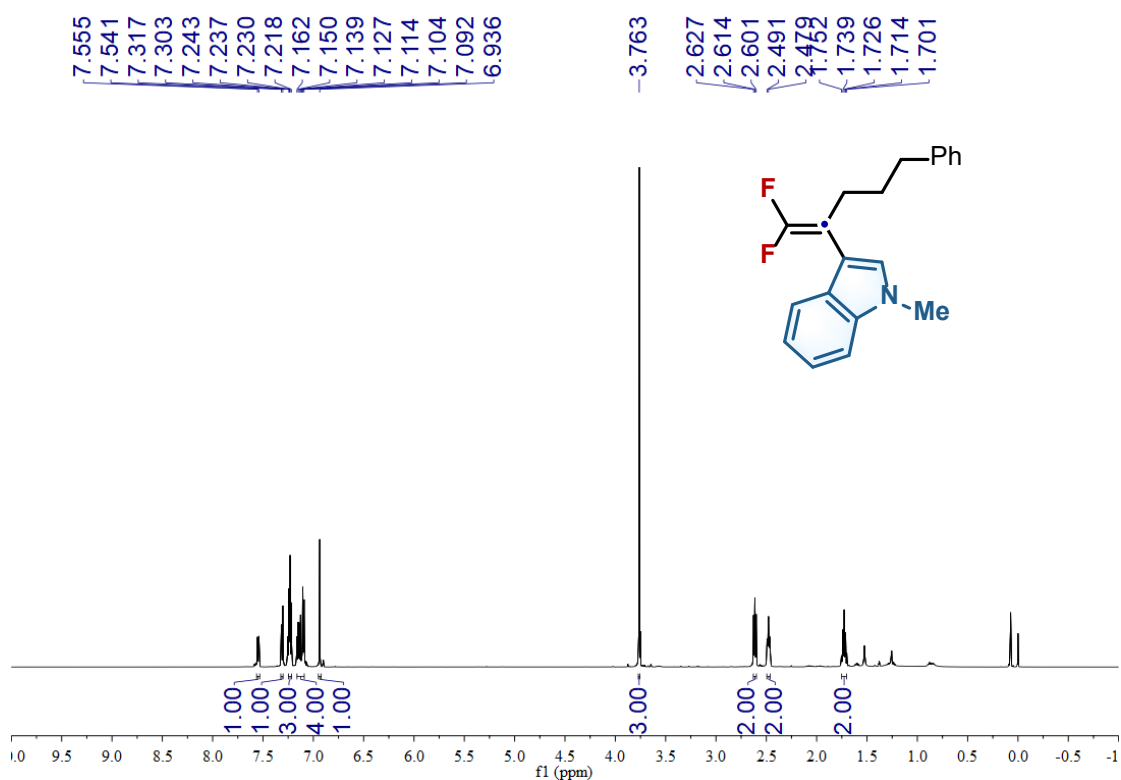
Supplementary Fig.361. ¹H NMR (600 MHz, CDCl₃) spectrum of 121



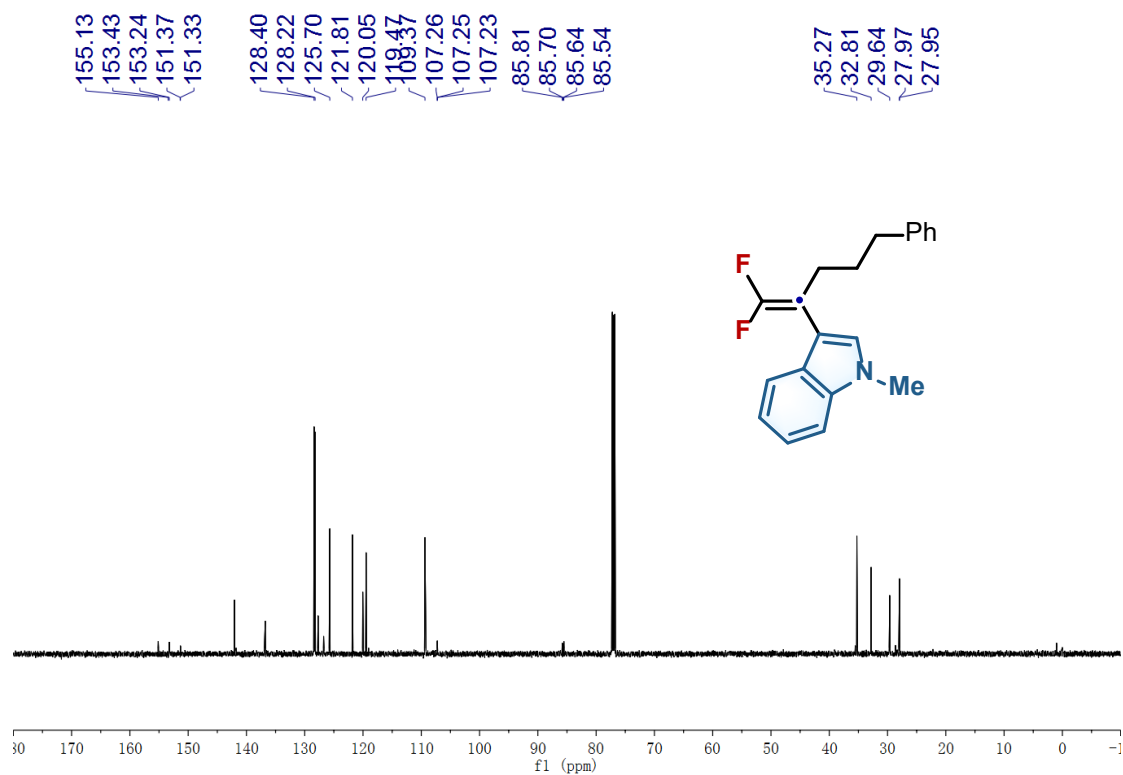
Supplementary Fig. 362. ¹³C NMR (150 MHz, CDCl₃) spectrum of 121



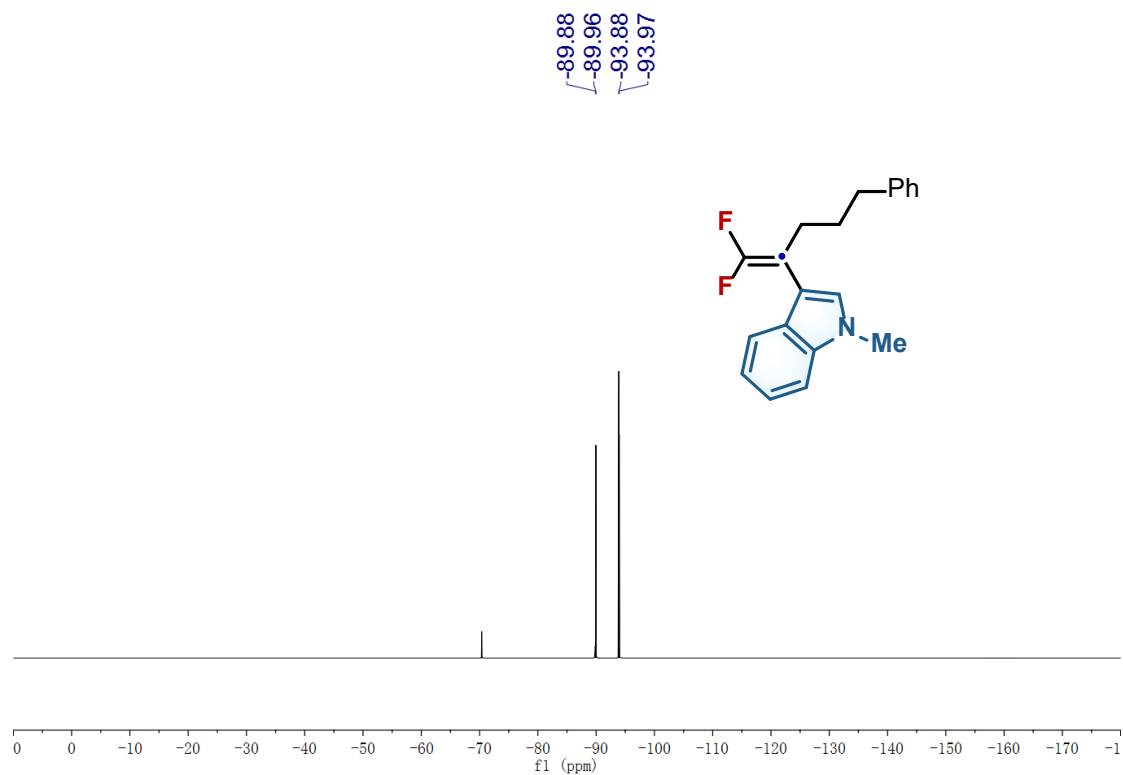
Supplementary Fig. 363. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 121



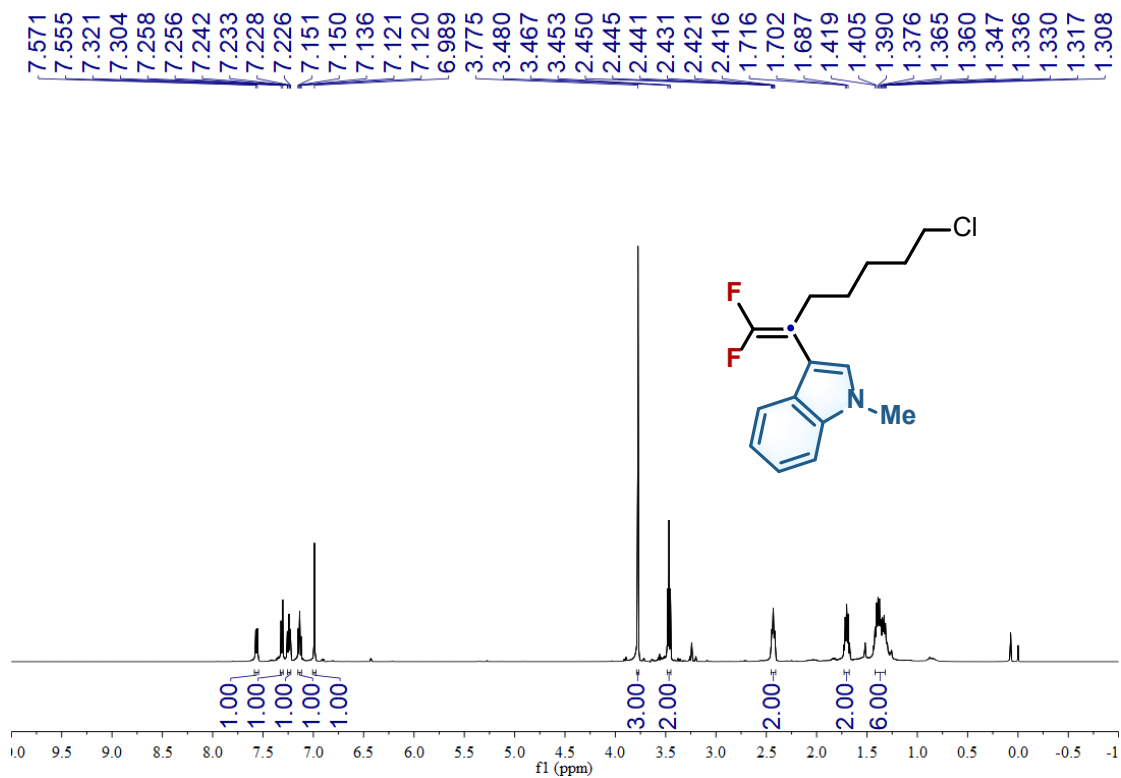
Supplementary Fig. 364. ¹H NMR (600 MHz, CDCl₃) spectrum of 122



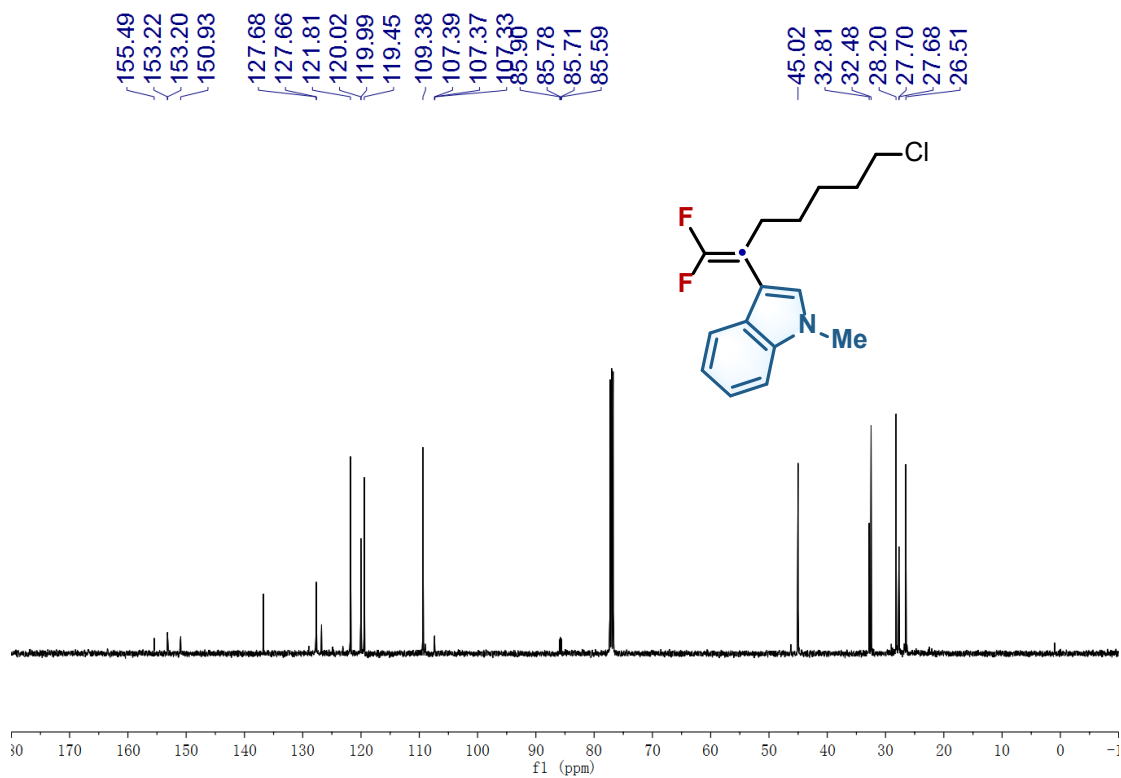
Supplementary Fig. 365. ¹³C NMR (150 MHz, CDCl₃) spectrum of 122



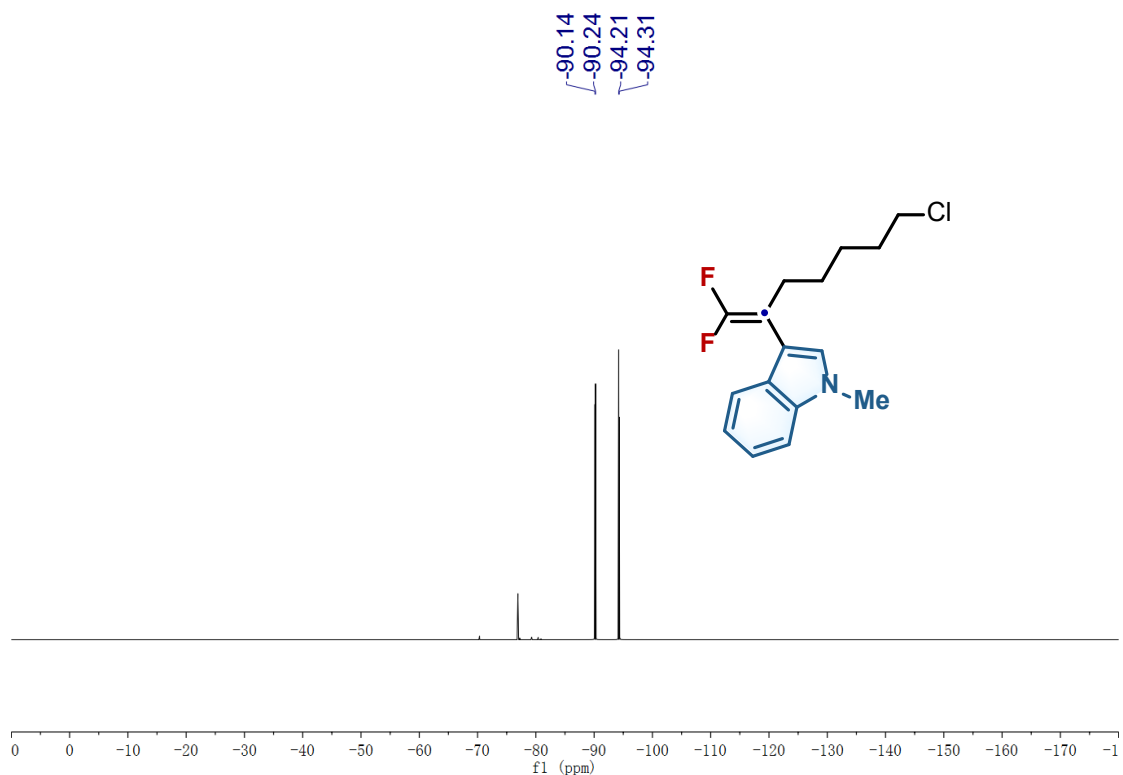
Supplementary Fig. 366. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 122



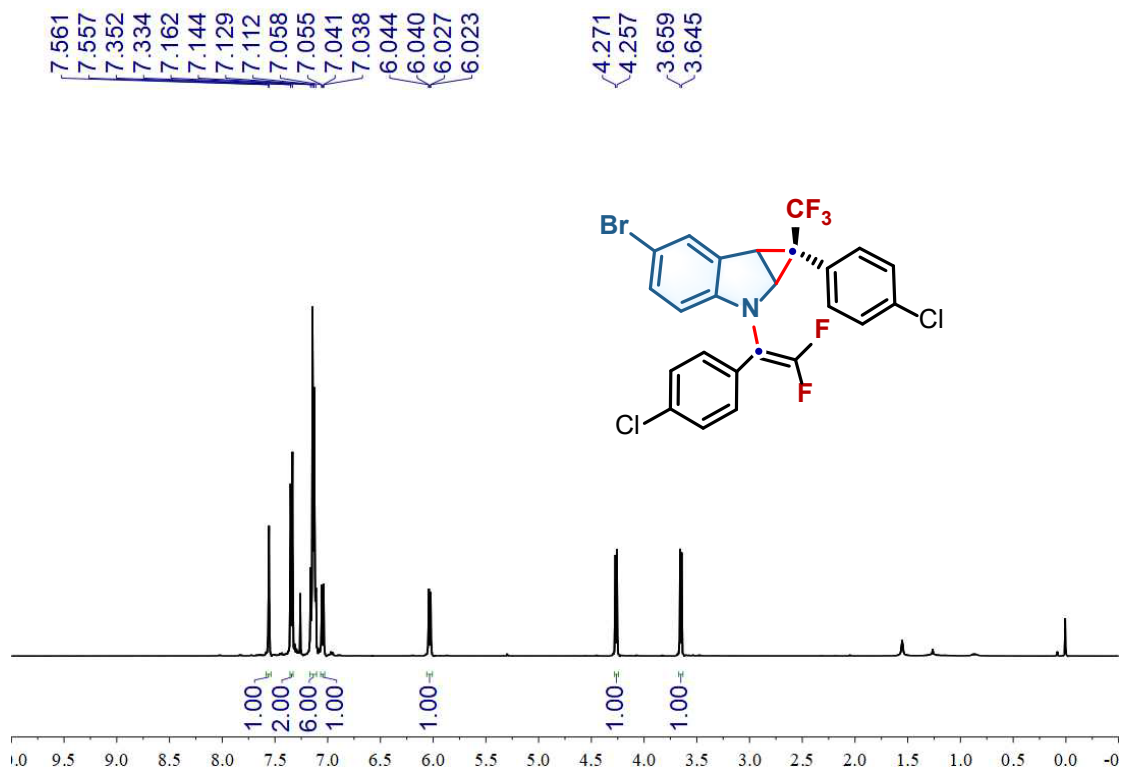
Supplementary Fig. 367. ¹H NMR (500 MHz, CDCl₃) spectrum of 123



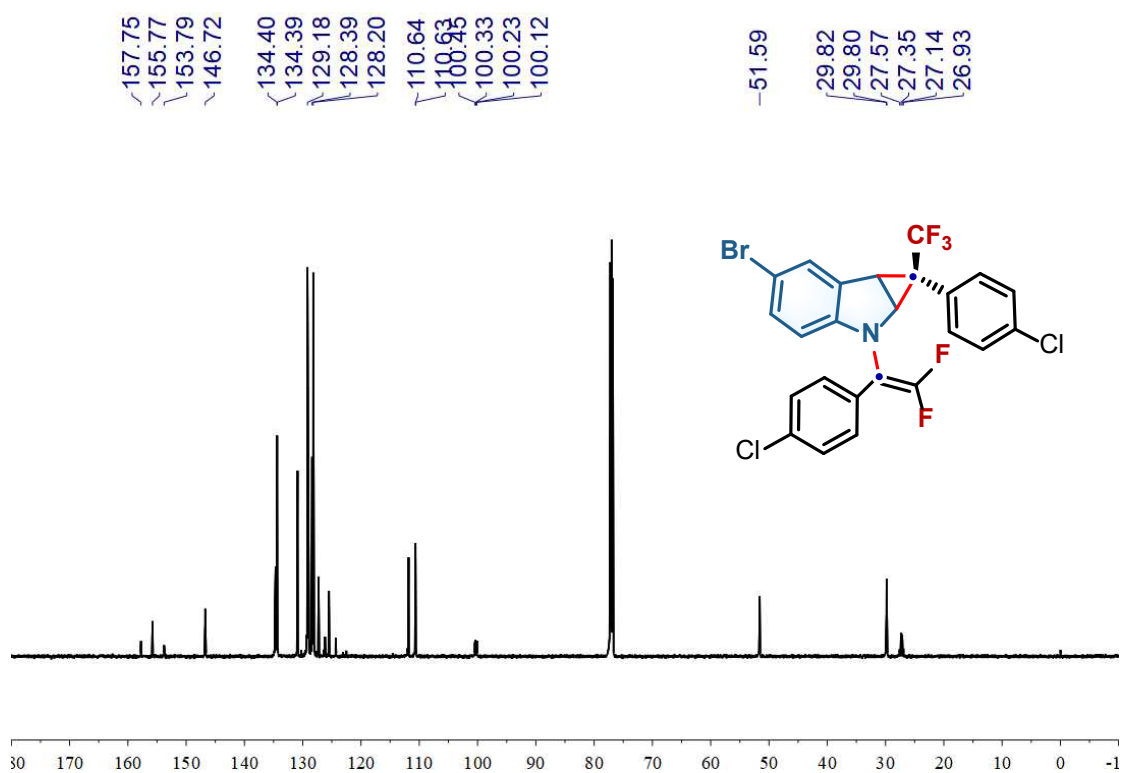
Supplementary Fig. 368. ¹³C NMR (125 MHz, CDCl₃) spectrum of 123



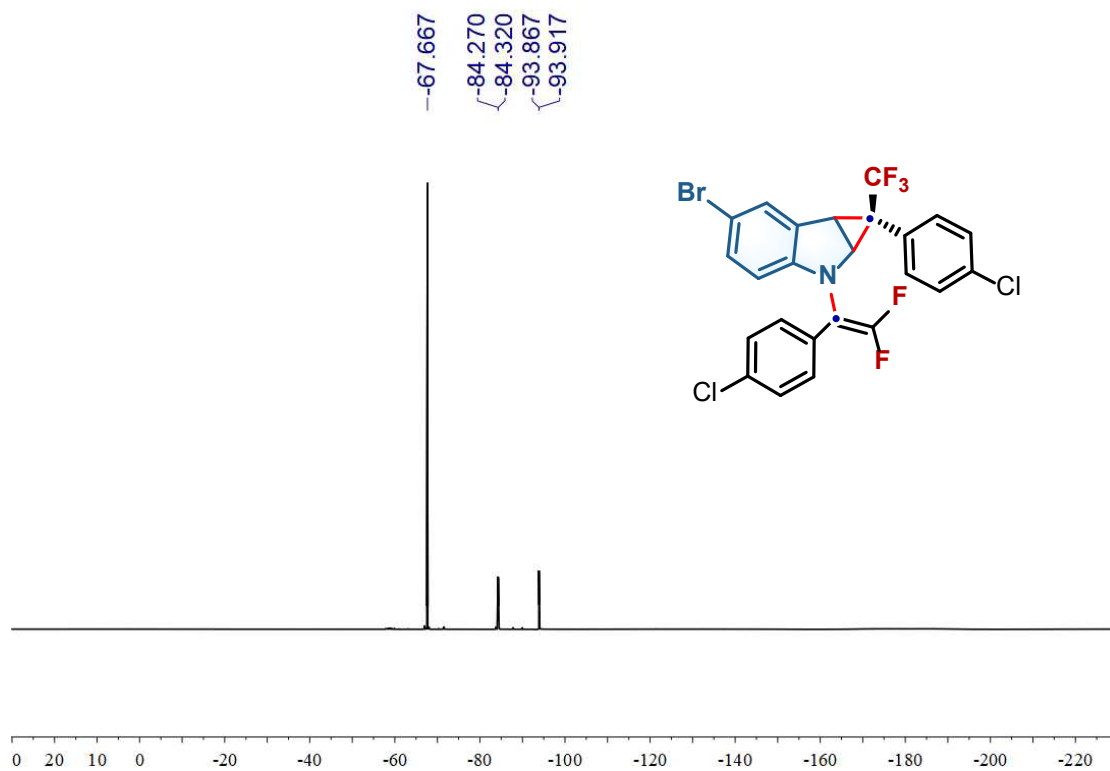
Supplementary Fig. 369. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 123



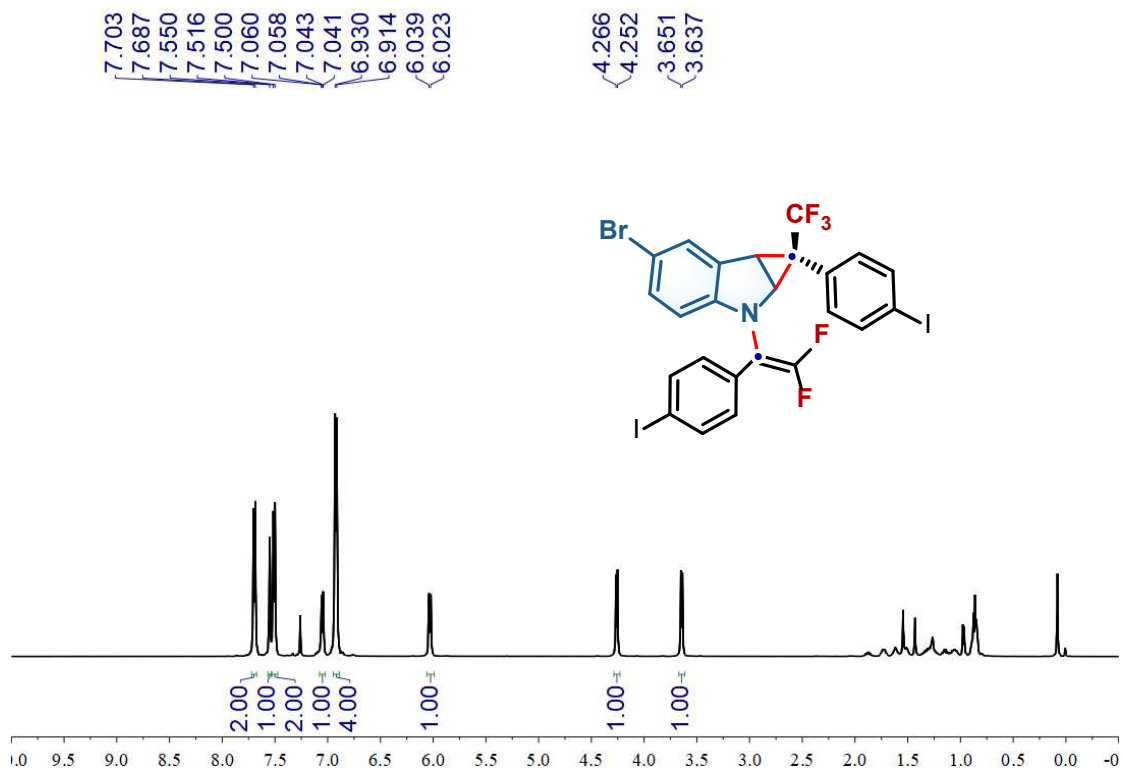
Supplementary Fig. 370. ^1H NMR (500 MHz, CDCl_3) spectrum of 124



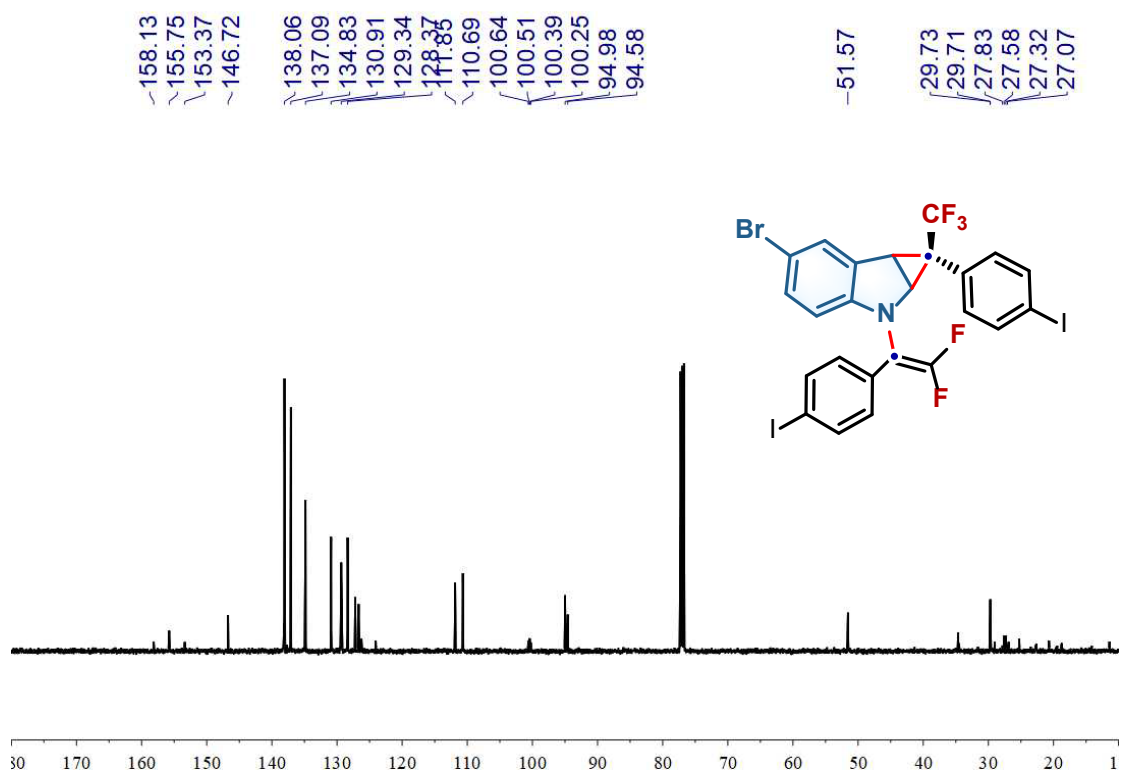
Supplementary Fig. 371. ^{13}C NMR (150 MHz, CDCl_3) spectrum of **124**



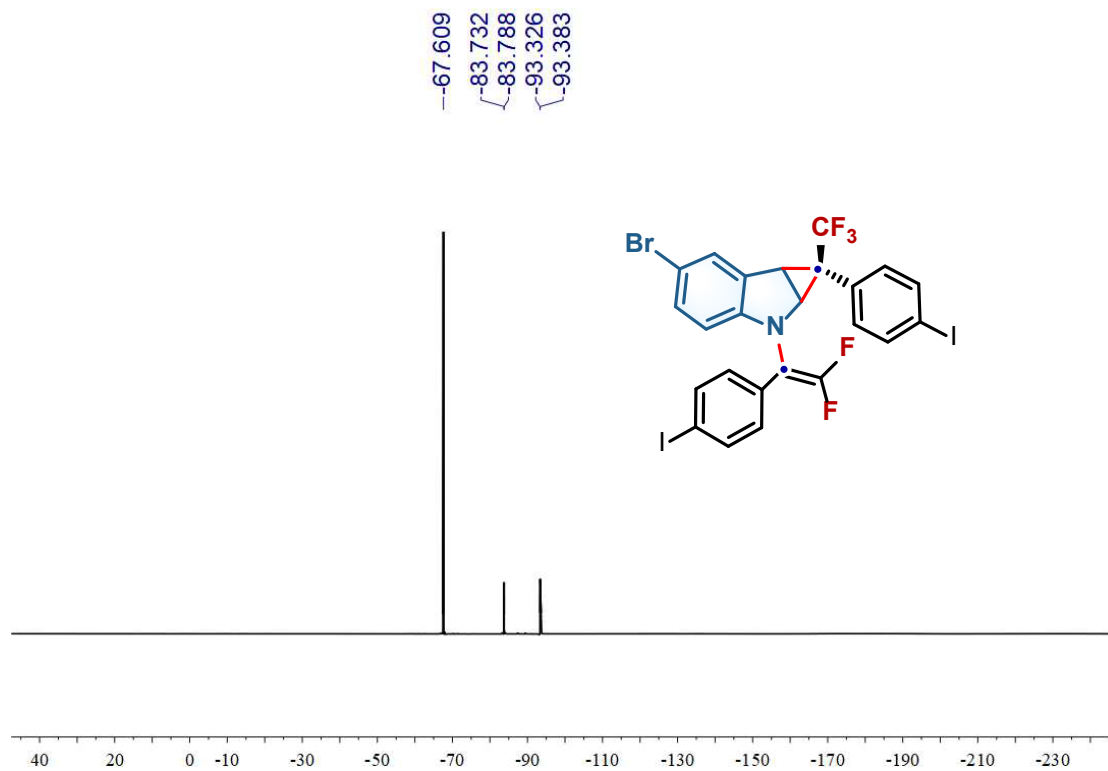
Supplementary Fig. 372. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **124**



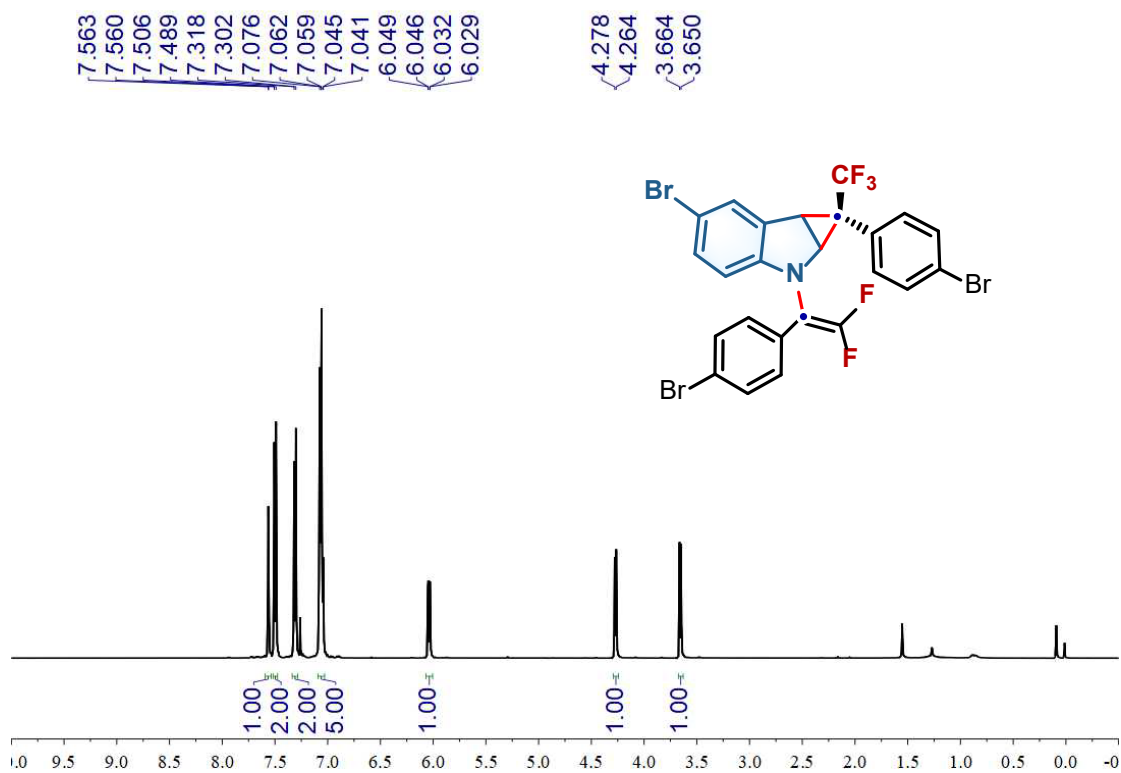
Supplementary Fig. 373. ¹H NMR (500 MHz, CDCl₃) spectrum of **125**



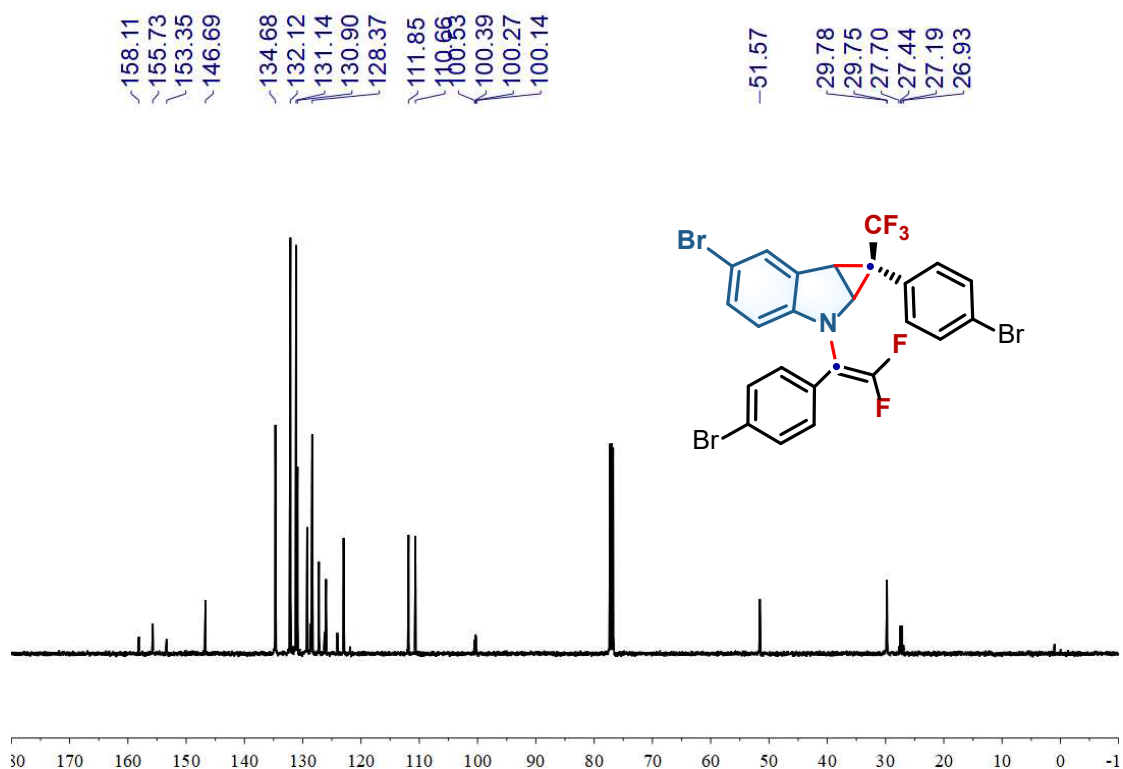
Supplementary Fig. 374. ¹³C NMR (125 MHz, CDCl₃) spectrum of **125**



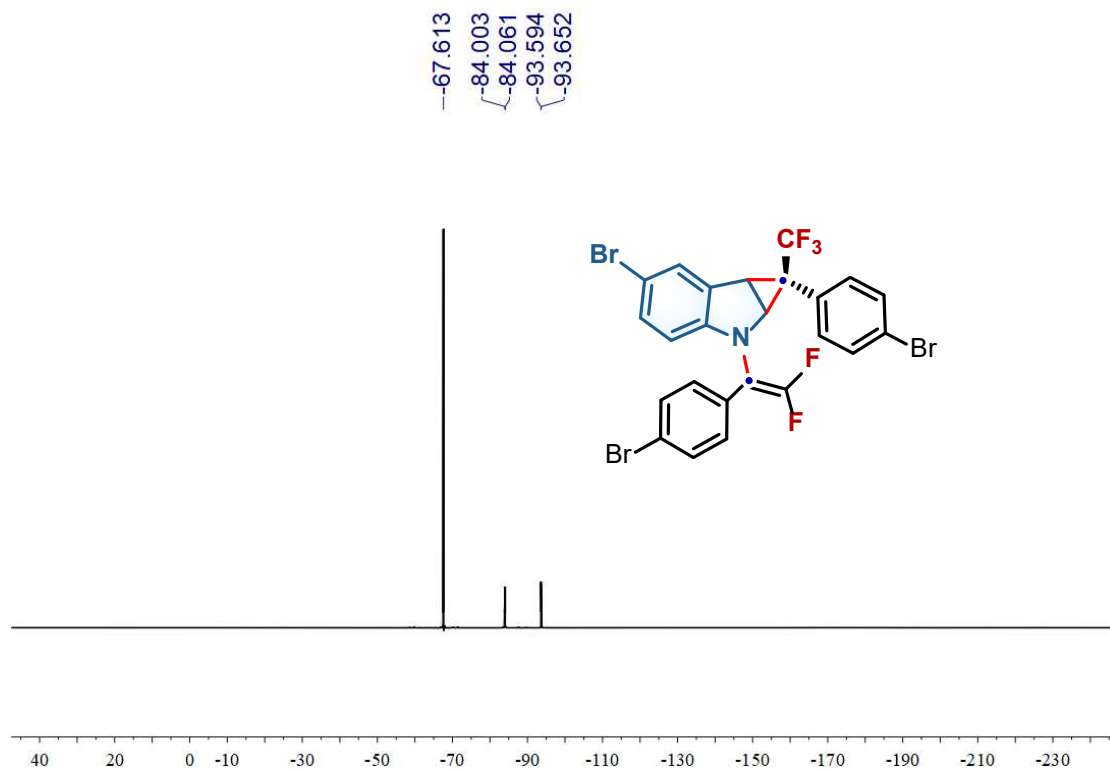
Supplementary Fig. 375. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **125**



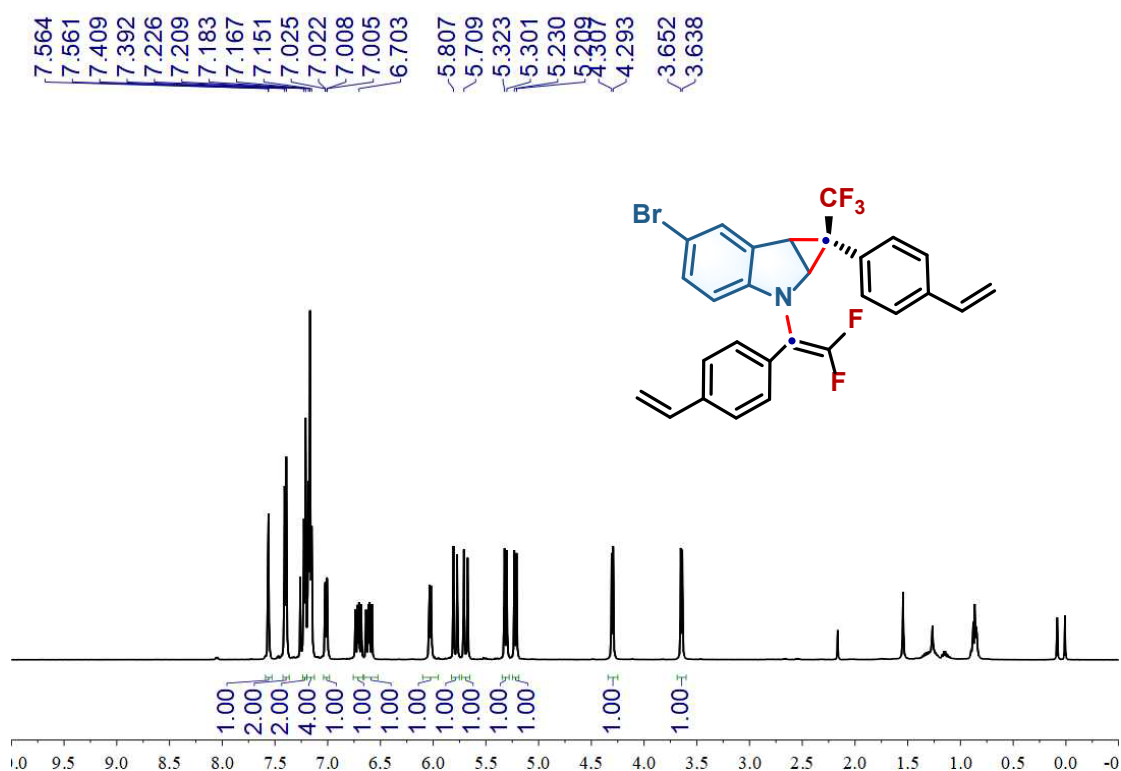
Supplementary Fig. 376. ^1H NMR (500 MHz, CDCl_3) spectrum of **126**



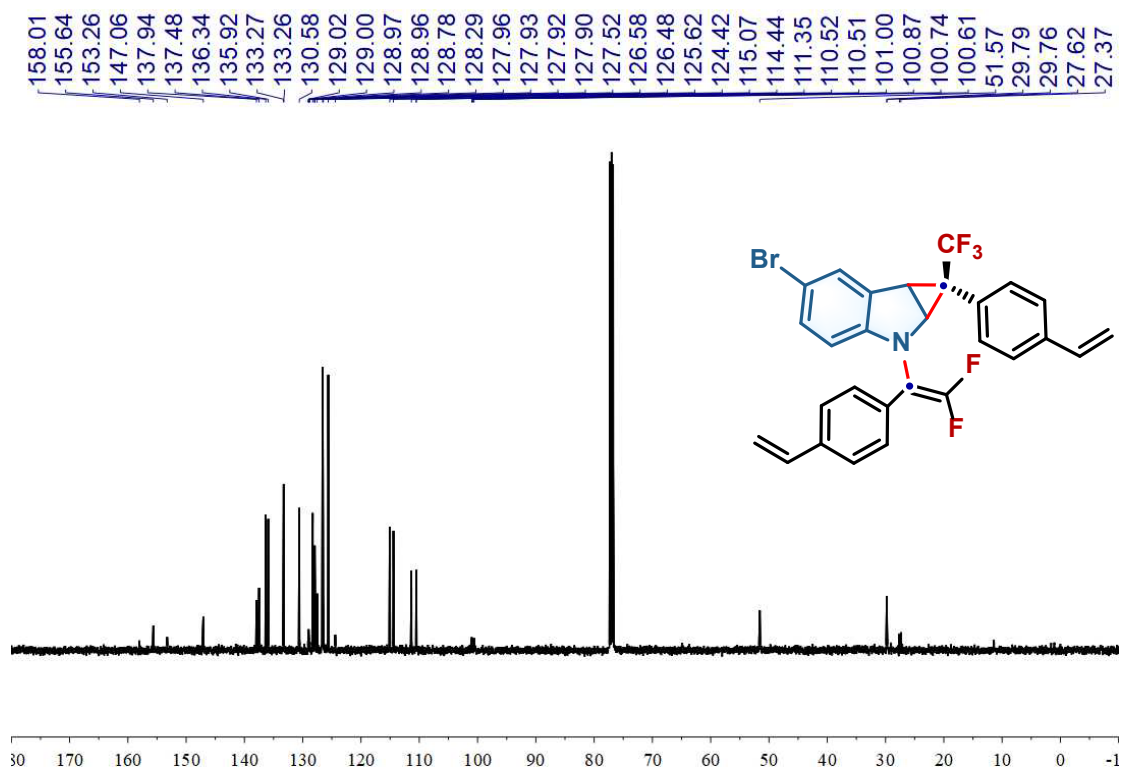
Supplementary Fig. 377. ^{13}C NMR (125 MHz, CDCl_3) spectrum of **126**



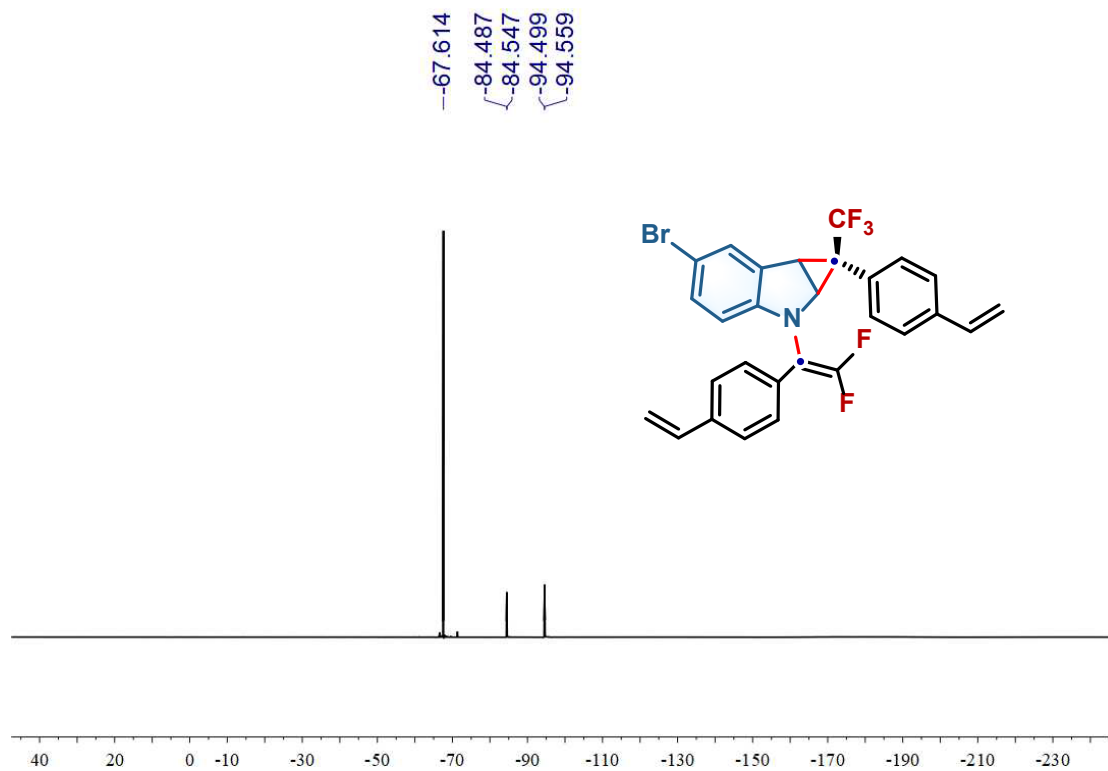
Supplementary Fig. 378. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **126**



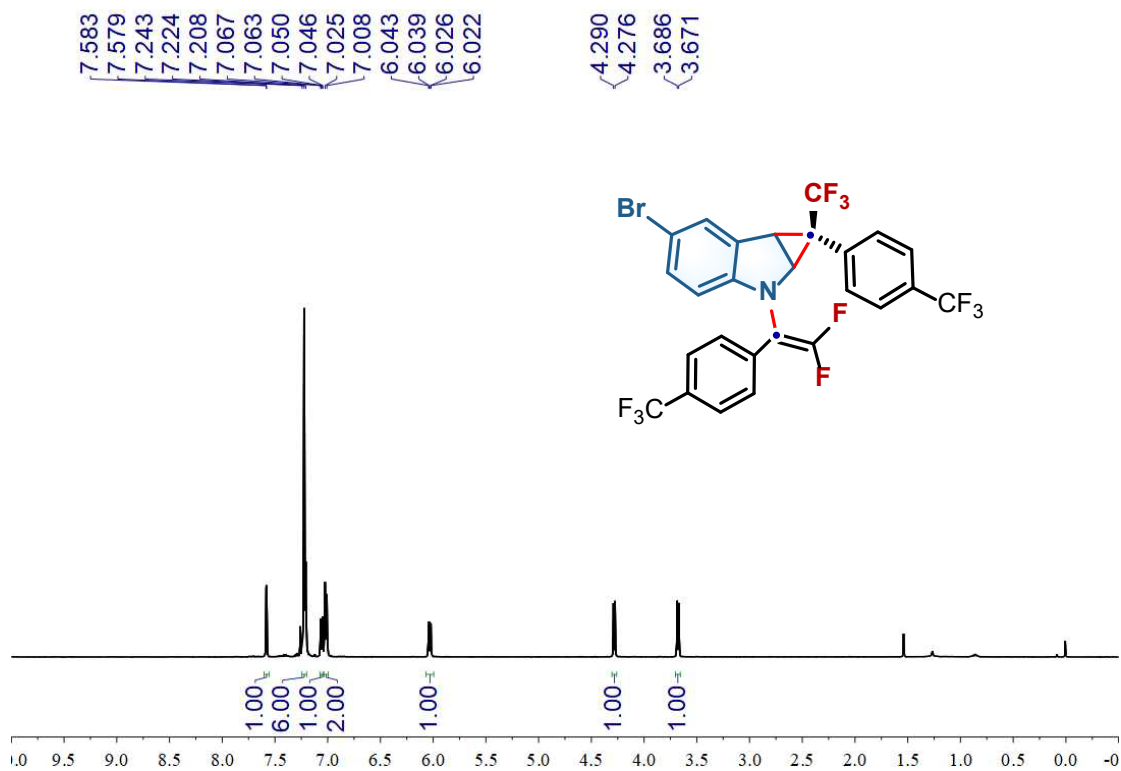
Supplementary Fig. 379. ¹H NMR (500 MHz, CDCl₃) spectrum of 127



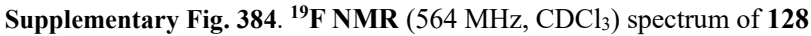
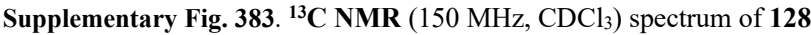
Supplementary Fig. 380. ¹³C NMR (125 MHz, CDCl₃) spectrum of 127

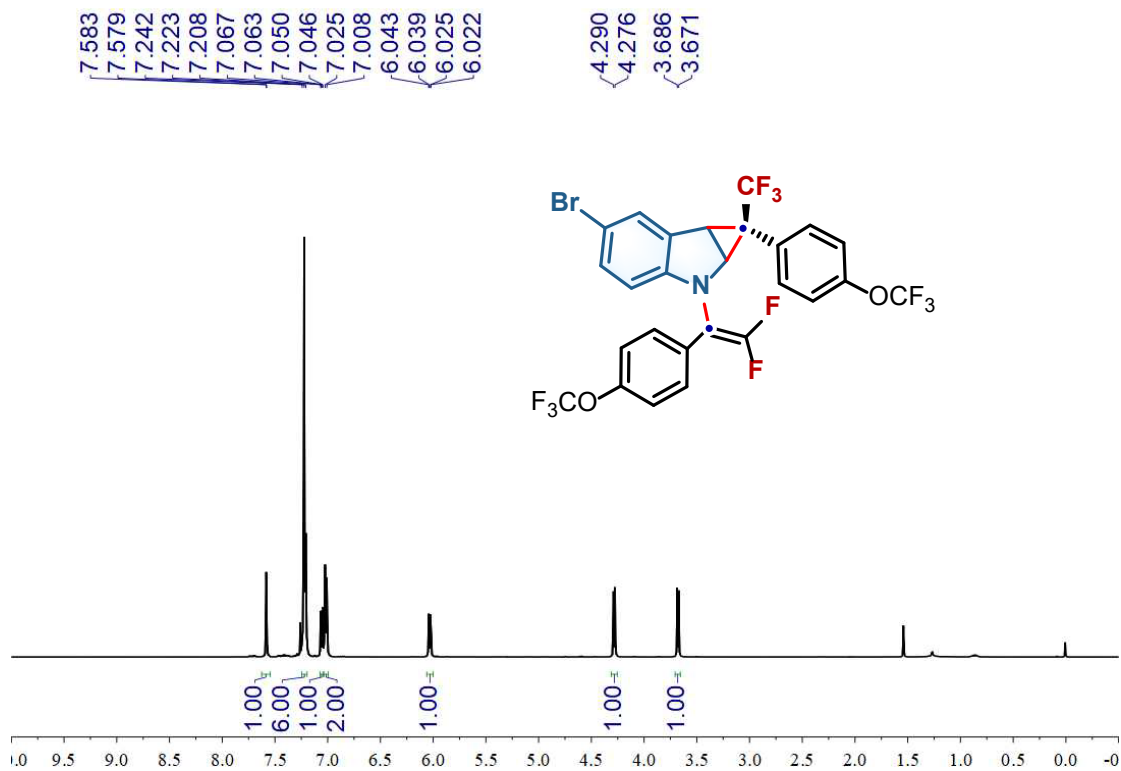


Supplementary Fig. 381. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **127**

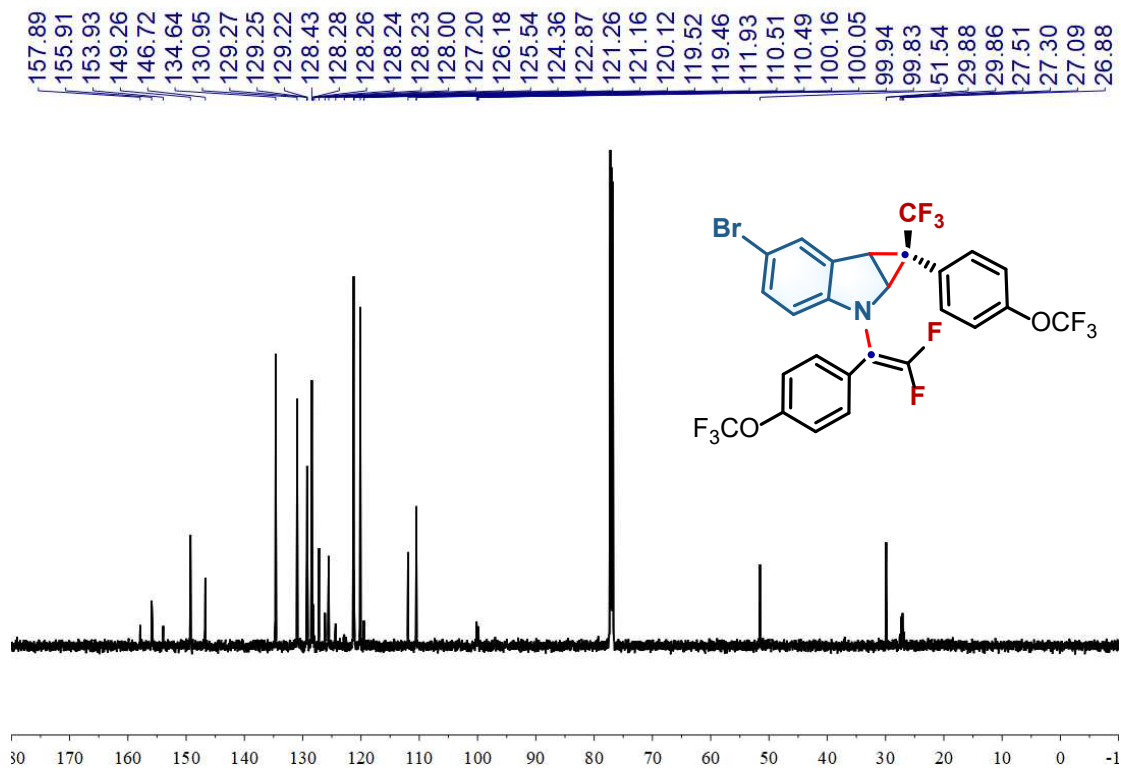


Supplementary Fig. 382. ^1H NMR (500 MHz, CDCl_3) spectrum of **128**

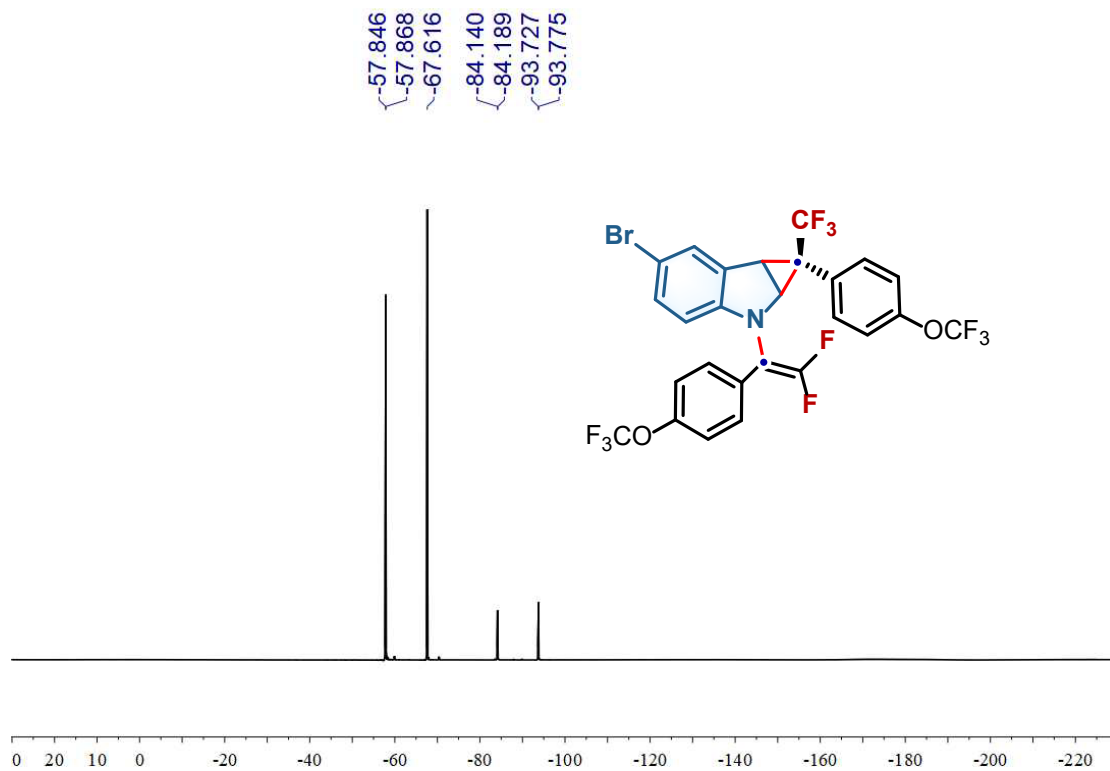




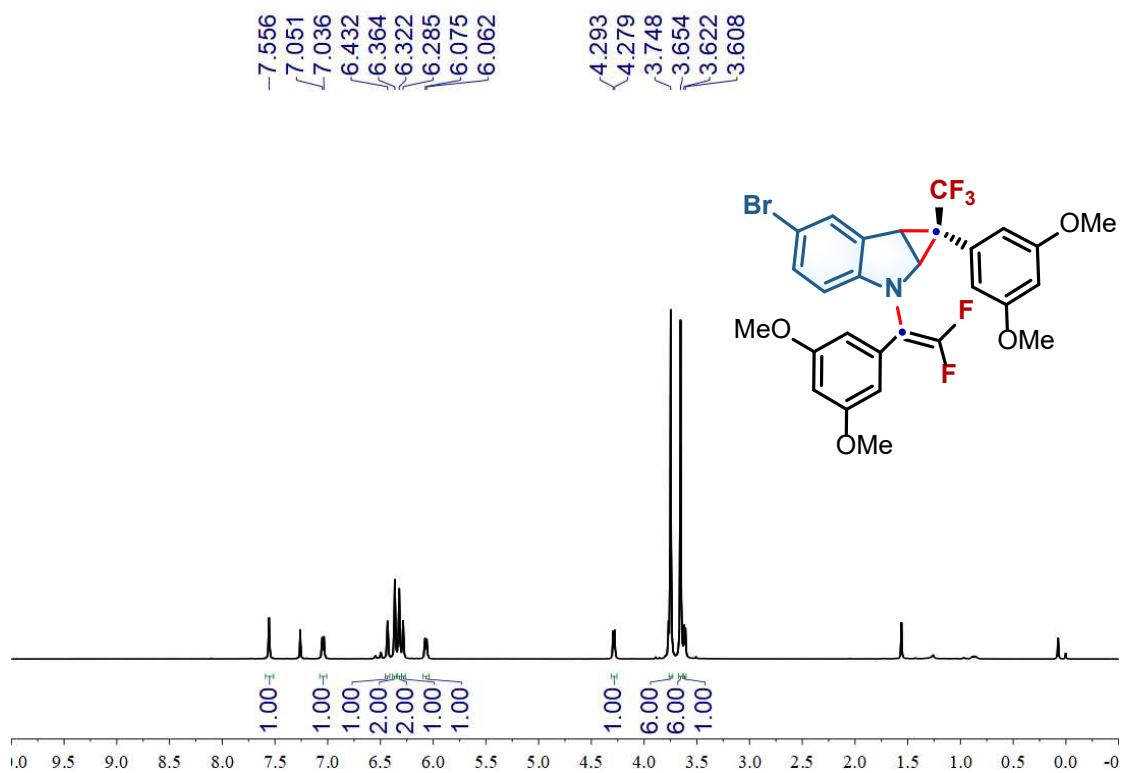
Supplementary Fig. 385. ¹H NMR (500 MHz, CDCl₃) spectrum of 129



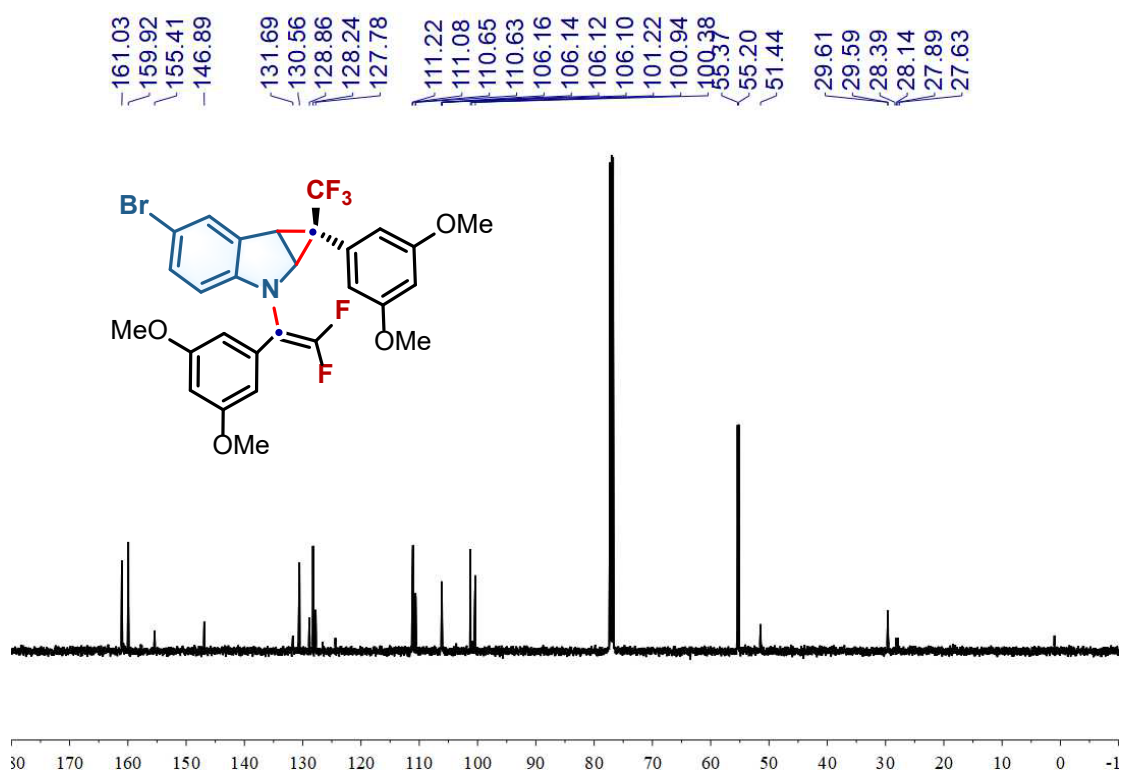
Supplementary Fig. 386. ¹³C NMR (150 MHz, CDCl₃) spectrum of 129



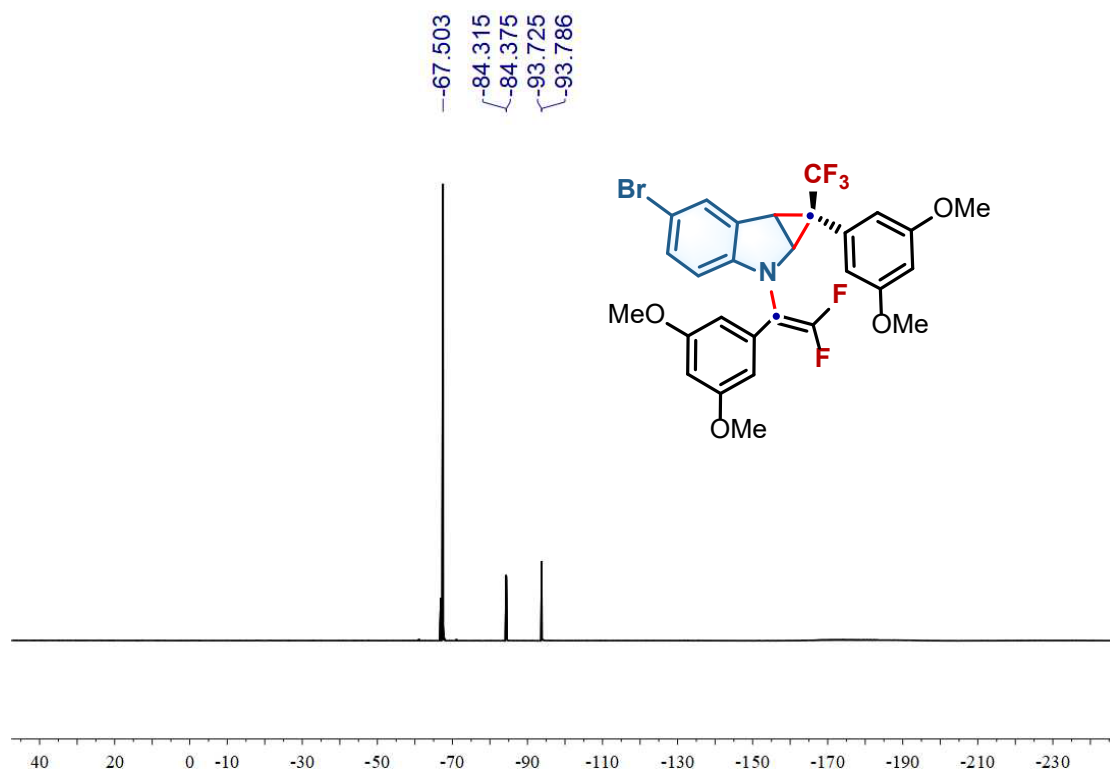
Supplementary Fig. 387. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **129**



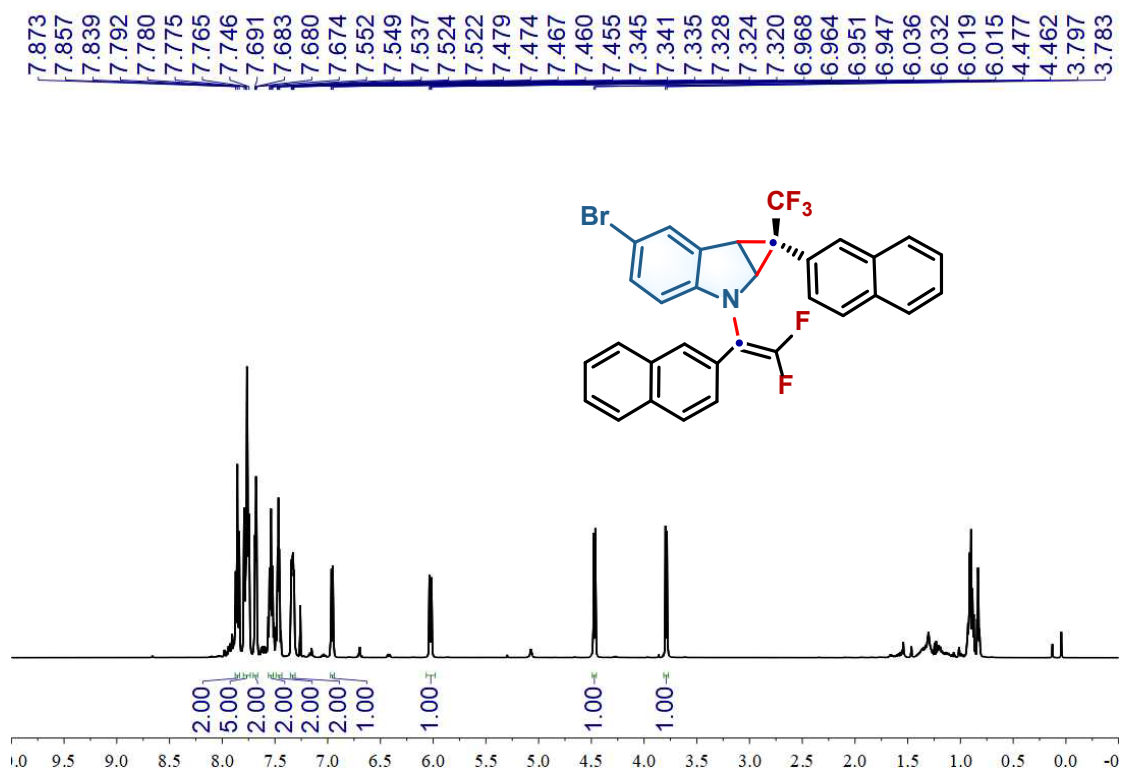
Supplementary Fig. 388. ¹H NMR (500 MHz, CDCl₃) spectrum of **130**



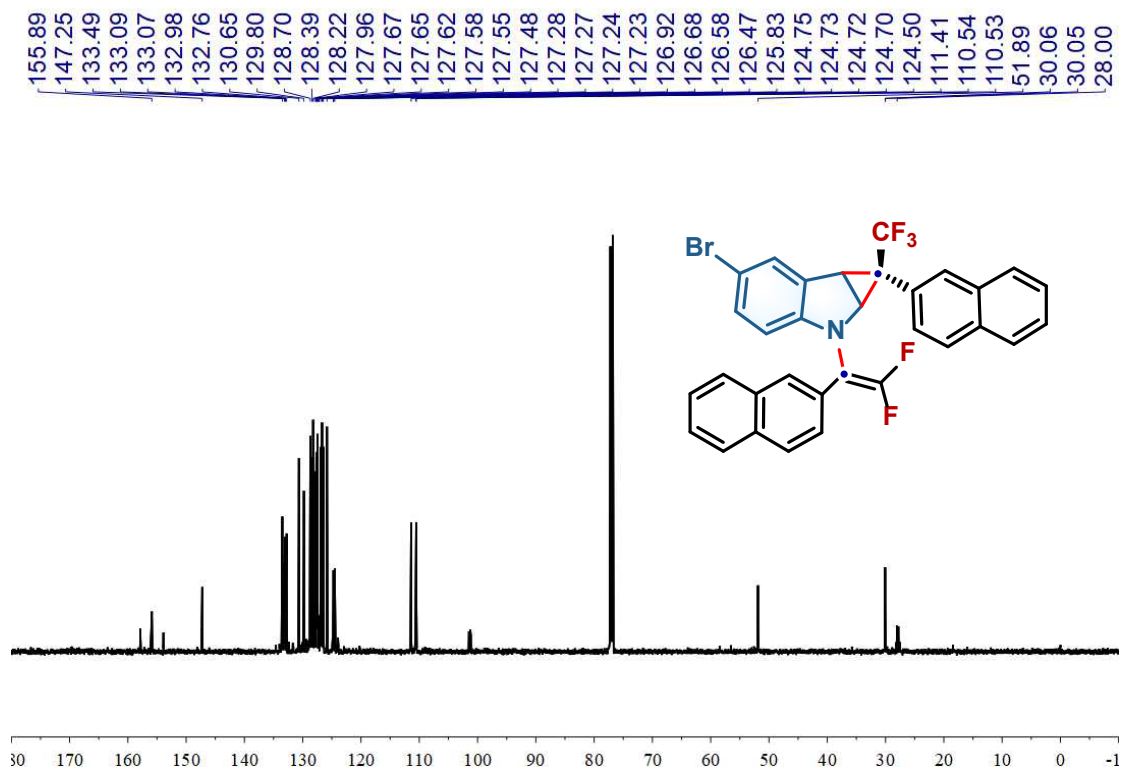
Supplementary Fig. 389. ^{13}C NMR (125 MHz, CDCl_3) spectrum of **130**



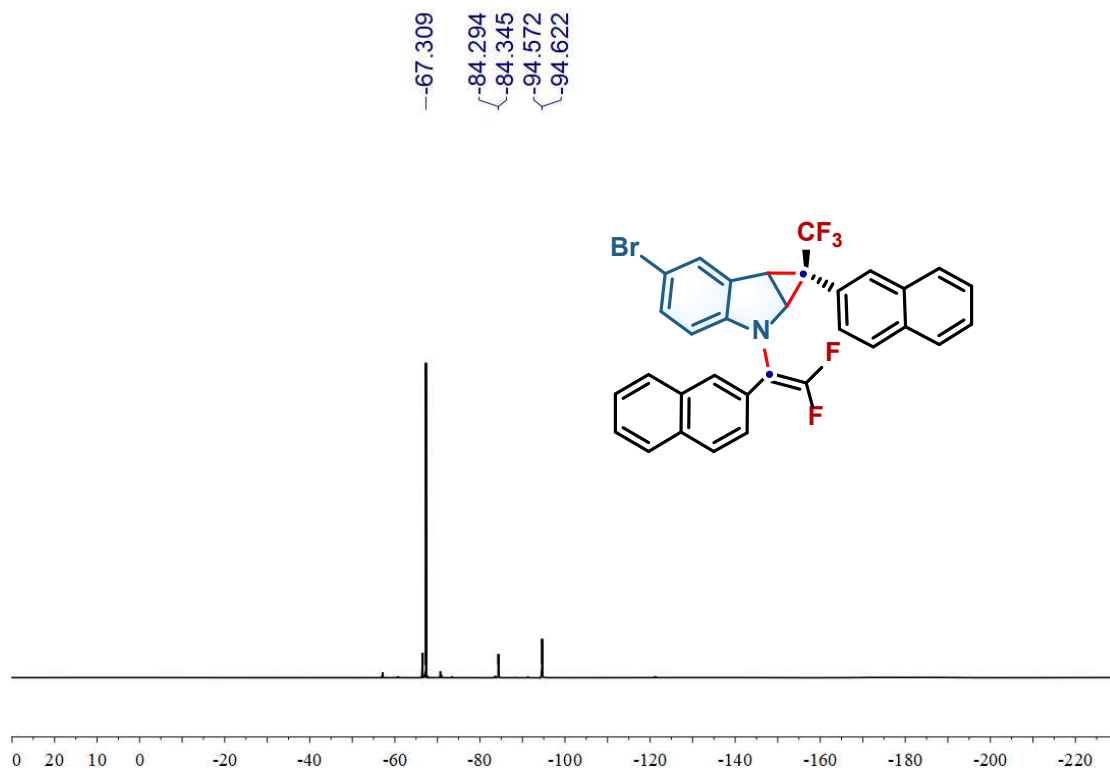
Supplementary Fig. 390. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **130**



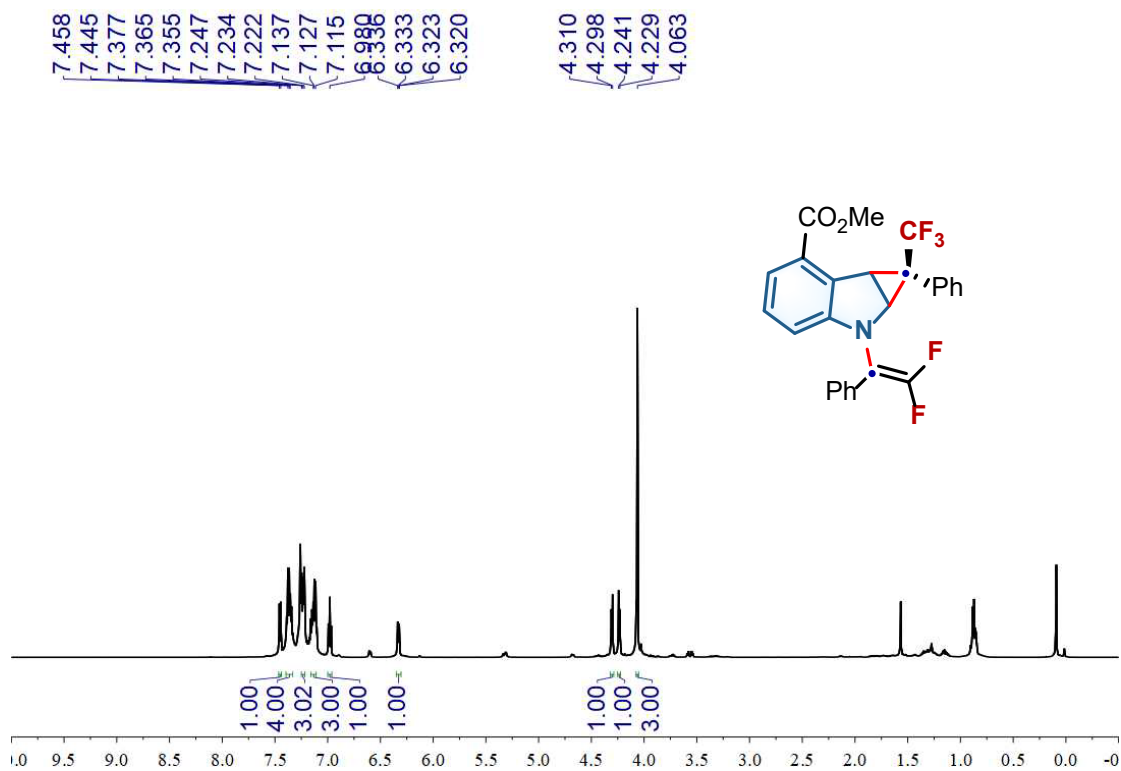
Supplementary Fig. 391. ¹H NMR (500 MHz, CDCl₃) spectrum of **131**



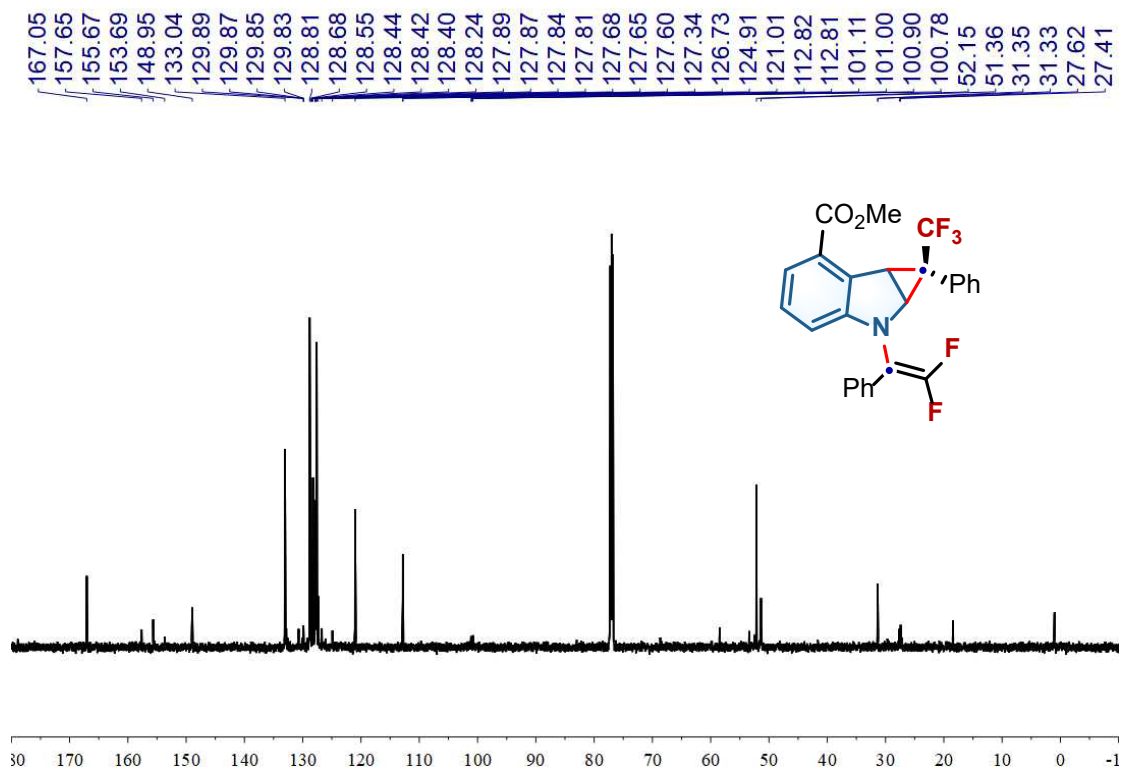
Supplementary Fig. 392. ¹³C NMR (150 MHz, CDCl₃) spectrum of **131**



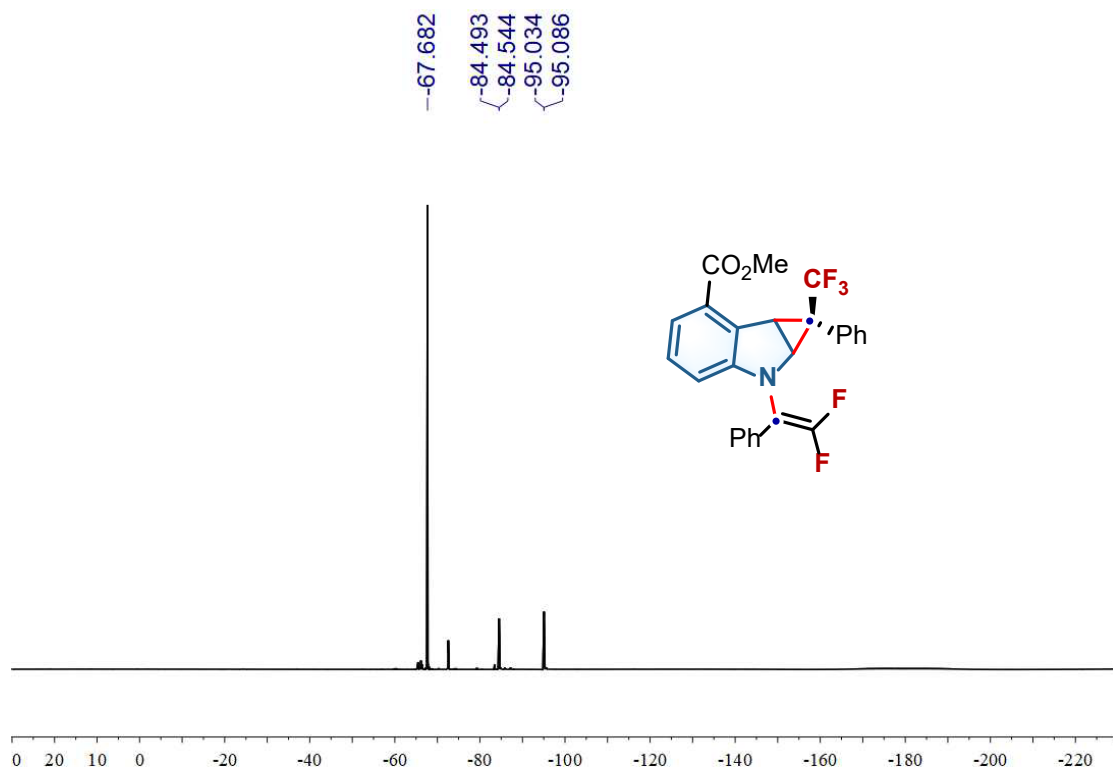
Supplementary Fig. 393. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **131**



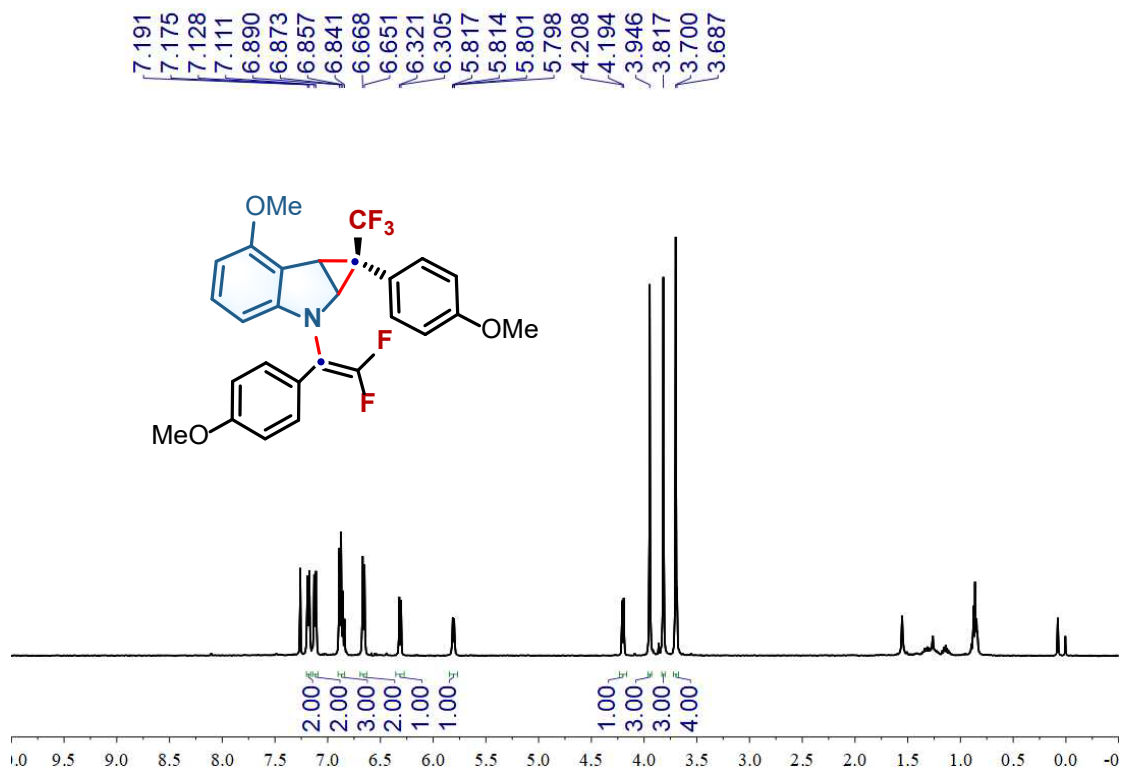
Supplementary Fig. 394. ¹H NMR (600 MHz, CDCl₃) spectrum of **132**



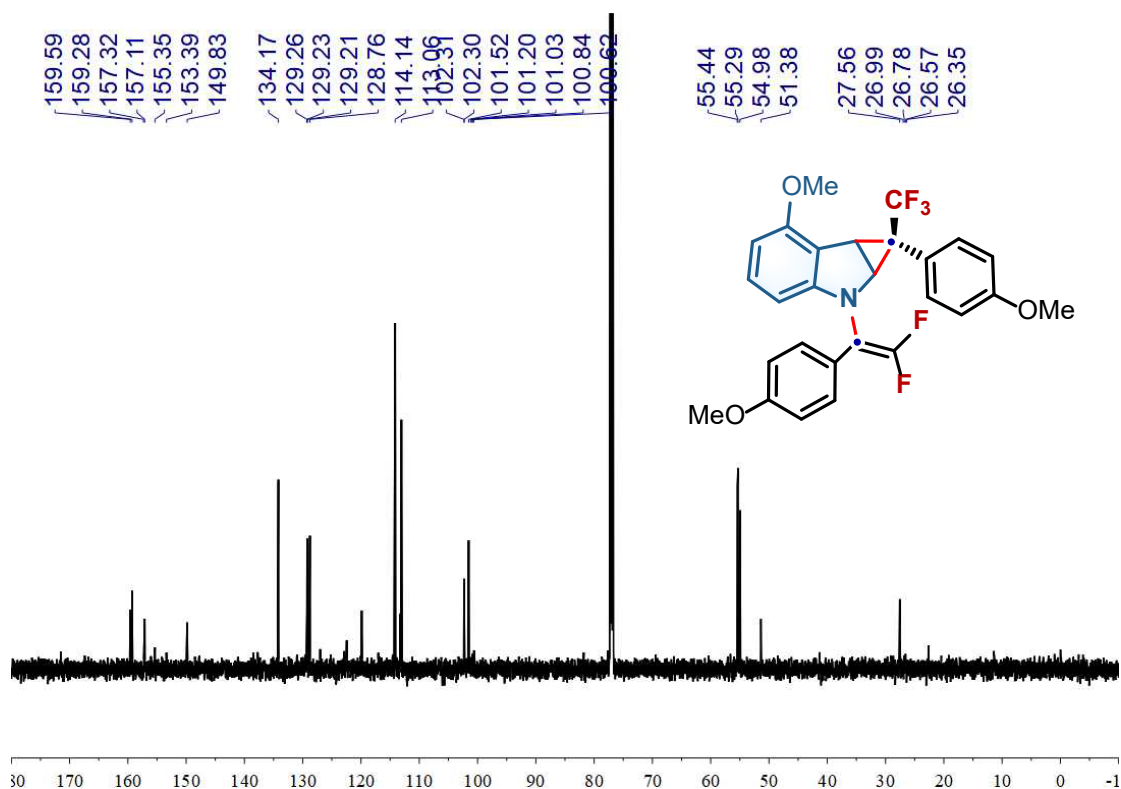
Supplementary Fig. 395. ¹³C NMR (150 MHz, CDCl₃) spectrum of 132



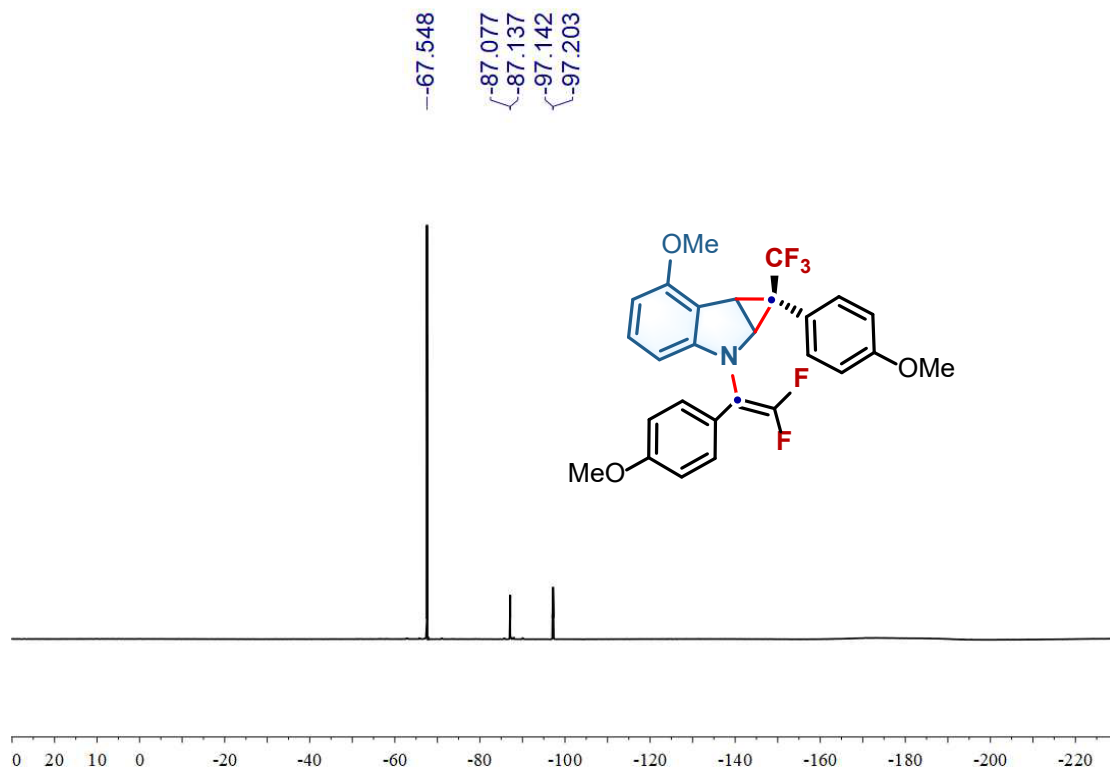
Supplementary Fig. 396. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 132



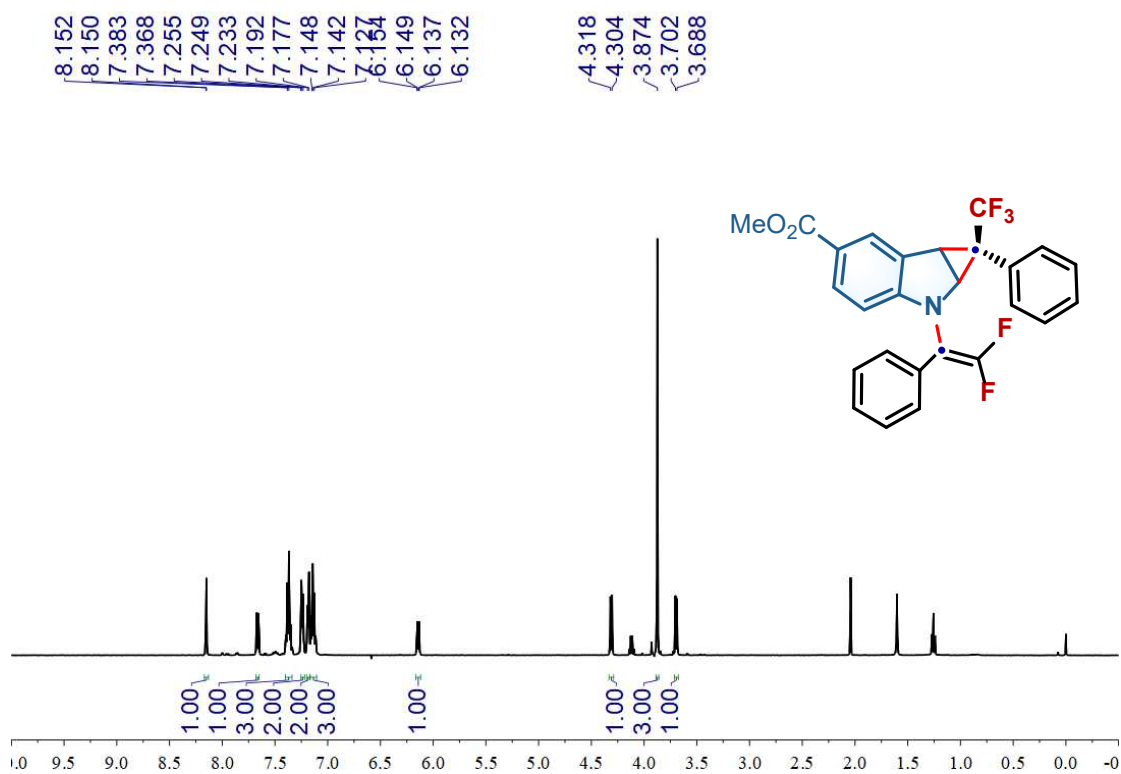
Supplementary Fig. 397. ¹H NMR (500 MHz, CDCl₃) spectrum of 133



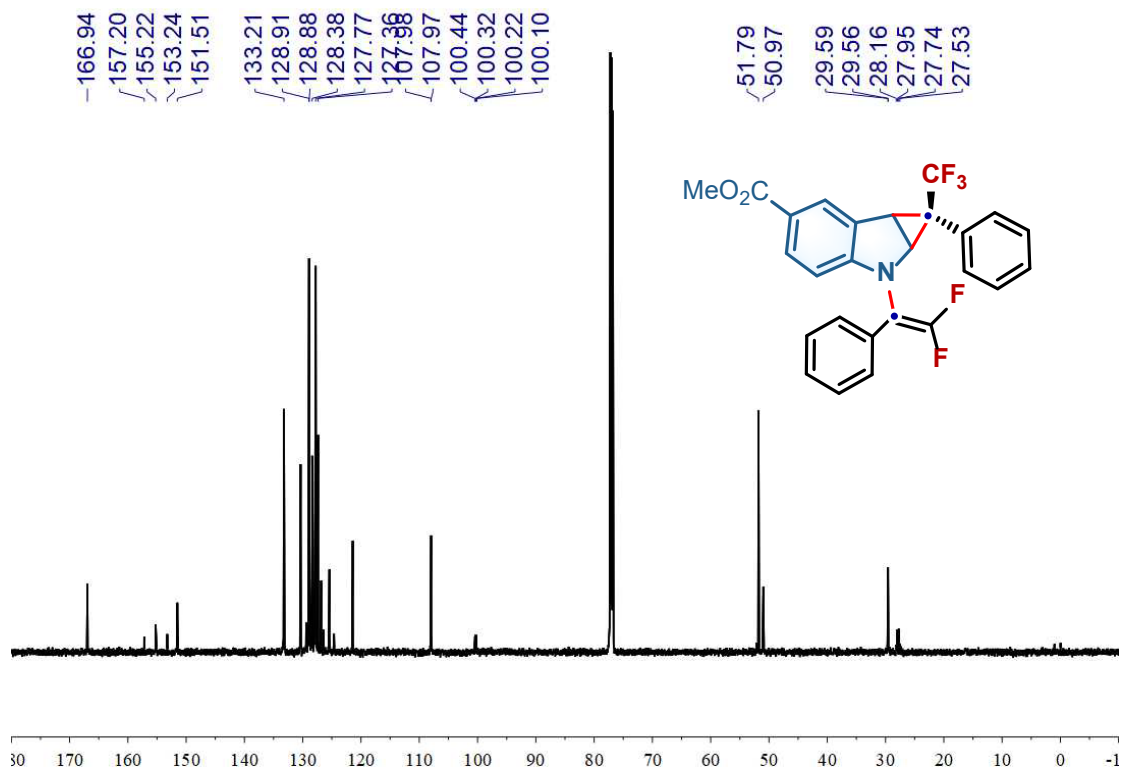
Supplementary Fig. 398. ¹³C NMR (150 MHz, CDCl₃) spectrum of 133



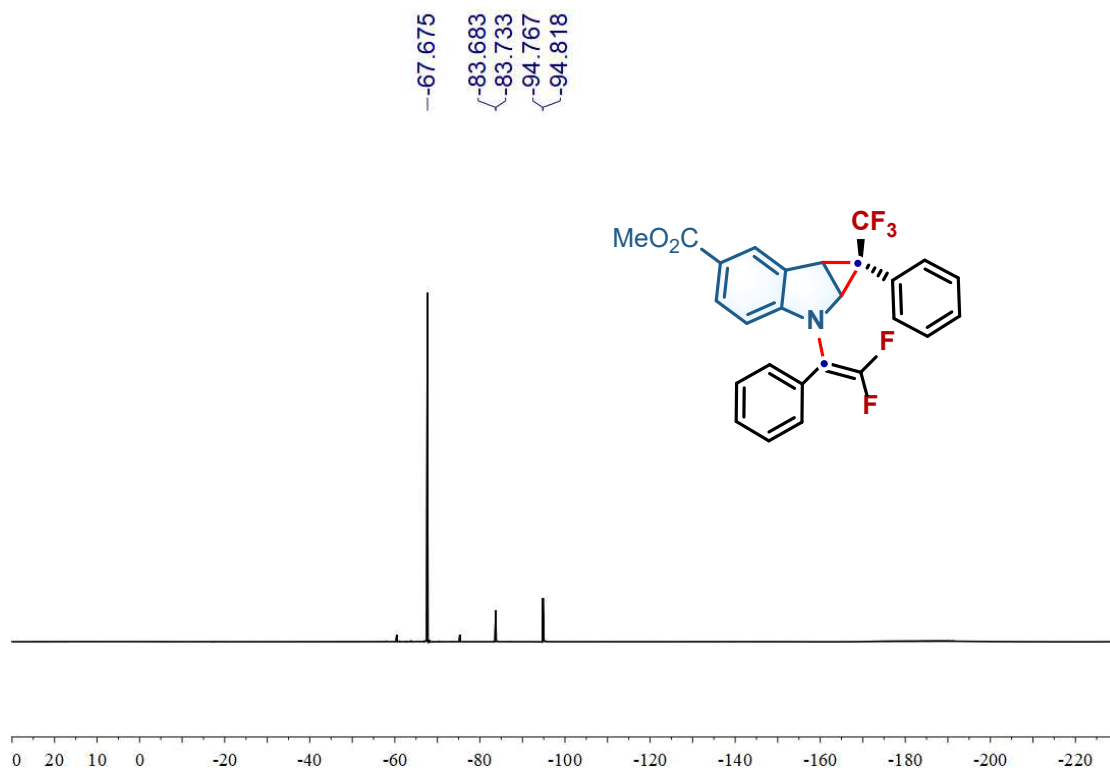
Supplementary Fig. 399. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 133



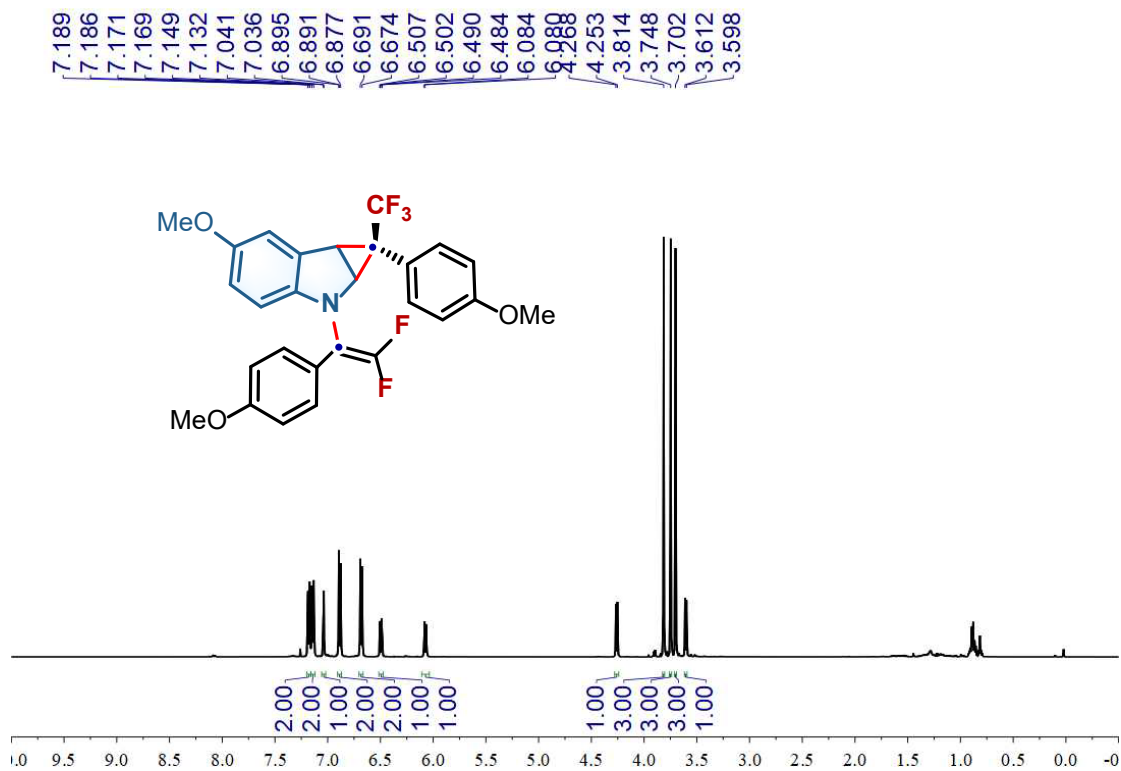
Supplementary Fig. 400. ^1H NMR (500 MHz, CDCl_3) spectrum of 134



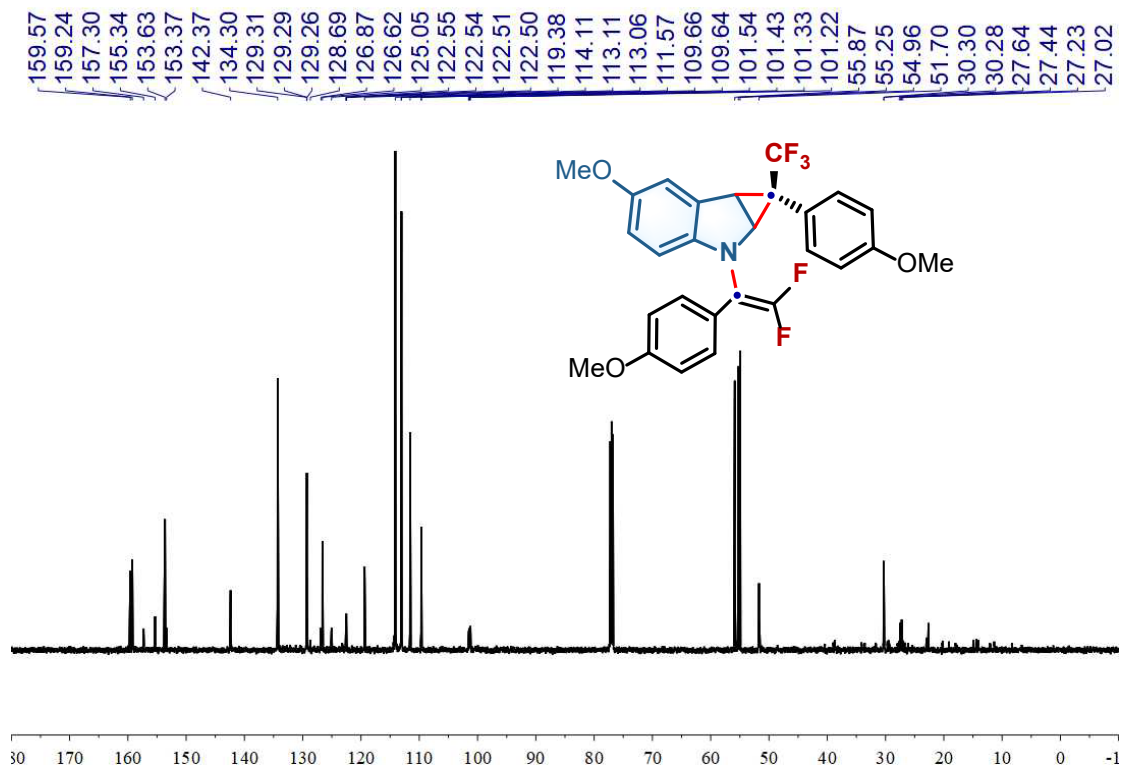
Supplementary Fig. 401. ¹³C NMR (150 MHz, CDCl₃) spectrum of 134



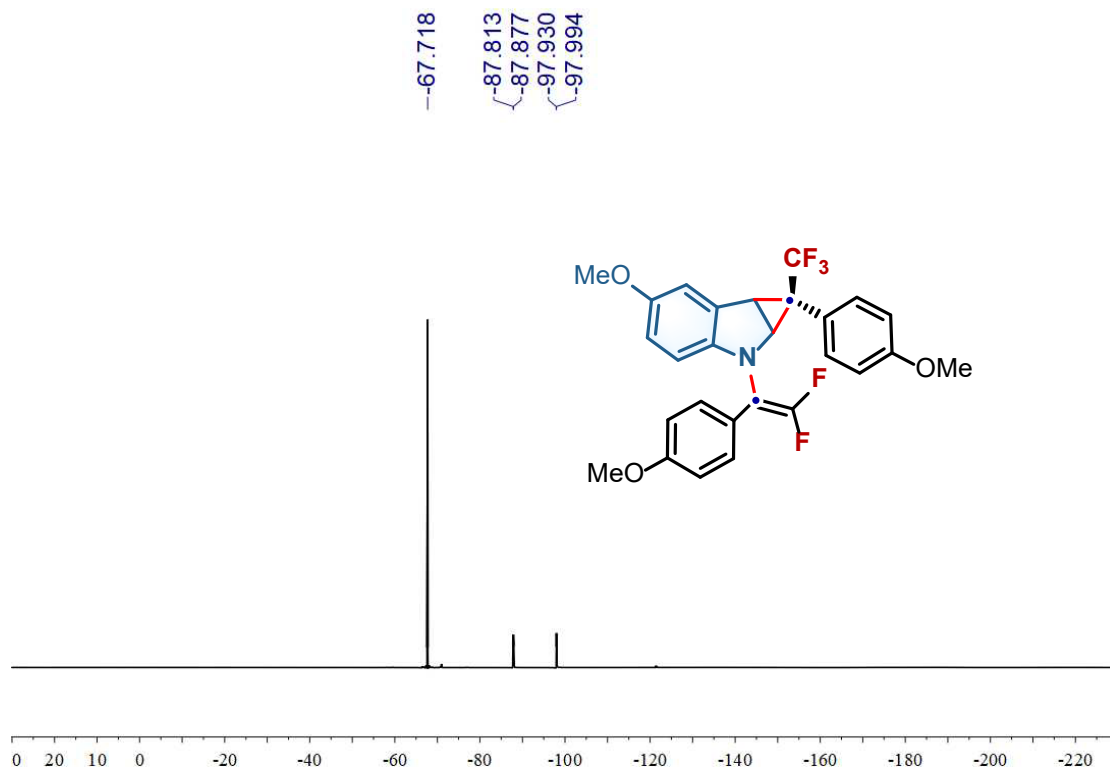
Supplementary Fig. 402. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 134



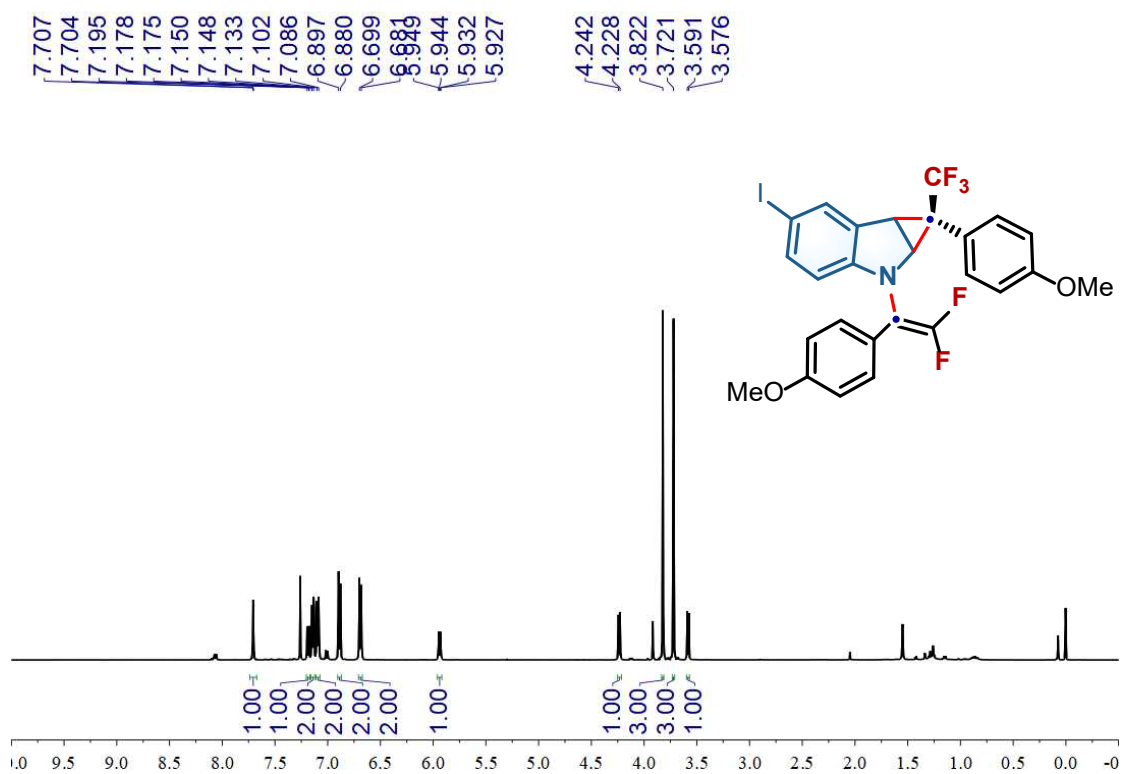
Supplementary Fig. 403. ¹H NMR (500 MHz, CDCl₃) spectrum of 135



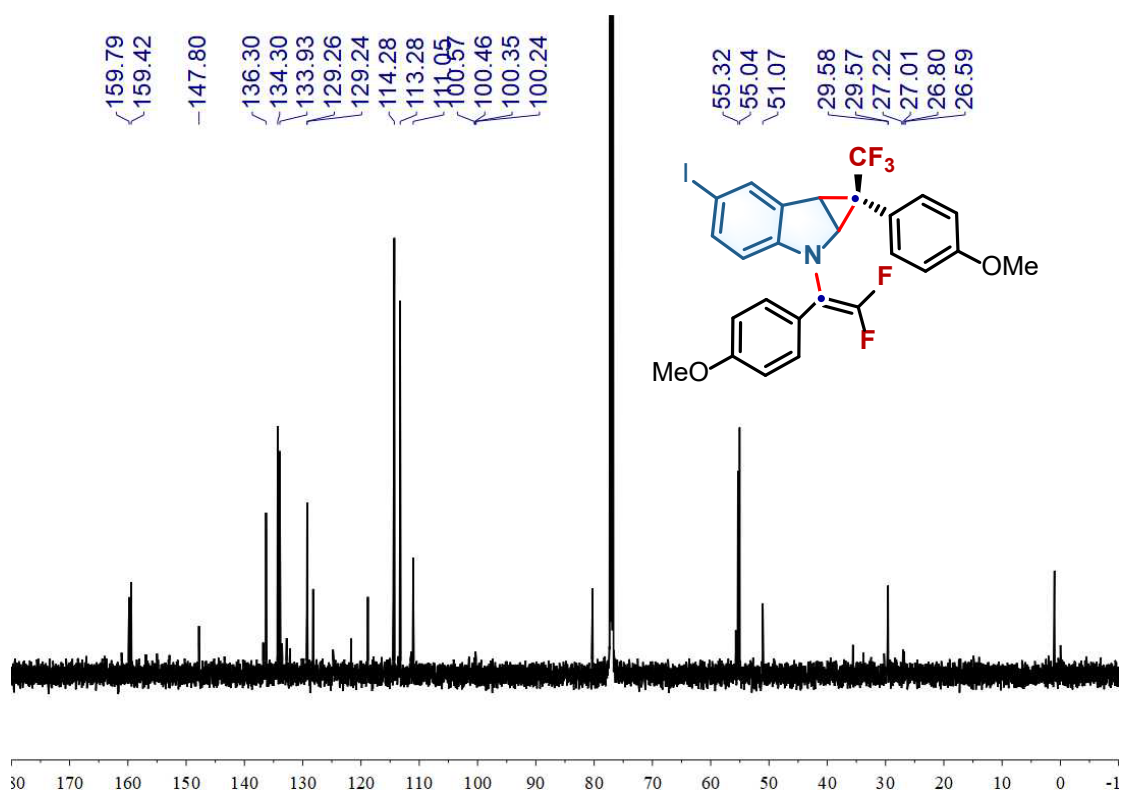
Supplementary Fig. 404. ¹³C NMR (150 MHz, CDCl₃) spectrum of 135



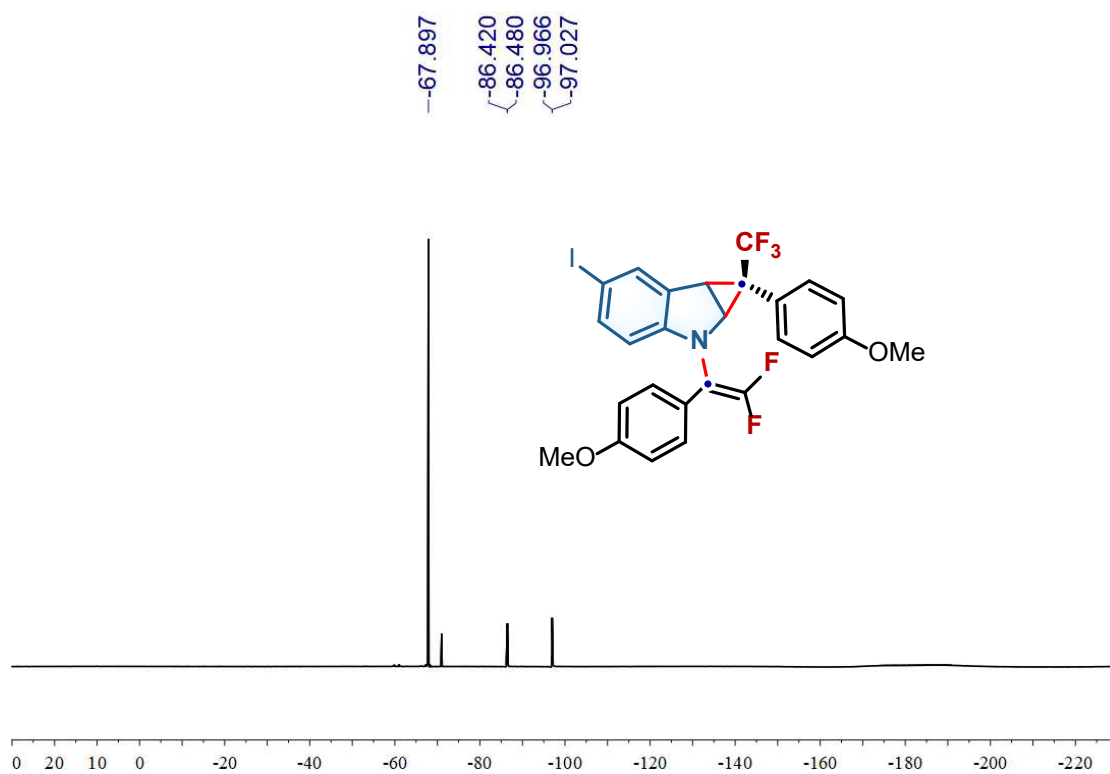
Supplementary Fig. 405. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 135



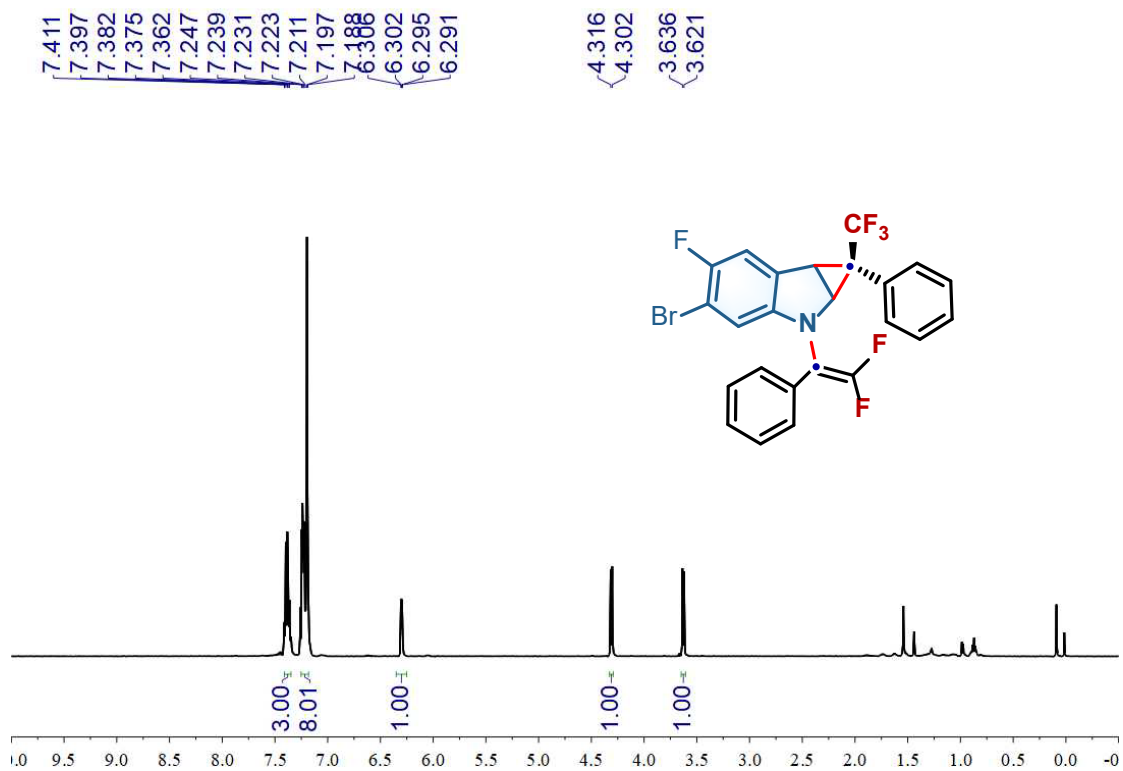
Supplementary Fig. 406. ^1H NMR (500 MHz, CDCl_3) spectrum of 136



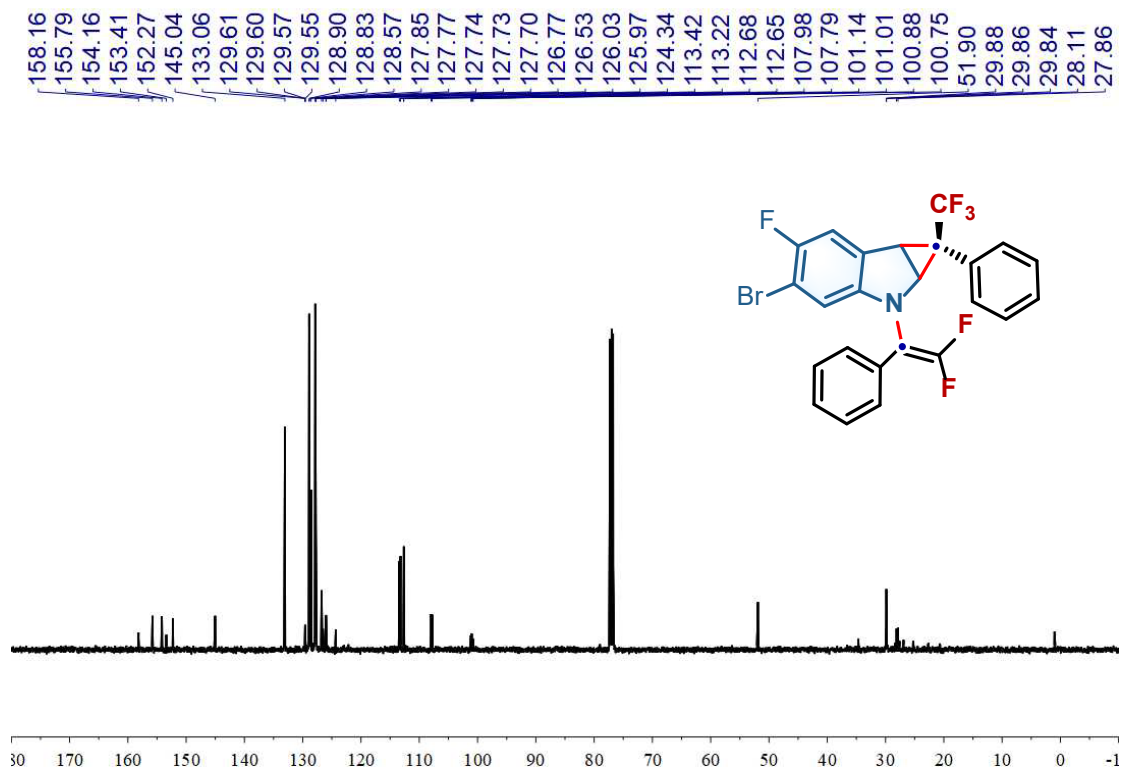
Supplementary Fig. 407. ¹³C NMR (150 MHz, CDCl₃) spectrum of **136**



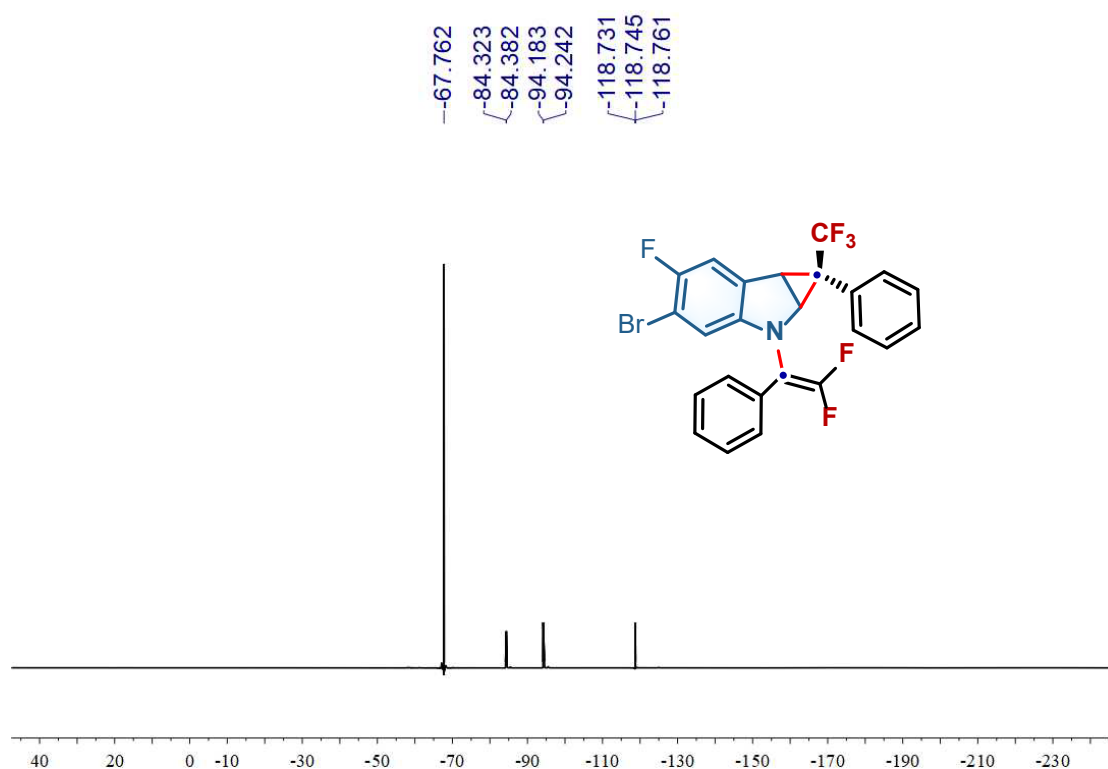
Supplementary Fig. 408. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **136**



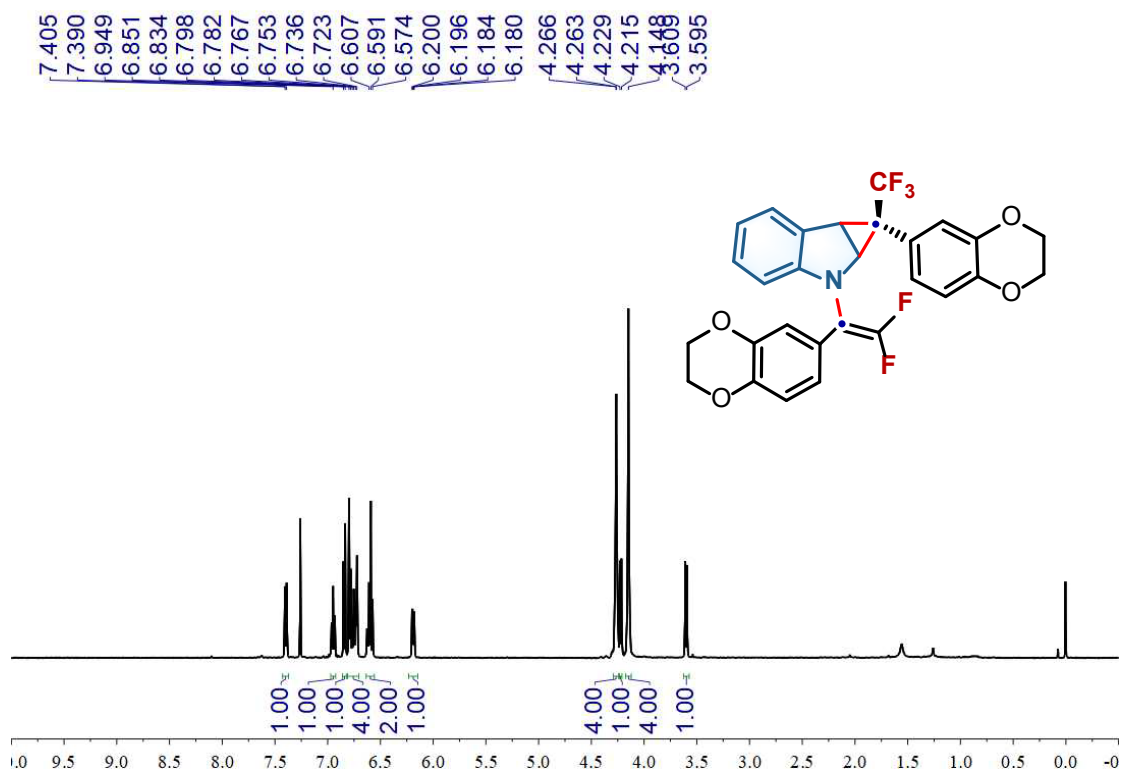
Supplementary Fig. 409. ¹H NMR (500 MHz, CDCl₃) spectrum of 137



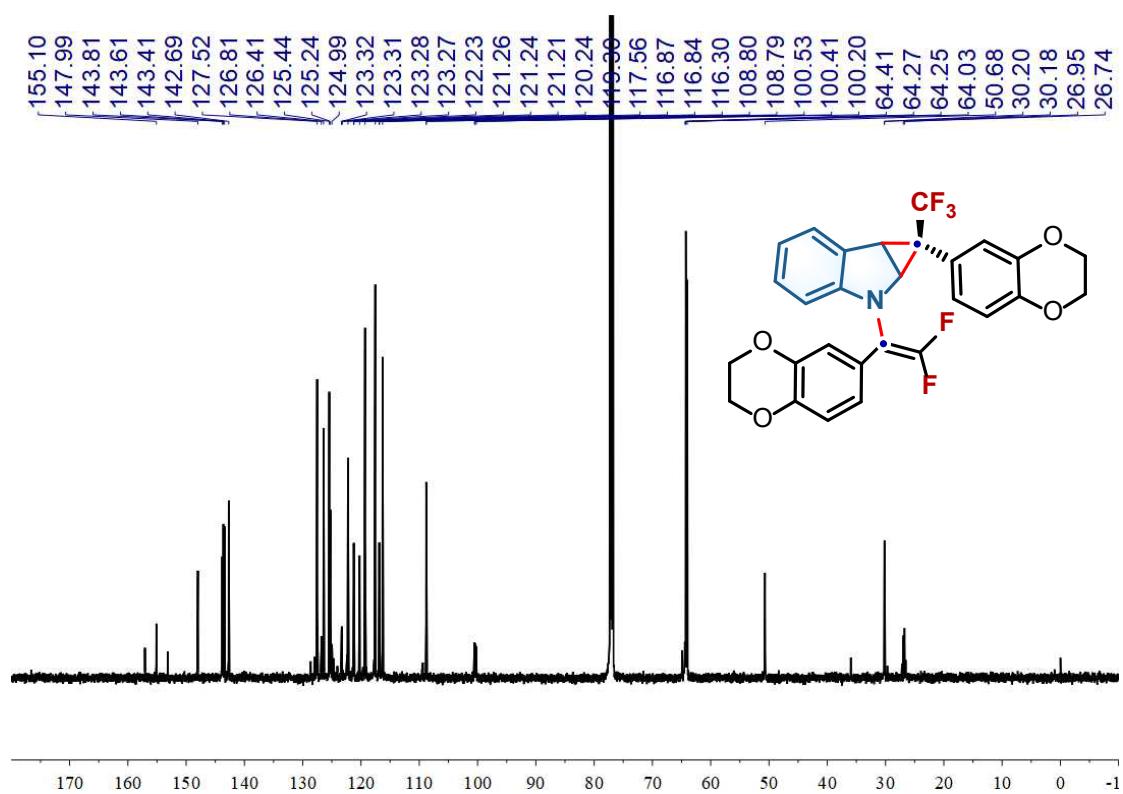
Supplementary Fig. 410. ¹³C NMR (125 MHz, CDCl₃) spectrum of 137



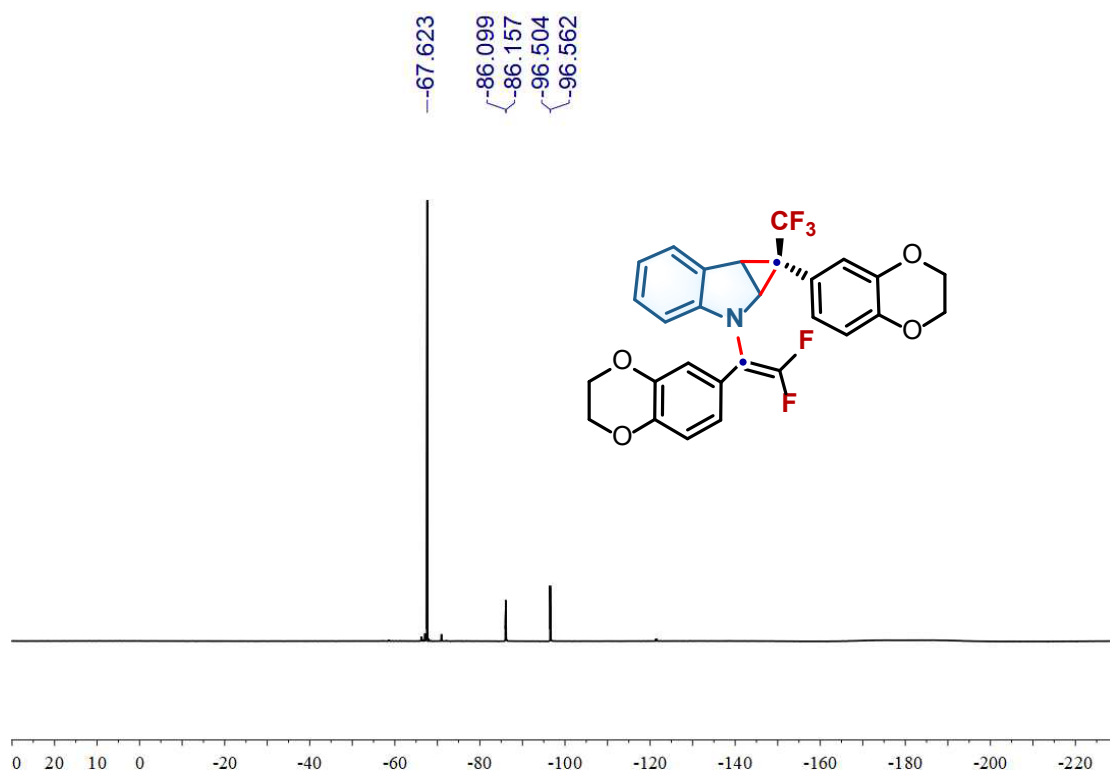
Supplementary Fig. 411. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 137



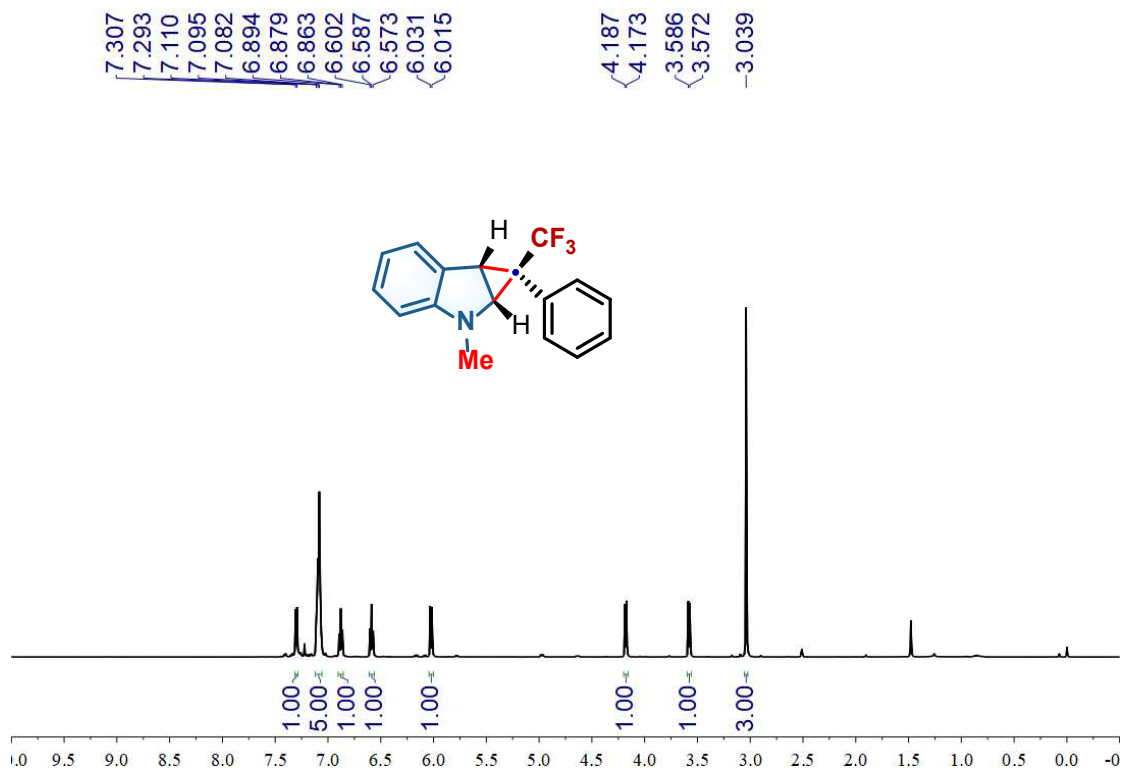
Supplementary Fig. 412. ¹H NMR (500 MHz, CDCl₃) spectrum of 138



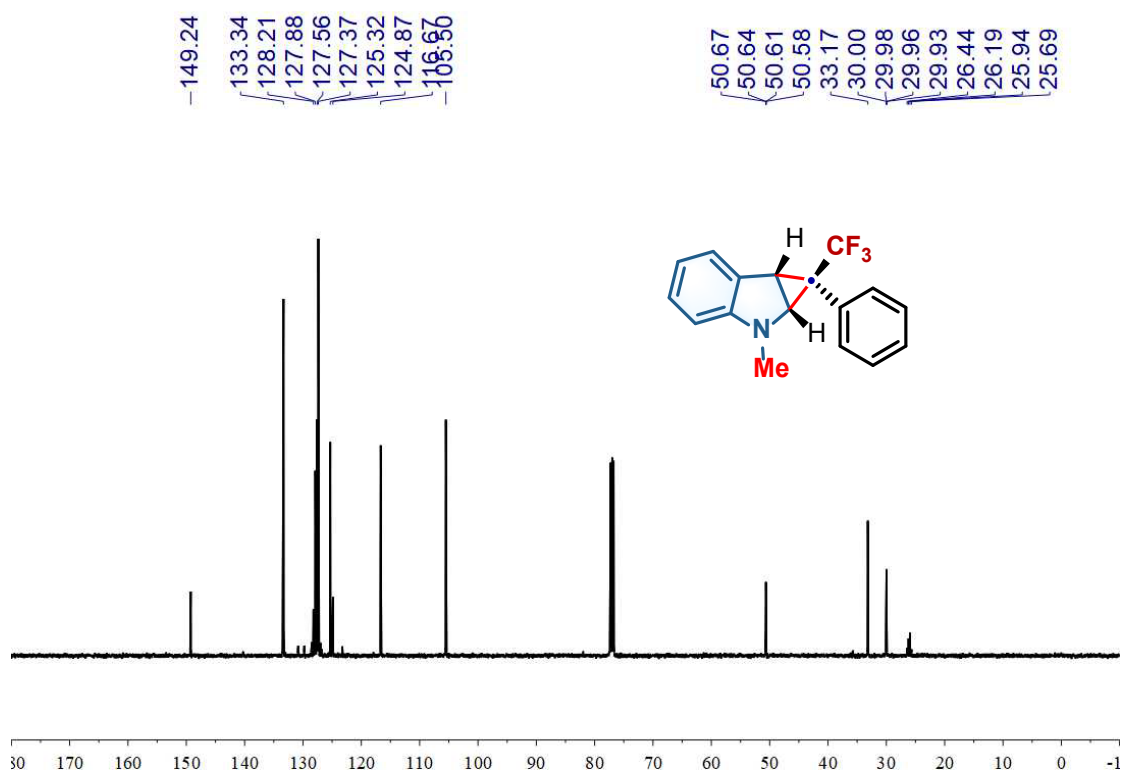
Supplementary Fig. 413. ¹³C NMR (150 MHz, CDCl₃) spectrum of 138



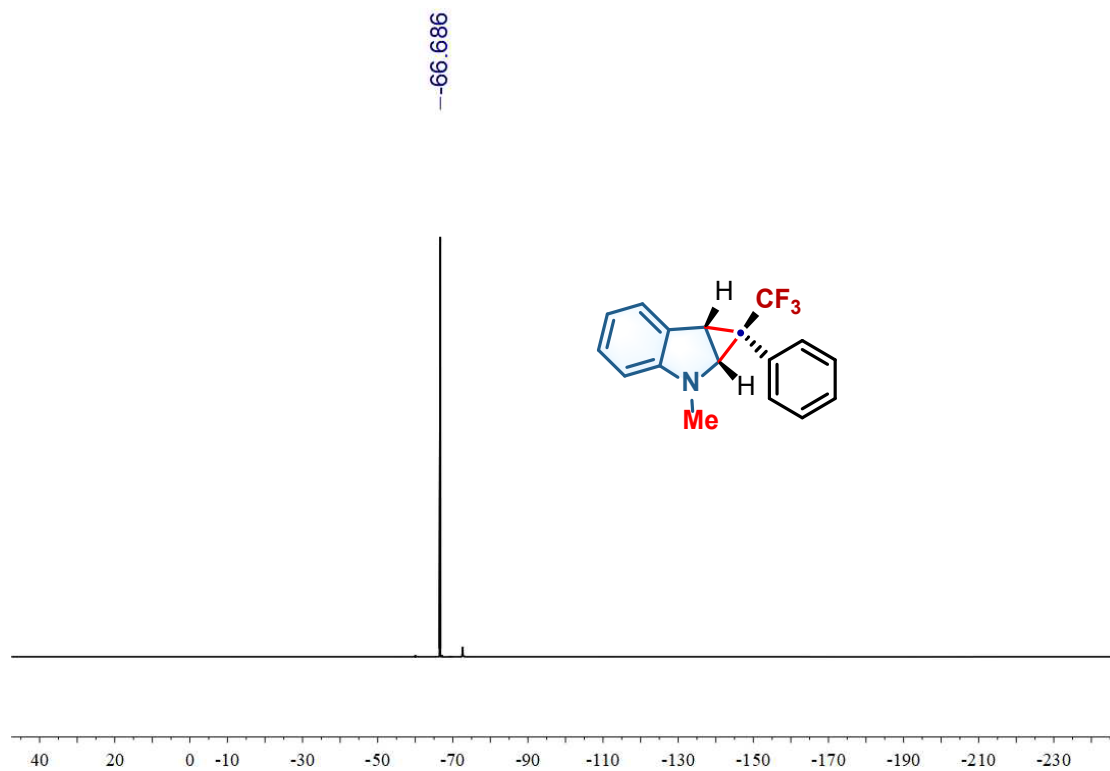
Supplementary Fig. 414. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 138



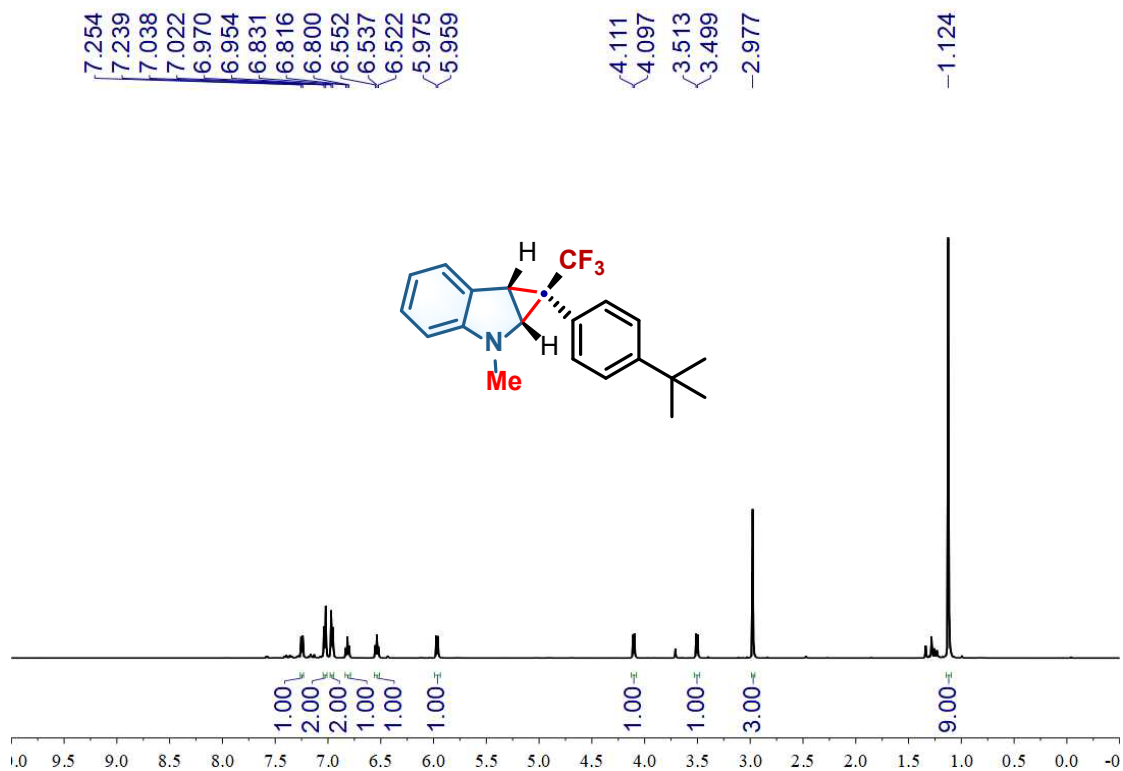
Supplementary Fig. 415. ¹H NMR (500 MHz, CDCl₃) spectrum of **139**



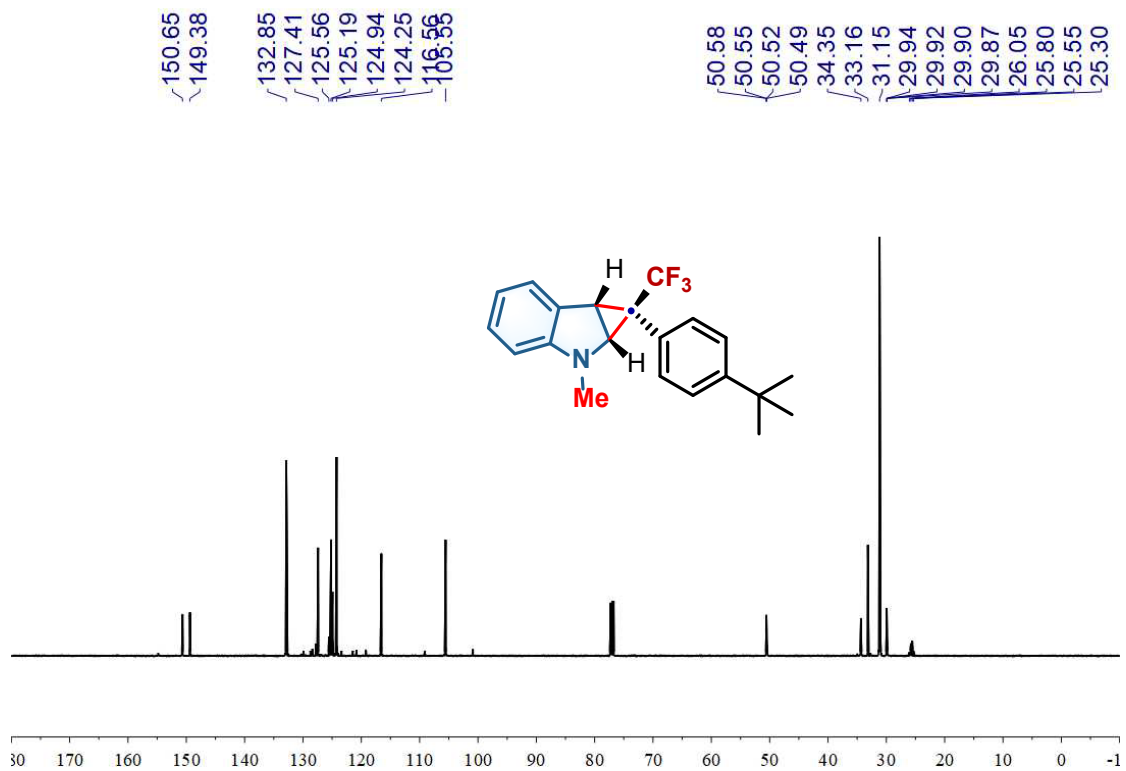
Supplementary Fig. 416. ¹³C NMR (125 MHz, CDCl₃) spectrum of **139**



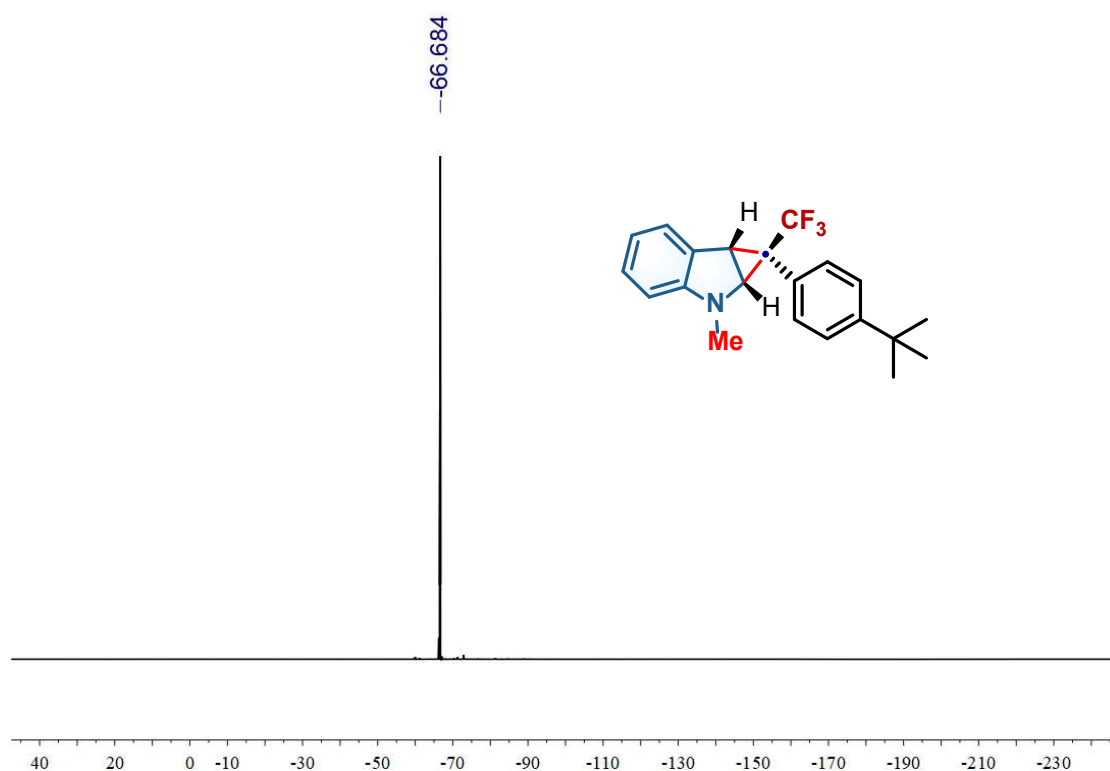
Supplementary Fig. 417. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **139**



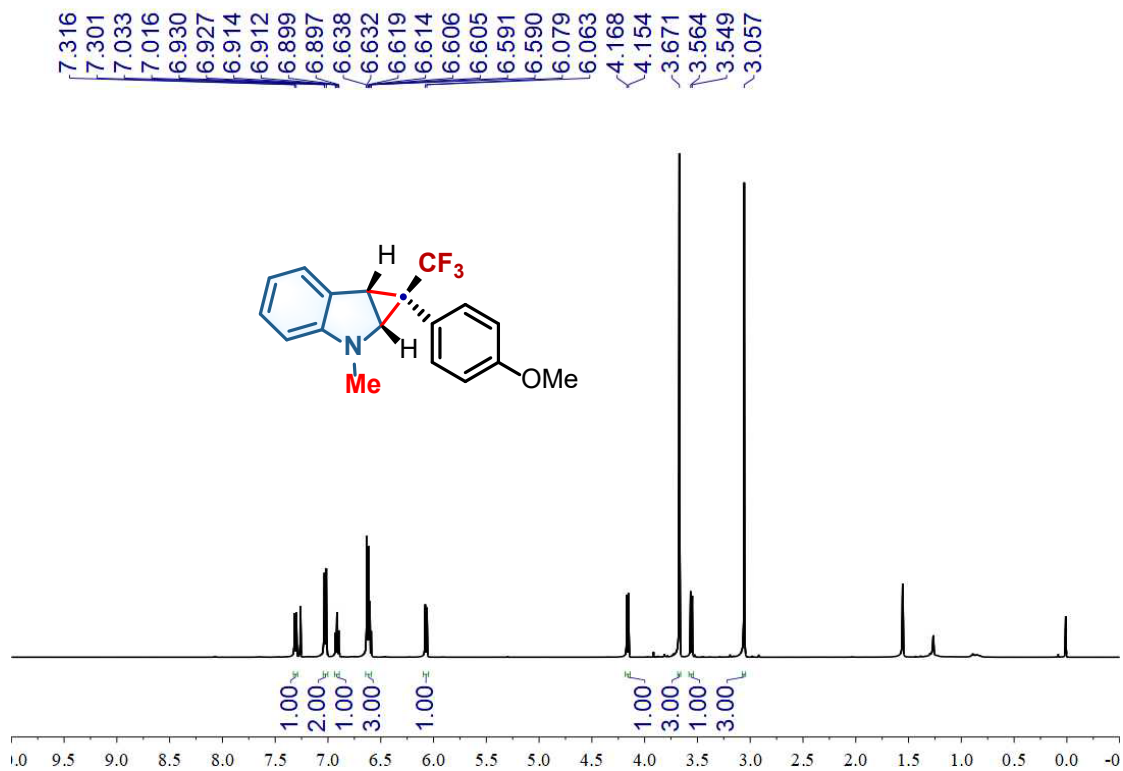
Supplementary Fig. 418. ^1H NMR (500 MHz, CDCl_3) spectrum of **140**



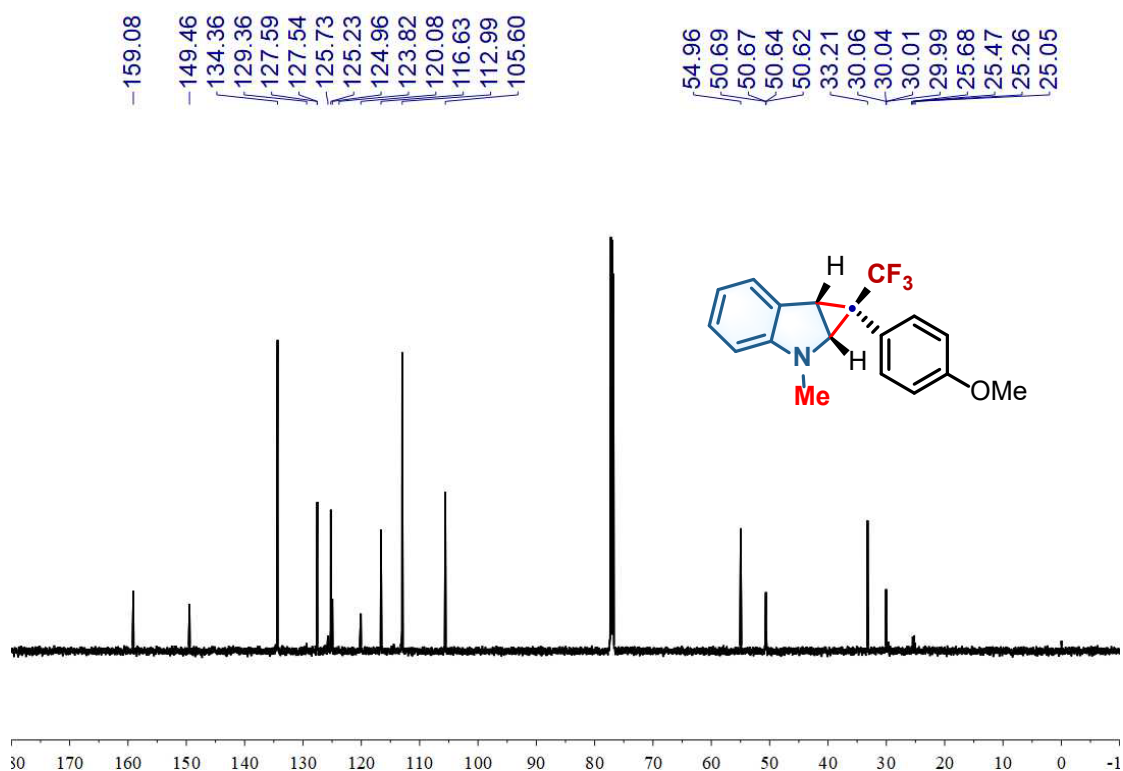
Supplementary Fig. 419. ¹³C NMR (125 MHz, CDCl₃) spectrum of 140



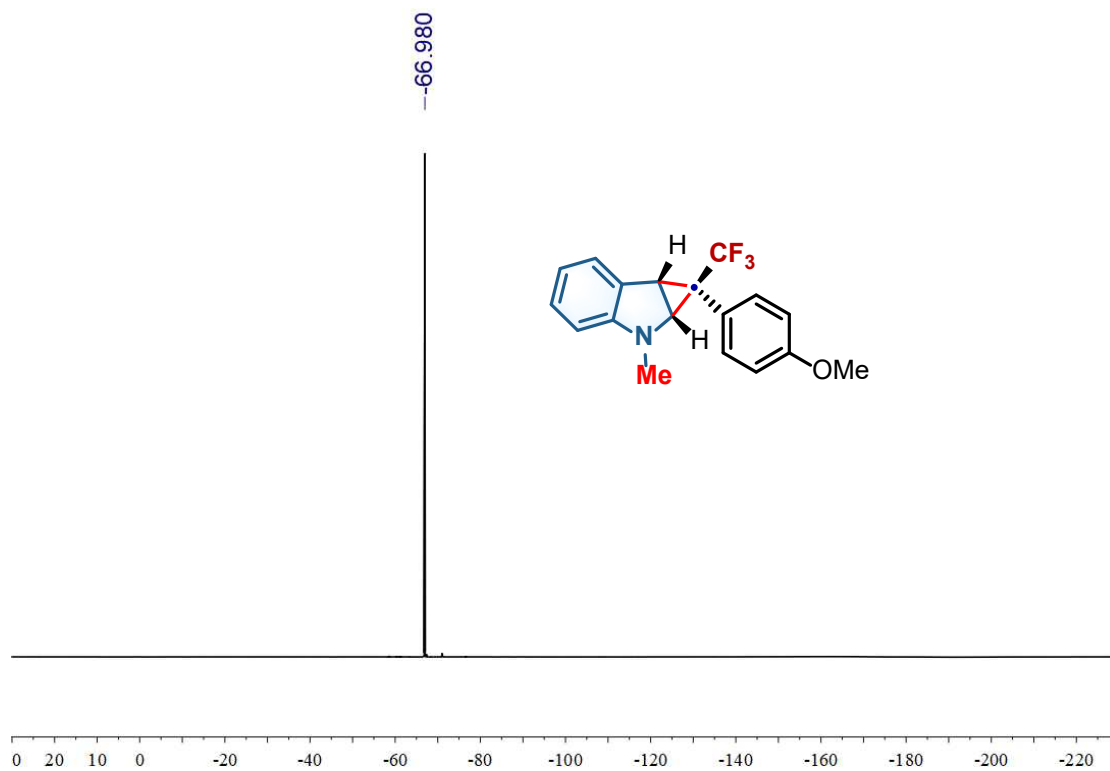
Supplementary Fig. 420. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 140



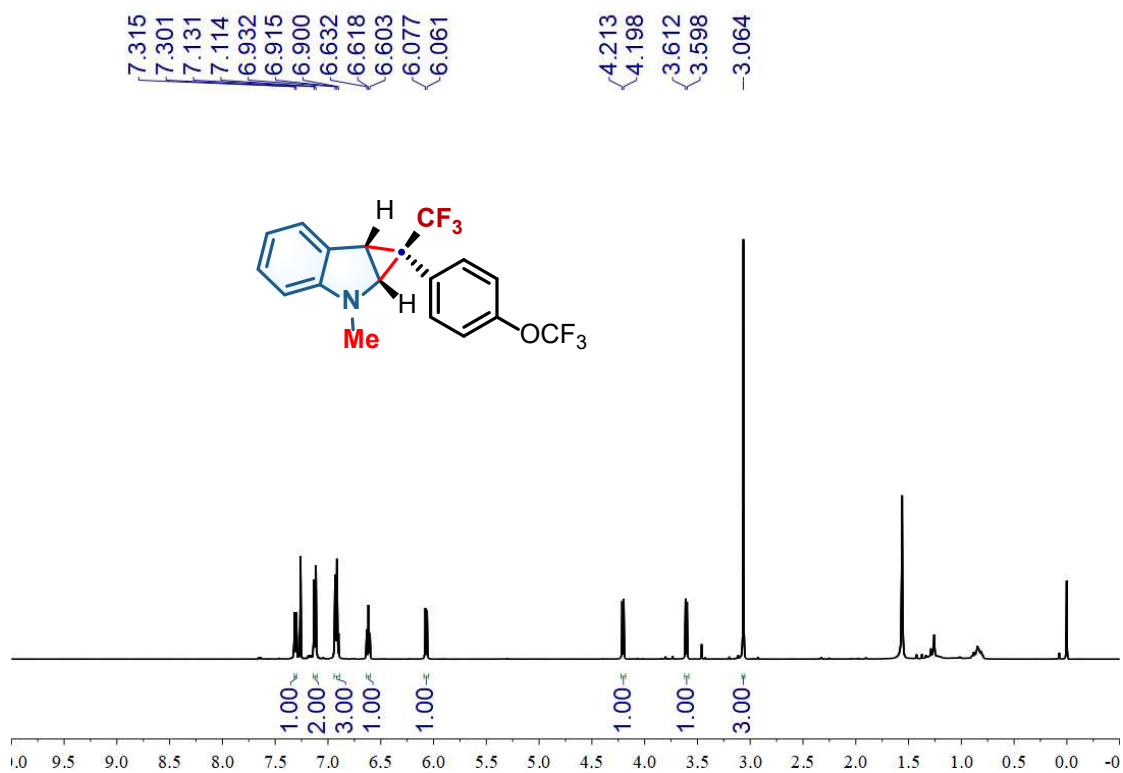
Supplementary Fig. 421. ¹H NMR (500 MHz, CDCl₃) spectrum of **141**



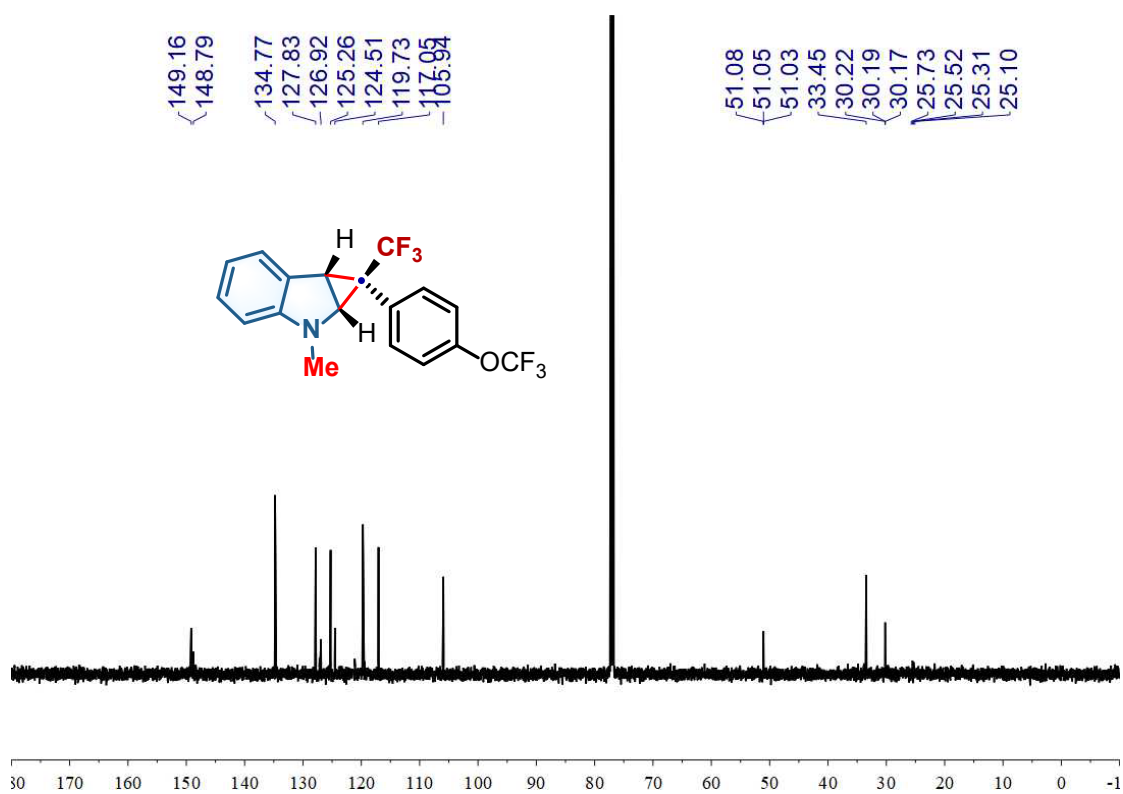
Supplementary Fig. 422. ¹³C NMR (150 MHz, CDCl₃) spectrum of **141**



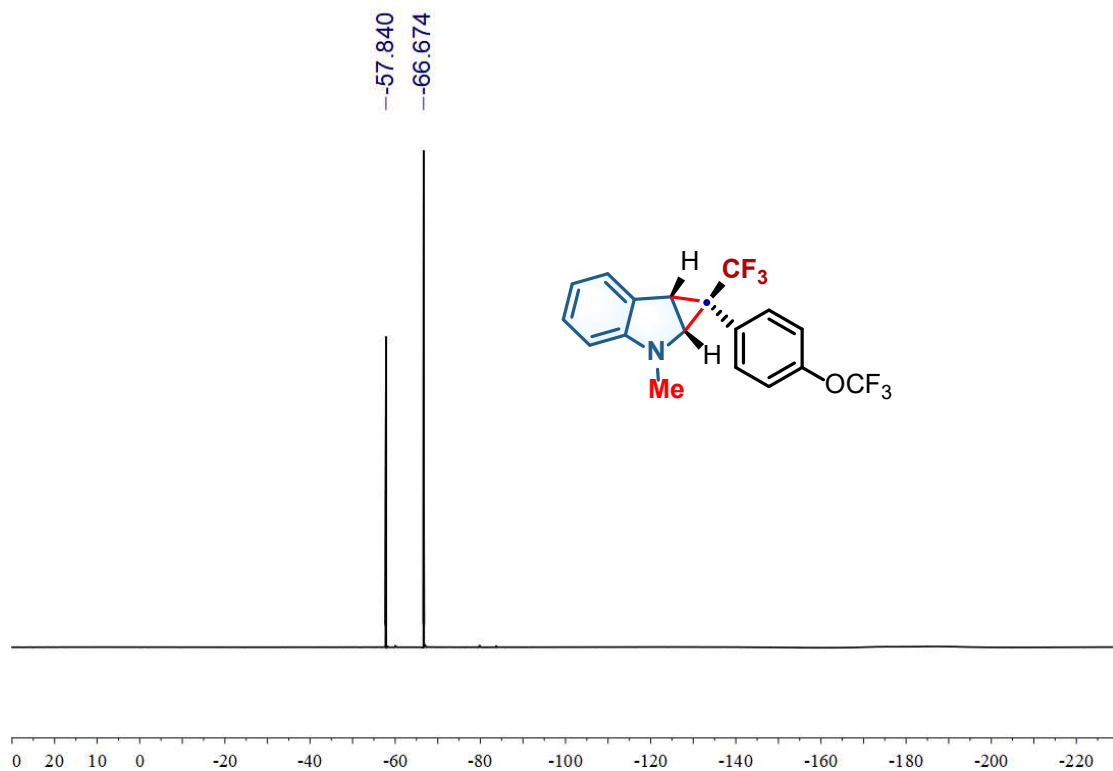
Supplementary Fig. 423. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 141



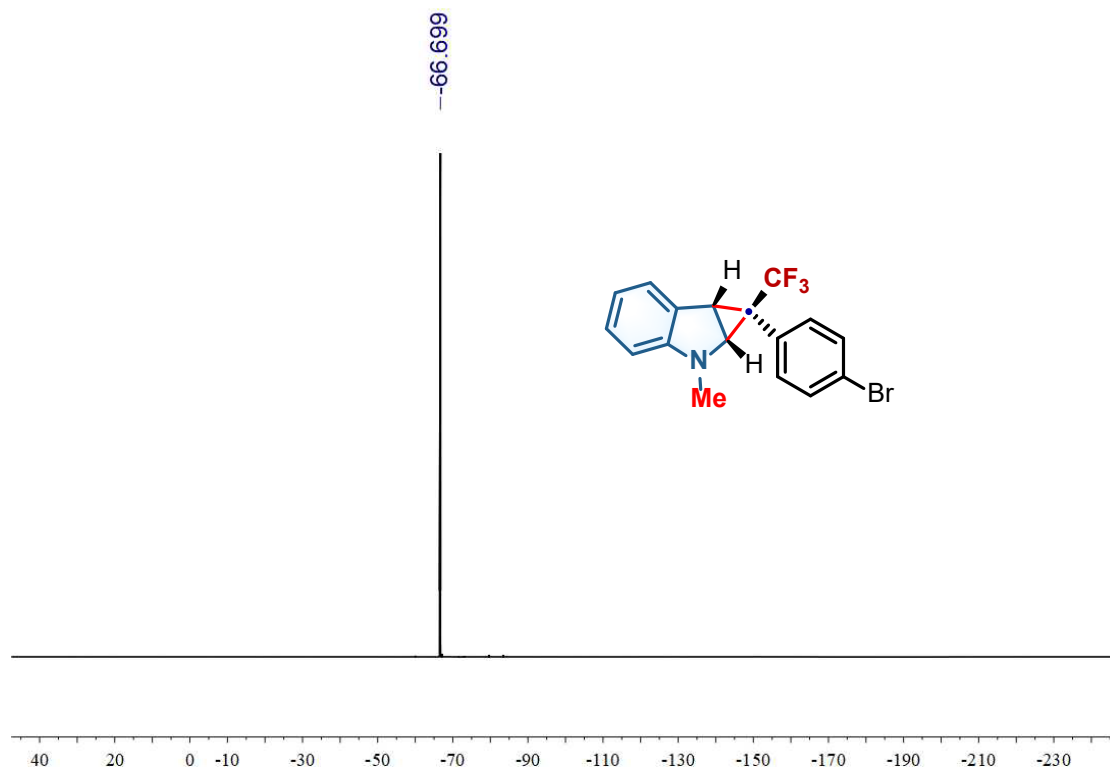
Supplementary Fig. 424. ^1H NMR (500 MHz, CDCl_3) spectrum of 142



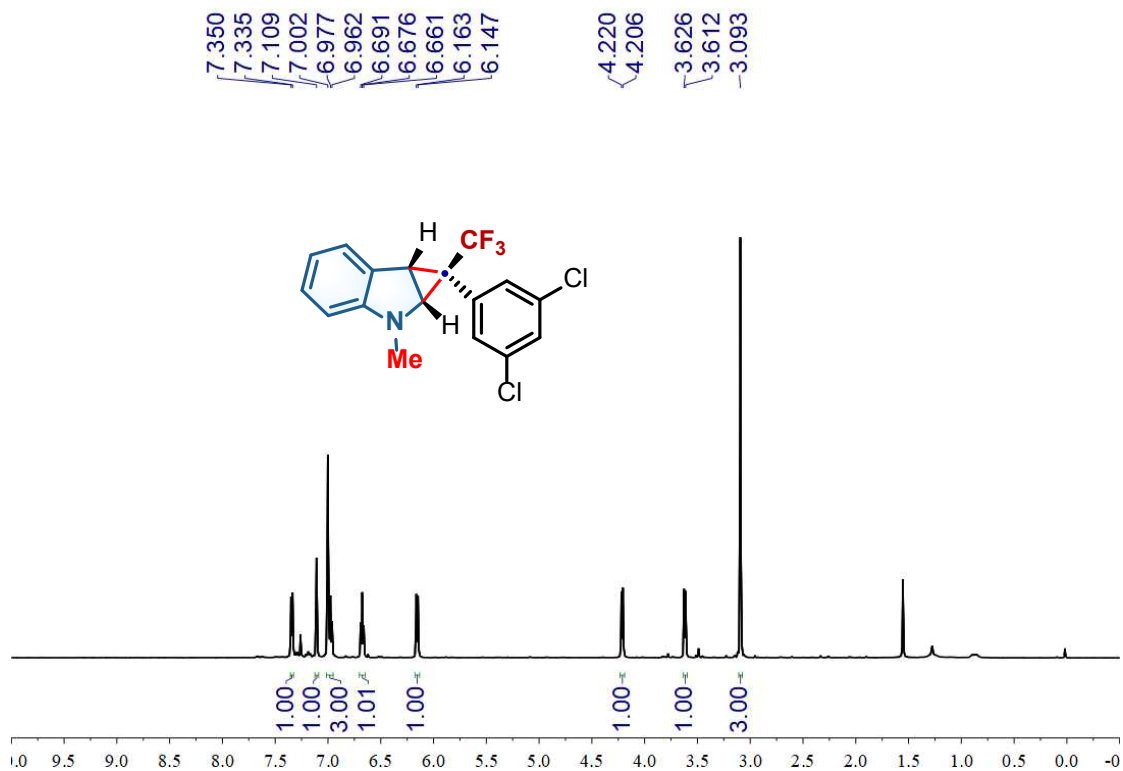
Supplementary Fig. 425. ¹³C NMR (150 MHz, CDCl₃) spectrum of **142**



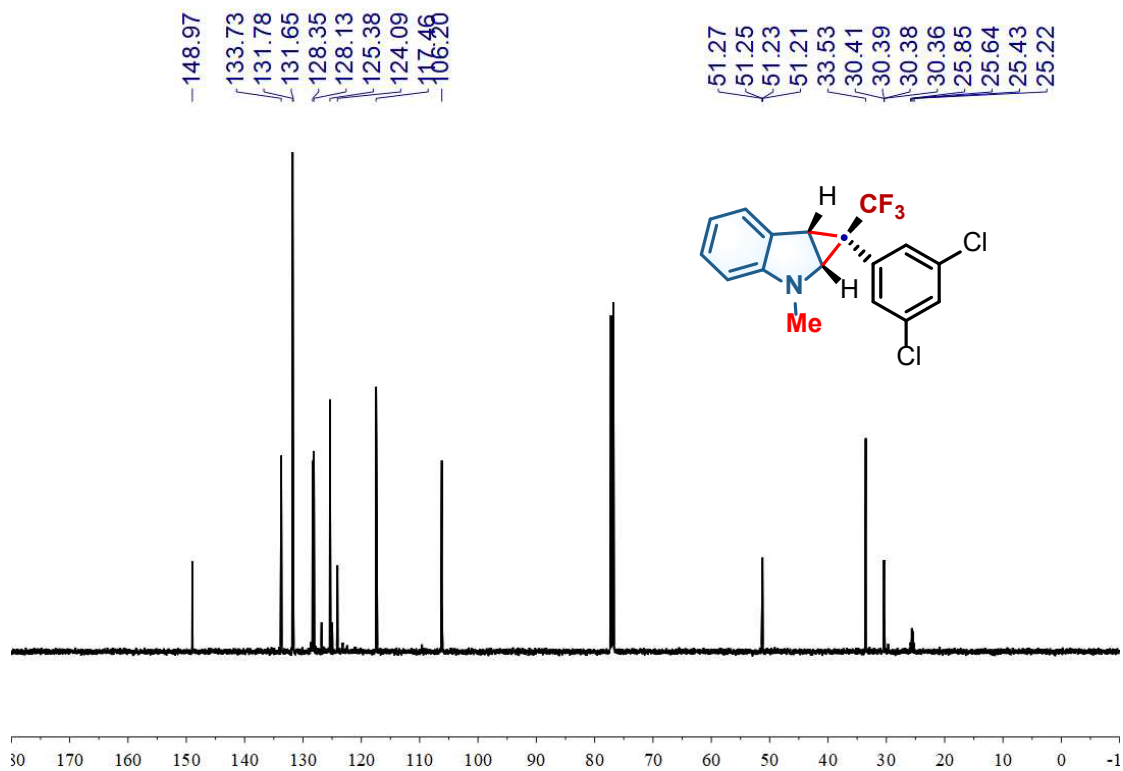
Supplementary Fig. 426. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **142**



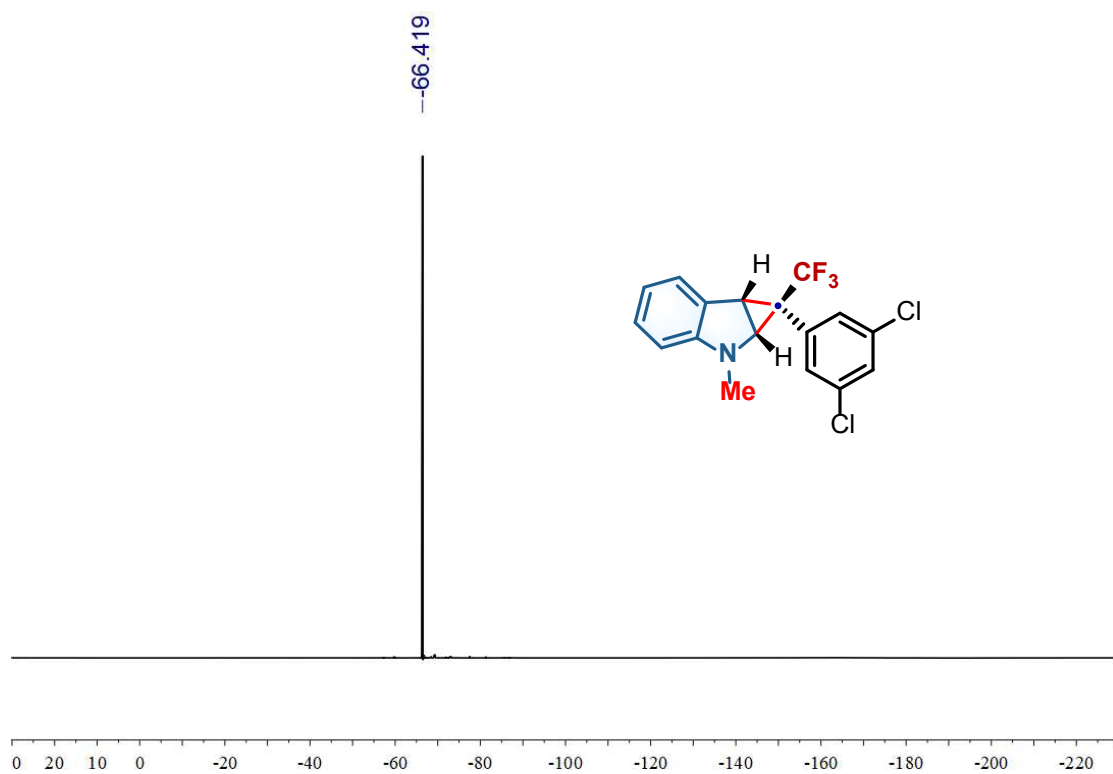
Supplementary Fig. 429. ^{19}F NMR (470 MHz, CDCl_3) spectrum of 143



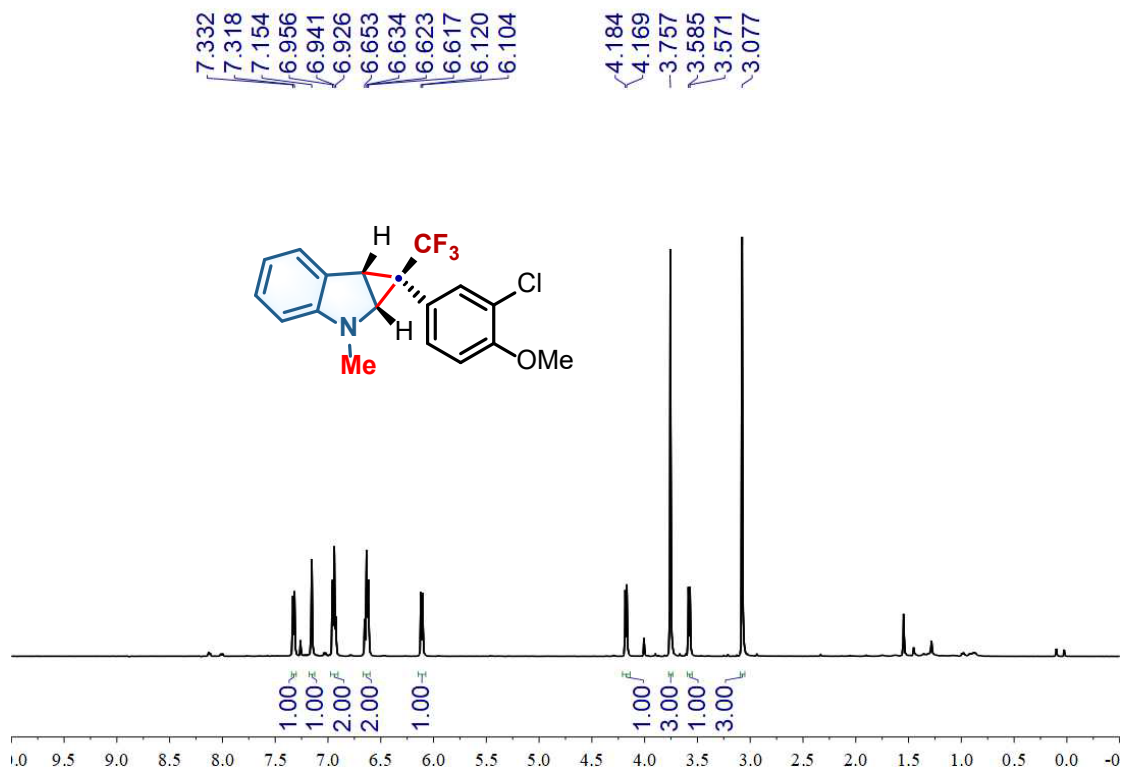
Supplementary Fig. 430. ^1H NMR (500 MHz, CDCl_3) spectrum of 144



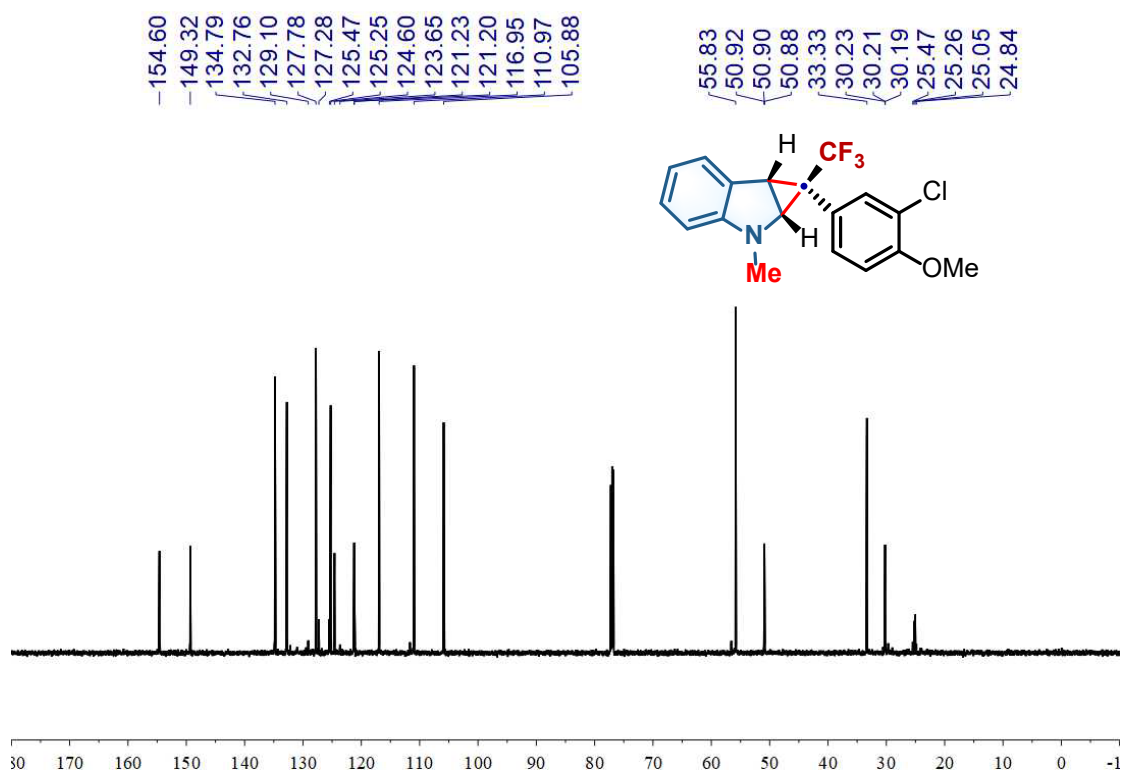
Supplementary Fig. 431. ¹³C NMR (150 MHz, CDCl₃) spectrum of 144



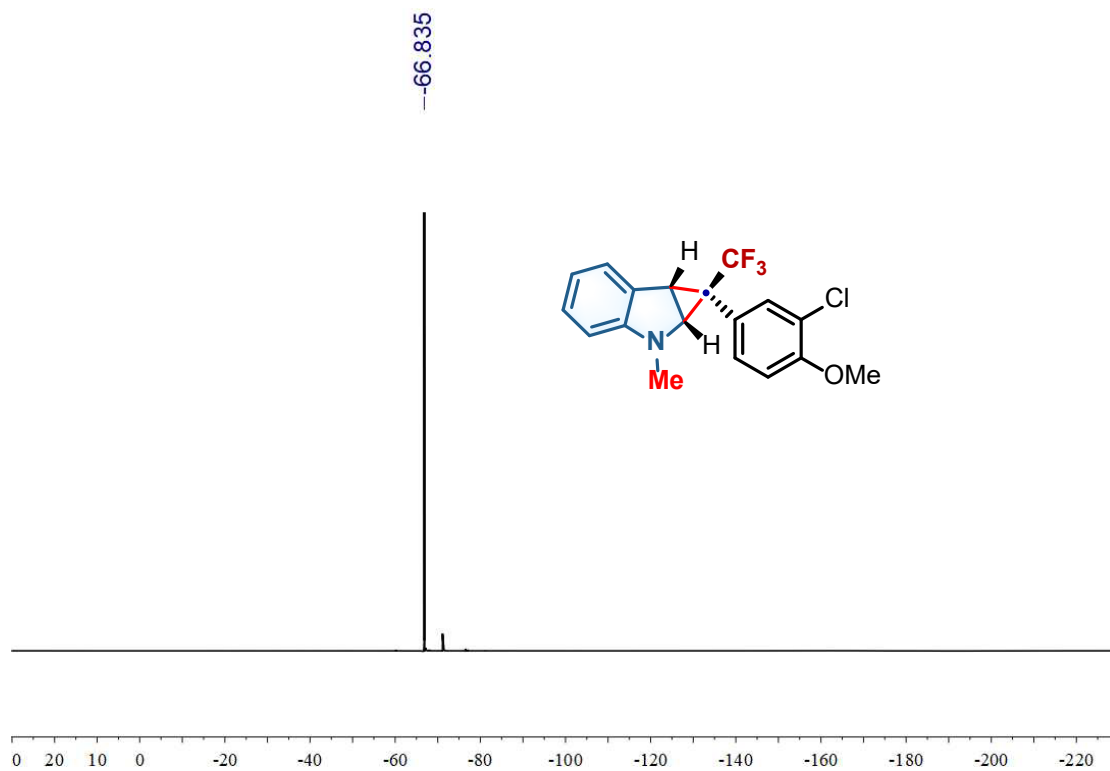
Supplementary Fig. 432. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 144



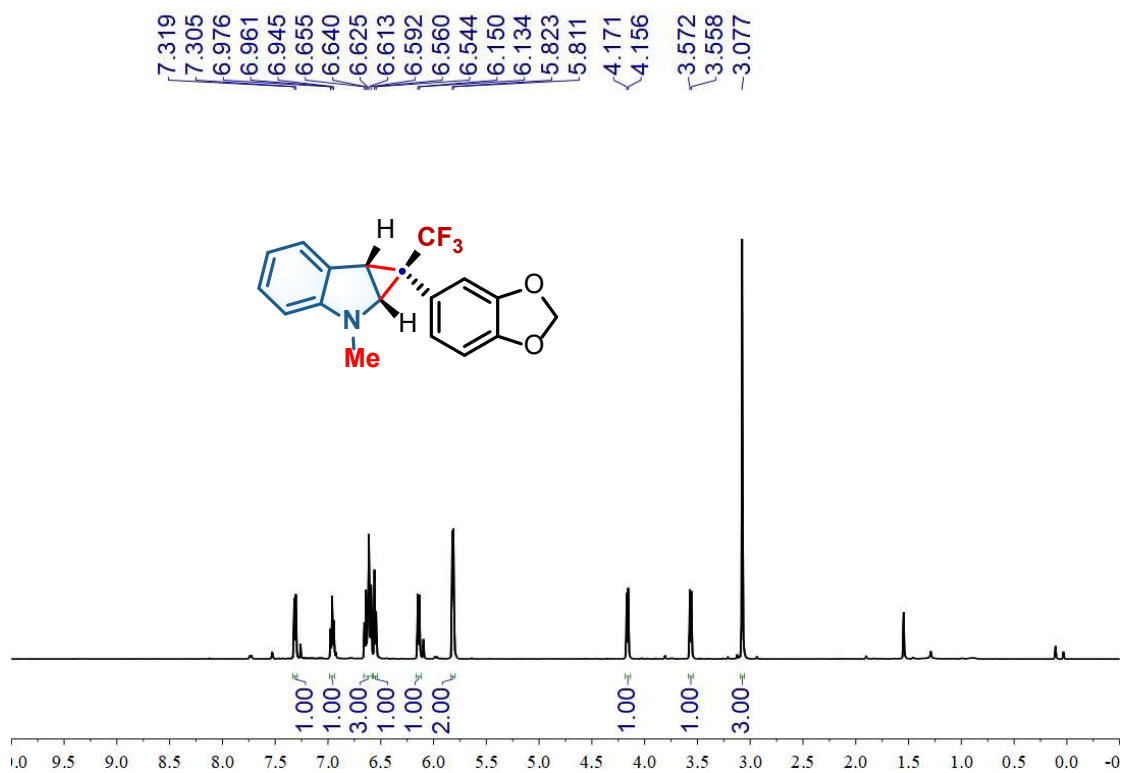
Supplementary Fig. 433. ¹H NMR (500 MHz, CDCl₃) spectrum of 145



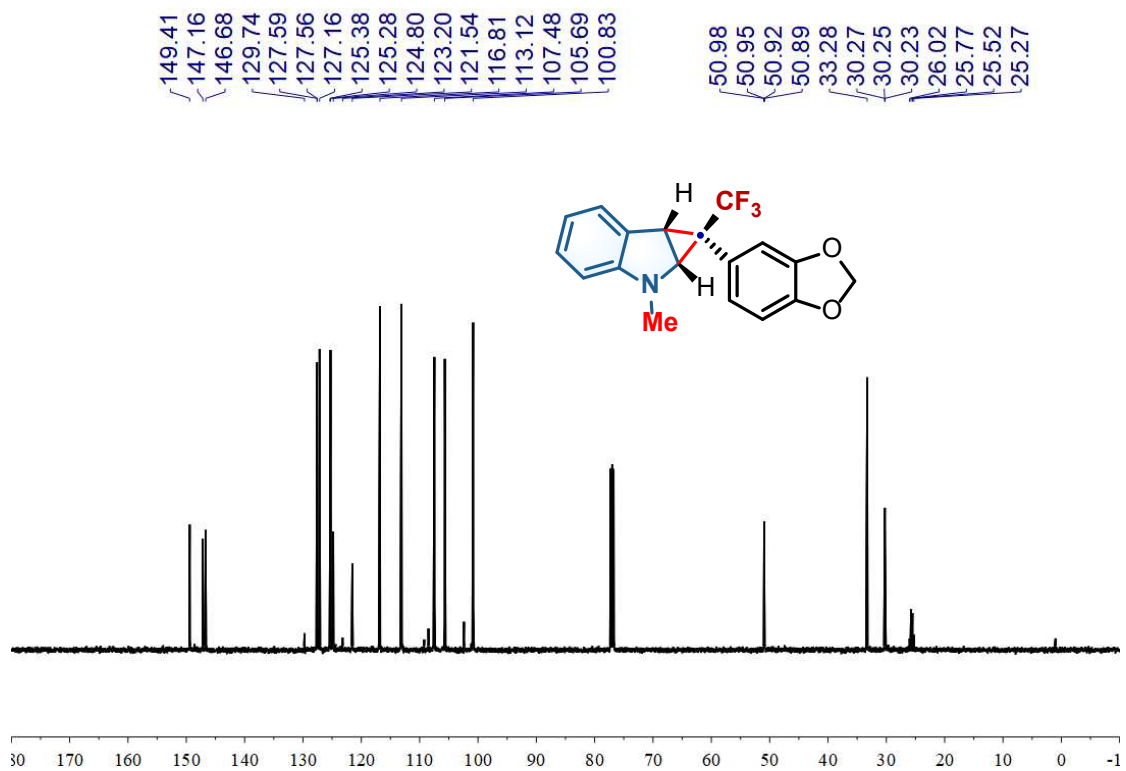
Supplementary Fig. 434. ¹³C NMR (150 MHz, CDCl₃) spectrum of 145



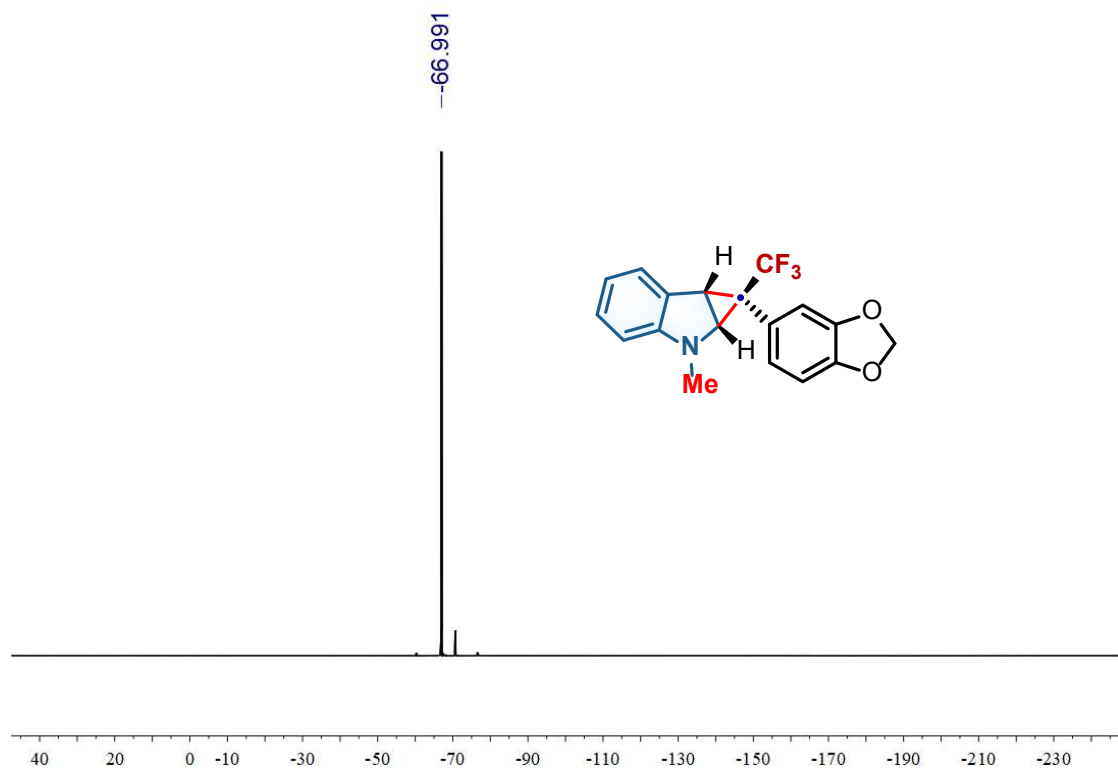
Supplementary Fig. 435. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 145



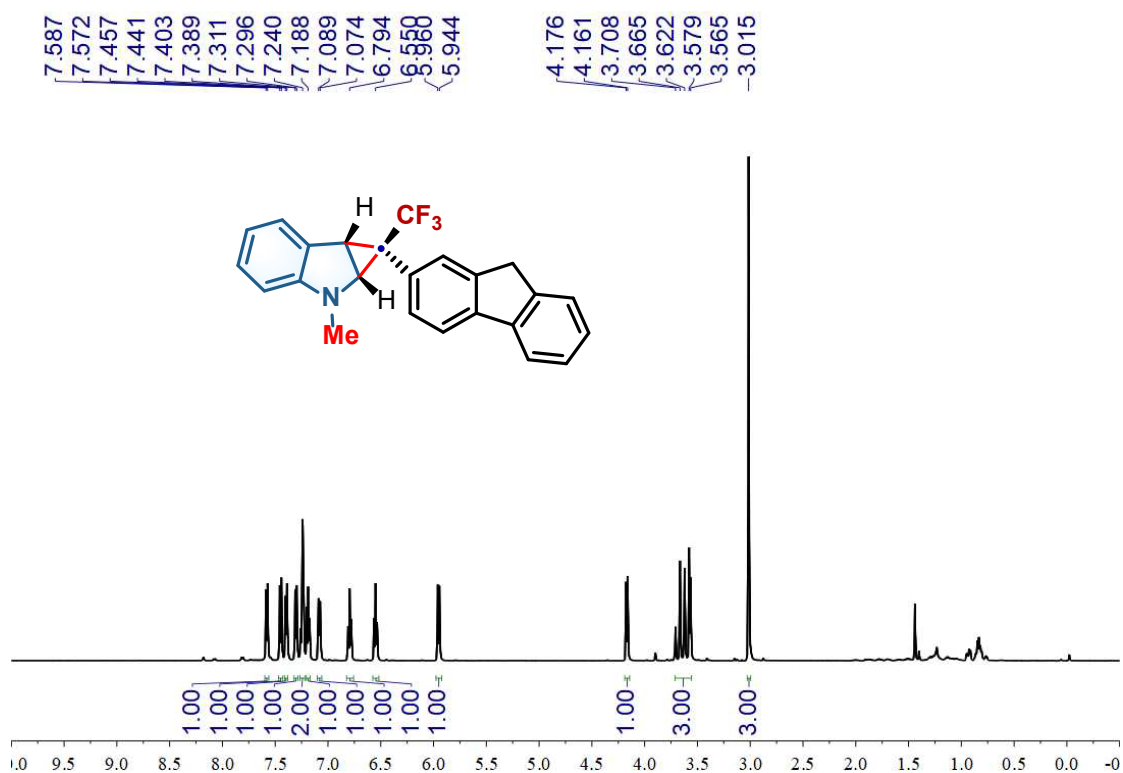
Supplementary Fig. 436. ¹H NMR (500 MHz, CDCl₃) spectrum of 146



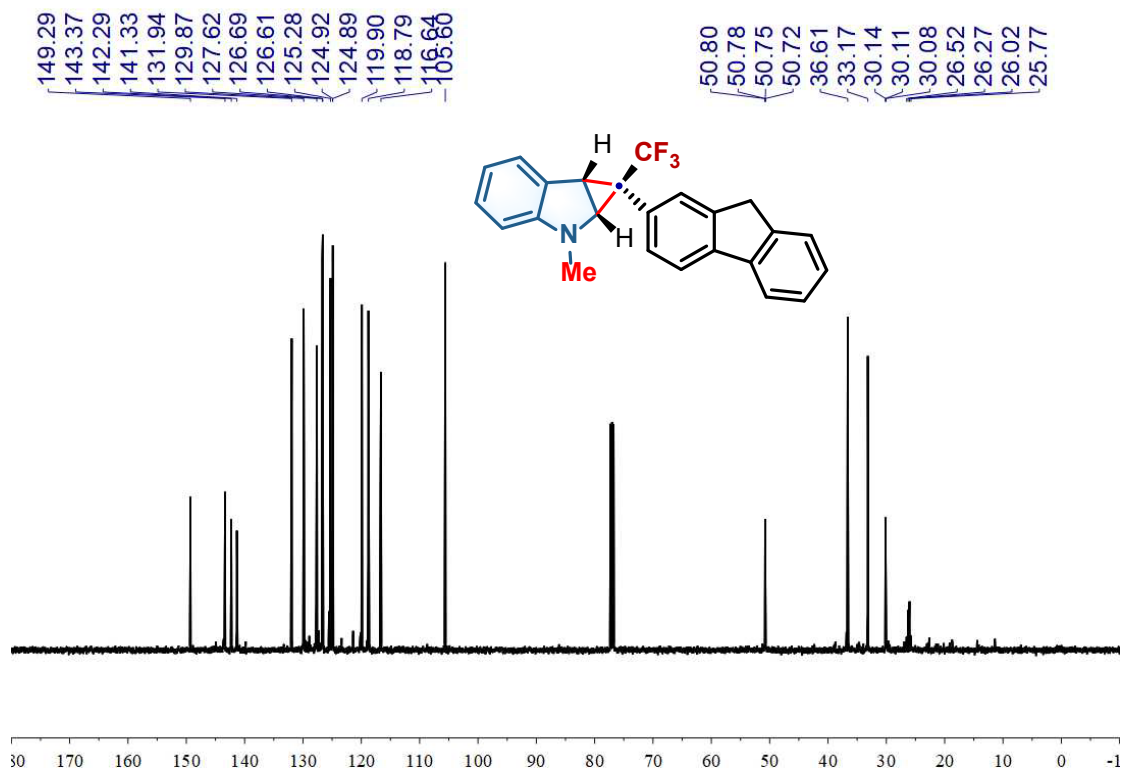
Supplementary Fig. 437. ¹³C NMR (125 MHz, CDCl₃) spectrum of 146



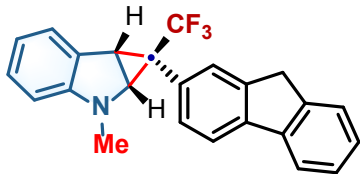
Supplementary Fig. 438. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 146



Supplementary Fig.439. ¹H NMR (500 MHz, CDCl₃) spectrum of **147**

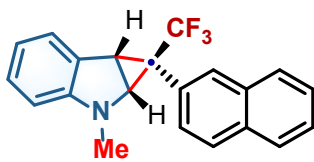


Supplementary Fig. 440. ¹³C NMR (125 MHz, CDCl₃) spectrum of **147**

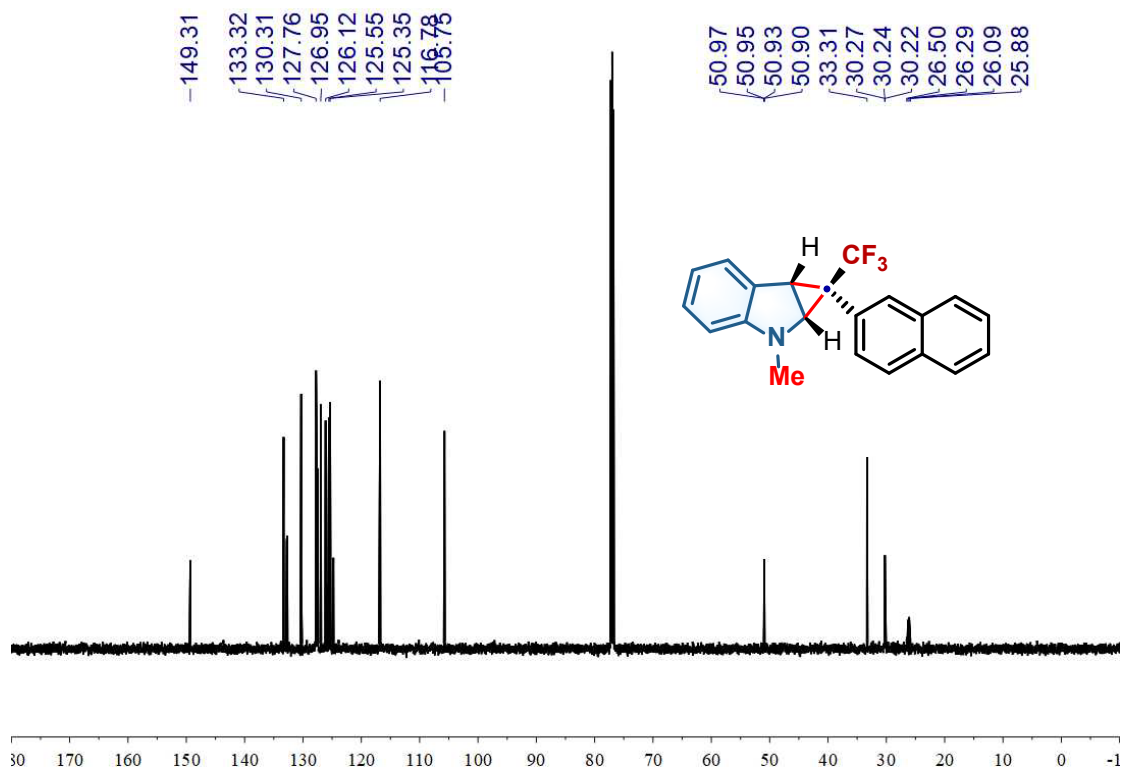


7.684
7.680
7.678
7.629
7.578
7.564
7.402
7.401
7.396
7.391
7.386
7.379
6.813
6.595
6.597
5.964

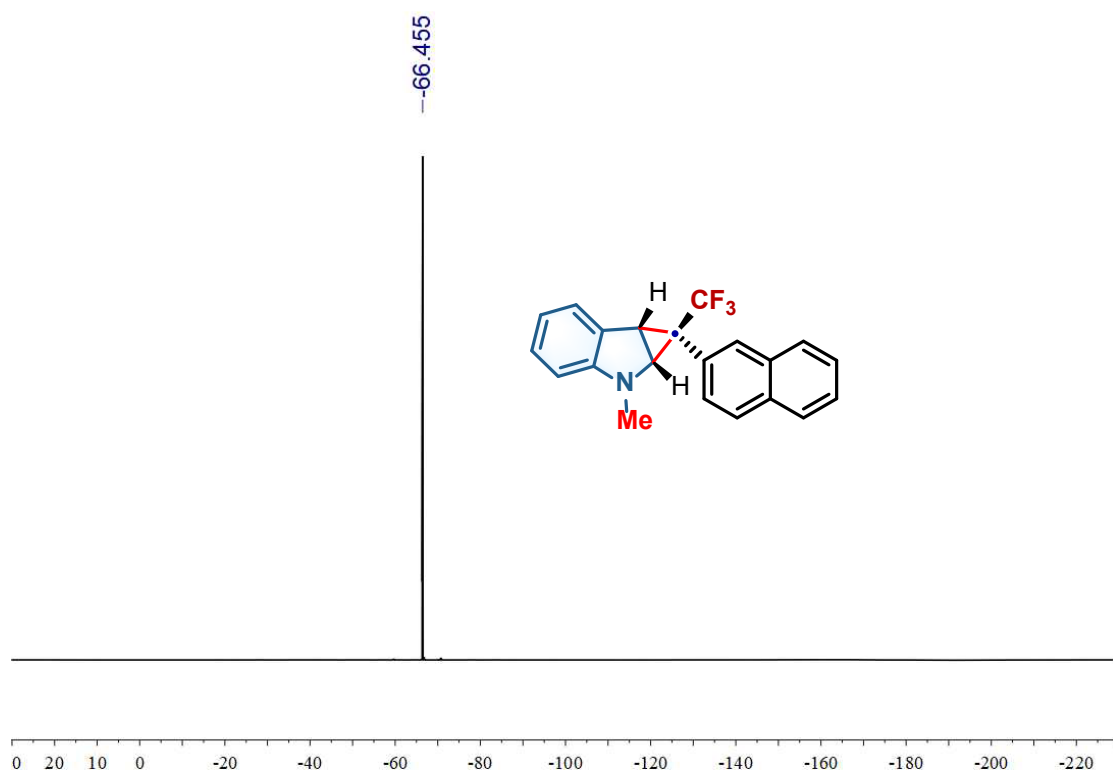
4.293
4.281
3.693
3.681
3.105



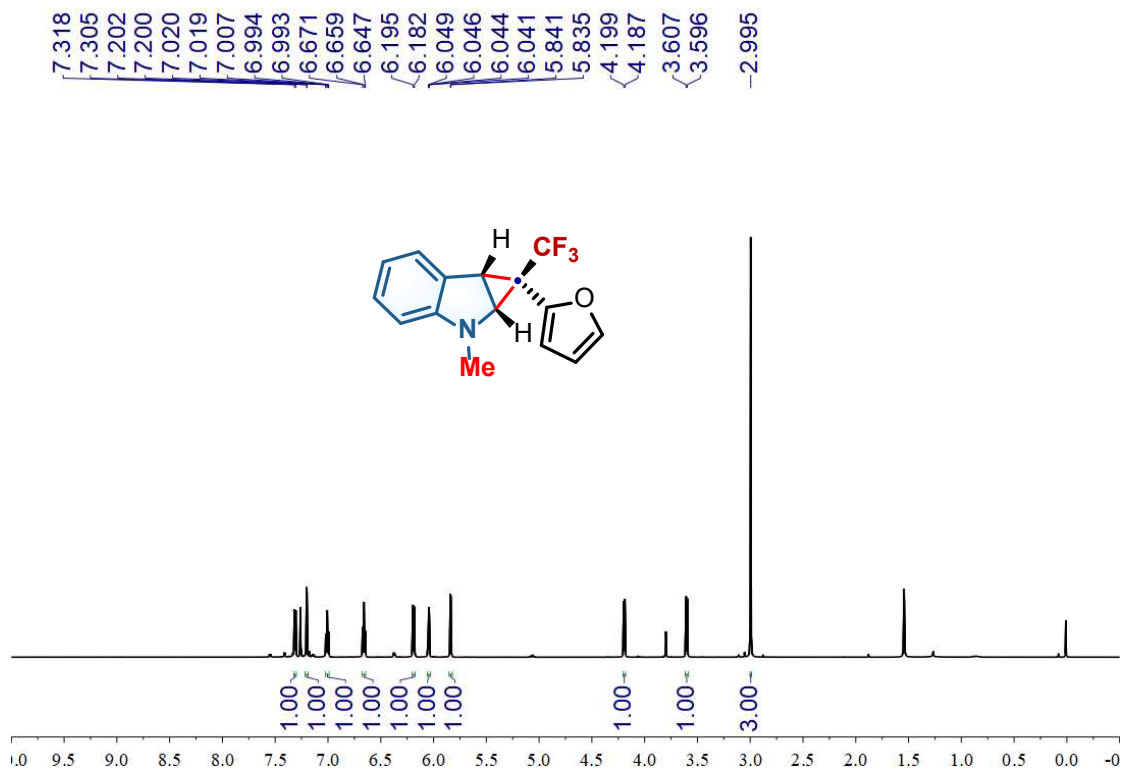
S369



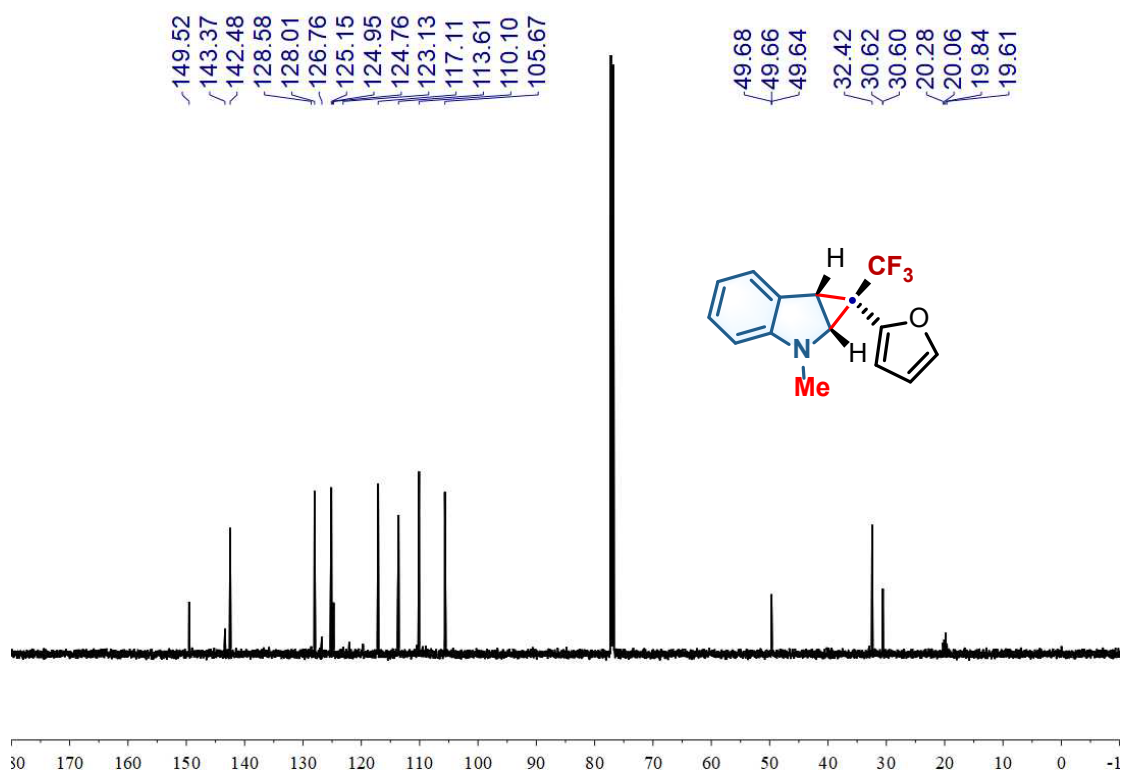
Supplementary Fig. 443. ¹³C NMR (150 MHz, CDCl₃) spectrum of 148



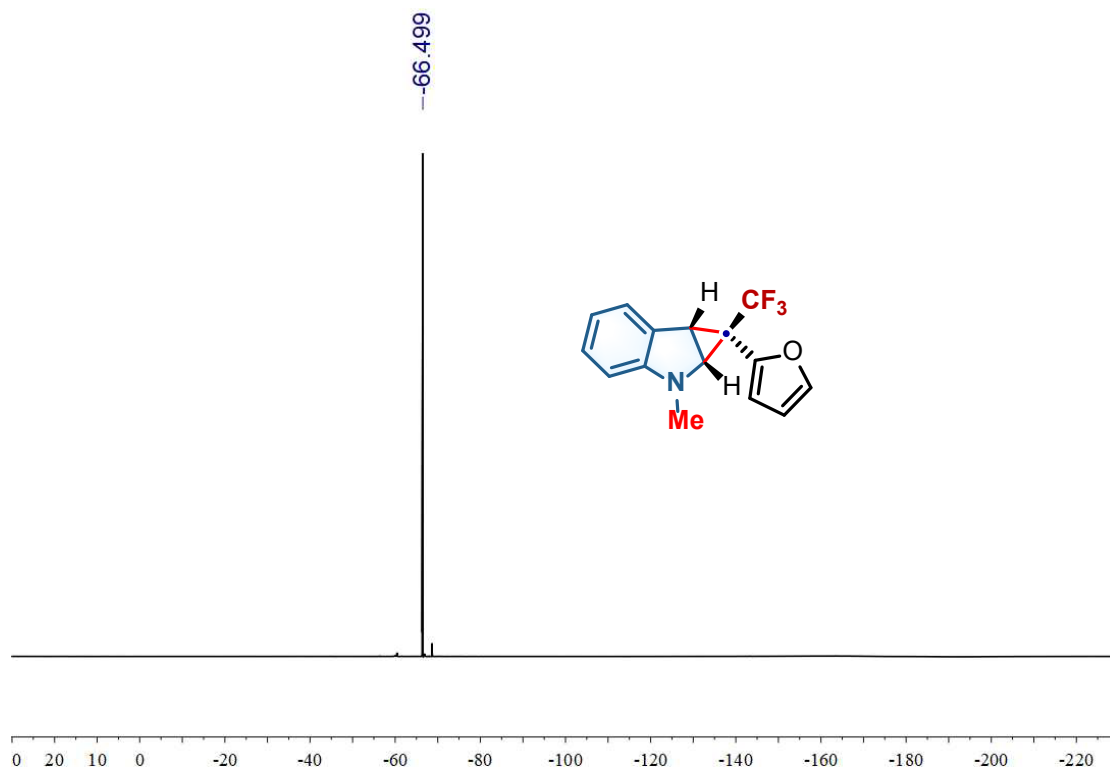
Supplementary Fig. 444. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 148



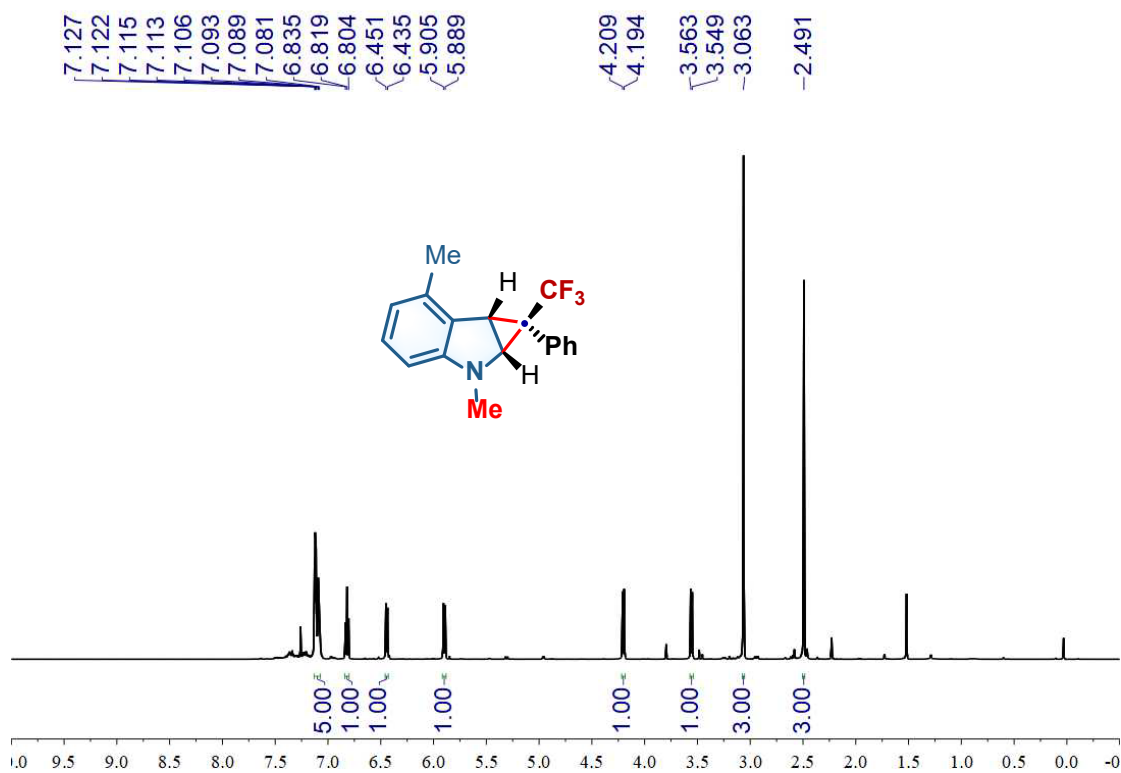
Supplementary Fig. 445. ¹H NMR (600 MHz, CDCl₃) spectrum of **149**



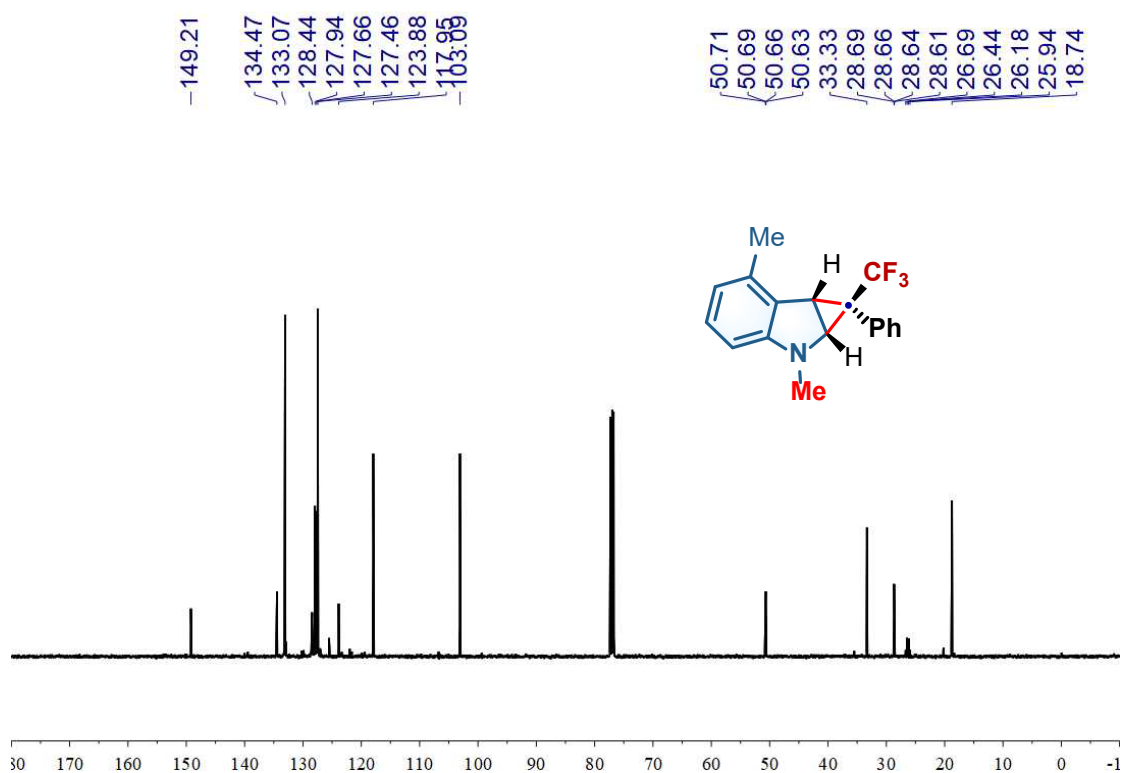
Supplementary Fig. 446. ¹³C NMR (150 MHz, CDCl₃) spectrum of **149**



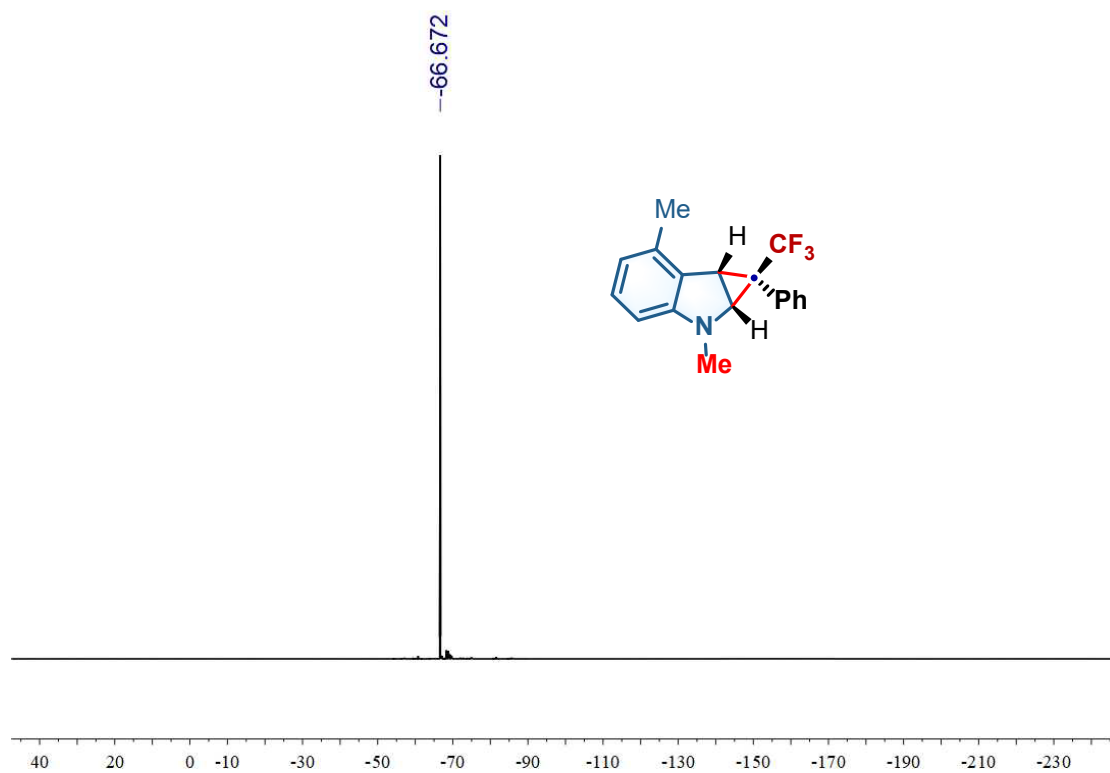
Supplementary Fig. 447. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 149



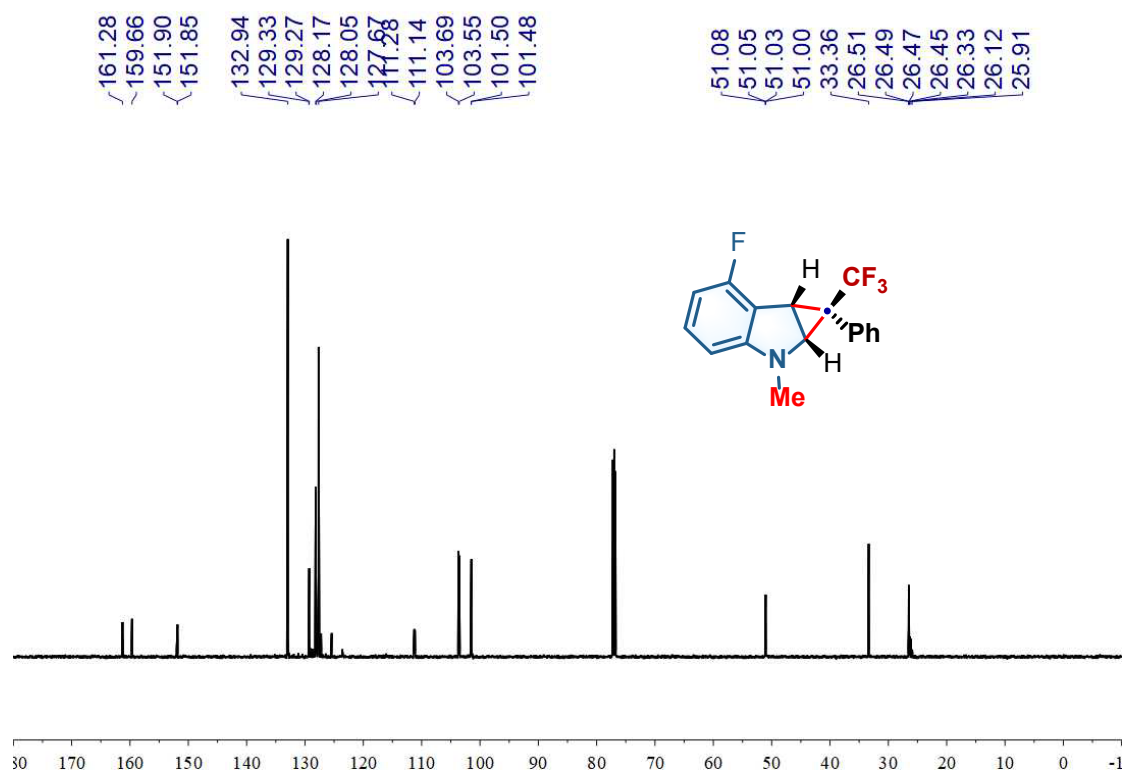
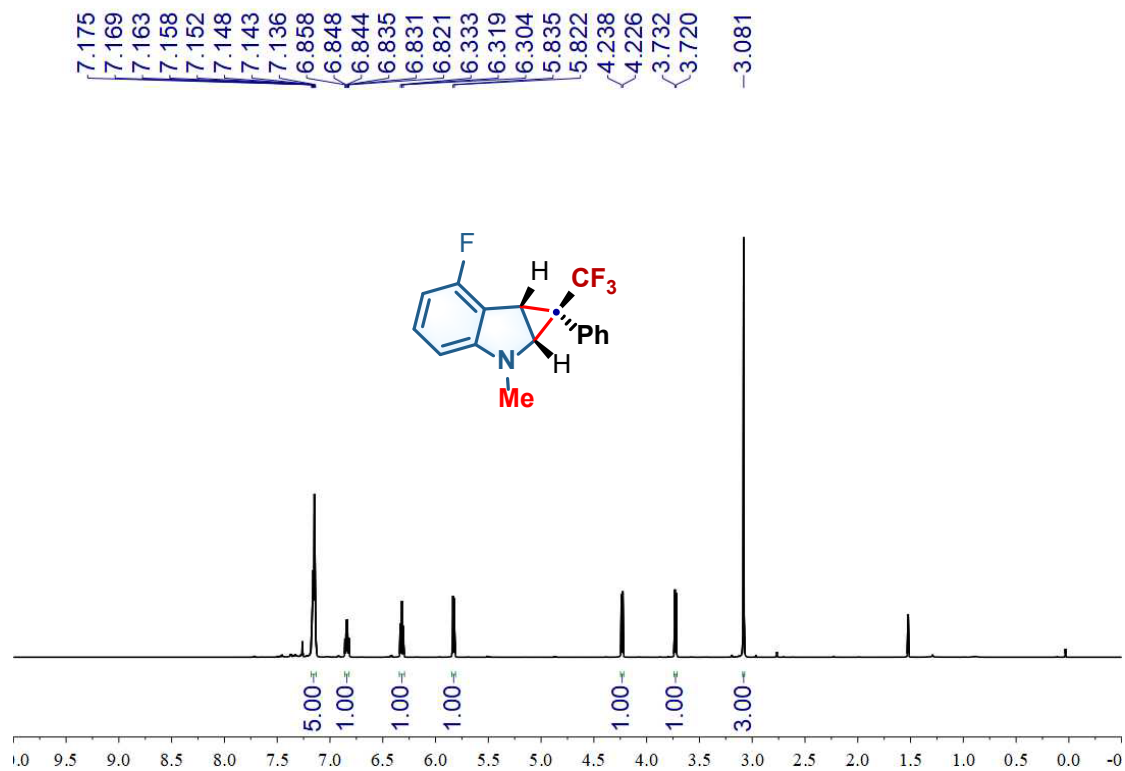
Supplementary Fig. 448. ¹H NMR (500 MHz, CDCl₃) spectrum of 150

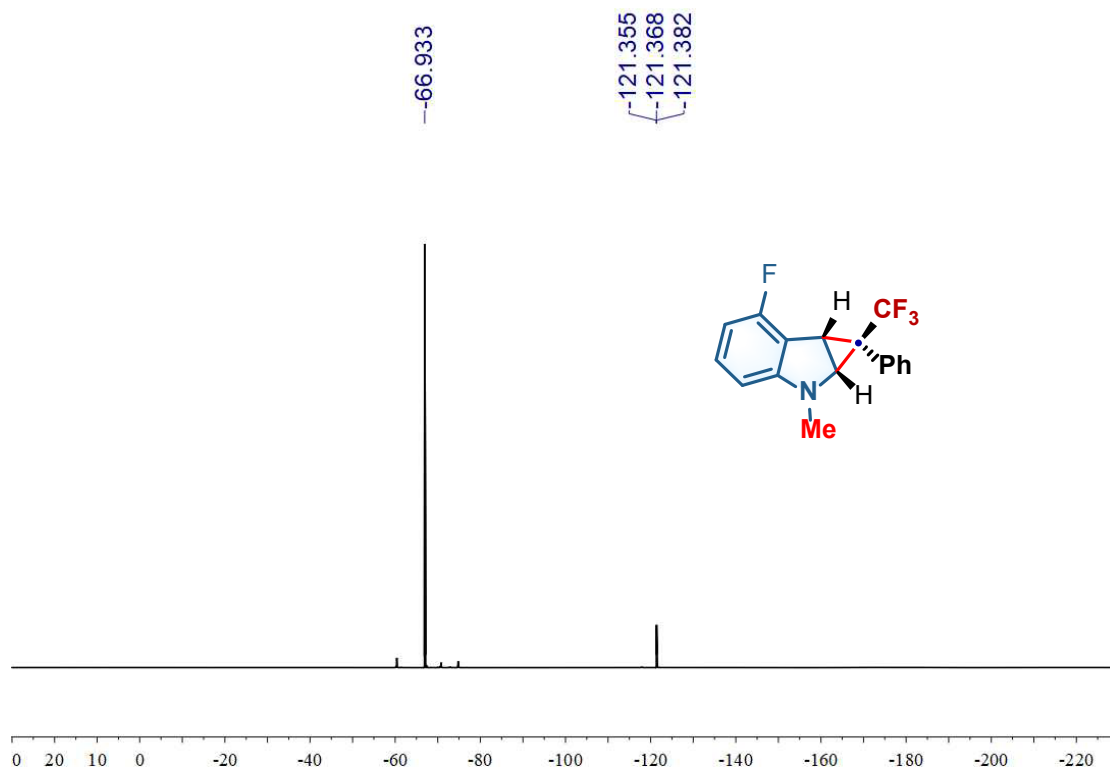


Supplementary Fig. 449. ¹³C NMR (125 MHz, CDCl₃) spectrum of **150**

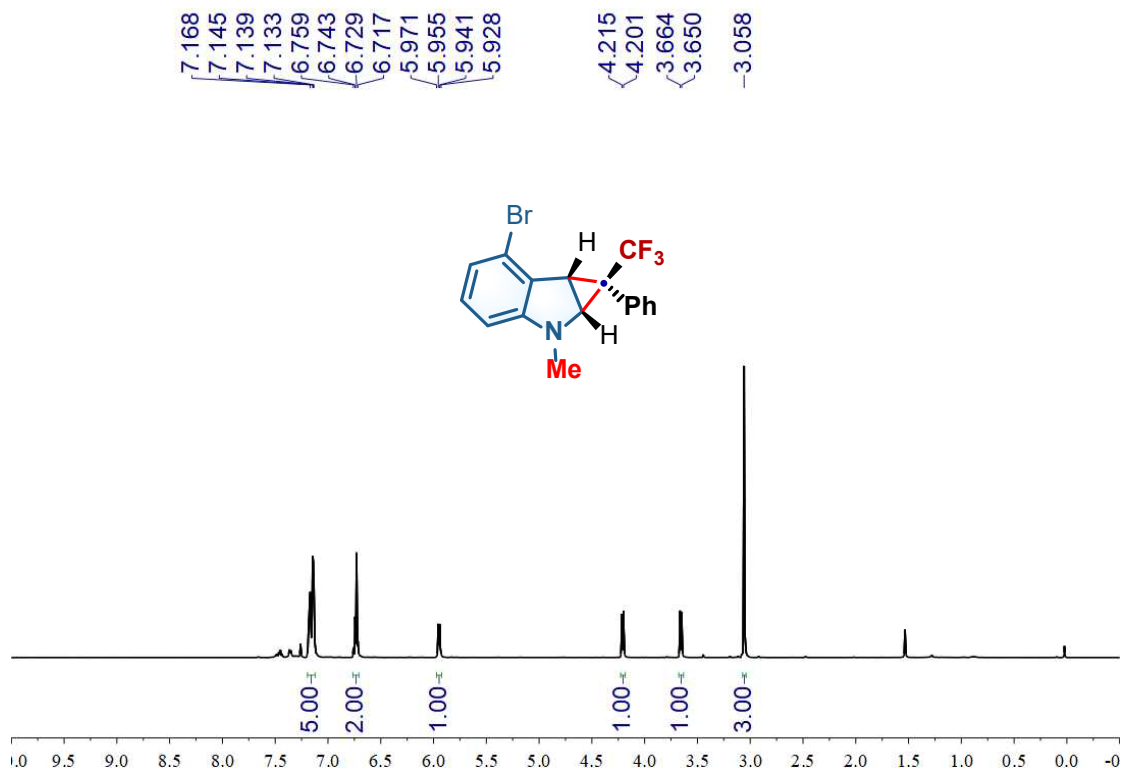


Supplementary Fig. 450. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **150**

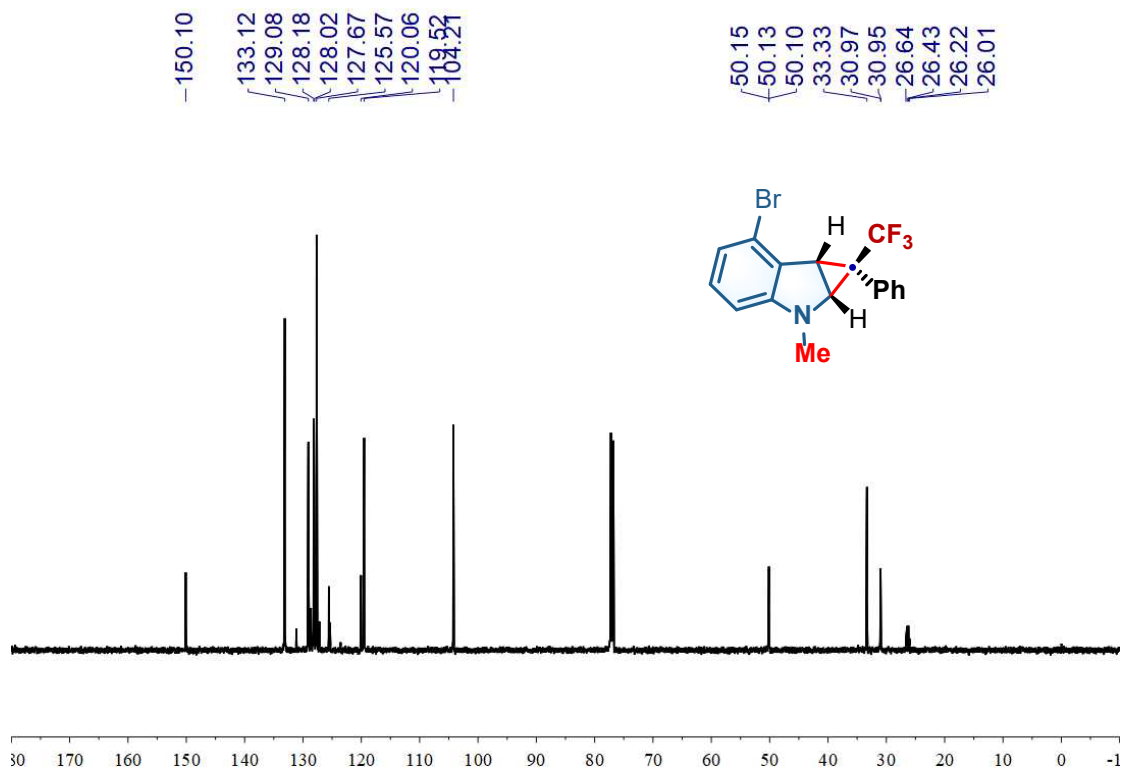




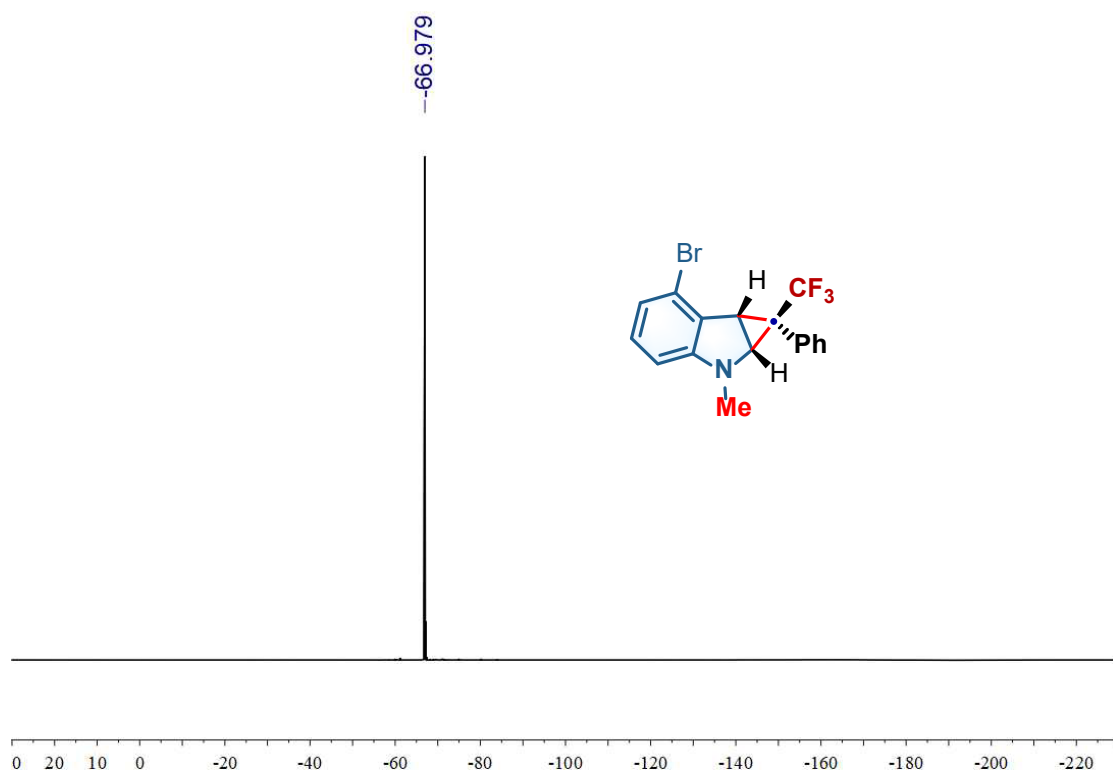
Supplementary Fig. 453. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **151**



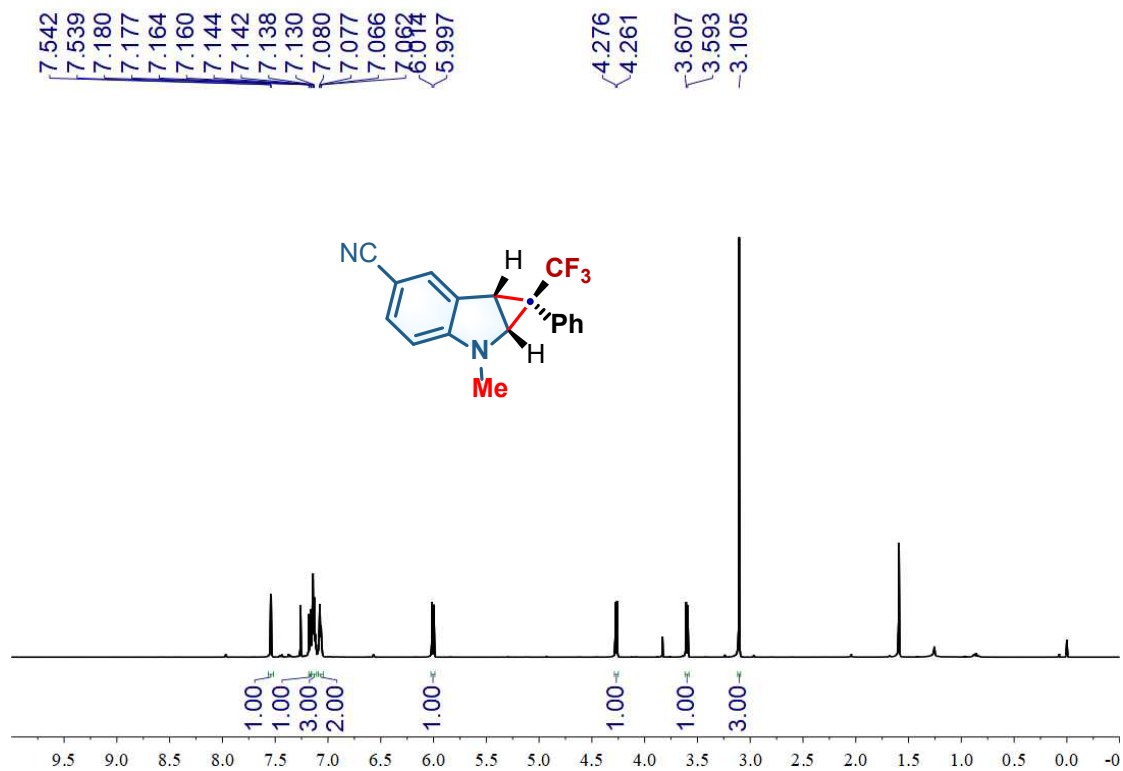
Supplementary Fig. 454. ^1H NMR (500 MHz, CDCl_3) spectrum of **152**



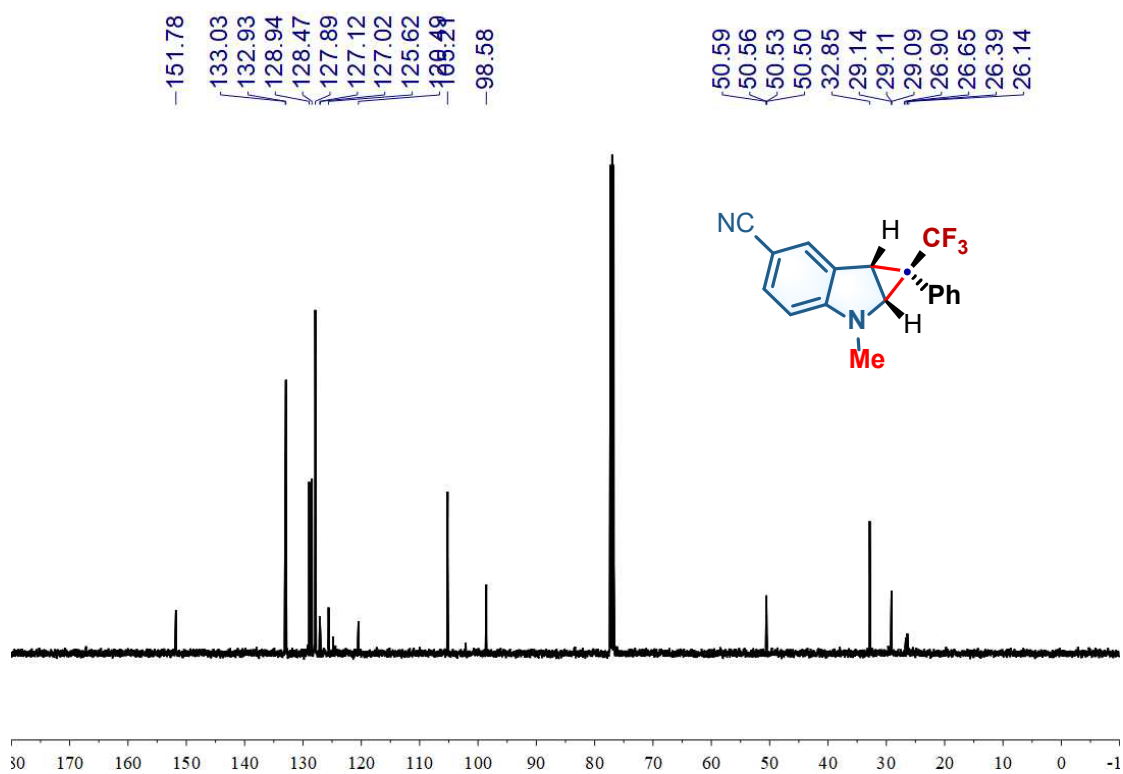
Supplementary Fig. 455. ¹³C NMR (150 MHz, CDCl₃) spectrum of **152**



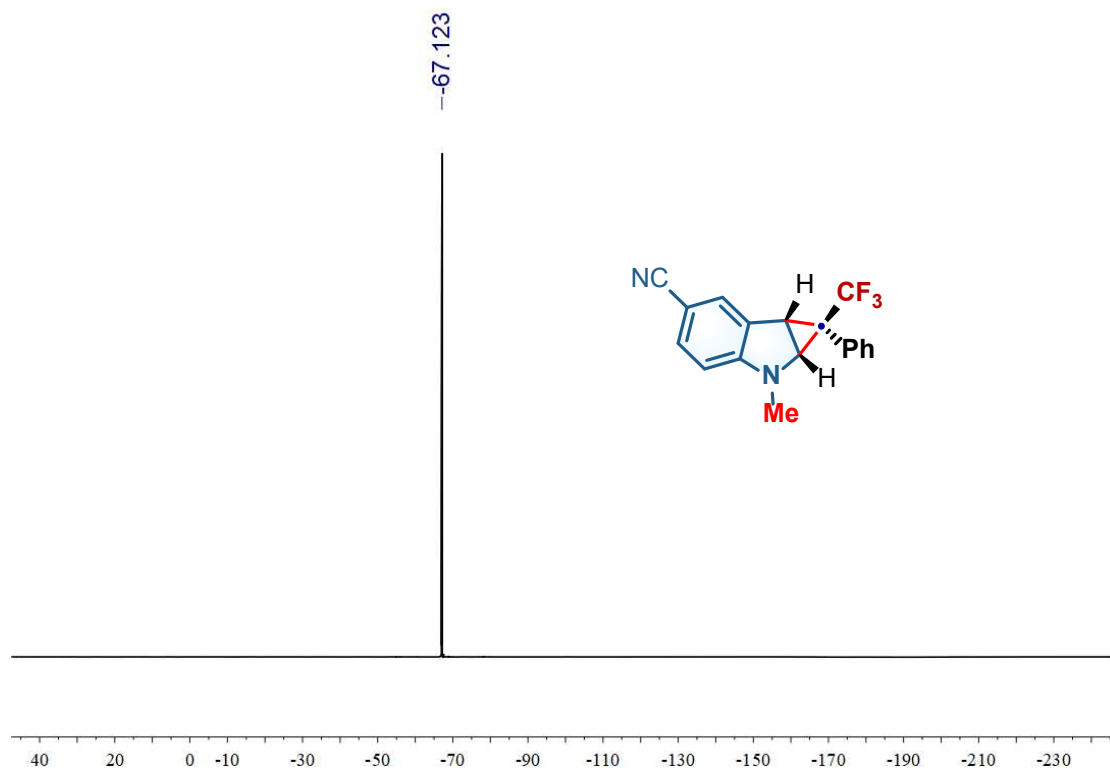
Supplementary Fig. 456. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **152**



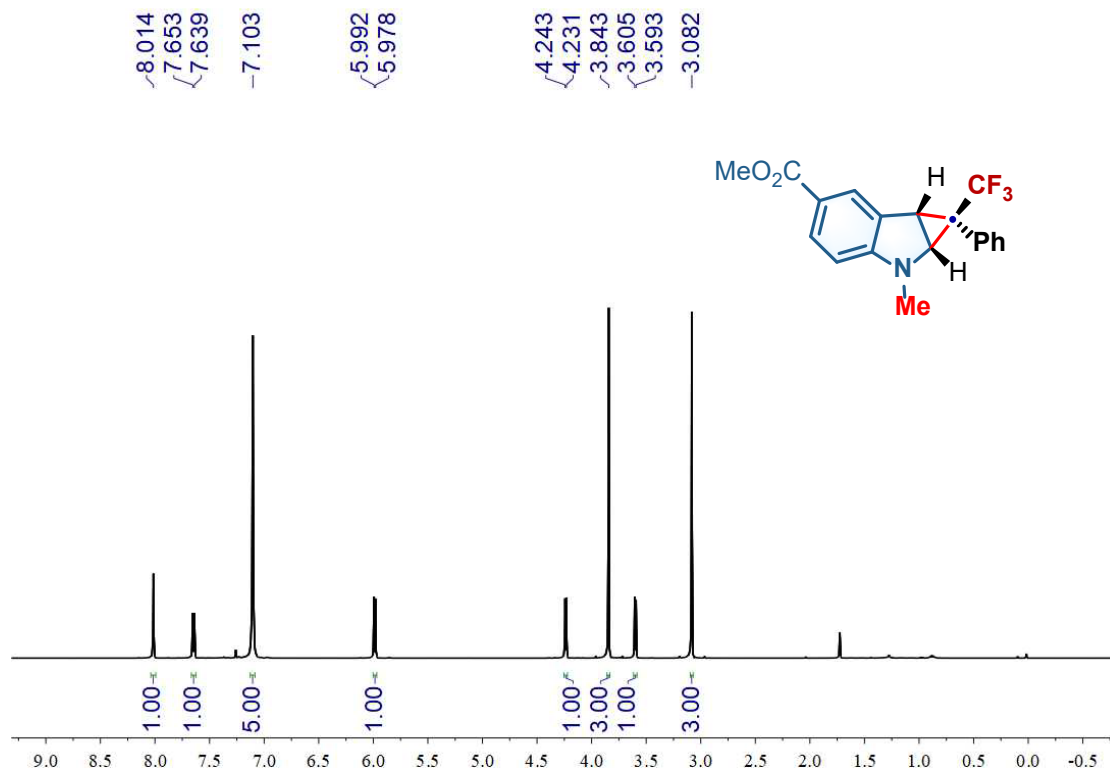
Supplementary Fig. 457. ¹H NMR (500 MHz, CDCl₃) spectrum of **153**



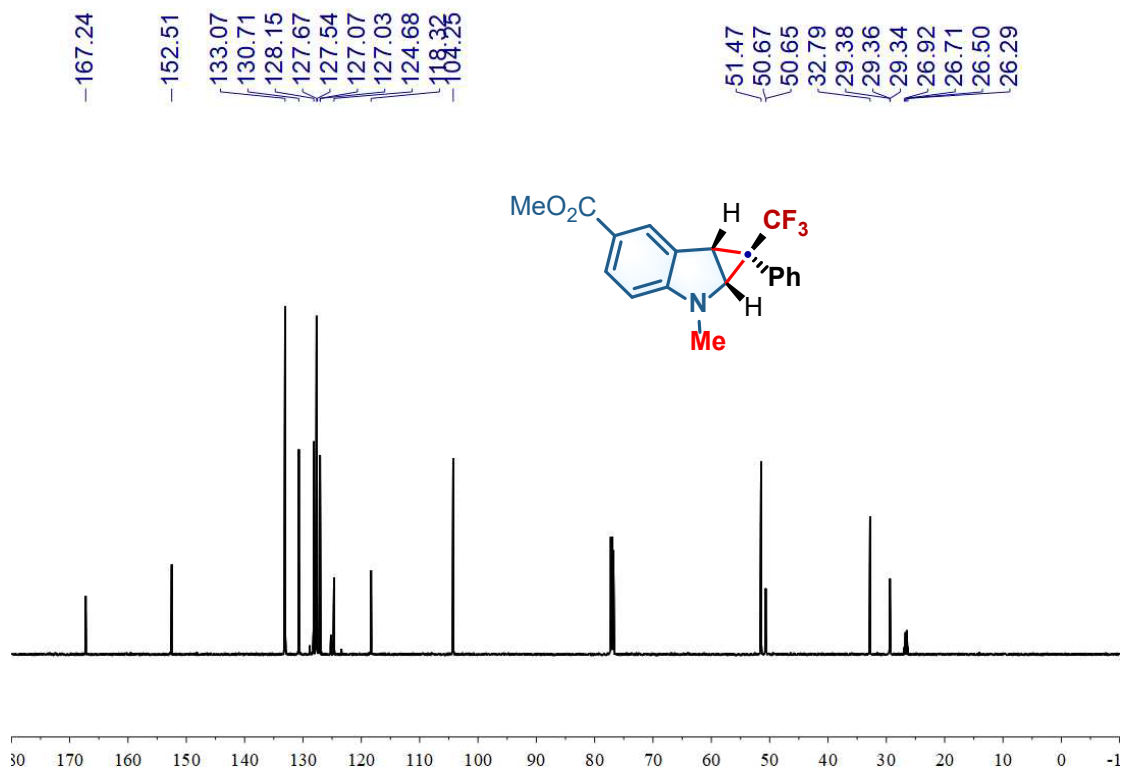
Supplementary Fig. 458. ¹³C NMR (125 MHz, CDCl₃) spectrum of **153**



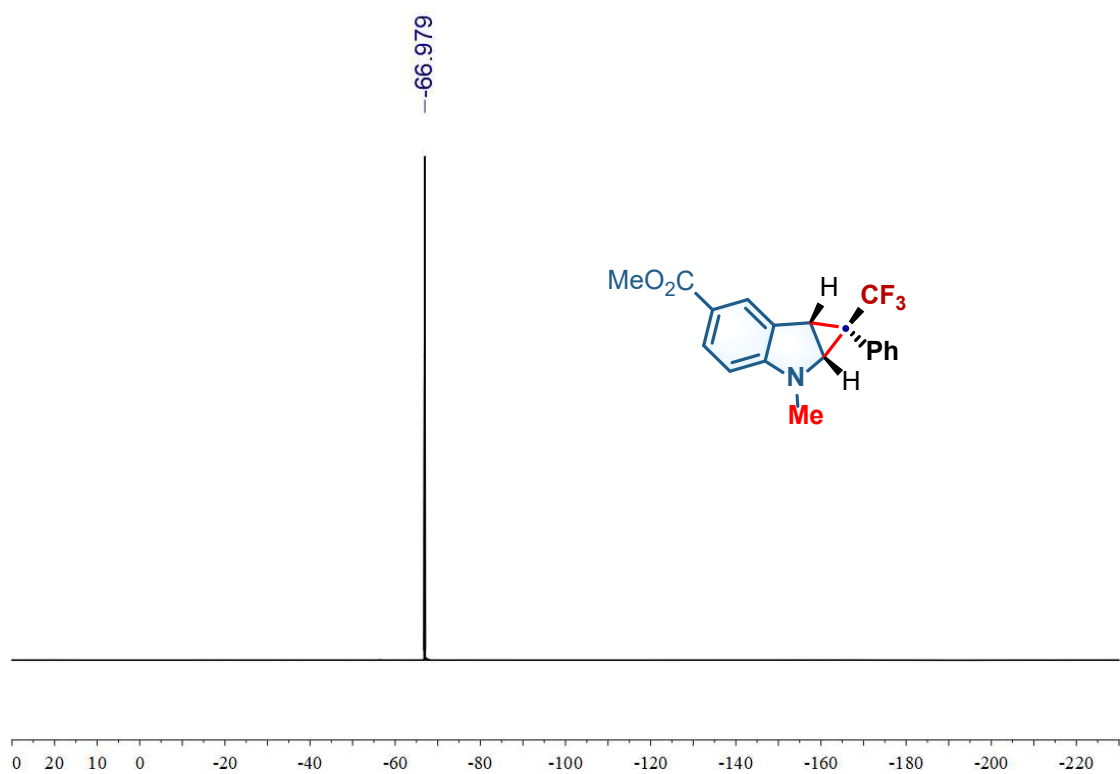
Supplementary Fig. 459. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **153**



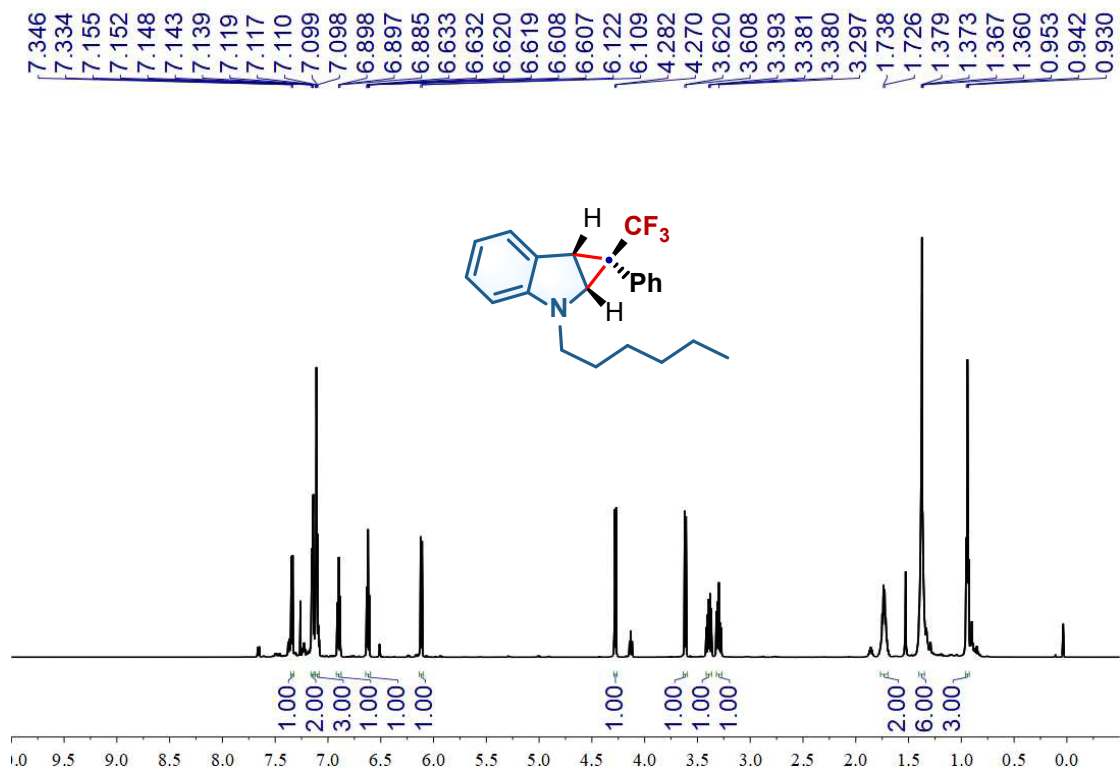
Supplementary Fig. 460. ¹H NMR (600 MHz, CDCl₃) spectrum of **154**



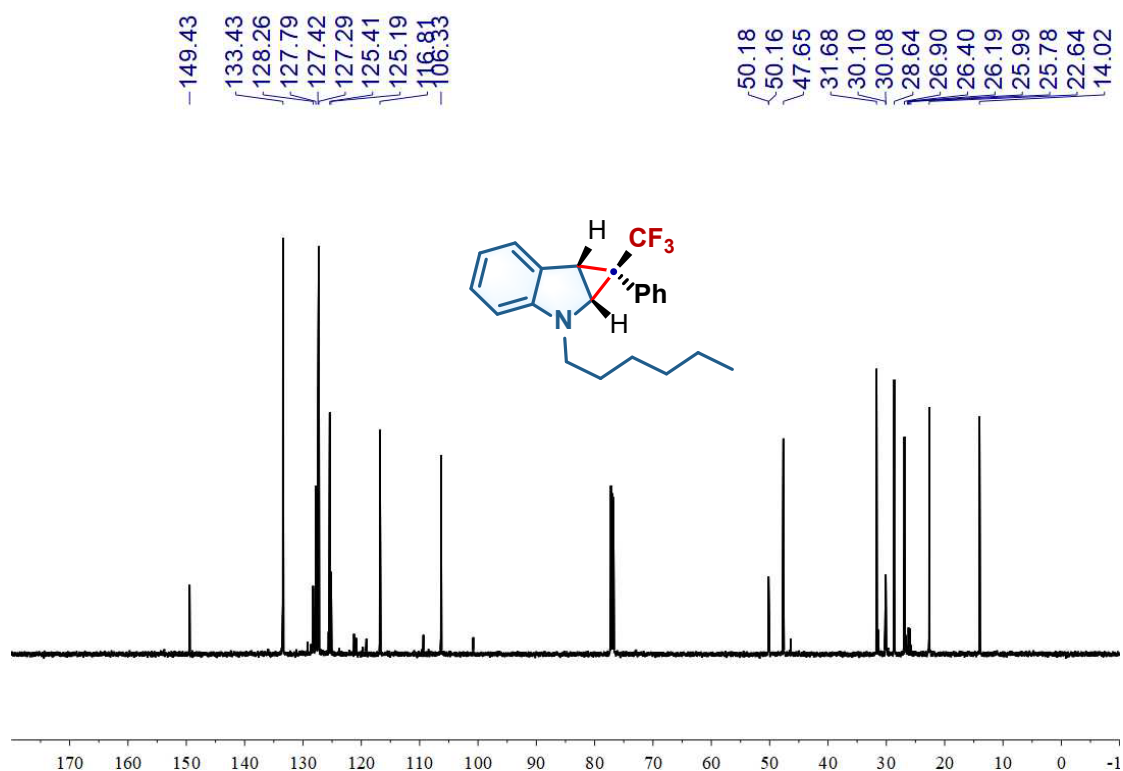
Supplementary Fig. 461. ¹³C NMR (150 MHz, CDCl₃) spectrum of **154**



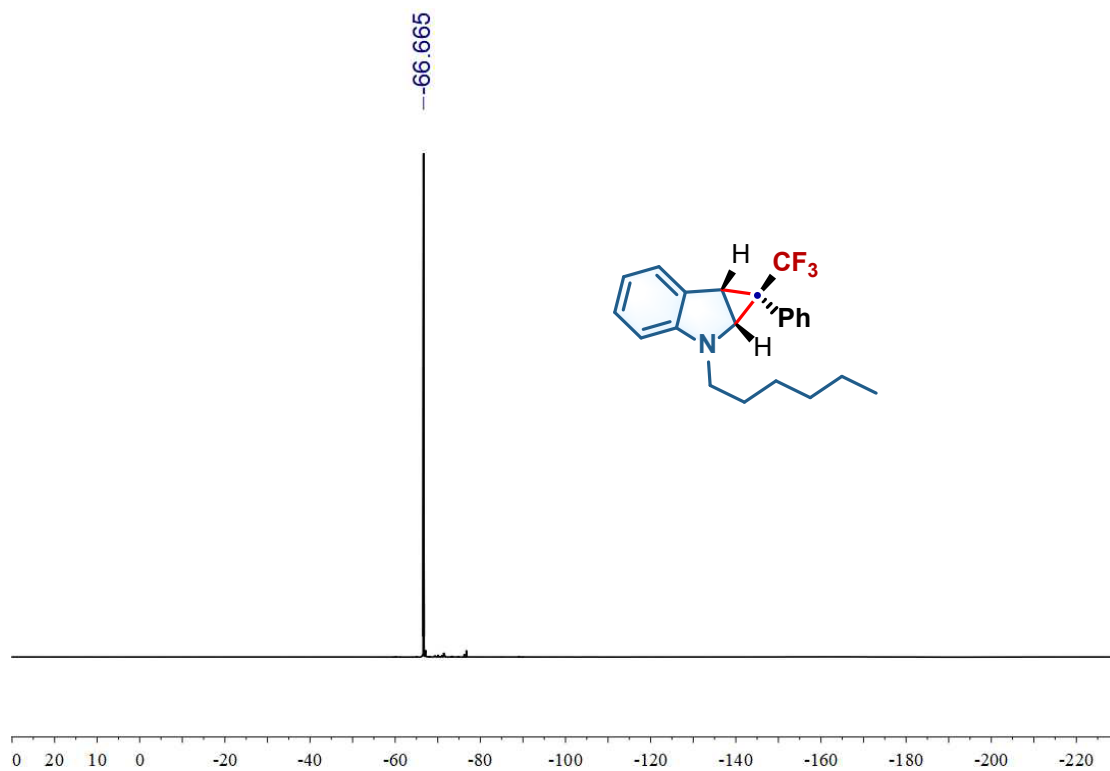
Supplementary Fig. 462. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **154**



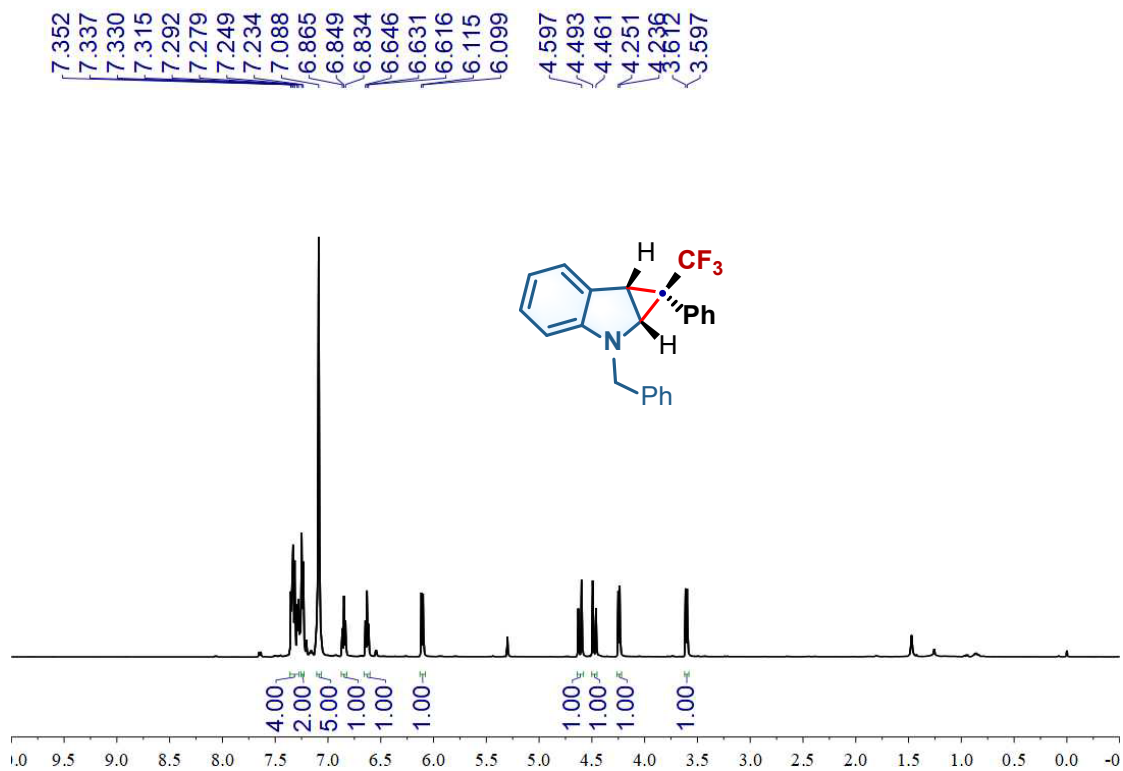
Supplementary Fig. 463. ¹H NMR (600 MHz, CDCl₃) spectrum of **155**



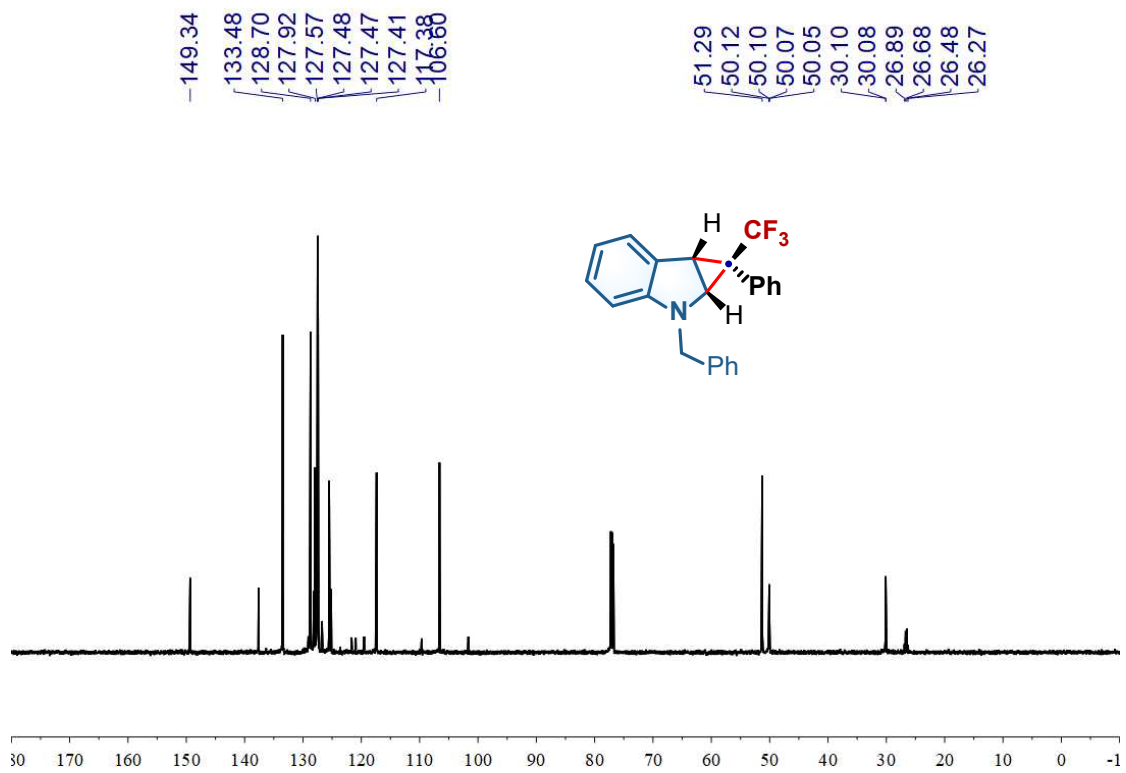
Supplementary Fig. 464. ¹³C NMR (150 MHz, CDCl₃) spectrum of **155**



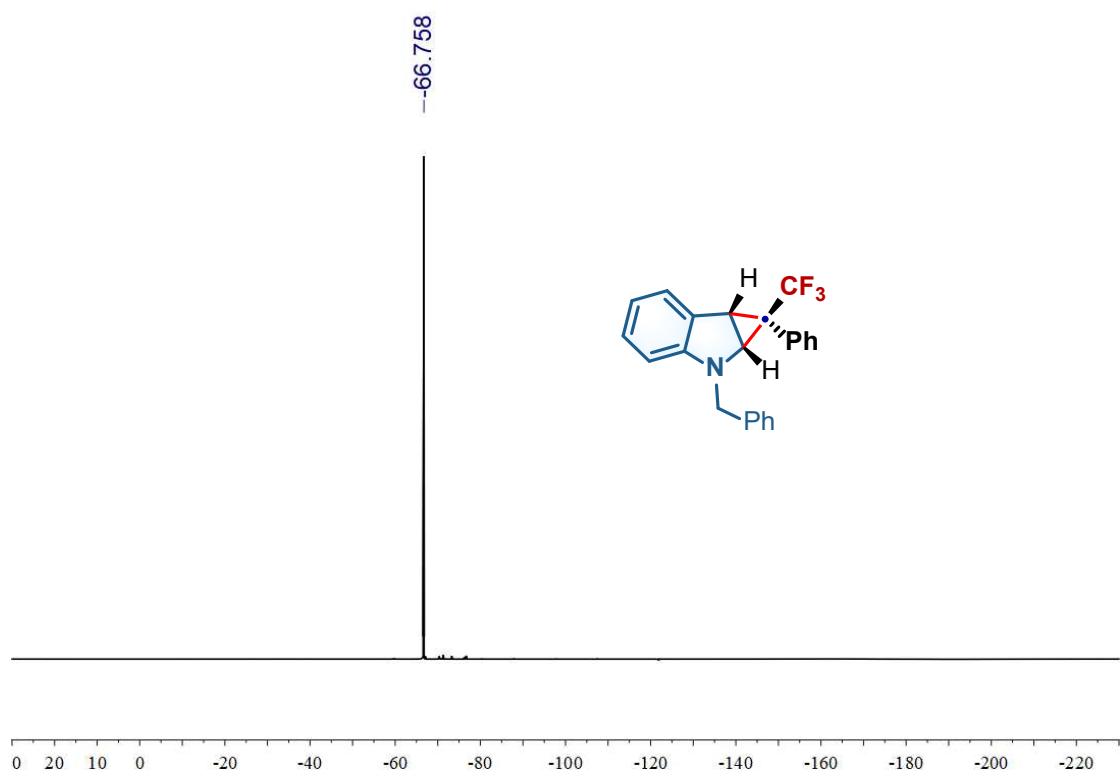
Supplementary Fig. 465. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **155**



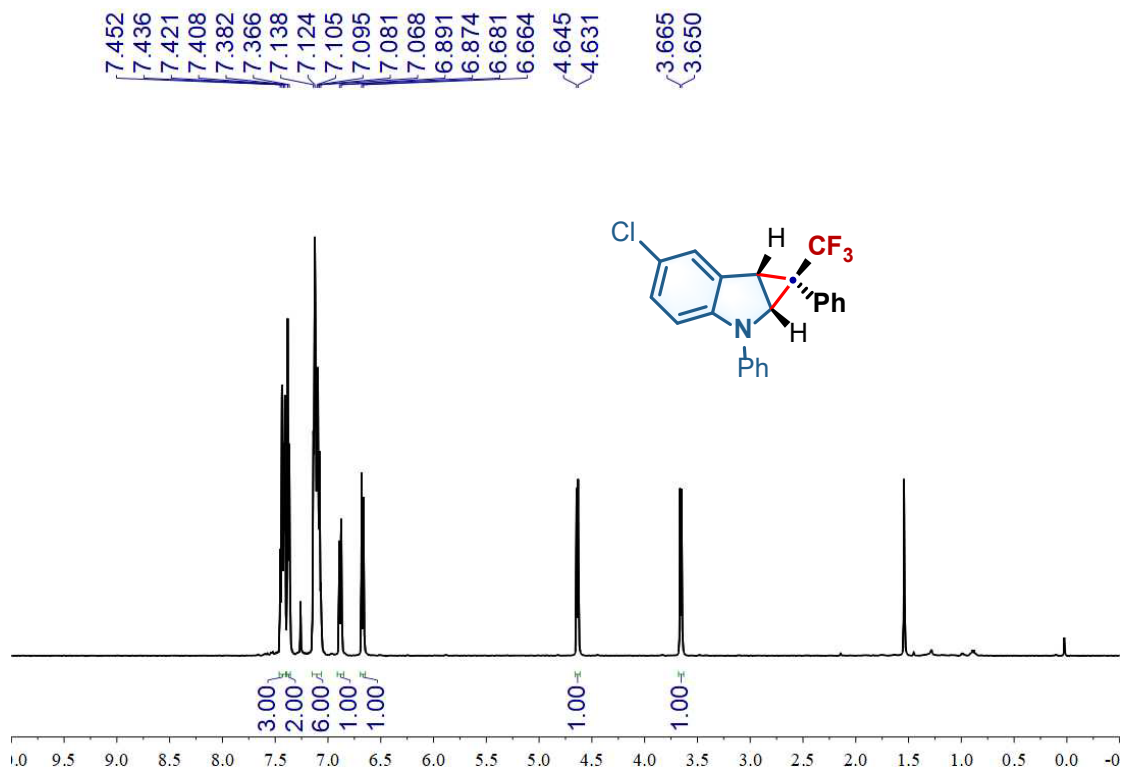
Supplementary Fig. 466. ^1H NMR (500 MHz, CDCl_3) spectrum of **156**



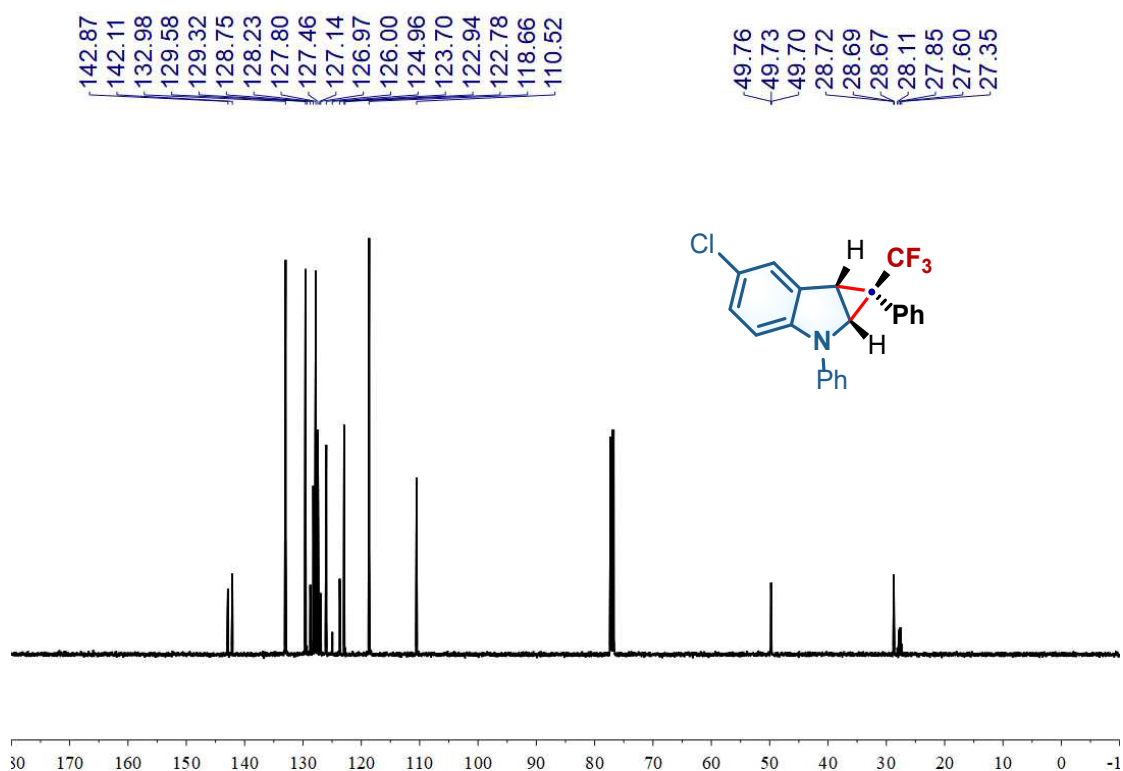
Supplementary Fig. 467. ¹³C NMR (150 MHz, CDCl₃) spectrum of **156**



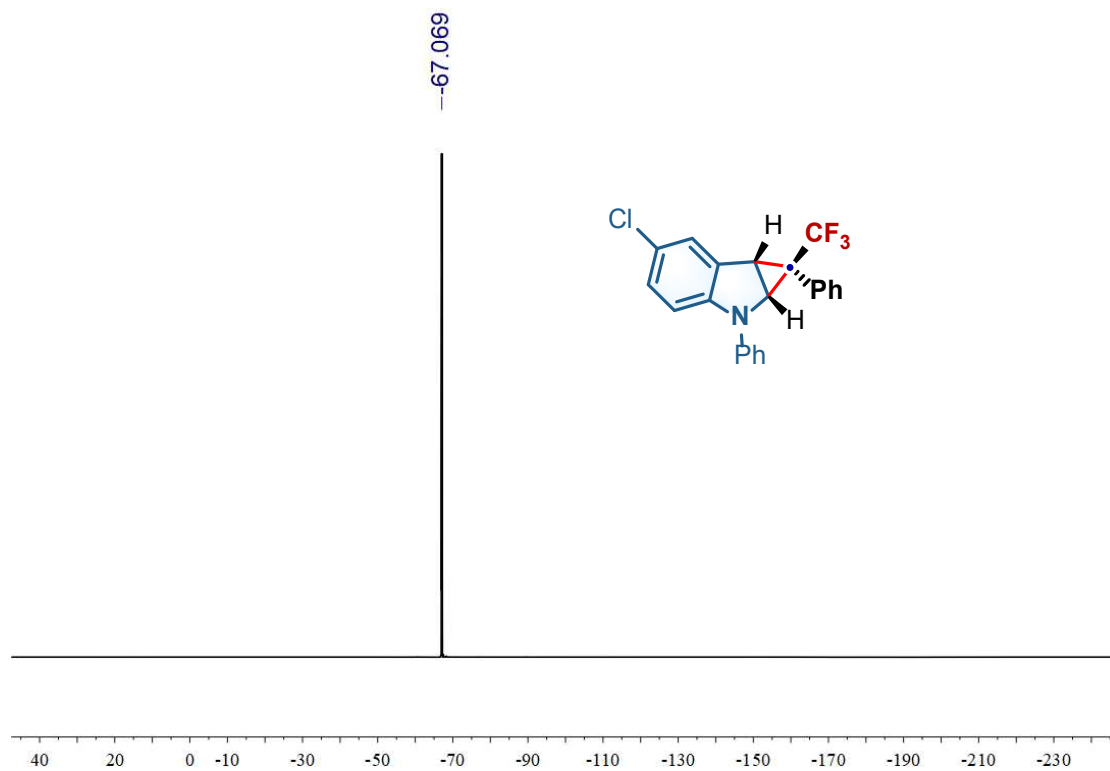
Supplementary Fig. 468. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **156**



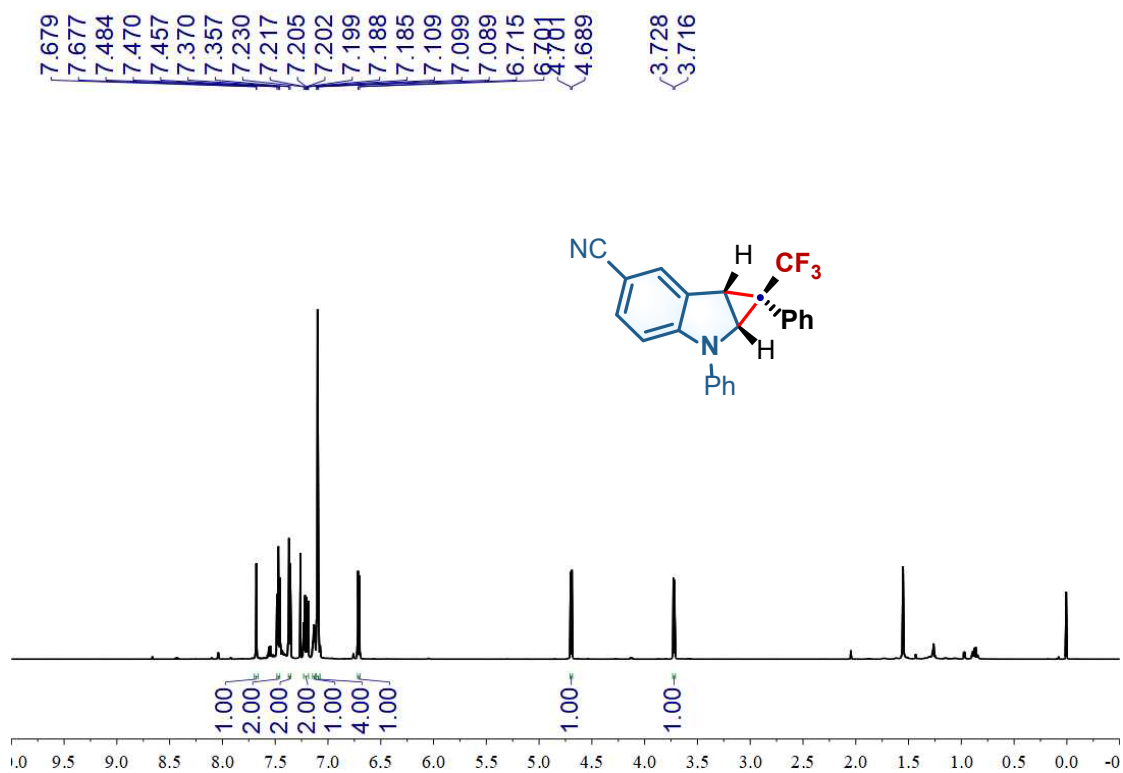
Supplementary Fig. 469. ¹H NMR (500 MHz, CDCl₃) spectrum of **157**



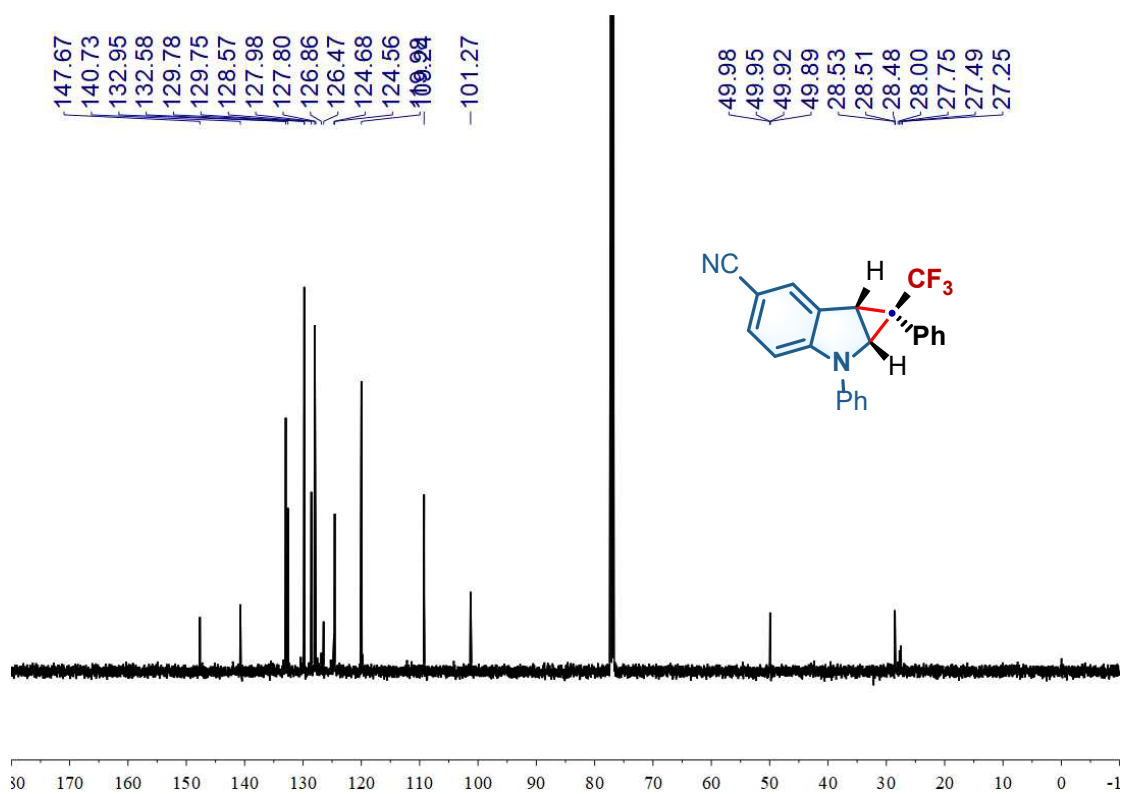
Supplementary Fig. 470. ¹³C NMR (125 MHz, CDCl₃) spectrum of **157**



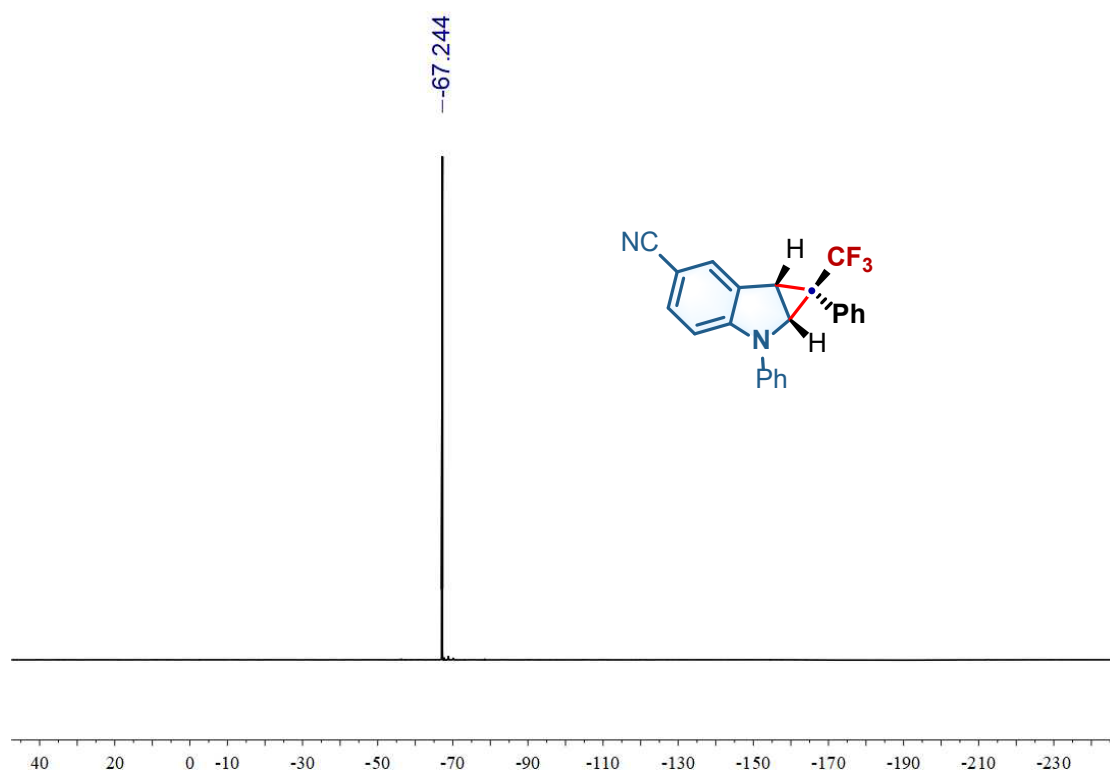
Supplementary Fig. 471. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **157**



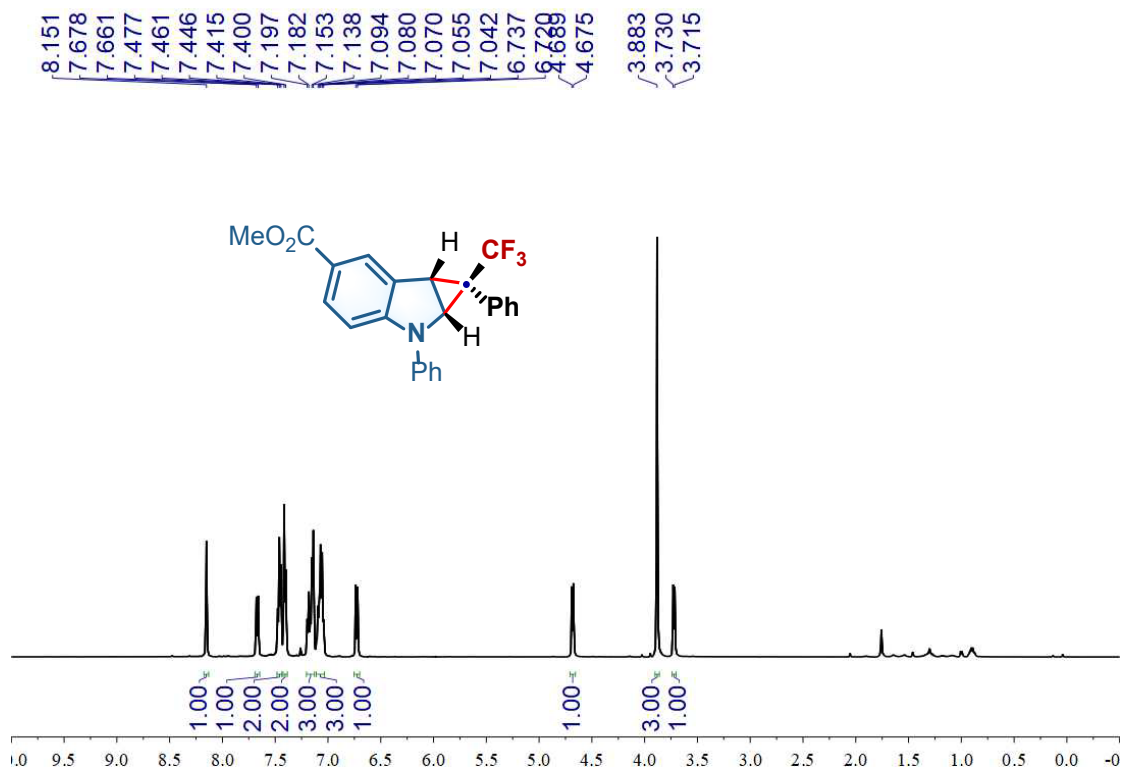
Supplementary Fig. 472. ¹H NMR (600 MHz, CDCl₃) spectrum of **158**



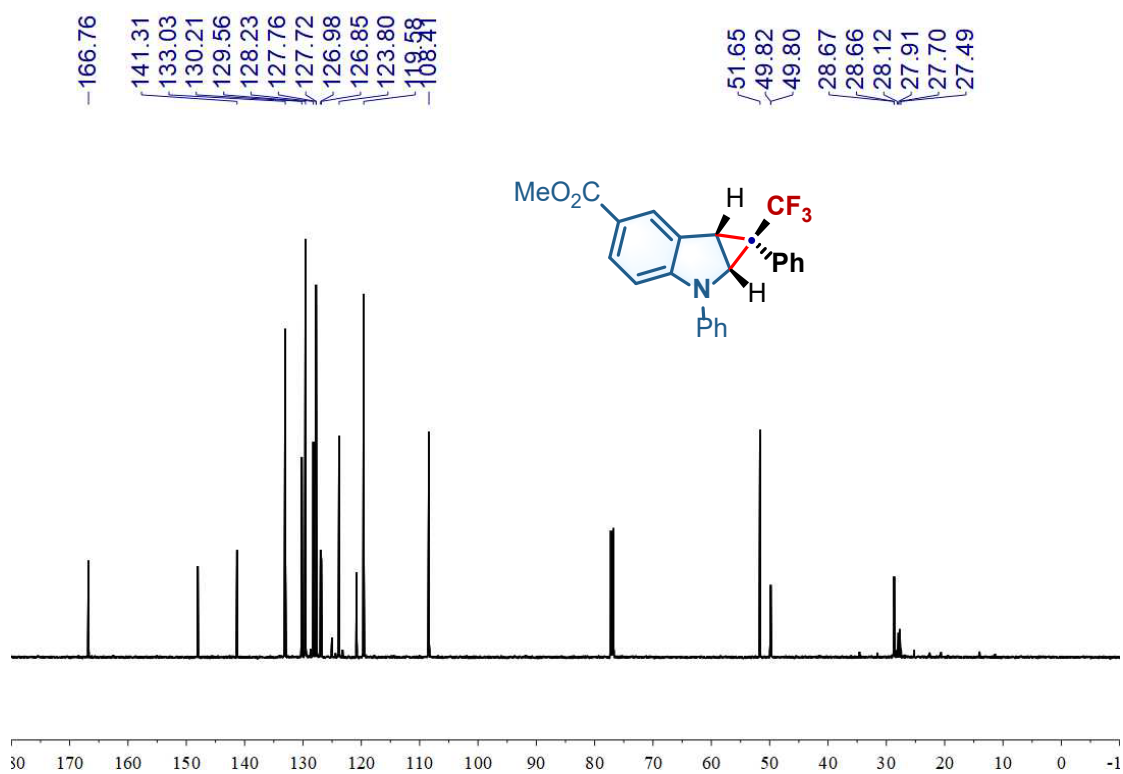
Supplementary Fig. 473. ¹³C NMR (125 MHz, CDCl₃) spectrum of **158**



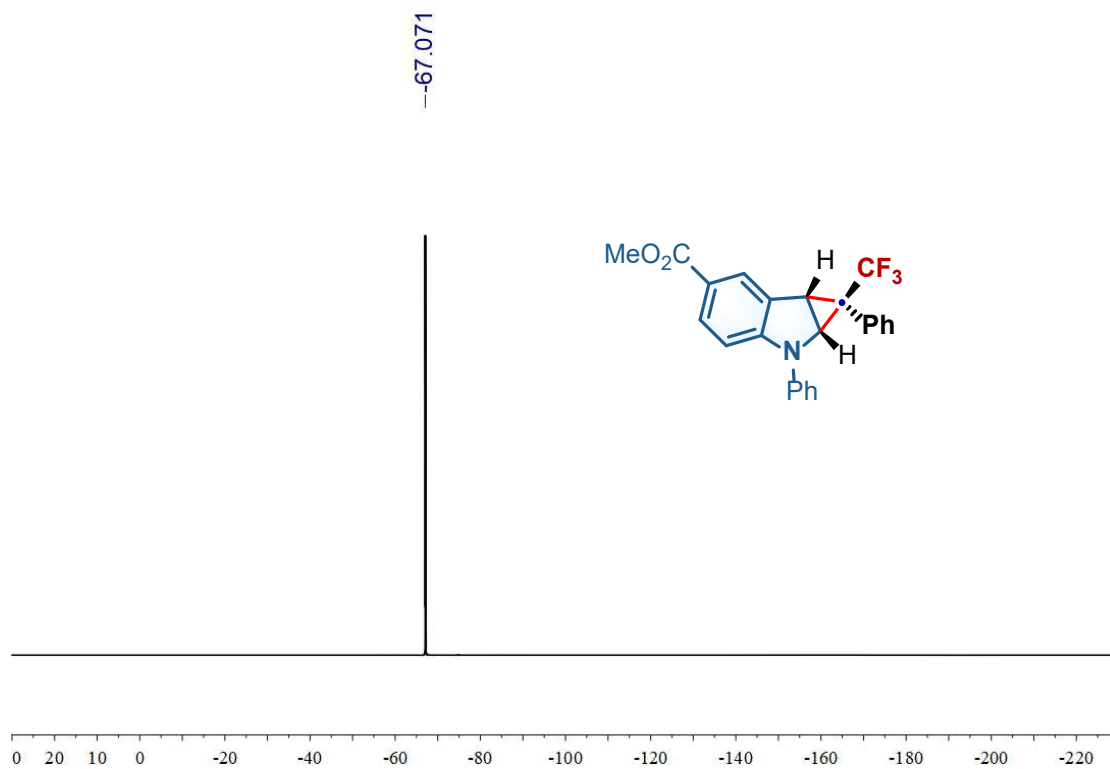
Supplementary Fig. 474. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **158**



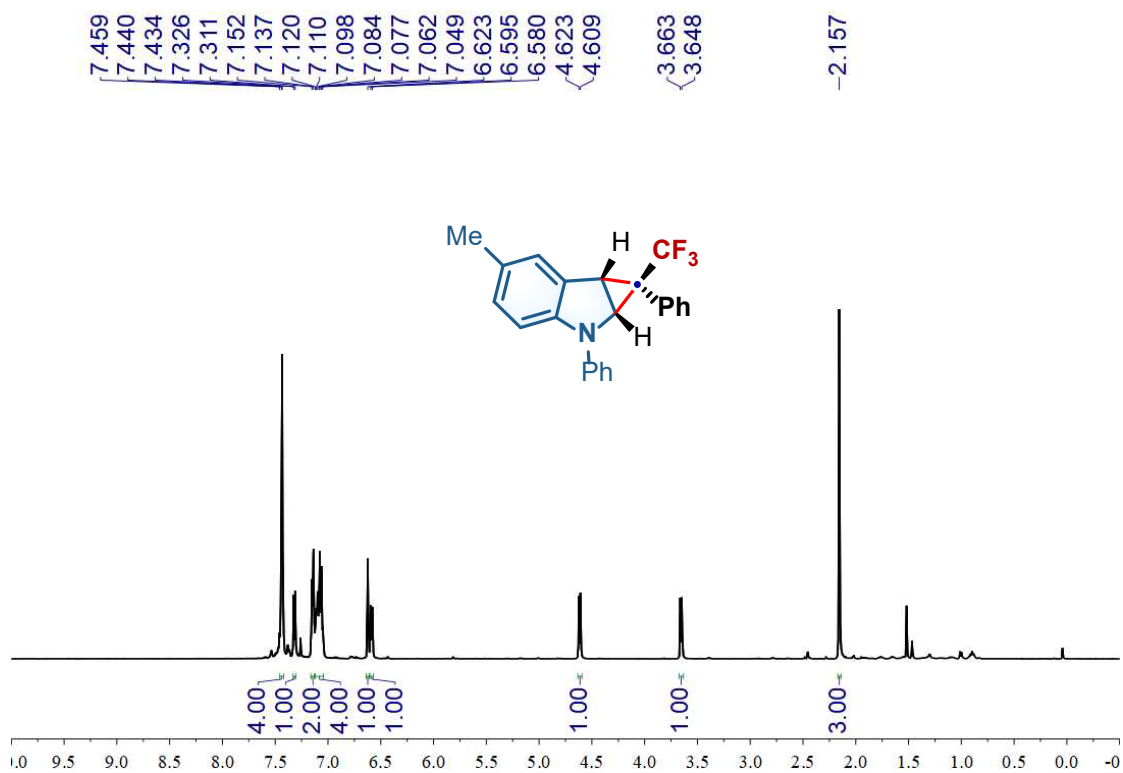
Supplementary Fig. 475. ¹H NMR (500 MHz, CDCl₃) spectrum of **159**



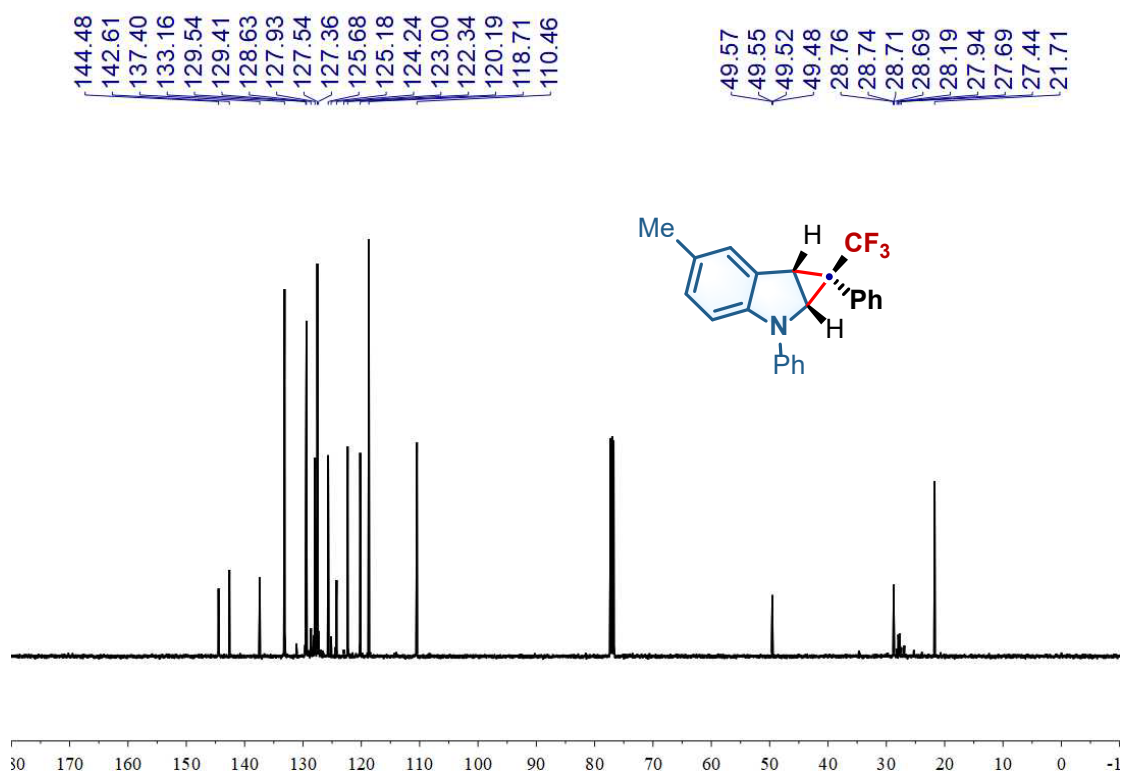
Supplementary Fig. 476. ¹³C NMR (150 MHz, CDCl₃) spectrum of **159**



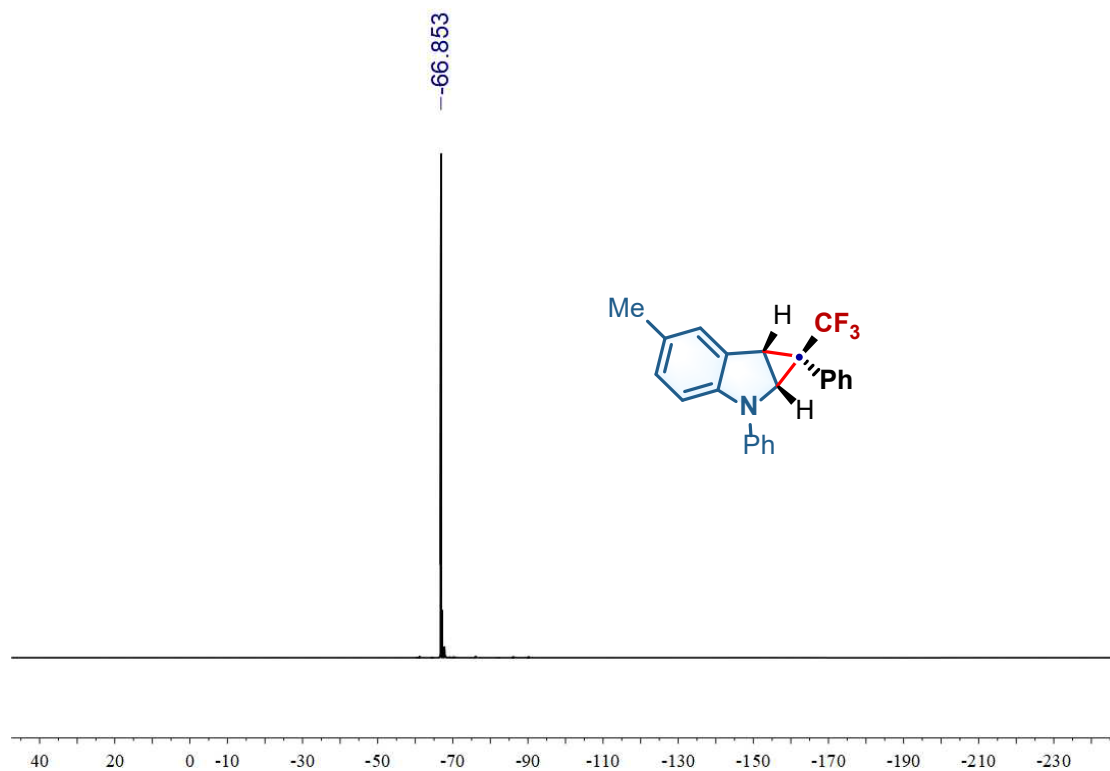
Supplementary Fig. 477. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **159**



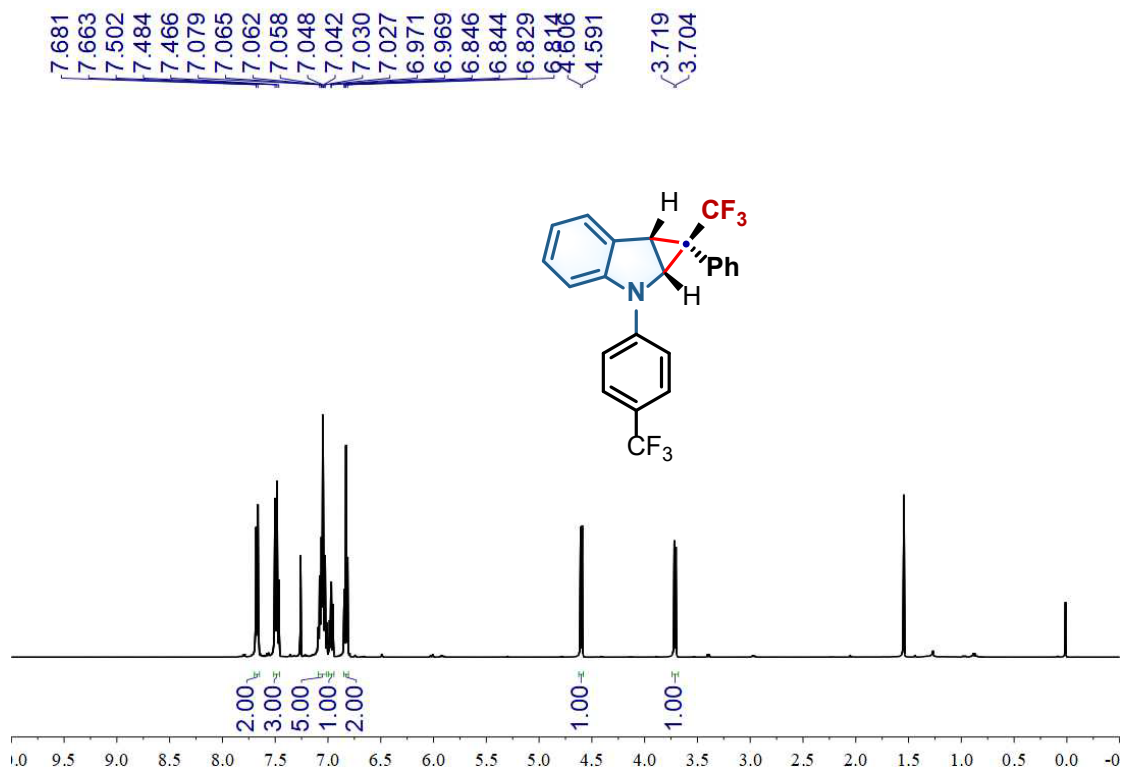
Supplementary Fig. 478. ^1H NMR (500 MHz, CDCl_3) spectrum of **160**



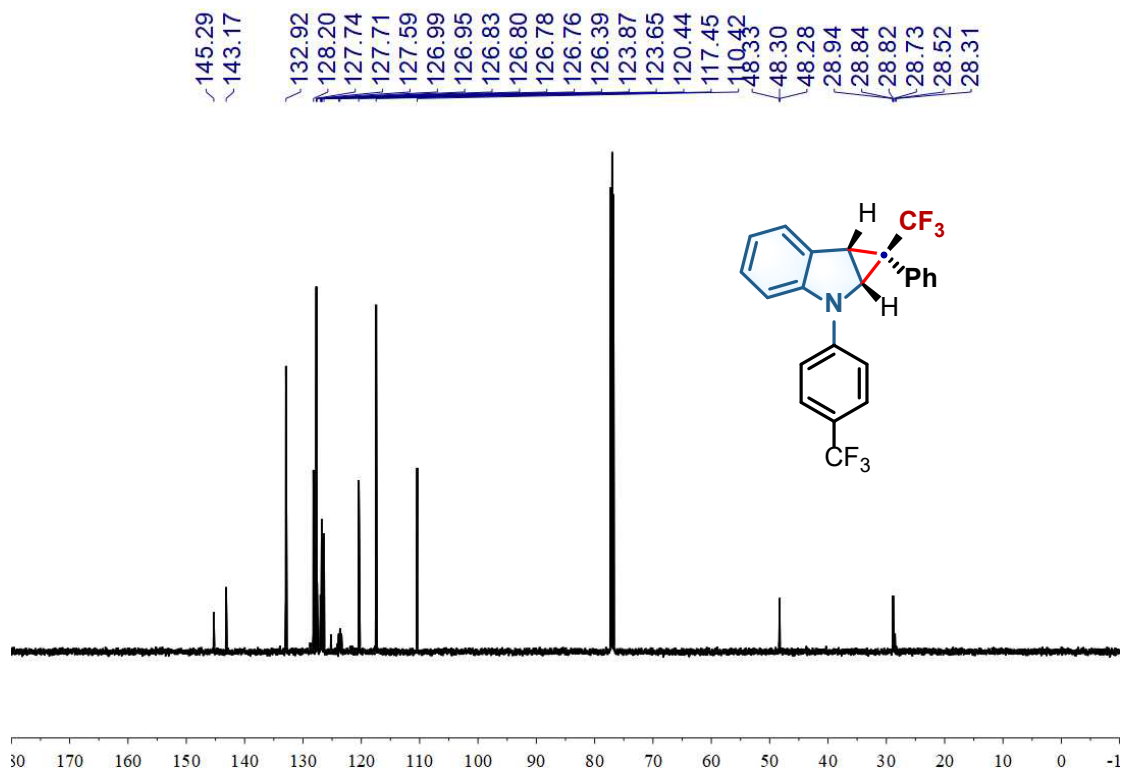
Supplementary Fig. 479. ¹³C NMR (125 MHz, CDCl₃) spectrum of **160**



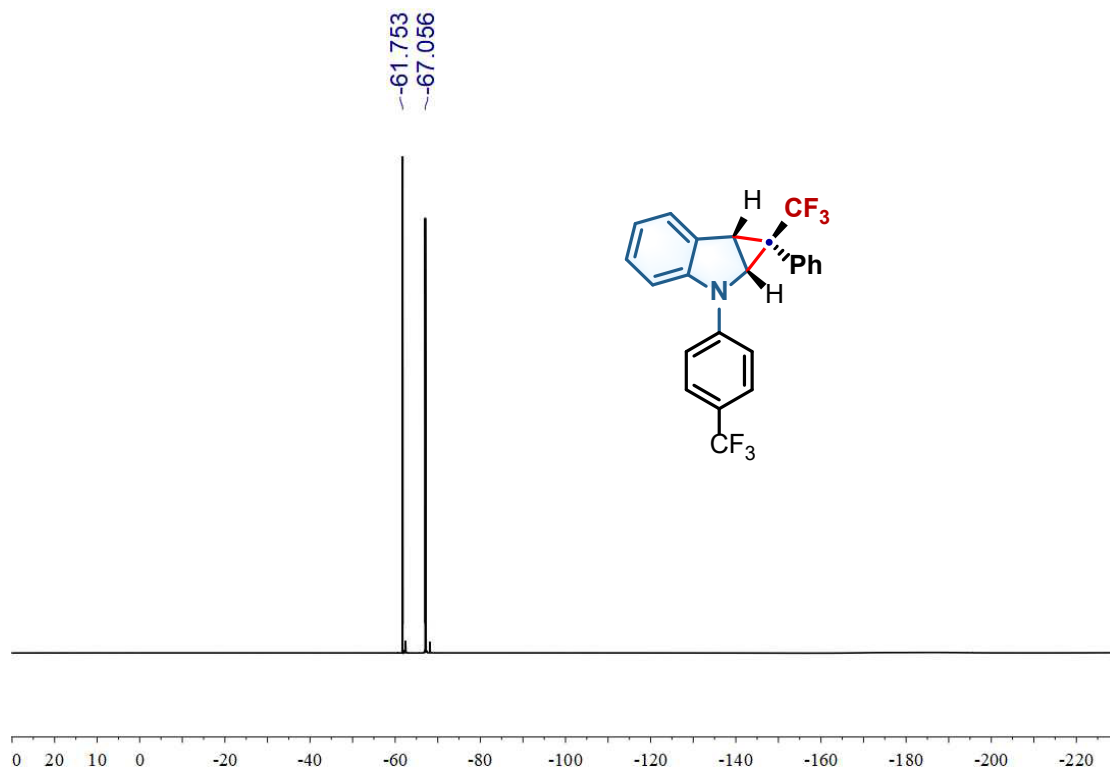
Supplementary Fig. 480. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **160**



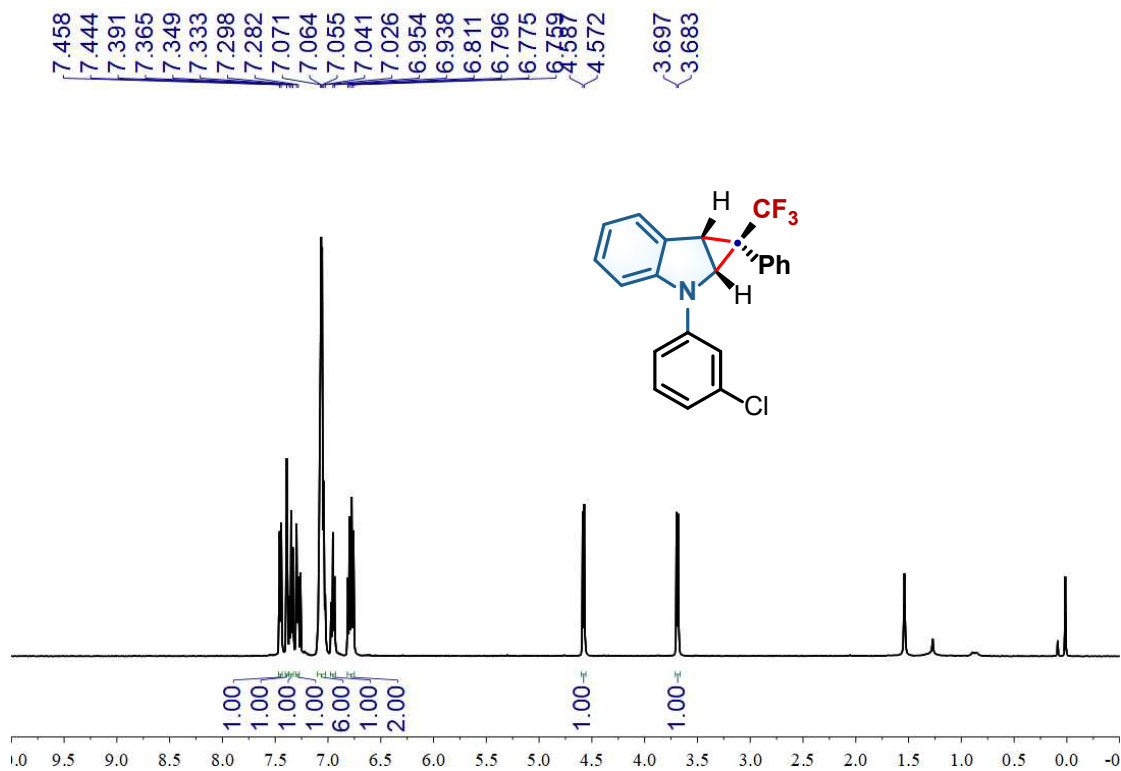
Supplementary Fig. 481. ¹H NMR (500 MHz, CDCl₃) spectrum of 161



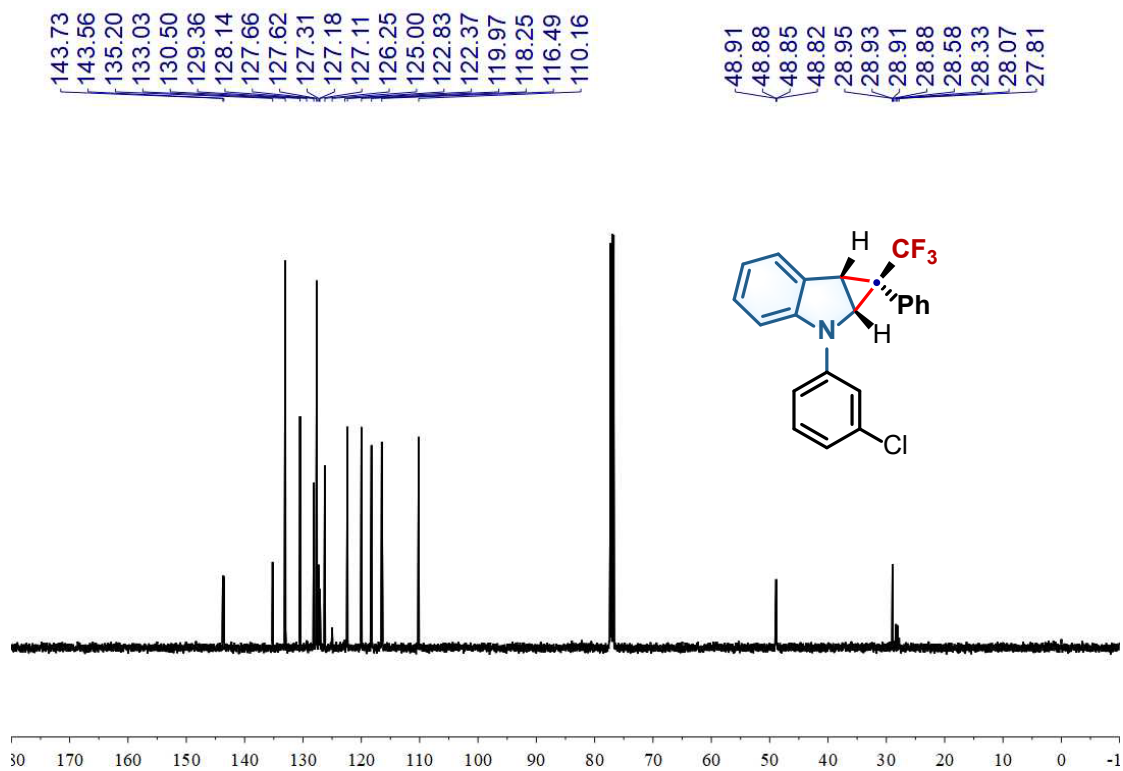
Supplementary Fig. 482. ¹³C NMR (150 MHz, CDCl₃) spectrum of 161



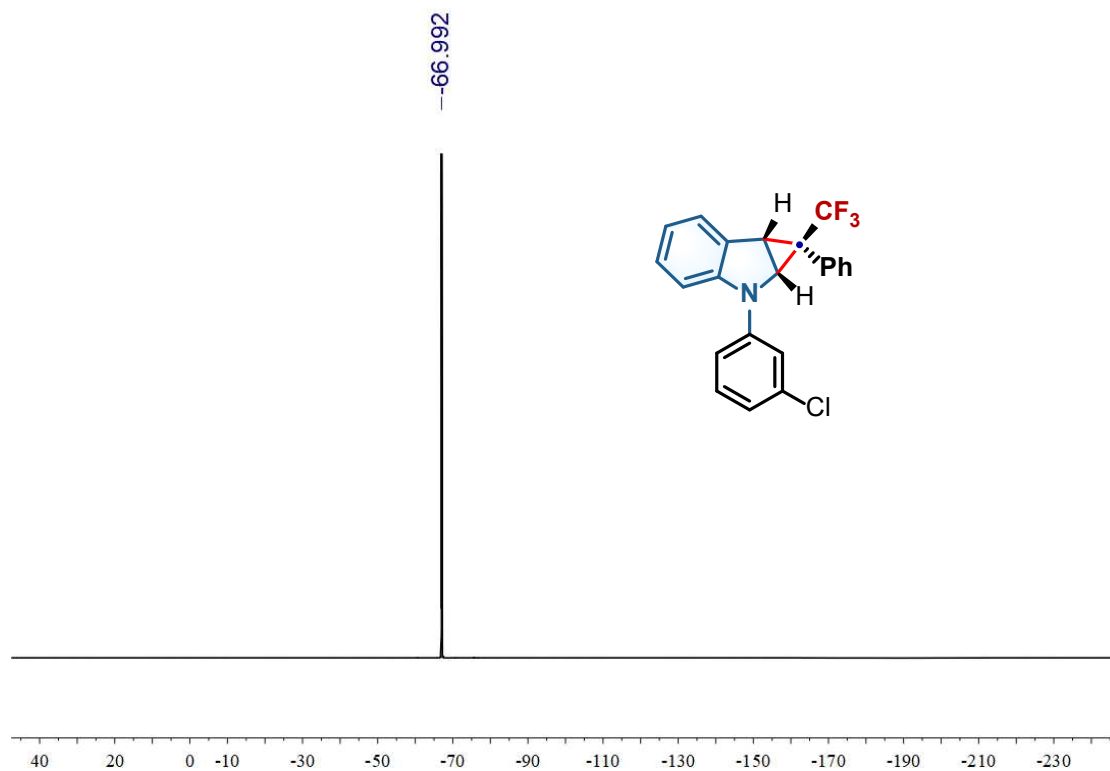
Supplementary Fig. 483. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **161**



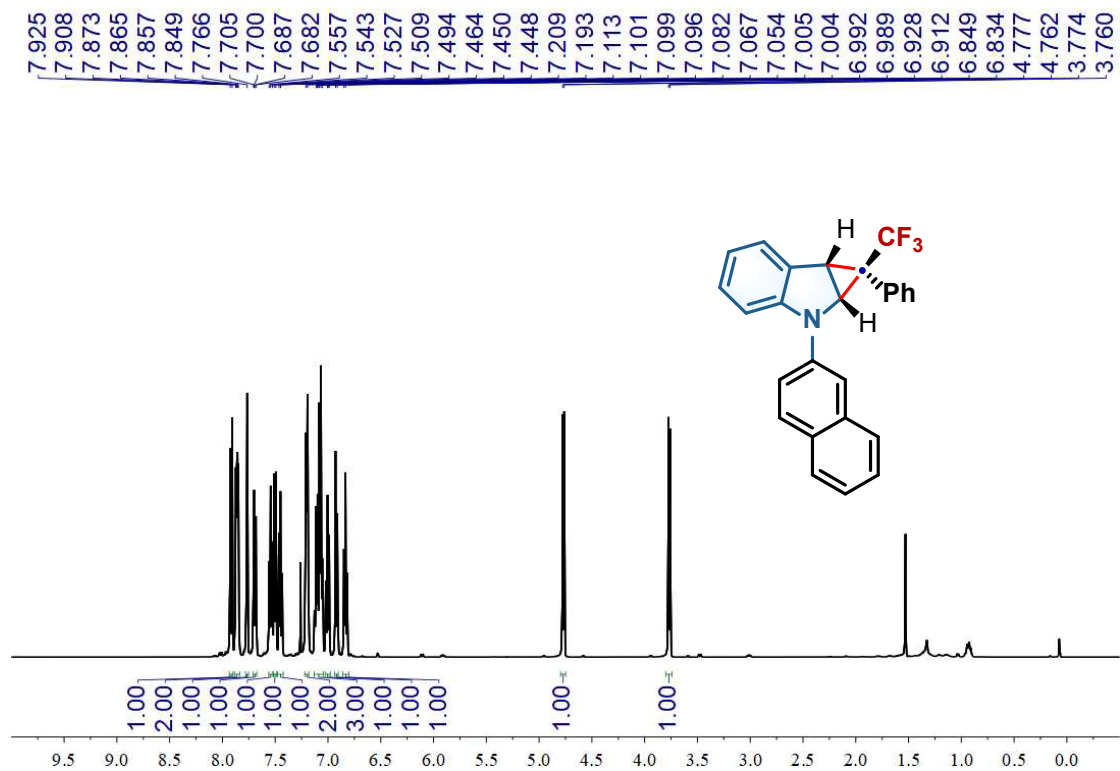
Supplementary Fig. 484. ¹H NMR (500 MHz, CDCl₃) spectrum of **162**



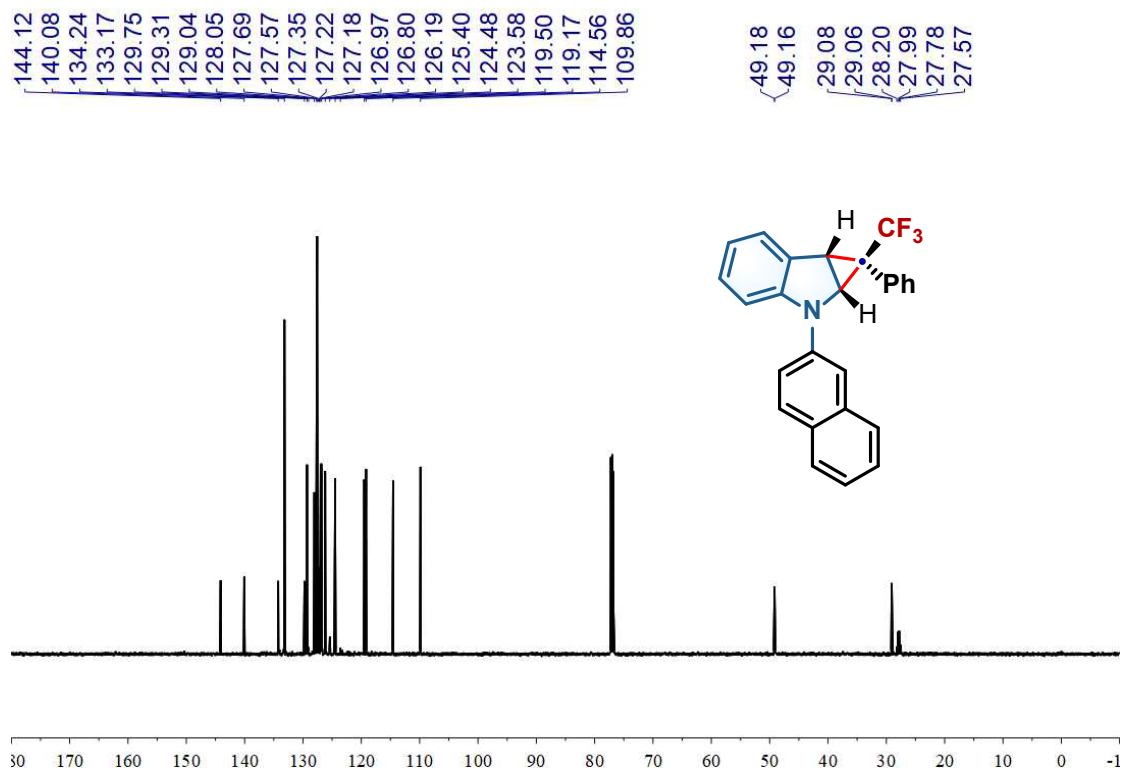
Supplementary Fig. 485. ¹³C NMR (125 MHz, CDCl₃) spectrum of **162**



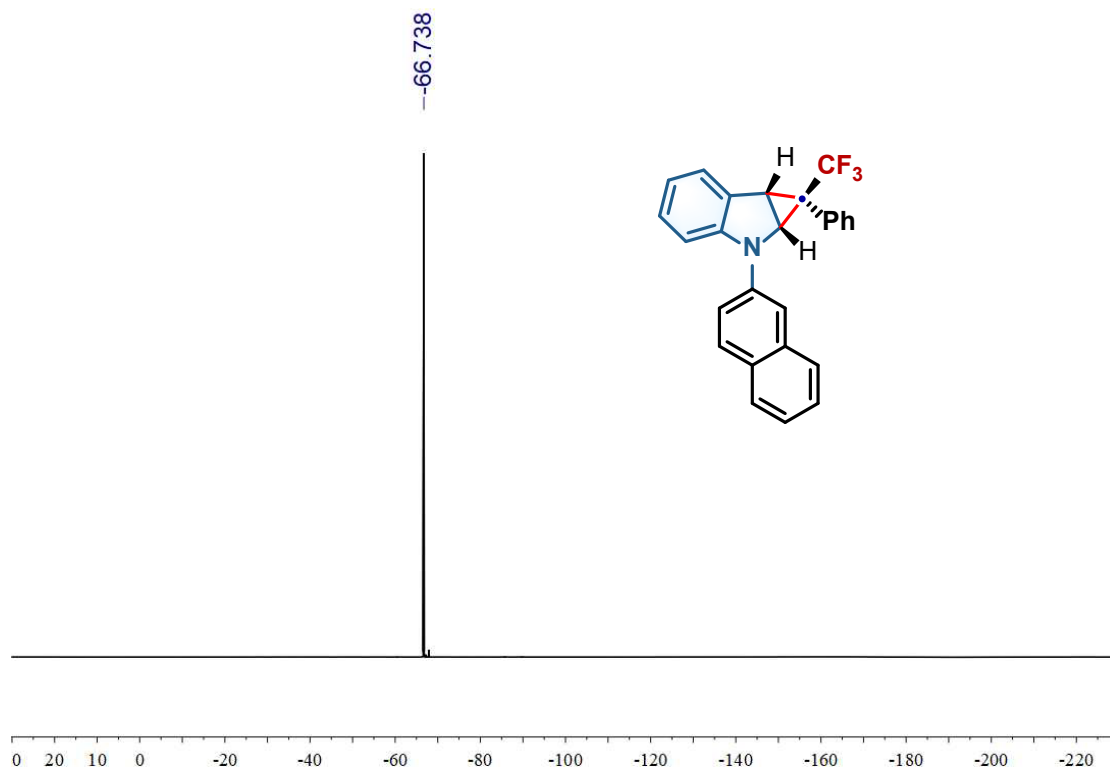
Supplementary Fig. 486. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of **162**



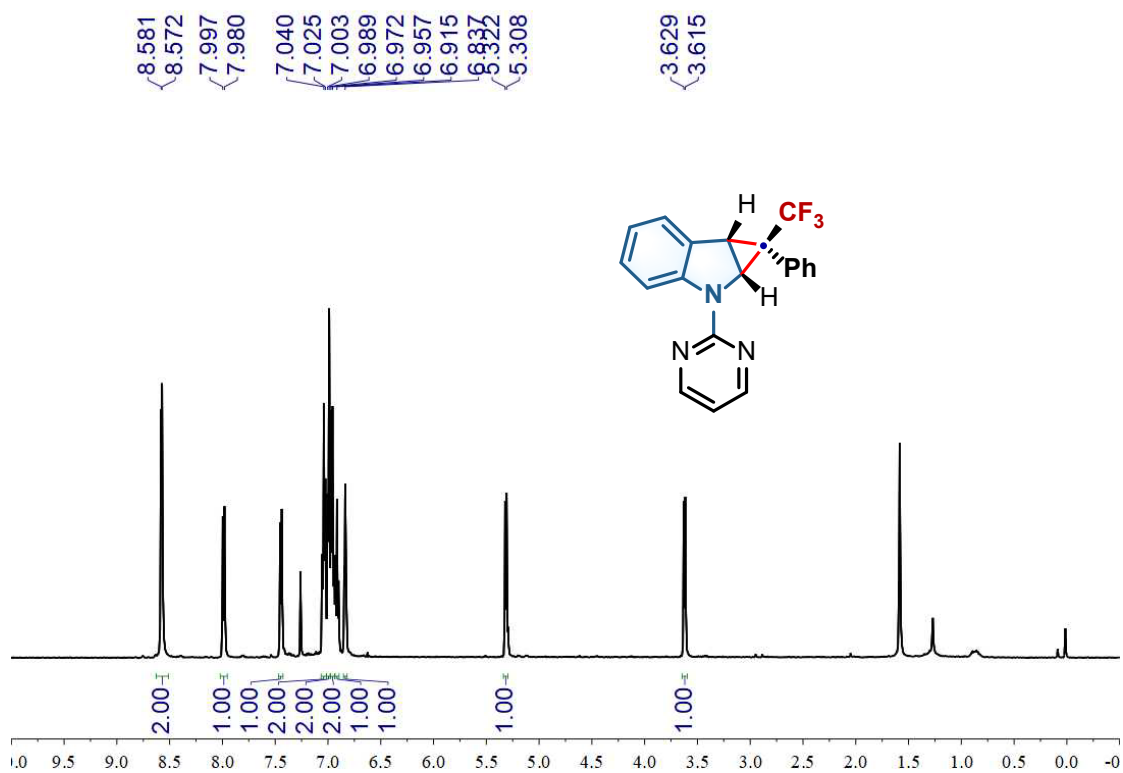
Supplementary Fig. 487. ¹H NMR (500 MHz, CDCl₃) spectrum of 163



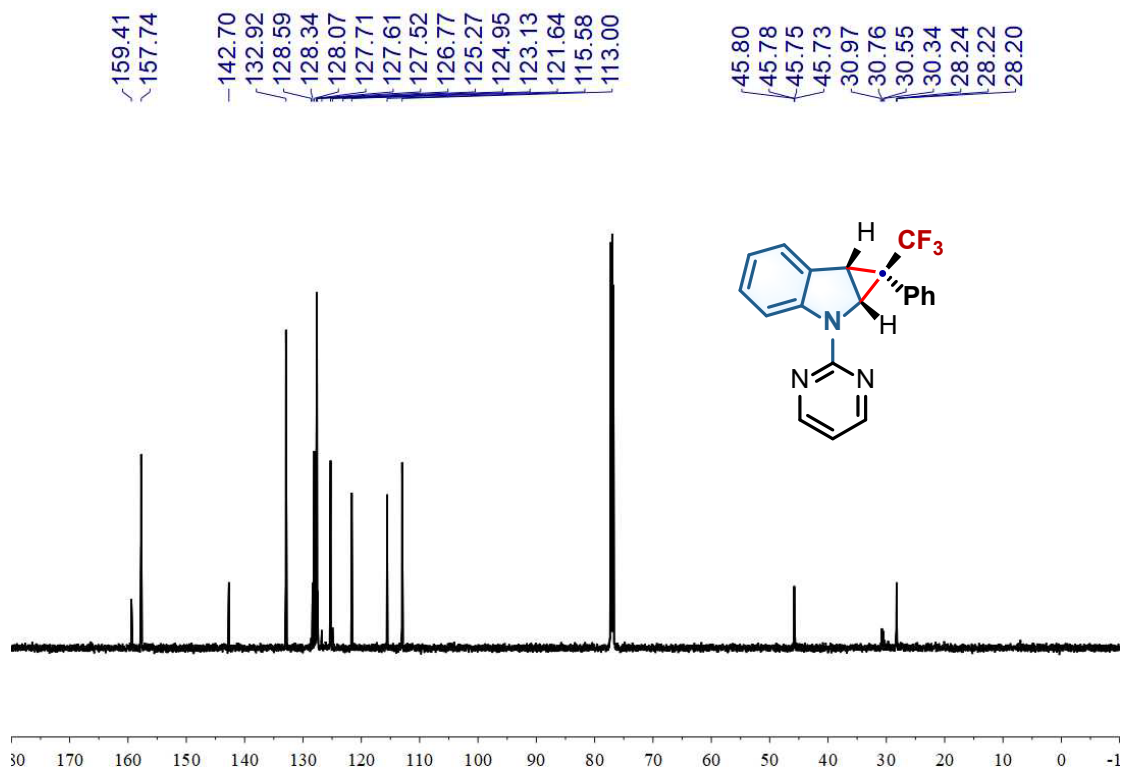
Supplementary Fig. 488. ¹³C NMR (150 MHz, CDCl₃) spectrum of 163



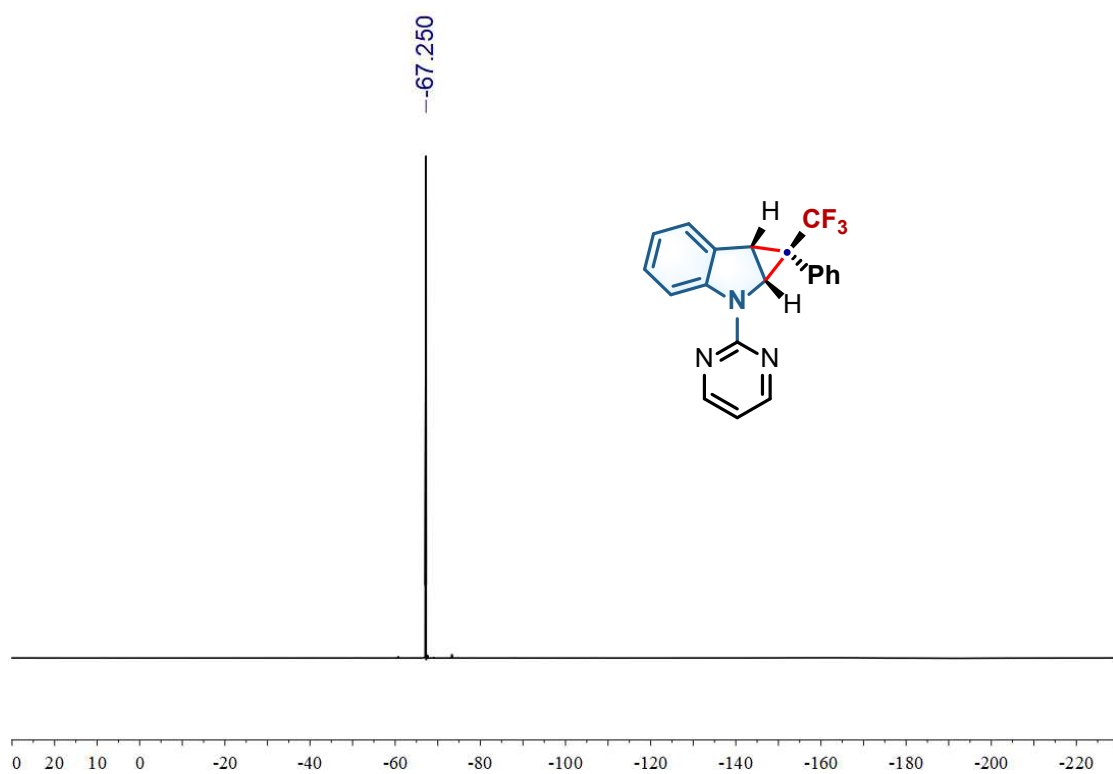
Supplementary Fig. 489. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **163**



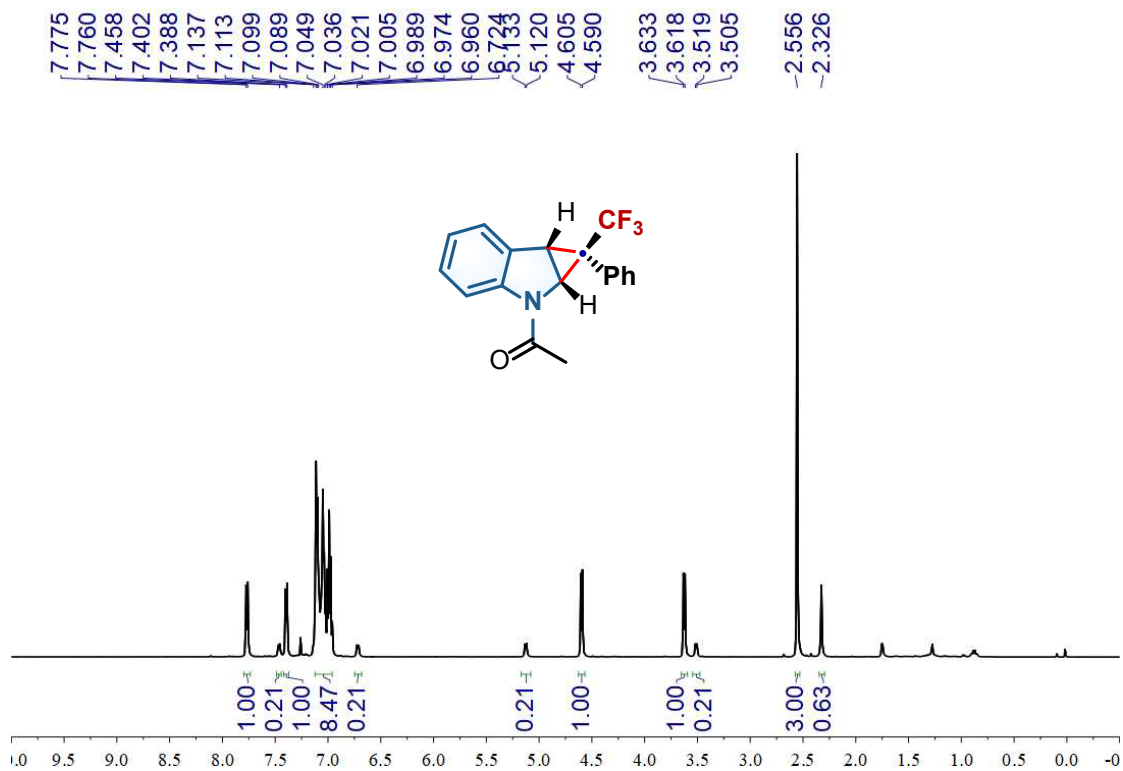
Supplementary Fig. 490. ^1H NMR (500 MHz, CDCl_3) spectrum of **164**



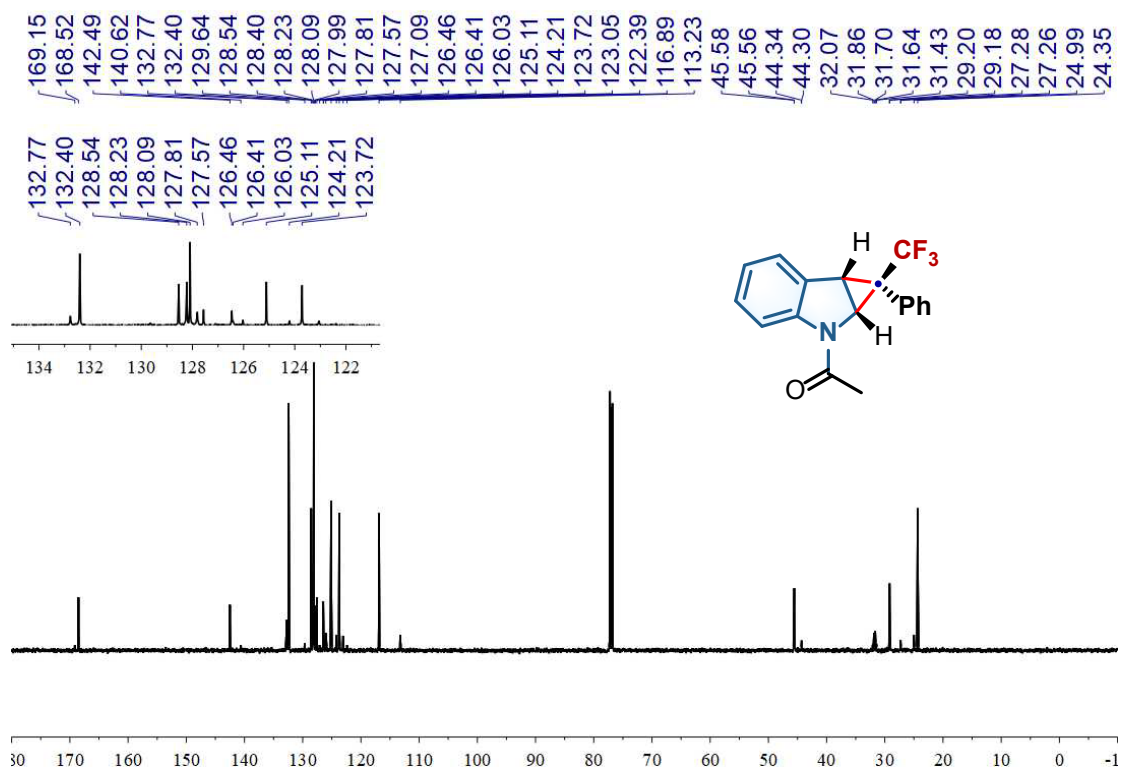
Supplementary Fig. 491. ¹³C NMR (150 MHz, CDCl₃) spectrum of 164



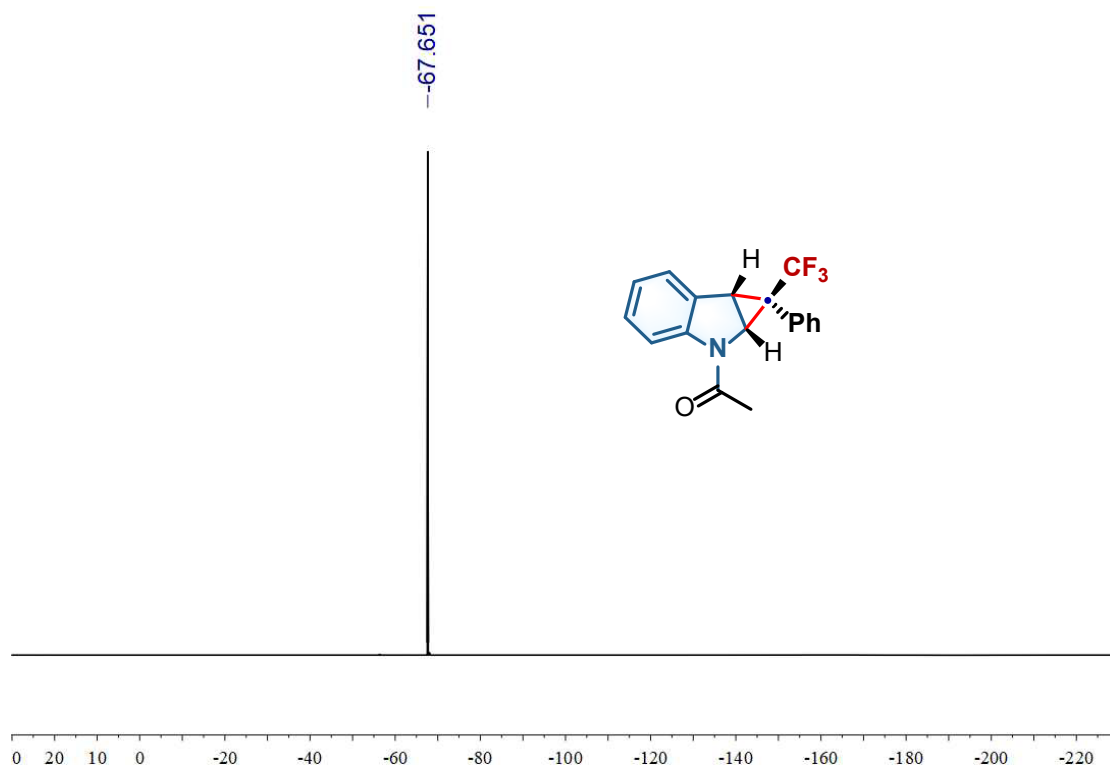
Supplementary Fig. 492. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 164



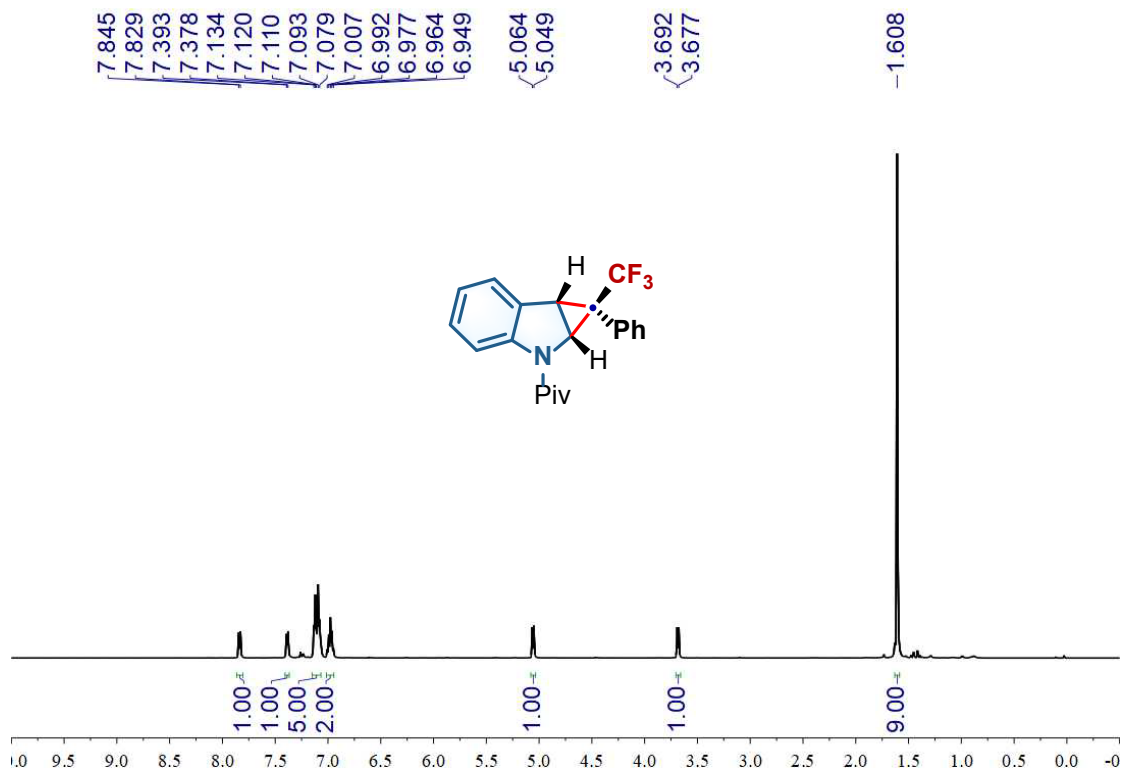
Supplementary Fig. 493. ¹H NMR (500 MHz, CDCl₃) spectrum of 165



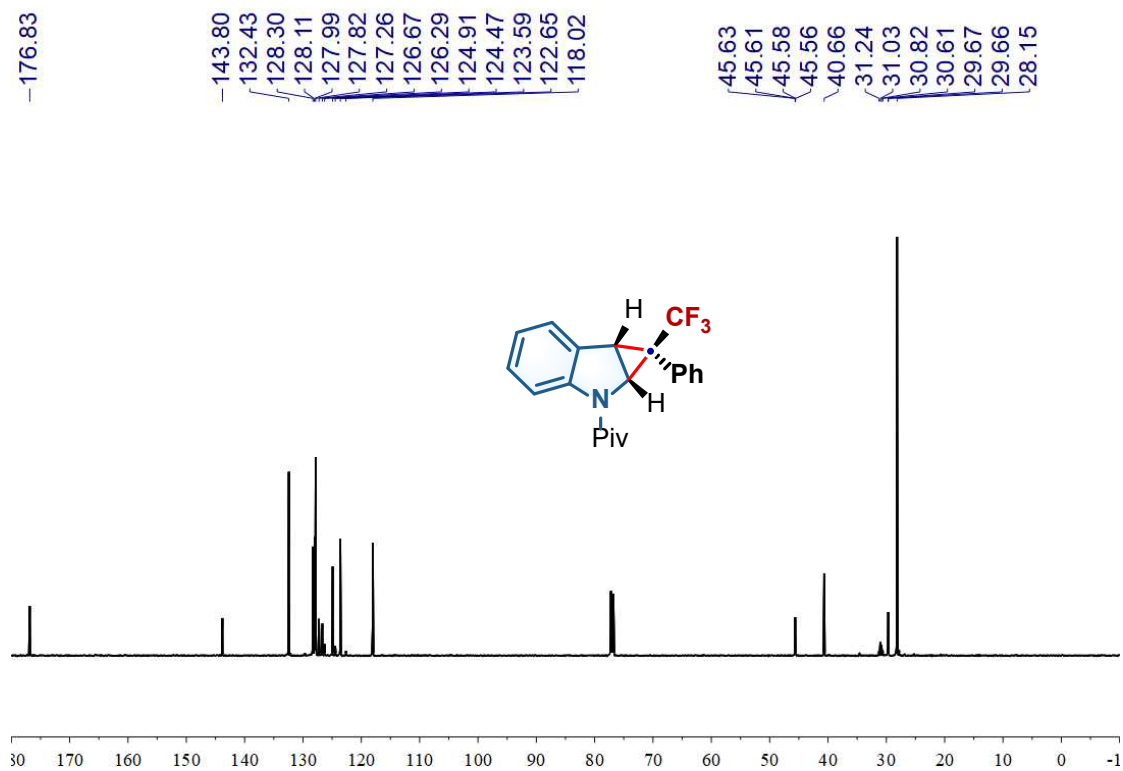
Supplementary Fig. 494. ¹³C NMR (150 MHz, CDCl₃) spectrum of 165



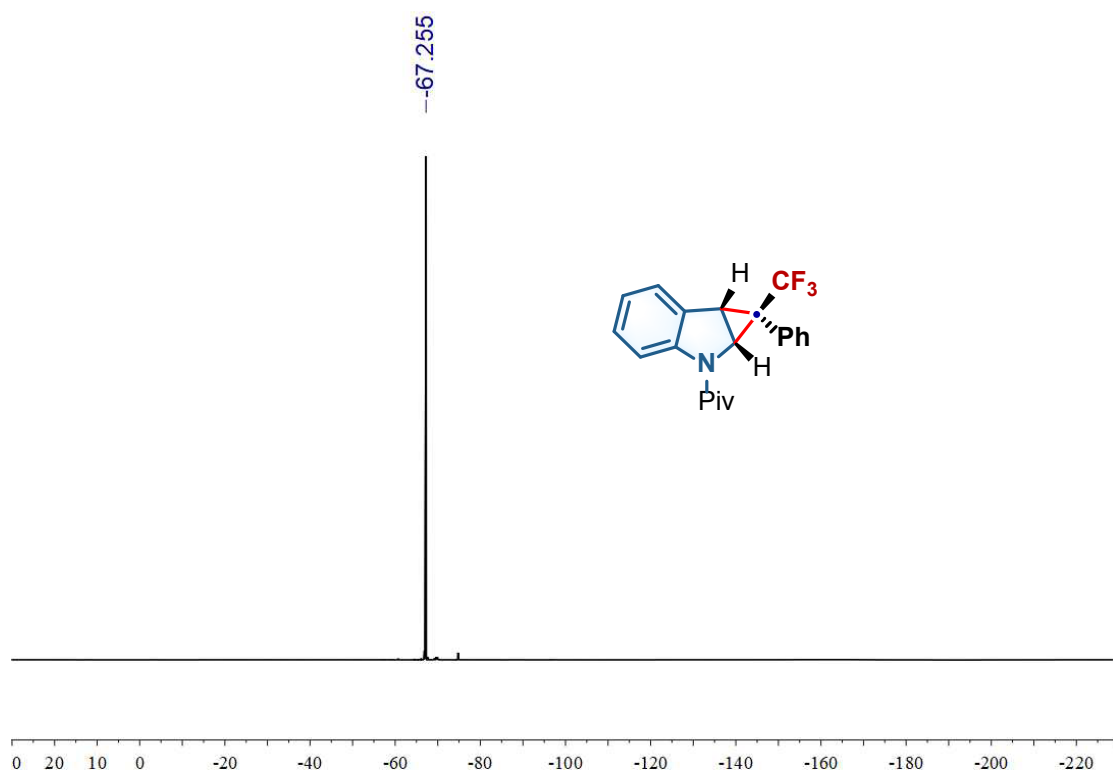
Supplementary Fig. 495. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **165**



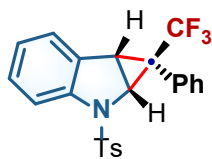
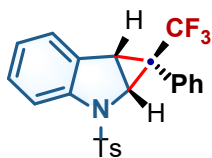
Supplementary Fig. 496. ^1H NMR (500 MHz, CDCl_3) spectrum of **166**

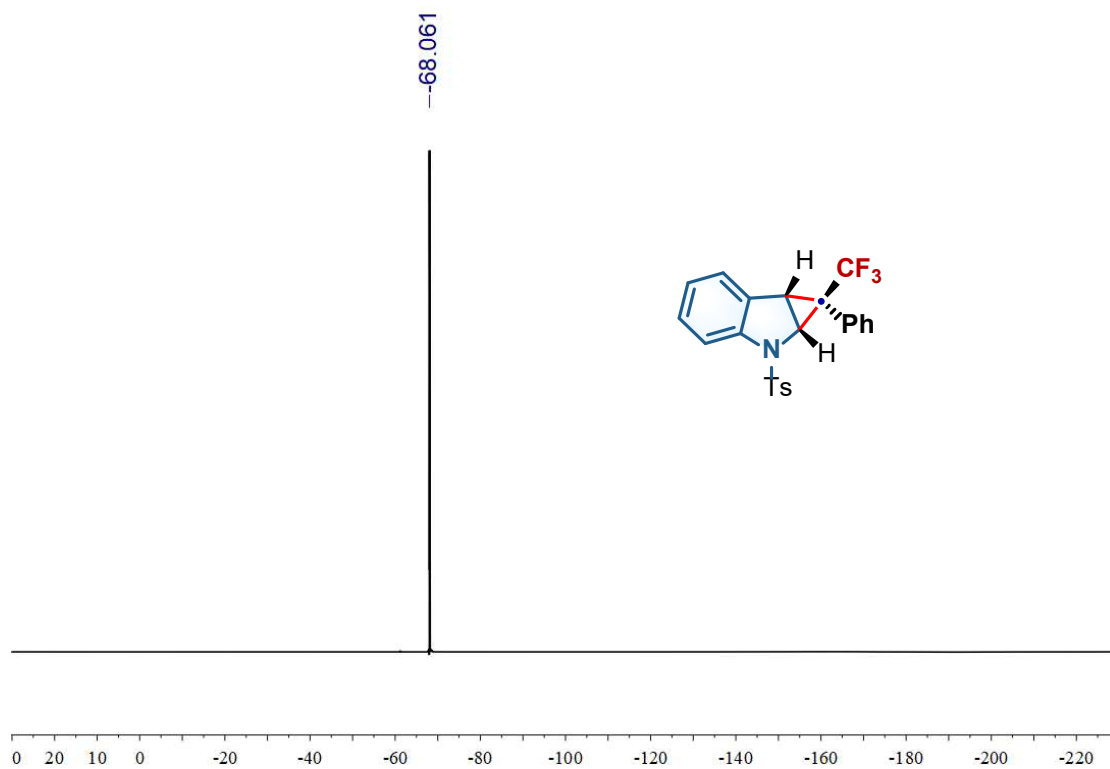


Supplementary Fig. 497. ¹³C NMR (150 MHz, CDCl₃) spectrum of **166**

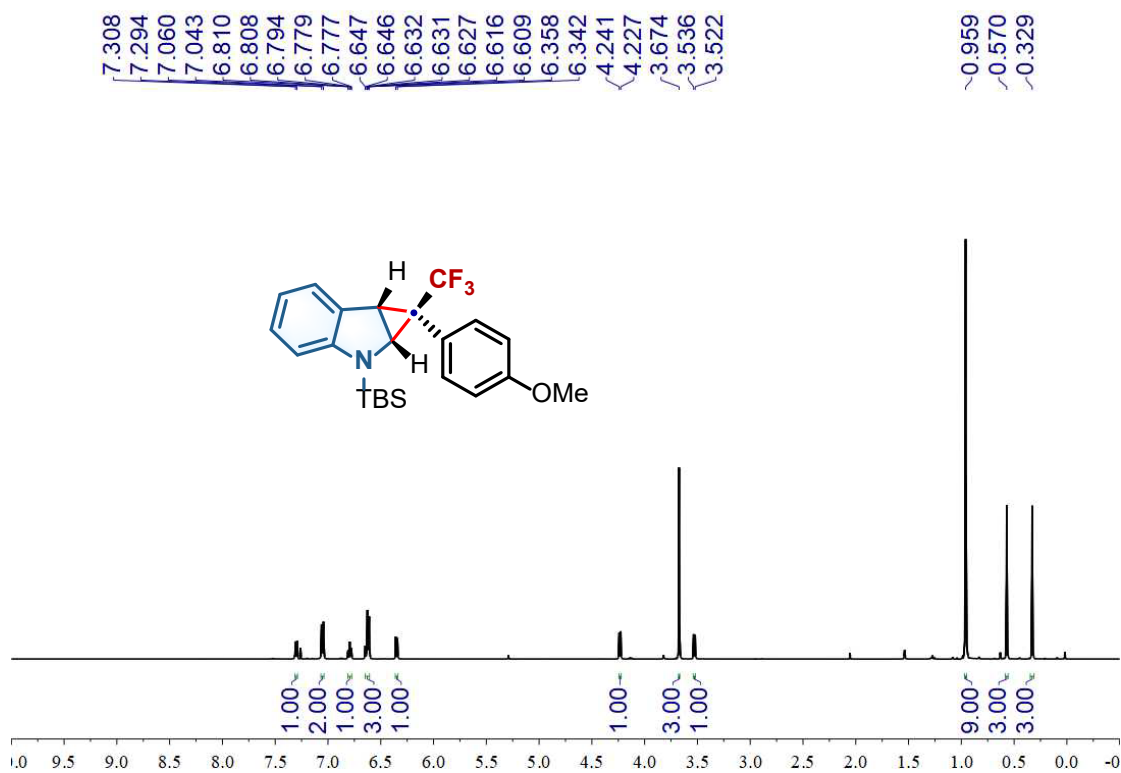


Supplementary Fig. 498. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **166**

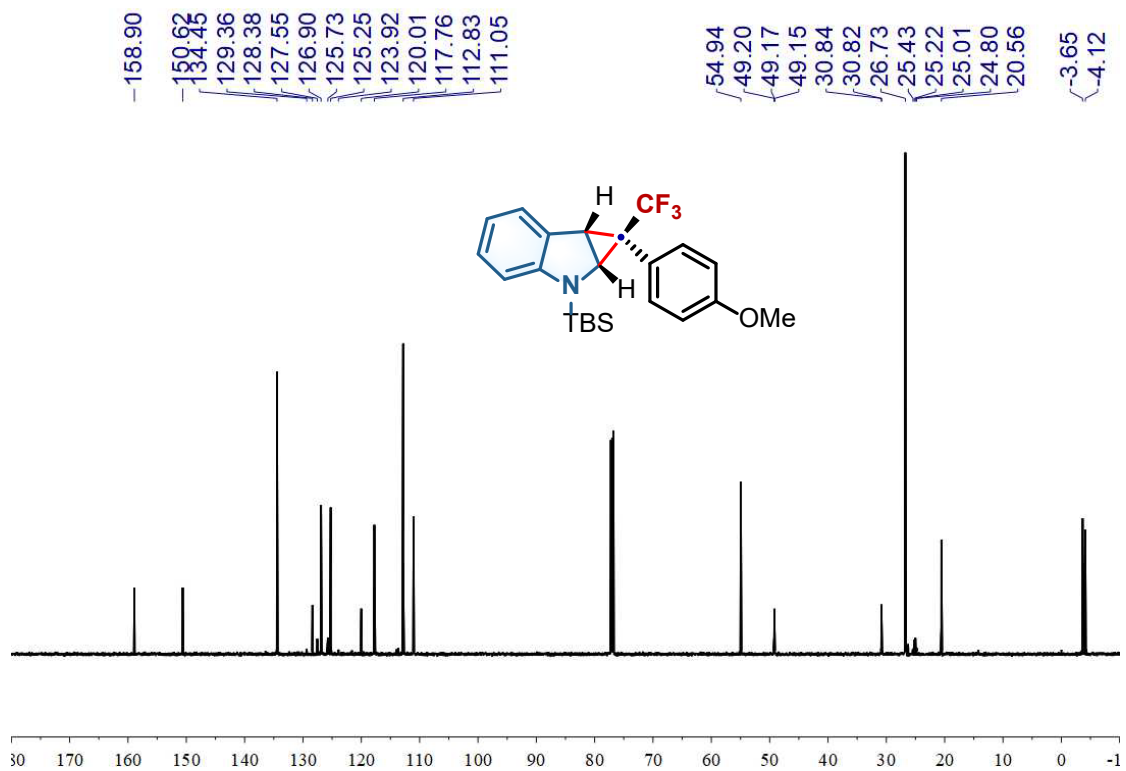




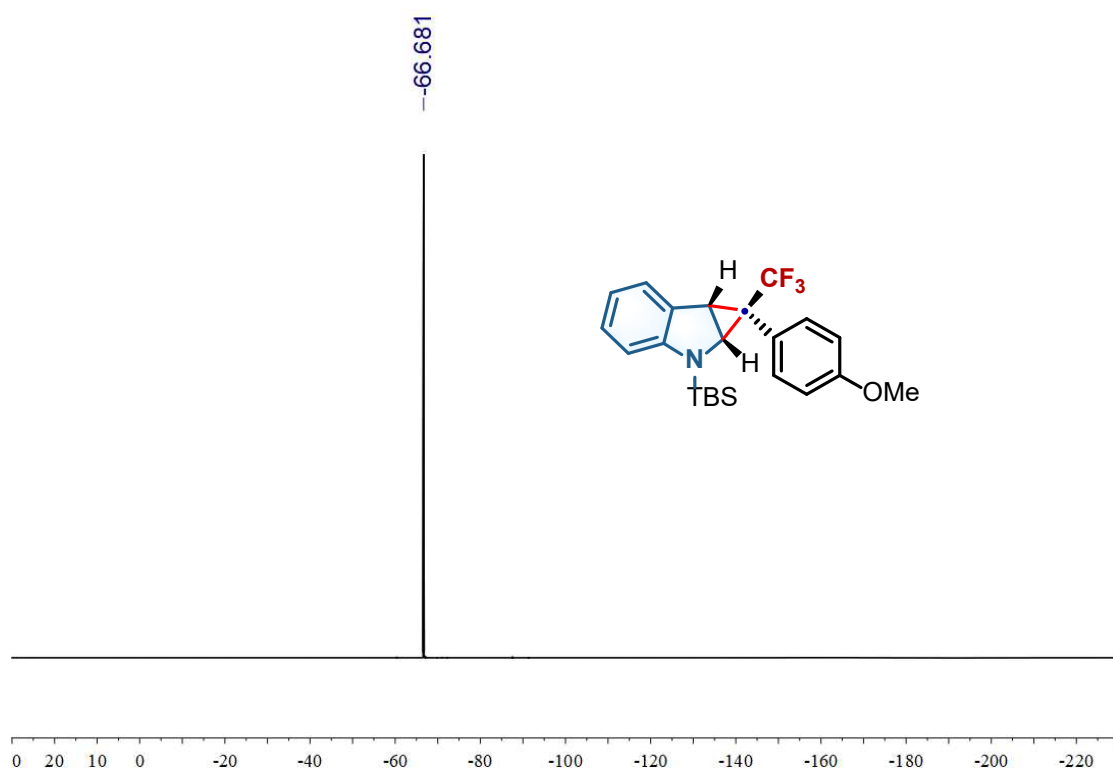
Supplementary Fig. 501. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **167**



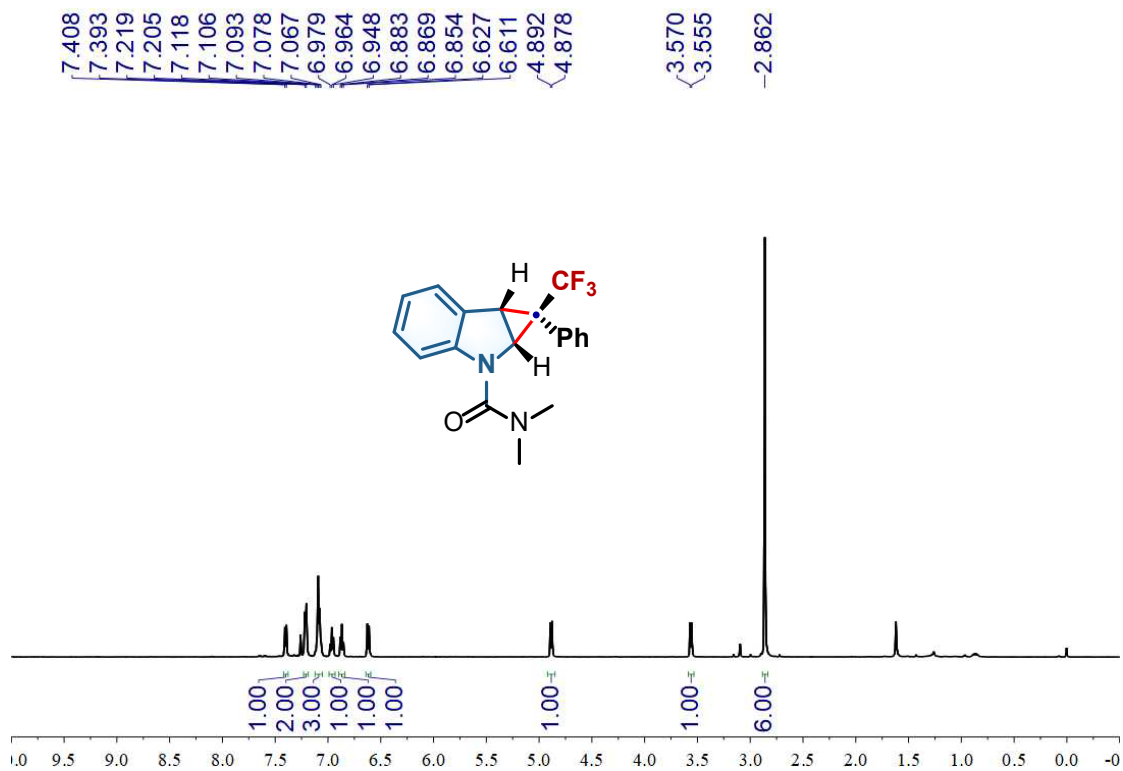
Supplementary Fig. 502. ^1H NMR (500 MHz, CDCl_3) spectrum of **168**



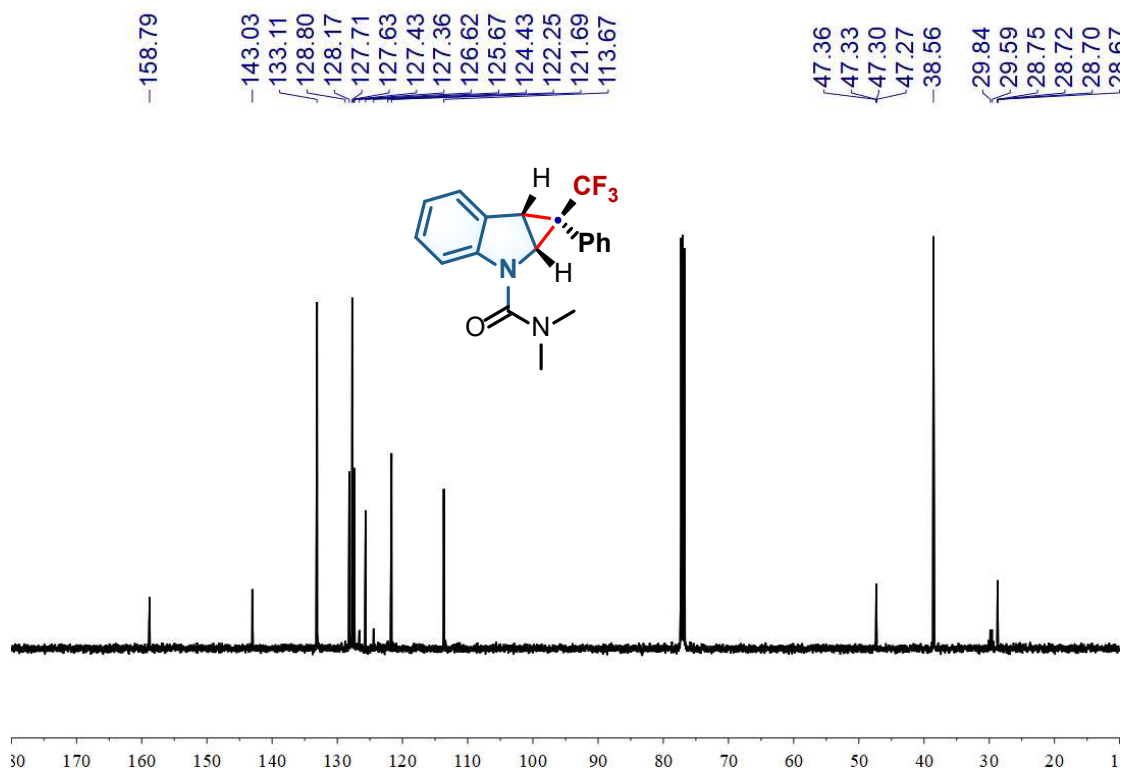
Supplementary Fig. 503. ¹³C NMR (150 MHz, CDCl₃) spectrum of **168**



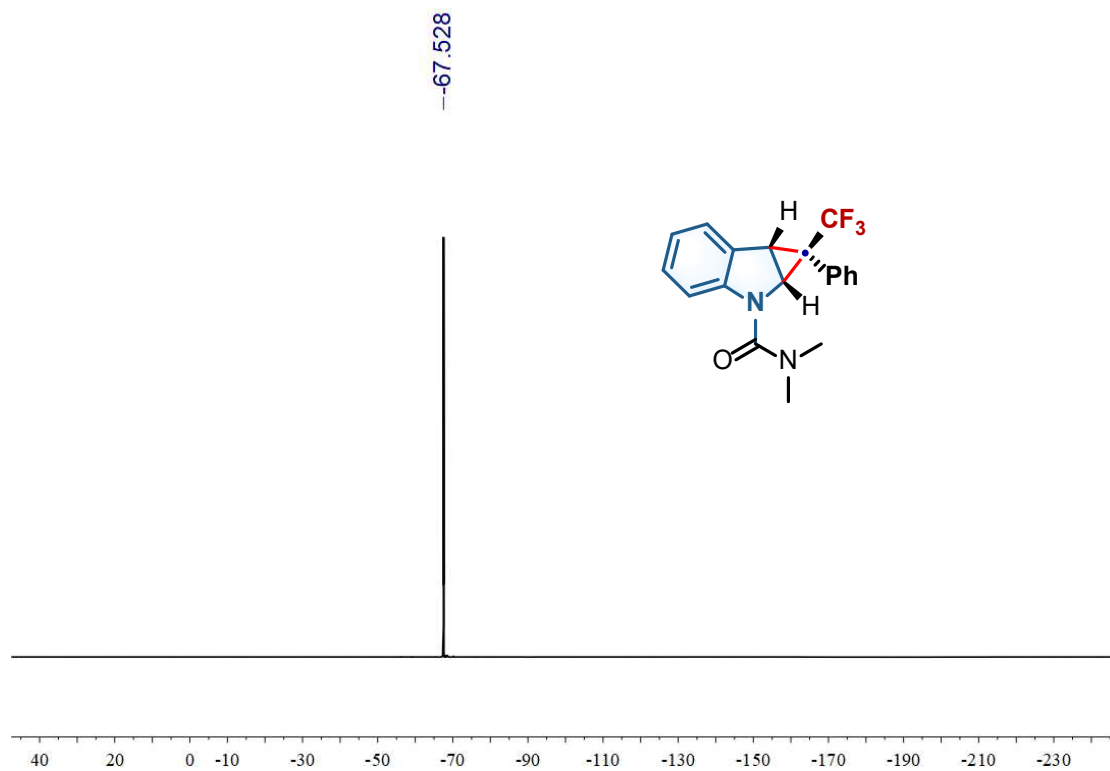
Supplementary Fig. 504. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of **168**



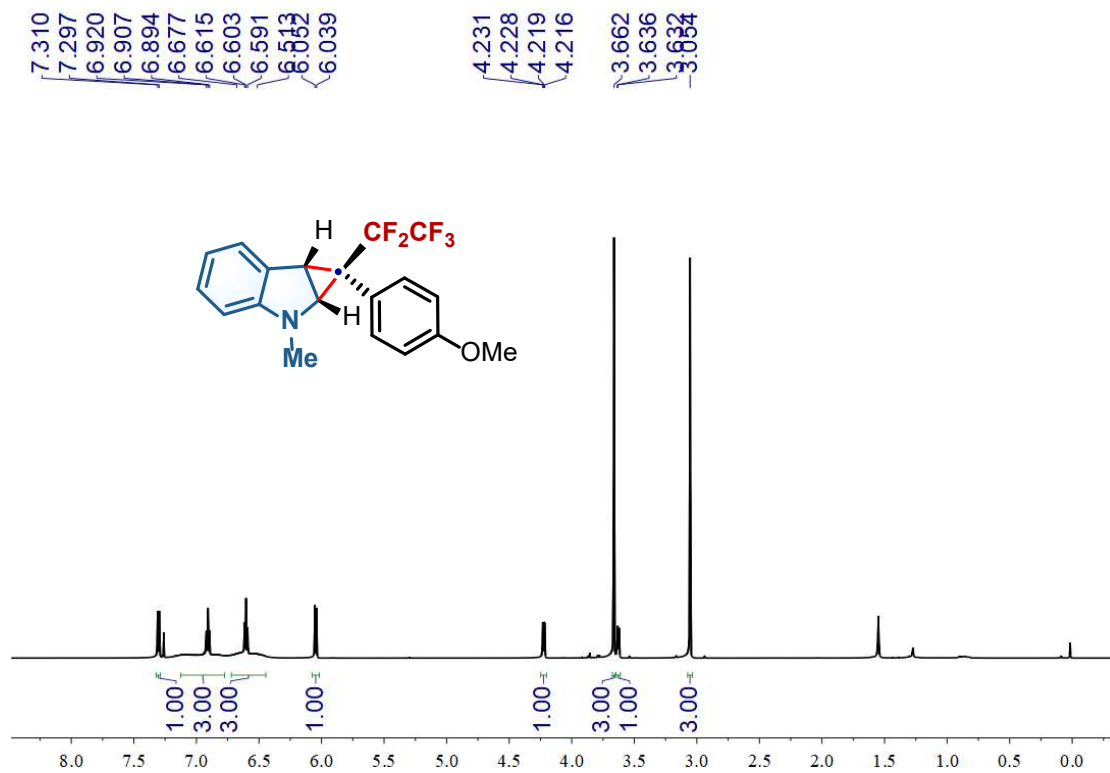
Supplementary Fig. 505. ¹H NMR (500 MHz, CDCl₃) spectrum of **169**



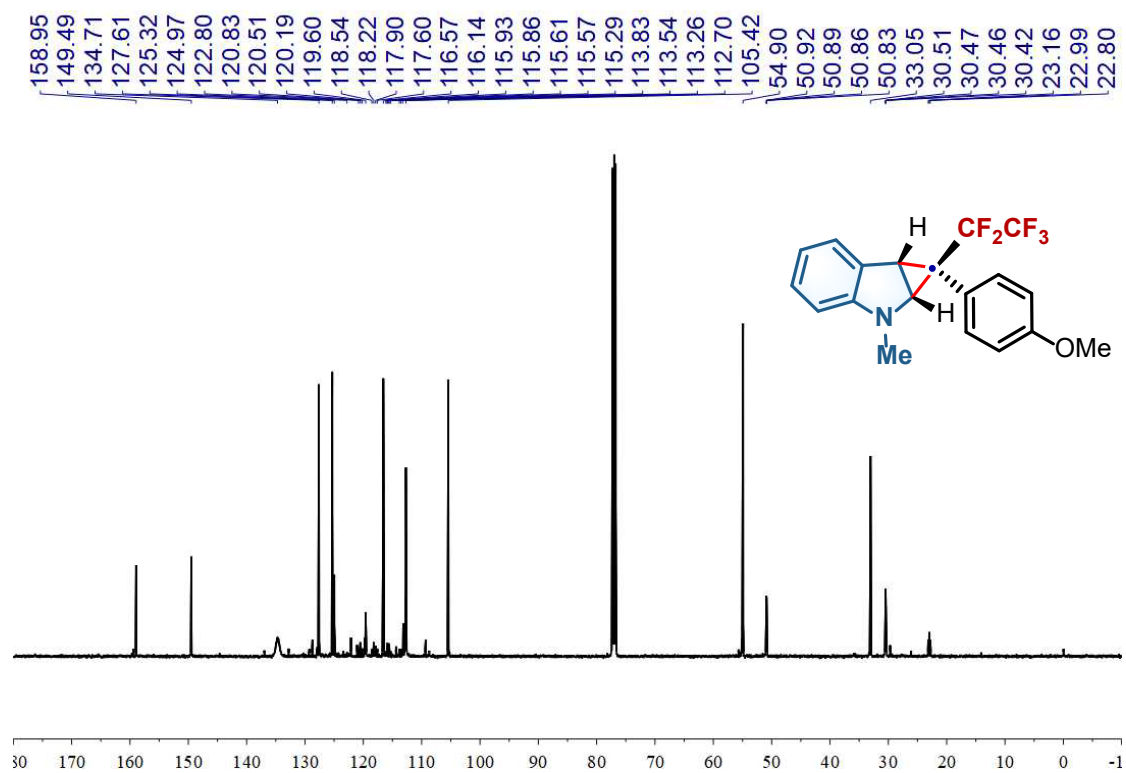
Supplementary Fig. 506. ¹³C NMR (125 MHz, CDCl₃) spectrum of **169**



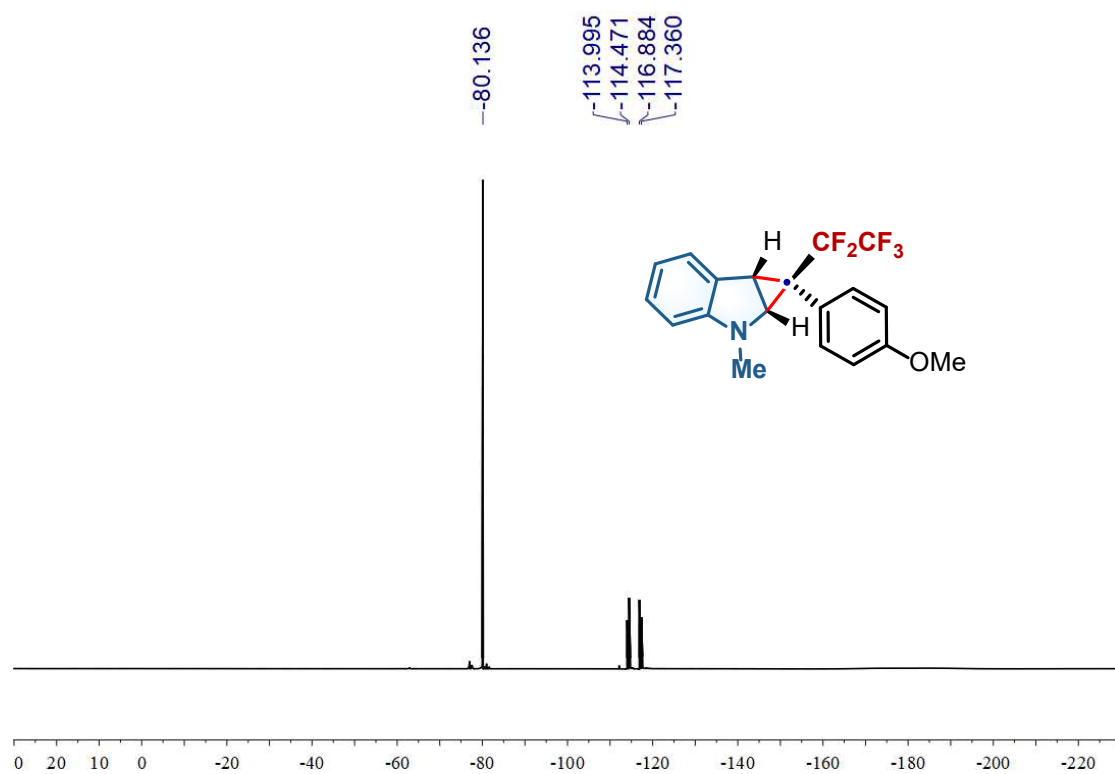
Supplementary Fig. 507. ^{19}F NMR (470 MHz, CDCl_3) spectrum of **169**



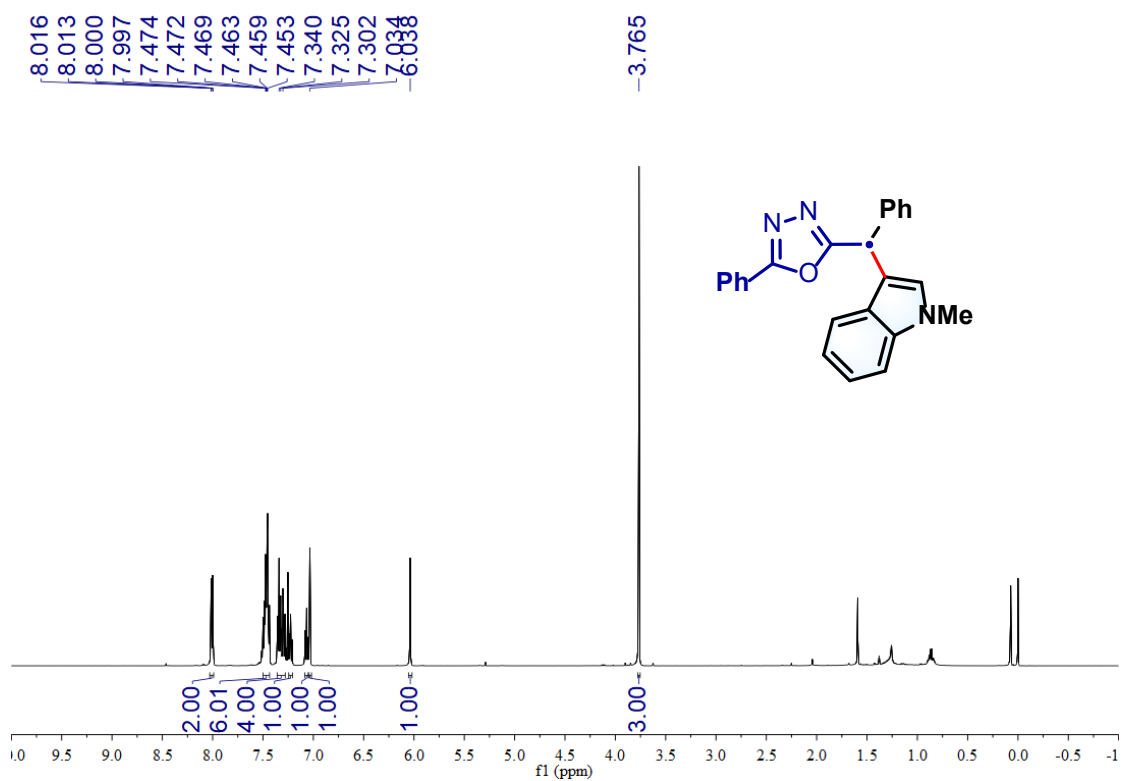
Supplementary Fig. 508. ^1H NMR (600 MHz, CDCl_3) spectrum of **170**



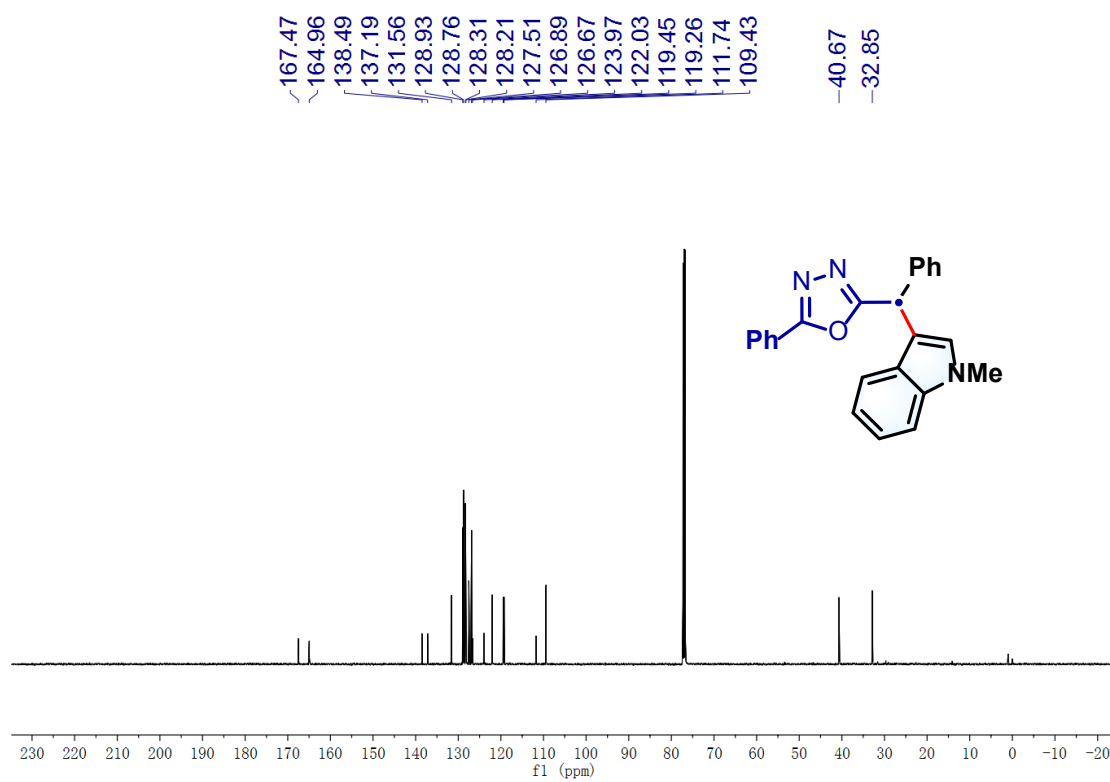
Supplementary Fig. 509. ¹³C NMR (125 MHz, CDCl₃) spectrum of 170



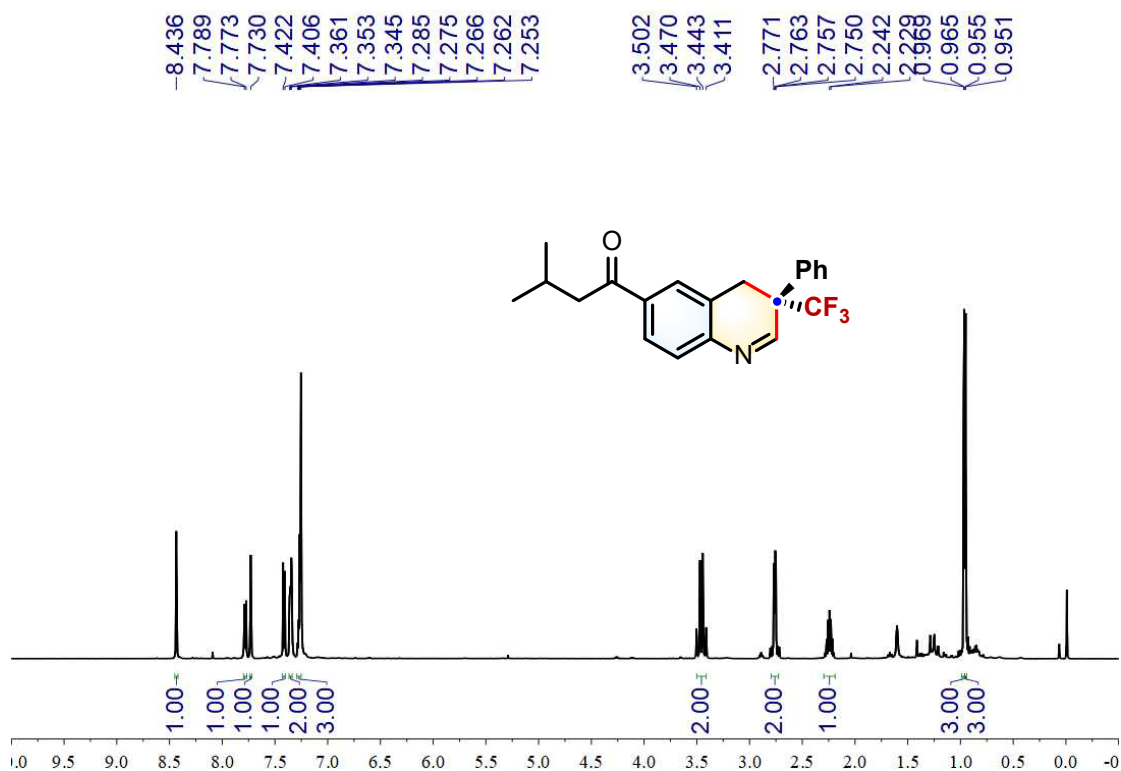
Supplementary Fig. 510. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 170



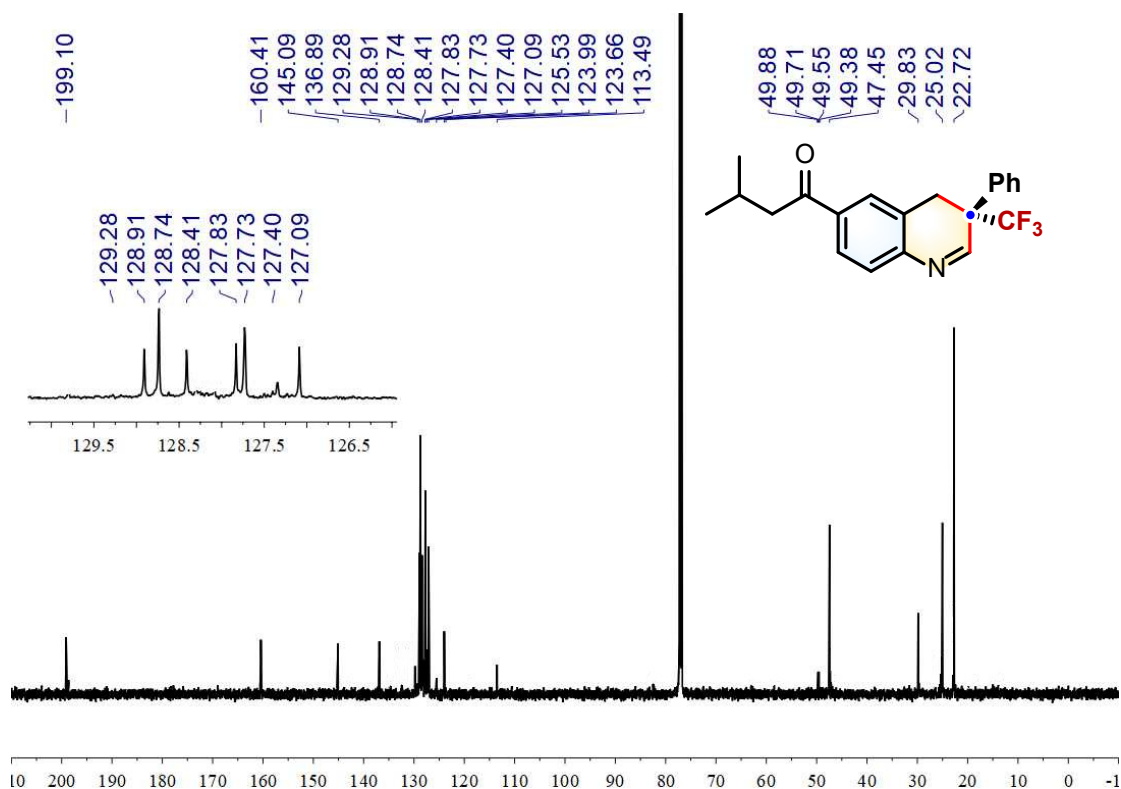
Supplementary Fig. 511. ¹H NMR (500 MHz, CDCl₃) spectrum of 171



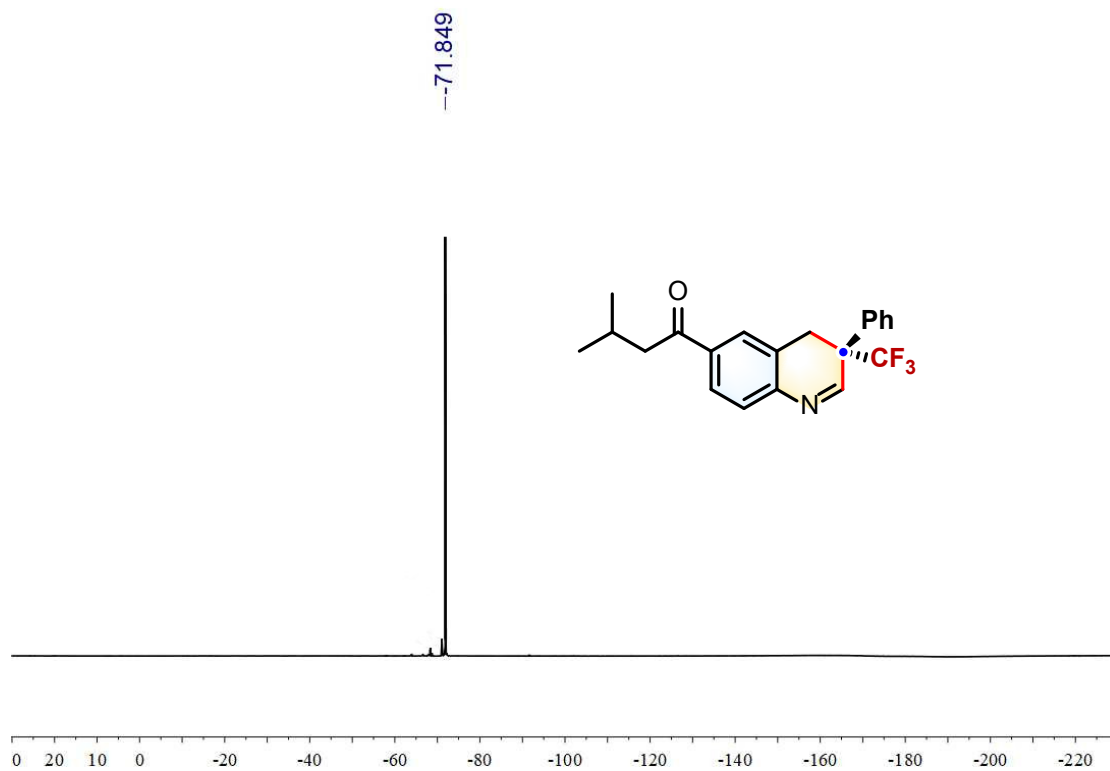
Supplementary Fig. 512. ¹³C NMR (125 MHz, CDCl₃) spectrum of 171



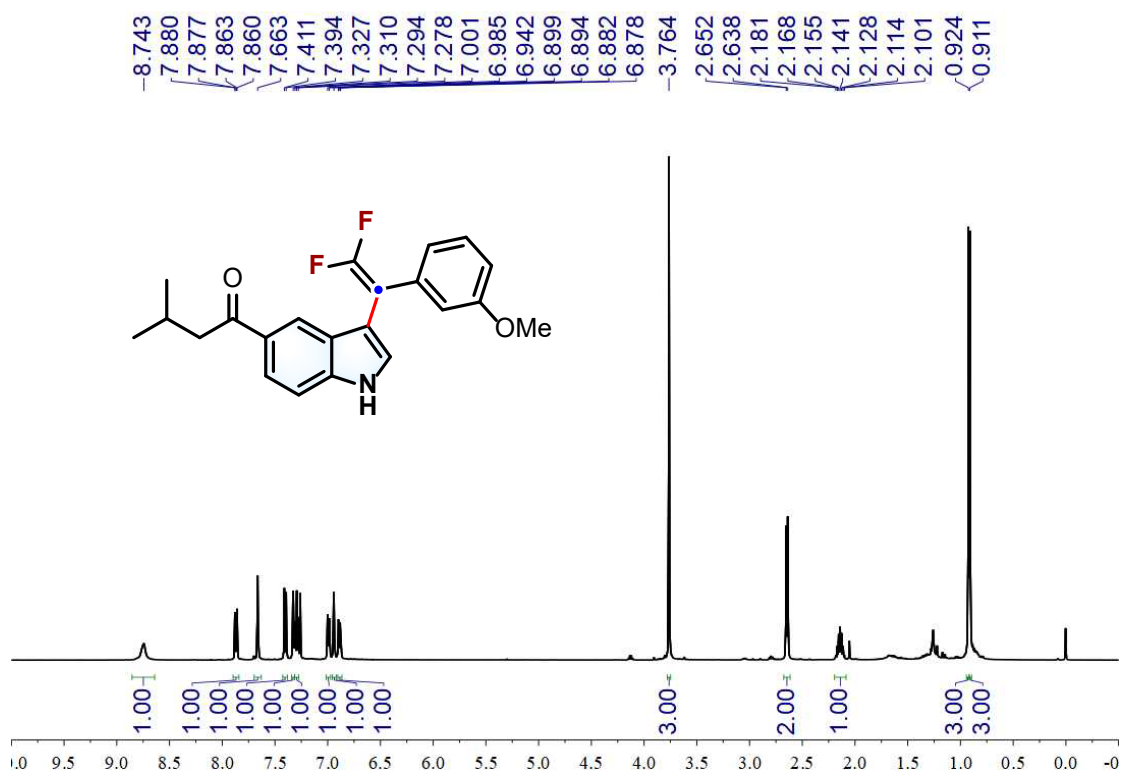
Supplementary Fig. 513. ¹H NMR (500 MHz, CDCl₃) spectrum of 172



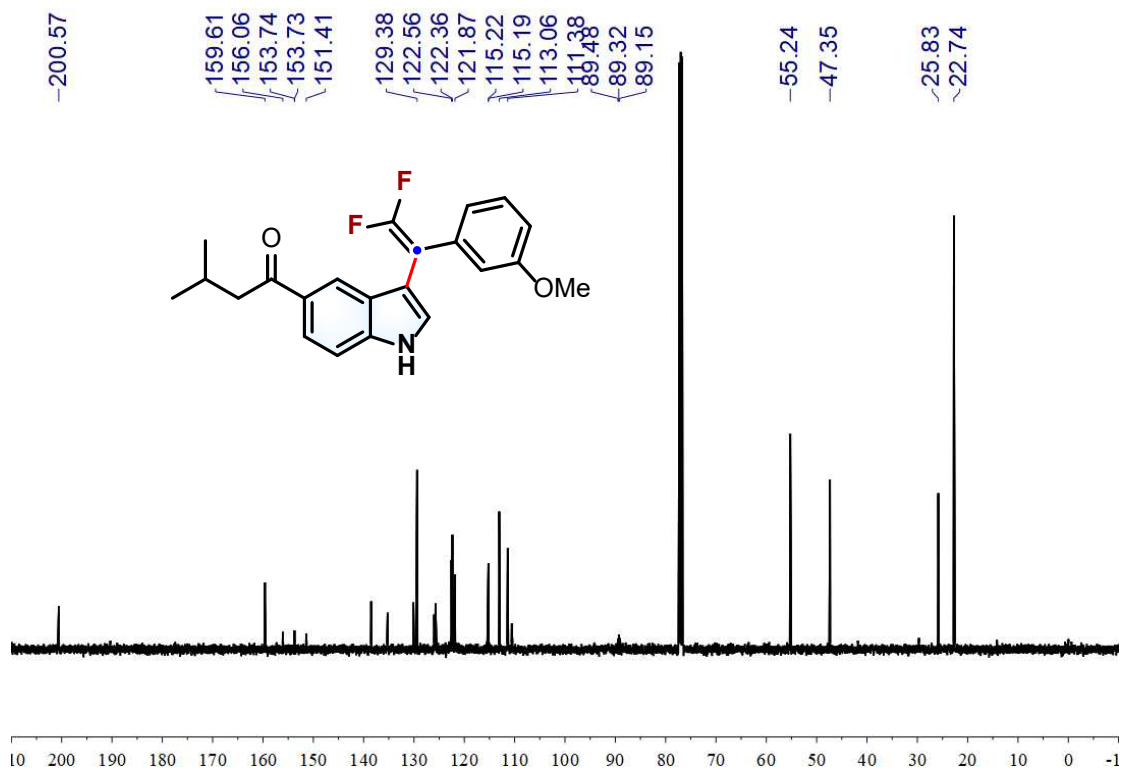
Supplementary Fig. 514. ¹³C NMR (150 MHz, CDCl₃) spectrum of 172



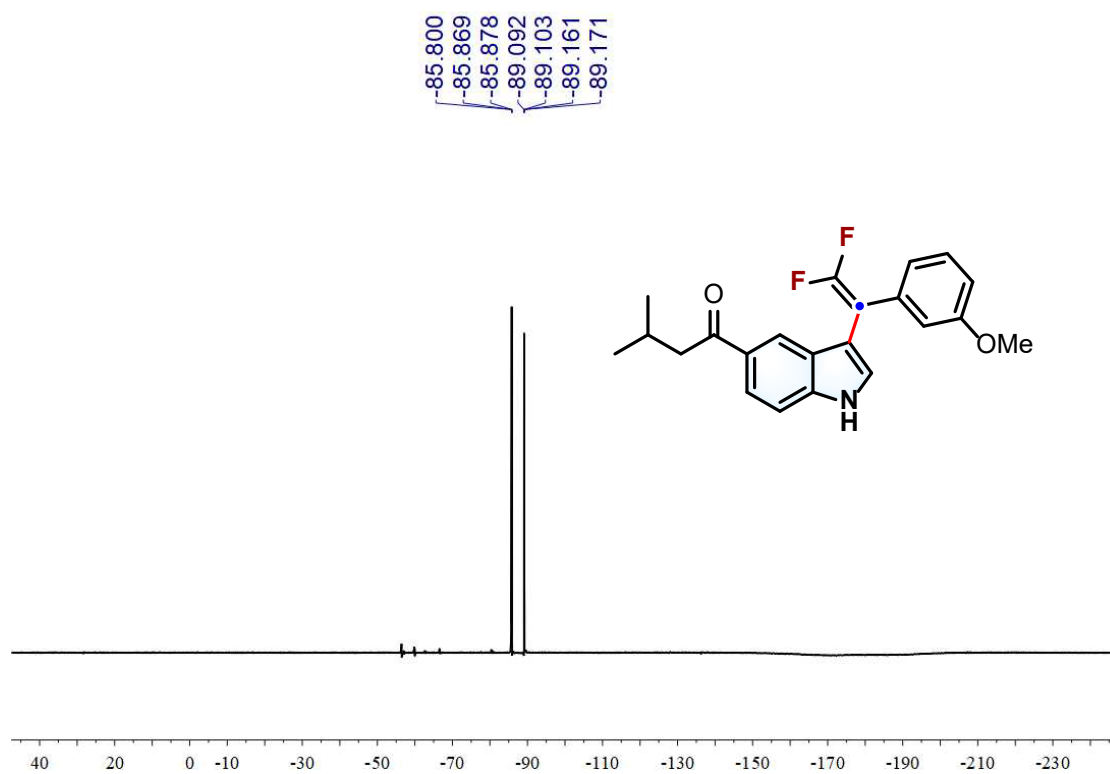
Supplementary Fig. 515. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 172



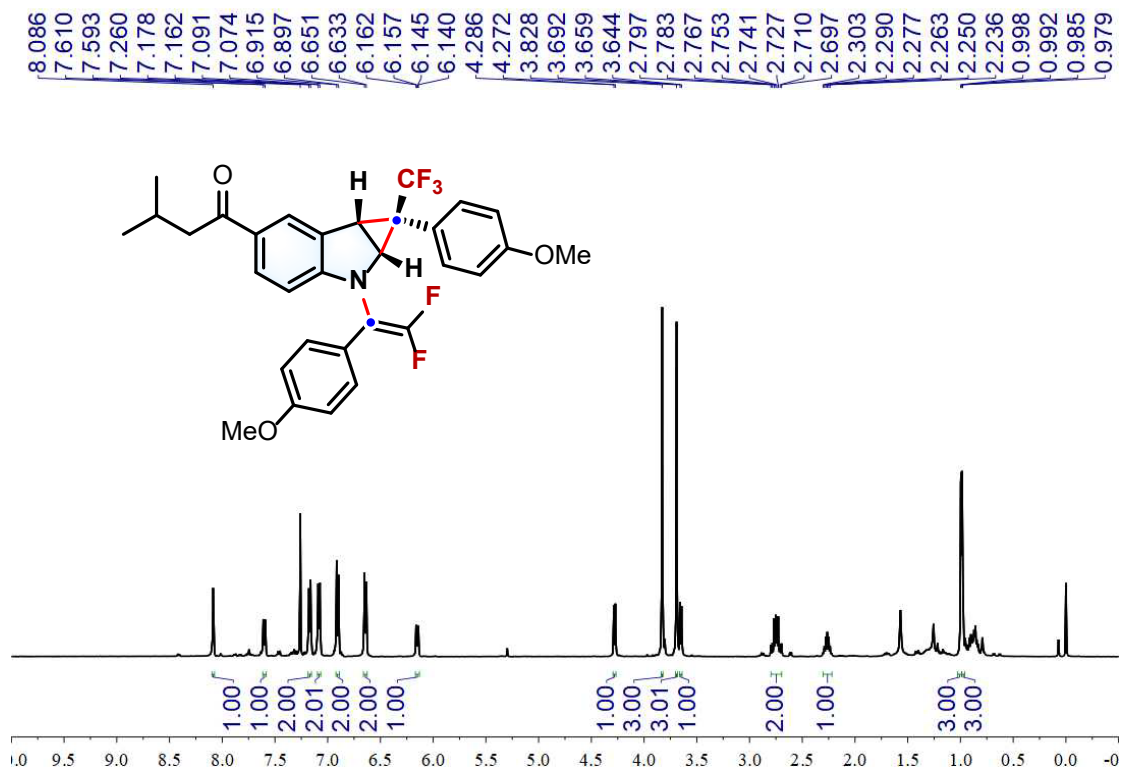
Supplementary Fig. 516. ^1H NMR (500 MHz, CDCl_3) spectrum of 173



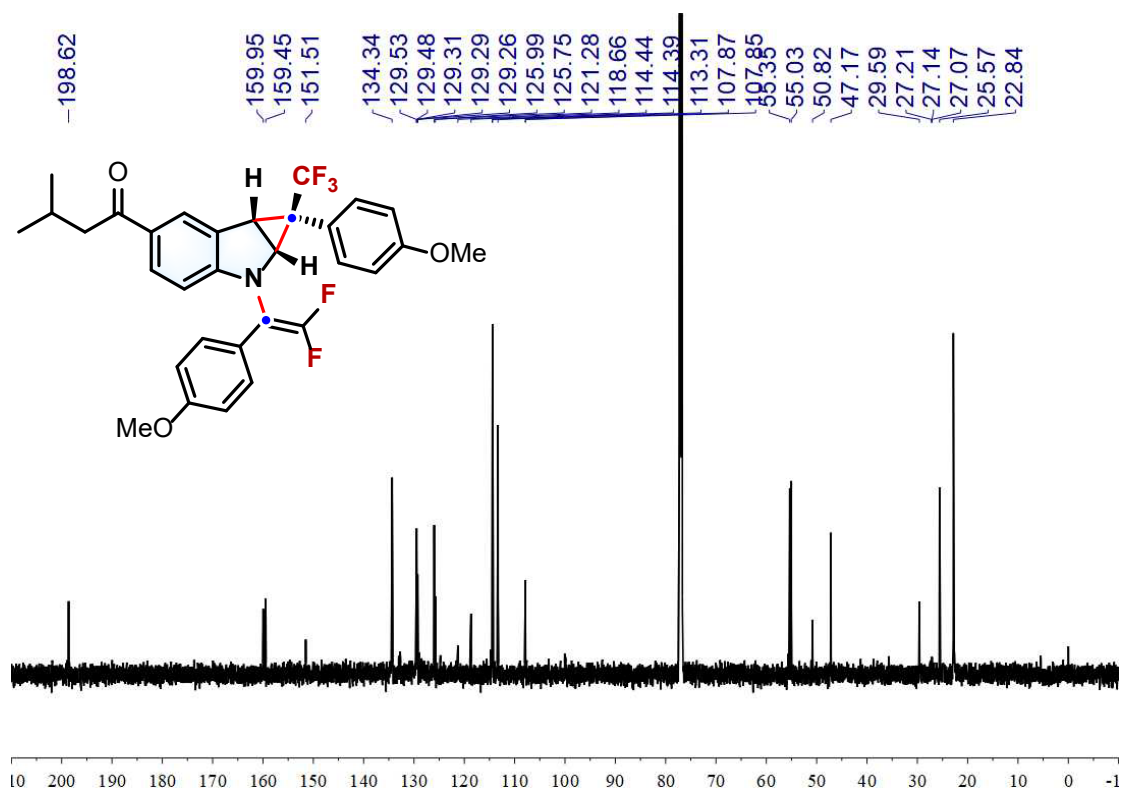
Supplementary Fig. 517. ¹³C NMR (125 MHz, CDCl₃) spectrum of 173



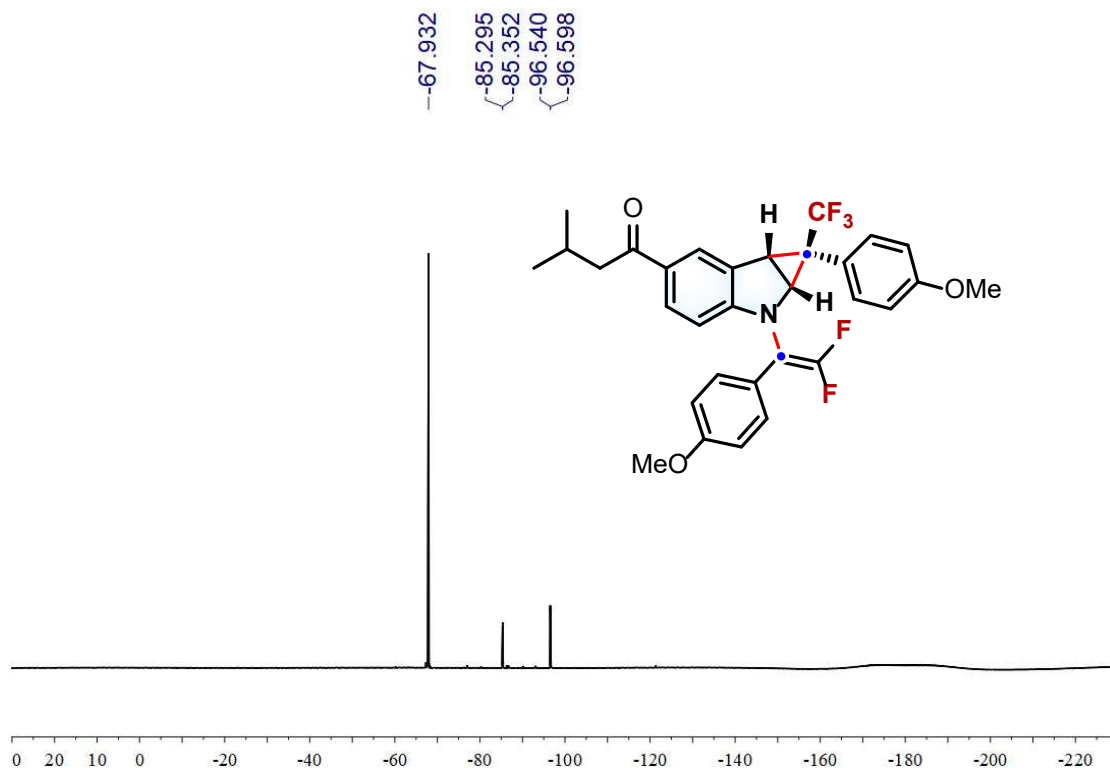
Supplementary Fig. 518. ¹⁹F NMR (470 MHz, CDCl₃) spectrum of 173



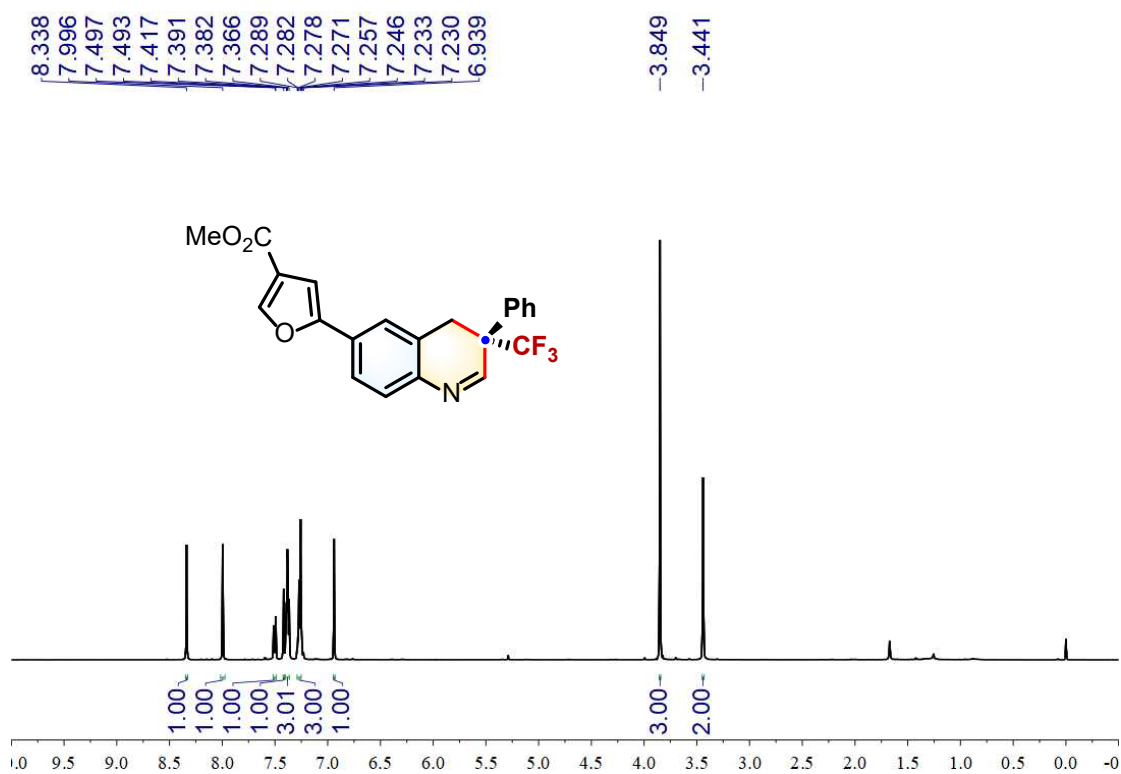
Supplementary Fig. 519. ^1H NMR (500 MHz, CDCl_3) spectrum of 174



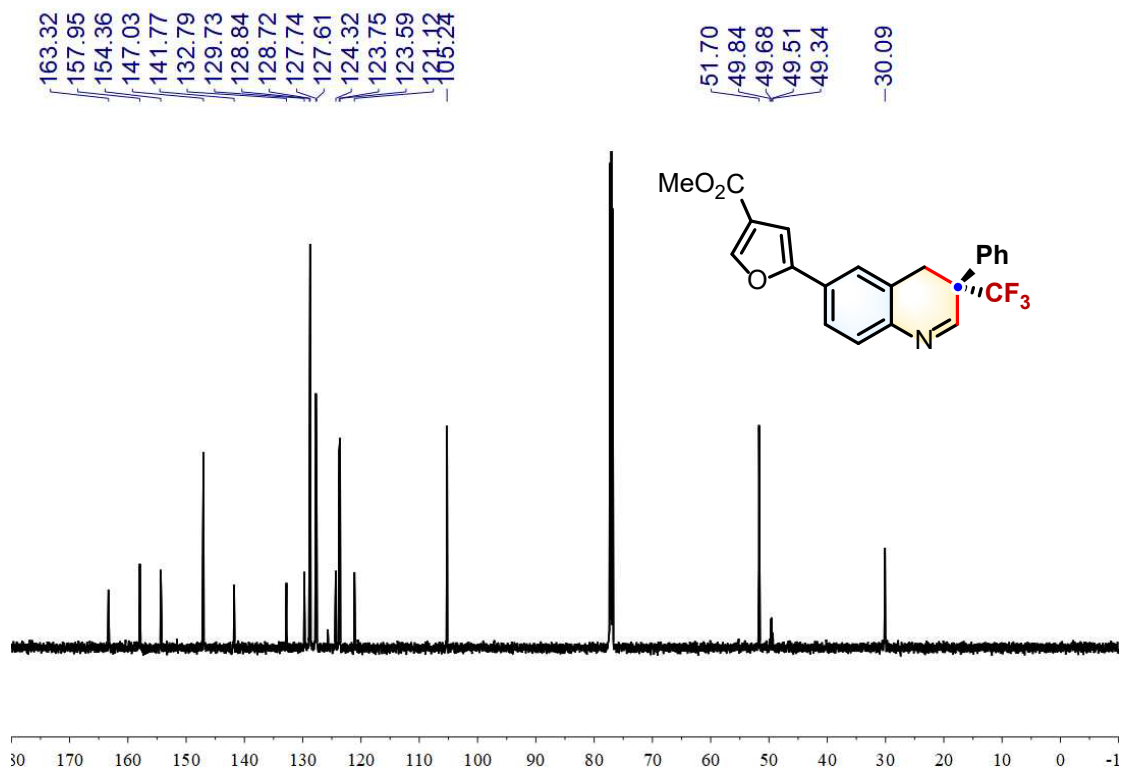
Supplementary Fig. 520. ^{13}C NMR (150 MHz, CDCl_3) spectrum of 174



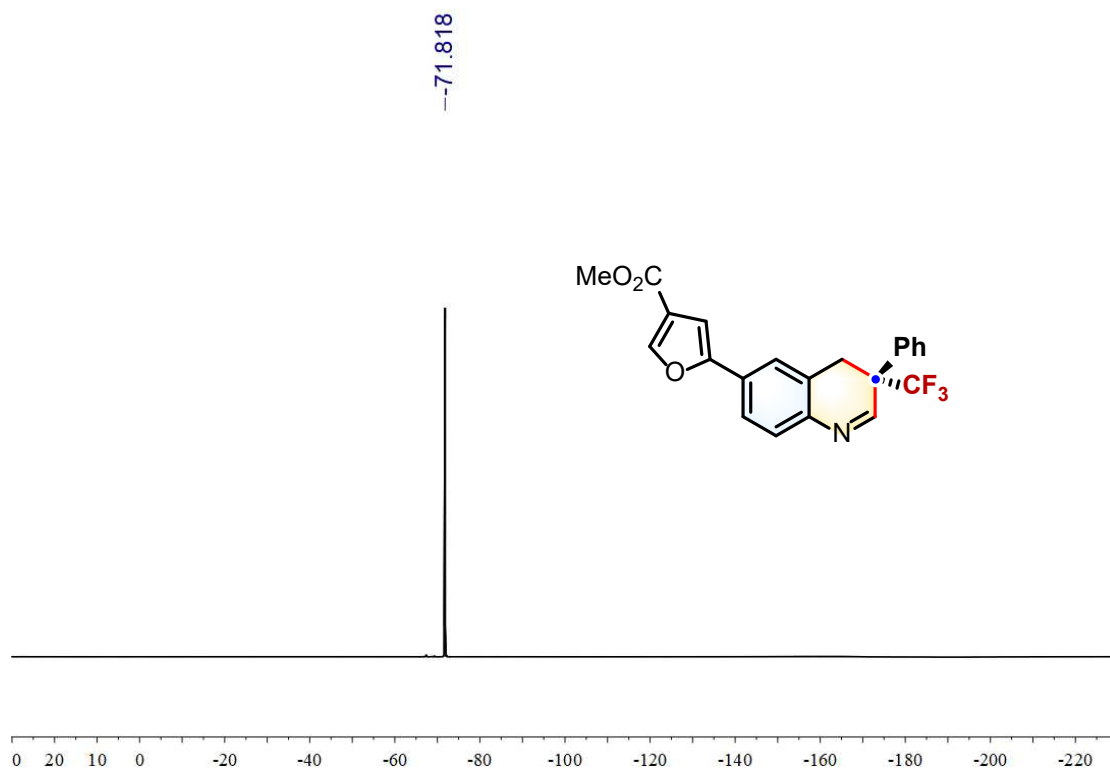
Supplementary Fig. 521. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 174



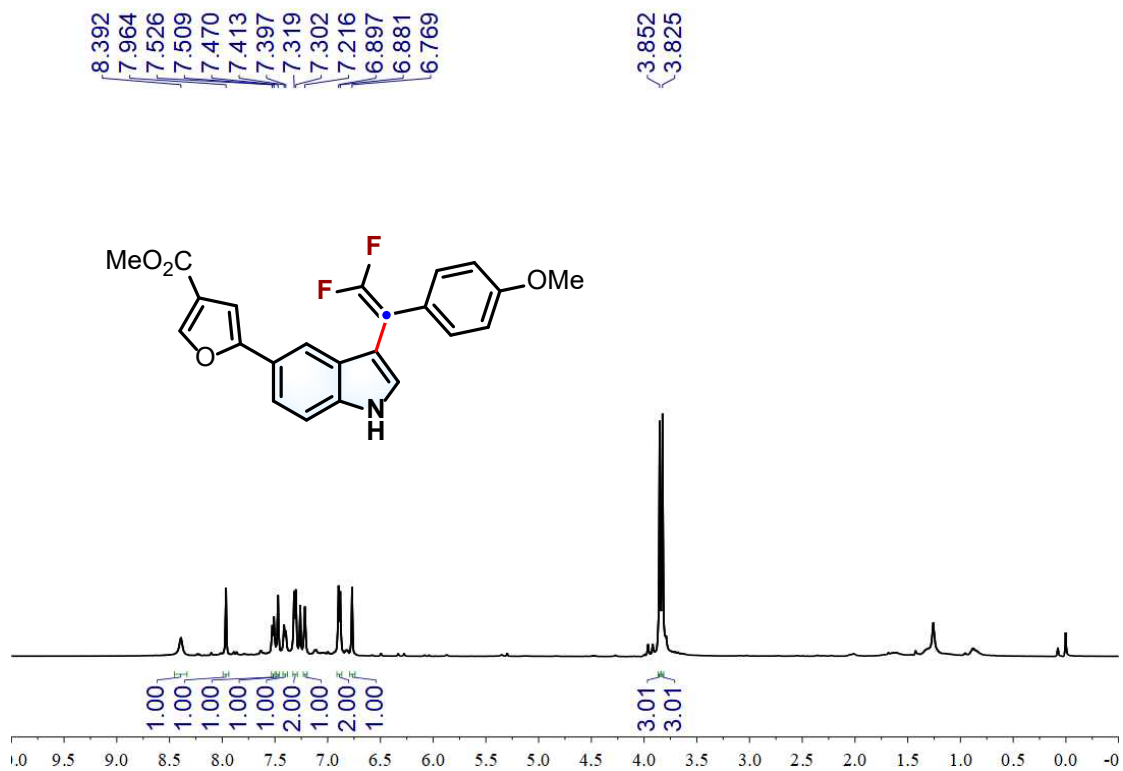
Supplementary Fig. 522. ^1H NMR (500 MHz, CDCl_3) spectrum of 175



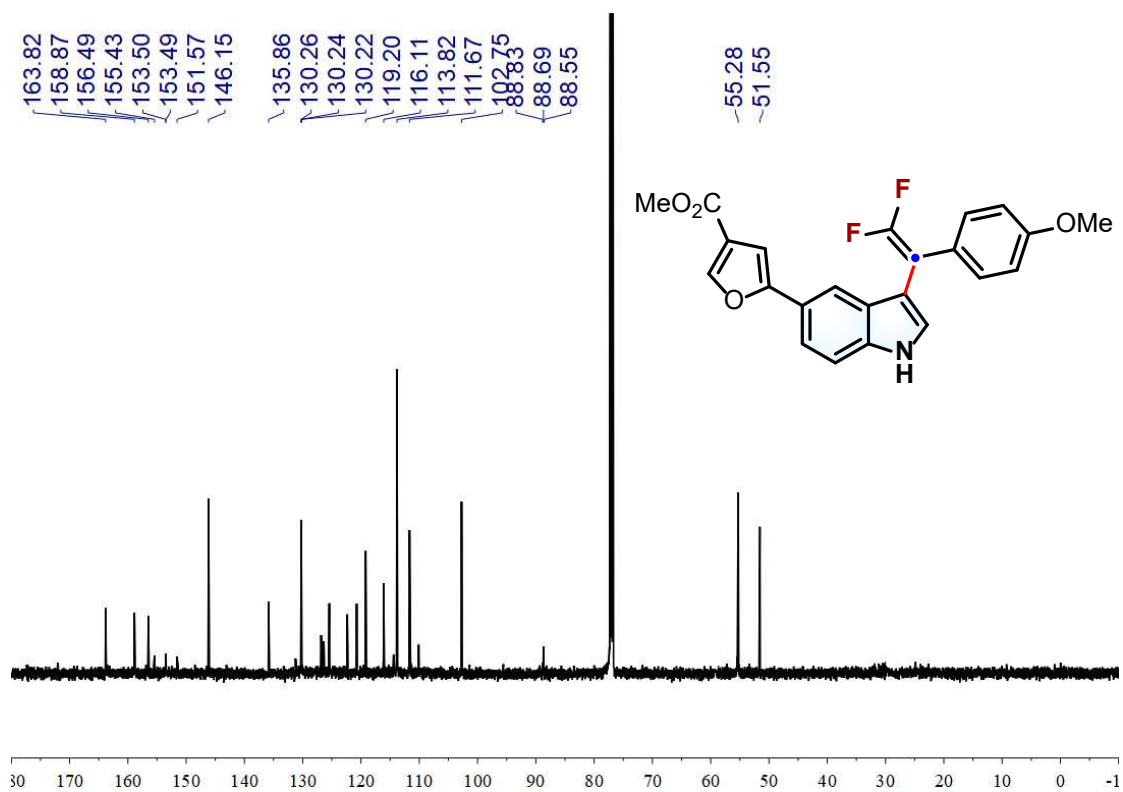
Supplementary Fig. 523. ¹³C NMR (150 MHz, CDCl₃) spectrum of 175



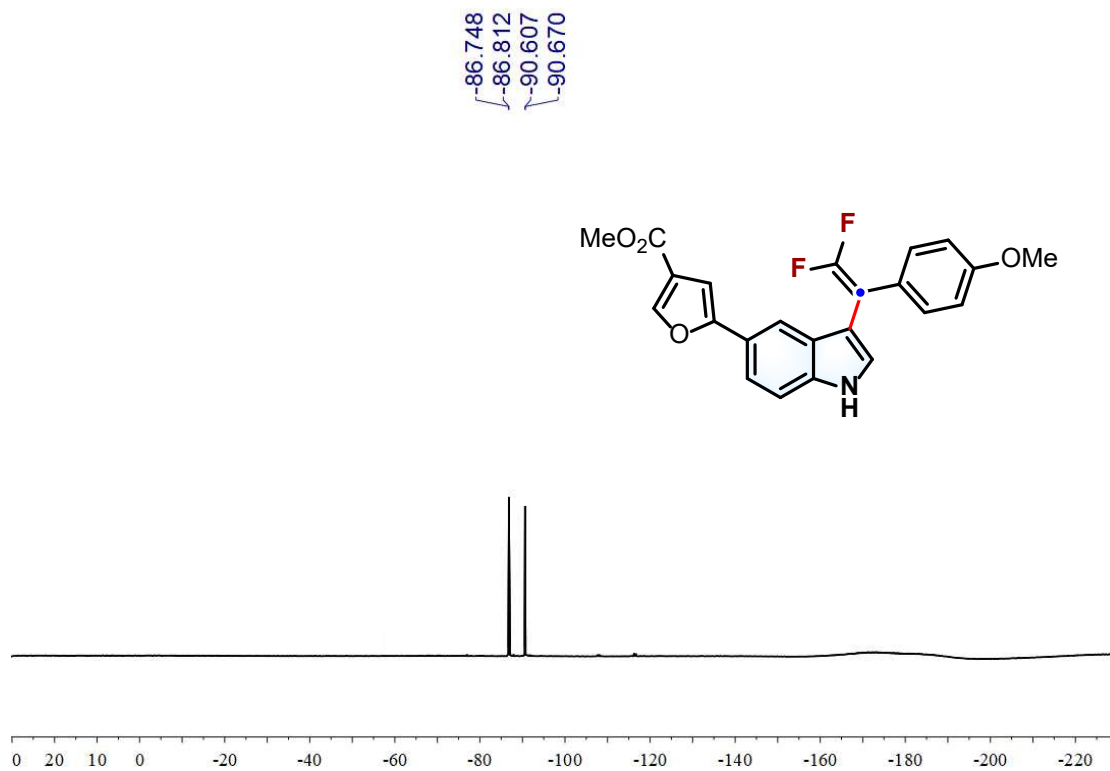
Supplementary Fig. 524. ¹⁹F NMR (564 MHz, CDCl₃) spectrum of 175



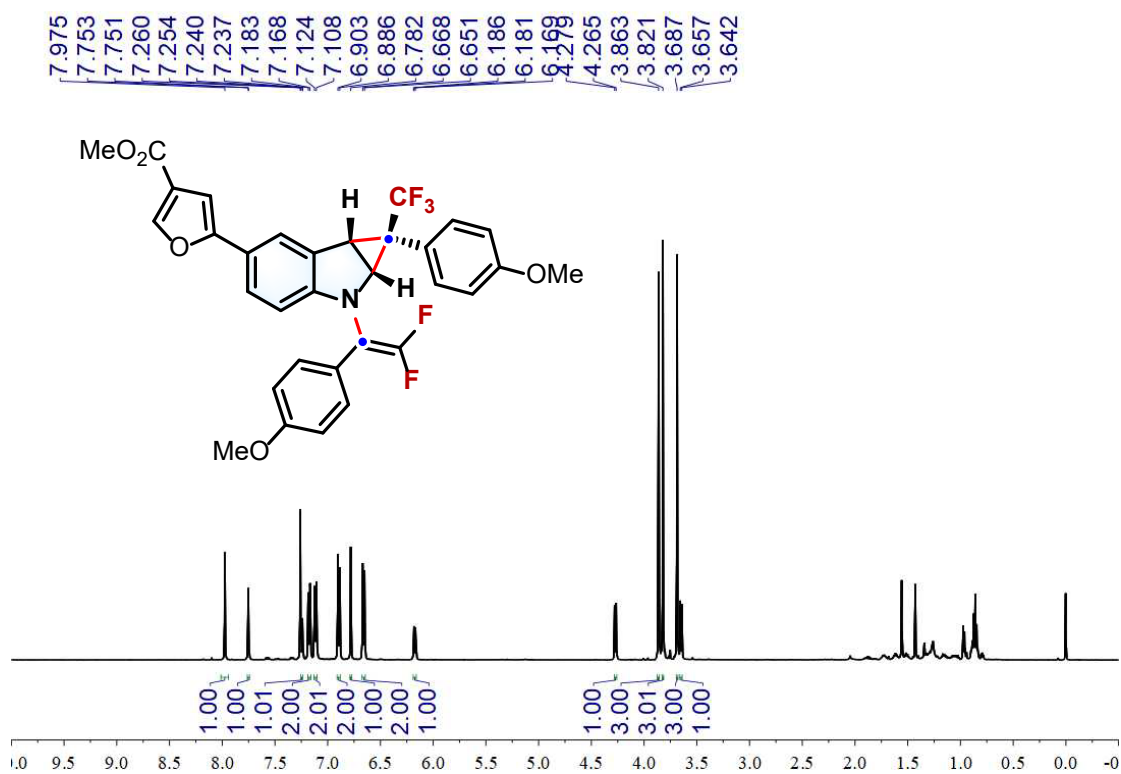
Supplementary Fig. 525. ¹H NMR (500 MHz, CDCl₃) spectrum of 176



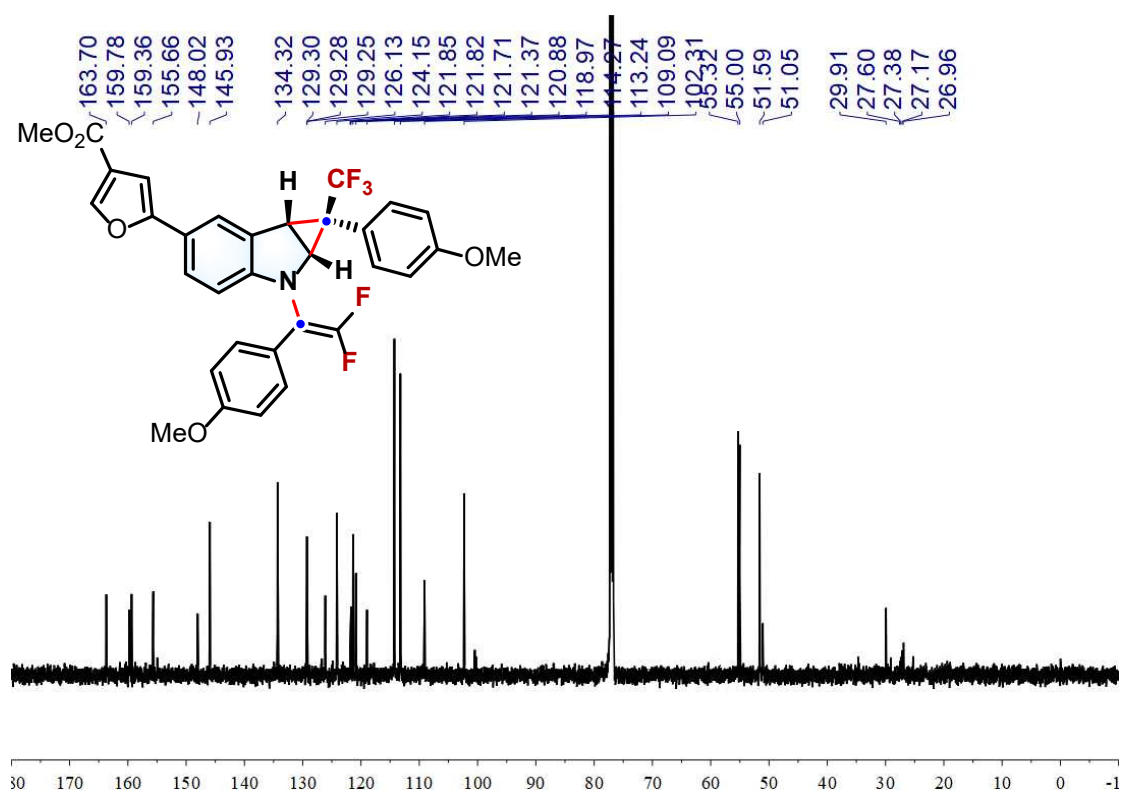
Supplementary Fig. 526. ¹³C NMR (150 MHz, CDCl₃) spectrum of 176



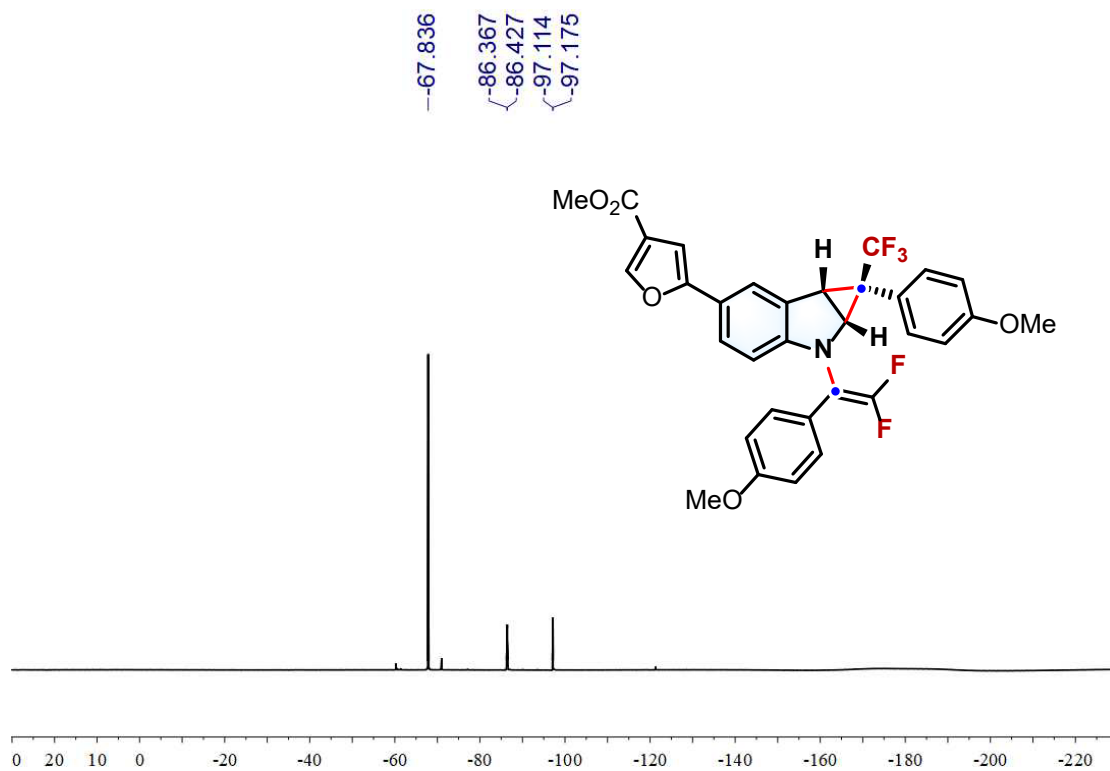
Supplementary Fig. 527. ^{19}F NMR (564 MHz, CDCl_3) spectrum of **176**



Supplementary Fig. 528. ^1H NMR (500 MHz, CDCl_3) spectrum of **177**



Supplementary Fig. 529. ^{13}C NMR (150 MHz, CDCl_3) spectrum of 177



Supplementary Fig. 530. ^{19}F NMR (564 MHz, CDCl_3) spectrum of 177

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