

Enantioselective formal $[4\pi+2\sigma]$ cycloaddition of bicyclobutanes with nitrones enabled by asymmetric Lewis acid catalysis

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Supporting Information

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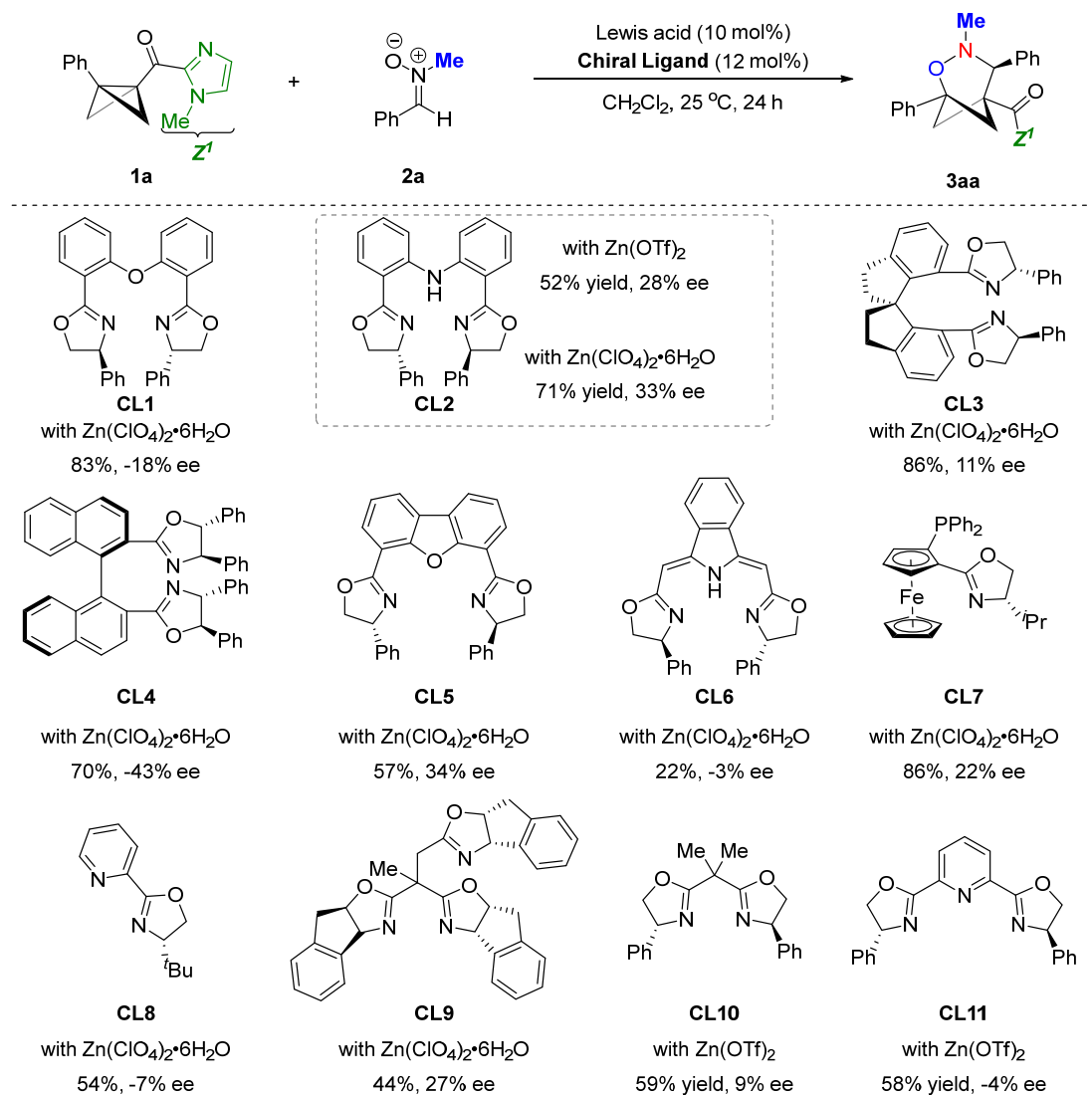
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1 General Information

All reactions were performed in flame-dried glassware using conventional Schlenk techniques under a static pressure of nitrogen unless otherwise stated. Liquids and solutions were transferred with syringes. Bicyclo[1.1.0]butanes (BCBs)^[1] and nitrones^[2] were prepared according to reported procedures. Co(OTf)₂ (98%, *Bide Chemical Company*) and other commercially available reagents were purchased from *Leyan, Energy Chemical* and *Bide Chemical Company* and used as received. The solvents (CH₂Cl₂, 1,2-dichloroethane, Et₂O, THF and toluene etc.) were dried and purified following standard procedures. PhCl and Ethyl acetate (EtOAc) were purchased from *Energy Chemical* (99%, Extra Dry) and used as received. Technical grade solvents for extraction or chromatography (Petroleum ether, CH₂Cl₂, and ethyl acetate) were distilled prior to use. Analytical thin layer chromatography (TLC) was performed on silica gel 60 F254 glass plates by *Merck*. Flash column chromatography was performed on silica gel 60 (40–63 μm, 230–400 mesh, ASTM) by *Grace* using the indicated solvents. ¹H, ¹³C NMR spectra were recorded in CDCl₃ on Bruker AV400 or 600 instruments. Chemical shifts are reported in parts per million (ppm) and are referenced to the residual solvent resonance as the internal standard (CDCl₃: δ = 7.26 ppm for ¹H NMR and CDCl₃: δ = 77.0 ppm for ¹³C NMR). Data are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants (Hz), and integration. The full-scan mass spectra were taken on a hybrid quadrupole-orbitrap mass spectrometer equipped with a heated electrospray ionization source (ThermoFischer Scientific, Bremen, Germany). Chiral HPLC analysis was performed on a Shimadzu LC-20AD instrument using Daicel chiral columns at 35 °C and a mixture of HPLC-grade hexanes and isopropanol as eluent. Acknowledgement: the ¹H, ¹³C NMR spectra, single crystal X-ray diffraction and HRMS (ESI) were performed at Analytical Instrumentation Center of Hunan University. The absolute configuration was determined by single crystal X-ray diffraction analysis on Rigaku XtaLAB PRO MM003-DS dual system with a Cu micro-focus source. Diffraction data was collected at 173 K on a Rigaku XtaLAB PRO MM003-DS dual System with a Cu micro-focus source.

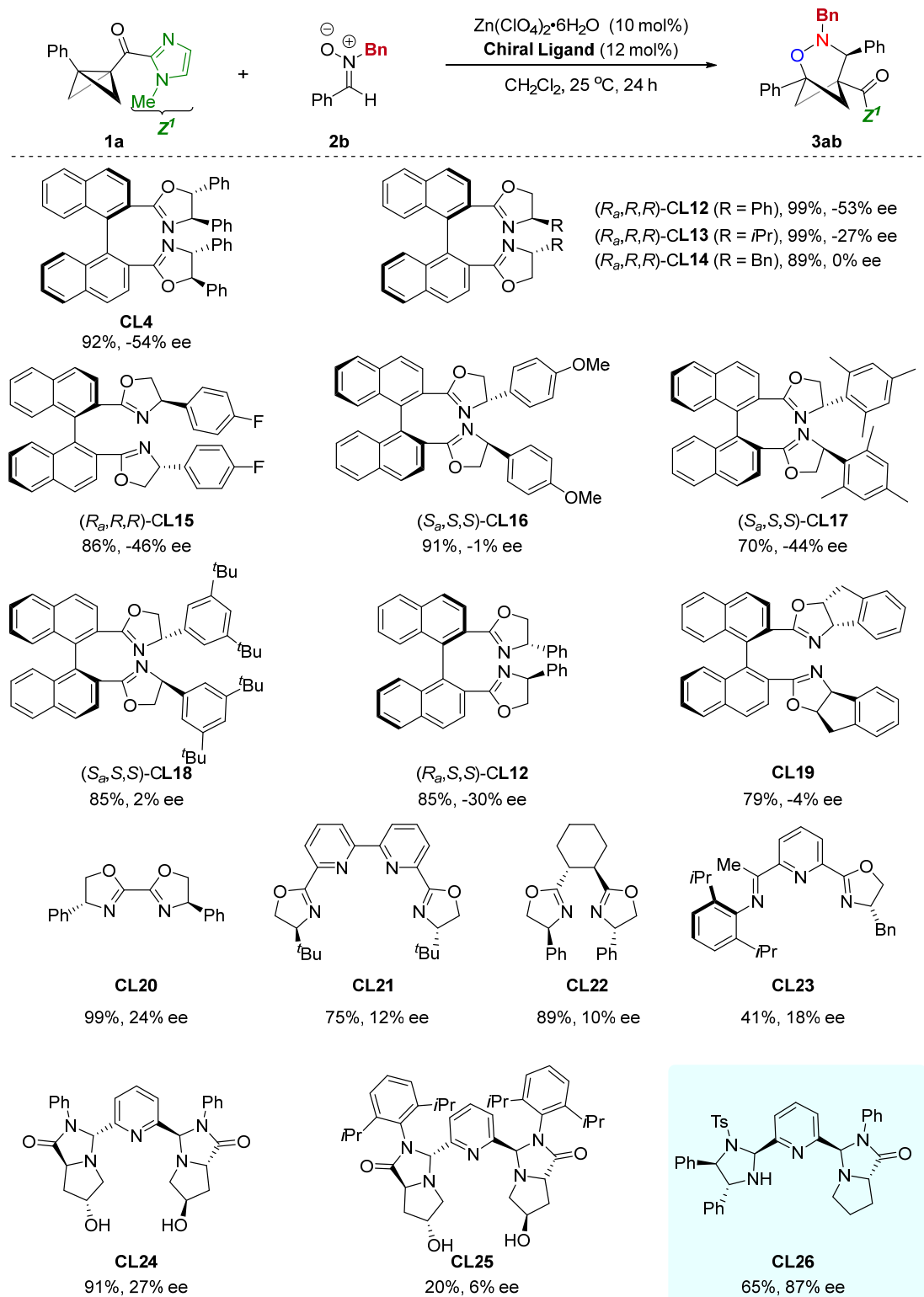
2 Optimization Study

Scheme S1. Screening of chiral ligands for the enantioselective (3+3) cycloaddition of BCB **1a** and nitron **2a**^[a]



[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2a** (0.12 mmol, 1.2 equiv), Lewis acid (10 mol%) and Ligand (12 mol%), CH₂Cl₂ (2 mL), 25 °C, under N₂ for 24 h. The yields of **3aa** was determined by ¹H NMR with CH₂Br₂ as an internal standard. The ee value was determined by chiral HPLC with hexane/2-propanol.

Scheme S2. Screening of chiral ligands for the enantioselective (3+3) cycloaddition of BCB **1a** and nitron **2b**^[a]



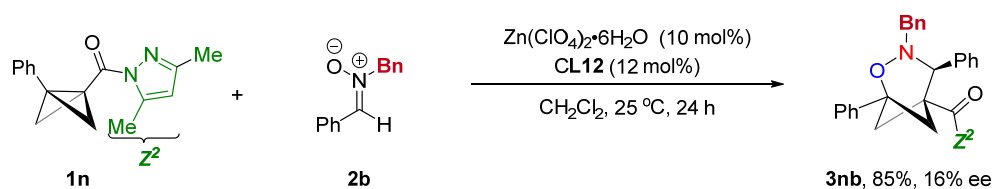
[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2b** (0.12 mmol, 1.2 equiv), $\text{Zn}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$ (10 mol%) and Ligand (12 mol%), CH_2Cl_2 (2 mL), 25 °C, under N_2 for 24 h. The yields of **3ab** was determined by ^1H NMR with CH_2Br_2 as an internal standard. The ee value was determined by chiral HPLC with hexane/2-propanol.

Table S1. Screening of Lewis acid and solvent for the enantioselective (3+3) cycloaddition of BCB **1a** and nitrone **2b** in the presence of **CL26** ^[a]

Entry	Lewis acid	solvent	Yield (%) ^[b]	ee (%) ^[c]
1	Eu(OTf) ₃	CH ₂ Cl ₂	90	2
2	Ga(OTf) ₃	CH ₂ Cl ₂	99	0
3	Sc(OTf) ₃	CH ₂ Cl ₂	66	17
4	Zn(OTf) ₂	CH ₂ Cl ₂	51	90
5	Ni(OTf) ₂	CH ₂ Cl ₂	95	80
6	Cu(OTf) ₂	CH ₂ Cl ₂	89	65
7	Fe(OTf) ₃	CH ₂ Cl ₂	84	14
8	Mg(OTf) ₂	CH ₂ Cl ₂	45	23
9	Co(OTf) ₂	CH ₂ Cl ₂	95	93.3
10	Co(OTf) ₂	EtOAc	96	92
11	Co(OTf) ₂	toluene	87	81
12	Co(OTf) ₂	THF	82	91
13	Co(OTf) ₂	1,4-dioxane	92	84
14	Co(OTf) ₂	DCE	93	91
15	Co(OTf) ₂	CH ₃ CN	60	59
16	Co(OTf) ₂	PhCl	85	93.7

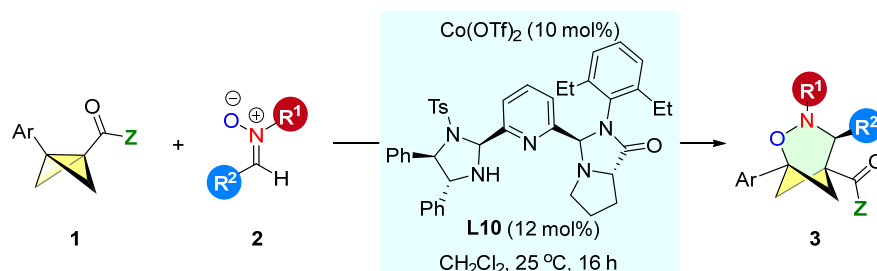
[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2b** (0.12 mmol, 1.2 equiv), Lewis acid (10 mol%) and **CL26** (12 mol%), solvent (2 mL), 25 °C, under N₂ for 24 h. [b] Determined by ¹H NMR with CH₂Br₂ as an internal standard. [c] Determined by chiral HPLC with hexane/2-propanol.

Scheme S3. Enantioselective cycloaddition of BCB **1n** and nitrone **2b** ^[a]



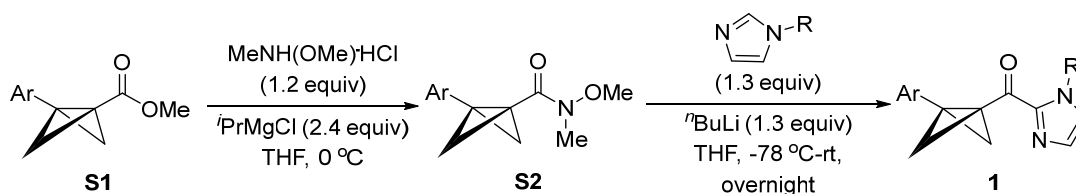
[a] Reaction conditions: **1n** (0.10 mmol, 1.0 equiv), **2b** (0.12 mmol, 1.2 equiv), Zn(ClO₄)₂·6H₂O (10 mol%) and **CL12** (12 mol%), CH₂Cl₂ (2 mL), 25 °C, under N₂ for 24 h. The yield of **3nb** was determined by ¹H NMR with CH₂Br₂ as an internal standard. The ee value was determined by chiral HPLC with hexane/2-propanol.

3 General Procedure for the Enantioselective (3+3) Cycloadditions (GP1)



Under an atmosphere of N_2 , to a 25 mL oven-dried Schlenk tube were added $\text{Co}(\text{OTf})_2$ (7.1 mg, 0.020 mmol) and **L10** (17.1 mg, 0.024 mmol), followed by 2.0 mL of anhydrous CH_2Cl_2 . The solution was stirred at 25 °C for 0.5 h, and then the BCBs **1** (0.20 mmol, 1.0 equiv) and nitrones **2** (0.24 mmol, 1.2 equiv) were added. Then the resulting mixture was stirred at room temperature for 16 h till full conversion of **1** by TLC analysis. After the solvent was removed under reduced pressure, the residue was directly subjected to a column chromatography purification using PE/EtOAc (4:1, v/v) as the eluent, to afford the desired product **3**.

4 General Procedure for the Synthesis of New Bicyclobutanes (GP2)



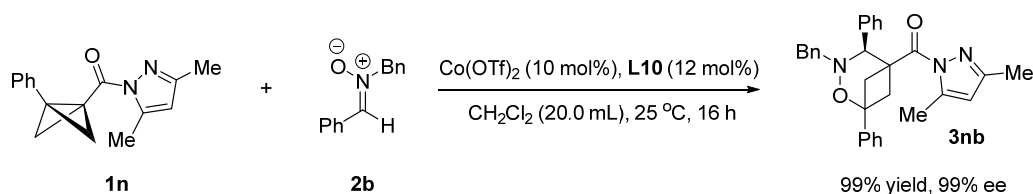
BCB esters **S1** were prepared according to literature procedures.^[1] Weinreb amide derived BCBs **S2** were synthesized as following: An oven-dried 100 mL round bottom flask equipped with a stir bar was cooled under vacuum. After backfilled with N_2 (x 3) and capped with a septum, BCB esters **S1** (5.00 mmol, 1.00 equiv) and THF (25 mL) were added. The reaction was cooled to 0 °C. $\text{MeNH}(\text{OMe})\cdot\text{HCl}$ (585 mg, 6 mmol, 1.2 equiv) and $i\text{PrMgCl}$ (6.0 mL, 2.0 M in THF, 12.0 mmol, 2.4 equiv) were sequentially added to the solution. After stirred at the same temperature for 12 h, the reaction was quenched by saturated NH_4Cl solution (20 mL). The aqueous layer was extracted with EtOAc (3 x 10 mL). The combined organic layers were washed with brine (25 mL),

dried over anhydrous MgSO_4 , filtered and concentrated by rotary evaporation. The crude Weinreb amide derived BCBs **S2** was directly used in next reaction.

An oven-dried 100 mL round bottom flask equipped with a stir bar was cooled under vacuum. After backfilled with N_2 (x 3) and capped with a septum, *N*-substituted imidazole derivatives (6.5 mmol, 1.3 equiv) and THF (20 mL) were added. The reaction was cooled to $-78\text{ }^\circ\text{C}$. $n\text{BuLi}$ (2.6 mL, 2.5 M in THF, 6.5 mmol, 1.3 equiv) was added to the solution. After stirred at the same temperature for 20 min, **S2** dissolved in THF (5 mL) was added. Next, the reaction was warm to room temperature and stirred overnight. Then, the reaction was quenched by saturated NH_4Cl solution (20 mL). The aqueous layer was extracted with EtOAc (3 x 10 mL). The combined organic layers were washed with brine (25 mL), dried over anhydrous MgSO_4 , filtered and concentrated by rotary evaporation. The residue was purified by flash chromatography on silica gel (petroleum ether/EtOAc = 5/1) to afford a new kind of BCB **1**.

NOTE: the bicyclo[1.1.0]butanes (**1n-p**) equipped with an acyl pyrazole group were synthesized according to the literature^[3].

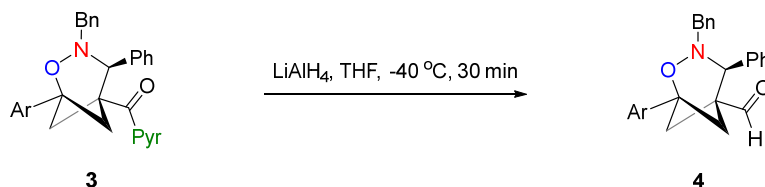
5 Scale-Up Experiment



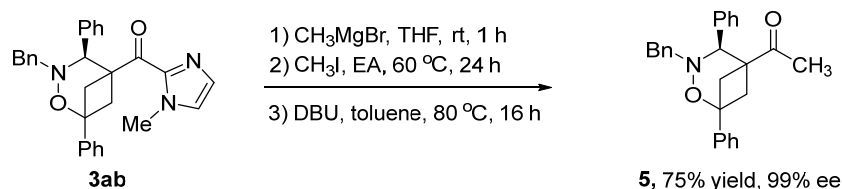
Under an atmosphere of N_2 , to a 100 mL oven-dried Schlenk tube were added $\text{Co}(\text{OTf})_2$ (35.7 mg, 0.10 mmol, 10 mol%) and **L10** (85.0 mg, 0.12 mmol, 12 mol%), followed by 20 mL of anhydrous CH_2Cl_2 . The solution was stirred at $25\text{ }^\circ\text{C}$ for 0.5 h. Then the BCB **1n** (252.0 mg, 1.00 mmol, 1.0 equiv) and nitron **2b** (253.2 mg, 1.20 mmol, 1.2 equiv) were added. The resulting mixture was stirred at room temperature for 16 h till full conversion of **1n** by TLC analysis. After the solvent was removed under reduced pressure, the residue was directly subjected to a column chromatography

purification using PE/EtOAc (20:1, v/v) as the eluent, to afford the desired product **3nb** (458.4 mg, 99% yield, 99% ee).

6 Synthetic Transformations

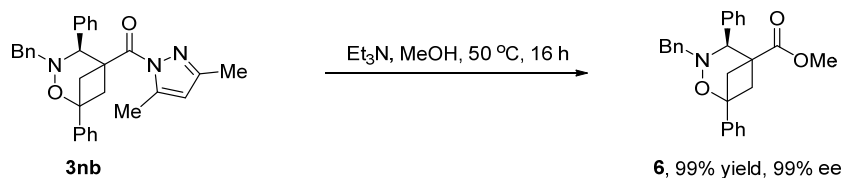


General Procedure for the conversion of 3nb or 3qb to aldehyde (GP3): The solution of LiAlH_4 (5.7 mg, 0.15 mmol, 1.5 equiv) in THF (2.0 mL) was cooled to $-40\text{ }^\circ\text{C}$, and then a solution of **3** (0.1 mmol, 1.0 equiv) in THF (1.0 mL) was charged into the solution at $-40\text{ }^\circ\text{C}$. After TLC analysis showed the starting material was consumed (30 min), HCl (aq. 1.0 M) was added at $-40\text{ }^\circ\text{C}$ and stirred for 15 min. The reaction mixture was directly filtered through celite, washed and extracted with EtOAc. The mixture was extracted with EtOAc ($3 \times 5.0\text{ mL}$). Filtered and concentrated on rotavapor under reduced pressure. The residue was purification by flash chromatography on silica gel using petroleum ether/ethyl acetate (10/1) to afford **4** as a colorless oil.

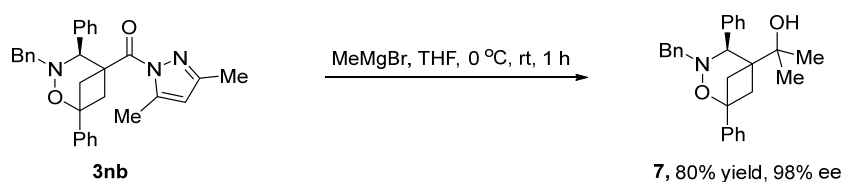


Synthesis of (5): In a flame dried Schlenk flask, MeMgBr (3.0 M in Et_2O , 0.1 mL, 0.3 mmol, 3.0 equiv) was added portionwise to a solution of the **3ab** (44.9 mg, 0.1 mmol, 1.0 equiv) in dry THF (1.0 mL) at room temperature. The reaction was stirred for 1.0 hours, and monitored by TLC. Then aqueous saturated NH_4Cl solution (5 mL) was added to quench the reaction. The solution was extracted with ethyl acetate, washed with brine, dried over Na_2SO_4 , filtered and concentrated on rotavapor under reduced pressure. The intermediate was dissolved with dry ethyl acetate (2.0 mL) and MeI (141.9 mg, 1.0 mmol, 10.0 equiv) was added. The reaction was heated at $60\text{ }^\circ\text{C}$ for 24 hours. And then, it was cooled down to room temperature and concentrated to dryness.

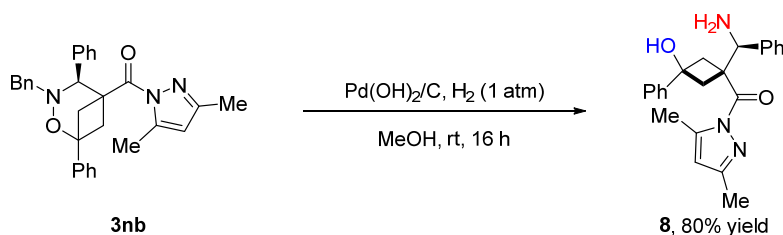
The residue was taken up in dry toluene (1.0 mL) and DBU (106.4 mg, 0.7 mmol, 7.0 equiv) was added. The mixture was heated at 80 °C for 16 hours. The crude residue was purified by silica gel column chromatography (PE/EtOAc = 5:1) to afford **5** (28.7 mg, 75%, 99% ee) as a colorless oil.



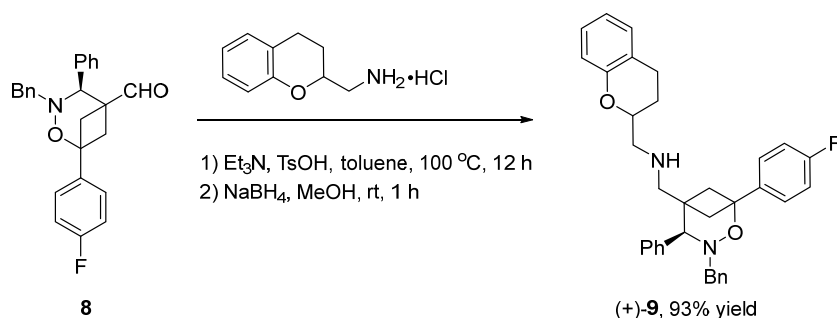
Synthesis of (6): To a solution of **3nb** (46.3 mg, 0.1 mmol, 1.0 equiv) in MeOH (2.0 mL) was added Et₃N (30 μ L, 0.4 mmol, 2.0 equiv). The mixture was then stirred at 50 °C for 16 hour, and monitored by TLC. After the solvent was removed under reduced pressure, the residue was directly subjected to a column chromatography purification (PE/EtOAc = 20:1) as the eluent to afford **6** (41.0 mg, 99% yield, 99% ee) as a colorless oil.



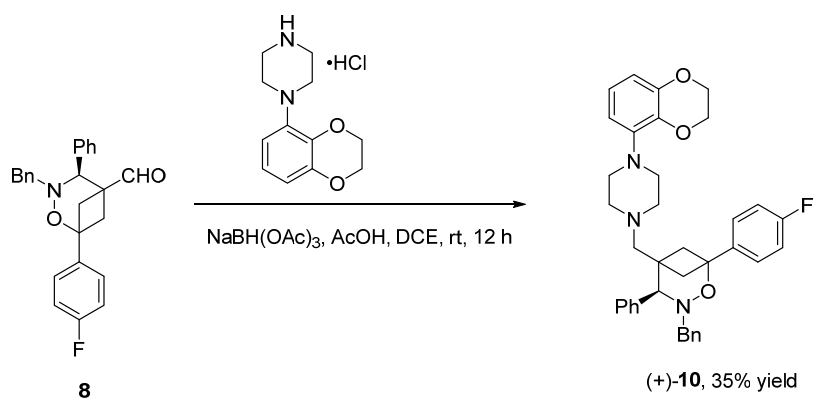
Synthesis of (7): In a flame dried Schlenk flask, **3nb** (46.3 mg, 0.1 mmol, 1.0 equiv) was stirred in anhydrous THF (2.0 mL). The solution was cooled to 0 °C and MeMgBr (3.0 M in Et₂O, 0.1 mL, 0.3 mmol, 3.0 equiv) was added slowly. And then the reaction was stirred at room temperature for 1 hour. Finally, aqueous saturated NH₄Cl solution (2.0 mL) was added to quench the reaction. The mixture was extracted with EtOAc (3 $\times$ 5.0 mL). Filtered and concentrated on rotavapor under reduced pressure. The residue was purification by flash chromatography on silica gel using petroleum ether/ethyl acetate (10/1) to afford **7** as a colorless oil (32.0 mg, 80% yield, 98% ee).



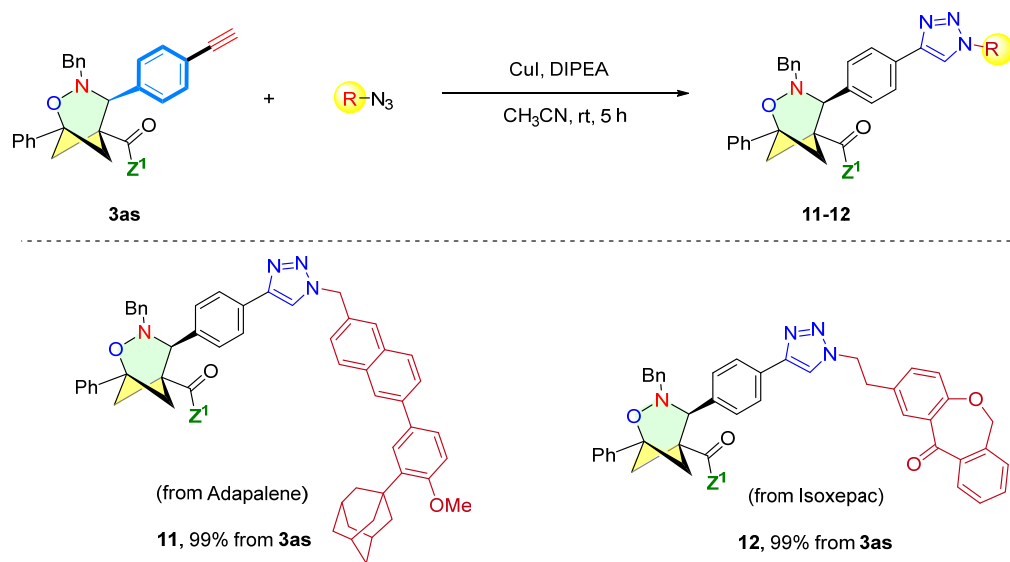
Synthesis of (8): To a solution of **3nb** (23.2 mg, 0.05 mmol, 1.0 equiv) in MeOH (5.0 mL) was added Pd(OH)₂/C (10 wt%) (5.0 mg). This flask was in a vacuum and back-filled with H₂ (1 atm). After being stirred at room temperature for 16 hour, the reaction solution was filtered, and the filtered-cake was washed with EtOAc (5.0 mL). The filtrate was evaporated under vacuo, and purified by silica gel column chromatography using petroleum ether/ethyl acetate (2/1) as the eluent to give the product **8** in 80% yield (15.0 mg). $[\alpha]_{\text{D}}^{20} = +32.7$ ($c = 0.30$, CHCl₃). The enantiomeric excess could not be determined using HPLC analysis with chiral stationary phases in our laboratory.



Synthesis of (9): To the solution of chroman-2-ylmethanamine hydrochloride (15.0 mg, 0.075 mmol) in toluene (1.0 mL) was added NEt₃ (7.6 mg, 0.075 mmol), and the mixture was stirred at 35 °C for 30 min. **8** (16.0 mg, 0.04 mmol), 4 Å MS (50 mg) and TsOH·H₂O (11.9 mg, 0.06 mmol) was added to the solution, and the mixture was stirred at 100 °C for 16 h. Then, the mixture was cooled to 0 °C. MeOH (1.0 mL) and NaBH₄ (2.3 mg, 0.06 mmol) was added to the solution, and the mixture was stirred for 1 h at room temperature. The resulting solution was quenched with H₂O and extracted with EtOAc (3 × 5.0 mL). Filtered and concentrated on rotavapor under reduced pressure. The residue was purification by flash chromatography on silica gel using petroleum ether/ethyl acetate (3/1) to afford **9** as a colorless oil (20.0 mg, 93% yield).



Synthesis of (10): **8** (19.4 mg, 0.05 mmol) and 1-(2,3-dihydrobenzo[b][1,4]dioxin-5-yl)piperazine hydrochloride (12.9 mg, 0.05 mmol) were mixed in 1,2-dichloroethane (2 mL) and treated with NaBH(OAc)₃ (15.9 mg, 0.075 mmol) and HOAc (20 μ L) under an atmosphere of argon. The reaction mixture was stirred at room temperature for 12 h. The resulting solution was quenched with 2 N NaOH (2.0 mL) and extracted with EtOAc (3 $\times$ 5.0 mL). Filtered and concentrated on rotavapor under reduced pressure. The residue was purification by flash chromatography on silica gel using petroleum ether/ethyl acetate (10/1) to afford **10** as a colorless oil (10.4 mg, 35% yield).

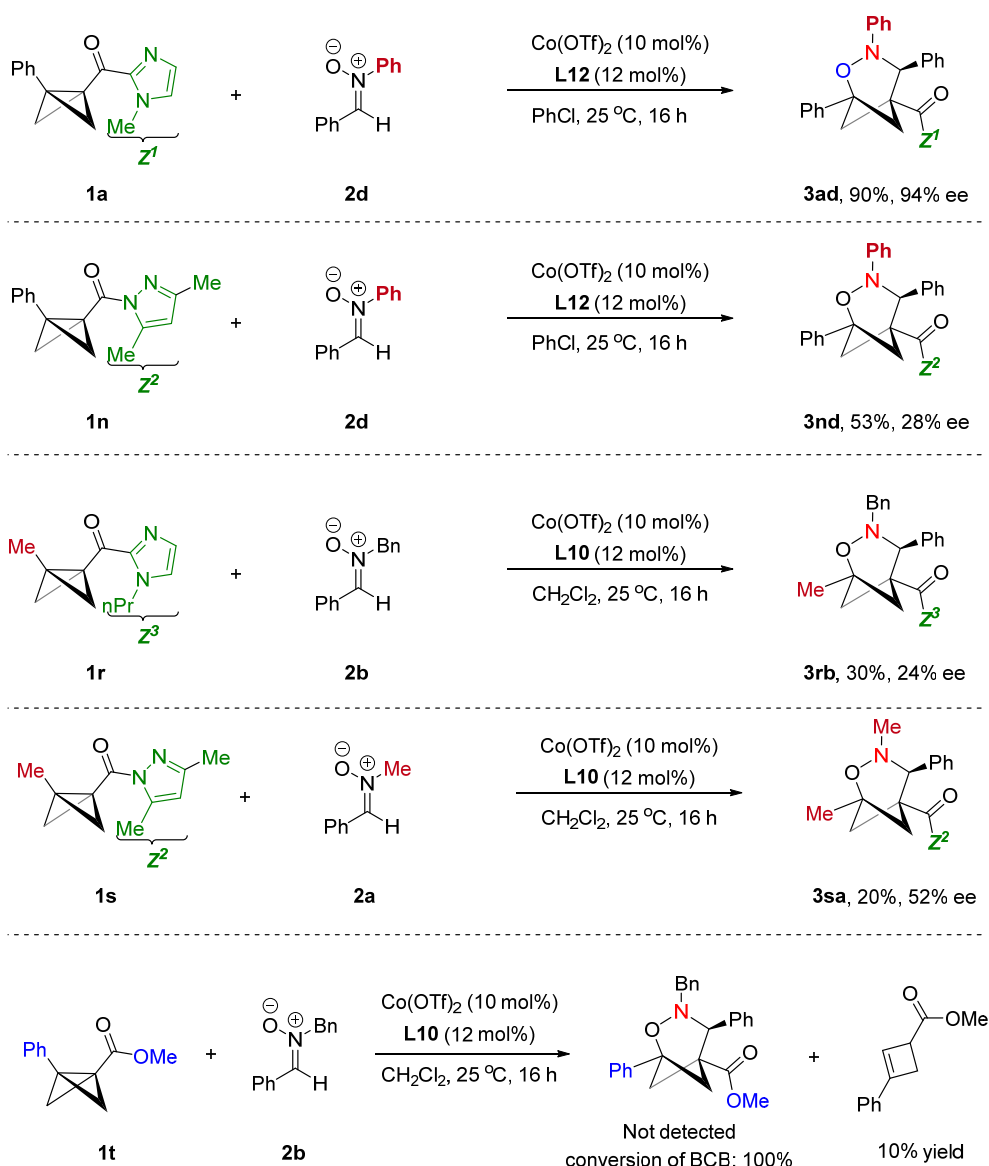


General Procedure for Copper-Catalyzed Alkyne–Azide Cycloaddition (GP4): A Schlenk tube is charged with **3as** (20.0 mg, 0.042 mmol, 1.0 equiv), CuI (0.8 mg, 0.004 mmol, 10 mol%), DIPEA (5.4 mg, 0.042 mmol, 1.0 equiv) and CH₃CN (1.0 mL). Then azide compounds (0.063 mmol, 1.5 equiv) was added. The reaction mixture is stirred

at room temperature for 5 h. The mixture is then concentrated under reduced pressure, and purified by silica gel column chromatography to give the product **11-12**.

7 Comparison of BCB with an Acyl Imidazole Group and BCB with an Acyl Pyrazole Moiety in Stereocontrol and Unsuccessful BCB Substrates

The (3+3) reaction of **2n** with *N*-phenyl nitron **2d** yields the desired **3nd** with 28% ee. In contrast, the cycloaddition of **1a** and **2d** produces **3ad** with 94% ee under identical reaction conditions. Unfortunately, the current reaction did not apply to methyl-substituted BCB substrate **1q**.



8 Non-Linear Effect Study

Table S2. Tabulation of non-linear effects^[a]

Reaction scheme: **1a** + **2b** $\xrightarrow[\text{CH}_2\text{Cl}_2, 25\text{ }^\circ\text{C}, 24\text{ h}]{\text{Co(OTf)}_2 (10\text{ mol\%}), \text{L10} (12\text{ mol\%})}$ **3ab**

Entry	L10 ee ^[b]	Product 3ab ee ^[b]
1	20	22
2	40	41
3	60	60
4	80	79
5	100	99

[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2b** (0.12 mmol, 1.2 equiv), Co(OTf)₂ (10 mol%) and **L10** (12 mol%), CH₂Cl₂ (2 mL), 25 °C, under N₂ for 24 h.

[b] Determined by chiral HPLC with hexane/2-propanol.

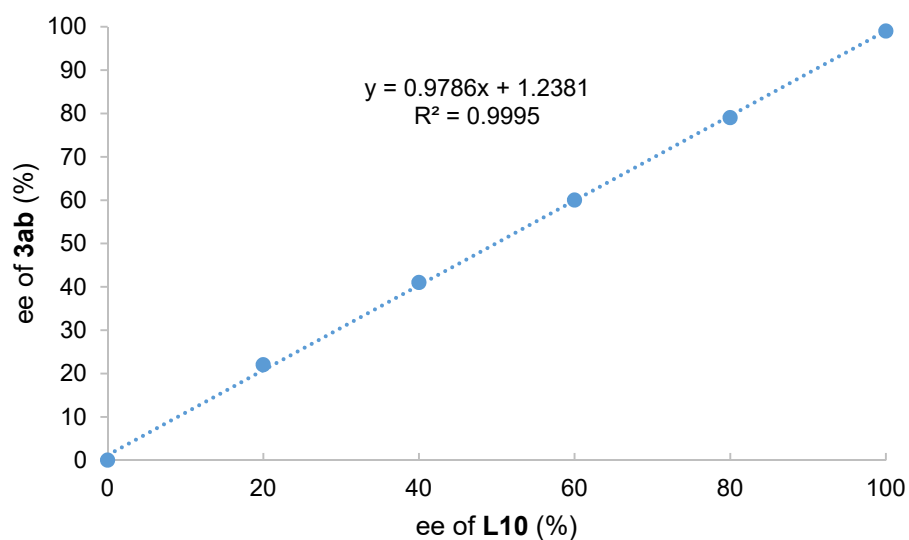
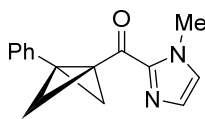


Figure S1. Non-linear effect study

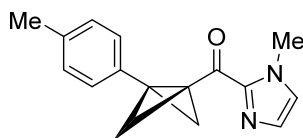
9 Characterization Data of the New BCBs and Products

**1a**

$C_{15}H_{14}N_2O$
 $M = 238.29$ g/mol

(1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone: (**1a**) Prepared from methyl-3-phenylbicyclo[1.1.0]butane-1-carboxylate (1.88 g, 10 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1a** as a white solid (1.53 g, 64% yield over 2 steps).

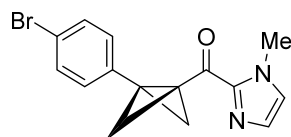
$R_f = 0.35$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.28-7.26 (m, 2H), 7.24-7.16 (m, 3H), 7.07 (s, 1H), 6.85 (s, 1H), 3.63 (s, 2H), 3.60 (s, 3H), 1.90 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 185.7, 143.4, 133.3, 128.7, 128.2, 127.0, 126.0, 125.7, 40.4, 38.0, 35.7, 32.9 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{15}H_{15}N_2O$: 239.1179; found: 239.1179.

**1b**

$C_{16}H_{16}N_2O$
 $M = 252.32$ g/mol

(1-methyl-1H-imidazol-2-yl)(3-(*p*-tolyl)bicyclo[1.1.0]butan-1-yl)methanone: (**1b**) Prepared from methyl 3-(*p*-tolyl)bicyclo[1.1.0]butane-1-carboxylate (0.94 g, 5 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1b** as a white solid (0.76 g, 60% yield over 2 steps).

$R_f = 0.35$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.16 (d, $J = 7.6$ Hz, 2H), 7.07 (s, 1H), 7.03 (d, $J = 7.6$ Hz, 2H), 6.85 (s, 1H), 3.61 (s, 5H), 2.27 (s, 3H), 1.88 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 185.8, 143.4, 136.8, 130.0, 129.0, 128.6, 125.9, 125.7, 41.0, 38.0, 35.7, 32.8, 21.1 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{16}H_{17}N_2O$: 253.1335; found: 253.1334.

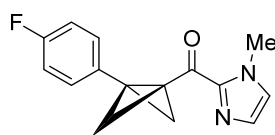
**1c**

$C_{15}H_{13}BrN_2O$
 $M = 317.19$ g/mol

(3-(4-bromophenyl)bicyclo[1.1.0]butan-1-yl)(1-methyl-1H-imidazol-2-yl)methanone: (1c)

Prepared from methyl 3-(4-bromophenyl)bicyclo[1.1.0]butane-1-carboxylate (1.34 g, 5 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1c** as a white solid (0.79 g, 50% yield over 2 steps).

$R_f = 0.30$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.33 (d, $J = 8.4$ Hz, 2H), 7.15 (d, $J = 8.4$ Hz, 2H), 7.07 (s, 1H), 6.89 (s, 1H), 3.69 (s, 3H), 3.62 (s, 2H), 1.88 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 185.1, 143.2, 132.7, 131.4, 128.8, 127.6, 126.0, 120.9, 39.4, 38.0, 36.0, 33.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{15}H_{14}BrN_2O$: 317.0284; found: 317.0282.

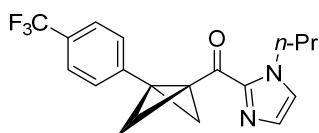
**1d**

$C_{15}H_{13}FN_2O$
 $M = 256.28$ g/mol

(3-(4-fluorophenyl)bicyclo[1.1.0]butan-1-yl)(1-methyl-1H-imidazol-2-yl)methanone: (1d)

Prepared from methyl 3-(4-fluorophenyl)bicyclo[1.1.0]butane-1-carboxylate (1.03 g, 5 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1d** as a white solid (0.64 g, 50% yield over 2 steps).

$R_f = 0.30$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.27-7.23 (m, 2H), 7.07 (s, 1H), 6.94-6.88 (m, 3H), 3.68 (s, 3H), 3.61 (s, 2H), 1.89 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 185.4, 162.1 (d, $J = 245$ Hz), 143.4, 129.2 (d, $J = 3$ Hz), 128.9, 127.6 (d, $J = 8$ Hz), 125.9, 115.3 (d, $J = 22$ Hz), 39.7, 38.1, 35.9, 32.5 ppm. **^{19}F NMR** (376 MHz, $CDCl_3$) δ -114.956 ppm. **HRMS** (ESI) m/z : $[M+NH_4]^+$ calcd. for $C_{15}H_{17}N_3O$: 274.1350; found: 274.1358.

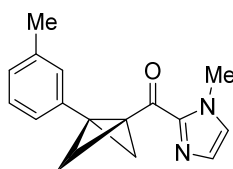


1e
 $C_{18}H_{17}F_3N_2O$
 $M = 334.13 \text{ g/mol}$

(1-propyl-1H-imidazol-2-yl)(3-(4-(trifluoromethyl)phenyl)bicyclo[1.1.0]butan-1-yl) methanone: (1e)

Prepared from methyl 3-(4-(trifluoromethyl)phenyl) bicycle [1.1.0] butane-1-carboxylate (1.28 g, 5 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1e** as a white solid (0.71 g, 52% yield over 2 steps).

$R_f = 0.36$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.45 (d, $J = 8.0$ Hz, 2H), 7.35 (d, $J = 8.0$ Hz, 2H), 7.09 (s, 1H), 6.92 (s, 1H), 4.07 (t, $J = 7.2$ Hz, 2H), 3.68 (s, 2H), 1.95 (s, 2H), 1.19 (q, $J = 7.2$ Hz, 2H), 0.53 (t, $J = 7.6$ Hz, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 184.8, 142.4, 138.1, 128.8 (q, $J = 30$ Hz), 125.7, 125.4, 125.2 (q, $J = 4$ Hz), 122.7, 123.4 (q, $J = 70$ Hz), 50.0, 38.2, 38.1, 33.8, 24.1, 10.5 ppm. **^{19}F NMR** (376 MHz, $CDCl_3$) δ -62.539 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{18}H_{18}F_3N_2O$: 335.1366; found: 335.1376.

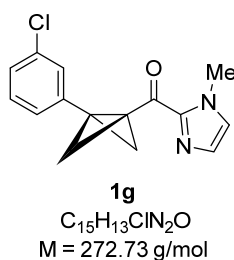


1f
 $C_{16}H_{16}N_2O$
 $M = 252.32 \text{ g/mol}$

(1-methyl-1H-imidazol-2-yl)(3-(m-tolyl)bicyclo[1.1.0]butan-1-yl)methanone: (1f) Prepared from methyl 3-(m-tolyl)bicyclo[1.1.0]butane-1-carboxylate (1.01 g, 5 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1f** as a white solid (0.50 g, 40% yield over 2 steps).

$R_f = 0.25$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.11-7.04 (m, 4H), 6.98 (d, $J = 6.8$ Hz, 1H), 6.84 (s, 1H), 3.61 (s, 3H), 3.60 (s, 2H), 2.25 (s, 3H), 1.87 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 185.8, 143.4, 137.8, 133.1, 128.6, 128.1,

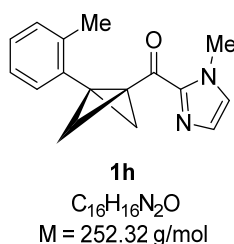
127.8, 126.8, 125.6, 123.0, 40.6, 38.0, 35.7, 32.8, 21.3 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{16}H_{17}N_2O$: 253.1335; found: 253.1334.



(3-(3-chlorophenyl)bicyclo[1.1.0]butan-1-yl)(1-methyl-1H-imidazol-2-yl)methanone: (1g)

Prepared from methyl 3-(3-chlorophenyl)bicyclo[1.1.0]butane-1-carboxylate (1.11 g, 5 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1g** as a white solid (0.59 g, 43% yield over 2 steps).

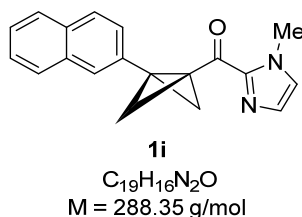
$R_f = 0.35$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.25 (s, 1H), 7.16-7.13 (m, 3H), 7.09 (s, 1H), 6.89 (s, 1H), 3.69 (s, 3H), 3.61 (s, 2H), 1.88 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 185.1, 143.2, 135.8, 134.2, 129.4, 128.8, 127.0, 126.2, 126.0, 124.2, 38.9, 38.0, 35.9, 33.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{15}H_{14}ClN_2O$: 273.0789; found: 273.0787.



(1-methyl-1H-imidazol-2-yl)(3-(o-tolyl)bicyclo[1.1.0]butan-1-yl)methanone: (1h) Prepared from methyl methyl 3-(o-tolyl)bicyclo[1.1.0]butane-1-carboxylate (0.61 g, 3 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1h** as a white solid (0.45 g, 59% yield over 2 steps).

$R_f = 0.35$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.12-7.05 (m, 3H), 7.01-6.96 (m, 2H), 6.93 (s, 1H), 3.85 (s, 3H), 3.35 (s, 2H), 2.44 (s, 3H), 1.94 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 186.8, 143.7, 138.7, 132.3, 130.7, 128.8,

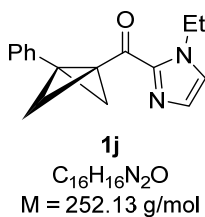
127.1, 126.0, 125.8, 125.6, 41.3, 38.6, 36.1, 30.3, 20.4 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{16}H_{17}N_2O$: 253.1335; found: 253.1335.



(1-methyl-1H-imidazol-2-yl)(3-(naphthalen-2-yl)bicyclo[1.1.0]butan-1-yl)methanone: (**1i**)

Prepared from methyl 3-(naphthalen-2-yl)bicyclo[1.1.0]butane-1-carboxylate (1.19 g, 5 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1i** as a white solid (0.72 g, 50% yield over 2 steps).

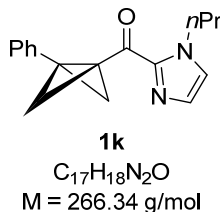
$R_f = 0.30$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.77 (s, 1H), 7.73 (d, $J = 8.0$ Hz, 2H), 7.65 (d, $J = 8.4$ Hz, 1H), 7.44-7.36 (m, 2H), 7.33 (d, $J = 8.4$ Hz, 1H), 7.07 (s, 1H), 6.79 (s, 1H), 3.77 (s, 2H), 3.53 (s, 3H), 1.96 (s, 2H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 185.4, 143.4, 133.2, 132.4, 131.1, 128.7, 127.8, 127.6, 127.5, 126.2, 125.8, 125.7, 125.6, 123.5, 40.8, 38.2, 35.8, 33.2 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{19}H_{17}N_2O$: 289.1335; found: 289.1331.



(1-ethyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone: (**1j**) Prepared from methyl-3-phenylbicyclo[1.1.0]butane-1-carboxylate (1.88 g, 10 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1j** as a white solid (1.35 g, 62% yield over 2 steps).

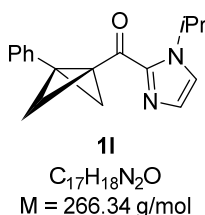
$R_f = 0.35$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.28-7.24 (m, 2H), 7.20 (t, $J = 7.2$ Hz, 2H), 7.16-7.12 (m, 1H), 7.08 (s, 1H), 6.91 (s, 1H), 4.06 (q, $J = 7.2$ Hz, 2H), 3.63 (s, 2H), 1.91 (s, 2H), 0.94 (t, $J = 7.2$ Hz, 3H) ppm. **^{13}C NMR** (100

MHz, CDCl₃): δ 185.5, 142.5, 133.3, 128.8, 128.2, 126.9, 125.8, 124.1, 43.3, 40.1, 37.9, 33.0, 16.1 ppm. **HRMS** (ESI) m/z : [M+H]⁺ calcd. for C₁₆H₁₇N₂O: 253.1335; found: 253.1332.



(3-phenylbicyclo[1.1.0]butan-1-yl)(1-propyl-1H-imidazol-2-yl)methanone: (**1k**) Prepared from methyl-3-phenylbicyclo[1.1.0]butane-1-carboxylate (1.88 g, 10 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1k** as a white solid (1.47 g, 55% yield over 2 steps).

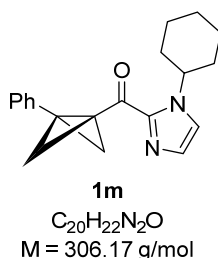
R_f = 0.30 (petroleum ether/EtOAc = 5/1). **¹H NMR** (400 MHz, CDCl₃): δ 7.27-7.15 (m, 5H), 7.09 (s, 1H), 6.90 (s, 1H), 4.02 (t, J = 7.2 Hz, 2H), 3.62 (s, 2H), 1.93 (s, 2H), 1.22-1.17 (m, 2H), 0.54 (t, J = 7.2 Hz, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 185.6, 142.6, 133.2, 128.6, 128.3, 126.9, 125.8, 125.0, 49.9, 40.2, 37.9, 33.1, 24.1, 10.7 ppm. **HRMS** (ESI) m/z : [M+H]⁺ calcd. for C₁₇H₁₉N₂O: 267.1492; found: 267.1487.



(1-isopropyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone: (**1l**) Prepared from methyl-3-phenylbicyclo[1.1.0]butane-1-carboxylate (1.88 g, 10 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1l** as a white solid (1.36 g, 51% yield over 2 steps).

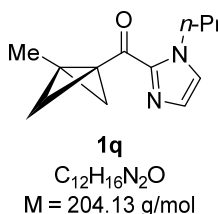
R_f = 0.35 (petroleum ether/EtOAc = 5/1). **¹H NMR** (400 MHz, CDCl₃): δ 7.27-7.15 (m, 5H), 7.11 (s, 1H), 7.08 (s, 1H), 5.03-4.97 (m, 1H), 3.59 (s, 2H), 1.93 (s, 2H), 1.07 (d, J = 6.8 Hz, 6H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 186.1, 142.5, 133.3, 129.1, 128.3,

126.9, 125.8, 119.8, 48.6, 40.1, 38.0, 33.4, 23.3 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{17}H_{19}N_2O$: 267.1492; found: 267.1488.



(1-cyclohexyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone: (1m) Prepared from methyl-3-phenylbicyclo[1.1.0]butane-1-carboxylate (1.88 g, 10 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1m** as a white solid (1.10 g, 52% yield over 2 steps).

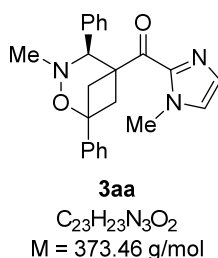
$R_f = 0.35$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.27-7.14 (m, 5H), 7.09 (s, 1H), 7.06 (s, 1H), 4.55-4.49 (m, 1H), 3.57 (s, 2H), 1.93 (s, 2H), 1.67-1.63 (m, 3H), 1.51-1.49 (m, 2H), 1.26-1.15 (m, 4H), 1.09-1.02 (m, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 186.2, 142.6, 133.3, 129.0, 128.2, 126.8, 125.8, 122.2, 56.0, 40.1, 37.9, 34.1, 33.6, 25.5, 25.2 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{20}H_{23}N_2O$: 307.1805; found: 307.1801.



(3-methylbicyclo[1.1.0]butan-1-yl)(1-propyl-1H-imidazol-2-yl)methanone: (1q) Prepared from benzyl 3-methylbicyclo[1.1.0]butane-1-carboxylate (2.02 g, 10 mmol, 1.0 equiv) according to the **GP2**. Purification by flash chromatography on silica gel afforded **1q** as a colorless oil (1.02 g, 50% yield over 2 steps).

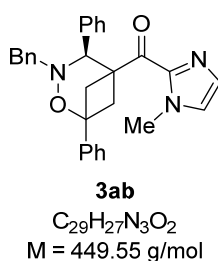
$R_f = 0.40$ (petroleum ether/EtOAc = 5/1). **1H NMR** (400 MHz, $CDCl_3$): δ 7.10 (s, 1H), 7.02 (s, 1H), 4.35 (t, $J = 7.2$ Hz, 2H), 2.89 (s, 2H), 1.84-1.74 (m, 2H), 1.57 (s, 3H), 1.53 (s, 2H), 0.91 (t, $J = 7.2$ Hz, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 188.2, 143.2, 128.7,

124.8, 50.3, 41.1, 36.0, 24.7, 23.1, 12.9, 11.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{12}H_{17}N_2O$: 205.1335; found: 205.1333.



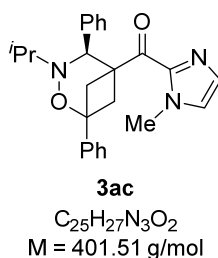
(S)-(3-methyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3aa) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-methyl-1-phenylmethanimine oxide (**2a**, 32.4 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3aa** as a white solid (64.2 mg, 86% yield).

3aa: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 10/90, 1.0 mL/min, 254 nm; t_r (major) = 10.89 min, t_r (minor) = 15.61 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +66.8$ ($c = 1.50$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.44 (d, $J = 6.8$ Hz, 2H), 7.39-7.36 (m, 2H), 7.32-7.28 (m, 1H), 7.20 (s, 1H), 7.15-7.11 (m, 3H), 7.09-7.07 (m, 2H), 6.87 (s, 1H), 4.58 (s, 1H), 3.61 (t, $J = 8.6$ Hz, 1H), 3.40 (s, 3H), 2.90-2.84 (m, 2H), 2.62 (s, 3H), 2.47 (d, $J = 10.4$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.55, 142.6, 141.1, 138.1, 129.1, 128.3, 128.1, 127.9, 127.8, 125.9, 125.9, 81.9, 77.3, 53.8, 49.9, 43.3, 35.1, 33.5 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{24}N_3O_2$: 374.1863; found: 374.1856.



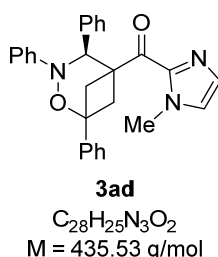
(S)-(3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3ab) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (*Z*)-*N*-benzyl-1-phenylmethanimine oxide (**2b**, 50.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ab** as a white solid (72.4 mg, 85% yield).

3ab: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 10/90, 1.0 mL/min, 254 nm; *tr* (minor) = 15.00 min, *tr* (major) = 19.23 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +79.3 (*c* = 0.85, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.37 (d, *J* = 7.2 Hz, 2H), 7.30-7.24 (m, 9H), 7.14 (s, 5H), 6.87 (s, 1H), 4.85 (s, 1H), 3.99 (AB, *J* = 15.2 Hz, 1H), 3.86 (AB, *J* = 14.8 Hz, 1H), 3.65 (t, *J* = 9.4 Hz, 1H), 3.41 (s, 3H), 2.93 (d, *J* = 9.6 Hz, 1H), 2.81 (t, *J* = 9.2 Hz, 1H), 2.42 (d, *J* = 10.0 Hz, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.6, 142.6, 141.3, 138.2, 138.1, 129.1, 128.6, 128.2, 128.11, 128.07, 127.9, 127.8, 127.5, 126.6, 125.9, 125.4, 81.7, 74.4, 58.5, 54.1, 49.7, 35.1, 35.0 ppm. **HRMS** (ESI) *m/z*: [M+H]⁺ calcd. for C₂₉H₂₈N₃O₂: 450.2166; found: 450.2166.



(S)-(3-isopropyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3ac) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (*Z*)-*N*-isopropyl-1-phenylmethanimine oxide (**2c**, 39.2 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ac** as a white solid (64.2 mg, 80% yield).

3ac: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 5/95, 1.0 mL/min, 254 nm; tr (minor) = 6.79 min, tr (major) = 8.15 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +37.2 (c = 2.00, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.44 (d, J = 8.0 Hz, 2H), 7.36 (t, J = 7.4 Hz, 2H), 7.30-7.26 (m, 1H), 7.20 (s, 1H), 7.14-7.05 (m, 5H), 6.86 (s, 1H), 4.98 (s, 1H), 3.57 (t, J = 9.4 Hz, 1H), 3.38 (s, 3H), 2.94-2.90 (m, 1H), 2.87 (d, J = 9.6 Hz, 1H), 2.74 (t, J = 9.0 Hz, 1H), 2.37 (d, J = 10.0 Hz, 1H), 1.21 (d, J = 6.8 Hz, 3H), 1.14 (d, J = 6.4 Hz, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 192.1, 142.78, 142.0, 138.8, 129.0, 128.2, 127.9, 127.74, 127.71, 127.5, 125.7, 125.4, 80.8, 70.1, 53.9, 51.5, 49.3, 35.1, 34.4, 21.2, 14.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₂₅H₂₈N₃O₂: 402.2176; found: 402.2176.

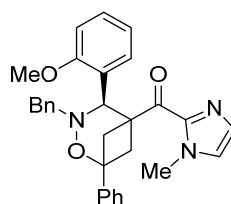


(S)-(1-methyl-1H-imidazol-2-yl)(1,3,4-triphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)methanone:

(3ad) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (*Z*)-*N*,1-diphenylmethanimine oxide (**2d**, 47.3 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ad** as colorless oil (78.4 mg, 90% yield).

3ad: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 10/90, 1.0 mL/min, 254 nm; tr (minor) = 13.10 min, tr (major) = 20.54 min) gave the isomeric composition of the product: 94% ee. $[\alpha]_D^{20}$ = +66.8 (c = 1.38, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.49 (d, J = 7.6 Hz, 2H), 7.41 (t, J = 7.6 Hz, 2H), 7.36-7.31 (m, 1H), 7.18-7.14 (m, 8H), 7.06 (d, J = 8.0 Hz, 2H), 6.97 (s, 1H), 6.86 (t, J = 7.4 Hz, 1H), 6.02 (s, 1H), 3.71 (s, 3H), 3.24-3.16 (m, 2H), 2.73 (d, J = 9.6 Hz, 1H), 2.65 (d, J = 9.2 Hz, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 190.8, 149.8, 142.1, 140.5, 138.6, 129.4, 128.5, 128.4, 128.1, 127.6, 127.5, 126.4, 125.9, 121.6, 117.0, 83.6, 71.1,

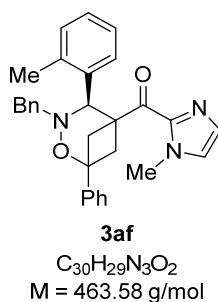
54.1, 45.4, 35.7, 35.7 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{28}H_{26}N_3O_2$: 436.2020; found: 436.2011.



3ae
 $C_{30}H_{29}N_3O_3$
 $M = 479.58$ g/mol

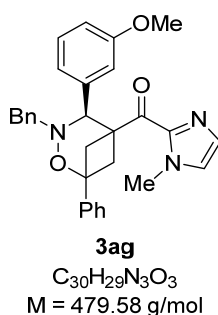
(S)-(3-benzyl-4-(2-methoxyphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ae**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(2-methoxyphenyl)methanimine oxide (**2e**, 57.9 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ae** as a white solid (89.2 mg, 93% yield).

3ae: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (minor) = 8.97 min, t_r (major) = 11.54 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +96.0$ ($c = 2.00$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.65 (d, $J = 7.6$ Hz, 1H), 7.36 (d, $J = 7.6$ Hz, 2H), 7.32-7.21 (m, 7H), 7.19-7.09 (m, 3H), 6.88 (t, $J = 7.6$ Hz, 1H), 6.81 (s, 1H), 6.60 (d, $J = 8.4$ Hz, 1H), 5.34 (s, 1H), 3.94 (AB, $J = 14.8$ Hz, 1H), 3.90 (AB, $J = 14.8$ Hz, 1H), 3.72 (t, $J = 9.2$ Hz, 1H), 3.47 (s, 3H), 3.40 (s, 3H), 2.99 (d, $J = 9.6$ Hz, 1H), 2.90 (t, $J = 9.2$ Hz, 1H), 2.46 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 192.3, 156.8, 142.7, 141.5, 138.7, 129.2, 128.9, 128.8, 128.4, 128.1, 127.7, 127.4, 126.4, 126.1, 125.43, 125.35, 120.6, 109.9, 81.7, 65.8, 58.4, 55.2, 53.9, 50.0, 35.8, 35.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{30}H_{30}N_3O_3$: 480.2282; found: 480.2270.



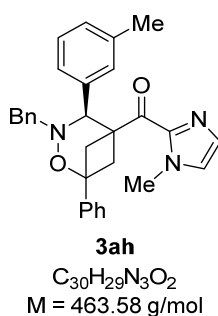
(S)-(3-benzyl-1-phenyl-4-(o-tolyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3af) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(o-tolyl)methanimine oxide (**2f**, 54.0 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3af** as a white solid (66.8 mg, 72% yield).

3af: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak IC, *i*PrOH/hexane = 15/85, 0.8 mL/min, 254 nm; t_r (major) = 8.86 min, t_r (minor) = 9.20 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +116.9$ ($c = 1.50$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.66 (d, $J = 8.0$ Hz, 1H), 7.34 (d, $J = 7.2$ Hz, 2H), 7.28-7.20 (m, 8H), 7.15-7.10 (m, 2H), 7.03 (t, $J = 7.4$ Hz, 1H), 6.90 (d, $J = 7.6$ Hz, 1H), 6.82 (s, 1H), 5.06 (s, 1H), 3.90 (s, 1H), 3.92 (AB, $J = 14.4$ Hz, 1H), 3.85 (AB, $J = 14.8$ Hz, 1H), 3.79 (t, $J = 9.2$ Hz, 1H), 3.37 (s, 3H), 3.02 (d, $J = 9.6$ Hz, 1H), 2.86 (t, $J = 9.2$ Hz, 1H), 2.50 (d, $J = 10.0$ Hz, 1H), 2.05 (s, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 192.1, 142.7, 141.3, 138.5, 136.8, 135.9, 130.0, 128.9, 128.4, 128.2, 128.1, 127.8, 127.7, 127.5, 126.5, 126.2, 126.0, 125.4, 81.8, 69.3, 57.8, 54.2, 50.5, 36.1, 34.9, 19.4 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{30}H_{30}N_3O_2$: 464.2333; found: 464.2324.



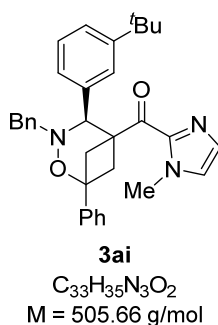
(S)-(3-benzyl-4-(3-methoxyphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ag**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(3-methoxyphenyl)methanimine oxide (**2g**, 57.9 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ag** as colorless oil (57.5 mg, 60% yield).

3ag: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, iPrOH/hexane = 15/85, 0.8 mL/min, 254 nm; tr (minor) = 16.40 min, tr (major) = 17.12 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20}$ = +63.7 (c = 1.38, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.38 (d, J = 8.4 Hz, 2H), 7.30-7.27 (m, 6H), 7.23-7.20 (m, 3H), 7.06 (t, J = 8.0 Hz, 1H), 6.91 (s, 1H), 6.76-6.67 (m, 3H), 4.83 (s, 1H), 4.01 (AB, J = 14.8 Hz, 1H), 3.86 (AB, J = 14.8 Hz, 1H), 3.65 (s, 3H), 3.62 (t, J = 9.6 Hz, 1H), 3.49 (s, 3H), 2.92 (d, J = 10.0 Hz, 1H), 2.79 (t, J = 9.2 Hz, 1H), 2.41 (d, J = 10.0 Hz, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.5, 159.3, 142.8, 141.3, 139.6, 138.2, 129.2, 129.1, 128.7, 128.2, 127.9, 127.5, 126.6, 125.9, 125.4, 120.0, 114.2, 112.8, 81.7, 74.3, 58.7, 55.1, 54.1, 49.7, 35.2, 35.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₃₀H₃₀N₃O₃: 480.2282; found: 480.2271.



(S)-(3-benzyl-1-phenyl-4-(*m*-tolyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ah**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(*m*-tolyl)methanimine oxide (**2h**, 54.0 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ah** as a white solid (76.0 mg, 82% yield).

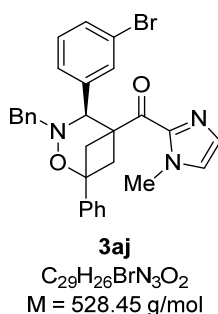
3ah: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralcel IC, i PrOH/hexane = 10/90, 0.8 mL/min, 254 nm; tr (minor) = 8.18 min, tr (major) = 8.61 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +97.5 (c = 1.88, CHCl_3). **^1H NMR** (400 MHz, CDCl_3): δ 7.37 (d, J = 7.6 Hz, 2H), 7.30-7.26 (m, 6H), 7.24-7.19 (m, 3H), 7.04-7.01 (m, 1H), 6.97-6.93 (m, 2H), 6.87 (s, 2H), 4.78 (s, 1H), 4.00 (AB, J = 14.8 Hz, 1H), 3.84 (AB, J = 14.8 Hz, 1H), 3.64 (t, J = 9.4 Hz, 1H), 3.40 (s, 3H), 2.93 (d, J = 9.6 Hz, 1H), 2.80 (t, J = 9.2 Hz, 1H), 2.41 (d, J = 10.0 Hz, 1H), 2.19 (s, 3H) ppm. **^{13}C NMR** (100 MHz, CDCl_3): δ 191.7, 142.8, 141.4, 138.2, 138.0, 137.6, 129.0, 128.8, 128.6, 128.5, 128.1, 128.0, 127.8, 127.5, 126.6, 125.7, 125.4, 124.8, 81.7, 74.3, 58.6, 54.0, 49.7, 35.0, 34.9, 21.23 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{30}\text{H}_{30}\text{N}_3\text{O}_2$: 464.2333; found: 464.2323.



(S)-(3-benzyl-4-(3-(tert-butyl)phenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ai**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(3-(tert-butyl)phenyl)methanimine oxide (**2i**, 64.2 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ai** as colorless oil (87.0 mg, 86% yield).

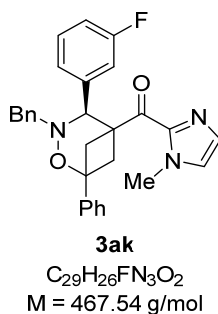
3ai: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 11.76 min, tr (major) = 18.65 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +30.9 (c = 2.13, CHCl_3). **^1H NMR** (400 MHz, CDCl_3): δ 7.37 (d, J = 7.2 Hz, 2H), 7.31-7.25 (m, 6H), 7.23-7.18 (m, 4H), 7.16-7.11 (m, 2H), 6.98 (s, 1H), 6.84 (s, 1H), 4.85 (s, 1H), 4.02 (AB, J = 14.8 Hz, 1H), 3.86 (AB, J = 14.8 Hz, 1H), 3.66 (t, J = 9.4 Hz, 1H), 3.41 (s, 3H), 2.91 (d,

$J = 9.6$ Hz, 1H), 2.81 (t, $J = 9.2$ Hz, 1H), 2.41 (d, $J = 10.4$ Hz, 1H), 1.13 (s, 9H) ppm. **^{13}C NMR** (100 MHz, CDCl_3): δ 191.5, 150.7, 142.7, 141.4, 138.3, 137.6, 129.0, 128.6, 128.12, 128.07, 127.8, 127.5, 126.6, 125.9, 125.5, 125.4, 124.9, 124.5, 81.7, 74.7, 58.6, 54.1, 49.8, 35.2, 35.0, 34.5, 31.2 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{33}\text{H}_{36}\text{N}_3\text{O}_2$: 506.2802; found: 506.2792.



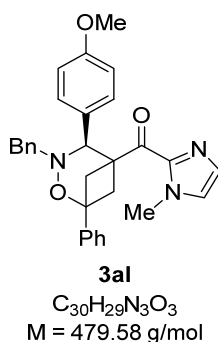
(S)-(3-benzyl-4-(3-bromophenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3aj) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(3-bromophenyl)methanimine oxide (**2j**, 69.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ai** as a white solid (81.4 mg, 77% yield).

3aj: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, $i\text{PrOH}$ /hexane = 15/85, 1.0 mL/min, 254 nm; t_r (major) = 9.82 min, t_r (minor) = 13.10 min) gave the isomeric composition of the product: 99.6% ee. $[\alpha]_D^{20} = +47.1$ ($c = 2.00$, CHCl_3). **^1H NMR** (400 MHz, CDCl_3): δ 7.36 (d, $J = 7.6$ Hz, 2H), 7.30-7.23 (m, 11H), 7.07-7.03 (m, 2H), 6.95 (s, 1H), 4.83 (s, 1H), 3.98 (AB, $J = 14.8$ Hz, 1H), 3.87 (AB, $J = 14.8$ Hz, 1H), 3.56 (d, $J = 9.4$ Hz, 1H), 3.52 (s, 3H), 2.91 (d, $J = 9.6$ Hz, 1H), 2.78 (t, $J = 9.4$ Hz, 1H), 2.41 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, CDCl_3): δ 191.1, 142.4, 141.1, 140.5, 137.7, 131.2, 131.1, 129.9, 129.3, 128.7, 128.2, 127.9, 127.6, 126.8, 126.4, 126.3, 125.4, 122.0, 81.7, 73.7, 58.9, 54.1, 49.5, 35.2, 34.7 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{29}\text{H}_{27}\text{BrN}_3\text{O}_2$: 528.1281; found: 528.1271.



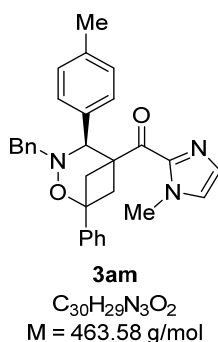
(S)-(3-benzyl-4-(3-fluorophenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3ak) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(3-fluorophenyl)methanimine oxide (**2k**, 55.0 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ak** as colorless oil (68.2 mg, 73% yield).

3ak: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (major) = 10.03 min, t_r (minor) = 10.55 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +86.1$ ($c = 1.50$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.36 (d, $J = 7.6$ Hz, 2H), 7.31-7.22 (m, 9H), 7.13-7.08 (m, 1H), 6.94-6.84 (m, 4H), 4.89 (s, 1H), 3.98 (AB, $J = 14.8$ Hz, 1H), 3.87 (AB, $J = 14.8$ Hz, 1H), 3.59 (t, $J = 9.4$ Hz, 1H), 3.53 (s, 3H), 2.90 (d, $J = 10.0$ Hz, 1H), 2.78 (t, $J = 9.2$ Hz, 1H), 2.41 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.2, 162.5 (d, $J = 244$ Hz), 142.4, 141.1, 140.8 (d, $J = 7$ Hz), 137.9, 129.6 (d, $J = 8$ Hz), 129.3, 128.7, 128.2, 127.9, 127.6, 126.8, 126.2, 125.4, 123.5 (d, $J = 3$ Hz), 115.0 (d, $J = 18$ Hz), 114.8 (d, $J = 19$ Hz), 81.7, 73.7 (d, $J = 2$ Hz), 58.8, 54.1, 49.6, 35.3, 34.9 ppm. **^{19}F NMR** (376 MHz, $CDCl_3$): δ -112.755 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{29}H_{27}FN_3O_2$: 468.2072; found: 468.2082.



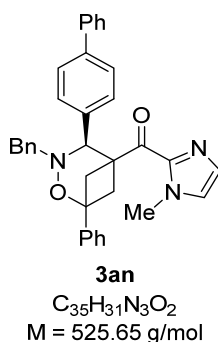
(S)-(3-benzyl-4-(4-methoxyphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3al) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(4-methoxyphenyl)methanimine oxide (**2l**, 57.9 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3al** as a white solid (76.7 mg, 80% yield).

3al: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (major) = 14.42 min, tr (minor) = 16.83 min) gave the isomeric composition of the product: 97% ee. $[\alpha]_D^{20} = +52.0$ ($c = 1.88$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.37 (d, $J = 7.6$ Hz, 2H), 7.29-7.20 (m, 9H), 7.07 (d, $J = 8.0$ Hz, 2H), 6.89 (s, 1H), 6.68 (d, $J = 8.0$ Hz, 2H), 4.82 (s, 1H), 3.96 (AB, $J = 15.2$ Hz, 1H), 3.83 (AB, $J = 15.2$ Hz, 1H), 3.72 (s, 3H), 3.63 (t, $J = 9.4$ Hz, 1H), 3.49 (s, 3H), 2.91 (d, $J = 9.6$ Hz, 1H), 2.78 (t, $J = 9.2$ Hz, 1H), 2.40 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.8, 159.2, 142.6, 141.4, 138.3, 130.2, 129.1, 129.0, 128.6, 128.1, 127.8, 127.5, 126.6, 125.9, 125.4, 113.5, 81.6, 73.7, 58.3, 55.1, 54.0, 49.7, 35.3, 34.9 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{30}H_{30}N_3O_3$: 480.2282; found: 480.2272.



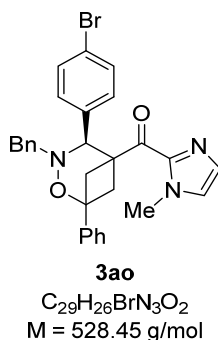
(S)-(3-benzyl-1-phenyl-4-(p-tolyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3am) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(p-tolyl)methanimine oxide (**2m**, 54.0 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3am** as a white solid (69.5 mg, 75% yield).

3am: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (major) = 10.45 min, tr (minor) = 12.95 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20} = +75.4$ ($c = 1.50$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.37 (d, $J = 7.2$ Hz, 2H), 7.29-7.20 (m, 9H), 7.02 (d, $J = 8.0$ Hz, 2H), 6.94 (d, $J = 7.6$ Hz, 2H), 6.89 (s, 1H), 4.82 (s, 1H), 4.00 (AB, $J = 14.8$ Hz, 1H), 3.83 (AB, $J = 14.8$ Hz, 1H), 3.64 (t, $J = 9.2$ Hz, 1H), 3.44 (s, 3H), 2.92 (d, $J = 9.6$ Hz, 1H), 2.79 (t, $J = 9.2$ Hz, 1H), 2.40 (d, $J = 10.0$ Hz, 1H), 2.23 (s, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.8, 142.7, 141.4, 138.3, 137.7, 135.1, 129.1, 128.8, 128.6, 128.1, 127.8, 127.7, 127.5, 126.6, 125.9, 125.4, 81.6, 74.0, 58.4, 54.1, 49.7, 35.2, 35.0, 21.1 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{30}H_{30}N_3O_2$: 464.2333; found: 464.2325.



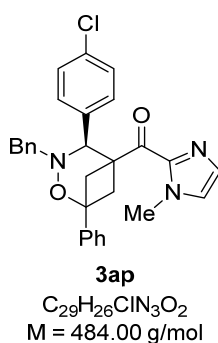
(S)-4-([1,1'-biphenyl]-4-yl)-3-benzyl-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-ylidene(1-methyl-1H-imidazol-2-yl)methanone: (**3an**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-1-([1,1'-biphenyl]-4-yl)-N-benzylmethanimine oxide (**2n**, 70.0 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3an** as a white solid (98.8 mg, 94% yield).

3an: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (major) = 15.70 min, t_r (minor) = 18.52 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +4.5$ ($c = 2.48$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.50 (d, $J = 7.6$ Hz, 2H), 7.42–7.37 (m, 6H), 7.33–7.27 (m, 7H), 7.24–7.20 (m, 5H), 6.88 (s, 1H), 4.90 (s, 1H), 4.05 (AB, $J = 14.8$ Hz, 1H), 3.89 (AB, $J = 15.2$ Hz, 1H), 3.69 (t, $J = 9.4$ Hz, 1H), 3.43 (s, 3H), 2.94 (d, $J = 9.6$ Hz, 1H), 2.82 (t, $J = 9.0$ Hz, 1H), 2.45 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.6, 142.6, 141.3, 140.8, 140.5, 138.1, 137.2, 129.2, 128.8, 128.7, 128.3, 128.2, 127.9, 127.6, 127.3, 126.9, 126.7, 126.6, 125.9, 125.4, 81.7, 74.1, 58.6, 54.1, 49.8, 35.2, 35.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{35}H_{32}N_3O_2$: 526.2489; found: 526.2475.



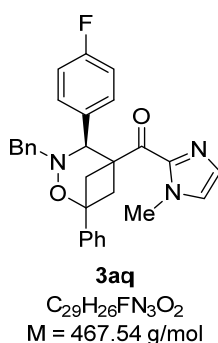
(S)-(3-benzyl-4-(4-bromophenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3ao) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(4-bromophenyl)methanimine oxide (**2o**, 69.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ao** as a white solid (87.7mg, 83% yield).

3ao: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (major) = 12.33 min, tr (minor) = 13.94 min) gave the isomeric composition of the product: 99.6% ee. $[\alpha]_D^{20} = +26.9$ ($c = 2.10$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.34 (d, $J = 7.6$ Hz, 2H), 7.30-7.21 (m, 11H), 7.05 (d, $J = 8.0$ Hz, 2H), 6.93 (s, 1H), 4.88 (s, 1H), 3.95 (AB, $J = 14.8$ Hz, 1H), 3.85 (AB, $J = 14.8$ Hz, 1H), 3.60 (t, $J = 9.8$ Hz, 1H), 3.55 (s, 3H), 2.89 (d, $J = 9.6$ Hz, 1H), 2.76 (t, $J = 9.2$ Hz, 1H), 2.41 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.2, 142.3, 141.1, 137.8, 137.2, 131.3, 129.6, 129.3, 128.7, 128.2, 127.9, 127.6, 126.8, 126.2, 125.4, 122.0, 81.7, 73.6, 58.6, 54.0, 49.7, 35.4, 34.9 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{29}H_{27}BrN_3O_2$: 528.1281; found: 528.1270.



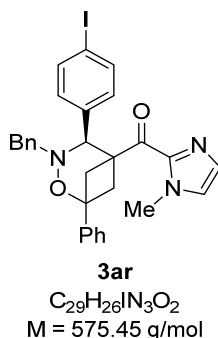
(S)-(3-benzyl-4-(4-chlorophenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ap**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(4-chlorophenyl)methanimine oxide (**2p**, 58.8 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ap** as a white solid (77.4 mg, 80% yield).

3ap: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, iPrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (major) = 12.08 min, t_r (minor) = 14.57 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20}$ = +44.8 (c = 1.88, CHCl_3). $^1\text{H NMR}$ (400 MHz, CDCl_3): δ 7.34 (d, J = 7.6 Hz, 2H), 7.30-7.20 (m, 9H), 7.13-7.19 (m, 4H), 6.92 (s, 1H), 4.89 (s, 1H), 3.95 (AB, J = 14.8 Hz, 1H), 3.85 (AB, J = 14.8 Hz, 1H), 3.60 (t, J = 9.4 Hz, 1H), 3.54 (s, 3H), 2.89 (d, J = 9.6 Hz, 1H), 2.77 (t, J = 9.2 Hz, 1H), 2.41 (d, J = 10.0 Hz, 1H) ppm. $^{13}\text{C NMR}$ (100 MHz, CDCl_3): δ 191.2, 142.3, 141.1, 137.9, 136.7, 133.8, 129.29, 129.26, 128.6, 128.3, 128.2, 127.9, 127.6, 126.7, 126.2, 125.4, 81.7, 73.6, 58.6, 54.0, 50.0, 35.4, 34.9 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{29}\text{H}_{27}\text{ClN}_3\text{O}_2$: 484.1786; found: 484.1778.



(S)-(3-benzyl-4-(4-fluorophenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3aq**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(4-fluorophenyl)methanimine oxide (**2q**, 55.0 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3aq** as colorless oil (77.6 mg, 83% yield).

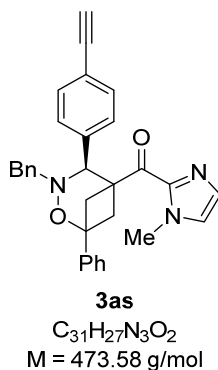
3aq: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (major) = 11.00 min, tr (minor) = 14.11 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20}$ = +68.1 (c = 1.00, CHCl_3). **^1H NMR** (400 MHz, CDCl_3): δ 7.35 (d, J = 8.8 Hz, 2H), 7.30-7.20 (m, 9H), 7.16-7.13 (m, 2H), 6.90 (s, 1H), 6.84 (t, J = 8.8 Hz, 2H), 4.89 (s, 1H), 3.96 (AB, J = 14.8 Hz, 1H), 3.85 (AB, J = 14.8 Hz, 1H), 3.61 (t, J = 9.4 Hz, 1H), 3.52 (s, 3H), 2.90 (d, J = 9.6 Hz, 1H), 2.78 (t, J = 9.0 Hz, 1H), 2.41 (d, J = 10.0 Hz, 1H) ppm. **^{13}C NMR** (100 MHz, CDCl_3): δ 191.4, 162.4 (d, J = 246 Hz), 142.4, 141.2, 138.0, 134.0 (d, J = 3 Hz), 129.6 (d, J = 8 Hz), 129.2, 128.6, 128.2, 127.9, 127.6, 126.7, 126.1, 125.4, 115.0 (d, J = 21 Hz), 114.9, 81.7, 73.5, 58.5, 54.0, 49.7, 35.3, 34.9 ppm. **^{19}F NMR** (376 MHz, CDCl_3): δ -113.657 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{29}\text{H}_{27}\text{FN}_3\text{O}_2$: 468.2082; found: 468.2073.



(S)-(3-benzyl-4-(4-iodophenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ar**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(4-iodophenyl)methanimine oxide (**2r**, 80.9 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ar** as a white solid (92.1 mg, 80% yield).

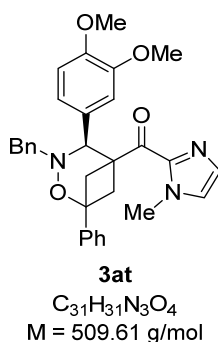
3ar: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (major) = 12.19 min, tr (minor) = 13.19 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +13.5 (c = 2.25, CHCl_3). **^1H NMR** (400 MHz, CDCl_3): δ 7.48 (d, J = 7.6 Hz, 2H), 7.34 (d, J = 7.6 Hz, 2H),

7.29-7.23 (m, 8H), 7.20 (s, 1H), 6.91 (d, $J = 8.4$ Hz, 3H), 4.86 (s, 1H), 3.95 (AB, $J = 14.8$ Hz, 1H), 3.85 (AB, $J = 14.8$ Hz, 1H), 3.59 (t, $J = 9.4$ Hz, 1H), 3.54 (s, 3H), 2.89 (d, $J = 10.0$ Hz, 1H), 2.76 (t, $J = 9.2$ Hz, 1H), 2.41 (d, $J = 10.4$ Hz, 1H) ppm. ^{13}C NMR (100 MHz, CDCl_3): δ 191.2, 142.3, 141.1, 137.9, 137.8, 137.3, 129.8, 129.3, 128.6, 128.2, 127.9, 127.6, 126.7, 126.2, 125.4, 93.8, 81.7, 73.7, 58.6, 54.0, 49.6, 35.4, 34.9 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{29}\text{H}_{27}\text{IN}_3\text{O}_2$: 576.1142; found: 576.1133.



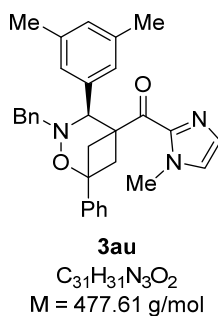
(S)-(3-benzyl-4-(4-ethynylphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3as) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(4-ethynylphenyl)methanimine oxide (**2s**, 56.5 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3as** as a white solid (66.3 mg, 70% yield).

3as: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak IC, iPrOH/hexane = 5/95, 0.8 mL/min, 254 nm; tr (minor) = 10.68 min, tr (major) = 11.58 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +19.2$ ($c = 1.50$, CHCl_3). ^1H NMR (400 MHz, CDCl_3): δ 7.34 (d, $J = 7.6$ Hz, 2H), 7.30-7.21 (m, 11H), 7.12 (d, $J = 7.6$ Hz, 2H), 6.90 (s, 1H), 4.89 (s, 1H), 3.94 (AB, $J = 14.8$ Hz, 1H), 3.85 (AB, $J = 14.8$ Hz, 1H), 3.61 (t, $J = 9.4$ Hz, 1H), 3.50 (s, 3H), 3.03 (s, 1H), 2.90 (d, $J = 9.6$ Hz, 1H), 2.78 (t, $J = 9.2$ Hz, 1H), 2.42 (d, $J = 10.0$ Hz, 1H) ppm. ^{13}C NMR (100 MHz, CDCl_3): δ 191.2, 142.4, 141.2, 139.0, 137.9, 131.9, 129.2, 128.7, 128.2, 128.0, 127.9, 127.6, 126.7, 126.1, 125.4, 121.8, 83.3, 81.7, 77.5, 74.0, 58.7, 54.1, 49.7, 35.3, 35.0 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{31}\text{H}_{28}\text{N}_3\text{O}_2$: 474.2176; found: 474.2169.



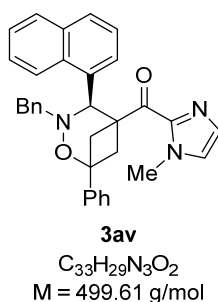
(S)-(3-benzyl-4-(3,4-dimethoxyphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3at) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (*Z*)-*N*-benzyl-1-(3,4-dimethoxyphenyl)methanimine oxide (**2t**, 65.1 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3at** as a white solid (87.7 mg, 86% yield).

3at: $R_f = 0.3$ (petroleum ether/EtOAc = 1/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (major) = 13.12 min, t_r (minor) = 16.81 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20} = +51.2$ ($c = 2.10$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.38 (d, $J = 7.6$ Hz, 2H), 7.30-7.22 (m, 9H), 6.91 (s, 1H), 6.85 (d, $J = 8.4$ Hz, 1H), 6.69 (d, $J = 8.4$ Hz, 1H), 6.58 (s, 1H), 4.83 (s, 1H), 4.02 (AB, $J = 14.8$ Hz, 1H), 3.86 (AB, $J = 14.8$ Hz, 1H), 3.80 (s, 3H), 3.66 (s, 3H), 3.62 (t, $J = 9.4$ Hz, 1H), 3.53 (s, 3H), 2.90 (d, $J = 9.6$ Hz, 1H), 2.77 (t, $J = 9.2$ Hz, 1H), 2.40 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.5, 148.5, 148.2, 142.7, 141.3, 138.3, 130.6, 129.0, 128.6, 128.1, 127.8, 127.5, 126.6, 125.9, 125.4, 119.8, 111.1, 110.9, 81.6, 73.9, 58.5, 55.7, 55.6, 54.1, 49.7, 35.4, 34.9 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{31}H_{32}N_3O_4$: 510.2387; found: 510.2378.



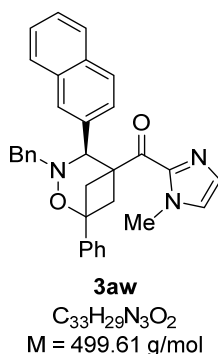
(S)-(3-benzyl-4-(3,5-dimethylphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3au**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(3,5-dimethylphenyl)methanimine oxide (**2u**, 57.4 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3au** as colorless oil (82.1 mg, 86% yield).

3au: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, iPrOH/hexane = 10/90, 1.0 mL/min, 254 nm; tr (major) = 7.52 min, tr (minor) = 9.74 min) gave the isomeric composition of the product: 97% ee. $[\alpha]_D^{20}$ = +85.3 (c = 2.00, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.38 (d, J = 7.2 Hz, 2H), 7.30-7.21 (m, 9H), 6.88 (s, 1H), 6.78 (s, 1H), 6.69 (s, 2H), 4.72 (s, 1H), 4.01 (AB, J = 14.8 Hz, 1H), 3.83 (AB, J = 14.8 Hz, 1H), 3.62 (t, J = 9.4 Hz, 1H), 3.40 (s, 3H), 2.93 (d, J = 9.6 Hz, 1H), 2.79 (t, J = 9.2 Hz, 1H), 2.40 (d, J = 10.0 Hz, 1H), 2.15 (s, 6H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.8, 143.0, 141.4, 138.3, 137.9, 137.4, 129.6, 129.0, 128.7, 128.1, 127.8, 127.5, 126.6, 125.6, 125.5, 125.4, 81.7, 74.3, 58.6, 54.0, 49.6, 34.9, 34.8, 21.2 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₃₁H₃₂N₃O₂: 478.2489; found: 478.2478.



(S)-(3-benzyl-4-(naphthalen-1-yl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3av**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(naphthalen-1-yl)methanimine oxide (**2v**, 62.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3av** as a white solid (86.9 mg, 87% yield).

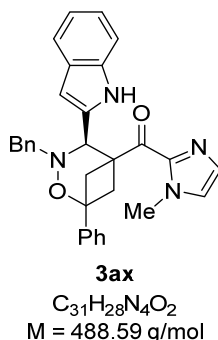
3av: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (major) = 11.64 min, tr (minor) = 16.06 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +165.5 (c = 2.00, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 8.10 (d, J = 7.2 Hz, 1H), 7.80 (d, J = 8.4 Hz, 1H), 7.70 (t, J = 7.8 Hz, 2H), 7.46 (t, J = 8.0 Hz, 1H), 7.36-7.28 (m, 7H), 7.26-7.18 (m, 5H), 7.04 (s, 1H), 6.50 (s, 1H), 5.60 (s, 1H), 3.98-3.82 (m, 3H), 3.09 (d, J = 10.0 Hz, 1H), 2.99 (t, J = 9.4 Hz, 1H), 2.83 (s, 3H), 2.45 (d, J = 10.4 Hz, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.7, 142.5, 141.3, 138.0, 133.6, 133.4, 130.9, 128.8, 128.7, 128.4, 128.24, 128.17, 127.8, 127.6, 126.6, 125.8, 125.7, 125.5, 125.1, 124.9, 123.0, 81.7, 67.4, 58.6, 54.7, 49.9, 35.9, 34.3 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₃₃H₃₀N₃O₂: 500.2333; found: 500.2323.



(S)-3-benzyl-4-(naphthalen-2-yl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl(1-methyl-1H-imidazol-2-yl)methanone: (**3aw**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(naphthalen-2-yl)methanimine oxide (**2w**, 62.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3aw** as a white solid (82.9 mg, 83% yield).

3aw: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak IC, *i*PrOH/hexane = 10/90, 0.8 mL/min, 254 nm; tr (minor) = 9.06 min, tr (major) = 9.91 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20}$ = +51.8 (c = 2.00, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.75-7.72 (m, 1H), 7.67 (d, J = 8.4 Hz, 1H), 7.63-7.61 (m, 1H), 7.45-7.34 (m, 6H), 7.32-7.18 (m, 9H), 6.84 (s, 1H), 5.03 (s, 1H), 4.03 (AB,

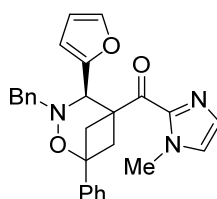
$J = 14.8$ Hz, 1H), 3.89 (AB, $J = 14.8$ Hz, 1H), 3.74 (t, $J = 9.4$ Hz, 1H), 3.19 (s, 3H), 2.96 (d, $J = 10.0$ Hz, 1H), 2.85 (t, $J = 9.0$ Hz, 1H), 2.47 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, CDCl_3): δ 191.5, 142.7, 141.3, 138.1, 135.7, 133.2, 133.0, 129.2, 128.7, 128.2, 127.94, 127.85, 127.6, 127.5, 127.4, 126.7, 126.0, 125.9, 125.44, 125.35, 81.8, 74.4, 58.7, 54.2, 49.8, 35.1, 35.0 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{33}\text{H}_{30}\text{N}_3\text{O}_2$: 500.2333; found: 500.2323.



(R)-(3-benzyl-4-(1H-indol-2-yl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3ax) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(1H-indol-2-yl)methanimine oxide (**2x**, 60.1 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ax** as a white solid (30.3 mg, 31% yield).

3ax: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, $i\text{PrOH/hexane} = 15/85$, 1.0 mL/min, 254 nm; t_r (minor) = 14.81 min, t_r (major) = 28.58 min) gave the isomeric composition of the product: 95% ee. $[\alpha]_D^{20} = +18.1$ ($c = 0.75$, CHCl_3). **^1H NMR** (400 MHz, CDCl_3): δ 8.45 (s, 1H), 7.40 (d, $J = 8.0$ Hz, 1H), 7.37-7.22 (m, 12H), 7.10 (t, $J = 7.6$ Hz, 1H), 7.01 (t, $J = 7.6$ Hz, 1H), 6.92 (s, 1H), 5.88 (s, 1H), 5.24 (s, 1H), 4.10 (AB, $J = 14.8$ Hz, 1H), 3.96 (AB, $J = 14.8$ Hz, 1H), 3.57 (t, $J = 9.4$ Hz, 1H), 3.51 (s, 3H), 2.86 (d, $J = 9.6$ Hz, 1H), 2.75 (t, $J = 9.2$ Hz, 1H), 2.50 (d, $J = 10.4$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, CDCl_3): δ 190.5, 142.4, 141.0, 137.5, 135.8, 134.9, 129.2, 129.0, 128.3, 128.0, 127.7, 126.9, 126.3, 125.4, 121.9, 120.2, 119.7,

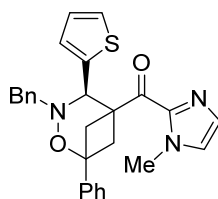
111.1, 101.4, 81.8, 68.1, 59.2, 53.4, 49.0, 35.5, 34.8 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{31}H_{29}N_4O_2$: 489.2275; found: 489.2275.



3ay
 $C_{27}H_{25}N_3O_3$
 $M = 439.52$ g/mol

(R)-(3-benzyl-4-(furan-2-yl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ay**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(furan-2-yl)methanimine oxide (**2y**, 48.3 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ay** as a white solid (52.7 mg, 60% yield).

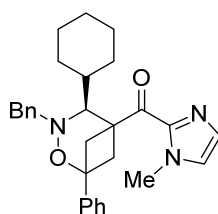
3ay: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (major) = 14.63 min, t_r (minor) = 19.42 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +56.4$ ($c = 1.00$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.39 (d, $J = 7.6$ Hz, 2H), 7.32-7.21 (m, 10H), 7.05 (s, 1H), 6.97 (s, 1H), 6.18 (s, 1H), 5.01 (s, 1H), 4.11 (AB, $J = 14.8$ Hz, 1H), 3.89 (AB, $J = 14.8$ Hz, 1H), 3.73 (s, 3H), 3.50 (t, $J = 9.4$ Hz, 1H), 2.83 (d, $J = 9.6$ Hz, 1H), 2.71 (t, $J = 9.2$ Hz, 1H), 2.38 (d, $J = 10.4$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.3, 143.0, 142.3, 141.3, 140.4, 138.2, 129.2, 128.6, 128.2, 127.9, 127.5, 126.7, 126.2, 125.4, 122.5, 109.1, 81.7, 66.2, 58.6, 53.4, 49.1, 35.6, 34.4 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{27}H_{26}N_3O_3$: 440.1969; found: 440.1965.

**3az**

$C_{27}H_{25}N_3O_2S$
 $M = 455.58 \text{ g/mol}$

(R)-(3-benzyl-1-phenyl-4-(thiophen-2-yl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3az) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-(thiophen-2-yl)methanimine oxide (**2z**, 52.2 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3az** as a white solid (72.9 mg, 80% yield).

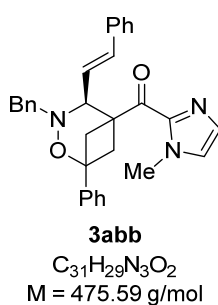
3az: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 12.91 min, tr (major) = 14.54 min) gave the isomeric composition of the product: 99.7% ee. $[\alpha]_D^{20} = +71.2$ ($c = 1.75$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.42 (d, $J = 7.6$ Hz, 2H), 7.32-7.21 (m, 9H), 7.17 (d, $J = 5.2$ Hz, 1H), 6.97 (s, 1H), 6.74 (t, $J = 4.2$ Hz, 1H), 6.35 (s, 1H), 5.37 (s, 1H), 4.12 (AB, $J = 14.8$ Hz, 1H), 3.89 (AB, $J = 14.8$ Hz, 1H), 3.64 (s, 3H), 3.59 (t, $J = 9.4$ Hz, 1H), 2.87 (d, $J = 9.6$ Hz, 1H), 2.76 (t, $J = 9.2$ Hz, 1H), 2.37 (d, $J = 10.4$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 190.7, 142.4, 141.14, 141.09, 138.0, 129.2, 128.7, 128.2, 127.9, 127.6, 126.7, 126.2, 125.8, 125.7, 125.4, 124.9, 81.7, 69.8, 58.7, 54.1, 48.6, 35.5, 34.1 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{27}H_{26}N_3O_2S$: 456.1740; found: 456.1735.

**3aaa**

$C_{29}H_{33}N_3O_2$
 $M = 455.60 \text{ g/mol}$

(S)-(3-benzyl-4-cyclohexyl-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3aaa**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (Z)-N-benzyl-1-cyclohexylmethanimine oxide (**2aa**, 52.2 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3aaa** as a white solid (54.7 mg, 60% yield).

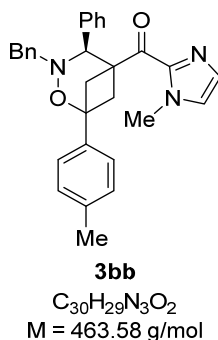
3aaa: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, iPrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (major) = 7.40 min, tr (minor) = 8.31 min) gave the isomeric composition of the product: 70% ee. $[\alpha]_D^{20}$ = +67.1 (c = 1.38, CHCl₃). **¹H NMR** (600 MHz, CDCl₃): δ 7.49 (d, J = 7.2 Hz, 2H), 7.33 (t, J = 5.0 Hz, 2H), 7.24 (s, 5H), 7.20-7.19 (m, 2H), 7.01 (s, 1H), 4.44 (AB, J = 14.8 Hz, 1H), 4.27 (AB, J = 14.8 Hz, 1H), 4.12 (s, 1H), 4.00 (s, 3H), 3.07 (t, J = 9.4 Hz, 1H), 2.78 (t, J = 9.4 Hz, 1H), 2.60 (d, J = 10.8 Hz, 1H), 2.49 (d, J = 10.2 Hz, 1H), 1.84 (d, J = 12.6 Hz, 1H), 1.65-1.54 (m, 5H), 1.17-1.11 (m, 1H), 1.07-0.96 (m, 3H), 0.78-0.74 (m, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 192.9, 142.1, 141.4, 139.0, 129.2, 128.8, 128.1, 128.0, 127.4, 126.7, 126.3, 125.4, 81.4, 73.2, 63.2, 52.4, 48.5, 43.0, 36.6, 36.2, 29.9, 29.3, 27.2, 27.1, 26.5 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₂₉H₃₄N₃O₂: 456.2646; found: 456.2638.



(S,E)-(3-benzyl-1-phenyl-4-styryl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3abb**) Prepared from ((1-methyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1a**, 47.6 mg, 0.20 mmol) and (1Z,2E)-N-benzyl-3-phenylprop-2-en-1-imine oxide (**2bb**, 57.0 mg, 0.24 mmol) according to the

GP1 at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3abb** as a white solid (73.2 mg, 77% yield).

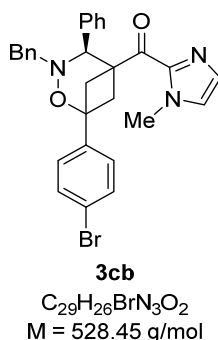
3abb: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 10/90, 1.0 mL/min, 254 nm; tr (minor) = 13.50 min, tr (major) = 14.24 min) gave the isomeric composition of the product: 97% ee. $[\alpha]_D^{20}$ = +12.3 (c = 1.75, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.44 (d, J = 7.6 Hz, 2H), 7.30-7.27 (m, 6H), 7.22-7.18 (m, 6H), 7.15-7.13 (m, 2H), 6.90 (s, 1H), 6.19-6.08 (m, 2H), 4.50 (d, J = 8.2 Hz, 1H), 4.28 (AB, J = 14.8 Hz, 1H), 3.98 (AB, J = 14.8 Hz, 1H), 3.69 (s, 3H), 3.50 (t, J = 9.2 Hz, 1H), 2.83 (d, J = 9.6 Hz, 1H), 2.71 (t, J = 9.0 Hz, 1H), 2.39 (d, J = 10.0 Hz, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.9, 142.5, 141.3, 138.1, 136.3, 133.9, 129.3, 128.7, 128.4, 128.1, 127.9, 127.8, 127.5, 126.6, 126.4, 126.2, 125.8, 125.4, 81.6, 72.8, 58.8, 52.5, 48.7, 35.6, 34.8 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₃₁H₃₀N₃O₂: 476.2333; found: 476.2324.



(S)-3-benzyl-4-phenyl-1-(p-tolyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl(1-methyl-1H-imidazol-2-yl)methanone: (**3bb**) Prepared from (1-methyl-1H-imidazol-2-yl)(3-(p-tolyl)bicyclo[1.1.0]butan-1-yl)methanone (**1b**, 50.5 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3bb** as colorless oil (83.4 mg, 90% yield).

3bb: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 10.34 min, tr (major) = 21.60 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +90.2 (c = 2.00,

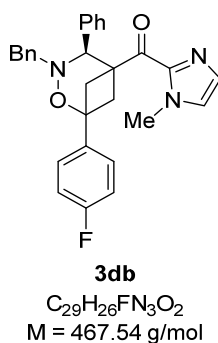
CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.36 (d, *J* = 7.6 Hz, 2H), 7.28-7.23 (m, 2H), 7.21-7.18 (m, 4H), 7.13-7.08 (m, 7H), 6.86 (s, 1H), 4.83 (s, 1H), 3.98 (AB, *J* = 14.8 Hz, 1H), 3.84 (AB, *J* = 14.8 Hz, 1H), 3.63 (t, *J* = 9.4 Hz, 1H), 3.40 (s, 3H), 2.90 (d, *J* = 9.6 Hz, 1H), 2.79 (t, *J* = 9.0 Hz, 1H), 2.39 (d, *J* = 10.0 Hz, 1H), 2.29 (s, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.7, 142.6, 138.5, 138.2, 137.2, 129.1, 128.8, 128.6, 128.1, 128.0, 127.9, 127.8, 126.6, 125.8, 125.3, 81.6, 74.3, 58.5, 54.1, 49.8, 35.1, 34.9, 21.1 ppm. **HRMS** (ESI) *m/z*: [M+H]⁺ calcd. for C₃₀H₃₀N₃O₂: 464.2333; found: 464.2323.



(S)-3-benzyl-1-(4-bromophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl(1-methyl-1H-imidazol-2-yl)methanone: (3cb) Prepared from (3-(4-bromophenyl)bicyclo[1.1.0]butan-1-yl)(1-methyl-1H-imidazol-2-yl)methanone (**1c**, 63.4 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3cb** as colorless oil (100.4 mg, 95% yield).

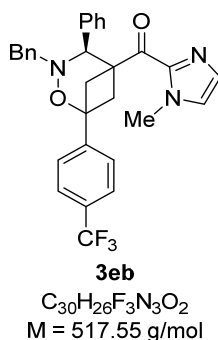
3cb: *R_f* = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; *tr* (minor) = 11.66 min, *tr* (major) = 28.74 min) gave the isomeric composition of the product: 99% ee. [α]_D²⁰ = +82.1 (*c* = 1.25, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.40 (d, *J* = 8.2 Hz, 2H), 7.35 (d, *J* = 7.6 Hz, 2H), 7.30-7.25 (m, 3H), 7.23-7.20 (m, 2H), 7.16-7.14 (m, 7H), 6.89 (s, 1H), 4.83 (s, 1H), 3.98 (AB, *J* = 14.8 Hz, 1H), 3.83 (AB, *J* = 14.8 Hz, 1H), 3.62 (t, *J* = 9.2 Hz, 1H), 3.43 (s, 3H), 2.88 (d, *J* = 9.6 Hz, 1H), 2.78 (t, *J* = 9.2 Hz, 1H), 2.38 (d, *J* = 10.0 Hz, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.4, 142.6, 140.4, 138.1, 137.9, 131.3, 129.2, 128.6, 128.2, 127.89, 127.86, 127.2, 126.7, 126.0, 121.6, 81.2, 74.4, 58.6, 54.0, 49.8, 35.2,

35.1 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{29}H_{27}BrN_3O_2$: 528.1281; found: 528.1271.



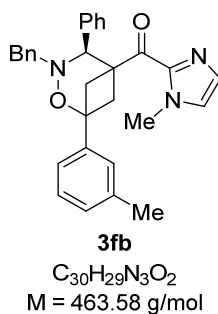
(S)-(3-benzyl-1-(4-fluorophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3db**) Prepared from (3-(4-fluorophenyl)bicyclo[1.1.0]butan-1-yl)(1-methyl-1H-imidazol-2-yl)methanone (**1d**, 51.2 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3db** as colorless oil (87.6 mg, 94% yield).

3db: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (minor) = 10.27 min, t_r (major) = 17.57 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20} = +89.7$ ($c = 1.00$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.35 (d, $J = 8.0$ Hz, 2H), 7.30-7.20 (m, 6H), 7.14 (s, 5H), 6.96 (d, $J = 9.0$ Hz, 2H), 6.88 (s, 1H), 4.83 (s, 1H), 3.98 (AB, $J = 14.8$ Hz, 1H), 3.83 (d, $J = 14.8$ Hz, 1H), 3.63 (t, $J = 9.4$ Hz, 1H), 3.42 (s, 3H), 2.89 (d, $J = 9.6$ Hz, 1H), 2.79 (t, $J = 9.2$ Hz, 1H), 2.38 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.5, 162.2 (d, $J = 245$ Hz), 142.6, 138.1 (d, $J = 11$ Hz), 137.3 (d, $J = 3$ Hz), 129.2, 128.6, 128.2, 128.1, 127.9, 127.23, 127.15, 126.7, 125.9, 115.0 (d, $J = 22$ Hz), 81.3, 74.4, 58.6, 54.0, 49.8, 35.12, 35.06 ppm. **^{19}F NMR** (376 MHz, $CDCl_3$) δ -114.912 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{29}H_{27}FN_3O_2$: 468.2082; found: 468.2073.



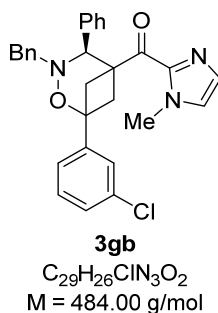
(S)-(3-benzyl-4-phenyl-1-(4-(trifluoromethyl)phenyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3eb) Prepared from (1-methyl-1H-imidazol-2-yl)(3-(4-(trifluoromethyl)phenyl)bicyclo[1.1.0]butan-1-yl)methanone (**1e**, 61.2 mg, 0.20 mmol) and (*Z*)-*N*-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3eb** as colorless oil (86.6 mg, 84% yield).

3eb: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 9.51 min, tr (major) = 23.71 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20} = +93.9$ ($c = 1.00$, $CHCl_3$). **1H NMR** (600 MHz, $CDCl_3$): δ 7.54 (d, $J = 7.8$ Hz, 2H), 7.39-7.35 (m, 4H), 7.30 (t, $J = 7.2$ Hz, 2H), 7.25-7.21 (m, 2H), 7.18-7.14 (m, 5H), 6.91 (s, 1H), 4.86 (s, 1H), 4.00 (AB, $J = 14.8$ Hz, 1H), 3.84 (AB, $J = 14.8$ Hz, 1H), 3.65 (t, $J = 9.6$ Hz, 1H), 3.45 (s, 3H), 2.93 (d, $J = 9.6$ Hz, 1H), 2.82 (t, $J = 9.2$ Hz, 1H), 2.43 (d, $J = 10.0$ Hz, 1H) ppm. **^{13}C NMR** (150 MHz, $CDCl_3$): δ 191.3, 145.1, 142.5, 138.0, 137.8, 129.7 (q, $J = 32$ Hz), 129.2, 128.6, 128.23, 128.21, 127.9, 127.8, 126.8, 126.0, 125.7, 125.2 (q, $J = 4$ Hz), 124.1 (q, $J = 270$ Hz), 81.2, 74.5, 58.7, 54.1, 49.9, 35.2 ppm. **^{19}F NMR** (565 MHz, $CDCl_3$) δ -62.520 ppm. **HRMS** (ESI) m/z : $[M+K]^+$ calcd. for $C_{30}H_{26}F_3N_3O_2K$: 556.1609; found: 556.1603.



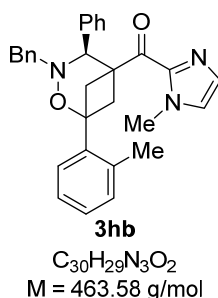
(S)-(3-benzyl-4-phenyl-1-(*m*-tolyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (3fb) Prepared from (1-methyl-1H-imidazol-2-yl)(3-(*m*-tolyl)bicyclo[1.1.0]butan-1-yl)methanone (**1f**, 50.5 mg, 0.20 mmol) and (*Z*)-*N*-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3fb** as a white solid (79.7 mg, 86% yield).

3fb: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 10/90, 1.0 mL/min, 254 nm; t_r (minor) = 5.06 min, t_r (major) = 6.24 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +84.9$ ($c = 2.00$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.37 (d, $J = 7.6$ Hz, 2H), 7.27 (t, $J = 7.6$ Hz, 2H), 7.23-7.17 (m, 3H), 7.16-7.08 (m, 7H), 7.04 (d, $J = 7.6$ Hz, 1H), 6.87 (s, 1H), 4.83 (s, 1H), 3.99 (AB, $J = 14.8$ Hz, 1H), 3.85 (AB, $J = 14.8$ Hz, 1H), 3.64 (t, $J = 9.4$ Hz, 1H), 3.41 (s, 3H), 2.92 (d, $J = 9.6$ Hz, 1H), 2.79 (t, $J = 9.2$ Hz, 1H), 2.40 (d, $J = 10.0$ Hz, 1H), 2.28 (s, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.7, 142.6, 141.3, 138.2, 138.1, 137.7, 129.1, 128.7, 128.3, 128.10, 128.06, 127.9, 127.8, 126.6, 126.2, 125.9, 122.4, 81.7, 74.4, 58.5, 54.1, 49.7, 35.1, 35.1, 21.4 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{30}H_{30}N_3O_2$: 464.2333; found: 464.2326.



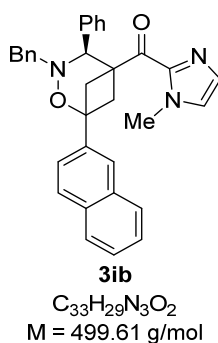
(S)-(3-benzyl-1-(3-chlorophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3gb**) Prepared from (3-(3-chlorophenyl)bicyclo[1.1.0]butan-1-yl)(1-methyl-1H-imidazol-2-yl)methanone (**1g**, 54.5 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3gb** as a white solid (90.0 mg, 93% yield).

3gb: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 8.06 min, tr (major) = 11.52 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20}$ = +84.3 (c = 2.00, CHCl_3). $^1\text{H NMR}$ (400 MHz, CDCl_3): δ 7.36 (d, J = 7.2 Hz, 2H), 7.31-7.27 (m, 3H), 7.24-7.19 (m, 4H), 7.14 (s, 6H), 6.88 (s, 1H), 4.84 (s, 1H), 3.99 (AB, J = 14.8 Hz, 1H), 3.84 (AB, J = 14.8 Hz, 1H), 3.62 (t, J = 9.4 Hz, 1H), 3.42 (s, 3H), 2.89 (d, J = 10.0 Hz, 1H), 2.79 (t, J = 9.2 Hz, 1H), 2.39 (d, J = 10.0 Hz, 1H) ppm. $^{13}\text{C NMR}$ (100 MHz, CDCl_3): δ 191.3, 143.3, 142.5, 138.0, 137.9, 134.1, 129.5, 129.2, 128.7, 128.2, 127.9, 127.8, 127.6, 126.8, 126.0, 125.9, 123.5, 81.2, 74.4, 58.6, 54.0, 49.9, 35.1 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{29}\text{H}_{27}\text{ClN}_3\text{O}_2$: 484.1786; found: 484.1778.



(S)-(3-benzyl-4-phenyl-1-(o-tolyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3hb**) Prepared from (1-methyl-1H-imidazol-2-yl)(3-(o-tolyl)bicyclo[1.1.0]butan-1-yl)methanone (**1h**, 50.5 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3hb** as colorless oil (83.4 mg, 90% yield).

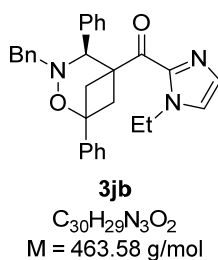
3hb: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 10.12 min, tr (major) = 15.60 min) gave the isomeric composition of the product: 94% ee. $[\alpha]_D^{20}$ = +111.5 (c = 2.00, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.29 (d, J = 7.2 Hz, 2H), 7.24-7.22 (m, 3H), 7.19-7.09 (m, 9H), 7.03 (d, J = 7.2 Hz, 1H), 6.87 (s, 1H), 4.82 (s, 1H), 3.93 (AB, J = 14.4 Hz, 1H), 3.88 (t, J = 9.0 Hz, 1H), 3.74 (AB, J = 14.4 Hz, 1H), 3.39 (s, 3H), 2.98-2.91 (m, 2H), 2.36 (d, J = 10.0 Hz, 1H), 2.19 (s, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.6, 142.7, 138.5, 138.3, 138.2, 130.9, 129.1, 129.0, 128.2, 128.12, 128.06, 127.9, 127.7, 126.66, 126.65, 125.8, 125.2, 82.9, 74.3, 58.7, 54.0, 49.2, 35.1, 33.4, 19.6 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₃₀H₃₀N₃O₂: 464.2333; found: 464.2325.



(S)-(3-benzyl-1-(naphthalen-2-yl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone: (**3ib**) Prepared from (1-methyl-1H-imidazol-2-yl)(3-(naphthalen-2-yl)bicyclo[1.1.0]butan-1-yl)methanone (**1i**, 57.7 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3ib** as a white solid (83.9 mg, 84% yield).

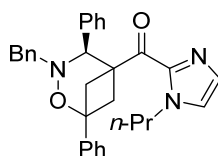
3ib: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 9.25 min, tr (major) = 28.45 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +115.5 (c = 2.00, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.78-7.71 (m, 4H), 7.45-7.39 (m, 5H), 7.30 (t, J = 7.6 Hz, 2H), 7.25-7.23 (m, 2H), 7.16 (s, 5H), 6.88 (s, 1H), 4.89 (s, 1H), 4.02 (AB, J = 14.6 Hz, 1H), 3.88 (AB, J = 14.8 Hz, 1H), 3.72 (t, J = 9.4 Hz, 1H), 3.42 (s, 3H), 3.05 (d,

$J = 8.4$ Hz, 1H), 2.90 (t, $J = 9.1$ Hz, 1H), 2.49 (d, $J = 10.0$ Hz, 1H) ppm. ^{13}C NMR (100 MHz, CDCl_3): δ 191.6, 142.6, 138.7, 138.2, 138.1, 133.0, 132.8, 129.2, 128.8, 128.2, 128.1, 127.92, 127.90, 127.86, 127.5, 126.7, 125.94, 125.92, 125.88, 124.4, 123.6, 81.8, 74.5, 58.7, 54.2, 49.8, 35.1, 35.1 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{33}\text{H}_{30}\text{N}_3\text{O}_2$: 500.2333; found: 500.2322.



(S)-(3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-ethyl-1H-imidazol-2-yl)methanone: (**3jb**) Prepared from ((1-ethyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1j**, 50.4 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3jb** as a white solid (74.1 mg, 80% yield).

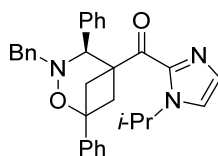
3jb: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, $i\text{PrOH}$ /hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 8.56 min, tr (major) = 16.27 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_{\text{D}}^{20} = +78.1$ ($c = 1.75$, CHCl_3). ^1H NMR (400 MHz, CDCl_3): δ 7.37 (d, $J = 7.6$ Hz, 2H), 7.30-7.21 (m, 9H), 7.16-7.13 (m, 5H), 6.95 (s, 1H), 4.90 (s, 1H), 4.16-4.08 (m, 1H), 3.98 (AB, $J = 14.8$ Hz, 1H), 3.86 (AB, $J = 15.2$ Hz, 1H), 3.80-3.73 (m, 1H), 3.67 (t, $J = 9.4$ Hz, 1H), 2.94 (d, $J = 9.6$ Hz, 1H), 2.82 (t, $J = 9.0$ Hz, 1H), 2.42 (d, $J = 10.4$ Hz, 1H), 0.87 (t, $J = 7.0$ Hz, 3H) ppm. ^{13}C NMR (100 MHz, CDCl_3): δ 191.4, 141.7, 141.4, 138.3, 138.2, 129.3, 128.6, 128.20, 128.15, 128.0, 127.8, 127.5, 126.6, 125.4, 124.5, 81.7, 74.5, 58.5, 54.2, 50.0, 43.2, 35.1, 15.9 ppm. **HRMS** (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd. for $\text{C}_{30}\text{H}_{30}\text{N}_3\text{O}_2$: 464.2333; found: 464.2331.

**3kb**

$C_{31}H_{31}N_3O_2$
 $M = 477.61 \text{ g/mol}$

(S)-(3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-propyl-1H-imidazol-2-yl)methanone: (**3kb**) Prepared from ((1-propyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1k**, 53.2 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3x** as a white solid (77.4 mg, 81% yield).

3kb: $R_f = 0.4$ (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; t_r (minor) = 8.04 min, t_r (major) = 15.44 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{26} = +61.4$ ($c = 1.88$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.37 (d, $J = 7.6$ Hz, 2H), 7.30-7.26 (m, 6H), 7.25-7.21 (m, 3H), 7.19-7.17 (m, 2H), 7.13-7.12 (m, 3H), 6.93 (s, 1H), 4.92 (s, 1H), 4.19-4.12 (m, 1H), 3.98 (AB, $J = 14.8$ Hz, 1H), 3.86 (AB, $J = 14.8$ Hz, 1H), 3.70-3.60 (m, 2H), 2.93 (d, $J = 9.6$ Hz, 1H), 2.81 (t, $J = 9.0$ Hz, 1H), 2.41 (d, $J = 10.0$ Hz, 1H), 1.26-1.12 (m, 2H), 0.64 (t, $J = 7.4$ Hz, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.3, 141.7, 141.4, 138.3, 138.2, 129.1, 128.6, 128.22, 128.15, 128.1, 128.0, 127.8, 127.5, 126.6, 125.42, 125.40, 81.7, 74.5, 58.5, 54.2, 50.0, 49.8, 35.2, 23.7, 10.9 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{31}H_{32}N_3O_2$: 478.2489; found: 478.2484.

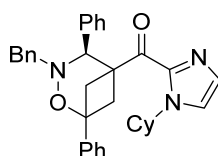
**3lb**

$C_{31}H_{31}N_3O_2$
 $M = 477.61 \text{ g/mol}$

(S)-(3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-isopropyl-1H-imidazol-2-yl)methanone: (**3lb**) Prepared from ((1-isopropyl-1H-imidazol-2-yl)(3-

phenylbicyclo[1.1.0]butan-1-yl)methanone (**1l**, 53.2 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3lb** as a white solid (69.7 mg, 73% yield).

3lb: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 6.65 min, tr (major) = 21.65 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20}$ = +37.3 (c = 1.75, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.37 (d, J = 7.6 Hz, 2H), 7.32-7.28 (m, 9H), 7.19-7.11 (m, 6H), 4.91-4.85 (m, 2H), 3.97 (AB, J = 14.8 Hz, 1H), 3.85 (AB, J = 14.8 Hz, 1H), 3.66 (t, J = 9.2 Hz, 1H), 2.95 (d, J = 9.6 Hz, 1H), 2.83 (t, J = 9.2 Hz, 1H), 2.43 (d, J = 10.0 Hz, 1H), 1.30 (d, J = 6.8 Hz, 3H), 0.81 (d, J = 5.6 Hz, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.6, 141.7, 141.4, 138.3, 129.6, 128.6, 128.2, 128.13, 128.06, 127.9, 127.8, 127.5, 126.6, 125.4, 120.3, 81.7, 74.6, 58.4, 54.5, 50.2, 48.6, 35.1, 23.2, 23.0 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₃₁H₃₂N₃O₂: 478.2489; found: 478.2487.

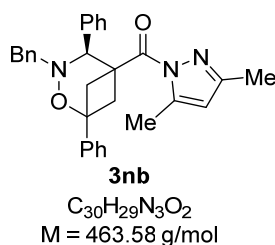


3mb
C₃₄H₃₅N₃O₂
M = 517.67 g/mol

(S)-3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl(1-cyclohexyl-1H-imidazol-2-yl)methanone: (**3mb**) Prepared from ((1-cyclohexyl-1H-imidazol-2-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1m**, 58.8 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3mb** as a white solid (72.0 mg, 71% yield).

3mb: R_f = 0.4 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 15/85, 1.0 mL/min, 254 nm; tr (minor) = 6.51 min, tr (major) = 25.27 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20}$ = +27.5 (c = 1.75,

CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.37 (d, *J* = 7.6 Hz, 2H), 7.30-7.21 (m, 9H), 7.16-7.11 (m, 6H), 4.90 (s, 1H), 4.43-4.35 (m, 1H), 3.98 (AB, *J* = 14.8 Hz, 1H), 3.85 (AB, *J* = 14.8 Hz, 1H), 3.66 (t, *J* = 9.6 Hz, 1H), 2.95 (d, *J* = 9.6 Hz, 1H), 2.83 (t, *J* = 9.2 Hz, 1H), 2.43 (d, *J* = 10.0 Hz, 1H), 1.98 (d, *J* = 10.4 Hz, 1H), 1.77 (d, *J* = 12.0 Hz, 1H), 1.62 (d, *J* = 11.6 Hz, 2H), 1.40-1.26 (m, 2H), 1.17-1.06 (m, 4H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.7, 141.8, 141.4, 138.2, 129.4, 128.6, 128.2, 128.1, 128.0, 127.84, 127.81, 127.5, 126.6, 125.4, 120.8, 81.7, 74.6, 58.4, 56.2, 54.5, 50.2, 35.1, 34.0, 33.8, 25.40, 25.36, 25.2 ppm. **HRMS** (ESI) *m/z*: [M+H]⁺ calcd. for C₃₄H₃₆N₃O₂: 518.2802; found: 518.2796.

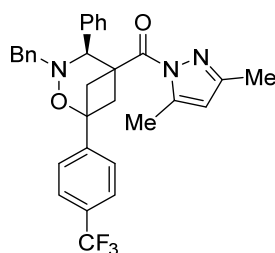


(S)-3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl(3,5-dimethyl-1H-pyrazol-1-yl)methanone: (3nb) Prepared from (3,5-dimethyl-1H-pyrazol-1-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1n**, 50.5 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (20/1) afforded **3nb** as a white solid (91.9 mg, 99% yield).

3nb: *R_f* = 0.6 (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, iPrOH/hexane = 2/98, 1.0 mL/min, 254 nm; *tr* (major) = 9.53 min, *tr* (minor) = 13.49 min) gave the isomeric composition of the product: 99% ee. [α]_D²⁰ = +62.8 (*c* = 0.50, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.38 (d, *J* = 8.0 Hz, 2H), 7.31-7.27 (m, 6H), 7.24-7.20 (m, 2H), 7.17 (s, 5H), 5.84 (s, 1H), 4.81 (s, 1H), 4.02 (AB, *J* = 14.8 Hz, 1H), 3.84 (AB, *J* = 14.8 Hz, 1H), 3.72 (t, *J* = 9.6 Hz, 1H), 2.96 (d, *J* = 9.6 Hz, 1H), 2.74 (t, *J* = 9.4 Hz, 1H), 2.41 (d, *J* = 10.0 Hz, 1H), 2.30 (s, 3H), 2.05 (s, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 172.6, 151.9, 144.0, 141.2, 138.1, 137.7, 128.7, 128.3, 128.2, 128.1, 127.8,

127.53, 127.47, 126.7, 125.3, 110.2, 81.5, 73.6, 58.7, 51.7, 50.0, 35.9, 13.9, 13.5 ppm.

HRMS (ESI) m/z : $[M+H]^+$ calcd. for $C_{30}H_{30}N_3O_2$: 464.2333; found: 464.2319.

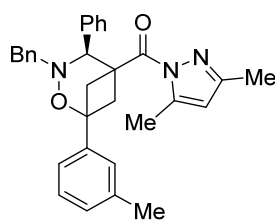


3ob

$C_{31}H_{28}F_3N_3O_2$
 $M = 531.58$ g/mol

(S)-(3-benzyl-4-phenyl-1-(4-(trifluoromethyl)phenyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(3,5-dimethyl-1H-pyrazol-1-yl)methanone: (**3ob**) Prepared from (3,5-dimethyl-1H-pyrazol-1-yl)(3-(4-(trifluoromethyl)phenyl)bicyclo[1.1.0]butan-1-yl)methanone (**1o**, 64.0 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (20/1) afforded **3ob** as a colorless oil (89.0 mg, 84% yield).

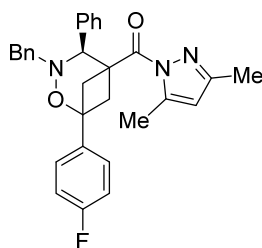
3ob: $R_f = 0.6$ (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak OD-H, i PrOH/hexane = 2/98, 0.8 mL/min, 254 nm; tr (major) = 5.83 min, tr (minor) = 6.52 min) gave the isomeric composition of the product: 92% ee. $[\alpha]_D^{20} = +49.0$ ($c = 1.00$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.54 (d, $J = 8.0$ Hz, 2H), 7.38 (d, $J = 8.0$ Hz, 4H), 7.31 (d, $J = 7.2$ Hz, 2H), 7.26-7.23 (m, 1H), 7.20-7.16 (m, 5H), 5.86 (s, 1H), 4.82 (s, 1H), 4.02 (AB, $J = 14.4$ Hz, 1H), 3.84 (AB, $J = 14.4$ Hz, 1H), 3.72 (t, $J = 9.6$ Hz, 1H), 2.97 (d, $J = 10.0$ Hz, 1H), 2.76 (t, $J = 9.2$ Hz, 1H), 2.41 (d, $J = 10.0$ Hz, 1H), 2.31 (s, 3H), 2.06 (s, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 172.3, 152.2, 144.9, 144.1, 137.9, 137.4, 129.7 (q, $J = 32$ Hz), 128.7, 128.41, 128.38, 127.9, 127.4, 126.8, 125.7, 125.2 (q, $J = 4$ Hz), 124.1 (q, $J = 270$ Hz), 110.4, 81.1, 73.7, 58.8, 51.8, 50.2, 36.1, 13.9, 13.5 ppm. **^{19}F NMR** (376 MHz, $CDCl_3$) δ -62.528 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{31}H_{28}F_3N_3O_2$: 532.2206; found: 532.2213.

**3pb**

$C_{31}H_{31}N_3O_2$
 $M = 477.61 \text{ g/mol}$

(S)-(3-benzyl-4-phenyl-1-(m-tolyl)-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(3,5-dimethyl-1H-pyrazol-1-yl)methanone: (3pb) Prepared from (3,5-dimethyl-1H-pyrazol-1-yl)(3-(m-tolyl)bicyclo[1.1.0]butan-1-yl)methanone (**1p**, 53.2 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (20/1) afforded **3pb** as a colorless oil (95.4 mg, 99% yield).

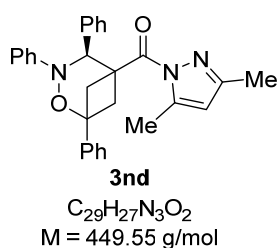
3pb: $R_f = 0.6$ (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 2/98, 1.0 mL/min, 254 nm; tr (major) = 6.69 min, tr (minor) = 9.00 min) gave the isomeric composition of the product: 99.5% ee. $[\alpha]_D^{20} = +58.0$ ($c = 1.25$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.31 (d, $J = 7.6$ Hz, 2H), 7.22 (t, $J = 7.6$ Hz, 2H), 7.16-7.11 (m, 2H), 7.08 (s, 5H), 7.02-6.95 (m, 3H), 5.75 (s, 1H), 4.72 (s, 1H), 3.94 (AB, $J = 14.8$ Hz, 1H), 3.76 (AB, $J = 14.8$ Hz, 1H), 3.62 (t, $J = 9.6$ Hz, 1H), 2.88 (d, $J = 10.0$ Hz, 1H), 2.65 (t, $J = 9.2$ Hz, 1H), 2.31 (d, $J = 10.0$ Hz, 1H), 2.22 (s, 3H), 2.20 (s, 3H), 1.97 (s, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 172.6, 151.9, 144.0, 141.1, 138.1, 137.74, 137.69, 128.8, 128.3, 128.2, 128.1, 127.8, 127.5, 126.7, 126.2, 122.4, 110.2, 81.5, 73.5, 58.7, 51.8, 49.9, 36.0, 21.4, 13.9, 13.5 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{31}H_{32}N_3O_2$: 478.2489; found: 478.2501.

**3qb**

$C_{30}H_{28}FN_3O_2$
 $M = 481.57 \text{ g/mol}$

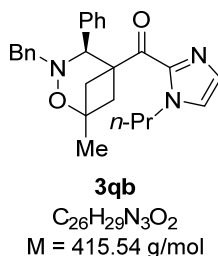
(S)-(3-benzyl-1-(4-fluorophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(3,5-dimethyl-1H-pyrazol-1-yl)methanone: (**3qb**) Prepared from (3,5-dimethyl-1H-pyrazol-1-yl)(3-(4-fluorophenyl)bicyclo[1.1.0]butan-1-yl)methanone (**1q**, 54.0 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.7 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (20/1) afforded **3qb** as a colorless oil (93.4 mg, 97% yield).

3qb: R_f = 0.6 (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, iPrOH/hexane = 1/99, 1.0 mL/min, 254 nm; tr (major) = 12.55 min, tr (minor) = 16.69 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +56.7 (c = 1.50, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.37 (d, J = 6.8 Hz, 2H), 7.30 (t, J = 7.4 Hz, 2H), 7.26-7.22 (m, 3H), 7.16 (s, 5H), 6.96 (t, J = 8.8 Hz, 2H), 5.85 (s, 1H), 4.80 (s, 1H), 4.01 (AB, J = 14.8 Hz, 1H), 3.83 (AB, J = 14.8 Hz, 1H), 3.70 (t, J = 9.6 Hz, 1H), 2.93 (d, J = 10.0 Hz, 1H), 2.73 (t, J = 9.4 Hz, 1H), 2.37 (d, J = 10.4 Hz, 1H), 2.31 (s, 3H), 2.05 (s, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 172.4, 162.2 (d, J = 244 Hz), 152.0, 144.1, 138.0, 137.6, 137.1 (d, J = 3 Hz), 128.7, 128.3, 127.9, 127.5, 127.1 (d, J = 8 Hz), 126.7, 115.0 (d, J = 22 Hz), 110.3, 81.1, 73.6, 58.7, 51.7, 50.0, 36.0, 13.9, 13.5 ppm. **¹⁹F NMR** (376 MHz, CDCl₃) δ -114.853 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₃₀H₂₉FN₃O₂: 482.2238; found: 482.2227.



(S)-(3,5-dimethyl-1H-pyrazol-1-yl)(1,3,4-triphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)methanone: (**3nd**)^[3a] Prepared from (3,5-dimethyl-1H-pyrazol-1-yl)(3-phenylbicyclo[1.1.0]butan-1-yl)methanone (**1n**, 50.5 mg, 0.20 mmol) and (Z)-N,1-diphenylmethanimine oxide (**2d**, 47.3 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (20/1) afforded **3nd** as a white solid (48.0 mg, 53% yield).

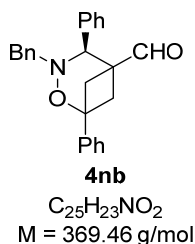
3nd: R_f = 0.6 (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 2/98, 1.0 mL/min, 254 nm; tr (major) = 9.29 min, tr (minor) = 10.91 min) gave the isomeric composition of the product: 28% ee. $[\alpha]_D^{20}$ = +14.9 (c = 1.20, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.50-7.48 (m, 2H), 7.43-7.40 (m, 2H), 7.36-7.35 (m, 1H), 7.21-7.16 (m, 7H), 7.07-7.05 (m, 2H), 6.89-6.86 (m, 1H), 5.94 (s, 2H), 3.25 (t, J = 9.4 Hz, 1H), 3.18 (t, J = 9.4 Hz, 1H), 2.77 (d, J = 10.0 Hz, 1H), 2.58 (d, J = 10.4 Hz, 1H), 2.31 (s, 3H), 2.25 (s, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 172.0, 152.4, 150.0, 144.30, 140.29, 138.3, 128.9, 128.5, 128.4, 128.3, 128.2, 127.1, 125.9, 121.5, 116.7, 110.7, 83.5, 70.2, 51.8, 45.3, 36.6, 13.97, 13.91 ppm.



(S)-(3-benzyl-1-methyl-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-propyl-1H-imidazol-2-yl)methanone: (**3qb**) Prepared from (3-methylbicyclo[1.1.0]butan-1-yl)(1-propyl-1H-imidazol-2-yl)methanone (**1q**, 40.8 mg, 0.20 mmol) and (Z)-N-benzyl-1-phenylmethanimine oxide (**2b**, 50.6 mg, 0.24 mmol) according to the **GP1** at rt for 16 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (5/1) afforded **3qb** as a white solid (25.0 mg, 30% yield).

3qb: R_f = 0.6 (petroleum ether/EtOAc = 3/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 10/90, 1.0 mL/min, 254 nm; tr (minor) = 5.67 min, tr (major) = 14.57 min) gave the isomeric composition of the product: 24% ee. $[\alpha]_D^{20}$ = +5.1 (c = 0.51, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.37-7.31 (m, 2H), 7.26 (t, J = 7.6 Hz, 2H), 7.21-7.18 (m, 2H), 7.12-7.09 (m, 5H), 6.90 (s, 1H), 4.77 (s, 1H), 4.14-4.07 (m, 1H), 3.89 (AB, J = 14.8 Hz, 1H), 3.75 (AB, J = 14.8 Hz, 1H), 3.64-3.57 (m, 1H), 3.30 (t, J = 9.4 Hz, 1H), 2.51 (t, J = 9.2 Hz, 1H), 2.32 (d, J = 9.6 Hz, 1H), 2.10 (d, J = 10.0 Hz, 1H), 1.27 (s, 3H), 1.21-1.11 (m, 2H), 0.63 (t, J = 7.4 Hz, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.6, 141.7, 138.4, 138.4, 129.0, 128.6, 128.1, 128.0, 127.82, 127.80, 126.5, 125.2,

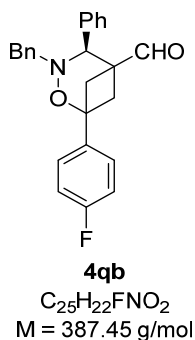
79.1, 74.3, 58.5, 54.6, 51.3, 49.8, 33.6, 23.7, 23.4, 10.9 ppm. **HRMS** (ESI) m/z : $[M+Na]^+$ calcd. for $C_{26}H_{29}N_3O_2Na$: 438.2152; found: 438.2158.



(S)-3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptane-5-carbaldehyde (4nb):

Prepared from (S)-(3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(3,5-dimethyl-1H-pyrazol-1-yl)methanone (**3nb**, 46.3 mg, 0.1 mmol) according to the **GP3** at -40 °C for 30 min. Purification by flash chromatography on silica gel using petroleum ether/ethyl acetate (10/1) afforded **4nb** as a colorless oil (20.0 mg, 54% yield).

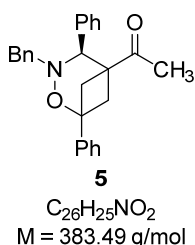
4nb: $R_f = 0.4$ (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, i PrOH/hexane = 2/98, 1.0 mL/min, 254 nm; t_r (minor) = 7.54 min, t_r (major) = 8.66 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +99.0$ ($c = 0.50$, $CHCl_3$). **1H NMR** (600 MHz, $CDCl_3$): δ 9.23 (s, 1H), 7.53-7.52 (m, 2H), 7.40-7.38 (m, 2H), 7.36-7.33 (m, 3H), 7.32-7.28 (m, 6H), 7.27-7.23 (m, 2H), 4.29 (s, 1H), 4.13 (AB, $J = 14.8$ Hz, 1H), 3.81 (AB, $J = 14.8$ Hz, 1H), 3.53 (t, $J = 9.6$ Hz, 1H), 2.69 (d, $J = 9.6$ Hz, 1H), 2.30 (d, $J = 9.6$ Hz, 1H), 2.06 (t, $J = 9.0$ Hz, 1H) ppm. **^{13}C NMR** (150 MHz, $CDCl_3$): δ 200.5, 140.7, 137.28, 137.25, 129.2, 129.1, 128.9, 128.3, 128.0, 127.94, 127.89, 127.0, 125.3, 81.7, 72.0, 58.1, 52.2, 45.8, 35.1 ppm. **HRMS** (ESI) m/z : $[M+Na]^+$ calcd. for $C_{25}H_{23}NO_2Na$: 392.1621; found: 392.1624.



(S)-3-benzyl-1-(4-fluorophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptane-5-carbaldehyde (4qb):

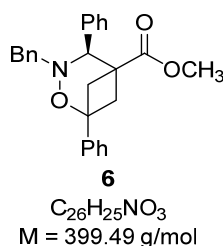
Prepared from (S)-(3-benzyl-1-(4-fluorophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(3,5-dimethyl-1H-pyrazol-1-yl)methanone (**3qb**, 48.1 mg, 0.1 mmol) according to the **GP3** at -40 °C for 30 min. Purification by flash chromatography on silica gel using petroleum ether/ethyl acetate (10/1) afforded **4qb** as a colorless oil (23.3 mg, 60% yield).

(4qb): R_f = 0.4 (petroleum ether/EtOAc = 10/1). $[\alpha]_D^{20}$ = +133.6 (c = 0.70, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 9.22 (s, 1H), 7.52 (d, J = 7.2 Hz, 2H), 7.41-7.28 (m, 7H), 7.26-7.22 (m, 3H), 6.98 (t, J = 8.6 Hz, 2H), 4.28 (s, 1H), 4.11 (AB, J = 14.8 Hz, 1H), 3.79 (AB, J = 14.8 Hz, 1H), 3.51 (t, J = 9.2 Hz, 1H), 2.66 (d, J = 9.2 Hz, 1H), 2.26 (d, J = 9.6 Hz, 1H), 2.05 (t, J = 9.2 Hz, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 200.4, 162.4 (d, J = 146 Hz), 137.2 (d, J = 7 Hz), 136.6 (d, J = 3 Hz), 129.2, 129.0, 128.0, 127.2, 127.1, 127.0, 115.1 (d, J = 21 Hz), 81.2, 72.0, 58.1, 52.1, 45.8, 35.3 ppm. **¹⁹F NMR** (376 MHz, CDCl₃) δ -114.222 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for C₂₅H₂₃FNO₂: 388.1707; found: 388.1702.

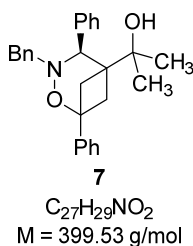


(S)-1-(3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)ethan-1-one (5): R_f = 0.3 (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 10/90, 1.0 mL/min, 254 nm; tr (minor) = 5.06 min, tr (major) = 6.24 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20}$ = +53.2 (c = 0.58, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.50-7.47 (m, 2H), 7.37-7.23 (m, 13H), 4.25 (s, 1H), 4.09 (AB, J = 14.8 Hz, 1H), 3.79 (d, J = 14.8 Hz, 1H), 3.60 (t, J = 9.4 Hz, 1H), 2.59 (d, J = 9.6 Hz, 1H), 2.29 (d, J = 10.0 Hz, 1H), 2.21 (t, J = 9.2 Hz, 1H), 1.68 (s, 3H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 208.8, 140.8, 137.5, 137.4, 129.0, 128.9, 128.8, 128.3, 128.2,

127.9, 127.8, 126.9, 125.3, 80.6, 73.2, 58.3, 54.4, 47.4, 35.3, 26.6 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{26}H_{26}NO_2$: 384.1958; found: 384.1950.

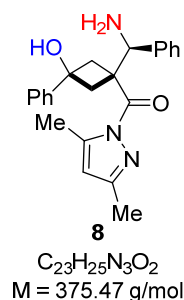


Methyl (S)-3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptane-5-carboxylate (6): $R_f = 0.6$ (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 2/98, 1.0 mL/min, 254 nm; t_r (minor) = 9.25 min, t_r (major) = 10.40 min) gave the isomeric composition of the product: 98% ee. $[\alpha]_D^{20} = +65.4$ ($c = 1.00$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.50 (d, $J = 6.4$ Hz, 2H), 7.36-7.22 (m, 13H), 4.24 (s, 1H), 4.09 (AB, $J = 14.8$ Hz, 1H), 3.80 (AB, $J = 14.8$ Hz, 1H), 3.58 (t, $J = 9.6$ Hz, 1H), 3.31 (s, 3H), 2.72 (d, $J = 9.4$ Hz, 1H), 2.37 (d, $J = 10.0$ Hz, 1H), 2.22 (t, $J = 9.2$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 172.7, 140.8, 137.9, 137.4, 129.0, 128.5, 128.4, 128.2, 128.1, 127.9, 127.7, 126.9, 125.3, 81.3, 73.1, 58.6, 51.3, 48.6, 47.7, 35.7 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{26}H_{26}NO_3$: 400.1907; found: 400.1901.

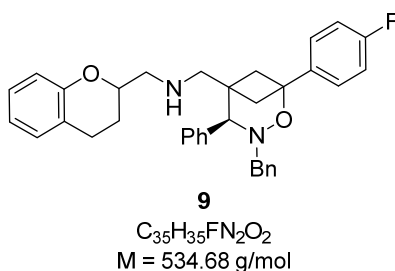


(S)-2-(3-benzyl-1,4-diphenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)propan-2-ol (7): $R_f = 0.3$ (petroleum ether/EtOAc = 10/1). HPLC analysis (Chiralpak AD-H, *i*PrOH/hexane = 5/95, 0.8 mL/min, 254 nm; t_r (minor) = 12.11 min, t_r (major) = 12.63 min) gave the isomeric composition of the product: 99% ee. $[\alpha]_D^{20} = +22.0$ ($c = 0.75$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.60 (s, 1H), 7.38-7.21 (m, 14H), 4.09 (s, 1H), 3.98 (AB, $J = 14.6$ Hz, 1H), 3.66 (d, $J = 14.8$ Hz, 1H), 3.32 (t, $J = 9.2$ Hz, 1H), 2.82 (d, $J = 9.6$ Hz, 1H), 2.22 (d, $J = 10.0$ Hz, 1H), 1.79 (t, $J = 9.0$ Hz, 1H), 1.12 (s, 3H), 0.65 (s, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 142.1, 140.0, 138.0, 130.0, 129.1, 128.6, 128.1, 127.8, 127.4,

126.7, 125.4, 80.0, 74.9, 72.0, 58.4, 50.7, 43.8, 33.2, 26.4, 25.4 ppm. **HRMS** (ESI) m/z : $[M+H]^+$ calcd. for $C_{27}H_{30}NO_2$: 400.2271; found: 400.2263.

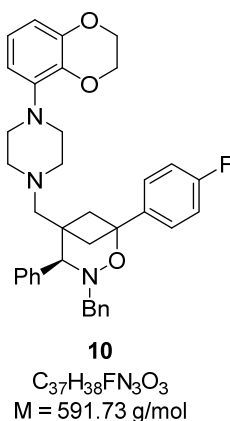


(S)-1-(1-(amino(phenyl)methyl)-3-hydroxy-3-phenylcyclobutyl)(3,5-dimethyl-1H-pyrazol-1-yl)methanone (8): $R_f = 0.5$ (petroleum ether/EtOAc = 1/1). $[\alpha]_D^{20} = +32.7$ ($c = 0.30$, $CHCl_3$). **1H NMR** (400 MHz, $CDCl_3$): δ 7.47 (d, $J = 8.4$, 2H), 7.32 (t, $J = 7.4$ Hz, 2H), 7.22-7.20 (m, 4H), 6.93-6.91 (m, 2H), 5.87 (s, 1H), 5.06 (s, 1H), 3.48 (d, $J = 14.0$ Hz, 1H), 3.26 (d, $J = 14.4$ Hz, 1H), 3.04 (dd, $J = 14.4$, 4.4 Hz, 1H), 2.85 (dd, $J = 14.4$, 4.0 Hz, 1H), 2.26 (s, 3H), 2.17 (s, 3H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 174.5, 151.5, 146.1, 144.5, 143.1, 128.6, 128.1, 127.8, 126.6, 125.8, 125.0, 110.2, 71.2, 57.6, 50.4, 50.3, 40.3, 14.02, 13.95 ppm. **HRMS** (ESI) m/z : $[M+K]^+$ calcd. for $C_{23}H_{25}N_3O_2K$: 414.1578; found: 414.1582.

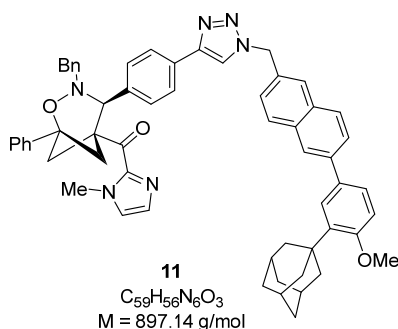


N-(((S)-3-benzyl-1-(4-fluorophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)methyl)-1-(chroman-2-yl)methanamine (9): $R_f = 0.3$ (petroleum ether/EtOAc = 3/1). $[\alpha]_D^{20} = +50.8$ ($c = 0.25$, $CHCl_3$). **1H NMR** (600 MHz, $CDCl_3$): δ 7.55 (d, $J = 7.2$ Hz, 2H), 7.35-7.30 (m, 5H), 7.28-7.25 (m, 4H), 7.22 (t, $J = 7.2$ Hz, 1H), 7.10-7.07 (m, 1H), 7.03 (d, $J = 7.8$ Hz, 1H), 6.97 (t, $J = 8.4$ Hz, 2H), 6.83 (t, $J = 7.8$ Hz, 1H), 6.78 (t, $J = 9.0$ Hz, 1H), 4.08 (s, 1H), 4.04-3.92 (m, 2H), 3.76-3.73 (m, 1H), 3.35-3.31 (m, 1H), 2.84-2.78 (m, 1H), 2.72-2.69 (m, 1H), 2.60-2.53 (m, 1H), 2.50-2.46 (m, 1H), 2.30-2.22 (m, 2H), 1.98-1.94 (m,

1H), 1.89-1.83 (m, 2H), 1.74-1.65 (m, 1H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 162.2 (d, *J* = 244 Hz) 154.6, 139.1, 139.0, 138.1, 137.9, 129.6, 129.5, 128.9, 128.50, 128.45, 128.12, 128.09, 127.8, 127.21, 127.18, 127.15, 127.13, 126.7, 122.0, 120.1, 116.7, 116.6, 115.0, 114.8, 81.9, 81.8, 75.3, 75.3, 75.1, 74.9, 59.1, 55.0, 54.73, 54.68, 54.6, 46.0, 45.9, 43.6, 43.5, 36.7, 36.5, 25.5, 25.4, 24.6 ppm. **¹⁹F NMR** (565 MHz, CDCl₃) δ -115.186 ppm. **HRMS** (ESI) *m/z*: [M+Na]⁺ calcd. for C₃₅H₃₅FN₂O₂: 535.2755; found: 535.2744.

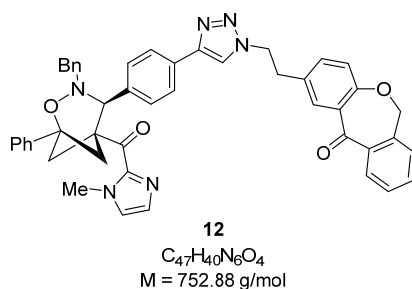


(S)-3-benzyl-5-((4-(2,3-dihydrobenzo[b][1,4]dioxin-5-yl)piperazin-1-yl)methyl)-1-(4-fluorophenyl)-4-phenyl-2-oxa-3-azabicyclo[3.1.1]heptane (10): *R_f* = 0.2 (petroleum ether/EtOAc = 10/1). [α]_D²⁰ = +24.5 (*c* = 0.20, CHCl₃). **¹H NMR** (600 MHz, CDCl₃): δ 7.58 (d, *J* = 6.6 Hz, 2H), 7.35-7.31 (m, 4H), 7.29-7.20 (m, 6H), 6.96 (t, *J* = 9.0 Hz, 2H), 6.78 (t, *J* = 7.8 Hz, 1H), 6.59 (dd, *J* = 8.4, 1.2 Hz, 1H), 6.54 (dd, *J* = 7.8, 1.2 Hz, 1H), 4.29-4.28 (m, 2H), 4.23-4.22 (m, 2H), 4.16 (s, 1H), 4.03 (AB, *J* = 14.8 Hz, 1H), 3.75 (AB, *J* = 14.8 Hz, 1H), 3.32 (t, *J* = 9.0 Hz, 1H), 2.98 (s, 4H), 2.56 (s, 2H), 2.50 (d, *J* = 9.0 Hz, 1H), 2.14-2.06 (m, 4H), 1.98 (d, *J* = 13.2 Hz, 1H), 1.79 (d, *J* = 9.6 Hz, 1H) ppm. **¹³C NMR** (150 MHz, CDCl₃): δ 162.1 (d, *J* = 243 Hz), 144.1, 141.9, 139.2, 138.3, 137.9 (d, *J* = 5 Hz), 136.4, 129.4, 128.8, 127.9, 127.8, 127.7, 127.1 (d, *J* = 9 Hz), 126.6, 120.6, 114.9 (d, *J* = 21 Hz), 111.8, 110.5, 82.5, 75.6, 64.3, 63.9, 63.6, 59.1, 54.1, 50.9, 48.5, 43.1, 37.3 ppm. **¹⁹F NMR** (565 MHz, CDCl₃) δ -115.24 ppm. **HRMS** (ESI) *m/z*: [M+Na]⁺ calcd. for C₃₇H₃₈FN₃O₃Na: 614.2789; found: 614.2775.



((4S)-4-(4-(1-((6-(3-(adamantan-1-yl)-4-methoxyphenyl)naphthalen-2-yl)methyl)-1H-1,2,3-triazol-4-yl)phenyl)-3-benzyl-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone (11): Prepared from (S)-(3-benzyl-4-(4-ethynylphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone (**3as**, 20.0 mg, 0.042 mmol) and 1-(5-(6-(azidomethyl)naphthalen-2-yl)-2-methoxyphenyl)adamantane (26.7 mg, 0.063 mmol) according to the **GP4** at rt for 5 h. Purification by flash chromatography on silica gel using petroleum ether/EtOAc (4/1) afforded **11** as a white solid (37.7 mg, 99% yield).

11: R_f = 0.2 (petroleum ether/EtOAc = 2/1). $[\alpha]_D^{20}$ = +0.9 (c = 1.00, CHCl₃). **¹H NMR** (400 MHz, CDCl₃): δ 7.98 (s, 1H), 7.87 (t, J = 9.8 Hz, 2H), 7.78-7.76 (m, 2H), 7.62-7.57 (m, 4H), 7.52 (d, J = 8.4 Hz, 1H), 7.38-7.33 (m, 3H), 7.29-7.24 (m, 7H), 7.20-7.17 (m, 4H), 6.99 (d, J = 8.4 Hz, 1H), 6.89 (s, 1H), 5.70 (d, J = 4.0 Hz, 2H), 4.89 (s, 1H), 3.98 (AB, J = 14.8 Hz, 1H), 3.89 (s, 3H), 3.85 (AB, J = 14.8 Hz, 1H), 3.63 (t, J = 9.4 Hz, 1H), 3.45 (s, 3H), 2.90 (d, J = 9.6 Hz, 1H), 2.79 (t, J = 9.2 Hz, 1H), 2.41 (d, J = 10.0 Hz, 1H), 2.18 (s, 6H), 2.10 (s, 3H), 1.80 (s, 6H) ppm. **¹³C NMR** (100 MHz, CDCl₃): δ 191.4, 158.8, 147.8, 142.5, 141.3, 140.0, 139.0, 138.2, 138.0, 133.4, 132.6, 131.9, 131.4, 130.3, 129.3, 129.2, 128.7, 128.4, 128.24, 128.16, 127.84, 127.55, 127.2, 126.7, 126.6, 126.1, 125.9, 125.6, 125.6, 125.44, 125.40, 124.8, 119.5, 112.1, 81.7, 74.0, 58.6, 55.2, 54.5, 54.1, 49.7, 40.6, 37.1, 35.3, 34.9, 29.1 ppm. **HRMS** (ESI) m/z : $[M-H]^+$ calcd. for C₅₉H₅₅N₆O₃: 895.4341; found: 895.4353.

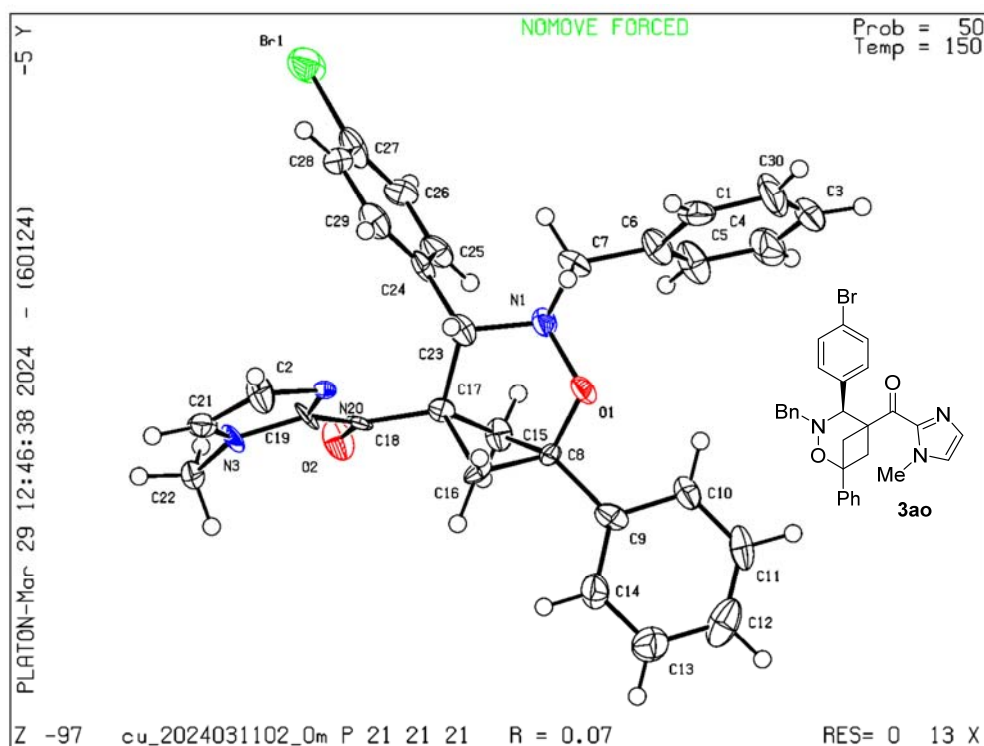


(S)-2-(2-(4-(4-(3-benzyl-5-(1-methyl-1H-imidazole-2-carbonyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-4-yl)phenyl)-1H-1,2,3-triazol-1-yl)ethyl)dibenzo[b,e]oxepin-11(6H)-one (12): Prepared from (S)-(3-benzyl-4-(4-ethynylphenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone (**3as**, 20.0 mg, 0.042 mmol) and 2-(2-azidoethyl)dibenzo[b,e]oxepin-11(6H)-one (17.6 mg, 0.063 mmol) according to the **GP4** at rt for 5 h. Purification by flash chromatography on silica gel using EtOAc afforded **12** as a white solid (31.6 mg, 99% yield).

12: $R_f = 0.2$ (petroleum ether/EtOAc = 1/1). $[\alpha]_D^{20} = +10.0$ ($c = 0.50$, $CHCl_3$). **1H NMR** (600 MHz, $CDCl_3$): δ 8.07 (d, $J = 2.4$ Hz, 1H), 7.87 (d, $J = 7.8$, 1H), 7.58-7.55 (m, 3H), 7.50-7.47 (m, 2H), 7.37-7.36 (m, 3H), 7.31-7.28 (m, 5H), 7.26-7.16 (m, 7H), 6.97 (d, $J = 8.4$ Hz, 1H), 6.90 (s, 1H), 5.18 (s, 2H), 4.90 (s, 1H), 4.62 (t, $J = 7.2$ Hz, 2H), 4.01 (AB, $J = 14.8$ Hz, 1H), 3.87 (AB, $J = 14.8$ Hz, 1H), 3.65 (t, $J = 9.0$ Hz, 1H), 3.46 (s, 3H), 3.26 (t, $J = 7.2$ Hz, 2H), 2.92 (d, $J = 9.6$ Hz, 1H), 2.81 (t, $J = 9.0$ Hz, 1H), 2.43 (d, $J = 9.6$ Hz, 1H) ppm. **^{13}C NMR** (100 MHz, $CDCl_3$): δ 191.5, 190.9, 160.4, 147.2, 142.5, 141.3, 140.3, 138.12, 138.06, 135.8, 135.5, 132.9, 131.6, 130.6, 130.3, 129.5, 129.3, 129.2, 128.7, 128.4, 128.2, 127.9, 127.6, 126.7, 126.1, 125.5, 125.4, 125.3, 121.3, 119.8, 81.7, 74.0, 73.6, 58.6, 54.1, 51.5, 49.7, 35.7, 35.3, 35.0 ppm. **HRMS** (ESI) m/z : $[M+K]^+$ calcd. for $C_{47}H_{40}N_6O_3K$: 791.2743; found: 791.2746.

10 Crystal Structure of **3ao**

The crystals are grown by slow solvent ($\text{CH}_2\text{Cl}_2/\text{Et}_2\text{O}/n\text{-Hexane}$) evaporation at room temperature. CCDC number of (S)-(3-benzyl-4-(4-bromophenyl)-1-phenyl-2-oxa-3-azabicyclo[3.1.1]heptan-5-yl)(1-methyl-1H-imidazol-2-yl)methanone **3ao** (>99% ee) is 2345666. Flack parameter of **3ao**: 0.116(7)



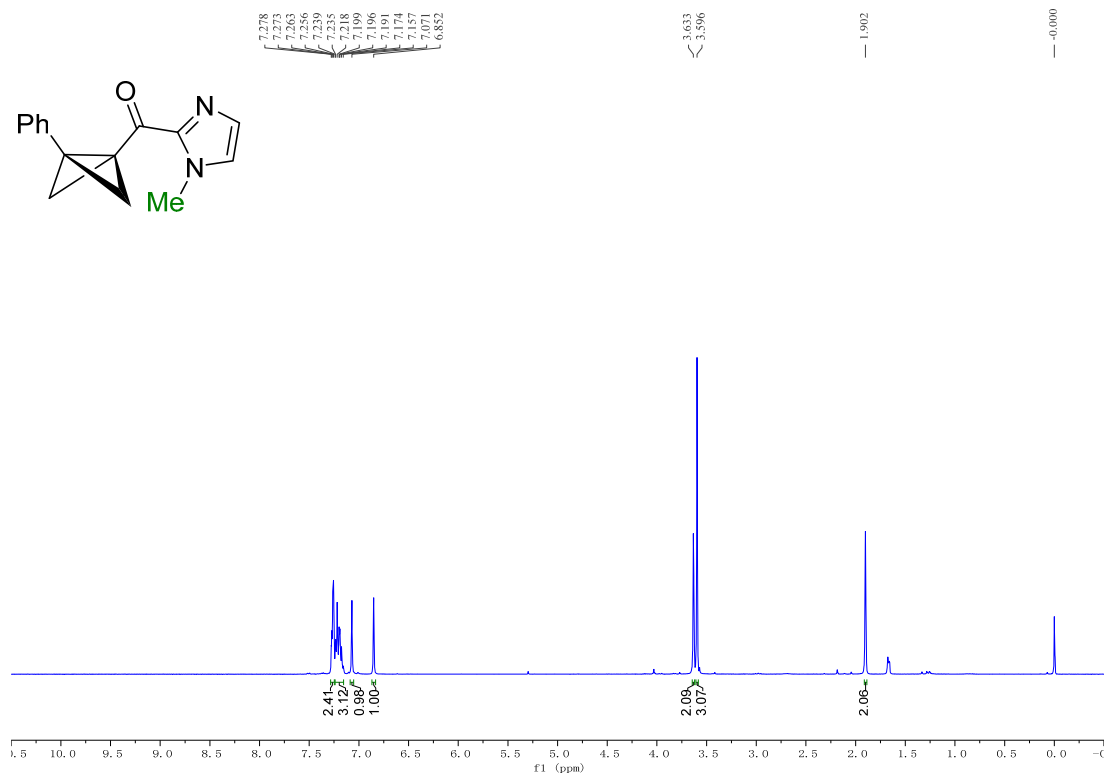
Datablock: cu_2024031102_0m

Bond precision:	C-C = 0.0133 Å	Wavelength=1.54178
Cell:	a=10.0277(2) alpha=90	b=10.9571(3) beta=90
Temperature:	150 K	c=26.1879(7) gamma=90
	Calculated	Reported
Volume	2877.38(12)	2877.38(12)
Space group	P 21 21 21	P 21 21 21
Hall group	P 2ac 2ab	P 2ac 2ab
Moiety formula	C29 H26 Br N3 O2 [+ solvent]	C29 H26 Br N3 O2
Sum formula	C29 H26 Br N3 O2 [+ solvent]	C29 H26 Br N3 O2
Mr	528.43	528.44
Dx, g cm ⁻³	1.220	1.220
Z	4	4
Mu (mm ⁻¹)	2.162	2.162
F000	1088.0	1088.0
F000'	1087.99	
h,k,lmax	12,13,31	12,13,31
Nref	5262[2994]	5247
Tmin,Tmax	0.802,0.933	0.539,0.753
Tmin'	0.467	
Correction method= # Reported T Limits: Tmin=0.539 Tmax=0.753		
AbsCorr = MULTI-SCAN		
Data completeness=	1.75/1.00	Theta(max)= 68.329

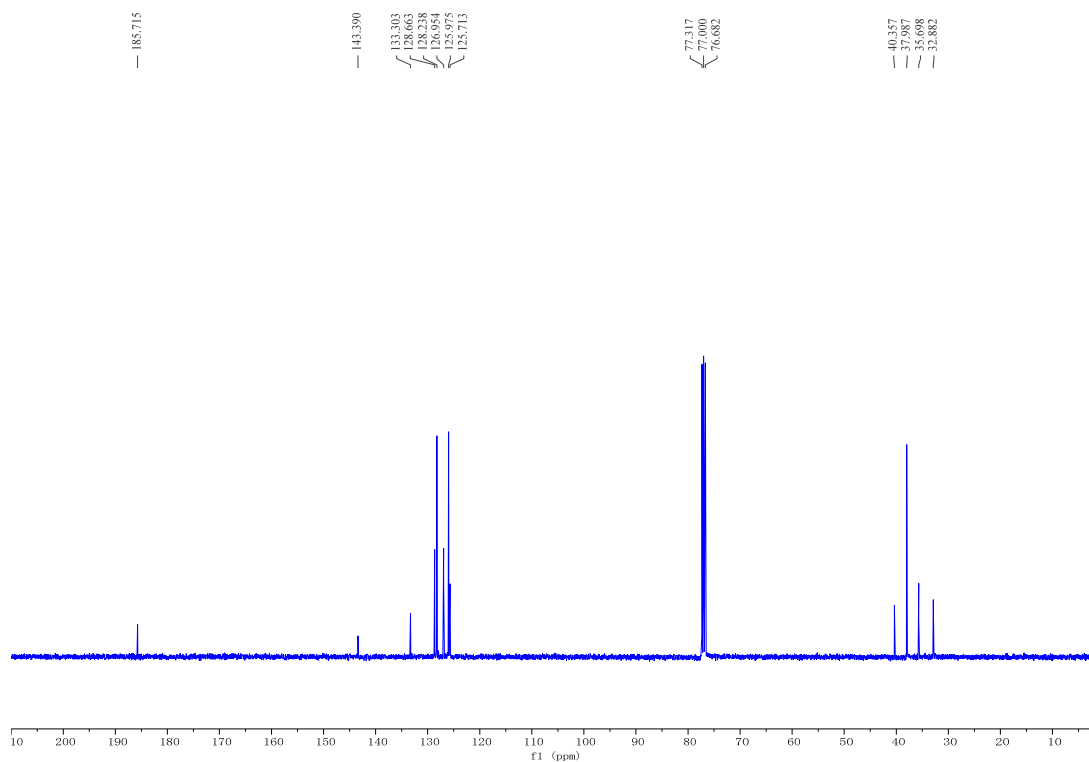
11 NMR and HPLC Spectra

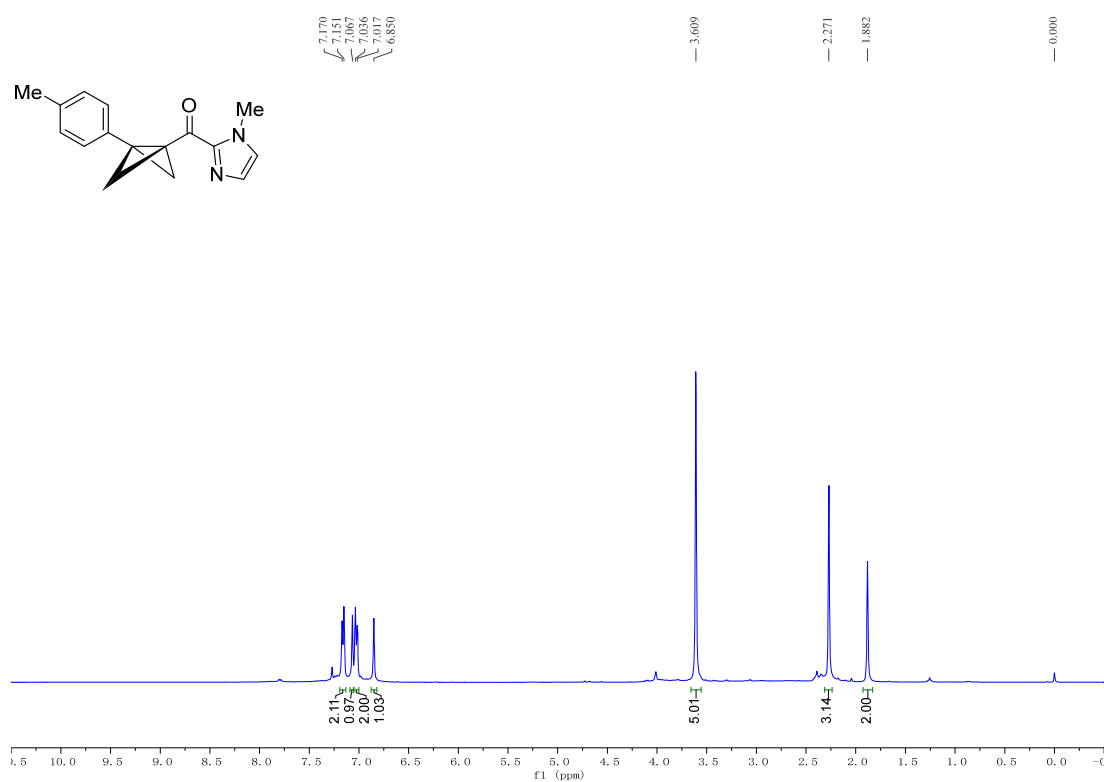
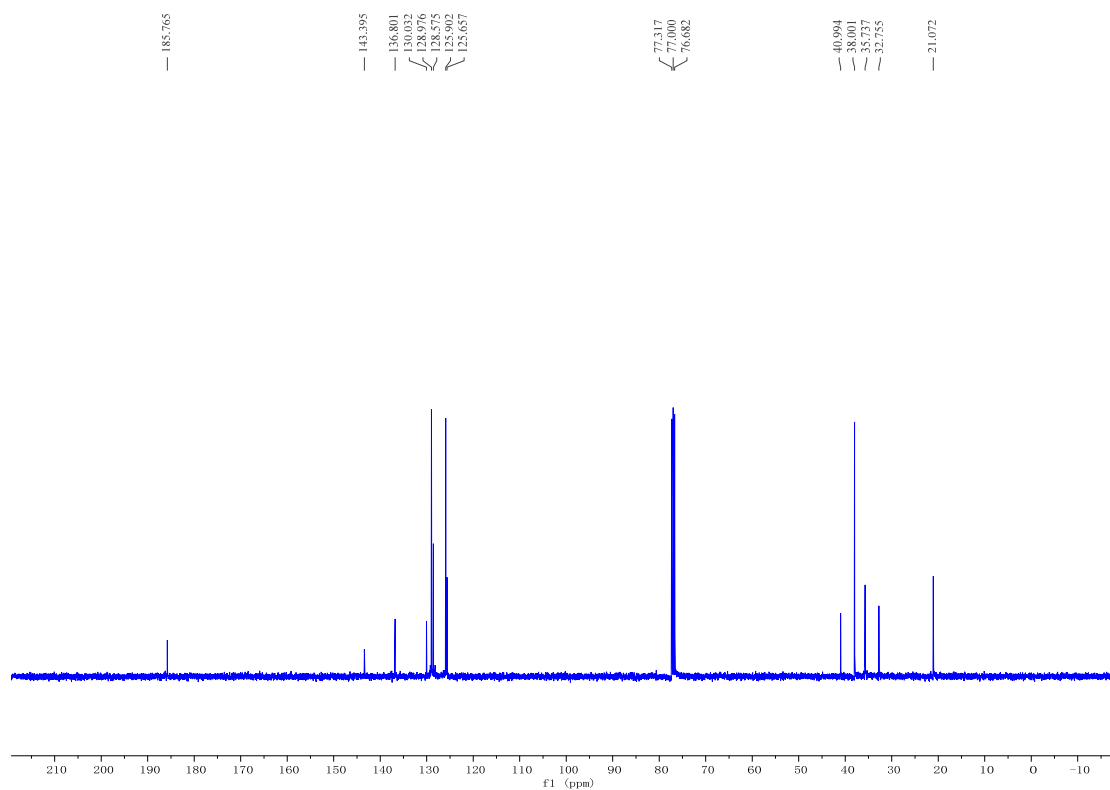
^1H and ^{13}C NMR Spectra for Compound 1a:

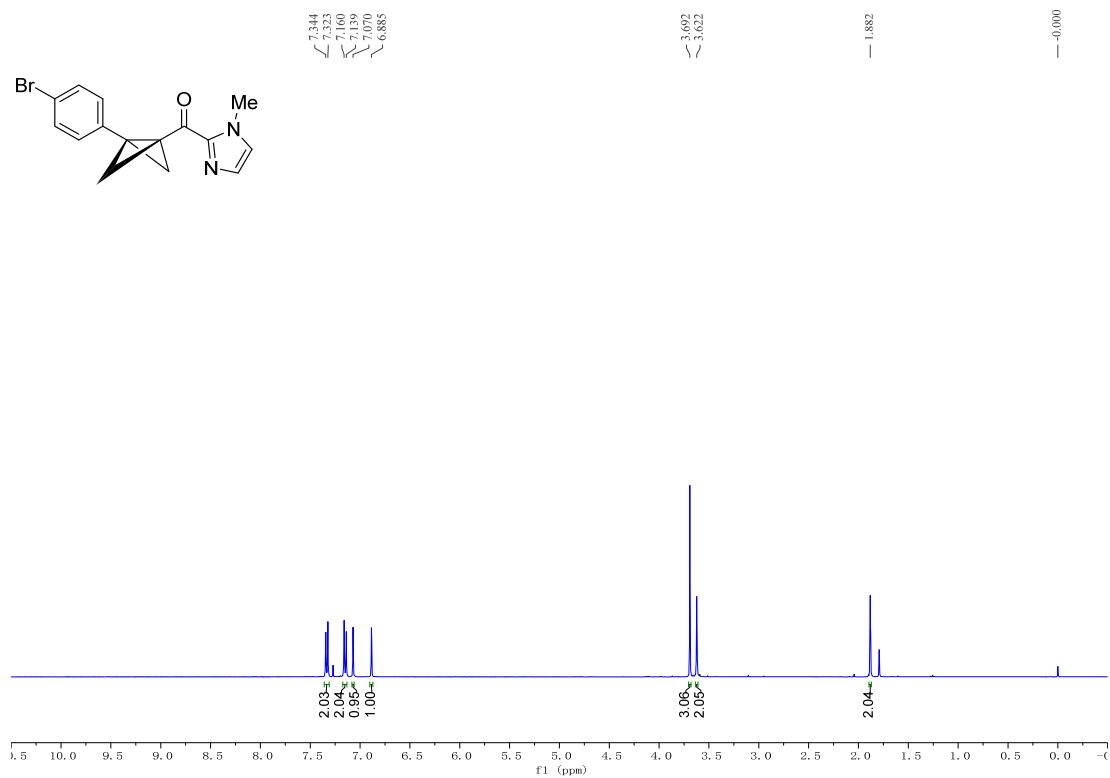
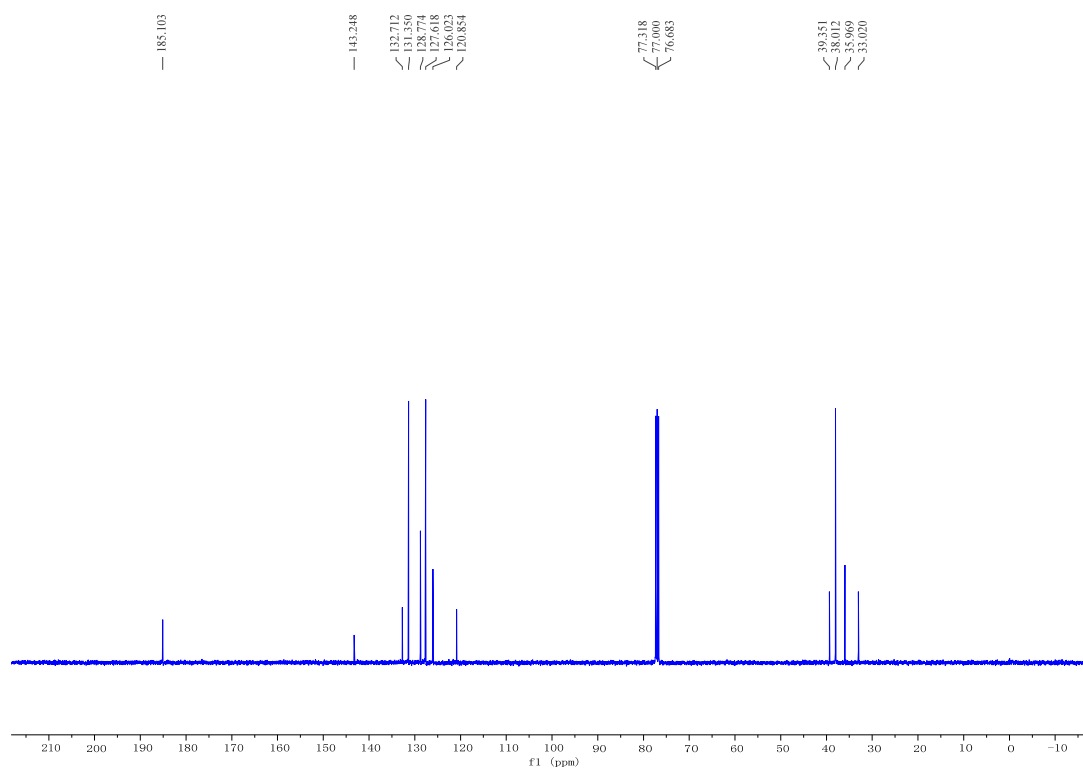
^1H NMR (400 MHz, CDCl_3)

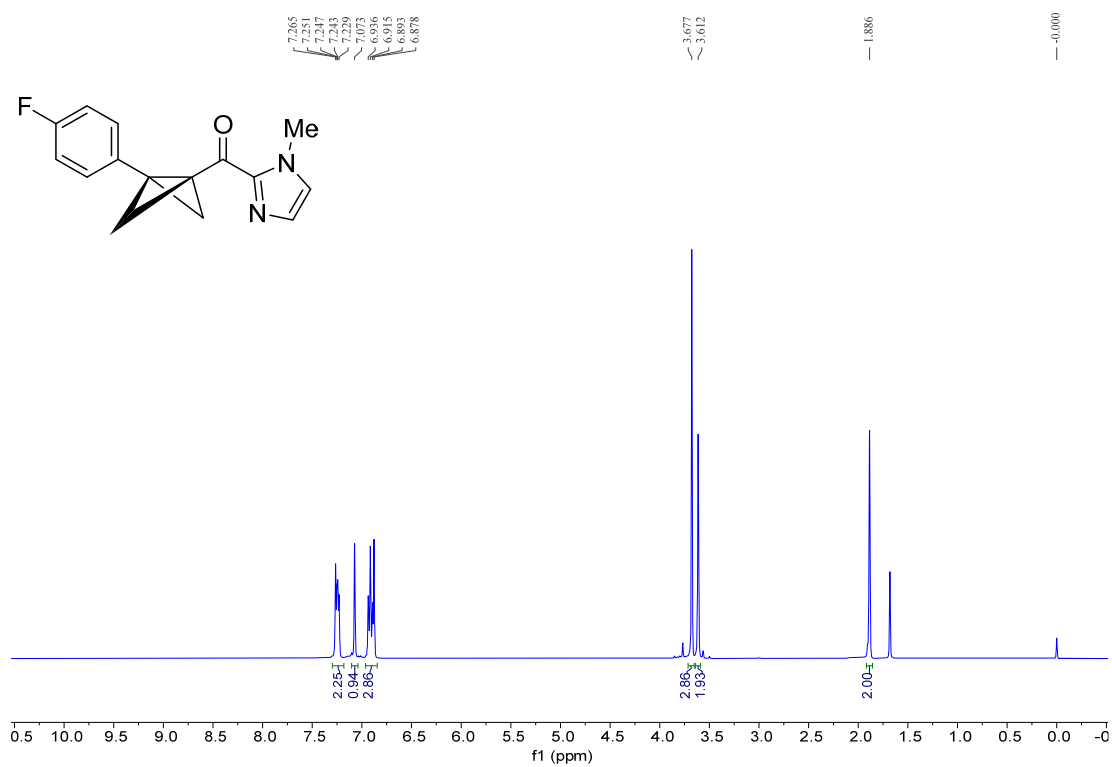
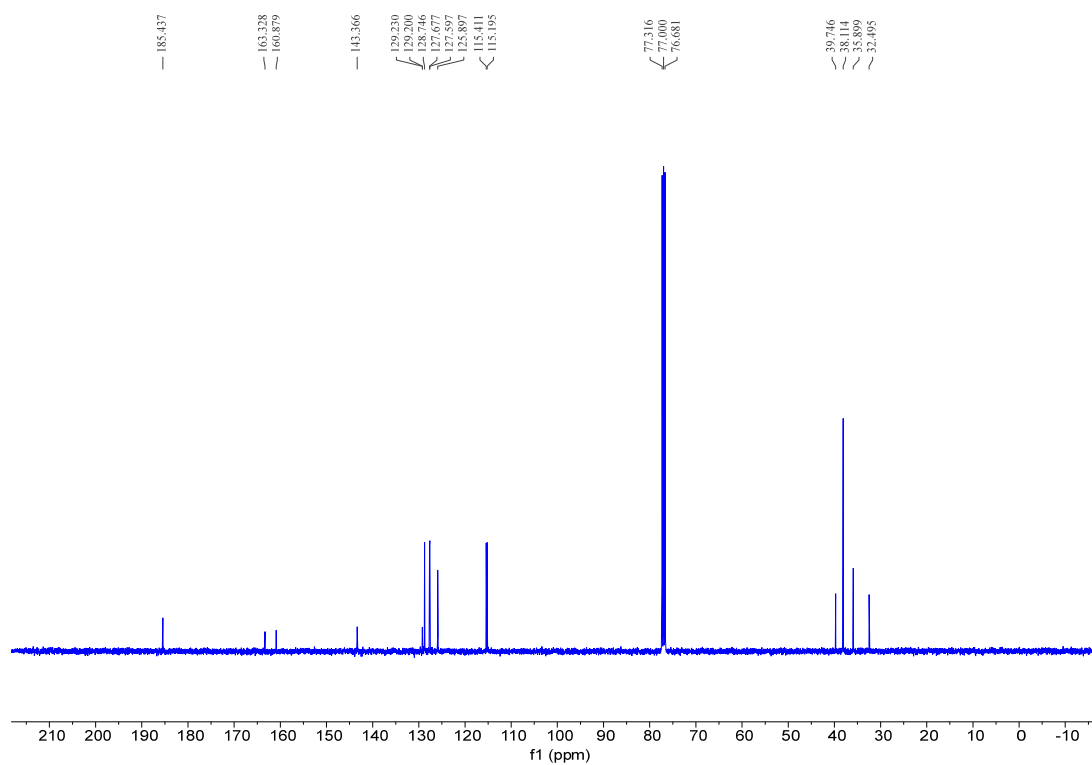


^{13}C NMR (100 MHz, CDCl_3)

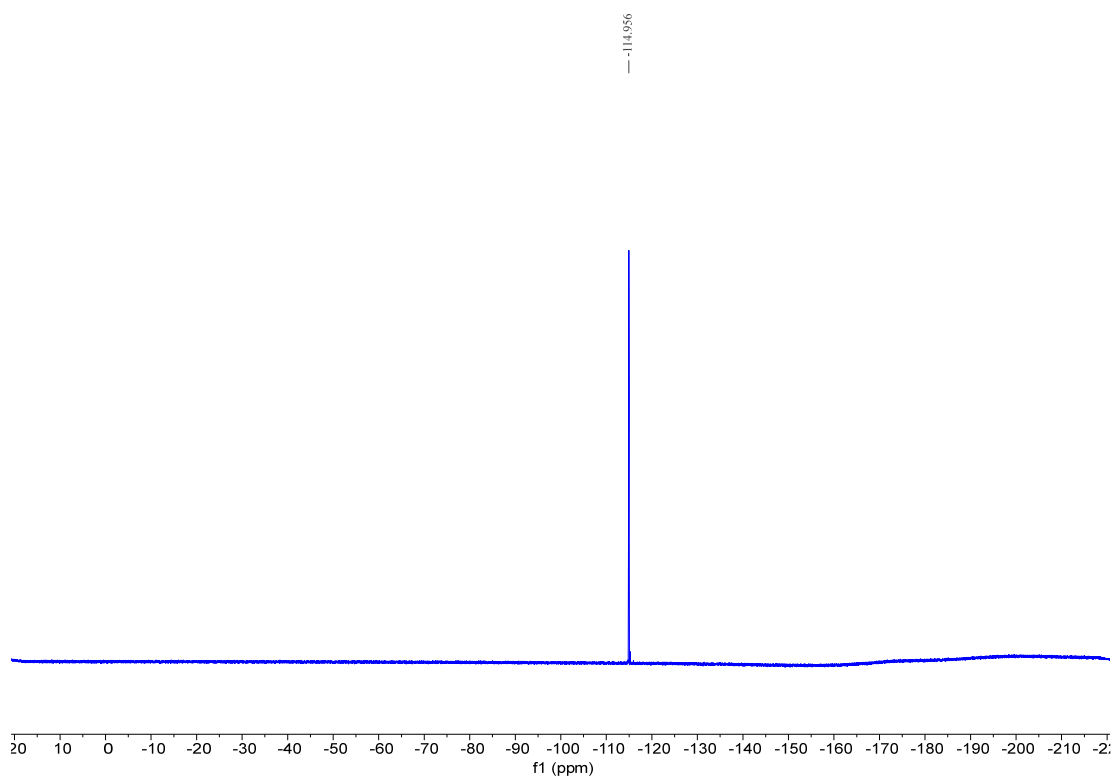


^1H and ^{13}C NMR Spectra for Compound 1b: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 1c: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

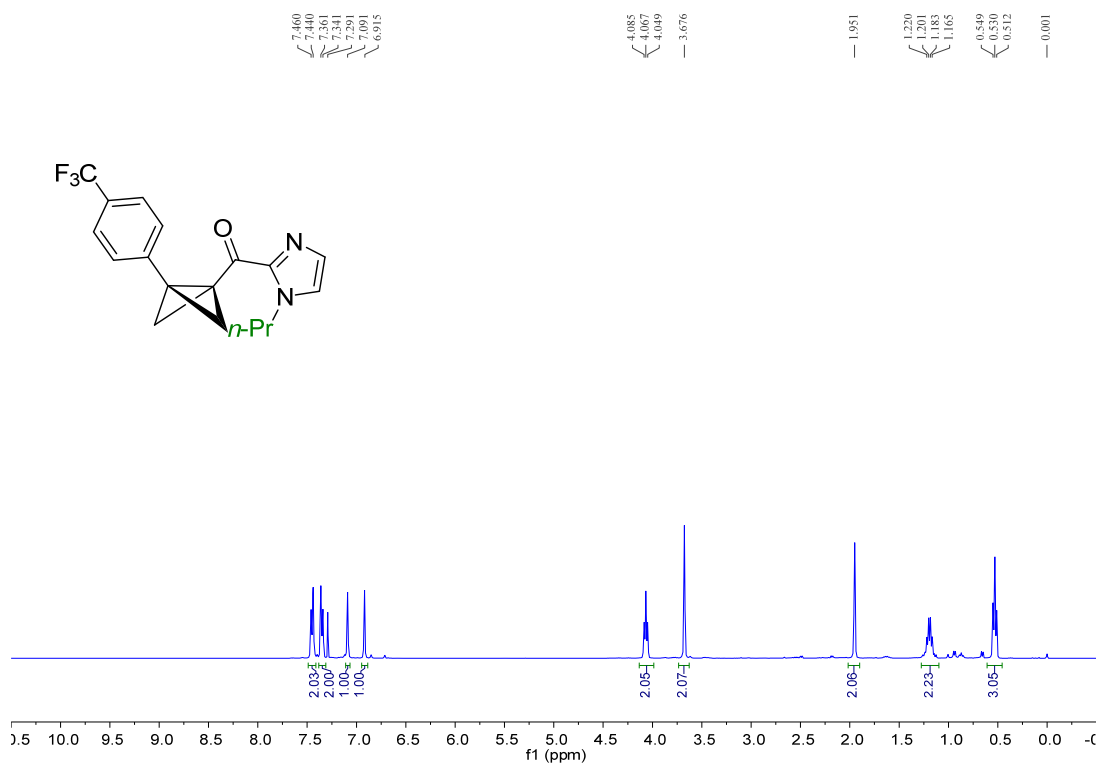
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 1d: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

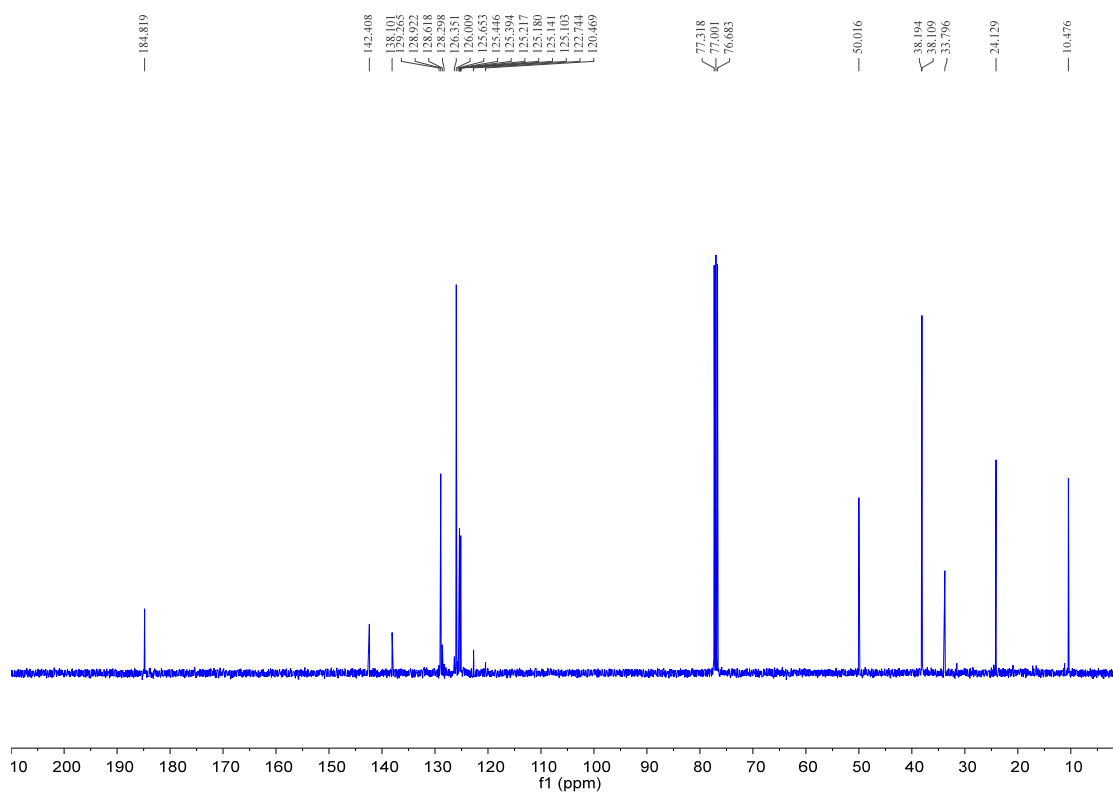
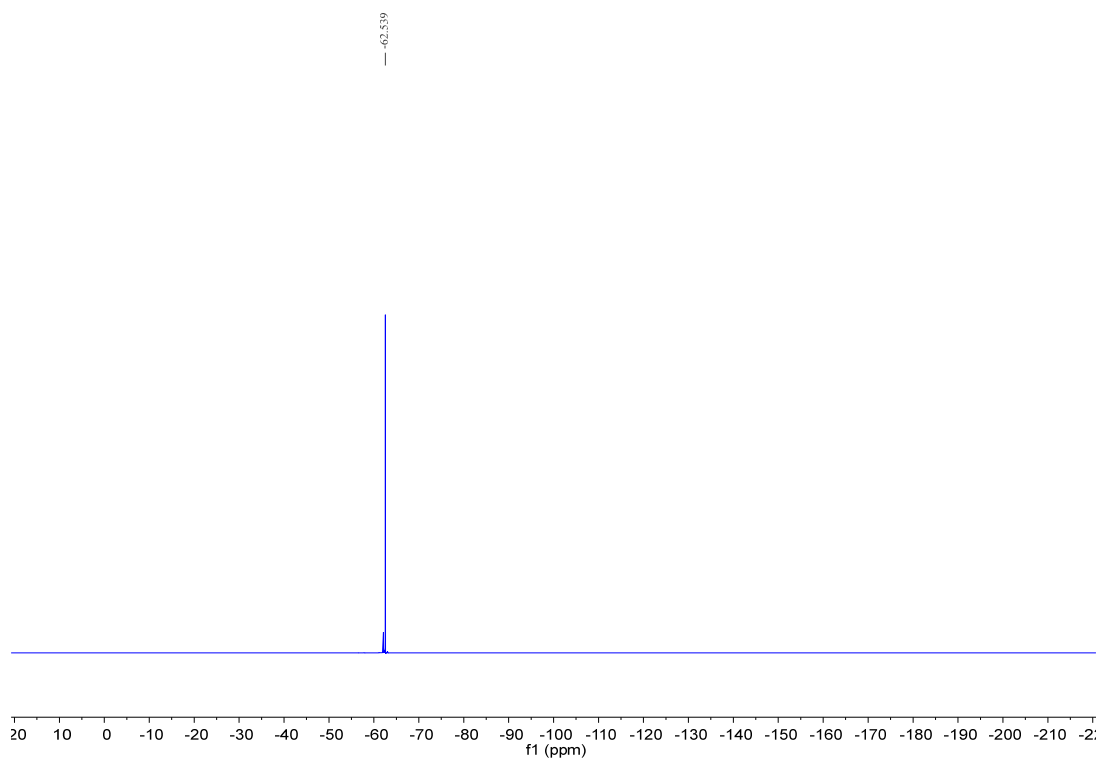
^{19}F NMR (376 MHz, CDCl_3)

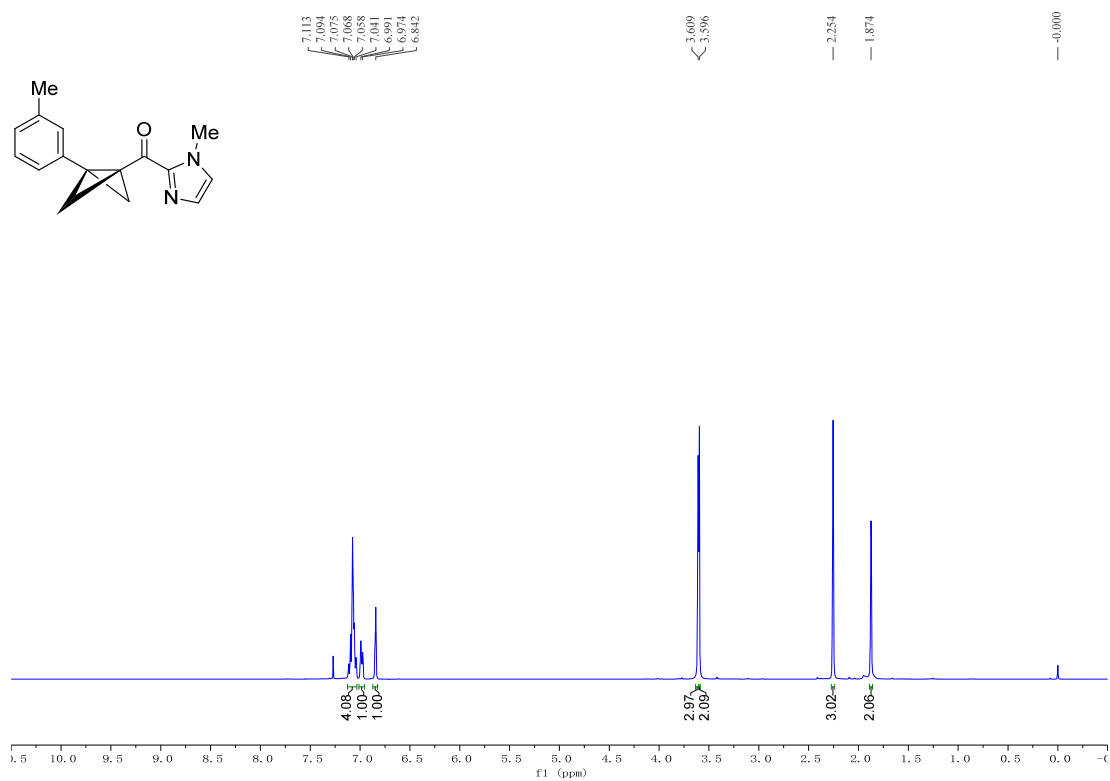
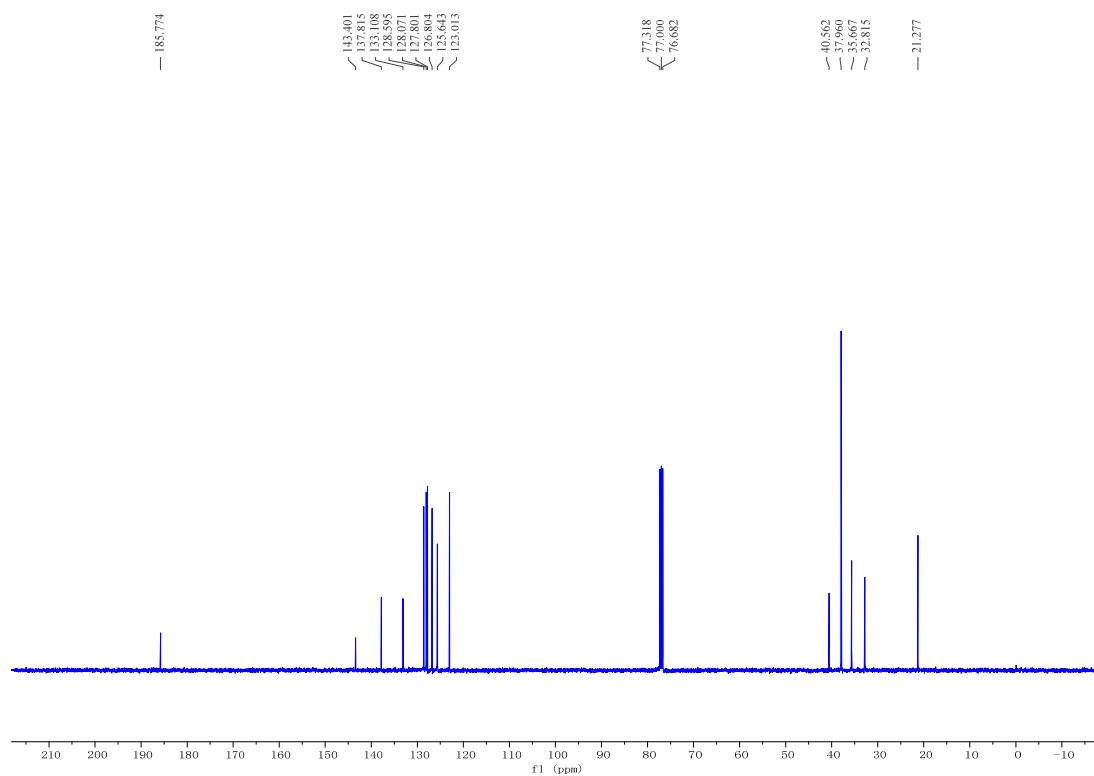


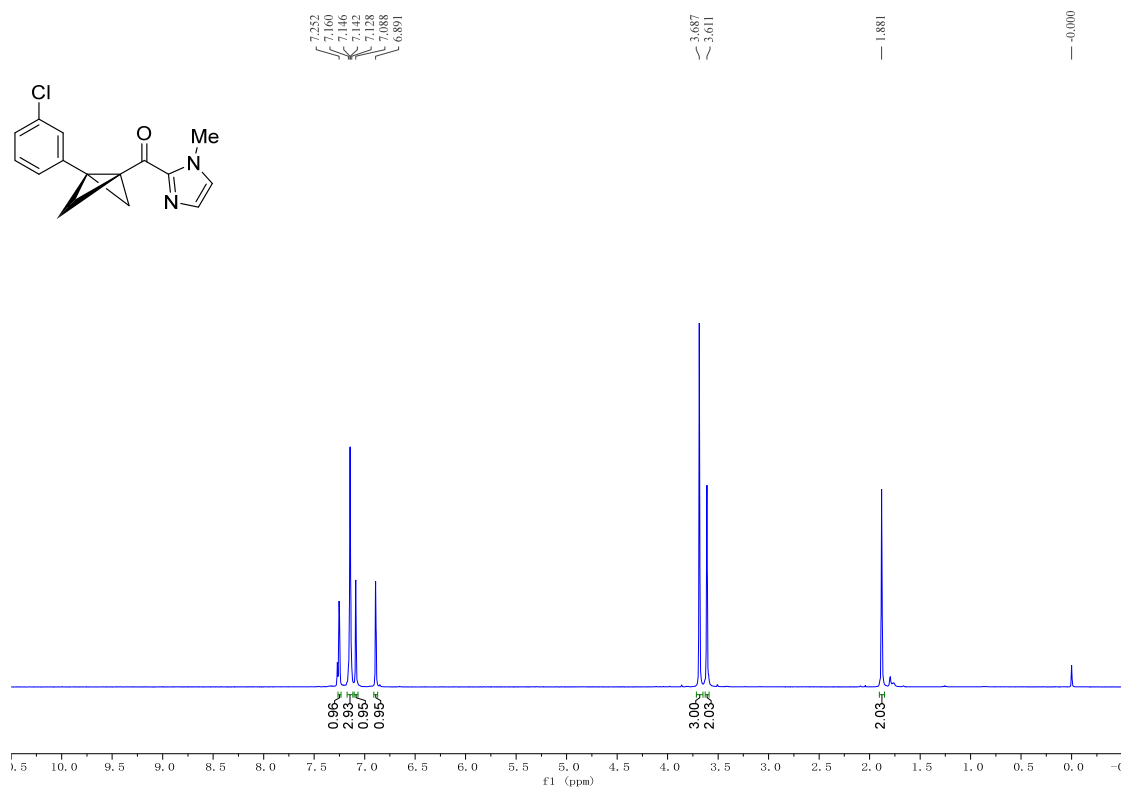
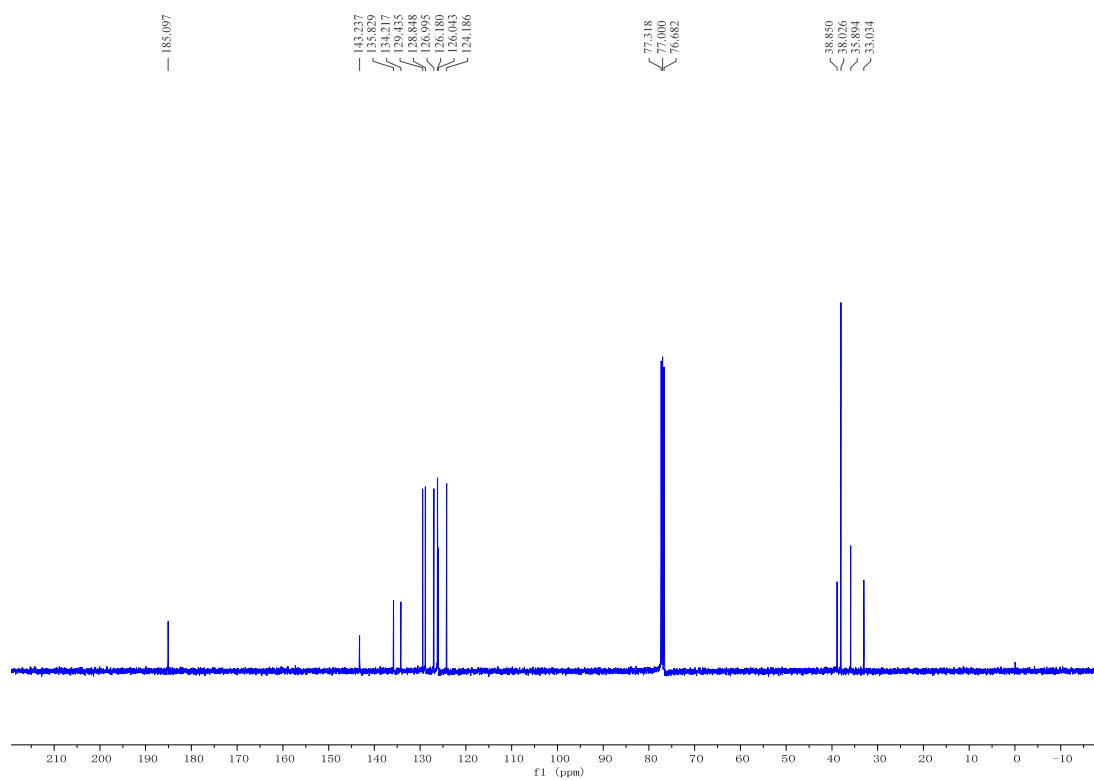
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 1e:

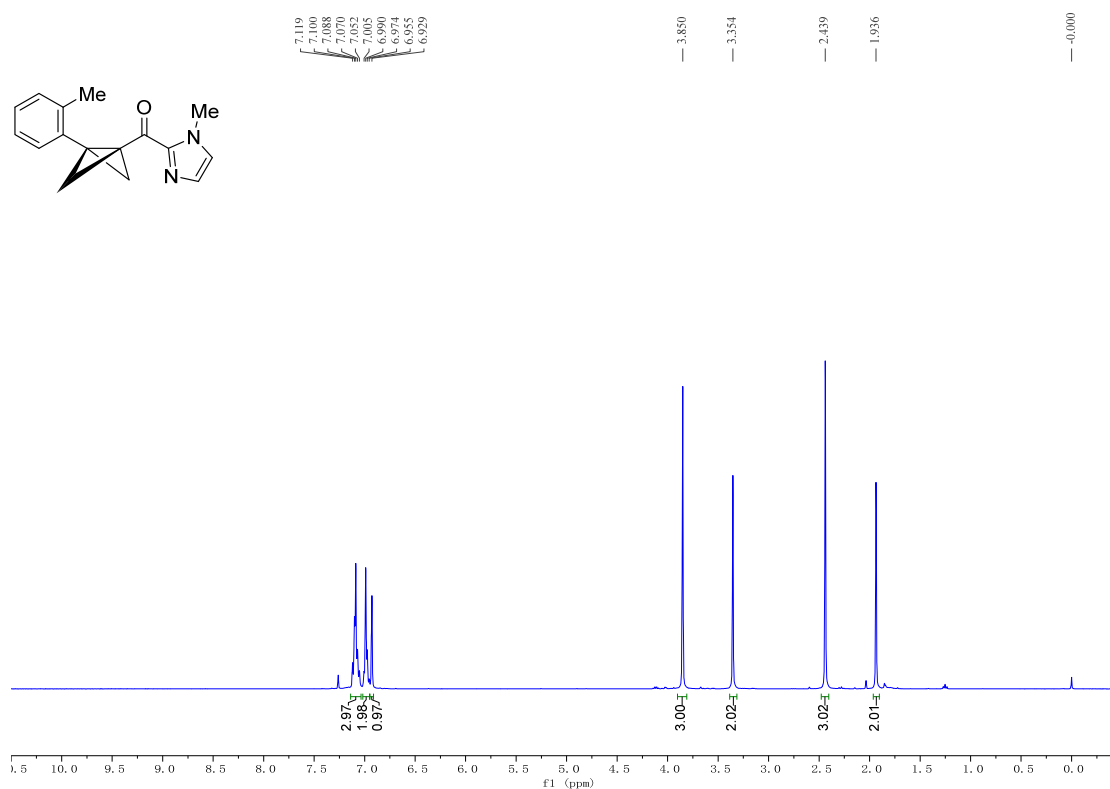
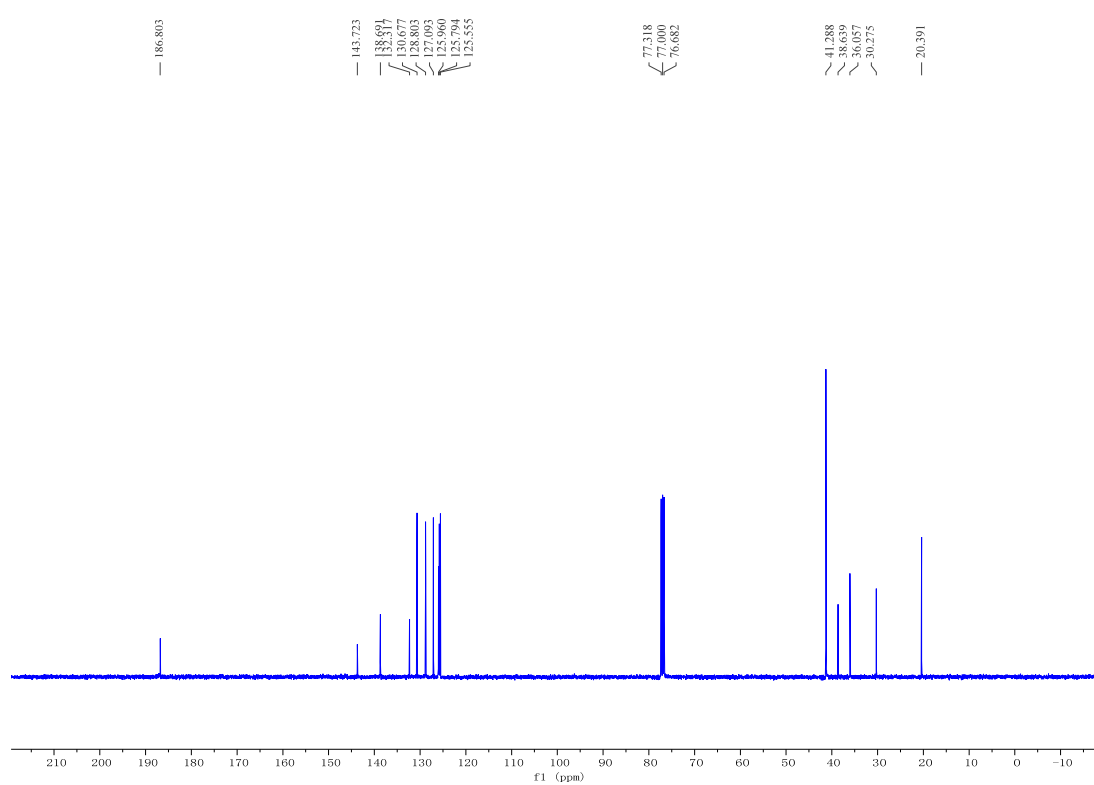
^1H NMR (400 MHz, CDCl_3)

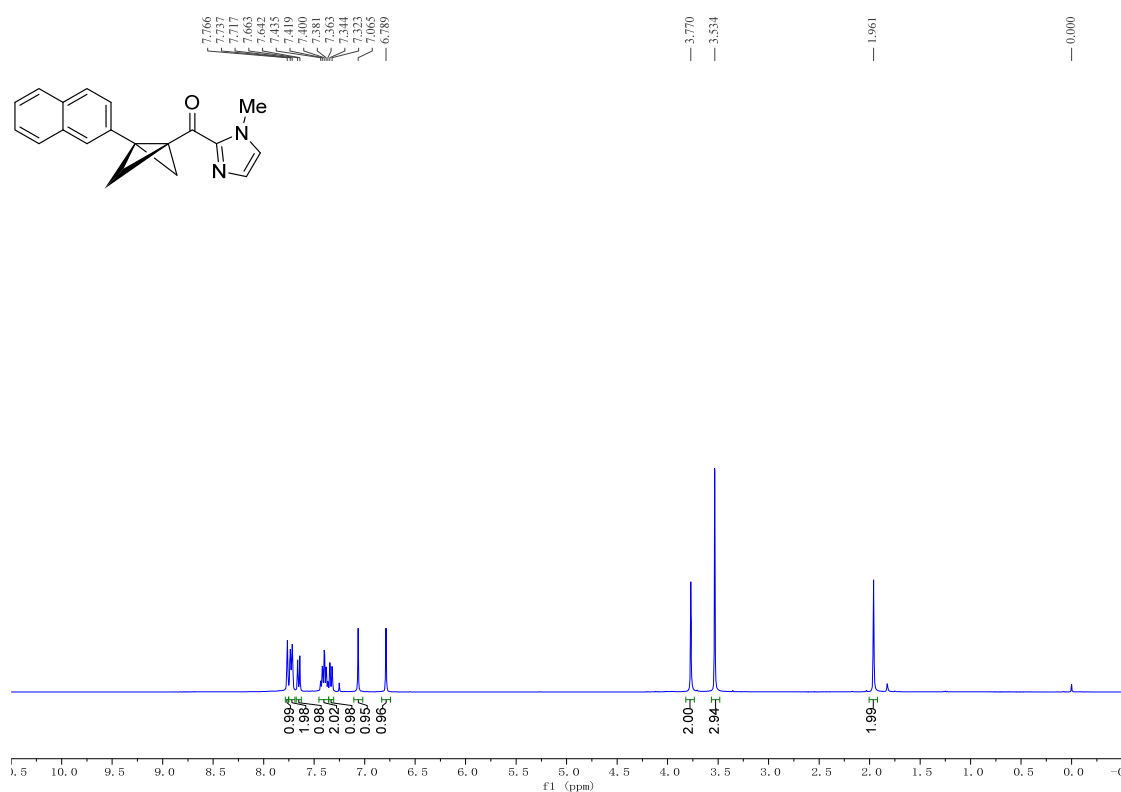
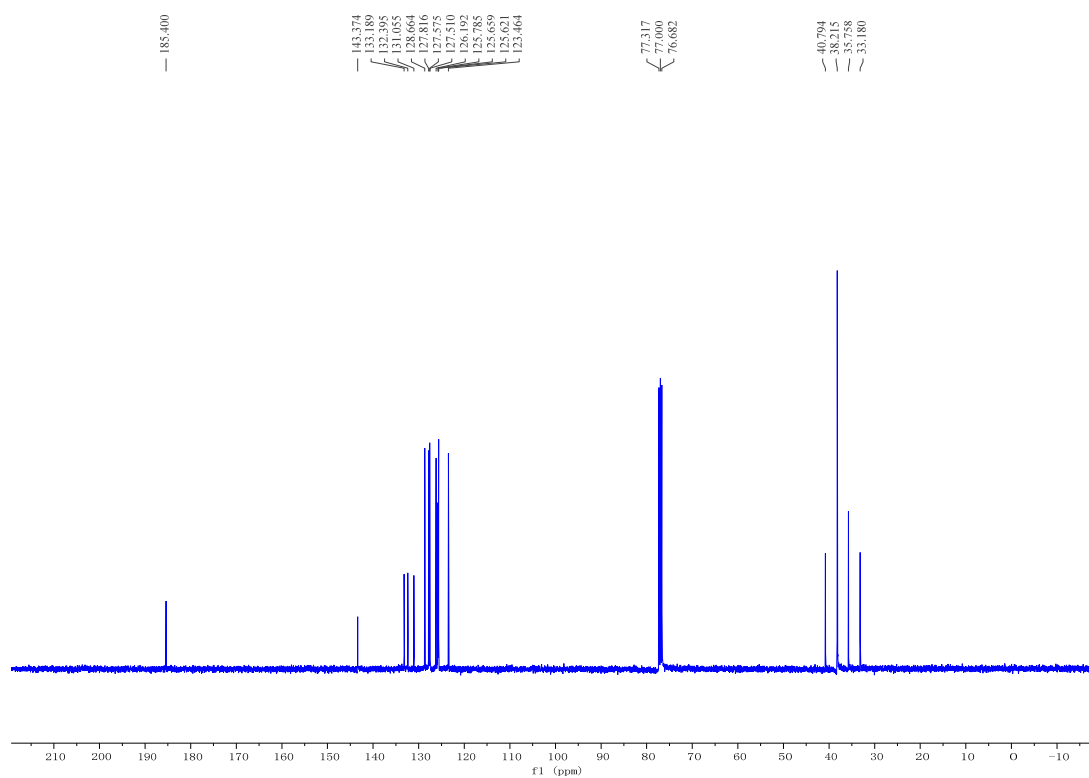


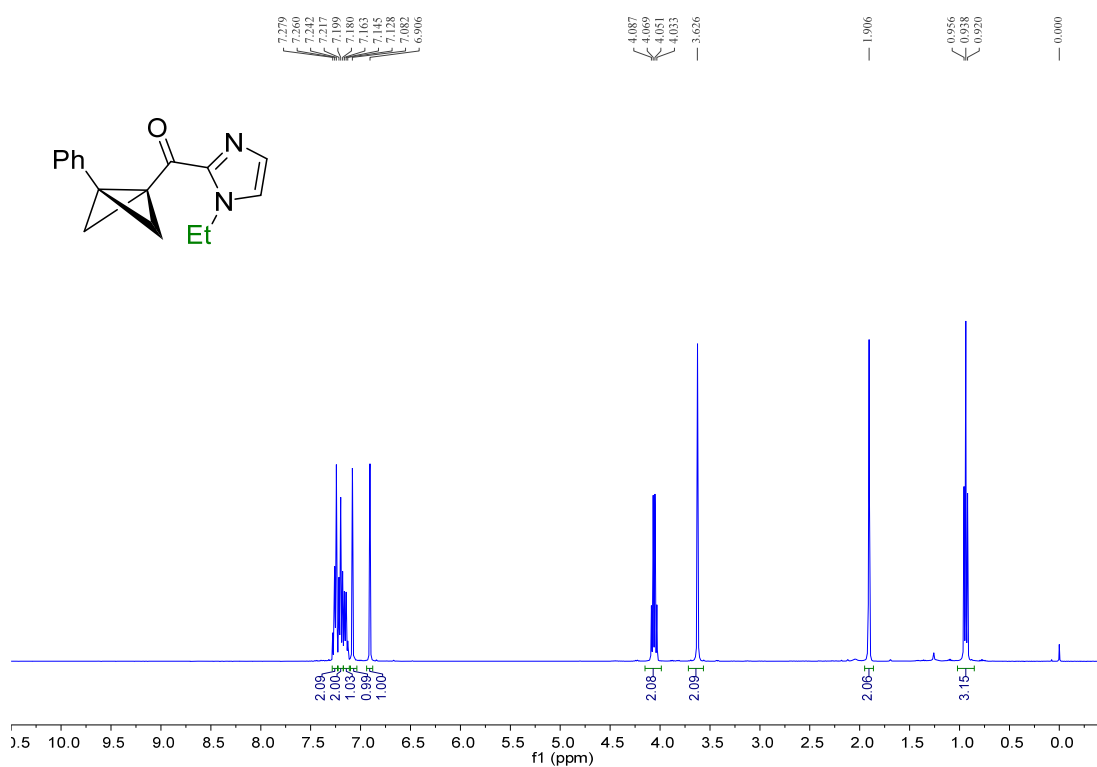
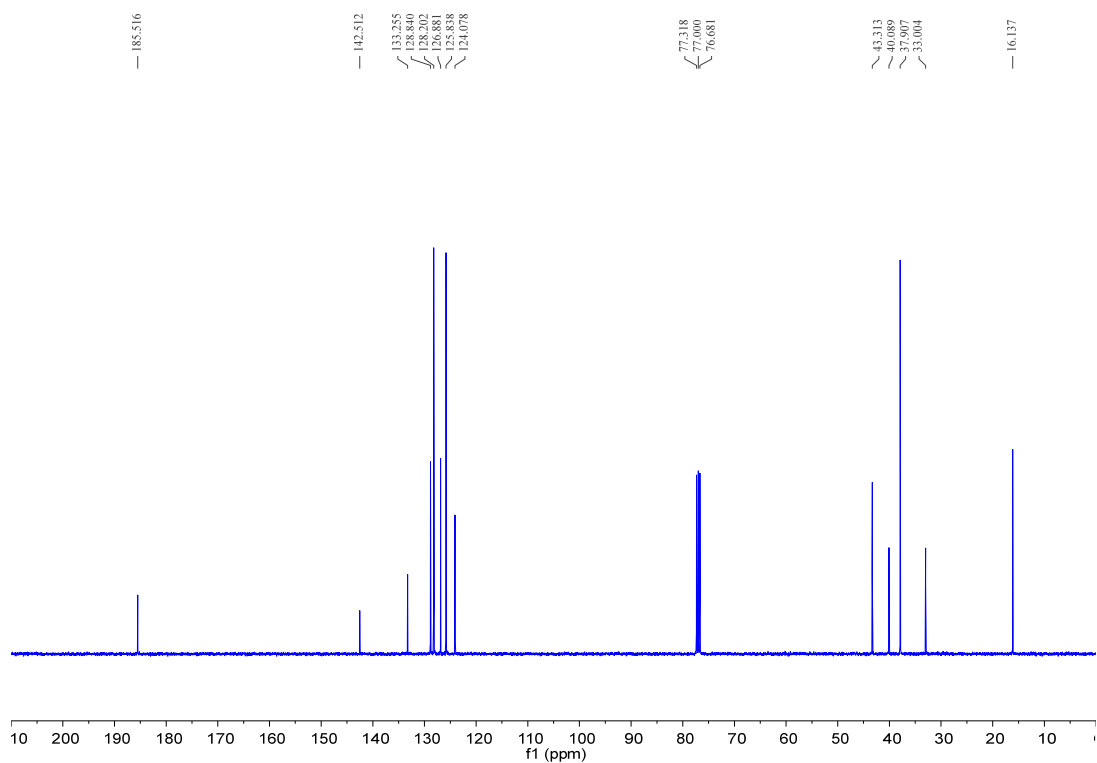
^{13}C NMR (100 MHz, CDCl_3) ^{19}F NMR (376 MHz, CDCl_3)

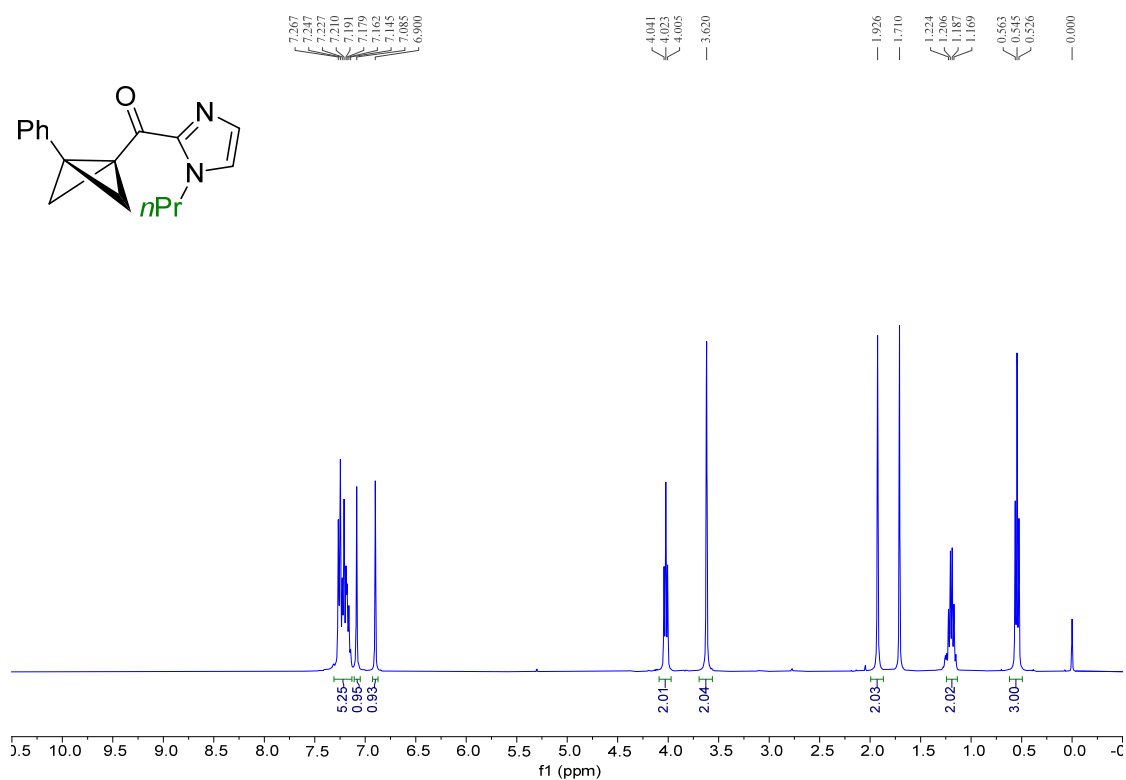
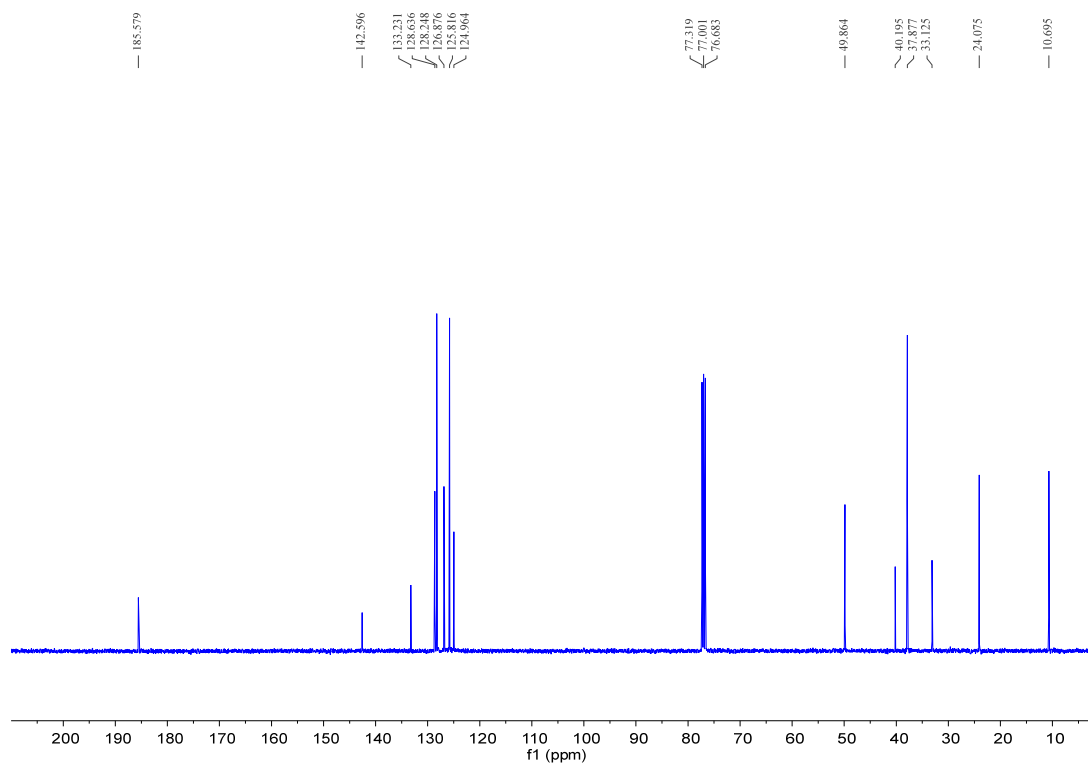
^1H and ^{13}C NMR Spectra for Compound 1f: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

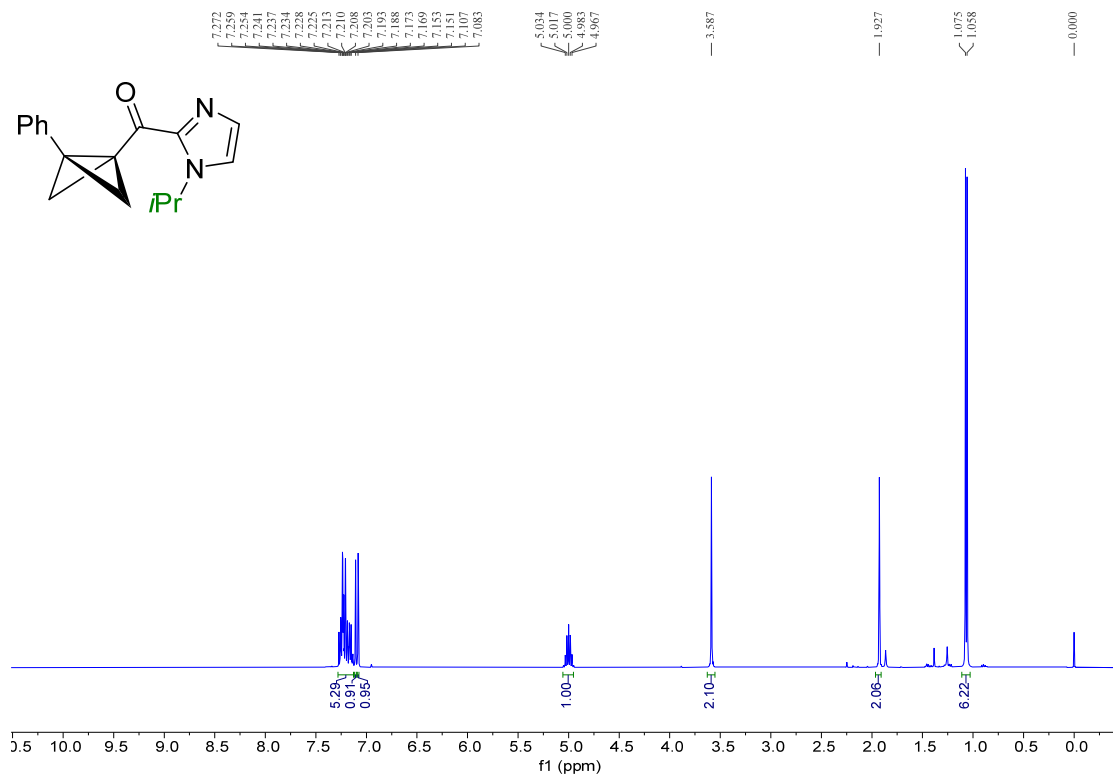
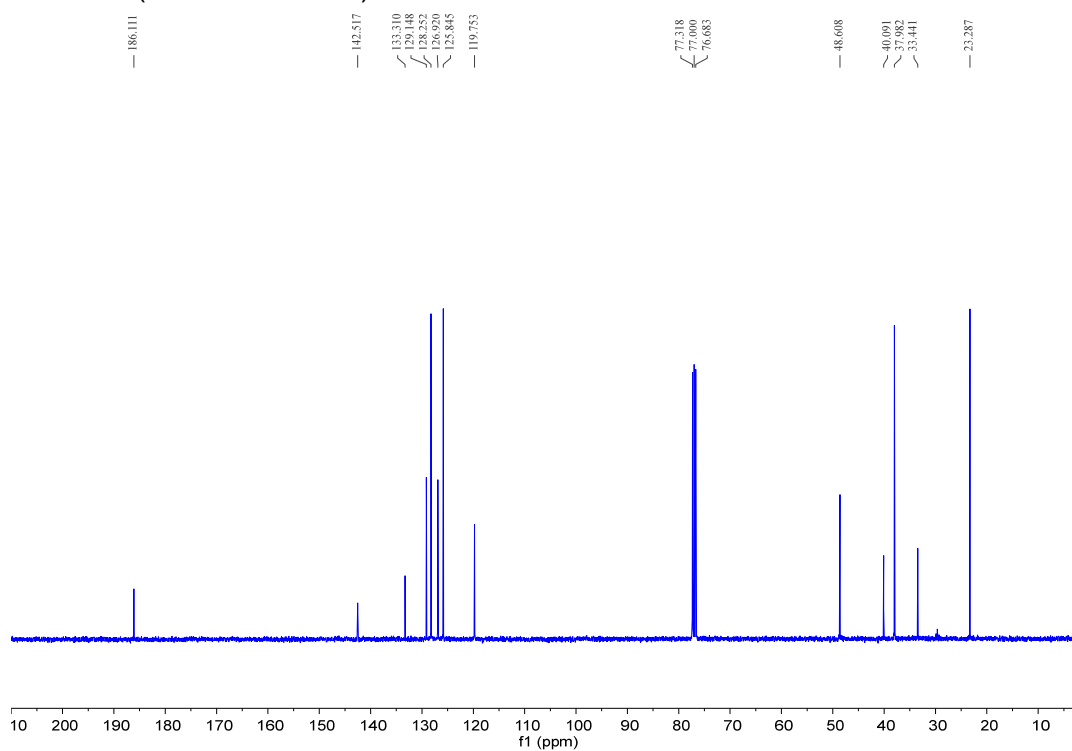
^1H and ^{13}C NMR Spectra for Compound 1g: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

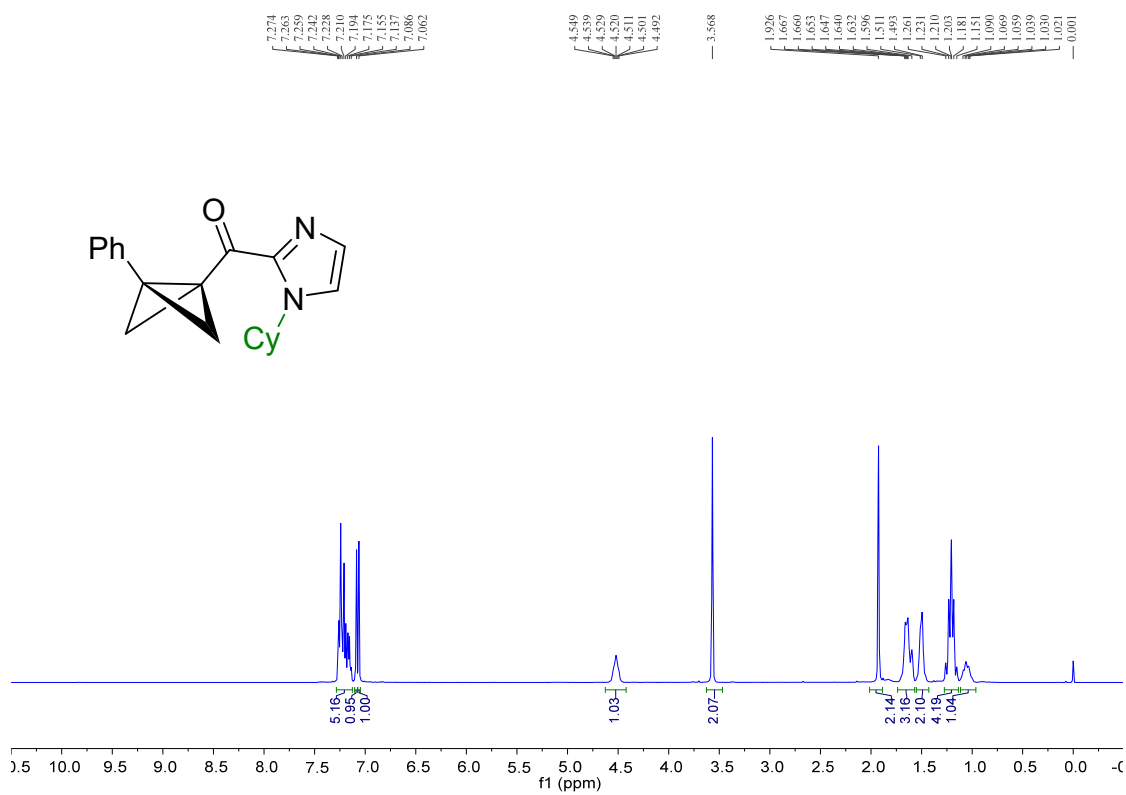
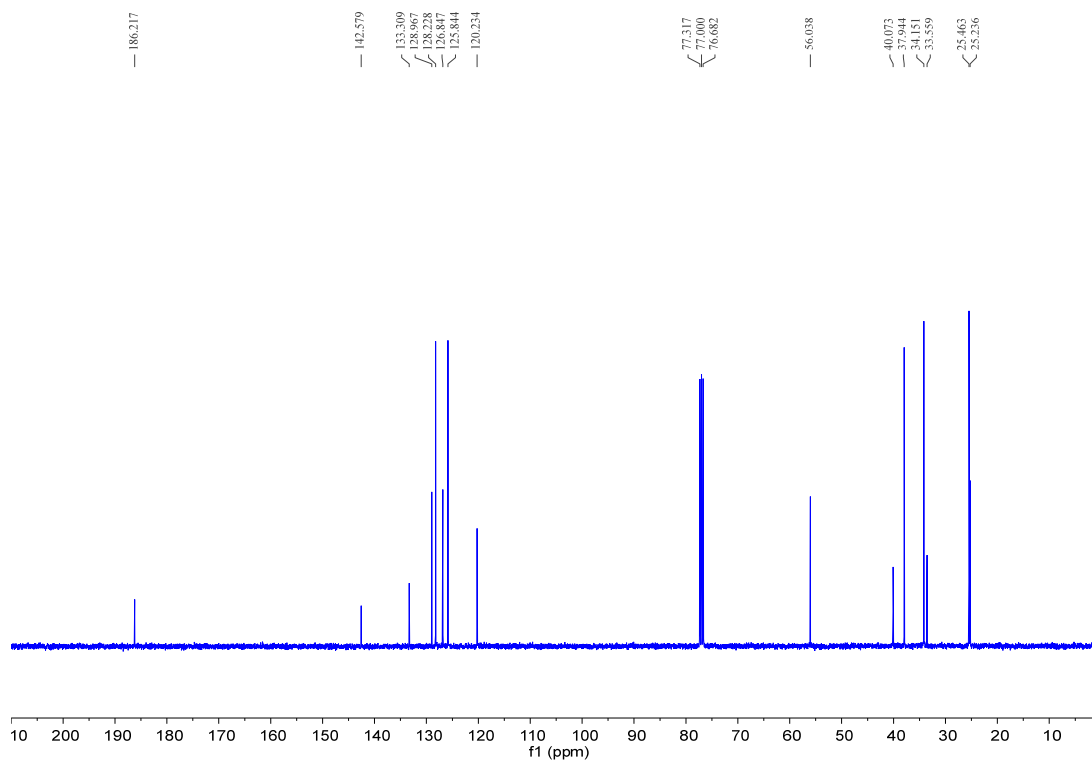
^1H and ^{13}C NMR Spectra for Compound 1h: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

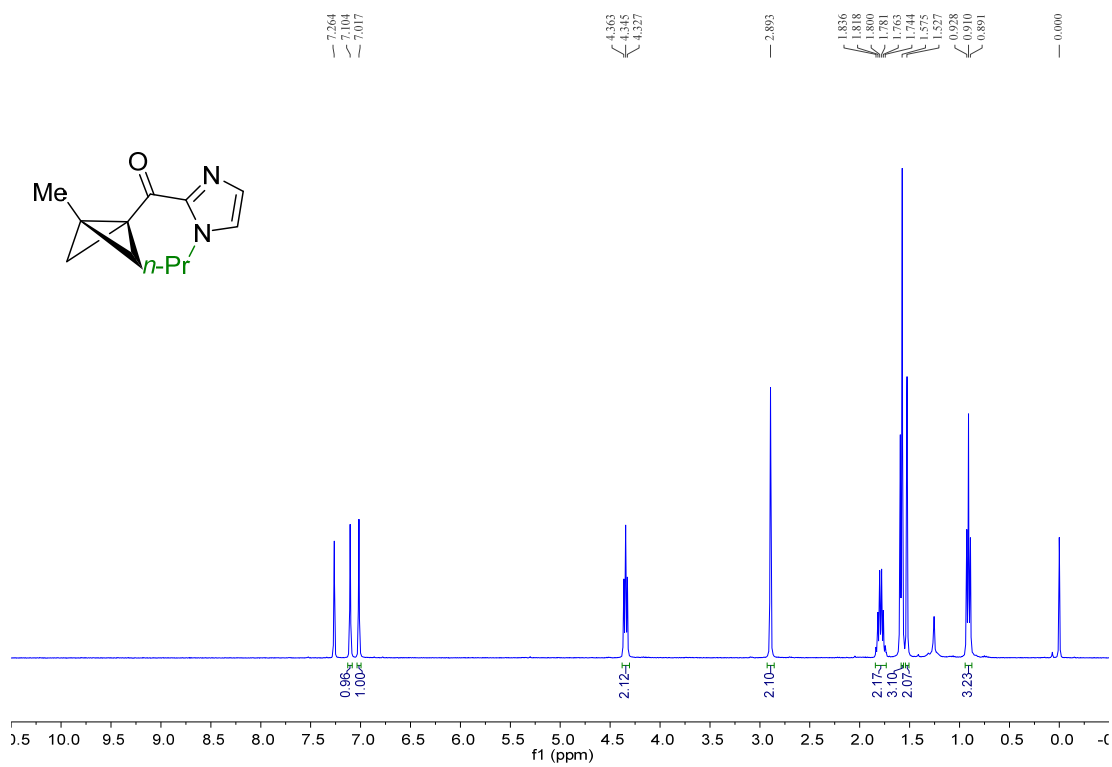
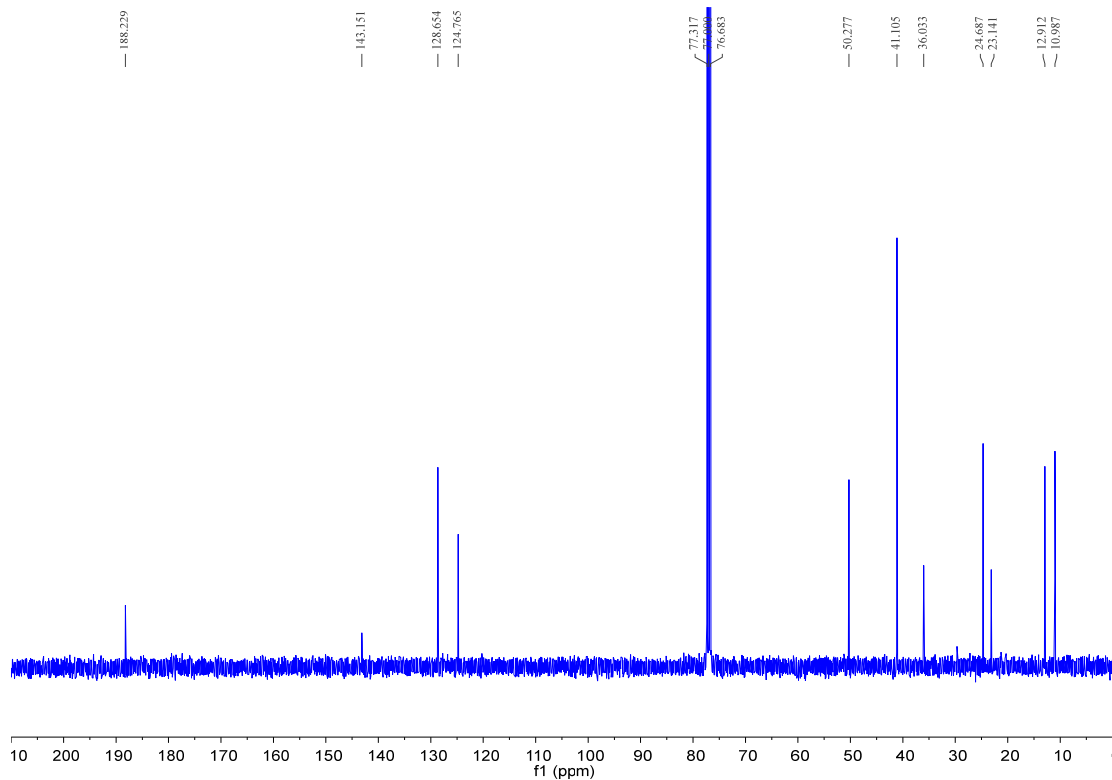
^1H and ^{13}C NMR Spectra for Compound 1i: **^1H NMR (400 MHz, CDCl_3)** **^{13}C NMR (100 MHz, CDCl_3)**

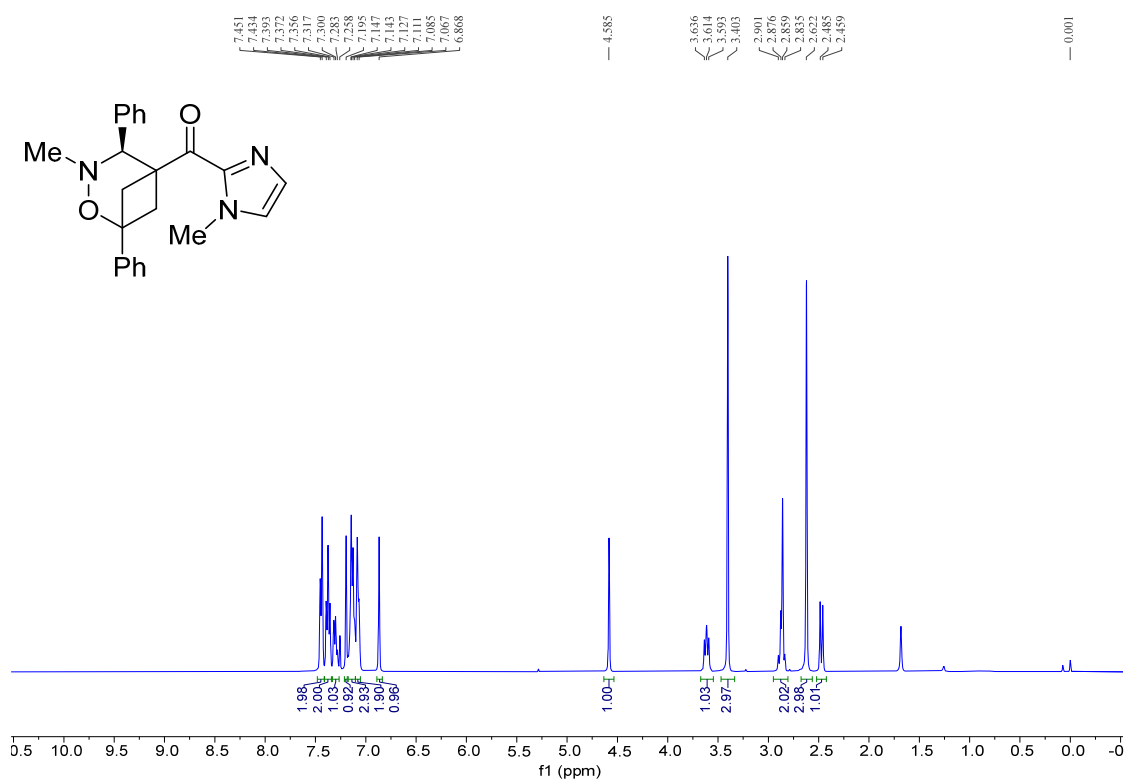
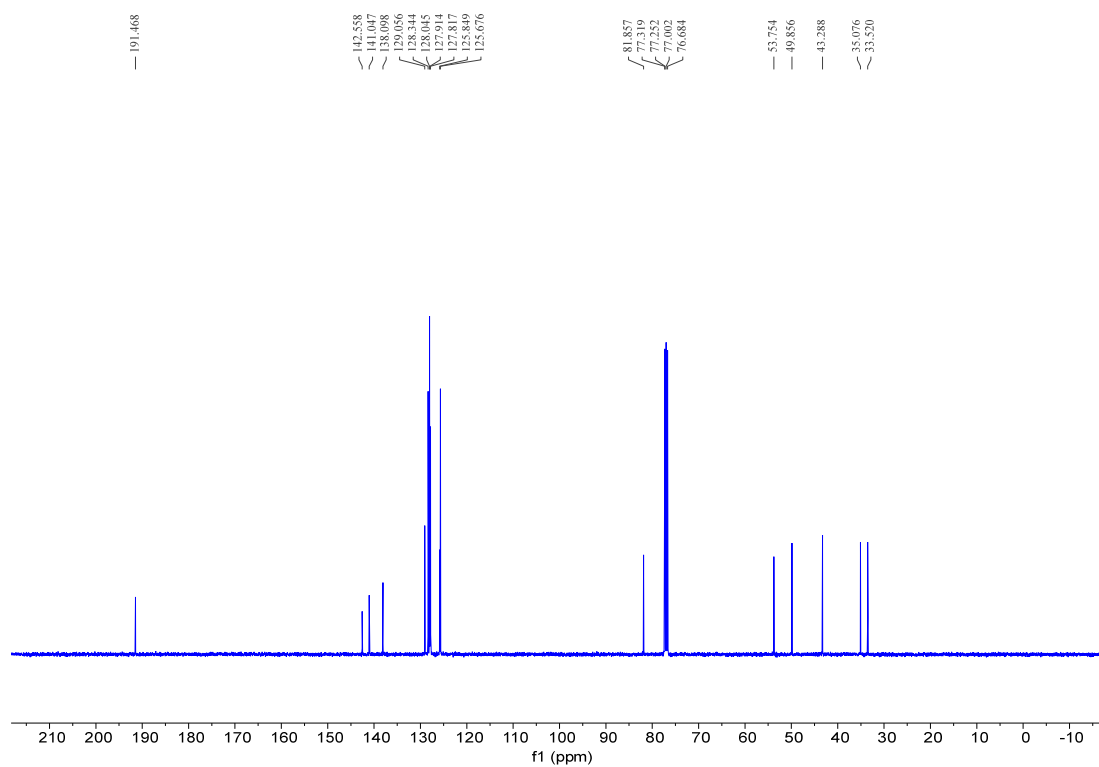
^1H and ^{13}C NMR Spectra for Compound 1j: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

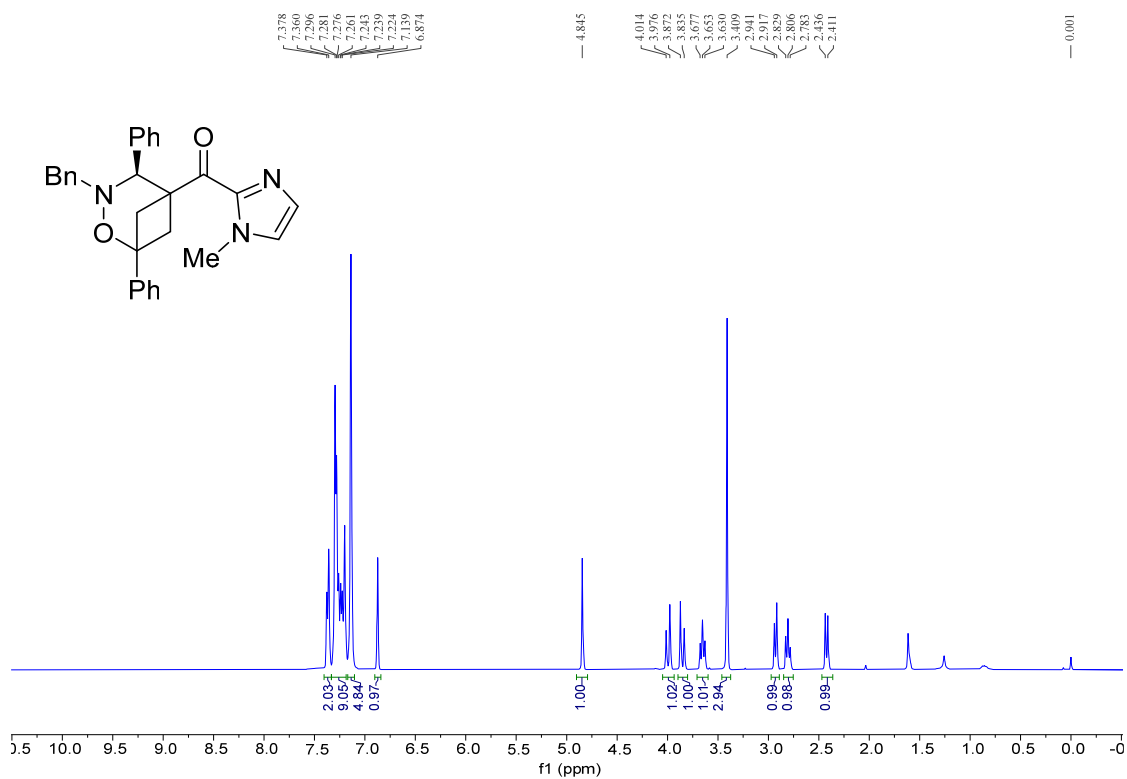
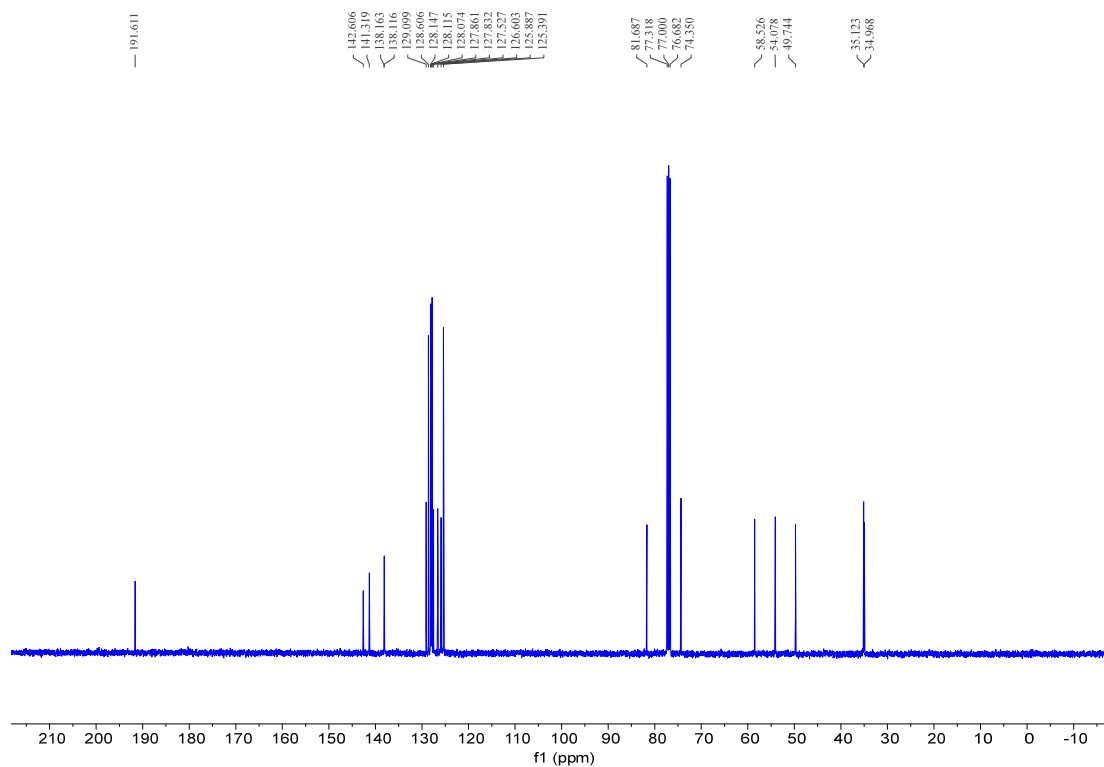
^1H and ^{13}C NMR Spectra for Compound 1k: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

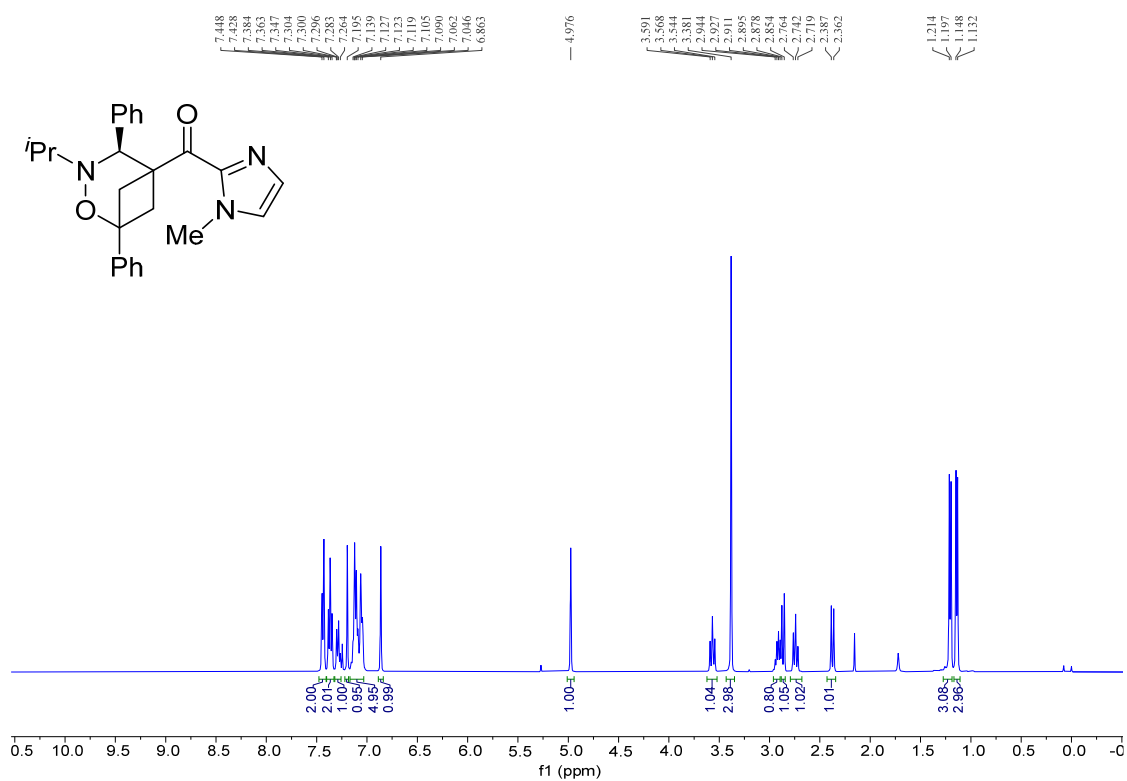
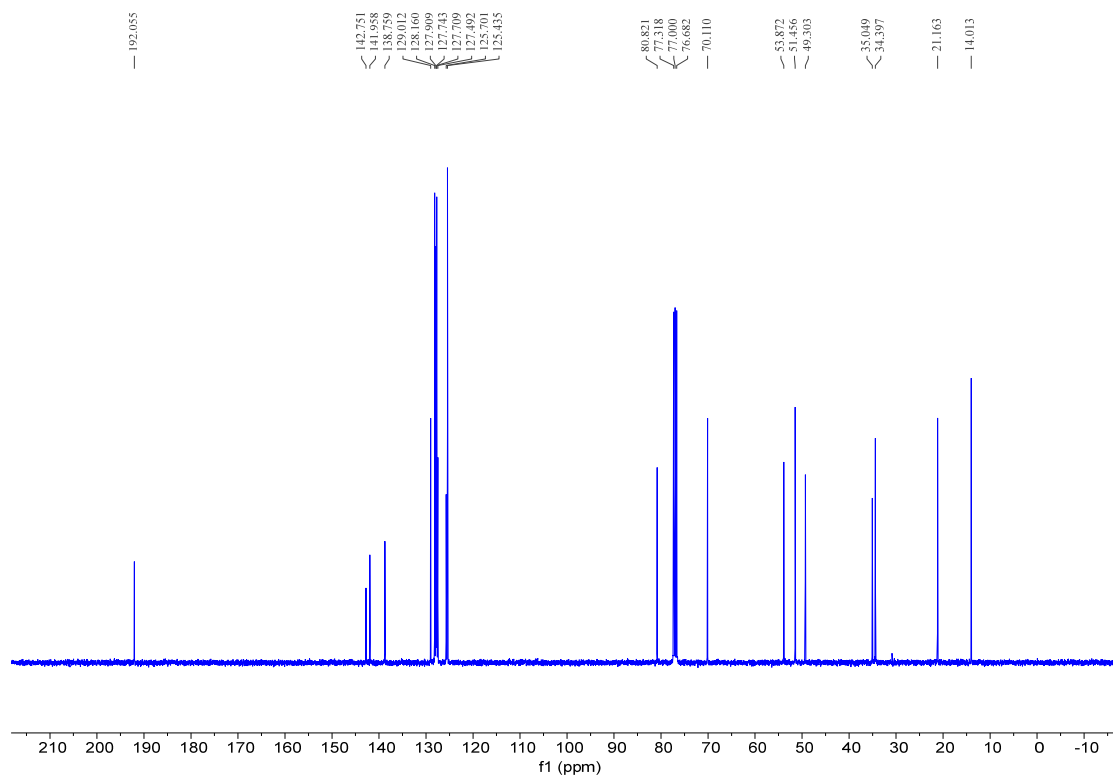
^1H and ^{13}C NMR Spectra for Compound 1l: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

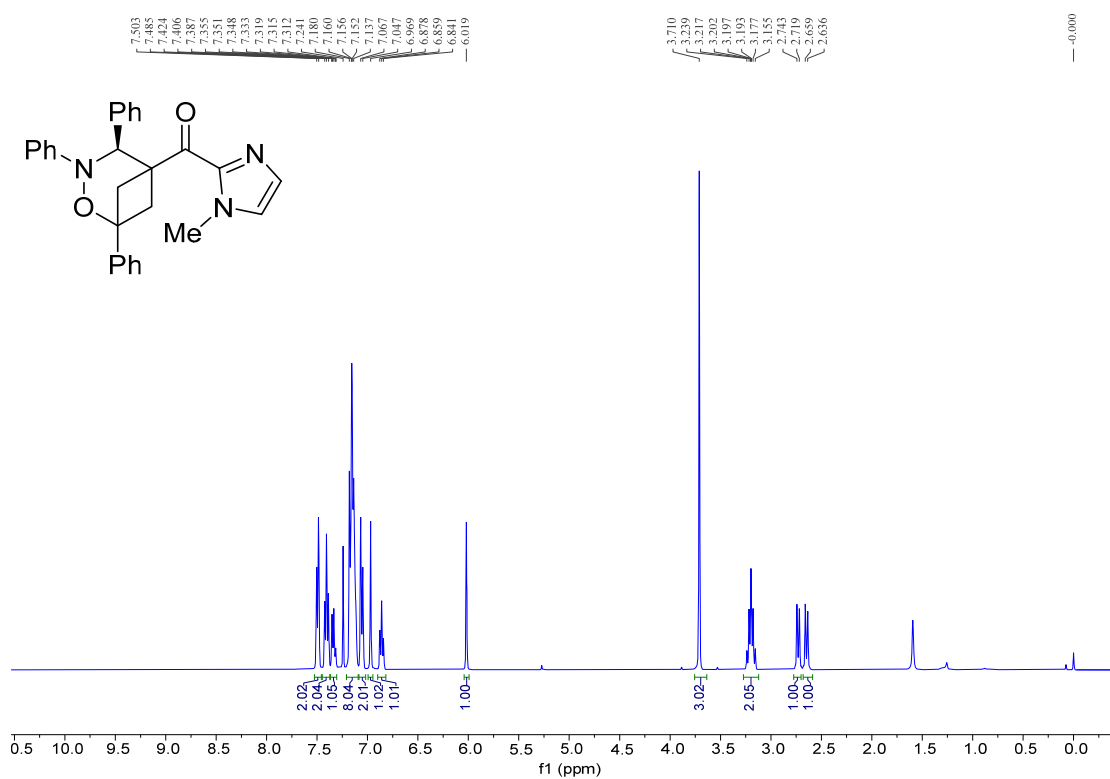
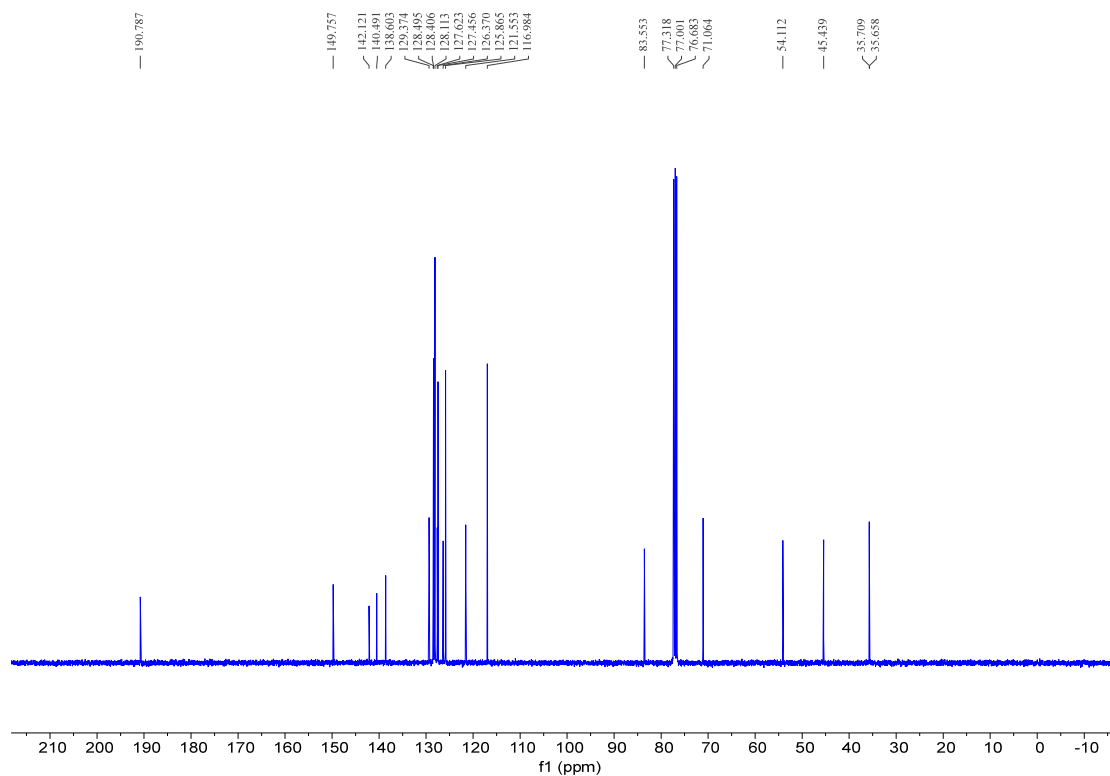
^1H and ^{13}C NMR Spectra for Compound 1m: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

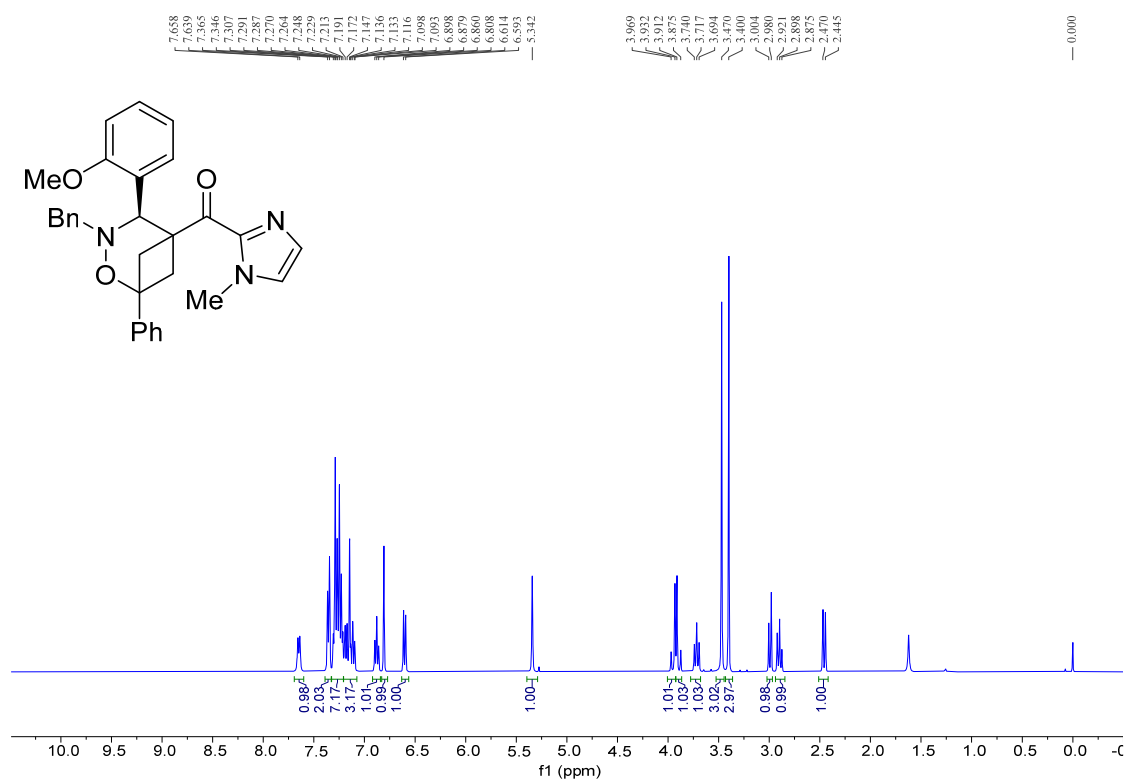
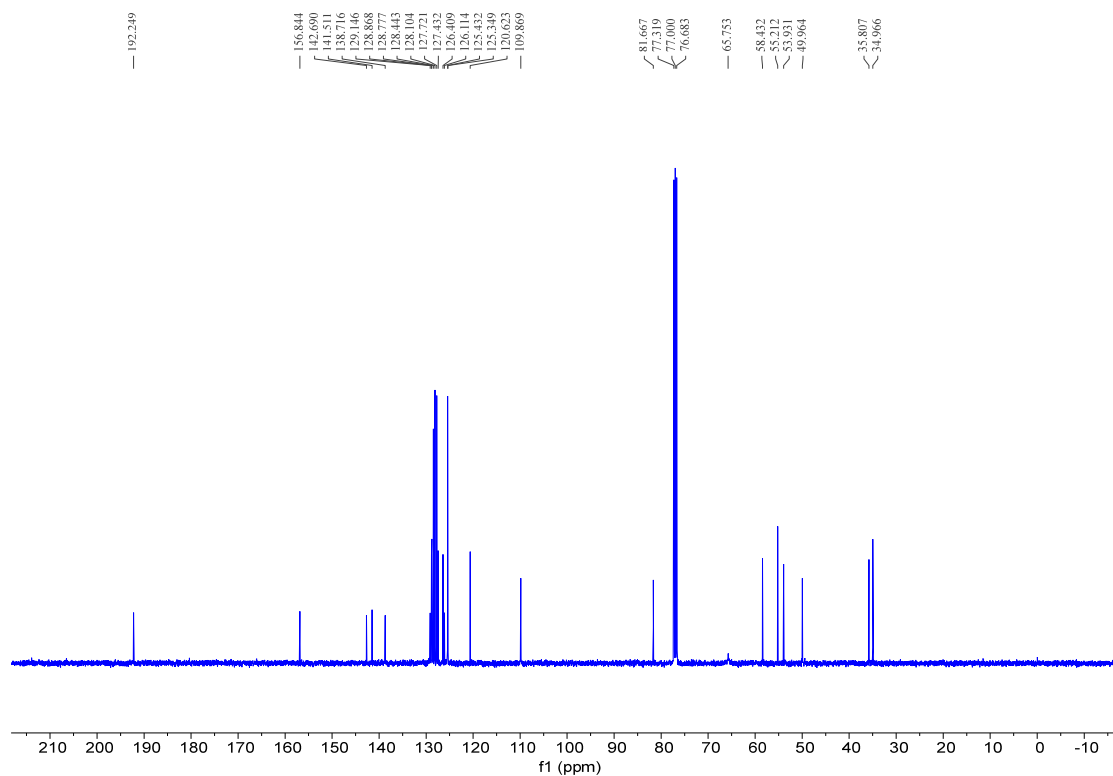
^1H and ^{13}C NMR Spectra for Compound 1q: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

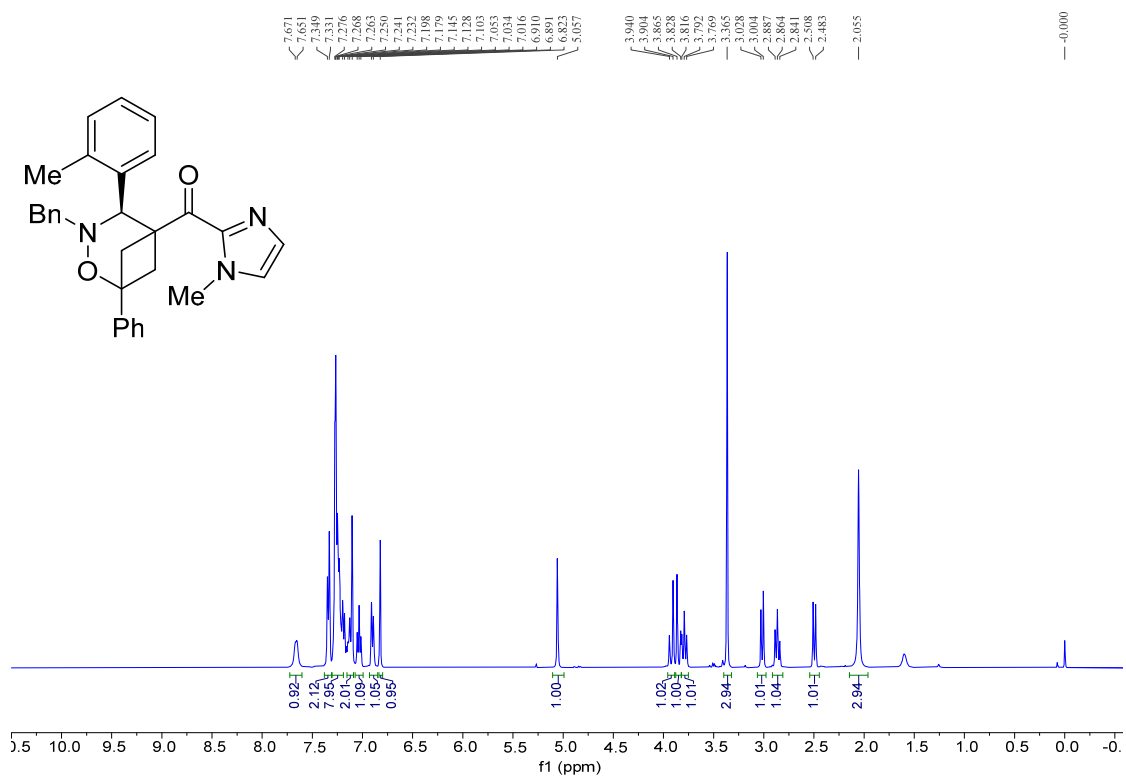
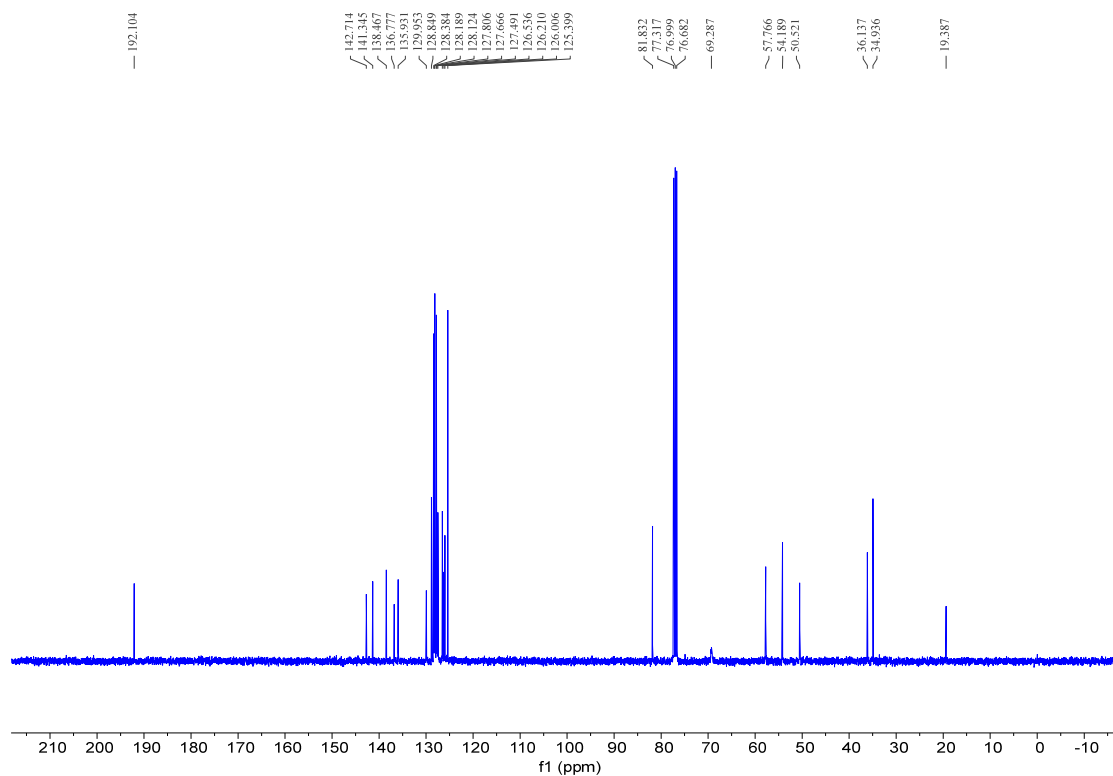
^1H and ^{13}C NMR Spectra for Compound 3aa: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

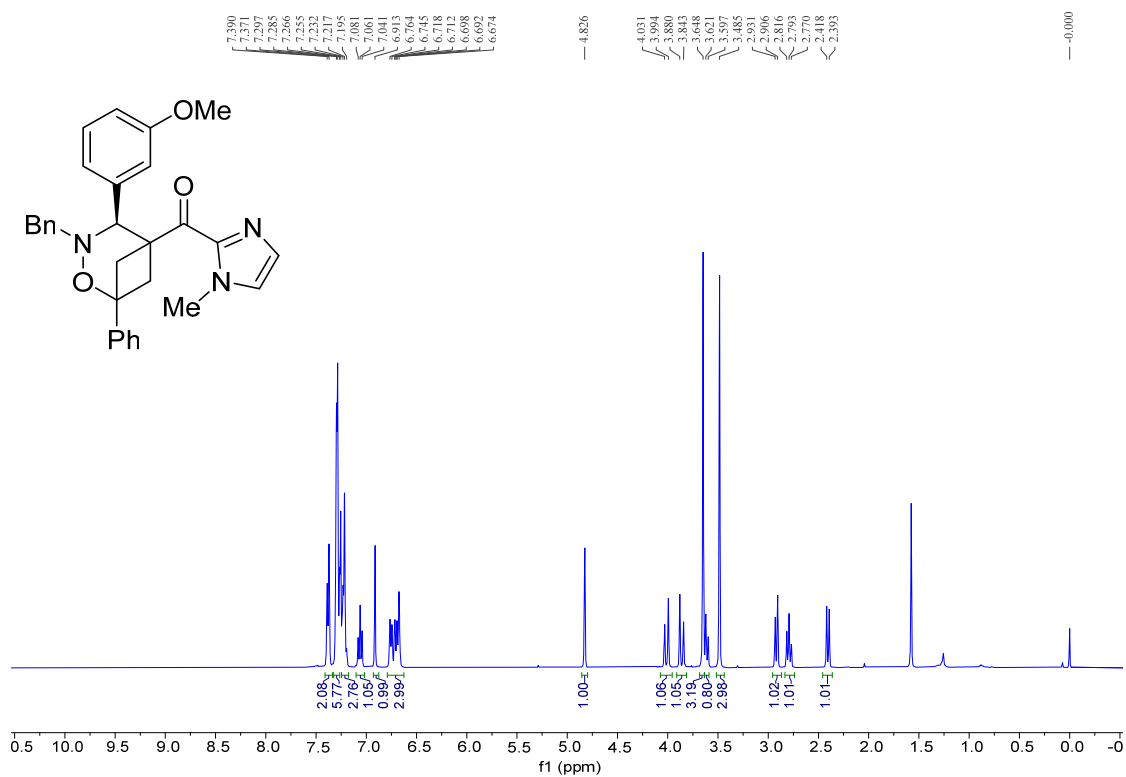
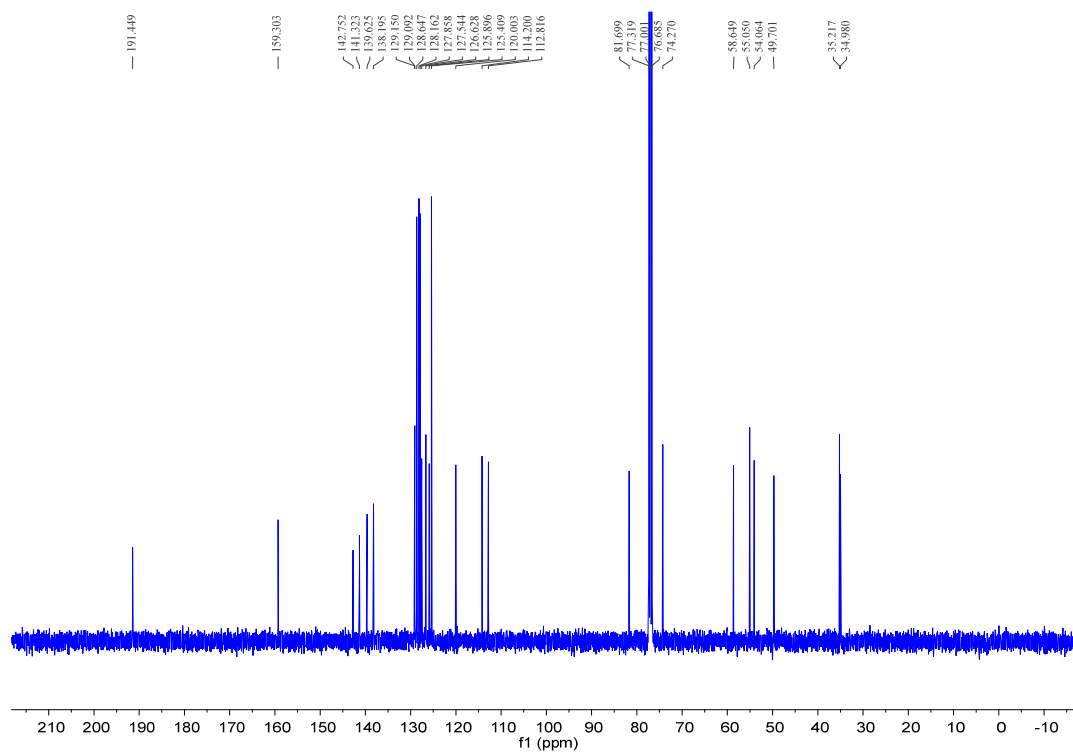
^1H and ^{13}C NMR Spectra for Compound 3ab: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

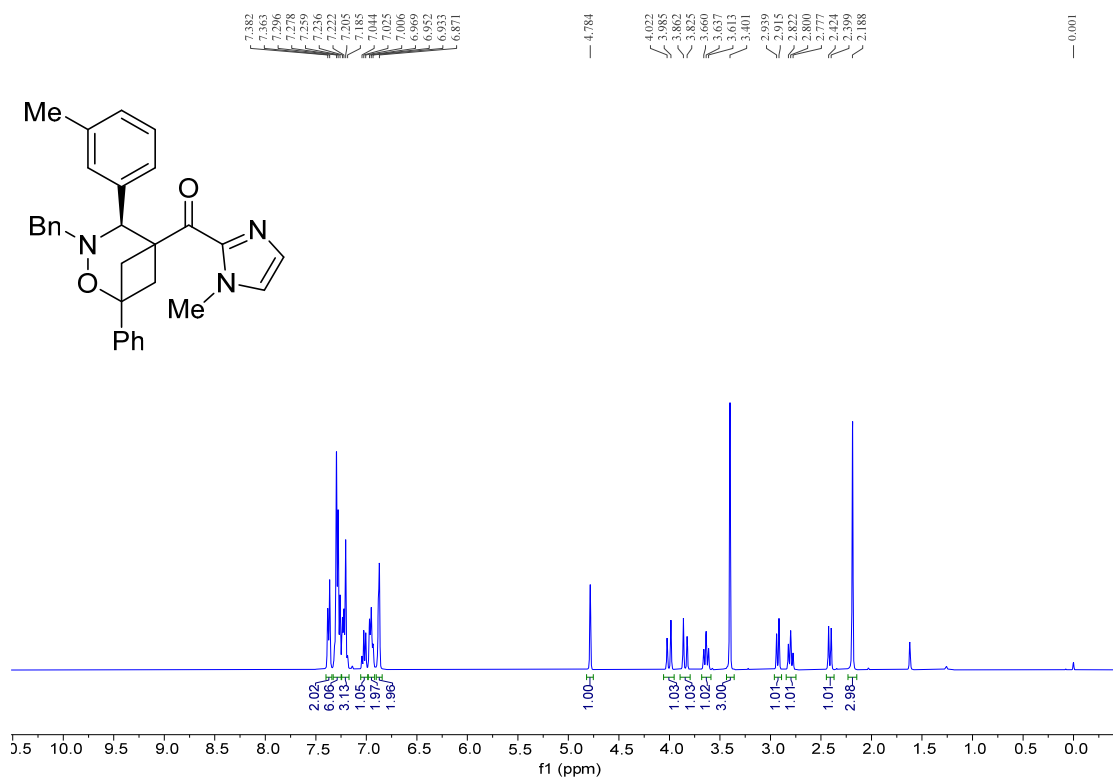
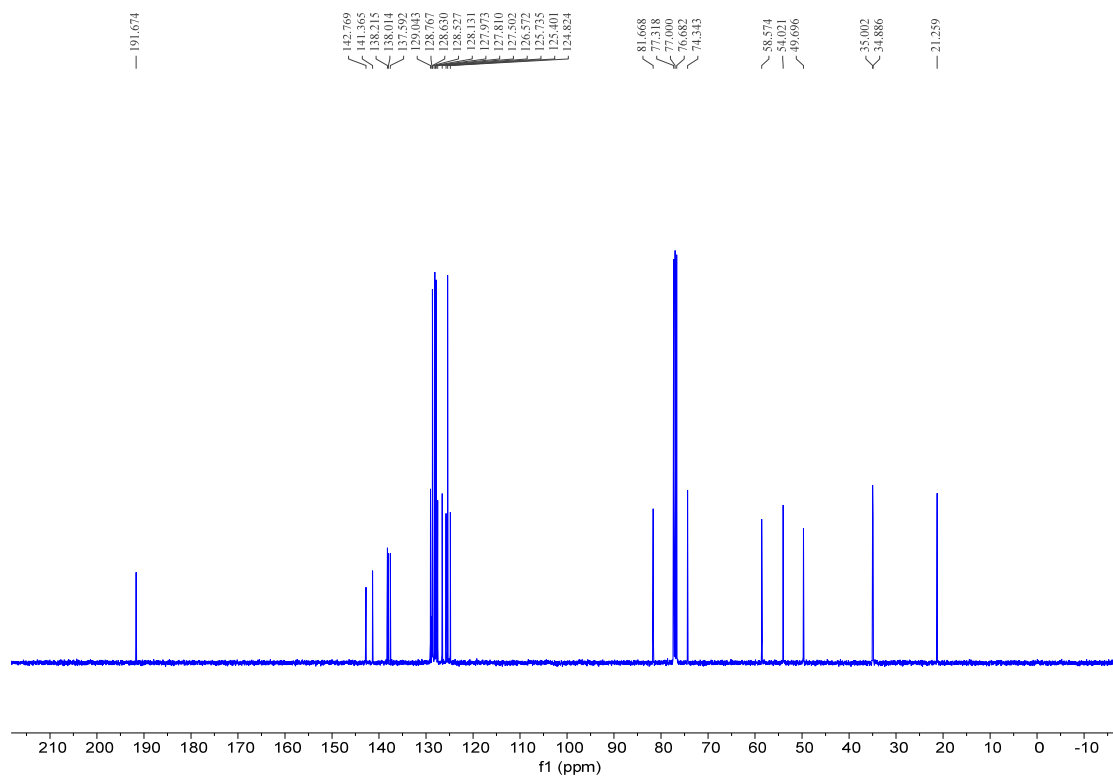
^1H and ^{13}C NMR Spectra for Compound 3ac: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

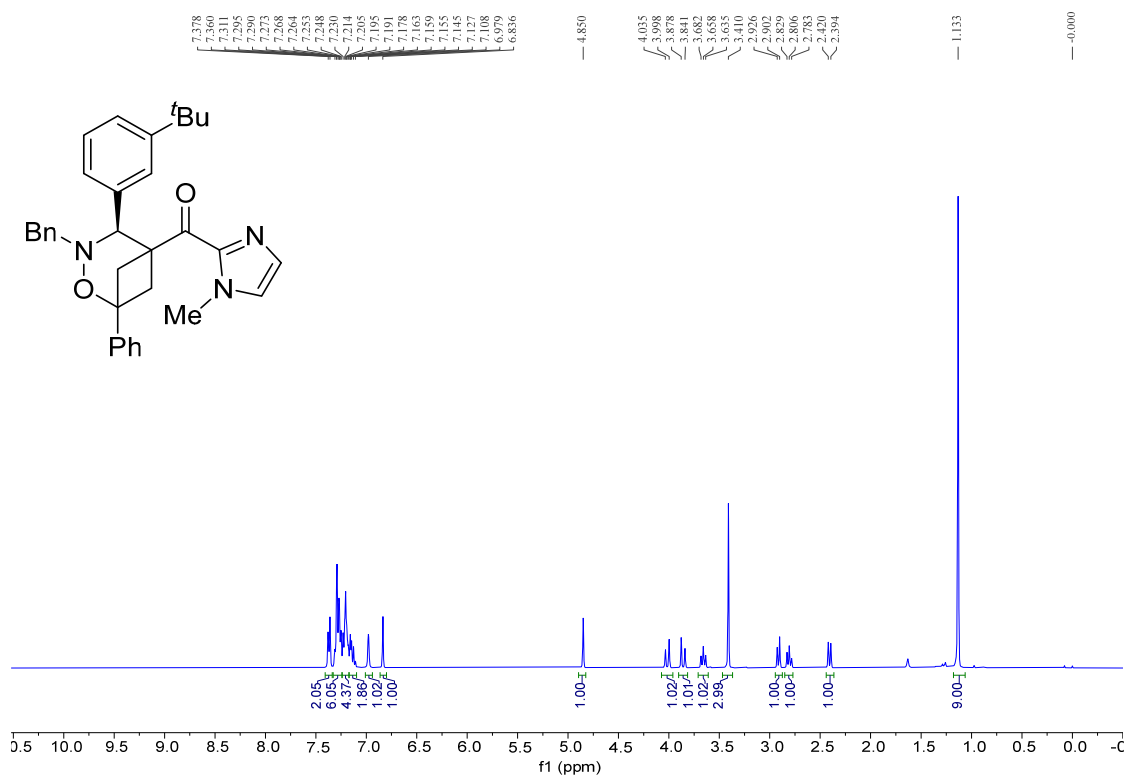
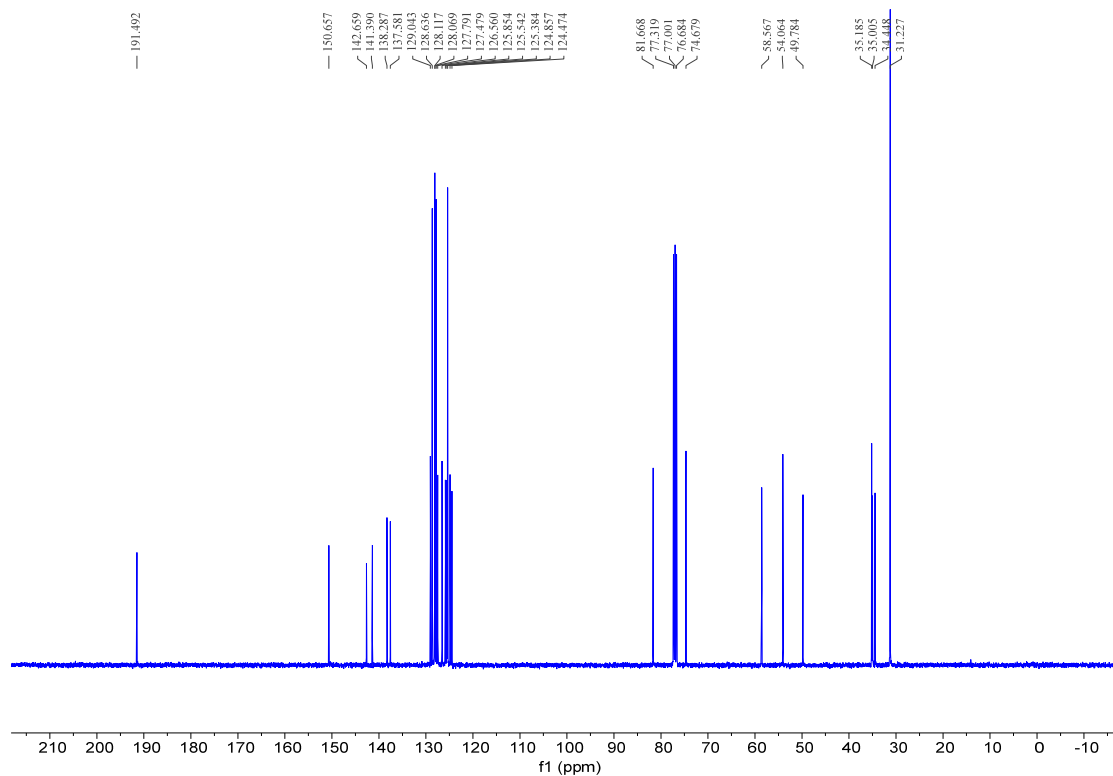
^1H and ^{13}C NMR Spectra for Compound 3ad: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

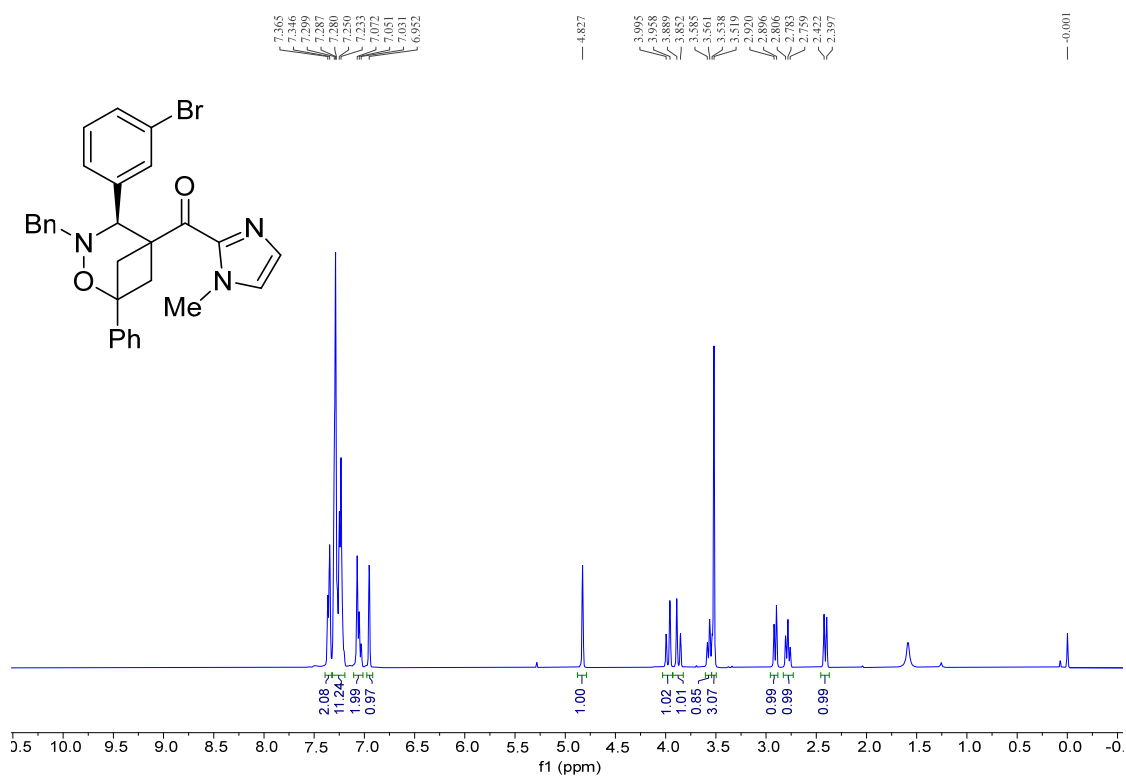
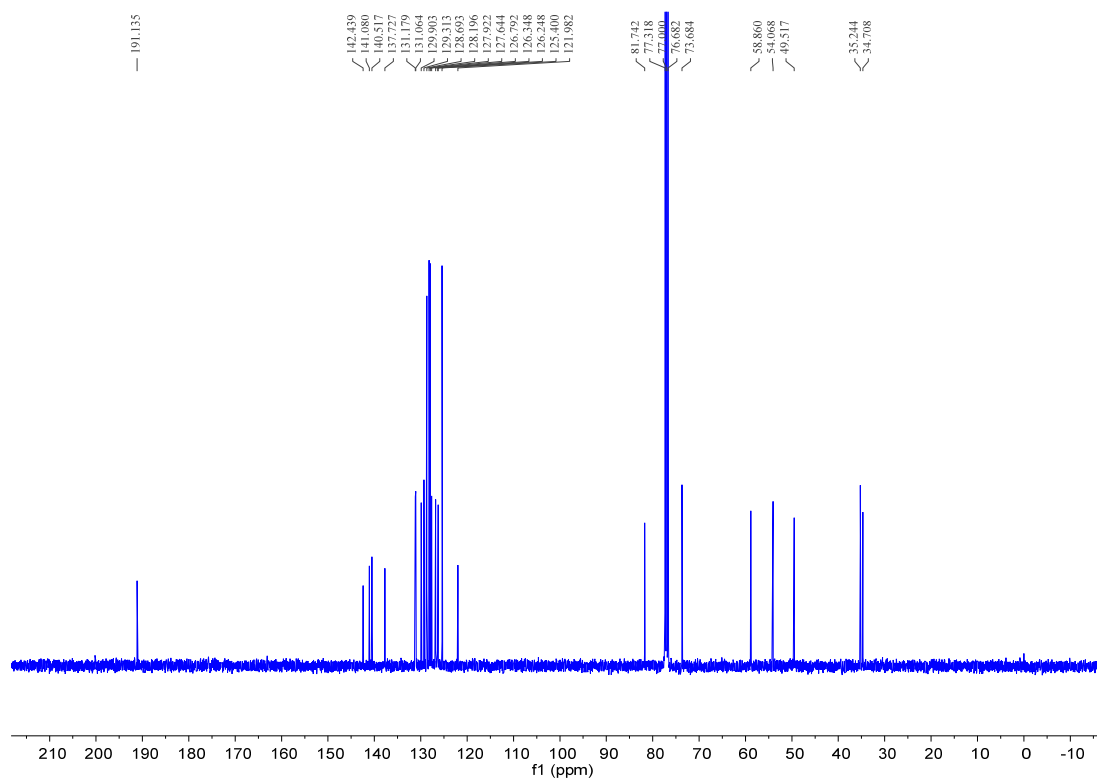
^1H and ^{13}C NMR Spectra for Compound 3ae: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

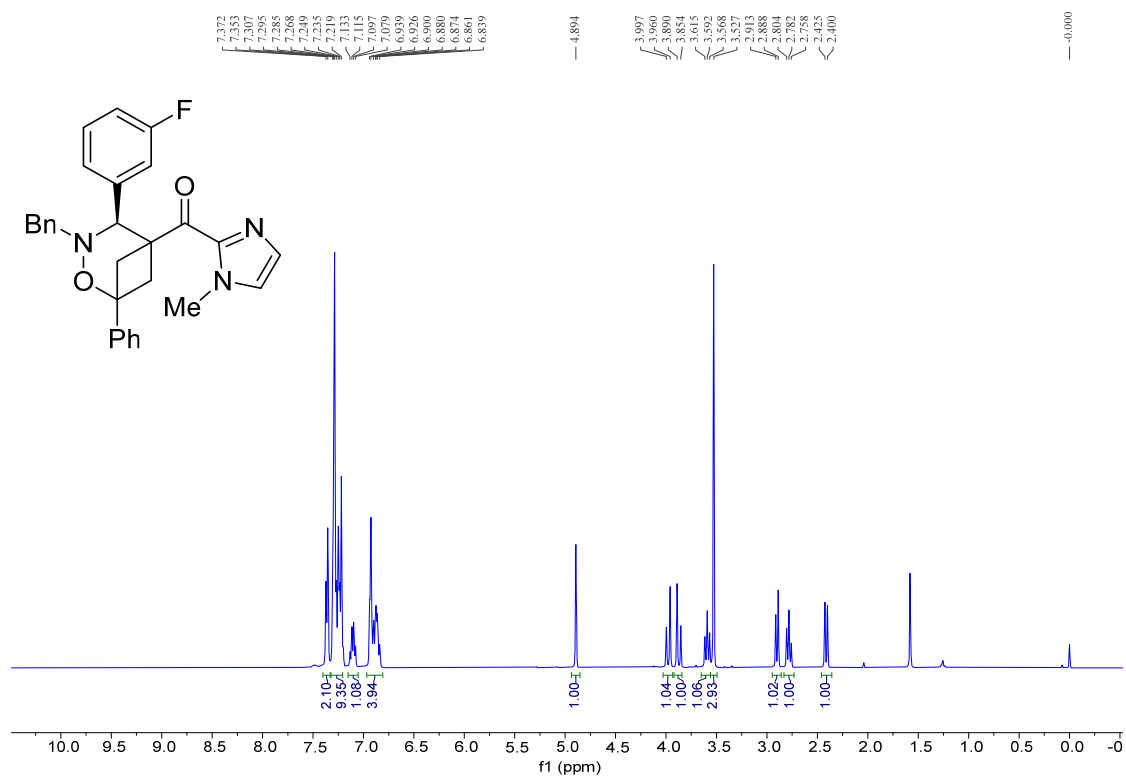
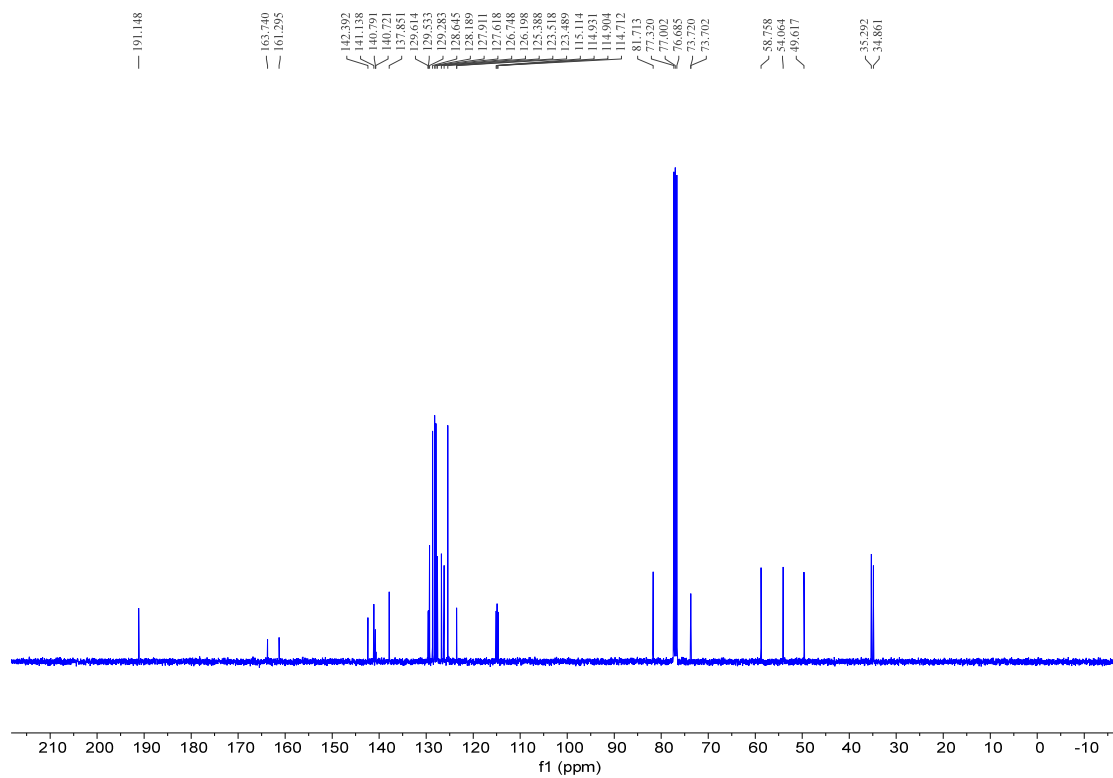
^1H and ^{13}C NMR Spectra for Compound 3af: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 3ag: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

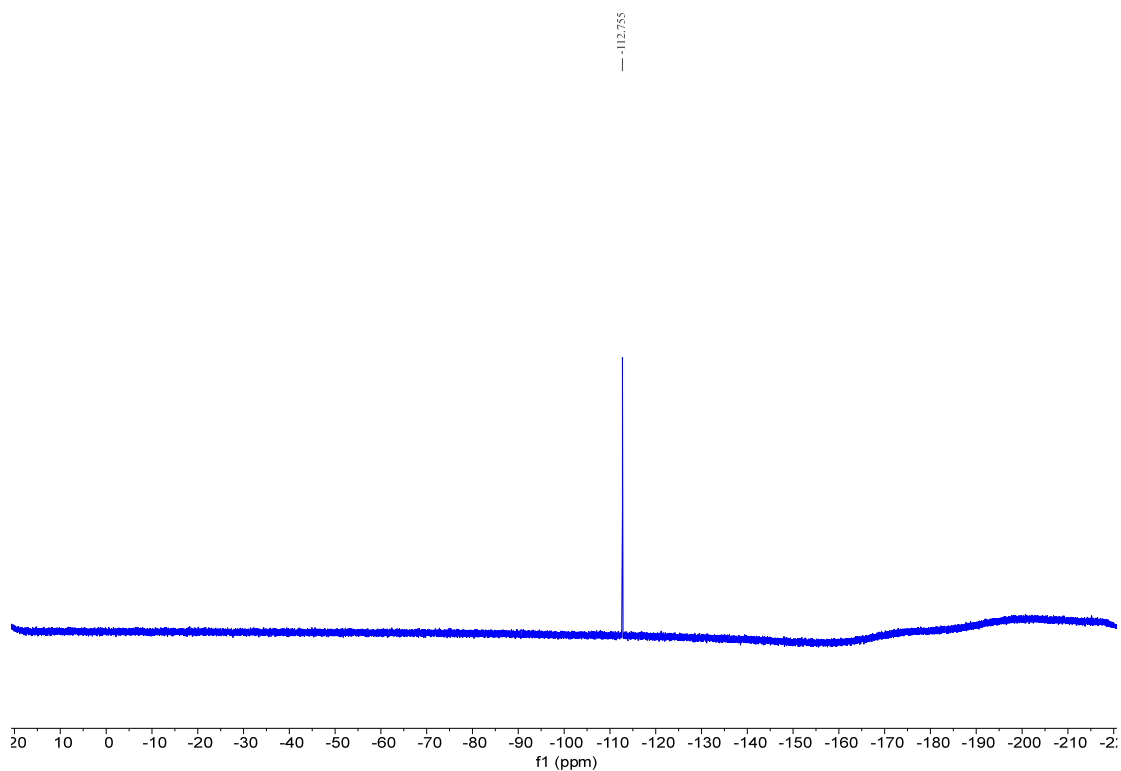
^1H and ^{13}C NMR Spectra for Compound 3ah: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 3ai: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 3aj: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

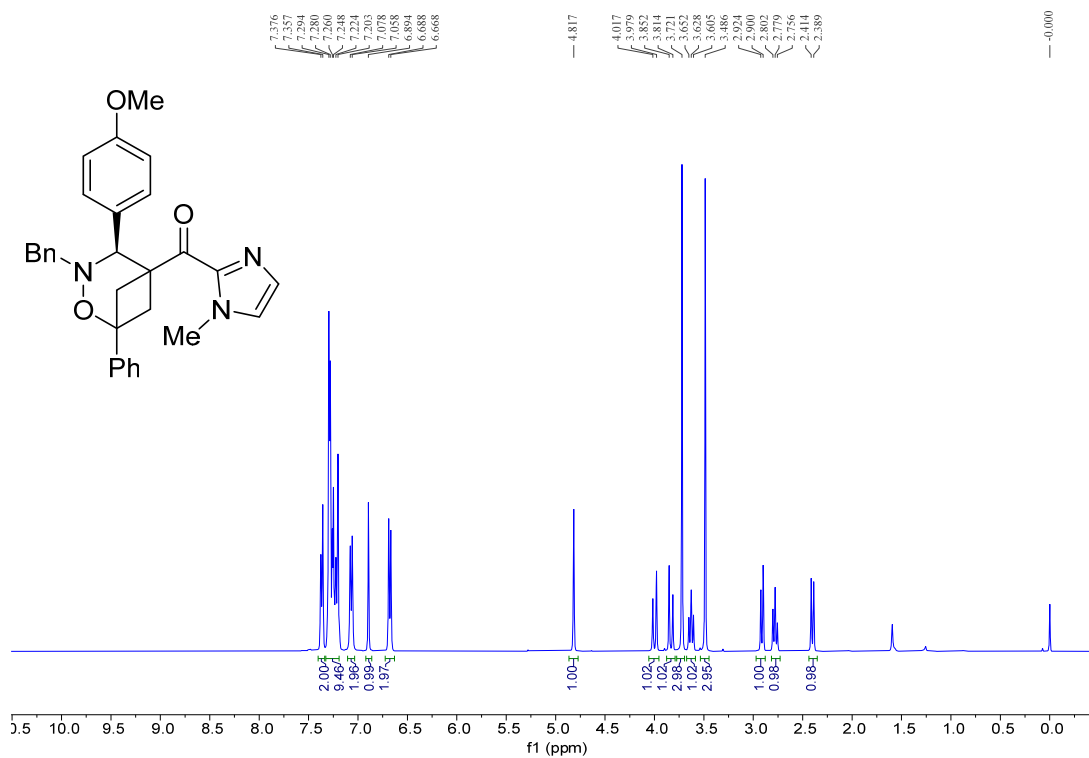
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 3ak: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

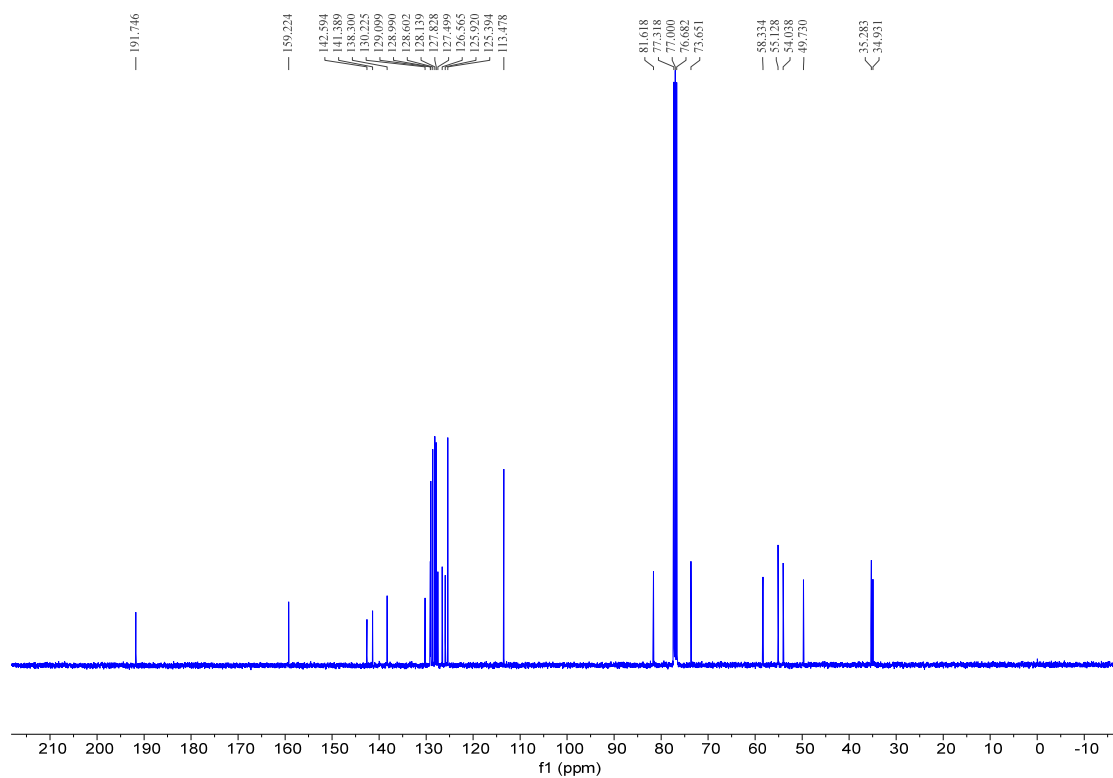
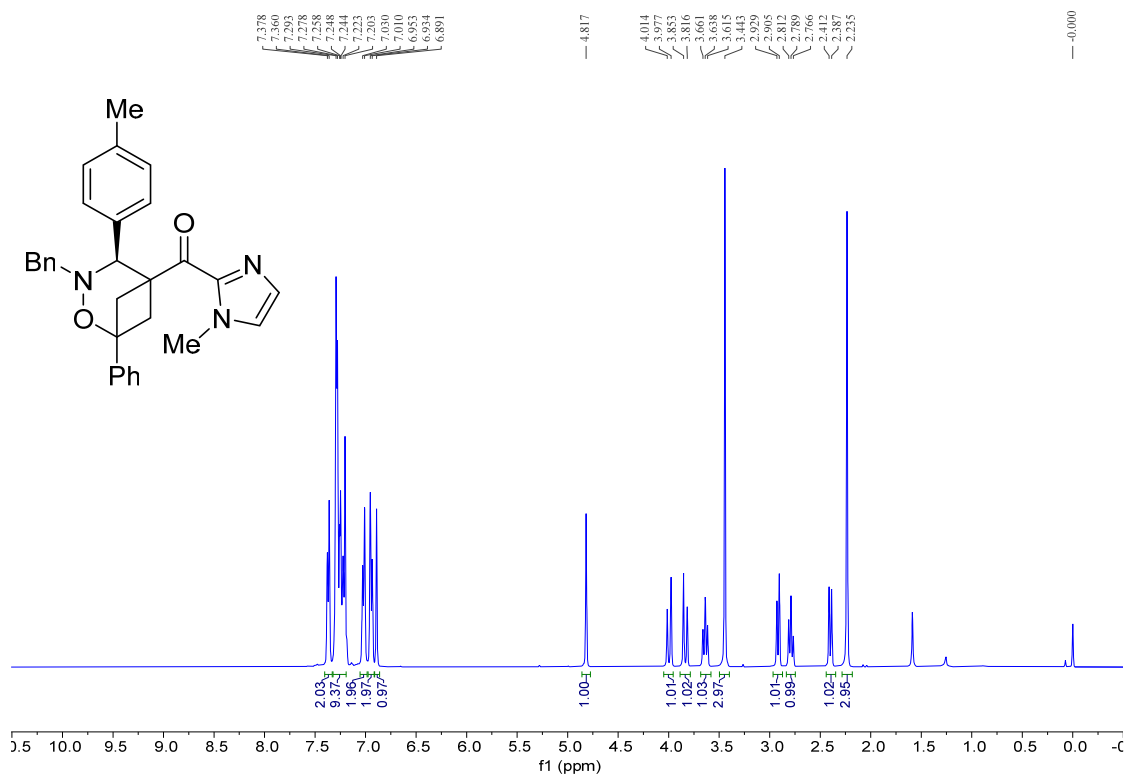
^{19}F NMR (376 MHz, CDCl_3)

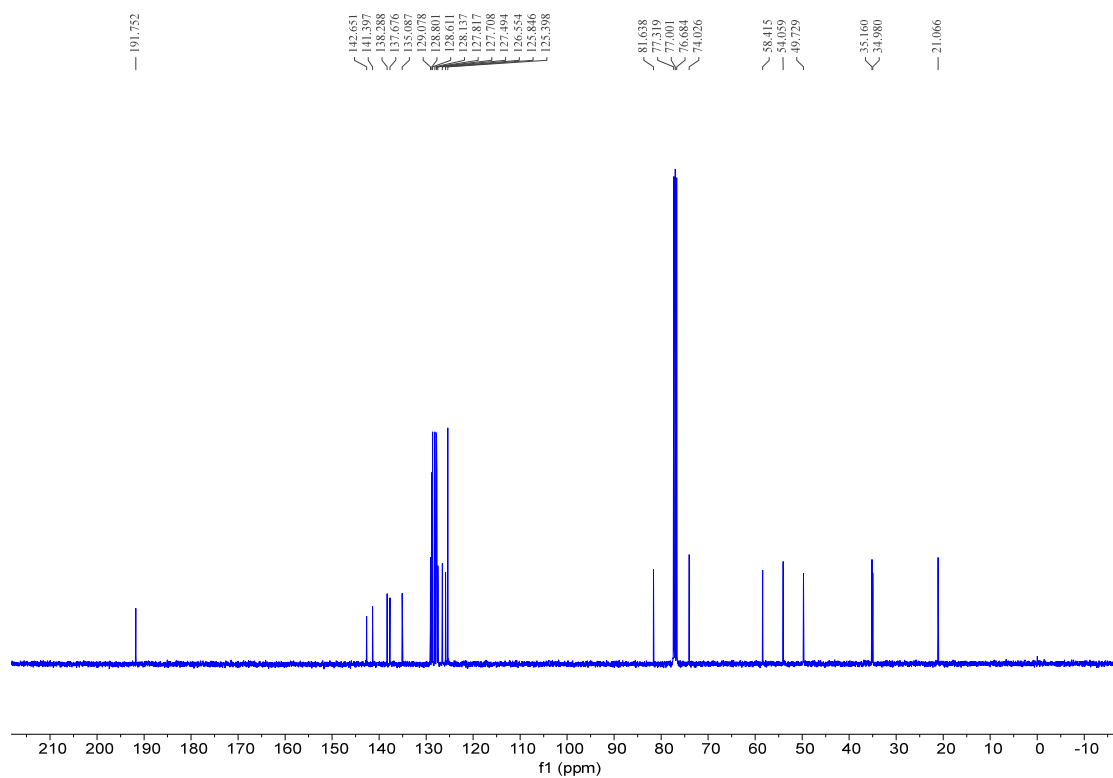
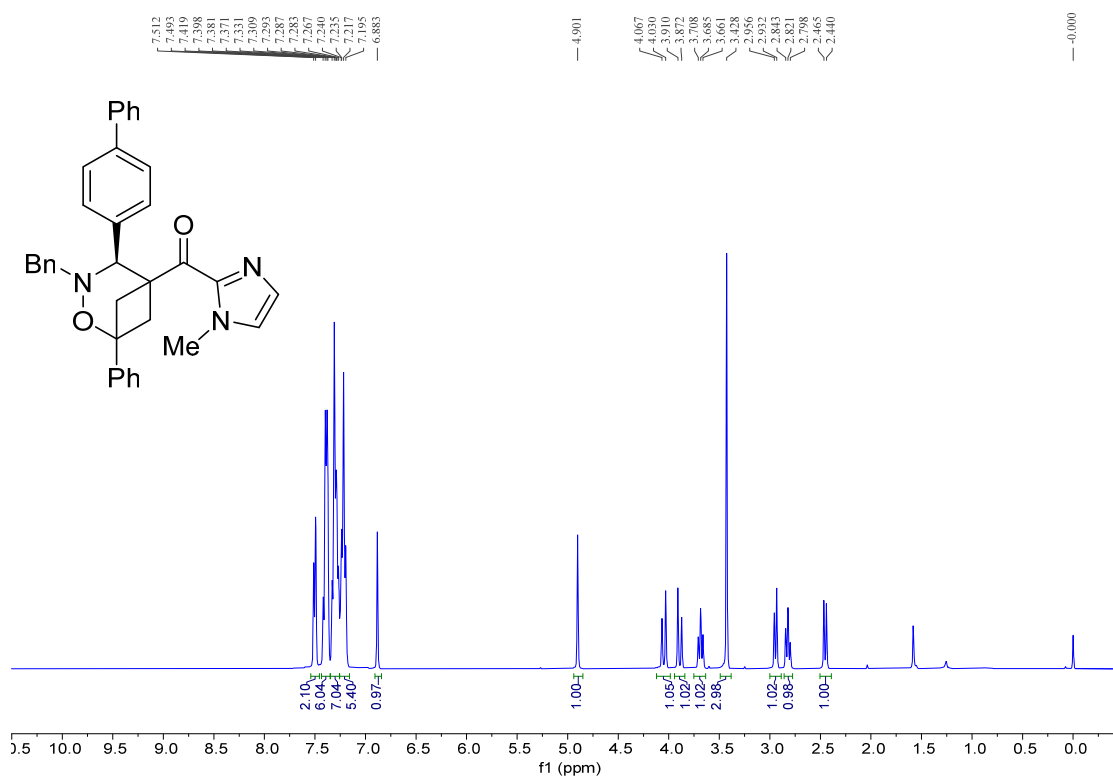


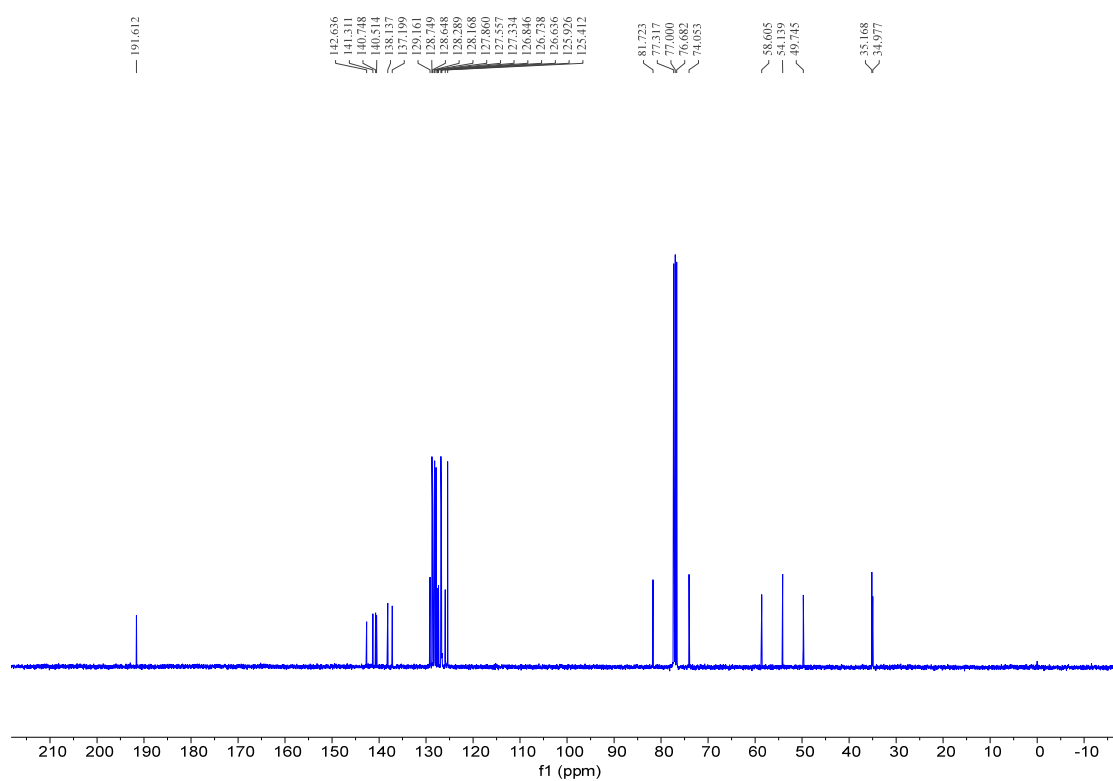
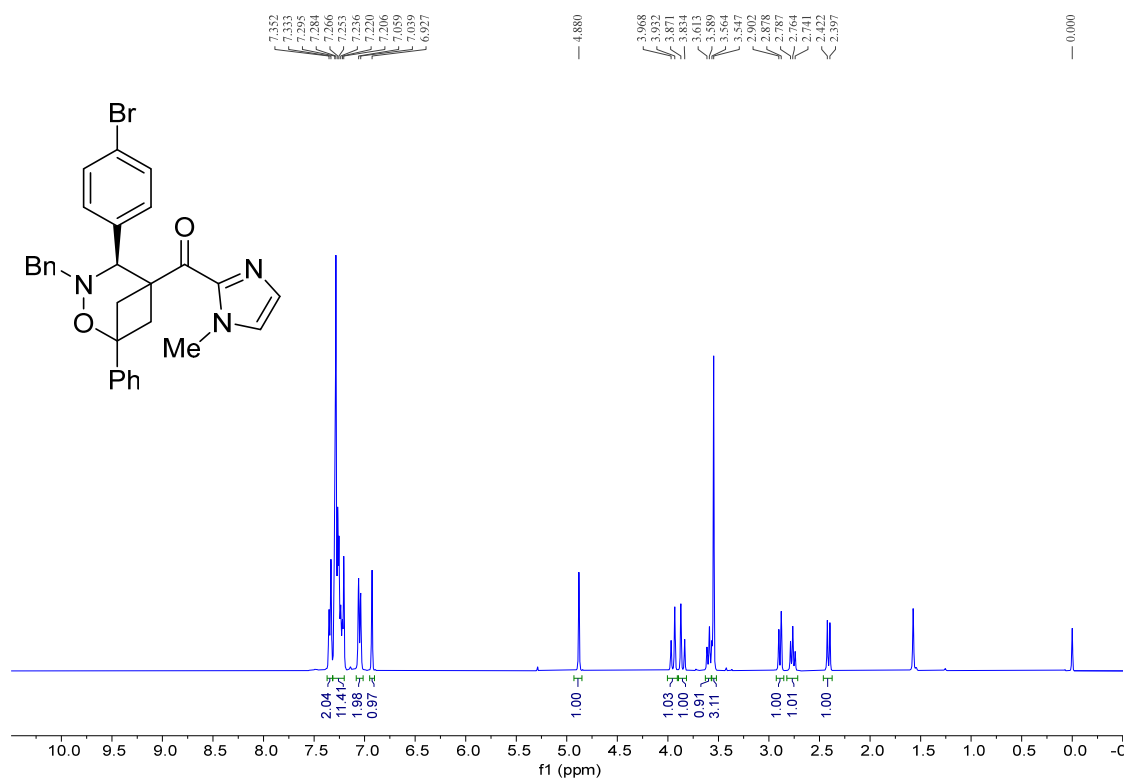
^1H and ^{13}C NMR Spectra for Compound 3al:

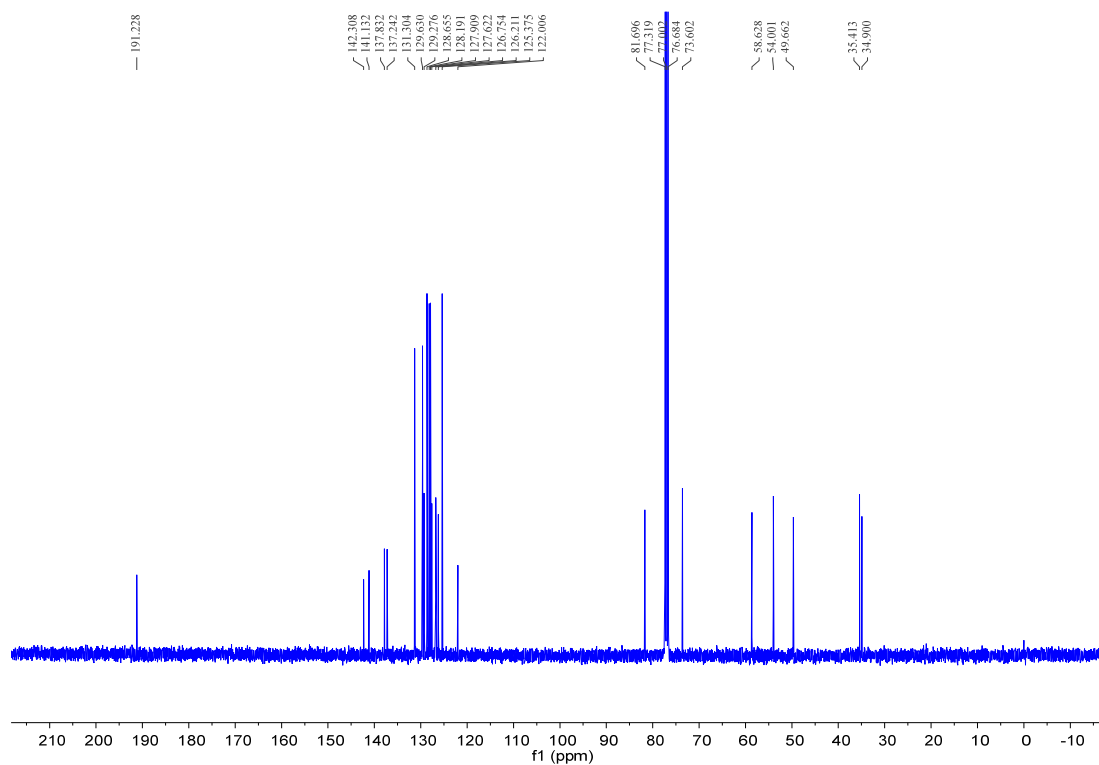
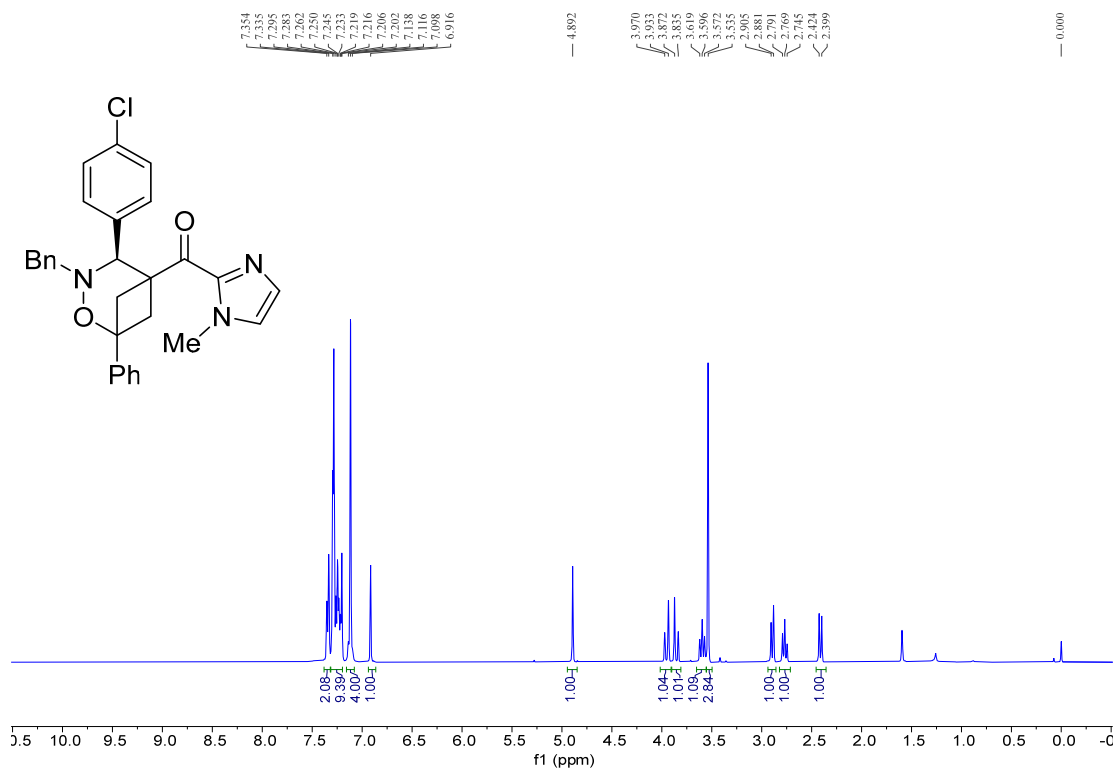
^1H NMR (400 MHz, CDCl_3)

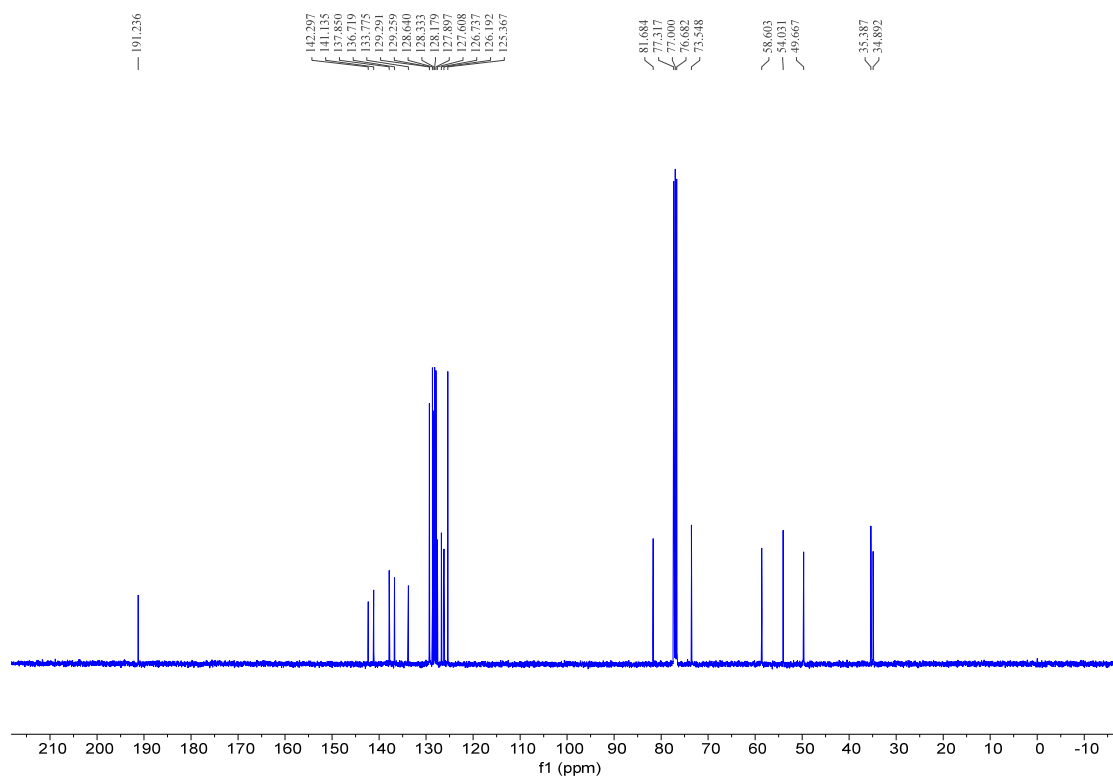
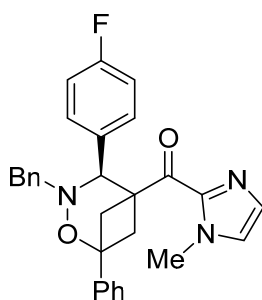
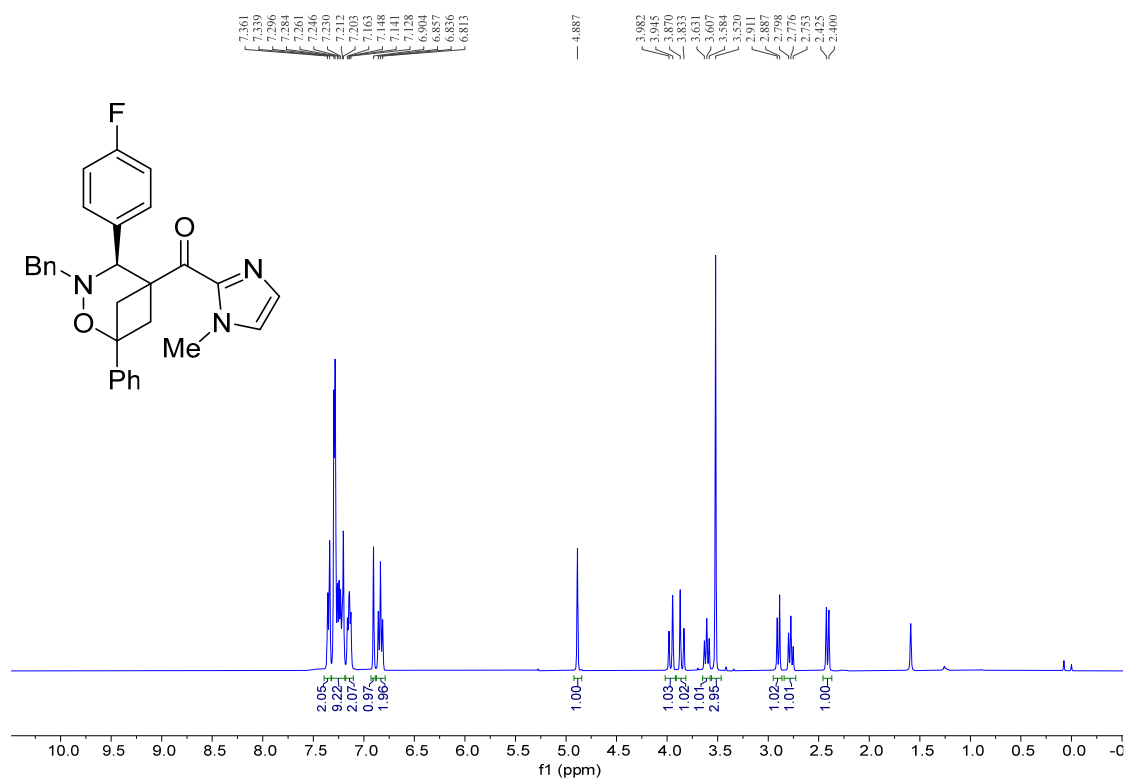


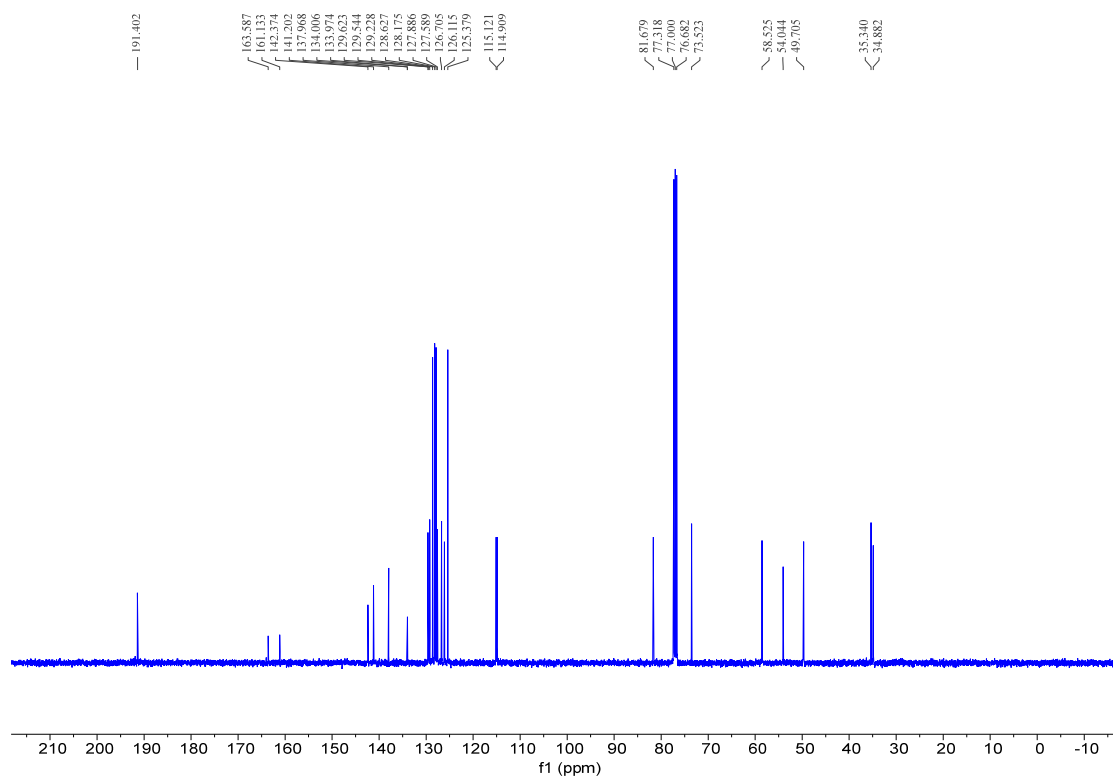
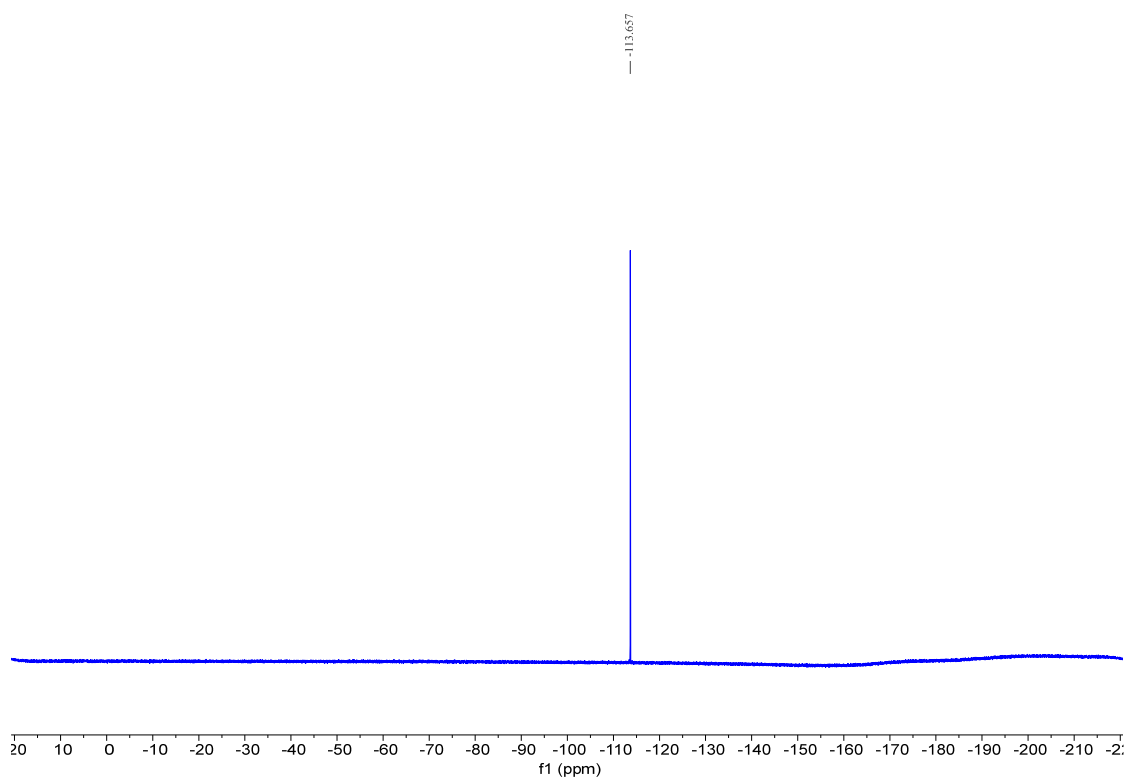
^{13}C NMR (100 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 3am: ^1H NMR (400 MHz, CDCl_3)

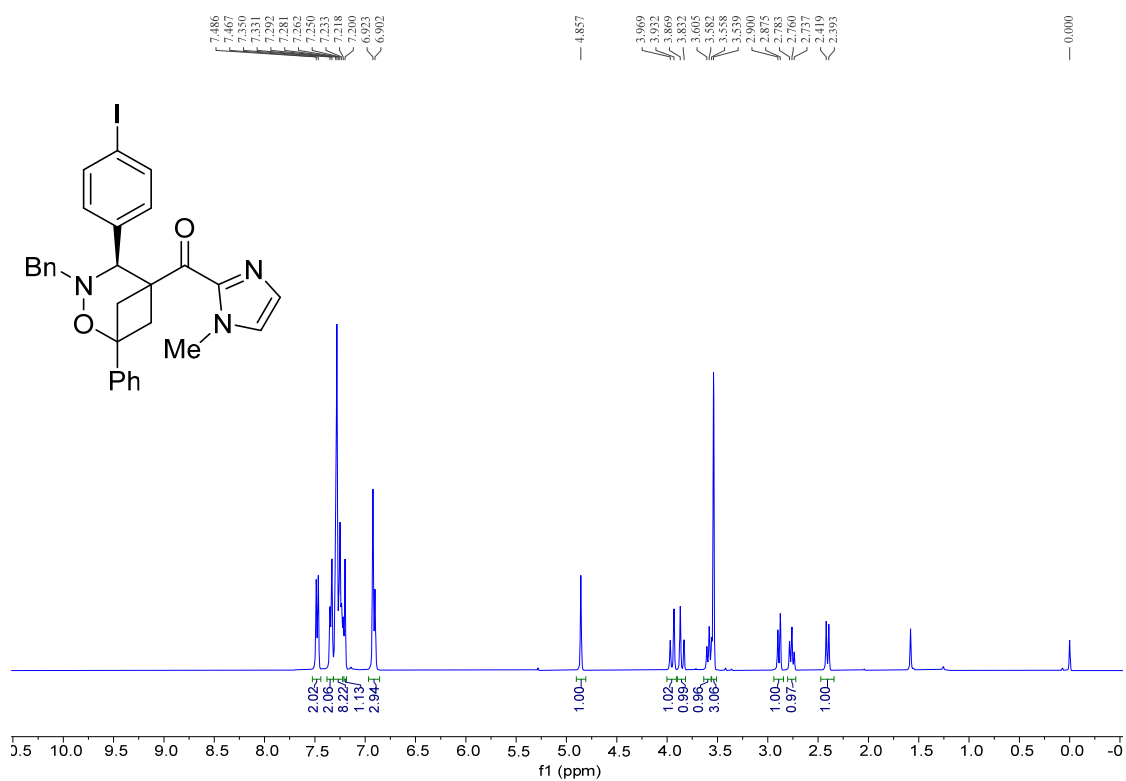
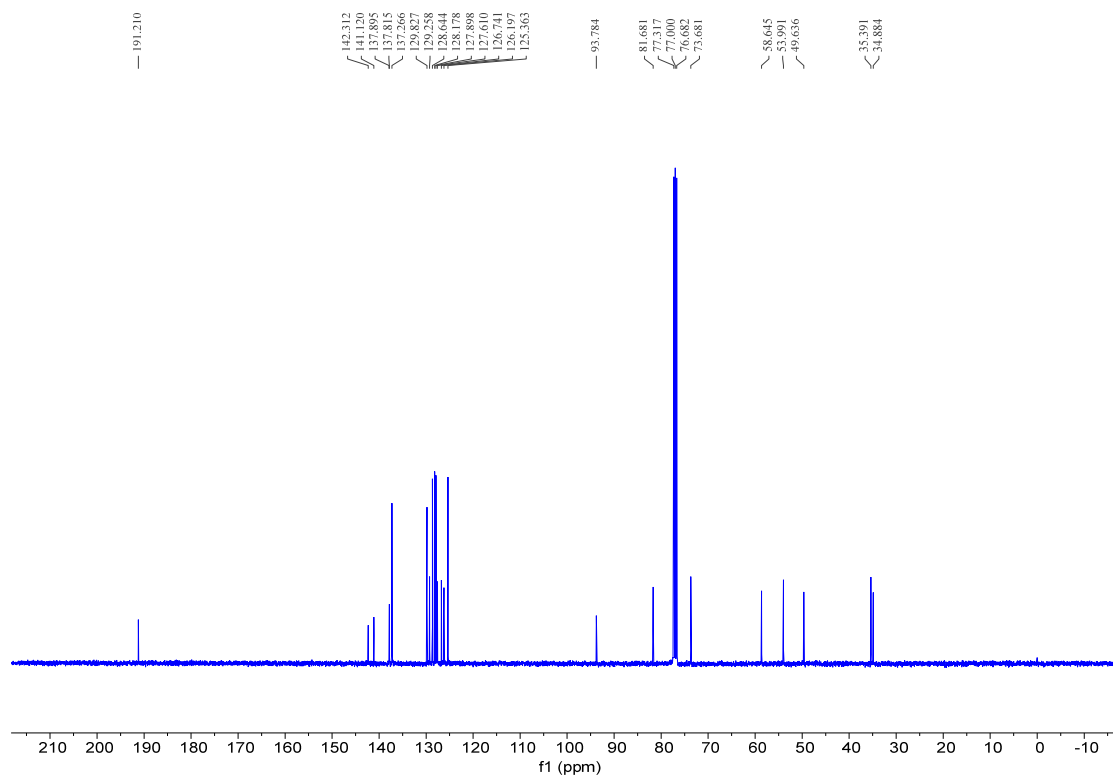
^{13}C NMR (100 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 3an: ^1H NMR (400 MHz, CDCl_3)

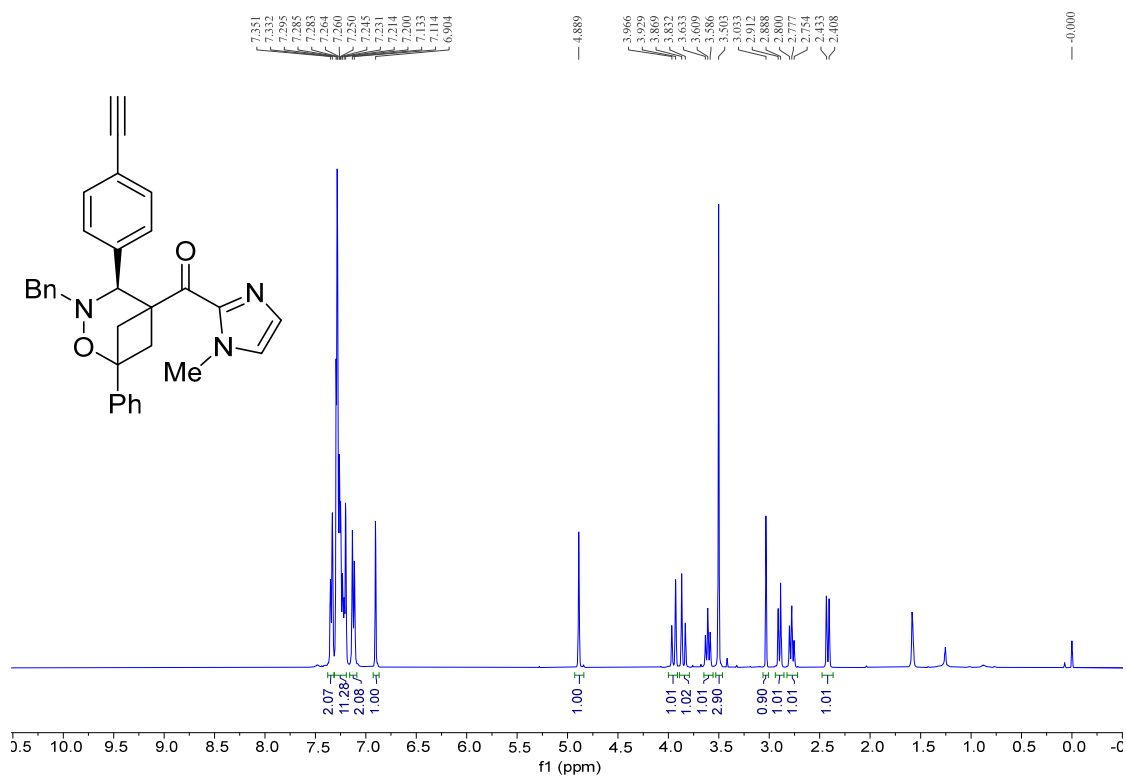
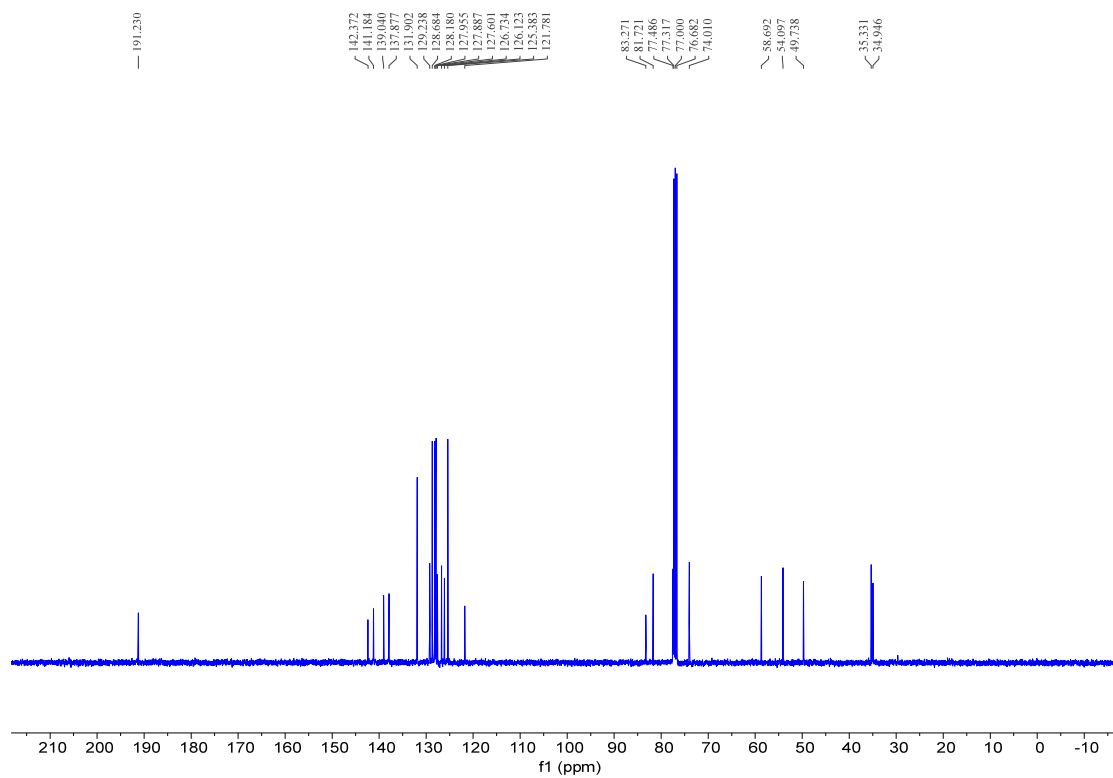
^{13}C NMR (100 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 3ao: ^1H NMR (400 MHz, CDCl_3)

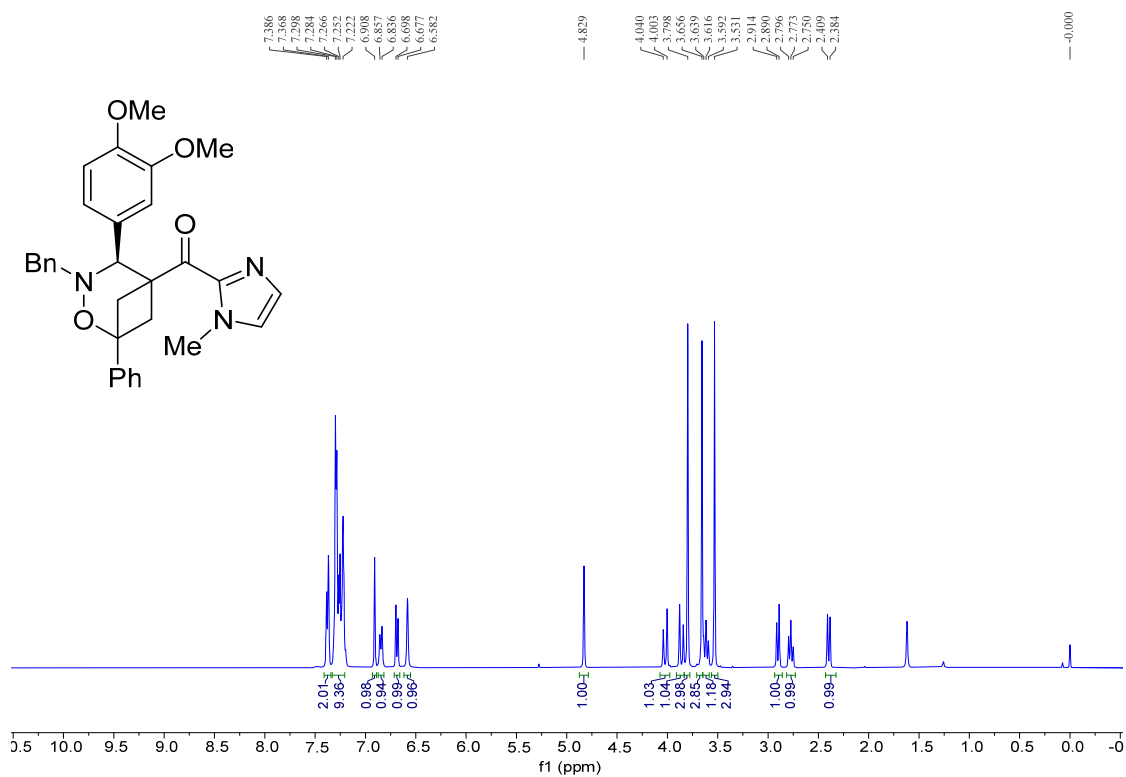
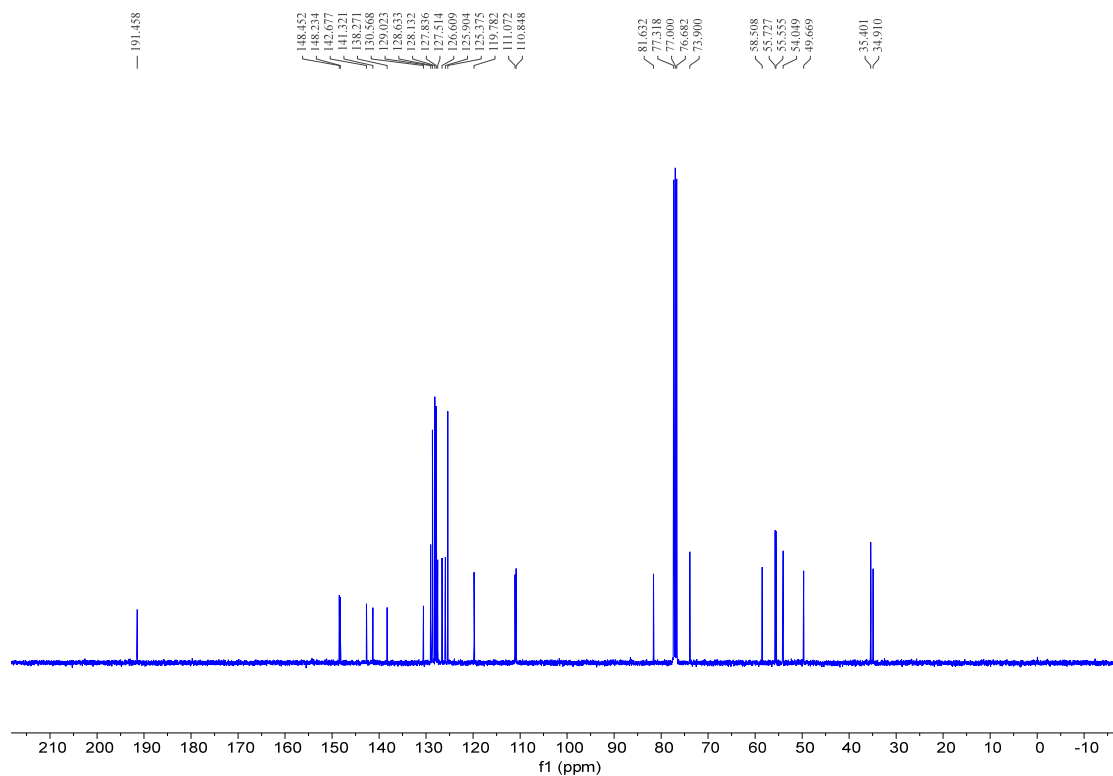
^{13}C NMR (100 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 3ap: ^1H NMR (400 MHz, CDCl_3)

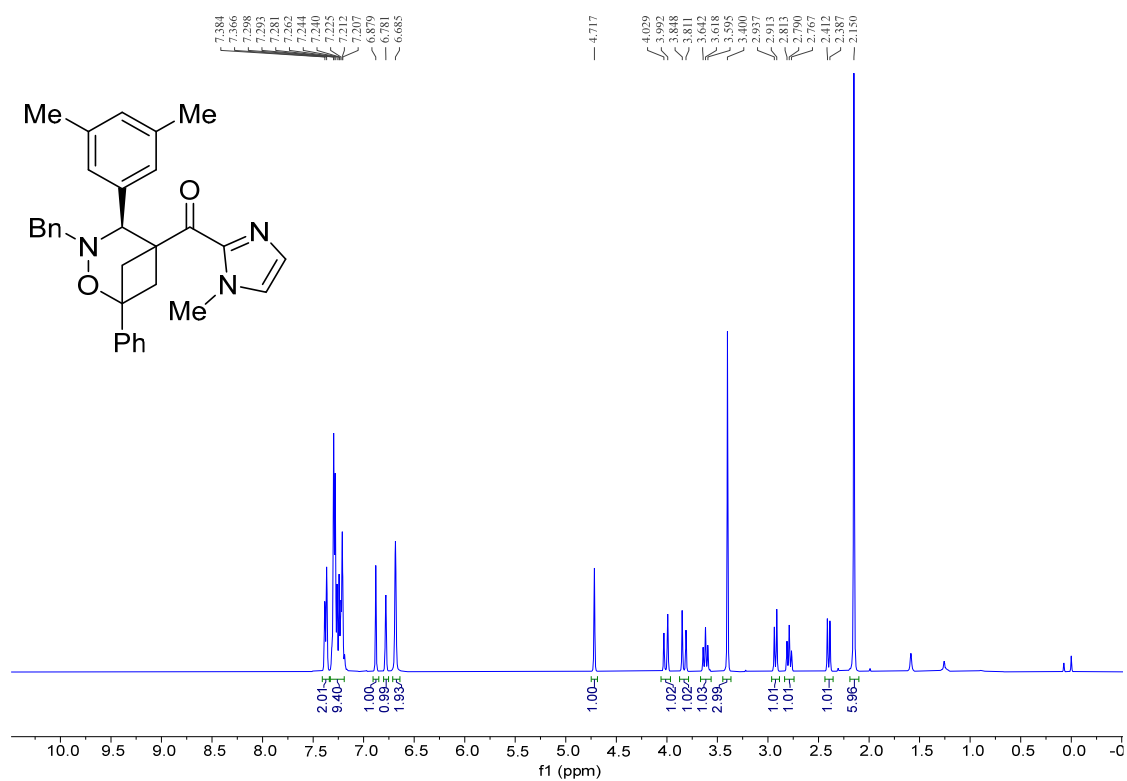
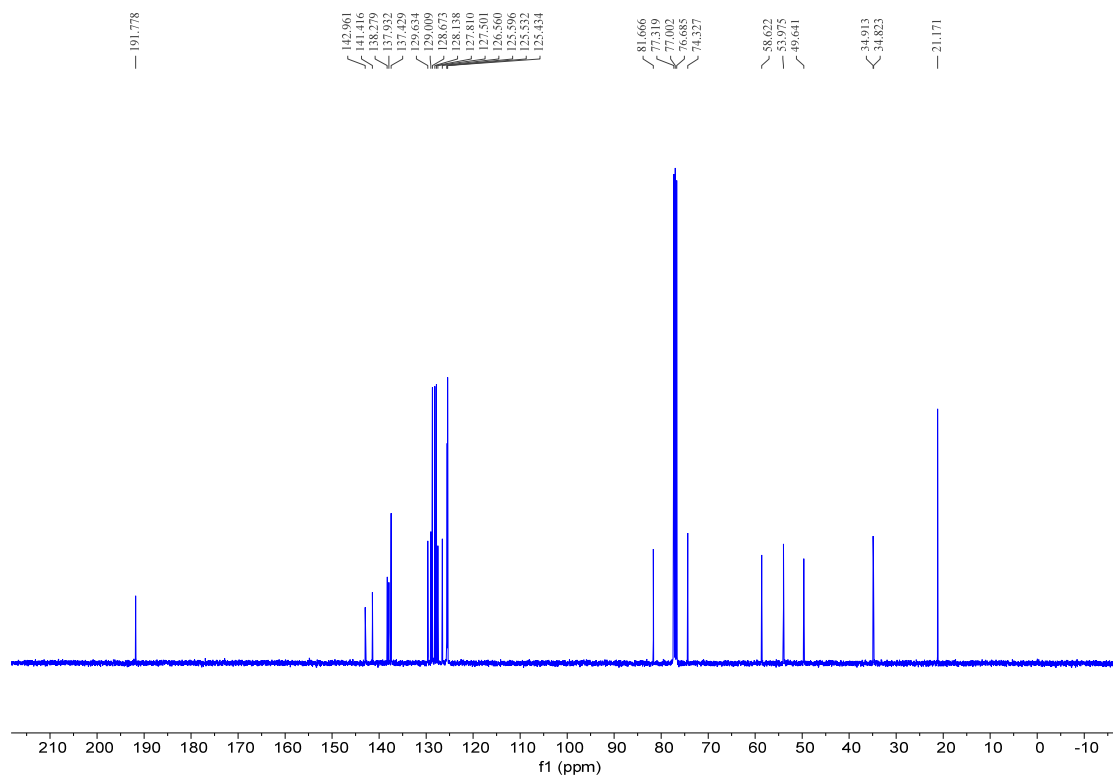
^{13}C NMR (100 MHz, CDCl_3) ^1H , ^{13}C and ^{19}F NMR Spectra for Compound 3aq: ^1H NMR (400 MHz, CDCl_3)

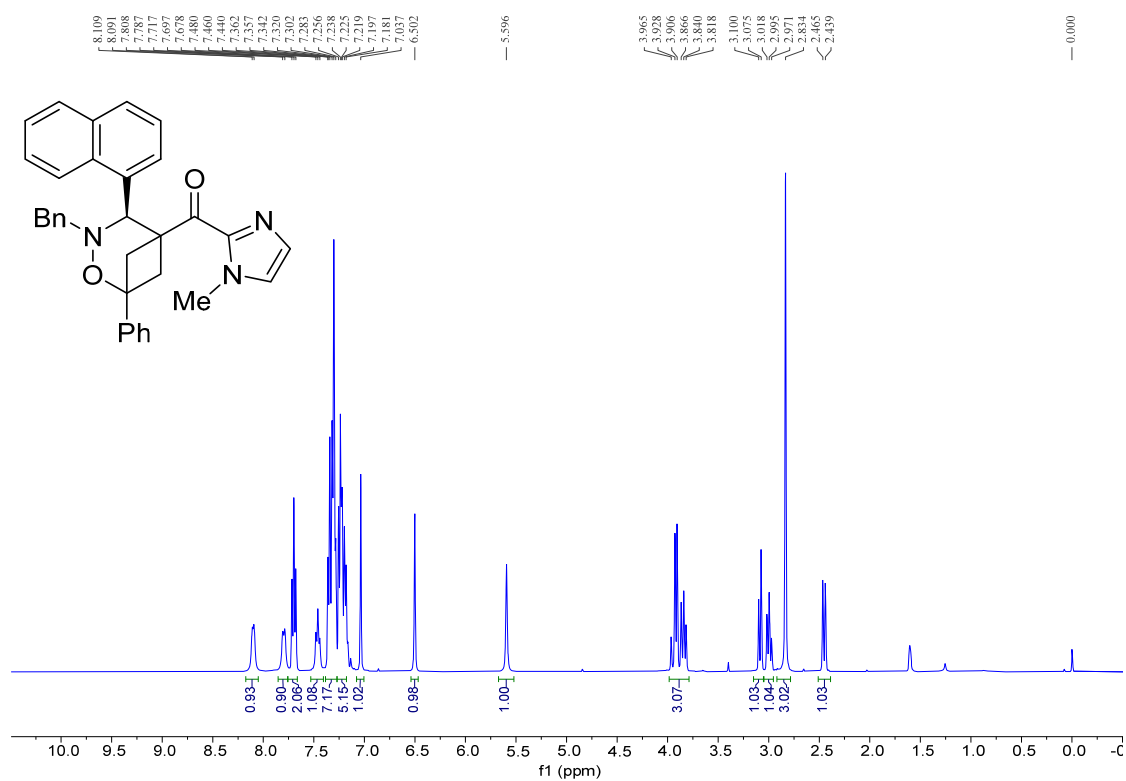
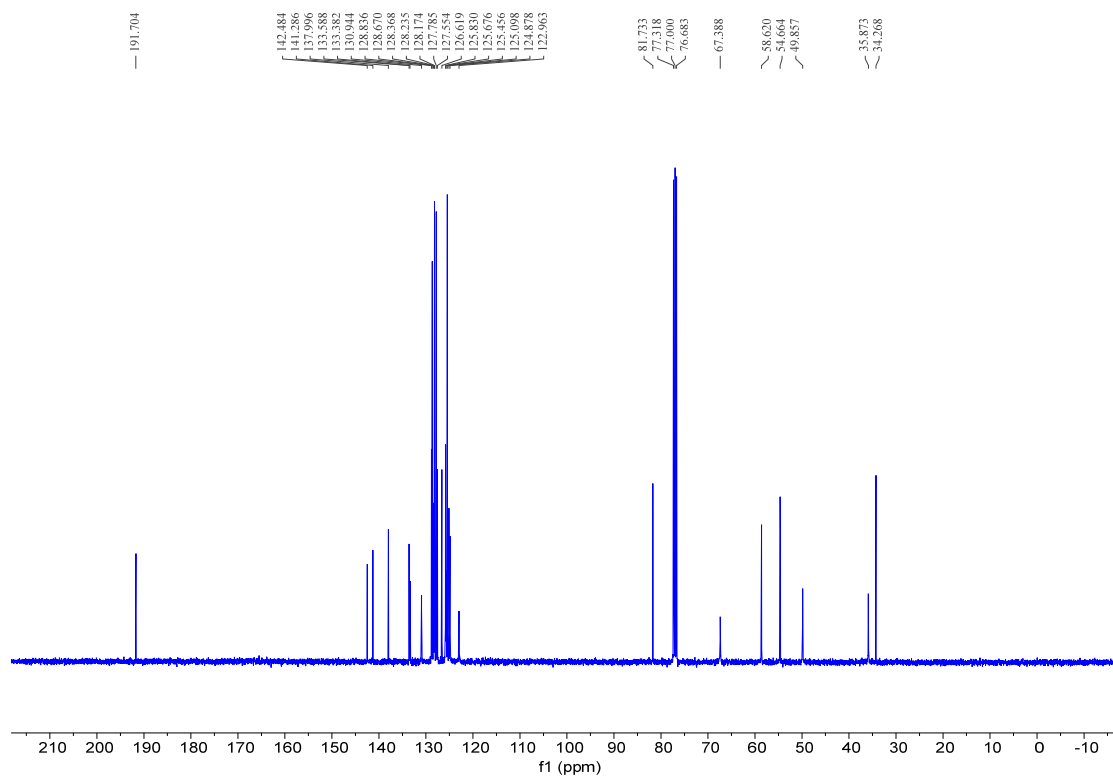
^{13}C NMR (100 MHz, CDCl_3) ^{19}F NMR (376 MHz, CDCl_3)

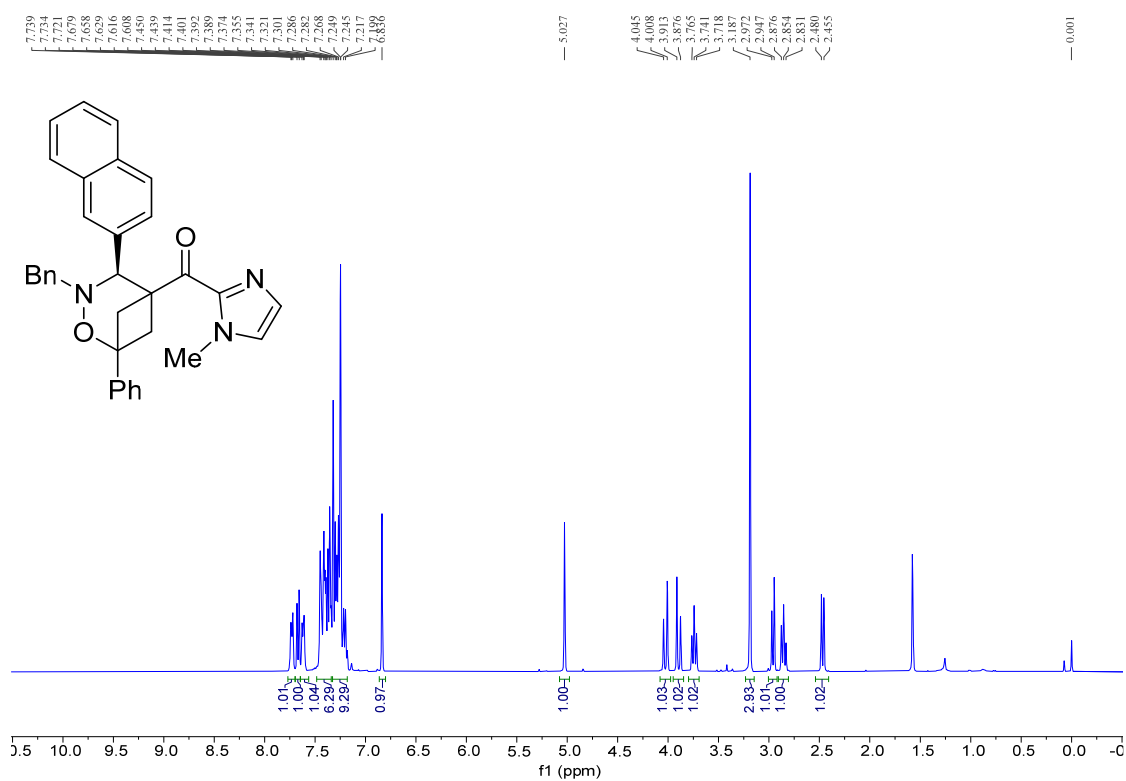
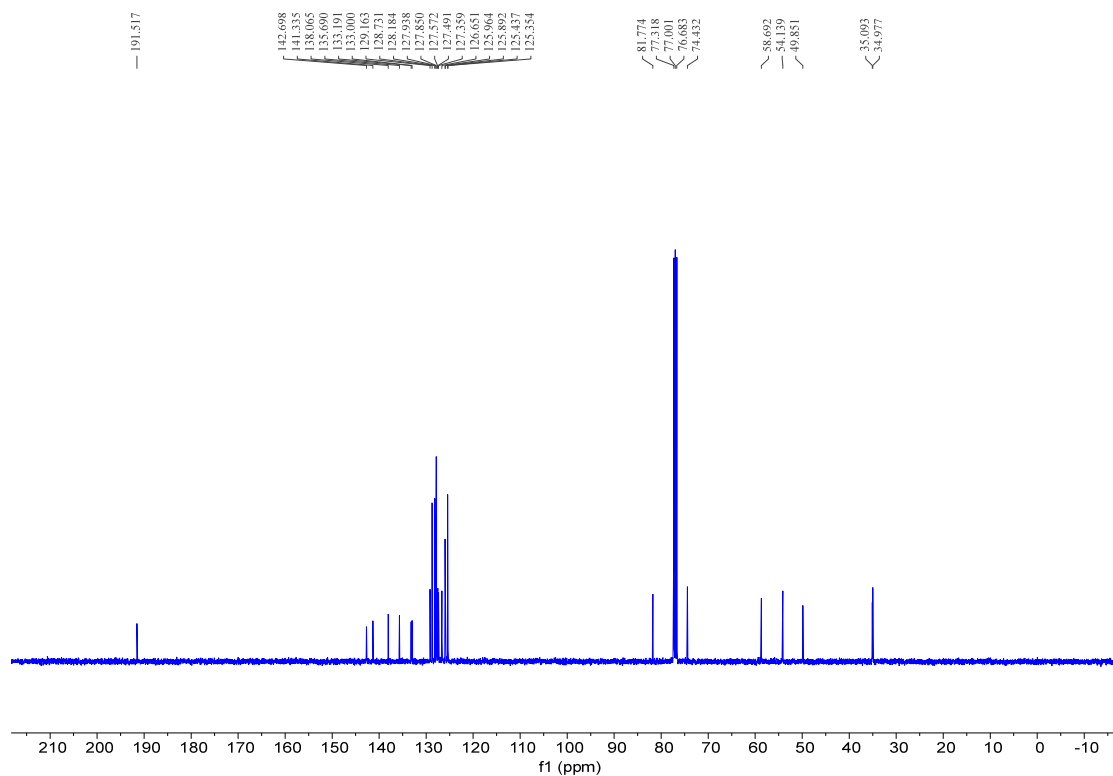
^1H and ^{13}C NMR Spectra for Compound 3ar: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

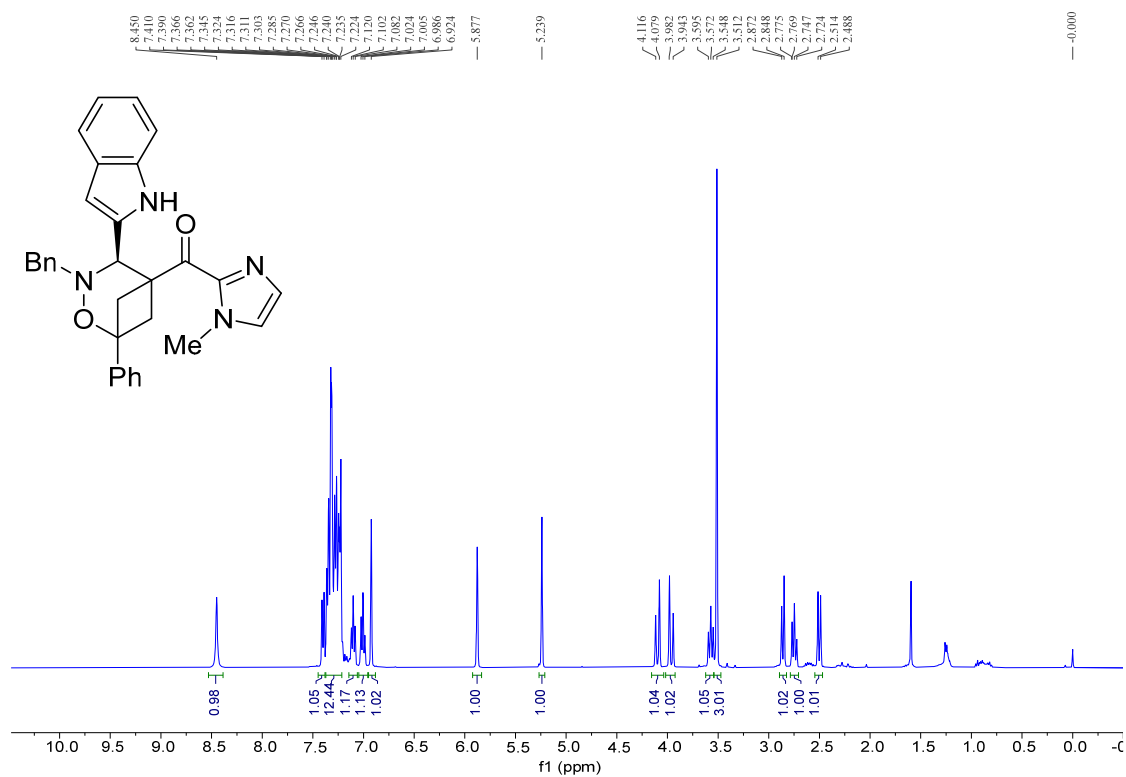
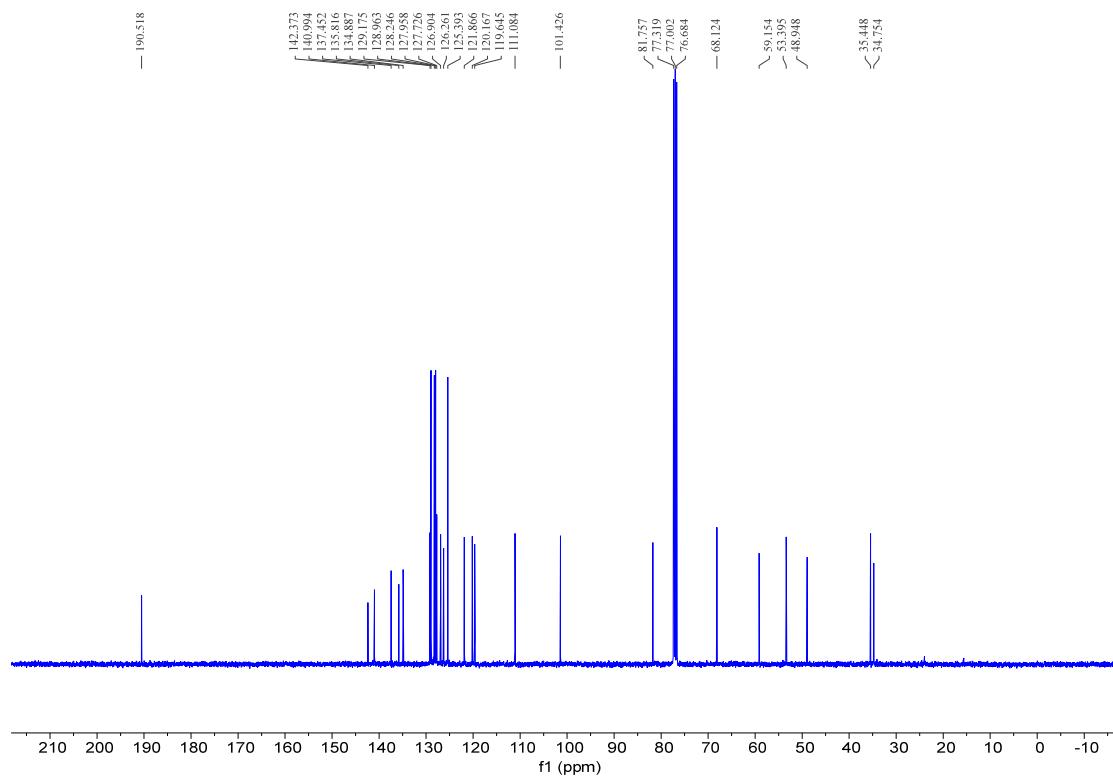
^1H and ^{13}C NMR Spectra for Compound 3as: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

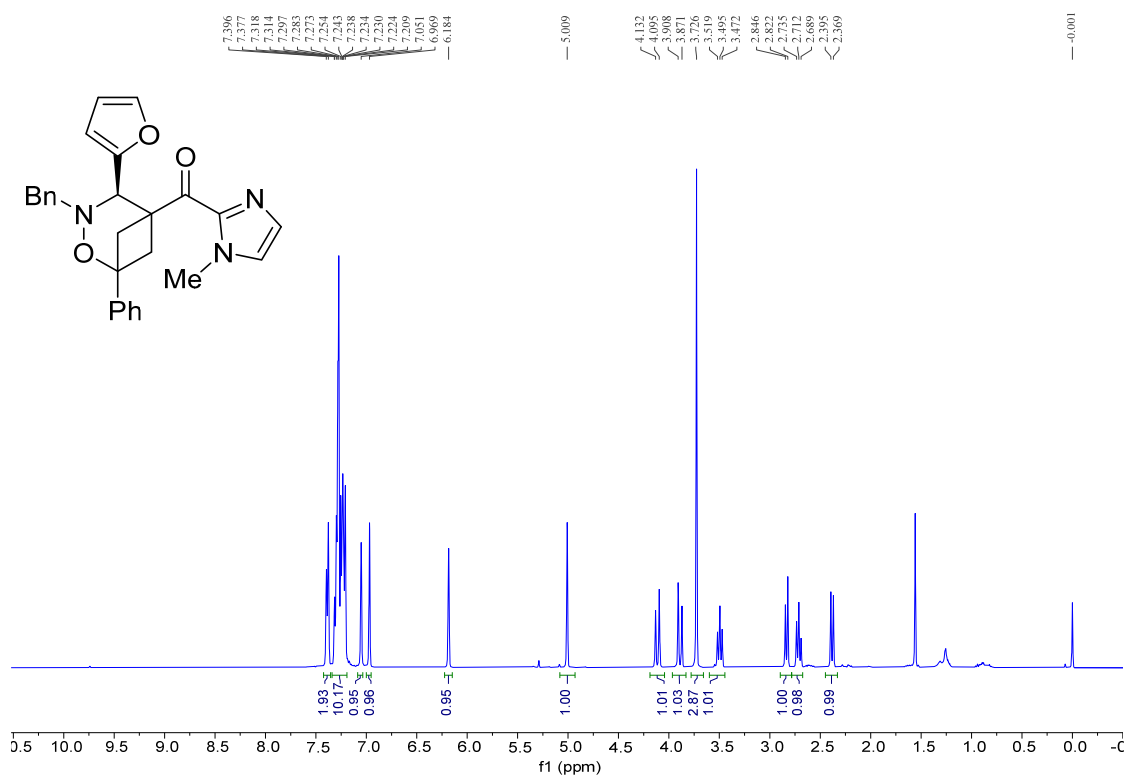
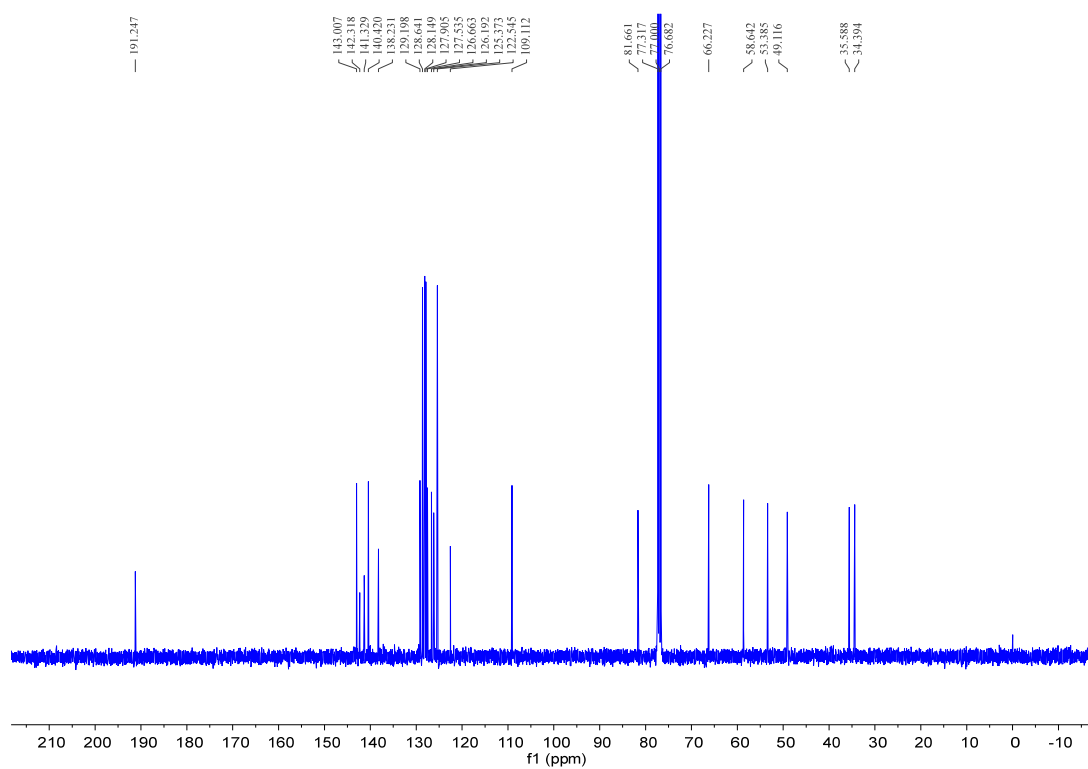
^1H and ^{13}C NMR Spectra for Compound 3at: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

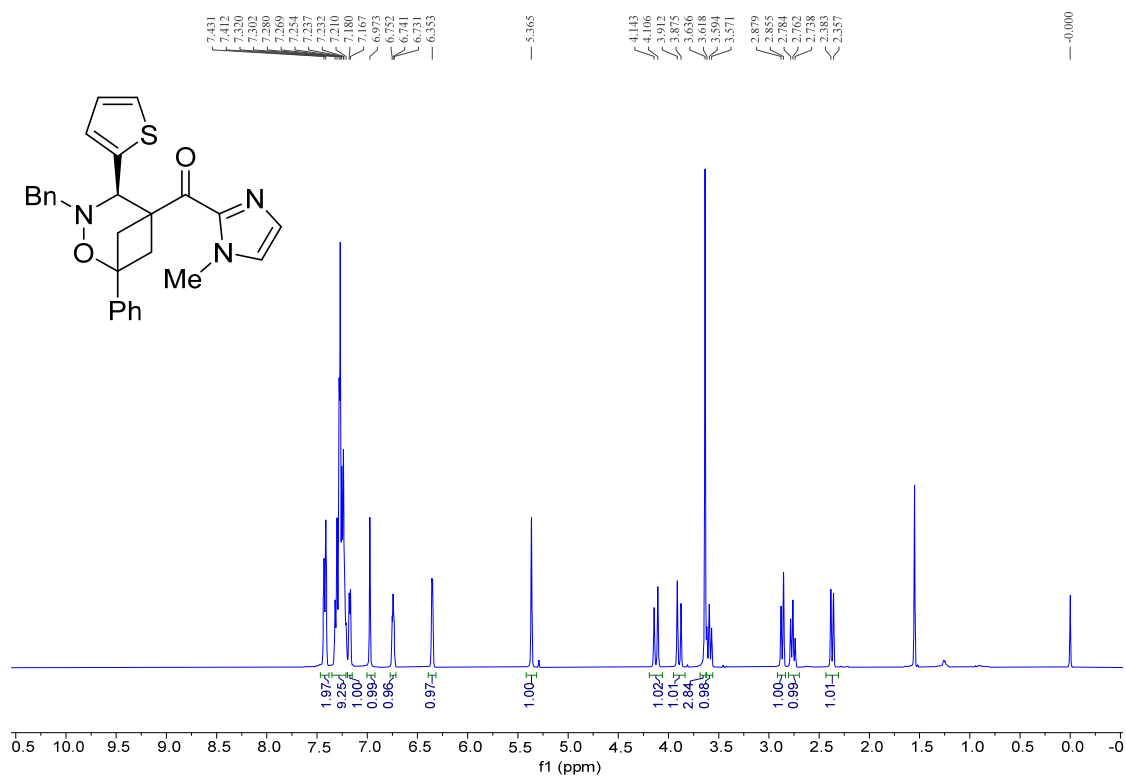
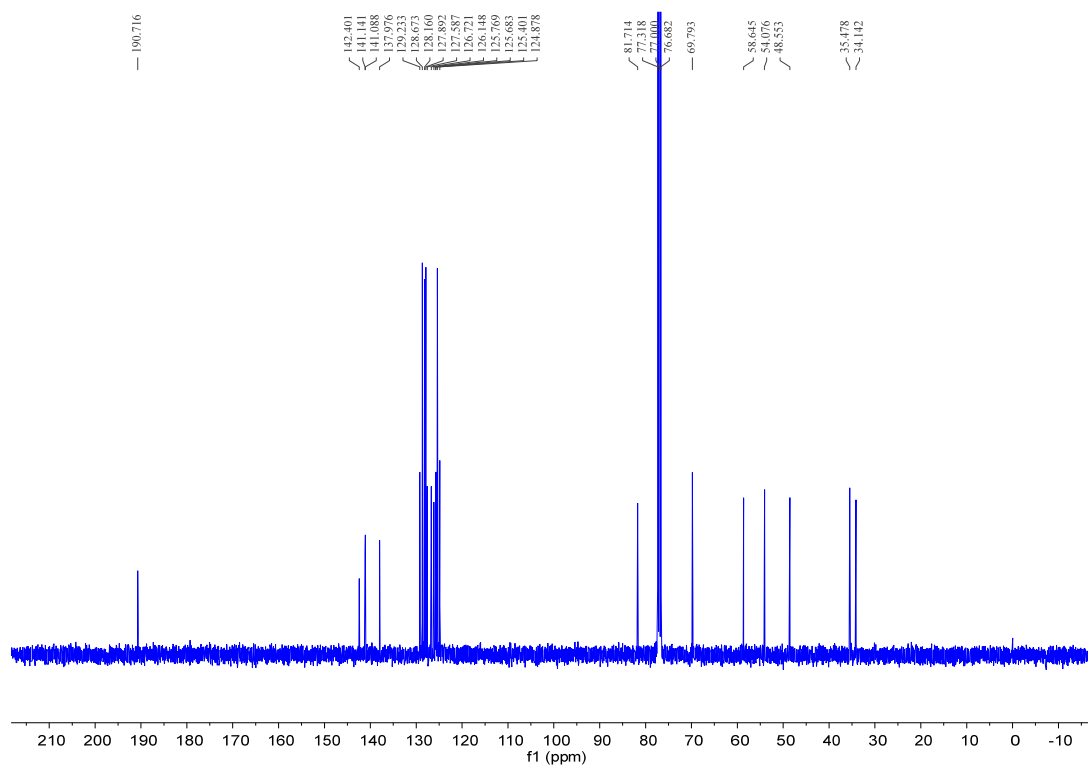
^1H and ^{13}C NMR Spectra for Compound 3au: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

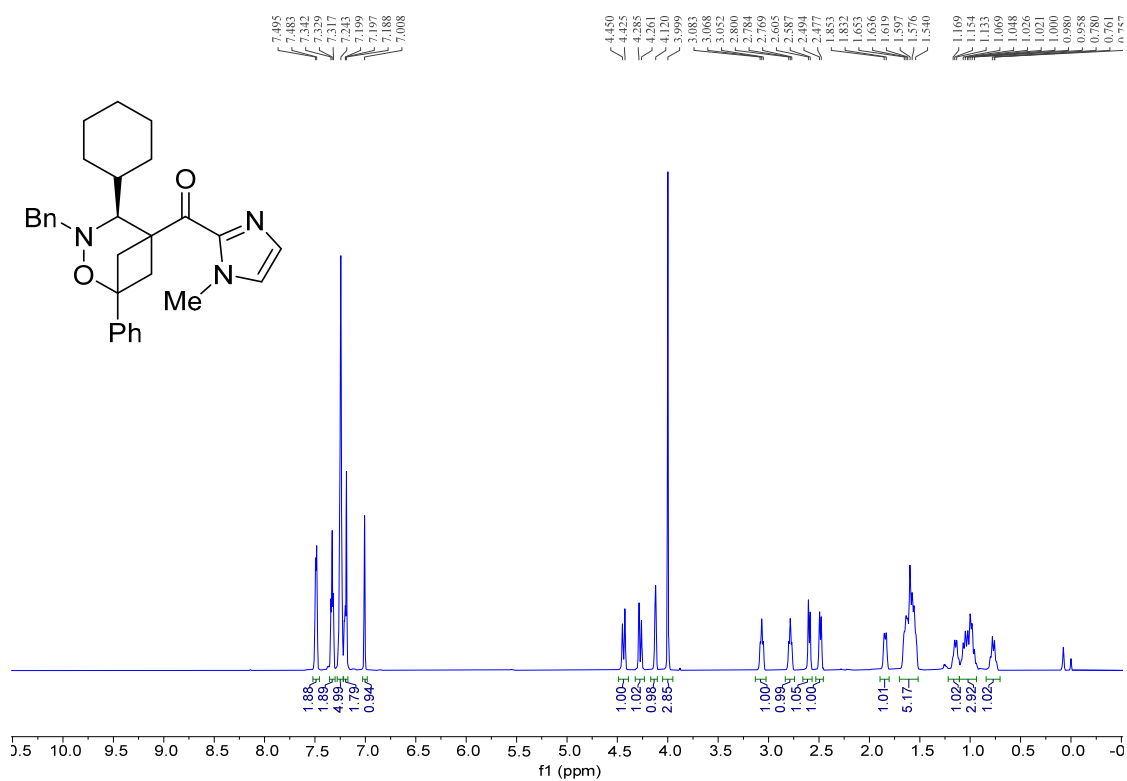
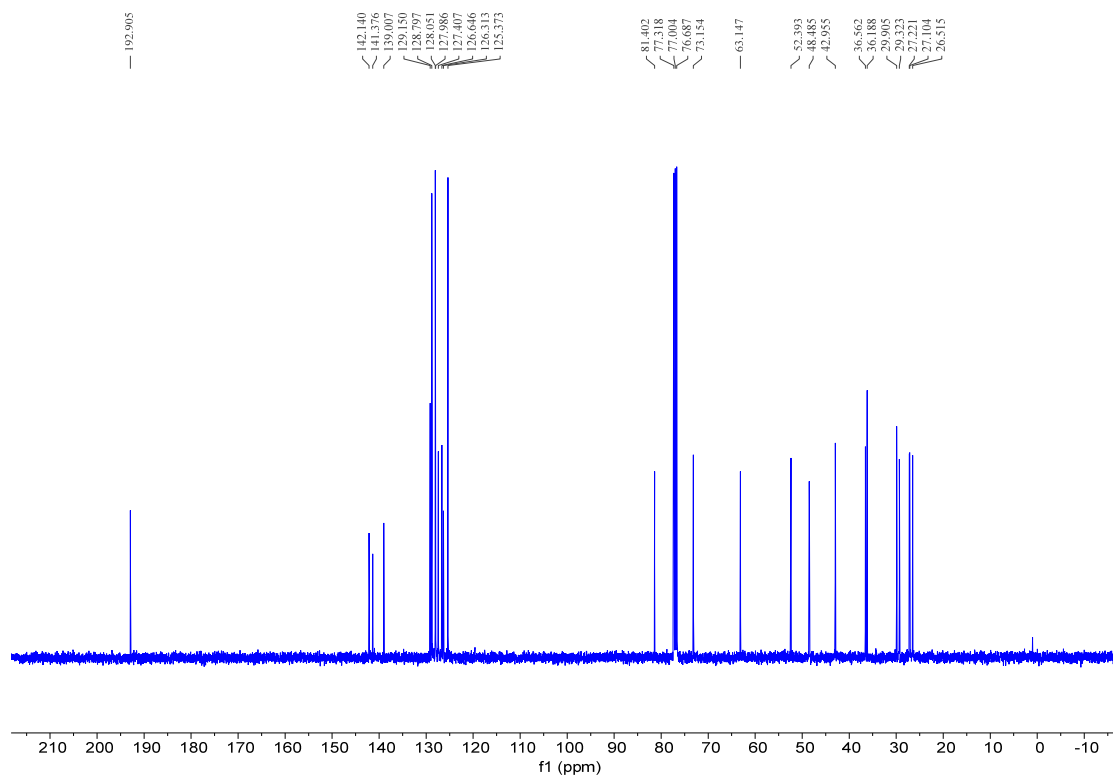
^1H and ^{13}C NMR Spectra for Compound 3av: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

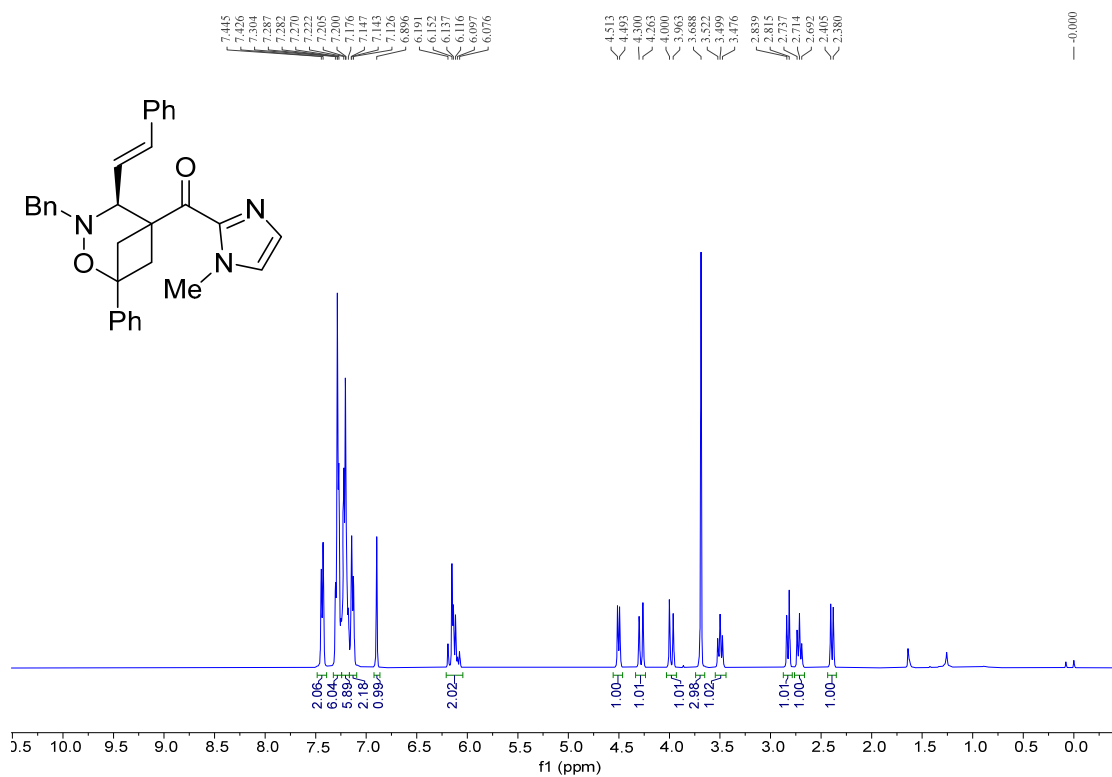
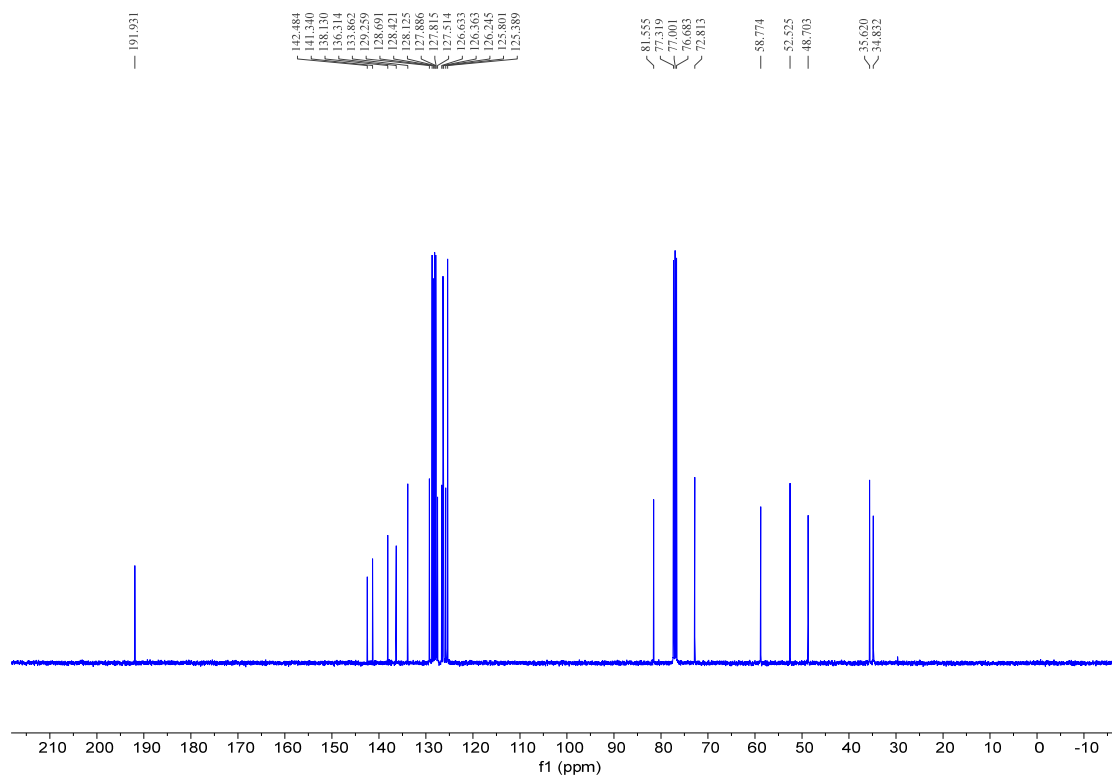
^1H and ^{13}C NMR Spectra for Compound 3aw: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

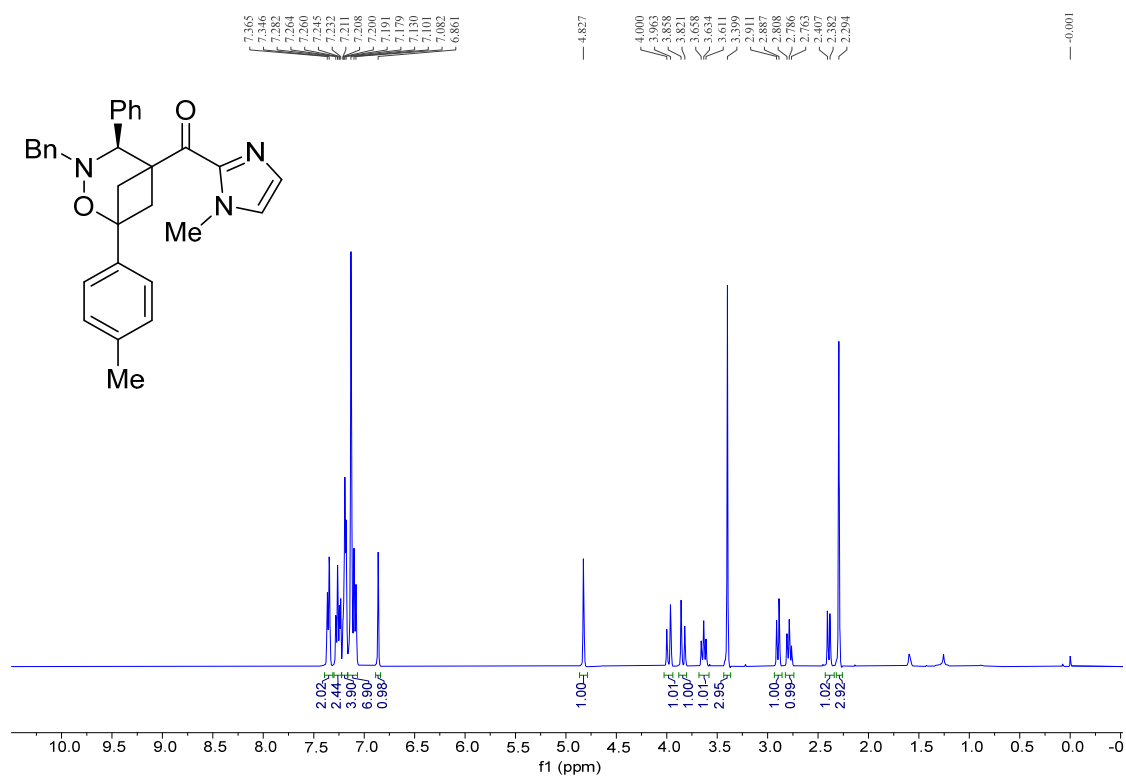
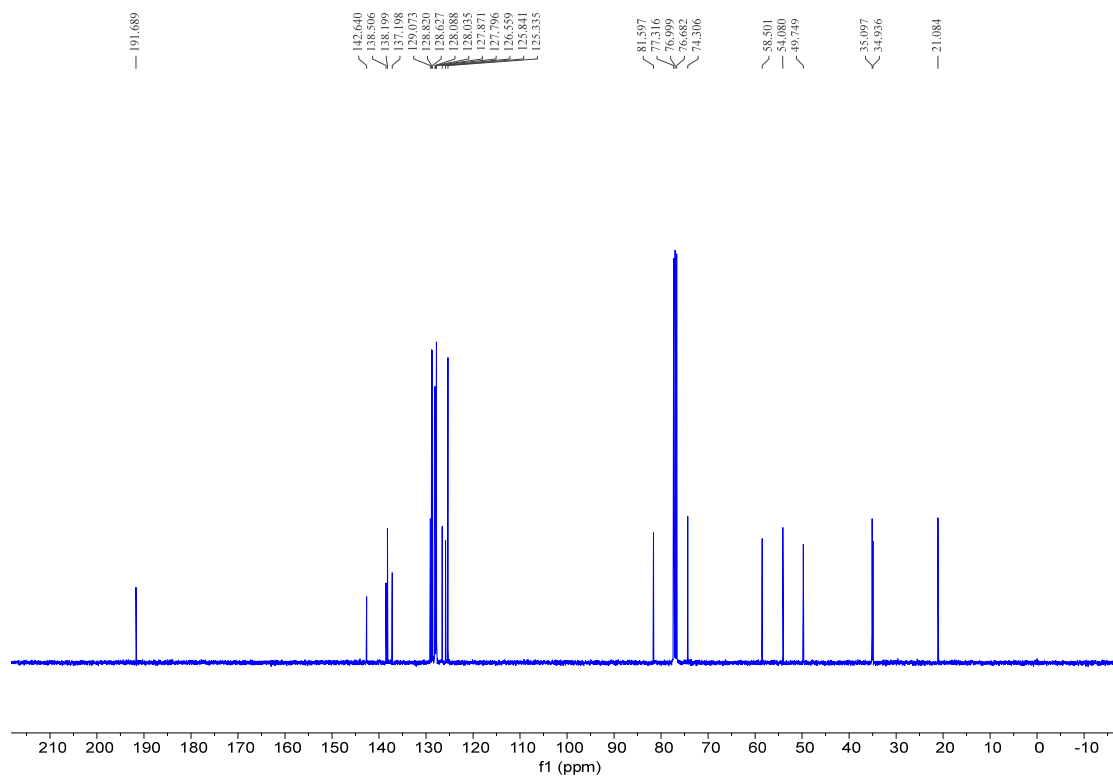
^1H and ^{13}C NMR Spectra for Compound 3ax: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

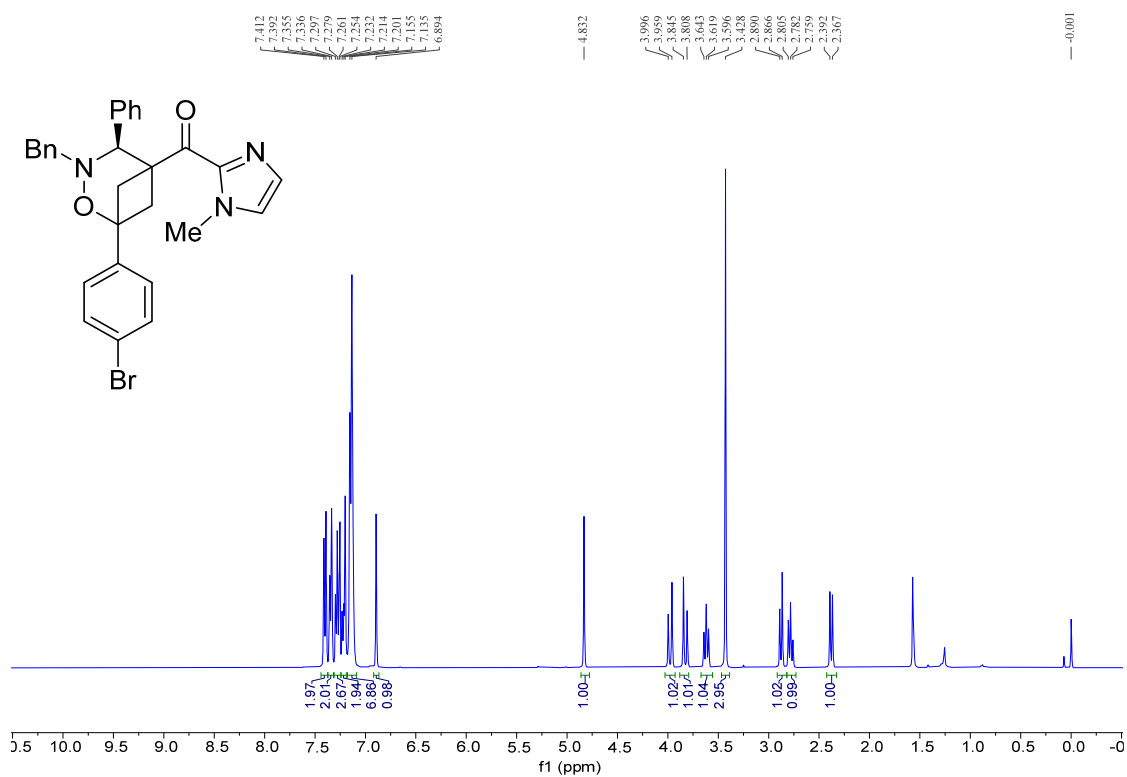
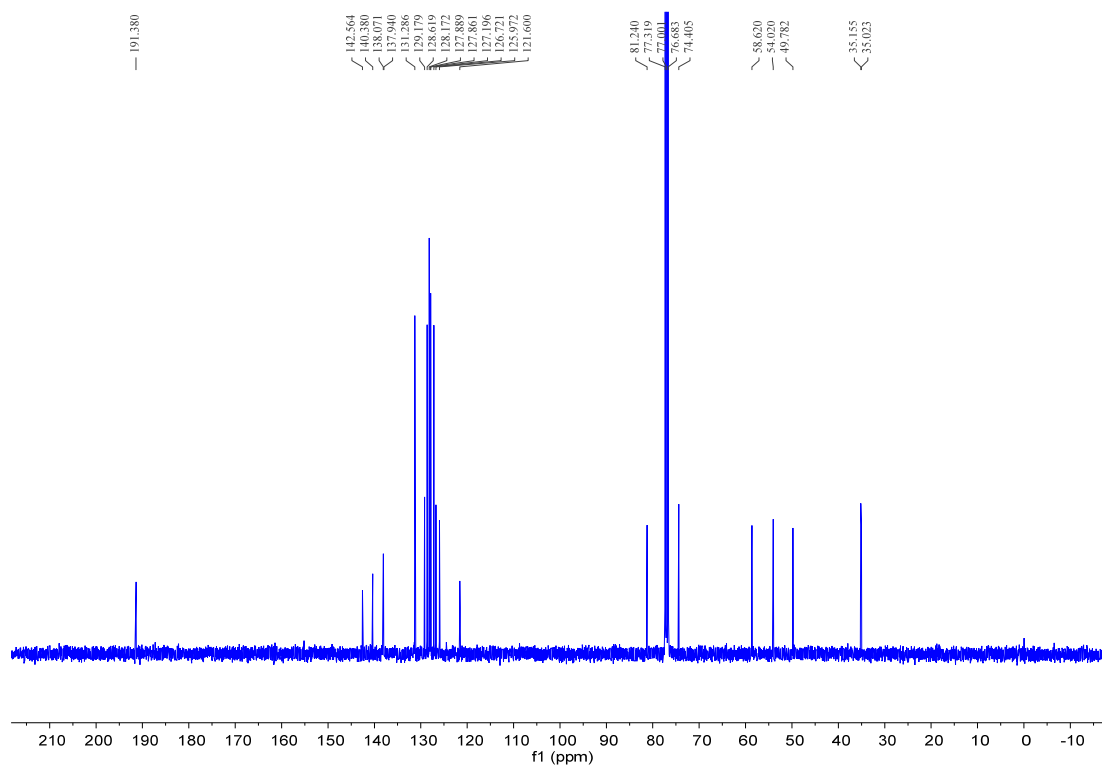
^1H and ^{13}C NMR Spectra for Compound 3ay: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

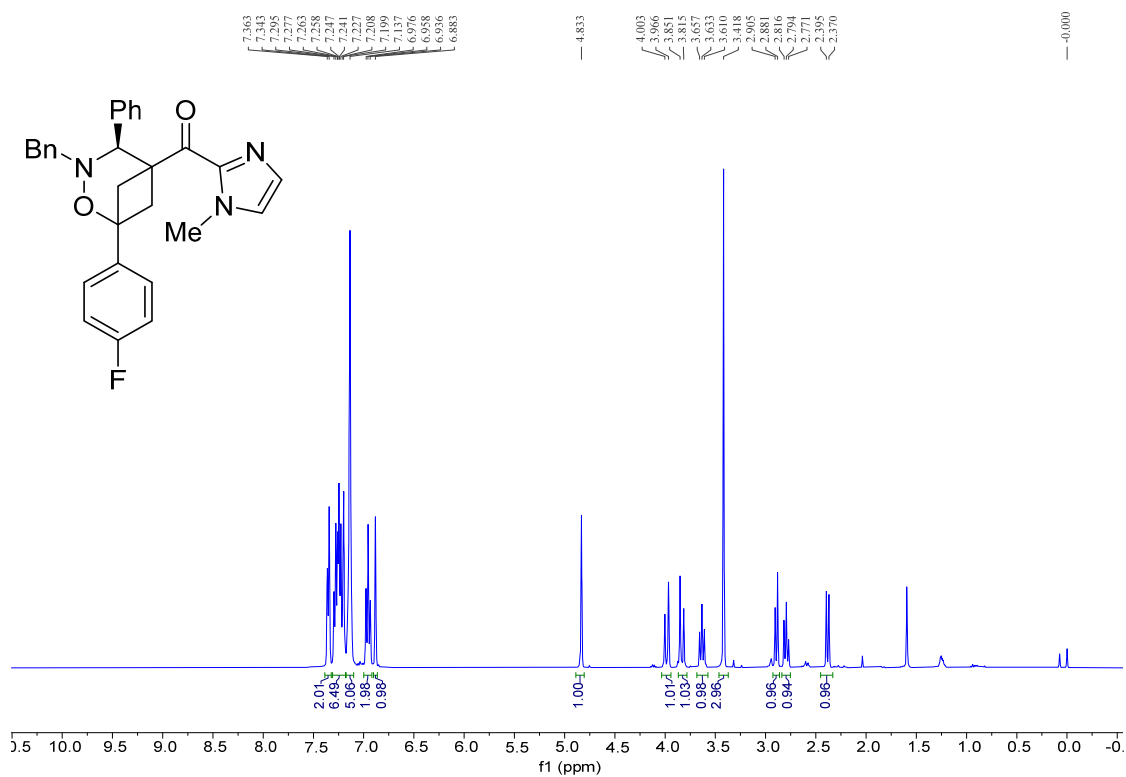
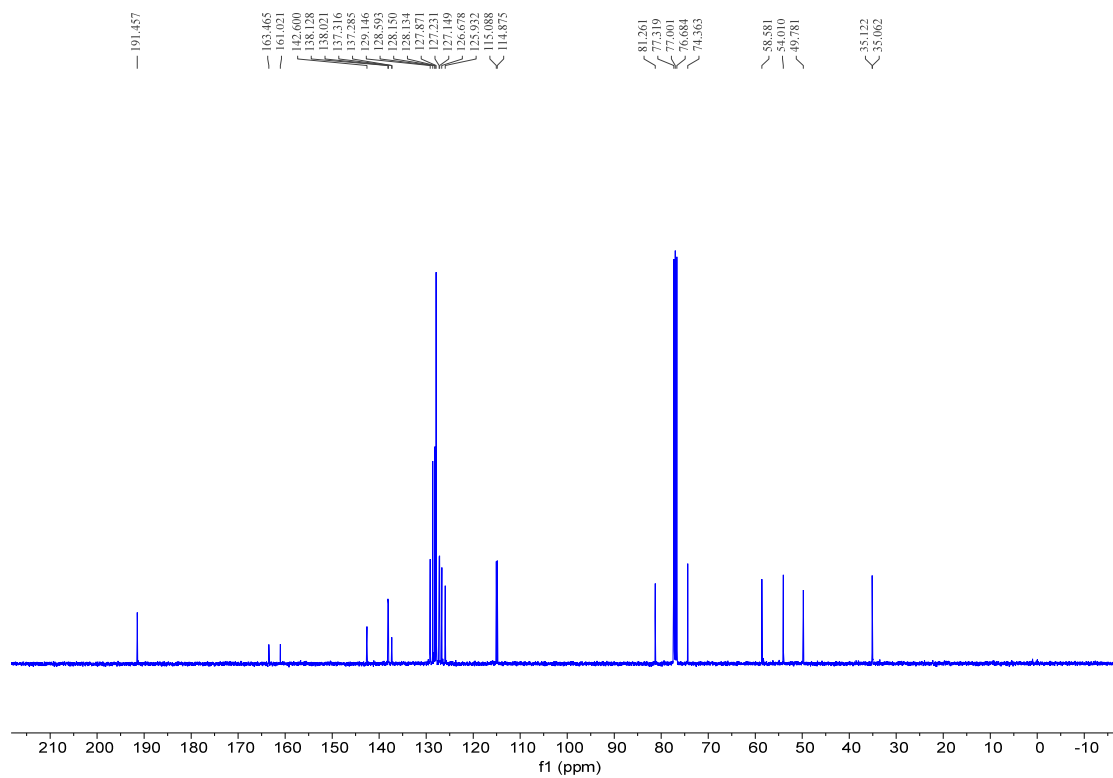
^1H and ^{13}C NMR Spectra for Compound 3az: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 3aaa: ^1H NMR (600 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

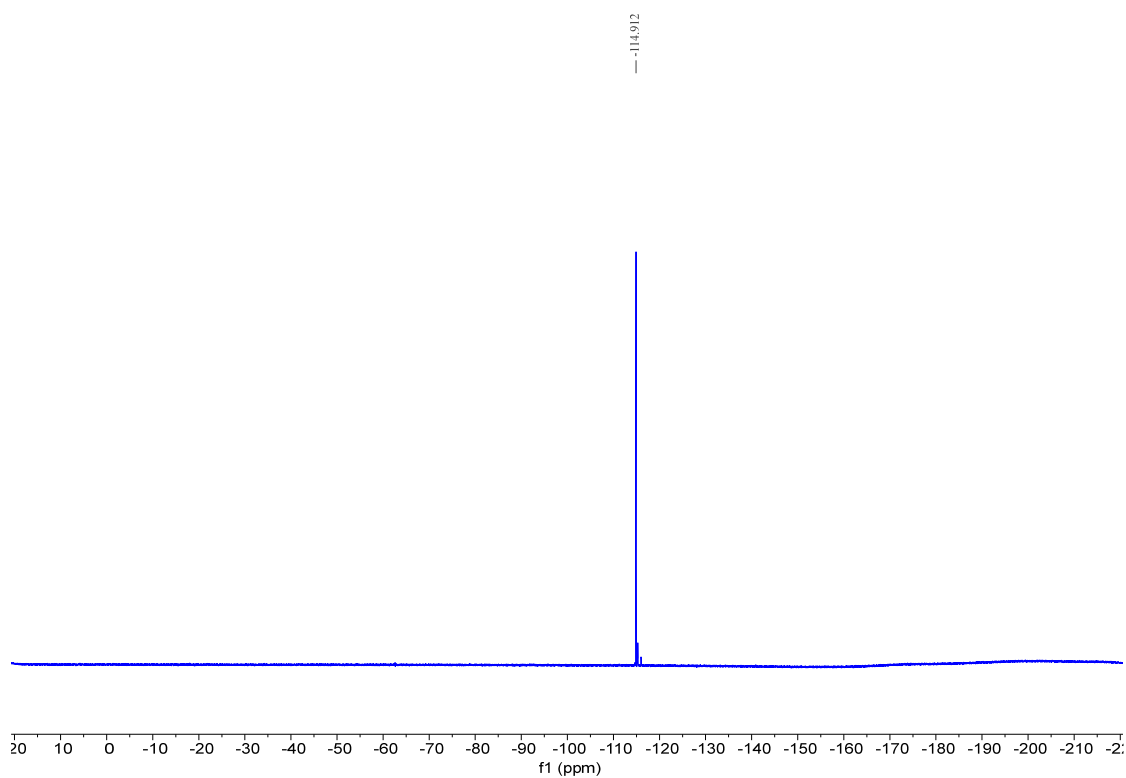
^1H and ^{13}C NMR Spectra for Compound 3abb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 3bb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 3cb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

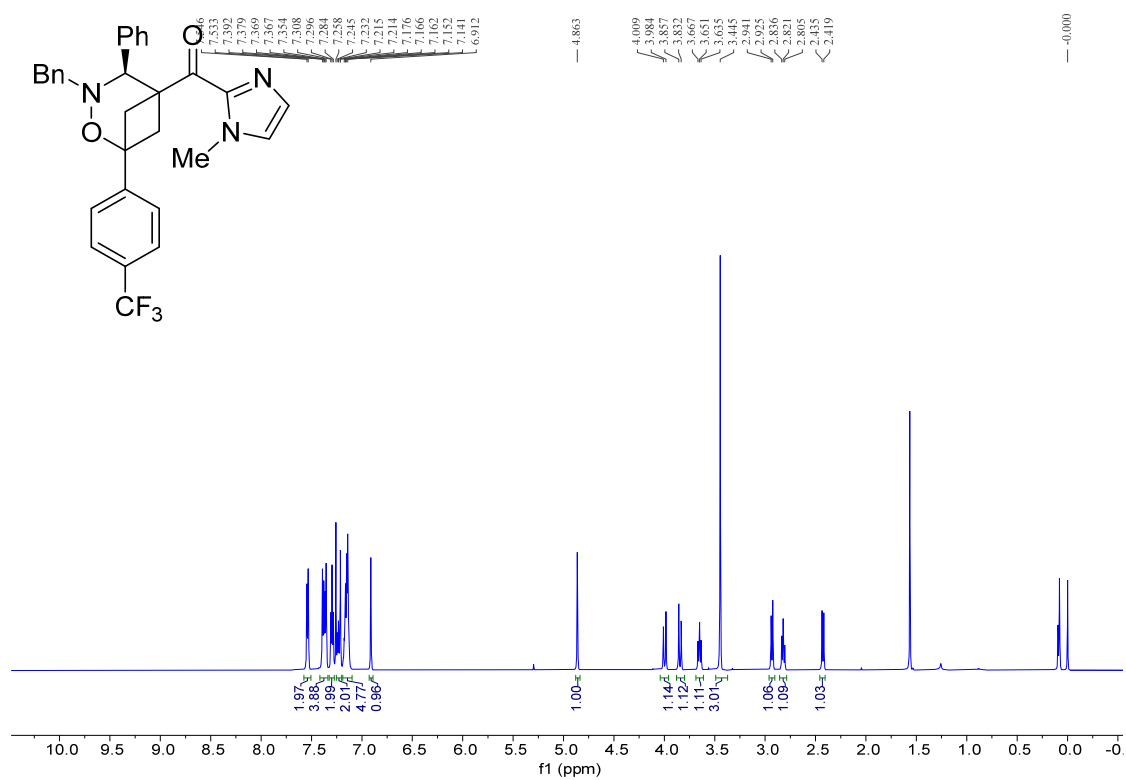
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 3db: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

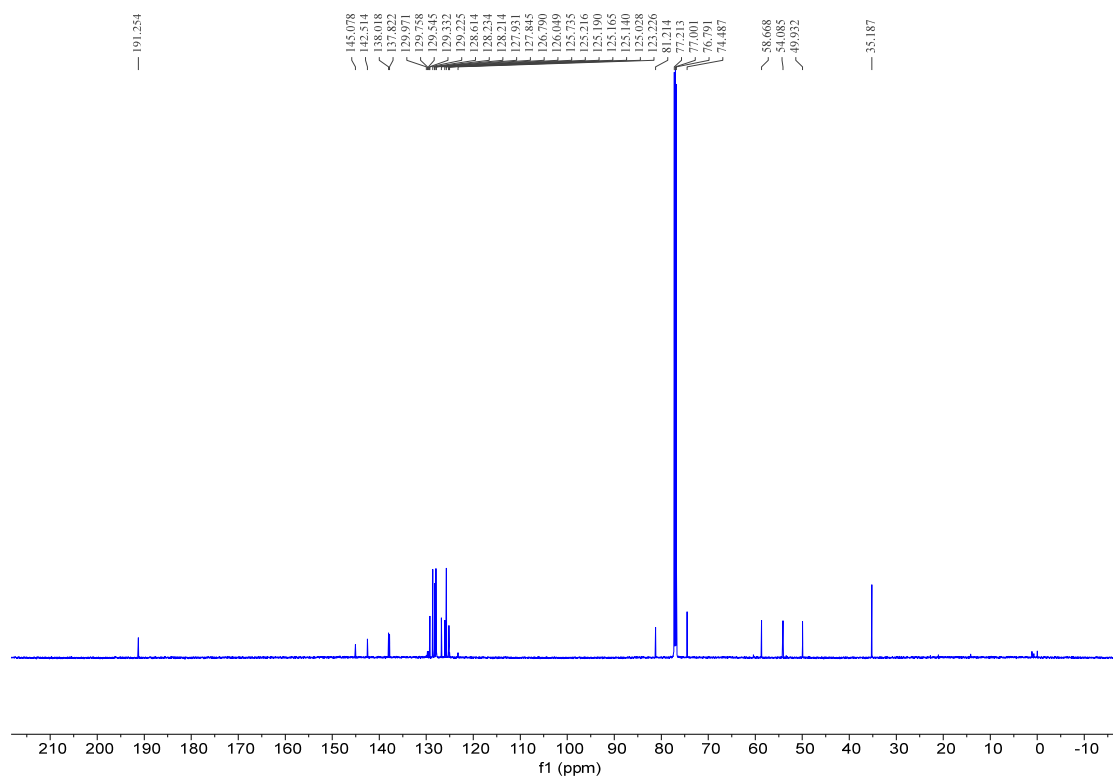
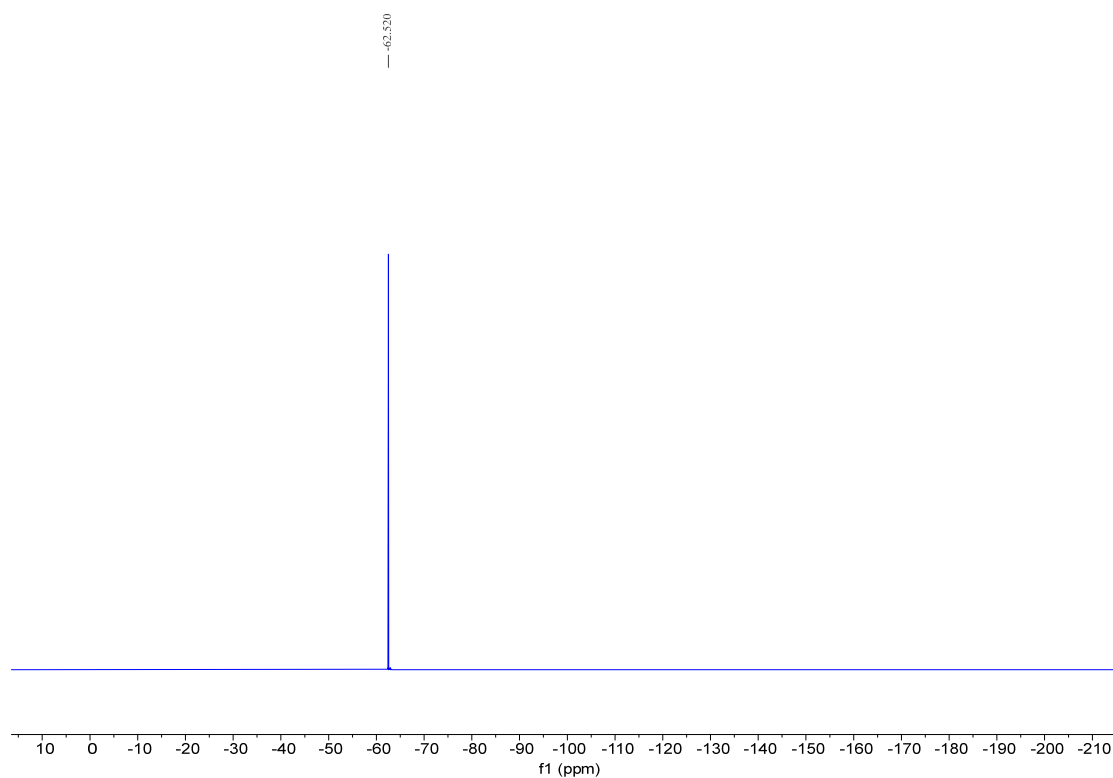
^{19}F NMR (376 MHz, CDCl_3)

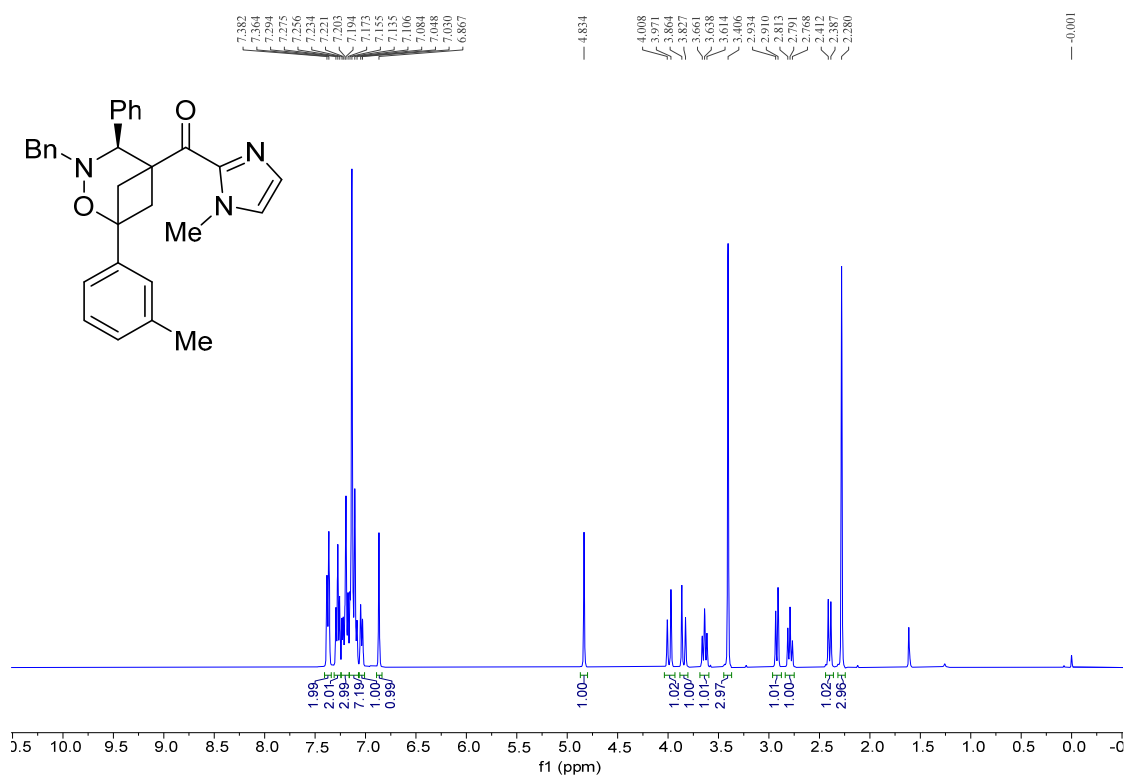
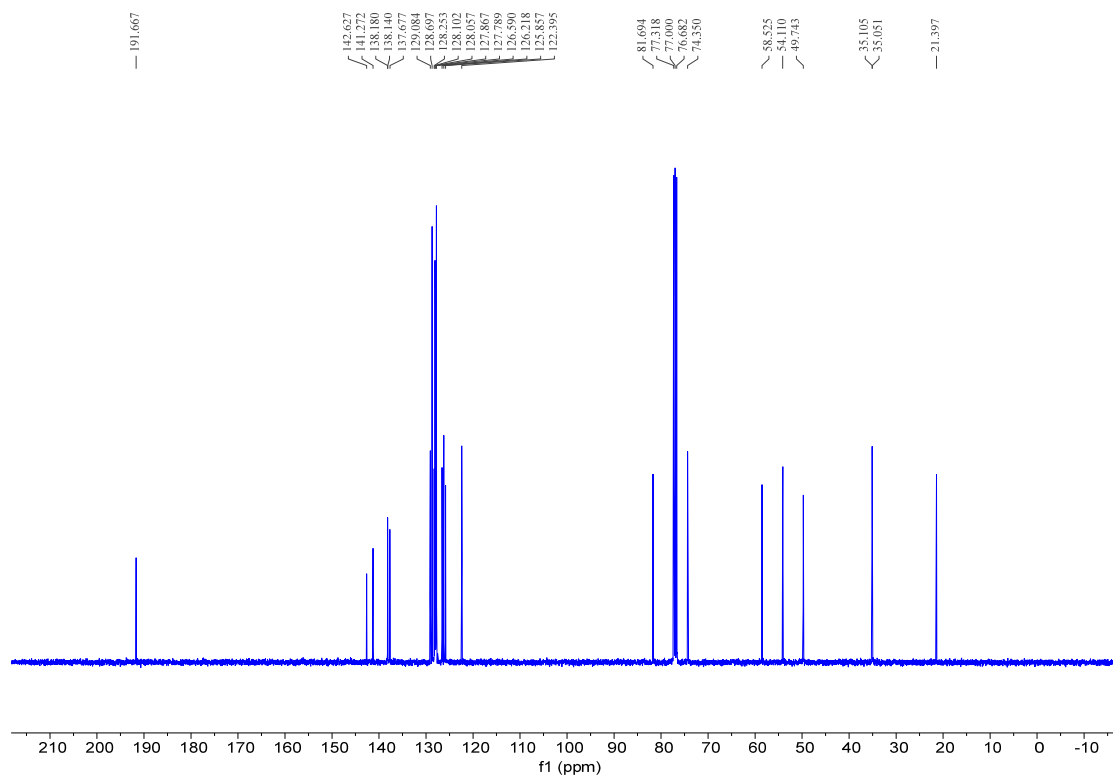


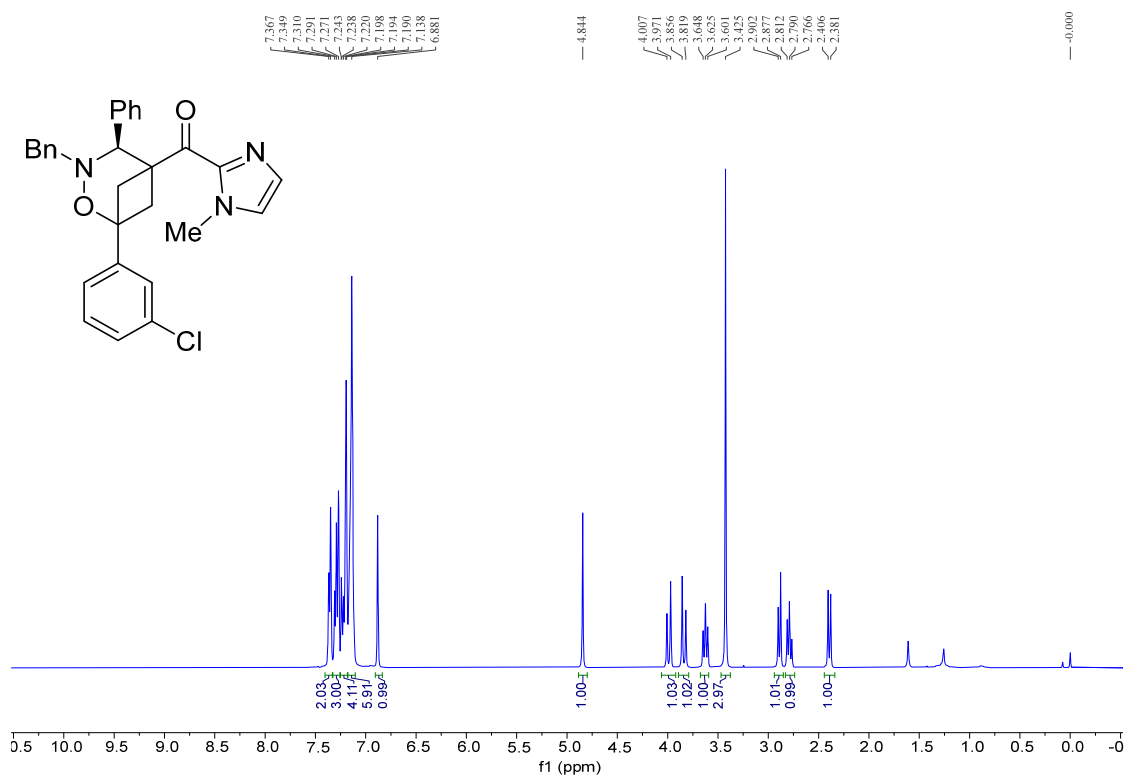
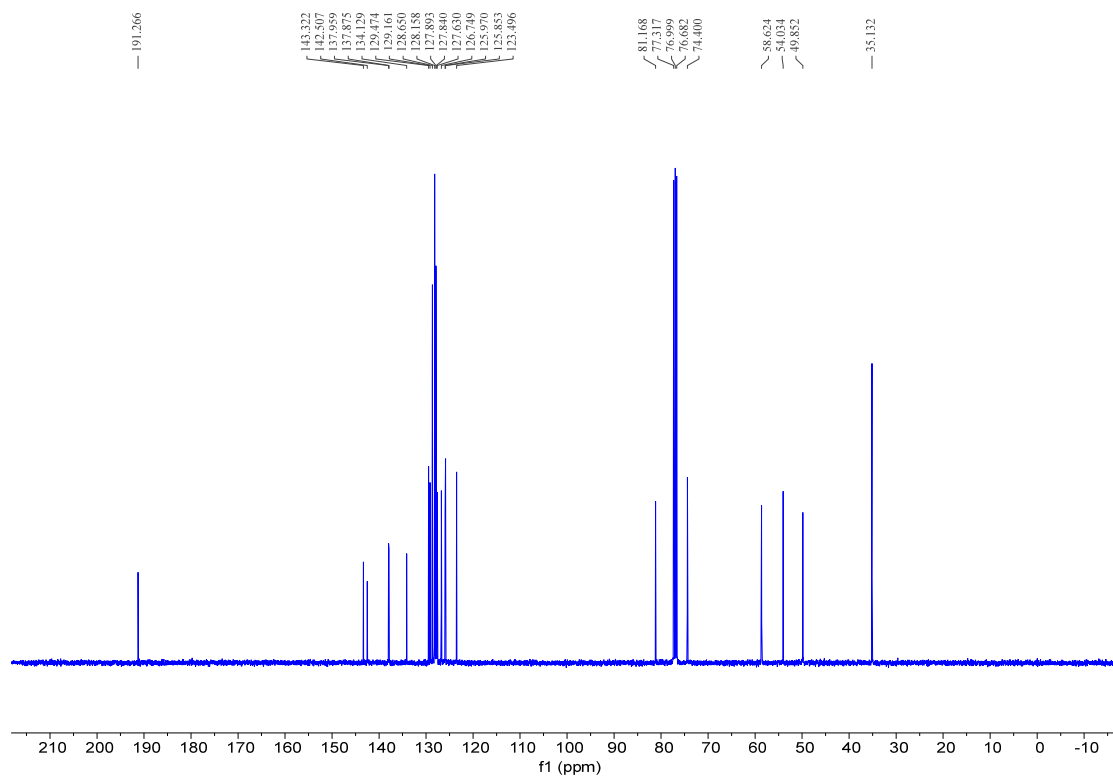
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 3eb:

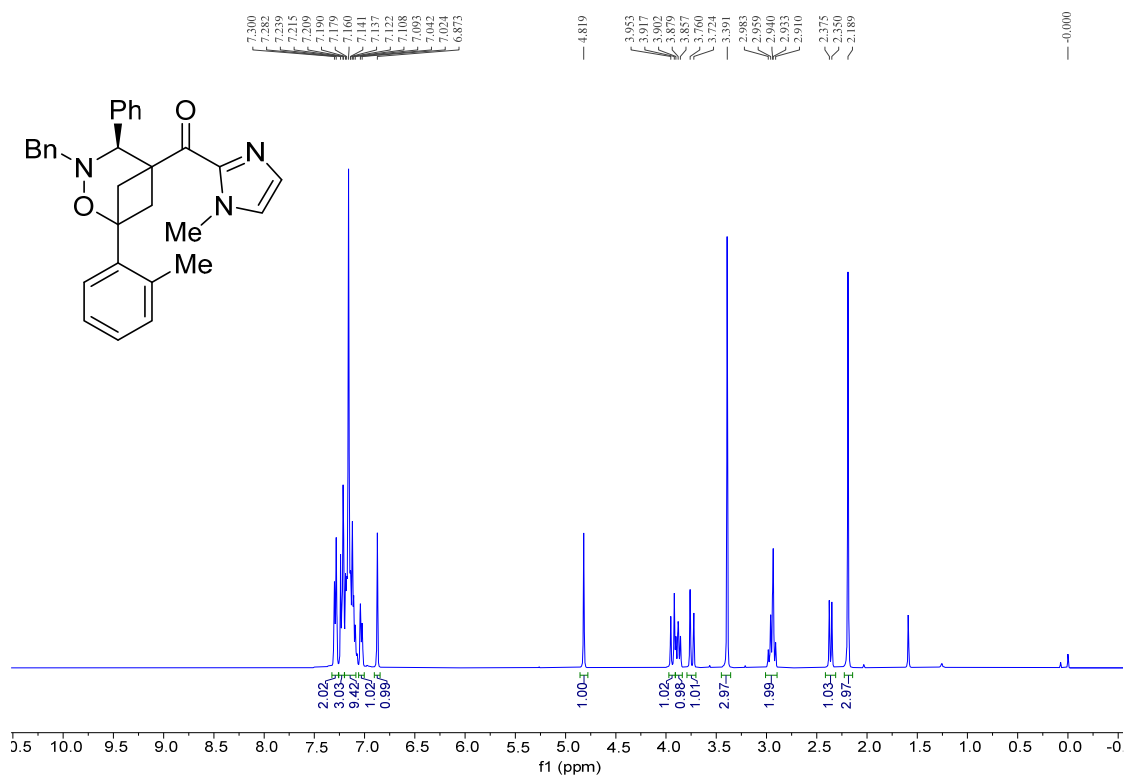
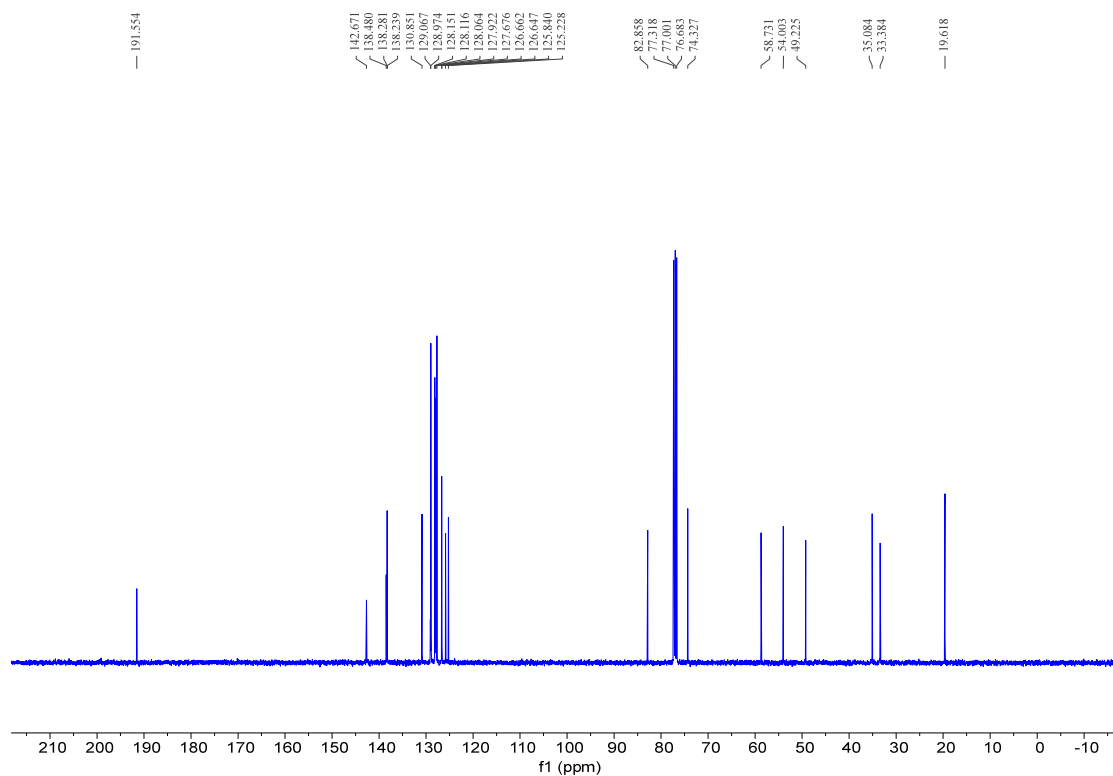
^1H NMR (600 MHz, CDCl_3)

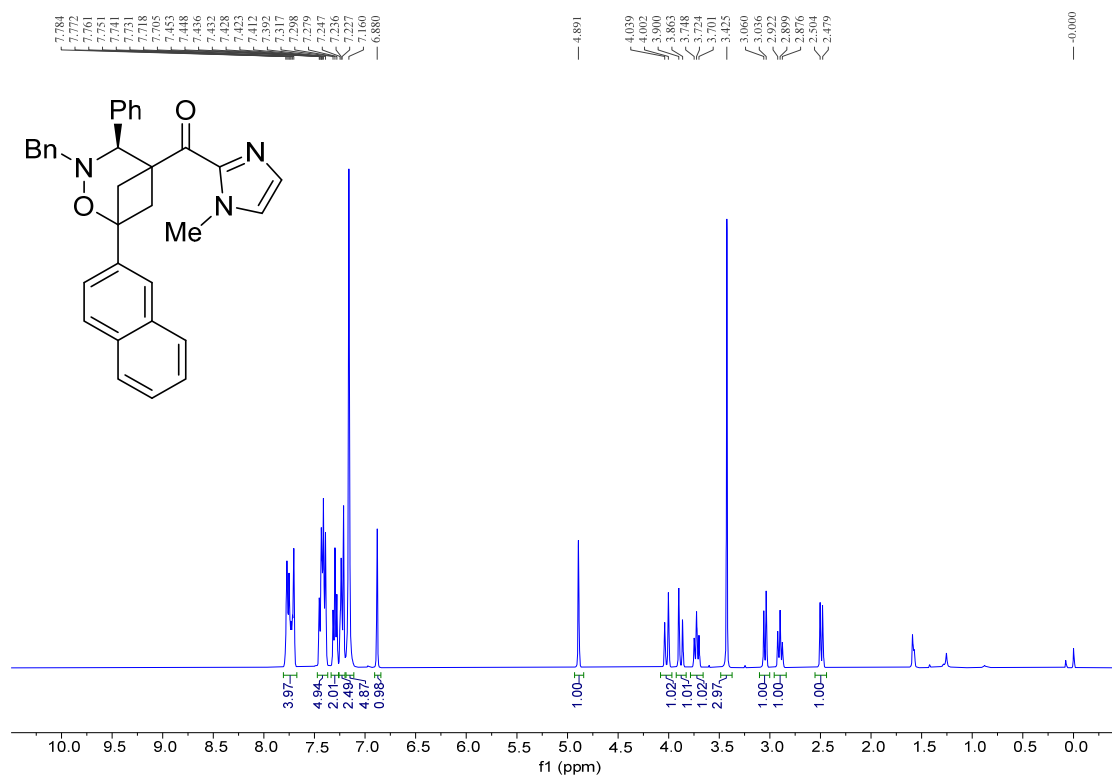
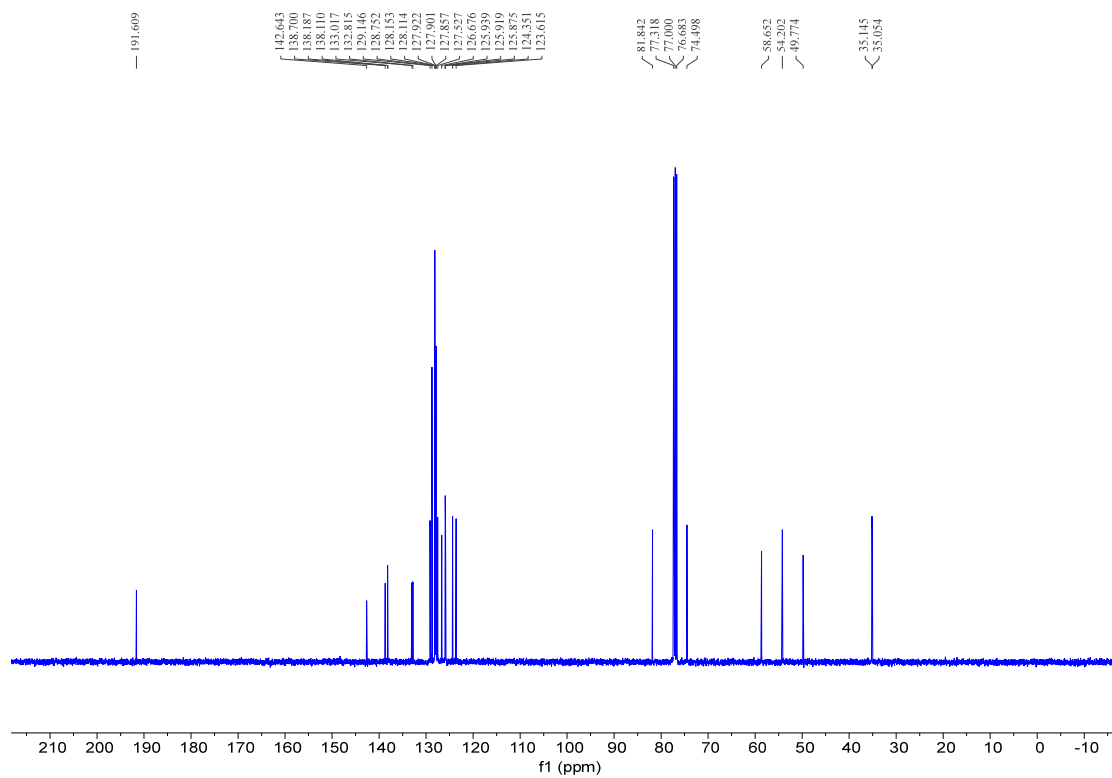


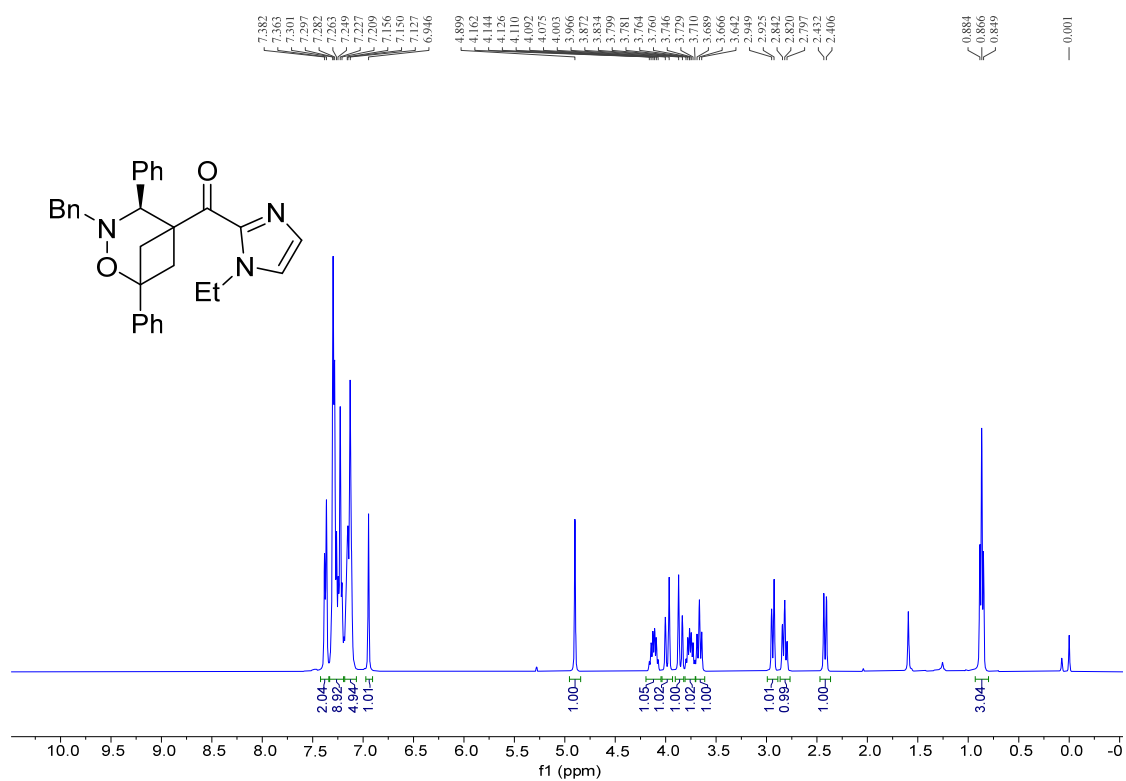
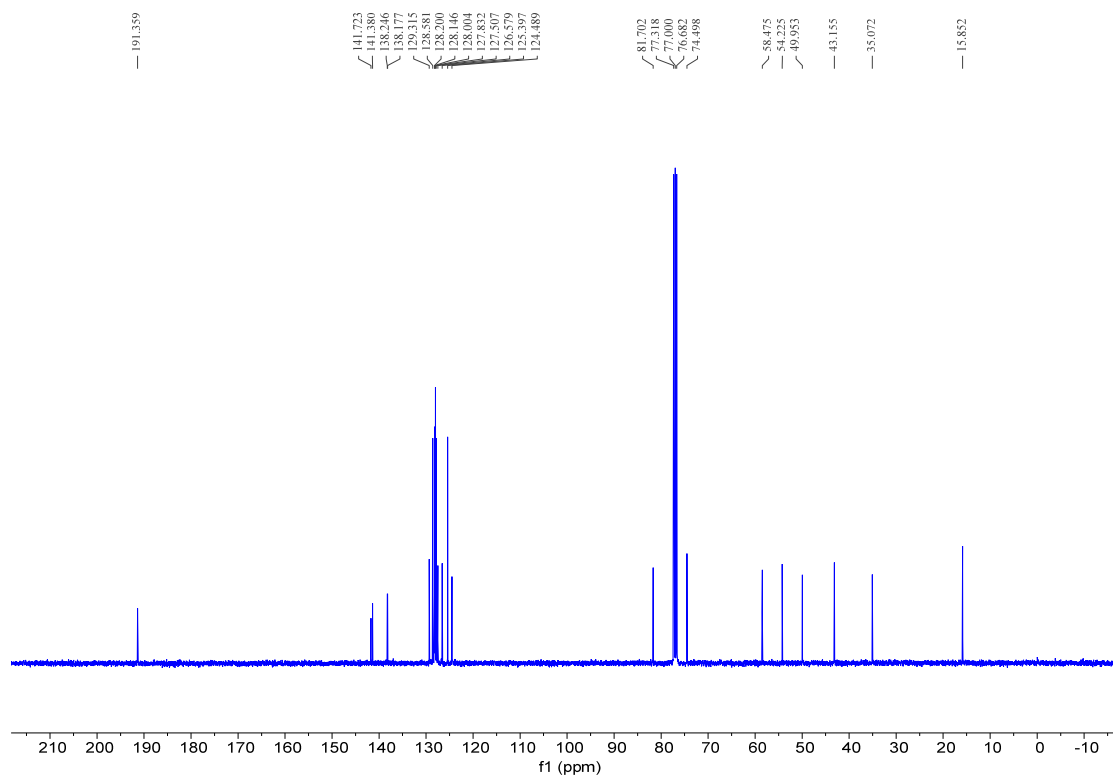
^{13}C NMR (100 MHz, CDCl_3) ^{19}F NMR (565 MHz, CDCl_3)

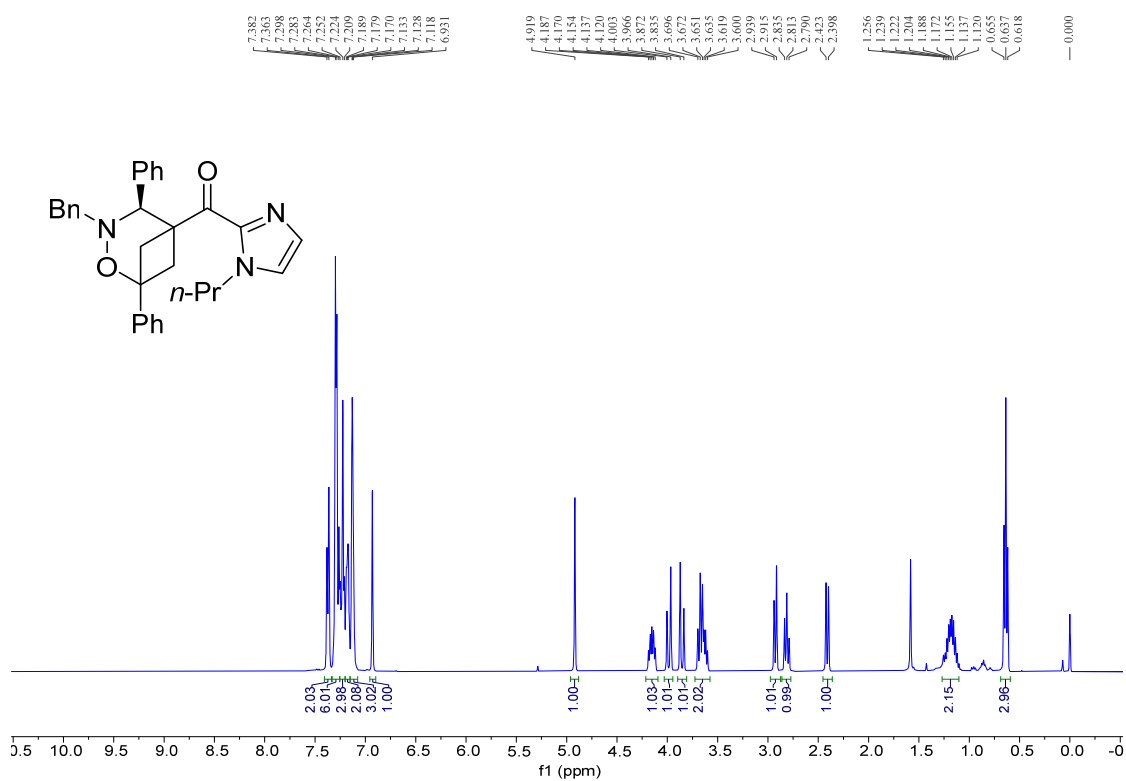
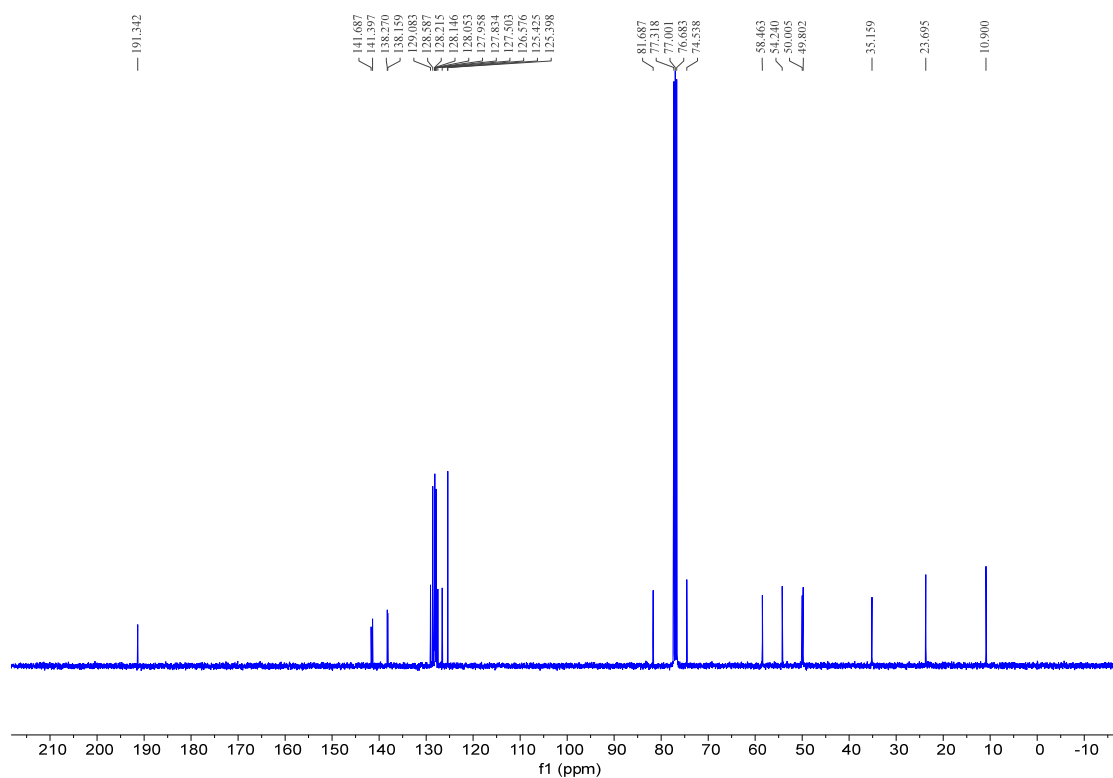
^1H and ^{13}C NMR Spectra for Compound 3fb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

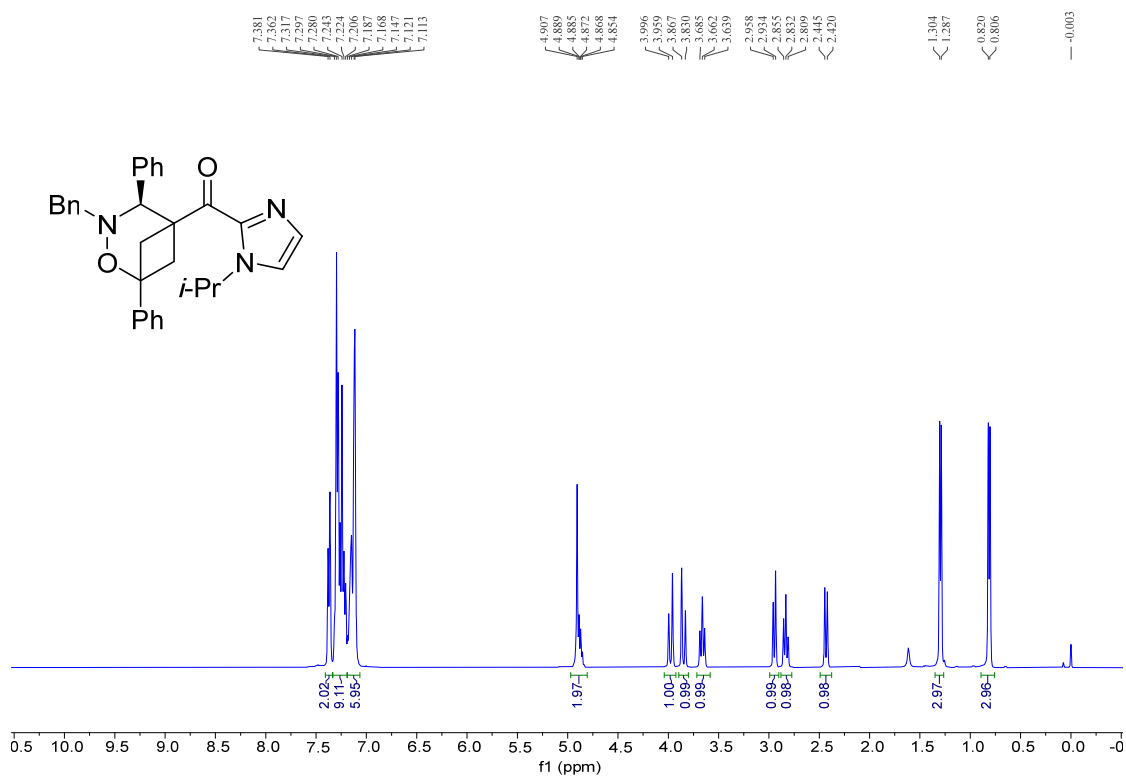
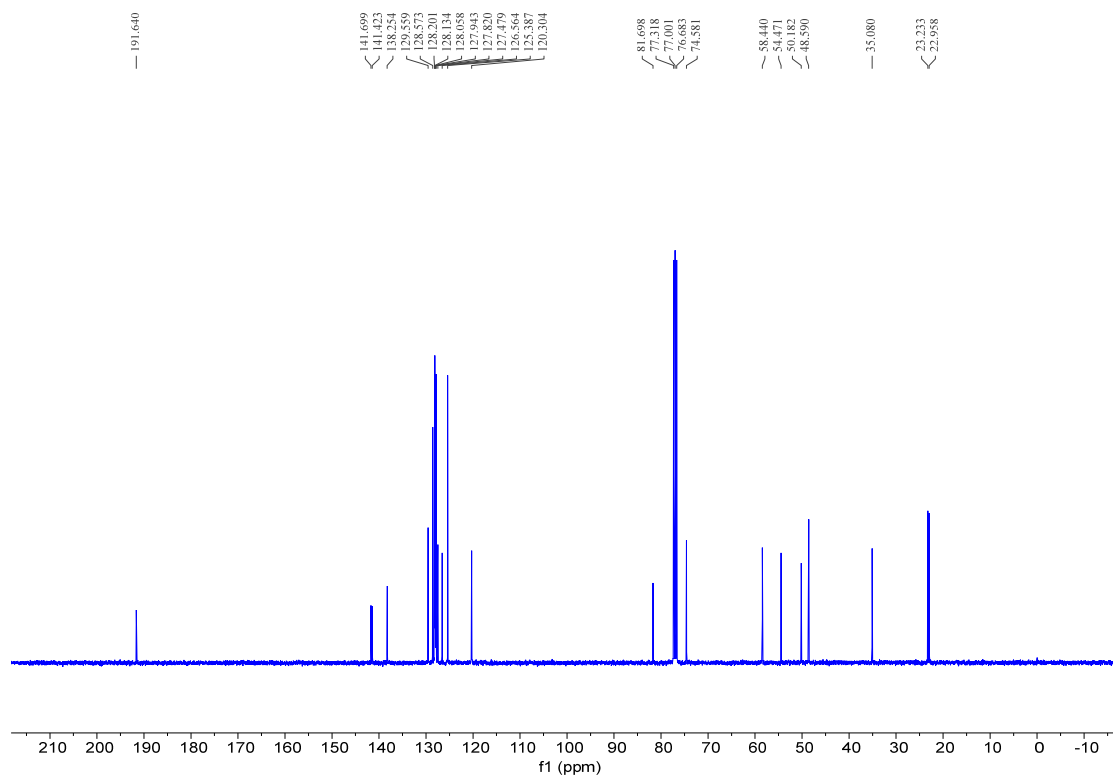
^1H and ^{13}C NMR Spectra for Compound 3gb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

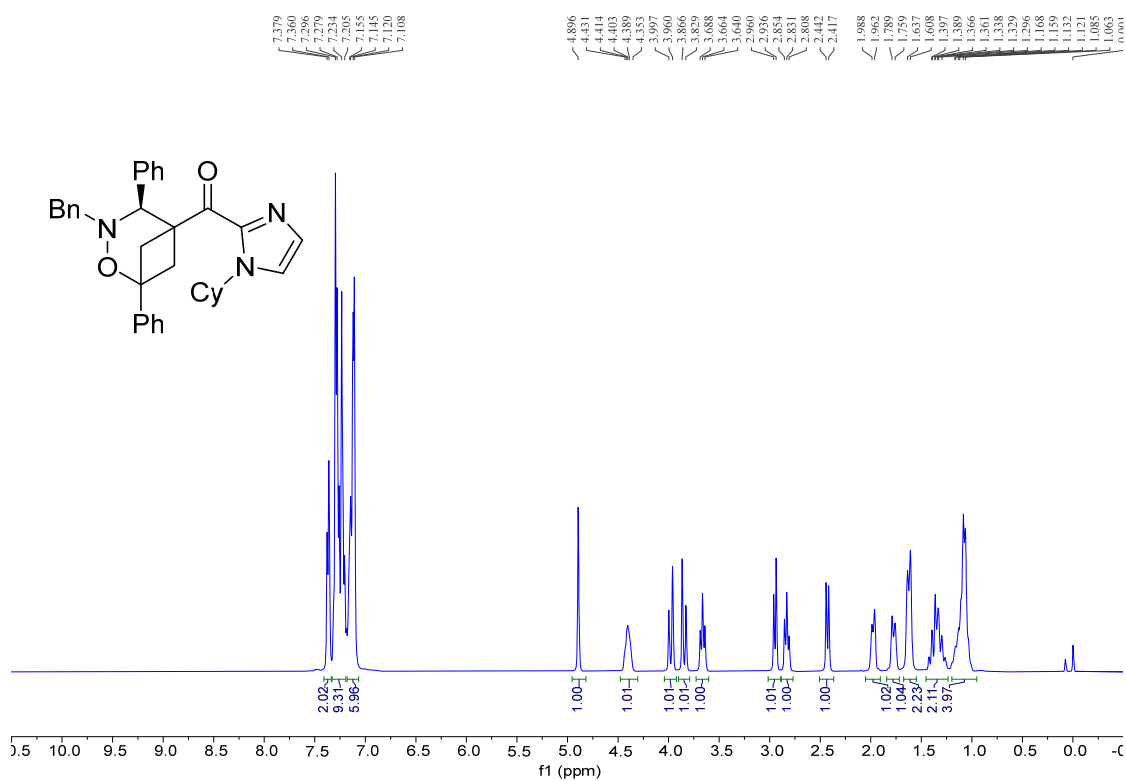
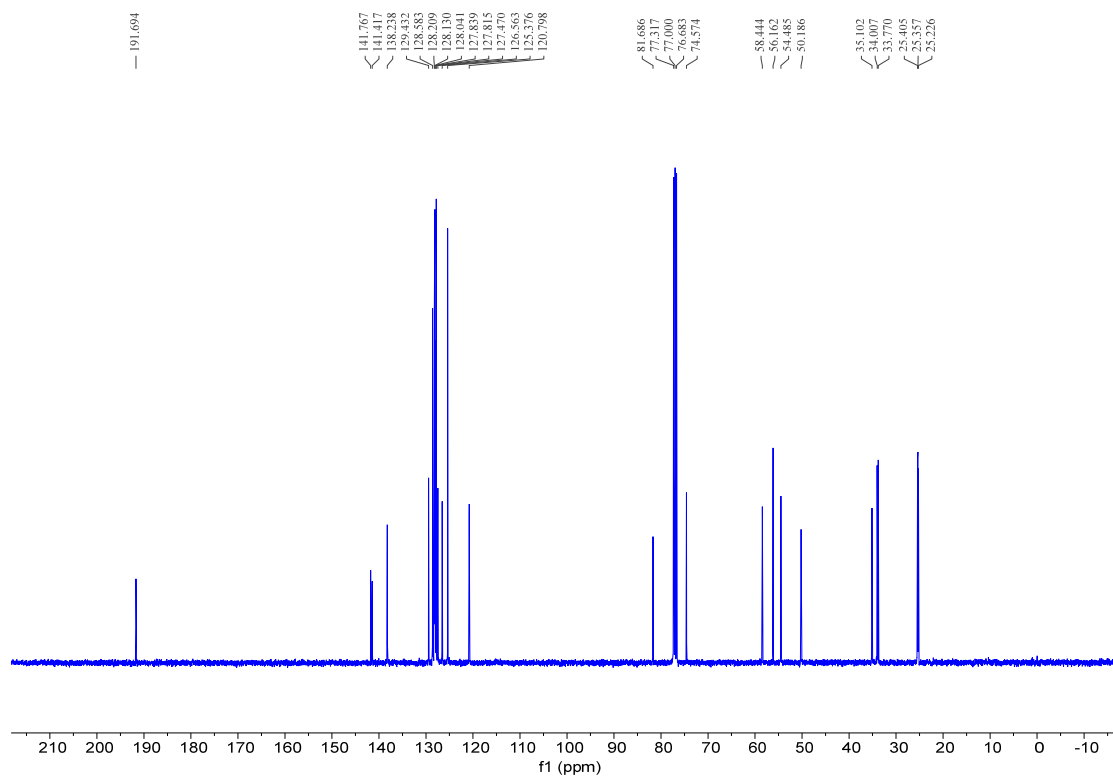
^1H and ^{13}C NMR Spectra for Compound 3hb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

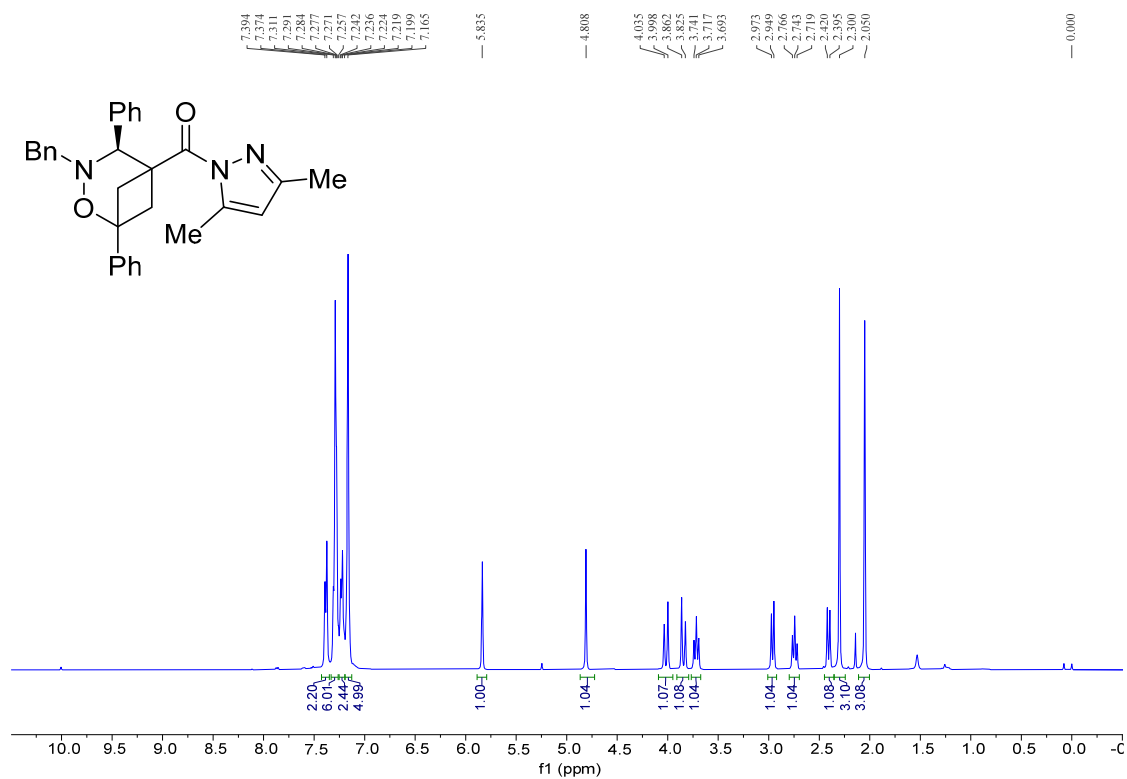
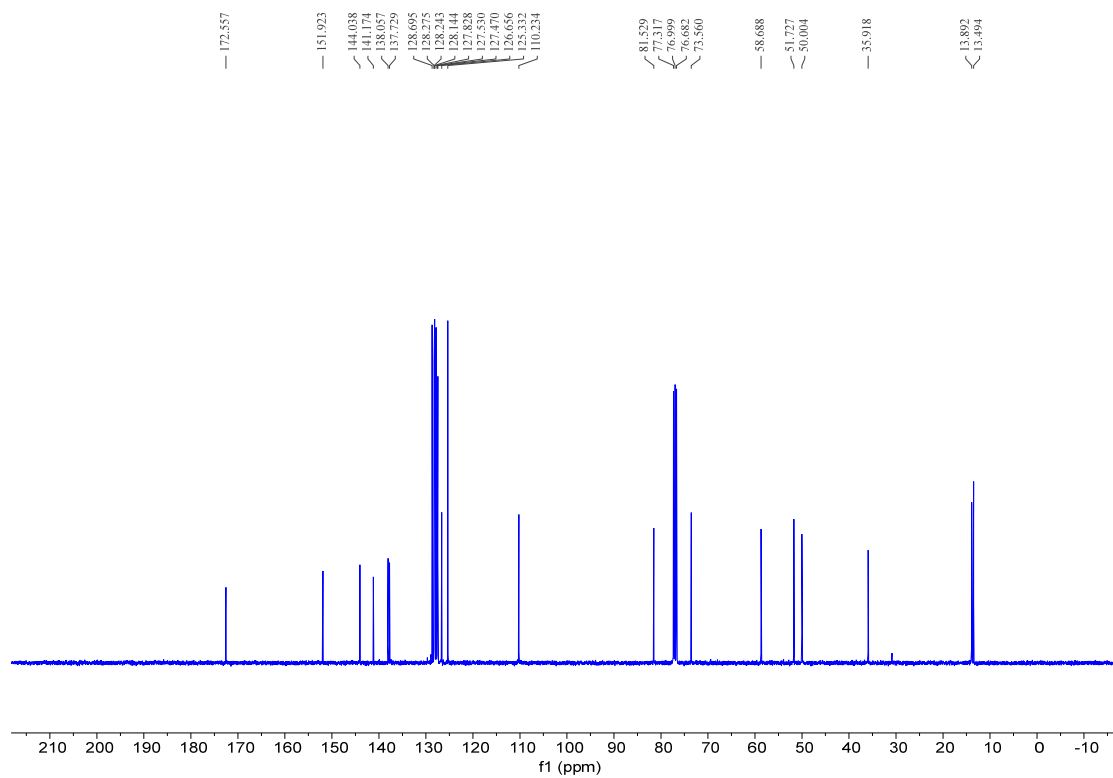
^1H and ^{13}C NMR Spectra for Compound 3ib: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

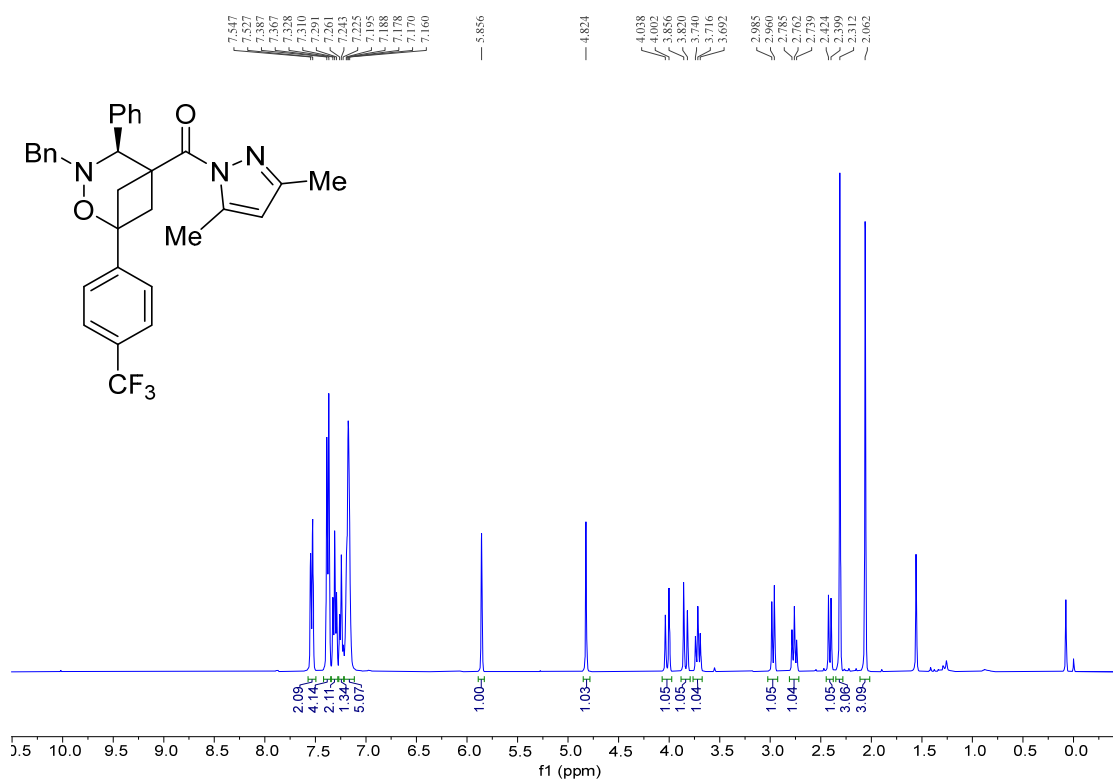
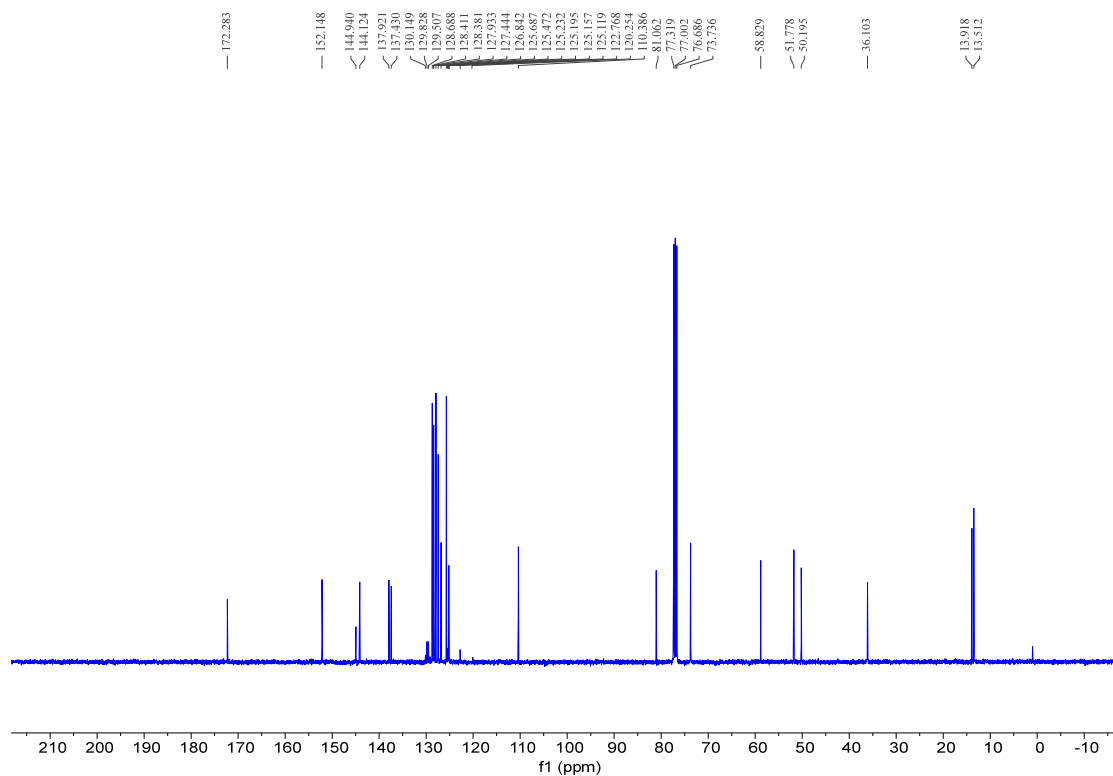
^1H and ^{13}C NMR Spectra for Compound 3jb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

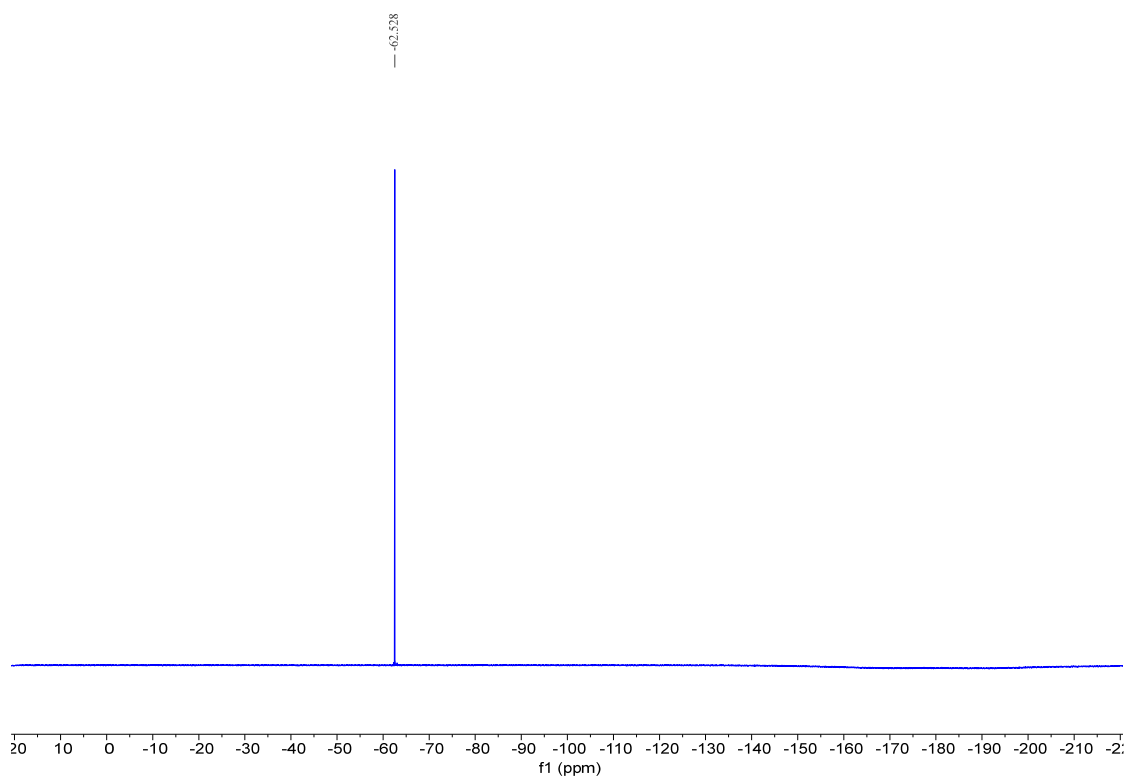
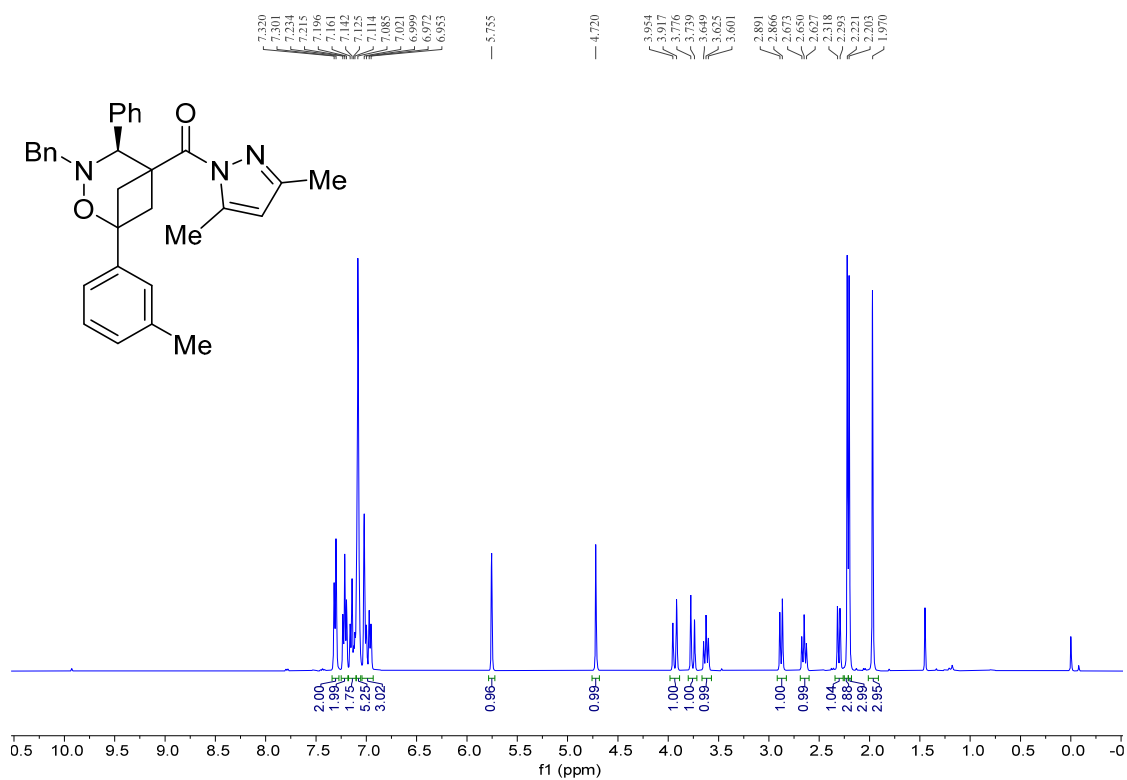
^1H and ^{13}C NMR Spectra for Compound 3kb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

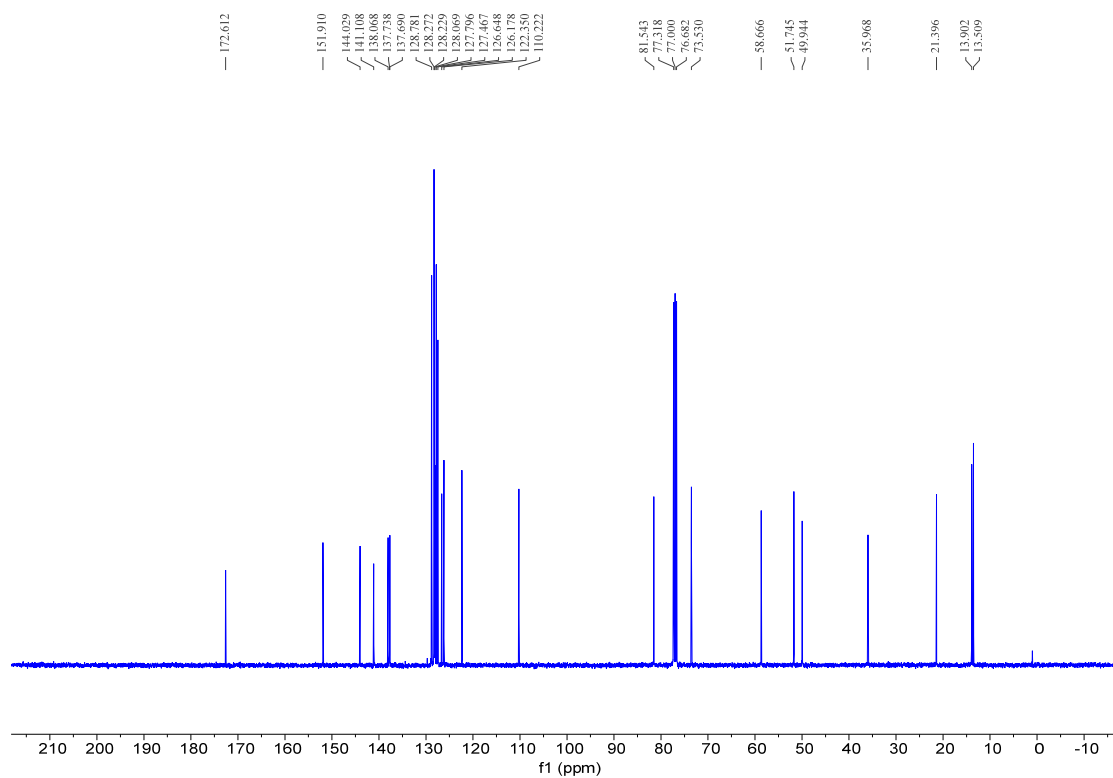
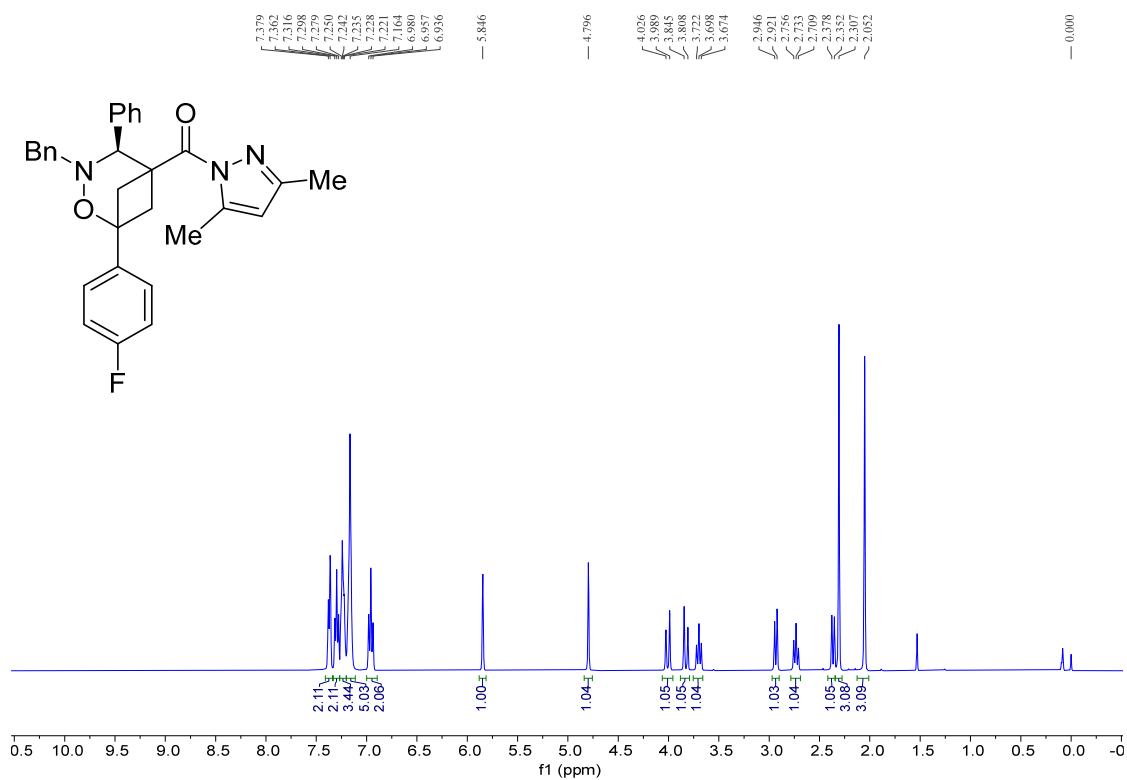
^1H and ^{13}C NMR Spectra for Compound 3lb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

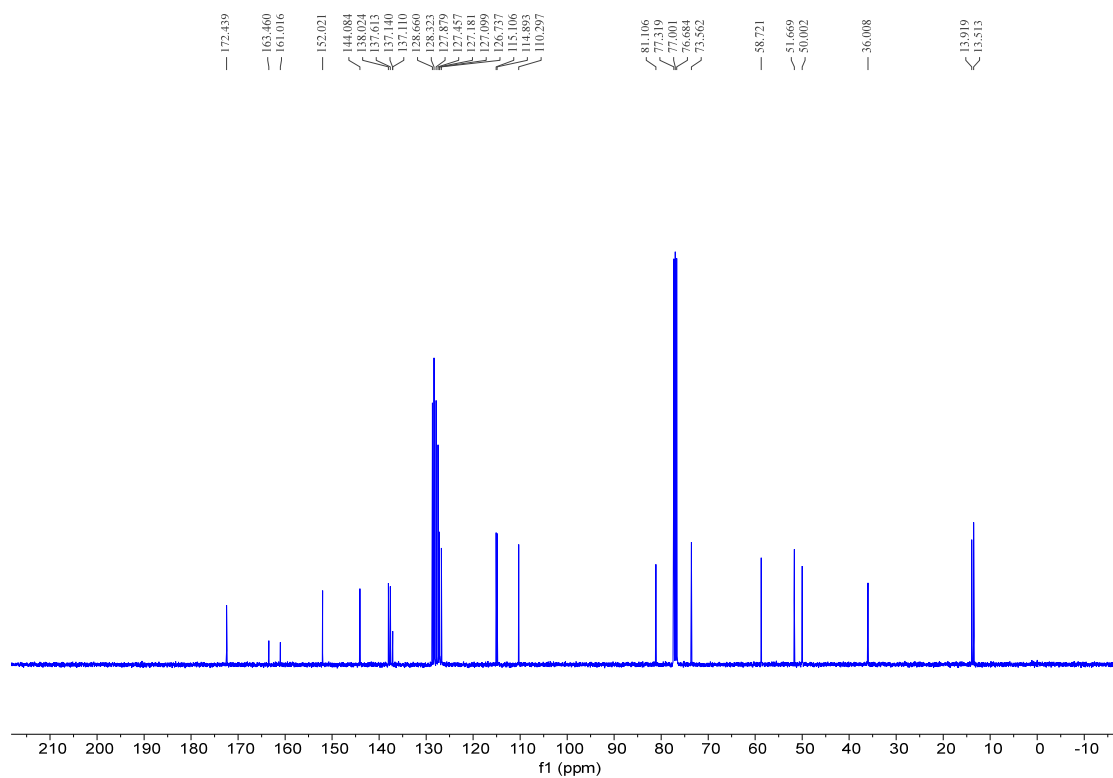
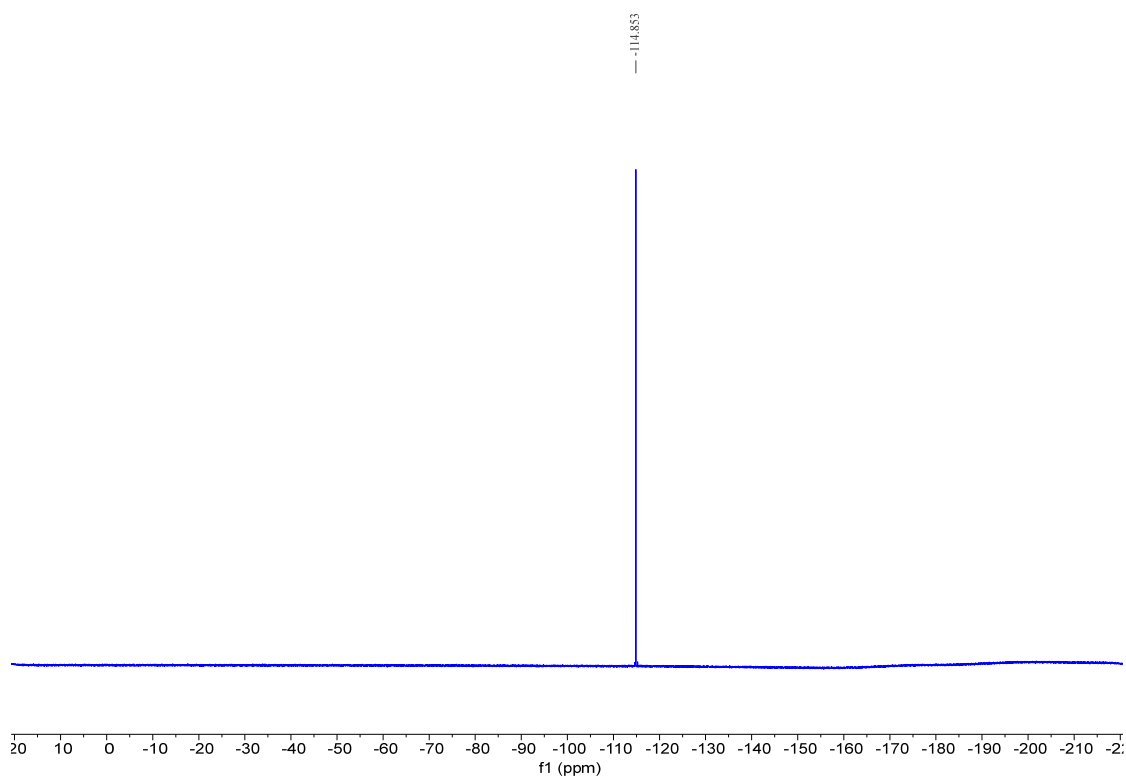
^1H and ^{13}C NMR Spectra for Compound 3mb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

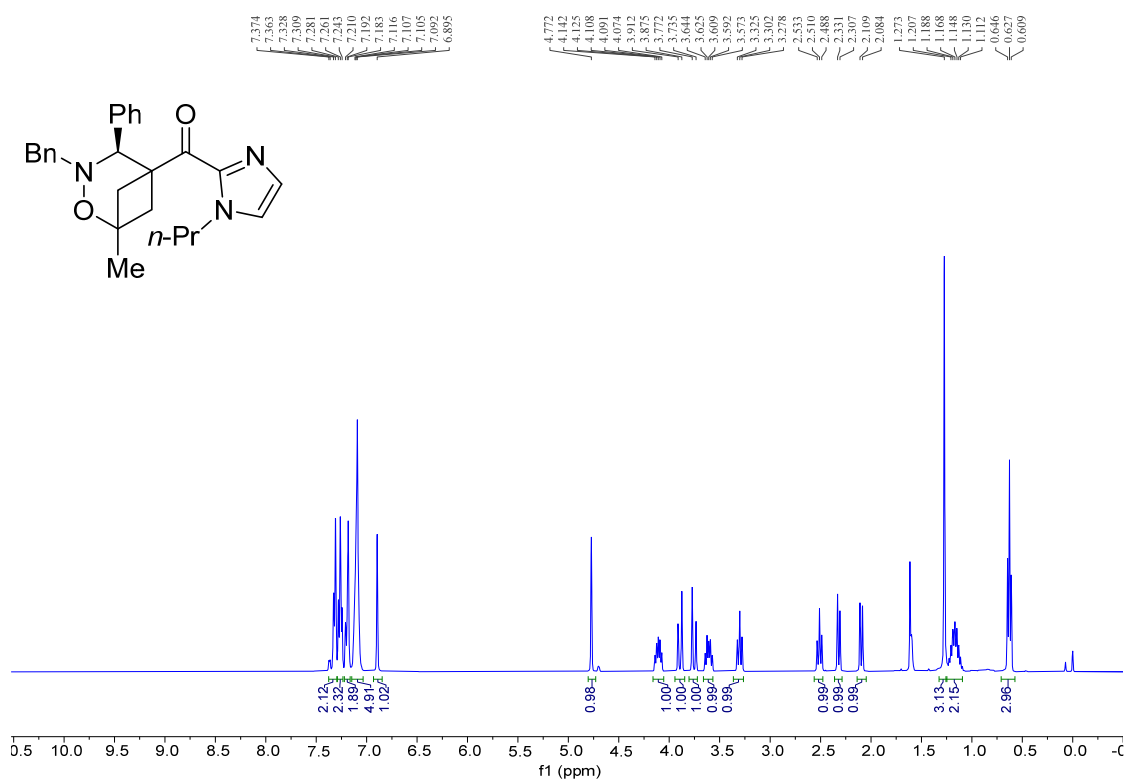
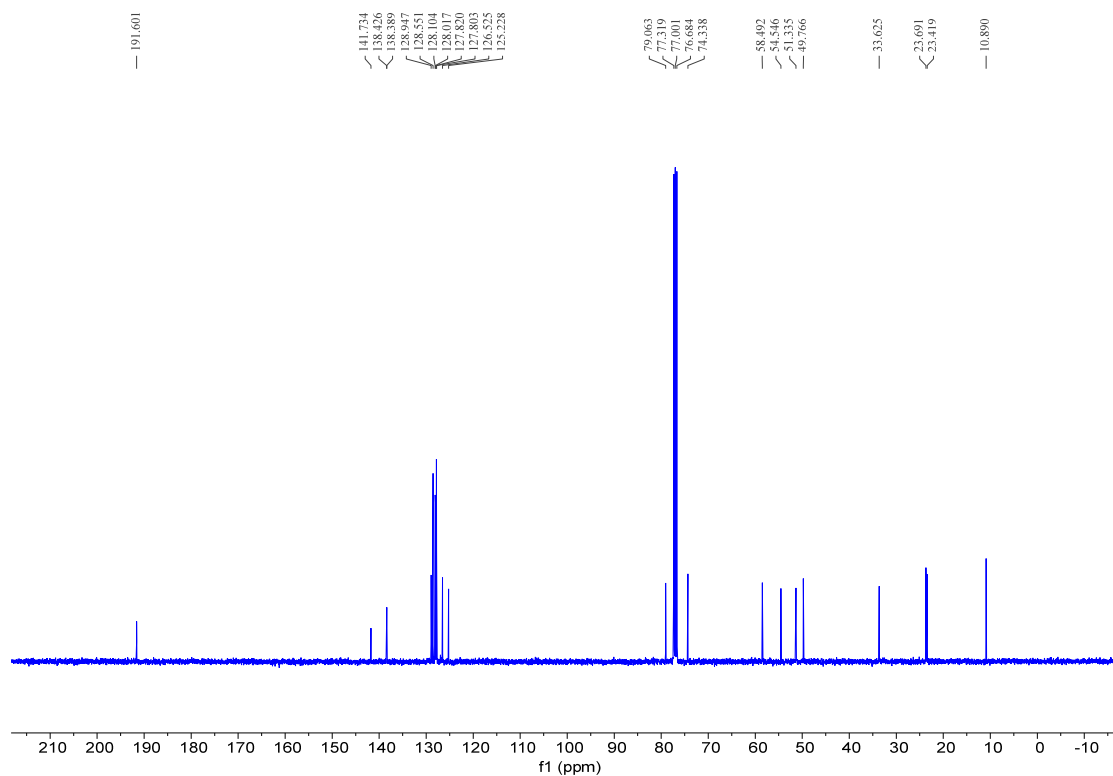
^1H and ^{13}C NMR Spectra for Compound 3nb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

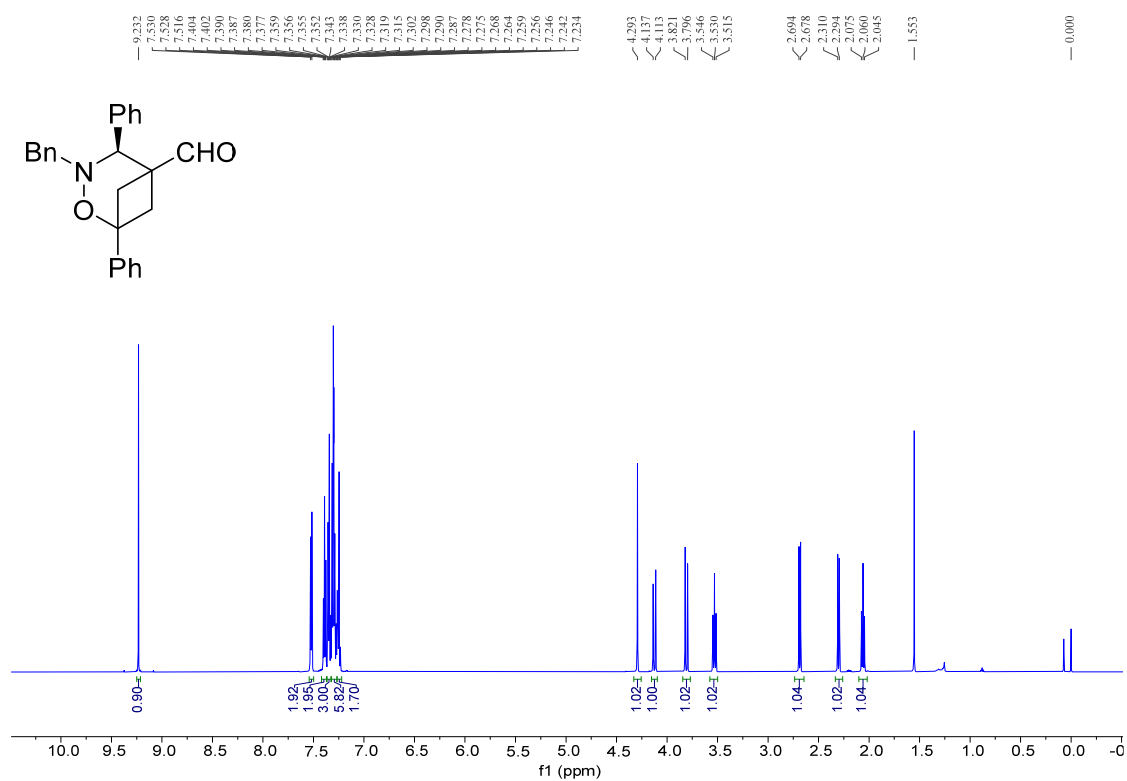
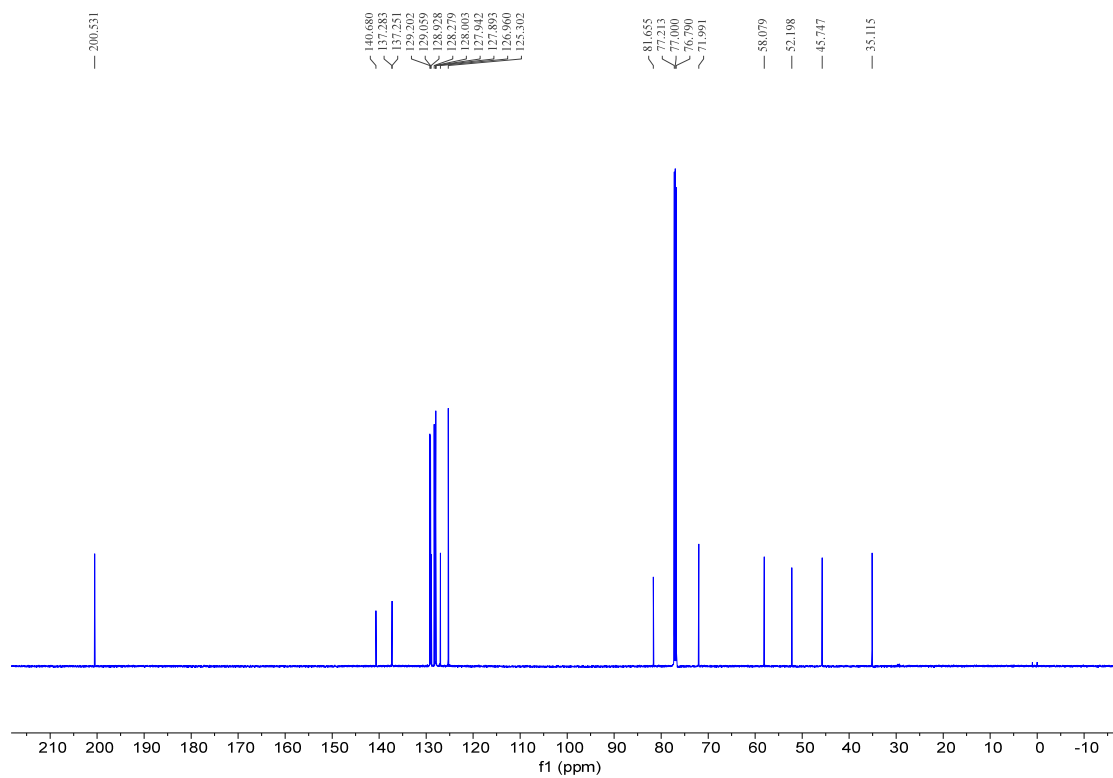
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 3ob: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

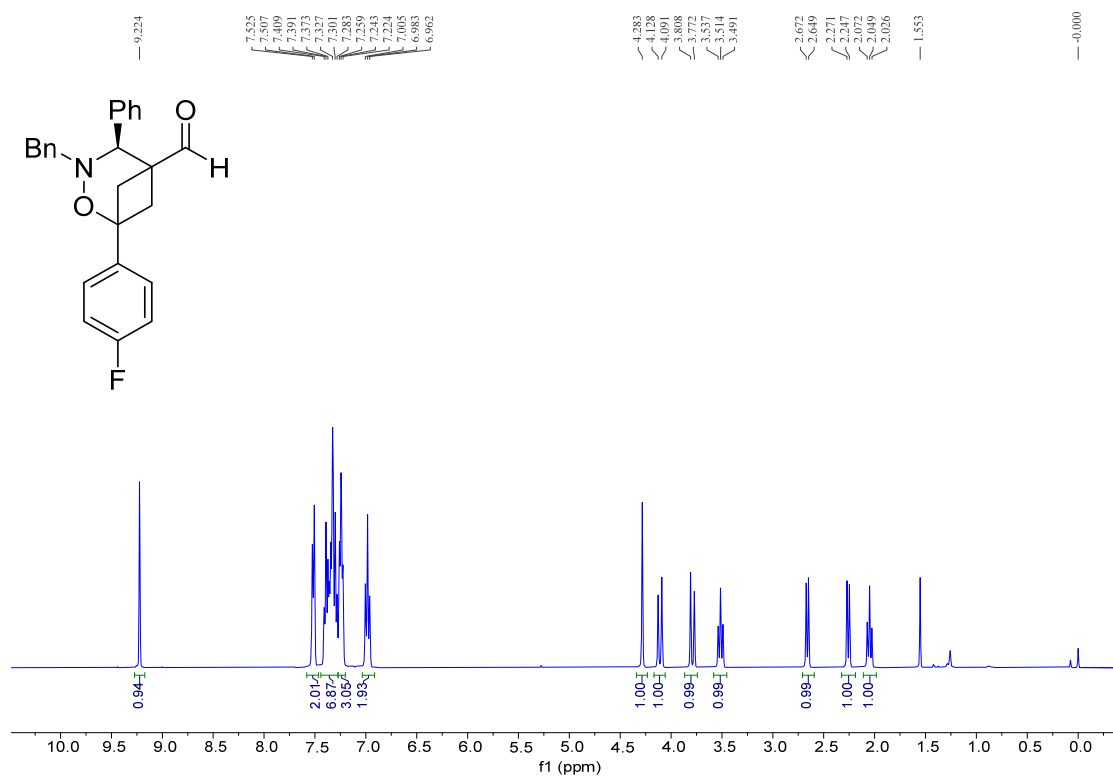
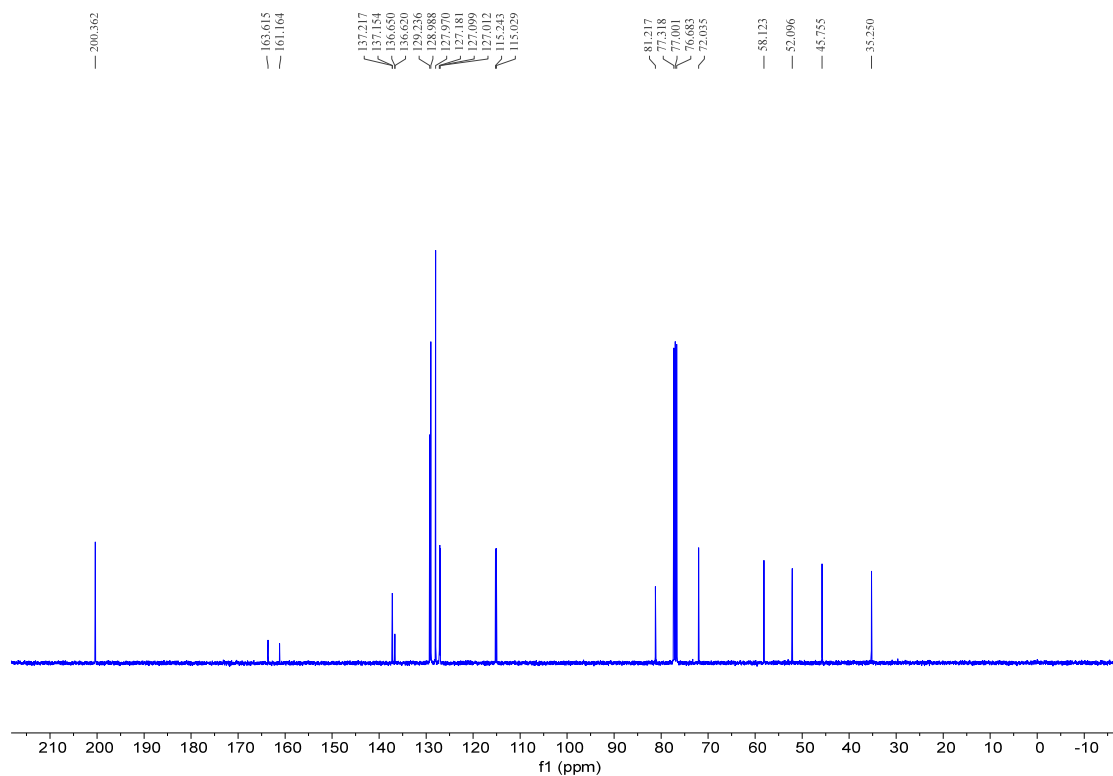
^{19}F NMR (376 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 3pb: ^1H NMR (400 MHz, CDCl_3)

^{13}C NMR (100 MHz, CDCl_3) ^1H , ^{13}C and ^{19}F NMR Spectra for Compound 3qb: ^1H NMR (400 MHz, CDCl_3)

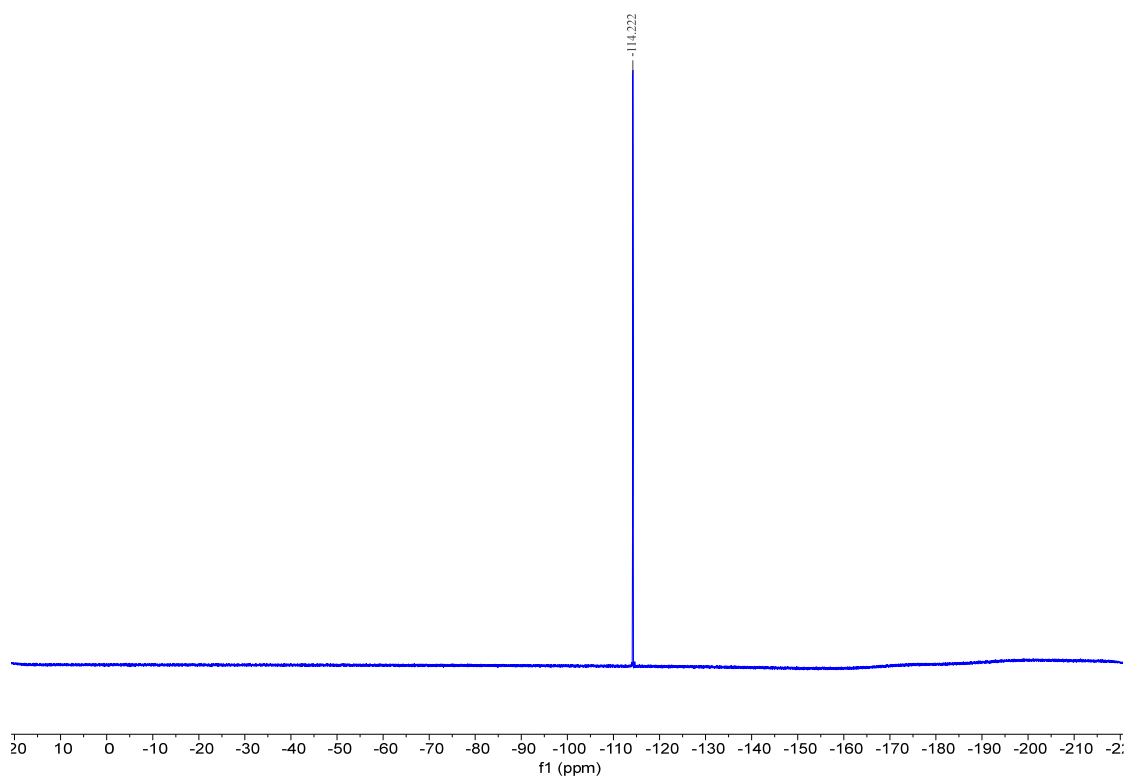
^{13}C NMR (100 MHz, CDCl_3) ^{19}F NMR (376 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 3rb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

^1H and ^{13}C NMR Spectra for Compound 4nb: ^1H NMR (600 MHz, CDCl_3) ^{13}C NMR (150 MHz, CDCl_3)

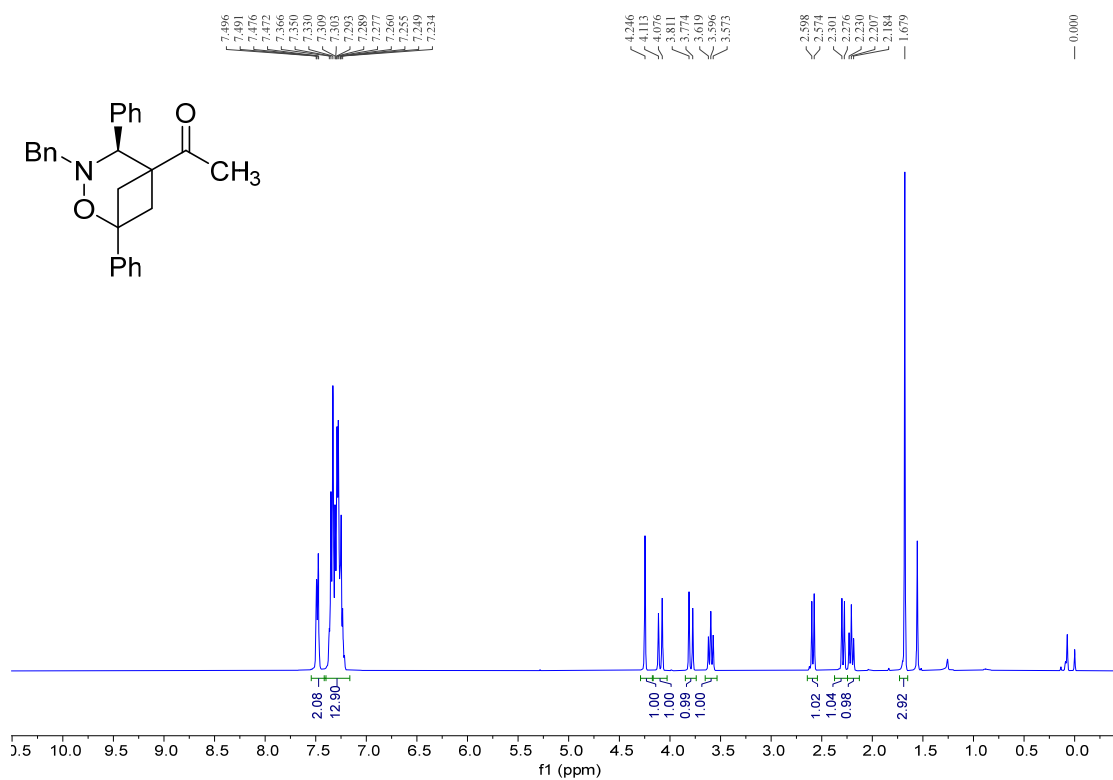
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 4qb: ^1H NMR (400 MHz, CDCl_3) ^{13}C NMR (100 MHz, CDCl_3)

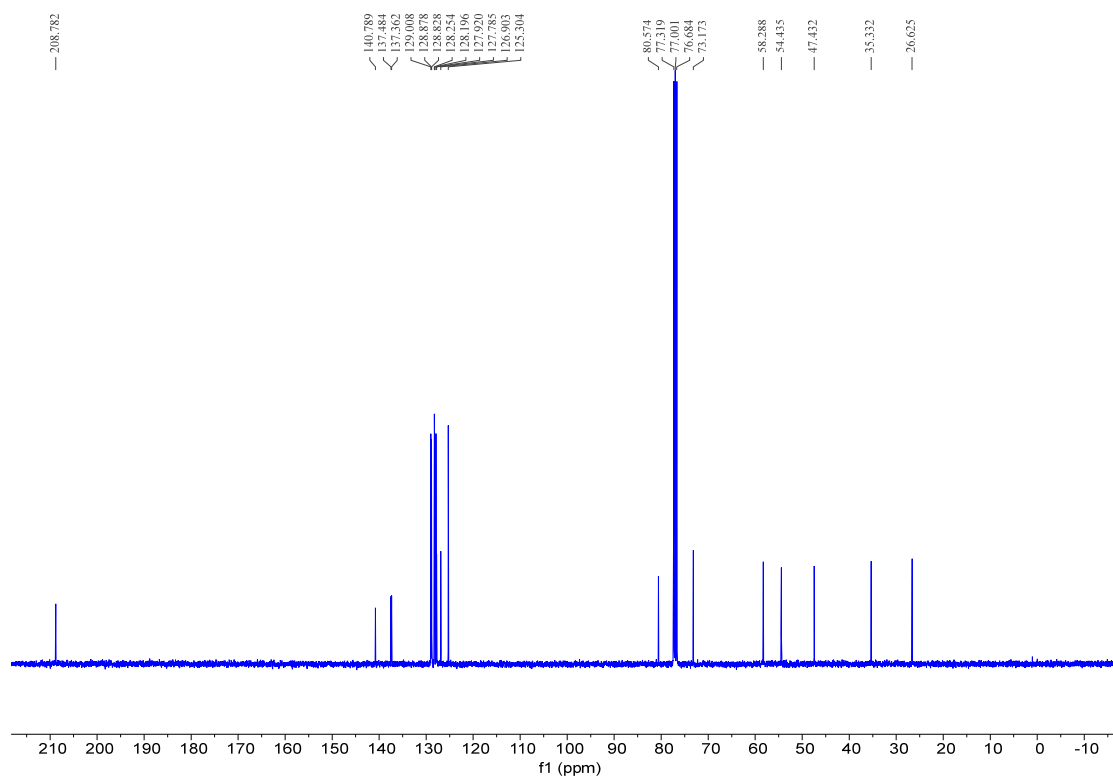
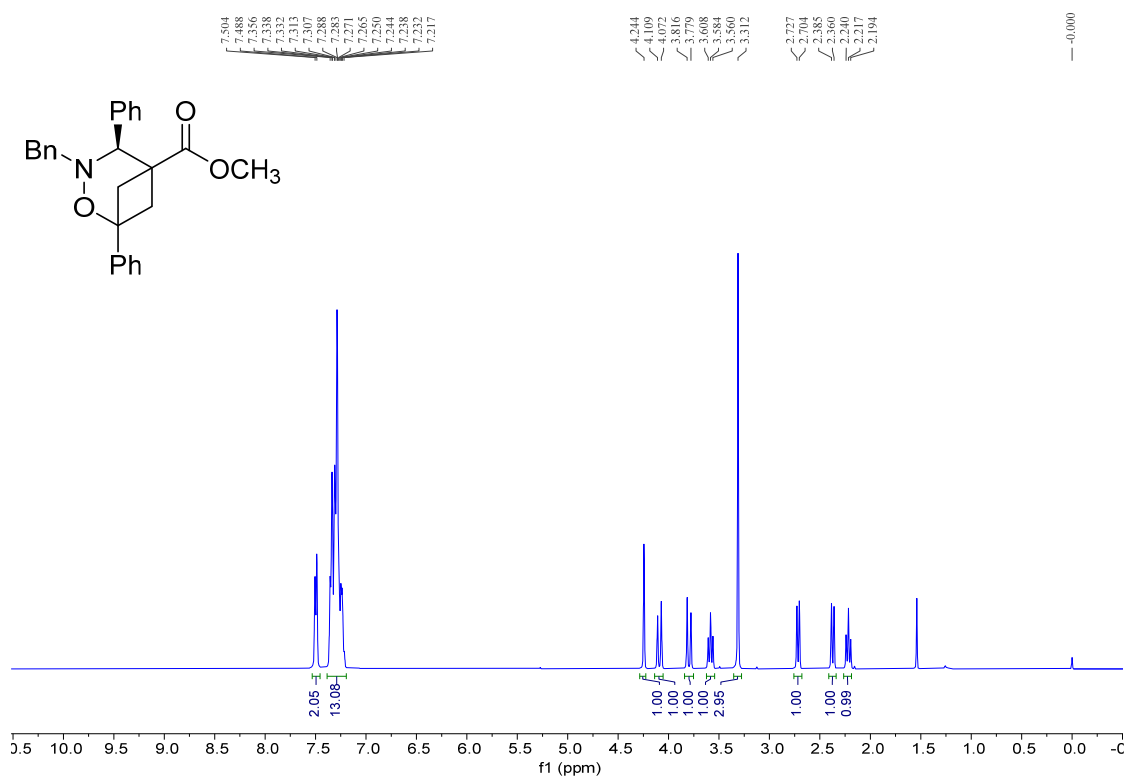
^{19}F NMR (376 MHz, CDCl_3)

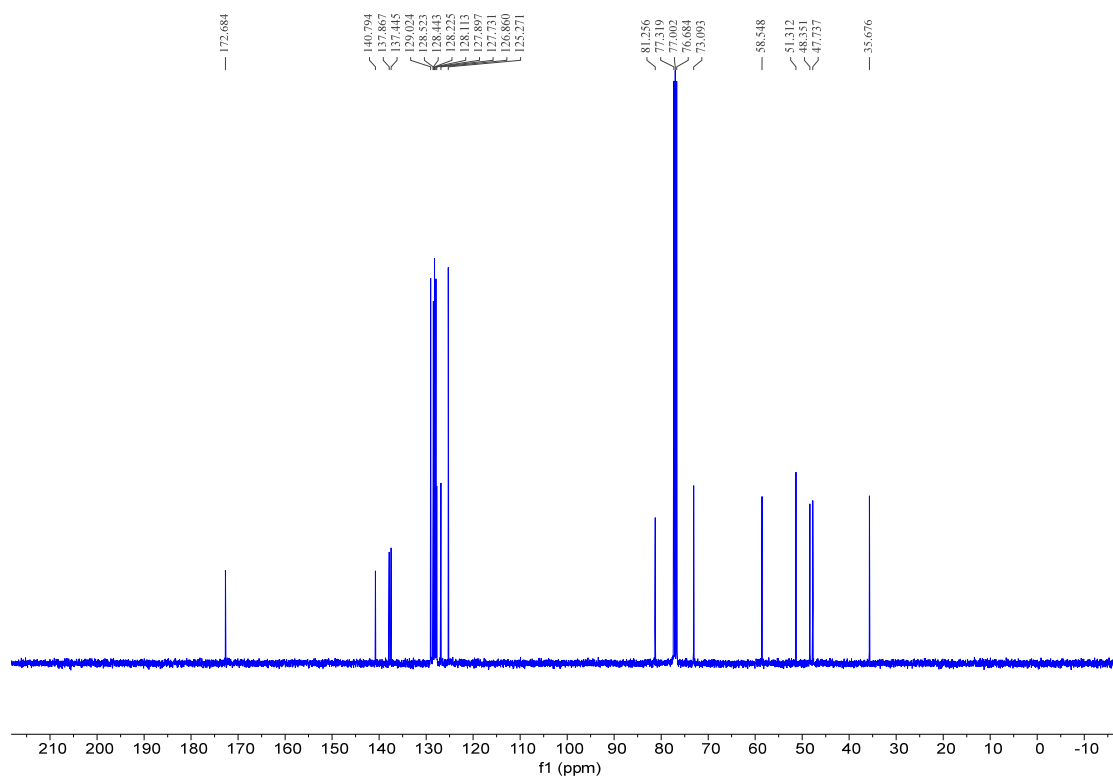
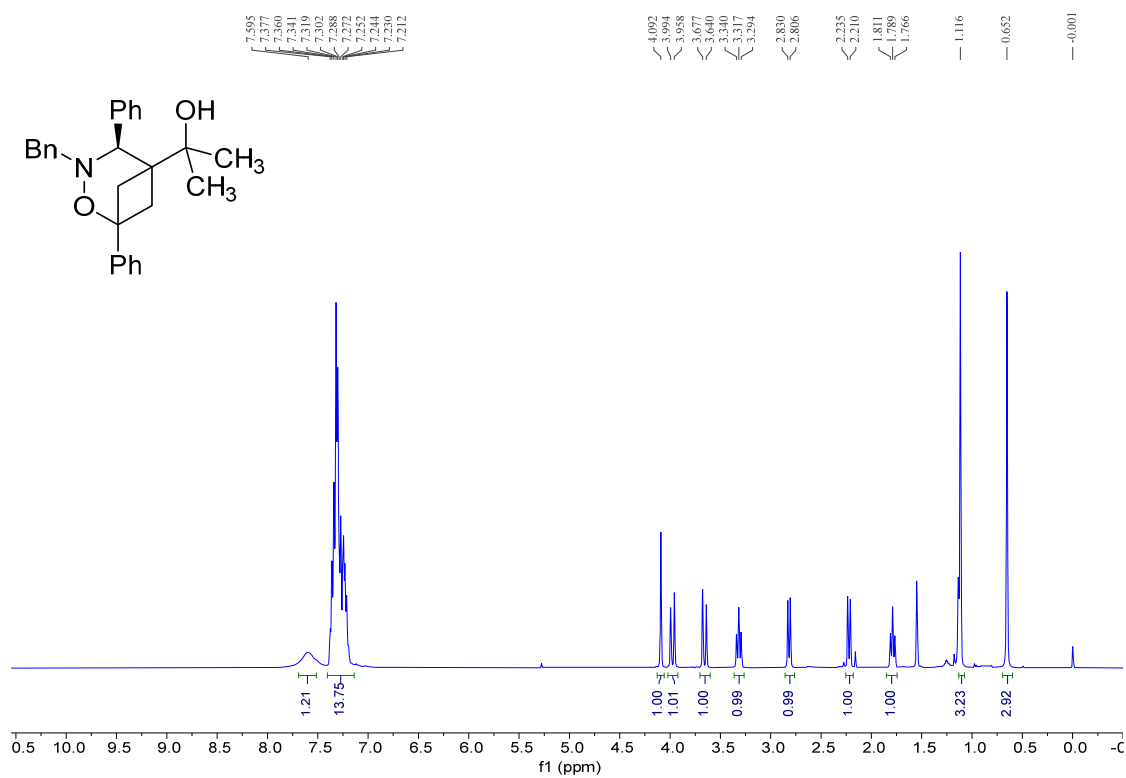


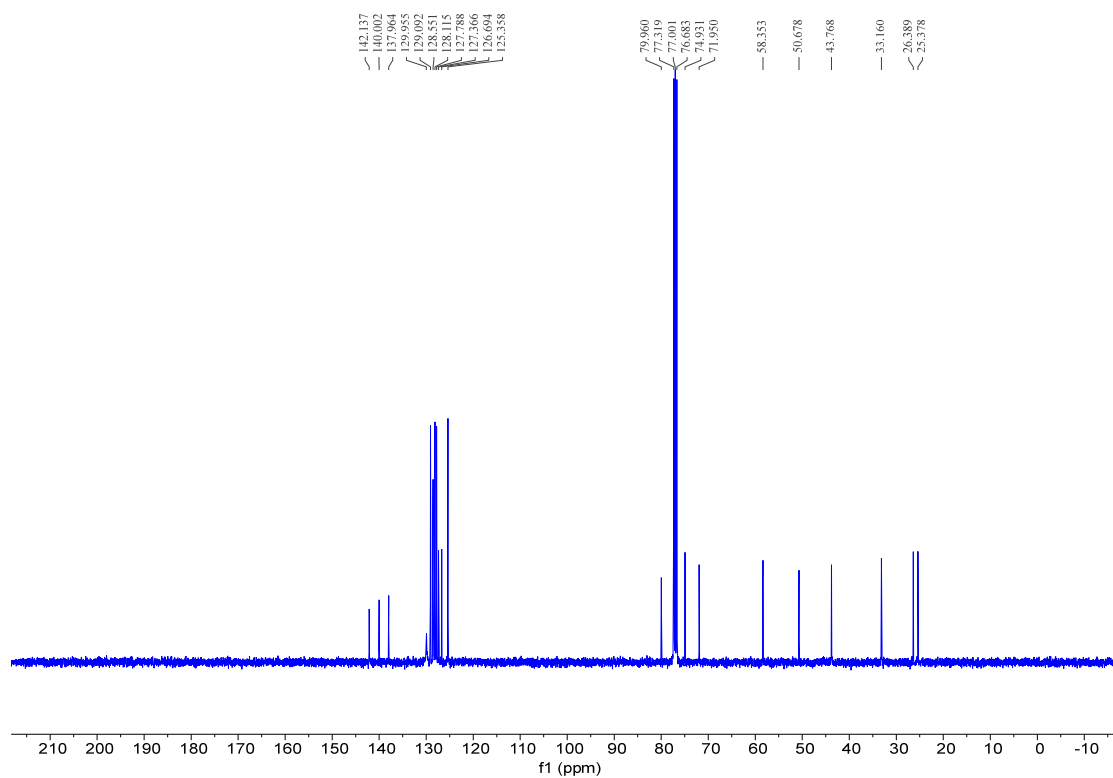
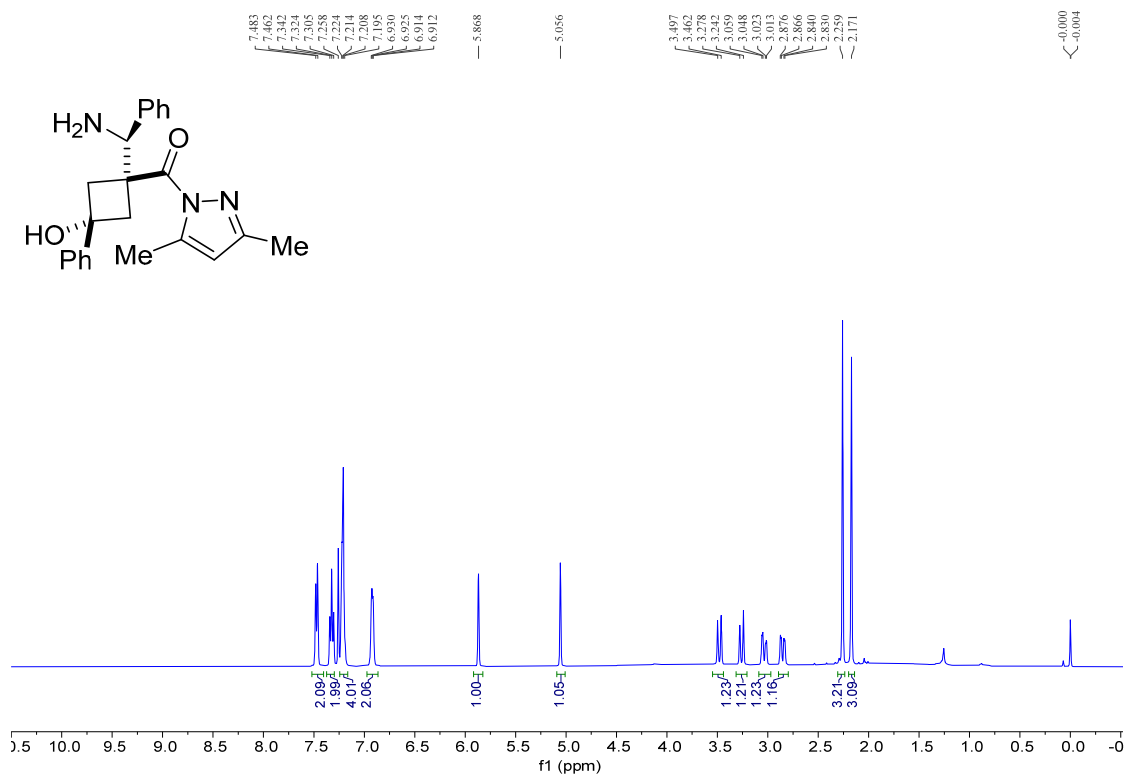
^1H and ^{13}C NMR Spectra for Compound 5:

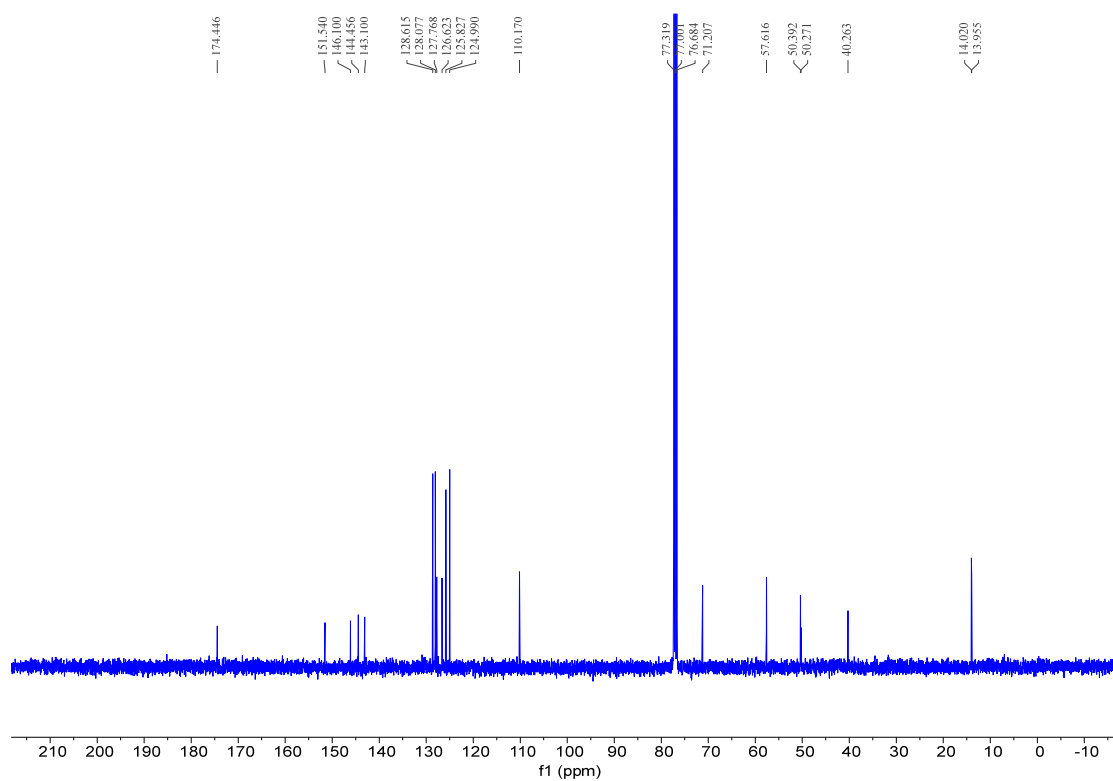
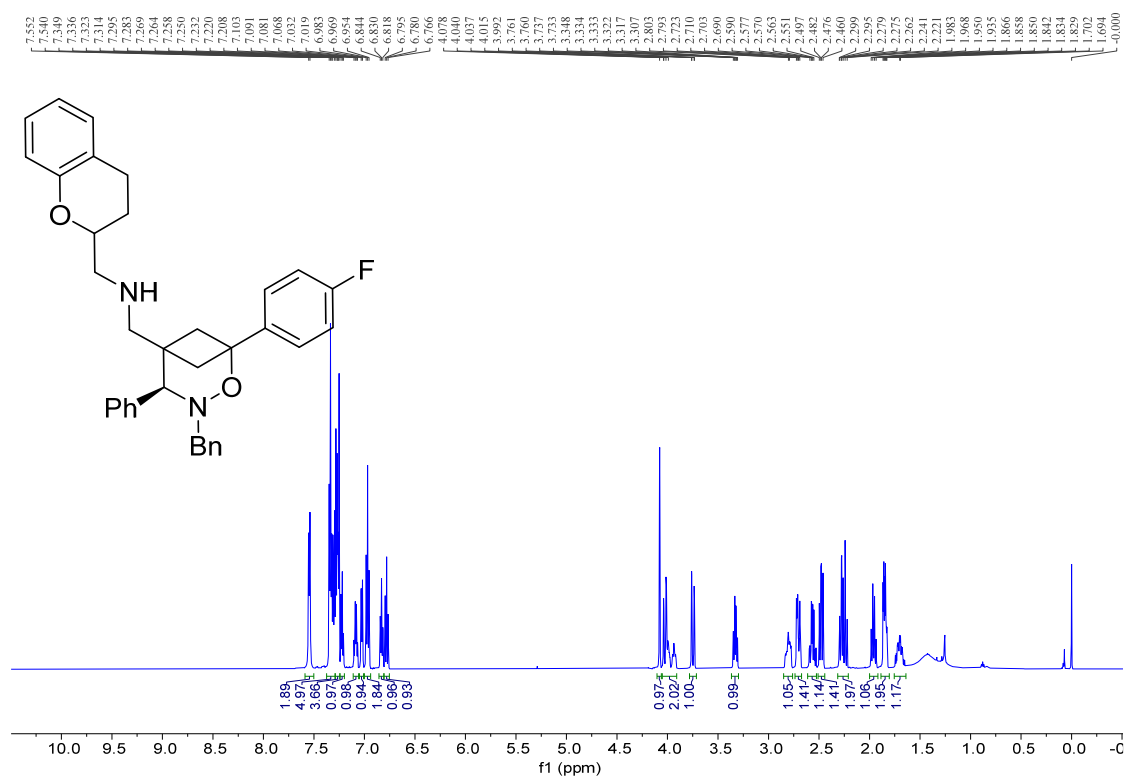
^1H NMR (400 MHz, CDCl_3)

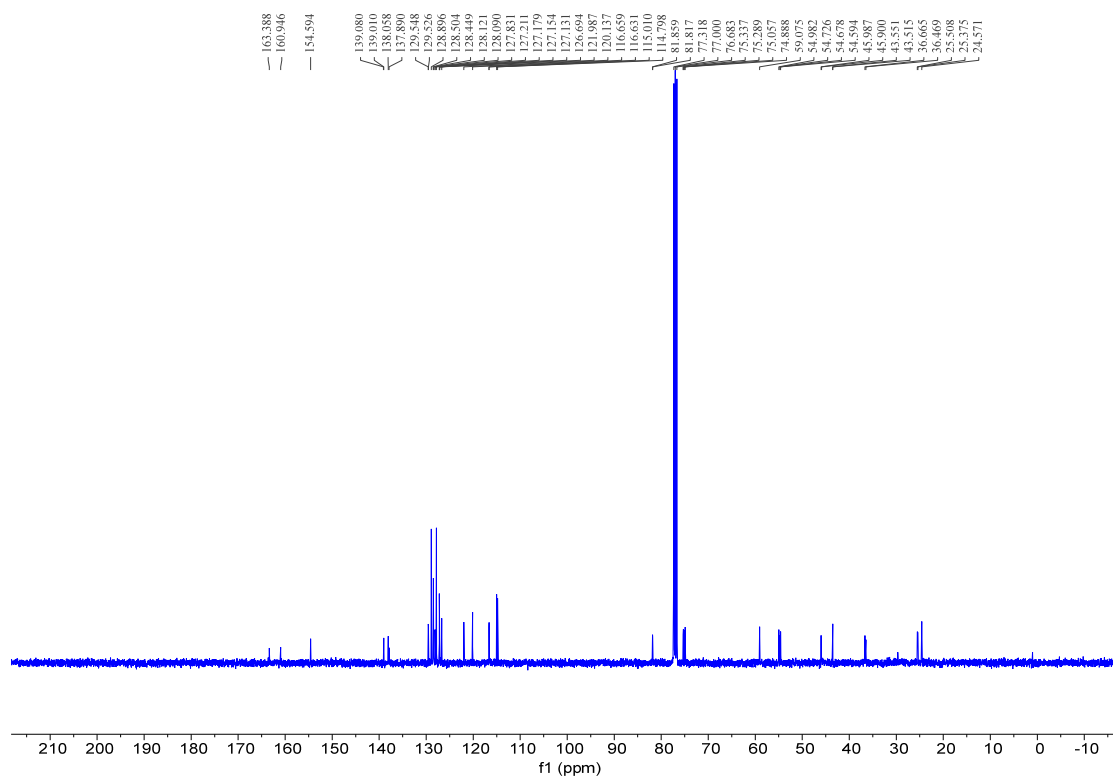
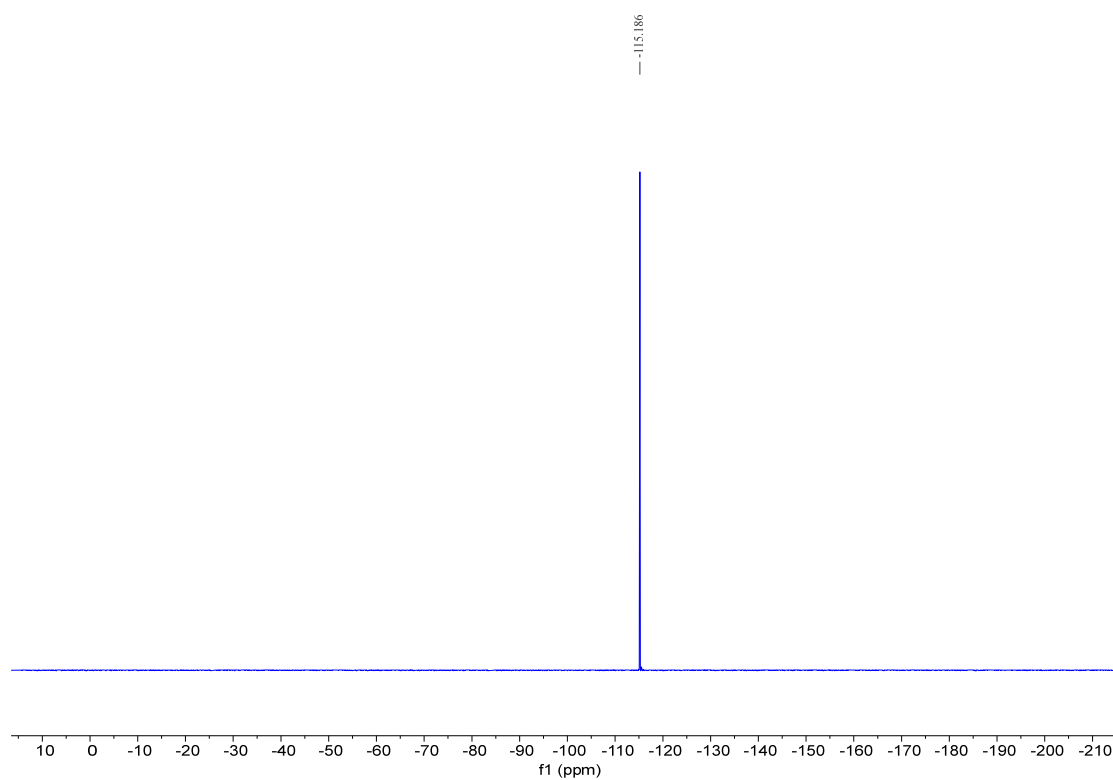


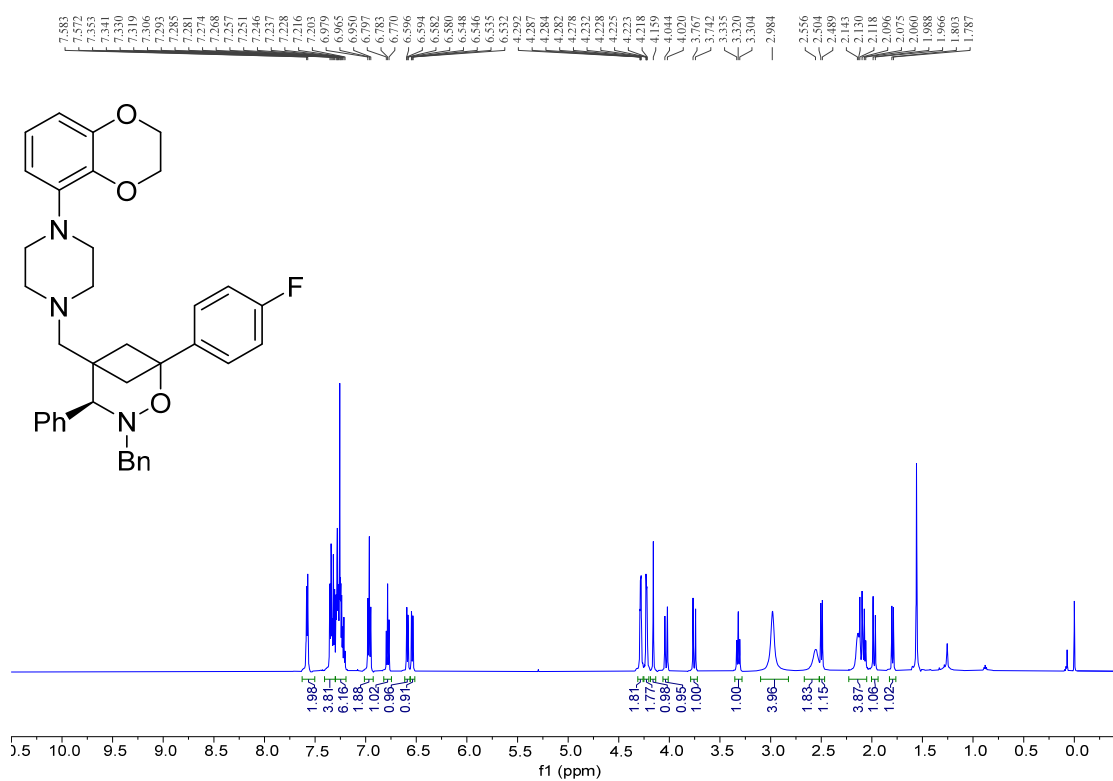
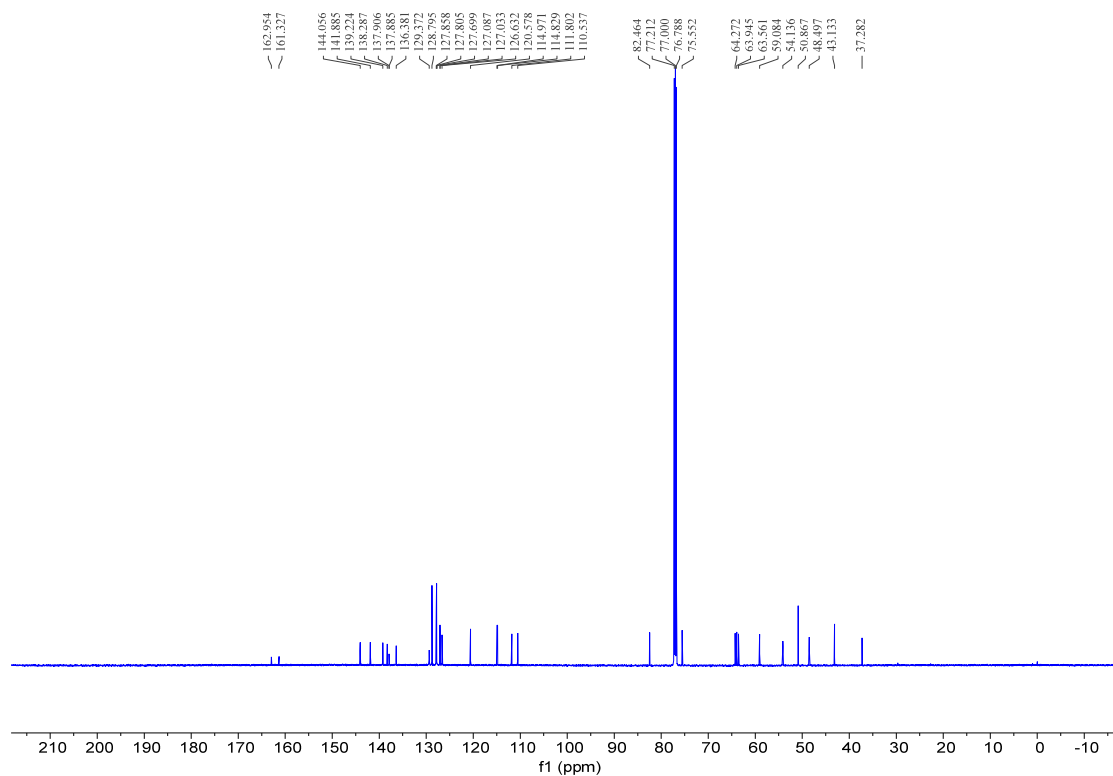
^{13}C NMR (100 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 6: ^1H NMR (400 MHz, CDCl_3)

^{13}C NMR (100 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 7: ^1H NMR (400 MHz, CDCl_3)

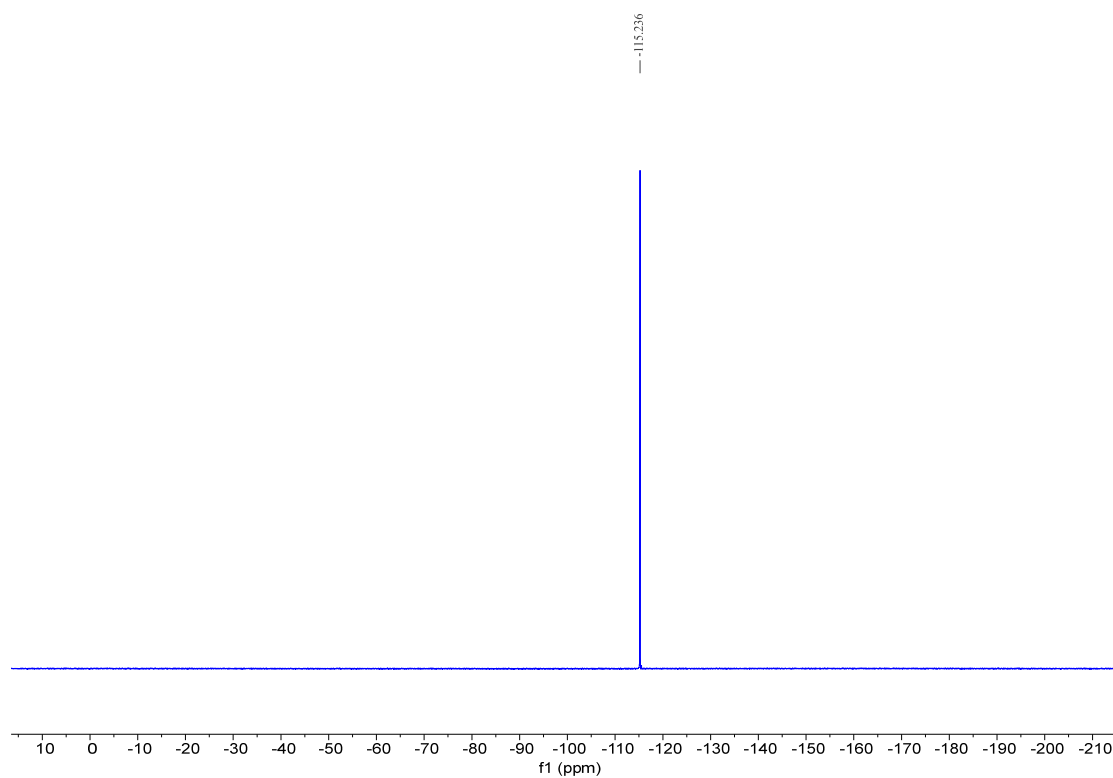
^{13}C NMR (100 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 8: ^1H NMR (400 MHz, CDCl_3)

^{13}C NMR (100 MHz, CDCl_3) ^1H , ^{13}C and ^{19}F NMR Spectra for Compound 9: ^1H NMR (600 MHz, CDCl_3)

^{13}C NMR (100 MHz, CDCl_3) ^{19}F NMR (565 MHz, CDCl_3)

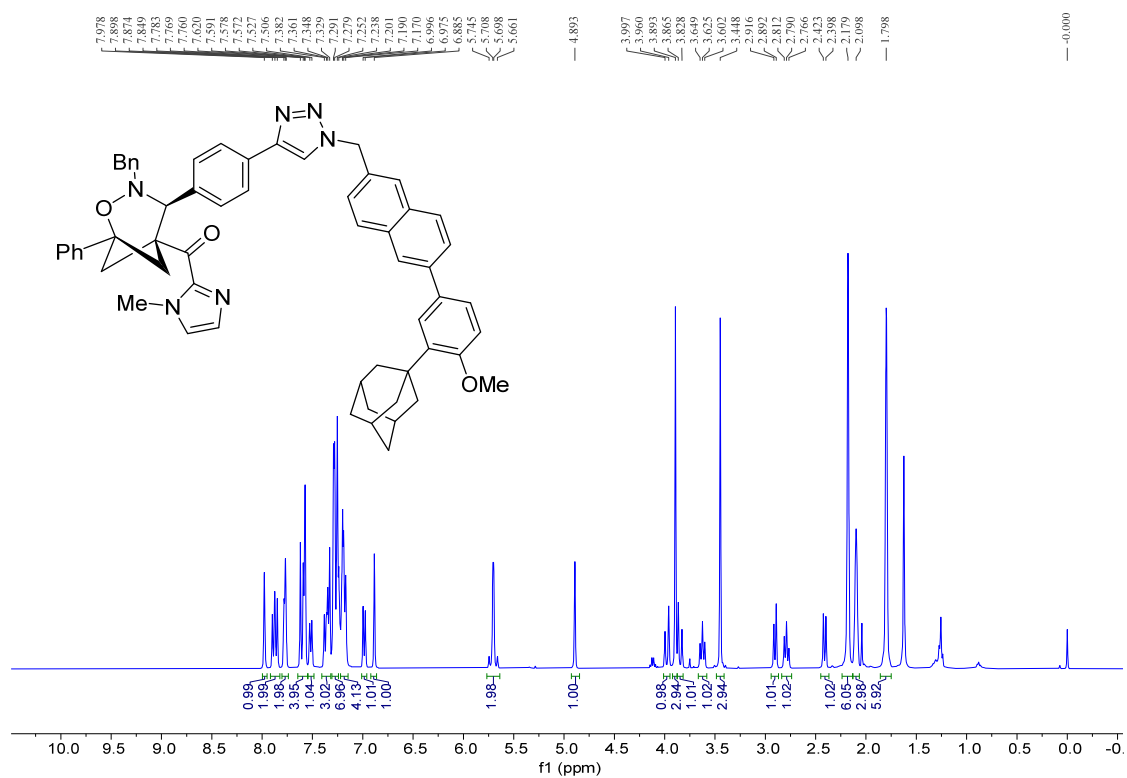
^1H , ^{13}C and ^{19}F NMR Spectra for Compound 10: **^1H NMR (600 MHz, CDCl_3)** **^{13}C NMR (150 MHz, CDCl_3)**

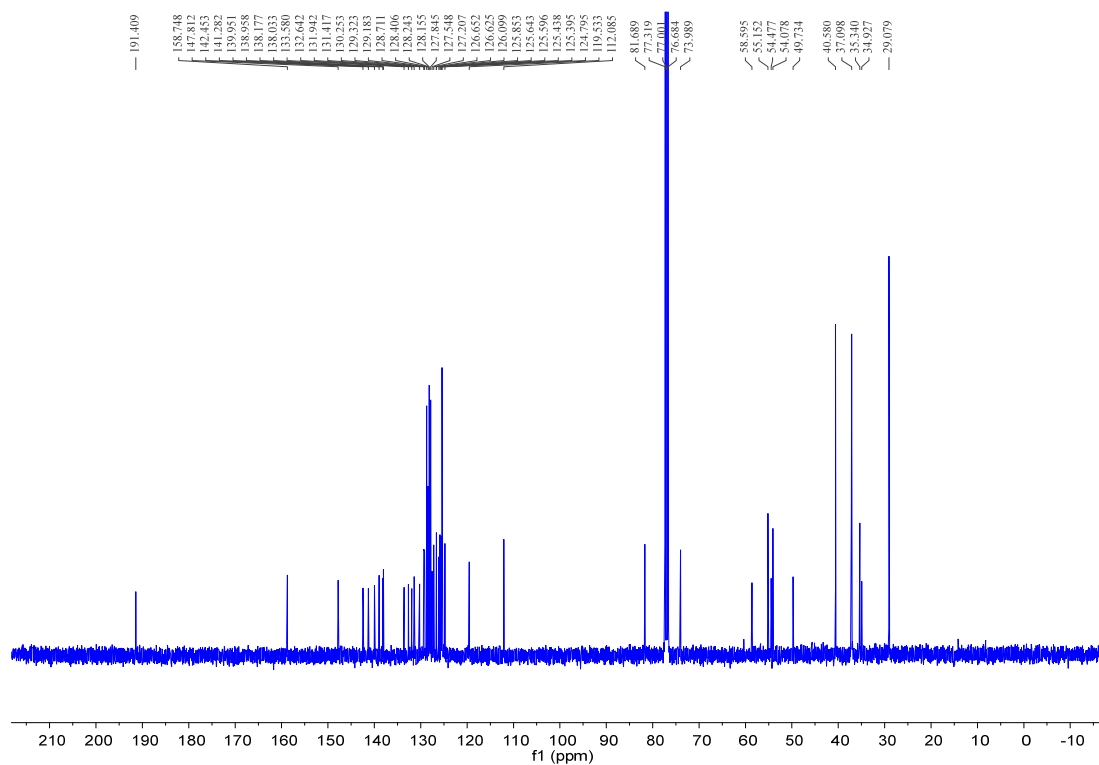
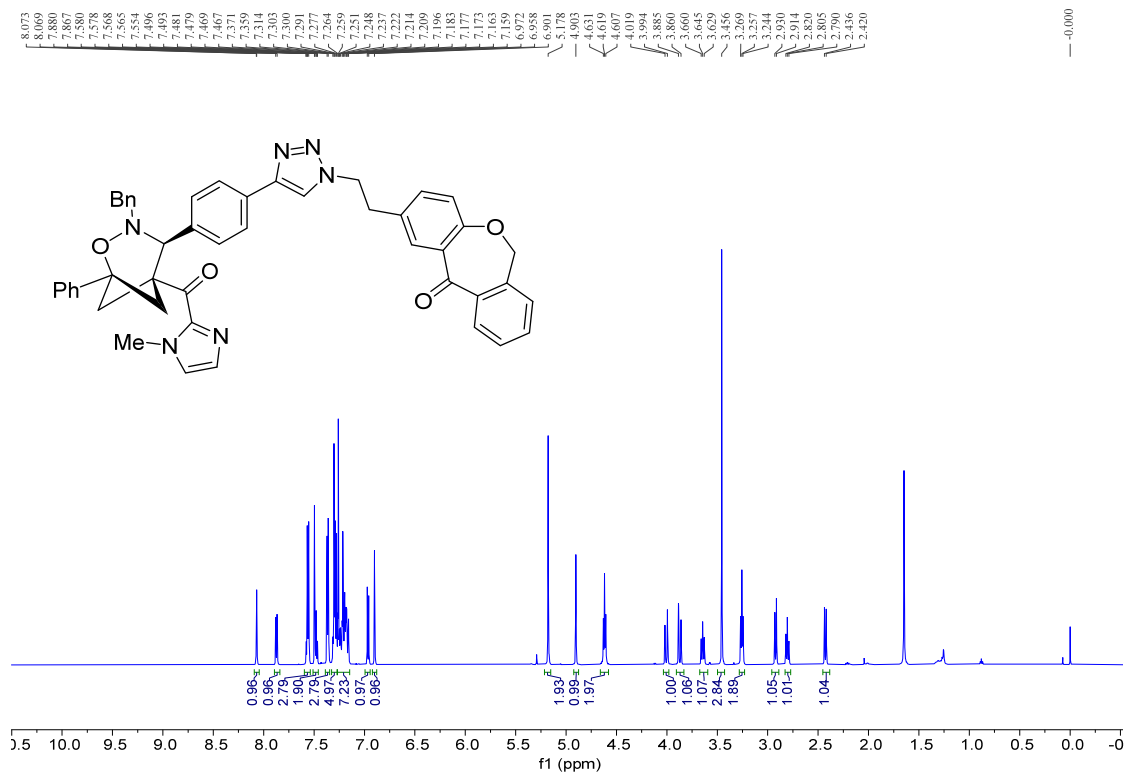
^{19}F NMR (565 MHz, CDCl_3)

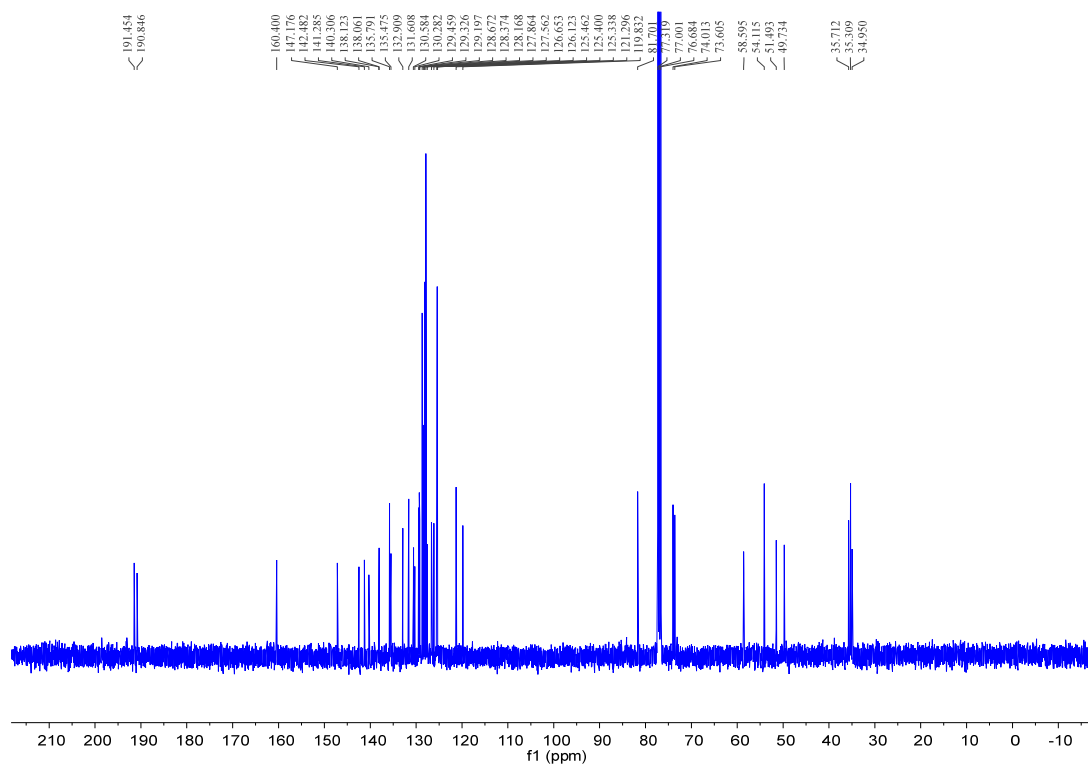


^1H and ^{13}C NMR Spectra for Compound 11:

^1H NMR (600 MHz, CDCl_3)



^{13}C NMR (150 MHz, CDCl_3) ^1H and ^{13}C NMR Spectra for Compound 12: ^1H NMR (600 MHz, CDCl_3)

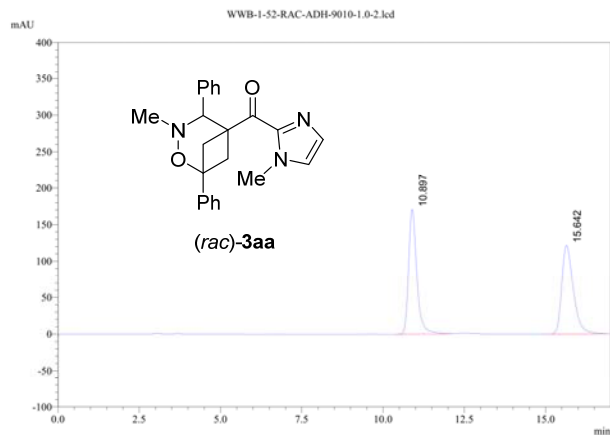
^{13}C NMR (100 MHz, CDCl_3)

Analysis Report

2024-03-19 11:21:33 1 / 1



Sample Name : WWB-1-52-RAC-ADH-9010-1.0-1
 Sample ID : WWB-1-52-RAC-ADH-9010-1.0-1
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 Method File : 90-10.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2023/10/8 10:12:50
 Date Processed : 2023/10/8 10:32:29



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.897	10.392	170784	3015242	50.071
2	15.642	14.983	121756	3006637	49.929
Total			292540	6021879	100.000

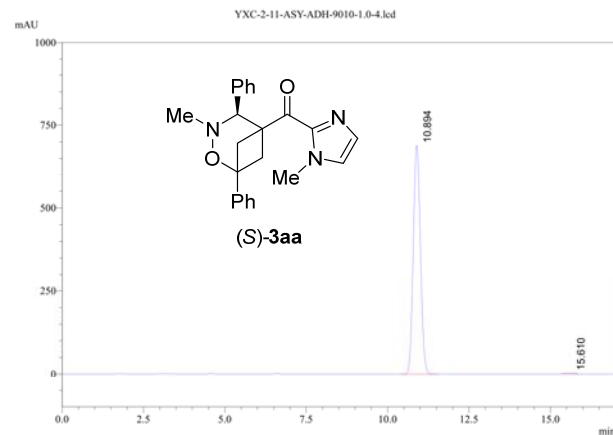
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Analysis Report

2024-03-19 11:21:10 1 / 1



Sample Name : YXC-2-11-ASY-ADH-9010-1.0-3
 Sample ID : YXC-2-11-ASY-ADH-9010-1.0-3
 Data File : YXC-2-11-ASY-ADH-9010-1.0-4.lcd
 Method File : 90-10.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2024/3/19 11:03:01
 Date Processed : 2024/3/19 11:20:40



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
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2	15.610	15.333	3333	60216	0.567
Total			692191	10613509	100.000

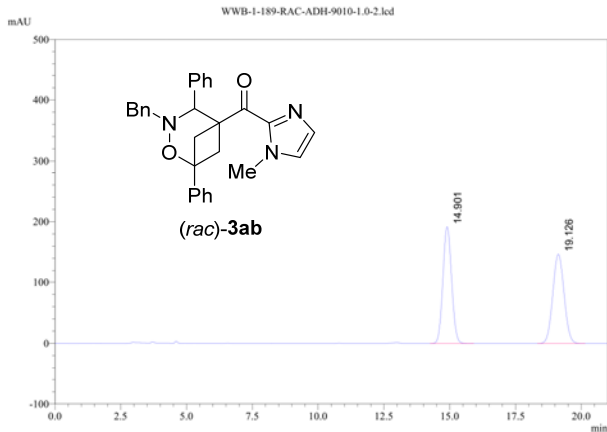
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Analysis Report

2024-02-29 16:10:16 1 / 1



Sample Name : WWB-1-189-RAC-ADH-9010-1.0-1
Sample ID : WWB-1-189-RAC-ADH-9010-1.0-1
Data File : WWB-1-189-RAC-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/2/29 15:43:43
Date Processed : 2024/2/29 16:07:46



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
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2	19.126	18.325	147012	4377492	49.809
Total			338924	8788538	100.000

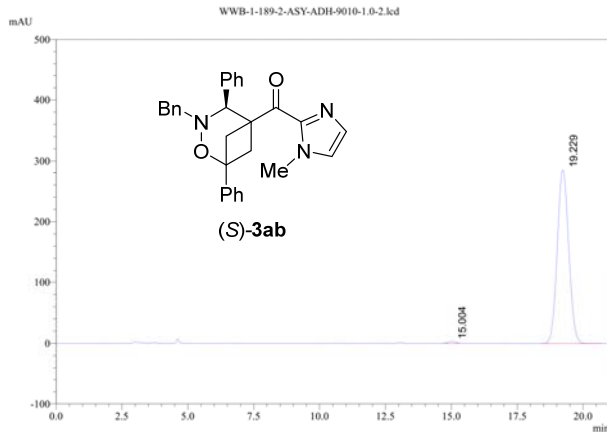
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Analysis Report

2024-02-29 16:09:55 1 / 1



Sample Name : WWB-1-189-2-ASY-ADH-9010-1.0-1
Sample ID : WWB-1-189-2-ASY-ADH-9010-1.0-1
Data File : WWB-1-189-2-ASY-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/2/29 15:18:31
Date Processed : 2024/2/29 16:09:08



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
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2	19.229	18.317	285544	8609355	99.274
Total			288543	8672342	100.000

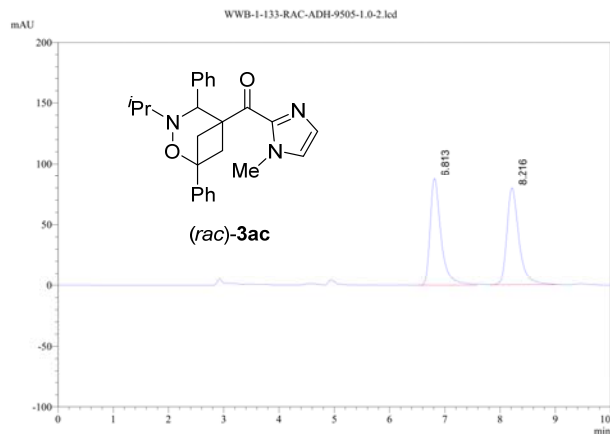
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Analysis Report

2024-03-25 19:39:22 1 / 1



Sample Name : WWB-1-133-RAC-ADH-9505-1.0-1
 Sample ID : WWB-1-133-RAC-ADH-9505-1.0-1
 Data File : WWB-1-133-RAC-ADH-9505-1.0-2.lcd
 Method File : 90-10.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2023/12/27 17:12:50
 Date Processed : 2024/3/25 19:29:13



Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
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2	8.216	7.9577	79577	1212012	49.936
Total			167277	2427142	100.000

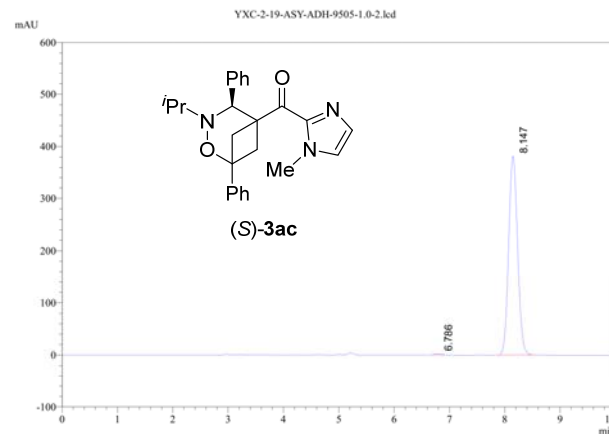
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Analysis Report

2024-03-25 19:40:30 1 / 1



Sample Name : YXC-2-19-ASY-ADH-9505-1.0-1
 Sample ID : YXC-2-19-ASY-ADH-9505-1.0-1
 Data File : YXC-2-19-ASY-ADH-9505-1.0-2.lcd
 Method File : 90-10.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2024/3/25 19:26:25
 Date Processed : 2024/3/25 19:40:10



Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	6.786	6.683	2030	15116	0.352
2	8.147	7.883	381725	4274411	99.648
Total			383755	4289527	100.000

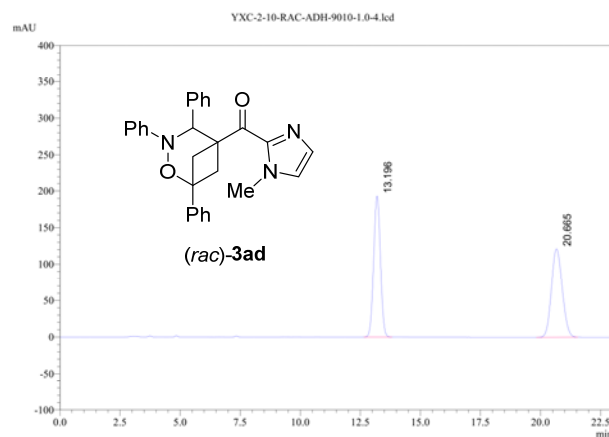
D:\1-Date\6-WWB\YXC-2-19-ASY-ADH-9505-1.0-2.lcd

Analysis Report

2024-03-19 10:42:32 1 / 1



Sample Name : YXC-2-10-RAC-ADH-9010-1.0-3
Sample ID : YXC-2-10-RAC-ADH-9010-1.0-3
Data File : YXC-2-10-RAC-ADH-9010-1.0-4.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/19 10:08:44
Date Processed : 2024/3/19 10:38:08



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	13.196	12.642	192865	3787653	49.943
2	20.665	19.825	121229	3796231	50.057
Total			314094	7583884	100.000

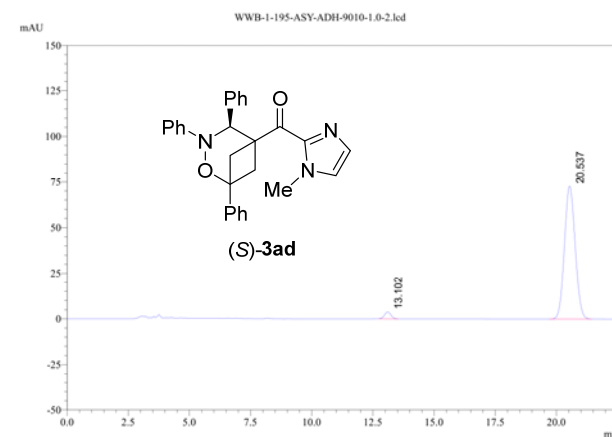
D:\1-Data\6-WWB\YXC-2-10-RAC-ADH-9010-1.0-4.lcd

Analysis Report

2024-03-20 10:08:07 1 / 1



Sample Name : WWB-1-195-ASY-ADH-9010-1.0-1
Sample ID : WWB-1-195-ASY-ADH-9010-1.0-1
Data File : WWB-1-195-ASY-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/20 9:43:58
Date Processed : 2024/3/20 10:07:20



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	13.102	12.733	3707	68303	2.977
2	20.537	19.708	72778	2226030	97.023
Total			76485	2294333	100.000

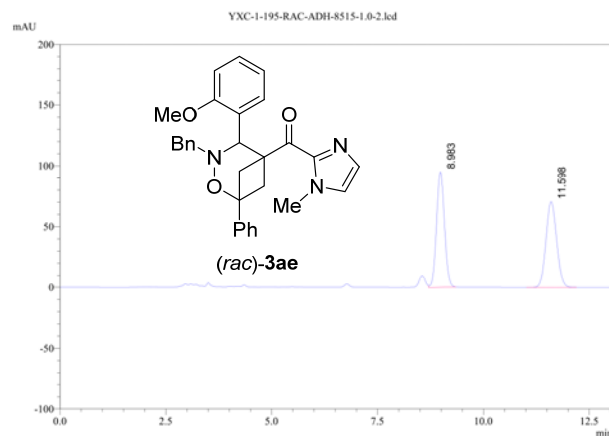
D:\1-Data\6-WWB\WWB-1-195-ASY-ADH-9010-1.0-2.lcd

Analysis Report

2024-03-14 10:36:44 1 / 1



Sample Name : YXC-1-195-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-195-RAC-ADH-8515-1.0-1
Data File : YXC-1-195-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 10:20:15
Date Processed : 2024/3/14 10:34:04



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.983	8.700	95065	1247877	50.084
2	11.598	11.017	70505	1243670	49.916
Total			165570	2491547	100.000

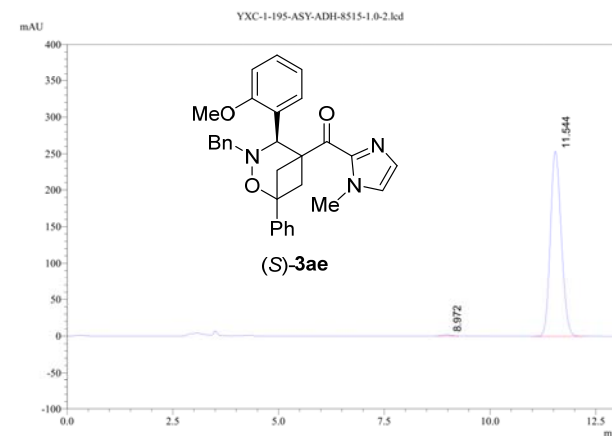
D:\1-Data\6-WWB\YXC-1-195-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-14 10:51:49 1 / 1



Sample Name : YXC-1-195-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-195-ASY-ADH-8515-1.0-1
Data File : YXC-1-195-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 10:34:59
Date Processed : 2024/3/14 10:51:26



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.972	8.717	2025	26632	0.584
2	11.544	10.975	253743	4537244	99.416
Total			255767	4563875	100.000

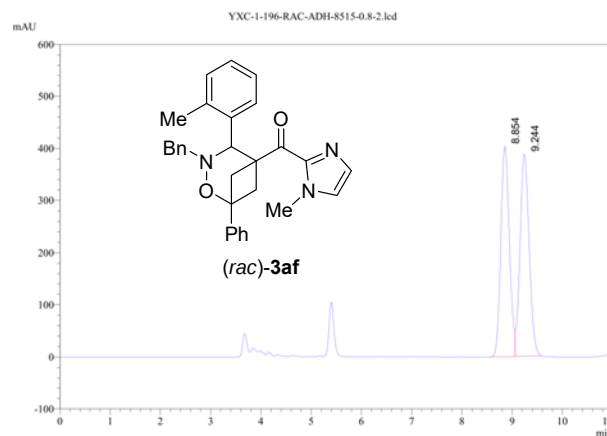
D:\1-Data\6-WWB\YXC-1-195-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-14 17:27:47 1 / 1



Sample Name : YXC-1-196-RAC-ADH-8515-0.8-1
Sample ID : YXC-1-196-RAC-ADH-8515-0.8-1
Data File : YXC-1-196-RAC-ADH-8515-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 16:55:47
Date Processed : 2024/3/14 17:14:21



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.854	8.558	402694	4768315	49.462
2	9.244	9.058	387074	4872079	50.538
Total			789768	9640394	100.000

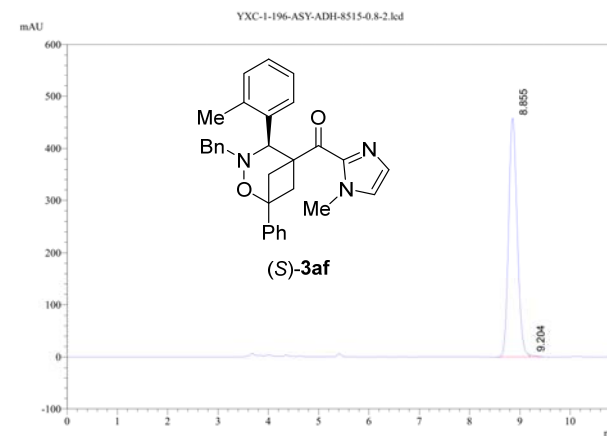
D:\1-Data\6-WWB\YXC-1-196-RAC-ADH-8515-0.8-2.lcd

Analysis Report

2024-03-14 17:27:58 1 / 1



Sample Name : YXC-1-196-ASY-ADH-8515-0.8-1
Sample ID : YXC-1-196-ASY-ADH-8515-0.8-1
Data File : YXC-1-196-ASY-ADH-8515-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 17:15:02
Date Processed : 2024/3/14 17:27:17



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.855	8.525	457725	5447201	99.500
2	9.204	9.192	4137	27348	0.500
Total			461861	5474549	100.000

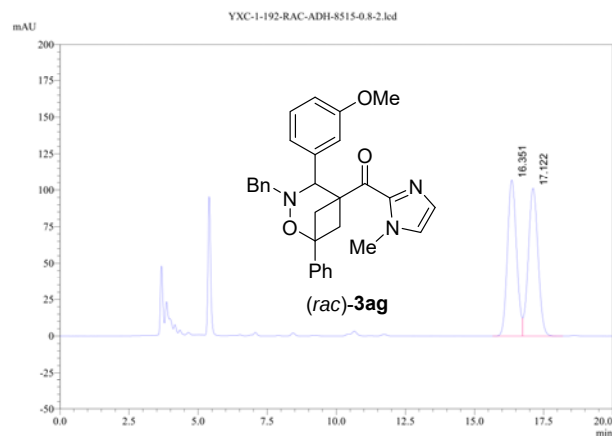
D:\1-Data\6-WWB\YXC-1-196-ASY-ADH-8515-0.8-2.lcd

Analysis Report

2024-03-14 16:30:29 1 / 1



Sample Name : YXC-1-192-RAC-ADH-8515-0.8-1
Sample ID : YXC-1-192-RAC-ADH-8515-0.8-1
Data File : YXC-1-192-RAC-ADH-8515-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 16:03:24
Date Processed : 2024/3/14 16:27:32



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	16.351	15.658	106713	2456846	49.695
2	17.122	16.742	101089	2486953	50.305
Total			207802	4943799	100.000

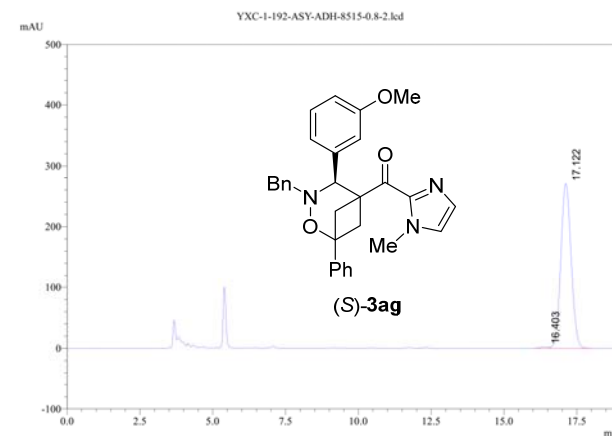
D:\1-Data\6-WWBI\YXC-1-192-RAC-ADH-8515-0.8-2.lcd

Analysis Report

2024-04-16 15:48:02 1 / 1



Sample Name : YXC-1-192-ASY-ADH-8515-0.8-1
Sample ID : YXC-1-192-ASY-ADH-8515-0.8-1
Data File : YXC-1-192-ASY-ADH-8515-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 16:28:31
Date Processed : 2024/3/14 16:54:40



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	16.403	15.958	2524	50867	0.757
2	17.122	16.567	270544	6665730	99.243
Total			273067	6716597	100.000

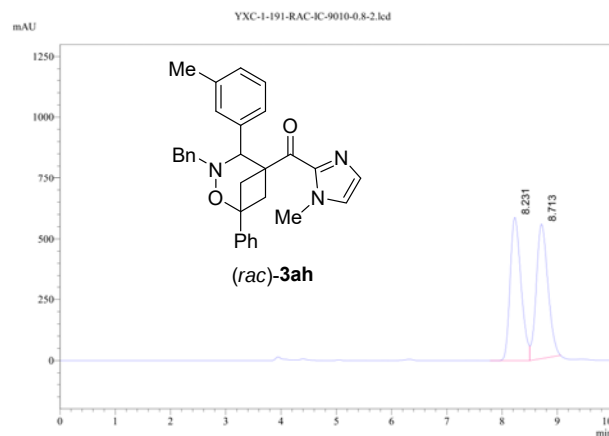
D:\1-Data\6-WWBI\YXC-1-192-ASY-ADH-8515-0.8-2.lcd

Analysis Report

2024-03-16 09:52:18 1 / 1



Sample Name : YXC-1-191-RAC-IC-9010-0.8-1
Sample ID : YXC-1-191-RAC-IC-9010-0.8-1
Data File : YXC-1-191-RAC-IC-9010-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/16 9:14:57
Date Processed : 2024/3/16 9:51:46



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.231	7.783	588033	8088358	49.951
2	8.713	8.500	551916	8104251	50.049
Total			1139950	16192609	100.000

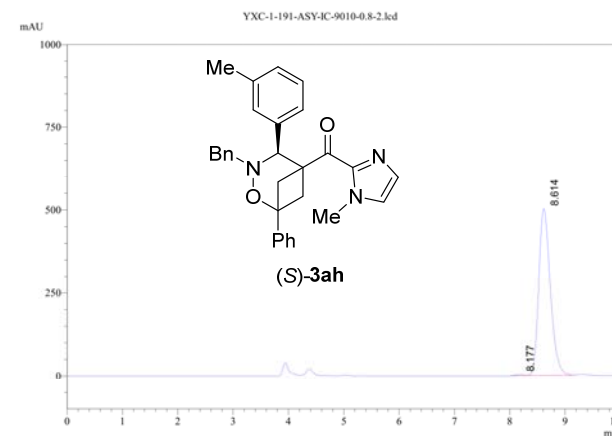
D:\1-Data\6-WWBI\YXC-1-191-RAC-IC-9010-0.8-2.lcd

Analysis Report

2024-03-16 09:50:25 1 / 1



Sample Name : YXC-1-191-ASY-IC-9010-0.8-1
Sample ID : YXC-1-191-ASY-IC-9010-0.8-1
Data File : YXC-1-191-ASY-IC-9010-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/16 9:32:22
Date Processed : 2024/3/16 9:47:16



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.177	8.008	3983	43181	0.591
2	8.614	8.325	501617	7265326	99.409
Total			505599	7308507	100.000

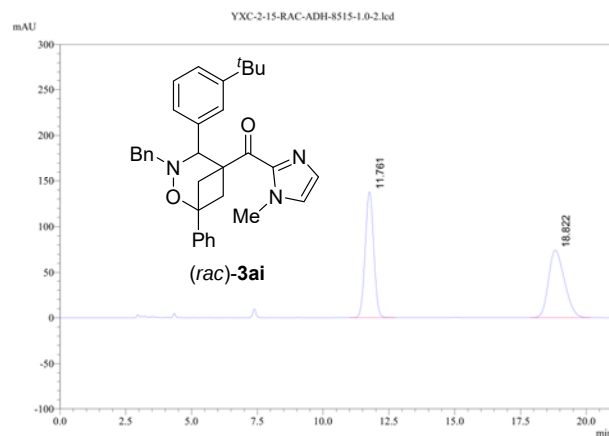
D:\1-Data\6-WWBI\YXC-1-191-ASY-IC-9010-0.8-2.lcd

Analysis Report

2024-03-25 20:50:28 1 / 1



Sample Name : YXC-2-15-RAC-ADH-8515-1.0-1
Sample ID : YXC-2-15-RAC-ADH-8515-1.0-1
Data File : YXC-2-15-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/25 20:01:59
Date Processed : 2024/3/25 20:28:09



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	11.761	11.000	137571	3114842	49.981
2	18.822	17.850	74020	3117169	50.019
Total			211591	6232010	100.000

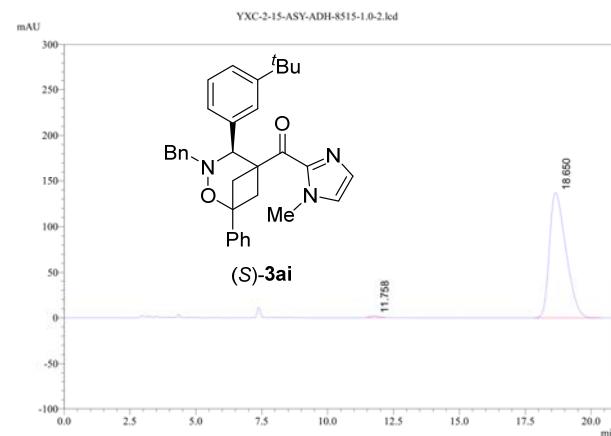
D:\1-Data\6-WWB\YXC-2-15-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-25 20:51:37 1 / 1



Sample Name : YXC-2-15-ASY-ADH-8515-1.0-1
Sample ID : YXC-2-15-ASY-ADH-8515-1.0-1
Data File : YXC-2-15-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/25 20:29:08
Date Processed : 2024/3/25 20:51:10



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	11.758	11.433	1993	41221	0.683
2	18.650	17.842	137169	5990055	99.317
Total			139162	6031276	100.000

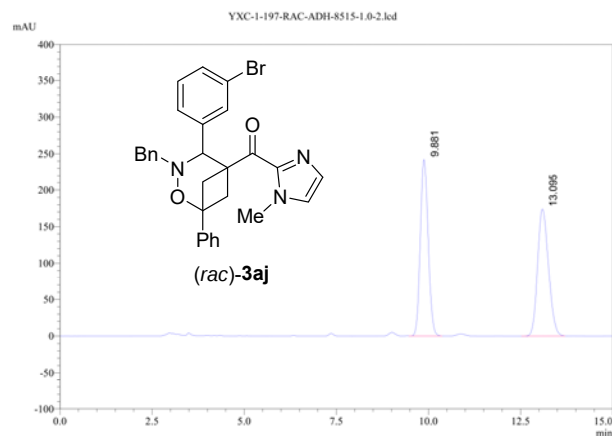
D:\1-Data\6-WWB\YXC-2-15-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-14 11:06:32 1 / 1



Sample Name : YXC-1-197-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-197-RAC-ADH-8515-1.0-1
Data File : YXC-1-197-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 10:03:12
Date Processed : 2024/3/14 10:19:28



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.881	9.467	241857	3589956	49.921
2	13.095	12.525	173776	3601361	50.079
Total			415634	7191317	100.000

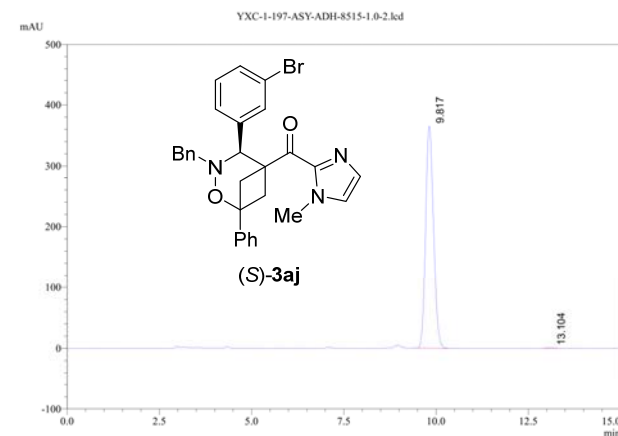
D:\1-Data\6-WWB\YXC-1-197-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-14 11:06:52 1 / 1



Sample Name : YXC-1-197-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-197-ASY-ADH-8515-1.0-1
Data File : YXC-1-197-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 10:48:59
Date Processed : 2024/3/14 11:05:58



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.817	9.425	364823	5429670	99.812
2	13.104	12.867	671	10221	0.188
Total			365494	5439891	100.000

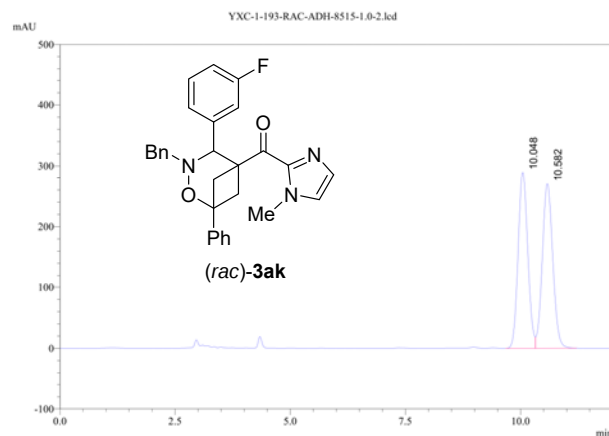
D:\1-Data\6-WWB\YXC-1-197-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-13 19:11:35 1 / 1



Sample Name : YXC-1-193-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-193-RAC-ADH-8515-1.0-1
Data File : YXC-1-193-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/13 18:47:54
Date Processed : 2024/3/13 19:08:11



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.048	9.675	289500	4227893	49.724
2	10.582	10.325	270082	4274824	50.276
Total			559582	8502717	100.000

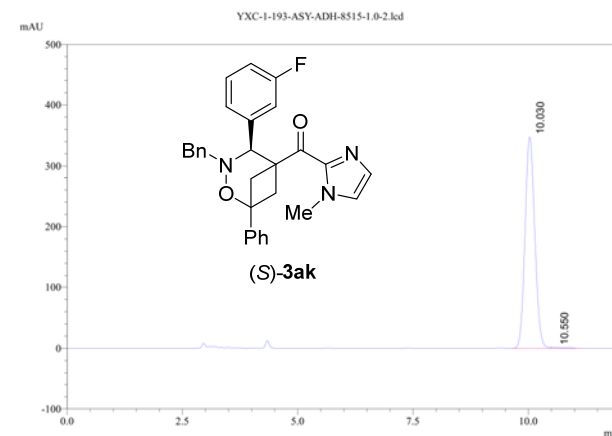
D:\1-Data\6-WWB\YXC-1-193-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-13 19:25:30 1 / 1



Sample Name : YXC-1-193-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-193-ASY-ADH-8515-1.0-1
Data File : YXC-1-193-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/13 19:09:17
Date Processed : 2024/3/13 19:22:48



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.030	9.650	347617	5106310	99.327
2	10.550	10.492	1602	34591	0.673
Total			349219	5140901	100.000

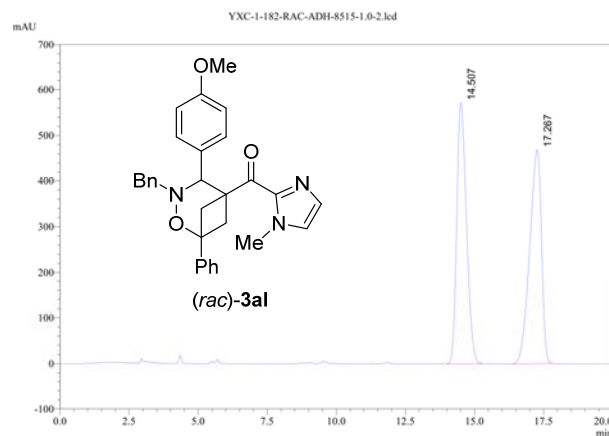
D:\1-Data\6-WWB\YXC-1-193-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 14:53:15 1 / 1



Sample Name : YXC-1-182-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-182-RAC-ADH-8515-1.0-1
Data File : YXC-1-182-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 14:29:32
Date Processed : 2024/3/8 14:50:37



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	14.507	13.975	571643	13895029	50.013
2	17.267	16.292	468627	13887924	49.987
Total			1040270	27782953	100.000

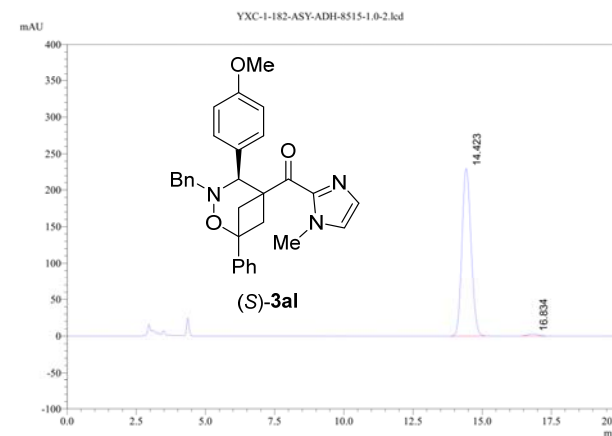
D:\1-Data\6-WWBI\YXC-1-182-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 15:14:25 1 / 1



Sample Name : YXC-1-182-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-182-ASY-ADH-8515-1.0-1
Data File : YXC-1-182-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 14:51:28
Date Processed : 2024/3/8 15:14:05



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	14.423	13.833	230016	5278181	98.628
2	16.834	16.433	2972	73427	1.372
Total			232988	5351608	100.000

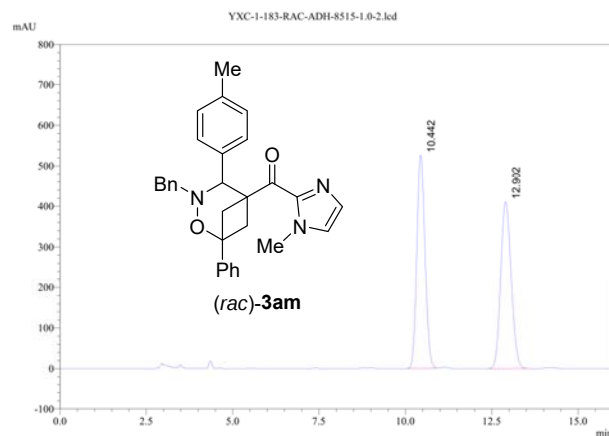
D:\1-Data\6-WWBI\YXC-1-182-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 15:40:34 1 / 1



Sample Name : YXC-1-183-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-183-RAC-ADH-8515-1.0-1
Data File : YXC-1-183-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 15:16:00
Date Processed : 2024/3/8 15:37:43



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.442	10.058	525678	8628731	49.861
2	12.902	12.392	411102	8676742	50.139
Total			936779	17305473	100.000

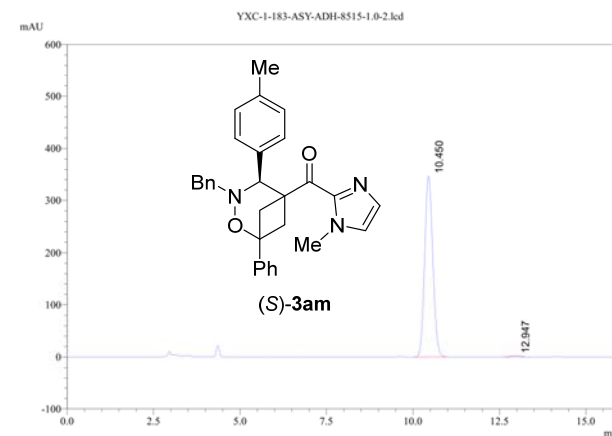
D:\1-Data\6-WWB\YXC-1-183-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 16:28:10 1 / 1



Sample Name : YXC-1-183-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-183-ASY-ADH-8515-1.0-1
Data File : YXC-1-183-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 15:38:36
Date Processed : 2024/3/8 16:01:53



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.450	10.017	347759	5679335	99.159
2	12.947	12.592	2471	48178	0.841
Total			350230	5727513	100.000

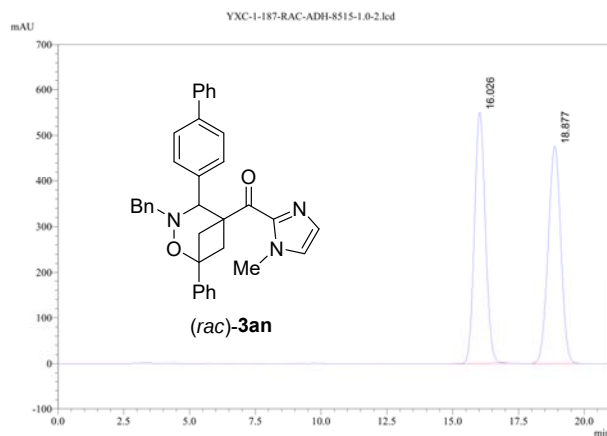
D:\1-Data\6-WWB\YXC-1-183-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 10:21:28 1 / 1



Sample Name : YXC-1-187-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-187-RAC-ADH-8515-1.0-1
Data File : YXC-1-187-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 9:52:51
Date Processed : 2024/3/8 10:18:33



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	16.026	15.067	549967	15891895	49.912
2	18.877	17.925	475898	15947992	50.088
Total			1025865	31839887	100.000

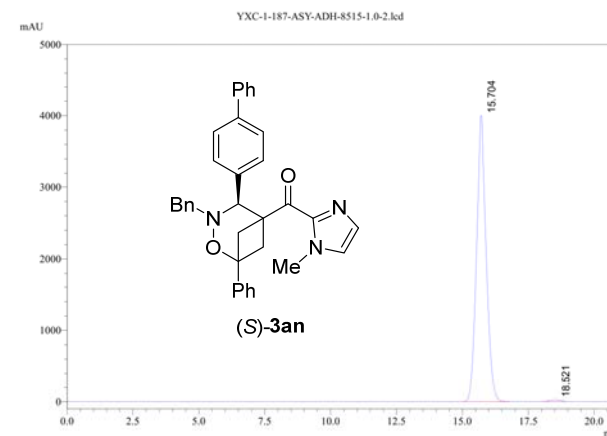
D:\1-Data\6-WWB\YXC-1-187-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 10:41:45 1 / 1



Sample Name : YXC-1-187-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-187-ASY-ADH-8515-1.0-1
Data File : YXC-1-187-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 10:19:31
Date Processed : 2024/3/8 10:41:07



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	15.704	15.000	3998580	100714192	99.353
2	18.521	18.050	23121	655880	0.647
Total			4021701	101370072	100.000

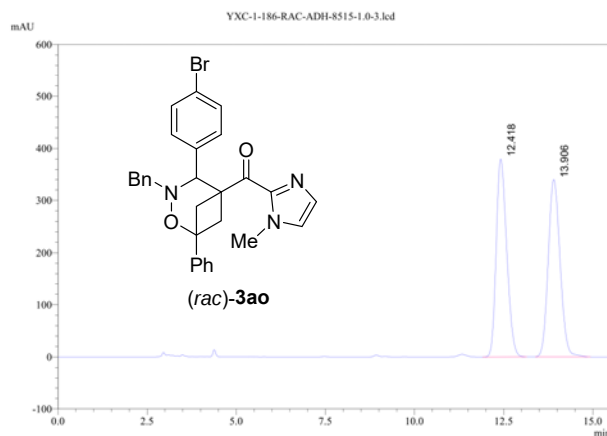
D:\1-Data\6-WWB\YXC-1-187-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-06 21:42:33 1 / 1



Sample Name : YXC-1-186-RAC-ADH-8515-1.0-2
Sample ID : YXC-1-186-RAC-ADH-8515-1.0-2
Data File : YXC-1-186-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/6 21:07:47
Date Processed : 2024/3/6 21:42:20



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.418	11.908	379652	7774863	49.728
2	13.906	13.383	339545	7859883	50.272
Total			719197	15634746	100.000

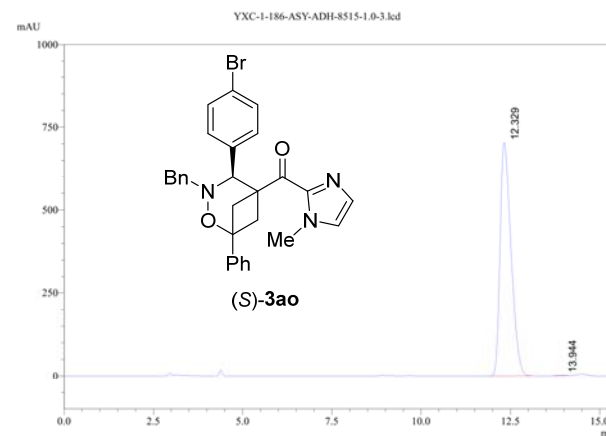
D:\1-Data\6-WWBI\YXC-1-186-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-06 21:43:45 1 / 1



Sample Name : YXC-1-186-ASY-ADH-8515-1.0-2
Sample ID : YXC-1-186-ASY-ADH-8515-1.0-2
Data File : YXC-1-186-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/6 21:24:51
Date Processed : 2024/3/6 21:43:26



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.329	11.925	702846	14945422	99.813
2	13.944	13.650	1687	28046	0.187
Total			704533	14973468	100.000

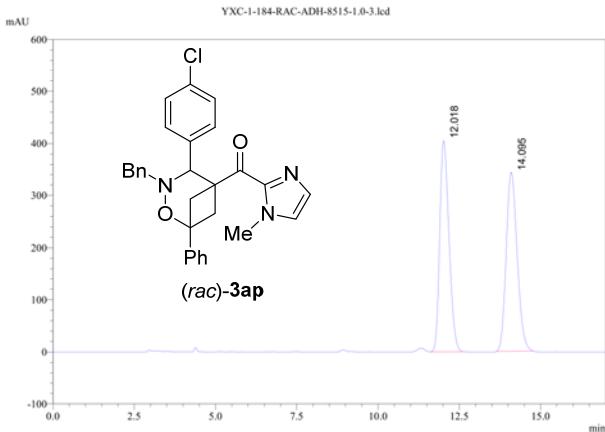
D:\1-Data\6-WWBI\YXC-1-186-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-06 21:10:49 1 / 1



Sample Name : YXC-1-184-RAC-ADH-8515-1.0-2
Sample ID : YXC-1-184-RAC-ADH-8515-1.0-2
Data File : YXC-1-184-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/6 20:09:52
Date Processed : 2024/3/6 20:33:38



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.018	11.600	404519	7964018	49.828
2	14.095	13.633	342160	8019079	50.172
Total			746679	15983097	100.000

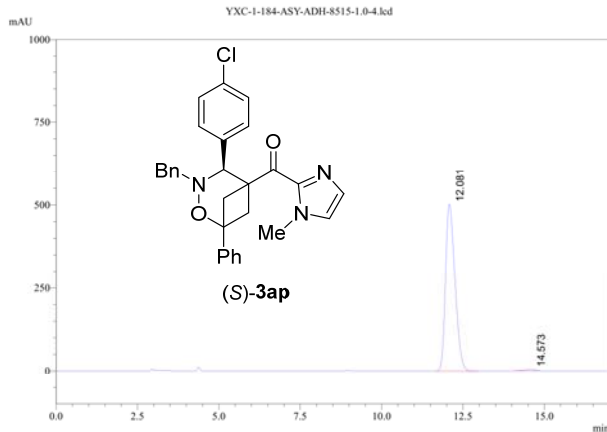
D:\1-Data\6-WWB\YXC-1-184-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-06 21:09:52 1 / 1



Sample Name : YXC-1-184-ASY-ADH-8515-1.0-2
Sample ID : YXC-1-184-ASY-ADH-8515-1.0-2
Data File : YXC-1-184-ASY-ADH-8515-1.0-4.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/6 20:48:58
Date Processed : 2024/3/6 21:09:31



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.081	11.658	502613	10151025	98.904
2	14.573	14.042	4749	112448	1.096
Total			507362	10263474	100.000

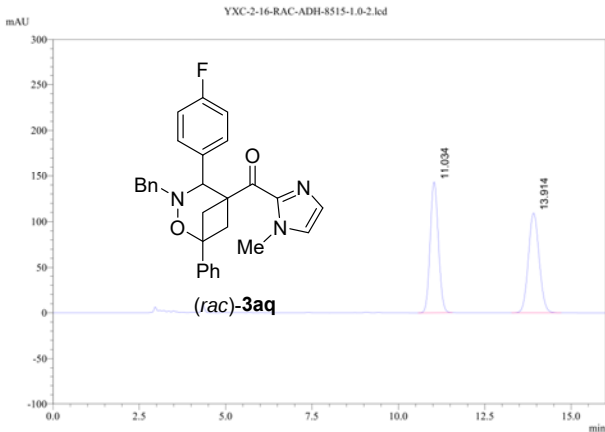
D:\1-Data\6-WWB\YXC-1-184-ASY-ADH-8515-1.0-4.lcd

Analysis Report

2024-03-25 21:14:15 1 / 1



Sample Name : YXC-2-16-RAC-ADH-8515-1.0-1
Sample ID : YXC-2-16-RAC-ADH-8515-1.0-1
Data File : YXC-2-16-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/25 20:52:58
Date Processed : 2024/3/25 21:11:38



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	11.034	10.567	143088	2384230	50.038
2	13.914	13.275	109323	2380601	49.962
Total			252411	4764831	100.000

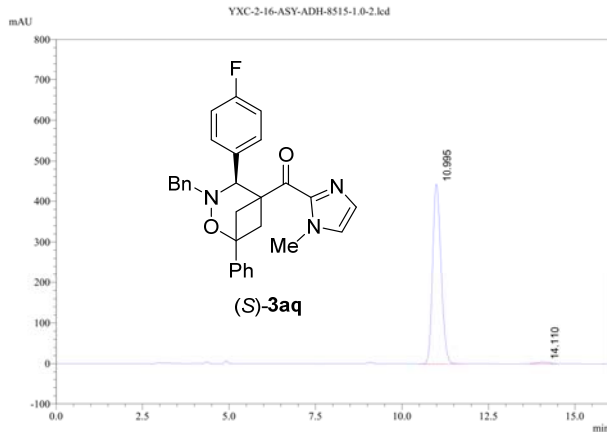
D:\1-Data\6-WWB\YXC-2-16-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-25 21:44:53 1 / 1



Sample Name : YXC-2-16-ASY-ADH-8515-1.0-1
Sample ID : YXC-2-16-ASY-ADH-8515-1.0-1
Data File : YXC-2-16-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/25 21:12:44
Date Processed : 2024/3/25 21:44:32



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.995	10.492	441646	7498265	98.775
2	14.110	13.650	3852	92967	1.225
Total			445498	7591233	100.000

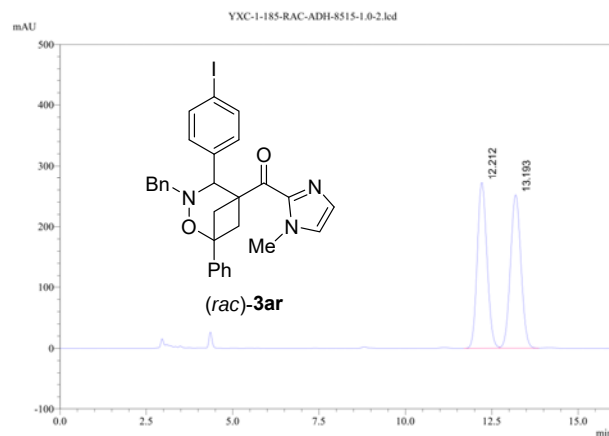
D:\1-Data\6-WWB\YXC-2-16-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 16:28:49 1 / 1



Sample Name : YXC-1-185-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-185-RAC-ADH-8515-1.0-1
Data File : YXC-1-185-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 16:02:59
Date Processed : 2024/3/8 16:25:40



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.212	11.692	272013	5350557	49.985
2	13.193	12.725	251800	5353826	50.015
Total			523814	10704383	100.000

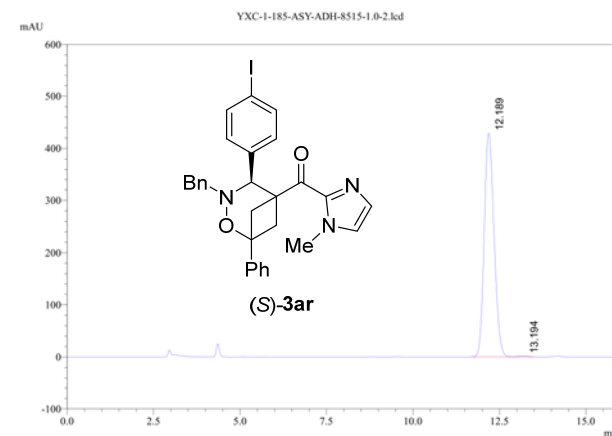
D:\1-Data\6-WWB\YXC-1-185-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 16:43:39 1 / 1



Sample Name : YXC-1-185-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-185-ASY-ADH-8515-1.0-1
Data File : YXC-1-185-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 16:26:41
Date Processed : 2024/3/8 16:43:18



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.189	11.658	429140	8481412	99.524
2	13.194	12.892	1959	40571	0.476
Total			431098	8521983	100.000

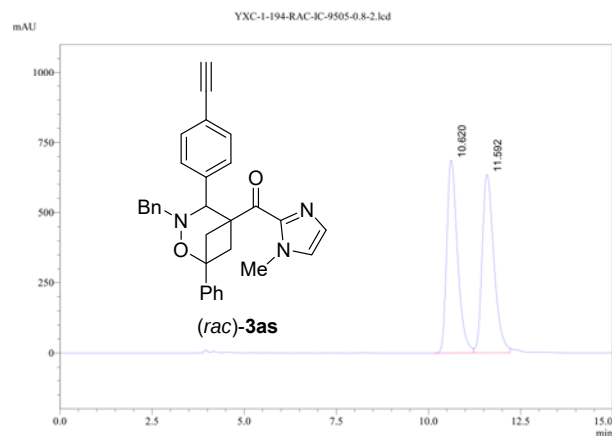
D:\1-Data\6-WWB\YXC-1-185-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-16 10:37:42 1 / 1



Sample Name : YXC-1-194-RAC-IC-9505-0.8-1
Sample ID : YXC-1-194-RAC-IC-9505-0.8-1
Data File : YXC-1-194-RAC-IC-9505-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/16 10:17:55
Date Processed : 2024/3/16 10:35:31



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.620	10.158	686376	13940064	49.657
2	11.592	11.225	635207	14132783	50.343
Total			1321583	28072847	100.000

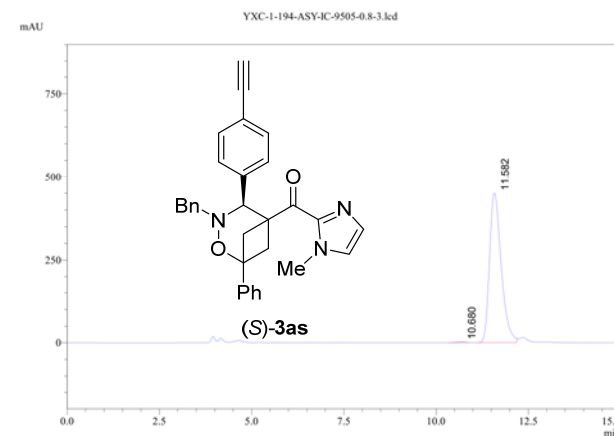
D:\1-Data\6-WWBI\YXC-1-194-RAC-IC-9505-0.8-2.lcd

Analysis Report

2024-03-16 11:20:11 1 / 1



Sample Name : YXC-1-194-ASY-IC-9505-0.8-1
Sample ID : YXC-1-194-ASY-IC-9505-0.8-1
Data File : YXC-1-194-ASY-IC-9505-0.8-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/16 10:54:53
Date Processed : 2024/3/16 11:19:44



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.680	10.325	1758	29106	0.293
2	11.582	11.108	449978	9896263	99.707
Total			451736	9925369	100.000

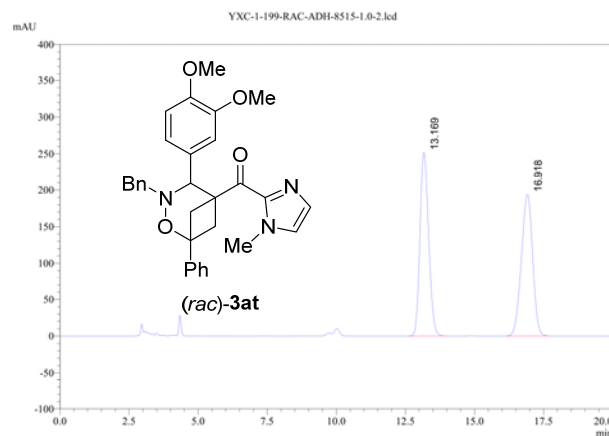
D:\1-Data\6-WWBI\YXC-1-194-ASY-IC-9505-0.8-3.lcd

Analysis Report

2024-03-14 15:47:51 1 / 1



Sample Name : YXC-1-199-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-199-RAC-ADH-8515-1.0-1
Data File : YXC-1-199-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 14:59:45
Date Processed : 2024/3/14 15:23:40



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	13.169	12.625	251515	5488511	50.000
2	16.918	16.133	193566	5488567	50.000
Total			445081	10977078	100.000

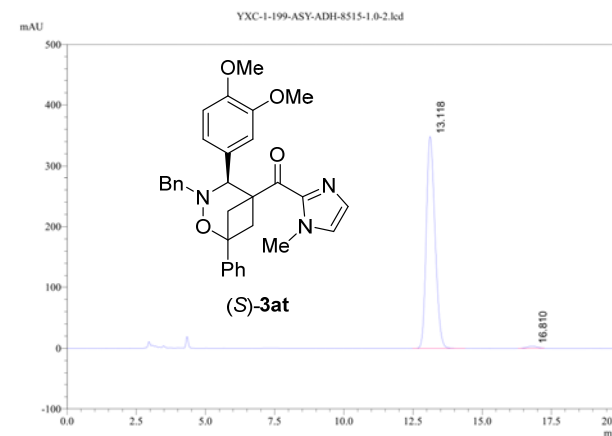
D:\1-Data\6-WWB\YXC-1-199-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-14 15:48:15 1 / 1



Sample Name : YXC-1-199-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-199-ASY-ADH-8515-1.0-1
Data File : YXC-1-199-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/14 15:24:40
Date Processed : 2024/3/14 15:47:07



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	13.118	12.475	348438	7667272	98.875
2	16.810	16.300	3319	87214	1.125
Total			351757	7754486	100.000

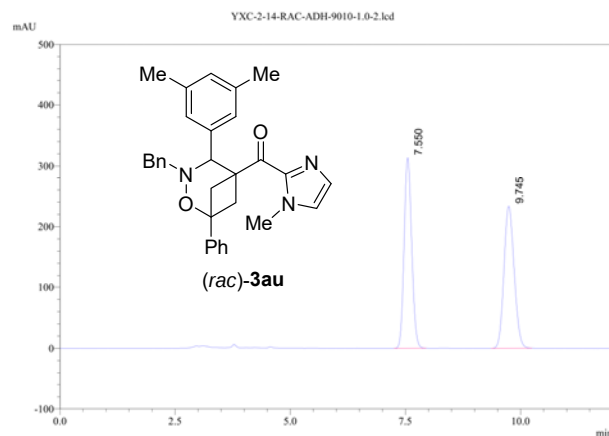
D:\1-Data\6-WWB\YXC-1-199-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-19 15:51:02 1 / 1



Sample Name : YXC-2-14-RAC-ADH-9010-1.0-1
Sample ID : YXC-2-14-RAC-ADH-9010-1.0-1
Data File : YXC-2-14-RAC-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/19 15:34:27
Date Processed : 2024/3/19 15:48:45



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	7.550	7.250	313314	3584898	49.891
2	9.745	9.358	233160	3600534	50.109
Total			546474	7185432	100.000

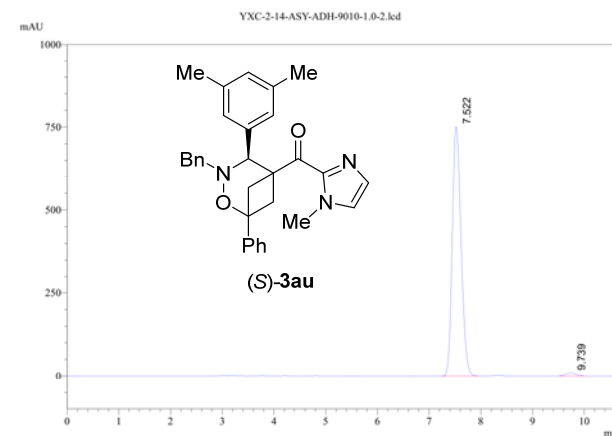
D:\1-Data\6-WWB\YXC-2-14-RAC-ADH-9010-1.0-2.lcd

Analysis Report

2024-03-19 16:02:06 1 / 1



Sample Name : YXC-2-14-ASY-ADH-9010-1.0-1
Sample ID : YXC-2-14-ASY-ADH-9010-1.0-1
Data File : YXC-2-14-ASY-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/19 15:49:41
Date Processed : 2024/3/19 16:01:26



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	7.522	7.242	751519	8826986	98.507
2	9.739	9.492	8528	133821	1.493
Total			760047	8960807	100.000

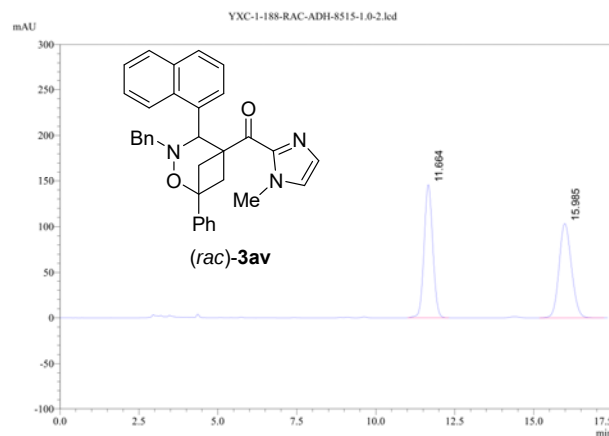
D:\1-Data\6-WWB\YXC-2-14-ASY-ADH-9010-1.0-2.lcd

Analysis Report

2024-03-08 11:05:09 1 / 1



Sample Name : YXC-1-188-RAC-ADH-8515-1.0-1
Sample ID : YXC-1-188-RAC-ADH-8515-1.0-1
Data File : YXC-1-188-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 10:43:19
Date Processed : 2024/3/8 11:04:40



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	11.664	11.008	145567	2802690	49.799
2	15.985	15.183	103408	2825323	50.201
Total			248975	5628013	100.000

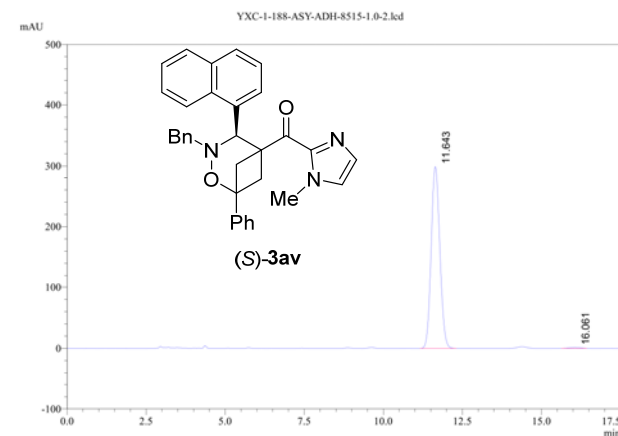
D:\1-Data\6-WWB\YXC-1-188-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-08 11:20:13 1 / 1



Sample Name : YXC-1-188-ASY-ADH-8515-1.0-1
Sample ID : YXC-1-188-ASY-ADH-8515-1.0-1
Data File : YXC-1-188-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/8 11:01:39
Date Processed : 2024/3/8 11:19:59



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	11.643	11.158	299057	5705082	99.497
2	16.061	15.625	1163	28852	0.503
Total			300220	5733934	100.000

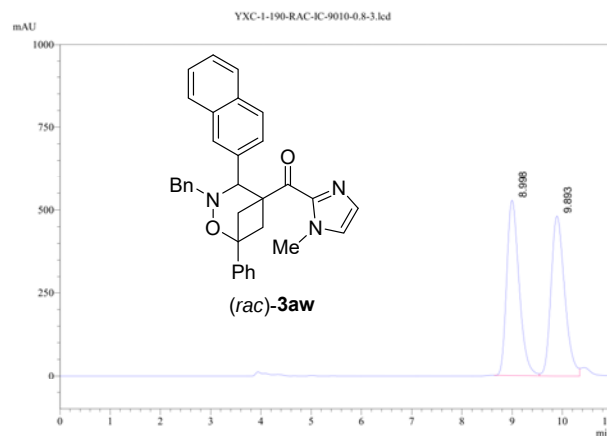
D:\1-Data\6-WWB\YXC-1-188-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-15 22:03:09 1 / 1



Sample Name : YXC-1-190-RAC-IC-9010-0.8-1
Sample ID : YXC-1-190-RAC-IC-9010-0.8-1
Data File : YXC-1-190-RAC-IC-9010-0.8-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/15 21:50:51
Date Processed : 2024/3/15 22:02:50



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.998	8.642	527180	9050652	49.864
2	9.893	9.542	481278	9099950	50.136
Total			1008459	18150601	100.000

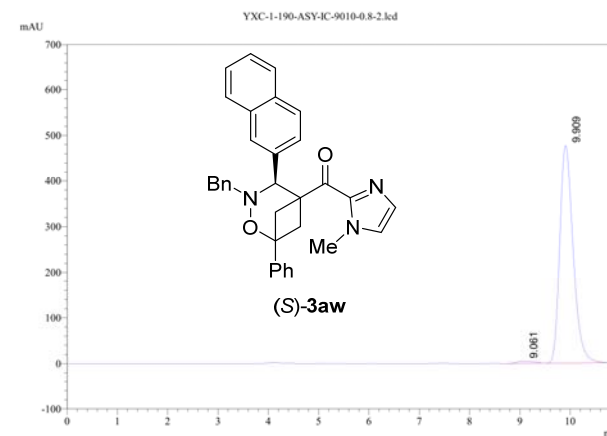
D:\1-Data\6-WWBI\YXC-1-190-RAC-IC-9010-0.8-3.lcd

Analysis Report

2024-03-15 21:52:58 1 / 1



Sample Name : YXC-1-190-ASY-IC-9010-0.8-1
Sample ID : YXC-1-190-ASY-IC-9010-0.8-1
Data File : YXC-1-190-ASY-IC-9010-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/15 21:36:17
Date Processed : 2024/3/15 21:52:27



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.061	8.742	4897	101582	1.140
2	9.909	9.517	476848	8811454	98.860
Total			481745	8913036	100.000

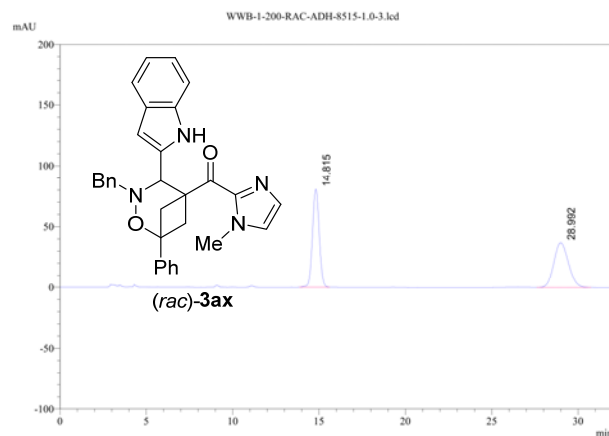
D:\1-Data\6-WWBI\YXC-1-190-ASY-IC-9010-0.8-2.lcd

Analysis Report

2024-03-28 10:09:52 1 / 1



Sample Name : WWB-1-200-RAC-ADH-8515-1.0-2
Sample ID : WWB-1-200-RAC-ADH-8515-1.0-2
Data File : WWB-1-200-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/28 9:33:38
Date Processed : 2024/3/28 10:09:34



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	14.815	13.858	80685	2202970	50.342
2	28.992	27.608	36996	2173023	49.658
Total			117681	4375993	100.000

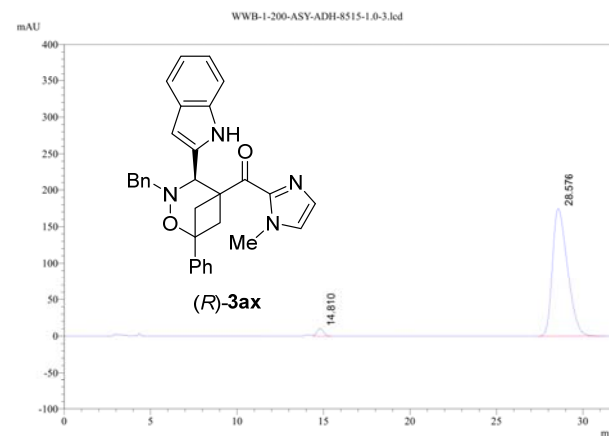
D:\1-Date\6-WWB\WWB-1-200-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-28 10:42:08 1 / 1



Sample Name : WWB-1-200-ASY-ADH-8515-1.0-2
Sample ID : WWB-1-200-ASY-ADH-8515-1.0-2
Data File : WWB-1-200-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/28 10:08:00
Date Processed : 2024/3/28 10:41:28



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	14.810	14.417	10410	277619	2.559
2	28.576	27.200	174527	10573168	97.441
Total			184938	10850787	100.000

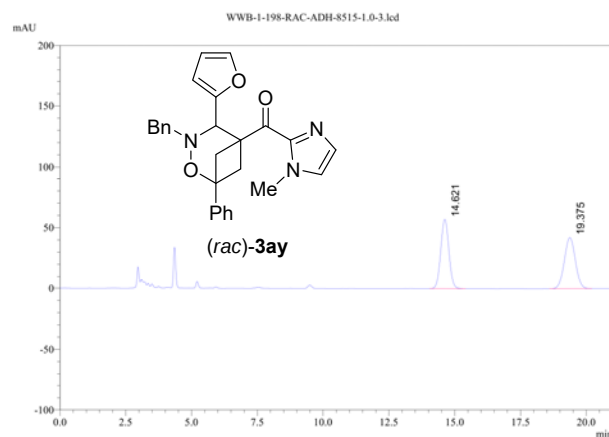
D:\1-Date\6-WWB\WWB-1-200-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-27 21:55:49 1 / 1



Sample Name : WWB-1-198-RAC-ADH-8515-1.0-2
Sample ID : WWB-1-198-RAC-ADH-8515-1.0-2
Data File : WWB-1-198-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/27 21:11:59
Date Processed : 2024/3/27 21:33:35



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	14.621	14.050	57087	1235613	50.064
2	19.375	18.600	42211	1232456	49.936
Total			99298	2468069	100.000

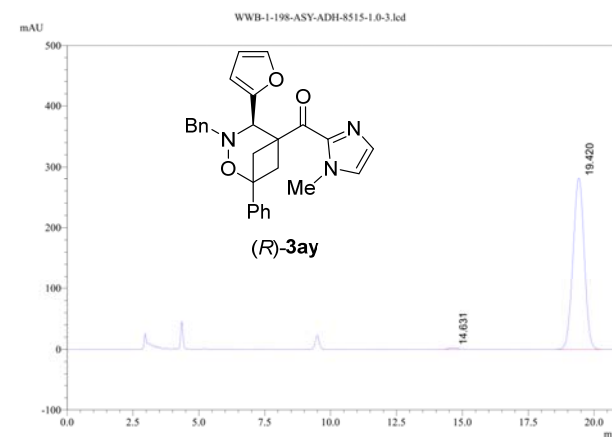
D:\1-Date\6-WWB\WWB-1-198-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-27 21:56:43 1 / 1



Sample Name : WWB-1-198-ASY-ADH-8515-1.0-2
Sample ID : WWB-1-198-ASY-ADH-8515-1.0-2
Data File : WWB-1-198-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/27 21:34:28
Date Processed : 2024/3/27 21:56:26



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	14.631	14.342	2359	43221	0.515
2	19.420	18.567	281642	8352376	99.485
Total			284001	8395597	100.000

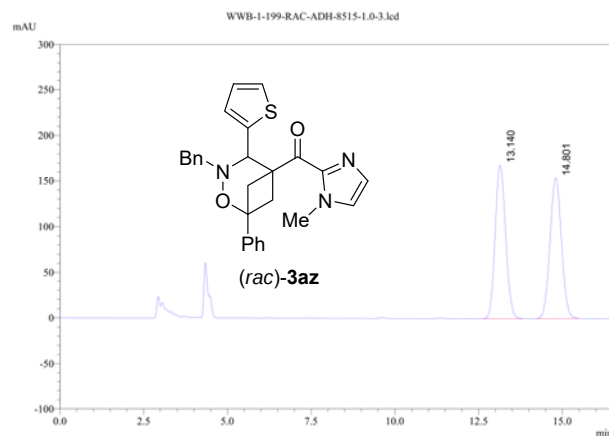
D:\1-Date\6-WWB\WWB-1-198-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-28 09:15:31 1 / 1



Sample Name : WWB-1-199-RAC-ADH-8515-1.0-2
Sample ID : WWB-1-199-RAC-ADH-8515-1.0-2
Data File : WWB-1-199-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/28 8:54:41
Date Processed : 2024/3/28 9:11:44



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	13.140	12.600	168497	3655273	49.941
2	14.801	14.225	153936	3663928	50.059
Total			322434	7319201	100.000

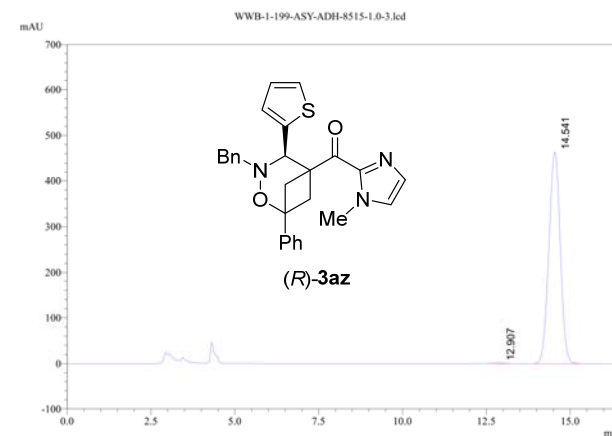
D:\1-Date\6-WWB\WWB-1-199-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-28 09:32:26 1 / 1



Sample Name : WWB-1-199-ASY-ADH-8515-1.0-2
Sample ID : WWB-1-199-ASY-ADH-8515-1.0-2
Data File : WWB-1-199-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/28 9:12:49
Date Processed : 2024/3/28 9:32:00



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.907	12.533	799	15858	0.145
2	14.541	13.842	463538	10925145	99.855
Total			464337	10941004	100.000

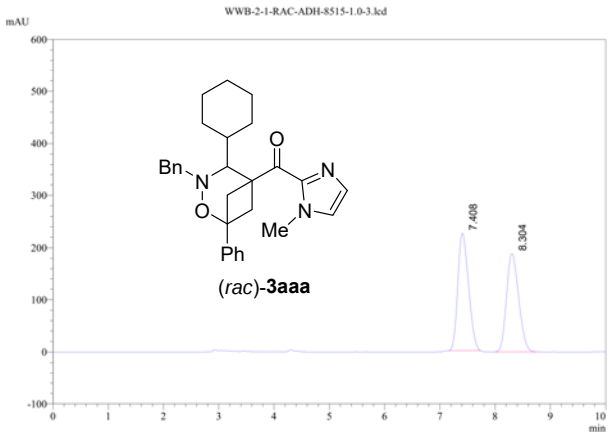
D:\1-Date\6-WWB\WWB-1-199-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-04-24 10:27:16 1 / 1



Sample Name : WWB-2-1-RAC-ADH-8515-1.0-2
Sample ID : WWB-2-1-RAC-ADH-8515-1.0-2
Data File : WWB-2-1-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/28 10:43:10
Date Processed : 2024/3/28 11:02:12



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	7.408	7.158	225273	3025053	51.303
2	8.304	7.992	188617	2871408	48.697
Total			413890	5896462	100.000

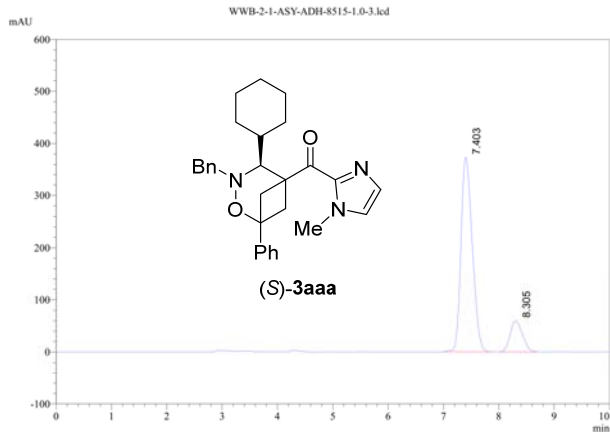
D:\1-Data\6-WWB\WWB-2-1-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-04-24 10:27:30 1 / 1



Sample Name : WWB-2-1-ASY-ADH-8515-1.0-2
Sample ID : WWB-2-1-ASY-ADH-8515-1.0-2
Data File : WWB-2-1-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/28 11:03:03
Date Processed : 2024/3/28 11:14:58



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	7.403	7.008	373312	5284383	85.203
2	8.305	8.017	59607	917696	14.797
Total			432919	6202079	100.000

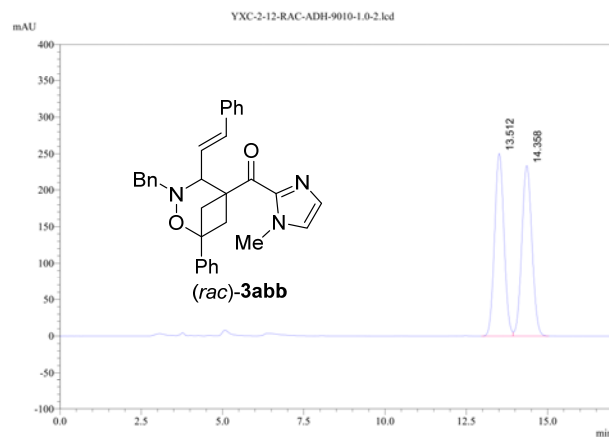
D:\1-Data\6-WWB\WWB-2-1-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-19 15:15:15 1 / 1



Sample Name : YXC-2-12-RAC-ADH-9010-1.0-1
Sample ID : YXC-2-12-RAC-ADH-9010-1.0-1
Data File : YXC-2-12-RAC-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/19 14:51:47
Date Processed : 2024/3/19 15:15:01



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	13.512	12.958	250510	5061689	49.893
2	14.358	13.942	233945	5083312	50.107
Total			484455	10145000	100.000

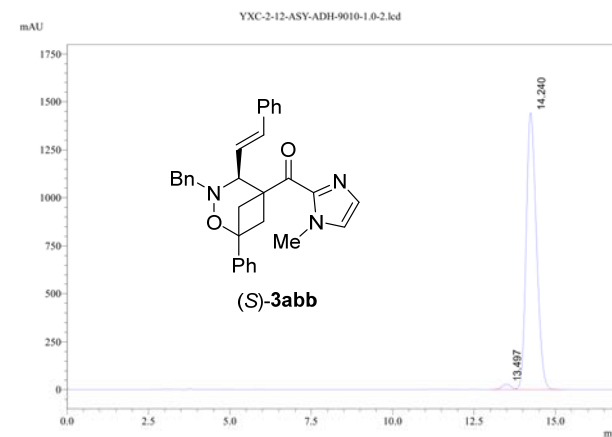
D:\1-Data\6-WWB\YXC-2-12-RAC-ADH-9010-1.0-2.lcd

Analysis Report

2024-03-19 15:36:53 1 / 1



Sample Name : YXC-2-12-ASY-ADH-9010-1.0-1
Sample ID : YXC-2-12-ASY-ADH-9010-1.0-1
Data File : YXC-2-12-ASY-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/19 15:13:48
Date Processed : 2024/3/19 15:32:18



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	13.497	13.017	27984	552578	1.716
2	14.240	13.792	1442364	31645346	98.284
Total			1470348	32197924	100.000

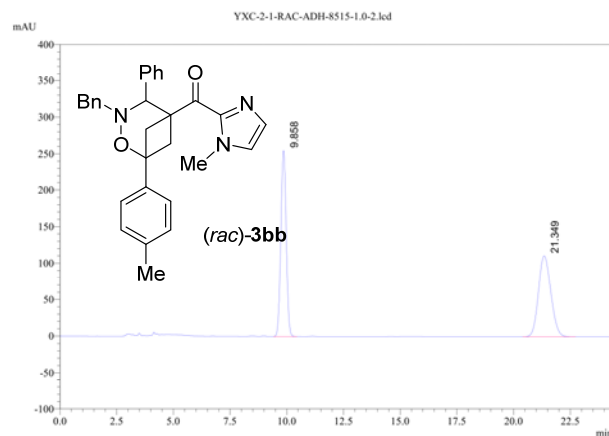
D:\1-Data\6-WWB\YXC-2-12-ASY-ADH-9010-1.0-2.lcd

Analysis Report

2024-03-20 18:43:49 1 / 1



Sample Name : YXC-2-1-RAC-ADH-8515-1.0-1
Sample ID : YXC-2-1-RAC-ADH-8515-1.0-1
Data File : YXC-2-1-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/20 14:31:36
Date Processed : 2024/3/20 14:57:27



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.858	9.408	254896	4205405	50.024
2	21.349	20.400	110903	4201438	49.976
Total			365799	8406843	100.000

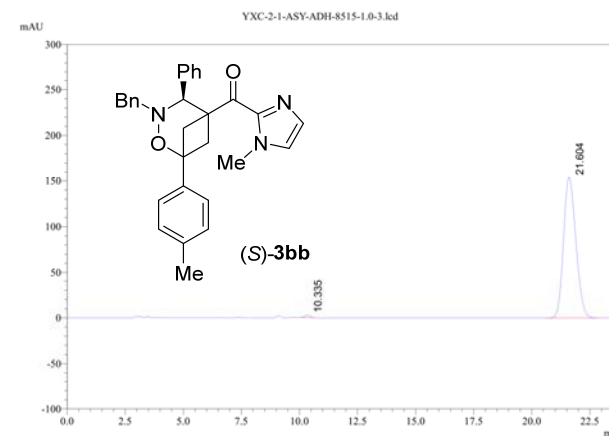
D:\1-Data\6-WWBI\YXC-2-1-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-20 18:44:18 1 / 1



Sample Name : YXC-2-1-ASY-ADH-8515-1.0-2
Sample ID : YXC-2-1-ASY-ADH-8515-1.0-2
Data File : YXC-2-1-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/20 17:50:04
Date Processed : 2024/3/20 18:14:48



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.335	10.058	2695	38841	0.677
2	21.604	20.625	154136	5697163	99.323
Total			156831	5736004	100.000

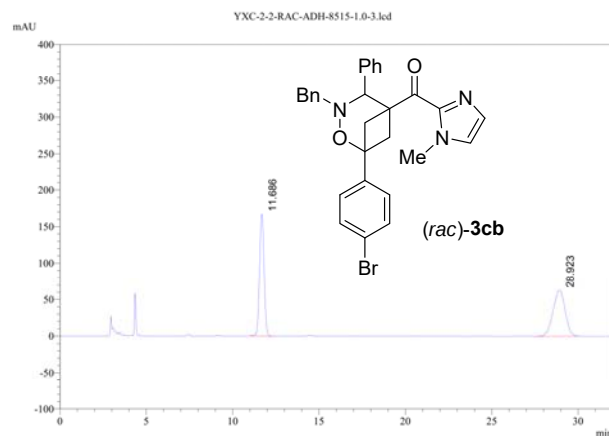
D:\1-Data\6-WWBI\YXC-2-1-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-18 20:50:39 1 / 1



Sample Name : YXC-2-2-RAC-ADH-8515-1.0-2
Sample ID : YXC-2-2-RAC-ADH-8515-1.0-2
Data File : YXC-2-2-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/18 20:07:47
Date Processed : 2024/3/18 20:48:05



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	11.686	11.000	167007	3040222	50.060
2	28.923	27.583	62902	3032949	49.940
Total			229909	6073171	100.000

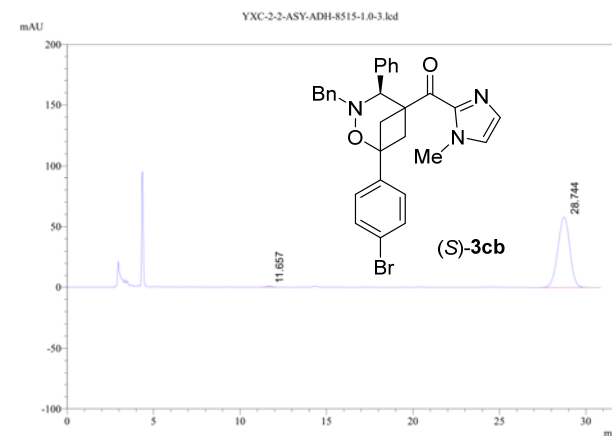
D:\1-Data\6-WWBI\YXC-2-2-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-18 21:20:40 1 / 1



Sample Name : YXC-2-2-ASY-ADH-8515-1.0-2
Sample ID : YXC-2-2-ASY-ADH-8515-1.0-2
Data File : YXC-2-2-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/18 20:48:56
Date Processed : 2024/3/18 21:20:20



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	11.657	11.217	863	16314	0.582
2	28.744	27.350	58084	2785904	99.418
Total			58947	2802218	100.000

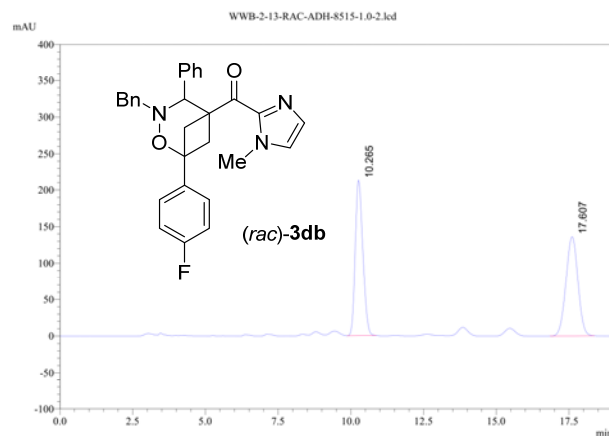
D:\1-Data\6-WWBI\YXC-2-2-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-30 17:07:08 1 / 1



Sample Name : WWB-2-13-RAC-ADH-8515-1.0-1
Sample ID : WWB-2-13-RAC-ADH-8515-1.0-1
Data File : WWB-2-13-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/30 16:40:54
Date Processed : 2024/3/30 17:06:36



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.265	9.867	212656	3870818	49.855
2	17.607	16.850	136000	3893389	50.145
Total			348656	7764207	100.000

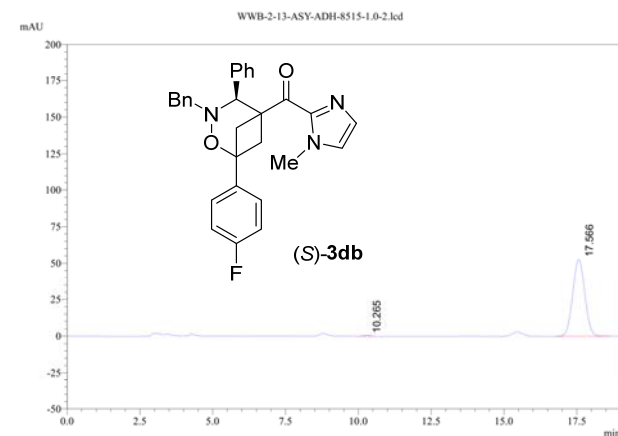
D:\1-Data\6-WWB\WWB-2-13-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-30 17:22:24 1 / 1



Sample Name : WWB-2-13-ASY-ADH-8515-1.0-1
Sample ID : WWB-2-13-ASY-ADH-8515-1.0-1
Data File : WWB-2-13-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/30 17:01:25
Date Processed : 2024/3/30 17:21:44



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.265	10.033	508	8307	0.545
2	17.566	16.792	52666	1516699	99.455
Total			53175	1525005	100.000

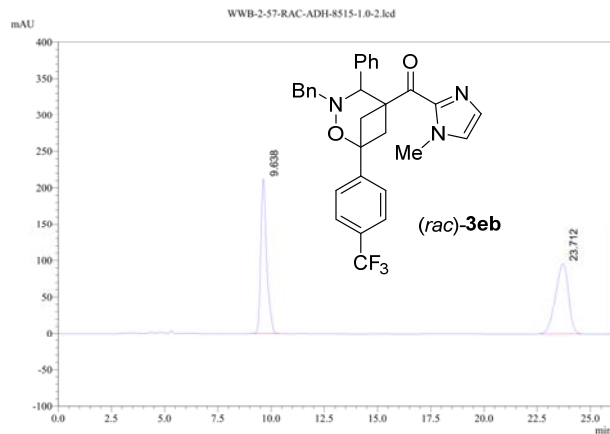
D:\1-Data\6-WWB\WWB-2-13-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-05-07 16:10:29 1 / 1



Sample Name : WWB-2-57-RAC-ADH-8515-1.0-1
 Sample ID : WWB-2-57-RAC-ADH-8515-1.0-1
 Data File : WWB-2-57-RAC-ADH-8515-1.0-2.lcd
 Method File : 98-02.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2024/5/7 14:54:53
 Date Processed : 2024/5/7 16:09:54



Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.638	9.067	211492	4045334	49.963
2	23.712	22.583	95526	4051254	50.037
Total			307019	8096588	100.000

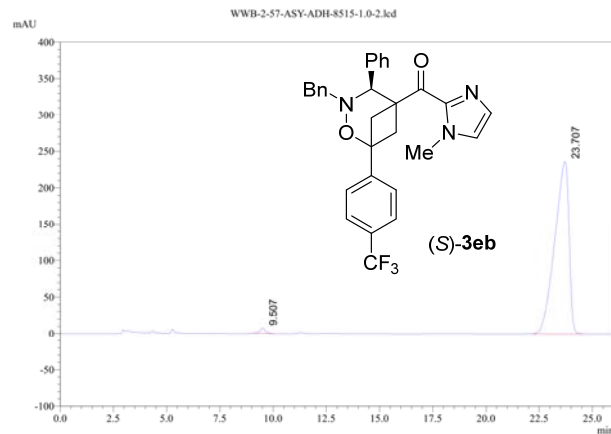
D:\1-Data\6-WWB\WWB-2-57-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-05-07 16:10:43 1 / 1



Sample Name : WWB-2-57-ASY-ADH-8515-1.0-1
 Sample ID : WWB-2-57-ASY-ADH-8515-1.0-1
 Data File : WWB-2-57-ASY-ADH-8515-1.0-2.lcd
 Method File : 98-02.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2024/5/7 15:40:44
 Date Processed : 2024/5/7 16:09:31



Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.507	9.050	6882	133805	1.203
2	23.707	22.108	236479	10990996	98.797
Total			243361	11124800	100.000

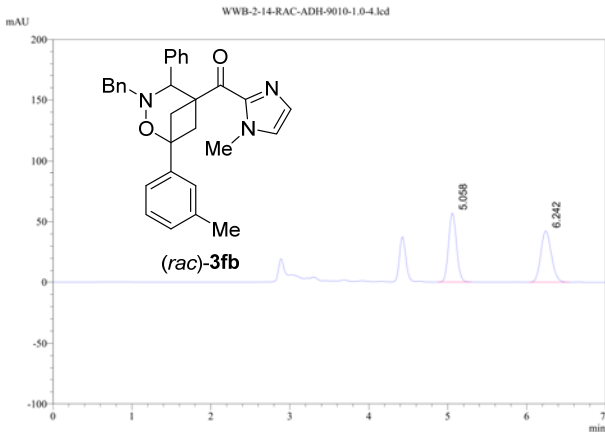
D:\1-Data\6-WWB\WWB-2-57-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-04-02 15:21:37 1 / 1



Sample Name : WWB-2-14-RAC-ADH-9010-1.0-1
Sample ID : WWB-2-14-RAC-ADH-9010-1.0-1
Data File : WWB-2-14-RAC-ADH-9010-1.0-4.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/2 15:11:08
Date Processed : 2024/4/2 15:21:00



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.058	4.875	56902	399463	50.169
2	6.242	6.033	42483	396773	49.831
Total			99385	796236	100.000

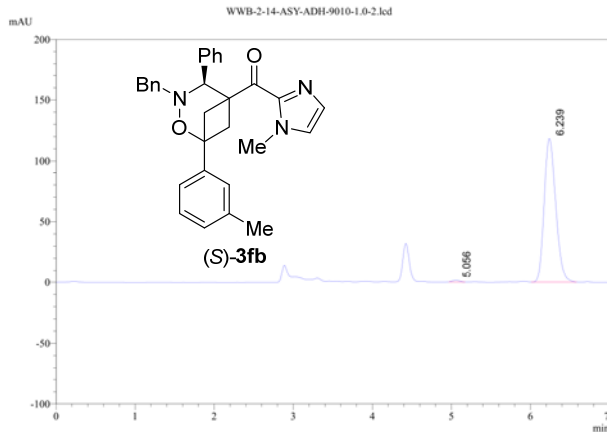
D:\1-Data\6-WWB\WWB-2-14-RAC-ADH-9010-1.0-4.lcd

Analysis Report

2024-04-02 15:27:43 1 / 1



Sample Name : WWB-2-14-ASY-ADH-9010-1.0-1
Sample ID : WWB-2-14-ASY-ADH-9010-1.0-1
Data File : WWB-2-14-ASY-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/2 15:19:13
Date Processed : 2024/4/2 15:27:34



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.056	4.967	1444	8995	0.742
2	6.239	6.008	118292	1203188	99.258
Total			119736	1212183	100.000

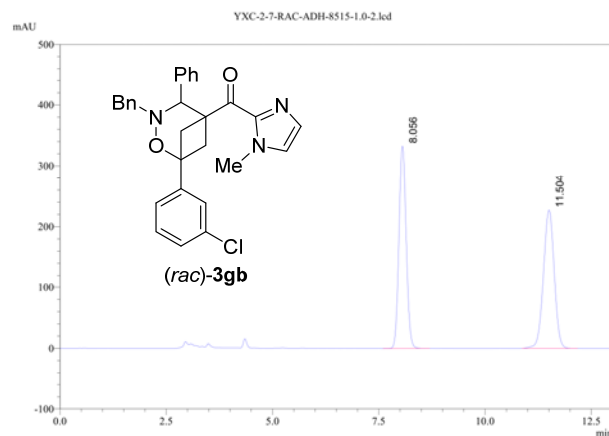
D:\1-Data\6-WWB\WWB-2-14-ASY-ADH-9010-1.0-2.lcd

Analysis Report

2024-03-20 18:45:08 1 / 1



Sample Name : YXC-2-7-RAC-ADH-8515-1.0-1
Sample ID : YXC-2-7-RAC-ADH-8515-1.0-1
Data File : YXC-2-7-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/20 14:56:49
Date Processed : 2024/3/20 15:17:10



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.056	7.600	332645	3943502	49.607
2	11.504	10.867	227063	4006009	50.393
Total			559708	7949511	100.000

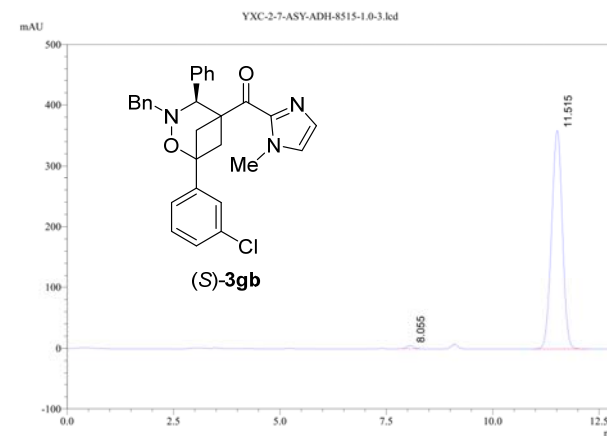
D:\1-Data\6-WWBI\YXC-2-7-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-20 18:59:40 1 / 1



Sample Name : YXC-2-7-ASY-ADH-8515-1.0-2
Sample ID : YXC-2-7-ASY-ADH-8515-1.0-2
Data File : YXC-2-7-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/20 18:41:20
Date Processed : 2024/3/20 18:59:31



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.055	7.867	5434	61607	0.964
2	11.515	10.942	359239	6328886	99.036
Total			364673	6390493	100.000

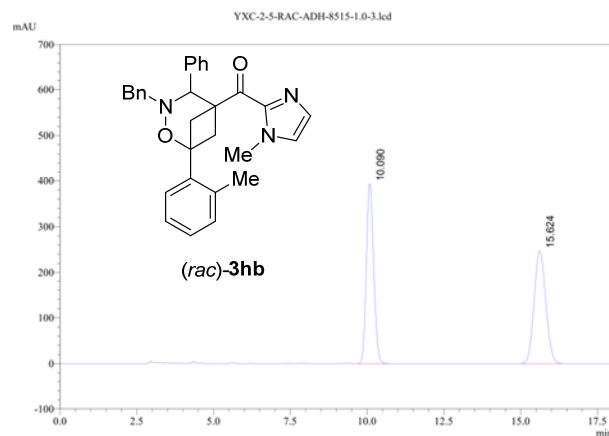
D:\1-Data\6-WWBI\YXC-2-7-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-18 21:45:14 1 / 1



Sample Name : YXC-2-5-RAC-ADH-8515-1.0-2
Sample ID : YXC-2-5-RAC-ADH-8515-1.0-2
Data File : YXC-2-5-RAC-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/18 21:22:14
Date Processed : 2024/3/18 21:44:49



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.090	9.642	394073	6504813	49.974
2	15.624	14.958	247342	6511606	50.026
Total			641415	13016419	100.000

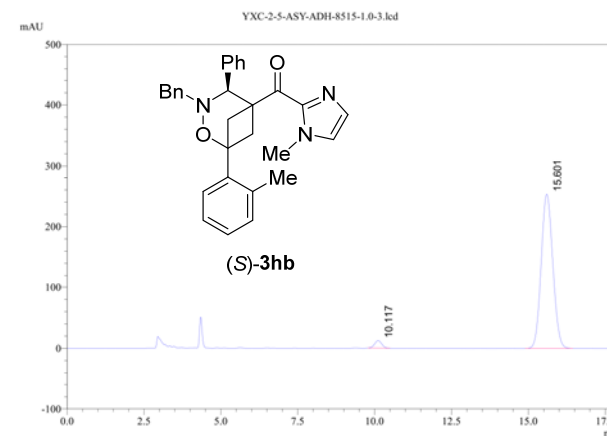
D:\1-Data\6-WWBI\YXC-2-5-RAC-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-18 22:02:41 1 / 1



Sample Name : YXC-2-5-ASY-ADH-8515-1.0-2
Sample ID : YXC-2-5-ASY-ADH-8515-1.0-2
Data File : YXC-2-5-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/18 21:43:29
Date Processed : 2024/3/18 22:02:21



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	10.117	9.783	12243	198668	2.894
2	15.601	14.900	253099	6665021	97.106
Total			265342	6863688	100.000

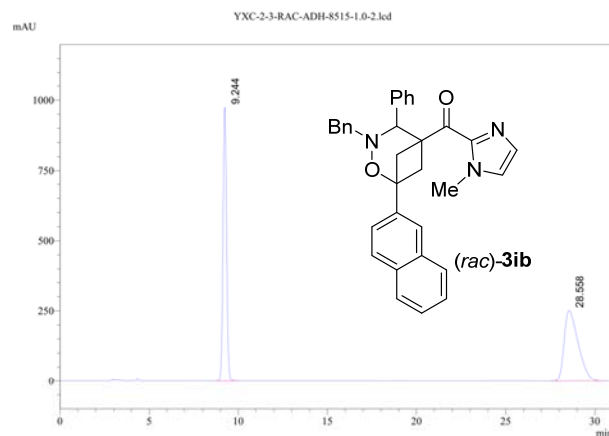
D:\1-Data\6-WWBI\YXC-2-5-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-16 17:09:23 1 / 1



Sample Name : YXC-2-3-RAC-ADH-8515-1.0-1
Sample ID : YXC-2-3-RAC-ADH-8515-1.0-1
Data File : YXC-2-3-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/16 16:35:06
Date Processed : 2024/3/16 17:09:05



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.244	8.725	975047	13563347	49.721
2	28.558	27.508	251205	13715627	50.279
Total			1226252	27278973	100.000

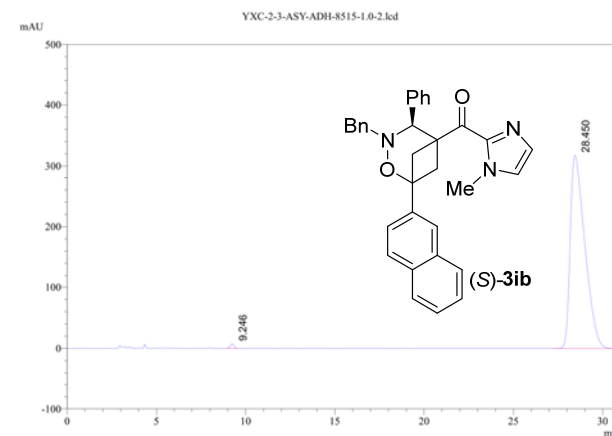
D:\1-Data\6-WWBI\YXC-2-3-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-16 17:40:24 1 / 1



Sample Name : YXC-2-3-ASY-ADH-8515-1.0-1
Sample ID : YXC-2-3-ASY-ADH-8515-1.0-1
Data File : YXC-2-3-ASY-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/16 17:07:13
Date Processed : 2024/3/16 17:40:04



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.246	8.925	7328	102588	0.565
2	28.450	27.183	317939	18042693	99.435
Total			325266	18145281	100.000

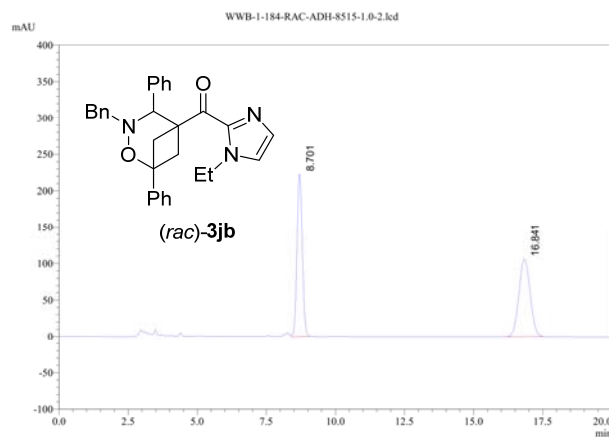
D:\1-Data\6-WWBI\YXC-2-3-ASY-ADH-8515-1.0-2.lcd

Analysis Report

2024-02-28 14:19:44 1 / 1



Sample Name : WWB-1-184-RAC-ADH-8515-1.0-1
Sample ID : WWB-1-184-RAC-ADH-8515-1.0-1
Data File : WWB-1-184-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/2/28 10:36:28
Date Processed : 2024/2/28 10:58:30



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.701	8.408	222841	2987634	49.968
2	16.841	16.150	106146	2991499	50.032
Total			328987	5979134	100.000

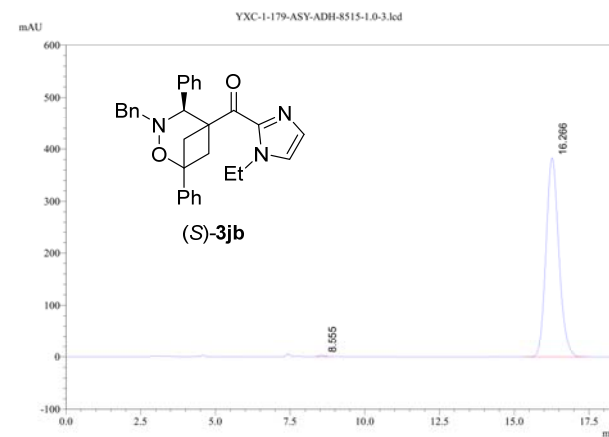
D:\1-Date\6-WWB\WWB-1-184-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-06 17:27:55 1 / 1



Sample Name : YXC-1-179-ASY-ADH-8515-1.0-2
Sample ID : YXC-1-179-ASY-ADH-8515-1.0-2
Data File : YXC-1-179-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/6 17:07:40
Date Processed : 2024/3/6 17:27:06



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.555	8.333	3044	39418	0.343
2	16.266	15.367	382984	11453630	99.657
Total			386027	11493048	100.000

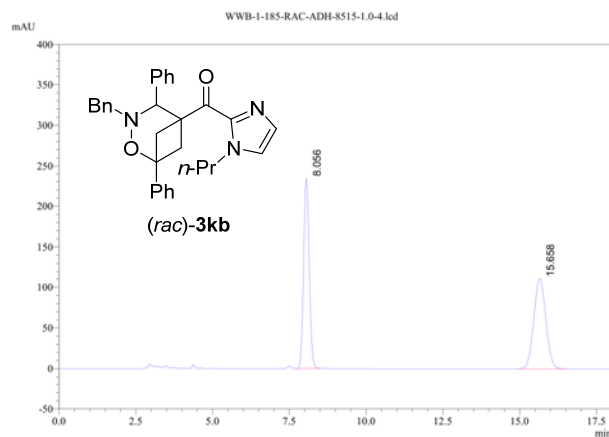
D:\1-Date\6-WWB\YXC-1-179-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-02-28 15:55:12 1 / 1



Sample Name : WWB-1-185-RAC-ADH-8515-1.0-1
Sample ID : WWB-1-185-RAC-ADH-8515-1.0-1
Data File : WWB-1-185-RAC-ADH-8515-1.0-4.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/2/28 15:31:55
Date Processed : 2024/2/28 15:51:40



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.056	7.733	233959	2972618	49.765
2	15.658	14.950	110535	3000685	50.235
Total			344493	5973302	100.000

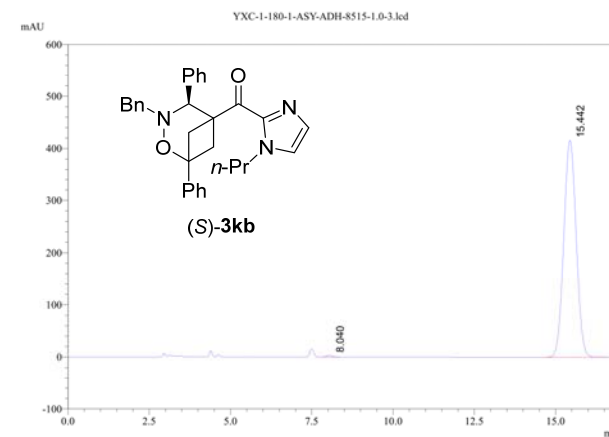
D:\1-Data\6-WWB\WWB-1-185-RAC-ADH-8515-1.0-4.lcd

Analysis Report

2024-03-06 19:07:58 1 / 1



Sample Name : YXC-1-180-1-ASY-ADH-8515-1.0-2
Sample ID : YXC-1-180-1-ASY-ADH-8515-1.0-2
Data File : YXC-1-180-1-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/6 18:48:59
Date Processed : 2024/3/6 19:07:23



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	8.040	7.808	3758	45534	0.412
2	15.442	14.575	415868	10996378	99.588
Total			419626	11041912	100.000

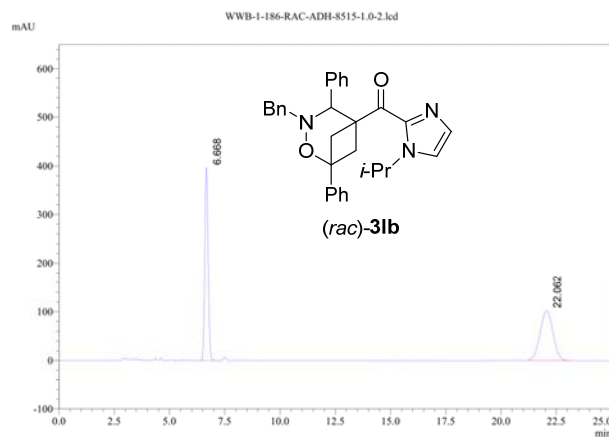
D:\1-Data\6-WWB\YXC-1-180-1-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-02-28 16:52:30 1 / 1



Sample Name : WWB-1-186-RAC-ADH-8515-1.0-1
Sample ID : WWB-1-186-RAC-ADH-8515-1.0-1
Data File : WWB-1-186-RAC-ADH-8515-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/2/28 15:52:28
Date Processed : 2024/2/28 16:18:53



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	6.668	6.375	396383	4130734	49.990
2	22.062	21.175	101756	4132374	50.010
Total			498140	8263108	100.000

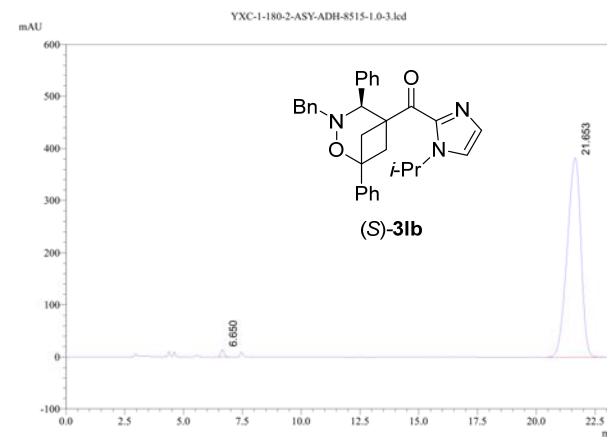
D:\1-Data\6-WWB\WWB-1-186-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-06 19:34:26 1 / 1



Sample Name : YXC-1-180-2-ASY-ADH-8515-1.0-2
Sample ID : YXC-1-180-2-ASY-ADH-8515-1.0-2
Data File : YXC-1-180-2-ASY-ADH-8515-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/6 19:09:37
Date Processed : 2024/3/6 19:33:49



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	6.650	6.450	14209	144911	0.927
2	21.653	20.400	382571	15483960	99.073
Total			396780	15628871	100.000

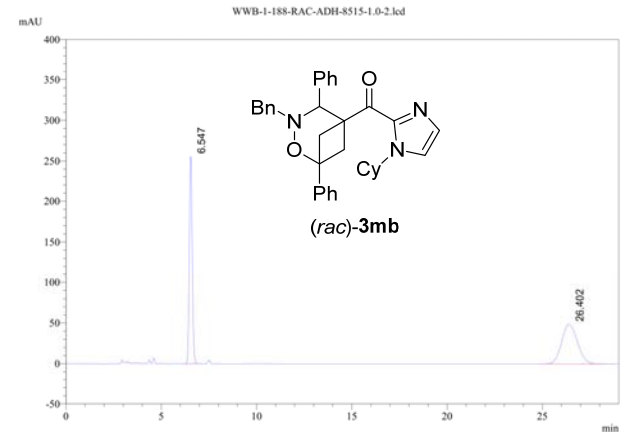
D:\1-Data\6-WWB\YXC-1-180-2-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-02-28 18:30:18 1 / 1



Sample Name : WWB-1-188-RAC-ADH-8515-1.0-1
 Sample ID : WWB-1-188-RAC-ADH-8515-1.0-1
 Data File : WWB-1-188-RAC-ADH-8515-1.0-2.lcd
 Method File : 90-10.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2024/2/28 16:50:47
 Date Processed : 2024/2/28 17:20:32



Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	6.547	6.183	255439	2746555	49.817
2	26.402	25.142	48448	2766750	50.183
Total			303887	5513306	100.000

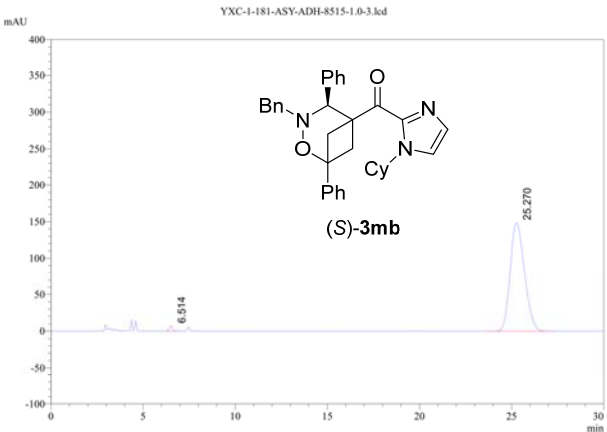
D:\1-Data\6-WWB\WWB-1-188-RAC-ADH-8515-1.0-2.lcd

Analysis Report

2024-03-06 20:08:11 1 / 1



Sample Name : YXC-1-181-ASY-ADH-8515-1.0-2
 Sample ID : YXC-1-181-ASY-ADH-8515-1.0-2
 Data File : YXC-1-181-ASY-ADH-8515-1.0-3.lcd
 Method File : 90-10.lcm
 Report Format File : DEFAULT.lsr
 Date Acquired : 2024/3/6 19:36:14
 Date Processed : 2024/3/6 20:07:42



Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	6.514	6.225	7080	72969	0.903
2	25.270	23.758	148442	8011080	99.097
Total			155522	8084050	100.000

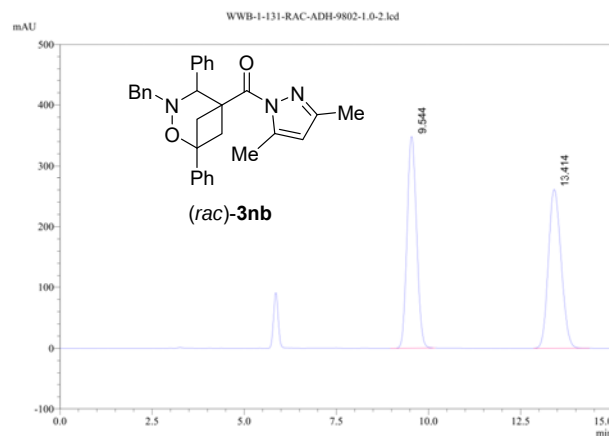
D:\1-Data\6-WWB\YXC-1-181-ASY-ADH-8515-1.0-3.lcd

Analysis Report

2024-03-25 19:12:50 1 / 1



Sample Name : WWB-1-131-RAC-ADH-9802-1.0-1
Sample ID : WWB-1-131-RAC-ADH-9802-1.0-1
Data File : WWB-1-131-RAC-ADH-9802-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2023/12/26 15:47:41
Date Processed : 2024/3/25 19:12:05



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.544	8.967	348171	6236119	49.771
2	13.414	12.850	260692	6293387	50.229
Total			608863	12529506	100.000

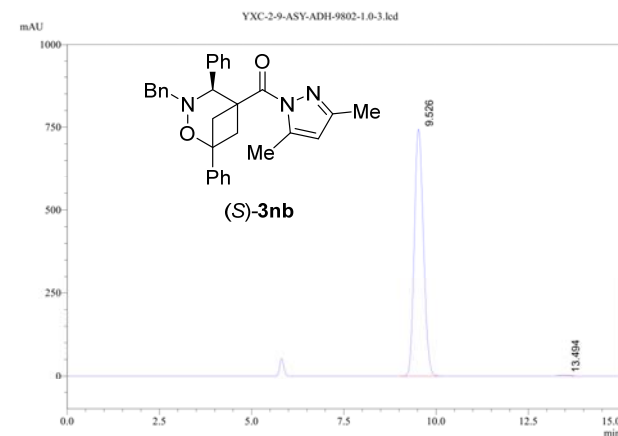
D:\1-Date\6-WWB\WWB-1-131-RAC-ADH-9802-1.0-2.lcd

Analysis Report

2024-03-25 19:14:13 1 / 1



Sample Name : YXC-2-9-ASY-ADH-9802-1.0-2
Sample ID : YXC-2-9-ASY-ADH-9802-1.0-2
Data File : YXC-2-9-ASY-ADH-9802-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/25 18:57:57
Date Processed : 2024/3/25 19:13:42



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.526	9.050	743690	12798511	99.604
2	13.494	13.250	2817	50840	0.396
Total			746507	12849351	100.000

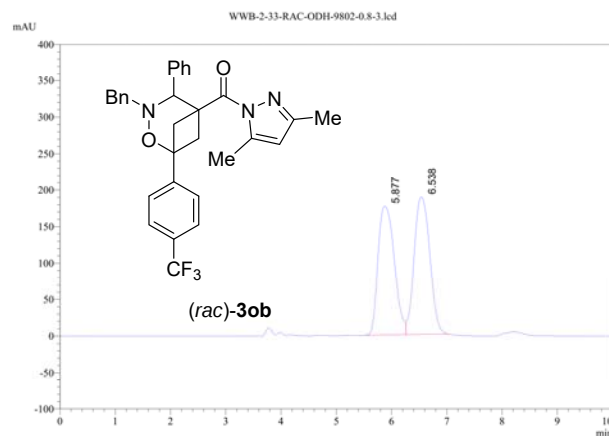
D:\1-Date\6-WWB\YXC-2-9-ASY-ADH-9802-1.0-3.lcd

Analysis Report

2024-04-18 16:23:17 1 / 1



Sample Name : WWB-2-33-RAC-ODH-9802-0.8-2
Sample ID : WWB-2-33-RAC-ODH-9802-0.8-2
Data File : WWB-2-33-RAC-ODH-9802-0.8-3.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/18 15:59:14
Date Processed : 2024/4/18 16:13:27



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.877	5.492	176209	3620315	49.375
2	6.538	6.258	188121	3711981	50.625
Total			364330	7332295	100.000

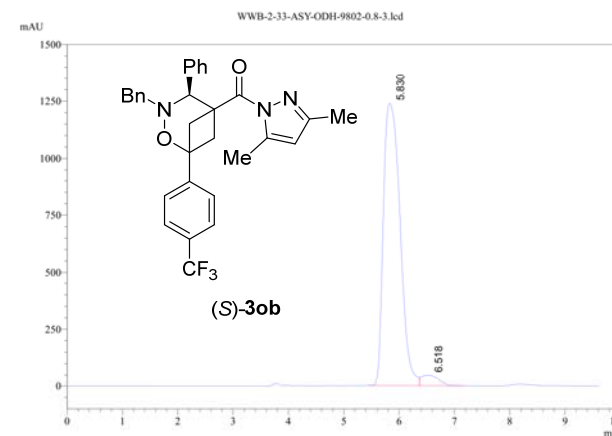
D:\1-Data\6-WWB\WWB-2-33-RAC-ODH-9802-0.8-3.lcd

Analysis Report

2024-04-18 16:23:34 1 / 1



Sample Name : WWB-2-33-ASY-ODH-9802-0.8-2
Sample ID : WWB-2-33-ASY-ODH-9802-0.8-2
Data File : WWB-2-33-ASY-ODH-9802-0.8-3.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/18 16:11:51
Date Processed : 2024/4/18 16:22:32



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.830	5.433	1238764	25986508	96.127
2	6.518	6.367	47924	1047103	3.873
Total			1286688	27033610	100.000

D:\1-Data\6-WWB\WWB-2-33-ASY-ODH-9802-0.8-3.lcd

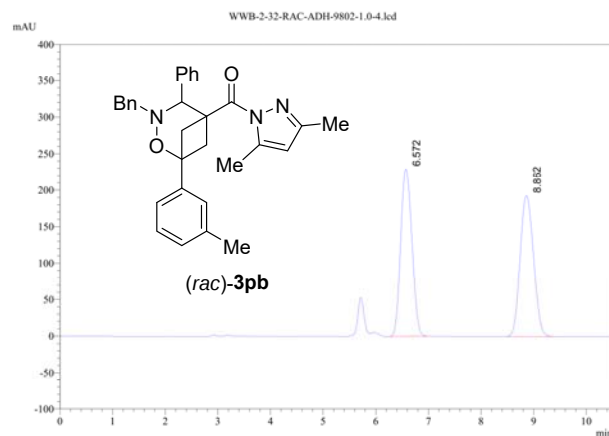
Analysis Report

2024-04-22 11:20:21 1 / 1



Sample Name : WWB-2-32-RAC-ADH-9802-1.0-1
Sample ID : WWB-2-32-RAC-ADH-9802-1.0-1
Data File : WWB-2-32-RAC-ADH-9802-1.0-4.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/22 11:06:23
Date Processed : 2024/4/22 11:17:22

Sample Information



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	6.572	6.267	229194	3403634	49.882
2	8.862	8.475	192796	3419714	50.118
Total			421990	6823348	100.000

D:\1-Data\6-WWB\WWB-2-32-RAC-ADH-9802-1.0-4.lcd

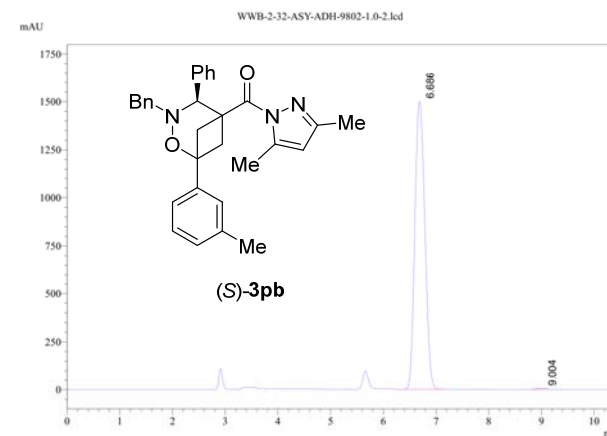
Analysis Report

2024-04-22 11:30:14 1 / 1



Sample Name : WWB-2-32-ASY-ADH-9802-1.0-1
Sample ID : WWB-2-32-ASY-ADH-9802-1.0-1
Data File : WWB-2-32-ASY-ADH-9802-1.0-2.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/22 11:18:27
Date Processed : 2024/4/22 11:29:45

Sample Information



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	6.686	6.342	1500103	19823799	99.753
2	9.004	8.825	4223	49039	0.247
Total			1504326	19872838	100.000

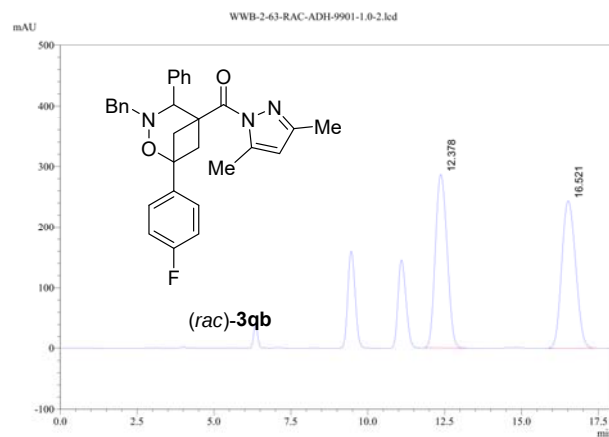
D:\1-Data\6-WWB\WWB-2-32-ASY-ADH-9802-1.0-2.lcd

Analysis Report

2024-05-10 11:05:17 1 / 1



Sample Name : WWB-2-63-RAC-ADH-9901-1.0-1
Sample ID : WWB-2-63-RAC-ADH-9901-1.0-1
Data File : WWB-2-63-RAC-ADH-9901-1.0-2.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/5/10 10:02:02
Date Processed : 2024/5/10 10:22:29



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.378	11.858	286561	7636129	49.858
2	16.521	15.858	243812	7679759	50.142
Total			530373	15315888	100.000

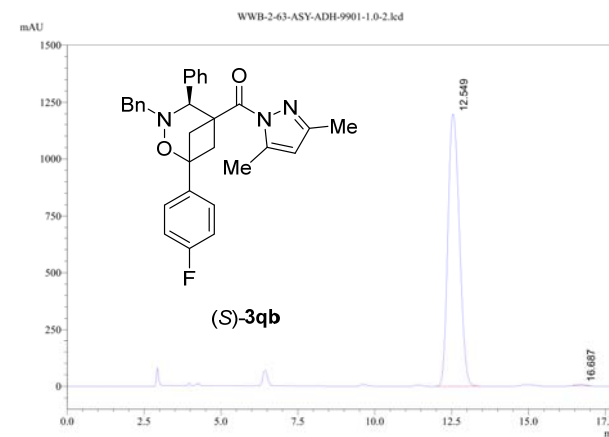
D:\1-Data\6-WWB\WWB-2-63-RAC-ADH-9901-1.0-2.lcd

Analysis Report

2024-05-10 11:05:35 1 / 1



Sample Name : WWB-2-63-ASY-ADH-9901-1.0-1
Sample ID : WWB-2-63-ASY-ADH-9901-1.0-1
Data File : WWB-2-63-ASY-ADH-9901-1.0-2.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/5/10 10:21:15
Date Processed : 2024/5/10 10:40:06



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.549	12.000	1198428	30917643	99.585
2	16.687	16.417	5994	128861	0.415
Total			1204422	31046505	100.000

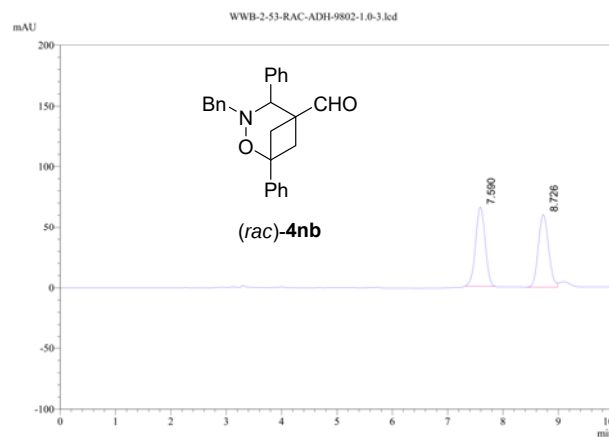
D:\1-Data\6-WWB\WWB-2-63-ASY-ADH-9901-1.0-2.lcd

Analysis Report

2024-04-29 20:15:20 1 / 1



Sample Name : WWB-2-53-RAC-ADH-9802-1.0-1
Sample ID : WWB-2-53-RAC-ADH-9802-1.0-1
Data File : WWB-2-53-RAC-ADH-9802-1.0-3.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/29 19:51:46
Date Processed : 2024/4/29 20:02:25



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	7.590	7.317	65377	786229	50.550
2	8.726	8.425	60167	769121	49.450
Total			125543	1555351	100.000

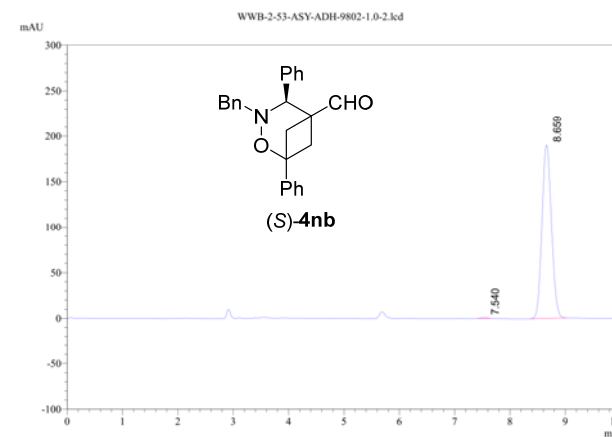
D:\1-Data\6-WWB\WWB-2-53-RAC-ADH-9802-1.0-3.lcd

Analysis Report

2024-04-29 20:15:41 1 / 1



Sample Name : WWB-2-53-ASY-ADH-9802-1.0-1
Sample ID : WWB-2-53-ASY-ADH-9802-1.0-1
Data File : WWB-2-53-ASY-ADH-9802-1.0-2.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/29 20:03:15
Date Processed : 2024/4/29 20:14:23



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	7.540	7.417	922	7383	0.326
2	8.659	8.367	190471	2260587	99.674
Total			191393	2267970	100.000

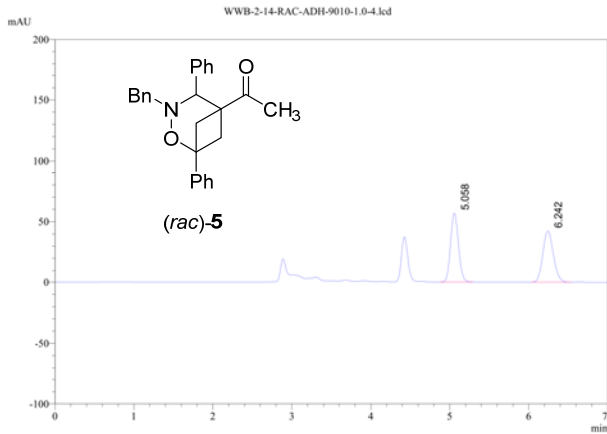
D:\1-Data\6-WWB\WWB-2-53-ASY-ADH-9802-1.0-2.lcd

Analysis Report

2024-04-02 15:21:37 1 / 1



Sample Name : WWB-2-14-RAC-ADH-9010-1.0-1
Sample ID : WWB-2-14-RAC-ADH-9010-1.0-1
Data File : WWB-2-14-RAC-ADH-9010-1.0-4.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/2 15:11:08
Date Processed : 2024/4/2 15:21:00



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.058	4.875	56902	399463	50.169
2	6.242	6.033	42483	396773	49.831
Total			99385	796236	100.000

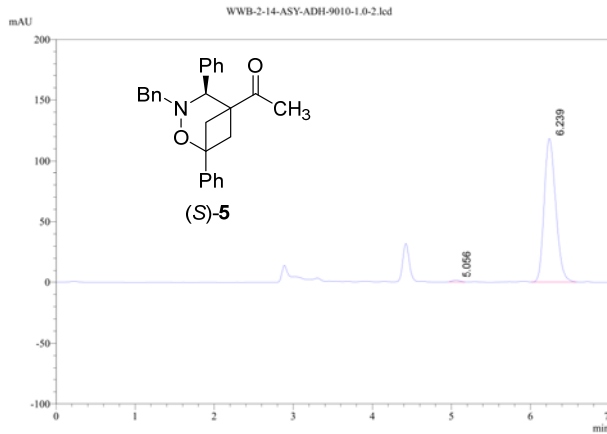
D:\1-Data\6-WWB\WWB-2-14-RAC-ADH-9010-1.0-4.lcd

Analysis Report

2024-04-02 15:27:43 1 / 1



Sample Name : WWB-2-14-ASY-ADH-9010-1.0-1
Sample ID : WWB-2-14-ASY-ADH-9010-1.0-1
Data File : WWB-2-14-ASY-ADH-9010-1.0-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/2 15:19:13
Date Processed : 2024/4/2 15:27:34



Detector A Channel 1 254nm					
Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.056	4.967	1444	8995	0.742
2	6.239	6.008	118292	1203188	99.258
Total			119736	1212183	100.000

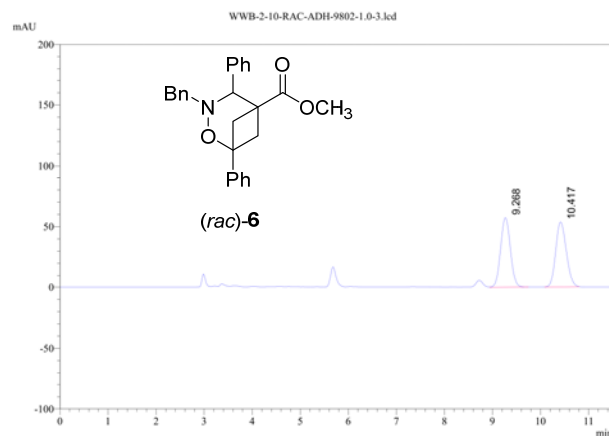
D:\1-Data\6-WWB\WWB-2-14-ASY-ADH-9010-1.0-2.lcd

Analysis Report

2024-03-29 21:59:57 1 / 1



Sample Name : WWB-2-10-RAC-ADH-9802-1.0-2
Sample ID : WWB-2-10-RAC-ADH-9802-1.0-2
Data File : WWB-2-10-RAC-ADH-9802-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/29 21:45:03
Date Processed : 2024/3/29 21:57:24



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.268	8.942	57347	816263	49.802
2	10.417	10.083	53482	822765	50.198
Total			110829	1639027	100.000

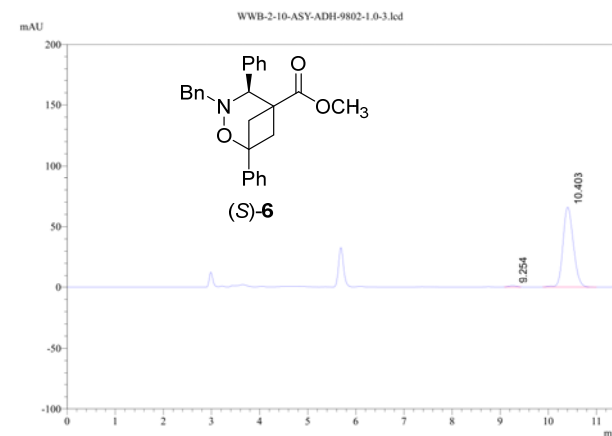
D:\1-Data\6-WWB\WWB-2-10-RAC-ADH-9802-1.0-3.lcd

Analysis Report

2024-03-29 22:12:52 1 / 1



Sample Name : WWB-2-10-ASY-ADH-9802-1.0-2
Sample ID : WWB-2-10-ASY-ADH-9802-1.0-2
Data File : WWB-2-10-ASY-ADH-9802-1.0-3.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/29 21:58:30
Date Processed : 2024/3/29 22:12:40



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.254	9.083	968	10815	1.079
2	10.403	9.883	65743	991145	98.921
Total			66711	1001960	100.000

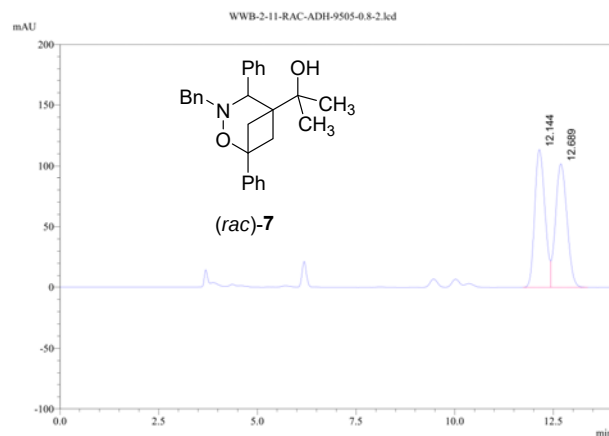
D:\1-Data\6-WWB\WWB-2-10-ASY-ADH-9802-1.0-3.lcd

Analysis Report

2024-03-29 21:34:54 1 / 1



Sample Name : WWB-2-11-RAC-ADH-9505-0.8-1
Sample ID : WWB-2-11-RAC-ADH-9505-0.8-1
Data File : WWB-2-11-RAC-ADH-9505-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/29 20:58:42
Date Processed : 2024/3/29 21:17:27



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.144	11.725	113722	2059234	50.018
2	12.689	12.433	101936	2057761	49.982
Total			215658	4116995	100.000

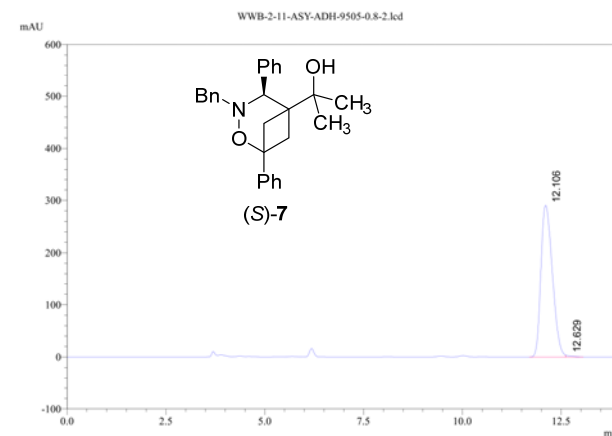
D:\1-Data\6-WWB\WWB-2-11-RAC-ADH-9505-0.8-2.lcd

Analysis Report

2024-03-29 21:35:14 1 / 1



Sample Name : WWB-2-11-ASY-ADH-9505-0.8-1
Sample ID : WWB-2-11-ASY-ADH-9505-0.8-1
Data File : WWB-2-11-ASY-ADH-9505-0.8-2.lcd
Method File : 90-10.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/3/29 21:18:20
Date Processed : 2024/3/29 21:34:01



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	12.106	11.692	290471	5863090	99.452
2	12.629	12.617	3282	32312	0.548
Total			293753	5895402	100.000

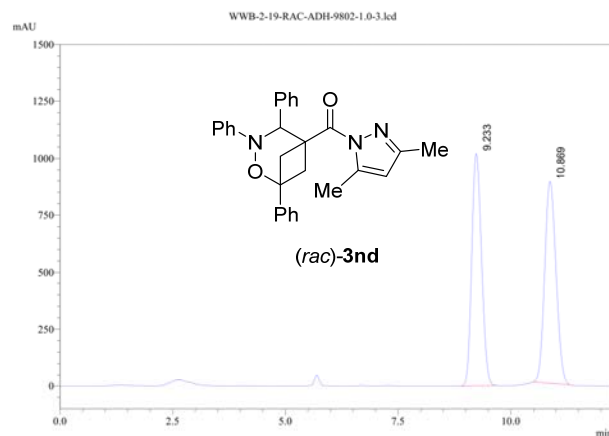
D:\1-Data\6-WWB\WWB-2-11-ASY-ADH-9505-0.8-2.lcd

Analysis Report

2024-04-16 15:46:20 1 / 1



Sample Name : WWB-2-19-RAC-ADH-9802-1.0-1
Sample ID : WWB-2-19-RAC-ADH-9802-1.0-1
Data File : WWB-2-19-RAC-ADH-9802-1.0-3.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/5 15:23:39
Date Processed : 2024/4/5 15:36:36



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.233	8.858	1020268	15369146	49.775
2	10.869	10.500	884611	15507991	50.225
Total			1904879	30877137	100.000

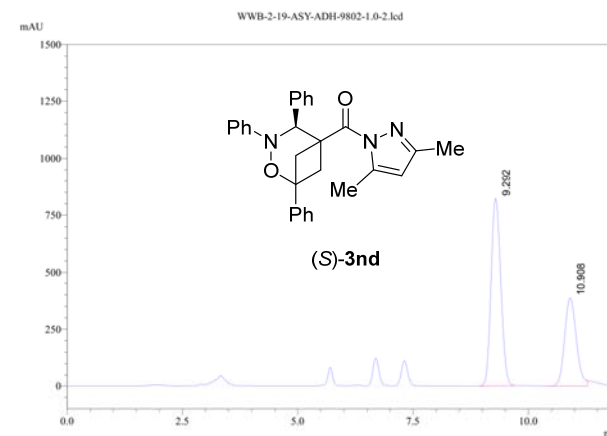
D:\1-Data\6-WWB\WWB-2-19-RAC-ADH-9802-1.0-3.lcd

Analysis Report

2024-04-16 15:46:36 1 / 1



Sample Name : WWB-2-19-ASY-ADH-9802-1.0-1
Sample ID : WWB-2-19-ASY-ADH-9802-1.0-1
Data File : WWB-2-19-ASY-ADH-9802-1.0-2.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/5 15:37:15
Date Processed : 2024/4/5 15:51:25



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	9.292	8.883	822236	12066117	63.749
2	10.908	10.433	386980	6861395	36.251
Total			1209215	18927512	100.000

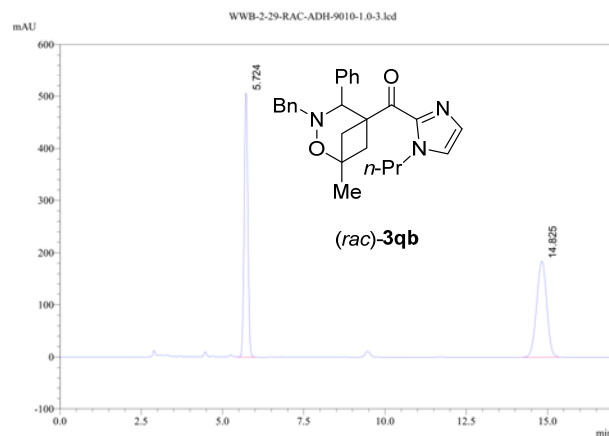
D:\1-Data\6-WWB\WWB-2-19-ASY-ADH-9802-1.0-2.lcd

Analysis Report

2024-04-17 16:45:58 1 / 1



Sample Name : WWB-2-29-RAC-ADH-9010-1.0-1
Sample ID : WWB-2-29-RAC-ADH-9010-1.0-1
Data File : WWB-2-29-RAC-ADH-9010-1.0-3.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/17 15:56:32
Date Processed : 2024/4/17 16:17:54



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.724	5.467	505887	3939366	49.829
2	14.825	14.250	184001	3966392	50.171
Total			689888	7905758	100.000

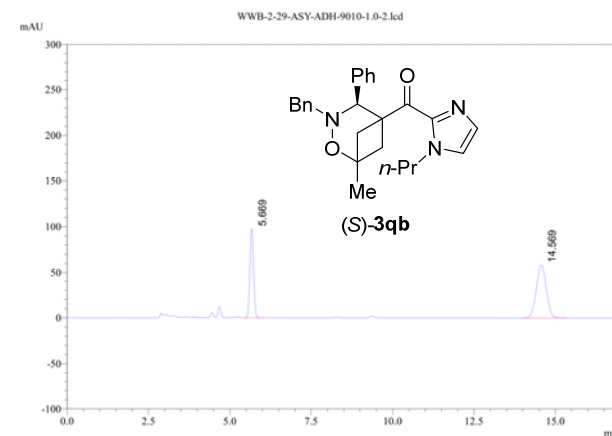
D:\1-Data\6-WWB\WWB-2-29-RAC-ADH-9010-1.0-3.lcd

Analysis Report

2024-04-17 16:46:24 1 / 1



Sample Name : WWB-2-29-ASY-ADH-9010-1.0-1
Sample ID : WWB-2-29-ASY-ADH-9010-1.0-1
Data File : WWB-2-29-ASY-ADH-9010-1.0-2.lcd
Method File : 98-02.lcm
Report Format File : DEFAULT.lsr
Date Acquired : 2024/4/17 16:18:51
Date Processed : 2024/4/17 16:43:57



Detector A Channel 1 254nm

Peak#	Ret. Time [min]	Peak Start [min]	Height [mAU]	Area [mAU*min]	Area%
1	5.669	5.425	97440	765456	38.152
2	14.569	13.958	58199	1240886	61.848
Total			155639	2006343	100.000

D:\1-Data\6-WWB\WWB-2-29-ASY-ADH-9010-1.0-2.lcd

12 References

- [1] a) K. Dhake, K. J. Woelk, J. Becica, A. Un, S. E. Jenny, D. C. Leitch, *Angew. Chem. Int. Ed.* **2022**, *61*, e202204719; b) K. Livingstone, K. Siebold, S. Meyer, V. M. Heras, C. G. Daniliuc, R. Gilmour, *ACS Catal.* **2022**, *12*, 14507-14516; c) R. Guo, Y.-C. Chang, L. Herter, C. Salome, S. E. Braley, T. C. Fessard, M. K. Brown, *J. Am. Chem. Soc.* **2022**, *144*, 7988-7994; d) J. C. Sharland, H. M. L. Davies, *Org. Lett.* **2023**, *25*, 5214-5219.
- [2] a) P. H. Poulsen, S. Vergura, A. Monleon, D. K. B. Jørgensen, K. A. Jørgensen, *J. Am. Chem. Soc.* **2016**, *138*, 6412-6415; b) C. Matassini, C. Parmeggiani, F. Cardona, A. Goti, *Org. Lett.* **2015**, *17*, 4082-4085.
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