Supplementary Information

Interchannel Coupling in Two-Channel AlGaN/GaN Plasmonic Terahertz Detectors

Srinivasa Ramanujam, Sabareesan. P,
Sathish Kumar Dhayalan, Muthubalan Varadharajaperumal

Table S1: Every time-domain verification run: full perturbation model and time-domain photovoltage (μV, at the run's drive, 0.3× nominal unless stated; near-threshold runs at $0.2k_BT/q$) and their deviation (%). Rows E1–E65 are the further checks marked in Figs. 6(a) (physics added in turn), 6(c) (temperature, bias for $n_g = 10^{12}\,\mathrm{cm}^{-2}$), 7(d) (channel a emptied in the access regions) and S4(b) (drain pad).

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
0	freq	No-cap	0.5 THz, drive 0.05×	-0.6068	-0.6049	-0.32
1	freq	No-cap	0.75 THz, drive 0.05×	-0.3308	-0.329	-0.55
2	freq	No-cap	1 THz	-7.467	-7.408	-0.79
3	freq	No-cap	1.5 THz	-3.044	-3.025	-0.63
4	freq	No-cap	2 THz	-1.781	-1.773	-0.45
5	freq	No-cap	2.5 THz	-0.7822	-0.7745	-0.99
6	freq	No-cap	3 THz	-0.2211	-0.2197	-0.62
7	freq	No-cap	4 THz	-0.01129	-0.01178	+4.38
8	freq	GaN-cap	0.5 THz, drive 0.05×	-0.7692	-0.7668	-0.31
9	freq	GaN-cap	0.75 THz, drive 0.05×	-0.4238	-0.4218	-0.47
10	freq	GaN-cap	1 THz	-9.424	-9.36	-0.68
11	freq	GaN-cap	1.5 THz	-4.029	-4.001	-0.70
12	freq	GaN-cap	2 THz	-2.282	-2.27	-0.50
13	freq	GaN-cap	2.5 THz	-0.7	-0.6923	-1.10
14	freq	GaN-cap	3 THz	-0.1222	-0.1206	-1.30
15	freq	GaN-cap	4 THz	-0.1206	-0.1208	+0.20
16	freq	AlN-cap	0.5 THz, drive 0.05×	-0.2587	-0.2575	-0.43
17	freq	AlN-cap	0.75 THz, drive 0.05×	-0.1448	-0.144	-0.51
18	freq	AlN-cap	1 THz	-3.242	-3.214	-0.87
19	freq	AlN-cap	1.5 THz	-1.433	-1.423	-0.74
20	freq	AlN-cap	2 THz	-0.6975	-0.6913	-0.88
21	freq	AlN-cap	2.5 THz	-0.3553	-0.3521	-0.91
22	freq	AlN-cap	3 THz	-0.1482	-0.1473	-0.61
23	freq	AlN-cap	4 THz	-0.02312	-0.02341	+1.29
24	param	No-cap	N_{TS}=0.2×	-7.336	-7.284	-0.70
25	param	No-cap	N_{TS}=5×	-7.476	-7.416	-0.79
26	param	No-cap	E_{TS}=1.1 eV	-7.502	-7.441	-0.81
27	param	No-cap	E_{TS}=1.6 eV	-7.408	-7.352	-0.75
28	param	No-cap	N_{TB}=0.2×	-6.651	-6.595	-0.84
29	param	No-cap	N_{TB}=5×	-10.12	-10.05	-0.69
30	param	No-cap	E_{TB}=0.8 eV	-7.73	-7.67	-0.78
31	param	No-cap	t_{AlGaN}=10 nm	-15.26	-15.16	-0.64
32	param	No-cap	t_{AlGaN}=50 nm	-6.036	-5.979	-0.93
33	param	No-cap	L_g=0.15 μm	-7.151	-7.084	-0.94
34	param	No-cap	L_g=0.75 μm	-9.673	-9.629	-0.46
35	param	No-cap	T=77 K	-11.73	-11.65	-0.70
36	param	No-cap	T=400 K	-6.745	-6.711	-0.50
37	param	No-cap	V_G=-2 V	-19.4	-19.26	-0.71
38	param	GaN-cap	N_{TS}=0.2×	-9.393	-9.33	-0.67
39	param	GaN-cap	N_{TS}=5×	-9.445	-9.38	-0.68
40	param	GaN-cap	E_{TS}=1.1 eV	-9.517	-9.45	-0.70
41	param	GaN-cap	E_{TS}=1.6 eV	-9.274	-9.214	-0.65
42	param	GaN-cap	N_{TB}=0.2×	-8.294	-8.235	-0.72
43	param	GaN-cap	N_{TB}=5×	-12.96	-12.87	-0.70
44	param	GaN-cap	E_{TB}=0.8 eV	-9.795	-9.729	-0.67

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
45	param	GaN-cap	t_{AlGaN}=10 nm	-21.77	-21.53	-1.08
46	param	GaN-cap	t_{AlGaN}=50 nm	-6.781	-6.724	-0.84
47	param	GaN-cap	L_g=0.15 μm	-9.23	-9.156	-0.80
48	param	GaN-cap	L_g=0.75 μm	-11.33	-11.26	-0.60
49	param	GaN-cap	T=77 K	-15.59	-15.45	-0.90
50	param	GaN-cap	T=400 K	-7.743	-7.705	-0.50
51	param	GaN-cap	V_G=-2 V	-22.9	-22.74	-0.69
52	param	AlN-cap	N_{TS}=0.2×	-5.214	-5.194	-0.38
53	param	AlN-cap	N_{TS}=5×	-3.126	-3.099	-0.84
54	param	AlN-cap	E_{TS}=1.1 eV	-3.242	-3.214	-0.87
55	param	AlN-cap	E_{TS}=1.6 eV	-3.243	-3.215	-0.87
56	param	AlN-cap	N_{TB}=0.2×	-2.96	-2.934	-0.88
57	param	AlN-cap	N_{TB}=5×	-3.992	-3.958	-0.84
58	param	AlN-cap	E_{TB}=0.8 eV	-3.327	-3.299	-0.86
59	param	AlN-cap	t_{AlGaN}=10 nm	-3.369	-3.339	-0.91
60	param	AlN-cap	t_{AlGaN}=50 nm	-3.123	-3.095	-0.87
61	param	AlN-cap	L_g=0.15 μm	-3.033	-3.006	-0.88
62	param	AlN-cap	L_g=0.75 μm	-4.075	-4.038	-0.90
63	param	AlN-cap	T=77 K	-4.734	-4.699	-0.76
64	param	AlN-cap	T=400 K	-2.664	-2.648	-0.57
65	param	AlN-cap	V_G=-2 V	-3.424	-3.396	-0.82
66	param	GaN-cap	t_{cap}=3 nm	-8.397	-8.34	-0.68
67	param	GaN-cap	t_{cap}=10 nm	-11.1	-11.02	-0.68
68	param	AlN-cap	t_{AlN}=4 nm	-3.162	-3.134	-0.88
69	param	AlN-cap	t_{AlN}=8 nm	-3.347	-3.318	-0.88
70	sub	No-cap	n_g=2e11 cm^{-2}	-42.21	-42.1	-0.25
71	sub	No-cap	n_g=1e12 cm^{-2}	-5.336	-5.304	-0.60
72	sub	GaN-cap	n_g=2e11 cm^{-2}	-26.97	-26.87	-0.38
73	sub	GaN-cap	n_g=1e12 cm^{-2}	-3.106	-3.082	-0.78
74	sub	AlN-cap	n_g=2e11 cm^{-2}	-26.52	-26.45	-0.24
75	sub	AlN-cap	n_g=1e12 cm^{-2}	-3.822	-3.805	-0.47
76	grid	No-cap	Δx=20 nm	-7.486	-7.428	-0.79
77	grid	No-cap	Δx=10 nm	-7.467	-7.408	-0.79
78	grid	No-cap	Δx=5 nm	-7.46	-7.401	-0.79
79	grid	GaN-cap	Δx=20 nm	-9.456	-9.392	-0.68
80	grid	GaN-cap	Δx=10 nm	-9.424	-9.36	-0.68
81	grid	GaN-cap	Δx=5 nm	-9.417	-9.353	-0.68
82	grid	AlN-cap	Δx=20 nm	-3.248	-3.22	-0.87
83	grid	AlN-cap	Δx=10 nm	-3.242	-3.214	-0.87
84	grid	AlN-cap	Δx=5 nm	-3.24	-3.211	-0.87
85	amp	No-cap	drive 0.3×	-7.467	-7.408	-0.79
86	amp	No-cap	drive 0.3×, no v_{sat}	-7.467	-7.416	-0.68
87	amp	No-cap	drive 1×	-82.97	-81.71	-1.52
88	amp	No-cap	drive 1×, no v_{sat}	-82.97	-82.22	-0.89
89	amp	No-cap	drive 3×	-746.7	-710.3	-4.87
90	amp	No-cap	drive 3×, no v_{sat}	-746.7	-729	-2.37
91	amp	No-cap	drive 10×	-8297	-6640	-19.97
92	amp	No-cap	drive 10×, no v_{sat}	-8297	-7062	-14.88
93	amp	No-cap	drive 30×	-7.467e+04	-3.648e+04	-51.14
94	amp	No-cap	drive 30×, no v_{sat}	-7.467e+04	-4.1e+04	-45.09
95	amp	GaN-cap	drive 0.3×	-9.424	-9.36	-0.68
96	amp	GaN-cap	drive 0.3×, no v_{sat}	-9.424	-9.373	-0.54
97	amp	GaN-cap	drive 1×	-104.7	-103.1	-1.52
98	amp	GaN-cap	drive 1×, no v_{sat}	-104.7	-104	-0.72
99	amp	GaN-cap	drive 3×	-942.4	-892	-5.34
100	amp	GaN-cap	drive 3×, no v_{sat}	-942.4	-923.9	-1.96
101	amp	GaN-cap	drive 10×	-1.047e+04	-8117	-22.48
102	amp	GaN-cap	drive 10×, no v_{sat}	-1.047e+04	-8991	-14.13
103	amp	GaN-cap	drive 30×	-9.424e+04	-4.235e+04	-55.06
104	amp	GaN-cap	drive 30×, no v_{sat}	-9.424e+04	-5.127e+04	-45.60
105	amp	AlN-cap	drive 0.3×	-3.242	-3.214	-0.87
106	amp	AlN-cap	drive 0.3×, no v_{sat}	-3.242	-3.218	-0.74
107	amp	AlN-cap	drive 1×	-36.03	-35.4	-1.74
108	amp	AlN-cap	drive 1×, no v_{sat}	-36.03	-35.66	-1.02
109	amp	AlN-cap	drive 3×	-324.2	-302.8	-6.62
110	amp	AlN-cap	drive 3×, no v_{sat}	-324.2	-312.8	-3.52

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
111	amp	AlN-cap	drive 10×	-3603	-2707	-24.86
112	amp	AlN-cap	drive 10×, no v_{sat}	-3603	-2971	-17.54
113	amp	AlN-cap	drive 30×	-3.242e+04	-1.645e+04	-49.25
114	amp	AlN-cap	drive 30×, no v_{sat}	-3.242e+04	-1.856e+04	-42.75
121	sub	No-cap	n_g=1e10 cm^{-2}	-111.3	-110.2	-1.07
122	sub	GaN-cap	n_g=1e10 cm^{-2}	-79.29	-78.35	-1.19
123	sub	AlN-cap	n_g=1e10 cm^{-2}	-102.4	-100.5	-1.91
124	freq	No-cap	0.2 THz, drive 0.05×	-1.673	-1.659	-0.79
125	freq	No-cap	0.4 THz, drive 0.05×	-0.8192	-0.8165	-0.33
126	freq	No-cap	0.6 THz, drive 0.05×	-0.4654	-0.4635	-0.41
127	freq	No-cap	0.8 THz, drive 0.05×	-0.299	-0.2972	-0.59
128	freq	No-cap	1.2 THz	-5.232	-5.201	-0.60
129	freq	No-cap	1.4 THz	-3.605	-3.584	-0.59
130	freq	No-cap	1.6 THz	-2.638	-2.621	-0.65
131	freq	No-cap	1.8 THz	-2.131	-2.117	-0.65
132	freq	No-cap	2.2 THz	-1.403	-1.397	-0.48
133	freq	No-cap	2.4 THz	-0.985	-0.9769	-0.82
134	freq	No-cap	2.6 THz	-0.6023	-0.5959	-1.06
135	freq	No-cap	2.8 THz	-0.3531	-0.3503	-0.81
136	freq	No-cap	3.2 THz	-0.1346	-0.1337	-0.65
137	freq	No-cap	3.4 THz	-0.07406	-0.07338	-0.92
138	freq	No-cap	3.6 THz	-0.02307	-0.02243	-2.77
139	freq	No-cap	3.8 THz	0.006365	0.006457	+1.45
140	freq	No-cap	4.2 THz	-0.04579	-0.04632	+1.15
141	freq	No-cap	4.4 THz	-0.0712	-0.07154	+0.49
142	freq	No-cap	4.6 THz	-0.08029	-0.0804	+0.13
143	freq	No-cap	4.8 THz	-0.07558	-0.07555	-0.05
144	freq	No-cap	5 THz	-0.06356	-0.06342	-0.22
145	freq	GaN-cap	0.2 THz, drive 0.05×	-2.069	-2.049	-0.97
146	freq	GaN-cap	0.4 THz, drive 0.05×	-1.032	-1.028	-0.35
147	freq	GaN-cap	0.6 THz, drive 0.05×	-0.5932	-0.5909	-0.37
148	freq	GaN-cap	0.8 THz, drive 0.05×	-0.383	-0.3811	-0.50
149	freq	GaN-cap	1.2 THz	-6.475	-6.435	-0.63
150	freq	GaN-cap	1.4 THz	-4.62	-4.588	-0.70
151	freq	GaN-cap	1.6 THz	-3.585	-3.561	-0.65
152	freq	GaN-cap	1.8 THz	-2.911	-2.896	-0.50
153	freq	GaN-cap	2.2 THz	-1.602	-1.589	-0.81
154	freq	GaN-cap	2.4 THz	-0.9541	-0.9439	-1.07
155	freq	GaN-cap	2.6 THz	-0.5067	-0.5016	-1.00
156	freq	GaN-cap	2.8 THz	-0.2612	-0.2586	-0.98
157	freq	GaN-cap	3.2 THz	-0.03189	-0.03085	-3.27
158	freq	GaN-cap	3.4 THz	0.0006013	0.0004834	-19.61
159	freq	GaN-cap	3.6 THz	-0.04078	-0.04172	+2.31
160	freq	GaN-cap	3.8 THz	-0.09477	-0.09558	+0.86
161	freq	GaN-cap	4.2 THz	-0.1087	-0.1084	-0.25
162	freq	GaN-cap	4.4 THz	-0.08137	-0.08106	-0.38
163	freq	GaN-cap	4.6 THz	-0.05949	-0.05925	-0.40
164	freq	GaN-cap	4.8 THz	-0.04253	-0.04232	-0.49
165	freq	GaN-cap	5 THz	-0.03136	-0.03127	-0.29
166	freq	AlN-cap	0.2 THz, drive 0.05×	-0.5822	-0.5684	-2.36
167	freq	AlN-cap	0.4 THz, drive 0.05×	-0.334	-0.3322	-0.54
168	freq	AlN-cap	0.6 THz, drive 0.05×	-0.2022	-0.2014	-0.43
169	freq	AlN-cap	0.8 THz, drive 0.05×	-0.1307	-0.13	-0.54
170	freq	AlN-cap	1.2 THz	-2.318	-2.299	-0.83
171	freq	AlN-cap	1.4 THz	-1.68	-1.667	-0.73
172	freq	AlN-cap	1.6 THz	-1.227	-1.217	-0.77
173	freq	AlN-cap	1.8 THz	-0.9137	-0.9061	-0.83
174	freq	AlN-cap	2.2 THz	-0.5387	-0.5338	-0.91
175	freq	AlN-cap	2.4 THz	-0.4112	-0.4075	-0.91
176	freq	AlN-cap	2.6 THz	-0.304	-0.3013	-0.89
177	freq	AlN-cap	2.8 THz	-0.2159	-0.2141	-0.81
178	freq	AlN-cap	3.2 THz	-0.1001	-0.09993	-0.19
179	freq	AlN-cap	3.4 THz	-0.06782	-0.06817	+0.51
180	freq	AlN-cap	3.6 THz	-0.04656	-0.04729	+1.56
181	freq	AlN-cap	3.8 THz	-0.03249	-0.03347	+3.03
182	freq	AlN-cap	4.2 THz	-0.01697	-0.01719	+1.27

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
183	freq	AlN-cap	4.4 THz	-0.01311	-0.01331	+1.58
184	freq	AlN-cap	4.6 THz	-0.01083	-0.01098	+1.35
185	freq	AlN-cap	4.8 THz	-0.009587	-0.009764	+1.85
186	freq	AlN-cap	5 THz	-0.008921	-0.009084	+1.83
187	param	No-cap	N_{TS}=0.1×	-7.051	-7.018	-0.46
188	param	No-cap	N_{TS}=0.1585×	-7.045	-7.009	-0.51
189	param	No-cap	N_{TS}=0.2512×	-7.451	-7.393	-0.78
190	param	No-cap	N_{TS}=0.3981×	-7.46	-7.401	-0.78
191	param	No-cap	N_{TS}=0.631×	-7.464	-7.405	-0.79
192	param	No-cap	N_{TS}=1×	-7.467	-7.408	-0.79
193	param	No-cap	N_{TS}=1.5849×	-7.47	-7.411	-0.79
194	param	No-cap	N_{TS}=2.5119×	-7.472	-7.413	-0.79
195	param	No-cap	N_{TS}=3.9811×	-7.474	-7.415	-0.79
196	param	No-cap	N_{TB}=0.1×	-6.483	-6.428	-0.85
197	param	No-cap	N_{TB}=0.1585×	-6.587	-6.532	-0.84
198	param	No-cap	N_{TB}=0.2512×	-6.723	-6.667	-0.83
199	param	No-cap	N_{TB}=0.3981×	-6.903	-6.846	-0.82
200	param	No-cap	N_{TB}=0.631×	-7.142	-7.085	-0.81
201	param	No-cap	N_{TB}=1×	-7.467	-7.408	-0.79
202	param	No-cap	N_{TB}=1.5849×	-7.915	-7.855	-0.77
203	param	No-cap	N_{TB}=2.5119×	-8.553	-8.49	-0.74
204	param	No-cap	N_{TB}=3.9811×	-9.491	-9.425	-0.70
205	param	No-cap	E_{TS}=1 eV	-7.517	-7.456	-0.82
206	param	No-cap	E_{TS}=1.2 eV	-7.485	-7.425	-0.80
207	param	No-cap	E_{TS}=1.3 eV	-7.467	-7.408	-0.79
208	param	No-cap	E_{TS}=1.4 eV	-7.448	-7.39	-0.78
209	param	No-cap	E_{TS}=1.5 eV	-7.428	-7.372	-0.76
210	param	No-cap	E_{TS}=1.7 eV	-7.386	-7.332	-0.74
211	param	No-cap	E_{TS}=1.8 eV	-7.364	-7.31	-0.72
212	param	No-cap	E_{TB}=0.4 eV	-7.219	-7.161	-0.80
213	param	No-cap	E_{TB}=0.5 eV	-7.362	-7.303	-0.79
214	param	No-cap	E_{TB}=0.6 eV	-7.492	-7.433	-0.79
215	param	No-cap	E_{TB}=0.7 eV	-7.614	-7.554	-0.78
216	param	No-cap	E_{TB}=0.9 eV	-7.84	-7.78	-0.77
217	param	No-cap	E_{TB}=1 eV	-7.947	-7.886	-0.77
218	param	No-cap	t_{AlGaN}=5 nm	-25.58	-24.95	-2.45
219	param	No-cap	t_{AlGaN}=7.5 nm	-20.37	-20.15	-1.09
220	param	No-cap	t_{AlGaN}=15 nm	-10.23	-10.16	-0.65
221	param	No-cap	t_{AlGaN}=20 nm	-8.367	-8.307	-0.72
222	param	No-cap	t_{AlGaN}=25 nm	-7.467	-7.408	-0.79
223	param	No-cap	t_{AlGaN}=35 nm	-6.599	-6.541	-0.88
224	param	No-cap	t_{AlGaN}=50 nm	-6.036	-5.979	-0.93
225	param	No-cap	t_{AlGaN}=75 nm	-5.626	-5.576	-0.89
226	param	No-cap	t_{AlGaN}=100 nm	-5.407	-5.365	-0.78
227	param	No-cap	L_g=0.1 μm	-7.121	-7.055	-0.94
228	param	No-cap	L_g=0.2 μm	-7.212	-7.147	-0.90
229	param	No-cap	L_g=0.3 μm	-7.467	-7.408	-0.79
230	param	No-cap	L_g=0.4 μm	-7.916	-7.86	-0.70
231	param	No-cap	L_g=0.5 μm	-8.527	-8.476	-0.60
232	param	No-cap	L_g=0.6 μm	-9.168	-9.125	-0.48
233	param	No-cap	L_g=0.7 μm	-9.599	-9.558	-0.43
234	param	No-cap	L_g=0.8 μm	-9.651	-9.6	-0.52
235	param	No-cap	L_g=0.9 μm	-9.415	-9.348	-0.71
236	param	No-cap	L_g=1 μm	-9.124	-9.046	-0.86
237	param	No-cap	t_{buffer}=0.3 μm	-7.448	-7.387	-0.81
238	param	No-cap	t_{buffer}=0.5 μm	-7.451	-7.391	-0.81
239	param	No-cap	t_{buffer}=0.75 μm	-7.456	-7.396	-0.80
240	param	No-cap	t_{buffer}=1 μm	-7.461	-7.401	-0.80
241	param	No-cap	t_{buffer}=1.5 μm	-7.467	-7.408	-0.79
242	param	No-cap	t_{buffer}=2 μm	-7.473	-7.414	-0.78
243	param	No-cap	t_{buffer}=3 μm	-7.479	-7.421	-0.78
244	param	No-cap	T=100 K	-11.71	-11.63	-0.69
245	param	No-cap	T=150 K	-11.46	-11.38	-0.71
246	param	No-cap	T=200 K	-10.38	-10.29	-0.81
247	param	No-cap	T=250 K	-8.644	-8.567	-0.89
248	param	No-cap	T=350 K	-6.982	-6.939	-0.62

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
249	param	GaN-cap	N_{TS}=0.1×	-8.889	-8.837	-0.59
250	param	GaN-cap	N_{TS}=0.1585×	-9.382	-9.319	-0.67
251	param	GaN-cap	N_{TS}=0.2512×	-9.399	-9.336	-0.67
252	param	GaN-cap	N_{TS}=0.3981×	-9.409	-9.346	-0.68
253	param	GaN-cap	N_{TS}=0.631×	-9.417	-9.353	-0.68
254	param	GaN-cap	N_{TS}=1×	-9.424	-9.36	-0.68
255	param	GaN-cap	N_{TS}=1.5849×	-9.43	-9.366	-0.68
256	param	GaN-cap	N_{TS}=2.5119×	-9.436	-9.372	-0.68
257	param	GaN-cap	N_{TS}=3.9811×	-9.442	-9.378	-0.68
258	param	GaN-cap	N_{TB}=0.1×	-8.068	-8.009	-0.73
259	param	GaN-cap	N_{TB}=0.1585×	-8.208	-8.149	-0.72
260	param	GaN-cap	N_{TB}=0.2512×	-8.393	-8.333	-0.71
261	param	GaN-cap	N_{TB}=0.3981×	-8.639	-8.578	-0.70
262	param	GaN-cap	N_{TB}=0.631×	-8.971	-8.909	-0.69
263	param	GaN-cap	N_{TB}=1×	-9.424	-9.36	-0.68
264	param	GaN-cap	N_{TB}=1.5849×	-10.05	-9.982	-0.67
265	param	GaN-cap	N_{TB}=2.5119×	-10.92	-10.85	-0.66
266	param	GaN-cap	N_{TB}=3.9811×	-12.16	-12.08	-0.68
267	param	GaN-cap	E_{TS}=1 eV	-9.561	-9.493	-0.71
268	param	GaN-cap	E_{TS}=1.2 eV	-9.471	-9.406	-0.69
269	param	GaN-cap	E_{TS}=1.3 eV	-9.424	-9.36	-0.68
270	param	GaN-cap	E_{TS}=1.4 eV	-9.375	-9.313	-0.67
271	param	GaN-cap	E_{TS}=1.5 eV	-9.326	-9.264	-0.66
272	param	GaN-cap	E_{TS}=1.7 eV	-9.221	-9.162	-0.64
273	param	GaN-cap	E_{TS}=1.8 eV	-9.166	-9.108	-0.63
274	param	GaN-cap	E_{TB}=0.4 eV	-9.075	-9.013	-0.69
275	param	GaN-cap	E_{TB}=0.5 eV	-9.276	-9.213	-0.68
276	param	GaN-cap	E_{TB}=0.6 eV	-9.459	-9.395	-0.68
277	param	GaN-cap	E_{TB}=0.7 eV	-9.631	-9.566	-0.67
278	param	GaN-cap	E_{TB}=0.9 eV	-9.95	-9.883	-0.67
279	param	GaN-cap	E_{TB}=1 eV	-10.1	-10.03	-0.67
280	param	GaN-cap	t_{AlGaN}=5 nm	-24.98	-24.29	-2.78
281	param	GaN-cap	t_{AlGaN}=7.5 nm	-34.85	-34.23	-1.79
282	param	GaN-cap	t_{AlGaN}=15 nm	-13.85	-13.75	-0.72
283	param	GaN-cap	t_{AlGaN}=20 nm	-11	-10.93	-0.65
284	param	GaN-cap	t_{AlGaN}=25 nm	-9.424	-9.36	-0.68
285	param	GaN-cap	t_{AlGaN}=35 nm	-7.82	-7.76	-0.77
286	param	GaN-cap	t_{AlGaN}=50 nm	-6.781	-6.724	-0.84
287	param	GaN-cap	t_{AlGaN}=75 nm	-6.032	-5.983	-0.82
288	param	GaN-cap	t_{AlGaN}=100 nm	-5.646	-5.605	-0.73
289	param	GaN-cap	L_g=0.1 μm	-9.294	-9.219	-0.80
290	param	GaN-cap	L_g=0.2 μm	-9.228	-9.158	-0.76
291	param	GaN-cap	L_g=0.3 μm	-9.424	-9.36	-0.68
292	param	GaN-cap	L_g=0.4 μm	-9.864	-9.801	-0.64
293	param	GaN-cap	L_g=0.5 μm	-10.47	-10.4	-0.58
294	param	GaN-cap	L_g=0.6 μm	-11.04	-10.99	-0.52
295	param	GaN-cap	L_g=0.7 μm	-11.34	-11.28	-0.54
296	param	GaN-cap	L_g=0.8 μm	-11.21	-11.14	-0.69
297	param	GaN-cap	L_g=0.9 μm	-10.81	-10.72	-0.88
298	param	GaN-cap	L_g=1 μm	-10.4	-10.29	-1.01
299	param	GaN-cap	t_{buffer}=0.3 μm	-9.457	-9.392	-0.70
300	param	GaN-cap	t_{buffer}=0.5 μm	-9.448	-9.382	-0.69
301	param	GaN-cap	t_{buffer}=0.75 μm	-9.439	-9.374	-0.69
302	param	GaN-cap	t_{buffer}=1 μm	-9.434	-9.37	-0.68
303	param	GaN-cap	t_{buffer}=1.5 μm	-9.424	-9.36	-0.68
304	param	GaN-cap	t_{buffer}=2 μm	-9.418	-9.355	-0.67
305	param	GaN-cap	t_{buffer}=3 μm	-9.41	-9.347	-0.67
306	param	GaN-cap	T=100 K	-15.64	-15.5	-0.88
307	param	GaN-cap	T=150 K	-15.14	-15.01	-0.83
308	param	GaN-cap	T=200 K	-13.17	-13.07	-0.80
309	param	GaN-cap	T=250 K	-10.9	-10.82	-0.75
310	param	GaN-cap	T=350 K	-8.474	-8.424	-0.59
311	param	AlN-cap	N_{TS}=0.1×	-6.147	-6.146	-0.02
312	param	AlN-cap	N_{TS}=0.1585×	-5.465	-5.45	-0.28
313	param	AlN-cap	N_{TS}=0.2512×	-4.999	-5.008	+0.17
314	param	AlN-cap	N_{TS}=0.3981×	-4.474	-4.443	-0.69

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
315	param	AlN-cap	N_{TS}=0.631×	-3.929	-3.891	-0.97
316	param	AlN-cap	N_{TS}=1×	-3.242	-3.214	-0.87
317	param	AlN-cap	N_{TS}=1.5849×	-3.136	-3.11	-0.84
318	param	AlN-cap	N_{TS}=2.5119×	-3.131	-3.105	-0.84
319	param	AlN-cap	N_{TS}=3.9811×	-3.127	-3.101	-0.84
320	param	AlN-cap	N_{TB}=0.1×	-2.902	-2.876	-0.88
321	param	AlN-cap	N_{TB}=0.1585×	-2.939	-2.913	-0.88
322	param	AlN-cap	N_{TB}=0.2512×	-2.986	-2.959	-0.88
323	param	AlN-cap	N_{TB}=0.3981×	-3.05	-3.023	-0.87
324	param	AlN-cap	N_{TB}=0.631×	-3.134	-3.107	-0.87
325	param	AlN-cap	N_{TB}=1×	-3.242	-3.214	-0.87
326	param	AlN-cap	N_{TB}=1.5849×	-3.385	-3.356	-0.86
327	param	AlN-cap	N_{TB}=2.5119×	-3.577	-3.546	-0.86
328	param	AlN-cap	N_{TB}=3.9811×	-3.833	-3.8	-0.85
329	param	AlN-cap	E_{TS}=1 eV	-3.242	-3.214	-0.87
330	param	AlN-cap	E_{TS}=1.2 eV	-3.242	-3.214	-0.87
331	param	AlN-cap	E_{TS}=1.3 eV	-3.242	-3.214	-0.87
332	param	AlN-cap	E_{TS}=1.4 eV	-3.242	-3.214	-0.87
333	param	AlN-cap	E_{TS}=1.5 eV	-3.242	-3.214	-0.87
334	param	AlN-cap	E_{TS}=1.7 eV	-3.248	-3.22	-0.87
335	param	AlN-cap	E_{TS}=1.8 eV	-3.264	-3.235	-0.87
336	param	AlN-cap	E_{TB}=0.4 eV	-3.16	-3.132	-0.87
337	param	AlN-cap	E_{TB}=0.5 eV	-3.208	-3.18	-0.87
338	param	AlN-cap	E_{TB}=0.6 eV	-3.251	-3.223	-0.87
339	param	AlN-cap	E_{TB}=0.7 eV	-3.29	-3.262	-0.87
340	param	AlN-cap	E_{TB}=0.9 eV	-3.362	-3.333	-0.86
341	param	AlN-cap	E_{TB}=1 eV	-3.395	-3.366	-0.86
342	param	AlN-cap	t_{AlGaN}=5 nm	-2.742	-2.714	-1.03
343	param	AlN-cap	t_{AlGaN}=7.5 nm	-3.279	-3.248	-0.93
344	param	AlN-cap	t_{AlGaN}=15 nm	-3.364	-3.334	-0.88
345	param	AlN-cap	t_{AlGaN}=20 nm	-3.283	-3.254	-0.87
346	param	AlN-cap	t_{AlGaN}=25 nm	-3.242	-3.214	-0.87
347	param	AlN-cap	t_{AlGaN}=35 nm	-3.183	-3.156	-0.86
348	param	AlN-cap	t_{AlGaN}=50 nm	-3.123	-3.095	-0.87
349	param	AlN-cap	t_{AlGaN}=75 nm	-3.09	-3.064	-0.86
350	param	AlN-cap	t_{AlGaN}=100 nm	-3.112	-3.086	-0.83
351	param	AlN-cap	L_g=0.1 μm	-2.975	-2.949	-0.87
352	param	AlN-cap	L_g=0.2 μm	-3.097	-3.07	-0.88
353	param	AlN-cap	L_g=0.3 μm	-3.242	-3.214	-0.87
354	param	AlN-cap	L_g=0.4 μm	-3.418	-3.389	-0.87
355	param	AlN-cap	L_g=0.5 μm	-3.622	-3.59	-0.89
356	param	AlN-cap	L_g=0.6 μm	-3.832	-3.796	-0.94
357	param	AlN-cap	L_g=0.7 μm	-4.01	-3.969	-1.02
358	param	AlN-cap	L_g=0.8 μm	-4.12	-4.081	-0.95
359	param	AlN-cap	L_g=0.9 μm	-4.147	-4.102	-1.08
360	param	AlN-cap	L_g=1 μm	-4.107	-4.056	-1.25
361	param	AlN-cap	t_{buffer}=0.3 μm	-3.226	-3.198	-0.88
362	param	AlN-cap	t_{buffer}=0.5 μm	-3.229	-3.201	-0.88
363	param	AlN-cap	t_{buffer}=0.75 μm	-3.233	-3.205	-0.87
364	param	AlN-cap	t_{buffer}=1 μm	-3.237	-3.209	-0.87
365	param	AlN-cap	t_{buffer}=1.5 μm	-3.242	-3.214	-0.87
366	param	AlN-cap	t_{buffer}=2 μm	-3.247	-3.219	-0.86
367	param	AlN-cap	t_{buffer}=3 μm	-3.252	-3.224	-0.86
368	param	AlN-cap	T=100 K	-4.722	-4.683	-0.81
369	param	AlN-cap	T=150 K	-4.689	-4.647	-0.89
370	param	AlN-cap	T=200 K	-4.402	-4.36	-0.95
371	param	AlN-cap	T=250 K	-3.808	-3.772	-0.95
372	param	AlN-cap	T=350 K	-2.884	-2.862	-0.76
373	param	GaN-cap	t_{cap}=2 nm	-7.716	-7.664	-0.68
374	param	GaN-cap	t_{cap}=3 nm	-8.397	-8.34	-0.68
375	param	GaN-cap	t_{cap}=4 nm	-8.947	-8.886	-0.68
376	param	GaN-cap	t_{cap}=5 nm	-9.424	-9.36	-0.68
377	param	GaN-cap	t_{cap}=6 nm	-9.848	-9.781	-0.68
378	param	GaN-cap	t_{cap}=7 nm	-10.22	-10.15	-0.68
379	param	GaN-cap	t_{cap}=8 nm	-10.56	-10.49	-0.68
380	param	GaN-cap	t_{cap}=9 nm	-10.85	-10.77	-0.68

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
381	param	AlN-cap	t_{AlN}=3 nm	-3.041	-3.016	-0.82
382	param	AlN-cap	t_{AlN}=3.5 nm	-3.104	-3.076	-0.90
383	param	AlN-cap	t_{AlN}=4.5 nm	-3.207	-3.179	-0.87
384	param	AlN-cap	t_{AlN}=5 nm	-3.242	-3.214	-0.87
385	param	AlN-cap	t_{AlN}=5.5 nm	-3.271	-3.242	-0.87
386	param	AlN-cap	t_{AlN}=6 nm	-3.294	-3.265	-0.87
387	param	AlN-cap	t_{AlN}=6.5 nm	-3.312	-3.283	-0.87
388	param	AlN-cap	t_{AlN}=7 nm	-3.326	-3.297	-0.88
389	param	AlN-cap	t_{AlN}=7.5 nm	-3.338	-3.309	-0.88
390	vg	No-cap	n_g=3e13 cm^{-2}, drive 0.035×	-0.1011	-0.1005	-0.67
391	vg	No-cap	n_g=1e13 cm^{-2}, drive 0.035×	-0.1049	-0.1041	-0.68
392	vg	No-cap	n_g=3e12 cm^{-2}, drive 0.035×	-0.9634	-0.9571	-0.66
393	vg	No-cap	n_g=5e11 cm^{-2}, drive 0.037×	-15.68	-15.64	-0.23
394	vg	No-cap	n_g=1e11 cm^{-2}, drive 0.039×	-63.23	-62.98	-0.39
395	vg	No-cap	n_g=5e10 cm^{-2}, drive 0.038×	-81.48	-81.08	-0.49
396	vg	No-cap	n_g=3e10 cm^{-2}, drive 0.038×	-93.24	-92.68	-0.61
397	vg	GaN-cap	n_g=3e13 cm^{-2}, drive 0.03×	-0.0972	-0.09667	-0.54
398	vg	GaN-cap	n_g=1e13 cm^{-2}, drive 0.03×	-0.0972	-0.09667	-0.54
399	vg	GaN-cap	n_g=3e12 cm^{-2}, drive 0.031×	-0.61	-0.6056	-0.72
400	vg	GaN-cap	n_g=5e11 cm^{-2}, drive 0.032×	-9.48	-9.444	-0.38
401	vg	GaN-cap	n_g=1e11 cm^{-2}, drive 0.033×	-41.01	-40.8	-0.49
402	vg	GaN-cap	n_g=5e10 cm^{-2}, drive 0.033×	-53.74	-53.45	-0.55
403	vg	GaN-cap	n_g=3e10 cm^{-2}, drive 0.032×	-62.91	-62.49	-0.67
404	vg	AlN-cap	n_g=3e13 cm^{-2}, drive 0.041×	-0.05954	-0.05912	-0.70
405	vg	AlN-cap	n_g=1e13 cm^{-2}, drive 0.04×	-0.1002	-0.09947	-0.70
406	vg	AlN-cap	n_g=3e12 cm^{-2}, drive 0.038×	-0.7764	-0.7711	-0.67
407	vg	AlN-cap	n_g=5e11 cm^{-2}, drive 0.04×	-10.37	-10.35	-0.19
408	vg	AlN-cap	n_g=1e11 cm^{-2}, drive 0.041×	-41.6	-41.39	-0.51
409	vg	AlN-cap	n_g=5e10 cm^{-2}, drive 0.041×	-58.13	-57.64	-0.83
410	vg	AlN-cap	n_g=3e10 cm^{-2}, drive 0.04×	-71.7	-71.04	-0.91
411	amp	No-cap	drive 0.5×	-20.74	-20.55	-0.93
412	amp	No-cap	drive 0.5×, no v_{sat}	-20.74	-20.6	-0.70
413	amp	No-cap	drive 2×	-331.9	-321.9	-3.01
414	amp	No-cap	drive 2×, no v_{sat}	-331.9	-327.1	-1.43
415	amp	No-cap	drive 5×	-2074	-1886	-9.05
416	amp	No-cap	drive 5×, no v_{sat}	-2074	-1966	-5.21
417	amp	No-cap	drive 20×	-3.319e+04	-2.047e+04	-38.31
418	amp	No-cap	drive 20×, no v_{sat}	-3.319e+04	-2.238e+04	-32.55
419	amp	GaN-cap	drive 0.5×	-26.18	-25.96	-0.85
420	amp	GaN-cap	drive 0.5×, no v_{sat}	-26.18	-26.03	-0.56
421	amp	GaN-cap	drive 2×	-418.8	-405.3	-3.23
422	amp	GaN-cap	drive 2×, no v_{sat}	-418.8	-414	-1.16
423	amp	GaN-cap	drive 5×	-2618	-2354	-10.08
424	amp	GaN-cap	drive 5×, no v_{sat}	-2618	-2499	-4.53
425	amp	GaN-cap	drive 20×	-4.188e+04	-2.414e+04	-42.37
426	amp	GaN-cap	drive 20×, no v_{sat}	-4.188e+04	-2.819e+04	-32.71
427	amp	AlN-cap	drive 0.5×	-9.007	-8.913	-1.04
428	amp	AlN-cap	drive 0.5×, no v_{sat}	-9.007	-8.937	-0.78
429	amp	AlN-cap	drive 2×	-144.1	-138.5	-3.87
430	amp	AlN-cap	drive 2×, no v_{sat}	-144.1	-141.3	-1.98
431	amp	AlN-cap	drive 5×	-900.7	-789	-12.40
432	amp	AlN-cap	drive 5×, no v_{sat}	-900.7	-834.9	-7.31
433	amp	AlN-cap	drive 20×	-1.441e+04	-8626	-40.14
434	amp	AlN-cap	drive 20×, no v_{sat}	-1.441e+04	-9681	-32.82
435	grid	No-cap	Δx=40 nm	-7.784	-7.725	-0.75
436	grid	No-cap	Δx=30 nm	-7.343	-7.284	-0.81
437	grid	No-cap	Δx=15 nm	-7.41	-7.35	-0.80
438	grid	No-cap	Δx=7 nm	-7.49	-7.431	-0.79
439	grid	GaN-cap	Δx=40 nm	-10.2	-10.14	-0.61
440	grid	GaN-cap	Δx=30 nm	-9.328	-9.263	-0.70
441	grid	GaN-cap	Δx=15 nm	-9.382	-9.317	-0.69
442	grid	GaN-cap	Δx=7 nm	-9.526	-9.463	-0.66
443	grid	AlN-cap	Δx=40 nm	-3.312	-3.284	-0.85
444	grid	AlN-cap	Δx=30 nm	-3.178	-3.15	-0.88
445	grid	AlN-cap	Δx=15 nm	-3.215	-3.187	-0.87
446	grid	AlN-cap	Δx=7 nm	-3.243	-3.215	-0.86

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
447	grid	No-cap	Δx=12.5 nm	-7.469	-7.41	-0.79
448	grid	No-cap	Δx=25 nm	-7.493	-7.434	-0.78
449	grid	No-cap	Δx=50 nm	-7.57	-7.511	-0.78
450	grid	GaN-cap	Δx=12.5 nm	-9.418	-9.354	-0.68
451	grid	GaN-cap	Δx=25 nm	-9.438	-9.374	-0.68
452	grid	GaN-cap	Δx=50 nm	-9.543	-9.478	-0.68
453	grid	AlN-cap	Δx=12.5 nm	-3.244	-3.216	-0.87
454	grid	AlN-cap	Δx=25 nm	-3.251	-3.223	-0.87
455	grid	AlN-cap	Δx=50 nm	-3.258	-3.229	-0.88
456	tauE	No-cap	τ_E=0.05 ps	-9.437	-9.364	-0.77
457	tauE	No-cap	τ_E=0.1 ps	-8.67	-8.603	-0.77
458	tauE	No-cap	τ_E=0.2 ps	-7.836	-7.778	-0.74
459	tauE	No-cap	τ_E=0.3 ps	-7.571	-7.515	-0.74
460	tauE	No-cap	τ_E=0.7 ps	-7.457	-7.395	-0.84
461	tauE	No-cap	τ_E=1 ps	-7.448	-7.381	-0.90
462	tauE	No-cap	τ_E=1.5 ps	-7.411	-7.337	-1.00
463	tauE	No-cap	τ_E=2 ps	-7.359	-7.278	-1.09
464	tauE	GaN-cap	τ_E=0.05 ps	-12.68	-12.6	-0.67
465	tauE	GaN-cap	τ_E=0.1 ps	-11.61	-11.54	-0.66
466	tauE	GaN-cap	τ_E=0.2 ps	-10.35	-10.28	-0.63
467	tauE	GaN-cap	τ_E=0.3 ps	-9.835	-9.773	-0.64
468	tauE	GaN-cap	τ_E=0.7 ps	-9.176	-9.11	-0.72
469	tauE	GaN-cap	τ_E=1 ps	-8.848	-8.779	-0.78
470	tauE	GaN-cap	τ_E=1.5 ps	-8.33	-8.256	-0.88
471	tauE	GaN-cap	τ_E=2 ps	-7.842	-7.766	-0.97
472	tauE	AlN-cap	τ_E=0.05 ps	-3.856	-3.824	-0.84
473	tauE	AlN-cap	τ_E=0.1 ps	-3.569	-3.539	-0.84
474	tauE	AlN-cap	τ_E=0.2 ps	-3.292	-3.265	-0.82
475	tauE	AlN-cap	τ_E=0.3 ps	-3.23	-3.203	-0.82
476	tauE	AlN-cap	τ_E=0.7 ps	-3.275	-3.245	-0.91
477	tauE	AlN-cap	τ_E=1 ps	-3.313	-3.281	-0.97
478	tauE	AlN-cap	τ_E=1.5 ps	-3.354	-3.318	-1.07
479	tauE	AlN-cap	τ_E=2 ps	-3.38	-3.341	-1.17
E1	physics	AlN-cap	base	-4.14	-4.107	-0.79
E2	physics	AlN-cap	+pressure	-4.129	-4.097	-0.78
E3	physics	AlN-cap	+viscosity	-4.134	-4.101	-0.78
E4	physics	AlN-cap	$+\gamma(n)$	-4.17	-4.138	-0.78
E5	physics	AlN-cap	+compression	-4.17	-4.138	-0.78
E6	physics	AlN-cap	$+\gamma(T_e)$	-3.229	-3.205	-0.76
E7	physics	AlN-cap	+heating	-3.242	-3.214	-0.87
E8	physics	GaN-cap	base	-13.58	-13.5	-0.61
E9	physics	GaN-cap	+pressure	-13.56	-13.47	-0.61
E10	physics	GaN-cap	+viscosity	-13.55	-13.47	-0.61
E11	physics	GaN-cap	$+\gamma(n)$	-13.71	-13.63	-0.61
E12	physics	GaN-cap	+compression	-13.71	-13.63	-0.61
E13	physics	GaN-cap	$+\gamma(T_e)$	-10.22	-10.16	-0.59
E14	physics	GaN-cap	+heating	-9.424	-9.36	-0.68
E15	physics	No-cap	base	-10.11	-10.04	-0.71
E16	physics	No-cap	+pressure	-10.08	-10.01	-0.71
E17	physics	No-cap	+viscosity	-10.09	-10.02	-0.71
E18	physics	No-cap	$+\gamma(n)$	-10.21	-10.14	-0.71
E19	physics	No-cap	+compression	-10.21	-10.14	-0.71
E20	physics	No-cap	$+\gamma(T_e)$	-7.611	-7.558	-0.70
E21	physics	No-cap	+heating	-7.467	-7.408	-0.79
E22	temp	AlN-cap	T=77 K, V_G=-11.82 V	-0.2316	-0.2313	-0.10
E23	temp	AlN-cap	T=100 K, V_G=-11.82 V	-0.3861	-0.386	-0.03
E24	temp	AlN-cap	T=150 K, V_G=-11.84 V	-0.9151	-0.9157	+0.06
E25	temp	AlN-cap	T=200 K, V_G=-11.85 V	-1.854	-1.854	-0.03
E26	temp	AlN-cap	T=250 K, V_G=-11.87 V	-3.063	-3.052	-0.35
E27	temp	AlN-cap	T=300 K, V_G=-11.88 V	-3.822	-3.805	-0.47
E28	temp	AlN-cap	T=350 K, V_G=-11.90 V	-3.959	-3.942	-0.42
E29	temp	AlN-cap	T=400 K, V_G=-11.93 V	-3.762	-3.747	-0.40
E30	temp	GaN-cap	T=77 K, V_G=-4.61 V	-0.1919	-0.191	-0.49
E31	temp	GaN-cap	T=100 K, V_G=-4.61 V	-0.3505	-0.3494	-0.31
E32	temp	GaN-cap	T=150 K, V_G=-4.62 V	-0.9702	-0.9686	-0.17
E33	temp	GaN-cap	T=200 K, V_G=-4.64 V	-1.935	-1.928	-0.37

Id	Kind	Device	Case	Model	Time domain	Dev. (%)
E34	temp	GaN-cap	T=250 K, V_G=-4.65 V	-2.825	-2.806	-0.68
E35	temp	GaN-cap	T=300 K, V_G=-4.67 V	-3.106	-3.082	-0.78
E36	temp	GaN-cap	T=350 K, V_G=-4.69 V	-2.862	-2.842	-0.71
E37	temp	GaN-cap	T=400 K, V_G=-4.71 V	-2.439	-2.423	-0.64
E38	temp	No-cap	T=77 K, V_G=-4.72 V	-0.4981	-0.4954	-0.53
E39	temp	No-cap	T=100 K, V_G=-4.72 V	-0.8338	-0.8307	-0.38
E40	temp	No-cap	T=150 K, V_G=-4.73 V	-2.028	-2.024	-0.20
E41	temp	No-cap	T=200 K, V_G=-4.74 V	-3.687	-3.678	-0.24
E42	temp	No-cap	T=250 K, V_G=-4.76 V	-5.044	-5.02	-0.49
E43	temp	No-cap	T=300 K, V_G=-4.77 V	-5.336	-5.304	-0.60
E44	temp	No-cap	T=350 K, V_G=-4.79 V	-4.811	-4.784	-0.55
E45	temp	No-cap	T=400 K, V_G=-4.81 V	-4.046	-4.027	-0.48
E46	pad	AlN-cap	$C_{pad,d}$=1 fF	-2.984	-2.962	-0.75
E47	pad	AlN-cap	$C_{pad,d}$=2 fF	-2.44	-2.421	-0.76
E48	pad	AlN-cap	$C_{pad,d}$=5 fF	-1.695	-1.68	-0.86
E49	pad	AlN-cap	$C_{pad,d}$=10 fF	-1.408	-1.393	-1.02
E50	pad	AlN-cap	$C_{pad,d}$=20 fF	-1.28	-1.267	-1.02
E51	pad	GaN-cap	$C_{pad,d}$=1 fF	-6.957	-6.908	-0.71
E52	pad	GaN-cap	$C_{pad,d}$=2 fF	-5.481	-5.433	-0.88
E53	pad	GaN-cap	$C_{pad,d}$=5 fF	-4.25	-4.211	-0.90
E54	pad	GaN-cap	$C_{pad,d}$=10 fF	-3.844	-3.809	-0.91
E55	pad	GaN-cap	$C_{pad,d}$=20 fF	-3.658	-3.623	-0.96
E56	pad	No-cap	$C_{pad,d}$=1 fF	-5.868	-5.832	-0.61
E57	pad	No-cap	$C_{pad,d}$=2 fF	-4.368	-4.336	-0.72
E58	pad	No-cap	$C_{pad,d}$=5 fF	-3.162	-3.134	-0.88
E59	pad	No-cap	$C_{pad,d}$=10 fF	-2.846	-2.82	-0.93
E60	pad	No-cap	$C_{pad,d}$=20 fF	-2.73	-2.703	-0.97
E61	no a	AlN-cap	N_{TS}=0.2×, V_G=0 V	-0.08181	-0.08159	-0.27
E62	no a	AlN-cap	N_{TS}=0.2×, V_G=-2 V	-0.08139	-0.08113	-0.32
E63	no a	AlN-cap	N_{TS}=0.2×, V_G=-4 V	-0.08071	-0.08032	-0.49
E64	no a	AlN-cap	N_{TS}=0.2×, V_G=-4.6 V	-0.08059	-0.08007	-0.64
E65	no a	AlN-cap	N_{TS}=0.2×, V_G=-4.85 V	-0.08211	-0.08155	-0.67

Table S2: Semi-analytical theory vs. full model: photovoltage deviation ΔV_{ph} and impedance deviation $|\Delta Z_{dev}|/|Z_{dev}|$ (%) with transmission-line access regions (the semi-analytical theory of the paper), with lumped access impedances, and with each access region solved with its full 2D capacitance matrix.

		Transmission line		Lumped		Full 2D capacitance	
Device	f (THz)	ΔV_{ph}	$\lvert\Delta Z\rvert$	ΔV_{ph}	$\lvert\Delta Z\rvert$	ΔV_{ph}	$\lvert\Delta Z\rvert$
No-cap	0.5	+3	6	-21	12	+2	7
No-cap	1	+6	1	-28	44	+2	3
No-cap	1.5	-1	6	-32	67	+3	3
No-cap	2	-0	9	-51	98	-6	6
No-cap	2.5	+33	6	-36	140	-22	9
GaN-cap	0.5	+3	6	-18	18	+4	7
GaN-cap	1	+4	2	-28	54	+4	3
GaN-cap	1.5	-3	7	-42	78	+3	3
GaN-cap	2	+1	5	-55	126	-7	7
GaN-cap	2.5	+68	9	-16	178	-6	6
AlN-cap	0.5	+5	4	+10	32	+8	5
AlN-cap	1	+8	2	-7	50	+7	3
AlN-cap	1.5	+7	6	-14	70	+7	2
AlN-cap	2	+7	7	-22	90	+5	2
AlN-cap	2.5	+15	10	-18	118	-7	2

Table S3: Cumulative physics contributions: $|V_{ph}|$ (μV) at nominal drive as the terms of Eq. (2) of the main text are added in turn.

Device	f (THz)	base	+pressure	+viscosity	+$\gamma(n)$	+compression	+$\gamma(T_e)$	+heating
No-cap	1	112.3	112.0	112.1	113.4	113.4	84.6	83.0
GaN-cap	1	150.9	150.6	150.6	152.3	152.3	113.6	104.7
AlN-cap	1	46.0	45.9	45.9	46.3	46.3	35.9	36.0
No-cap	2	27.5	27.4	27.4	27.8	27.8	19.9	19.8
GaN-cap	2	32.8	33.0	32.9	33.3	33.3	24.8	25.4
AlN-cap	2	9.7	9.7	9.7	9.8	9.8	7.7	7.7

Table S4: Responsivity R_V (V/W) as the model refinements are added in turn, and its sensitivity to the energy relaxation time.

	1 THz			2 THz		
Model	No-cap	GaN-cap	AlN-cap	No-cap	GaN-cap	AlN-cap
Baseline (sheet stat., $m^* = 0.2m_0$, Fermi-surface γ_T)	0.117	0.127	0.053	0.101	0.148	0.049
+ Schrödinger–Poisson	0.191	0.207	0.087	0.180	0.205	0.076
+ band mass, non-parabolicity	0.202	0.219	0.093	0.190	0.213	0.080
+ energy-resolved γ_T (full model)	0.221	0.279	0.096	0.211	0.270	0.082
full, $\tau_E = 0.2$ ps	0.232	0.306	0.097	0.217	0.273	0.083
full, $\tau_E = 1$ ps	0.220	0.261	0.098	0.209	0.270	0.083
full, no energy balance	0.302	0.405	0.123	–	–	–

Table S5: Kinetic (Mermin) vs. hydrodynamic gated plasmon at 1 THz unless stated. Mermin density response $\Pi_M = (1 + i\gamma/\omega)\Pi_B(\tilde{\omega})/[1 + (i\gamma/\omega)\Pi_B(\tilde{\omega})/\Pi_B(0)]$, $\tilde{\omega} = \omega + i\gamma$, with $\Pi_B = (2n/m^* v_F^2)[\tilde{\omega}/(\tilde{\omega}^2 - k^2 v_F^2)^{1/2} - 1]$ when degenerate and $\Pi_B = -(n/k_B T)[1 + \zeta Z(\zeta)]$, $\zeta = \tilde{\omega}/(\sqrt{2}kv_{th})$, when non-degenerate ($Z$: plasma dispersion function); the hydrodynamic reference keeps only the kinetic part of η', so the compressibility is not counted twice. Columns: Knudsen number $|k|v/\gamma$ and phase velocity $\omega/|k|$ relative to $v = v_F$ (degenerate) or $v_{th} = (k_B T/m^*)^{1/2}$ (non-degenerate, near threshold), relative wavenumber change, and semi-analytical photovoltage change (–: not evaluated, channel a empty).

Device	Case	Kn	$\omega/\lvert k\rvert v$	$\lvert\Delta k/k\rvert$ (%)	ΔV_{ph} (%)
No-cap	near threshold, n_g=1.6×10^{10} cm^{-2} (V_G=-5.46 V)	1.01	1.08	20.84	-28.35
GaN-cap	near threshold, n_g=3.2×10^{10} cm^{-2} (V_G=-5.42 V)	0.70	1.03	15.11	-23.73
AlN-cap	near threshold, n_g=2×10^{10} cm^{-2} (V_G=-12.67 V)	0.63	0.85	13.71	–
No-cap	near threshold, n_g=1×10^{10} cm^{-2} (V_G=-5.48 V)	1.03	1.06	22.53	-28.72
No-cap	near threshold, n_g=1×10^{11} cm^{-2} (V_G=-5.33 V)	0.74	1.48	16.42	-22.78
No-cap	near threshold, n_g=1×10^{12} cm^{-2} (V_G=-4.77 V)	0.28	3.86	3.12	-3.92
No-cap	77 K, V_G=0	1.12	4.63	1.14	+0.29
GaN-cap	77 K, V_G=0	1.02	5.04	0.90	+0.18
AlN-cap	77 K, V_G=0	1.12	4.64	1.17	+0.08
No-cap	nominal, L_g=0.1 μm, 1 THz	0.28	4.04	0.34	-0.05
No-cap	nominal, L_g=0.1 μm, 2 THz	0.50	4.47	0.47	-0.02
No-cap	nominal, L_g=0.3 μm, 1 THz	0.28	4.04	0.34	-0.08
No-cap	nominal, L_g=0.3 μm, 2 THz	0.50	4.47	0.47	-0.25
No-cap	nominal, L_g=1 μm, 1 THz	0.28	4.04	0.34	-0.08
No-cap	nominal, L_g=1 μm, 2 THz	0.50	4.47	0.47	-0.03
GaN-cap	nominal, L_g=0.1 μm, 1 THz	0.25	4.39	0.28	-0.03
GaN-cap	nominal, L_g=0.1 μm, 2 THz	0.46	4.87	0.38	-0.02
GaN-cap	nominal, L_g=0.3 μm, 1 THz	0.25	4.39	0.28	-0.06
GaN-cap	nominal, L_g=0.3 μm, 2 THz	0.46	4.87	0.38	-0.18
GaN-cap	nominal, L_g=1 μm, 1 THz	0.25	4.39	0.28	-0.03
GaN-cap	nominal, L_g=1 μm, 2 THz	0.46	4.87	0.38	-0.01
AlN-cap	nominal, L_g=0.1 μm, 1 THz	0.28	4.05	0.35	-0.03
AlN-cap	nominal, L_g=0.1 μm, 2 THz	0.50	4.48	0.47	-0.03
AlN-cap	nominal, L_g=0.3 μm, 1 THz	0.28	4.05	0.35	-0.08
AlN-cap	nominal, L_g=0.3 μm, 2 THz	0.50	4.48	0.47	-0.08
AlN-cap	nominal, L_g=1 μm, 1 THz	0.28	4.05	0.35	-0.13
AlN-cap	nominal, L_g=1 μm, 2 THz	0.50	4.48	0.47	+2.80

Table S6: Sensitivity checks at zero bias and 1 THz (R_V in V/W). (a) Drain-pad capacitance $C_{pad,d}$. (b) Source access length L_{sg}, with $\Re Z_{dev}$ (Ω) in parentheses. (c) Drain access length L_{gd}. (d) AlN-cap with an extra series resistance R_{ca} (Ω mm) on channel a at each contact (friction added in 50 nm segments of channel a next to the contacts), with $\Re Z_{dev}$ and R_{out} (Ω). (e) Hot-electron coefficient γ_T from different polar-optical-phonon matrix elements: R_V, the reduction of $|V_{ph}|$ caused by γ_T, and the factor applied to γ_T (ratio of $d\ln\gamma/dT_e$ at $T_e = T$ to that of the energy-independent matrix element, per channel). (f) Antenna coupling: quarter-wave transformer rematched at each frequency (paper), antenna connected directly to the device, and conjugate match of $Z_{dev} + R_c$; no pad capacitance. (g) Thermal coefficients C_v, β, b, κ evaluated at the local (n, T_e) instead of at equilibrium (automatically differentiated model with the same discretization, friction frozen at γ_0): change of V_{ph} at 1 THz, and the thermal-noise NEP (pW/$\sqrt{\text{Hz}}$) with frozen and with local coefficients.

(a) $C_{pad,d}$ (fF)	No-cap	GaN-cap	AlN-cap
0	0.221	0.279	0.096
10	0.084	0.114	0.042
20	0.081	0.108	0.038
50	0.079	0.105	0.036
(b) L_{sg} (μm)			
0.3	0.321 (12)	0.419 (15)	0.151 (11)
0.5	0.285 (19)	0.364 (25)	0.124 (16)
1	0.221 (39)	0.279 (50)	0.096 (32)
1.5	0.180 (61)	0.227 (74)	0.079 (47)
2	0.152 (82)	0.192 (94)	0.068 (62)
(c) L_{gd} (μm)			
1	0.217	0.276	0.095
2	0.221	0.279	0.096
3	0.220	0.277	0.096

(d) R_{ca} (Ω mm)	R_V	$\Re Z_{dev}$	R_{out}
0	0.096	31.7	99.0
0.3	0.099	31.8	99.1
1	0.104	31.9	99.3
3	0.113	32.1	99.7
10	0.123	32.3	101.0

(e) POP matrix element	No-cap	GaN-cap	AlN-cap
Energy-independent (paper)	0.221 (26%)	0.279 (27%)	0.096 (22%)
Screened 2D Fröhlich	0.211 (29%, ×1.13)	0.281 (26%, ×0.97)	0.089 (28%, ×1.14/1.23)
Unscreened 2D Fröhlich	0.245 (18%, ×0.68)	0.348 (9%, ×0.33)	0.088 (29%, ×1.42/1.30)

(f) Device, frequency	rematched	direct	conjugate
No-cap, 0.5 THz	0.161	0.144	0.162
No-cap, 1 THz	0.221	0.212	0.222
No-cap, 2 THz	0.211	0.210	0.211
GaN-cap, 0.5 THz	0.205	0.193	0.206
GaN-cap, 1 THz	0.279	0.275	0.279
GaN-cap, 2 THz	0.270	0.268	0.283
AlN-cap, 0.5 THz	0.069	0.062	0.069
AlN-cap, 1 THz	0.096	0.089	0.096
AlN-cap, 2 THz	0.082	0.080	0.083
AlN-cap, $\mu_a = 1500$, 1 THz	0.015	0.011	0.016

(g) Device	V_G (V)	ΔV_{ph} (%)	NEP frozen	NEP local
No-cap	0.00	−0.00	5825.8	5825.9
No-cap	−5.30	−2.96	25.7	26.5
No-cap	−5.40	−8.71	20.5	22.5
No-cap	−5.45	−14.36	19.5	22.8
No-cap	−5.50	−19.36	20.5	25.4
GaN-cap	0.00	−0.00	5083.0	5083.2
GaN-cap	−5.30	−2.93	29.6	30.5
GaN-cap	−5.40	−7.96	25.0	27.2
AlN-cap	0.00	+0.00	13365.8	13365.8

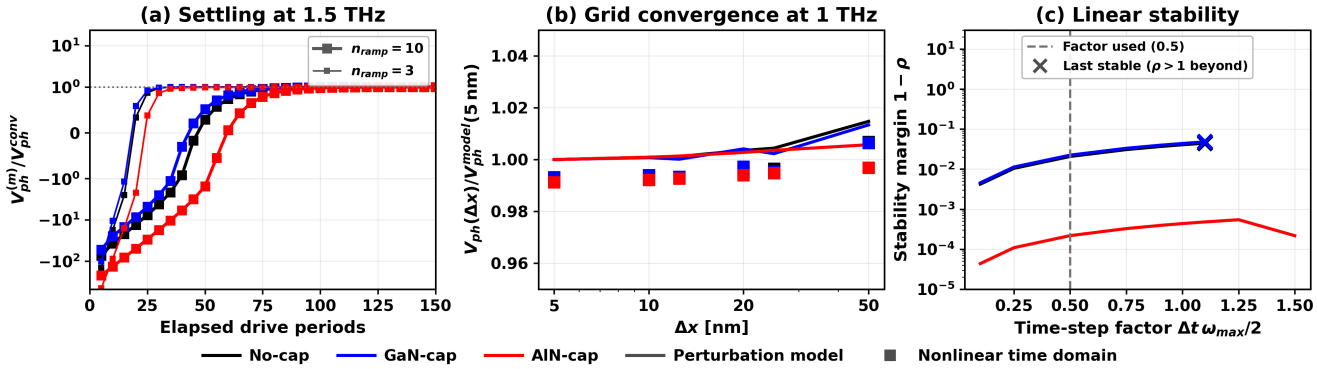


Figure S1: (a) Chunk-averaged time-domain photovoltage $V_{ph}^{(m)}$ (average over the m-th chunk; 5-period chunks for these settling runs, 20 in the verification runs), normalized to its converged value V_{ph}^{conv}, vs. elapsed periods at 1.5 THz for gate-voltage ramps of 10 (thick) and 3 (thin) periods. (b) Photovoltage at 1 THz vs. grid spacing on grids commensurate with the gate and access lengths: perturbation model (lines) and time-domain solver (squares). (c) Stability margin $1 - \rho$ of the one-step update operator (ρ: spectral radius) vs. time-step factor; crosses mark the last stable factor (the AlN-cap curve stays stable over the range shown).

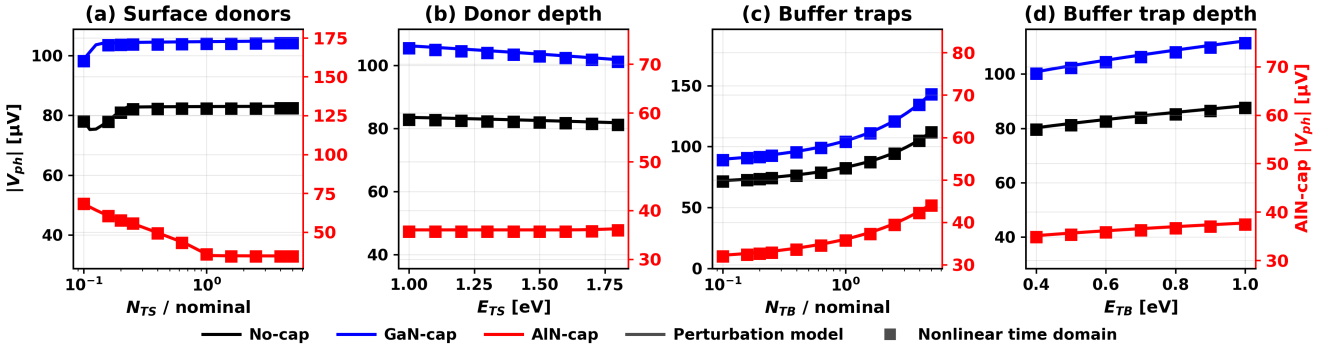


Figure S2: Photovoltage at 1 THz vs. (a) surface donor density and (b) depth, (c) buffer trap density and (d) depth; No-cap and GaN-cap on the left axis, AlN-cap on the right axis. Lines: perturbation model; squares: nonlinear time-domain solver.

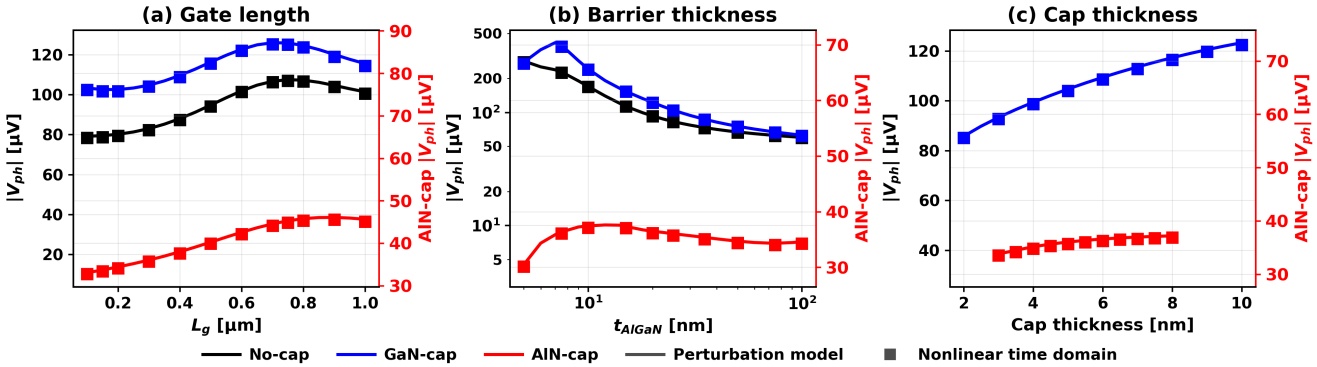


Figure S3: Photovoltage at 1 THz vs. (a) gate length, (b) barrier thickness and (c) cap thickness; AlN-cap on the right axis, the others on the left (No-cap, having no cap, is absent from (c)). Lines: perturbation model; squares: nonlinear time-domain solver.

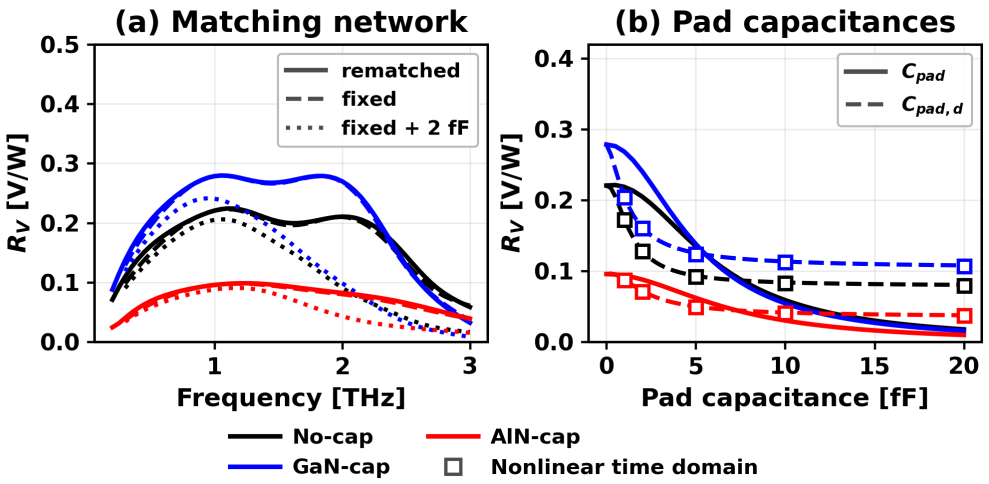


Figure S4: (a) Responsivity vs. frequency with the quarter-wave transformer rematched at every frequency (solid), held at its 1 THz design (dashed), and held with a 2 fF antenna-feed capacitance (dotted). (b) Responsivity at 1 THz vs. antenna-feed pad capacitance C_{pad} (solid; fixed network) and drain-pad capacitance $C_{pad,d}$ (dashed; open squares: nonlinear time-domain solver, within 1.0%).

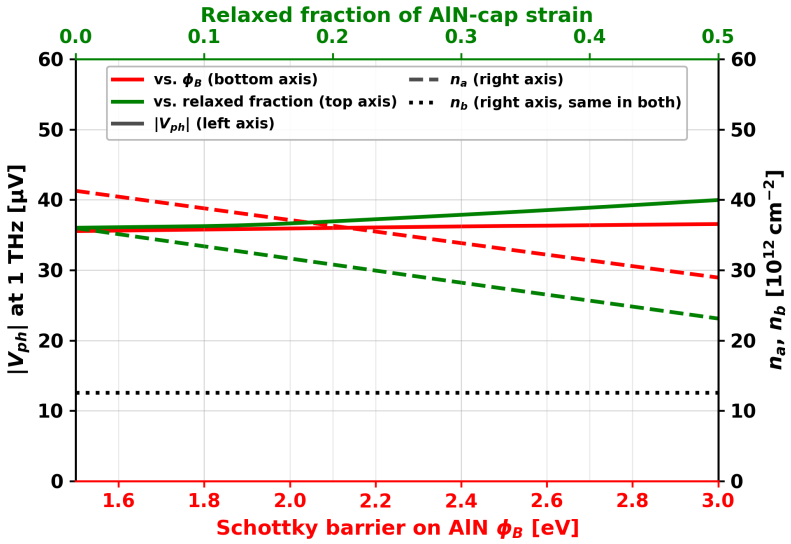


Figure S5: AlN-cap: $|V_{ph}|$ at 1 THz (solid) and the gated densities n_a (dashed) and n_b (dotted) vs. the Schottky barrier on AlN (red, bottom axis) and vs. the relaxed fraction f_{rel} of the AlN strain, with the piezoelectric polarization scaled by $1 - f_{\mathrm{rel}}$ (green, top axis); densities on the right axis, n_b the same in both sweeps. The Schrödinger–Poisson solution at nominal parameters is shown in Fig. 2a of the paper.