Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

Modular Construction of Sulfinimidate Esters: Expanding Chemical Space and Enabling Late-Stage Diversification

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General Information

Column chromatography was generally performed on silica gel (300-400 mesh) and reactions were monitored by thin layer chromatography (TLC) using UV light to visualize the course of the reactions.

The ^{1}H NMR (400 MHz) and ^{13}C NMR (100 MHz) and ^{19}F NMR (376 MHz) data were recorded with Chloroform-*d* as solvent at room temperature. The chemical shifts (δ) are reported in ppm and coupling constants (*J*) in Hz. ^{1}H NMR spectra was recorded with Chloroform-*d* (δ= 7.26 ppm) as internal reference; ^{13}C NMR spectra was recorded with Chloroform-*d* (δ = 77.0 ppm) as internal reference. IR and HRMS were performed by the State-authorized Analytical Center in Soochow University.

General procedure

General procedure for *N*-sulfonyl sulfinimidate esters synthesis

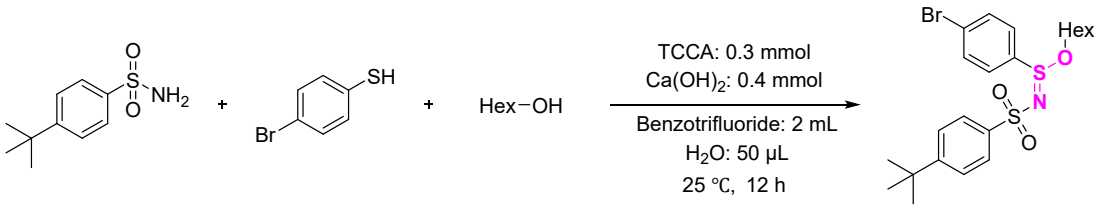
To a 25 mL sealed tube, were added trichloroisocyanuric acid (0.3 mmol, 1.5 equiv., 69.7 mg), $Ca(OH)_2$ (0.4 mmol, 2.0 equiv., 29.6 mg), sulfamide (0.2 mmol) and thiol (0.4 mmol, 2.0 equiv.). Subsequently, Benzotrifluoride (2.0 mL), H_2O (50 μL) and alcohol (0.4 mmol, 2.0 equiv.) were added under air. The mixture was stirred in oil bath at 25 ℃ for 12 h. When over, the reaction mixture was quenched with sodium thiosulfate and diluted with ethyl acetate (20 mL), then washed with NaCl (saturated in water, 3×20 mL) and dried over $MgSO_4$. The solvent was removed under reduced pressure and the residue was purified by silica gel column chromatography (ethyl acetate/ petroleum ether) to afford desired products.

General procedure for *N*-acyl sulfinimidate esters synthesis

To a 25 mL sealed tube, were added trichloroisocyanuric acid (0.3 mmol, 1.5 equiv., 69.7 mg), K_3PO_4 (0.4 mmol, 2.0 equiv., 84.9 mg), amide (0.2 mmol) and thiol (0.4 mmol, 2.0 equiv.). Subsequently, cyclohexane (2.0 mL) and alcohol (0.4 mmol, 2.0 equiv.) were added under air. The mixture was stirred in oil bath at 25 ℃ for 12 h. When over, the reaction mixture was quenched with sodium thiosulfate and diluted with ethyl acetate (20 mL), then washed with NaCl (saturated in water, 3×20 mL) and dried over $MgSO_4$. The solvent was removed under reduced pressure and the residue was purified by silica gel column chromatography (ethyl acetate/ petroleum ether) to afford desired products.

Optimization of reaction conditions

Table S1 Optimization of reaction conditions for *N*-sulfonyl sulfinimidate esters[a]

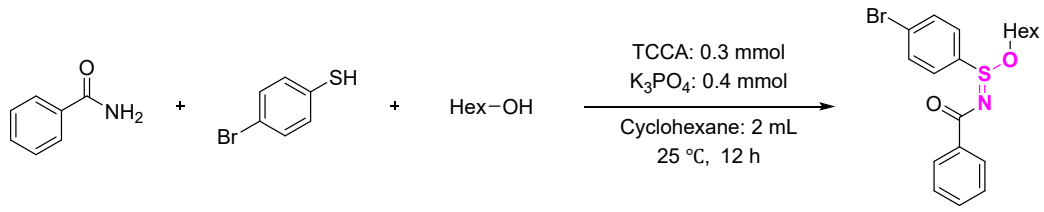


1a: 0.2 mmol **2a**: 0.4 mmol **3a**: 0.4 mmol **4a**

Entry	Variation from "standard conditions"	Yield(%)[b]
1	none	85
2	Absence of H_2O	79
3	CCl_4 instead of Benzotrifluoride	66
4	DCM instead of Benzotrifluoride	70
5	MeCN instead of Benzotrifluoride	< 5
6	Cyclohexane instead of Benzotrifluoride	73
7	EA instead of Benzotrifluoride	< 5
8	DMF instead of Benzotrifluoride	< 5
9	DMSO instead of Benzotrifluoride	< 5
10	Acetone instead of Benzotrifluoride	< 5
11	THF instead of Benzotrifluoride	< 5
12	Na_3PO_4 instead of $Ca(OH)_2$	60
13	$Ba(OH)_2·H_2O$ instead of $Ca(OH)_2$	58
14	Cs_2CO_3 instead of $Ca(OH)_2$	57
15	DMAP instead of $Ca(OH)_2$	36
16	Et_3N instead of $Ca(OH)_2$	63
17	pyridine instead of $Ca(OH)_2$	51
18	t-BuOCl instead of TCCA	41
19	DCDMH instead of TCCA	19
20	NCS instead of TCCA	36

[a] Standard conditions: sulfamides, sulfamides and sulfamates (0.2 mmol), alcohols (0.4 mmol), thiols (0.4 mmol), chlorine source (0.3 mmol), base (0.4 mmol), H_2O (50 μL) in solvent (2.0 mL), under air at 25°C for 12 h.

Table S2 Optimization of reaction conditions for *N*-acyl sulfinimidate esters[a]



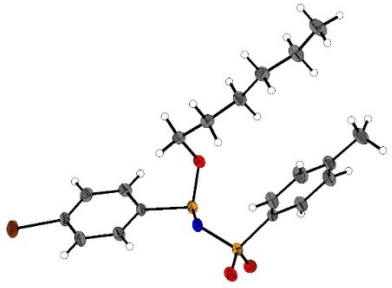
1bi: 0.2 mmol **2a**: 0.4 mmol **3a**: 0.4 mmol **4bi**

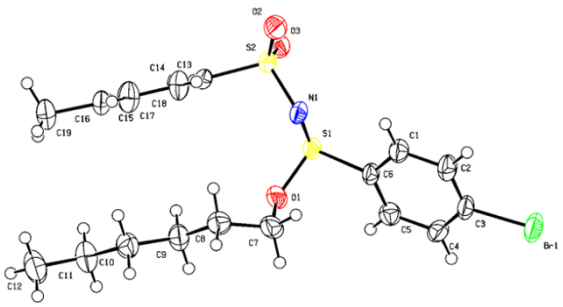
Entry	Variation from "standard conditions"	Yield(%)[b]
1	none	68
2	CCl_4 instead of Cyclohexane	39
3	MeCN instead of Cyclohexane	< 5
4	Benzotrifluoride instead of Cyclohexane	53
5	EA instead of Cyclohexane	< 5
6	DMF instead of Cyclohexane	< 5
7	DMSO instead of Cyclohexane	< 5
8	THF instead of Cyclohexane	< 5
9	$Ca(OH)_2$ instead of K_3PO_4	30
10	$K_3PO_4 \cdot 3H_2O$ instead of K_3PO_4	41
11	Na_3PO_4 instead of K_3PO_4	43
12	DMAP instead of K_3PO_4	< 5
13	Et_3N instead of K_3PO_4	< 5
14	pyridine instead of K_3PO_4	< 5
15	t-BuOCl instead of TCCA	< 5
16	DCDMH instead of TCCA	16
17	NCS instead of TCCA	< 5

[a] Standard conditions: amides and carbamates (0.2 mmol), alcohols (0.4 mmol), thiols (0.4 mmol), chlorine source (0.3 mmol), base (0.4 mmol) in solvent (2.0 mL), under air at 25°C for 12 h.

X-Ray diffraction analysis

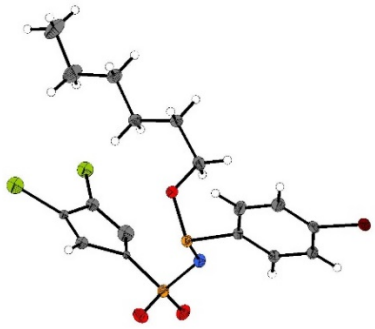
X-Ray single-crystal data of product 4b

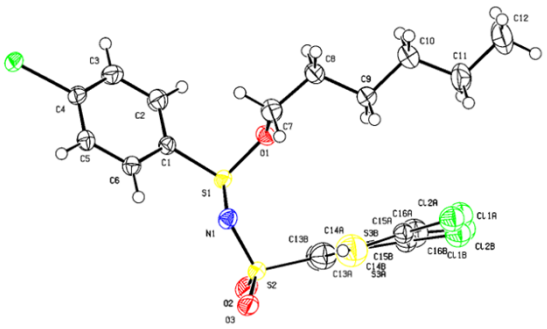




Empirical formula	$C_{19}H_{24}BrNO_3S_2$	
Formula weight	458.42	
Temperature/K	223.00	
Crystal system	triclinic	
Space group	P-1	
Unit cell dimensions	a = 7.9637(6) Å	α= 78.595(5)
	b = 8.4266(5) Å	β= 76.521(6)
	c = 16.2353(10) Å	γ = 84.394(5)
Volume/Å^3	1037.05(12)	
Z	2	
Z′	1	
Wavelength/Å	0.71073	
$D_{calc.}$/g cm^{-3}	1.468	
μ/mm-1	2.201	
F(000)	472.0	
Crystal size/mm^3	0.30×0.20×0.05	
Radiation type	Mo Kα	
2Θ range for data collection/°	2.469 to 29.129	
Measured reflections	11652	
Independent reflections	5275 [R_{int} = 0.0407]	
Reflections with I >2(I)	3375	
restraints/parameters	0/237	
Goodness-of-fit on F^2	1.037	
Final R indexes [I>=2σ (I)]	R_1 = 0.0500, wR_2 = 0.0840	
Final R indexes [all data]	R_1 = 0.0938, wR_2 = 0.1018	
Largest diff. peak/hole/e Å^{-3}	0.541/-0.638	

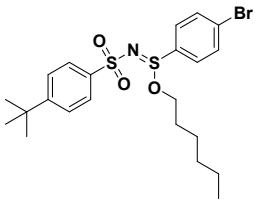
X-Ray single-crystal data of product 4ap





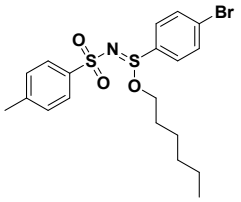
Empirical formula	$C_{16}H_{18}BrCl_2NO_3S_3$	
Formula weight	519.30	
Temperature/K	150.0	
Crystal system	triclinic	
Space group	P-1	
Unit cell dimensions	a = 6.6878(2) Å	α= 89.7990(10)
	b = 7.1027(3) Å	β= 87.8530(10)
	c = 22.8301(8) Å	γ = 75.2420(10)
Volume/Å^3	1047.93(7)	
Z	2	
Wavelength/Å	0.71073	
ρ_{calc}g/cm^3	1.646	
μ/mm-1	2.532	
F(000)	524.0	
Crystal size/mm^3	0.3×0.2×0.1	
Radiation	Mo Kα (λ = 0.71073)	
2Θ range for data collection/°	3.57 to 55.04	
Index ranges	-8 ⩽ h ⩽ 8, -9 ⩽ k ⩽ 9, -29 ⩽ l ⩽ 29	
Reflections collected	16296	
Independent reflections	4757 [R_{int} = 0.0543, R_{sigma} = 0.0520]	
Data/restraints/parameters	4757/0/107	
Goodness-of-fit on F^2	1.123	
Final R indexes [I>=2σ (I)]	R_1 = 0.1228, wR_2 = 0.3005	
Final R indexes [all data]	R_1 = 0.1385, wR_2 = 0.3165	
Largest diff. peak/hole/e Å^{-3}	6.13/-3.95	

Characterization Data of Products



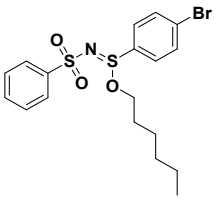
4a

petroleum ether / ethyl acetate = 15:1 – 6:1, a yellow solid, 85% yield (84.8 mg). mp: 62 – 64 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.84 (m, 2H), 7.68 – 7.63 (m, 4H), 7.47 – 7.44 (m, 2H), 3.88 (dt, *J* = 9.3, 6.7 Hz, 1H), 3.41 (dt, *J* = 9.3, 6.8 Hz, 1H), 1.42 – 1.36 (m, 2H), 1.29 (s, 9H), 1.23 – 1.10 (m, 6H), 0.80 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.5, 140.2, 134.7, 132.7, 128.8, 128.2, 126.1, 125.7, 65.8, 34.9, 31.03, 30.97, 28.7, 25.0, 22.2, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{30}BrNO_3S_2$+Na^+: 524.0723, found: 524.0708. **IR** (neat, cm^{-1}): υ 2957, 2871, 1314, 1153,1021, 1001, 825, 793, 629.



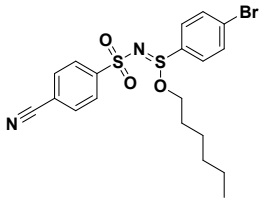
4b

petroleum ether / ethyl acetate = 15:1 – 5:1, a colorless solid, 91% yield (83.2 mg). mp: 80 – 82 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.86 – 7.83 (m, 2H), 7.70 – 7.65 (m, 4H), 7.29 – 7.27 (m, 2H), 4.03 (dq, *J* = 9.8, 7.1 Hz, 1H), 3.60 (dq, *J* = 9.8, 7.1 Hz, 1H), 2.40 (s, 3H), 1.13 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 142.5, 140.4, 134.8, 132.8, 129.3, 128.8, 128.2, 126.3, 65.8, 31.1, 28.8, 25.1, 22.3, 21.4, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{24}BrNO_3S_2$+Na^+: 482.0253, found: 482.0257. **IR** (neat, cm^{-1}): υ 3353, 3259, 2957, 2931, 2860, 1736, 1242, 1146, 1003, 816, 698.



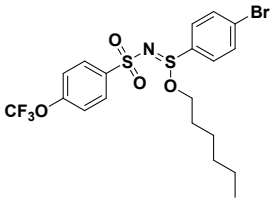
4c

petroleum ether / ethyl acetate = 15:1 – 8:1, a white solid, 76% yield (67.3 mg). mp: 80 – 82 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.96 – 7.93 (m, 2H), 7.68 – 7.63 (m, 4H), 7.52 – 7.43 (m, 3H), 3.88 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.43 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.44 – 1.36 (m, 2H), 1.23 – 1.09 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 143.2, 134.6, 132.8, 131.9, 128.81, 128.77, 128.3, 126.3, 65.9, 31.0, 28.8, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{22}BrNO_3S_2$+H^+: 444.0298, found: 444.0302. **IR** (neat, cm^{-1}): υ 2956, 2928, 1328, 1143, 1001, 819, 738, 636.



4d

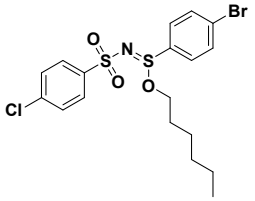
petroleum ether / ethyl acetate = 15:1 – 6:1, a yellow solid, 59% yield (55.2 mg). mp: 78 – 80 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.07 – 8.04 (m, 2H), 7.77 – 7.75 (m, 2H), 7.71 – 7.63 (m, 4H), 3.96 – 3.89 (m, 1H), 3.52 – 3.46 (m, 1H), 1.46 – 1.42 (m, 2H), 1.23 – 1.12 (m, 6H), 0.83 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 147.3, 134.0, 133.0, 132.7, 128.8, 128.7, 127.0, 117.4, 115.6, 66.5, 31.0, 28.8, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{21}BrN_2O_3S_2$+Na^+: 491.0070, found: 491.0058. **IR** (neat, cm^{-1}): υ 3346, 3090, 2956, 2935, 2921, 2859, 2230, 1568, 1467, 1319, 1147, 992, 890, 823, 807, 636.



4e

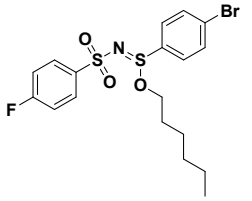
petroleum ether / ethyl acetate = 20:1 – 10:1, a yellow solid, 92% yield (97.0 mg). mp: 46 – 48 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.01 – 7.97 (m, 2H), 7.69 – 7.64 (m, 4H), 7.29 – 7.27 (m, 2H), 3.92 – 3,86 (m, 1H), 3.47 – 3.41 (m, 1H), 1.45 – 1.37 (m, 2H), 1.22 – 1.09 (m, 6H), 0.81 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 151.5 (q, *J* = 1.9 Hz), 141.7, 134.3, 132.9, 128.8, 128.5, 128.4, 120.7, 120.1 (q, *J* = 259.2 Hz), 66.1, 31.0, 28.8, 25.0, 22.2, 13.7. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ

-57.77 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{21}BrF_3NO_4S_2$+Na^+: 551.9920, found: 551.9918. **IR** (neat, cm^{-1}): υ 2959, 2930, 2874, 1469, 1321, 1247, 1222, 1163, 1149, 995, 790, 697.



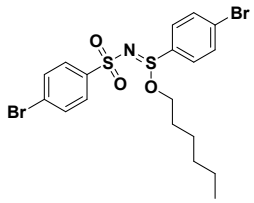
4f

petroleum ether / ethyl acetate = 15:1 – 7:1, a white solid, 89% yield (84.9 mg). mp: 78 – 80 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.90 – 7 .87 (m, 2H), 7.70 – 7.63 (m, 4H), 7.44 – 7.41 (m, 2H), 3.93 – 3.87 (m, 1H), 3.45 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.46 – 1.38 (m, 2H), 1.23 – 1.11 (m, 6H), 0.83 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 141.8, 138.2, 134.4, 132.9, 129.0, 128.8, 128.5, 127.8, 66.1, 31.1, 28.8, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{21}BrClNO_3S_2$+Na^+: 501.9707, found: 501.9690. **IR** (neat, cm^{-1}): υ 3092, 2952, 2922, 2854, 1468, 1319, 1150, 993, 796, 623.



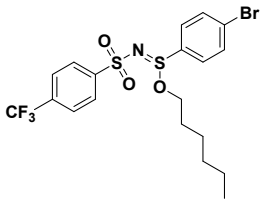
4g

petroleum ether / ethyl acetate = 15:1 – 7:1, a yellow solid, 96% yield (88.5 mg). mp: 61 – 63 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.98 – 7.93 (m, 2H), 7.70 – 7.63 (m, 4H), 7.16 – 7.10 (m, 2H), 3.94 – 3.88 (m, 1H), 3.46 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.47 – 1.39 (m, 2H), 1.24 – 1.11 (m, 6H), 0.83 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 164.5 (d, *J* = 253.4 Hz), 139.4 (d, *J* = 3.3 Hz), 134.5, 132.9, 129.0 (d, *J* = 9.1 Hz), 128.8, 128.4, 115.9 (d, *J* = 22.4 Hz), 66.0, 31.1, 28.8, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -106.58 (s, 1F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{21}BrFNO_3S_2$+Na^+: 486.0002, found: 486.0005. **IR** (neat, cm^{-1}): υ 3359, 3258, 2957, 2928, 2869, 1313, 1288, 1145, 1012, 1001, 912, 834, 819, 697, 667.



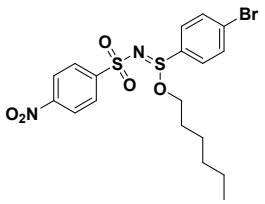
4h

petroleum ether / ethyl acetate =15:1 – 7:1, a colorless solid, 88% yield (92.0 mg). mp: 78 – 80 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.83 – 7.80 (m, 2H), 7.70 – 7.63 (m, 4H), 7.61 – 7.58 (m, 2H), 3.91 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.45 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.47 – 1.39 (m, 2H), 1.24 – 1.12 (m, 6H), 0.84 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 142.3, 134.4, 132.9, 132.0, 128.8, 128.5, 128.0, 126.7, 66.1, 31.1, 28.8, 25.1, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{21}Br_2NO_3S_2$+Na^+: 543.9222, found: 543.9219. **IR** (neat, cm^{-1}): υ 2951, 2923, 2857, 1570, 1468, 1318, 1066, 884, 819, 794, 729, 699, 609.



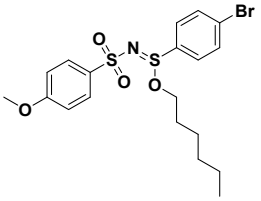
4i

petroleum ether / ethyl acetate =15:1 – 7:1, a white solid, 97% yield (99.1 mg). mp: 74 – 76 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.10 – 8.08 (m, 2H), 7.75 – 7.73 (m, 2H), 7.72 – 7.64 (m, 4H), 3.91 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.47 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.46 – 1.37 (m, 2H), 1.23 – 1.10 (m, 6H), 0.83 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 146.7 (q, *J* = 1.2 Hz), 134.2, 133.7 (q, *J* = 33.1 Hz), 133.0, 128.8, 128.7, 126.9, 126.0 (q, *J* = 3.6 Hz), 123.3 (q, *J* = 270.9 Hz), 66.3, 31.0, 28.8, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-d) δ -63.02 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{21}BrF_3NO_3S_2$+Na^+: 533.9991, found: 534.0006. **IR** (neat, cm^{-1}): υ 2963, 2928, 1316, 1149, 1137, 1090, 1076, 1001, 913, 821, 804, 726, 710, 616.



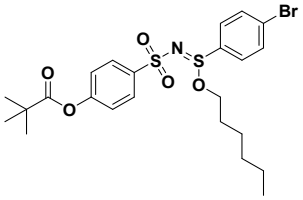
4j

petroleum ether / ethyl acetate = 15:1 – 8:1, a yellow solid, 86% yield (83.9 mg). mp: 126 – 128 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.33 – 8.30 (m, 2H), 8.15 – 8.11 (m, 2H), 7.72 – 7.64 (m, 4H), 3.96 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.52 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.50 – 1.43 (m, 2H), 1.23 – 1.11 (m, 6H), 0.82 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 149.6, 148.9, 134.0, 133.1, 128.9, 128.7, 127.6, 124.1, 66.6, 31.0, 28.9, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{21}BrN_2O_5S_2$+Na^+: 510.9968, found: 510.9961. **IR** (neat, cm^{-1}): υ 3335, 3251, 2955, 2923, 2854, 1520, 1347, 1150, 993, 730, 684, 615.



4k

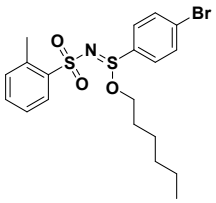
petroleum ether / ethyl acetate = 15:1 – 5:1, a light yellow solid, 80% yield (75.7 mg). mp: 58 – 60 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.83 (m, 2H), 7.67 – 7.61 (m, 4H), 6.93 – 6.89 (m, 2H), 3.88 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.80 (s, 3H), 3.41 (dt, *J* = 9.5, 6.7 Hz, 1H), 1.43 – 1.37 (m, 2H), 1.22 – 1.08 (m, 6H), 0.80 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 162.2, 135.1, 134.7, 132.7, 128.8, 128.3, 128.1, 113.8, 65.7, 55.4, 31.0, 28.8, 25.0, 22.2, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{24}BrNO_4S_2$+H^+: 476.0383, found: 476.0388. **IR** (neat, cm^{-1}): υ 2950, 2925, 2869, 2859, 1386, 1142, 1066, 995, 821, 808, 731, 697, 666.



4l

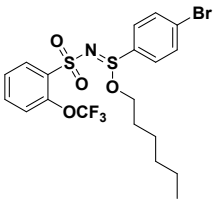
petroleum ether / ethyl acetate = 20:1 – 10:1, a viscous waxy oil, 49% yield (53.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.98 – 7.95 (m, 2H), 7.69 – 7.64 (m, 4H), 7.18 – 7.15 (m, 2H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.46 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.49 – 1.42 (m, 2H), 1.33 (s, 9H), 1.24 – 1.14 (m, 6H), 0.83

(t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 176.3, 153.8, 140.4, 134.6, 132.9, 128.8, 128.4, 127.9, 122.0, 66.1, 39.1, 31.1, 28.9, 27.0, 25.1, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{30}BrNO_5S_2$+Na^+: 568.0621, found: 568.0621. **IR** (neat, cm^{-1}): υ 3084, 2956, 2930, 2871, 1747, 1149, 1108, 1001, 894, 689, 606.



4m

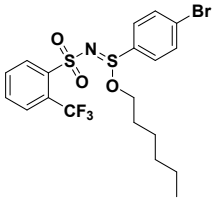
petroleum ether / ethyl acetate = 20:1 – 10:1, a light yellow solid, 84% yield (76.8 mg). mp: 71 – 73 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.08 – 8.05 (m, 1H), 7.71 – 7.66 (m, 4H), 7.42 – 7.38 (m, 1H), 7.30 – 7.26 (m, 2H), 3.91 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.46 (dt, *J* = 9.5, 6.6 Hz, 1H), 2.75 (s, 3H), 1.45 – 1.35 (m, 2H), 1.24 – 1.11 (m, 6H), 0.84 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 141.3, 136.9, 134.8, 132.8, 132.03, 132.01, 128.7, 128.2, 127.5, 125.8, 66.2, 31.0, 28.8, 25.0, 22.2, 20.5, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{24}BrNO_3S_2$+H^+: 458.0454, found: 458.0454. **IR** (neat, cm^{-1}): υ 3376, 3272, 2956, 2922, 2856, 1568, 1469, 1307, 1153, 999, 824, 760, 697, 688.



4n

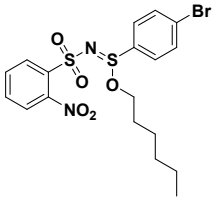
petroleum ether / ethyl acetate = 15:1 – 8:1, a colorless solid, 83% yield (87.5 mg). mp: 77 – 79 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.17 – 8.14 (m, 1H), 7.69 – 7.64 (m, 4H), 7.57 – 7.53 (m, 1H), 7.39 – 7.35 (m, 1H), 7.32 – 7.29 (m, 1H), 4.11 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.61 (dt, *J* = 9.7, 6.6 Hz, 1H), 1.59 – 1.52 (m, 2H), 1.26 – 1.16 (m, 6H), 0.83 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 145.8 (q, *J* = 1.9 Hz), 134.8, 134.4, 133.7, 132.8, 130.2, 128.7, 128.4, 126.2, 120.2 (q, *J* = 260.6 Hz), 119.6 (q, *J* = 1.8 Hz), 66.7, 31.1, 29.0, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -55.94 (s, 3F).

HRMS (ESI-TOF): Anal Calcd. For. $C_{19}H_{21}BrF_3NO_4S_2$+Na^+: 551.9920, found: 551.9925. **IR** (neat, cm^{-1}): υ 2957, 2925, 2875, 1471, 1241, 1217, 1162, 1150, 1069, 994, 768, 700.



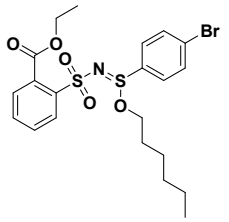
4o

petroleum ether / ethyl acetate = 15:1 – 8:1, a light yellow solid, 79% yield (80.7 mg). mp: 91 – 93 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.37 – 8.35 (m, 1H), 7.83 – 7.81 (m, 1H), 7.71 – 7.61 (m, 6H), 4.03 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.53 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.51 – 1.44 (m, 2H), 1.24 – 1.14 (m, 6H), 0.83 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 141.5 (q, *J* = 0.9 Hz), 134.3, 132.7, 132.2, 132.0, 130.4, 128.7, 128.3, 127.9 (q, *J* = 6.3 Hz), 127.2 (q, *J* = 33.2 Hz), 122.7 (q, *J* = 274.5 Hz), 66.2, 30.9, 28.7, 24.9, 22.1, 13.7. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -57.35 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{21}BrF_3NO_3S_2$+Na^+: 535.9971, found: 535.9971. **IR** (neat, cm^{-1}): υ 2959, 2937, 1470, 1322, 1305, 1267, 1144, 997, 882, 837, 798, 780, 703.



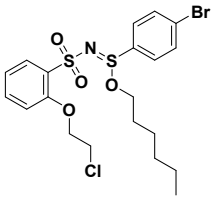
4p

petroleum ether / ethyl acetate = 15:1 – 7:1, a light yellow solid, 74% yield (72.2 mg). mp: 94 – 96 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.26 – 8.21 (m, 1H), 7.71 – 7.61 (m, 7H), 4.14 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.65 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.60 – 1.53 (m, 2H), 1.26 – 1.16 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 147.5, 135.6, 134.5, 133.0, 132.8, 132.0, 130.3, 128.8, 128.5, 124.1, 67.2, 31.1, 28.9, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{21}BrN_2O_5S_2$+H^+: 489.0149, found: 489.0156. **IR** (neat, cm^{-1}): υ 2964, 2919, 2855, 1540, 1319, 1149, 1019, 1001, 879, 839, 798, 785, 728, 702.



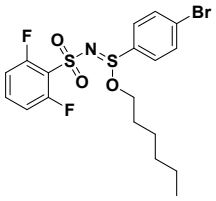
4q

petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 60% yield (61.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.16 –8.12 (m, 1H), 7.67 – 7.62 (m, 4H), 7.55 – 7.51 (m, 3H), 4.42 – 4.27 (m, 2H), 4.09 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.57 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.55 – 1.48 (m, 2H), 1.34 (t, *J* = 7.2 Hz, 3H), 1.24 – 1.15 (m, 6H), 0.82 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 167.4, 140.7, 135.1, 132.6, 131.8, 131.7, 130.3, 128.9, 128.6, 127.9, 66.4, 62.0, 31.0, 28.9, 25.0, 22.2, 13.9, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{26}BrNO_5S_2$+H^+: 516.0509, found: 516.0504. **IR** (neat, cm^{-1}): υ 3086, 2956, 2929, 2859, 1725, 1290, 1255, 1059, 1021, 1002, 754, 733.



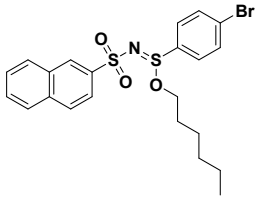
4r

petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 63% yield (65.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.08 – 8.05 (m, 1H), 7.66 – 7.61 (m, 4H), 7.49 – 7.45 (m, 1H), 7.10 – 7.06 (m, 1H), 6.95 – 6.93 (m, 1H), 4.31 – 4.18 (m, 2H), 4.14 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.81 – 3.70 (m, 2H), 3.57 (dt, *J* = 9.7, 6.6 Hz, 1H), 1.60 – 1.53 (m, 2H), 1.27 – 1.17 (m, 6H), 0.84 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.1, 135.3, 133.9, 132.6, 131.4, 129.9, 128.9, 127.9, 121.4, 114.3, 70.0, 66.0, 41.5, 31.1, 29.0, 25.2, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{25}BrClNO_4S_2$+Na^+: 545.9969, found: 545.9969. **IR** (neat, cm^{-1}): υ 2956, 2928, 2859, 1588, 1473, 1150, 1066, 1022, 1002, 891, 825, 798, 755, 732.



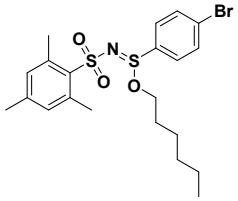
4s

petroleum ether / ethyl acetate = 15:1 – 7:1, a light yellow solid, 83% yield (79.5 mg). mp: 59 – 61 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.70 – 7.66 (m, 4H), 7.47 – 7.40 (m, 1H), 6.97 – 6.92 (m, 2H), 4.10 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.60 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.56 – 1.49 (m, 2H), 1.24 – 1.14 (m, 6H), 0.81 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 159.1 (dd, *J* = 258.5, 4.0 Hz), 134.3, 133.7 (t, *J* = 10.9 Hz), 132.9, 128.7, 128.5, 120.4 (t, *J* = 15.7 Hz), 112.8 (dd, *J* = 23.5, 3.6 Hz), 66.8, 31.0, 28.9, 25.0, 22.2, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -107.04 (s, 2F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{20}BrF_2NO_3S_2$+Na^+: 503.9908, found: 503.9903. **IR** (neat, cm^{-1}): υ 2957, 2921, 2857, 1609, 1465, 1331, 1159, 1000, 803, 789, 637.



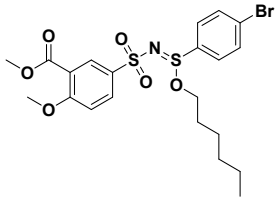
4t

petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 87% yield (85.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.52 (s, 1H), 7.96 – 7.90 (m, 3H), 7.87 – 7.85 (m, 1H), 7.86 – 7.64 (m, 4H), 7.61 – 7.54 (m, 2H), 3.89 (dt, *J* = 9.5, 6.7 Hz, 1H), 3.42 (dt, *J* = 9.5, 6.7 Hz, 1H), 1.37 – 1.27 (m, 2H), 1.13 – 0.97 (m, 6H), 0.76 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 140.1, 134.6, 134.4, 132.8, 132.1, 129.12, 129.08, 128.8, 128.34, 128.30, 127.7, 127.3, 126.9, 122.3, 65.9, 31.0, 28.8, 25.0, 22.2, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{24}BrNO_3S_2$+Na^+: 518.0253, found: 518.0237. **IR** (neat, cm^{-1}): υ 2953, 2929, 2858, 1470, 1307, 1148, 1127, 1020, 999, 731, 659.



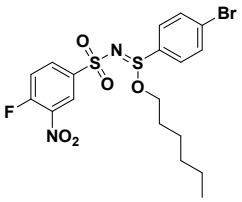
4u

petroleum ether / ethyl acetate = 20:1 – 10:1, a colorless oil, 62% yield (60.1 mg). mp: 63 – 65 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.69 – 7.64 (m, 4H), 6.90 (s, 2H), 3.82 (dt, *J* = 9.5, 6.7 Hz, 1H), 3.37 (dt, *J* = 9.5, 6.7 Hz, 1H), 2.72 (s, 6H), 2.26 (s, 3H), 1.41 – 1.30 (m, 2H), 1.25 – 1.18 (m, 2H), 1.12 – 1.07 (m, 4H), 0.83 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 141.3, 138.2, 137.6, 135.1, 132.8, 131.5, 128.9, 128.2, 65.5, 31.2, 28.9, 25.1, 23.1, 22.4, 20.9, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{28}BrNO_3S_2$+Na^+: 510.0566, found: 510.0567. **IR** (neat, cm^{-1}): υ 3371, 3262, 2971, 2947, 2923, 2855, 1306, 1002, 784, 659.



4v

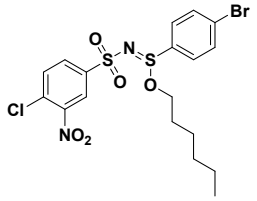
petroleum ether / ethyl acetate = 15:1 – 2:1, a viscous waxy oil, 90% yield (95.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.39 – 8.33 (m, 1H), 8.05 – 8.02 (m, 1H), 7.69 – 7.63 (m, 4H), 7.04 – 7.02 (m, 1H), 3.97 – 3.88 (m, 4H), 3.86 (s, 3H), 3.47 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.48 – 1.41 (m, 2H), 1.23 – 1.11 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 165.0, 161.5, 134.9, 134.6, 132.8, 131.7, 130.3, 128.8, 128.4, 120.1, 111.9, 66.1, 56.3, 52.2, 31.1, 28.9, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{26}BrNO_6S_2$+Na^+: 554.0278, found: 554.0276. **IR** (neat, cm^{-1}): υ 3086, 2953, 2858, 1732, 1281, 1146, 1019, 1000, 871, 785, 732, 658.



4w

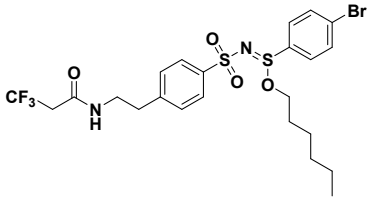
petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 87% yield (88.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.63 – 8.61 (m, 1H), 8.23 – 8.19 (m, 1H), 7.73 – 7.65 (m, 4H), 7.44 – 7.39 (m, 1H), 3.99 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.55 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.53 – 1.47 (m, 2H), 1.24 – 1.14 (m,

6H), 0.82 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 157.0 (d, *J* = 271.2 Hz), 140.5 (d, *J* = 4.2 Hz), 137.0 (d, *J* = 8.6 Hz), 133.8, 133.4 (d, *J* = 9.7 Hz), 133.1, 128.9, 128.7, 124.9 (d, *J* = 2.1 Hz), 119.3 (d, *J* = 21.9 Hz), 66.8, 31.0, 28.9, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -111.43 (s, 1F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{20}BrFN_2O_5S_2$+Na^+: 528.9874, found: 528.9870. **IR** (neat, cm^{-1}): υ 3091, 2956, 2929, 2859, 1537, 1162, 1021, 1000, 897, 817, 733, 657.



4x

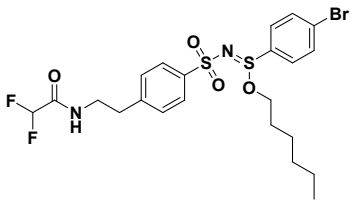
petroleum ether / ethyl acetate = 15:1 – 8:1, a yellow solid, 87% yield (90.8 mg). mp: 65 – 67 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.41 – 8.40 (m, 1H), 8.08 – 8.05 (m, 1H), 7.73 – 7.65 (m, 5H), 3.97 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.53 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.52 – 1.44 (m, 2H), 1.24 – 1.13 (m, 6H), 0.82 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 147.9, 143.8, 134.1, 133.4, 132.9, 130.9, 130.8, 129.2, 129.0, 124.0, 67.1, 31.3, 29.2, 25.4, 22.6, 14.1. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{20}BrClN_2O_5S_2$+$Na^+$: 546.9558, found: 546.9555. **IR** (neat, cm^{-1}): υ 3342, 3086, 2959, 2925, 2858, 1538, 1321, 1140, 994, 841, 799, 641.



4y

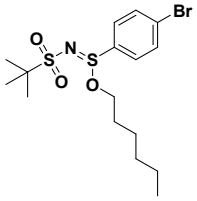
petroleum ether / ethyl acetate = 15:1 – 2:1, a yellow solid, 65% yield (77.5 mg). mp: 168 – 170 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.82 – 7.78 (m, 2H), 7.70 – 7.61 (m, 4H), 7.28 – 7.26 (m, 2H), 6.52 (t, *J* = 5.9 Hz, 1H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.51 – 3.44 (m, 3H), 3.01 (q, *J* = 10.6 Hz, 2H), 2.86 (t, *J* = 6.9 Hz, 2H), 1.48 – 1.40 (m, 2H), 1.24 – 1.11 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.0 (q, *J* = 3.8 Hz), 143.4, 141.2, 134.4, 132.9, 129.3, 128.8, 128.5, 126.5, 124.0 (q, *J* = 276.8 Hz), 66.2, 41.2 (q, *J* = 29.1 Hz), 40.5, 35.0, 31.1, 28.8, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz,

Chloroform-*d*) δ -62.95 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{28}BrF_3N_2O_4S_2$+$H^+$: 599.0679, found: 599.0680. **IR** (neat, cm^{-1}): υ 3350, 3198, 3089, 2956, 2930, 2870, 1663, 1158, 1133, 1067, 572, 542.



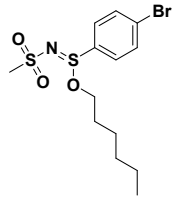
4z

petroleum ether / ethyl acetate = 15:1 – 2:1, a viscous waxy oil, 61% yield (68.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.85 – 7.83 (m, 2H), 7.69 – 7.61 (m, 4H), 7.29– 7.27 (m, 2H), 6.80 (t, *J* = 6.3 Hz, 1H), 5.83 (t, *J* = 54.3 Hz, 1H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.55 (q, *J* = 6.8 Hz, 2H), 3.48 (dt, *J* = 9.6, 6.7 Hz, 1H), 2.90 (t, *J* = 7.2 Hz, 2H), 1.48 – 1.41 (m, 2H), 1.23 – 1.12 (m, 6H), 0.82 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 162.7 (t, *J* = 24.8 Hz), 142.7, 141.5, 134.5, 132.9, 129.2, 128.8, 128.4, 126.6, 108.3 (t, *J* = 251.9 Hz), 66.2, 40.0, 34.9, 31.0, 28.8, 25.0, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -126.20 (s, 2F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{27}BrF_2N_2O_4S_2$+$Na^+$: 589.0436, found: 589.0436. **IR** (neat, cm^{-1}): υ 3322, 3088, 2955, 2929, 2859, 1697, 1292, 1025, 1000, 822, 688.



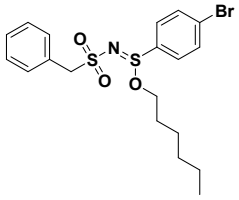
4aa

petroleum ether / ethyl acetate = 15:1 – 8:1, a yellow solid, 71% yield (60.1 mg). mp: 49 – 51 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.76 – 7.70 (m, 4H), 4.18 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.71 (dt, *J* = 9.8, 6.7 Hz, 1H), 1.67 – 1.60 (m, 2H), 1.41 (s, 9H), 1.31 – 1.21 (m, 6H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 135.7, 132.9, 128.6, 128.2, 66.9, 59.3, 31.2, 29.1, 25.2, 24.5, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{26}BrNO_3S_2$+Na^+: 446.0430, found: 446.0439. **IR** (neat, cm^{-1}): υ 3171, 3086, 2957, 2932, 2869, 1472, 1281, 1113, 1001, 989, 909, 735, 667.



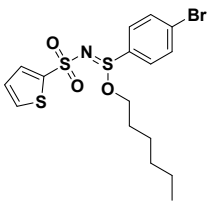
4ab

petroleum ether / ethyl acetate = 15:1 – 6:1, a yellow solid, 64% yield (48.8 mg). mp: 38 – 40 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.73 – 7.69 (m, 4H), 4.14 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.63 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.07 (s, 3H), 1.66 – 1.59 (m, 2H), 1.31 – 1.19 (m, 6H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 134.8, 132.9, 128.7, 128.4, 66.4, 43.3, 31.1, 29.1, 25.2, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{21}BrClNO_3S_2$+H^+: 384.0121, found: 384.0103. **IR** (neat, cm^{-1}): υ 3088, 2957, 2926, 2857, 1325, 1137, 1003, 928, 805, 719.



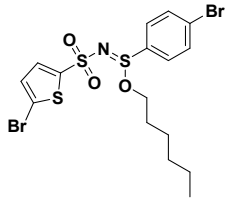
4ac

petroleum ether / ethyl acetate = 15:1 – 7:1, a yellow solid, 72% yield (65.8 mg). mp: 110-112 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.61 – 7.58 (m, 2H), 7.47 – 7.43 (m, 2H), 7.24 – 7.17 (m, 3H), 7.15 – 7.11 (m, 2H), 4.33 – 4.21 (m, 2H), 3.93 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.47 (dt, *J* = 9.7, 6.6 Hz, 1H), 1.50 – 1.43 (m, 2H), 1.19 – 1.11 (m, 6H), 0.77 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 135.2, 132.6, 130.9, 130.1, 128.5, 128.4, 128.3, 128.1, 67.1, 60.7, 31.1, 29.0, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{24}BrNO_3S_2$+H^+: 458.0454, found: 458.0438. **IR** (neat, cm^{-1}): υ 3381, 3314, 3274, 3246, 1321, 1145, 1123, 1001, 778, 740, 697.



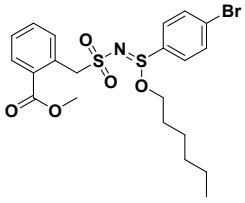
4ad

petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 88% yield (79.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.70 – 7.65 (m, 4H), 7.62 – 7.61 (m, 1H), 7.50 – 7.48 (m, 1H), 7.02 – 7.00 (m, 1H), 3.99 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.50 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.50 – 1.44 (m, 2H), 1.24 – 1.12 (m, 6H), 0.82 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 144.6, 134.3, 132.8, 130.8, 130.6, 128.8, 128.4, 126.9, 66.4, 31.0, 28.8, 25.0, 22.2, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{20}BrNO_3S_3$+Na^+: 471.9681, found: 471.9677. **IR** (neat, cm^{-1}): υ 3089, 2955, 2926, 2858, 1312, 1142, 1019, 1000, 890, 716, 667.



4ae

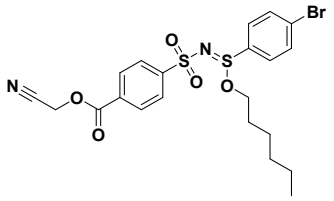
petroleum ether / ethyl acetate = 20:1 – 10:1, a light yellow solid, 81% yield (85.4 mg). mp: 50 – 52 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.71 – 7.65 (m, 4H), 7.37 – 7.36 (m, 1H), 6.99 – 6.98 (m, 1H), 4.01 (dt, *J* = 9.5, 6.6 Hz, 1H), 3.50 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.53 – 1.45 (m, 2H), 1.25 – 1.15 (m, 6H), 0.82 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 145.4, 134.0, 132.9, 130.6, 129.8, 128.8, 128.6, 118.6, 66.5, 31.0, 28.8, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{19}Br_2NO_3S_3$+H^+: 529.8947, found: 529.8944. **IR** (neat, cm^{-1}): υ 3092, 3076, 2951, 2924, 2854, 1319, 1141, 989, 794, 605, 588.



4af

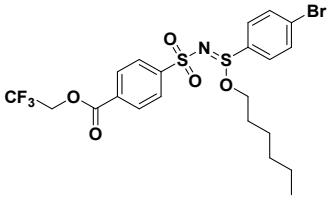
petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 75% yield (77.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.85 – 7.83 (m, 1H), 7.66 – 7.62 (m, 2H), 7.53 – 7.50 (m, 2H), 7.45 – 7.42 (m, 1H), 7.39 – 7.31 (m, 2H), 5.00 (dd, *J* = 140.6, 13.4 Hz, 2H), 4.02 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.70 (s, 3H), 3.53 (dt, *J* = 9.8, 6.7 Hz, 1H), 1.56 – 1.49 (m, 2H), 1.24 – 1.14 (m, 6H), 0.81 (t, *J* = 6.9 Hz, 3H). **^{13}C**

NMR (100 MHz, Chloroform-*d*) δ 167.3, 135.2, 133.3, 132.5, 131.8, 131.1, 130.78, 130.75, 128.5, 128.2, 128.0, 66.9, 57.4, 52.0, 31.0, 29.0, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{26}BrNO_5S_2$+Na^+: 538.0328, found: 538.0326. **IR** (neat, cm^{-1}): υ 3088, 2956, 2929, 2859, 1707, 1471, 1186, 1142, 1066, 926, 817, 737.



4ag

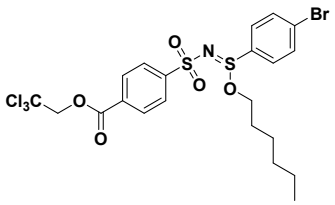
petroleum ether / ethyl acetate = 15:1 – 5:1, a yellow solid, 74% yield (77.8 mg). mp: 82 – 84 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.16 – 8.12 (m, 2H), 8.07 – 8.04 (m, 2H), 7.71 – 7.63 (m, 4H), 4.98 (s, 2H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.49 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.48 – 1.40 (m, 2H), 1.23 – 1.10 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.7, 148.2, 134.2, 133.0, 130.8, 130.5, 128.74, 128.68, 126.6, 114.0, 66.4, 49.2, 31.0, 28.8, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{23}BrN_2O_5S_2$+Na^+: 551.0104, found: 551.0103. **IR** (neat, cm^{-1}): υ 3089, 2956, 2929, 2859, 1738, 1261, 1152, 999, 760, 730, 692, 621.



4ah

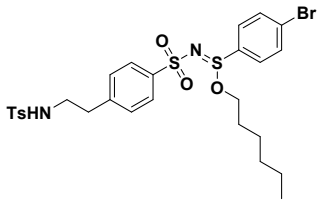
petroleum ether / ethyl acetate = 15:1 – 8:1, a yellow oil, 75% yield (85.4 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.18 – 8.15 (m, 2H), 8.07 – 8.04 (m, 2H), 7.71 – 7.63 (m, 4H), 4.71 (q, *J* = 8.4 Hz, 2H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.48 (dt, *J* = 9.5, 6.6 Hz, 1H), 1.47 – 1.39 (m, 2H), 1.23 – 1.11 (m, 6H), 0.81 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.6, 148.0, 134.2, 133.0, 131.3, 130.5, 128.8, 128.6, 126.6, 122.8 (q, *J* = 277.2 Hz), 66.3, 61.0 (q, *J* = 36.9 Hz), 31.0, 28.8, 25.0, 22.2, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -73.62 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For.

$C_{21}H_{23}BrF_3NO_5S_2$+H^+: 570.0226, found: 570.0218. **IR** (neat, cm^{-1}): υ 2957, 2931, 2860, 1740, 1290, 1252, 1152, 1104, 908, 760, 620.



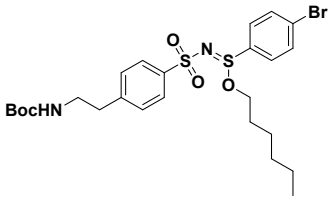
4ai

petroleum ether / ethyl acetate = 20:1 – 10:1, a viscous waxy oil, 81% yield (100.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.22 – 8.19 (m, 2H), 8.07 – 8.04 (m, 2H), 7.69 – 7.64 (m, 4H), 4.96 (s, 2H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.47 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.46 – 1.48 (m, 2H), 1.22 – 1.08 (m, 6H), 0.80 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.5, 147.9, 134.2, 132.9, 131.6, 130.5, 128.7, 128.6, 126.6, 94.6, 74.5, 66.2, 31.0, 28.8, 25.0, 22.2, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{23}BrCl_3NO_5S_2$+$Na^+$: 641.9139, found: 641.9138. **IR** (neat, cm^{-1}): υ 3089, 2956, 2928, 2859, 1740, 1256, 1151, 1000, 733, 1712, 689.



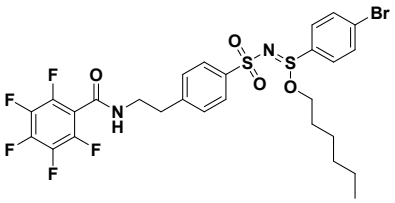
4aj

petroleum ether / ethyl acetate = 15:1 – 3:1, a light yellow solid, 62% yield (79.4 mg). mp: 126 – 128 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.81 – 7.79 (m, 2H), 7.68 – 7.62 (m, 6H), 7.26 – 7.23 (m, 2H), 7.19 – 7.17 (m, 2H), 5.06 – 5.00 (m, 1H), 3.94 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.48 (dt, *J* = 9.6, 6.7 Hz, 1H), 3.16 (q, *J* = 6.8 Hz, 2H), 2.80 (t, *J* = 7.1 Hz, 2H), 2.39 (s, 3H), 1.48 – 1.41 (m, 2H), 1.24 – 1.11 (m, 6H), 0.81 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 143.5, 142.6, 141.5, 136.7, 134.6, 132.8, 129.7, 129.2, 128.8, 128.3, 126.9, 126.6, 66.2, 43.7, 35.7, 31.0, 28.8, 25.0, 22.3, 21.4, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{27}H_{33}BrN_2O_5S_3$+Na^+: 665.0607, found: 665.0593. **IR** (neat, cm^{-1}): υ 3380, 3272, 2956, 2927, 2857, 1329, 1144, 813, 550.



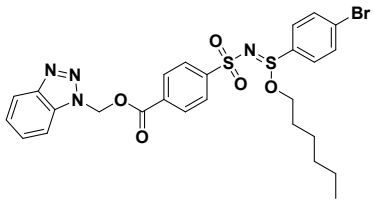
4ak

petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 74% yield (86.7mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.85 (m, 2H), 7.69 – 7.64 (m, 4H), 7.29 – 7.27 (m, 2H), 4.58 (s, 1H), 3.94 (dt, *J* = 9.6, 6.5 Hz, 1H), 3.48 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.35 (q, *J* = 6.8 Hz, 2H), 2.83 (t, *J* = 7.0 Hz, 2H), 1.47 – 1.42 (m, 2H), 1.40 (s, 9H), 1.24 – 1.12 (m, 6H), 0.83 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 143.6, 141.3, 134.7, 132.8, 129.2, 128.8, 128.3, 126.6, 79.4, 66.1, 41.4, 36.0, 31.1, 28.9, 28.3, 25.1, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{25}H_{35}BrN_2O_5S_2$+Na^+: 611.1043, found: 611.1043. **IR** (neat, cm^{-1}): υ 3376, 2957, 2930, 2870, 1700, 1148, 1024, 1000, 794, 732.



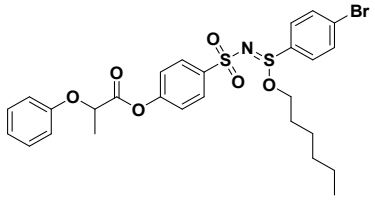
4al

petroleum ether / ethyl acetate = 15:1 – 3:1, a viscous waxy oil, 90% yield (122.4 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.71 – 7.64 (m, 4H), 7.59 – 7.56 (m, 2H), 7.31 – 7.29 (m, 2H), 7.07 (t, *J* = 5.9 Hz, 1H), 3.85 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.65 (q, *J* = 6.6 Hz, 2H), 3.42 (dt, *J* = 9.6, 6.7 Hz, 1H), 2.95 (t, *J* = 6.9 Hz, 2H), 1.44 – 1.37 (m, 2H), 1.21 – 1.10 (m, 6H), 0.80 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 157.6, 143.3, 141.0, 134.3, 132.8, 129.3, 128.6, 128.4, 126.3, 66.2, 40.9, 34.8, 31.0, 28.7, 25.0, 22.2, 13.7. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -140.82 – -140.92 (m, 2F), -151.79 – -151.90 (m, 1F), -160.49 – -160.64 (m, 2F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{27}H_{26}BrF_5N_2O_4S_2$+$H^+$: 681.0511, found: 681.0513. **IR** (neat, cm^{-1}): υ 3317, 2932, 2860, 1683, 1517, 1501, 1322, 1146, 990, 797, 732.



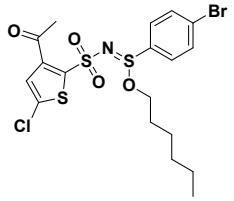
4am

petroleum ether / ethyl acetate = 15:1 – 3:1, a light yellow solid, 67% yield (82.8 mg). mp: 130 – 132 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.12 – 8.09 (m, 2H), 8.06 – 8.04 (m, 1H), 7.99 – 7.96 (m, 2H), 7.86 – 7.83 (m, 1H), 7.67 – 7.57 (m, 4H), 7.57 – 7.53 (m, 1H), 7.42 – 7.38 (m, 1H), 6.84 (s, 2H), 3.89 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.46 (dt, *J* = 9.6, 6.6 Hz, 1H), 1.44 – 1.36 (m, 2H), 1.16 – 1.04 (m, 6H), 0.75 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 164.2, 148.0, 145.9, 134.1, 132.9, 132.7, 131.3, 130.5, 128.7, 128.6, 128.5, 126.5, 124.6, 120.0, 109.9, 68.5, 66.4, 30.9, 28.7, 24.9, 22.2, 13.7. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{26}H_{27}BrN_4O_5S_2$+Na^+: 643.0478, found: 643.0463. **IR** (neat, cm^{-1}): υ 3085, 2957, 2926, 2860, 1737, 1330, 1143, 1002, 739, 548.



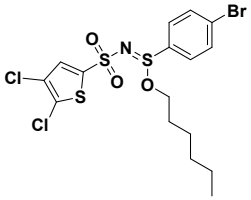
4an

petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 78% yield (94.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.98 – 7.94 (m, 2H), 7.69 – 7.62 (m, 4H), 7.32 – 7.27 (m, 2H), 7.16 – 7.12 (m, 2H), 7.02 – 6.93 (m, 1H), 6.97 – 6.92 (m, 2H), 4.99 (q, *J* = 6.8 Hz, 1H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.47 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.77 (d, *J* = 6.8 Hz, 3H), 1.48 – 1.41 (m, 2H), 1.25 – 1.13 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 170.1, 157.2, 152.7, 141.0, 134.4, 132.8, 129.6, 128.8, 128.4, 128.0, 121.9, 121.7, 115.1, 72.4, 66.2, 31.0, 28.8, 25.0, 22.2, 18.4, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{27}H_{30}BrNO_6S_2$+Na^+: 632.0570, found: 632.0565. **IR** (neat, cm^{-1}): υ 2955, 2930, 2870, 1774, 1588, 1491, 1146, 1089, 1024, 1000, 753, 689.



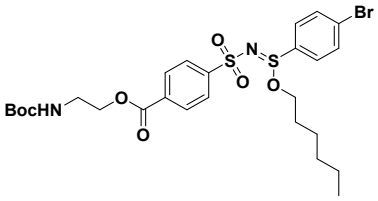
4ao

petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 74% yield (77.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.68 – 7.63 (m, 4H), 7.15 (s, 1H), 4.13 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.66 (dt, *J* = 9.7, 6.6 Hz, 1H), 2.49 (s, 3H), 1.62 – 1.56 (m, 2H), 1.26 – 1.17 (m, 6H), 0.82 (t, *J* = 6.7 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 192.7, 145.9, 138.6, 134.7, 133.8, 132.7, 128.7, 128.4, 128.3, 67.5, 31.0, 29.9, 29.0, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{21}BrClNO_4S_3$+Na^+: 549.9377, found: 549.9387. **IR** (neat, cm^{-1}): υ 2955, 2925, 2857, 1685, 1406, 1307, 1139, 1021, 1002, 732, 643.



4ap

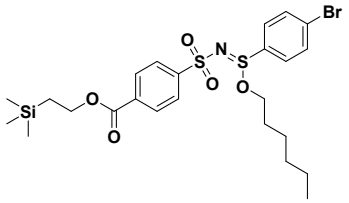
petroleum ether / ethyl acetate = 20:1 – 10:1, a white solid, 87% yield (89.9 mg). mp: 58 – 60 °C. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.75 – 7.67 (m, 4H), 7.40 (s, 1H), 4.04 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.54 (dt, *J* = 9.5, 6.6 Hz, 1H), 1.57 – 1.50 (m, 2H), 1.27 – 1.16 (m, 6H), 0.85 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 141.2, 133.8, 133.1, 130.1, 129.4, 128.9, 128.8, 124.2, 66.8, 31.1, 28.9, 25.1, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{18}BrCl_2NO_3S_3$+$H^+$: 517.9082, found: 517.9073. **IR** (neat, cm^{-1}): υ 3088, 2956, 2916, 2855, 1321, 1138, 986, 877, 616, 539.



4aq

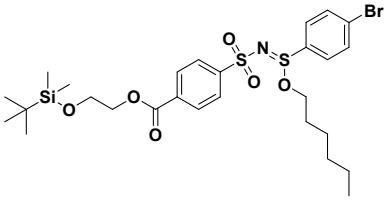
petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 74% yield (93.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.13 – 8.10 (m, 2H), 8.00 – 7.98 (m, 2H), 7.68 – 7.62 (m, 4H), 4.91 (s, 1H), 4.36

(t, *J* = 5.4 Hz, 2H), 3.91 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.53 – 3.45(m, 3H), 1.45 – 1.41 (m, 2H), 1.39 (s, 9H), 1.22 – 1.09 (m, 6H), 0.81 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 165.1, 155.8, 147.2, 134.3, 132.93, 132.89, 130.2, 128.8, 128.6, 126.4, 79.6, 66.3, 64.8, 39.5, 31.0, 28.8, 28.3, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{26}H_{35}BrN_2O_7S_2$+Na^+: 655.0941, found: 655.0940. **IR** (neat, cm^{-1}): υ 2957, 2930, 2860, 1715, 1268, 1152, 1088, 1025, 999, 762, 729, 692, 620.



4ar

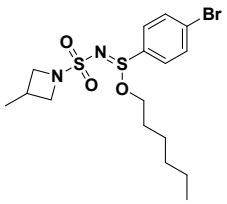
petroleum ether / ethyl acetate = 20:1 – 10:1, a light red solid, 71% yield (83.4 mg). mp: 58 – 60 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.12 – 8.09 (m, 2H), 8.01 – 7.99 (m, 2H), 7.68 – 7.62 (m, 4H), 4.42 – 4.38 (m, 2H), 3.88 (dt, *J* = 9.4, 6.6 Hz, 1H), 3.43 (dt, *J* = 9.5, 6.6 Hz, 1H), 1.43 – 1.35 (m, 2H), 1.22 – 1.09 (m, 8H), 0.80 (t, *J* = 7.1 Hz, 3H), 0.05 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 165.3, 146.9, 134.3, 133.6, 132.9, 129.9, 128.7, 128.5, 126.3, 66.1, 63.8, 31.0, 28.7, 25.0, 22.2, 17.3, 13.8, -1.6. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{34}BrNO_5S_2Si$+Na^+: 610.0724, found: 610.0724. **IR** (neat, cm^{-1}): υ 2953, 2928, 2856, 1713, 1320, 1273, 1106, 994, 827, 800, 694, 615.



4as

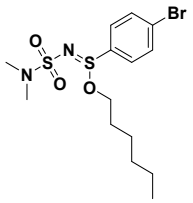
petroleum ether / ethyl acetate = 20:1 – 10:1, a white solid, 80% yield (103.2 mg). mp: 68 – 70 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.14 – 8.11 (m, 2H), 8.03 – 7.99 (m, 2H), 7.69 – 7.62 (m, 4H), 4.40 – 4.37 (m, 2H), 3.93 – 3.87 (m, 3H), 3.48 – 3.43 (m, 1H), 1.45 – 1.37 (m, 2H), 1.22 – 1.08 (m, 6H), 0.86 (s, 9H), 0.80 (t, *J* = 7.1 Hz, 3H), 0.04 (s, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 165.2, 147.1, 134.3, 133.2, 132.9, 130.1, 128.8, 128.5, 126.3, 66.6, 66.2, 61.1, 31.0, 28.8, 25.7, 25.0, 22.3, 18.2, 13.8, -5.4.

HRMS (ESI-TOF): Anal Calcd. For. $C_{27}H_{40}BrNO_6S_2Si+H^+$: 648.1302, found: 648.1295. **IR** (neat, cm^{-1}): υ 3091, 2951, 2925, 2852, 1712, 1320, 1274, 994, 799, 615, 516.



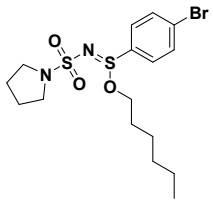
4at

petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 63% yield (54.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.77 – 7.70 (m, 4H), 4.19 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.98 – 3.90 (m, 2H), 3.71 (dt, *J* = 9.7, 6.7 Hz, 1H), 3.54 – 3.40 (m, 1H), 3.45 – 3.41 (m, 1H), 2.67 – 2.54 (m, 1H), 1.67 – 1.60 (m, 2H), 1.30 – 1.16 (m, 6H), 1.17 (d, *J* = 6.8 Hz, 3H), 0.84 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 135.4, 132.8, 128.7, 128.2, 67.0, 57.8, 31.1, 29.2, 25.2, 23.5, 22.3, 18.9, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{25}BrN_2O_3S_2+H^+$: 437.0563, found: 437.0571. **IR** (neat, cm^{-1}): υ 3086, 2957, 2928, 2871, 1471, 1324, 1152, 1021, 1000, 898, 731, 632.



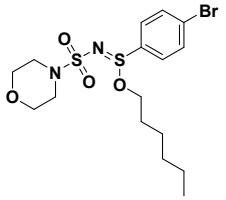
4au

petroleum ether / ethyl acetate = 20:1 – 8:1, a colorless oil, 74% yield (60.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.74 – 7.69 (m, 4H), 4.16 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.67 (dt, *J* = 9.8, 6.7 Hz, 1H), 2.77 (s, 6H), 1.66 – 1.59 (m, 2H), 1.30 – 1.21 (m, 6H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 135.5, 132.8, 128.7, 128.1, 66.6, 38.8, 31.1, 29.2, 25.2, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{14}H_{23}BrN_2O_3S_2+H^+$: 411.0407, found: 411.0407 **IR** (neat, cm^{-1}): υ 3086, 2951, 2929, 2871, 1469, 1140, 1028, 1004, 701.



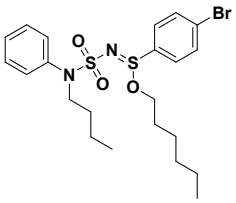
4av

petroleum ether / ethyl acetate = 15:1 – 5:1, a colorless oil, 78% yield (68.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.72 – 7.67(m, 4H), 4.14 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.67 (dt, *J* = 9.7, 6.7 Hz, 1H), 3.35 – 3.22 (m, 4H), 1.89 – 1.82 (m, 4H), 1.65 – 1.58 (m, 2H), 1.30 – 1.19 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 135.6, 132.7, 128.6, 128.0, 66.5, 48.5, 31.1, 29.2, 25.24, 25.18, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{25}BrN_2O_3S_2$+H^+: 439.0543, found: 439.0542. **IR** (neat, cm^{-1}): υ 3086, 2954, 2929, 2859, 1468, 1324, 1142, 1027, 994,917, 824, 723, 620.



4aw

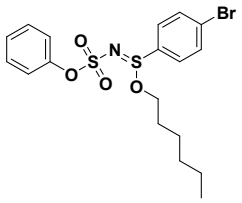
petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 75% yield (67.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.75 – 7.67 (s, 4H), 4.16 (dt, *J* = 9.7, 6.5 Hz, 1H), 3.80 – 3.70 (m, 4H), 3.66 (dt, *J* = 9.7, 6.7 Hz, 1H), 3.79 – 3.71 (m, 4H), 1.66 – 1.59 (m, 2H), 1.31 – 1.19 (m, 6H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 135.1, 132.9, 128.6, 128.3, 66.6, 66.0, 46.7, 31.1, 29.1, 25.2, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{25}BrN_2O_4S_2$+Na^+: 475.0332, found: 475.0324. **IR** (neat, cm^{-1}): υ 3086, 2956, 2923, 2856, 1319, 1294, 1260, 1148, 1113, 1029, 1003, 939, 764, 720.



4ax

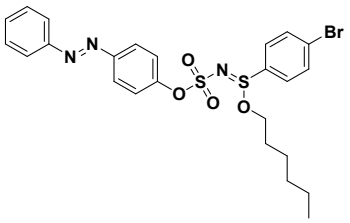
petroleum ether / ethyl acetate = 20:1 – 12:1, a yellow liquid, 79% yield (81.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.71 – 7.67 (m, 2H), 7.63 – 7.59 (m, 2H), 7.38 – 7.35 (m, 2H), 7.32 – 7.27 (m, 2H), 7.25

– 7.21 (m, 1H), 4.02 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.76 – 3.61 (m, 2H), 3.54 (dt, *J* = 9.8, 6.7 Hz, 1H), 1.59 – 1.52 (m, 2H), 1.48 – 1.41 (m, 2H), 1.38 – 1.31 (m, 2H), 1.28 – 1.18 (m, 6H), 0.85 (t, *J* = 7.3 Hz, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 140.8, 135.6, 132.6, 128.8, 128.6, 128.3, 128.0, 127.2, 67.1, 50.9, 31.1, 30.3, 29.1, 25.1, 22.3, 19.7, 13.8, 13.6. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{31}BrN_2O_3S_2$+H^+: 515.1033, found: 515.1028. **IR** (neat, cm^{-1}): υ 3087, 2956, 2930, 2870, 1326, 1138, 1002, 883, 695.



4ay

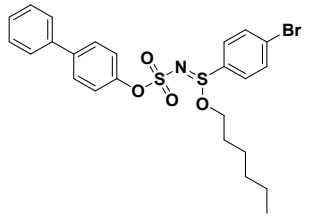
petroleum ether / ethyl acetate = 20:1 – 10:1, a colorless liquid, 76% yield (69.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.71 – 7.68 (m, 2H), 7.63 – 7.60 (m, 2H), 7.33 – 7.29 (m, 4H), 7.24 – 7.19 (m, 1H), 4.10 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.61 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.61 – 1.54 (m, 2H), 1.26 – 1.18 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 150.7, 133.9, 132.9, 129.5, 128.8, 128.7, 126.4, 122.0, 67.9, 31.0, 29.0, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{22}BrNO_4S_2$+Na^+: 482.0066, found: 482.0066. **IR** (neat, cm^{-1}): υ 2955, 2927, 2859, 1488, 1471, 1347, 1165, 1146, 1022, 1004, 854, 775, 690.



4az

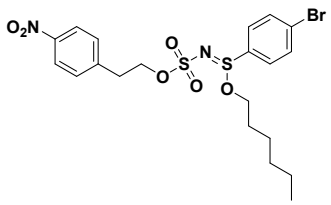
petroleum ether / ethyl acetate = 15:1 – 5:1, a red solid, 60% yield (67.6 mg). mp: 72 – 74 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.92 – 7.88 (m, 4H), 7.73 – 7.70 (m, 2H), 7.67 – 7.64 (m, 2H), 7.54 – 7.45 (m, 5H), 4.13 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.64 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.62 – 1.57 (m, 2H), 1.26 – 1.19 (m, 6H), 0.82 (t, *J* = 6.7 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 152.5, 152.4, 150.5, 133.9, 133.0, 131.2, 129.1, 129.0, 128.7, 124.1, 122.9, 122.5, 68.1, 31.1, 29.0, 25.1, 22.3, 13.8. **HRMS** (ESI-

TOF): Anal Calcd. For. $C_{24}H_{26}BrN_3O_4S_2$+Na^+: 586.0441, found: 586.0413. **IR** (neat, cm^{-1}): υ 3101, 3068, 2977, 2940, 1720, 1313, 1144, 1004, 730, 689.



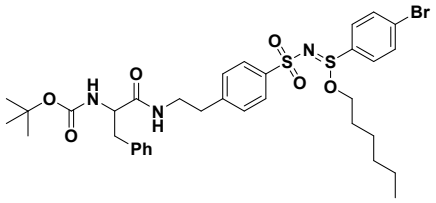
4ba

petroleum ether / ethyl acetate = 15:1 – 5:1, a colorless solid, 65% yield (69.6 mg). mp: 72 – 74 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.72 – 7.69 (m, 2H), 7.67 – 7.63 (m, 2H), 7.55 – 7.50 (m, 4H), 7.46 – 7.42 (m, 2H), 7.40 – 7.33 (m, 3H), 4.14 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.65 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.64 – 1.58 (m, 2H), 1.29 – 1.17 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 150.1, 139.9, 139.6, 134.1, 133.0, 128.9, 128.8, 128.7, 128.1, 127.5, 127.0, 122.3, 68.0, 31.1, 29.1, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{26}BrNO_4S_2$+Na^+: 560.0359, found: 560.0360. **IR** (neat, cm^{-1}): υ 3091, 3077, 2955, 2920, 2863, 1338, 1148, 1001, 869, 758, 694.



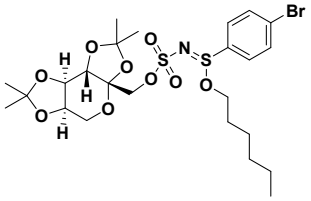
4bb

petroleum ether / ethyl acetate = 15:1 – 3:1, a viscous waxy oil, 83% yield (88.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.10 – 8.06 (m, 2H), 7.72 – 7.68 (m, 2H), 7.66 – 7.62 (m, 2H), 7.40 – 7.37 (m, 2H), 4.43 (t, *J* = 6.4 Hz, 2H), 4.09 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.61 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.14 (t, *J* = 6.4 Hz, 2H), 1.60 – 1.53 (m, 2H), 1.26 – 1.15 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 146.9, 145.0, 134.2, 133.1, 129.9, 128.9, 128.7, 123.7, 69.4, 67.6, 35.2, 31.1, 29.1, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{25}BrN_2O_6S_2$+H^+: 535.0390, found: 525.0370. **IR** (neat, cm^{-1}): υ 3088, 2955, 2931, 2870, 1720, 1342, 1314, 1156, 1006, 889, 804, 731.



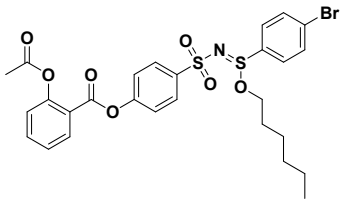
4bc

petroleum ether / ethyl acetate = 15:1 – 2:1, a yellow solid, 55% yield (80.7 mg). mp: 55 – 57 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.86 (m, 2H), 7.73 – 7.68 (m, 4H), 7.33 – 7.27 (m, 3H), 7.22 – 7.18 (m, 4H), 6.07 (t, *J* = 4.8 Hz, 1H), 5.13 – 5.11 (m, 1H), 4.32 – 4.27 (m, 1H), 3.99 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.56 – 3.37 (m, 3H), 3.05 (d, *J* = 7.1 Hz, 2H), 2.81 – 2.68 (m, 2H), 1.53 – 1.47 (m, 2H), 1.42 (s, 9H), 1.29 – 1.18 (m, 6H), 0.88 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 171.2, 155.3, 143.2, 141.4, 136.6, 134.7, 132.8, 129.2, 129.0, 128.8, 128.6, 128.3, 126.9, 126.6, 80.1, 66.1, 55.9, 40.2, 38.6, 35.4, 31.1, 28.8, 28.2, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{34}H_{44}BrN_3O_6S_2$+Na^+: 758.1727, found: 758.1725. **IR** (neat, cm^{-1}): υ 2957, 2928, 1655, 1293, 1148, 1025, 1001, 732, 697.



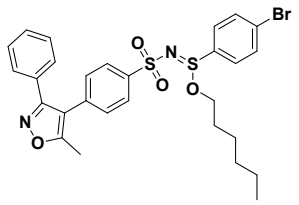
4bd

petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 77% yield (96.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.75 – 7.70 (m, 4H), 4.59 – 4.54(m, 1H), 4.38 – 4.37 (m, 1H), 4.25 – 4.14 (m, 4H), 3.88 – 3.84 (m, 1H), 3.74 – 3.65 (m, 2H), 1.66 – 1.59 (m, 2H), 1.48 (d, *J* = 13.8 Hz, 3H), 1.40 – 1.37 (m, 6H), 1.30 – 1.19 (m, 9H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 134.4, 134.3, 132.9, 128.9, 128.8, 128.64, 128.60, 109.01, 108.99, 100.98, 100.96, 70.61, 70.60, 69.95, 69.92, 69.5, 69.4, 67.6, 67.4, 61.2, 31.1, 29.1, 26.5, 26.4, 25.7, 25.2, 25.1, 24.0, 23.9, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{36}BrNO_9S_2$+H^+: 626.1088, found: 626.1082. **IR** (neat, cm^{-1}): υ 3089, 2988, 2934, 2872, 1348, 1159, 1068, 1050, 997, 886, 830, 817.



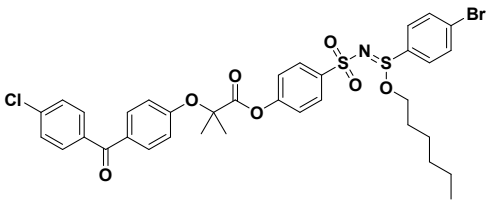
4be

petroleum ether / ethyl acetate = 15:1 – 5:1, a yellow solid, 63% yield (78.3 mg). mp: 48 – 50 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.19 – 8.17 (m, 1H), 8.03 – 8.00 (m, 2H), 7.70 – 7.62 (m, 5H), 7.40 – 7.35 (m, 1H), 7.31 – 7.27 (m, 2H), 7.18 – 7.15 (m, 1H), 3.96 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.50 (dt, *J* = 9.6, 6.7 Hz, 1H), 2.28 (s, 3H), 1.52 – 1.45 (m, 2H), 1.25 – 1.15 (m, 6H), 0.83 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 169.5, 162.1, 153.1, 151.2, 140.8, 134.9, 134.5, 132.8, 132.0, 128.8, 128.4, 128.0, 126.2, 124.0, 122.1, 121.8, 66.2, 31.0, 28.8, 25.1, 22.3, 20.9, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{27}H_{28}BrNO_7S_2$+Na^+: 646.0363, found: 646.0363. **IR** (neat, cm^{-1}): υ 3735, 3619, 2924, 1730, 1195, 1152, 1017, 921.



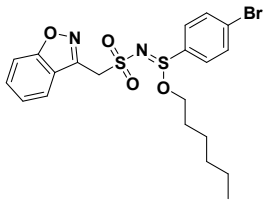
4bf

petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 85% yield (102.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.94 – 7.91 (m, 2H), 7.70 – 7.65 (m, 4H), 7.36 – 7.34 (m, 3H), 7.30 – 7.26 (m, 4H), 3.98 (dt, *J* = 9.6, 6.5 Hz, 1H), 3.53 (dt, *J* = 9.7, 6.7 Hz, 1H), 2.44 (s, 3H), 1.51 – 1.44 (m, 2H), 1.23 – 1.13 (m, 6H), 0.80 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 167.0, 160.9, 142.2, 134.5, 134.3, 132.8, 129.9, 129.5, 128.7, 128.5, 128.4, 128.3, 126.6, 114.5, 66.2, 31.0, 28.8, 25.1, 22.2, 13.8, 11.6. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{28}H_{29}BrN_2O_4S_2$+Na^+: 625.0624, found: 625.0630. **IR** (neat, cm^{-1}): υ 2955, 2928, 2859, 1339, 1149, 1026, 1001, 901, 696, 611.



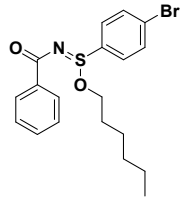
4bg

petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 71% yield (107.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.97 – 7.95 (m, 2H), 7.77 – 7.75 (m, 2H), 7.69 – 7.62 (m, 6H), 7.43 – 7.41 (d, *J* = 8.2 Hz, 2H), 7.11 – 7.09 (m, 2H), 6.97 – 6.95 (m, 2H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.46 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.80 (s, 6H), 1.47 – 1.40 (m, 2H), 1.23 – 1.11 (m, 6H), 0.80 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 194.0, 171.7, 159.2, 152.8, 141.1, 138.4, 136.1, 134.4, 132.8, 132.0, 131.0, 130.7, 128.7, 128.5, 128.4, 128.0, 121.6, 117.2, 79.3, 66.1, 31.0, 28.8, 25.3, 25.0, 22.2, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{35}H_{35}BrClNO_7S_2$+Na^+: 782.0620, found: 782.0613. **IR** (neat, cm^{-1}): υ 3086, 2955, 2929, 2870, 1760, 1597, 1148, 1088, 1000, 927, 762.



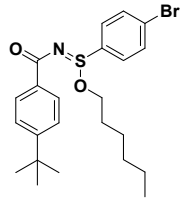
4bh

petroleum ether / ethyl acetate = 15:1 – 5:1, a yellow solid, 72% yield (71.7 mg). mp: 135 – 137 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.96 – 7.94 (m, 1H), 7.68 – 7.65 (m, 2H), 7.59 – 7.50 (m, 4H), 7.35 – 7.31 (m, 1H), 4.80 (dd, *J* = 3.2, 5.8 Hz, 2H), 4.08 (dt, *J* = 9.6, 6.5 Hz, 1H), 3.54 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.59 – 1.52 (m, 2H), 1.26 – 1.17 (m, 6H), 0.83 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.5, 150.4, 134.3, 132.7, 130.2, 128.7, 128.4, 124.1, 122.8, 120.9, 109.6, 67.0, 51.6, 31.1, 28.9, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{23}BrN_2O_4S_2$+Na^+: 521.0175, found: 521.0176. **IR** (neat, cm^{-1}): υ 3328, 3265, 3085, 2989, 2931, 1516, 1384, 1329, 1143, 1036, 1006, 915, 818, 737.



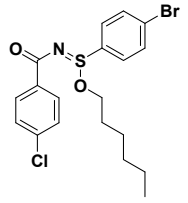
4bi

petroleum ether / ethyl acetate = 20:1 – 10:1, a yellow solid, 68% yield (55.4 mg). mp: 38 – 40 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.28 – 8.25 (m, 2H), 7.93 – 7.89 (m, 2H), 7.75 – 7.72 (m, 2H), 7.54 – 7.49 (m, 1H), 7.46 – 7.41 (m, 2H), 4.26 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.92 (dt, *J* = 9.8, 6.6 Hz, 1H), 1.68 – 1.61 (m, 2H), 1.31 – 1.20 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 178.3, 135.9, 135.6, 132.6, 131.9, 129.4, 129.3, 128.0, 127.7, 68.5, 31.2, 29.6, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{22}BrNO_2S+Na^+$: 430.0447, found: 430.0441. **IR** (neat, cm^{-1}): υ 3050, 3010, 2954, 2931, 2858, 1600, 1566, 1314, 1285, 1275, 887, 705.



4bj

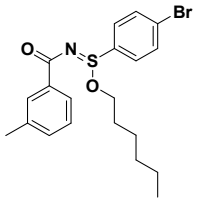
petroleum ether / ethyl acetate = 20:1 – 12:1, a yellow oil, 70% yield (64.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.21 – 8.18 (m, 2H), 7.92 – 7.89 (m, 2H), 7.75 – 7.71 (m, 2H), 7.48 – 7.44 (m, 2H), 4.25 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.90 (dt, *J* = 9.9, 6.6 Hz, 1H), 1.67 – 1.60 (m, 2H), 1.35 (s, 9H), 1.31 – 1.20 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 178.3, 155.4, 136.1, 132.9, 132.6, 129.31, 129.29, 127.6, 125.0, 68.3, 34.9, 31.21, 31.18, 29.6, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{30}BrNO_2S+H^+$: 464.1254, found: 464.1256. **IR** (neat, cm^{-1}): υ 3085, 2956, 2929, 2868, 1607, 1312, 1281, 1184, 1125, 1009, 895, 776, 735, 709.



4bk

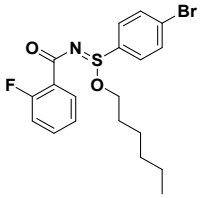
petroleum ether / ethyl acetate = 20:1 – 10:1, a colorless oil, 70% yield (61.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.20 – 8.17 (m, 2H), 7.90 – 7.87 (m, 2H), 7.76 – 7.72 (m, 2H), 7.41 – 7.38 (m, 2H), 4.25 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.92 (dt, *J* = 9.8, 6.6 Hz, 1H), 1.67 – 1.60 (m, 2H), 1.30 – 1.20 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 177.3, 138.1, 135.7, 134.1, 132.7, 130.8, 129.2,

128.2, 127.8, 68.8, 31.2, 29.6, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{21}BrClNO_2S+Na^+$: 464.0058, found: 464.0067. **IR** (neat, cm^{-1}): υ 3084, 2955, 2927, 2858, 1609, 1271, 1009, 889, 761, 735.



4bl

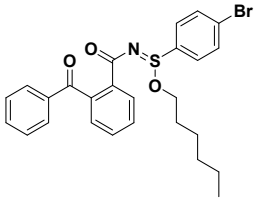
petroleum ether / ethyl acetate = 20:1 – 12:1, a yellow oil, 46% yield (38.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.08 – 8.05 (m, 2H), 7.92 – 7.88 (m, 2H), 7.76 – 7.72 (m, 2H), 7.33 – 7.32 (m, 2H), 4.26 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.93 (dt, *J* = 9.9, 6.6 Hz, 1H), 2.42 (s, 3H), 1.68 – 1.61 (m, 2H), 1.32 – 1.20 (m, 6H), 0.83 (t, *J* = 6.7 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 178.6, 137.6, 136.0, 135.5, 132.7, 132.6, 129.9, 129.3, 127.9, 127.6, 126.6, 68.6, 31.2, 29.6, 25.2, 22.4, 21.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{24}BrNO_2S+H^+$: 424.0764, found: 424.0763. **IR** (neat, cm^{-1}): υ 3083, 2954, 2927, 2858, 1579, 1276, 1200, 1066, 874, 746, 731.



4bm

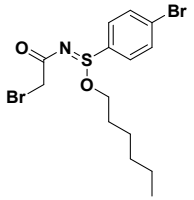
petroleum ether / ethyl acetate = 20:1 – 10:1, a yellow oil, 74% yield (62.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.08 – 8.04 (m, 1H), 7.92 – 7.87 (m, 2H), 7.73 – 7.69 (m, 2H), 7.46 – 7.41 (m, 1H), 7.19 – 7.08 (m, 2H), 4.27 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.92 (dt, *J* = 9.9, 6.6 Hz, 1H), 1.68 – 1.61 (dt, *J* = 14.4, 6.7 Hz, 2H), 1.33 – 1.19 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 176.4 (d, *J* = 4.2 Hz), 161.8 (d, *J* = 256.9 Hz), 135.5, 132.9 (d, *J* = 8.8 Hz), 132.6, 132.0 (d, *J* = 1.5 Hz), 129.4, 127.7, 124.4 (d, *J* = 10.0 Hz), 123.6 (d, *J* = 3.8 Hz), 116.6 (d, *J* = 23.1 Hz), 68.7, 31.2, 29.6, 25.1, 22.4, 13.9. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -109.72 (d, *J* = 2.1 Hz, 1F). **HRMS** (ESI-TOF): Anal Calcd.

For. $C_{19}H_{21}BrFNO_2S+H^+$: 428.0513, found: 428.0512. **IR** (neat, cm^{-1}): υ 3083, 2955, 2928, 2858, 1608, 1302, 1129, 1066, 756, 731, 696.



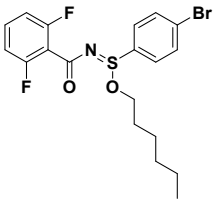
4bn

petroleum ether / ethyl acetate = 15:1 – 8:1, a viscous waxy oil, 56% yield (57.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.22 – 8.20 (m, 1H), 7.71 – 7.68 (m, 2H), 7.64 – 7.60 (m, 2H), 7.58 – 7.53 (m, 4H), 7.46 – 7.42 (m, 1H), 7.37 – 7.35 (m, 1H), 7.33 – 7.29 (m, 2H), 3.55 (dt, *J* = 9.7, 6.5 Hz, 1H), 3.28 (dt, *J* = 9.7, 6.6 Hz, 1H), 1.38 – 1.31 (m, 2H), 1.23 – 1.17 (m, 2H), 1.14 – 1.08 (m, 4H), 0.82 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 197.5, 177.3, 141.1, 137.9, 134.9, 134.6, 132.5, 132.4, 131.3, 129.7, 129.4, 129.3, 129.2, 128.2, 127.8, 127.3, 67.3, 31.1, 29.2, 25.0, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{26}H_{26}BrNO_3S+H^+$: 514.0870, found: 514.0871. **IR** (neat, cm^{-1}): υ 3084, 3062, 2954, 2925, 2856, 1669, 1280, 1066, 862, 699.



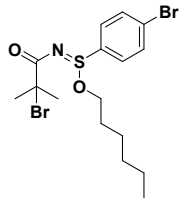
4bo

petroleum ether / ethyl acetate = 20:1 – 10:1, a colorless oil, 45% yield (38.1 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.81 – 7.77 (m, 2H), 7.73 – 7.68 (m, 2H), 4.20 (dt, *J* = 9.9, 6.6 Hz, 1H), 4.04 (dd, *J* = 18.9, 12.0 Hz, 2H), 3.87 (dt, *J* = 9.8, 6.6 Hz, 1H), 1.66 – 1.59 (m, 2H), 1.31 – 1.21 (m, 6H), 0.85 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 179.4, 134.9, 132.7, 129.1, 128.1, 69.3, 31.8, 31.2, 29.5, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{14}H_{19}Br_2NO_2S+Na^+$: 447.9375, found: 447.9370. **IR** (neat, cm^{-1}): υ 3084, 2954, 2928, 2858, 1624, 1470, 1284, 1163, 1066, 818, 733.



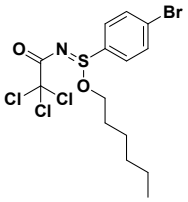
4bp

petroleum ether / ethyl acetate = 20:1 – 10:1, a yellow oil, 64% yield (56.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.85 – 7.81 (m, 2H), 7.72 – 7.68 (m, 2H), 7.34 – 7.26 (m, 1H), 6.95 – 6.89 (m, 2H), 4.27 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.88 (dt, *J* = 9.8, 6.6 Hz, 1H), 1.71 – 1.64 (m, 2H), 1.34 – 1.22 (m, 6H), 0.85 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 173.4, 161.4 (d, *J* = 7.3 Hz), 158.9 (d, *J* = 7.3 Hz), 134.8, 132.7, 130.6 (t, *J* = 10.2 Hz), 129.3, 128.0, 116.9 (t, *J* = 20.2 Hz), 111.9 – 111.5 (m), 68.6, 31.2, 29.5, 25.2, 22.4, 13.9. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -112.07 (s, 2F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{20}BrF_2NO_2S+H^+$: 444.0439, found: 444.0439. **IR** (neat, cm^{-1}): υ 3087, 2955, 2929, 2859, 1616, 1464, 1287, 1120, 1005, 853, 729.



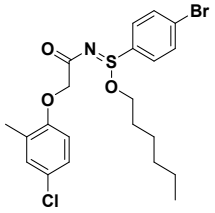
4bq

petroleum ether / ethyl acetate = 30:1 – 20:1, a yellow oil, 42% yield (37.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.83 – 7.80 (m, 2H), 7.72 – 7.69 (m, 2H), 4.20 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.81 (dt, *J* = 9.8, 6.6 Hz, 1H), 2.03 (s, 6H), 1.66 – 1.59 (m, 2H), 1.30 – 1.20 (m, 6H), 0.85 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 184.4, 135.4, 132.7, 129.3, 127.8, 68.4, 61.9, 31.7, 31.7, 31.2, 29.5, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{16}H_{23}Br_2NO_2S+H^+$: 453.9869, found: 453.9869. **IR** (neat, cm^{-1}): υ 3083, 2956, 2927, 2858, 1620, 1283, 1163, 879, 731.



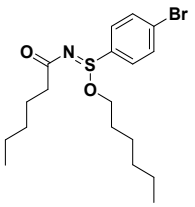
4br

petroleum ether / ethyl acetate = 20:1 – 15:1, a colorless oil, 71% yield (63.5 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.85 – 7.83 (m, 2H), 7.76 – 7.73 (m, 2H), 4.23 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.84 (dt, *J* = 9.8, 6.5 Hz, 1H), 1.68 – 1.61 (m, 2H), 1.31 – 1.21 (m, 6H), 0.85 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 173.3, 134.0, 133.0, 129.3, 128.7, 69.2, 31.1, 29.4, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{14}H_{17}BrCl_3NO_2S+Na^+$: 471.9101, found: 471.9101. **IR** (neat, cm^{-1}): υ 3087, 2955, 2929, 2859, 1656, 1241, 1067, 873, 811, 677.



4bs

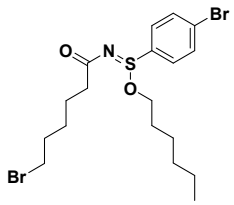
petroleum ether / ethyl acetate = 15:1 – 8:1, a colorless oil, 70% yield (67.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.70 – 7.65 (m, 4H), 7.12 – 7.11 (m, 1H), 7.05 – 7.02 (m, 1H), 6.69 – 6.67 (m, 1H), 4.76 (dd, *J* = 16.0, 17.5 Hz, 2H), 4.14 (dt, *J* = 9.8, 6.7 Hz, 1H), 3.85 (dt, *J* = 9.8, 6.6 Hz, 1H), 2.29 (s, 3H), 1.64 – 1.57 (m, 2H), 1.30 – 1.20 (m, 6H), 0.85 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 181.2, 155.2, 135.1, 132.6, 130.5, 129.0, 128.9, 128.0, 126.1, 125.3, 112.3, 69.2, 69.1, 31.2, 29.5, 25.1, 22.4, 16.2, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{25}BrClNO_3S+H^+$: 486.0500, found: 486.0503. **IR** (neat, cm^{-1}): υ 3084, 2955, 2923, 2854, 1647, 1489, 1208, 1183, 1135, 1065, 868, 802, 733.



4bt

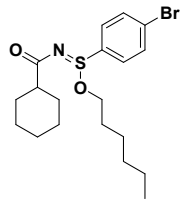
petroleum ether / ethyl acetate = 20:1 – 10:1, a yellow oil, 61% yield (48.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.80 – 7.75 (m, 2H), 7.69 – 7.65 (m, 2H), 4.16 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.86 (dt, *J* = 9.9, 6.6 Hz, 1H), 2.49 – 2.46 (m, 2H), 1.73 – 1.66 (m, 2H), 1.65 – 1.58 (m, 2H), 1.35 – 1.31 (m, 4H), 1.30 – 1.21 (m, 6H), 0.90 – 0.82 (m, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 187.5, 135.9, 132.5, 129.1, 127.4, 68.7, 38.8, 31.6, 31.2, 29.6, 25.8, 25.2, 22.45, 22.39, 14.0, 13.9. **HRMS** (ESI-TOF): Anal

Calcd. For. $C_{18}H_{28}BrNO_2S+Na^+$: 426.0896, found: 426.0901. **IR** (neat, cm^{-1}): υ 3084, 2955, 2927, 2858, 1621, 1171, 1066, 869, 731.



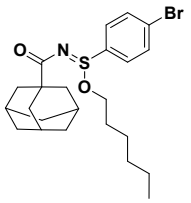
4bu

petroleum ether / ethyl acetate = 15:1 – 6:1, a yellow oil, 41% yield (39.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.79 – 7.76 (m, 2H), 7.70 – 7.67 (m, 2H), 4.17 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.87 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.41 (t, *J* = 6.8 Hz, 2H), 2.53 – 2.49 (m, 2H), 1.93 – 1.86 (m, 2H), 1.77 – 1.69 (m, 2H), 1.66 – 1.59 (m, 2H), 1.55 – 1.47 (m, 2H), 1.30 – 1.21 (m, 6H), 0.85 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 186.9, 135.8, 132.6, 129.1, 127.6, 68.8, 38.4, 33.8, 32.6, 31.2, 29.7, 27.9, 25.2, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{27}Br_2NO_2S+Na^+$: 502.0022, found: 502.0021. **IR** (neat, cm^{-1}): υ 3083, 2954, 2929, 2958, 1620, 1470, 1254, 1066, 1009, 865, 818, 731.



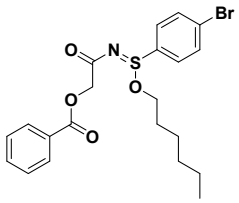
4bv

petroleum ether / ethyl acetate = 30:1 – 20:1, a colorless oil, 48% yield (39.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.78 – 7.75 (m, 2H), 7.68 – 7.65 (m, 2H), 4.15 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.84 (dt, *J* = 9.9, 6.6 Hz, 1H), 2.45 (tt, *J* = 11.4, 3.6 Hz, 1H), 1.99 – 1.96 (m, 2H), 1.79 – 1.73 (m, 2H), 1.66 – 1.57 (m, 3H), 1.55 – 1.44 (m, 2H), 1.35 – 1.19 (m, 9H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 190.0, 136.1, 132.5, 129.2, 127.4, 68.4, 47.1, 31.2, 30.1, 30.0, 29.6, 26.0, 25.9, 25.8, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{28}BrNO_2S+H^+$: 414.1097, found: 414.1019. **IR** (neat, cm^{-1}): υ 3083, 2926, 2853, 1617, 1246, 1168, 1008, 865, 730.



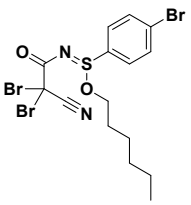
4bw

petroleum ether / ethyl acetate = 20:1 – 10:1, a colorless solid, 42% yield (39.1 mg). mp: 70 – 72 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.81 – 7.77 (m, 2H), 7.70 – 7.66 (m, 2H), 4.15 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.82 (dt, *J* = 10.0, 6.6 Hz, 1H), 2.03 – 2.02 (m, 3H), 1.99 – 1.98 (m, 6H), 1.73 – 1.72 (m, 6H), 1.63 – 1.56 (m, 2H), 1.29 – 1.20 (m, 6H), 0.85 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 191.9, 136.4, 132.5, 129.3, 127.3, 68.1, 42.9, 39.8, 36.7, 31.2, 29.7, 28.4, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{32}BrNO_2S+H^+$: 466.1410, found: 466.1411. **IR** (neat, cm^{-1}): υ 2955, 2918, 2900, 2850, 1616, 1234, 1079, 866, 822, 694.



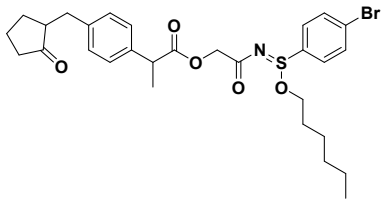
4bx

petroleum ether / ethyl acetate = 15:1 – 8:1, a yellow oil, 70% yield (65.1 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.14 – 8.12 (m, 2H), 7.74 – 7.70 (m, 2H), 7.65 – 7.60 (m, 2H), 7.59 – 7.54 (m, 1H), 7.46 – 7.42 (m, 2H), 5.01 (dd, *J* = 15.6, 31.8 Hz, 2H), 4.18 (dt, *J* = 9.9, 6.6 Hz, 1H), 3.84 (dt, *J* = 9.9, 6.6 Hz, 1H), 1.65 – 1.58 (m, 2H), 1.29 – 1.19 (m, 6H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 179.9, 166.2, 135.1, 133.0, 132.6, 129.9, 129.8, 129.1, 128.3, 127.9, 69.1, 64.8, 31.1, 29.5, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{24}BrNO_4S+H^+$: 466.0683, found: 466.0685. **IR** (neat, cm^{-1}): υ 3086, 2954, 2929, 2858, 1723, 1647, 1210, 1112, 1067, 866, 707.



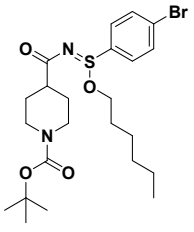
4by

petroleum ether / ethyl acetate = 20:1 – 12:1, a colorless oil, 74% yield (77.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.83 (m, 2H), 7.79 – 7.76 (m, 2H), 4.23 (dt, *J* = 9.7, 6.6 Hz, 1H), 3.82 (dt, *J* = 9.7, 6.5 Hz, 1H), 1.68 – 1.63 (m, 2H), 1.32 – 1.22 (m, 6H), 0.86 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 170.6, 133.20, 133.18, 129.3, 129.2, 115.5, 69.4, 31.2, 31.1, 29.4, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{15}H_{17}Br_3N_2O_2S+Na^+$: 552.8413, found: 552.8419. **IR** (neat, cm^{-1}): υ 3345, 2955, 2928, 2858, 1716, 1652, 1362, 1173, 1068, 1009, 820, 737.



4bz

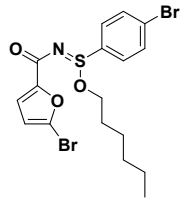
petroleum ether / ethyl acetate = 15:1 – 3:1, a viscous waxy oil, 41% yield (48.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.73 – 7.64 (m, 4H), 7.28 – 7.25 (m, 2H), 7.11 – 7.09 (m, 2H), 4.87 – 4.62 (m, 2H), 4.13 (dq, *J* = 9.8, 6.7 Hz, 1H), 3.87 – 3.73 (m, 2H), 3.11 (dd, *J* = 13.9, 4.0 Hz, 1H), 2.51 – 2.45 (m, 1H), 2.36 – 2.28 (m, 2H), 2.14 – 2.03 (m, 2H), 1.98 – 1.90 (m, 1H), 1.75 – 1.67 (m, 1H), 1.62 – 1.48 (m, 6H), 1.30 – 1.19 (m, 6H), 0.85 (t, *J* = 6.7 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 179.79, 179.78, 174.13, 174.10, 138.7, 138.2, 135.1, 135.0, 132.6, 129.1, 129.05, 129.98, 127.9, 127.7, 68.7, 68.50, 68.48, 64.68, 64.65, 50.9, 44.8, 38.1, 35.1, 31.1, 29.5, 29.4, 29.2, 25.1, 22.3, 20.4, 18.83, 18.81, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{29}H_{36}BrNO_5S+Na^+$: 614.1370, found: 614.1374. **IR** (neat, cm^{-1}): υ 2956, 2928, 2857, 1736, 1648, 1151, 1066, 822, 733.



4ca

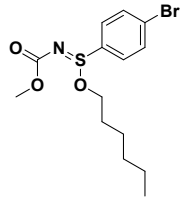
petroleum ether / ethyl acetate = 15:1 – 3:1, a yellow oil, 52% yield (53.5 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.77 – 7.74 (m, 2H), 7.69 – 7.66 (m, 2H), 4.16 – 4.06 (m, 3H), 3.82 (dt, *J* = 9.9, 6.6 Hz, 1H), 2.82 (t, *J* = 12.3 Hz, 2H), 2.56 (tt, *J* = 11.2, 3.8 Hz, 1H), 1.96 – 1.92 (m, 2H), 1.74 – 1.65 (m, 2H),

1.63 – 1.56 (m, 2H), 1.44 (s, 9H), 1.28 – 1.19 (m, 6H), 0.83 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 188.1, 154.8, 135.7, 132.6, 129.1, 127.6, 79.3, 68.5, 44.9, 31.2, 29.6, 29.03, 28.98, 28.4, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{35}BrN_2O_4S+H^+$: 515.1574, found: 515.1574. **IR** (neat, cm^{-1}): υ 2954, 2926, 2856, 1687, 1365, 1160, 1034, 867, 731.



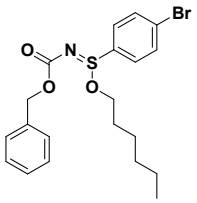
4cb

petroleum ether / ethyl acetate = 15:1 – 8:1, a viscous waxy oil, 59% yield (56.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.86 – 7.83 (m, 2H), 7.73 – 7.70 (m, 2H), 7.16 (d, *J* = 3.4 Hz, 1H), 6.42 (d, *J* = 3.5 Hz, 1H), 4.23 (dt, *J* = 9.9, 6.7 Hz, 1H), 3.91 (dt, *J* = 9.8, 6.6 Hz, 1H), 1.67 – 1.60 (m, 2H), 1.30 – 1.18 (m, 6H), 0.82 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 168.4, 151.9, 135.3, 132.7, 129.2, 127.9, 126.1, 118.4, 113.7, 69.1, 31.1, 29.6, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{17}H_{19}Br_2NO_3S+Na^+$: 499.9325, found: 499.9326. **IR** (neat, cm^{-1}): υ 3086, 2954, 2926, 2857, 1619, 1462, 1294, 1147, 1123, 1009, 876, 761, 730.



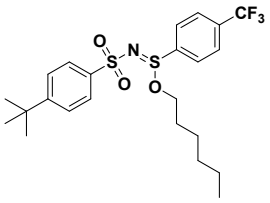
4cc

petroleum ether / ethyl acetate = 15:1 – 7:1, a colorless oil, 59% yield (42.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.79 – 7.75 (m, 2H), 7.69 – 7.65 (m, 2H), 4.12 (dt, *J* = 9.8, 6.7 Hz, 1H), 3.77 (s, 3H), 3.64 (dt, *J* = 9.9, 6.6 Hz, 1H), 1.62 – 1.55 (m, 2H), 1.29 – 1.18 (m, 6H), 0.84 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 164.7, 135.2, 132.6, 129.1, 127.8, 66.5, 53.4, 31.1, 29.4, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{14}H_{20}BrNO_3S+H^+$: 362.0421, found: 362.0418. **IR** (neat, cm^{-1}): υ 3085, 2952, 2929, 2858, 1658, 1241, 1066, 895, 736.



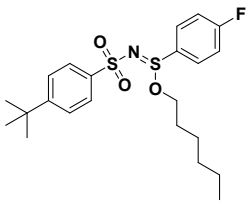
4cd

petroleum ether / ethyl acetate = 15:1 – 7:1, a colorless oil, 78% yield (68.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.80 – 7.76 (m, 2H), 7.69 – 7.66 (m, 2H), 7.44 – 7.41 (m, 2H), 7.37 – 7.29 (m, 3H), 5.21 (dd, *J* = 12.8 Hz, 13.3 Hz, 2H), 4.13 (dt, *J* = 9.8, 6.6 Hz, 1H), 3.66 (dt, *J* = 9.8, 6.6 Hz, 1H), 1.62 – 1.55 (m, 2H), 1.28 – 1.18 (m, 6H), 0.85 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 164.1, 136.6, 135.2, 132.6, 129.2, 128.4, 128.3, 128.0, 127.8, 68.1, 66.7, 31.2, 29.4, 25.2, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{24}BrNO_3S+H^+$: 440.0713, found: 440.0714. **IR** (neat, cm^{-1}): υ 3088, 3032, 2954, 2929, 2858, 1655, 1229, 890, 733, 695.



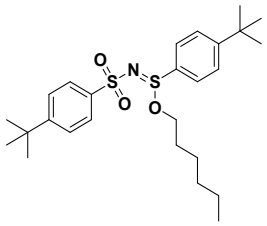
5a

petroleum ether / ethyl acetate = 15:1 – 7:1, a colorless solid, 87% yield (85.1 mg). mp: 52 – 54 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.96 – 7.94 (m, 2H), 7.90 – 7.86 (m, 2H), 7.81 – 7.79 (m, 2H), 7.50 – 7.46 (m, 2H), 3.96 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.48 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.48 – 1.40 (m, 2H), 1.31 (s, 9H), 1.25 – 1.12 (m, 6H), 0.83 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 140.1, 139.8, 134.8 (q, *J* = 33.5 Hz), 128.1, 126.5 (q, *J* = 3.7 Hz), 126.2, 125.8, 123.0 (q, *J* = 273.3 Hz), 66.5, 35.0, 31.1, 31.0, 28.9, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -63.12 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{30}F_3NO_3S_2+H^+$: 490.1692, found: 490.1687. **IR** (neat, cm^{-1}): υ 3101, 3060, 2966, 2934, 2871, 1321, 1298, 1151, 1130, 1108, 1028, 1006, 904, 840, 634.



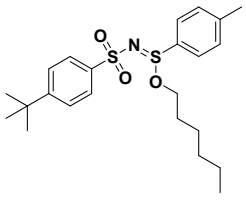
5b

petroleum ether / ethyl acetate = 15:1 – 7:1, a yellow oil, 75% yield (65.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.86 (m, 2H), 7.85 – 7.80 (m, 2H), 7.48 – 7.45 (m, 2H), 7.26 – 7.20 (m, 2H), 3.89 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.42 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.44 – 1.36 (m, 2H), 1.30 (s, 9H), 1.24 – 1.11 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 165.4 (d, *J* = 256.0 Hz), 155.5, 140.3, 131.3 (d, *J* = 3.2 Hz), 130.0 (d, *J* = 9.4 Hz), 126.1, 125.7, 116.9 (d, *J* = 22.8 Hz), 65.6, 35.0, 31.1, 31.0, 28.8, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -104.55 (s, 1F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{30}FNO_3S_2$+H^+: 440.1724, found: 440.1721. **IR** (neat, cm^{-1}): υ 3100, 2958, 2932, 2870, 1491, 1151, 1021, 1002, 838, 793, 627.



5c

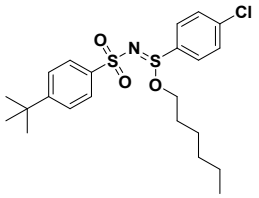
petroleum ether / ethyl acetate = 15:1 – 8:1, a viscous waxy oil, 83% yield (79.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.90 – 7.87 (m, 2H), 7.74 – 7.71 (m, 2H), 7.56 – 7.52 (m, 2H), 7.48 – 7.44 (m, 2H), 3.92 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.45 (dt, *J* = 9.7, 6.7 Hz, 1H), 1.44 – 1.37 (m, 2H), 1.32 (s, 18H), 1.31 (s, 18H), 1.24 – 1.11 (m, 6H), 0.83 (t, *J* = 7.0 Hz, 3H).**^{13}C NMR** (100 MHz, Chloroform-*d*) δ 157.0, 155.3, 140.6, 132.4, 127.2, 126.5, 126.2, 125.6, 65.4, 35.1, 34.9, 31.14, 31.06, 31.0, 28.9, 25.1, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{30}BrNO_5S_2$+H^+: 478.2445, found: 478.2437. **IR** (neat, cm^{-1}): υ 3067, 2958, 2869, 1314, 1021, 1002, 837, 793, 638.



5d

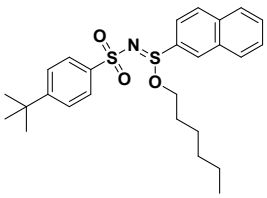
petroleum ether / ethyl acetate = 15:1 – 6:1, a yellow solid, 83% yield (72.2 mg). mp: 61 – 63 °C. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.86 (m, 2H), 7.69 – 7.66 (m, 2H), 7.47 – 7.43 (m, 2H), 7.33

– 7.31 (m, 2H), 3.86 (dt, *J* = 9.5, 6.6 Hz, 1H), 3.38 (dt, *J* = 9.6, 6.8 Hz, 1H), 2.40 (s, 3H), 1.41 – 1.34 (m, 2H), 1.30 (s, 9H), 1.23 – 1.09 (m, 6H), 0.81 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.3, 144.0, 140.6, 132.3, 130.1, 127.3, 126.1, 125.6, 65.0, 34.9, 31.1, 31.0, 28.8, 25.1, 22.3, 21.4, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{33}NO_3S_2$+H^+: 436.1975, found: 436.1967. **IR** (neat, cm^{-1}): υ 2949, 2871, 1314, 1308, 1153, 1003, 794, 624.



5e

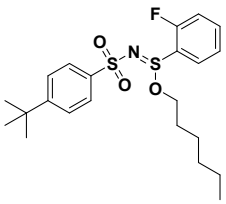
petroleum ether / ethyl acetate = 15:1 – 8:1, a viscous waxy oil, 79% yield (71.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.85 (m, 2H), 7.76 – 7.73 (m, 2H), 7.53 – 7.46 (m, 4H), 3.89 (dt, *J* = 9.5, 6.6 Hz, 1H), 3.42 (dt, *J* = 9.5, 6.7 Hz, 1H), 1.43 – 1.37 (m, 2H), 1.30 (s, 9H), 1.24 – 1.12 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.6, 140.2, 139.8, 134.1, 129.8, 128.8, 126.1, 125.7, 65.7, 35.0, 31.1, 31.0, 28.8, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{30}ClNO_3S_2$+Na^+: 478.1248, found: 478.1247. **IR** (neat, cm^{-1}): υ 3088, 2957, 2929, 2869, 1437, 1313, 1153, 1023, 1001, 793, 635.



5f

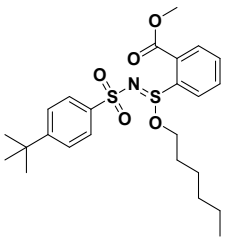
petroleum ether / ethyl acetate = 15:1 – 6:1, a colorless oil, 79% yield (74.4 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.40 (s, 1H), 7.98 – 7.93 (m, 4H), 7.90 – 7.88 (m, 1H), 7.75 – 7.72 (m, 1H), 7.66 – 7.58 (m, 2H), 7.49 – 7.47 (m, 2H), 3.91 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.39 (dt, *J* = 9.5, 6.7 Hz, 1H), 1.42 – 1.36 (m, 2H), 1.30 (s, 9H), 1.21 – 1.08 (m, 6H), 0.80 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.4, 140.5, 135.0, 132.4, 132.3, 129.7, 129.11, 129.06, 128.8, 127.9, 127.7, 126.2, 125.7, 122.1, 65.2, 34.9, 31.1, 31.0, 28.8, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{26}H_{33}NO_3S_2$+H^+:

472.1975, found: 472.1970. **IR** (neat, cm^{-1}): υ 3057, 2956, 2931, 2867, 1306, 1152, 1018, 1003, 794, 630.



5g

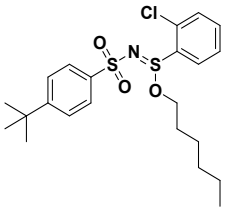
petroleum ether / ethyl acetate = 15:1 – 7:1, a colorless solid, 86% yield (75.5 mg). mp: 55 – 57 °C. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.14 – 8.10 (m, 1H), 7.88 – 7.85 (m, 2H), 7.64 – 7.58 (m, 1H), 7.48 – 7.44 (m, 2H), 7.35 – 7.31 (m, 1H), 7.23 – 7.18 (m, 1H), 3.98 (dt, *J* = 9.5, 6.5 Hz, 1H), 3.53 (dt, *J* = 9.4, 6.7 Hz, 1H), 1.46 – 1.39 (m, 2H), 1.30 (s, 9H), 1.24 – 1.12 (m, 6H), 0.81 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 160.0 (d, *J* = 255.2 Hz), 155.6, 140.4, 135.7 (d, *J* = 8.2 Hz), 128.4, 126.2, 125.8, 125.1 (d, *J* = 3.6 Hz), 123.6 (d, *J* = 13.1 Hz), 116.7 (d, *J* = 19.8 Hz), 67.1, 35.0, 31.15, 31.12, 28.9, 25.0, 22.4, 13.9. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -111.8 (s, 1F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{30}FNO_3S_2+H^+$: 440.1724, found: 440.1728. **IR** (neat, cm^{-1}): υ 3091, 2957, 2929, 2871, 1471, 1305, 1156, 1026, 1011, 796, 764, 635.



5h

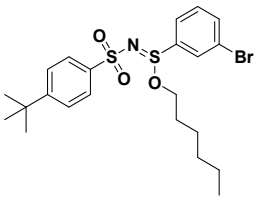
petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 74% yield (70.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.49 – 8.46 (m, 1H), 8.07 – 8.05 (m, 1H), 7.89 – 7.85 (m, 2H), 7.74 – 7.70 (m, 1H), 7.67 – 7.63 (m, 1H), 7.45 – 7.42 (m, 2H), 4.00 (dt, *J* = 9.4, 6.7 Hz, 1H), 3.92 (s, 3H), 3.68 (dt, *J* = 9.4, 6.7 Hz, 1H), 1.45 – 1.39 (m, 2H), 1.28 (s, 9H), 1.23 – 1.10 (m, 6H), 0.80 (t, *J* = 7.0 Hz, 3H).**^{13}C NMR** (100 MHz, Chloroform-*d*) δ 165.0, 155.2, 140.7, 137.6, 133.2, 132.7, 131.4, 128.7, 127.3, 126.1, 125.5, 69.1, 52.9, 34.9, 31.1, 31.0, 29.0, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For.

$C_{24}H_{33}NO_5S_2$+H^+: 480.1873, found: 480.1868. **IR** (neat, cm^{-1}): υ 2956, 2869, 1721, 1281, 1152, 1108, 1019, 1004, 632.



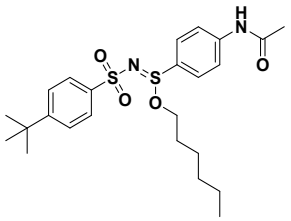
5i

petroleum ether / ethyl acetate = 15:1 – 5:1, a colorless solid, 85% yield (77.4 mg). mp: 58 – 60 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.26 – 8.24 (m, 1H), 7.88 – 7.85 (m, 2H), 7.56 – 7.51 (m, 1H), 7.48 – 7.43 (m, 4H), 3.97 (dt, *J* = 9.5, 6.5 Hz, 1H), 3.54 (dt, *J* = 9.5, 6.7 Hz, 1H), 1.45 – 1.39 (m, 2H), 1.30 (s, 9H), 1.24 – 1.11 (m, 6H), 0.81 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.4, 140.4, 134.5, 134.1, 133.9, 130.7, 128.7, 127.6, 126.1, 125.7, 67.2, 35.0, 31.1, 31.0, 28.8, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{30}ClNO_3S_2$+H^+: 458.1399, found: 458.1398. **IR** (neat, cm^{-1}): υ 3074, 2958, 2925, 2860, 1450, 1310, 1020, 1008, 773, 633.



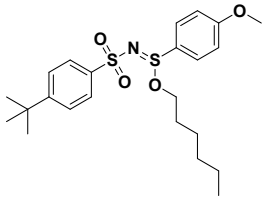
5j

petroleum ether / ethyl acetate = 20:1 – 10:1, a viscous waxy oil, 74% yield (73.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.94 – 7.93 (m, 1H), 7.89 – 7.85 (m, 2H), 7.71 – 7.68 (m, 2H), 7.49 – 7.45 (m, 2H), 7.43 – 7.39 (m, 1H), 3.90 (dt, *J* = 9.5, 6.6 Hz, 1H), 3.43 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.45 – 1.36 (m, 2H), 1.30 (s, 9H), 1.24 – 1.10 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.6, 140.2, 137.6, 136.1, 130.9, 130.0, 126.1, 126.0, 125.7, 123.5, 66.0, 34.9, 31.1, 31.0, 28.8, 25.0, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{30}BrNO_3S_2$+H^+: 502.0903, found: 502.0902. **IR** (neat, cm^{-1}): υ 3068, 2957, 2931, 2869, 1460, 1153, 1007, 991, 891, 788, 633.



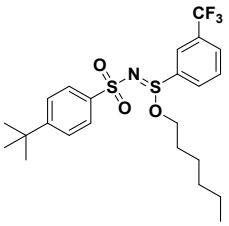
5k

petroleum ether / ethyl acetate = 15:1 – 2:1, a yellow oil, 84% yield (80.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 9.12 (s, 1H), 7.99 – 7.95 (m, 2H), 7.89 – 7.86 (m, 2H), 7.72 – 7.68 (m, 2H), 7.51 – 7.48 (m, 2H), 3.72 (dt, *J* = 9.5, 6.6 Hz, 1H), 3.29 (dt, *J* = 9.4, 6.7 Hz, 1H), 2.18 (s, 3H), 1.32 (s, 9H), 1.28 – 1.25 (m, 2H), 1.21 – 1.16 (m, 2H), 1.10 – 1.04 (m, 4H), 0.81 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 169.8, 155.9, 143.8, 140.1, 128.3, 128.1, 126.1, 125.9, 120.0, 65.0, 35.0, 31.11, 31.05, 28.7, 25.1, 24.5, 22.3, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{34}N_2O_4S_2$+H^+: 479.2033, found: 479.2042. **IR** (neat, cm^{-1}): υ 3327, 3187, 2958, 2929, 2869, 1703, 1590, 1527, 1312, 1149, 1019, 1000, 794, 630.



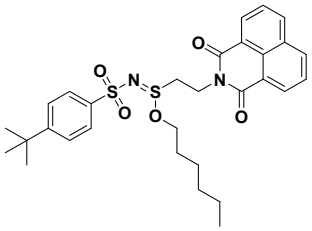
5l

petroleum ether / ethyl acetate = 15:1 – 7:1, a viscous waxy oil, 70% yield (63.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.86 (m, 2H), 7.75 – 7.72 (m, 2H), 7.47 – 7.44 (m, 2H), 7.03 – 6.99 (m, 2H), 3.87 – 3.81 (m, 4H), 3.38 (dt, *J* = 9.6, 6.8 Hz, 1H), 1.41 – 1.33 (m, 2H), 1.30 (s, 9H), 1.24 – 1.09 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.4, 155.3, 140.6, 129.3, 126.4, 126.1, 125.6, 114.9, 64.7, 55.6, 34.9, 31.12, 31.05, 28.8, 25.1, 22.3, 13.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{33}NO_4S_2$+H^+: 452.1924, found: 452.1926. **IR** (neat, cm^{-1}): υ 3242, 2956, 2931, 2860, 1594, 1496, 1255, 1165, 1024, 831.



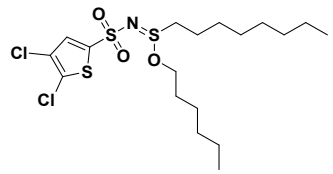
5m

petroleum ether / ethyl acetate = 15:1 – 7:1, a yellow oil, 83% yield (81.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.02 – 7.99 (m, 2H), 7.90 – 7.84 (m, 3H), 7.73 – 7.69 (m, 1H), 7.50 – 7.47 (m, 2H), 3.96 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.49 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.49 – 1.42 (m, 2H), 1.31 (s, 9H), 1.24 – 1.13 (m, 6H), 0.83 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 140.1, 137.5, 132.2 (q, *J* = 33.6 Hz), 130.8, 130.3, 129.7 (q, *J* = 3.6 Hz), 126.1, 125.8, 124.4 (q, *J* = 3.8 Hz), 123.0 (q, *J* = 271.5 Hz), 66.6, 35.0, 31.1, 31.0, 28.9, 25.1, 22.3, 13.8. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.82 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{30}F_3NO_3S_2$+H^+: 490.1692, found: 490.1684. **IR** (neat, cm^{-1}): υ 3074, 2960, 2871, 1323, 1153, 1132, 1021, 1010, 994, 792, 693, 638.



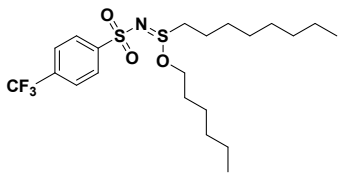
5n

petroleum ether / ethyl acetate = 15:1 – 3:1, a white solid, 38% yield (43.2 mg). mp: 111 – 113 °C. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.60 – 8.58 (m, 2H), 8.26 – 8.23 (m, 2H), 7.85 – 7.82 (m, 2H), 7.79 – 7.75 (m, 2H), 7.44 – 7.41 (m, 2H), 4.62 – 4.48 (m, 2H), 4.10 (dt, *J* = 9.5, 6.7 Hz, 1H), 4.00 (dt, *J* = 9.5, 6.8 Hz, 1H), 3.67 (dt, *J* = 13.9, 5.8 Hz, 1H), 3.45 – 3.38 (m, 1H), 1.56 – 1.49 (m, 2H), 1.29 (s, 9H), 1.24 – 1.17 (m, 6H), 0.84 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.9, 155.3, 140.5, 134.6, 131.7, 131.6, 128.1, 127.1, 126.2, 125.6, 122.0, 70.8, 52.1, 35.0, 34.2, 31.2, 31.1, 29.4, 25.1, 22.4, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{30}H_{36}N_2O_5S_2$+H^+: 569.2139, found: 569,2138. **IR** (neat, cm^{-1}): υ 2961, 2902, 2870, 1700, 1684, 1148, 993, 778, 628.



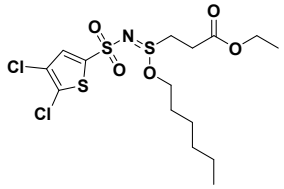
5o

petroleum ether / ethyl acetate = 15:1 – 8:1, a viscous waxy oil, 59% yield (56.1 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.35 (s, 1H), 4.11 – 4.02 (m, 2H), 3.19 – 3.06 (m, 2H), 1.69 – 1.61 (m, 4H), 1.38 – 1.22 (m, 16H), 0.90 – 0.85 (m, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 141.6, 129.7, 129.0, 124.1, 71.1, 52.5, 31.6, 31.2, 29.4, 29.0, 28.8, 28.2, 25.1, 22.5, 22.4, 14.0, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{18}H_{31}Cl_2NO_3S_3$+Na^+: 498.0736, found: 498.0735. **IR** (neat, cm^{-1}): υ 3247, 3092, 2956, 2926, 2857, 1322, 1164, 1139, 1022, 923.



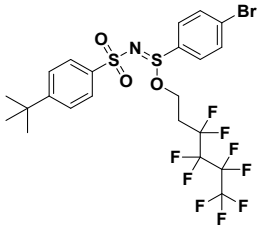
5p

petroleum ether / ethyl acetate = 15:1 – 6:1, a colorless oil, 42% yield (39.4 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.04 – 8.02 (m, 2H), 7.73 – 7.71 (m, 2H), 4.06 – 3.96 (m, 2H), 3.16 – 3.03 (m, 2H), 1.64 – 1.53 (m, 4H), 1.31 – 1.19 (m, 16H), 0.88 – 0.84 (m, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 147.0 (q, *J* = 1.2 Hz), 133.5 (q, *J* = 33.1 Hz), 126.8, 125.8 (q, *J* = 3.7 Hz), 123.3 (q, *J* = 272.7 Hz), 70.5, 52.5, 31.5, 31.2, 29.4, 28.9, 28.8, 28.1, 25.1, 22.53, 22.48, 22.4, 14.0, 13.9. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -63.03 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{34}F_3NO_3S_2$+H^+: 470.2005, found: 470.2005. **IR** (neat, cm^{-1}): υ 2957, 2928, 2858, 1321, 1152, 1132, 1062, 1005, 709.



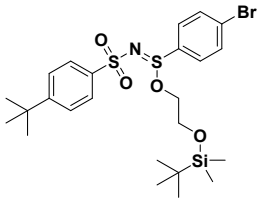
5q

petroleum ether / ethyl acetate = 15:1 – 7:1, a viscous waxy oil, 55% yield (50.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.33 (s, 1H), 4.17 – 4.08 (m, 4H), 3.47 – 3.40 (m, 1H), 3.30 (dt, *J* = 13.3, 6.0 Hz, 1H), 2.85 – 2.71 (m, 2H), 1.70 – 1.63 (m, 2H), 1.34 – 1.23 (m, 9H), 0.90 – 0.86 (m, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 170.1, 141.3, 129.8, 129.1, 124.1, 71.9, 61.7, 47.5, 31.2, 29.5, 27.3, 25.1, 22.4, 14.0, 13.9. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{15}H_{23}Cl_2NO_5S_3$+Na^+: 487.9979, found: 487.9983. **IR** (neat, cm^{-1}): υ 3098, 2957, 1931, 2871, 1727, 1316, 1137, 1019, 907, 617.



6a

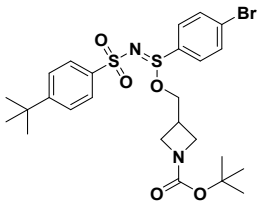
petroleum ether / ethyl acetate = 15:1 – 7:1, a colorless solid, 78% yield (103.1 mg). mp: 109 – 111 °C. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.86 (m, 2H), 7.72 – 7.67 (m, 4H), 7.51 – 7.47 (m, 2H), 4.21 (dt, *J* = 10.7, 6.3 Hz, 1H), 3.72 (dt, *J* = 10.7, 6.5 Hz, 1H), 2.32 – 2.18 (m, 2H), 1.30 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 156.1, 139.7, 133.9, 133.0, 128.9, 128.8, 126.2, 125.9, 56.8, 56.72, 56.67, 35.0, 31.0, 30.9, 30.8, 30.6. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -81.04 – -81.11 (m, 3F), -113.37 – -113.60 (m, 2F), -124.38 – -124.46 (m, 2F), -126.00 – -126.10 (m, 2F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{21}BrF_9NO_3S_2$+Na^+: 685.9875, found: 685.9868. **IR** (neat, cm^{-1}): υ 2970, 2902, 1231, 1218, 1133, 976, 825, 799, 706.



6b

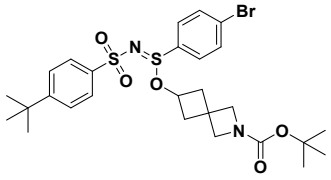
petroleum ether / ethyl acetate = 15:1 – 7:1, a colorless oil, 70% yield (80.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.85 (m, 2H), 7.71 – 7.63 (m, 4H), 7.48 – 7.45 (m, 2H), 4.08 – 4.02 (m, 1H), 3.68 – 3.63 (m, 3H), 1.31 (s, 9H), 0.84 (s, 9H), 0.01 (d, *J* = 7.4 Hz, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.6, 140.1, 134.9, 132.7, 129.0, 128.3, 126.2, 125.7, 67.9, 61.3, 35.0, 31.0, 25.7, 18.1, -5.4, -5.5.

HRMS (ESI-TOF): Anal Calcd. For. $C_{24}H_{36}BrNO_4S_2Si+Na^+$: 596.0931, found: 596.0920. **IR** (neat, cm^{-1}): υ 2964, 2929, 2872, 1639, 1279, 1152, 1001, 839, 780, 732, 633.



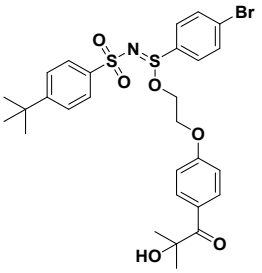
6c

petroleum ether / ethyl acetate = 15:1 – 3:1, a white solid, 63% yield (73.6 mg). mp: 121 – 123 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.83 (m, 2H), 7.70 – 7.65 (m, 4H), 7.49 – 7.46 (m, 2H), 4.07 – 4.03 (m, 1H), 3.86 – 3.82 (m, 2H), 3.55 – 3.51 (m, 1H), 3.47 – 3.44 (m, 2H), 2.58 – 2.52 (m, 1H), 1.38 (s, 9H), 1.30 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 156.0, 155.9, 139.8, 134.2, 133.0, 128.8, 128.7, 126.1, 125.8, 79.6, 65.9, 35.0, 31.0, 29.6, 28.2, 27.8. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{25}H_{33}BrN_2O_5S_2+H^+$: 587.1067, found: 587.1070. **IR** (neat, cm^{-1}): υ 3085, 2962, 2925, 2869, 1598, 1253, 1152, 999, 883, 766.



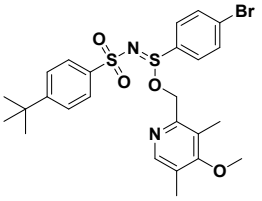
6d

petroleum ether / ethyl acetate = 15:1 – 2:1, a viscous waxy oil, 80% yield (97.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.83 – 7.80 (m, 2H), 7.67 – 7.62 (m, 4H), 7.47 – 7.44 (m, 2H), 4.55 – 4.48 (m, 1H), 3.74 – 3.69 (m, 4H), 2.34 – 2.28 (m, 1H), 2.14 – 2.01 (m, 3H), 1.36 (s, 9H), 1.29 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.8, 155.7, 140.0, 135.0, 132.8, 128.7, 128.4, 126.1, 125.7, 79.4, 66.3, 42.0, 41.8, 35.0, 31.0, 30.7, 28.2. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{27}H_{35}BrN_2O_5S_2+Na^+$: 633.1063, found: 633.1061. **IR** (neat, cm^{-1}): υ 3350, 2972, 2932, 2877, 1681, 1418, 1199, 1086, 1046, 1004, 880, 637.



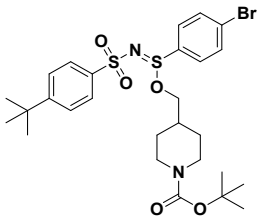
6e

petroleum ether / ethyl acetate = 15:1 – 2:1, a viscous waxy oil, 70% yield (87.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.06 – 8.02 (m, 2H), 7.90 – 7.86 (m, 2H), 7.72 – 7.66 (m, 4H), 7.50 – 7.47 (m, 2H), 6.87 – 6.84 (m, 2H), 4.41 – 4.36 (m, 1H), 4.18 – 4.07 (m, 3H), 4.00 – 3,95 (m, 1H), 1.62 (s, 6H), 1.31 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 202.5, 161.7, 156.0, 139.7, 134.4, 132.9, 132.4, 129.0, 128.7, 126.6, 126.2, 125.9, 114.1, 75.9, 65.9, 63.7, 35.1, 31.1, 28.6. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{28}H_{32}BrNO_6S_2$+Na^+: 644.0747, found: 644.0747. **IR** (neat, cm^{-1}): υ 3083, 2961, 2924, 2869, 1598, 1253, 999, 791, 632.



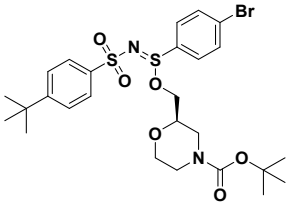
6f

petroleum ether / ethyl acetate = 15:1 – 3:1, a viscous waxy oil, 70% yield (79.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.14 (s, 1H), 7.91 – 7.88 (m, 2H), 7.77 – 7.73 (m, 2H), 7.67 – 7.63 (m, 2H), 7.49 – 7.46 (m, 2H), 5.18 (d, *J* = 11.0 Hz, 1H), 4.66 (d, *J* = 11.0 Hz, 1H), 3.72 (s, 3H), 2.22 (s, 3H), 2.12 (s, 3H), 1.31 (s, 9H).**^{13}C NMR** (100 MHz, Chloroform-*d*) δ 164.2, 155.6, 151.5, 149.4, 140.1, 134.7, 132.8, 129.2, 128.4, 127.0, 126.6, 126.2, 125.8, 66.8, 59.9, 35.0, 31.1, 13.3, 10.6. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{25}H_{29}BrN_2O_4S_2$+H^+: 567.0805, found: 567.0803. **IR** (neat, cm^{-1}): υ 3063, 2963, 2904, 2869, 1570, 1471, 1265, 1085, 1065, 1002, 726, 630.



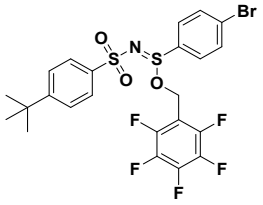
6g

petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 84% yield (102.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.84 (m, 2H), 7.70 – 7.64 (m, 4H), 7.49 – 7.45 (m, 2H), 4.01 (s, 2H), δ 3.75 (dd, *J* = 9.5, 6.2 Hz, 1H), 3.20 (dd, *J* = 9.5, 6.5 Hz, 1H), 2.56 (t, *J* = 11.5 Hz, 2H), 1.63 –1.41 (m, 15H), 1.30 (s, 9H), 1.00 – 0.88 (m, 2H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 154.5, 140.2, 134.4, 132.9, 128.8, 128.5, 126.2, 125.8, 79.5, 68.7, 35.8, 35.0, 31.1, 28.3. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{27}H_{37}BrN_2O_5S_2$+H^+: 615.1380, found:615.1387. **IR** (neat, cm^{-1}): υ 3086, 2966, 2868, 1684, 1151, 1001, 910, 728, 636.



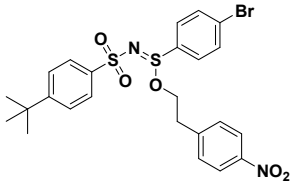
6h

petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 80% yield (98.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.83 (m, 2H), 7.70 – 7.63 (m, 4H), 7.48 – 7.44 (m, 2H), 3.98 – 3.91 (m, 1H), 3.77 – 3.67 (m, 3H), 3.52 – 3.34 (m, 3H), 2.87 – 2.74 (m, 1H), 2.53 – 2.38 (m, 1H), 1.42 (s, 9H), 1.28 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7 (d, *J* = 3.6 Hz), 154.3 (d, *J* = 1.9 Hz), 139.8 (d, *J* = 5.0 Hz), 134.3 (d, *J* = 26.5 Hz), 132.8 (d, *J* = 5.1 Hz), 128.9 (d, *J* = 3.9 Hz), 128.5 (d, *J* = 5.7 Hz), 126.1 (d, *J* = 1.4 Hz), 125.8 (d, *J* = 2.2 Hz), 80.3, 72.9, 72.8, 66.1, 34.9, 31.0, 28.2. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{26}H_{35}BrN_2O_6S_2$+H^+: 617.1173, found: 617.1171. **IR** (neat, cm^{-1}): υ 3086, 2967, 2907, 2867, 1736, 1694, 1239, 1154, 1001, 950, 791, 731, 637.



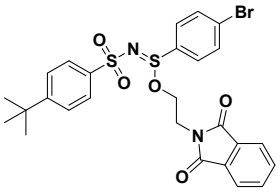
6i

petroleum ether / ethyl acetate = 15:1 – 7:1, a yellow solid, 64% yield (76.2 mg). mp: 139 – 141 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.94 – 7.93 (m, 1H), 7.89 – 7.85 (m, 2H), 7.71 – 7.68 (m, 2H), 7.49 – 7.45 (m, 2H), 7.43 – 7.39 (m, 1H), 3.90 (dt, *J* = 9.5, 6.6 Hz, 1H), 3.43 (dt, *J* = 9.6, 6.7 Hz, 1H), 1.45 – 1.36 (m, 2H), 1.30 (s, 9H), 1.24 – 1.10 (m, 6H), 0.82 (t, *J* = 7.1 Hz, 3H). **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -140.98 – -141.08 (m, 2F), -150.49 – -150.61 (m, 1F), -160.71 – -160.86 (m, 2F). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 156.0, 139.6, 133.8, 133.0, 129.1, 129.0, 126.2, 125.9, 53.5, 35.0, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{19}BrF_5NO_3S_2$+Na^+: 619.9782, found: 619.9783. **IR** (neat, cm^{-1}): υ 2966, 2904, 1720, 1313, 1150, 1000, 920, 732, 635.



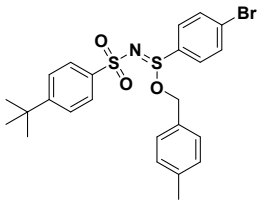
6j

petroleum ether / ethyl acetate = 15:1 – 4:1, a yellow solid, 75% yield (84.6 mg). mp: 123 – 125 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.10 – 8.07 (m, 2H), 7.87 – 7.84 (m, 2H), 7.62 – 7.58 (m, 2H), 7.55 – 7.52 (m, 2H), 7.49 – 7.46 (m, 2H), 7.24 – 7.20 (m, 2H), 4.24 (dt, *J* = 10.1, 6.4 Hz, 1H), 3.72 (dt, *J* = 10.1, 6.9 Hz, 1H), 2.90 – 2.82 m, 2H), 1.29 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.9, 146.9, 144.3, 139.8, 134.2, 132.8, 129.7, 128.7, 128.6, 126.1, 125.8, 123.6, 64.6, 35.1, 35.0, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{25}BrN_2O_5S_2$+H^+: 567.0441, found: 567.0450. **IR** (neat, cm^{-1}): υ 2967, 2931, 2902, 1515, 1346, 1282, 1144, 998, 747, 641.



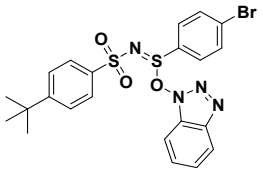
6k

petroleum ether / ethyl acetate = 15:1 – 3:1, a white solid, 58% yield (68.2 mg). mp: 110 – 112 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.86 – 7.80 (m, 4H), 7.76 – 7.71 (m, 2H), 7.65 – 7.61 (m, 2H), 7.53 – 7.46 (m, 4H), 4.09 – 4.05 (m, 1H), 3.89 – 3.80 (m, 2H), 3.71 – 3.66 (m, 1H), 1.31 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 167.6, 155.8, 139.7, 134.4, 134.2, 132.8, 131.7, 128.8, 128.6, 126.2, 125.9, 123.4, 62.1, 36.9, 35.0, 31.1. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{26}H_{25}BrN2O_5S_2$+Na^+: 611.0281, found:611.0281. **IR** (neat, cm^{-1}): υ 2967, 2904, 1720, 1409, 1312, 1148, 1000, 731, 635.



6l

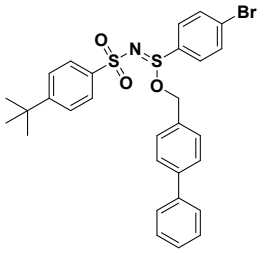
petroleum ether / ethyl acetate = 20:1 – 10:1, a yellow solid, 48% yield (49.8 mg). mp: 150 – 152 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.93 – 7.90 (m, 2H), 7.71 – 7.65 (m, 4H), 7.50 – 7.47 (m, 2H), 7.09 – 7.07(m, 2H), 6.96 – 6.94 (m, 2H), 4.84 (d, *J* = 10.8 Hz, 1H), 4.42 (d, *J* = 10.8 Hz, 1H), 2.32 (s, 3H), 1.33 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 140.2, 139.1, 134.7, 132.8, 130.6, 129.3, 129.1, 129.0, 128.4, 126.3, 125.9, 67.3, 35.0, 31.1, 21.2. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{26}BrNO_3S_2$+Na^+: 542.0430, found:542.0431. **IR** (neat, cm^{-1}): υ 2962, 2922, 2855, 1464, 1291, 1152, 1024, 1003, 795, 727, 632.



6m

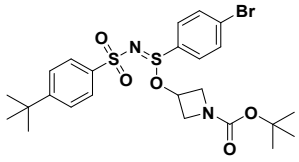
petroleum ether / ethyl acetate = 20:1 – 15:1, a viscous waxy oil, 40% yield (42.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.10 – 8.07(m, 1H), 8.03 – 7.99 (m, 3H), 7.85 – 7.82 (m, 2H), 7.77 – 7.74 (m, 2H), 7.68 – 7.64 (m, 1H), 7.56 – 7.53 (m, 2H), 7.48 – 7.44 (m, 1H), 1.33 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 157.5, 142.7, 138.4, 133.2, 132.7, 131.1, 130.6, 129.7, 129.0, 126.9, 126.2, 125.6, 120.0,

110.3, 35.2, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{21}BrN_4O_3S_2$+Na^+: 551.0131, found: 555.0137. **IR** (neat, cm^{-1}): υ 3085, 2960, 2930, 2870, 1685, 1163, 1149, 1068, 1004, 746.



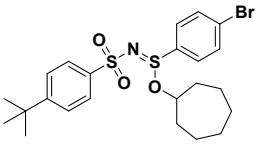
6n

petroleum ether / ethyl acetate = 15:1 – 6:1, a colorless solid, 66% yield (76.7 mg). mp: 114 – 116 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.95 – 7.92 (m, 2H), 7.73 – 7.67 (m, 4H), 7.55 – 7.48 (m, 6H), 7.46 – 7.41 (m, 2H), 7.37 – 7.33 (m, 1H), 7.17 – 7.13 m, 2H), 4.94 (d, *J* = 10.9 Hz, 1H), 4.50 (d, *J* = 10.9 Hz, 1H), 1.32 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.8, 142.0, 140.2, 140.1, 134.6, 132.9, 132.6, 129.5, 129.0, 128.8, 128.5, 127.6, 127.4, 127.0, 126.3, 125.9, 66.9, 35.0, 31.1. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{29}H_{28}BrNO_3S_2$+Na^+: 604.0587, found: 604.0588. **IR** (neat, cm^{-1}): υ 2966, 2908, 2872, 1719, 1384, 1312, 1142, 1000, 730, 635.



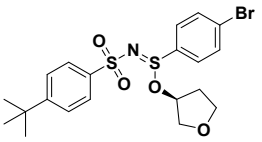
6o

petroleum ether / ethyl acetate = 15:1 – 4:1, a viscous waxy oil, 61% yield (69.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.85 – 7.81 (m, 2H), 7.70 – 7.68 (m, 4H), 7.50 – 7.46 (m, 2H), 4.91 (s, 1H), 3.87 (s, 1H), 3.74 – 3.70 (m, 2H), 3.59 (s, 1H), 1.36 (s, 9H), 1.31 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 156.1, 155.6, 139.6, 133.1, 128.6, 126.1, 125.9, 100.0, 80.1, 35.0, 31.0, 28.2. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{31}BrN_2O_5S_2$+H^+: 573.0911, found: 573.0925. **IR** (neat, cm^{-1}): υ 2967, 2904, 2883, 1718, 1312, 1149, 998, 731, 634.



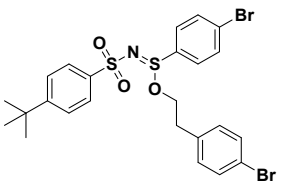
6p

petroleum ether / ethyl acetate = 20:1 – 10:1, a yellow solid, 60% yield (61.3 mg). mp: 113 – 115 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.84 (m, 2H), 7.67 – 7.63 (s, 4H), 7.48 – 7.44 (m, 2H), 4.56 – 4.50 (m, 1H), 1.96 – 1.88 (m, 1H), 1.74 – 1.45 (m, 9H), 1.30 (s, 9H), 1.27 – 1.20 (m, 2H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.5, 140.4, 136.3, 132.6, 128.6, 127.9, 126.1, 125.7, 82.8, 35.0, 34.9, 31.0, 27.99, 27.97, 22.3, 22.2. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{30}BrNO_3S_2$+Na^+: 536.0723, found: 536.0719. **IR** (neat, cm^{-1}): υ 2927, 2861, 1304, 1151, 1025, 999, 819, 776, 732, 633.



6q

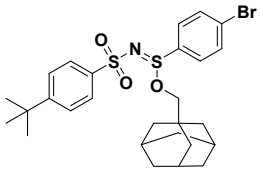
petroleum ether / ethyl acetate = 15:1 – 2:1, a viscous waxy oil, 42% yield (40.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.83 (m, 2H), 7.70 – 7.65 (m, 4H), 7.50 – 7.46 (m, 2H), 5.07 – 4.99 (m, 1H), 3.84 – 3.53 (m, 4H), 2.08 – 1.79 (m, 2H), 1.31 (d, *J* = 1.3 Hz, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.91, 155.89, 139.9, 135.23, 135.19, 133.0, 132.9, 128.73, 128.68, 128.6, 128.5, 126.2, 126.1, 125.88, 125.86, 79.0, 78.5, 73.0, 72.9, 66.8, 66.7, 35.0, 33.6, 33.4, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{24}BrNO_4S_2$+H^+: 486.0403, found: 486.0403. **IR** (neat, cm^{-1}): υ 2966, 2908, 2872, 1719, 1409, 1146, 1000, 730, 635.



6r

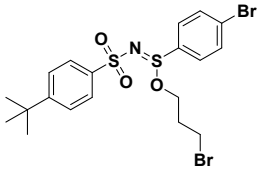
petroleum ether / ethyl acetate = 15:1 – 5:1, a colorless solid, 90% yield (107.5 mg). mp: 100 – 102 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.85 (m, 2H), 7.59 – 7.56 (m, 2H), 7.50 – 7.45 (m, 4H),

7.35 – 7.32 (m, 2H), 6.89 – 6.86 (m, 2H), 4.10 (dt, *J* = 9.9, 6.4 Hz, 1H), 3.61 (dt, *J* = 9.9, 7.1 Hz, 1H), 2.72 – 2,60 (m, 2H), 1.29 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 139.9, 135.5, 134.2, 132.7, 131.5, 130.5, 128.7, 128.3, 126.1, 125.8, 120.6, 65.4, 34.9, 34.6, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{25}Br_2NO_3S_2$+Na^+: 619.9535, found: 615.9537. **IR** (neat, cm^{-1}): υ 3082, 3059, 2963, 2930, 2868, 1298, 1284, 813, 745, 641.



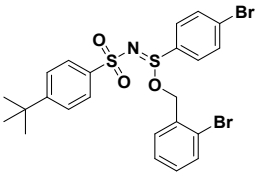
6s

petroleum ether / ethyl acetate = 15:1 – 8:1, a colorless solid, 87% yield (98.0 mg). mp: 140 – 142 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.90 – 7.86 (m, 2H), 7.70 – 7.65 (m, 4H), 7.49 – 7.46 (m, 2H), 3.38 (d, *J* = 9.1 Hz, 1H), 2.85 (d, *J* = 9.1 Hz, 1H), 1.89 – 1.87 (m, 3H), 1.68 – 1.63 (m, 3H), 1.54 – 1.50 (m, 3H), 1.31 (s, 9H), 1.26 (d, *J* = 2.9 Hz, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.5, 140.5, 134.6, 132.8, 129.0, 128.2, 126.2, 125.8, 74.2, 38.8, 36.6, 35.0, 33.3, 31.1, 27.7. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{27}H_{34}BrNO_3S_2$+H^+: 566.1216, found: 566.1217. **IR** (neat, cm^{-1}): υ 3264, 3088, 2902, 2848, 1717, 1251, 1159, 1032, 1000, 818, 739.



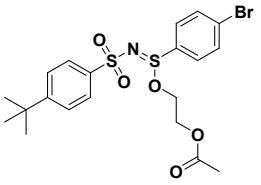
6t

petroleum ether / ethyl acetate = 15:1 – 5:1, a colorless solid, 86% yield (92.0 mg). mp: 77 – 79 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.85 (m, 2H), 7.71 – 7.67 (m, 4H), 7.50 – 7.46 (m, 2H), 4.08 – 4.02 (m, 1H), 3.60 –3.54 (m, 1H), 3.29 – 3.20 (m, 2H), 1.97 – 1.89 (m, 2H), 1.31 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.8, 140.0, 134.2, 132.9, 128.9, 128.6, 126.1, 125.8, 62.6, 35.0, 31.7, 31.0, 28.6. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{23}Br_2NO_3S_2$+H^+: 537.9539, found: 537.9537. **IR** (neat, cm^{-1}): υ 2962, 2923, 2902, 1307, 983, 961, 869, 801, 628.



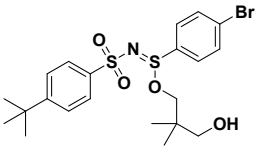
6u

petroleum ether / ethyl acetate = 15:1 – 6:1, a light yellow solid, 85% yield (99.1 mg). mp: 116 – 118 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.92 – 7.89 (m, 2H), 7.77 – 7.72 (m, 2H), 7.69 – 7.65 (m, 2H), 7.50 – 7.45 (m, 3H), 7.24 – 7.15 (m, 2H), 7.13 – 7.10 (m, 1H), 4.98 (d, *J* = 11.4 Hz, 1H), 4.60 (d, *J* = 11.3 Hz, 1H), 1.31 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 140.0, 134.4, 133.4, 132.9, 132.8, 131.3, 130.6, 129.0, 128.6, 127.6, 126.2, 125.9, 124.2, 66.7, 35.0, 31.1. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{23}Br_2NO_3S_2$+Na^+: 607.9358, found: 607.9354. **IR** (neat, cm^{-1}): υ 3087, 2965, 2926, 2872, 1639, 1279, 1152, 1000, 846, 779, 731, 663.



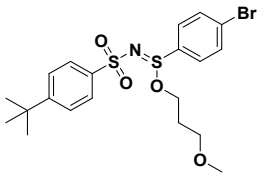
6v

petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 50% yield (50.1 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.84 (m, 2H), 7.68 (s, 4H), 7.50 – 7.45 (m, 2H), 4.15 – 4.10 (m, 1H), 4.07 – 4.00 (m, 2H), 3.72 – 3.66 (m, 1H), 2.01 (s, 3H), 1.30 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 170.4, 155.9, 139.8, 134.4, 132.9, 128.9, 128.7, 126.2, 125.8, 63.1, 61.7, 35.0, 31.0, 20.6. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{24}BrNO_5S_2$+H^+: 502.0353, found: 502.0354. **IR** (neat, cm^{-1}): υ 3087, 2963, 2905, 2870, 1741, 1227, 997, 877, 789, 633.



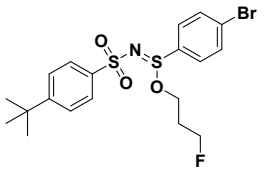
6w

petroleum ether / ethyl acetate = 15:1 – 3:1, a colorless solid, 62% yield (62.1 mg). mp: 143 – 145 °C. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.85 (m, 2H), 7.72 – 7.65 (m, 4H), 7.50 – 7.47 (m, 2H), 4.00 (d, *J* = 9.1 Hz, 1H), 3.42 (d, *J* = 11.2 Hz, 1H), 3.21 (d, *J* = 11.2 Hz, 1H), 3.01 (d, *J* = 9.1 Hz, 1H), 2.62 (s, 1H), 1.32 (s, 9H), 0.79 (d, *J* = 2.0 Hz, 6H).**^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.9, 139.5, 134.2, 133.0, 128.9, 128.5, 126.3, 125.9, 68.5, 66.9, 36.6, 35.1, 31.1, 21.25, 21.21. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{28}BrNO_4S_2$+Na^+: 526.0515, found: 526.0515. **IR** (neat, cm^{-1}): υ 2962, 2925, 2902, 2876, 1287, 1149, 1033, 1004, 917, 829, 803, 740, 697, 638.



6x

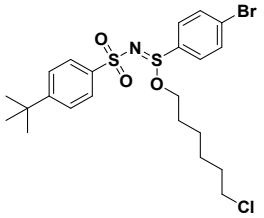
petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 79% yield (77.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.83 (m, 2H), 7.68 – 7.62 (m, 4H), 7.47 – 7.44 (m, 2H), 4.00 (dt, *J* = 9.8, 6.2 Hz, 1H), 3.55 (dt, *J* = 9.8, 6.5 Hz, 1H), 3.28 – 3.22 (m, 2H), 3.20 (s, 3H), 1.69 – 1.63 (m, 2H), 1.29 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.6, 140.1, 134.5, 132.7, 128.8, 128.3, 126.1, 125.7, 68.2, 62.9, 58.5, 34.9, 31.0, 29.1. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{26}BrNO_4S_2$+H^+: 490.0539, found: 490.0538. **IR** (neat, cm^{-1}): υ 2962, 2870, 1471, 1152, 1109, 1023, 999, 782, 632.



6y

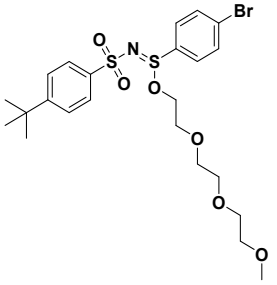
petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 83% yield (78.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.84 (m, 2H), 7.70 – 7.65 (m, 4H), 7.49 – 7.46 (m, 2H), 4.42 – 4.33 (m, 1H), 4.31 – 4.21 (m, 1H), 4.05 (dt, *J* = 10.0, 6.0 Hz, 1H), 3.56 (dt, *J* = 10.0, 6.3 Hz, 1H), 1.85 – 1.79 (m, 1H), 1.79 – 1.72 (m, 1H), 1.30 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.8, 140.0, 134.2, 132.9, 128.8, 128.5, 126.1, 125.8, 79.7 (d, *J* = 166.1 Hz), 61.1 (d, *J* = 5.0 Hz), 35.0, 31.0, 29.9 (d, *J* = 20.0 Hz).

^{19}F NMR (376 MHz, Chloroform-*d*) δ 18.96 (m, 1F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{23}BrFNO_3S_2$+H^+: 478.0340, found: 478.0334. **IR** (neat, cm^{-1}): υ 3086, 2964, 2906, 2869, 1306, 1021, 997, 911, 782, 633.



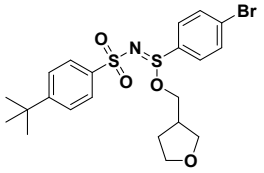
6z

petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 83% yield (88.5 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.84 (m, 2H), 7.69 – 7.64 (m, 4H), 7.48 – 7.45 (m, 2H), 3.94 (dt, *J* = 9.7, 6.5 Hz, 1H), 3.48 – 3.42 (m, 3H), 1.71 – 1.64 (m, 2H), 1.48 – 1.41 (m, 2H), 1.36 – 1.28 (m, 11H), 1.24 – 1.18 (m, 2H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.6, 140.2, 134.6, 132.8, 128.8, 128.3, 126.1, 125.7, 65.4, 44.7, 34.9, 32.1, 31.0, 28.7, 26.1, 24.7. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{29}BrClNO_3S_2$+Na^+: 558.0333, found:558.0329. **IR** (neat, cm^{-1}): υ 2959, 2867, 1288, 1152, 1022, 998, 793, 731, 633.



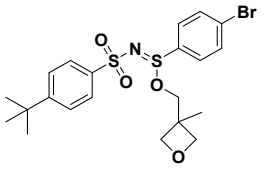
6aa

petroleum ether / ethyl acetate = 15:1 – 2:1, a yellow oil, 73% yield (81.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.86 – 7.83 (m, 2H), 7.73 – 7.69 (m, 2H), 7.67 – 7.63 (m, 2H), 7.47 – 7.44 (m, 2H), 4.15 – 4.10 (m, 1H), 3.74 – 3,69(m, 1H), 3.59 – 3.48 (m, 10H), 3.32 (s, 3H), 1.29 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.6, 140.0, 134.7, 132.7, 129.1, 128.3, 126.1, 125.7, 71.7, 70.41, 70.37, 70.36, 68.8, 65.5, 58.9, 34.9, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{23}H_{32}BrNO_6S_2$+Na^+: 584.0747, found: 584.0739. **IR** (neat, cm^{-1}): υ 3246, 3089, 2960, 2872, 1333, 1164, 1109, 1089, 1002, 834, 630.



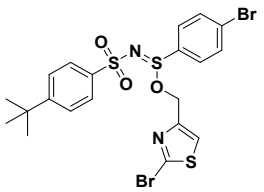
6ab

petroleum ether / ethyl acetate = 15:1 – 7:1, a viscous waxy oil, 78% yield (77.9 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.85 (m, 2H), 7.74 – 7.64 (m, 4H), 7.49 – 7.45 (m, 2H), 3.96 – 3.29 (m, 5H), 1.86 – 1.34 (m, 4H), 1.31 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 155.6, 140.12, 140.06, 134.8, 134.4, 132.8, 132.7, 129.04, 129.00, 128.4, 128.3, 126.2, 126.1, 125.8, 76.4, 76.2, 68.4, 68.32, 68.26, 66.6, 35.0, 31.0, 27.7, 27.4, 25.6, 25.3. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{26}BrNO_6S_2$+Na^+: 524.0359, found: 524.0358. **IR** (neat, cm^{-1}): υ 3082, 2970, 2902, 1318, 1157, 1084, 1021, 1000, 918, 793, 728, 632.



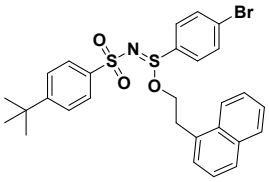
6ac

petroleum ether / ethyl acetate = 15:1 – 7:1, a colorless solid, 70% yield (69.9 mg). mp: 128 – 130 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.89 – 7.86 (m, 2H), 7.73 – 7.68(m, 4H), 7.50 – 7.46 (m, 2H), 4.23 – 4.17 (m, 4H), 3.99 (d, *J* = 9.5 Hz, 1H), 3.41 (d, *J* = 9.5 Hz, 1H), 1.30 (s, 9H), 1.14 (s, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.9, 140.0, 134.2, 133.0, 128.8, 128.7, 126.2, 125.9, 78.9, 68.5, 39.0, 35.0, 31.0, 20.7. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{26}BrNO_4S_2$+H^+: 500.0560, found: 500.0560. **IR** (neat, cm^{-1}): υ 2967, 2868, 1317, 1157, 998, 909, 799, 740, 631.



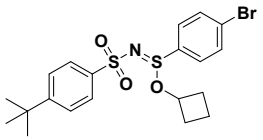
6ad

petroleum ether / ethyl acetate = 15:1 – 5:1, a yellow solid, 60% yield (70.8 mg). mp: 131 – 133 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.85 (m, 2H), 7.72 – 7.64 (m, 4H), 7.48 – 7.45 (m, 2H), 7.16 (s, 1H), 5.02 (d, *J* = 12.3 Hz, 1H), 4.66 (d, *J* = 12.1 Hz, 1H), 1.30 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.8, 149.8, 139.7, 136.7, 134.2, 132.8, 129.0, 128.7, 126.2, 125.9, 123.5, 61.6, 35.0, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{20}Br_2N_2O_3S_3$+$H^+$: 590.9076, found: 590.9076. **IR** (neat, cm^{-1}): υ 2968, 2902, 1719, 1386, 1312, 1146, 1002, 791, 733, 640.



6ae

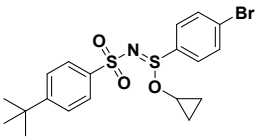
petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 84% yield (95.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.94 – 7.90 (m, 2H), 7.85 – 7.82 (m, 1H), 7.75 – 7.73 (m, 1H), 7.68 – 7.66 (m, 1H), 7.51 – 7.48 (m, 2H), 7.47 – 7.41 (m, 2H), 7.40 – 7.37 (m, 2H), 7.35 – 7.29 (m, 3H), 7.19 – 7.17 (m, 1H), 4.22 (dt, *J* = 9.9, 6.5 Hz, 1H), 3.81 (dt, *J* = 9.9, 7.3 Hz, 1H), 3.26 – 3.15 (m, 2H), 1.30 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 140.1, 134.0, 133.7, 132.4, 132.3, 131.5, 128.8, 128.6, 128.1, 127.6, 127.4, 126.20, 126.18, 125.8, 125.7, 125.3, 123.0, 65.2, 34.9, 32.4, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{28}H_{28}BrNO_3S_2$+H^+: 572.0747, found:572.0746. **IR** (neat, cm^{-1}): υ 3087, 2966, 2906, 2872, 1720, 1312, 1149, 1000, 730, 635.



6af

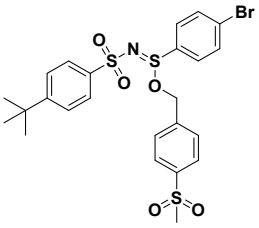
petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 61% yield (57.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.83 (m, 2H), 7.69 – 7.64 (m, 4H), 7.48 – 7.45 (m, 2H), 4.67 – 4.59 (m, 1H), 2.05 – 1.86 (m, 3H), 1.83 – 1.75 (m, 1H), 1.67 – 1.58 (m, 1H), 1.41 – 1.34 (m, 1H), 1.30 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.6, 140.2, 135.5, 132.7, 128.8, 128.2, 126.2, 125.7, 71.0, 35.0,

31.72, 31.69, 31.1, 13.1. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{20}H_{24}BrNO_3S_2$+H^+: 470.0454, found: 470.0456. **IR** (neat, cm^{-1}): υ 3086, 2961, 2905, 2869, 1306, 1019, 996, 782, 726, 633.



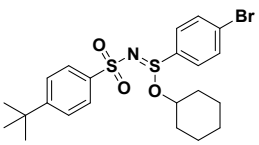
6ag

petroleum ether / ethyl acetate = 15:1 – 5:1, a viscous waxy oil, 78% yield (71.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.85 (m, 2H), 7.69 – 7.64 (m, 4H), 7.48 – 7.45 (m, 2H), 3.83 – 3.79 (m, 1H), 1.30 (s, 9H), 0.77 – 0.72 (m, 1H), 0.69 – 0.61 (m, 2H), 0.56 – 0.51 (m, 1H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 140.0, 135.1, 132.7, 128.7, 128.3, 126.2, 125.7, 52.1, 35.0, 31.0, 6.2, 6.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{22}BrNO_3S_2$+Na^+: 478.0117, found: 478.0116. **IR** (neat, cm^{-1}): υ 3086, 2963, 2904, 2869, 1305, 1152, 1021, 999, 787, 633.



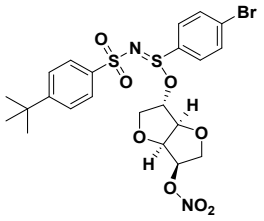
6ah

petroleum ether / ethyl acetate = 15:1 – 2:1, a colorless solid, 83% yield (96.8 mg). mp: 139 – 141 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.84 (m, 4H), 7.72 – 7.67 (m, 4H), 7.49 – 7.45 (m, 2H), 7.35 – 7.33 (m, 2H), 5.04 (d, *J* = 11.8 Hz, 1H), 4.53 (d, *J* = 11.8 Hz, 1H), 3.02 (s, 3H), 1.29 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 156.0, 140.8, 140.0, 139.7, 134.1, 133.0, 129.2, 128.8, 127.6, 126.2, 125.9, 64.9, 44.3, 35.0, 31.0. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{24}H_{26}BrNO_5S_3$+H^+: 586.0209, found: 586.0213. **IR** (neat, cm^{-1}): υ 2967, 2903, 1720, 1312, 1148, 1000, 730, 635.



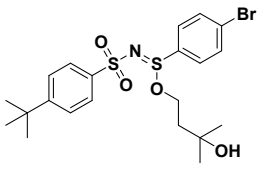
6ai

petroleum ether / ethyl acetate = 15:1 – 8:1, a yellow solid, 80% yield (79.5 mg). mp: 79 – 81 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.84 (m, 2H), 7.67 – 7.63 (m, 4H), 7.48 – 7.44 (m, 2H), 4.36 – 4.30 (m, 1H), 1.88 – 1.84 (m, 1H), 1.65 – 1.49 (m, 3H), 1.47 – 1.38 (m, 2H), 1.30 (s, 9H), 1.28 – 1.24 (m, 2H), 1.19 – 1.13 (m, 2H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.5, 140.4, 136.3, 132.6, 128.6, 127.9, 126.1, 125.7, 80.0, 35.0, 32.83, 32.78, 31.0, 24.8, 23.6, 23.5. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{28}BrNO_3S_2$+Na^+: 520.0587, found: 520.0583. **IR** (neat, cm^{-1}): υ 3089, 2930, 2856, 1318, 1152, 990, 918, 752, 738, 626.



6aj

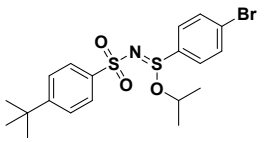
petroleum ether / ethyl acetate = 15:1 – 3:1, a viscous waxy oil, 67% yield (78.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.88 – 7.83 (m, 2H), 7.69 – 7.68 (m, 4H), 7.51 – 7.47 (m, 2H), 5.29 – 5.24 (m, 1H), 4.90 – 4.80 (m, 2H), 4.32 (dd, *J* = 78.4, 4.9 Hz, 1H), 3.90 (dt, *J* = 11.4, 2.8 Hz, 1H), 3.82 – 3.76 (m, 2H), 3.70 – 3.56 (m, 1H), δ 1.31 (d, *J* = 1.3 Hz, 1H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 156.2, 156.1, 139.475, 139.466, 134.7, 134.4, 133.1, 133.0, 129.1, 128.9, 128.72, 128.66, 126.3, 126.2, 126.0, 125.9, 86.7, 86.6, 81.41, 81.38, 81.0, 80.9, 80.5, 79.2, 73.34, 73.29, 69.18, 69.16, 35.0, 31.03, 30.98. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{22}H_{25}BrN_2O_8S_2$+Na^+: 611.0128, found: 611.0124. **IR** (neat, cm^{-1}): υ 3088, 2965, 2925, 2872, 1639, 1279, 1153, 1000, 849, 778, 730, 633.



6ak

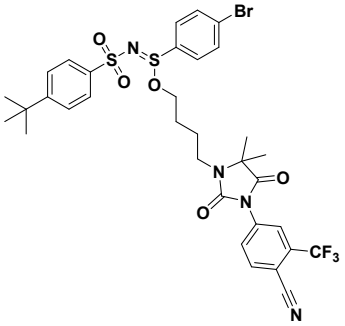
petroleum ether / ethyl acetate = 15:1 – 2:1, a yellow solid, 62% yield (62.1 mg). mp: 84 – 86 ℃. **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.87 – 7.84 (m, 2H), 7.69 – 7.64 (m, 4H), 7.49 – 7.45 (m, 2H), 4.17 (dt, *J* = 10.0, 6.9 Hz, 1H), 3.64 (dt, *J* = 10.0, 6.8 Hz, 1H), 1.98 (s, 1H), 1.68 – 1.60 (m, 2H), 1.30 (s, 9H),

1.10 (d, J = 8.2 Hz, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.7, 140.0, 134.4, 132.8, 128.9, 128.4, 126.2, 125.8, 69.5, 62.6, 41.8, 35.0, 31.0, 29.6, 29.5. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{21}H_{28}BrNO_4S_2$+Na^+: 526.0515, found: 526.0512. **IR** (neat, cm^{-1}): υ 3473, 3088, 2965, 2930, 2906, 2871, 1148, 1025, 1001, 730, 633.



6al

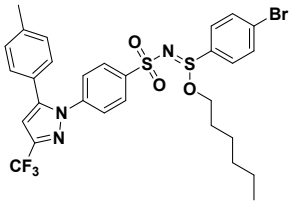
petroleum ether / ethyl acetate = 15:1 – 7:1, a viscous waxy oil, 81% yield (74.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.86 – 7.83 (m, 2H), 7.67 – 7.62 (m, 4H), 7.47 – 7.44 (m, 2H), 4.72 – 4.62 (m, 1H), 1.29 – 1.28 (m, 12H), 1.11 (d, J = 6.3 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.5, 140.3, 136.0, 132.6, 128.6, 128.0, 126.1, 125.7, 75.3, 34.9, 31.0, 23.2, 23.1. **HRMS** (ESI-TOF): Anal Calcd. For. $C_{19}H_{24}BrNO_3S_2$+Na^+: 482.0253, found: 482.0253. **IR** (neat, cm^{-1}): υ 3086, 2965, 2819, 1304, 1151, 996, 832, 730, 633.



6am

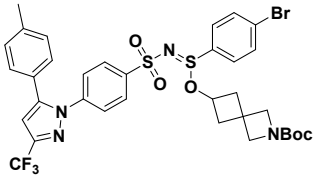
petroleum ether / ethyl acetate = 5:1 – 1.5:1, a viscous waxy oil, 89% yield (136.4 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.13 (d, J = 2.1 Hz, 1H), 8.00 – 7.97(m, 1H), 7.89 – 7.86 (m, 1H), 7.82 – 7.79 (m, 2H), 7.67 – 7.62 (m, 4H), 7.47 – 7.44 (m, 2H), 4.13 (dt, J = 9.9, 5.9 Hz, 1H), 3.59 (dt, J = 9.7, 5.7 Hz, 1H), 3.34 (t, J = 7.2 Hz, 2H), 1.76 – 1.65 (m, 4H), 1.51 (d, J = 3.9 Hz, 6H), 1.29 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 155.7, 152.8, 139.8, 136.4, 135.1, 134.3, 133.2 (q, J = 33.2 Hz), 132.8, 128.7, 128.4, 127.9, 126.0, 125.7, 122.9 (q, J = 4.9 Hz), 121.8 (q, J = 272.6 Hz), 114.9, 107.9 (q, J = 1.9 Hz), 64.7, 61.8, 39.5, 34.9, 30.9, 26.5, 25.6, 23.3, 23.2. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.93 (s,

3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{33}H_{34}BrF_3N_4O_5S_2$+$H^+$: 767.1179, found: 767.1180. **IR** (neat, cm^{-1}): υ 2966, 2908, 2872, 1719, 1409, 1312, 1141, 1000, 730, 635.



7a

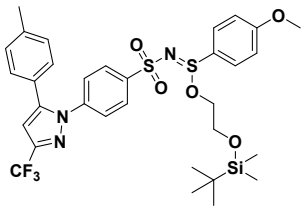
petroleum ether / ethyl acetate = 15:1 – 6:1, a viscous waxy oil, 90% yield (120.1 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.96 – 7.91 (m, 2H), 7.71 – 7.62 (m, 2H), 7.66 – 7.62 (m, 2H), 7.44 – 7.40 (m, 2H), 7.15 – 7.13 (m, 2H), 7.09 – 7.07 (m, 2H), 6.71 (s, 1H), 3.97 (dt, *J* = 9.6, 6.6 Hz, 1H), 3.52 (dt, *J* = 9.6, 6.7 Hz, 1H), 2.36 (s, 3H), 1.52 – 1.45 (m, 2H), 1.24 – 1.14 (m, 6H), 0.82 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 145.1, 143.7 (q, *J* = 38.1 Hz), 142.7, 141.8, 139.6, 134.3, 132.9, 129.6, 128.7, 128.6, 128.5, 127.3, 125.6, 125.2, 121.0 (q, *J* = 269.1 Hz), 106.0 (q, *J* = 1.9 Hz), 66.3, 31.0, 28.8, 25.1, 22.2, 21.2, 13.7. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.36 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{29}H_{29}BrF_3N_3O_3S_2$+$Na^+$: 692.0658, found: 692.0659. **IR** (neat, cm^{-1}): υ 2956, 2930, 2860, 1734, 1147, 1235, 1151, 1133, 1002, 973, 801, 632.



7b

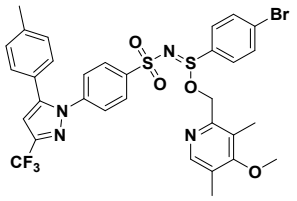
petroleum ether / ethyl acetate = 10:1 – 2:1, a viscous waxy oil, 78% yield (121.4 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.91 – 7.88 (m, 2H), 7.70 – 7.67 (m, 2H), 7.62 – 7.59 (m, 2H), 7.44 – 7.40 (m, 2H), 7.16 – 7.14 (m, 2H), 7.10 – 7.07 (m, 2H), 6.72 (s, 1H), 4.66 – 4.59 (m, 1H), 3.83 – 3.76 (m, 4H), 2.52 – 2.46 (m, 1H), 2.36 (s, 3H), 2.29 – 2.19 (m, 2H), 2.16 – 2.11 (m, 1H), 1.39 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 155.9, 145.1, 143.9 (q, *J* = 37.5 Hz), 142.4, 142.0, 139.7, 134.6, 133.0, 129.7, 128.8, 128.64, 128.63, 127.4, 125.6, 125.3, 121.0 (q, *J* = 267.5 Hz), 106.1 (q, *J* = 1.6 Hz), 79.5, 67.0, 42.2, 41.9, 30.9, 28.2, 21.3. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.39 (s, 3F). **HRMS** (ESI-TOF):

Anal Calcd. For. $C_{33}H_{34}BrF_3N_4O_5S_2$+$Na^+$: 801.0999, found: 801.0987 **IR** (neat, cm^{-1}): υ 2977, 2934, 2874, 1694, 1271, 1152, 1134, 975, 729.



7c

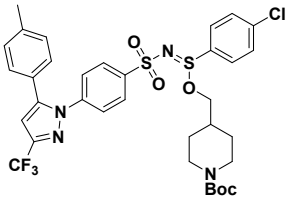
petroleum ether / ethyl acetate = 10:1 – 3:1, a viscous waxy oil, 68% yield (94.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.96 – 7.92 (m, 2H), 7.74 – 7.70 (m, 2H), 7.42 – 7.39 (m, 2H), 7.15 – 7.13 (m, 2H), 7.09 – 7.07 (m, 2H), 7.03 – 6.99 (m, 2H), 6.72 (s, 1H), 4.05 – 4.00 (m, 1H), 3.86 (s, 3H), 3.70 – 3.61 (m, 3H), 2.36 (s, 3H), 0.84 (s, 9H), 0.02 (s, 3H), 0.00 (s, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 163.6, 145.1, 143.8 (q, *J* = 38.2 Hz), 143.0, 141.7, 139.6, 129.6, 129.4, 128.6, 127.4, 126.0, 125.7, 125.3, 121.1 (q, *J* = 267.4 Hz), 115.0, 106.0 (q, *J* = 1.8 Hz), 67.0, 61.3, 55.7, 25.7, 21.2, 18.2, -5.4, -5.5. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.38 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{32}H_{38}F_3N_3O_5S_2Si$+$Na^+$: 716.1867, found: 716.1866. **IR** (neat, cm^{-1}): υ 2954, 2930, 2901, 2858, 1593, 1496, 1471, 1260, 1236, 1151, 1133, 1086, 829, 802.



7d

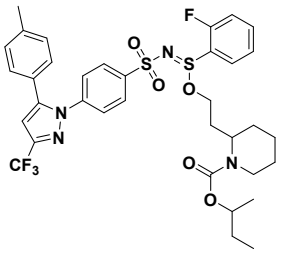
petroleum ether / ethyl acetate = 10:1 – 2:1, a viscous waxy oil, 75% yield (109.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.15 (s, 1H), 7.98 – 7.94 (m, 2H), 7.74 – 7.71 (m, 2H), 7.68 – 7.65 (m, 2H), 7.43 – 7.40 (m, 2H), 7.14 – 7.12 (m, 2H), 7.09 – 7.07 (m, 2H), 6.72 (s, 1H), 5.17 (d, *J* = 11.1 Hz, 1H), 4.69 (d, *J* = 11.1 Hz, 1H), 3.74 (s, 3H), 2.36 (s, 3H), 2.23 (s, 3H), 2.15 (s, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 164.4, 151.0, 149.3, 145.2, 143.9 (q, *J* = 38.1 Hz), 142.6, 142.0, 139.7, 134.2, 132.9, 129.7, 129.1, 128.8, 128.7, 127.5, 127.2, 126.7, 125.7, 125.4, 121.1 (q, *J* = 267.4 Hz), 106.1 (q, *J* = 1.6 Hz), 66.9, 60.0, 21.3, 13.3, 10.7. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.40 (s, 3F). **HRMS** (ESI-

TOF): Anal Calcd. For. $C_{32}H_{28}BrF_3N_4O_4S_2$+$H^+$: 733.0761, found: 733.0758. **IR** (neat, cm^{-1}): υ 3061, 2925, 1471, 1235, 1158, 1132, 1094, 974, 727.



7e

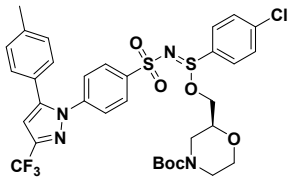
petroleum ether / ethyl acetate = 10:1 – 2:1, a viscous waxy oil, 97% yield (142.8 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.94 – 7.91 (m, 2H), 7.71 – 7.67 (m, 2H), 7.55 – 7.51 (m, 2H), 7.43 – 7.40 (m, 2H), 7.15 – 7.13 (m, 2H), 7.09 – 7.06 (m, 2H), 6.71 (s, 1H), 4.05 (s, 2H), 3.88 – 3.84 (m, 1H), 3.28 (t, *J* = 8.0 Hz, 1H), 2.72 – 2.52 (t, *J* = 13.1 Hz, 2H), 2.35 (s, 3H), 1.66 – 1.47 (m, 3H), 1.41 (s, 9H), 1.07 – 0.95 (m, 2H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 154.6, 145.1, 143.9 (q, *J* = 38.6 Hz), 142.6, 142.0, 140.3, 139.6, 133.4, 130.1, 129.6, 128.6, 127.4, 125.6, 125.4, 121.0 (q, *J* = 267.6 Hz), 106.0 (q, *J* = 1.4 Hz), 79.4, 69.2, 35.8, 28.4, 28.3, 28.2, 21.2. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.40 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{34}H_{36}BrF_3N_4O_3S_2$+$Na^+$: 761.1631, found: 761.1613. **IR** (neat, cm^{-1}): υ 2976, 2932, 2859, 1683, 1235, 1150, 1005, 971, 908, 728.



7f

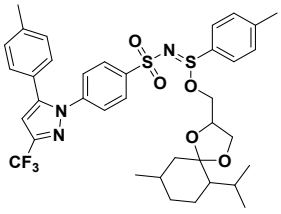
petroleum ether / ethyl acetate = 10:1 – 2:1, a viscous waxy oil, 92% yield (135.1 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.05 – 8.01 (m, 1H), 7.94 – 7.90 (m, 2H), 7.65 – 7.60 (m, 1H), 7.42 – 7.39 (m, 2H), 7.35 – 7.31 (m, 1H), 7.24 – 7.19 (m, 1H), 7.15 – 7.13 (m, 2H), 7.08 – 7.06 (m, 2H), 6.71 (s, 1H), 4.67 – 4.60 (m, 1H), 4.24 – 4.20 (m, 1H), 4.14 – 4.01 (m, 1H), 3.94 – 3.91 (m, 1H), 3.69 – 3.59 (m, 1H), 2.66 – 2.60 (m, 1H), 2.35 (s, 3H), 2.03 – 1.94 (m, 1H), 1.67 – 1.29 (m, 9H), 1.13 – 1.08 (m, 3H), 0.84 – 0.80 (m, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 161.2 (d, *J* = 3.9 Hz), 158.6 (d, *J* = 4.2 Hz), 155.3, 145.1, 143.8 (q, *J* = 38.3 Hz), 142.7, 141.9, 139.6, 135.9 (d, *J* = 8.2 Hz), 129.6, 128.6, 128.0 (d, *J* = 1.9

Hz), 128.0, 127.4, 125.6, 125.3, 125.2, 123.1 (d, J = 12.4 Hz), 121.0 (q, J = 267.4 Hz), 116.7 (d, J = 19.8 Hz), 106.0 (q, J = 1.7 Hz), 72.95, 72.92, 72.89, 72.85, 65.5, 64.9, 47.48, 47.45, 47.4, 38.89, 38.86, 38.82, 38.79, 38.77, 29.71, 29.68, 29.65, 29.6, 28.91, 28.88, 28.86, 28.6, 28.5, 28.4, 28.3, 25.21, 25.19, 25.17, 21.2, 19.61, 19.56, 18.8, 9.61, 9.59, 9.55. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.43 (s, 3F), -111.38 – -111.51(m, 1F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{35}H_{38}F_4N_4O_5S_2$+Na^+: 757.2112, found: 757.2093. **IR** (neat, cm^{-1}): υ 3101, 3068, 2975, 2939, 1720, 1313, 1145, 1090, 1005, 729.



7g

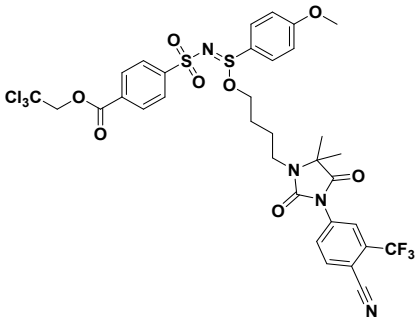
petroleum ether / ethyl acetate = 10:1 – 2:1, a viscous waxy oil, 88% yield (130.0 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.95 – 7.92 (m, 2H), 7.76 – 7.71 (m, 2H), 7.54 – 7.50 (m, 2H), 7.44 – 7.40 (m, 2H), 7.15 – 7.13 (m, 2H), 7.08 – 7.06 (m, 2H), 6.71 (s, 1H), 4.02 (s, 1H), 3.80 – 3.74 (m, 3H), 3.58 – 3.38 (m, 3H), 2.90 – 2.79 (m, 1H), 2.70 – 2.40 (m, 1H), 2.35 (s, 3H), 1.423 – 1.417 (m, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 154.48, 154.47, 145.2, 143.9 (q, J = 38.1, 37.6 Hz), 142.50, 142.47, 142.11, 142.08, 140.46, 140.44, 139.7, 133.53, 133.45, 130.11, 130.09, 129.7, 128.87, 128.6, 128.7, 127.52, 127.51, 125.7, 125.53, 125.49, 121.1 (q, J = 268.7 Hz), 106.1 (q, J = 1.3 Hz), 80.4, 73.0, 72.9, 66.35, 66.32, 66.29, 28.3, 21.3. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.38 – -62.39 (m, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{33}H_{34}BrF_3N_4O_6S_2$+$H^+$: 739.1634, found: 739.1621. **IR** (neat, cm^{-1}): υ 3091, 3070, 2976, 2928, 2867, 1692, 1410, 1236, 1151, 1133, 1005, 728.



7h

petroleum ether / ethyl acetate = 10:1 – 3:1, a viscous waxy oil, 97% yield (141.5 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.96 – 7.92 (m, 2H), 7.70 – 7.65 (m, 2H), 7.42 – 7.40 (m, 2H), 7.36 – 7.33 (m,

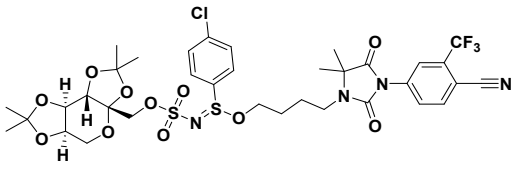
2H), 7.15 – 7.13 (m, 2H), 7.09 – 7.07 (m, 2H), 6.71 (s, 1H), 4.23 – 3.89 (m, 3H), 3.69 – 3.37 (m, 2H), 2.42 (s, 3H), 2.36 (s, 3H), 2.07 – 1.48 (m, 5H), 1.32 – 1.24 (m, 2H), 0.91 – 0.60 (m, 11H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 145.1, 144.8, 144.74, 144.71, 144.67, 144.6, 143.8 (q, *J* = 38.6 Hz), 142.72, 142.69, 142.67, 142.65, 142.59, 141.9, 141.84, 141.82, 139.6, 131.9, 131.8, 131.7, 131.6, 131.5, 131.3, 130.4 (q, *J* = 2.1 Hz), 129.6, 128.6, 127.41, 127.364, 127.358, 127.32, 127.26, 127.2, 125.64, 125.61, 125.29, 125.26, 125.2, 121.0 (q, *J* = 268.9 Hz), 113.68, 113.65, 113.45, 113.36, 113.33, 113.29, 113.22, 113.16, 106.0 (q, *J* = 1,9 Hz), 74.14, 74.12, 73.9, 73.8, 72.7, 72.6, 72.3, 72.2, 66.5, 66.14, 66.06, 65.9, 65.8, 65.7, 65.43, 65.38, 65.3, 65.1, 64.3, 64.1, 49.58, 49.56, 49.2, 49.1, 48.4, 48.3, 48.1, 47.9, 46.19, 46.18, 45.6, 45.4, 43.55, 43.52, 43.4, 34.4, 34.33, 34.29, 34.18, 34.16, 30.6, 30.5, 30.29, 30.27, 30.22, 30.16, 30.1, 30.0, 24.8, 24.7, 24.4, 24.31, 24.28, 24.25, 24.04, 24.01, 23.49, 23.47, 23.38, 23.34, 23.28, 23.26, 23.20, 23.19, 23.1, 23.01, 22.98, 22.9, 21.99, 22.96, 21.90, 21.86, 21.8, 21.5, 21.2, 18.8, 18.7, 18.33, 18.29, 18.04, 18.00, 17.84, 17.74. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.38 – -62.39 (m, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{37}H_{42}F_3N_3O_5S_2$+Na^+: 752.2411, found: 752.2411. **IR** (neat, cm^{-1}): υ 2952, 2928, 2870, 1498, 1236, 1152, 1135, 1007, 803, 730.



8a

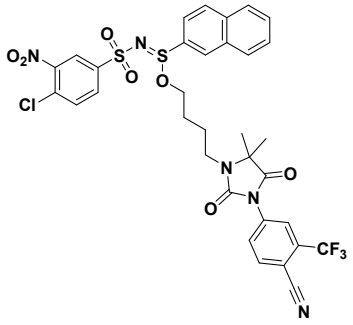
petroleum ether / ethyl acetate = 5:1 – 1:1, a viscous waxy oil, 57% yield (95.3 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.20 – 8.17 (m, 2H), 8.14 – 8.13 (m, 1H), 8.04 – 7.98 (m, 3H), 7.90 – 7.87 (m, 1H), 7.72 – 7.68 (m, 2H), 7.03 – 6.99 (m, 2H), 4.95 (s, 2H), 4.11 (dt, *J* = 9.8, 5.9 Hz, 1H), 3.84 (s, 3H), 3.57 (dt, *J* = 9.7, 5.6 Hz, 1H), 3.34 (t, *J* = 7.2 Hz, 2H), 1.74 – 1.65 (m, 4H), 1.53 (s, 3H), 1.52 (s, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 163.8, 163.6, 152.8, 148.0, 136.4, 135.1, 133.3 (q, *J* = 33.3 Hz), 131.5, 130.5, 129.2, 127.9, 126.5, 125.5, 123.0 (q, *J* = 4.9 Hz), 121.9 (q, *J* = 274.3 Hz), 115.1, 115.0, 108.0 (q, *J* = 2.0 Hz), 94.6, 74.5, 64.1, 61.9, 55.7, 39.6, 26.6, 25.7, 23.33, 23.31. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.96 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{33}H_{30}Cl_3F_3N_4O_8S_2$+$H^+$: 839.0566,

found: 839.0565. **IR** (neat, cm^{-1}): υ 3096, 2987, 2940, 2255, 2233, 1720, 1410, 1313, 1142, 996, 834, 729.



8b

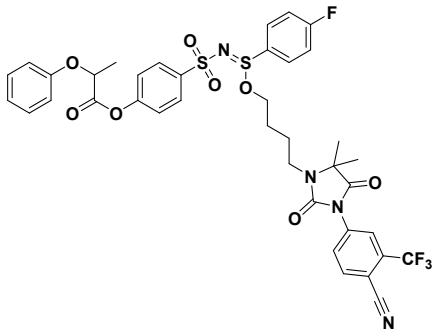
petroleum ether / ethyl acetate = 5:1 – 1.5:1, a viscous waxy oil, 80% yield (135.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.133 – 8.128 (m, 1H), 8.00 – 7.98 (m, 1H), 7.91 – 7.89 (m, 1H), 7.85 – 7.81 (m, 2H), 7.59 – 7.55 (m, 2H), 4.58 – 4.54 (m, 1H), 4.35 (t, *J* = 2.4 Hz, 1H), 4.30 – 4.13 (m, 4H), 3.88 – 3.83 (m, 1H), 3.73 – 3.65 (m, 2H), 3.38 – 3.35 (m, 2H), 1.82 – 1.74 (m, 4H), 1.54 – 1.45 (m, 9H), 1.53 – 1.46 (m, 6H), 1.29 (d, *J* = 7.3 Hz, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.55, 174.54, 152.9, 140.5, 140.4, 136.4, 135.2, 133.4 (q, *J* = 33.2 Hz), 133.2 (q, *J* = 15.3 Hz), 130.1, 128.9, 128.8, 127.9, 123.3, 123.2, 123.00 (q, *J* = 4.7 Hz), 122.97 (q, *J* = 4.9 Hz), 121.9 (q, *J* = 274.1 Hz), , 115.0, 109.03, 108.99, 108.98, 108.1 (q, *J* = 2.0 Hz), 100.92, 100.89, 70.5, 70.1, 70.0, 69.92, 69.88, 69.7, 69.6, 61.92, 61.91, 61.19, 61.16, 39.5, 26.7, 26.5, 26.4, 25.74, 25.67, 25.2, 23.93, 23.90, 23.35, 23.32. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.99 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{35}H_{40}ClF_3N_4O_{11}S_2$+$H^+$: 849.1849, found: 849.1840. **IR** (neat, cm^{-1}): υ 2988, 2939, 2255, 2233, 1720, 1410, 1313, 1159, 1141, 1070, 1053, 995, 832, 729.



8c

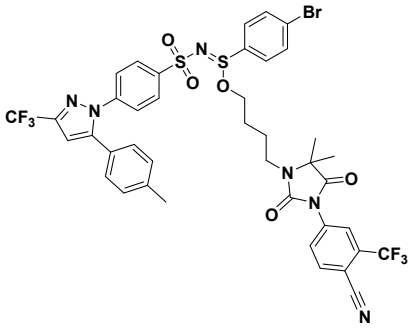
petroleum ether / ethyl acetate = 5:1 – 1.5:1, a viscous waxy oil, 85% yield (129.4 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.434 – 8.429 (m, 1H), 8.37 – 8.36 (m, 1H), 8.133 – 8.128 (m, 1H), 8.10 – 8.07 (m, 1H), 8.03 – 7.95 (m, 3H), 7.92 – 7.86 (m, 2H), 7.76 – 7.73 (m, 1H), 7.69 – 7.60 (m, 3H), 4.15 (dt, *J*

= 9.8, 5.7 Hz, 1H), 3.64 – 3.58 (m, 1H), 3.33 (t, *J* = 6.9 Hz, 2H), 1.75 – 1.66 (m, 4H), 1.52 (s, 6H), 1.51 (s, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 152.8, 147.5, 143.4, 136.4, 135.2, 135.1, 133.2 (q, *J* = 33.1 Hz), 132.6, 132.3, 130.9, 130.5, 130.5, 130.2, 129.6, 129.1, 129.0, 128.05, 127.96, 127.9, 123.6, 122.9 (q, *J* = 4.9 Hz), 121.9 (q, *J* = 272.6 Hz),121.5, 115.0, 107.9 (q, *J* = 2.1 Hz), 65.2, 61.8, 39.5, 26.5, 25.6, 23.25, 23.23. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.91 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{33}H_{27}ClF_3N_5O_7S_2+H^+$: 762.1066, found: 762.1067. **IR** (neat, cm^{-1}): υ 3094, 3064, 2978, 2941, 2887, 1719, 1409, 1312, 1138, 1009, 728.



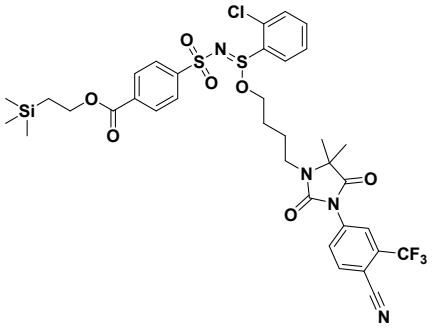
8d

petroleum ether / ethyl acetate = 5:1 – 1:1, a viscous waxy oil, 55% yield (89.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.14 – 8.13 (m, 1H), 7.99 – 7.93 (m, 3H), 7.90 – 7.88 (m, 1H), 7.82 – 7.77 (m, 2H), 7.33 – 7.27 (m, 2H), 7.26 – 7.21 (m, 2H), 7.16 – 7.12 (m, 2H), 7.03 – 6.99 (m, 1H), 6.96 – 6.92 (m, 2H), 4.99 (q, *J* = 6.8 Hz, 1H), 4.08 (dt, *J* = 9.7, 5.9 Hz, 1H), 3.56 – 3.50 (m, 1H), 3.31 (t, *J* = 7.2 Hz, 2H), 1.78 (d, *J* = 6.8 Hz, 3H), 1.71 – 1.61 (m, 4H), 1.50 – 1.48 (m, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.6, 170.4, 165.7 (d, *J* = 257.0 Hz), 157.3, 152.9, 152.8, 141.0, 136.5, 135.2, 133.5 (q, *J* = 33.2 Hz), 130.6 (d, *J* = 2.9 Hz), 130.0 (d, *J* = 9.4 Hz), 129.7, 128.1, 127.9, 126.4, 124.9, 124.1 (q, *J* = 163.8 Hz), 123.0 (q, *J* = 4.8 Hz), 122.9, 121.7, 117.2 (d, *J* = 22.9 Hz), 115.1, 115.0, 108.1 (q, *J* = 2.1 Hz), 72.4, 64.5, 61.9, 39.5, 26.5, 25.7, 23.30, 23.27, 18.5. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.99 (s, 3F), -103.59 (s, 1F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{38}H_{34}F_4N_4O_8S_2+H^+$: 815.1827, found: 815.1827. **IR** (neat, cm^{-1}): υ 3101, 3068, 2923, 2852, 1719, 1409,1313, 1145, 1004, 729.



8e

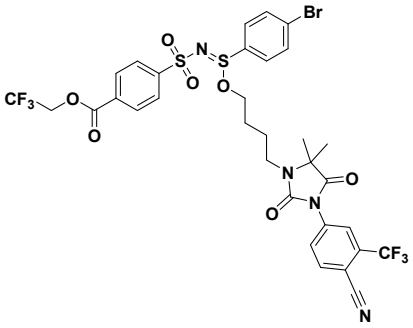
petroleum ether / ethyl acetate = 5:1 – 1:1, a viscous waxy oil, 86% yield (160.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.134 – 8.129 (m, 1H), 7.99 – 7.97 (m, 1H), 7.93 – 7.87 (m, 3H), 7.71 – 7.67 (m, 2H), 7.64 – 7.60 (m, 2H), 7.44 – 7.41 (m, 2H), 7.15 – 7.13 (m, 2H), 7.08 – 7.06 (m, 2H), 6.71 (s, 1H), 4.11 (dt, *J* = 9.6, 5.8 Hz, 1H), 3.57 (dt, *J* = 9.7, 5.6 Hz, 1H), 3.33 (t, *J* = 7.1 Hz, 2H), 2.36 (s, 3H), 1.72 – 1.62 (m, 4H), 1.52 (s, 3H), 1.51 (s, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 152.8, 145.2, 143.8 (q, *J* = 38.2 Hz), 142.5, 142.0, 139.7, 136.4, 135.1, 133.9, 133.4 (q, *J* = 33.1 Hz), 133.0, 129.6, 128.8, 128.7, 128.6, 127.9, 127.3, 125.5, 125.4, 123.0 (q, *J* = 5.0 Hz), 121.9 (q, *J* = 272.6 Hz), 121.0 (q, *J* = 267.5 Hz), 115.0, 108.0 (q, *J* = 2.1 Hz), 106.0 (q, *J* = 1.8 Hz), 64.9, 61.9, 39.4, 26.5, 25.6, 23.3, 23.2, 21.2. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.96 (s, 3F), -62.31 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{40}H_{33}BrF_6N_6O_5S_2$+$Na^+$: 957.0934, found: 957.0932. **IR** (neat, cm^{-1}): υ 2979, 2941, 1720, 1409, 1313, 1236, 1133, 1002, 909, 728.



8f

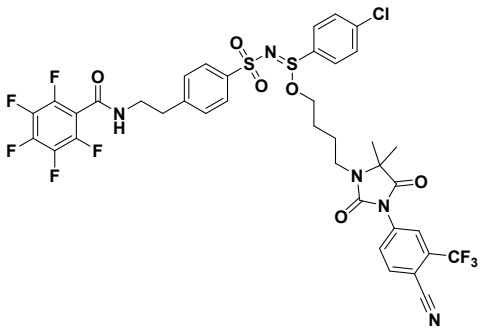
petroleum ether / ethyl acetate = 5:1 – 1:1, a viscous waxy oil, 80% yield (129.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.18 – 8.16 (m, 1H), 8.125 – 8.120 (m, 1H), 8.10 – 8.07 (m, 2H), 7.99 – 7.94 (m, 3H), 7.88 – 7.86 (m, 1H), 7.57 – 7.53 (m, 1H), 7.49 – 7.44 (m, 2H), 4.41 – 4.37 (m, 2H), 4.18 (dt, *J* = 9.7, 5.6 Hz, 1H), 3.77 – 3.72 (m, 1H), 3.32 (t, *J* = 7.1 Hz, 2H), 1.74 – 1.65 (m, 4H), 1.50 (s, 6H), 1.12 –

1.08 (m, 2H), 0.04 (s, 9H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 165.3, 152.8, 146.7, 136.4, 135.1, 134.8, 133.8, 133.6, 133.4, 133.3 (q, *J* = 32.9 Hz), 130.8, 129.9, 128.4, 127.9, 127.8, 126.2, 122.9 (q, *J* = 4.9 Hz), 121.9 (q, *J* = 272.5 Hz), 114.9, 107.9 (q, *J* = 2.1 Hz), 66.8, 63.8, 61.8, 39.5, 26.5, 25.6, 23.3, 17.3, -1.6. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.96 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{35}H_{38}ClF_3N_4O_7S_2Si+Na^+$: 833.1484, found: 833.1482. **IR** (neat, cm^{-1}): υ 3089, 2954, 2900, 1719, 1409, 1313, 1272, 1143, 1008, 837, 762, 730.



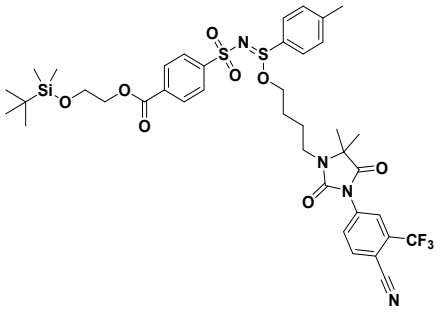
8g

petroleum ether / ethyl acetate = 5:1 – 1.5:1, a viscous waxy oil, 74% yield (123.7 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.16 – 8.13 (m, 3H), 8.02 – 7.97 (m, 3H), 7.89 – 7.87 (m, 1H), 7.70 – 7.66 (m, 2H), 7.65 – 7.61 (m, 2H), 4.70 (q, *J* = 8.3 Hz, 2H), 4.13 (dt, *J* = 9.8, 5.7 Hz, 1H), 3.62 (dt, *J* = 9.6, 5.5 Hz, 1H), 3.33 (t, *J* = 7.1 Hz, 2H), 1.73 – 1.65 (m, 4H), 1.52 (d, *J* = 2.9 Hz, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 163.5, 152.8, 147.7, 136.4, 135.1, 133.9, 133.3 (q, *J* = 33.2 Hz), 133.1, 131.4, 130.5, 128.9, 128.7, 127.9, 126.5, 123.0 (q, *J* = 4.9 Hz), 122.8 (q, *J* = 275.6 Hz), 121.9 (q, *J* = 272.5 Hz), 115.0, 108.0 (q, *J* = 2.1 Hz), 65.2, 61.9, 61.0 (q, *J* = 36.8 Hz), 39.5, 26.5, 25.6, 23.29, 23.26. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.98 (s, 3F), -73.58 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{32}H_{27}BrF_6N_4O_7S_2+Na^+$: 859.0301, found: 859.0298. **IR** (neat, cm^{-1}): υ 2977, 2941, 1720, 1384, 1312, 1296, 1149, 1000, 729.



8h

petroleum ether / ethyl acetate = 2:1 – 1:2, a viscous waxy oil, 69% yield (124.6 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.121 – 8.116 (m, 1H), 7.99 – 7.96 (m, 1H), 7.88 – 7.86 (m, 1H), 7.75 – 7.72 (m, 2H), 7.69 – 7.65 (m, 2H), 7.52 – 7.47 (m, 2H), 7.32 – 7.30 (m, 2H), 6.73 (t, *J* = 5.9 Hz, 1H), 4.05 (dt, *J* = 9.7, 5.8 Hz, 1H), 3.66 (q, *J* = 6.6 Hz, 2H), 3.55 (dt, *J* = 9.7, 5.8 Hz, 1H), 3.30 (t, *J* = 7.1 Hz, 2H), 2.96 (t, *J* = 6.9 Hz, 2H), 1.73 – 1.60 (m, 4H), 1.51 (s, 3H), 1.50 (s, 3H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 157.4, 152.8, 143.3, 141.0, 140.1, 136.4, 135.2, 133.5, 133.3 (q, *J* = 33.3 Hz), 130.0, 129.3, 128.6, 127.9, 126.4, 122.9 (q, *J* = 4.9 Hz), 121.9 (q, *J* = 274.2 Hz), 114.9, 107.9 (q, *J* = 2.0 Hz), 65.0, 61.9, 40.9, 39.5, 34.9, 26.5, 25.6, 23.25, 23.22. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -62.02 (s, 3F), -140.74 – -140.85 (m, 2F), -151.25 – -151.38 (m, 1F), -160.21 – -160.37 (m, 2F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{38}H_{30}ClF_8N_5O_6S_2$+$Na^+$: 926.1091, found: 926.1095. **IR** (neat, cm^{-1}): υ 3329, 2978, 2941, 2230, 1720, 1474, 1410, 1313, 1144, 991, 728.



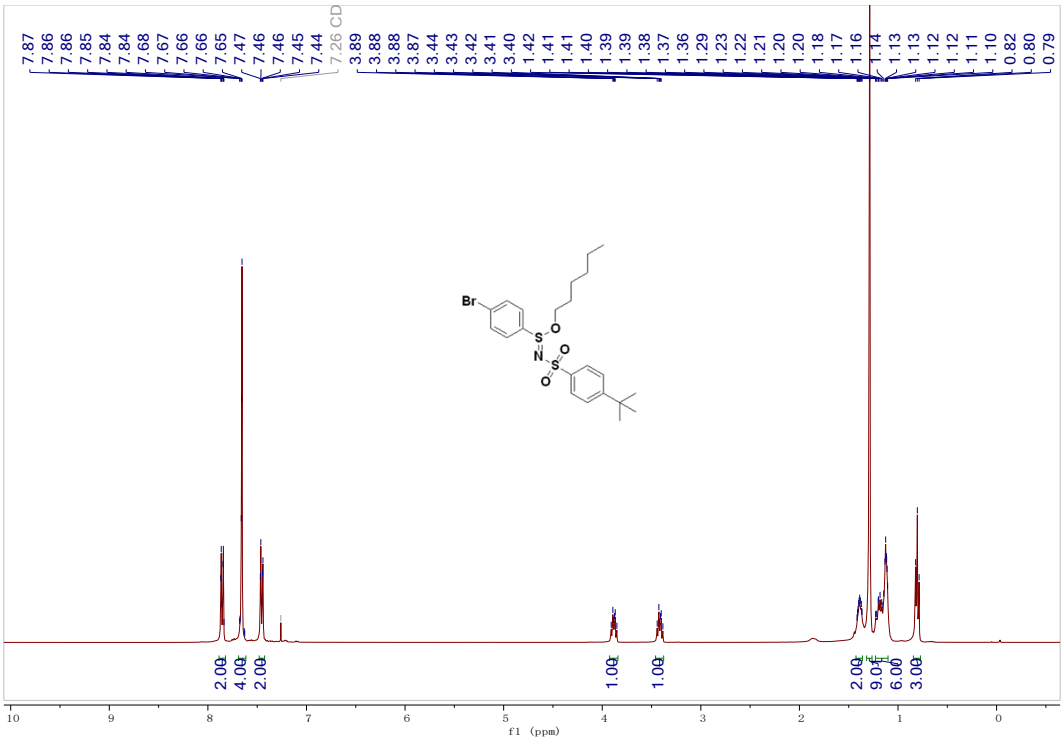
8i

petroleum ether / ethyl acetate = 5:1 – 1.5:1, a viscous waxy oil, 62% yield (105.2 mg). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.14 – 8.10 (m, 3H), 8.00 – 7.97 (m, 3H), 7.89 – 7.87 (m, 1H), 7.65 – 7.61 (m, 2H), 7.34 – 7.32 (m, 2H), 4.39 – 4.36 (m, 2H), 4.10 (dt, *J* = 9.7, 5.8 Hz, 1H), 3.92 – 3.90 (m, 2H), 3.57 (dt, *J* = 9.7, 5.6 Hz, 1H), 3.33 (t, *J* = 7.2 Hz, 2H), 2.40 (s, 3H), 1.75 – 1.64 (m, 4H), 1.52 (s, 3H), 1.51 (s,

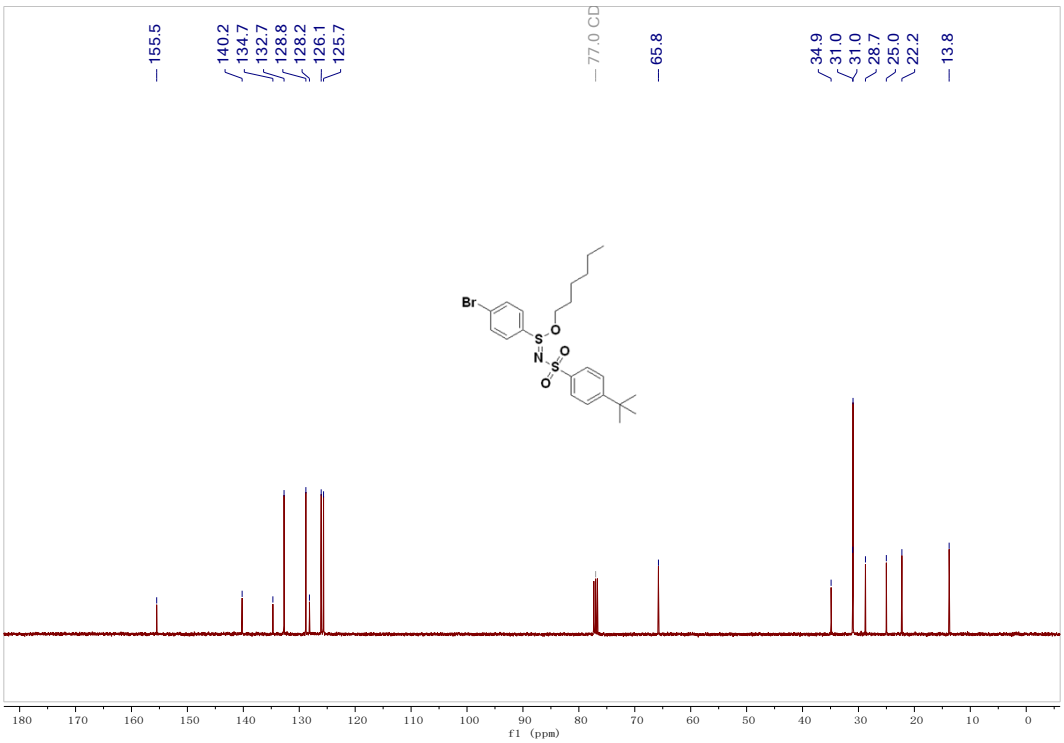
3H), 0.85 (s, 9H), 0.04 (s, 6H). **^{13}C NMR** (100 MHz, Chloroform-*d*) δ 174.5, 165.2, 152.8, 147.1, 144.6, 136.4, 135.1, 133.3 (q, *J* = 33.3 Hz), 133.2, 131.6, 130.4, 130.0, 127.9, 127.1, 126.3, 122.9 (q, *J* = 4.8 Hz), 121.9 (q, *J* = 274.2 Hz), 115.0, 108.0 (q, *J* = 2.0 Hz), 66.6, 64.4, 61.9, 61.0, 39.5, 26.5, 25.7, 23.28, 23.26, 21.4, 18.2, -5.4. **^{19}F NMR** (376 MHz, Chloroform-*d*) δ -61.97 (s, 3F). **HRMS** (ESI-TOF): Anal Calcd. For. $C_{39}H_{47}F_3N_4O_8S_2Si+Na^+$: 871.2449, found: 871.2443. **IR** (neat, cm^{-1}): υ 2988, 2939, 2256, 2233, 1720, 1410, 1313, 1159, 1141, 1070, 1053, 995, 832, 729.

NMR Spectra

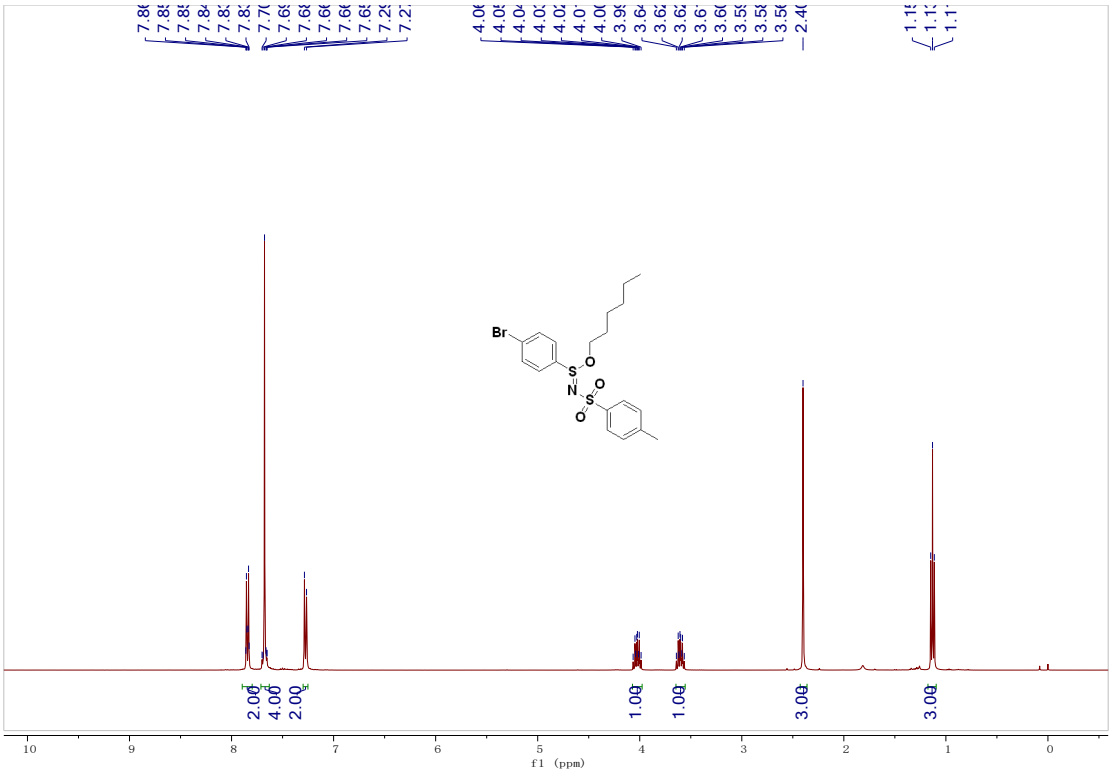
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4a**



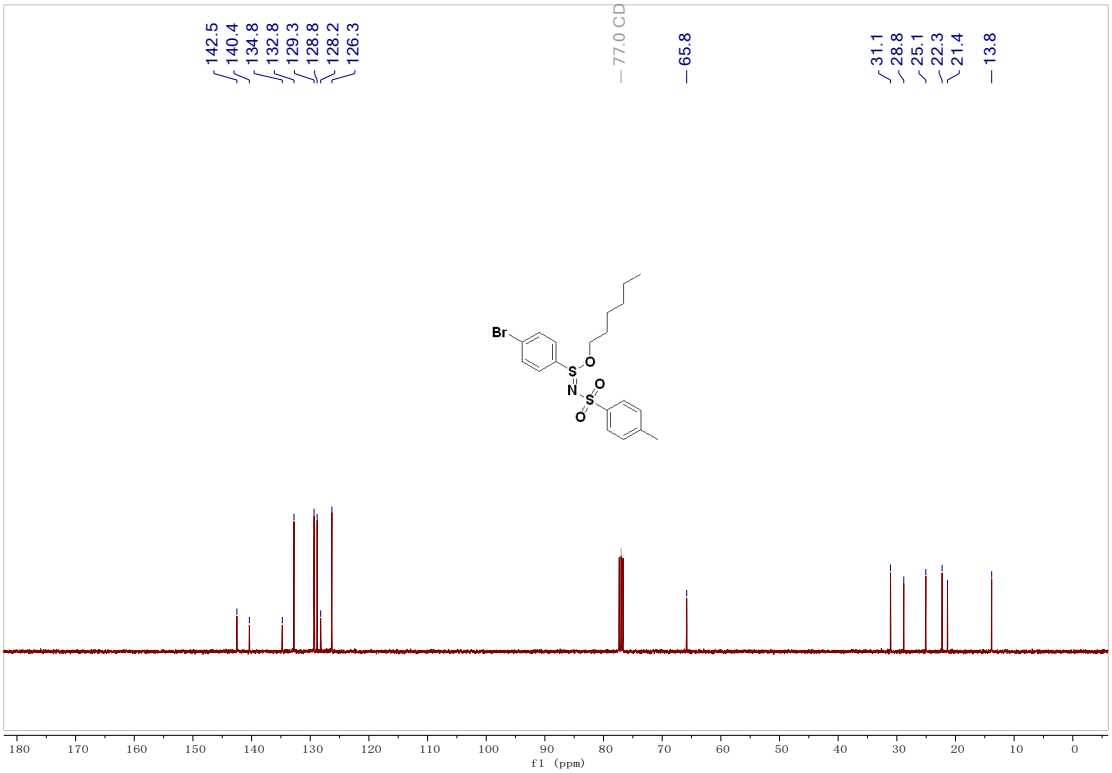
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4a**



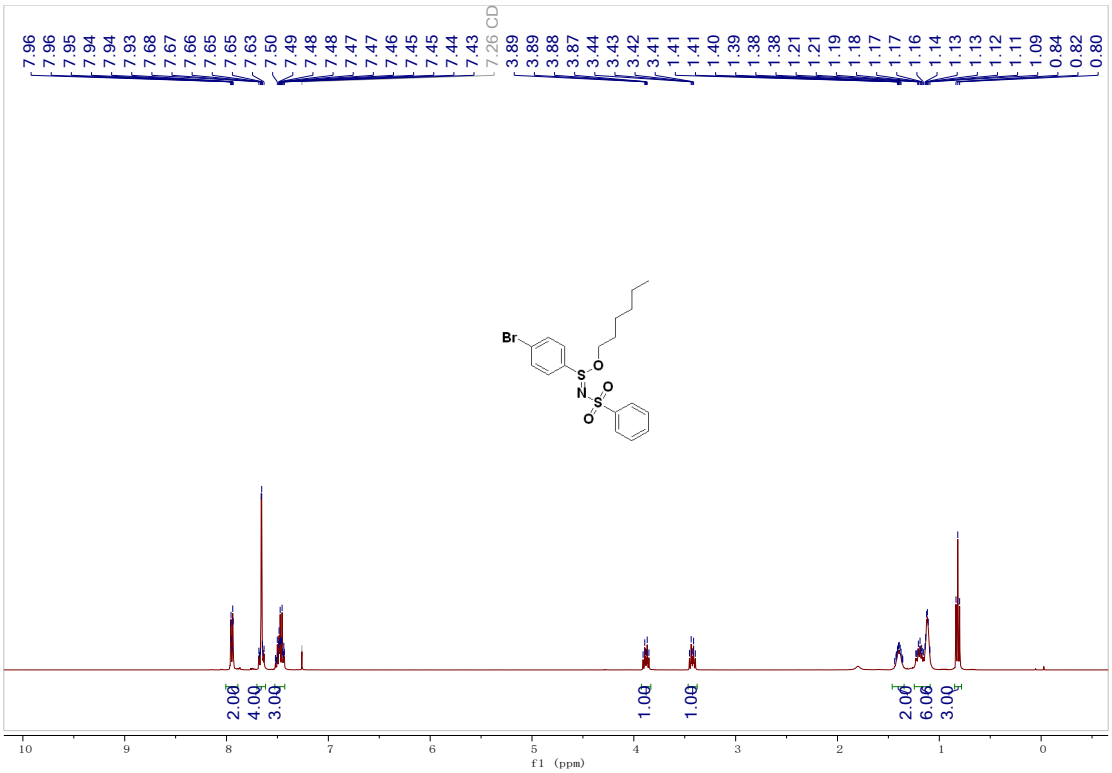
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4b**



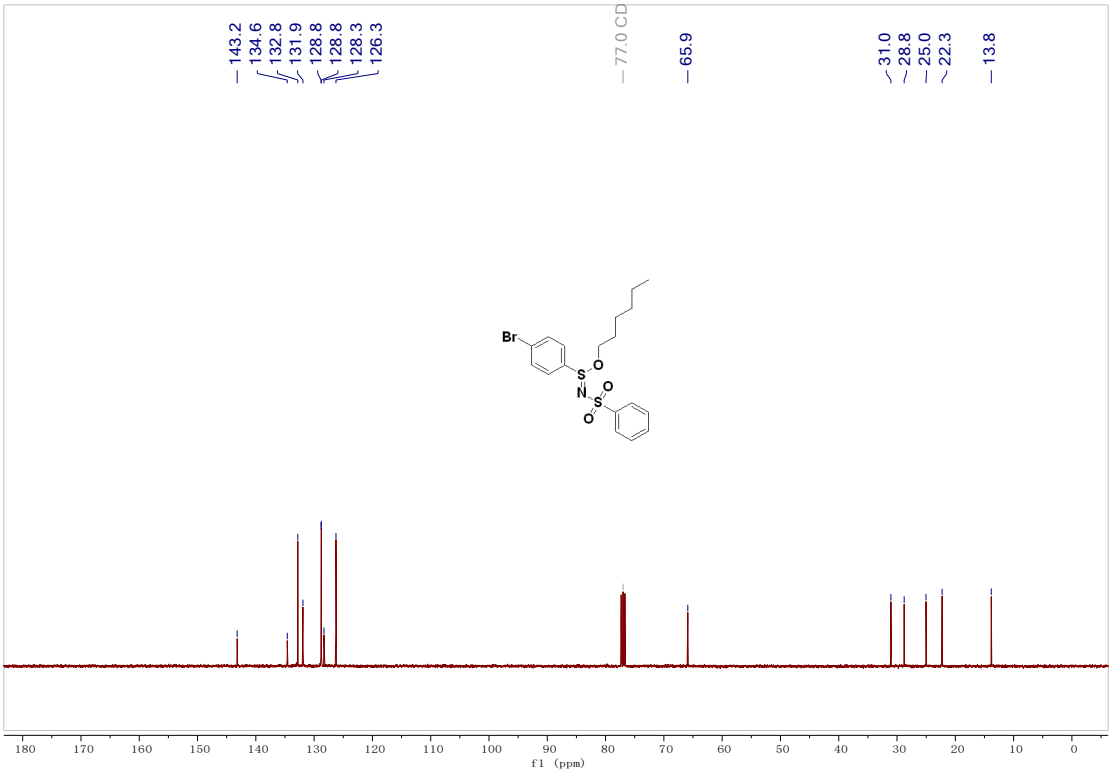
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4b**



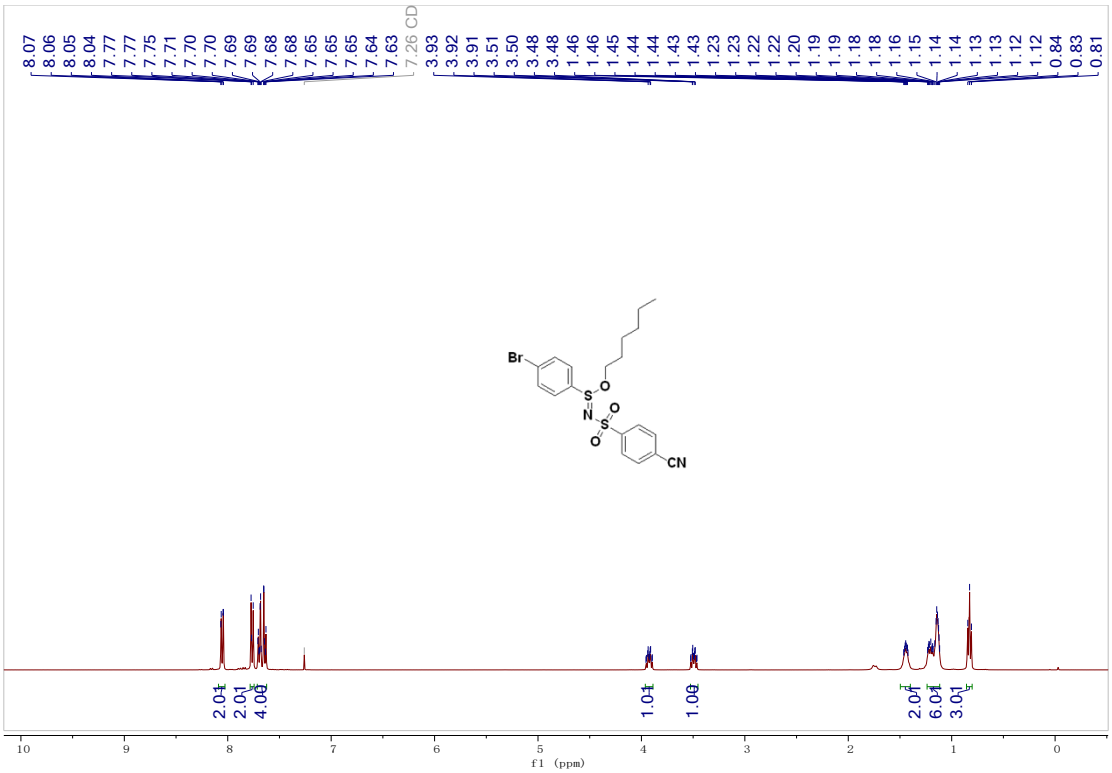
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4c**



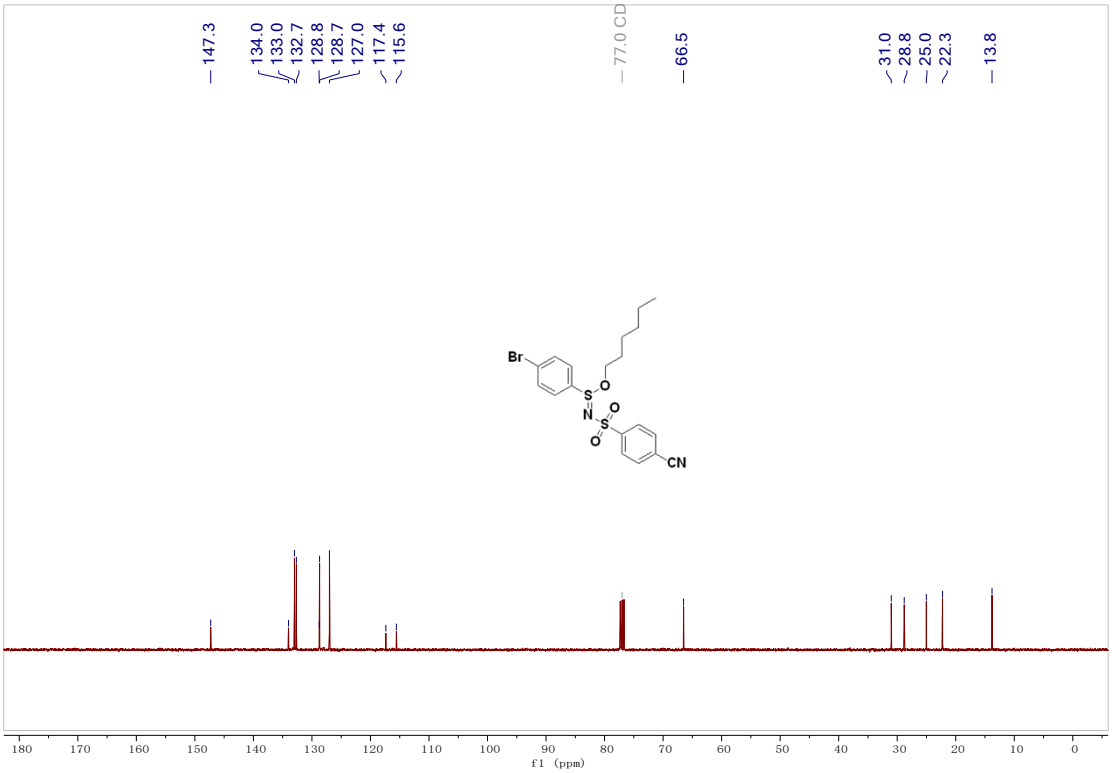
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4c**



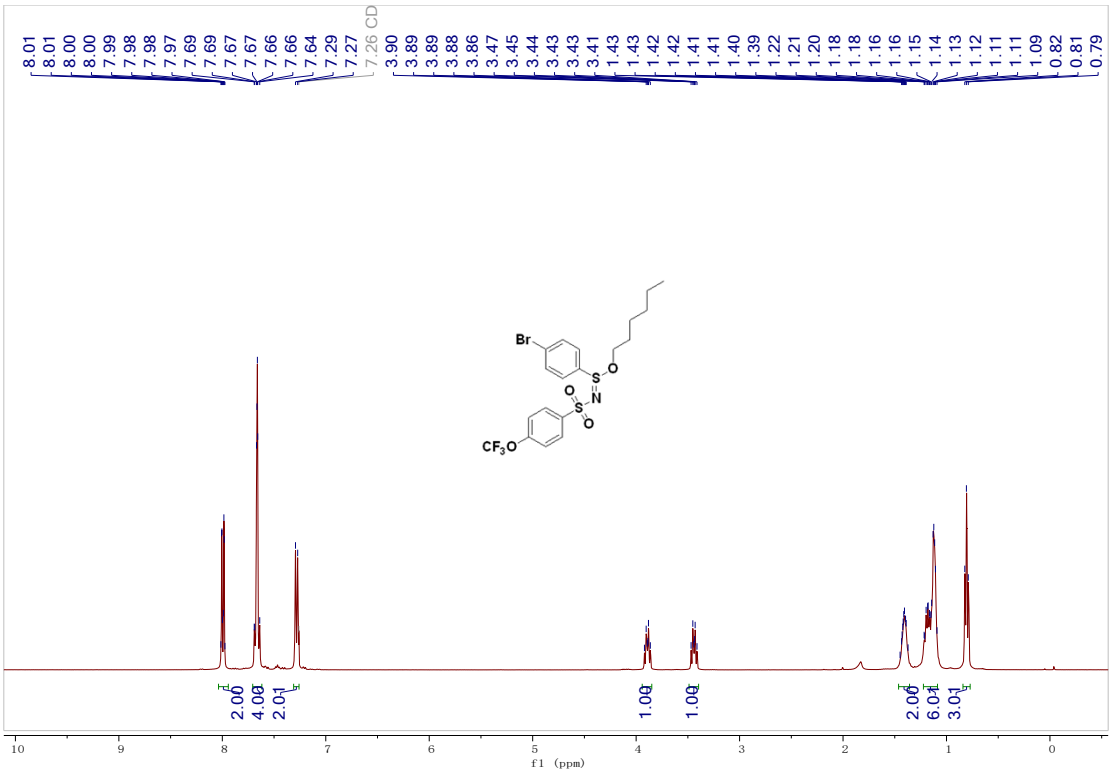
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4d**



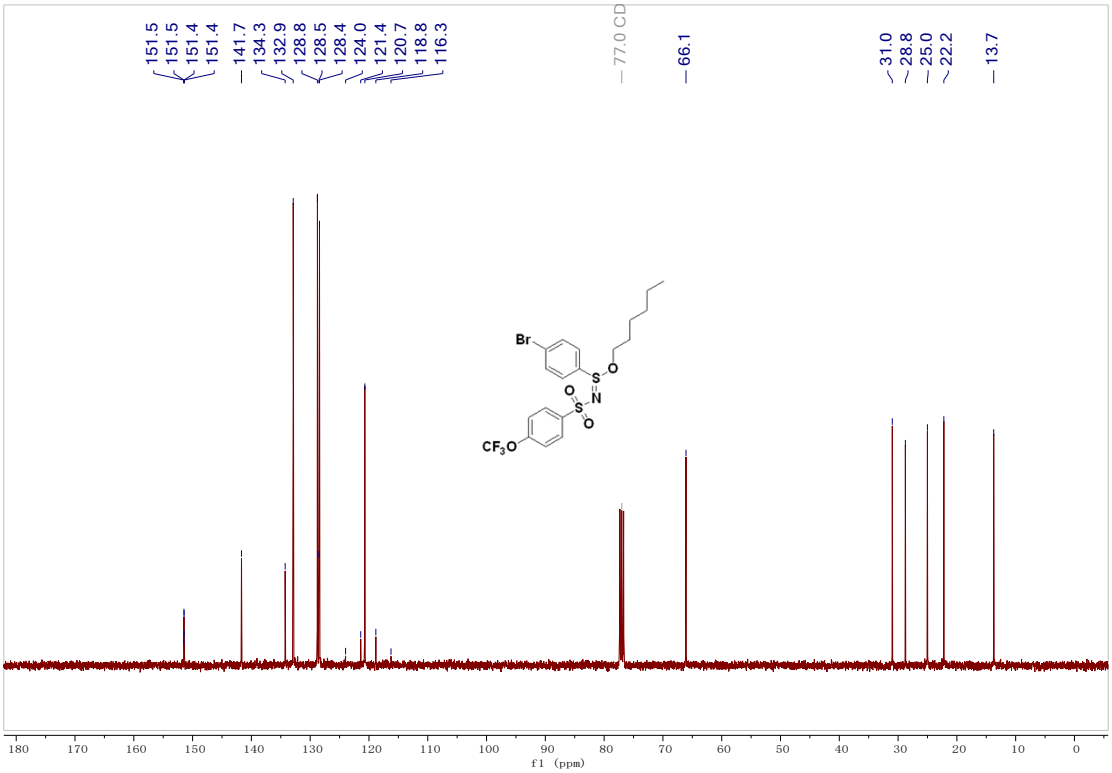
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4d**



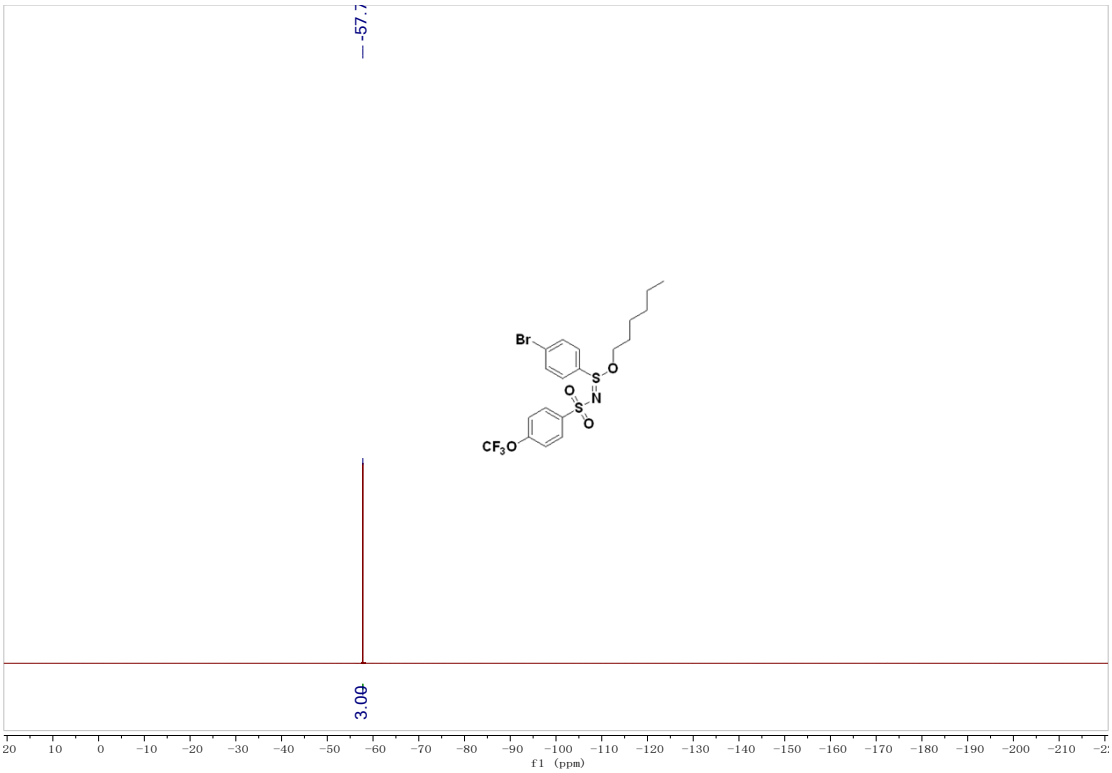
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4e**



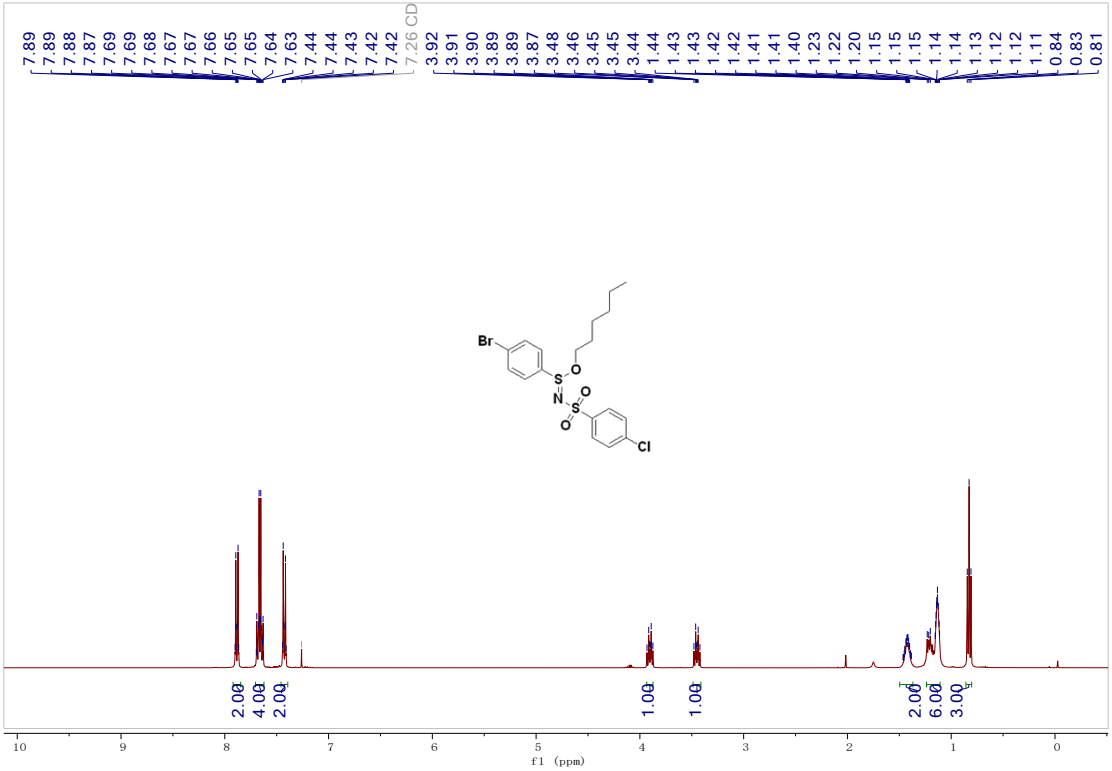
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4e**



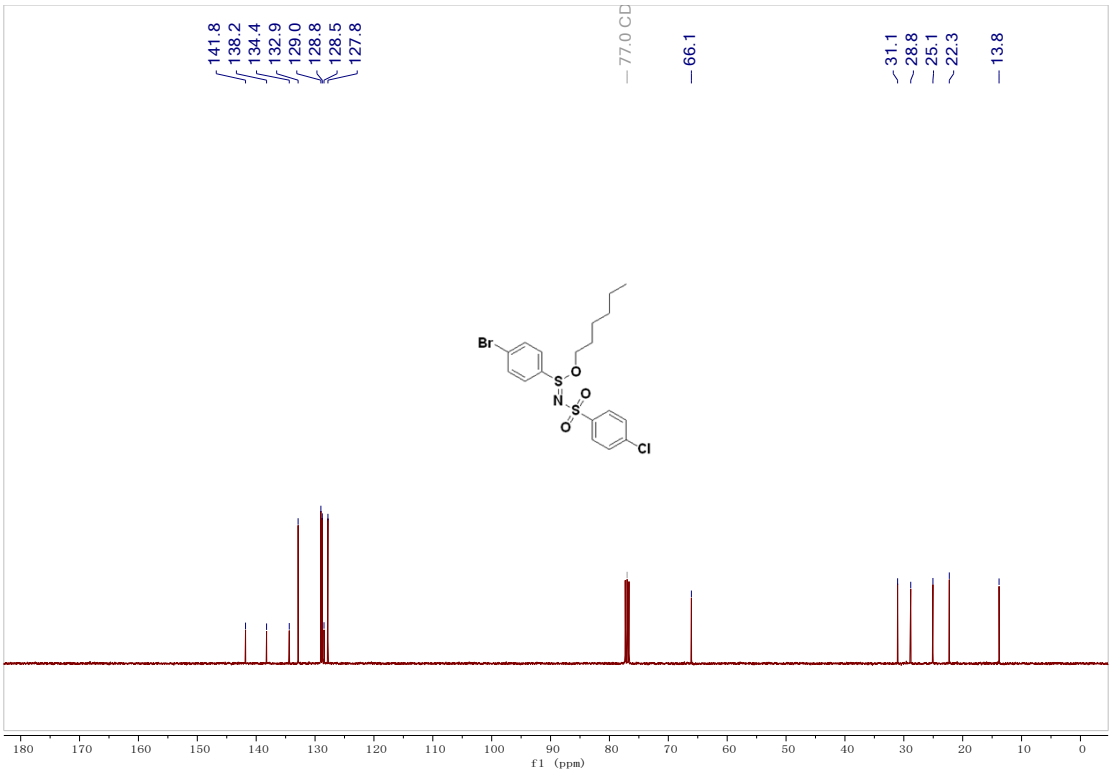
^{19}F NMR (376 MHz, Chloroform-d) of compound **4e**



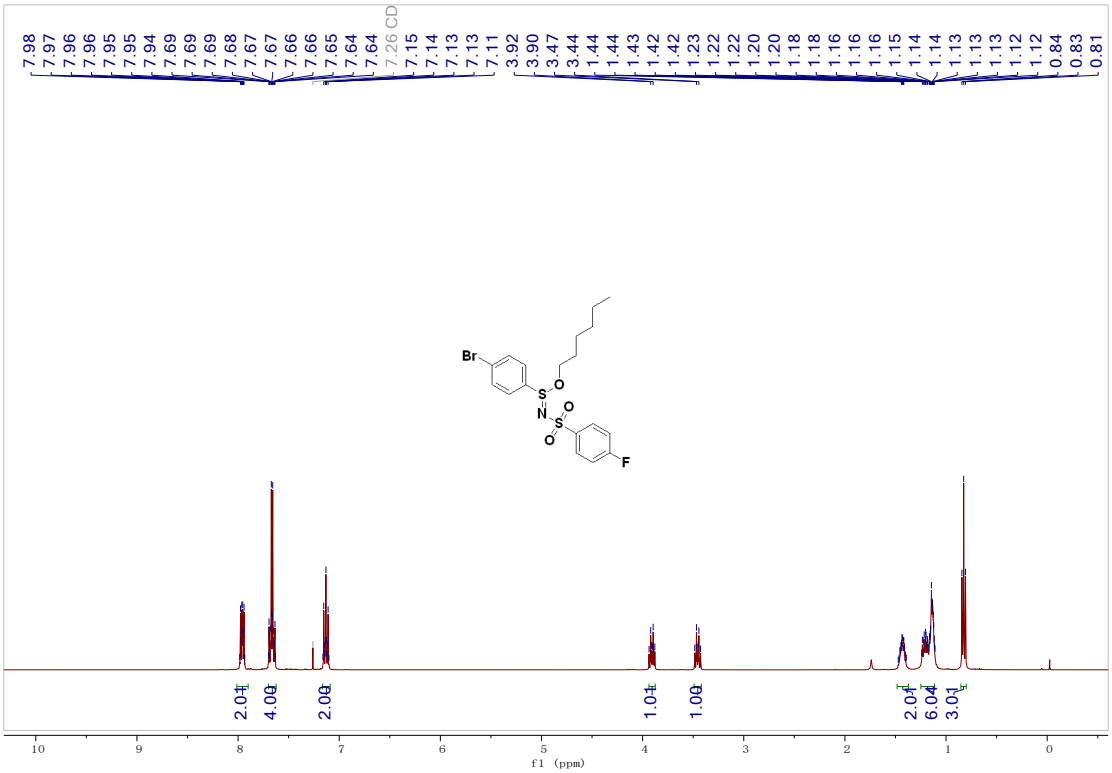
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4f**



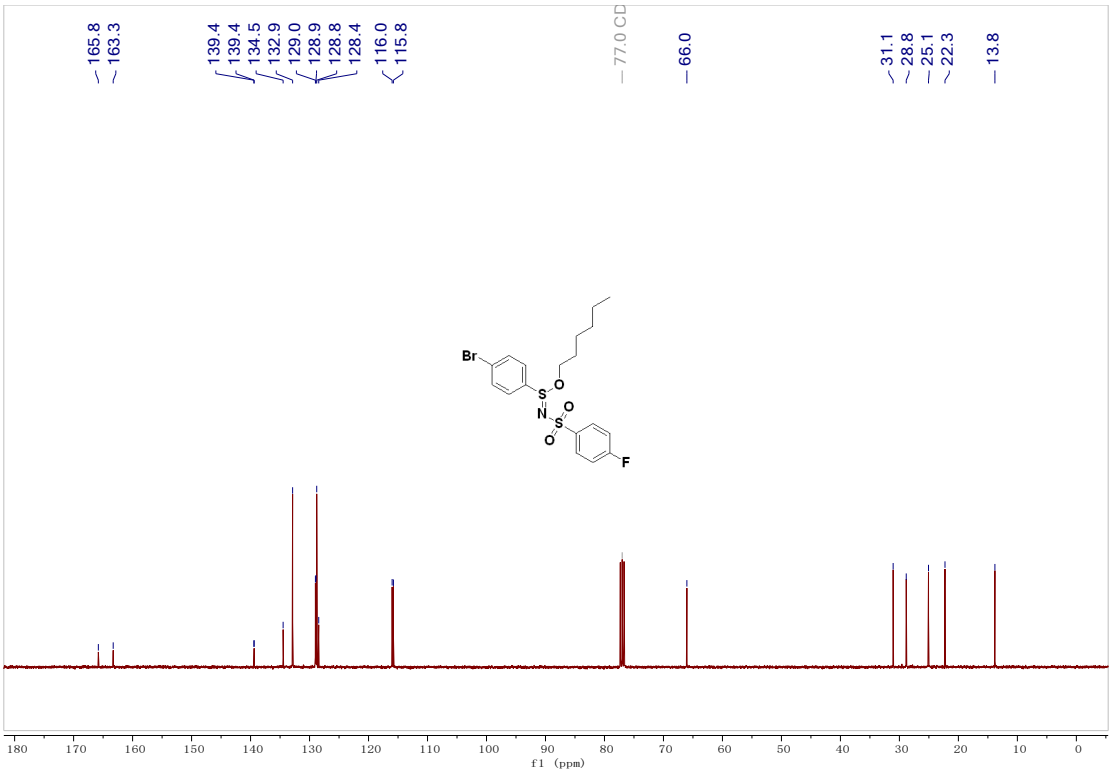
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4f**



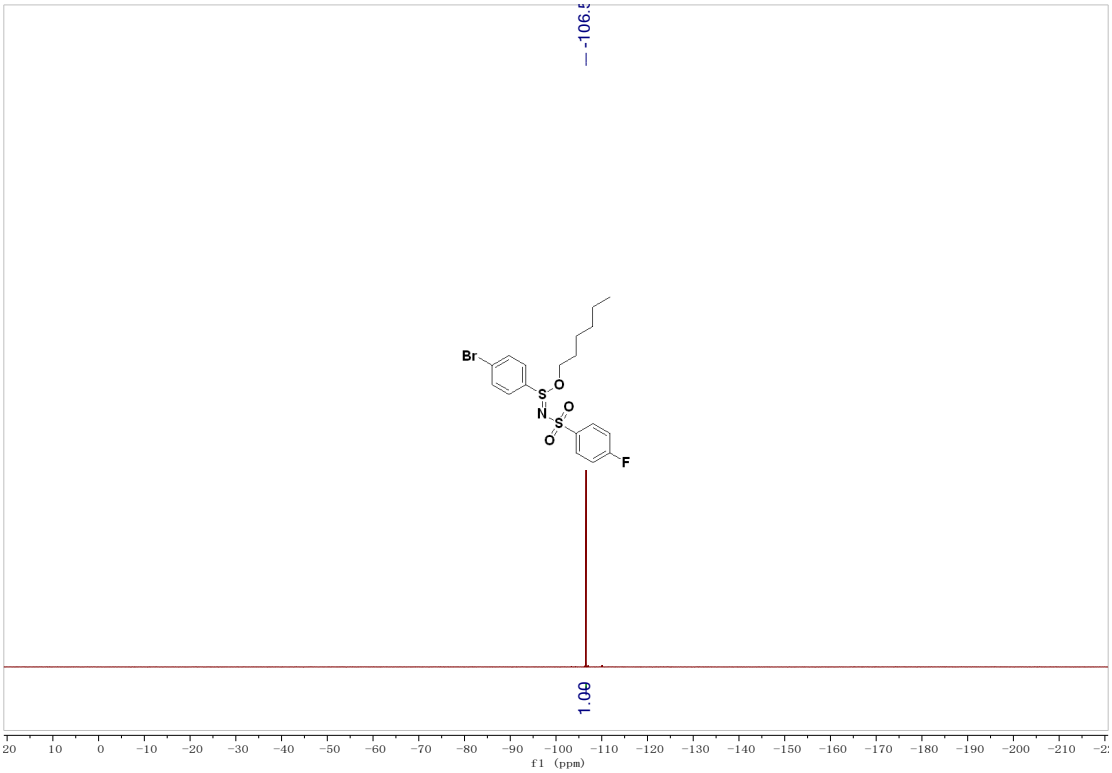
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4g**



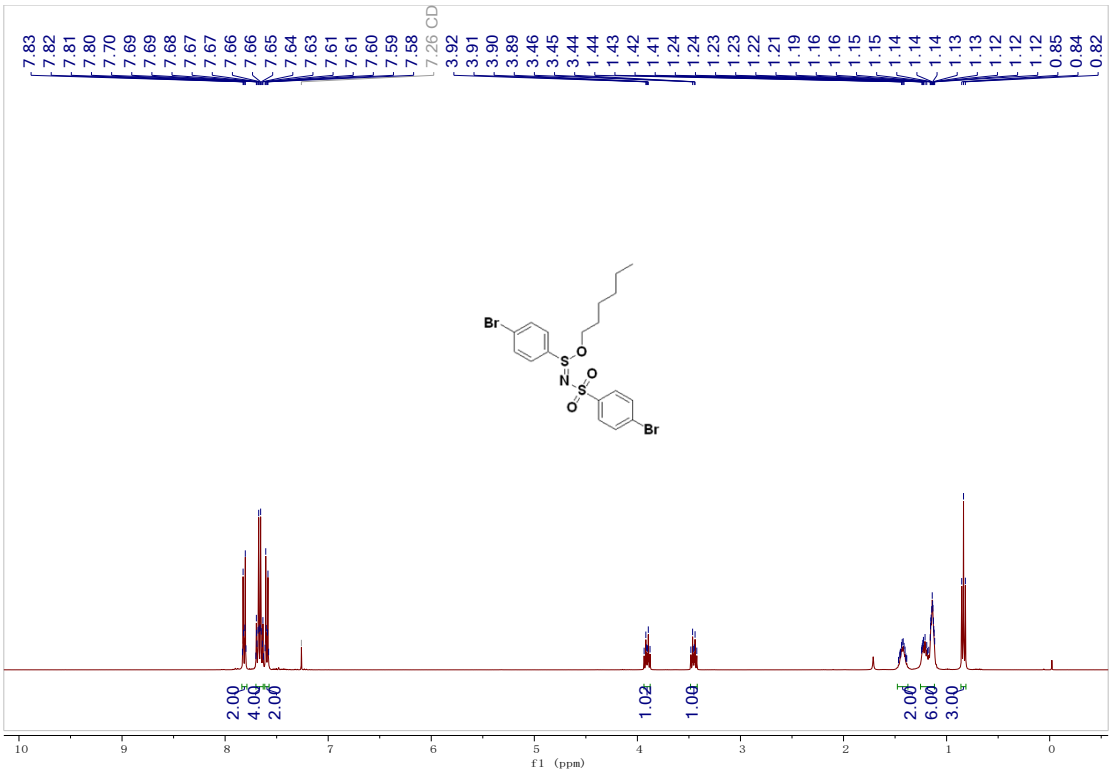
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4g**



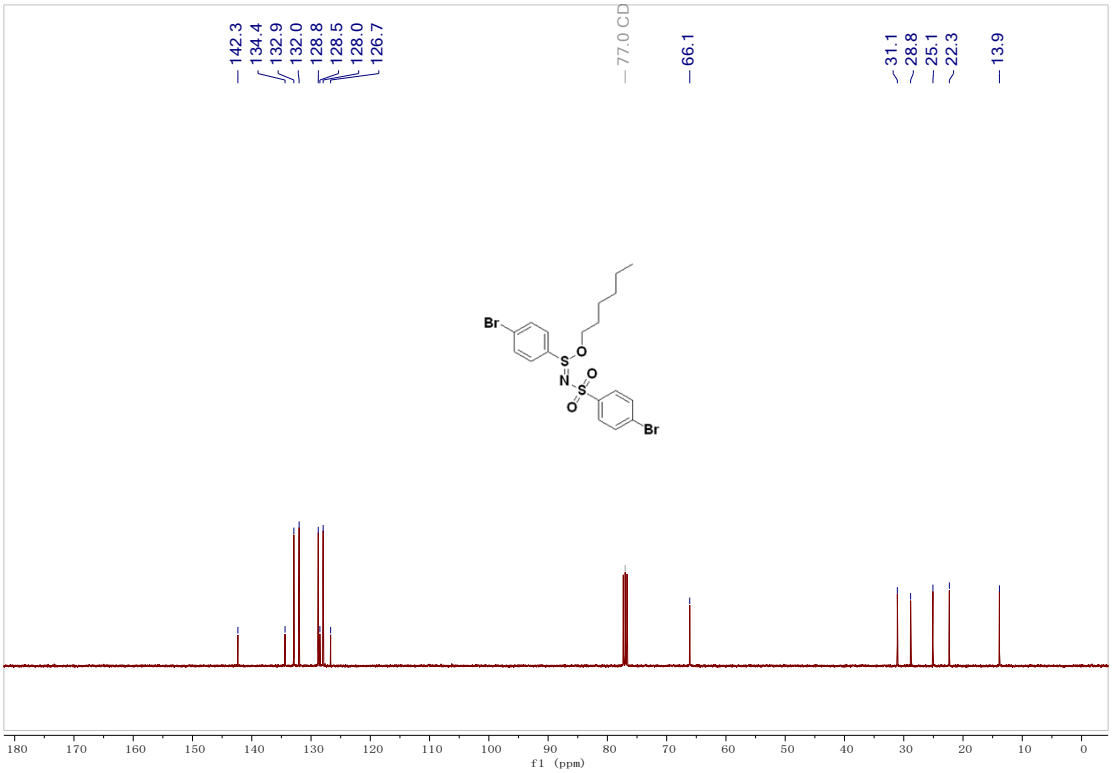
^{19}F NMR (376 MHz, Chloroform-d) of compound **4g**



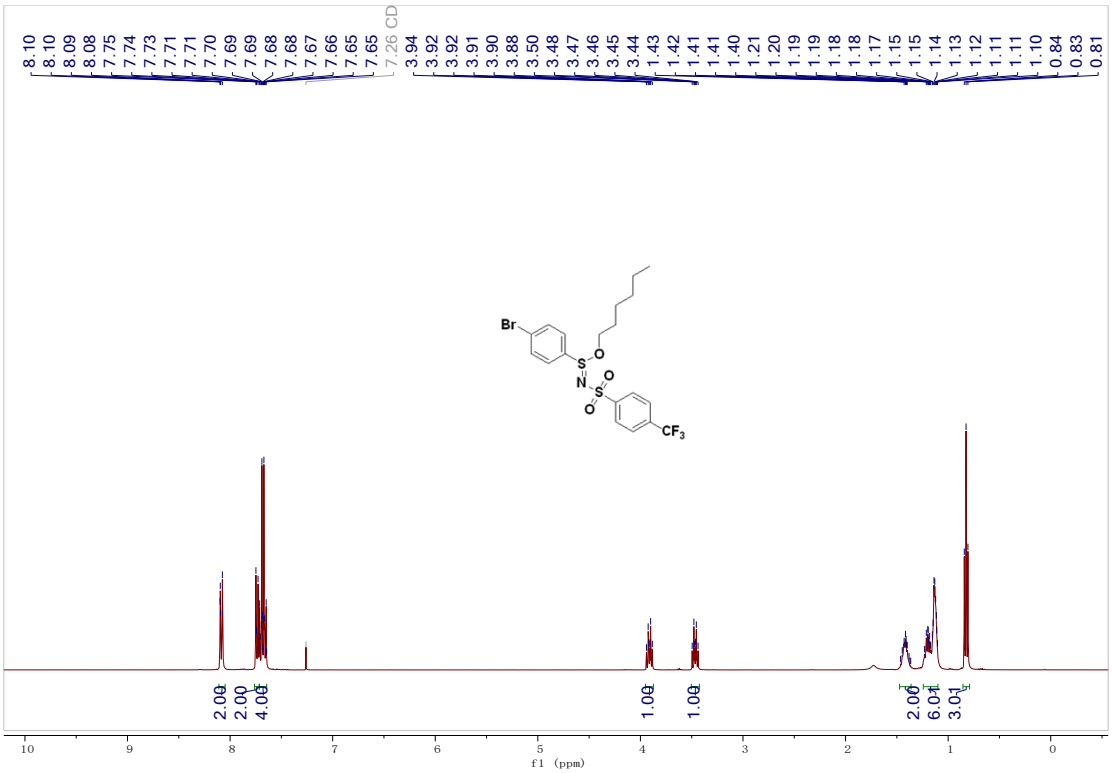
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4h**



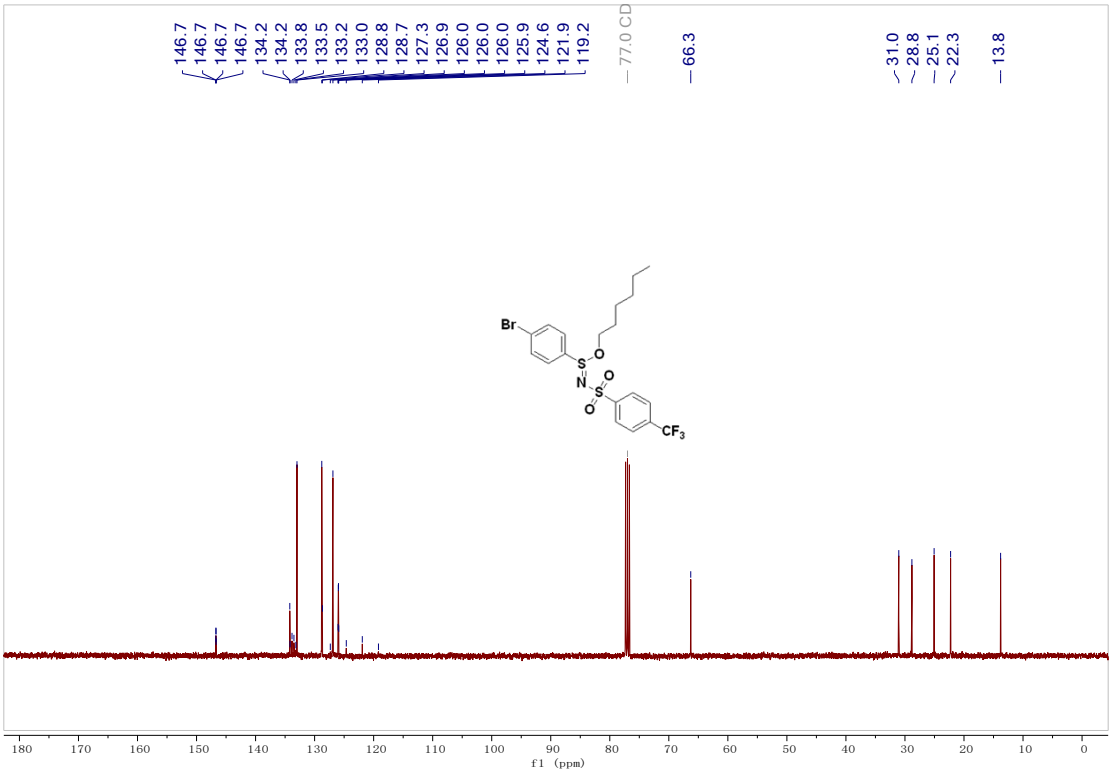
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4h**



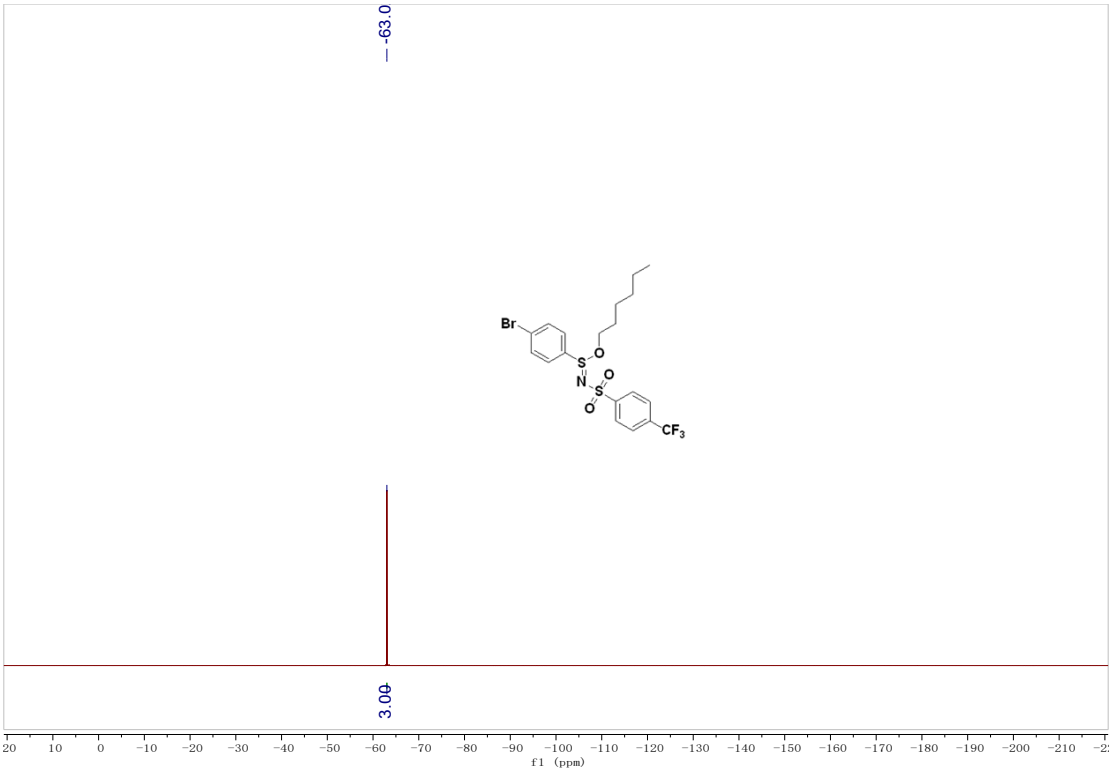
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4i**



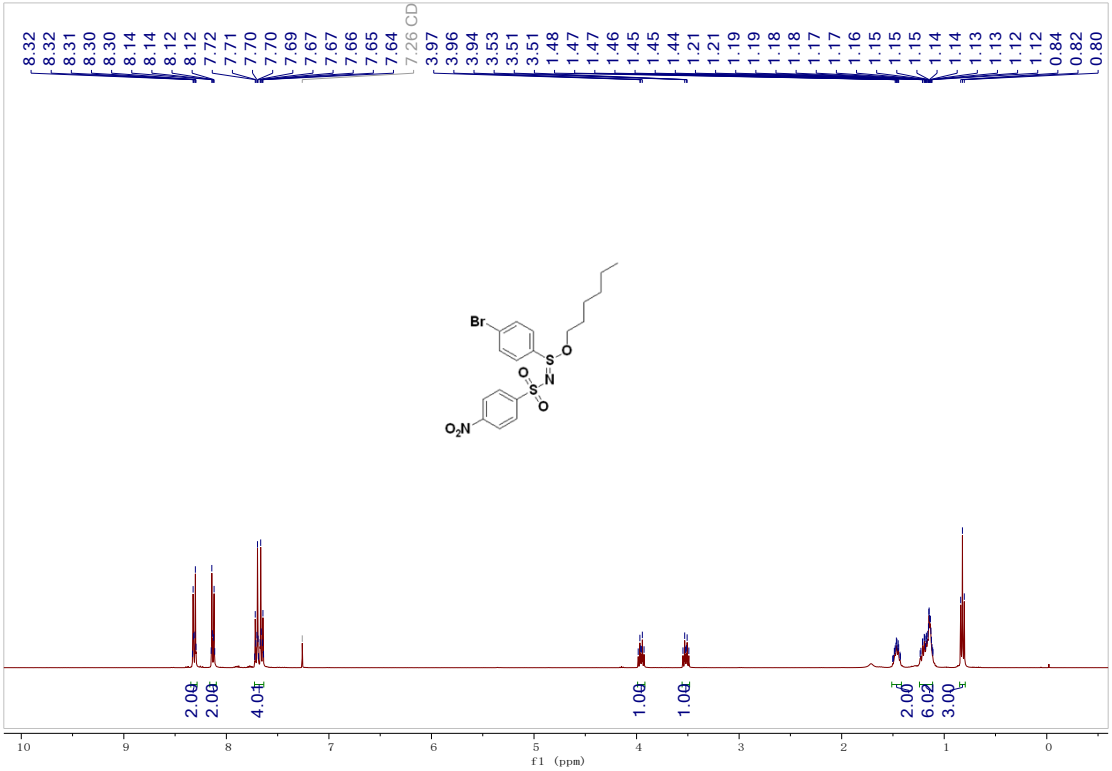
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4i**



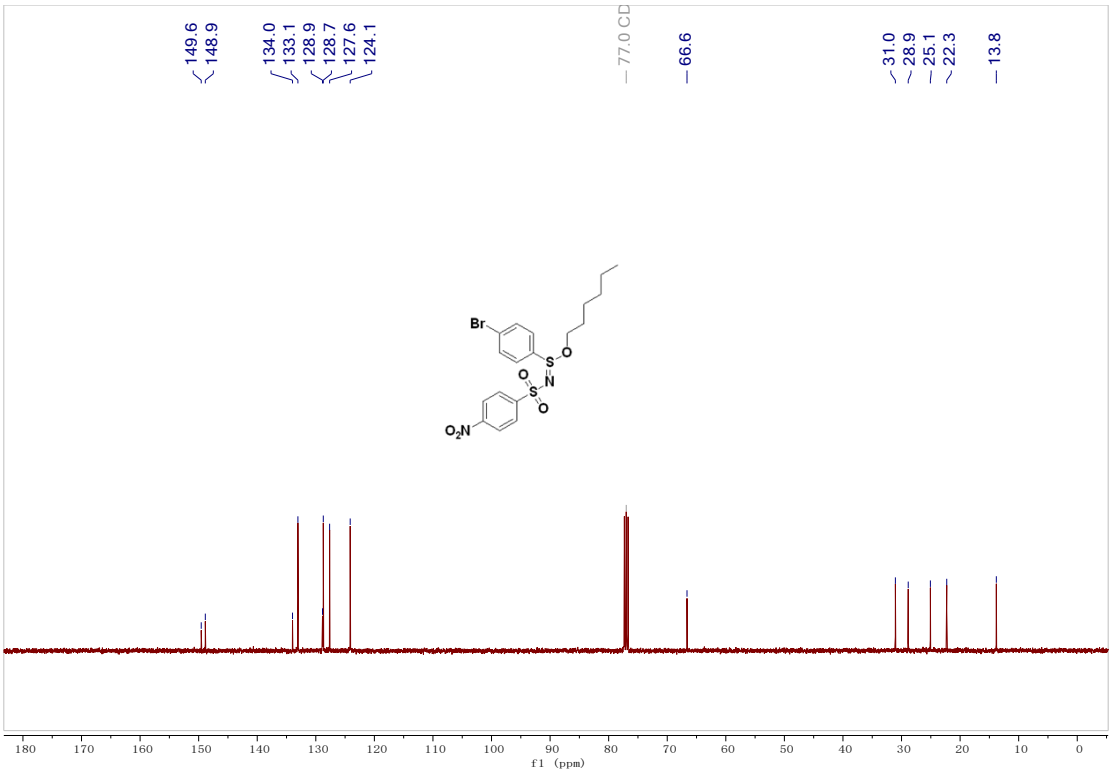
^{19}F NMR (376 MHz, Chloroform-d) of compound **4i**



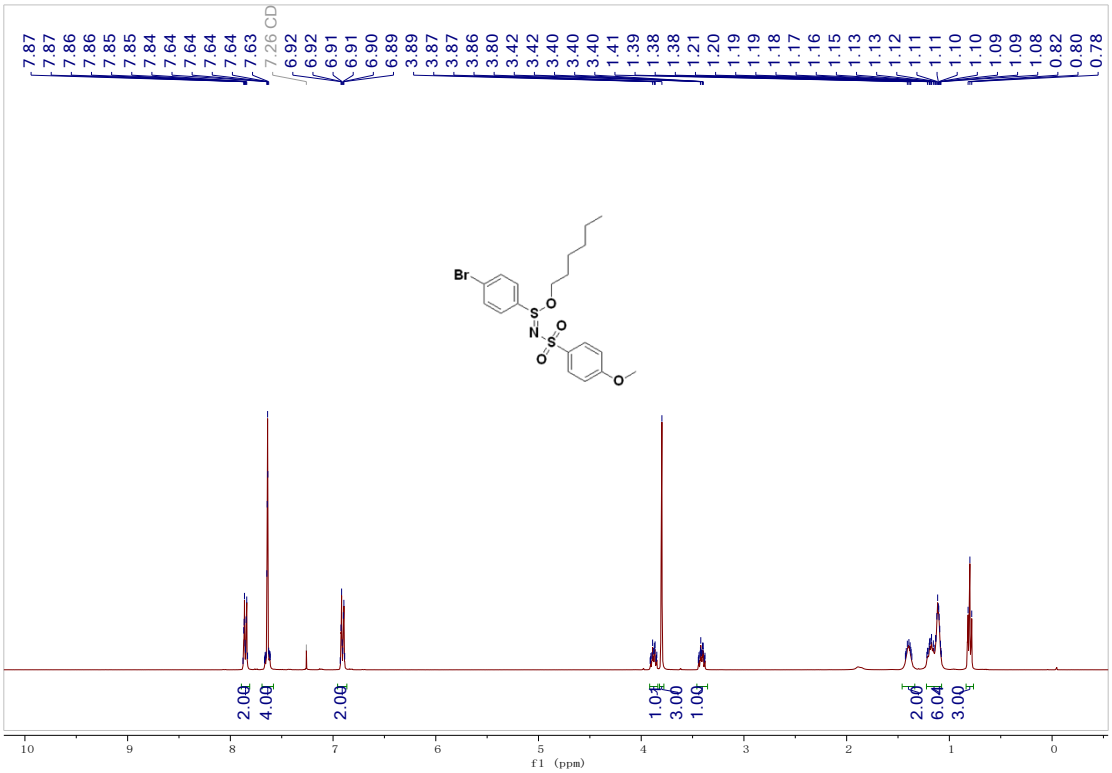
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4j**



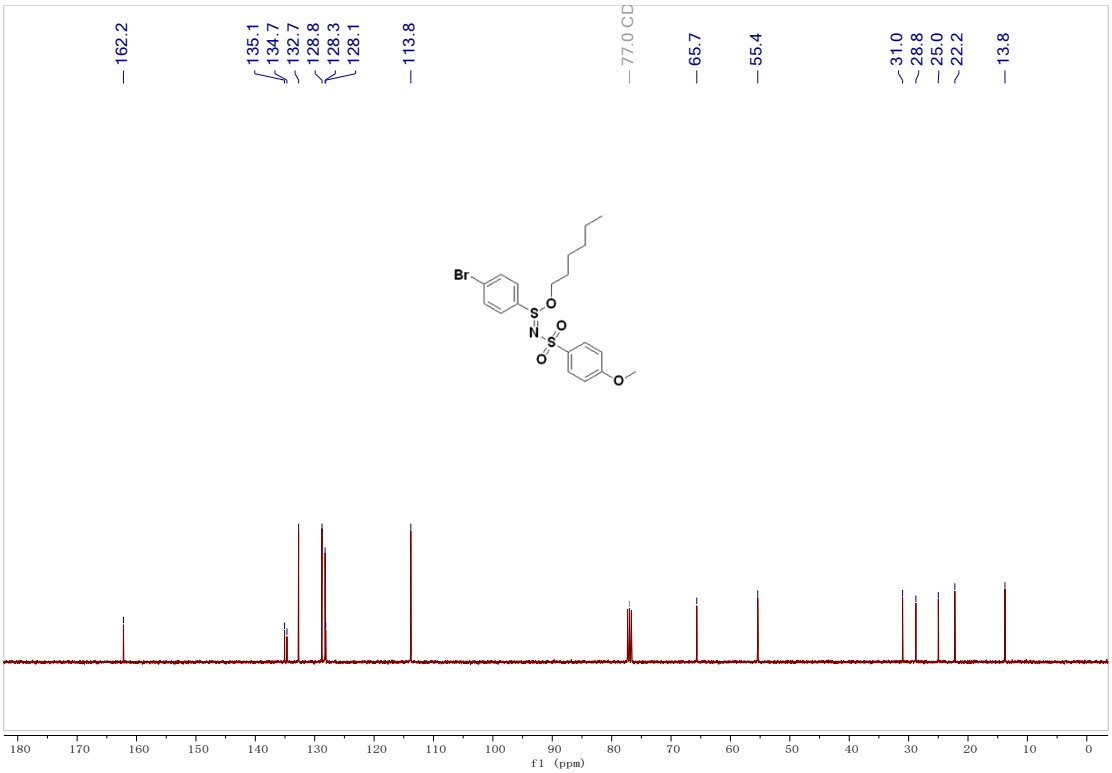
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4j**



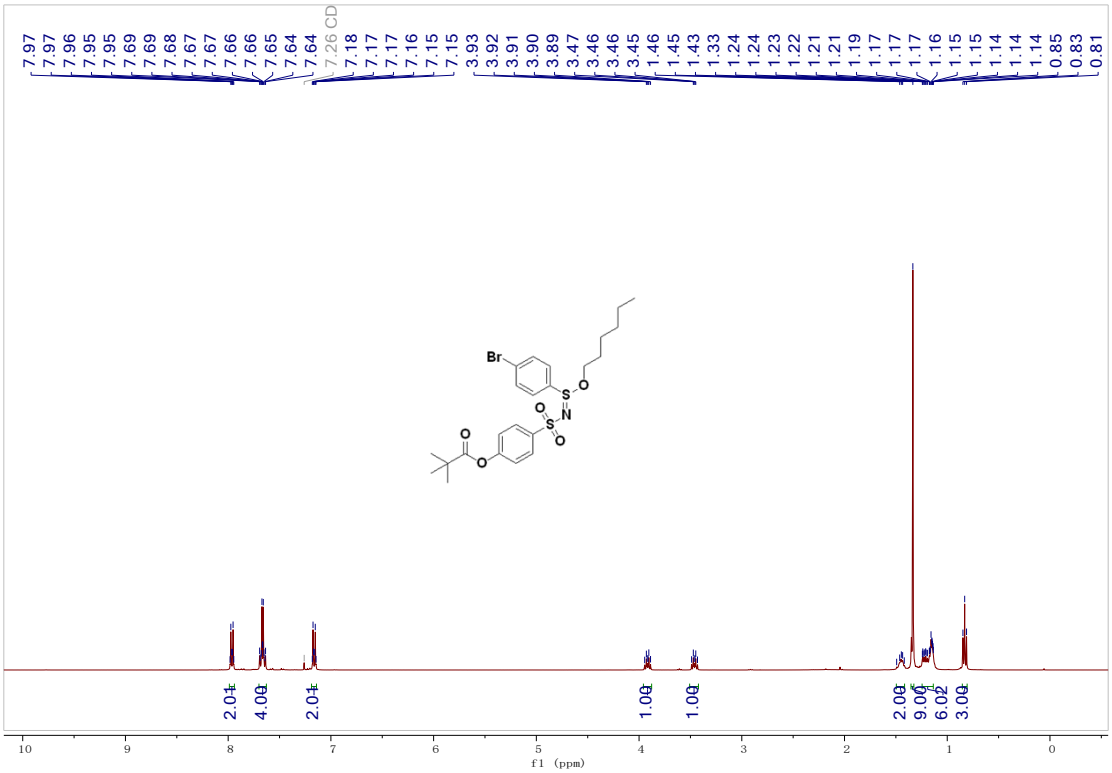
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4k**



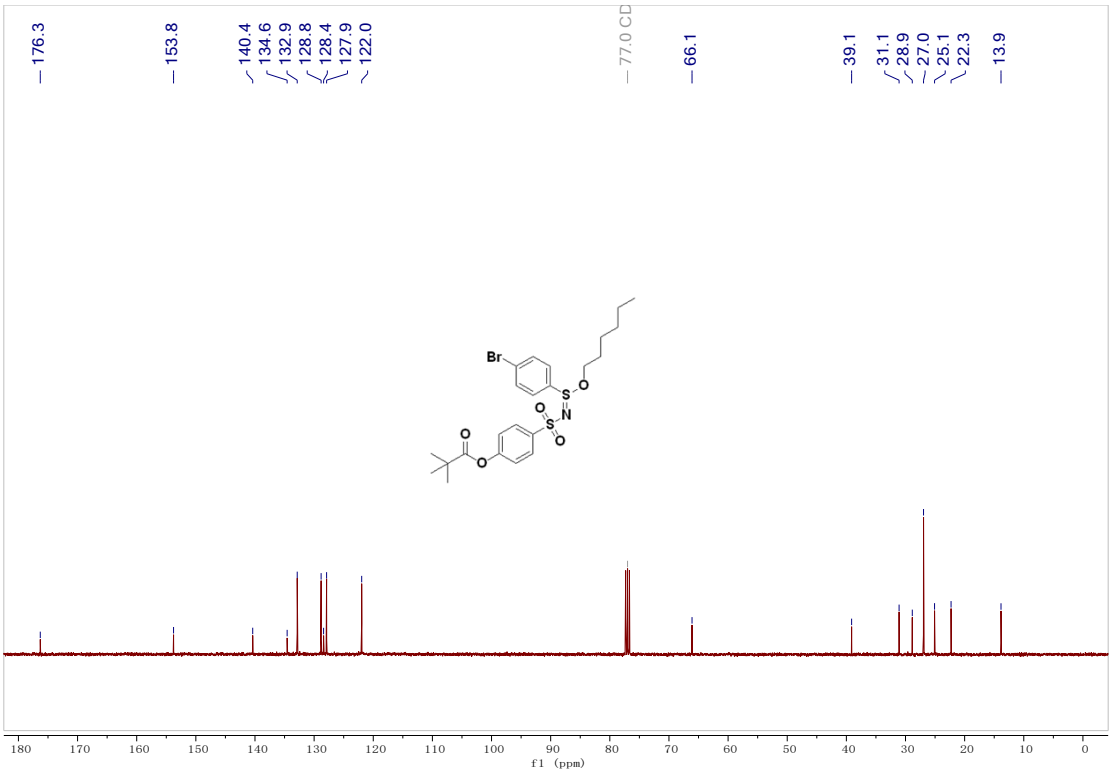
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4k**



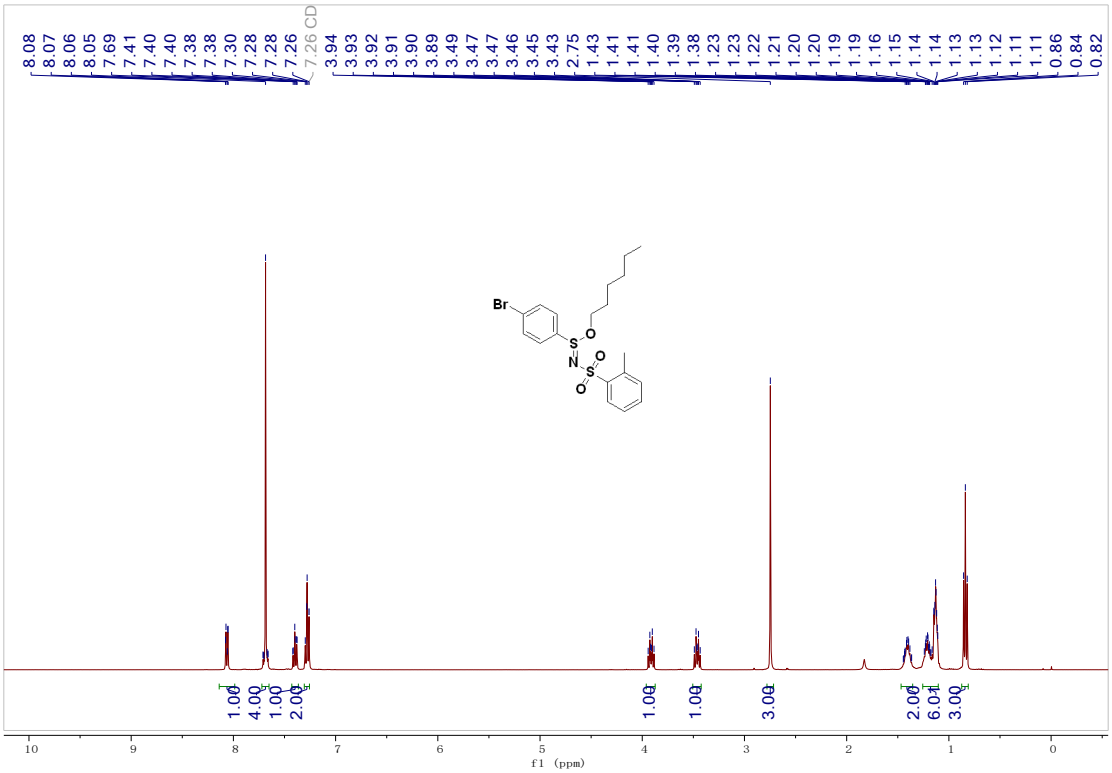
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4l**



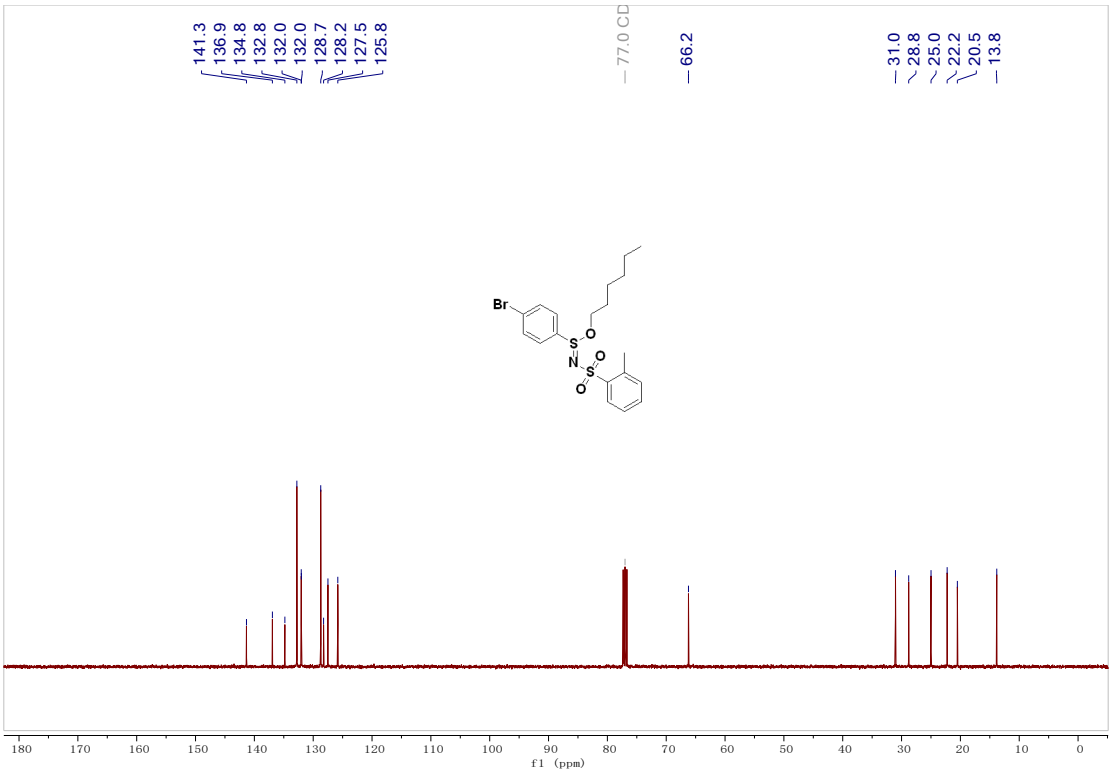
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4l**



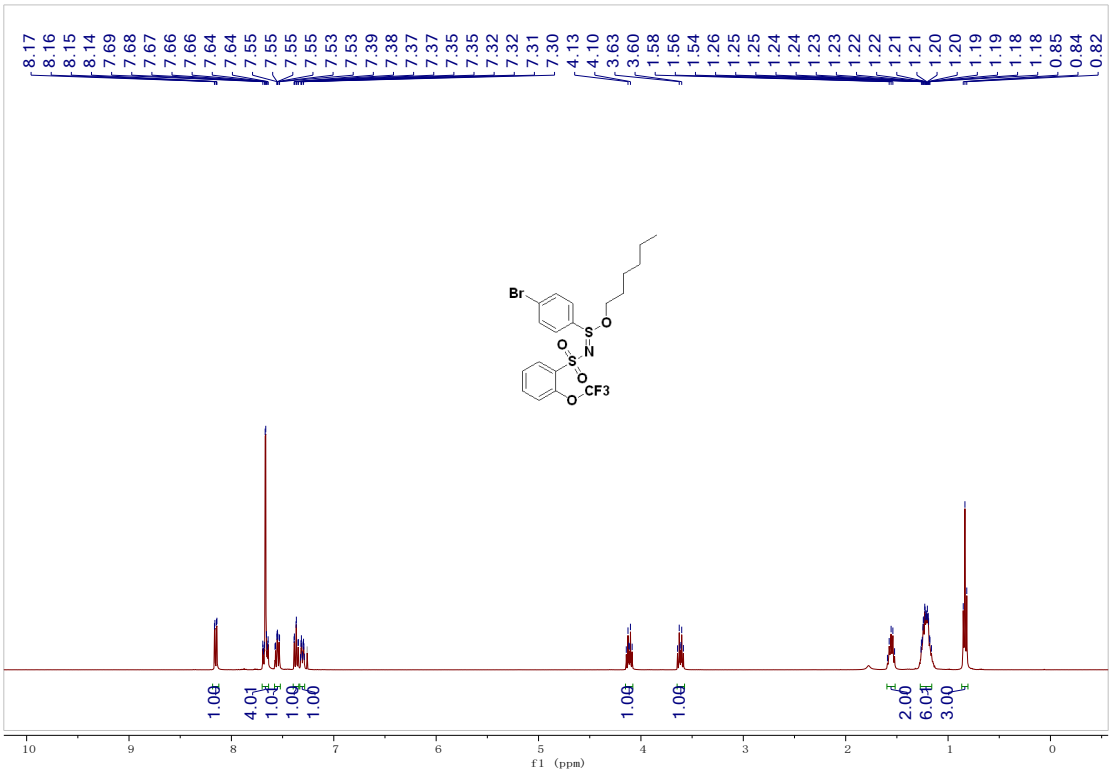
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4m**



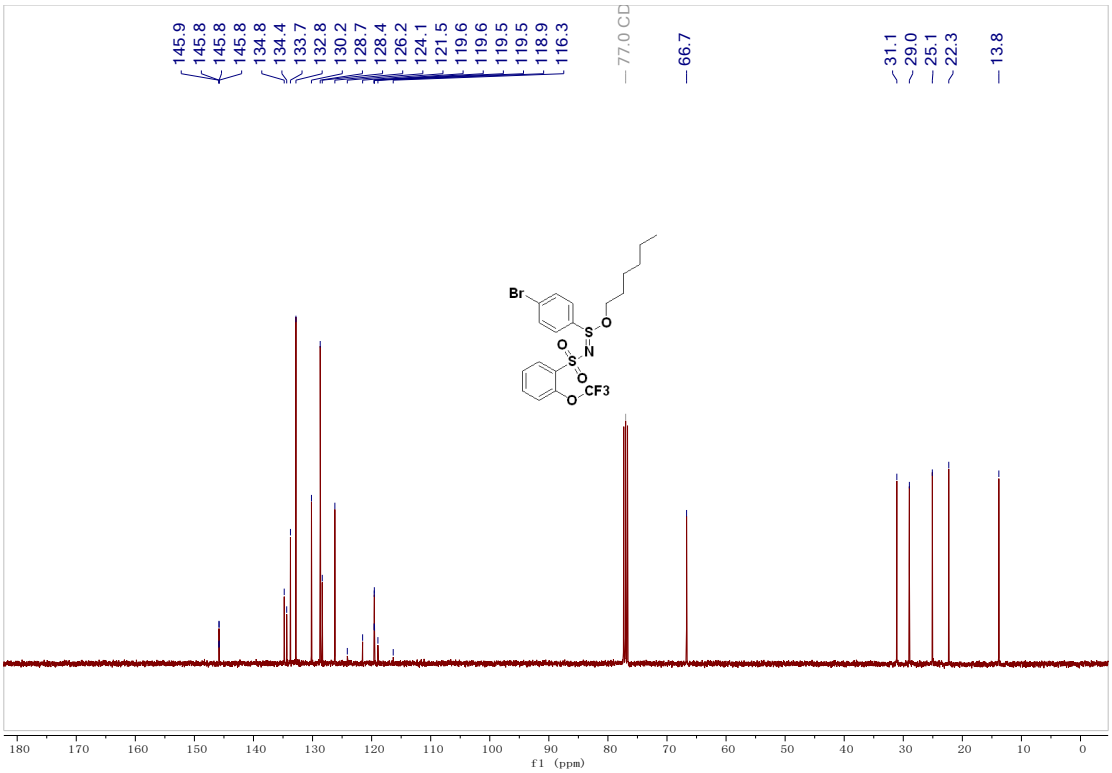
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4m**



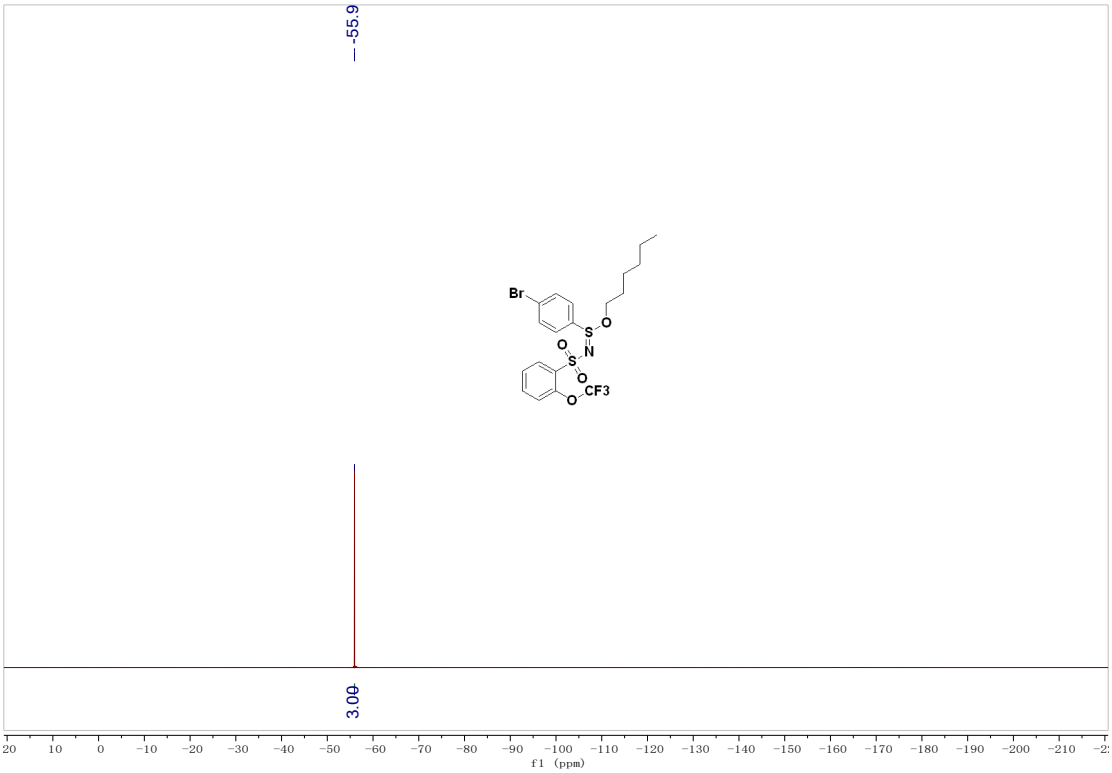
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4n**



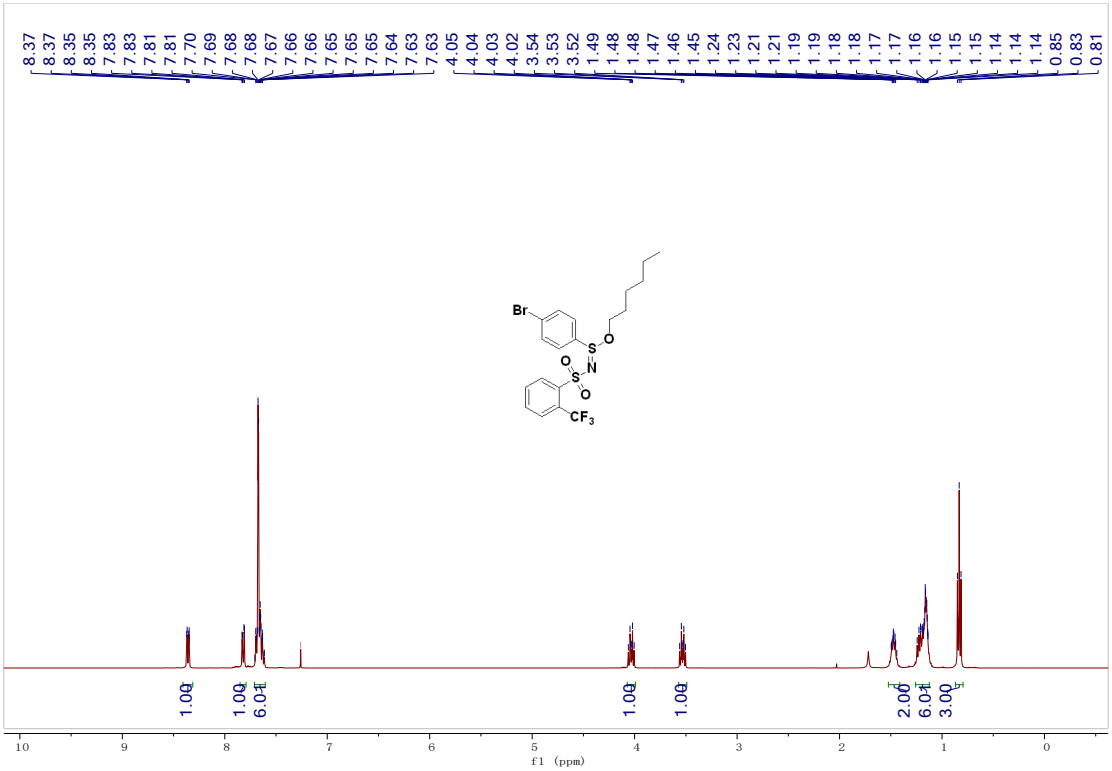
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4n**



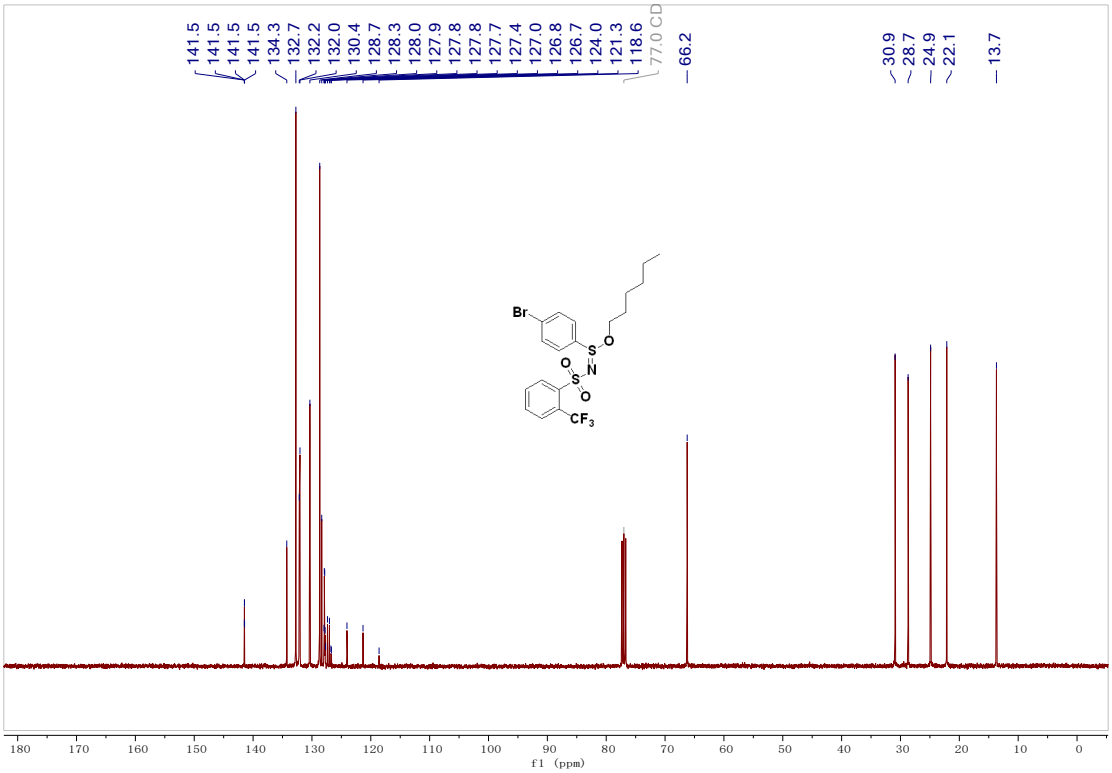
^{19}F NMR (376 MHz, Chloroform-d) of compound **4n**



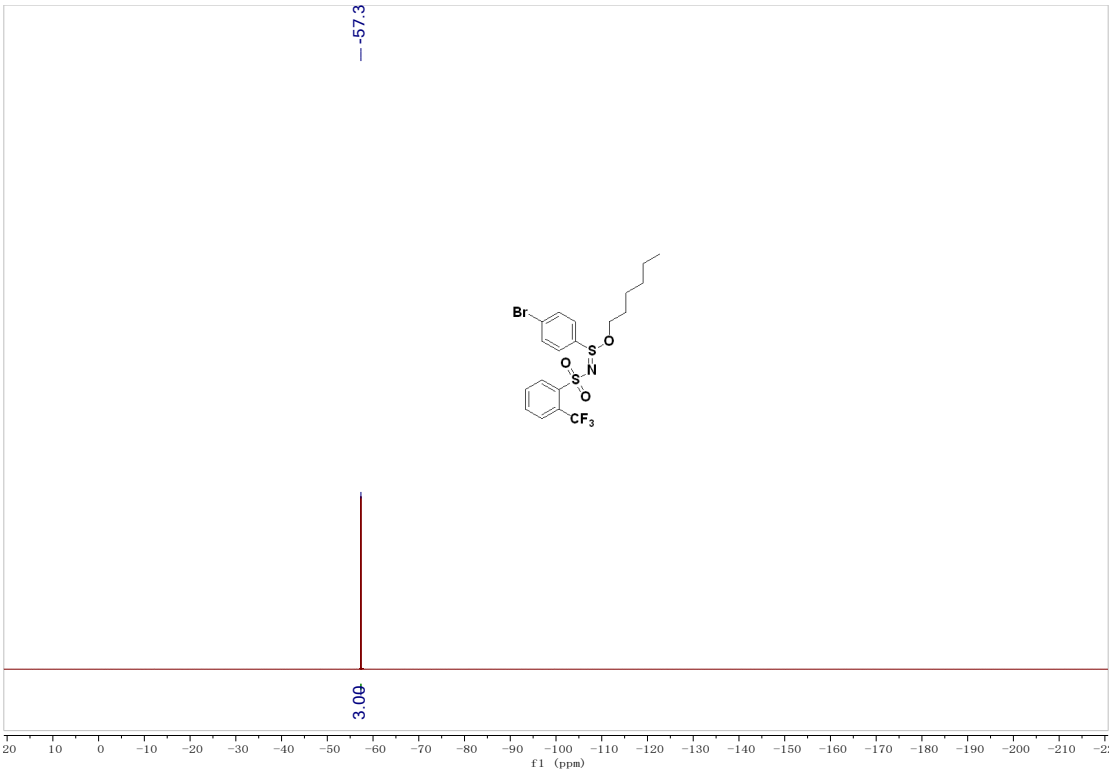
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4o**



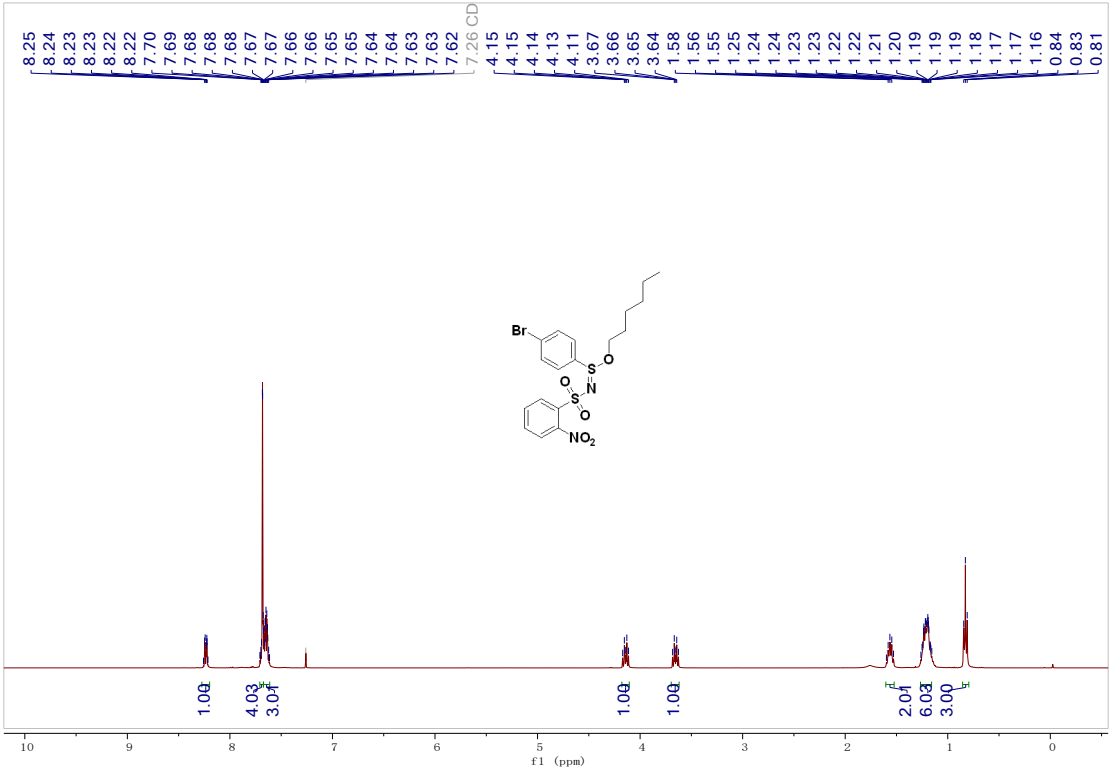
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4o**



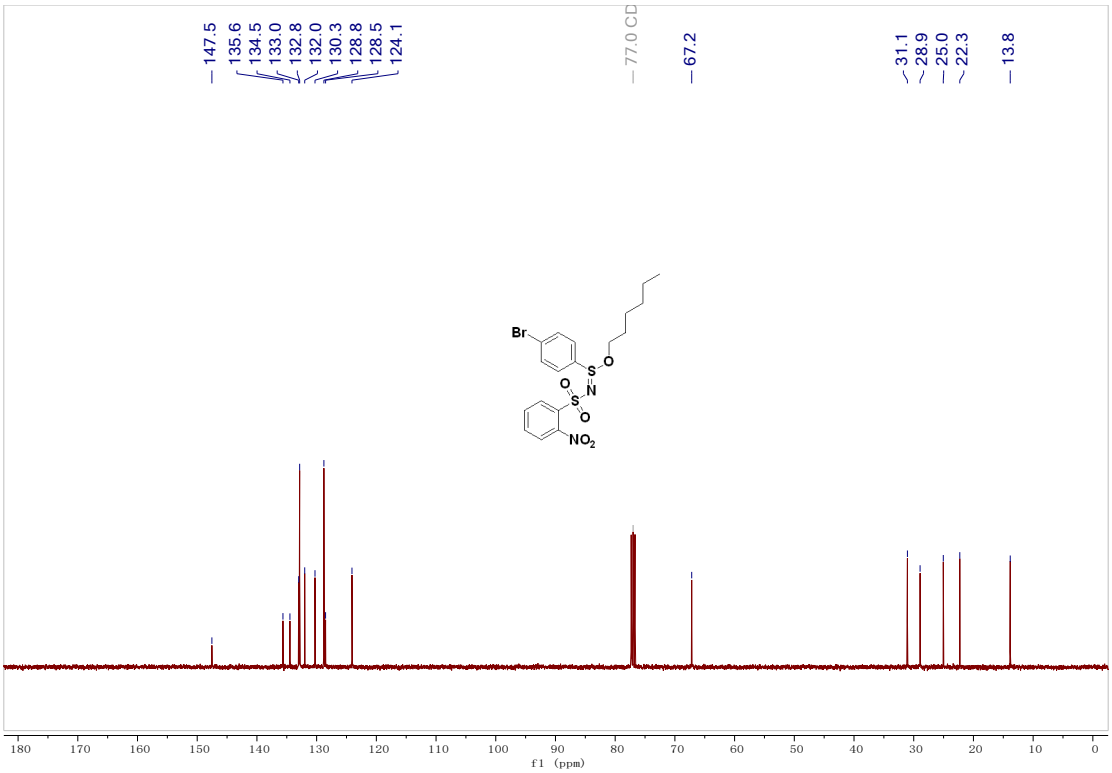
^{19}F NMR (376 MHz, Chloroform-d) of compound **4o**



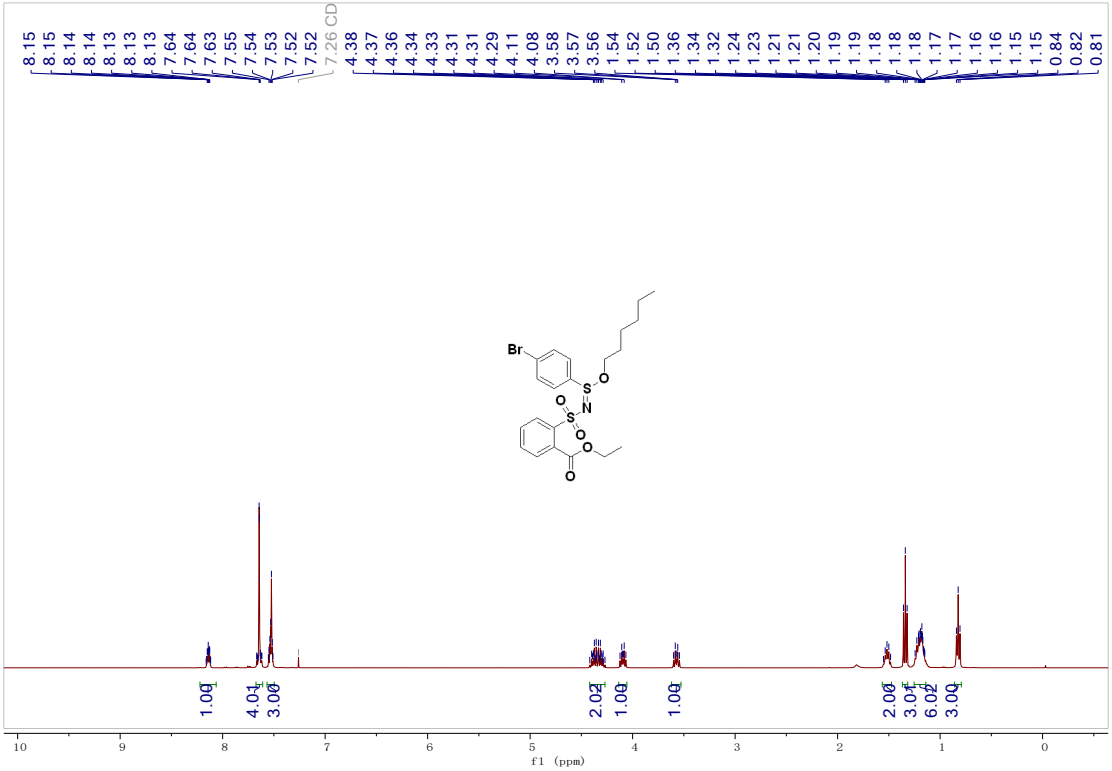
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4p**



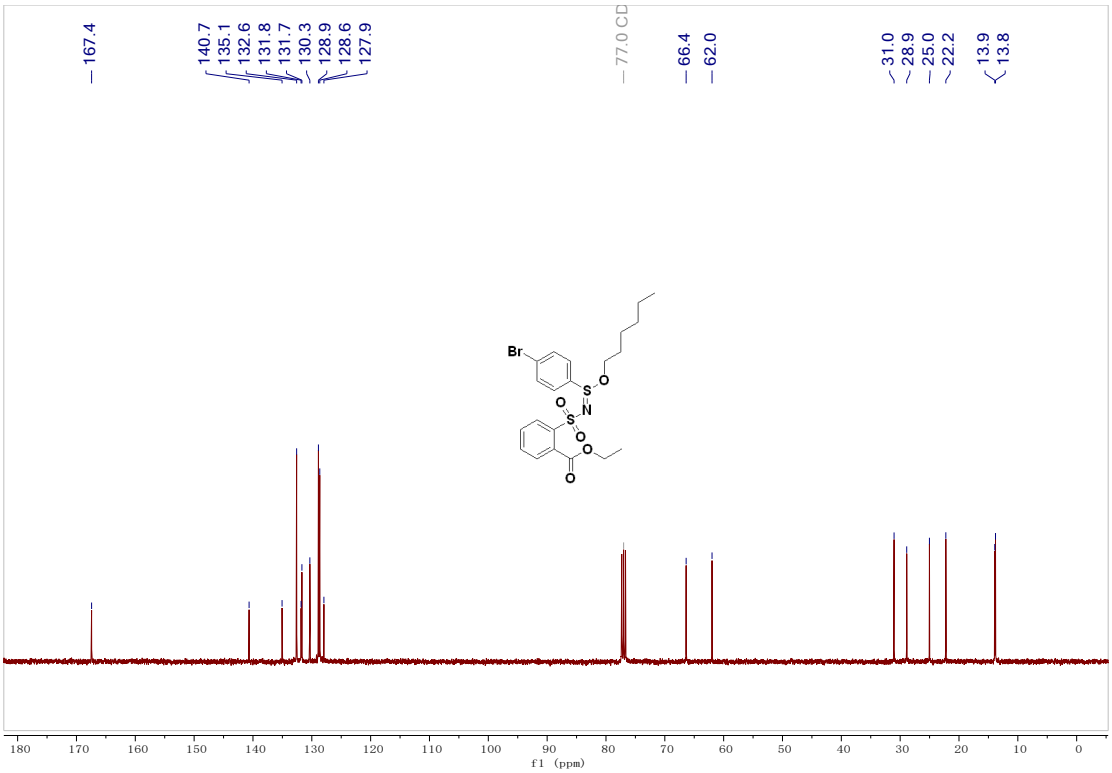
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4p**



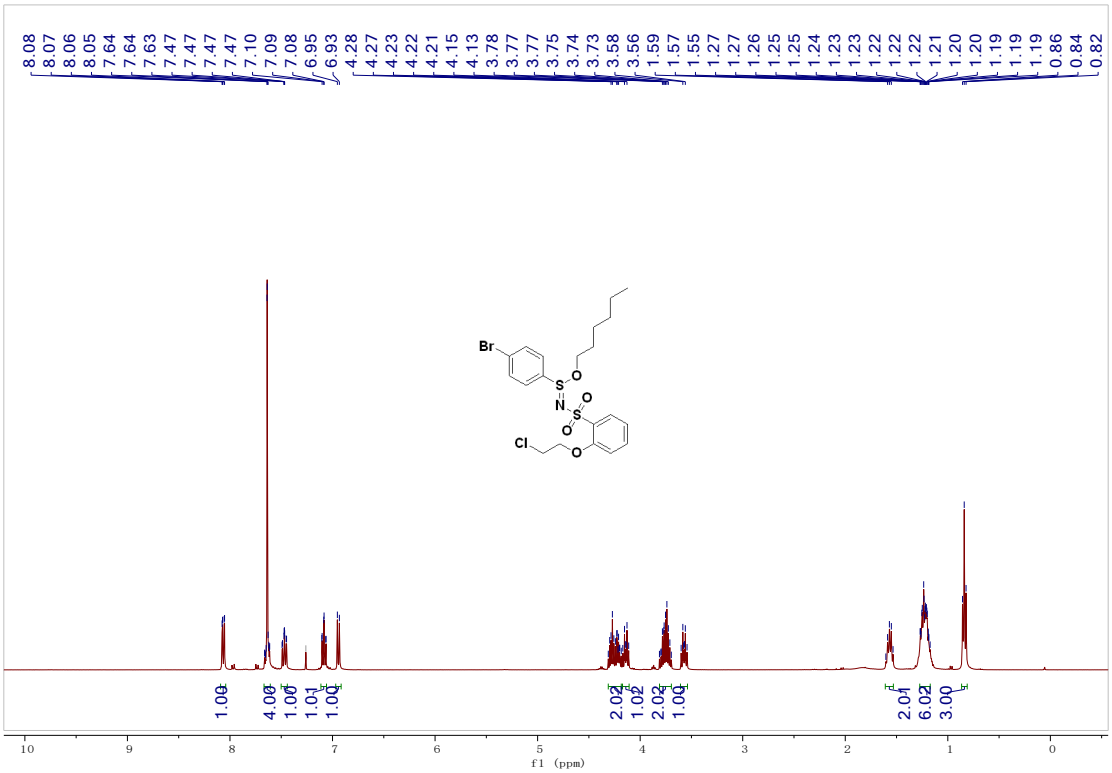
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4q**



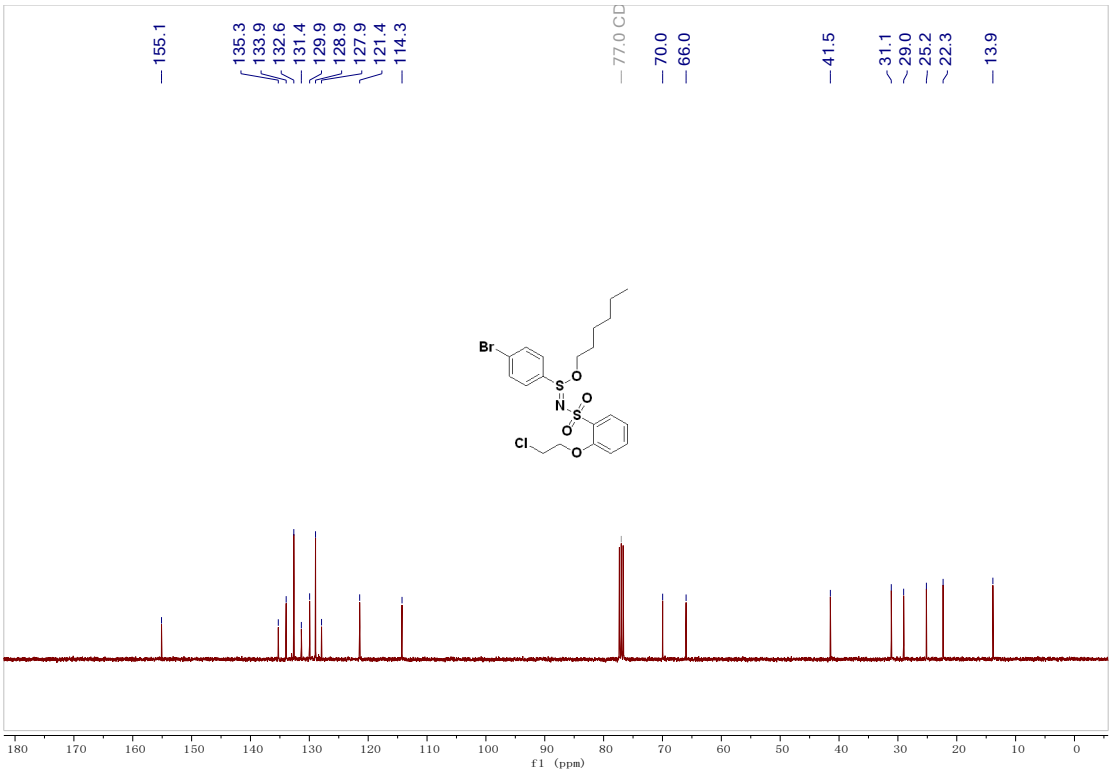
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4q**



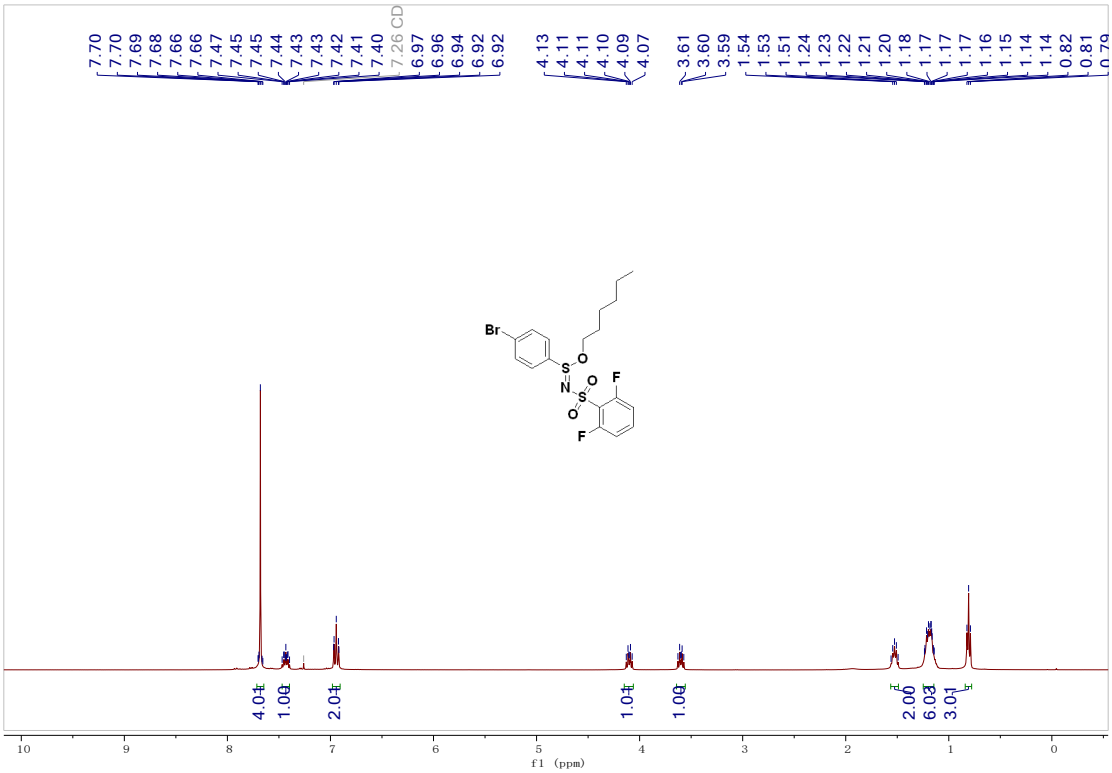
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4r**



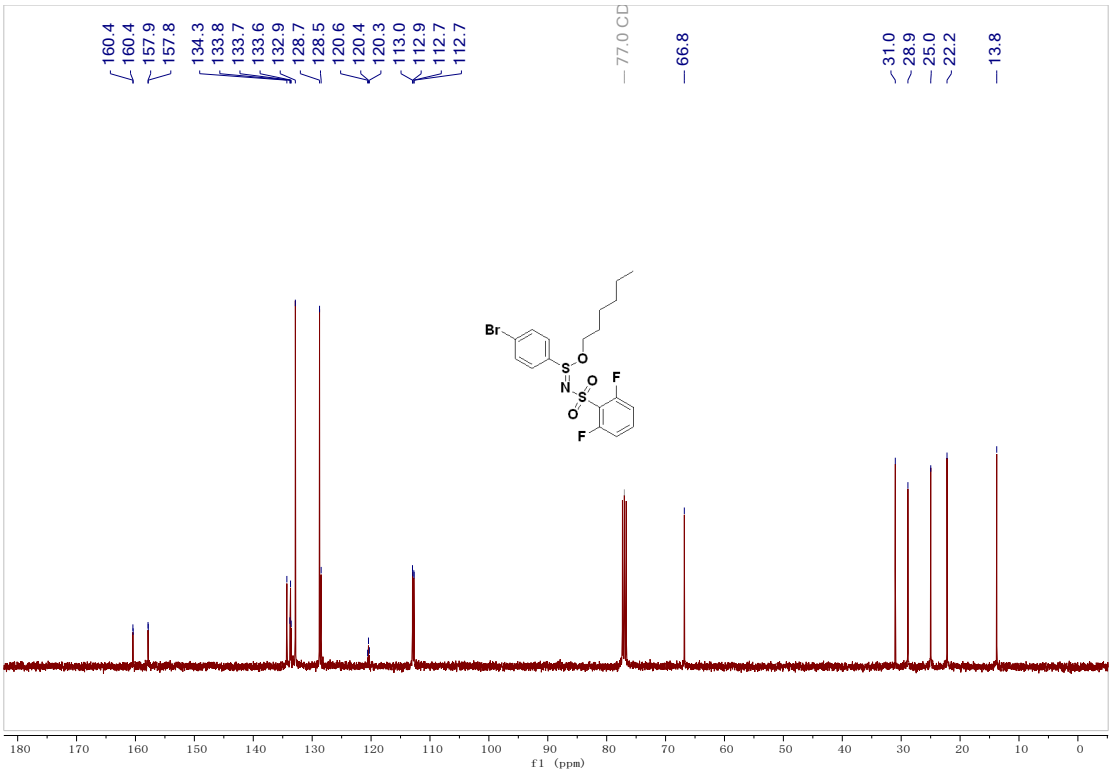
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4r**



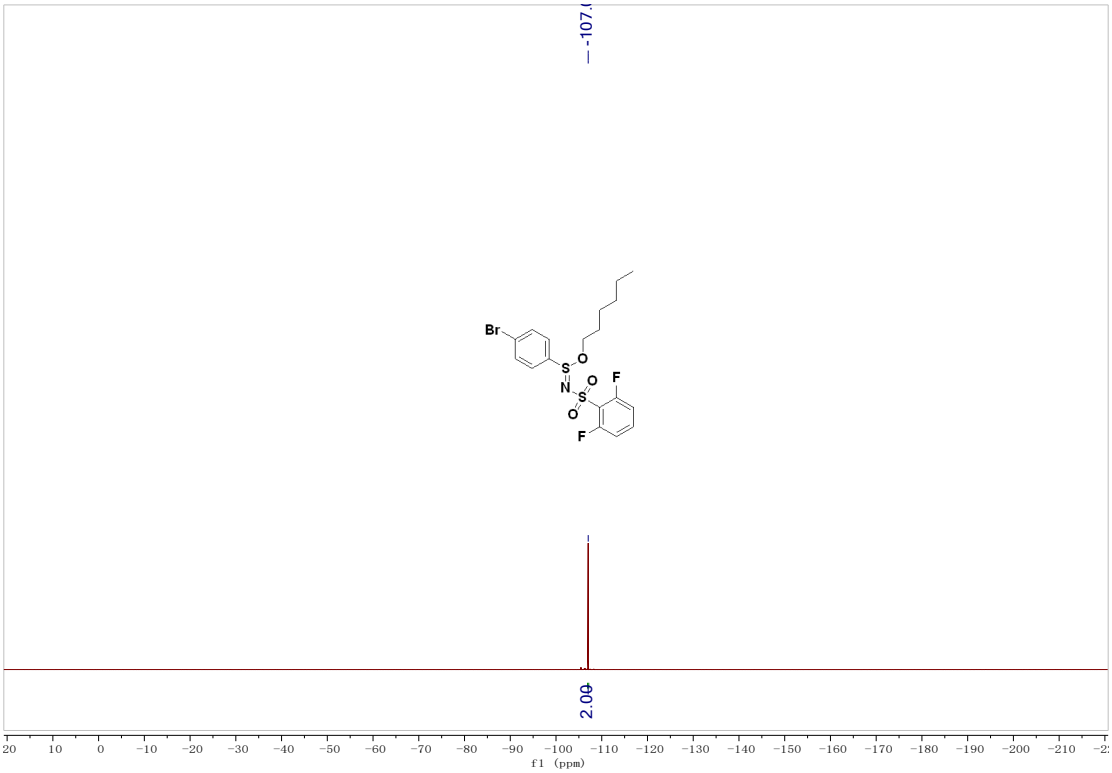
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4s**



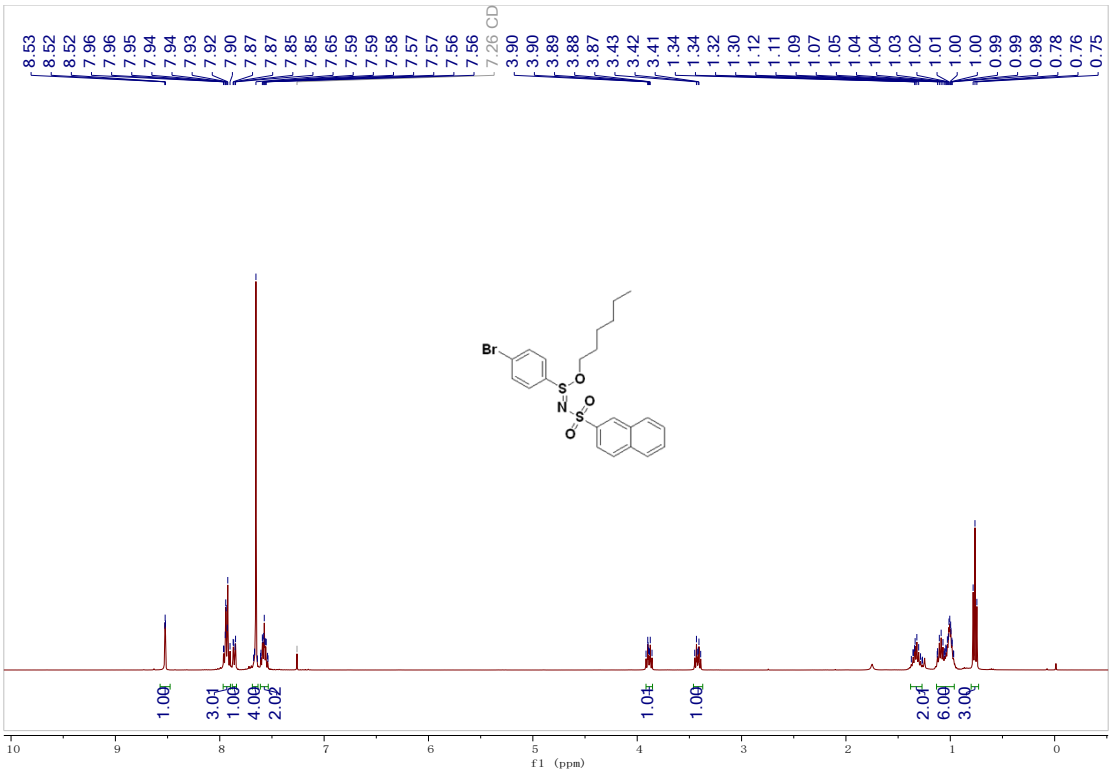
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4s**



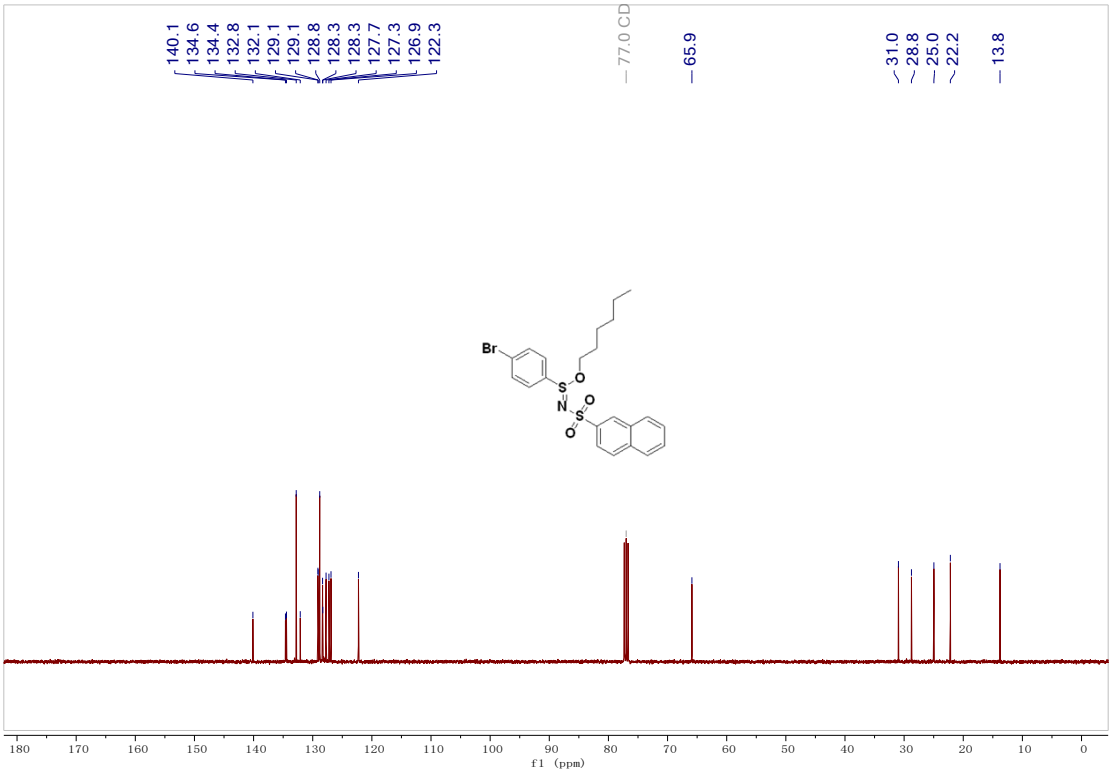
^{19}F NMR (376 MHz, Chloroform-d) of compound **4s**



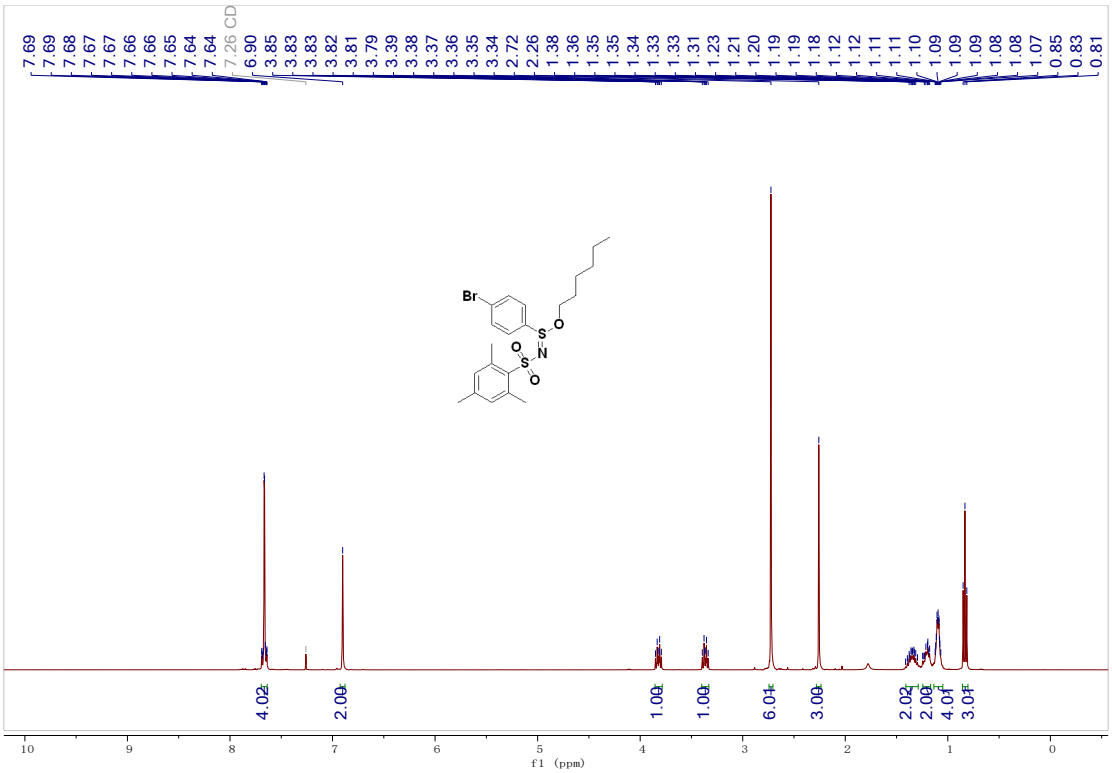
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4t**



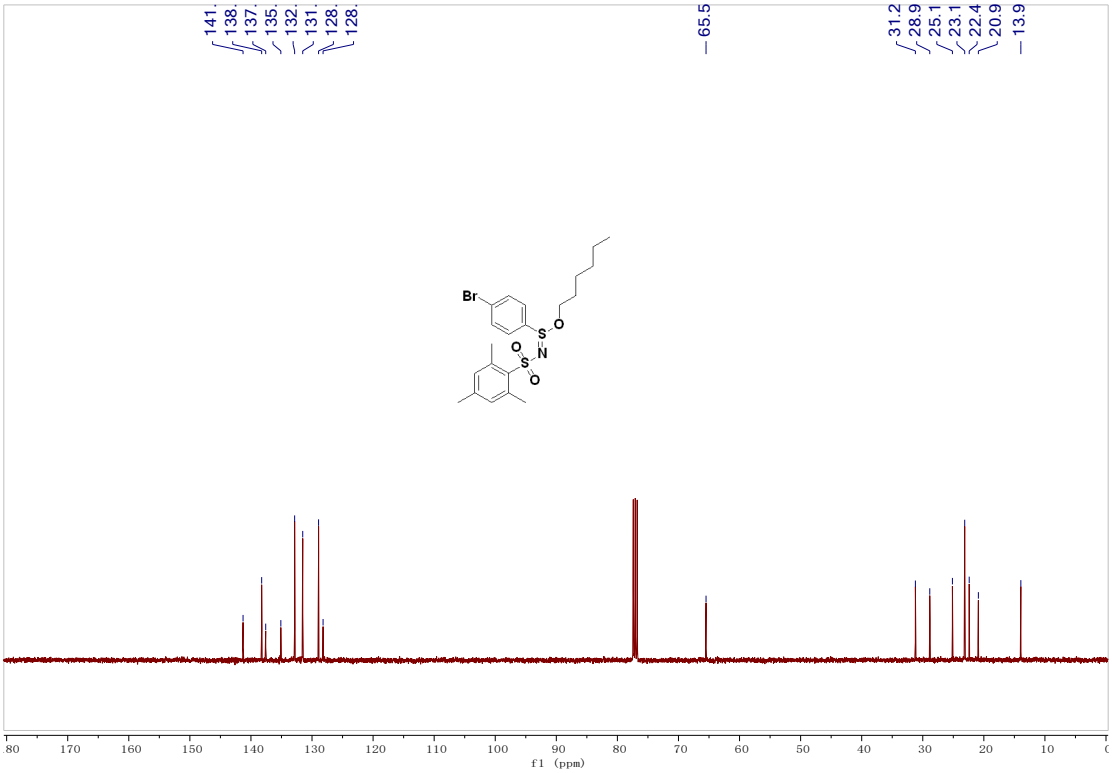
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4t**



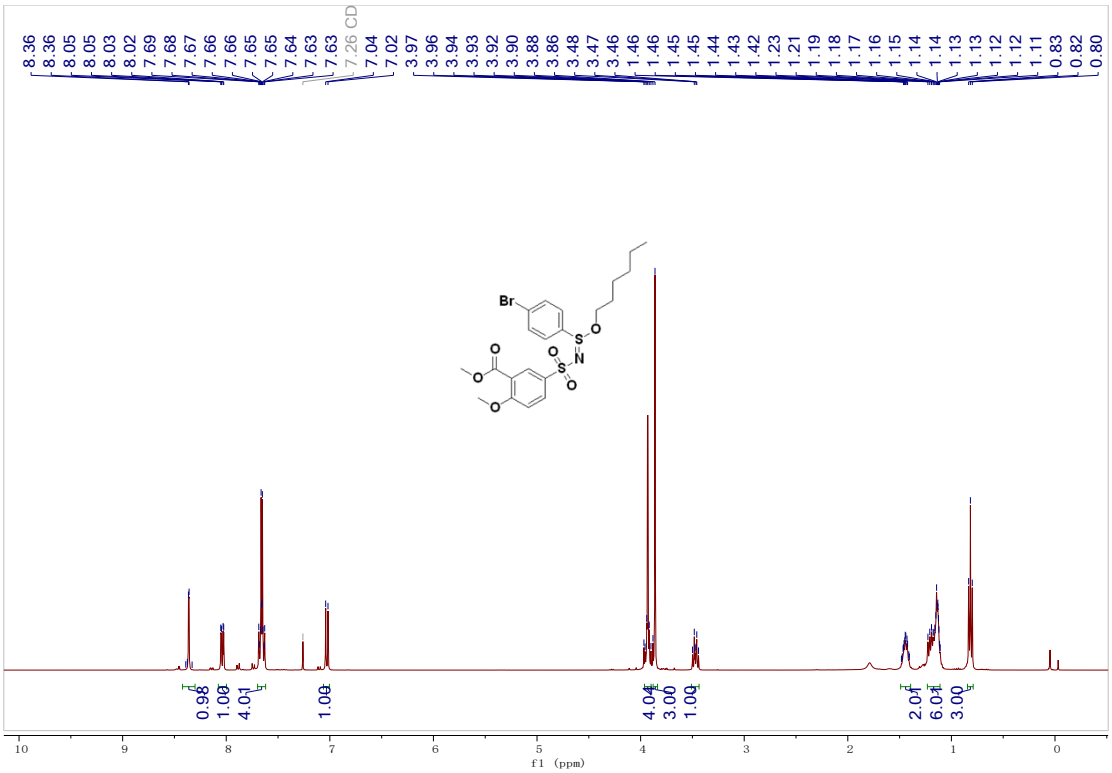
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4u**



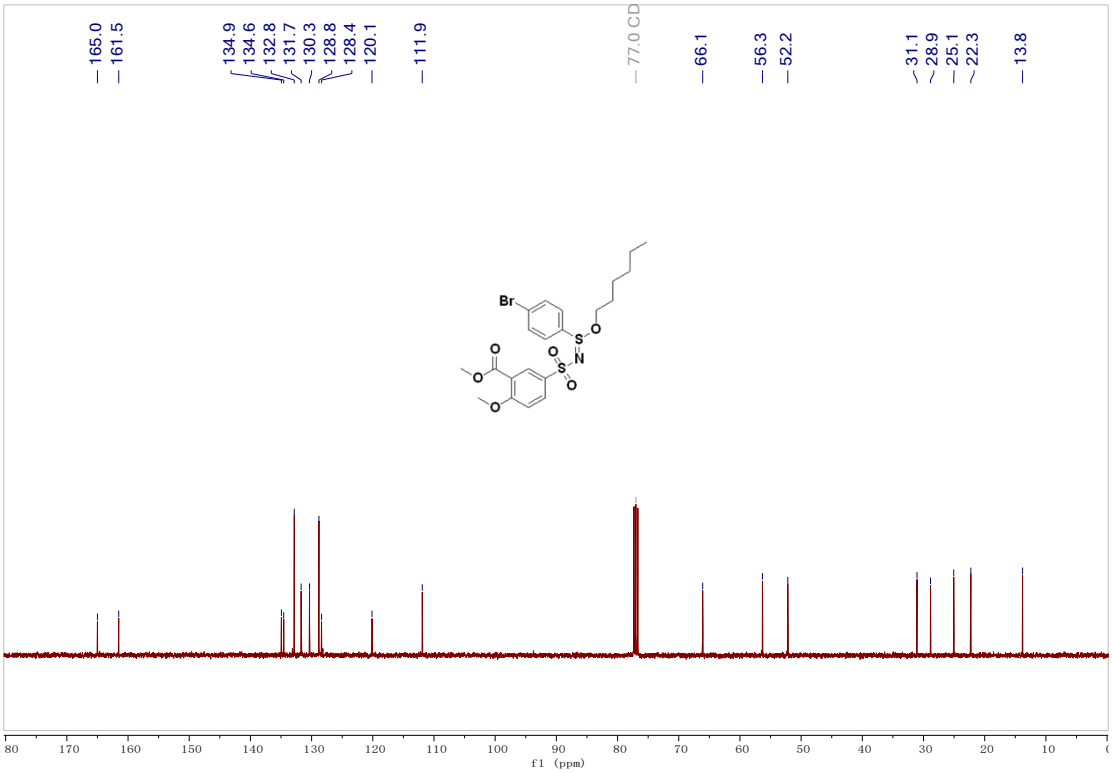
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4u**



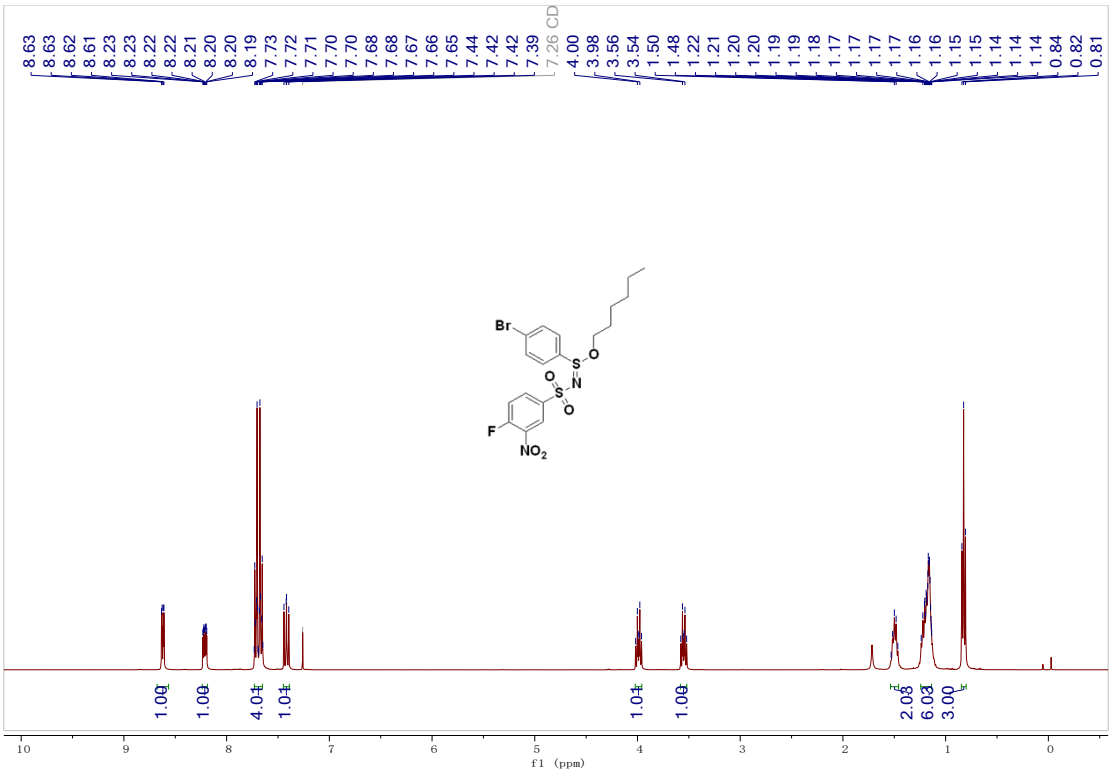
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4v**



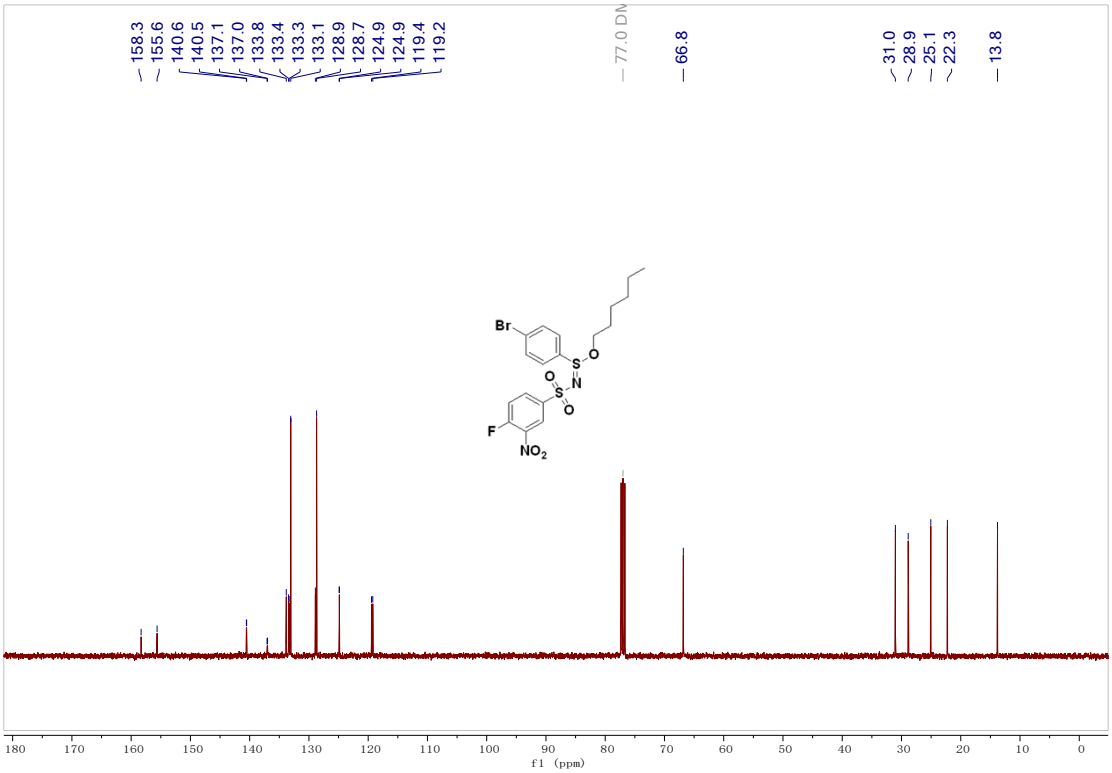
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4v**



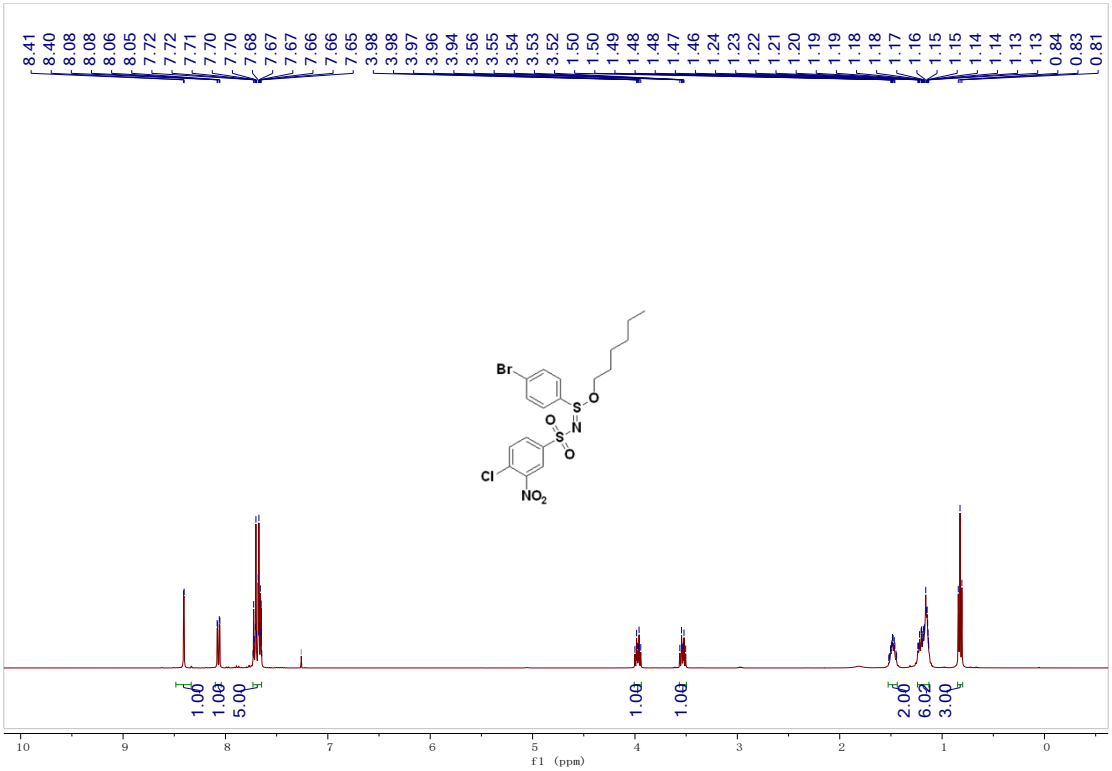
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4w**



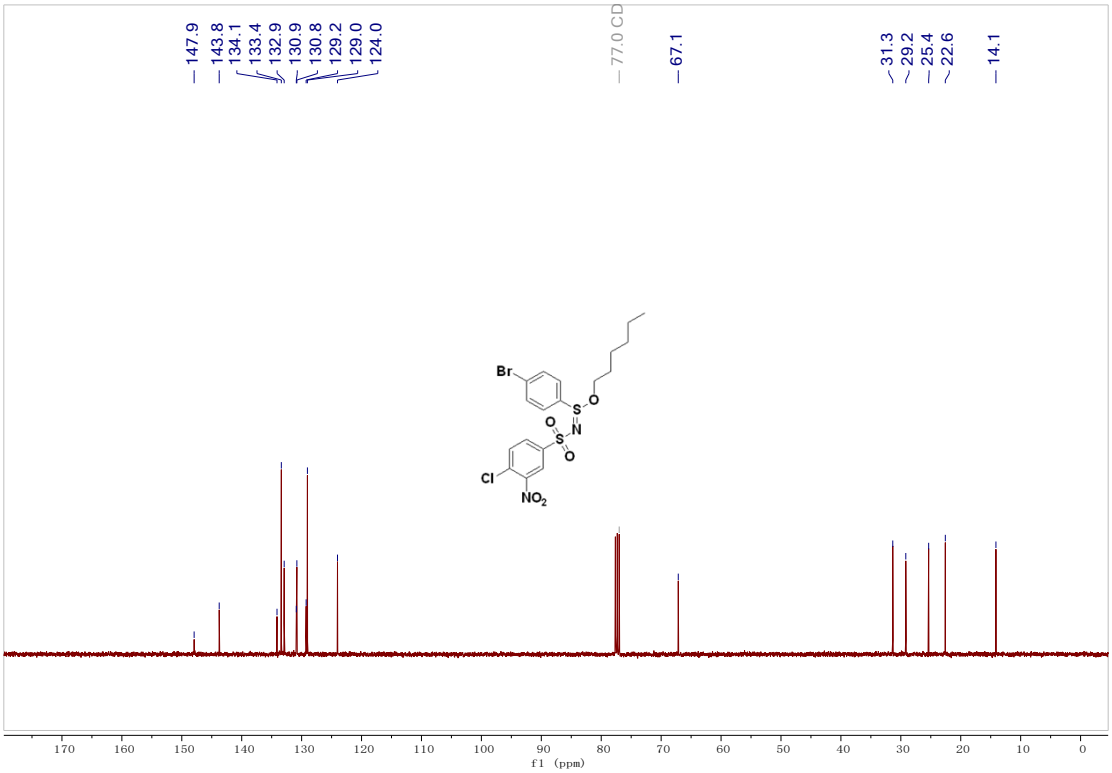
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4w**



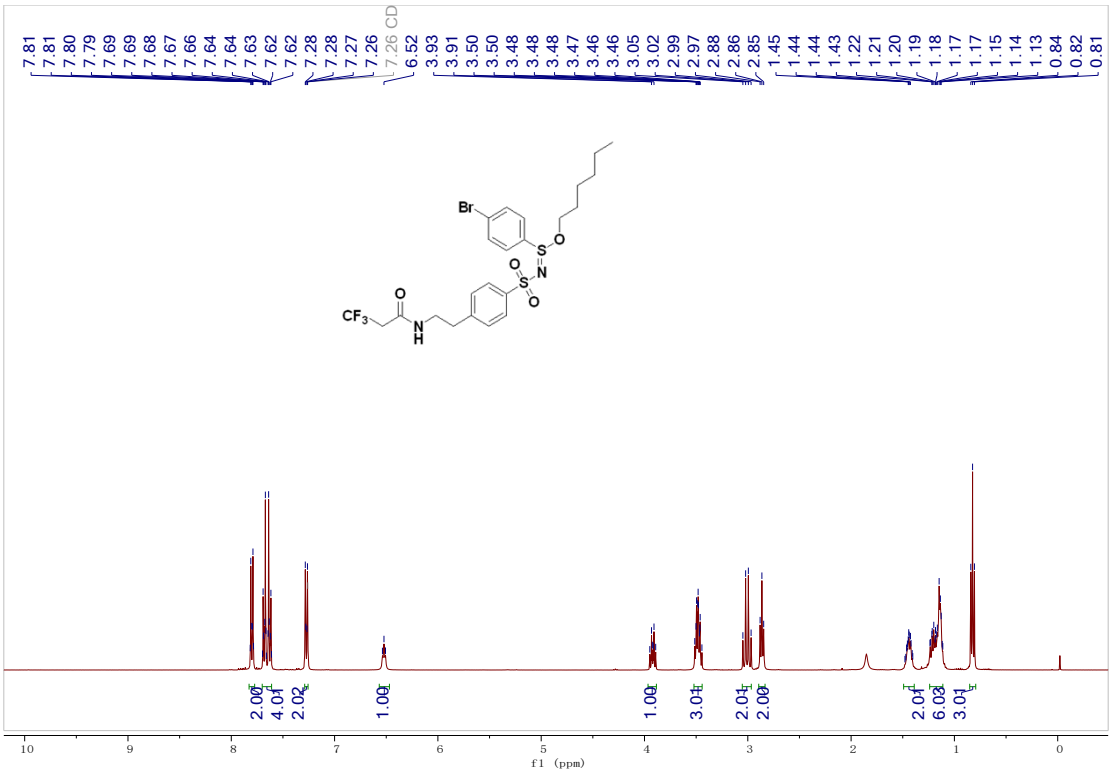
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4x**



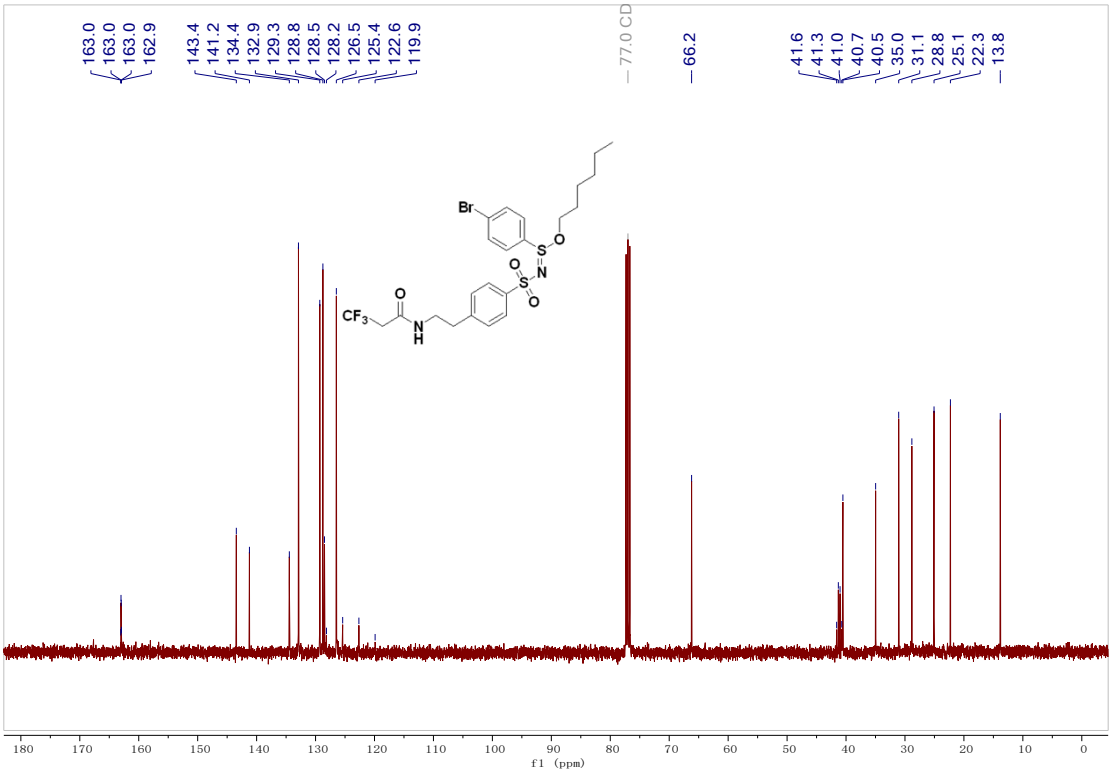
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4x**



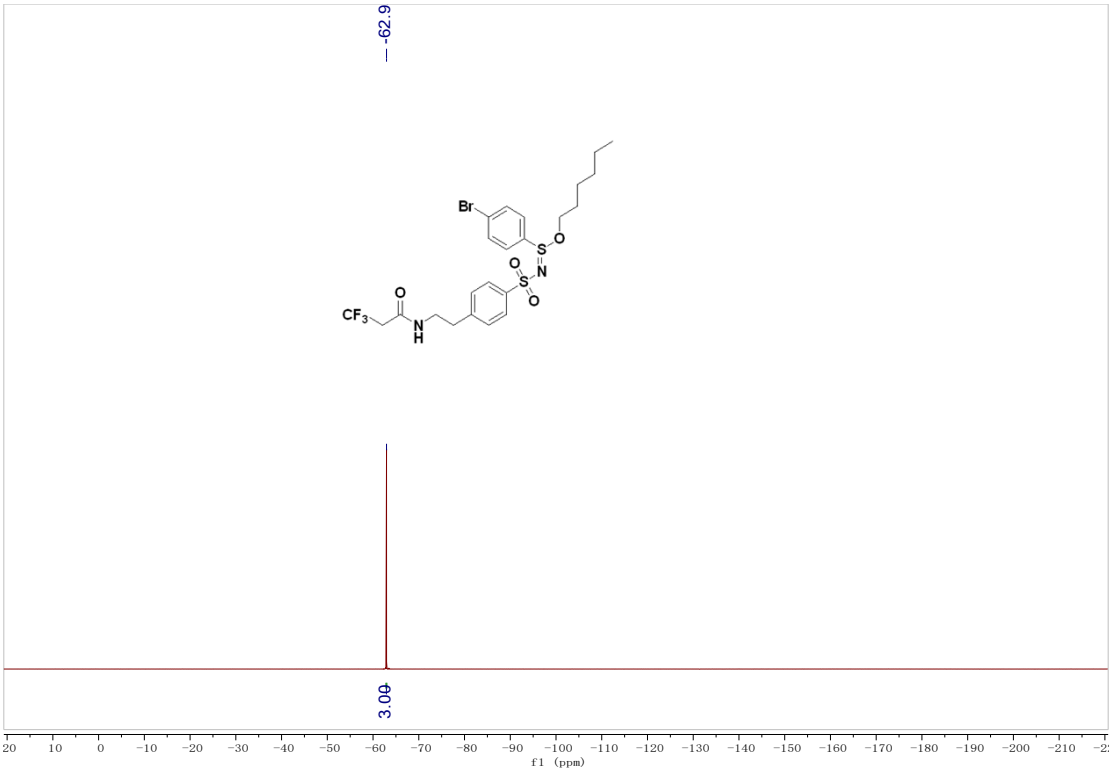
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4y**



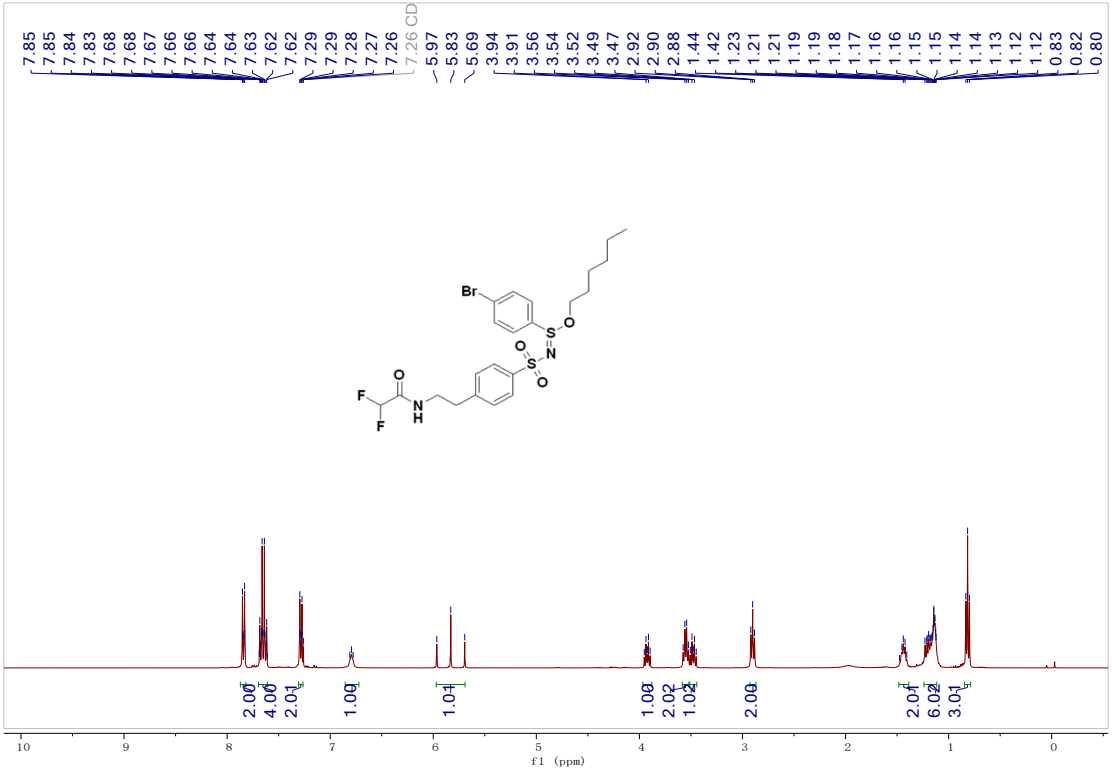
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4y**



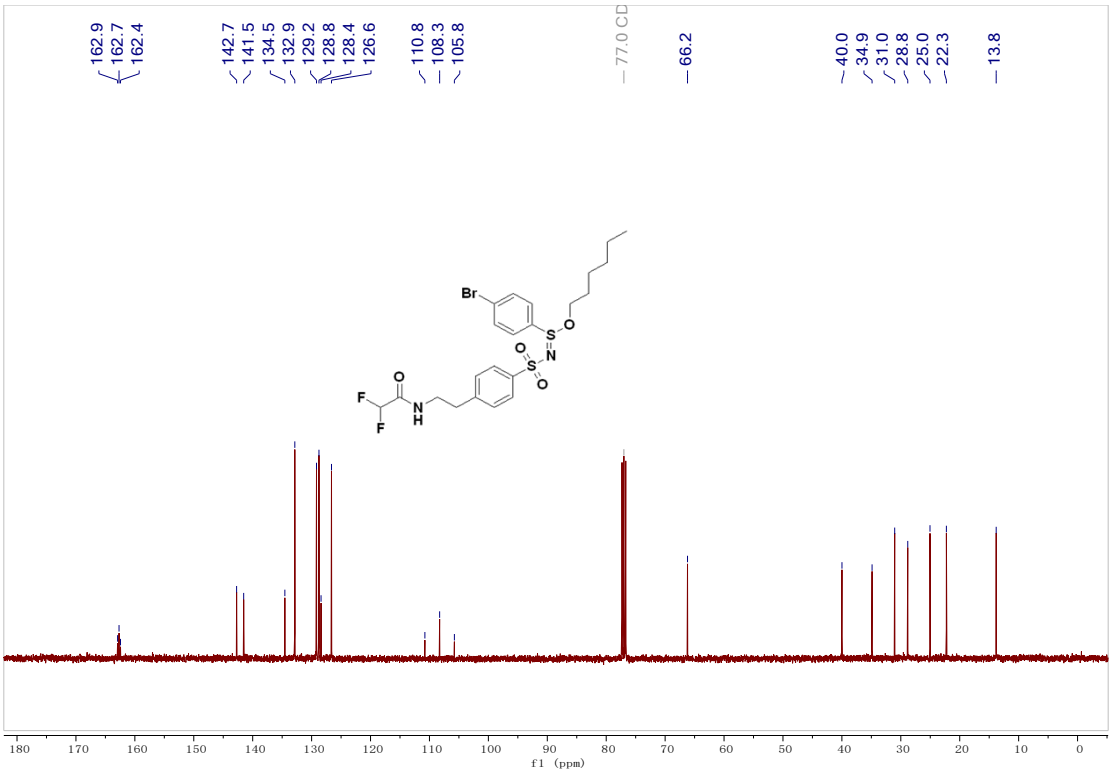
^{19}F NMR (376 MHz, Chloroform-d) of compound **4y**



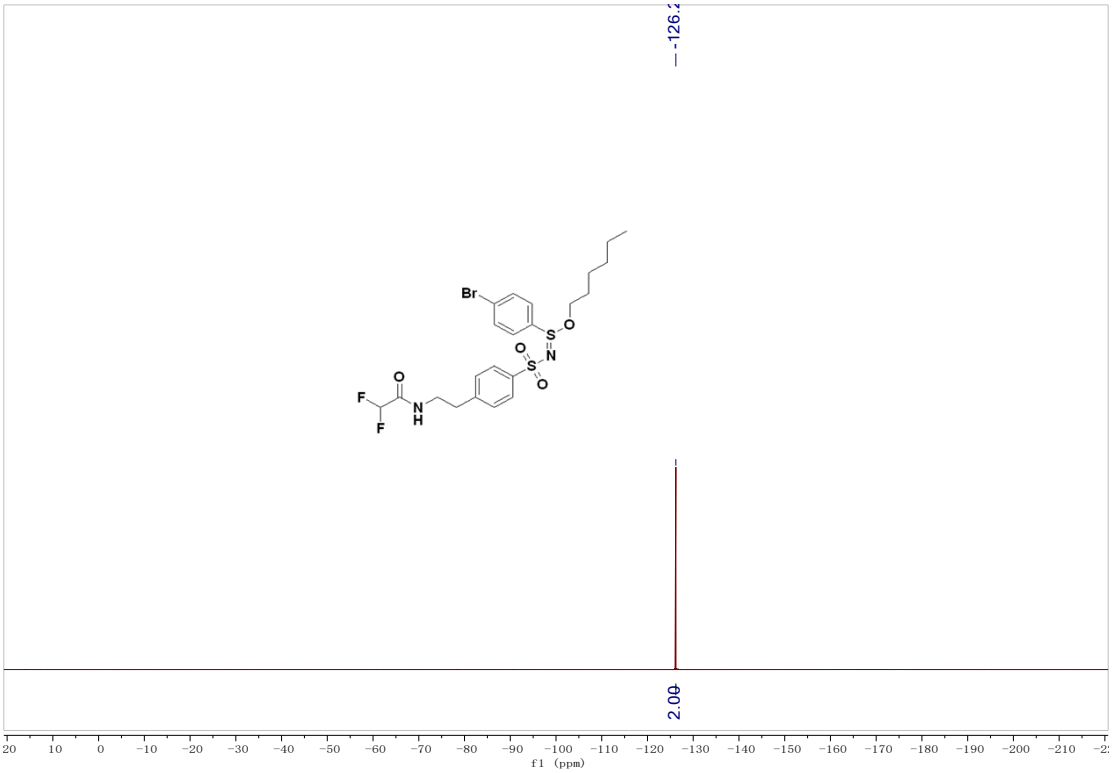
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4z**



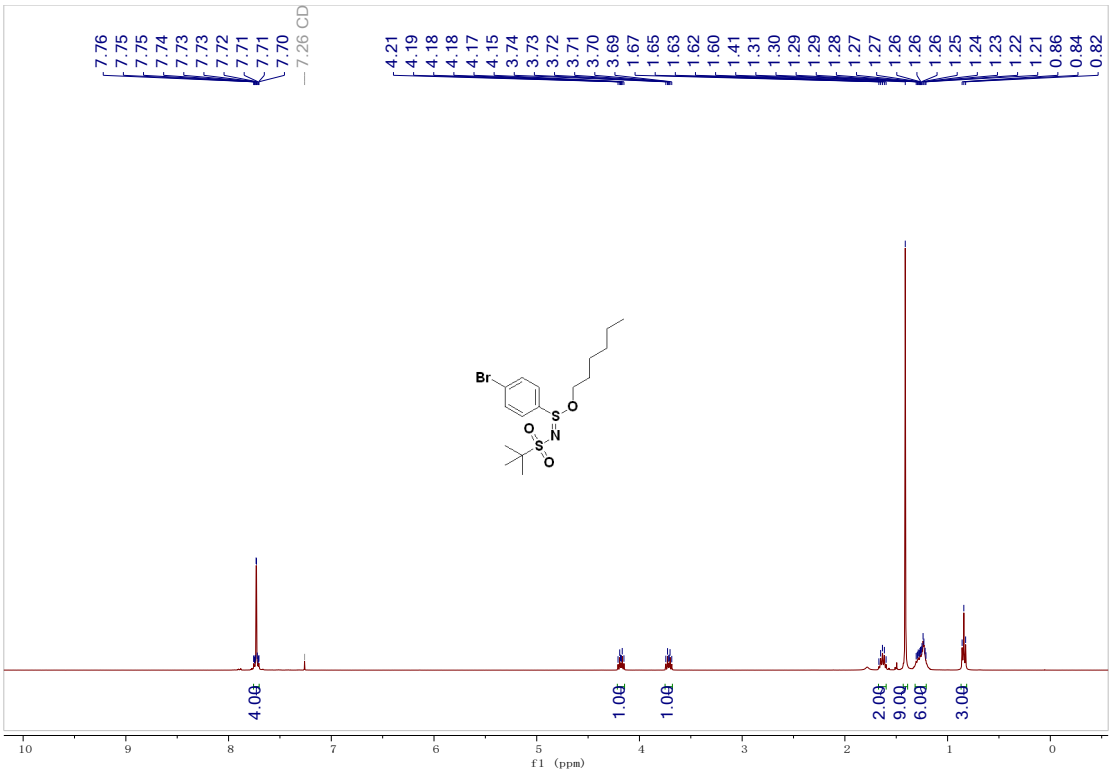
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4z**



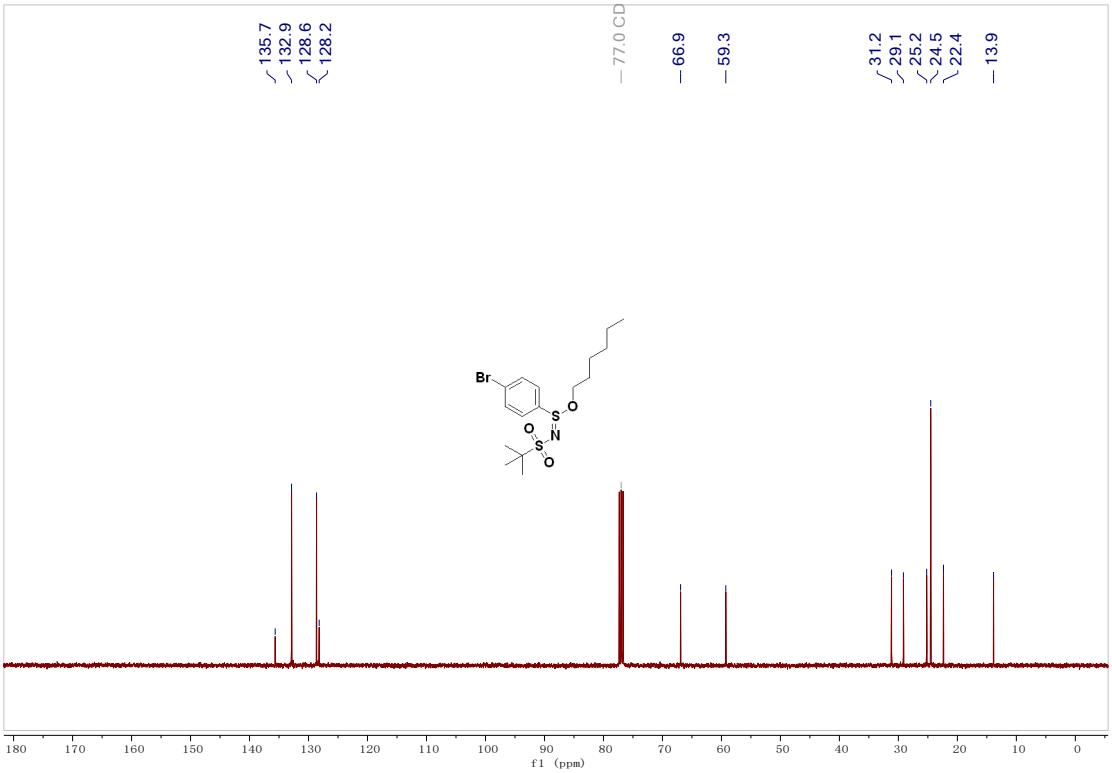
^{19}F NMR (376 MHz, Chloroform-d) of compound **4z**



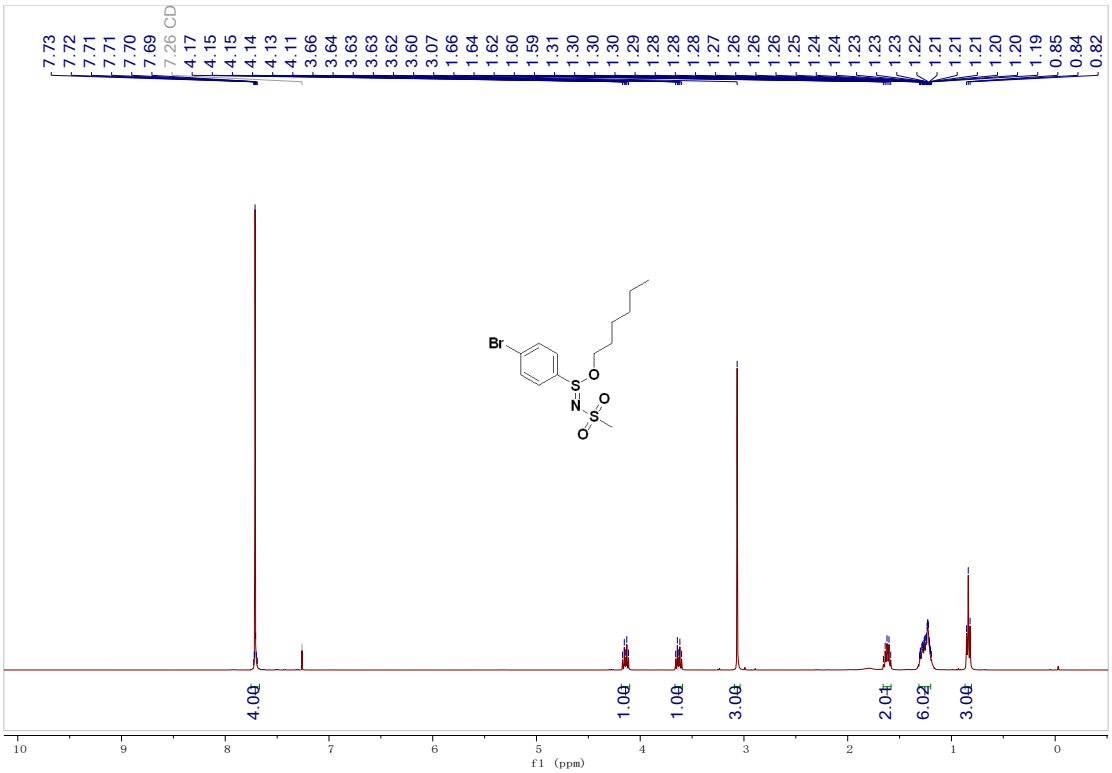
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4aa**



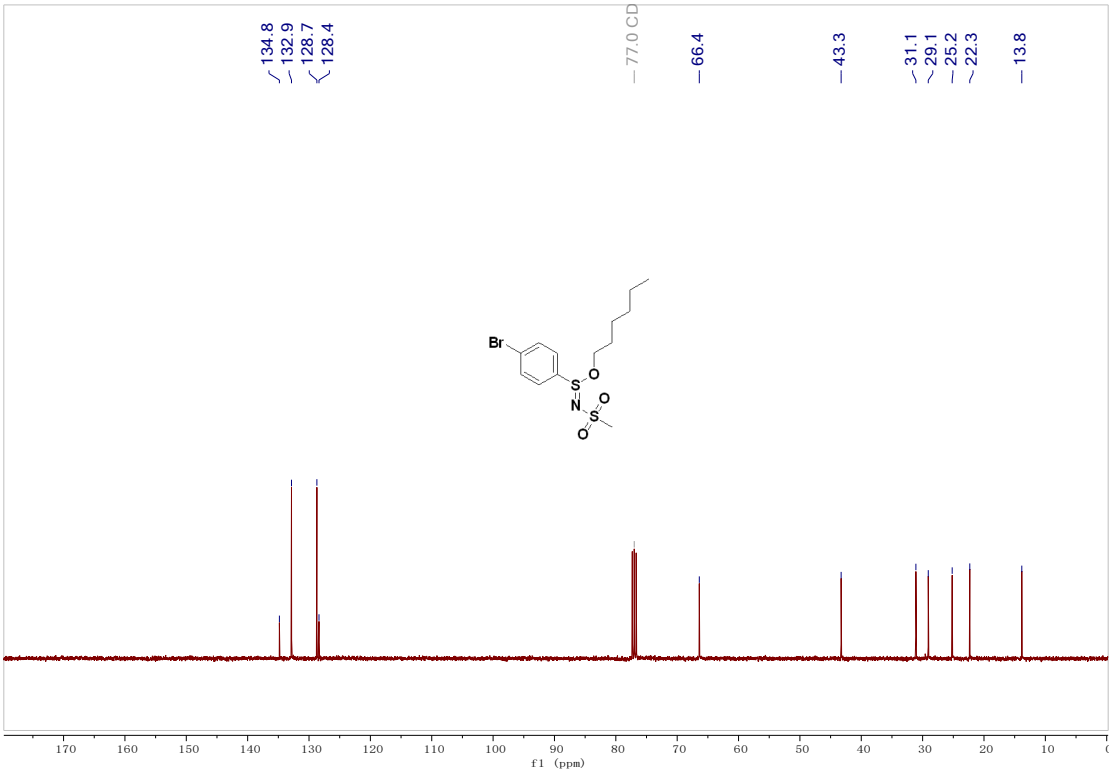
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4aa**



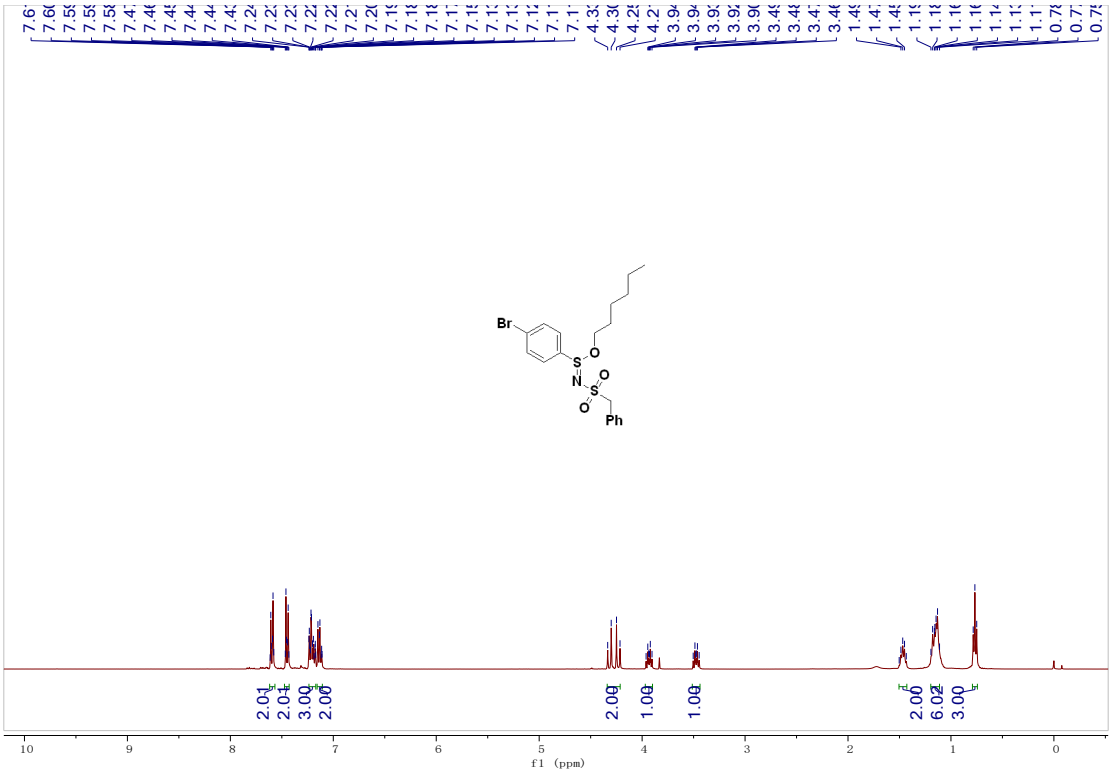
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ab**



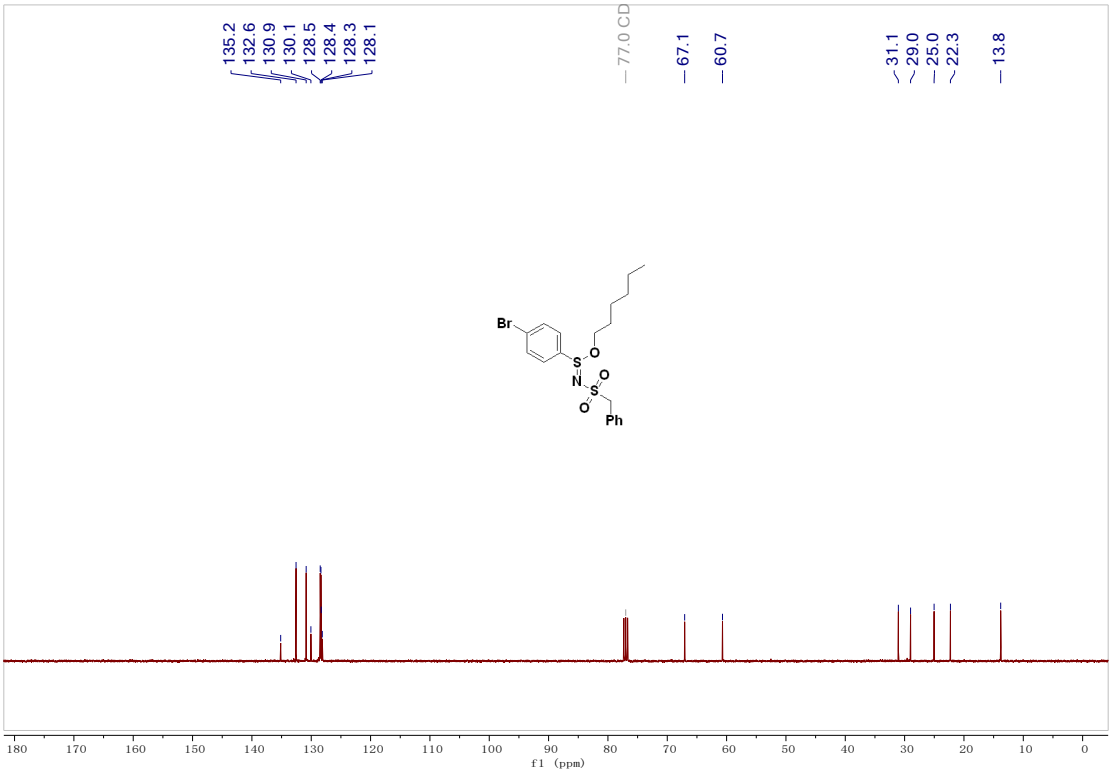
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ab**



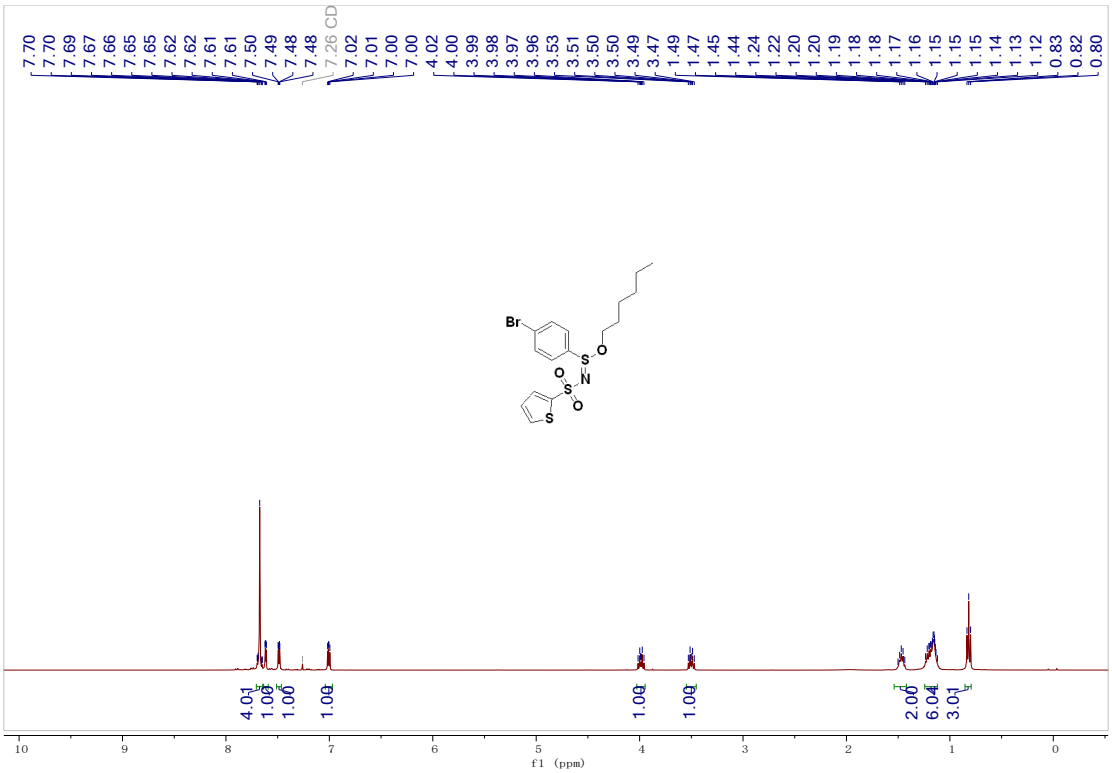
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ac**



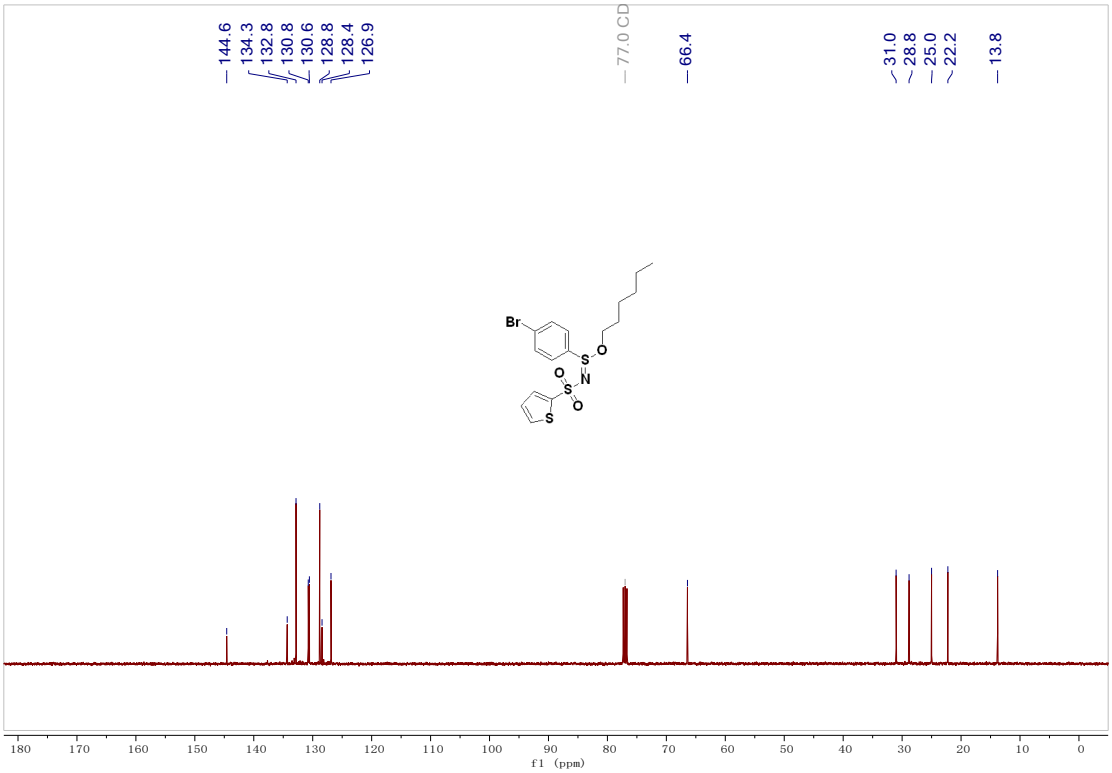
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ac**



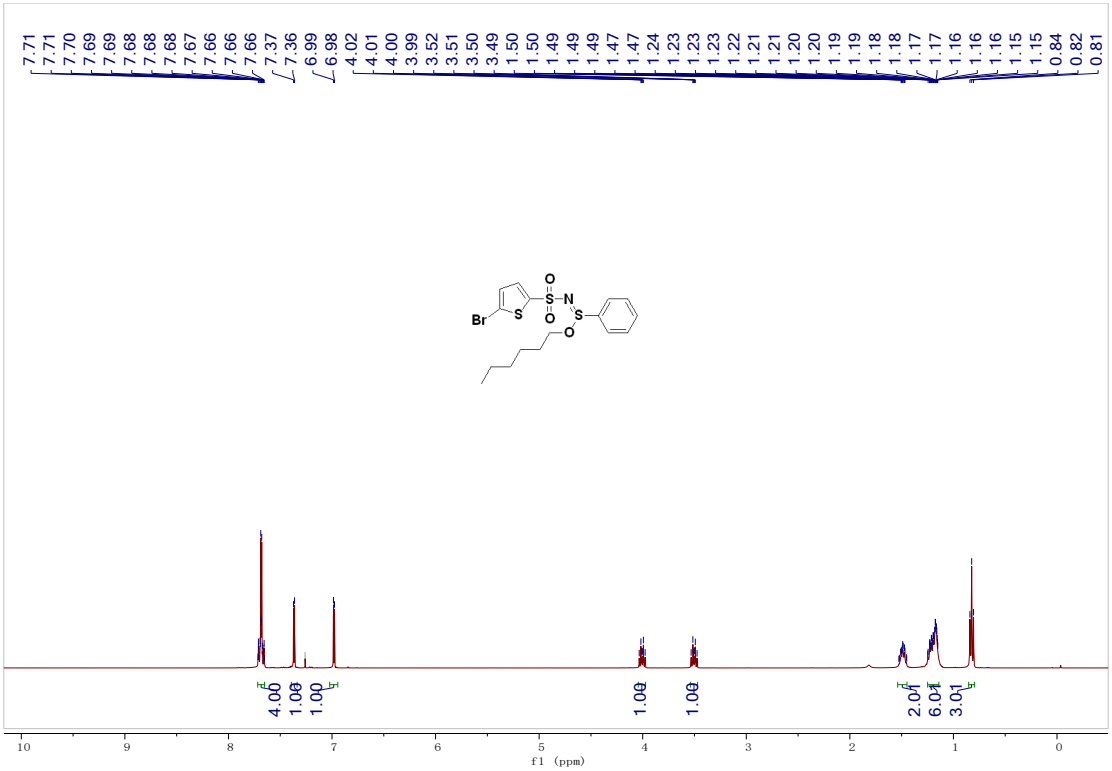
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ad**



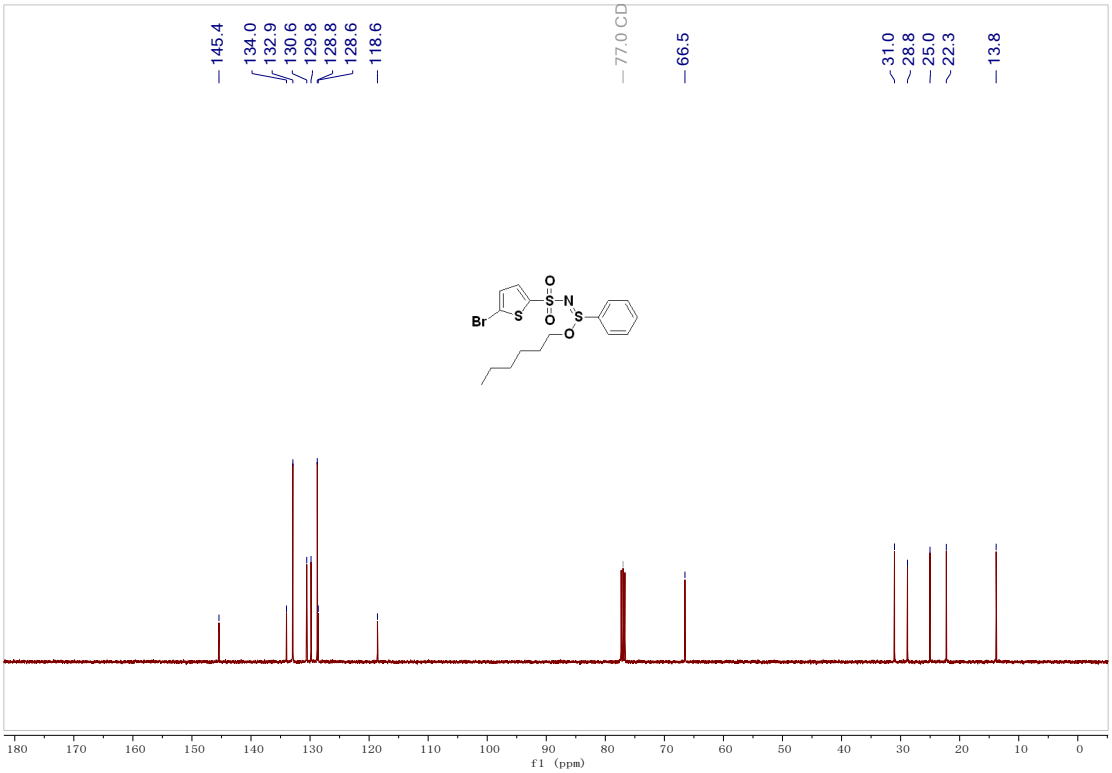
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ad**



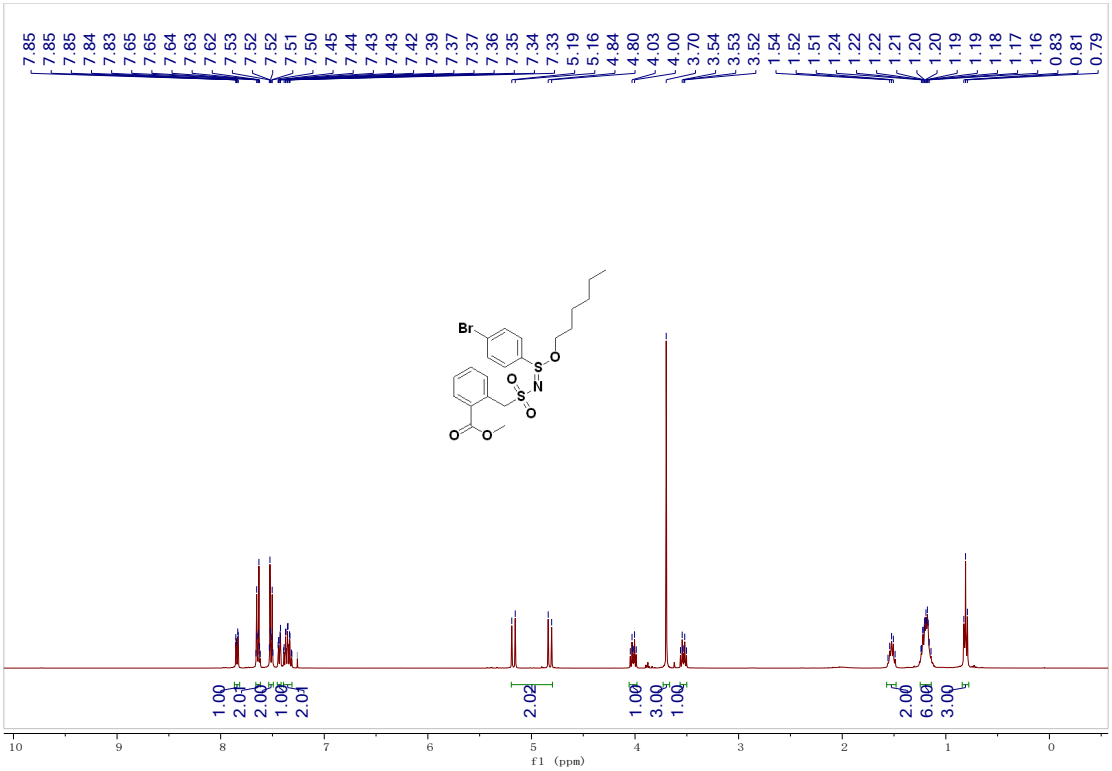
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ae**



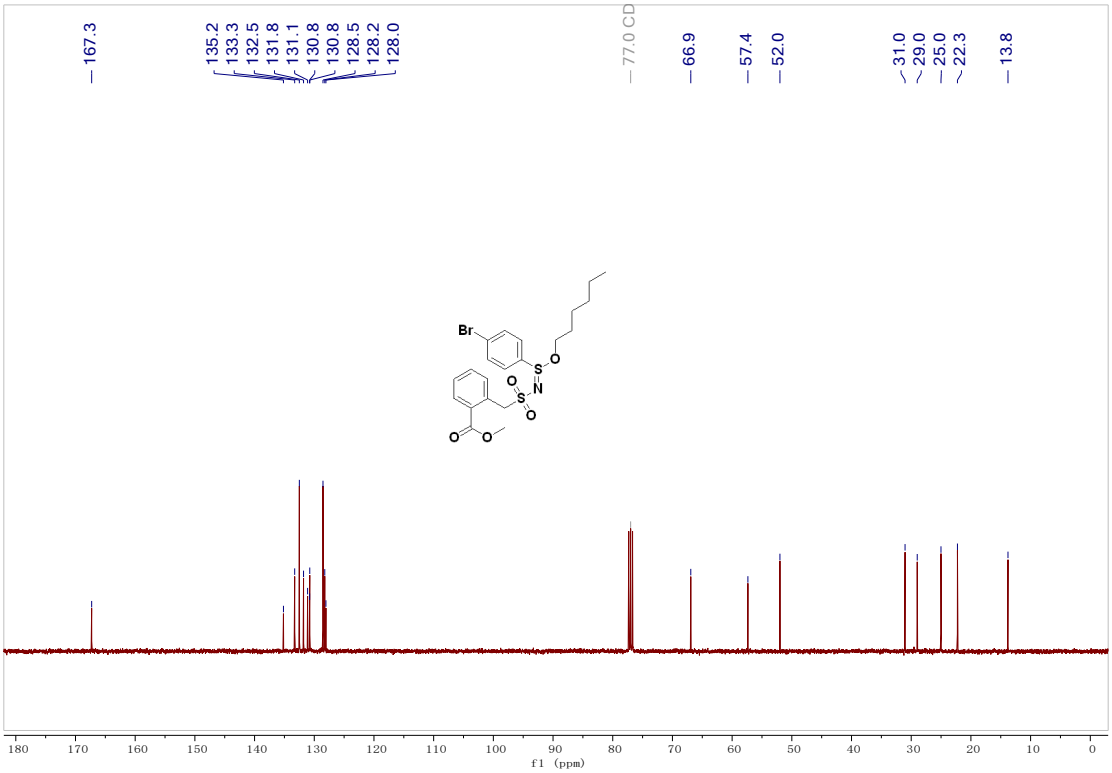
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ae**



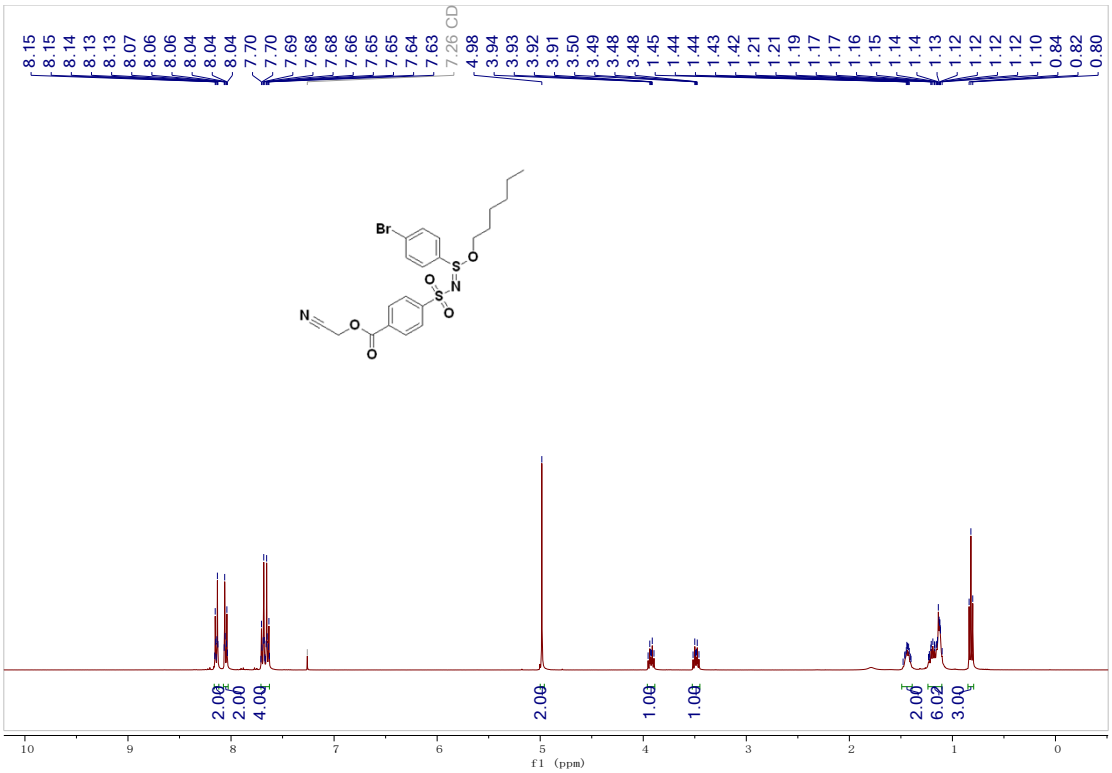
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4af**



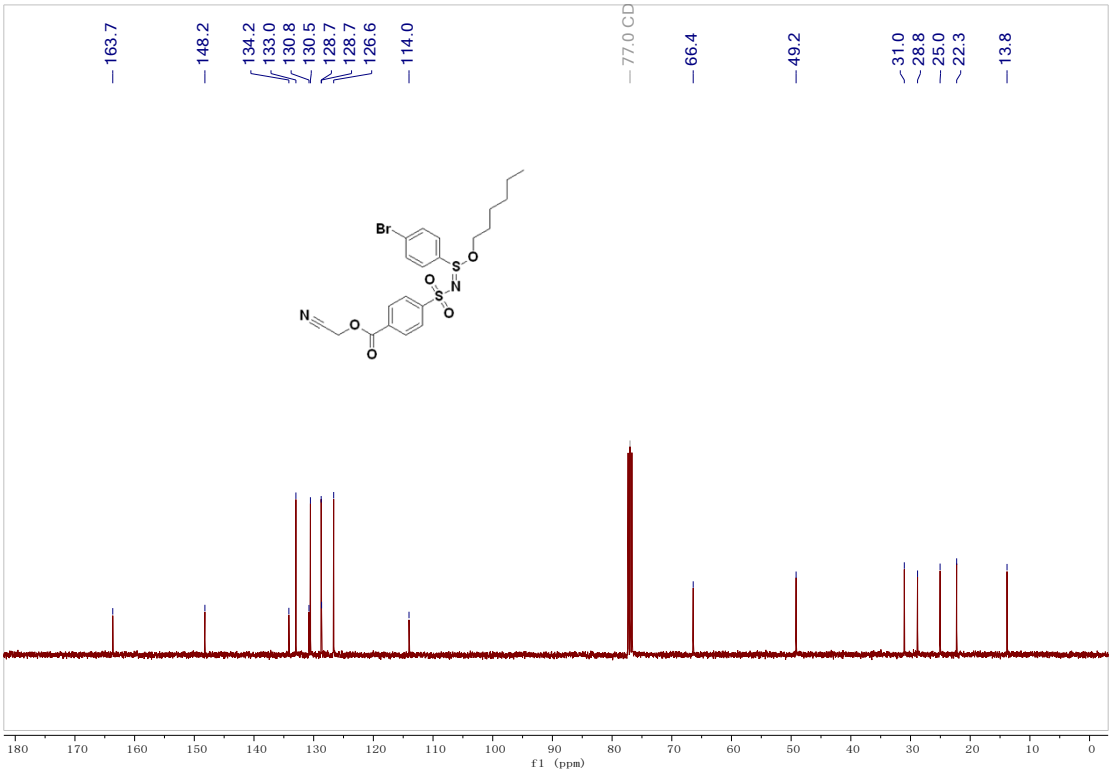
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4af**



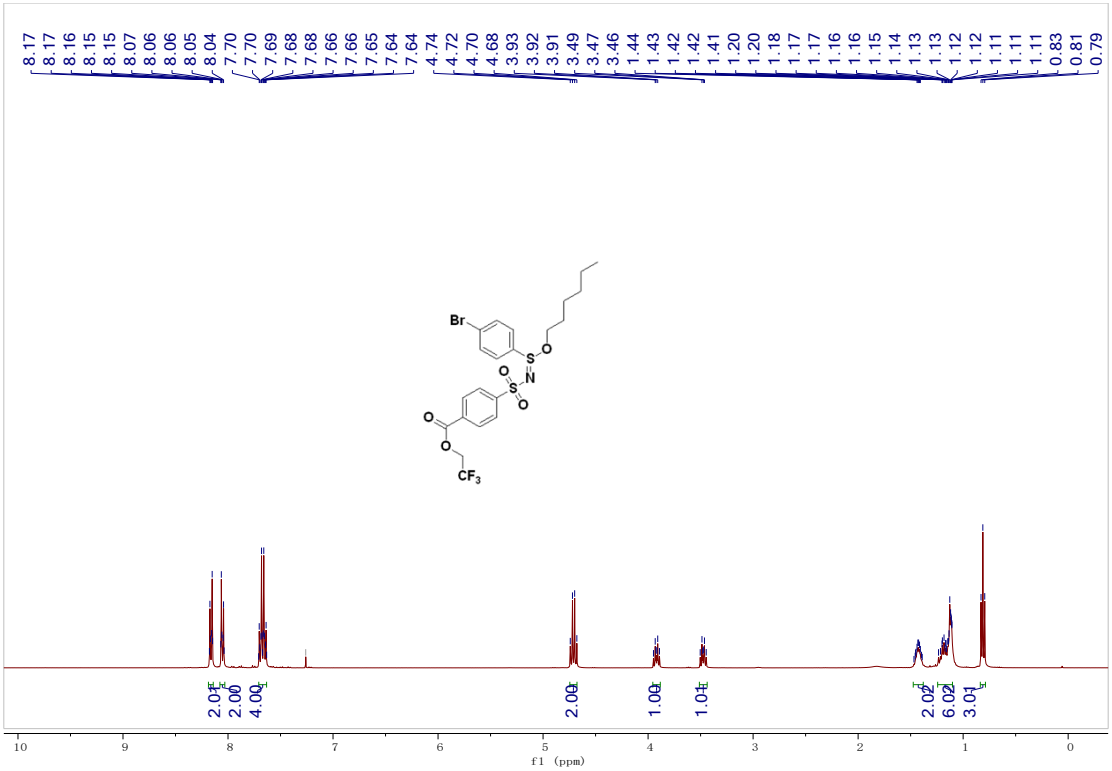
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ag**



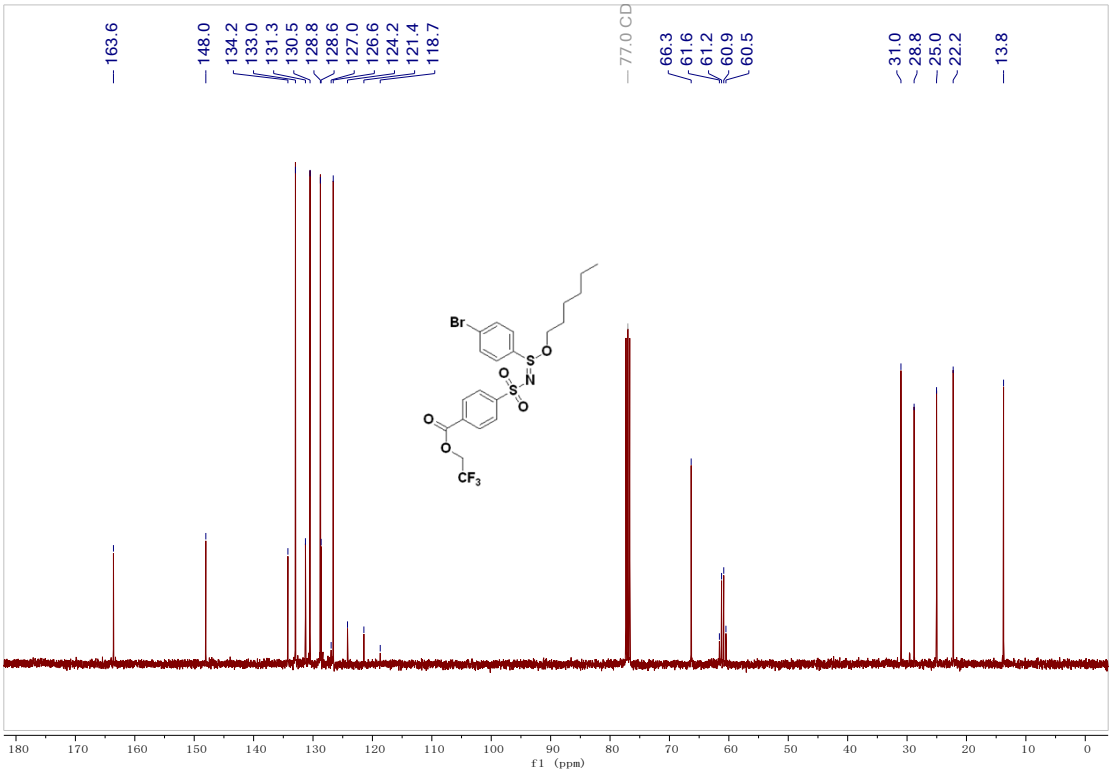
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ag**



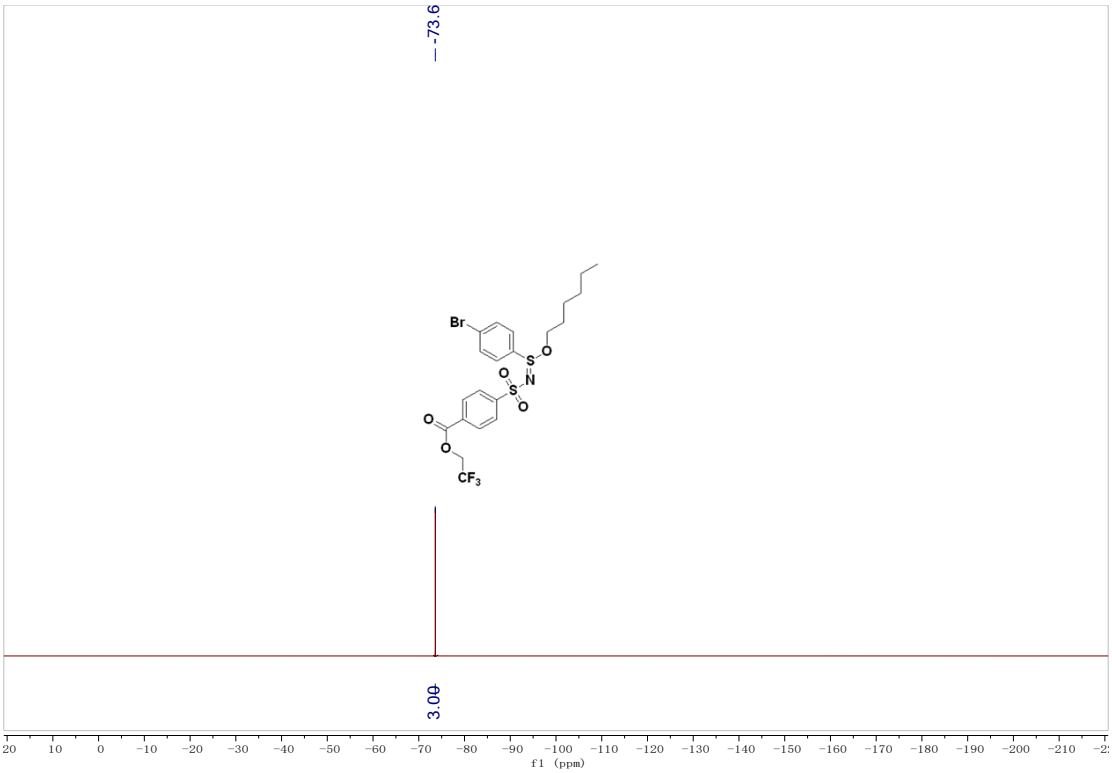
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ah**



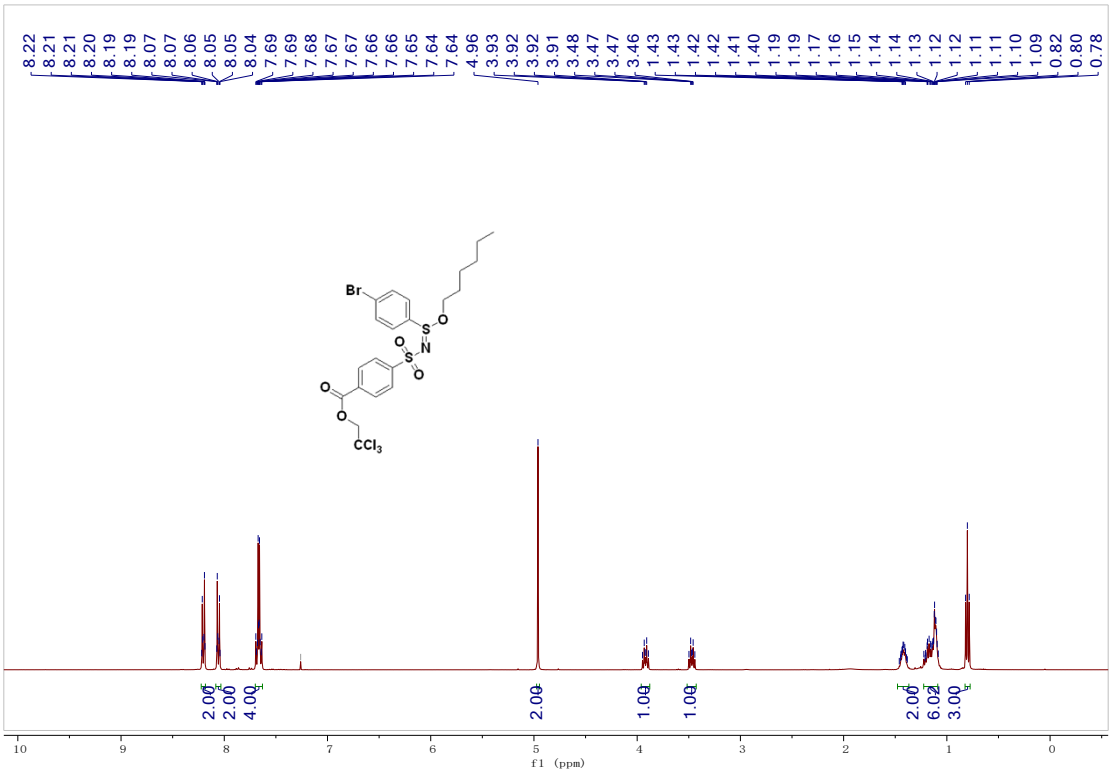
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ah**



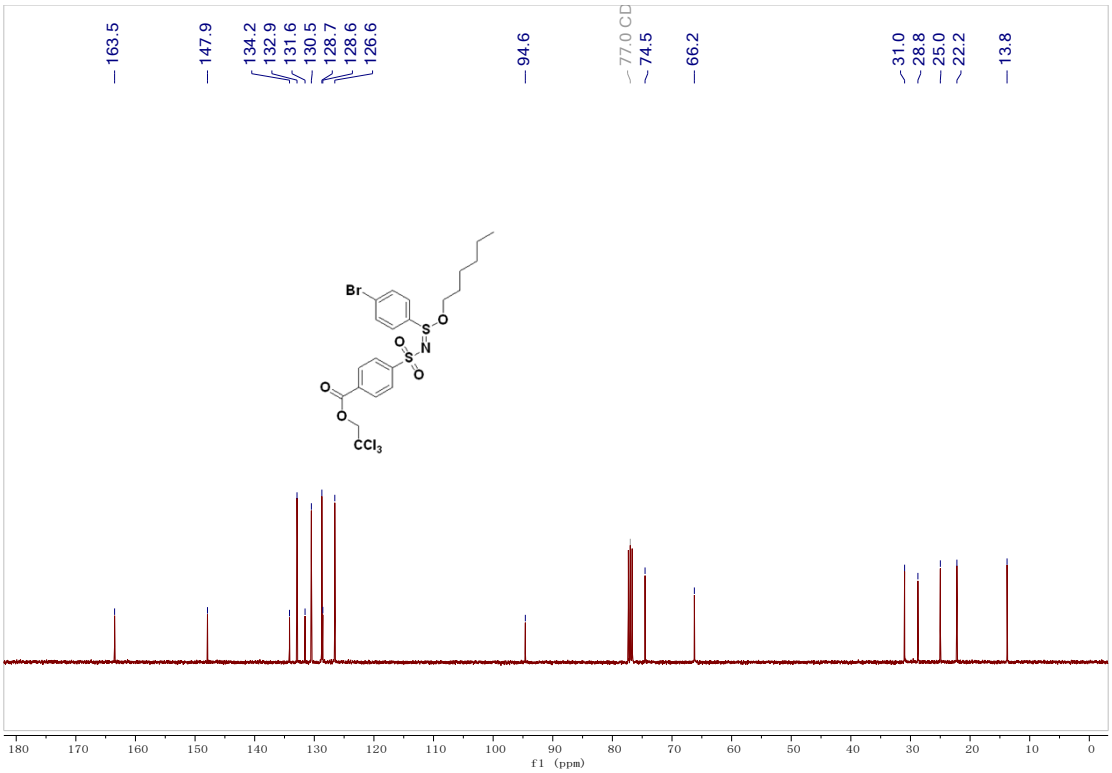
^{19}F NMR (376 MHz, Chloroform-d) of compound **4ah**



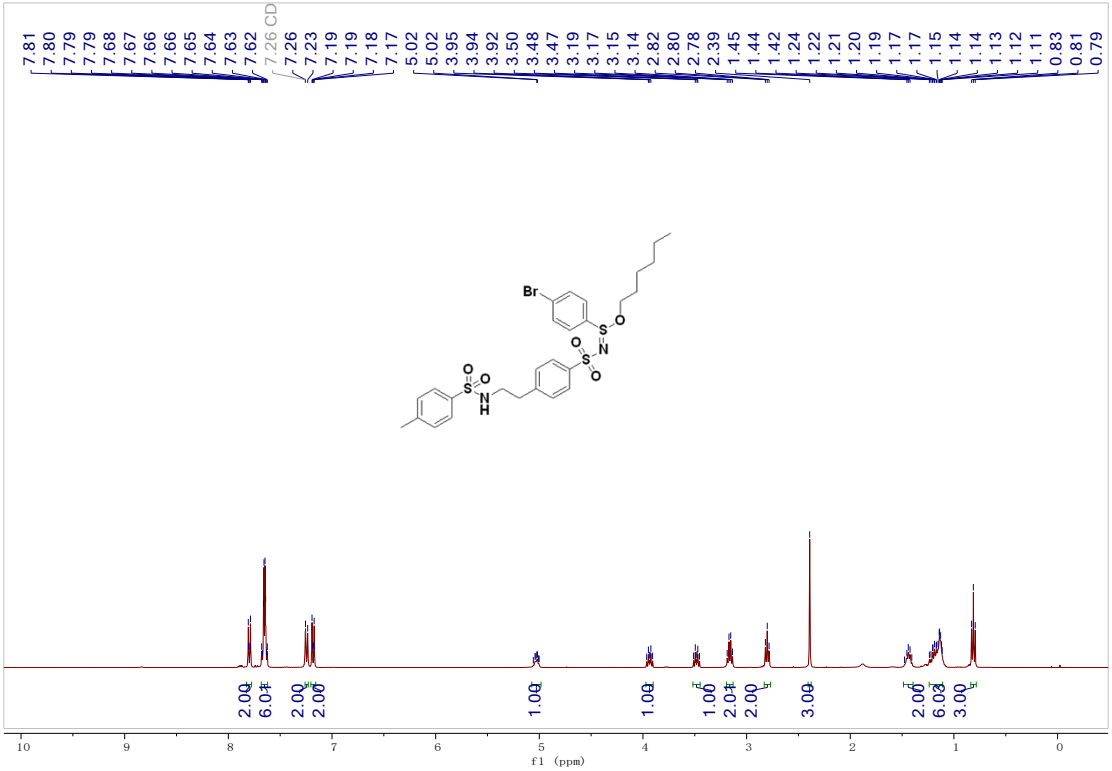
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ai**



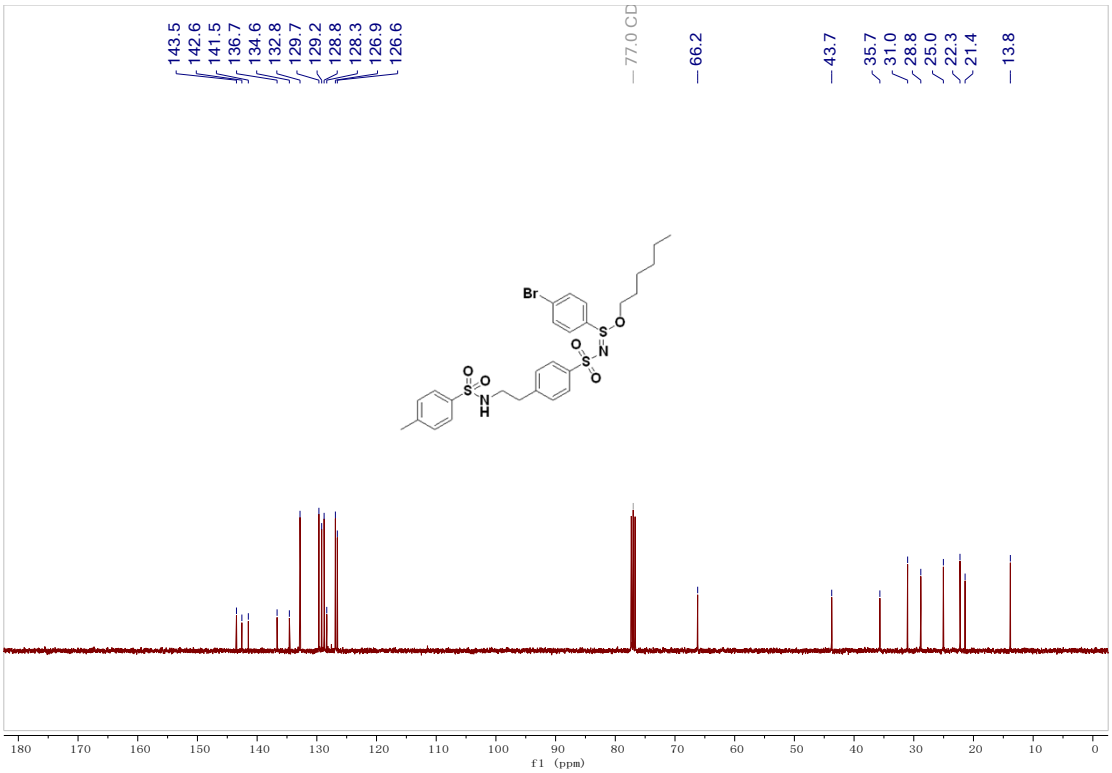
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ai**



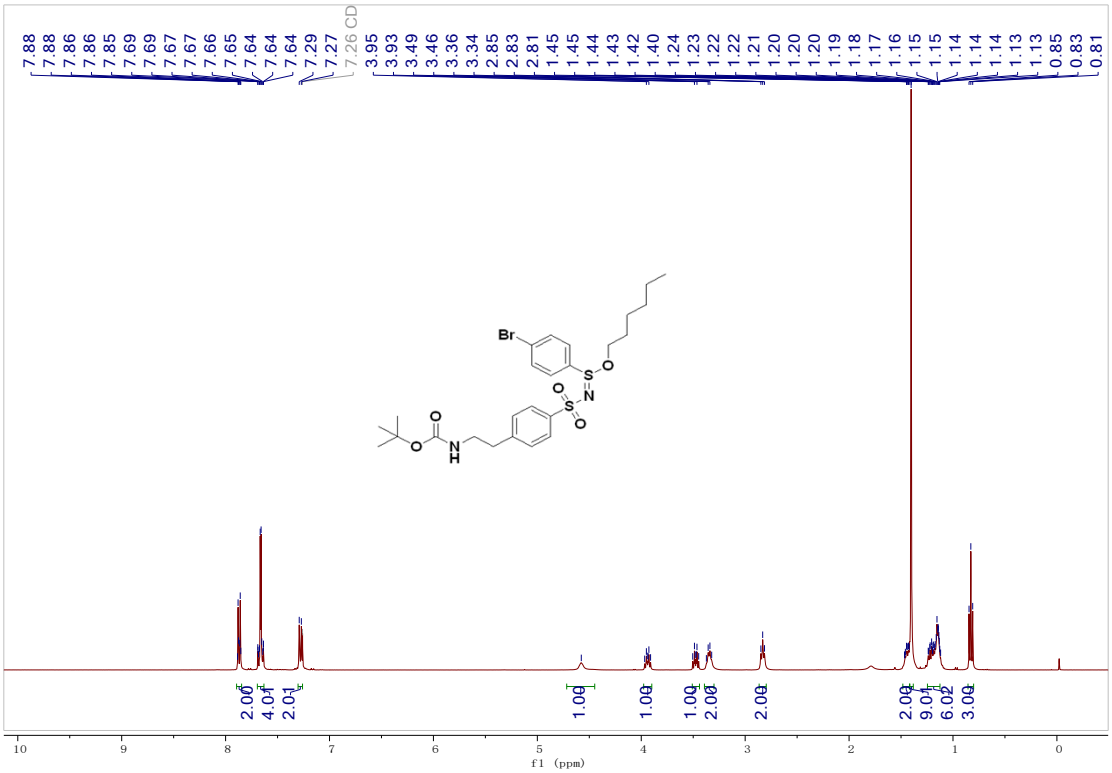
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4aj**



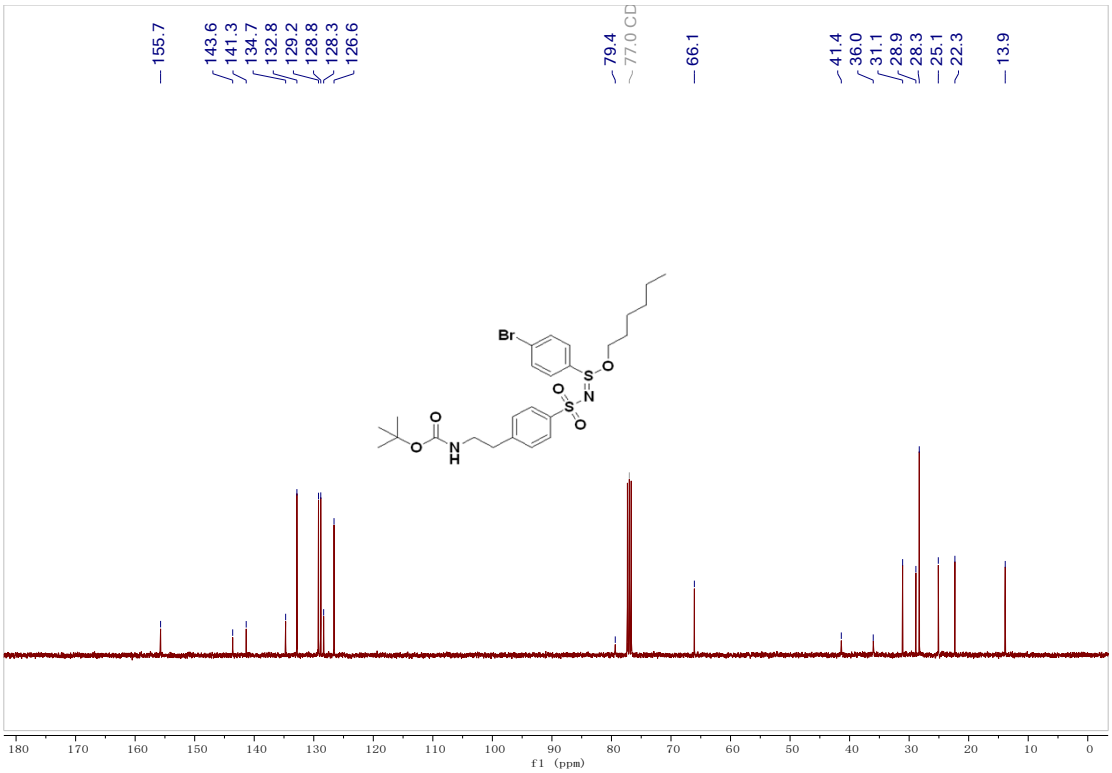
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4aj**



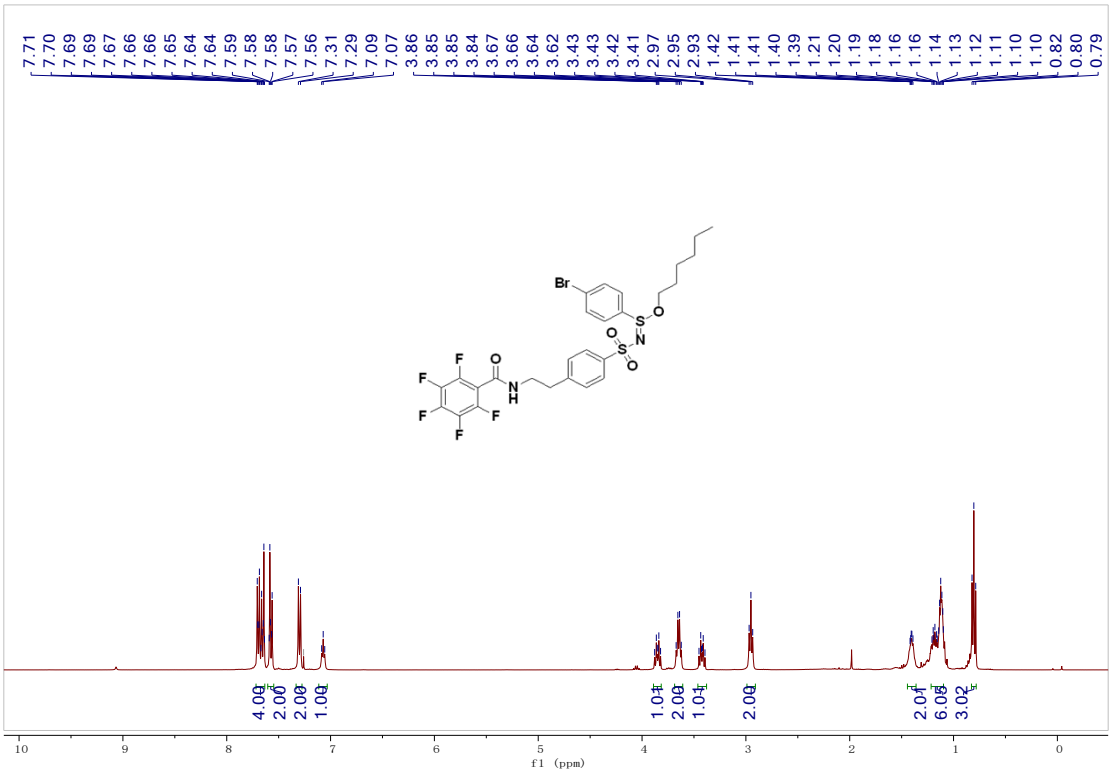
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ak**



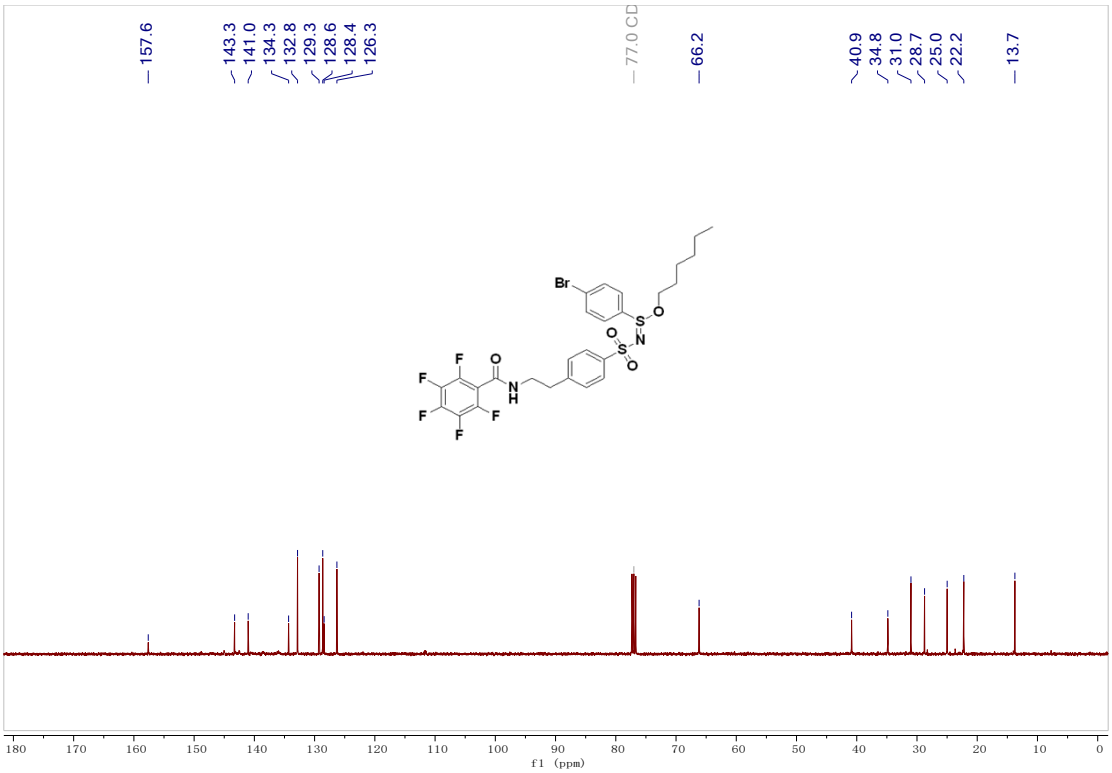
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ak**



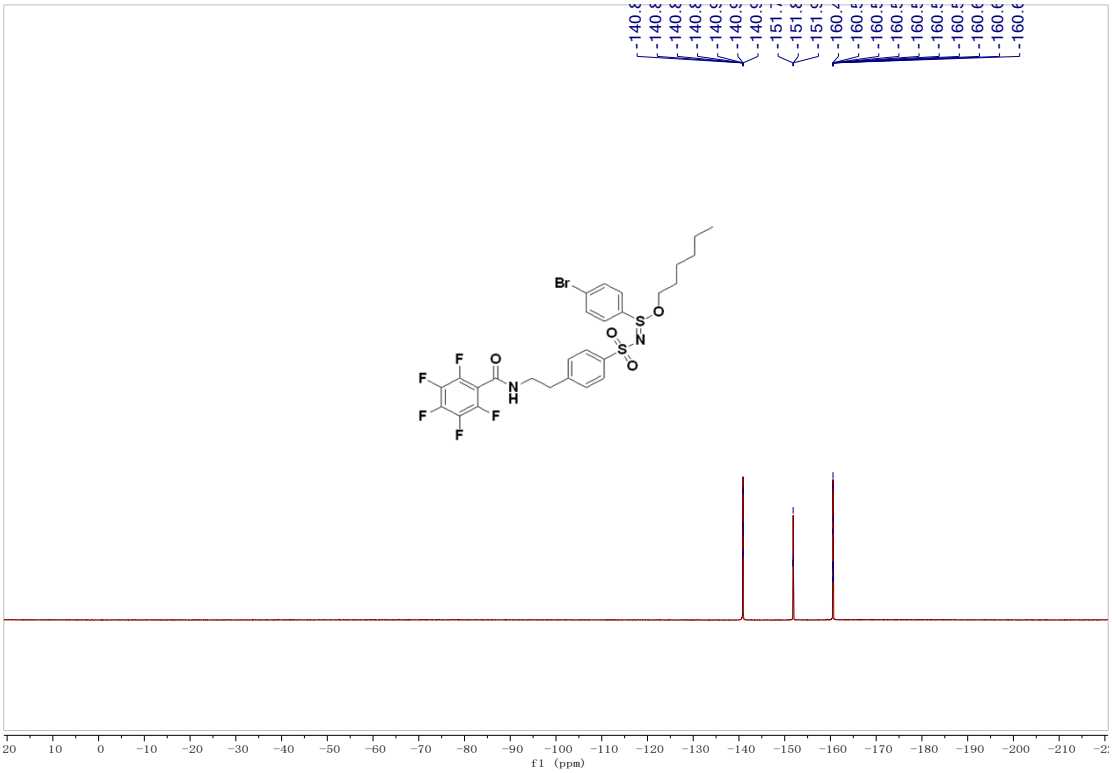
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4al**



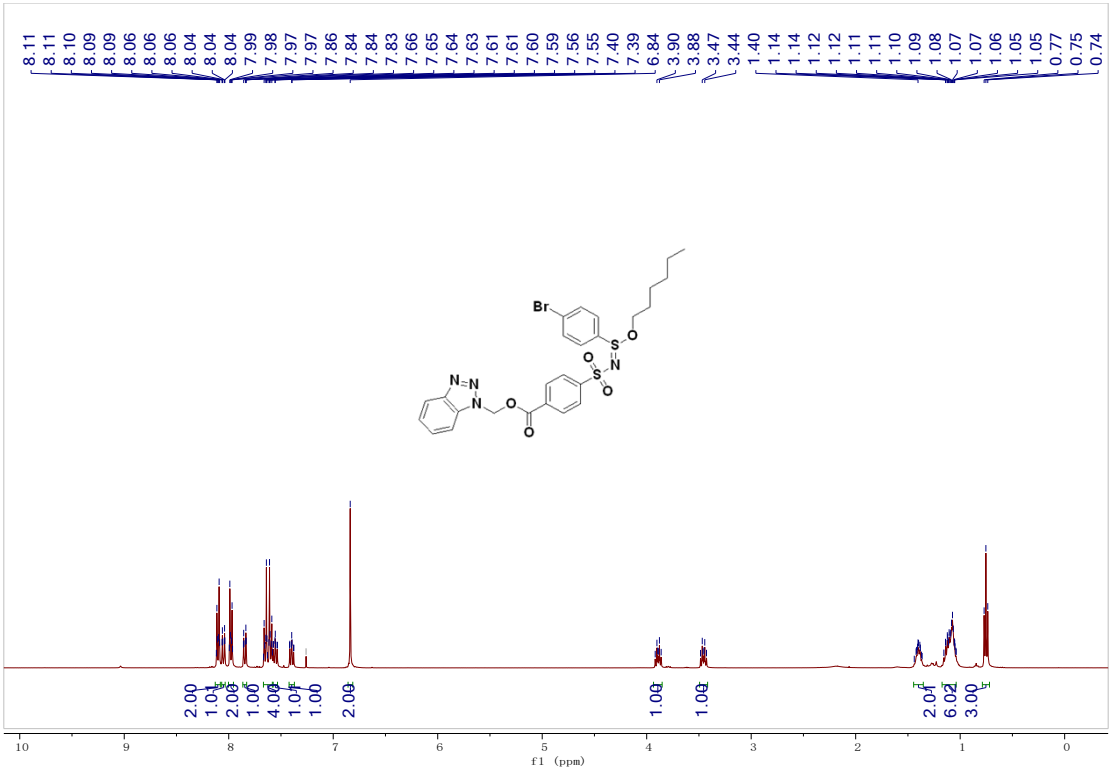
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4al**



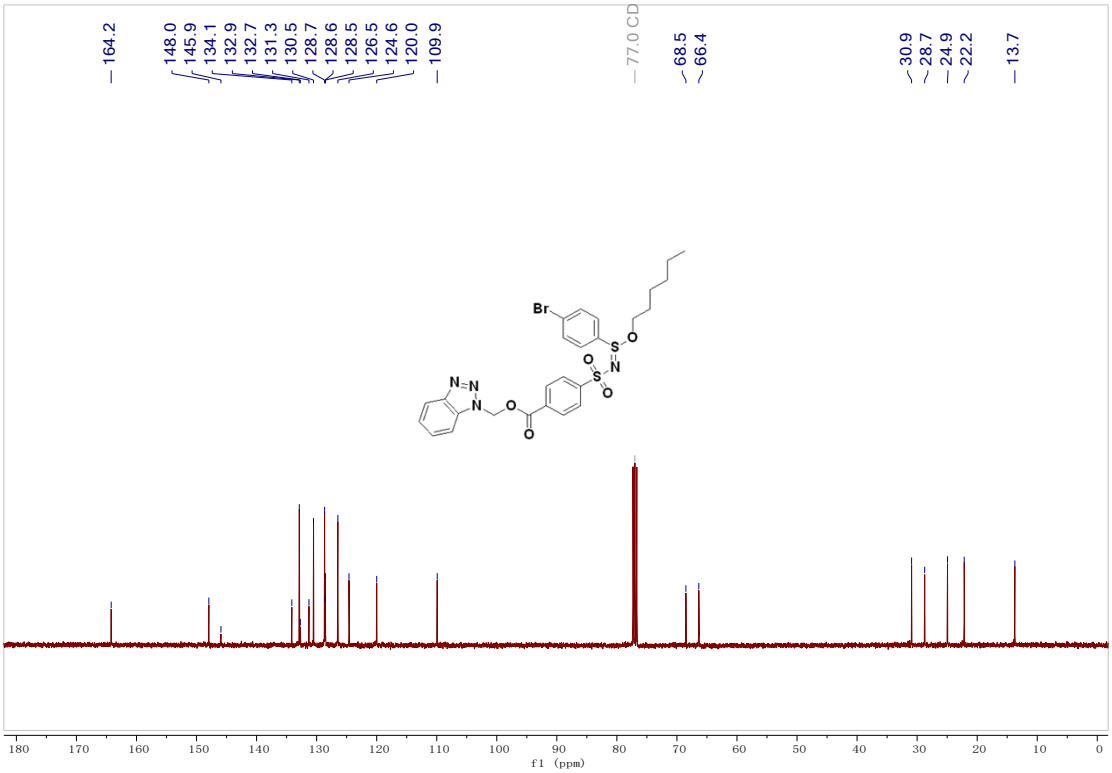
^{19}F NMR (376 MHz, Chloroform-d) of compound **4al**



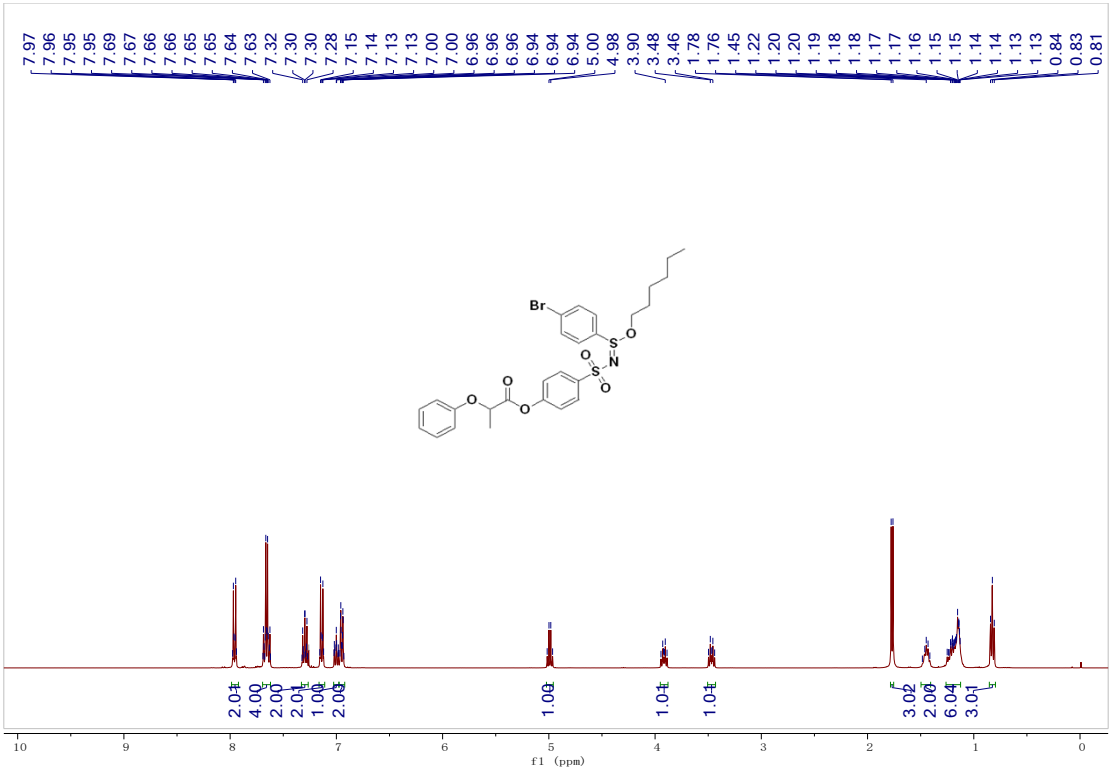
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4am**



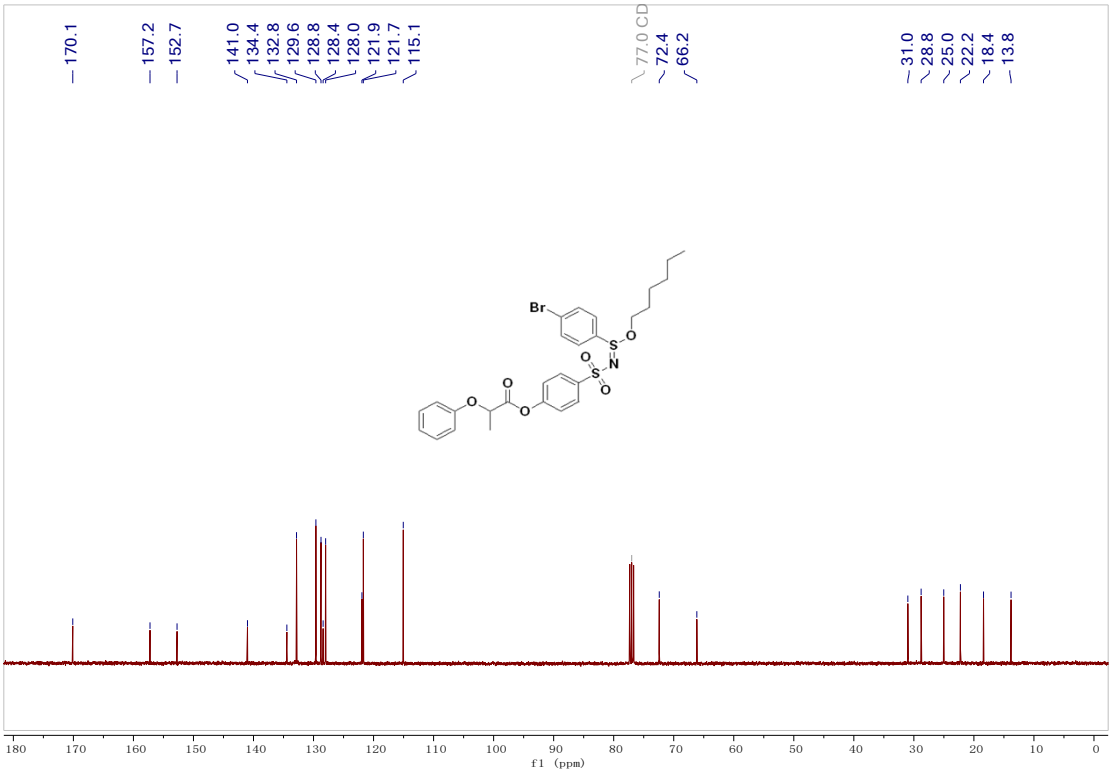
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4am**



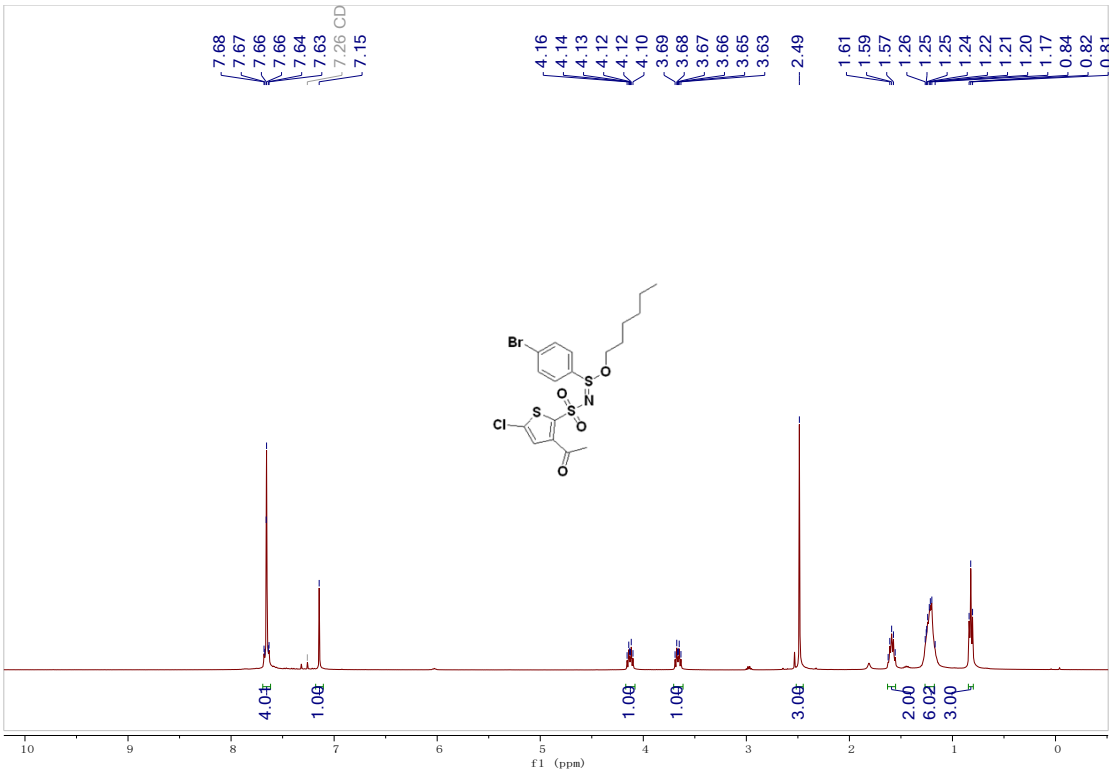
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4an**



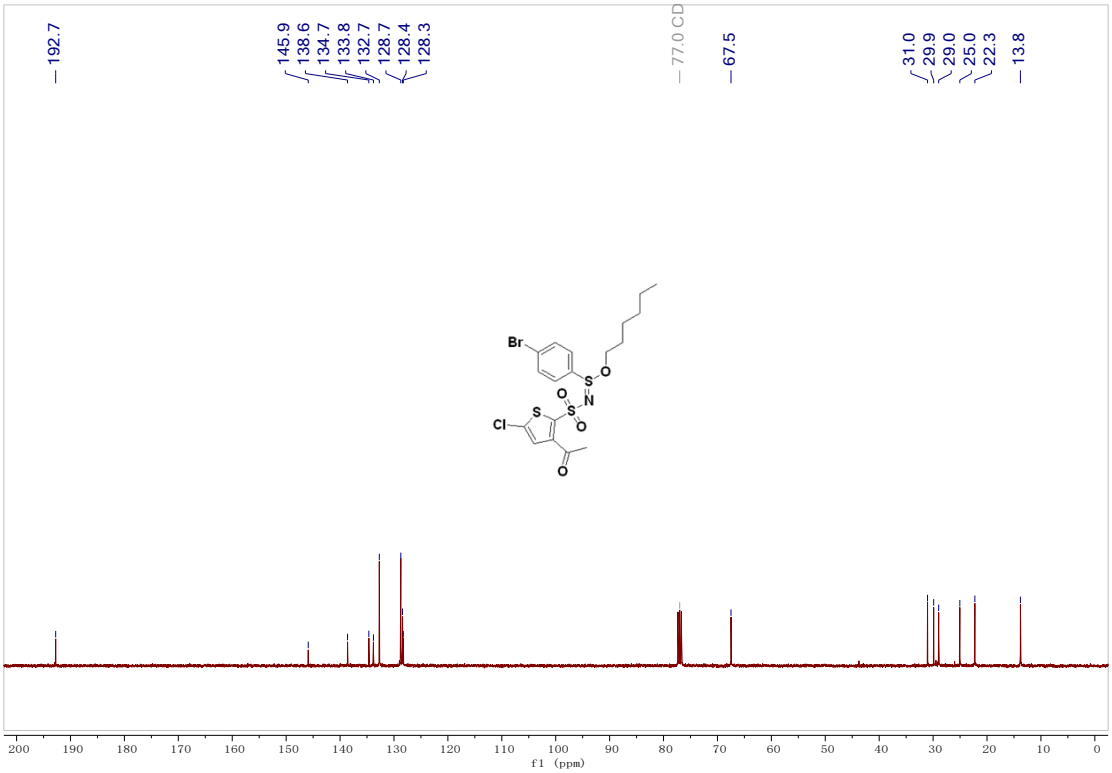
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4an**



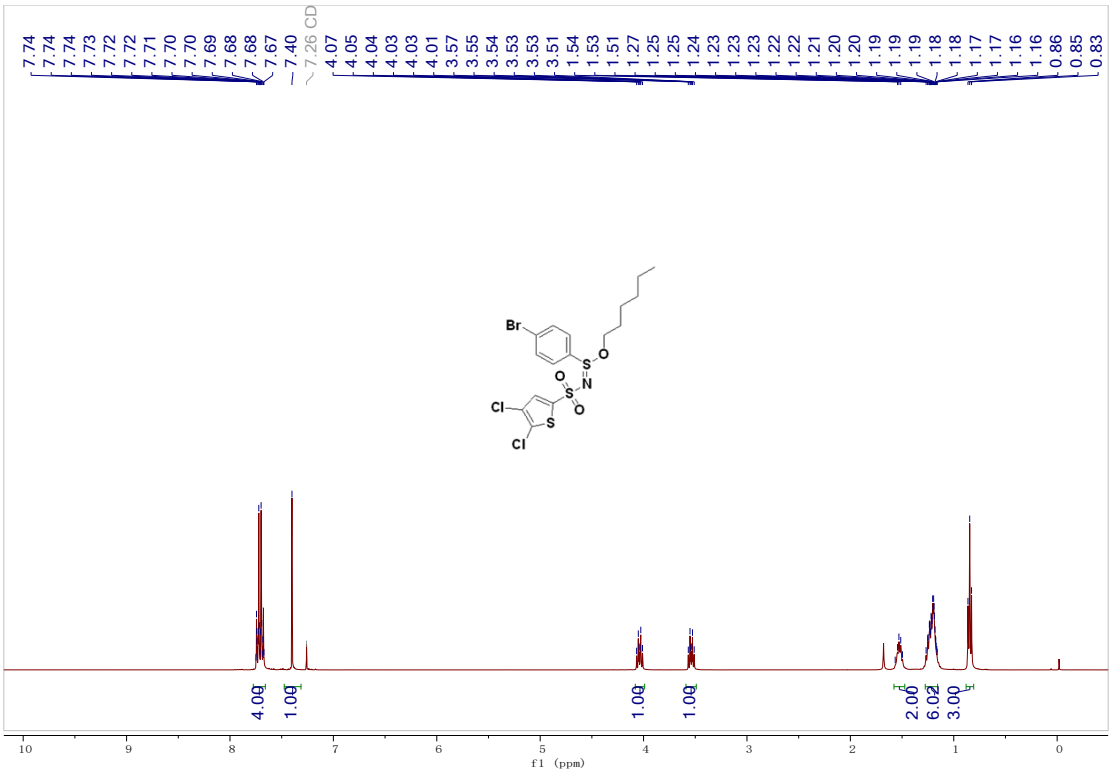
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ao**



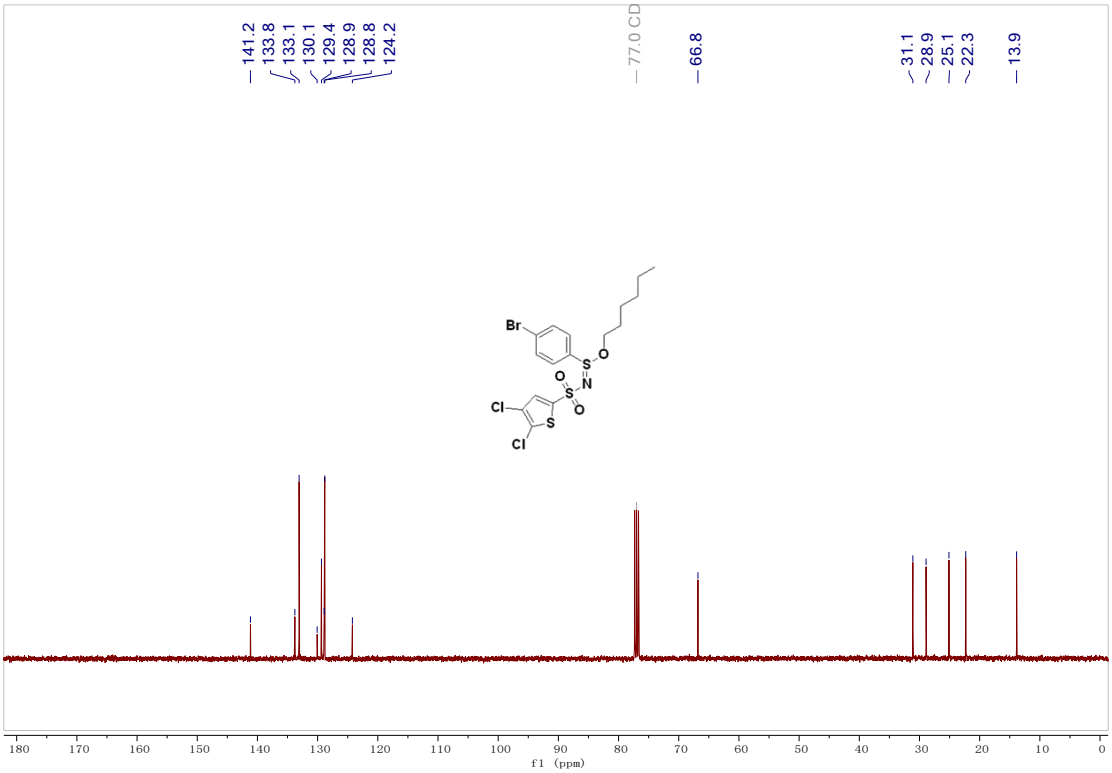
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ao**



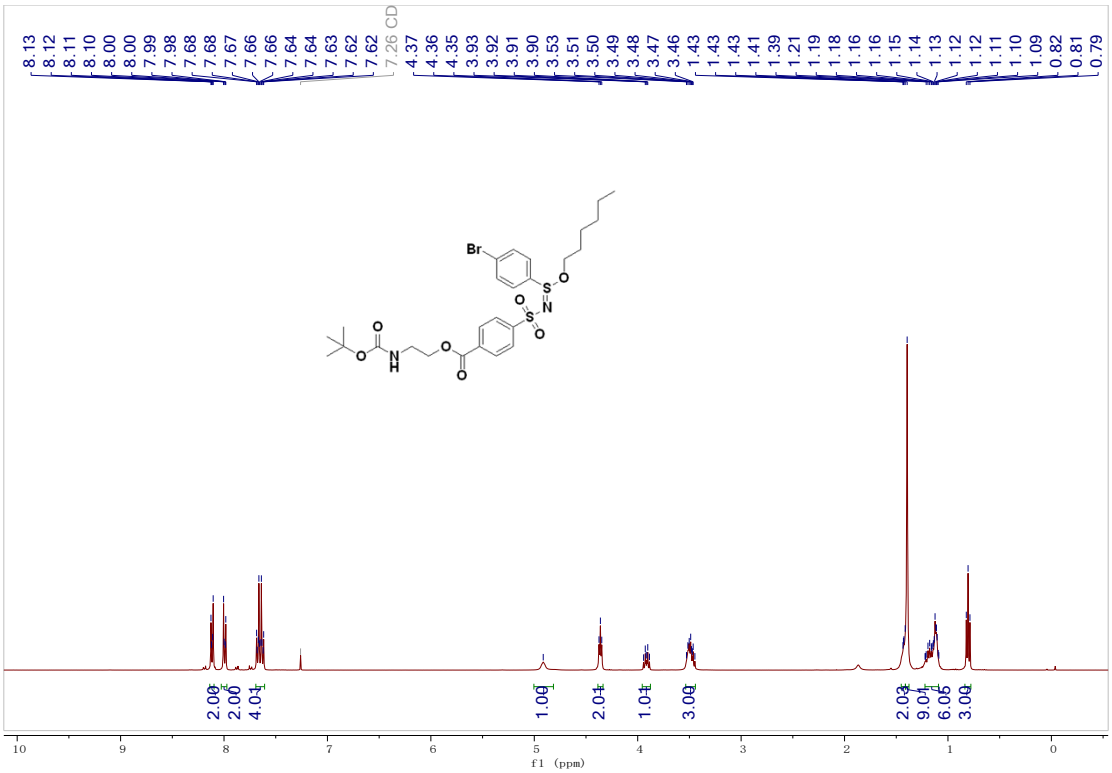
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ap**



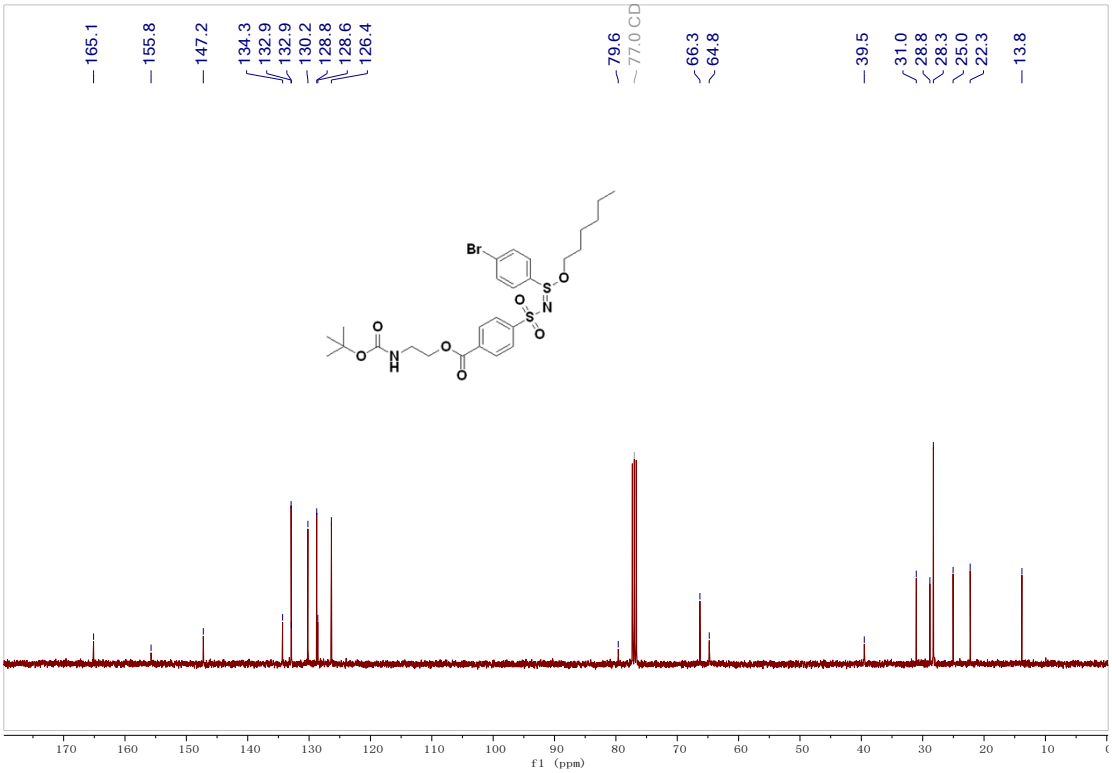
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ap**



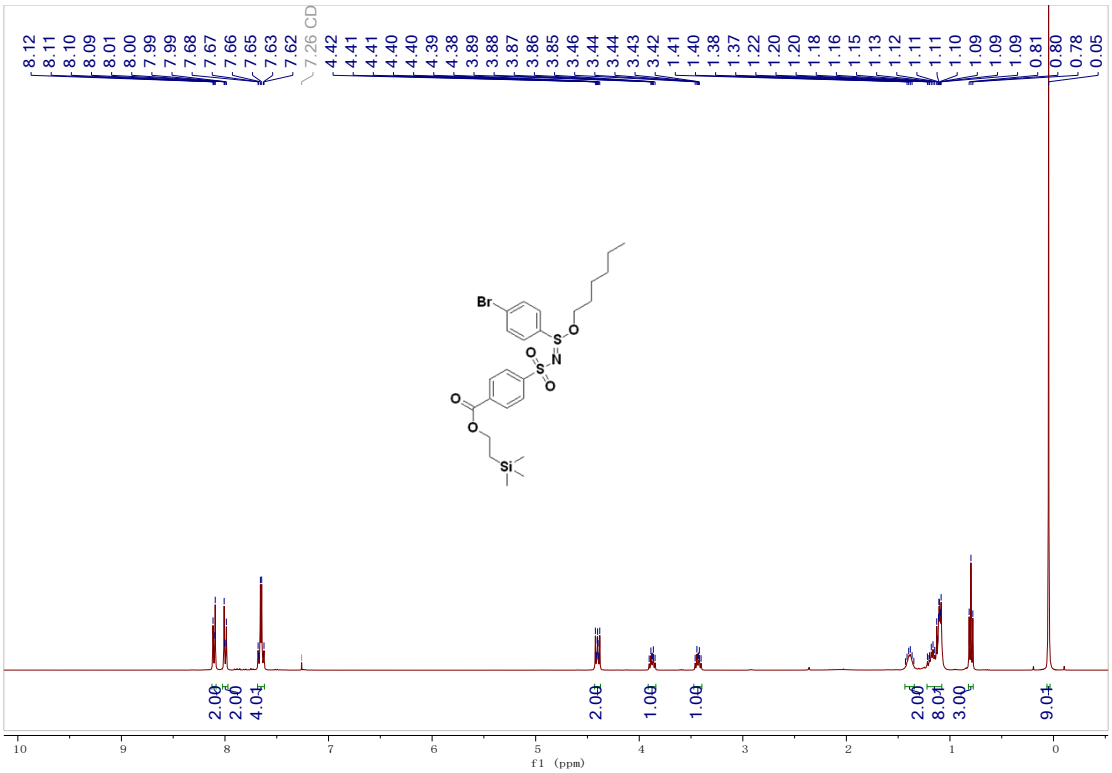
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4aq**



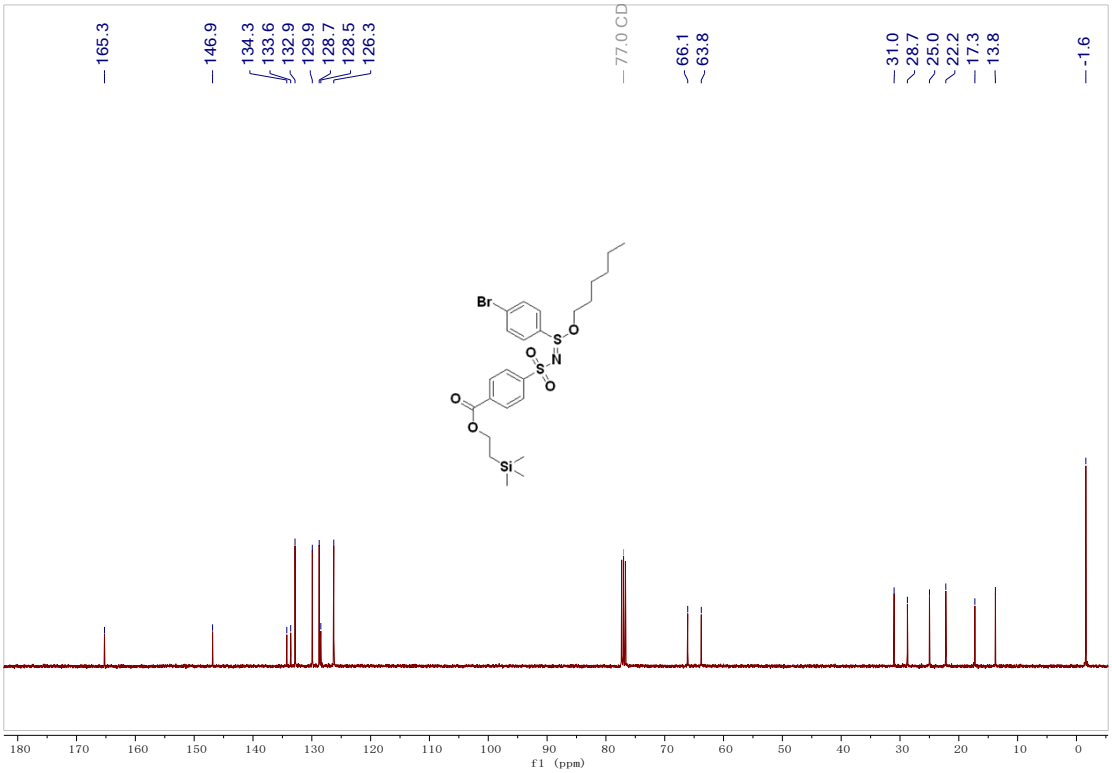
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4aq**



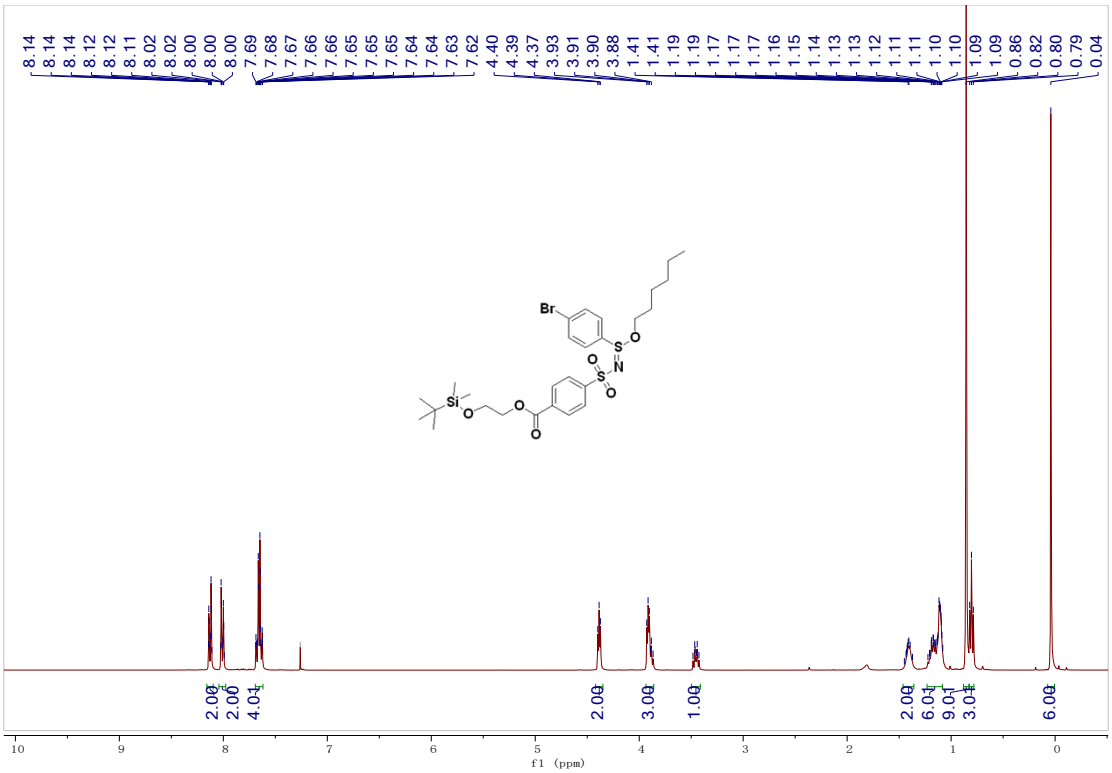
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ar**



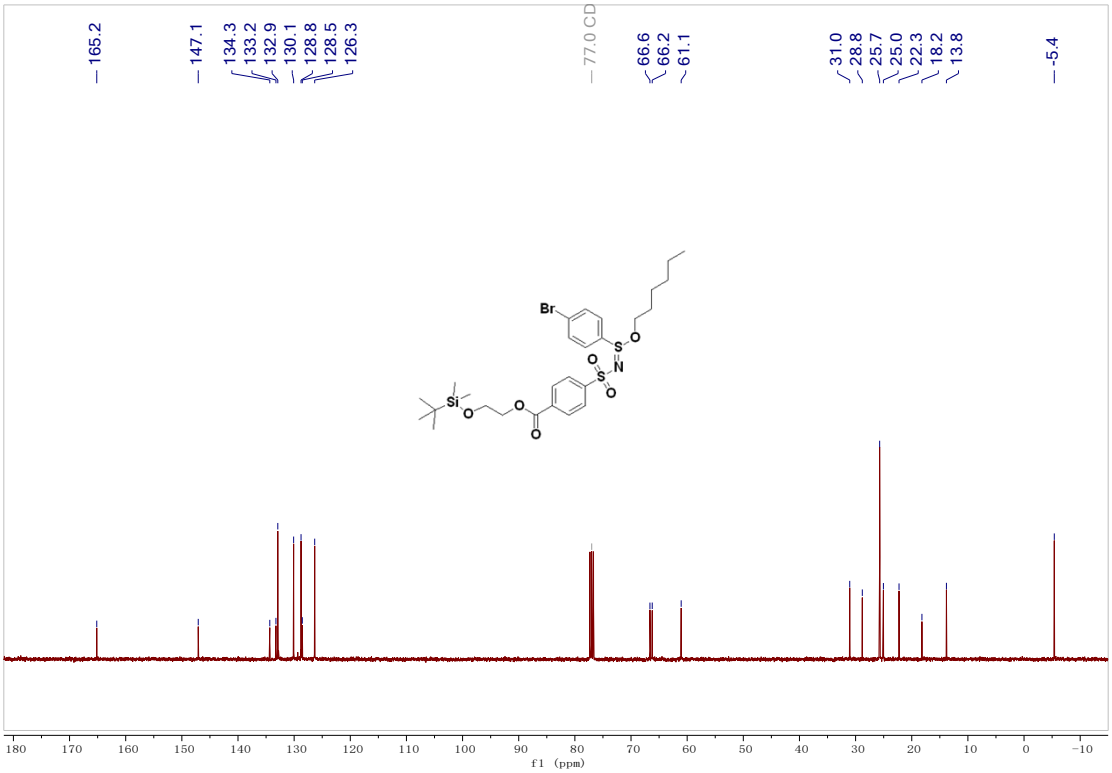
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ar**



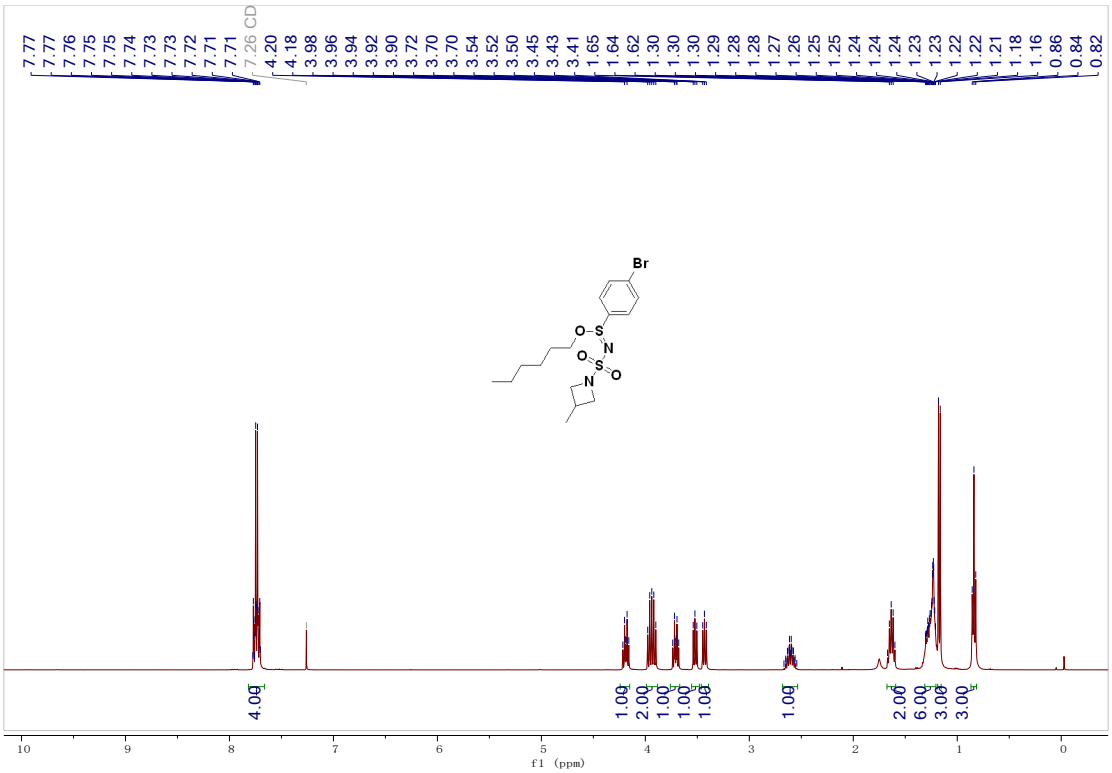
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4as**



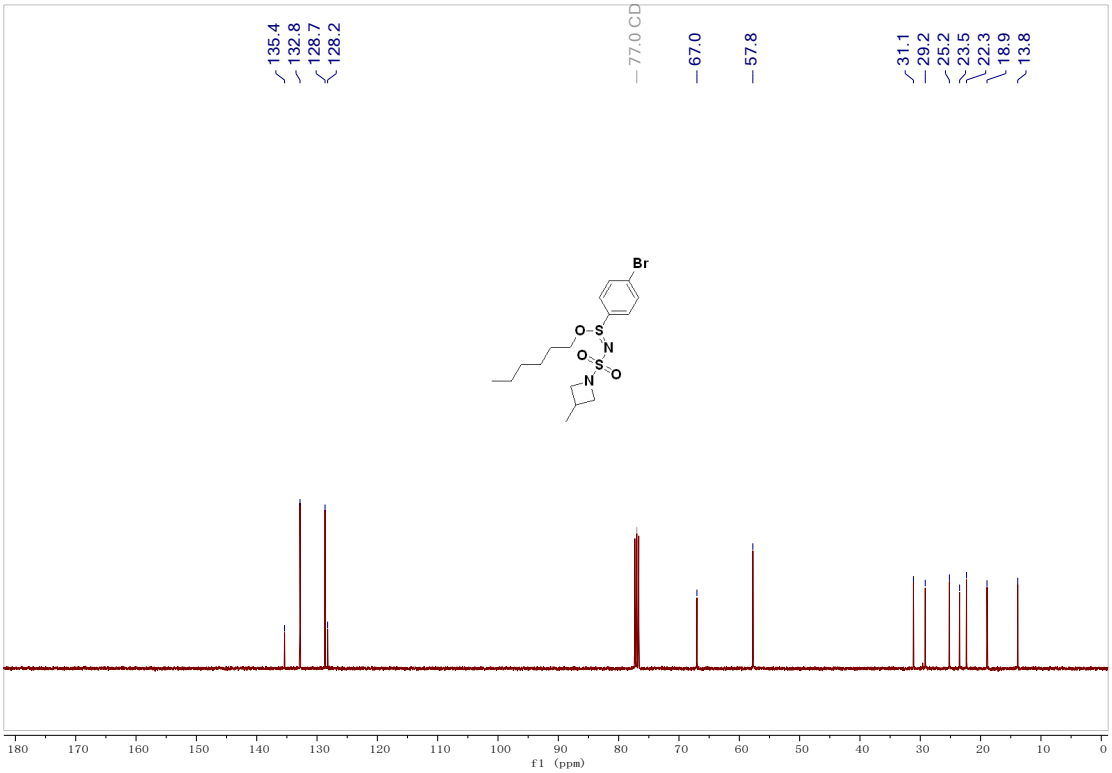
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4as**



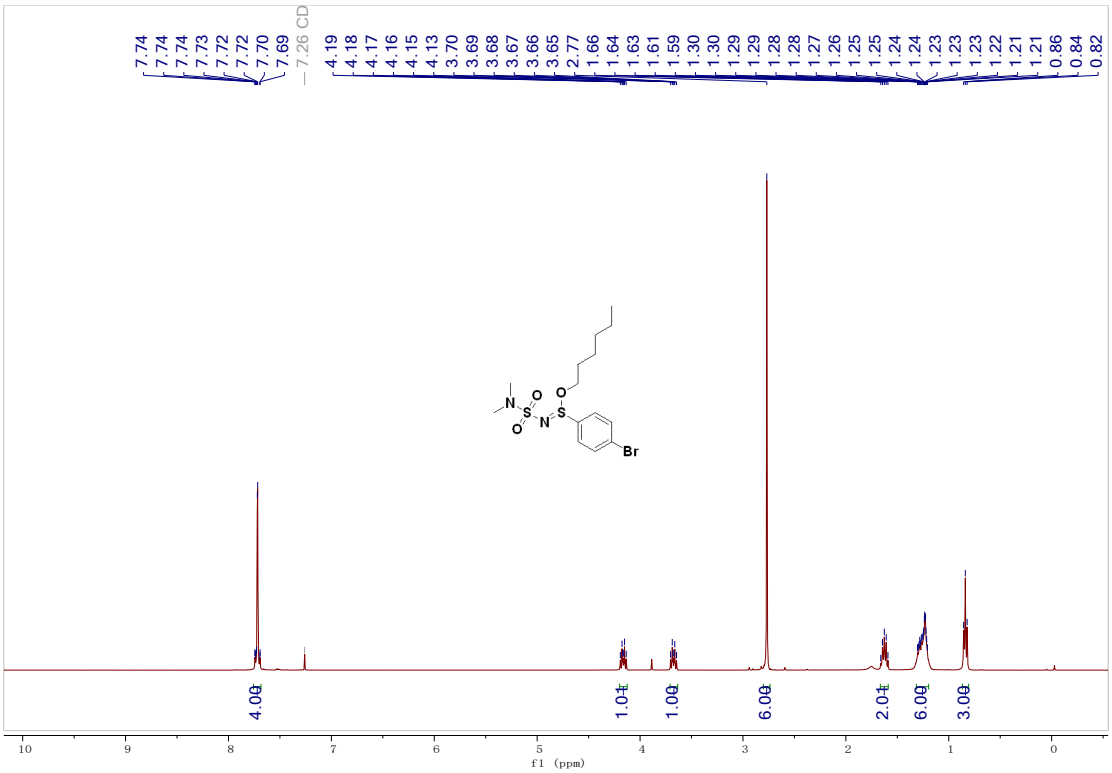
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4at**



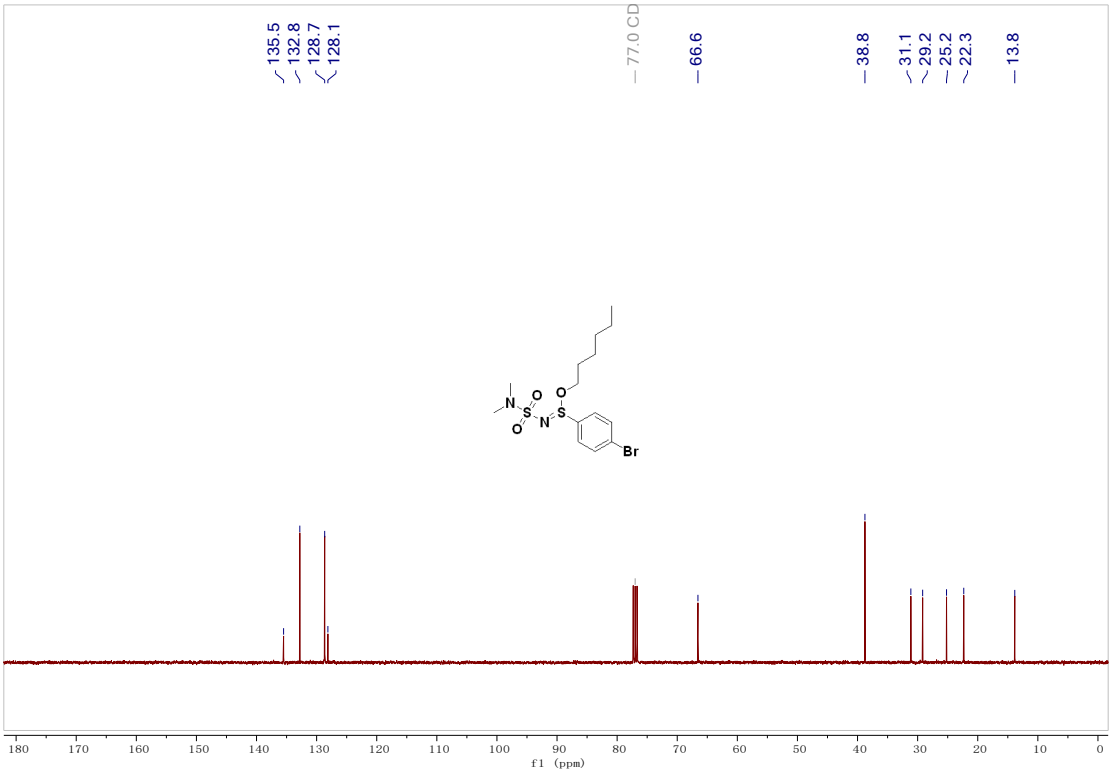
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4at**



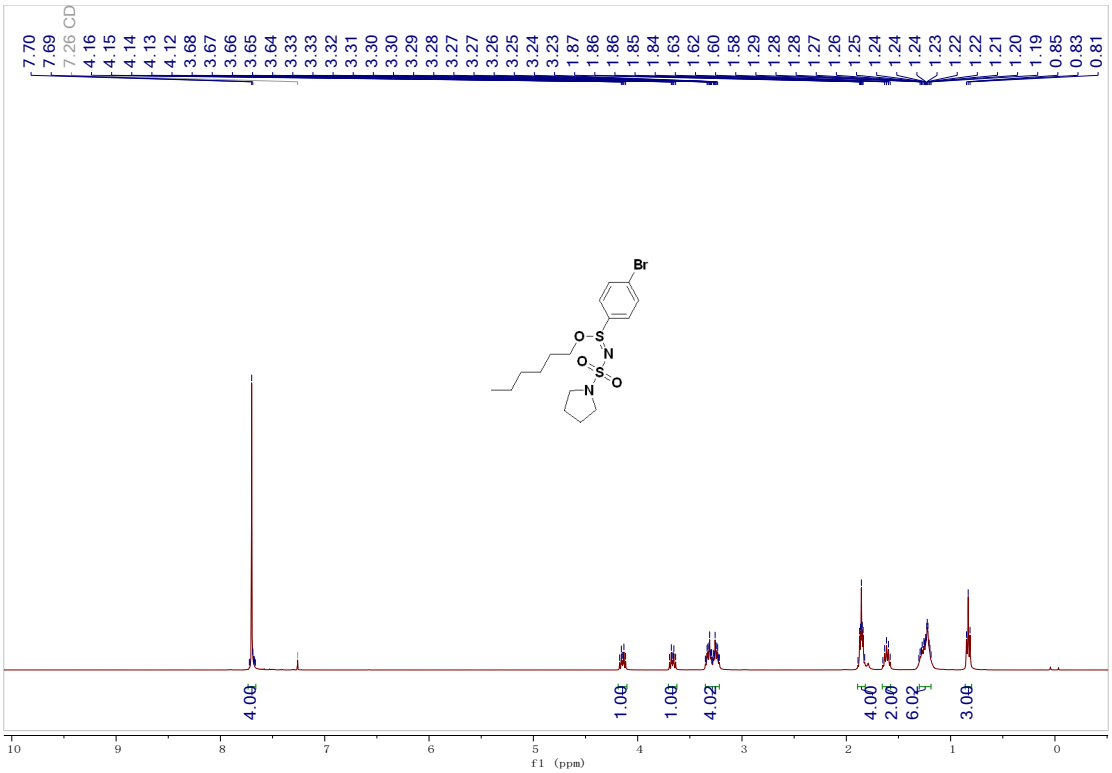
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4au**



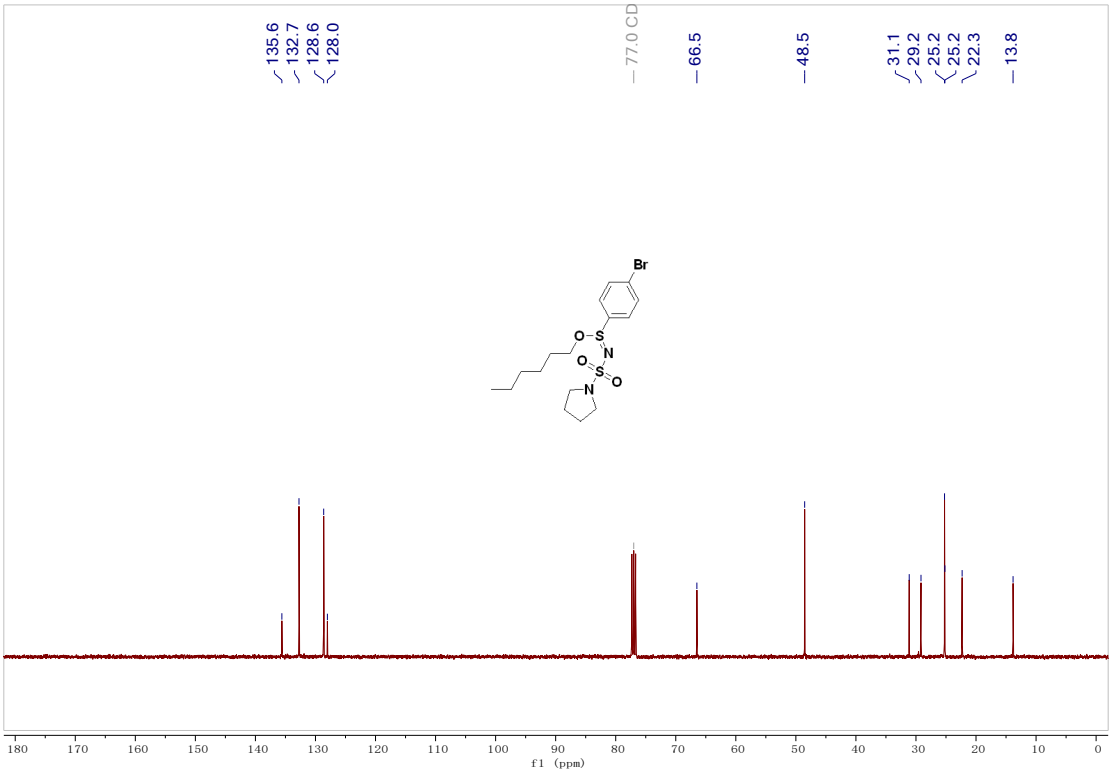
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4au**



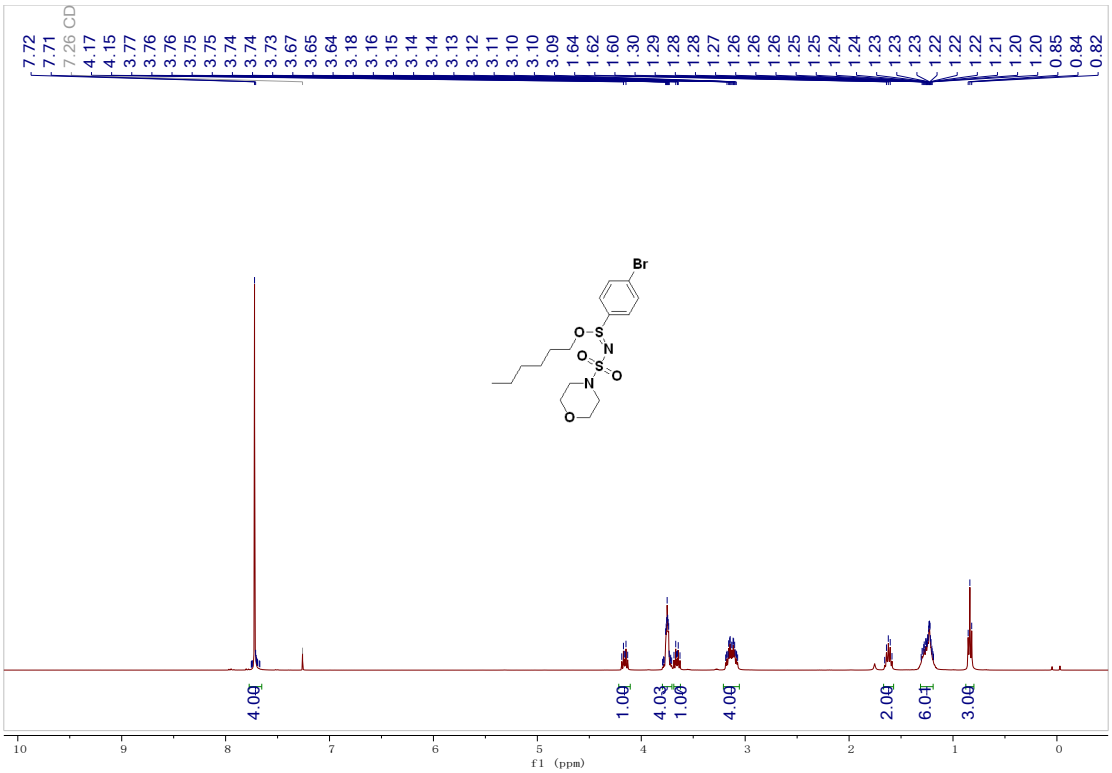
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4av**



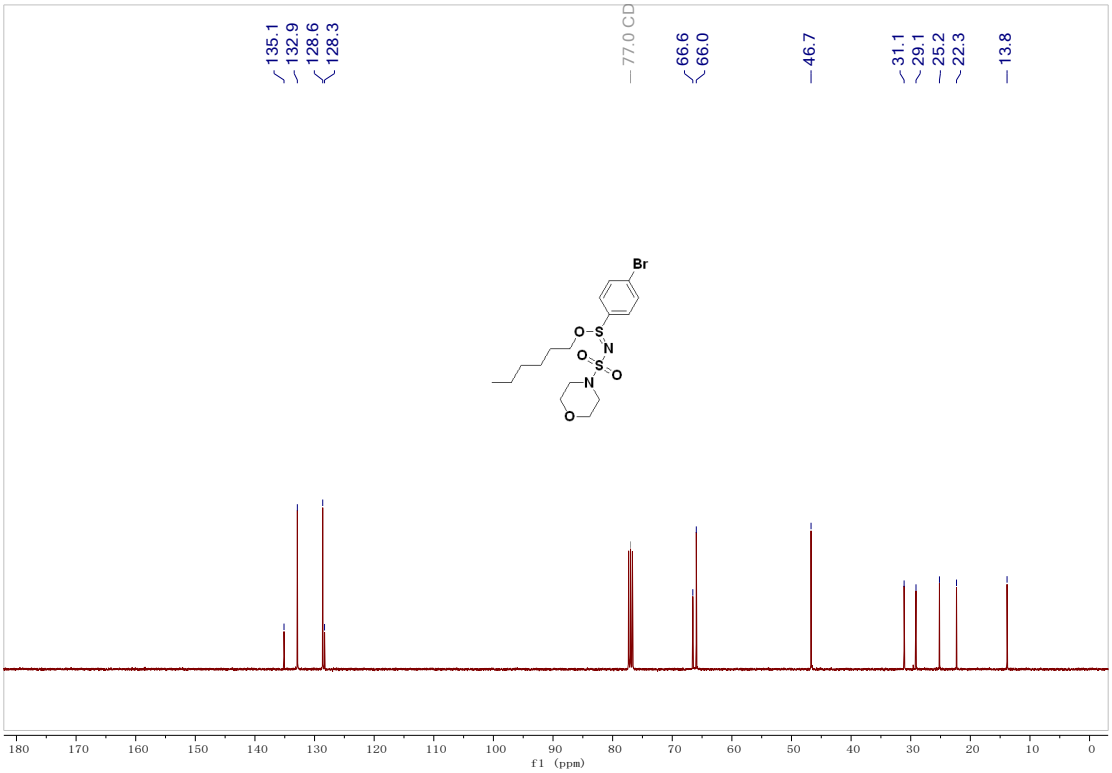
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4av**



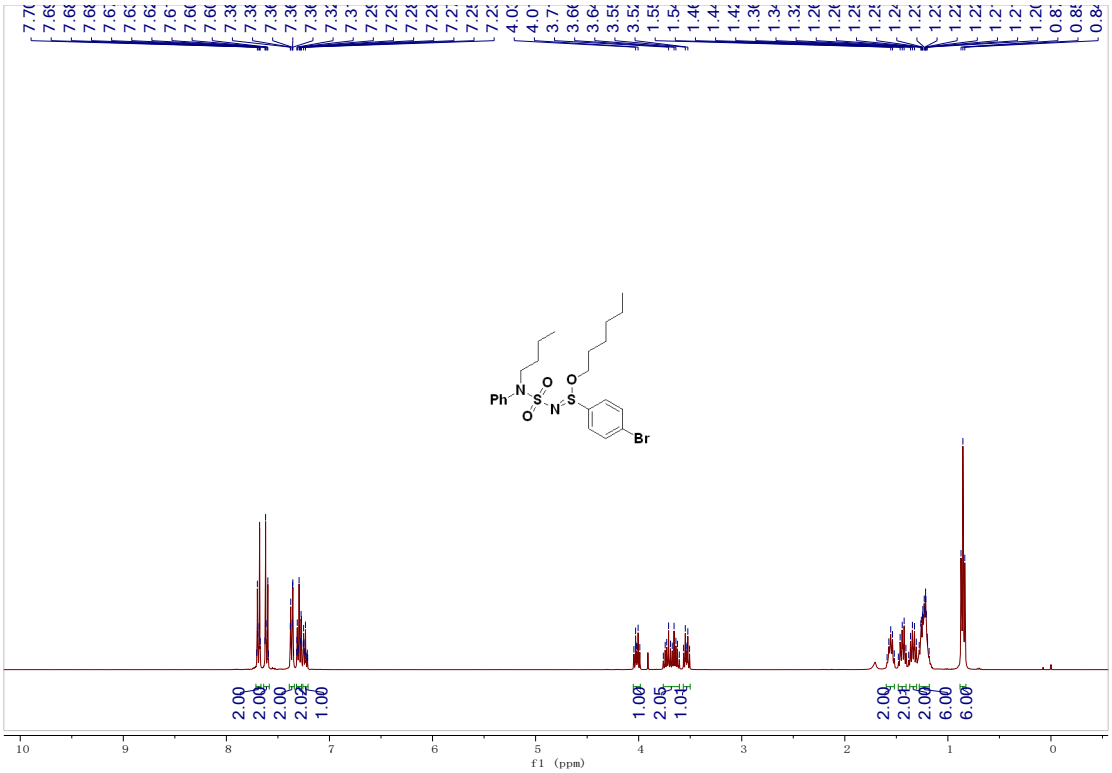
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4aw**



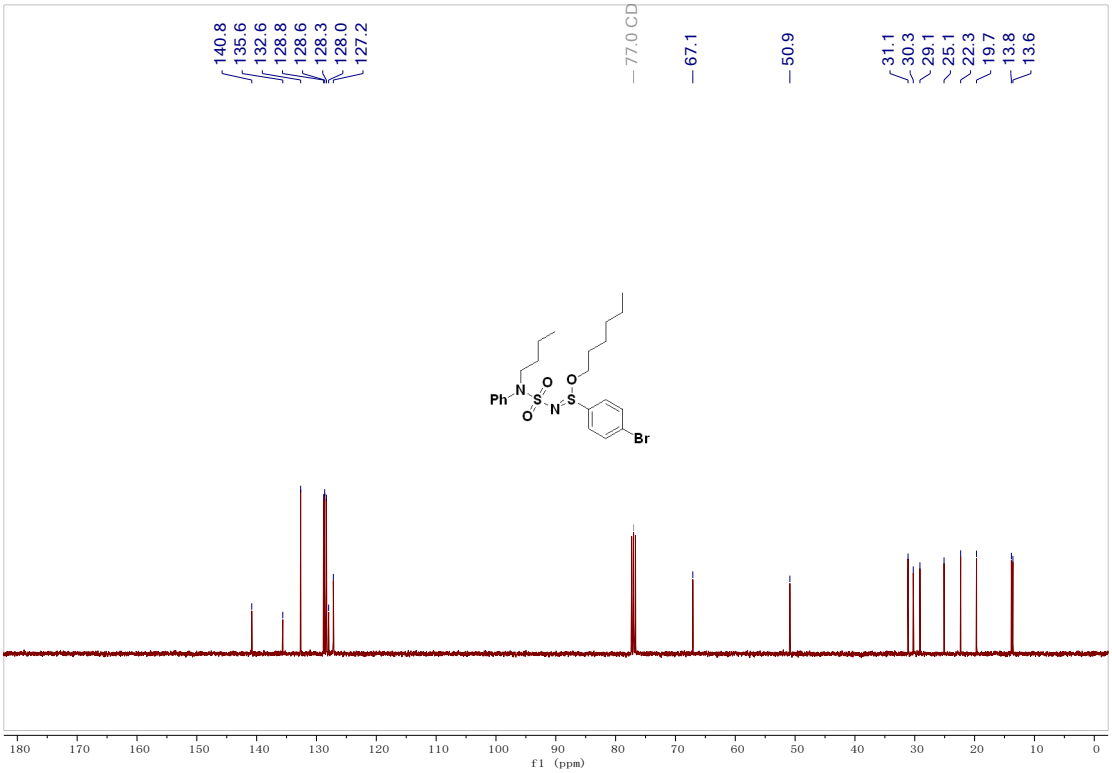
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4aw**



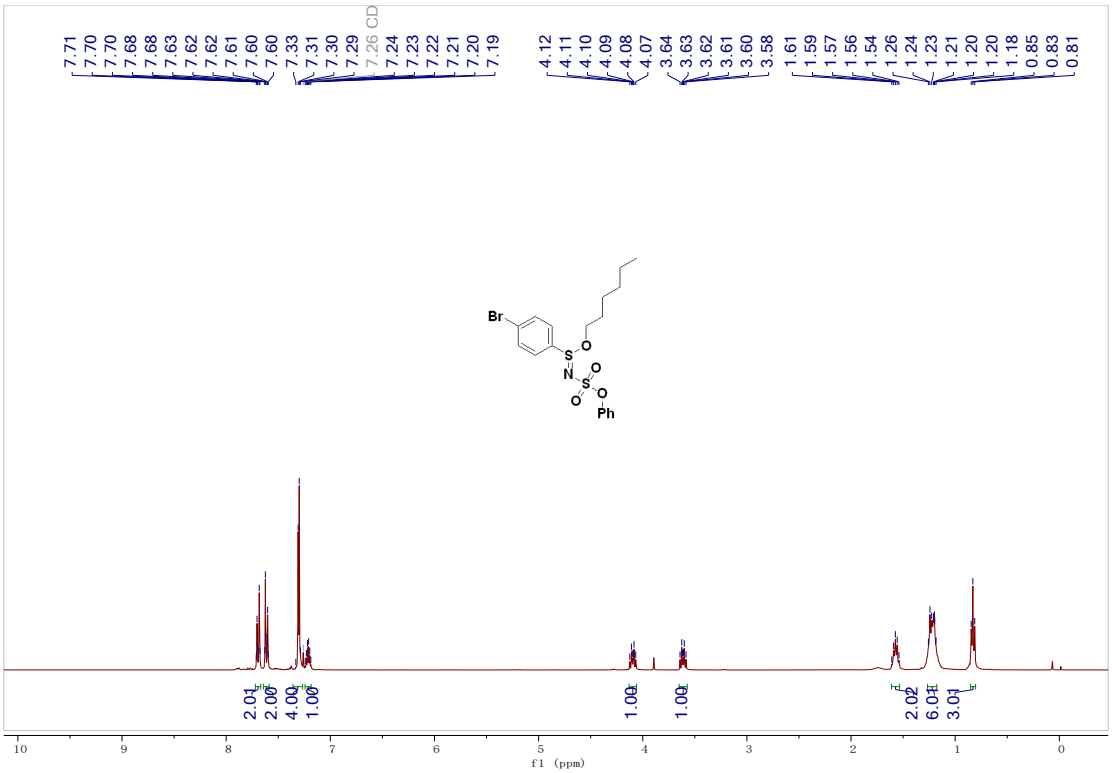
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ax**



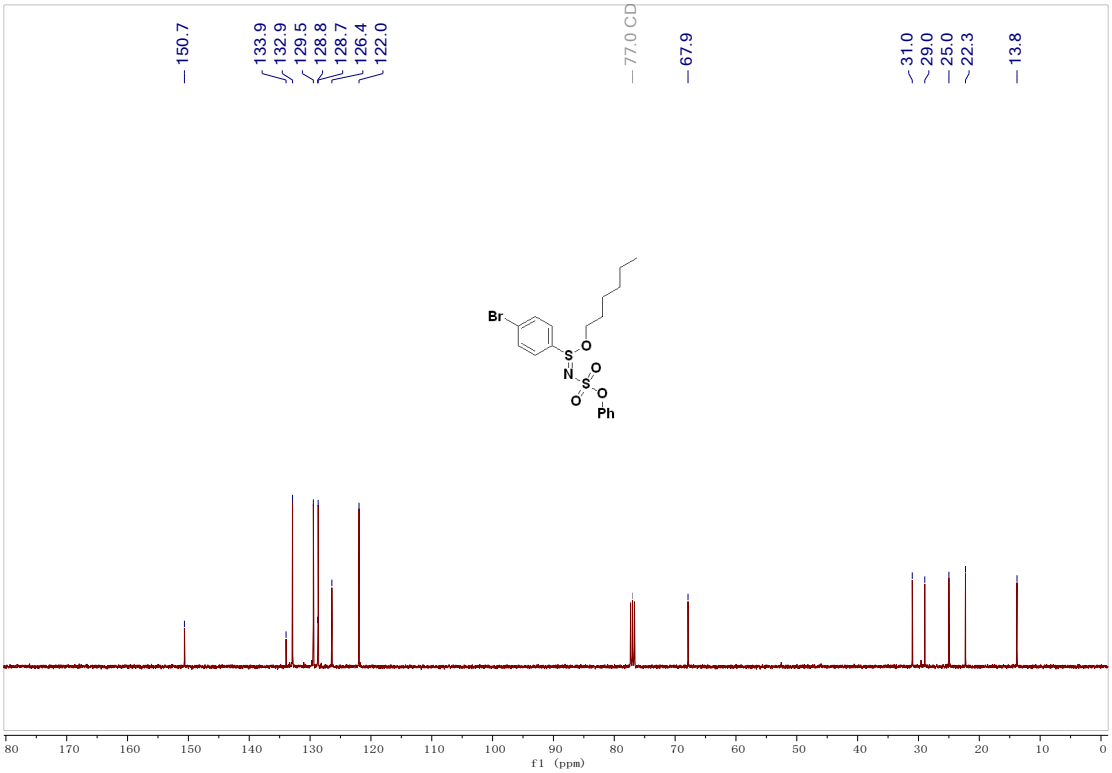
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ax**



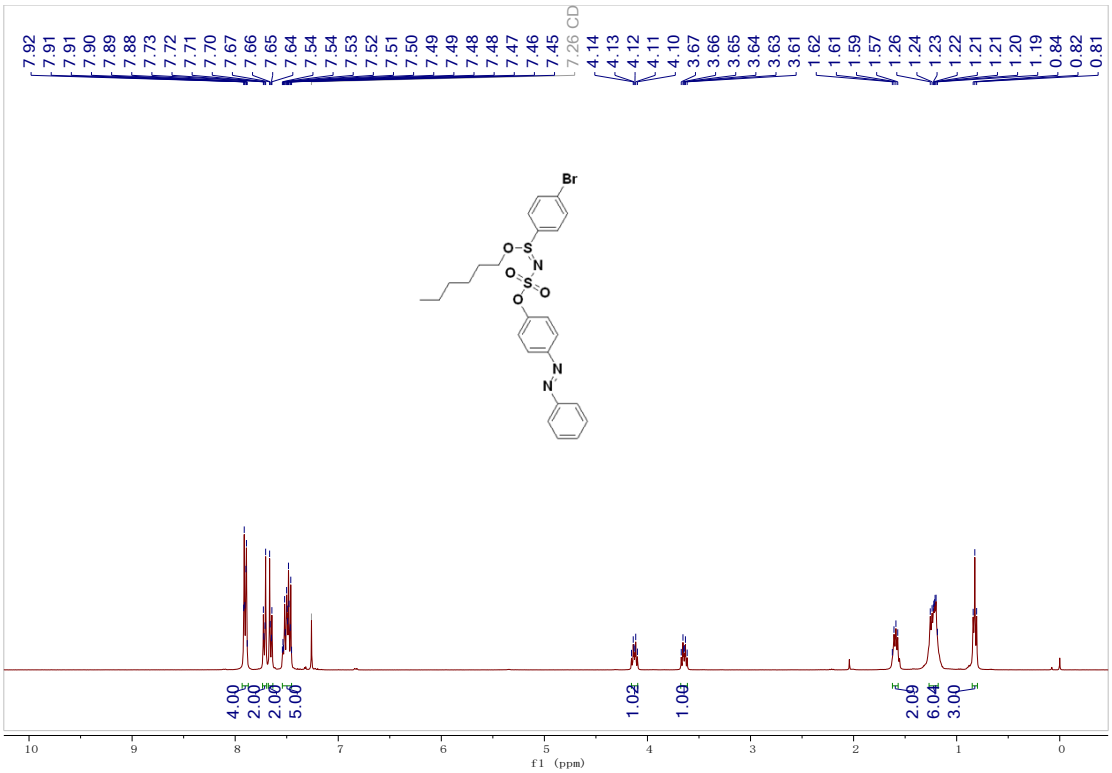
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ay**



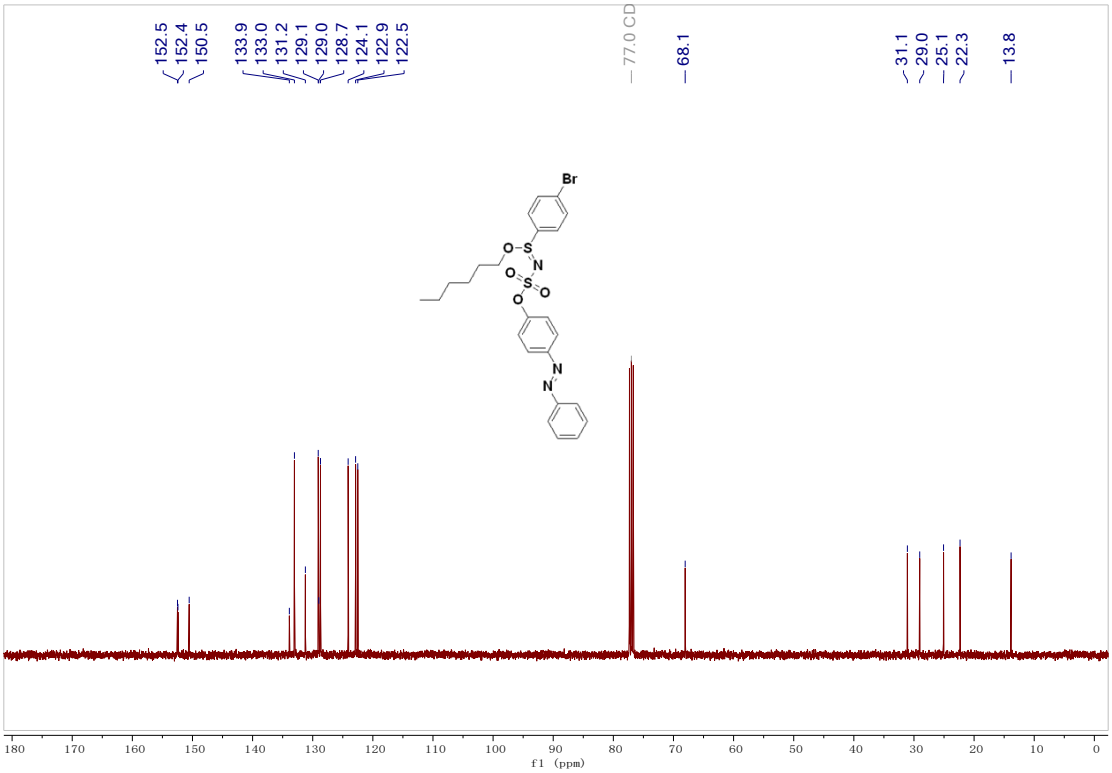
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ay**



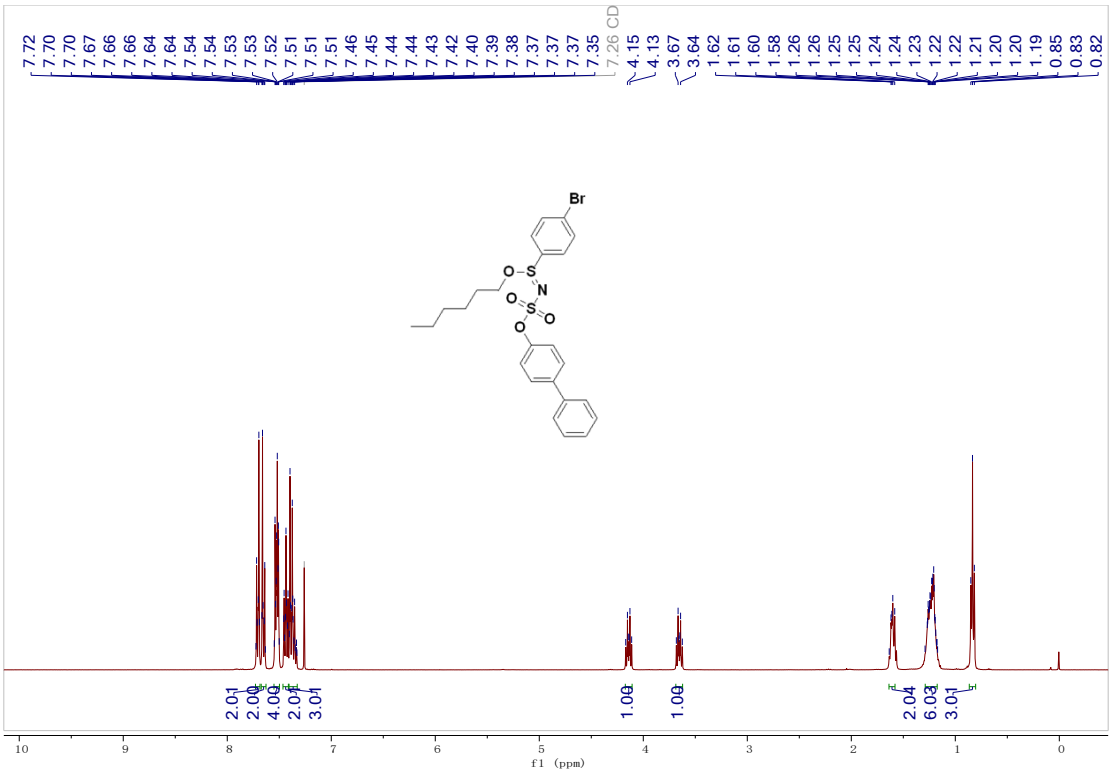
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4az**



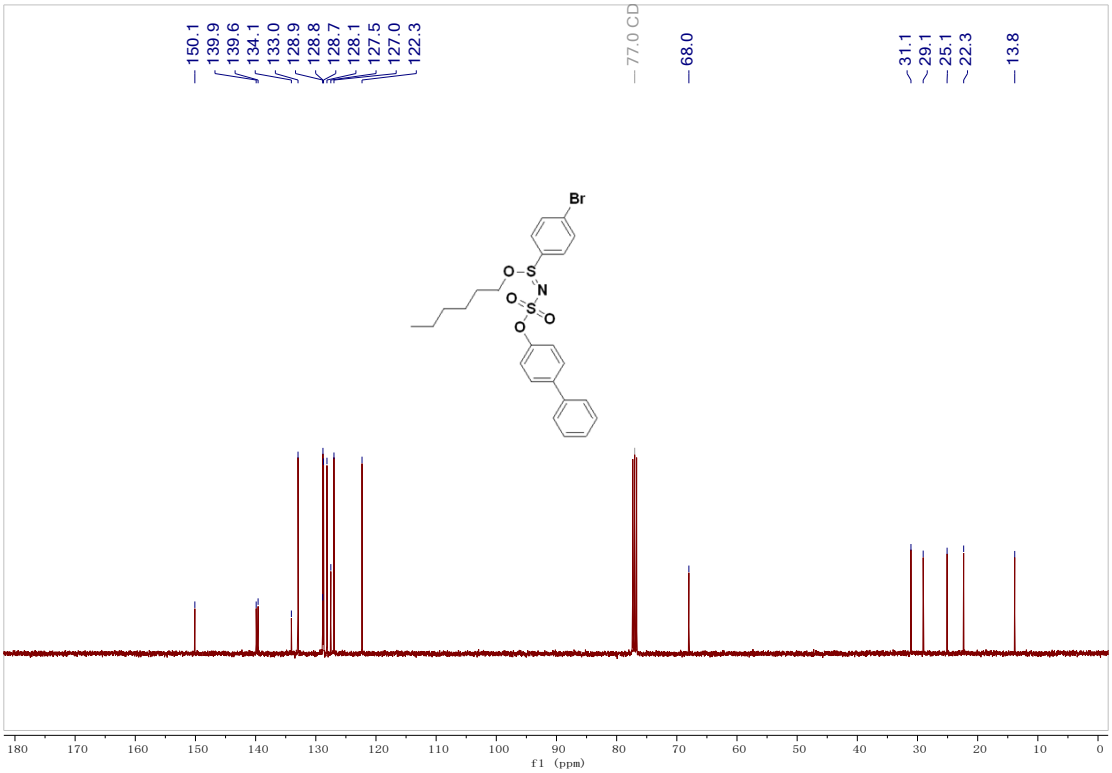
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4az**



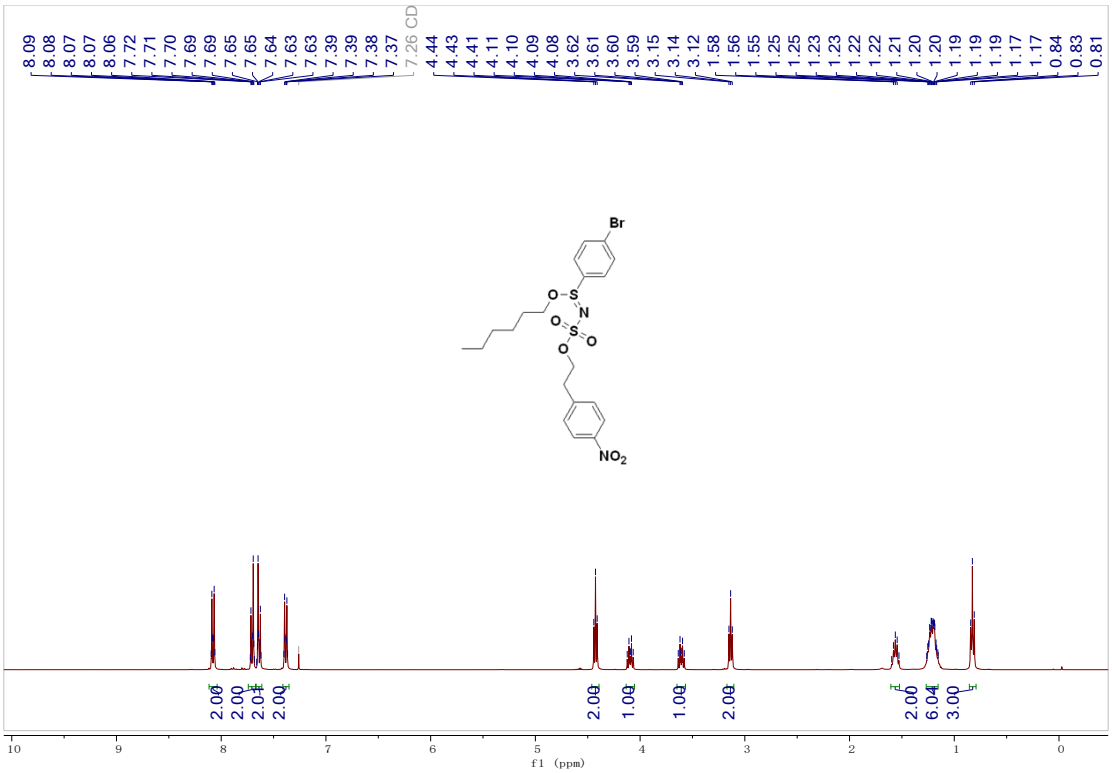
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ba**



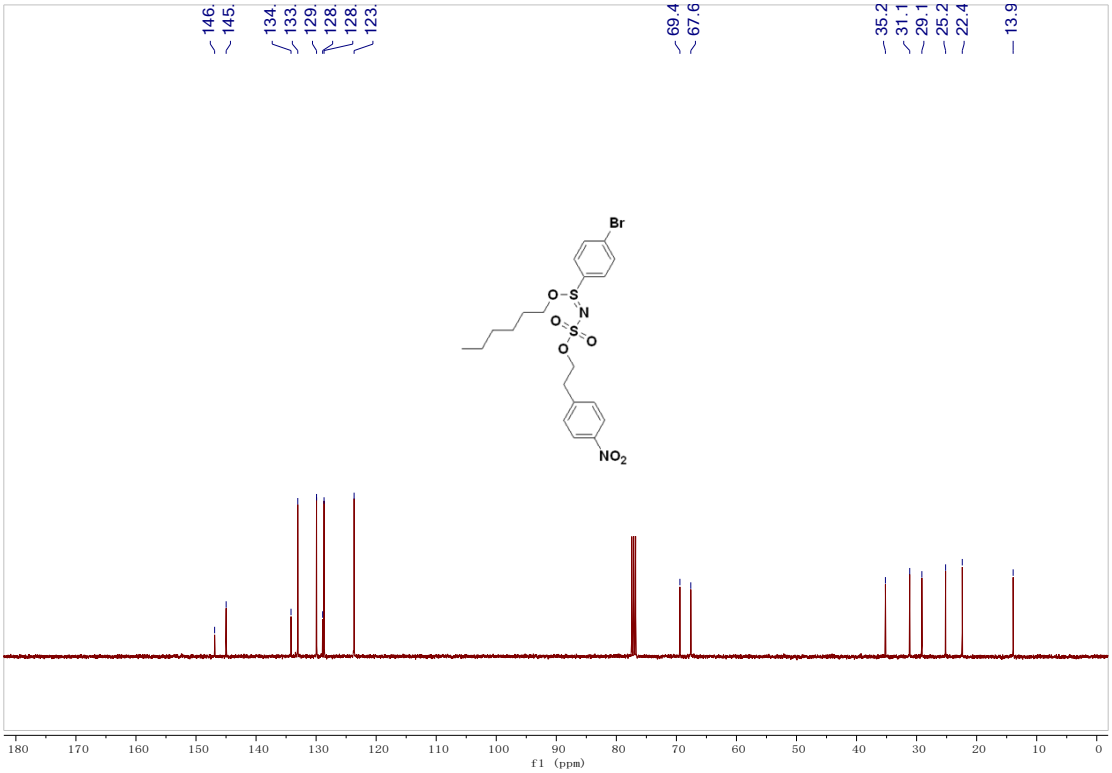
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ba**



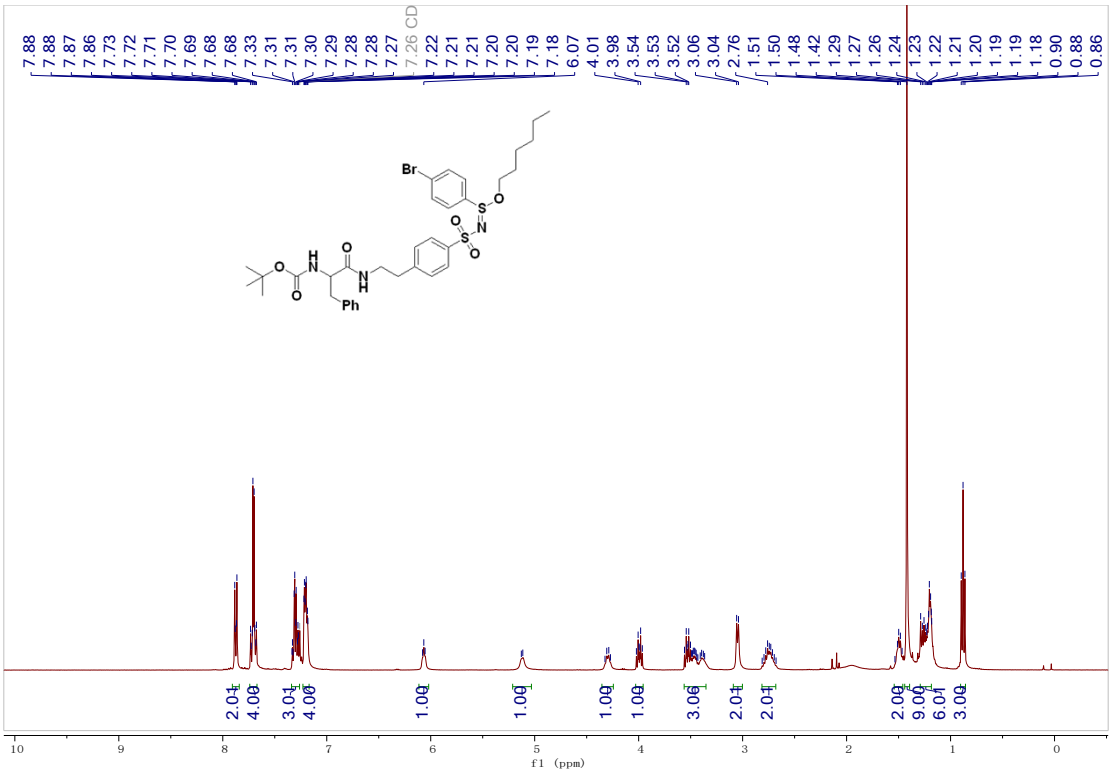
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bb**



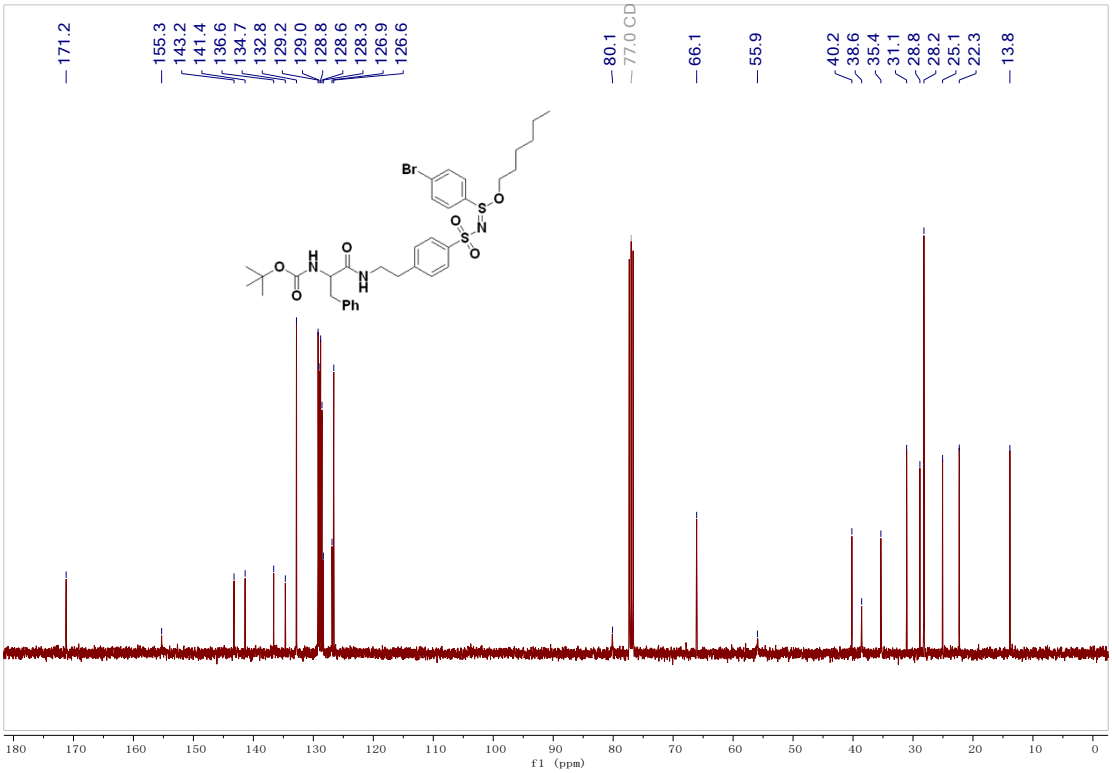
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bb**



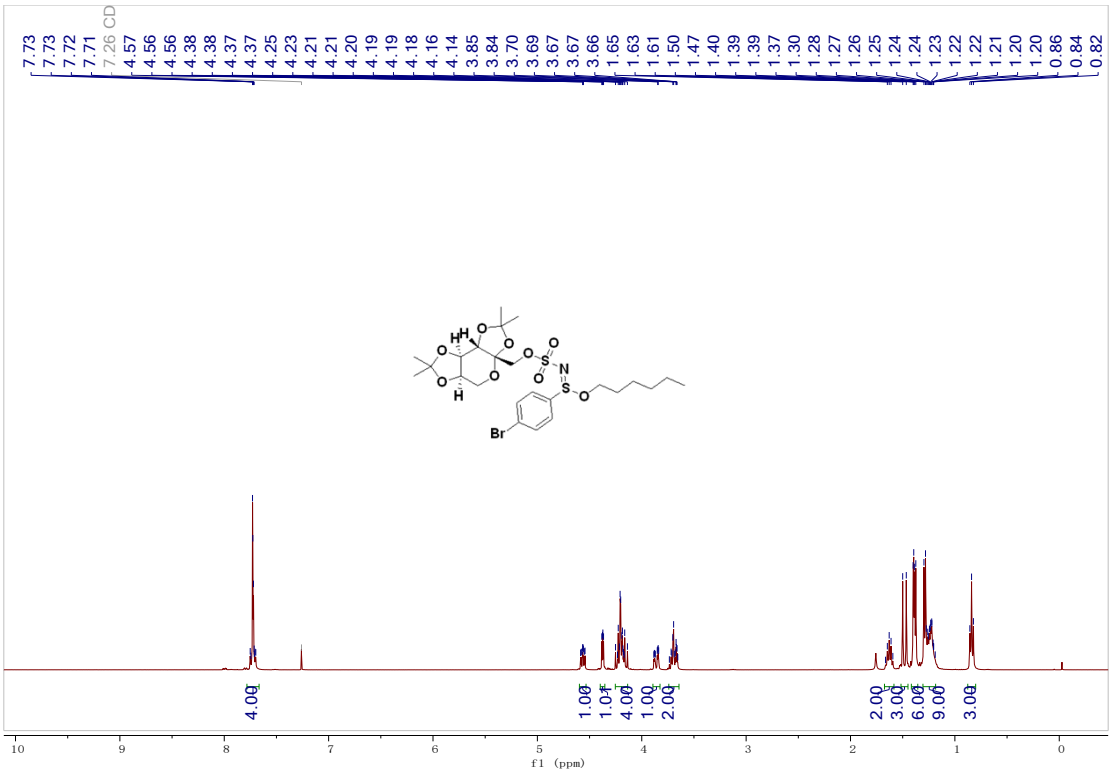
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bc**



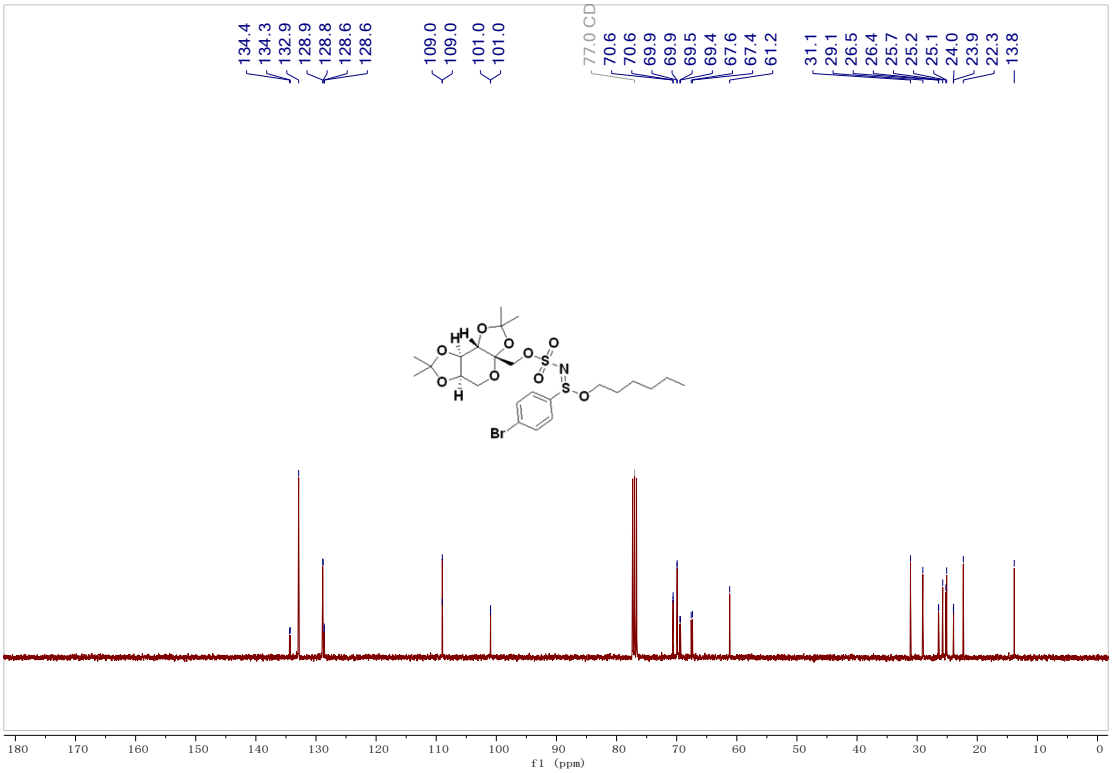
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bc**



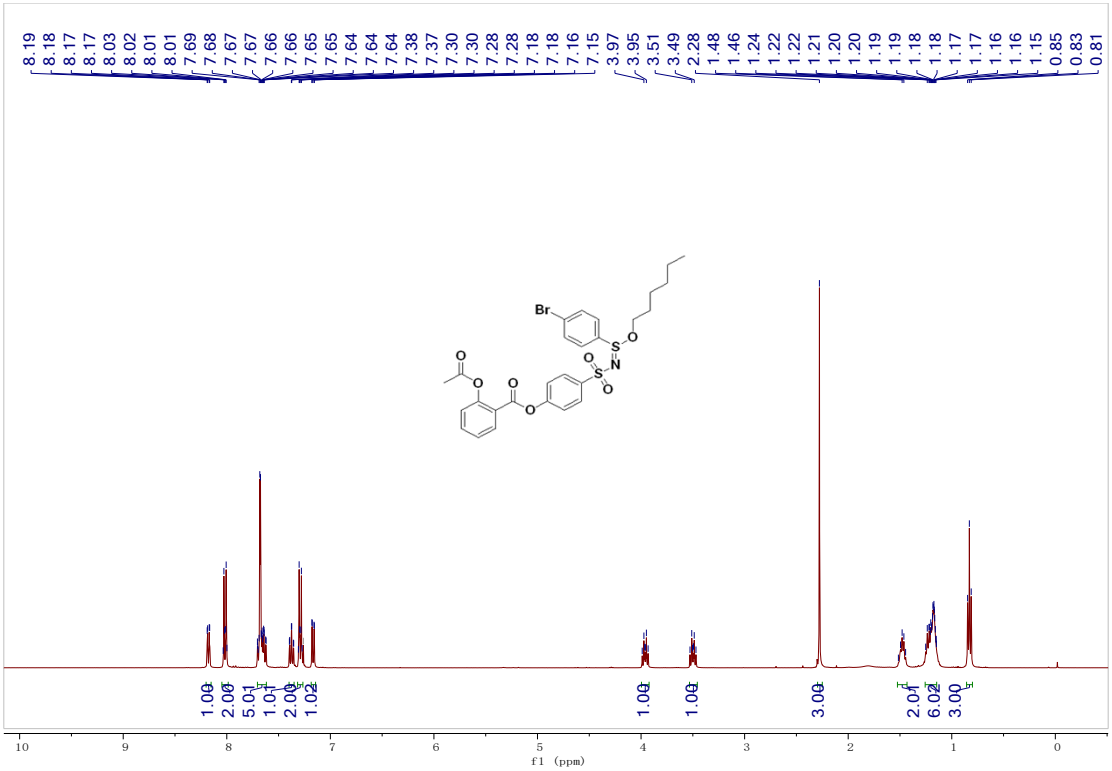
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bd**



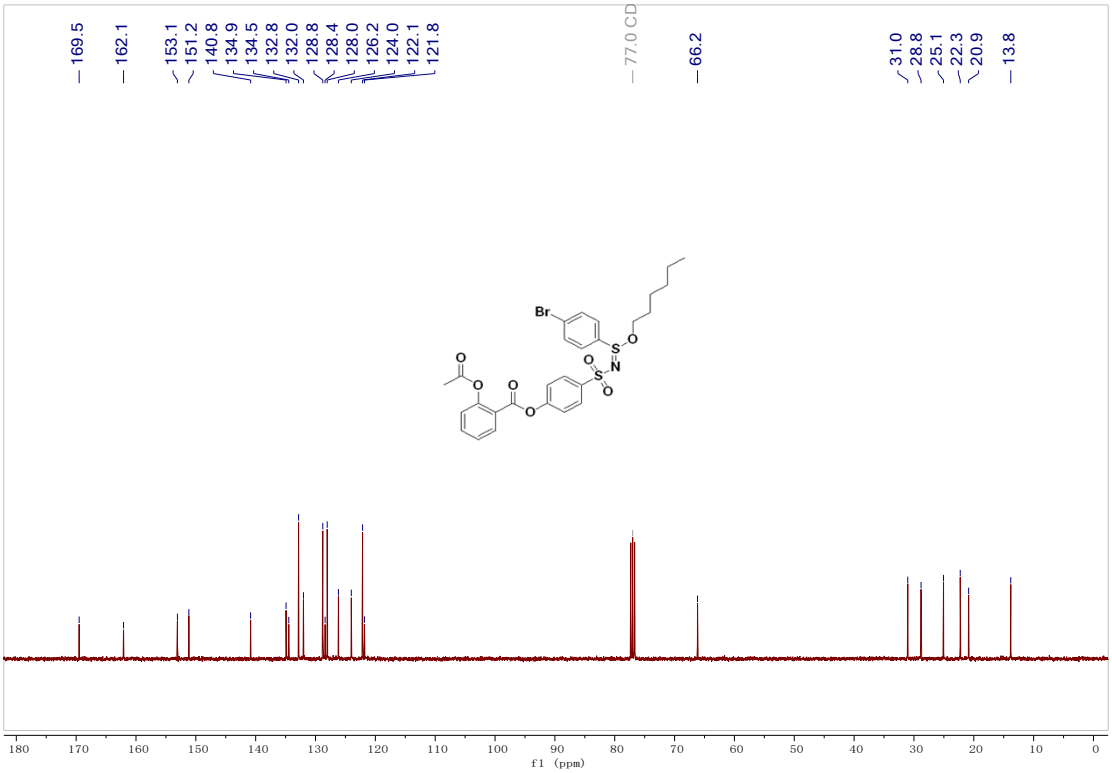
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bd**



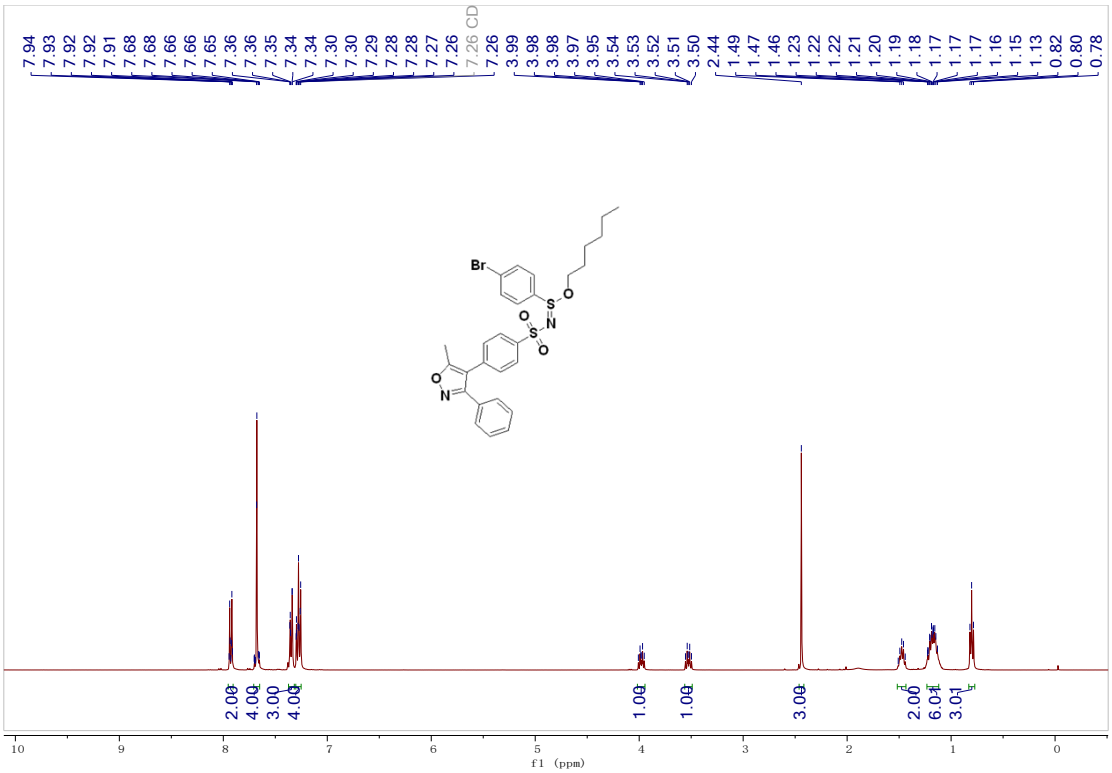
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4be**



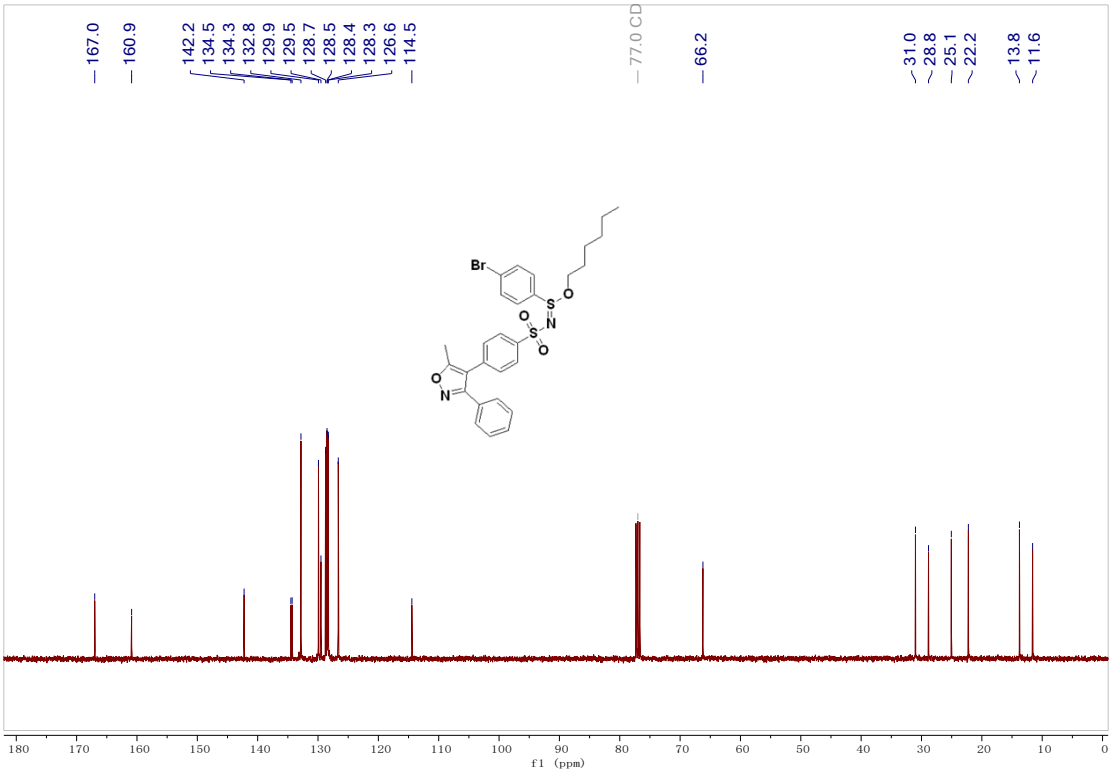
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4be**



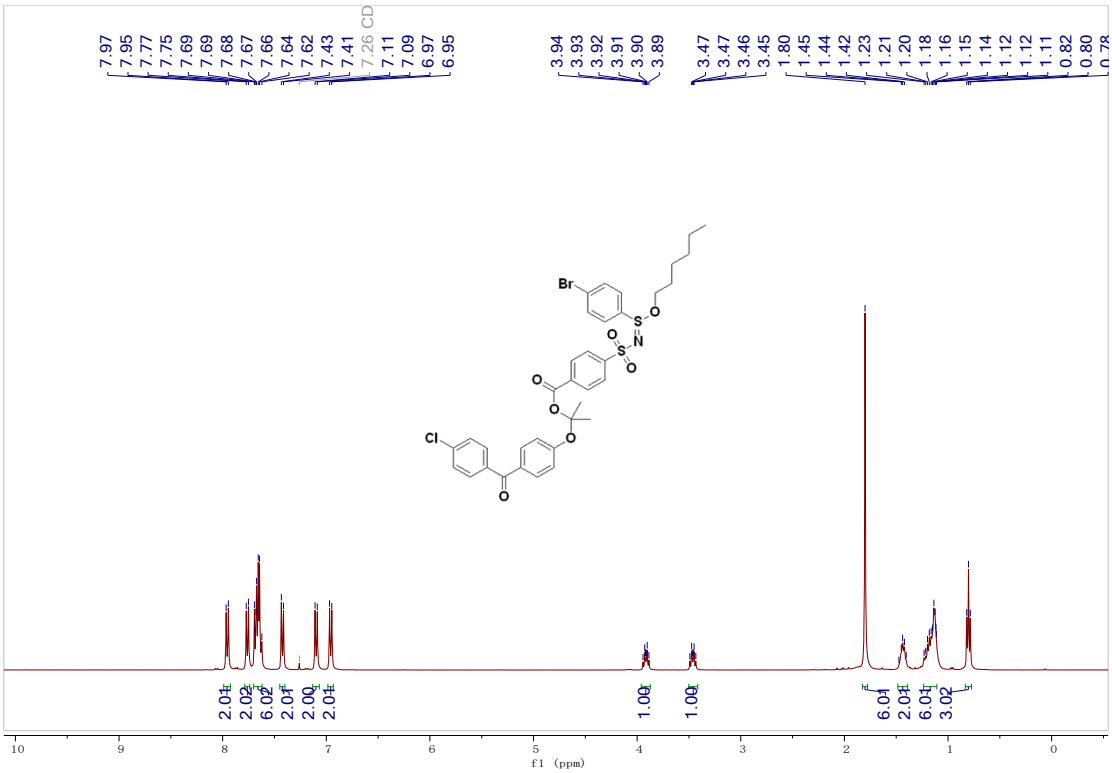
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bf**



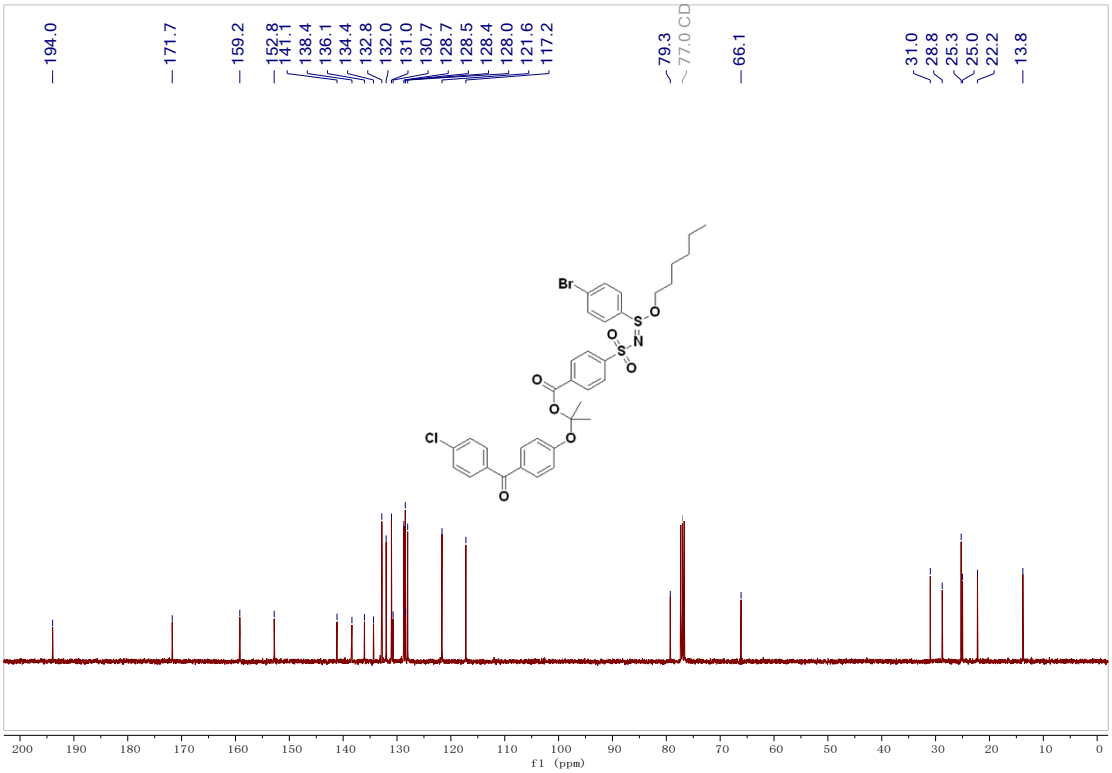
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bf**



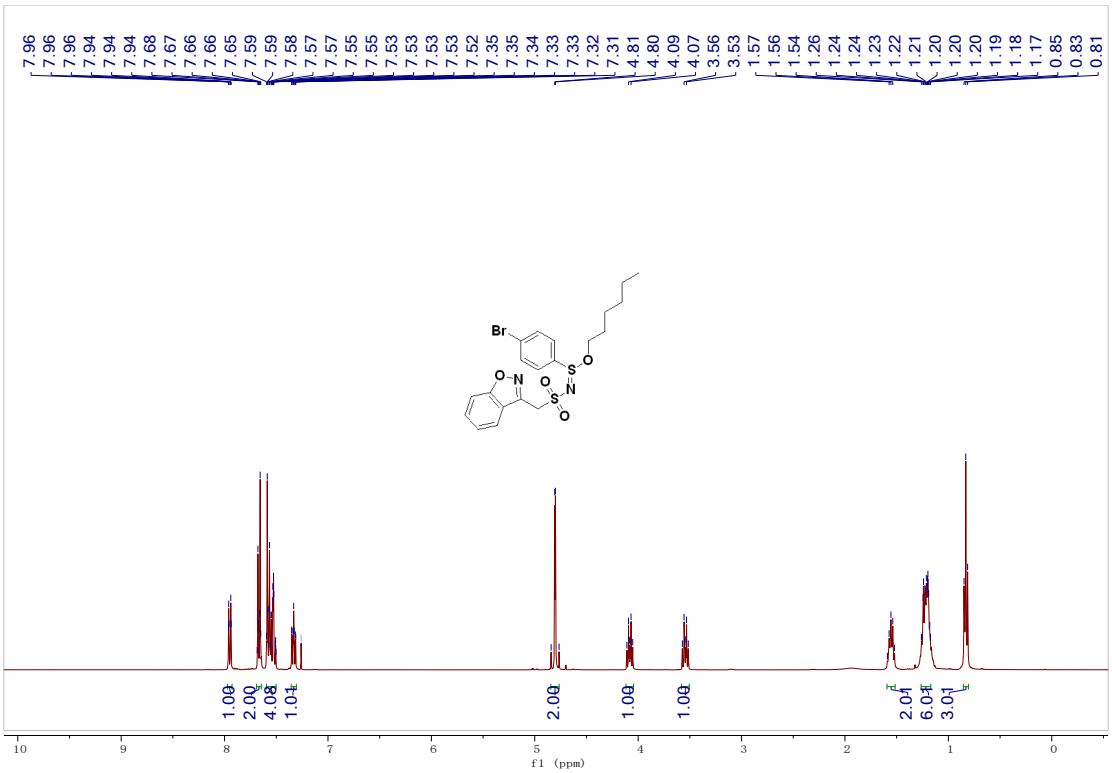
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bg**



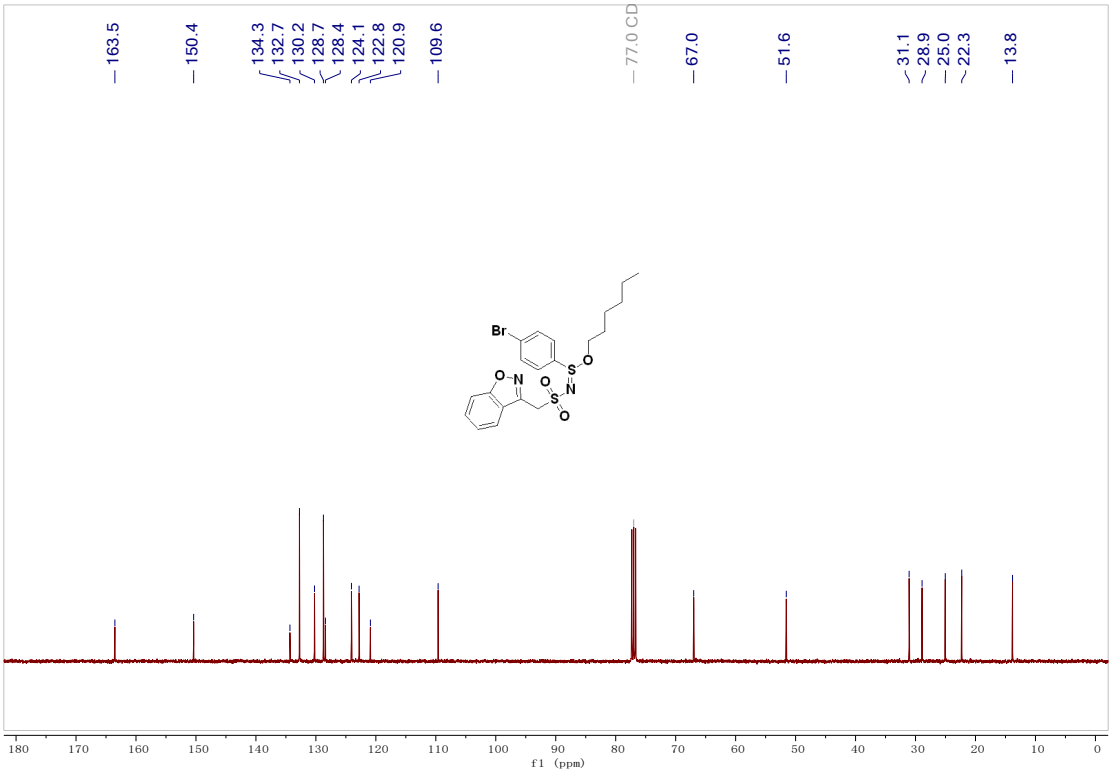
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bg**



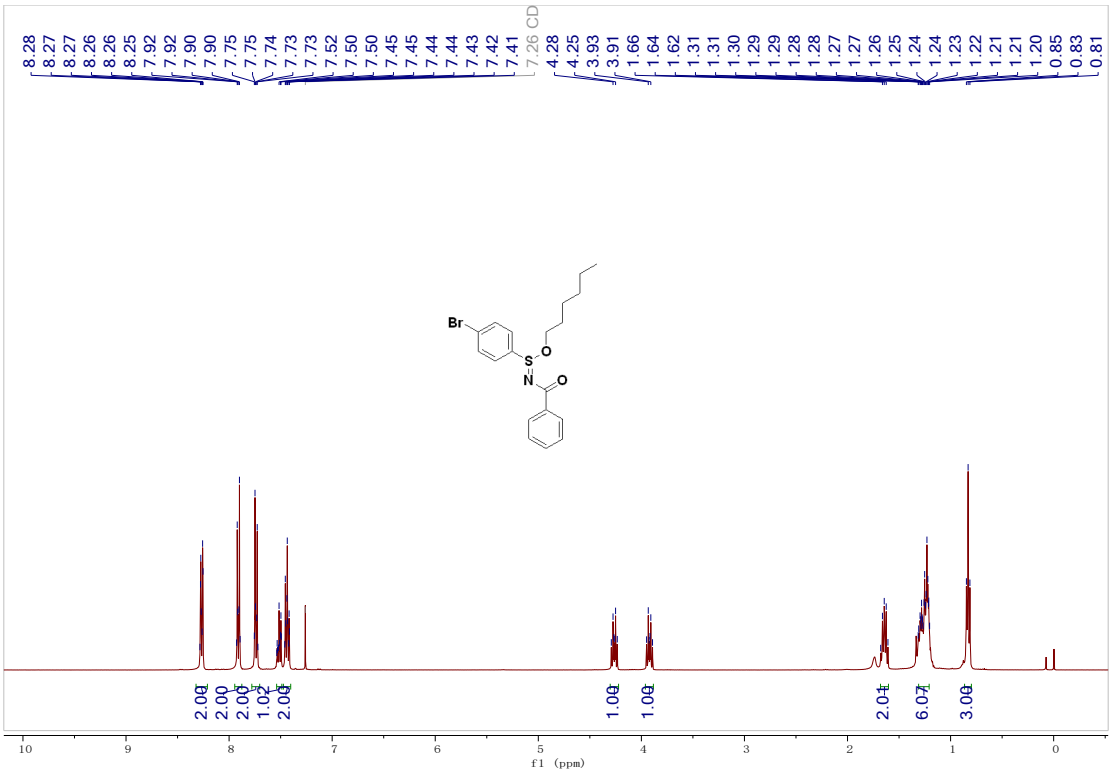
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bh**



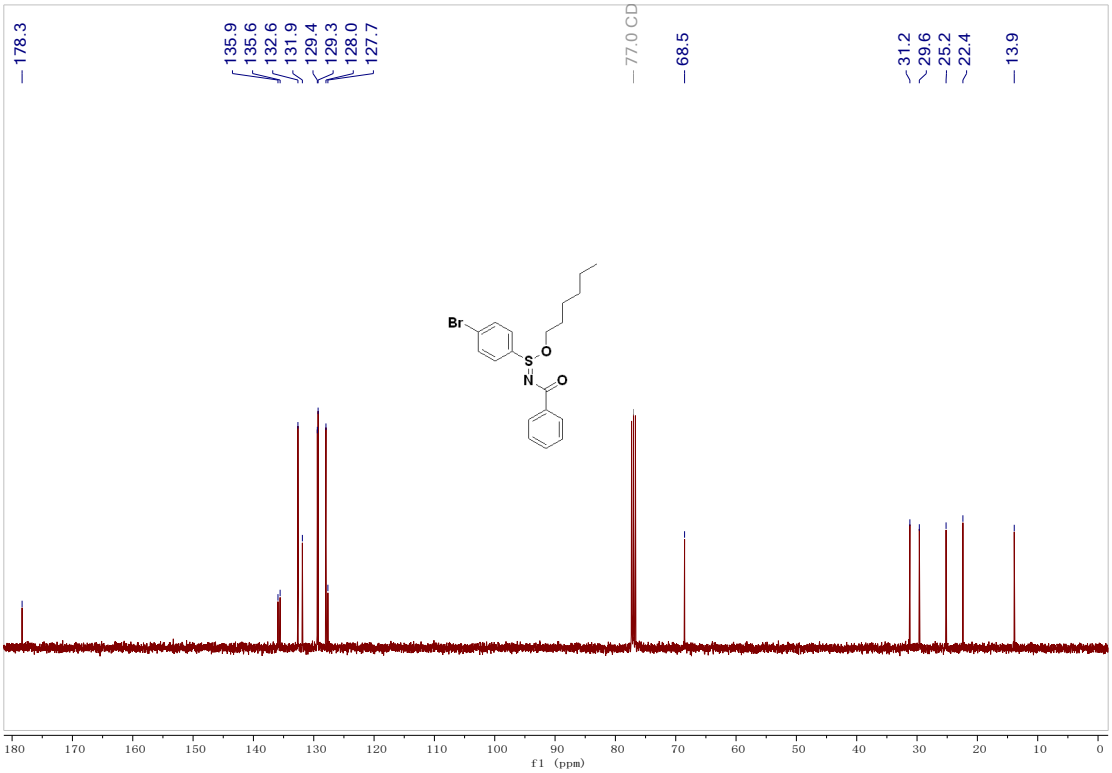
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bh**



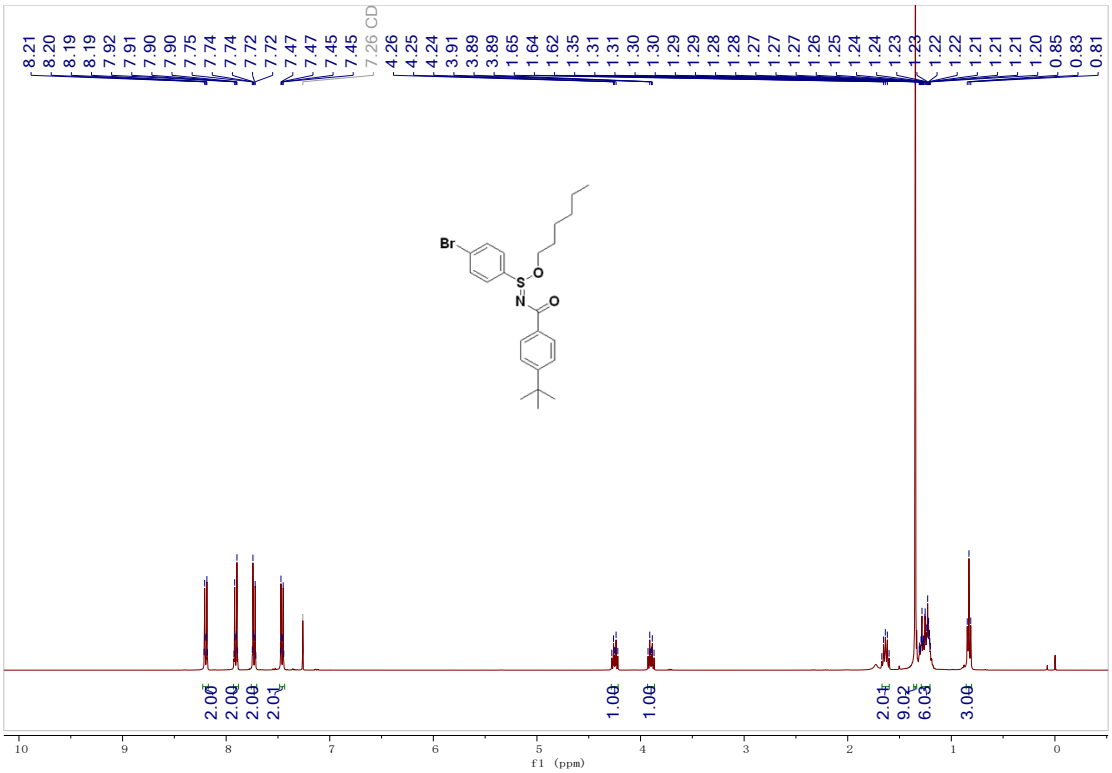
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bi**



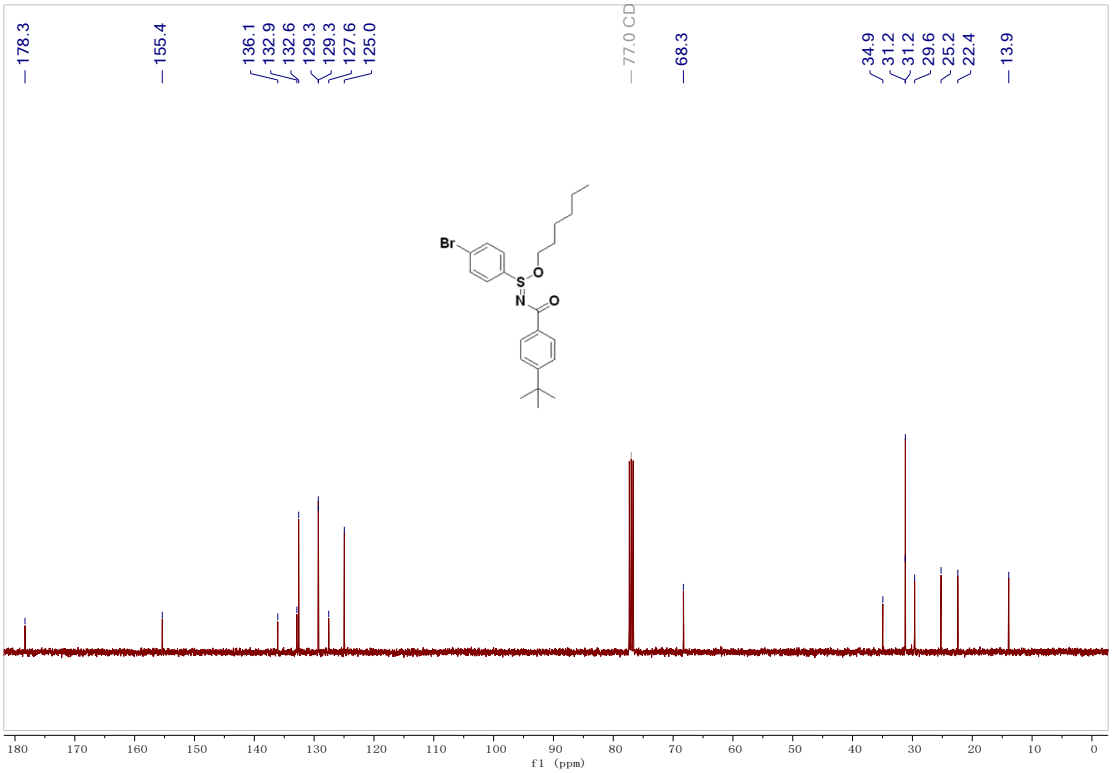
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bi**



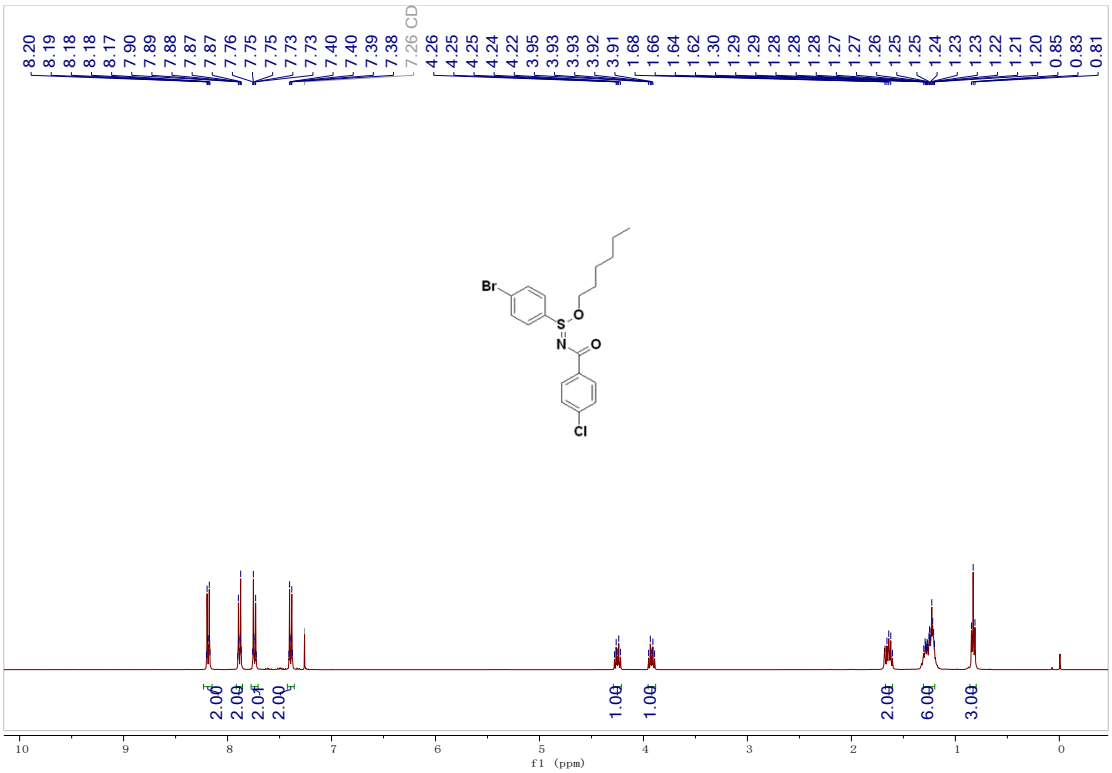
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bj**



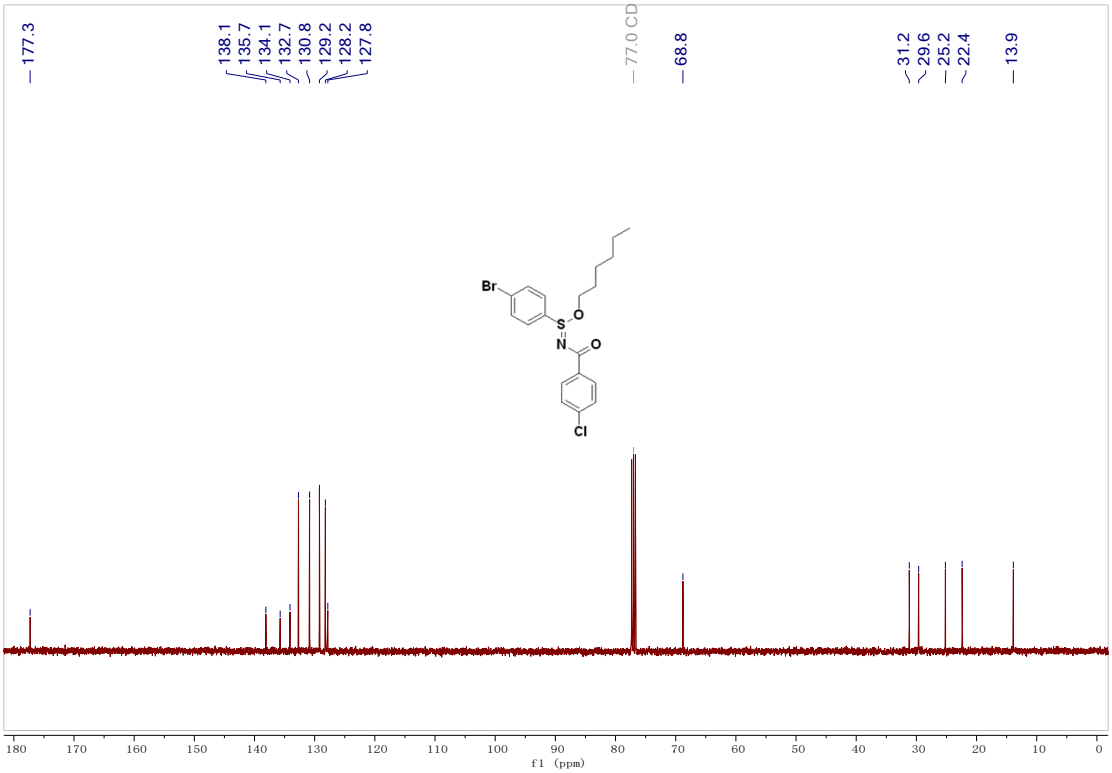
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bj**



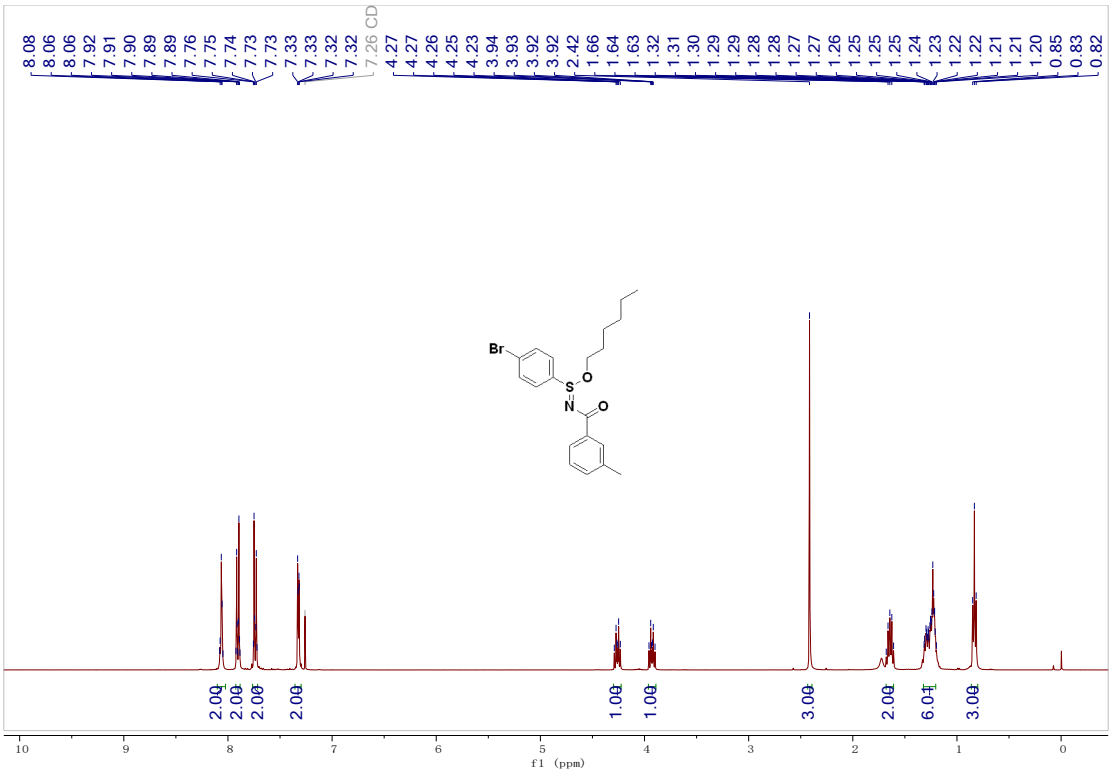
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bk**



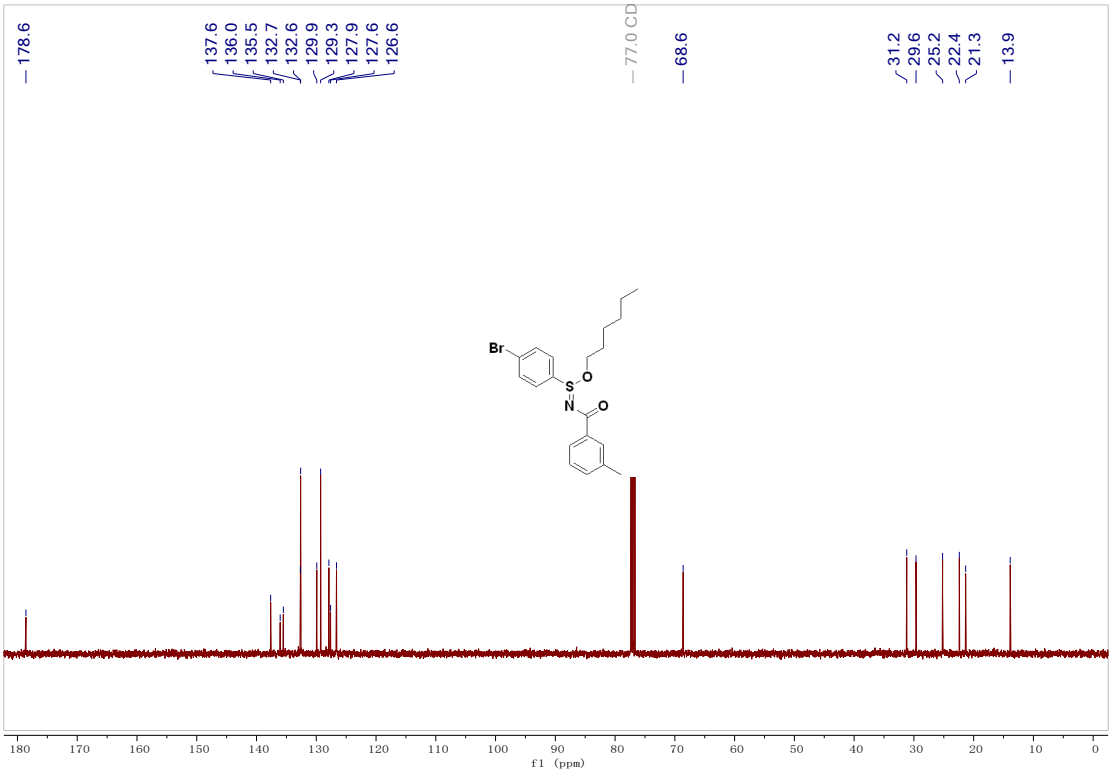
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bk**



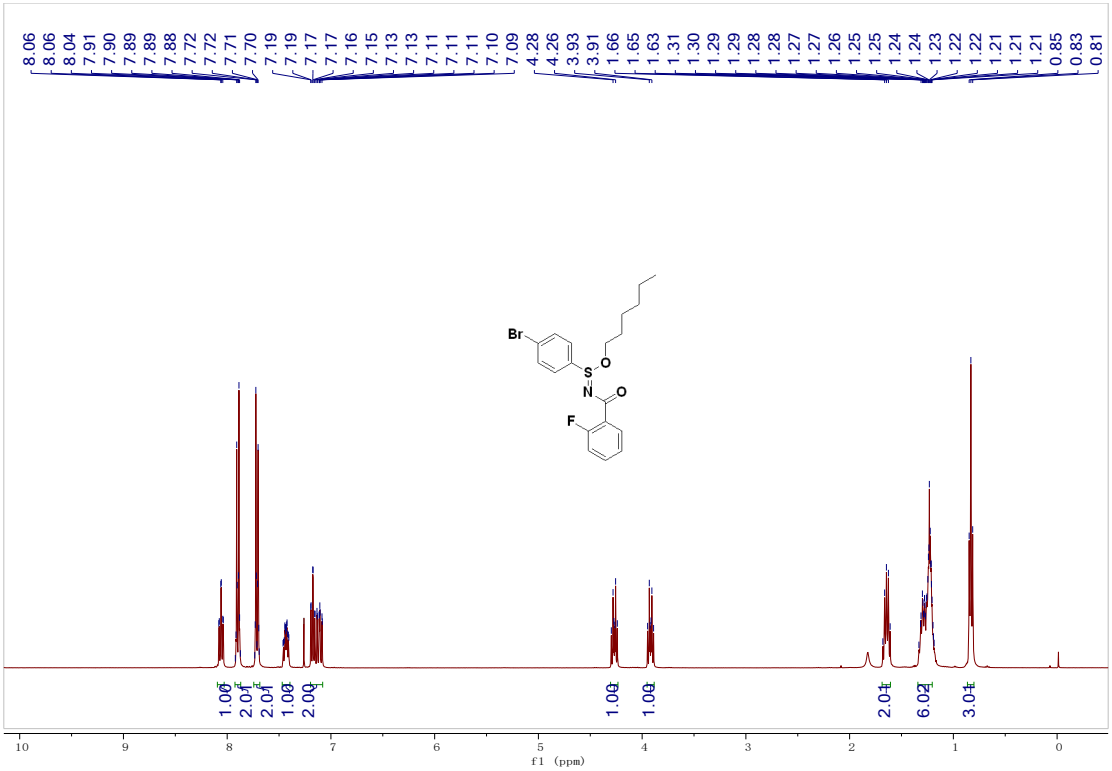
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bl**



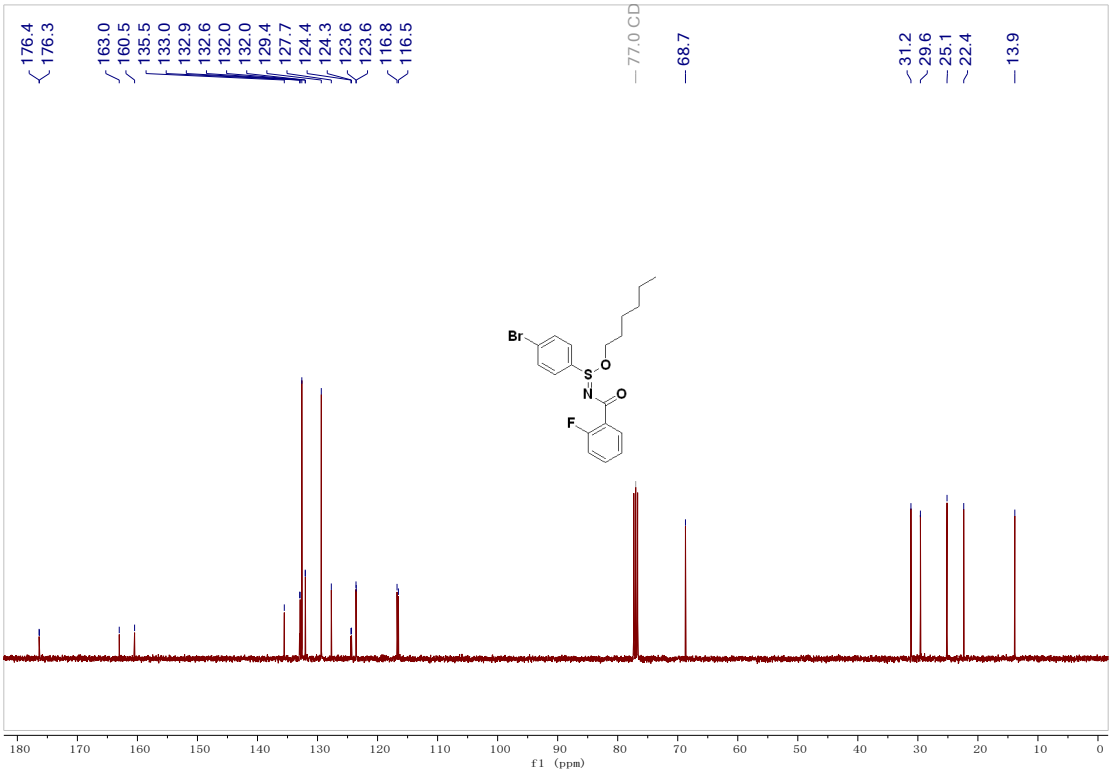
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bl**



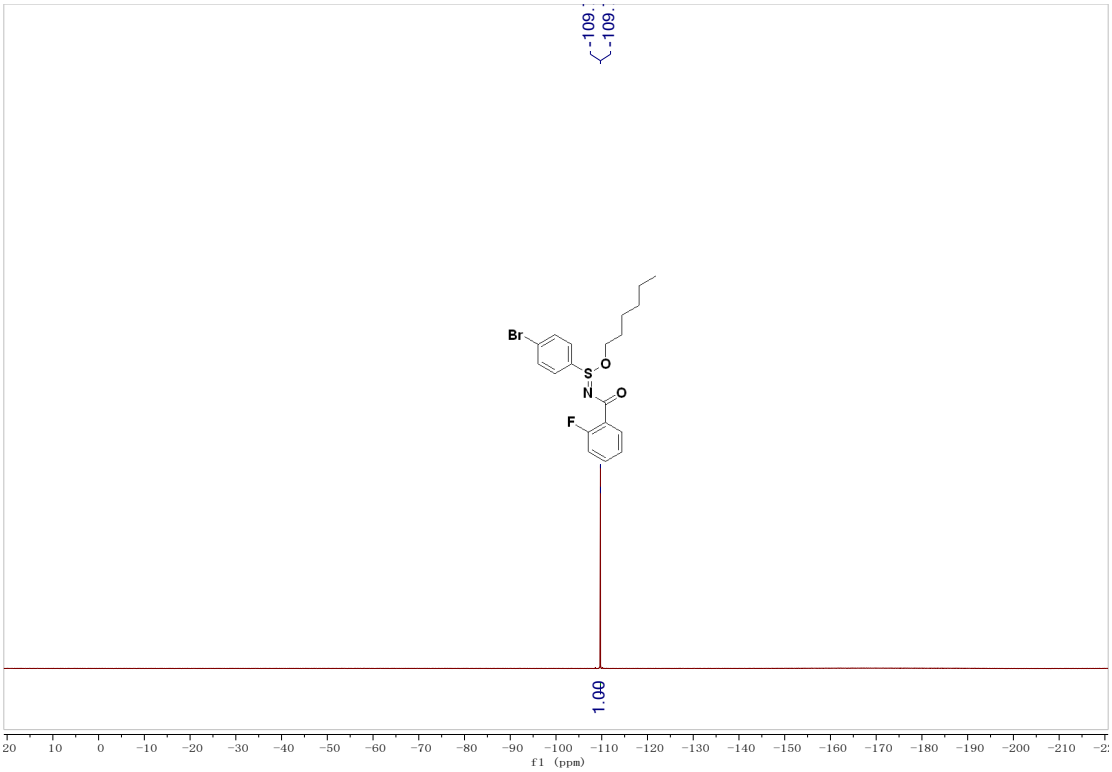
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bm**



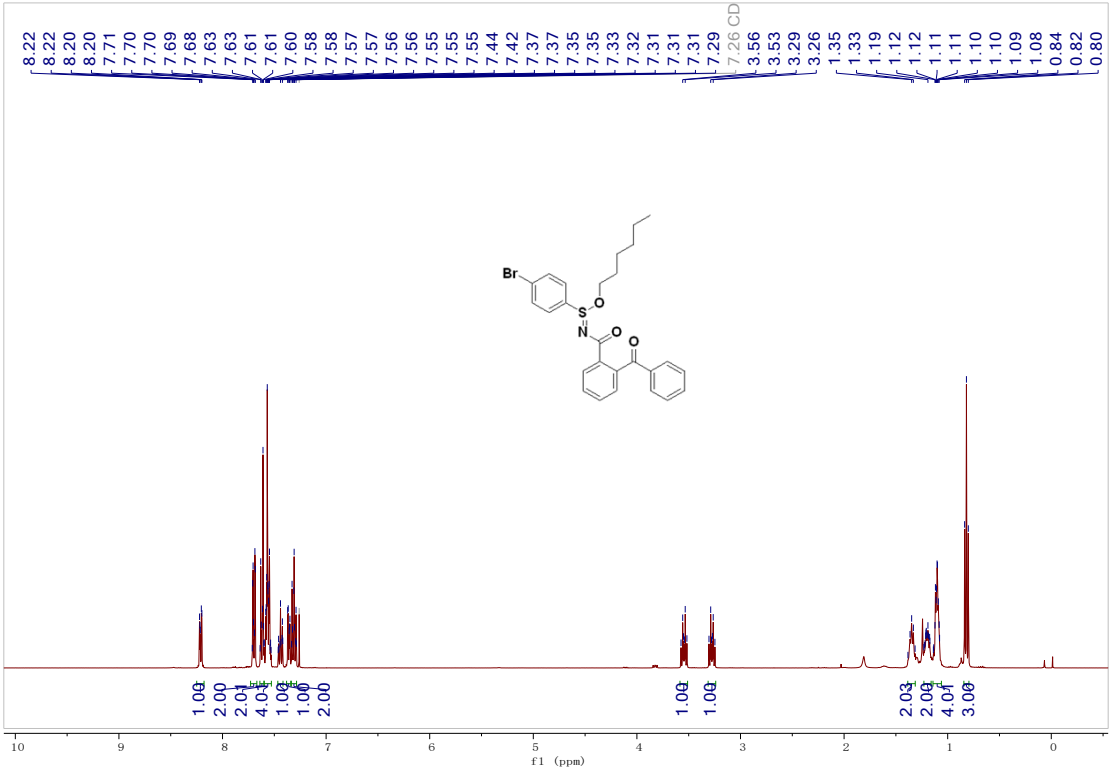
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bm**



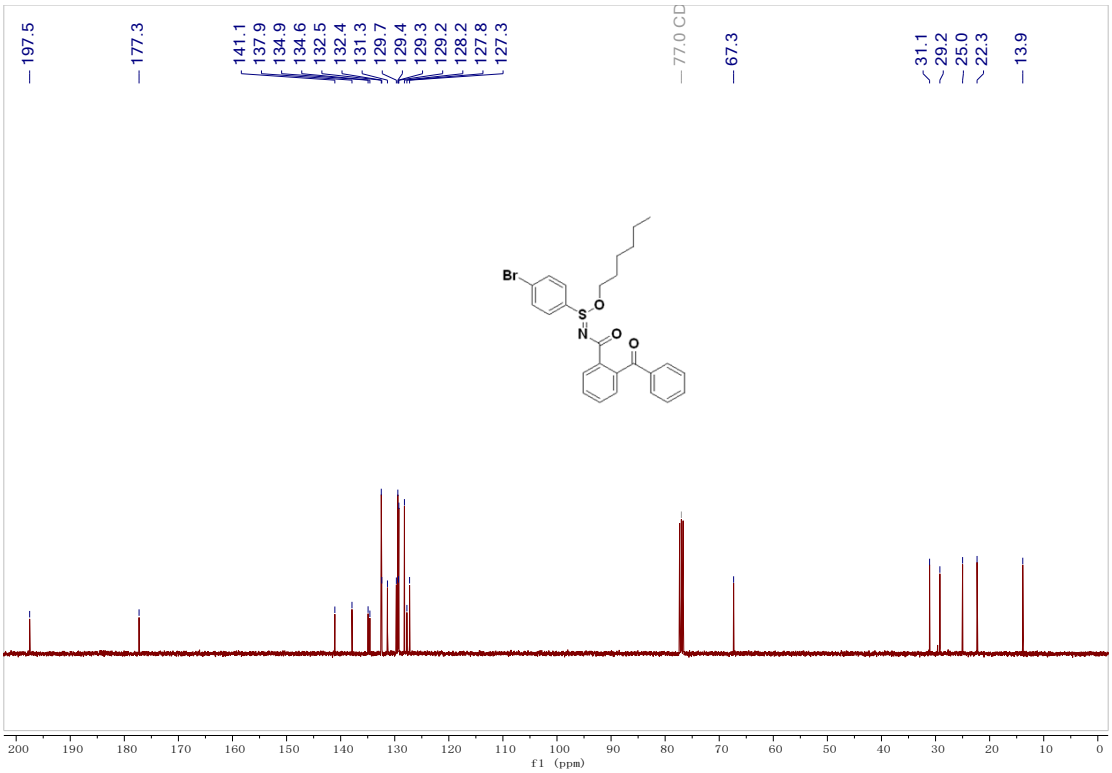
^{19}F NMR (376 MHz, Chloroform-d) of compound **4bm**



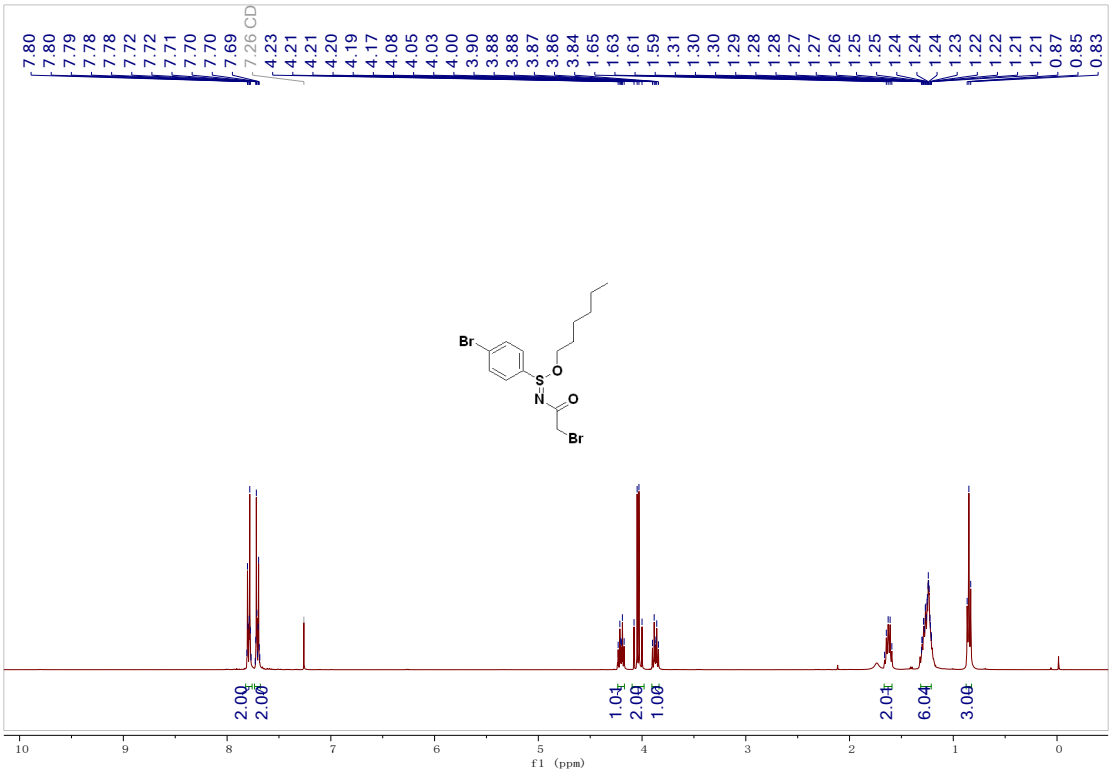
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bn**



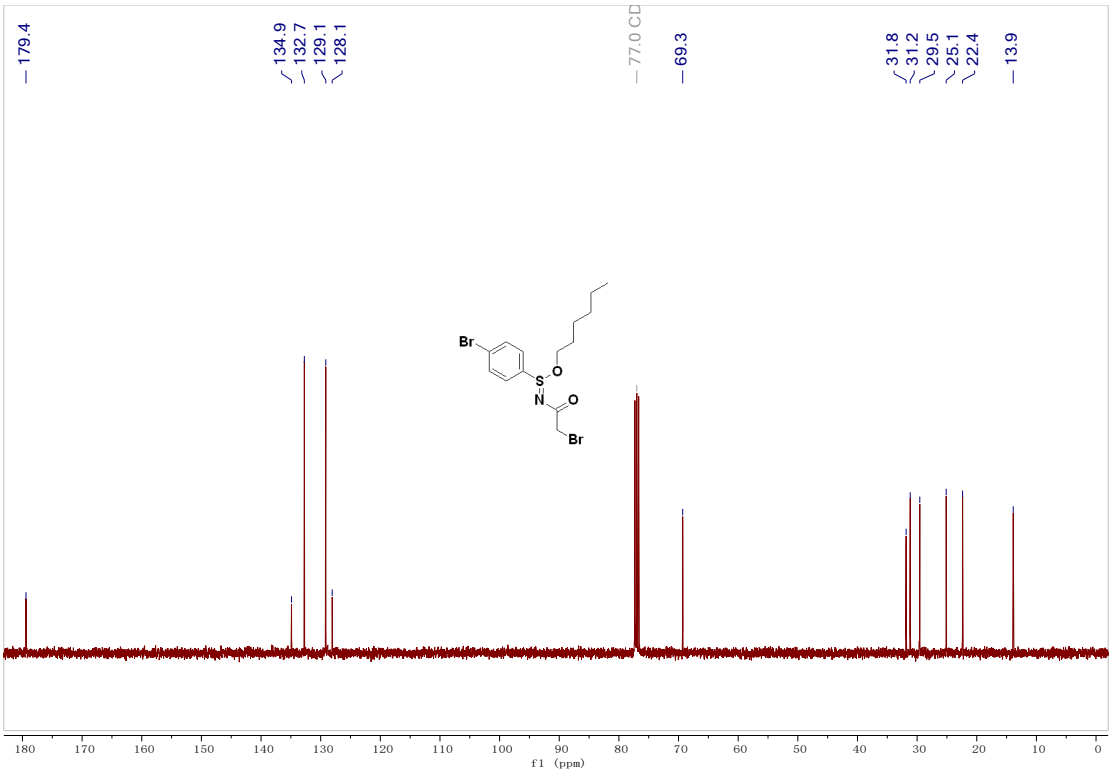
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bn**



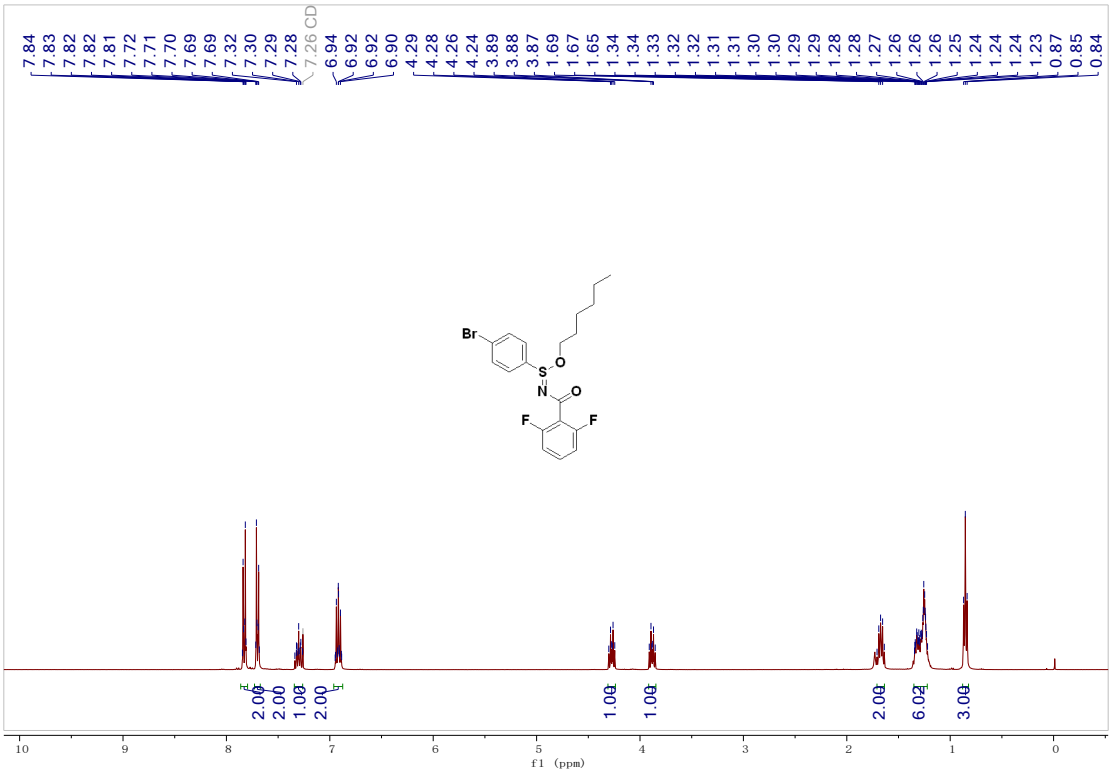
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bo**



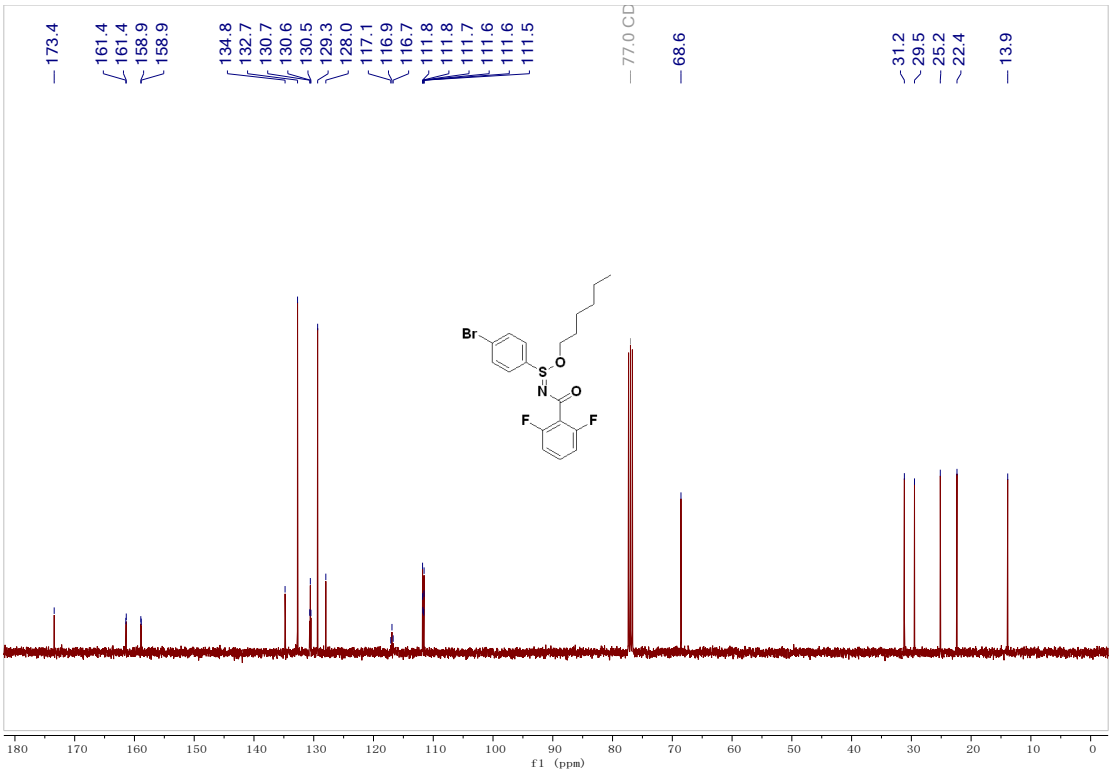
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bo**



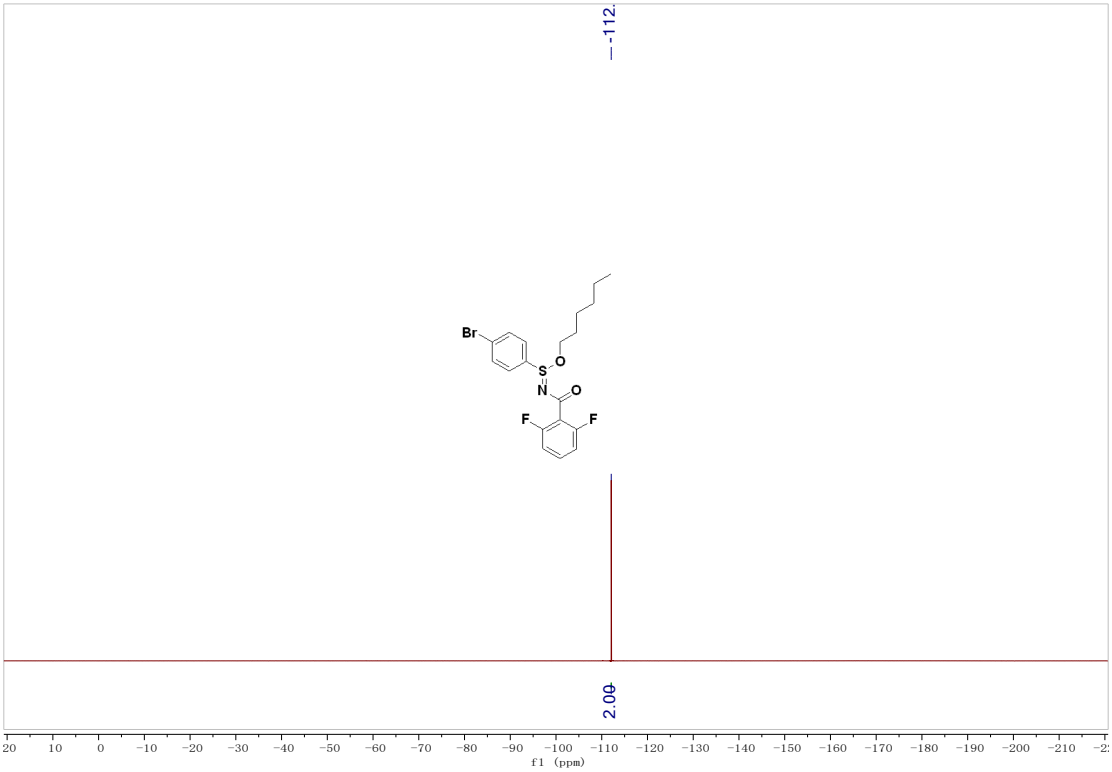
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bp**



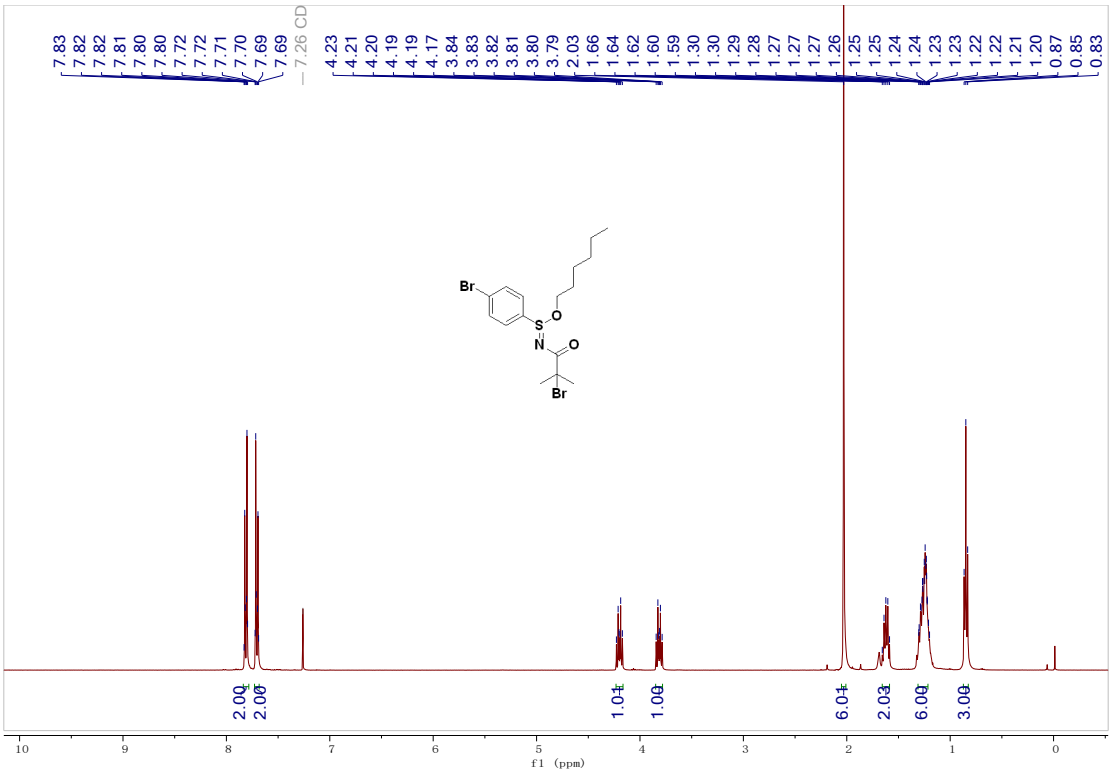
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bp**



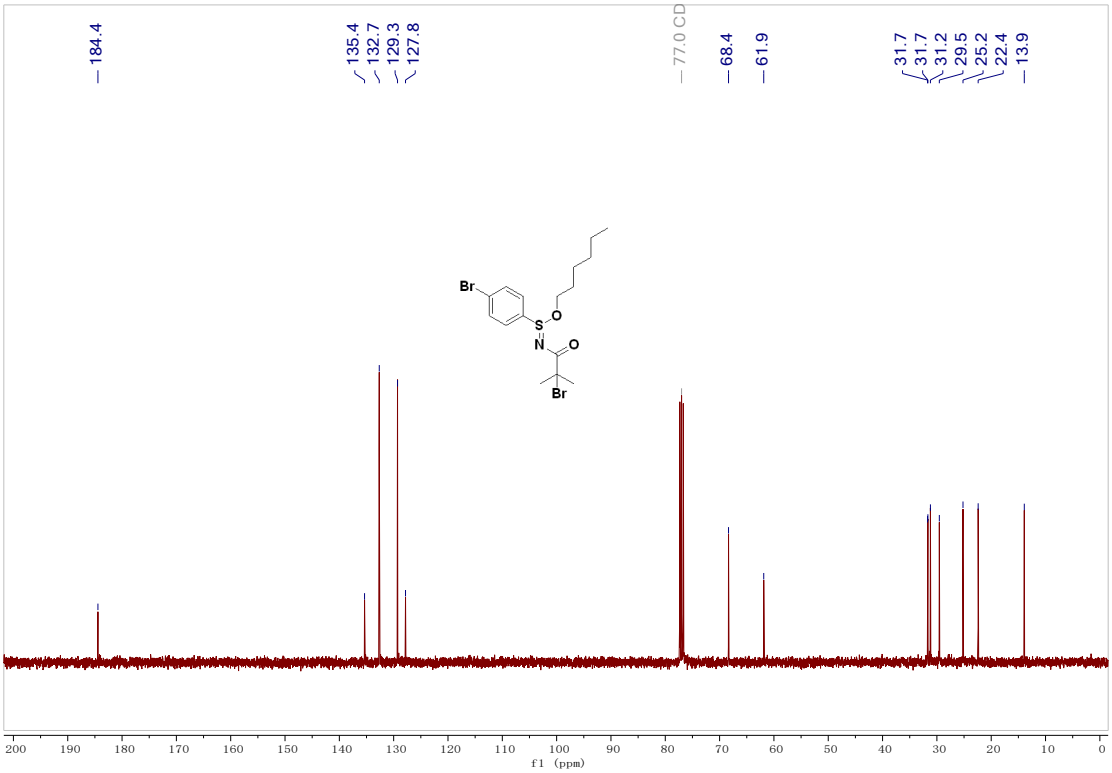
^{19}F NMR (376 MHz, Chloroform-d) of compound **4bp**



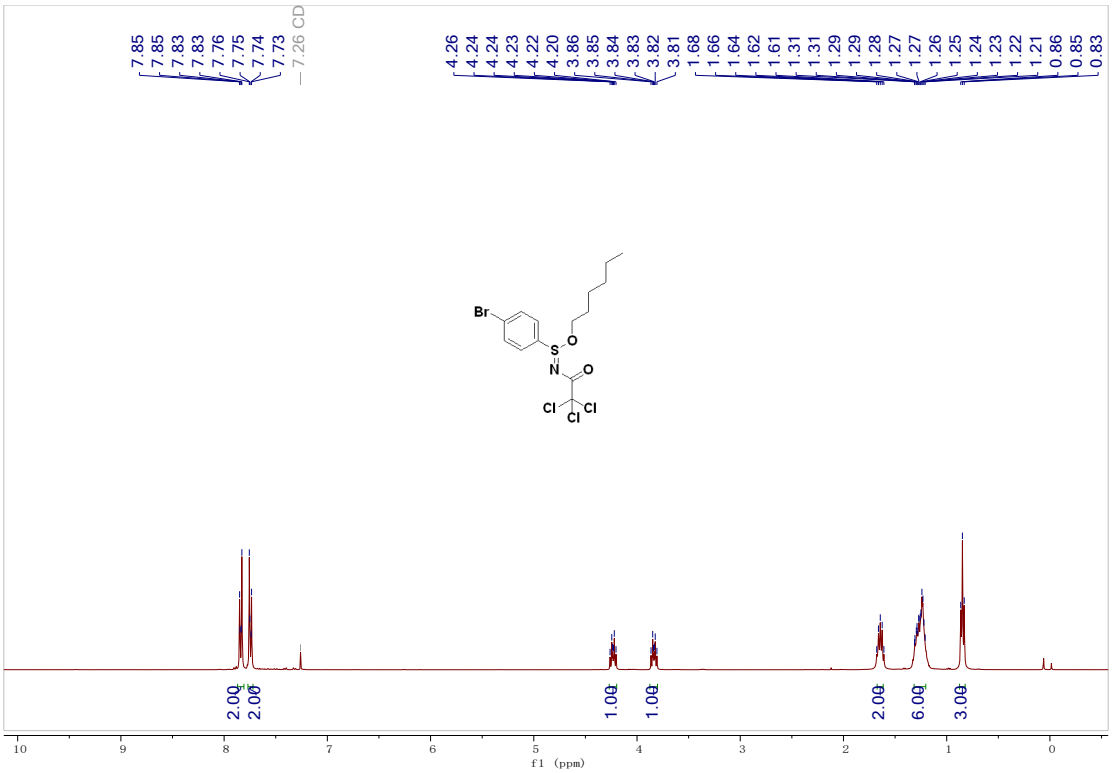
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bq**



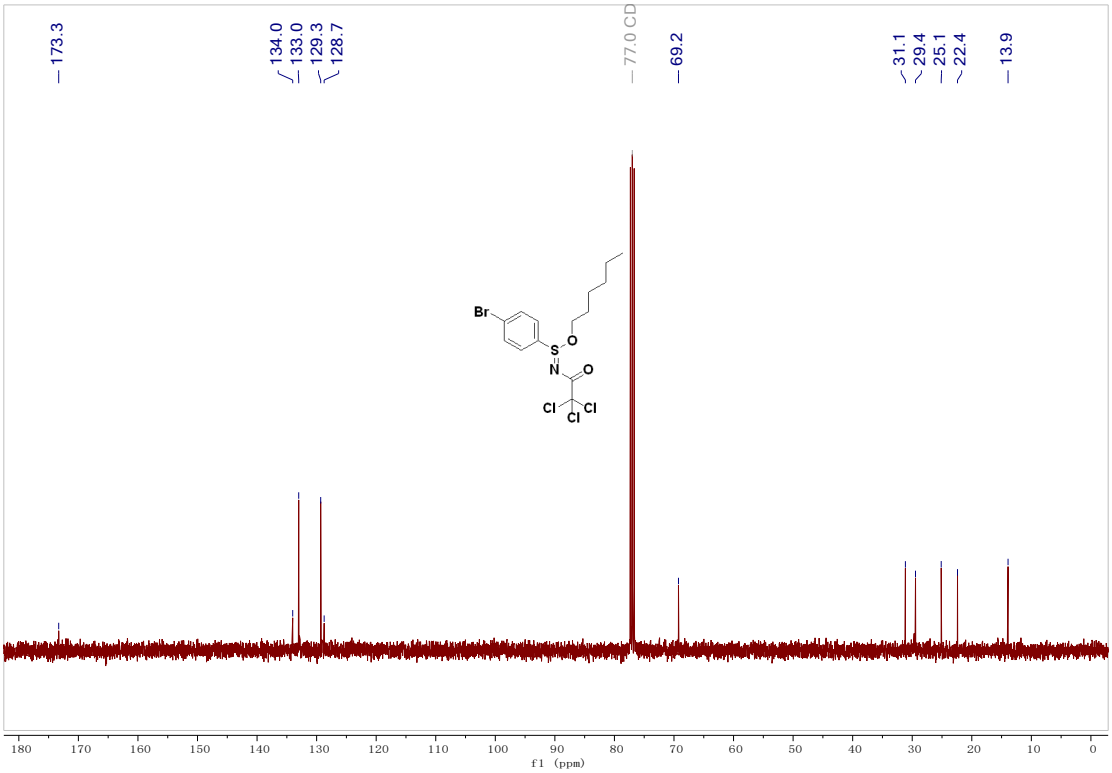
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bq**



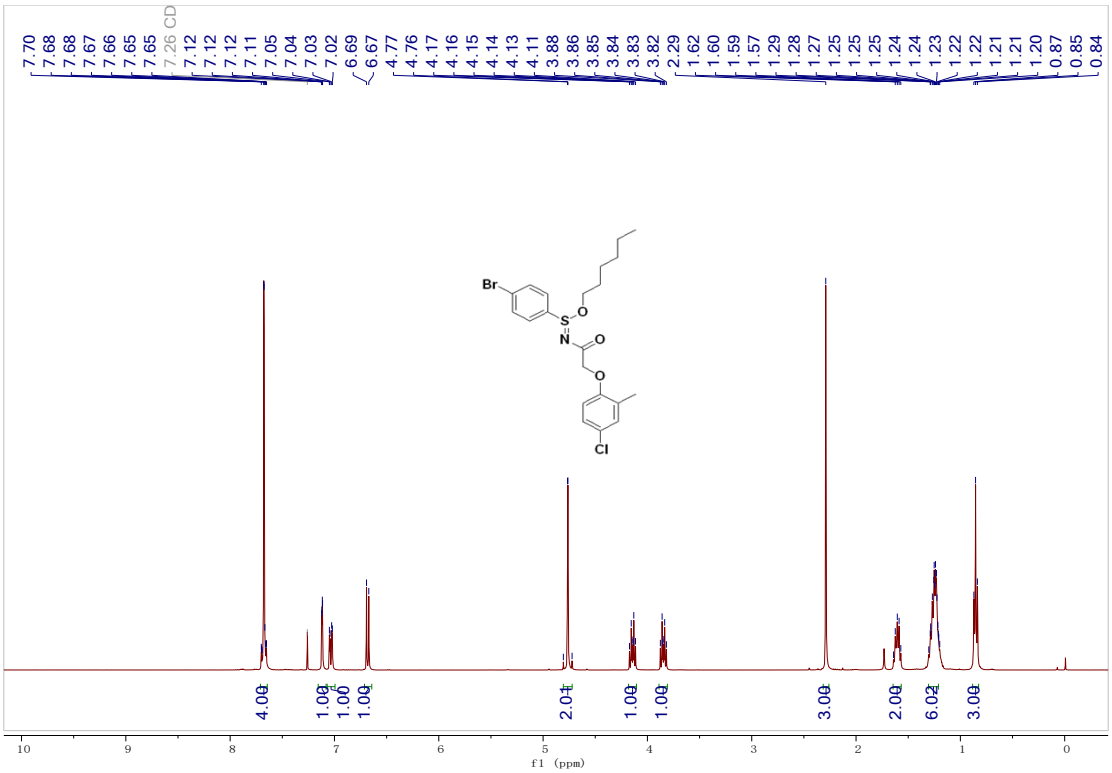
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4br**



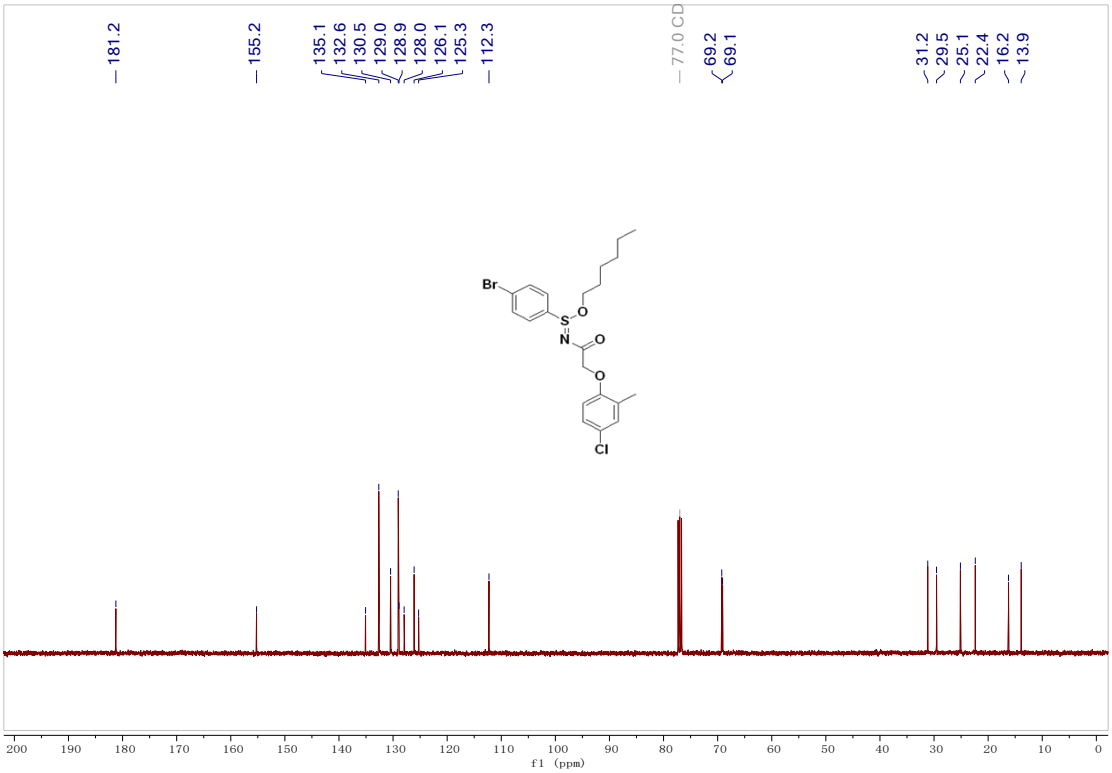
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4br**



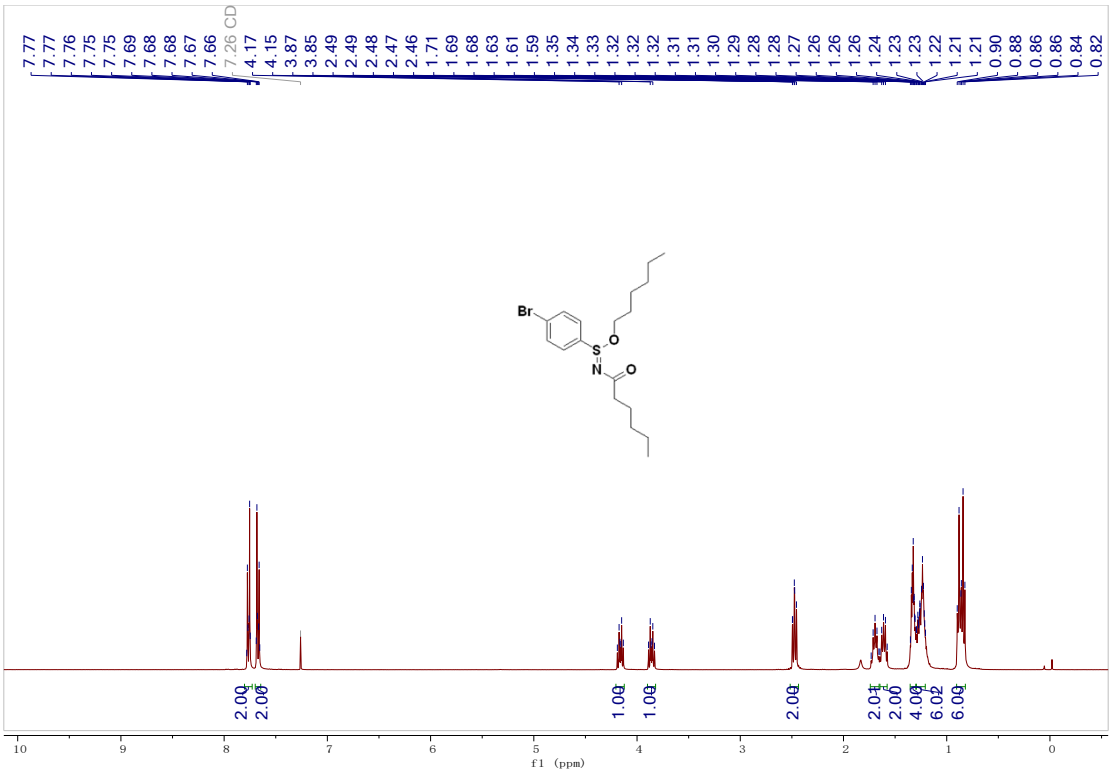
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bs**



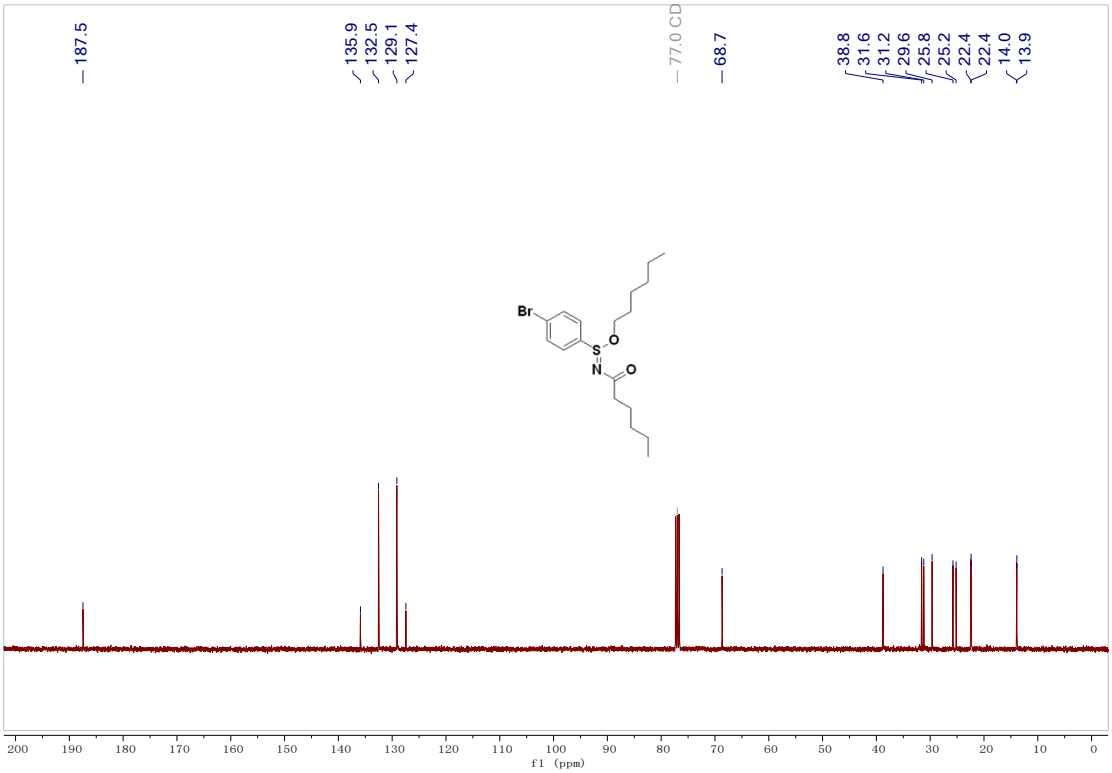
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bs**



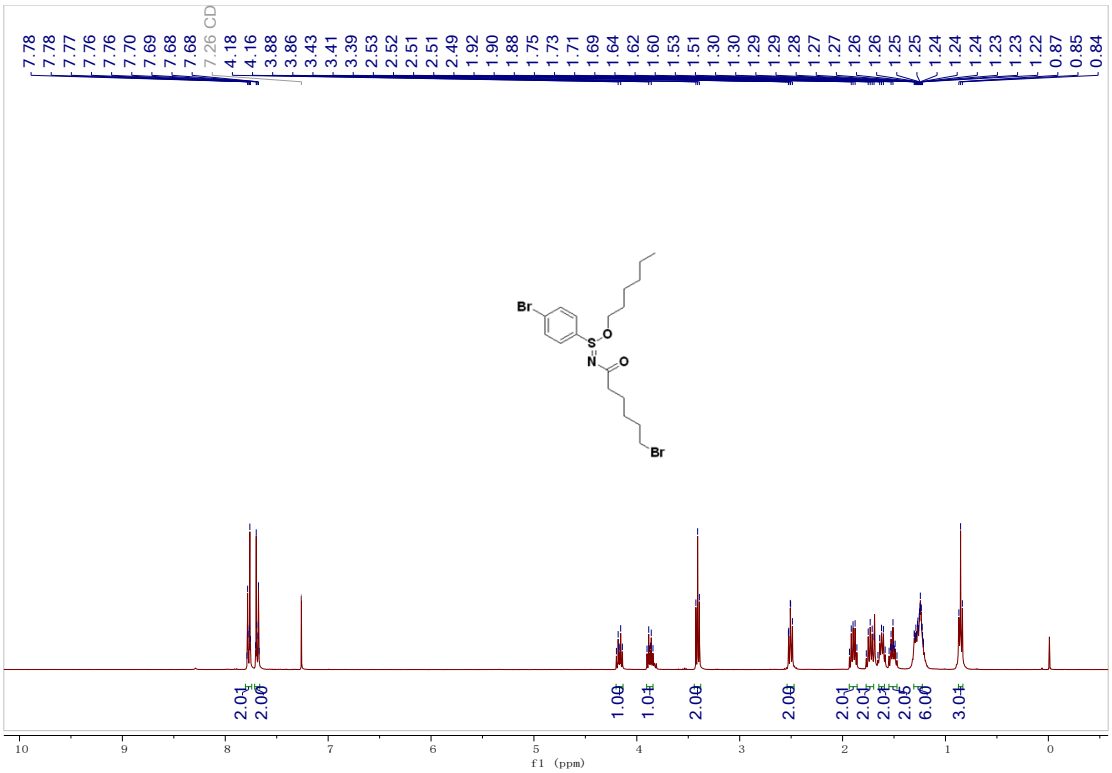
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bt**



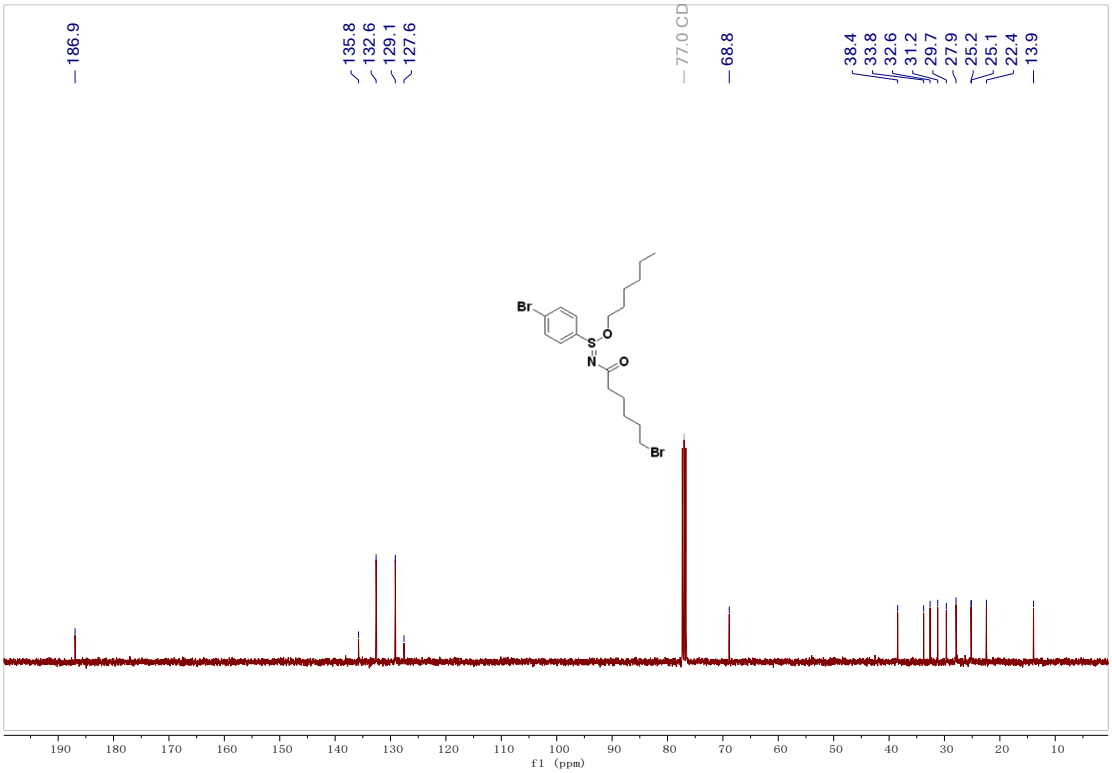
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bt**



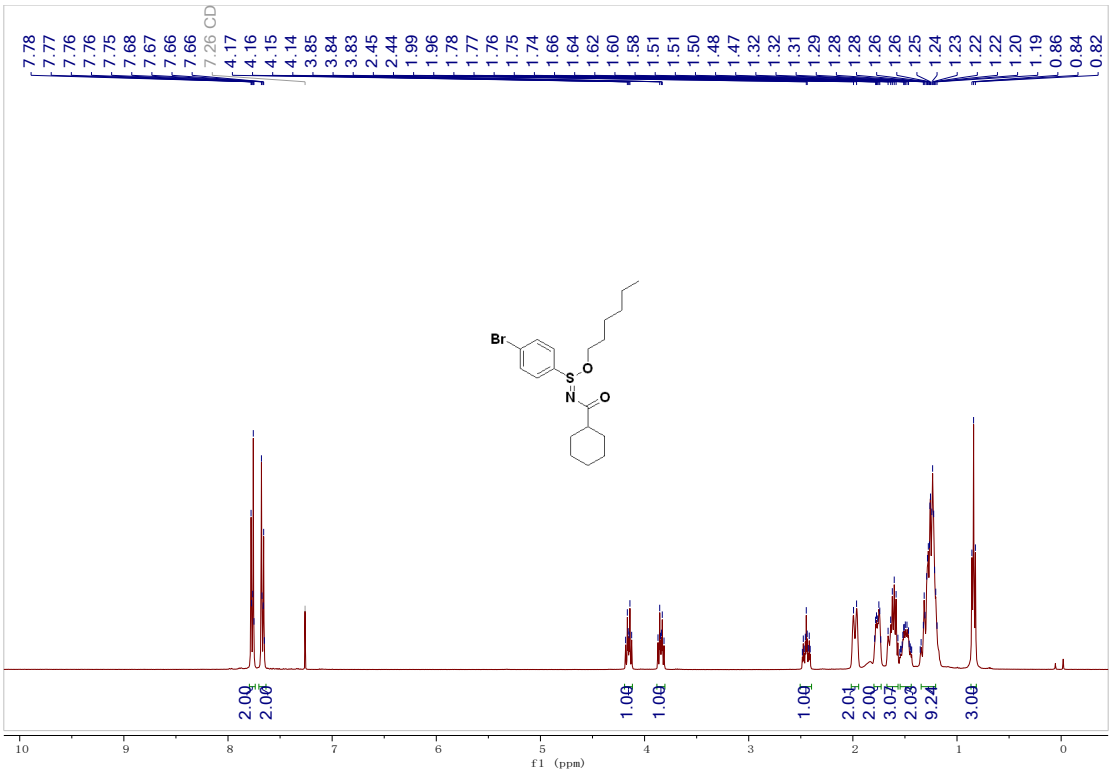
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bu**



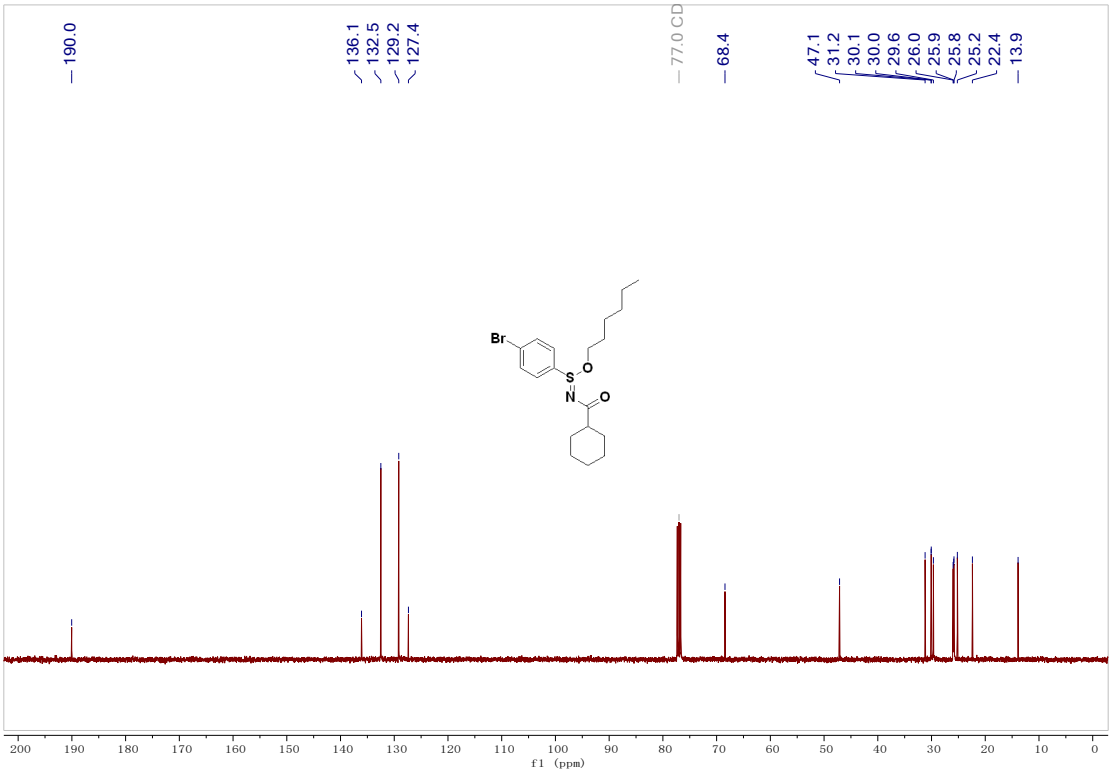
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bu**



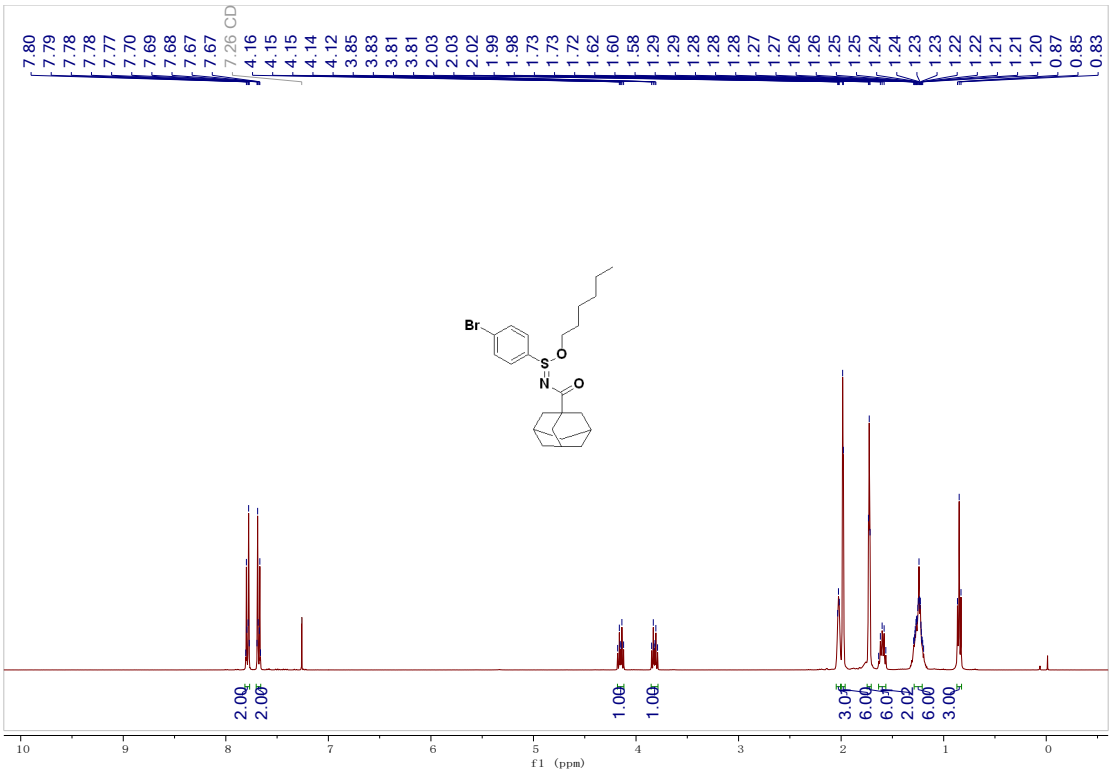
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bv**



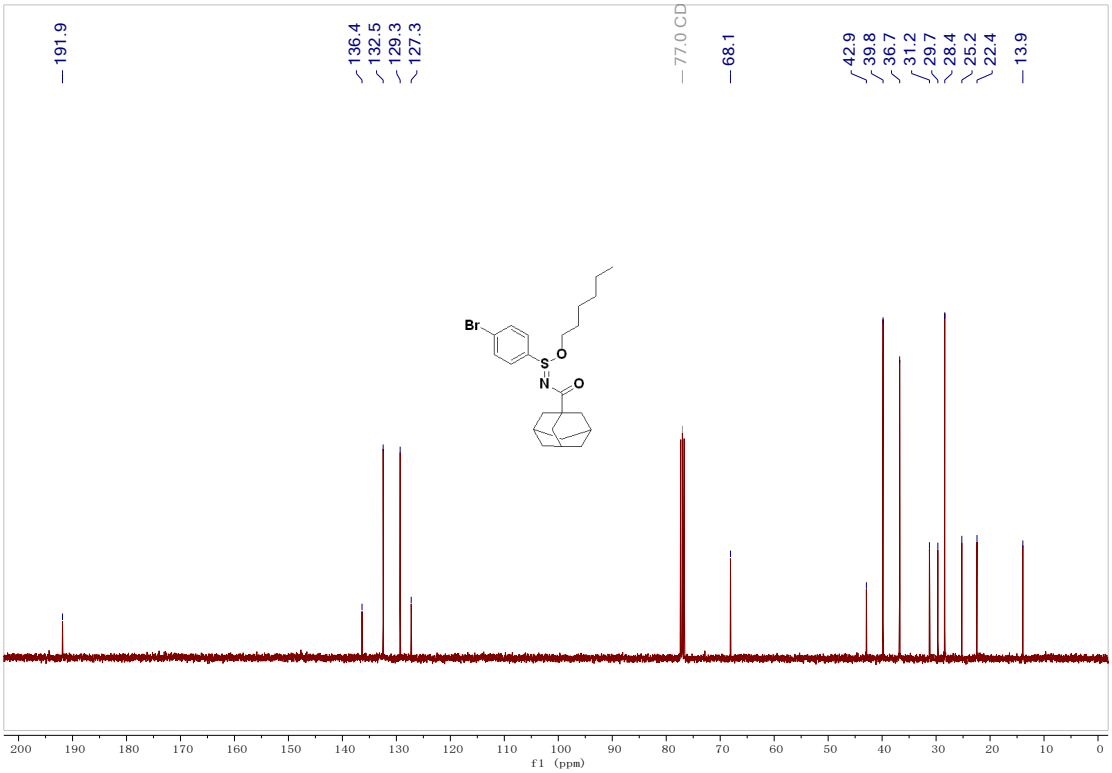
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bv**



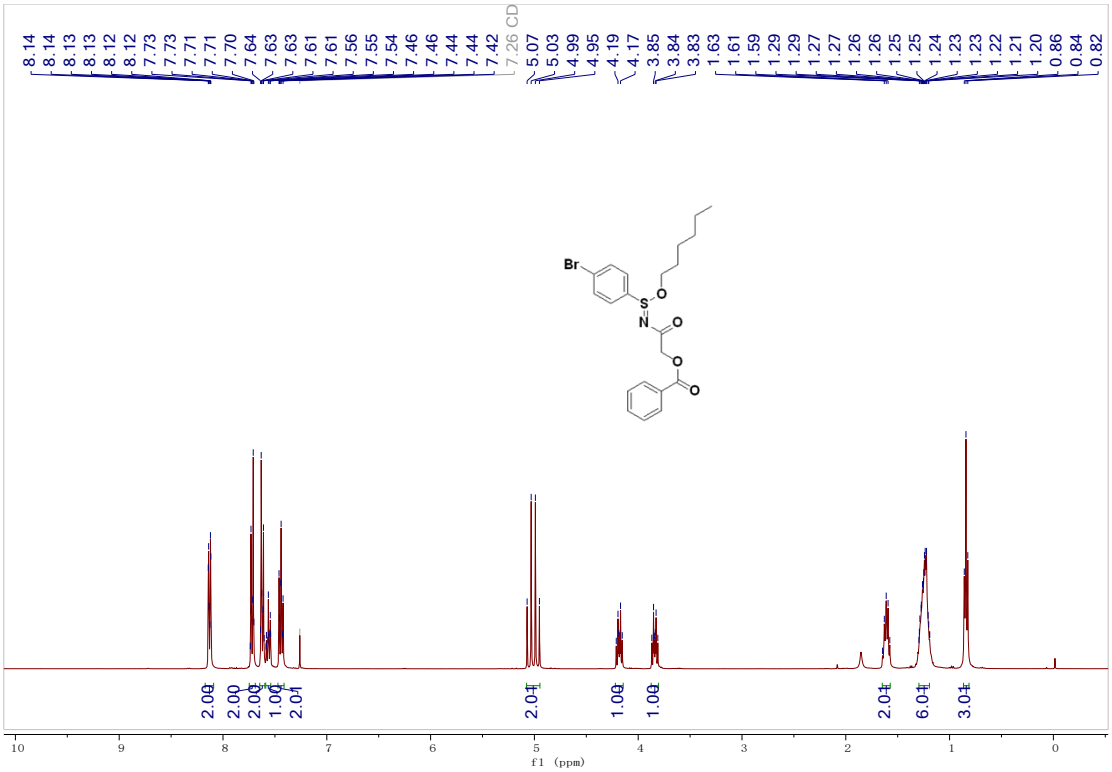
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bw**



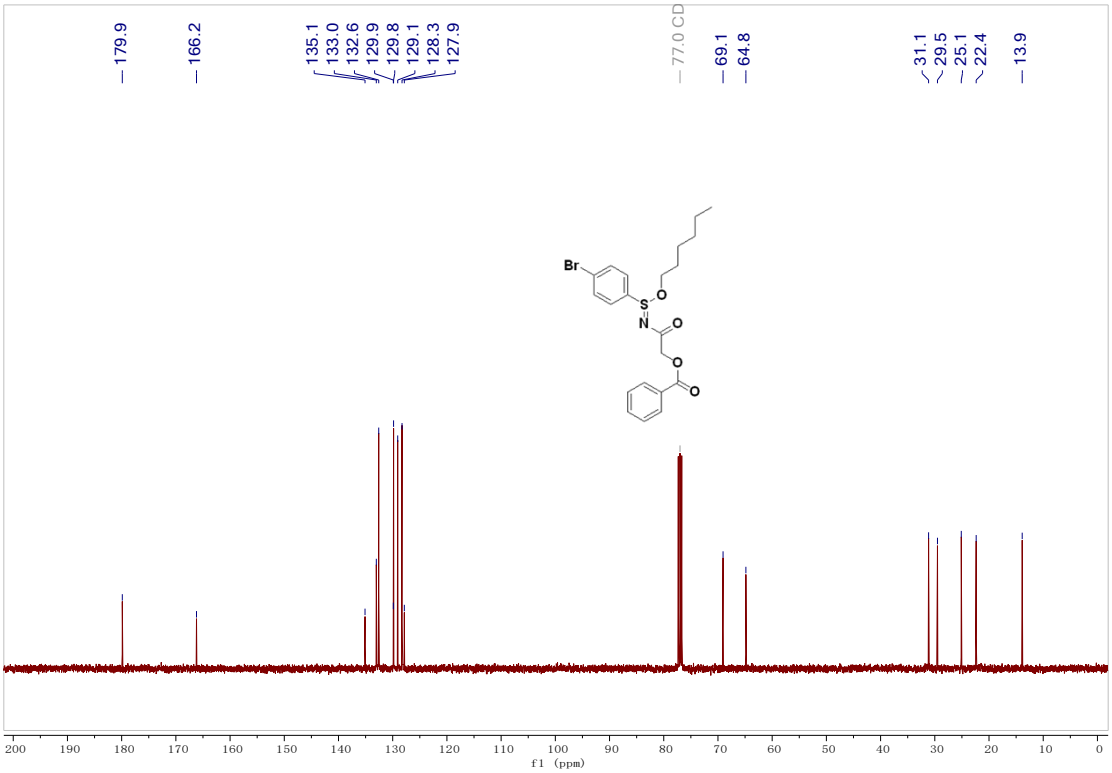
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bw**



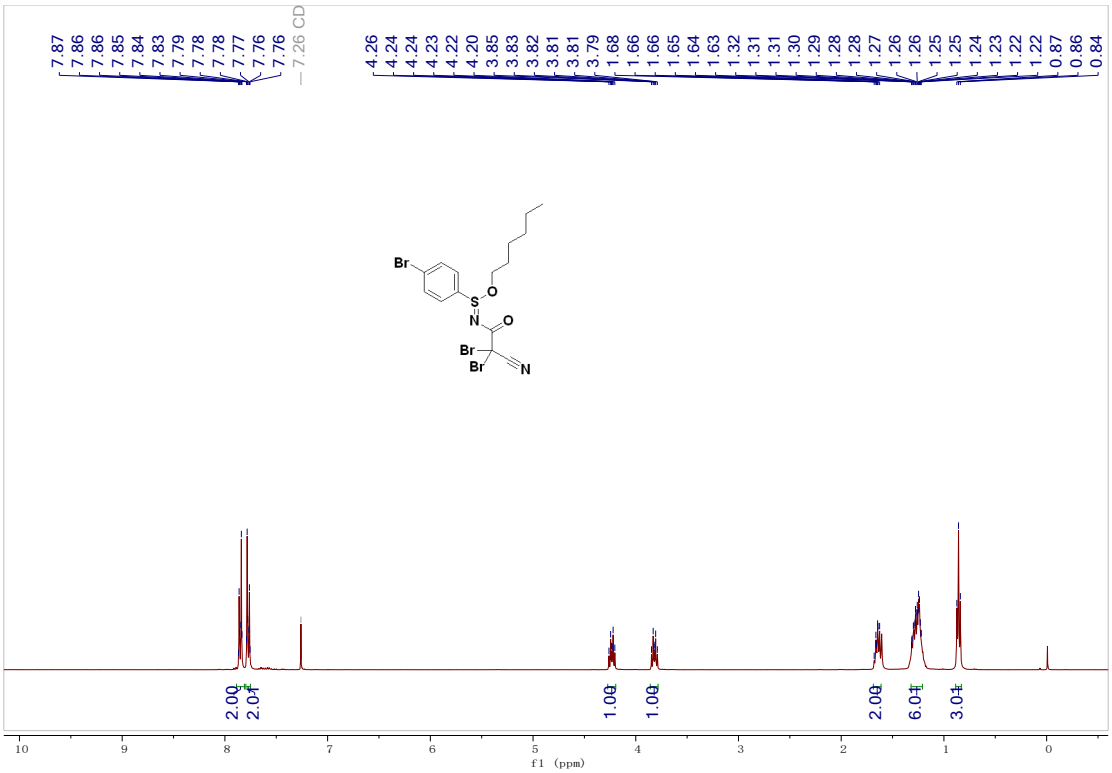
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bx**



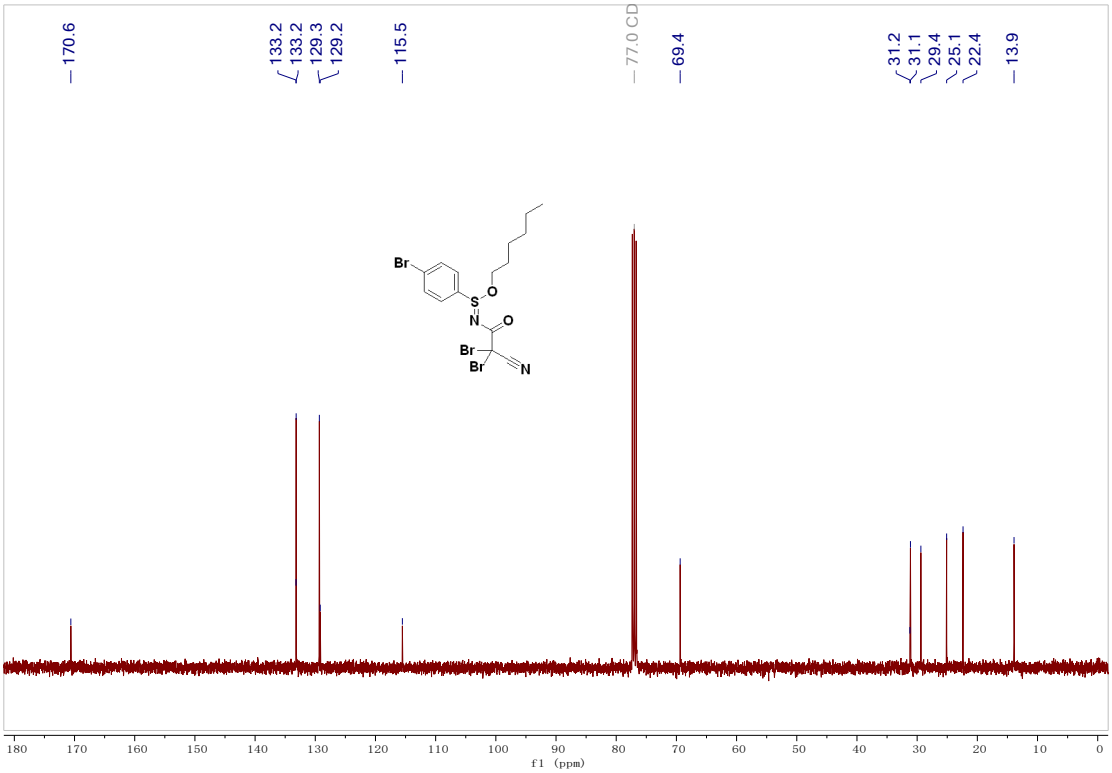
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bx**



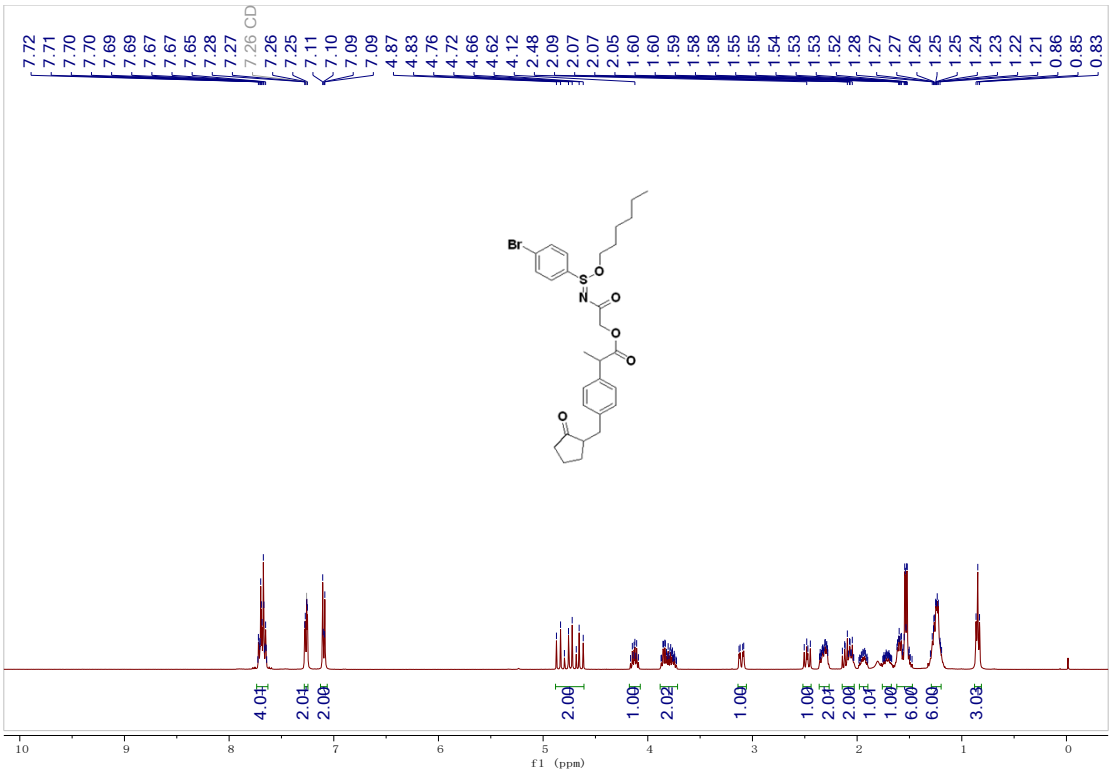
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4by**



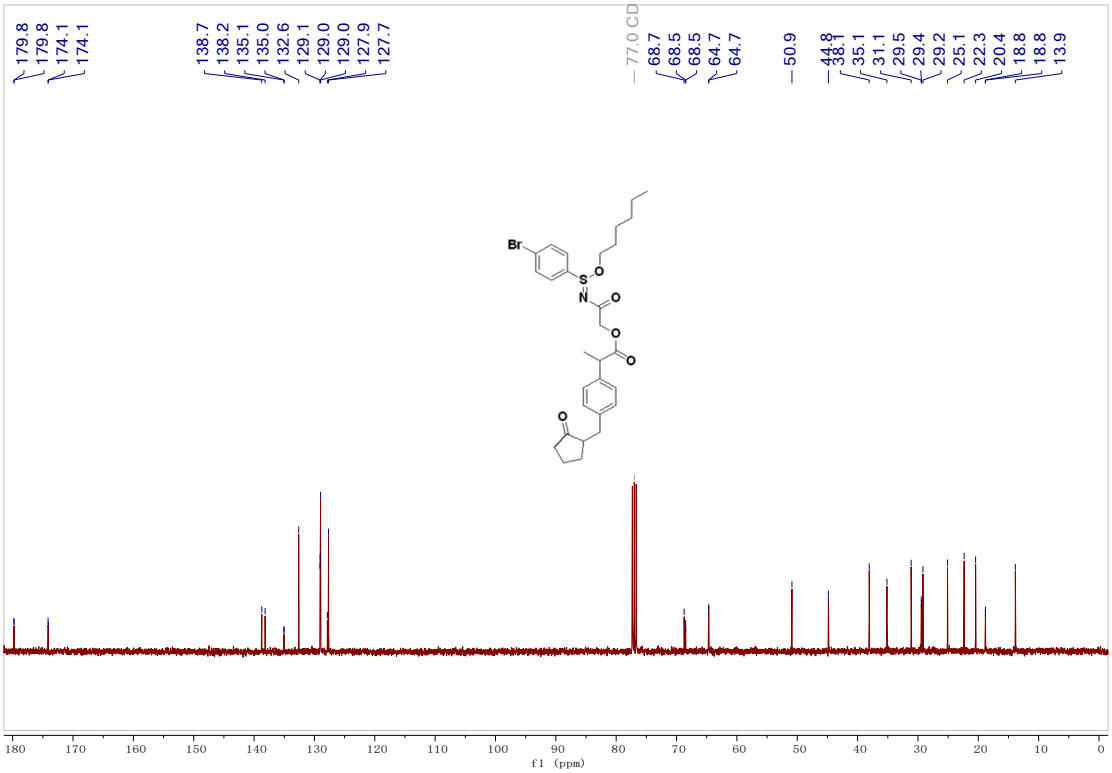
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4by**



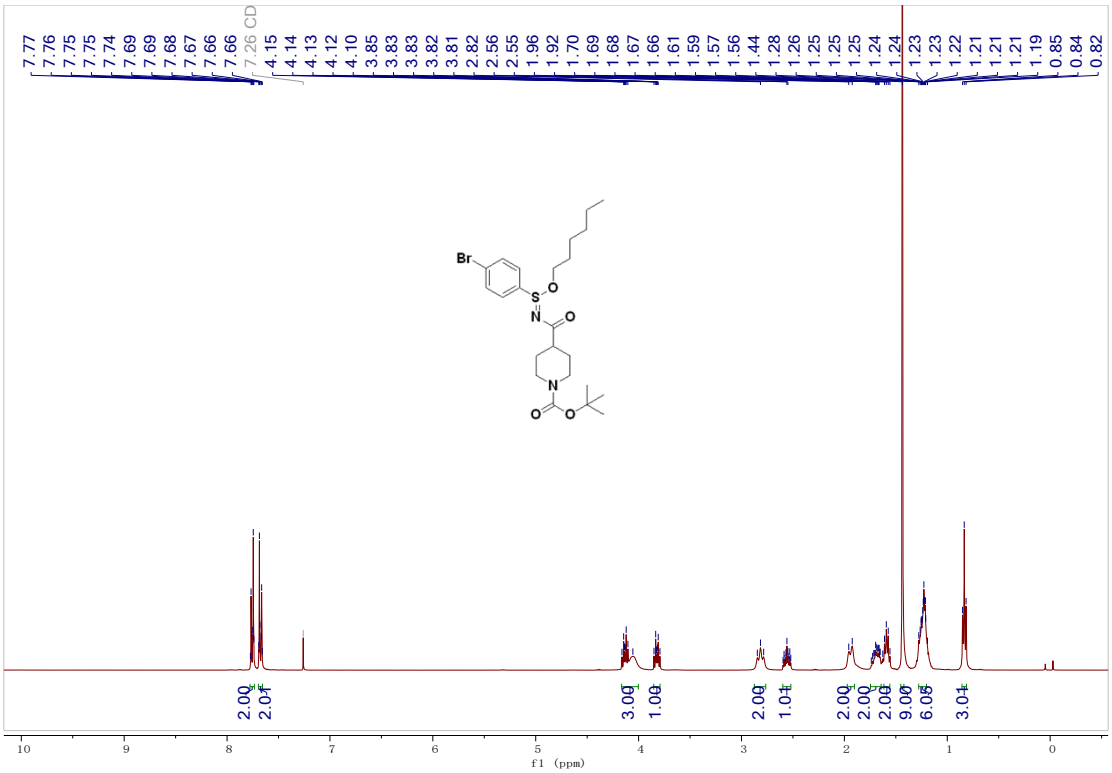
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4bz**



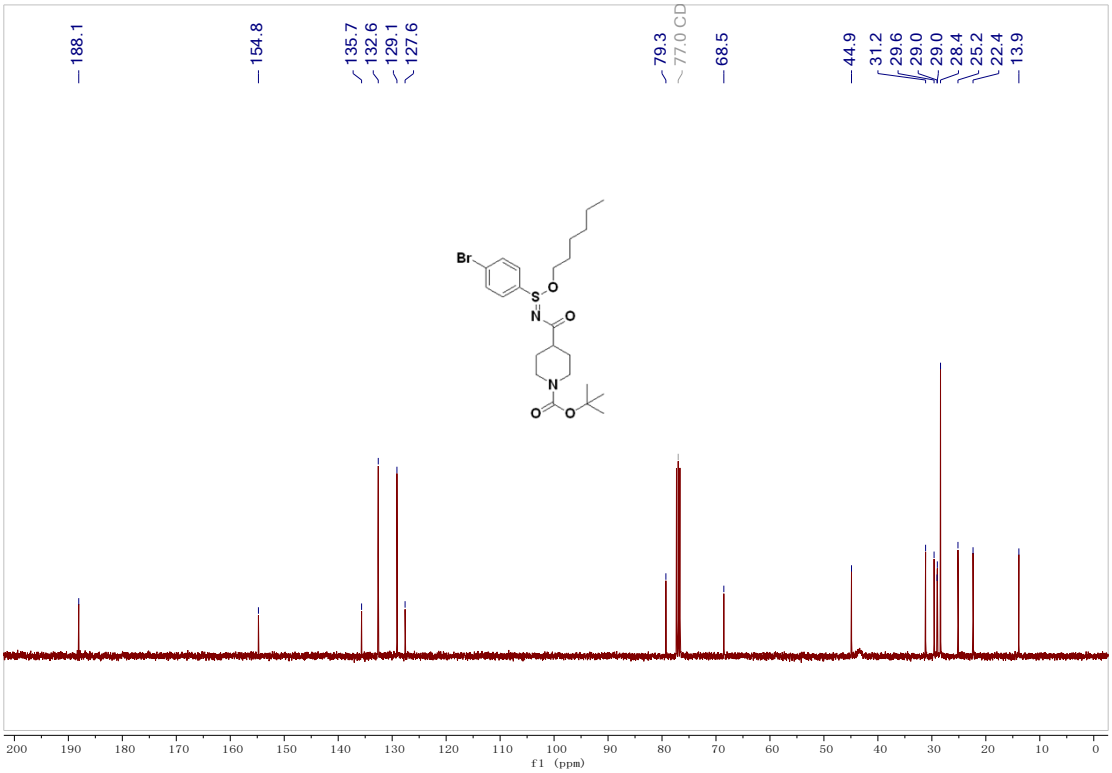
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4bz**



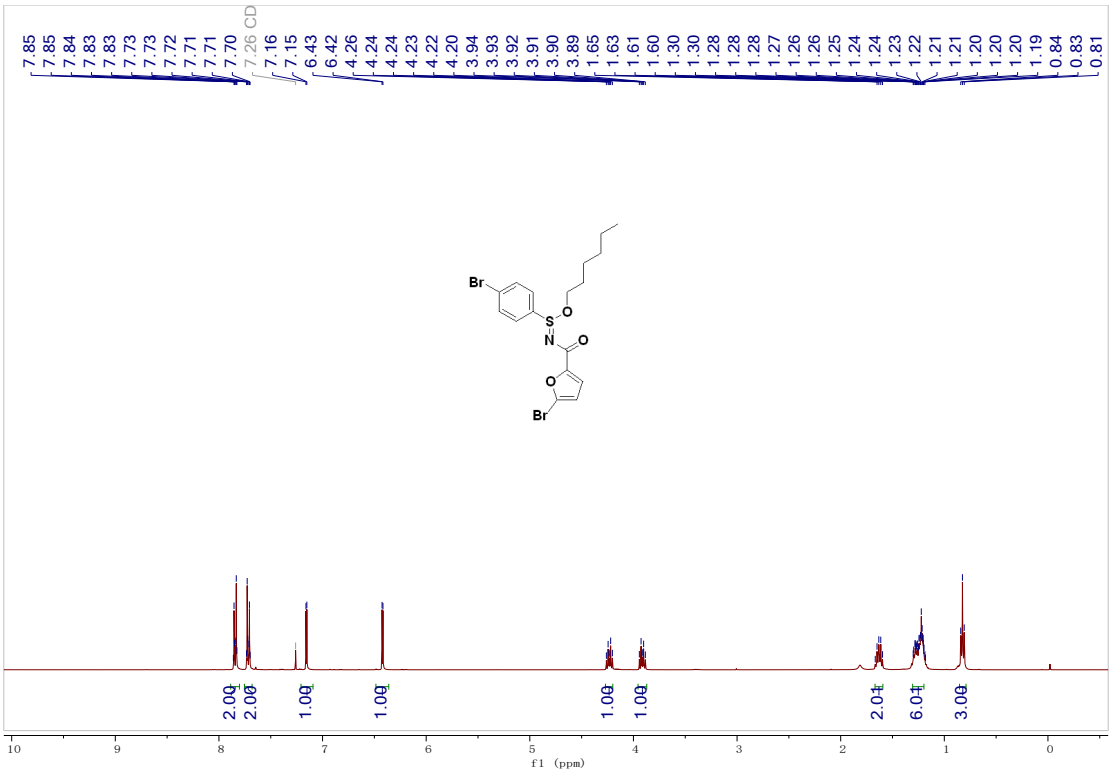
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4ca**



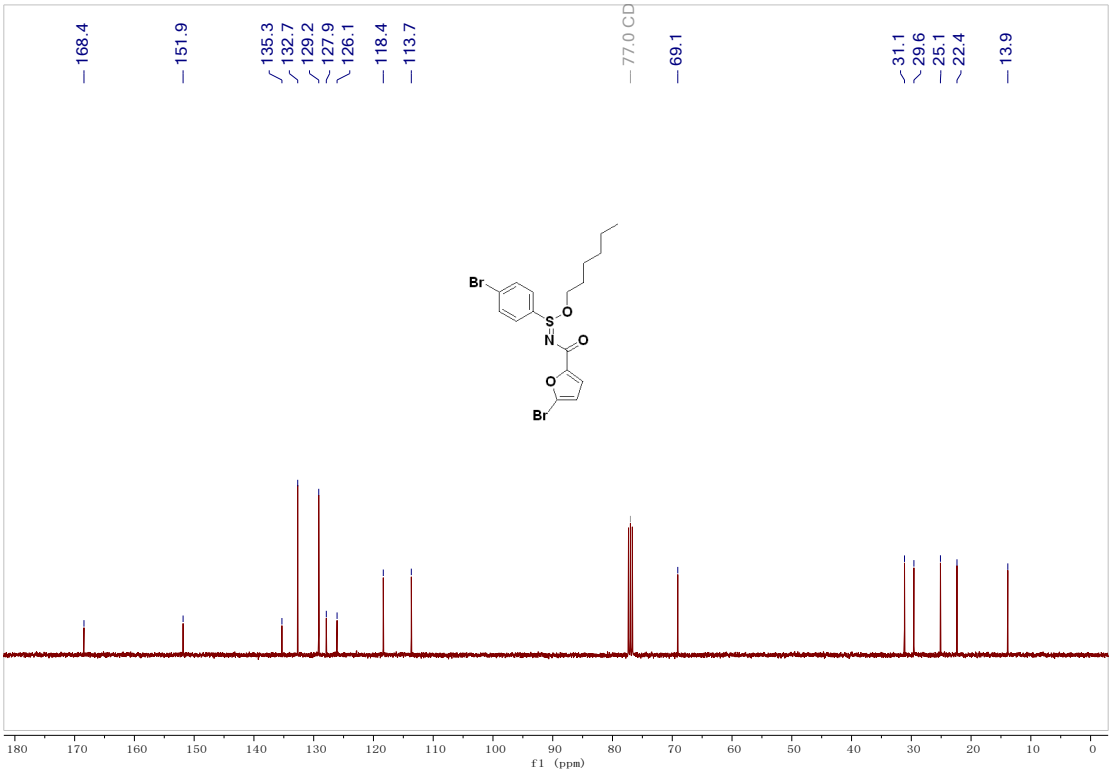
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4ca**



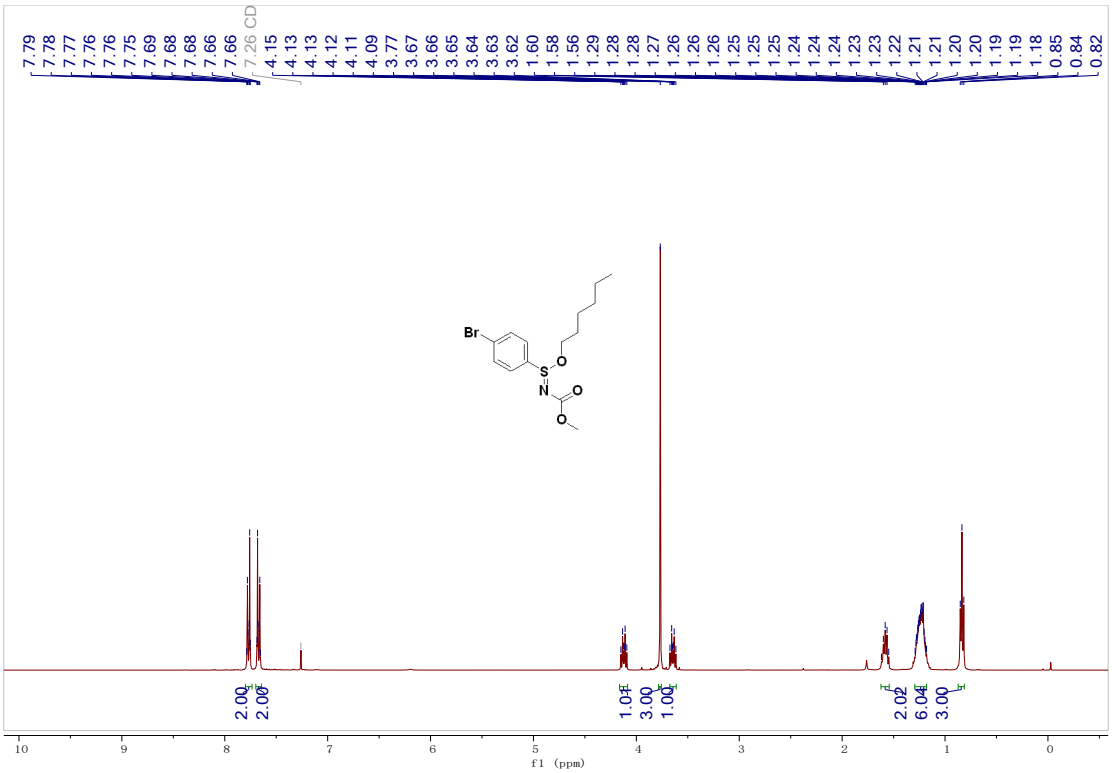
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4cb**



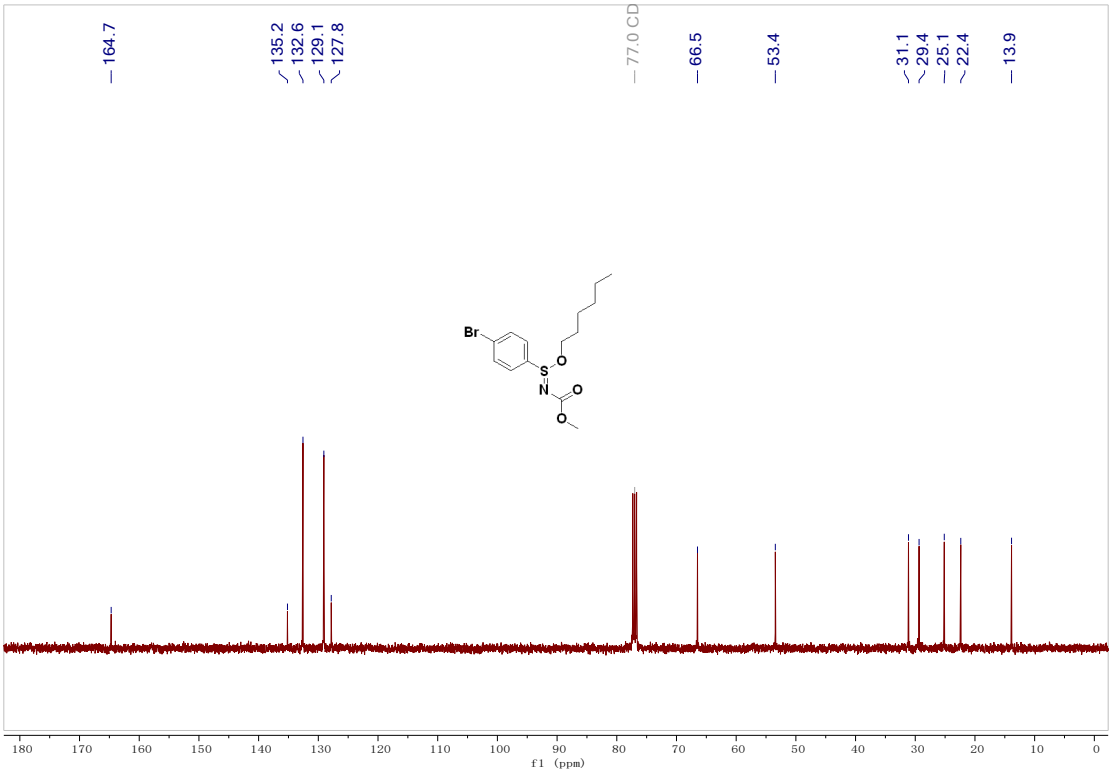
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4cb**



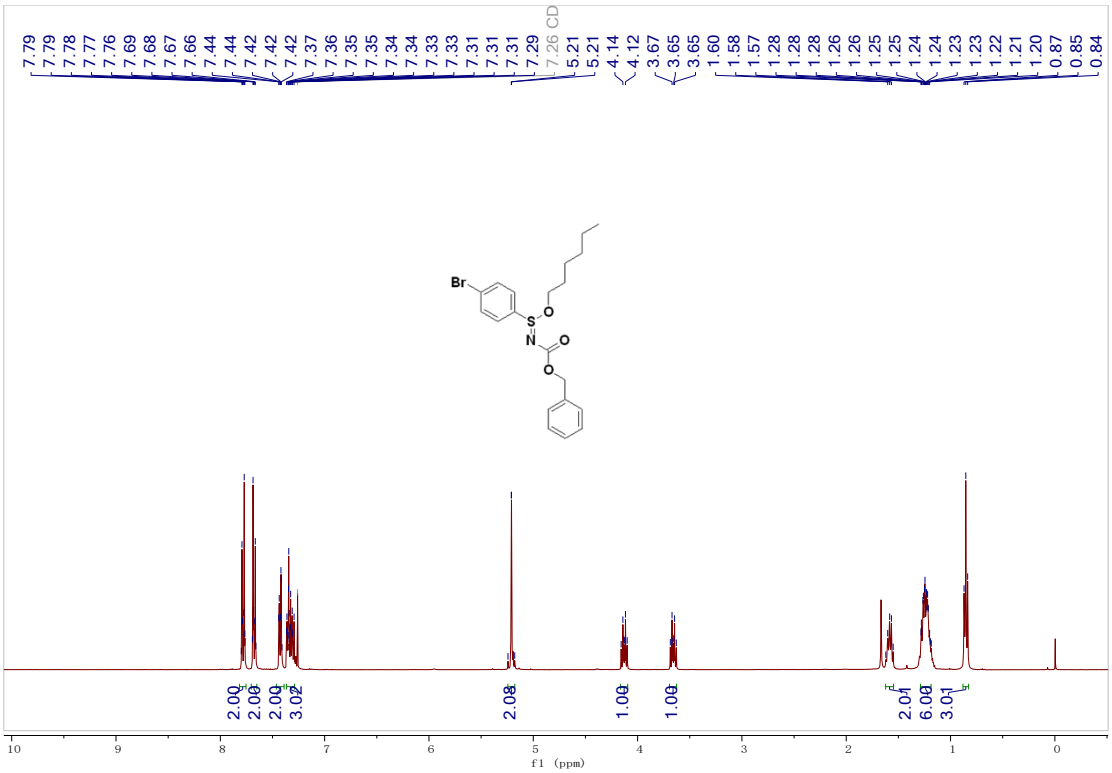
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4cc**



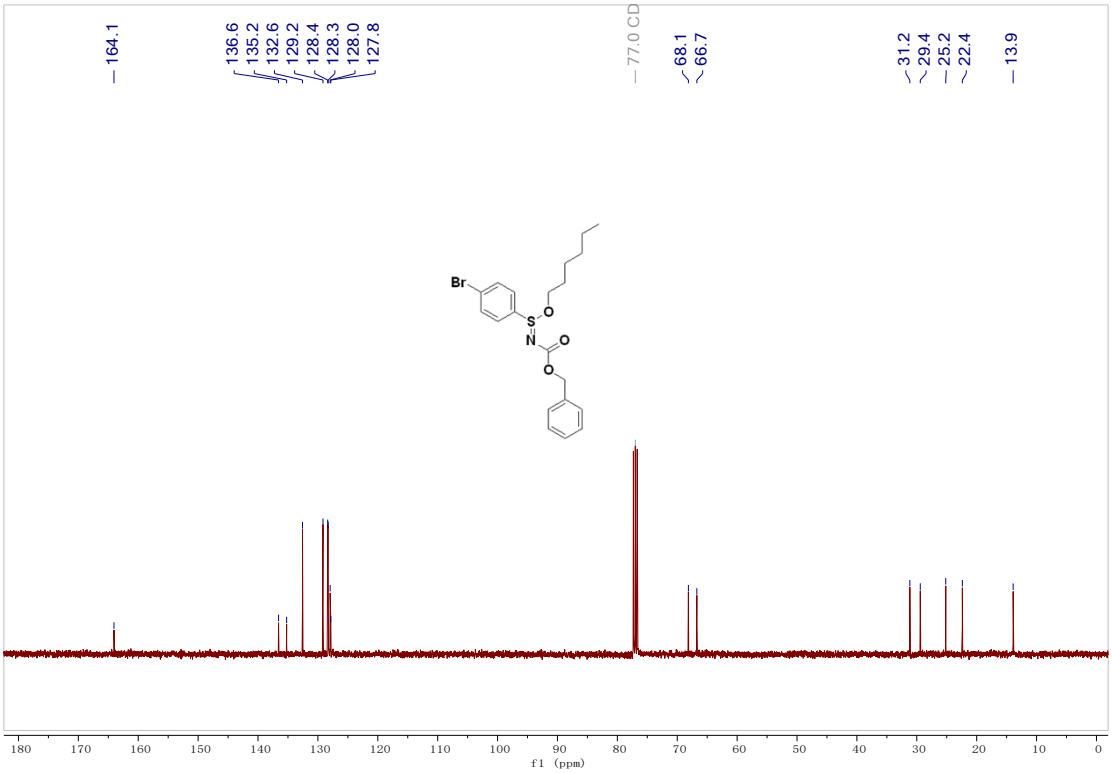
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4cc**



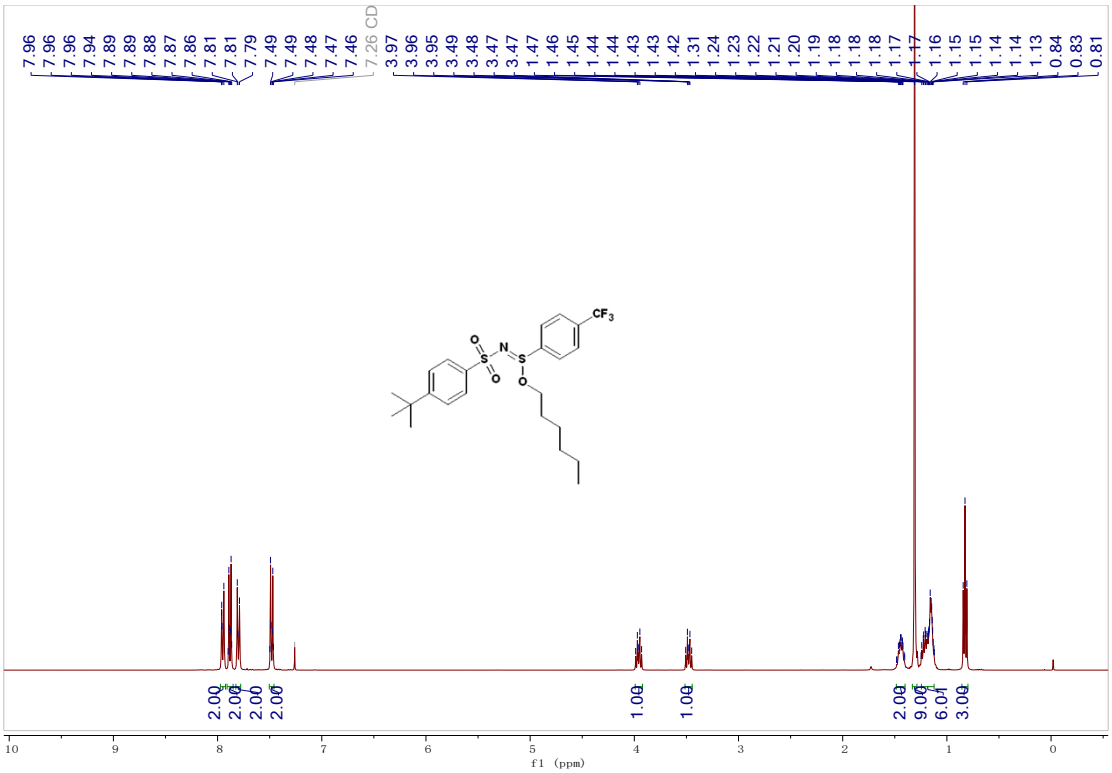
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **4cd**



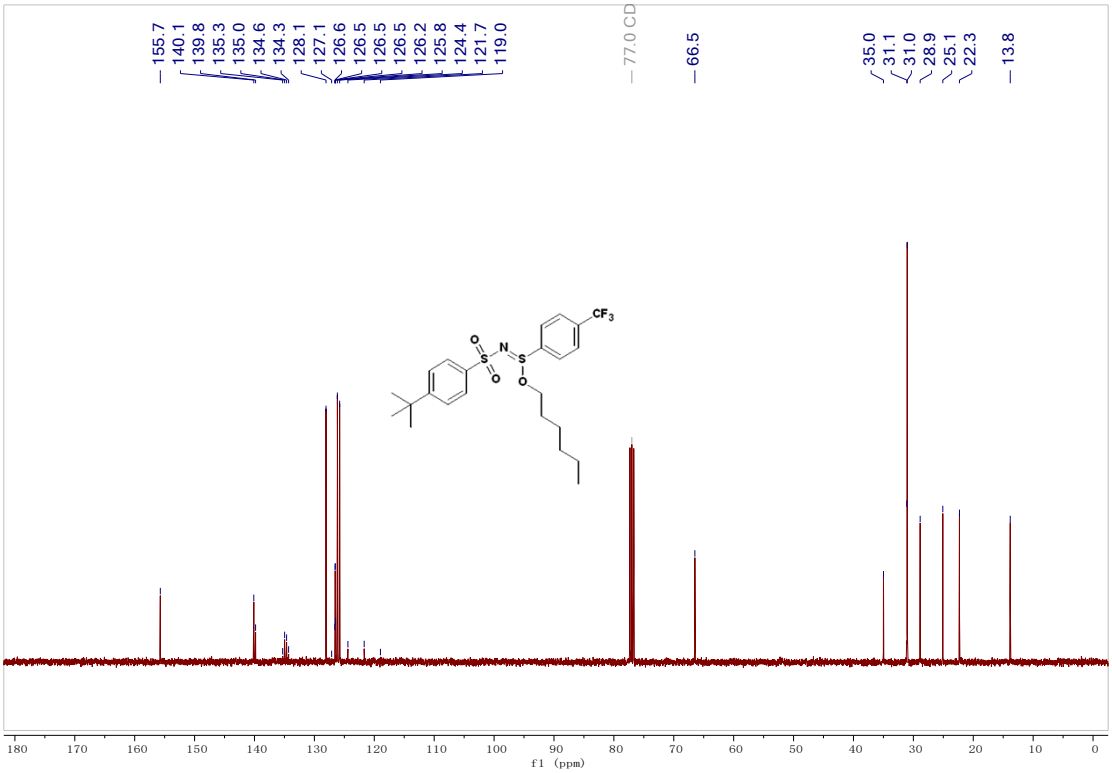
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **4cd**



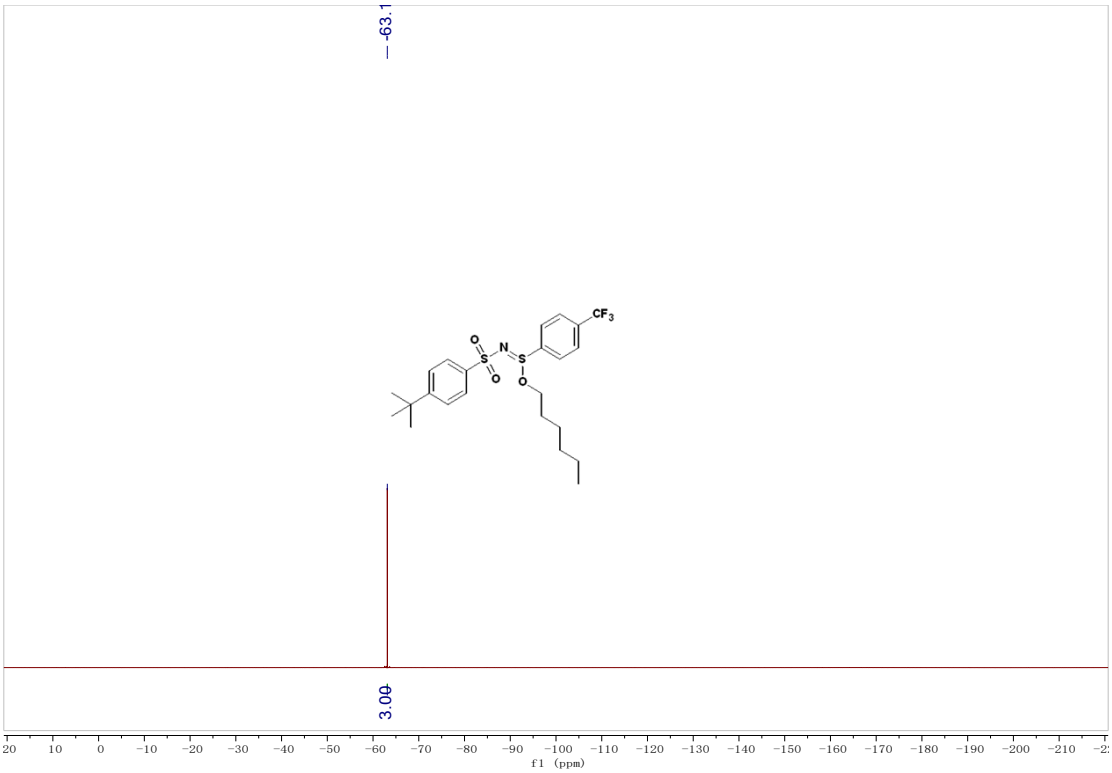
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5a**



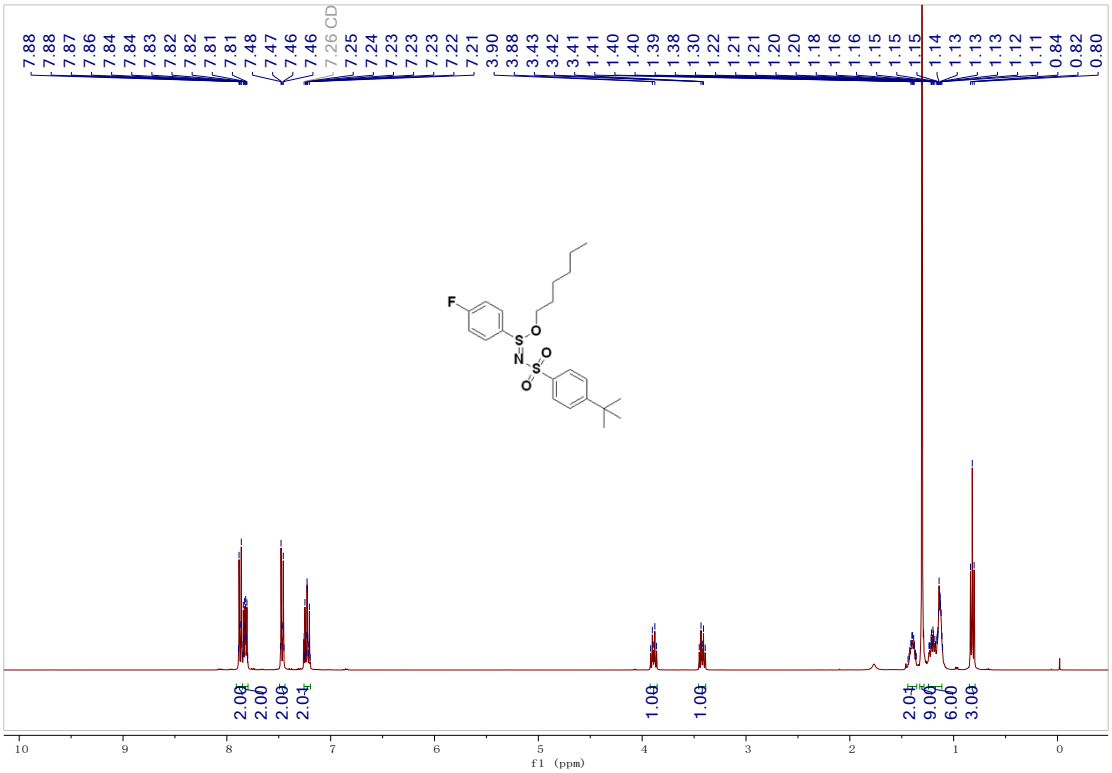
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5a**



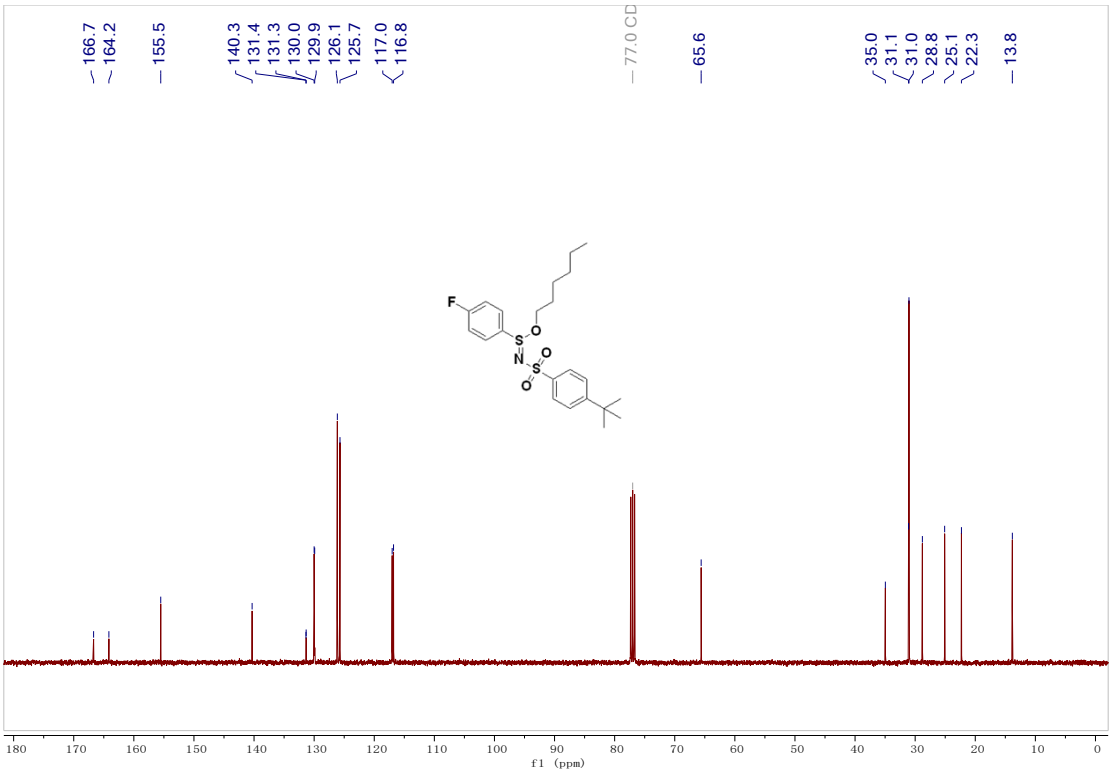
^{19}F NMR (376 MHz, Chloroform-d) of compound **5a**



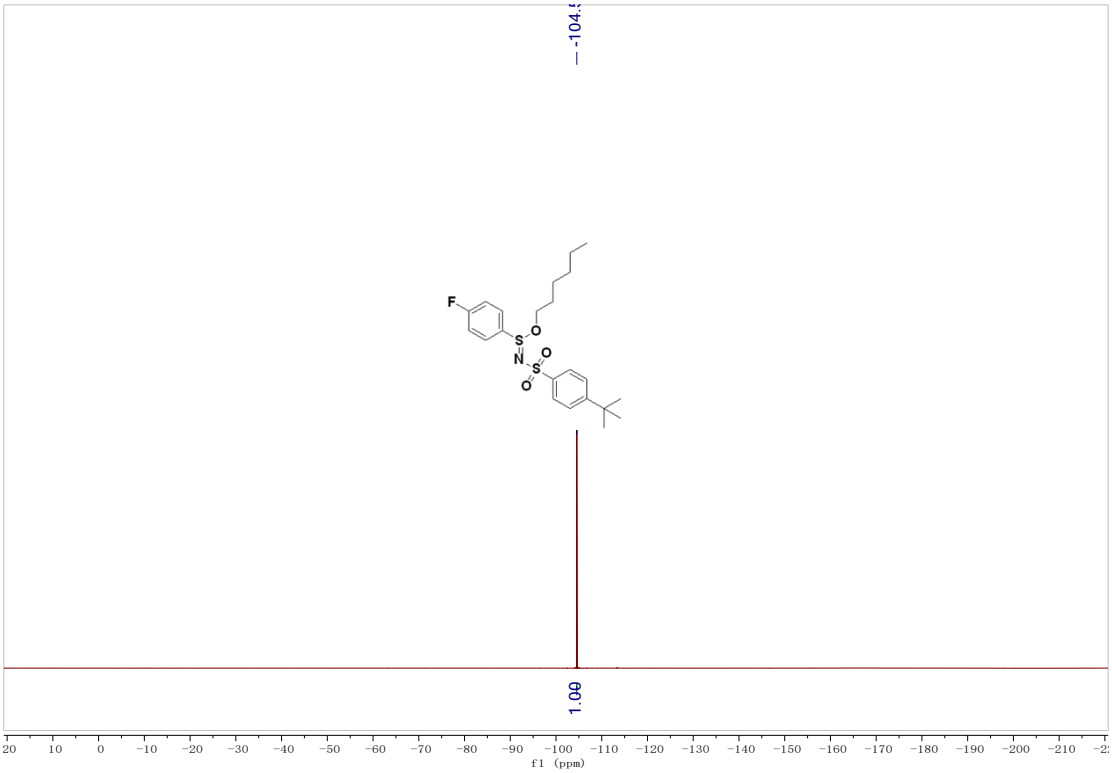
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5b**



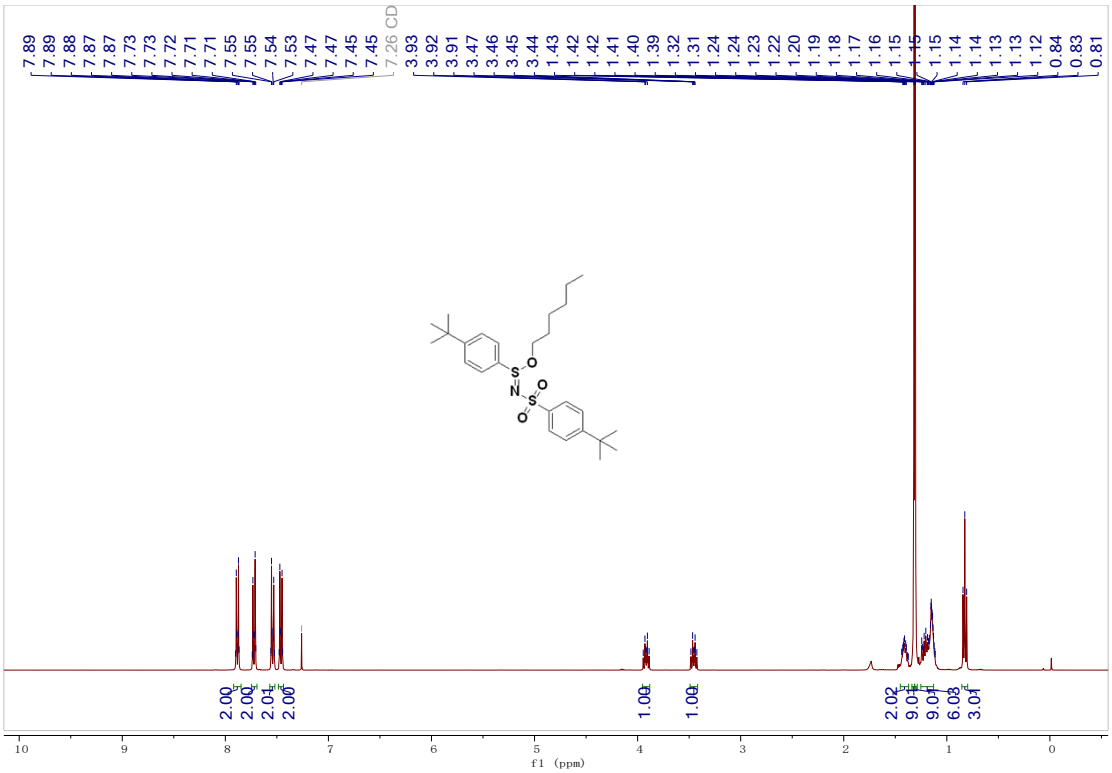
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5b**



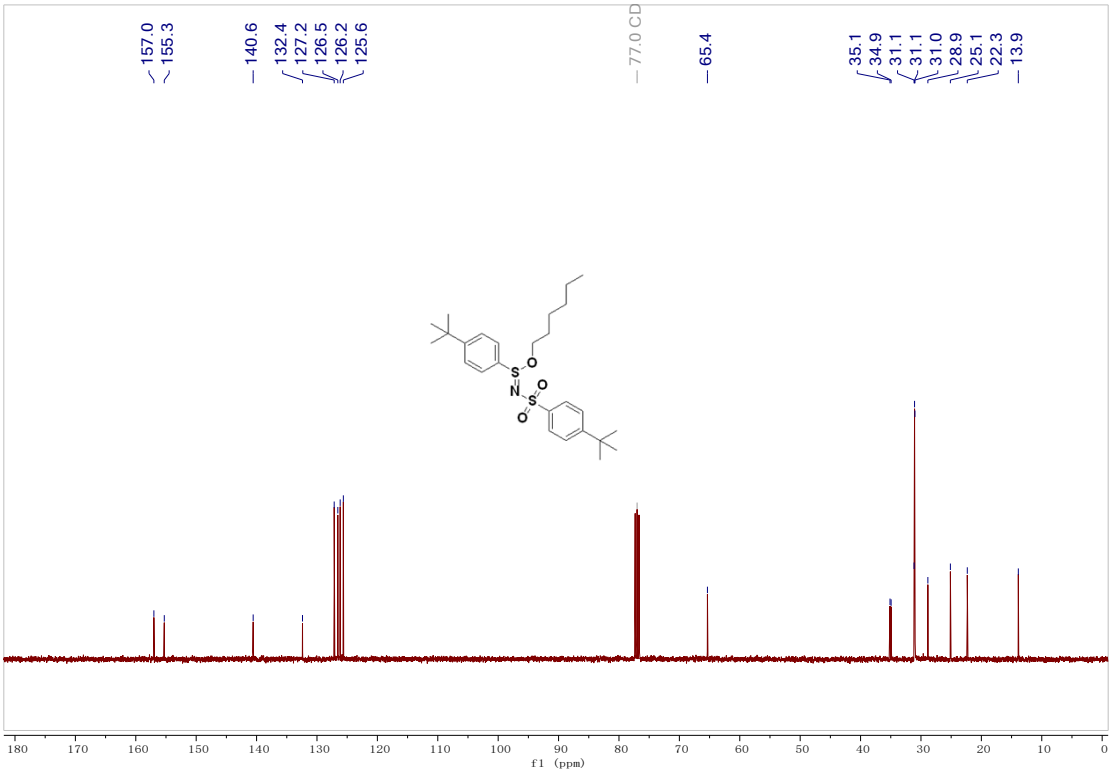
^{19}F NMR (376 MHz, Chloroform-d) of compound **5b**



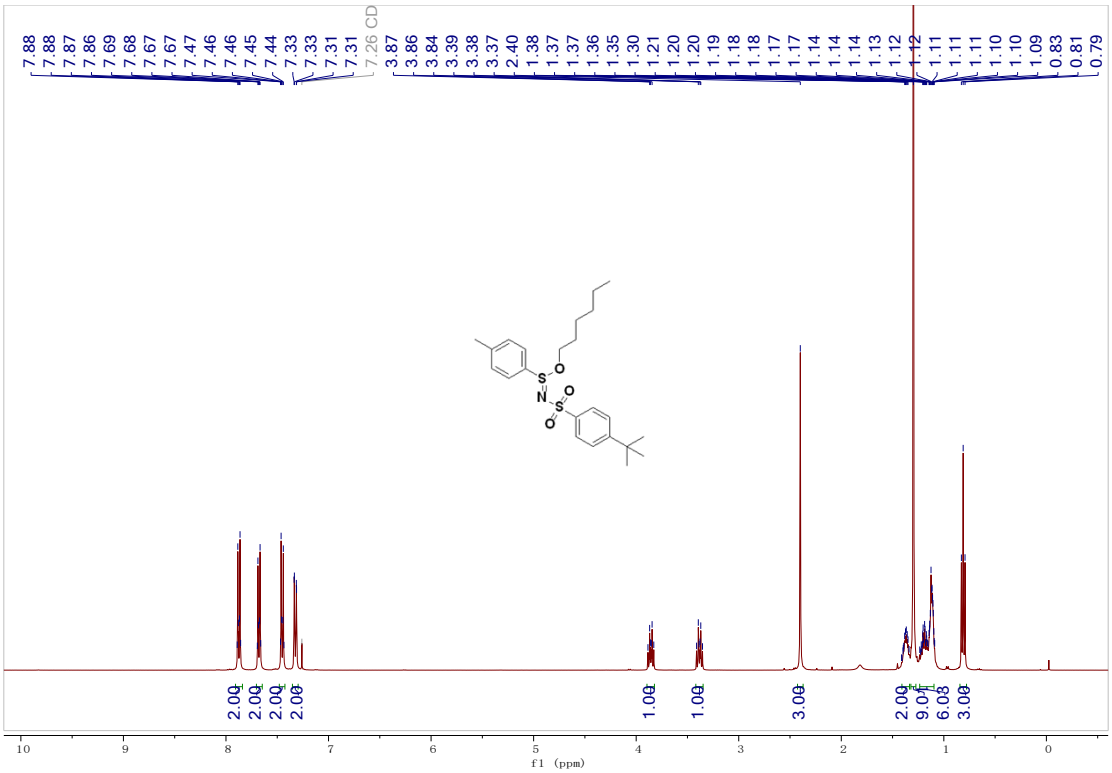
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5c**



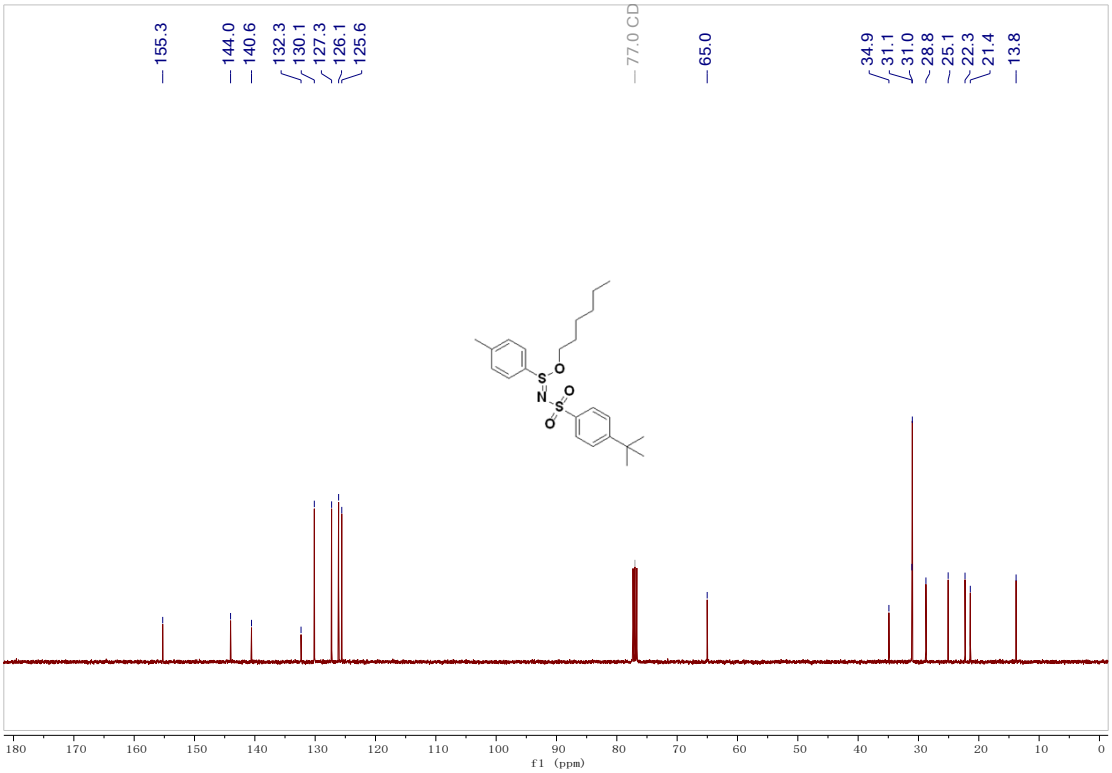
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5c**



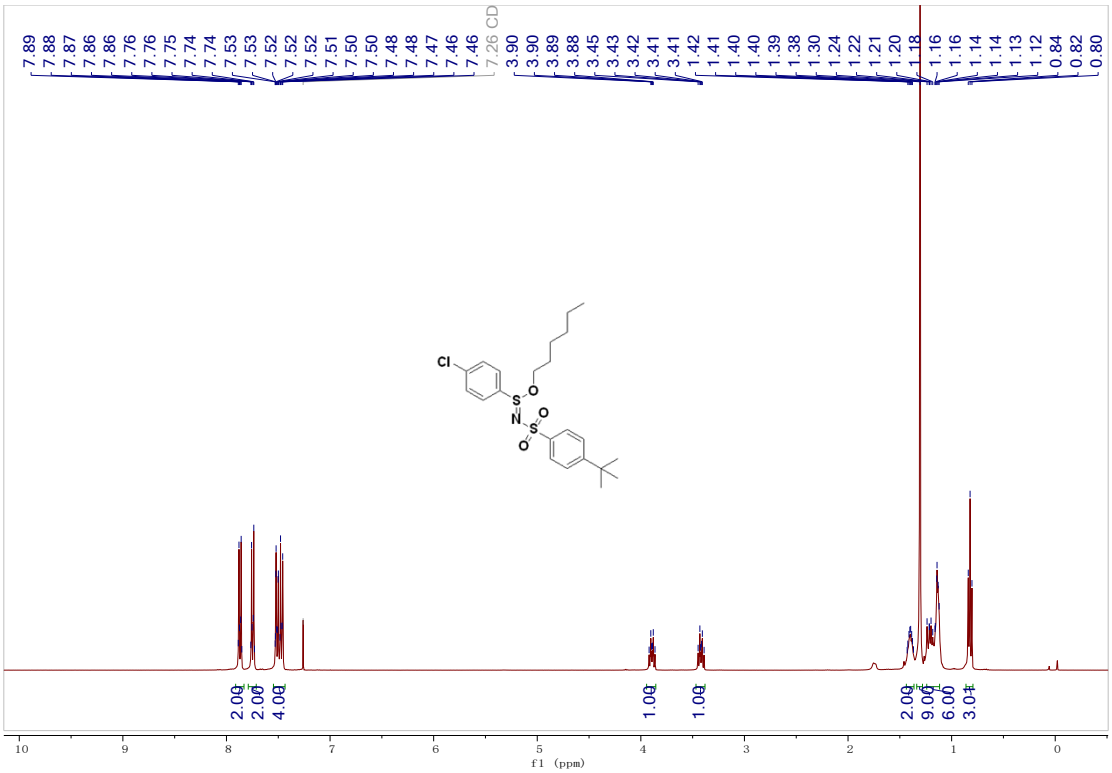
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5d**



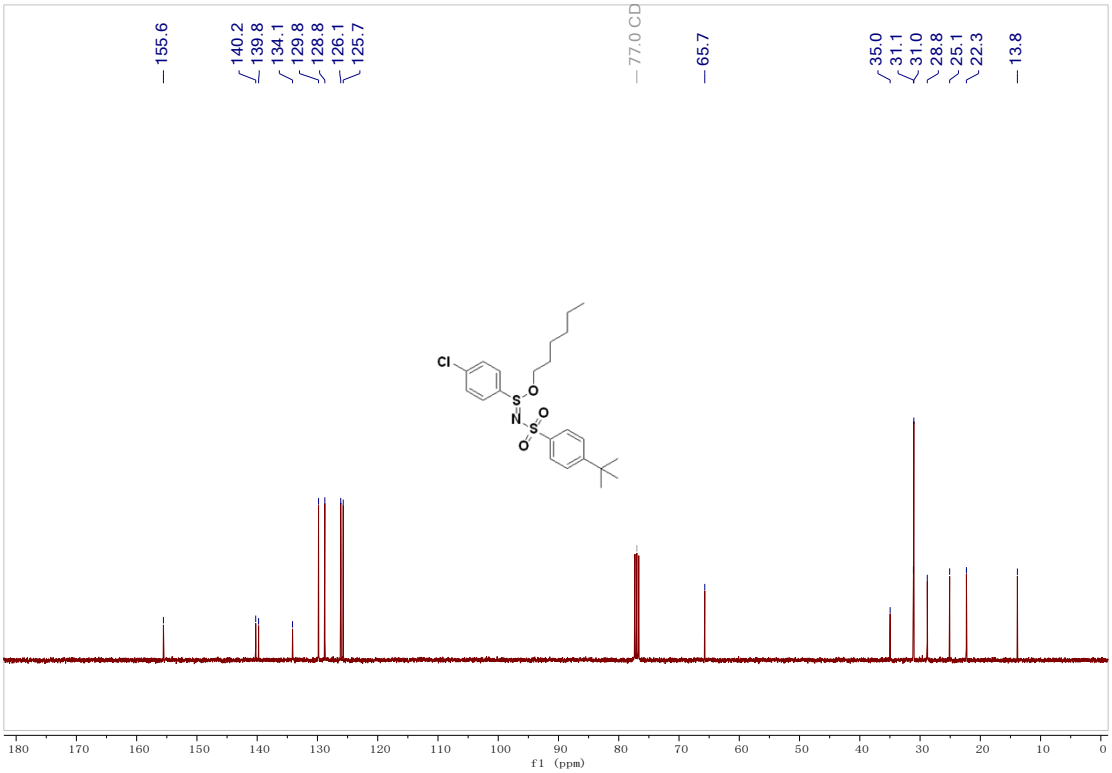
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5d**



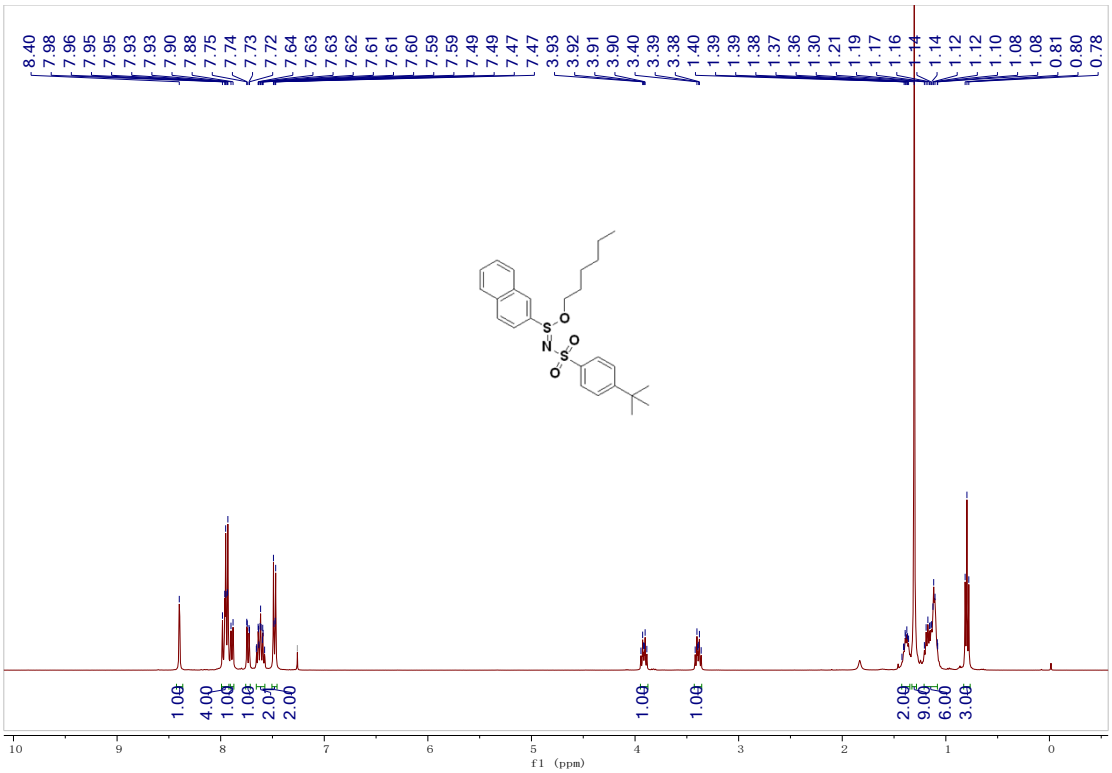
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5e**



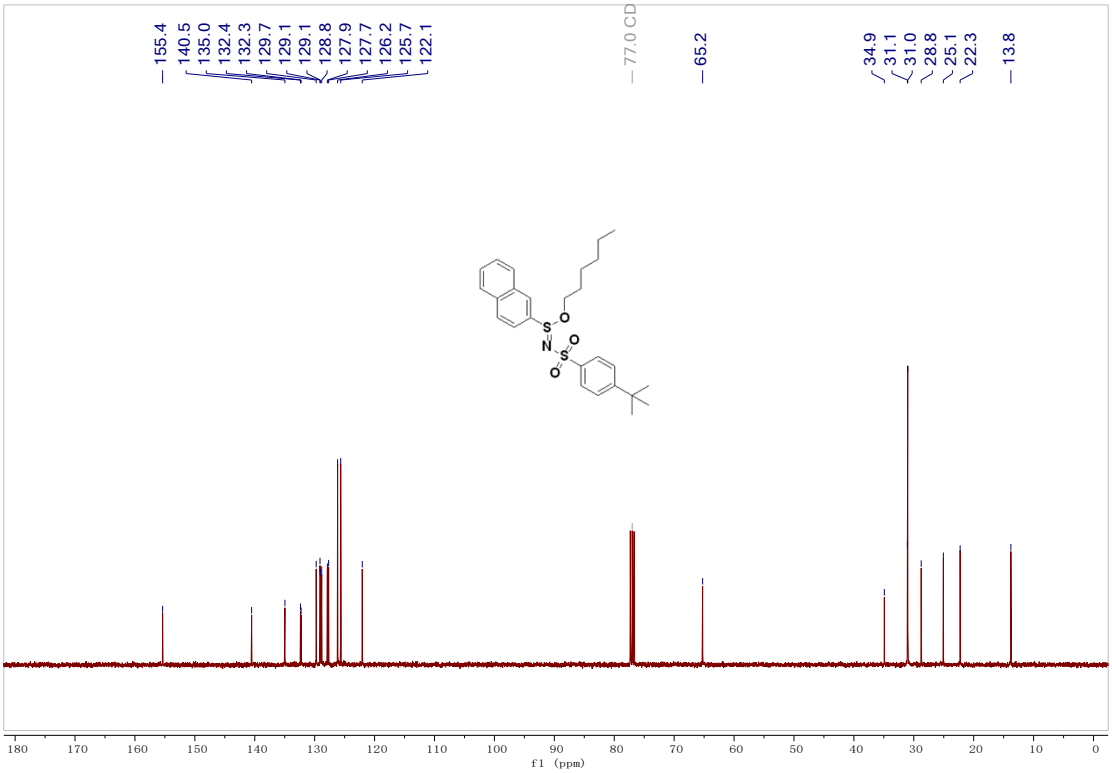
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5e**



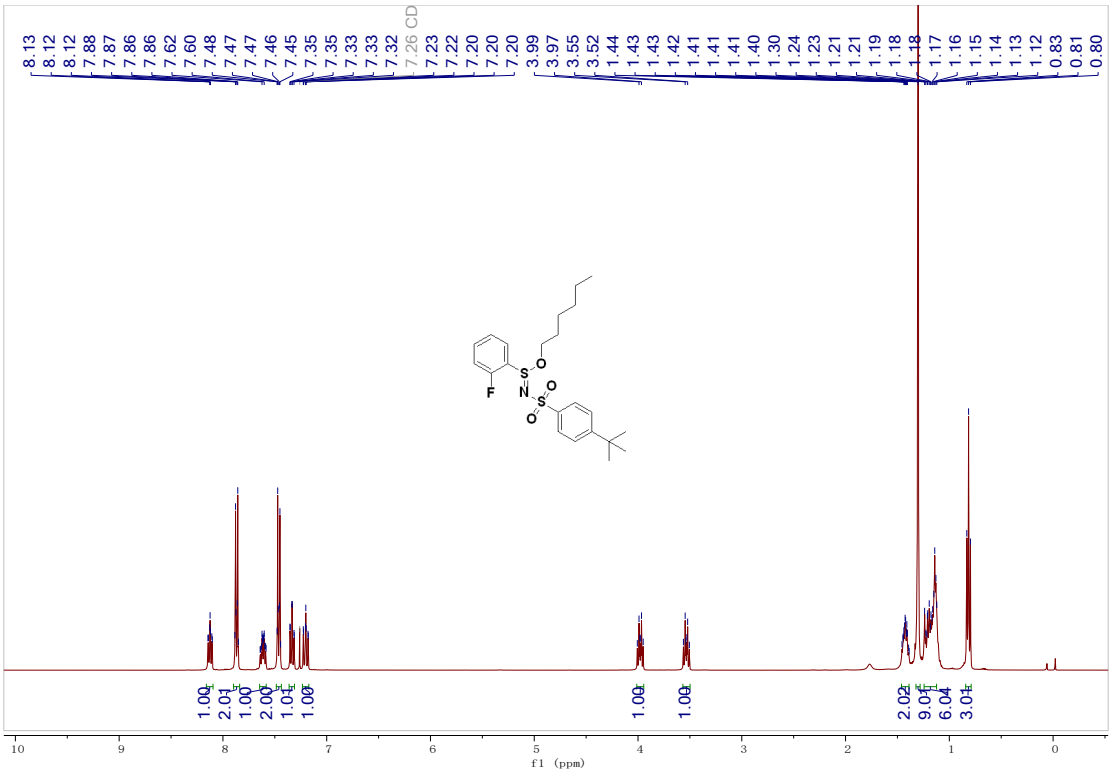
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5f**



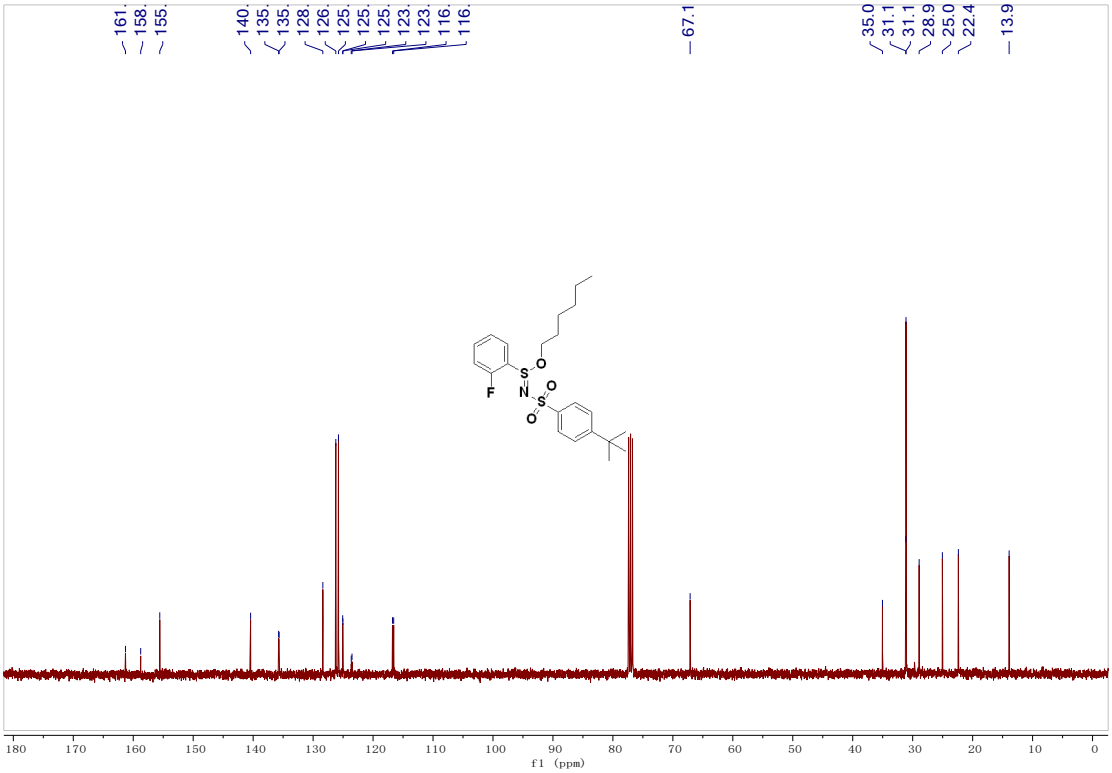
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5f**



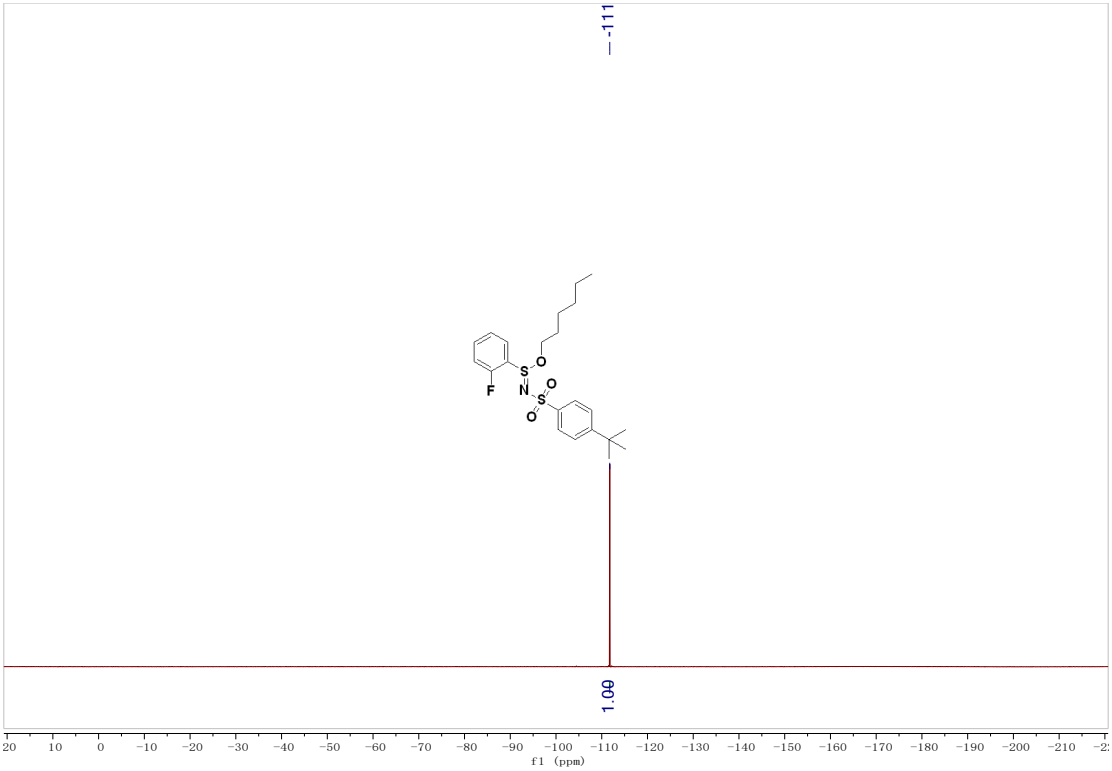
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5g**



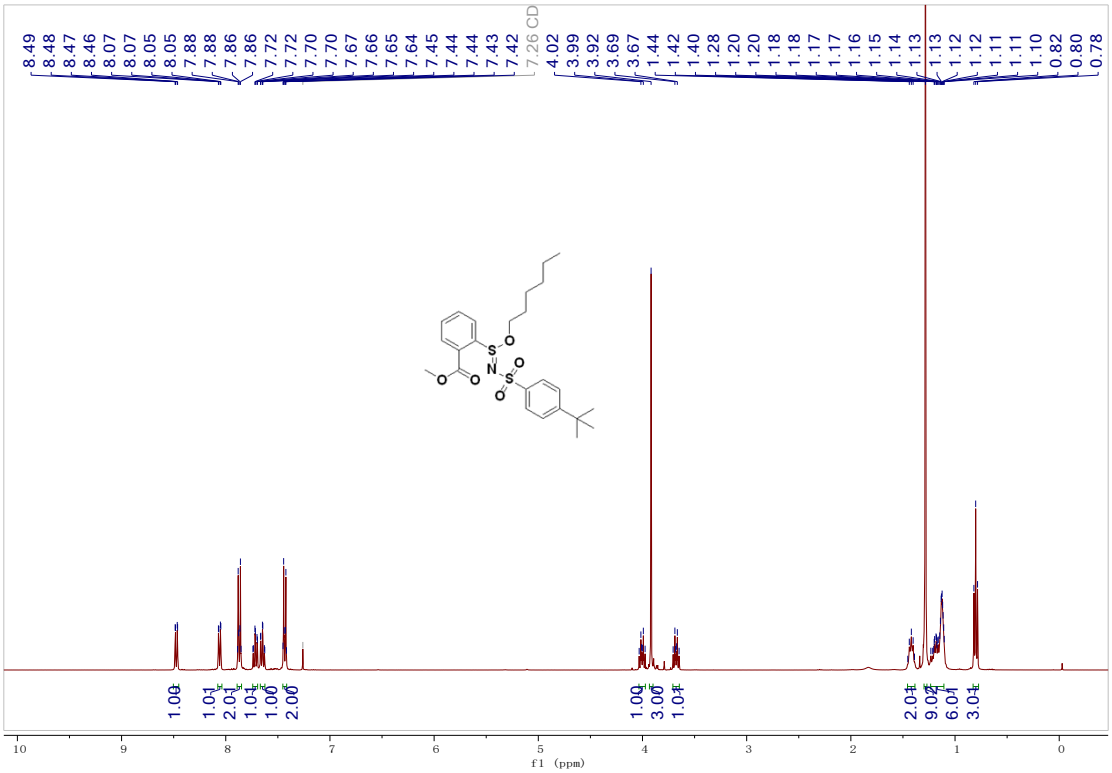
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5g**



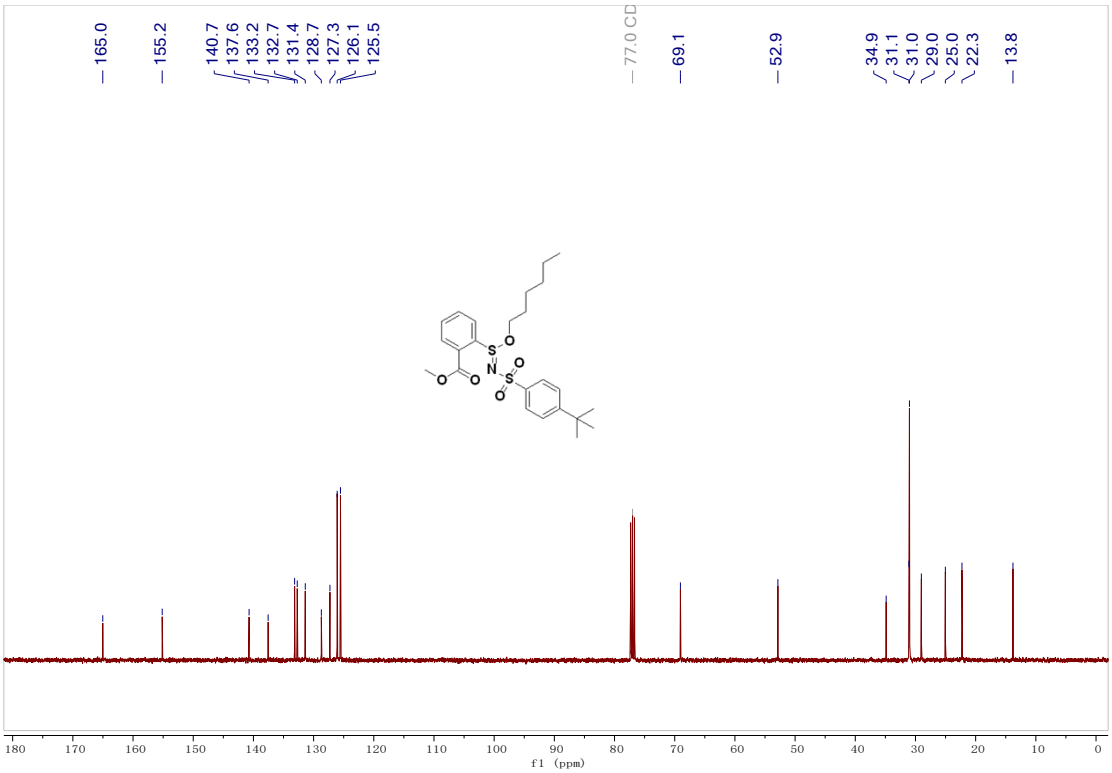
^{19}F NMR (376 MHz, Chloroform-d) of compound **5g**



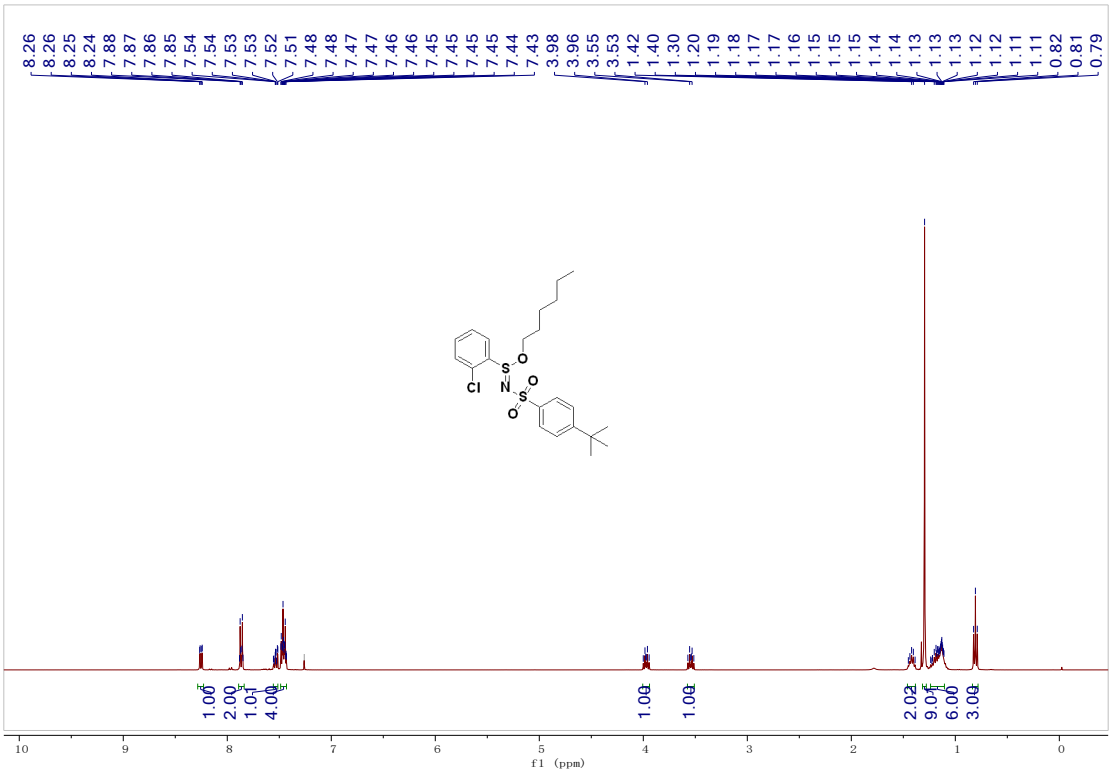
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5h**



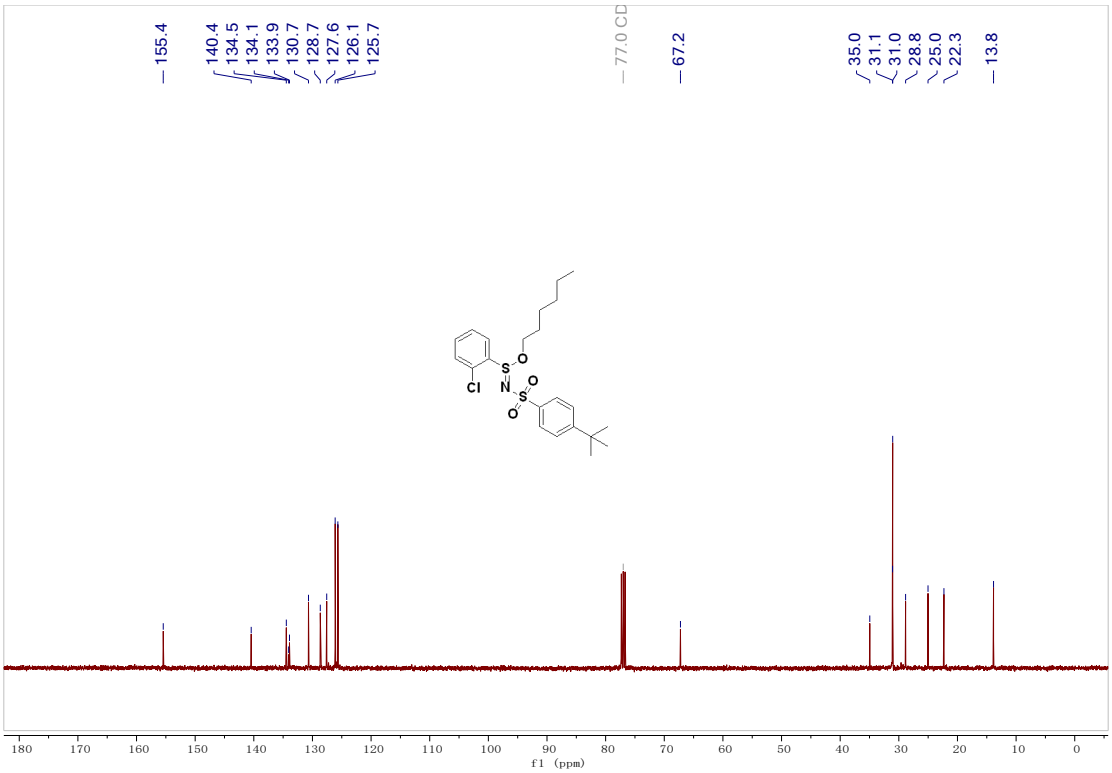
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5h**



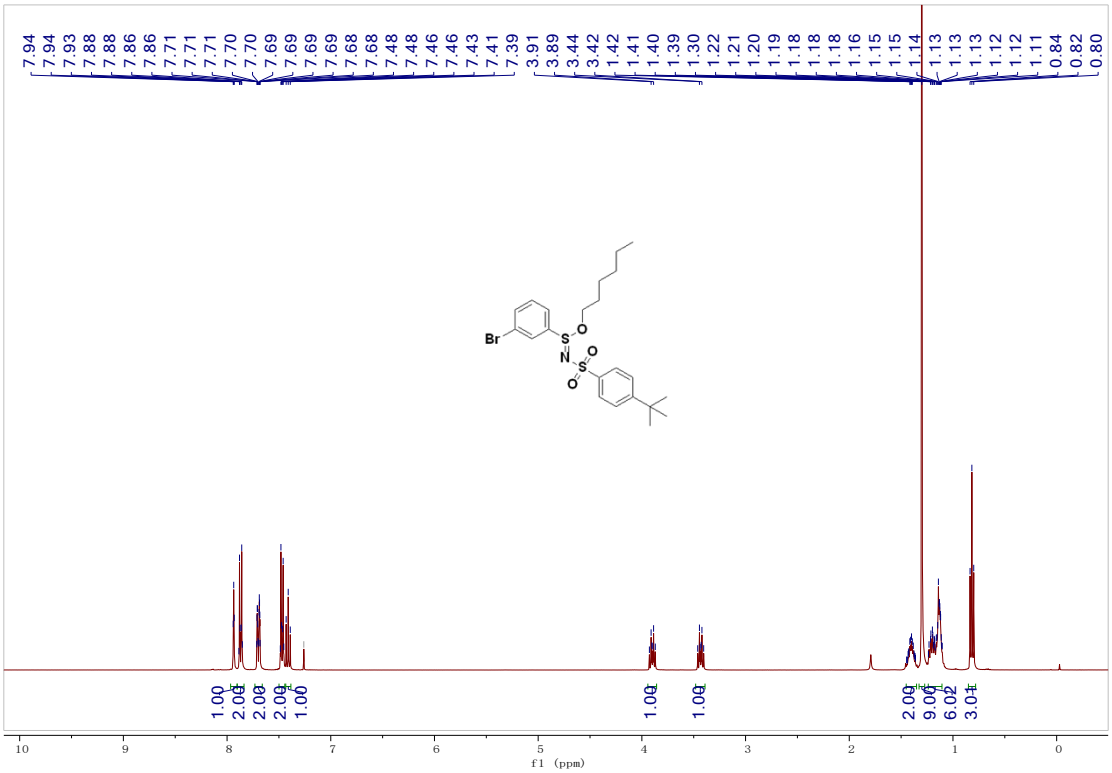
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5i**



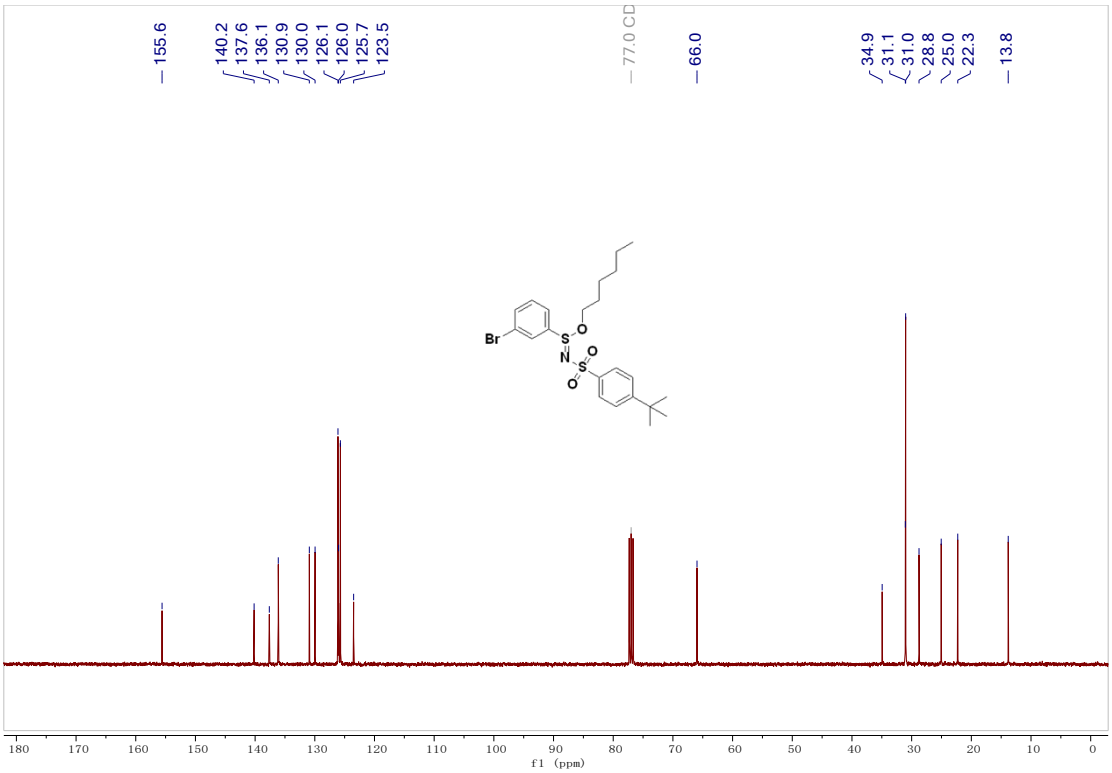
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5i**



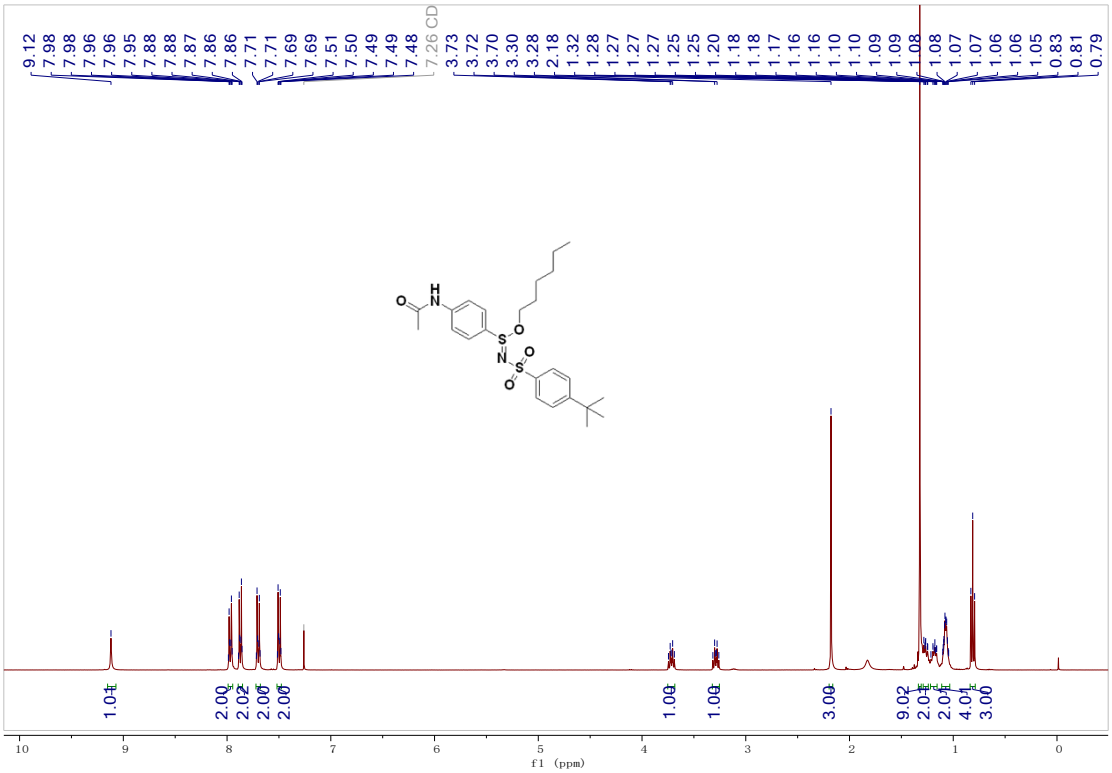
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5j**



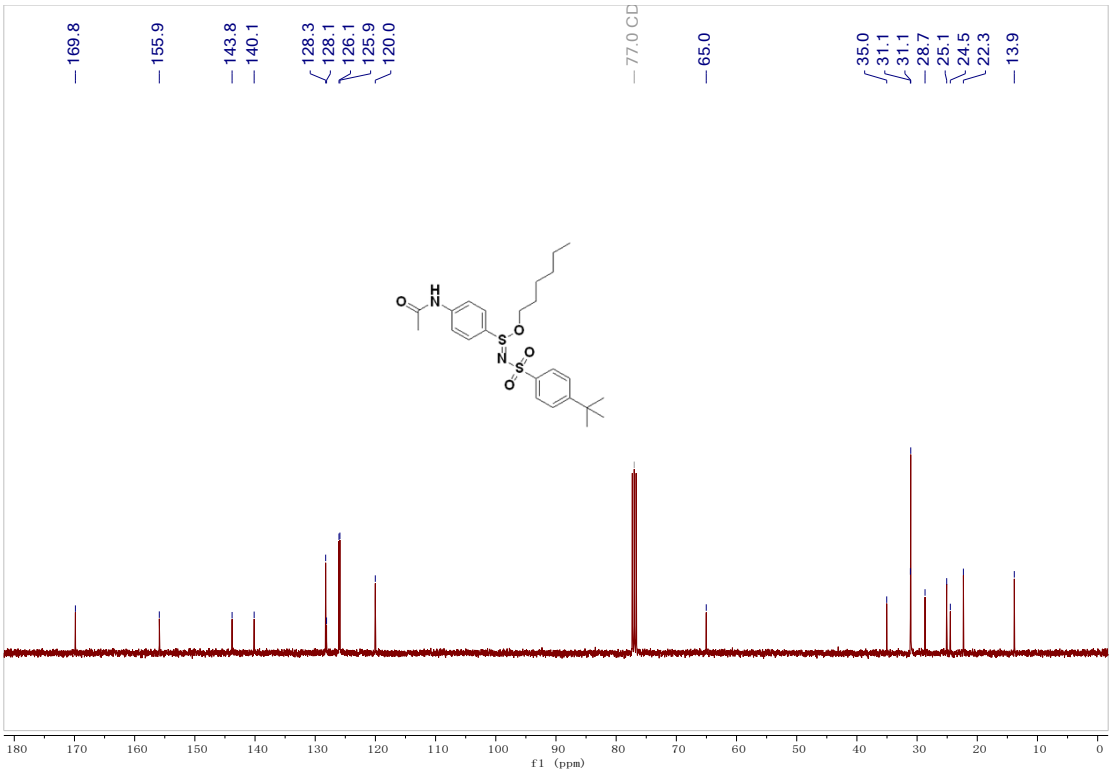
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5j**



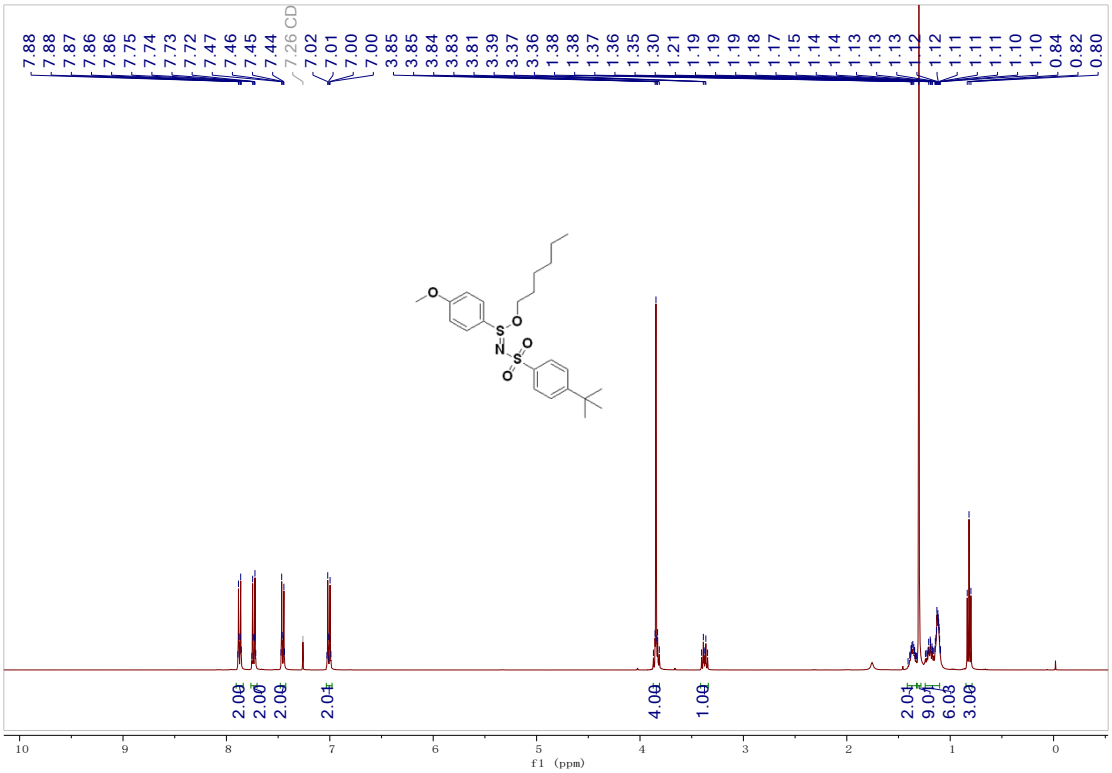
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5k**



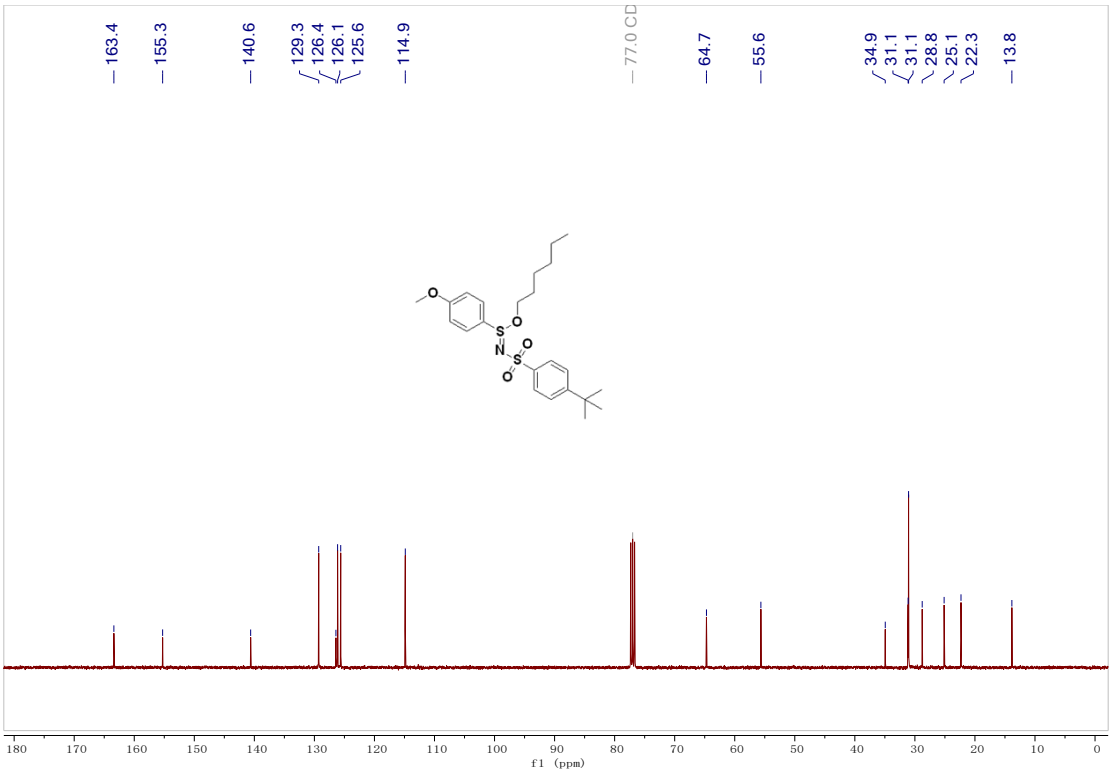
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5k**



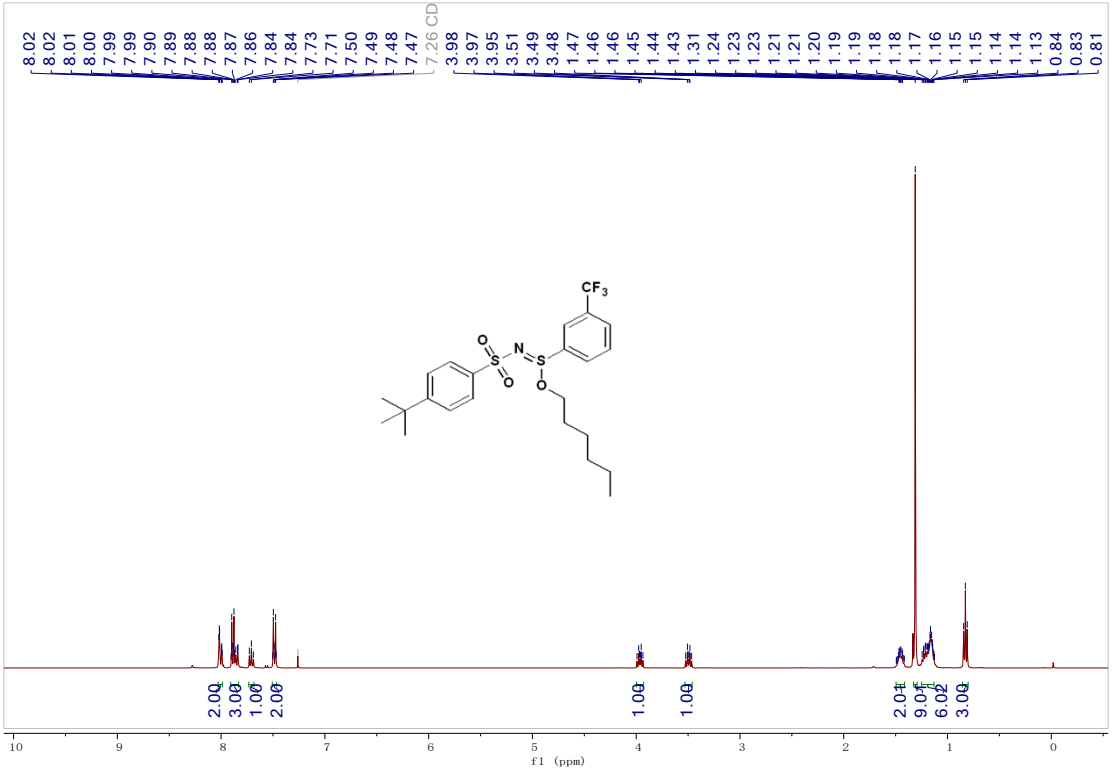
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5l**



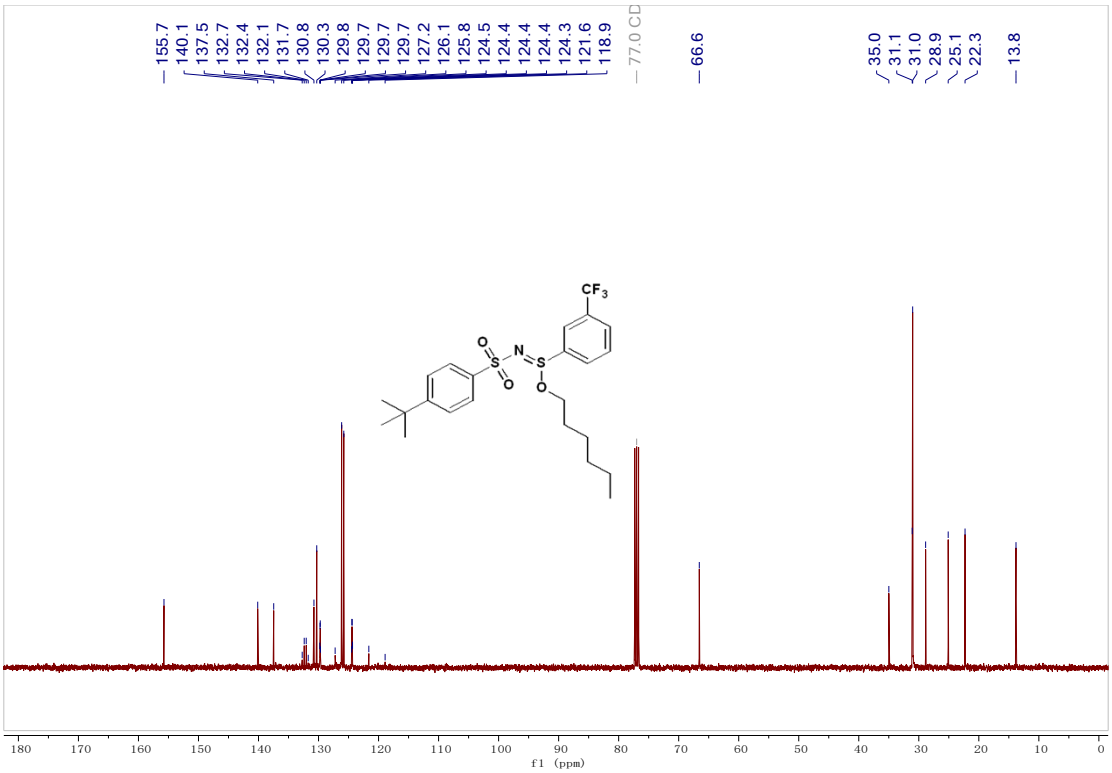
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5l**



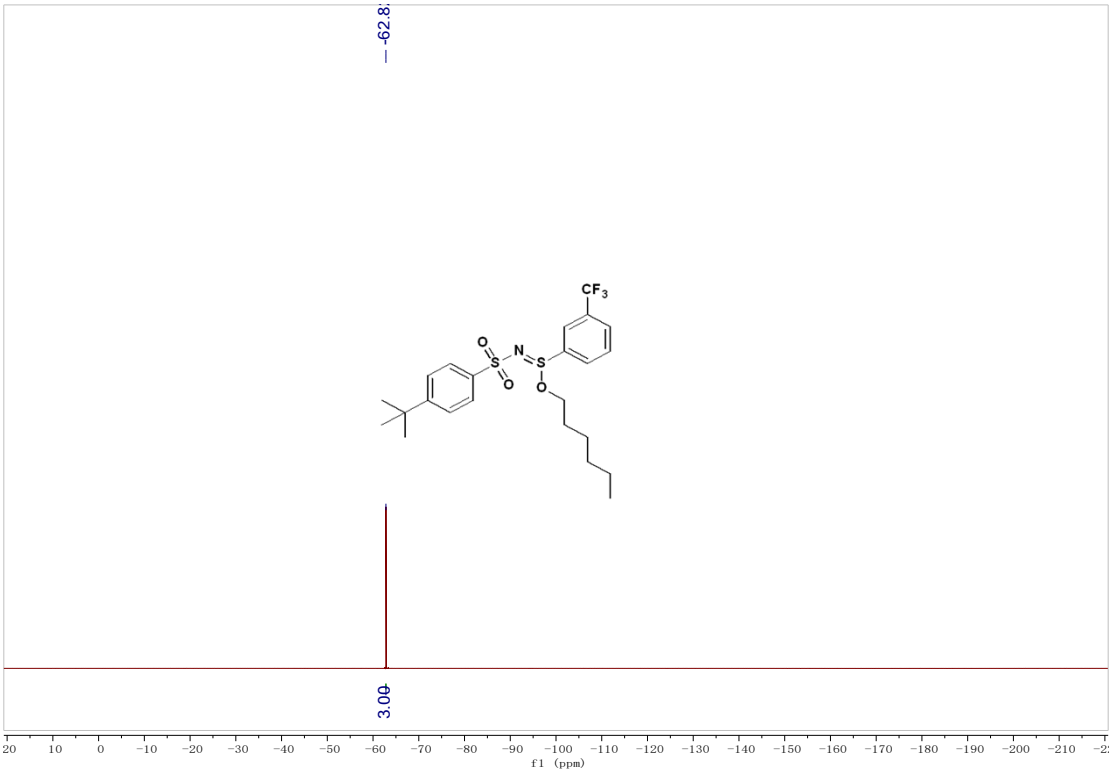
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5m**



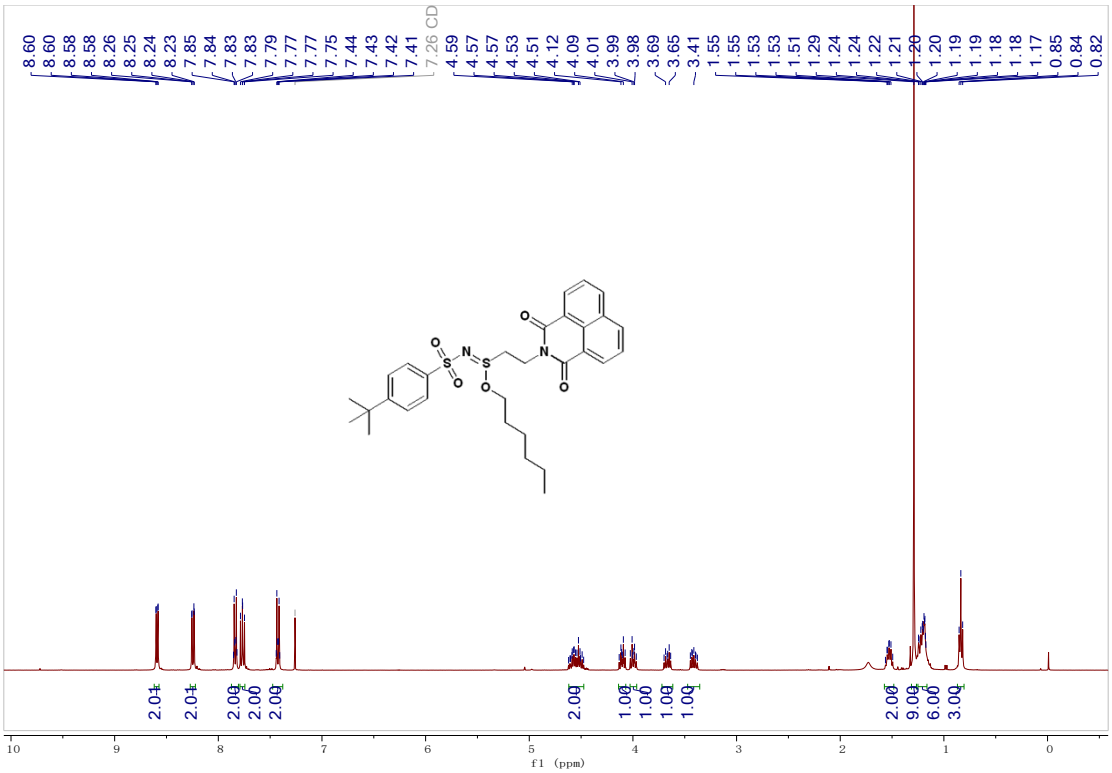
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5m**



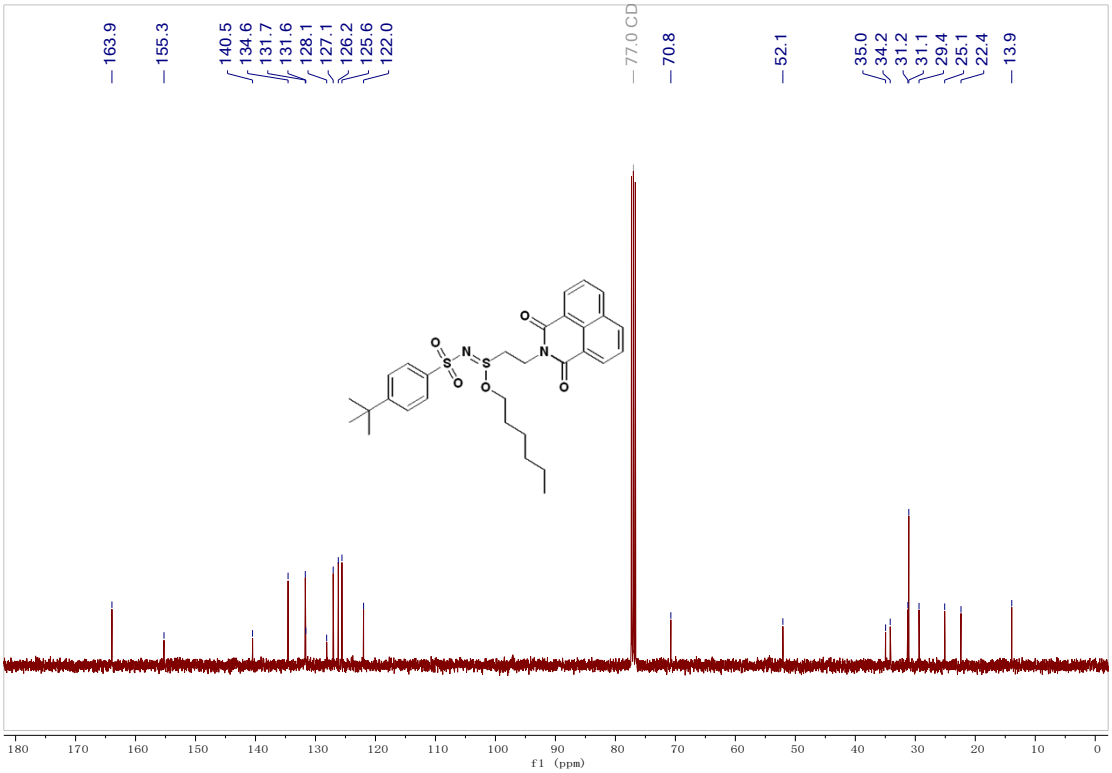
^{19}F NMR (376 MHz, Chloroform-d) of compound **5m**



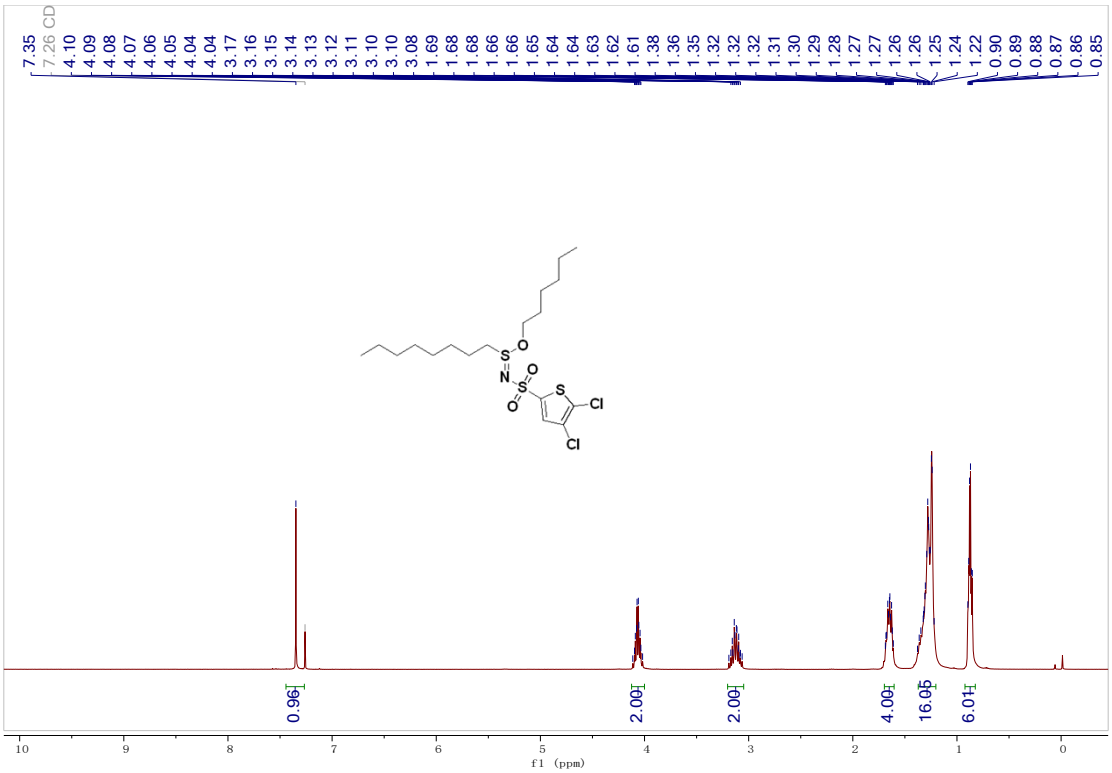
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5n**



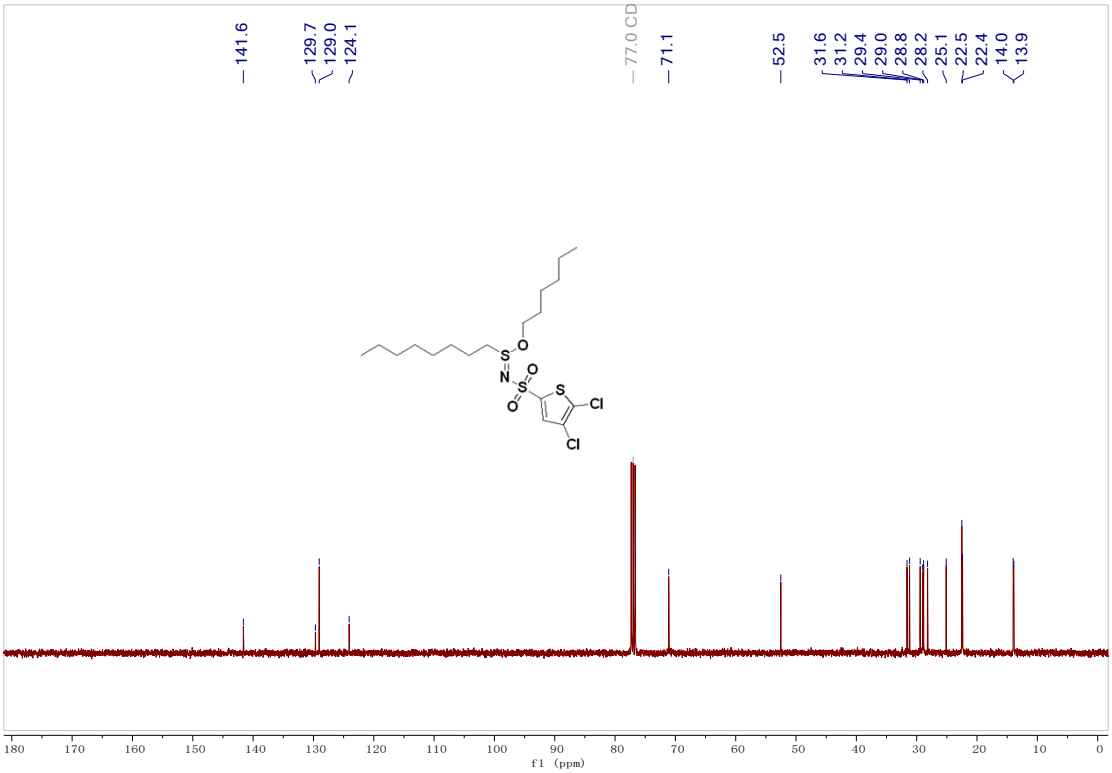
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5n**



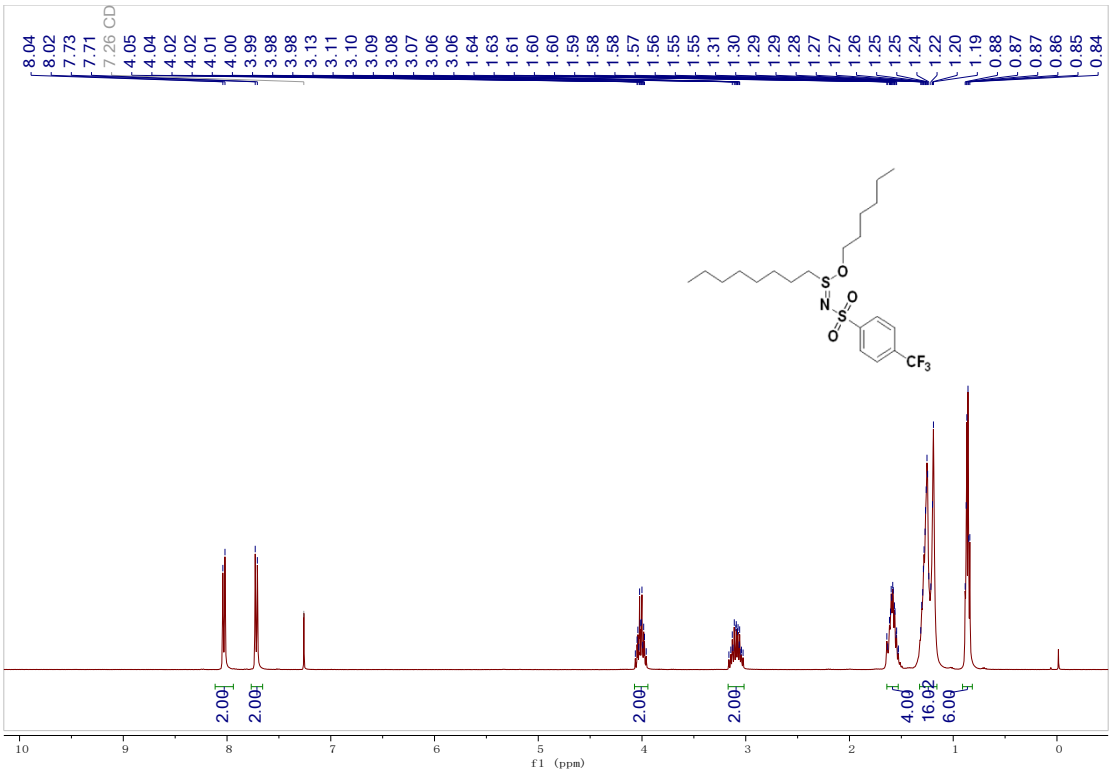
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5o**



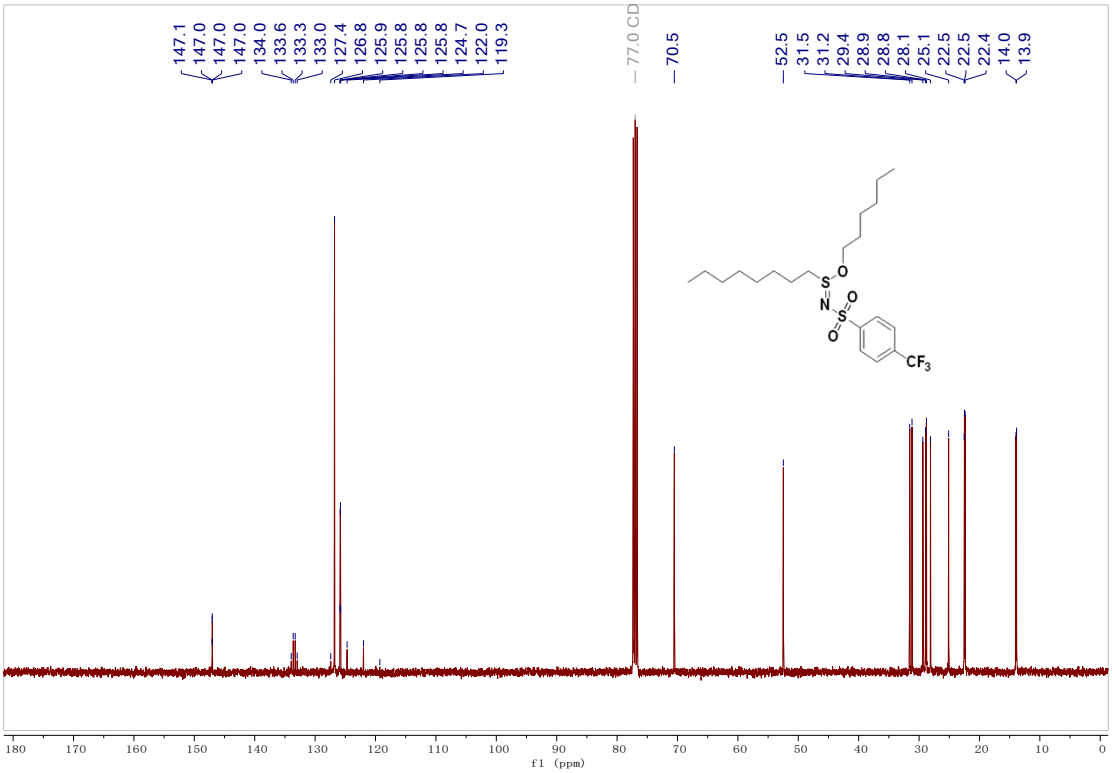
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5o**



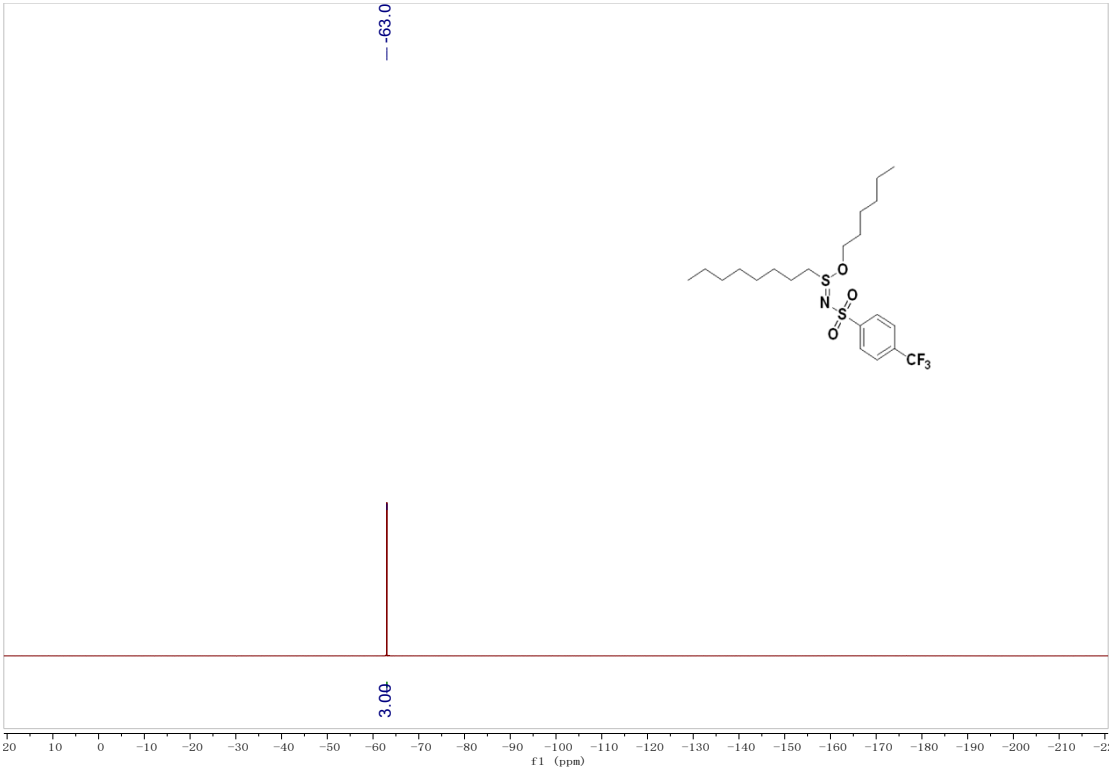
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5p**



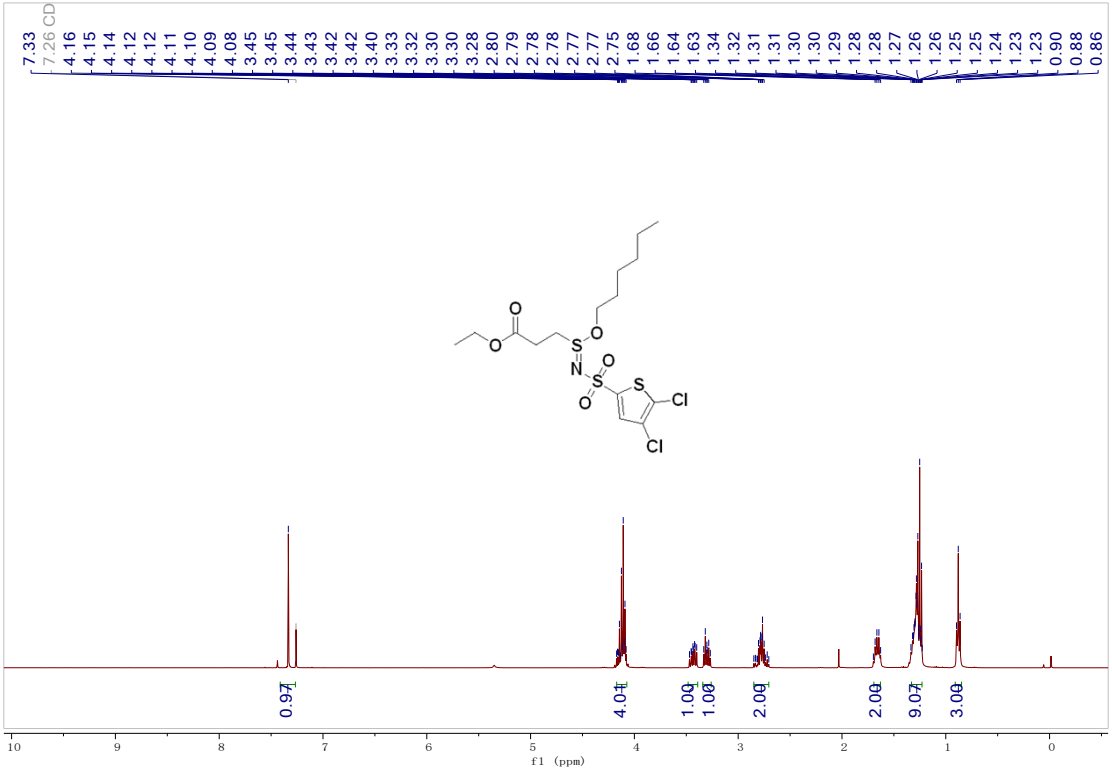
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5p**



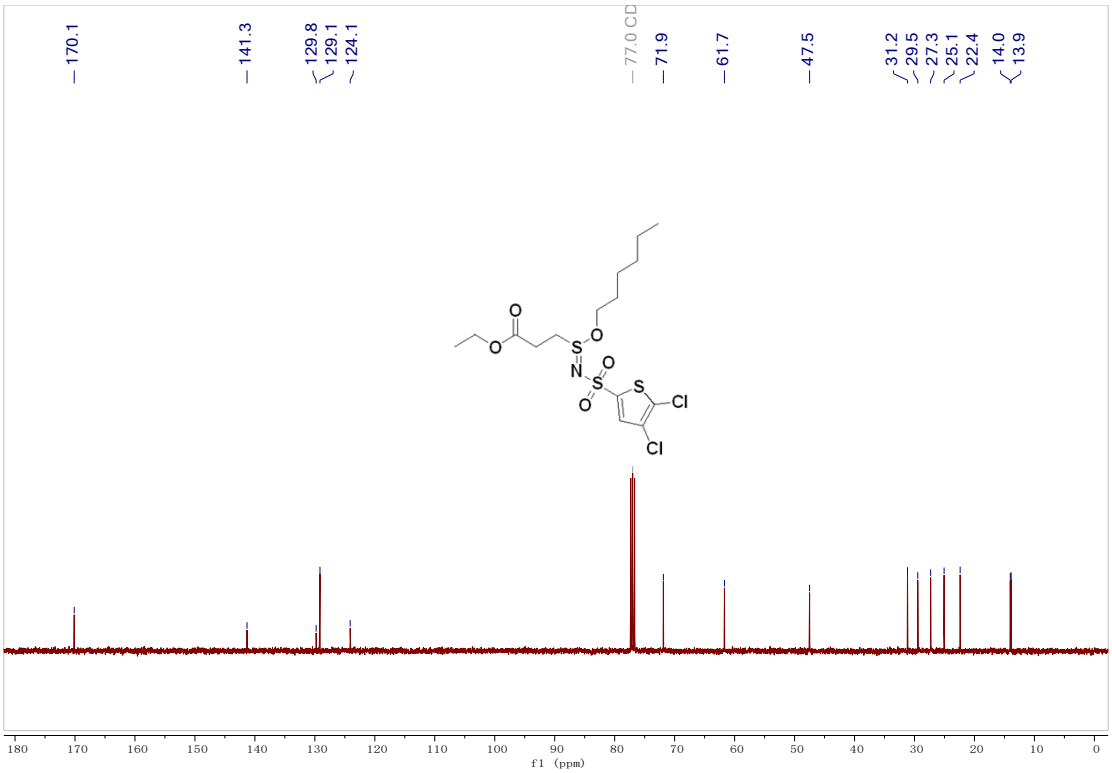
^{19}F NMR (376 MHz, Chloroform-d) of compound **5p**



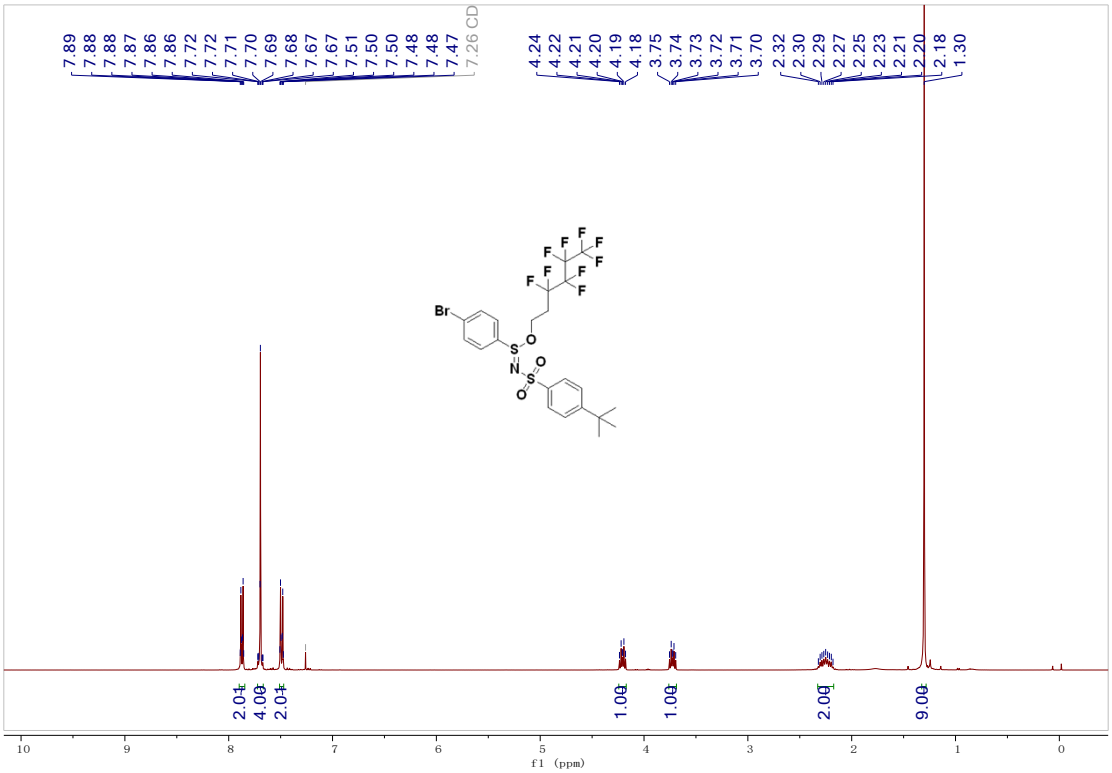
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **5q**



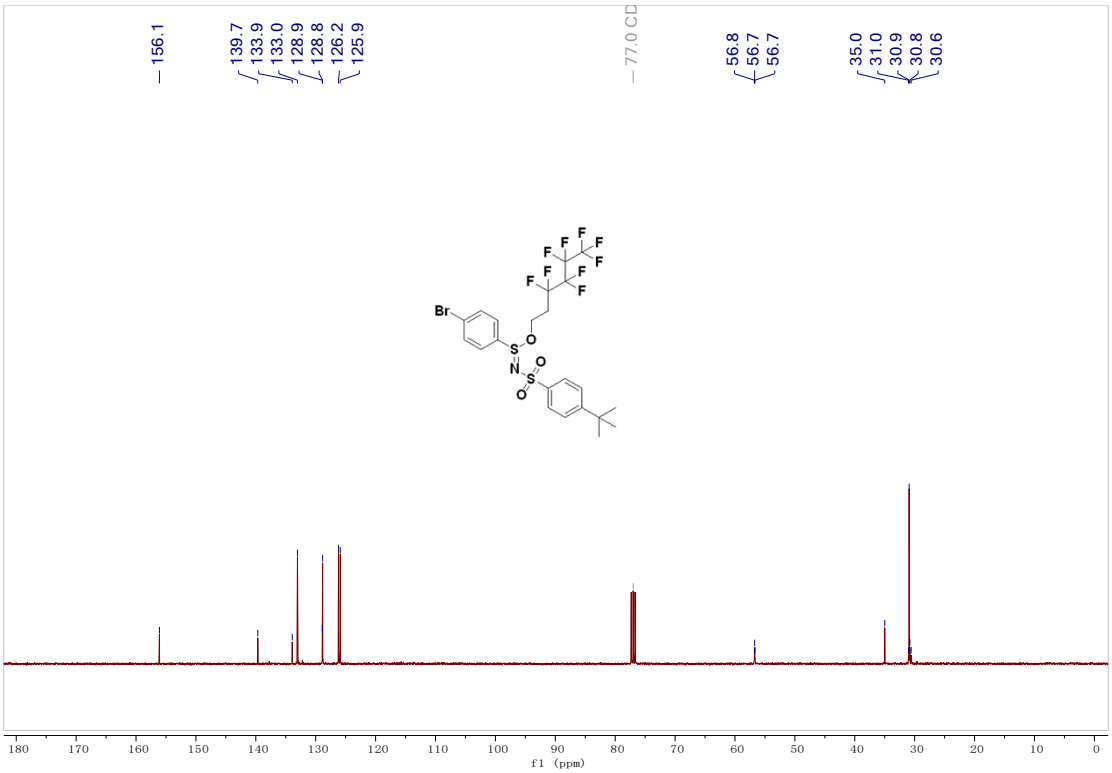
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **5q**



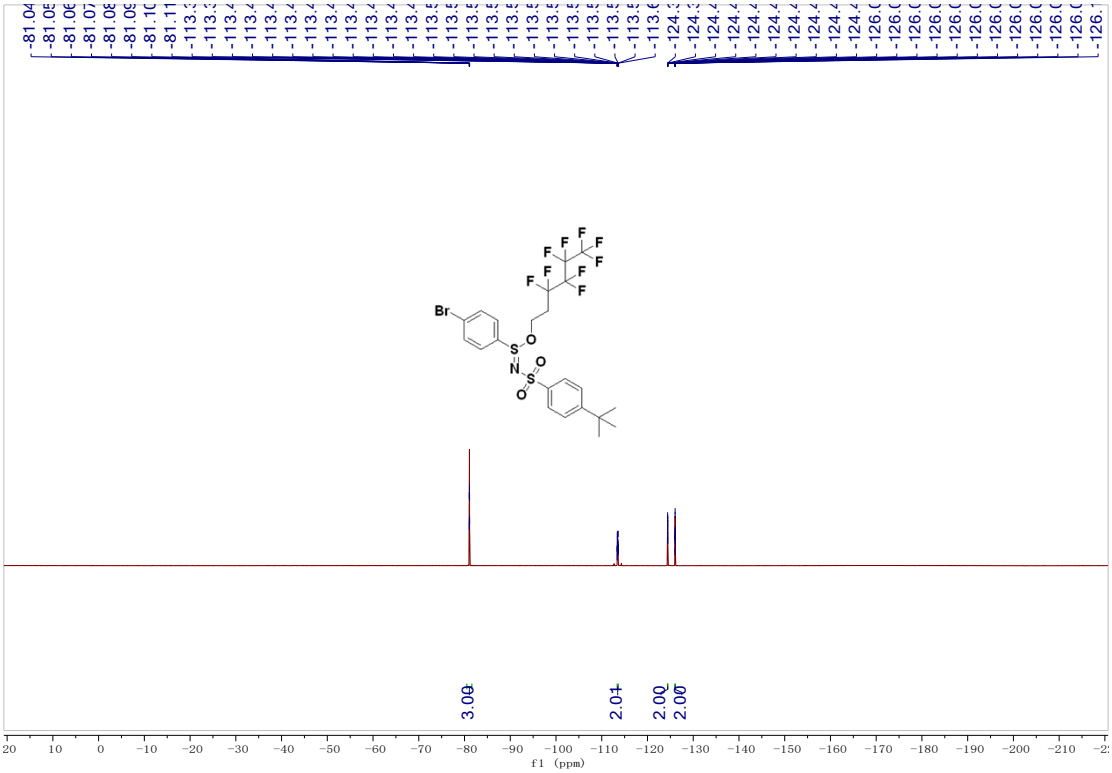
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6a**



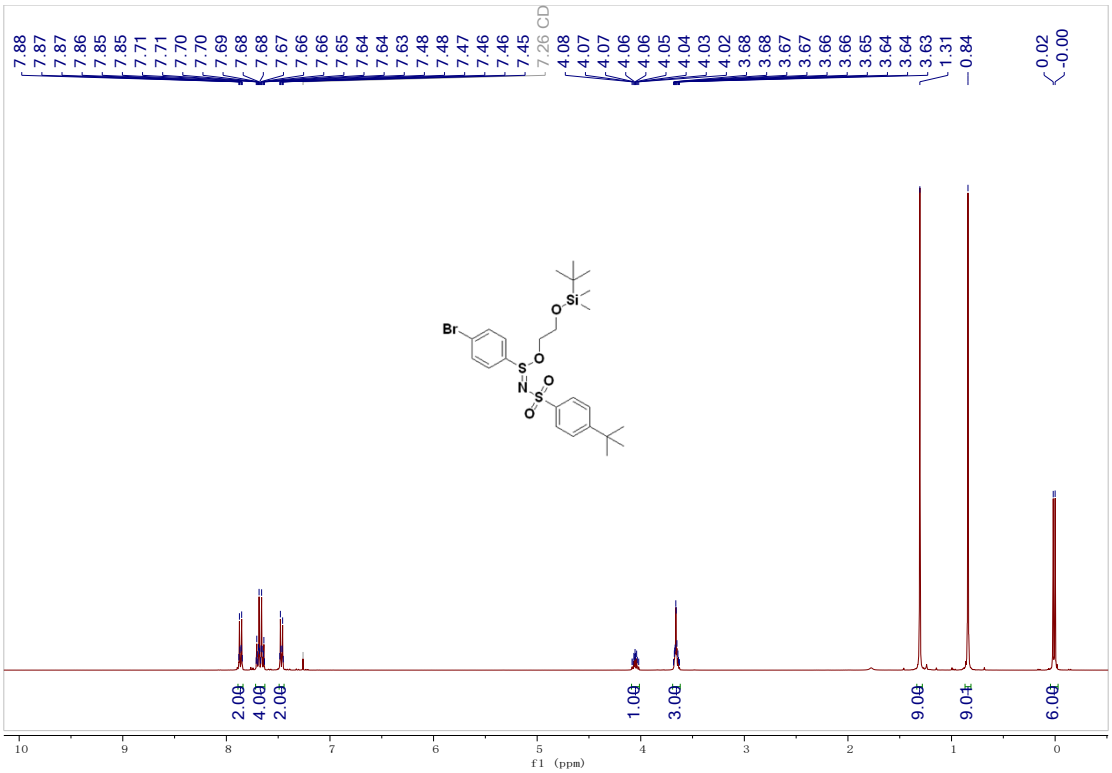
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6a**



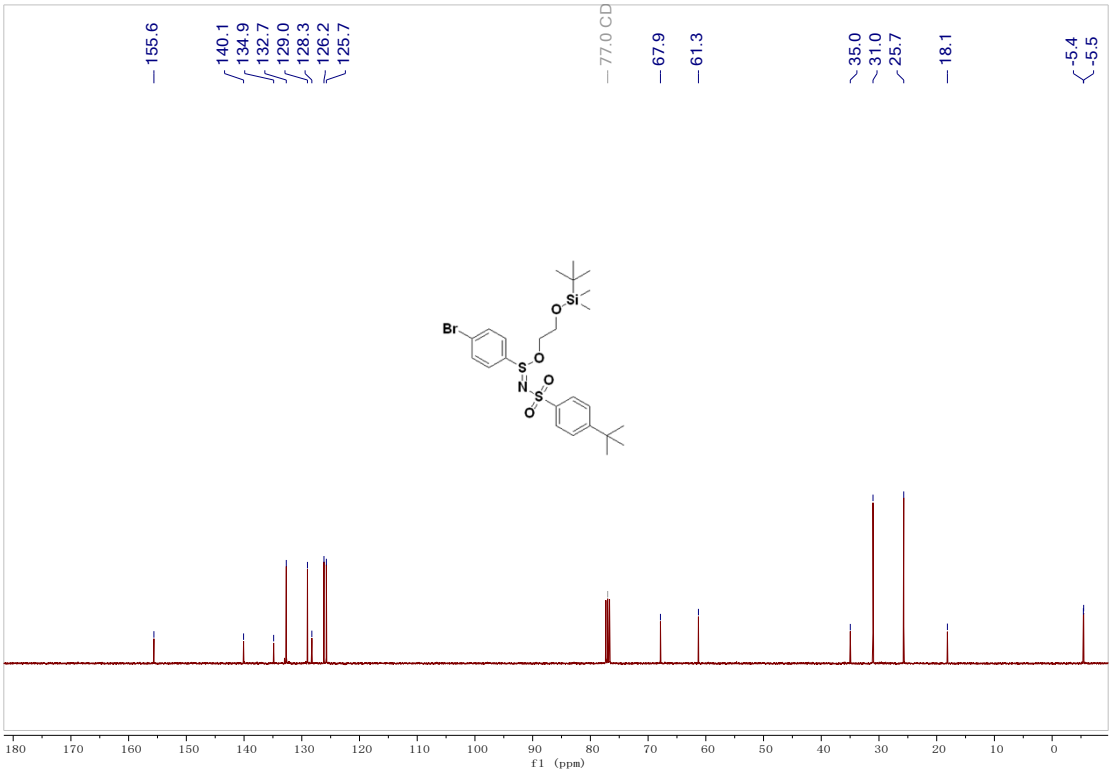
^{19}F NMR (376 MHz, Chloroform-d) of compound **6a**



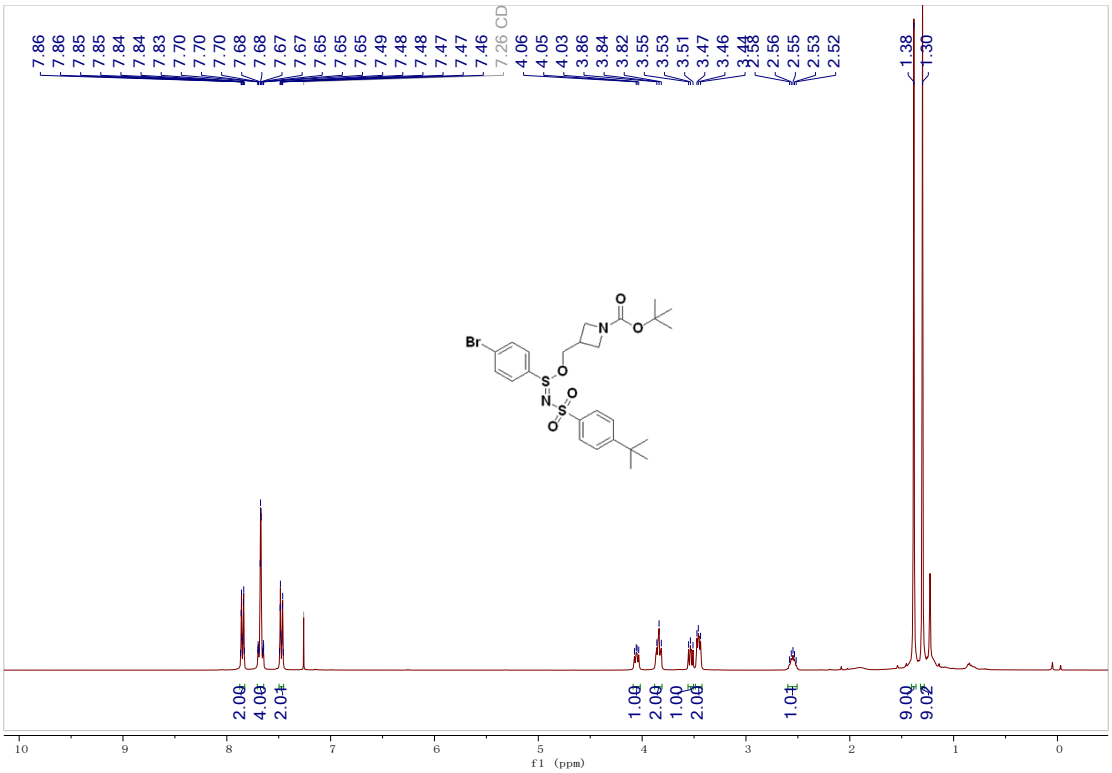
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6b**



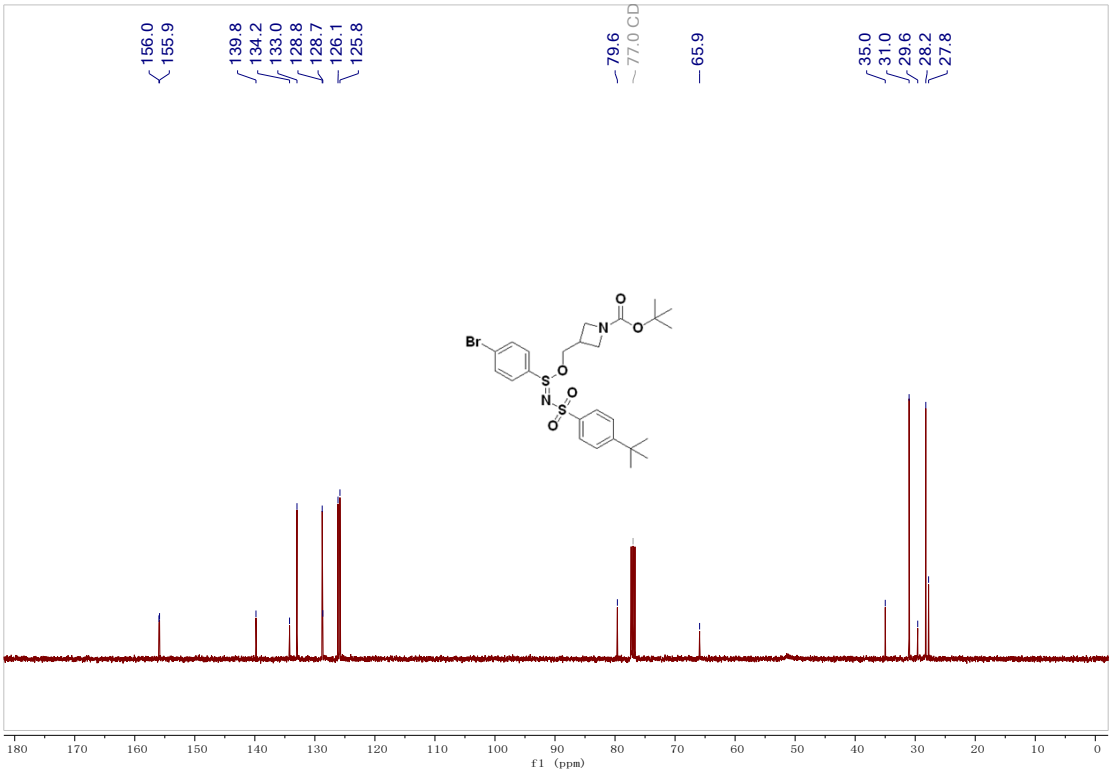
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6b**



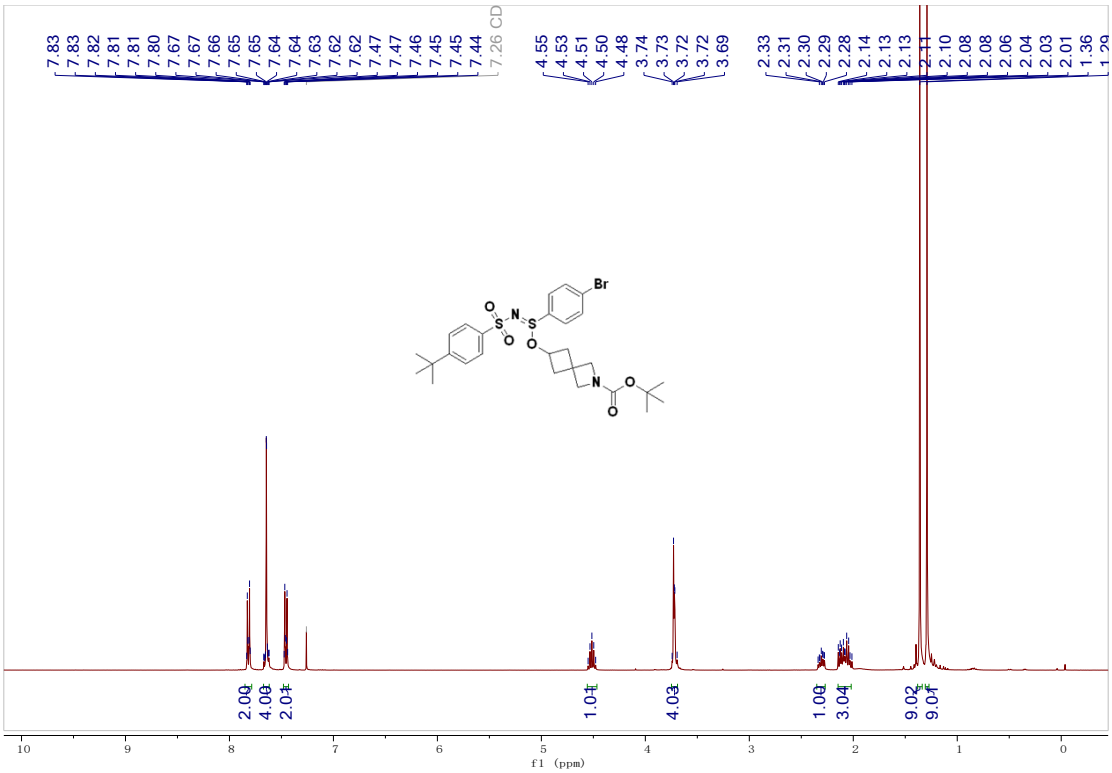
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6c**



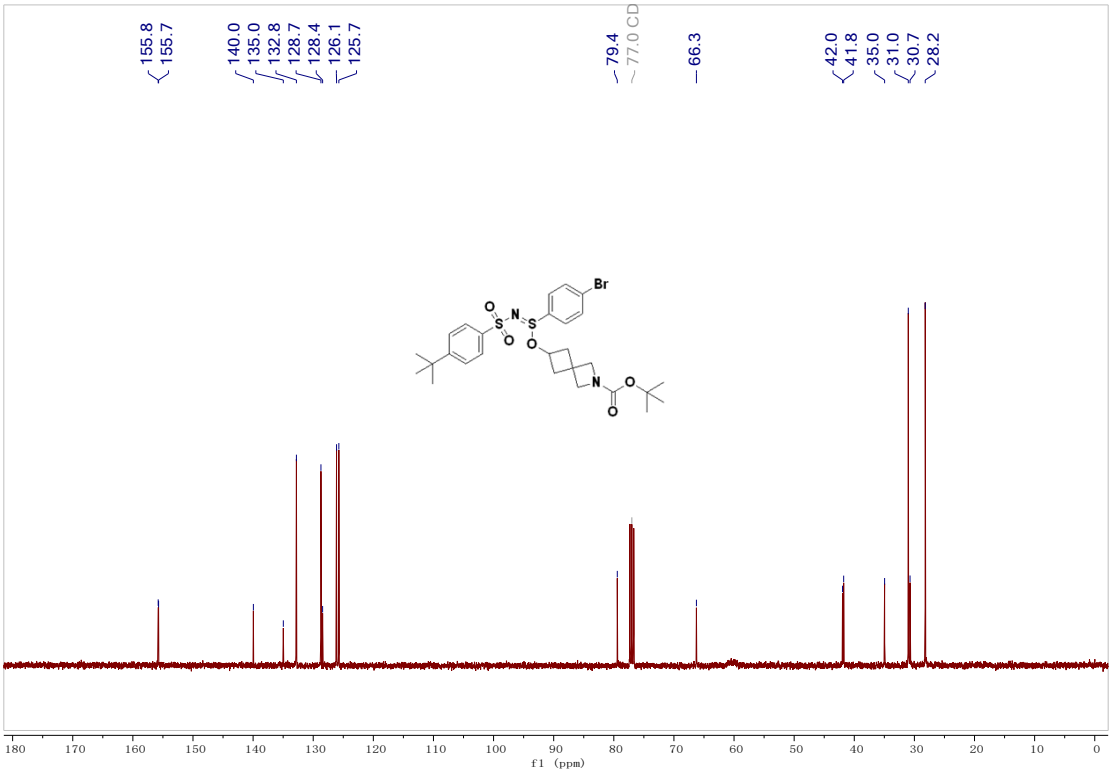
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6c**



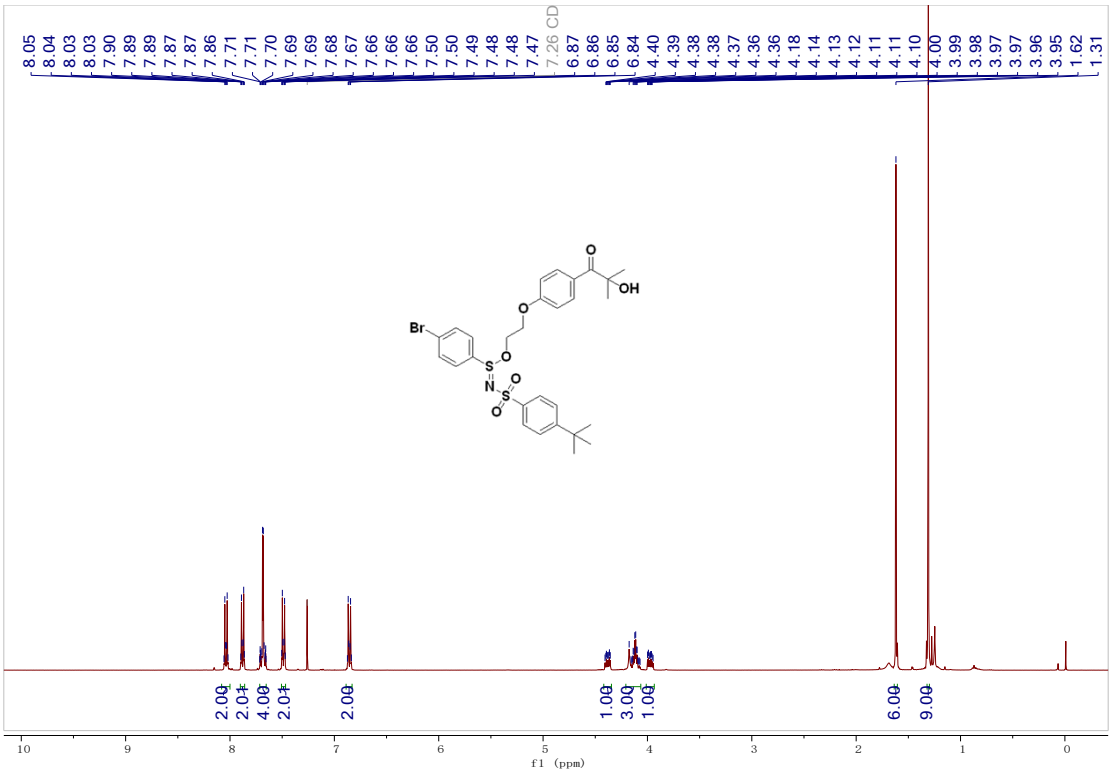
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6d**



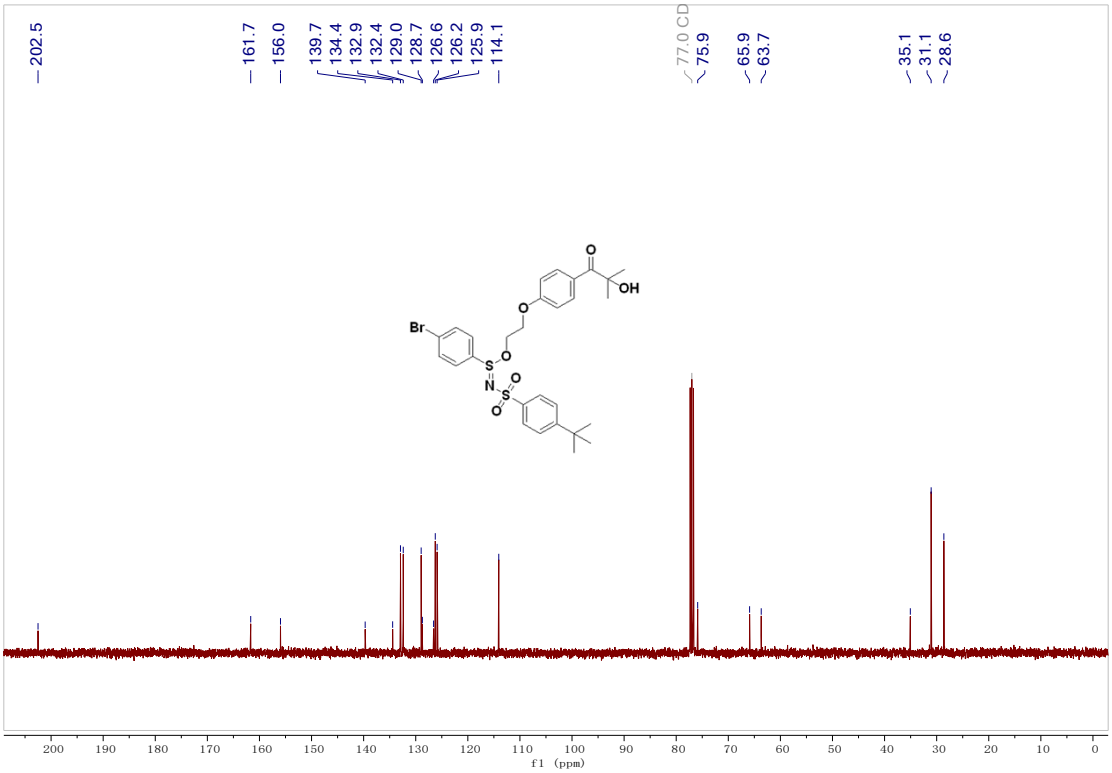
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6d**



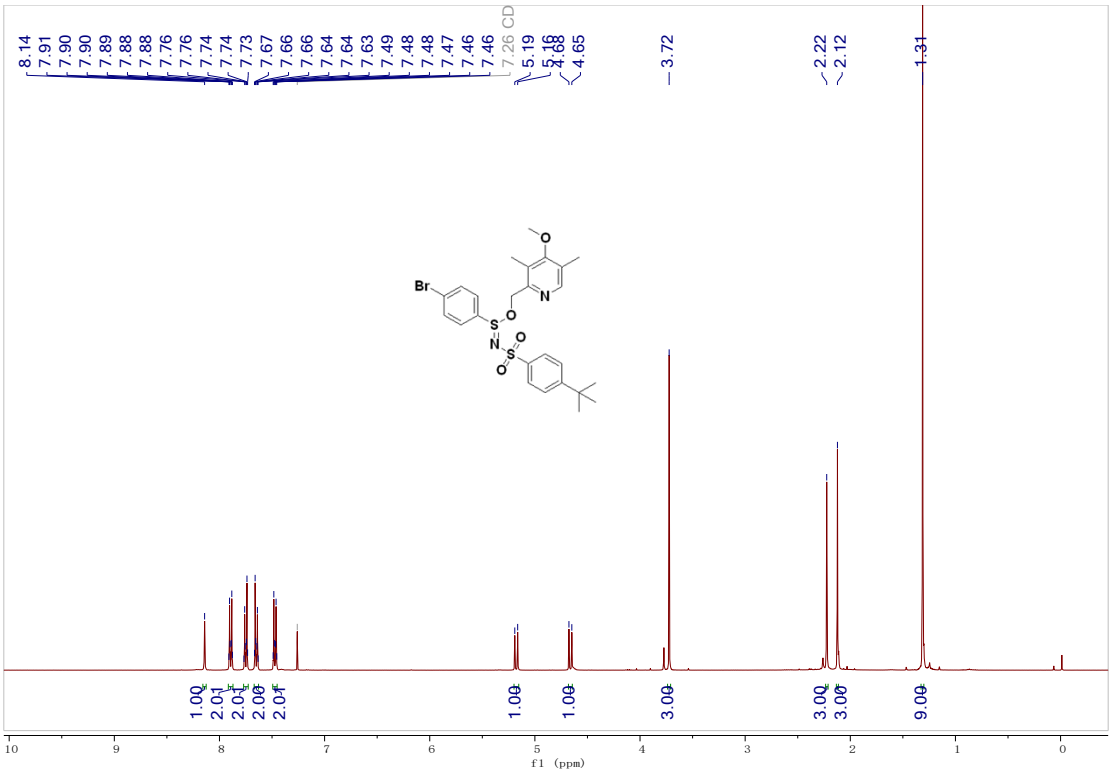
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6e**



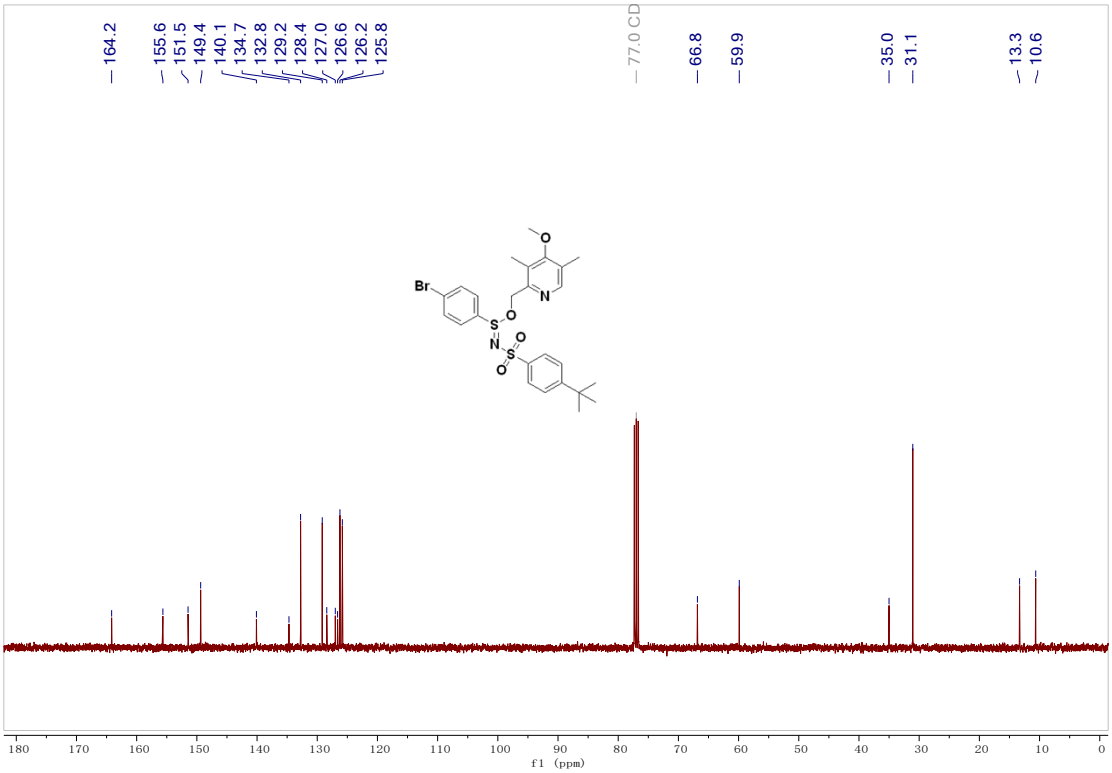
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6e**



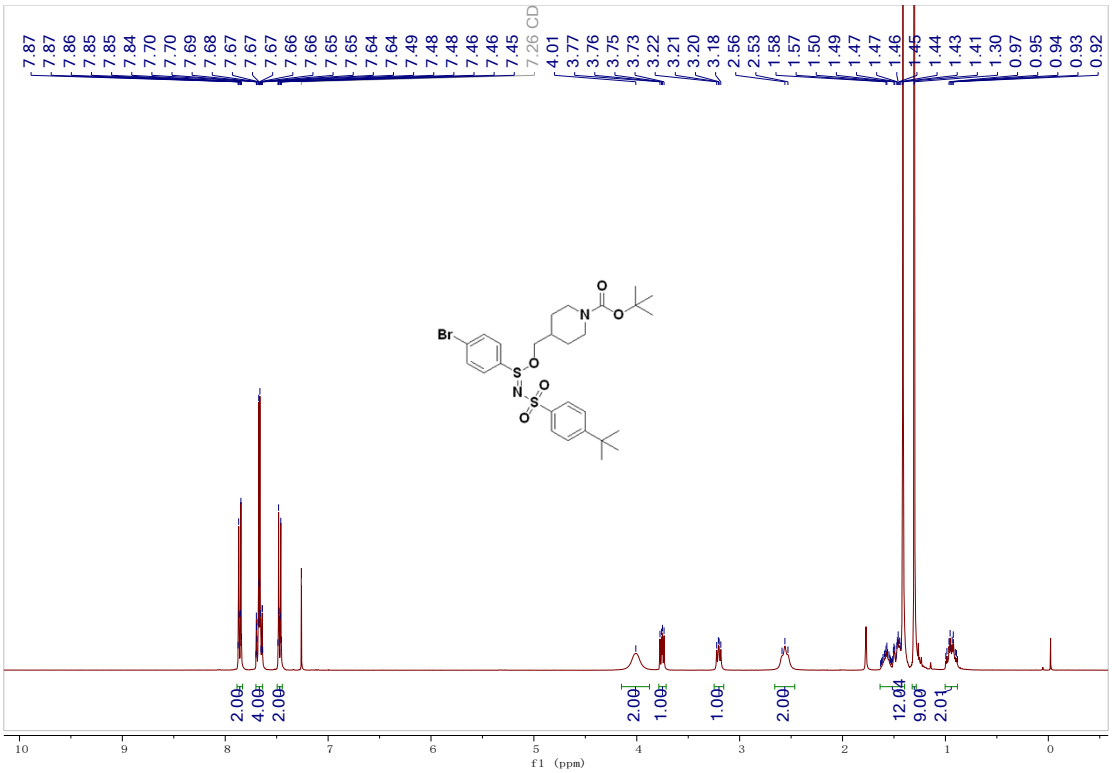
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6f**



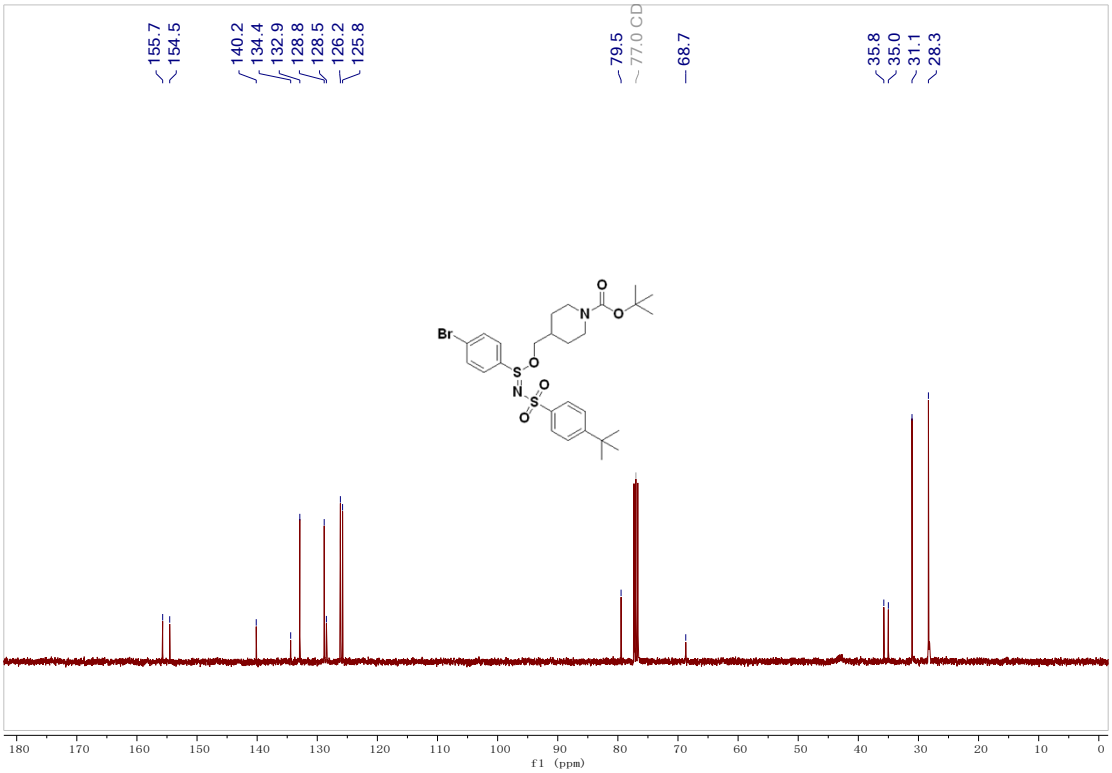
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6f**



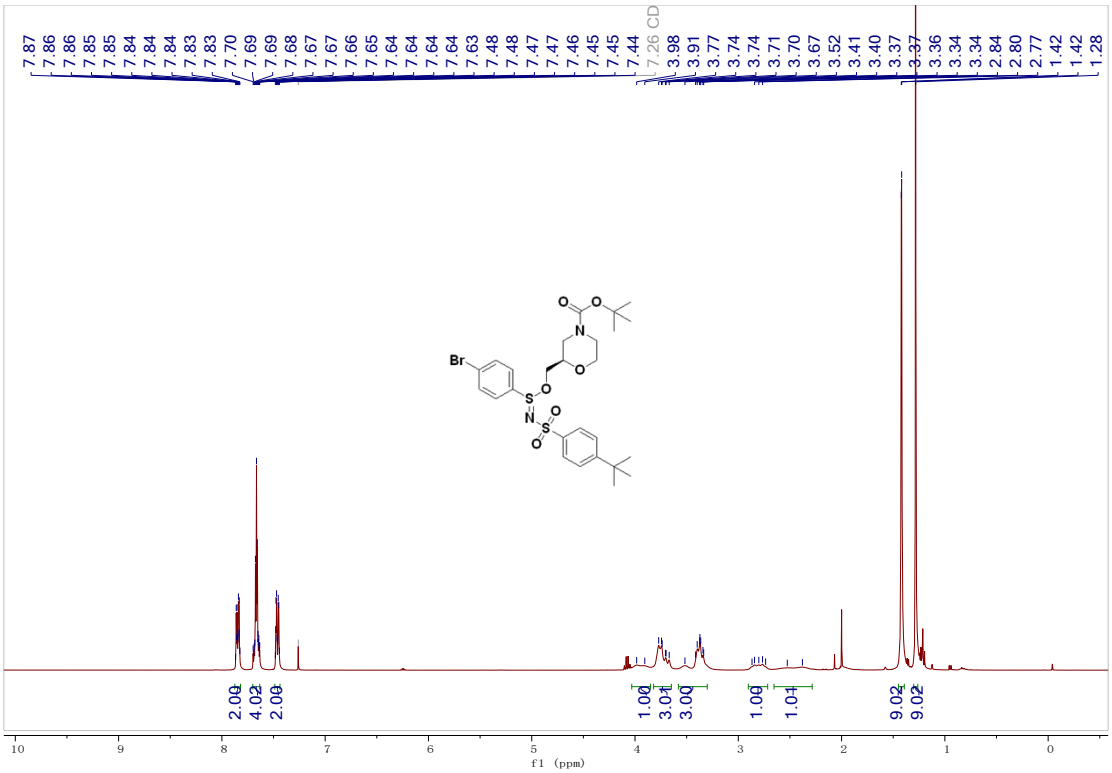
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6g**



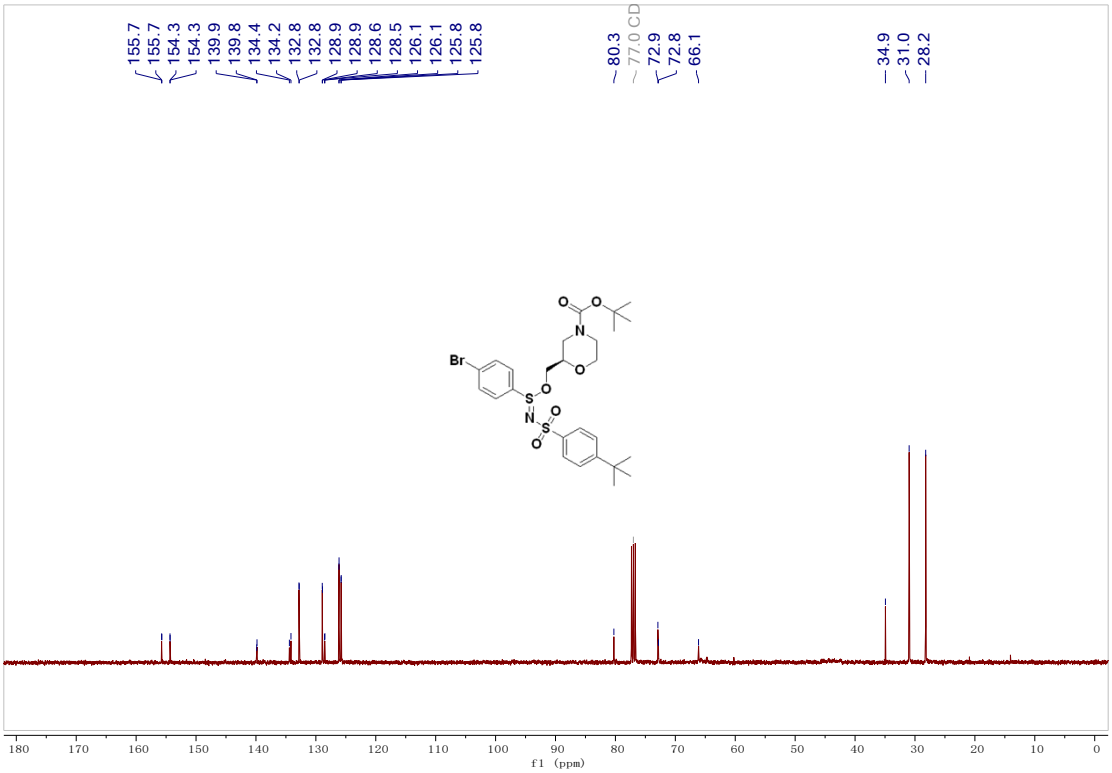
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6g**



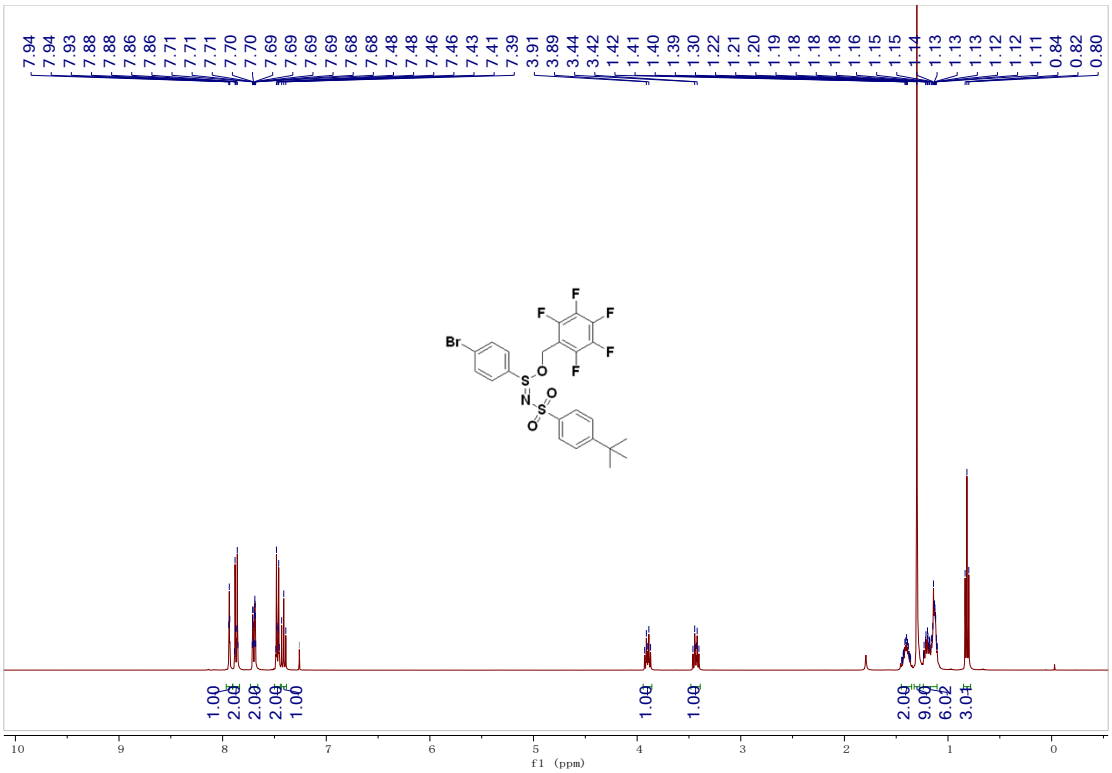
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6h**



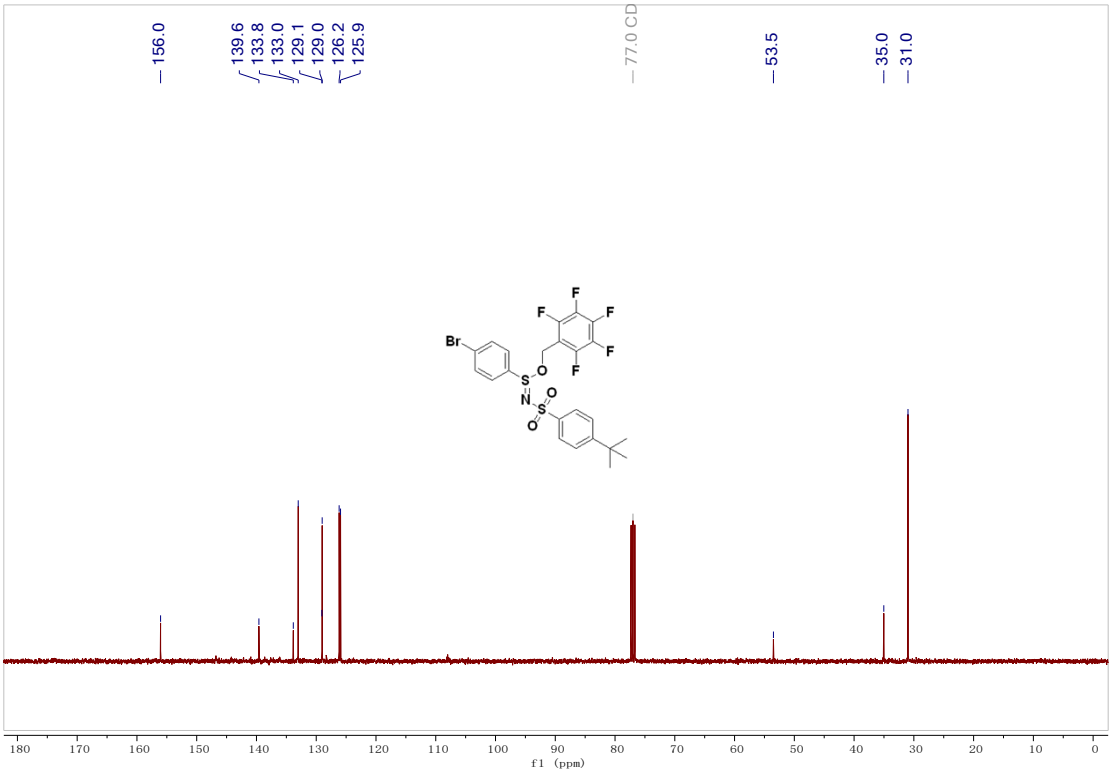
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6h**



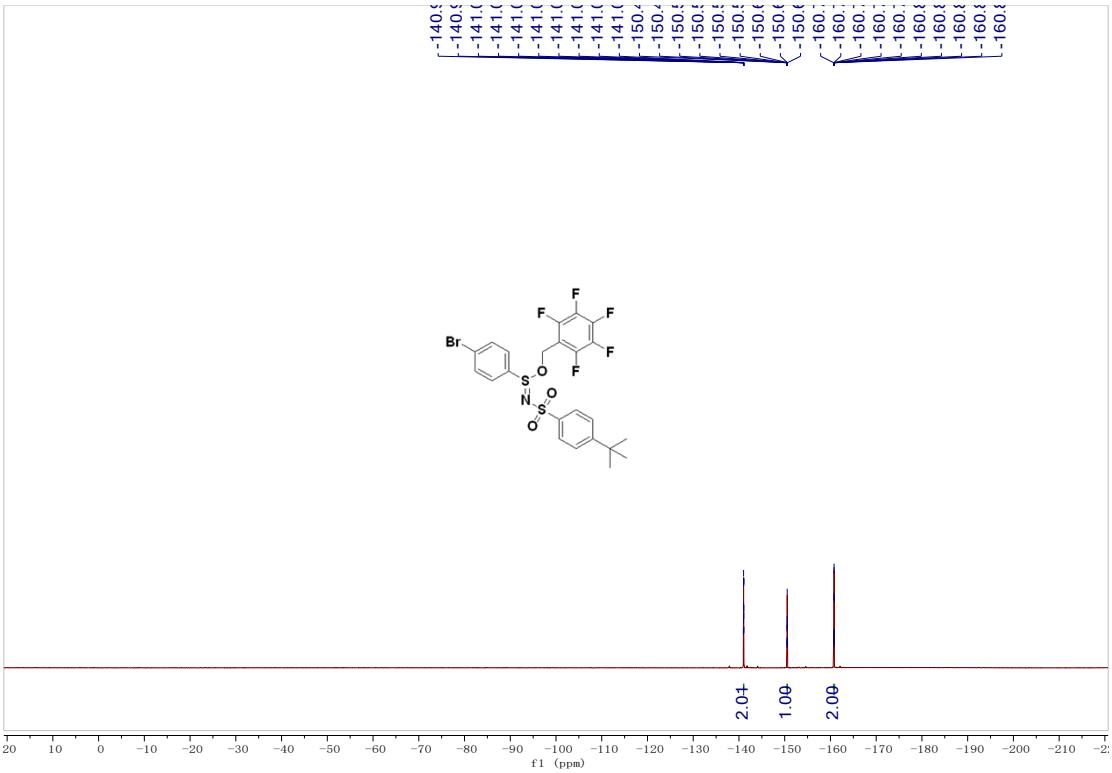
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6i**



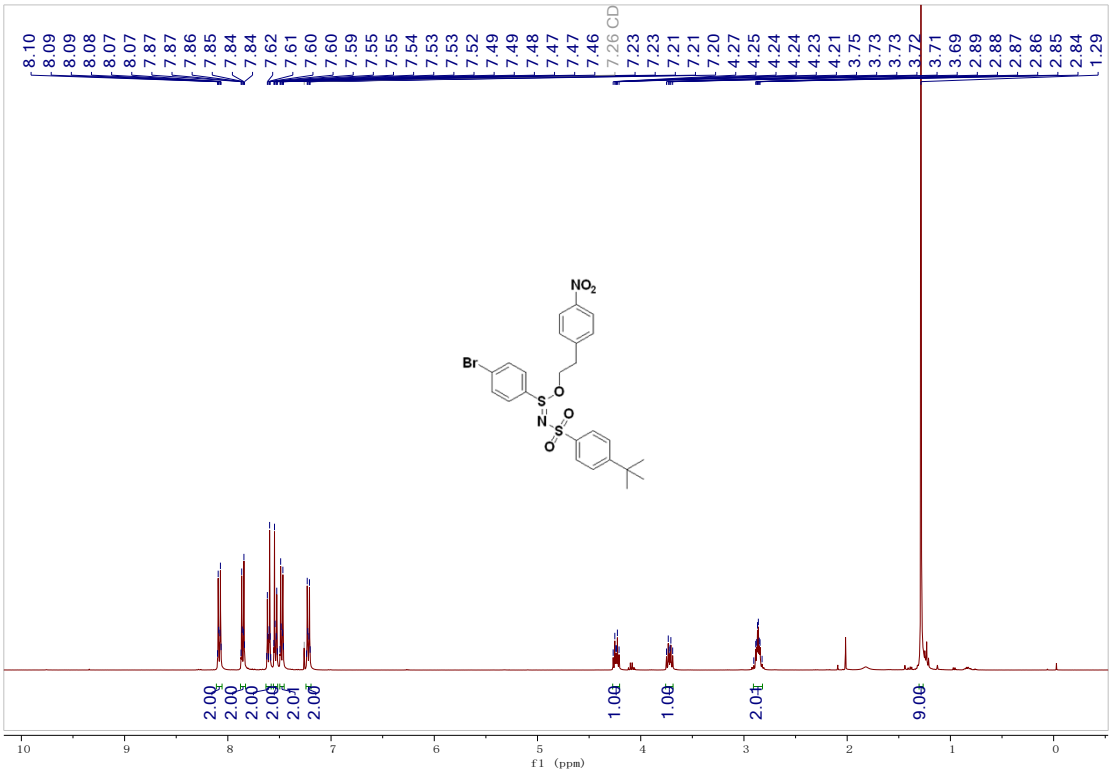
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6i**



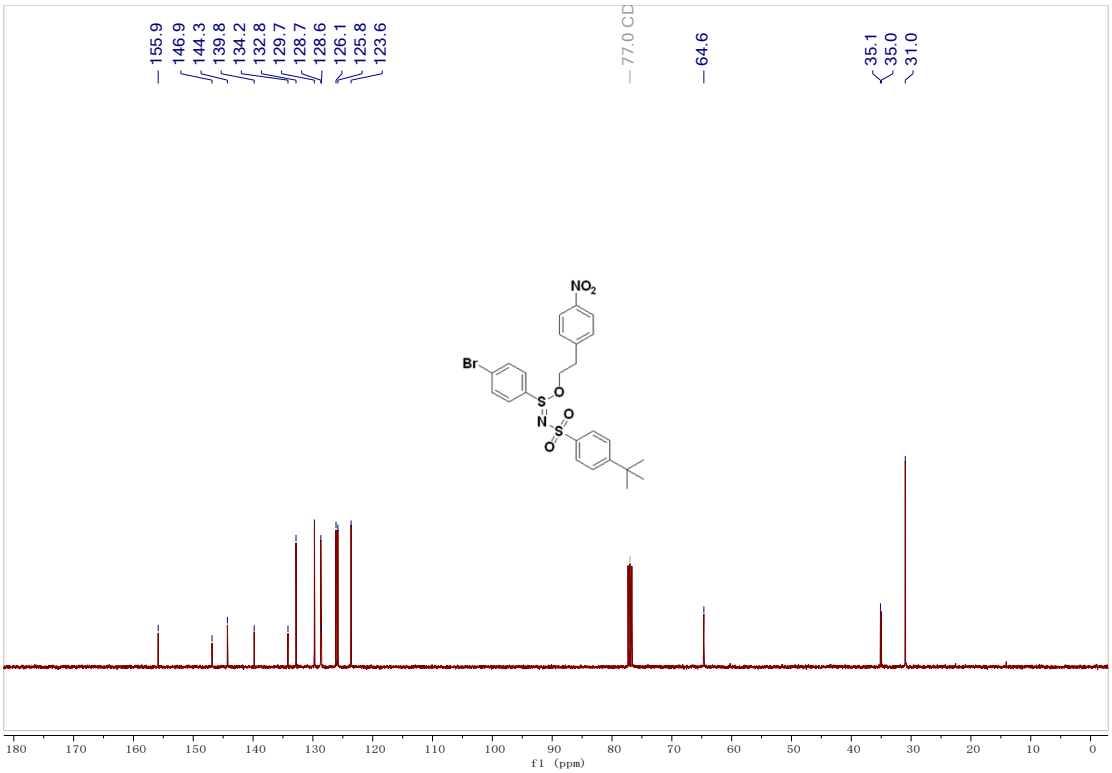
^{19}F NMR (376 MHz, Chloroform-d) of compound **6i**



^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6j**



^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6j**



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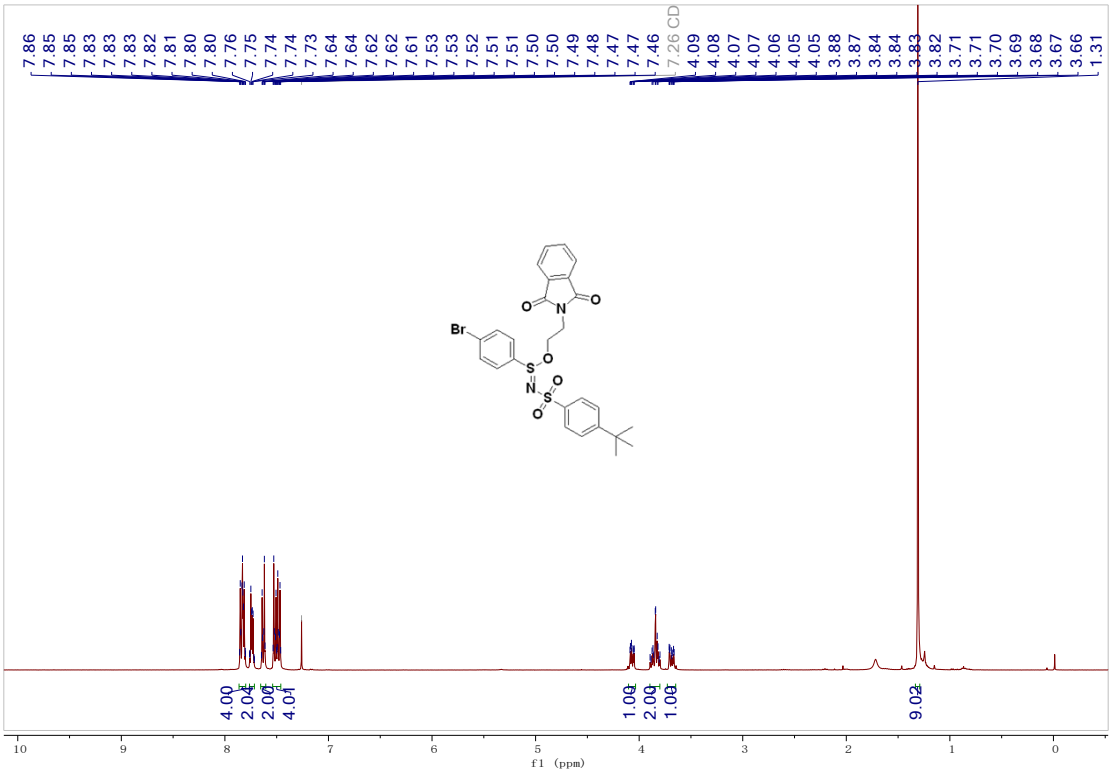
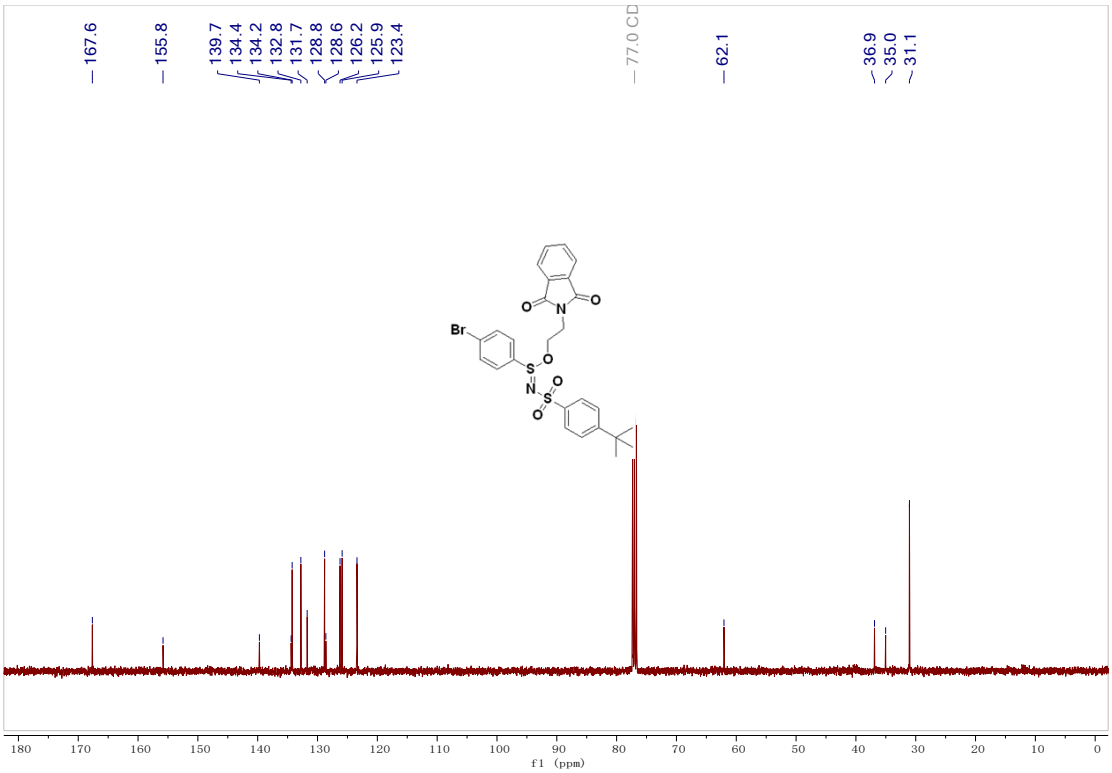
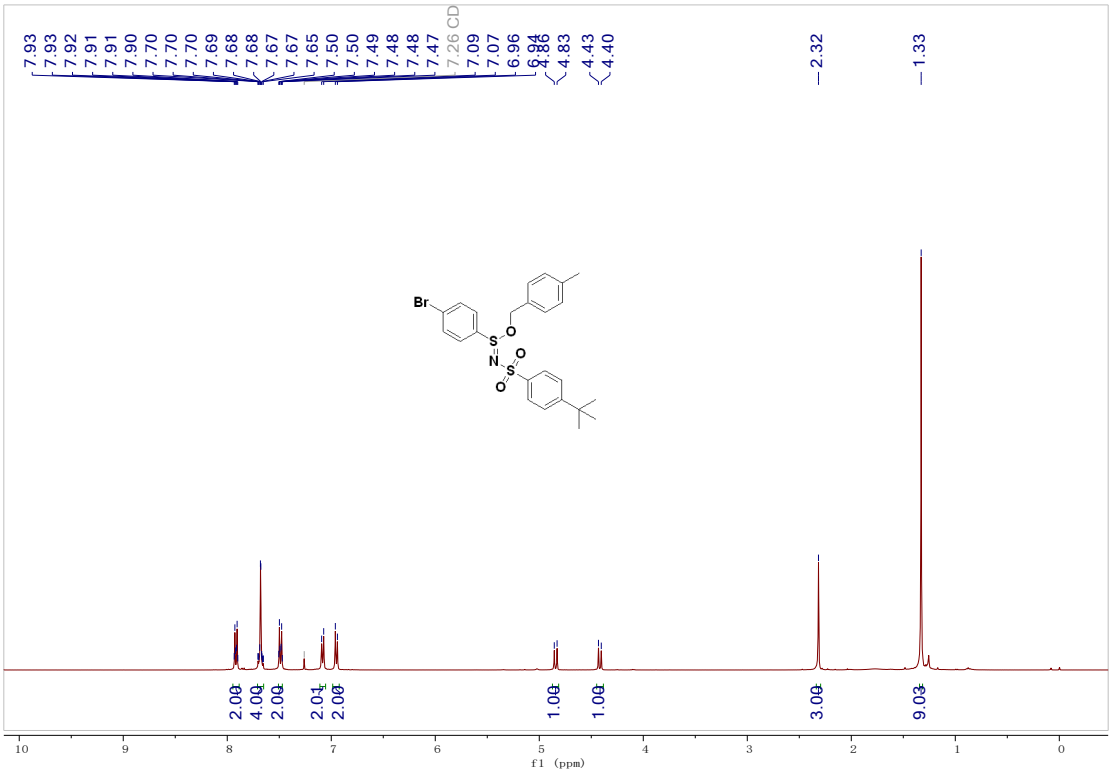


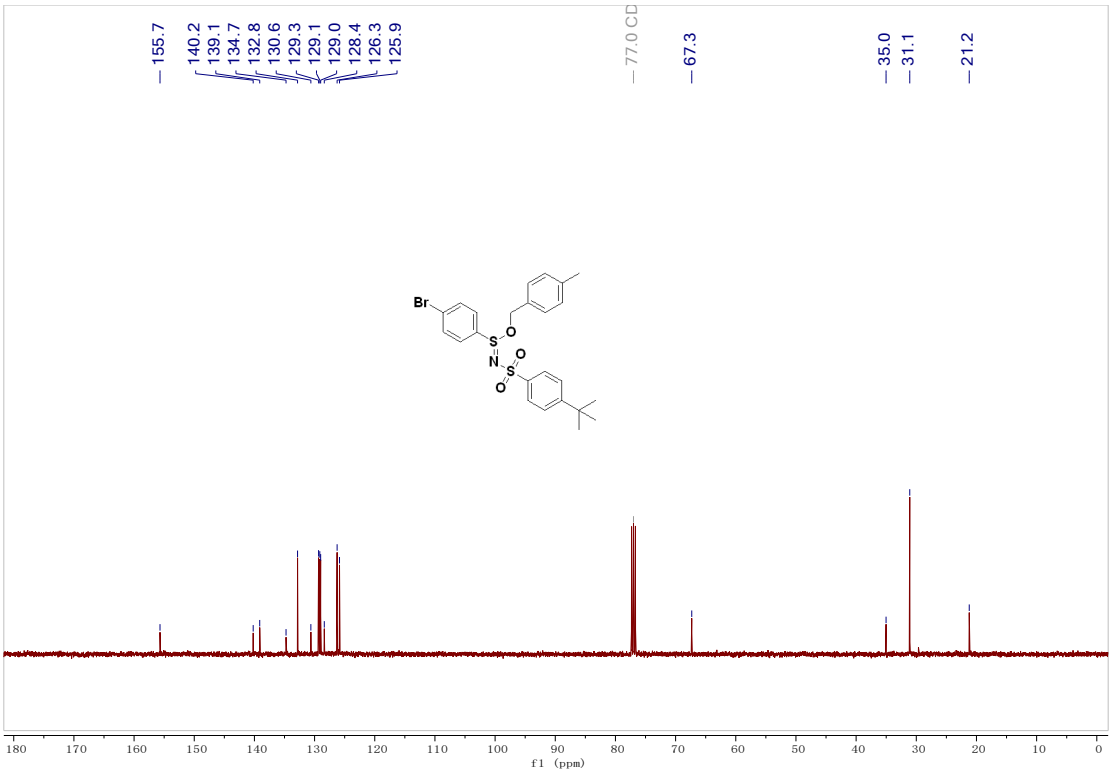
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6k**



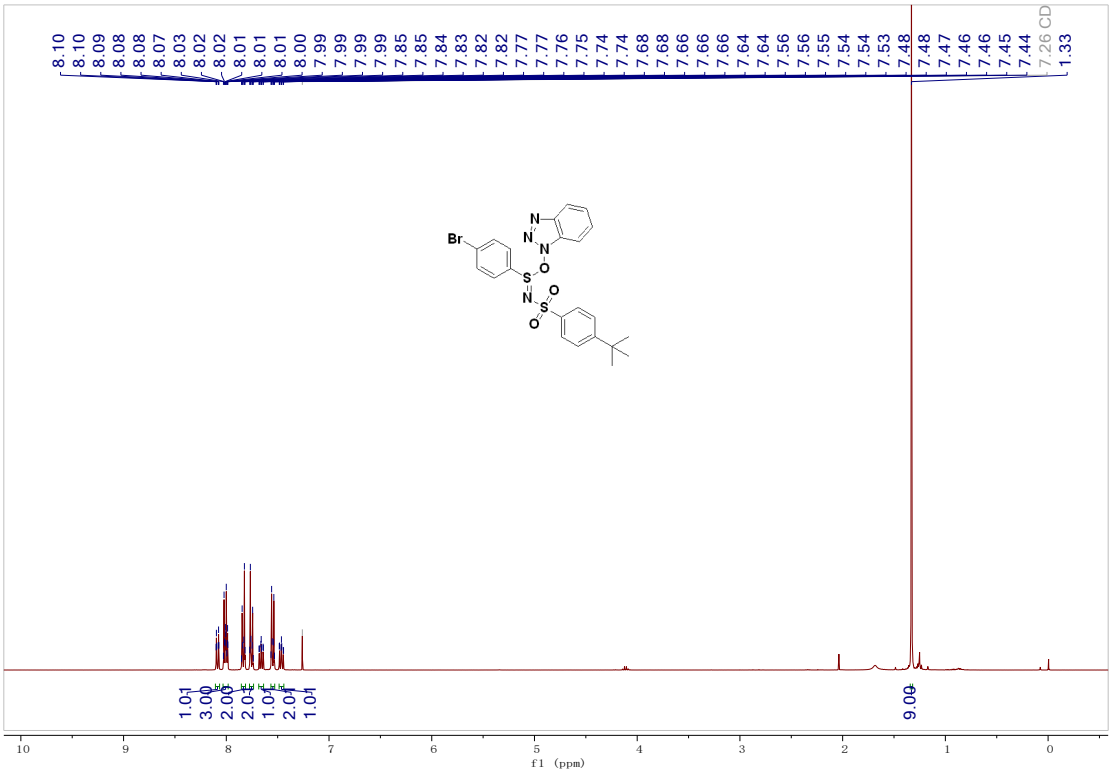
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6l**



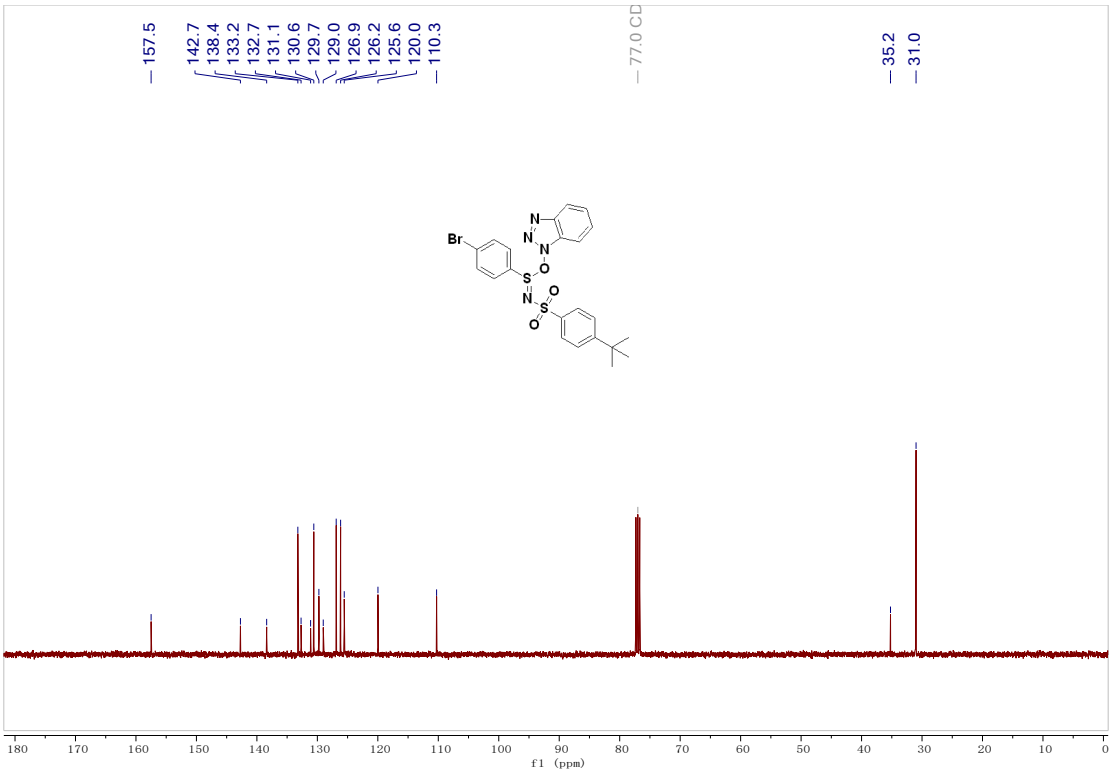
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6l**



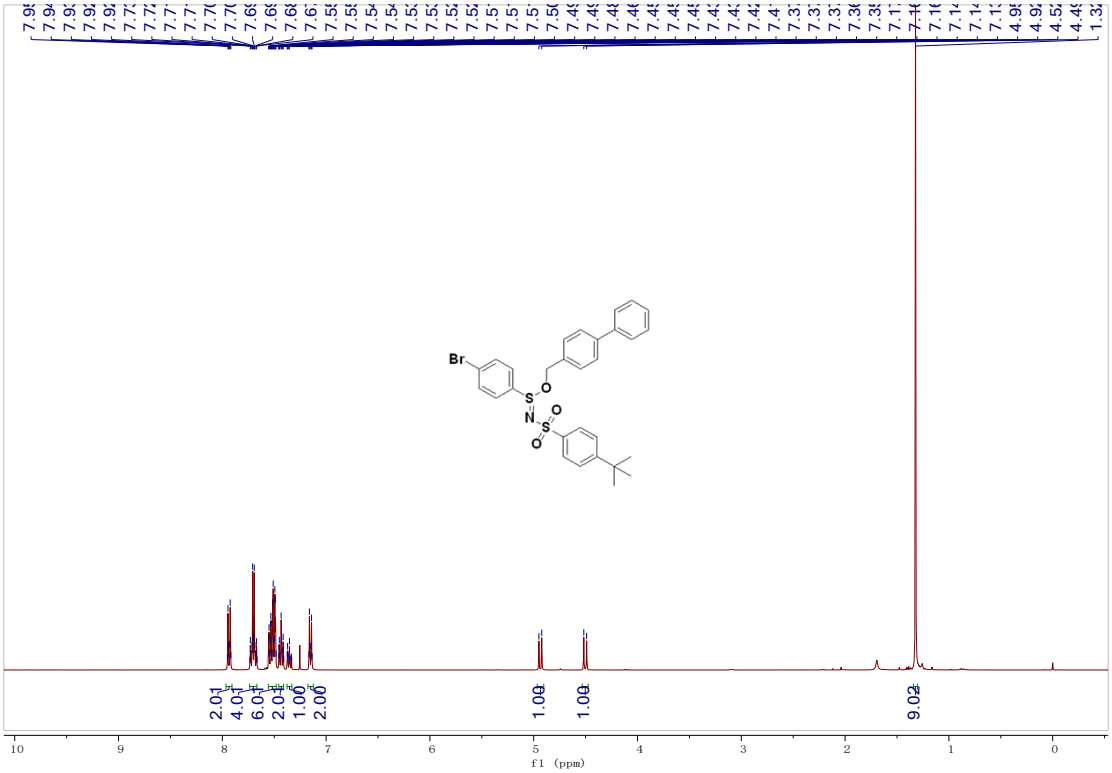
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6m**



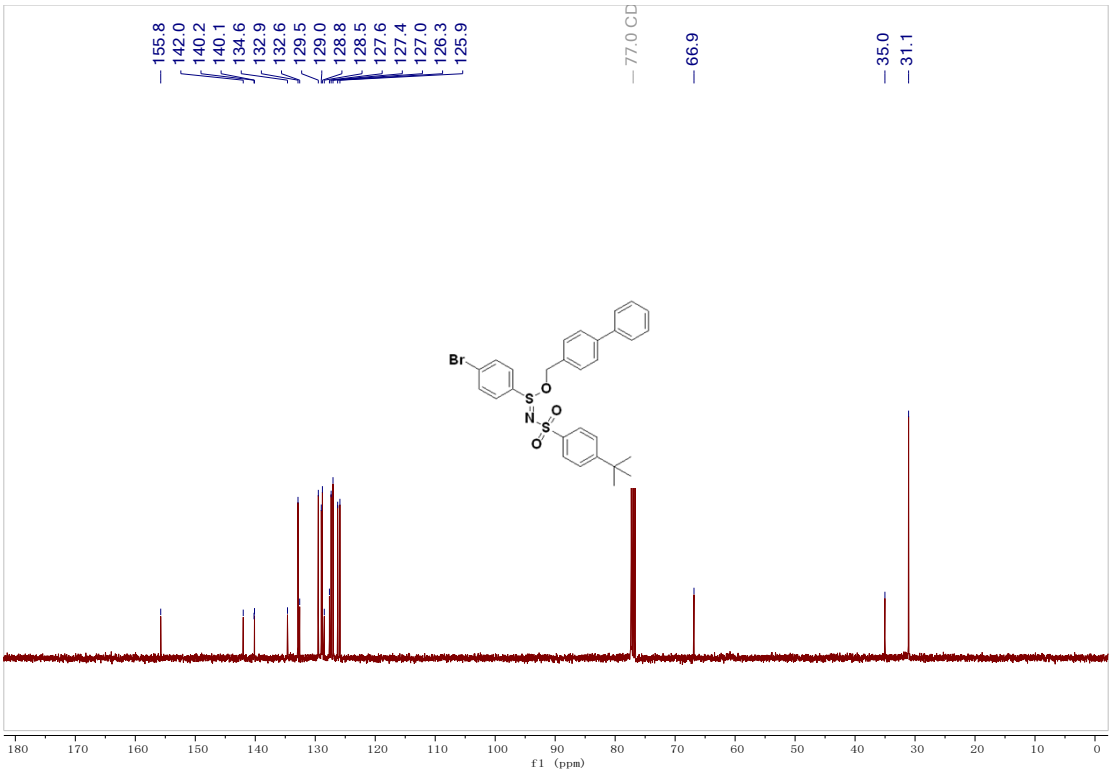
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6m**



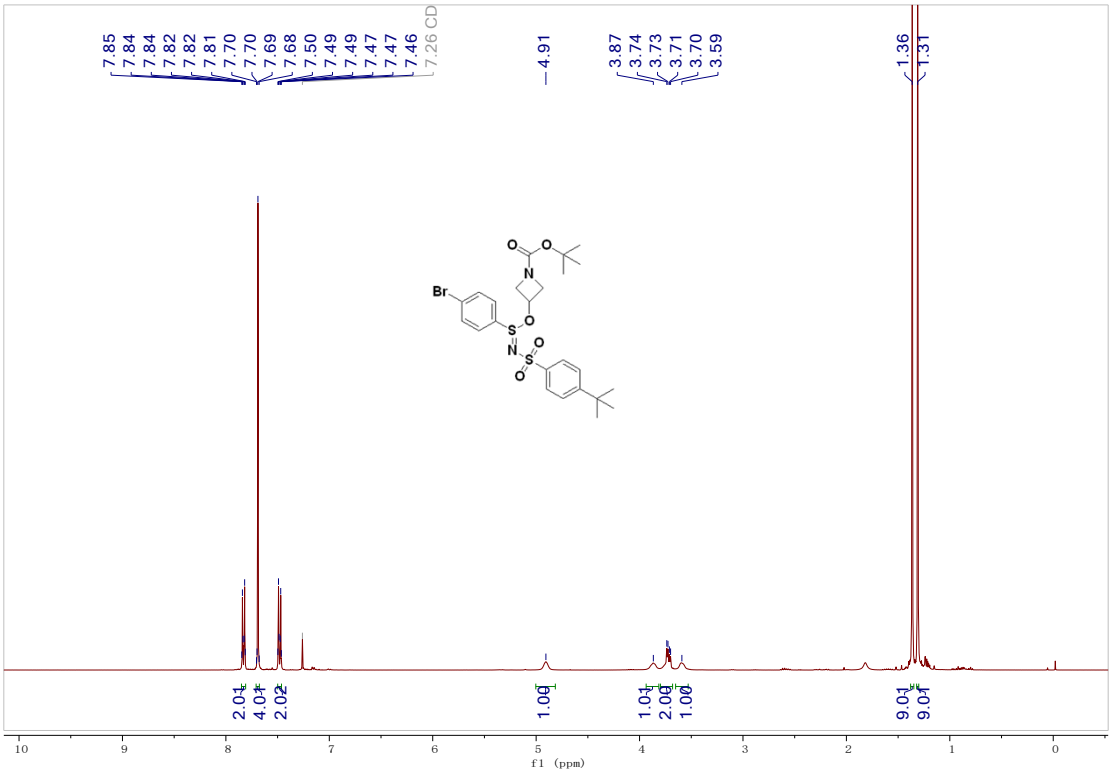
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6n**



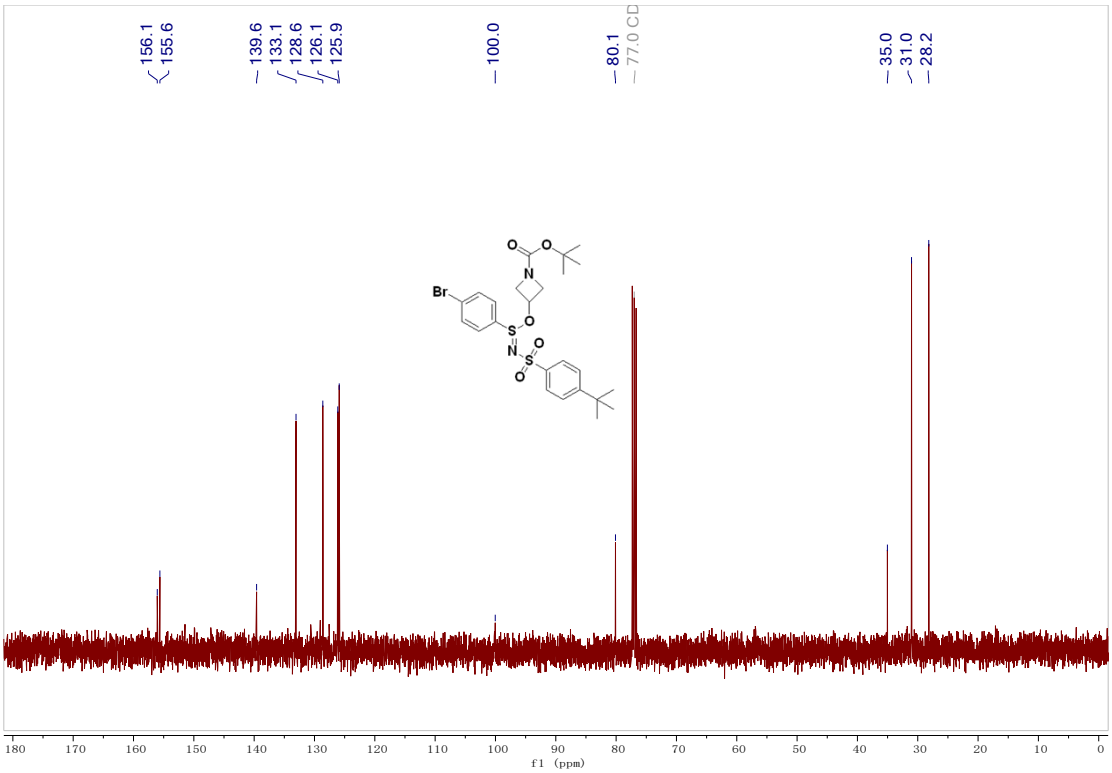
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6n**



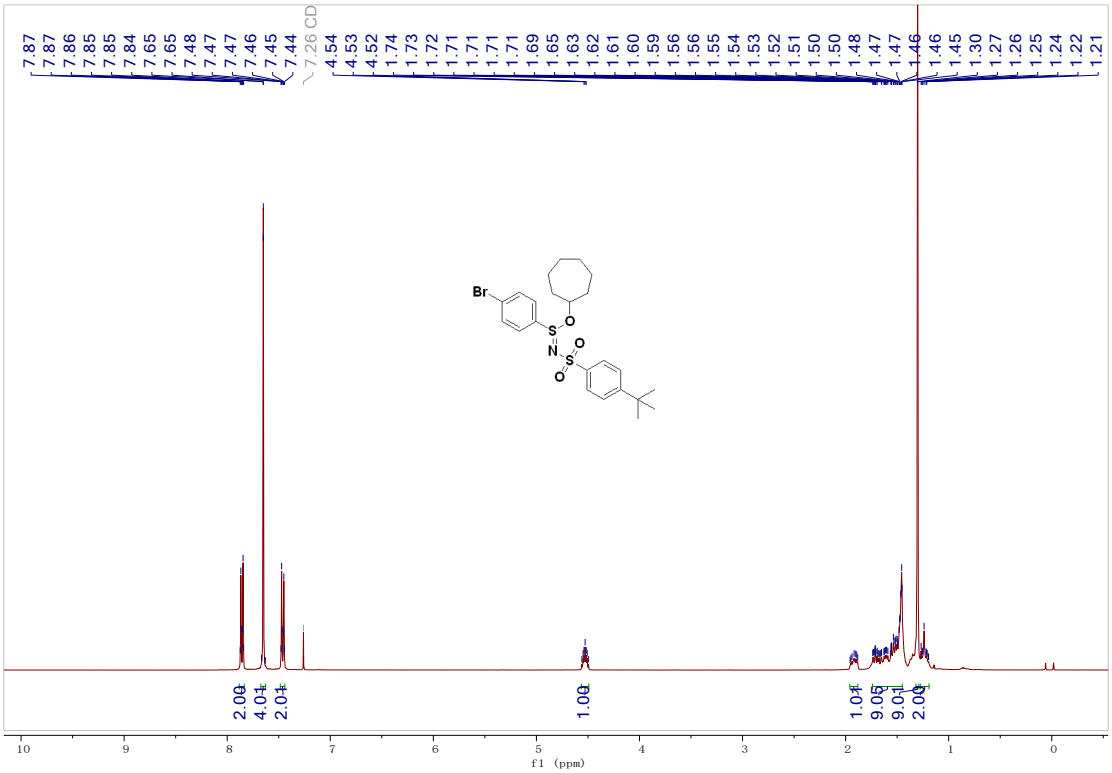
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6o**



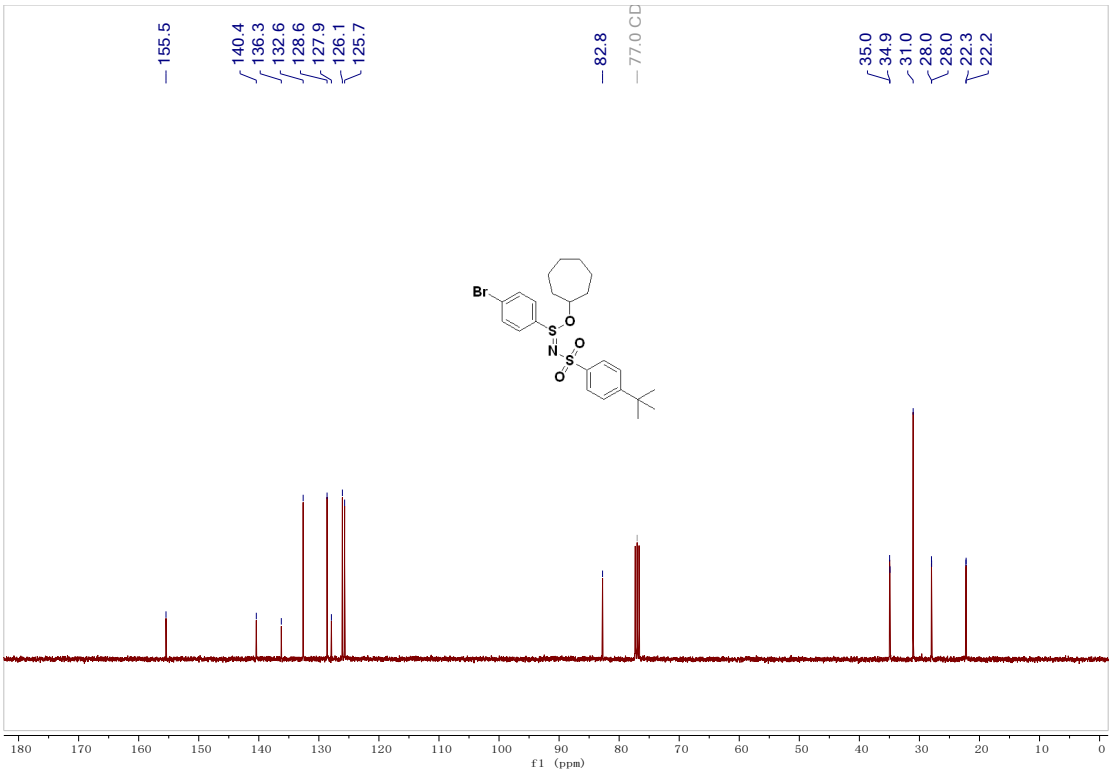
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6o**



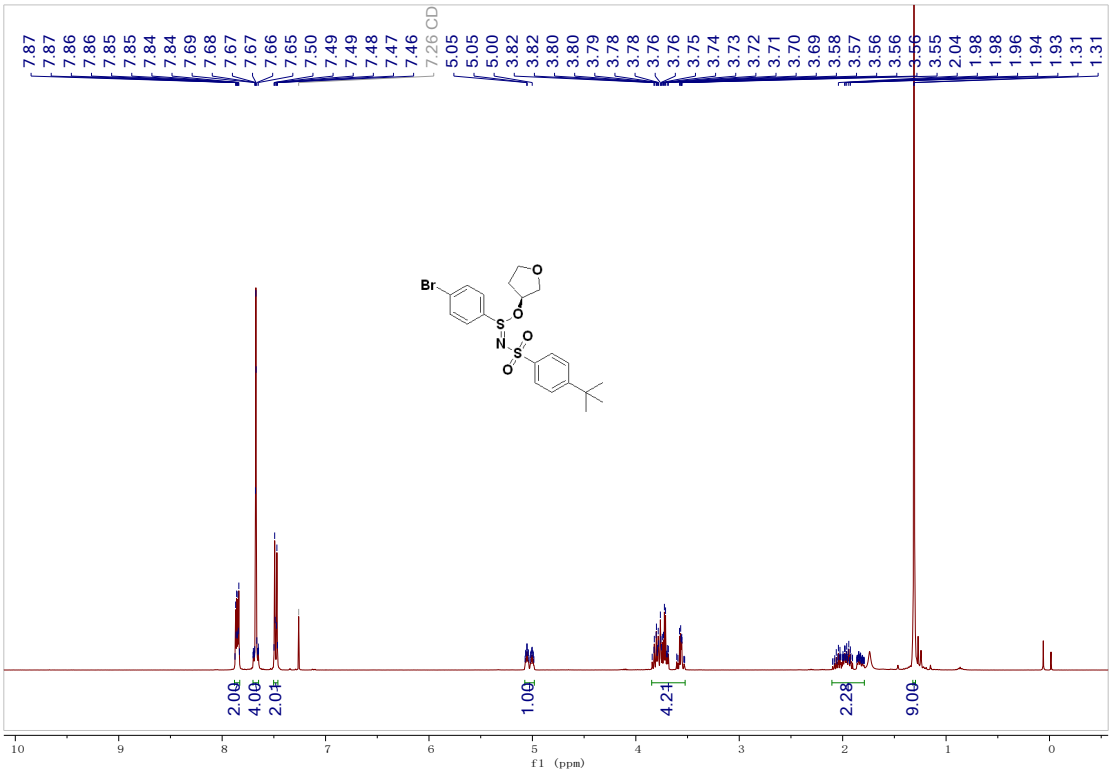
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6p**



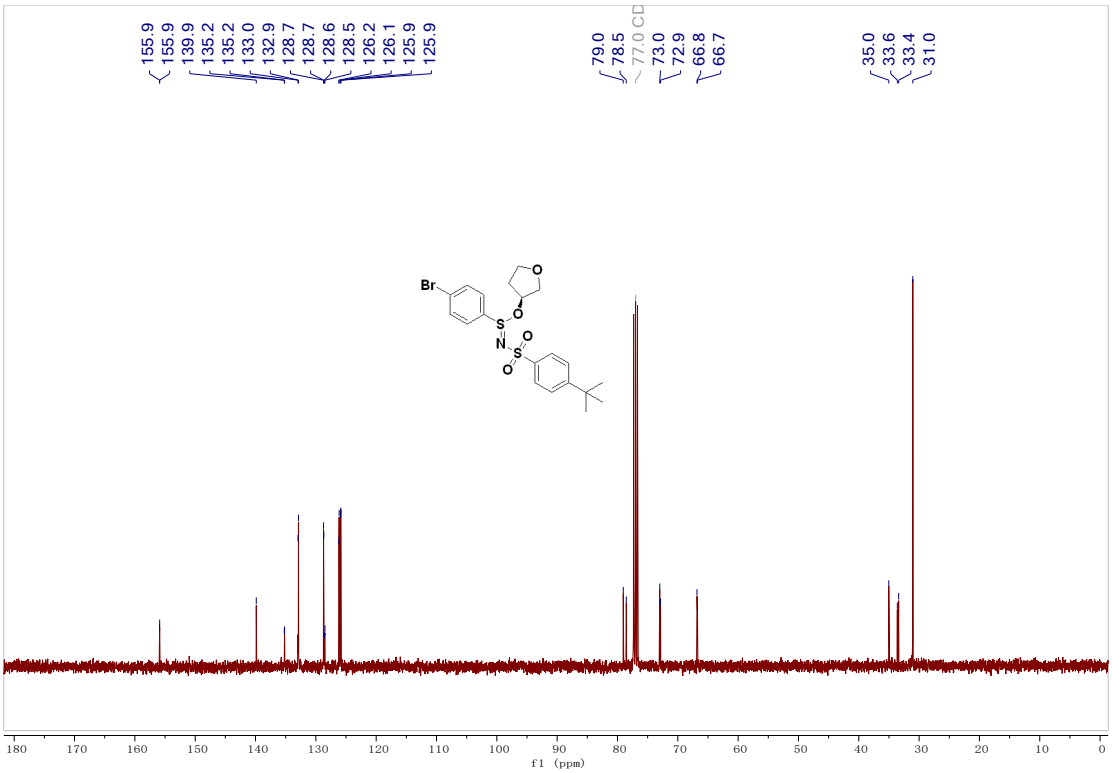
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6p**



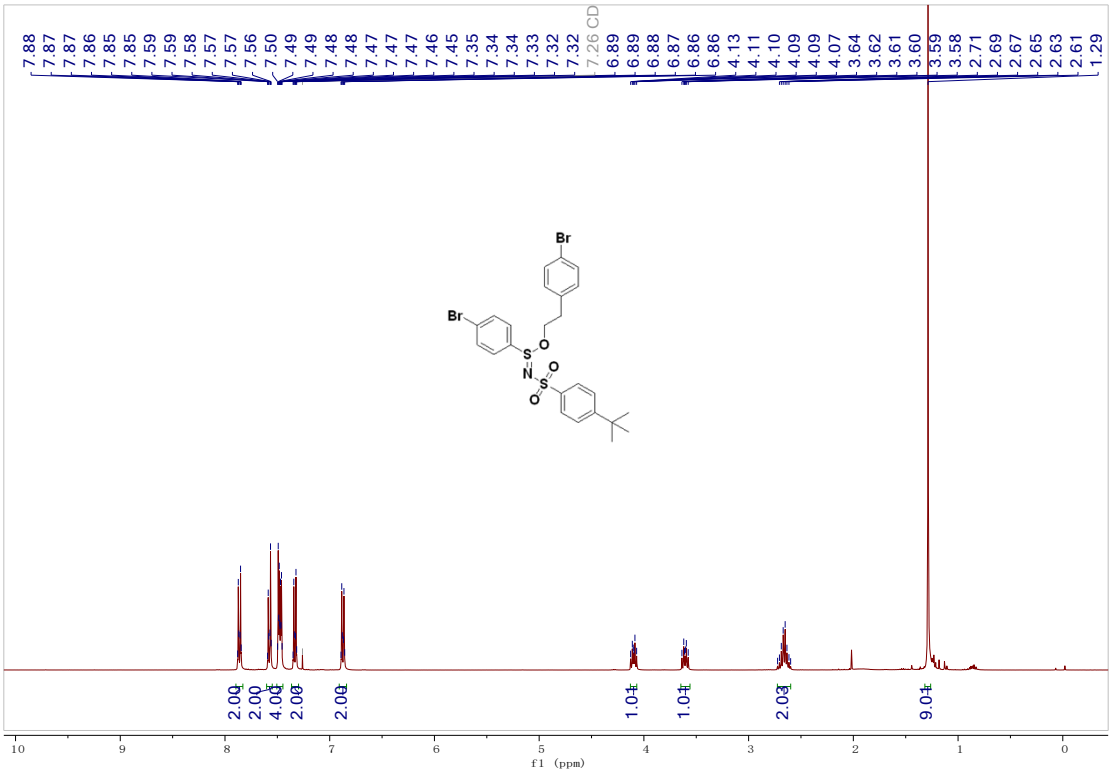
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6q**



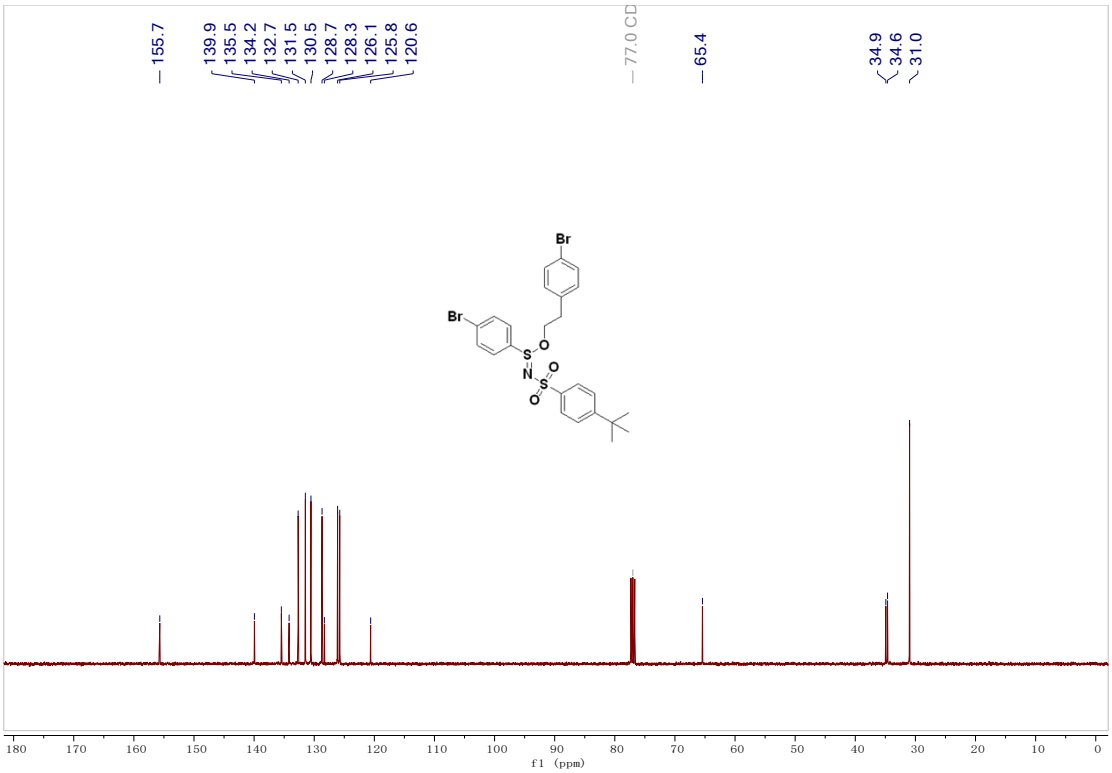
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6q**



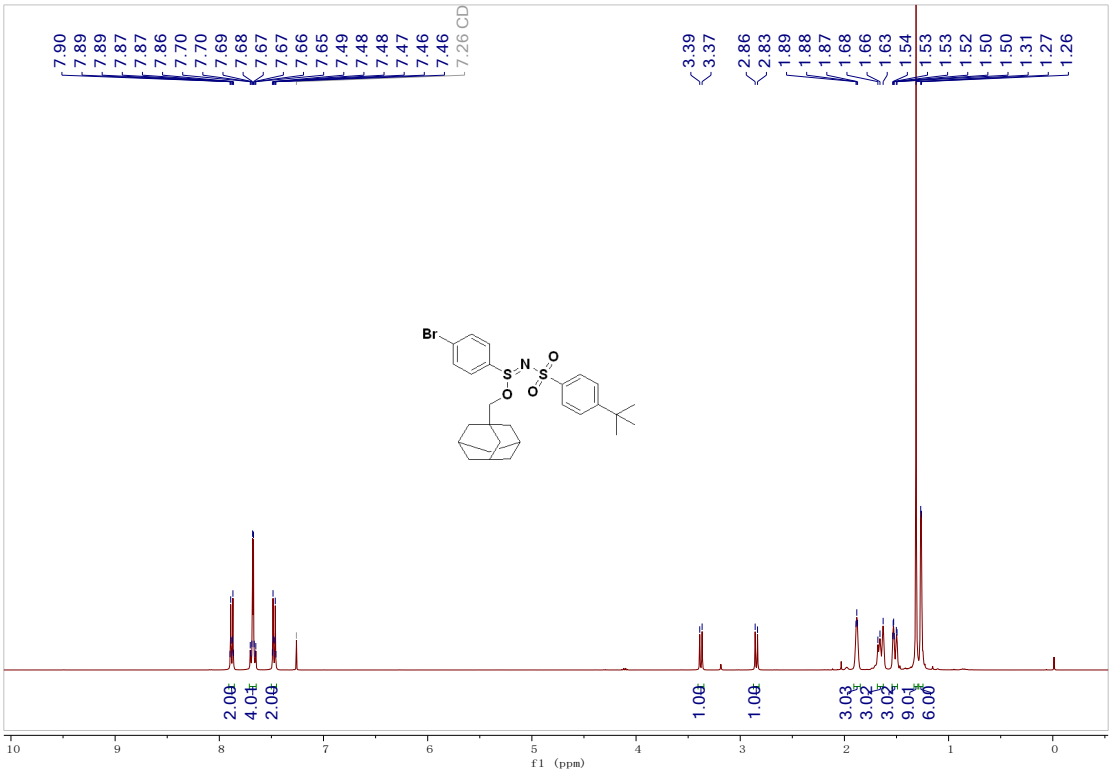
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6r**



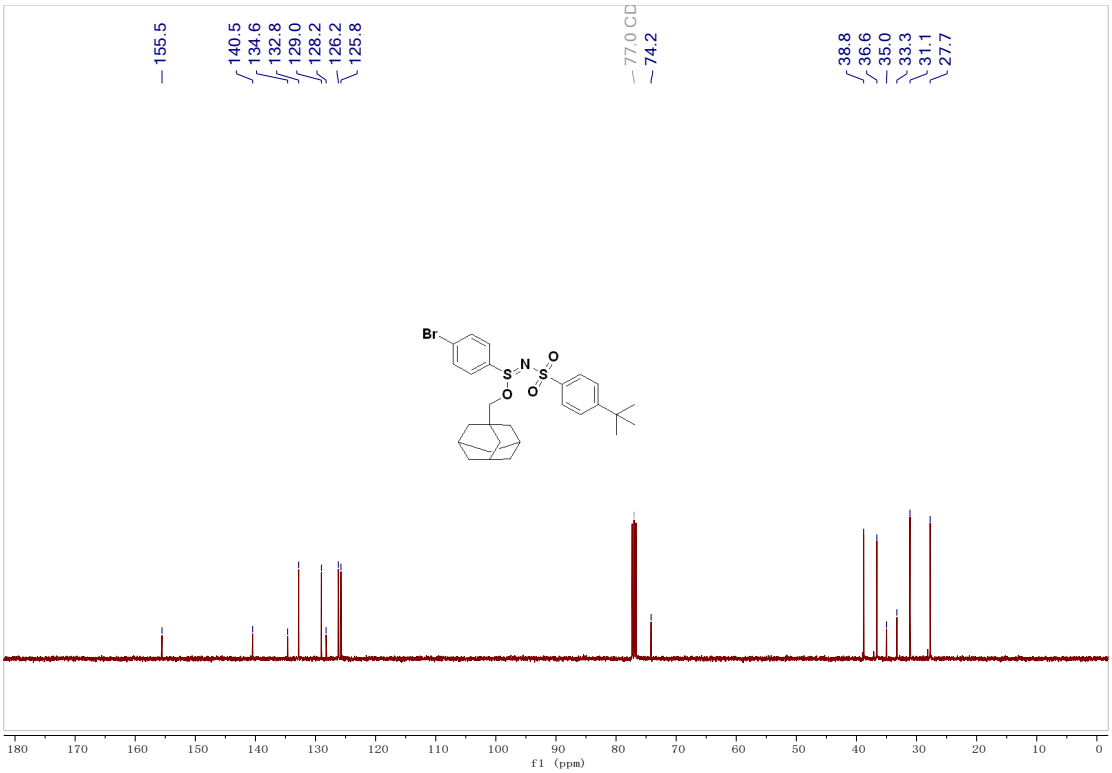
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6r**



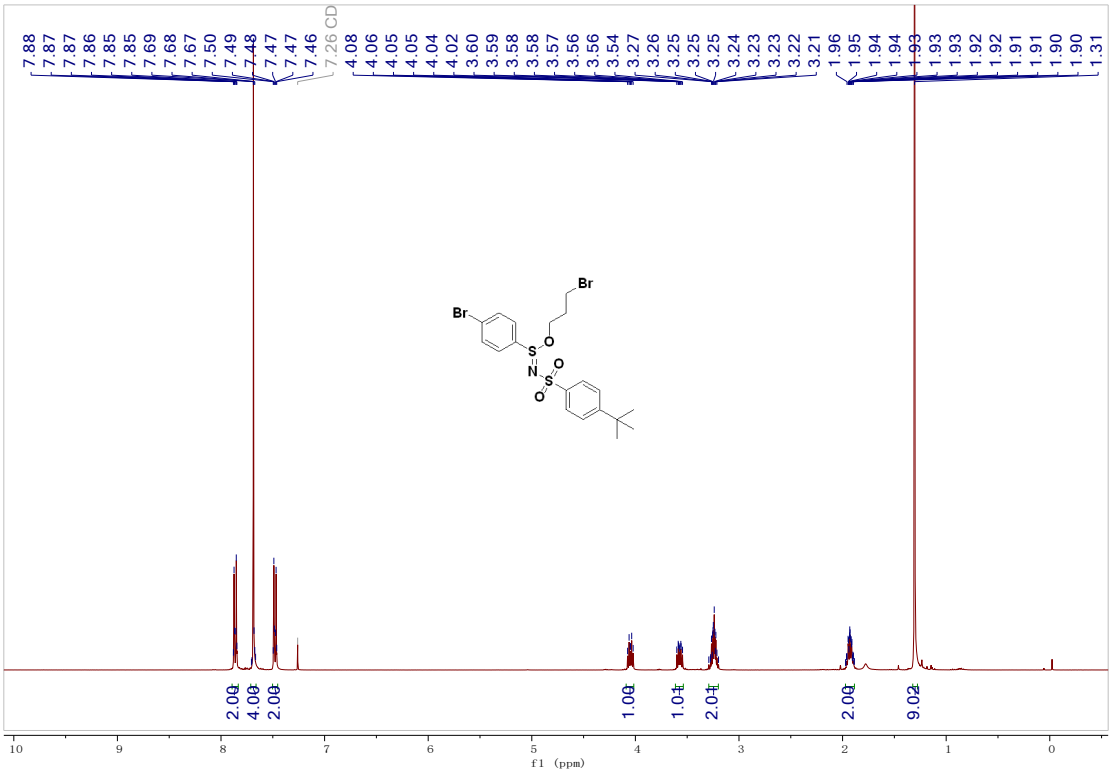
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6s**



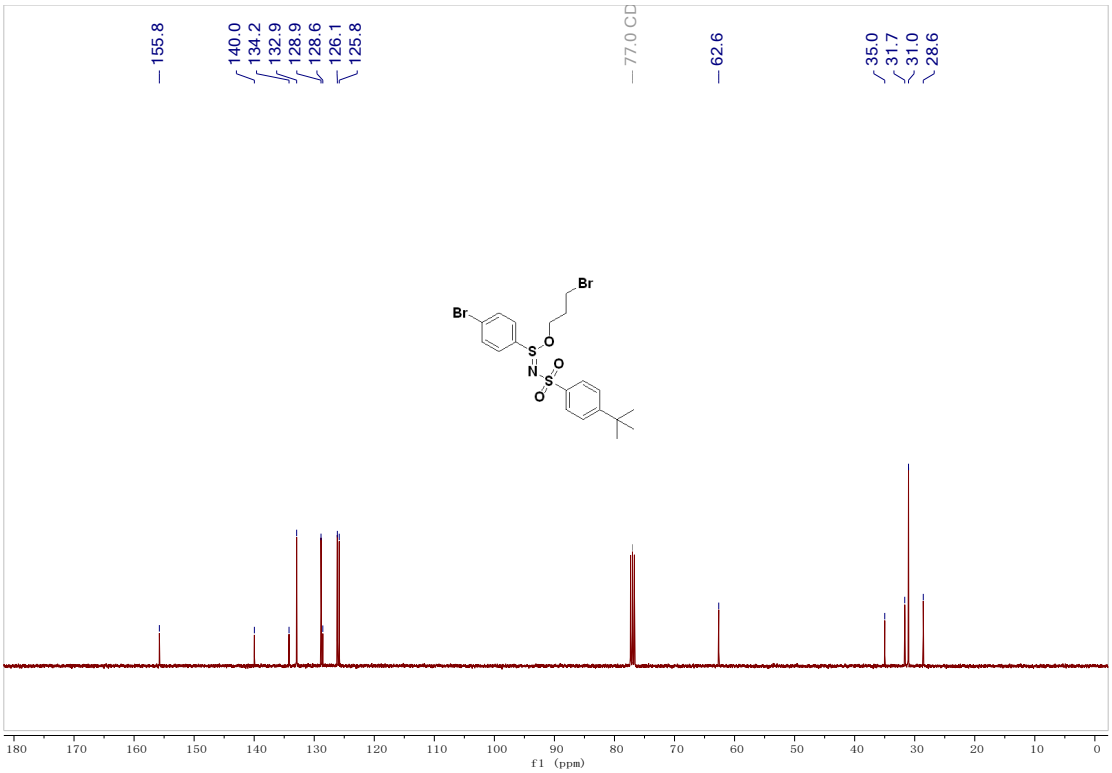
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6s**



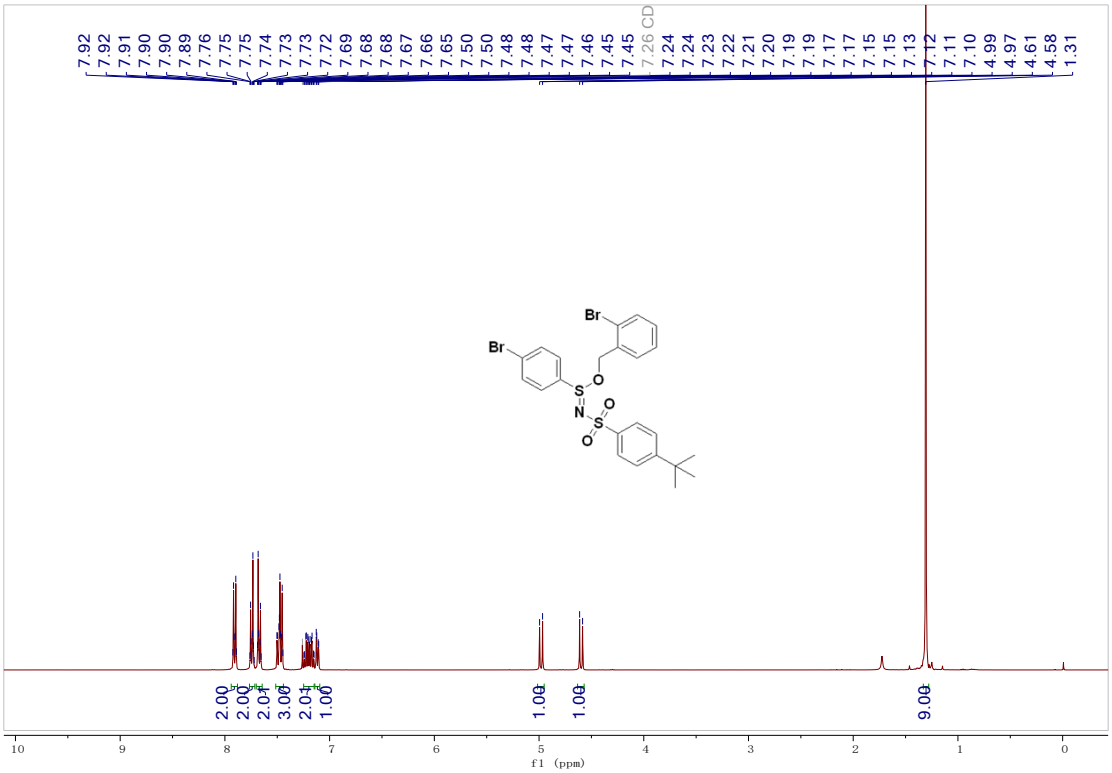
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6t**



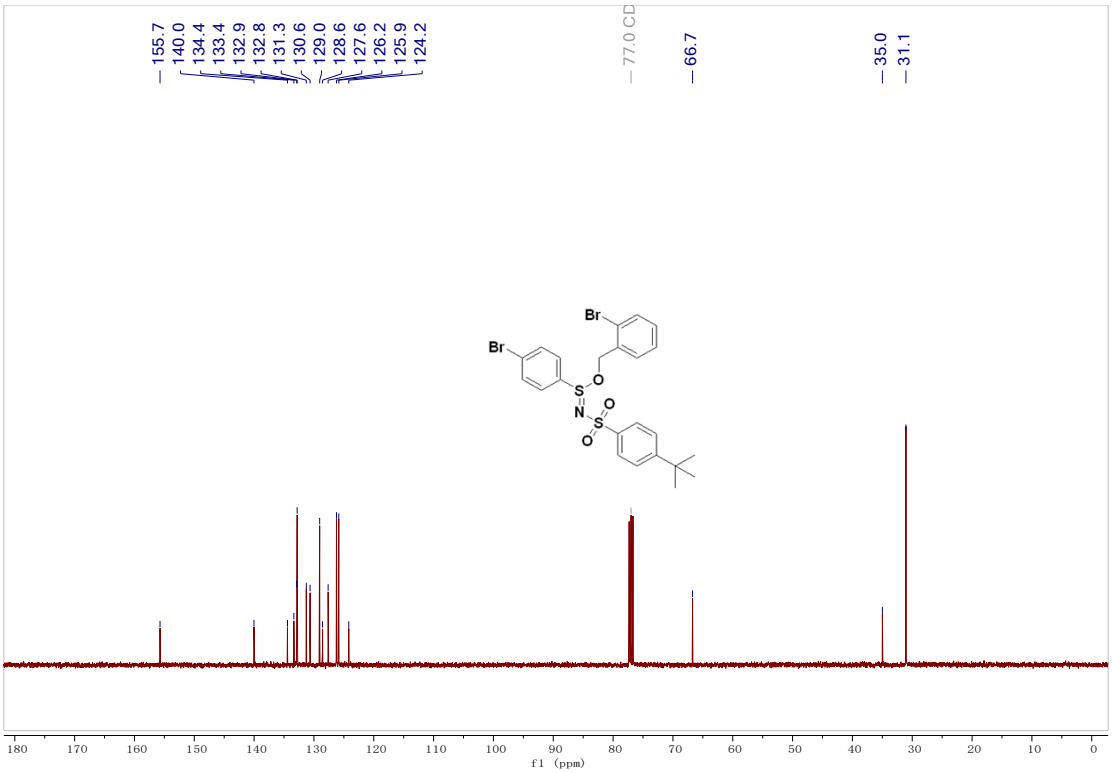
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6t**



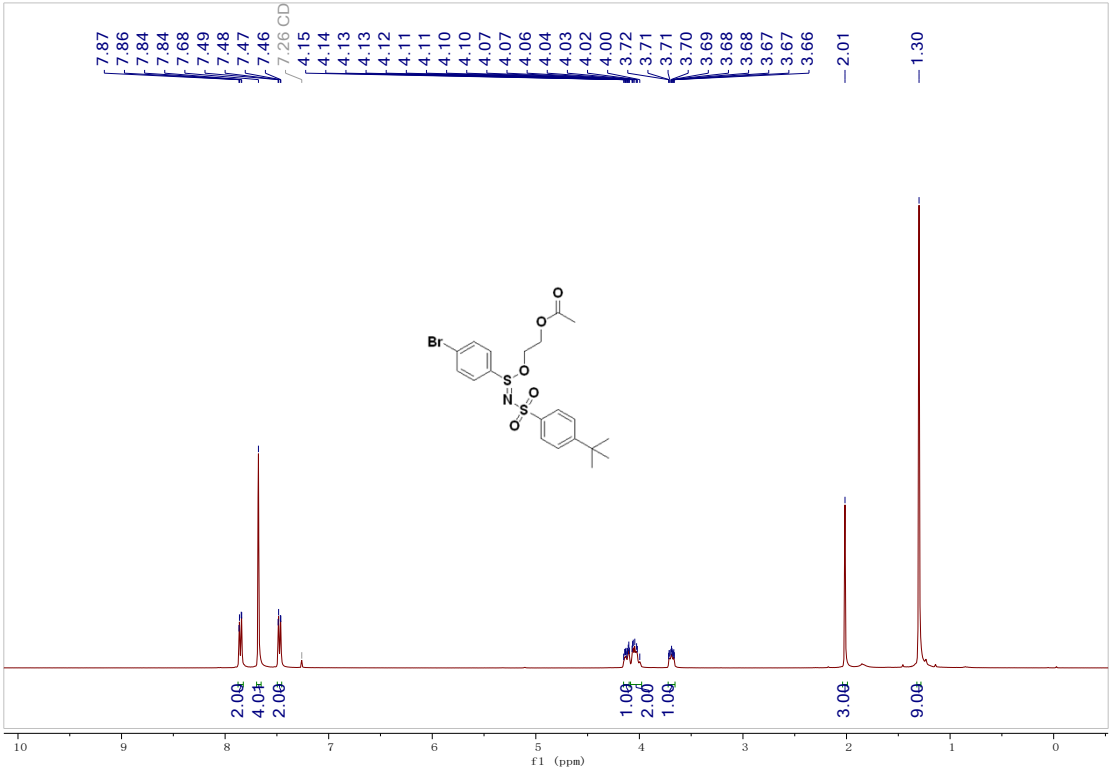
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6u**



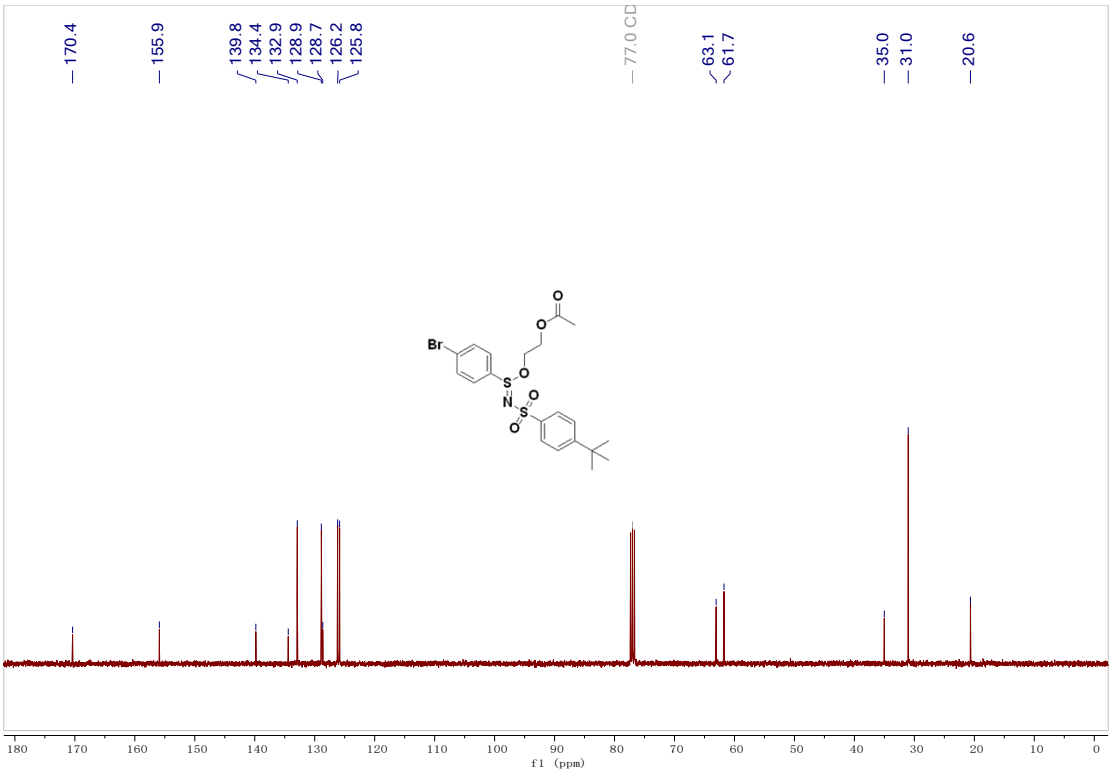
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6u**



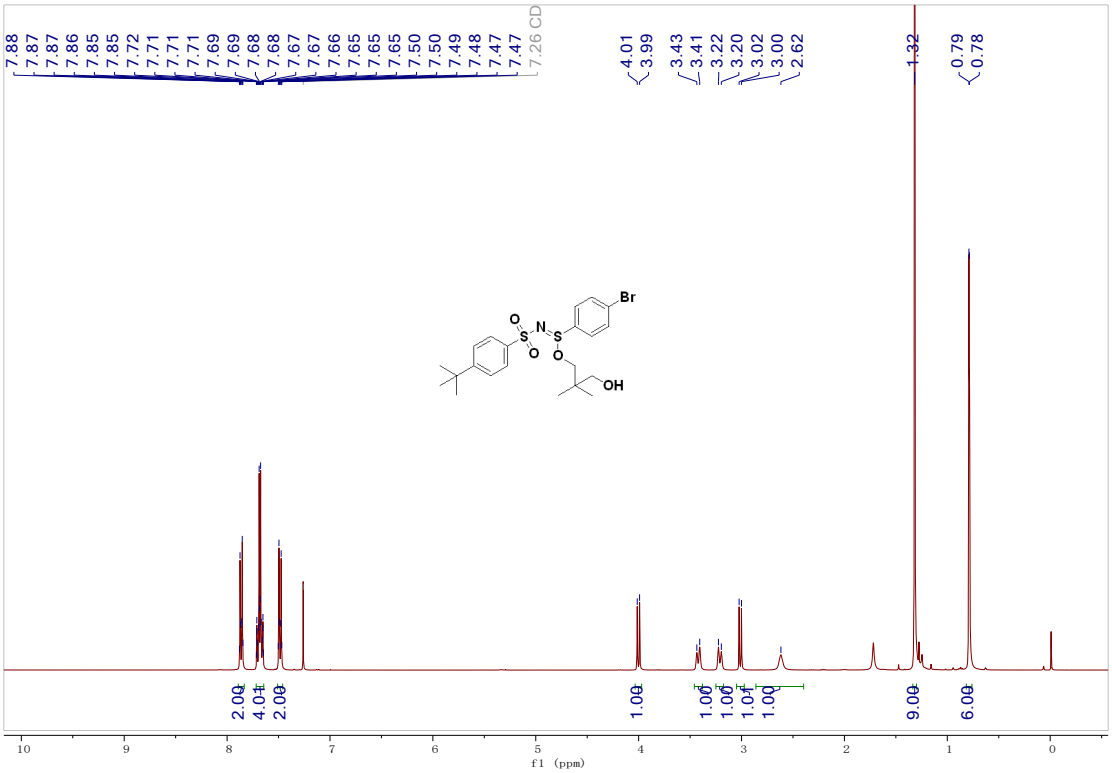
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6v**



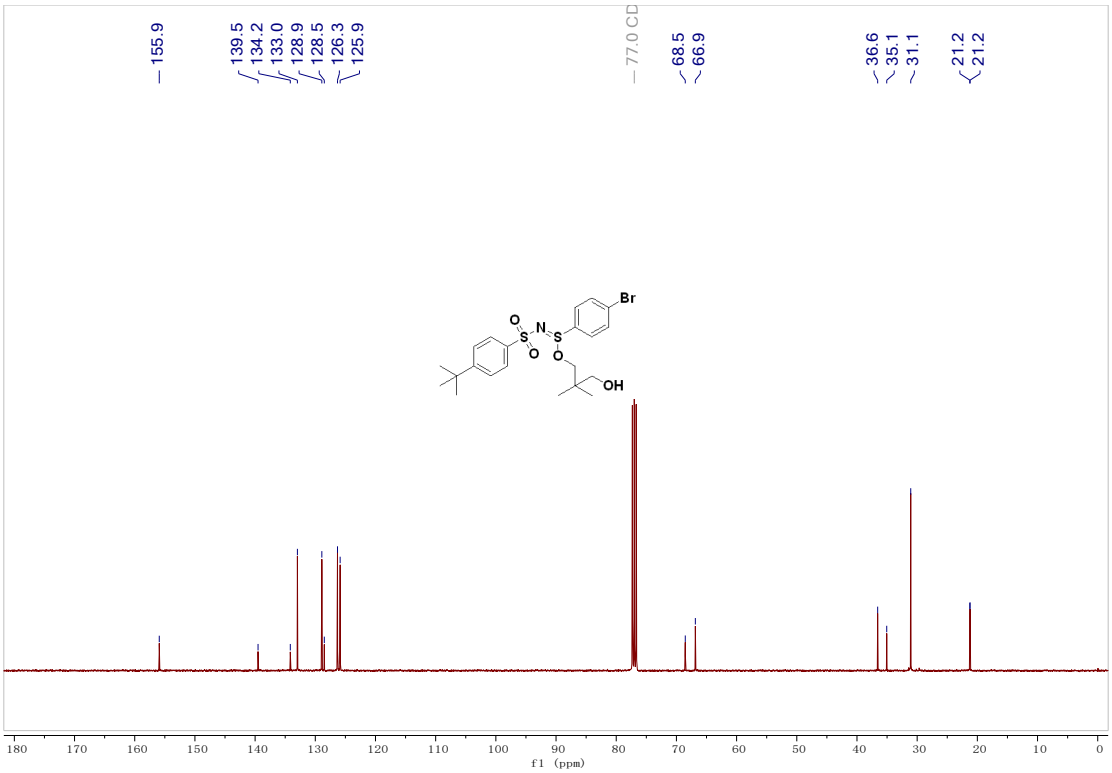
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6v**



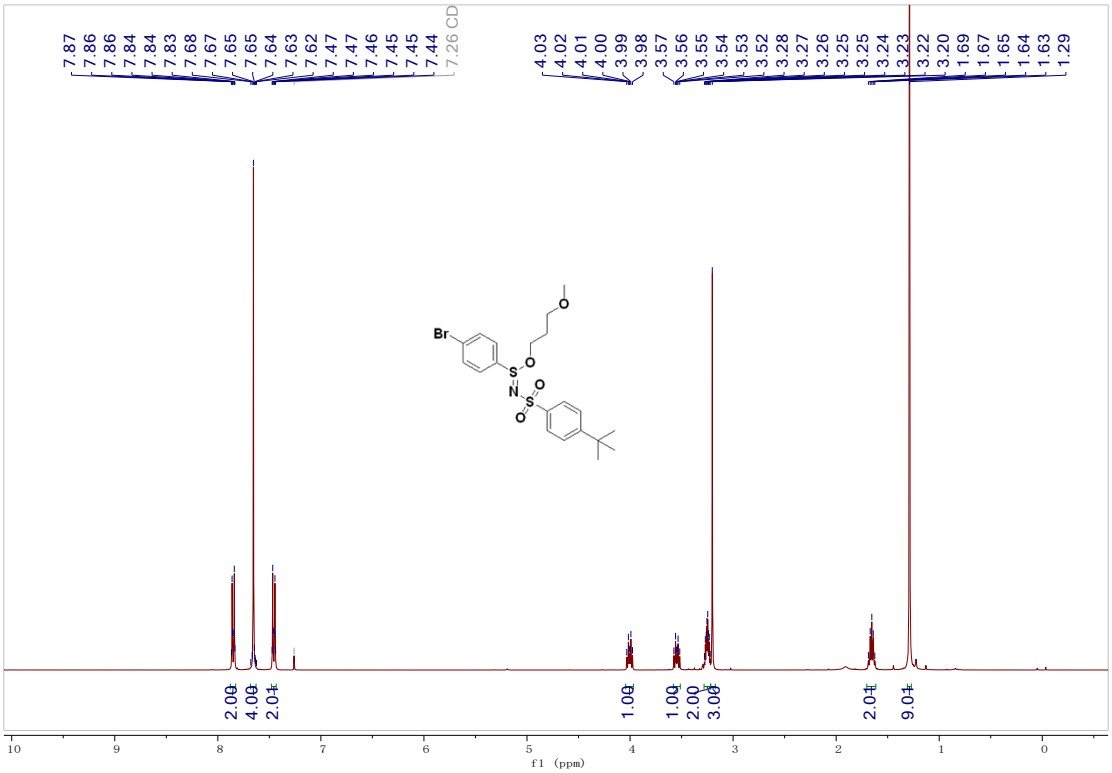
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6w**



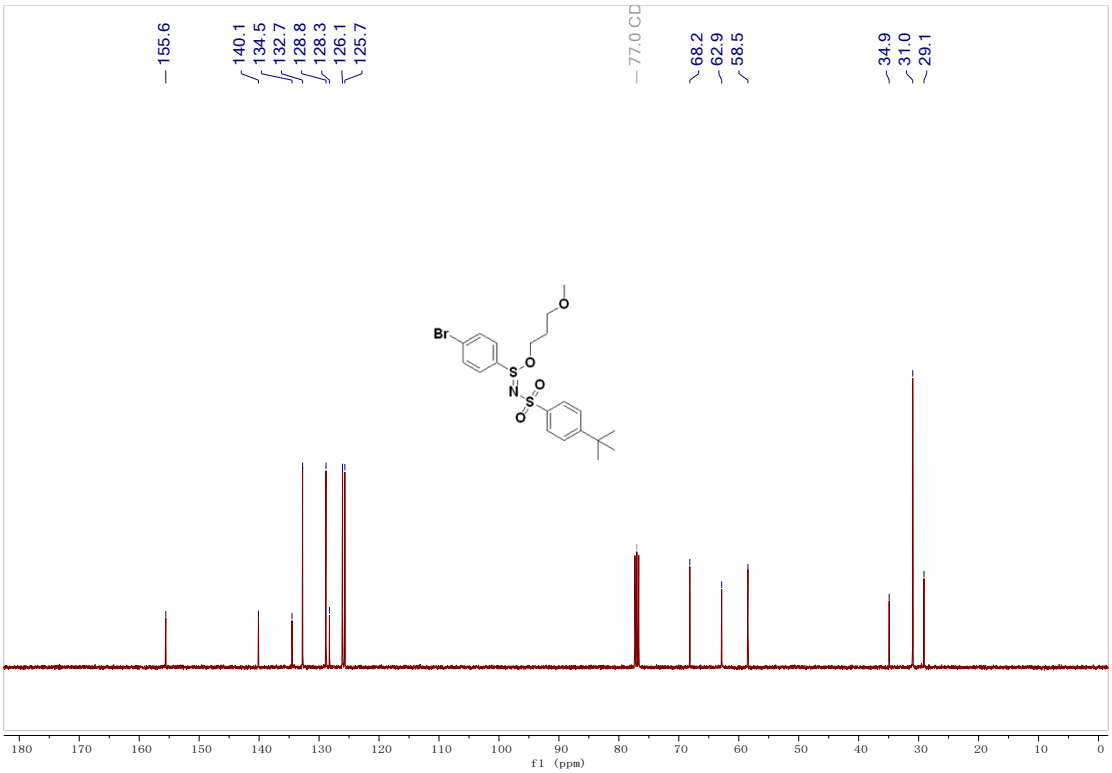
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6w**



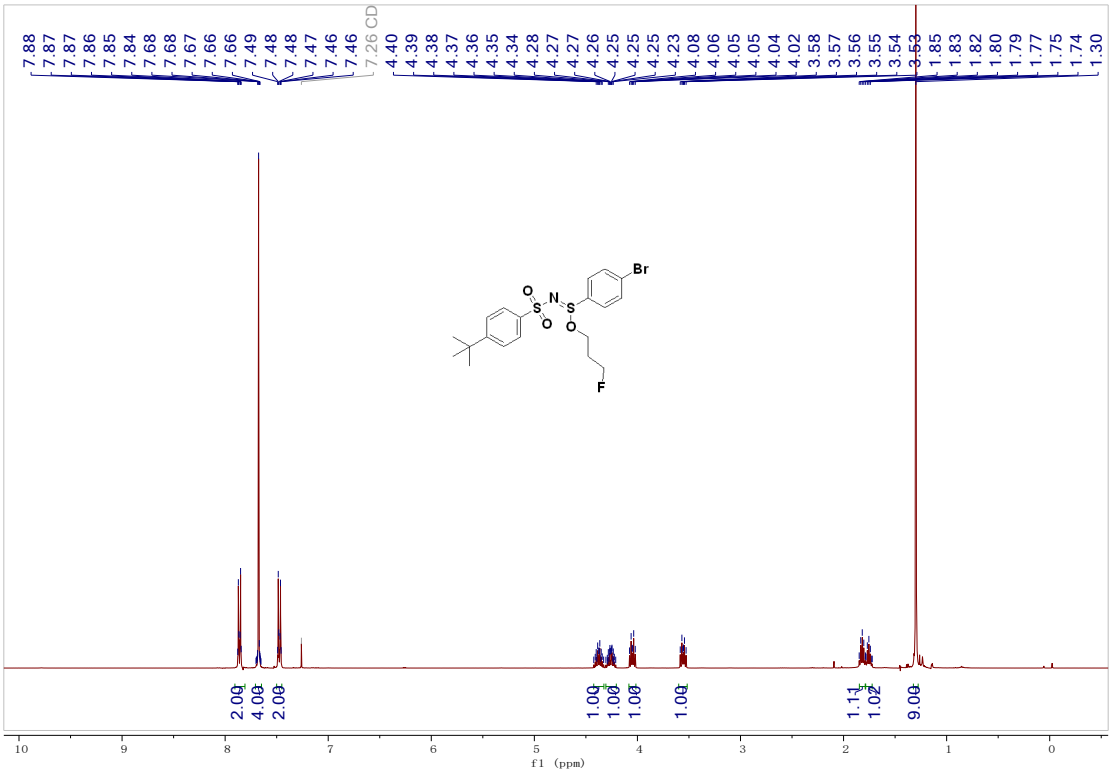
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6x**



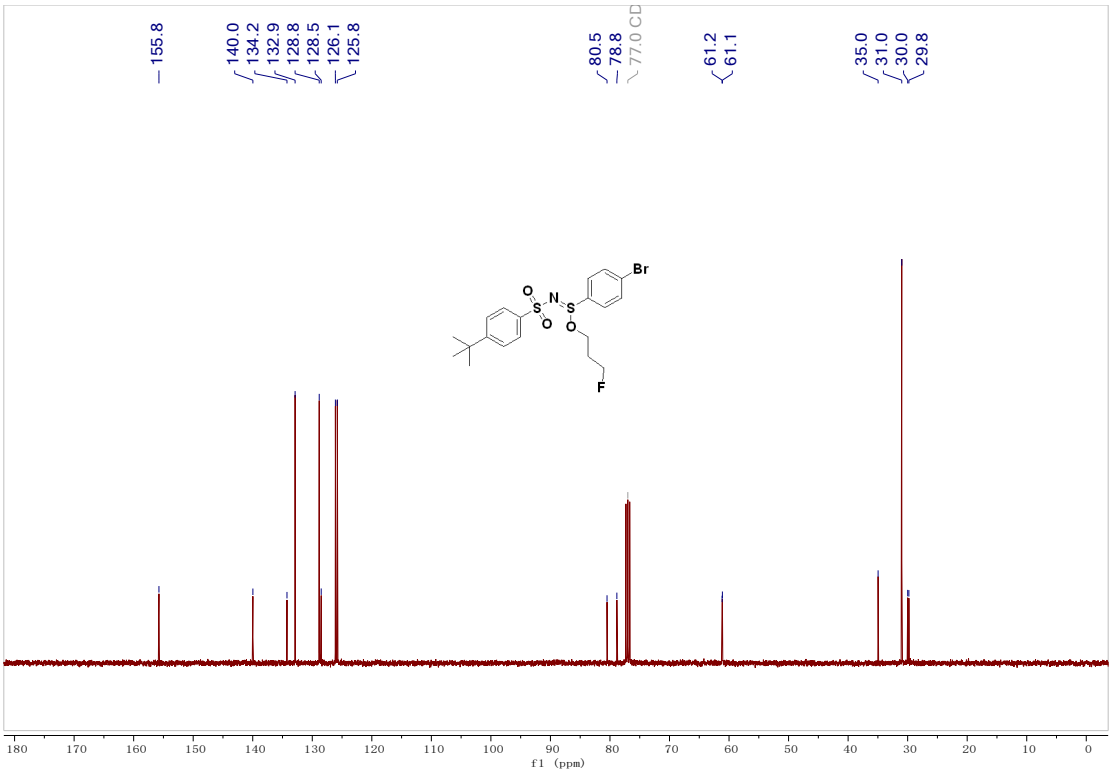
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6x**



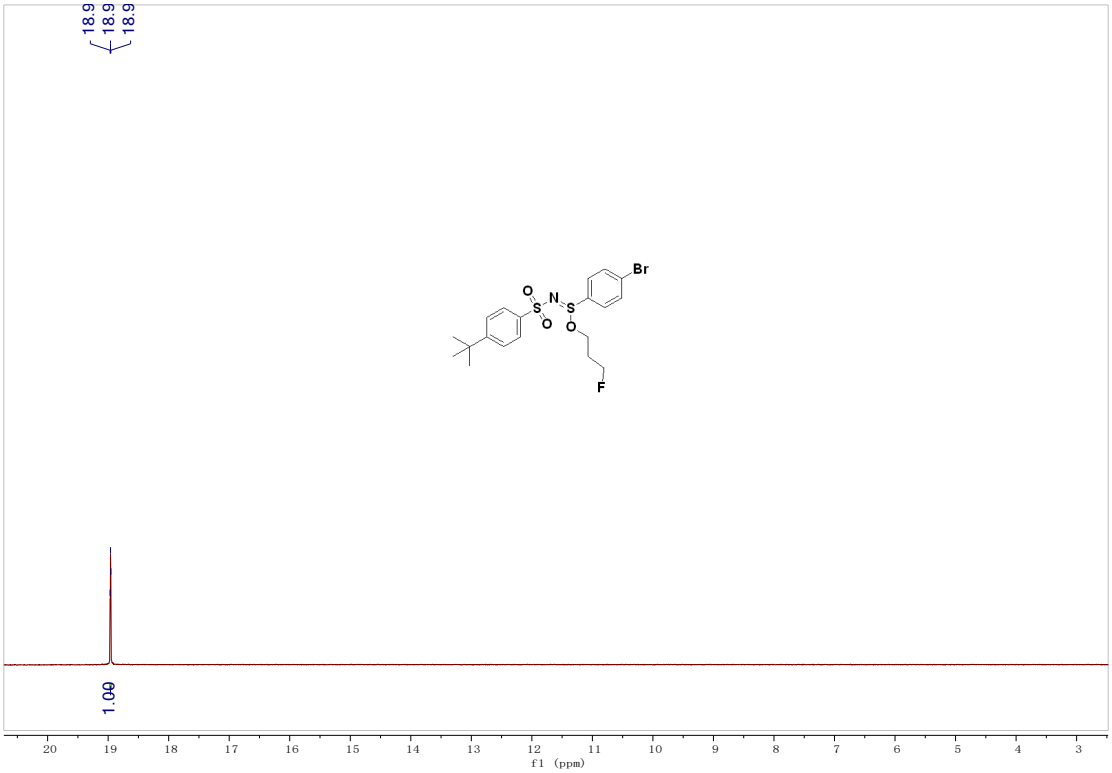
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6y**



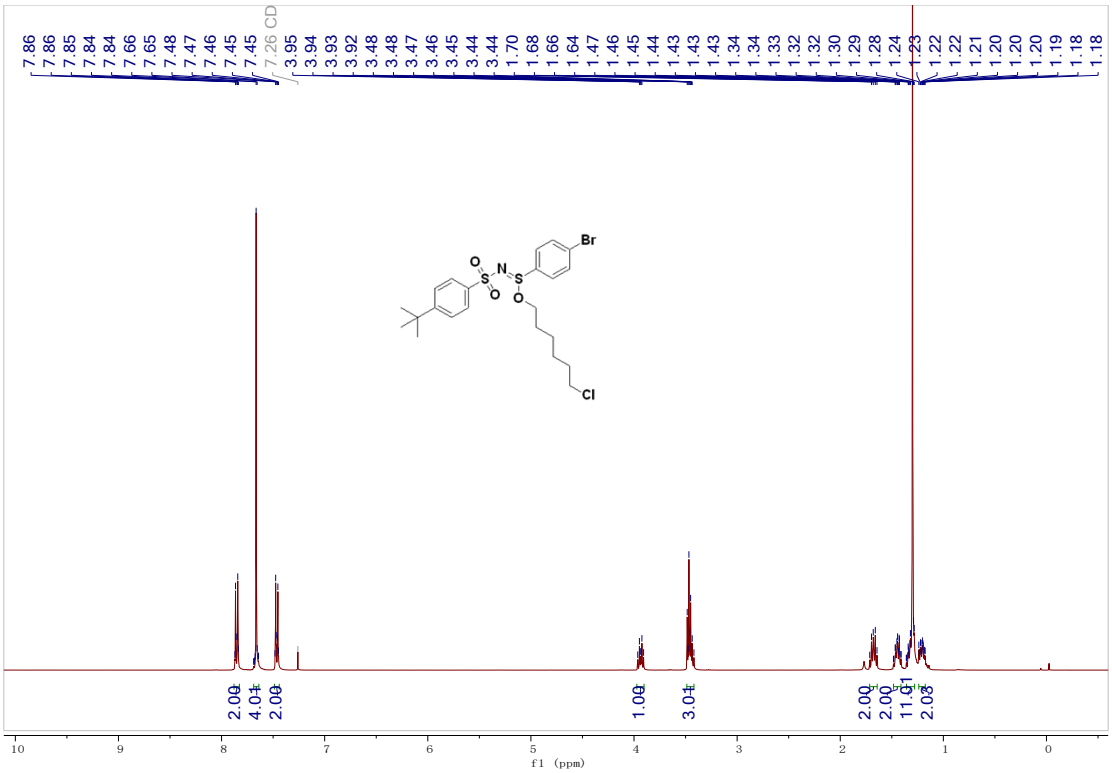
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6y**



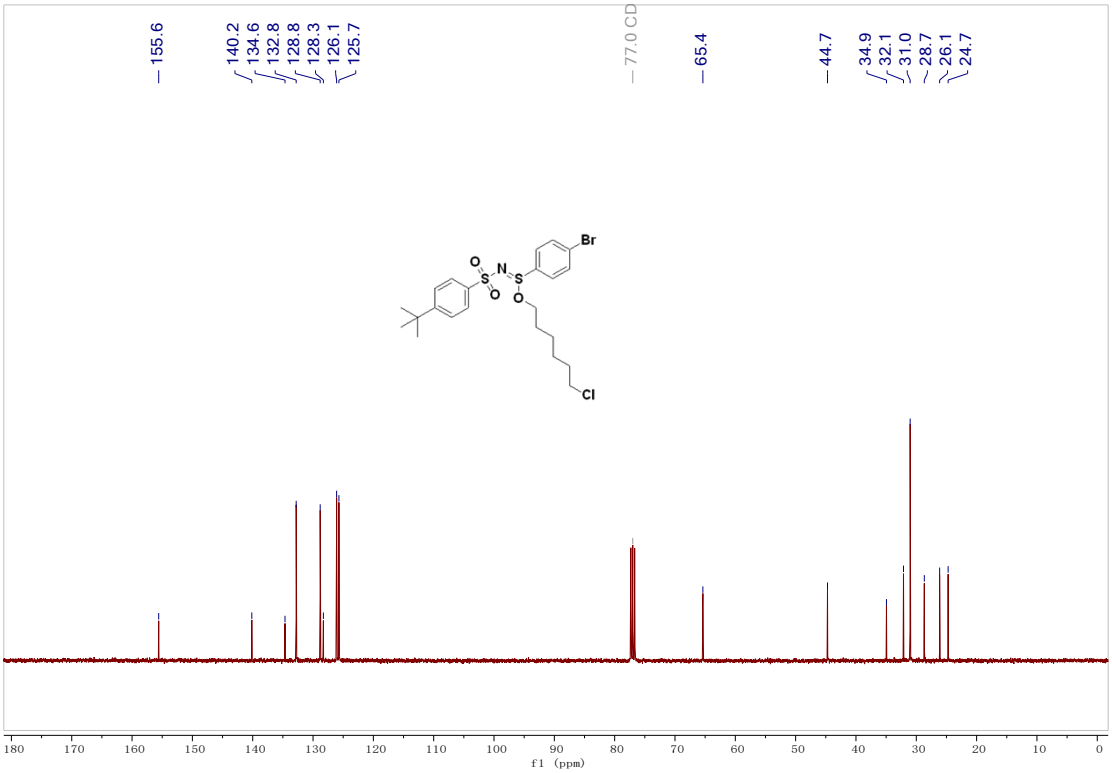
^{19}F NMR (376 MHz, Chloroform-d) of compound **6y**



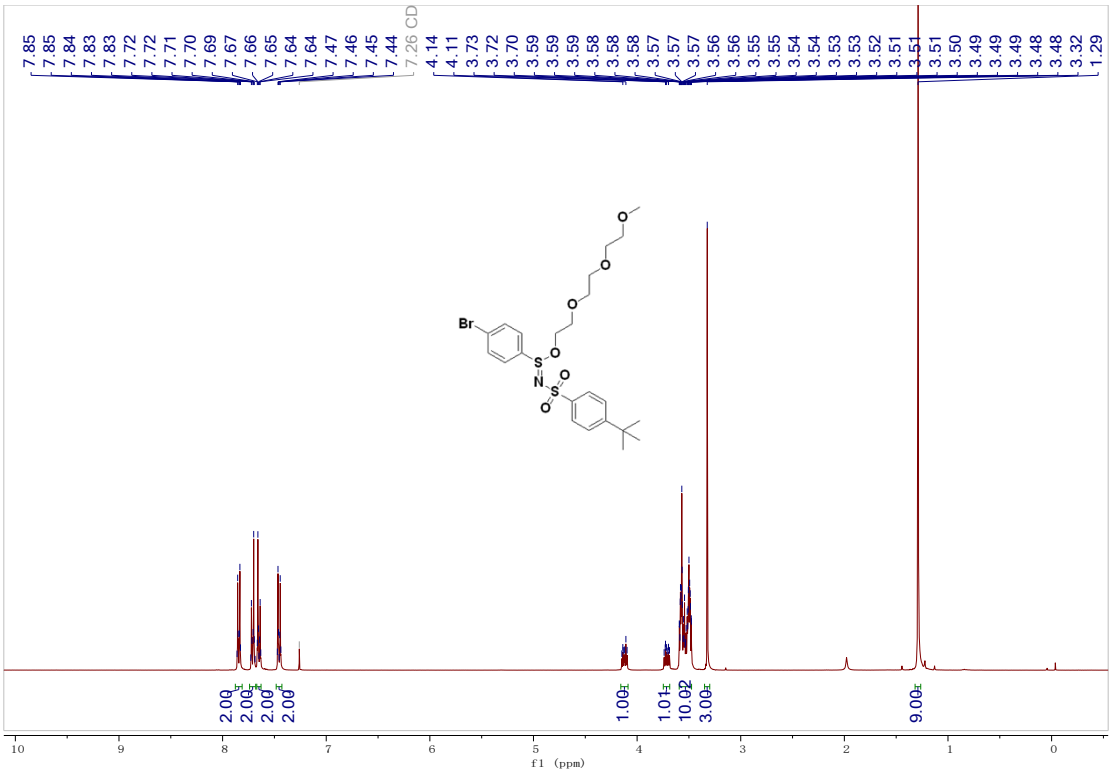
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6z**



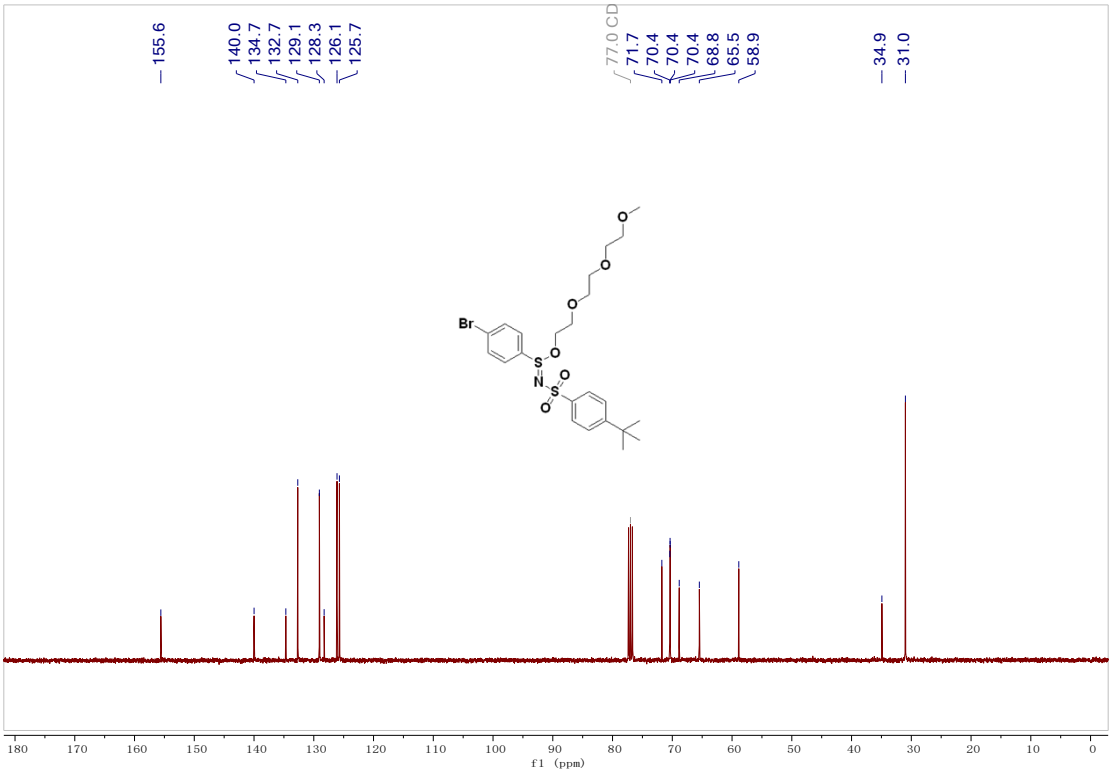
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6z**



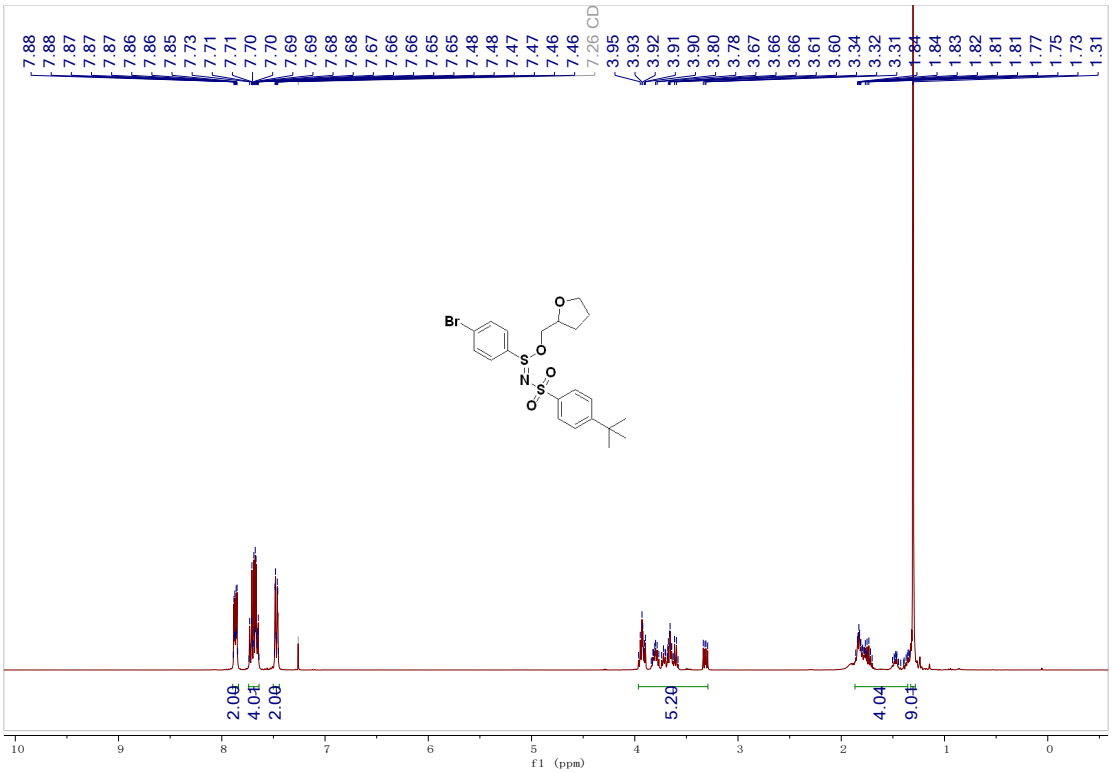
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6aa**



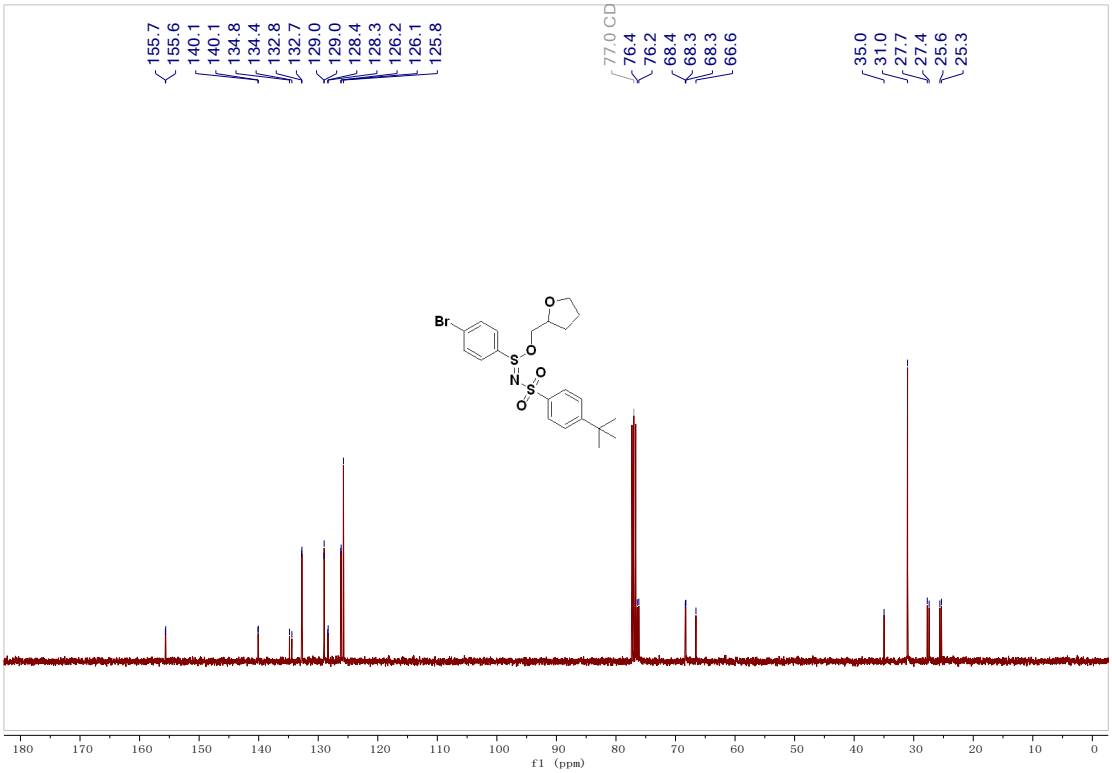
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6aa**



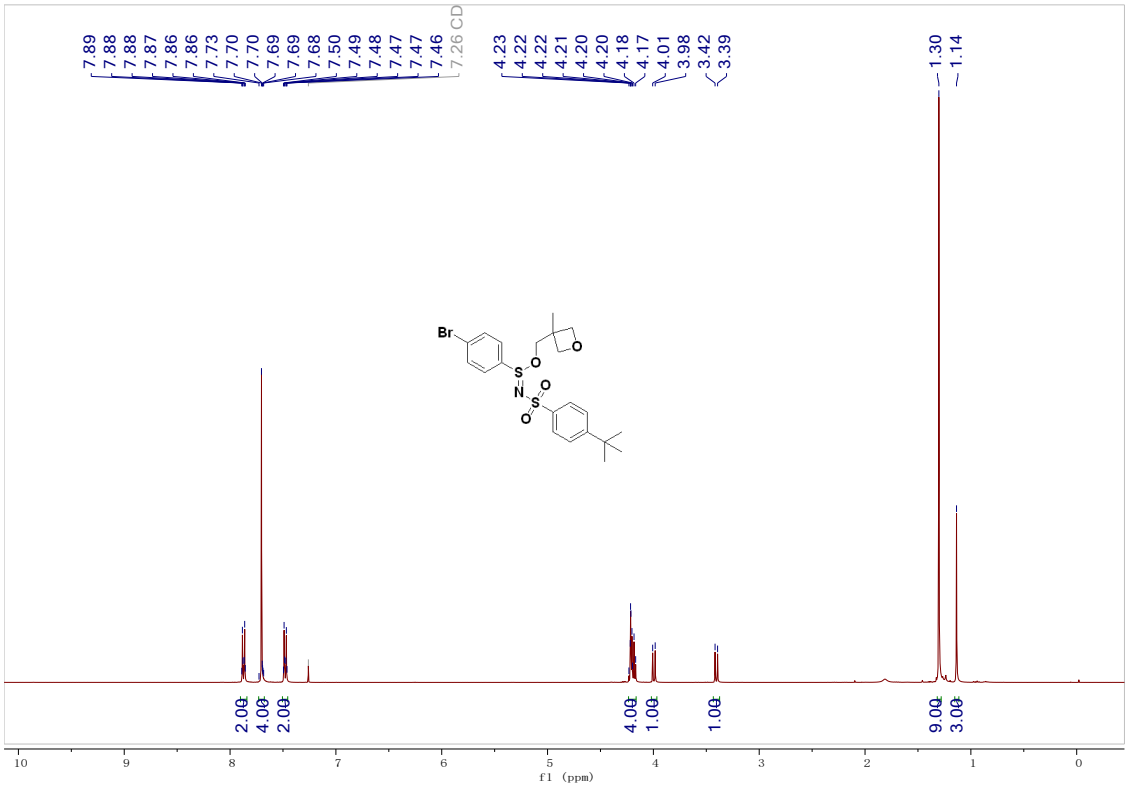
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ab**



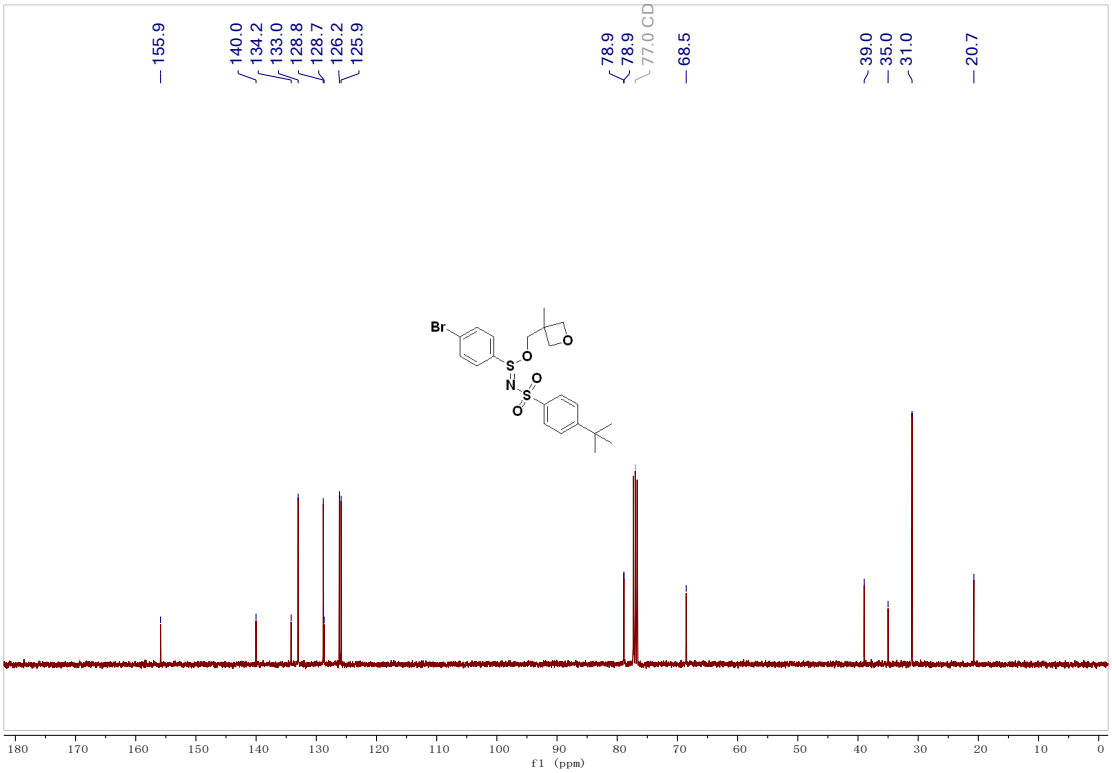
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ab**



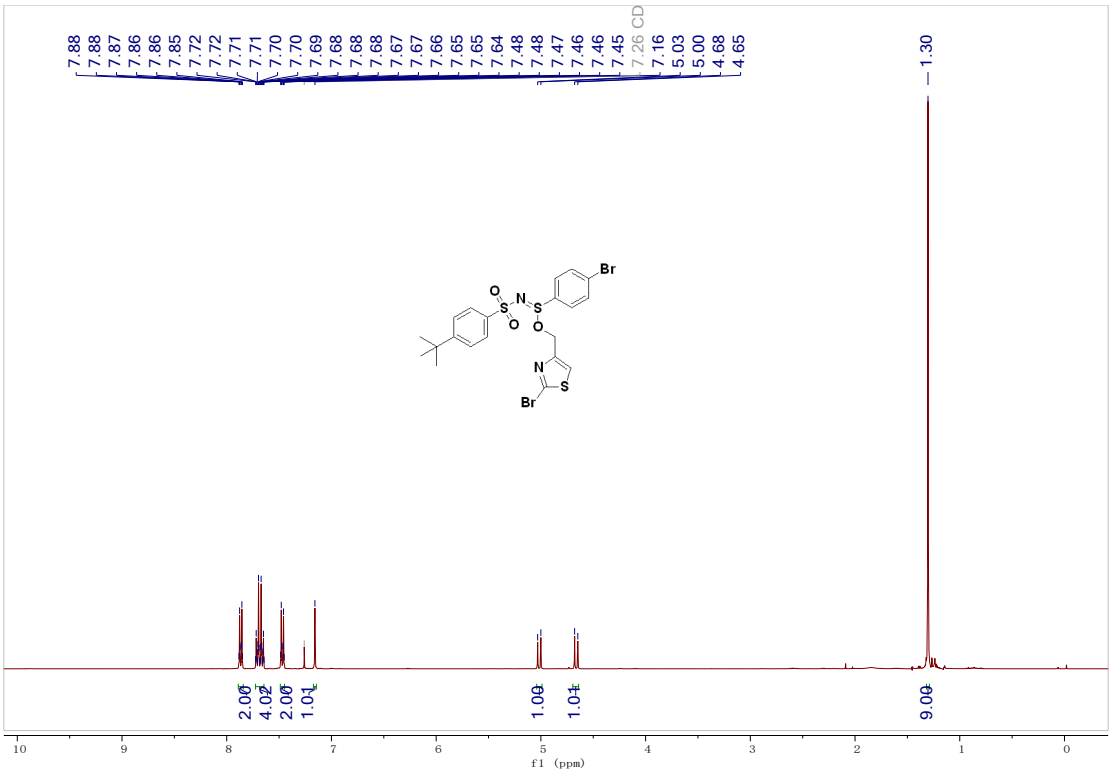
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ac**



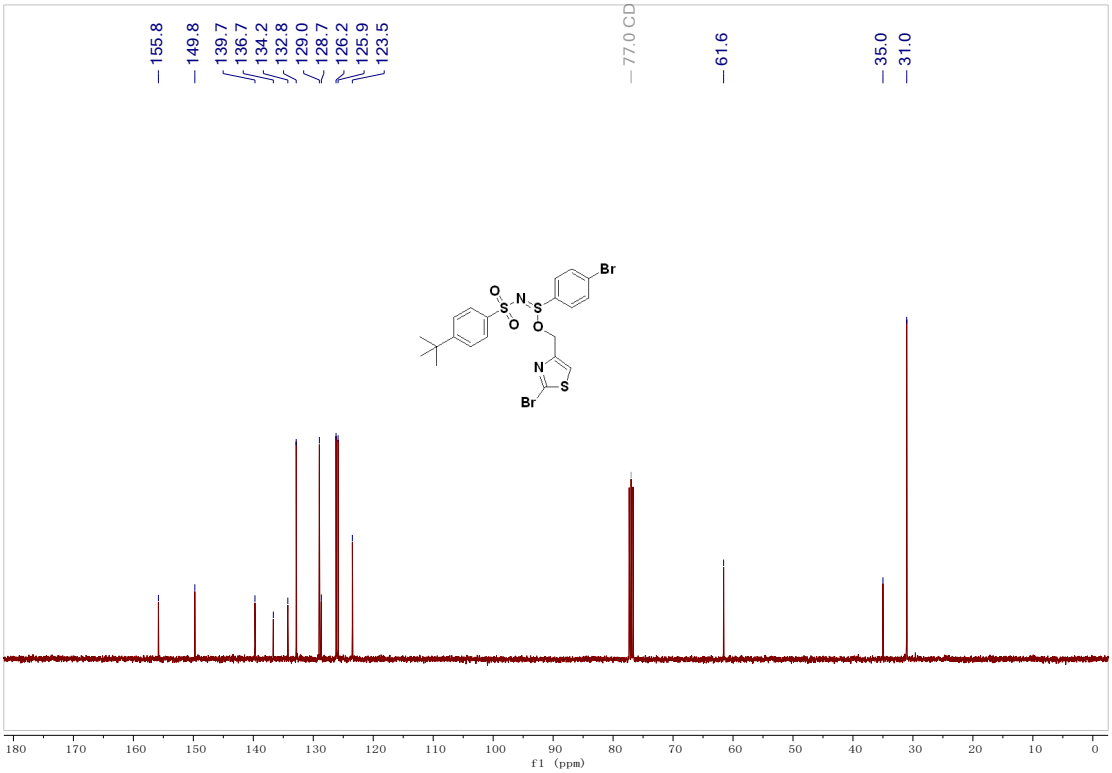
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ac**



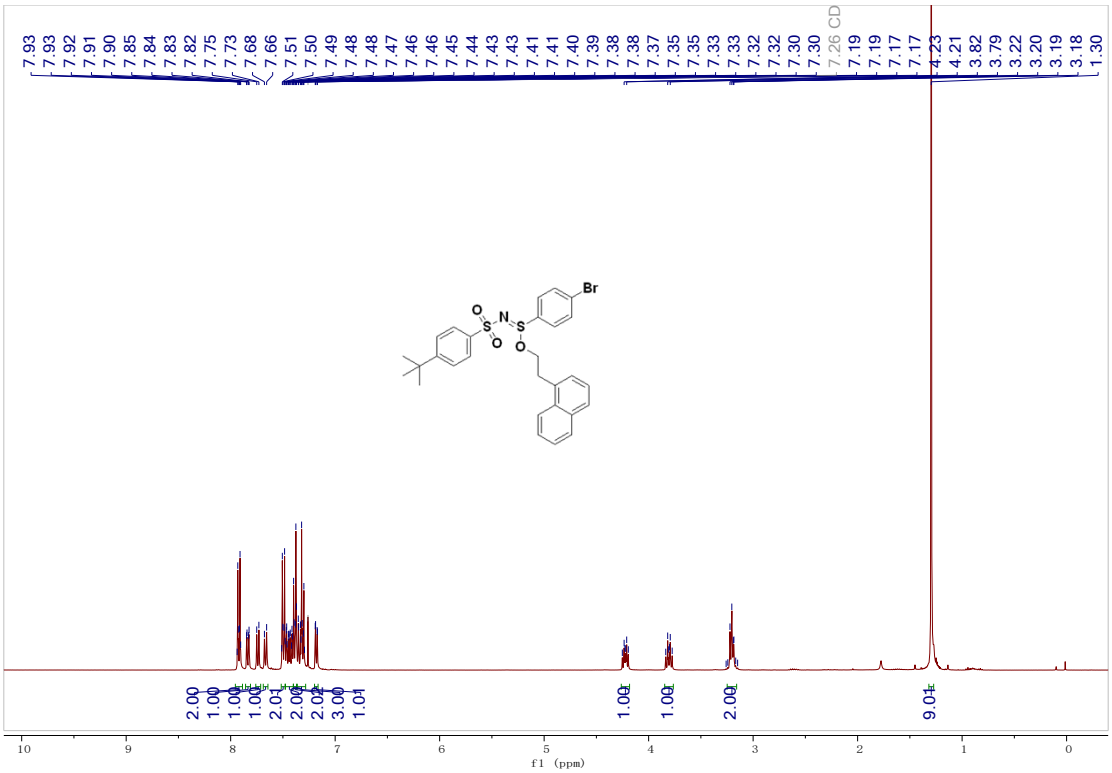
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ad**



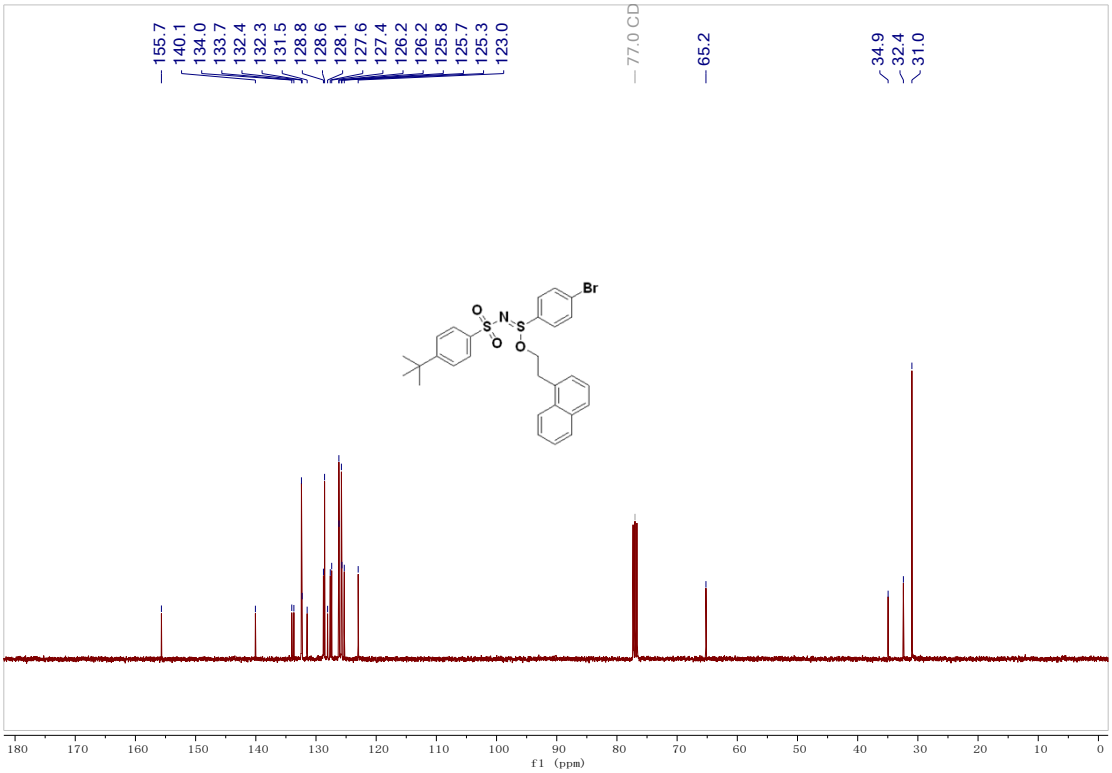
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ad**



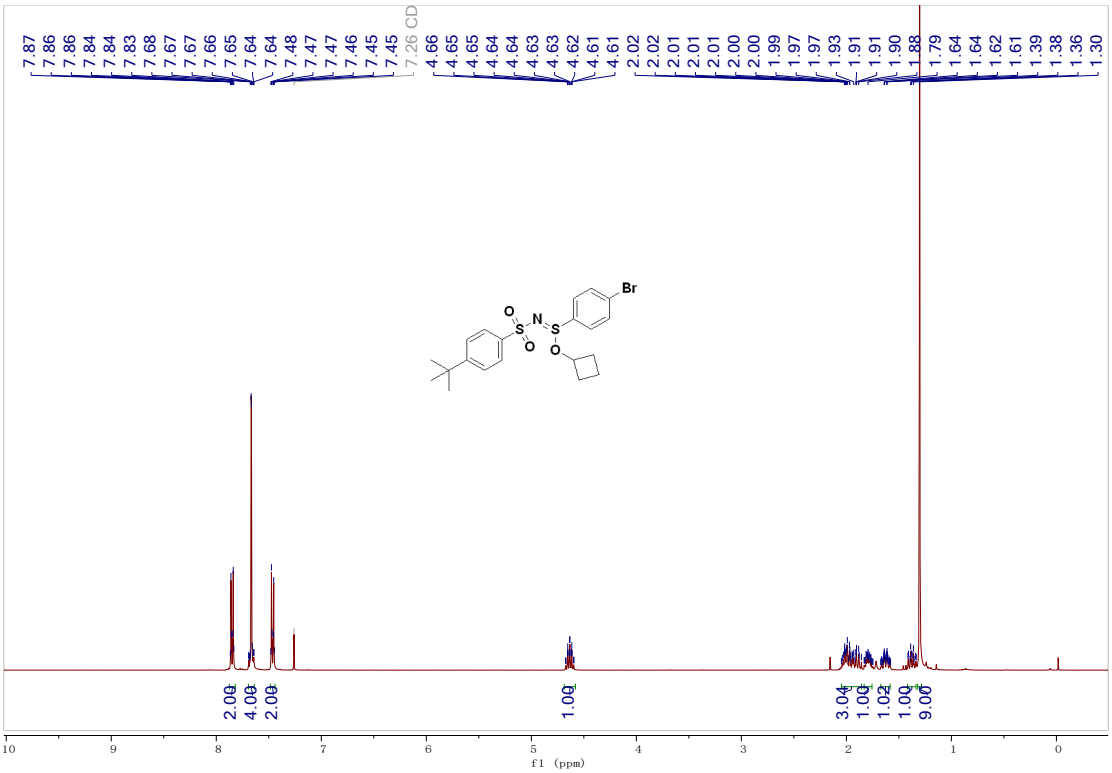
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ae**



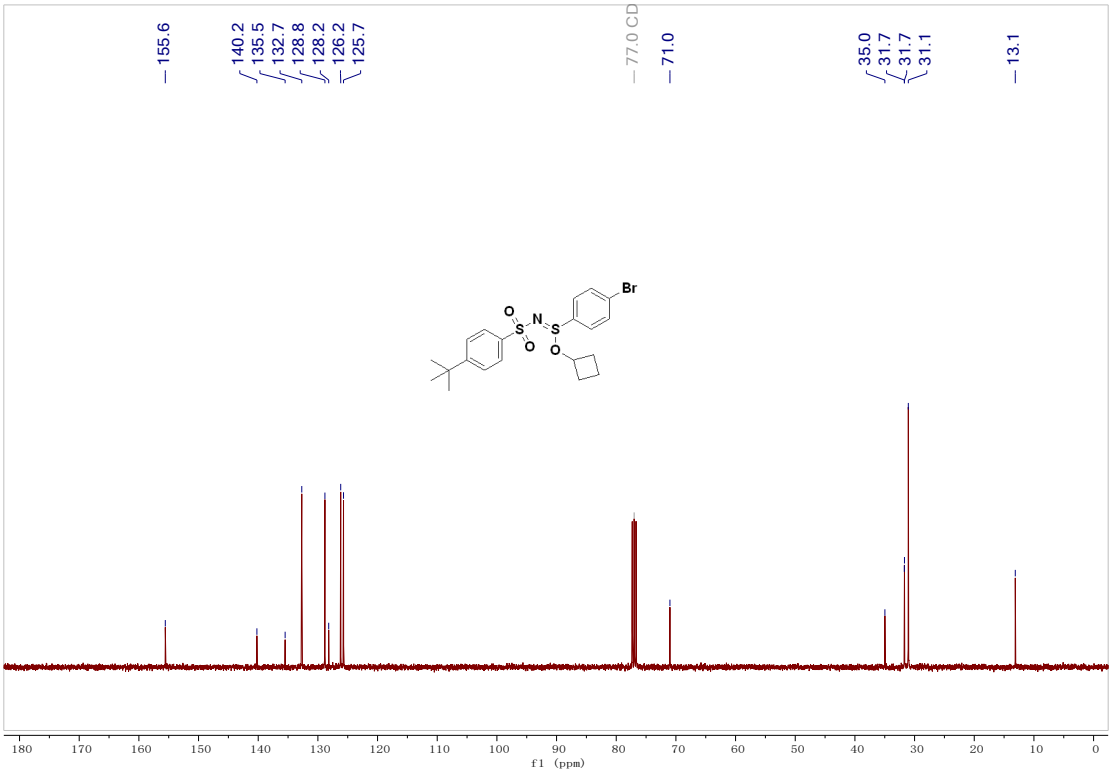
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ae**



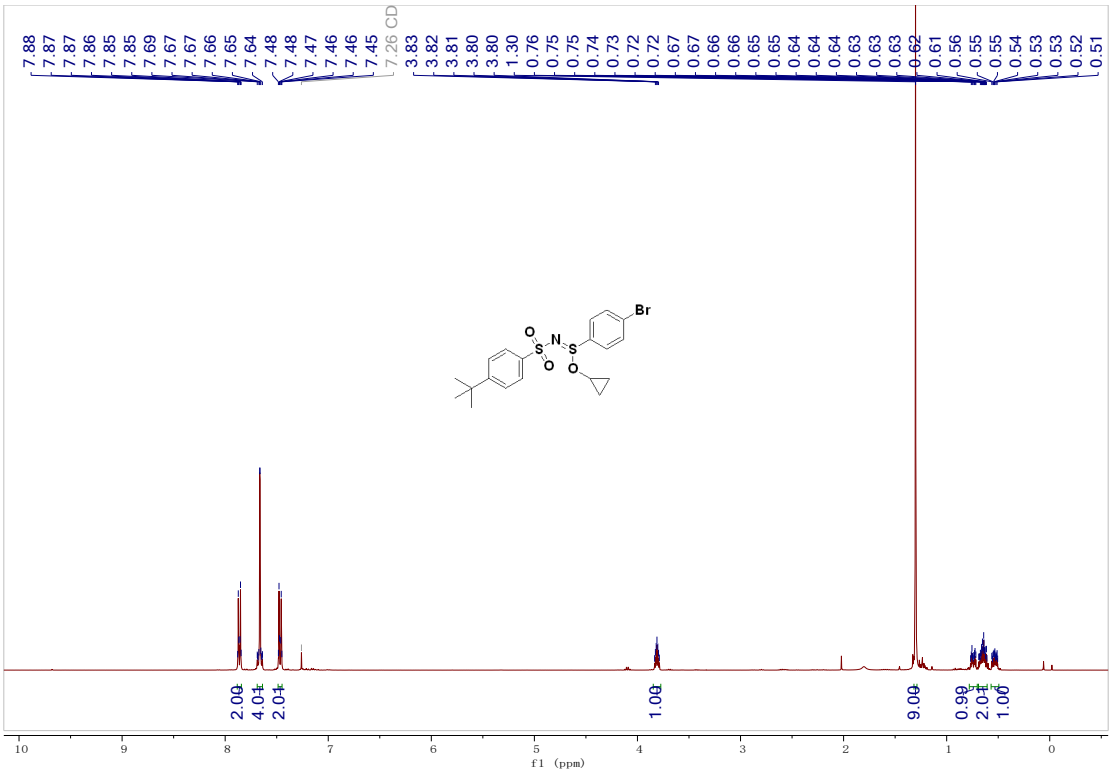
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6af**



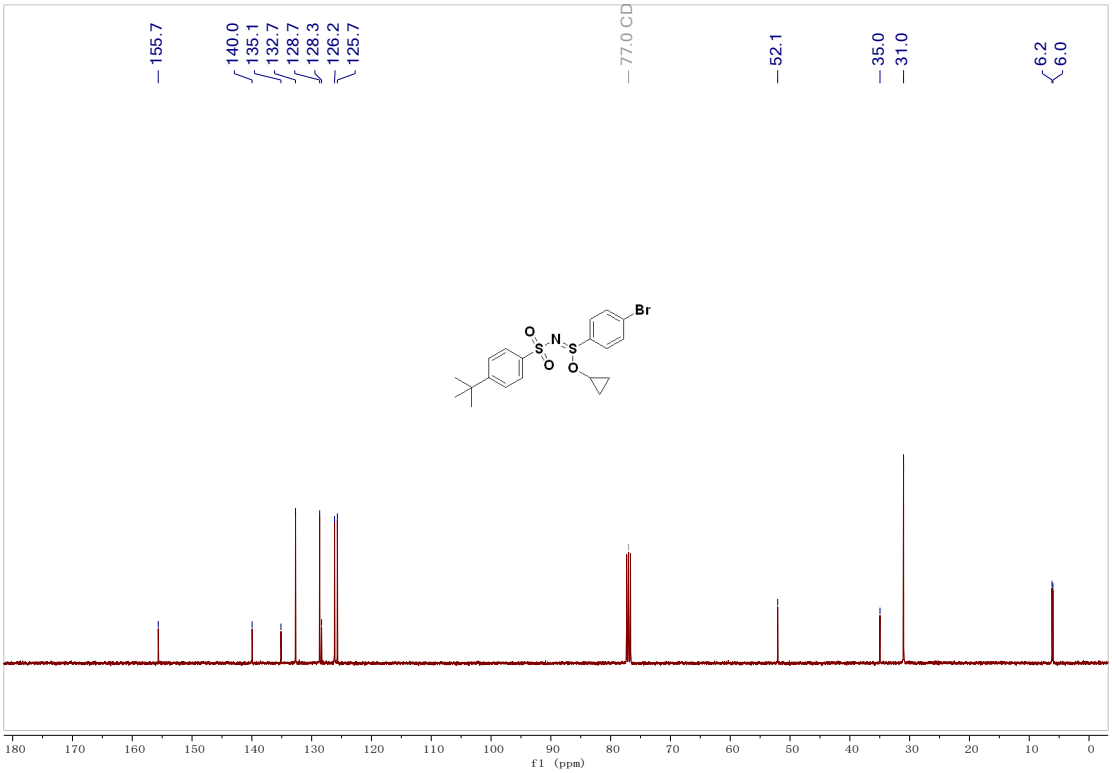
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6af**



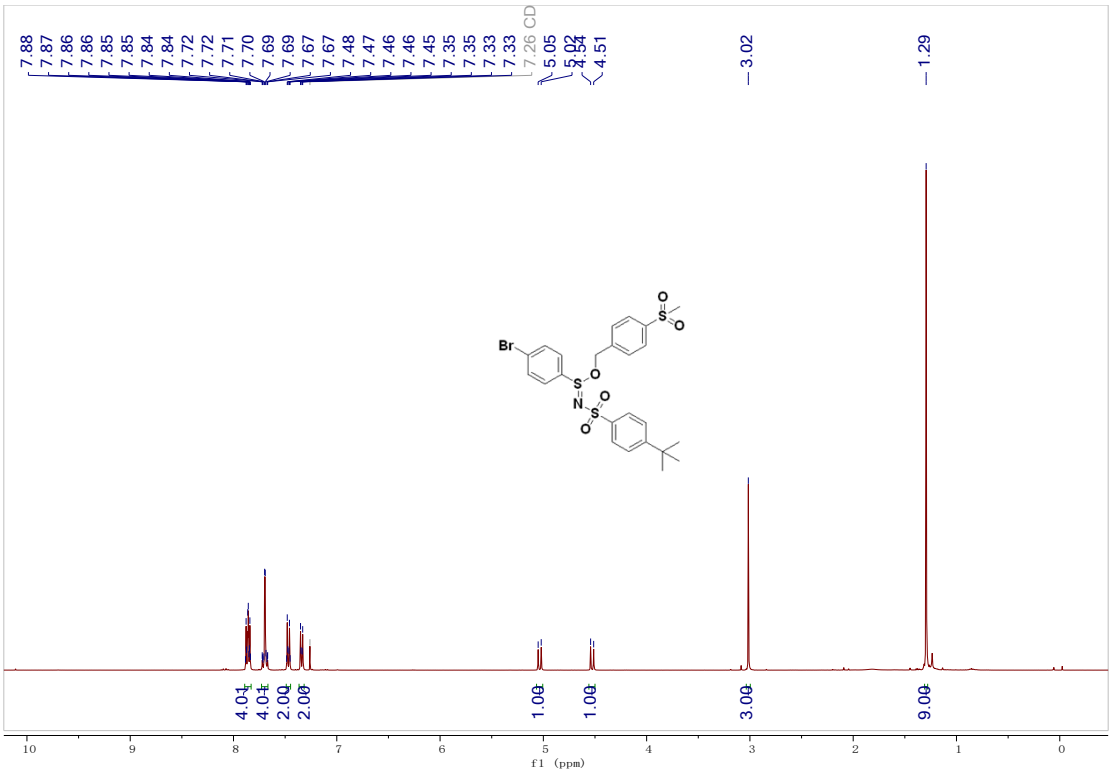
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ag**



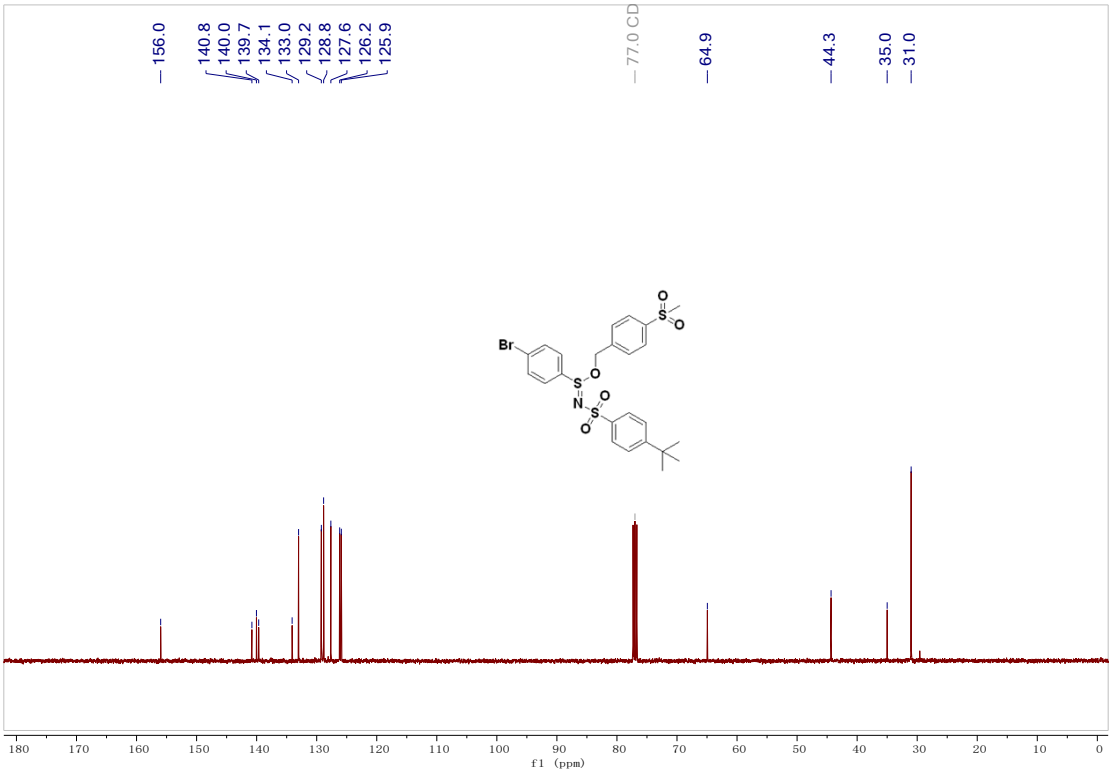
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ag**



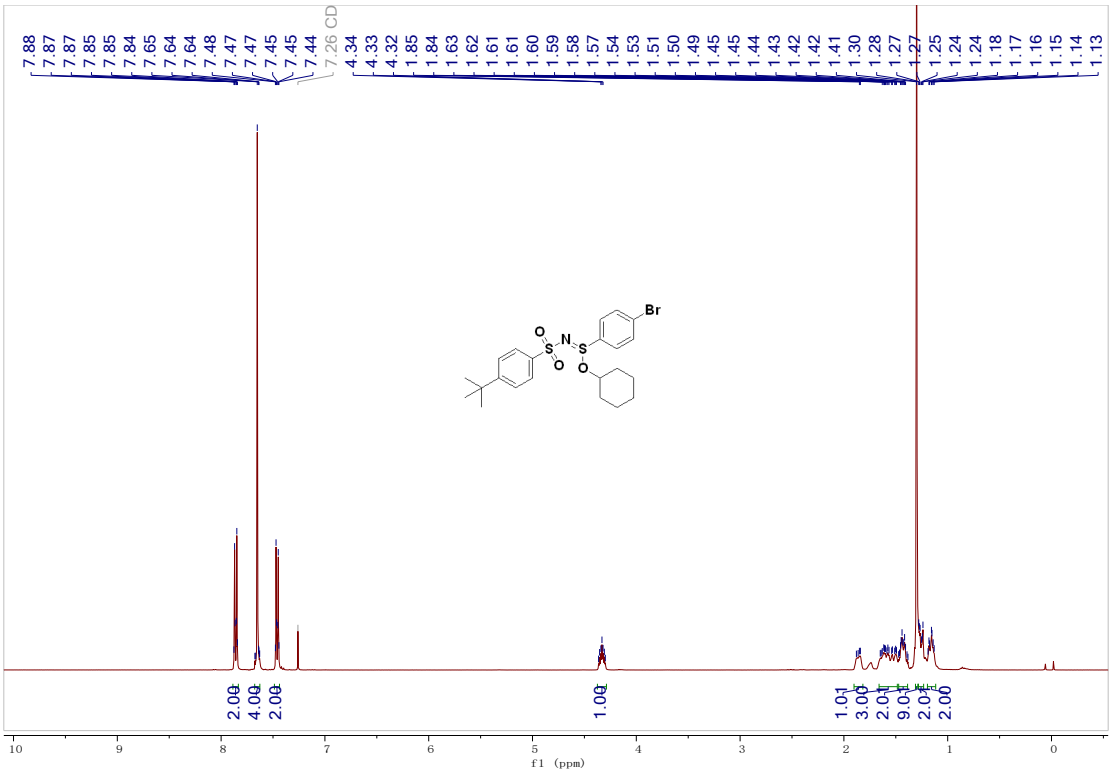
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ah**



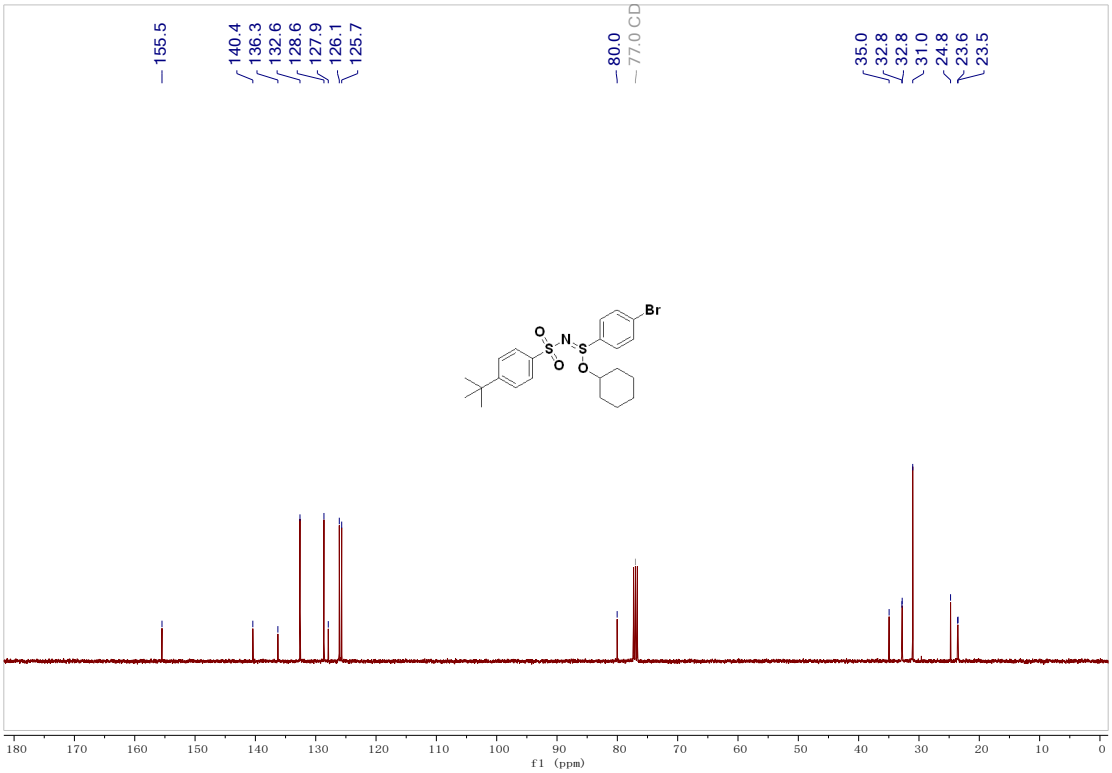
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ah**



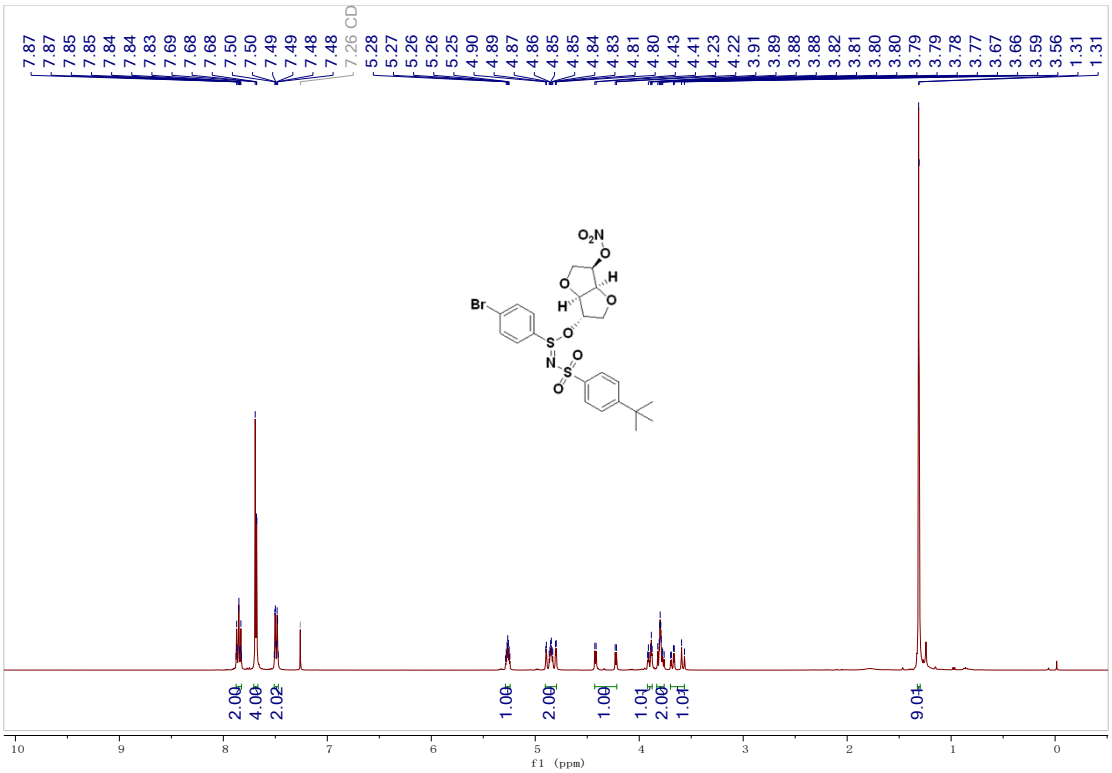
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ai**



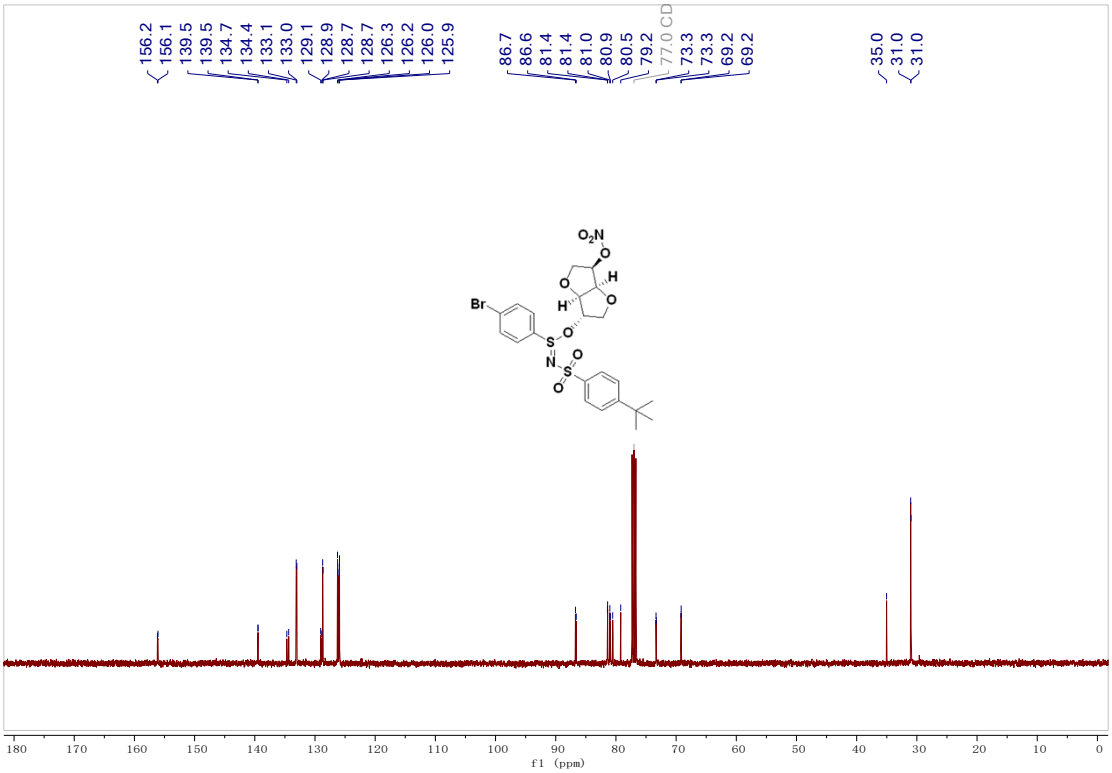
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ai**



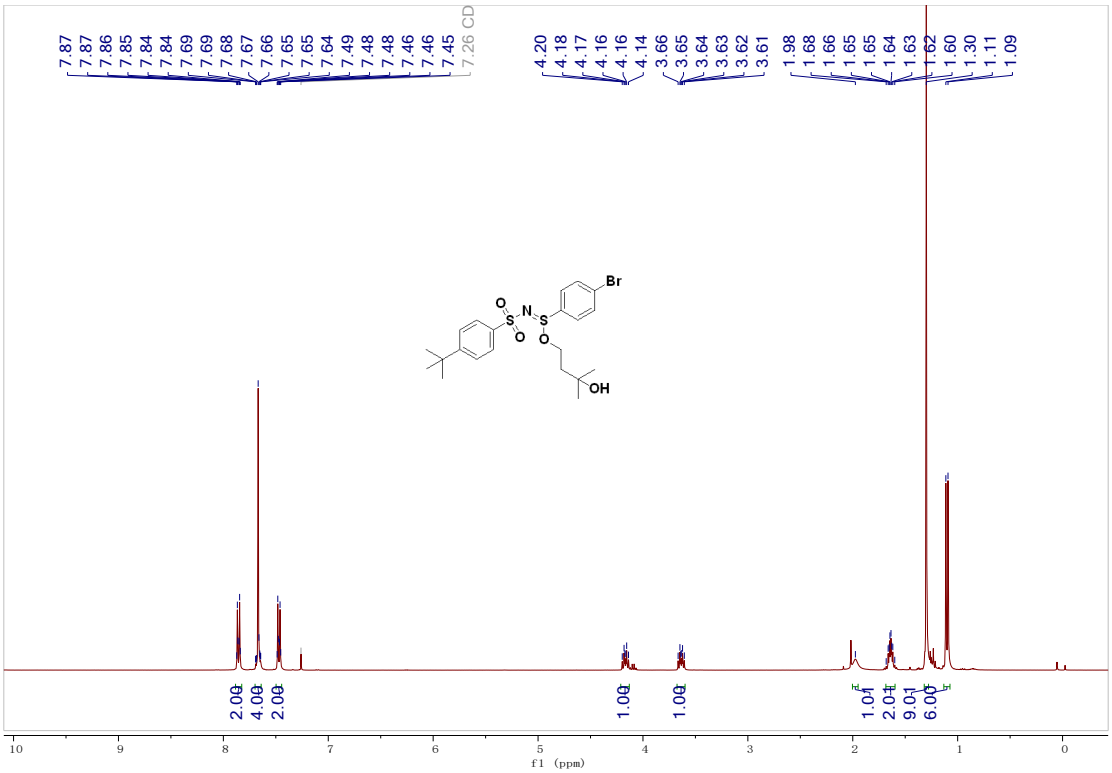
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6aj**



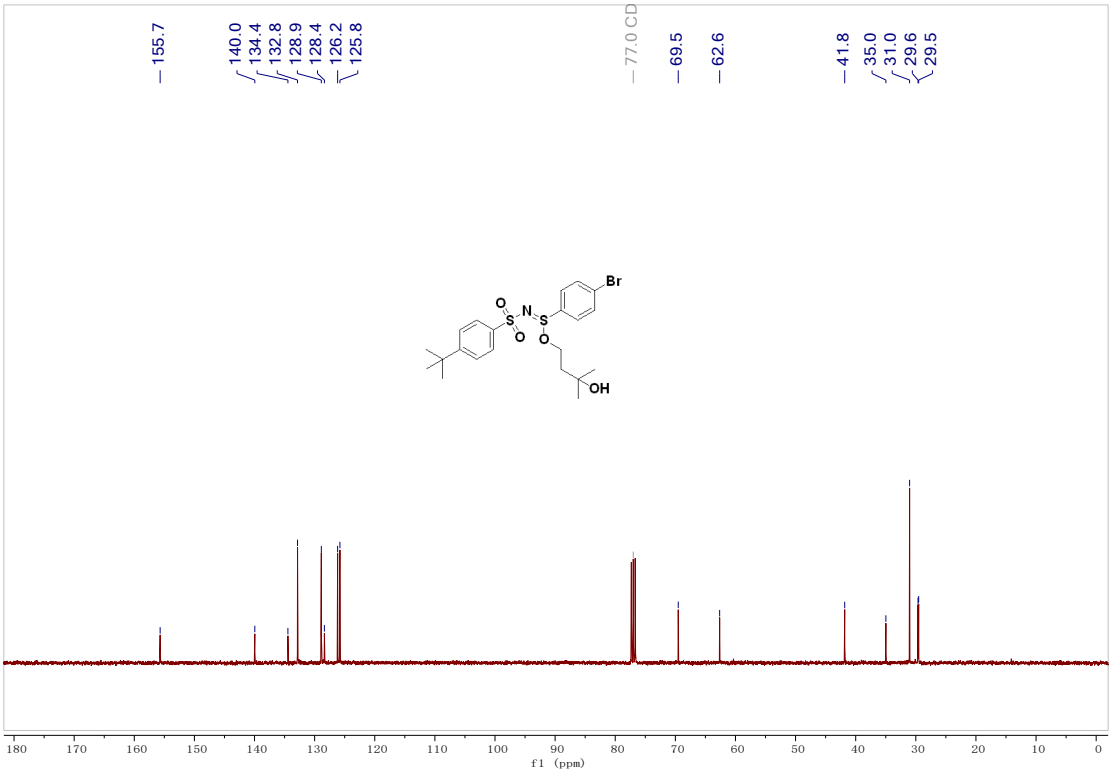
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6aj**



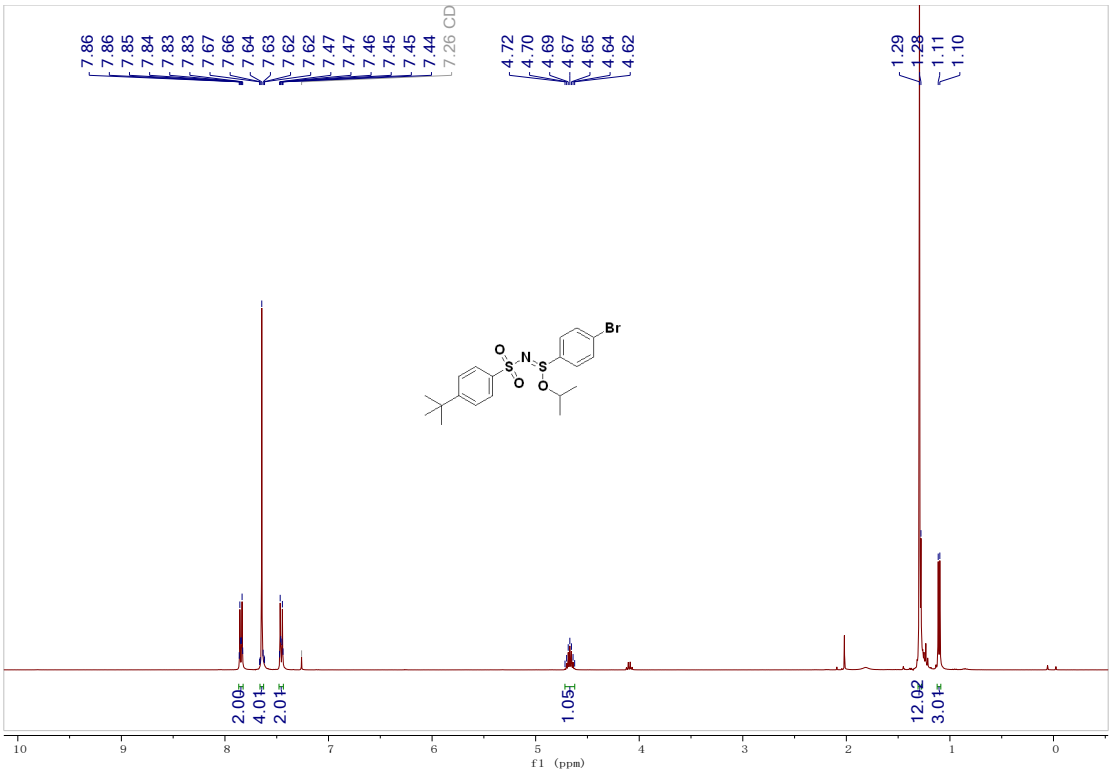
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6ak**



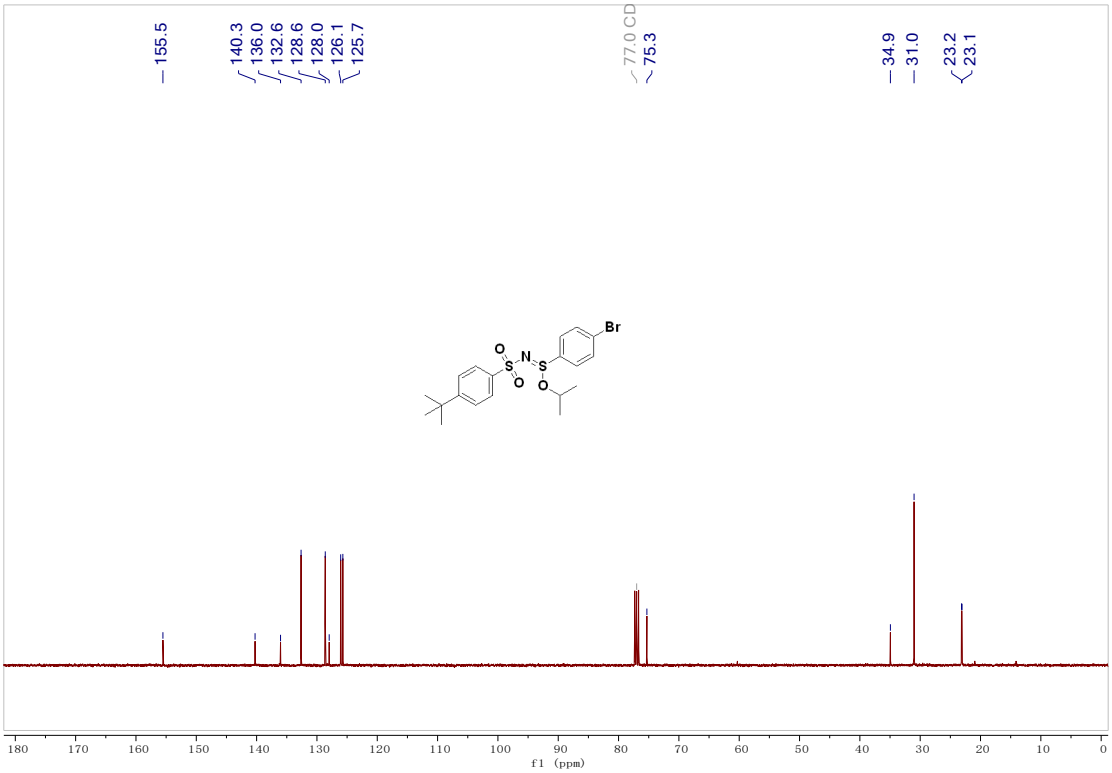
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6ak**



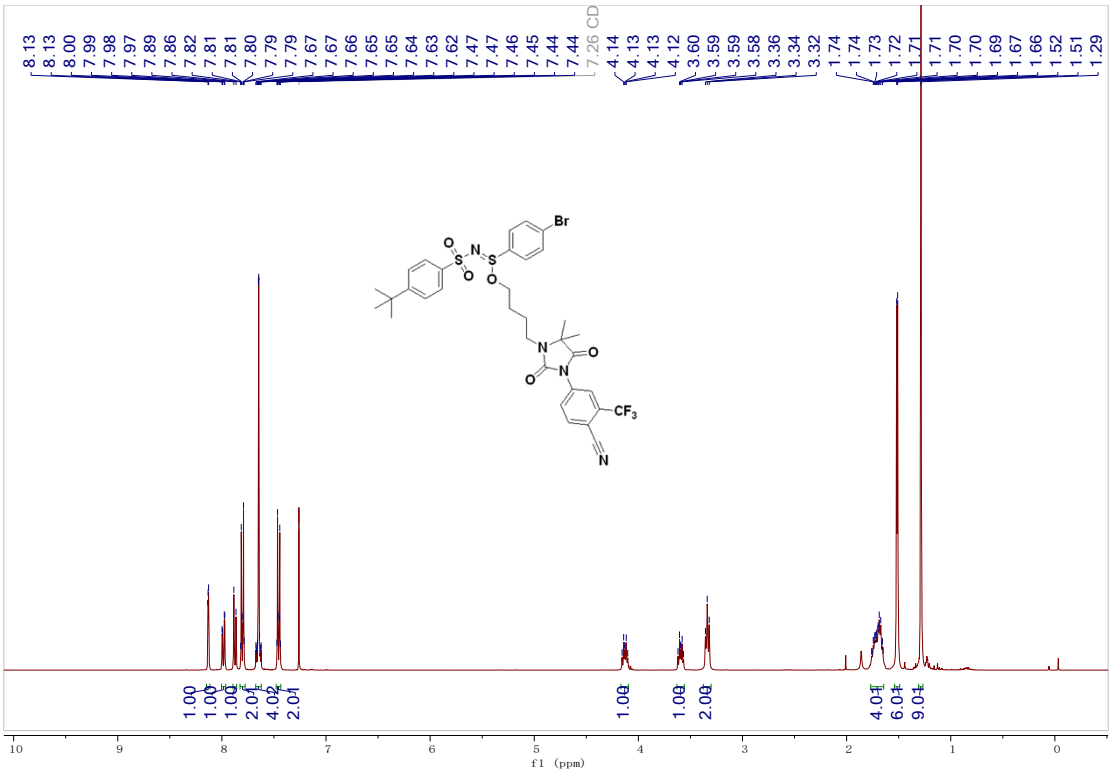
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6al**



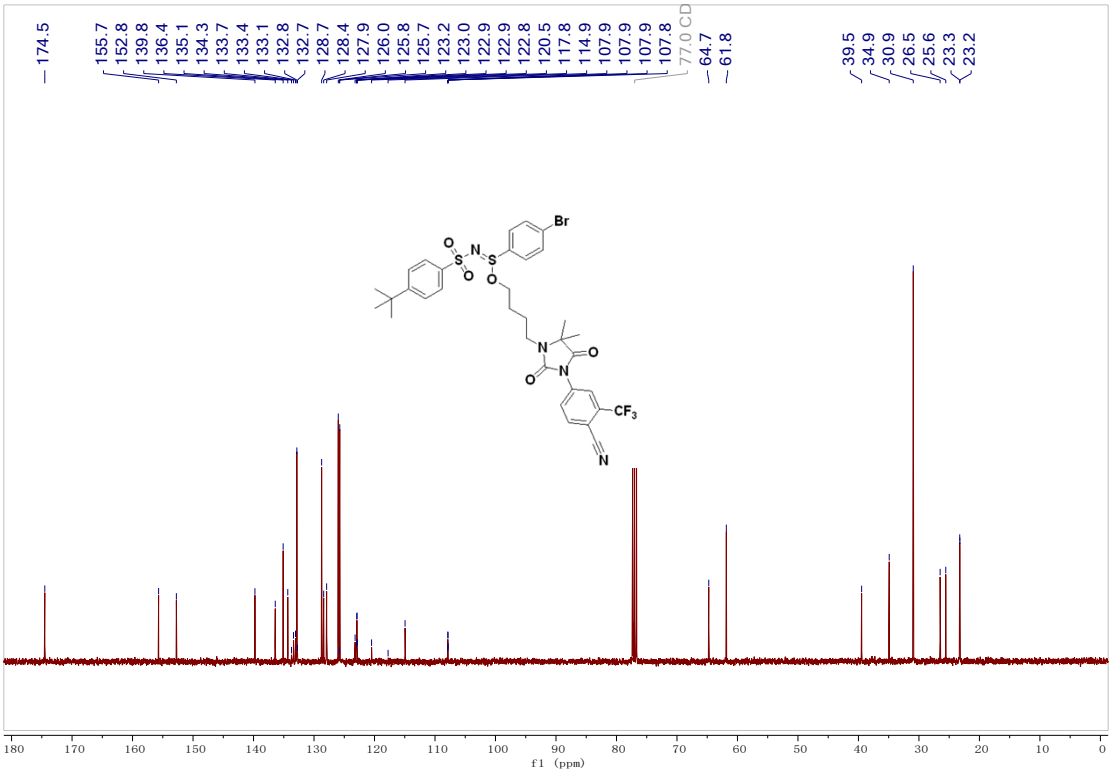
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6al**



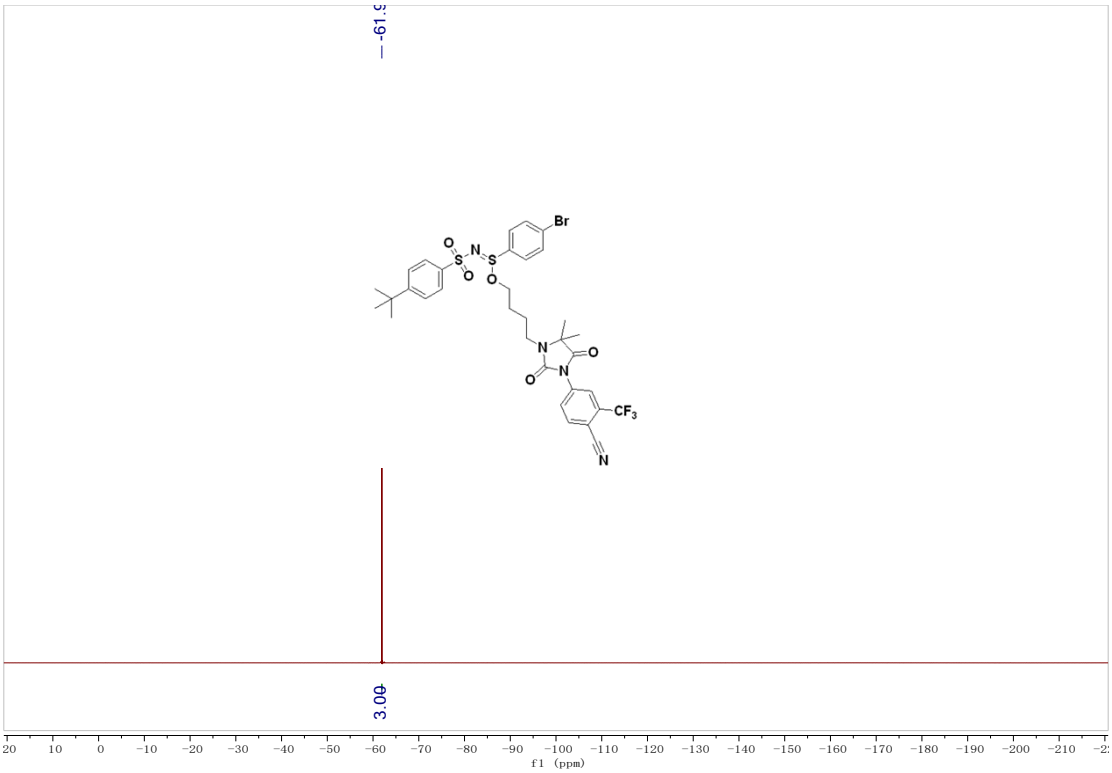
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **6am**



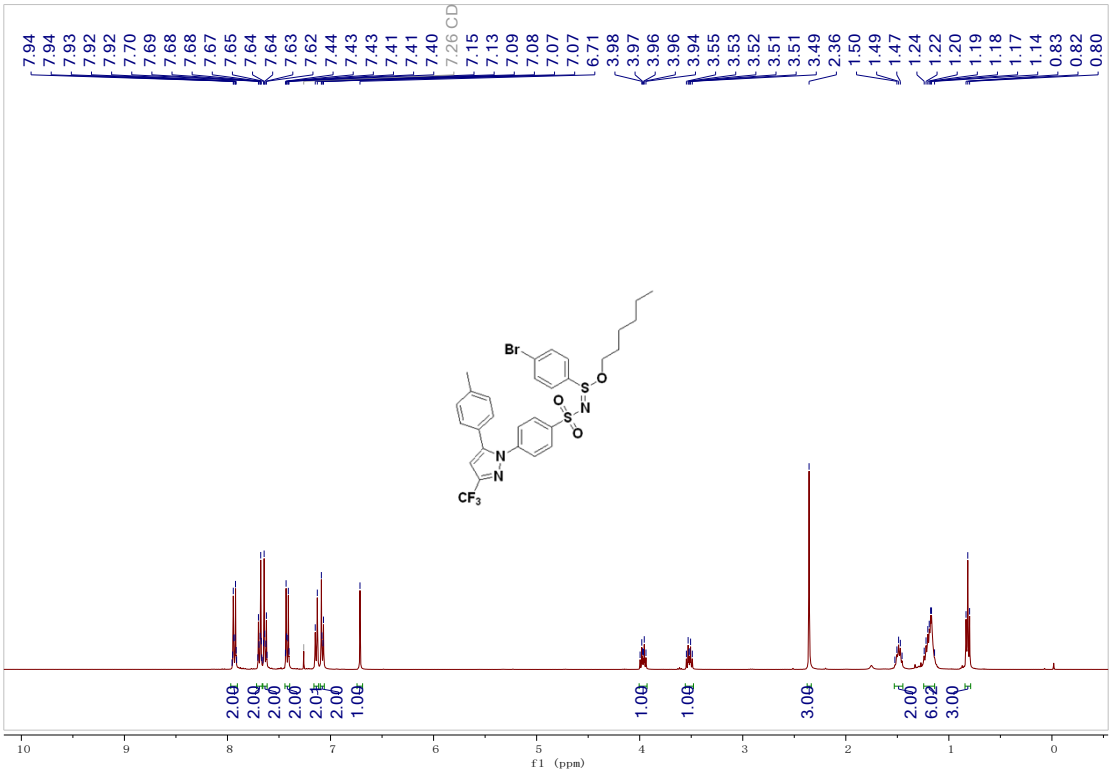
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **6am**



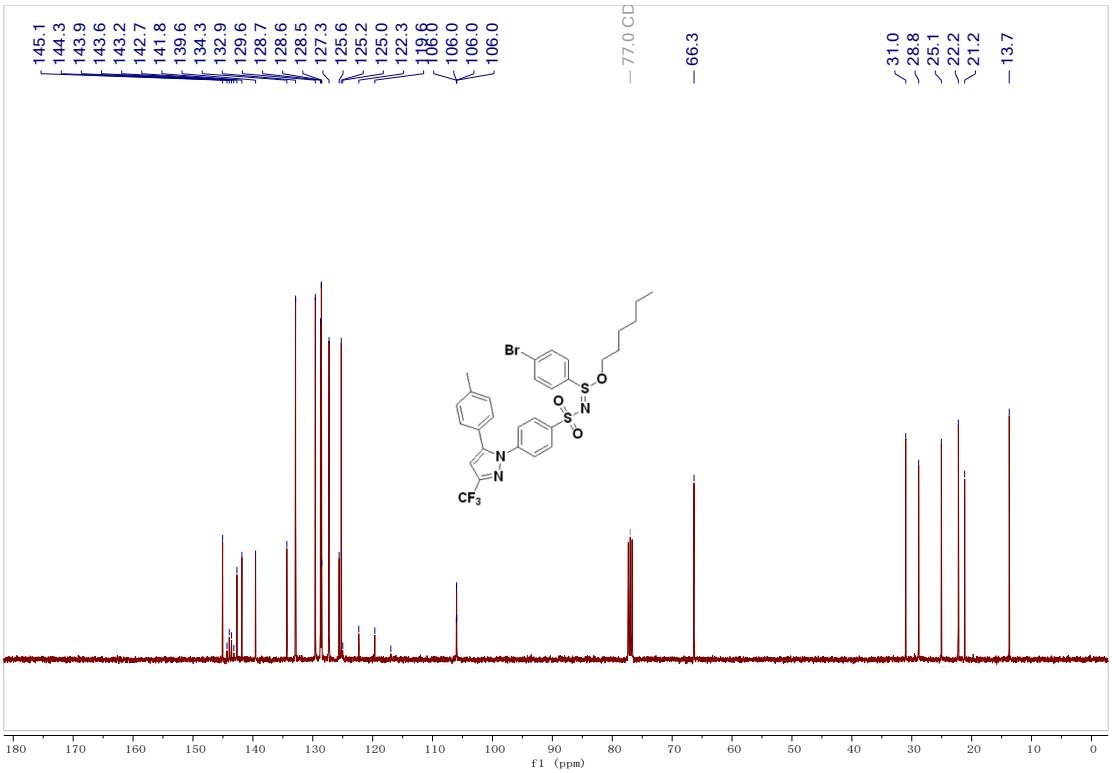
^{19}F NMR (376 MHz, Chloroform-d) of compound **6am**



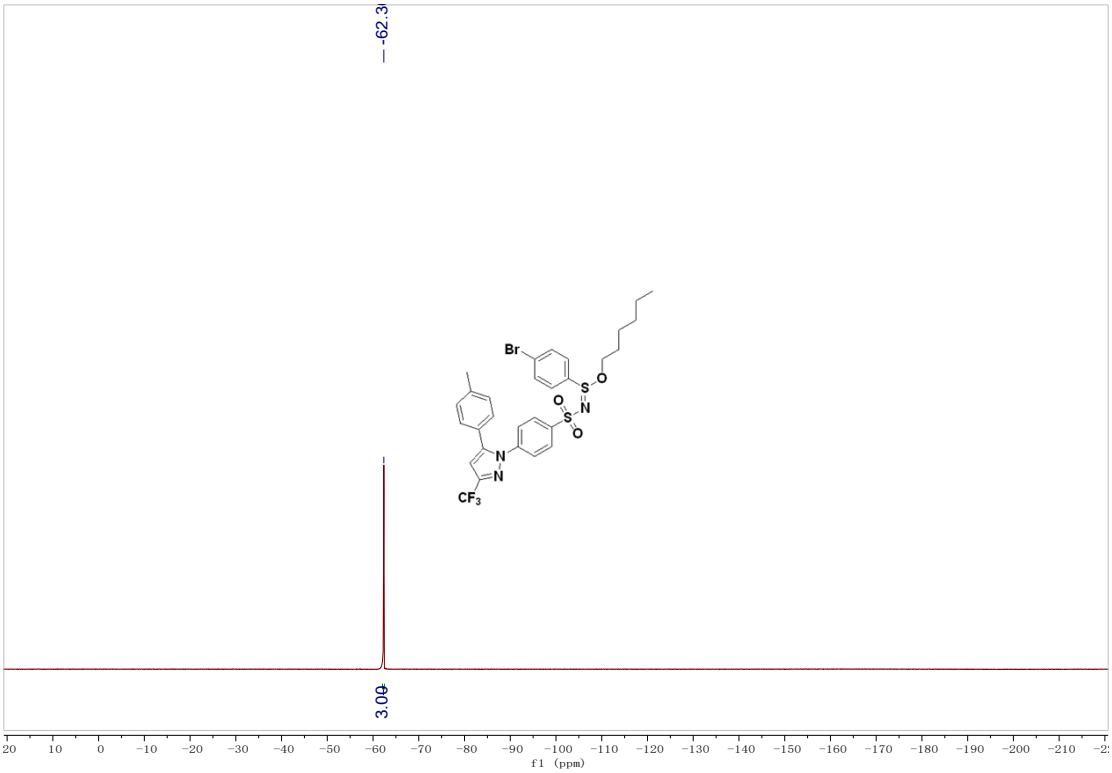
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7a**



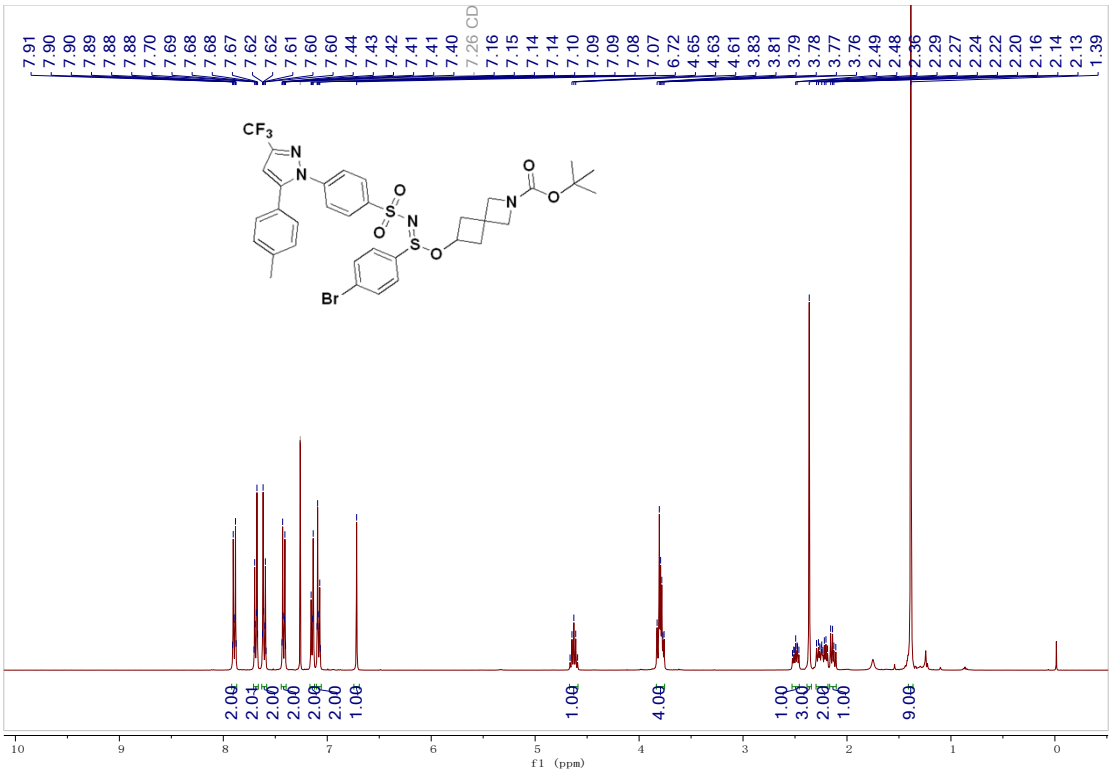
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7a**



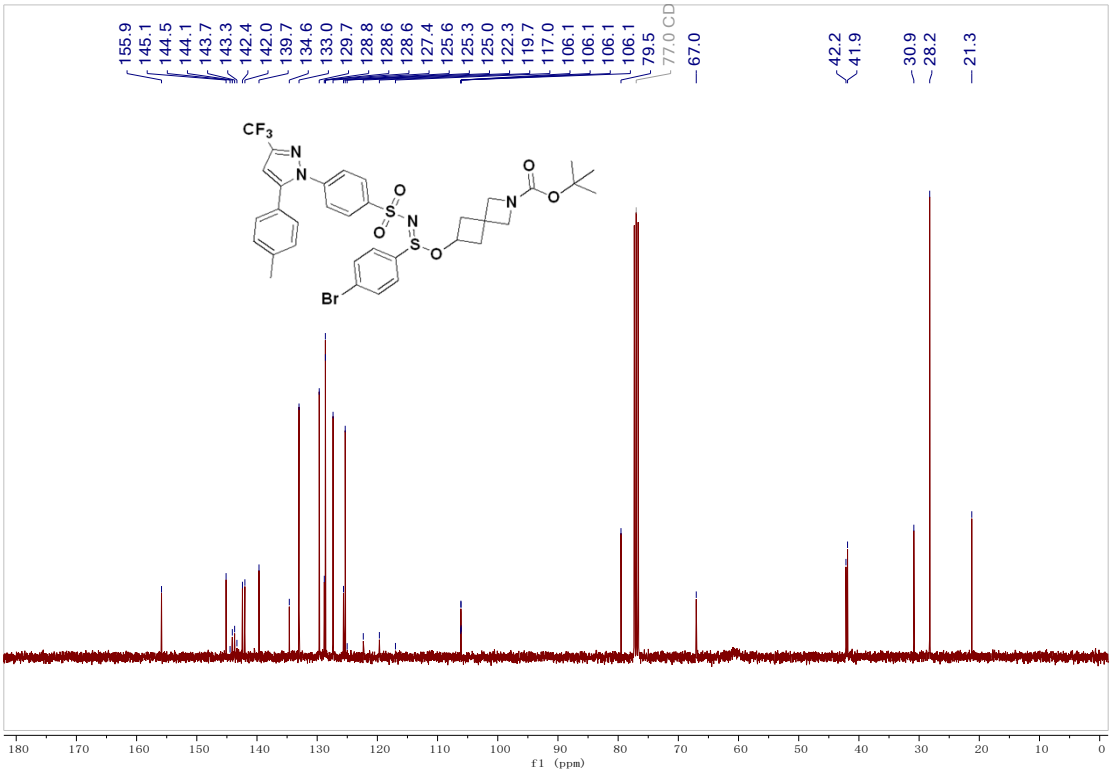
^{19}F NMR (376 MHz, Chloroform-d) of compound **7a**



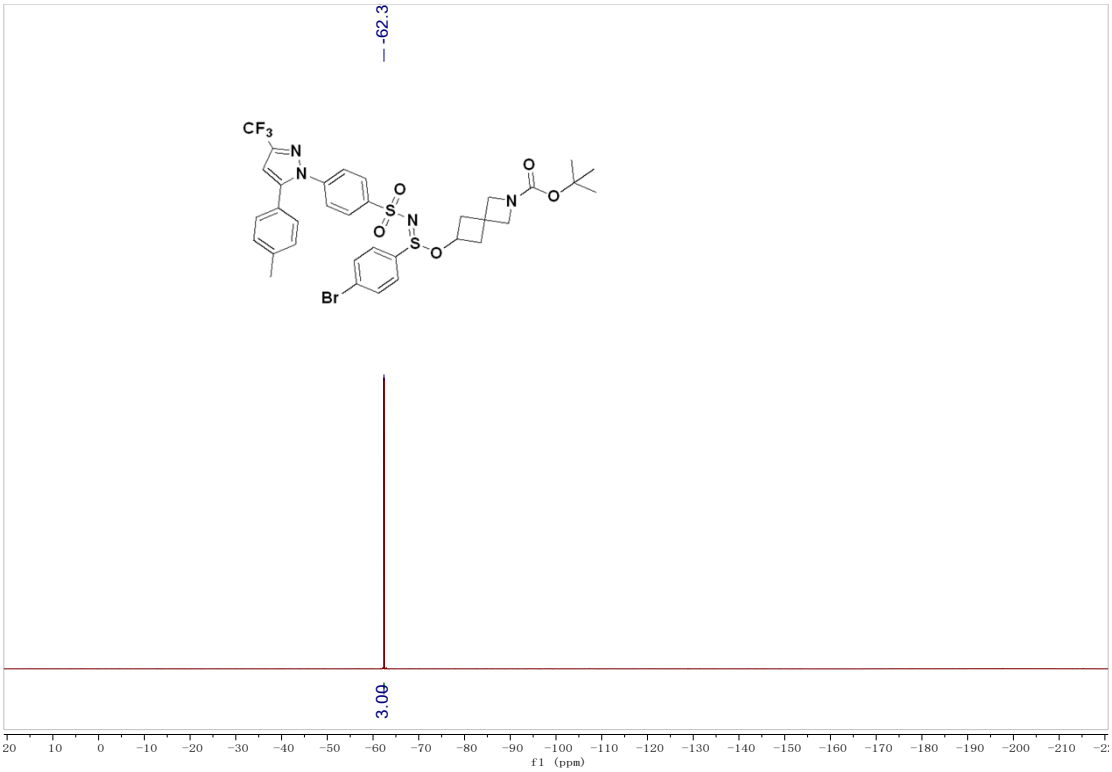
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7b**



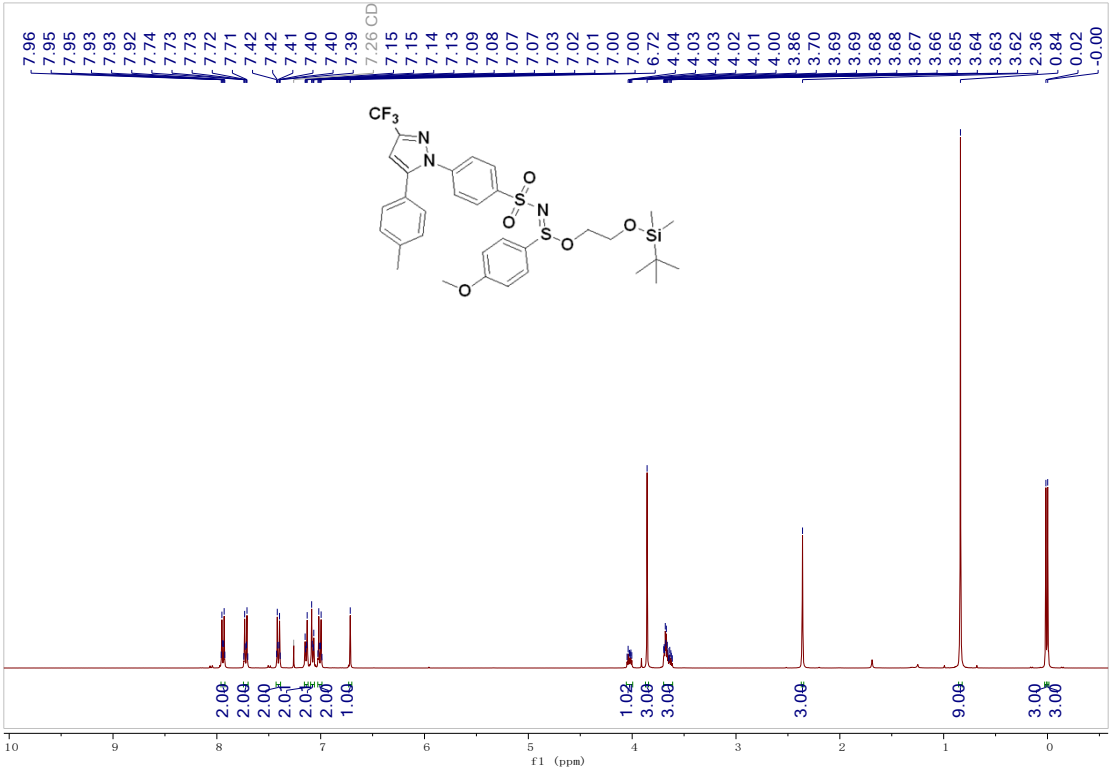
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7b**



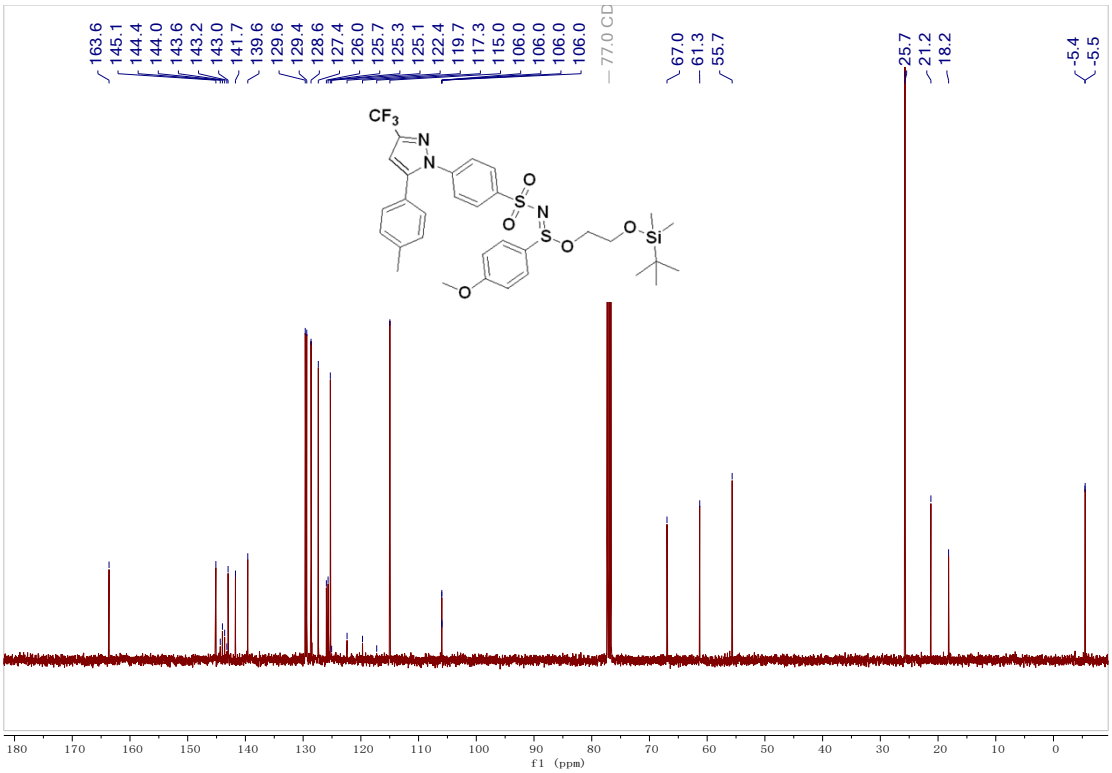
^{19}F NMR (376 MHz, Chloroform-d) of compound **7b**



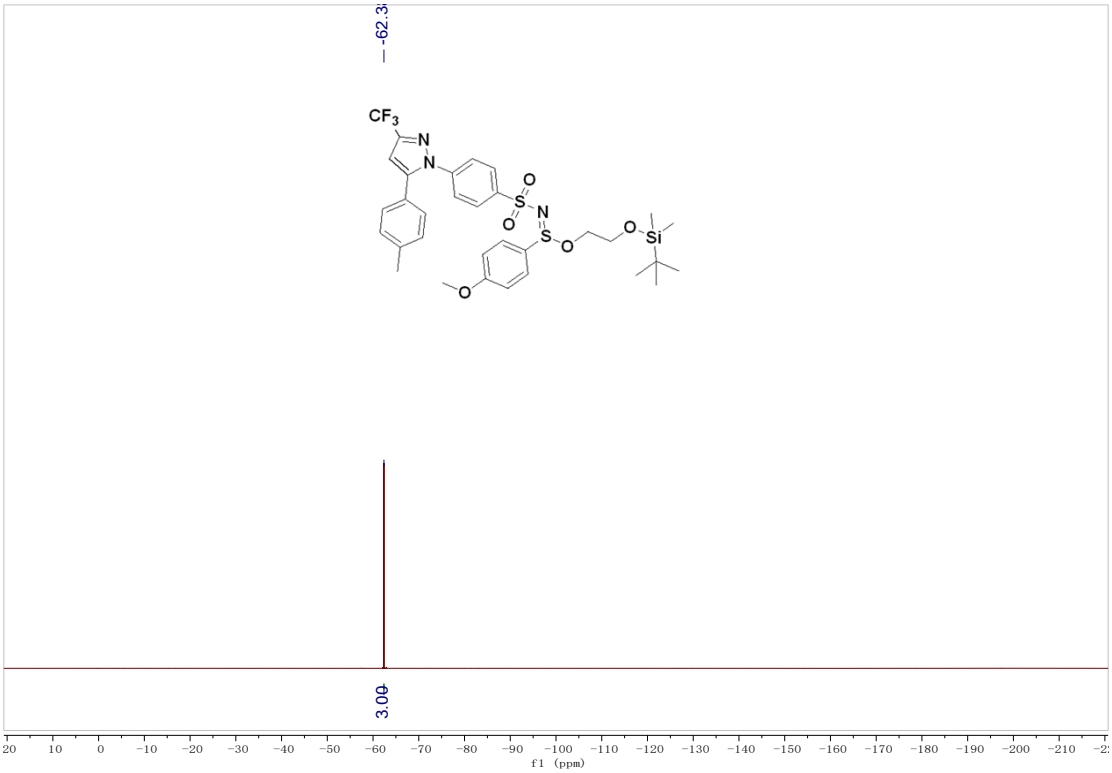
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7c**



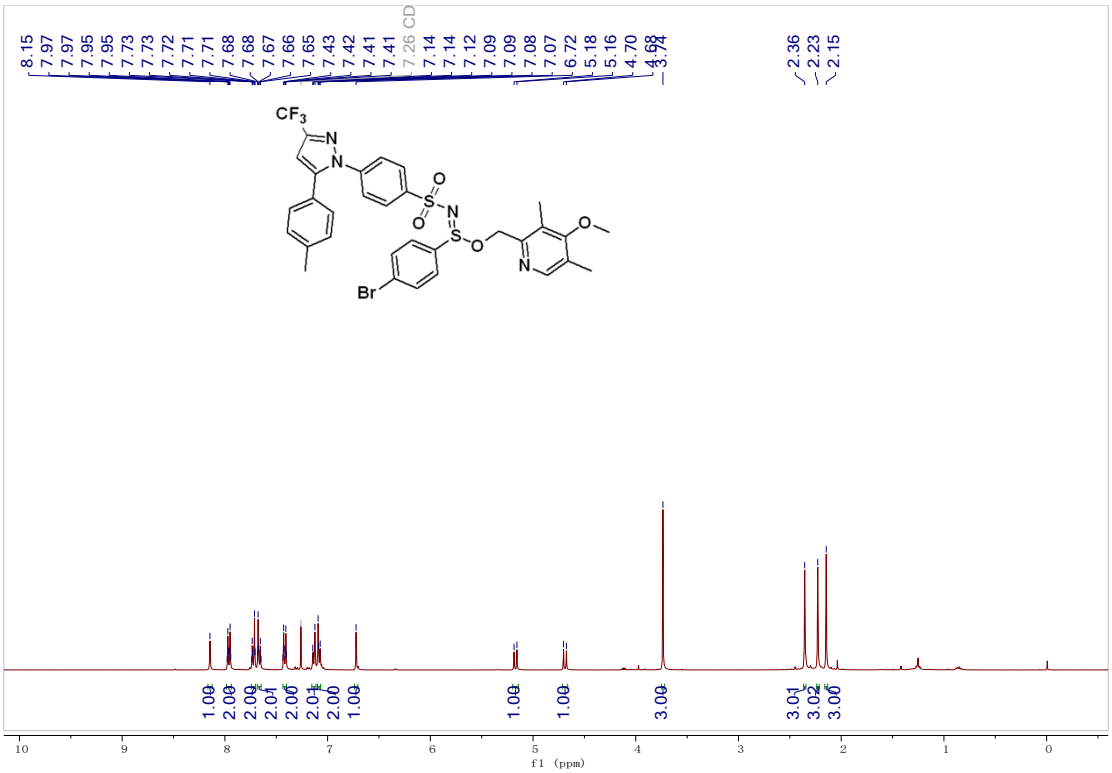
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7c**



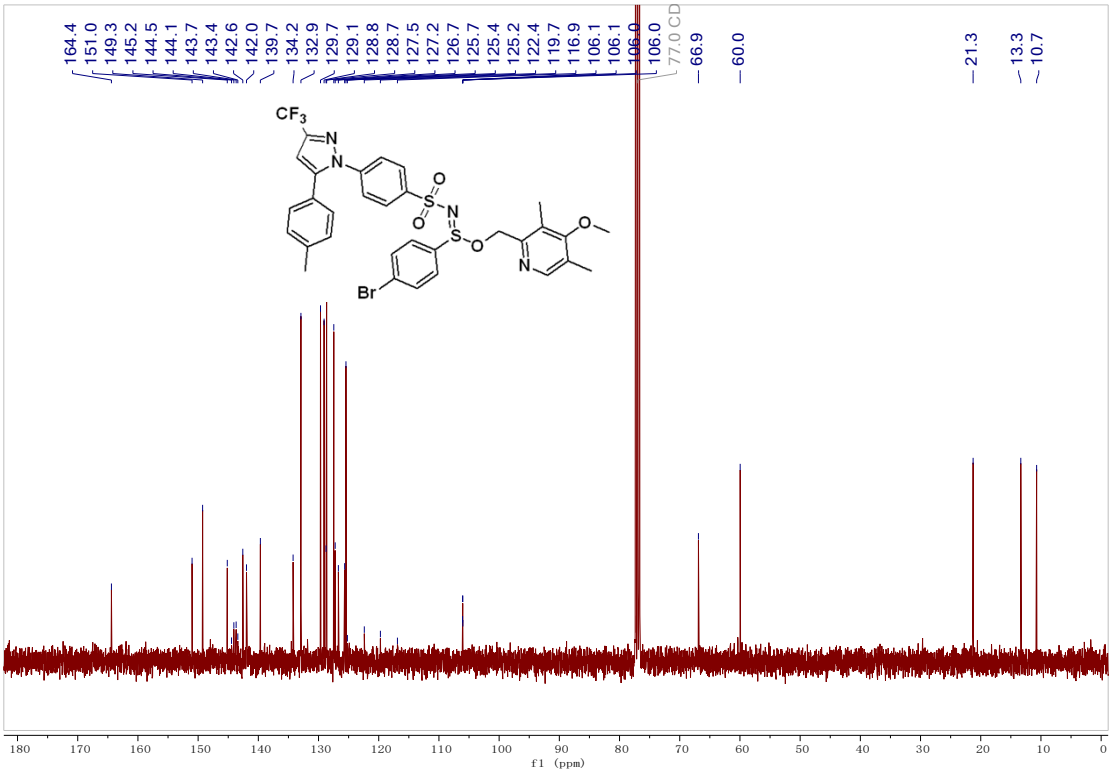
^{19}F NMR (376 MHz, Chloroform-d) of compound **7c**



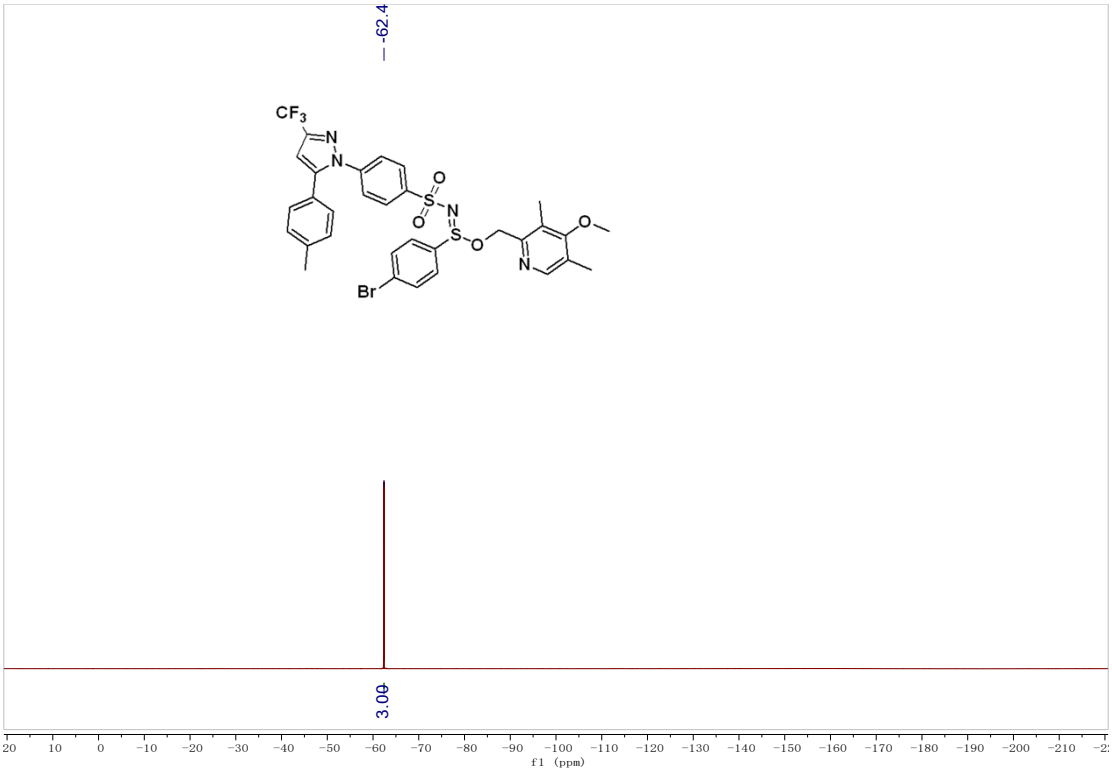
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7d**



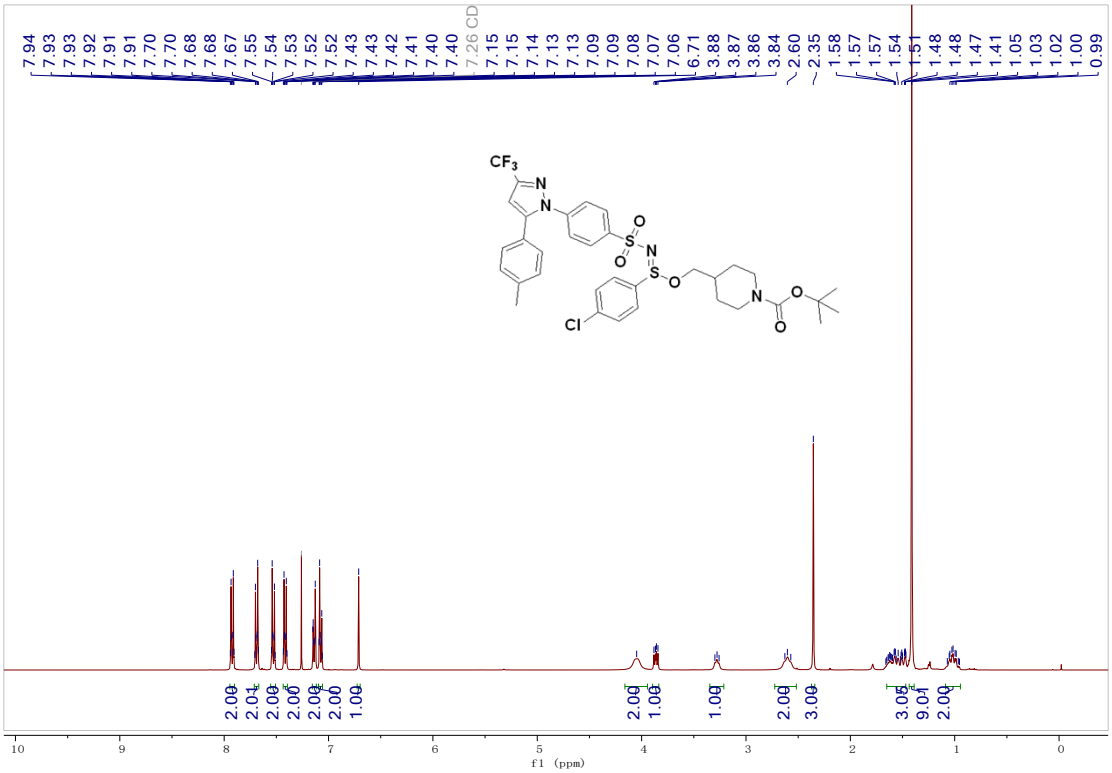
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7d**



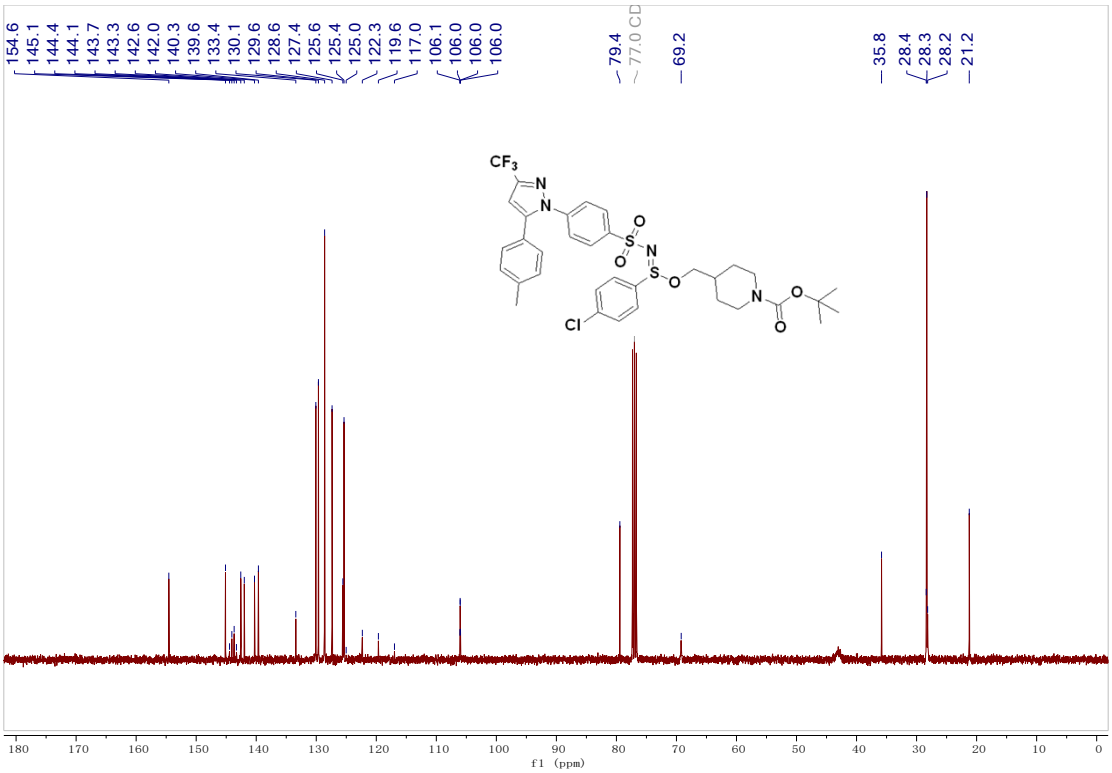
^{19}F NMR (376 MHz, Chloroform-d) of compound **7d**



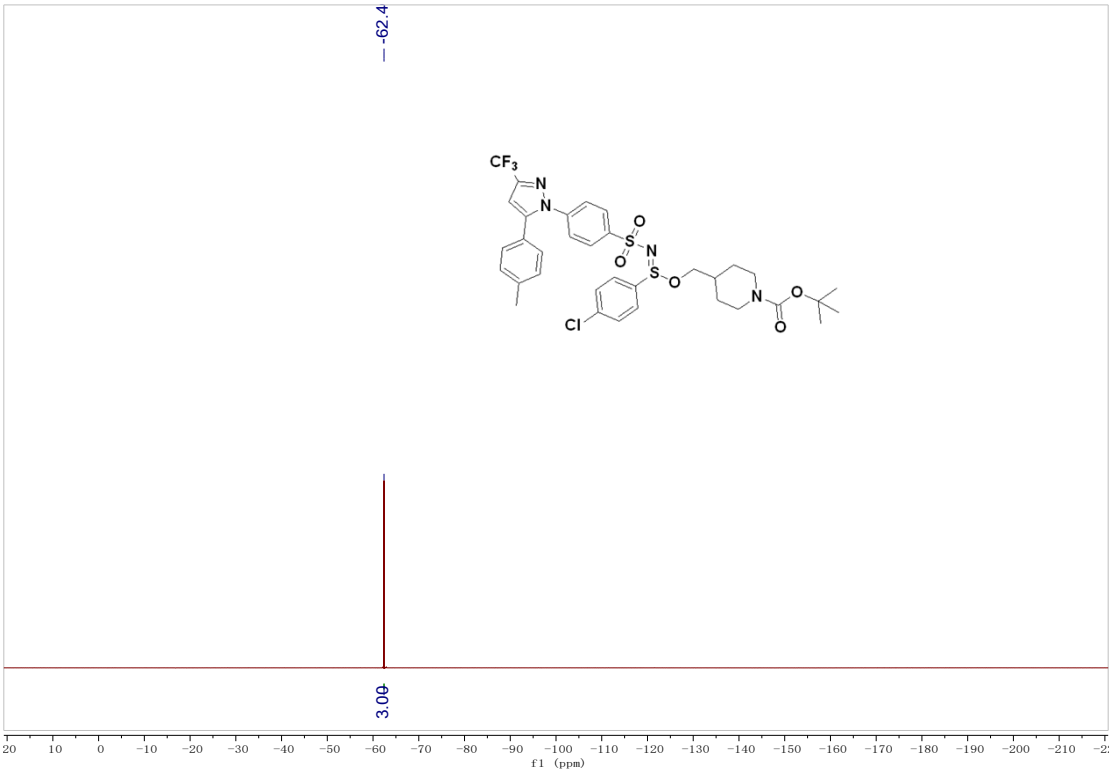
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7e**



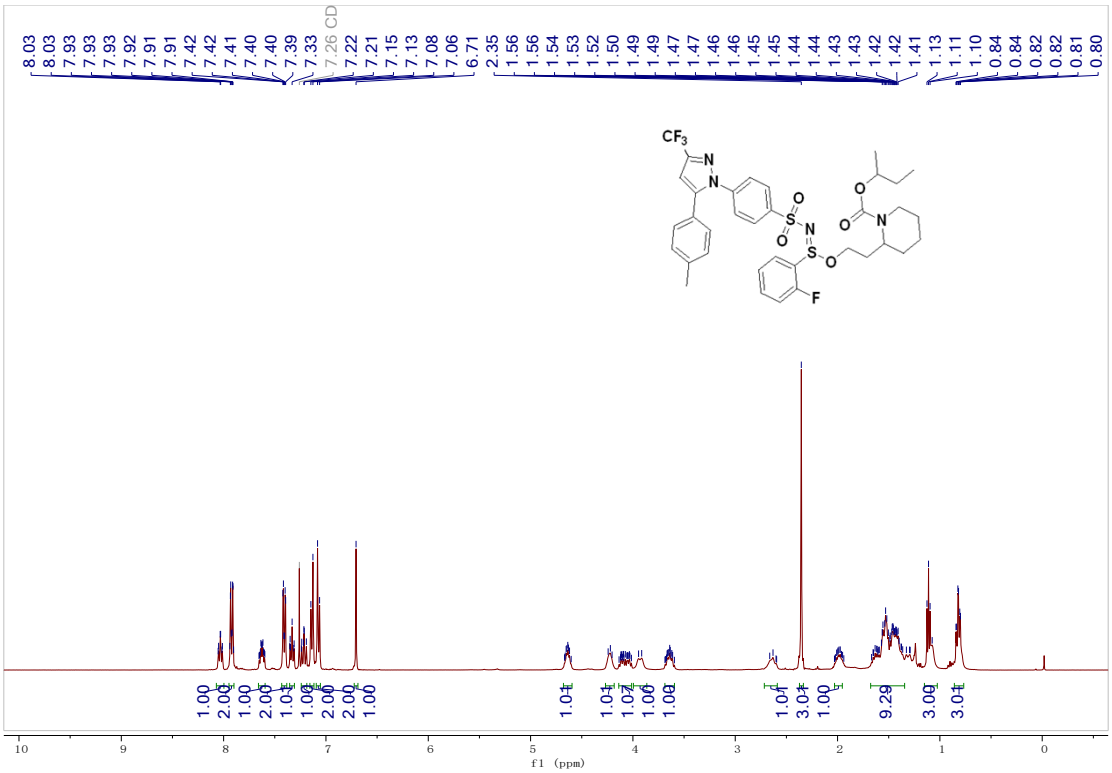
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7e**



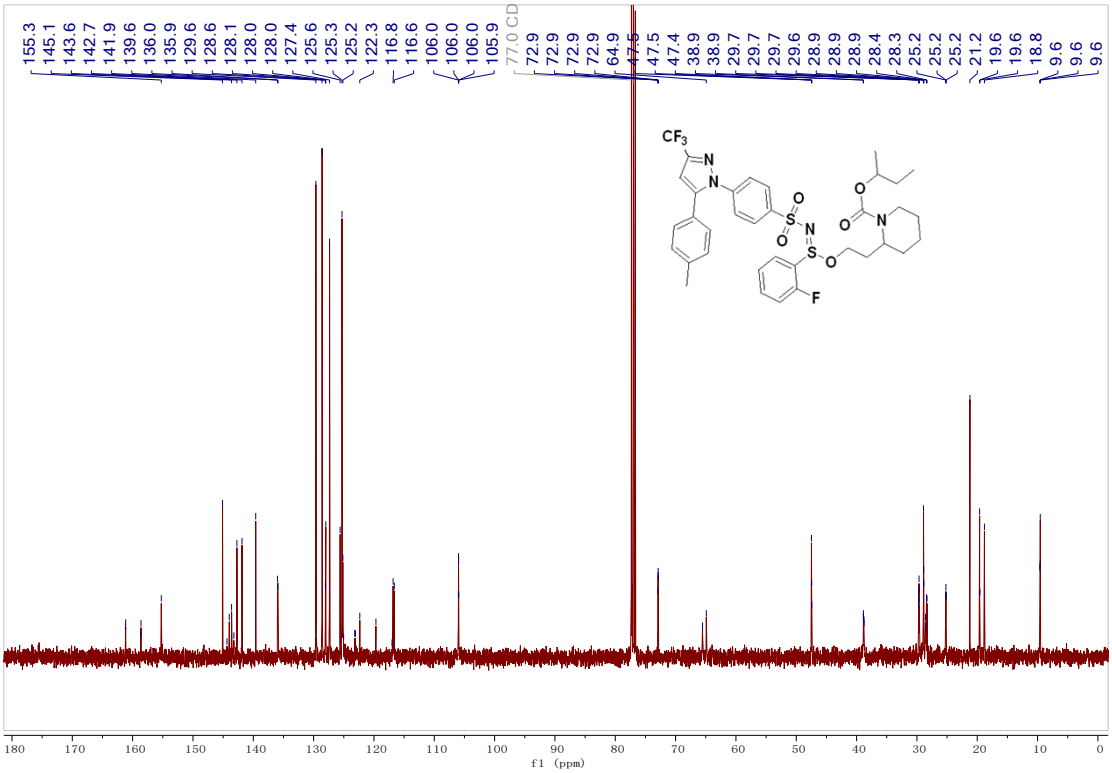
^{19}F NMR (376 MHz, Chloroform-d) of compound **7e**



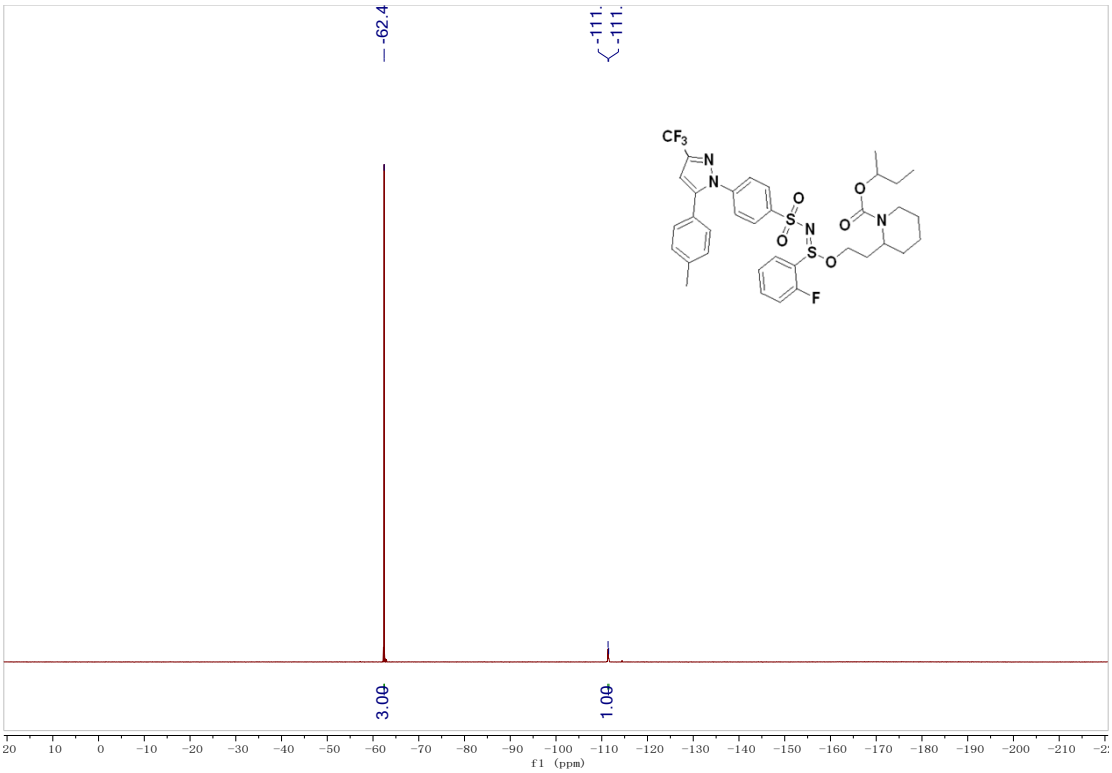
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7f**



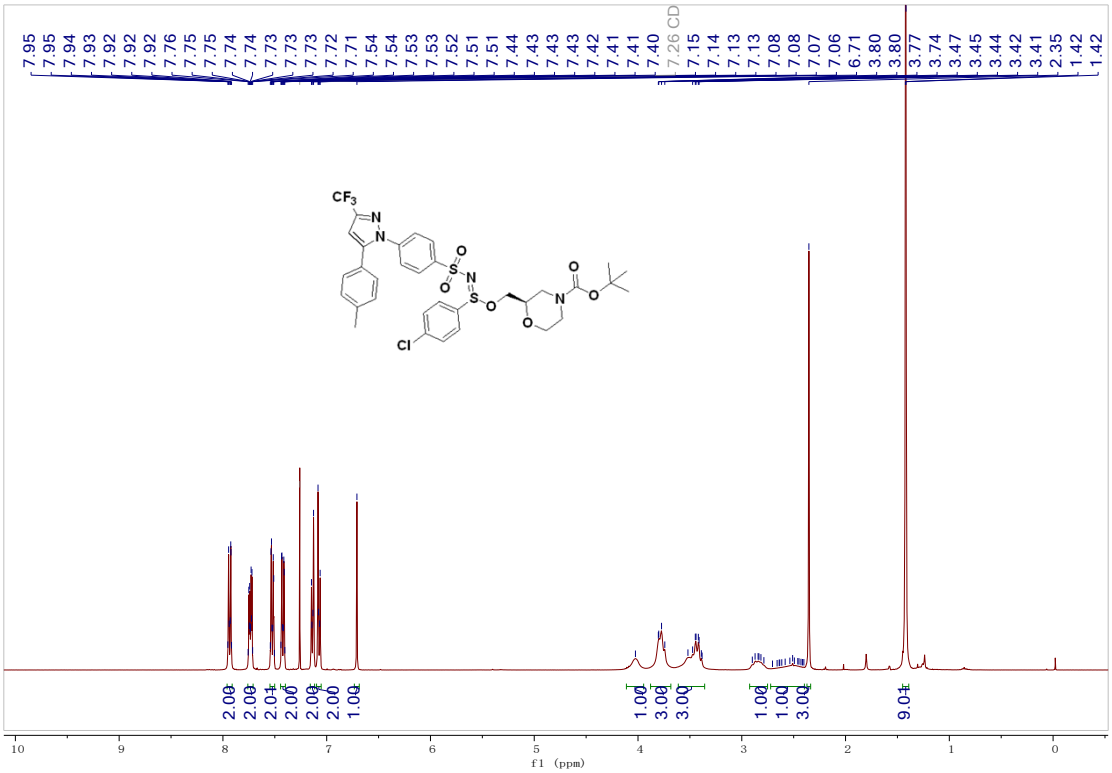
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7f**



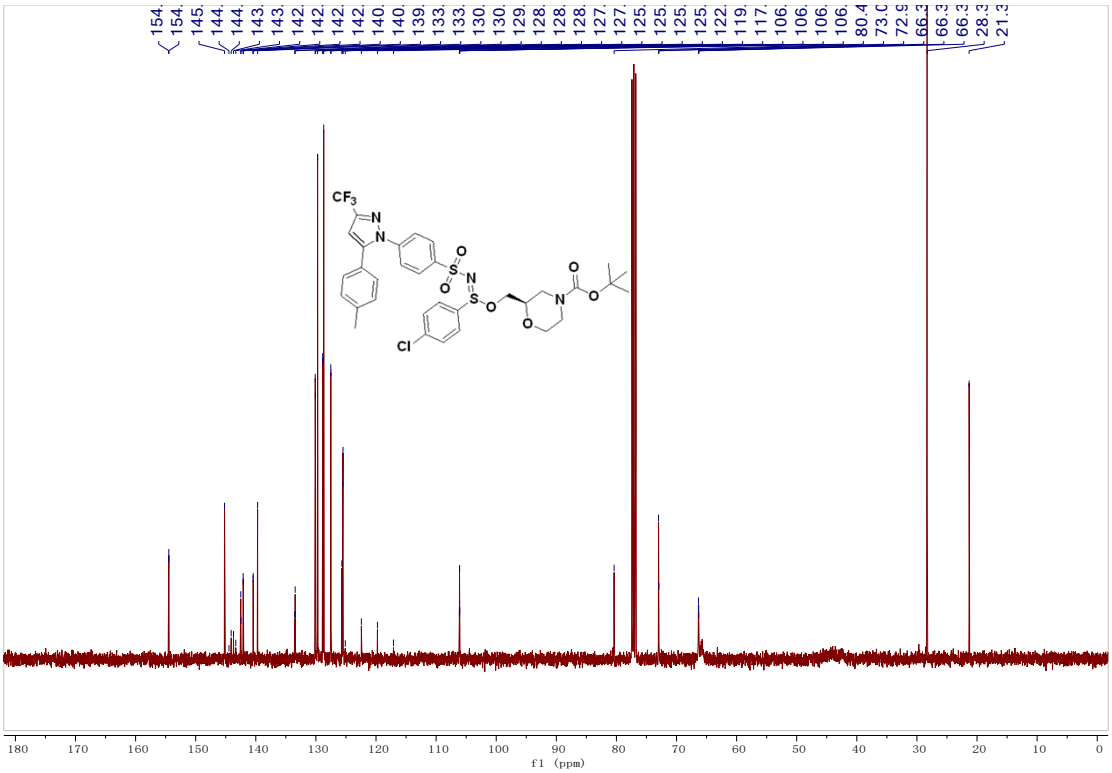
^{19}F NMR (376 MHz, Chloroform-d) of compound **7f**



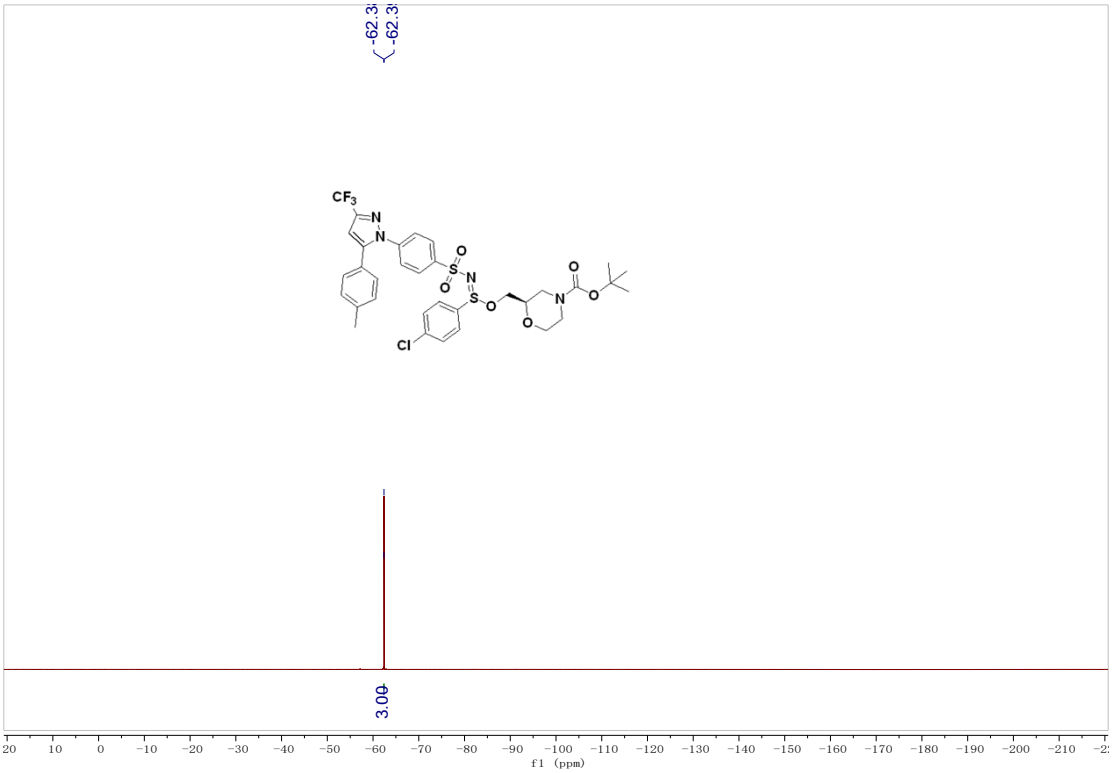
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7g**



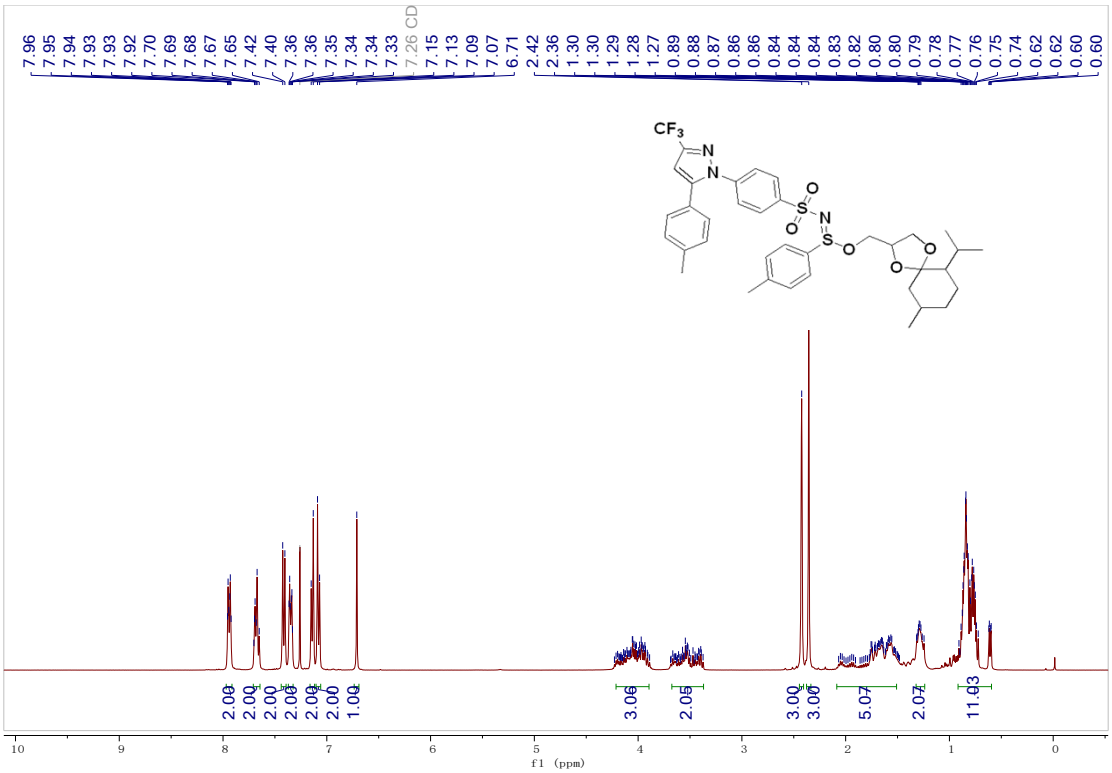
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7g**



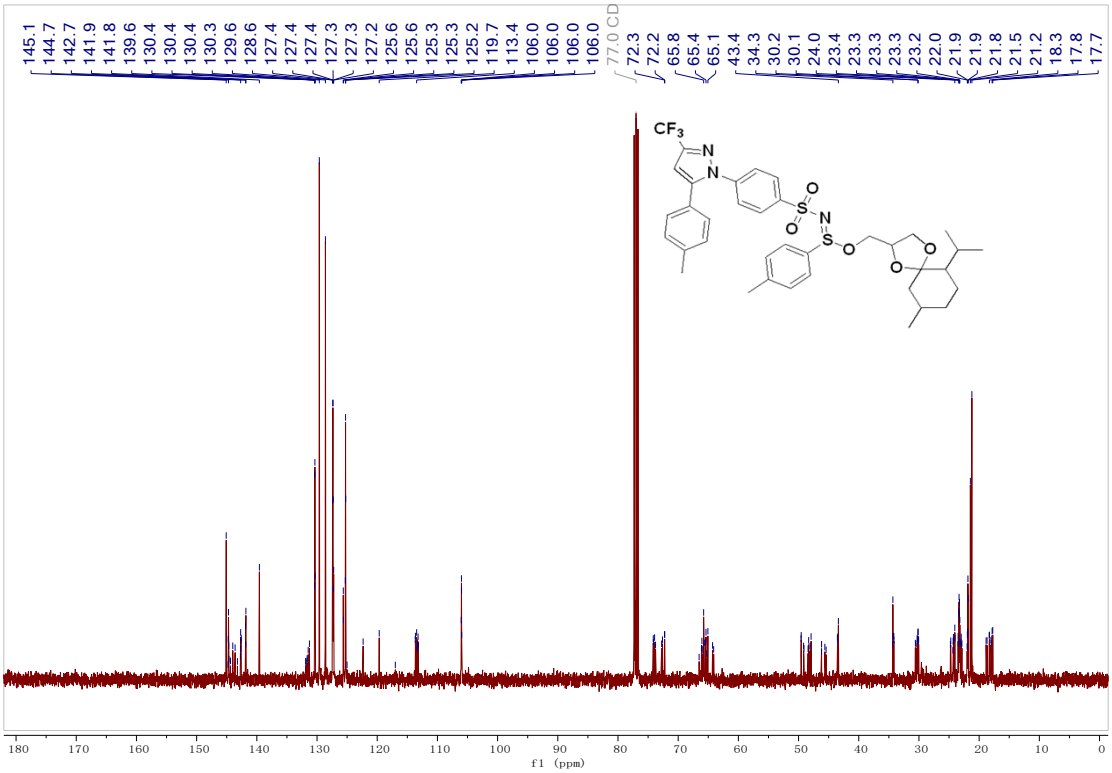
^{19}F NMR (376 MHz, Chloroform-d) of compound **7g**



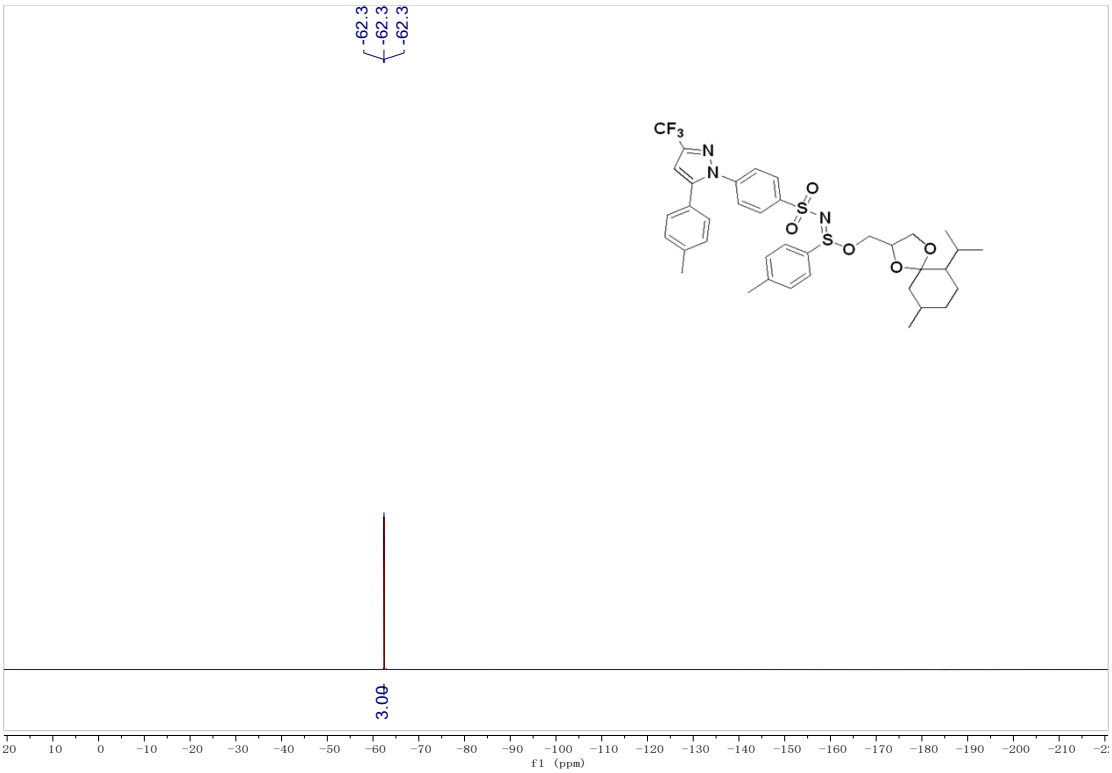
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **7h**



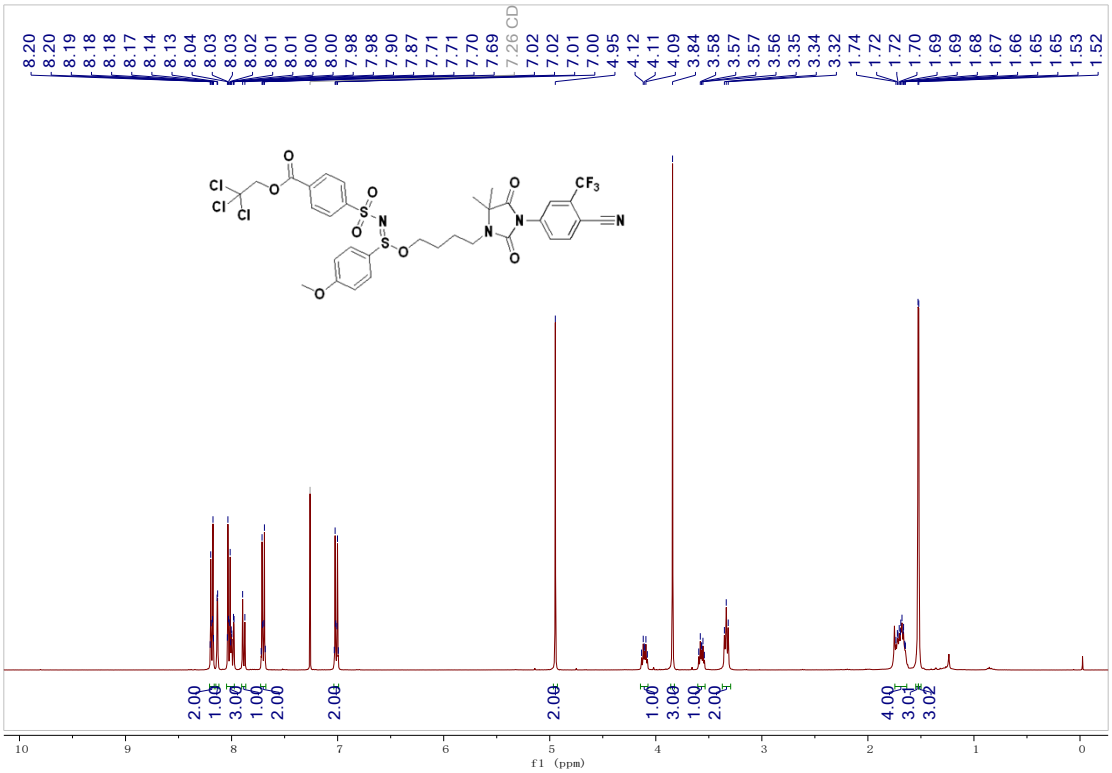
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **7h**



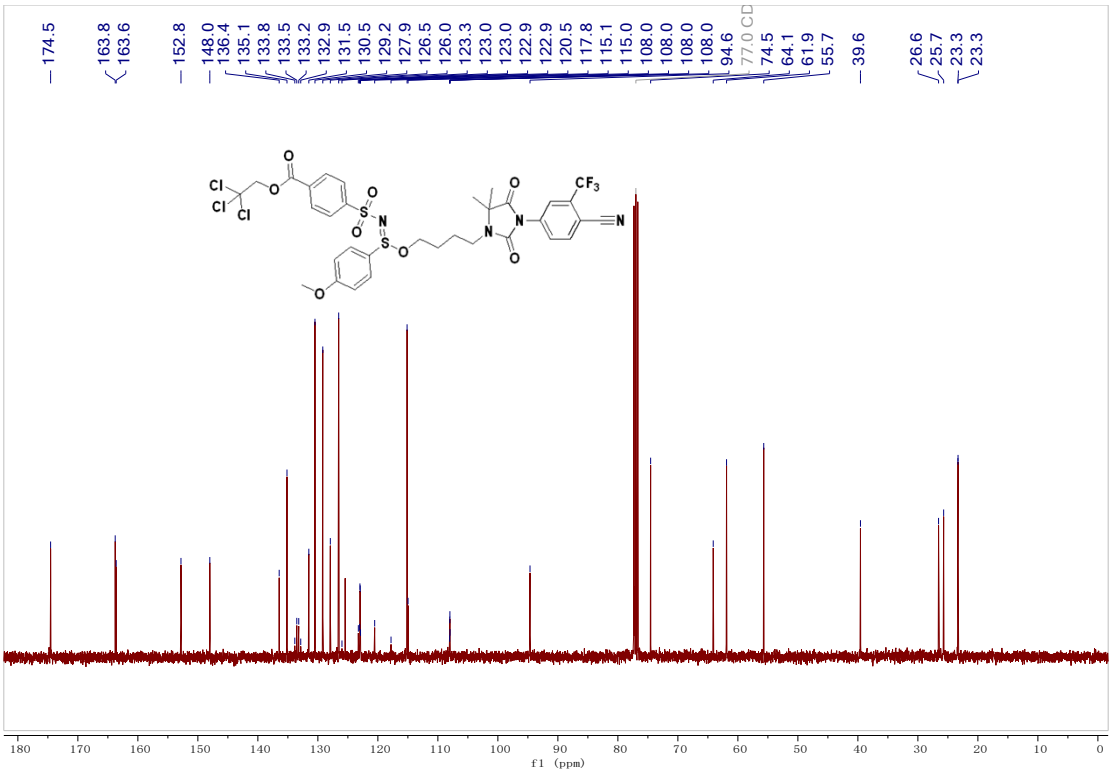
^{19}F NMR (376 MHz, Chloroform-d) of compound **7h**



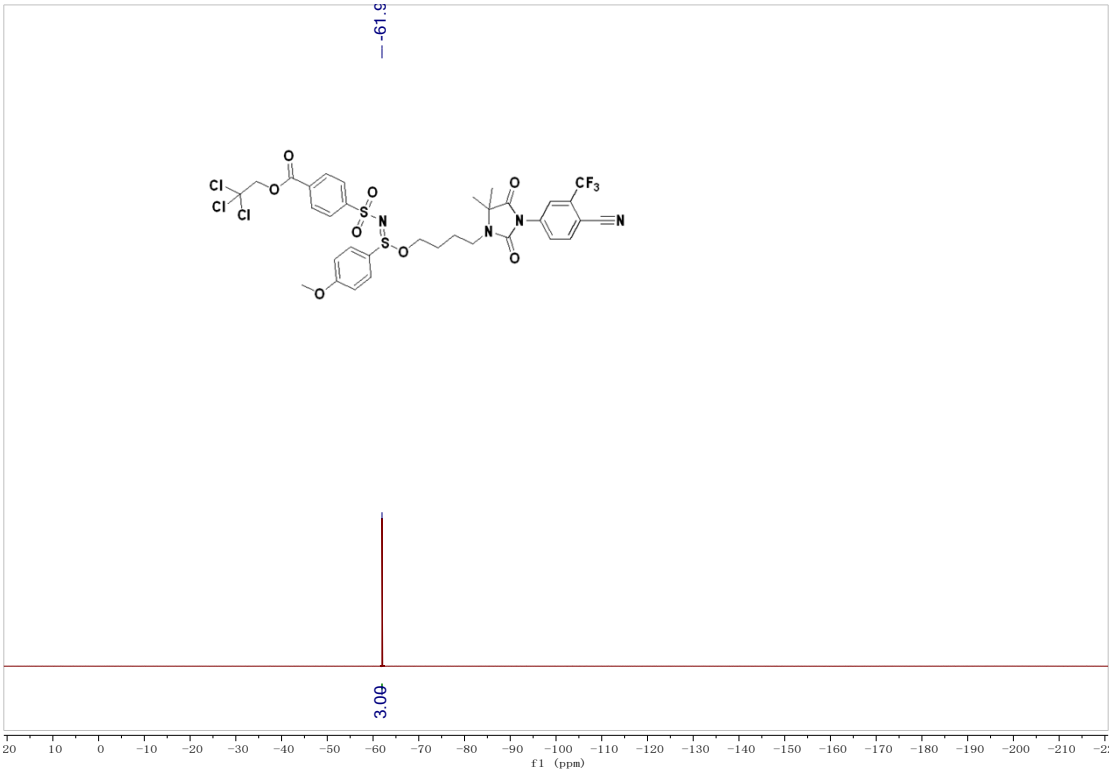
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8a**



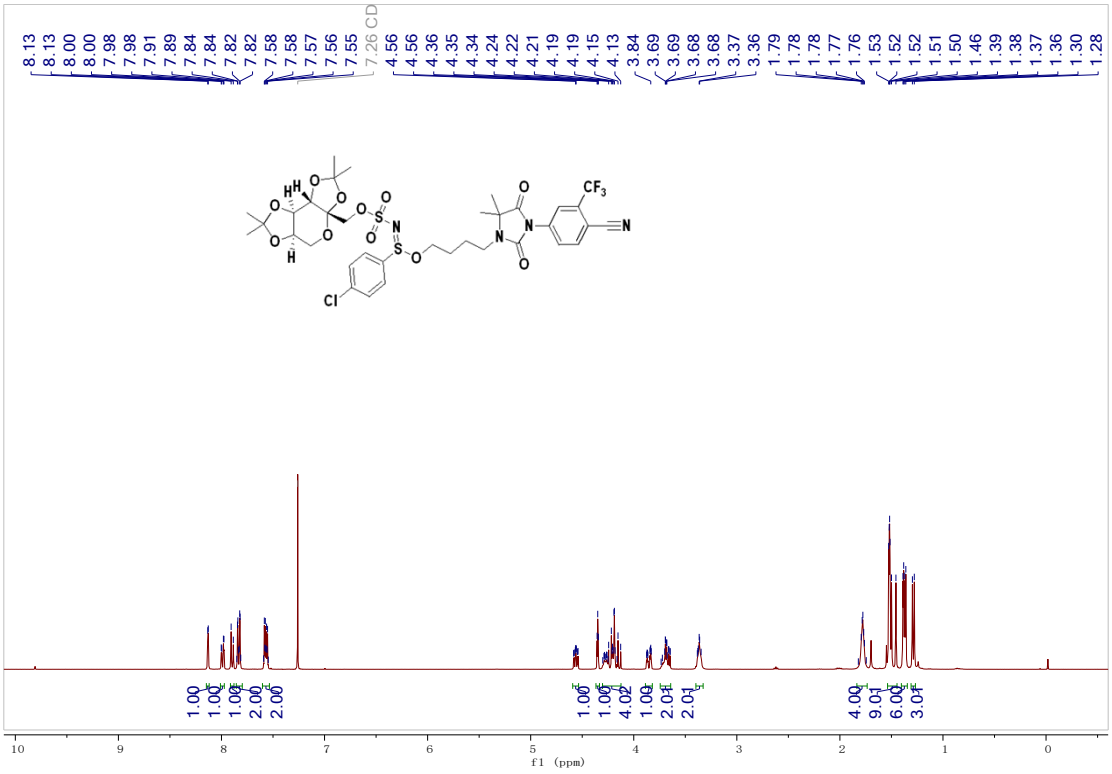
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8a**



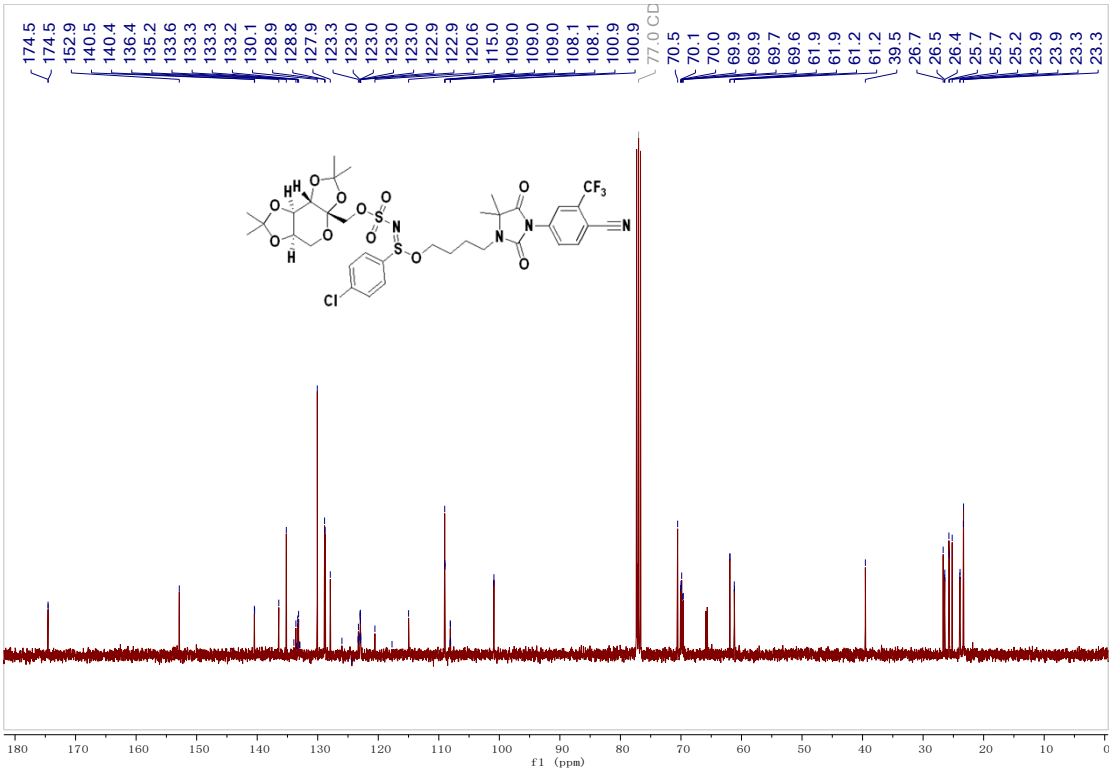
^{19}F NMR (376 MHz, Chloroform-d) of compound **8a**



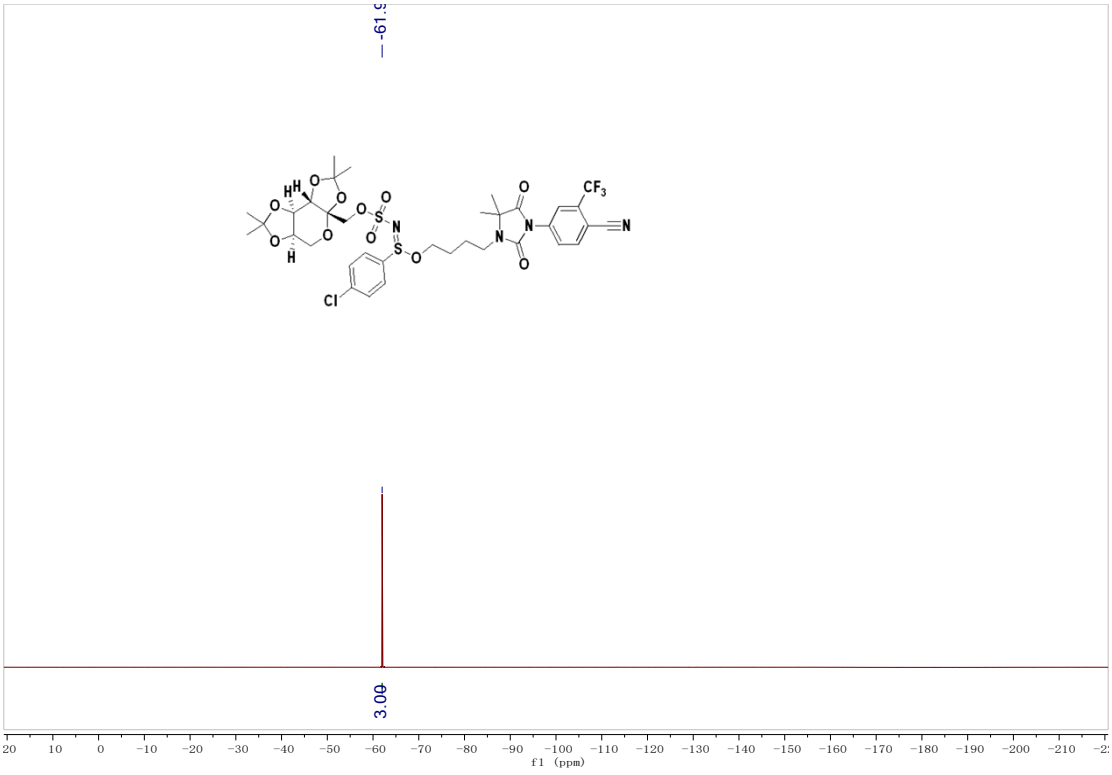
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8b**



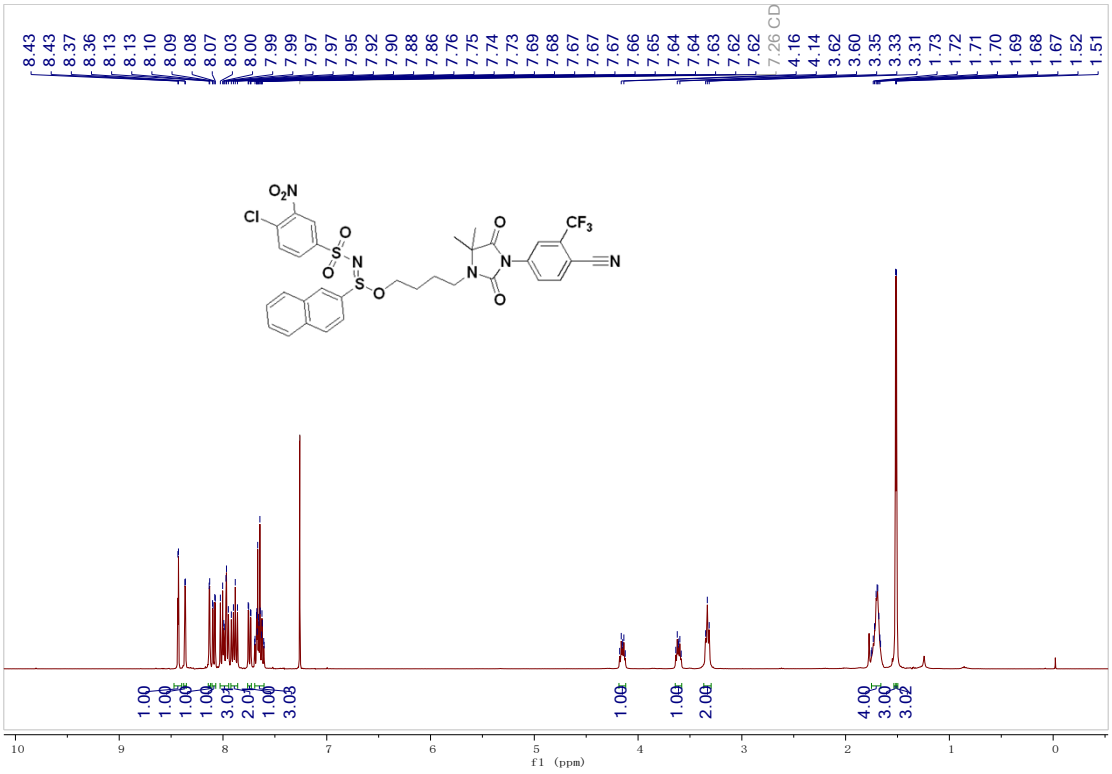
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8b**



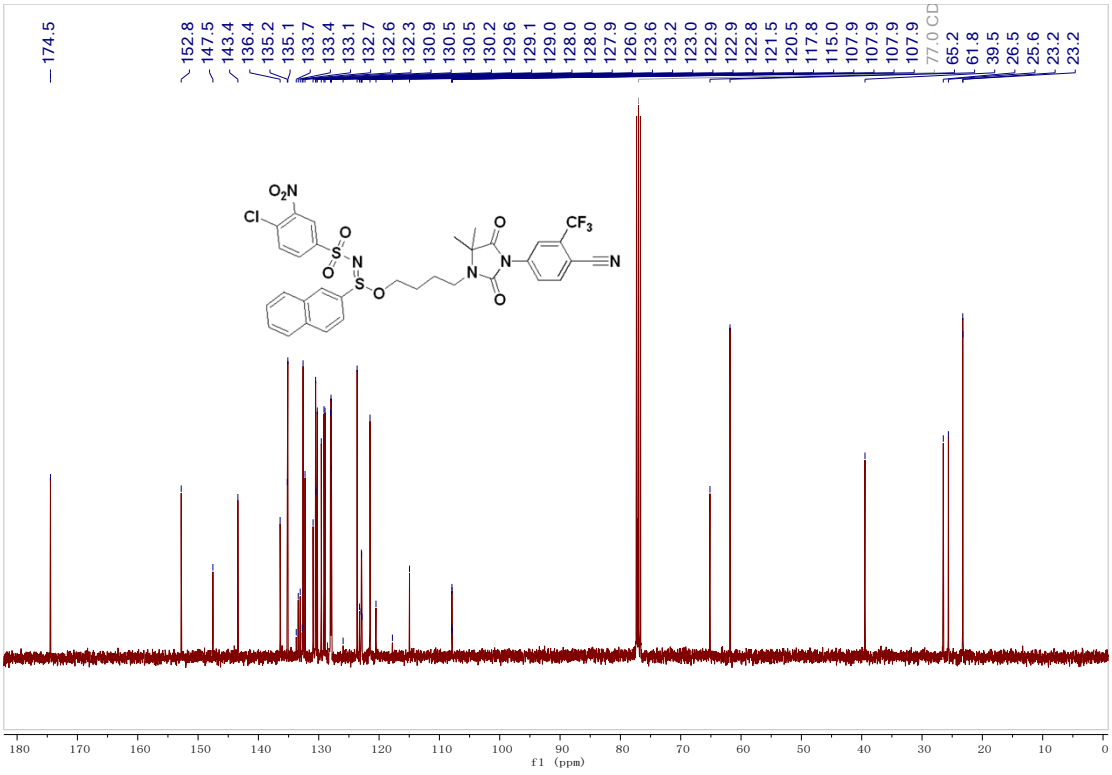
^{19}F NMR (376 MHz, Chloroform-d) of compound **8b**



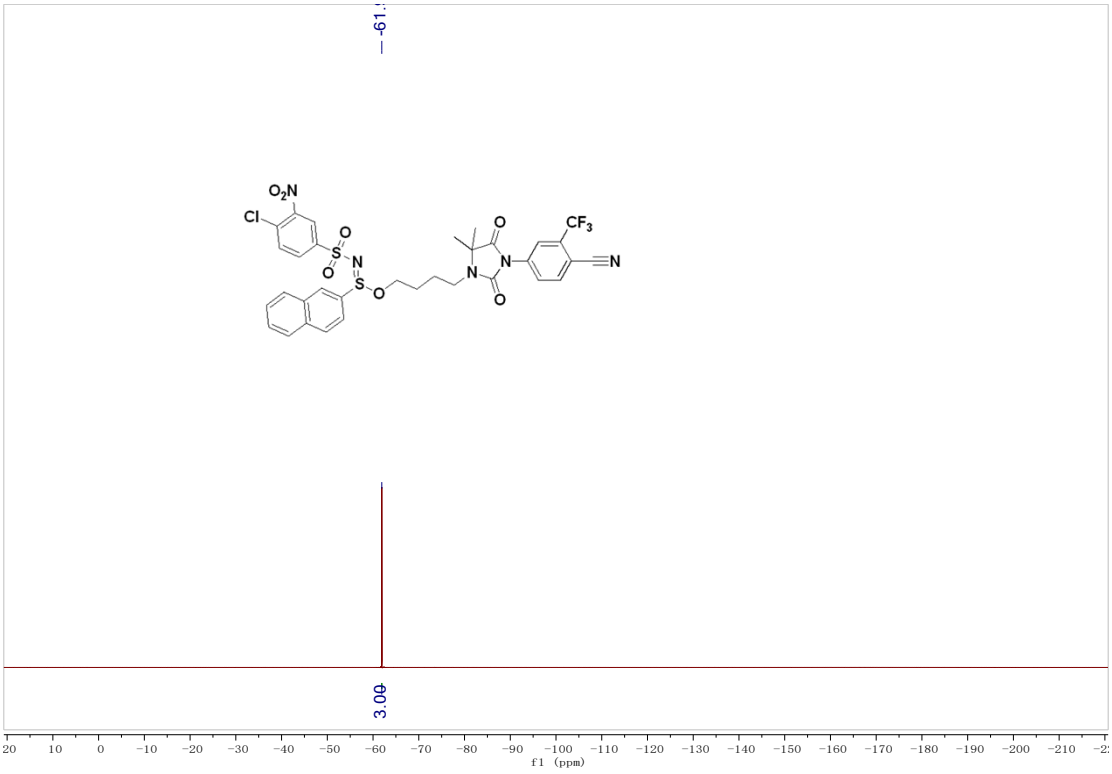
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8c**



^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8c**



^{19}F NMR (376 MHz, Chloroform-d) of compound **8c**



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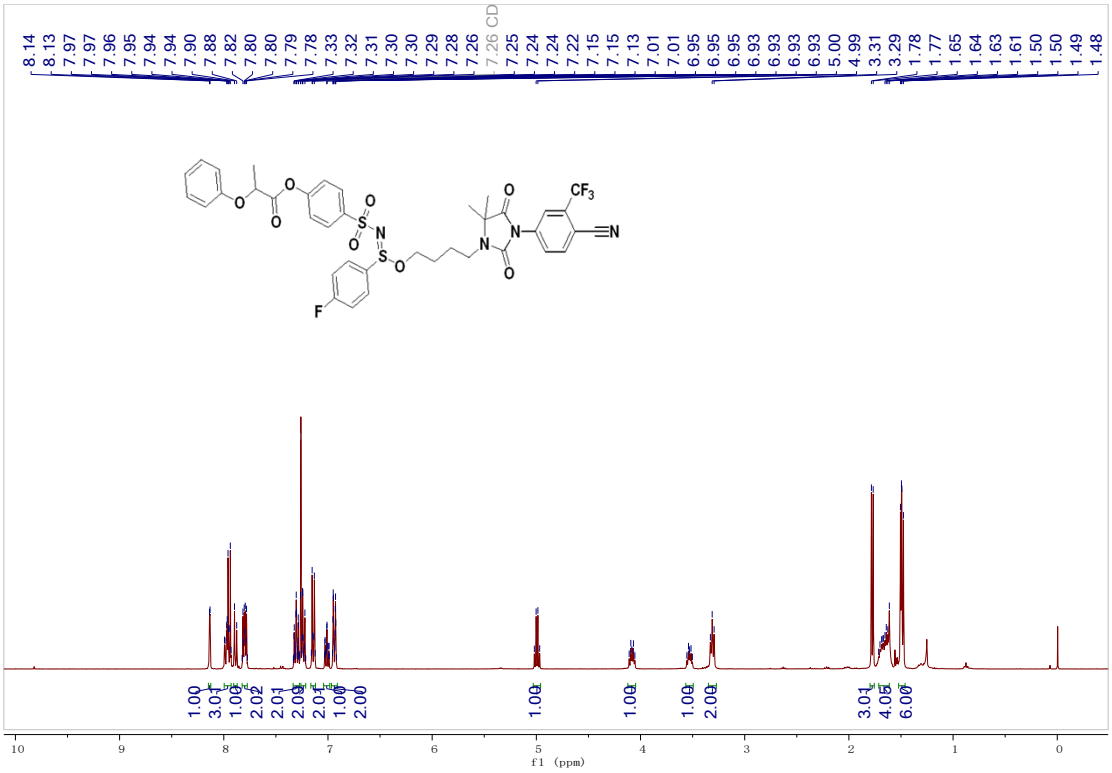
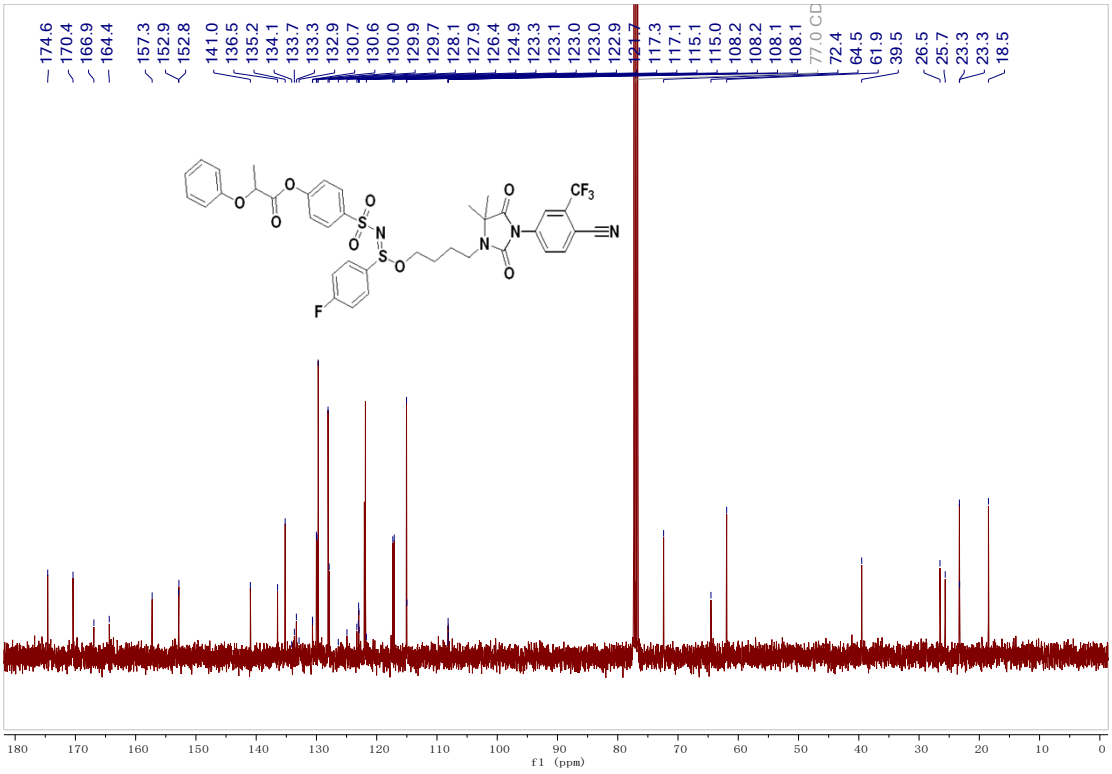
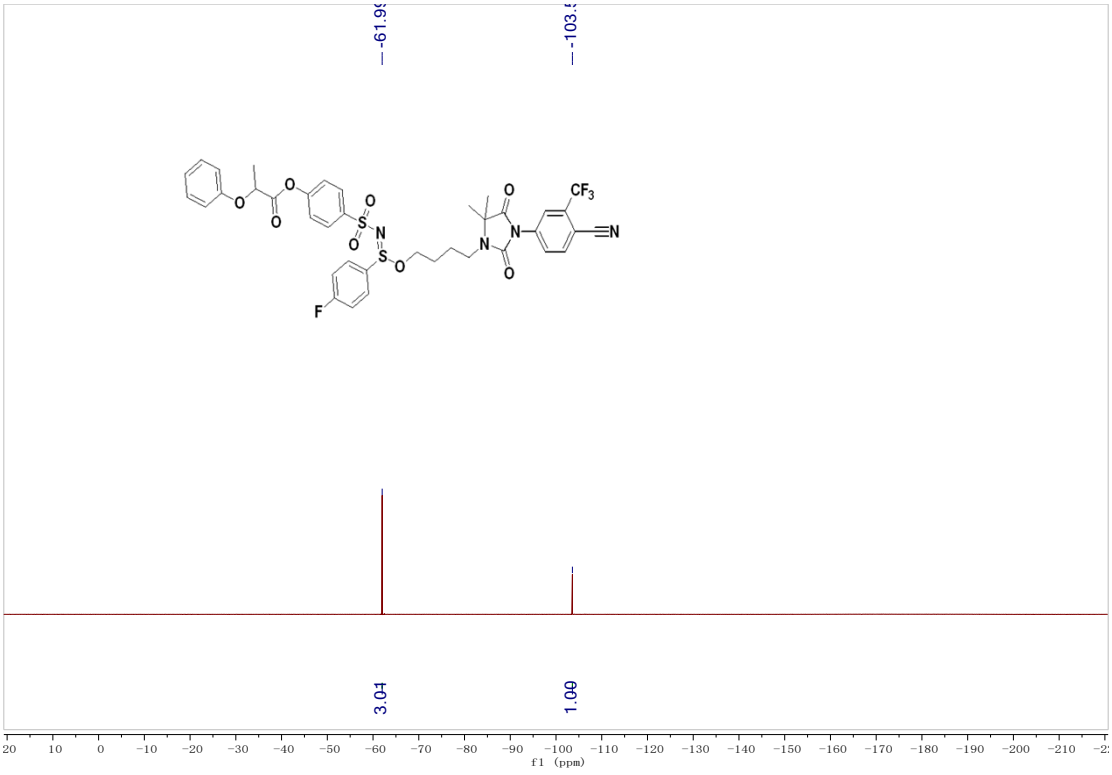


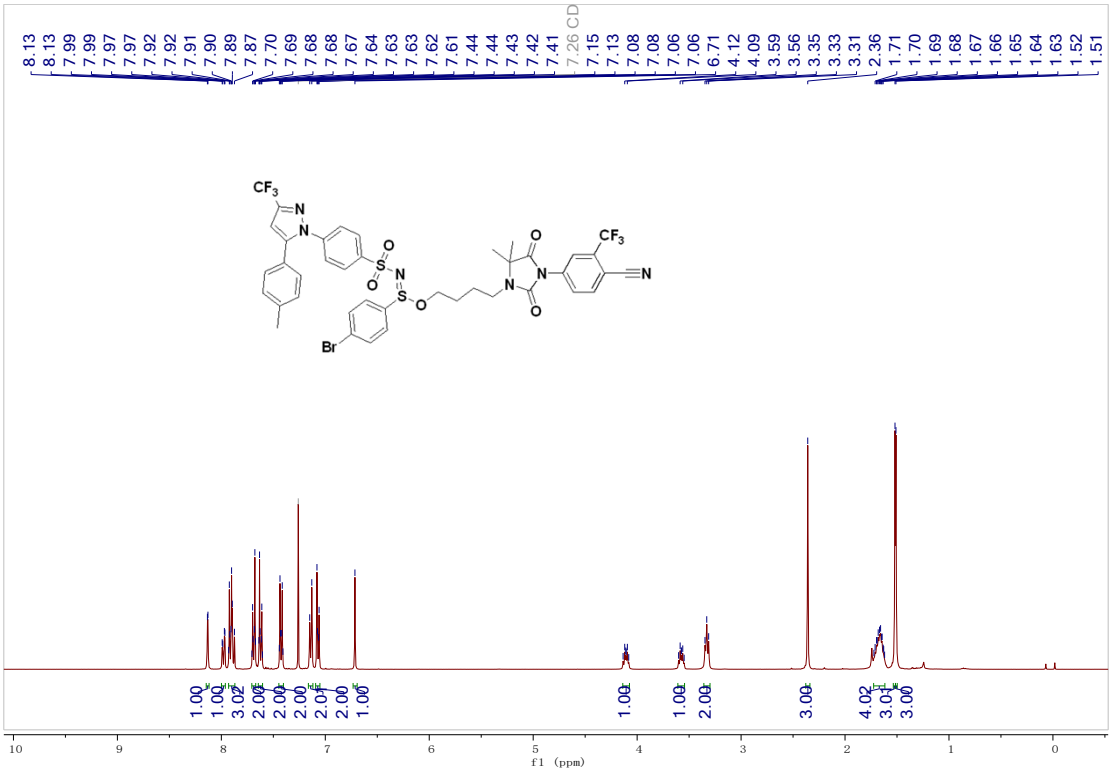
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8d**



^{19}F NMR (376 MHz, Chloroform-d) of compound **8d**



^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8e**



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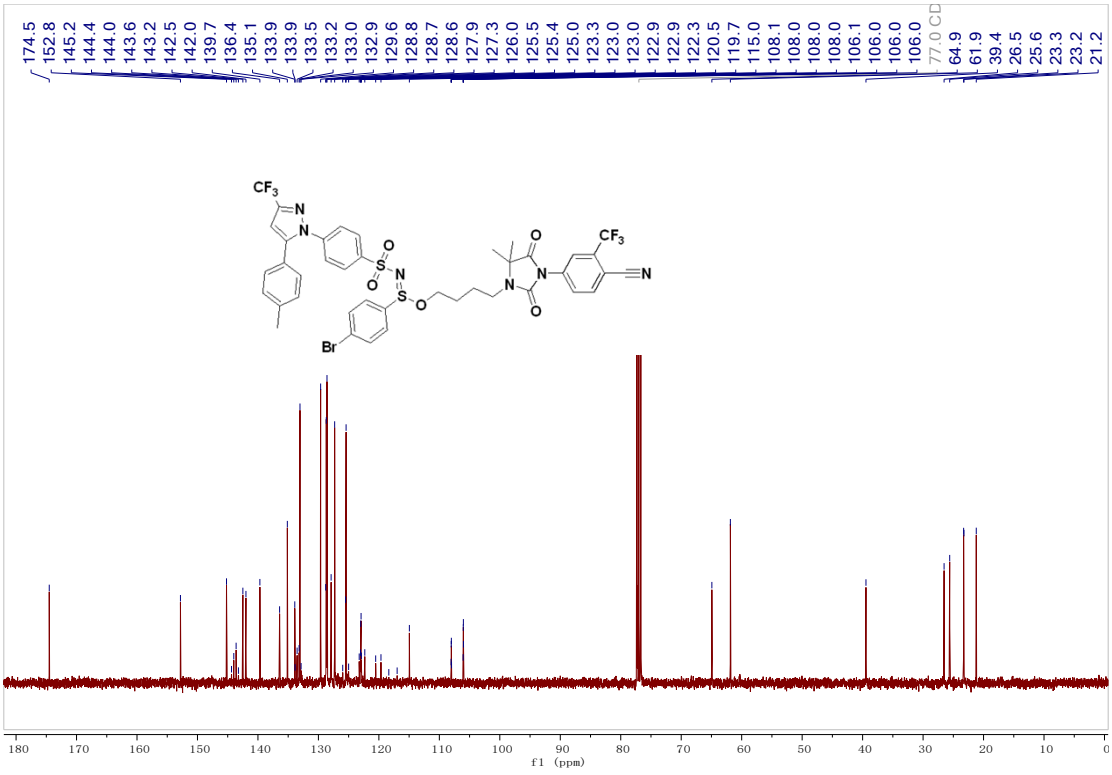
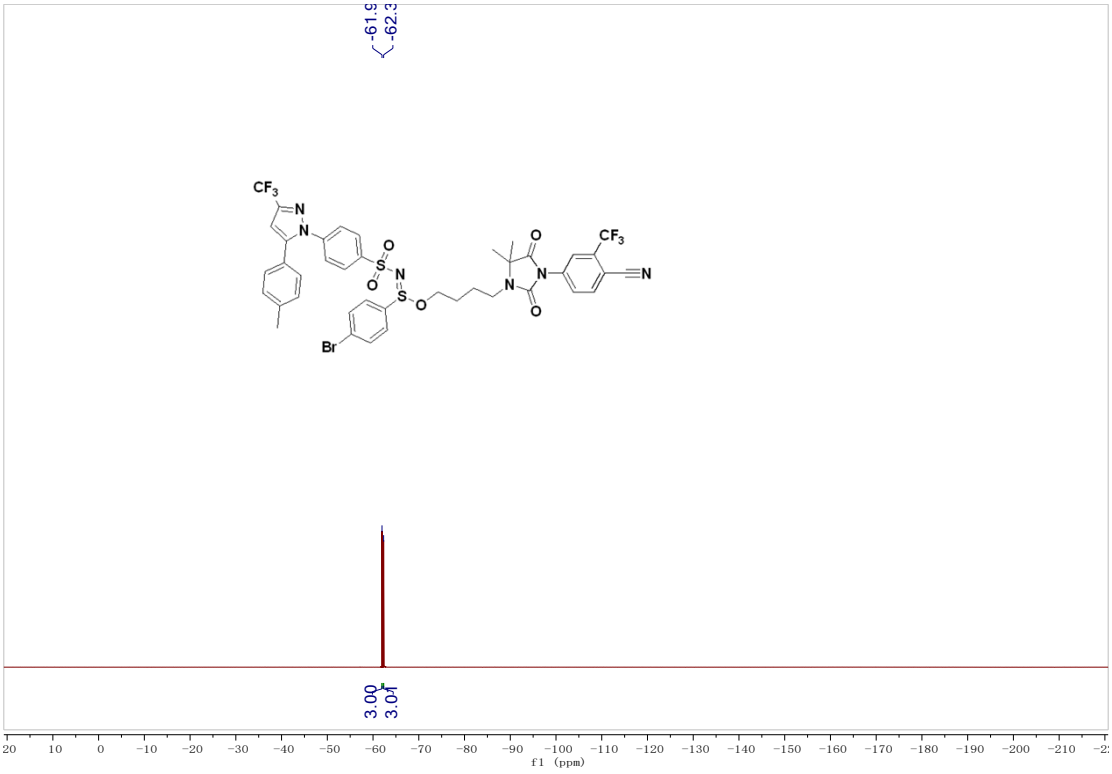


^{19}F NMR (376 MHz, Chloroform-d) of compound **8e**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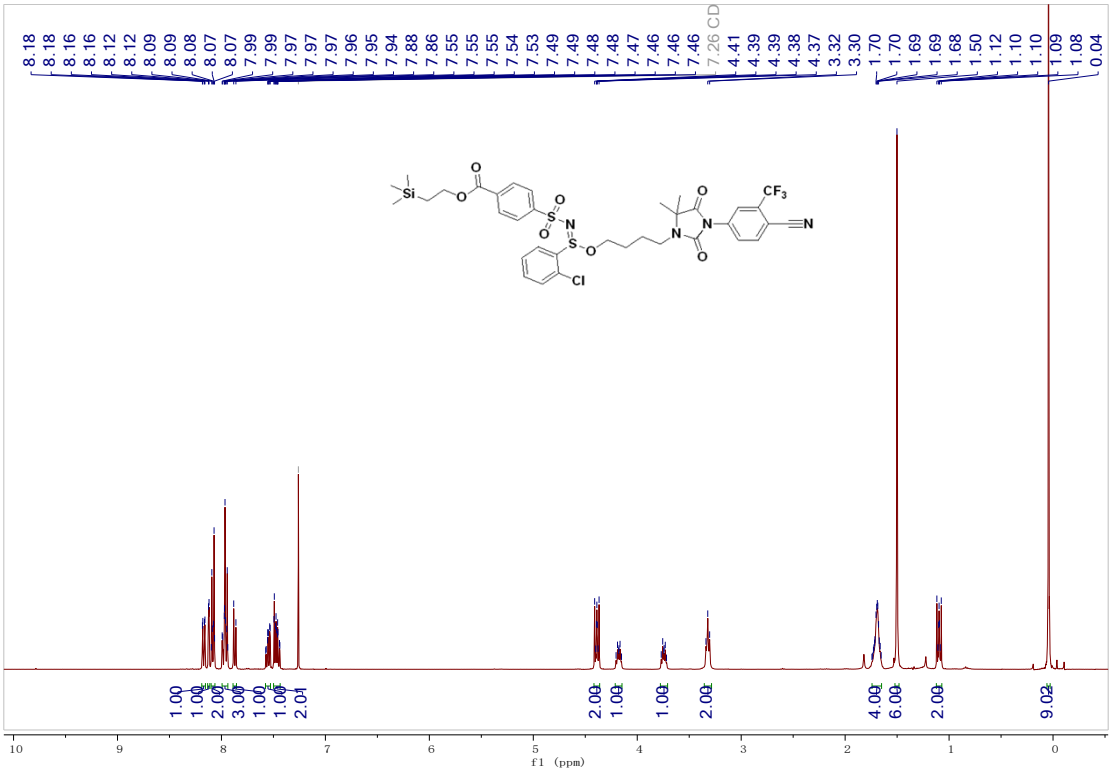
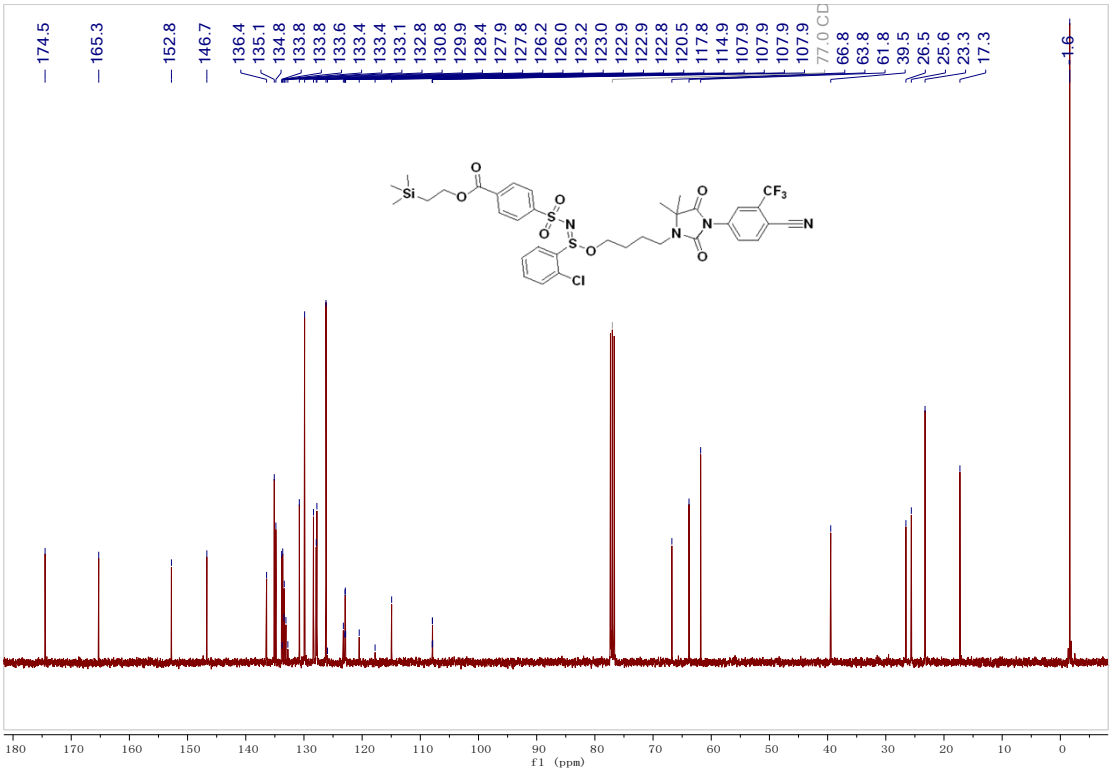
-62.3
CF3
N
N
O
S
O
N
S
O
Br
O
N
N
O
CF3
N
3.00
3.01
20 10 0 −10 −20 −30 −40 −50 −60 −70 −80 −90 −100 −110 −120 −130 −140 −150 −160 −170 −180 −190 −200 −210
f1 (ppm)

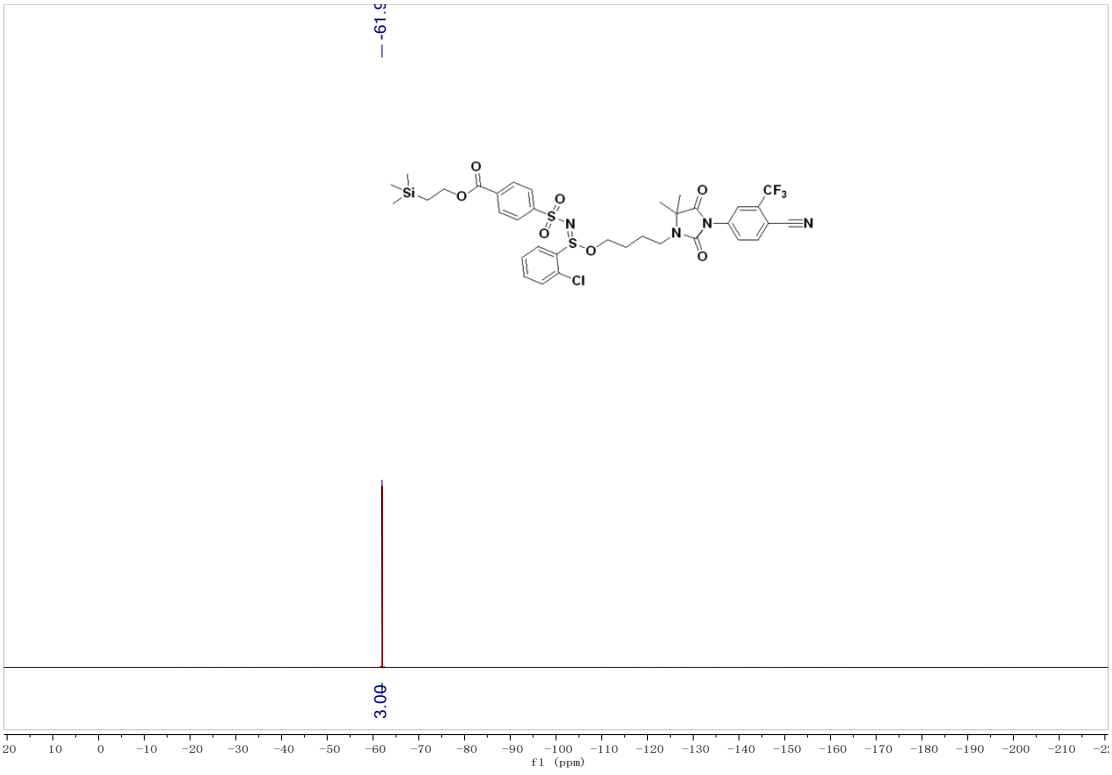
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8f**



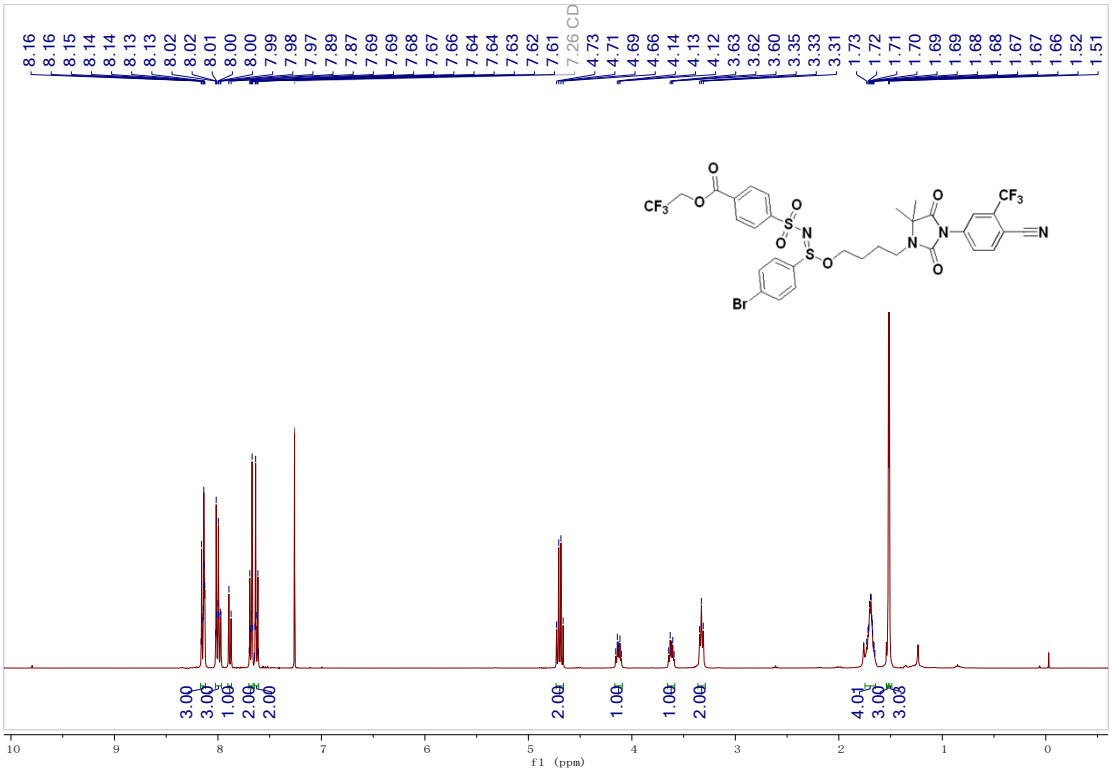
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8f**



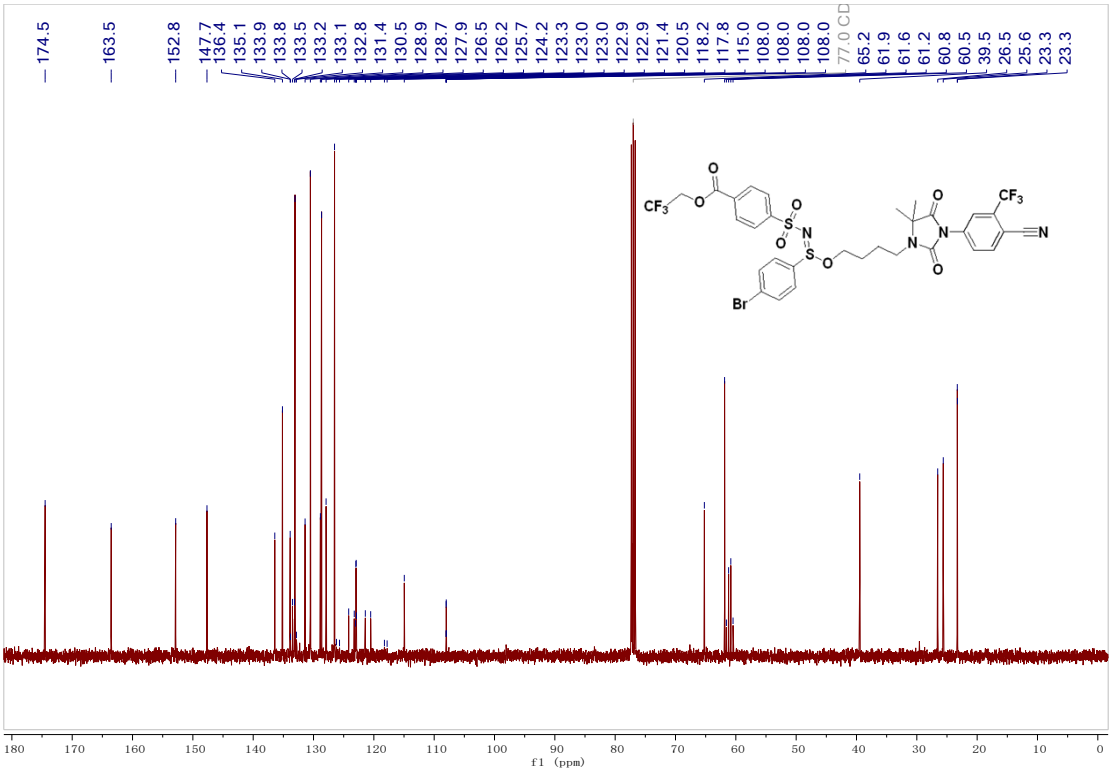
^{19}F NMR (376 MHz, Chloroform-d) of compound **8f**



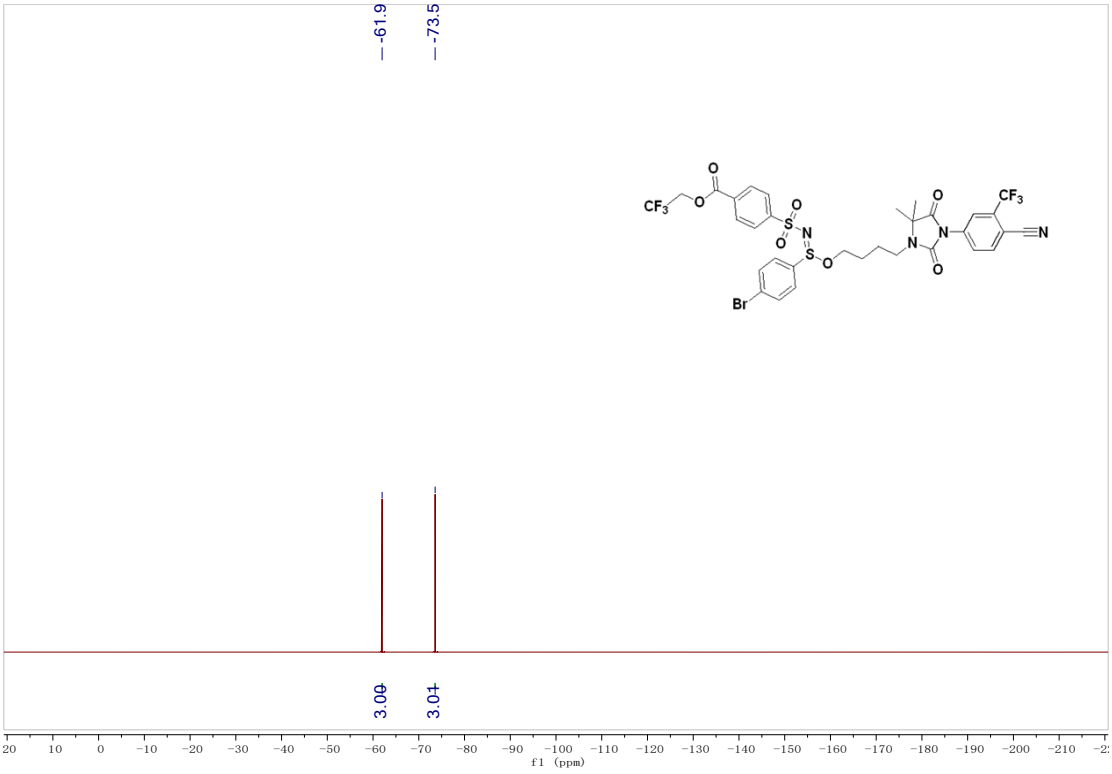
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8g**



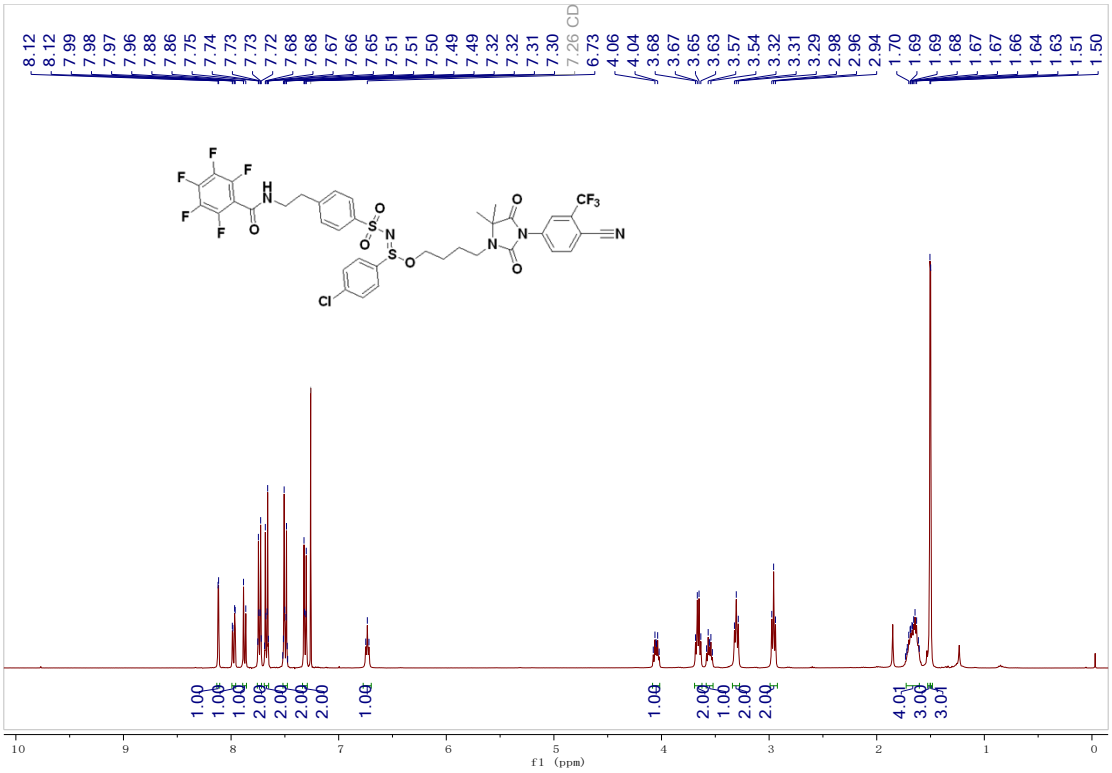
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8g**



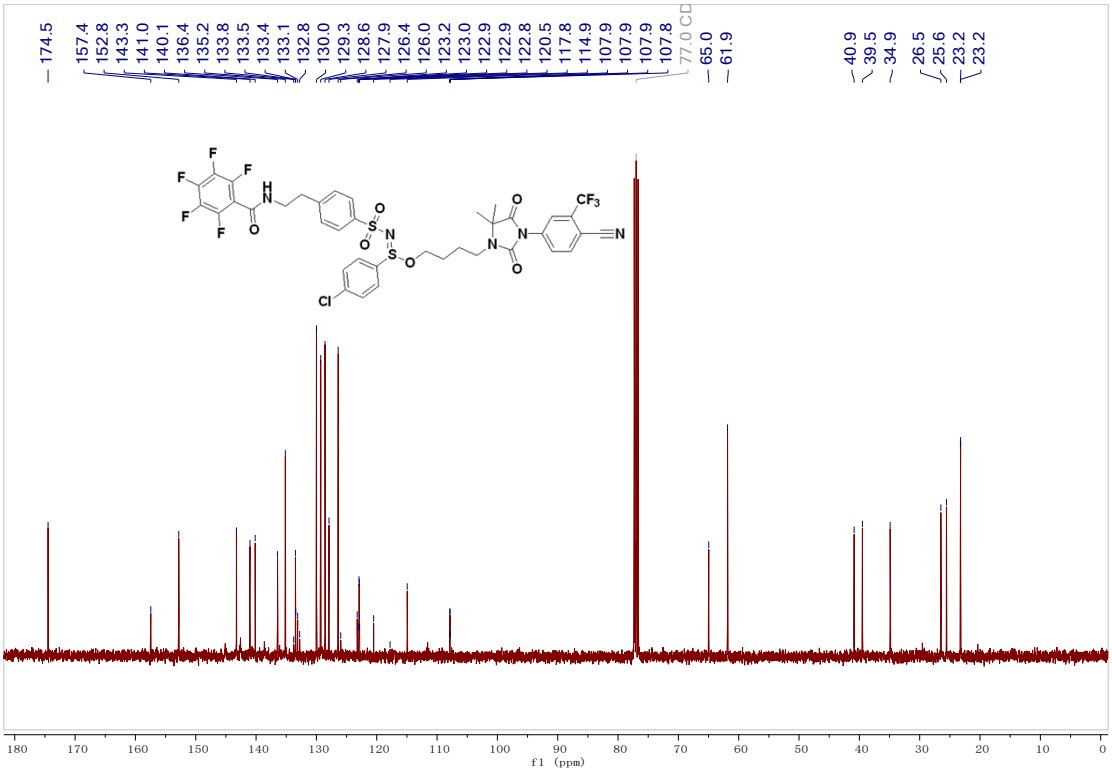
^{19}F NMR (376 MHz, Chloroform-d) of compound **8g**



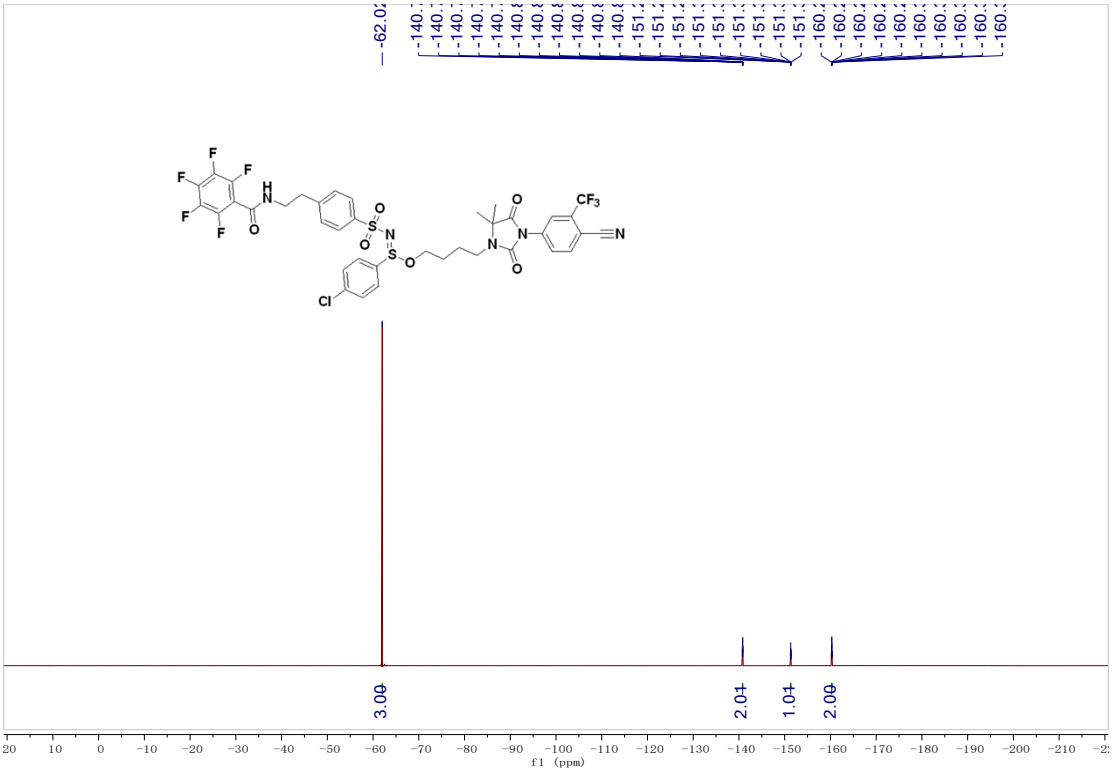
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8h**



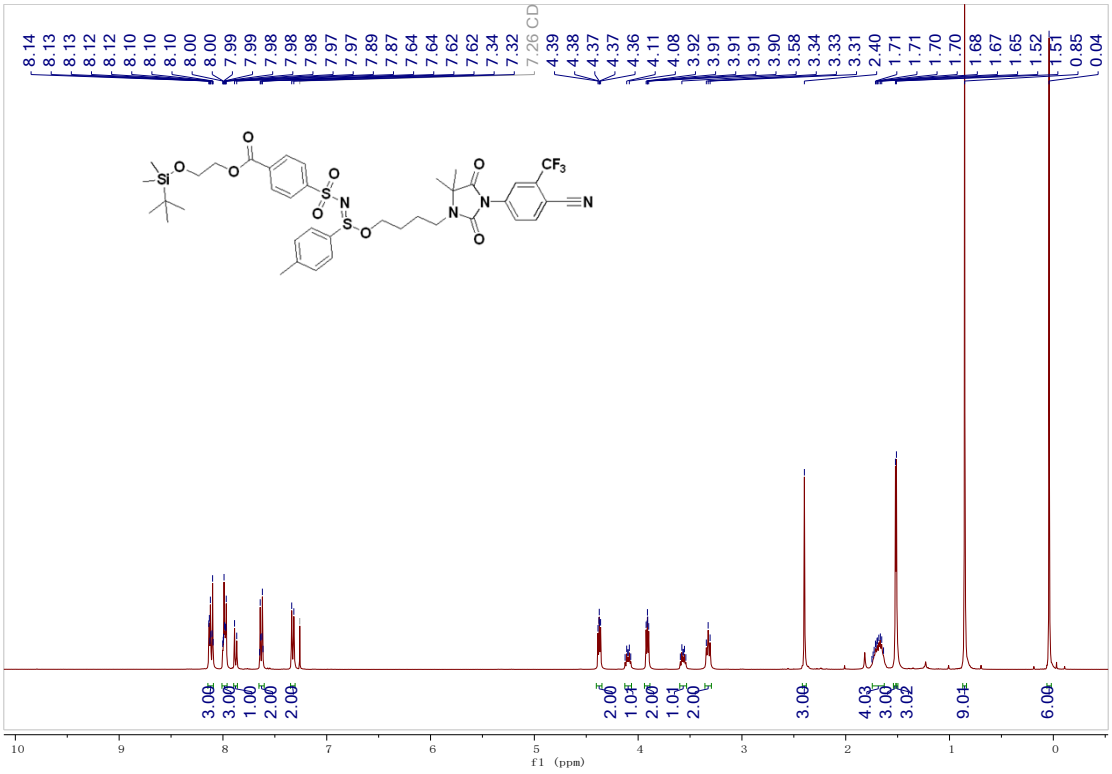
^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8h**



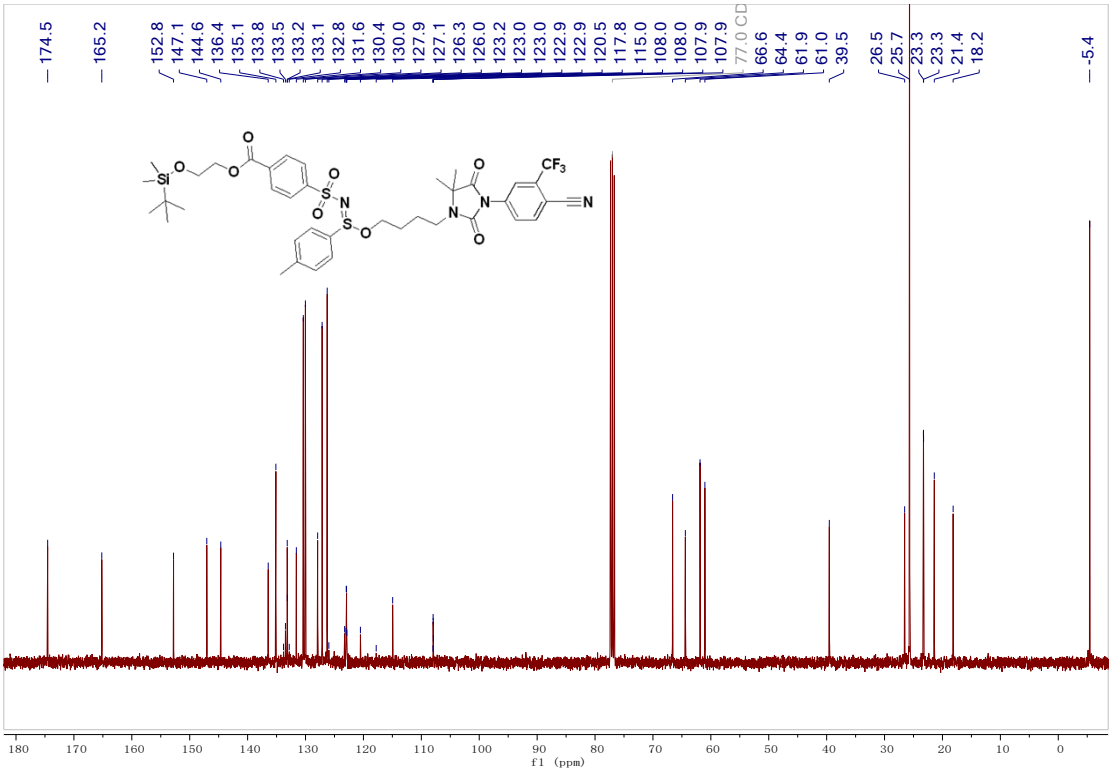
^{19}F NMR (376 MHz, Chloroform-d) of compound **8h**



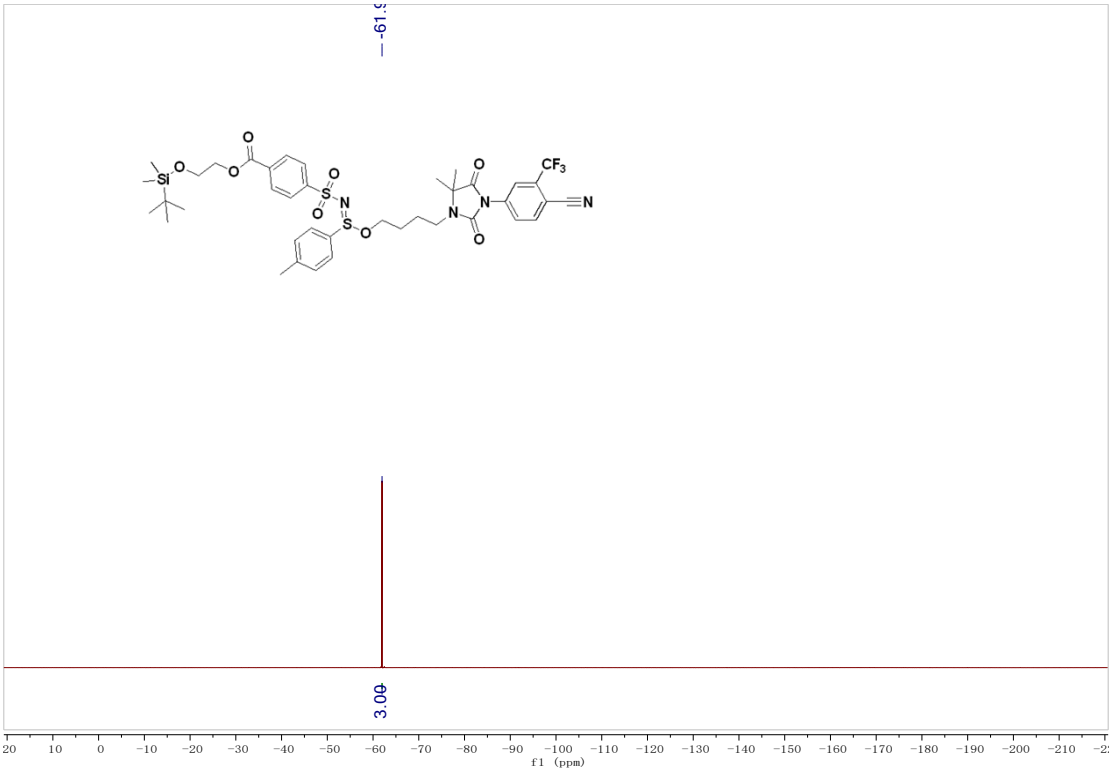
^{1}H NMR (400 MHz, Chloroform-*d*) of compound **8i**



^{13}C NMR (100 MHz, Chloroform-*d*) of compound **8i**



^{19}F NMR (376 MHz, Chloroform-d) of compound **8i**


-61.9
3.00
20 10 0 −10 −20 −30 −40 −50 −60 −70 −80 −90 −100 −110 −120 −130 −140 −150 −160 −170 −180 −190 −200 −210
f1 (ppm)