

Supporting Information

Copper-catalyzed tandem arylation-cyclization of 2-alkynylaryl isothiocyanates with diaryliodonium salts: an efficient synthesis of thiochromeno[2,3-*b*]indoles

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11-Phenylthiochromeno[2,3-*b*]indole (3a)

(CCDC 1063949)

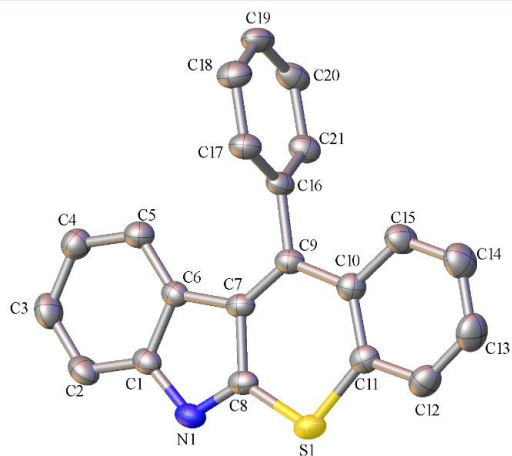


Figure S1. X-Ray crystal structure of **3a**.

S-(4-Methoxyphenyl) (2-(phenylethynyl)phenyl)carbamothioate (4a)

(CCDC 1438783)

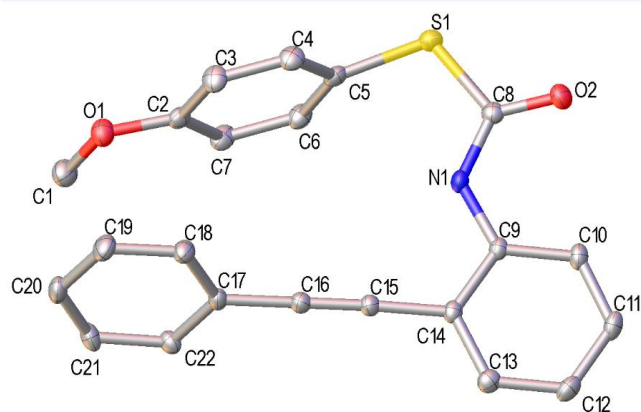
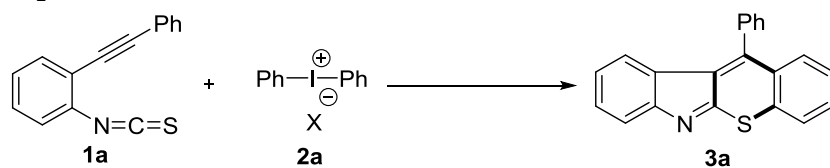


Figure S2. X-Ray crystal structure of **4a**.

Table S1. Optimization of reaction conditions^a

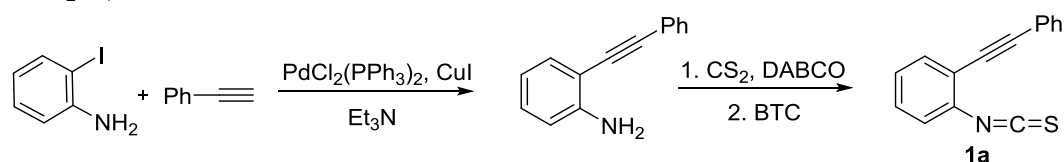
Entry	Solvent	Catalyst(%)	Base(eq)	X	Temp/ °C	Yield/% ^b
1	DCE	-	-	OTf	50	0
2	DCE	CuCl(10)	-	OTf	50	20
3	DCE	CuBr(10)	-	OTf	50	32
4	DCE	Cu(OTf) ₂ (10)	-	OTf	50	45
5	DCE	Cu(OAc) ₂ (10)	-	OTf	50	0
6	DCE	CuTc(10)	-	OTf	50	0
7	DCE	Cu(OTf) ₂ (10)	-	PF ₆	50	25
8	DCE	Cu(OTf) ₂ (10)	-	BF ₄	50	34
9	DCE	Cu(OTf) ₂ (10)	-	Cl	50	0
10	DCE	Cu(OTf) ₂ (10)	-	OTf	30	26
11	DCE	Cu(OTf) ₂ (10)	-	OTf	80	31
12	DCE	Cu(OTf) ₂ (10)	DABCO(1.0)	OTf	50	0
13	DCE	Cu(OTf) ₂ (10)	DBU(1.0)	OTf	50	10
14	DCE	Cu(OTf)₂(10)	K₂CO₃(1.0)	OTf	50	64
15	DCE	Cu(OTf) ₂ (10)	Na ₂ CO ₃ (1.0)	OTf	50	37
16	DCE	Cu(OTf) ₂ (10)	Cs ₂ CO ₃ (1.0)	OTf	50	42
17	DCE	Cu(OTf) ₂ (10)	NaHCO ₃ (1.0)	OTf	50	39
18	DCE	Cu(OTf) ₂ (10)	K ₂ CO ₃ (0.5)	OTf	50	55
19	DCE	Cu(OTf) ₂ (10)	K ₂ CO ₃ (2.0)	OTf	50	42
20	DCE	Cu(OTf) ₂ (5)	K ₂ CO ₃ (1.0)	OTf	50	28
21	DCE	Cu(OTf) ₂ (20)	K ₂ CO ₃ (1.0)	OTf	50	37
22 ^c	DCE	Cu(OTf) ₂ (10)	K ₂ CO ₃ (1.0)	OTf	50	40
23 ^d	DCE	Cu(OTf) ₂ (10)	K ₂ CO ₃ (1.0)	OTf	50	62
24	THF	Cu(OTf) ₂ (10)	K ₂ CO ₃ (1.0)	OTf	50	0
25	DCM	Cu(OTf) ₂ (10)	K ₂ CO ₃ (1.0)	OTf	50	38
26	Toluene	Cu(OTf) ₂ (10)	K ₂ CO ₃ (1.0)	OTf	50	35
27 ^e	DCE	Cu(OTf) ₂ (10)	K ₂ CO ₃ (1.0)	OTf	50	trace

^aReaction conditions: **1a** (0.2 mmol), **2a** (1.5 equiv), solvent (1.0 mL), 6 h, N₂. ^bIsolated yield. ^c**2a** (1.0 equiv). ^d**2a** (2.0 equiv). ^eReaction was performed under air.

General Methods

All reactions were carried out using standard Schlenk technique under nitrogen. DCE was distilled from CaH_2 . Unless noted, all commercial reagents were used without further purification. Melting points were recorded on a RY-1 microscopic melting apparatus and uncorrected. ^1H NMR spectra were recorded on 500 MHz and ^{13}C NMR spectra were recorded on 125 MHz by using a Bruker Avance 500 spectrometer. Chemical shifts were reported in part per million (δ) relative to tetramethylsilane (TMS). Mass spectra were obtained on an Ultima Global spectrometer with an ESI source. Diaryliodonium salts were prepared according to the literatures¹.

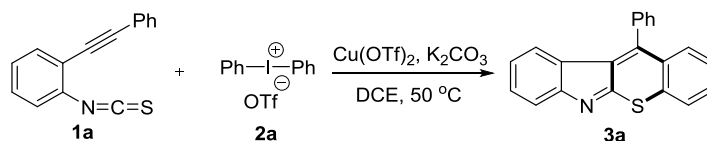
General procedure for synthesis of 2-alkynylphenyl isothiocyanates (**1a** for example)



A mixture of Et_3N (12.5 mL), $\text{PdCl}_2(\text{PPh}_3)_2$ (0.070 g, 2.0 mol%), CuI (0.010 g, 1.0 mol%), 2-iodoaniline (1.1 g, 5.0 mmol), and terminal acetylene (0.61 g, 6.0 mmol) was stirred at room temperature under nitrogen atmosphere for 3 h. The reaction was quenched with saturated NH_4Cl and extracted with EtOAc . The organic layer was washed with saturated NaCl and dried over anhydrous MgSO_4 . The mixture was concentrated in vacuum and the residue was purified by flash column chromatography on silica gel (petroleum ether/ethyl acetate = 15:1) to afford 2-(phenylethynyl)aniline as a yellow solid (0.88 g, 92%).

A round-bottom flask was charged with a mixture of 2-(phenylethynyl)aniline (0.88 g, 4.6 mmol), DABCO (4.05 g, 18.4 mmol) and toluene (11 mL). To the stirred mixture, CS_2 (1.40 g, 18.4 mmol) was added dropwise, and the mixture was stirred overnight at room temperature to get dithiocarbamate salt. Then the salt was filtered and washed with toluene. The dithiocarbamate salt (1.61 g, 4.4 mmol) and of CHCl_3 (11 mL) were added to a round-bottom flask. The mixture was cooled to $0\text{ }^\circ\text{C}$, BTC (0.44 g, 1.49 mmol) dissolved in CHCl_3 was added dropwise. The mixture was stirred for 1 h at $0\text{ }^\circ\text{C}$ and then refluxed for 2 h. The mixture was evaporated under reduced pressure and the residue was purified by silica gel column chromatography (petroleum ether) to obtain 1-isothiocyanato-2-(phenylethynyl)benzene as a yellow solid (**1a**, 0.68 g, 66%).

General procedure for the synthesis of thiochromeno[2,3-*b*]indoles (3a for example)

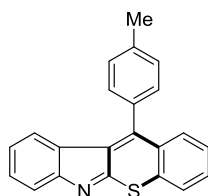


To a Schlenk tube was charged with a mixture of **1a** (117 mg, 0.5 mmol), **2a** (313 mg, 0.75 mmol), Cu(OTf)₂ (18 mg, 0.05 mmol), K₂CO₃ (70 mg, 0.5 mmol) and DCE (2.5 mL). The mixture was allowed to stir at 50 °C for 6 h under N₂. After that, the mixture was cooled to room temperature, quenched with saturated NaHCO₃ and extracted with EtOAc (3×10 mL). The organic layer was washed with saturated NaCl and dried over anhydrous MgSO₄. Evaporation of the solvent followed by purification on silica gel provided the product **3a** as a red solid (100 mg, 64%).

11-Phenylthiochromeno[2,3-*b*]indole (3a)

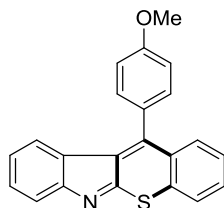
Red solid, 100 mg, 64% yield, Mp: 213-215 °C. R_f = 0.4 (petroleum ether/ethyl acetate = 4:1, v/v). ¹H NMR (CDCl₃, 500 MHz): δ 6.40 (d, *J* = 7.75 Hz, 1H), 6.96 (t, *J* = 7.52 Hz, 1H), 7.39-7.71 (m, 10H), 7.90 (d, *J* = 8.15 Hz, 1H); ¹³C NMR (CDCl₃, 125 MHz): δ 118.4, 122.1, 123.5, 126.2, 126.8, 128.3, 129.0, 129.1, 129.3, 129.5, 131.1, 133.4, 136.3, 150.0, 155.1, 161.6. HRMS [ESI] Calcd for C₂₁H₁₃NS [M + H]⁺ 312.0847, Found 312.0840.

11-(*p*-Tolyl)thiochromeno[2,3-*b*]indole (3b)



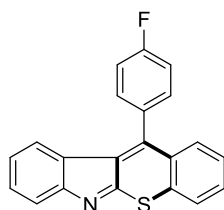
Red solid, 106 mg, 65% yield, Mp: 221-223 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ¹H NMR (CDCl₃, 500 MHz): δ 2.58 (s, 3H), 6.51 (d, *J* = 7.75 Hz, 1H), 6.97 (t, *J* = 7.55 Hz, 1H), 7.30 (d, *J* = 7.80 Hz, 2H), 7.38-7.49 (m, 4H), 7.57-7.62 (m, 2H), 7.70 (d, *J* = 7.80 Hz, 1H), 7.89 (d, *J* = 8.00 Hz, 1H); ¹³C NMR (CDCl₃, 125 MHz): δ 21.5, 118.3, 122.1, 123.5, 125.9, 126.3, 126.7, 128.2, 128.6, 129.0, 129.2, 130.1, 131.1, 133.2, 133.4, 135.7, 138.9, 146.3, 155.1, 161.6. HRMS [ESI] Calcd for C₂₂H₁₅NS [M + H]⁺ 326.1003, Found 326.1012.

11-(4-Methoxyphenyl)thiochromeno[2,3-*b*]indole (3c)



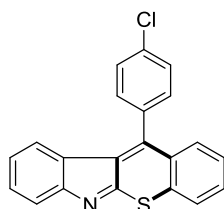
Red solid, 116 mg, 68% yield, Mp: 211-213 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 3.99 (s, 3H), 6.57 (d, J = 7.70 Hz, 1H), 6.99 (t, J = 7.50 Hz, 1H), 7.19 (d, J = 8.45 Hz, 2H), 7.34 (d, J = 8.50 Hz, 2H), 7.39-7.45 (m, 2H), 7.58 (t, J = 7.50 Hz, 1H), 7.64 (d, J = 8.15 Hz, 1H), 7.70 (d, J = 7.85 Hz, 1H), 7.88 (d, J = 8.00 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 55.5, 114.9, 117.7, 118.4, 122.1, 123.5, 125.9, 126.4, 126.8, 128.4, 128.7, 129.0, 129.2, 129.7, 131.1, 133.4, 146.0, 155.1, 160.1, 161.6. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{15}\text{NOS}$ $[\text{M} + \text{H}]^+$ 342.0953, Found 342.0962.

11-(4-Fluorophenyl)thiochromeno[2,3-*b*]indole (3d)



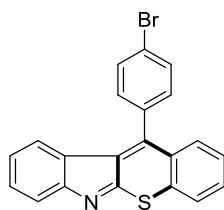
Red solid, 69 mg, 42% yield, Mp: 186-188 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.47 (d, J = 7.75 Hz, 1H), 7.00 (t, J = 7.53 Hz, 1H), 7.37-7.47 (m, 6H), 7.54-7.61 (m, 2H), 7.71 (d, J = 7.85 Hz, 1H), 7.90 (d, J = 8.00 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 116.8 (d, J = 21.4 Hz), 118.6, 122.3, 123.4, 126.1, 126.9, 128.3, 129.4, 129.6, 130.4, 130.8, 132.2, 133.4, 144.8, 155.2, 161.5, 163.1 (d, J = 249.2 Hz). HRMS [ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{FNS}$ $[\text{M} + \text{H}]^+$ 330.0753, Found 330.0762.

11-(4-Chlorophenyl)thiochromeno[2,3-*b*]indole (3e)



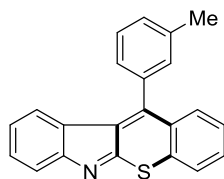
Red solid, 98 mg, 57% yield, Mp: 238-240 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.51 (d, J = 7.75 Hz, 1H), 7.01 (t, J = 7.50 Hz, 1H), 7.37-7.47 (m, 4H), 7.53 (d, J = 8.15 Hz, 1H), 7.60 (t, J = 7.48 Hz, 1H), 7.67-7.72 (m, 3H), 7.90 (d, J = 8.00 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 118.6, 122.3, 123.4, 126.0, 126.1, 127.0, 128.0, 129.4, 130.0, 130.1, 130.7, 133.4, 134.7, 135.2, 144.4, 155.2, 161.5. HRMS [ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{ClNS}$ $[\text{M} + \text{H}]^+$ 346.0457, Found 346.0462.

11-(4-Bromophenyl)thiochromeno[2,3-*b*]indole (3f)



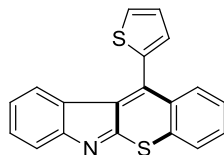
Red solid, 109 mg, 56% yield, Mp: 252-254 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.52 (d, J = 7.75 Hz, 1H), 7.02 (t, J = 7.50 Hz, 1H), 7.32 (d, J = 8.15 Hz, 2H), 7.40-7.47 (m, 2H), 7.53 (d, J = 7.80 Hz, 2H), 7.58-7.62 (m, 2H), 7.70 (d, J = 7.85 Hz, 1H), 7.83 (d, J = 8.15 Hz, 1H), 7.90 (d, J = 8.10 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 118.6, 122.4, 123.4, 125.9, 126.1, 126.9, 128.0, 129.4, 130.3, 130.7, 132.8, 133.4, 135.2, 144.4, 155.2, 161.5. HRMS [ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{BrNS}$ [$\text{M} + \text{H}$] $^+$ 389.9952, Found 389.9968.

11-(*m*-Tolyl)thiochromeno[2,3-*b*]indole (3g)



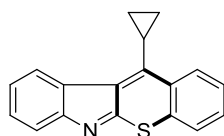
Red solid, 106 mg, 65% yield, Mp: 178-180 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 2.49 (s, 3H), 6.46 (d, J = 7.75 Hz, 1H), 6.97 (t, J = 7.53 Hz, 1H), 7.23 (t, J = 11.50 Hz, 2H), 7.39-7.47 (m, 3H), 7.54-7.62 (m, 3H), 7.70 (d, J = 7.85 Hz, 1H), 7.89 (d, J = 8.00 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 21.5, 118.4, 122.1, 123.6, 125.4, 125.9, 126.3, 126.8, 128.5, 128.8, 129.0, 129.2, 129.3, 129.7, 131.1, 133.4, 136.3, 139.3, 146.2, 155.2, 161.6. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{15}\text{NS}$ [$\text{M} + \text{H}$] $^+$ 326.1003, Found 326.1009.

11-(Thiophen-2-yl)thiochromeno[2,3-*b*]indole (3h)



Red solid, 111 mg, 70% yield, Mp: 192-194 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.59 (d, J = 7.70 Hz, 1H), 7.05 (t, J = 7.55 Hz, 1H), 7.21 (d, J = 2.85 Hz, 1H), 7.37-7.39 (m, 1H), 7.44-7.49 (q, 2H), 7.60 (t, J = 7.58 Hz, 1H), 7.69-7.72 (m, 2H), 7.78 (d, J = 8.15 Hz, 1H), 7.89 (d, J = 8.00 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 118.5, 122.5, 123.7, 125.9, 126.1, 127.7, 128.0, 128.8, 129.4, 129.6, 129.9, 130.7, 131.5, 132.9, 135.9, 138.8, 155.2, 161.4. HRMS [ESI] Calcd for $\text{C}_{19}\text{H}_{11}\text{NS}_2$ [$\text{M} + \text{H}$] $^+$ 318.0411, Found 318.0418.

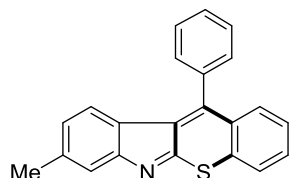
11-Cyclopropylthiochromeno[2,3-*b*]indole (3i)



Red solid, 70 mg, 51% yield, Mp: 157-160 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 0.85 (d, J = 5.15 Hz, 2H), 1.56 (d, J = 8.05 Hz, 2H),

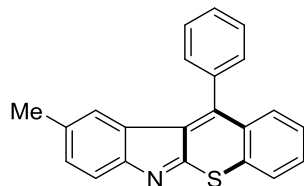
2.54-2.59 (m, 1H), 7.34 (t, $J = 7.45$ Hz, 1H), 7.54-7.56 (m, 3H), 7.73 (d, $J = 7.75$ Hz, 1H), 7.80 (t, $J = 4.48$ Hz, 1H), 8.41 (d, $J = 7.65$ Hz, 1H), 8.74-8.76 (m, 1H); ^{13}C NMR(CDCl_3 , 125 MHz): δ 11.4, 12.9, 29.7, 118.5, 122.1, 125.6, 125.7, 126.8, 128.8, 129.1, 129.2, 129.8, 132.2, 132.8, 147.2, 155.2, 162.1. HRMS [ESI] Calcd for $\text{C}_{18}\text{H}_{13}\text{NS}$ $[\text{M} + \text{H}]^+$ 276.0847, Found 276.0849.

3-Methyl-11-phenylthiochromeno[2,3-*b*]indole (3k)



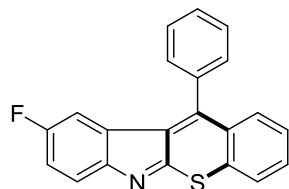
Red solid, 99 mg, 61% yield, Mp: 231-233 °C. $R_f = 0.40$ (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 2.45 (s, 3H), 6.28 (d, $J = 8.10$ Hz, 1H), 6.77 (d, $J = 7.85$ Hz, 1H), 7.37-7.42 (m, 3H), 7.50 (s, 1H), 7.55-7.58 (m, 2H), 7.63-7.68 (m, 3H), 7.87 (d, $J = 8.10$ Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 22.0, 118.9, 123.1, 123.3, 123.6, 125.9, 126.8, 128.4, 128.9, 129.0, 129.3, 129.4, 130.8, 133.1, 136.5, 139.8, 144.8, 155.5, 161.9. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{15}\text{NS}$ $[\text{M} + \text{H}]^+$ 326.1003, Found 326.1012.

2-Methyl-11-phenylthiochromeno[2,3-*b*]indole (3l)



Red solid, 100 mg, 62% yield, Mp: 238-240 °C. $R_f = 0.40$ (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 2.19 (s, 3H), 6.16 (s, 1H), 7.25 (t, $J = 5.48$ Hz, 1H), 7.37-7.42 (m, 3H), 7.57 (t, $J = 7.25$ Hz, 3H), 7.67 (t, $J = 2.58$ Hz, 3H), 7.87 (t, $J = 4.28$ Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 21.5, 117.9, 124.1, 125.8, 126.3, 126.8, 128.4, 128.9, 129.2, 129.4, 130.0, 131.0, 131.6, 133.4, 136.4, 145.6, 153.2, 160.7. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{15}\text{NS}$ $[\text{M} + \text{H}]^+$ 326.1003, Found 326.1016.

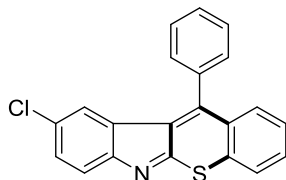
2-Fluoro-11-phenylthiochromeno[2,3-*b*]indole (3m)



Red solid, 109 mg, 66% yield, Mp: 229-131 °C. $R_f = 0.40$ (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.05 (dd, $J_1 = 9.25$ Hz, $J_2 = 2.45$ Hz, 1H), 7.14 (td, $J_1 = 8.95$ Hz, $J_2 = 2.50$ Hz, 1H), 7.40-7.43 (m, 3H), 7.58-7.62 (m, 3H), 7.69 (t, $J = 2.83$ Hz, 3H), 7.89 (d, J

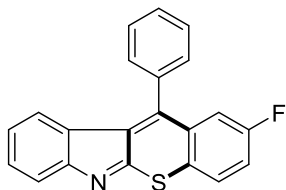
= 7.95 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 110.1(d, J = 26.1 Hz), 116.1(d, J = 24.4 Hz), 118.7, 118.8, 126.0, 126.8, 127.0, 128.1, 128.9, 129.3, 129.6, 131.3, 133.7, 133.8, 147.1, 151.3, 158.8(d, J = 239.1 Hz), 161.2. HRMS [ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{FNS}$ [$\text{M} + \text{H}$] $^+$ 330.0753, Found 330.0759.

2-Chloro-11-phenylthiochromeno[2,3-*b*]indole (3n)



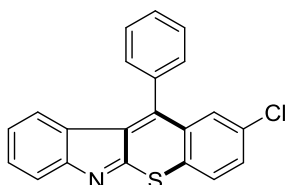
Red solid, 103 mg, 60% yield, Mp: 260-262 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.30 (d, J = 1.30 Hz, 1H), 7.37-7.44 (m, 4H), 7.59-7.63 (m, 3H), 7.70 (t, J = 2.68 Hz, 3H), 7.90 (t, J = 8.05 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz) δ 119.1, 120.0, 123.4, 126.2, 126.9, 127.5, 127.7, 128.2, 128.6, 128.7, 129.0, 129.4, 129.6, 129.7, 131.4, 133.8, 135.8, 140.2, 147.4, 153.4, 161.8. HRMS [ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{ClNS}$ [$\text{M} + \text{H}$] $^+$ 346.0457, Found 346.0462.

9-Fluoro-11-phenylthiochromeno[2,3-*b*]indole (3o)



Red solid, 84 mg, 51% yield, Mp: 255-257 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.39 (d, J = 7.70 Hz, 1H), 6.96 (t, J = 7.60 Hz, 1H), 7.10-7.14 (m, 1H), 7.41-7.45 (m, 3H), 7.55-7.61 (m, 2H), 7.67-7.71 (m, 4H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 113.1 (d, J = 25.2 Hz), 114.3 (d, J = 22.2 Hz), 118.6, 122.4, 123.3, 125.1, 126.2, 128.3, 128.9, 129.2, 129.6, 133.3, 135.8, 136.2, 145.3, 155.0, 160.9, 162.4 (d, J = 255.7 Hz). HRMS [ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{FNS}$ [$\text{M} + \text{H}$] $^+$ 330.0753, Found 330.0759.

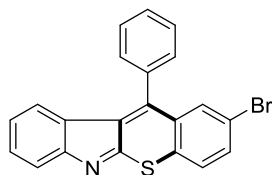
9-Chloro-11-phenylthiochromeno[2,3-*b*]indole (3p)



Red solid, 103 mg, 60% yield, Mp: 228-230 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.40 (d, J = 7.75 Hz, 1H), 6.96 (t, J = 7.58 Hz, 1H), 7.33-7.35 (m, 1H), 7.40-7.45 (m, 3H), 7.49 (d, J = 8.80 Hz, 1H), 7.67-7.70 (m, 4H), 7.88 (d, J =

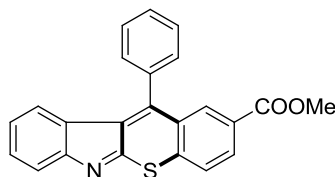
1.60 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 118.6, 122.5, 123.5, 126.2, 126.5, 126.9, 128.3, 129.2, 129.4, 129.6, 132.0, 134.8, 135.7, 135.9, 145.1, 155.2, 160.8. HRMS[ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{ClNS}$ $[\text{M} + \text{H}]^+$ 346.0457, Found 346.0465.

9-Bromo-11-phenylthiochromeno[2,3-*b*]indole (3q)



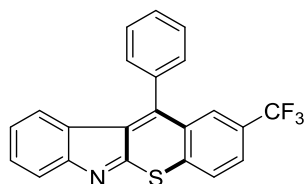
Red solid, 103 mg, 53% yield, Mp: 223-225 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.40 (d, J = 7.65 Hz, 1H), 6.96 (t, J = 7.53 Hz, 1H), 7.40-7.50 (m, 5H), 7.68-7.70 (m, 4H), 8.04 (s, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 118.7, 122.5, 123.6, 124.0, 126.1, 127.3, 128.4, 129.1, 129.4, 129.6, 132.1, 135.1, 135.9, 145.2, 155.3, 160.8. HRMS [ESI] Calcd for $\text{C}_{21}\text{H}_{12}\text{BrNS}$ $[\text{M} + \text{H}]^+$ 389.9952, Found 389.9958.

Methyl 11-phenylthiochromeno[2,3-*b*]indole-2-carboxylate (3r)



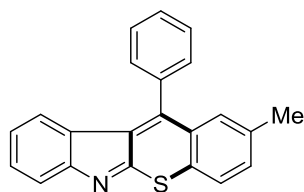
Red solid, 120 mg, 65% yield, Mp: 248-250 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 3.99 (s, 3H), 6.42 (d, J = 7.75 Hz, 1H), 6.97 (t, J = 7.55 Hz, 1H), 7.42-7.48 (m, 3H), 7.64 (d, J = 8.55 Hz, 1H), 7.69-7.70 (m, 4H), 7.99 (d, J = 8.55 Hz, 1H), 8.57 (s, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 52.7, 118.7, 122.5, 123.9, 126.0, 126.2, 128.4, 129.3, 129.7, 129.9, 130.2, 130.9, 131.6, 133.1, 135.9, 144.7, 155.4, 161.5, 165.7. HRMS [ESI] Calcd for $\text{C}_{23}\text{H}_{15}\text{NO}_2\text{S}$ $[\text{M} + \text{H}]^+$ 370.0902, Found 370.0912.

11-Phenyl-9-(trifluoromethyl)thiochromeno[2,3-*b*]indole (3s)



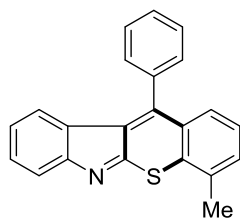
Red solid, 87 mg, 46% yield, Mp: 210-212 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 6.43 (d, J = 7.75 Hz, 1H), 7.00 (t, J = 7.55 Hz, 1H), 7.42-7.48 (m, 3H), 7.70-7.71 (m, 4H), 7.80 (d, J = 8.80 Hz, 2H), 8.01 (d, J = 8.15 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 118.8, 122.8, 124.0 (d, J = 301.2 Hz), 125.5 (q, J = 33.3 Hz), 128.3, 128.6, 129.6, 129.8, 130.4, 135.3, 137.0, 144.8, 155.3, 160.3. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{12}\text{F}_3\text{NS}$ $[\text{M} + \text{H}]^+$ 380.0721, Found 380.0730.

9-Methyl-11-phenylthiochromeno[2,3-*b*]indole (3t)



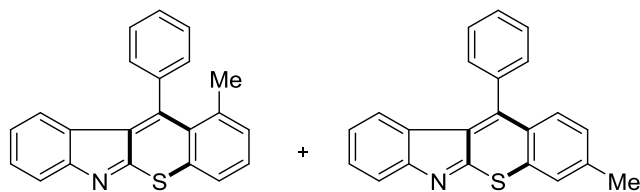
Red solid, 94 mg, 58% yield, Mp: 219-221 °C. R_f = 0.4 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 3.05 (s, 3H), 6.40 (d, J = 7.75 Hz, 1H), 6.94 (t, J = 7.53 Hz, 1H), 7.22 (d, J = 8.45 Hz, 1H), 7.41-7.43 (m, 3H), 7.47 (d, J = 8.35 Hz, 1H), 7.67-7.72 (m, 10H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 21.5, 30.9, 118.3, 122.0, 123.3, 126.1, 126.3, 126.8, 127.4, 128.3, 128.8, 128.9, 129.4, 130.9, 133.7, 136.5, 140.3, 146.2, 155.0, 161.6, 206.8. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{15}\text{NS}$ $[\text{M} + \text{H}]^+$ 326.1003, Found 326.1009.

7-Methyl-11-phenylthiochromeno[2,3-*b*]indole (3u)

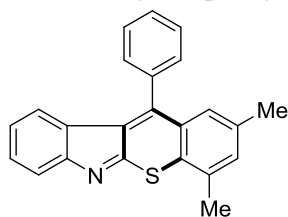


Red solid, 87 mg, 54% yield, Mp: 250-252 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 2.00 (s, 3H), 5.98 (d, J = 7.80 Hz, 1H), 6.86 (t, J = 7.50 Hz, 1H), 7.22 (d, J = 7.15 Hz, 1H), 7.39 (t, J = 7.50 Hz, 1H), 7.43-7.46 (m, 3H), 7.61-7.66 (m, 4H), 7.79 (d, J = 7.90 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 26.4, 118.3, 121.8, 123.9, 126.1, 127.0, 128.3, 128.9, 129.0, 129.3, 131.1, 131.6, 135.0, 140.5, 141.5, 147.4, 155.1, 160.8. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{15}\text{NS}$ $[\text{M} + \text{H}]^+$ 326.1003, Found 326.1005.

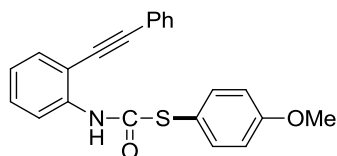
10-Methyl-11-phenylthiochromeno[2,3-*b*]indole (3v) and 8-methyl-11-phenylthiochromeno[2,3-*b*]indole (3v')



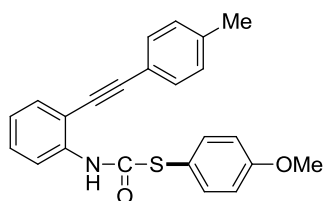
Red solid, 109 mg, 67% yield, $3\text{v}/3\text{v}' = 1.8:1$. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 2.37 (s, 1.6H, for 3v'), 2.71 (s, 3H, for 3v), 6.36 (d, J = 7.75 Hz, 1H, for 3v), 6.39 (d, J = 7.75 Hz, 1H, for 3v'), 6.92-6.98 (m, 1.8H), 7.34 (t, J = 7.88 Hz, 1.8H), 7.40-7.50 (m, 8H), 7.66-7.73 (m, 7H), 7.79 (d, J = 8.15 Hz, 0.6H). HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{15}\text{NS}$ $[\text{M} + \text{H}]^+$ 326.1003, Found 326.1014.

7,9-Dimethyl-11-phenylthiochromeno[2,3-*b*]indole (3w)

Red solid, 59 mg, 35% yield, Mp: 188-190 °C. R_f = 0.40 (petroleum ether/ethyl acetate = 4:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 1.96 (s, 3H), 2.45 (s, 3H), 5.96 (d, J = 7.85 Hz, 1H), 6.85 (t, J = 7.55 Hz, 1H), 7.05 (s, 1H), 7.37 (t, J = 7.55 Hz, 1H), 7.44-7.45 (m, 2H), 7.60-7.65 (m, 5H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 21.0, 26.2, 118.2, 121.7, 123.6, 123.9, 126.1, 127.2, 128.3, 128.7, 128.8, 129.3, 130.3, 133.2, 135.3, 139.7, 140.7, 141.2, 147.6, 155.0, 160.8. HRMS [ESI] Calcd for $\text{C}_{23}\text{H}_{17}\text{NS}$ [$\text{M} + \text{H}$] $^+$ 340.1160, Found 340.1162.

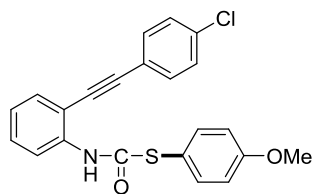
S-(4-Methoxyphenyl) (2-(phenylethynyl)phenyl)carbamothioate (4a)

Yellow solid, 111 mg, 62% yield, Mp: 88-90 °C. R_f = 0.50 (petroleum ether/ethyl acetate = 12:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 3.67 (s, 3H), 6.79 (d, J = 8.45 Hz, 2H), 7.05 (t, J = 7.55 Hz, 1H), 7.31 (t, J = 7.85 Hz, 1H), 7.41-7.49 (m, 6H), 7.52 (d, J = 8.40 Hz, 2H), 7.96 (s, 1H), 8.21 (d, J = 8.40 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 55.2, 83.7, 96.3, 111.9, 115.3, 118.3, 119.2, 122.3, 123.6, 128.5, 129.7, 131.7, 131.9, 137.3, 138.4, 161.1, 165.4. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{17}\text{NO}_2\text{S}$ [$\text{M} + \text{H}$] $^+$ 360.1058, Found 360.1062.

S-(4-Methoxyphenyl)(2-(p-tolylethynyl)phenyl)carbamothioate (4b)

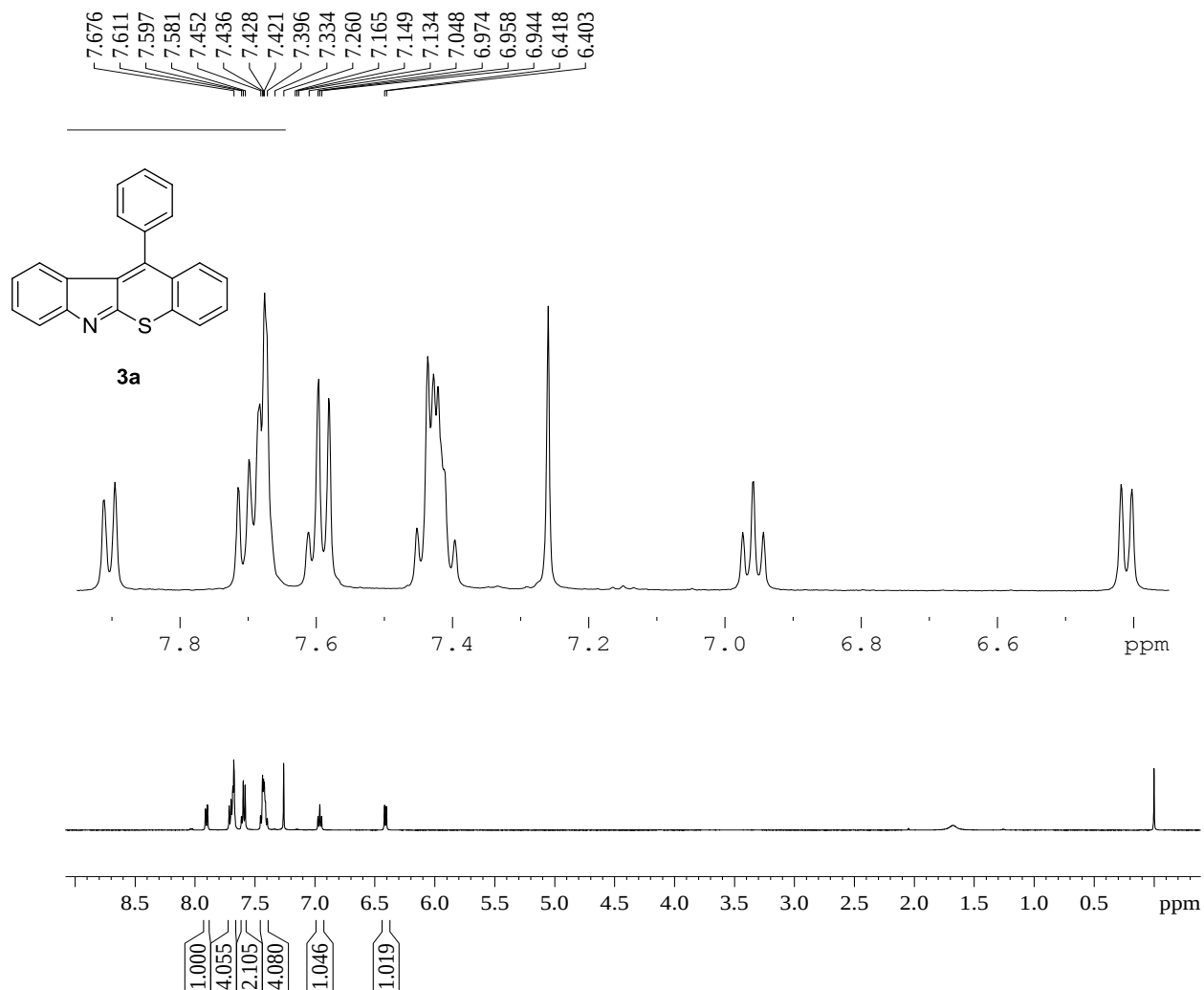
Yellow solid, 119 mg, 64% yield, Mp: 100-102 °C. R_f = 0.50 (petroleum ether/ethyl acetate = 12:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 2.43 (s, 3H), 3.70 (s, 3H), 6.83 (d, J = 8.55 Hz, 2H), 7.07 (t, J = 7.50 Hz, 1H), 7.23 (t, J = 7.75 Hz, 2H), 7.32 (t, J = 7.76 Hz, 1H), 7.40 (d, J = 7.85 Hz, 2H), 7.46 (d, J = 7.50 Hz, 1H), 7.54 (d, J = 8.50 Hz, 2H), 7.99 (s, 1H), 8.23 (d, J = 8.30 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 21.5, 55.2, 83.1, 96.6, 112.1, 115.2, 118.4, 119.1, 123.6, 129.2, 129.5, 131.5, 131.9, 137.2, 138.4, 139.1, 161.1, 165.3. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{17}\text{NO}_2\text{S}$ [$\text{M} + \text{H}$] $^+$ 374.1215, Found 374.1225.

S-(4-Methoxyphenyl)(2-((4-chlorophenyl)ethynyl)phenyl)carbamothioate (4c)



Yellow solid, 124 mg, 70% yield, Mp: 116-118 °C. R_f = 0.50 (petroleum ether/ethyl acetate = 12:1, v/v). ^1H NMR (CDCl_3 , 500 MHz): δ 3.69 (s, 3H), 6.80 (d, J = 8.45 Hz, 2H), 7.06 (t, J = 7.48 Hz, 1H), 7.33 (t, J = 7.73 Hz, 1H), 7.38 (s, 4H), 7.43 (d, J = 7.45 Hz, 1H), 7.52 (d, J = 8.50 Hz, 2H), 7.90 (s, 1H), 8.23 (d, J = 8.35 Hz, 1H); ^{13}C NMR (CDCl_3 , 125 MHz): δ 55.2, 84.6, 95.0, 111.5, 115.2, 118.2, 119.2, 120.7, 123.7, 128.9, 130.0, 132.0, 132.8, 135.0, 137.3, 138.4, 161.1, 165.4. HRMS [ESI] Calcd for $\text{C}_{22}\text{H}_{17}\text{NO}_2\text{S}$ $[\text{M} + \text{H}]^+$ 394.0669, Found 394.0672.

¹H NMR and ¹³C NMR spectra of thiochromeno[2,3-*b*]indoles

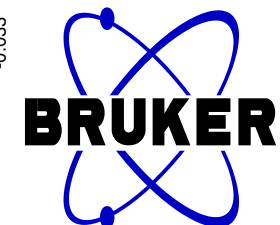
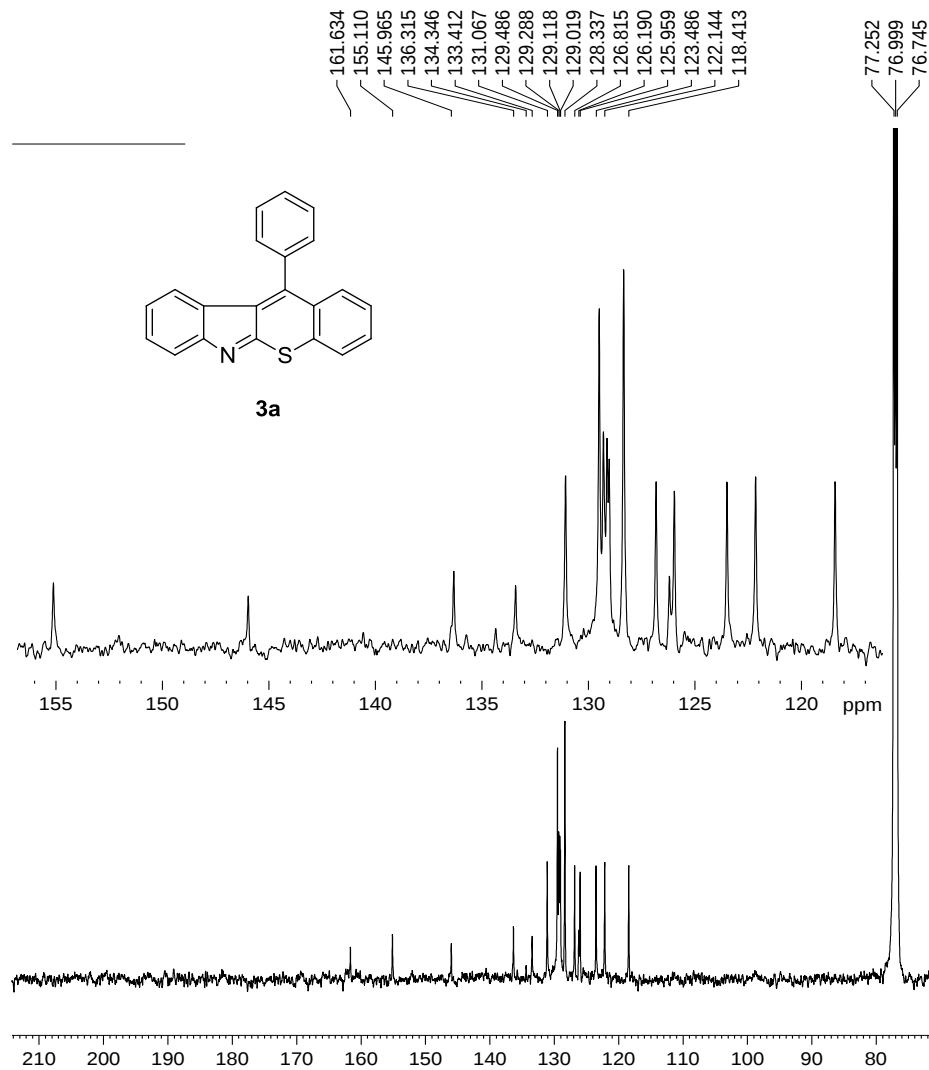


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DE             6.00 usec
TE             673.2 K
D1             2.00000000 sec
TD0            1
  
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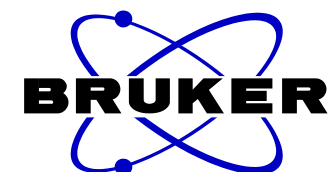
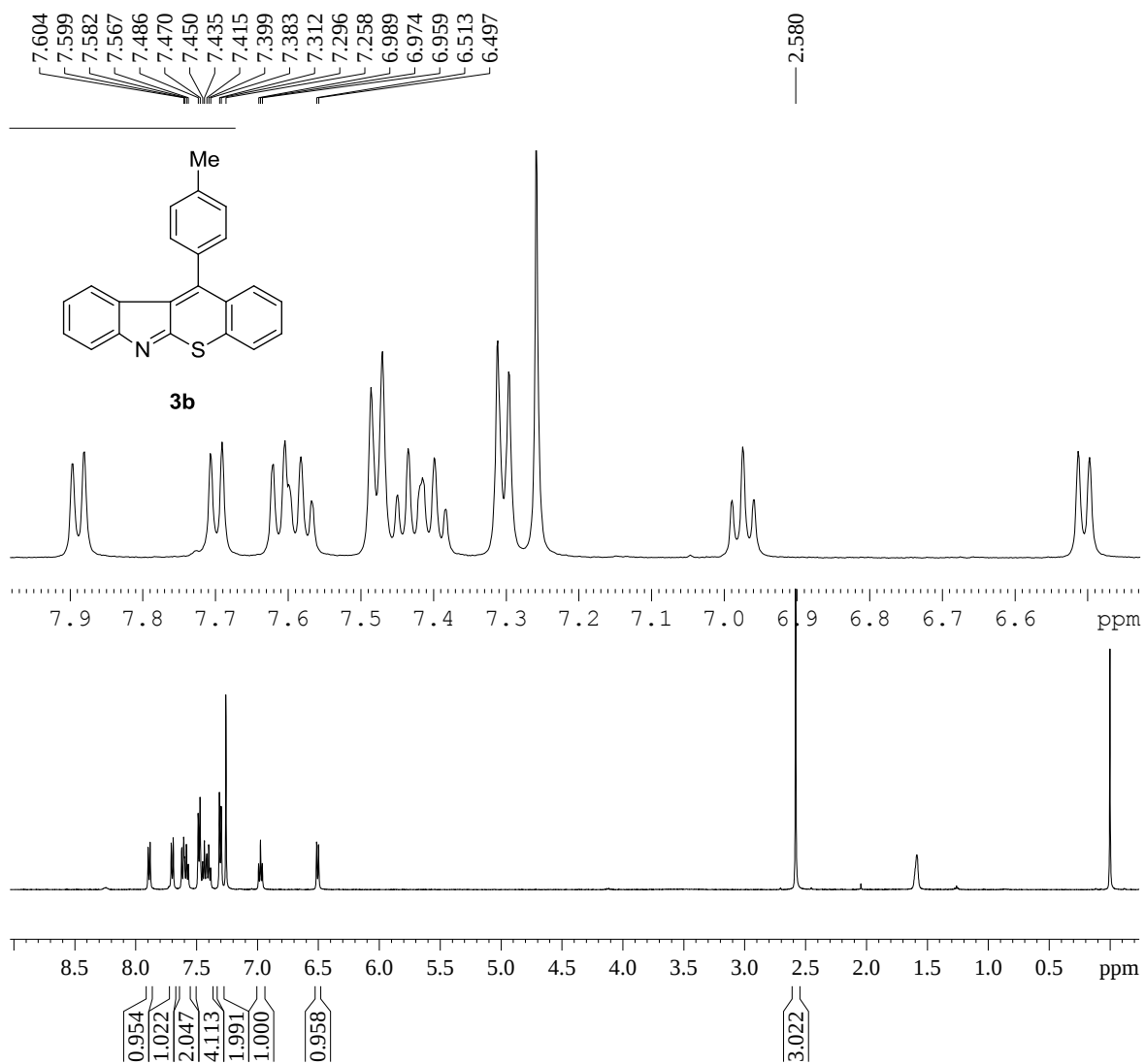
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TD0        20
  
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===== CHANNEL f1 =====
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PCPD2     80.00 usec
PL2       2.00 dB
PL12      17.70 dB
PL13      17.70 dB
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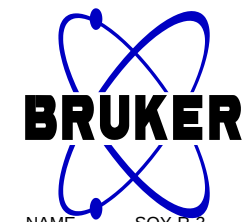
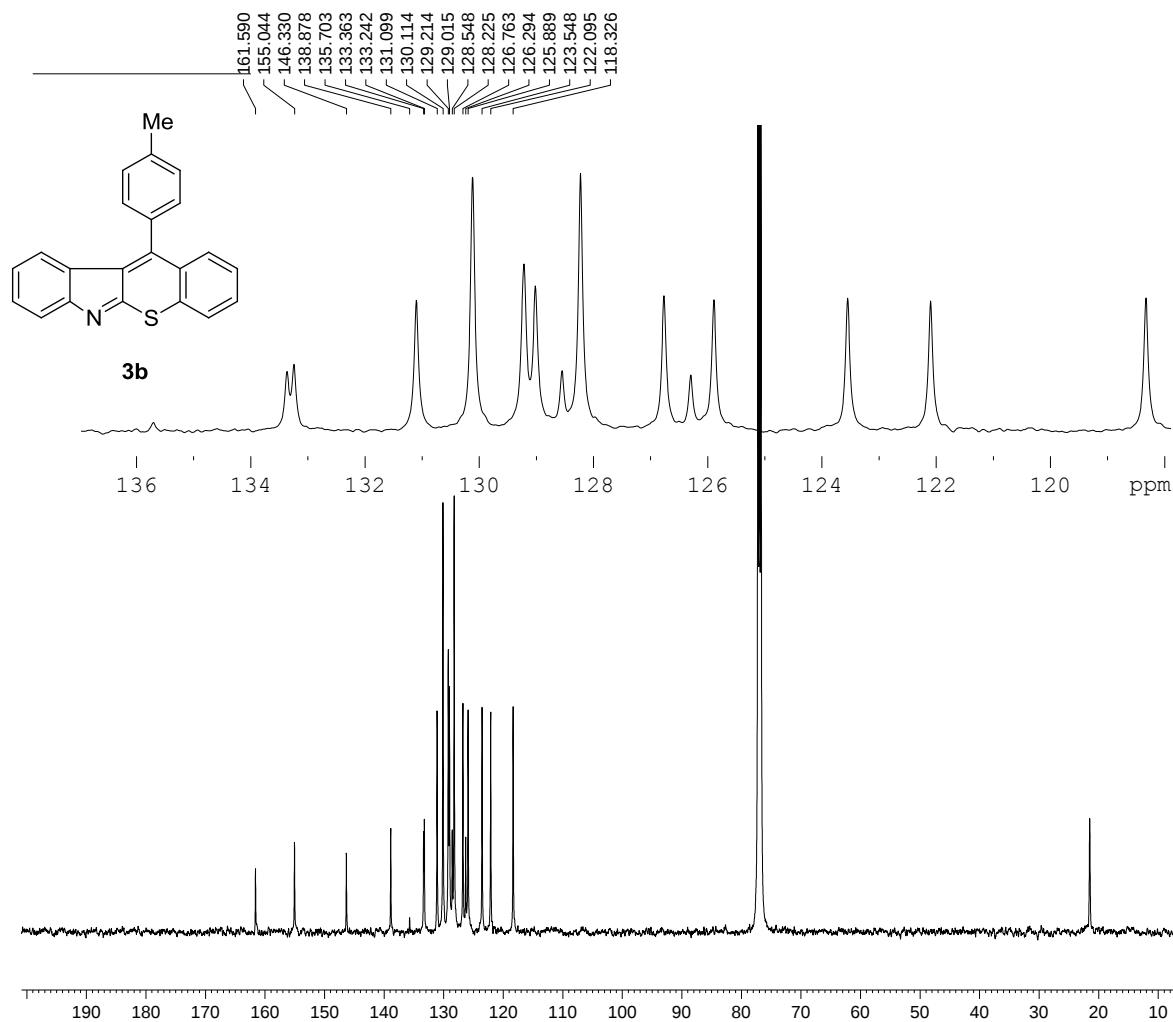


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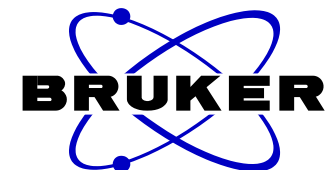
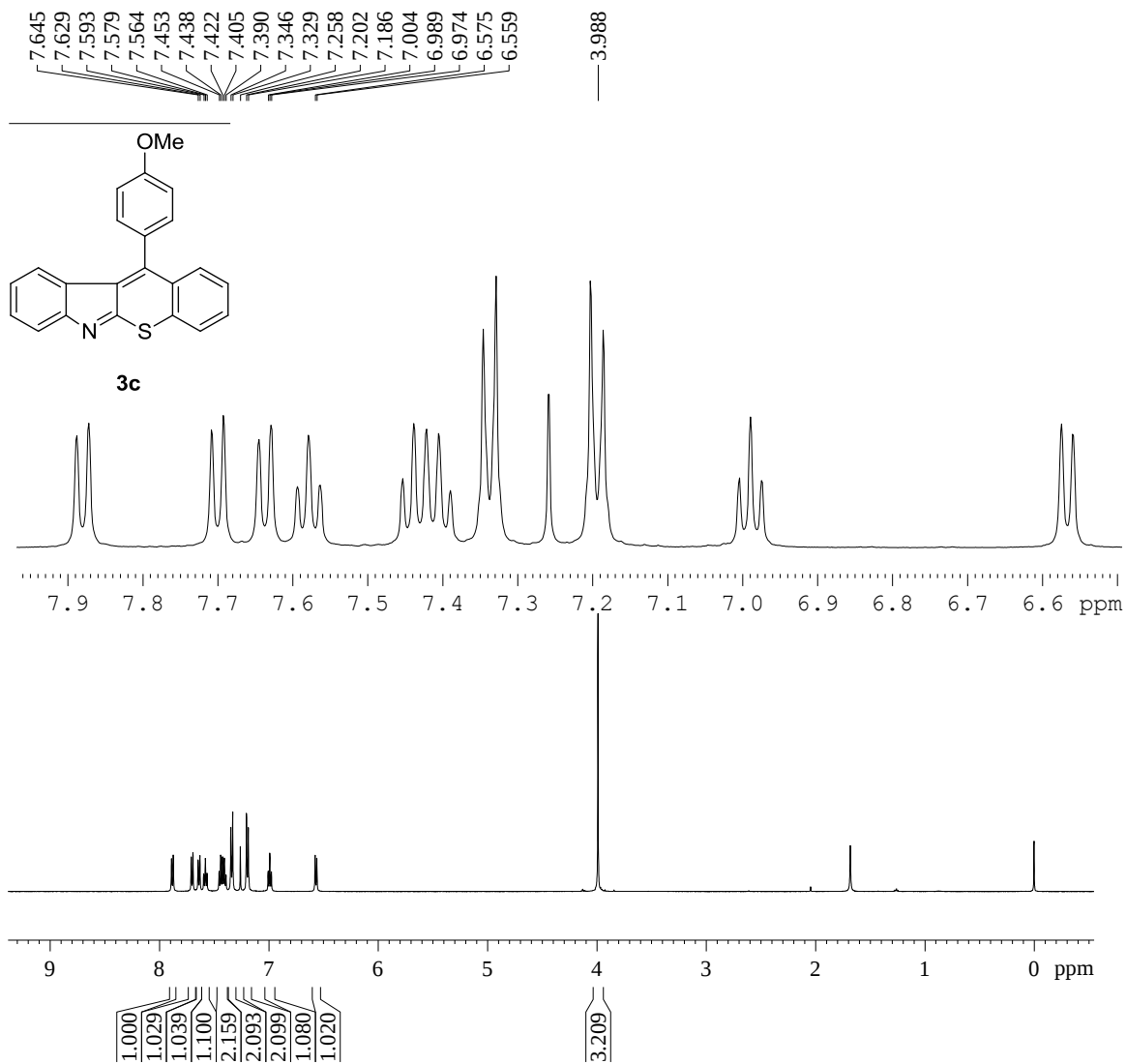
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 DW 15.300 usec
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 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 15

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===== CHANNEL f2 =====
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 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
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 PC 0
 1.00

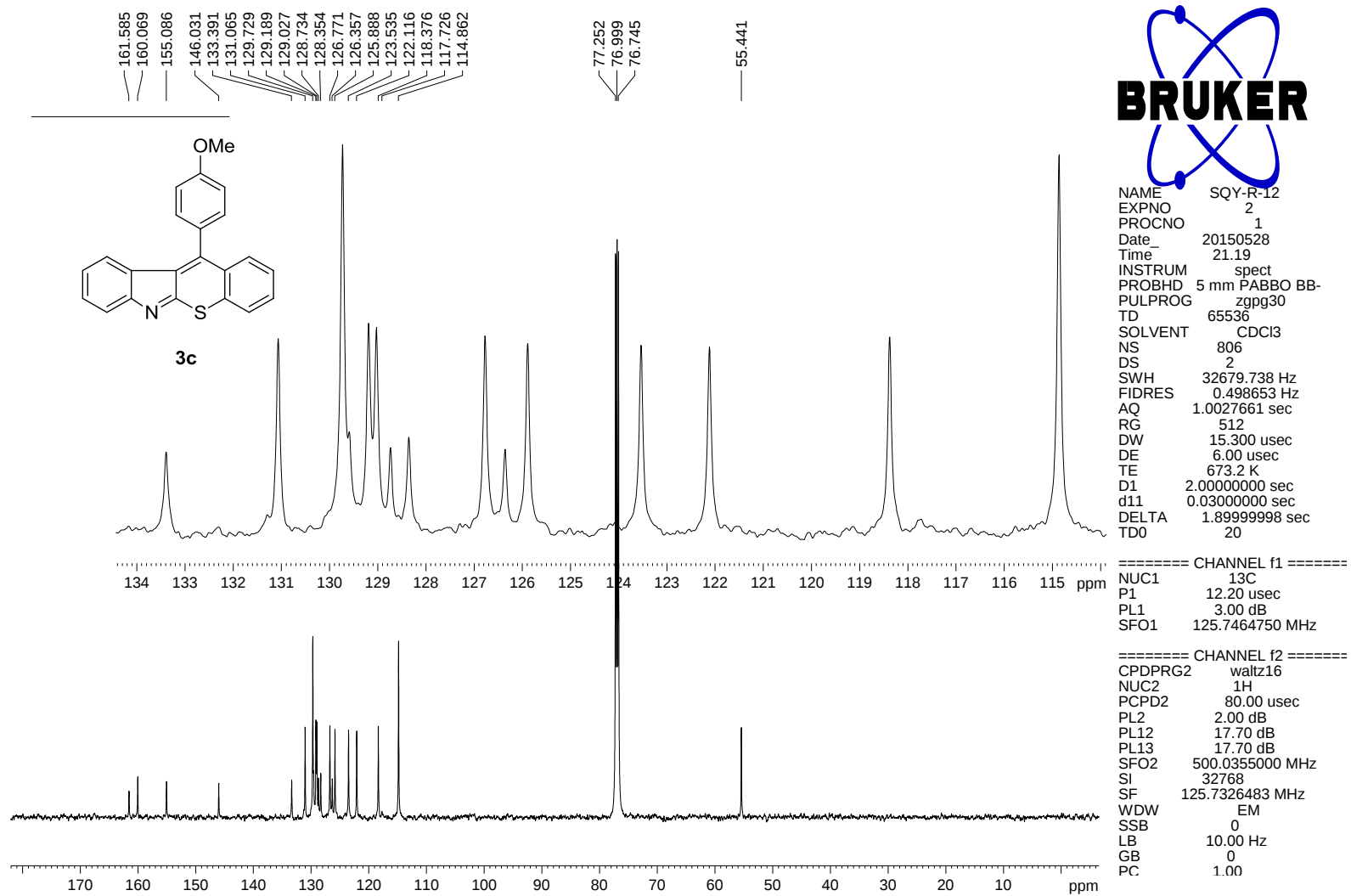


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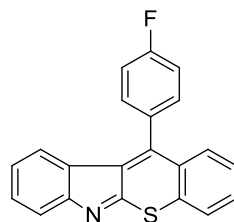
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D1             1.00000000 sec
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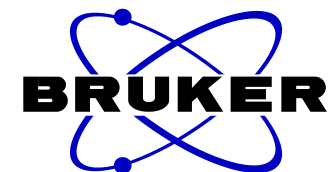
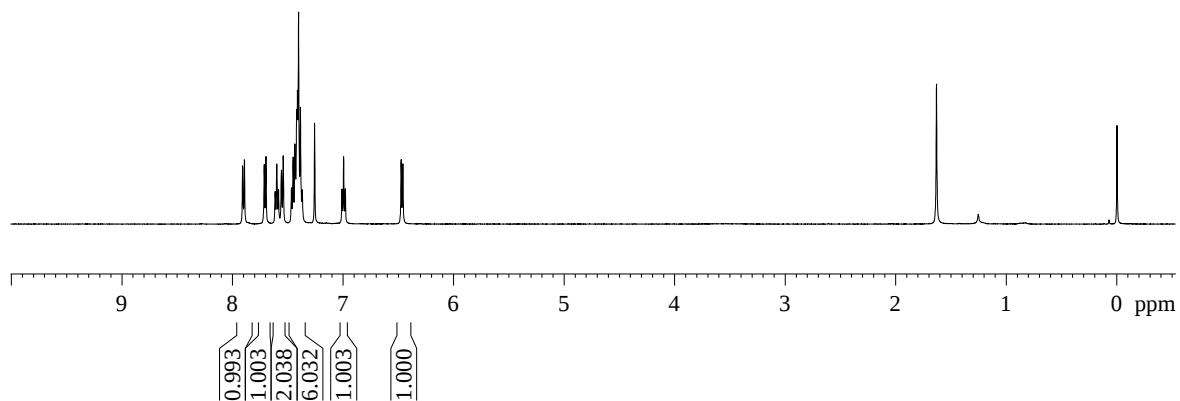
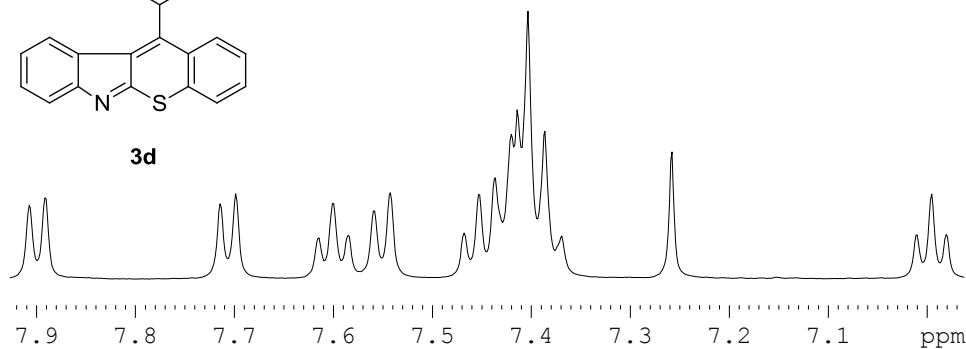
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6.476
6.460

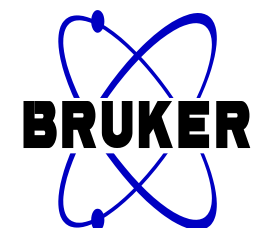
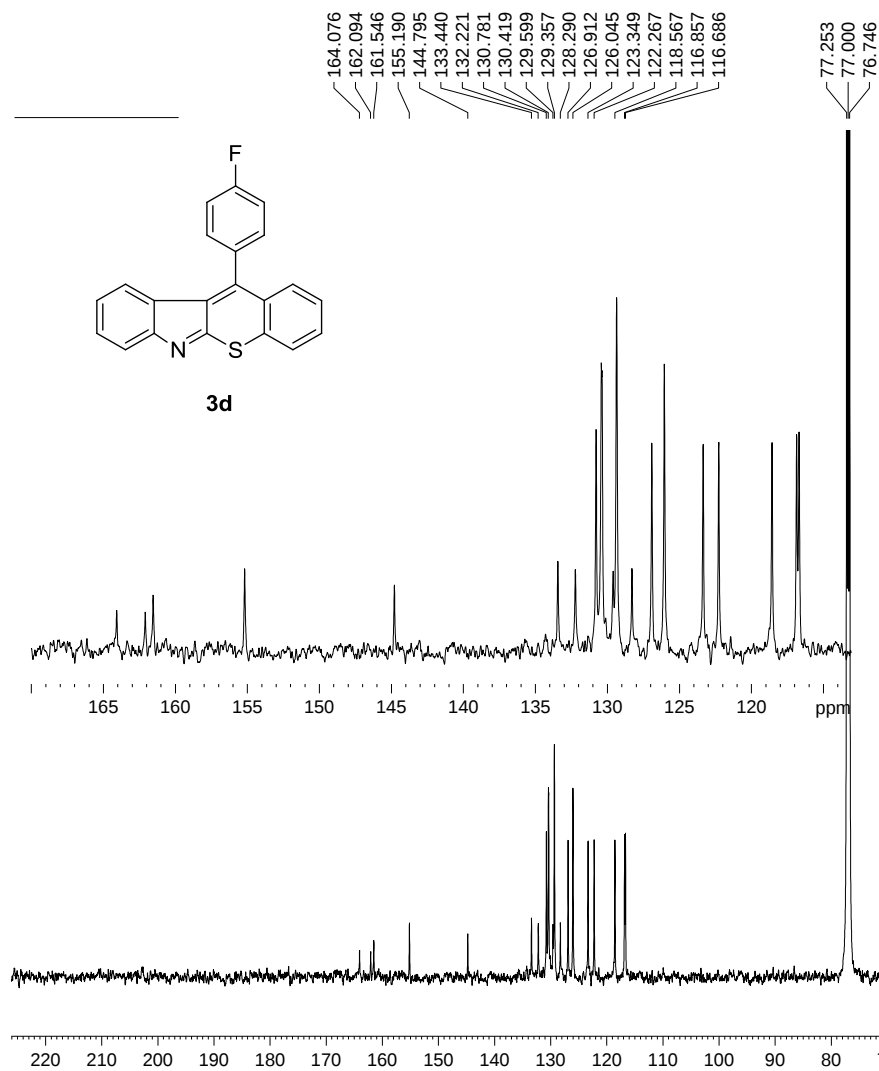


3d



NAME SQY-R-16
EXPNO 1
PROCNO 1
Date_ 20150616
Time_ 16.08
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 1
SWH 10000.000 Hz
FIDRES 0.305176 Hz
AQ 1.6385000 sec
RG 181
DW 50.000 usec
DE 6.00 usec
TE 673.2 K
D1 1.00000000 sec
TD0 1

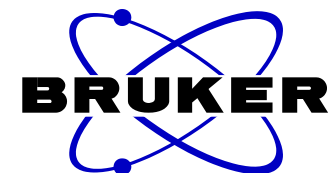
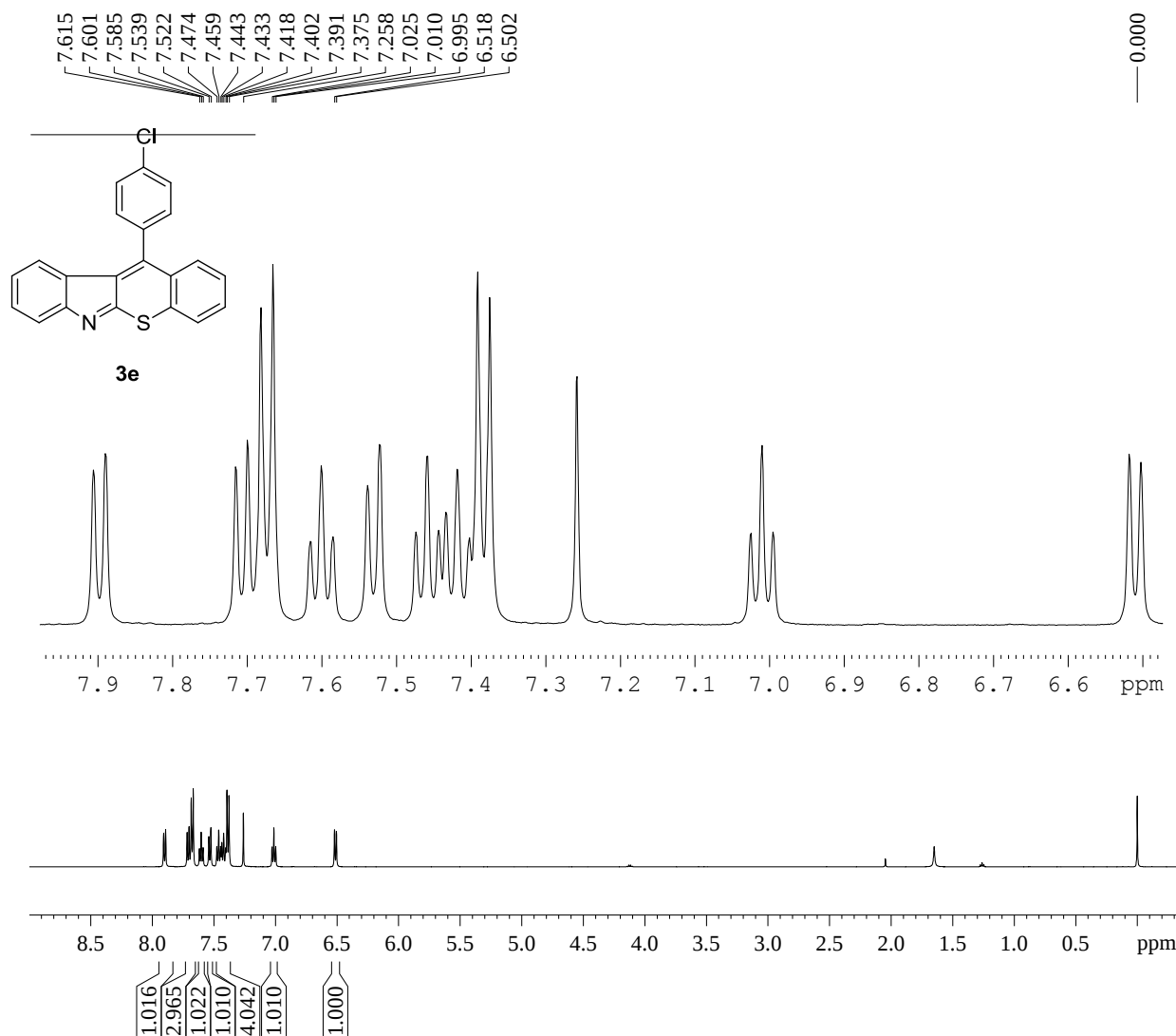
===== CHANNEL f1 =====
NUC1 1H
P1 13.00 usec
PL1 2.00 dB
SFO1 500.0335010 MHz
SI 16384
SF 500.0300113 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 2.00



NAME SQY-R-16
 EXPNO 2
 PROCNO 1
 Date_ 20150618
 Time_ 20.13
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1013
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 1440
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 10

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326463 MHz
 WDW EM
 SSB 0
 GB 10.00 Hz
 GB 0
 PC 1.00

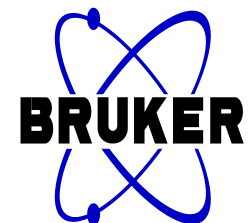
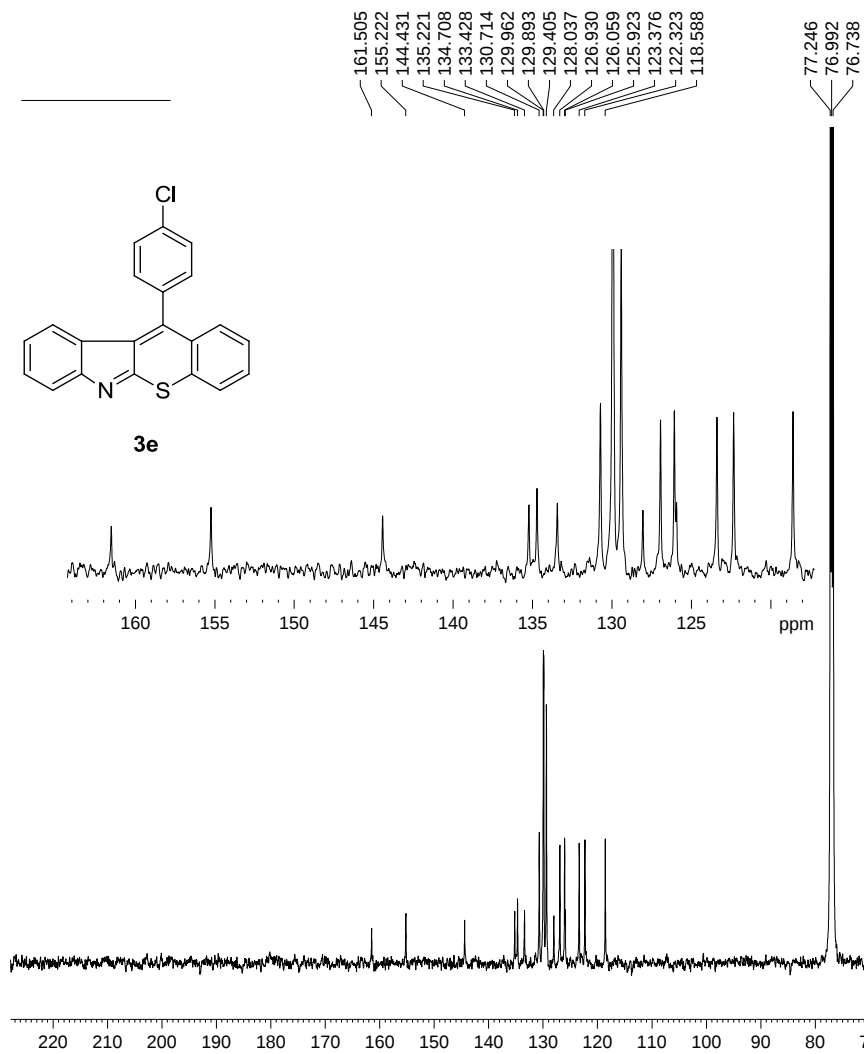


```

NAME                SQY-R-4
EXPNO                1
PROCNO               1
Date_                20150428
Time_                14.50
INSTRUM              spect
PROBHD               5 mm PABBO BB-
PULPROG              zg30
TD                   32768
SOLVENT              CDC13
NS                   16
DS                   1
SWH                  10000.000 Hz
FIDRES               0.305176 Hz
AQ                   1.6385000 sec
RG                   724
DW                   50.000 usec
DE                   6.00 usec
TE                   298.3 K
D1                   1.00000000 sec
TD0                  1
  
```

```

===== CHANNEL f1 =====
NUC1                  1H
P1                    13.00 usec
PL1                   2.00 dB
SFO1                  500.0335010 MHz
SI                    16384
SF                    500.0300113 MHz
WDW                   EM
SSB                   0
LB                    0.30 Hz
GB                    0
PC                    2.00
  
```



```

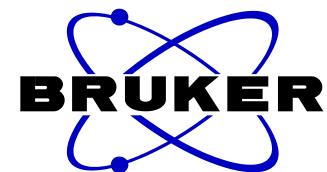
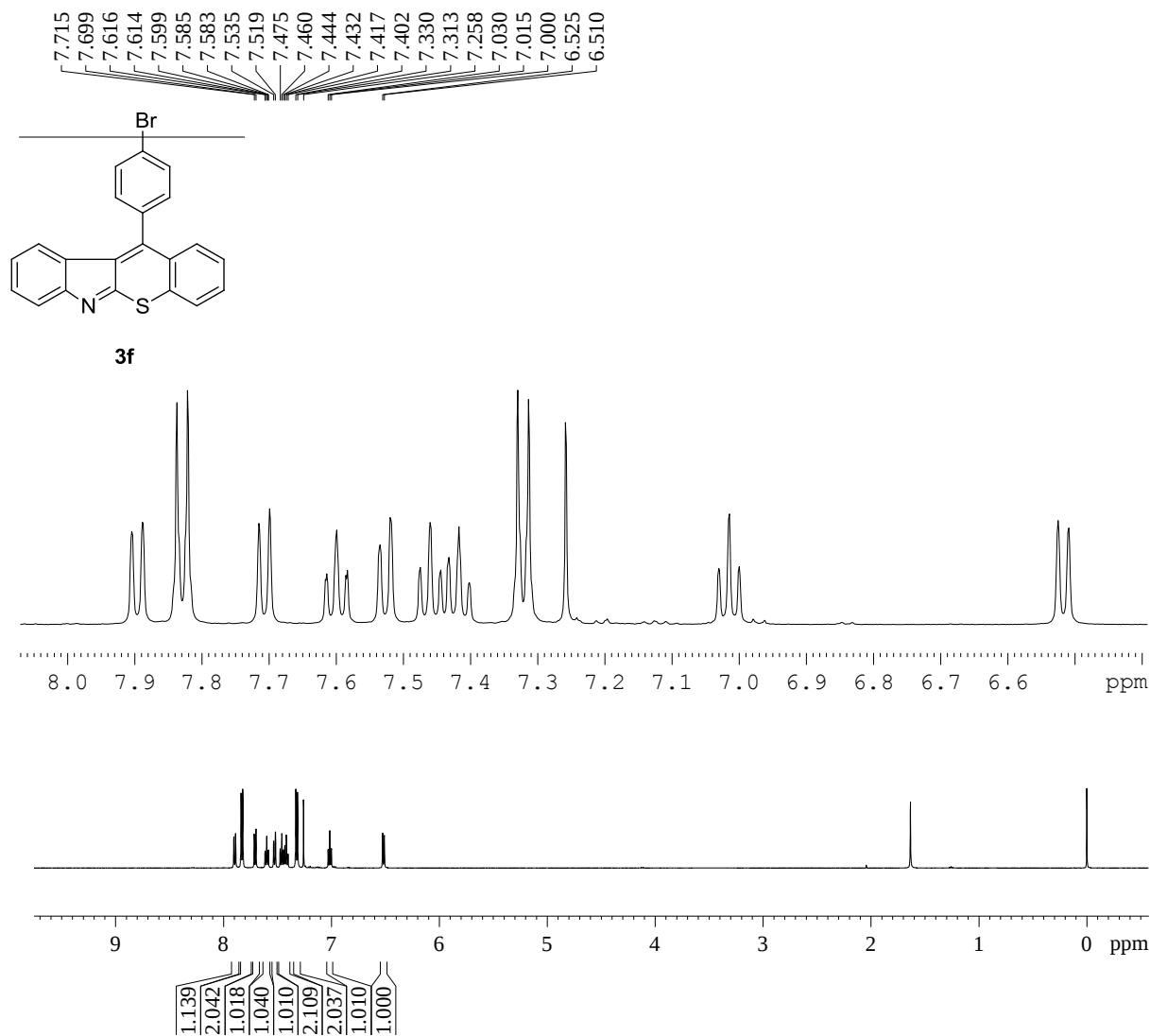
NAME      SQY-R-4
EXPNO     2
PROCNO    1
Date_     20150428
Time      21.22
INSTRUM    spect
PROBHD    5 mm PABBO BB-
PULPROG    zgpg30
TD         65536
SOLVENT    CDCl3
NS         851
DS         2
SWH        32679.738 Hz
FIDRES     0.498653 Hz
AQ         1.0027661 sec
RG         512
DW         15.300 usec
DE         6.00 usec
TE         673.2 K
D1         2.00000000 sec
d11        0.03000000 sec
DELTA      1.89999998 sec
TD0        20
  
```

```

===== CHANNEL f1 =====
NUC1      13C
P1        12.20 usec
PL1       3.00 dB
SFO1      125.7464750 MHz
  
```

```

===== CHANNEL f2 =====
CPDPRG2    waltz16
NUC2       1H
PCPD2      80.00 usec
PL2        2.00 dB
PL12       17.70 dB
PL13       17.70 dB
SFO2       500.0355000 MHz
SI         32768
SF         125.7326476 MHz
WDW        EM
SSB        0
GB         10.00 Hz
PC         1.00
  
```

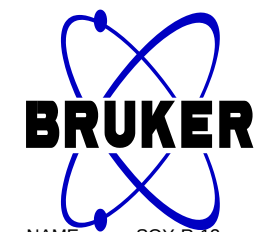
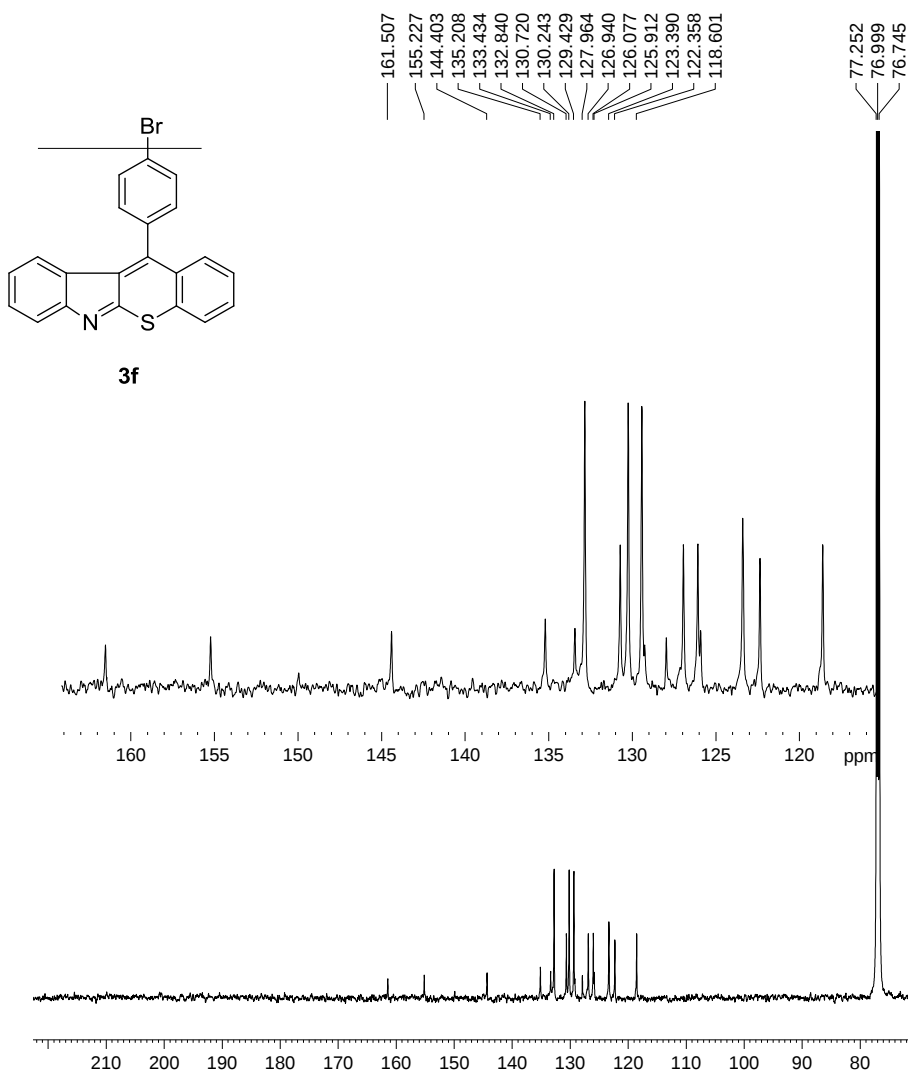


```

NAME          SQY-R-13
EXPNO          1
PROCNO         1
Date_          20150601
Time_          17.07
INSTRUM        spect
PROBHD         5 mm PABBO BB-
PULPROG        zg30
TD             32768
SOLVENT        CDCl3
NS             16
DS             1
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ            1.6385000 sec
RG             912
DW            50.000 usec
DE             6.00 usec
TE            298.5 K
D1            1.00000000 sec
TD0            1
  
```

```

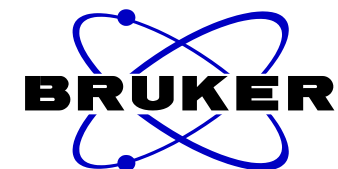
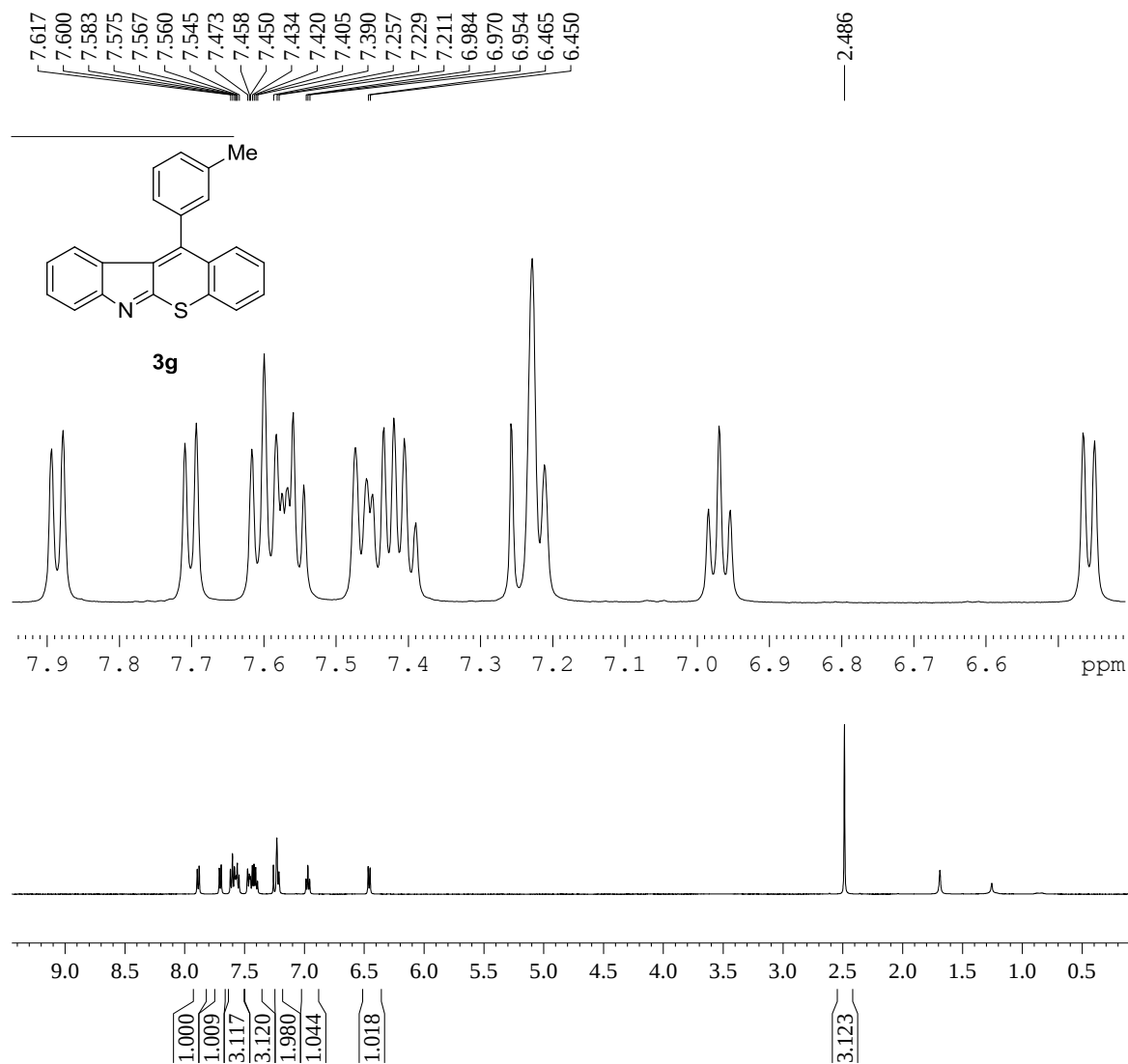
===== CHANNEL f1 =====
NUC1           1H
P1            13.00 usec
PL1            2.00 dB
SFO1          500.0335010 MHz
SI            16384
SF            500.0300115 MHz
WDW            EM
SSB            0
LB            0.30 Hz
GB            0
PC            2.00
  
```



NAME SQY-R-13
 EXPNO 2
 PROCNO 1
 Date_ 20150603
 Time 20.49
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1000
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 512
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.899999998 sec
 TD0 20

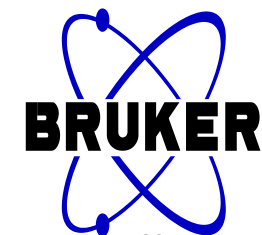
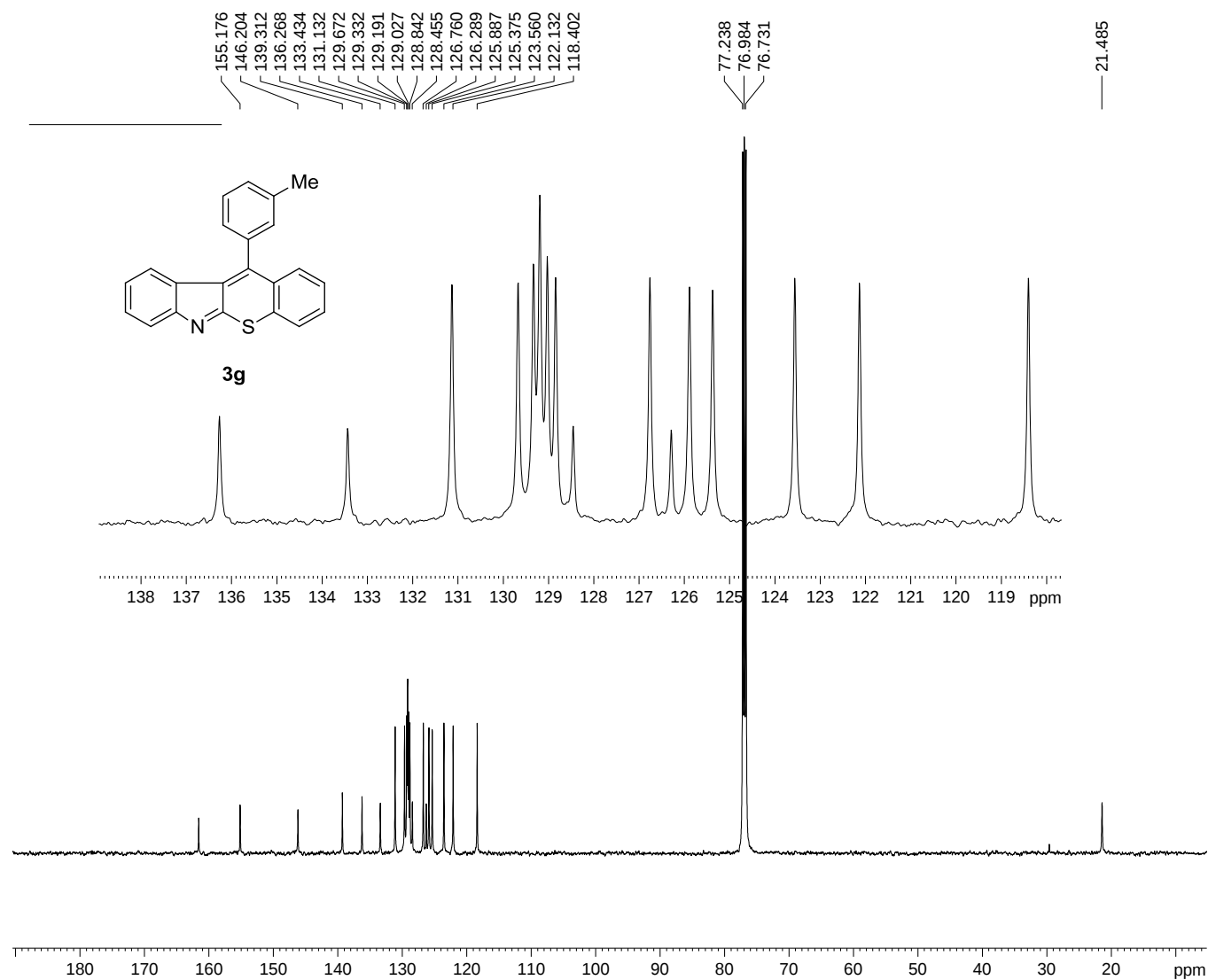
===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326462 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1 00



NAME SQY-R-14
EXPNO 1
PROCNO 1
Date_ 20150610
Time_ 16.50
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 1
SWH 10000.000 Hz
FIDRES 0.305176 Hz
AQ 1.6385000 sec
RG 362
DW 50.000 usec
DE 6.00 usec
TE 298.5 K
D1 1.00000000 sec
TD0 1

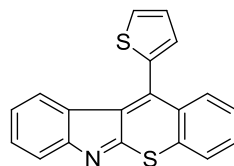
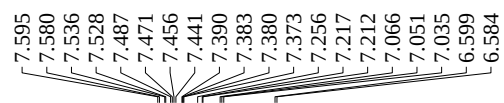
===== CHANNEL f1 =====
NUC1 1H
P1 13.00 usec
PL1 2.00 dB
SFO1 500.0335010 MHz
SI 16384
SF 500.0300119 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 2.00



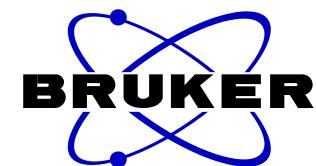
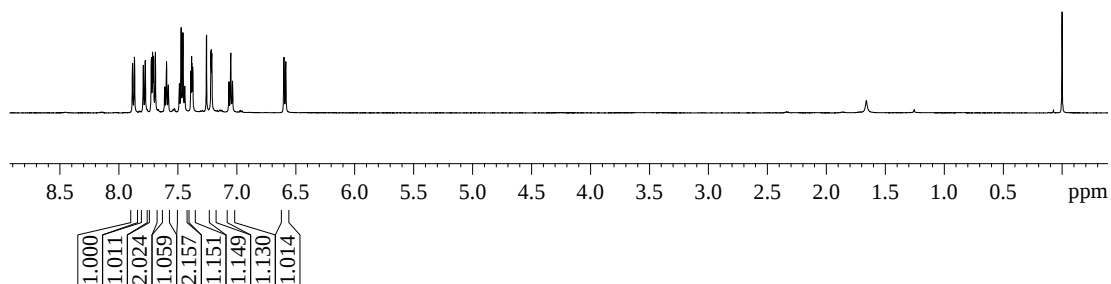
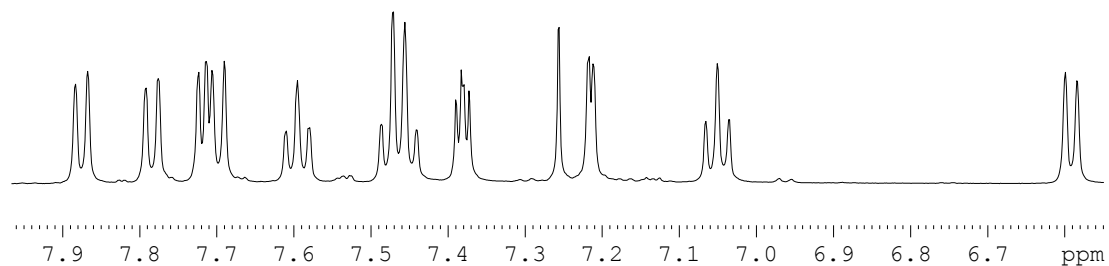
NAME SQY-R-14
 EXPNO 2
 PROCNO 1
 Date_ 20150612
 Time 11.37
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 3494
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 1030
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 20

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326462 MHz
 WDW EM
 SSB 0
 LB 8.00 Hz
 GB 0
 PC 1 00

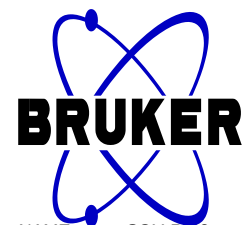
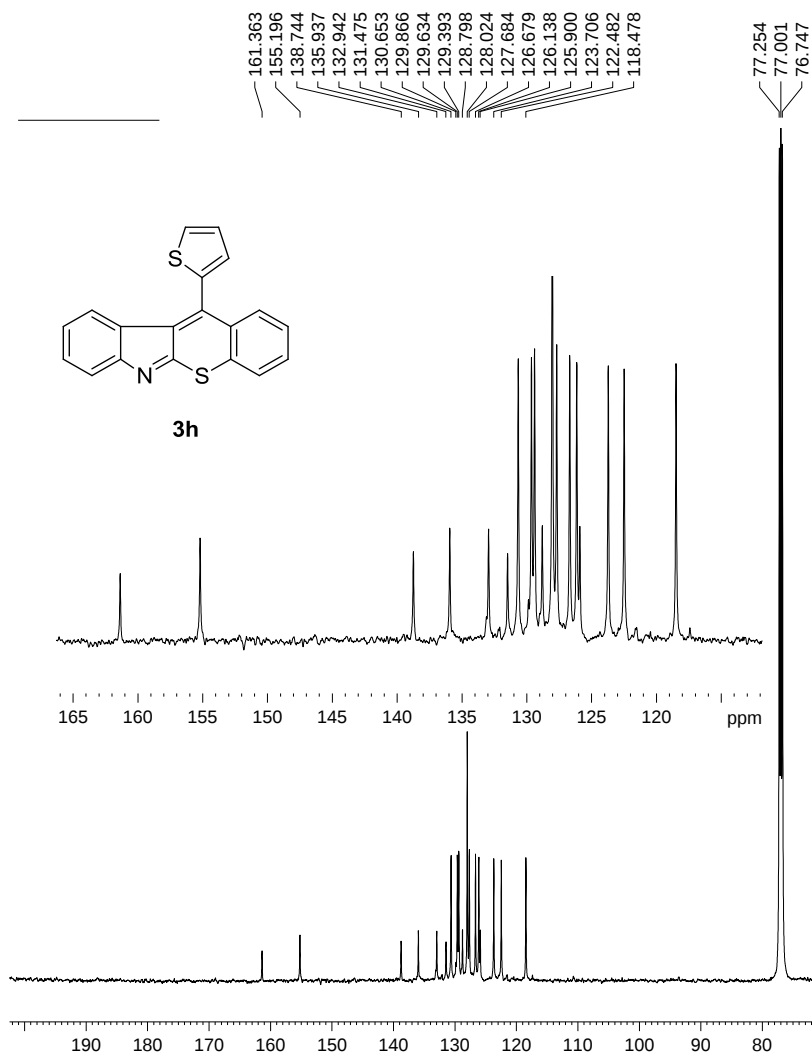


3h



NAME SQY-R-22
EXPNO 1
PROCNO 1
Date_ 20150713
Time_ 19.14
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 1
SWH 10000.000 Hz
FIDRES 0.305176 Hz
AQ 1.6385000 sec
RG 512
DW 50.000 usec
DE 6.00 usec
TE 673.2 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 13.00 usec
PL1 2.00 dB
SFO1 500.0335010 MHz
SI 16384
SF 500.0300124 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 2.00



NAME SQY-R-22
 EXPNO 2
 PROCNO 1
 Date_ 20150717
 Time_ 12.46
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 3574
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 512
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 10

===== CHANNEL f1 =====

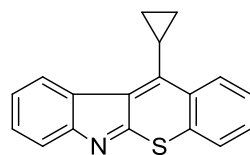
NUC1 ¹³C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====

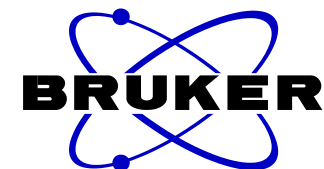
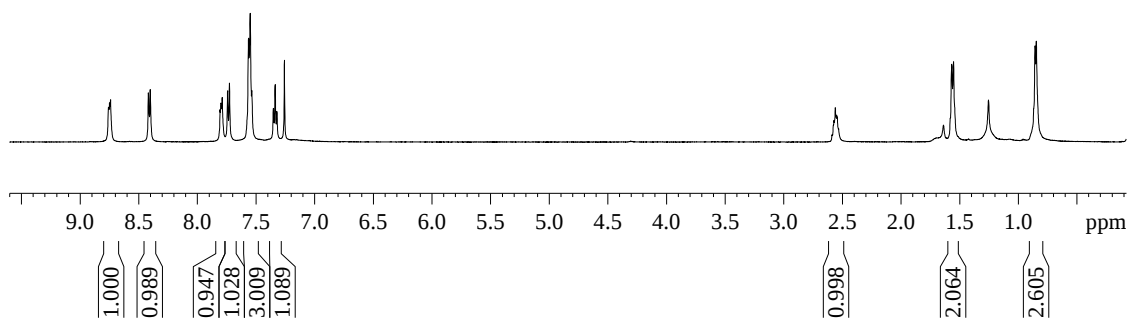
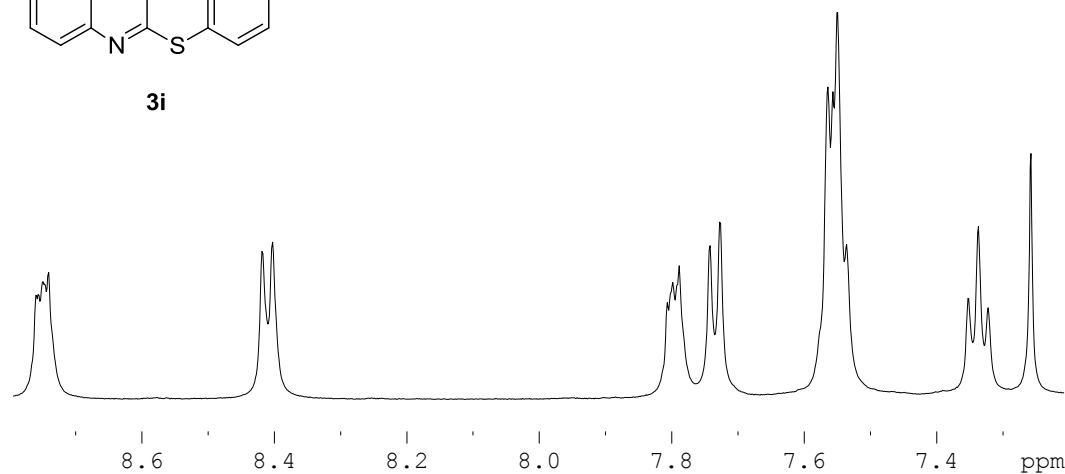
CPDPRG2 waltz16
 NUC2 ¹H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326481 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00

8.749
8.741
8.418
8.402
7.806
7.798
7.789
7.742
7.727
7.564
7.556
7.550
7.536
7.352
7.337
7.322
7.258

2.590
2.573
2.561
2.550
2.545
1.569
1.553
0.858
0.848

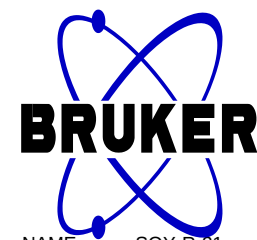
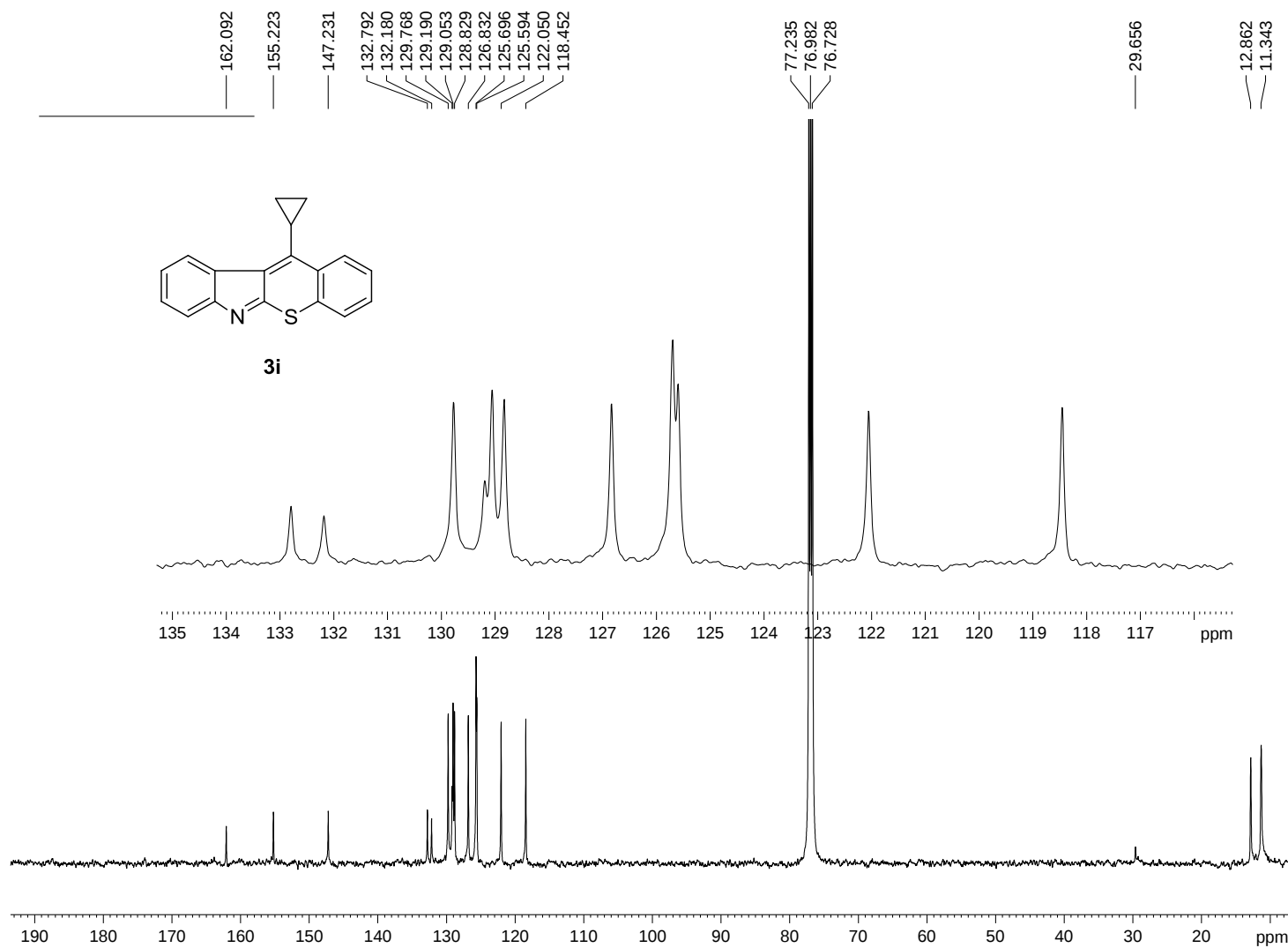


3i



NAME SQY-R-21
EXPNO 1
PROCNO 1
Date_ 20150713
Time_ 19.07
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 1
SWH 10000.000 Hz
FIDRES 0.305176 Hz
AQ 1.6385000 sec
RG 512
DW 50.000 usec
DE 6.00 usec
TE 673.2 K
D1 1.00000000 sec
TD0 1

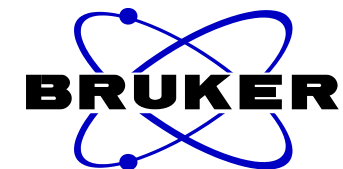
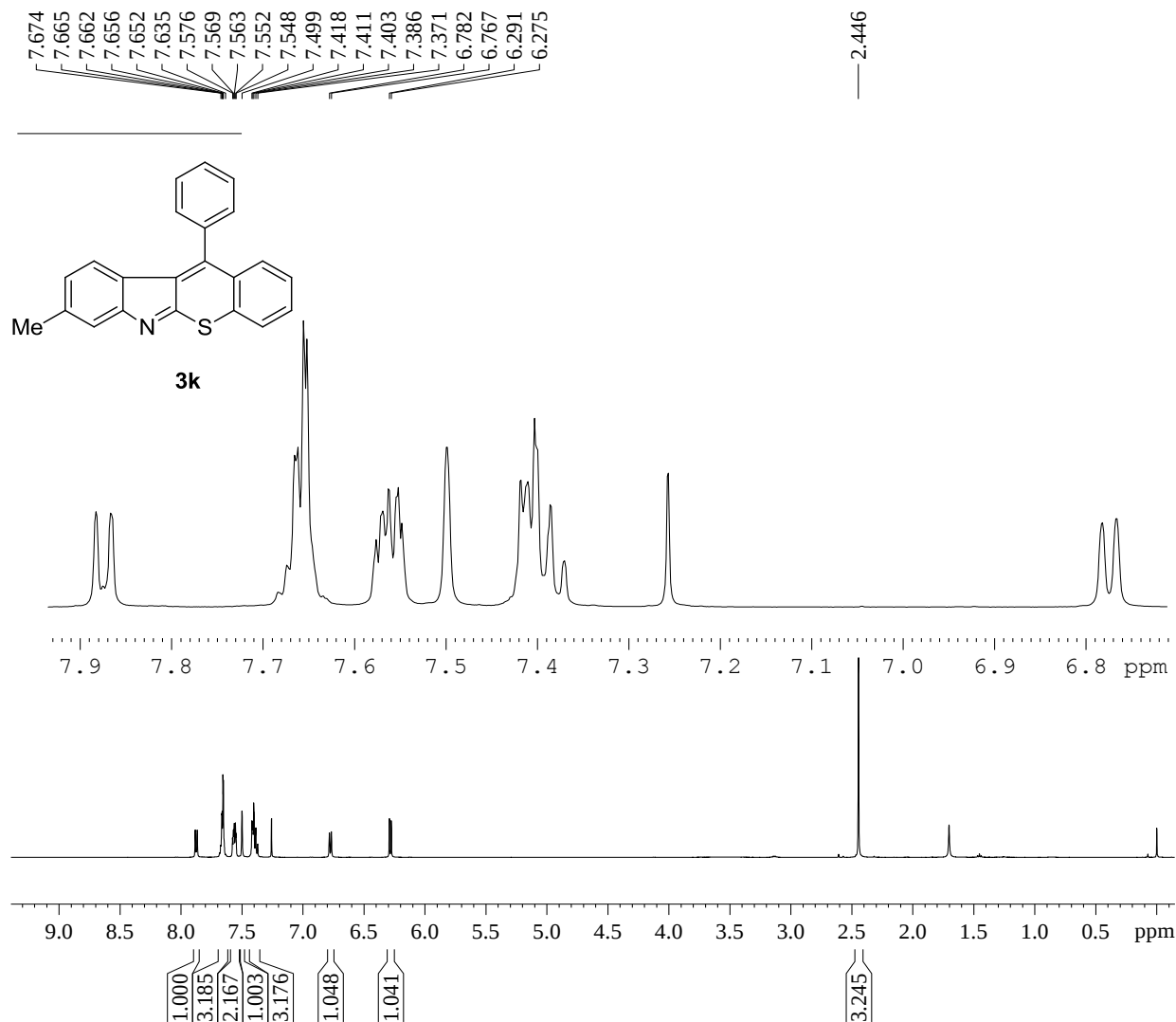
===== CHANNEL f1 =====
NUC1 1H
P1 13.00 usec
PL1 2.00 dB
SFO1 500.0335010 MHz
SI 16384
SF 500.0300115 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 2.00



NAME SQY-R-21
 EXPNO 2
 PROCNO 1
 Date_ 20150717
 Time 8.01
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1917
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 1440
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.0000000 sec
 d11 0.0300000 sec
 DELTA 1.89999998 sec
 TD0 10

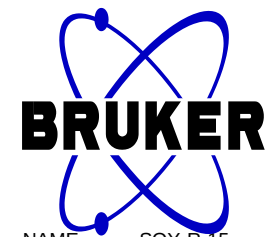
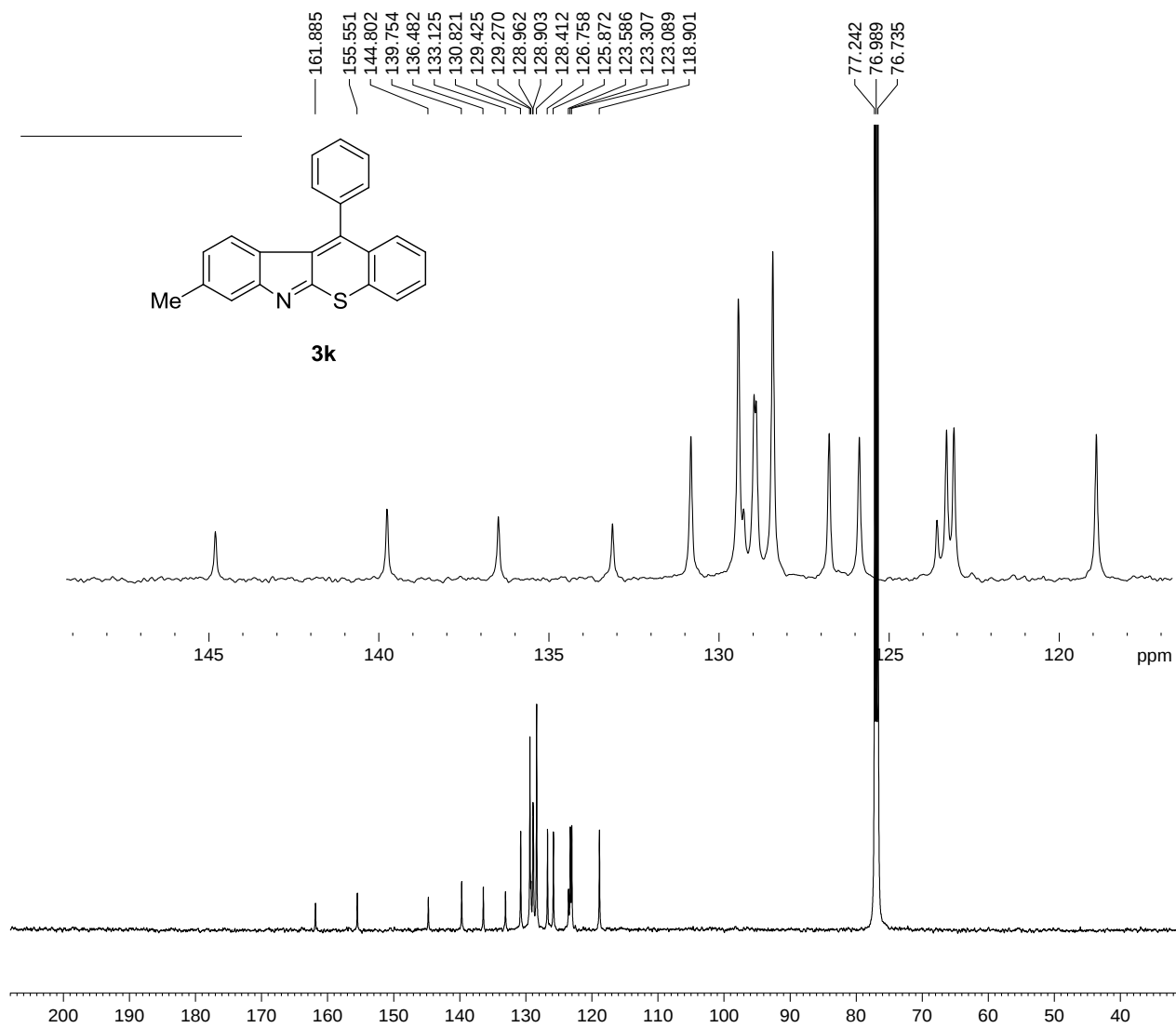
===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326463 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00



NAME SQY-R-15
 EXPNO 1
 PROCNO 1
 Date_ 20150604
 Time_ 10.43
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDCl3
 NS 16
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 456
 DW 50.000 usec
 DE 6.00 usec
 TE 673.2 K
 D1 1.00000000 sec
 TD0 1

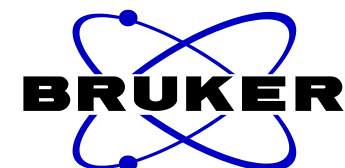
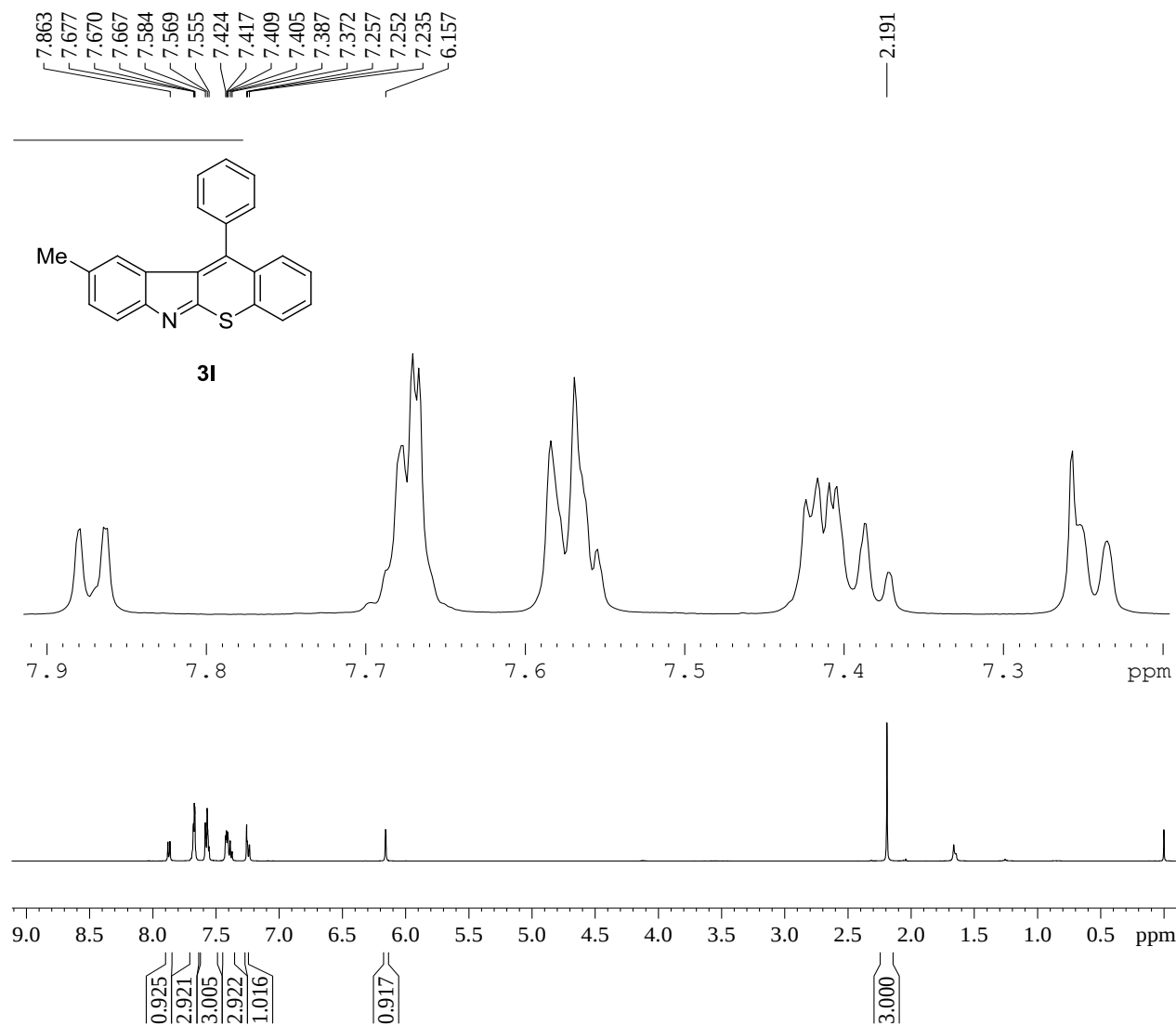
===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300119 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 2.00



NAME SQY-R-15
 EXPNO 2
 PROCNO 1
 Date_ 20150607
 Time 19.07
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 3583
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 512
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TDO 20

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326485 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00



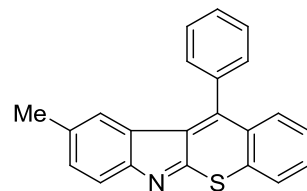
NAME SQY-R-19
 EXPNO 1
 PROCNO 1
 Date_ 20150616
 Time_ 16.13
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDC13
 NS 16
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 181
 DW 50.000 usec
 DE 6.00 usec
 TE 673.2 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300119 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 2.00

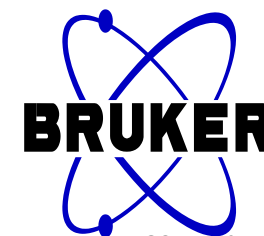
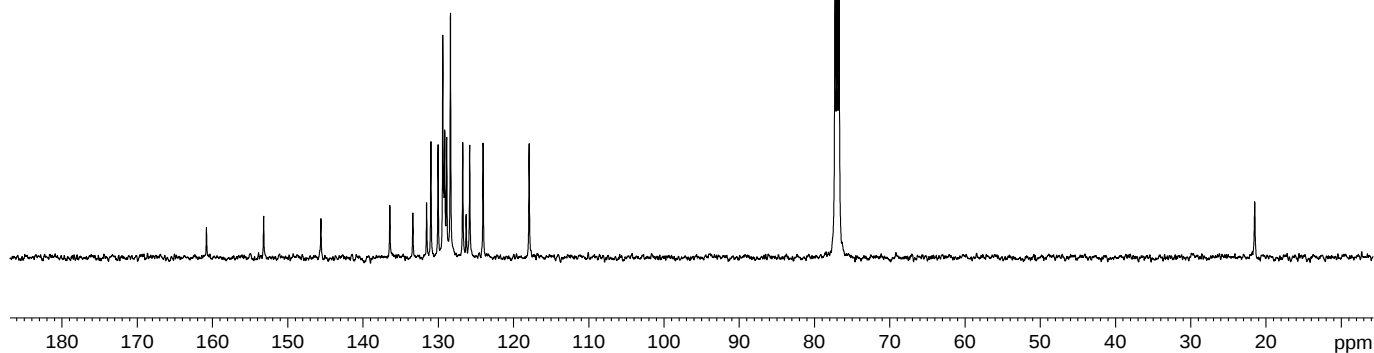
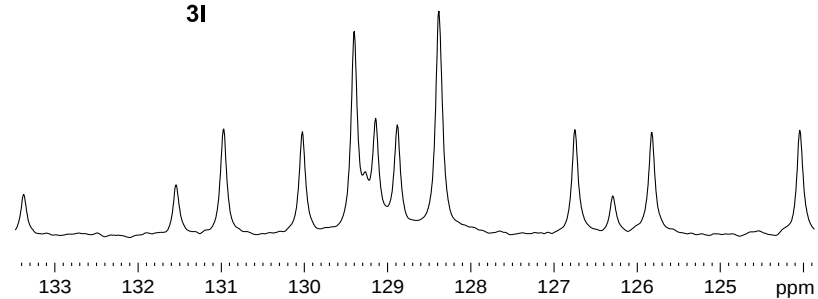
160.771
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136.432
133.374
131.543
130.972
130.024
129.401
129.143
128.882
128.384
126.748
126.292
125.823
124.043
117.920

77.251
76.997
76.743

21.483



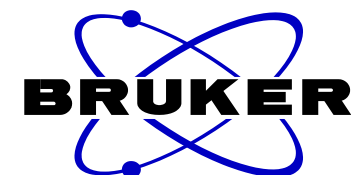
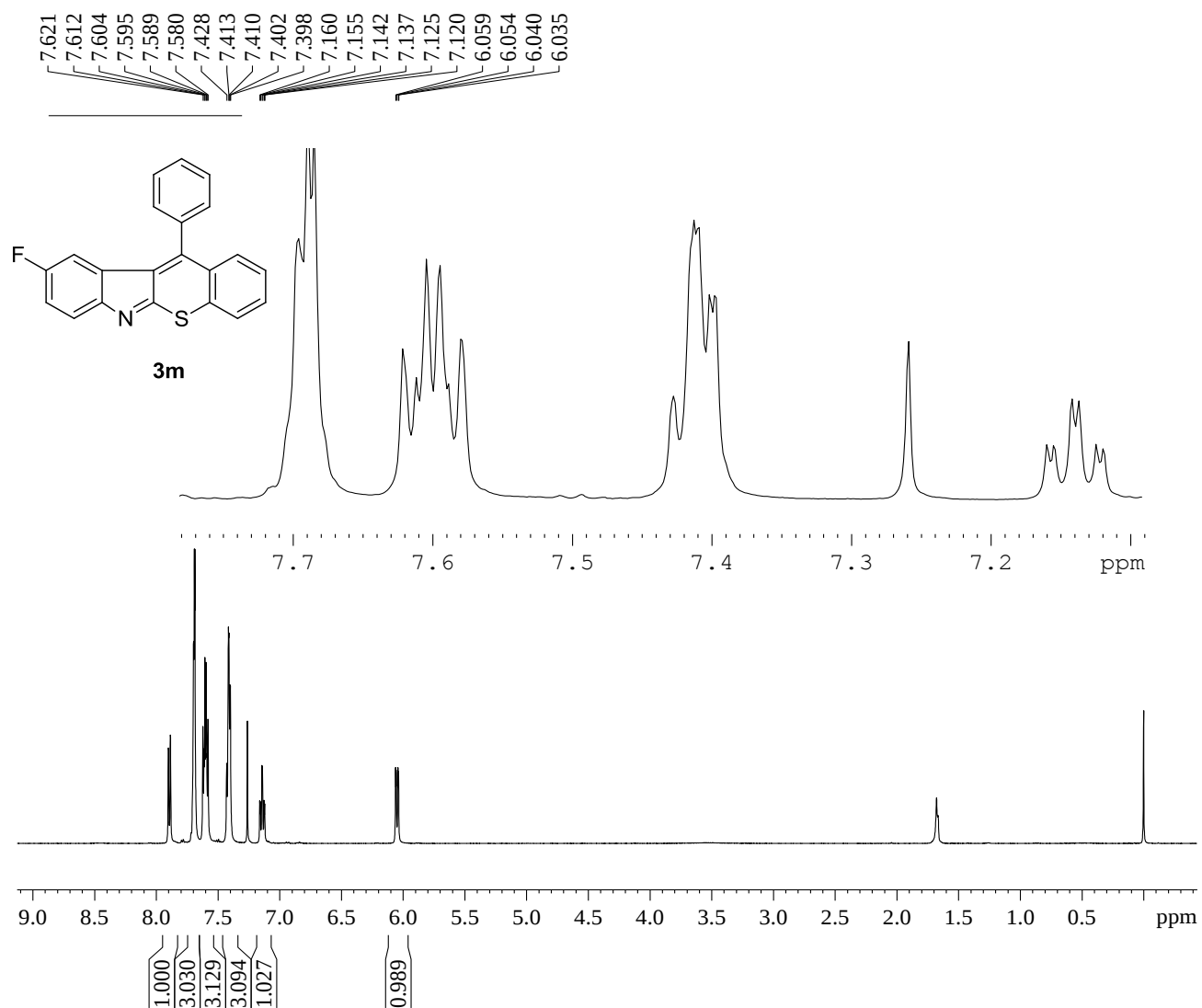
3I



NAME SQY-R-19
EXPNO 2
PROCNO 1
Date_ 20150618
Time 21.43
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 579
DS 2
SWH 32679.738 Hz
FIDRES 0.498653 Hz
AQ 1.0027661 sec
RG 1440
DW 15.300 usec
DE 6.00 usec
TE 673.2 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
TD0 10

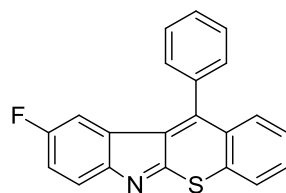
===== CHANNEL f1 =====
NUC1 13C
P1 12.20 usec
PL1 3.00 dB
SFO1 125.7464750 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 2.00 dB
PL12 17.70 dB
PL13 17.70 dB
SFO2 500.0355000 MHz
SI 32768
SF 125.7326493 MHz
WDW EM
SSB 0
LB 10.00 Hz
GB 0
PC 1 00

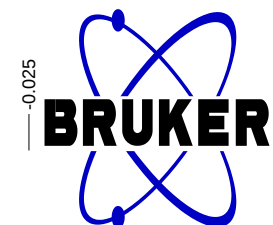
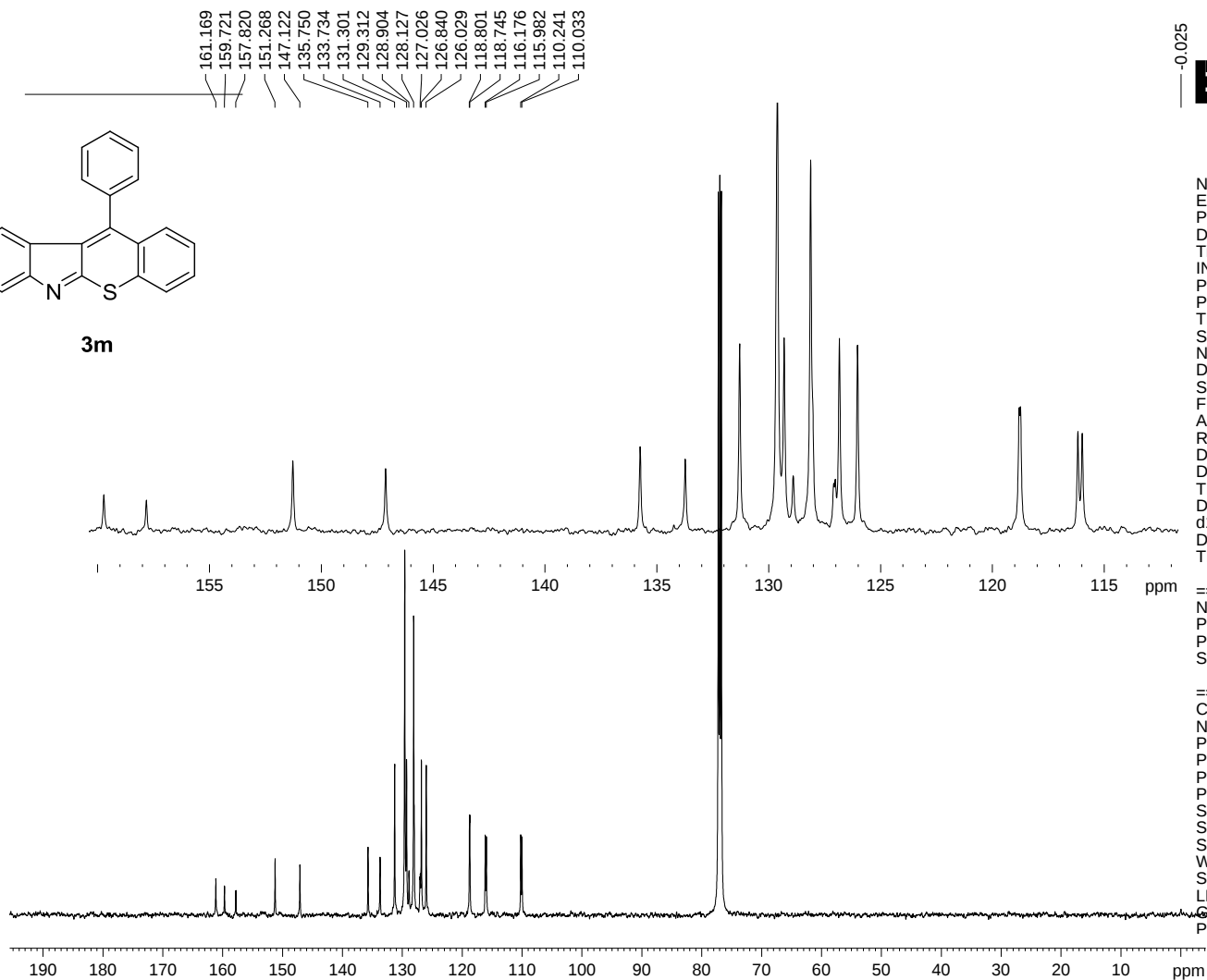


NAME SQY-R-17
 EXPNO 1
 PROCNO 1
 Date_ 20150604
 Time_ 10.48
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDCl3
 NS 16
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 456
 DW 50.000 usec
 DE 6.00 usec
 TE 673.2 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300107 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 2.00



3m

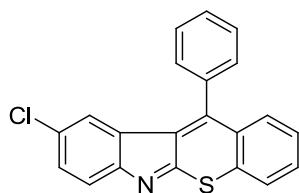


NAME SQY-R-17
EXPNO 2
PROCNO 1
Date_ 20150607
Time 17.55
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1427
DS 2
SWH 32679.738 Hz
FIDRES 0.498653 Hz
AQ 1.0027661 sec
RG 512
DW 15.300 usec
DE 6.00 usec
TE 673.2 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
TD0 20

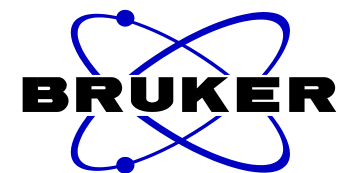
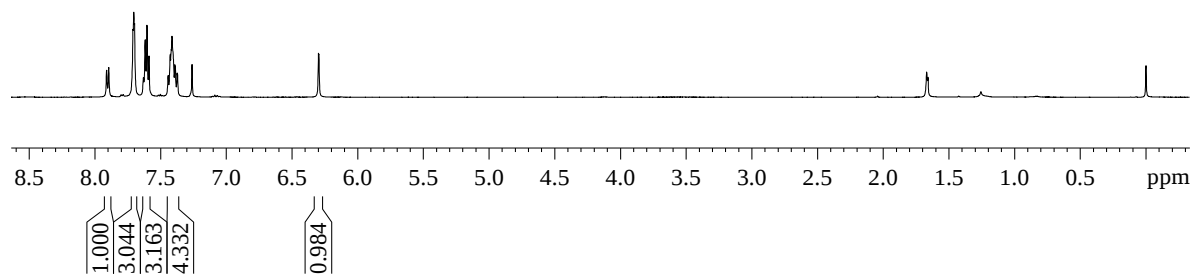
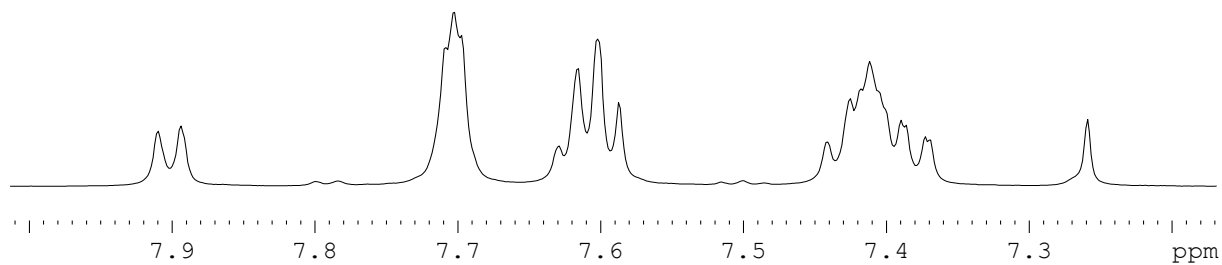
===== CHANNEL f1 =====
NUC1 13C
P1 12.20 usec
PL1 3.00 dB
SFO1 125.7464750 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 2.00 dB
PL12 17.70 dB
PL13 17.70 dB
SFO2 500.0355000 MHz
SI 32768
SF 125.7326485 MHz
WDW EM
SSB 0
LB 10.00 Hz
GB 0
PC 1.00

7.698
7.629
7.616
7.602
7.587
7.441
7.425
7.418
7.412
7.390
7.386
7.373
7.370
6.297
6.294

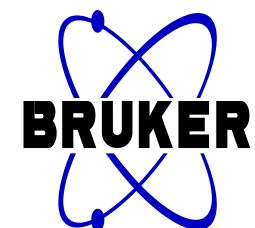
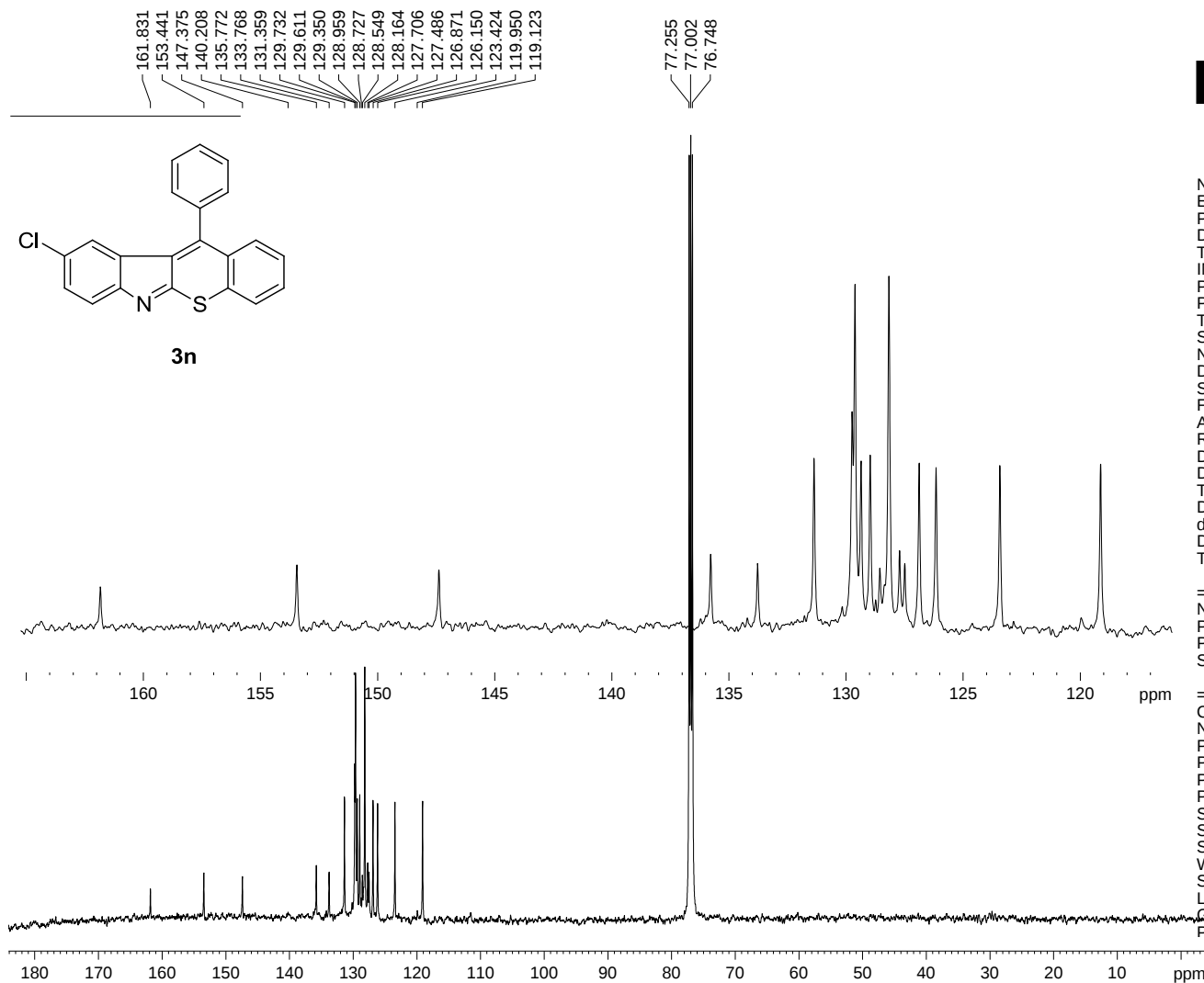


3n



NAME SQY-R-20
EXPNO 1
PROCNO 1
Date_ 20150616
Time_ 16.17
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 1
SWH 10000.000 Hz
FIDRES 0.305176 Hz
AQ 1.6385000 sec
RG 456
DW 50.000 usec
DE 6.00 usec
TE 673.2 K
D1 1.00000000 sec
TD0 1

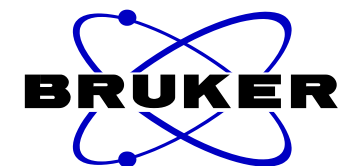
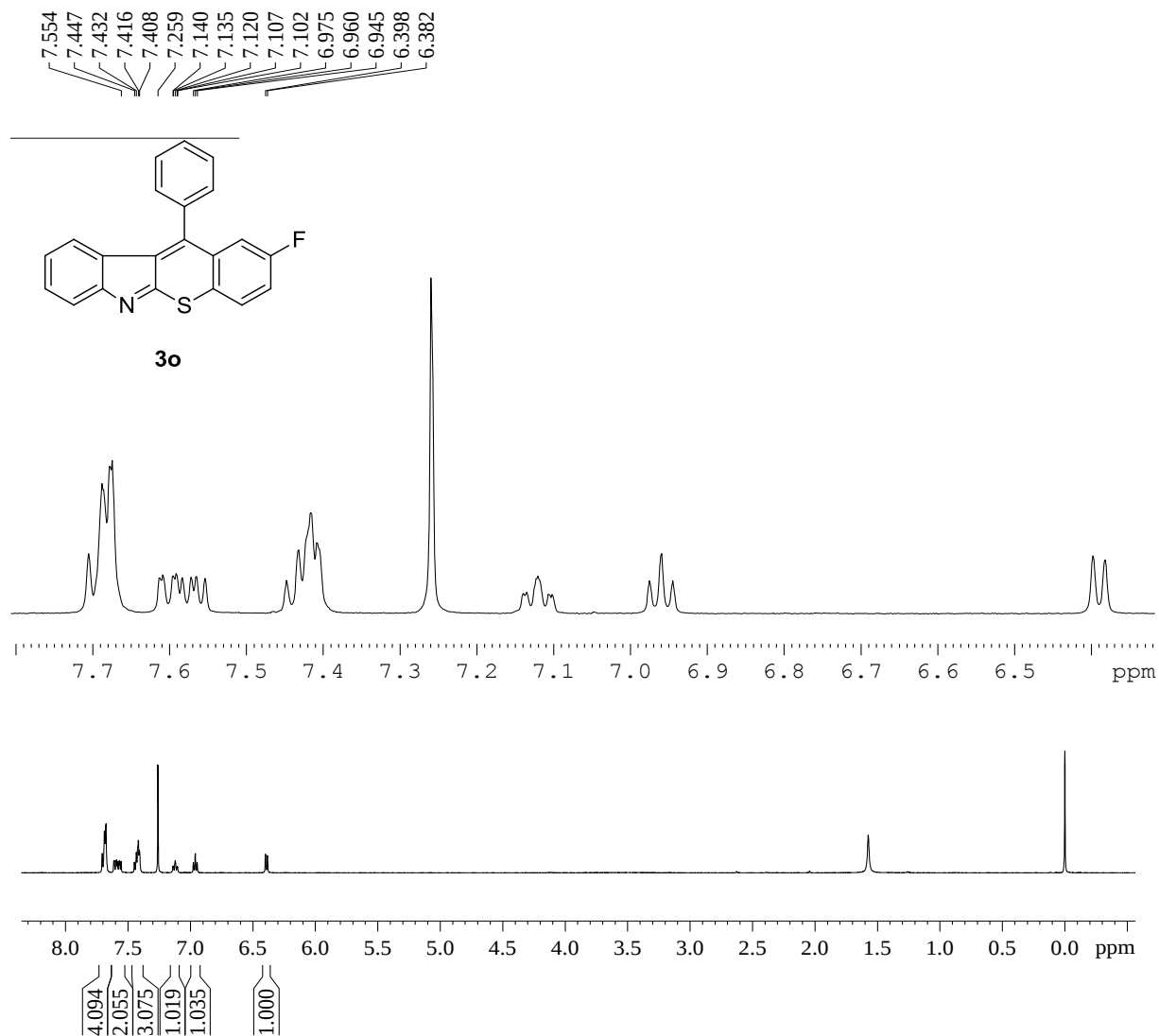
===== CHANNEL f1 =====
NUC1 1H
P1 13.00 usec
PL1 2.00 dB
SFO1 500.0335010 MHz
SI 16384
SF 500.0300107 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 2.00



NAME SQY-R-20
 EXPNO 2
 PROCNO 1
 Date_ 20150618
 Time 16.54
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl₃
 NS 809
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 1440
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 10

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326463 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00

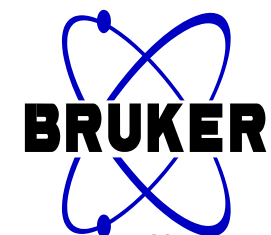
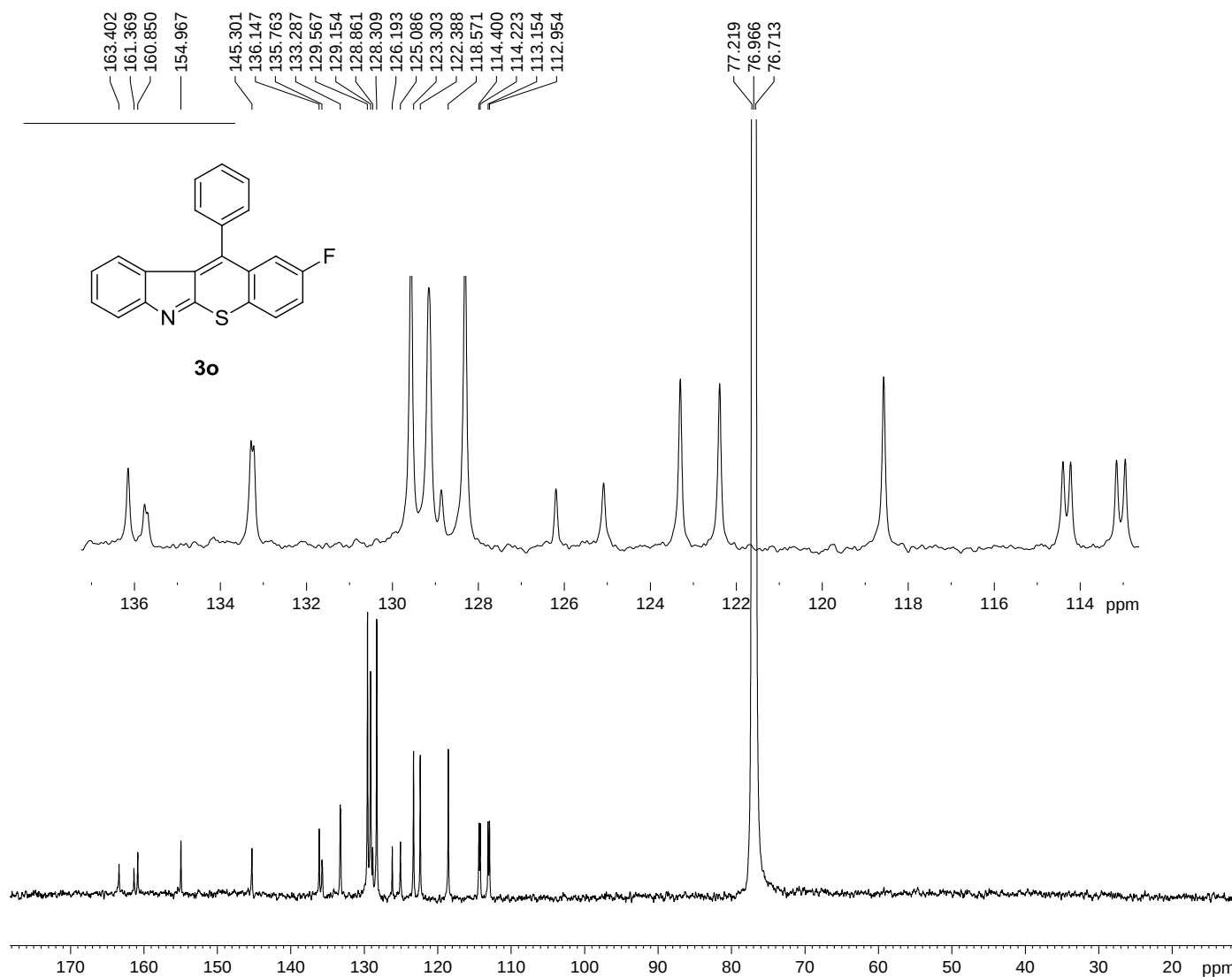


```

NAME          SQY-R-7
EXPNO          1
PROCNO         1
Date_          20150515
Time_          15.41
INSTRUM        spect
PROBHD         5 mm PABBO BB-
PULPROG        zg30
TD             32768
SOLVENT        CDCl3
NS             16
DS             1
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ             1.6385000 sec
RG             645
DW             50.000 usec
DE             6.00 usec
TE             673.2 K
D1             1.00000000 sec
TD0            1
  
```

```

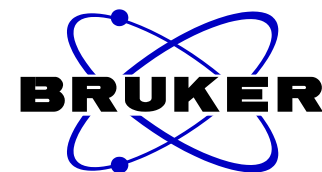
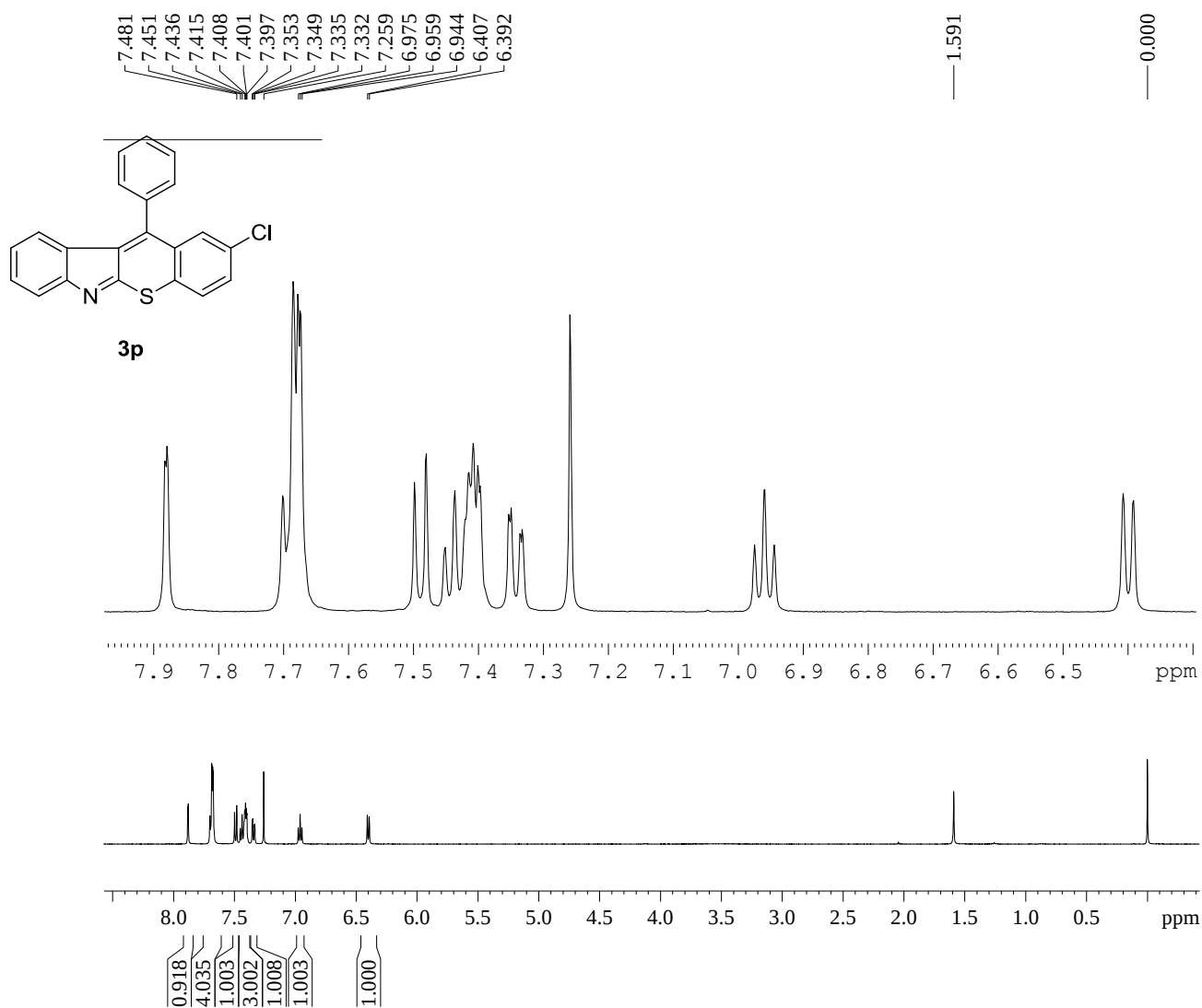
===== CHANNEL f1 =====
NUC1           1H
P1             13.00 usec
PL1            2.00 dB
SFO1           500.0335010 MHz
SI             16384
SF             500.0300110 MHz
WDW            EM
SSB            0
LB             0.30 Hz
GB             0
PC             2.00
  
```



NAME SQY-R-7
 EXPNO 2
 PROCNO 1
 Date 20150518
 Time 19.09
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 10000
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 322
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 20

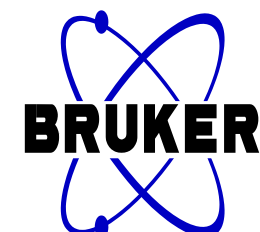
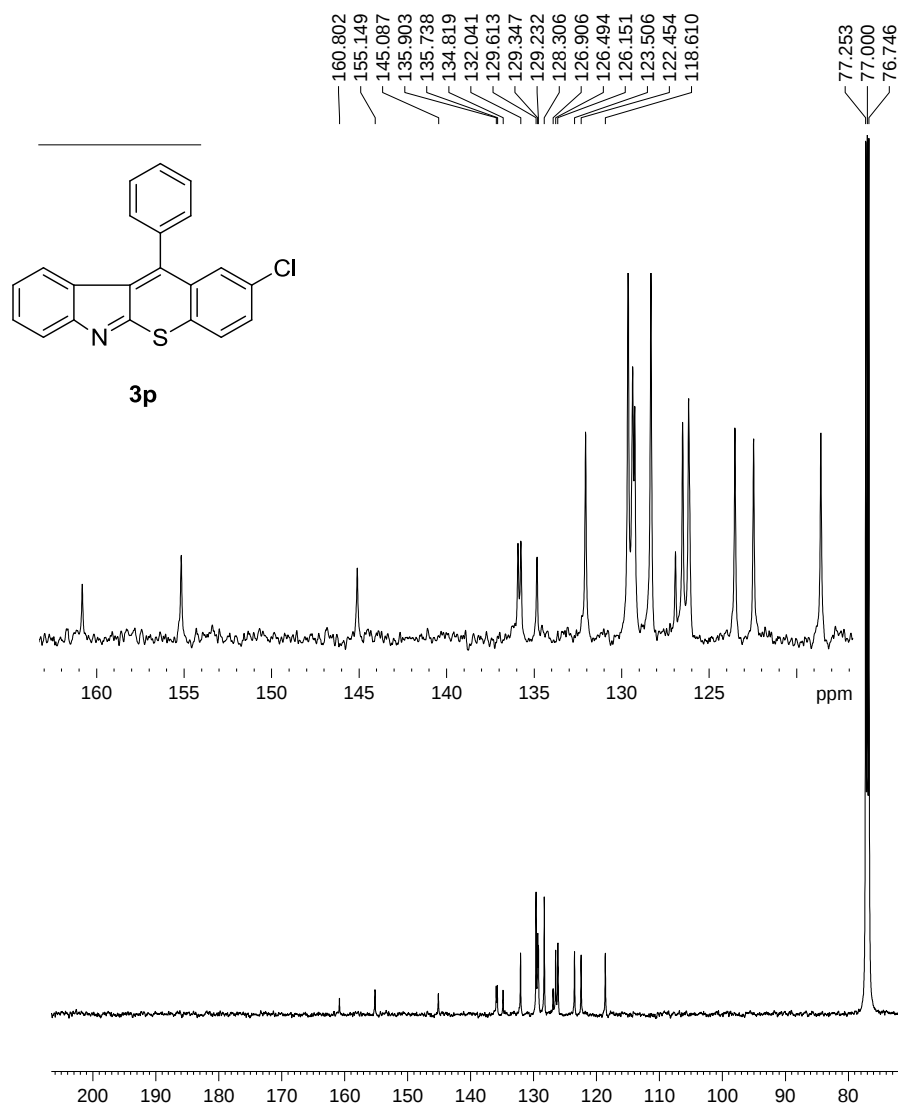
===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326459 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00



NAME SQY-R-6
 EXPNO 1
 PROCNO 1
 Date_ 20150514
 Time_ 16.31
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDCl3
 NS 16
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 645
 DW 50.000 usec
 DE 6.00 usec
 TE 673.2 K
 D1 1.00000000 sec
 TD0 1

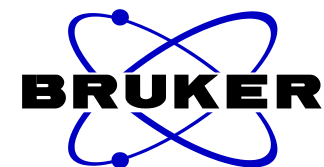
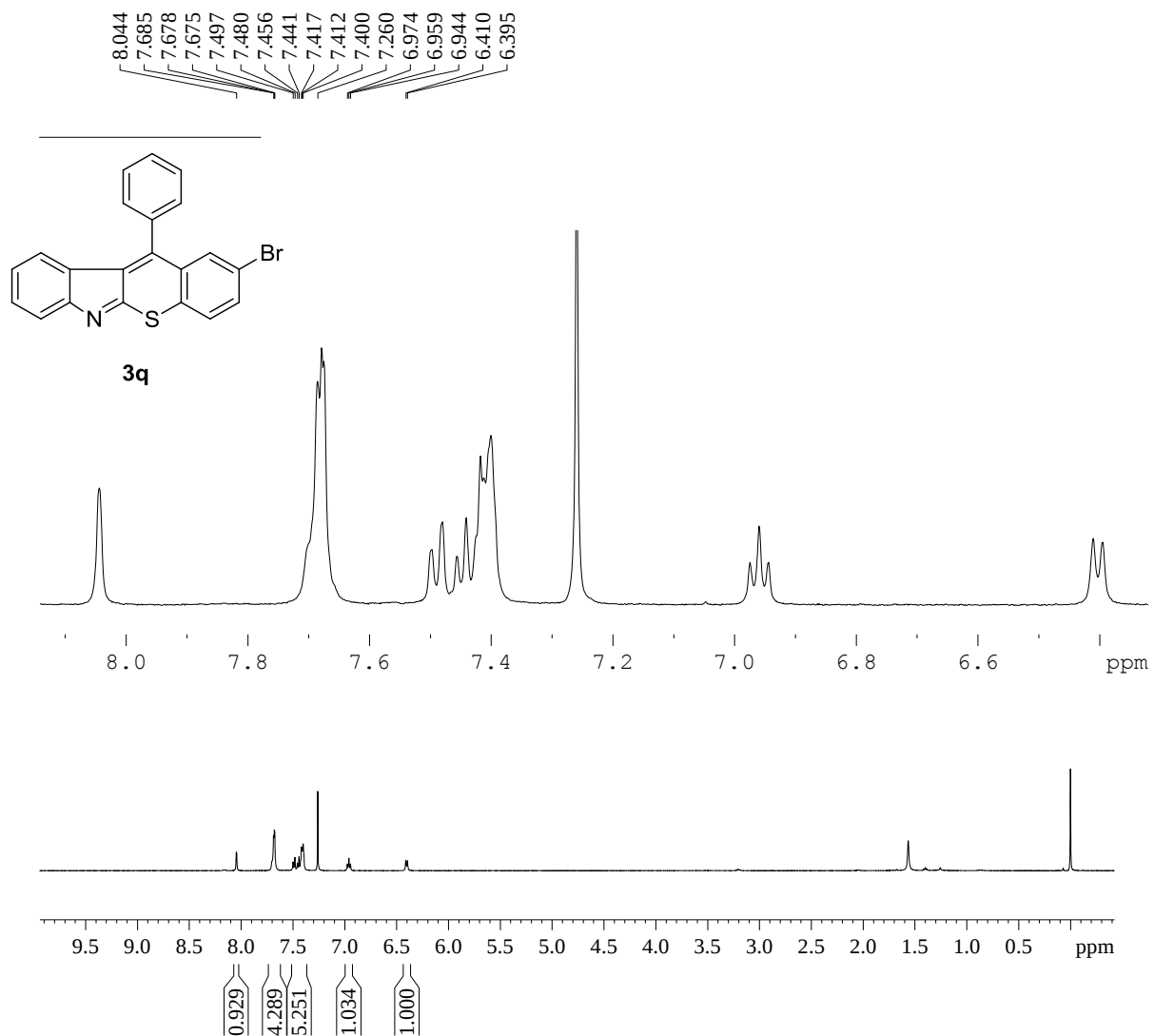
===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300113 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 2.00



NAME SQY-R-6
 EXPNO 2
 PROCNO 1
 Date_ 20150515
 Time 18.37
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1531
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 512
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TDO 20

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326459 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00

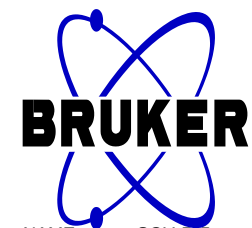
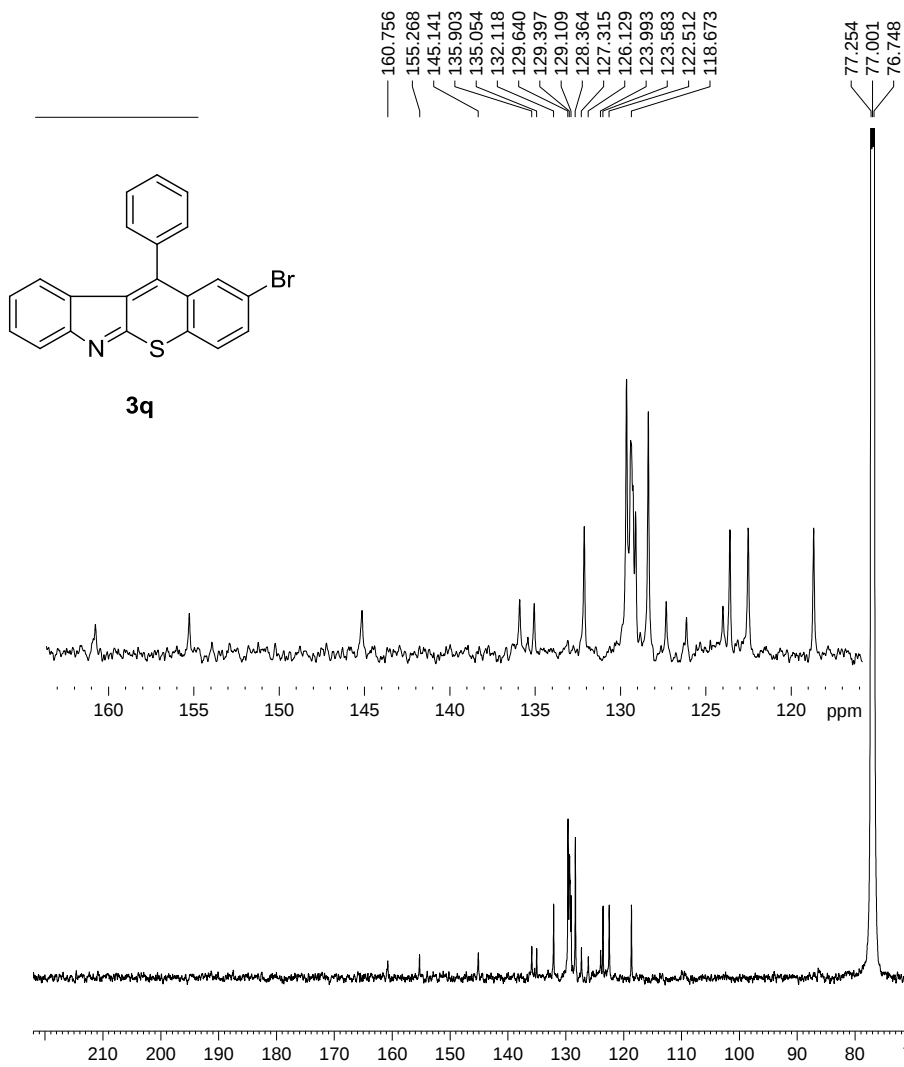


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NAME          SQY-R-5
EXPNO          1
PROCNO         1
Date_          20150507
Time_          15.25
INSTRUM        spect
PROBHD         5 mm PABBO BB-
PULPROG        zg30
TD             32768
SOLVENT        CDCl3
NS             16
DS             1
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ             1.6385000 sec
RG             645
DW             50.000 usec
DE             6.00 usec
TE             298.0 K
D1             1.00000000 sec
TD0            1
  
```

```

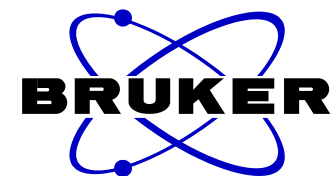
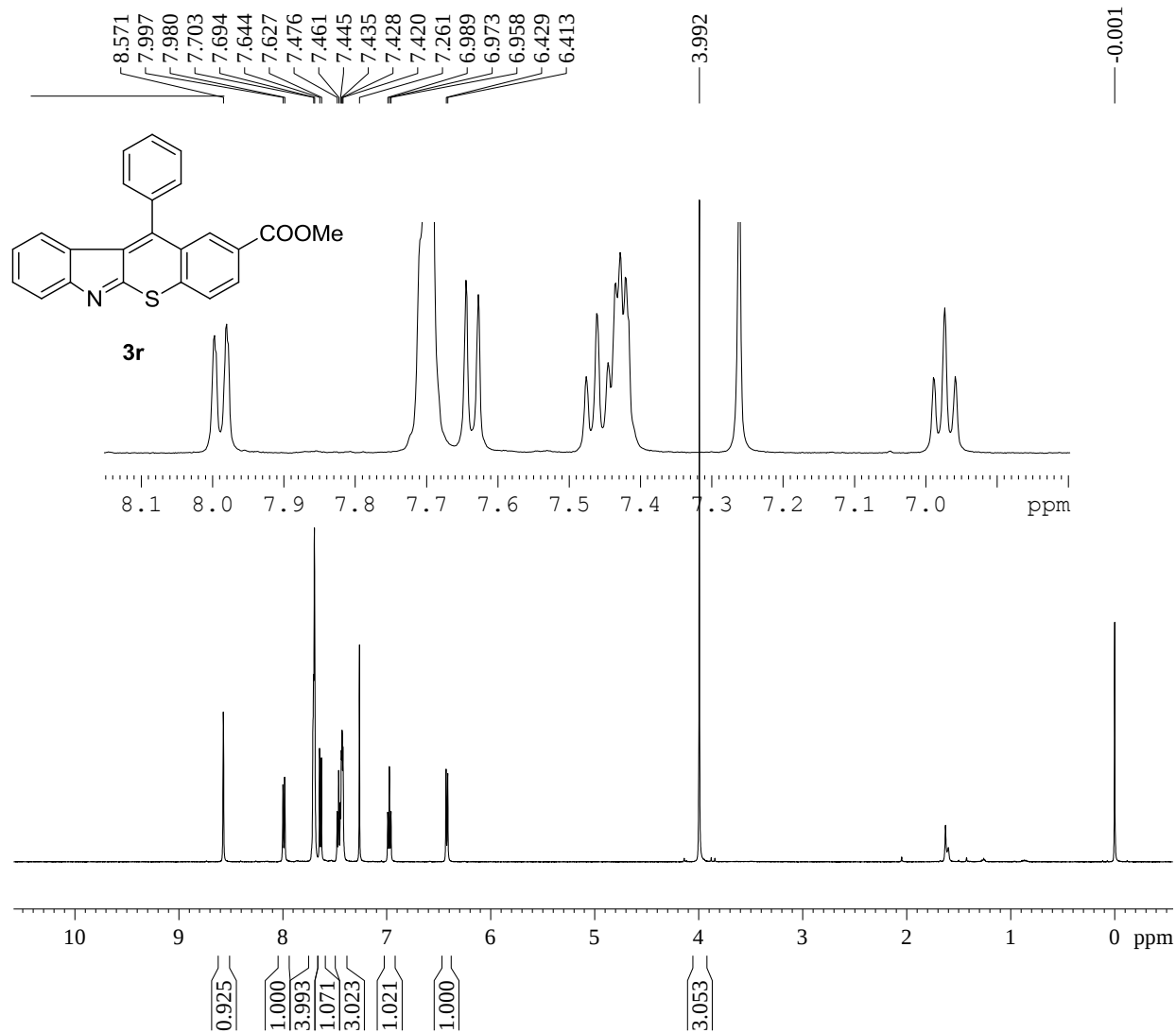
===== CHANNEL f1 =====
NUC1           1H
P1             13.00 usec
PL1            2.00 dB
SFO1           500.0335010 MHz
SI             16384
SF             500.0300109 MHz
WDW            EM
SSB            0
LB             0.30 Hz
GB             0
PC             2.00
  
```



NAME SQY-R-5
 EXPNO 2
 PROCNO 1
 Date_ 20150510
 Time 23.16
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 10000
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 4100
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TDO 10

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326413 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00

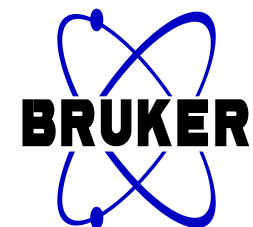
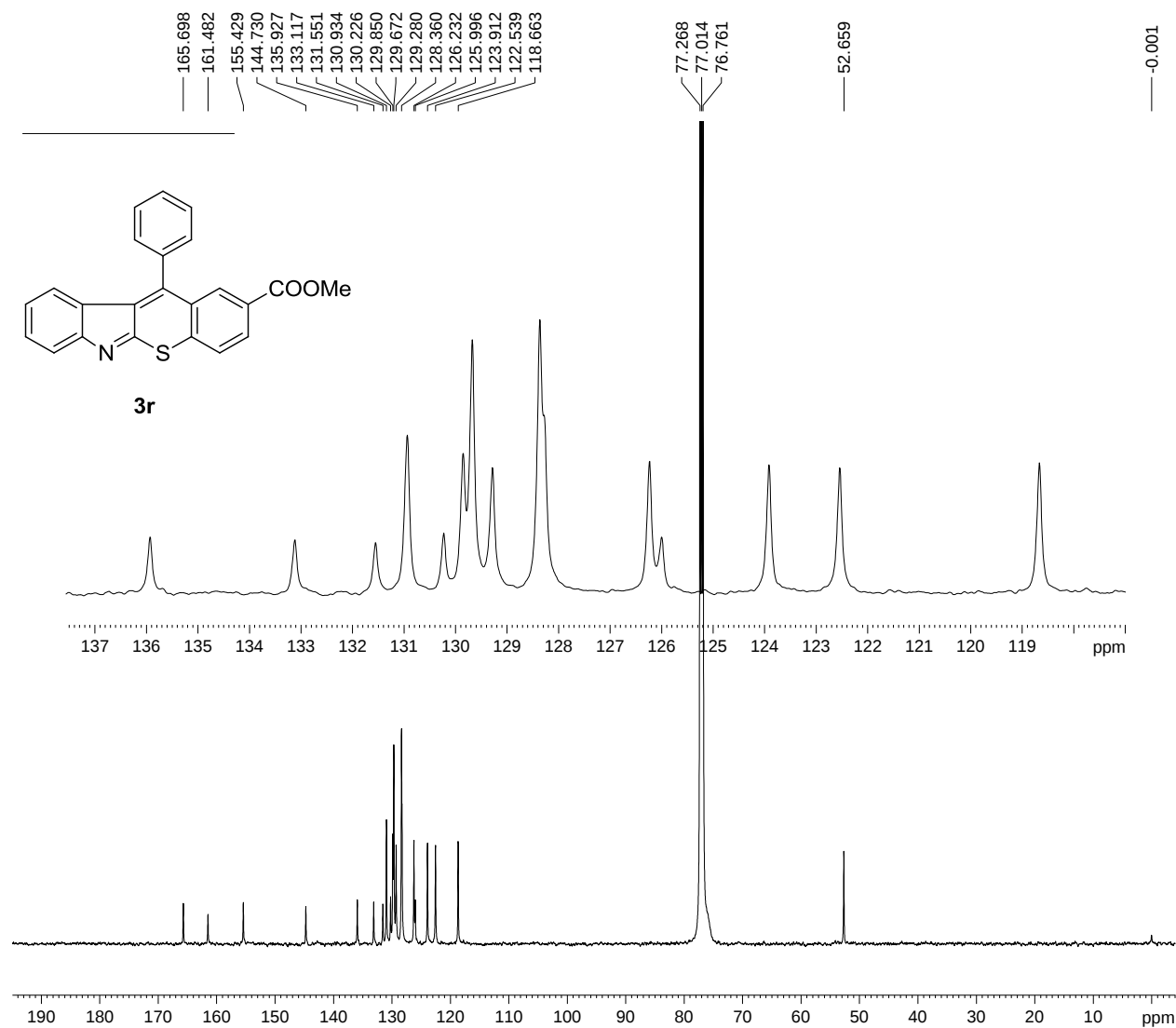


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NAME          SQY-R-23
EXPNO          1
PROCNO         1
Date_          20151203
Time_          17.22
INSTRUM        spect
PROBHD         5 mm PABBO BB-
PULPROG        zg30
TD             32768
SOLVENT        CDCl3
NS             16
DS             1
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ             1.6385000 sec
RG             812
DW             50.000 usec
DE             6.00 usec
TE             673.2 K
D1             1.00000000 sec
TD0            1
  
```

```

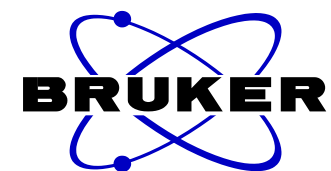
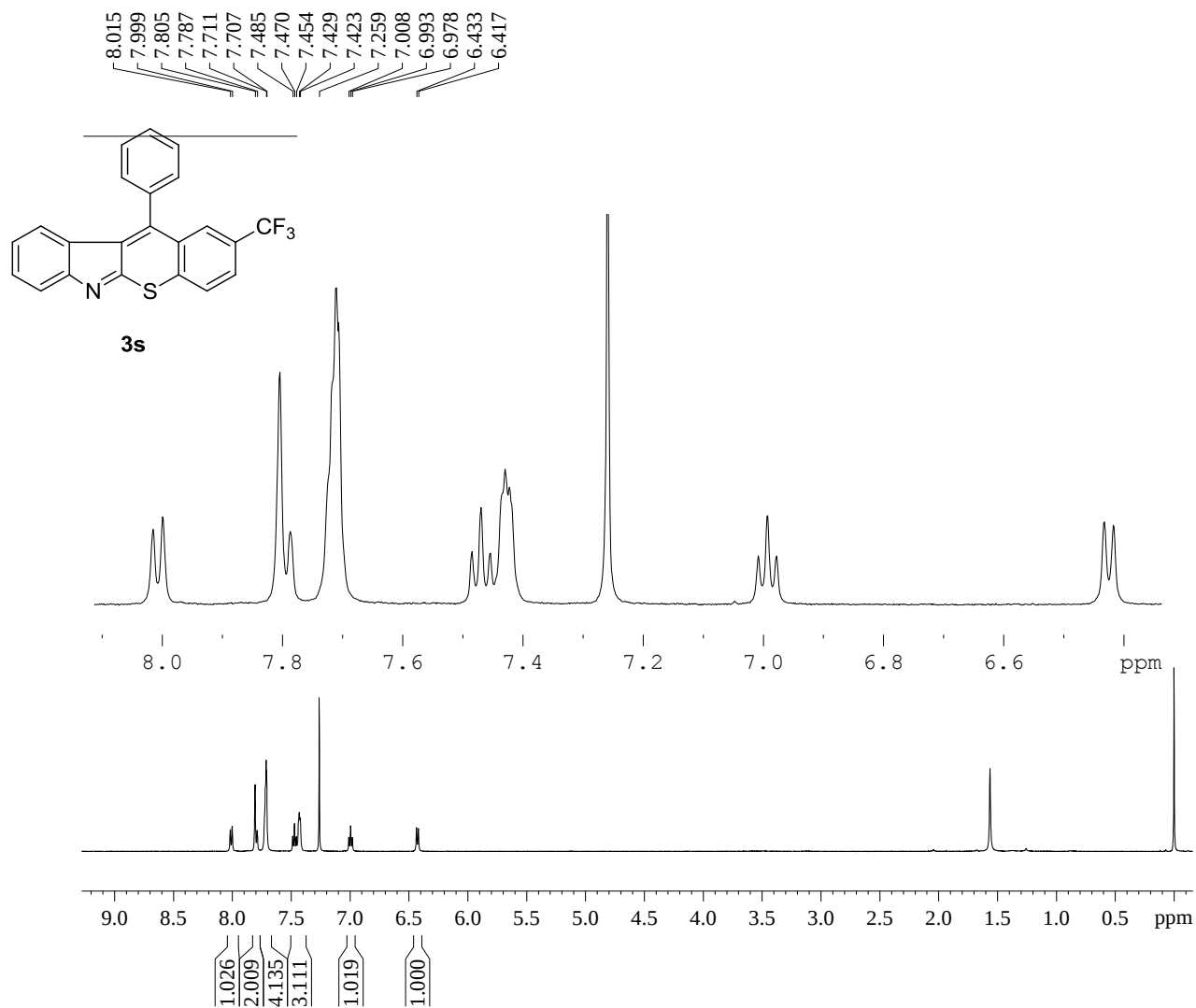
===== CHANNEL f1 =====
NUC1           1H
P1             13.00 usec
PL1            2.00 dB
SFO1           500.0335010 MHz
SI             16384
SF             500.0300097 MHz
WDW            EM
SSB            0
LB             0.30 Hz
GB             0
PC             2.00
  
```



NAME SQY-R-23
 EXPNO 2
 PROCNO 1
 Date_ 20151207
 Time 22.46
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 10000
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 4100
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 20

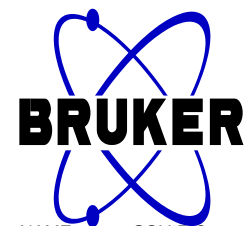
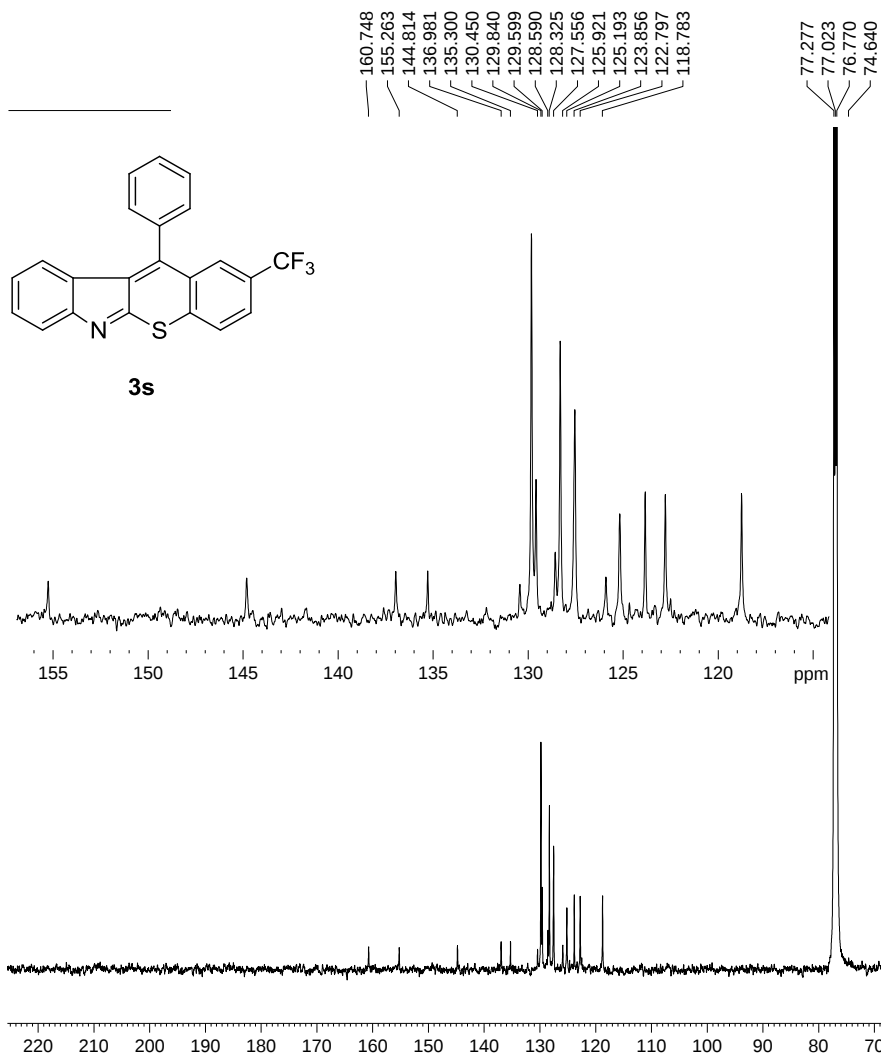
===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326428 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1 00



NAME SQY-R-8
 EXPNO 1
 PROCNO 1
 Date_ 20150515
 Time_ 15.47
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDCl₃
 NS 16
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 1030
 DW 50.000 usec
 DE 6.00 usec
 TE 673.2 K
 D1 1.00000000 sec
 TD0 1

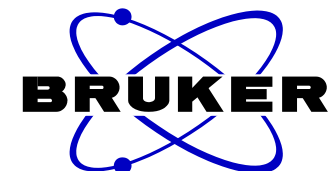
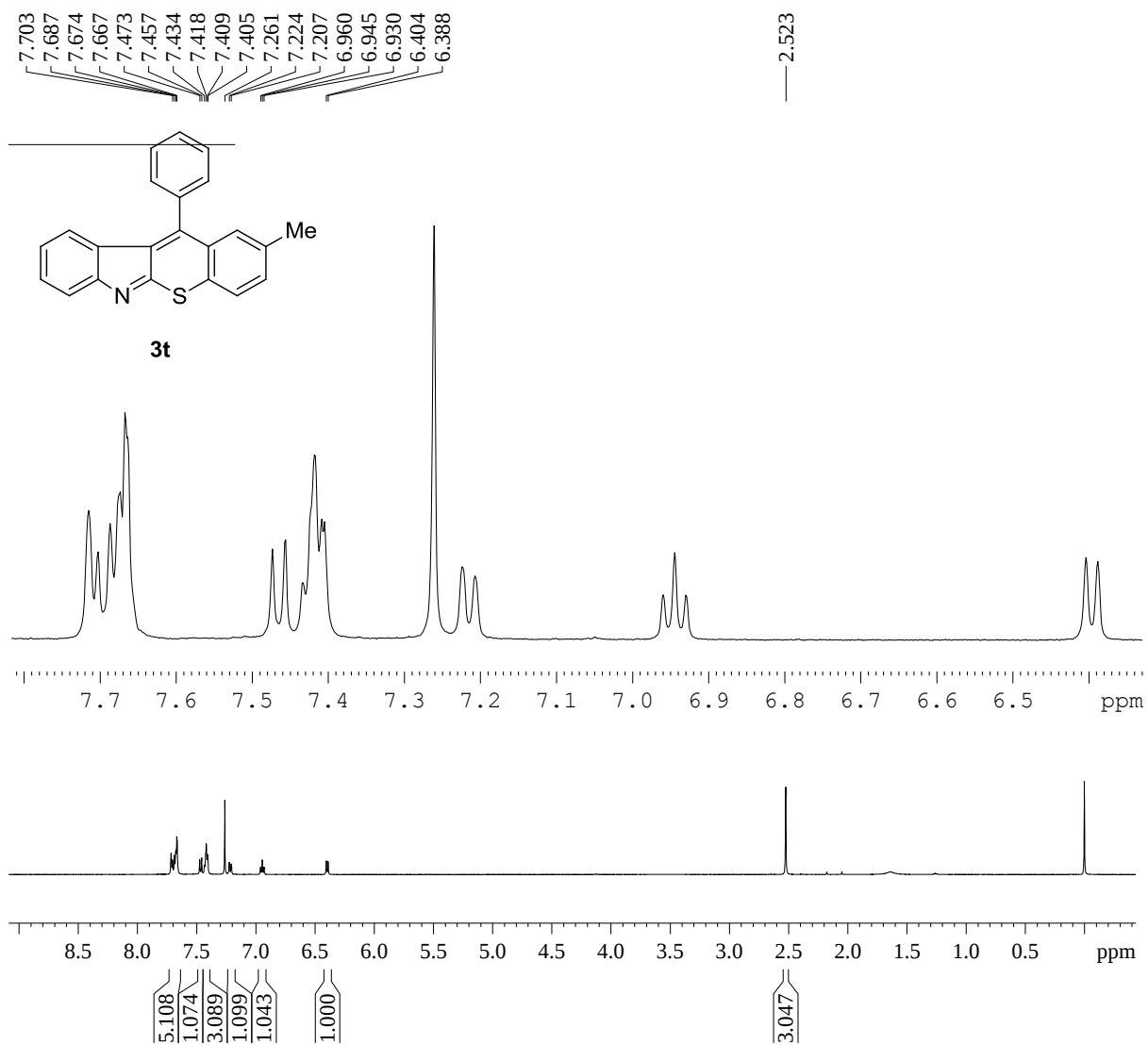
===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300110 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 2.00



NAME SQY-R-8
 EXPNO 2
 PROCNO 1
 Date_ 20150520
 Time 10.21
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 5630
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 456
 DW 15.300 usec
 DE 6.00 usec
 TE 300.1 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 10

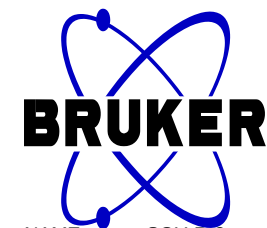
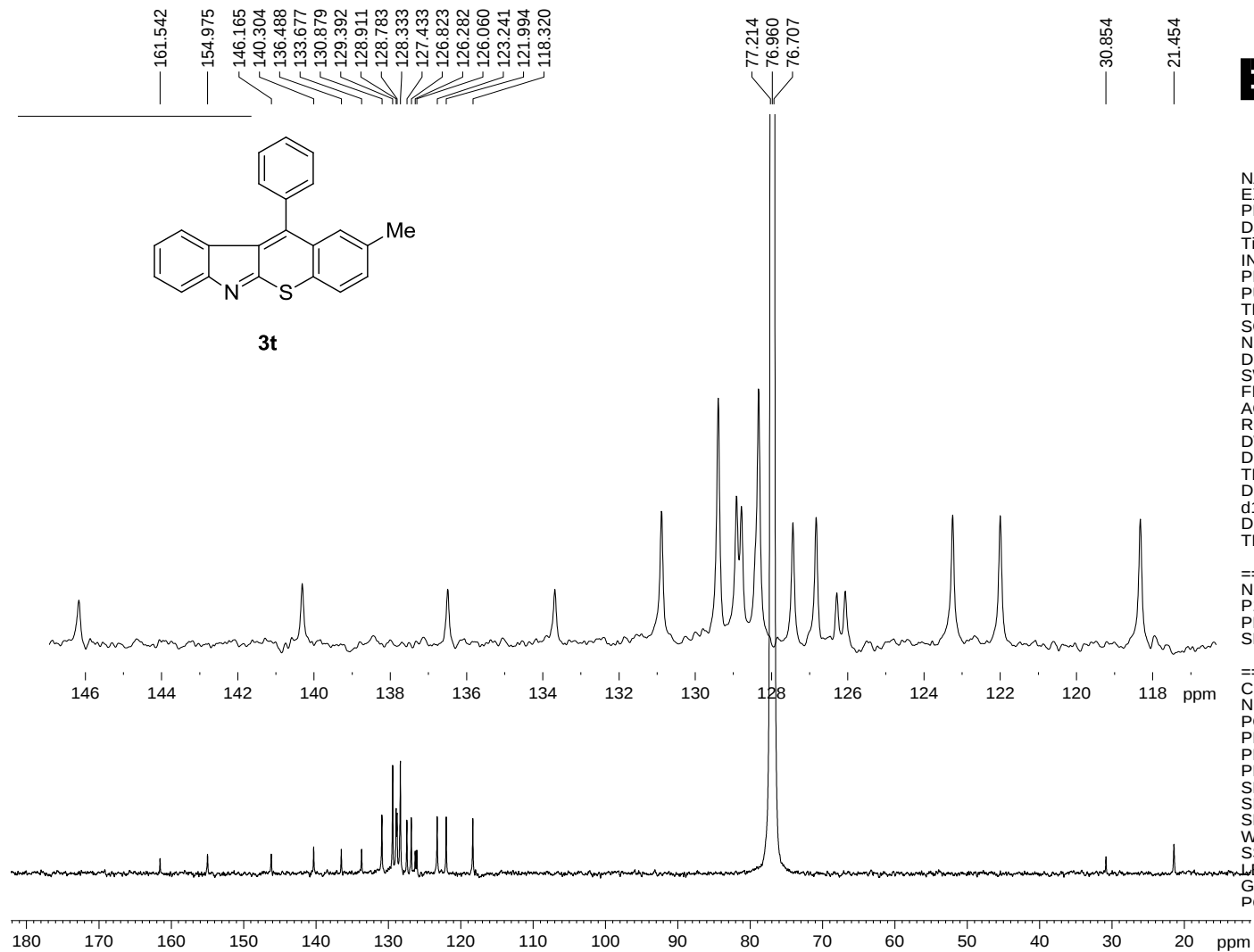
===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326413 MHz
 WDW EM
 SSB 0
 GB 8.00 Hz
 GB 0
 PC 1.00



NAME SQY-R-2
 EXPNO 1
 PROCNO 1
 Date_ 20150413
 Time_ 16.18
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDCl3
 NS 16
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 724
 DW 50.000 usec
 DE 6.00 usec
 TE 673.2 K
 D1 1.00000000 sec
 TD0 1

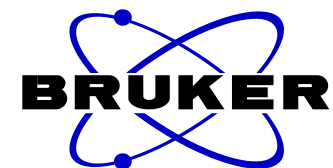
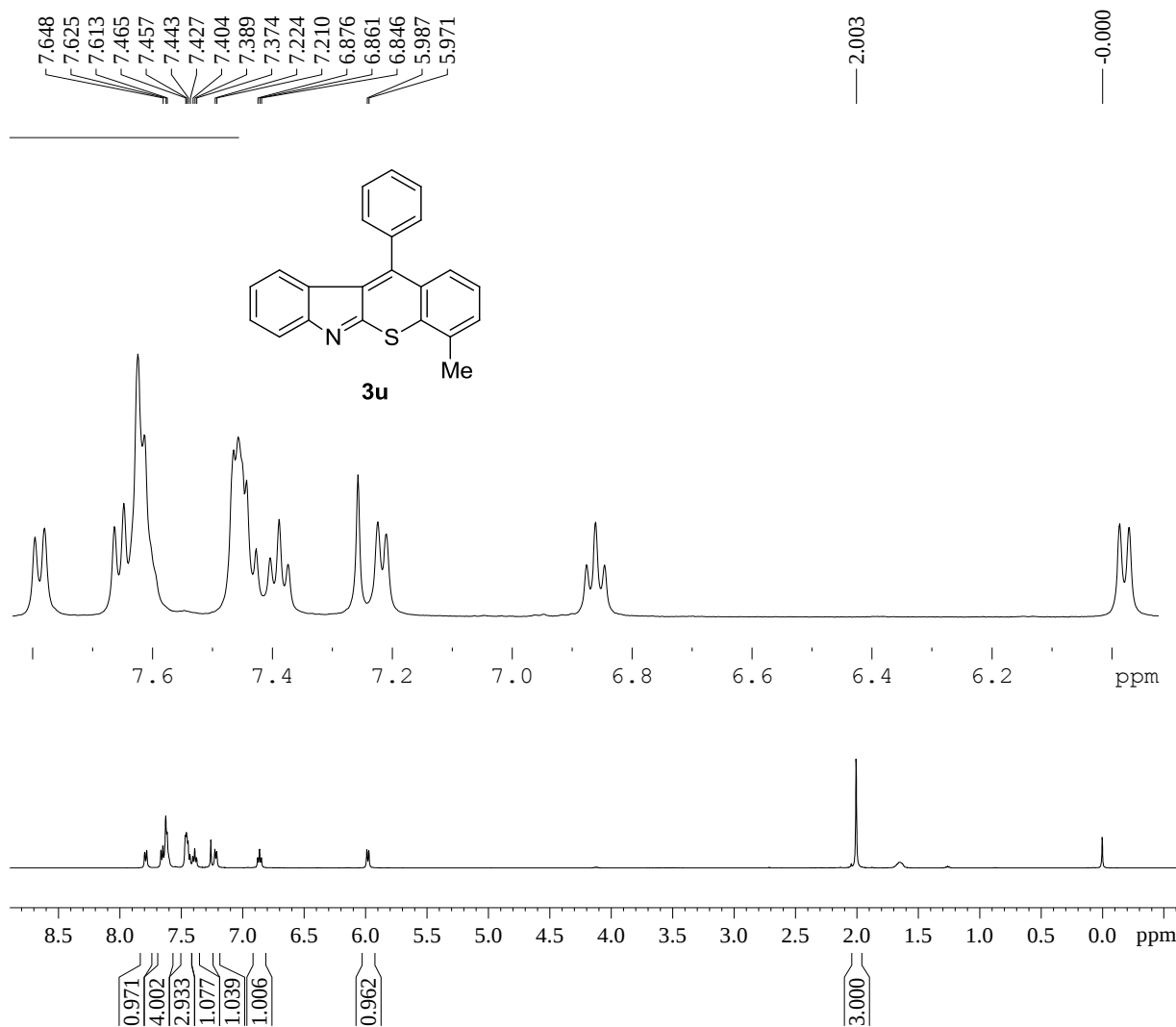
===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300098 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 2.00



NAME SQY-R-2
 EXPNO 2
 PROCNO 1
 Date_ 20150414
 Time 20.37
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 15934
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 2580
 DW 15.300 usec
 DE 6.00 usec
 TE 673.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 20

===== CHANNEL f1 =====
 NUC1 ¹³C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 ¹H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326484 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PC 1.00

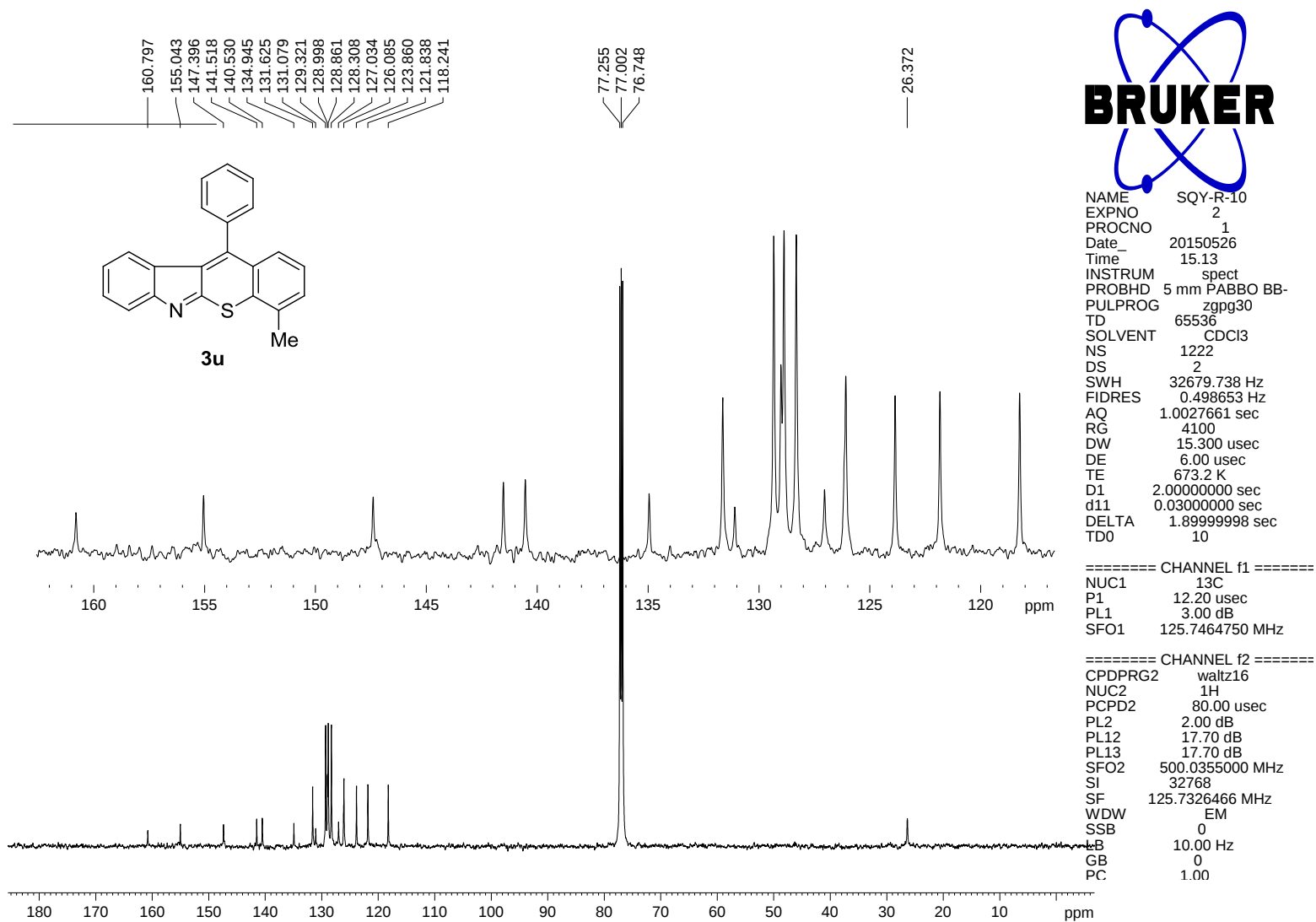


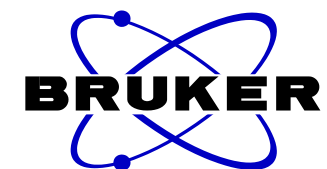
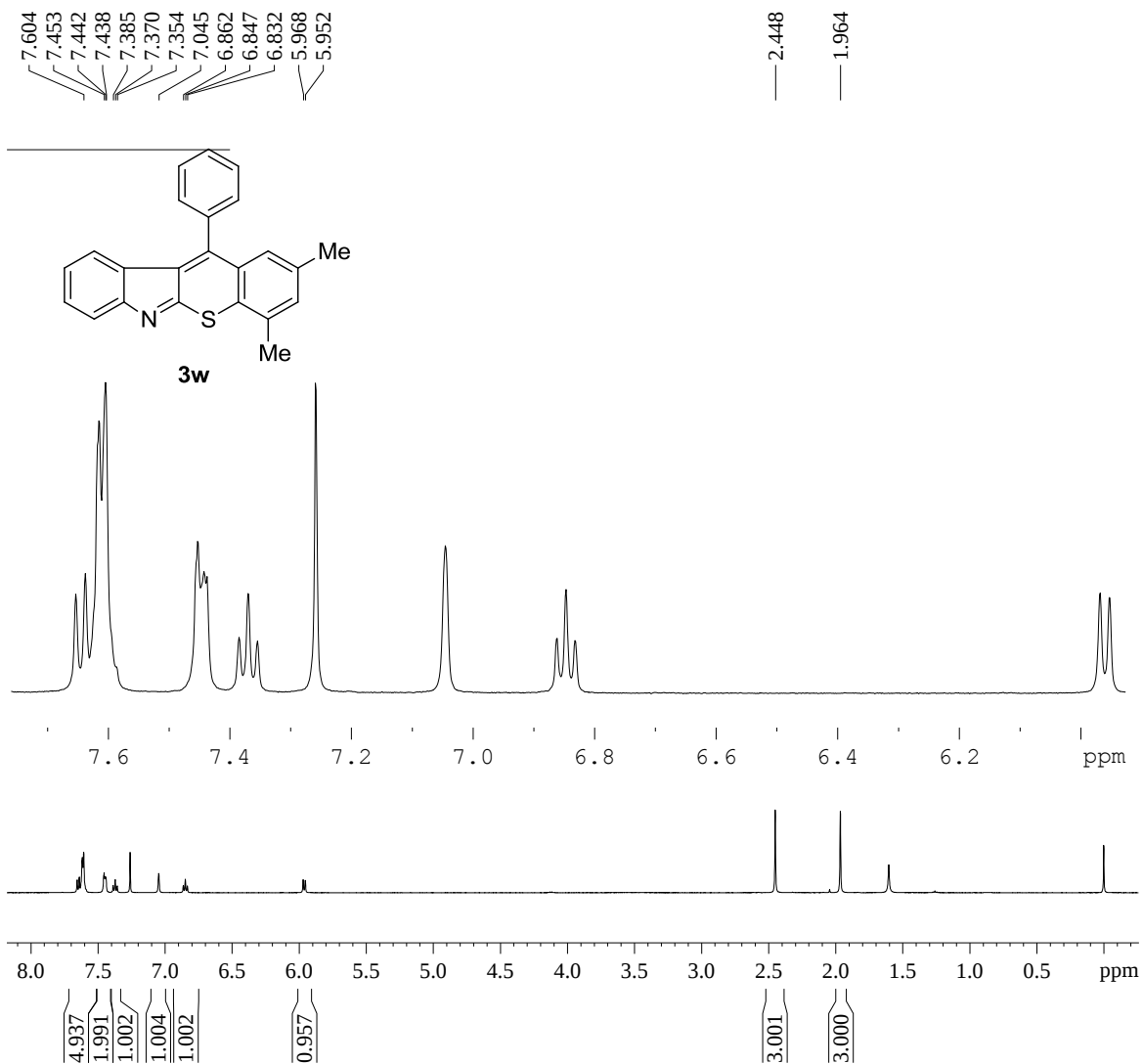
```

NAME          SQY-R-10
EXPNO          1
PROCNO         1
Date_          20150525
Time_          11.11
INSTRUM        spect
PROBHD         5 mm PABBO BB-
PULPROG        zg30
TD             32768
SOLVENT        CDCl3
NS             16
DS             1
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ             1.6385000 sec
RG             575
DW             50.000 usec
DE             6.00 usec
TE             673.2 K
D1             1.00000000 sec
TD0            1
  
```

```

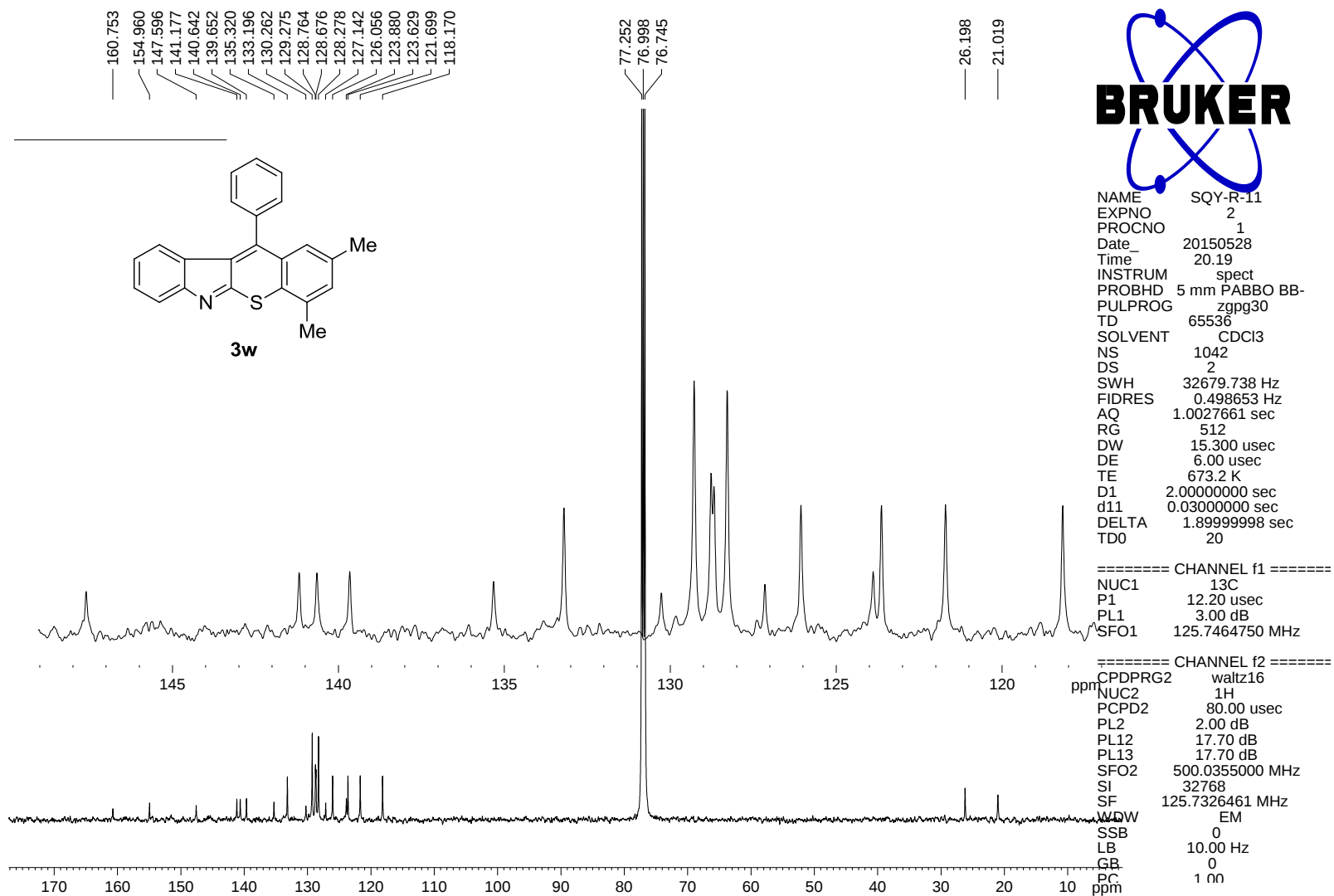
===== CHANNEL f1 =====
NUC1           1H
P1             13.00 usec
PL1            2.00 dB
SFO1           500.0335010 MHz
SI             16384
SF             500.0300116 MHz
WDW            EM
SSB            0
LB             0.30 Hz
GB             0
PC             2.00
  
```





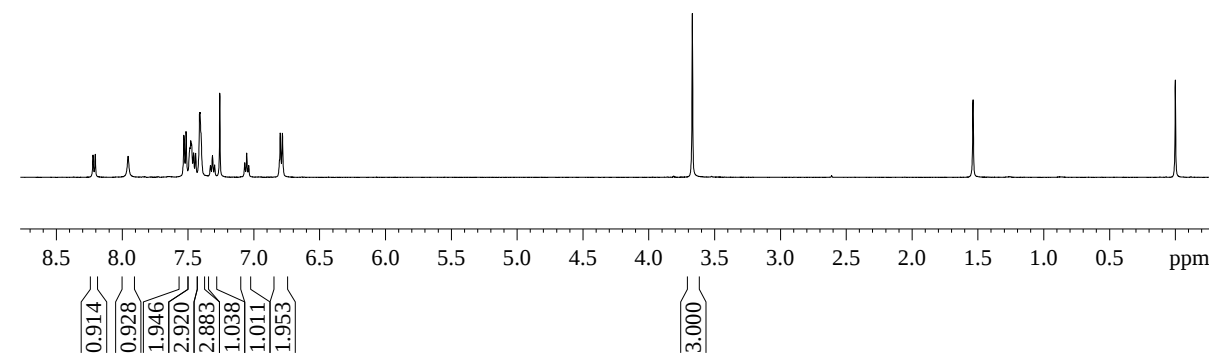
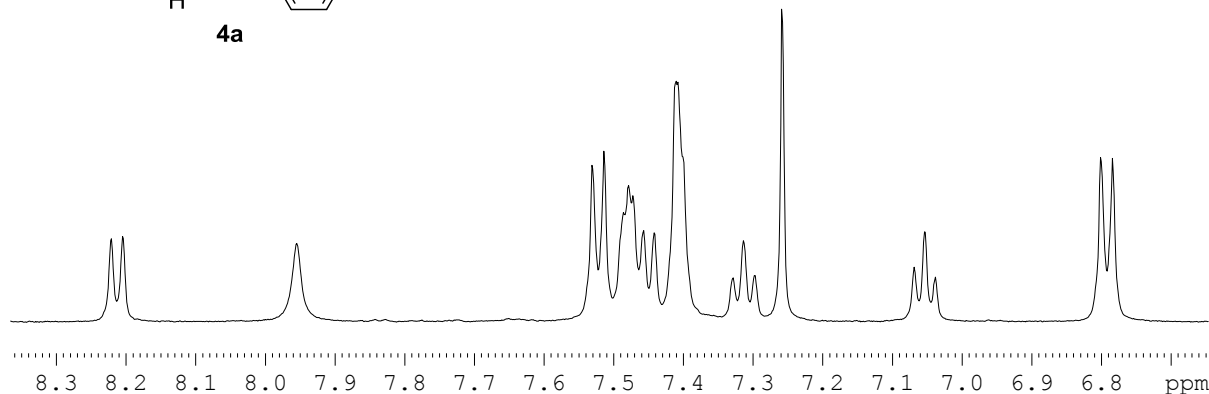
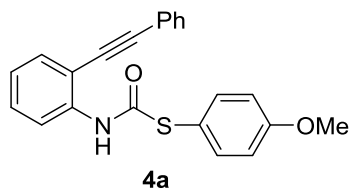
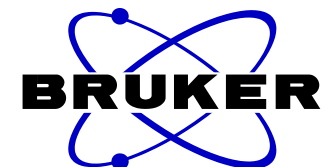
NAME SQY-R-11
 EXPNO 1
 PROCNO 1
 Date_ 20150528
 Time_ 15.38
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDCl3
 NS 16
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 724
 DW 50.000 usec
 DE 6.00 usec
 TE 673.2 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300113 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 2.00



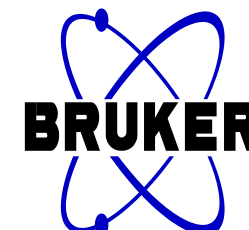
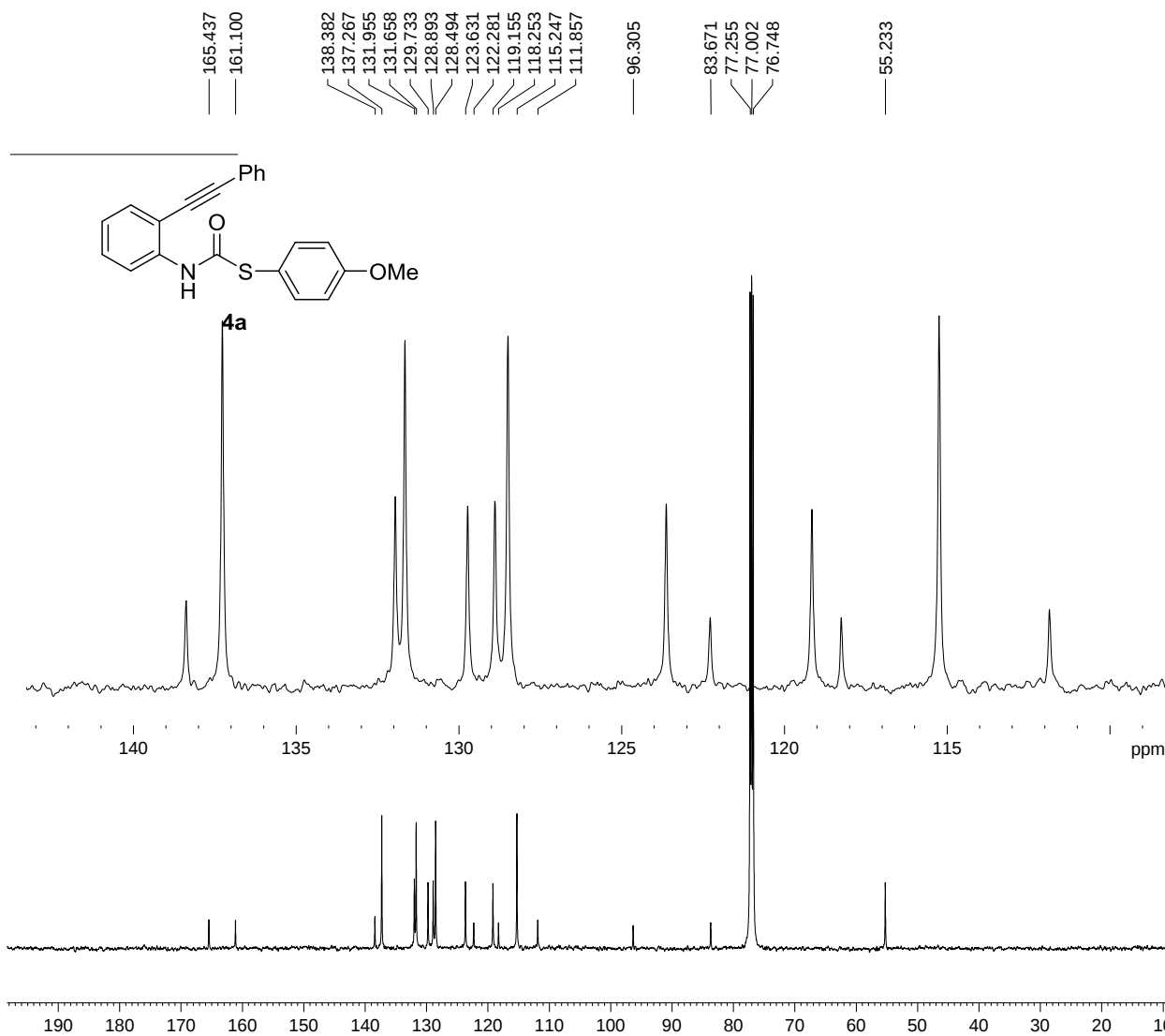
7.514
7.486
7.479
7.473
7.457
7.442
7.410
7.408
7.329
7.314
7.298
7.069
7.053
7.038
6.801
6.784

3.670



NAME SQY-R-9
EXPNO 1
PROCNO 1
Date_ 20150520
Time_ 15.32
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 1
SWH 10000.000 Hz
FIDRES 0.305176 Hz
AQ 1.6385000 sec
RG 1030
DW 50.000 usec
DE 6.00 usec
TE 673.2 K
D1 1.00000000 sec
TD0 1

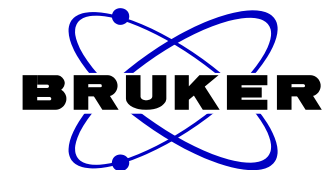
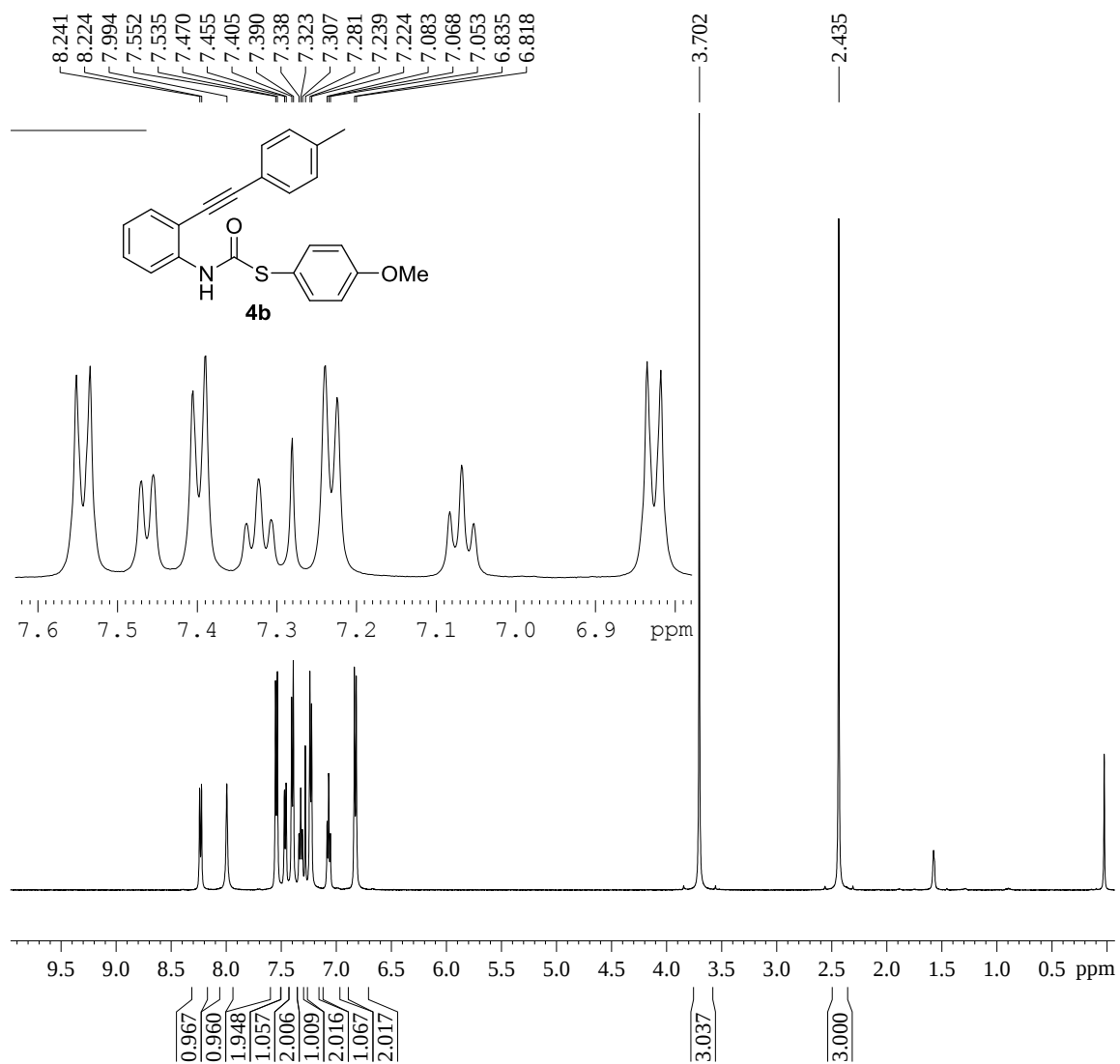
===== CHANNEL f1 =====
NUC1 1H
P1 13.00 usec
PL1 2.00 dB
SFO1 500.0335010 MHz
SI 16384
SF 500.0300113 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 2.00



NAME SQY-R-9
 EXPNO 2
 PROCNO 1
 Date_ 20150523
 Time 9.11
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1602
 DS 2
 SWH 32679.738 Hz
 FIDRES 0.498653 Hz
 AQ 1.0027661 sec
 RG 1440
 DW 15.300 usec
 DE 6.00 usec
 TE 298.9 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TDO 10

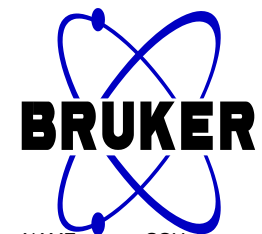
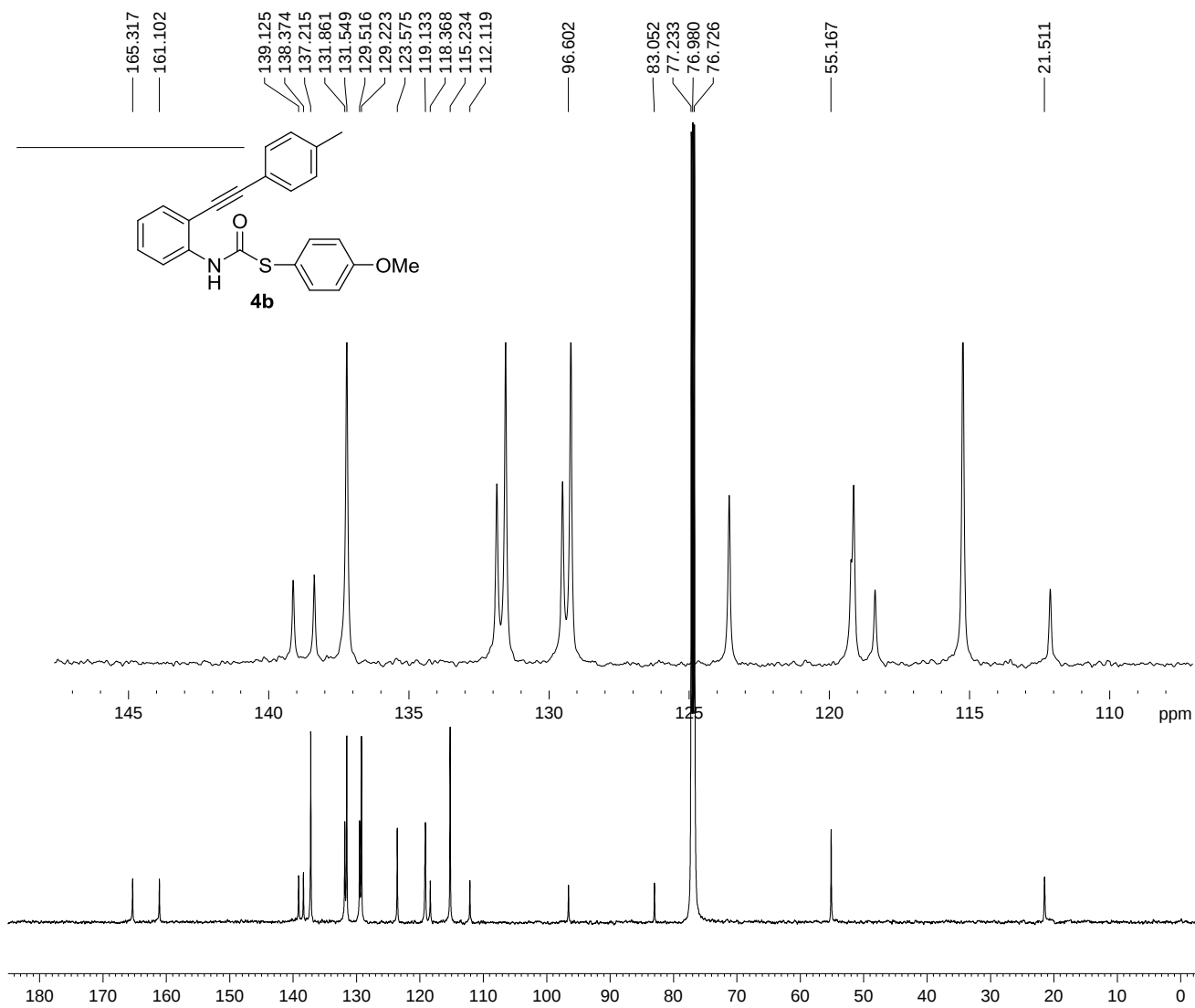
===== CHANNEL f1 =====
 NUC1 13C
 P1 12.20 usec
 PL1 3.00 dB
 SFO1 125.7464750 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.70 dB
 PL13 17.70 dB
 SFO2 500.0355000 MHz
 SI 32768
 SF 125.7326468 MHz
 WDW EM
 SSB 0
 LB 10.00 Hz
 GB 0
 PR 1.00



NAME SQY-4b
 EXPNO 1
 PROCNO 1
 Date_ 20150814
 Time_ 10.55
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 32768
 SOLVENT CDCl3
 NS 8
 DS 1
 SWH 10000.000 Hz
 FIDRES 0.305176 Hz
 AQ 1.6385000 sec
 RG 456
 DW 50.000 usec
 DE 6.00 usec
 TE 298.6 K
 D1 2.00000000 sec
 TD0 1

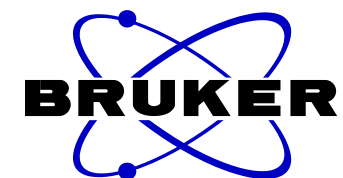
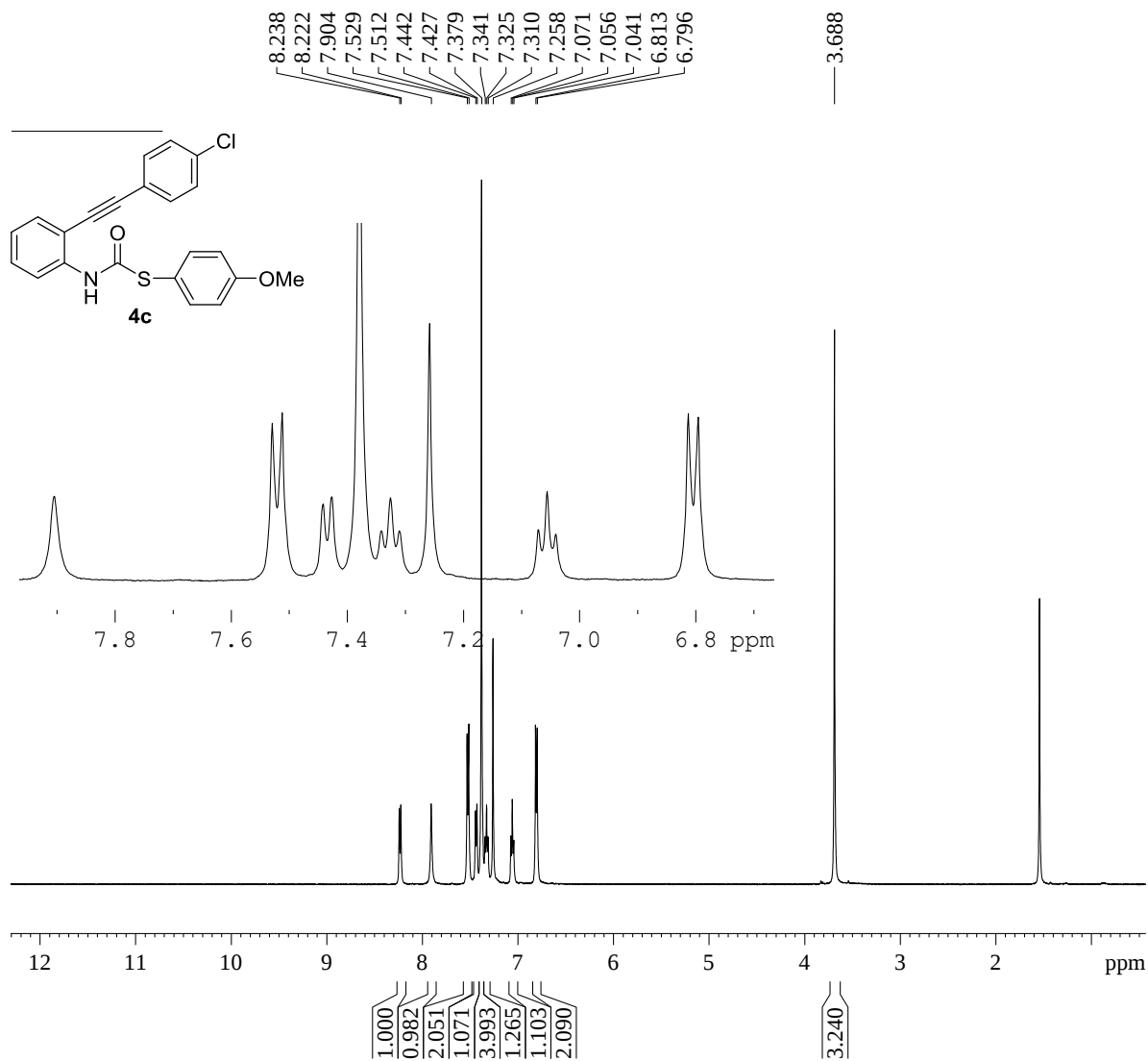
===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 SFO1 500.0335010 MHz
 SI 16384
 SF 500.0300000 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 4.00



NAME SQY-4b
EXPNO 2
PROCNO 1
Date_ 20150821
Time 18.44
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 3003
DS 2
SWH 32679.738 Hz
FIDRES 0.498653 Hz
AQ 1.0027661 sec
RG 287
DW 15.300 usec
DE 6.00 usec
TE 302.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
TD0 10

===== CHANNEL f1 =====
NUC1 13C
P1 12.20 usec
PL1 3.00 dB
SFO1 125.7464750 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 2.00 dB
PL12 17.70 dB
PL13 17.70 dB
SFO2 500.0355000 MHz
SI 32768
SF 125.7326466 MHz
WDW EM
SSB 0
LB 10.00 Hz
GB 0
PC 1 00



```

NAME                SQY-4C
EXPNO                1
PROCNO              1
Date_               20150821
Time_              11.27
INSTRUM             spect
PROBHD              5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT             CDC13
NS                  16
DS                   1
SWH                 10000.000 Hz
FIDRES              0.305176 Hz
AQ                 1.6385000 sec
RG                   645
DW                  50.000 usec
DE                   6.00 usec
TE                  299.0 K
D1                  1.00000000 sec
TD0                  1
  
```

```

===== CHANNEL f1 =====
NUC1                  1H
P1                    13.00 usec
PL1                    2.00 dB
SFO1                  500.0335010 MHz
SI                     16384
SF                    500.0300112 MHz
WDW                     EM
SSB                      0
LB                      0.30 Hz
GB                       0
PC                       2.00
  
```

