Electronic Supplementary Material (ESI) for ChemComm.

Supporting Information

Palladium-Catalyzed Regioselective Hydroboration of Aryl Alkenes with B_2pin_2

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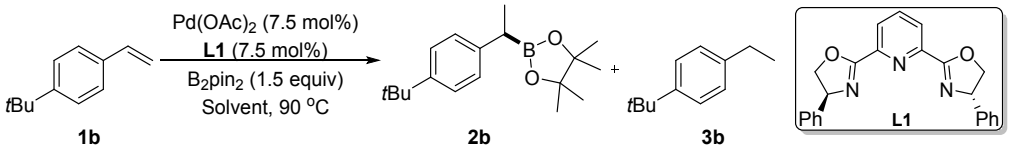
A. General Information

^1H and ^{13}C NMR spectra were recorded on BRUKER DRX-400 spectrometer using $CDCl_3$ as solvent and TMS as an internal standard. The chemical shifts are referenced to signals at 7.26 and 77.0 ppm, respectively. Multiplicity was indicated as follows: s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet), td (triplet of doublets), dt (doublet of triplets), ddd (doublet of doublet of doublets).The data of HRMS was carried out on a high-resolution mass spectrometer (LCMS-IT-TOF). IR spectra were obtained either as potassium bromide pellets or as liquid films between two potassium bromide pellets with a BRUKER TENSOR 27 spectrometer. Melting points were determined with Büchi Melting Point B-545 instrument. TLC was performed by using commercially prepared 100-400 mesh silica gel plates and visualization was effected at 254 nm. Unless otherwise stated, all reagents and solvents were purchased from commercial suppliers and used without further purification.

B. Optimization of Reaction Conditions

In a 20 mL sealed tube, $Pd(OAc)_2$ (0.0225 mmol), **L1** (0.0225 mmol), B_2pin_2 (0.45 mmol), solvent (1.5 mL), **1b** (0.30 mmol) were successively added and vigorously stirred together at 90 °C for 24 h under N_2 atmosphere. After the reaction was finished, the mixture was cooled to room temperature. The reaction was neutralized with saturated $NaHCO_3$ aq. and extracted with EtOAc (3 × 15 mL). The combined ethyl acetate layer was washed with brine (10 mL) and dried over anhydrous Na_2SO_4. The solvent was removed under vacuum. The crude product was purified by flash column chromatography (eluting with petroleum ether/ethyl acetate), and calculated the isolated yield.

Table S1. Screening of solvents and palladium catalysts[a]

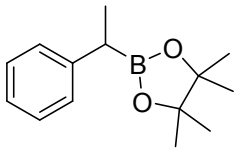


1b **2b** **3b**

entry	solvent (mL)	conversion (%)	**2b** yield (%)	**3b** yield (%)
1	AcOH (0.5), THF	90	67	20
2	AcOH (0.5),	88	81	4
3	AcOH (0.5), CH_3CN	95	93 (90)	N.D.
4	AcOH (0.5), toluene	45	31	N.D.
5	AcOH (0.5), DMSO	11	trace	N.D.
6	AcOH (0.5), *i*PrOH	56	10	34
7	*i*PrOH (1.5)	0	N.D.	N.D.
8	*i*PrOH (0.5), toluene	22	trace	11

Conditions: substrate **1b** (0.3 mmol), $Pd(OAc)_2$ (7.5 mol %), **L1** (7.5 mol %), B_2pin_2 (1.5 equiv), solvent (1.5 mL) under N_2 atmosphere at 90 °C for 24 h; Yields determined by GC-MS with *n*-dodecane as internal standard.

C. Characterization Data for All Products

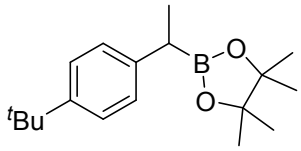


4,4,5,5-Tetramethyl-2-(1-phenylethyl)-1,3,2-dioxaborolane (2a)[1]

Colorless oil (59.8 mg, 86%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 – 7.18 (m, 4H), 7.16 – 7.07 (m, 1H), 2.43 (q, J = 7.3 Hz, 1H), 1.33 (d, J = 7.5 Hz, 3H), 1.20 (d, J = 5.3 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 145.0, 128.3, 127.8, 125.1, 83.3, 24.7, 24.6, 17.1. ^{11}B NMR (128 MHz, $CDCl_3$) δ 34.06.

HRMS-ESI (m/z): calcd for $C_{14}H_{21}BO_2$, $[M+Na]^+$: 255.1529; found, 255.1526. IR (KBr): 2966, 1458, 1361, 1146, 839, 571 cm^{-1}.

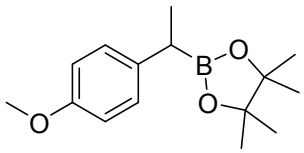


2-(1-(4-(*tert*-Butyl)phenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2b)[2]

Colorless oil (78.6 mg, 91%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.34 (d, J = 8.4 Hz, 2H), 7.21 (d, J = 8.3 Hz, 2H), 2.47 (q, J = 7.5 Hz, 1H), 1.39 (d, J = 2.7 Hz, 3H), 1.37 (s, 9H), 1.28 (d, J = 4.9 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 147.6, 141.7, 127.4, 125.2, 83.2, 34.3, 31.5, 24.7, 24.6, 17.3. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.49.

HRMS-ESI (m/z): calcd for $C_{18}H_{29}BO_2$, $[M+Na]^+$: 311.2156; found, 311.2157. IR (KBr): 2966, 1458, 1361, 1146, 839, 571 cm^{-1}.

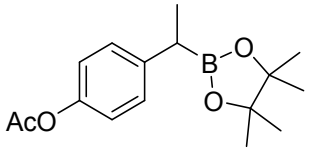


2-(1-(4-Methoxyphenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2c)[2]

Colorless oil (72 mg, 92%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.18 (d, J = 8.4 Hz, 2H), 6.85 (d, J = 8.4 Hz, 2H), 3.80 (s, 3H), 2.41 (q, J = 7.4 Hz, 1H), 1.34 (d, J = 7.5 Hz, 3H), 1.24 (d, J = 5.2 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 157.3, 137.0, 128.6, 113.8, 83.2, 55.2, 24.7, 24.6, 17.4. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.72.

HRMS-ESI (m/z): calcd for $C_{15}H_{23}BO_3$, $[M+Na]^+$: 285.1635; found, 285.1632. IR (KBr): 2977, 1610, 1510, 1460, 1353, 1321, 1245, 1144, 971, 837 cm^{-1}.

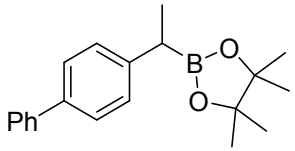


4-(1-(4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)ethyl)phenyl acetate (2d)[2]

Light yellow oil (80 mg, 92%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23 (d, *J* = 8.5 Hz, 2H), 6.99 (d, *J* = 8.5 Hz, 2H), 2.45 (q, *J* = 7.5 Hz, 1H), 2.29 (s, 2H), 1.33 (d, *J* = 7.5 Hz, 2H), 1.22 (d, *J* = 4.1 Hz, 6H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.65 (s, 1H), 148.2, 142.5, 128.6, 121.1, 83.3, 24.6, 24.5, 21.1, 17.1. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.71.

HRMS-ESI (m/z): calcd for $C_{16}H_{23}BO_4$, $[M+Na]^+$: 313.1584; found, 313.1582. IR (KBr): 2975, 1761, 1368, 1204, 846 cm^{-1}.

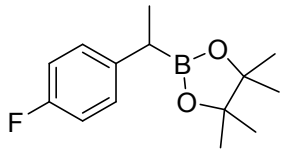


2-(1-([1,1'-Biphenyl]-4-yl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2e)[2]

Colorless oil (49.7 mg, 79.7%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 7.6 Hz, 2H), 7.57 (d, *J* = 7.9 Hz, 2H), 7.47 (t, *J* = 7.6 Hz, 2H), 7.36 (d, *J* = 7.9 Hz, 3H), 2.55 (q, *J* = 7.4 Hz, 1H), 1.44 (d, *J* = 7.5 Hz, 3H), 1.28 (d, *J* = 4.8 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 144.2, 141.3, 138.0, 128.7, 128.2, 127.1, 127.0, 126.8, 83.4, 24.7, 24.6, 17.1. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.63.

HRMS-ESI (m/z): calcd for $C_{20}H_{25}BO_2$, $[M+Na]^+$: 331.1843; found, 331.1840. IR (KBr): 2976, 1455, 1326, 1143, 842, 694 cm^{-1}.

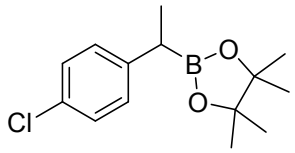


2-(1-(4-Fluorophenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2f)[1]

Light yellow oil (60 mg, 80%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.19 (dd, *J* = 8.4, 5.6 Hz, 2H), 6.97 (t, *J* = 8.7 Hz, 2H), 2.44 (q, *J* = 7.4 Hz, 1H), 1.34 (d, *J* = 7.5 Hz, 3H), 1.23 (d, *J* = 4.6 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 160.88 (d, *J* = 242.2 Hz), 140.53 (d, *J* = 3.2 Hz), 129.00 (d, *J* = 7.6 Hz), 114.95 (d, *J* = 21.0 Hz), 83.3, 24.6, 24.5, 17.2. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.93 (s, 1H).

HRMS-ESI (m/z): calcd for $C_{14}H_{20}BFO_2$, $[M+Na]^+$: 273.1435; found, 273.1431. IR (KBr): 2980, 1510, 1454, 1330, 1223, 1145, 981, 841 cm^{-1}.

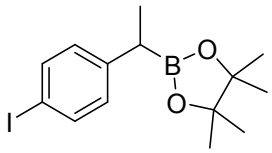


2-(1-(4-Chlorophenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2g)[3]

Colorless oil (66 mg, 83%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25 (d, *J* = 8.4 Hz, 2H), 7.17 (d, *J* = 8.4 Hz, 2H), 2.43 (q, *J* = 7.4 Hz, 1H), 1.34 (d, *J* = 7.5 Hz, 3H), 1.23 (d, *J* = 4.2 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 130.7, 129.1, 128.3, 83.4, 24.6, 24.5, 16.9. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.79 (s, 1H).

HRMS-ESI (m/z): calcd for $C_{14}H_{20}BClO_2$, $[M+Na]^+$: 289.1140; found, 289.1140. IR (KBr): 2977, 1488, 1325, 1143, 1061, 1013, 875 cm^{-1}.

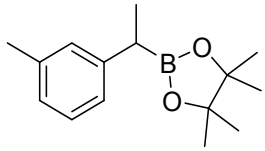


2-(1-(4-Iodophenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2h)

Colorless oil (75 mg, 70%).

^1H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.3 Hz, 2H), 6.97 (d, *J* = 8.3 Hz, 2H), 2.37 (q, *J* = 7.5 Hz, 1H), 1.29 (d, *J* = 7.5 Hz, 3H), 1.19 (d, *J* = 3.9 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 144.7, 137.2, 129.9, 90.0, 83.4, 24.7, 24.6, 16.8. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.24 (s, 1H).

HRMS-ESI (m/z): calcd for $C_{14}H_{20}BIO_2$, $[M+Na]^+$: 381.0496; found, 381.0490. IR (KBr): 2979, 1679, 1440, 1370, 1001, 818, 669 cm^{-1}.

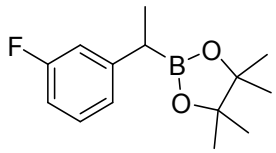


4,4,5,5-Tetramethyl-2-(1-(*m*-tolyl)ethyl)-1,3,2-dioxaborolane (2i)[2]

Colorless oil (65.6 mg, 89%).

^1H NMR (400 MHz, $CDCl_3$) δ 7.13 (t, *J* = 7.4 Hz, 1H), 7.01 (d, *J* = 7.6 Hz, 2H), 6.92 (d, *J* = 7.3 Hz, 1H), 2.38 (dd, *J* = 14.6, 7.3 Hz, 1H), 2.30 (s, 3H), 1.31 (d, *J* = 7.5 Hz, 3H), 1.19 (d, *J* = 5.5 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 144.9, 137.7, 128.6, 128.2, 125.9, 124.8, 83.2, 24.7, 24.6, 21.5, 17.2. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.49.

HRMS-ESI (m/z): calcd for $C_{15}H_{23}BO_2$, $[M+Na]^+$: 269.1686; found, 269.1681. IR (KBr): 2976, 1459, 1352, 1231, 1144, 862 cm^{-1}.

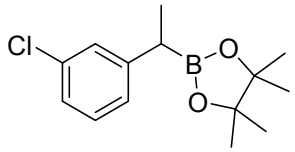


2-(1-(3-Fluorophenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2j)[3]

Light yellow oil (58.5 mg, 78%).

^1H NMR (400 MHz, $CDCl_3$) δ 7.23 (td, *J* = 7.9, 6.4 Hz, 1H), 7.01 (d, *J* = 7.7 Hz, 1H), 6.99 – 6.92 (m, 1H), 6.84 (td, *J* = 8.5, 2.5 Hz, 1H), 2.47 (q, *J* = 7.4 Hz, 1H), 1.35 (d, *J* = 7.5 Hz, 3H), 1.24 (d, *J* = 4.3 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 162.99 (d, *J* = 244.4 Hz), 147.68 (d, *J* = 7.2 Hz), 129.51 (d, *J* = 8.3 Hz), 123.45 (d, *J* = 2.5 Hz), 114.52 (d, *J* = 21.1 Hz), 111.90 (d, *J* = 21.2 Hz), 83.4, 24.6, 24.5, 16.7. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.76.

HRMS-ESI (m/z): calcd for $C_{14}H_{20}BFO_2$, $[M+Na]^+$: 273.1435; found, 273.1436. IR (KBr): 2978, 1585, 1452, 1327, 1142, 863 cm^{-1}.

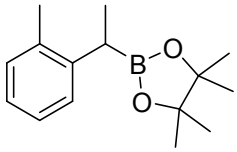


2-(1-(3-Chlorophenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2k)

Colorless oil (60.6 mg, 76%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23 (t, *J* = 1.7 Hz, 1H), 7.19 (d, *J* = 7.7 Hz, 1H), 7.17 – 7.09 (m, 2H), 2.44 (q, *J* = 7.4 Hz, 1H), 1.34 (d, *J* = 7.5 Hz, 3H), 1.23 (d, *J* = 4.2 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 147.1, 134.0, 129.4, 127.8, 126.0, 125.3, 83.5, 24.6, 24.5, 16.7. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.91.

HRMS-ESI (m/z): calcd for $C_{14}H_{20}BClO_2$, $[M+Na]^+$: 289.1140; found, 289.1140. IR (KBr): 2977, 1466, 1326, 1142, 876 cm^{-1}.

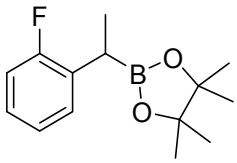


4,4,5,5-Tetramethyl-2-(1-(o-tolyl)ethyl)-1,3,2-dioxaborolane (2l)[1]

Colorless oil (59.7 mg, 81%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.24 – 7.09 (m, 3H), 7.04 (t, *J* = 7.3 Hz, 1H), 2.58 (q, *J* = 7.4 Hz, 1H), 2.31 (s, 3H), 1.31 (d, *J* = 7.5 Hz, 3H), 1.21 (d, *J* = 4.8 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 143.4, 135.6, 130.0, 127.1, 126.0, 125.0, 83.2, 24.7, 24.6, 19.9, 16.3. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.29.

HRMS-ESI (m/z): calcd for $C_{15}H_{23}BO_2$, $[M+Na]^+$: 269.1689; found, 269.1689. IR (KBr): 2977, 1446, 1324, 1144, 845 cm^{-1}.

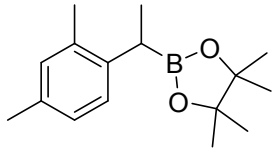


2-(1-(2-Fluorophenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2m)[2]

Colorless oil (45.7 mg, 61%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25 (td, *J* = 7.7, 1.8 Hz, 1H), 7.18 – 7.11 (m, 1H), 7.08 (dt, *J* = 7.4, 3.7 Hz, 1H), 7.04 – 6.97 (m, 1H), 2.60 (q, *J* = 7.5 Hz, 1H), 1.34 (d, *J* = 7.6 Hz, 3H), 1.26 (d, *J* = 4.1 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 160.86 (d, *J* = 243.6 Hz), 132.24 (d, *J* = 15.7 Hz), 129.55 (d, *J* = 5.1 Hz), 126.65 (d, *J* = 8.2 Hz), 124.02 (d, *J* = 3.3 Hz), 114.92 (d, *J* = 22.7 Hz), 83.4, 24.6, 24.5, 15.8.

HRMS-ESI (m/z): calcd for $C_{14}H_{20}BFO_2$, $[M+Na]^+$: 273.1435; found, 273.1439. IR (KBr): 2978, 1488, 1356, 1325, 1144, 754 cm^{-1}.

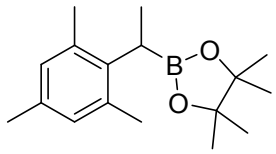


2-(1-(2,4-Dimethylphenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2n)

Colorless oil (67.8 mg, 87%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.13 (d, *J* = 8.0 Hz, 1H), 6.99 (d, *J* = 7.2 Hz, 2H), 2.57 (dd, *J* = 14.8, 7.3 Hz, 1H), 2.31 (d, *J* = 3.1 Hz, 6H), 1.33 (d, *J* = 7.5 Hz, 3H), 1.25 (d, *J* = 4.8 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 140.3, 135.4, 134.3, 130.9, 127.2, 126.7, 83.2, 77.3, 77.0, 76.7, 24.7, 24.6, 20.8, 19.8, 16.5. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.65 (s, 1H).

HRMS-ESI (m/z): calcd for $C_{16}H_{25}BO_2$, $[M+Na]^+$: 283.1843; found, 283.1847. IR (KBr): 2978, 1451, 1326, 1145, 845, 818 cm^{-1}.

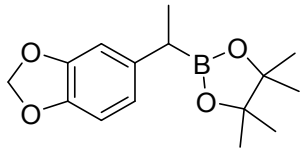


2-(1-Mesitylethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2o)

Colorless oil (61.6 mg, 75%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.73 (s, 2H), 2.53 (q, *J* = 7.5 Hz, 1H), 2.20 (s, 6H), 2.14 (s, 3H), 1.17 (s, 12H), 1.15 (d, *J* = 7.6 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 139.1, 135.8, 134.3, 129.2, 83.3, 25.0, 24.8, 20.7, 15.3. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.89.

HRMS-ESI (m/z): calcd for $C_{17}H_{27}BO_2$, $[M+Na]^+$: 297.1999; found, 297.2000. IR (KBr): 2976, 1459, 1349, 1312, 1145, 846 cm^{-1}.

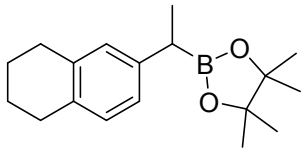


2-(1-(Benzo[d][1,3]dioxol-5-yl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2p)

Colorless oil (73.6 mg, 89%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.80 – 6.63 (m, 3H), 5.91 (s, 2H), 2.37 (q, *J* = 7.4 Hz, 1H), 1.31 (d, *J* = 7.5 Hz, 3H), 1.24 (d, *J* = 4.5 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 147.5, 145.1, 138.9, 120.4, 108.4, 108.1, 100.6, 83.3, 24.7, 24.6, 17.5. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.28.

HRMS-ESI (m/z): calcd for $C_{15}H_{21}BO_4$, $[M+Na]^+$: 299.1428; found, 299.1431. IR (KBr): 2978, 1488, 1443, 1243, 1104, 1039, 674 cm^{-1}.



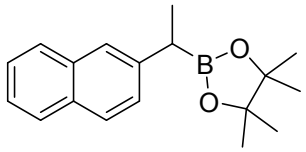
4,4,5,5-Tetramethyl-2-(1-(5,6,7,8-tetrahydronaphthalen-2-yl)ethyl)-1,3,2-dioxaborolane (2q)

Colorless oil (72.9 mg, 85%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.00 (s, 2H), 6.95 (s, 1H), 2.77 (d, *J* = 5.7 Hz, 4H), 2.39 (q, *J* = 7.4 Hz, 1H), 1.83 (dt, *J* = 5.9, 2.9 Hz, 4H), 1.35 (d, *J* = 7.4 Hz, 3H), 1.27 (d, *J* = 4.7 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 142.0, 136.8, 133.7, 129.1, 128.5, 125.1, 83.2, 29.5, 29.0, 24.6, 23.4, 23.3, 17.5. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.39.

HRMS-ESI (m/z): calcd for $C_{18}H_{27}BO_2$, $[M+Na]^+$: 309.2000; found, 309.2003. IR (KBr): 2926,

1444, 1324, 1146, 821 cm^{-1}.

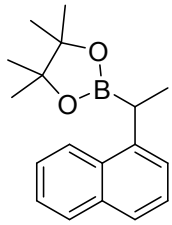


4,4,5,5-Tetramethyl-2-(1-(naphthalen-2-yl)ethyl)-1,3,2-dioxaborolane (2r)

White solid (77.8 mg, 92%), m.p. = 61 – 63 °C.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 (t, *J* = 9.0 Hz, 3H), 7.73 (s, 1H), 7.54 – 7.40 (m, 3H), 2.71 (dd, *J* = 14.5, 7.1 Hz, 0H), 1.52 (d, *J* = 7.4 Hz, 3H), 1.28 (d, *J* = 6.1 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 142.6, 133.9, 131.8, 127.7, 127.6, 127.5, 127.3, 125.7, 125.3, 124.8, 83.4, 24.7, 24.6, 16.8. ^{11}B NMR (128 MHz, $CDCl_3$) δ 34.47.

HRMS-ESI (m/z): calcd for $C_{18}H_{23}BO_2$, $[M+Na]^+$: 305.1687; found, 305.1690. IR (KBr): 2976, 1460, 1328, 1144, 856, 747 cm^{-1}.

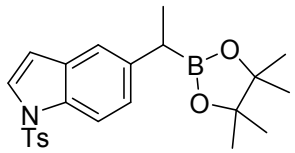


4,4,5,5-Tetramethyl-2-(1-(naphthalen-1-yl)ethyl)-1,3,2-dioxaborolane (2s)[1]

Colorless oil (75.2 mg, 89%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.18 (d, *J* = 8.2 Hz, 1H), 7.93 – 7.82 (m, 1H), 7.72 (dd, *J* = 7.1, 2.1 Hz, 1H), 7.60 – 7.43 (m, 4H), 3.19 (q, *J* = 7.4 Hz, 1H), 1.57 (d, *J* = 7.5 Hz, 3H), 1.26 (d, *J* = 4.2 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 141.5, 134.0, 132.1, 128.7, 125.8, 125.4, 125.2, 124.3, 124.1, 83.4, 24.7, 24.6, 16.5. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.86.

HRMS-ESI (m/z): calcd for $C_{18}H_{23}BO_2$, $[M+Na]^+$: 305.1687; found, 305.1690. IR (KBr): 2978, 1458, 1378, 1328, 1145, 851, 782 cm^{-1}.

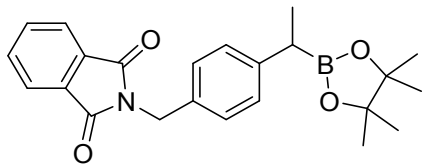


5-(1-(4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)ethyl)-1-tosyl-1H-indole (2t)

Brown oil (96 mg, 76%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.6 Hz, 1H), 7.74 (d, *J* = 8.2 Hz, 2H), 7.48 (d, *J* = 3.6 Hz, 1H), 7.34 (s, 1H), 7.18 (d, *J* = 8.0 Hz, 3H), 6.56 (d, *J* = 3.6 Hz, 1H), 2.48 (q, *J* = 7.4 Hz, 1H), 2.30 (s, 3H), 1.32 (d, *J* = 7.5 Hz, 3H), 1.18 (d, *J* = 6.4 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 144.7, 140.1, 135.5, 133.0, 131.1, 129.8, 126.8, 126.1, 125.1, 119.8, 113.3, 109.1, 83.3, 24.6, 24.5, 21.5, 17.4. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.32.

HRMS-ESI (m/z): calcd for $C_{23}H_{28}BNO_4S$, $[M+H]^+$: 426.1909; found, 426.1911. IR (KBr): 2978, 1456, 1370, 1173, 1135, 673, 584 cm^{-1}.

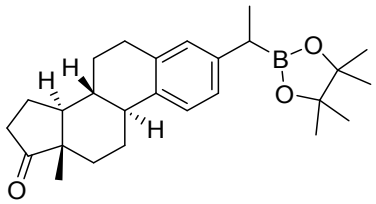


2-(4-(1-(4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)ethyl)benzyl)isoindoline-1,3-dione (2u)

White solid (105 mg, 90%), m.p. = 121 – 123 °C.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (dd, *J* = 5.3, 3.0 Hz, 2H), 7.70 (dd, *J* = 5.3, 3.1 Hz, 2H), 7.35 (d, *J* = 7.9 Hz, 2H), 7.18 (d, *J* = 7.9 Hz, 2H), 4.82 (s, 2H), 2.41 (q, *J* = 7.4 Hz, 1H), 1.30 (d, *J* = 7.5 Hz, 3H), 1.21 (d, *J* = 4.5 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.1, 144.7, 133.9, 133.0, 132.2, 128.7, 128.1, 123.3, 83.3, 41.3, 24.7, 24.6, 17.1. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.63.

HRMS-ESI (m/z): calcd for $C_{23}H_{26}BNO_4$, $[M+Na]^+$: 414.1851; found, 414.1859. IR (KBr): 2980, 1718, 1387, 1335, 1151, 849, 720 cm^{-1}.



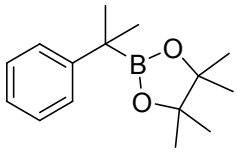
(8R,9S,13S,14S)-13-Methyl-3-(1-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)ethyl)-6,7,8,9,11,12,13,14,15,16-decahydro-17H-cyclopenta[a]phenanthren-17-one (2v)

Light yellow oil (32 mg, 79%).

18:1 *d.r.* value was measured by HPLC analysis with the corresponding alcohol obtained after oxidation.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.21 (d, *J* = 8.0 Hz, 1H), 7.03 (d, *J* = 8.0 Hz, 1H), 6.97 (s, 1H), 2.99 – 2.85 (m, 2H), 2.57 – 2.27 (m, 4H), 2.21 – 1.95 (m, 4H), 1.70 – 1.42 (m, 6H), 1.33 (d, *J* = 7.5 Hz, 3H), 1.25 (d, *J* = 4.3 Hz, 12H), 0.93 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 221.0, 142.3, 136.3, 136.2, 128.4, 125.4, 125.3, 83.2, 50.5, 48.0, 44.3, 38.2, 35.9, 31.6, 29.4, 26.6, 25.7, 24.6, 21.6, 17.4, 13.9. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.94.

HRMS-ESI (m/z): calcd for $C_{26}H_{37}BO_3$, $[M+H]^+$: 409.2913; found, 409.2920. IR (KBr): 2977, 1736, 1458, 1328, 1147, 783, 732 cm^{-1}.

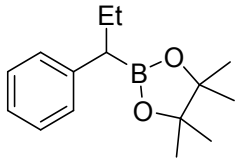


4,4,5,5-Tetramethyl-2-(2-phenylpropan-2-yl)-1,3,2-dioxaborolane (2w)[3]

Colorless oil (52.1 mg, 71%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.32 (dt, *J* = 19.4, 5.9 Hz, 4H), 7.18 (d, *J* = 6.9 Hz, 1H), 1.38 (s, 6H), 1.23 (s, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 148.6, 128.1, 126.3, 125.0, 83.3, 25.6, 24.5. ^{11}B NMR (128 MHz, $CDCl_3$) δ 34.33 (s, 1H).

HRMS-ESI (m/z): calcd for $C_{15}H_{23}BO_2$, $[M+Na]^+$: 269.1686; found, 269.1690. IR (KBr): 2923, 1641, 1522, 1298, 794, 715 cm^{-1}.

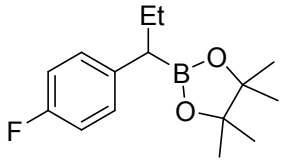


4,4,5,5-Tetramethyl-2-(1-phenylpropyl)-1,3,2-dioxaborolane (2aa)[2]

Colorless oil (55.3 mg, 75%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 – 7.27 (m, 2H), 7.23 (d, *J* = 6.7 Hz, 2H), 7.16 (t, *J* = 7.0 Hz, 1H), 2.25 (t, *J* = 7.9 Hz, 1H), 1.97 – 1.85 (m, 1H), 1.75 – 1.65 (m, 1H), 1.23 (d, *J* = 8.0 Hz, 12H), 0.94 (t, *J* = 7.3 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 143.3, 128.4, 128.2, 125.1, 83.2, 25.8, 24.7, 24.6, 13.9. ^{11}B NMR (128 MHz, $CDCl_3$) δ 34.58.

HRMS-ESI (m/z): calcd for $C_{15}H_{23}BO_2$, $[M+Na]^+$: 269.1686; found, 269.1691. IR (KBr): 2924, 1643, 1367, 1319, 701 cm^{-1}.

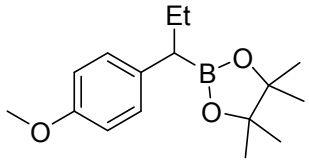


2-(1-(4-Fluorophenyl)propyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2ab)

Colorless oil (53 mg, 67%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.17 (dd, *J* = 8.5, 5.6 Hz, 2H), 6.95 (t, *J* = 8.7 Hz, 2H), 2.22 (t, *J* = 7.9 Hz, 1H), 1.87 (dq, *J* = 22.1, 7.4 Hz, 1H), 1.65 (tt, *J* = 14.7, 7.4 Hz, 1H), 1.22 (d, *J* = 6.8 Hz, 12H), 0.91 (t, *J* = 7.3 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 160.93 (d, *J* = 242.4 Hz), 138.90 (d, *J* = 3.3 Hz), 129.61 (d, *J* = 7.6 Hz), 114.89 (d, *J* = 20.8 Hz), 83.3, 25.9, 24.6, 24.5, 13.7. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.45.

HRMS-ESI (m/z): calcd for $C_{15}H_{22}BFO_2$, $[M+Na]^+$: 287.1592; found, 287.1587. IR (KBr): 2923, 1505, 1365, 1316, 1218, 1141, 793, 719 cm^{-1}.

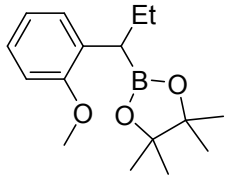


2-(1-(4-Methoxyphenyl)propyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2ac)

Colorless oil (67 mg, 81%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.15 (d, *J* = 8.5 Hz, 2H), 6.83 (d, *J* = 8.5 Hz, 2H), 3.79 (s, 3H), 2.19 (t, *J* = 7.8 Hz, 1H), 1.86 (dq, *J* = 14.9, 7.4 Hz, 1H), 1.71 – 1.59 (m, 1H), 1.23 (d, *J* = 7.6 Hz, 12H), 0.92 (t, *J* = 7.3 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 157.3, 135.3, 129.2, 113.7, 83.1, 55.1, 26.0, 24.7, 24.6, 13.8. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.72.

HRMS-ESI (m/z): calcd for $C_{16}H_{25}BO_3$, $[M+Na]^+$: 299.1792; found, 299.1797. IR (KBr): 2974, 1608, 1510, 1454, 1245, 1147, 834 cm^{-1}.

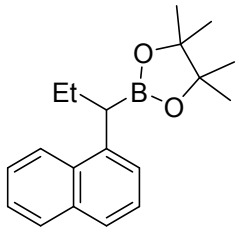


(R)-2-(1-(2-Methoxyphenyl)propyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2ad)

Colorless oil (60.4 mg, 73%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23 – 7.10 (m, 2H), 6.90 (td, *J* = 7.5, 1.2 Hz, 1H), 6.83 (d, *J* = 8.1 Hz, 1H), 3.81 (s, 3H), 2.38 (t, *J* = 7.6 Hz, 1H), 1.87 (dt, *J* = 14.3, 7.2 Hz, 1H), 1.69 (dt, *J* = 13.1, 7.4 Hz, 1H), 1.25 (d, *J* = 7.5 Hz, 12H), 0.94 (t, *J* = 7.3 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 157.0, 132.2, 129.6, 126.2, 120.4, 109.9, 82.9, 55.0, 24.8, 24.7, 23.8, 13.9. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.11.

HRMS-ESI (m/z): calcd for $C_{16}H_{25}BO_3$, $[M+Na]^+$: 299.1792; found, 299.1795. IR (KBr): 2971, 1593, 1458, 1366, 1315, 1240, 1145, 1031, 750 cm^{-1}.

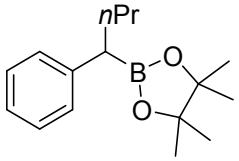


4,4,5,5-Tetramethyl-2-(1-(naphthalen-1-yl)propyl)-1,3,2-dioxaborolane (2ae)

Colorless oil (65.7 mg, 74%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (d, *J* = 8.2 Hz, 1H), 7.81 (d, *J* = 7.7 Hz, 1H), 7.65 (dd, *J* = 6.6, 2.7 Hz, 1H), 7.50 – 7.36 (m, 4H), 2.95 (t, *J* = 7.6 Hz, 1H), 2.05 (tt, *J* = 15.1, 7.5 Hz, 1H), 1.91 – 1.79 (m, 1H), 1.18 (d, *J* = 13.1 Hz, 12H), 0.99 (t, *J* = 7.3 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 139.9, 134.1, 132.3, 128.7, 125.8, 125.7, 125.3, 125.2, 125.1, 124.2, 83.4, 25.3, 24.8, 24.5, 14.2. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.62.

HRMS-ESI (m/z): calcd for $C_{19}H_{25}BO_2$, $[M+Na]^+$: 319.1843; found, 319.1848. IR (KBr): 2973, 1368, 1325, 1142, 963, 782 cm^{-1}.

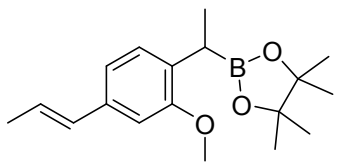


4,4,5,5-Tetramethyl-2-(1-phenylbutyl)-1,3,2-dioxaborolane (2af)[4]

Colorless oil (42.9 mg, 55%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.28 – 7.18 (m, 4H), 7.12 (dd, *J* = 9.4, 4.3 Hz, 1H), 2.32 (t, *J* = 10.1 Hz, 1H), 1.83 (dt, *J* = 12.7, 5.7 Hz, 1H), 1.70 – 1.59 (m, 1H), 1.30 (dd, *J* = 13.9, 6.5 Hz, 3H), 1.20 (d, *J* = 7.2 Hz, 12H), 0.90 (t, *J* = 5.9 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 128.4, 128.2, 125.0, 83.2, 34.8, 24.7, 24.6, 22.4, 14.1. ^{11}B NMR (128 MHz, $CDCl_3$) δ 32.75.

HRMS-ESI (m/z): calcd for $C_{16}H_{25}BO_2$, $[M+Na]^+$: 283.1843; found, 283.1851. IR (KBr): 2922, 1740, 1367, 1319, 1143, 853, 794, 698 cm^{-1}.



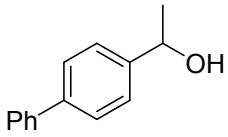
(E)-2-(1-(2-Methoxy-4-(prop-1-en-1-yl)phenyl)ethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane

(2ai)

Colorless oil (67.9 mg, 75%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.07 (d, *J* = 7.7 Hz, 1H), 6.85 (dd, *J* = 7.7, 1.6 Hz, 1H), 6.78 (d, *J* = 1.6 Hz, 1H), 6.36 (dd, *J* = 15.7, 1.8 Hz, 1H), 6.15 (dq, *J* = 15.6, 6.6 Hz, 1H), 3.79 (s, 3H), 2.43 (q, *J* = 7.6 Hz, 1H), 1.85 (dd, *J* = 6.5, 1.6 Hz, 3H), 1.27 (d, *J* = 7.4 Hz, 3H), 1.21 (d, *J* = 3.3 Hz, 13H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.9, 136.3, 132.8, 131.3, 128.3, 124.4, 118.6, 107.1, 82.9, 54.9, 24.7, 24.6, 18.4, 15.2. ^{11}B NMR (128 MHz, $CDCl_3$) δ 34.01.

HRMS-ESI (m/z): calcd for $C_{18}H_{27}BO_3$, $[M+Na]^+$: 325.1949; found, 325.1954. IR (KBr): 2975, 2930, 1691, 1458, 1355, 1253, 1145, 846 cm^{-1}.

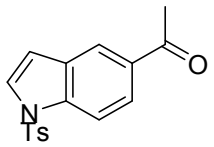


1-([1,1'-Biphenyl]-4-yl)ethan-1-ol (3)[5]

White solid (17.4 mg, 88%), m.p. = 87.5 – 88.5 °C.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (dt, *J* = 8.4, 2.0 Hz, 4H), 7.50 – 7.39 (m, 4H), 7.38 – 7.31 (m, 1H), 4.96 (q, *J* = 6.5 Hz, 1H), 1.77 (s, 1H), 1.54 (d, *J* = 6.5 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 144.8, 140.9, 140.5, 128.8, 127.3, 127.1, 125.8, 70.2, 25.2.

IR (KBr): 3329, 2913, 1644, 1555, 1403, 1077, 834, 691 cm^{-1}.

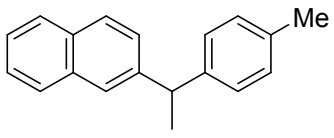


1-(1-Tosyl-1H-indol-5-yl)ethan-1-one (4)

Brown solid (23.7 mg, 76%), m.p. = 136 – 137 °C.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.19 (d, *J* = 1.6 Hz, 1H), 8.06 (dt, *J* = 8.8, 0.8 Hz, 1H), 7.97 (dd, *J* = 8.7, 1.7 Hz, 1H), 7.83 – 7.76 (m, 2H), 7.66 (d, *J* = 3.7 Hz, 1H), 7.27 (d, *J* = 8.1 Hz, 2H), 6.77 (dd, *J* = 3.7, 0.8 Hz, 1H), 2.65 (s, 3H), 2.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 197.6, 145.4, 137.3, 135.0, 132.8, 130.6, 130.0, 127.7, 126.8, 124.7, 122.6, 113.4, 109.5, 26.7, 21.6.

HRMS-ESI (m/z): calcd for $C_{17}H_{15}NO_3S$, $[M+H]^+$: 314.0845 found, 314.0843. IR (KBr): 1677, 1434, 1281, 1174, 1127, 813, 670, 583 cm^{-1}.

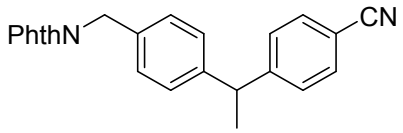


2-(1-(*p*-Tolyl)ethyl)naphthalene (5)

Colorless oil (17.5 mg, 71%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82 (ddd, *J* = 7.4, 5.2, 1.6 Hz, 2H), 7.78 – 7.69 (m, 2H), 7.46 (pd, *J* = 6.9, 1.4 Hz, 2H), 7.34 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.23 – 7.06 (m, 4H), 4.31 (q, *J* = 7.2 Hz, 1H), 2.35 (s, 3H), 1.75 (d, *J* = 7.2 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 144.0, 143.3, 135.6, 133.5, 132.1, 129.1, 127.9, 127.7, 127.6, 127.5, 126.8, 125.9, 125.3, 125.3, 44.4, 21.8, 21.0.

HRMS-ESI (m/z): calcd for $C_{19}H_{18}$, $[M+Na]^+$: 269.1301; found, 269.1295. IR (KBr): 1645, 1511, 810, 725 cm^{-1}.

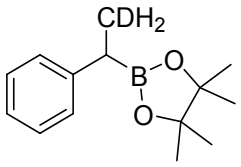


4-(1-(4-((1,3-Dioxoisoindolin-2-yl)methyl)phenyl)ethyl)benzonitrile (6)

White solid (24 mg, 66%), m.p. = 147 – 148 °C.

^1H NMR (400 MHz, $CDCl_3$) δ 7.90 – 7.83 (m, 2H), 7.73 (dd, *J* = 5.4, 3.0 Hz, 2H), 7.60 – 7.53 (m, 2H), 7.44 – 7.36 (m, 2H), 7.33 – 7.29 (m, 2H), 7.20 – 7.11 (m, 2H), 4.83 (s, 2H), 4.18 (q, *J* = 7.2 Hz, 1H), 1.63 (d, *J* = 7.2 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.0, 151.6, 144.3, 134.7, 134.0, 132.3, 132.1, 128.9, 128.4, 127.8, 123.3, 118.9, 110.0, 44.6, 41.2, 21.4.

HRMS-ESI (m/z): calcd for $C_{24}H_{18}N_2O_2$, $[M+Na]^+$: 389.1260; found, 389.1263. IR (KBr): 1710, 1390, 1341, 1089, 937, 716, 622 cm^{-1}.

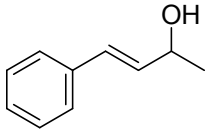


4,4,5,5-Tetramethyl-2-(1-phenylethyl-2-d)-1,3,2-dioxaborolane (*d1*-2a)

Colorless oil (51 mg, 73%).

^1H NMR (400 MHz, $CDCl_3$) δ 7.34 – 7.24 (m, 4H), 7.21 – 7.12 (m, 1H), 2.48 (t, *J* = 7.1 Hz, 0.84H), 1.42 – 1.33 (m, 2H), 1.25 (d, *J* = 5.4 Hz, 12H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 145.0, 128.3, 127.8, 125.1, 83.3, 24.7, 24.6, 17.1, 17.0, 16.8, 16.6. ^{11}B NMR (128 MHz, $CDCl_3$) δ 33.45.

HRMS-ESI (m/z): calcd for $C_{14}H_{20}DBO_2$, $[M+Na]^+$: 256.1592; found, 256.1597. IR (KBr): 2979, 1609, 1363, 1145, 850, 697 cm^{-1}.



(E)-4-Phenylbut-3-en-2-ol (8)[6]

Colorless oil (32.4 mg, 73%).

^1H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 7.4 Hz, 2H), 7.34 (t, *J* = 7.5 Hz, 2H), 7.28 (d, *J* = 6.8 Hz, 1H), 6.59 (d, *J* = 15.9 Hz, 1H), 6.29 (dd, *J* = 15.9, 6.4 Hz, 1H), 4.51 (p, *J* = 6.3 Hz, 1H), 1.85 (s, 1H), 1.40 (d, *J* = 6.4 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 136.7, 133.6, 129.4, 128.6, 127.6, 126.5, 68.9, 23.4.

IR (KBr): 2975, 1714, 1447, 1060, 968, 749, 695 cm^{-1}.

D. References

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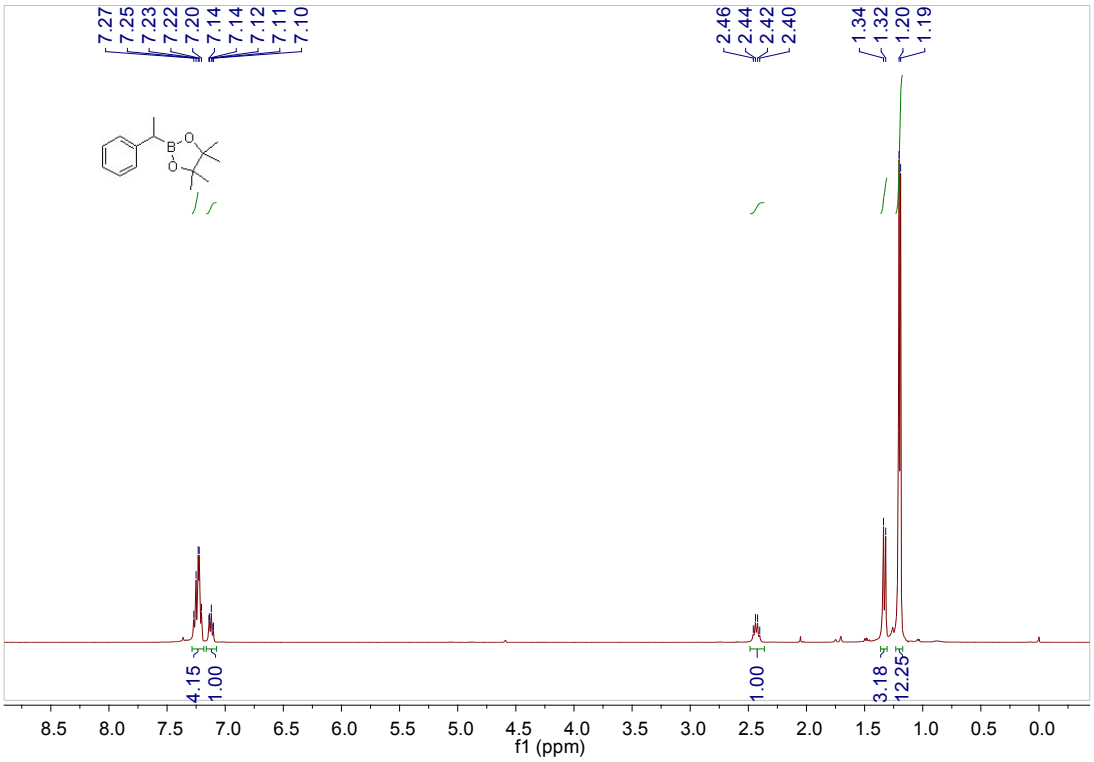
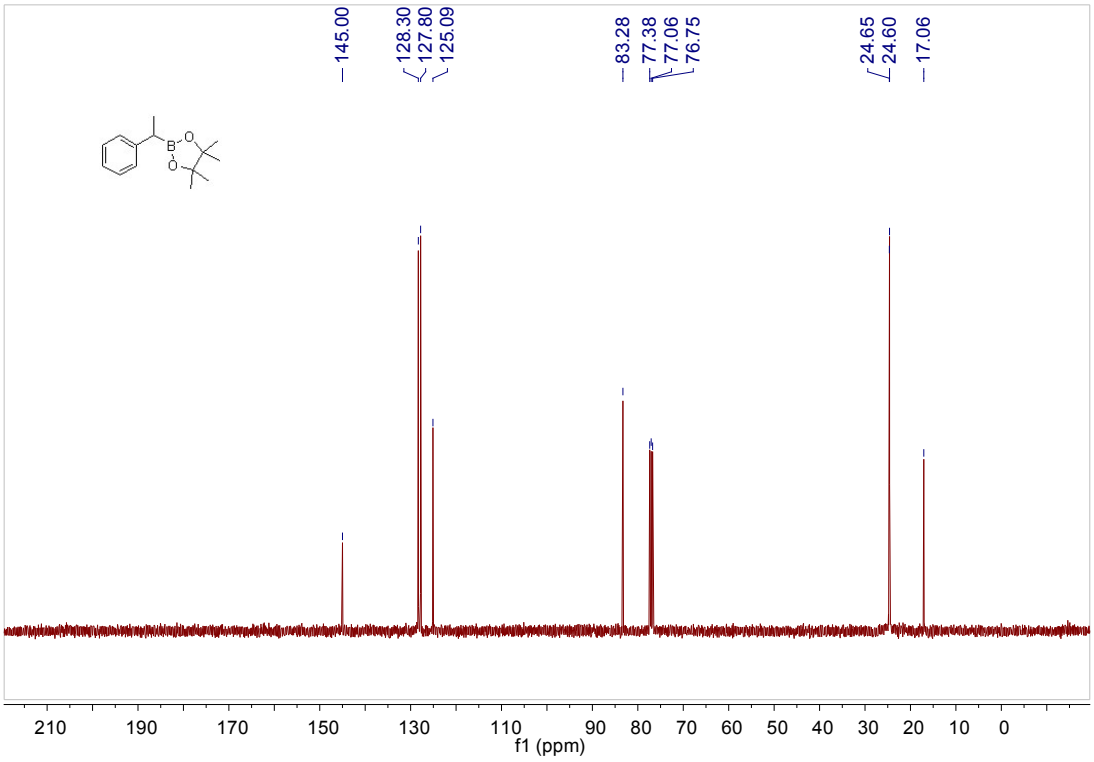
E. NMR Spectra for All Compounds

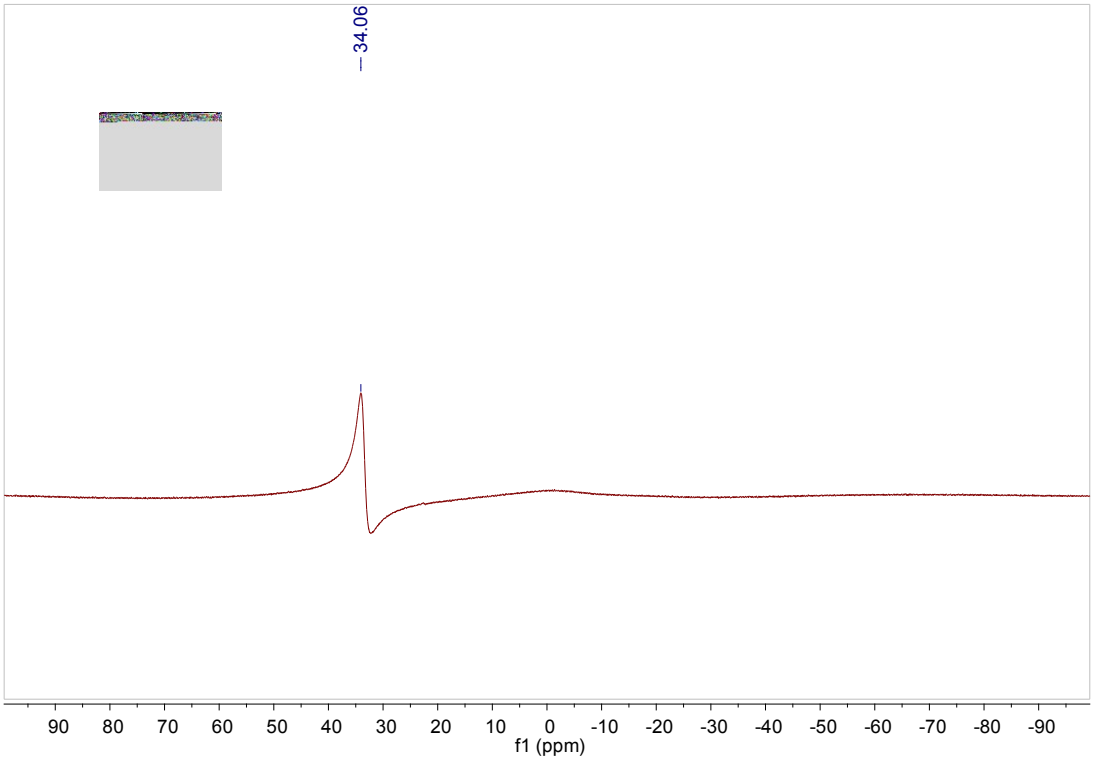
^{1}H NMR of compound 2a



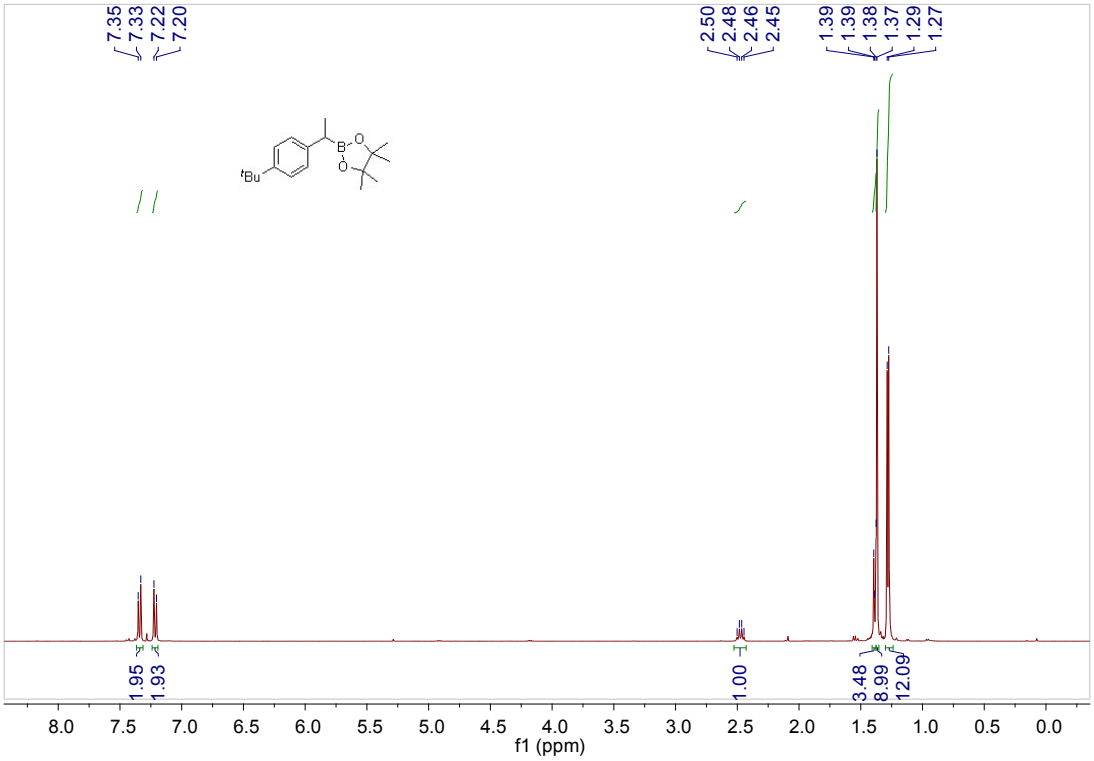
^{13}C NMR of compound 2a



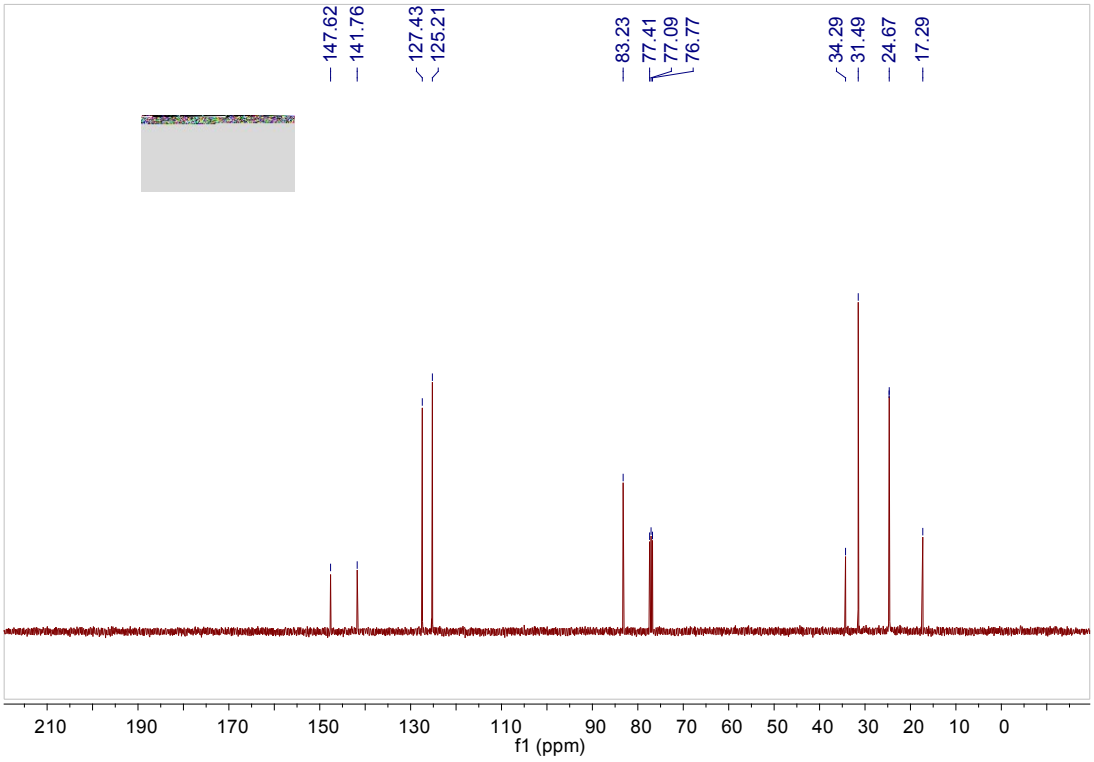
^{11}B NMR of compound 2a



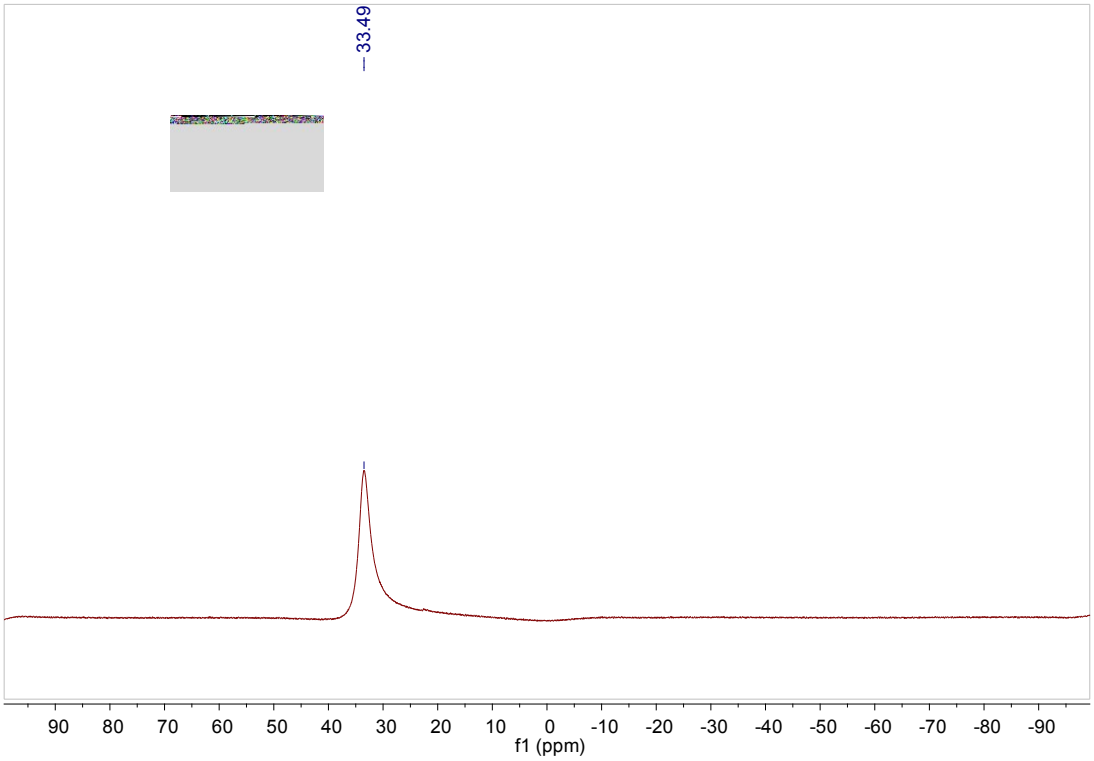
^{1}H NMR of compound 2b



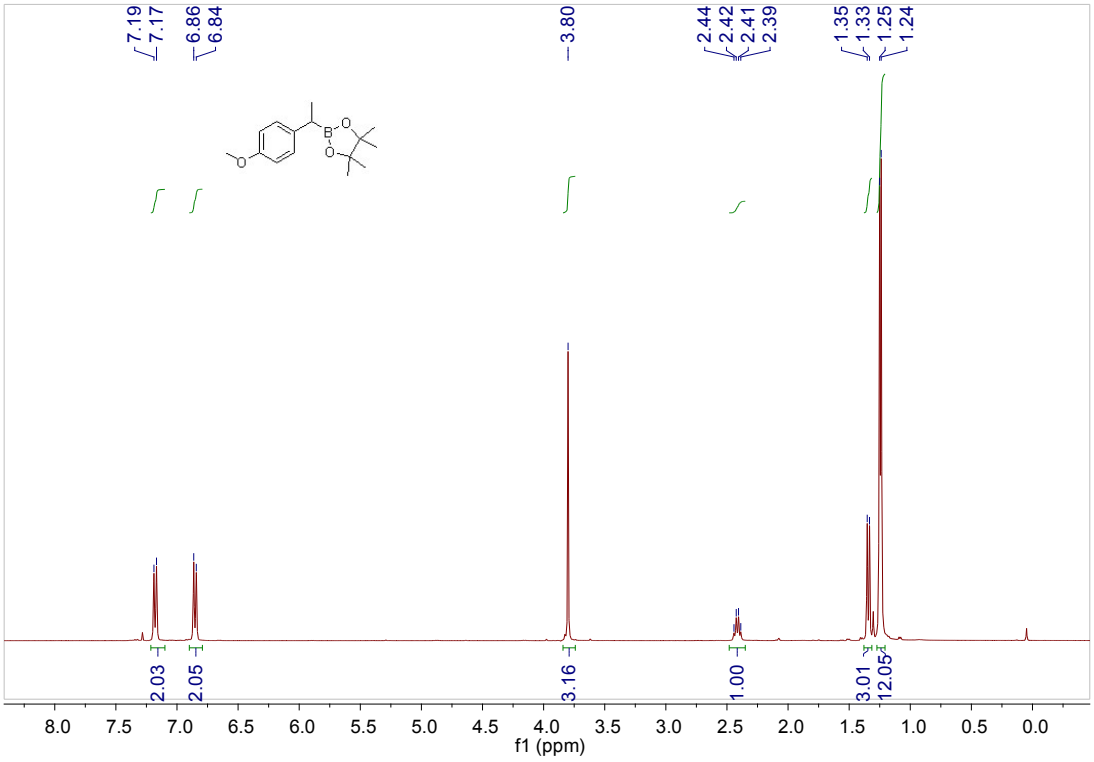
^{13}C NMR of compound 2b



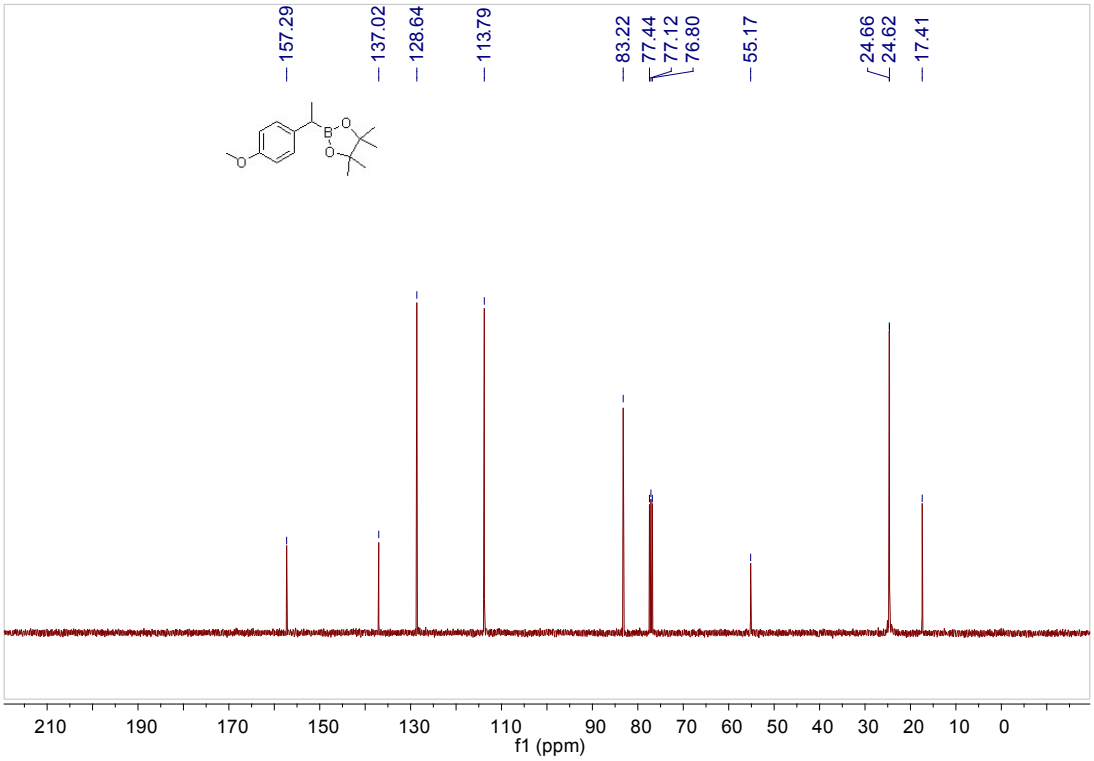
^{11}B NMR of compound 2b



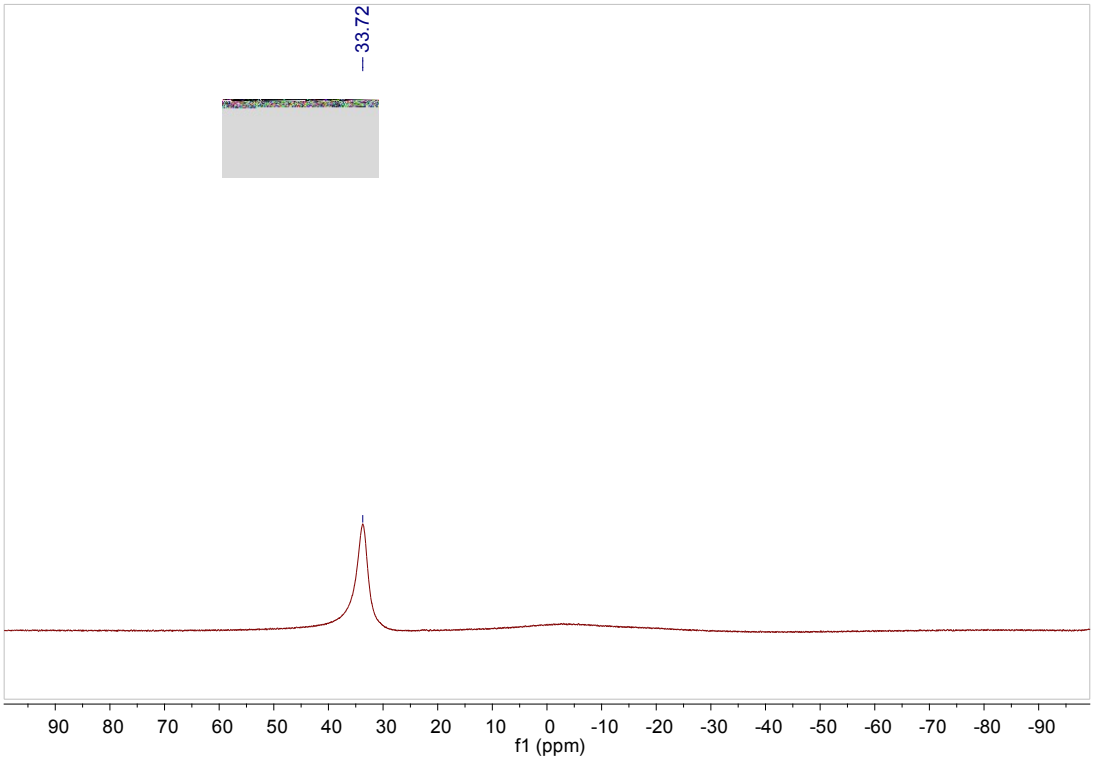
^{1}H NMR of compound 2c



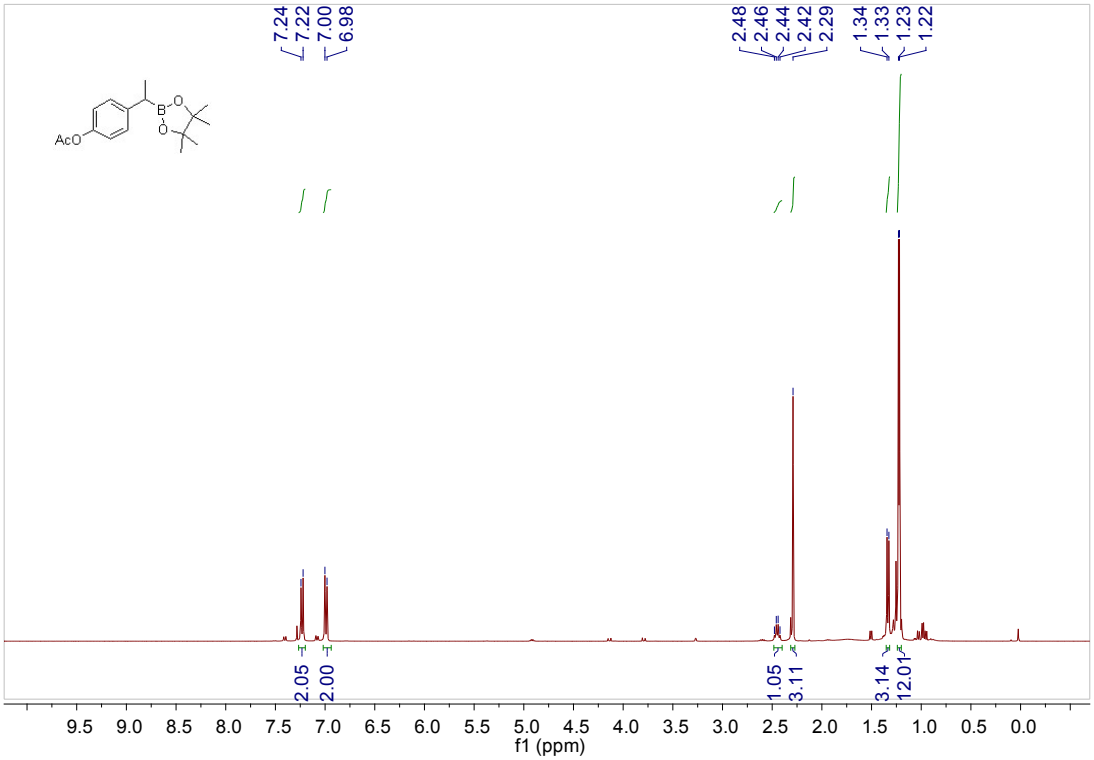
^{13}C NMR of compound 2c



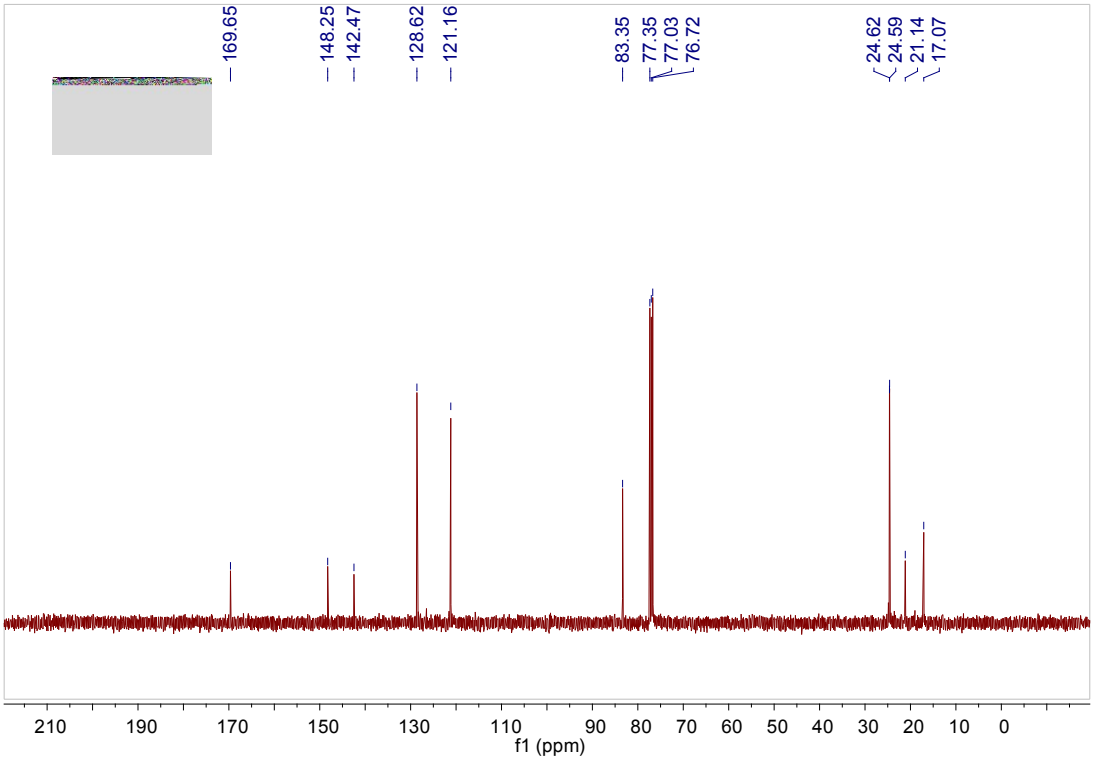
^{11}B NMR of compound 2c



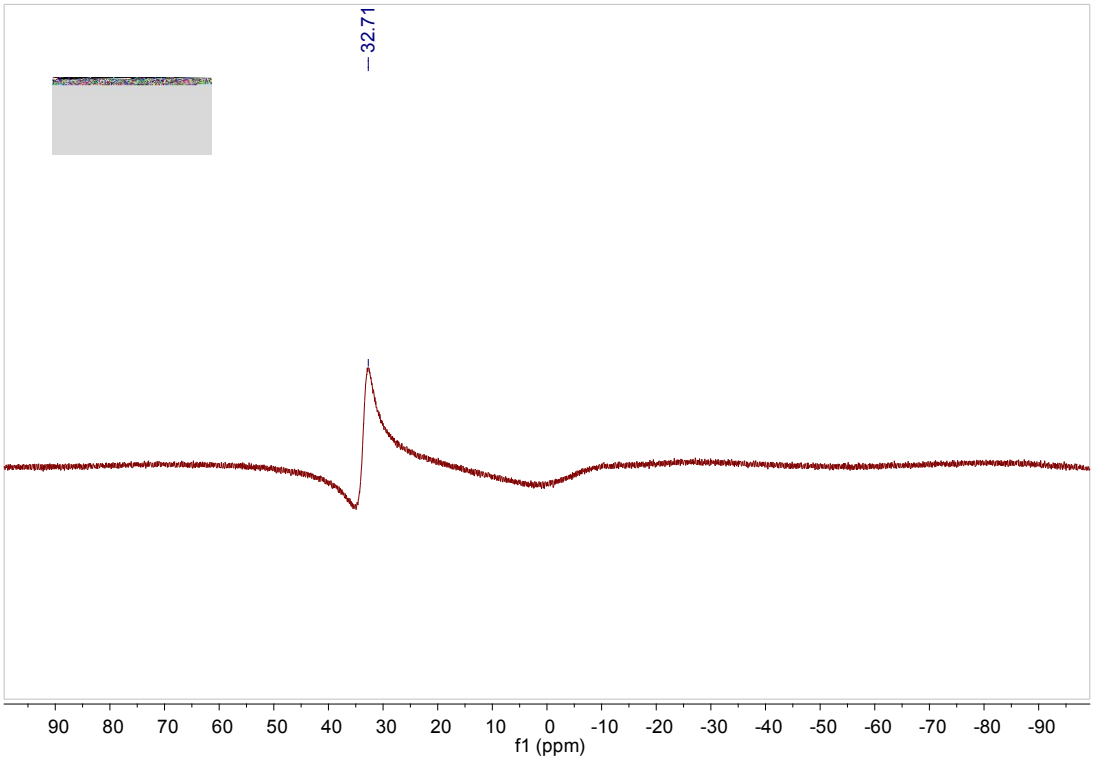
^{1}H NMR of compound 2d



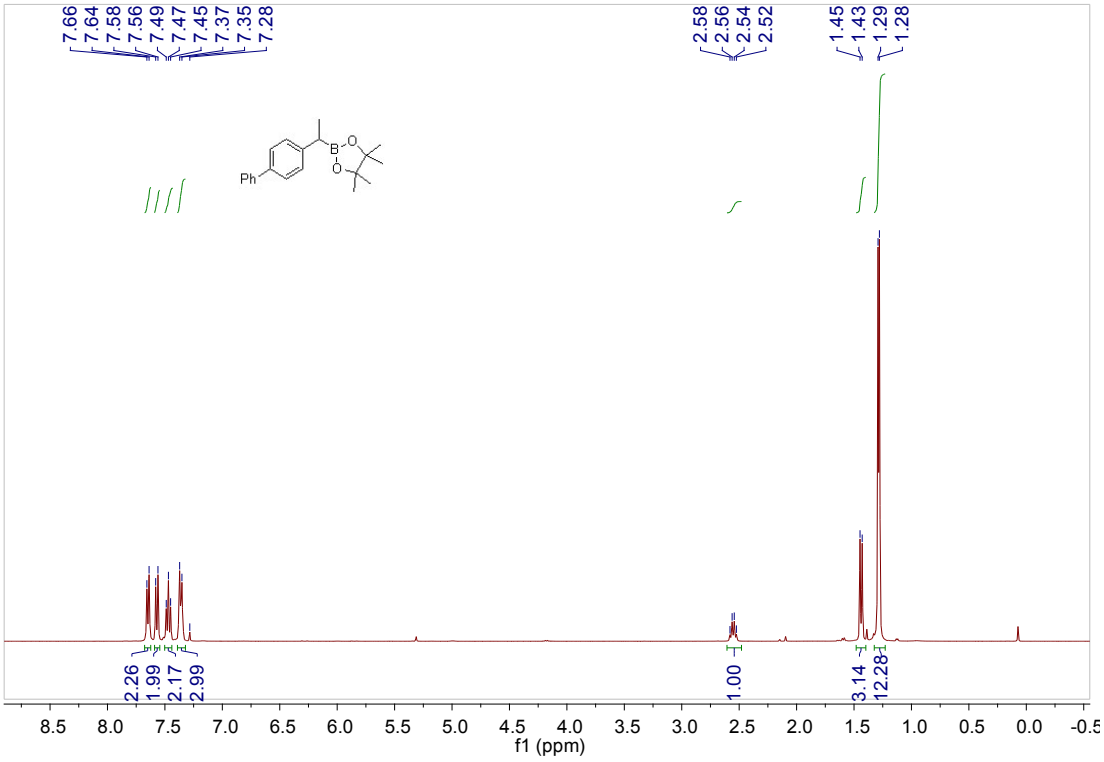
^{13}C NMR of compound 2d



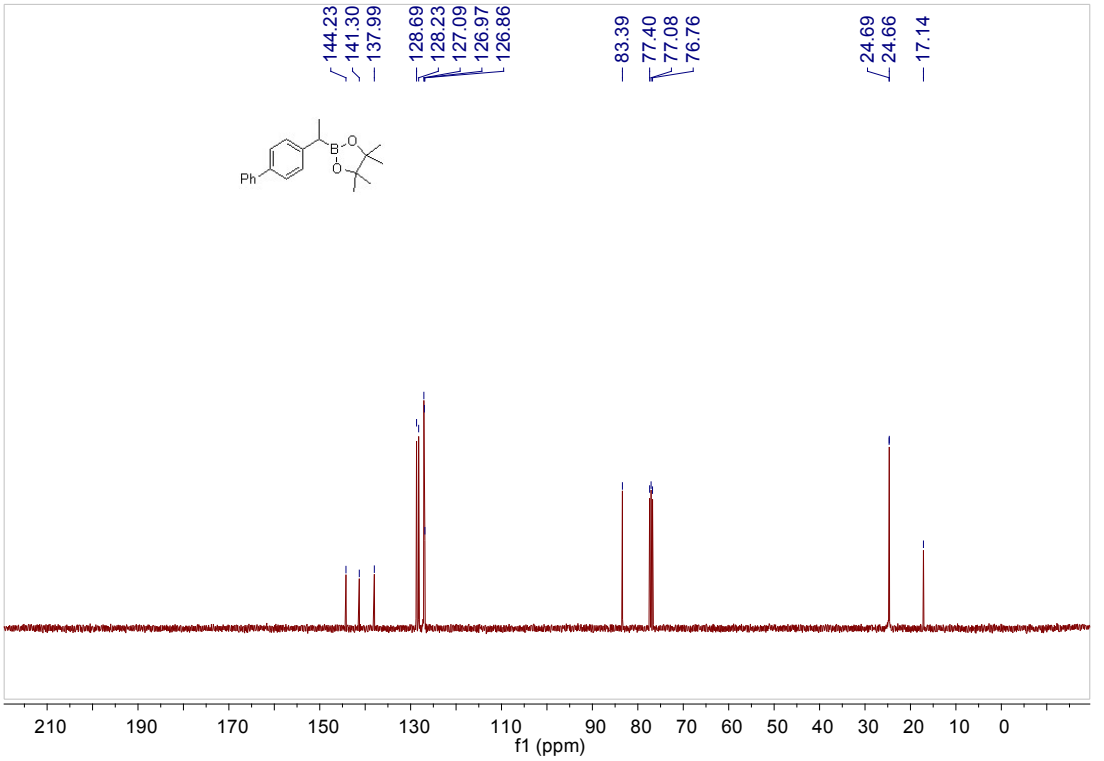
^{11}B NMR of compound 2d



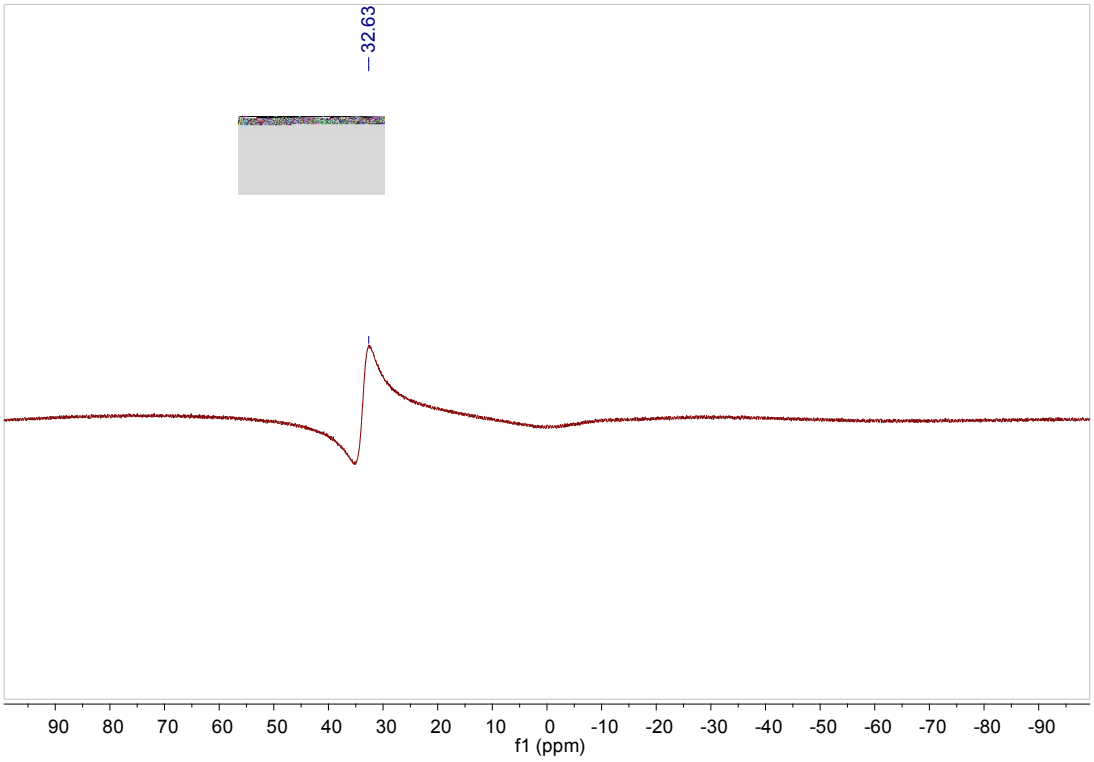
^{1}H NMR of compound 2e



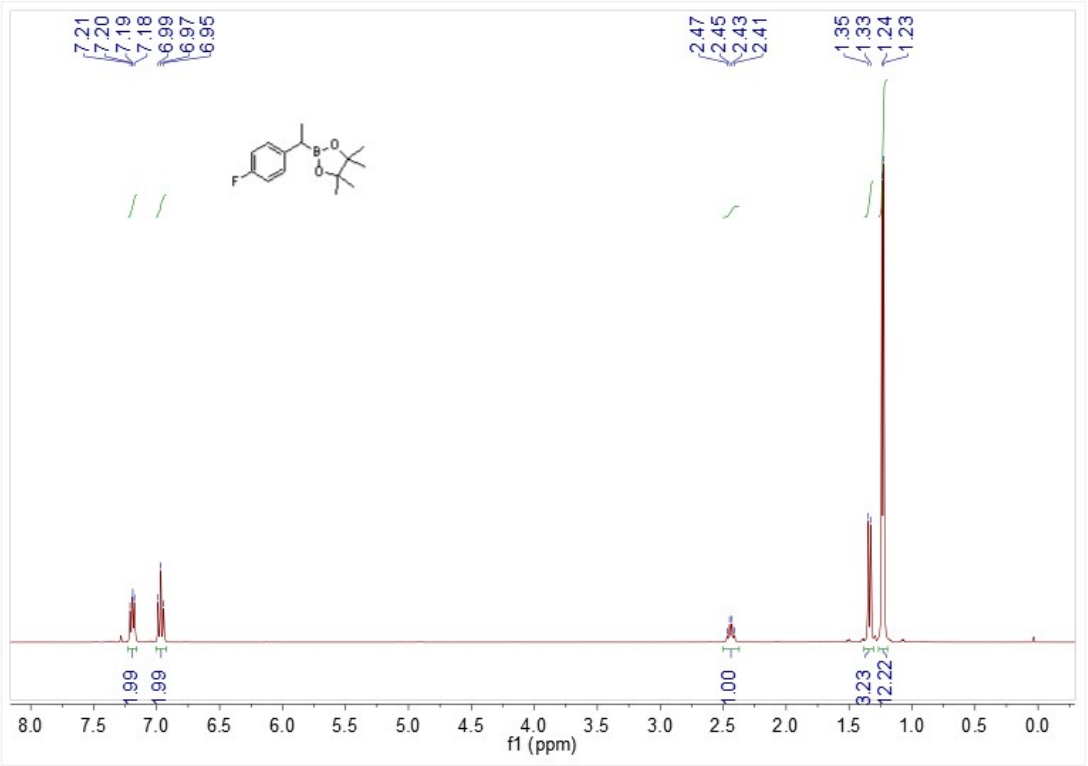
^{13}C NMR of compound 2e



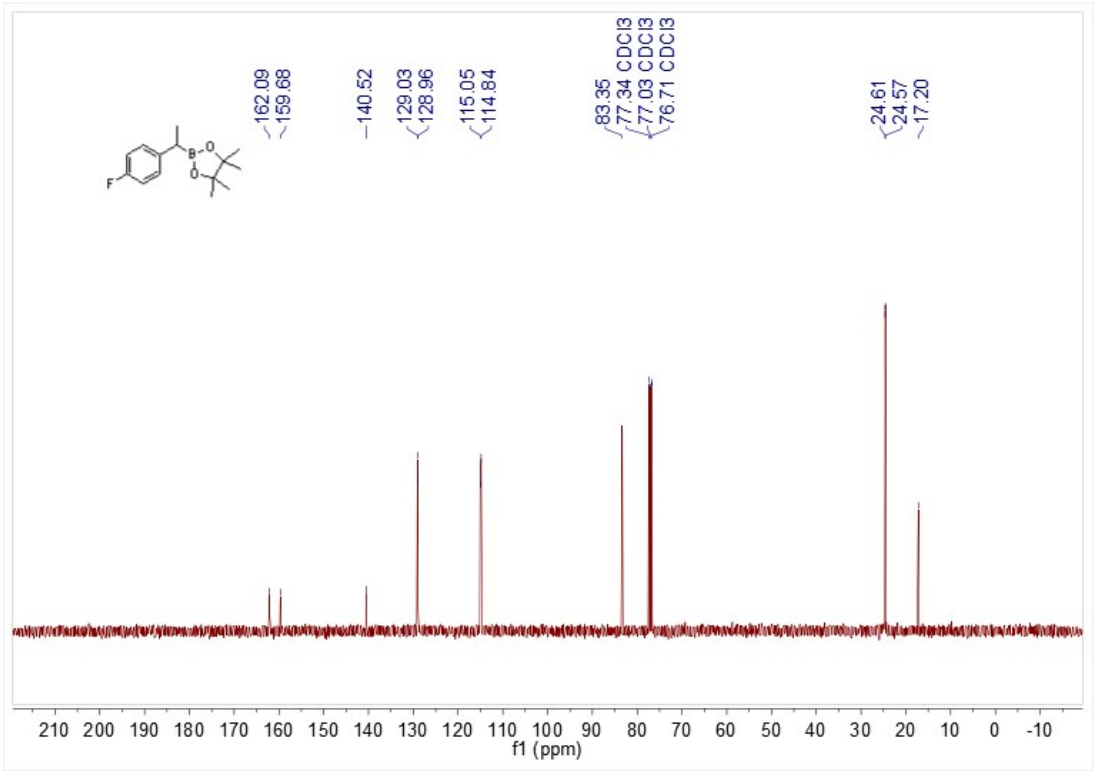
^{11}B NMR of compound 2e



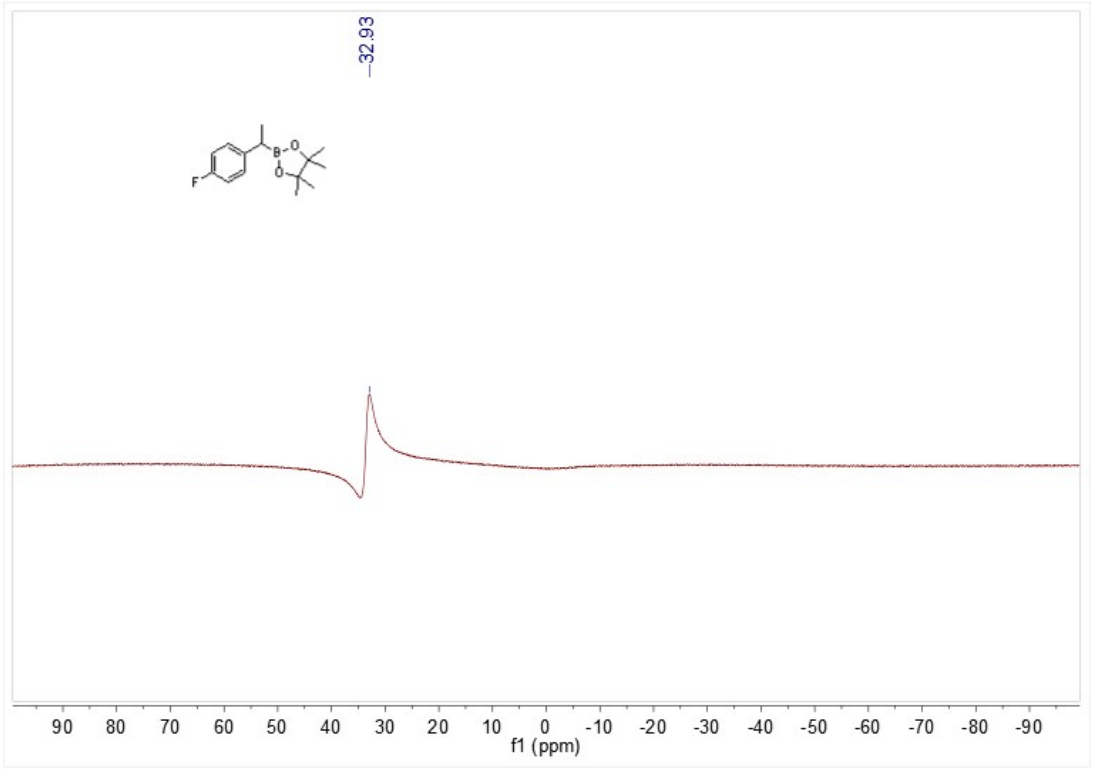
^{1}H NMR of compound 2f



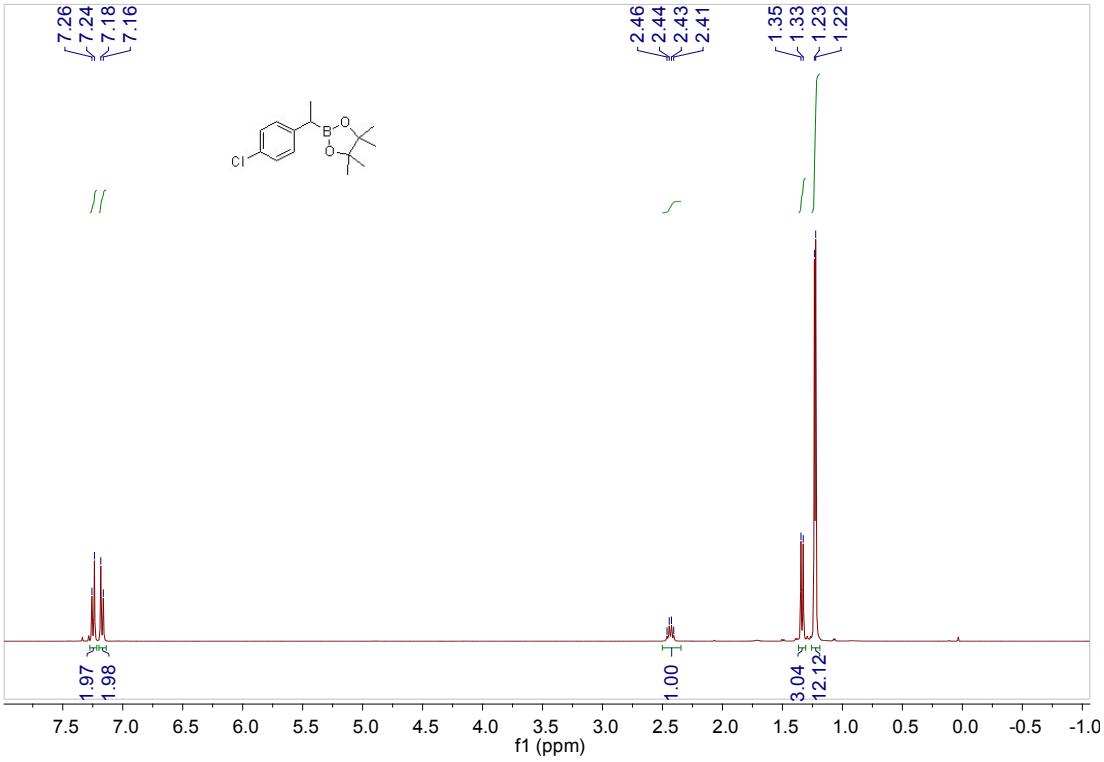
^{13}C NMR of compound 2f



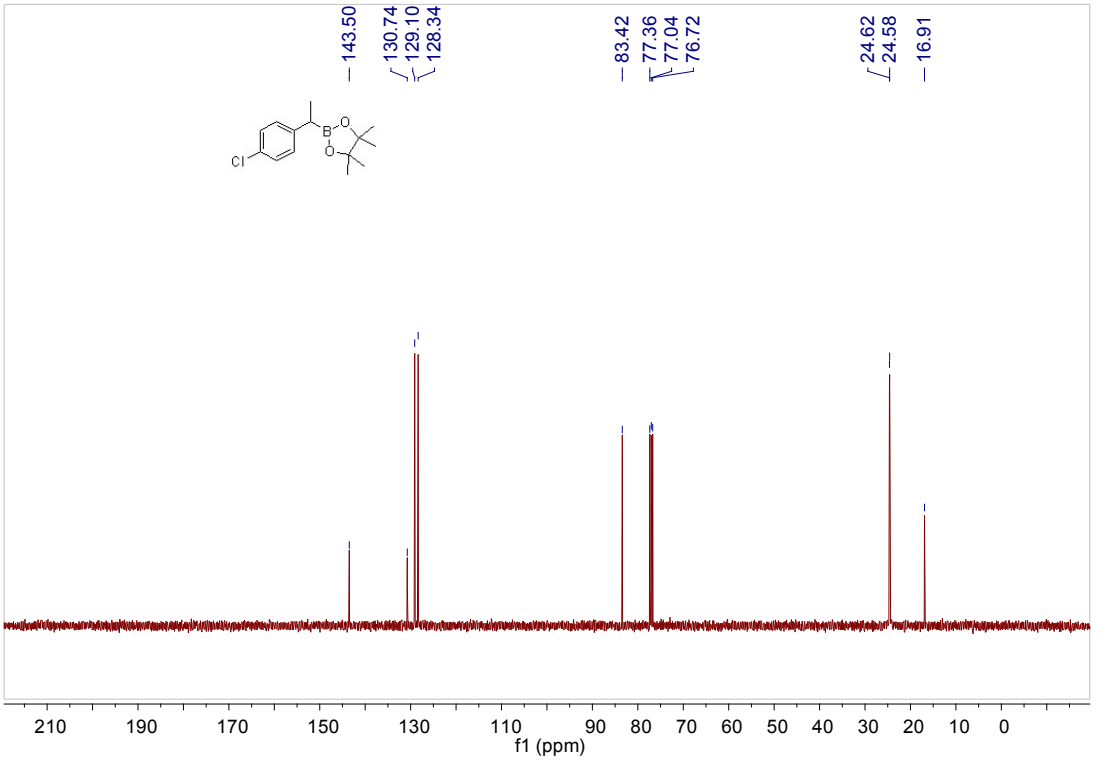
^{11}B NMR of compound 2f



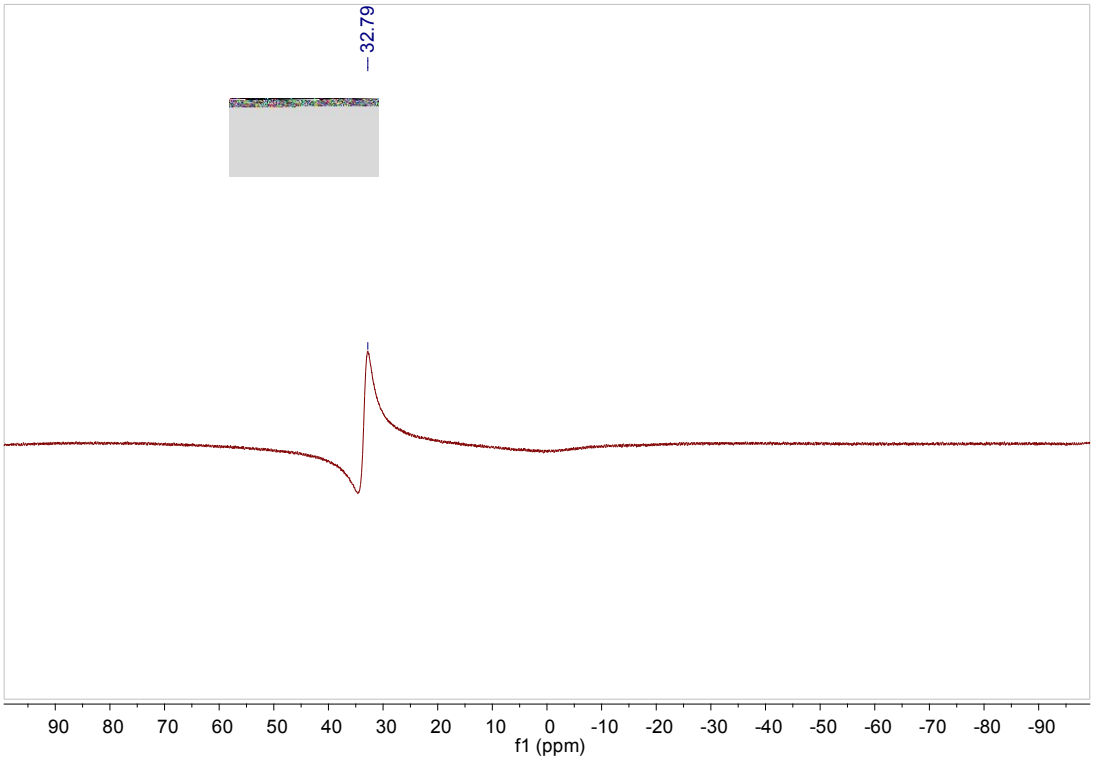
^{1}H NMR of compound 2g



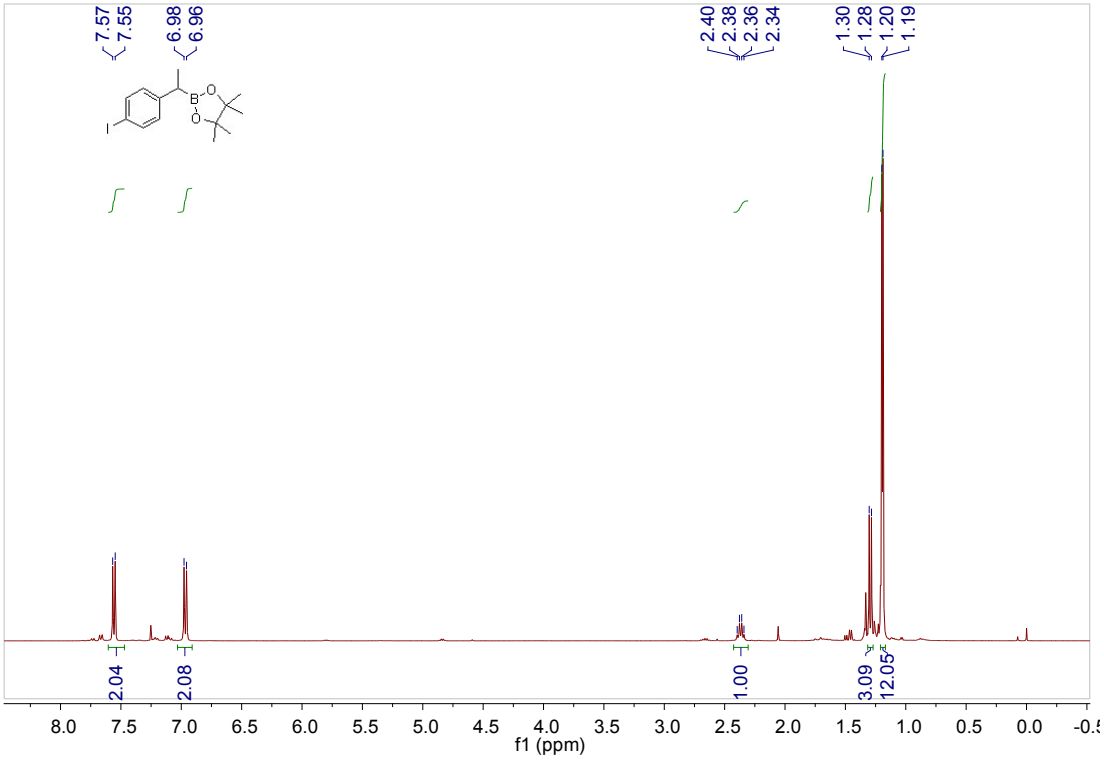
^{13}C NMR of compound 2g



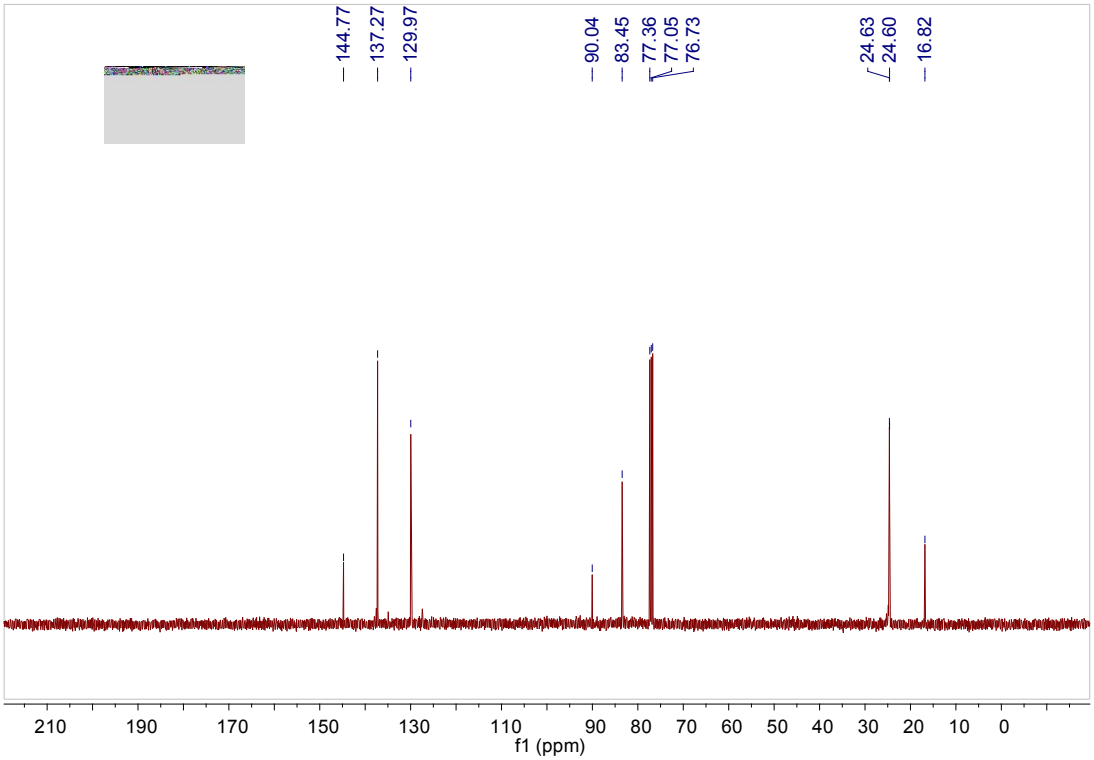
^{11}B NMR of compound 2g



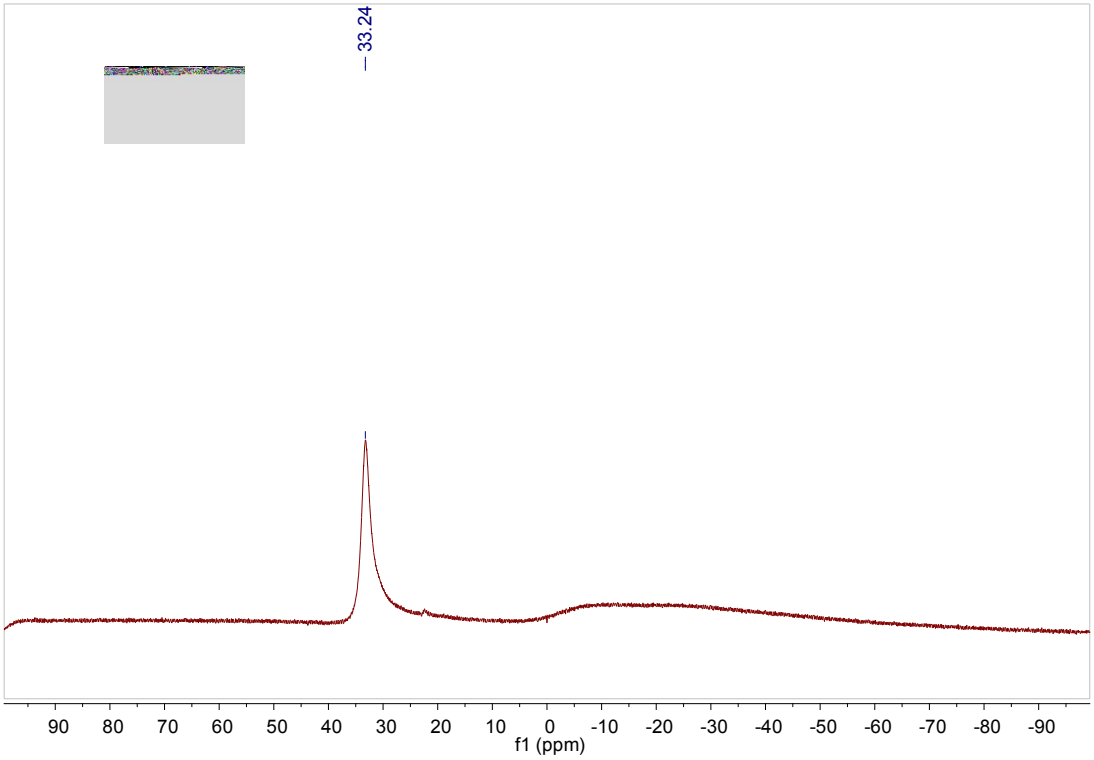
^{1}H NMR of compound 2h



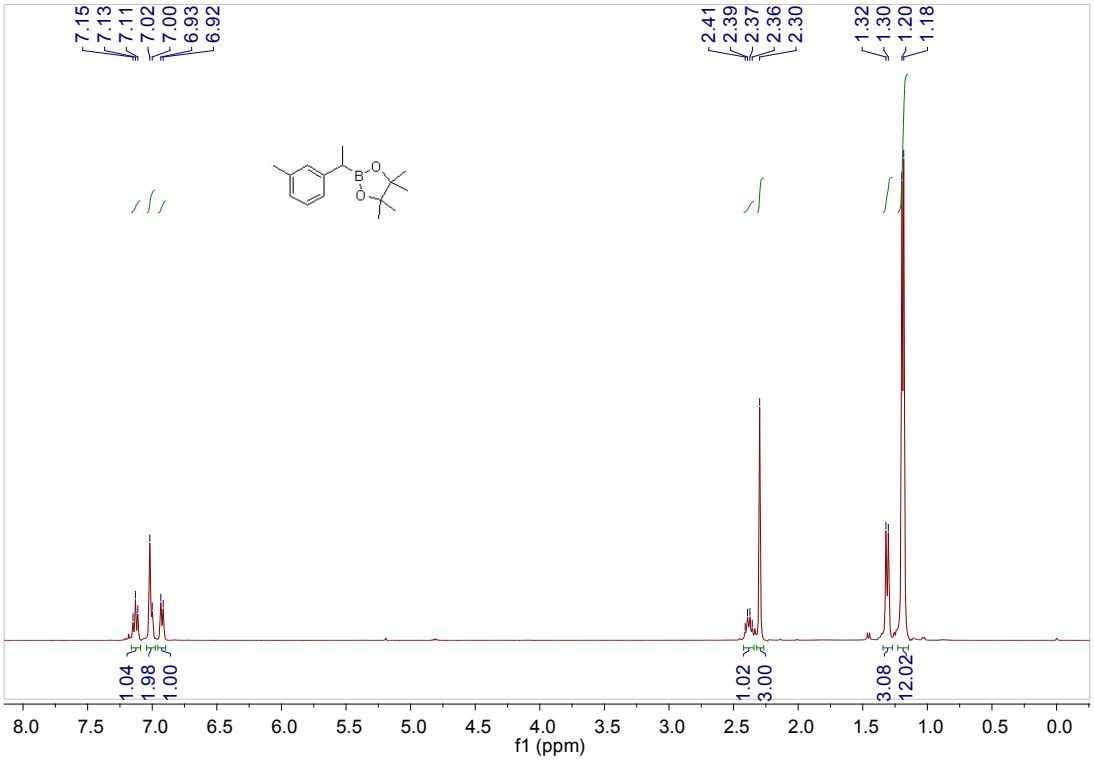
^{13}C NMR of compound 2h



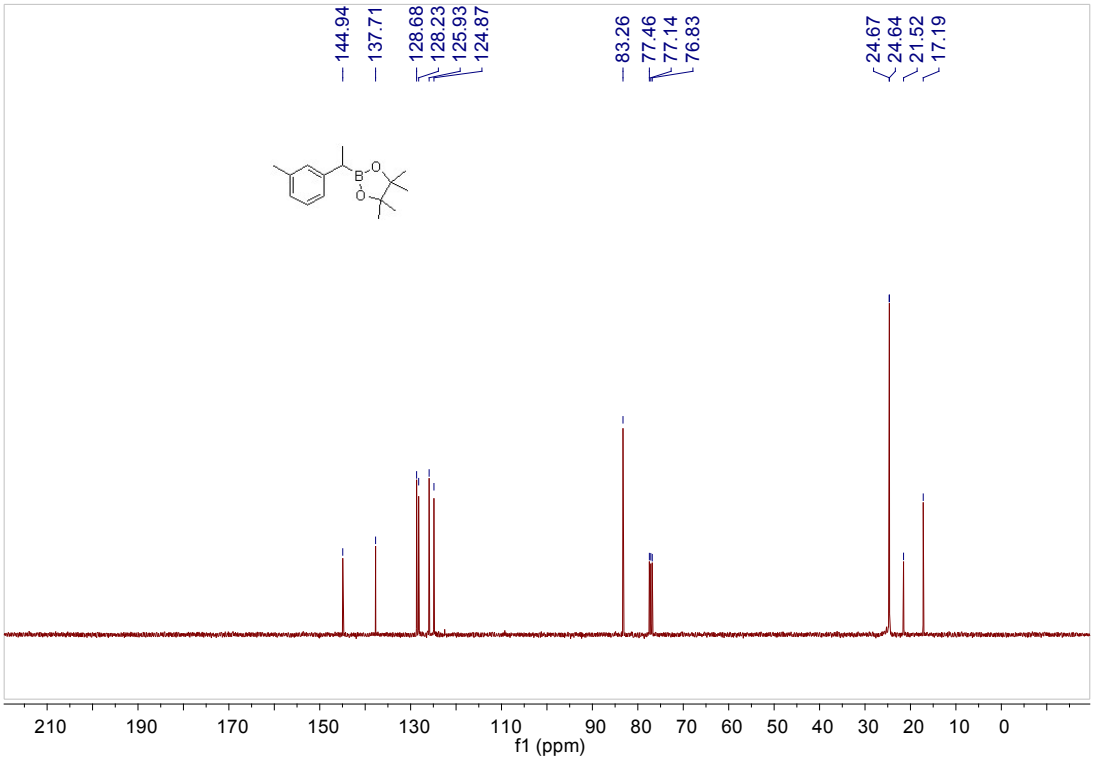
^{11}B NMR of compound 2h



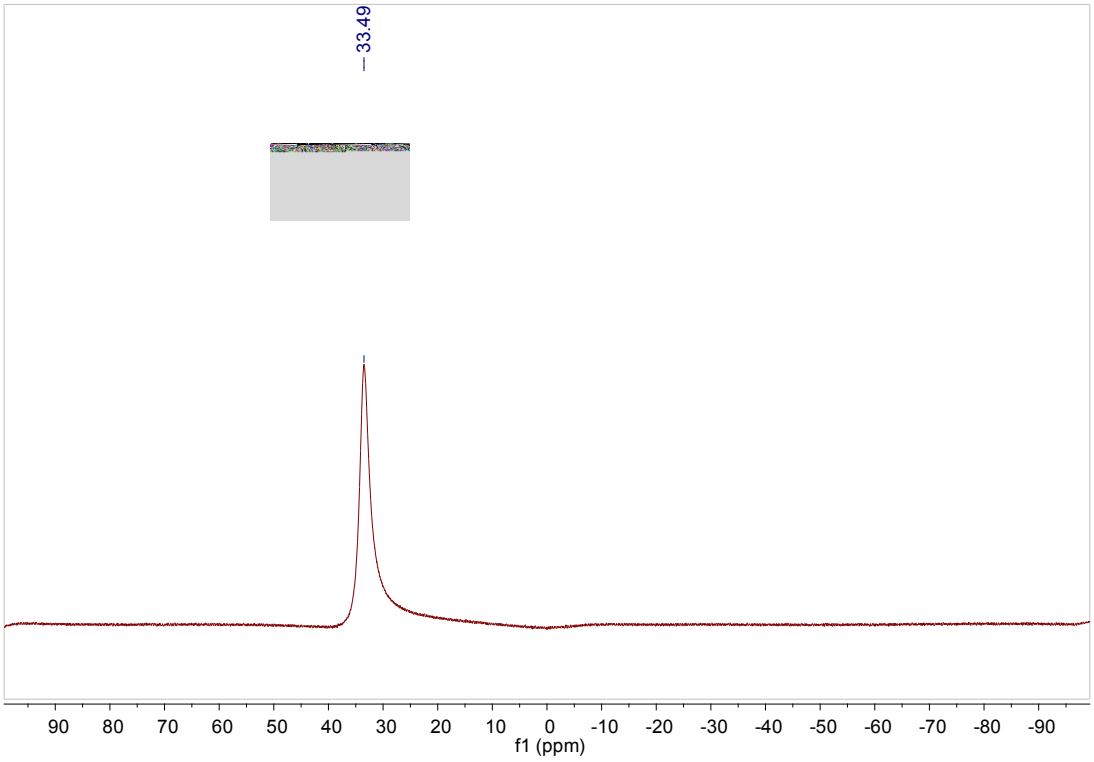
^{1}H NMR of compound 2i



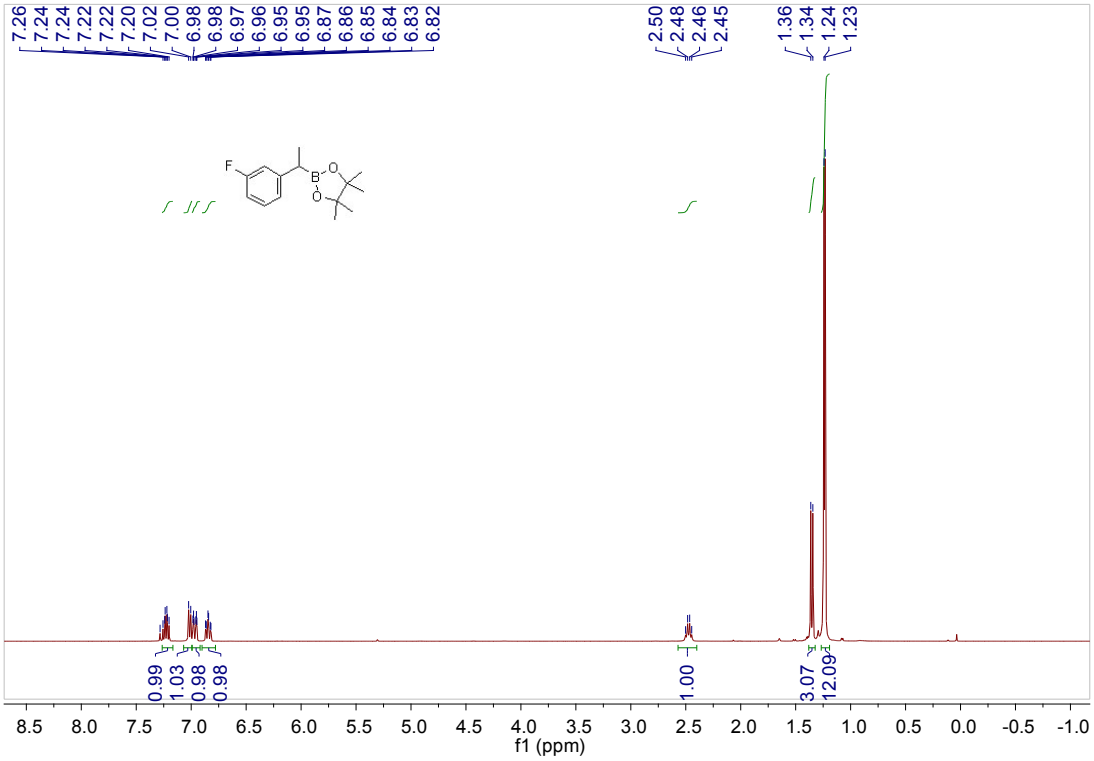
^{13}C NMR of compound 2i



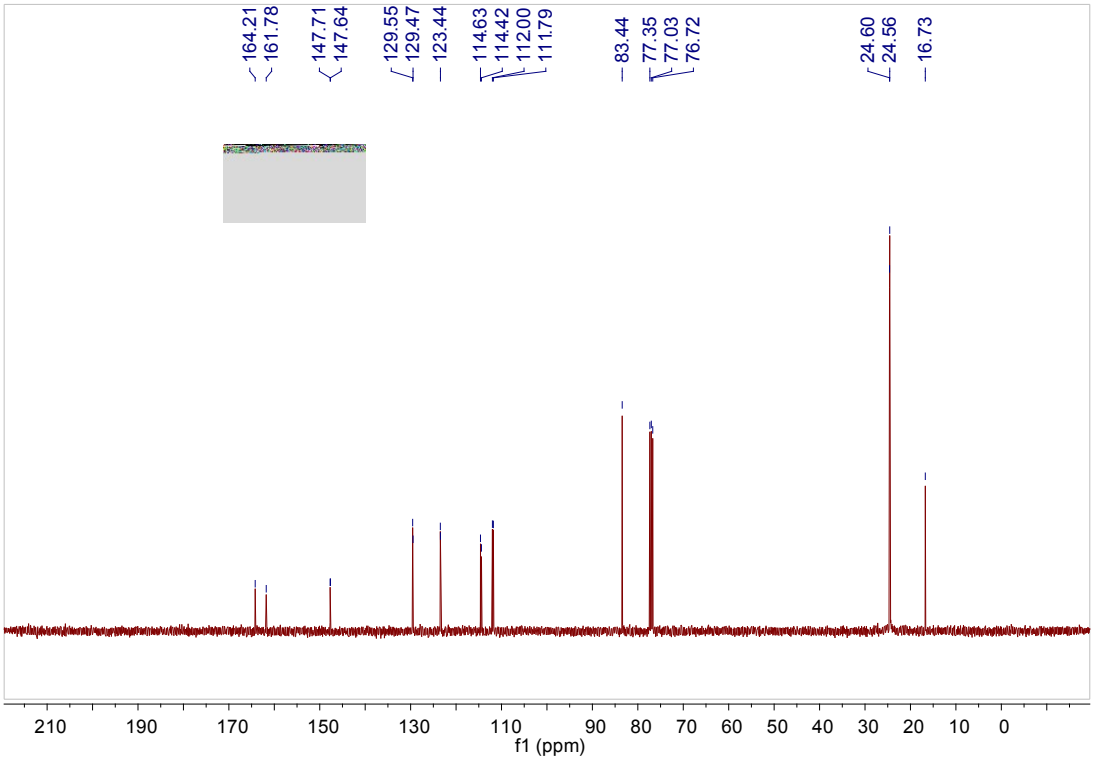
^{11}B NMR of compound 2i



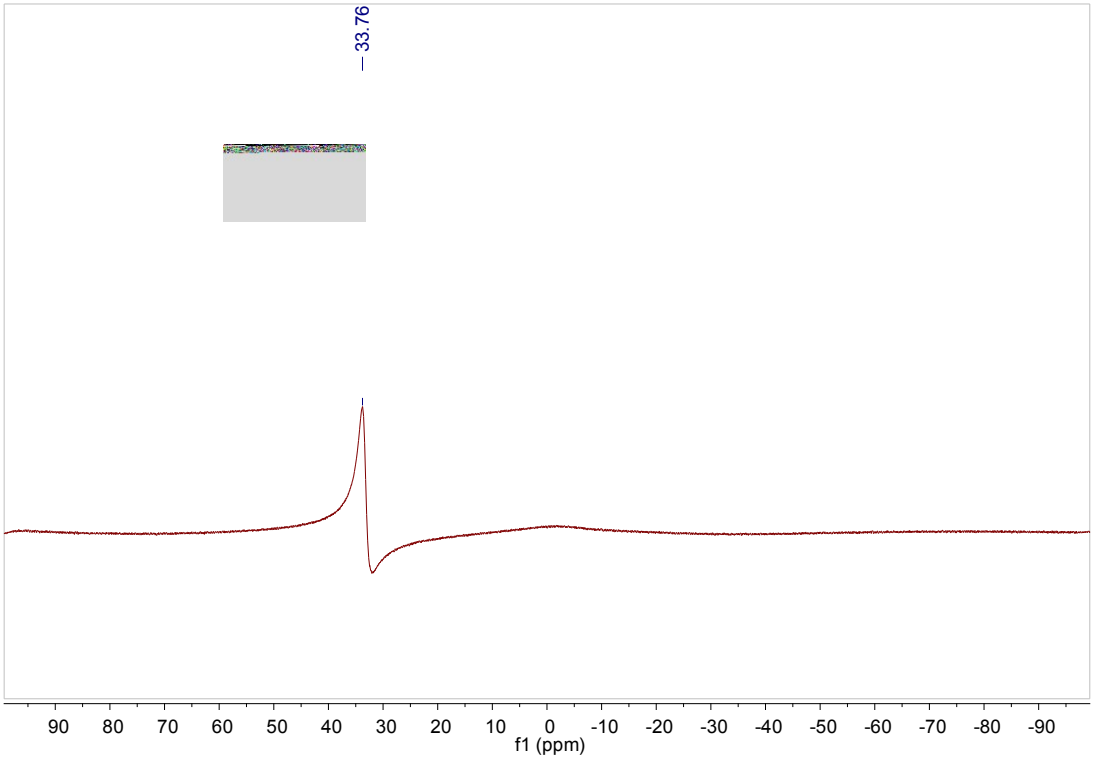
^{1}H NMR of compound 2j



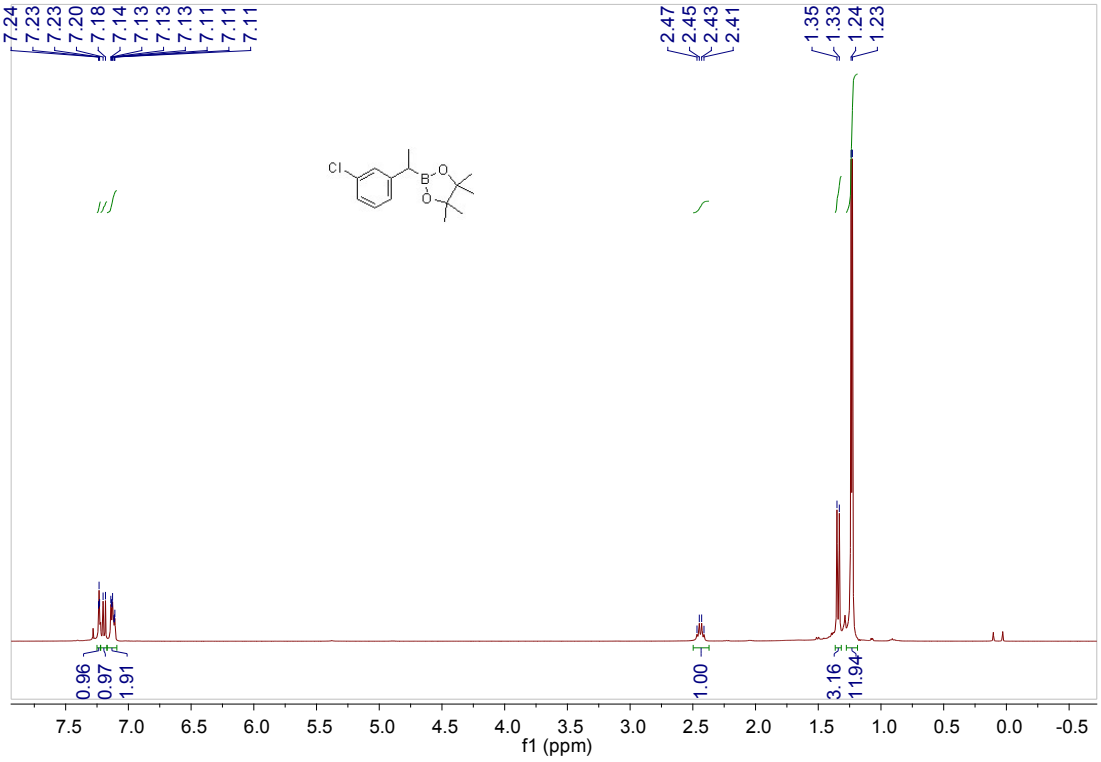
^{13}C NMR of compound 2j



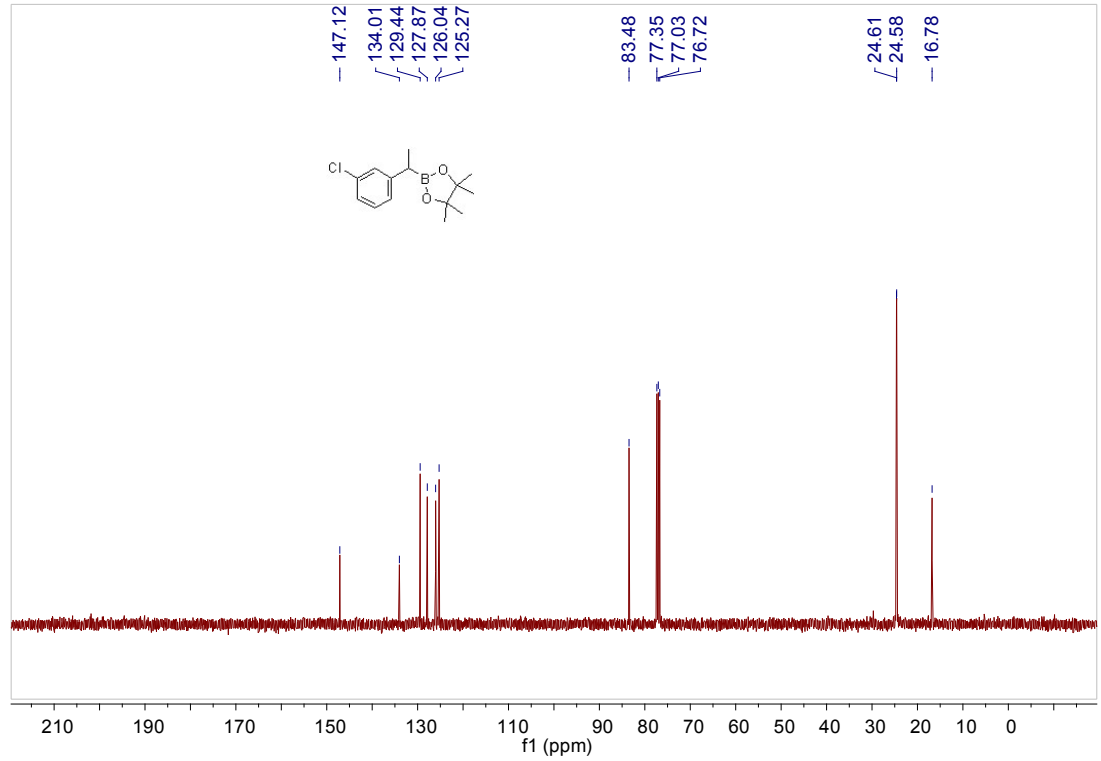
^{11}B NMR of compound 2j



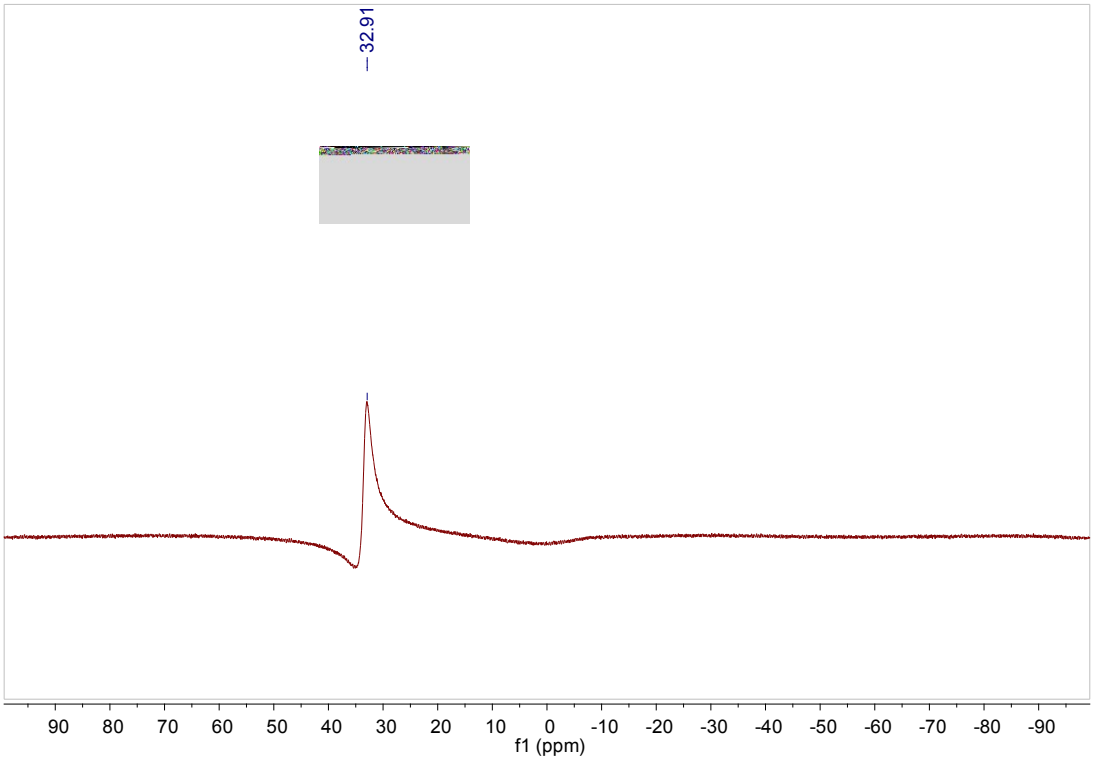
^{1}H NMR of compound 2k



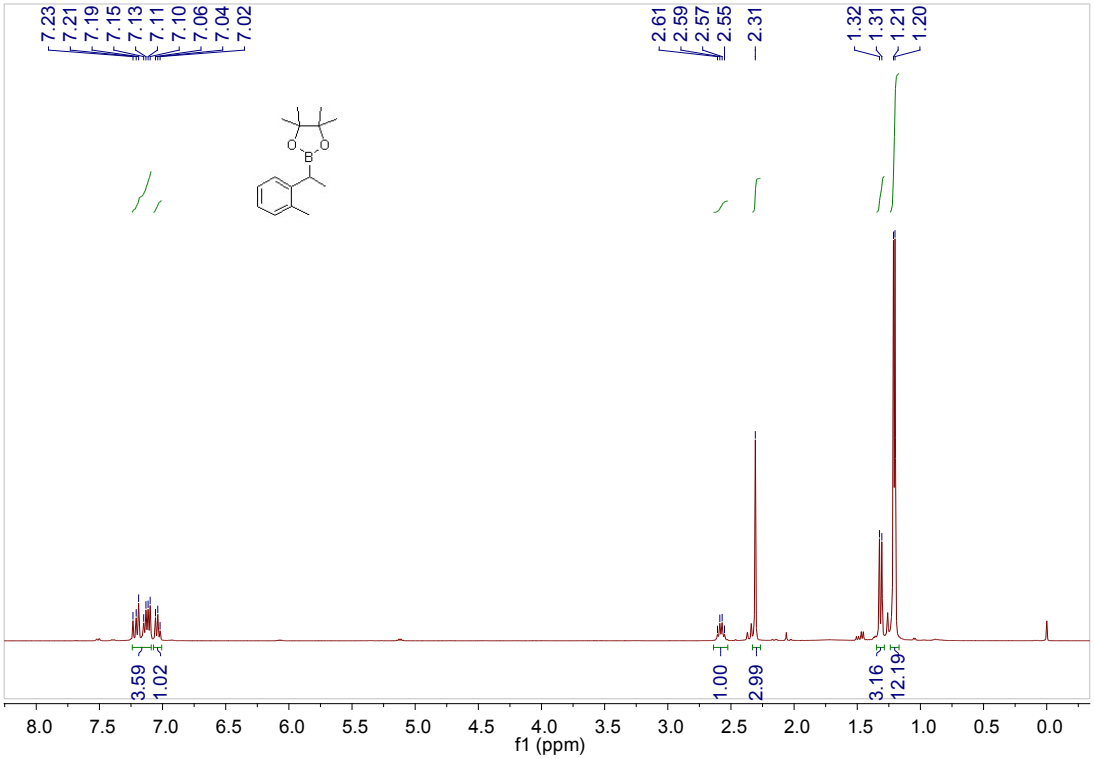
^{13}C NMR of compound 2k



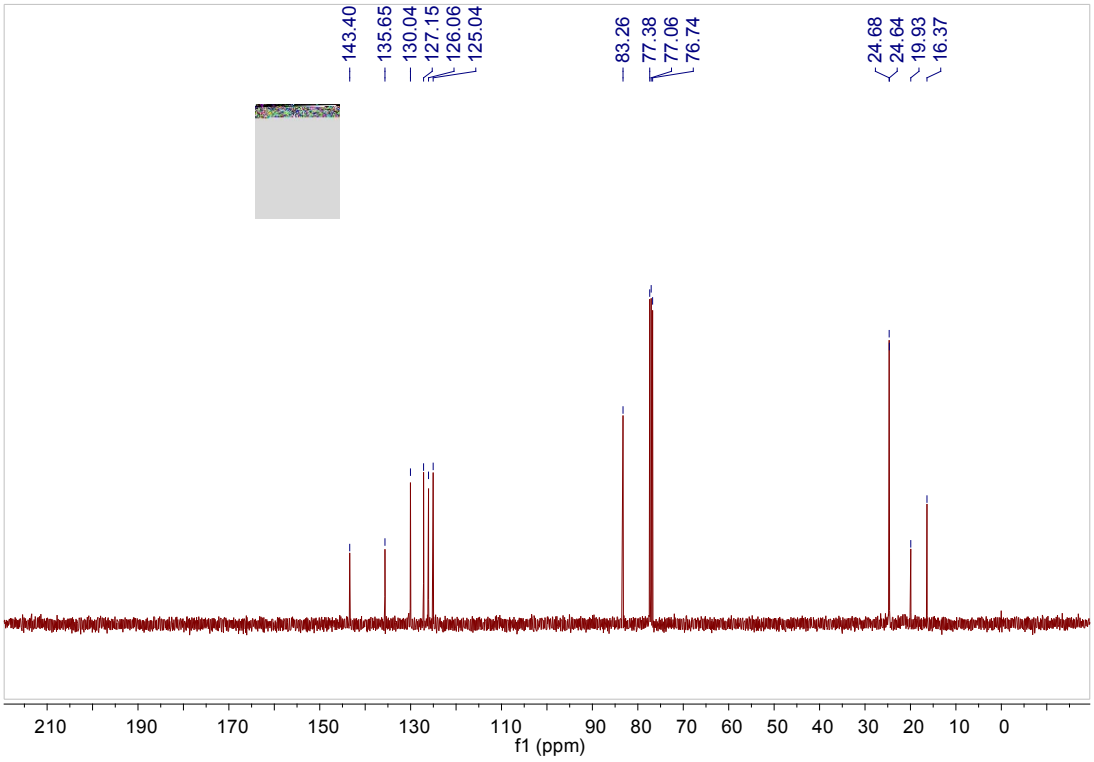
^{11}B NMR of compound 2k



^{1}H NMR of compound 2l



^{13}C NMR of compound 2l



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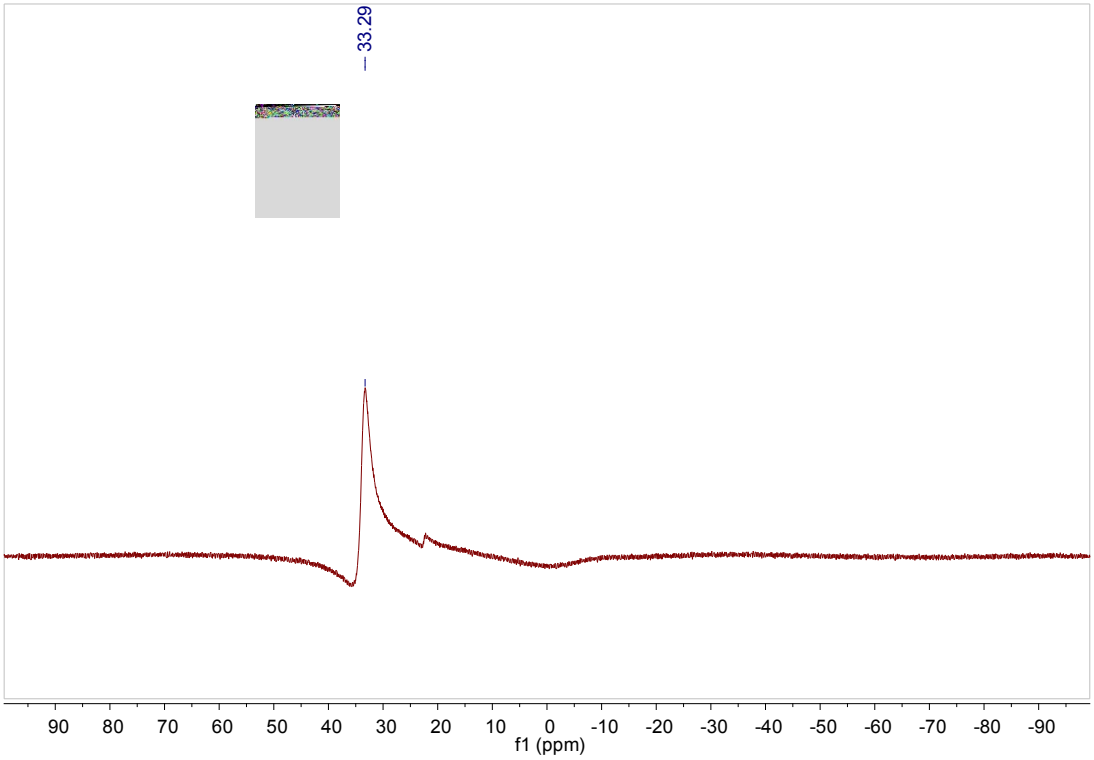
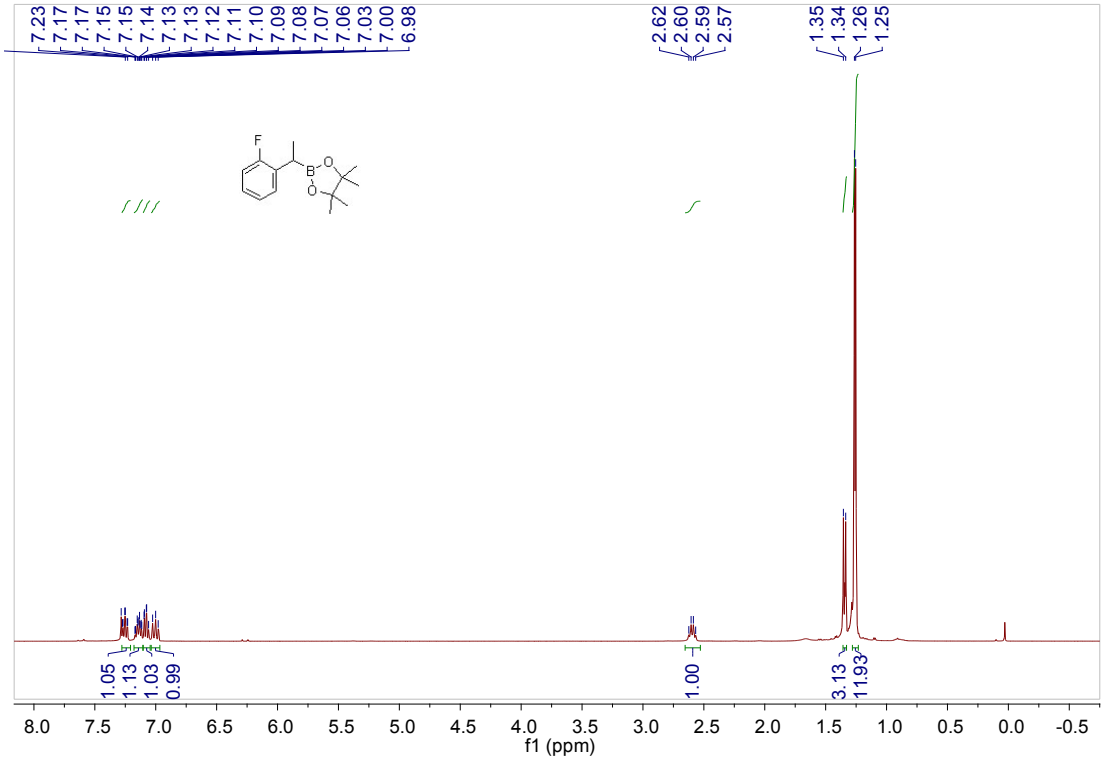
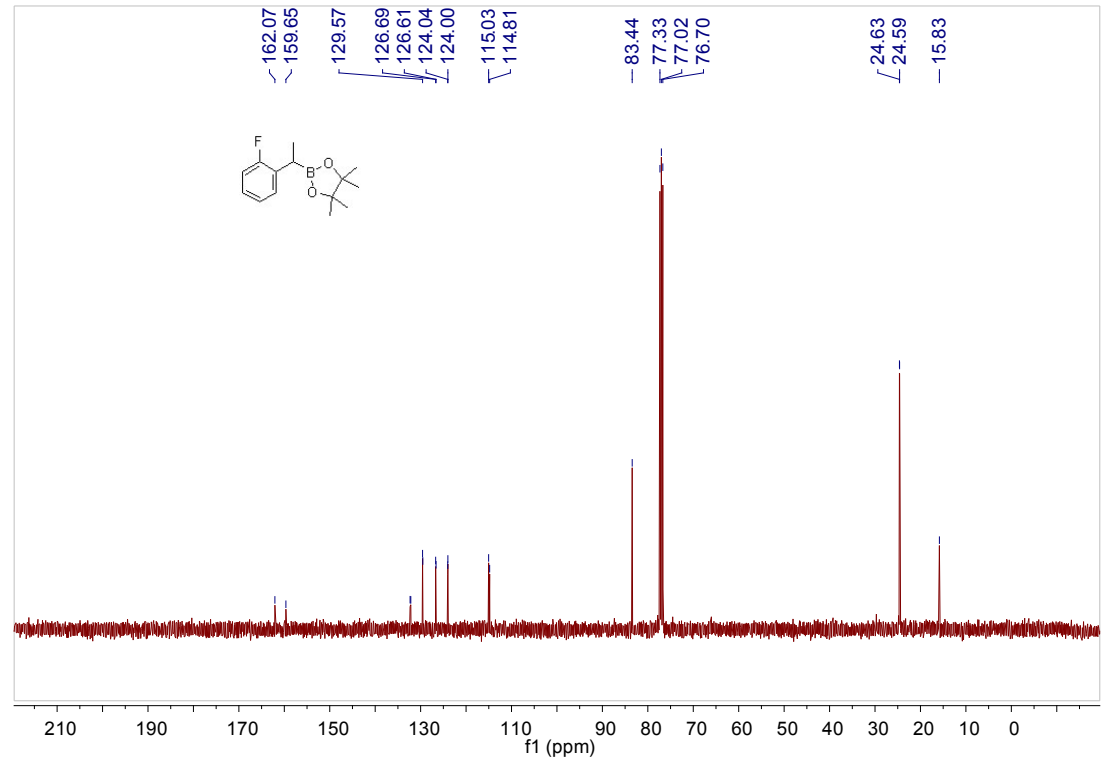


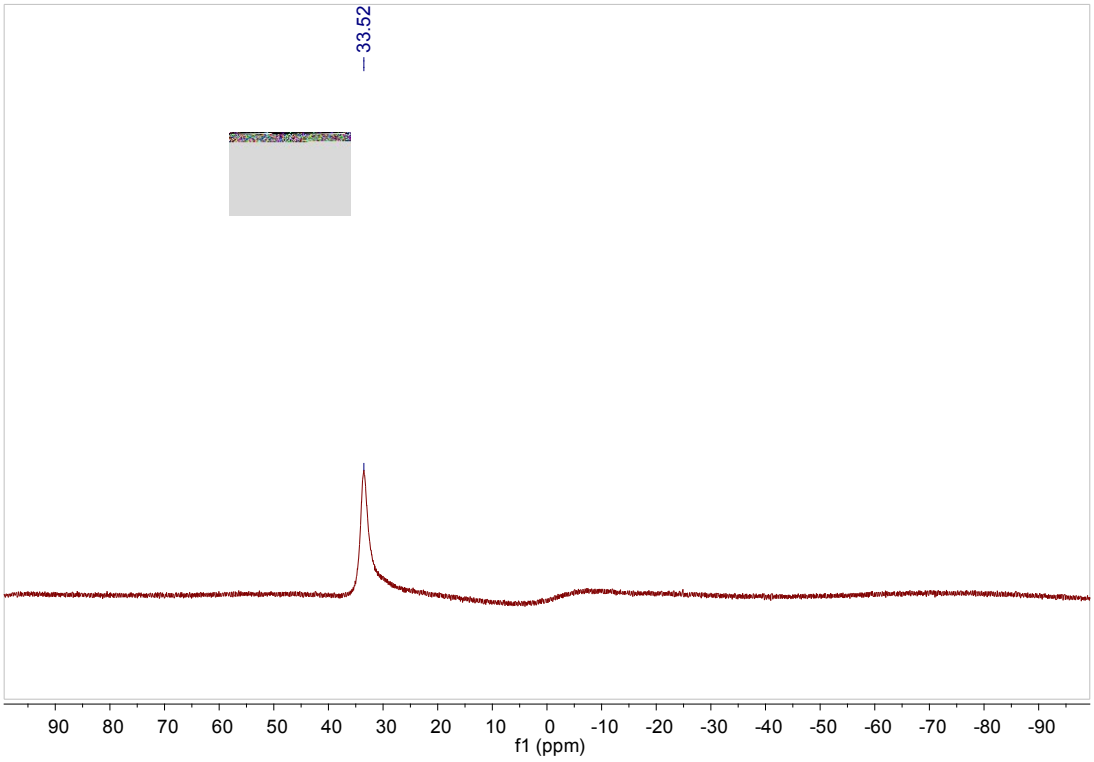
^{1}H NMR of compound 2m



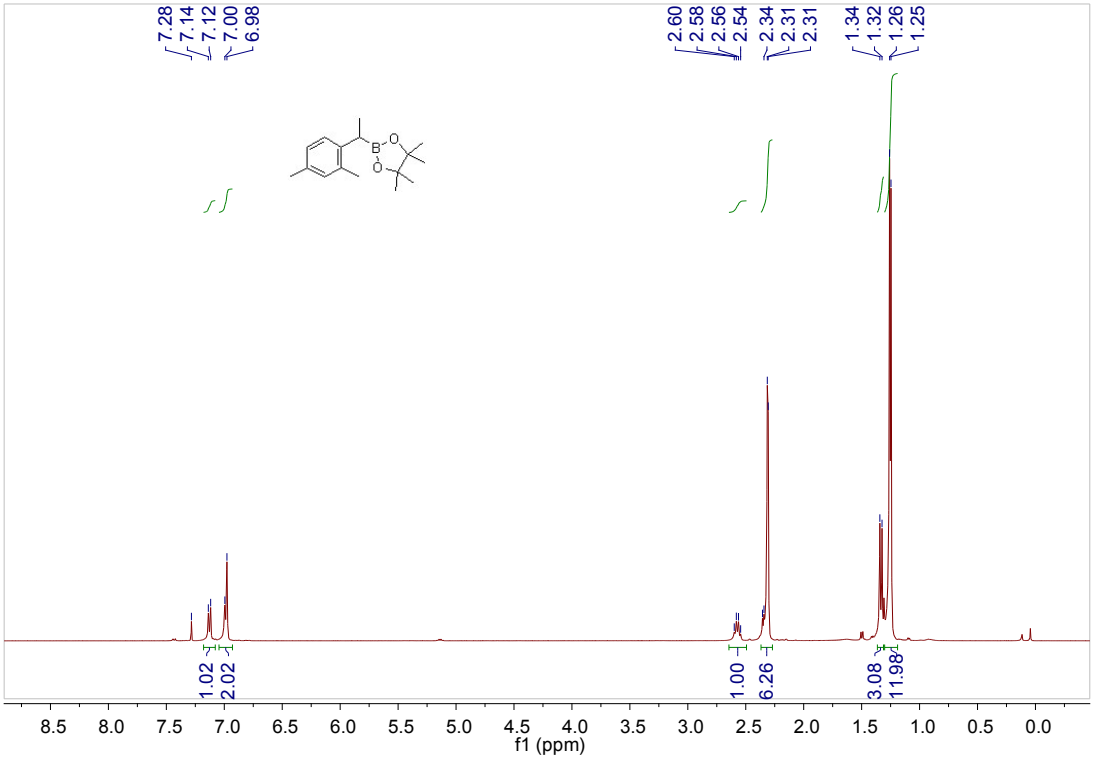
^{13}C NMR of compound 2m



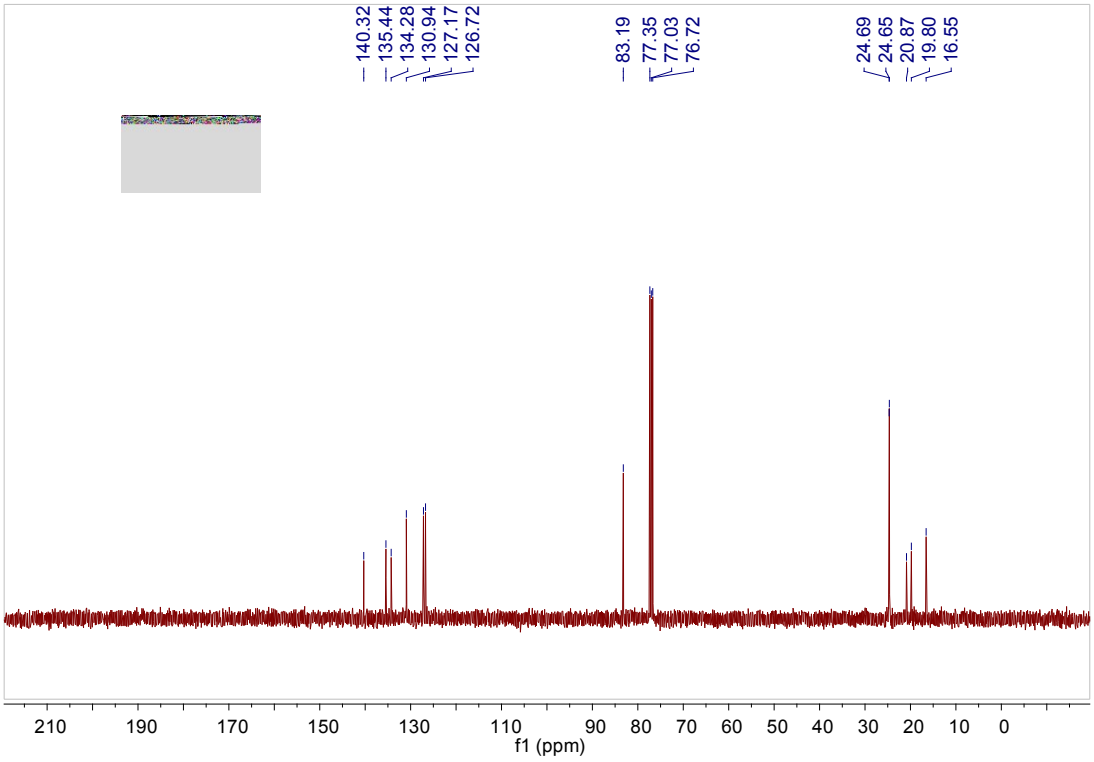
^{11}B NMR of compound 2m



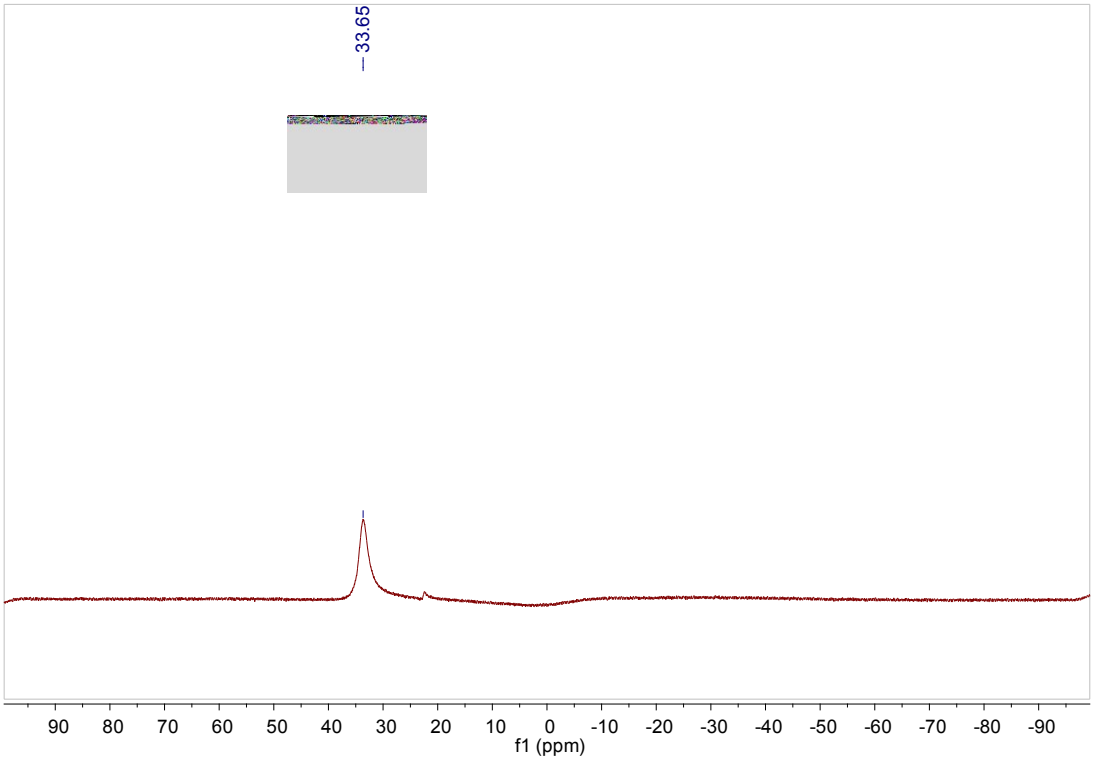
^{1}H NMR of compound 2n



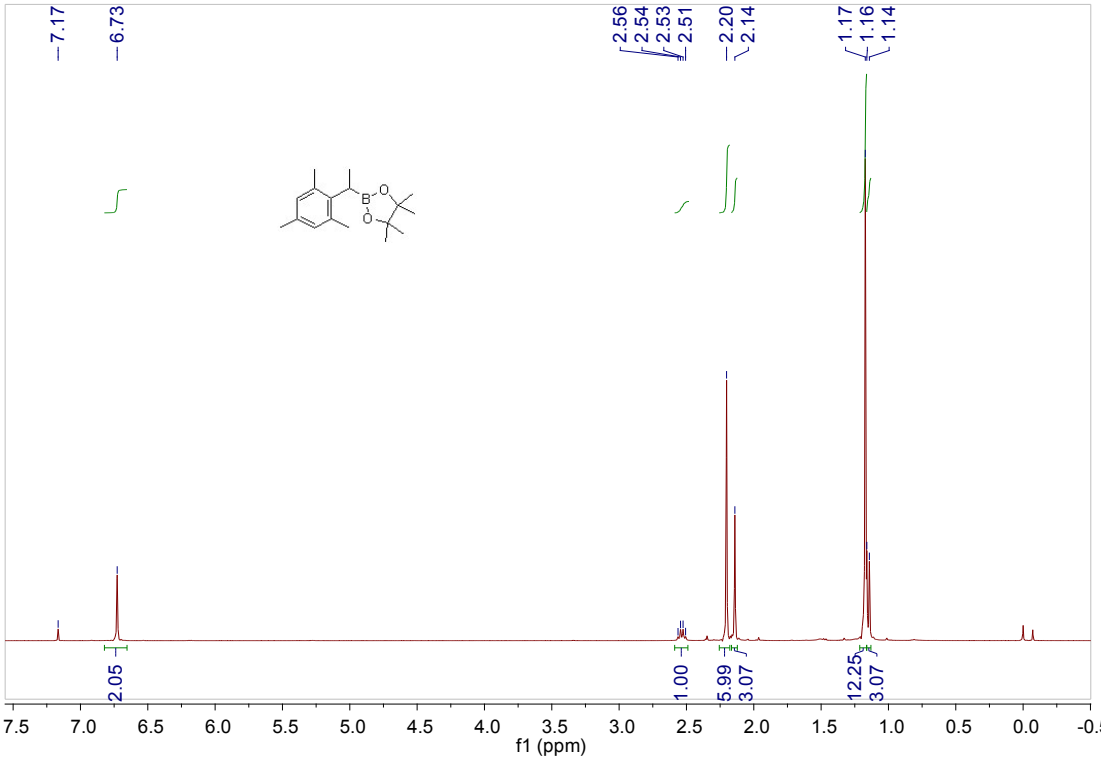
^{13}C NMR of compound 2n



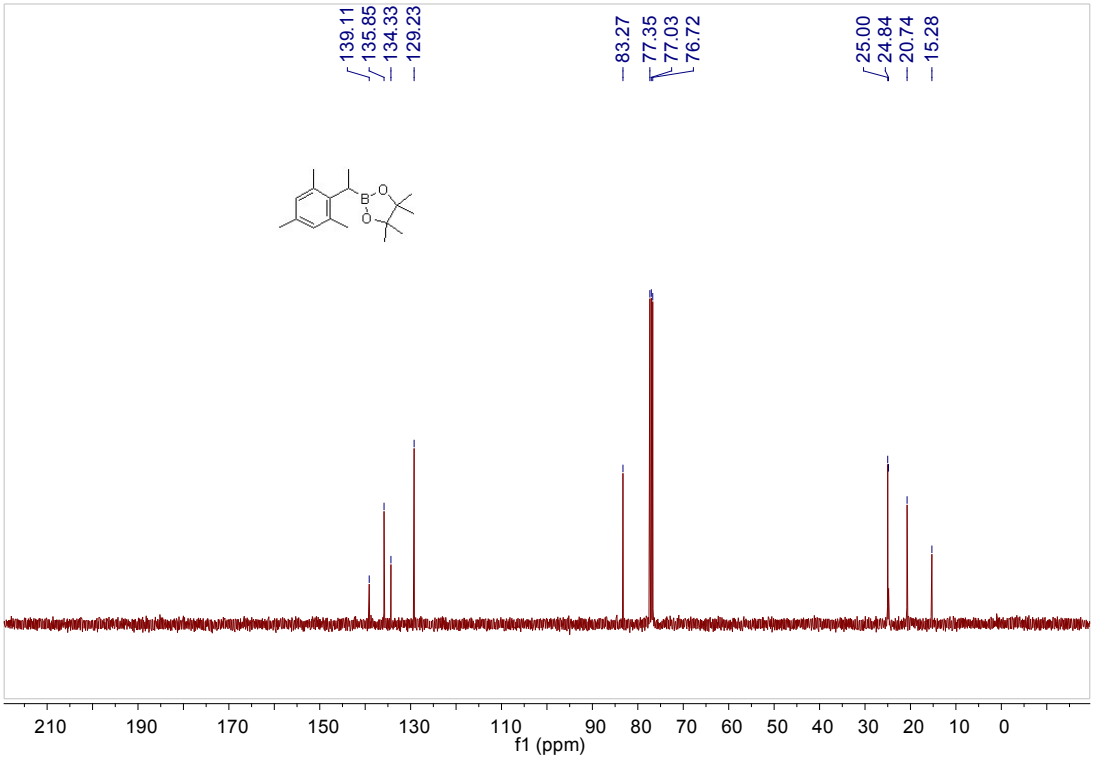
^{11}B NMR of compound 2n



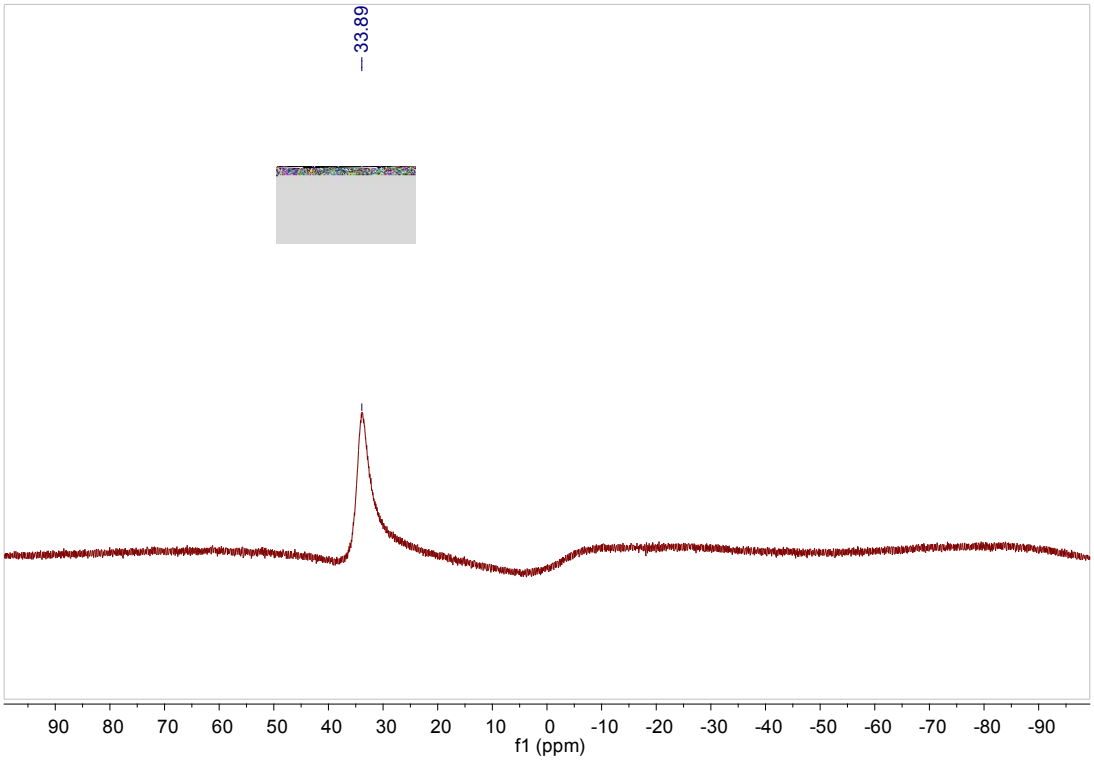
^{1}H NMR of compound 2o



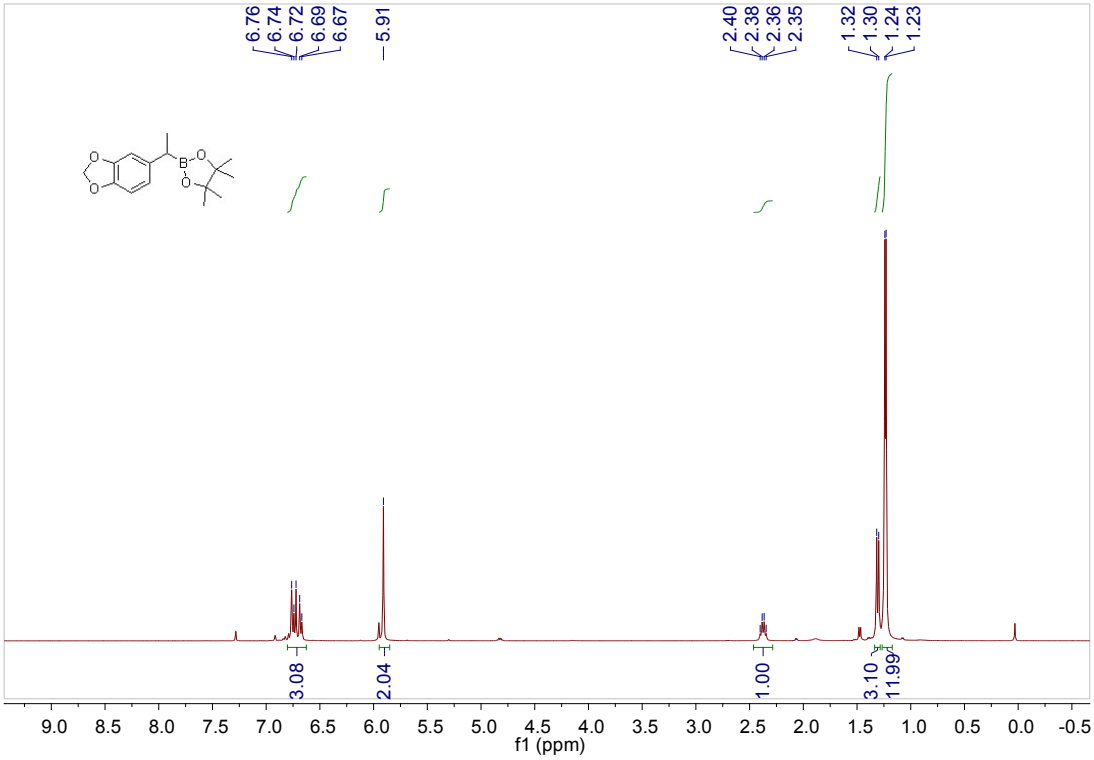
^{13}C NMR of compound 2o



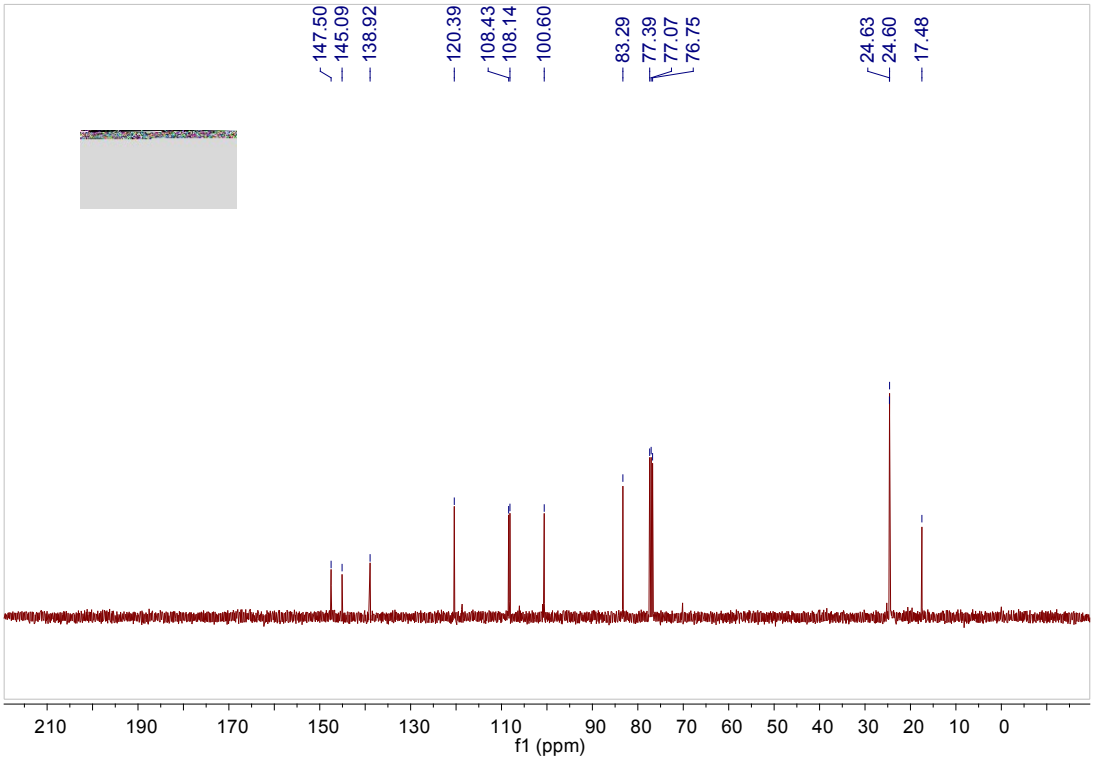
^{11}B NMR of compound 2o



^{1}H NMR of compound 2p



^{13}C NMR of compound 2p



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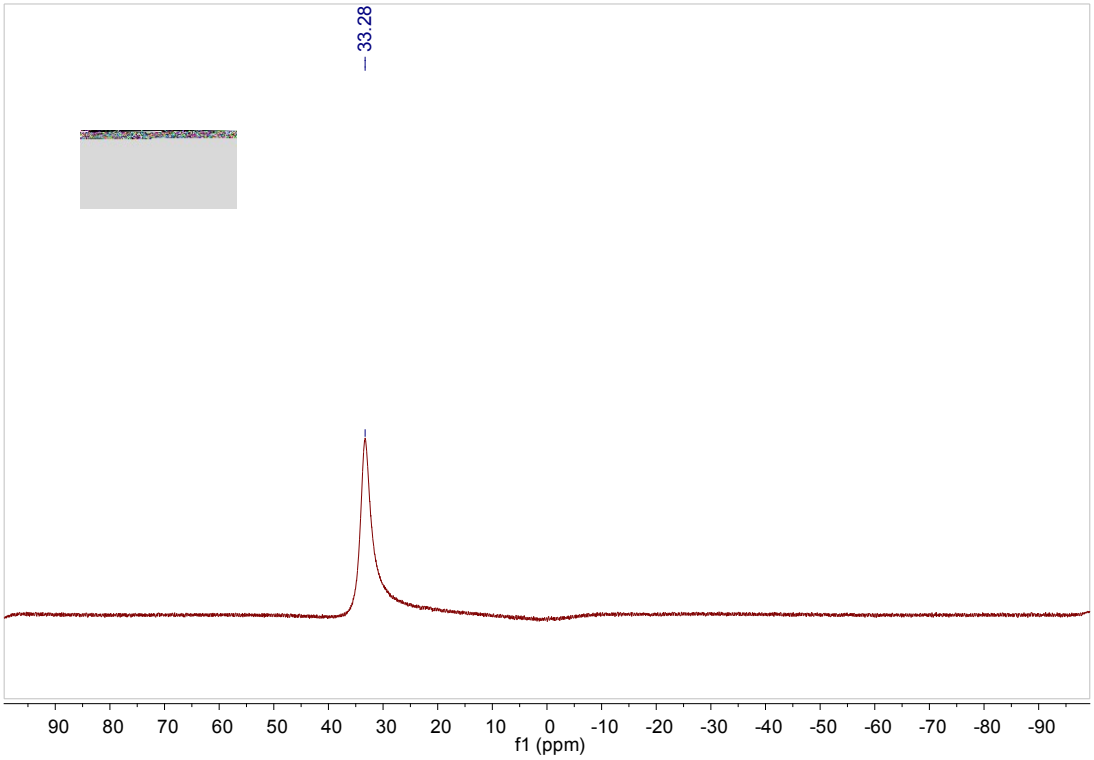
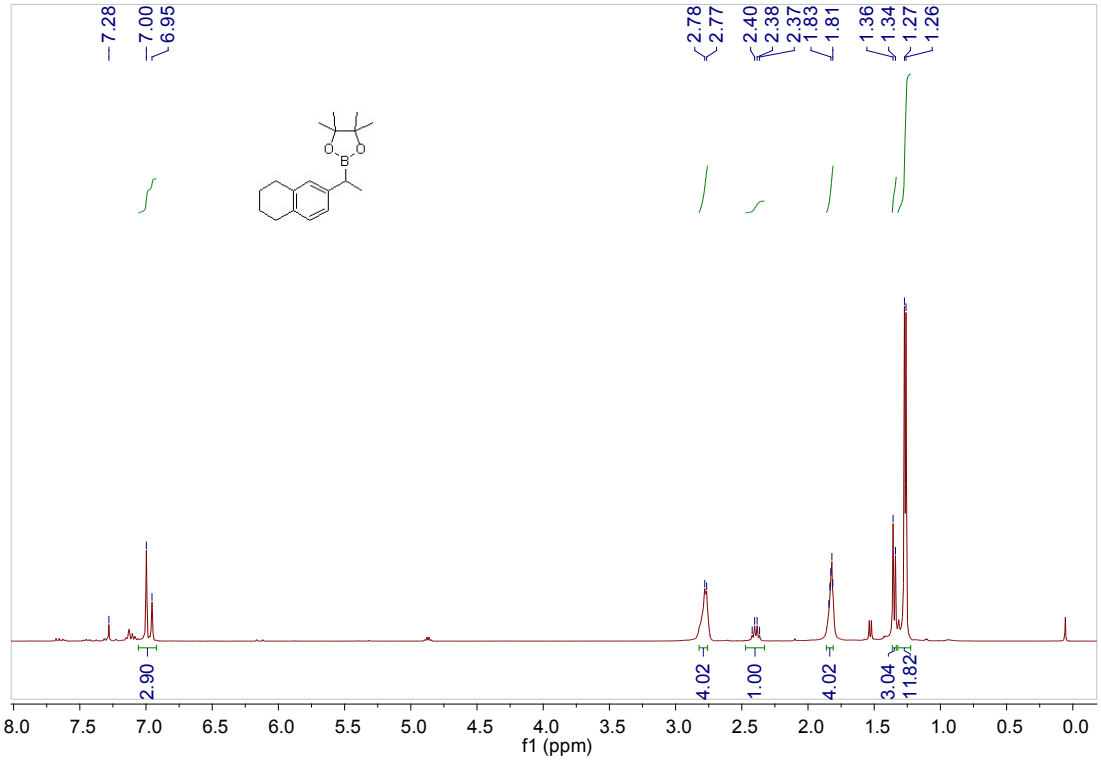
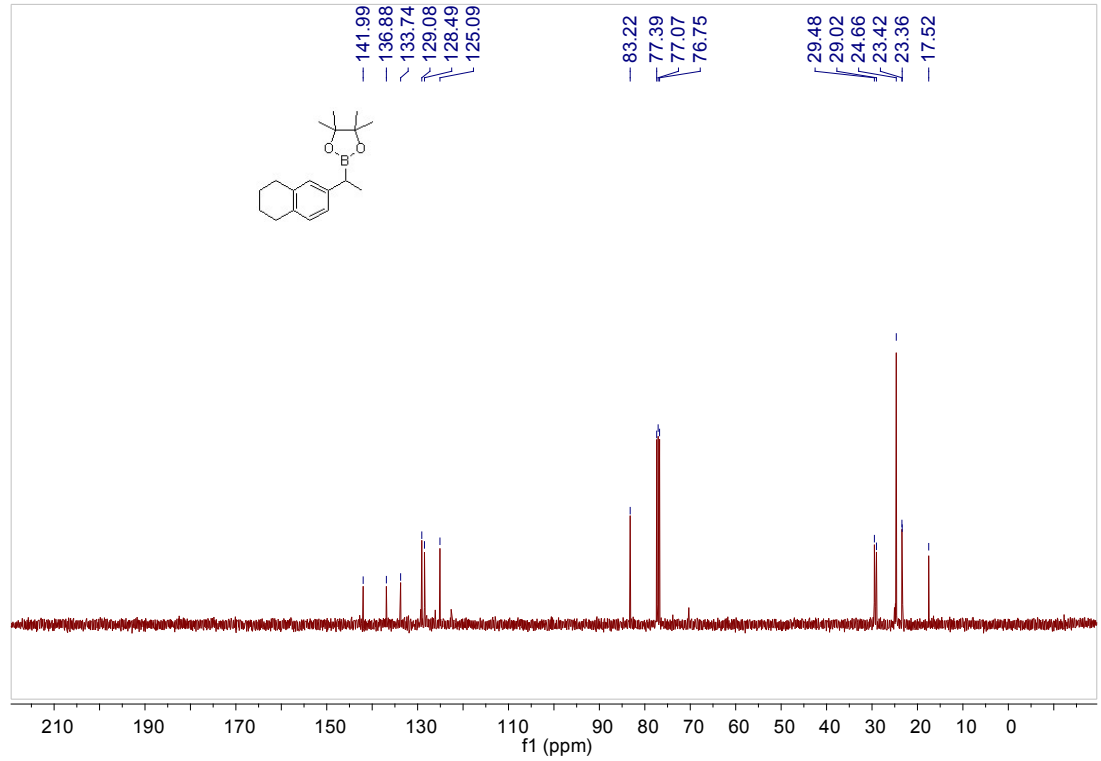


^{1}H NMR of compound 2q



^{13}C NMR of compound 2q



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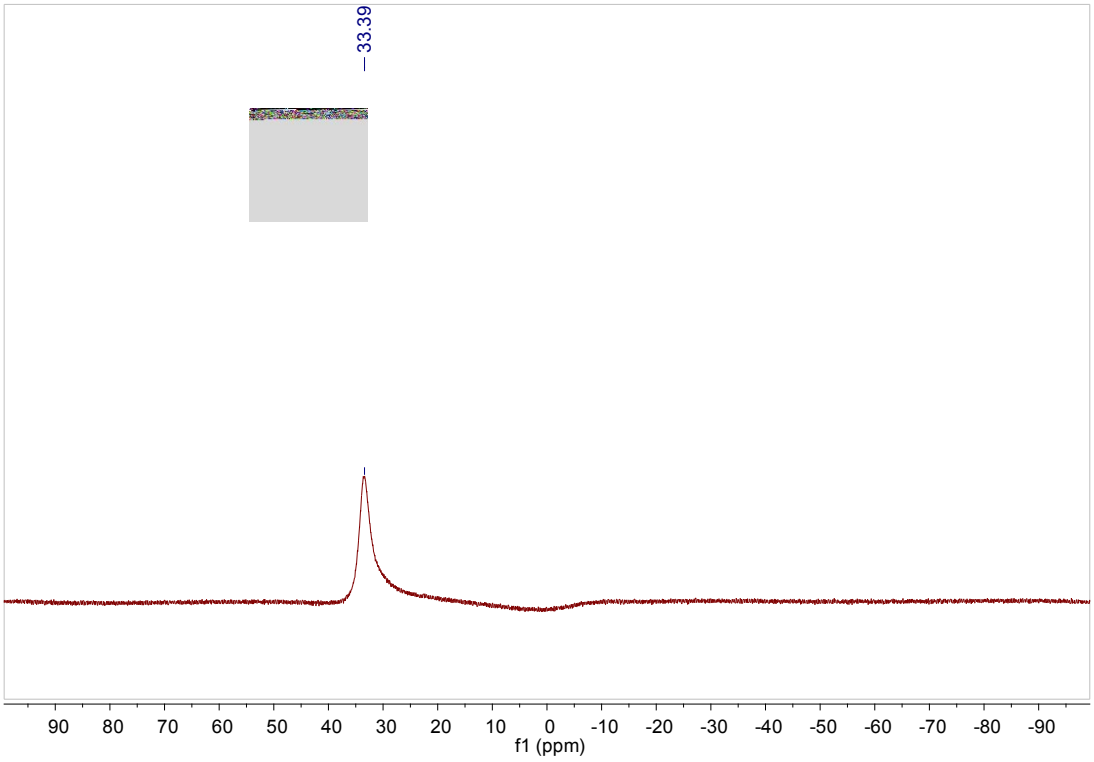
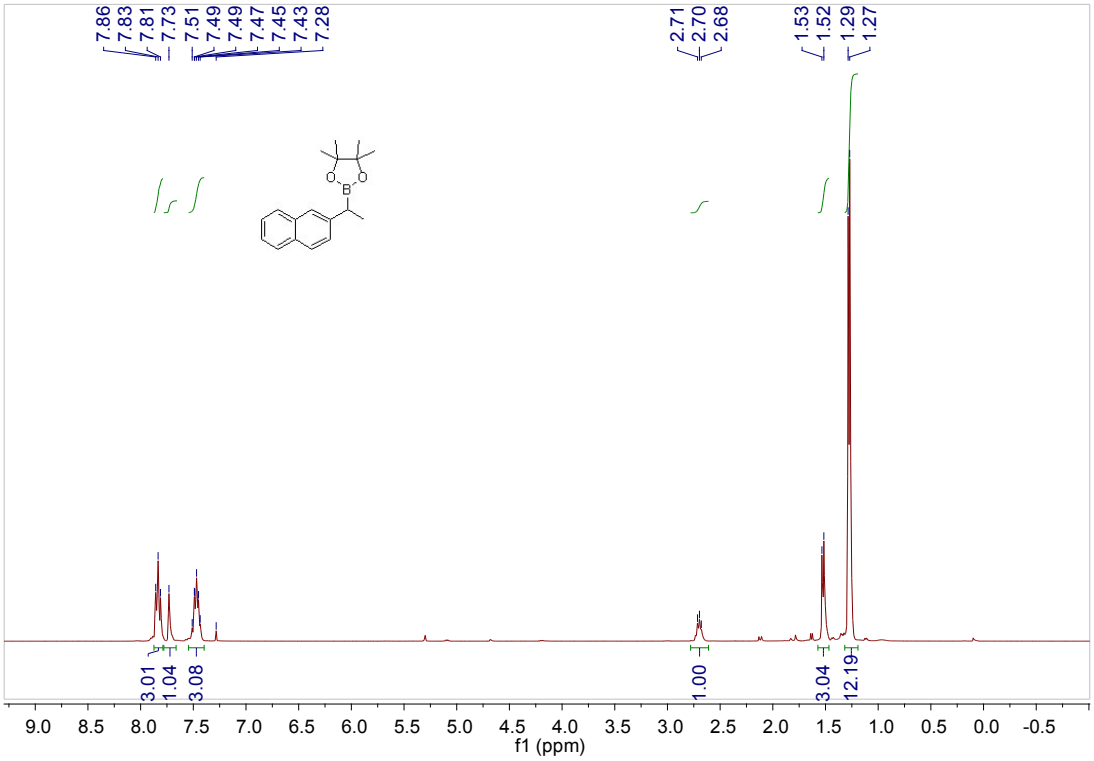
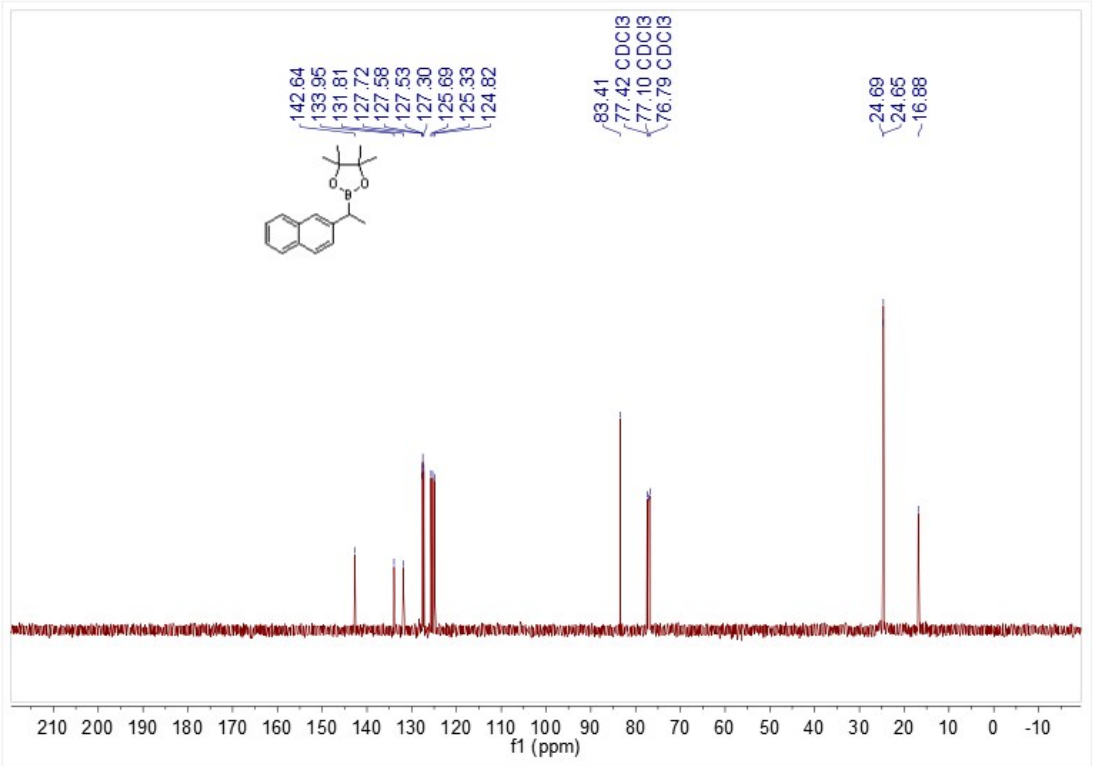


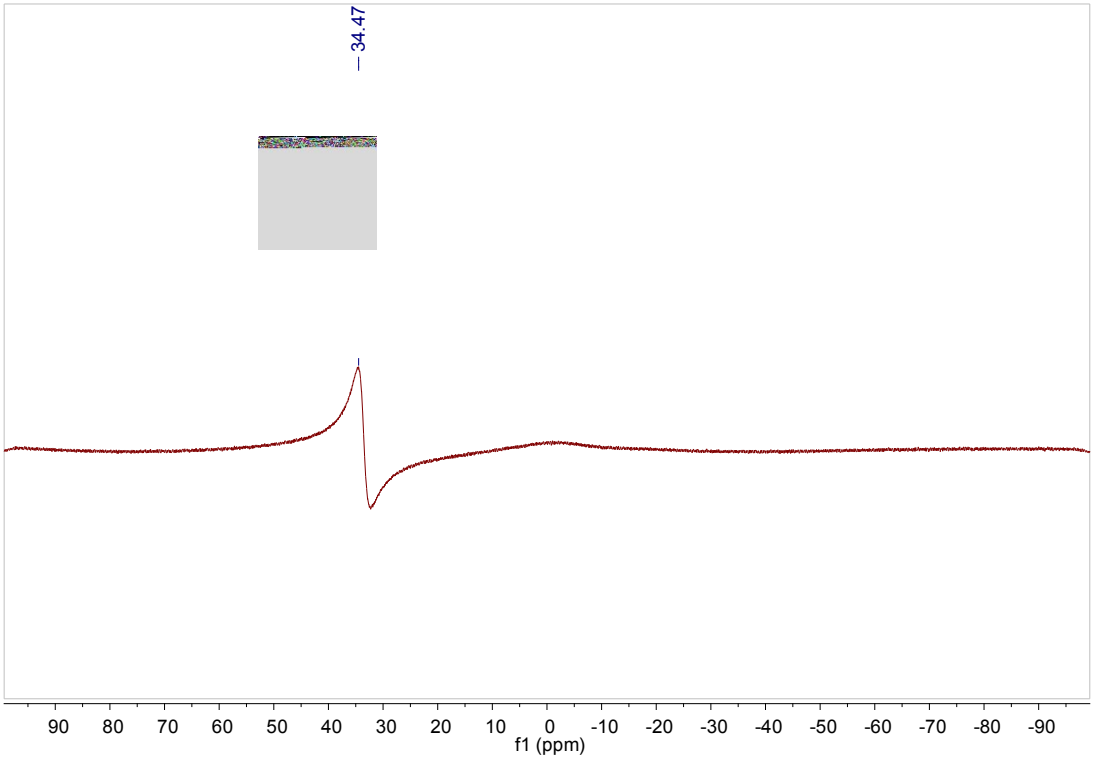
^{1}H NMR of compound 2r



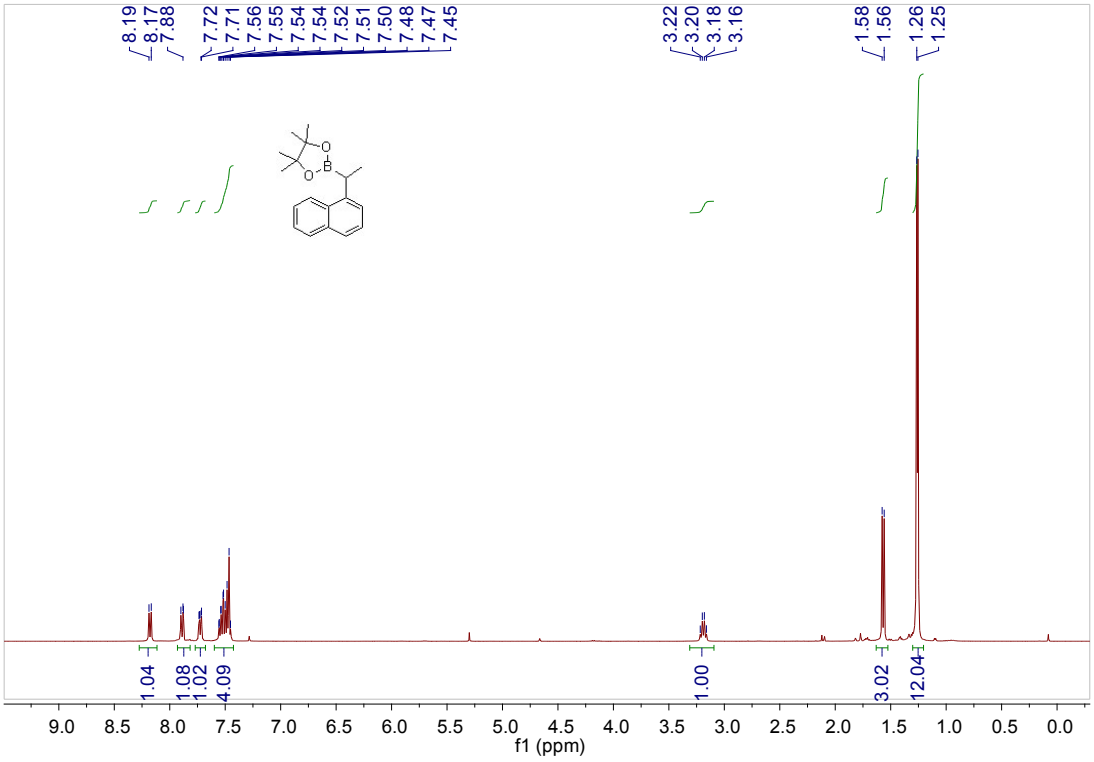
^{13}C NMR of compound 2r



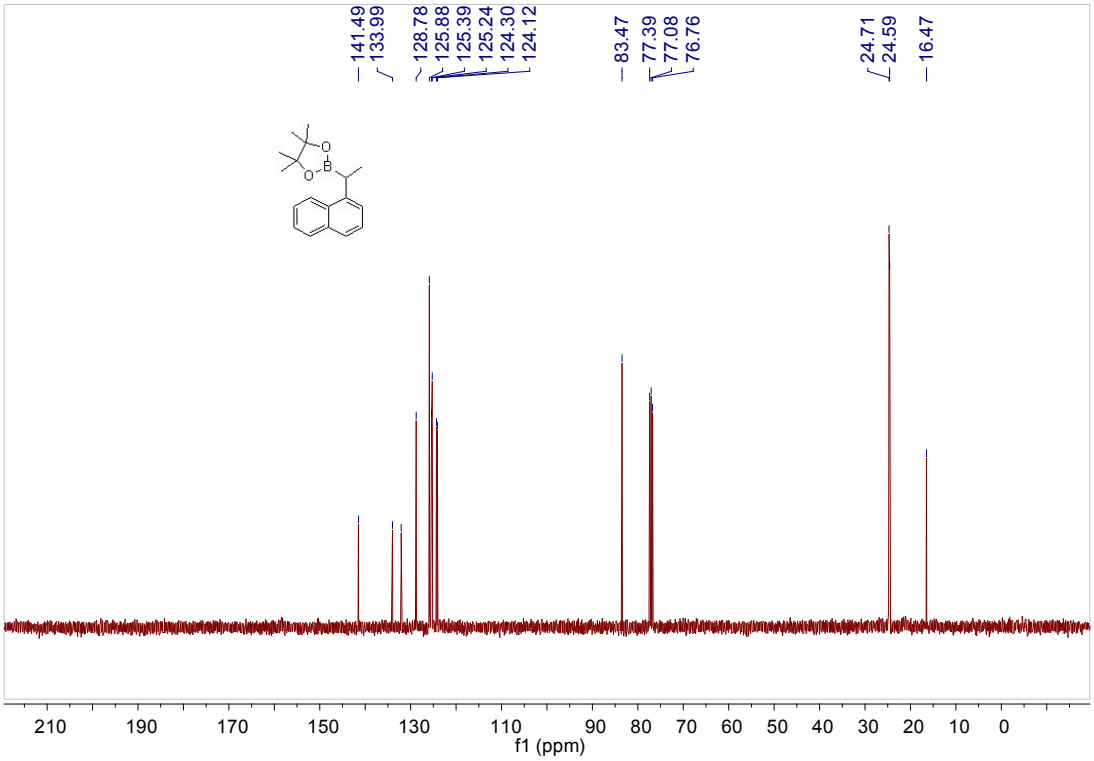
^{11}B NMR of compound 2r



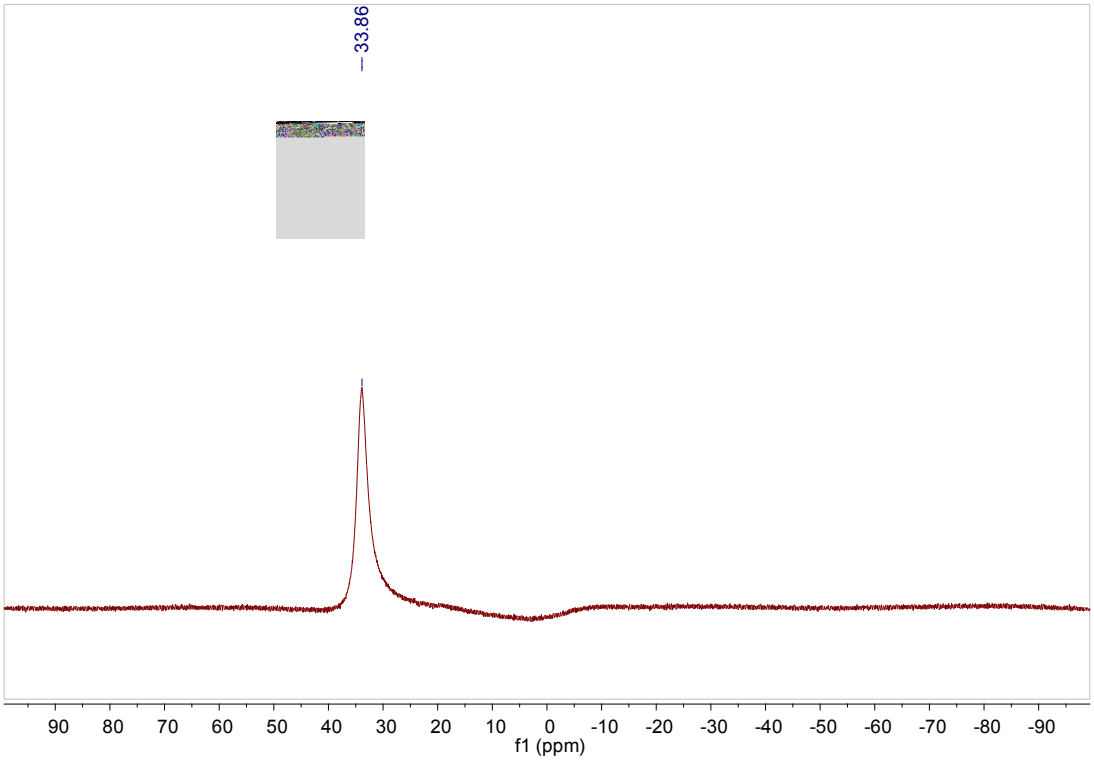
^{1}H NMR of compound 2s



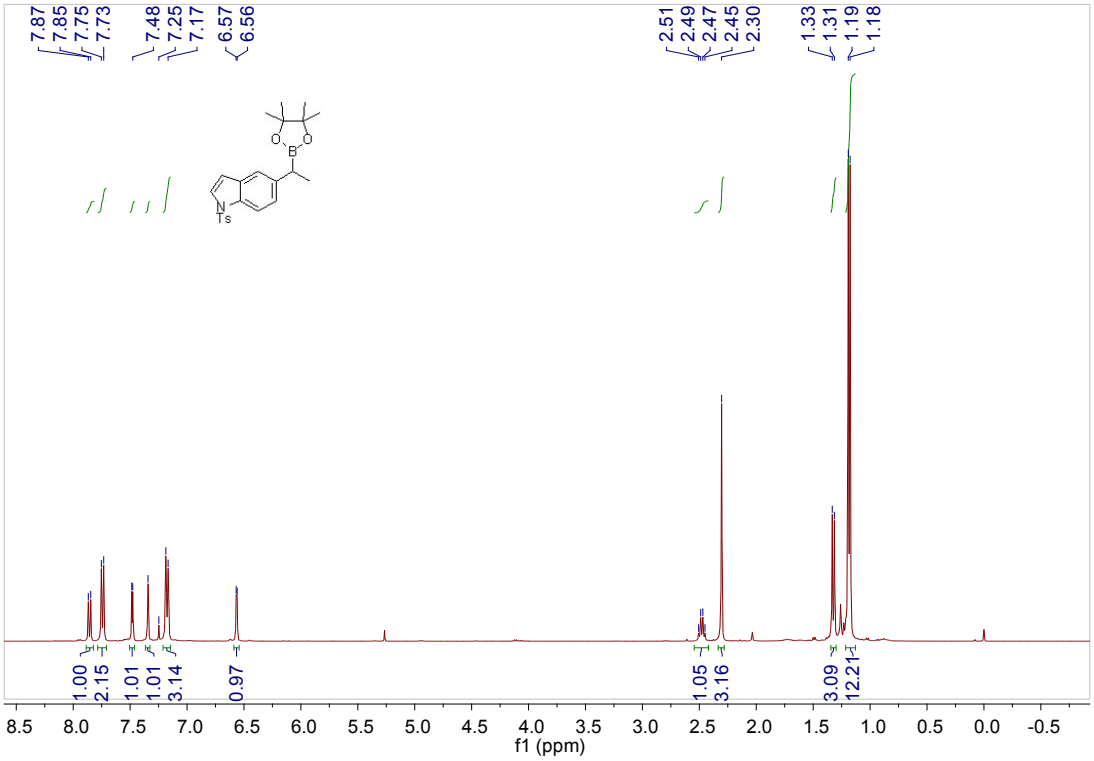
^{13}C NMR of compound 2s



^{11}B NMR of compound 2s



^{1}H NMR of compound 2t



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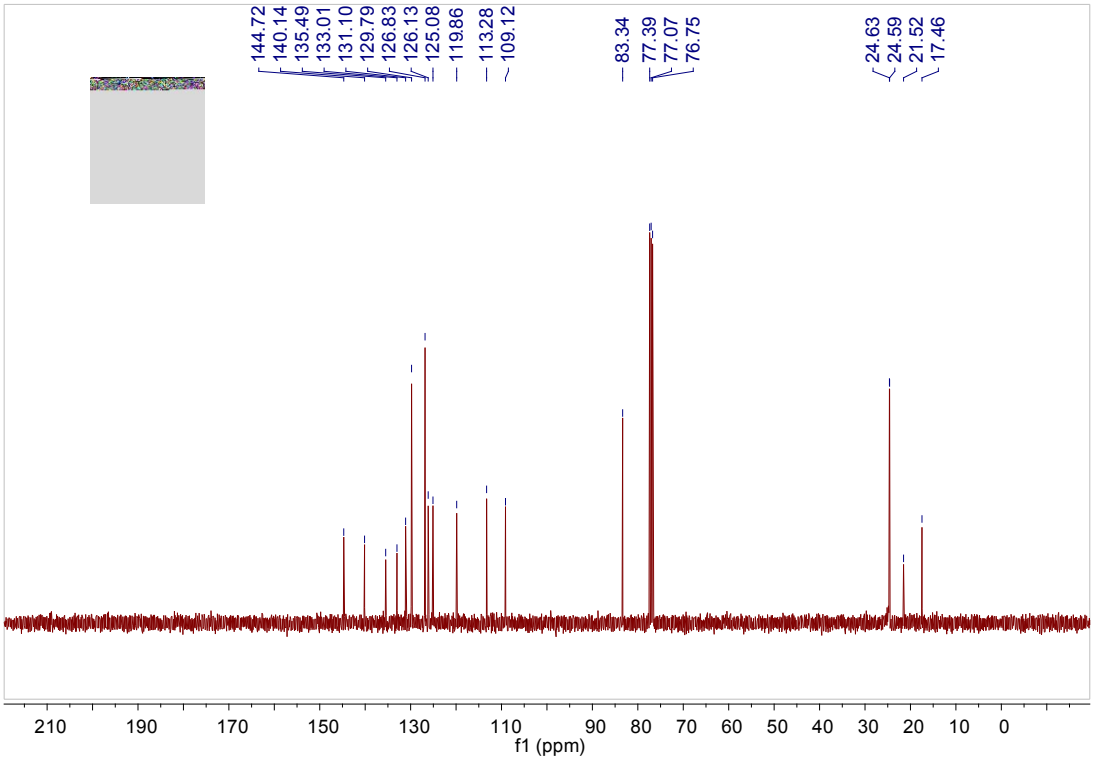

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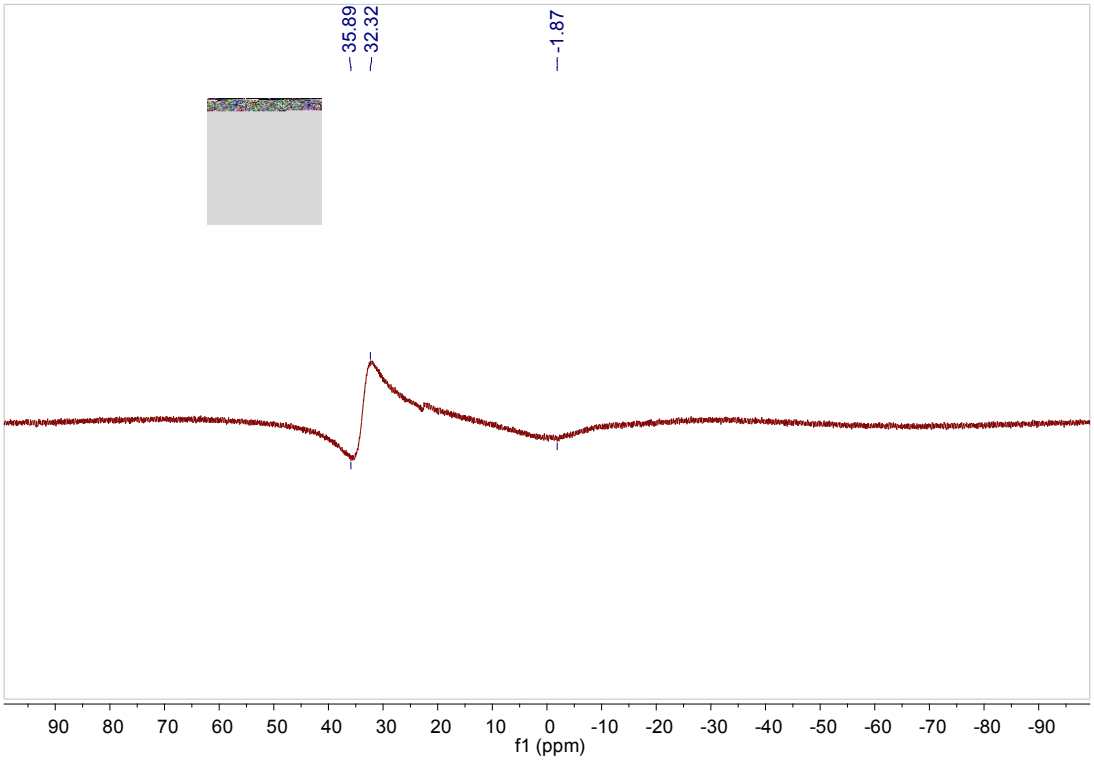
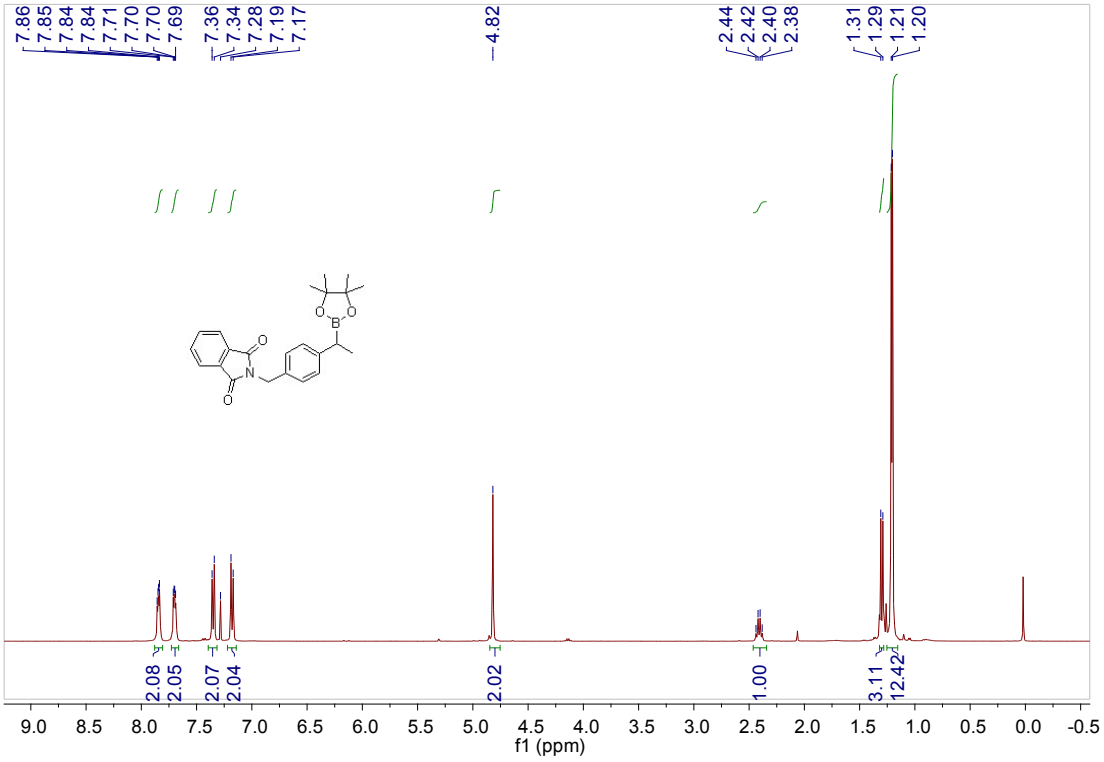
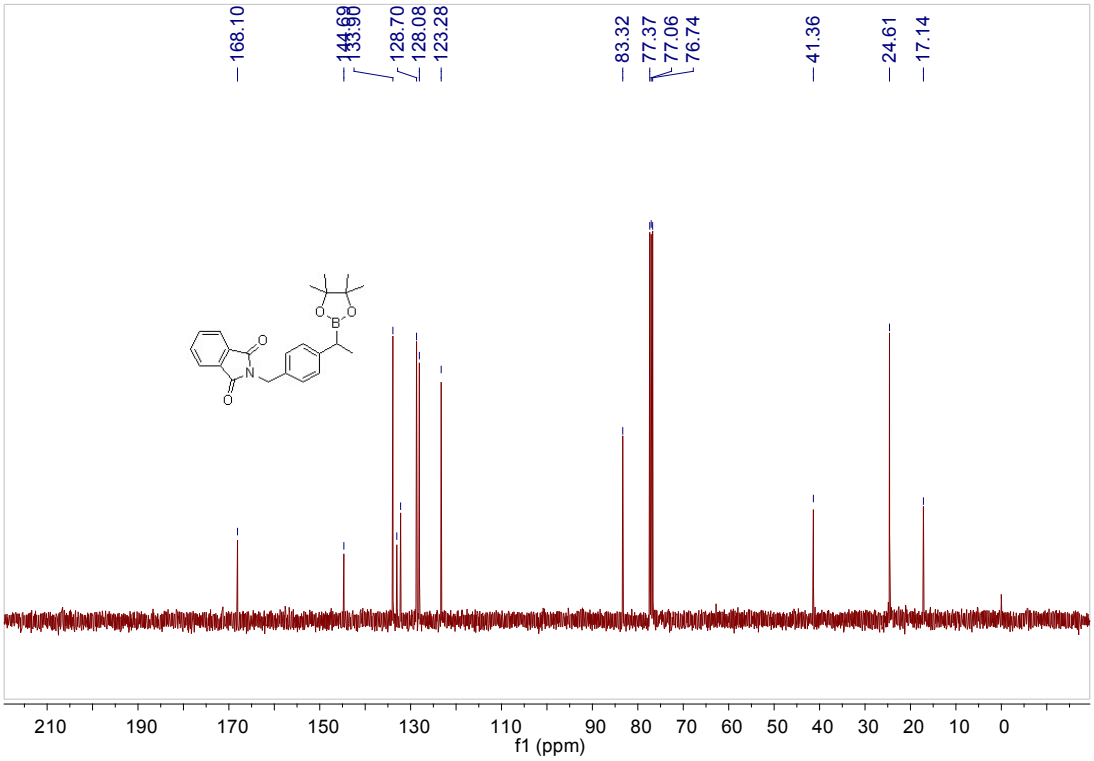


^{1}H NMR of compound 2u



^{13}C NMR of compound 2u



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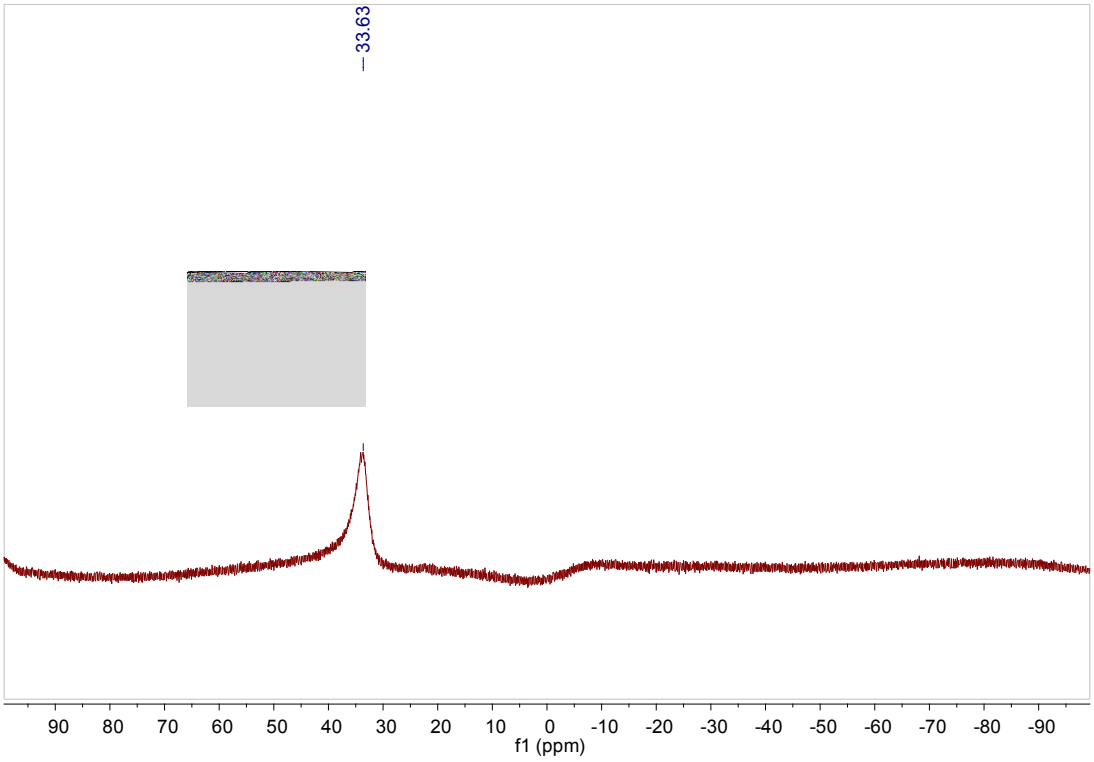
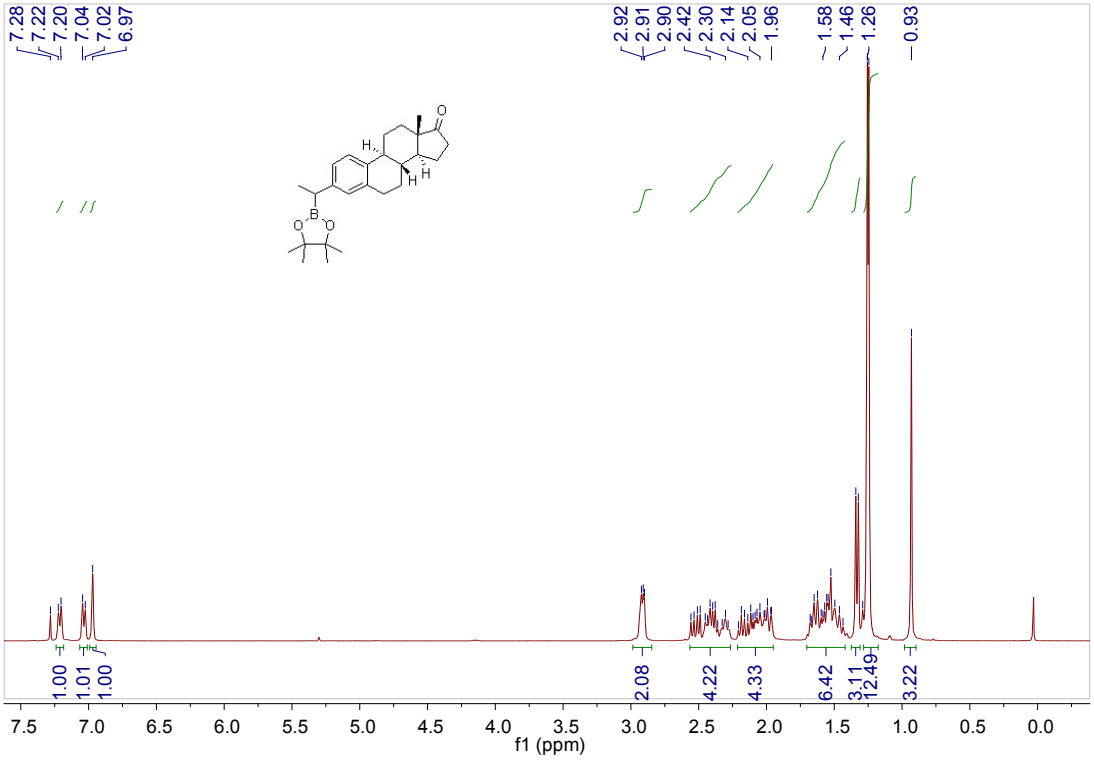
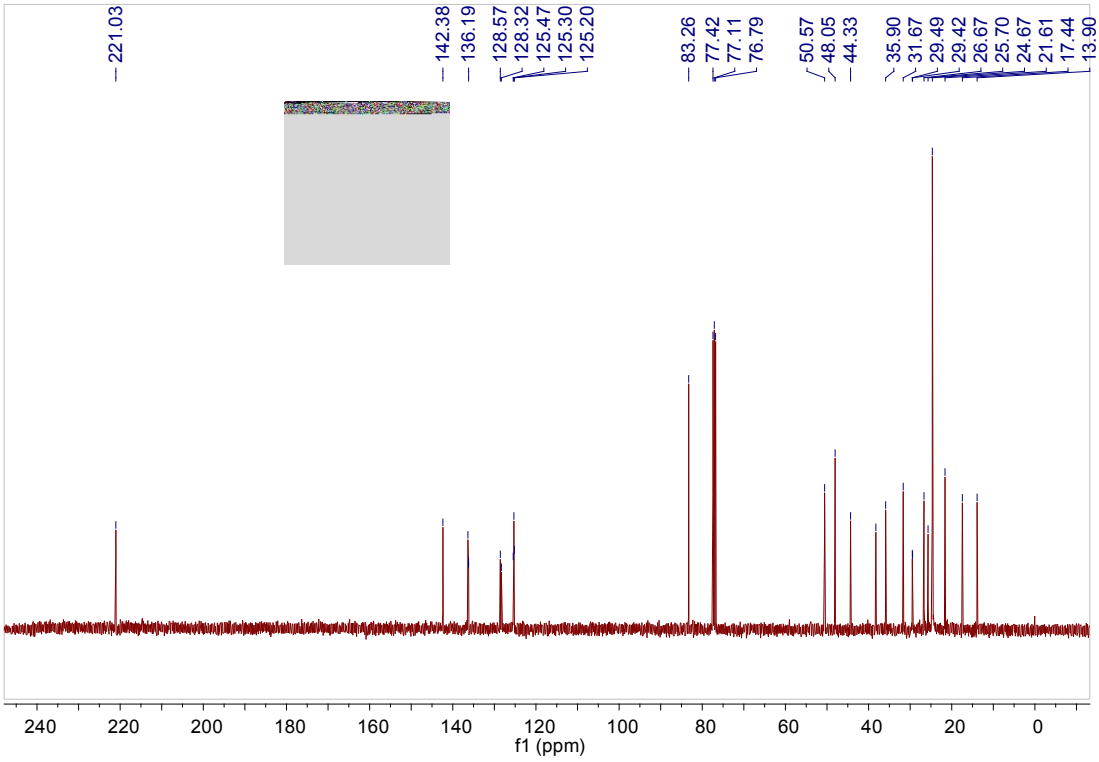


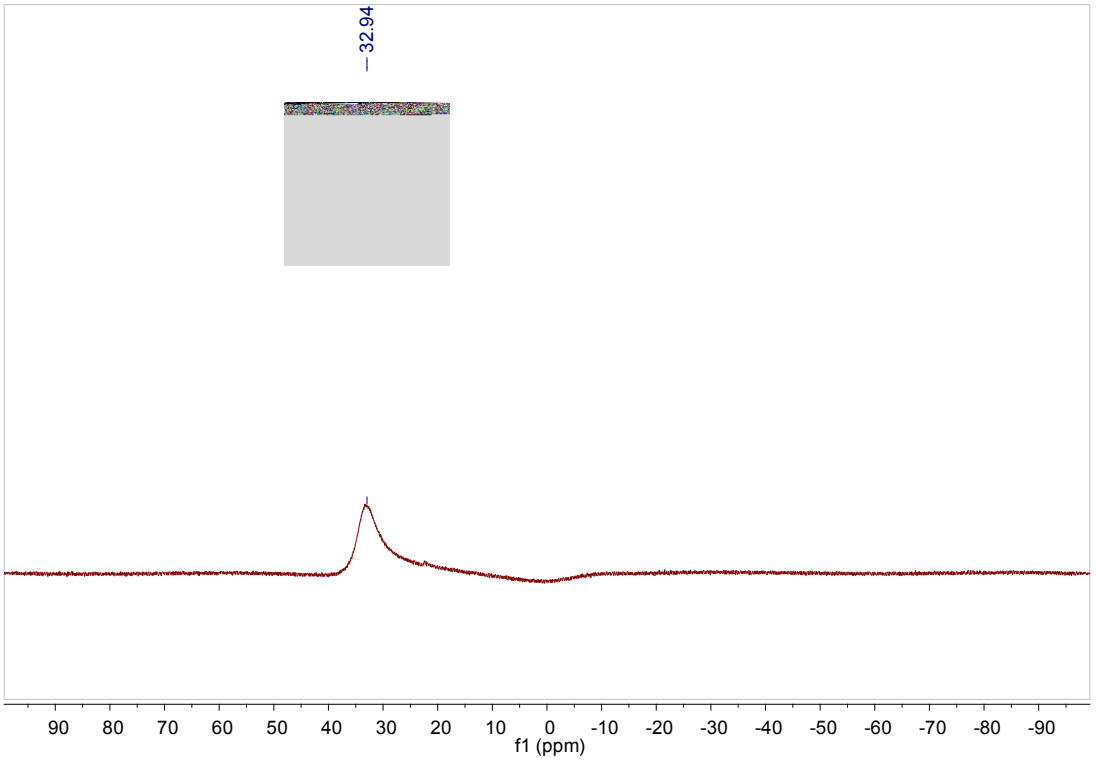
^{1}H NMR of compound 2v



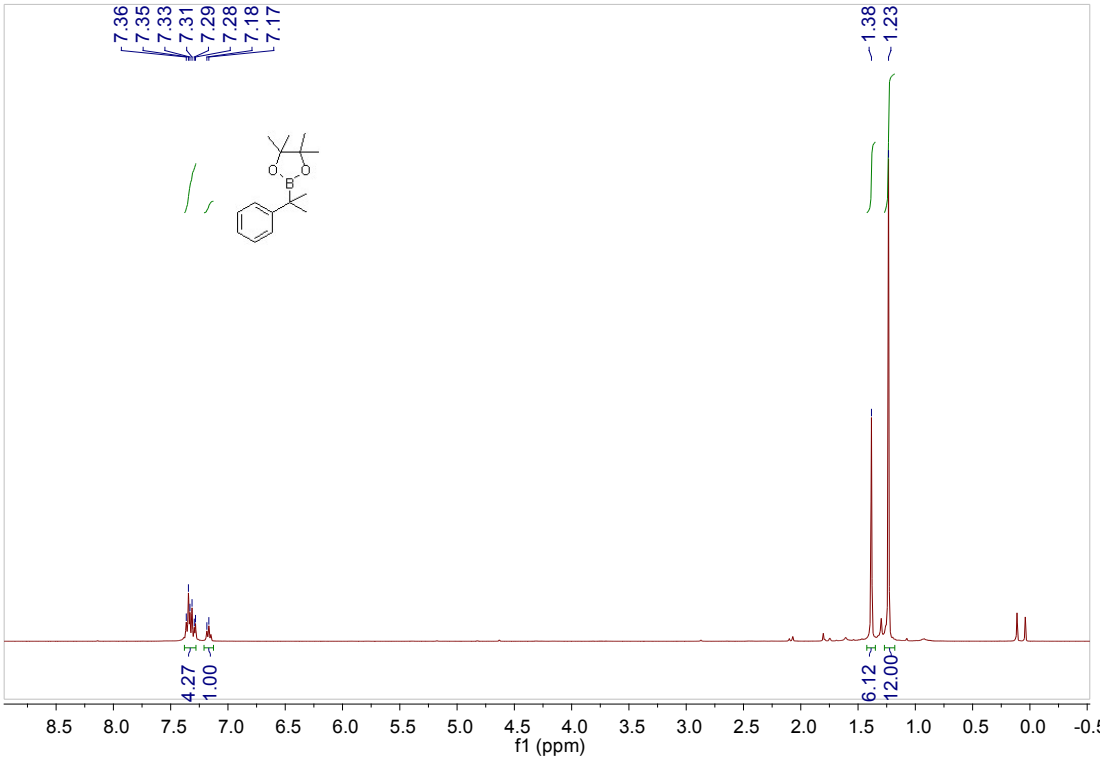
^{13}C NMR of compound 2v



^{11}B NMR of compound 2v



^{1}H NMR of compound 2w



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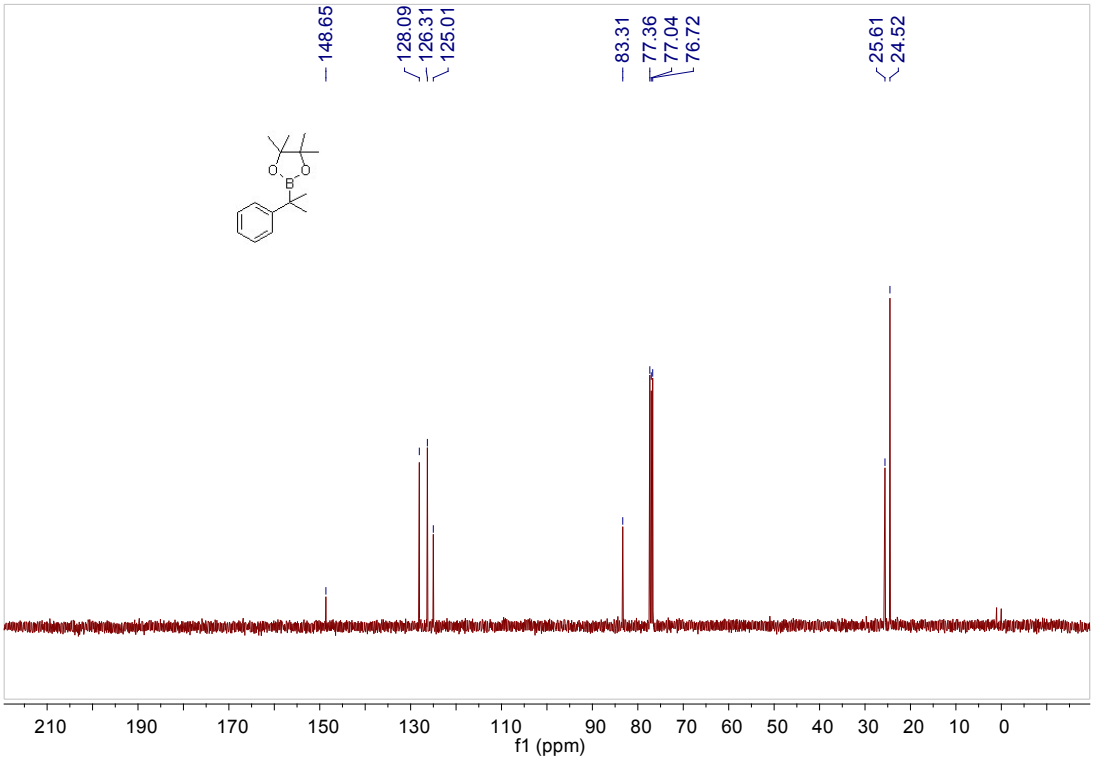

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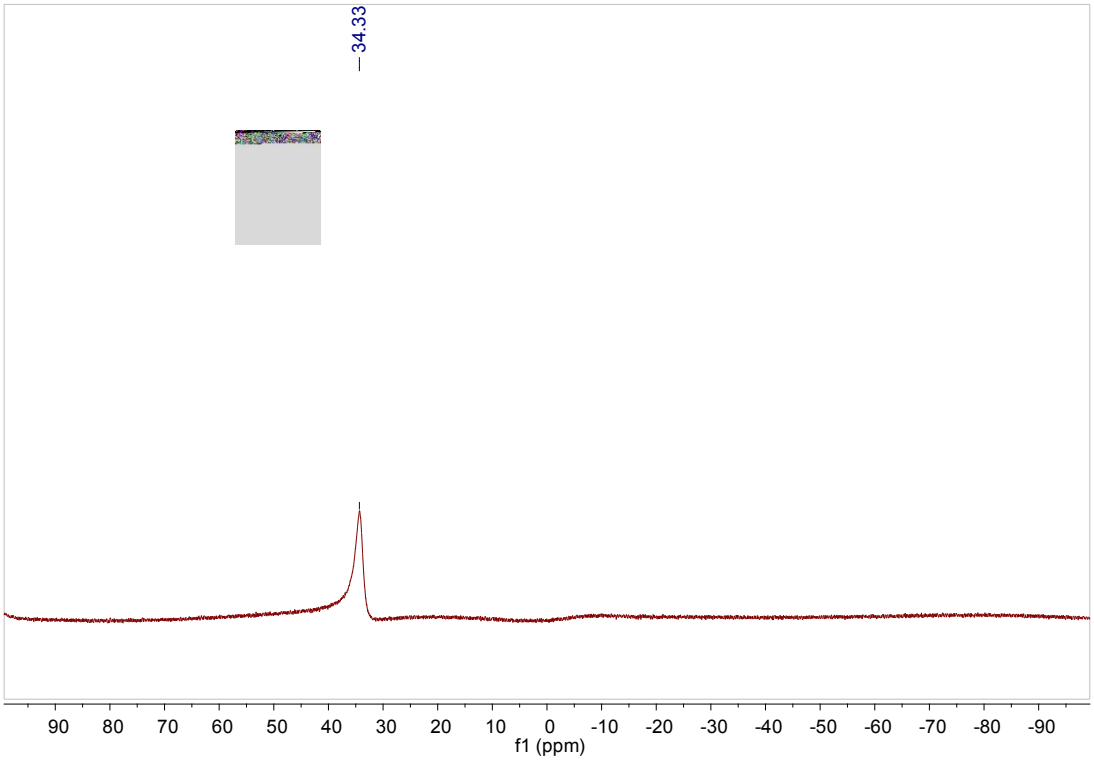
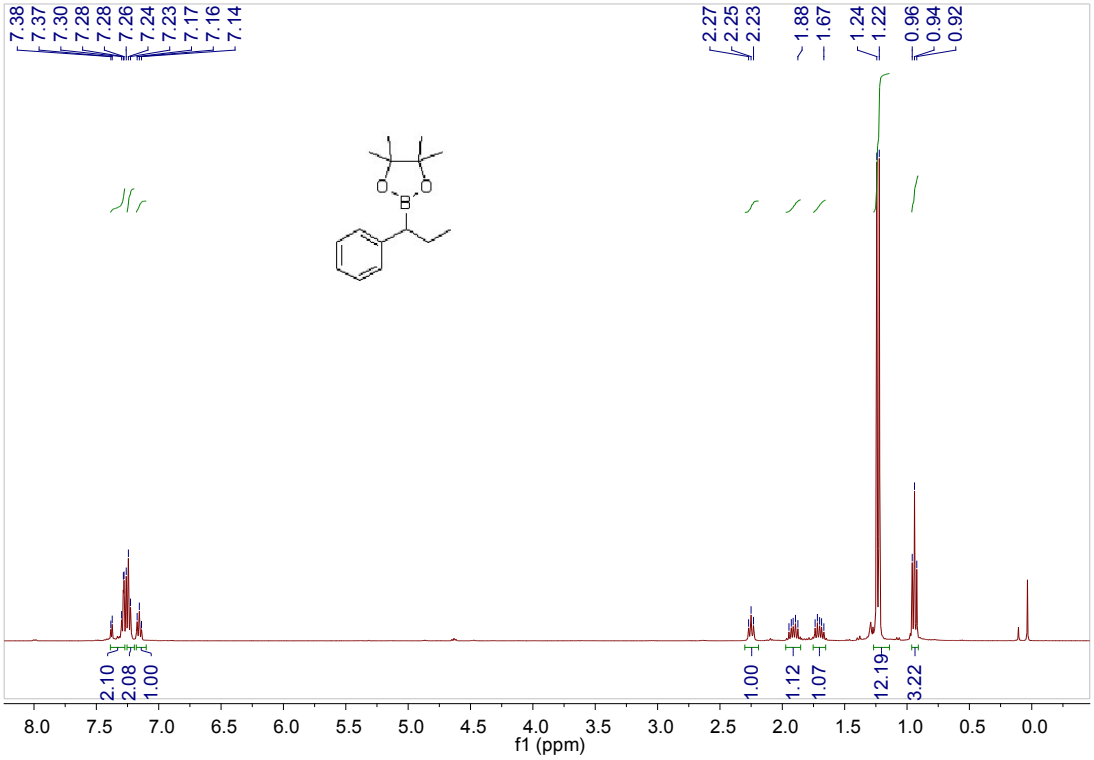


^{1}H NMR of compound 2aa



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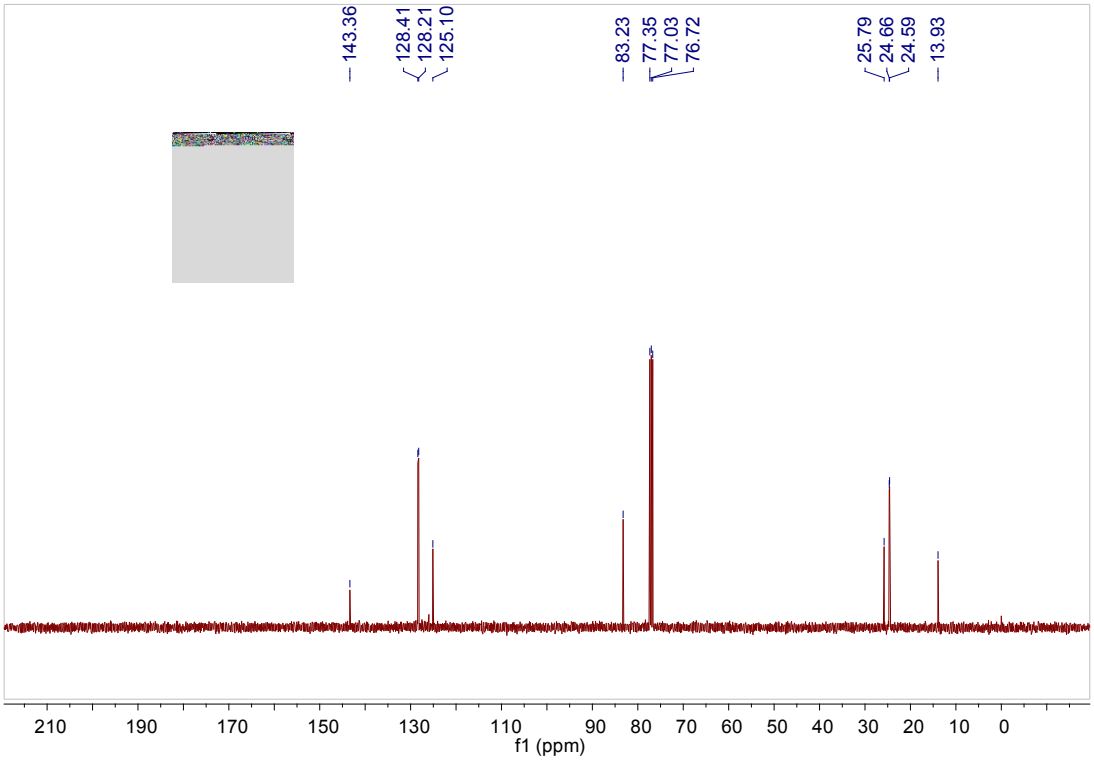

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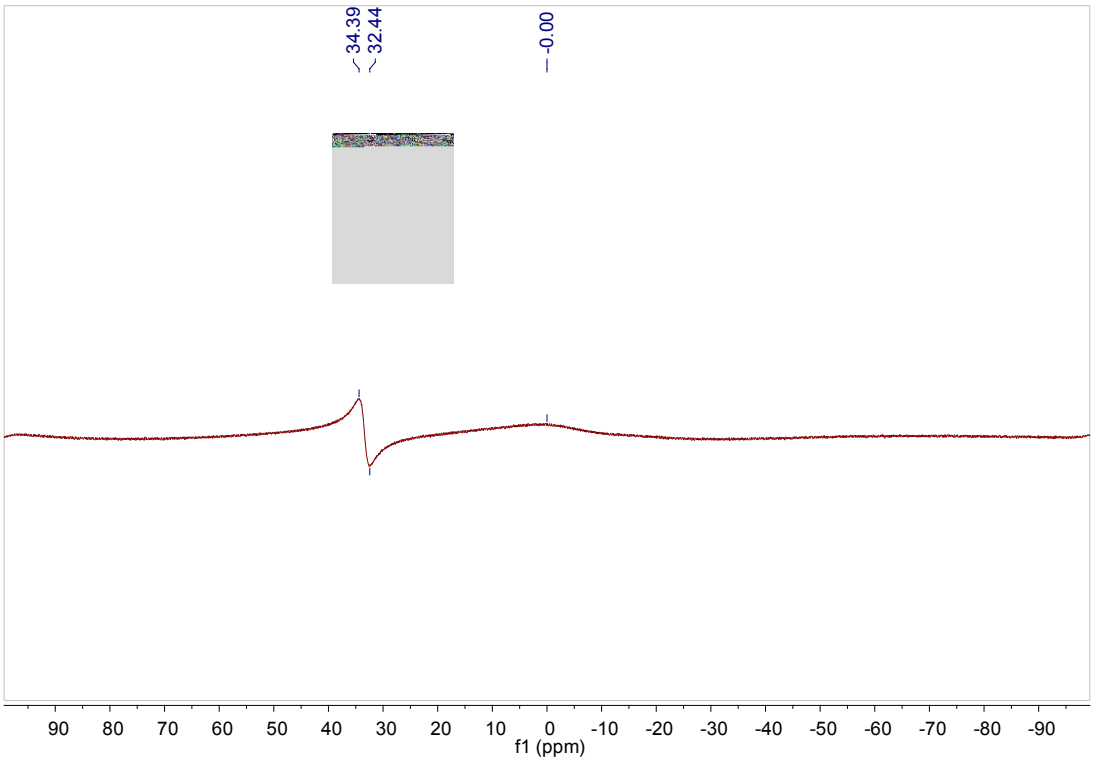
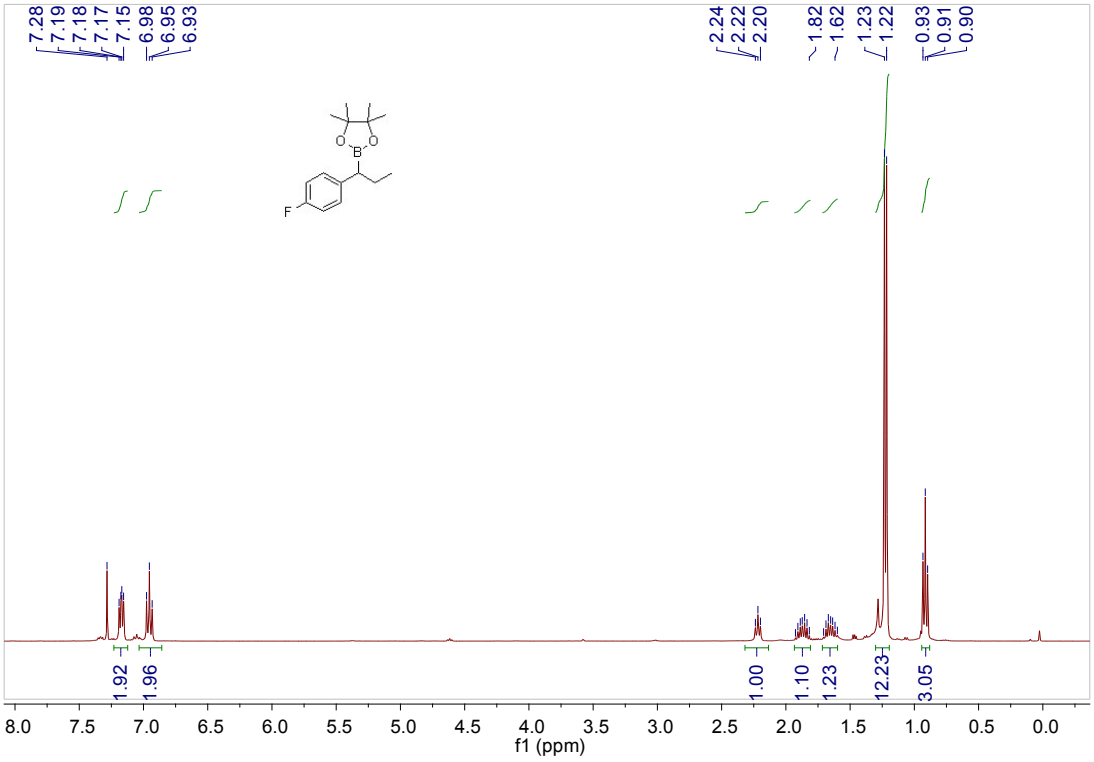
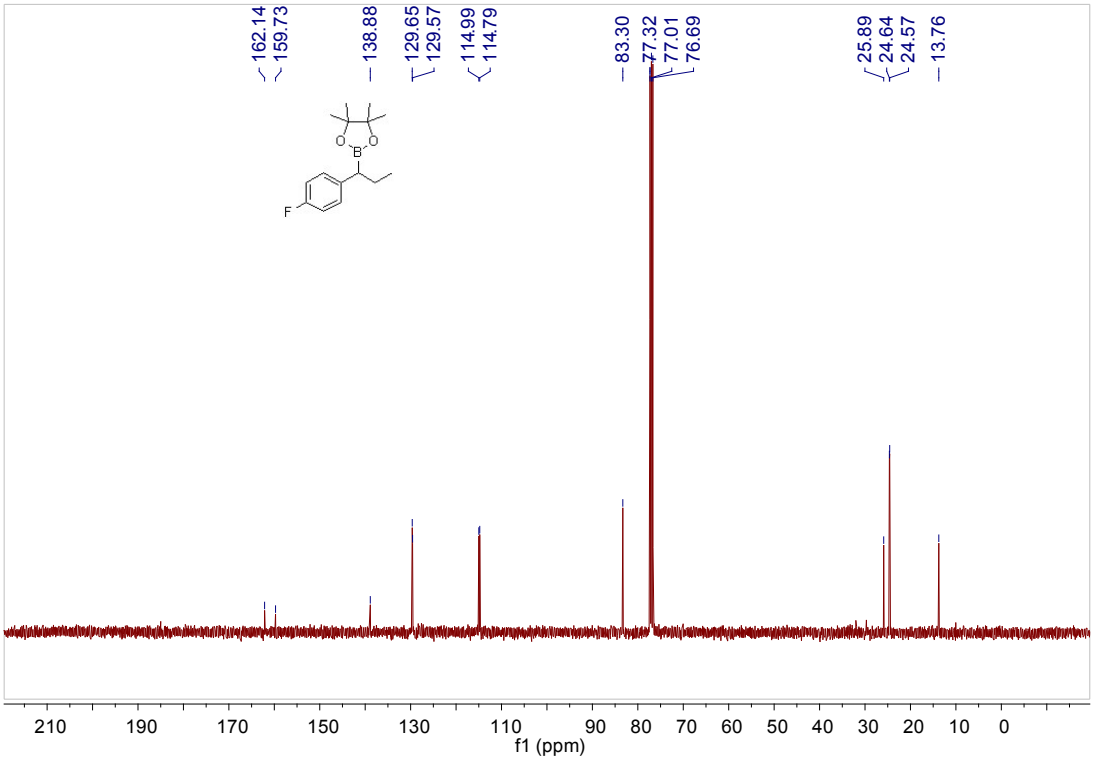


^{1}H NMR of compound 2ab



^{13}C NMR of compound 2ab



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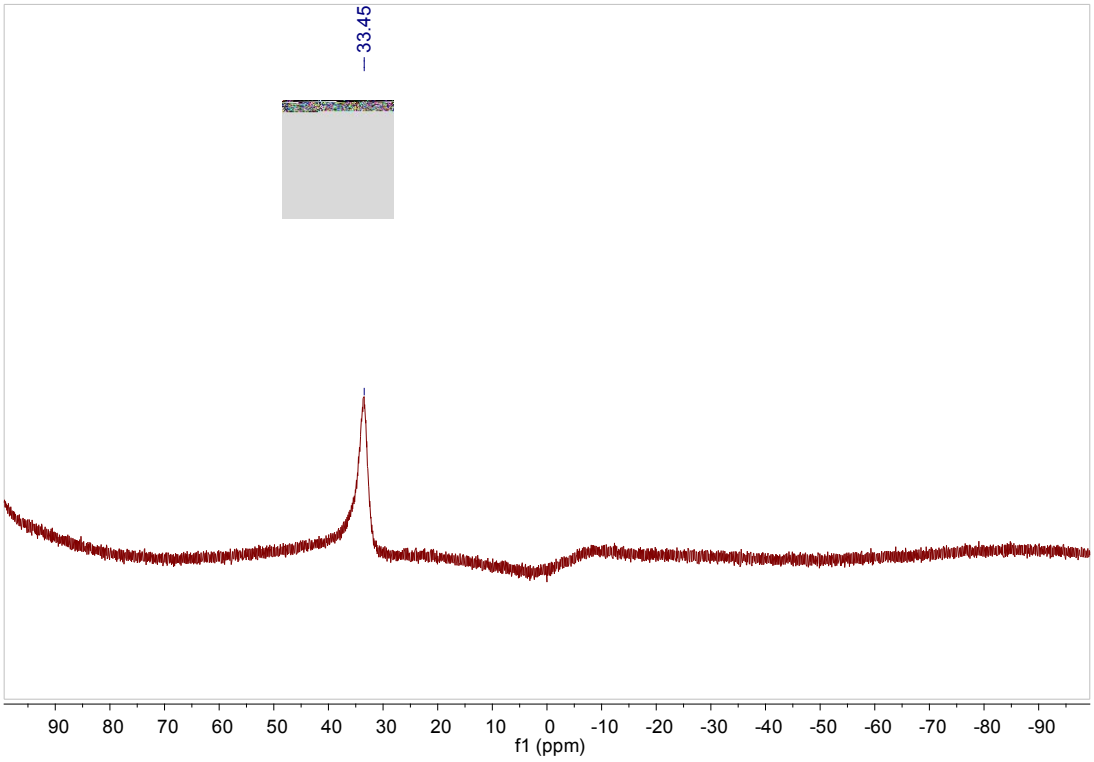
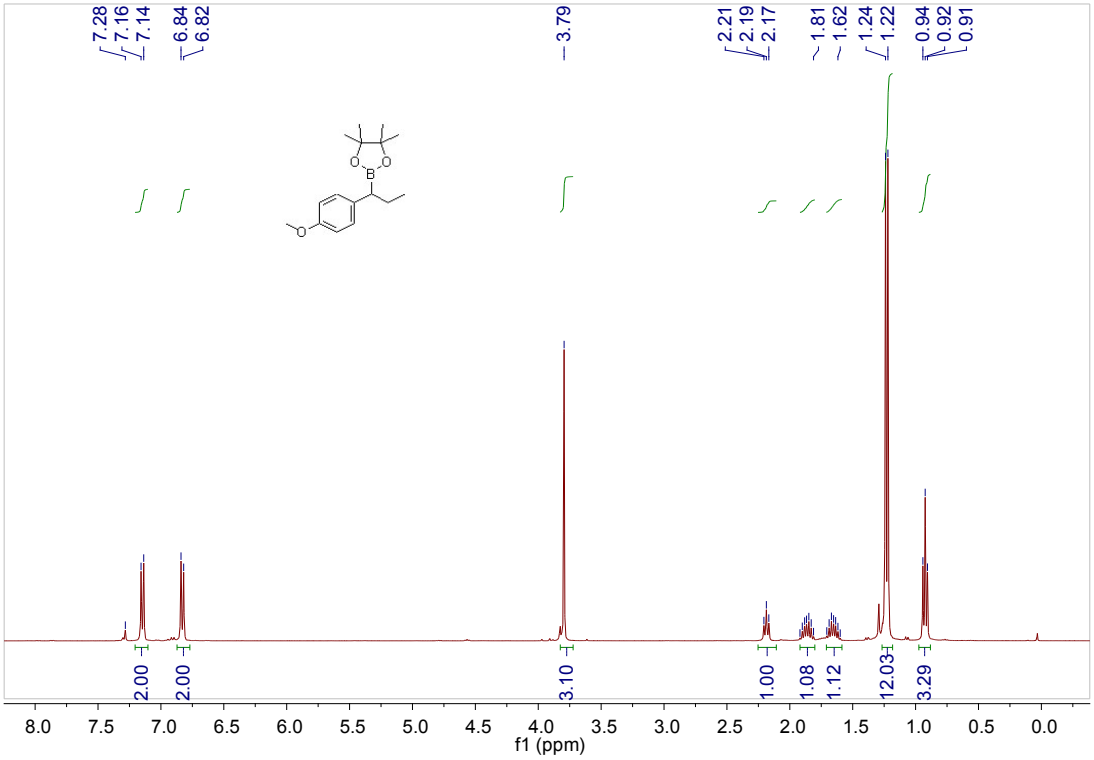
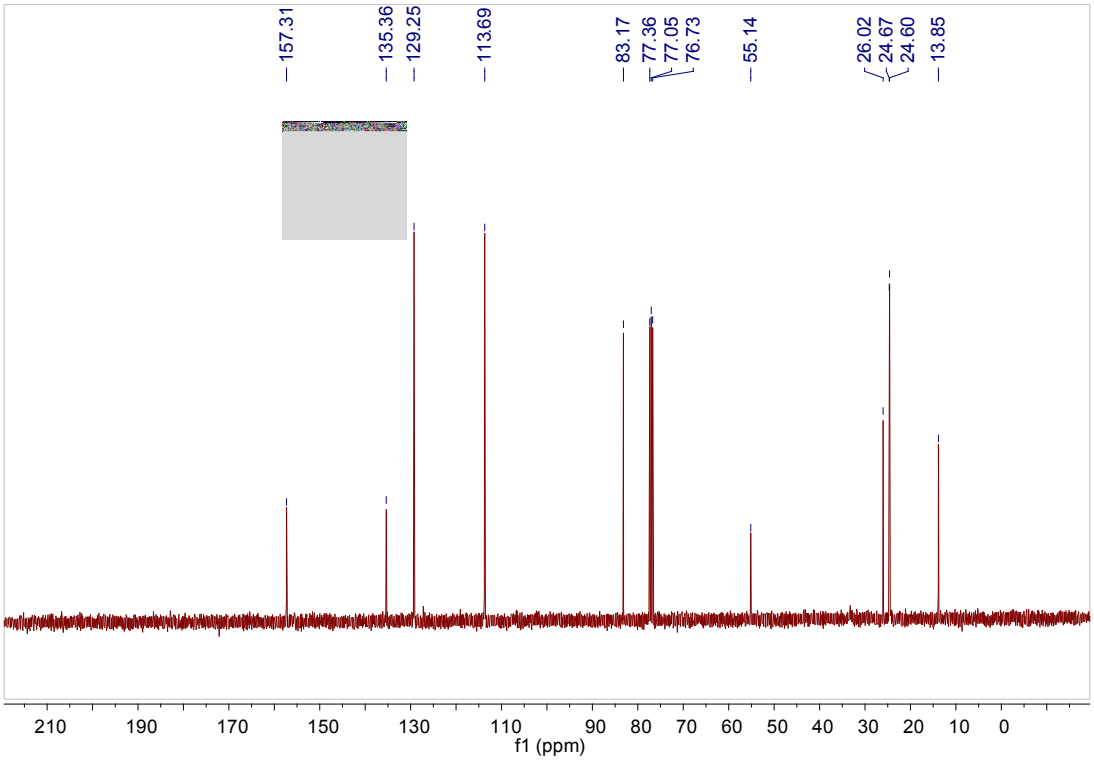


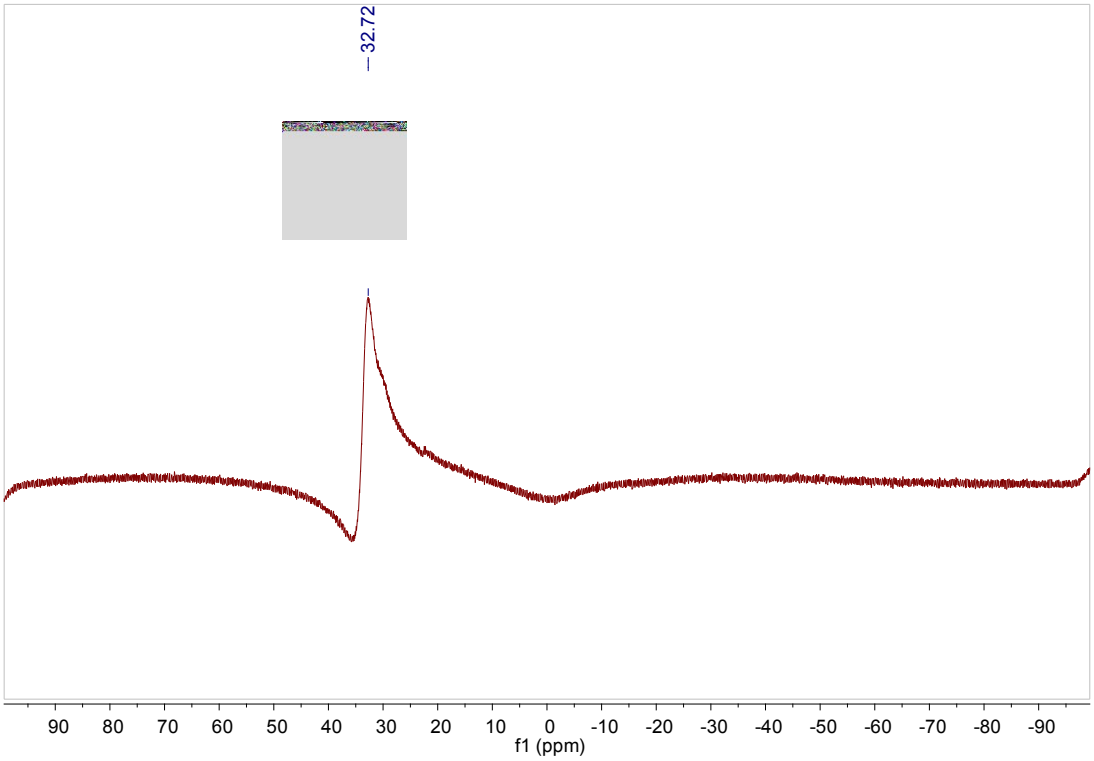
^{1}H NMR of compound 2ac



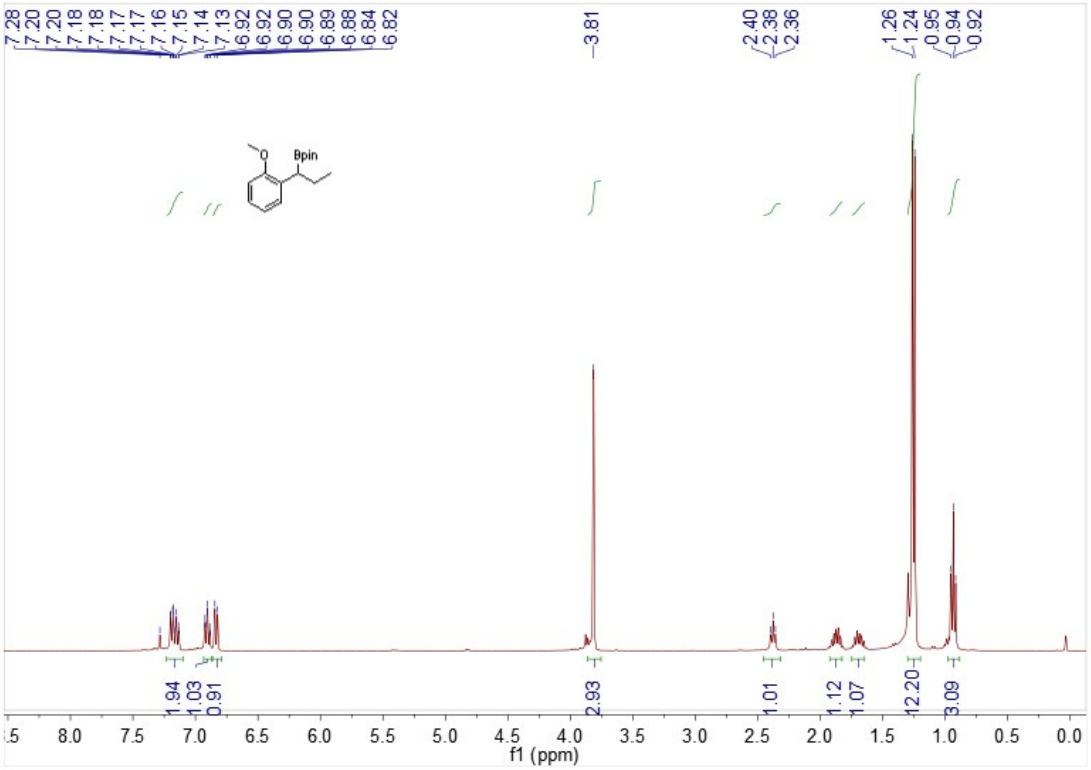
^{13}C NMR of compound 2ac



^{11}B NMR of compound 2ac



^{1}H NMR of compound 2ad



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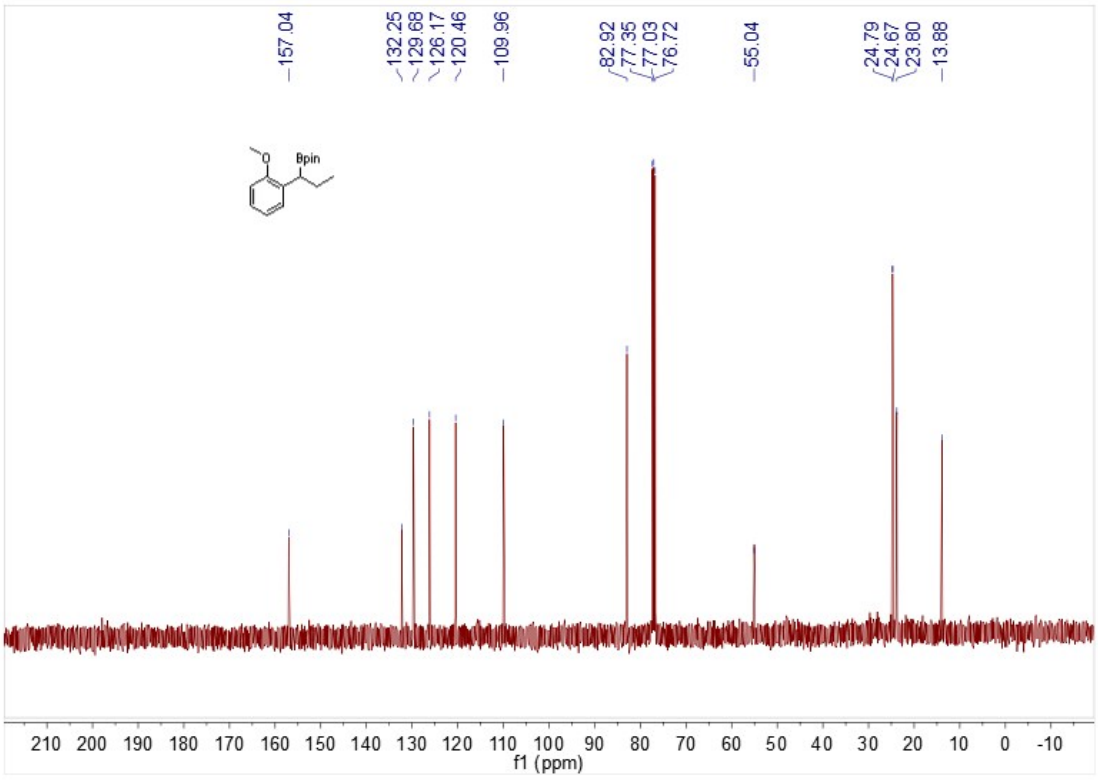
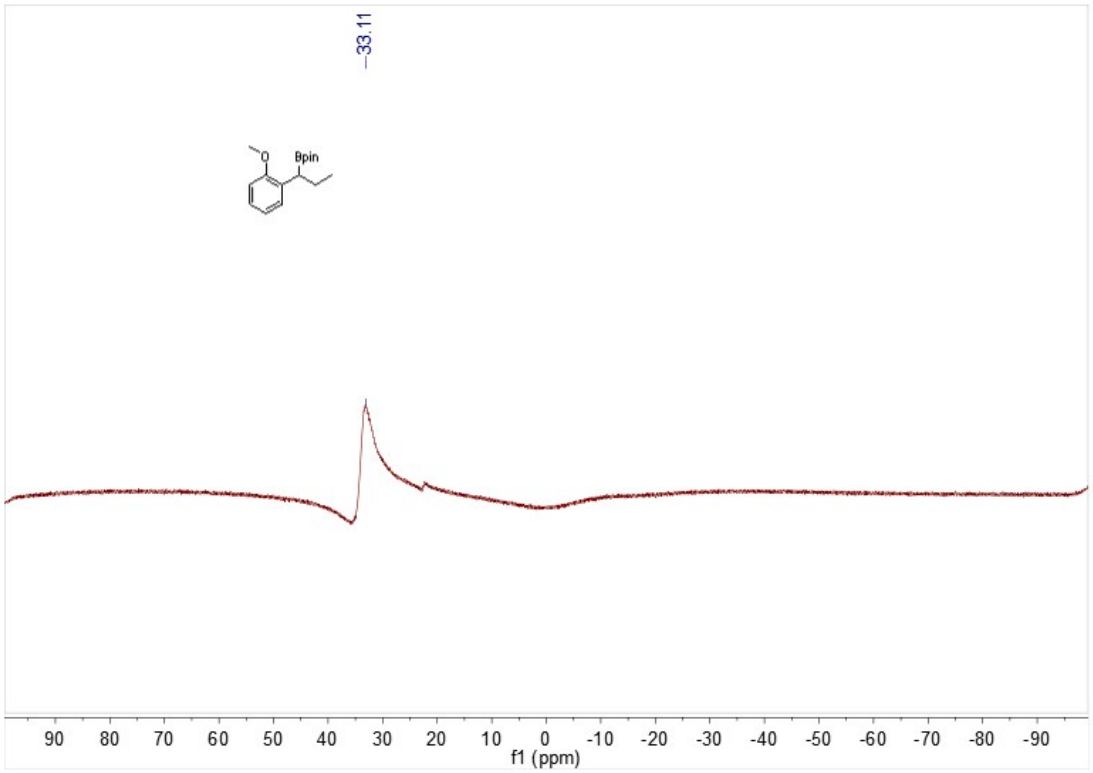
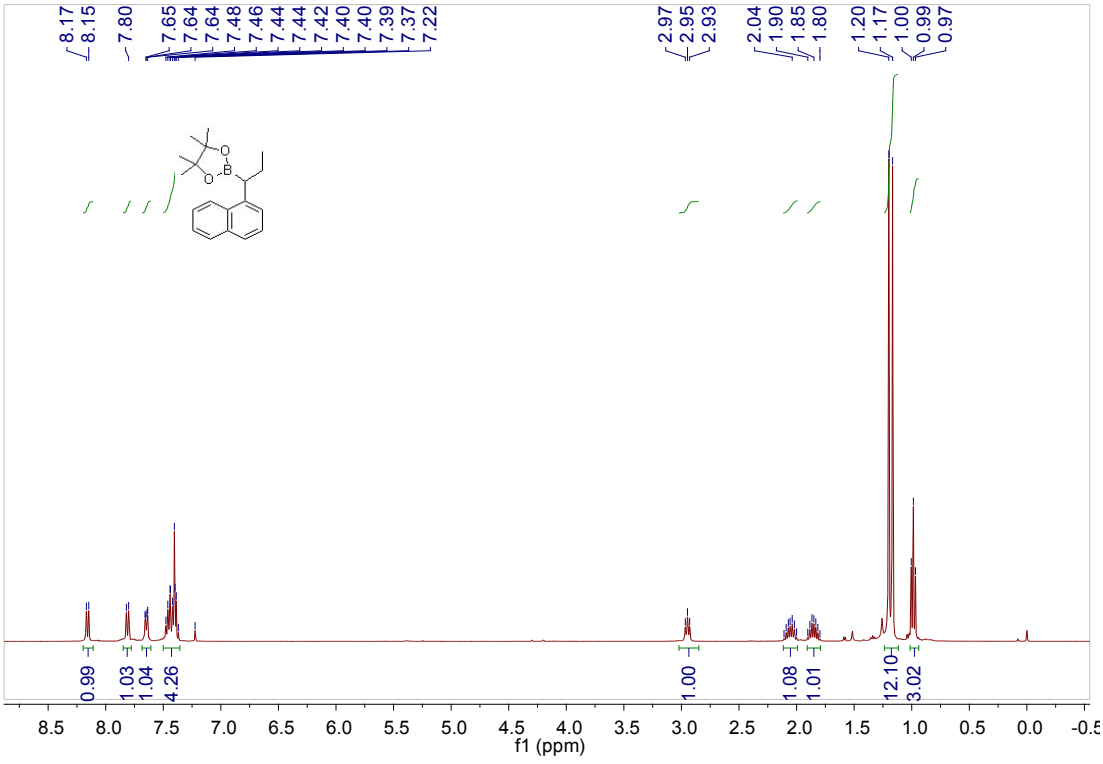


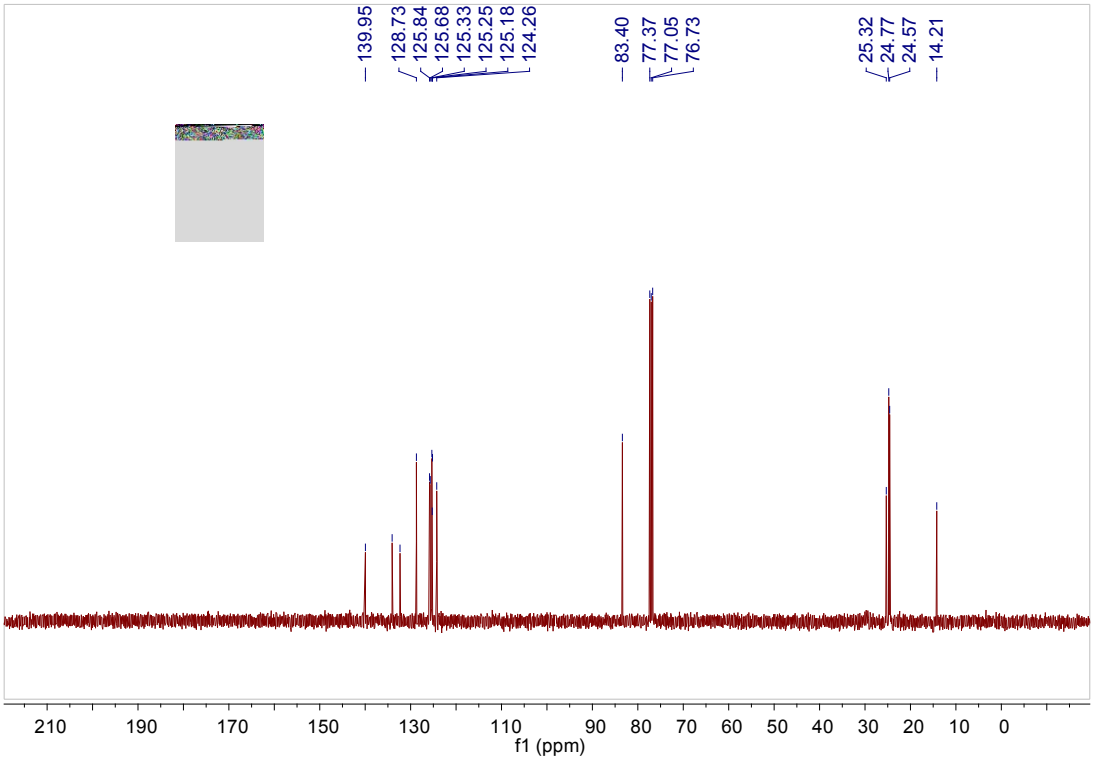
^{11}B NMR of compound 2ad



^{1}H NMR of compound 2ae



^{13}C NMR of compound 2ae



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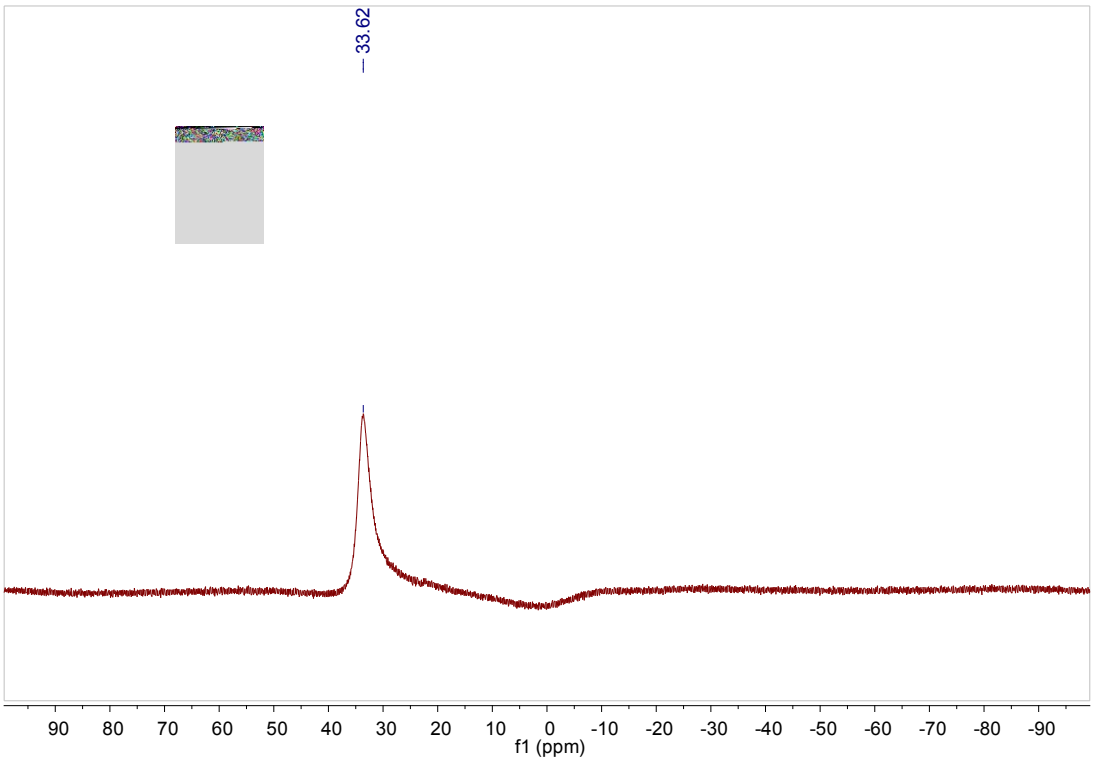
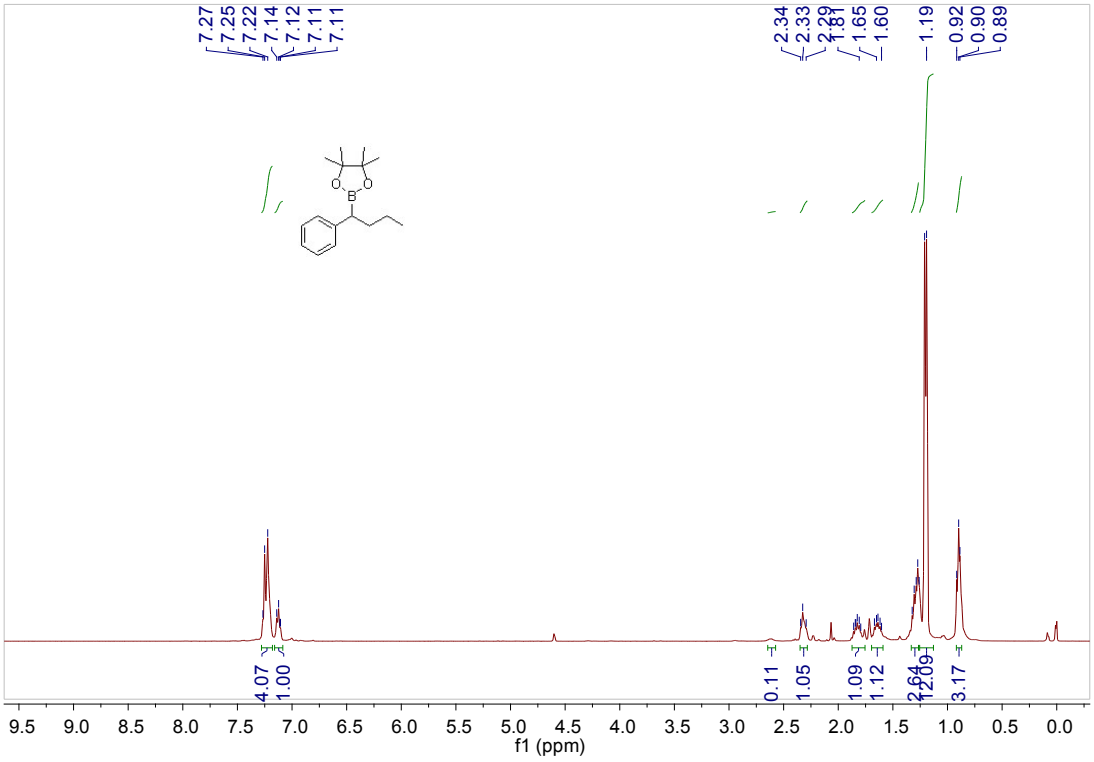


[1]H NMR of compound 2af



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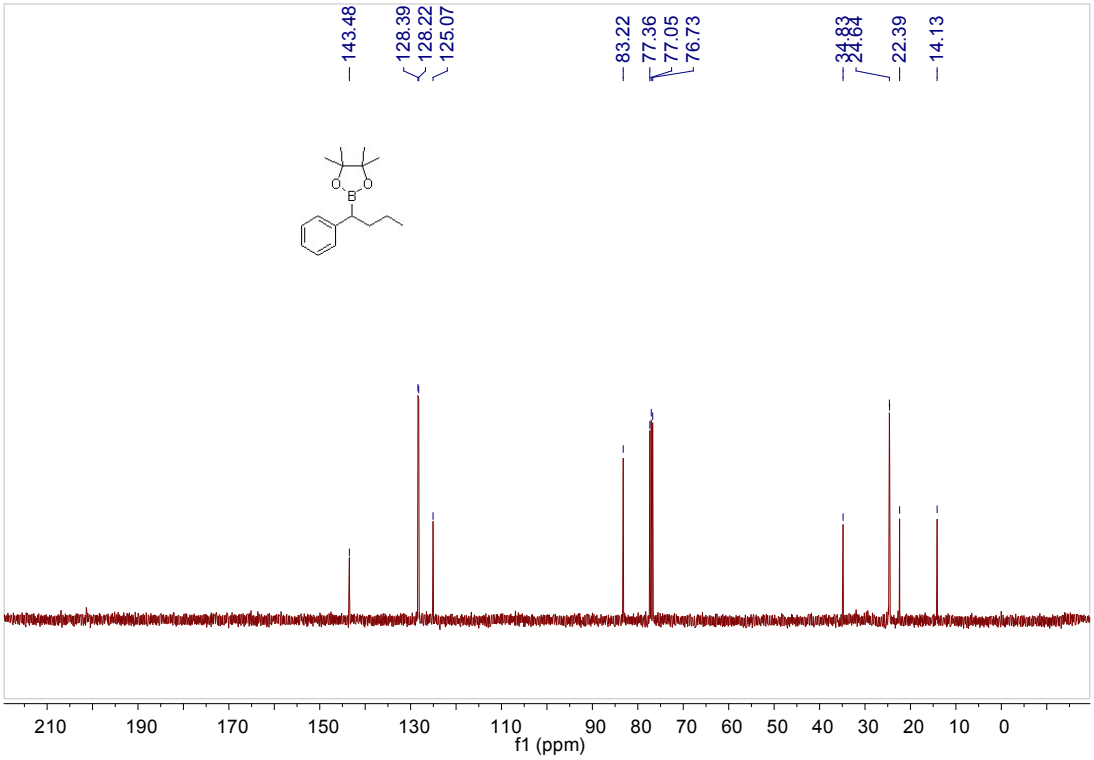

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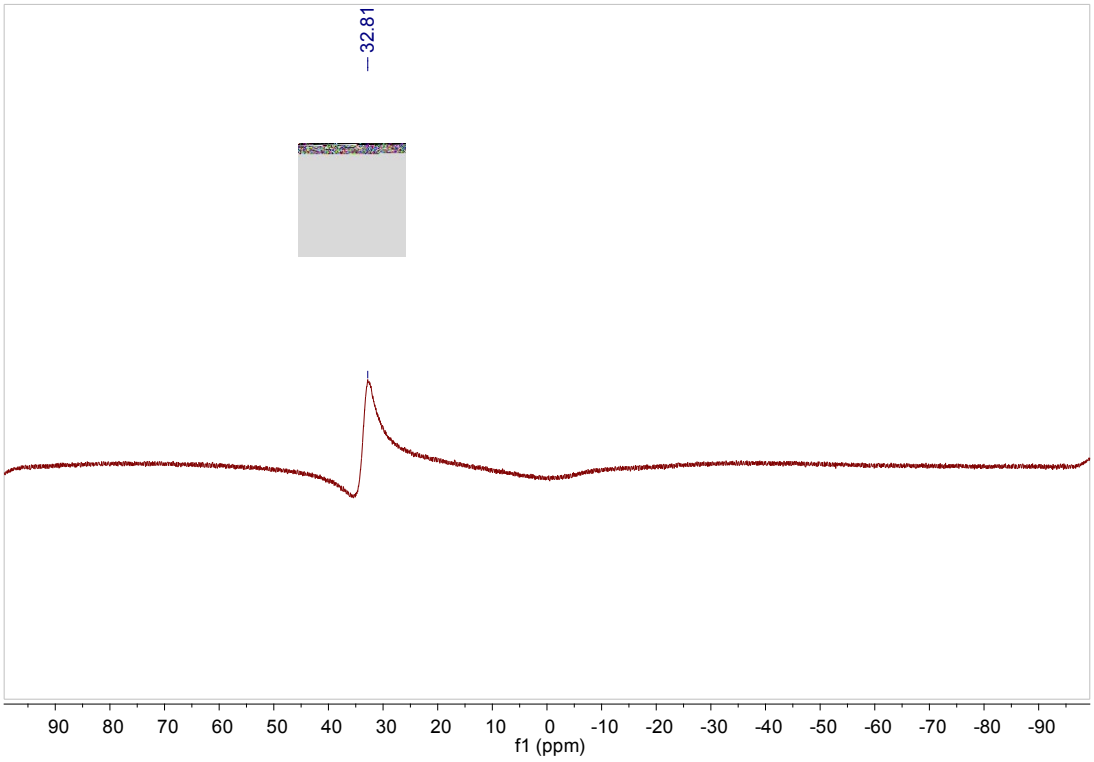
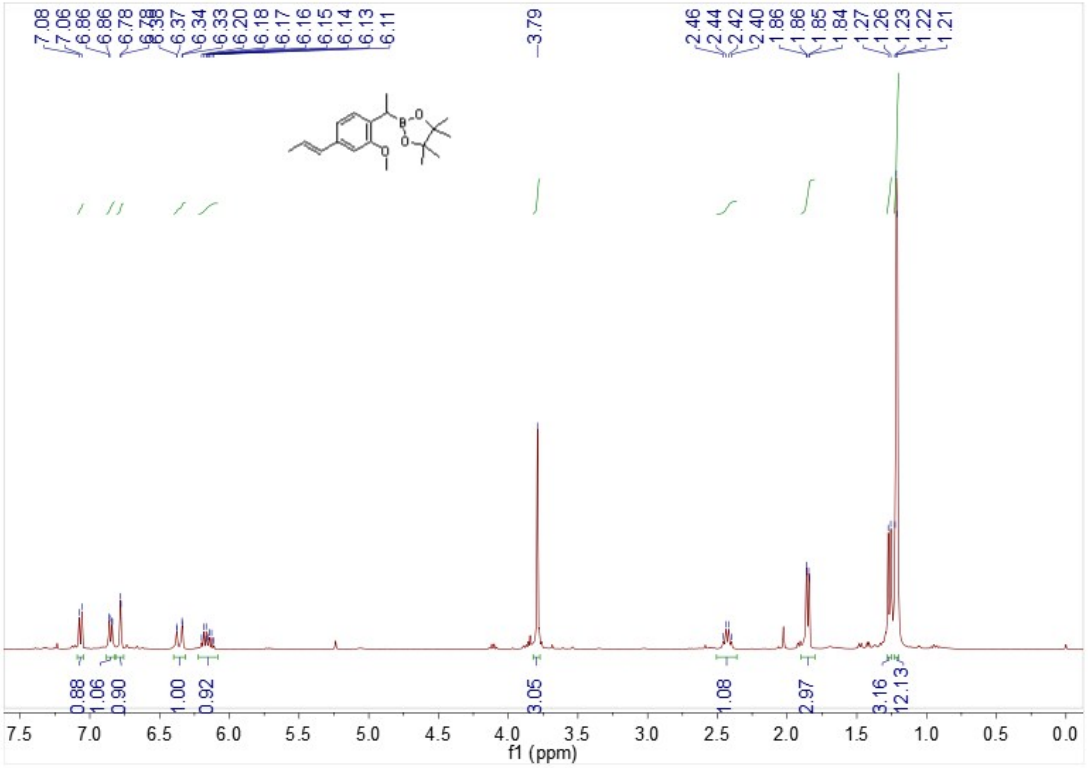


^{1}H NMR of compound 2ai



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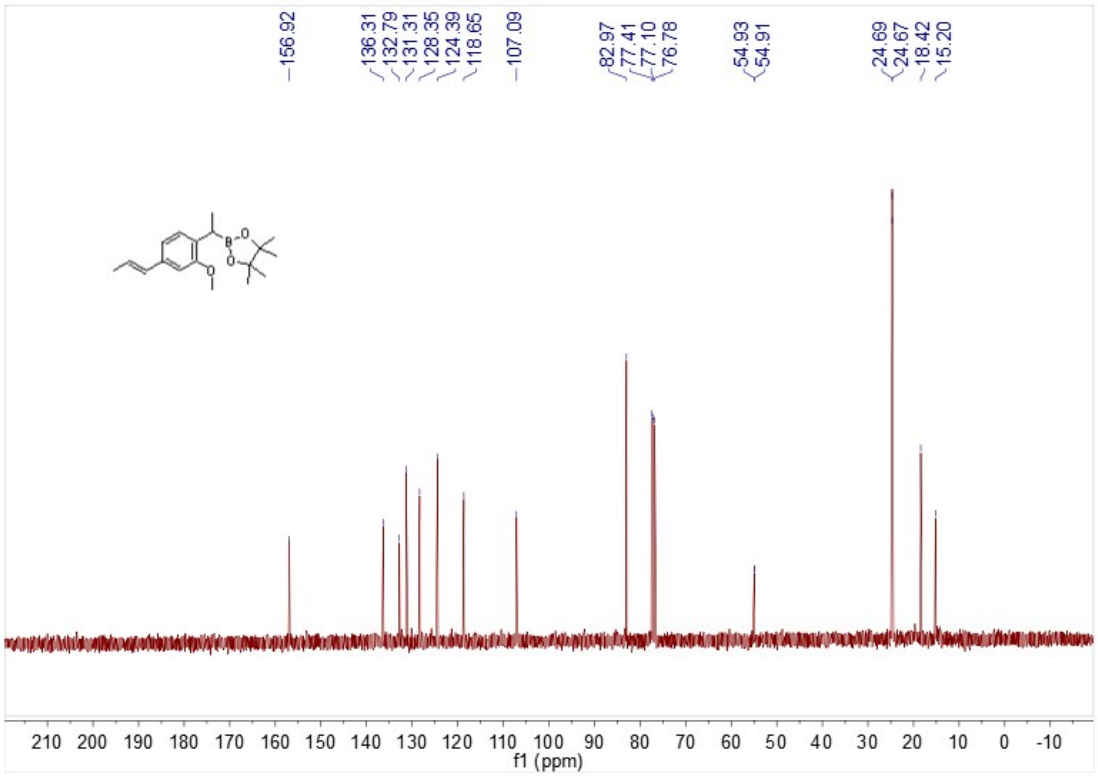
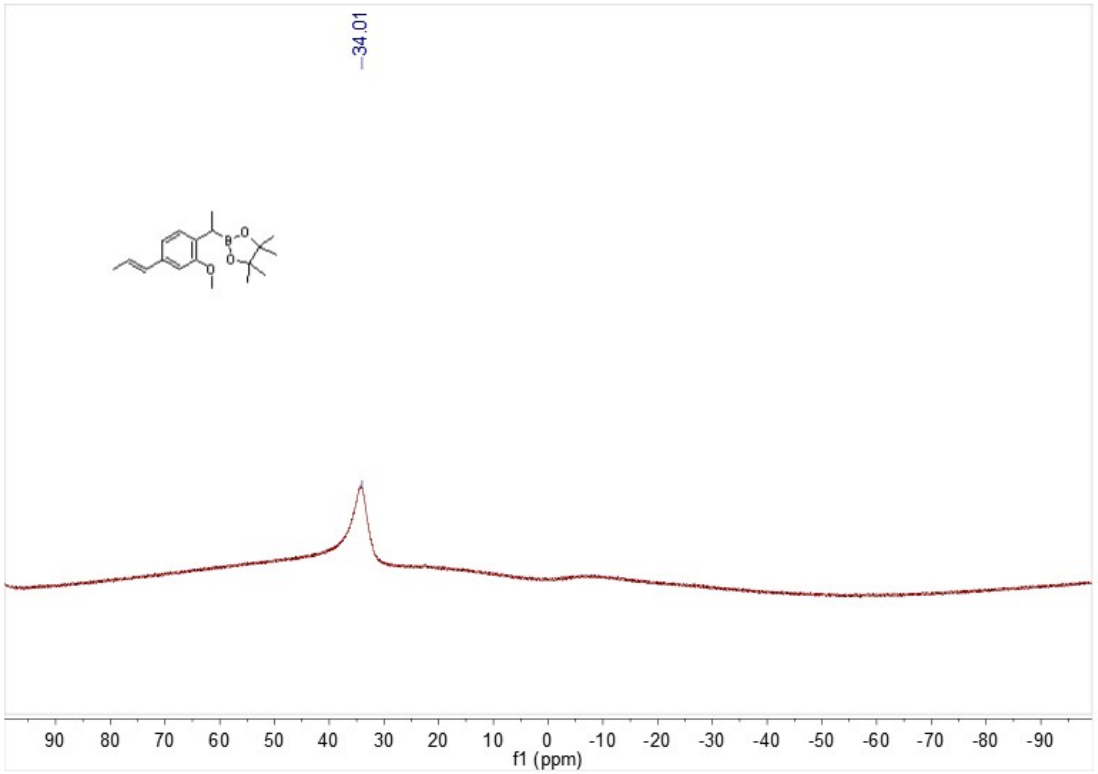
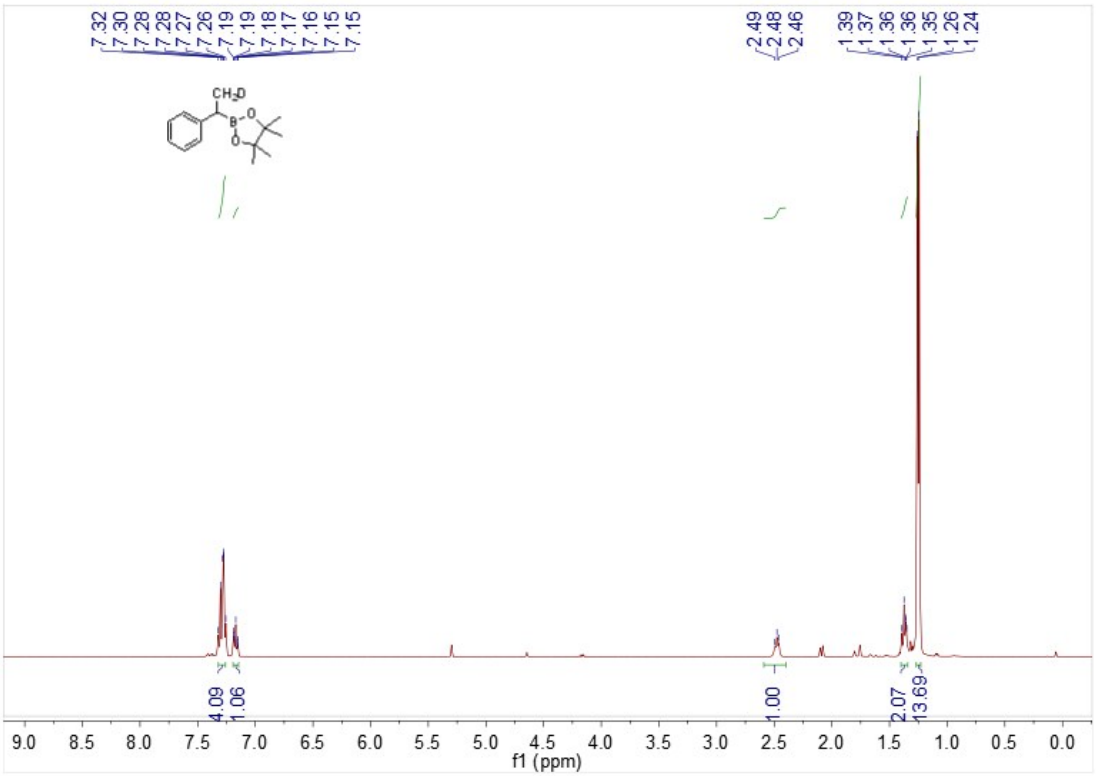


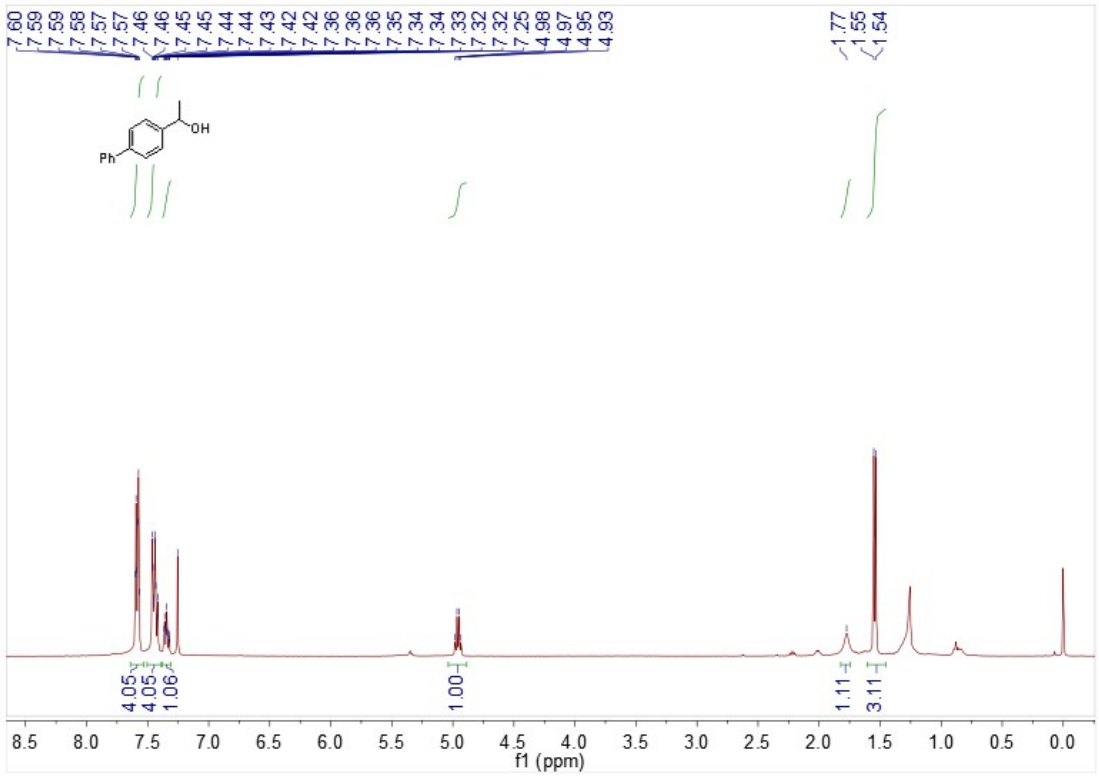
^{11}B NMR of compound 2ai



^{1}H NMR of compound *d1*-2a



^{1}H NMR of compound 4



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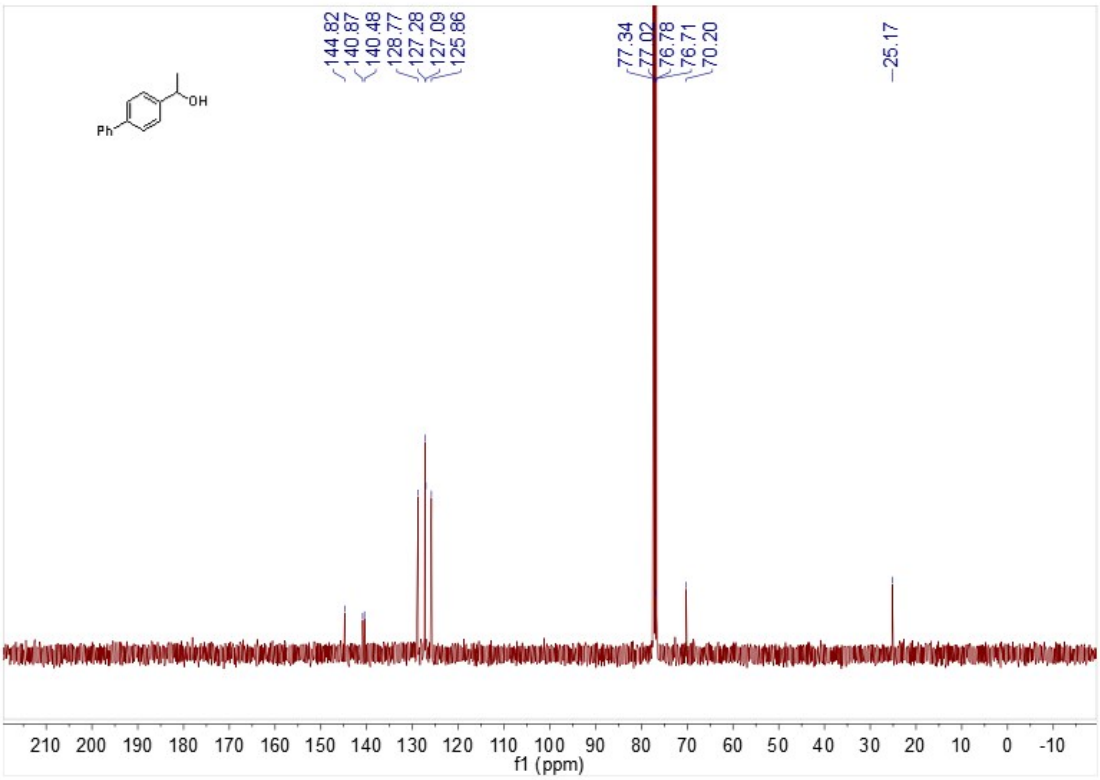
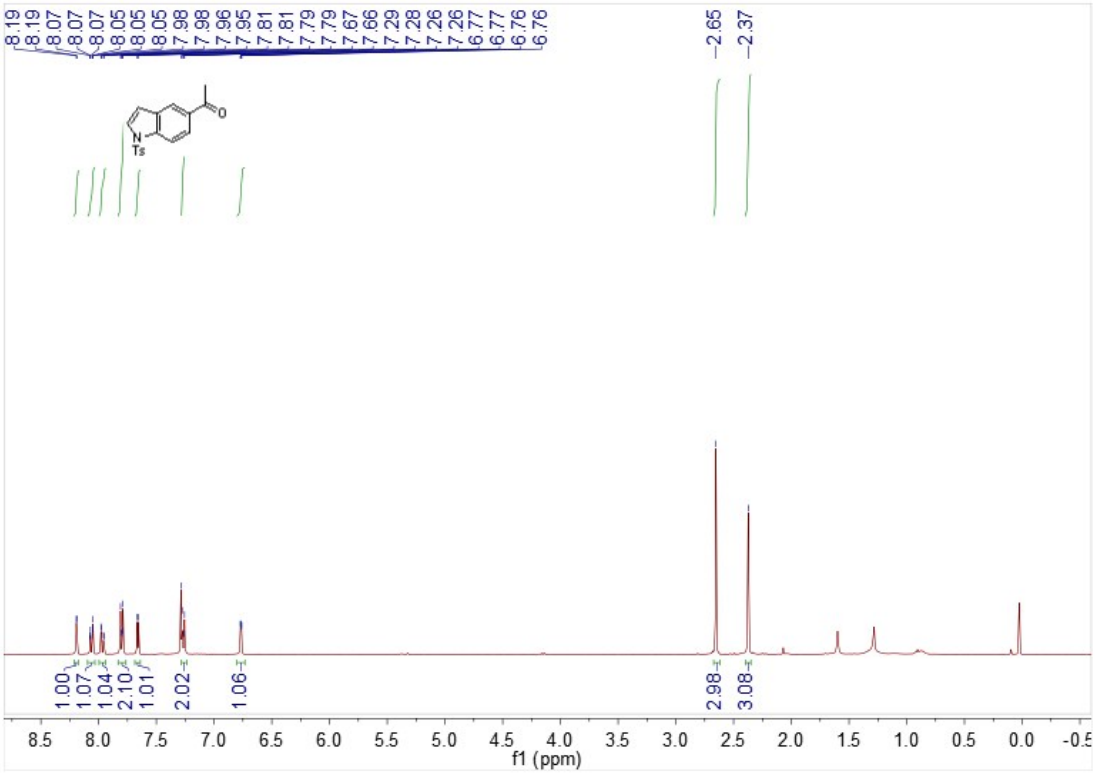
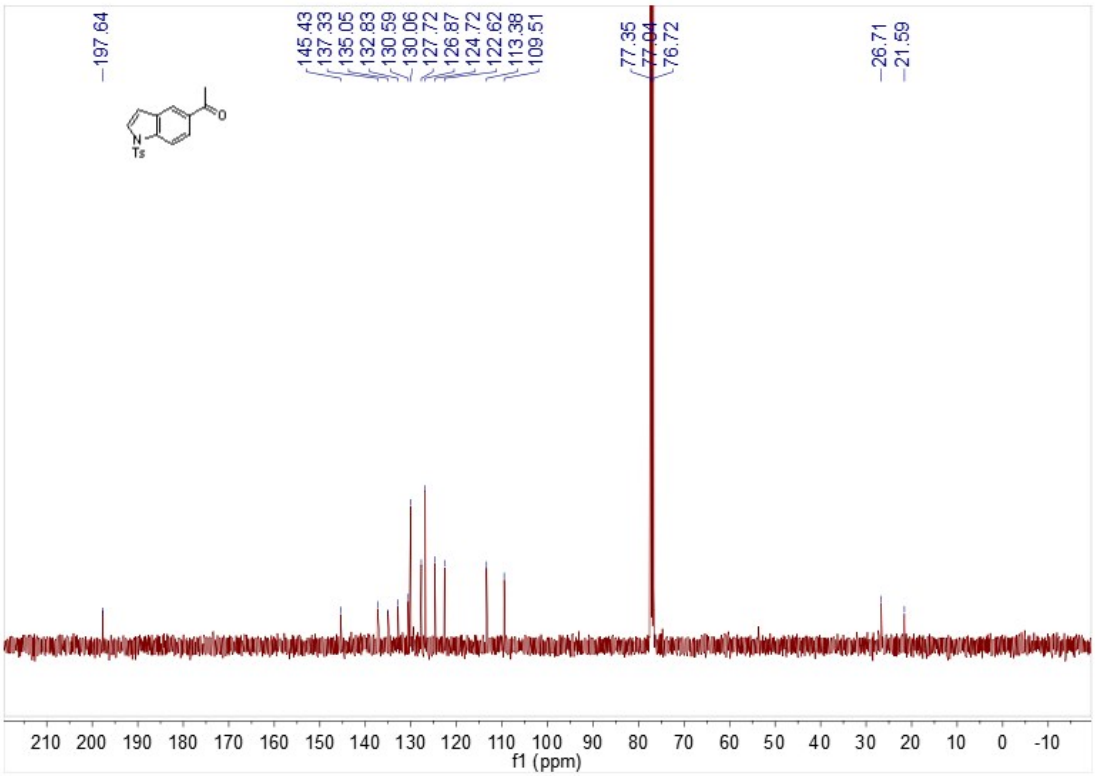


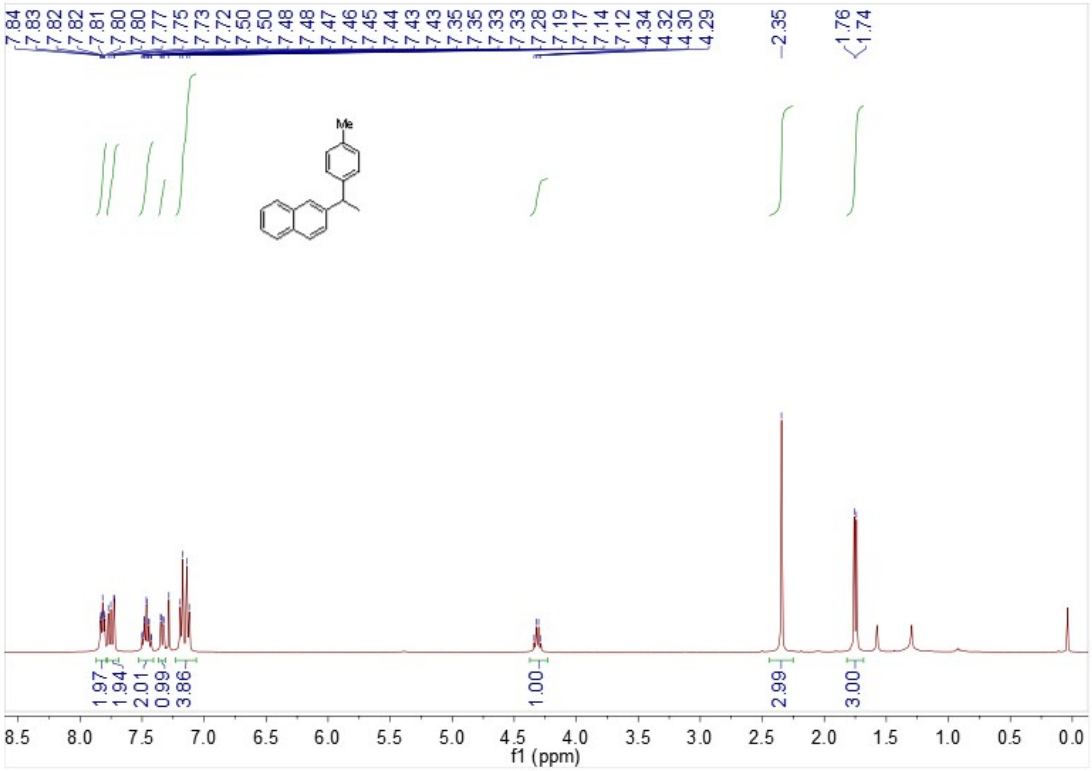
^{1}H NMR of compound 5



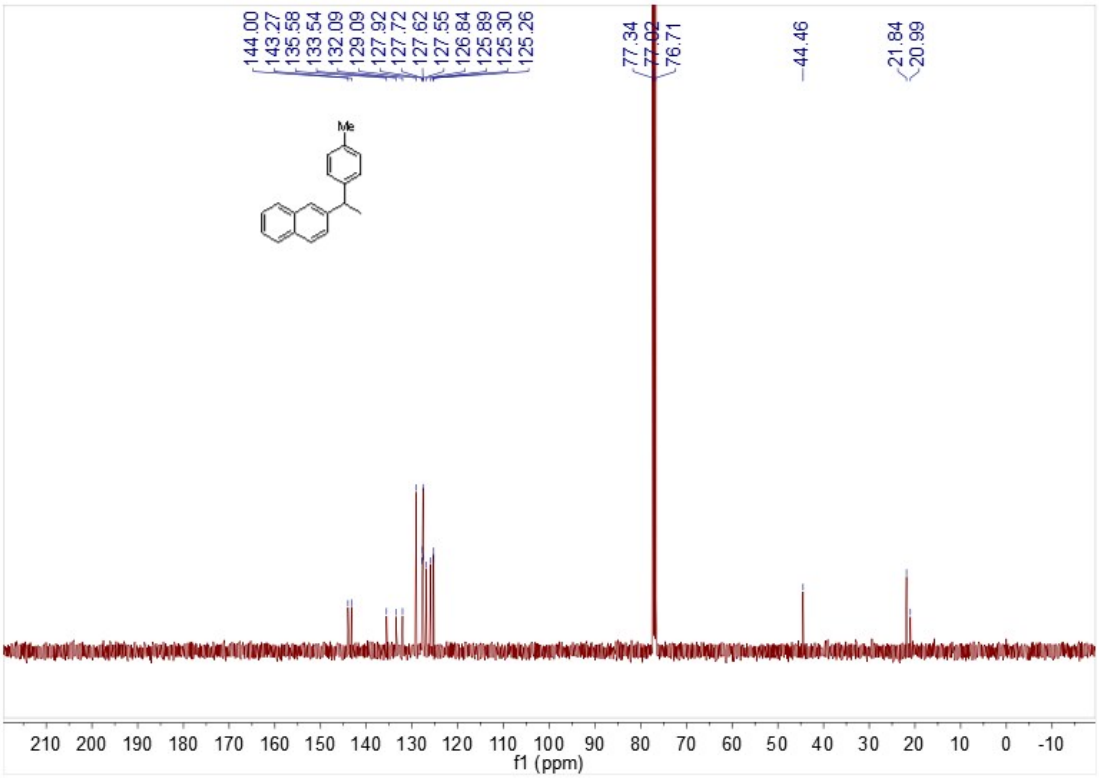
^{13}C NMR of compound 5



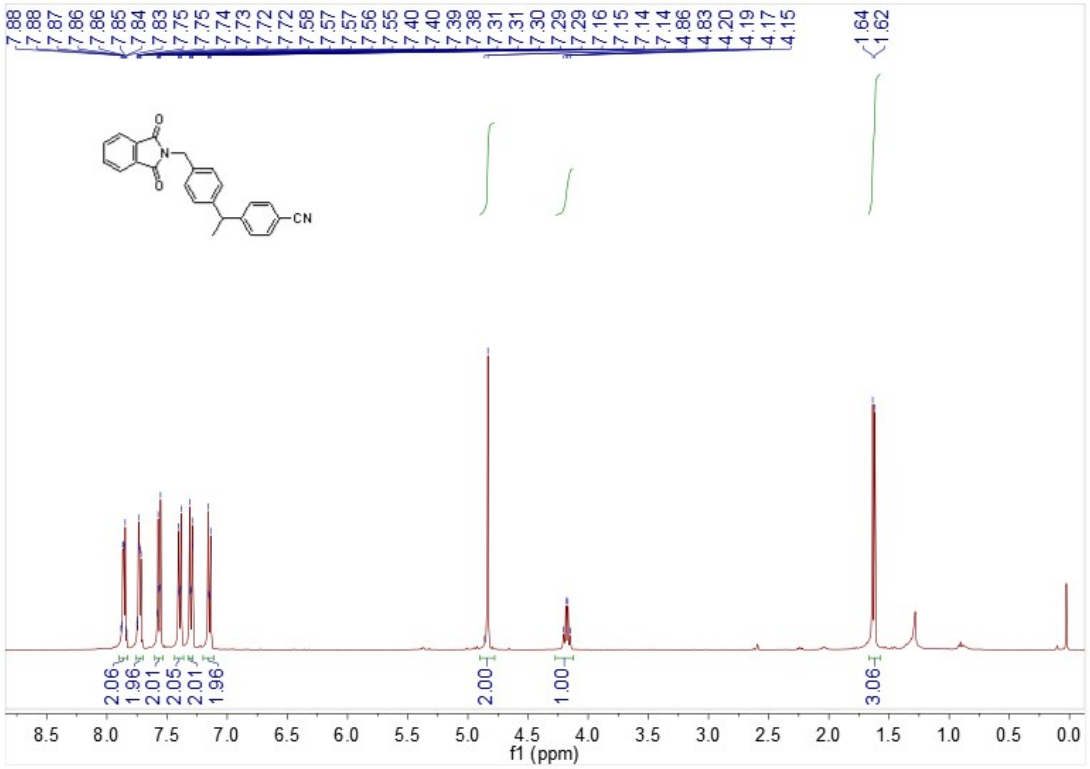
^{1}H NMR of compound 6



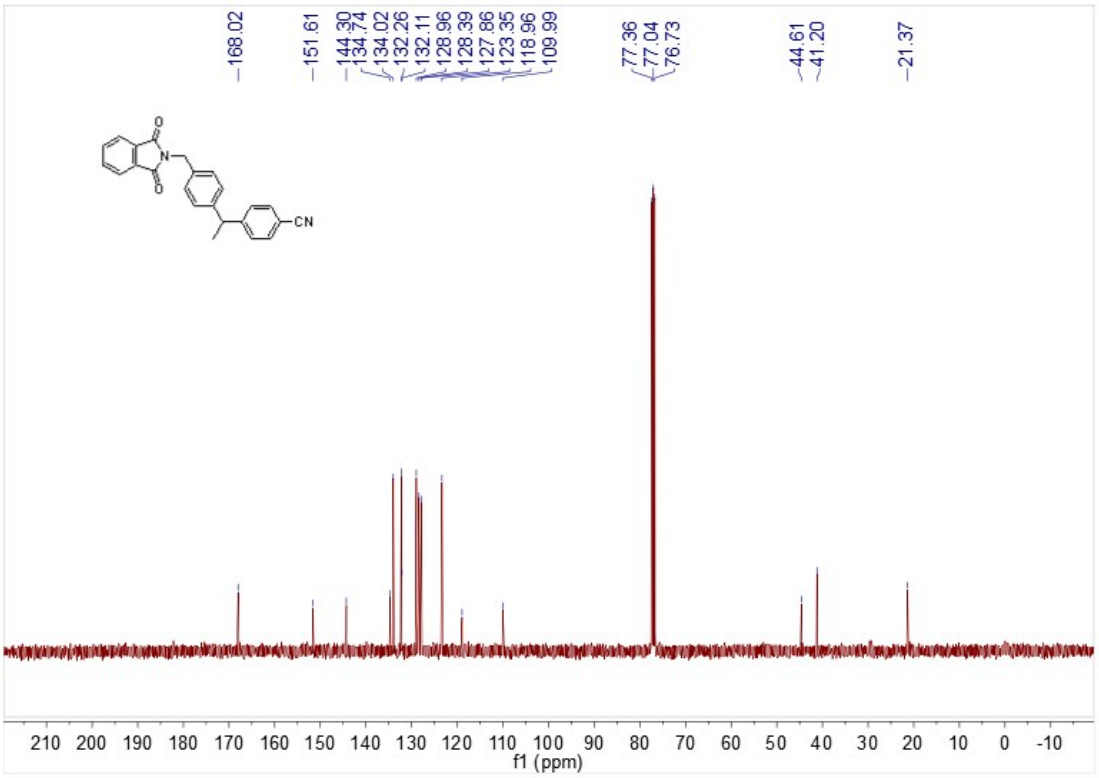
^{13}C NMR of compound 6



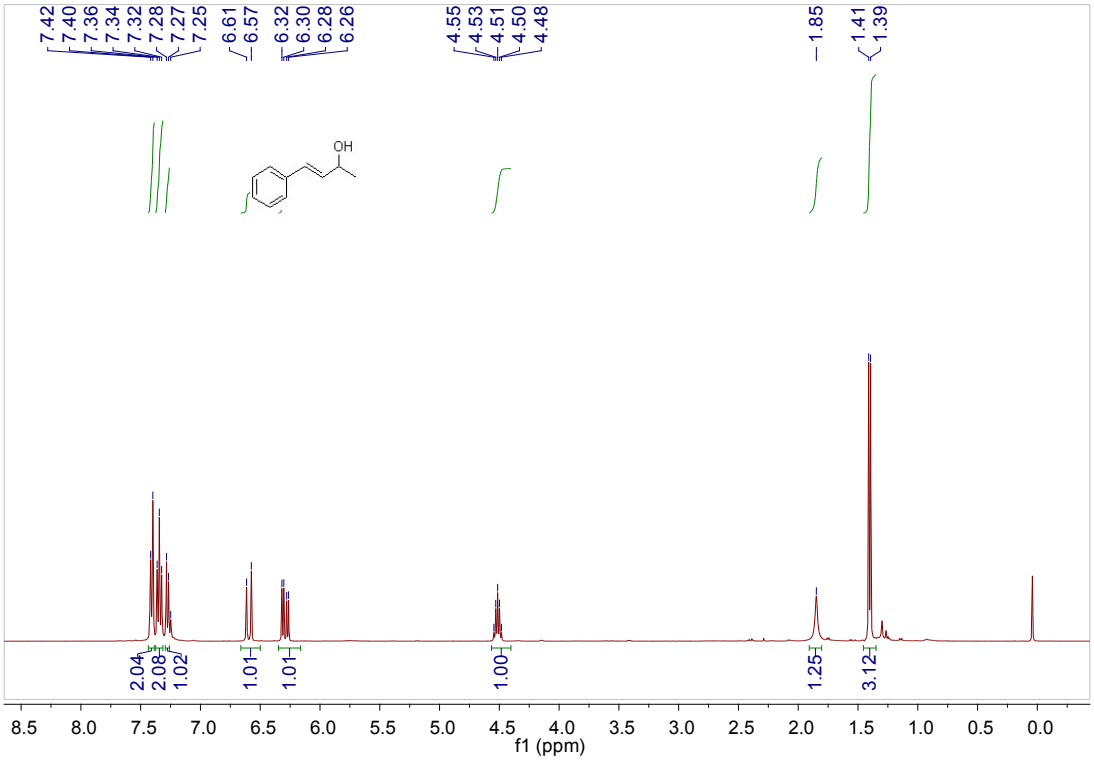
^{1}H NMR of compound 7



^{13}C NMR of compound 7



^{1}H NMR of compound 9



^{13}C NMR of compound 9