Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information for

Ligand-free, Catalytic and Regioselective Hydroboration of Selenoalkynes

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SUPPORTING INFORMATION

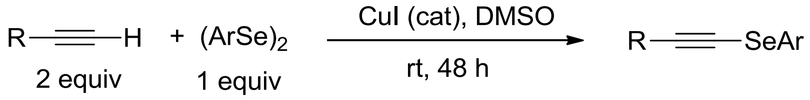
CONTENTS

1. General Information

Unless otherwise stated, all glassware was dried before use and all reactions were performed under an atmosphere of argon. When necessary, solvents were distilled from appropriate drying agents prior to use. All reagents were used as received from commercial suppliers unless otherwise stated. Reaction progress was monitored by thin layer chromatography (TLC) performed on aluminum plates coated with silica gel F254 with 0.2 mm thickness. Chromatograms were visualized by fluorescence quenching with UV light at 254 nm or by staining using vanillin solution. Flash column chromatography was performed using silica gel 60 (230-400 mesh, Merck and co.). ESI-QTOF-MS measurements were performed in the positive ion mode (m/z 50-2000 range). IR spectra were obtained on a FTIR-ATR instrument. All ^{1}H NMR and ^{13}C NMR spectra were recorded using a 400 or 500 MHz, spectrometer at 298K (frequencies for ^{1}H). Chemical shifts were given in parts per million (ppm, δ), referenced to the solvent peak of TMS, defined at δ = 0.00 ppm (^{1}H NMR) and δ = 77.0 (^{13}C NMR), and to the peak of PhSeSePh, defined at 459.0 ppm (^{77}Se NMR). Coupling constants are quoted in Hz (*J*). ^{1}H NMR splitting patterns were designated as singlet (s), doublet (d), triplet (t), quartet (q), quintet (quint), sextet (sext) and septet (sept). Splitting patterns that could not be interpreted or easily visualized were designated as multiplet (m).

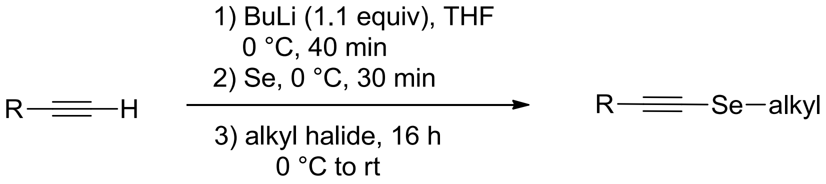
2. General Procedure for the Synthesis of the Starting Materials

Method A is based on the use of diselenides and terminal alkynes, through copper catalysis.[1]



Procedure: To a 25 mL open flask were added diselenide (1 mmol), alkyne (2 mmol), dimethylsulfoxide (8 mL) and CuI (0.1 mmol). The solution was stirred at room temperature for 48 hours. After this period, the work up was performed using NH_4Cl (saturated solution) and ethyl acetate. The crude products were purified by flash chromatography on silica with hexane.

Method B is based on the use of terminal alkynes, BuLi and selenium powder, and alkyl halides.



Procedure: To a flame-dried Schlenk flask under argon atmosphere were added dried THF (8 mL) and terminal alkyne (2 mmol). The solution was cooled to 0° C and BuLi (1.1 equiv, 2.2 mmol) was added. The reaction kept stirring for 40 minutes at 0 °C. After it, Se powder (2 mmol, 158 mg) was added slowly (2-3 portions) and the solution kept stirring for 30 minutes at 0° C. Then, the alkyl halide (1.2 equiv., 2.4 mmol) was added and the reaction kept stirring for 16 hours. After this period, the work up was performed using NH_4Cl (saturated solution) and ethyl acetate. The crude products were purified by flash chromatography on silica with hexane.

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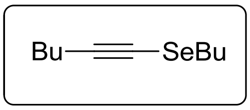
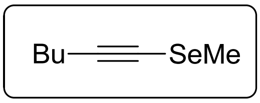
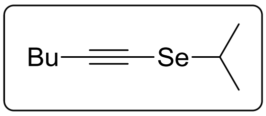
[1] Bieber, L. W.; Silva, M. F.; Menezes, P. H. *Tetrahedron Lett.* **2004**, *45*, 2735.



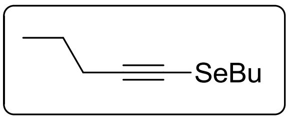
butyl(hex-1-yn-1-yl)selane (1a). Following the method B, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**72%**, 0.314 g) as a yellow oil. **^{1}H NMR (500 MHz, CDCl$_3$):** δ 2.75 (t, *J* = 7.4 Hz, 2H), 2.34 (t, *J* = 7.0 Hz, 2H), 1.77 (quint, *J* = 7.4 Hz, 2H), 1.54 - 1.47 (m, 2H), 1.47 - 1.38 (m, 4H), 0.96 – 0.89 (m, 6H). **^{13}C NMR (125 MHz, CDCl$_3$):** δ 100.3, 58.2, 32.1, 30.9, 28.6, 22.5, 21.9, 20.1, 13.54, 13.48.



hex-1-yn-1-yl(methyl)selane (1b). Following the method B, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), selenium (0.158 g, 2 mmol) and iodomethane (0.137 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**56%**, 0.197 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 2.32 (t, *J* = 7.0 Hz, 2H), 2.26 (s, 3H), 1.50 (quint, *J* = 7.0 Hz, 2H), 1.41 (sext, *J* = 7.0 Hz, 2H), 0.91 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 99.3, 59.1, 30.8, 21.9, 20.0, 13.5, 9.2.

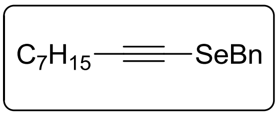


hex-1-yn-1-yl(isopropyl)selane (1c). Following the method B, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 2-chloropropane (0.21 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**30%**, 0.122 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 3.32 (hept, *J* = 6.8 Hz, 1H), 2.37 (t, *J* = 7.0 Hz, 2H), 1.60 - 1.37 (m, 10H), 0.92 (t, *J* = 7.3 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 102.4, 58.0, 34.5, 30.9, 24.0, 21.9, 20.1, 13.6.

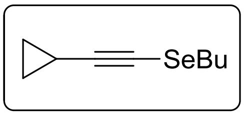


butyl(pent-1-yn-1-yl)selane (1e). Following the method B, the reaction was performed with 1-pentyne (0.2 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**65%**, 0.26 g) as a yellow oil. **^{1}H NMR**

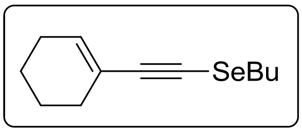
(400 MHz, $CDCl_3$): δ 2.75 (t, *J* = 7.4 Hz, 2H), 2.31 (t, *J* = 7.2 Hz, 2H), 1.78 (quint, *J* = 7.4 Hz, 2H), 1.55 (sext, *J* = 7.2 Hz, 2H), 1.44 (sext, *J* = 7.4 Hz, 2H), 0.98 (t, *J* = 7.4 Hz, 3H), 0.94 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 100.2, 58.3, 32.1, 28.5, 22.4, 22.36, 22.2, 13.5, 13.4.



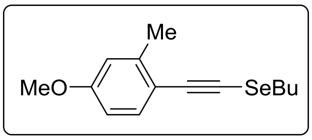
benzyl(non-1-yn-1-yl)selane (1f). Following the method A, the reaction was performed with 1-nonyne (0.33 mL, 2 mmol), dibenzyl diselenide (0.341 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**85%**, 0.5 g) as a yellow oil. **^{1}H NMR (500 MHz, $CDCl_3$):** δ 7.33 - 7.21 (m, 5H), 3.99 (s, 2H), 2.31 (t, *J* = 7.1 Hz, 2H), 1.48 (quint, *J* = 7.7 Hz, 2H), 1.35 - 1.27 (m, 8H), 0.89 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR (125 MHz, $CDCl_3$):** δ 138.0, 129.0, 128.6, 127.4, 102.6, 59.0, 32.5, 31.9, 28.94, 28.92, 28.88, 22.8, 20.6, 14.2. **IR (neat) vmax**: 2925, 2854, 1494, 1454, 1179, 756, 693, 595, 441, 422. **HRMS (ESI+):** exact mass calculated for $[M+H]^+$ ($C_{16}H_{22}Se$) requires *m*/*z* 295.0966, found: *m*/*z* 295.0942.



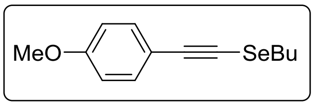
butyl(cyclopropylethynyl)selane (1g). Following the method B, the reaction was performed with phenylacetylene (0.17 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**50%**, 0.22 g) as a yellow oil. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 2.74 (t, *J* = 7.4 Hz, 2H), 1.76 (quint, *J* = 7.4 Hz, 2H), 1.49 – 1.32 (m, 3H), 0.93 (t, *J* = 7.4 Hz, 3H), 0.81 - 0.68 (m, 4H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 103.8, 54.3, 32.1, 28.7, 22.4, 13.5, 8.7, 1.0.



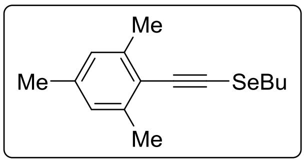
(cyclohex-1-en-1-ylethynyl)(butyl)selane (1h). Following the method B, the reaction was performed with 1-ethynylcyclohexene (0.23 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**65%**, 0.314 g) as a yellow oil. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 6.09 – 6.04 (m, 1H), 2.78 (t, *J* = 7.4 Hz, 2H), 2.15 – 2.06 (m, 4H), 1.78 (quint, *J* = 7.4 Hz, 2H), 1.66 – 1.50 (m, 4H), 1.49 – 1.38 (m, 2H), 0.93 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 134.6, 121.1, 101.3, 66.8, 32.1, 29.2, 29.1, 25.6, 22.4, 22.3, 21.4, 13.5.



butyl((4-methoxy-2-methylphenyl)ethynyl)selane (1i). Following the method B, the reaction was performed with 1-ethynyl-4-methoxy-2-methylbenzene (0.29 g, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**73%**, 0.41 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.32 (d, *J* = 8.5 Hz, 1H), 6.72 (d, *J* = 2.7 Hz, 1H), 6.66 (dd, *J* = 8.5, 2.7 Hz, 1H), 3.78 (s, 3H), 2.86 (t, *J* = 7.4 Hz, 2H), 2.41 (s, 3H), 1.85 (quint, *J* = 7.4 Hz, 2H), 1.48 (sext, *J* = 7.4 Hz, 2H), 0.95 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 159.3, 142.1, 133.3, 115.9, 114.9, 111.1, 98.1, 71.8, 55.2, 32.2, 29.4, 22.5, 21.0, 13.5.

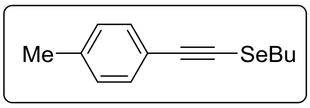


butyl((4-methoxyphenyl)ethynyl)selane (1j). Following the method B, the reaction was performed with 1-ethynyl-4-methoxybenzene (0.26 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**42%**, 0.22 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.37 (d, *J* = 8.5 Hz, 2H), 6.82 (d, *J* = 8.6 Hz, 2H), 3.81 (s, 3H), 2.86 (t, *J* = 7.4 Hz, 2H), 1.84 (quint, *J* = 7.4 Hz, 2H), 1.48 (sext, *J* = 7.4 Hz, 2H), 0.95 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 159.5, 133.2, 115.8, 113.9, 113.8, 99.1, 68.4, 55.2, 32.2, 29.3, 22.5, 13.5.

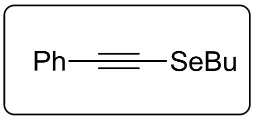


butyl(mesitylethynyl)selane (1k). Following the method B, the reaction was performed with 2-ethynyl-1,3,5-trimethylbenzene (0.31 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**70%**, 0.39 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 6.84 (s, 2H), 2.87 (t, *J* = 7.4 Hz, 2H), 2.38 (s, 6H), 2.26 (s, 3H), 1.88 (quint, *J* = 7.5

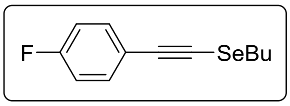
Hz, 2H), 1.48 (sext, *J* = 7.5 Hz, 2H), 0.95 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 140.0, 137.3, 127.5, 120.6, 97.2, 76.9, 32.3, 29.6, 22.5, 21.3, 21.0, 13.5.



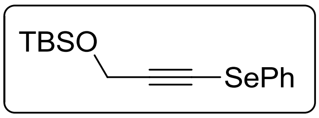
butyl(p-tolylethynyl)selane (1l). Following the method B, the reaction was performed with 1-ethynyl-4-methylbenzene (0.22 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**72%**, 0.36 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.31 (d, *J* = 8.2 Hz, 2H), 7.09 (d, *J* = 8.2 Hz, 2H), 2.86 (t, *J* = 7.4 Hz, 2H), 2.33 (s, 3H), 1.84 (quint, *J* = 7.4 Hz, 2H), 1.47 (sext, *J* = 7.4 Hz, 2H), 0.95 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 138.1, 131.4, 128.9, 120.6, 99.4, 69.4, 32.2, 29.3, 22.4, 21.4, 13.5.



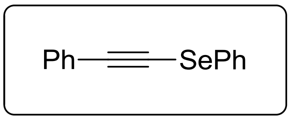
butyl(phenylethynyl)selane (1m). Following the method B, the reaction was performed with phenylacetylene (0.22 mL, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**80%**, 0.38 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.43 – 7.39 (m, 2H), 7.31 – 7.26 (m, 3H), 2.88 (t, *J* = 7.4 Hz, 2H), 1.85 (quint, *J* = 7.4 Hz, 2H), 1.48 (sext, *J* = 7.4 Hz, 2H), 0.96 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 131.4, 128.2, 127.9, 123.7, 99.3, 70.5, 32.2, 29.3, 22.5, 13.5.



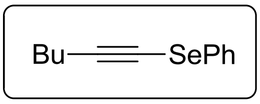
butyl((4-fluorophenyl)ethynyl)selane (1n). Following the method B, the reaction was performed with 1-ethynyl-4-fluorobenzene (0.24 g, 2 mmol), selenium (0.158 g, 2 mmol) and 1-bromobutane (0.238 mL, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**83%**, 0.42 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.42 – 7.36 (m, 2H), 7.02 – 6.95 (m, 2H), 2.88 (t, *J* = 7.4 Hz, 2H), 1.84 (quint, *J* = 7.4 Hz, 2H), 1.48 (sext, *J* = 7.4 Hz, 2H), 0.96 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 162.3 (d, *J* = 249.3 Hz), 133.4 (d, *J* = 8.3 Hz), 119.8 (d, *J* = 3.5 Hz), 115.5 (d, *J* = 22.1 Hz), 98.2, 70.2 (d, J = 1.6 Hz), 32.2, 29.3, 22.5, 13.5. **^{19}F NMR (376 MHz, CDCl$_3$):** δ -111.1.



tert-butyldimethyl ((3-(phenylselanyl)prop-2-yn-1-yl)oxy)silane (1o). Following the method A, the reaction was performed with propargyl alcohol (0.12 mL, 2 mmol), diphenyl diselenide (0.314 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using 100% hexane to 90:10 hexane/ethyl acetate) afforded the compound 3-(phenylselanyl)prop-2-yn-1-ol **1s** in (**87%**, 0.37 g) as a yellow oil. Next, the protection reaction was performed with selenoacetylene **1s** (0.21 g, 1 mmol), *tert*-butyl(chloro)dimethylsilane (0.181 g, 1.2 mmol) and triethylamine (0.17 mL, 1.2 mmol) in DCM (3 mL). Purification by flash column chromatography (using 100% hexane to 90:10 hexane/ethyl acetate) afforded the tittle compound in (**76%,** 0.25 g) as a yellow oil.**^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.57 – 7.53 (m, 2H), 7.35 – 7.30 (m, 2H), 7.30 – 7.25 (m, 1H), 4.55 (s, 2H), 0.94 (s, 9H), 0.16 (s, 6H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 129.4, 129.2, 128.4, 127.1, 102.6, 65.0, 52.8, 25.8, 18.3, -5.1.

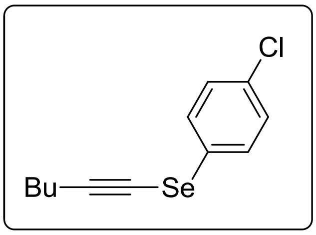


phenyl(phenylethynyl)selane (1p). Following the method B, the reaction was performed with phenylacetylene (0.22 mL, 2 mmol), and PhSeBr (0.52 g, 2.2 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**73%**, 0.38 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.62 – 7.56 (m, 2H), 7.53 – 7.46 (m, 2H), 7.36 – 7.21 (m, 6H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 131.7, 129.5, 129.0, 128.9, 128.5, 128.3, 127.1, 123.1, 102.9, 69.2.

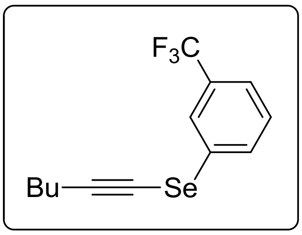


hex-1-yn-1-yl(phenyl)selane (1r). Following the method A, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), diphenyl diselenide (0.314 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**85%**, 0.405 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.54 – 7.49 (m, 2H), 7.33 – 7.27 (m, 2H), 7.25 – 7.20 (m, 1H), 2.46 (t, J = 7.0

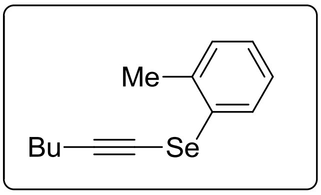
Hz, 2H), 1.62 – 1.54 (m, 2H), 1.46 (sext, *J* = 7.0 Hz, 2H), 0.93 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 129.35, 129.33, 128.6, 126.7, 104.7, 57.3, 30.8, 22.0, 20.2, 13.6.



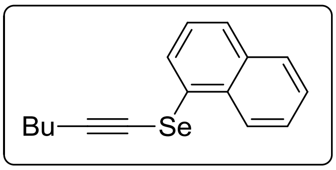
(4-chlorophenyl)(hex-1-yn-1-yl)selane (1s) Following the method A, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), 1,2-bis(4-chlorophenyl)diselane (0.382 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**84%**, 0.457 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.44-7.40 (m, 2H), 7.26-7.23 (m, 2H), 2.44 (t, *J* = 7.0 Hz, 2H), 1.60-1.53 (m, 2H), 1.47-1.39 (m, 2H), 0.92 (t, *J* = 7.3 Hz, 3H). **^{13}C NMR (125 MHz, CDCl$_3$):** δ 132.7, 129.8, 129.3, 127.5, 105.1, 56.9, 30.6, 21.9, 20.2, 13.5. **IR (neat) vmax**: 2956, 2929, 2870, 1473, 1388, 1089, 1064, 1009, 808, 489, 465, 429. **HRMS (ESI+):** exact mass calculated for [M+Na]$^+$ ($C_{12}H_{13}ClSe$) requires *m*/*z* 294.9769, found: *m*/*z* 294.9797.



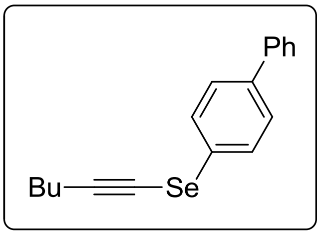
hex-1-yn-1-yl(3-(trifluoromethyl)phenyl)selane (1t). Following the method A, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), 1,2-bis(3-(trifluoromethyl)phenyl)diselane (0.450 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**92%**, 0.587 g) as a yellow oil. **^{1}H NMR (300 MHz, CDCl$_3$)** δ 7.80 (s, 1H), 7.66 (d, *J* = 7.7 Hz, 1H), 7.48 (d, *J* = 7.7 Hz, 1H), 7.40 (t, *J* = 7.7 Hz, 1H), 2.49 (t, *J* = 6.9 Hz, 2H), 1.68 – 1.40 (m, 4H), 0.94 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR (125 MHz, CDCl$_3$)** δ 131.7 (q, *J* = 32.5 Hz), 131.4, 130.1, 129.5, 125.0 (q, *J* = 3.9 Hz), 123.8 (q, *J* = 272.7 Hz) 123.4 (q, *J* = 3.8 Hz), 106.3, 56.3, 30.6, 21.9, 20.2, 13.5. **IR (neat) vmax**: 2960, 2922, 2870, 2190, 1599, 1430, 1319, 1125, 790, 470, 450, 441. **HRMS (ESI+):** exact mass calculated for [M+Na]$^+$ ($C_{13}H_{13}F_3Se$) requires *m*/*z* 329.0032, found: *m*/*z* 329.0048.



hex-1-yn-1-yl(o-tolyl)selane (1u). Following the method A, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), 1,2-di-o-tolyldiselane (0.340 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**89%**, 0.448 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.78 – 7.72 (m, 1H), 7.21 – 7.10 (m, 3H), 2.48 (t, *J* = 7.0 Hz, 2H), 2.28 (s, 3H), 1.68 – 1.43 (m, 4H), 0.95 (t, *J* = 7.3 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$)** δ 136.3, 130.2, 130.1, 128.9, 127.1, 126.9, 104.9, 57.4, 30.9, 22.1, 20.9, 20.4, 13.7. **IR (neat) vmax:** 2956, 2929, 2870, 1591, 1570, 1464, 1032, 741, 656, 448, 416. **HRMS (ESI+):** exact mass calculated for $[M+Na]^+$ ($C_{13}H_{16}Se$) requires *m*/*z* 275.0315, found: *m*/*z* 275.0345.

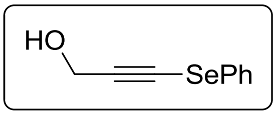


hex-1-yn-1-yl(naphthalen-1-yl)selane (1v). Following the method A, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), 1,2-di(naphthalen-1-yl)diselane (0.412 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**47%**, 0.27 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 8.01 – 7.94 (m, 2H), 7.88 – 7.84 (m, 1H), 7.78 (d, *J* = 8.2 Hz, 1H), 7.59 – 7.50 (m, 2H), 7.47 – 7.42 (m, 1H), 2.48 (t, *J* = 7.0 Hz, 2H), 1.64 – 1.56 (m, 2H), 1.53 – 1.42 (m, 2H), 0.95 (t, *J* = 7.3 Hz, 3H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 133.8, 131.9, 128.6, 128.1, 127.8, 127.7, 126.5, 126.3, 126.2, 125.2, 104.8, 57.2, 30.7, 21.9, 20.3, 13.6.

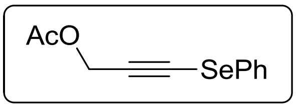


[1,1'-biphenyl]-4-yl(hex-1-yn-1-yl)selane (1w). Following the method A, the reaction was performed with 1-hexyne (0.23 mL, 2 mmol), 1,2-di([1,1'-biphenyl]-4-yl)diselane (0.466 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using hexane) afforded the title compound in (**80%**, 0.502 g) as a yellow oil. **^{1}H NMR (500 MHz, CDCl$_3$)** δ 7.64 - 7.58 (m, 4H), 7.57 – 7.53 (m, 2H), 7.46 (t, *J* = 7.6 Hz, 2H), 7.39 – 7.35 (m, 1H), 2.50 (t, *J* = 7.1 Hz, 2H), 1.66 – 1.58 (m, 2H), 1.50 (quint, *J* = 7.2 Hz, 2H), 0.97 (t, *J* = 7.3 Hz, 3H). **^{13}C**

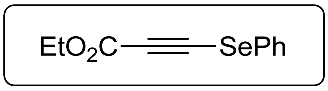
NMR (125 MHz, $CDCl_3$) δ 140.5, 140.0, 129.2, 129.0, 128.5, 128.2, 127.6, 127.1, 104.9, 57.5, 30.9, 22.1, 20.4, 13.7. **IR (neat) vmax:** 2955, 2928, 2869, 1477, 1393, 1072, 1004, 824, 755, 694, 465. **HRMS (ESI+):** exact mass calculated for $[M+H]^+$ ($C_{18}H_{18}Se$) requires *m*/*z* 315.0653, found: *m*/*z* 315.0627.



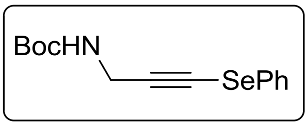
3-(phenylselanyl)prop-2-yn-1-ol (1x). Following the method A, the reaction was performed with propargyl alcohol (0.12 mL, 2 mmol), diphenyl diselenide (0.314 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using 100% hexane to 90:10 hexane/ethyl acetate) afforded the tittle compound in (**87%**, 0.37 g) as a yellow oil. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.57 – 7.49 (m, 2H), 7.36 – 7.26 (m, 2H), 7.29 – 7.20 (m, 1H), 4.46 (s, 2H), 2.27 (s, 1H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 129.4, 129.1, 128.0, 127.1, 102.0, 66.1, 51.8.



3-(phenylselanyl)prop-2-yn-1-yl acetate (1y). Following the method A, the reaction was performed with propargyl acetate (0.2 mL, 2 mmol), diphenyl diselenide (0.314 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using 100% hexane to 90:10 hexane/ethyl acetate) afforded the tittle compound in (**67%**, 0.33 g) as a yellow oil. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.56 – 7.48 (m, 2H), 7.37 – 7.28 (m, 2H), 7.29 – 7.21 (m, 1H), 4.88 (s, 2H), 2.09 (s, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 170.1, 129.5, 129.2, 127.8, 127.2, 97.8, 67.9, 53.0, 20.6.

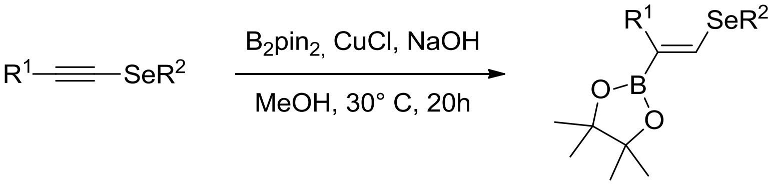


ethyl 3-(phenylselanyl)propiolate (1z). Following the method A, the reaction was performed with ethyl propiolate (0.2 mL, 2 mmol), diphenyl diselenide (0.314 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using 100% hexane to 90:10 hexane/ethyl acetate) afforded the tittle compound in (**94%**, 0.475 g) as a yellow oil. **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.58 – 7.54 (m, 2H), 7.40 – 7.30 (m, 3H), 4.26 (q, *J* = 7.1 Hz, 2H), 1.32 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 152.6, 130.2, 129.9, 128.2, 126.0, 96.3, 74.8, 62.0, 14.1.



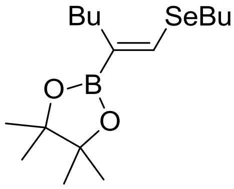
***tert-butyl (3-(phenylselanyl)prop-2-yn-1-yl)carbamate* (1aa).** Following the method A, the reaction was performed with *tert*-butyl prop-2-yn-1-ylcarbamate (0.31 g, 2 mmol), diphenyl diselenide (0.314 g, 1 mmol) and copper iodine (19 mg, 0.1 mmol). Purification by flash column chromatography (using 100% hexane to 80:20 hexane/ethyl acetate) afforded the tittle compound in (**64%**, 0.397 g) as a yellow oil. **^{1}H NMR (400 MHz, CDCl$_3$):** δ 7.54 – 7.48 (m, 2H), 7.34 – 7.22 (m, 3H), 4.84 (s, 1H), 4.16 (d, *J* = 4.6 Hz, 2H), 1.46 (s, 9H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ 155.2, 129.5, 129.0, 128.2, 127.1, 99.8, 80.0, 62.9, 31.9, 28.3.

3. General procedure for the hydroboration of selenoalkynes



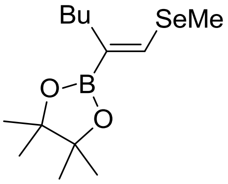
To a Schlenk flask under argon atmosphere were added B$_2$pin$_2$ (0.45 mmol, 115 mg, 1.5 equiv), CuCl (0.06 mmol, 6 mg, 20 mol%) and NaOH (0.6 mmol, 24 mg, 2 equiv). Next, selenoalkyne (0.3 mmol, 1 equiv) was solubilized in MeOH (1.5 mL) and added to the Schlenk. The reaction kept stirring for 20 h at 30° C. After this period, the crude was filtered and purified on column chromatography using hexane and ethyl acetate as eluent.

(*Z*)-2-(1-(butylselanyl)hex-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2a**)



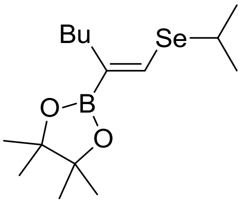
Following the general procedure, the reaction was performed using 65 mg of the selenoalkyne **1a**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **98%** yield, 101 mg, as a yellow solid. **^{1}H NMR** (400 MHz, CDCl$_3$) δ 7.27 (s, 1H), 2.76 (t, *J* = 7.4 Hz, 2H), 2.15 (t, *J* = 7.3 Hz, 2H), 1.69 (quint, *J* = 7.4 Hz, 2H), 1.45 – 1.30 (m, 6H), 1.24 (s, 12H), 0.95 – 0.87 (m, 6H). **^{13}C NMR** (100 MHz, CDCl$_3$) δ 139.5, 83.1, 33.1 (2C), 30.8, 26.5, 24.7, 22.8, 22.7, 14.1, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.0. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 255.5. **IR** (ν_{max}, cm^{-1}): 2957, 2928, 1568, 1365, 1144, 962, 833, 674. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{16}H_{31}BNaO_2Se$) requires *m*/*z* 369.1480, found: *m*/*z* 369.1477.

(*Z*)-4,4,5,5-tetramethyl-2-(1-(methylselanyl)hex-1-en-2-yl)-1,3,2-dioxaborolane (**2b**)



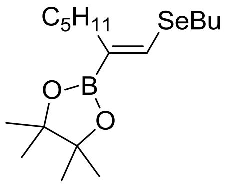
Following the general procedure, the reaction was performed using 52.5 mg of the selenoalkyne **1b**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **53%** yield, 48.2 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.24 (s, 1H), 2.20 (s, 3H), 2.15 (t, *J* = 7.2 Hz, 2H), 1.43 – 1.29 (m, 4H), 1.25 (s, 12H), 0.90 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 140.4, 83.2, 33.0, 30.8, 24.7, 22.6, 14.1, 6.4 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.14. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 169.58. **IR** (ν_{max}, cm^{-1}): 2926, 2870, 1569, 1365, 1306, 1144, 962, 858, 674. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{13}H_{25}BNaO_2Se$) requires *m*/*z* 327.1013, found: *m*/*z* 327.1016.

(*Z*)-2-(1-(isopropylselanyl)hex-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2c**)



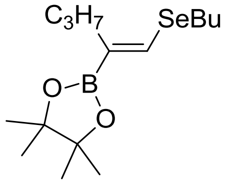
Following the general procedure, the reaction was performed using 61 mg of the selenoalkyne **1c**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **51%** yield, 50.7 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.35 (s, 1H), 3.31 (sept, *J* = 6.9 Hz, 1H), 2.14 (t, *J* = 7.6 Hz, 2H), 1.48 (d, *J* = 6.9 Hz, 6H), 1.42 – 1.27 (m, 4H), 1.25 (s, 12H), 0.90 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 138.1, 83.1, 33.2, 32.2, 30.9, 24.9, 24.7, 22.7, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.14. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 378.5. **IR** (ν_{max}, cm^{-1}): 2955, 2925, 1566, 1364, 1304, 1144, 1120, 858, 670. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{15}H_{29}BNaO_2Se$) requires *m*/*z* 355.1327, found: *m*/*z* 355.1330.

(*Z*)-2-(1-(butylselanyl)hept-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2d**)



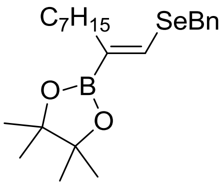
Following the general procedure, the reaction was performed using 69 mg of the selenoalkyne **1d**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **90%** yield, 97 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.28 (s, 1H), 2.77 (t, *J* = 7.5 Hz, 2H), 2.15 (t, *J* = 7.7 Hz, 2H), 1.70 (quint, *J* = 7.5 Hz, 2H), 1.47 – 1.37 (m, 4H), 1.32 – 1.28 (m, 4H), 1.25 (s, 12H), 0.92 (t, *J* = 7.4 Hz, 3H), 0.88 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 139.5, 83.1, 33.3, 33.1, 31.7, 28.2, 26.4, 24.6, 22.8, 22.6, 14.0, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.33. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 255.5. **IR** (v_{max}, cm^{-1}): 2957, 2928, 1565, 1362, 1304, 1144, 962, 858, 672. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{17}H_{33}BNaO_2Se$) requires *m*/*z* 383.1641, found: *m*/*z* 383.1639.

(*Z*)-2-(1-(butylselanyl)pent-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2e**)



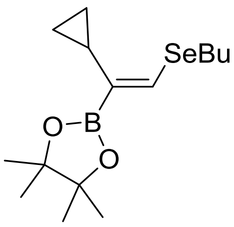
Following the general procedure, the reaction was performed using 61 mg of the selenoalkyne **1e**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **96%** yield, 95.4 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.30 (s, 1H), 2.77 (t, *J* = 7.5 Hz, 2H), 2.13 (t, *J* = 7.6 Hz, 2H), 1.71 (quint, *J* = 7.5 Hz, 2H), 1.48 – 1.36 (m, 4H), 1.25 (s, 12H), 0.95 – 0.88 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 139.8, 83.1, 35.3, 33.1, 26.4, 24.6, 22.8, 21.8, 14.0, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.18. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 256.3. **IR** (v_{max}, cm^{-1}): 2958, 2928, 1567, 1364, 1303, 1144, 1117, 962, 861, 672. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{15}H_{30}BO_2Se$) requires *m*/*z* 333.1508, found: *m*/*z* 333.1503.

(*Z*)-2-(1-(benzylselanyl)non-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2f**)



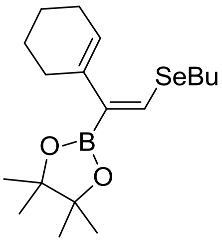
Following the general procedure, the reaction was performed using 88 mg of the selenoalkyne **1f**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **96%** yield, 121.3 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.38 (s, 1H), 7.35 – 7.26 (m, 4H), 7.24 – 7.18 (m, 1H), 4.02 (s, 2H), 2.12 (t, *J* = 7.7 Hz, 2H), 1.42 – 1.33 (m, 2H), 1.30 – 1.22 (m, 20H), 0.86 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 138.8, 138.7, 128.8, 128.6, 126.9, 83.2, 33.4, 31.8, 30.0, 29.5, 29.2, 28.6, 24.7, 22.6, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.16. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 325.4. **IR** (ν_{max}, cm^{-1}): 2924, 2853, 1567, 1364, 1305, 1143, 1122, 861, 695, 674. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{22}H_{35}BNaO_2Se$) requires *m*/*z* 445.1798, found: *m*/*z* 445.1794.

(Z)-2-(2-(butylselanyl)-1-cyclopropylvinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2g**)



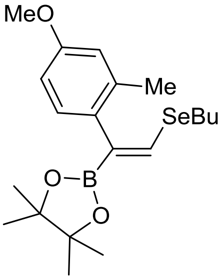
Following the general procedure, the reaction was performed using 60.3 mg of the selenoalkyne **1g**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **35%** yield, 34.6 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.29 (d, *J* = 1.0 Hz, 1H), 2.80 (t, *J* = 7.5 Hz, 2H), 1.73 (quint, *J* = 7.5 Hz, 2H), 1.48 – 1.34 (m, 3H), 1.22 (s, 12H), 0.93 (t, *J* = 7.5 Hz, 3H), 0.77 – 0.66 (m, 4H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 140.0, 82.9, 33.1, 26.7, 24.6, 22.8, 15.5, 13.6, 6.2 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 28.82. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 262.3. **IR** (ν_{max}, cm^{-1}): 2955, 2928, 1561, 1362, 1304, 1144, 962, 858, 680. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{15}H_{27}BNaO_2Se$) requires *m*/*z* 353.1167, found: *m*/*z* 353.1165.

(*Z*)-2-(2-(butylselanyl)-1-(cyclohex-1-en-1-yl)vinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2h**)



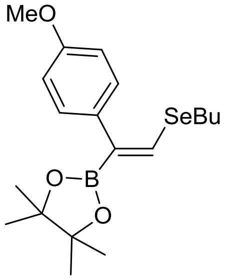
Following the general procedure, the reaction was performed using 72.4 mg of the selenoalkyne **1h**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **65%** yield, 72 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.28 (s, 1H), 5.56 – 5.52 (m, 1H), 2.71 (t, *J* = 7.6 Hz, 2H), 2.13 – 2.08 (m, 4H), 1.74 – 1.59 (m, 6H), 1.41 (sext, *J* = 7.6 Hz, 2H), 1.25 (s, 12H), 0.92 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 139.8, 139.5, 124.5, 83.1, 32.9, 27.8, 26.8, 25.0, 24.6, 22.9, 22.1, 14.1, 13.6 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 28.91. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 279.0. **IR** (ν_{max}, cm^{-1}): 2926, 2856, 1545, 1363, 1143, 962, 858, 685. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{18}H_{31}BNaO_2Se$) requires *m*/*z* 393.1484, found: *m*/*z* 393.1487.

(*Z*)-2-(2-(butylselanyl)-1-(4-methoxy-2-methylphenyl)vinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2i**)



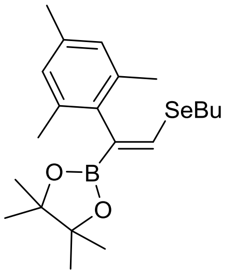
Following the general procedure, the reaction was performed using 84 mg of the selenoalkyne **1i**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **86%** yield, 106 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.69 (s, 1H), 6.98 (d, *J* = 8.3 Hz, 1H), 6.75 – 6.67 (m, 2H), 3.76 (s, 3H), 2.74 (t, *J* = 7.5 Hz, 2H), 2.18 (s, 3H), 1.67 (quint, *J* = 7.5 Hz, 2H), 1.37 (sext, *J* = 7.5 Hz, 2H), 1.24 (s, 12H), 0.90 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 158.3, 144.2, 136.3, 133.4, 128.9, 115.5, 110.8, 83.4, 54.9, 32.9, 26.4, 24.6, 22.8, 19.9, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 28.78. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 285.7. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{20}H_{32}BO_3Se$) requires *m*/*z* 411.1610, found: *m*/*z* 411.1635.

(*Z*)-2-(2-(butylselanyl)-1-(4-methoxyphenyl)vinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2j**)



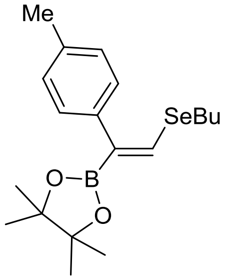
Following the general procedure, the reaction was performed using 80 mg of the selenoalkyne **1j**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **80%** yield, 95 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.28 (d, *J* = 8.8 Hz, 2H), 6.87 (d, *J* = 8.8 Hz, 2H), 3.79 (s, 3H), 2.78 (t, *J* = 7.5 Hz, 2H), 1.70 (quint, *J* = 7.5 Hz, 2H), 1.40 (sext, *J* = 7.5 Hz, 2H), 1.28 (s, 12H), 0.91 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 158.1, 141.8, 133.3, 129.3, 113.4, 83.5, 55.1, 32.8, 27.6, 24.7, 22.8, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.44. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 283.8. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{19}H_{30}BO_3Se$) requires *m*/*z* 397.1453, found: *m*/*z* 397.1466.

(*Z*)-2-(2-(butylselanyl)-1-mesitylvinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2k**)



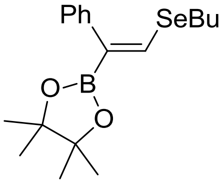
Following the general procedure, the reaction was performed using 69 mg of the selenoalkyne **1k**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **85%** yield, 104 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.72 (s, 1H), 6.85 (q, *J* = 0.6 Hz, 2H), 2.73 (t, *J* = 7.5 Hz, 2H), 2.26 (s, 3H), 2.12 (s, 6H), 1.66 (quint, *J* = 7.6 Hz, 2H), 1.37 (sext, *J* = 7.5 Hz, 2H), 1.24 (s, 12H), 0.89 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.2, 137.3, 135.7, 134.4, 128.2, 83.3, 33.1, 25.9, 24.6, 22.8, 21.2, 19.7, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 28.92. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 292.4. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{21}H_{34}BO_2Se$) requires *m*/*z* 409.1817, found: *m*/*z* 409.1830.

(*Z*)-2-(2-(butylselanyl)-1-(p-tolyl)vinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2l**)



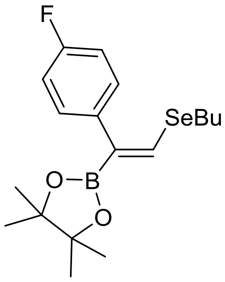
Following the general procedure, the reaction was performed using 75 mg of the selenoalkyne **1l**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **60%** yield, 68 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.65 (s, 1H), 7.23 (d, *J* = 8.1 Hz, 2H), 7.15 (d, *J* = 8.1 Hz, 2H), 2.79 (t, *J* = 7.5 Hz, 2H), 2.34 (s, 3H), 1.71 (quint, *J* = 7.5 Hz, 2H), 1.41 (sext, *J* = 7.5 Hz, 2H), 1.29 (s, 12H), 0.92 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 142.4, 137.9, 136.1, 128.7, 128.0, 83.5, 32.8, 27.6, 24.7, 22.8, 21.2, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.25. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 284.5. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{19}H_{30}BO_2Se$) requires *m*/*z* 381.1504, found: *m*/*z* 381.1500.

(*Z*)-2-(2-(butylselanyl)-1-phenylvinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2m**)



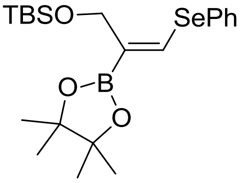
Following the general procedure, the reaction was performed using 65.2 mg of the selenoalkyne **1m**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **37%** yield, 40.5 mg, as a yellow solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (s, 1H), 7.35 – 7.30 (m, 4H), 7.24 – 7.19 (m, 1H), 2.79 (t, *J* = 7.5 Hz, 2H), 1.69 (quint, *J* = 7.5 Hz, 2H), 1.40 (sext, *J* = 7.5 Hz, 2H), 1.28 (s, 12H), 0.91 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.1, 140.9, 128.1, 128.0, 126.6, 83.6, 32.8, 27.6, 24.7, 22.8, 13.5 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.01. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 286.5. **IR** (v_{max}, cm^{-1}): 2961, 2928, 1543, 1363, 1307, 1264, 1141, 979, 856, 683. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{18}H_{27}BNaO_2Se$) requires *m*/*z* 389.1171, found: *m*/*z* 389.1176.

(*Z*)-2-(2-(butylselanyl)-1-(4-fluorophenyl)vinyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2n**)



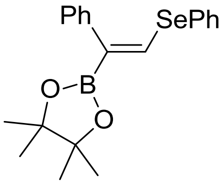
Following the general procedure, the reaction was performed using 69 mg of the selenoalkyne **1n**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **50%** yield, 58 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.67 (s, 1H), 7.29 (dd, *J* = 8.7, 5.7 Hz, 2H), 7.01 (t, *J* = 8.7 Hz, 2H), 2.80 (t, *J* = 7.4 Hz, 2H), 1.71 (quint, *J* = 7.4 Hz, 2H), 1.40 (sext, *J* = 7.4 Hz, 2H), 1.28 (s, 12H), 0.92 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 161.5 (d, *J* = 245.2 Hz), 143.3, 136.8 (d, *J* = 3.1 Hz), 129.8 (d, *J* = 7.9 Hz), 114.9 (d, *J* = 21.2 Hz), 83.7, 32.8, 27.7, 24.7, 22.8, 13.5 (*C*-B signal does not appear). **^{19}F NMR (376 MHz, $CDCl_3$):** δ -111.1. **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.11. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 286.2. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{18}H_{27}BFO_2Se$) requires *m*/*z* 385.1253, found: *m*/*z* 385.1263.

(*Z*)-tert-butyldimethyl((3-(phenylselanyl)-2-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)allyl)oxy)silane (**2o**)



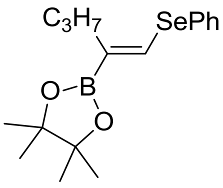
Following the general procedure, the reaction was performed using 97.6 mg of the selenoalkyne **1o**. Purification by flash column chromatography (using 100% hexane to 90:10 hexane/ethyl acetate) afforded the title compound in **85%** yield, 116 mg, as a yellow oil. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.63 – 7.60 (m, 3H), 7.33 – 7.31 (m, 3H), 4.42 (d, *J* = 1.09 Hz, 2H), 1.25 (s, 12H), 0.98 (s, 9H), 0.16 (s, 3H), 0.09 (s, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 142.5, 133.3, 132.4, 129.1, 127.4, 83.4, 63.6, 26.1, 24.7, 18.5, -5.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.14. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 413.0. **IR** (v_{max}, cm^{-1}): 2851, 1545, 1361, 1212, 1143, 962, 856, 671. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{21}H_{35}NaBO_3SeSi$) requires *m*/*z* 477.1517, found: *m*/*z* 477.1513.

(*Z*)-4,4,5,5-tetramethyl-2-(1-phenyl-2-(phenylselanyl)vinyl)-1,3,2-dioxaborolane (**2p**)



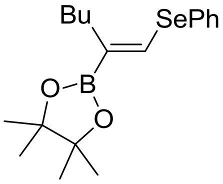
Following the general procedure, the reaction was performed using 77.1 mg of the selenoalkyne **1p**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **37%** yield, 42.8 mg, as a yellow solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.78 (s, 1H), 7.61 – 7.57 (m, 2H), 7.39 – 7.35 (m, 4H), 7.33 – 7.29 (m, 4H), 1.26 (s, 12H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.4, 140.6, 133.4, 130.8, 129.2, 128.2, 128.0, 127.7, 126.9, 83.7, 24.7 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.01. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 407.5. **IR** (ν_{max}, cm^{-1}): 2978, 2850, 1319, 742, 671, 553, 545. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{20}H_{23}BNaO_2Se$) requires *m*/*z* 409.0859, found: *m*/*z* 409.0854.

(*Z*)-4,4,5,5-tetramethyl-2-(1-(phenylselanyl)pent-1-en-2-yl)-1,3,2-dioxaborolane (**2q**)



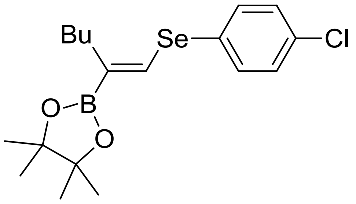
Following the general procedure, the reaction was performed using 67 mg of the selenoalkyne **1q**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **79%** yield, 83.2 mg, as a white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.59 – 7.55 (m, 2H), 7.41 (s, 1H), 7.32 – 7.27 (m, 3H), 2.22 (t, *J* = 7.8 Hz, 2H), 1.50 (sext, *J* = 7.6 Hz, 2H), 1.24 (s, 12H), 0.95 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 139.9, 133.3, 130.3, 129.1, 127.4, 83.3, 35.4, 24.7, 22.1, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.17. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 378.1. **IR** (ν_{max}, cm^{-1}): 2955, 2927, 1571, 1362, 1310, 1143, 1116, 739, 691, 667. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{17}H_{26}BO_2Se$) requires *m*/*z* 353.1195, found: *m*/*z* 353.1187.

(*Z*)-4,4,5,5-tetramethyl-2-(1-(phenylselanyl)hex-1-en-2-yl)-1,3,2-dioxaborolane (**2r**)



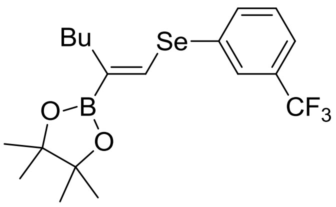
Following the general procedure, the reaction was performed using 72 mg of the selenoalkyne **1r**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **95%** yield, 104 mg, as a white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.60 – 7.53 (m, 2H), 7.39 (s, 1H), 7.31 – 7.26 (m, 3H), 2.24 (t, *J* = 7.6 Hz, 2H), 1.50 – 1.40 (m, 2H), 1.40 – 1.33 (m, 2H), 1.23 (s, 12H), 0.93 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 139.5, 133.3, 130.4, 129.1, 127.4, 83.3, 33.1, 31.0, 24.6, 22.6, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.15. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 377.3. **IR** (ν_{max}, cm^{-1}): 2921, 2852, 1570, 1364, 1142, 962, 862, 691, 672. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{18}H_{28}BO_2Se$) requires *m*/*z* 367.1352, found: *m*/*z* 367.1353.

(*Z*)-2-(1-((4-chlorophenyl)selanyl)hex-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2s**)



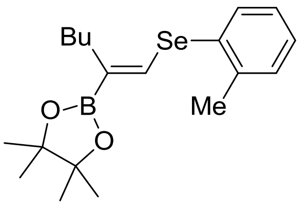
Following the general procedure, the reaction was performed using 81.5 mg of the selenoalkyne **1s**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **96%** yield, 115.1 mg, as a white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.49 (d, *J* = 8.6 Hz, 2H), 7.30 (s, 1H), 7.26 (d, *J* = 8.6 Hz, 2H), 2.23 (t, *J* = 7.6 Hz, 2H), 1.47 – 1.40 (m, 2H), 1.39 – 1.32 (m, 2H), 1.24 (s, 12H), 0.93 (t, *J* = 7.6 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 138.7, 134.6, 133.7, 129.3, 128.6, 83.4, 33.1, 31.0, 24.7, 22.6, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.11. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 373.6. **IR** (ν_{max}, cm^{-1}): 2950, 2923, 2845, 1567, 1474, 1363, 1309, 1145, 1086, 1010, 962, 822, 675. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{18}H_{26}BClNaO_2Se$) requires *m*/*z* 423.0777, found: *m*/*z* 423.0773.

(*Z*)-4,4,5,5-tetramethyl-2-(1-((3-(trifluoromethyl)phenyl)selanyl)hex-1-en-2-yl)-1,3,2-dioxaborolane (**2t**)



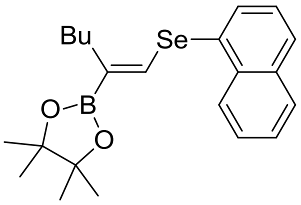
Following the general procedure, the reaction was performed using 91.6 mg of the selenoalkyne **1t**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **63%** yield, 81.9 mg, as a white solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.81 (s, 1H), 7.74 (d, *J* = 7.8 Hz, 1H), 7.54 (d, *J* = 7.8 Hz, 1H), 7.41 (t, *J* = 7.8 Hz, 1H), 7.32 (s, 1H), 2.25 (t, *J* = 7.6 Hz, 2H), 1.49 – 1.40 (m, 2H), 1.40 – 1.31 (m, 2H), 1.25 (s, 12H), 0.94 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 137.6, 136.4 (q, *J* = 0.9 Hz), 131.5, 131.4 (q, *J* = 32.5 Hz), 129.8 (q, *J* = 3.8 Hz), 129.5, 124.2 (q, *J* = 3.7 Hz), 123.7 (q, *J* = 272.8 Hz), 83.5, 33.2, 31.0, 24.7, 22.6, 14.1 (*C*-B signal does not appear). **^{19}F NMR** (376 MHz, $CDCl_3$) δ -62.6. **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.18. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 382.3. **IR** (ν_{max}, cm^{-1}): 2978, 2928, 1572, 1364, 1318, 1124, 797, 694, 674. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{19}H_{27}BF_3O_2Se$) requires *m*/*z* 435.1226, found: *m*/*z* 435.1228.

(*Z*)-4,4,5,5-tetramethyl-2-(1-(*o*-tolylselanyl)hex-1-en-2-yl)-1,3,2-dioxaborolane (**2u**)



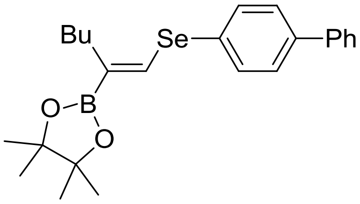
Following the general procedure, the reaction was performed using 75.4 mg of the selenoalkyne **1u**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **47%** yield, 53.5 mg, as a yellow solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.57 (d, *J* = 7.4 Hz, 1H), 7.31 (s, 1H), 7.24 – 7.18 (m, 2H), 7.17 – 7.10 (m, 1H), 2.42 (s, 3H), 2.28 (t, *J* = 7.6 Hz, 2H), 1.50 – 1.42 (m, 2H), 1.40 – 1.33 (m, 2H), 1.24 (s, 12H), 0.94 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 140.2, 139.0, 134.0, 131.2, 130.0, 127.8, 126.6, 83.3, 33.0, 31.1, 24.7, 22.8, 22.7, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.14. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 329.2. **IR** (ν_{max}, cm^{-1}): 2925, 2870, 1689, 1571, 1465, 1365, 1143, 1034, 861, 745, 671. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{19}H_{29}BNaO_2Se$) requires *m*/*z* 403.1328, found: *m*/*z* 403.1321.

(*Z*)-4,4,5,5-tetramethyl-2-(1-(naphthalen-1-ylselanyl)hex-1-en-2-yl)-1,3,2-dioxaborolane (**2v**)



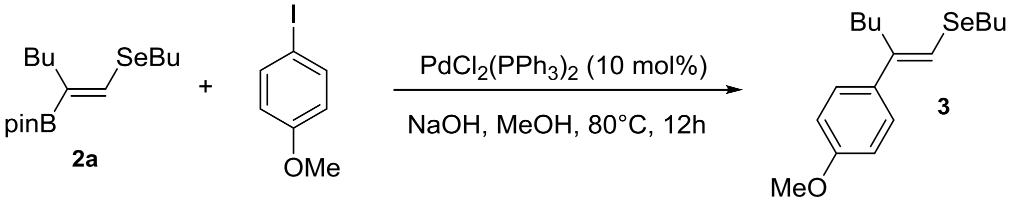
Following the general procedure, the reaction was performed using 86.2 mg of the selenoalkyne **1v**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **80%** yield, 99.6 mg, as a yellow solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.27 – 8.23 (m, 1H), 7.79 (dd, *J* = 7.1, 1.2 Hz, 1H), 7.77 – 7.72 (m, 2H), 7.50 – 7.39 (m, 2H), 7.31 (dd, *J* = 8.2, 7.1 Hz, 1H), 7.24 (s, 1H), 2.28 (t, *J* = 7.7 Hz, 2H), 1.49 – 1.40 (m, 2H), 1.38 – 1.30 (m, 2H), 1.12 (s, 12H), 0.90 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 139.7, 134.4, 134.0, 133.7, 129.4, 128.9, 128.5, 128.0, 126.7, 126.2, 125.9, 83.3, 33.1, 31.1, 24.6, 22.7, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.04. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 314.6. **IR** (ν_{max}, cm^{-1}): 2961, 2940, 1573, 1363, 1259, 1141, 1090, 1017, 862, 796, 674. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{22}H_{29}BNaO_2Se$) requires *m*/*z* 439.1329, found: *m*/*z* 439.1333.

(Z)-2-(1-([1,1'-biphenyl]-4-ylselanyl)hex-1-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2w**)



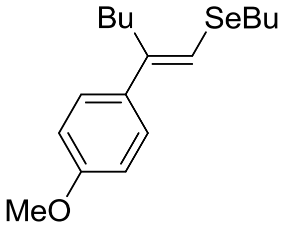
Following the general procedure, the reaction was performed using 94.2 mg of the selenoalkyne **1w**. Purification by flash column chromatography (using 100% hexane to 95:5 hexane/ethyl acetate) afforded the title compound in **47%** yield, 62.2 mg, as a yellow solid. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 8.3 Hz, 2H), 7.60 – 7.56 (m, 2H), 7.52 (d, *J* = 8.4 Hz, 2H), 7.47 – 7.41 (m, 3H), 7.38 – 7.33 (m, 1H), 2.26 (t, *J* = 7.6 Hz, 2H), 1.51 – 1.42 (m, 2H), 1.41 – 1.34 (m, 2H), 1.24 (s, 12H), 0.94 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 140.5, 140.4, 139.4, 133.6, 129.4, 128.8, 127.9, 127.5, 127.0, 83.3, 33.1, 31.0, 24.7, 22.7, 14.1 (*C*-B signal does not appear). **^{11}B NMR** (128 MHz, $CDCl_3$) δ 29.66. **^{77}Se NMR** (76 MHz, $CDCl_3$) δ 371.7. **IR** (ν_{max}, cm^{-1}): 2925, 1870, 1563, 1365, 1306, 1141, 1119, 861, 760, 674. **HRMS** (ESI+): exact mass calculated for $[M+Na]^+$ ($C_{24}H_{31}BNaO_2Se$) requires *m*/*z* 465.1486, found: *m*/*z* 465.1481.

4. Pd-catalyzed Suzuki coupling of 2a



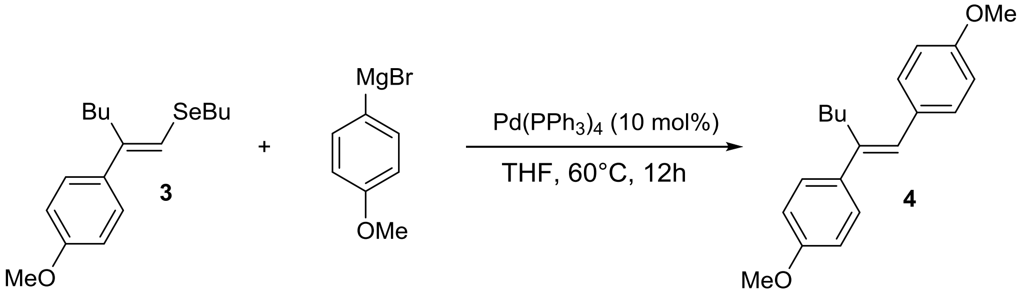
To a dried Schlenk flask under argon atmosphere were added 1-iodo-4-methoxybenzene (2.2 mmol, 513 mg, 1.1 equiv), $PdCl_2(PPh_3)_2$ (0.2 mmol, 140 mg, 10 mol%) and NaOH (4 mmol, 320 mg, 2 equiv). Next, selenoalkyne **2a** (2 mmol, 692 mg, 1 equiv) was solubilized in MeOH (10 mL) and added to the Schlenk. The reaction kept stirring for 12 h at 80° C. After this period, the crude was diluted with ethyl acetate and washed with saturated solution of NaCl, the organic phase was dried over $MgSO_4$ and concentred under reduced pressure. The compound **3** was purified on column chromatography using hexane as eluent.

(*E*)-butyl(2-(4-methoxyphenyl)hex-1-en-1-yl)selane (**3**)



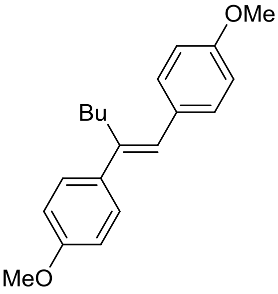
The compound **3** was obtained as a yellow oil in 82% yield (534 mg). **^{1}H NMR (400 MHz, $CDCl_3$):** δ 7.28 – 7.24 (m, 2H), 6.85 (d, *J* = 8.9 Hz, 2H), 6.39 (s, 1H), 3.81 (s, 3H), 2.75 (t, *J* = 7.5 Hz, 2H), 2.54 (t, *J* = 7.7 Hz, 2H), 1.73 (quint, *J* = 7.5 Hz, 2H), 1.48 – 1.29 (m, 6H), 0.93 (t, *J* = 7.4 Hz, 3H), 0.88 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ 158.5, 142.1, 134.5, 126.9, 117.3, 113.7, 55.2, 33.7, 33.0, 30.1, 26.7, 22.9, 22.6, 13.9, 13.6. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{17}H_{27}OSe$) requires *m*/*z* 327.1227, found: *m*/*z* 327.1228.

5. Pd-catalyzed Kumada coupling of 3



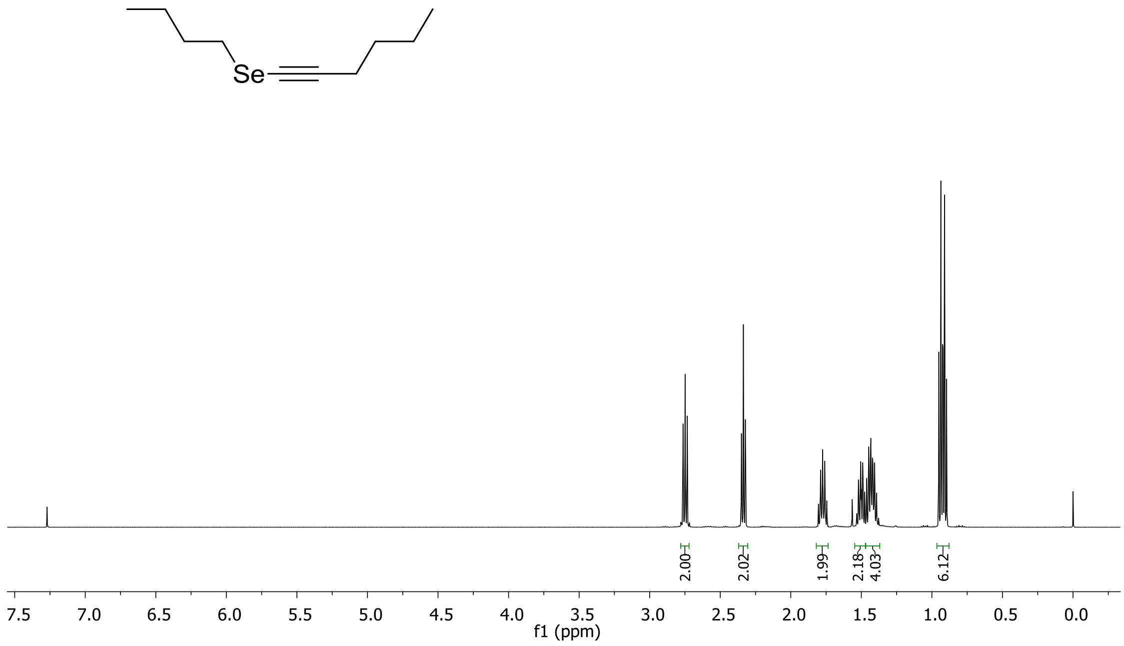
A mixture of organo selenide **3** (0.25 mmol) and $Pd(PPh_3)_4$ (0.1 equiv) were dissolved in THF (1 mL). After this, the organo magnesium reagent (2 equiv) were added. The mixture was then heated in oil bath for 12h at 60 °C. After the reaction was cooled to ambient temperature, the crude reaction mixture was diluted with ethyl acetate (3 mL) and then washed with saturated solution of NH_4Cl (10 mL). The organic phase was separated, dried over $MgSO_4$ and concentrated under vacuum. The residue was purified by flash chromatography and eluted with hexane.

(E)-4,4'-(hex-1-ene-1,2-diyl)bis(methoxybenzene) (**4**)

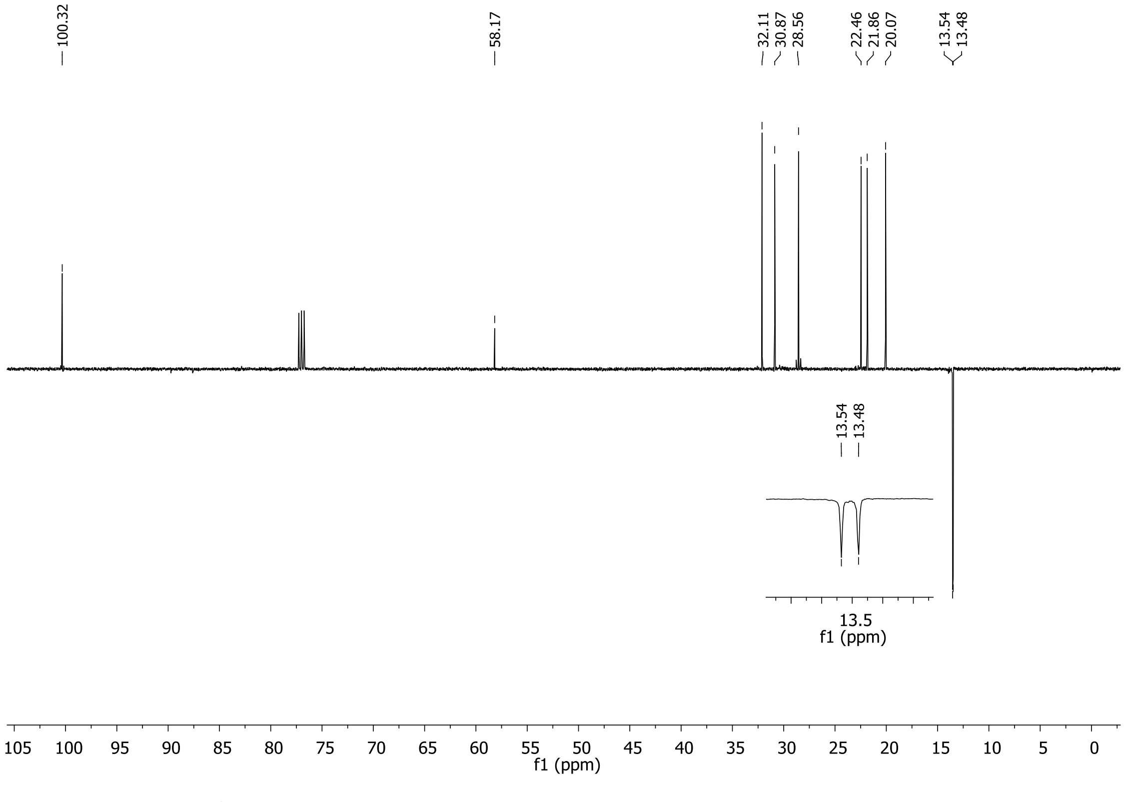


The compound **4** was obtained as a yellow solid in 66% yield (49 mg). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 8.9 Hz, 2H), 7.25 (d, *J* = 8.9 Hz, 2H), 6.94 – 6.86 (m, 4H), 6.58 (s, 1H), 3.83 (s, 6H), 2.67 (t, *J* = 7.5 Hz, 2H), 1.47 – 1.29 (m, 4H), 0.86 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ 158.7, 158.0, 141.4, 135.7, 131.1, 129.9, 127.5, 126.3, 113.65, 113.61, 55.28, 55.26, 31.0, 29.9, 22.8, 13.9. **HRMS** (ESI+): exact mass calculated for $[M+H]^+$ ($C_{20}H_{25}O_2$) requires *m*/*z* 297.1855, found: *m*/*z* 297.1854.

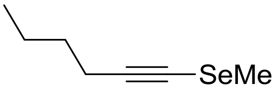
NMR SPECTRA

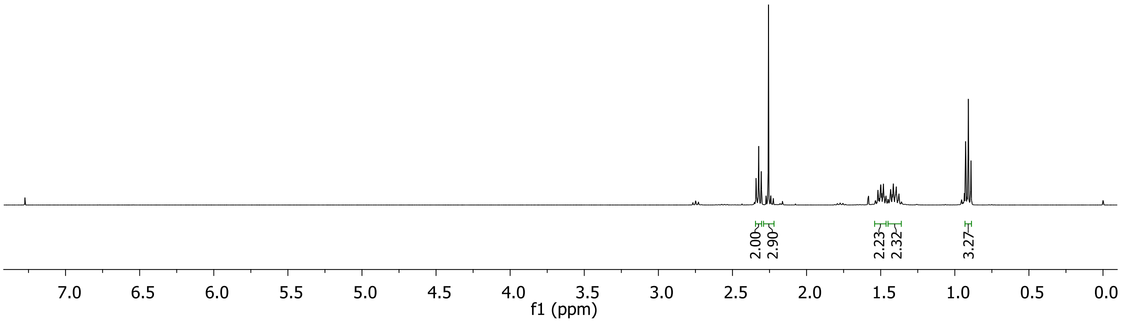


^{1}H NMR spectrum for compound **1a** ($CDCl_3$, 500 MHz)

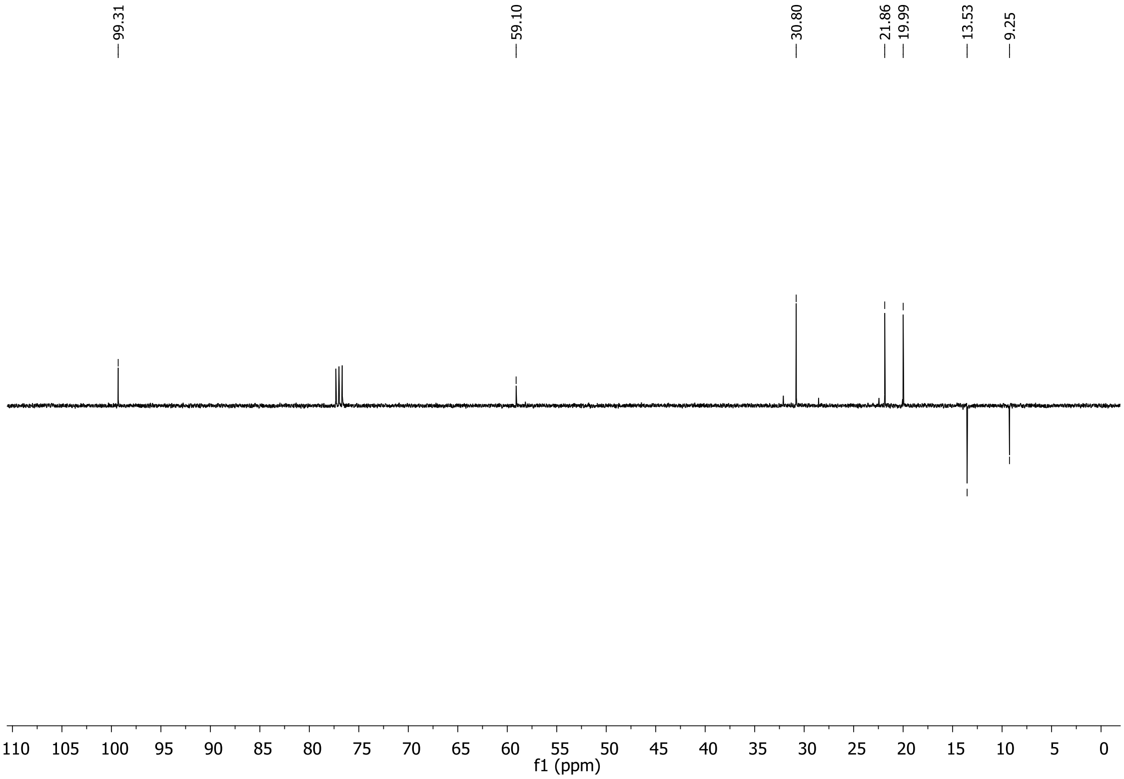


^{13}C NMR spectrum for compound **1a** ($CDCl_3$, 125 MHz)

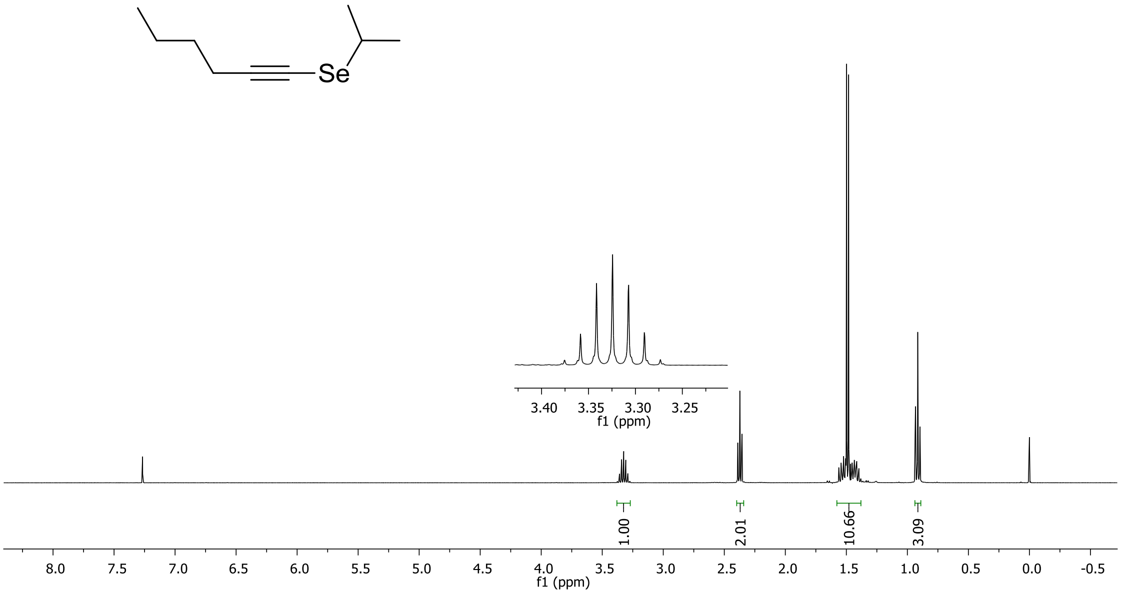




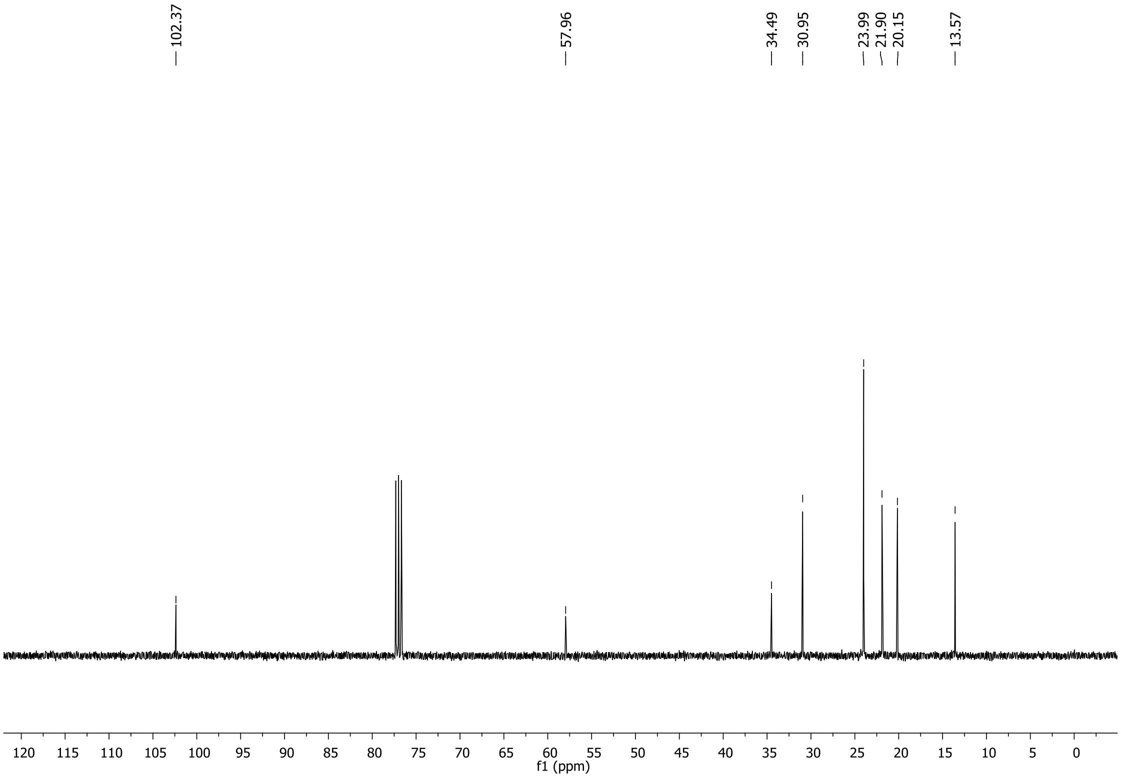
^{1}H NMR spectrum for compound **1b** ($CDCl_3$, 400 MHz)



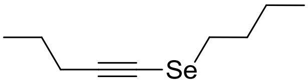
^{13}C NMR spectrum for compound **1b** ($CDCl_3$, 100 MHz)

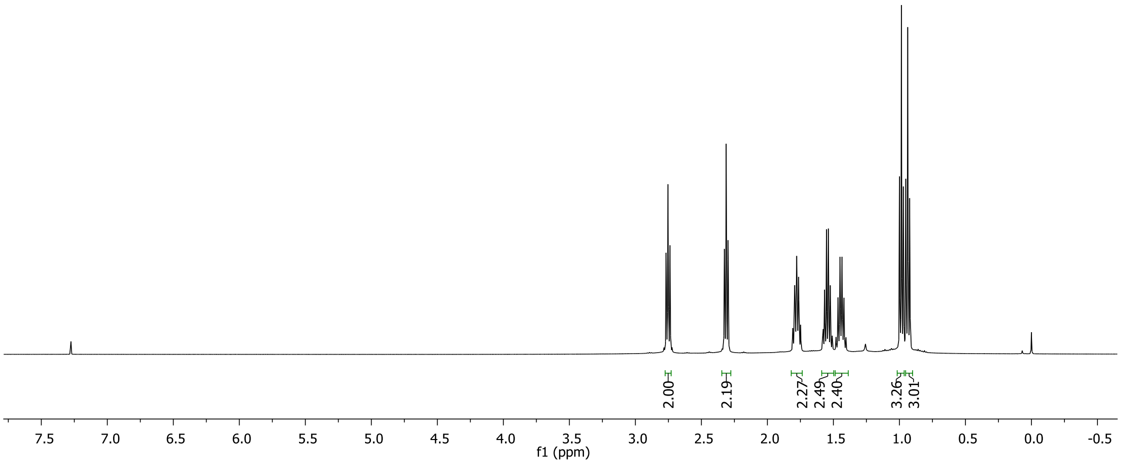


^{1}H NMR spectrum for compound **1c** ($CDCl_3$, 400 MHz)

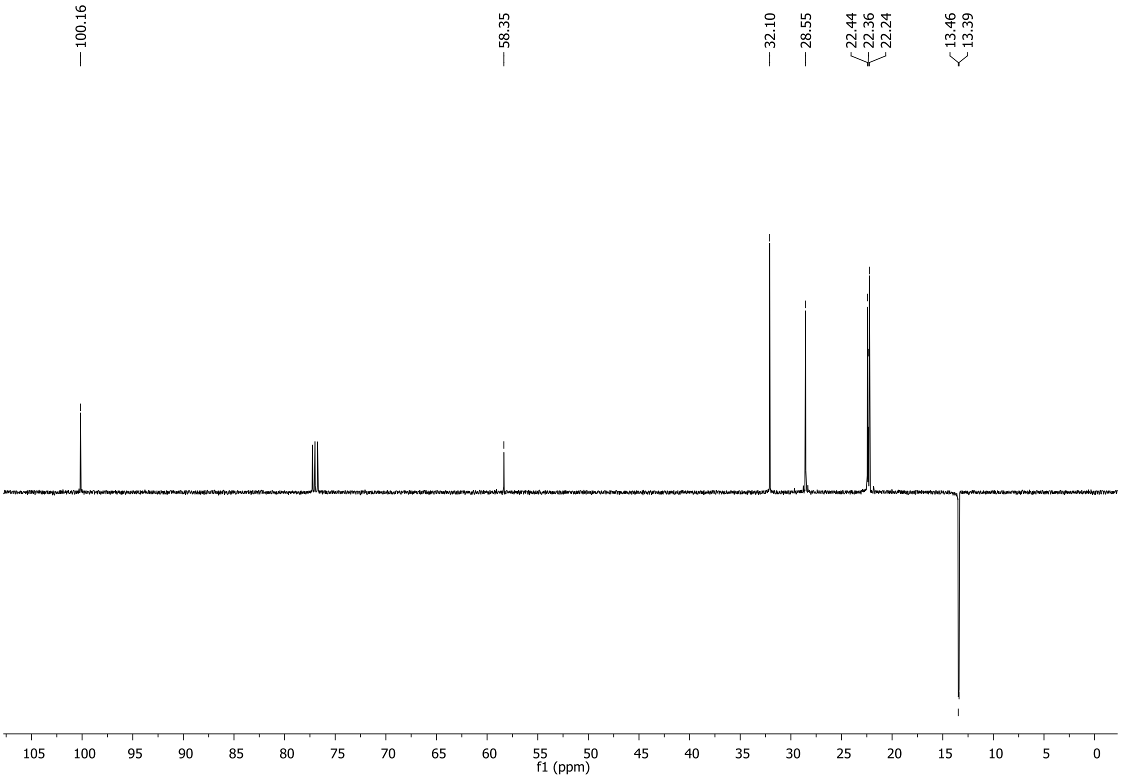


^{13}C NMR spectrum for compound **1c** ($CDCl_3$, 100 MHz)

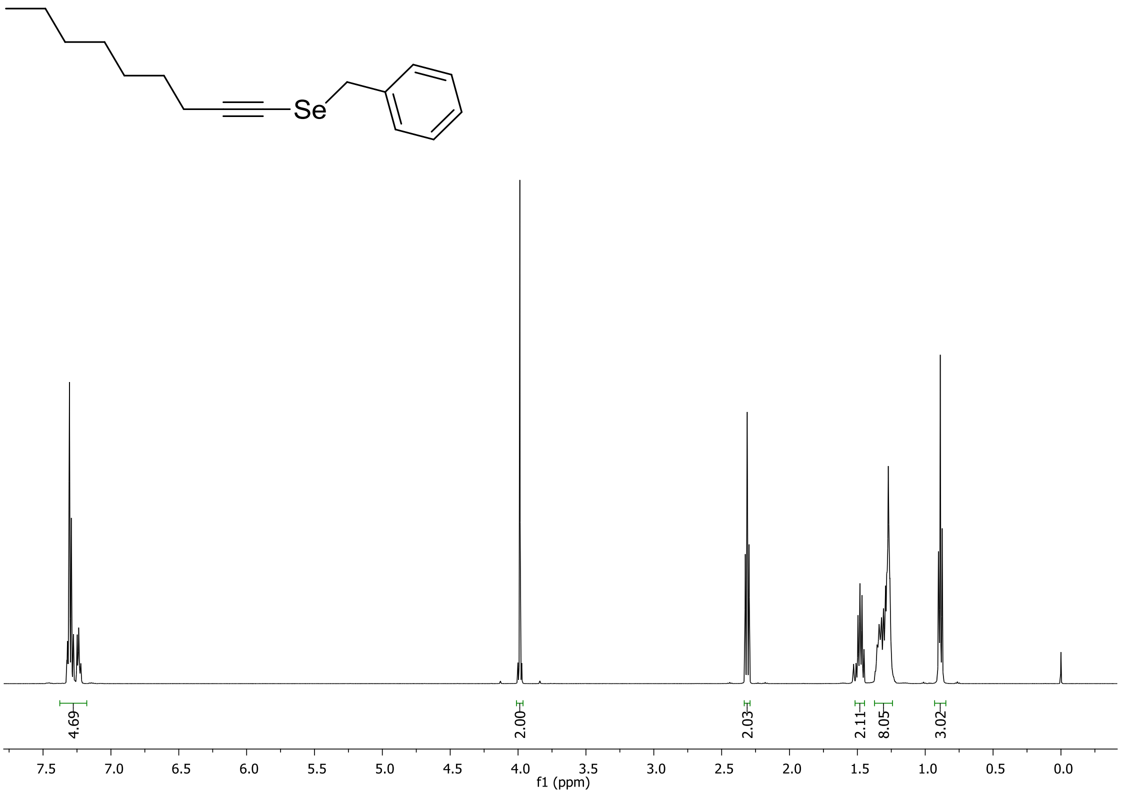




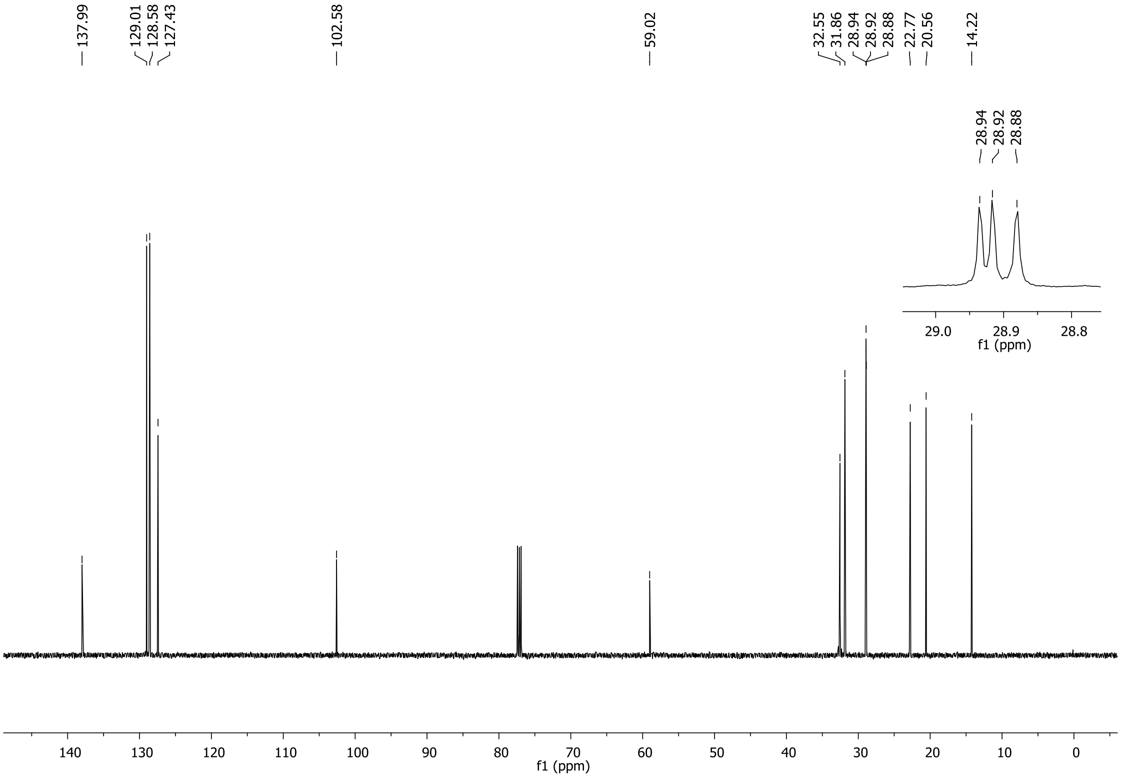
^{1}H NMR spectrum for compound **1e** ($CDCl_3$, 400 MHz)



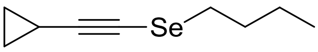
^{13}C NMR spectrum for compound **1e** ($CDCl_3$, 100 MHz)

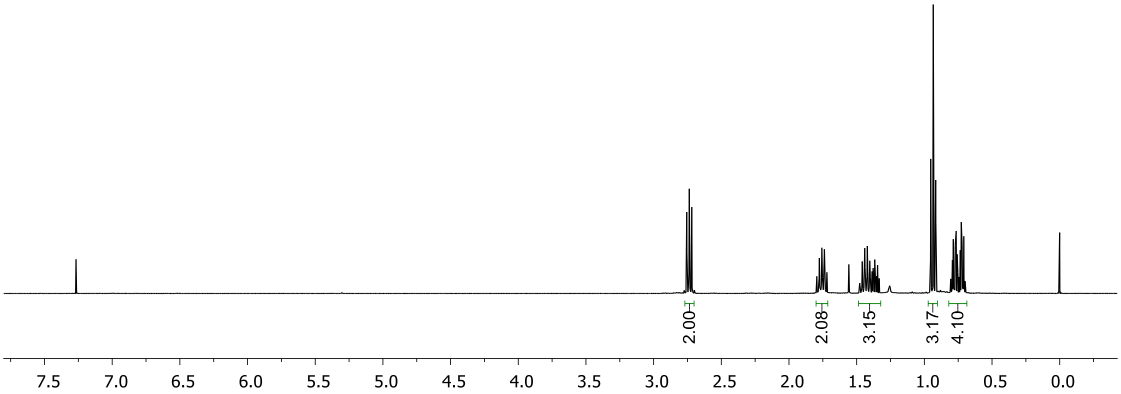


^{1}H NMR spectrum for compound **1f** ($CDCl_3$, 500 MHz)

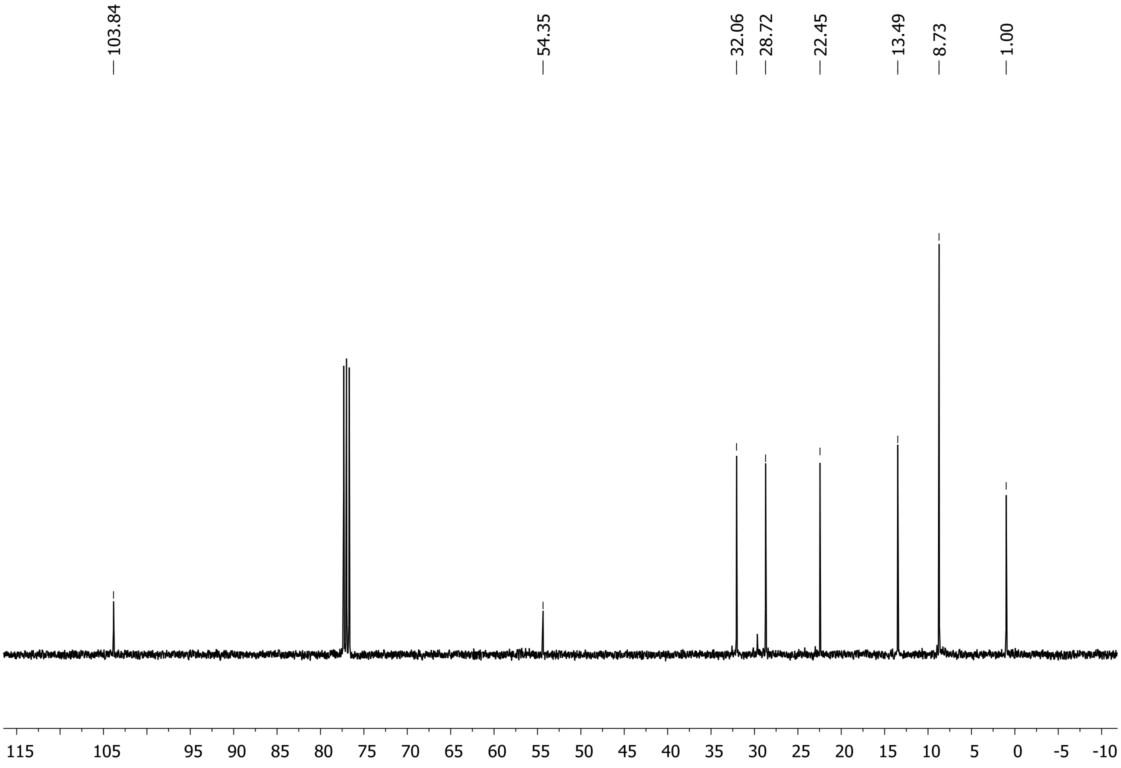


^{13}C NMR spectrum for compound **1f** ($CDCl_3$, 125 MHz)

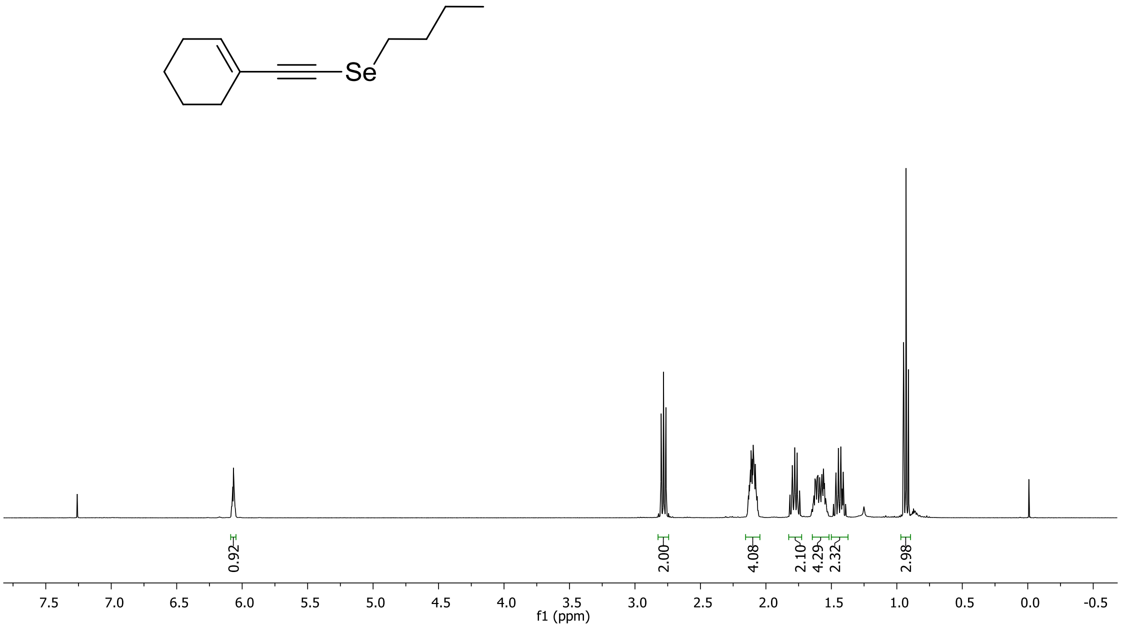




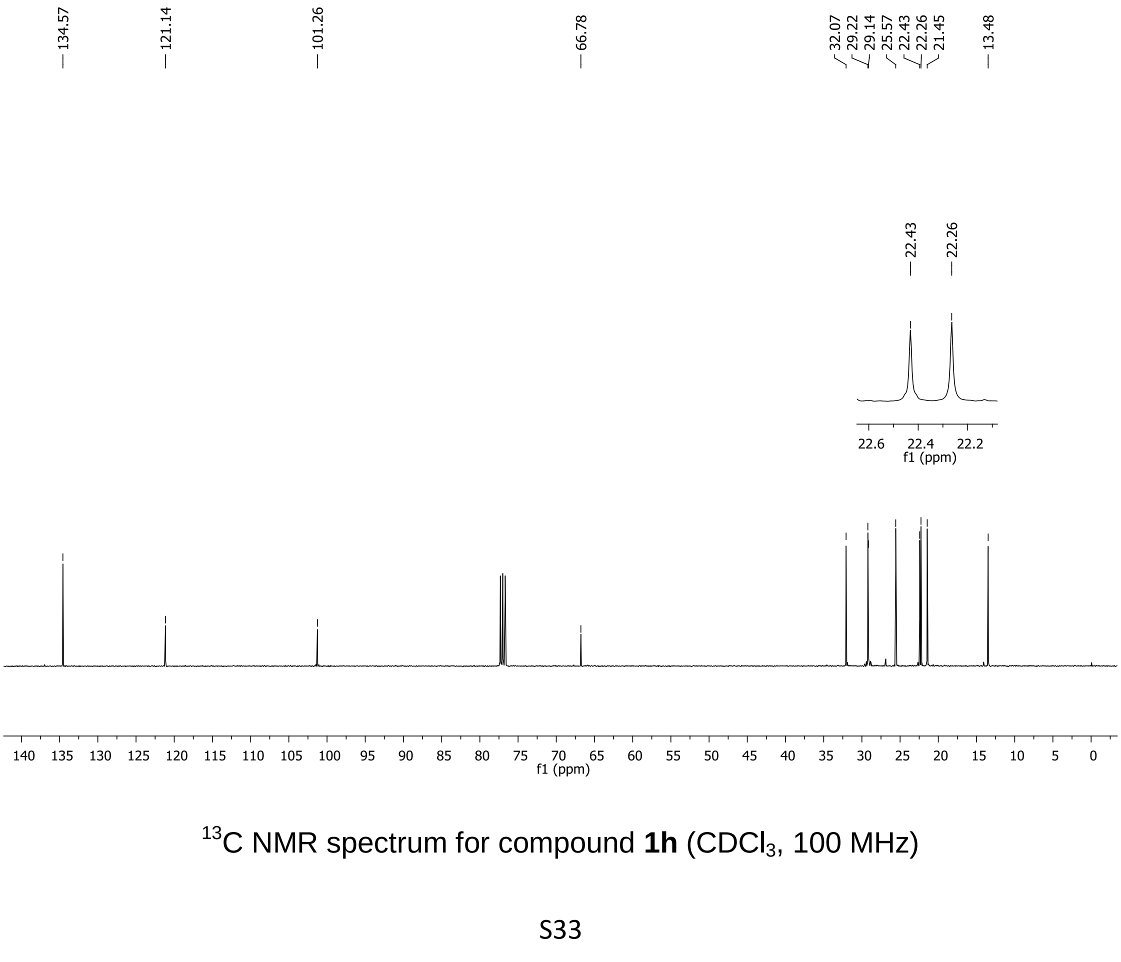
^{1}H NMR spectrum for compound **1g** ($CDCl_3$, 400 MHz)



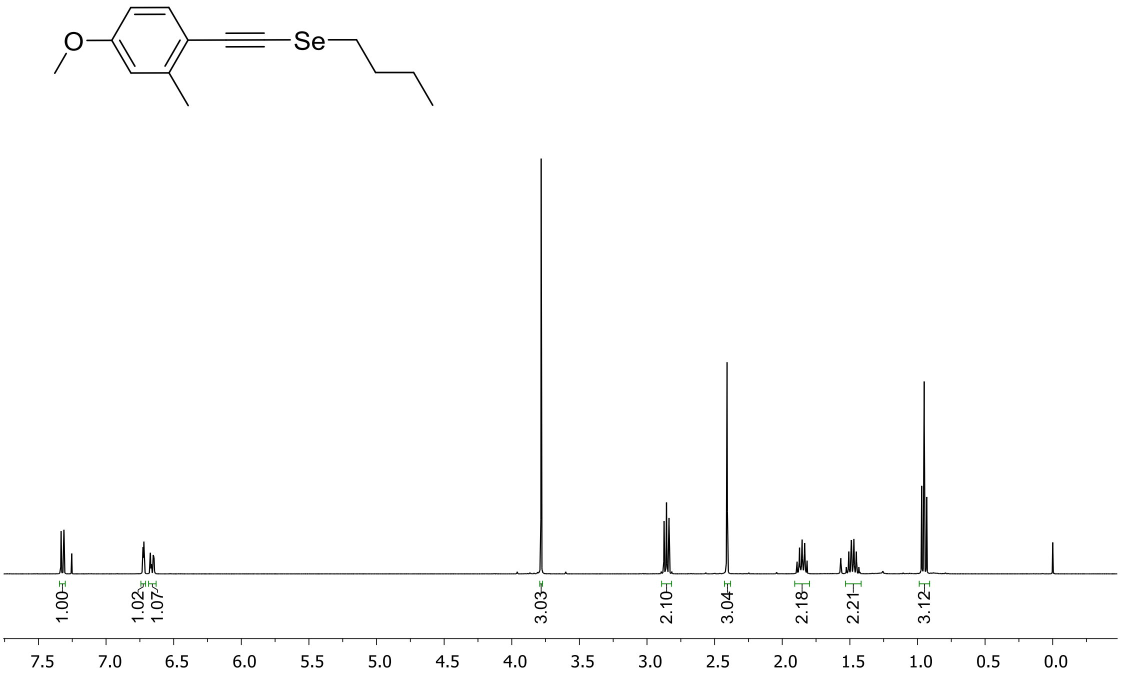
^{13}C NMR spectrum for compound **1g** ($CDCl_3$, 100 MHz)



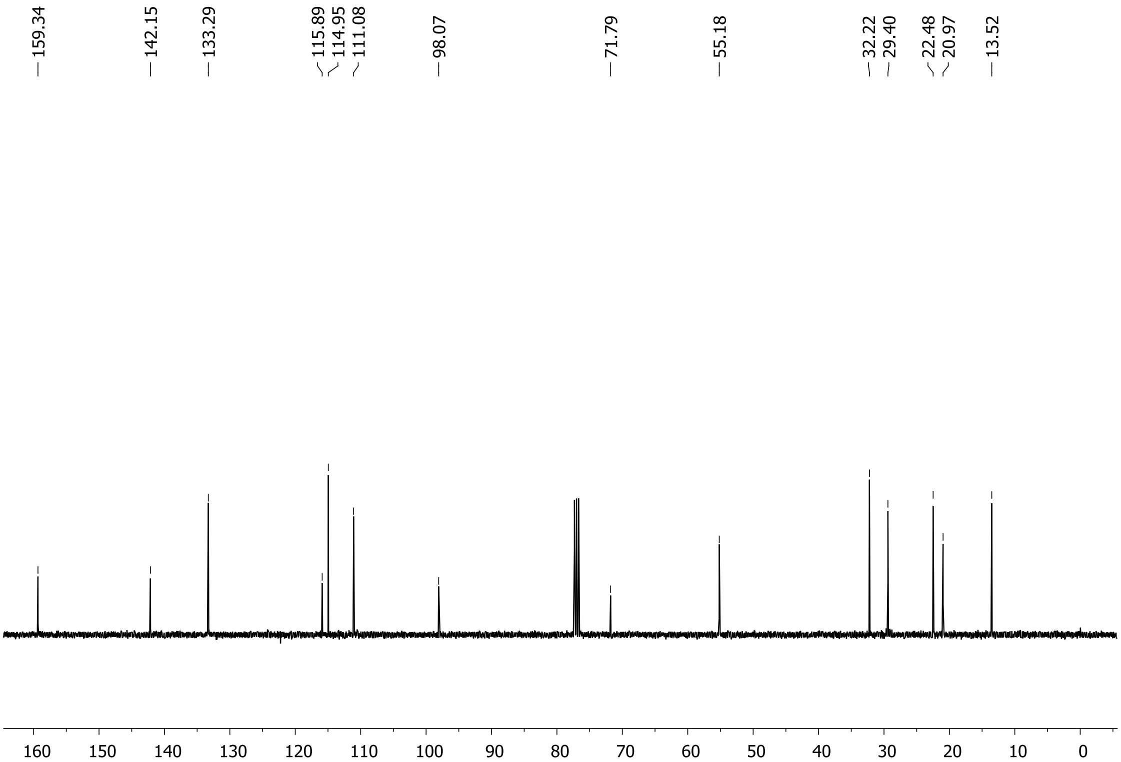
^{1}H NMR spectrum for compound **1h** (CDCl$_3$, 400 MHz)



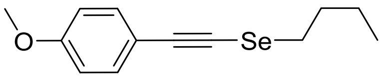
^{13}C NMR spectrum for compound **1h** (CDCl$_3$, 100 MHz)

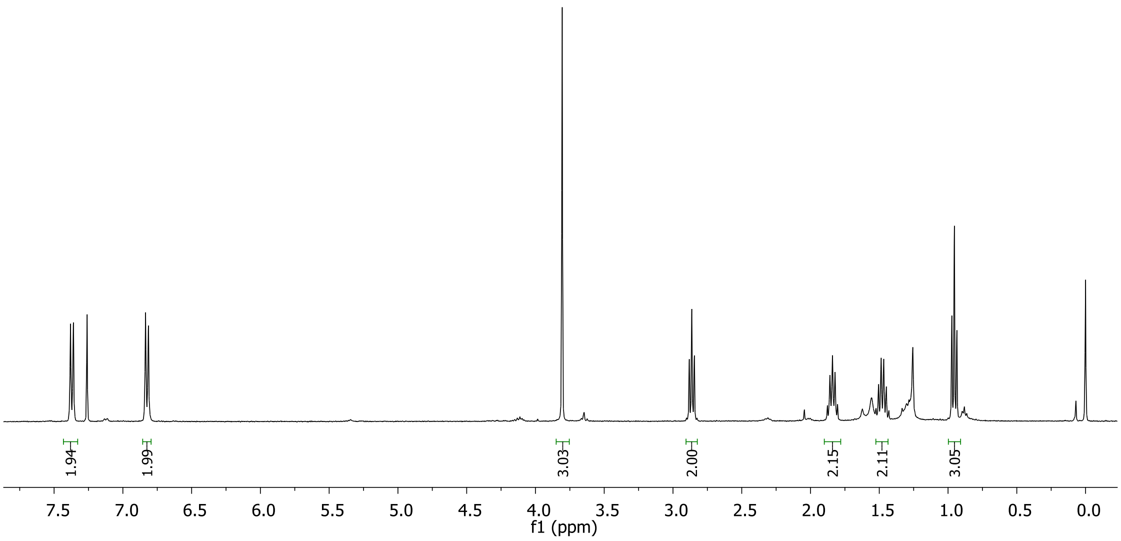


^{1}H NMR spectrum for compound **1i** ($CDCl_3$, 400 MHz)

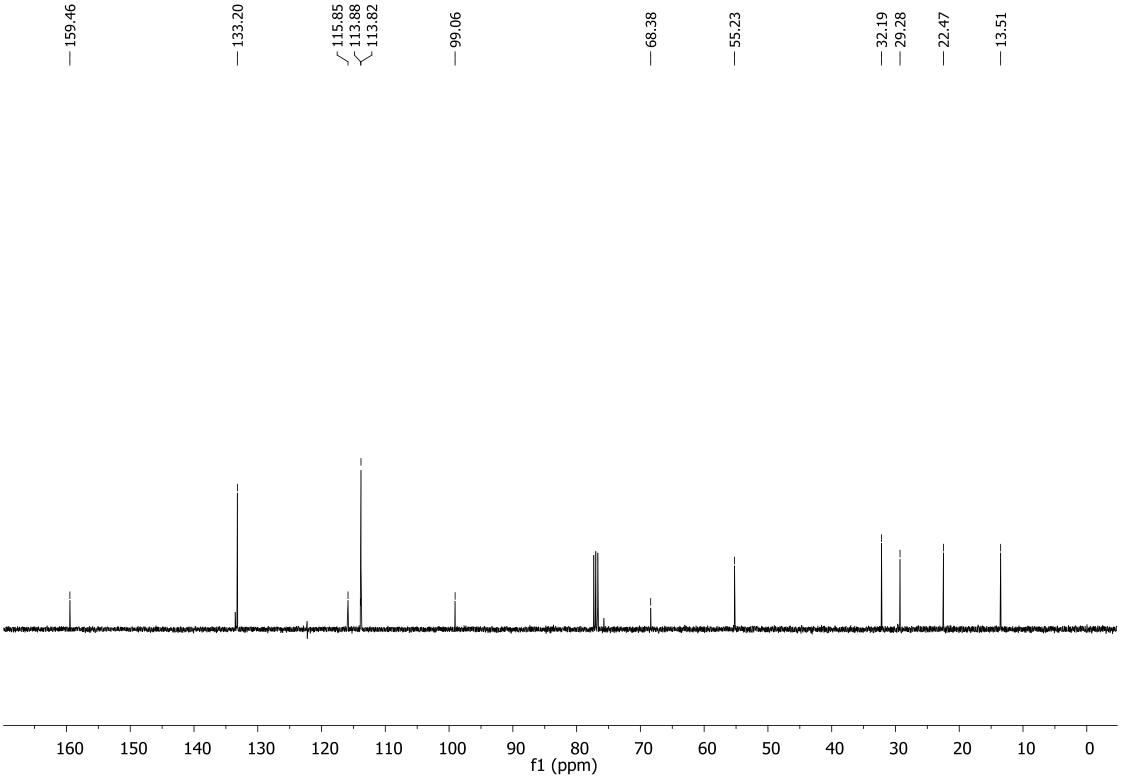


^{13}C NMR spectrum for compound **1i** ($CDCl_3$, 100 MHz)

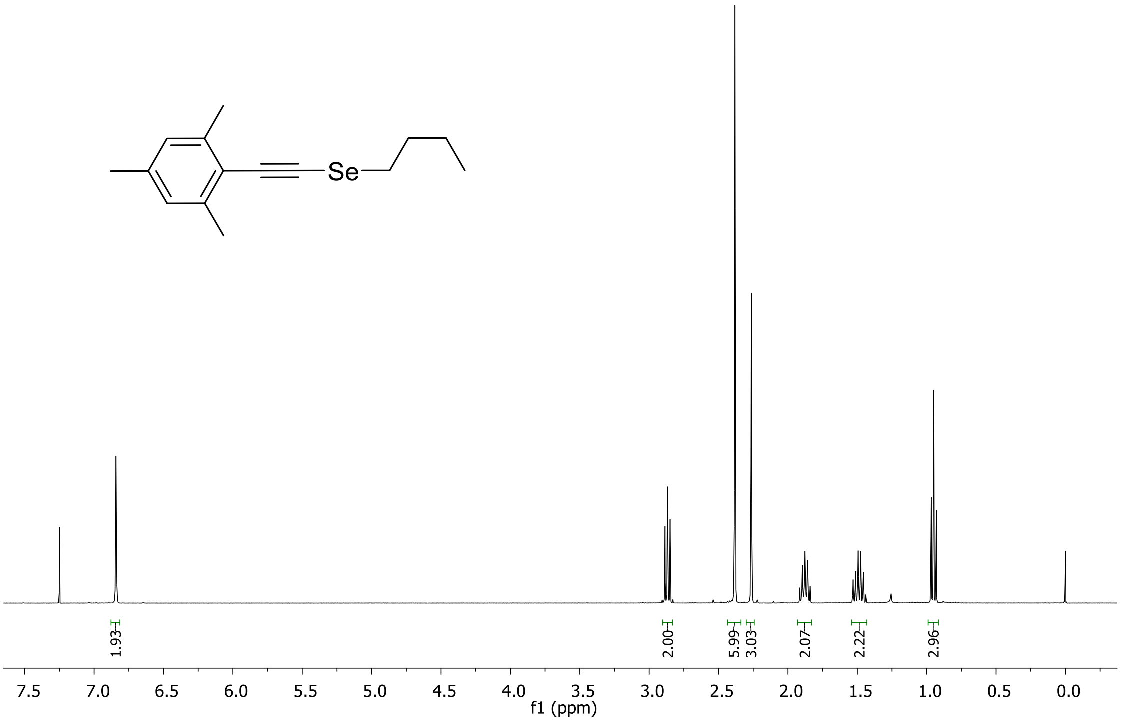




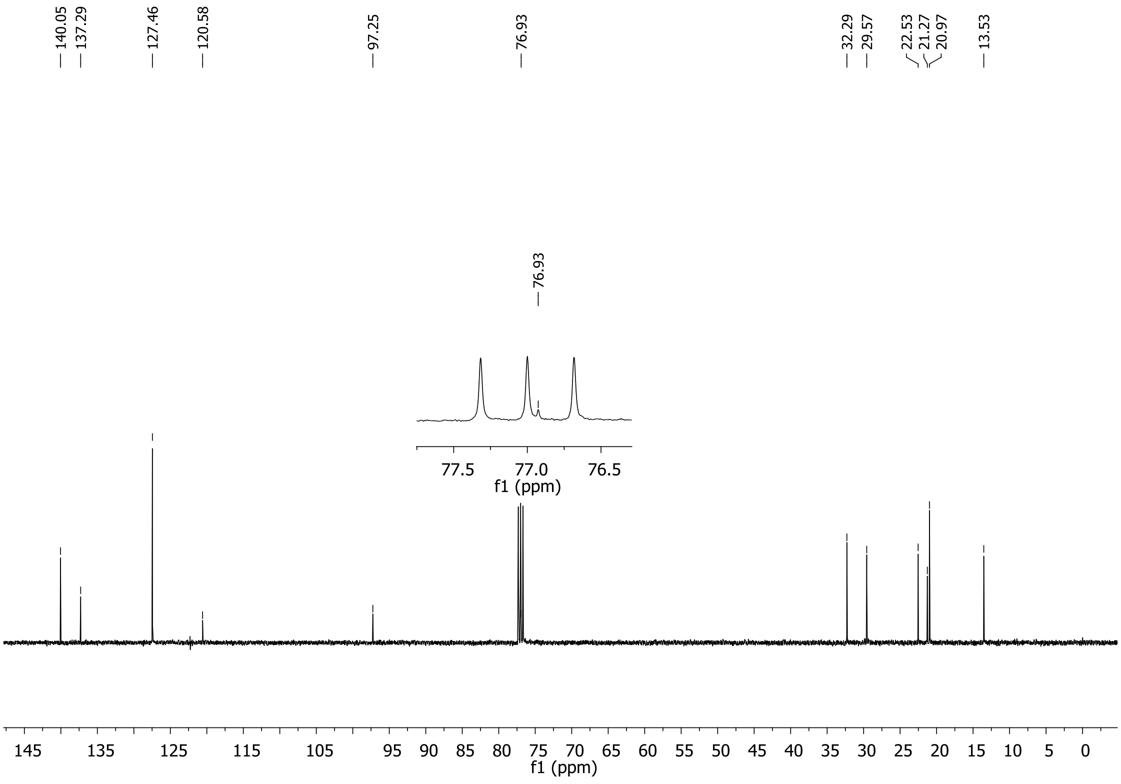
^{1}H NMR spectrum for compound **1j** (CDCl$_3$, 400 MHz)



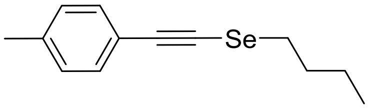
^{13}C NMR spectrum for compound **1j** (CDCl$_3$, 100 MHz)

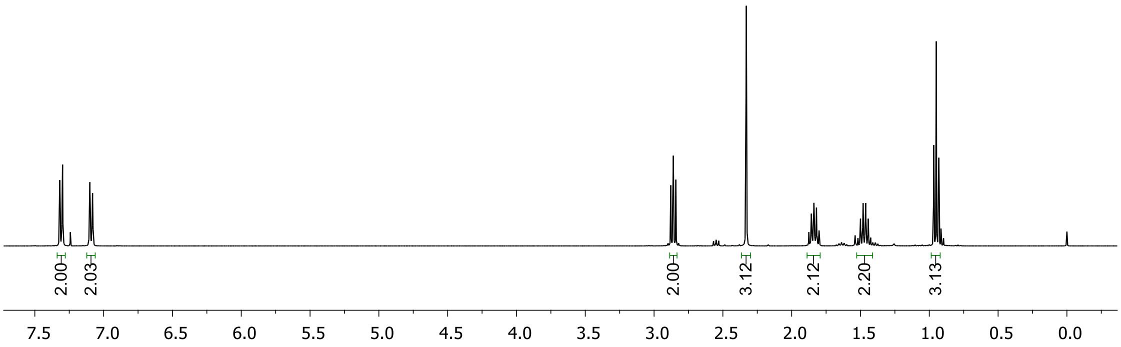


^{1}H NMR spectrum for compound **1k** ($CDCl_3$, 400 MHz)

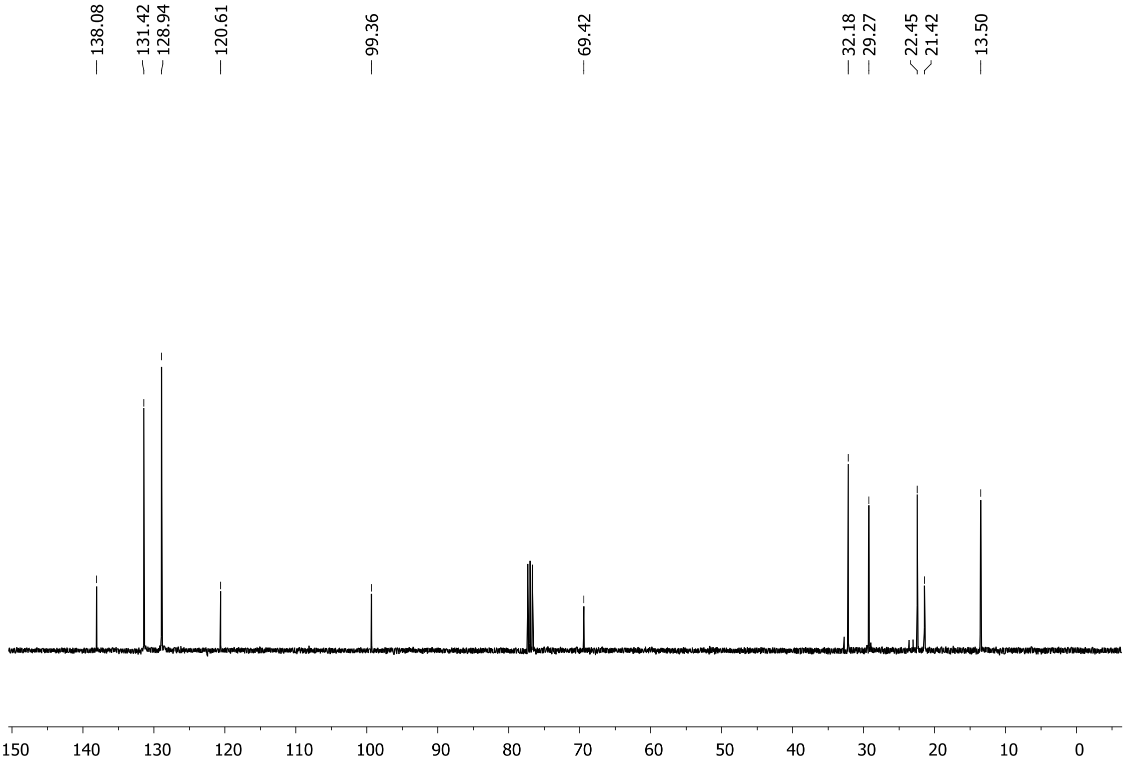


^{13}C NMR spectrum for compound **1k** ($CDCl_3$, 100 MHz)

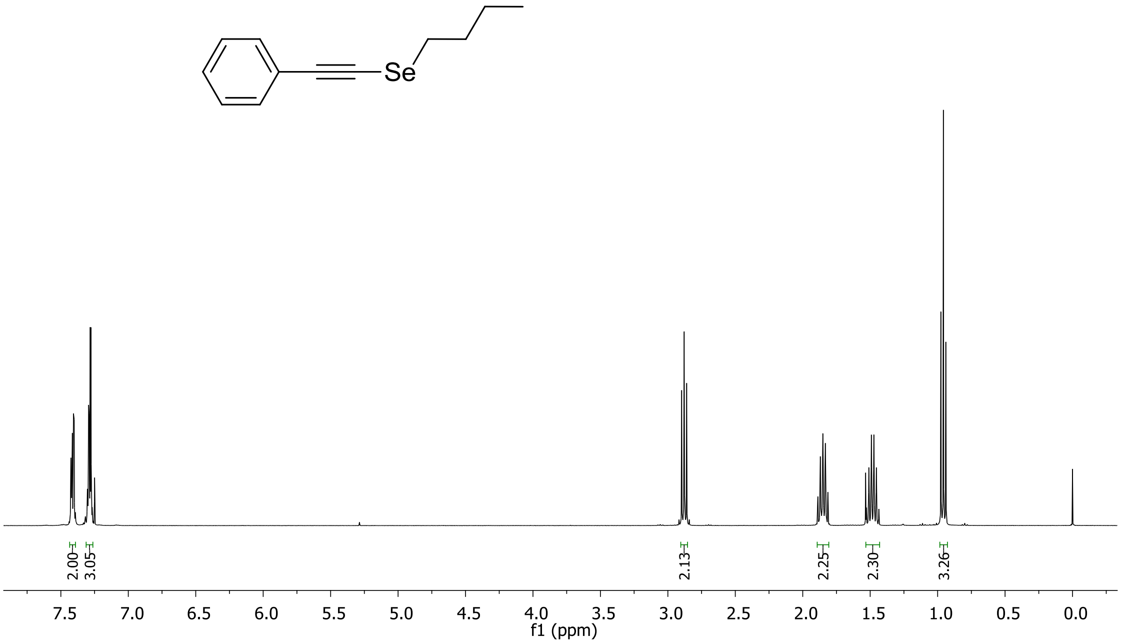




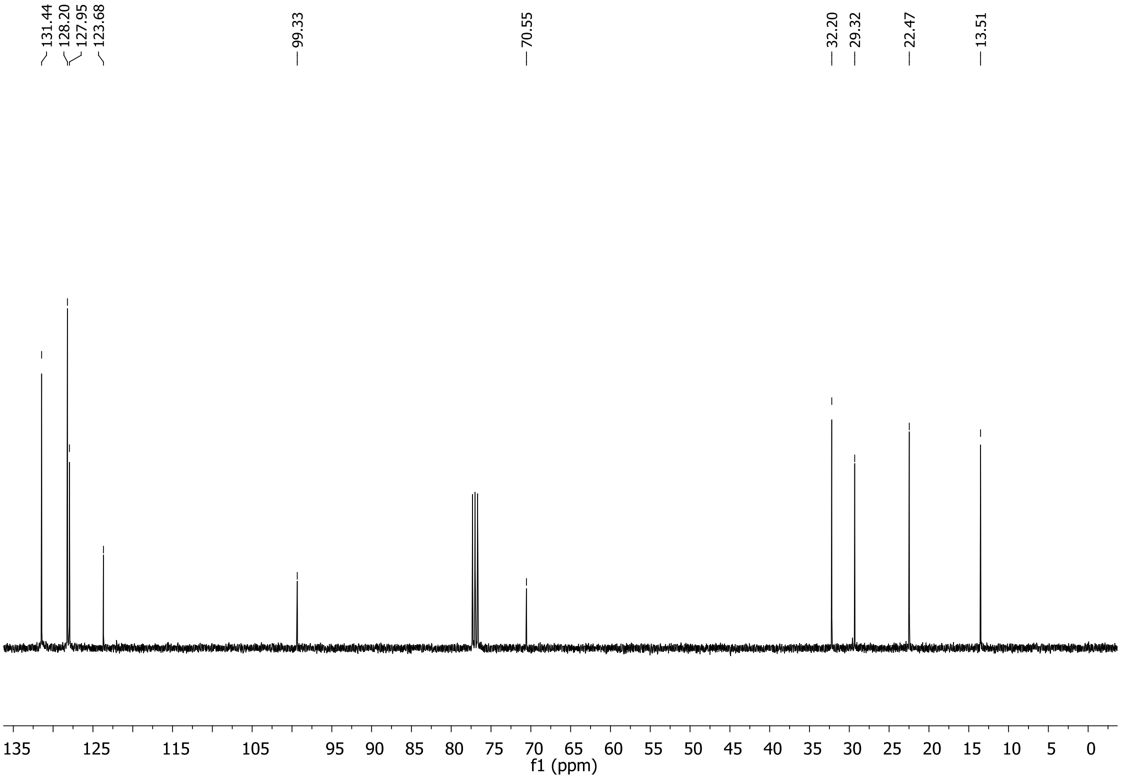
^{1}H NMR spectrum for compound **1l** (CDCl$_3$, 400 MHz)



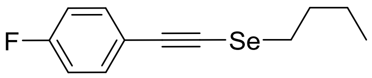
^{13}C NMR spectrum for compound **1l** (CDCl$_3$, 100 MHz)

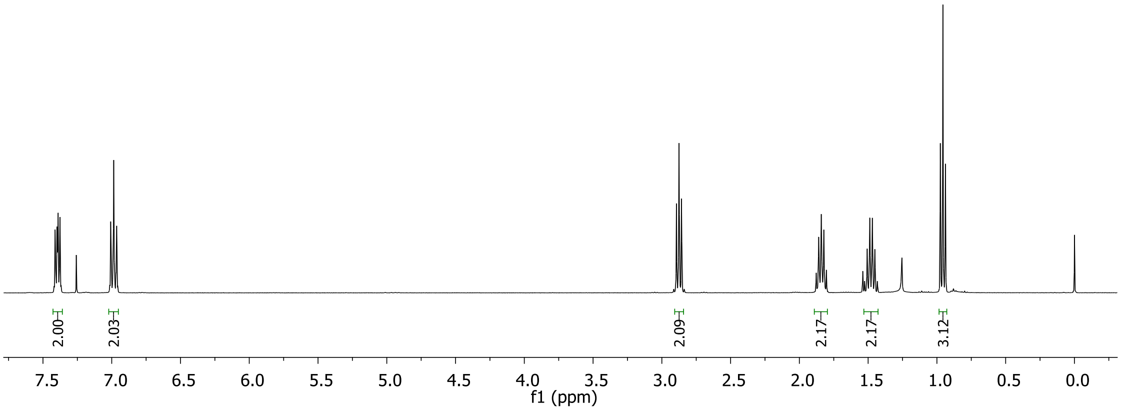


^{1}H NMR spectrum for compound **1m** ($CDCl_3$, 400 MHz)

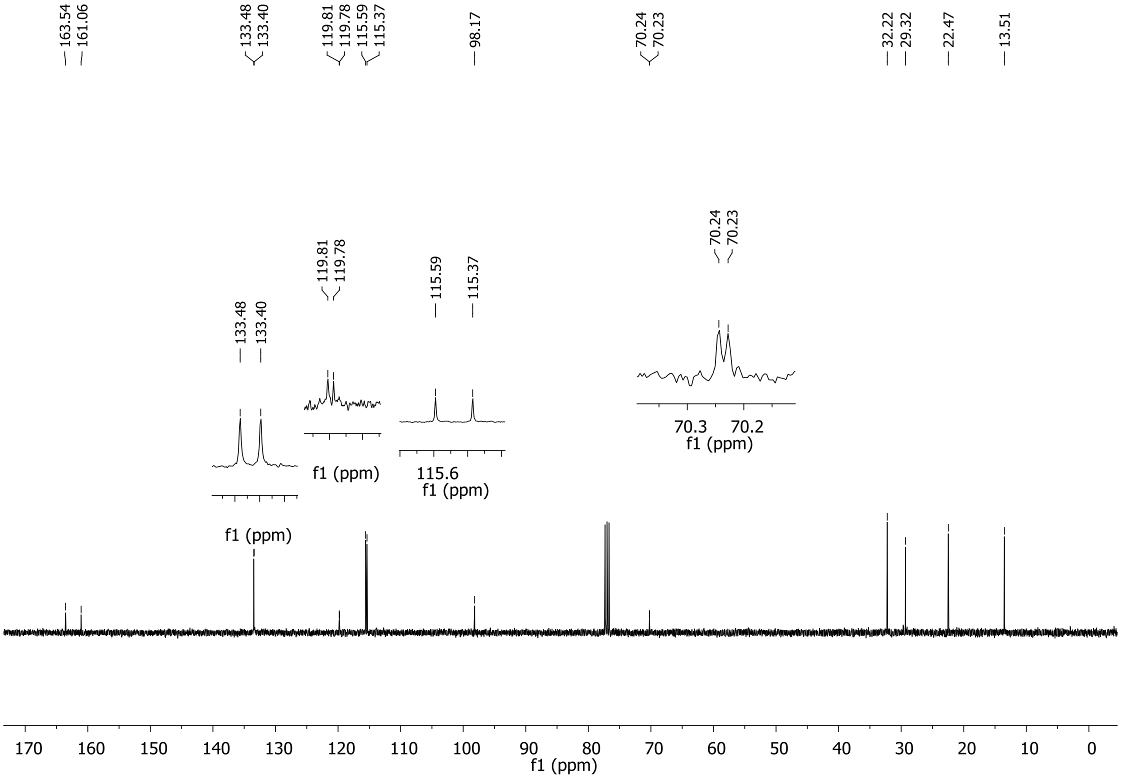


^{13}C NMR spectrum for compound **1m** ($CDCl_3$, 100 MHz)

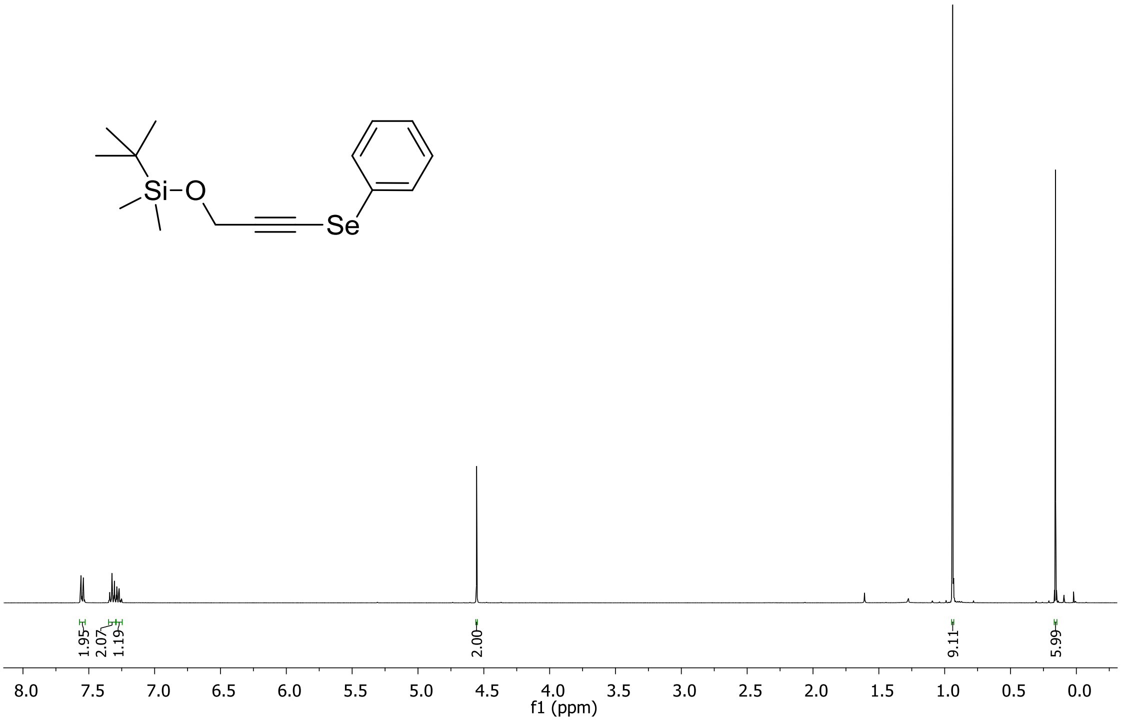




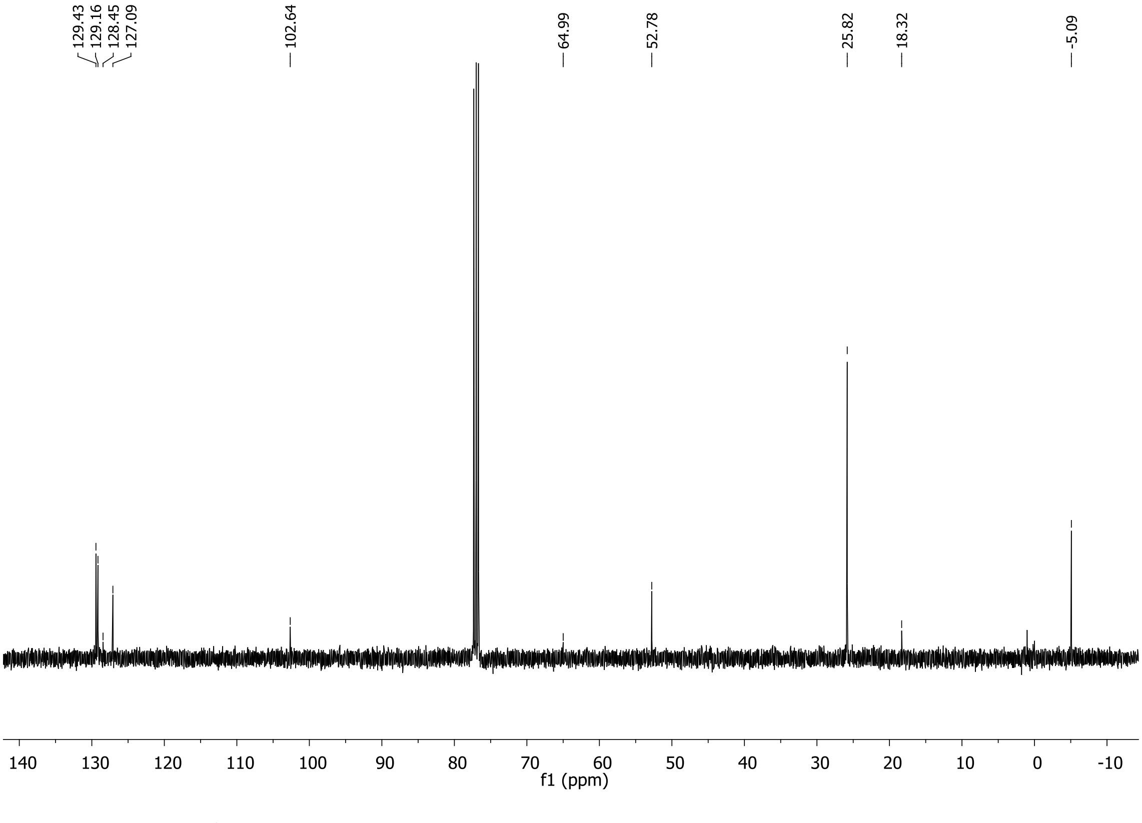
^{1}H NMR spectrum for compound **1n** ($CDCl_3$, 400 MHz)



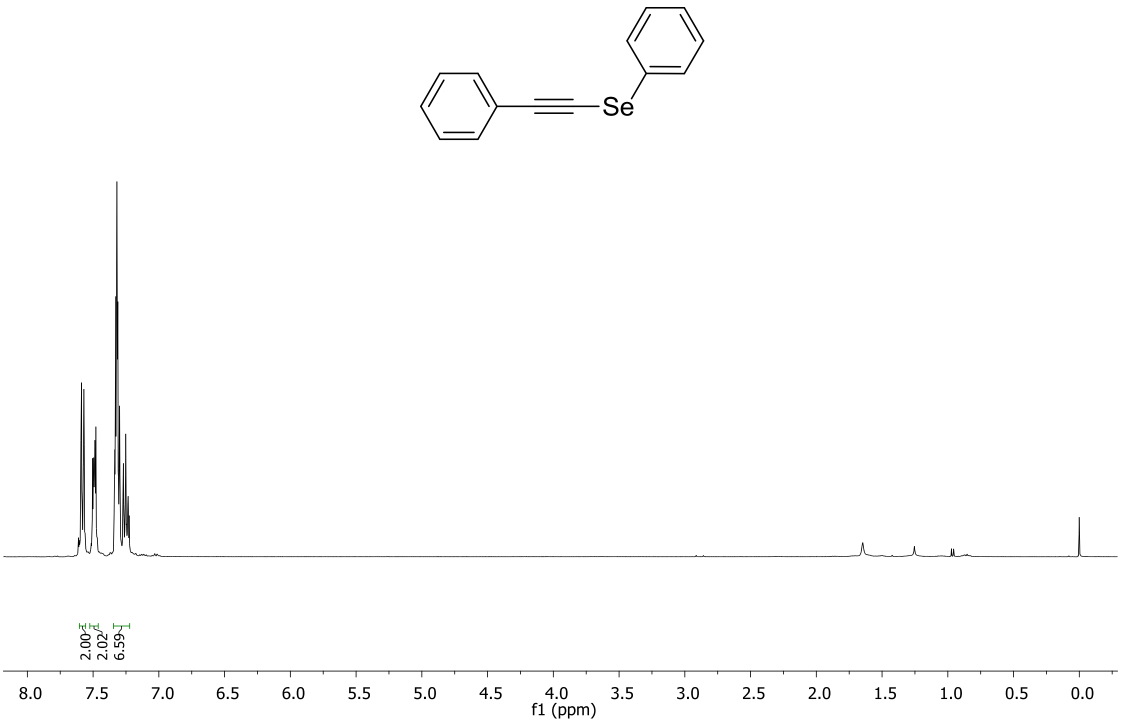
^{13}C NMR spectrum for compound **1n** ($CDCl_3$, 100 MHz)



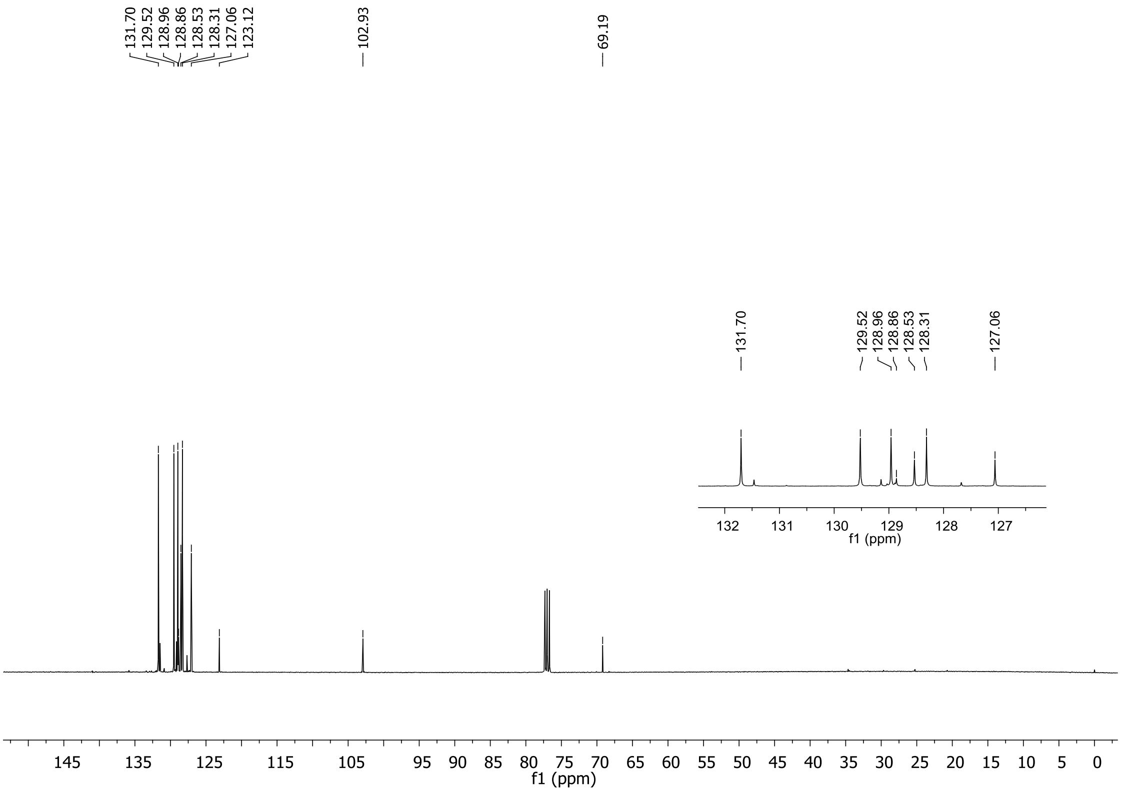
^{1}H NMR spectrum for compound **1o** ($CDCl_3$, 400 MHz)



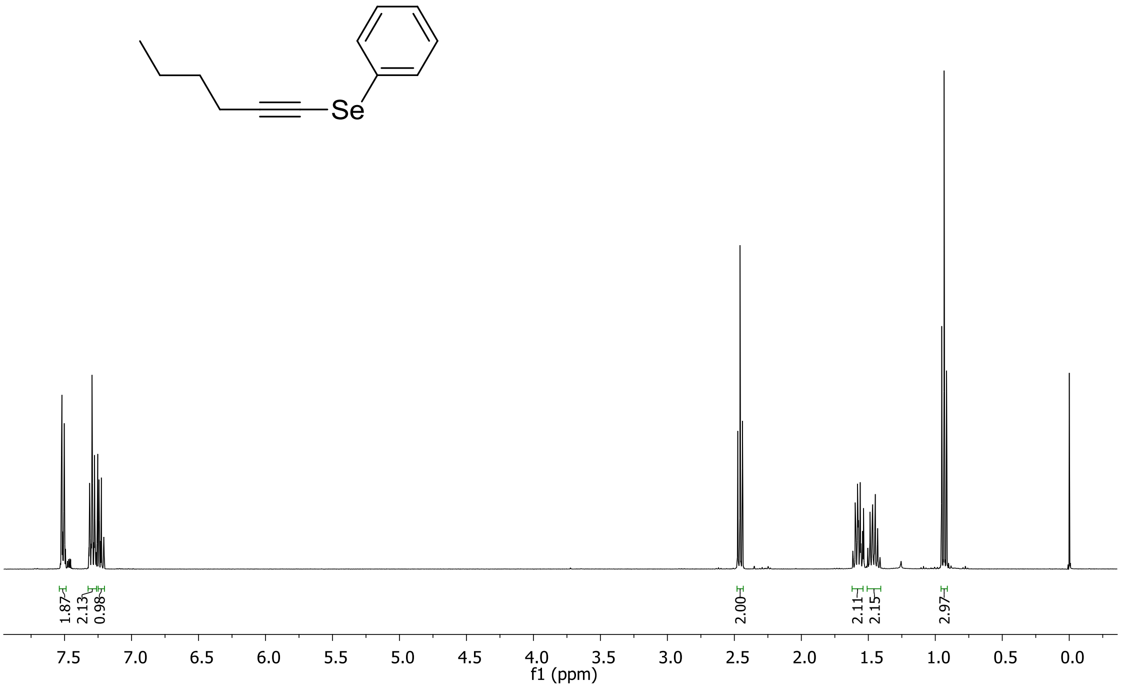
^{13}C NMR spectrum for compound **1o** ($CDCl_3$, 100 MHz)



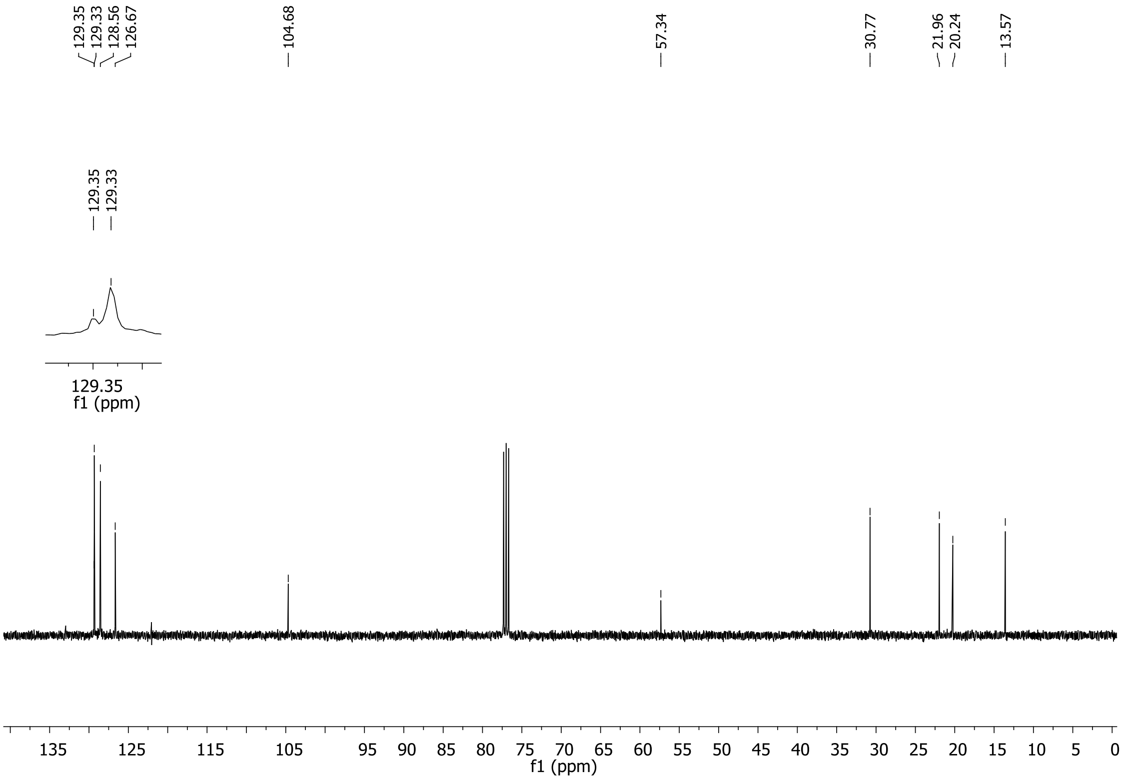
^{1}H NMR spectrum for compound **1p** ($CDCl_3$, 400 MHz)



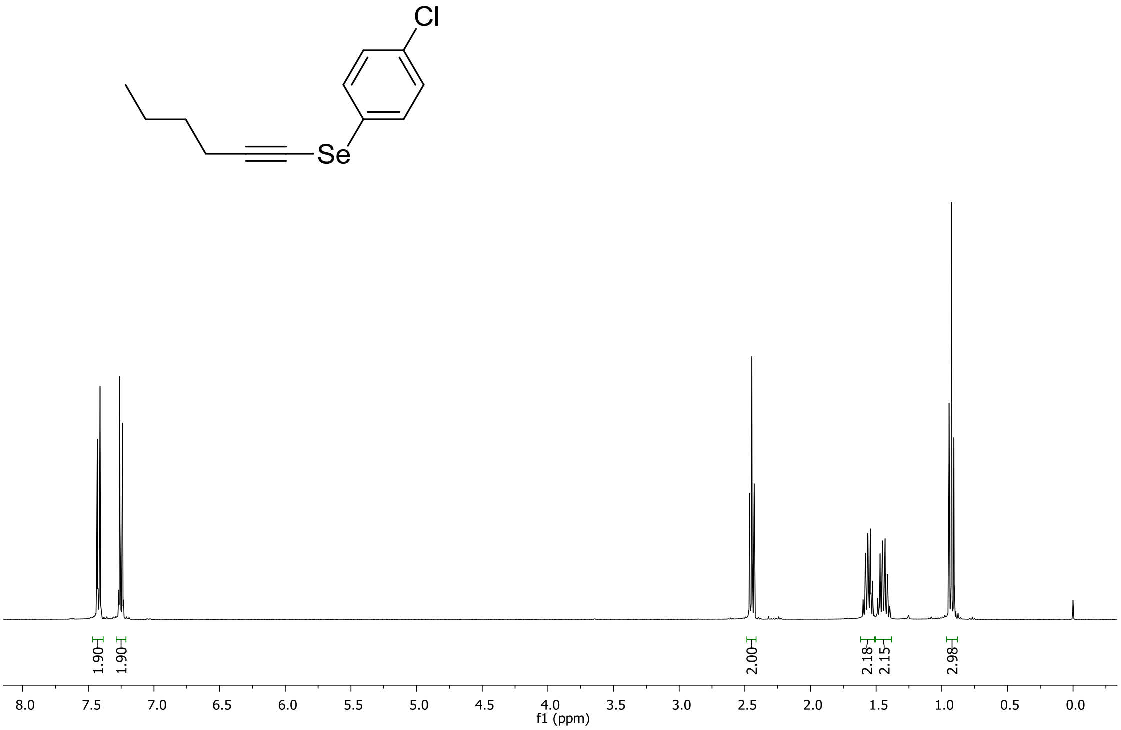
^{13}C NMR spectrum for compound **1p** ($CDCl_3$, 100 MHz)



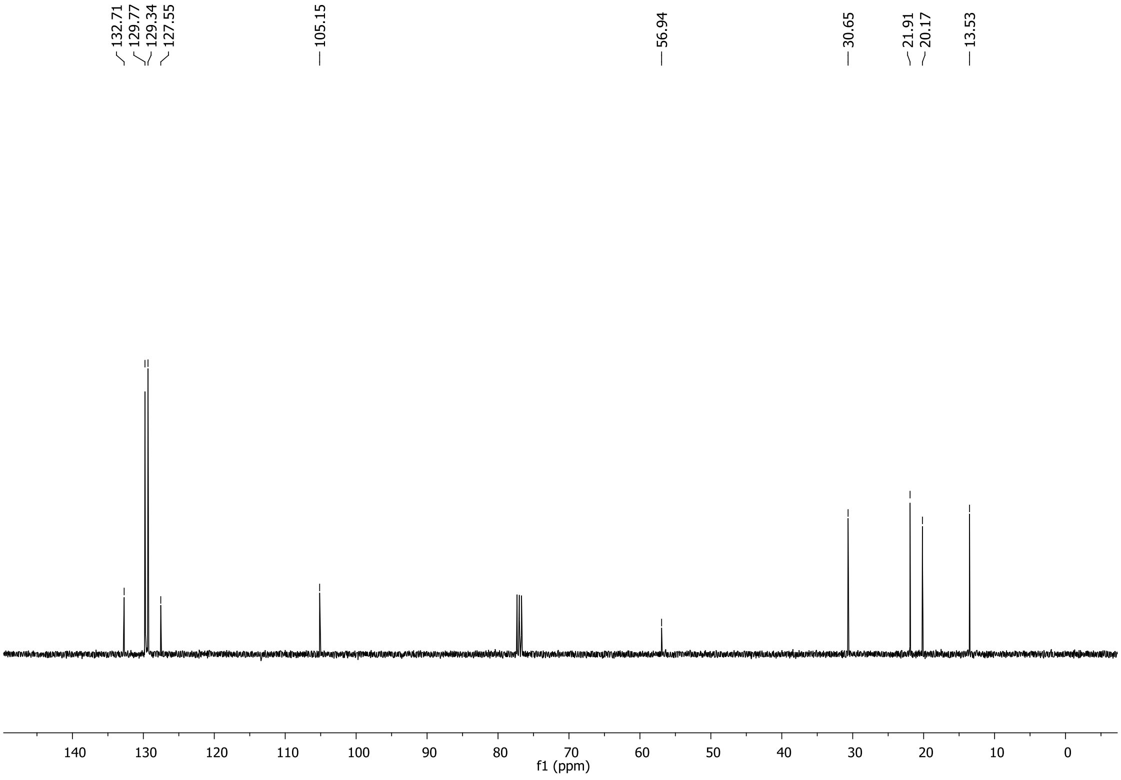
^{1}H NMR spectrum for compound **1r** ($CDCl_3$, 400 MHz)



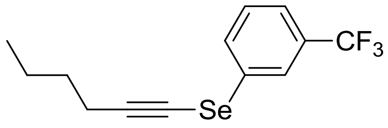
^{13}C NMR spectrum for compound **1r** ($CDCl_3$, 100 MHz)

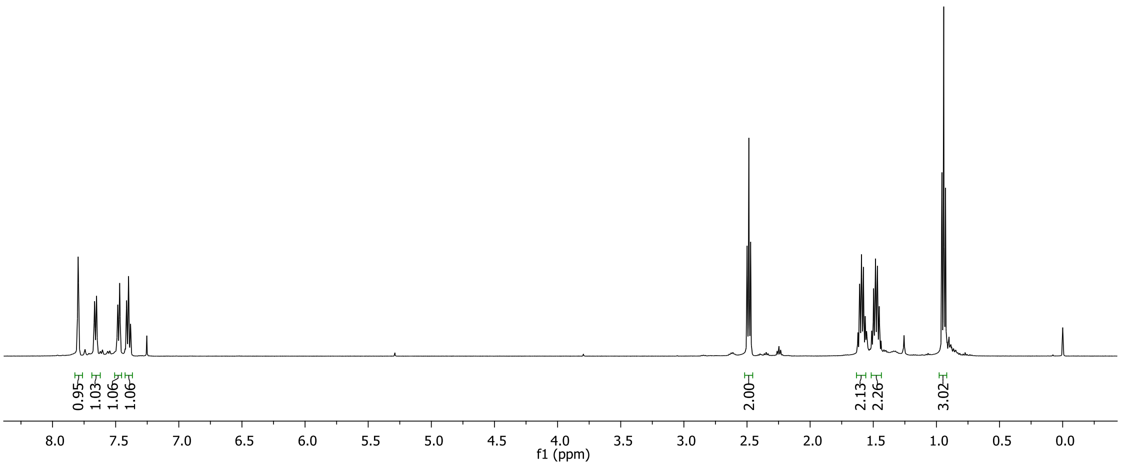


^{1}H NMR spectrum for compound **1s** ($CDCl_3$, 400 MHz)

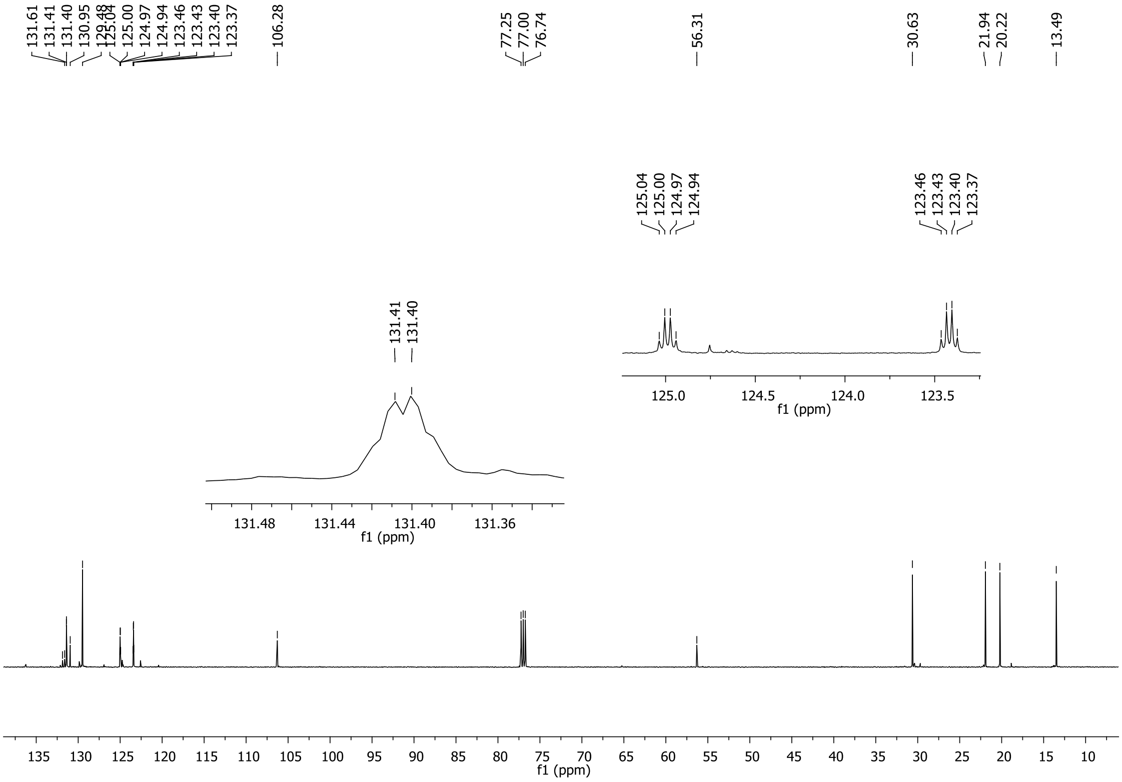


^{13}C NMR spectrum for compound **1s** ($CDCl_3$, 100 MHz)

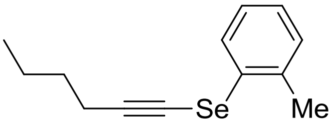


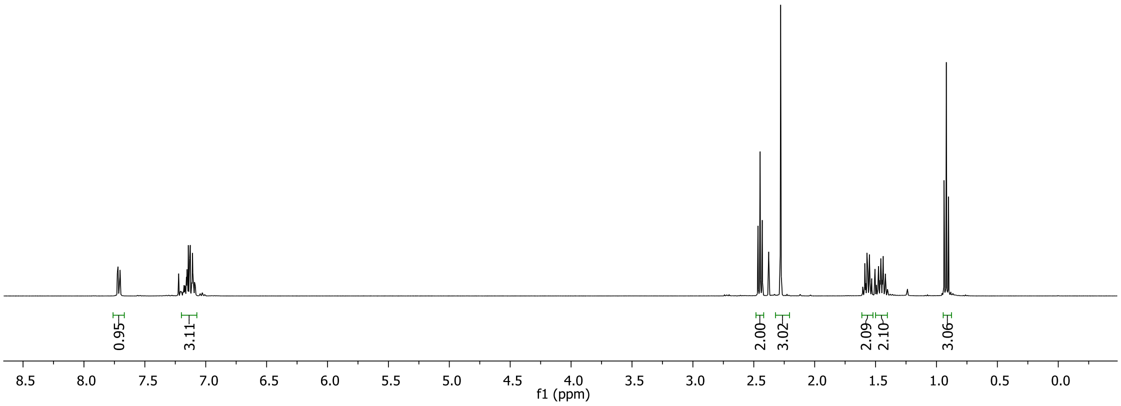


^{1}H NMR spectrum for compound **1t** ($CDCl_3$, 500 MHz)

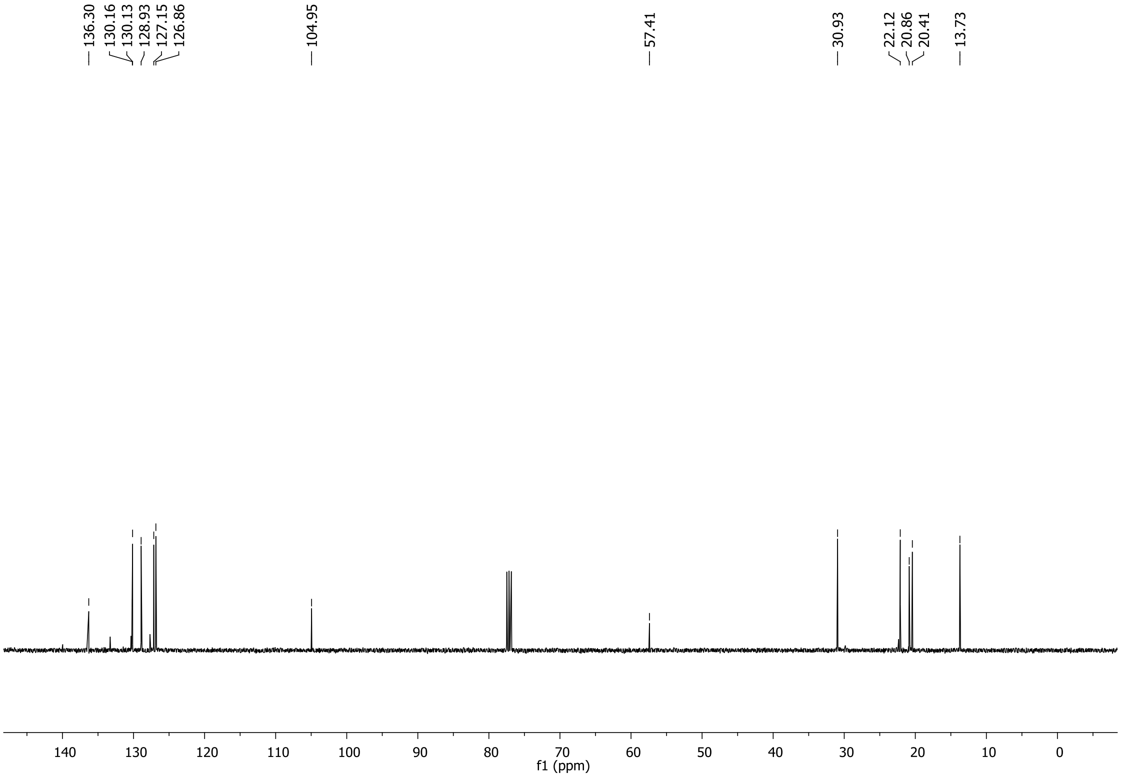


^{13}C NMR spectrum for compound **1t** ($CDCl_3$, 125 MHz)

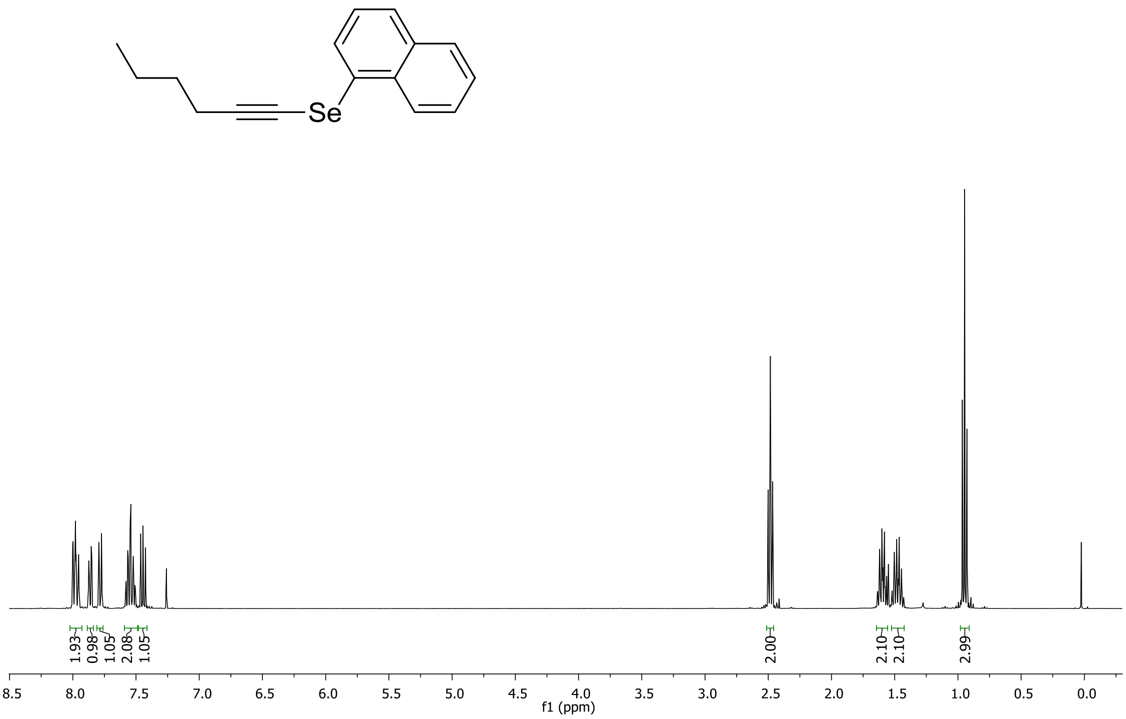




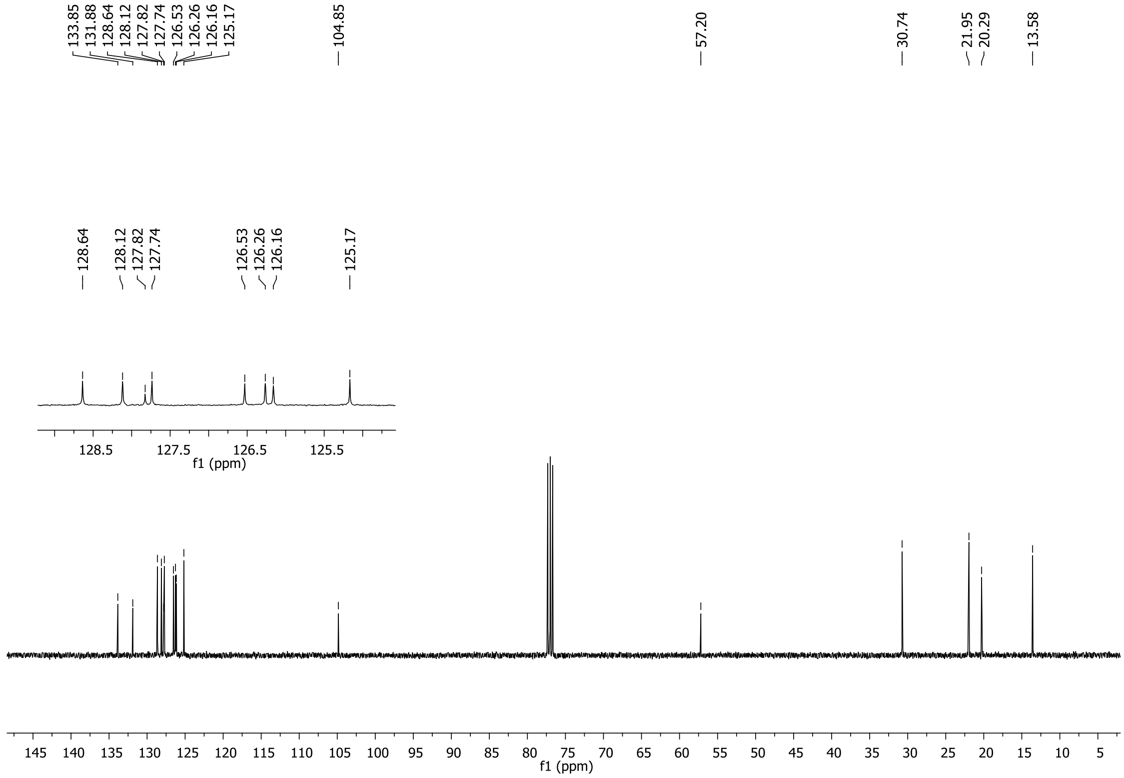
^{1}H NMR spectrum for compound **1u** (CDCl$_3$, 400 MHz)



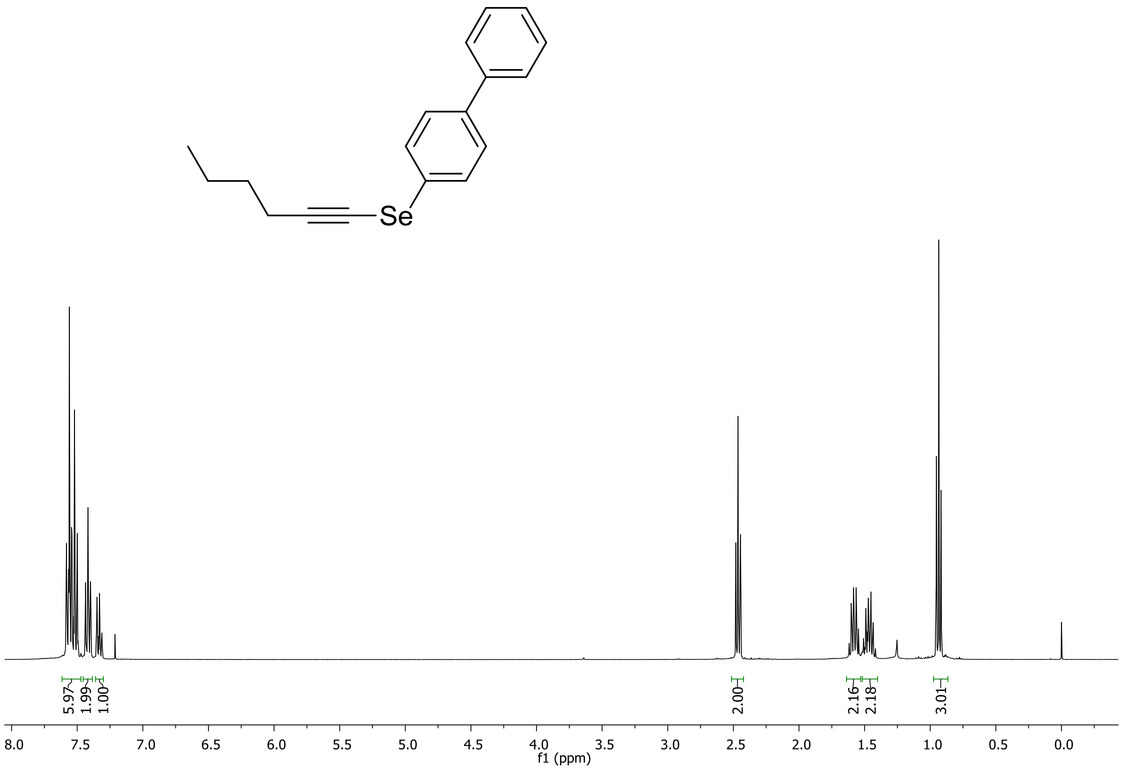
^{13}C NMR spectrum for compound **1u** (CDCl$_3$, 100 MHz)



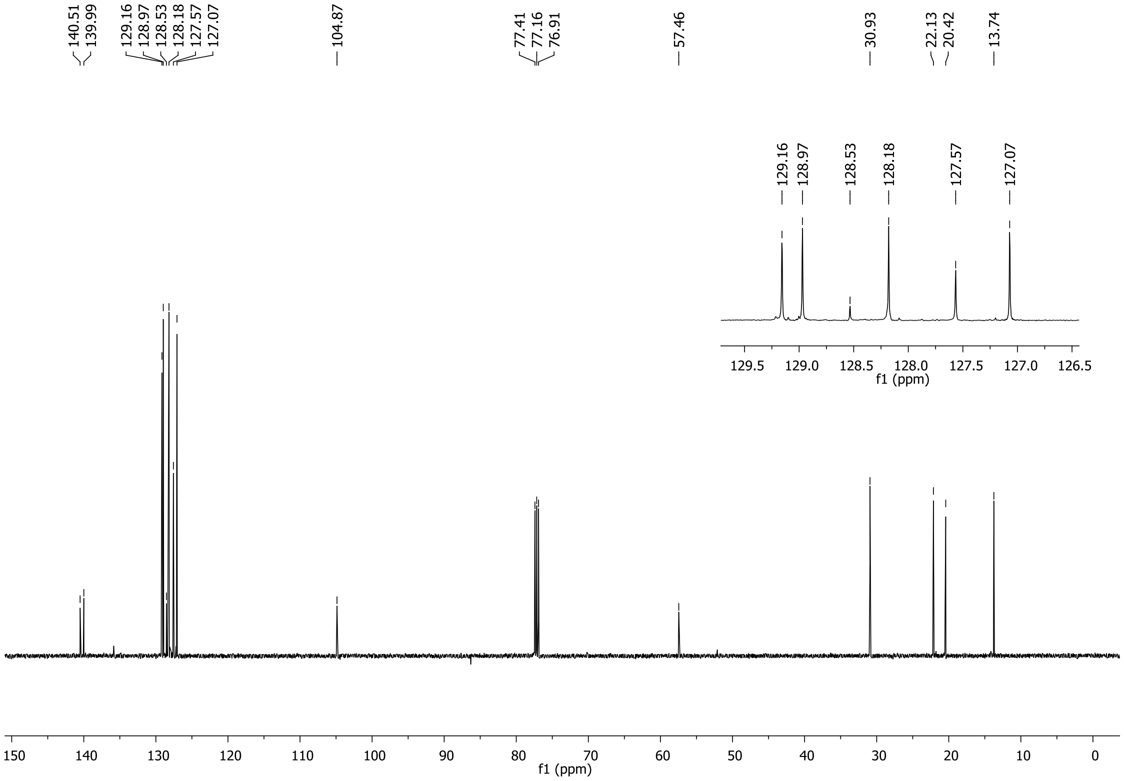
^{1}H NMR spectrum for compound **1v** ($CDCl_3$, 400 MHz)



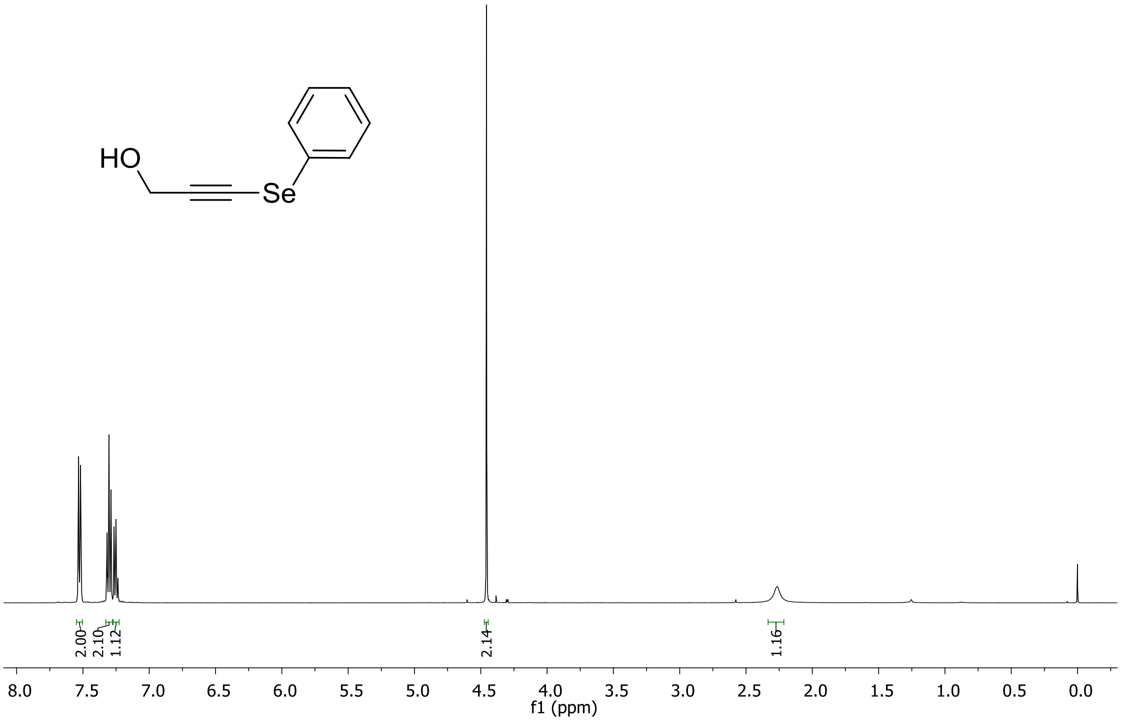
^{13}C NMR spectrum for compound **1v** ($CDCl_3$, 100 MHz)



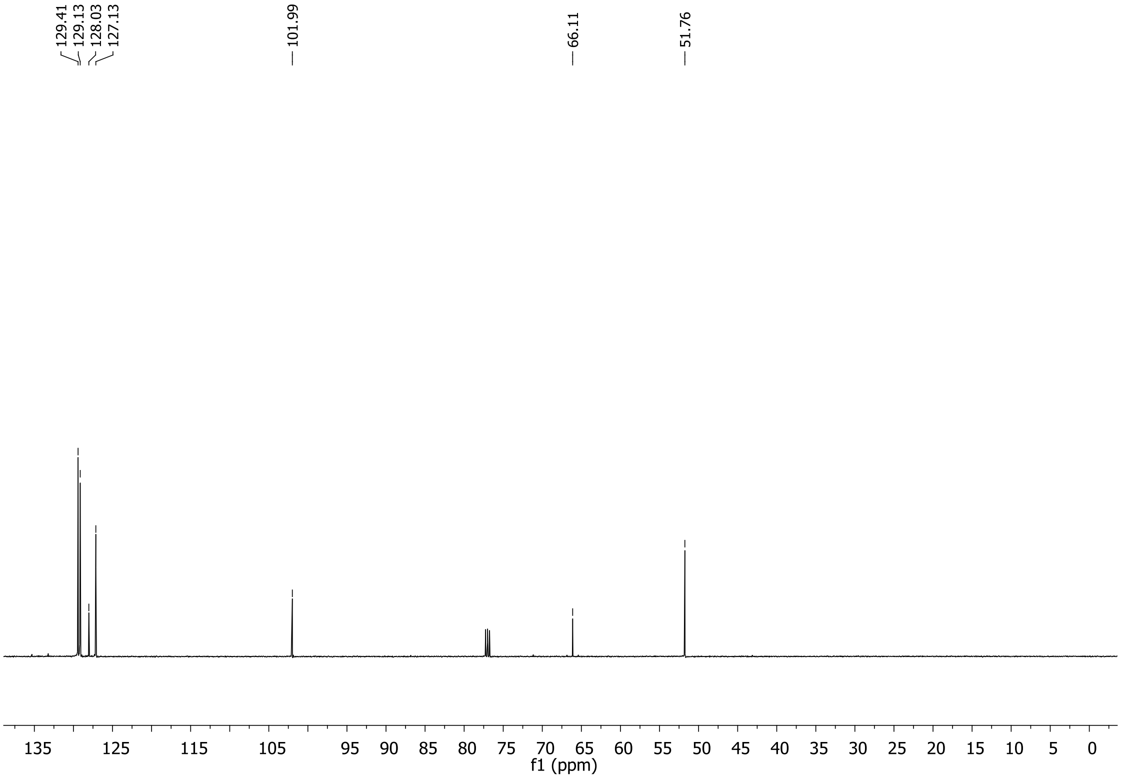
^{1}H NMR spectrum for compound **1w** ($CDCl_3$, 500 MHz)



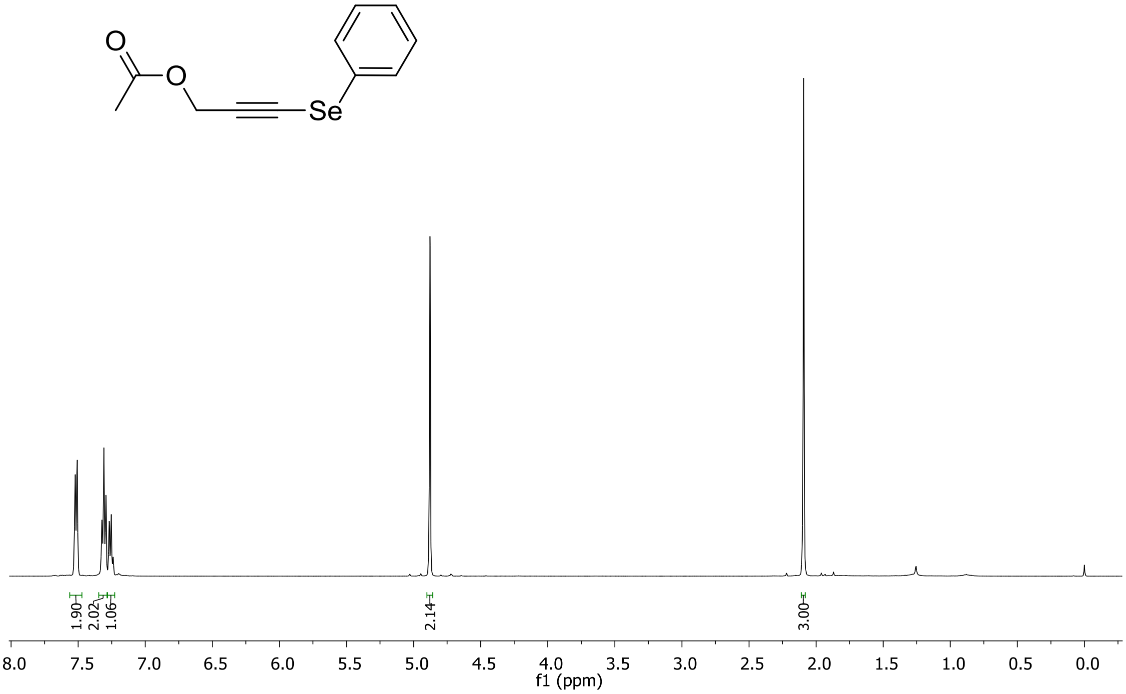
^{13}C NMR spectrum for compound **1w** ($CDCl_3$, 125 MHz)



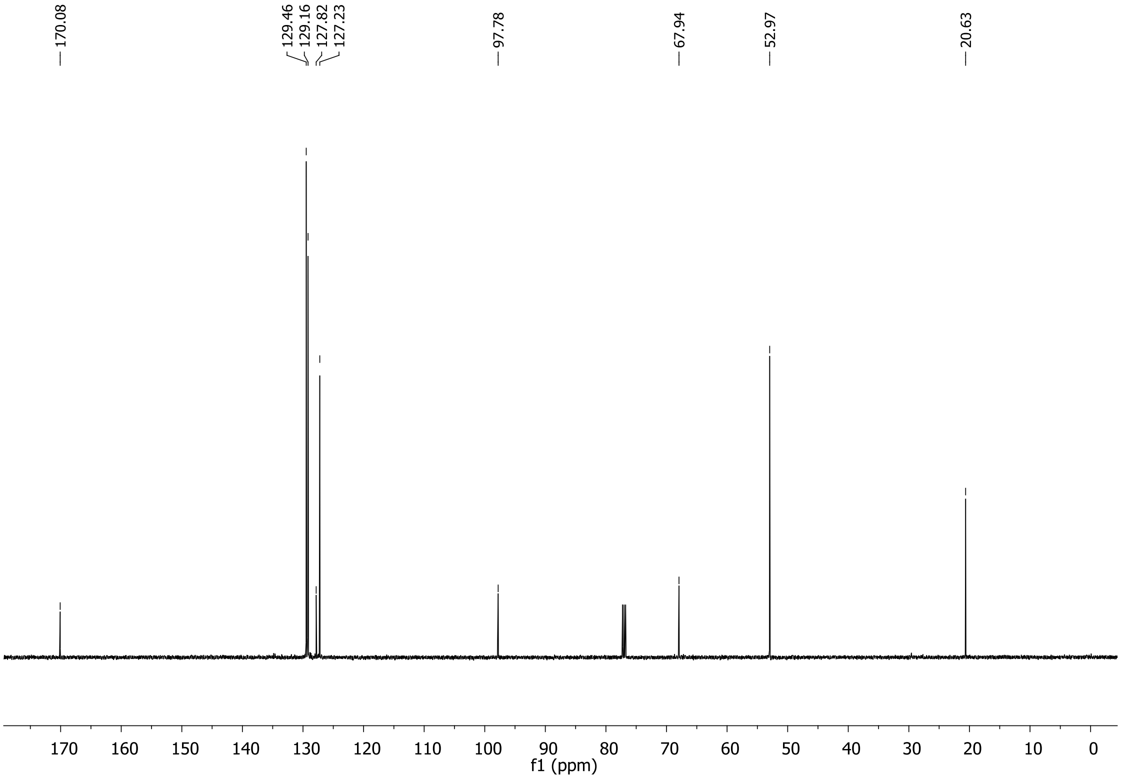
^{1}H NMR spectrum for compound **1x** ($CDCl_3$, 400 MHz)



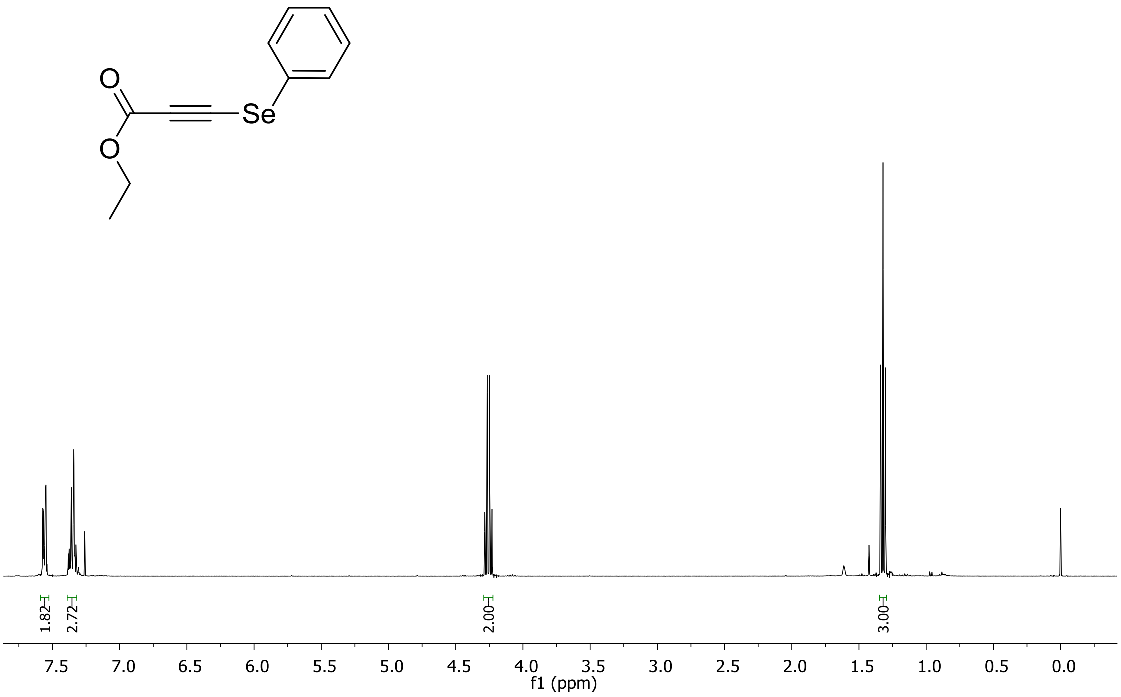
^{13}C NMR spectrum for compound **1x** ($CDCl_3$, 100 MHz)



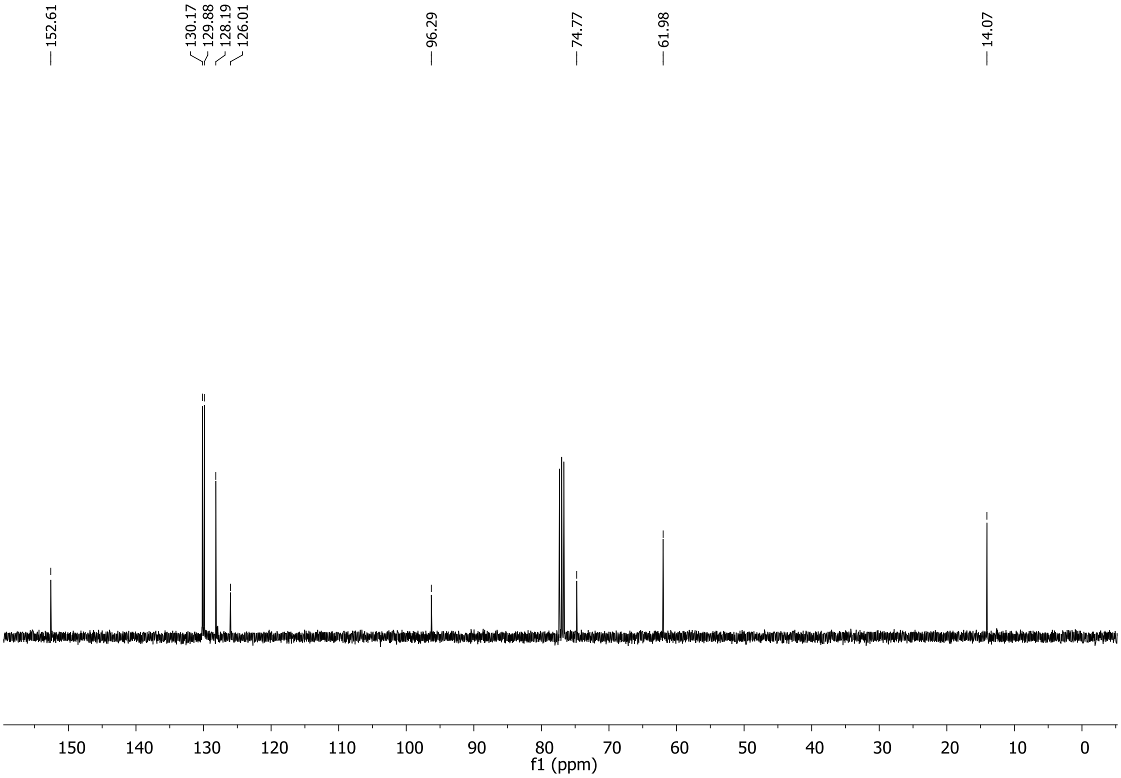
^{1}H NMR spectrum for compound **1y** ($CDCl_3$, 400 MHz)



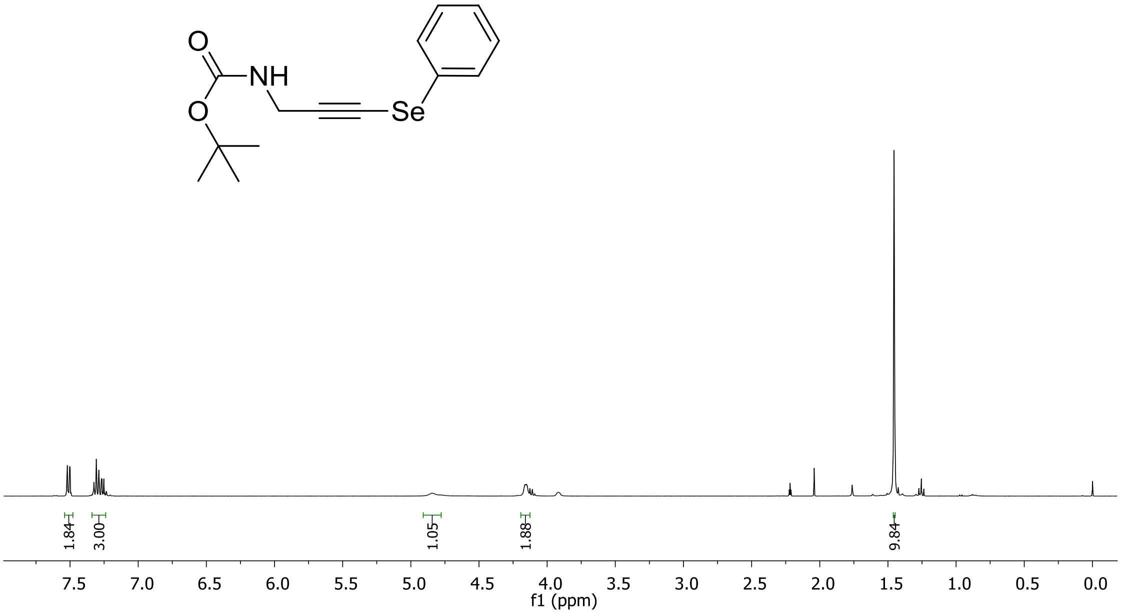
^{13}C NMR spectrum for compound **1y** ($CDCl_3$, 100 MHz)



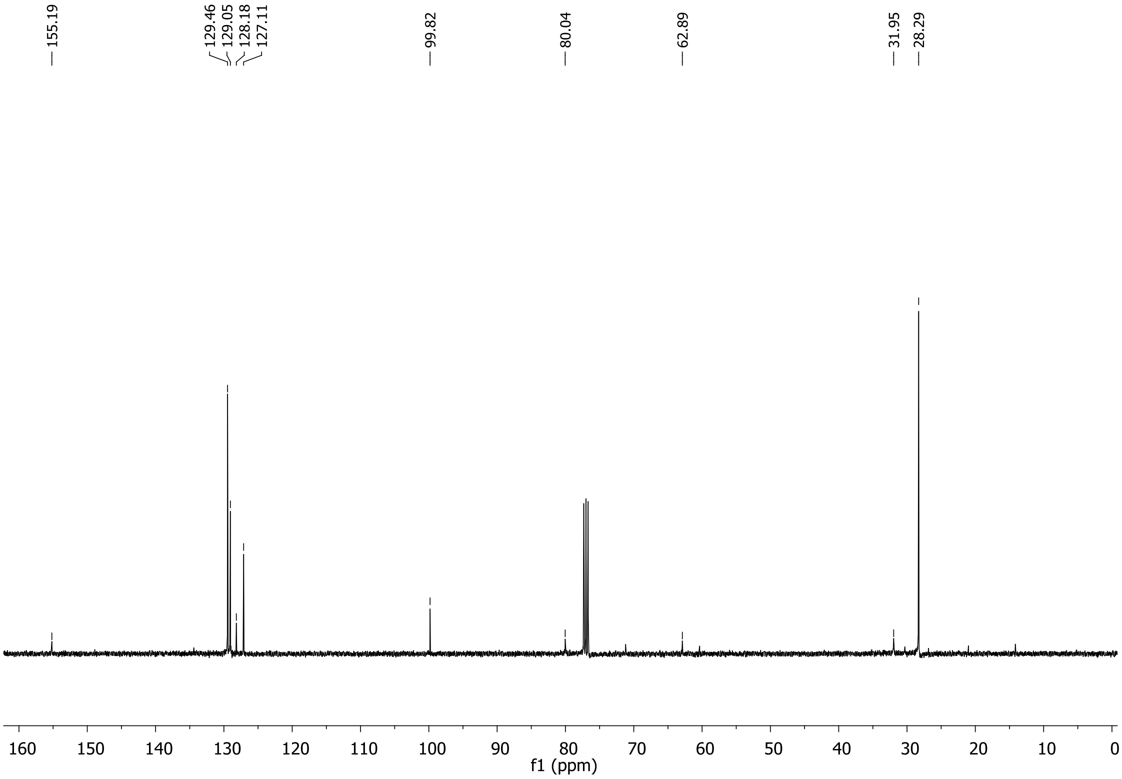
^{1}H NMR spectrum for compound **1z** ($CDCl_3$, 400 MHz)



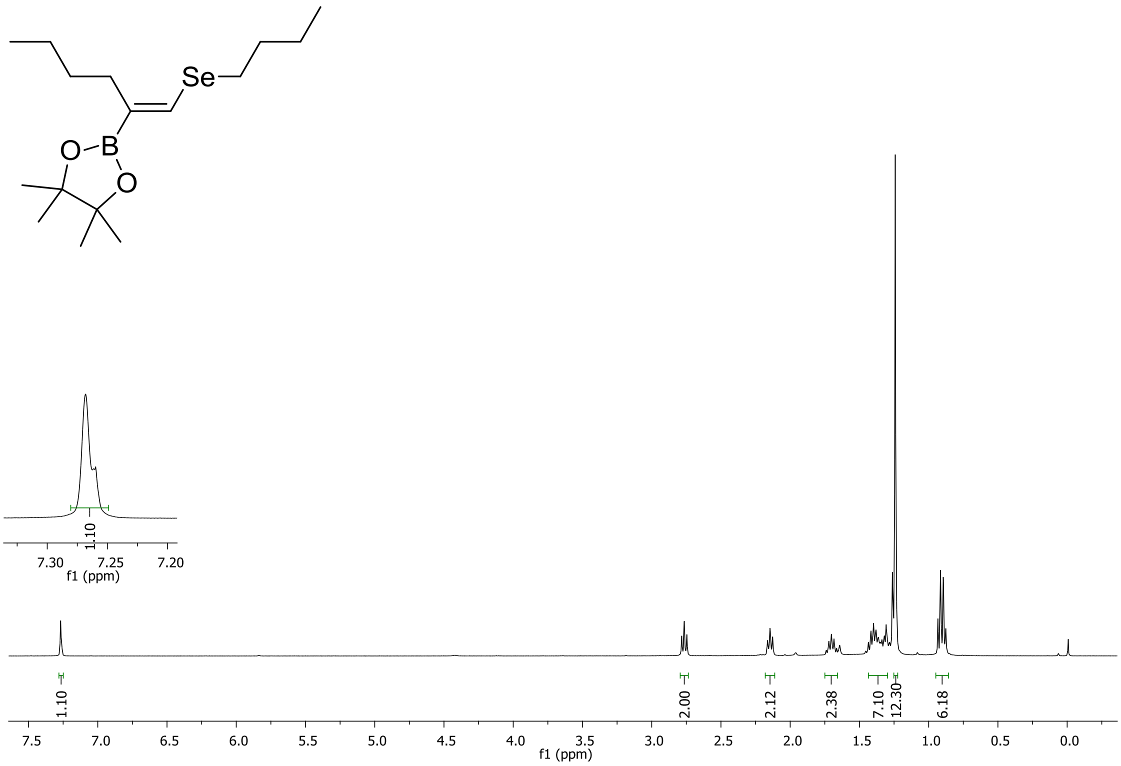
^{13}C NMR spectrum for compound **1z** ($CDCl_3$, 100 MHz)



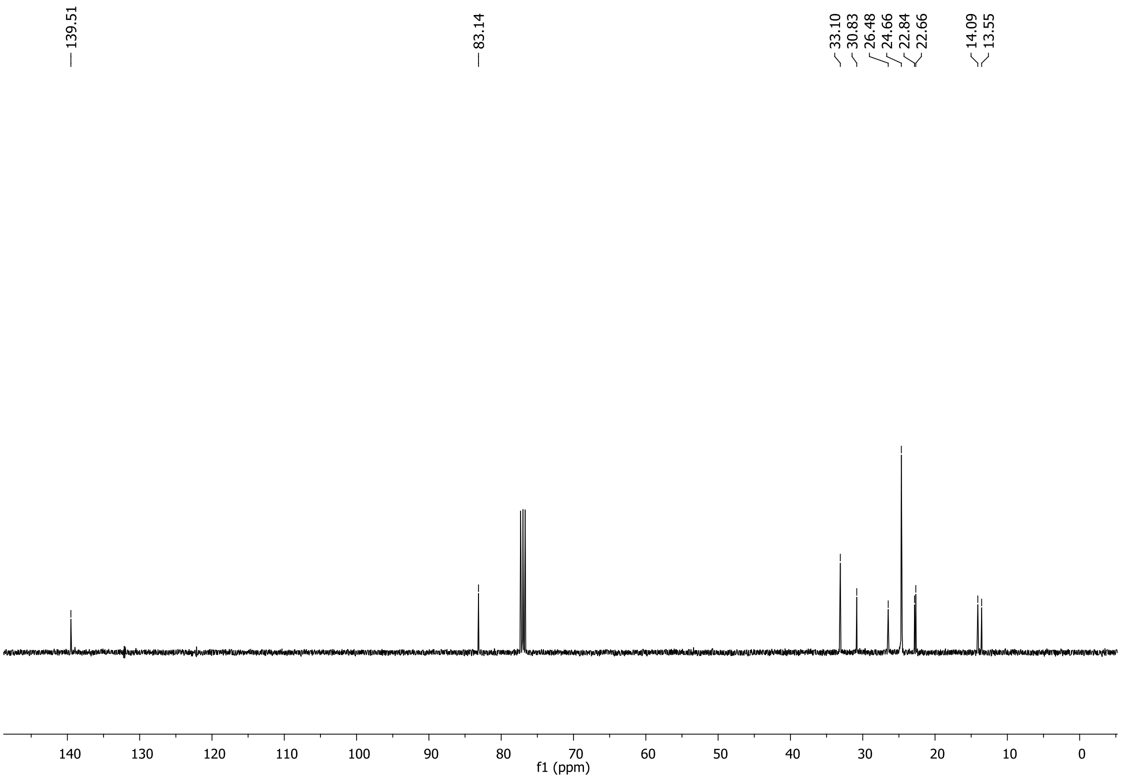
^{1}H NMR spectrum for compound **1aa** ($CDCl_3$, 400 MHz)



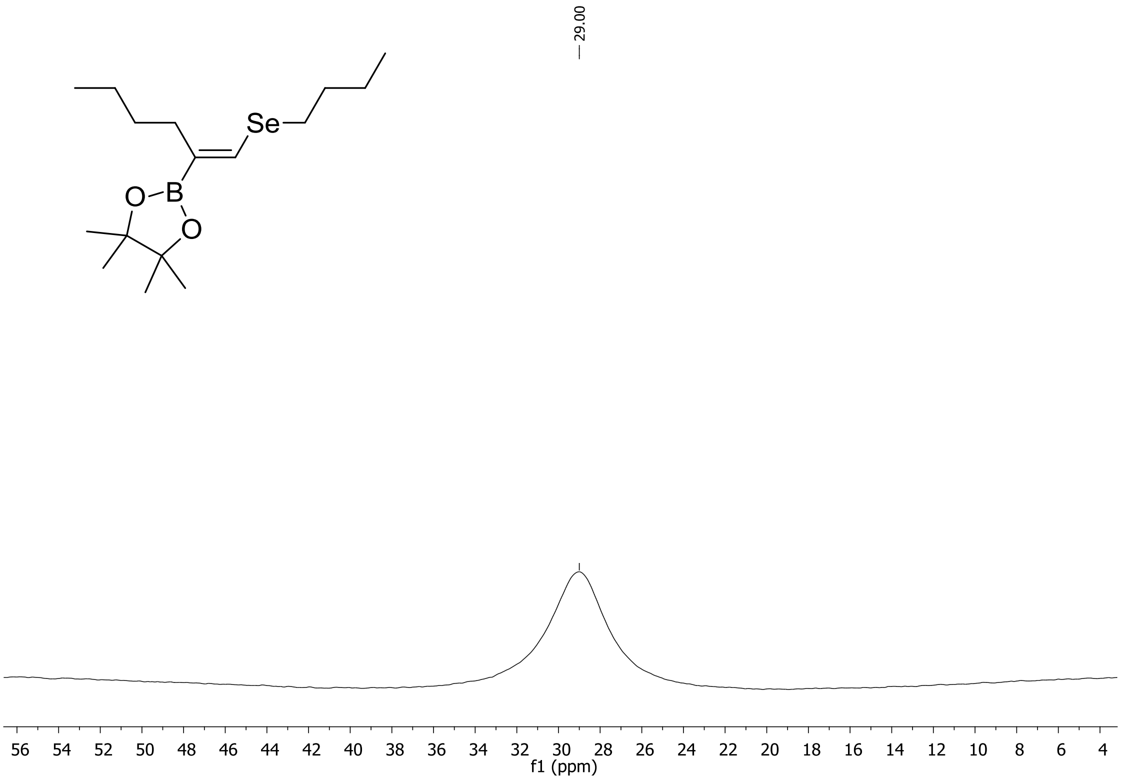
^{13}C NMR spectrum for compound **1aa** ($CDCl_3$, 100 MHz)



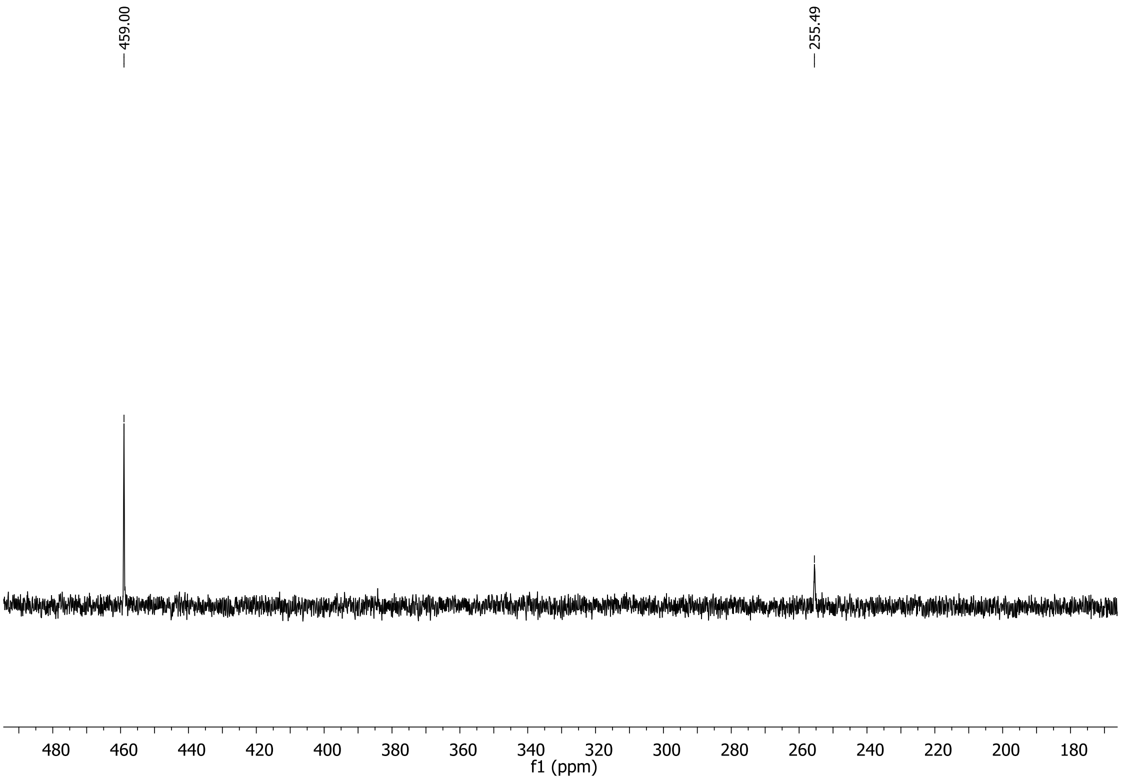
^{1}H NMR spectrum for compound **2a** ($CDCl_3$, 400 MHz)



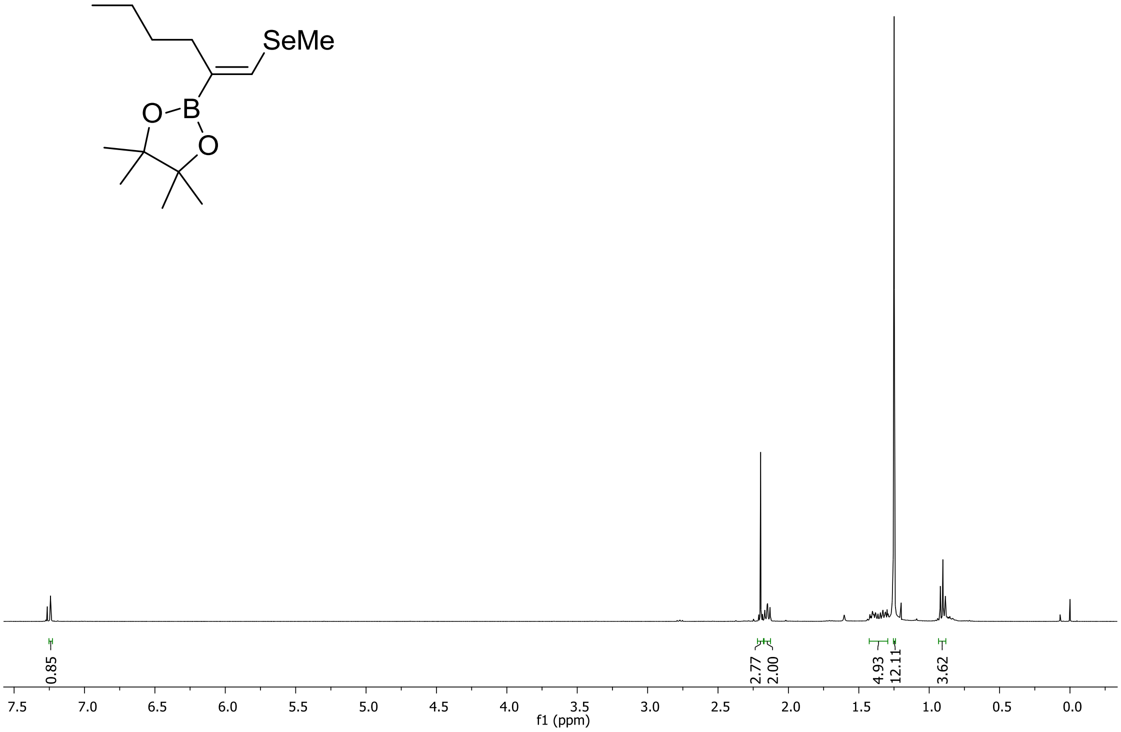
^{13}C NMR spectrum for compound **2a** ($CDCl_3$, 100 MHz)



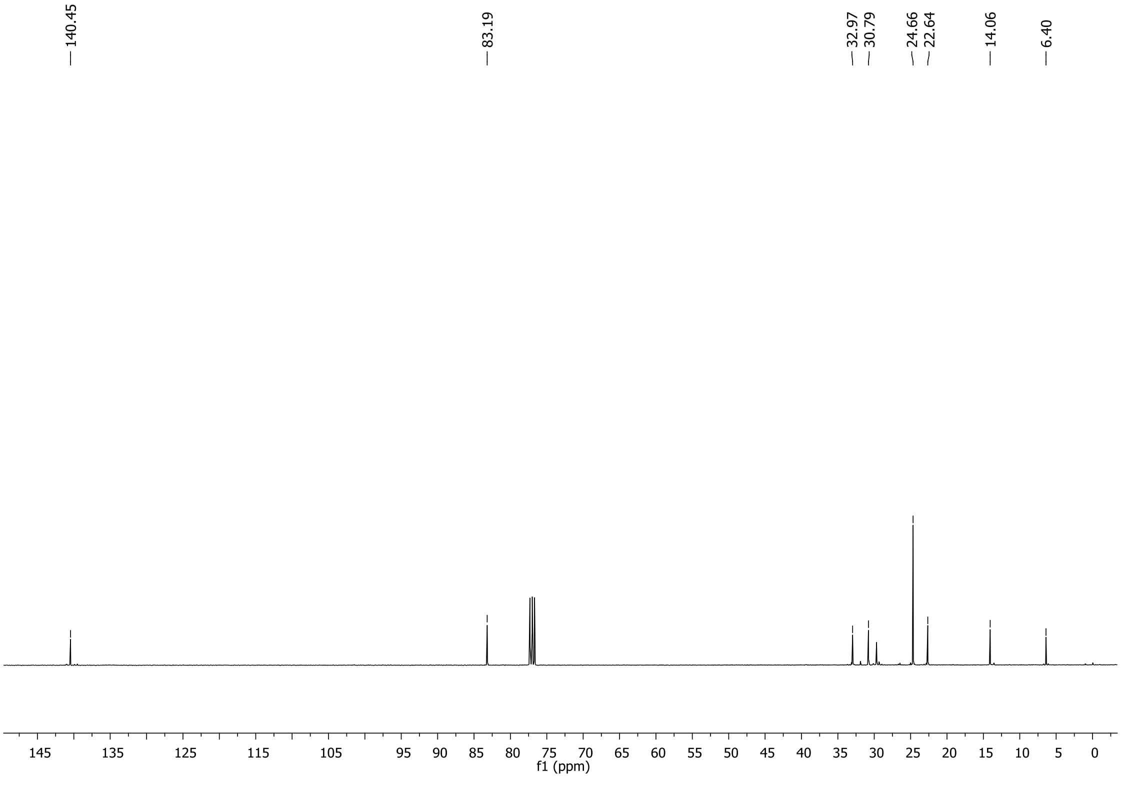
^{11}B NMR spectrum for compound **2a** ($CDCl_3$, 128 MHz)



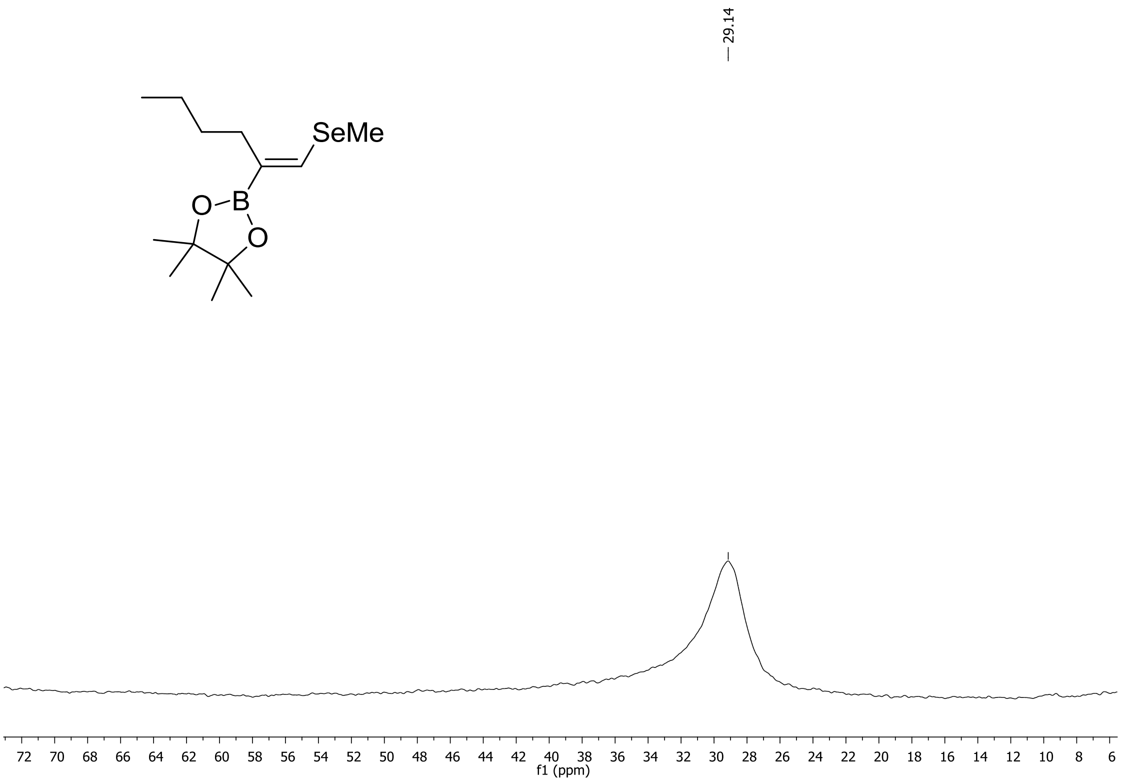
^{77}Se NMR spectrum for compound **2a** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



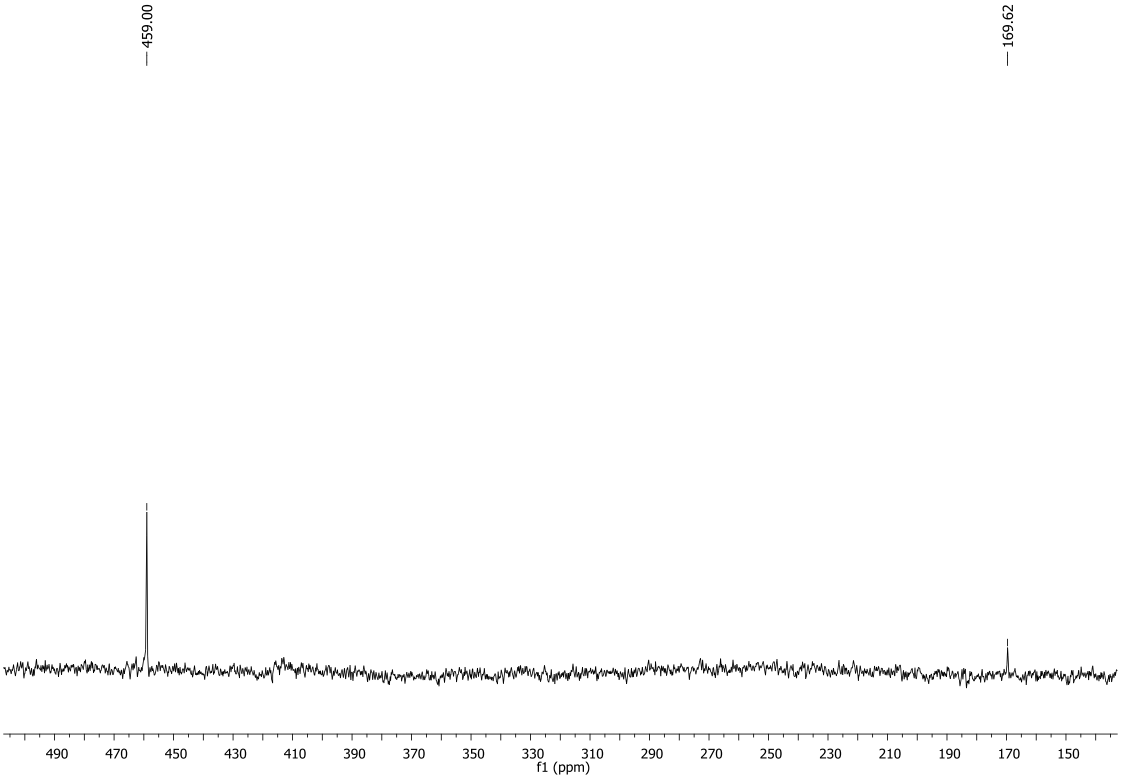
^{1}H NMR spectrum for compound **2b** (CDCl$_3$, 400 MHz)



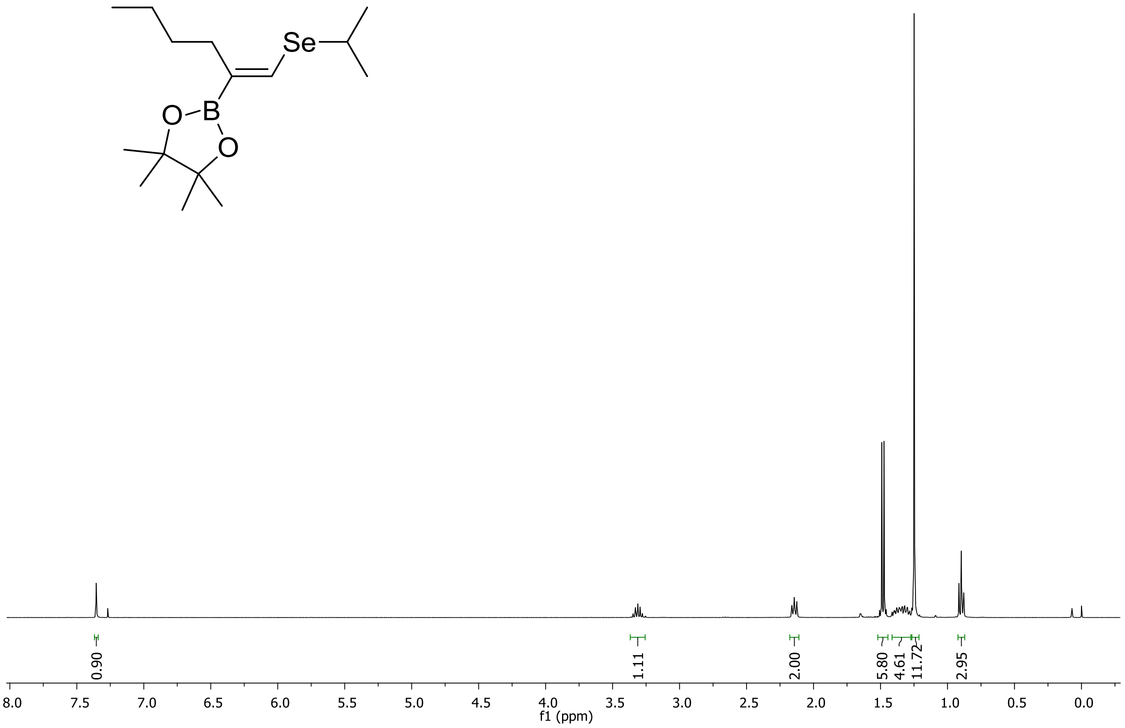
^{13}C NMR spectrum for compound **2b** (CDCl$_3$, 100 MHz)



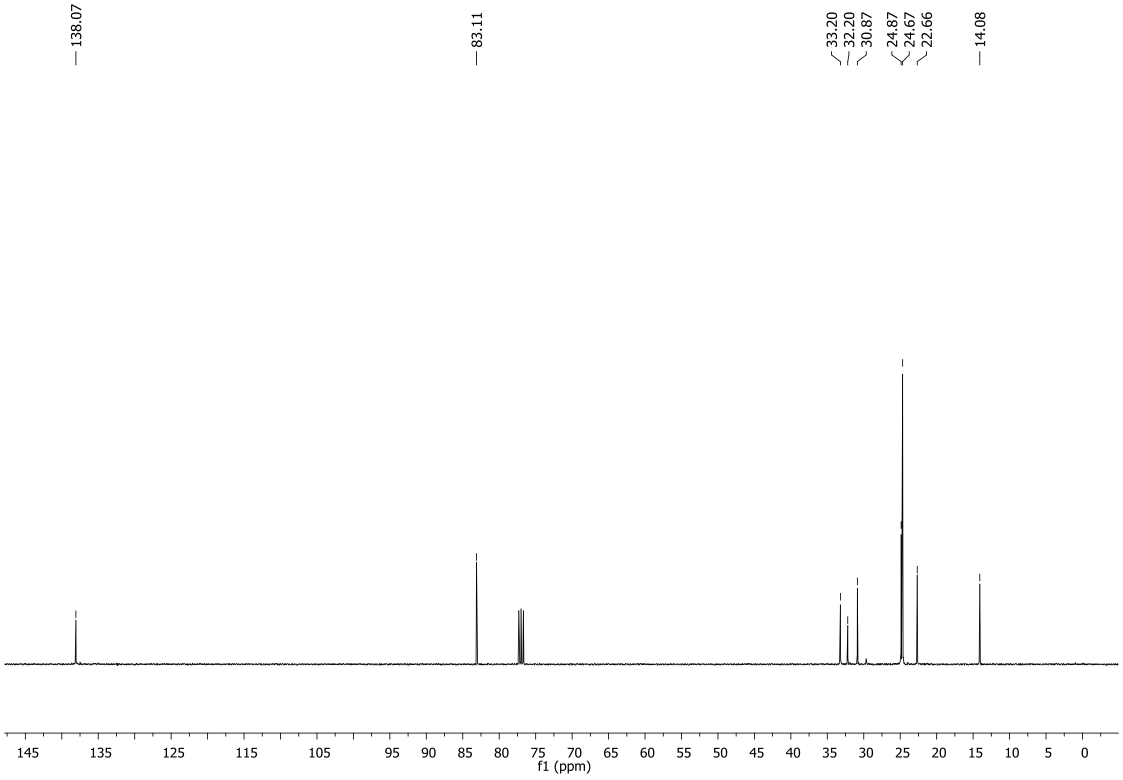
^{11}B NMR spectrum for compound **2b** ($CDCl_3$, 128 MHz)



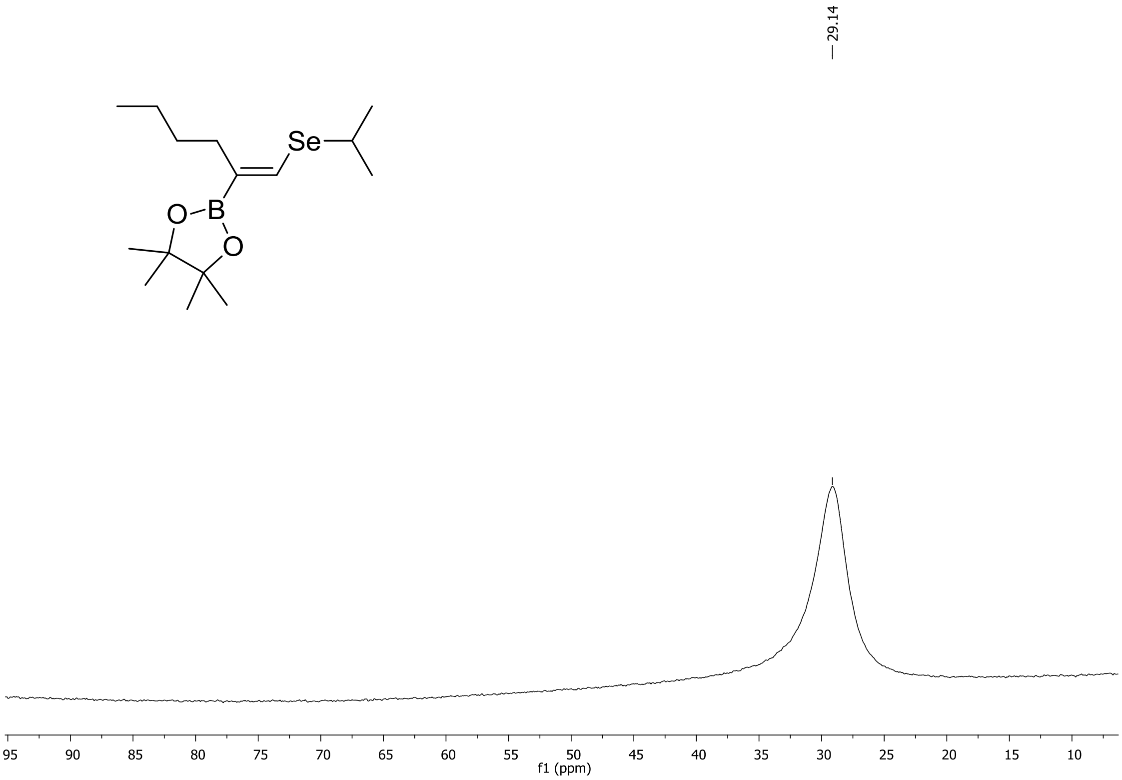
^{77}Se NMR spectrum for compound **2b** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



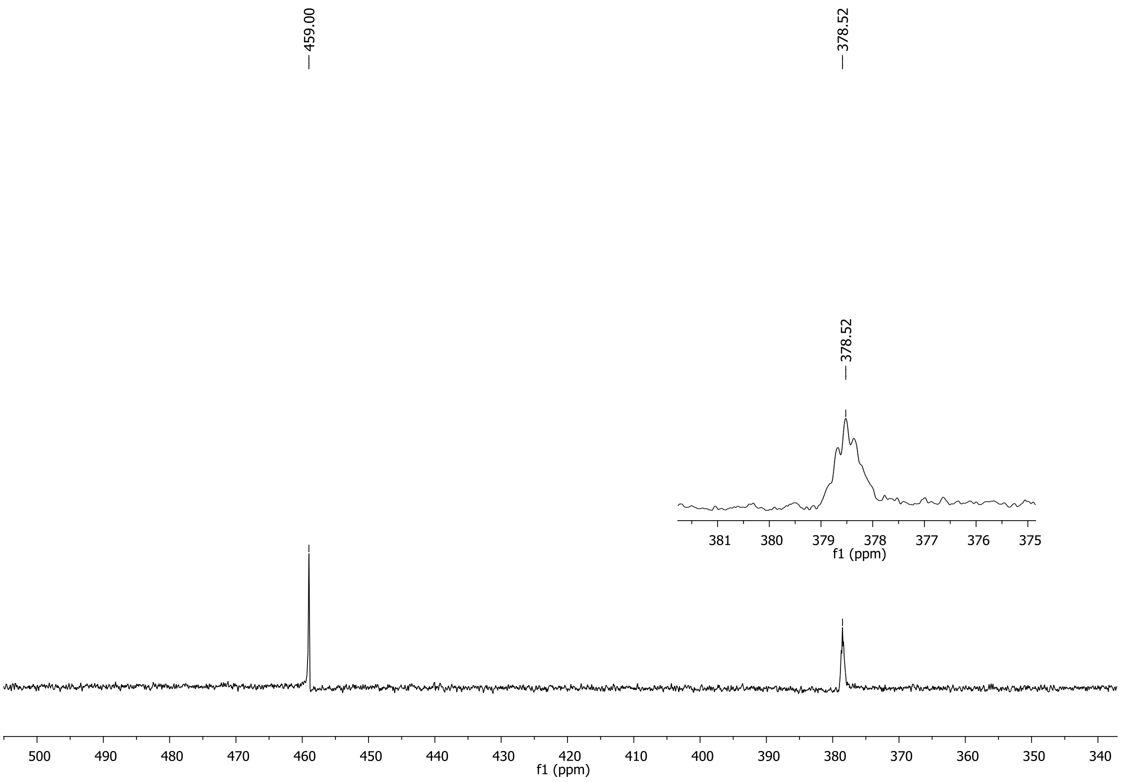
^{1}H NMR spectrum for compound **2c** ($CDCl_3$, 400 MHz)



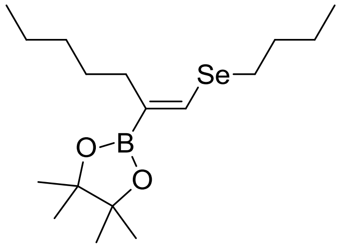
^{13}C NMR spectrum for compound **2c** ($CDCl_3$, 100 MHz)

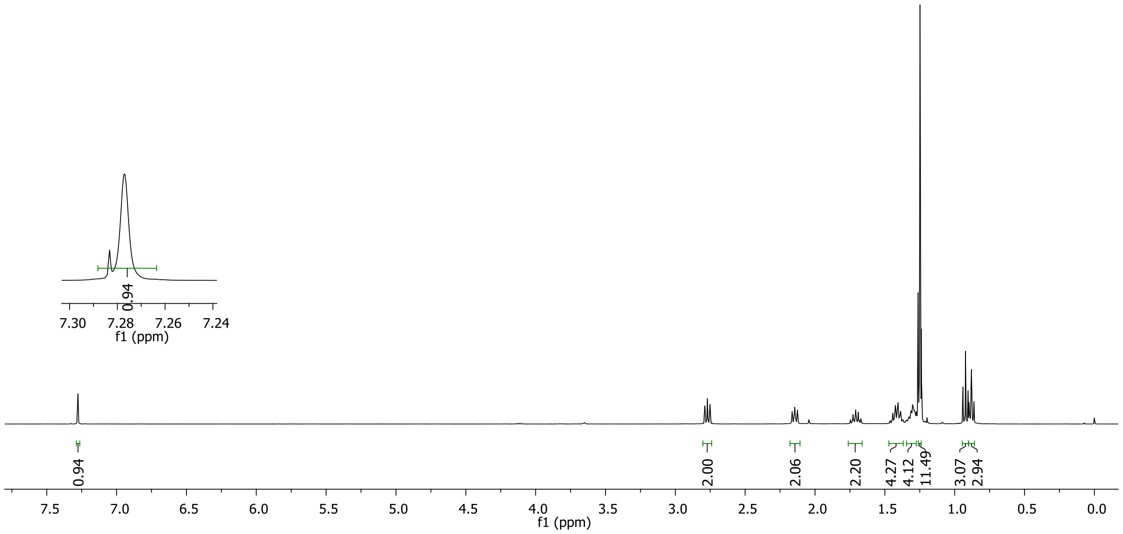


^{11}B NMR spectrum for compound **2c** ($CDCl_3$, 128MHz)

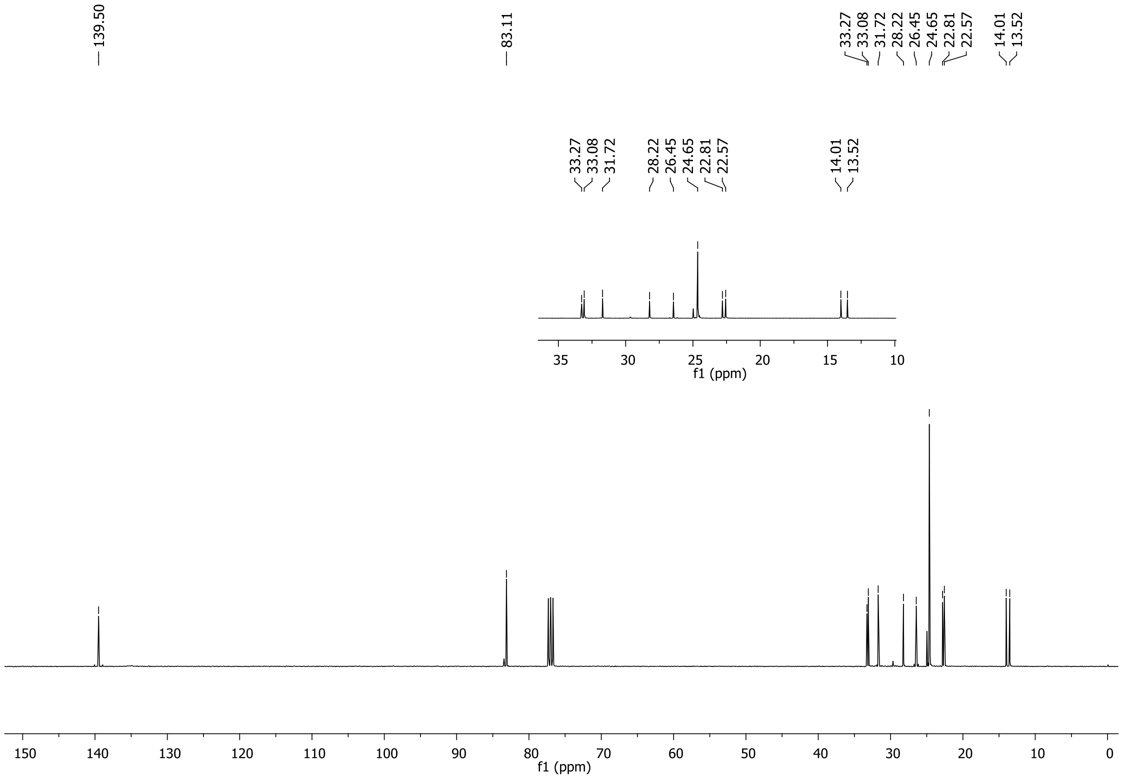


^{77}Se NMR spectrum for compound **2c** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)

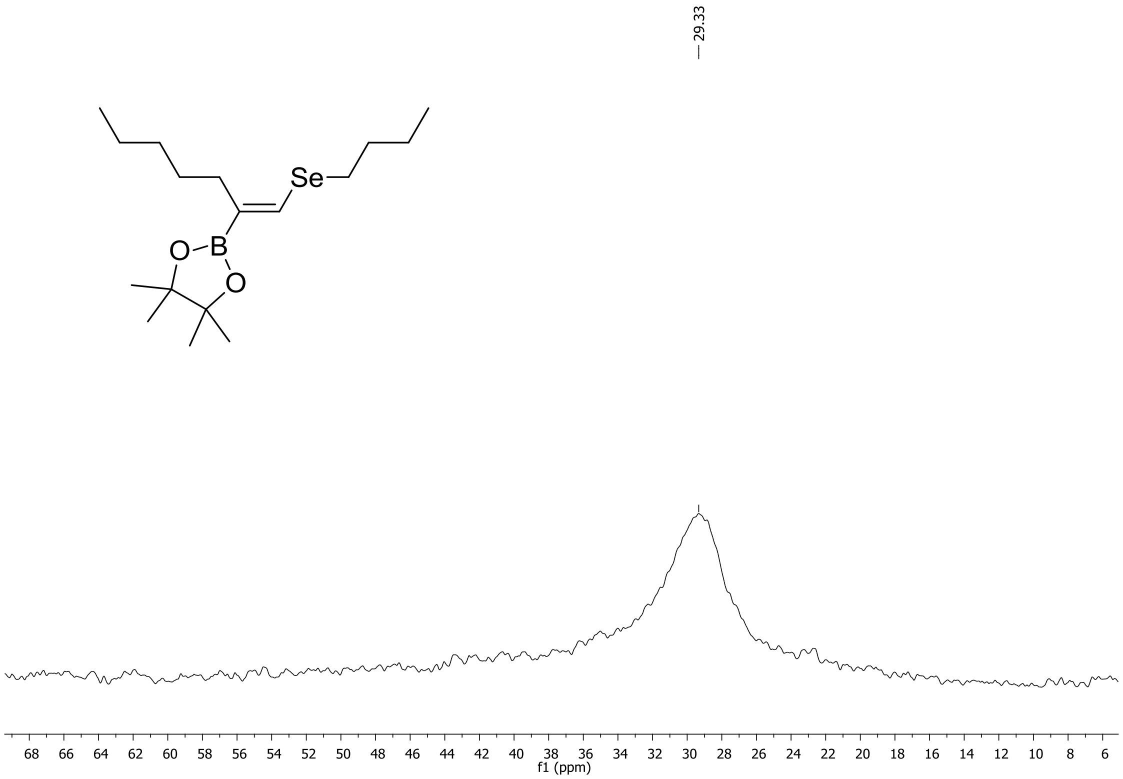




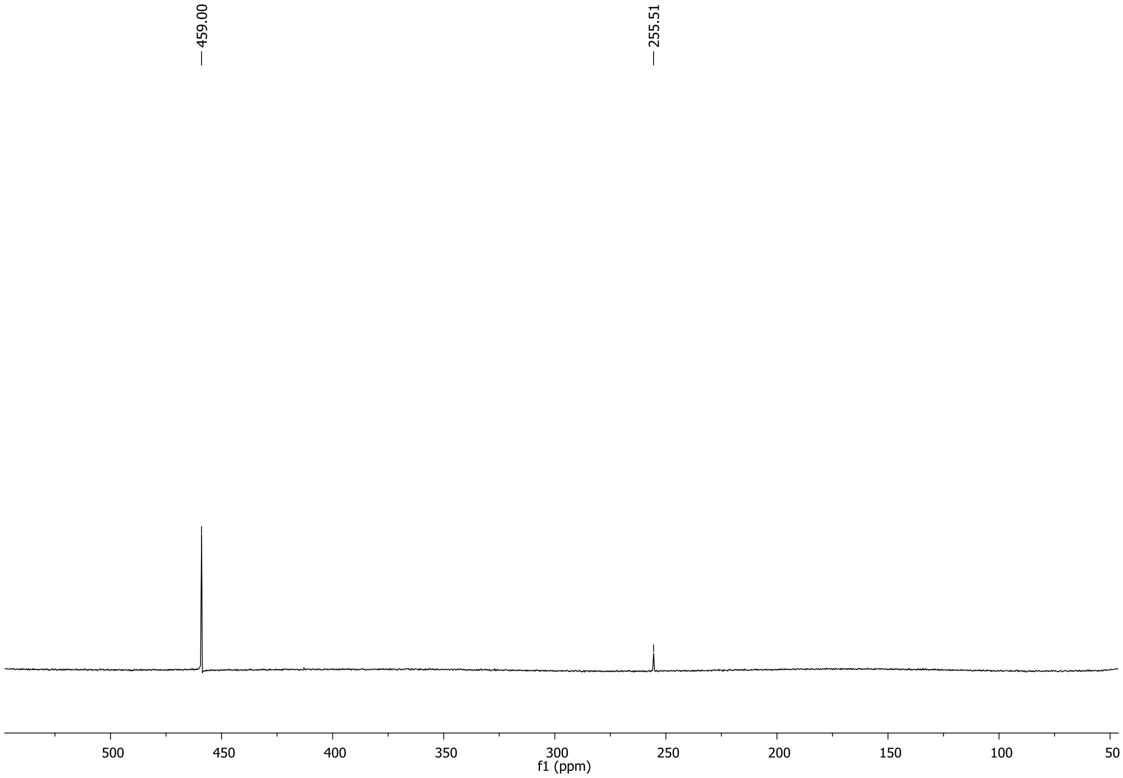
^{1}H NMR spectrum for compound **2d** ($CDCl_3$, 400 MHz)



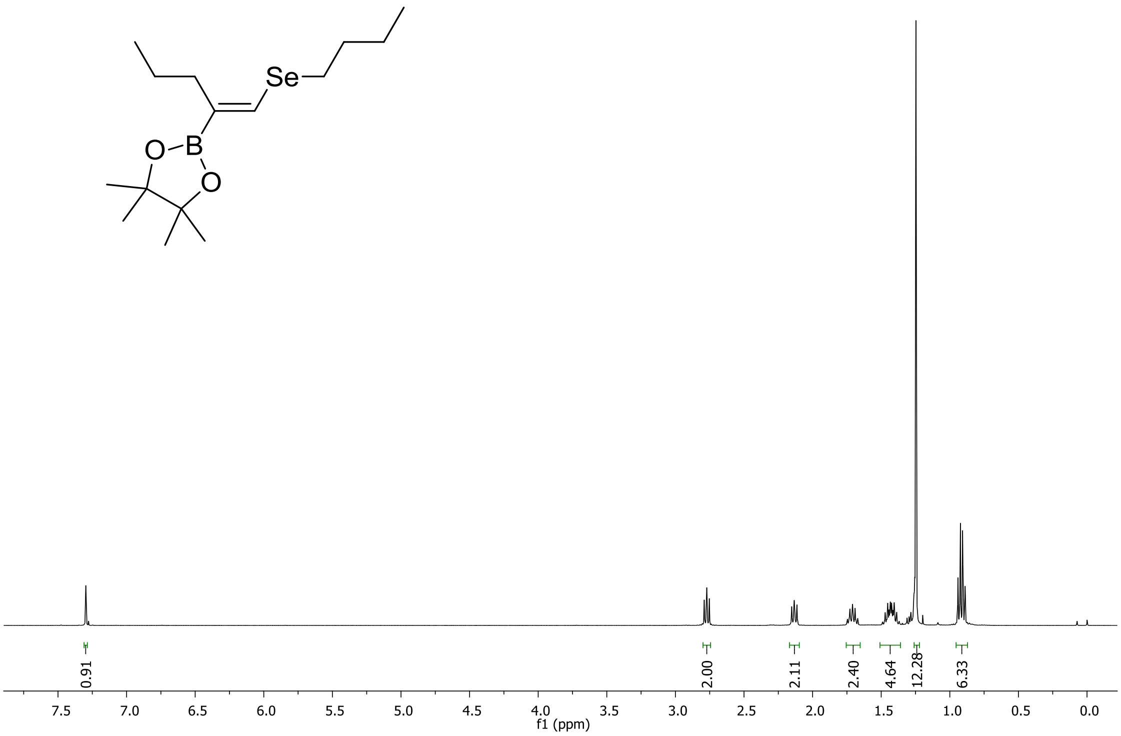
^{13}C NMR spectrum for compound **2d** ($CDCl_3$, 100 MHz)



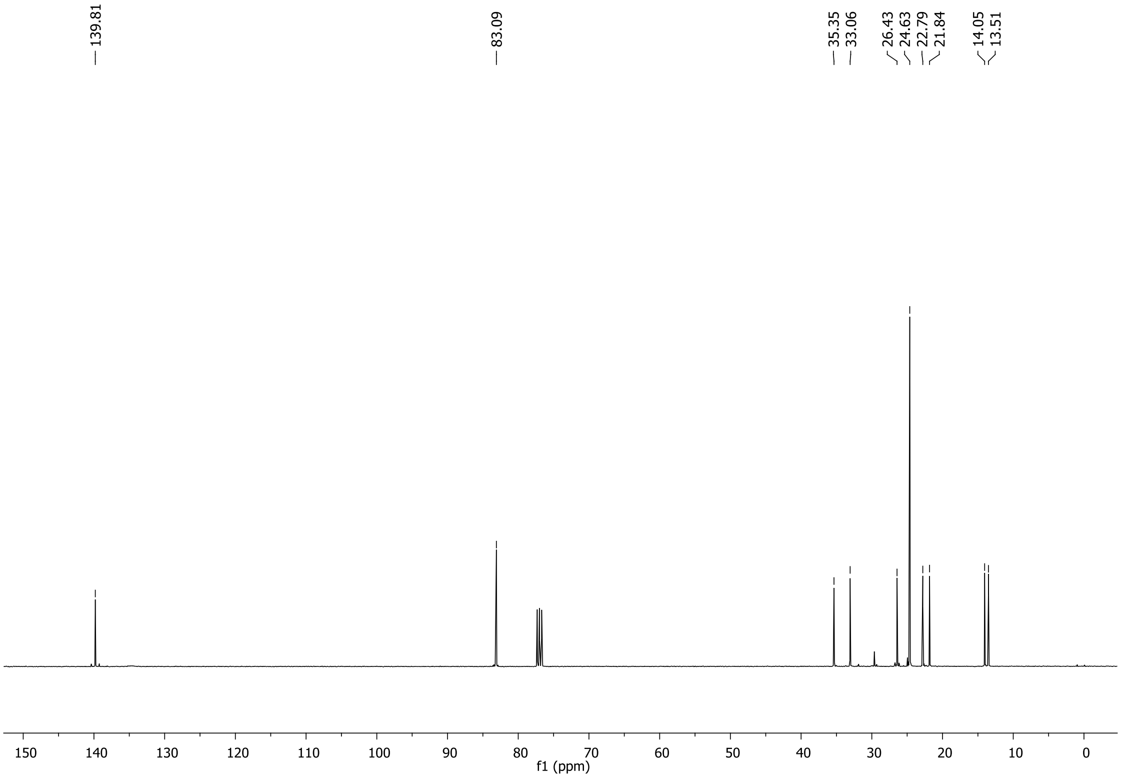
^{11}B NMR spectrum for compound **2d** ($CDCl_3$, 128 MHz)



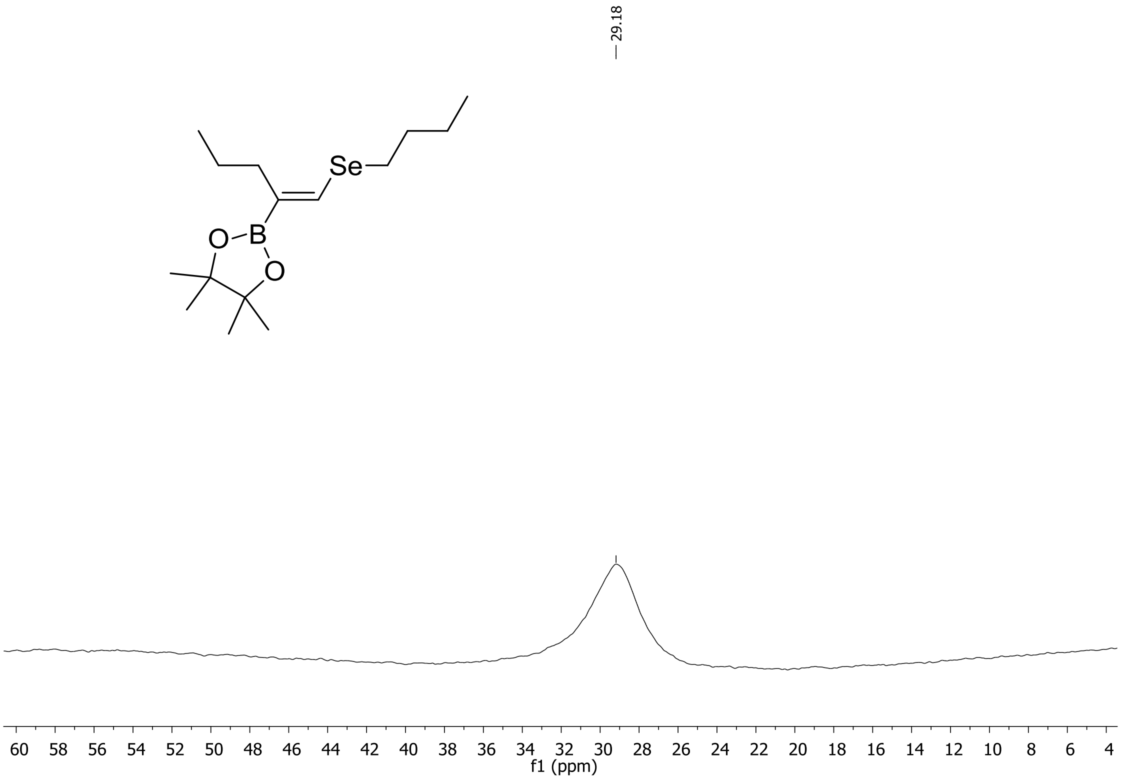
^{77}Se NMR spectrum for compound **2d** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



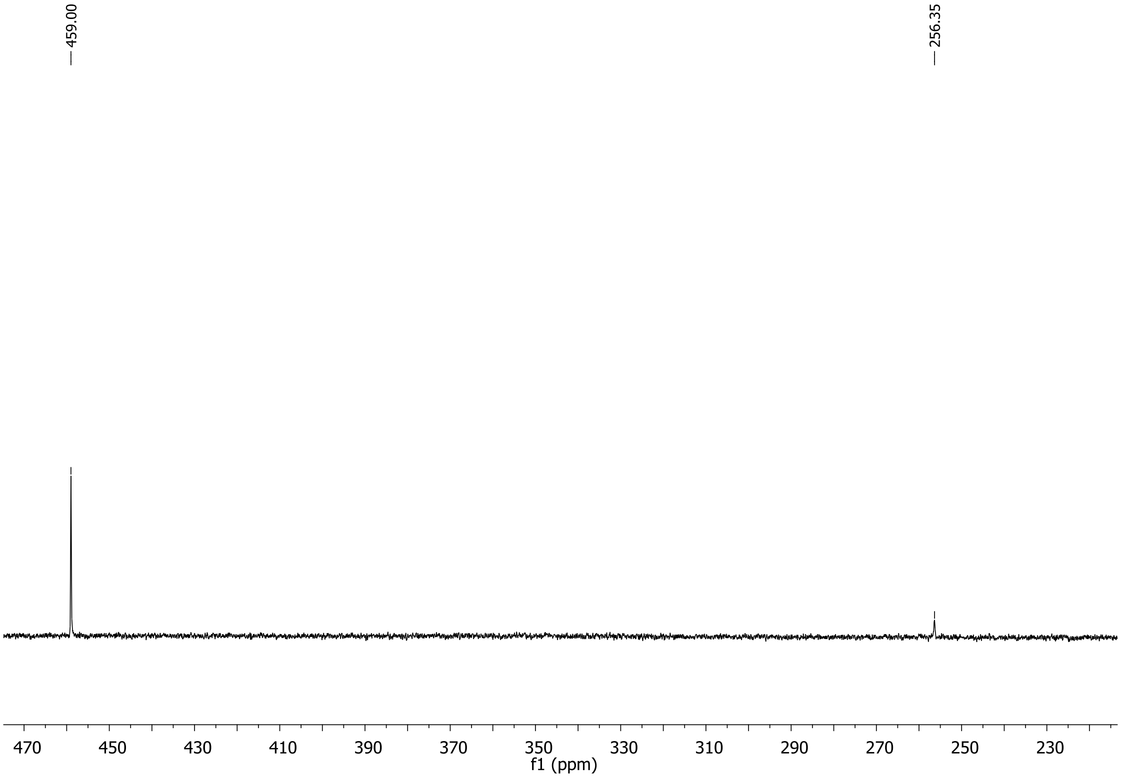
^{1}H NMR spectrum for compound **2e** (CDCl$_3$, 400 MHz)



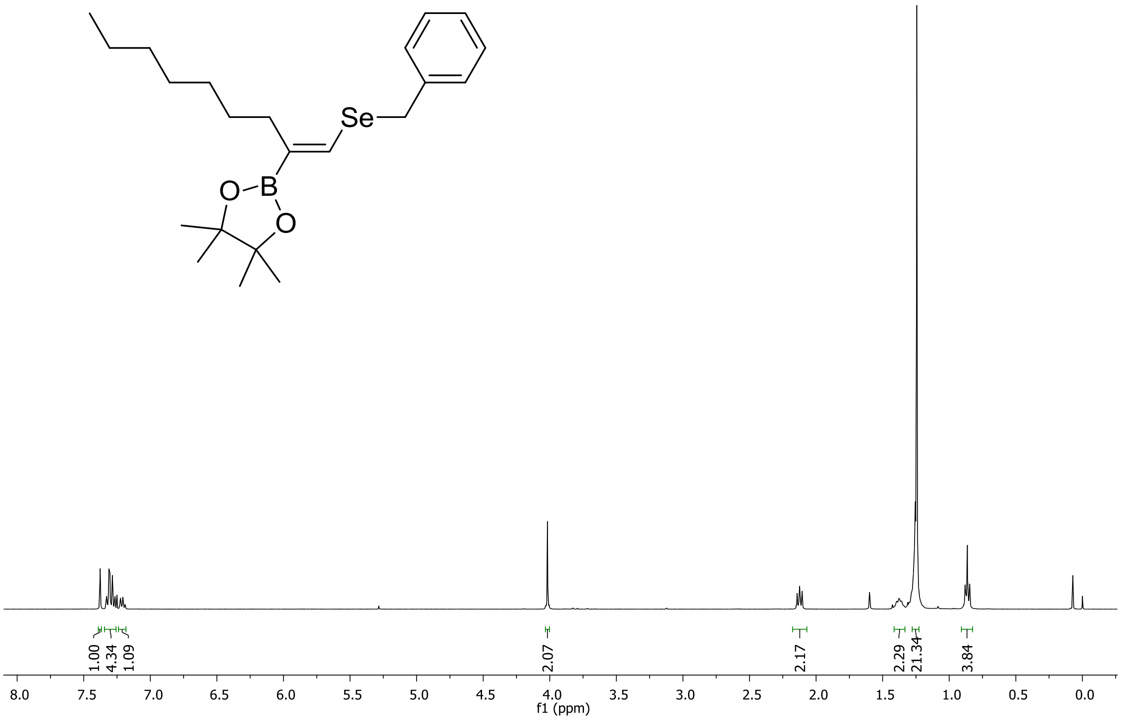
^{13}C NMR spectrum for compound **2e** (CDCl$_3$, 100 MHz)



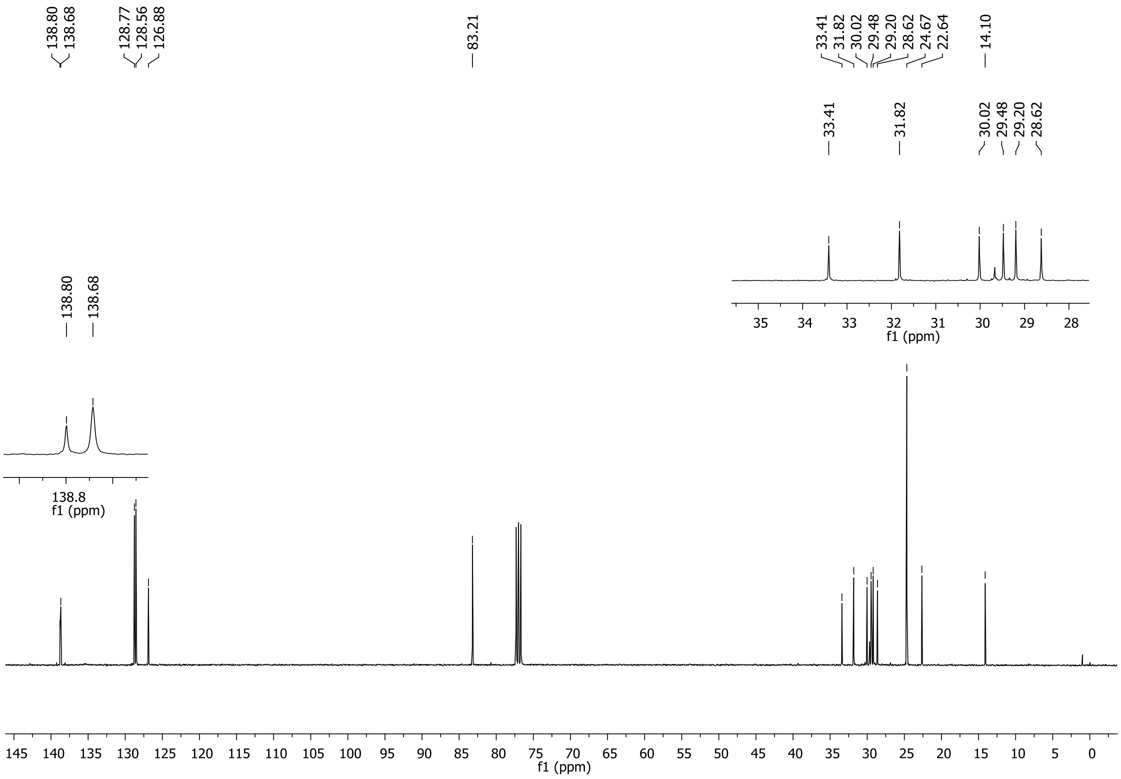
^{11}B NMR spectrum for compound **2e** ($CDCl_3$, 128 MHz)



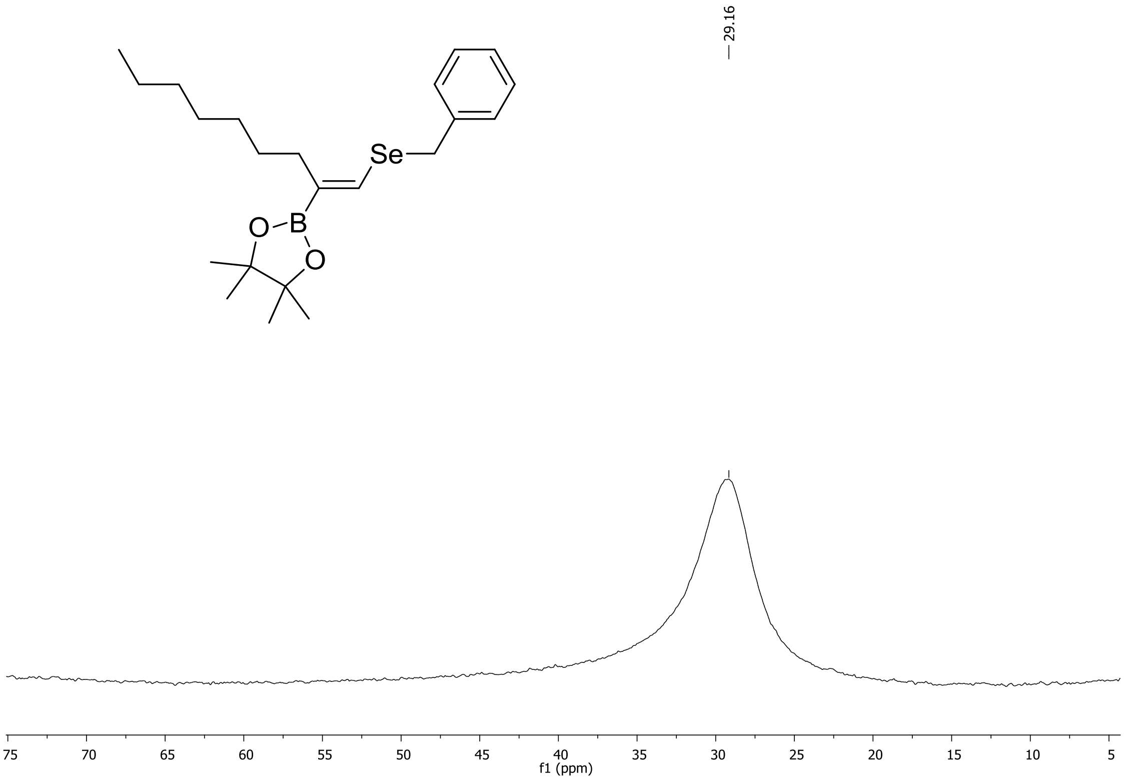
^{77}Se NMR spectrum for compound **2e** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



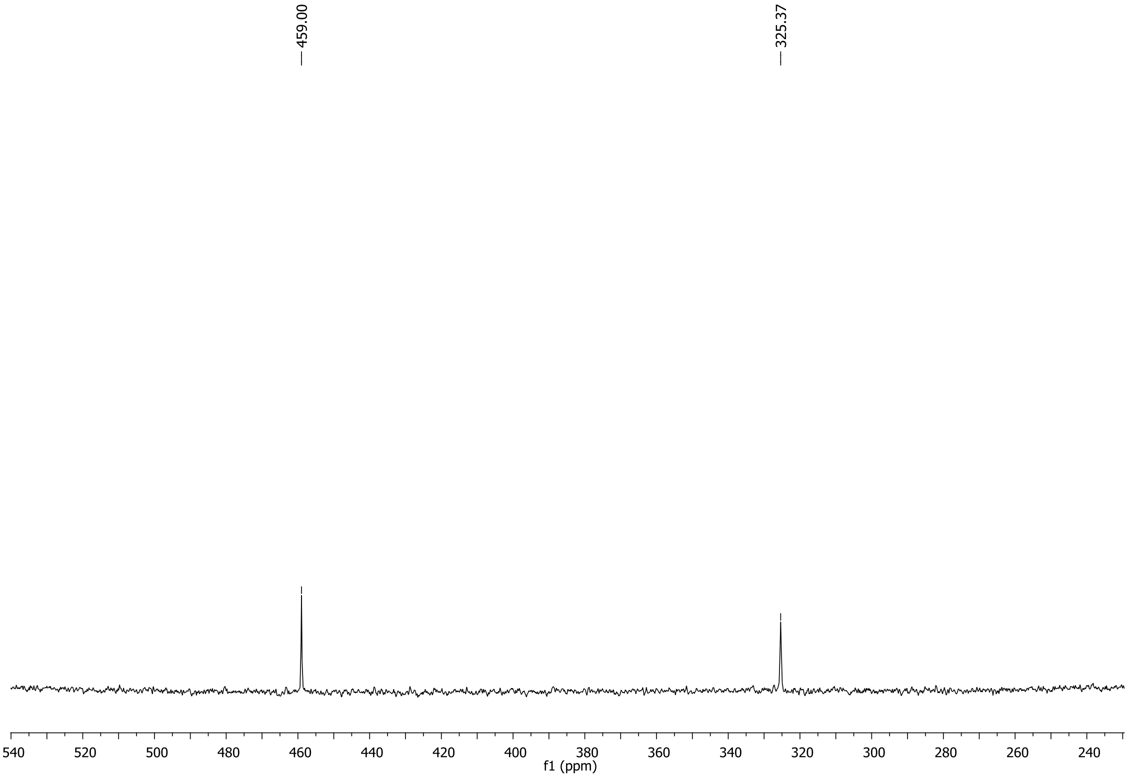
^{1}H NMR spectrum for compound **2f** ($CDCl_3$, 400 MHz)



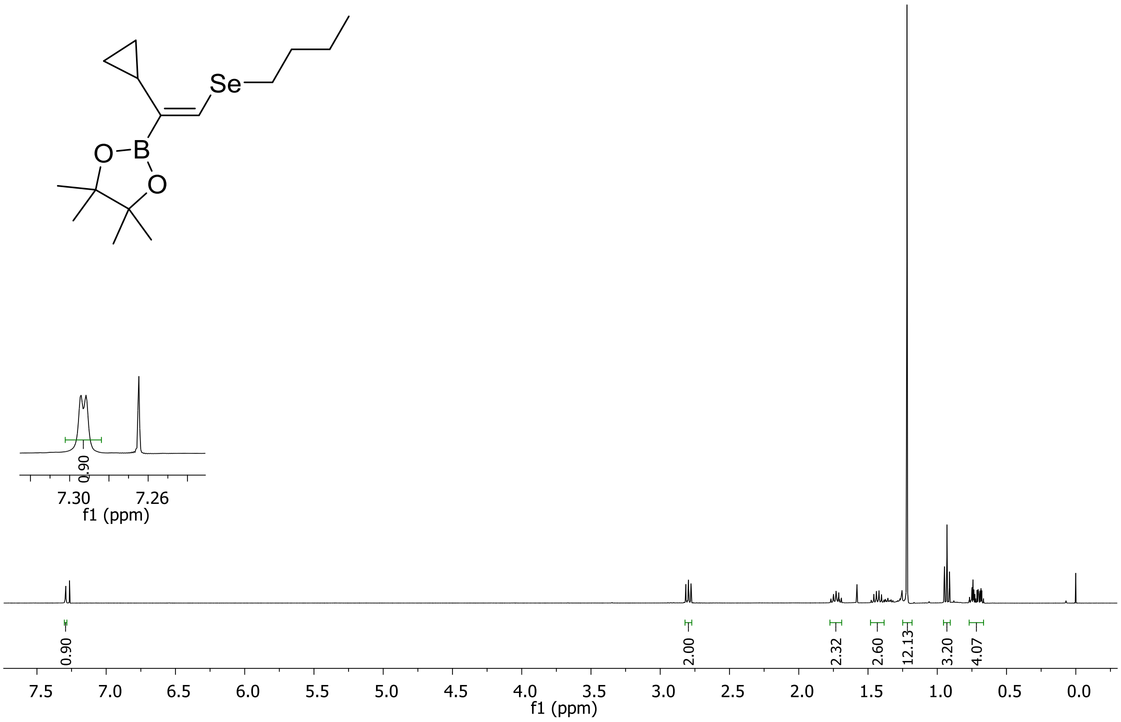
^{13}C NMR spectrum for compound **2f** ($CDCl_3$, 100 MHz)



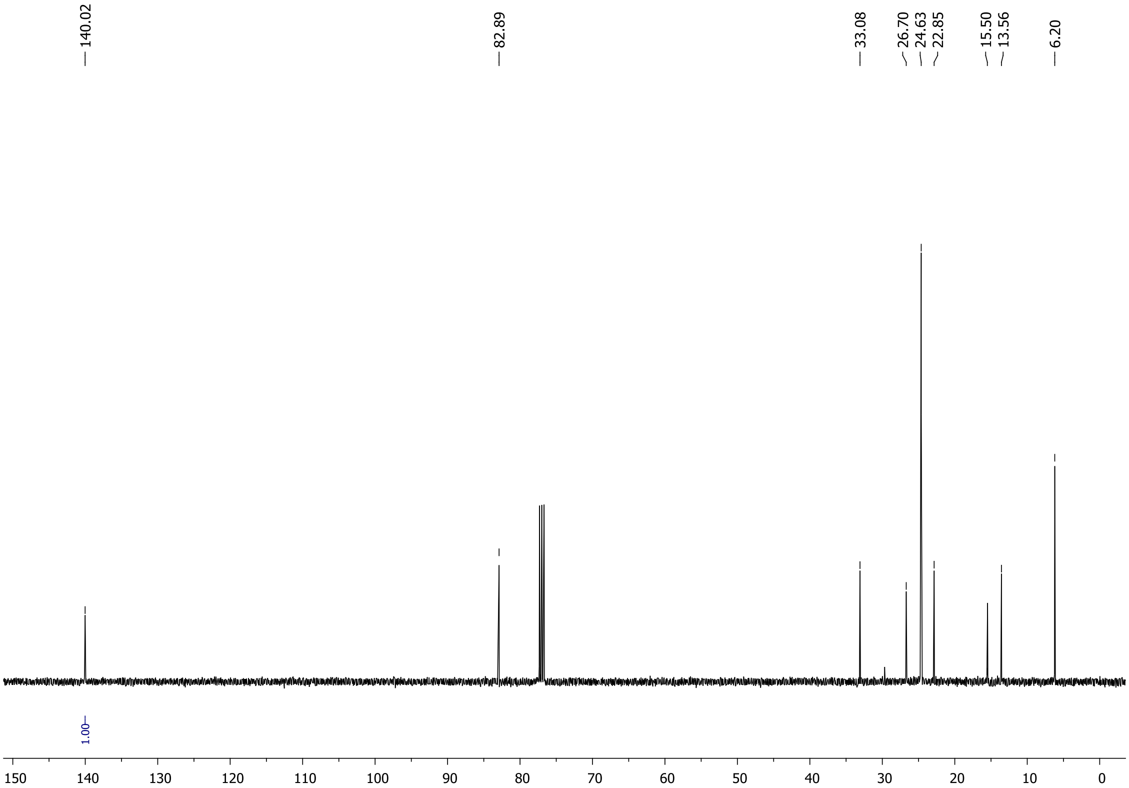
^{11}B NMR spectrum for compound **2f** (CDCl$_3$, 128MHz)



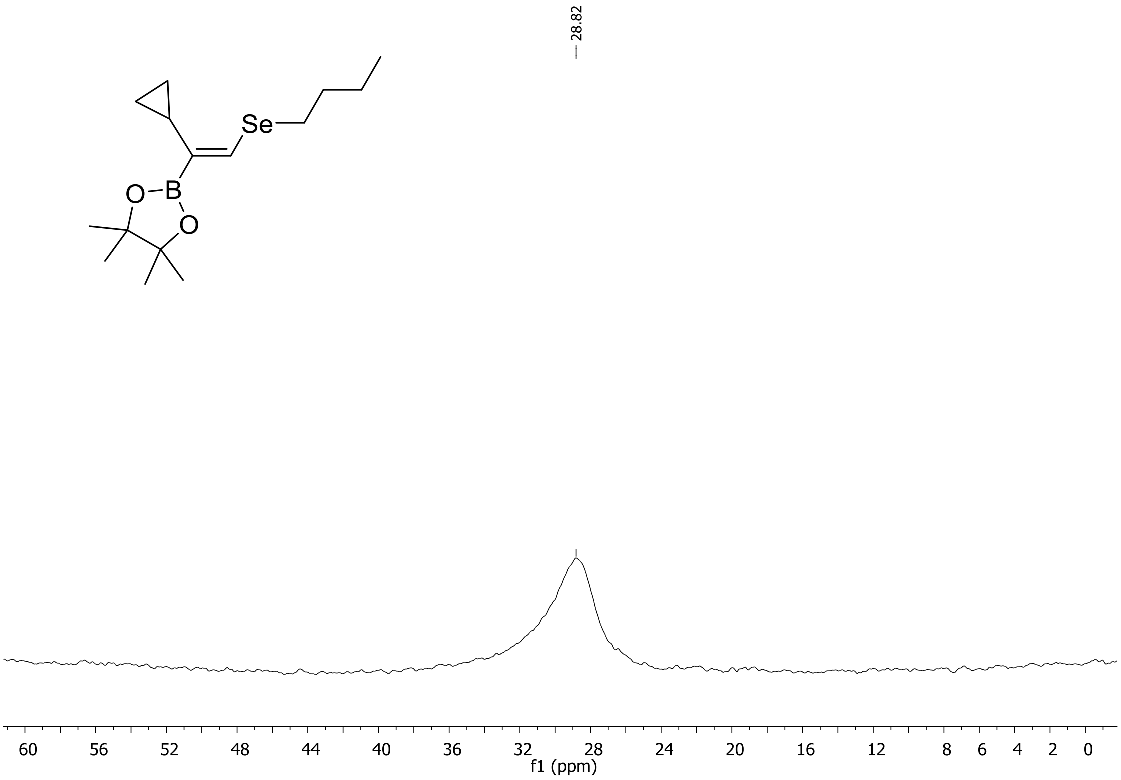
^{77}Se NMR spectrum for compound **2f** (CDCl$_3$, 76 MHz, (PhSe)$_2$ as internal standard)



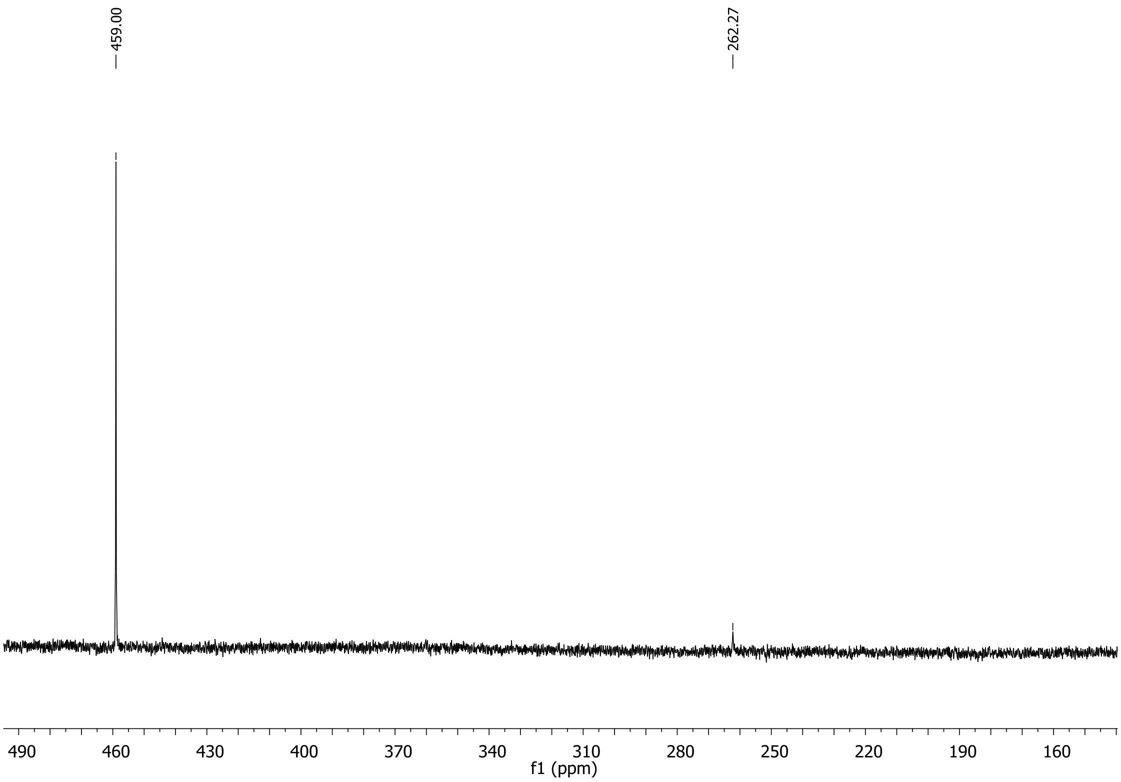
^{1}H NMR spectrum for compound **2g** (CDCl$_3$, 400 MHz)



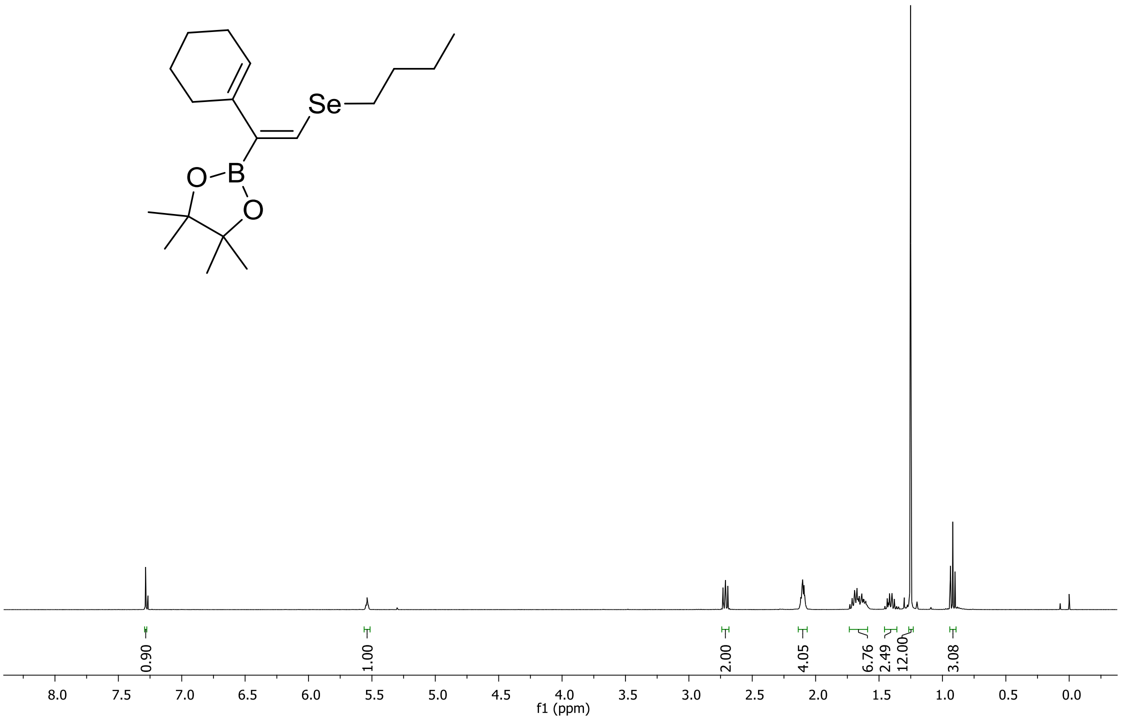
^{13}C NMR spectrum for compound **2g** (CDCl$_3$, 100 MHz)



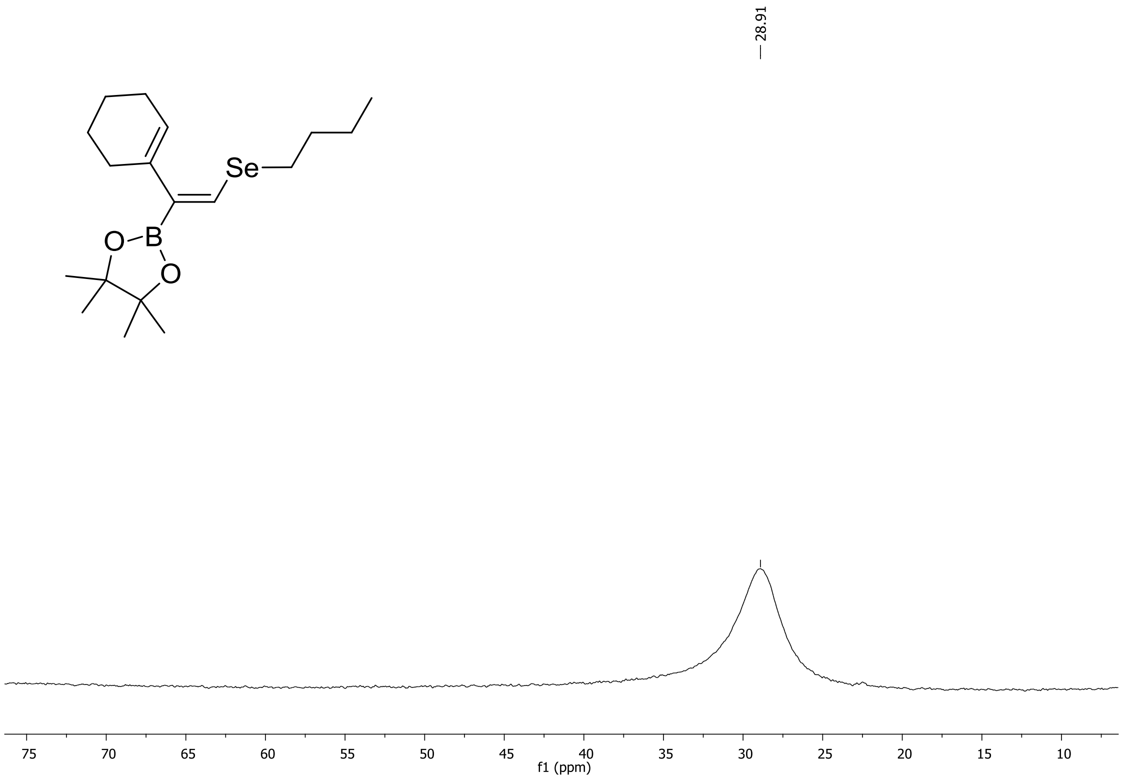
^{11}B NMR spectrum for compound **2g** ($CDCl_3$, 128MHz)



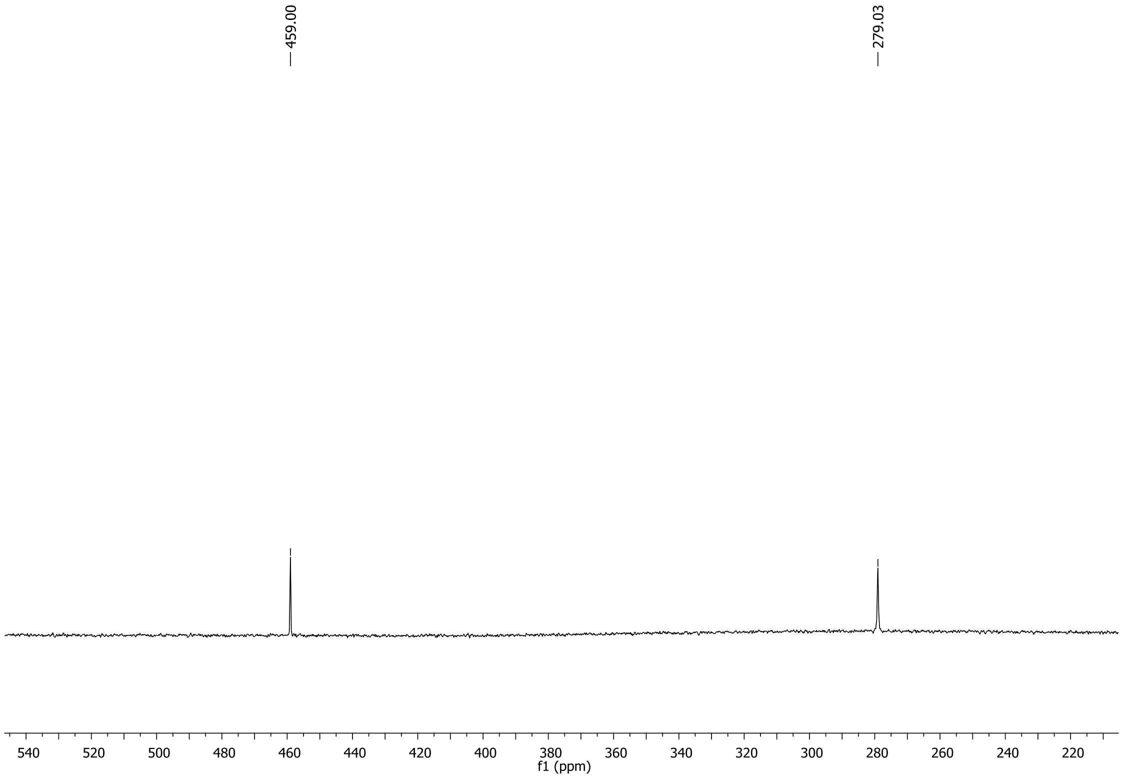
^{77}Se NMR spectrum for compound **2g** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



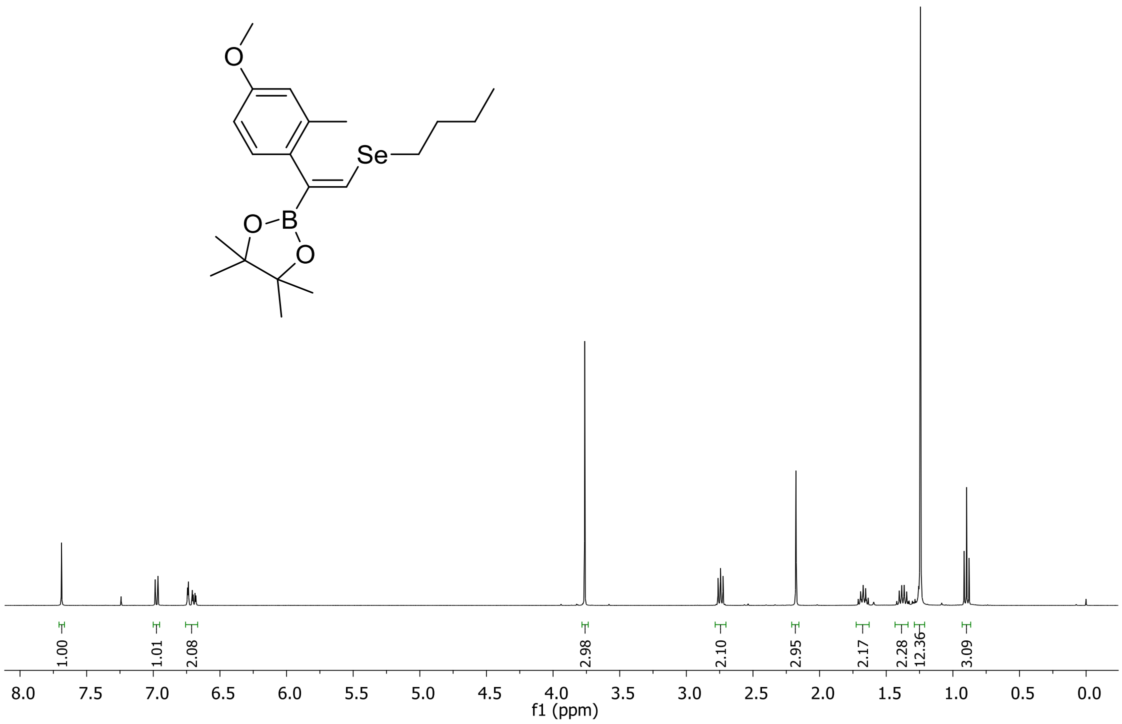
^{1}H NMR spectrum for compound **2h** ($CDCl_3$, 400 MHz)



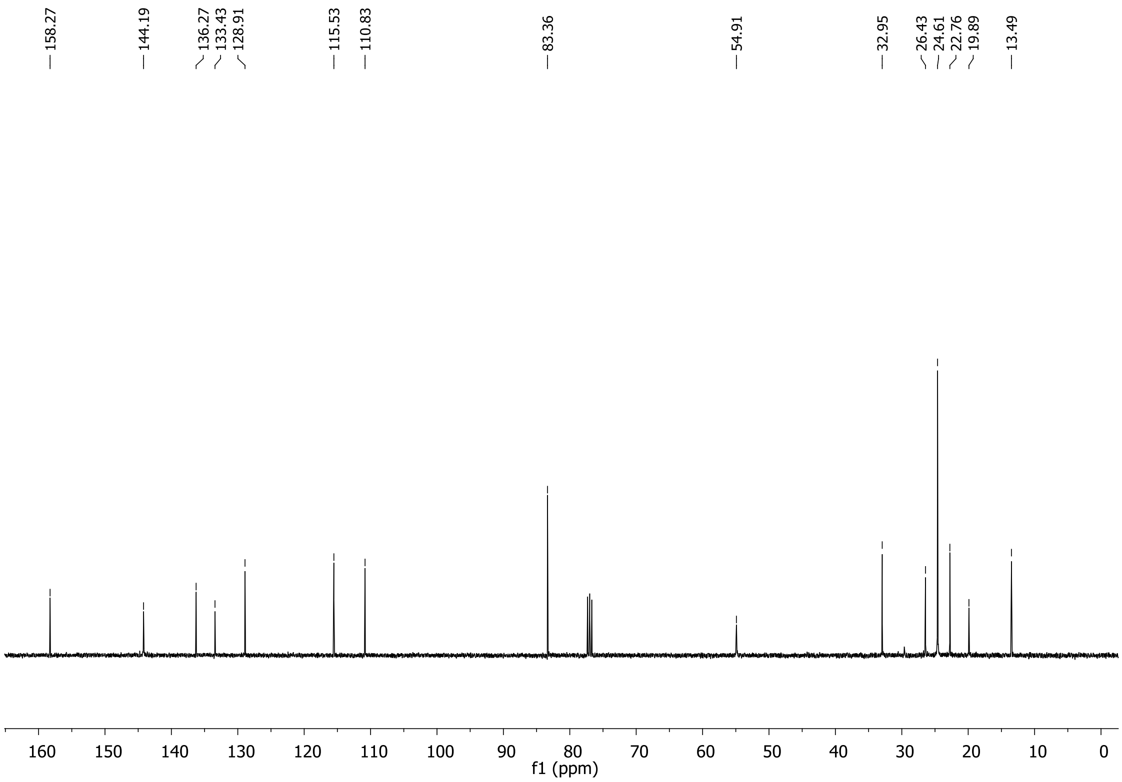
^{11}B NMR spectrum for compound **2h** ($CDCl_3$, 128MHz)



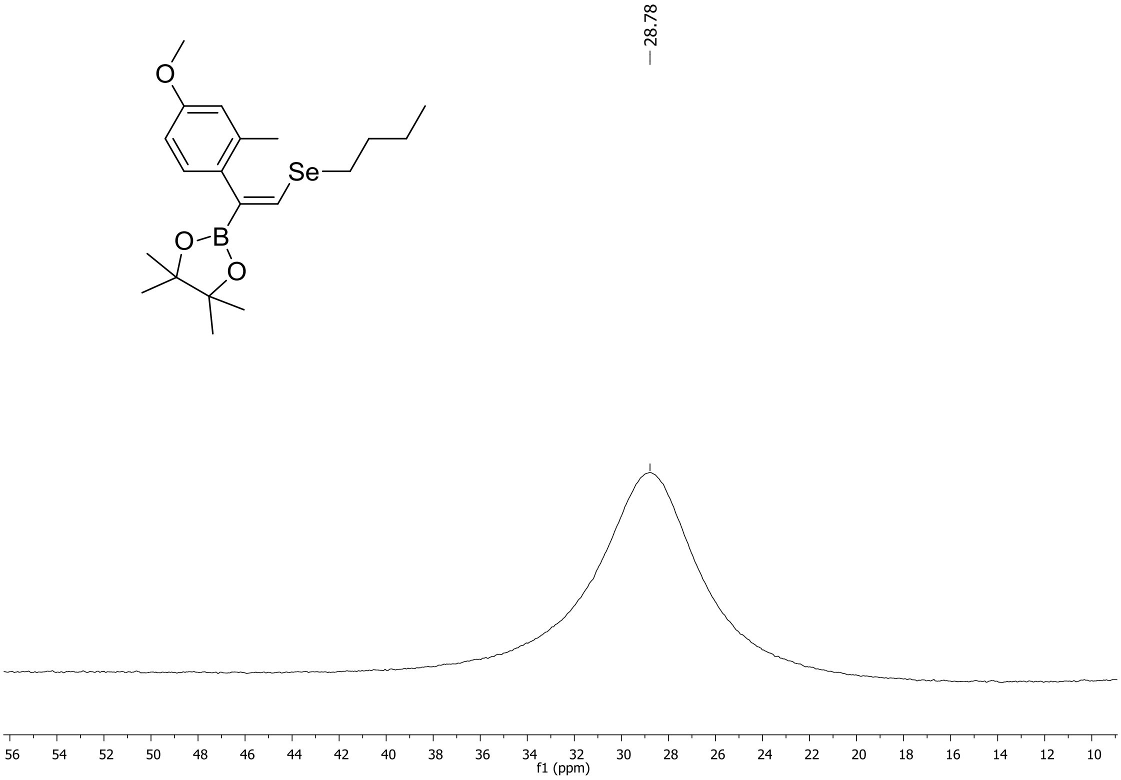
^{77}Se NMR spectrum for compound **2h** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



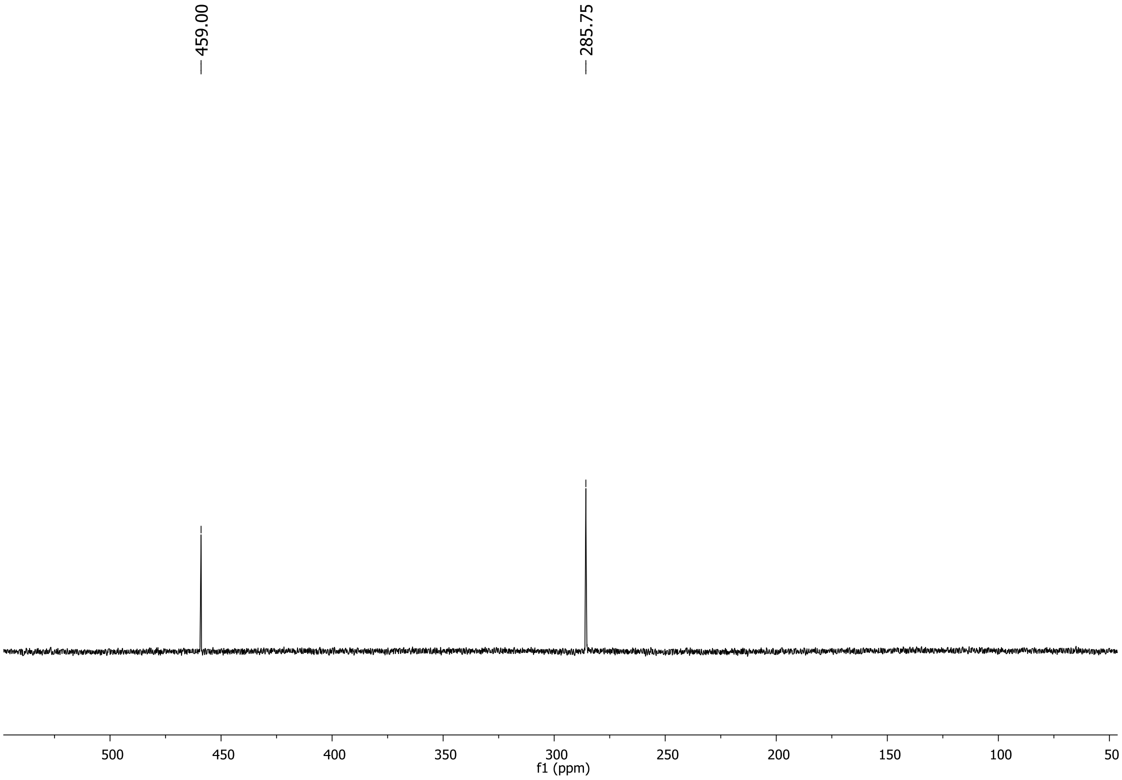
^{1}H NMR spectrum for compound **2i** ($CDCl_3$, 400 MHz)



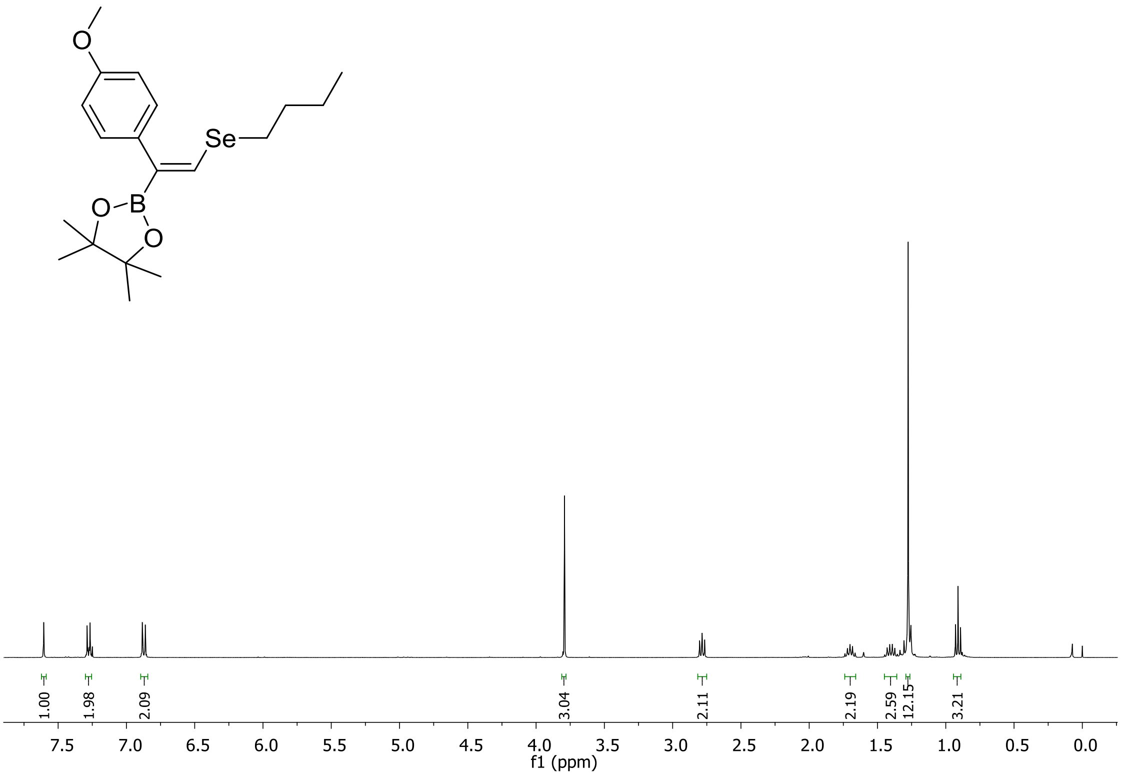
^{13}C NMR spectrum for compound **2i** ($CDCl_3$, 100 MHz)



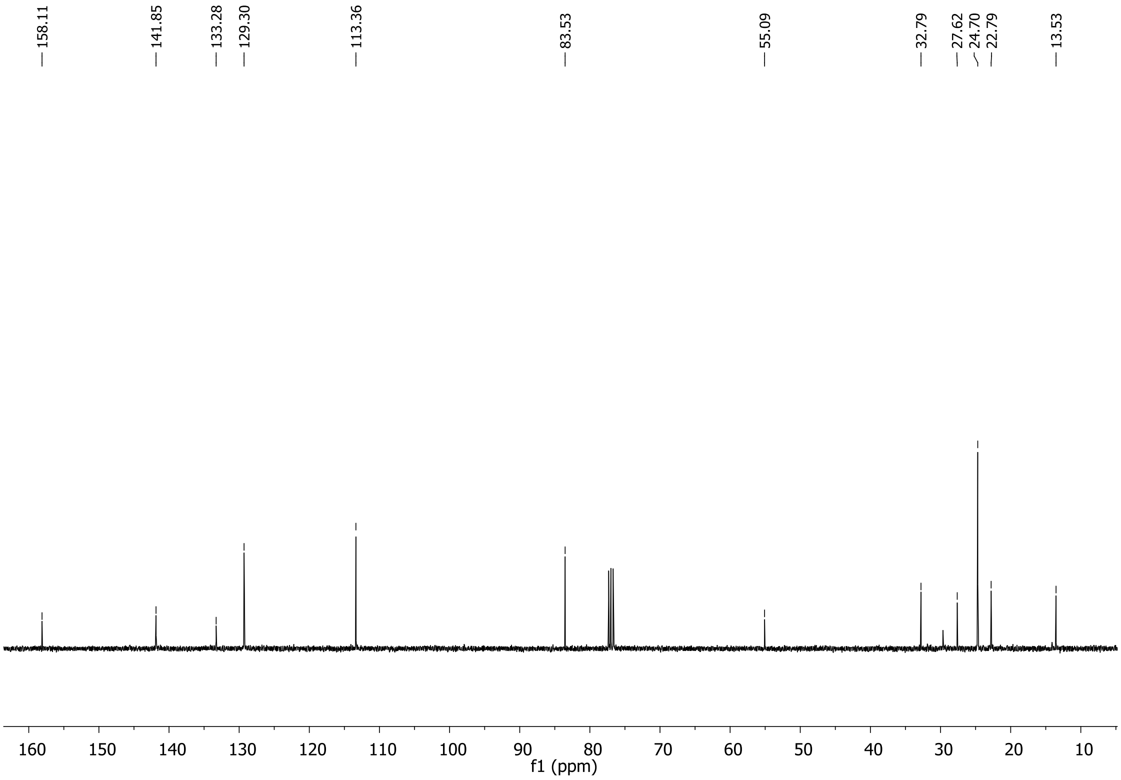
^{11}B NMR spectrum for compound **2i** (CDCl$_3$, 128MHz)



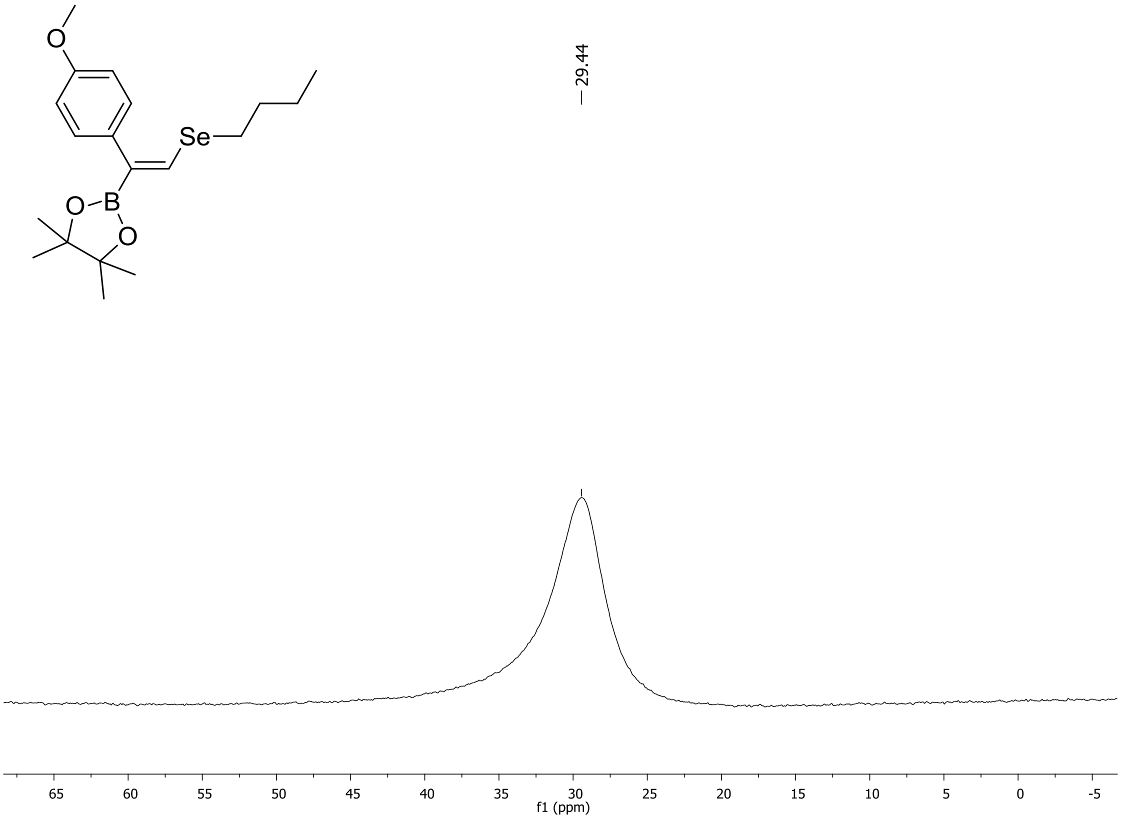
^{77}Se NMR spectrum for compound **2i** (CDCl$_3$, 76 MHz, (PhSe)$_2$ as internal standard



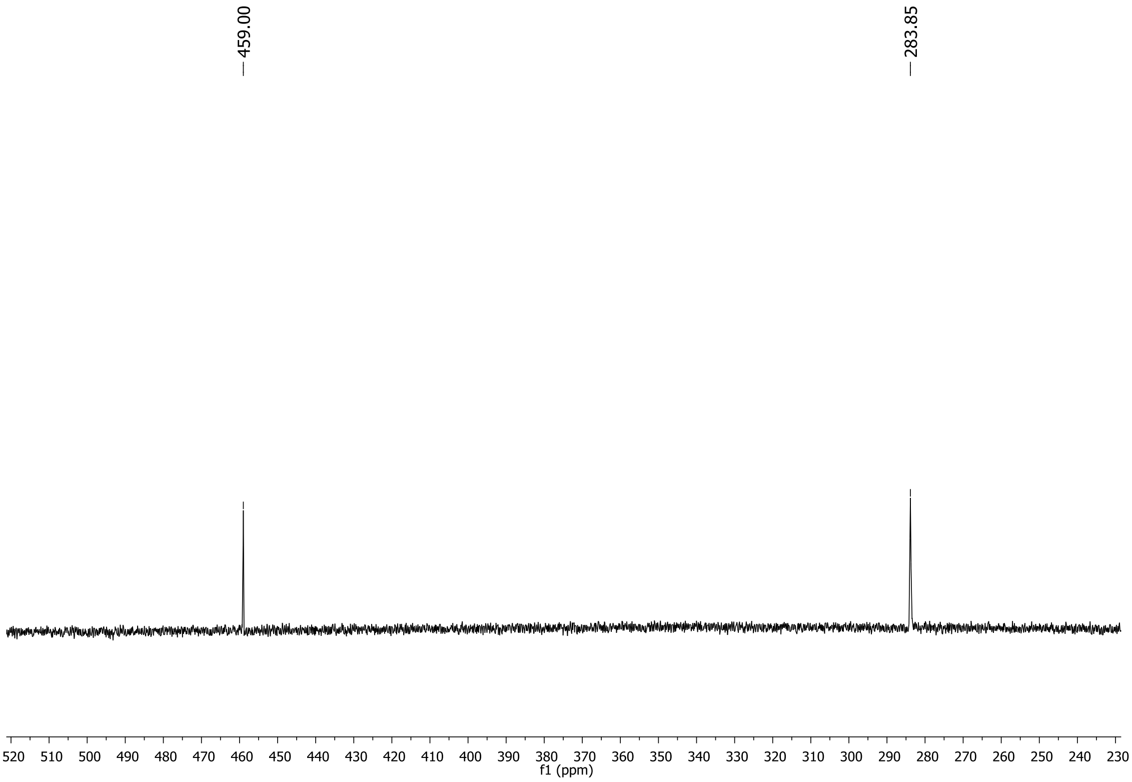
^{1}H NMR spectrum for compound **2j** ($CDCl_3$, 400 MHz)



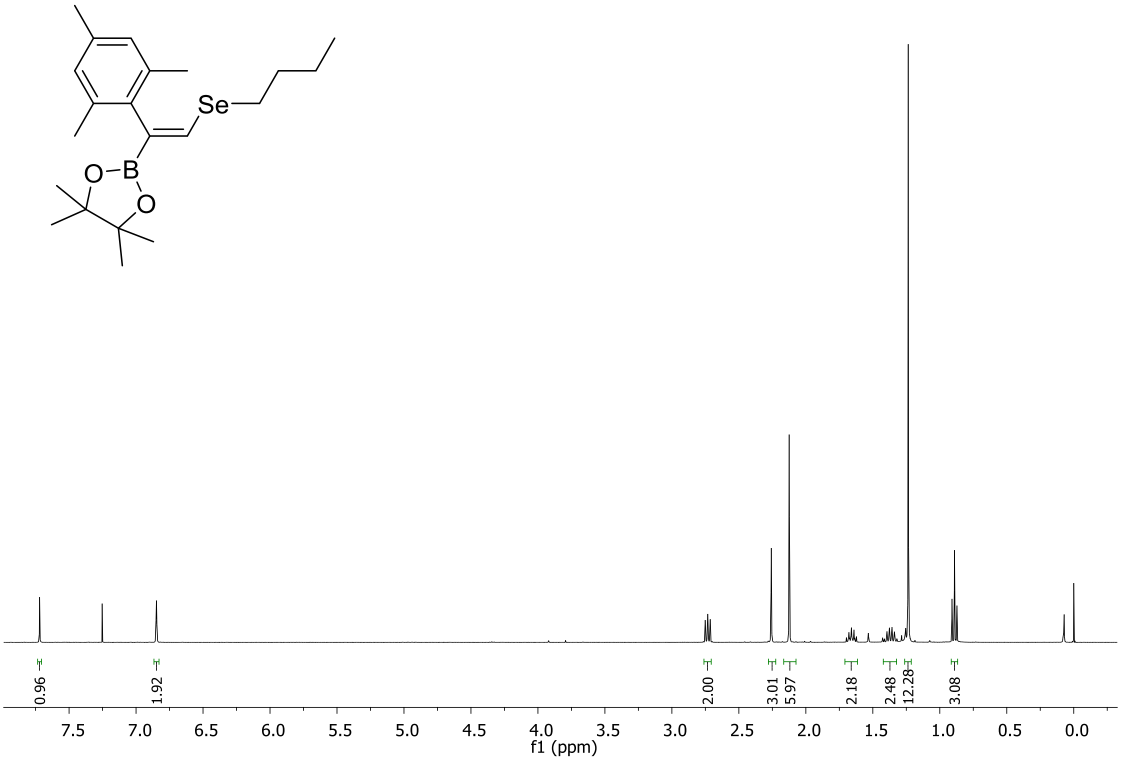
^{13}C NMR spectrum for compound **2j** ($CDCl_3$, 100 MHz)



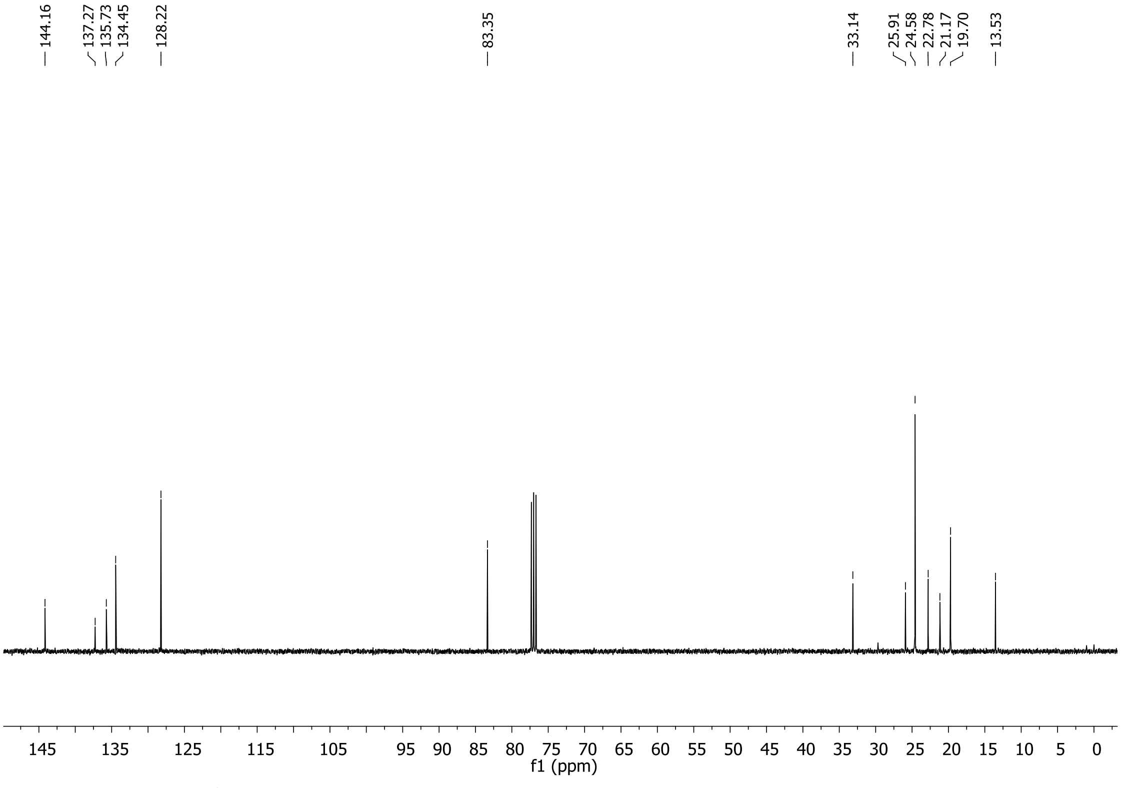
^{11}B NMR spectrum for compound **2j** ($CDCl_3$, 128MHz)



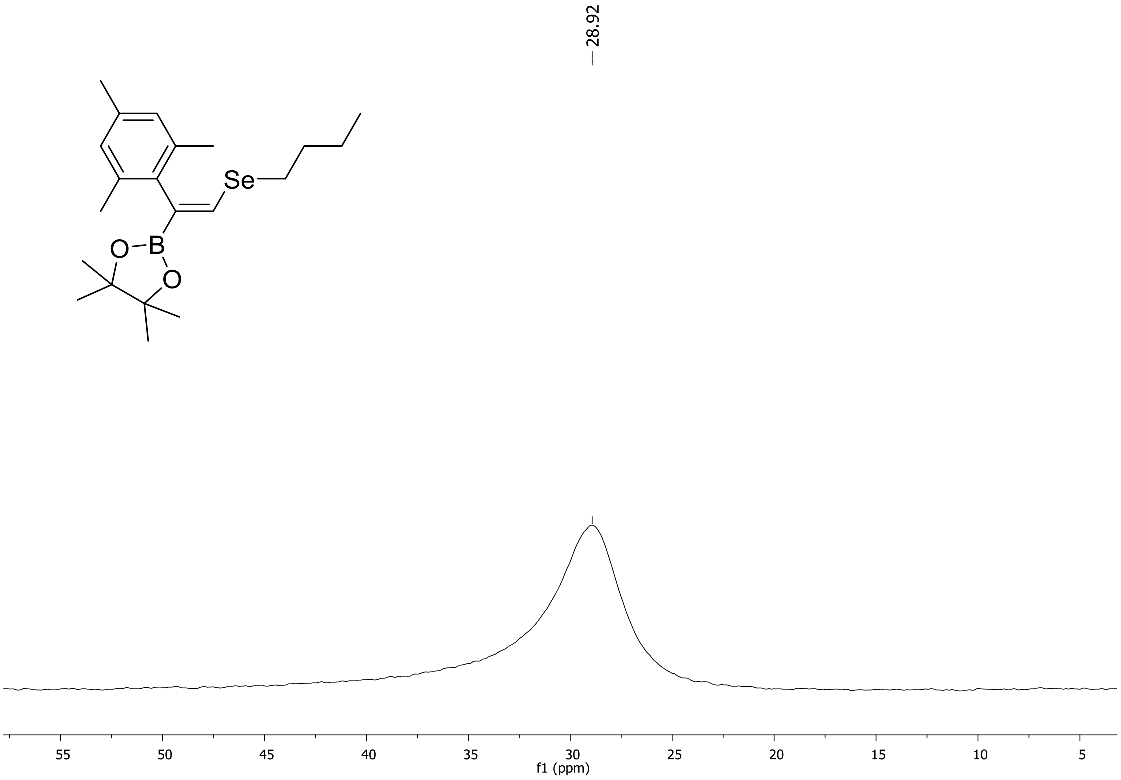
^{77}Se NMR spectrum for compound **2j** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard



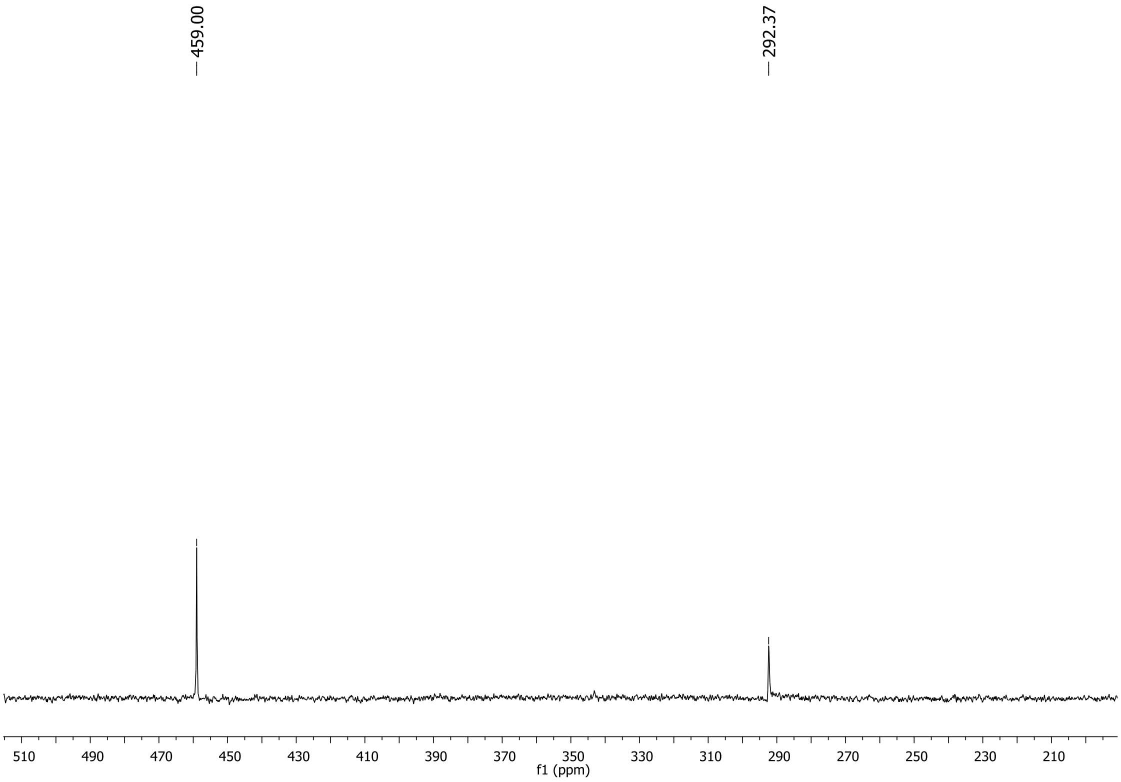
^{1}H NMR spectrum for compound **2k** ($CDCl_3$, 400 MHz)



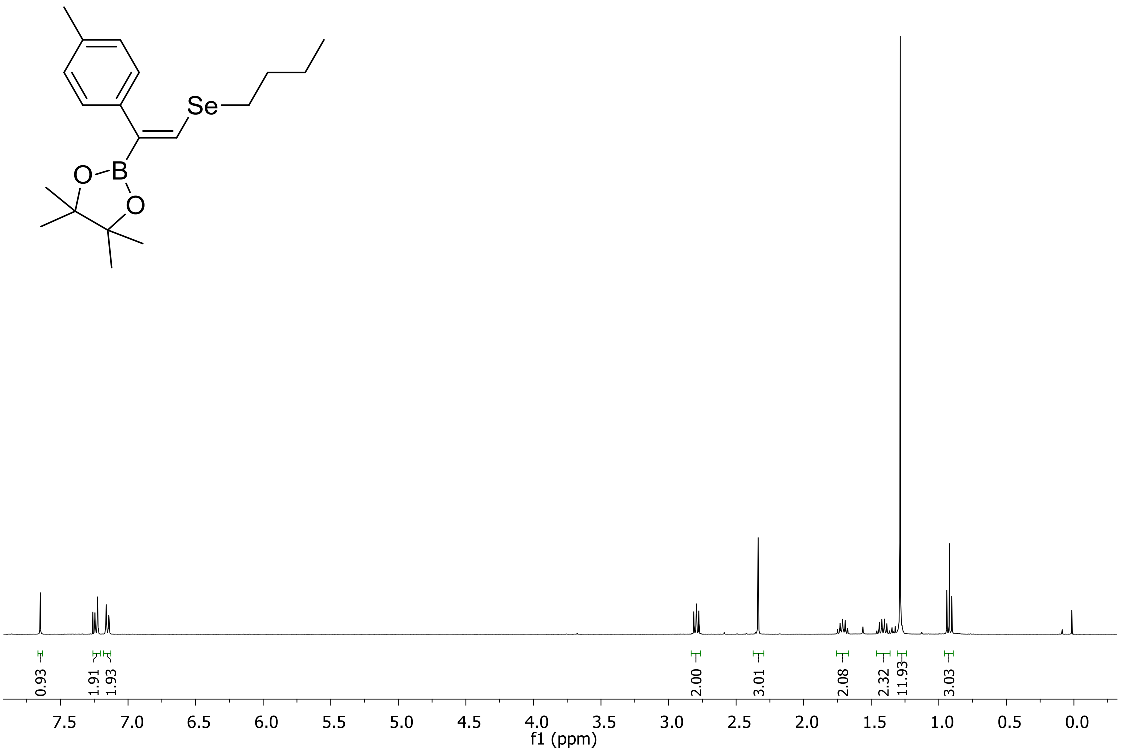
^{13}C NMR spectrum for compound **2k** ($CDCl_3$, 100 MHz)



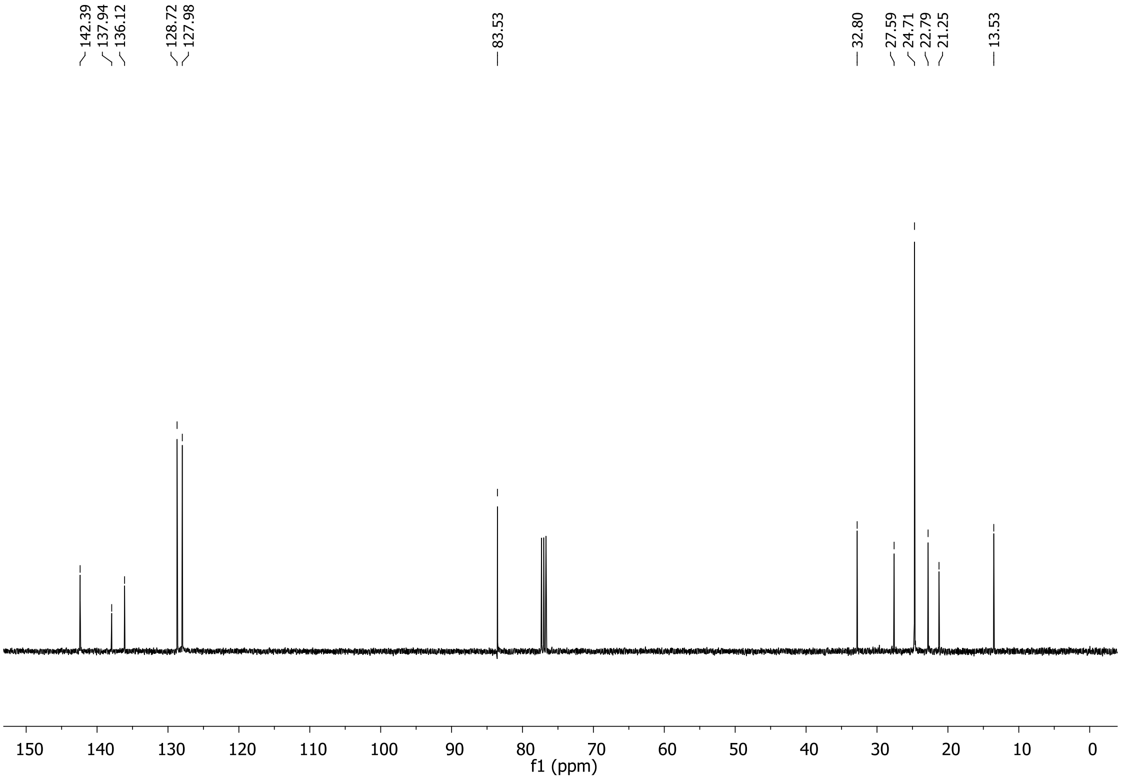
^{11}B NMR spectrum for compound **2k** (CDCl$_3$, 128MHz)



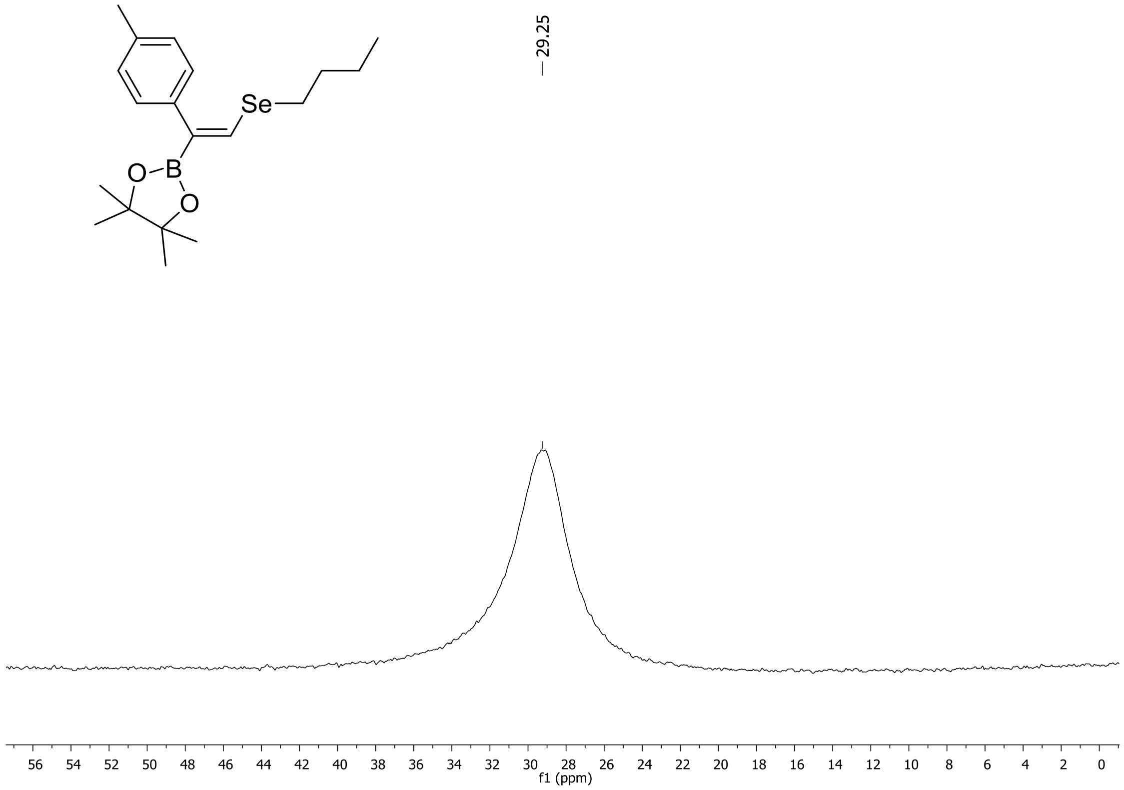
^{77}Se NMR spectrum for compound **2k** (CDCl$_3$, 76 MHz, (PhSe)$_2$ as internal standard



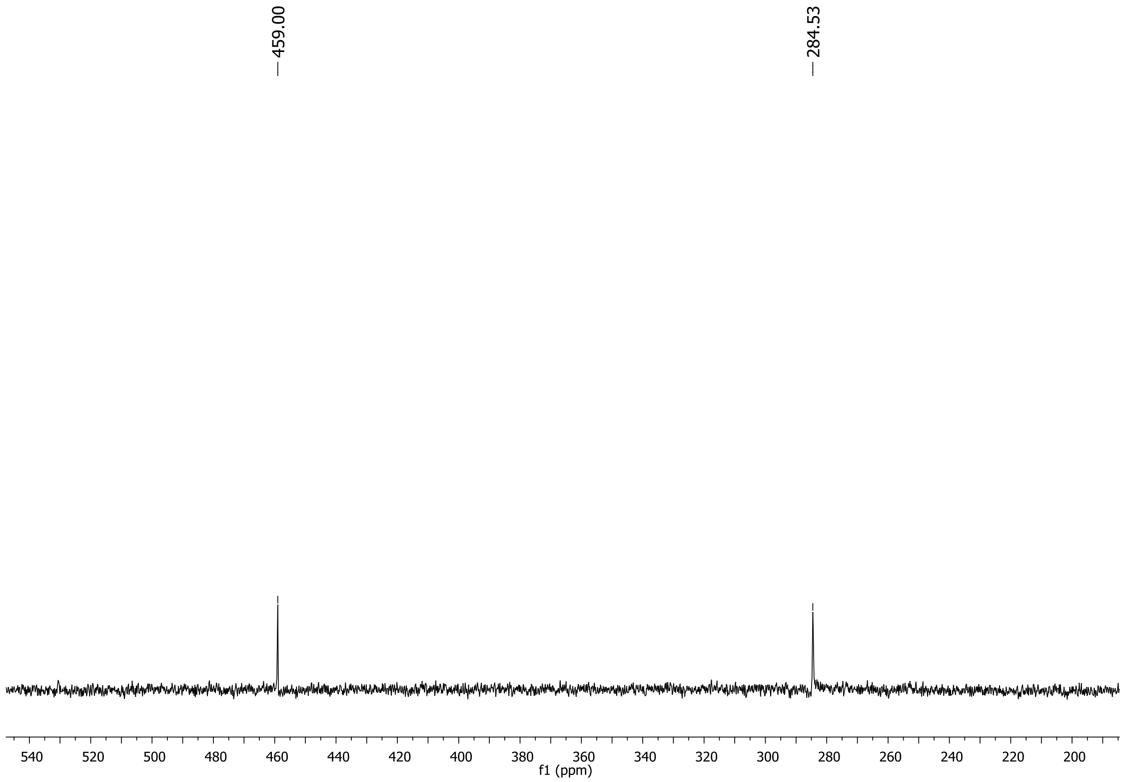
^{1}H NMR spectrum for compound **2l** ($CDCl_3$, 400 MHz)



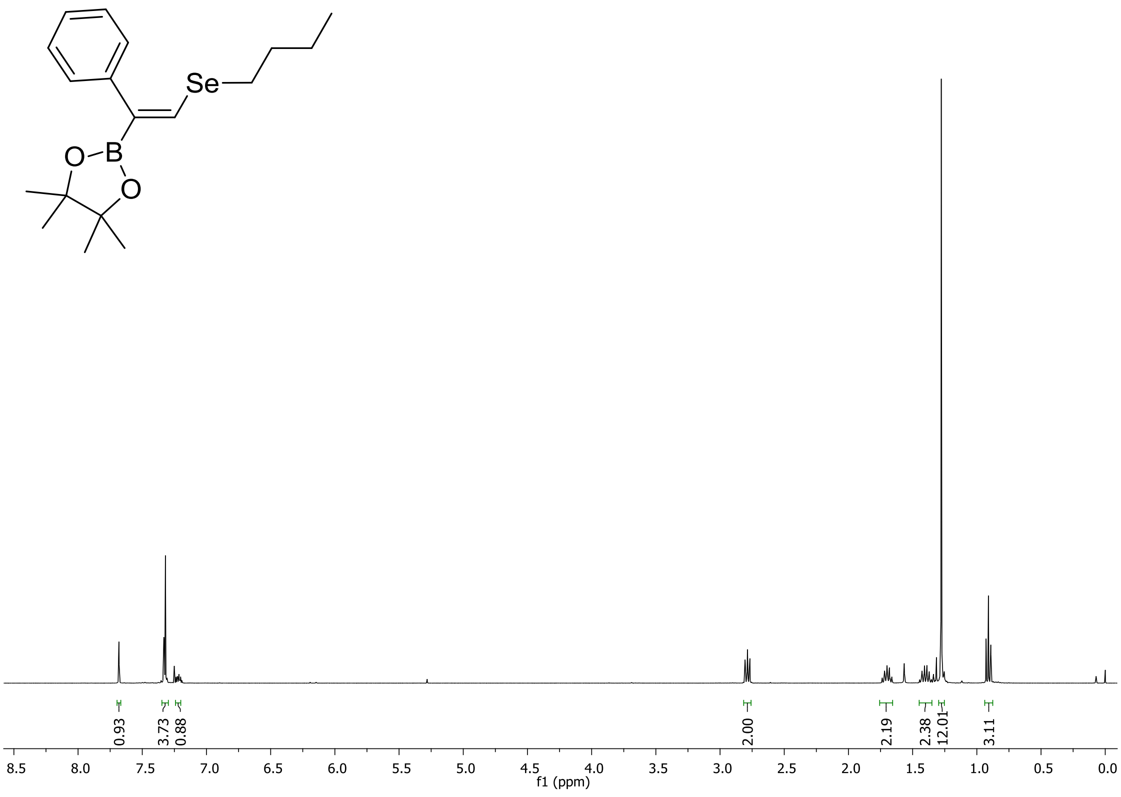
^{13}C NMR spectrum for compound **2l** ($CDCl_3$, 100 MHz)



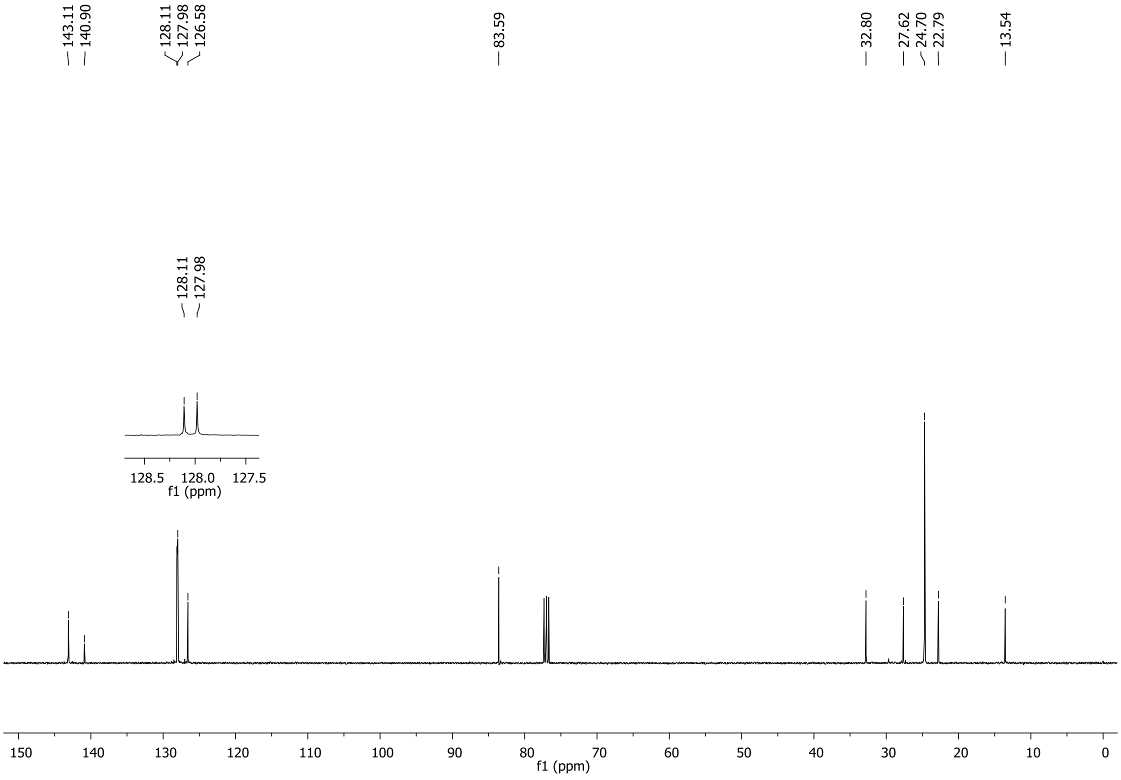
^{11}B NMR spectrum for compound **2l** ($CDCl_3$, 128MHz)



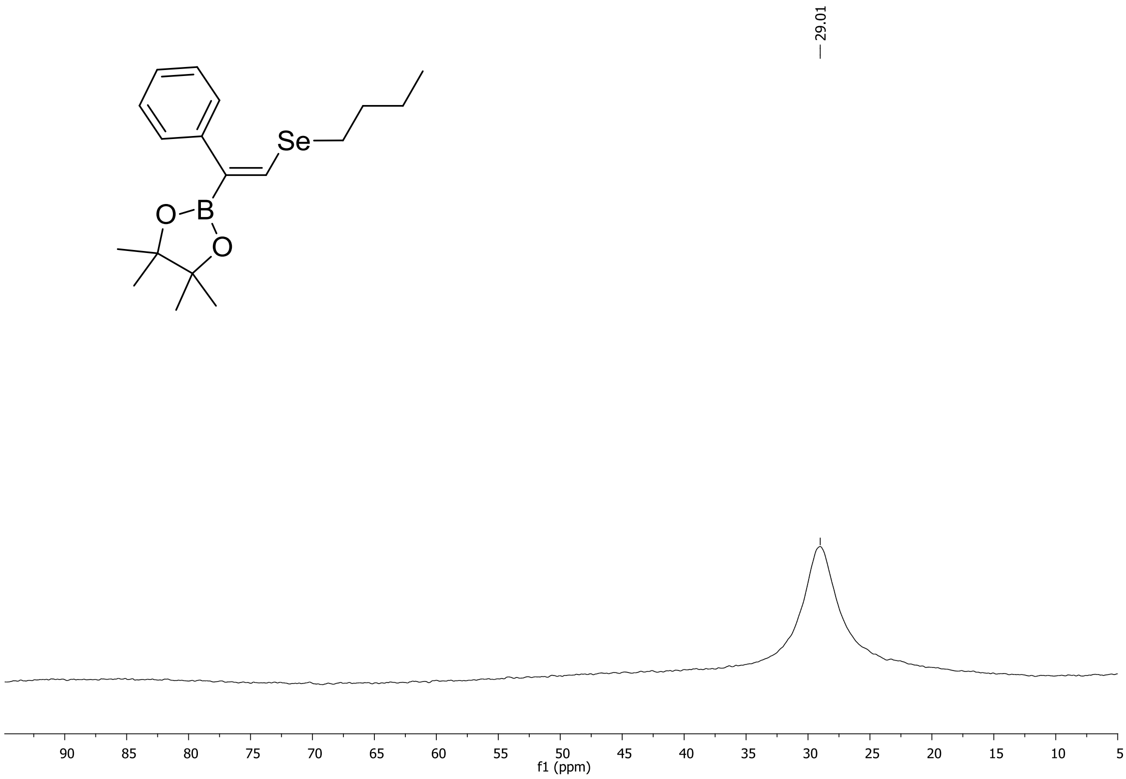
^{77}Se NMR spectrum for compound **2l** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard



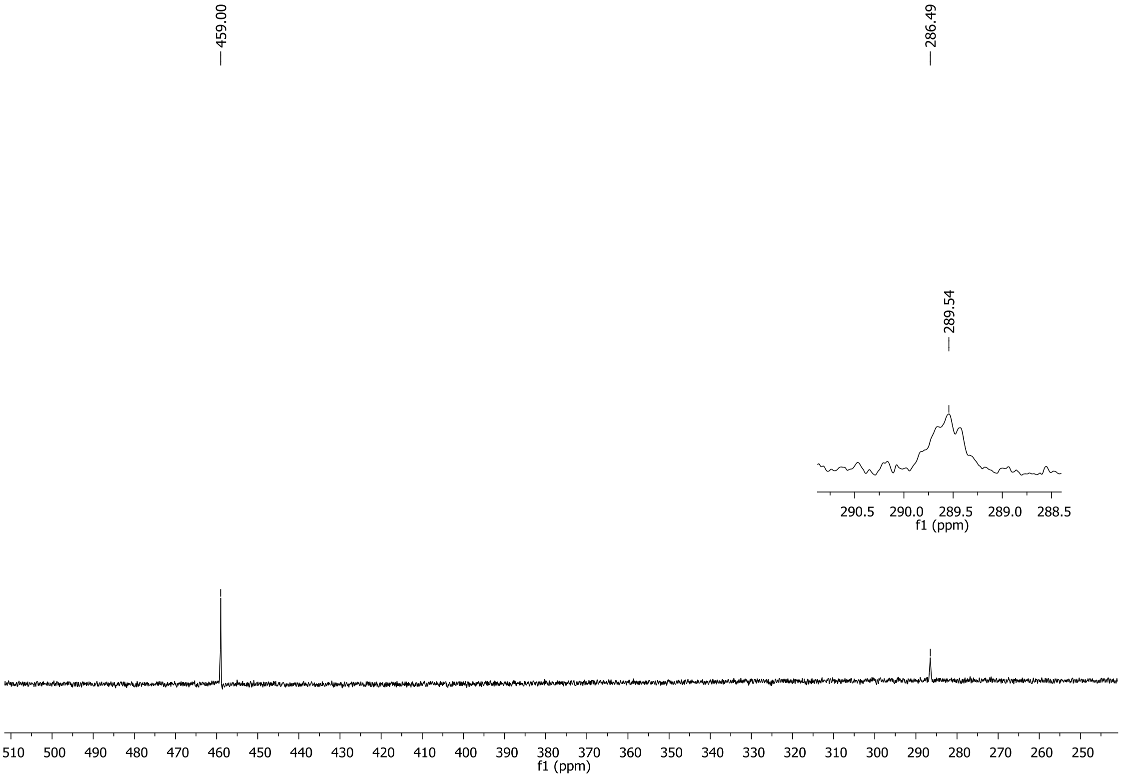
^{1}H NMR spectrum for compound **2m** ($CDCl_3$, 400 MHz)



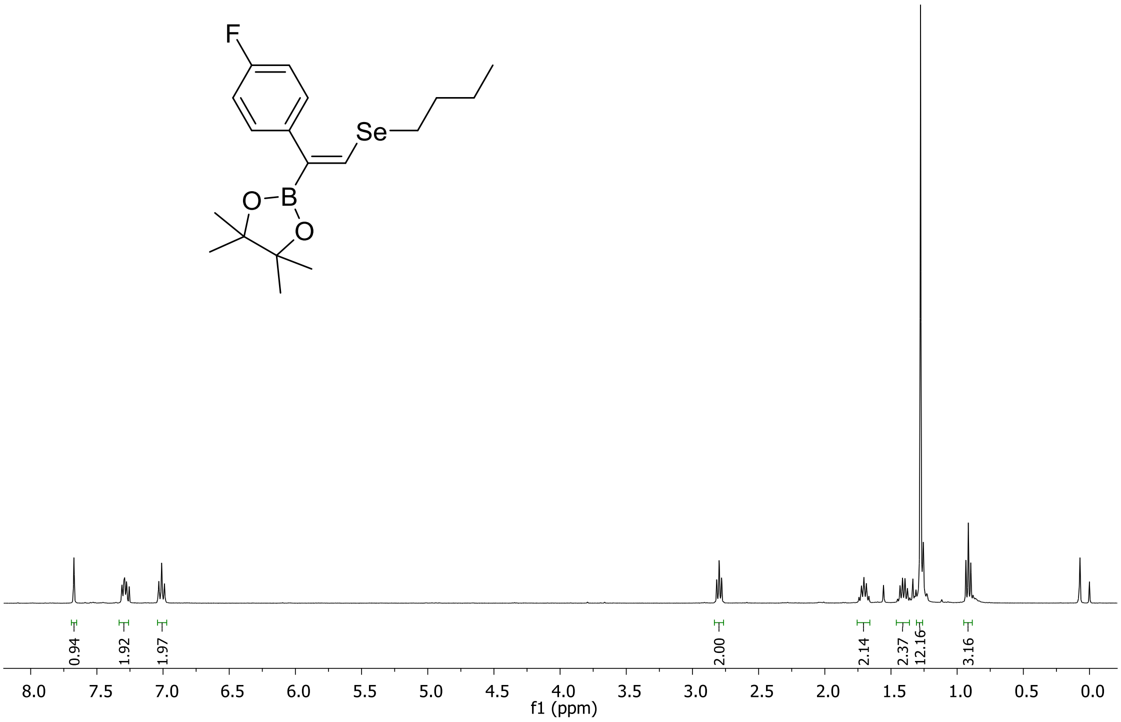
^{13}C NMR spectrum for compound **2m** ($CDCl_3$, 100 MHz)



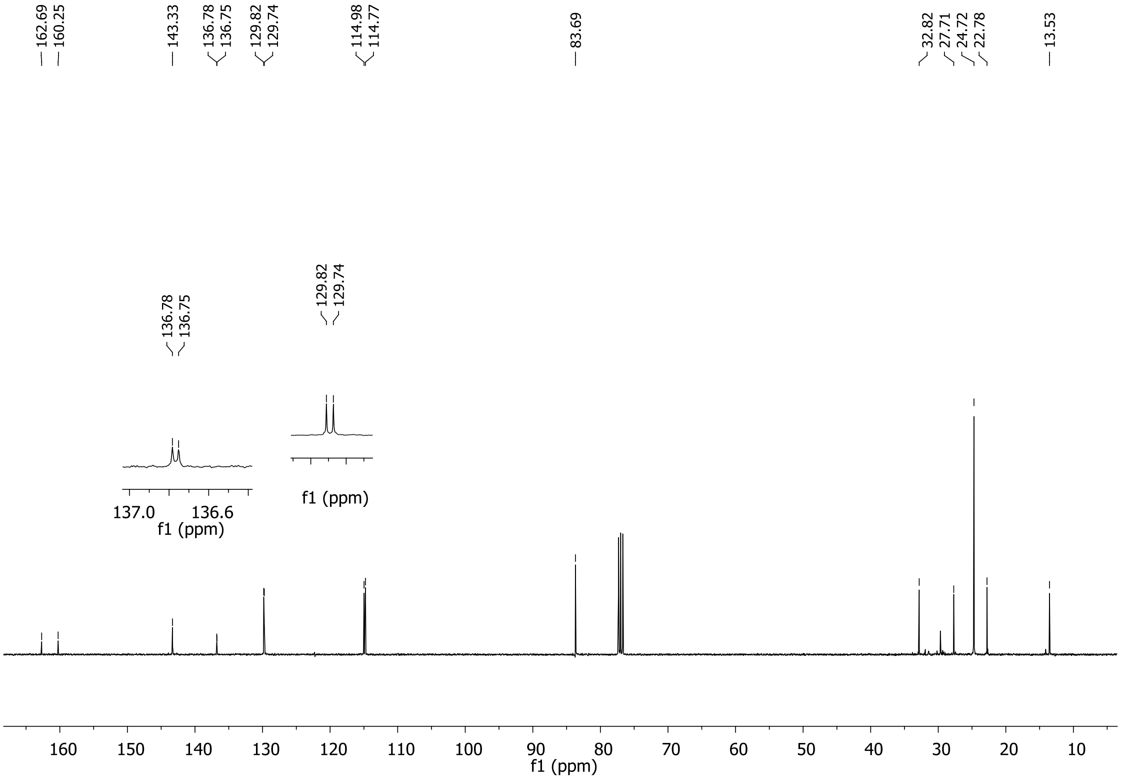
^{11}B NMR spectrum for compound **2m** ($CDCl_3$, 128MHz)



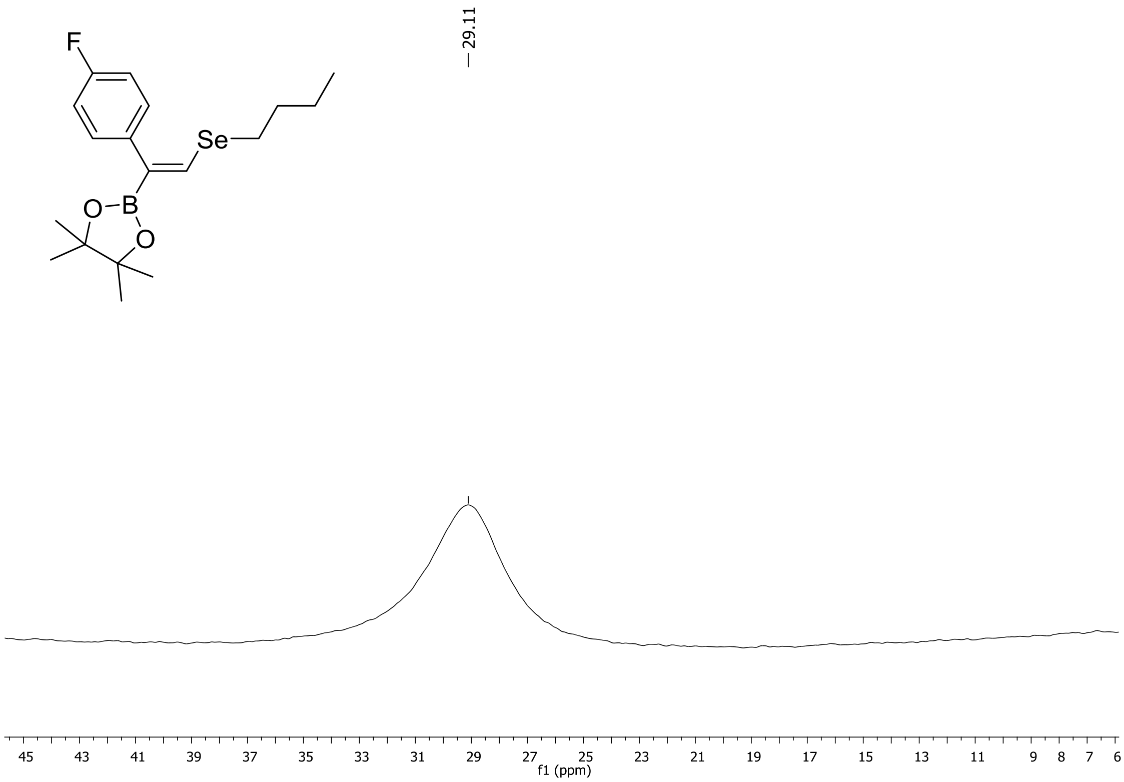
^{77}Se NMR spectrum for compound **2m** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



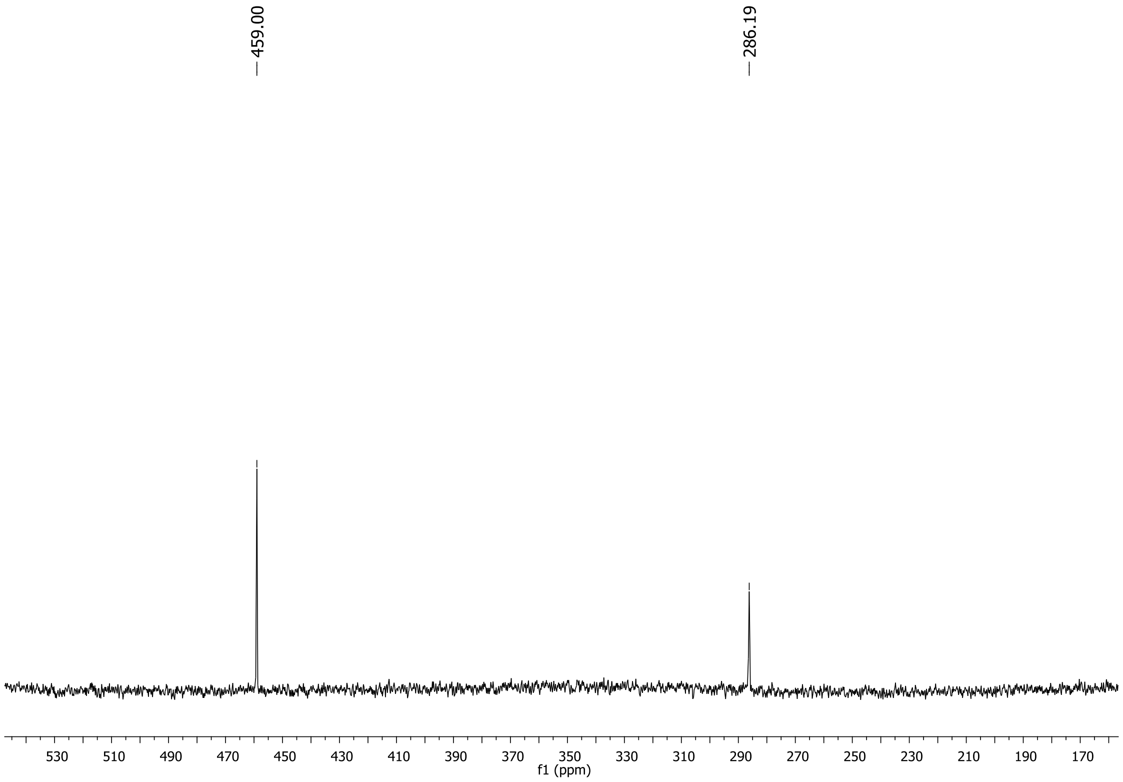
^{1}H NMR spectrum for compound **2n** ($CDCl_3$, 400 MHz)



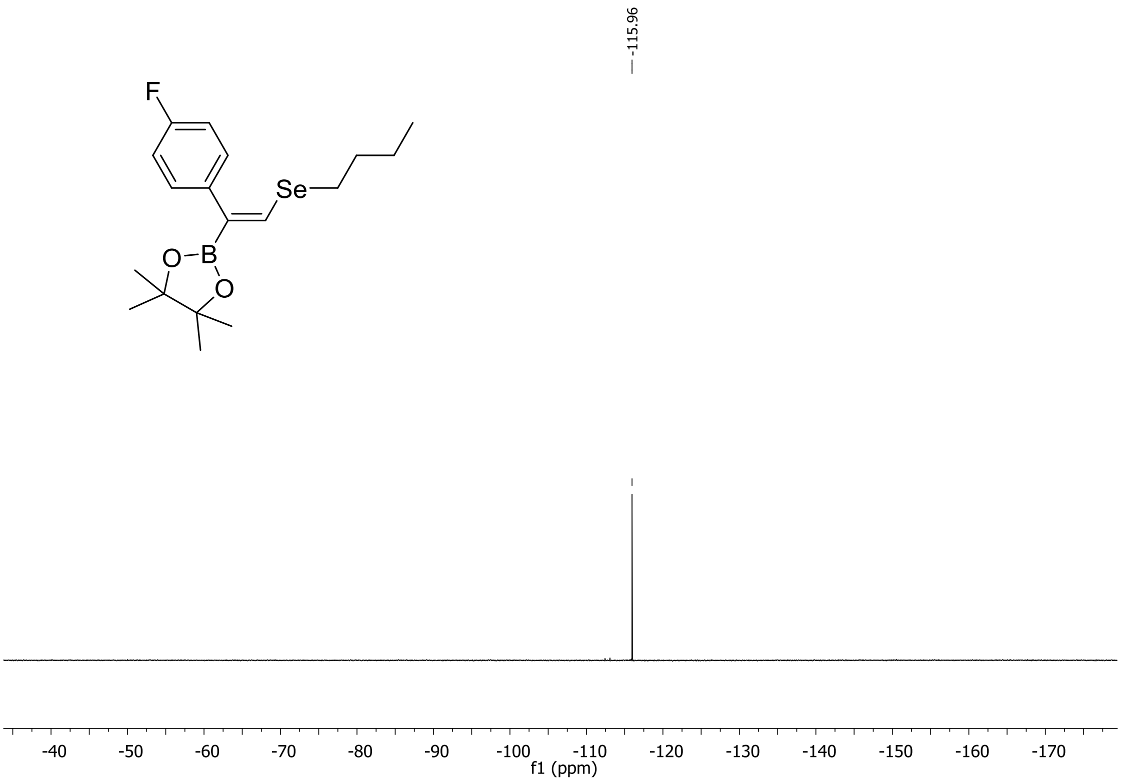
^{13}C NMR spectrum for compound **2n** ($CDCl_3$, 100 MHz)



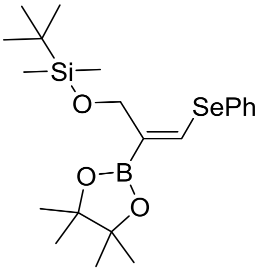
^{11}B NMR spectrum for compound **2n** ($CDCl_3$, 128MHz)

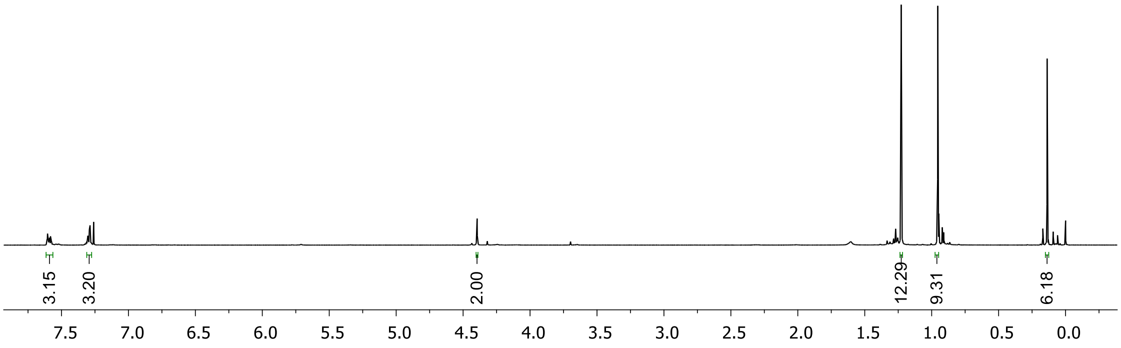


^{77}Se NMR spectrum for compound **2n** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard

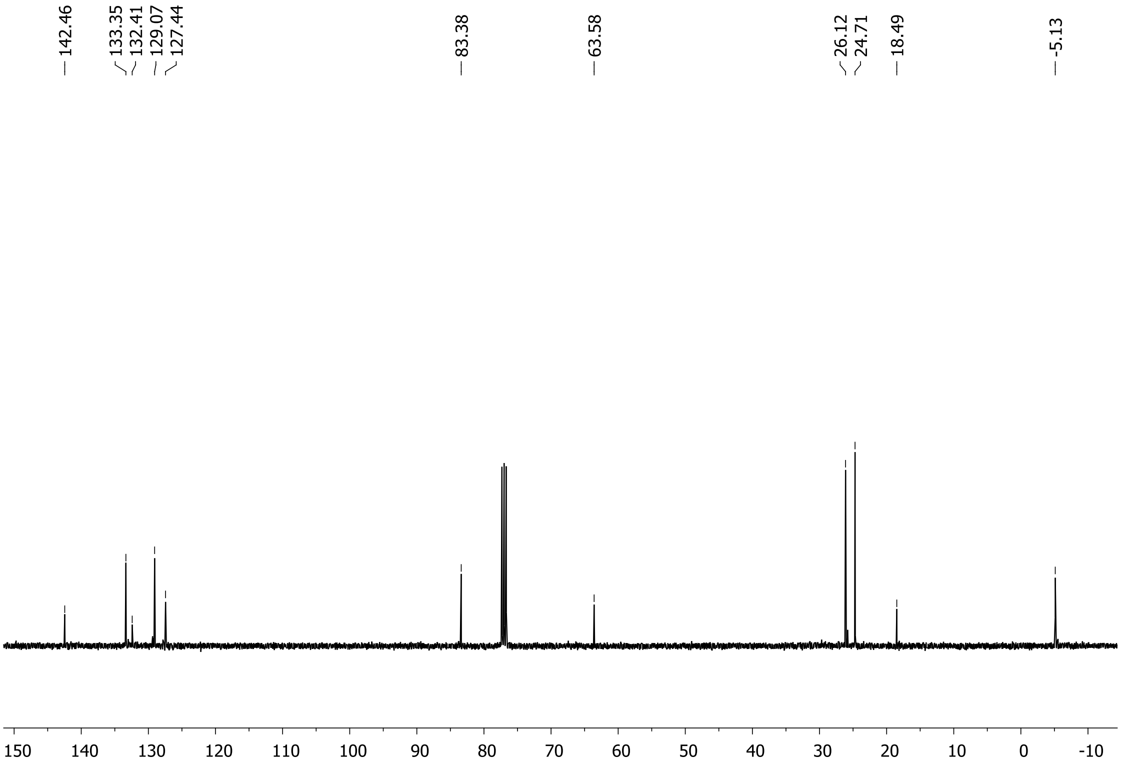


^{19}F NMR spectrum for compound **2n** (CDCl$_3$, 376 MHz)

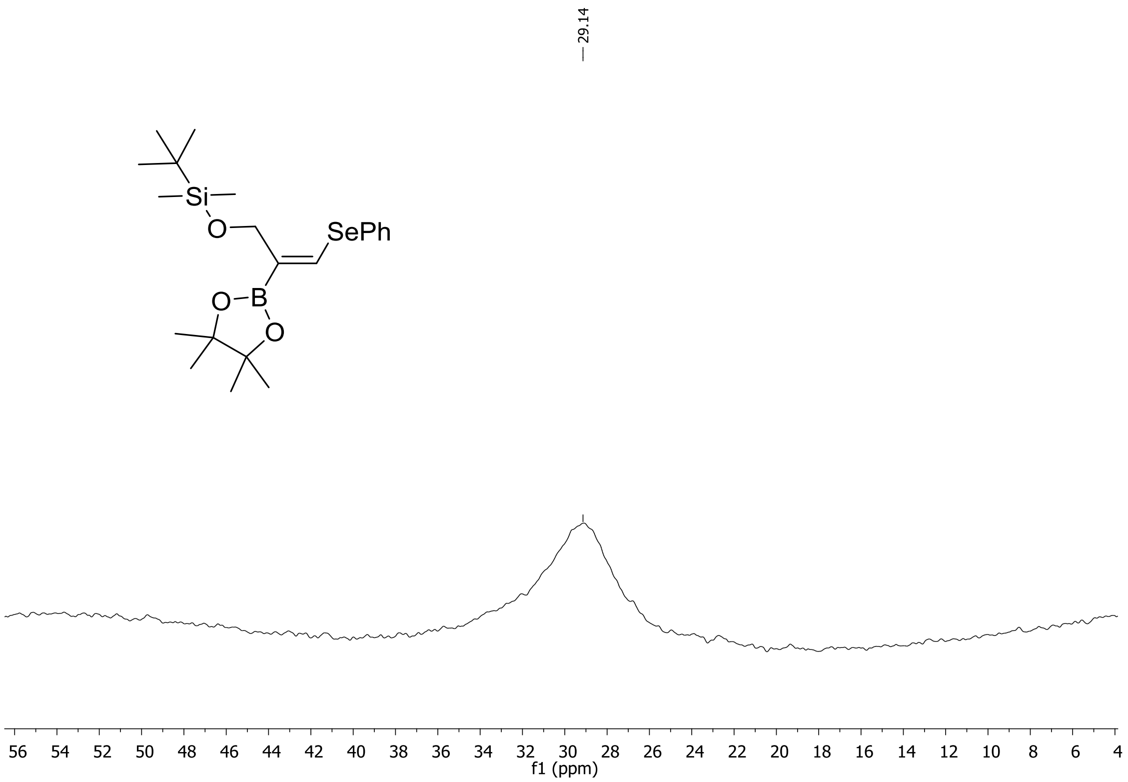




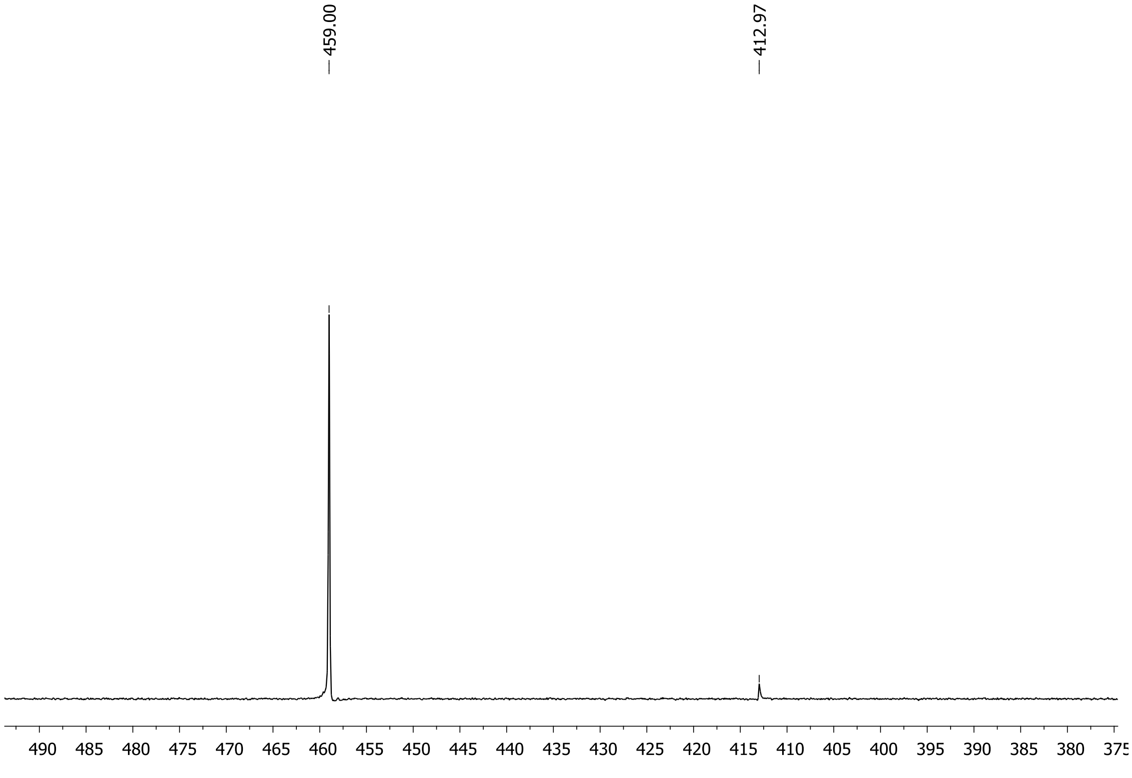
^{1}H NMR spectrum for compound **2o** ($CDCl_3$, 400 MHz)



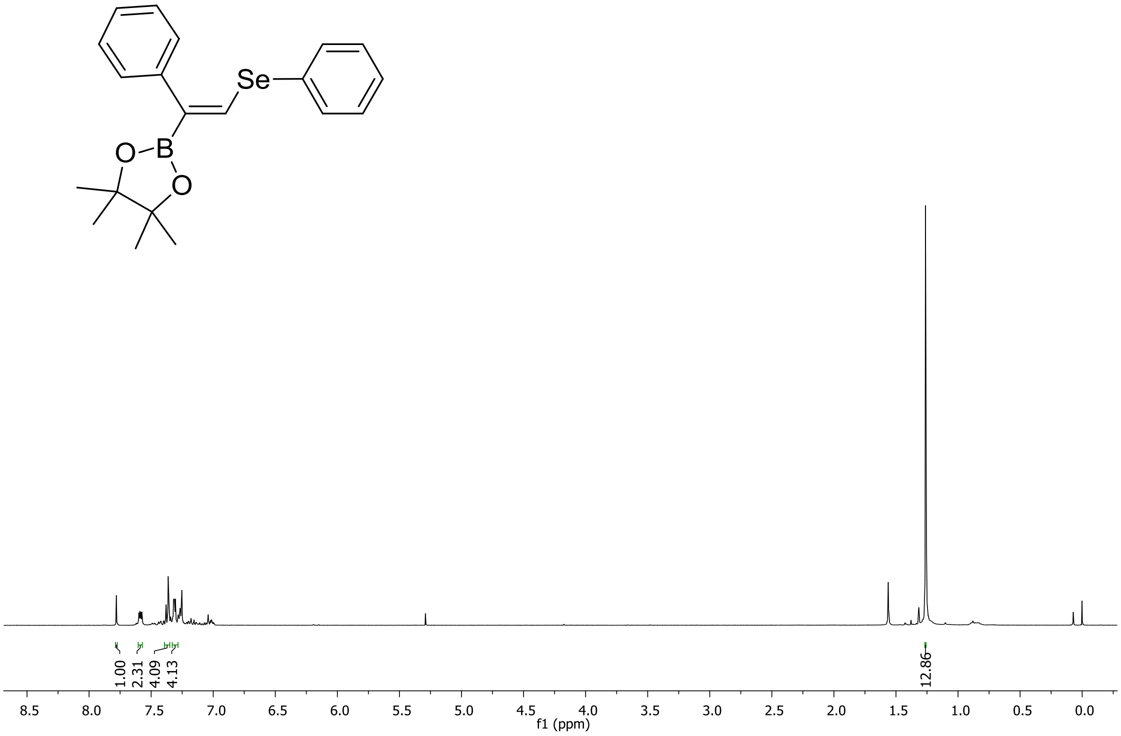
^{13}C NMR spectrum for compound **2o** ($CDCl_3$, 100 MHz)



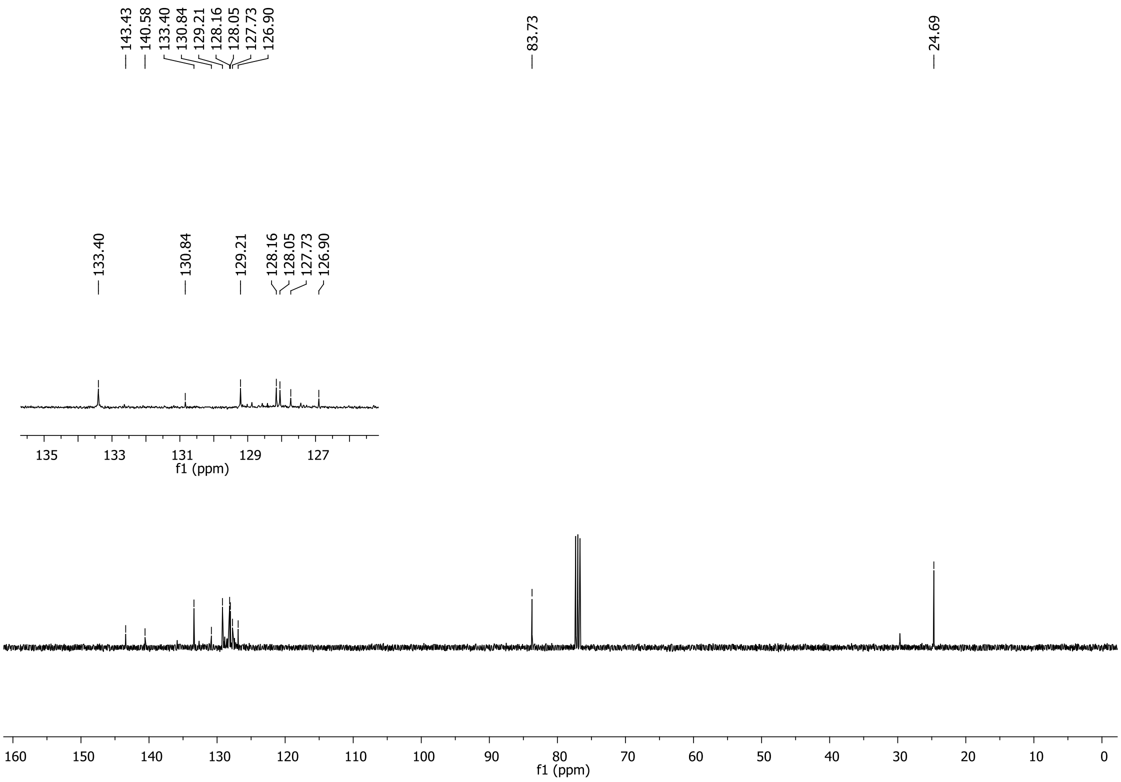
^{11}B NMR spectrum for compound **2o** (CDCl$_3$, 128MHz)



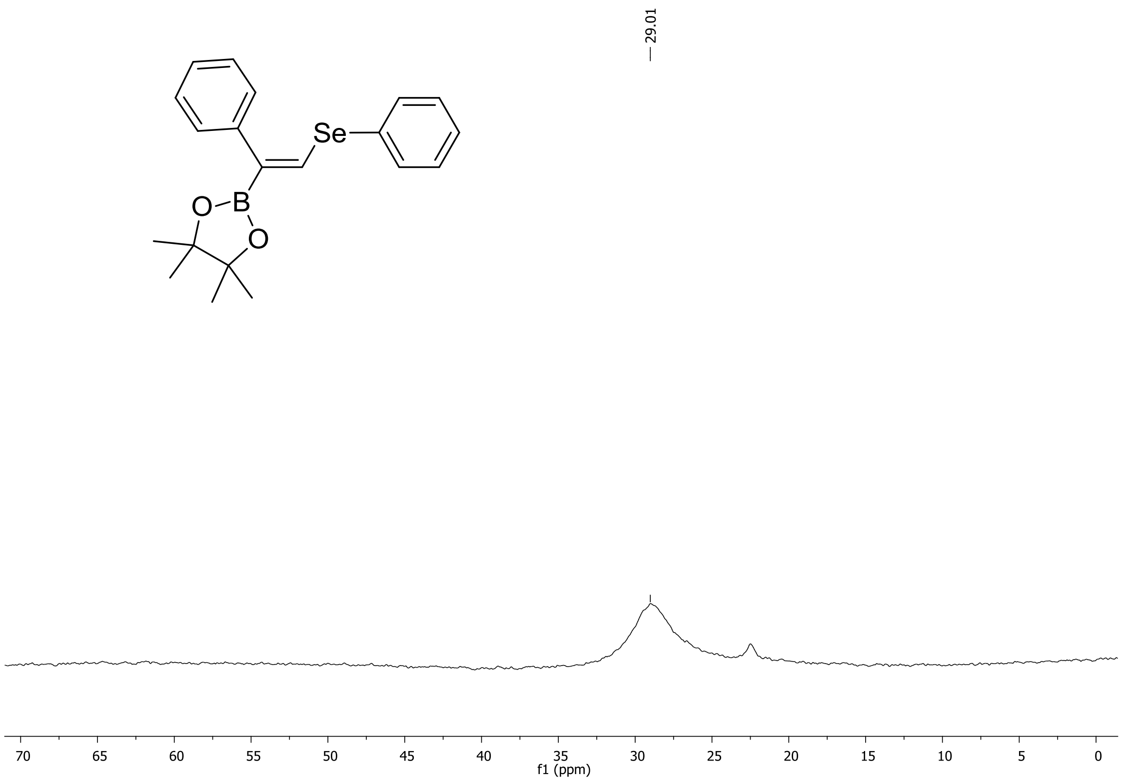
^{77}Se NMR spectrum for compound **2o** (CDCl$_3$, 76 MHz, (PhSe)$_2$ as internal standard)



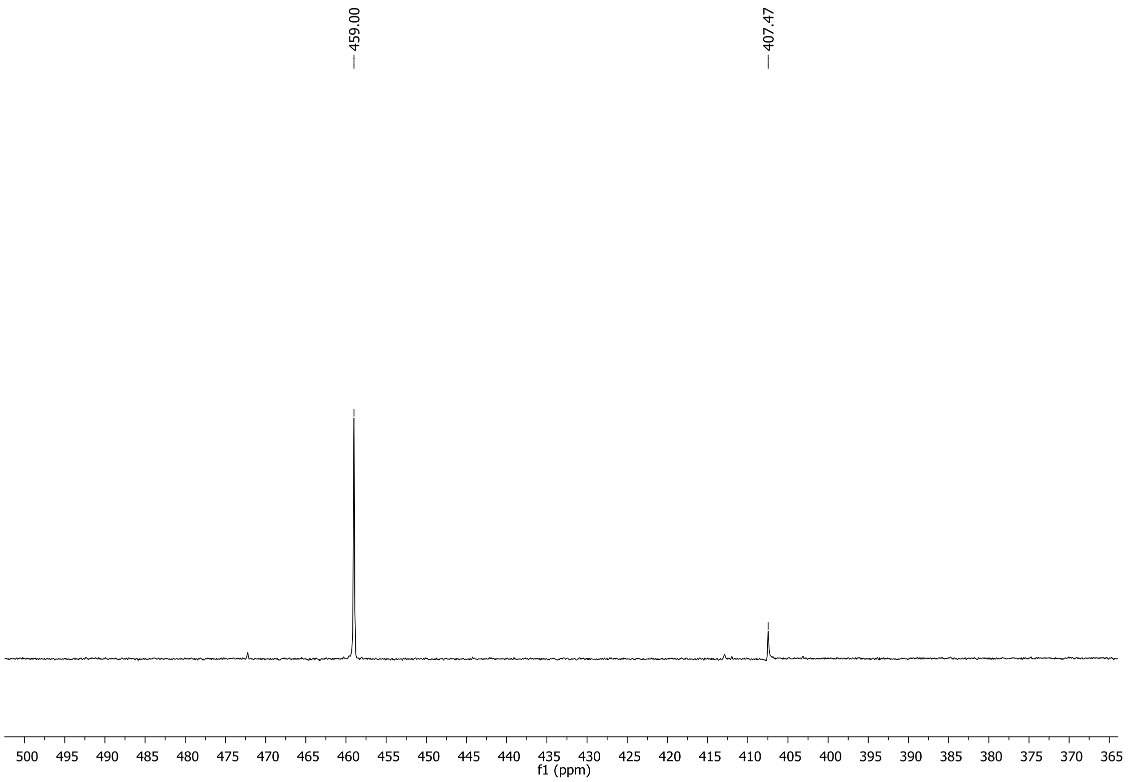
^{1}H NMR spectrum for compound **2p** ($CDCl_3$, 400 MHz)



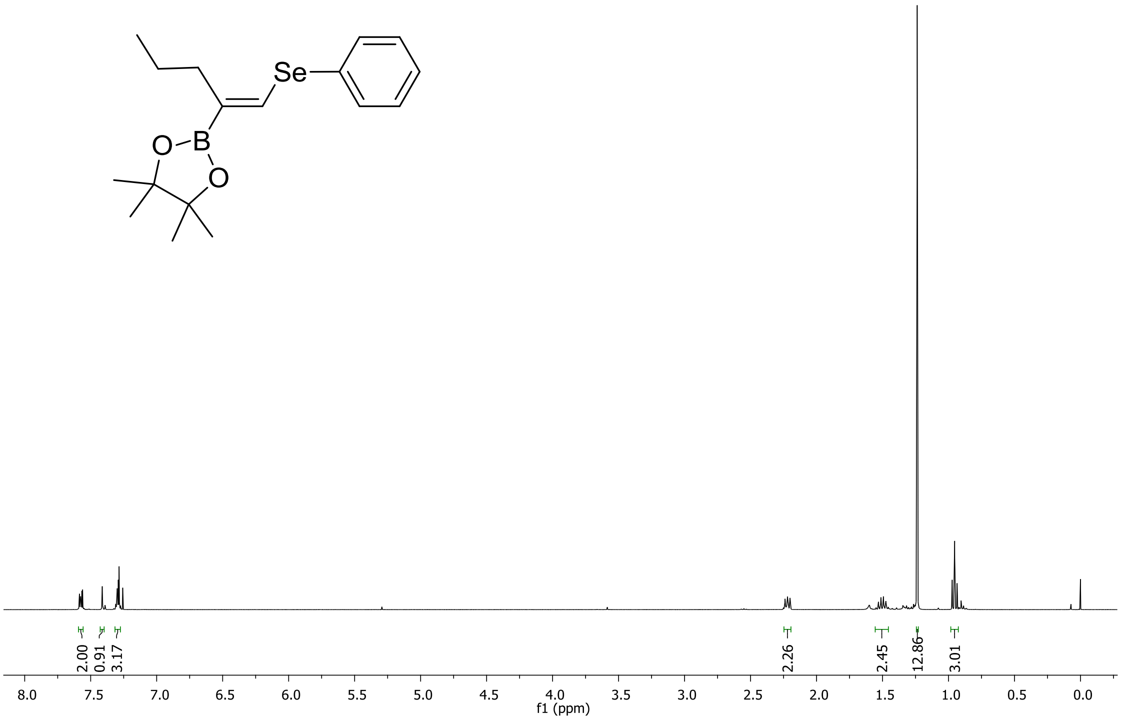
^{13}C NMR spectrum for compound **2p** ($CDCl_3$, 100 MHz)



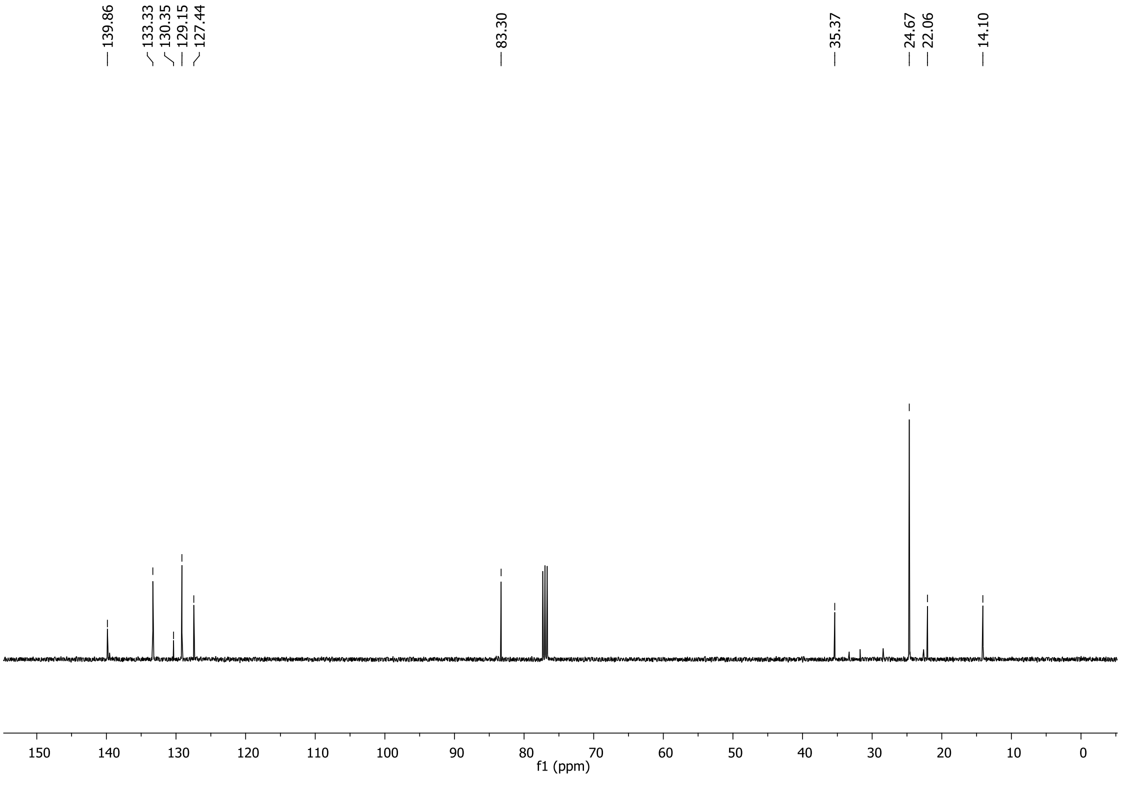
^{11}B NMR spectrum for compound **2p** ($CDCl_3$, 128MHz)



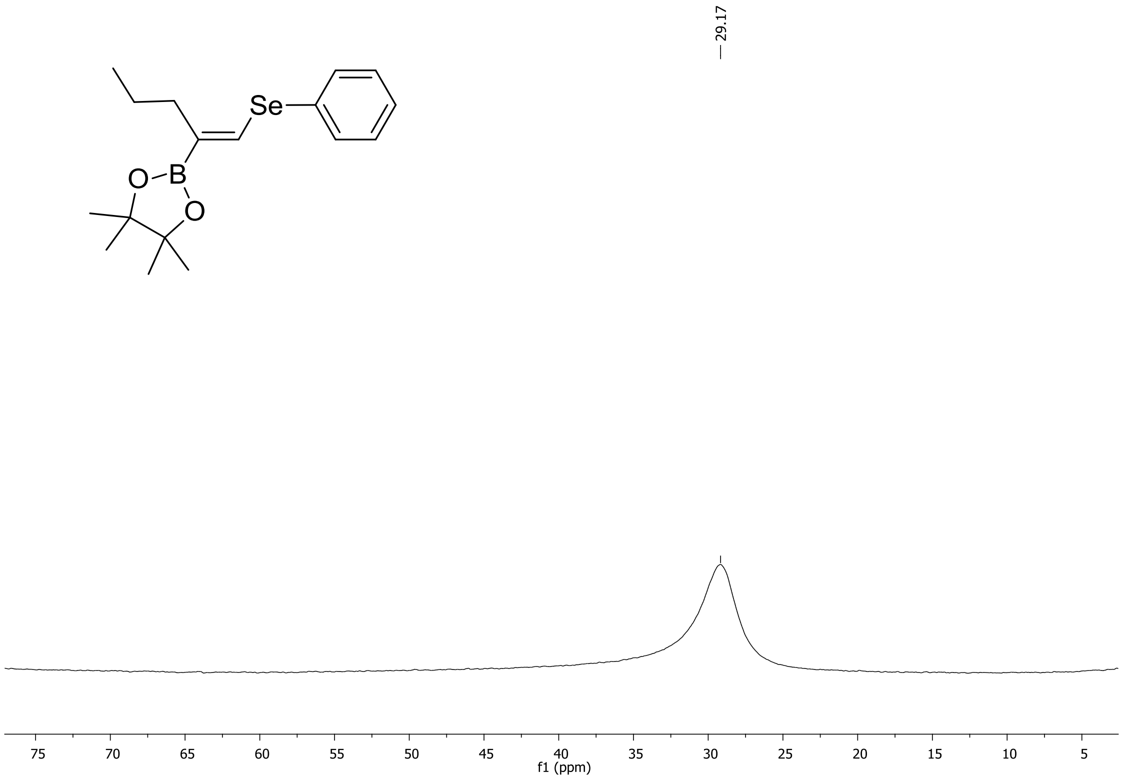
^{77}Se NMR spectrum for compound **2p** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



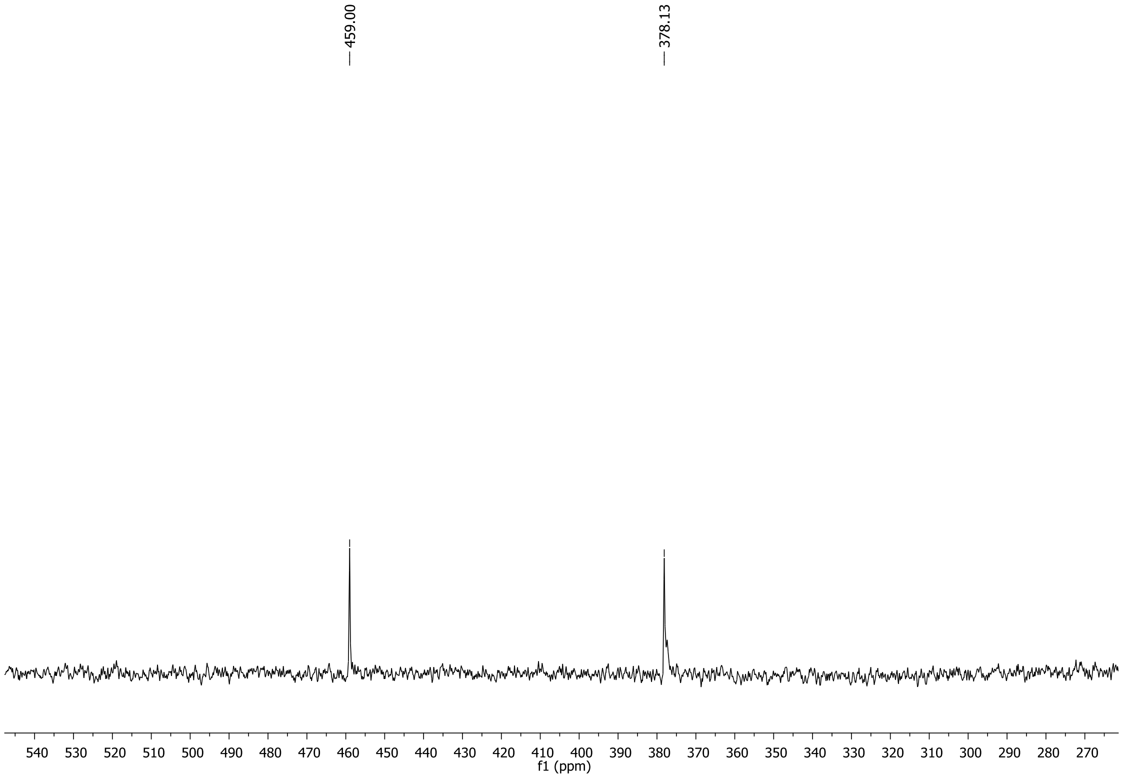
^{1}H NMR spectrum for compound **2q** ($CDCl_3$, 400 MHz)



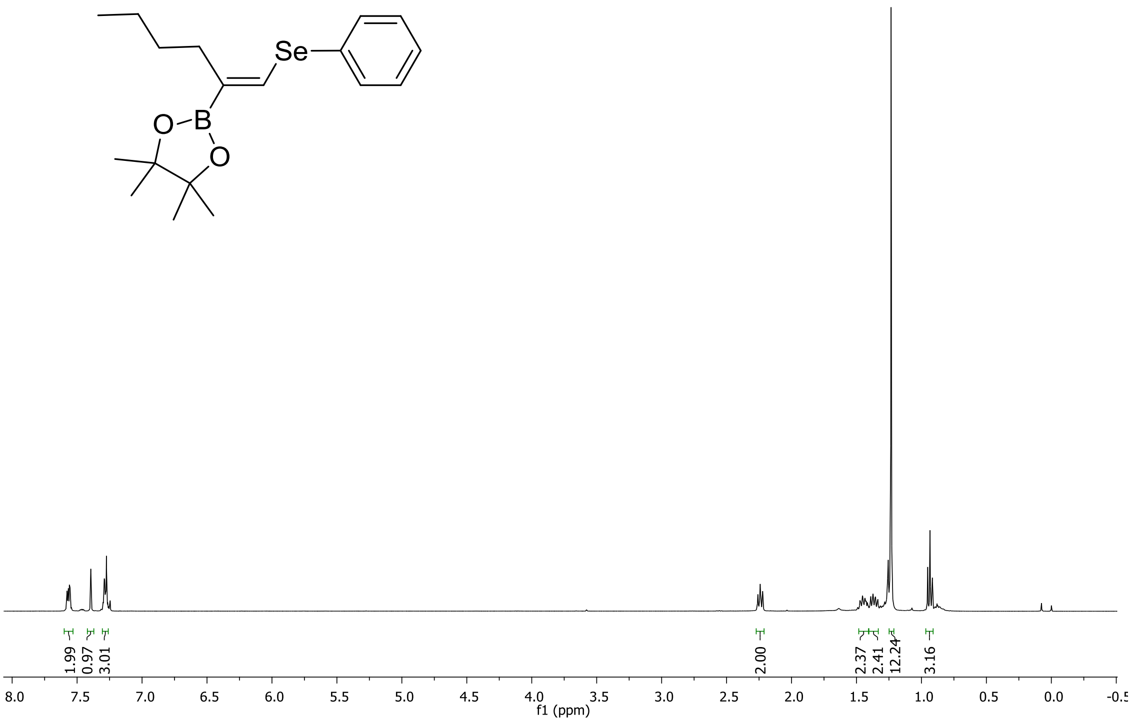
^{13}C NMR spectrum for compound **2q** ($CDCl_3$, 100 MHz)



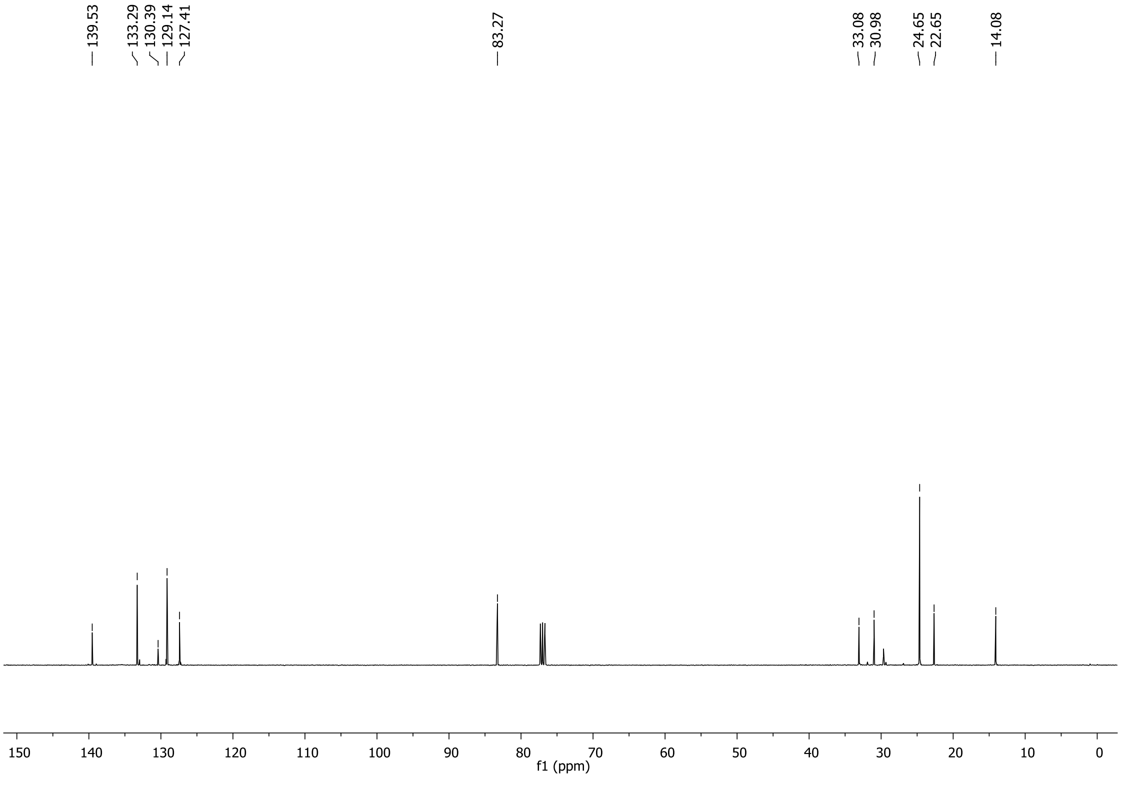
^{11}B NMR spectrum for compound **2q** ($CDCl_3$, 128MHz)



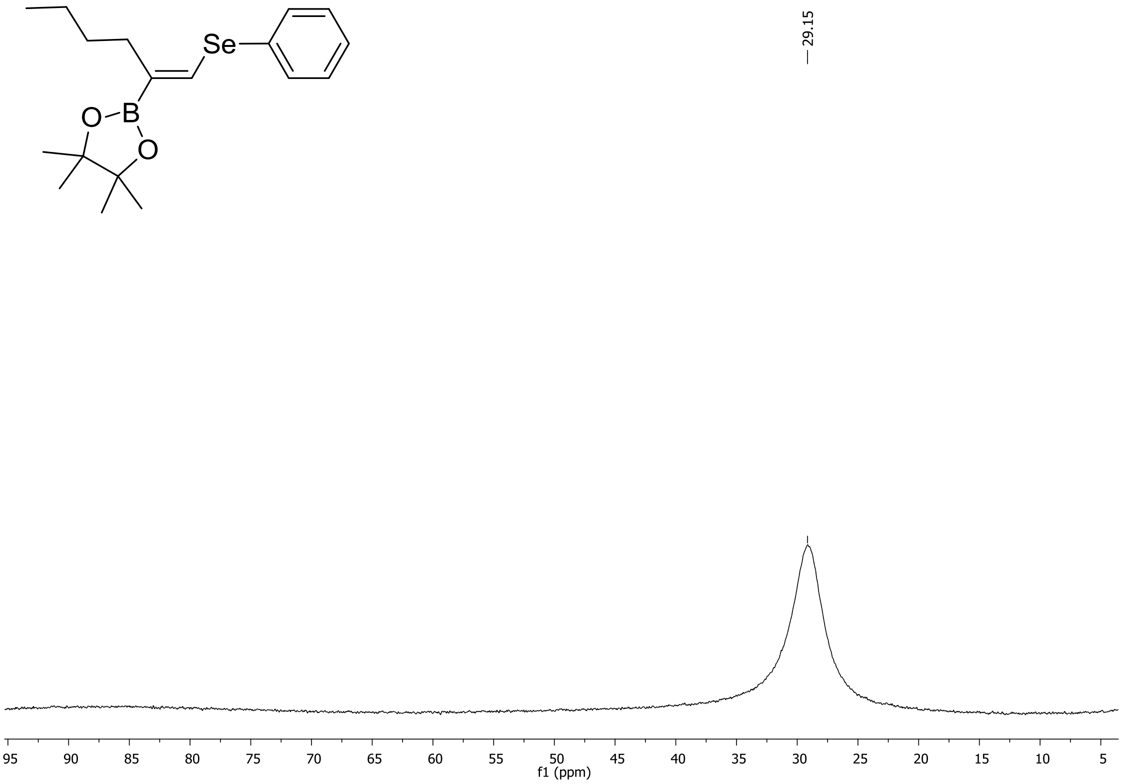
^{77}Se NMR spectrum for compound **2q** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



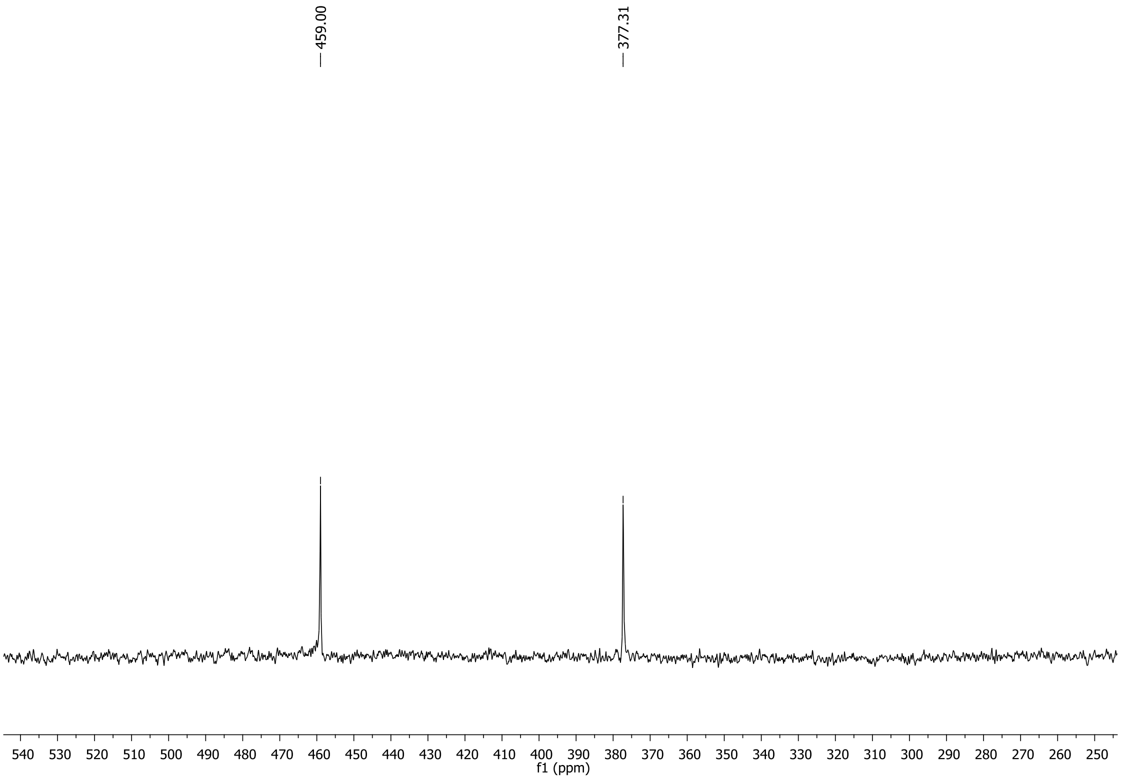
^{1}H NMR spectrum for compound **2r** ($CDCl_3$, 400 MHz)



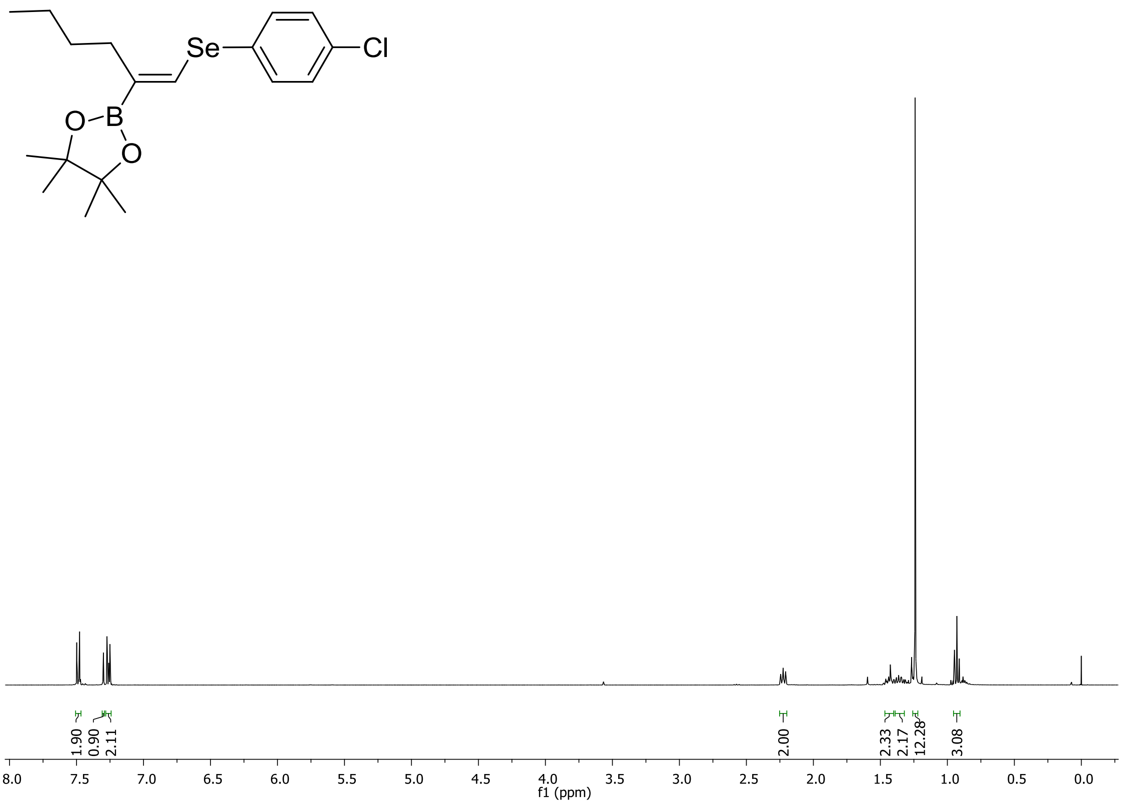
^{13}C NMR spectrum for compound **2r** ($CDCl_3$, 100 MHz)



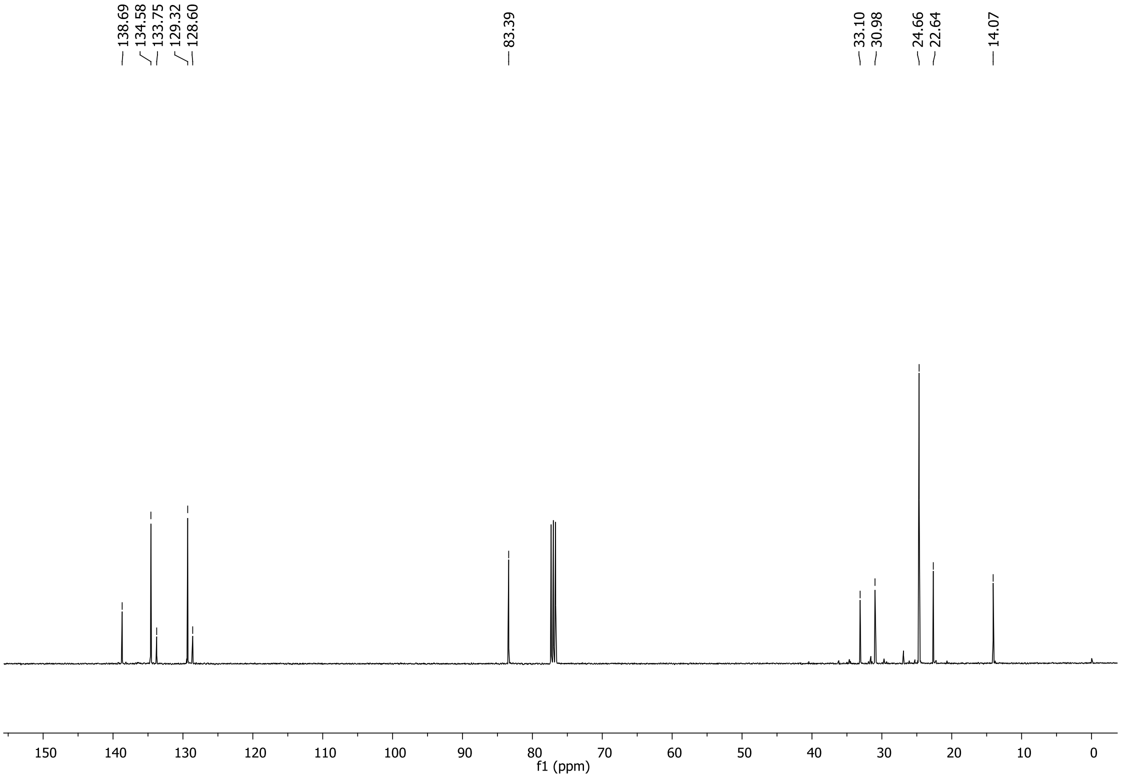
^{11}B NMR spectrum for compound **2r** ($CDCl_3$, 128MHz)



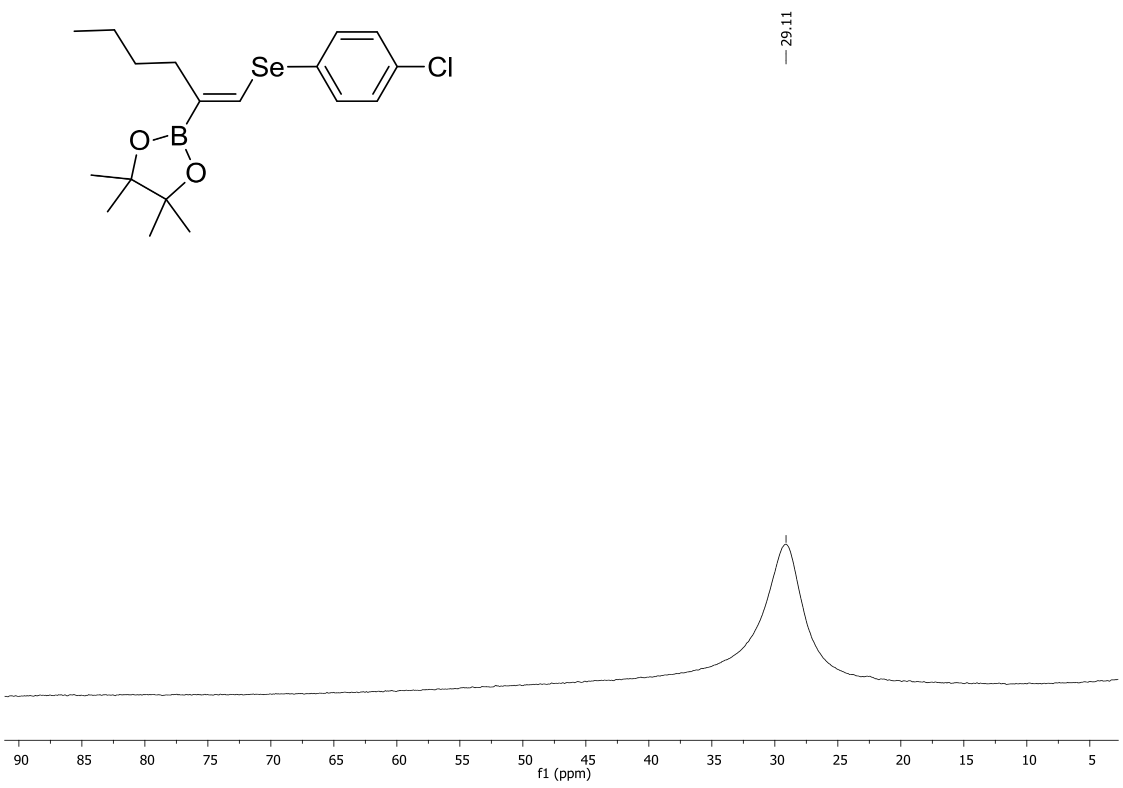
^{77}Se NMR spectrum for compound **2r** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



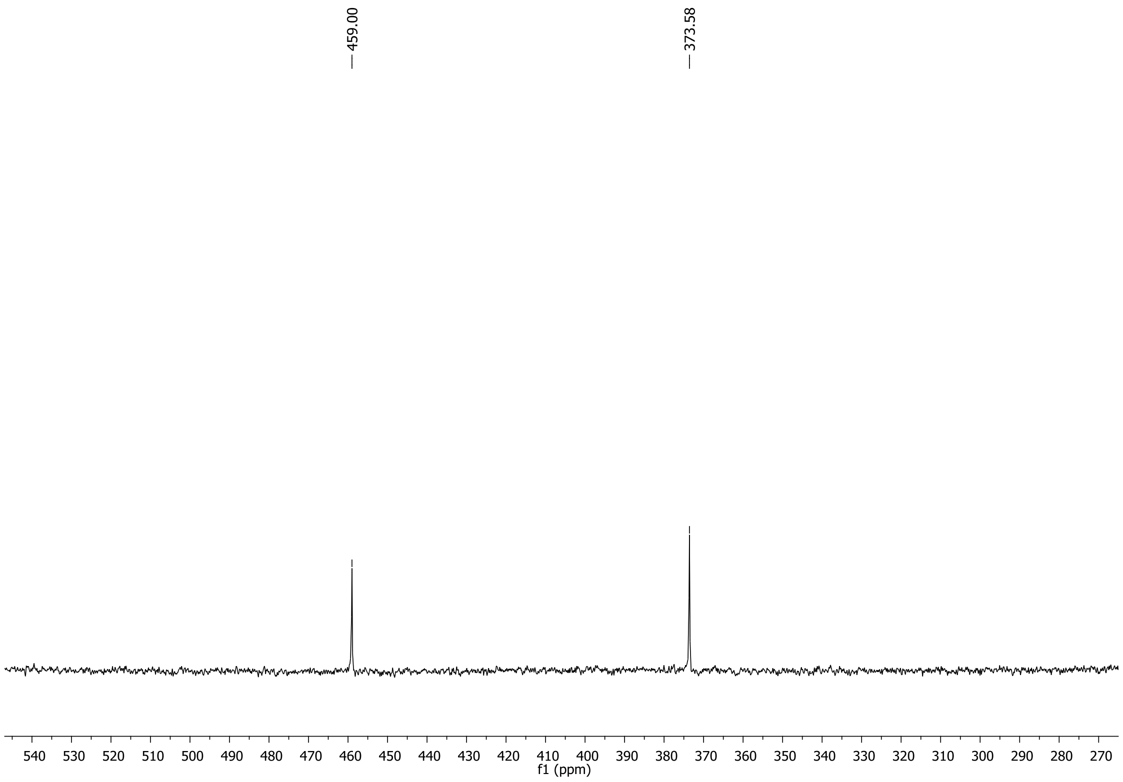
^{1}H NMR spectrum for compound **2s** ($CDCl_3$, 400 MHz)



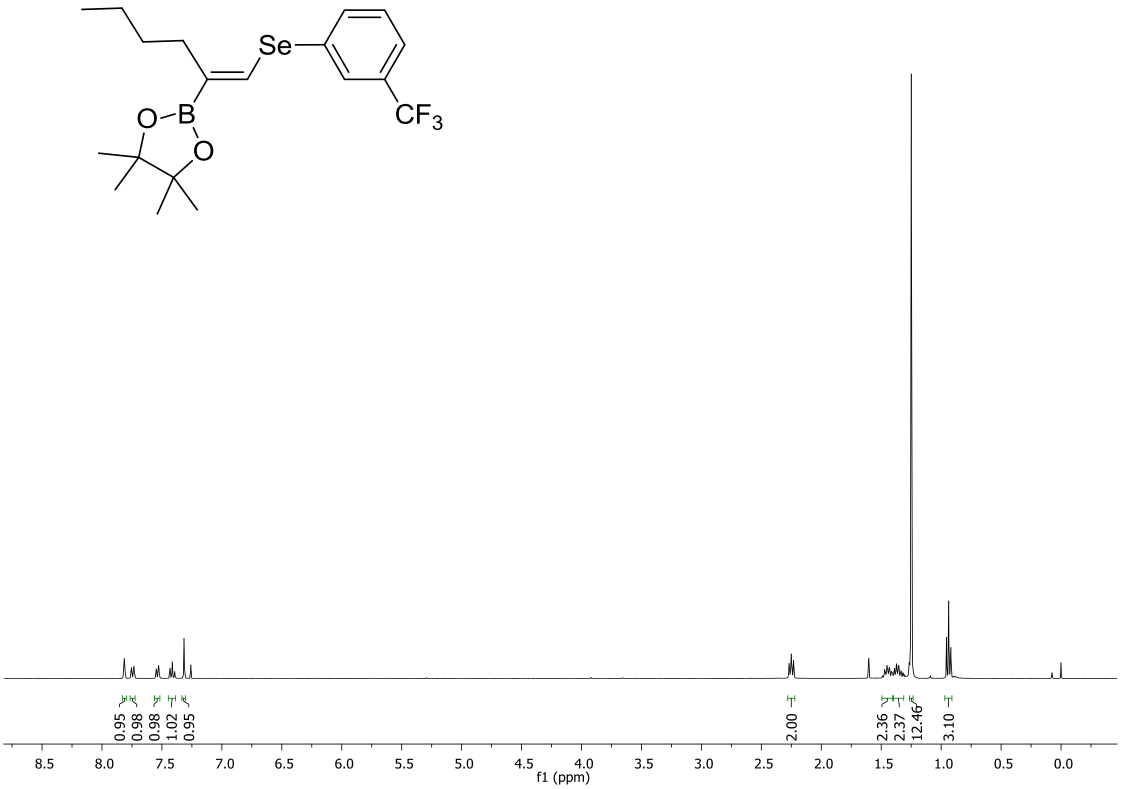
^{13}C NMR spectrum for compound **2s** ($CDCl_3$, 100 MHz)



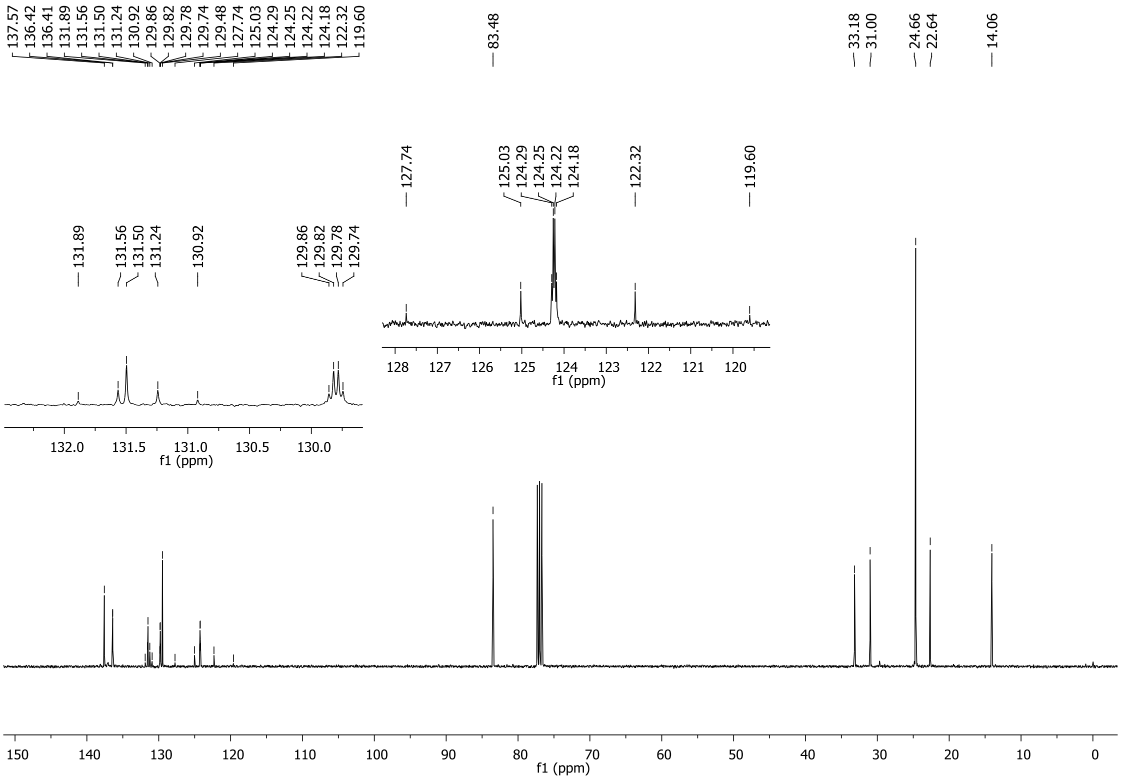
^{11}B NMR spectrum for compound **2s** ($CDCl_3$, 128MHz)



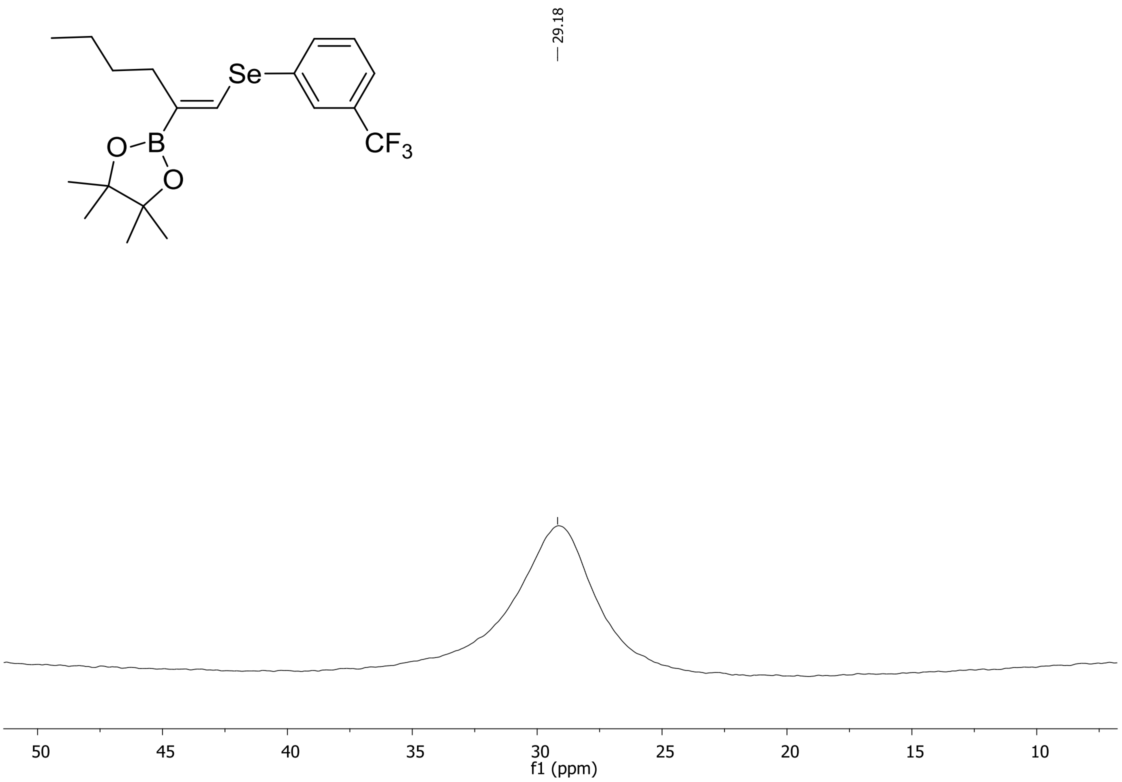
^{77}Se NMR spectrum for compound **2s** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



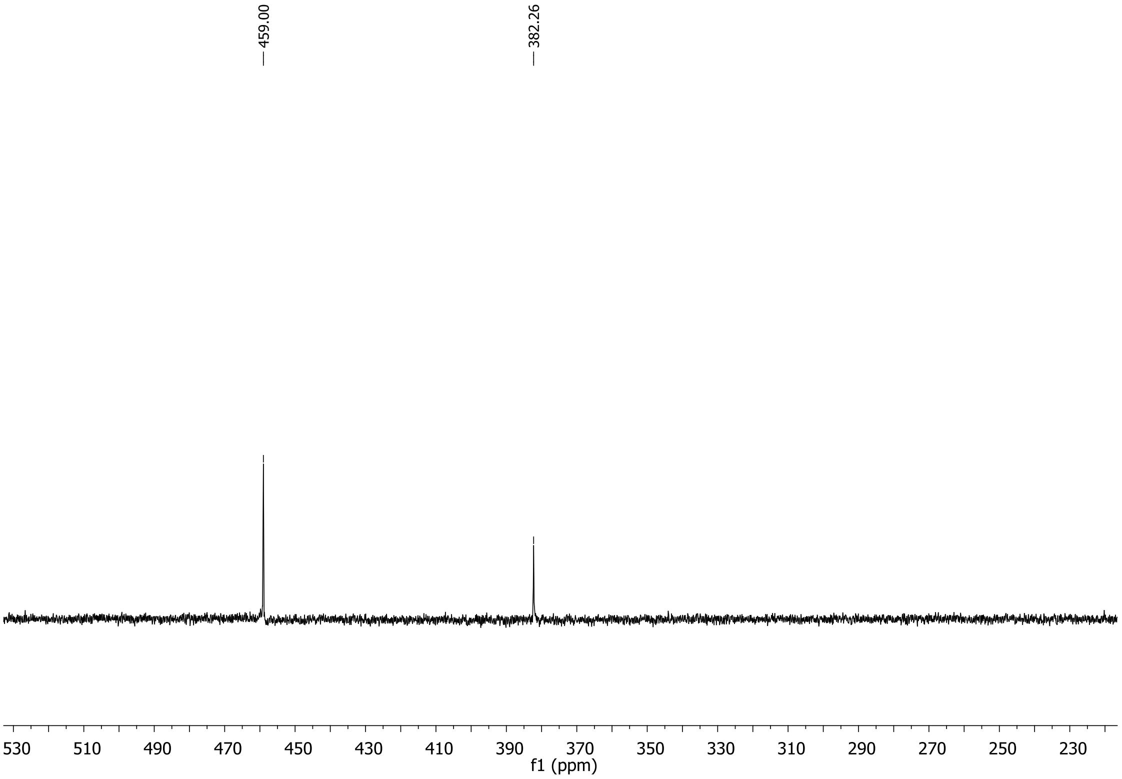
^{1}H NMR spectrum for compound **2t** (CDCl$_3$, 400 MHz)



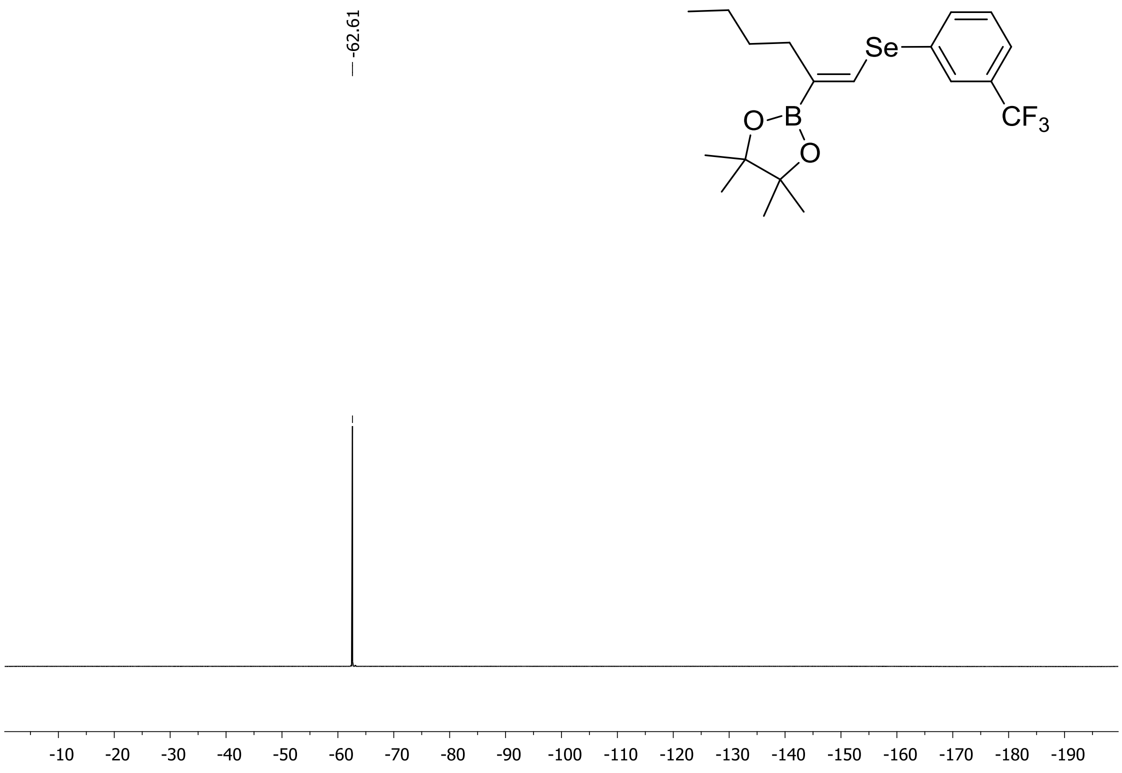
^{13}C NMR spectrum for compound **2t** (CDCl$_3$, 100 MHz)



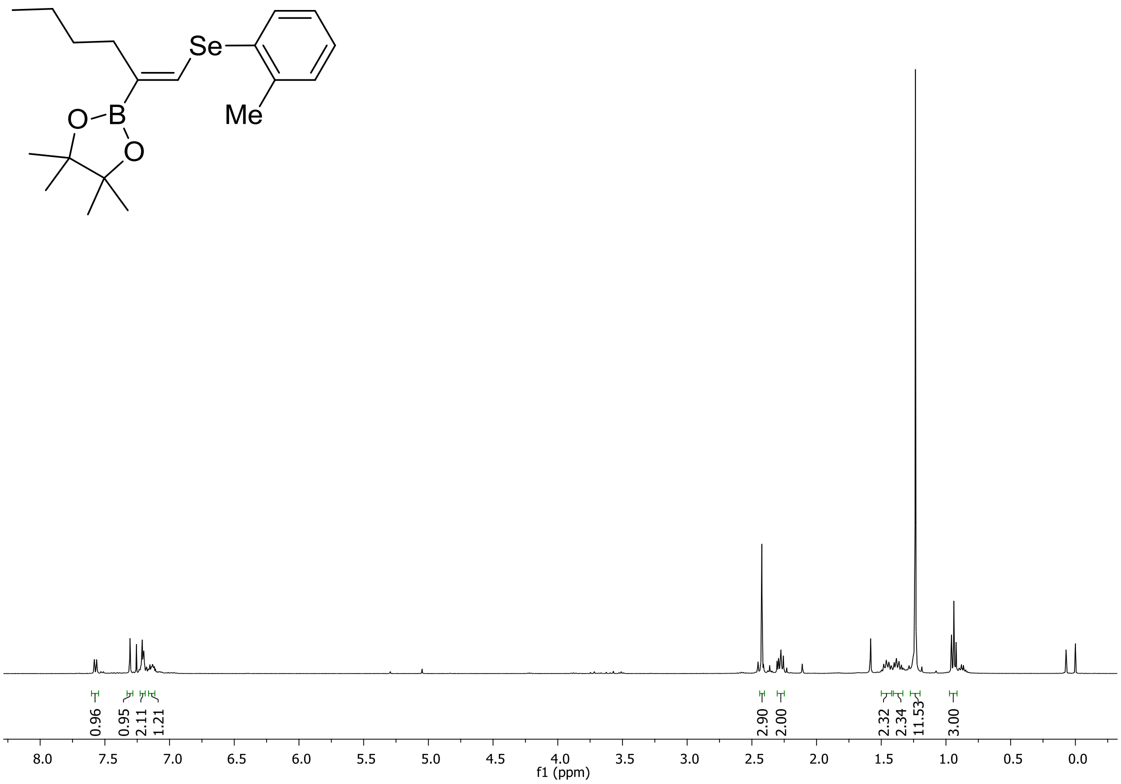
^{11}B NMR spectrum for compound **2t** ($CDCl_3$, 128MHz)



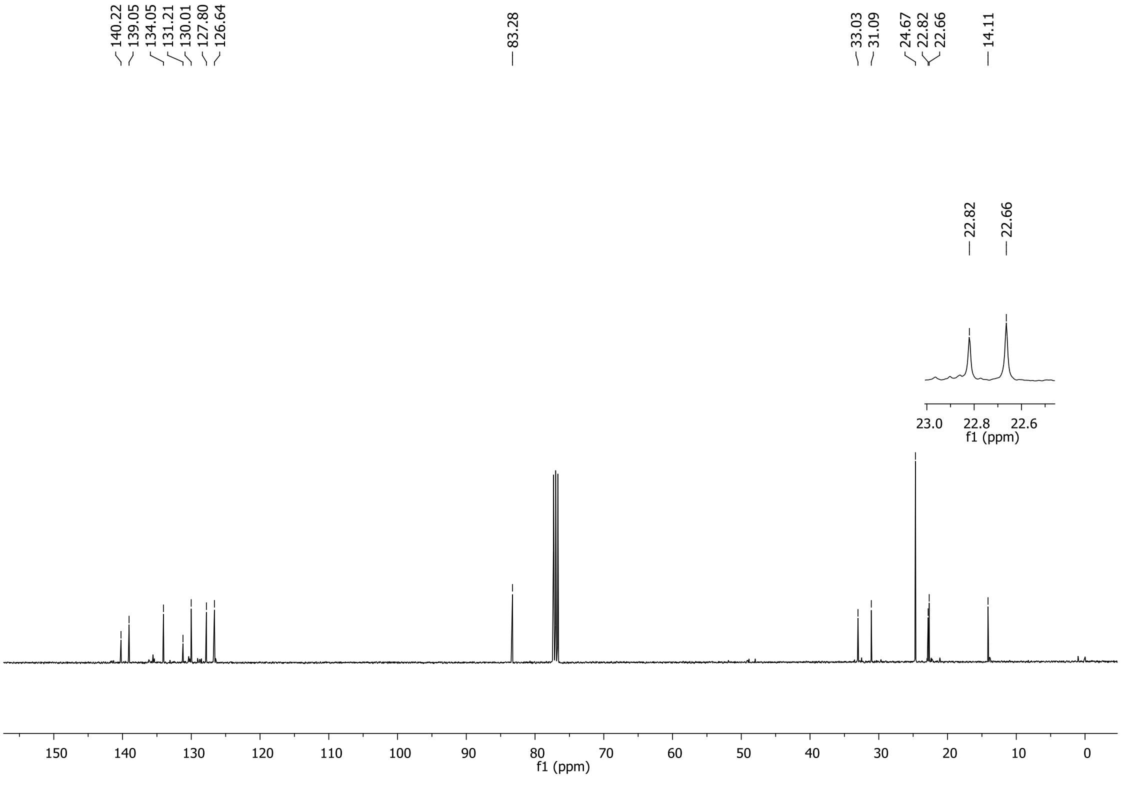
^{77}Se NMR spectrum for compound **2t** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



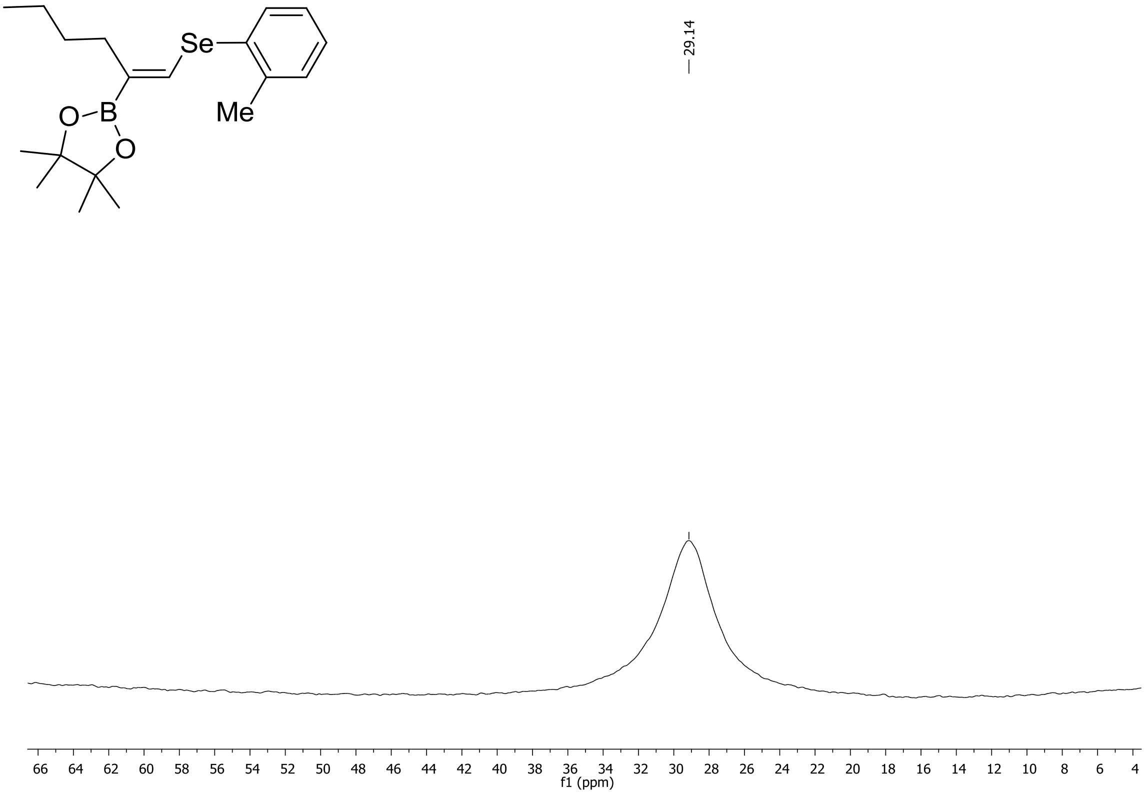
^{19}F NMR spectrum for compound **2t** ($CDCl_3$, 376 MHz)



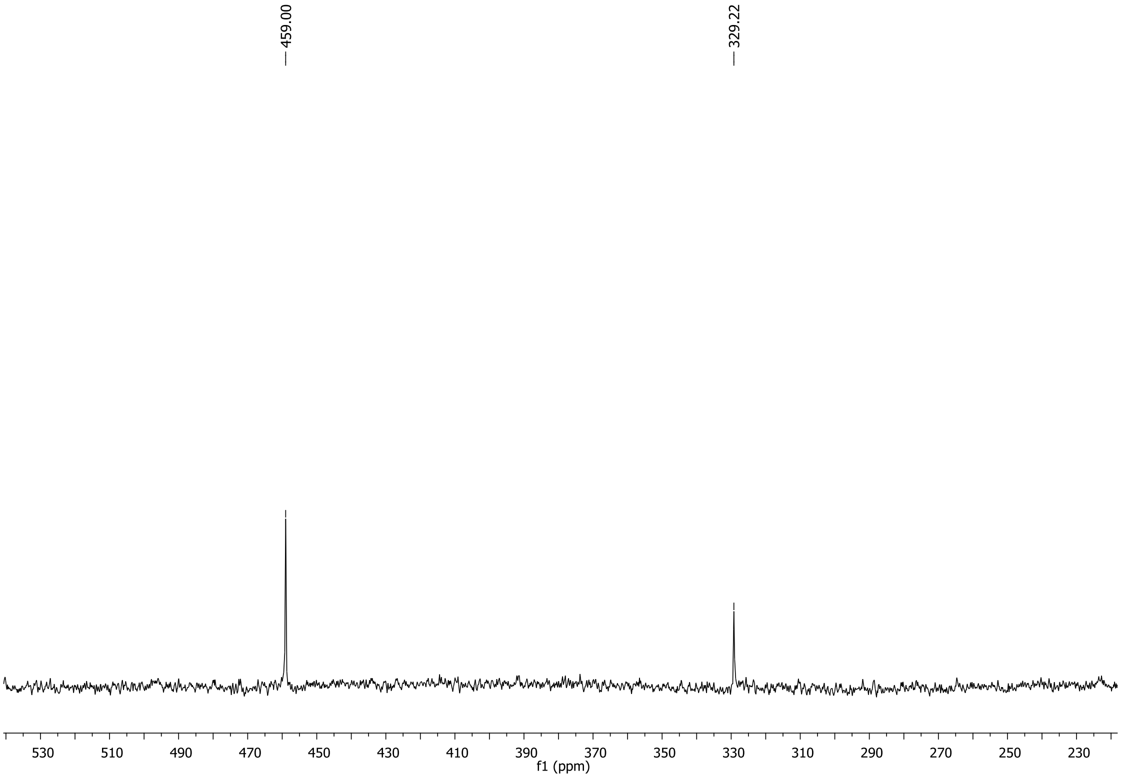
^{1}H NMR spectrum for compound **2u** ($CDCl_3$, 400 MHz)



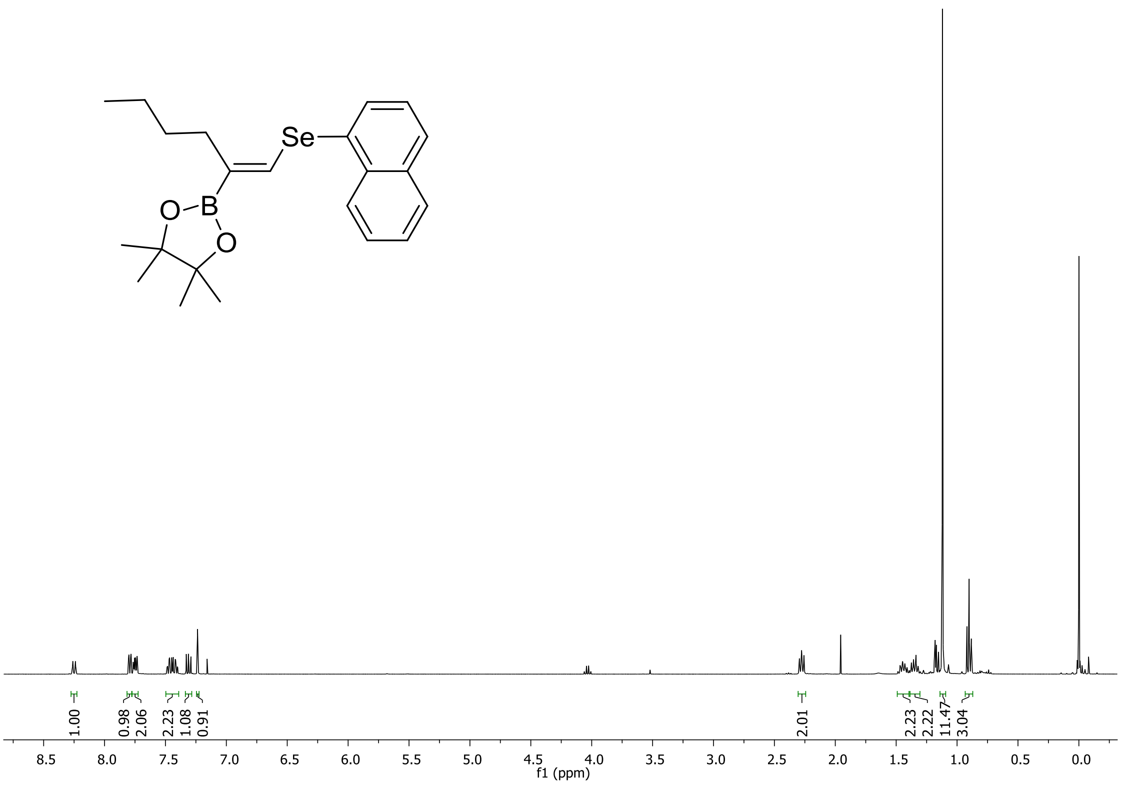
^{13}C NMR spectrum for compound **2u** ($CDCl_3$, 100 MHz)



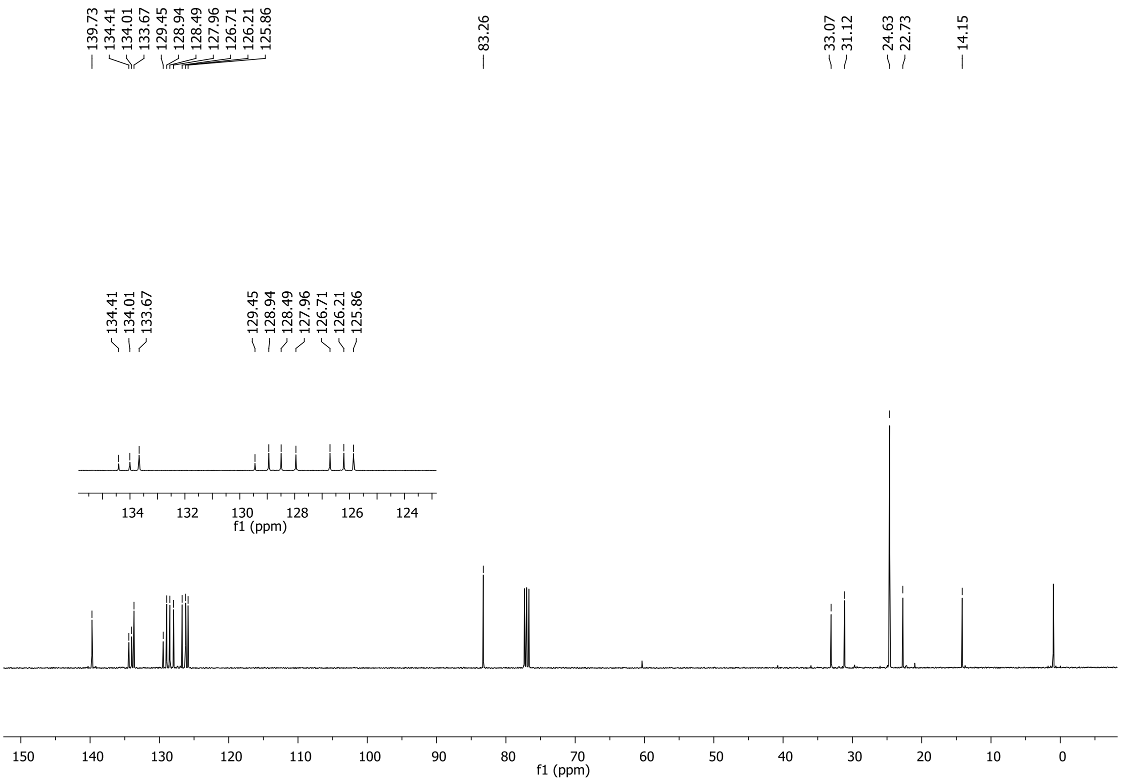
^{11}B NMR spectrum for compound **2u** (CDCl$_3$, 128MHz)



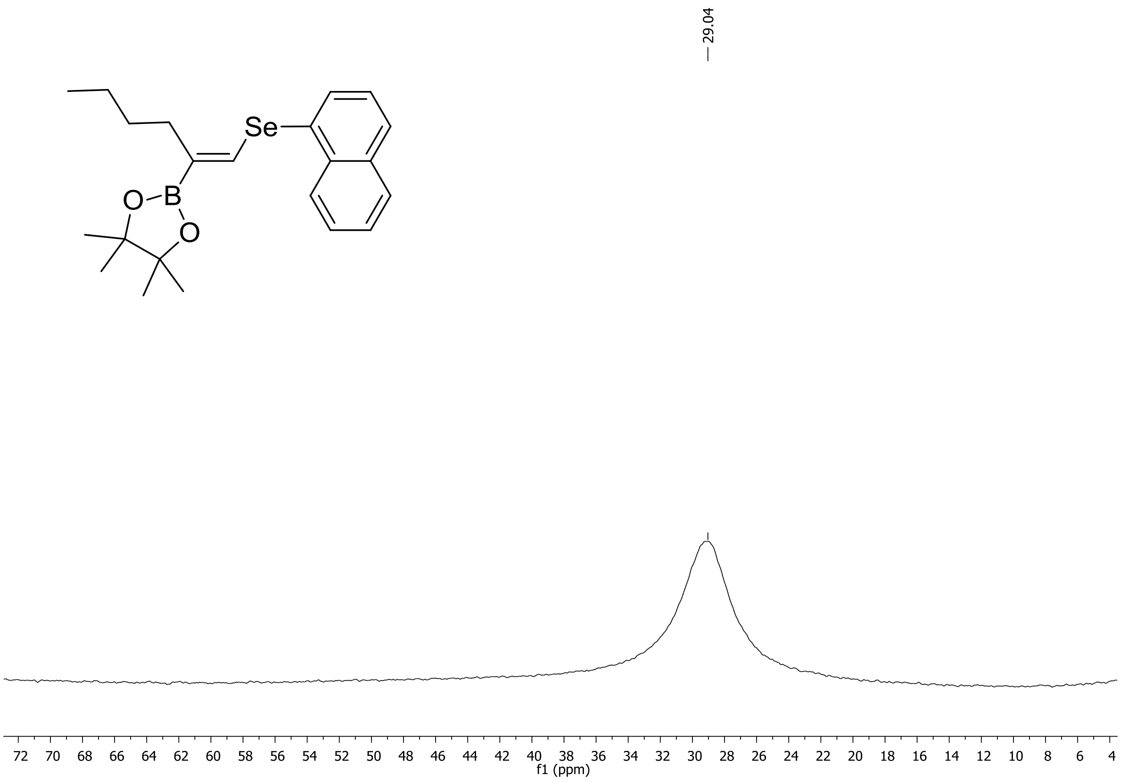
^{77}Se NMR spectrum for compound **2u** (CDCl$_3$, 76 MHz, (PhSe)$_2$ as internal standard)



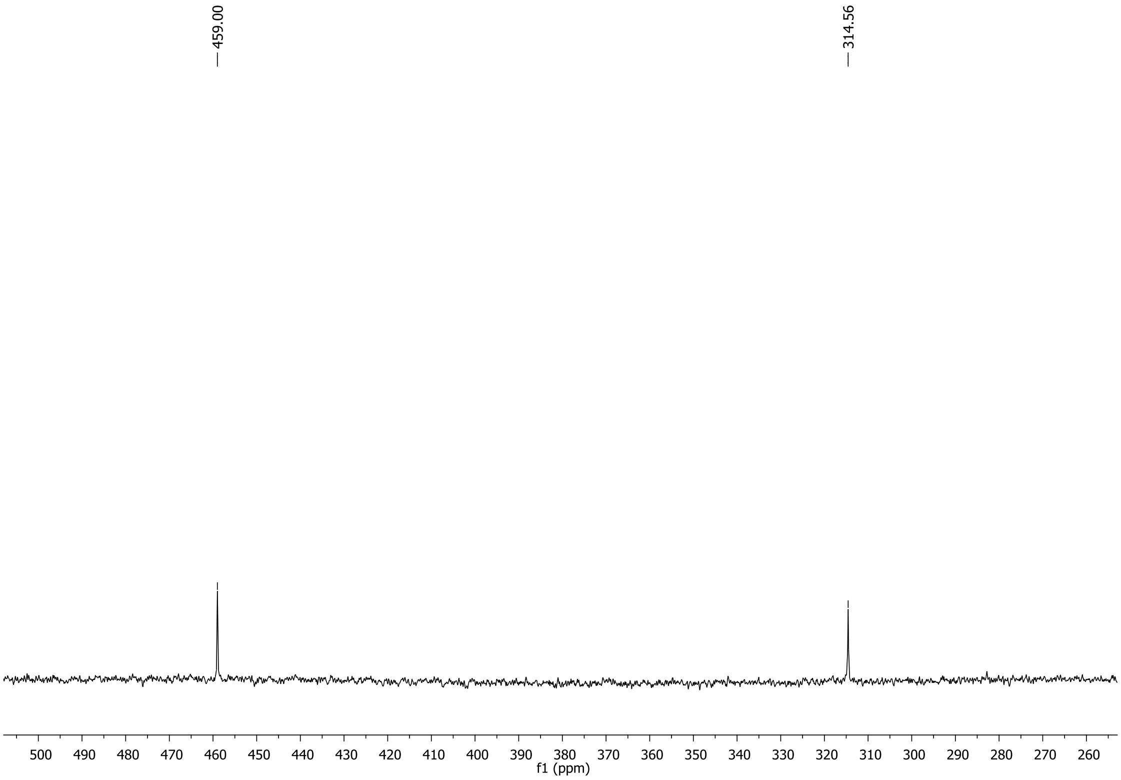
^{1}H NMR spectrum for compound **2v** ($CDCl_3$, 400 MHz)



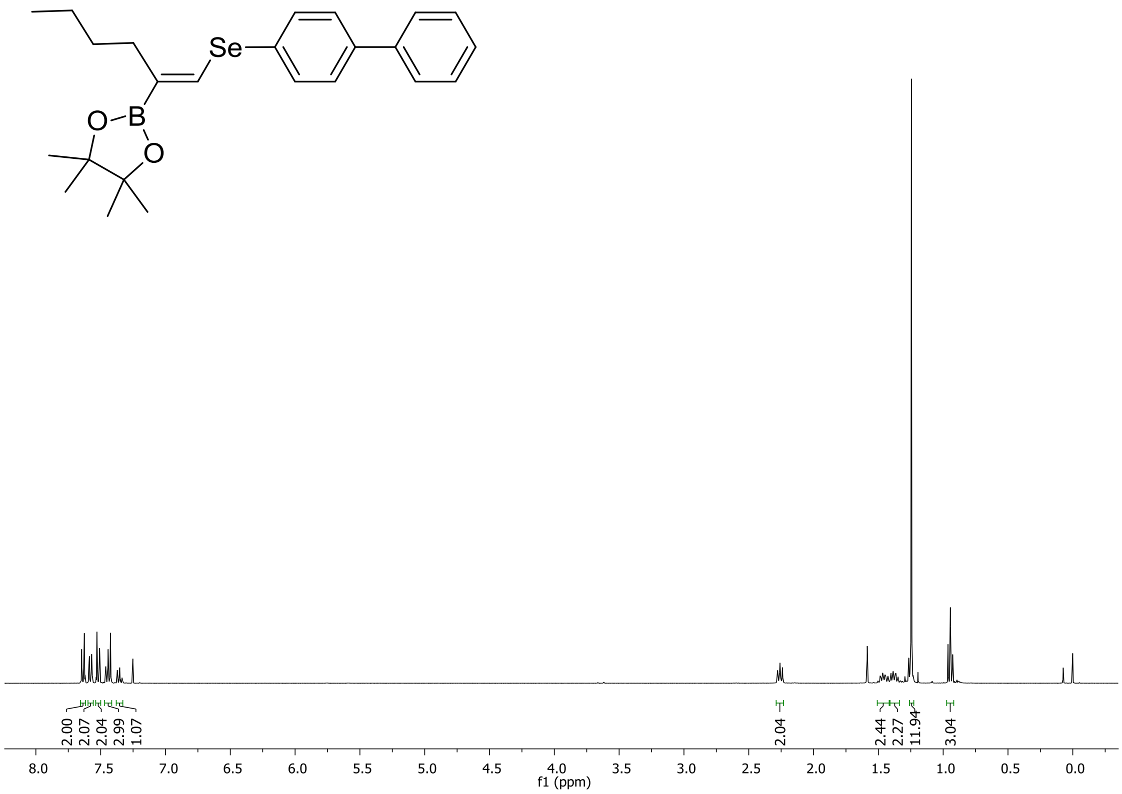
^{13}C NMR spectrum for compound **2v** ($CDCl_3$, 100 MHz)



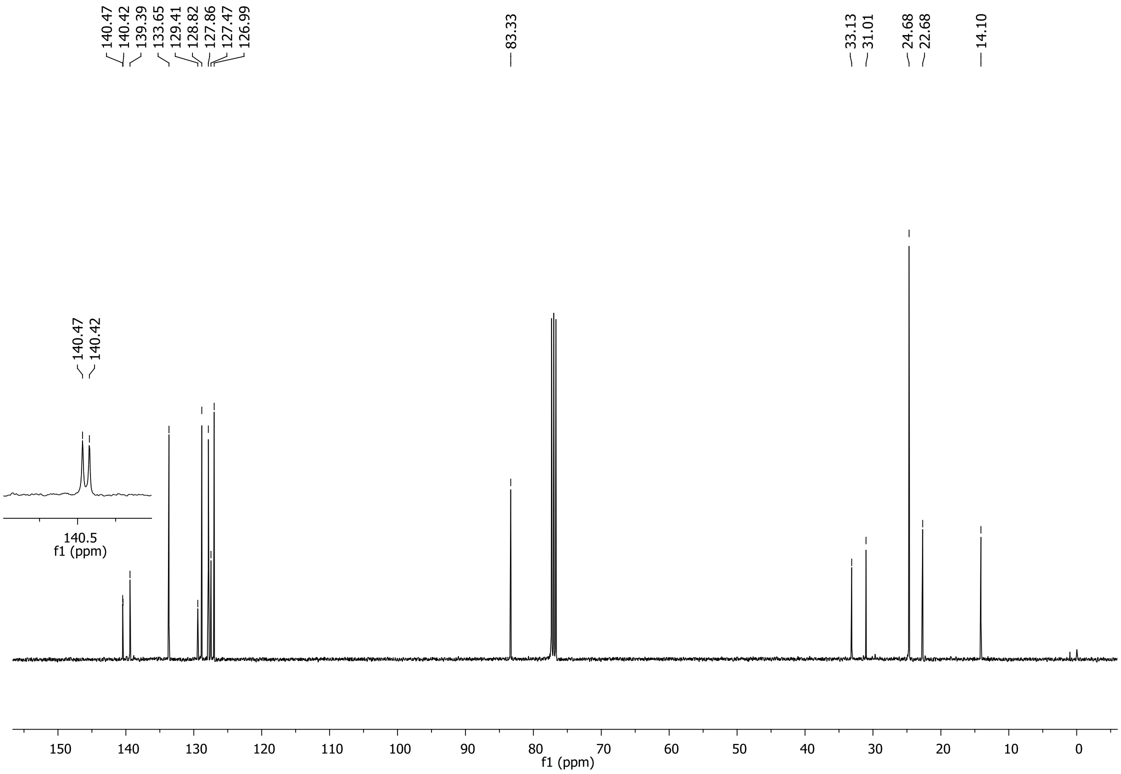
^{11}B NMR spectrum for compound **2v** ($CDCl_3$, 128MHz)



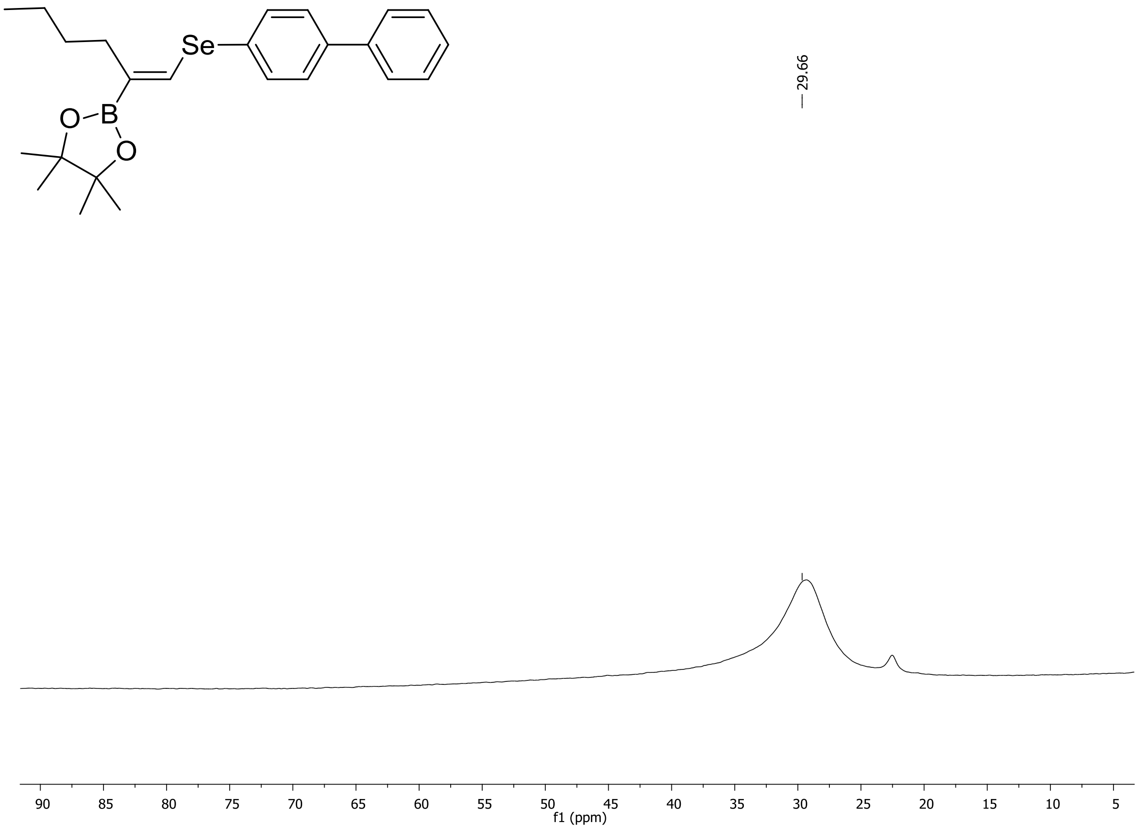
^{77}Se NMR spectrum for compound **2v** ($CDCl_3$, 76 MHz, $(PhSe)_2$ as internal standard)



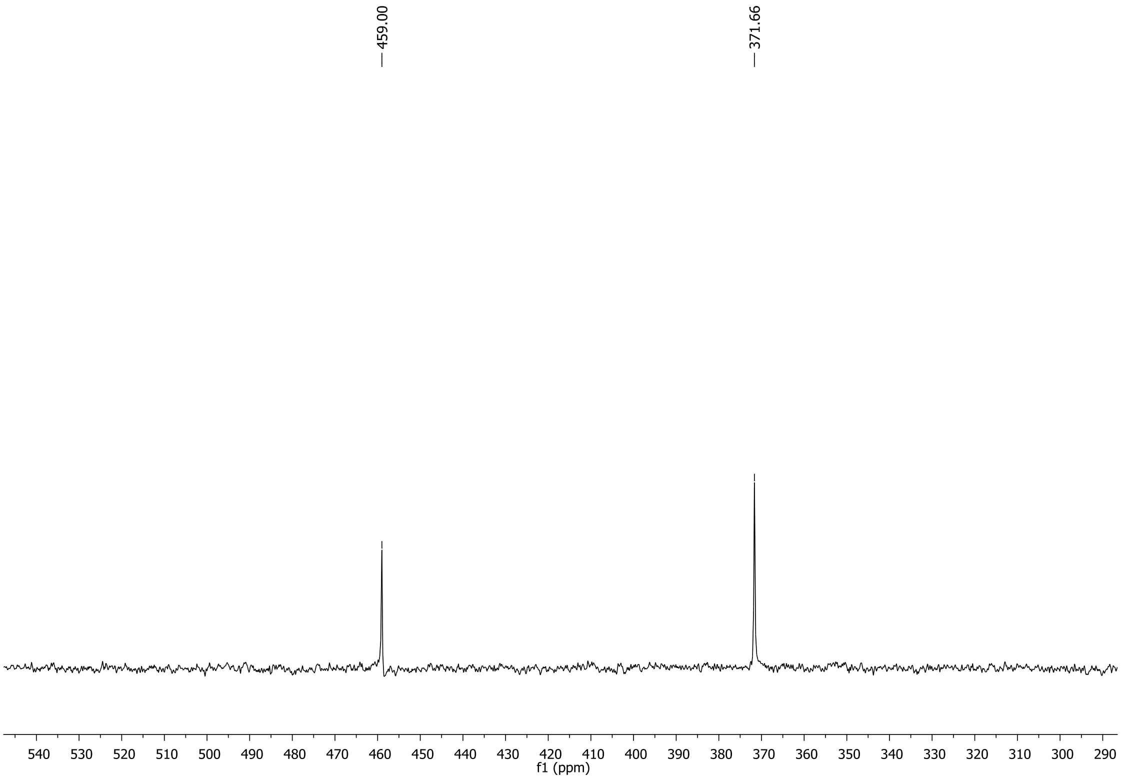
^{1}H NMR spectrum for compound **2w** ($CDCl_3$, 400 MHz)



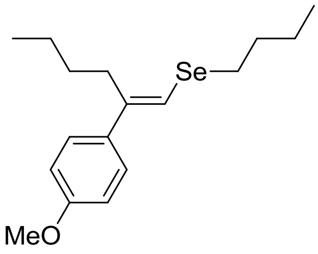
^{13}C NMR spectrum for compound **2w** ($CDCl_3$, 100 MHz)

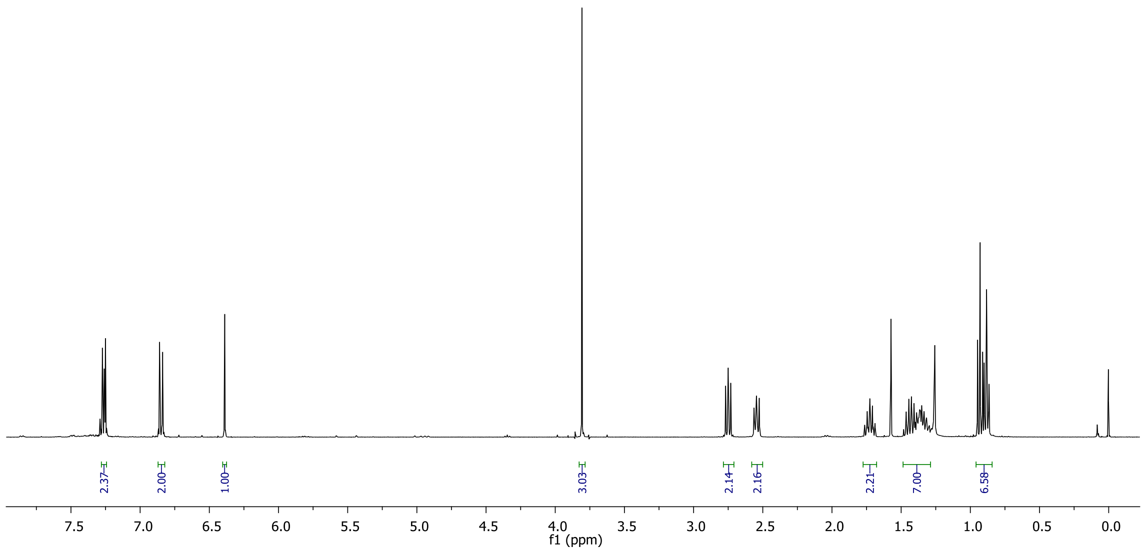


^{11}B NMR spectrum for compound **2w** (CDCl$_3$, 128MHz)

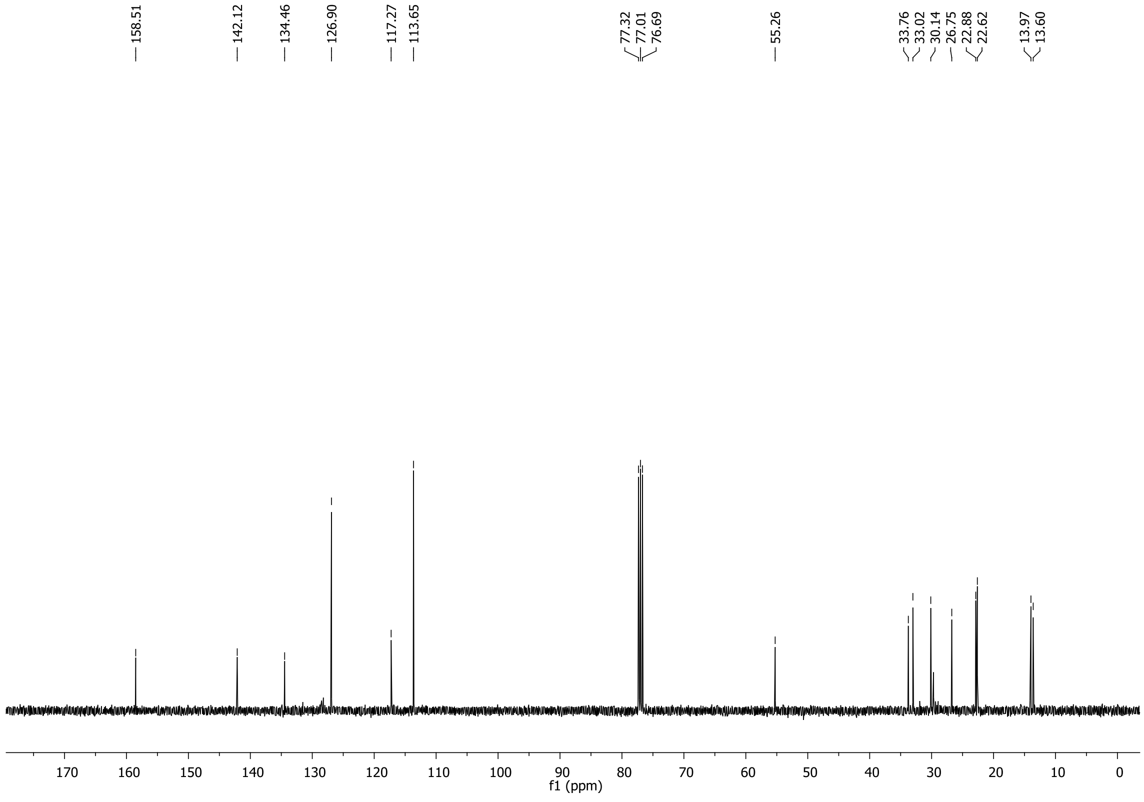


^{77}Se NMR spectrum for compound **2w** (CDCl$_3$, 76 MHz, (PhSe)$_2$ as internal standard)

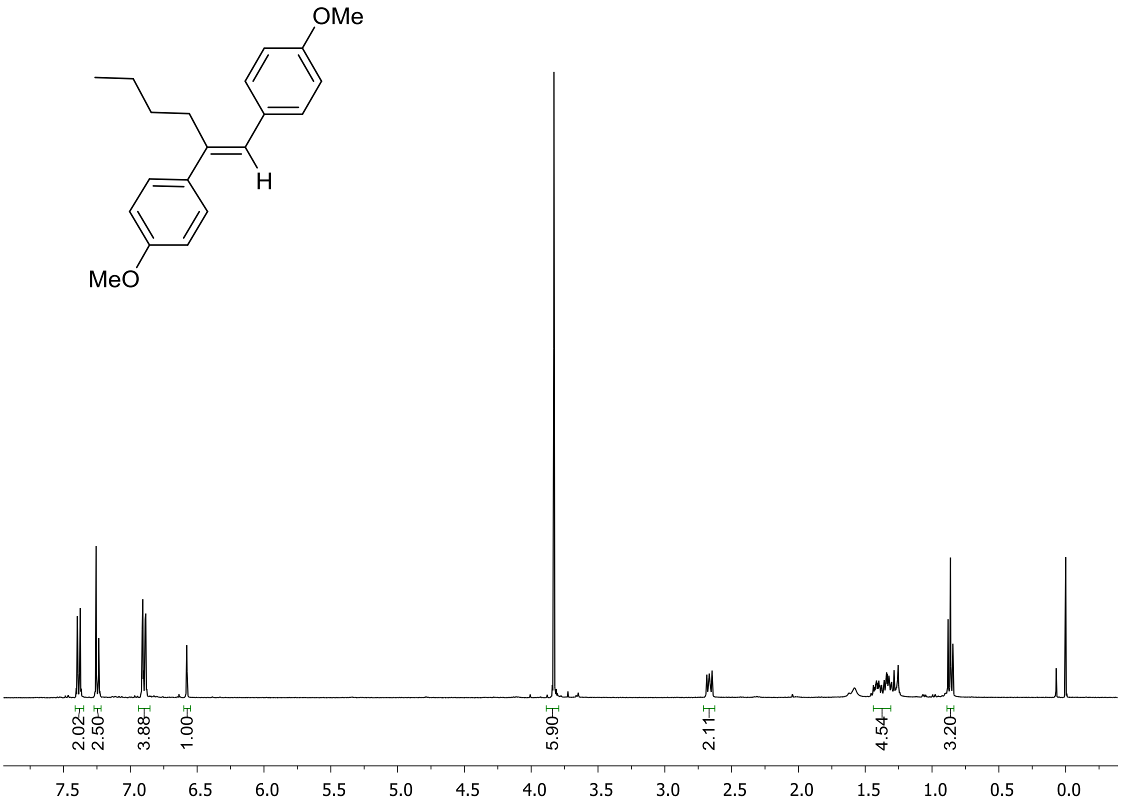




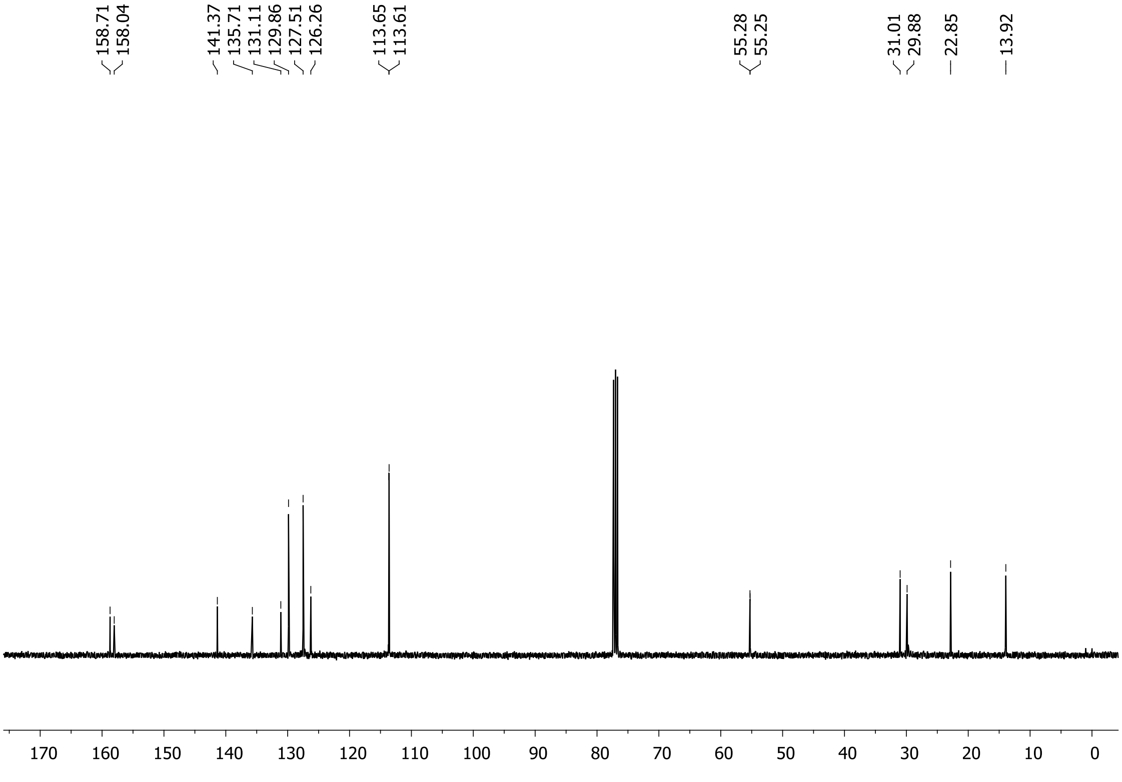
^{1}H NMR spectrum for compound **3** (CDCl$_3$, 400 MHz)



^{13}C NMR spectrum for compound **3** (CDCl$_3$, 100 MHz)



^{1}H NMR spectrum for compound **4** ($CDCl_3$, 400 MHz)



^{13}C NMR spectrum for compound **4** ($CDCl_3$, 100 MHz)