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Supporting Information

Exo-trig Selenocyclization of Secondary Allylic Carboxamides *En* Route to 2,5-Disubstituted Selenazolines: Feat by Woollins' Reagent

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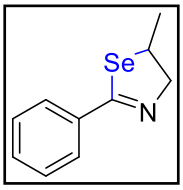
1. General information: Commercially available reagents and solvents were used without further purification. ^{1}H NMR spectra were recorded on 500 MHzs Bruker Avance III spectrometer equipped with BBO probe. Chemical shifts are reported in ppm with solvent resonance as the internal standard (DMSO-d_6: δ = 2.50 ppm). ^{13}C NMR spectra were recorded on an NMR instrument operated at 126 MHz with complete proton decoupling. Chemical shifts are reported in ppm with the solvent resonance as the internal standard (DMSO-d_6: δ = 39.52 ppm and $CDCl_3$: δ = 77.16 ppm). ^{77}Se and ^{19}F NMR spectra were recorded at 95 and 487 MHz, respectively. The following abbreviations were used for ^{1}H NMR spectra to indicate the signal multiplicity: s (singlet), d (doublet), t (triplet), q (quartet) and m (multiplet). HRMS was measured in ESI-QTOF mass spectrophotometer. Thin layer chromatography was performed on MERCK precoated silica gel 60F-254 (0.5 mm) aluminum plates and visualized under UV light at 254 nm. Column chromatography was performed using silica gel 60-120 and 100-200 mesh and neutral alumina. *N*-allyl aryl/heteroaryl/alkyl acid amides were synthesized from their respective substituted acids or chlorides and allylamine, assisted by either amide coupling or thionyl chloride, respectively.

Microwave Irradiation Experiments

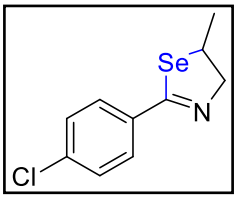
Microwave irradiation experiments were performed in a Monowave 200 single-mode microwave reactor. The reaction temperature is monitored by an external infrared (IR) sensor housed in the sidewalls of the microwave cavity, measuring the surface temperature of the reaction vessel. Reaction times refer to hold time at the desired set temperature and not to the total radiation time. Pressure sensing is achieved by a hydraulic sensor integrated in the swiveling cover of the instrument. The reusable 10 mL G10 Pyrex vial is sealed with PEEK snap caps and standard PTFE coated silicone septa. Reaction cooling is performed by compressed air automatically after the heating period has elapsed.

2. General procedure for selenocyclization of N-allyl aryl/heteroaryl/alkyl acid amides: *N*-allylbenzamides **1a** (0.5 mmol, 1 equiv) and Woollins' reagent (0.125 mmol, 0.25 equiv) was charged in a 10 mL microwave vial to which anhyd. xylene (0.2 M) was added. The vial was sealed with the cap and placed in a microwave reactor at 160 °C for 45 min. After the completion of the reaction (monitored by TLC), the reaction mixture was diluted with ethyl acetate and washed with water and brine solution. The organic layer obtained was dried over Na_2SO_4, filtered, and concentrated under reduced pressure to obtain a crude residue. The crude residue

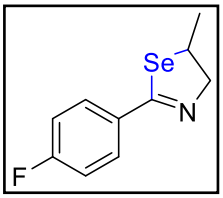
was subjected to neutral alumina gel column chromatography using hexane:ethyl acetate (99:01) as an eluting solvent to afford pure product **2a** in 92% yield. All the compounds **2a-w** were synthesized following the general procedure and thoroughly characterized by ^{1}H NMR, ^{13}C NMR, ^{77}Se NMR, ^{19}F NMR and HRMS (ESI).



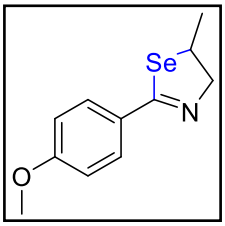
5-methyl-2-phenyl-4,5-dihydro-1,3-selenazole ***(2a)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2a** as pale-yellow liquid (92%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.77 (q, J = 2.0 Hz, 1H), 7.75 (d, J = 1.6 Hz, 1H), 7.47 – 7.43 (m, 1H), 7.42 – 7.38 (m, 2H), 4.47 – 4.13 (m, 3H), 1.56 (d, J = 6.7 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 167.0, 135.8, 131.0, 128.6, 128.5, 74.7, 45.1, 22.9. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 556.69. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_{11}NSe$ 226.0129, found 226.0144.



2-(4-chlorophenyl)-5-methyl-4,5-dihydro-1,3-selenazole ***(2b)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2b** as pale-yellow liquid (90%); ^{1}H NMR (500 MHz, CDCl3) δ 7.71 – 7.67 (m, 2H), 7.39 – 7.36 (m, 2H), 4.34 – 4.21 (m, 3H), 1.55 (d, J = 6.7 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.6, 137.1, 134.3, 130.1, 128.7, 74.8, 45.6, 22.8. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 558.21. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_{10}ClNSe$ 259.9740, found 259.9760.

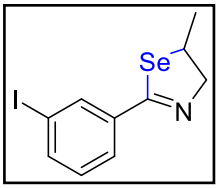


2-(4-fluorophenyl)-5-methyl-4,5-dihydro-1,3-selenazole ***(2c)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2c** as pale-yellow liquid (87%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.75 (dd, J = 8.9, 5.4 Hz, 2H), 7.08 (t, J = 8.7 Hz, 2H), 4.34 – 4.19 (m, 3H), 1.55 (d, J = 6.7 Hz, 3H). ^{13}C NMR (126 MHz, CDCl3) δ 165.4, 164.4 (d, J = 251.8 Hz), 132.2 (d, J = 2.9 Hz), 130.8 (d, J = 8.7 Hz), 115.5 (d, J = 22.1 Hz), 74.7, 45.6, 22.8. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 556.82. ^{19}F NMR (470 MHz, $CDCl_3$) δ -109.05. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_{10}FNSe$ 244.0035, found 244.0043.

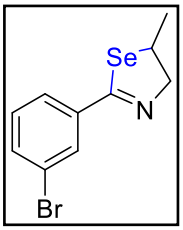


2-(4-methoxyphenyl)-5-methyl-4,5-dihydro-1,3-selenazole ***(2d)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 97/03) to afford **2d** as pale-yellow liquid (73%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.70 (d, J = 8.9 Hz, 2H), 6.90 (d, J = 8.9 Hz, 2H), 4.32 –

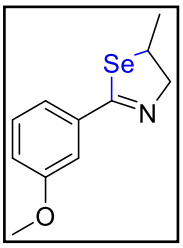
4.19 (m, 3H), 3.84 (s, 3H), 1.55 (d, *J* = 6.6 Hz, 3H.; ^{13}C NMR (126 MHz, $CDCl_3$) *δ* 166.0, 161.8, 130.5, 128.7, 113.8, 74.6, 55.4, 45.1, 22.8. ^{77}Se NMR (95 MHz, $CDCl_3$) *δ* 550.35. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{11}H_{13}NOSe$ 256.0235, found 256.0239.



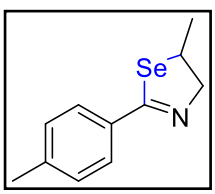
*2-(3-iodophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2e**)*. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2e** as pale-yellow liquid (85%); ^{1}H NMR (500 MHz, $CDCl_3$) *δ* 8.14 (t, *J* = 1.7 Hz, 1H), 7.77 (dt, *J* = 7.9, 1.3 Hz, 1H), 7.68 (dt, *J* = 7.8, 1.3 Hz, 1H), 7.13 (t, *J* = 7.8 Hz, 1H), 4.35 – 4.20 (m, 3H), 1.55 (d, *J* = 6.7 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.3, 139.8, 137.7, 137.2, 130.1, 128.3, 94.2, 74.7, 45.6, 22.9. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 561.63. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_{10}INSe$ 351.9096, found 351.9099.



*2-(3-bromophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2f**)*. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2f** as pale-yellow liquid (82%); ^{1}H NMR (500 MHz, $CDCl_3$) *δ* 7.94 (t, *J* = 1.8 Hz, 1H), 7.65 (dt, *J* = 7.8, 1.3 Hz, 1H), 7.57 (ddd, *J* = 8.0, 1.9, 1.0 Hz, 1H), 7.27 (t, *J* = 7.9 Hz, 1H), 4.35 – 4.22 (m, 3H), 1.55 (d, *J* = 6.6 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) *δ* 165.4, 137.7, 133.9, 131.4, 130.0, 127.6, 122.7, 74.7, 45.6, 22.8. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 562.18. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_{10}BrNSe$ 303.9235, found 303.9234.

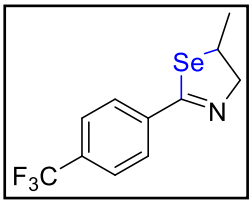


*2-(3-methoxyphenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2g**)*. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 97/03) to afford **2g** as pale-yellow liquid (71%); ^{1}H NMR (500 MHz, $CDCl_3$) *δ* 7.36 – 7.34 (m, 1H), 7.31 (d, *J* = 0.8 Hz, 1H), 7.30 (dd, *J* = 1.6, 1.0 Hz, 1H), 7.02 – 6.98 (m, 1H), 4.35 – 4.23 (m, 3H), 3.85 (s, 3H), 1.56 (d, *J* = 6.7 Hz, 3H). ^{13}C NMR (126 MHz, CDCl3) *δ* 166.9, 159.6, 137.1, 129.5, 122.0, 117.7, 112.6, 74.7, 55.4, 45.0, 22.9. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 559.28. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{11}H_{13}NOSe$ 256.0235, found 256.0231.

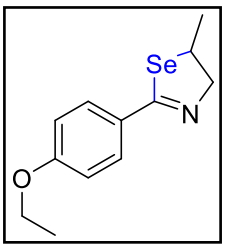


*5-methyl-2-(p-tolyl)-4,5-dihydro-1,3-selenazole (**2h**)*. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc =

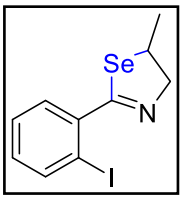
98/02) to afford **2h** as pale-yellow liquid (89%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 (dd, J = 6.5, 1.7 Hz, 2H), 7.20 (dd, J = 8.4, 0.6 Hz, 2H), 4.35 – 4.19 (m, 3H), 2.38 (s, 3H), 1.55 (d, J = 6.7 Hz, 3H), ^{13}C NMR (126 MHz, $CDCl_3$) δ 166.8, 141.4, 133.2, 129.2, 128.8, 74.6, 45.0, 22.9, 21.5. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 553.69. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{11}H_{13}NSe$ 240.0286, found 240.0284.



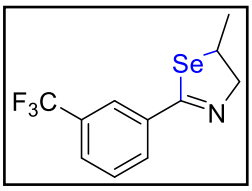
*5-methyl-2-(4-(trifluoromethyl)phenyl)-4,5-dihydro-1,3-selenazole (**2i**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2i** as pale-yellow liquid (93%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.86 (d, J = 8.1 Hz, 2H), 7.66 (d, J = 8.2 Hz, 2H), 4.38 – 4.24 (m, 3H), 1.57 (d, J = 6.6 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.6, 138.9, 132.6 (q, J = 32.6 Hz), 129.1, 125.5 (q, J = 3.8 Hz), 123.8 (d, J = 272.4 Hz), 74.9, 45.7, 22.8. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 563.50. ^{19}F NMR (470 MHz, $CDCl_3$) δ -62.84. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{11}H_{10}F_3NSe$ 294.0003, found 293.9996.



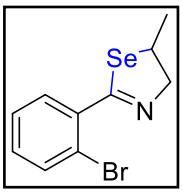
*2-(4-ethoxyphenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2j**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 97/03) to afford **2j** as pale-yellow liquid (71%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, J = 8.8 Hz, 1H), 6.81 (d, J = 8.8 Hz, 1H), 4.22 (dd, J = 6.1, 14.0 Hz, 1H), 4.19 – 4.16 (m, 1H), 4.13 (dd, J = 3.2, 13.9 Hz, 1H), 3.99 (q, J = 7.0 Hz, 2H), 1.47 (d, J = 6.6 Hz, 3H), 1.35 (t, J = 7.0 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 166.1, 161.2, 130.5, 128.5, 114.3, 74.6, 63.6, 45.1, 22.9, 14.7. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 550.00. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{12}H_{15}NOSe$ 270.0392, found 270.0402.



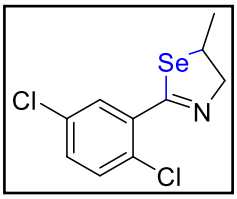
*2-(2-iodophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2k**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2k** as pale-yellow liquid (79%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.90 (dd, J = 8.0, 1.1 Hz, 1H), 7.43 (dd, J = 7.7, 1.7 Hz, 1H), 7.36 (td, J = 7.5, 1.1 Hz, 1H), 7.06 (td, J = 7.8, 1.8 Hz, 1H), 4.40 – 4.31 (m, 3H), 1.62 (d, J = 6.7 Hz, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 167.2, 141.2, 140.1, 130.7, 129.3, 128.0, 94.4, 74.5, 47.3, 22.9. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 619.63. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_{10}INSe$ 351.9096, found 351.9094.



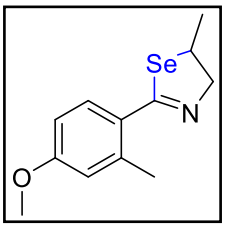
*5-methyl-2-(3-(trifluoromethyl)phenyl)-4,5-dihydro-1,3-selenazole (**2l**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2l** as pale-yellow liquid (90%). ^{1}H NMR (500 MHz, CDCl3) δ 8.05 (s, 1H), 7.90 (d, *J* = 7.8 Hz, 1H), 7.70 (d, *J* = 7.8 Hz, 1H), 7.53 (t, *J* = 7.8 Hz, 1H), 4.40 – 4.23 (m, 3H), 1.57 (d, *J* = 6.6 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) *δ* 165.5, 136.5, 132.2, 131.1 (q, *J* = 32.8 Hz), 129.1, 127.5 (q, *J* = 3.7 Hz), 125.4 (q, *J* = 3.9 Hz), 123.8 (d, *J* = 272.4 Hz), 74.7, 45.8, 22.9. ^{77}Se NMR (95 MHz, $CDCl_3$) *δ* 562.32. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{11}H_{10}F_3NSe$ 294.0003, found 293.9980.



*2-(2-bromophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2m**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2m** as pale-yellow liquid (78%). ^{1}H NMR (500 MHz, $CDCl_3$) *δ* 7.61 (d, *J* = 7.6, 1 Hz, 1H), 7.51 (dd, *J* = 7.7, 1.7 Hz, 1H), 7.33 (td, *J* = 7.6, 1.0 Hz, 1H), 7.24 (td, *J* = 7.7, 1.7 Hz, 1H), 4.40 – 4.21 (m, 3H), 1.59 (d, *J* = 6.6 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) *δ* 165.1, 137.6, 133.6, 130.8, 130.1, 127.3, 120.9, 74.3, 46.8, 22.7. ^{77}Se NMR (95 MHz, $CDCl_3$) *δ* 618.93. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_{10}BrNSe$ 303.9235, found 303.9212.

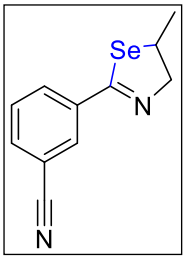


*2-(2,5-Dichlorophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2n**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 99/01) to afford **2n** as pale-yellow liquid (75%). ^{1}H NMR (500 MHz, $CDCl_3$) *δ* 7.62 (d, *J* = 2.5 Hz, 1H), 7.35 (d, *J* = 8.6 Hz, 1H), 7.30 (dd, *J* = 8.6, 2.5 Hz, 1H), 4.37 – 4.19 (m, 3H), 1.57 (d, *J* = 6.7 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) *δ* 162.6, 136.7, 132.7, 131.5, 130.7, 130.5, 130.1, 74.0, 46.4, 22.6. ^{77}Se NMR (95 MHz, $CDCl_3$) *δ* 619.62. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{10}H_9Cl_2NSe$ 293.9350, found 293.9332.

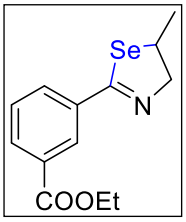


*2-(4-Methoxy-2-methylphenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2o**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 95/05) to afford **2o** as pale-yellow liquid (70%). ^{1}H NMR (500 MHz, $CDCl_3$) *δ* 7.45 (d, *J* = 8.2 Hz, 1H), 6.75 – 6.71 (m, 2H), 4.35 – 4.19 (m, 3H), 3.81 (s, 3H), 2.50 (s, 3H), 1.56 (d, *J* = 6.7 Hz, 3H). ^{13}C NMR

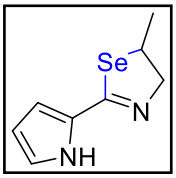
(126 MHz, $CDCl_3$) δ 165.9, 160.3, 138.6, 132.5, 128.4, 116.6, 110.8, 75.2, 55.3, 45.2, 22.9, 21.5. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 618.93. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{12}H_{15}NOSe$ 270.0392, found 270.0391.



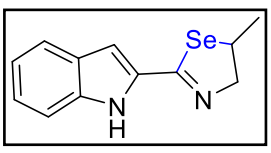
*3-(5-methyl-4,5-dihydro-1,3-selenazol-2-yl)benzonitrile (**2p**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 98/02) to afford **2p** as peach colored solid (87%); mp –54-56 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.06 (t, J = 1.5 Hz, 1H), 7.96 (dt, J = 1.4, 7.9 Hz, 4H), 7.72 (dt, J = 1.4, 7.7 Hz, 1H), 7.53 (td, J = 0.4, 7.9 Hz, 1H), 4.40 – 4.35 (m, 1H), 4.32 (q, J = 7.6 Hz, 1H), 4.27 (dd, J = 3.9, 15.3 Hz, 1H), 1.57 (d, J = 6.8 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 164.7, 137.0, 134.0, 132.9, 132.3, 129.4, 118.1, 112.9, 74.8, 46.1, 22.8. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 563.68. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{11}H_{10}N_2Se$ 251.0082, found 251.0079.



*ethyl 3-(5-methyl-4,5-dihydro-1,3-selenazol-2-yl)benzoate (**2q**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 98/02) to afford **2q** as pale yellow solid (86%); ^{1}H NMR (500 MHz, $CDCl_3$) δ ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.41 (t, J = 1.7 Hz, 1H), 8.15 (dt, J = 1.4, 7.8 Hz, 1H), 7.97 (dt, J = 1.5, 7.7 Hz, 1H), 7.50 (t, J = 7.8 Hz, 1H), 4.42 (q, J = 7.2 Hz, 2H), 4.39 – 4.27 (m, 3H), 1.59 (d, J = 6.6 Hz, 3H), 1.43 (t, J = 7.1 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ ^{13}C NMR (126 MHz, $CDCl_3$) δ 166.1, 166.0, 136.1, 132.8, 132.0, 131.0, 129.9, 128.6, 74.8, 61.3, 45.5, 22.9, 14.4. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 561.39. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{13}H_{15}NO_2Se$ 298.0341, found 298.0361.

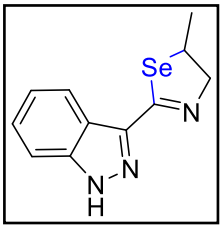


*5-methyl-2-(1H-pyrrol-2-yl)-4,5-dihydro-1,3-selenazole (**2r**).* The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 97/03) to afford **2r** as red liquid (80%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.99 (s, 1H), 6.90 (dd, J = 2.3, 1.3 Hz, 1H), 6.56 (dd, J = 3.6, 1.2 Hz, 1H), 6.23 (dd, J = 3.5, 2.8 Hz, 1H), 4.28 – 4.20 (m, 2H), 4.16 – 4.10 (m, 1H), 1.55 (d, J = 6.7 Hz, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 128.4, 122.0, 115.7, 110.0, 73.3, 44.9, 22.7. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 553.45. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_8H_{10}N_2Se$ 215.0082, found 215.0088.

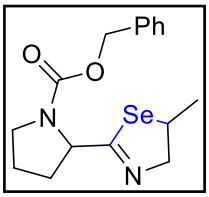


*2-(1H-indol-2-yl)-5-methyl-4,5-dihydro-1,3-selenazole (**2s**).* The crude product was purified by neutral alumina gel column chromatography

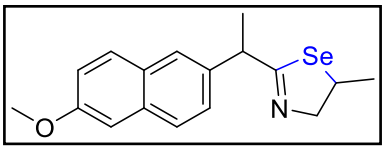
(hexane/EtOAc = 97/03) to afford **2s** as white solid (83%), mp 107–109 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.17 (s, 1H), 7.64 (dd, J = 8.0, 0.8 Hz, 1H), 7.35 (dd, J = 8.3, 0.9 Hz, 1H), 7.30 – 7.26 (m, 1H), 7.12 (ddd, J = 8.0, 7.0, 1.0 Hz, 1H), 6.86 (d, J = 1.3 Hz, 1H), 4.36 – 4.32 (m, 1H), 4.30 (dd, J = 15.5, 5.3 Hz, 1H), 4.20 (dd, J = 15.1, 3.9 Hz, 1H), 1.58 (d, J = 6.8 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 158.3, 136.9, 133.4, 127.9, 124.7, 121.8, 120.4, 111.5, 109.1, 73.8, 45.4, 22.7. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 560.86. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{12}H_{12}N_2Se$ 265.0238, found 265.0238.



2-(1H-indazol-3-yl)-5-methyl-4,5-dihydro-1,3-selenazole ***(2t)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 95/05) to afford **2t** as white solid (86%). mp 153–155 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 10.52 (s, 1H), 8.33 (dt, J = 8.2, 0.9 Hz, 2H), 7.50 (dt, J = 8.4, 0.9 Hz, 1H), 7.44 (ddd, J = 8.4, 6.9, 1.1 Hz, 1H), 7.29 (ddd, J = 7.9, 6.9, 0.9 Hz, 1H), 4.45 (dd, J = 15.8, 7.0 Hz, 1H), 4.39 (dd, J = 15.8, 4.2 Hz, 1H), 4.29 – 4.21 (m, 1H), 1.59 (d, J = 7.0 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 160.2, 142.7, 141.6, 127.6, 122.9, 122.5, 120.6, 109.9, 75.1, 43.2, 23.1. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 571.32. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{11}H_{11}N_3Se$ 266.0191, found 266.0201.

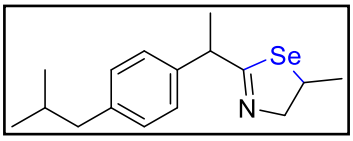


Benzyl 2-(5-methyl-4,5-dihydro-1,3-selenazol-2-yl)pyrrolidine-1-carboxylate ***(2u)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 95/05) to afford **2u** as dark yellow liquid (42%); ^{1}H NMR (500 MHz, $CDCl_3$) 7.40 – 7.27 (m, 5H), 5.19 (dd, J = 3.7, 12.6 Hz, 1H), 5.16 – 5.04 (m, 1H), 4.72 (dd, J = 6.4, 31.7 Hz, 1H), 4.23 – 3.88 (m, 3H), 3.59 – 3.48 (m, 2H), 2.31 – 2.18 (m, 1H), 2.15 – 1.95 (m, 2H), 1.94 – 1.87 (m, 1H), 1.49 – 1.32 (m, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 173.5, 173.4, 153.9, 153.8, 135.6, 135.5, 127.5, 127.4, 127.3, 127.3, 126.9, 126.9, 126.8, 126.7, 73.1, 73.0, 66.0, 65.9, 61.1, 61.0, 60.7, 60.6, 46.3, 46.2, 45.9, 45.7, 43.7, 43.6, 43.1, 43.0, 30.5, 30.2, 23.4, 23.2, 22.7, 22.6, 22.2, 22.1, 21.5, 21.4. ^{77}Se. NMR (95 MHz, $CDCl_3$) δ 567.96, 563.58, 561.81, 557.96. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{16}H_{20}N_2O_2Se$ 353.0763, found 353.0778.

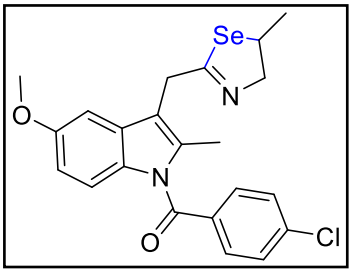


2-(1-(6-methoxynaphthalen-2-yl)ethyl)-5-methyl-4,5-dihydro-1,3-selenazole ***(2v)***. The crude product was purified by neutral

alumina gel column chromatography (hexane/EtOAc = 95/05) to afford **2v** as white solid (41%); mp 105–107 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 (d, J = 8.8 Hz, 1H), 7.70 (d, J = 8.4 Hz, 1H), 7.66 (s, 1H), 7.37 (dd, J = 8.5, 1.7 Hz, 1H), 7.14 (dd, J = 8.8, 2.5 Hz, 1H), 7.12 (d, J = 2.4 Hz, 1H), 4.15 – 3.98 (m, 4H), 3.91 (s, 3H), 1.67 – 1.62 (m, 3H), 1.42 (d, J = 6.7 Hz, 3H). ^{13}C NMR (126 MHz, CDCl3) δ 174.2, 157.6, 137.4, 133.8, 129.4, 128.9, 127.2, 126.4, 126.1, 118.9, 105.7, 73.9, 55.3, 47.8, 44.6, 22.9, 19.9. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 567.21. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{17}H_{19}NOSe$ 334.0705, found 334.0714.



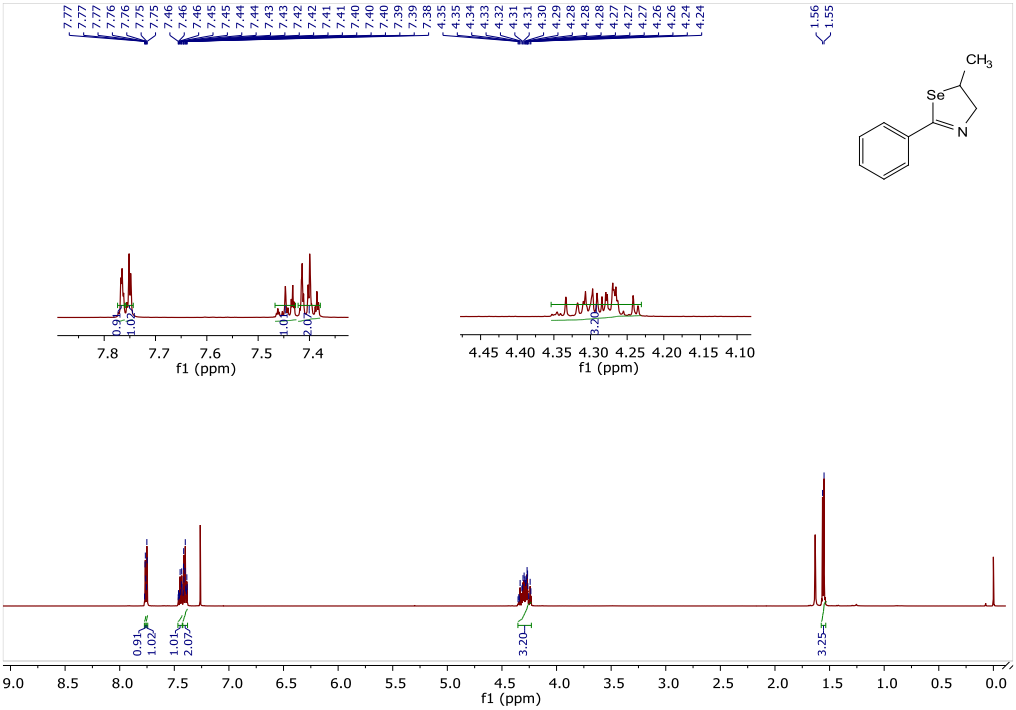
2-(1-(4-Isobutylphenyl)ethyl)-5-methyl-4,5-dihydro-1,3-selenazole ***(2w)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 93/07) to afford **2w** as pale-yellow liquid (52%); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.18 (dd, J = 8.1, 1.8 Hz, 2H), 7.10 (d, J = 7.1 Hz, 2H), 4.15 – 3.90 (m, 4H), 2.45 (d, J = 7.2 Hz, 2H), 1.85 (dp, J = 13.6, 6.8 Hz, 1H), 1.56 (dd, J = 7.1, 2.4 Hz, 3H), 1.42 (dd, J = 6.7, 2.7 Hz, 3H), 0.89 (d, J = 6.6 Hz, 6H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 174.9, 174.4, 140.6, 140.6, 139.5, 139.3, 129.3, 127.4, 127.3, 73.8, 73.8, 47.5, 47.4, 45.1, 44.6, 44.5, 30.2, 22.8, 22.5, 22.4, 20.0, 19.9. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 564.84, 555.40. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{16}H_{23}NSe$ 310.1068, found 310.1062.



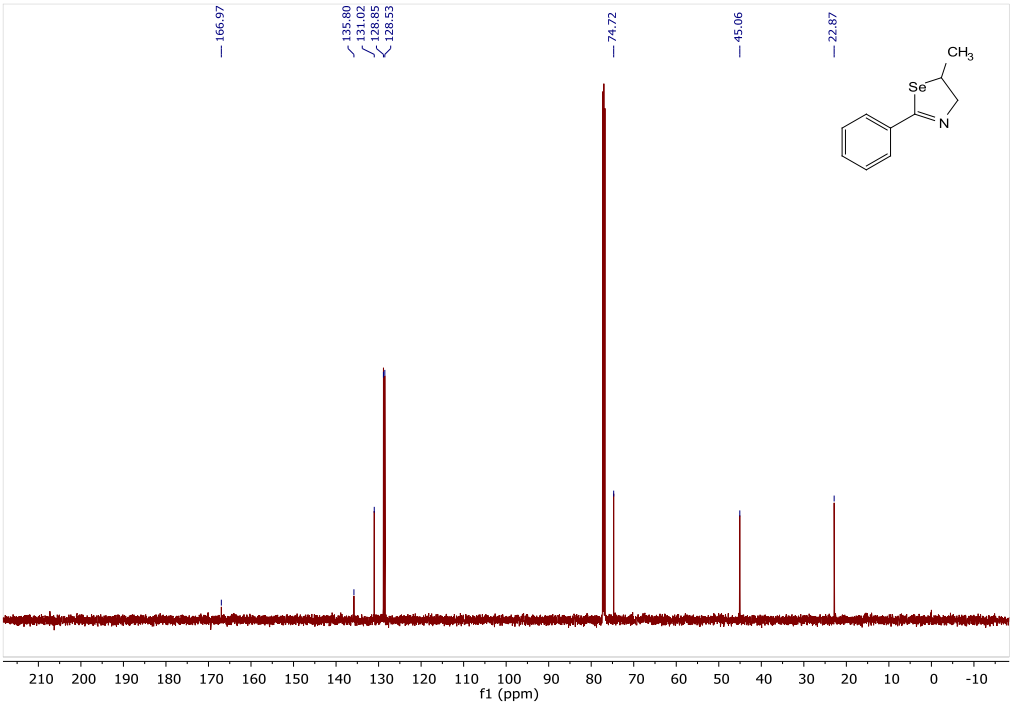
(4-chlorophenyl)(5-methoxy-2-methyl-3-((5-methyl-4,5-dihydro-1,3-selenazol-2-yl)methyl)-1H-indol-1-yl)methanone ***(2x)***. The crude product was purified by neutral alumina gel column chromatography (hexane/EtOAc = 92/08) to afford **2x** as cream solid (25%); mp –53-55 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 – 7.63 (m, 2H), 7.49 – 7.45 (m, 2H), 6.97 (d, J = 2.5 Hz, 1H), 6.91 (d, J = 9.0 Hz, 1H), 6.68 (dd, J = 2.5, 9.0 Hz, 1H), 4.16 – 4.09 (m, 2H), 4.04 – 3.99 (m, 1H), 3.94 (s, 2H), 3.83 (s, 3H), 2.38 (s, 3H), 1.45 (d, J = 6.7 Hz, 3H).^{13}C NMR (126 MHz, $CDCl_3$) δ 168.8, 168.4, 156.1, 139.3, 135.6, 134.0, 131.2, 130.6, 129.1, 115.0, 111.9, 111.1, 101.3, 74.0, 55.7, 45.3, 33.1, 22.9, 13.5. ^{77}Se NMR (95 MHz, $CDCl_3$) δ 505.05. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{22}H_{21}ClN_2O_2Se$ 461.0530, found 461.0527.

3. NMR spectra

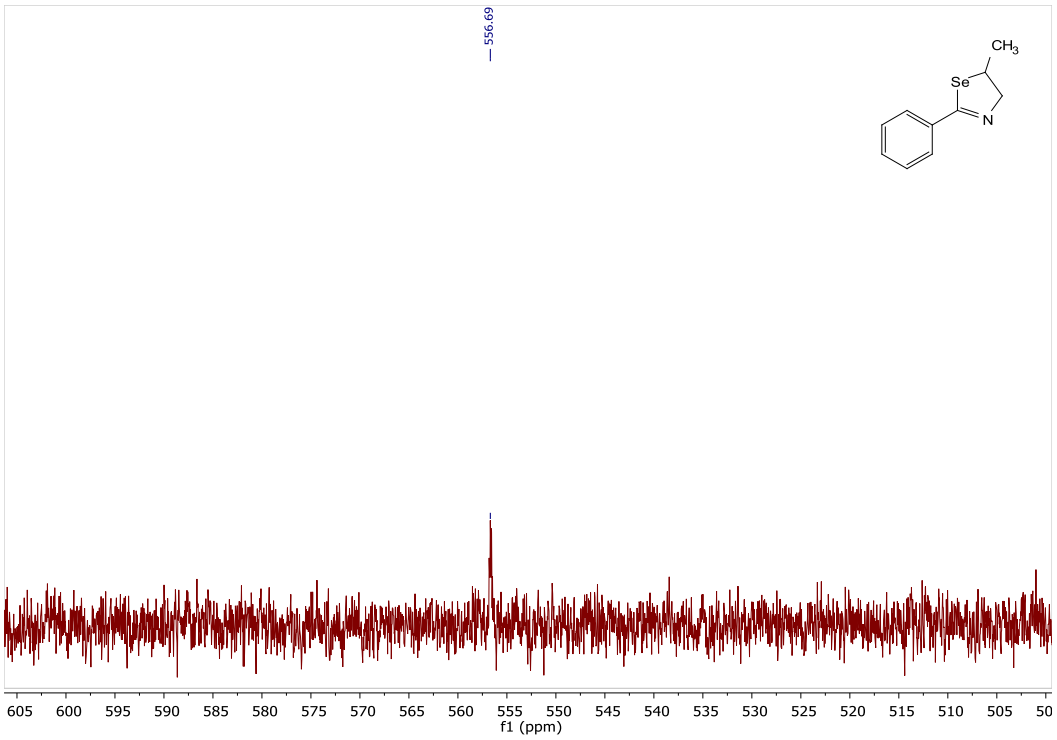
5-methyl-2-phenyl-4,5-dihydro-1,3-selenazole (**2a**)



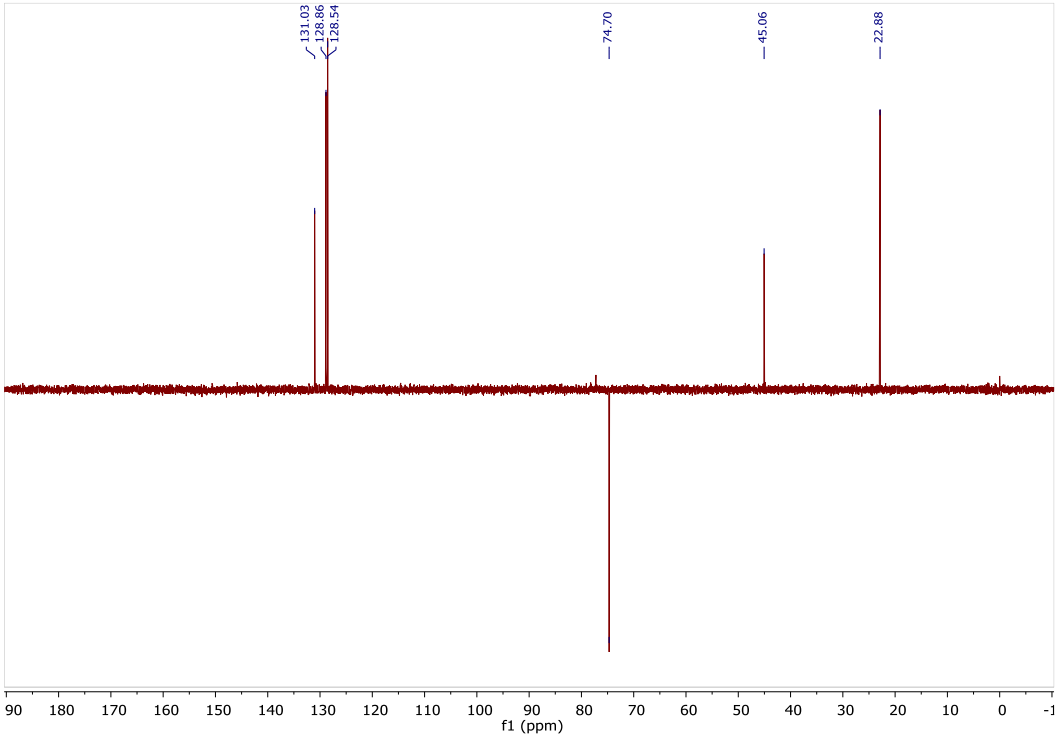
^{1}H NMR spectrum of compound **2a** ($CDCl_3$, 500 MHz)



^{13}C NMR spectrum of compound **2a** ($CDCl_3$, 126 MHz)

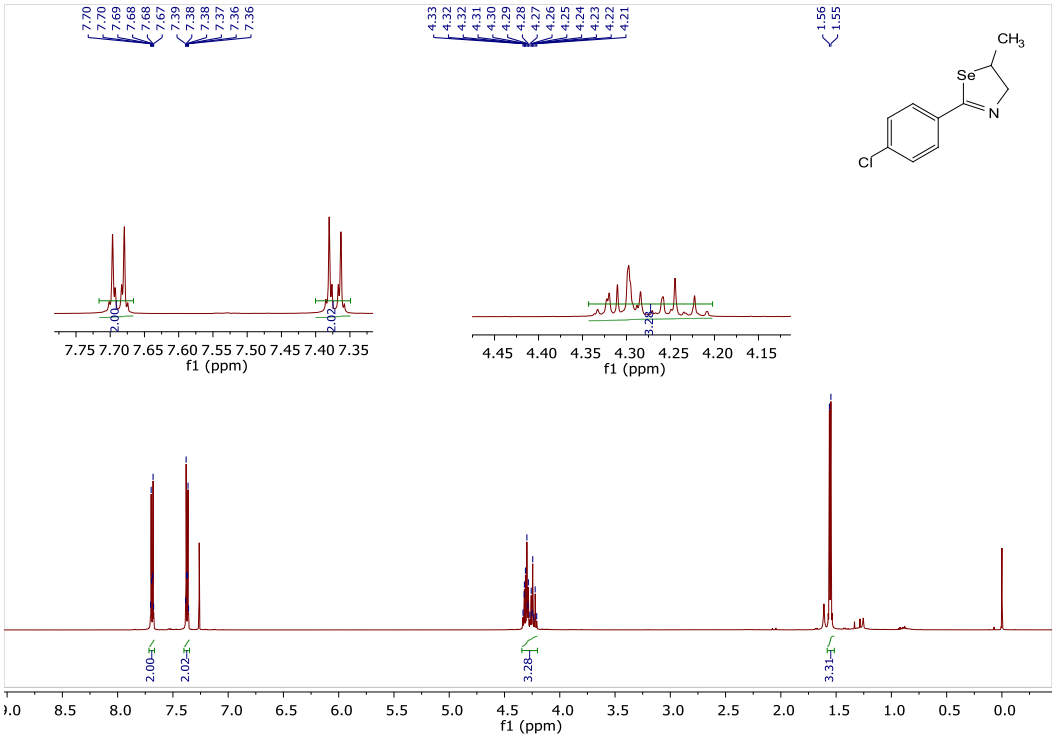


^{77}Se NMR spectrum of compound **2a** ($CDCl_3$, 95 MHz)

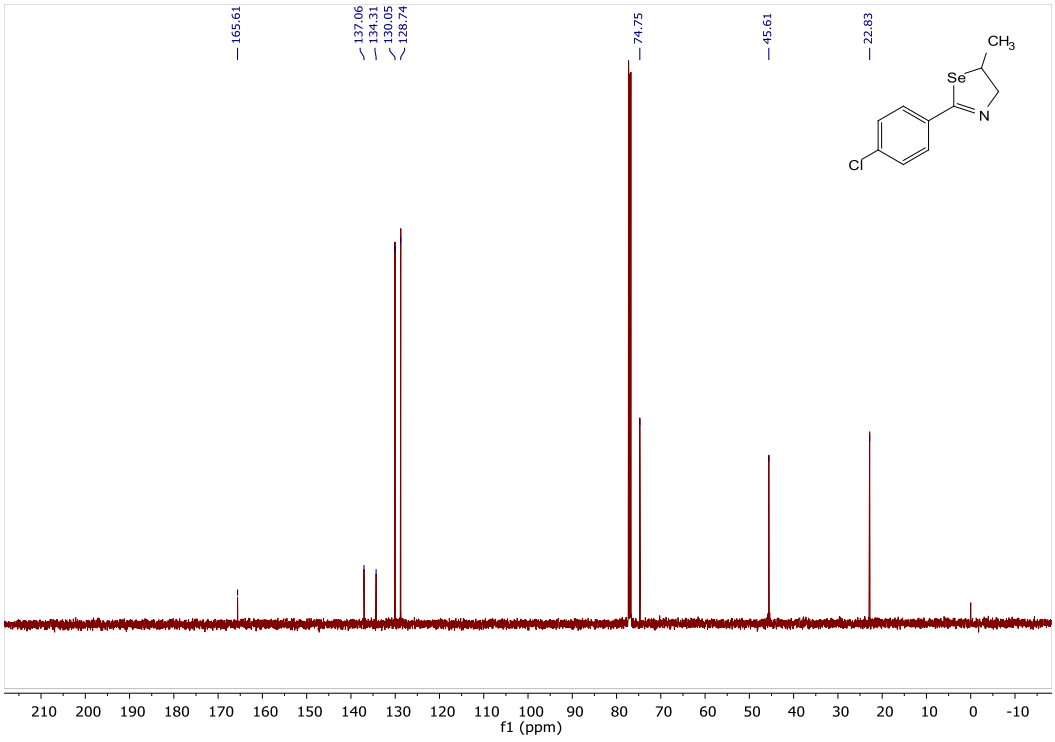


^{13}C DEPT135 NMR spectrum of compound **2a** ($CDCl_3$, 126 MHz)

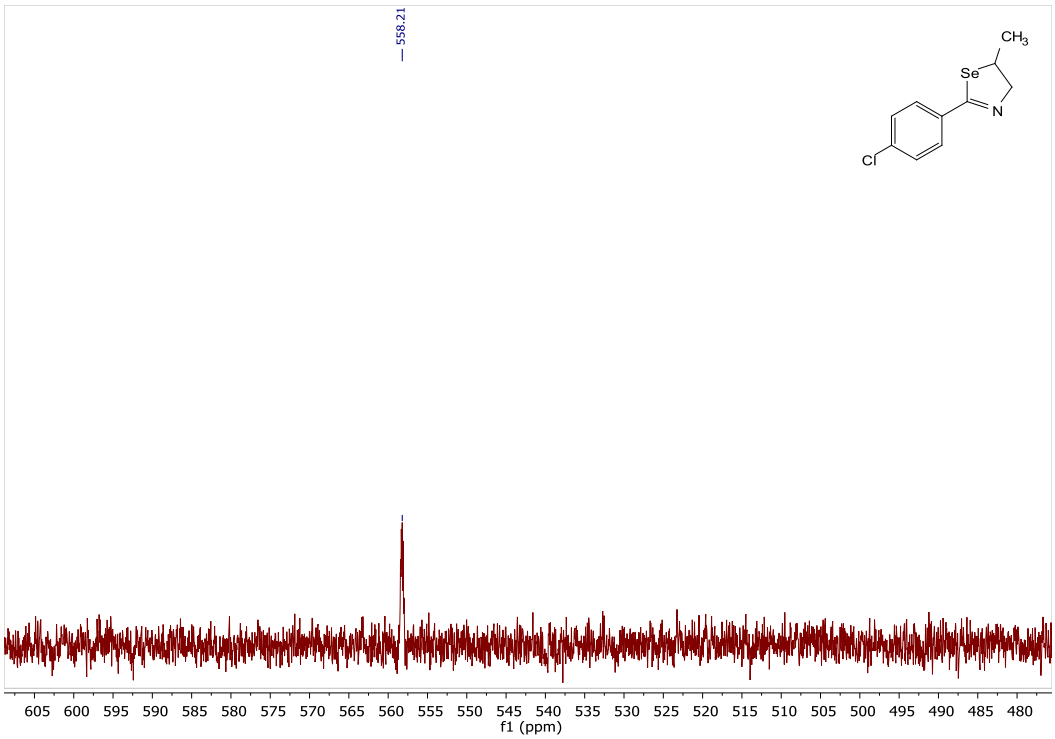
2-(4-chlorophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2b**)



^{1}H NMR spectrum of compound **2b** ($CDCl_3$, 500 MHz)

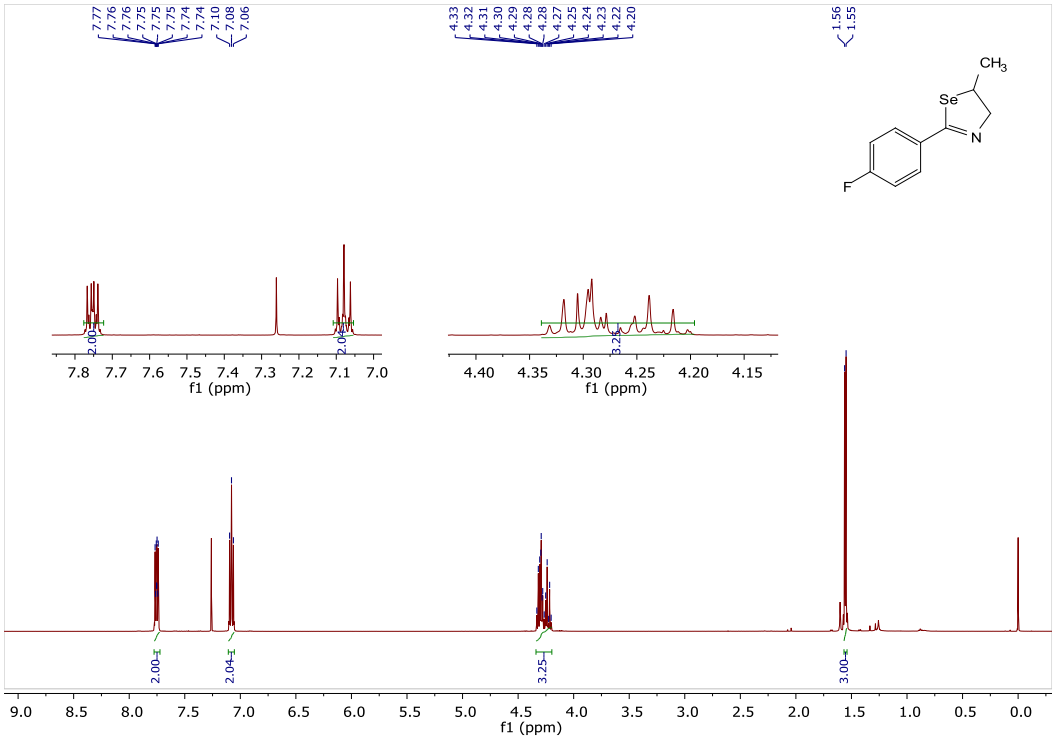


^{13}C NMR spectrum of compound **2b** ($CDCl_3$, 126 MHz)

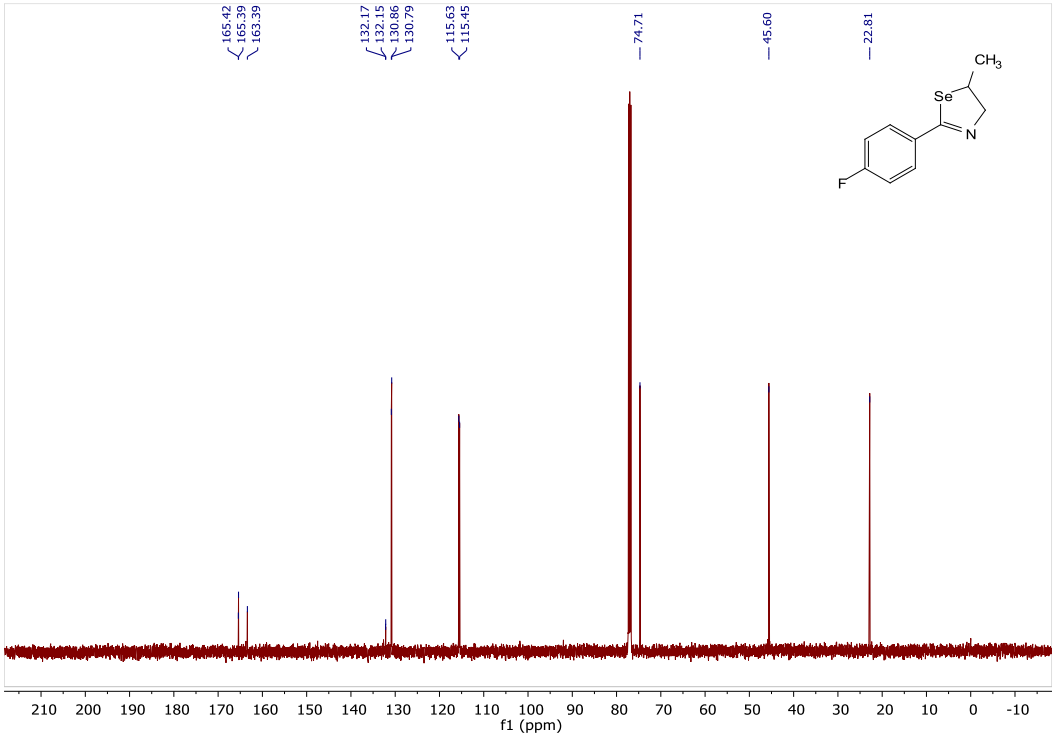


^{77}Se NMR spectrum of compound **2b** ($CDCl_3$, 95 MHz)

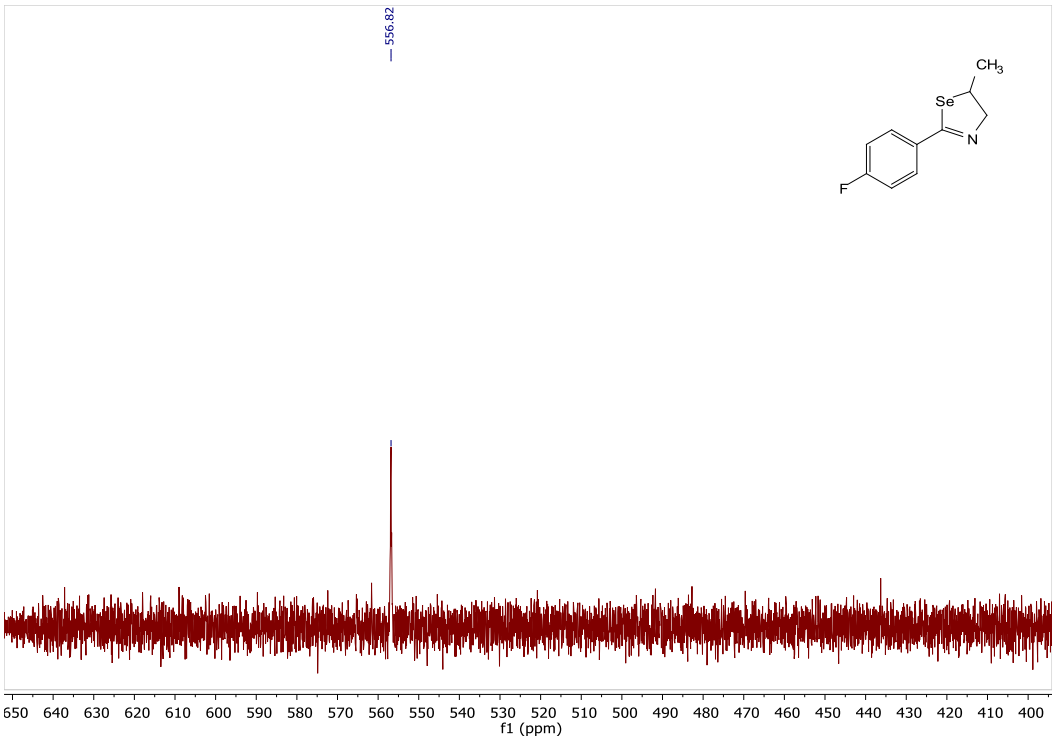
2-(4-fluorophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2c**)



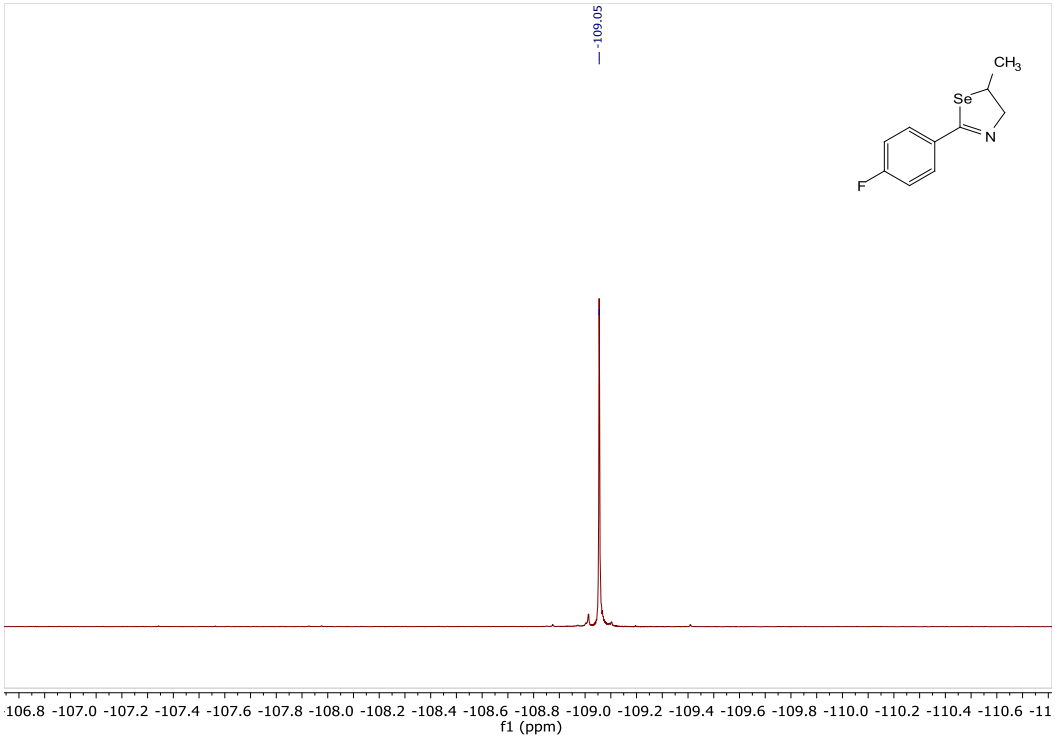
^{1}H NMR spectrum of compound **2c** ($CDCl_3$, 500 MHz)



^{13}C NMR spectrum of compound **2c** ($CDCl_3$, 126 MHz)

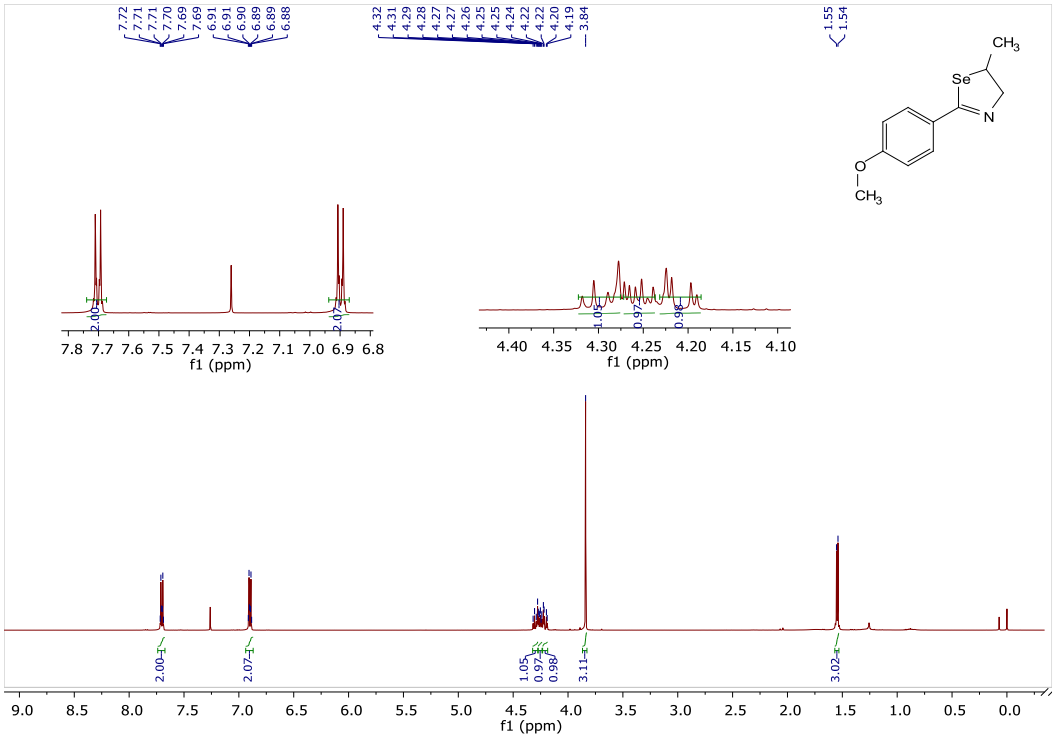


^{77}Se NMR spectrum of compound **2c** ($CDCl_3$, 95 MHz)

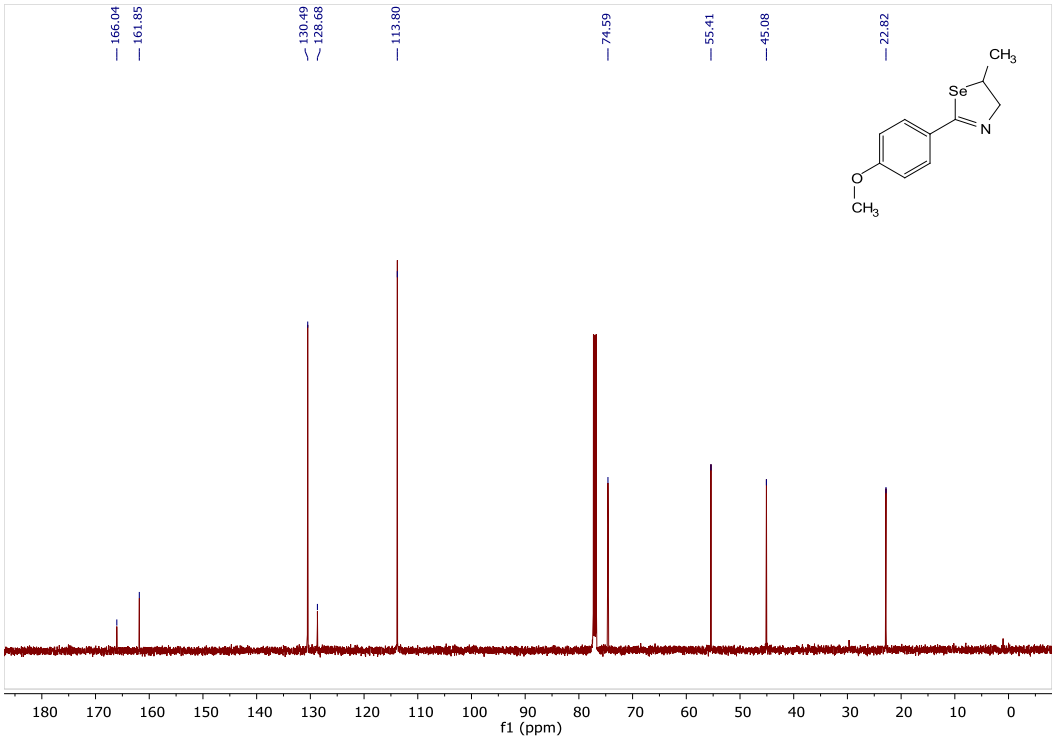


^{19}F NMR spectrum of compound **2c** ($CDCl_3$, 487 MHz)

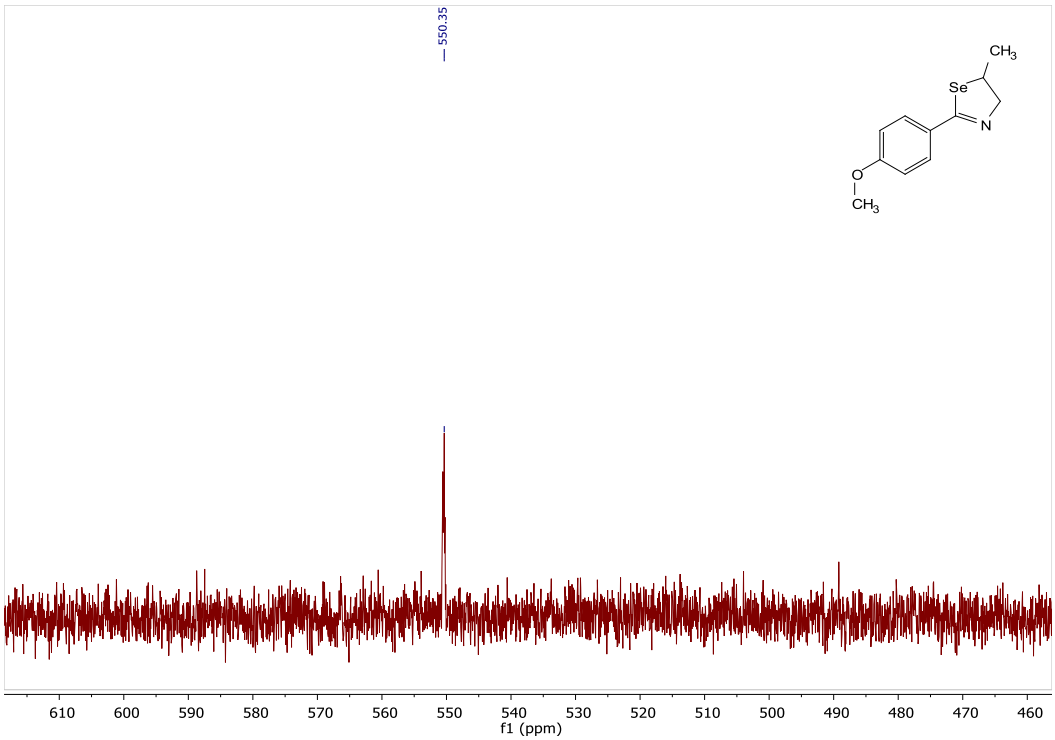
2-(4-methoxyphenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2d**)



^{1}H NMR spectrum of compound **2d** ($CDCl_3$, 500 MHz)

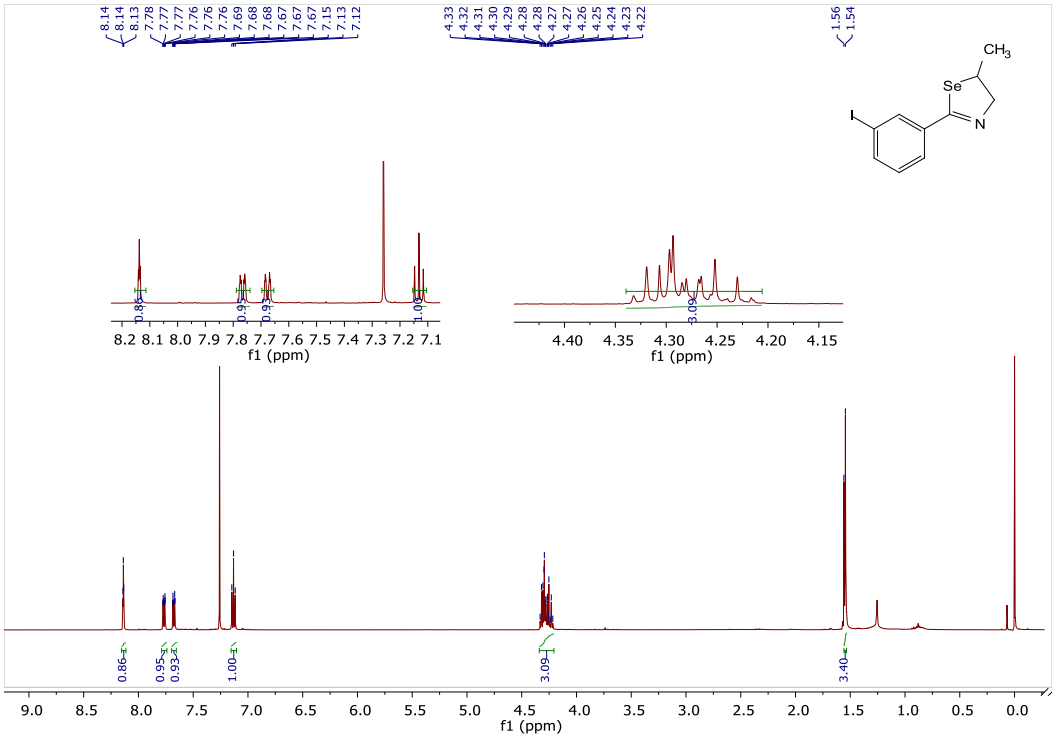


^{13}C NMR spectrum of compound **2d** ($CDCl_3$, 126 MHz)

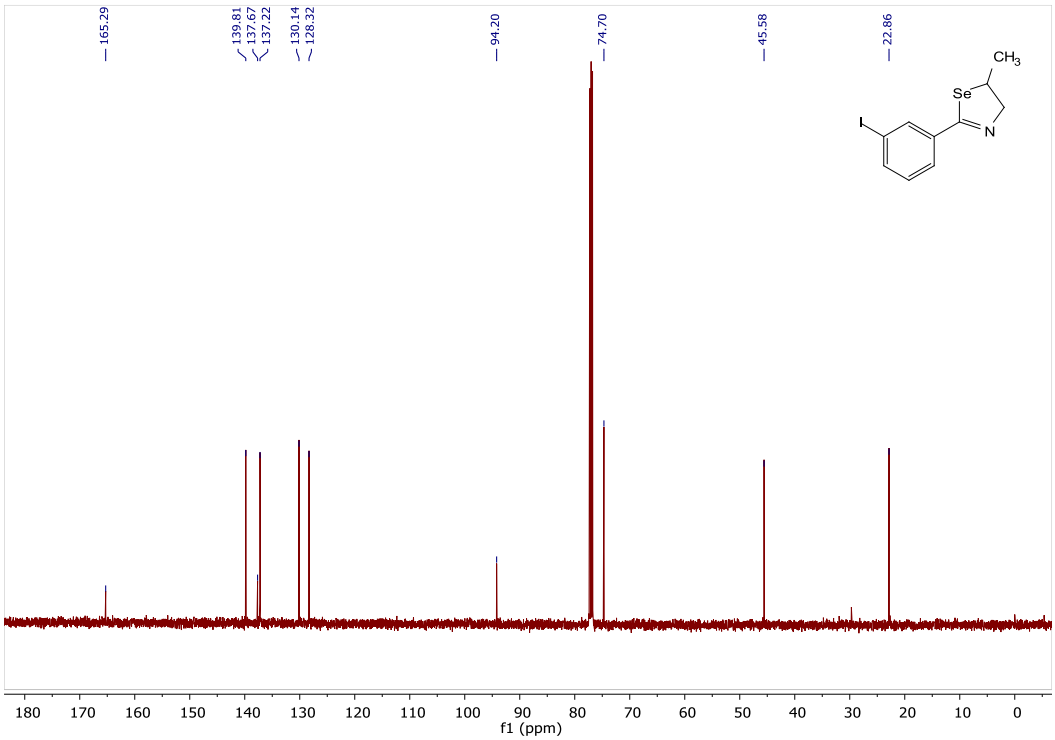


^{77}Se NMR spectrum of compound **2d** ($CDCl_3$, 95 MHz)

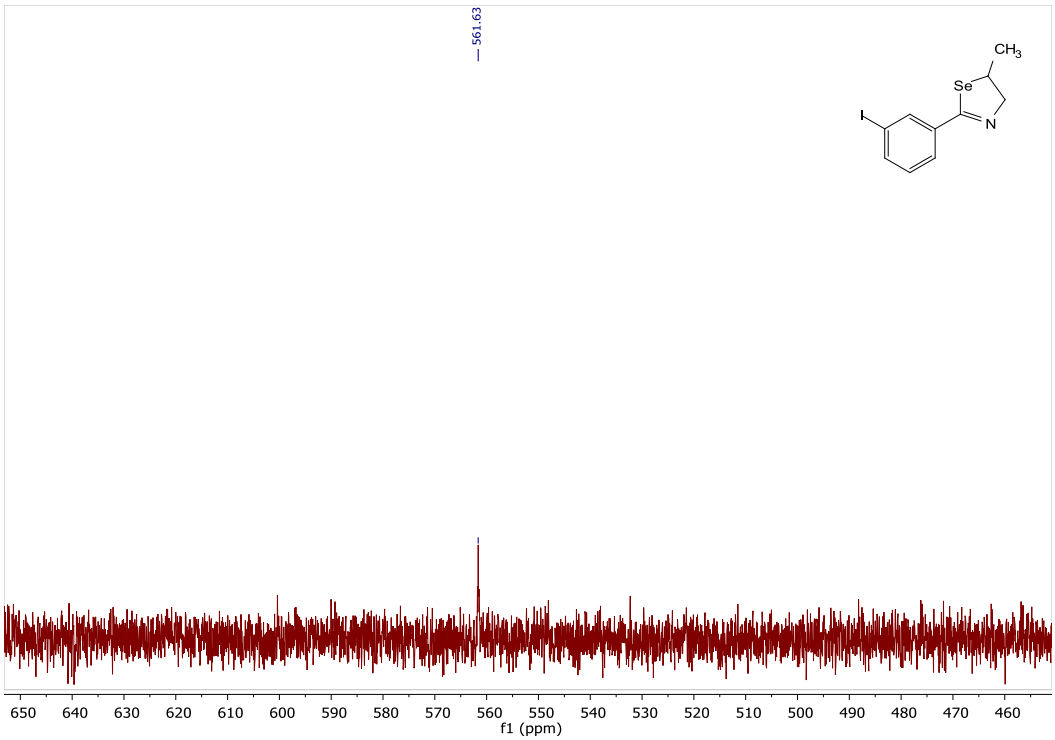
2-(3-iodophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2e**)



^{1}H NMR spectrum of compound **2e** ($CDCl_3$, 500 MHz)

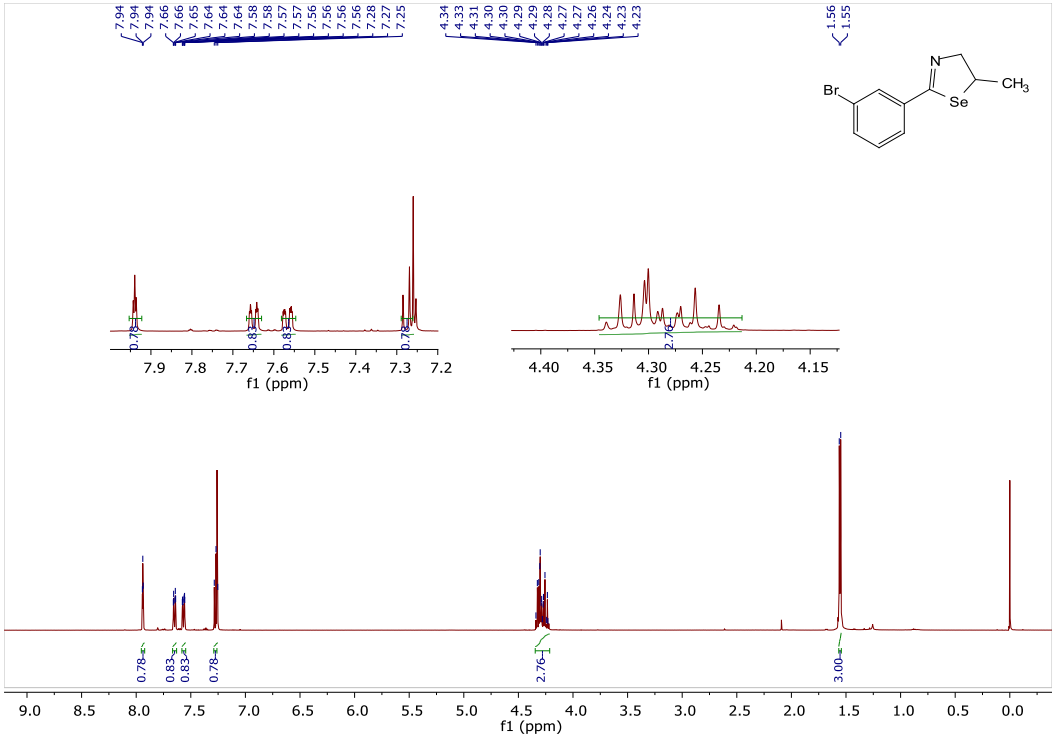


^{13}C NMR spectrum of compound **2e** ($CDCl_3$, 126 MHz)

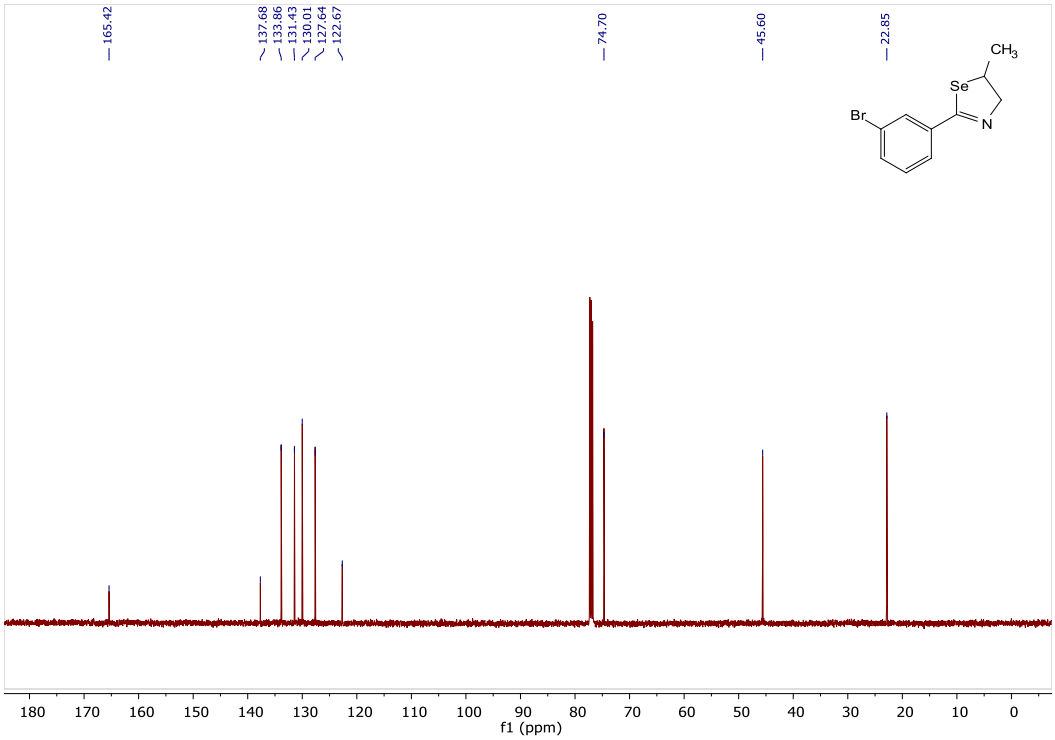


^{77}Se NMR spectrum of compound **2e** ($CDCl_3$, 95 MHz)

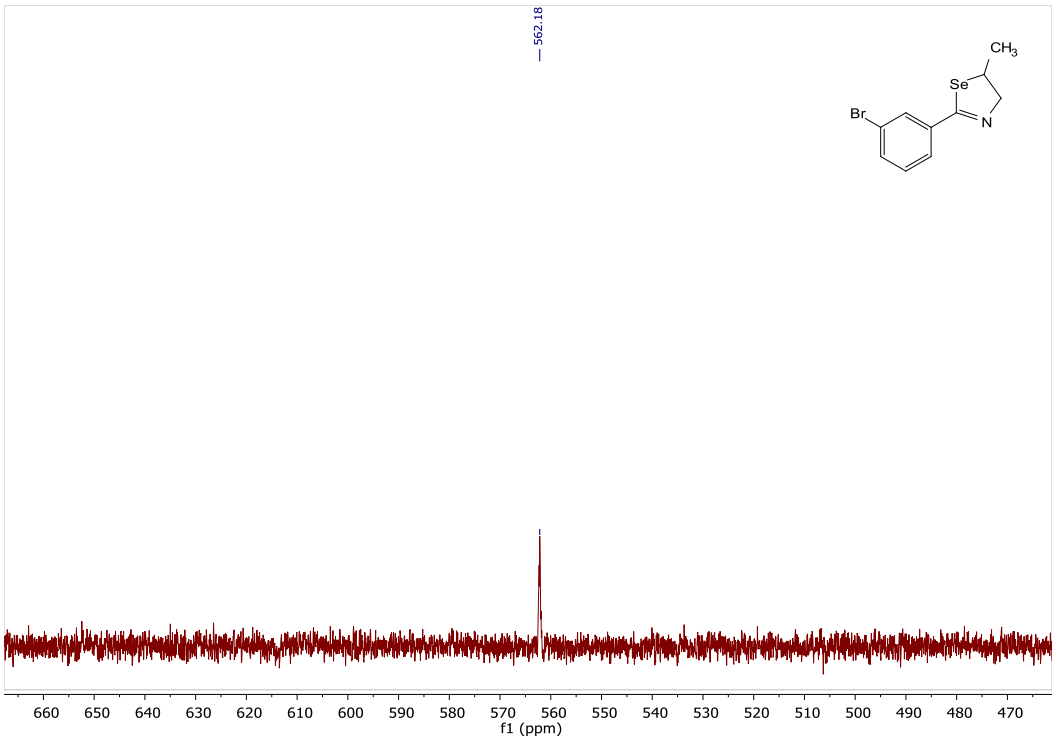
2-(3-bromophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2f**)



^{1}H NMR spectrum of compound **2f** ($CDCl_3$, 500 MHz)

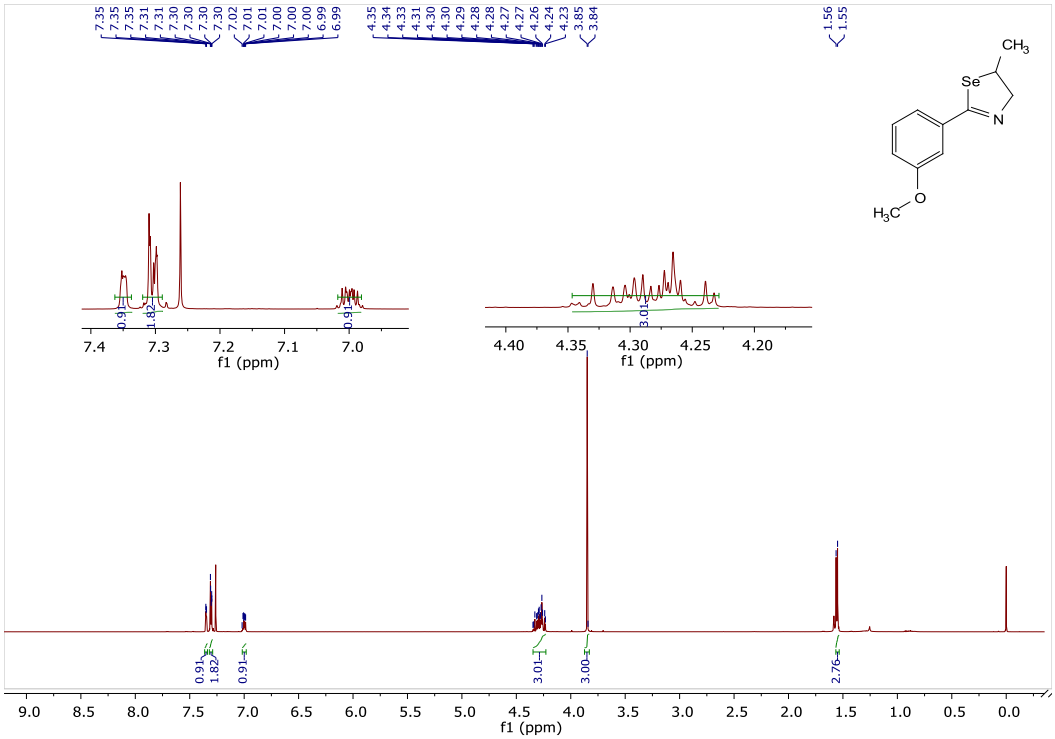


^{13}C NMR spectrum of compound **2f** ($CDCl_3$, 126 MHz)

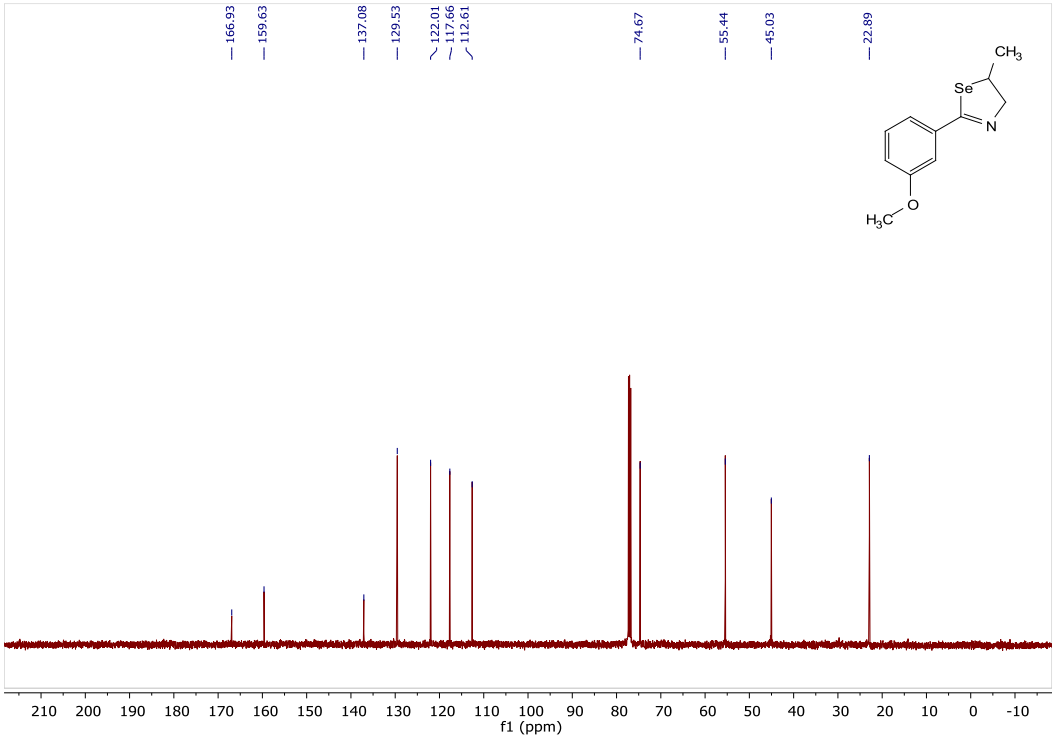


^{77}Se NMR spectrum of compound **2f** ($CDCl_3$, 95 MHz)

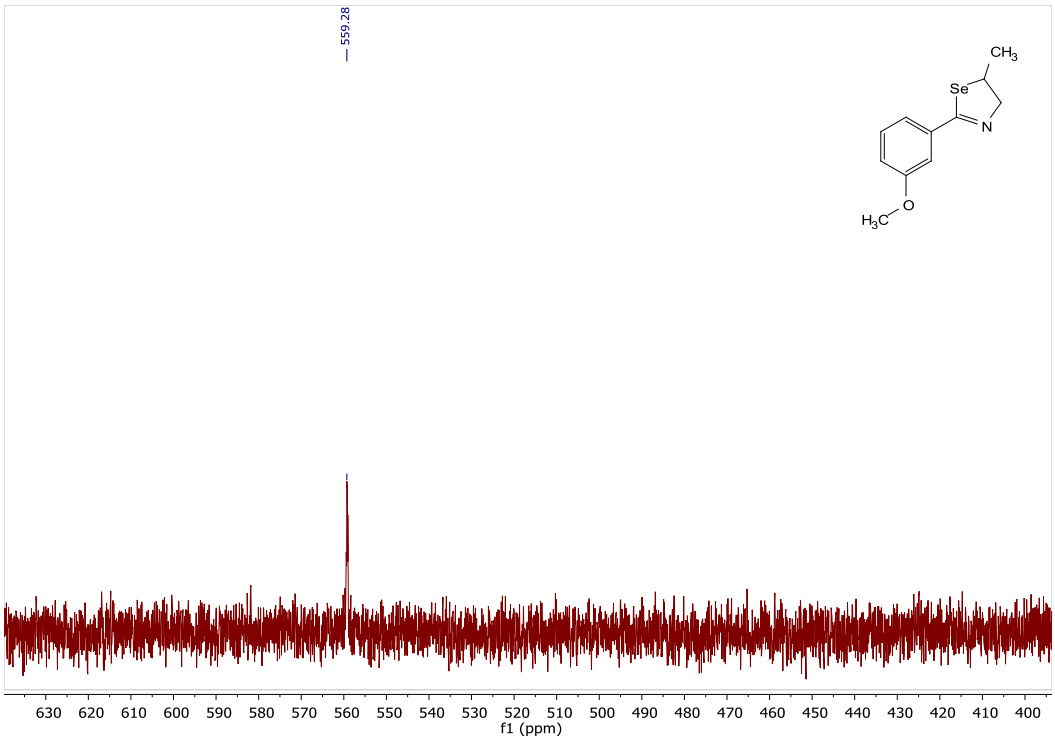
2-(3-methoxyphenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2g**)



^{1}H NMR spectrum of compound **2g** ($CDCl_3$, 500 MHz)

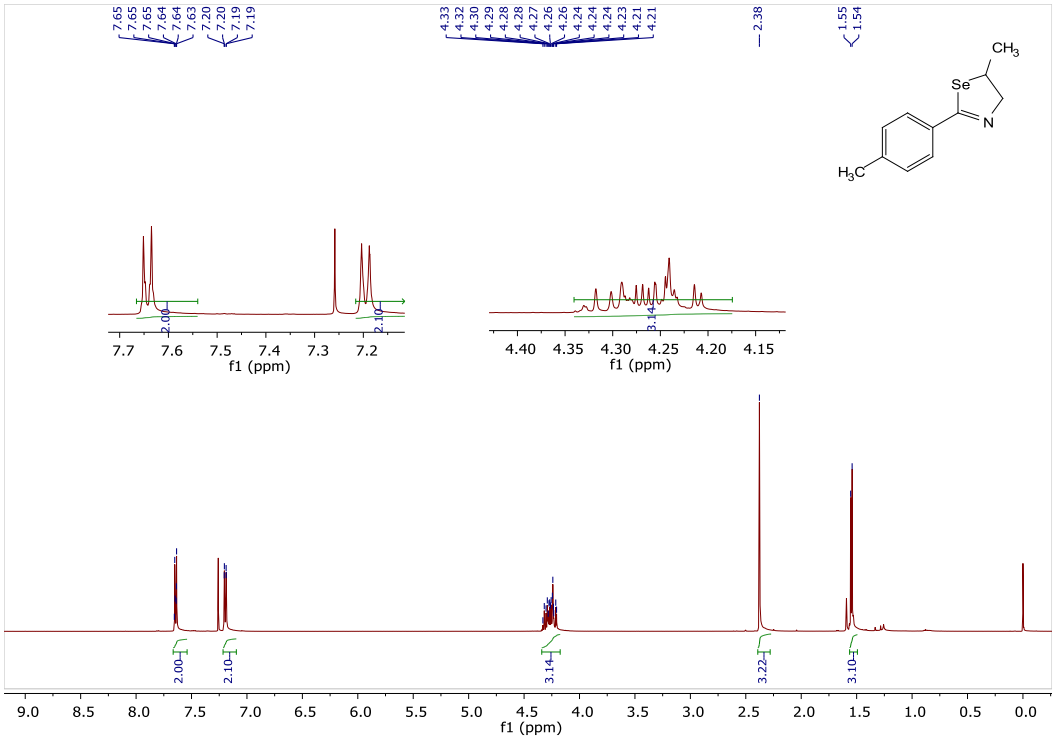


^{13}C NMR spectrum of compound **2g** ($CDCl_3$, 126 MHz)

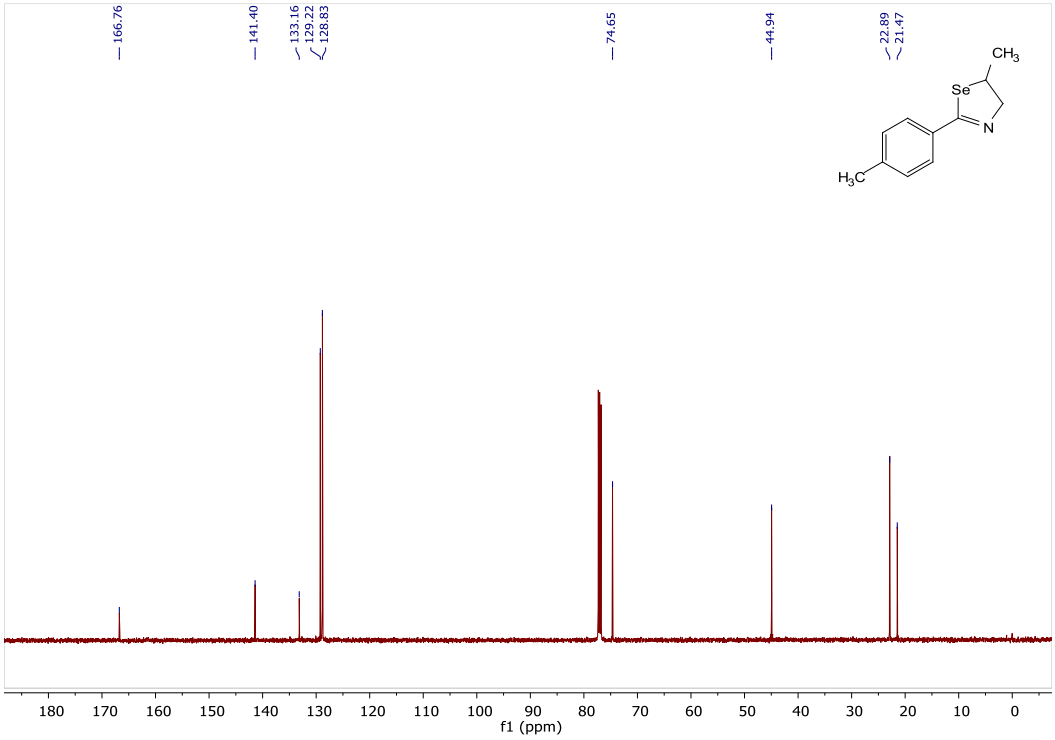


^{77}Se NMR spectrum of compound **2g** ($CDCl_3$, 95 MHz)

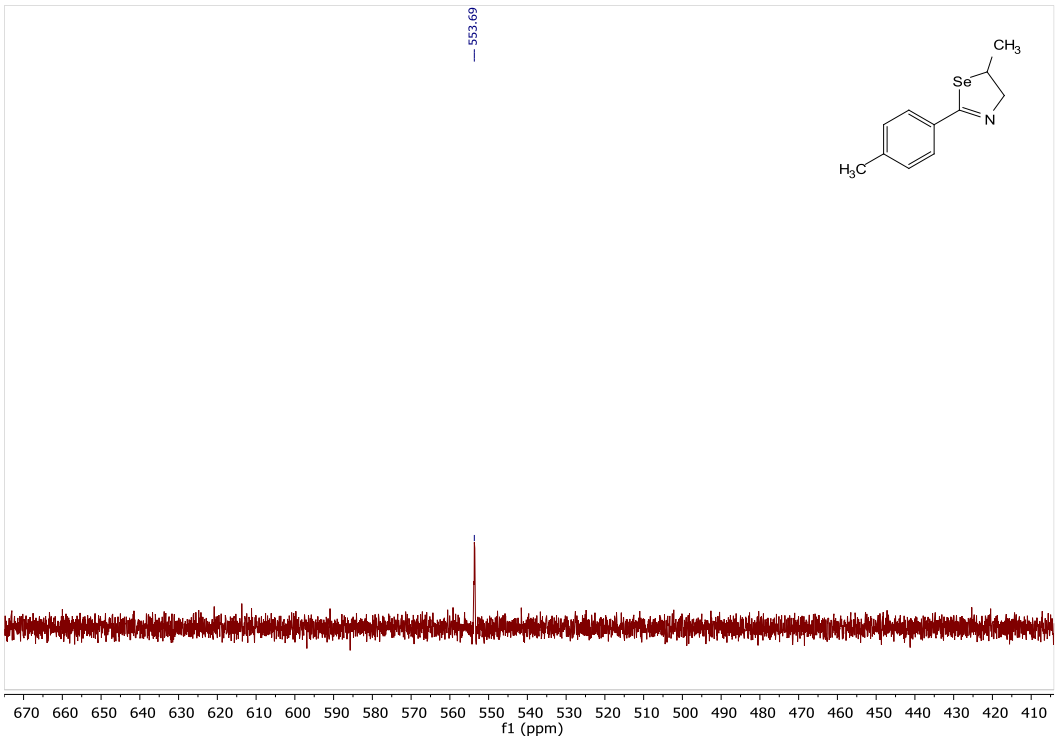
5-methyl-2-(p-tolyl)-4,5-dihydro-1,3-selenazole (**2h**)



^{1}H NMR spectrum of compound **2h** ($CDCl_3$, 500 MHz)

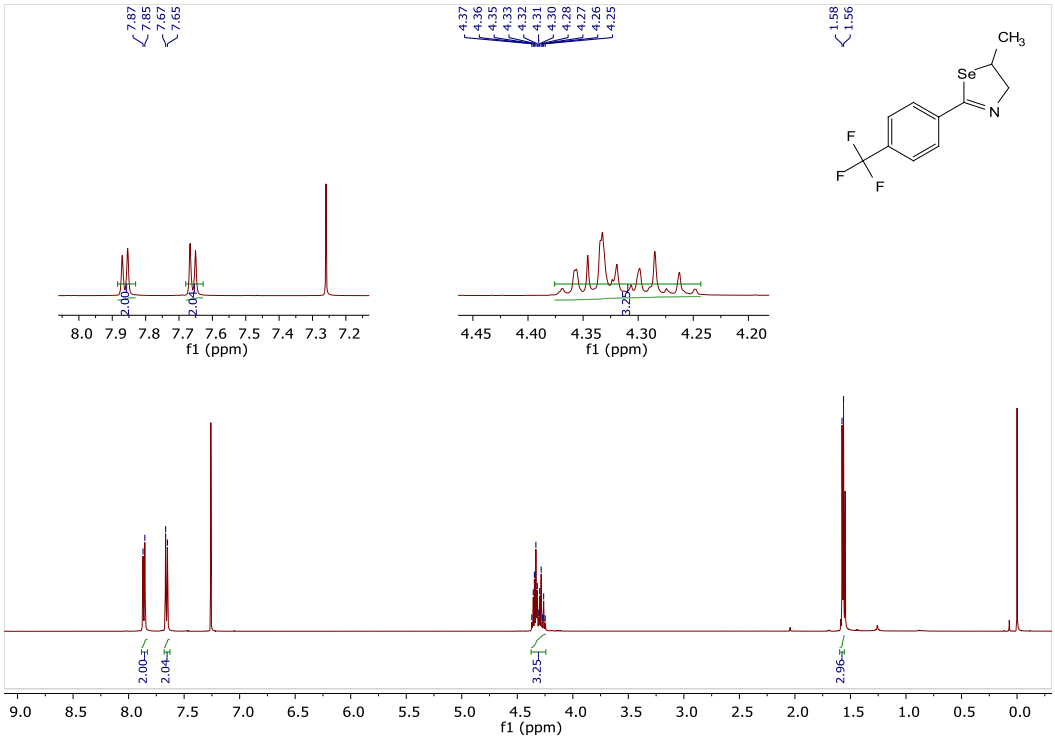


^{13}C NMR spectrum of compound **2h** ($CDCl_3$, 126 MHz)

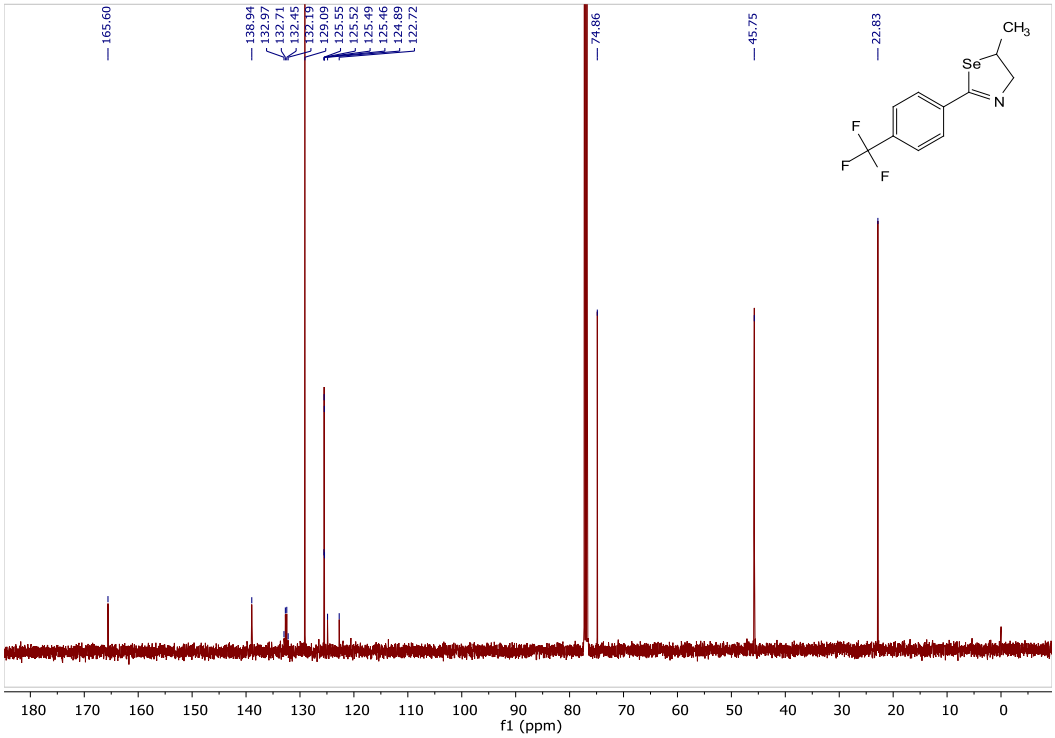


^{77}Se NMR spectrum of compound **2h** ($CDCl_3$, 95 MHz)

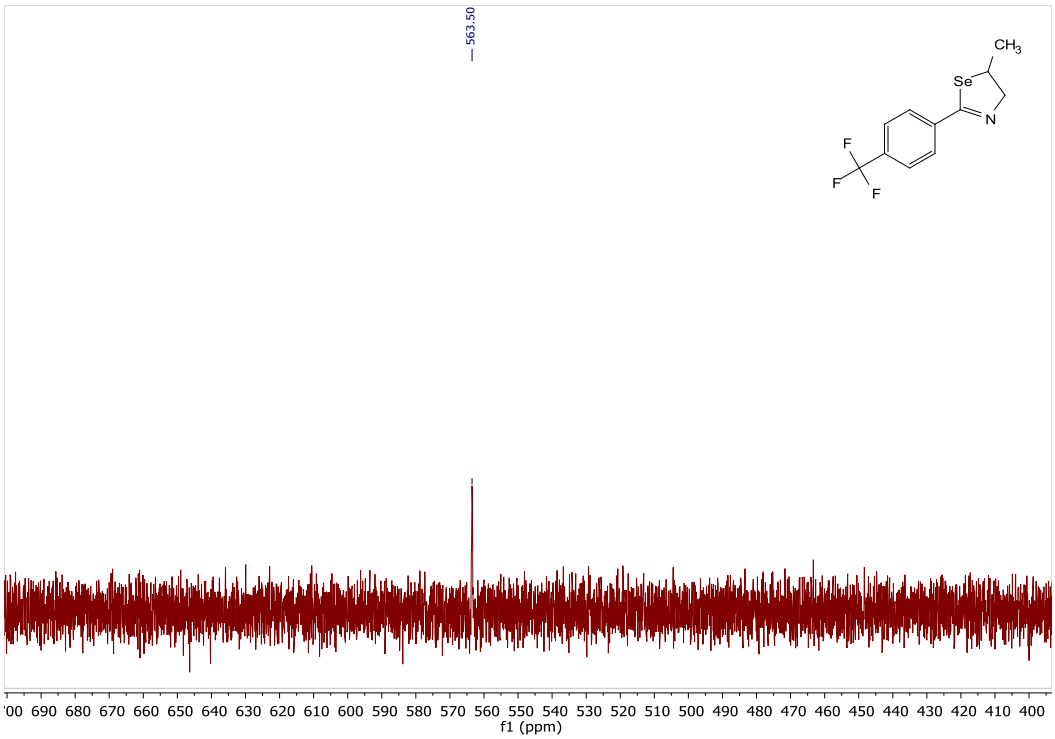
5-methyl-2-(4-(trifluoromethyl)phenyl)-4,5-dihydro-1,3-selenazole (**2i**)



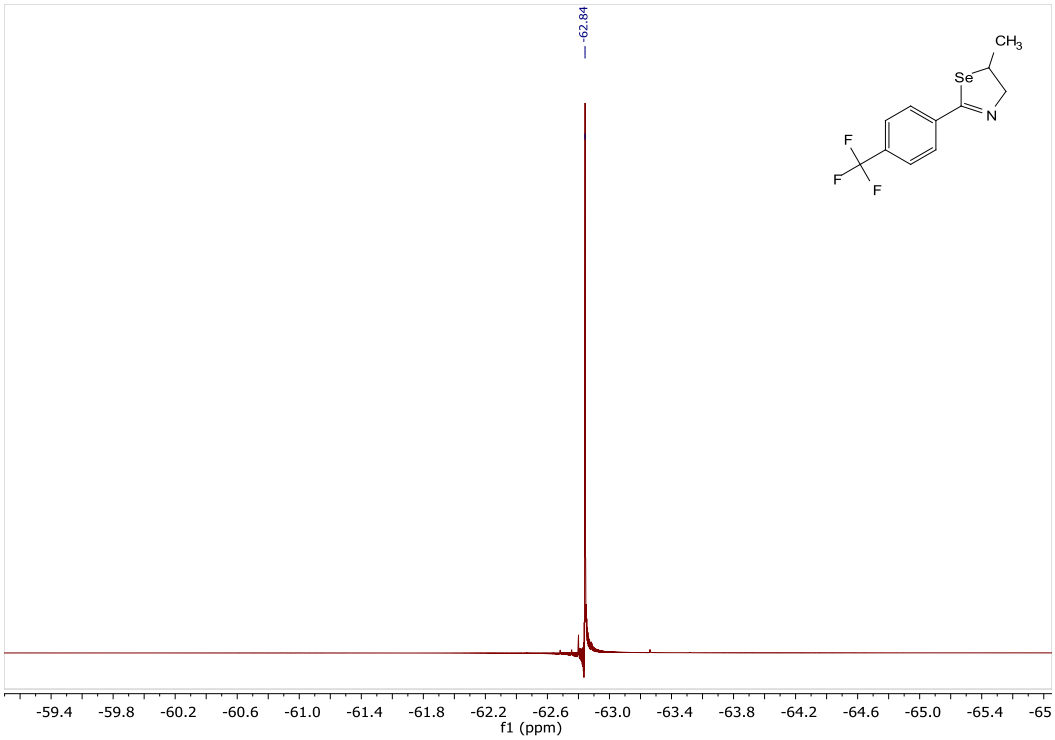
^{1}H NMR spectrum of compound **2i** ($CDCl_3$, 500 MHz)



^{13}C NMR spectrum of compound **2i** ($CDCl_3$, 126 MHz)

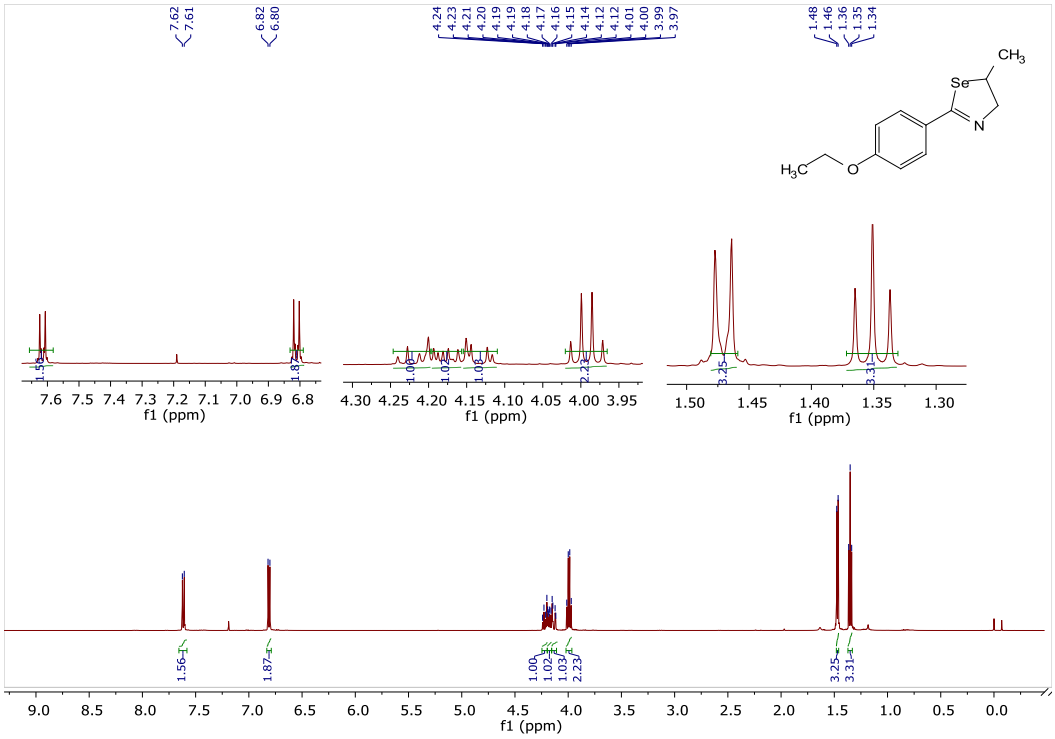


^{77}Se NMR spectrum of compound **2i** ($CDCl_3$, 95 MHz)

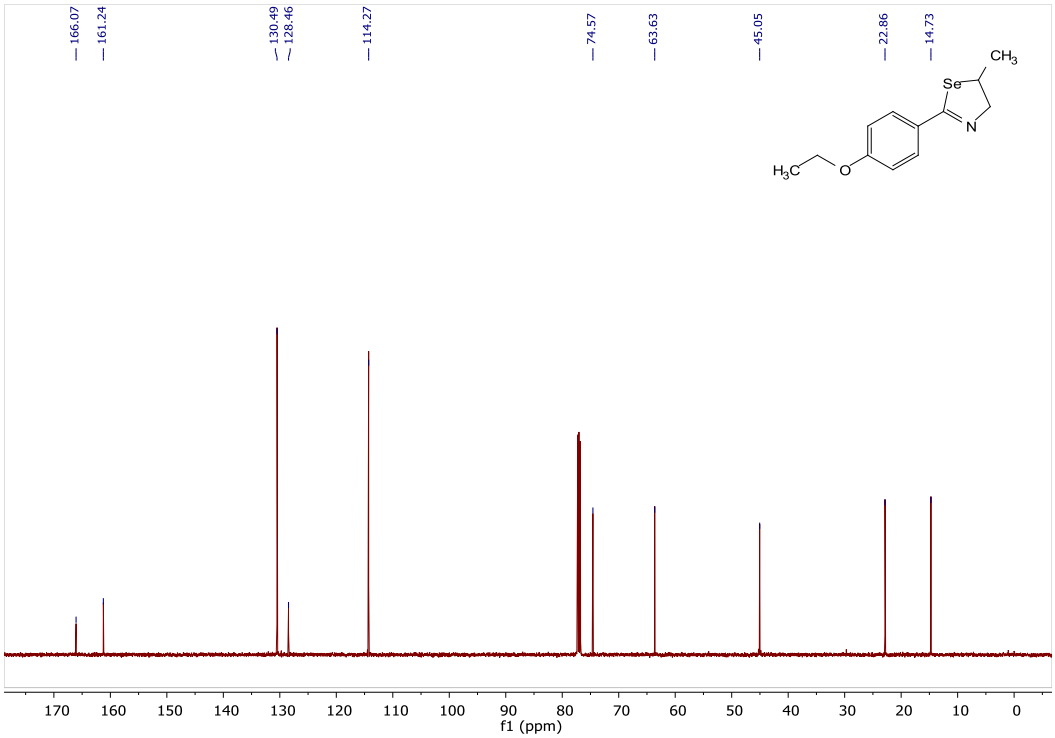


^{19}F NMR spectrum of compound **2i** ($CDCl_3$, 487 MHz)

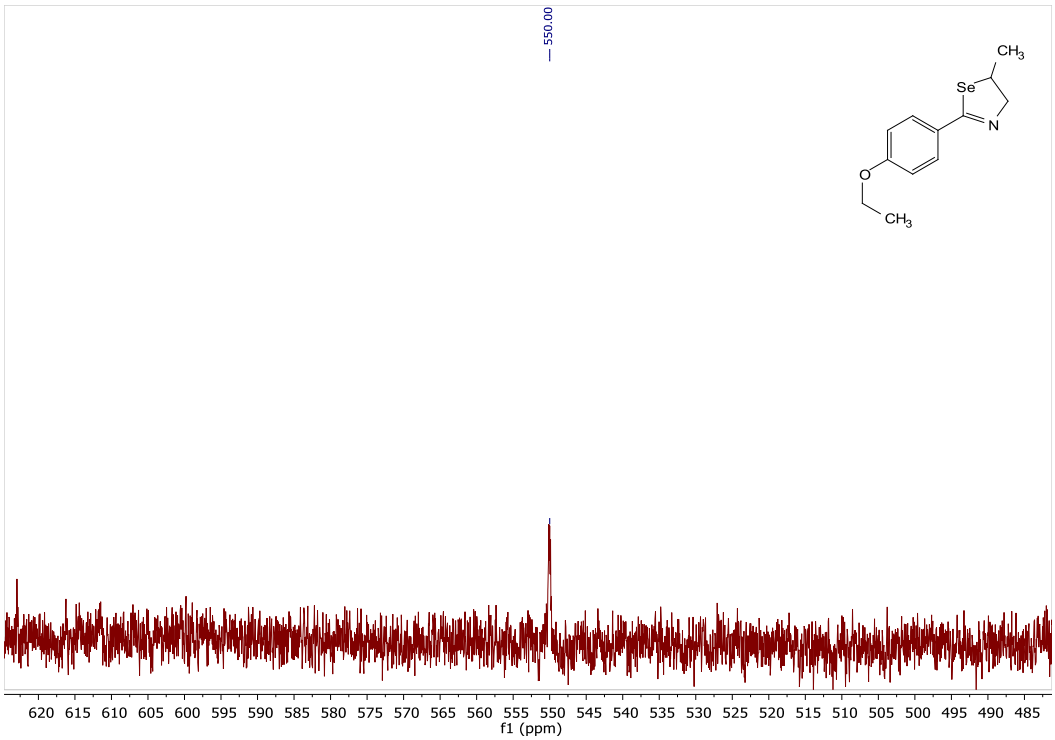
2-(4-ethoxyphenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2j**)



^{1}H NMR spectrum of compound **2j** ($CDCl_3$, 500 MHz)

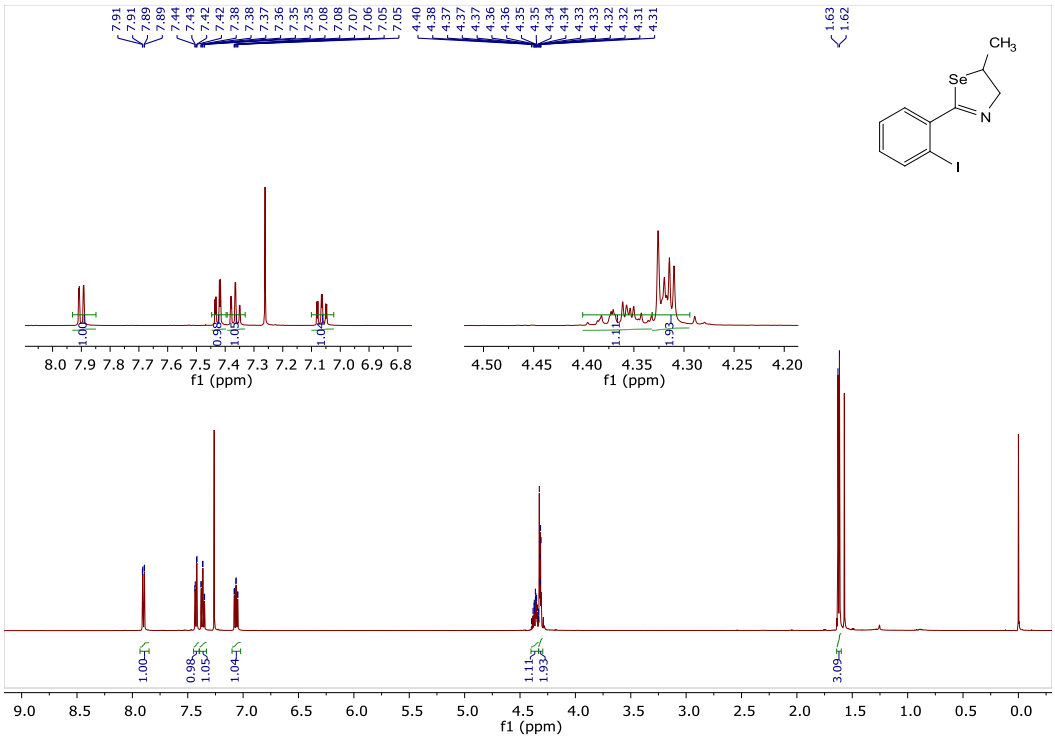


^{13}C NMR spectrum of compound **2j** ($CDCl_3$, 126 MHz)

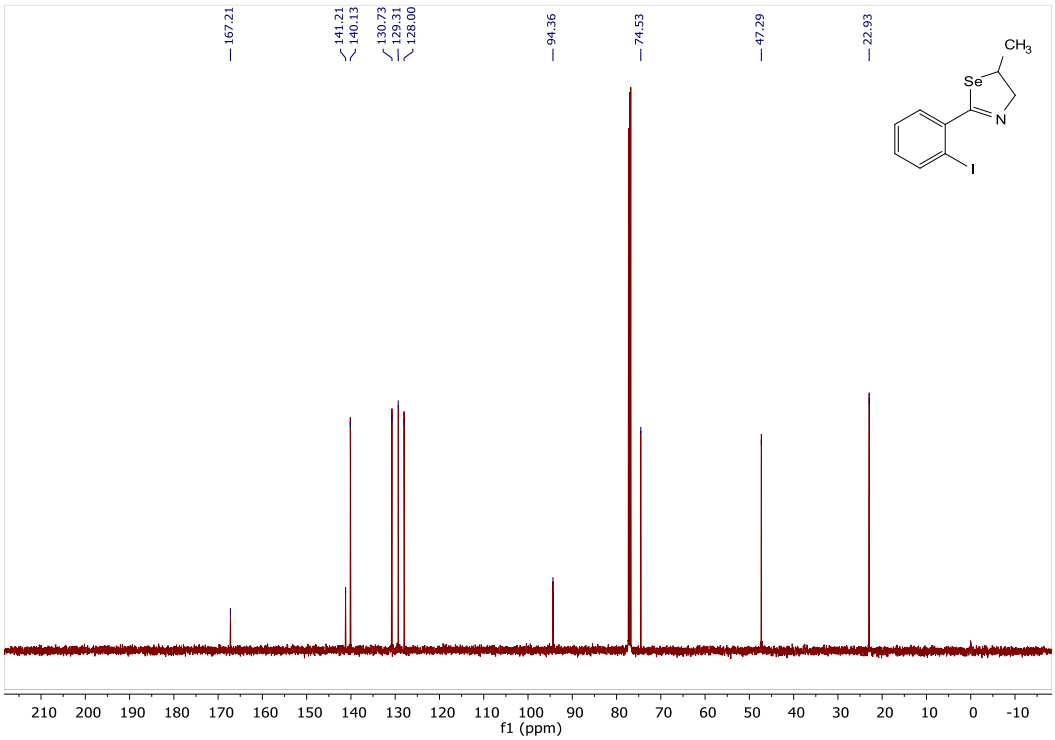


^{77}Se NMR spectrum of compound **2j** ($CDCl_3$, 95 MHz)

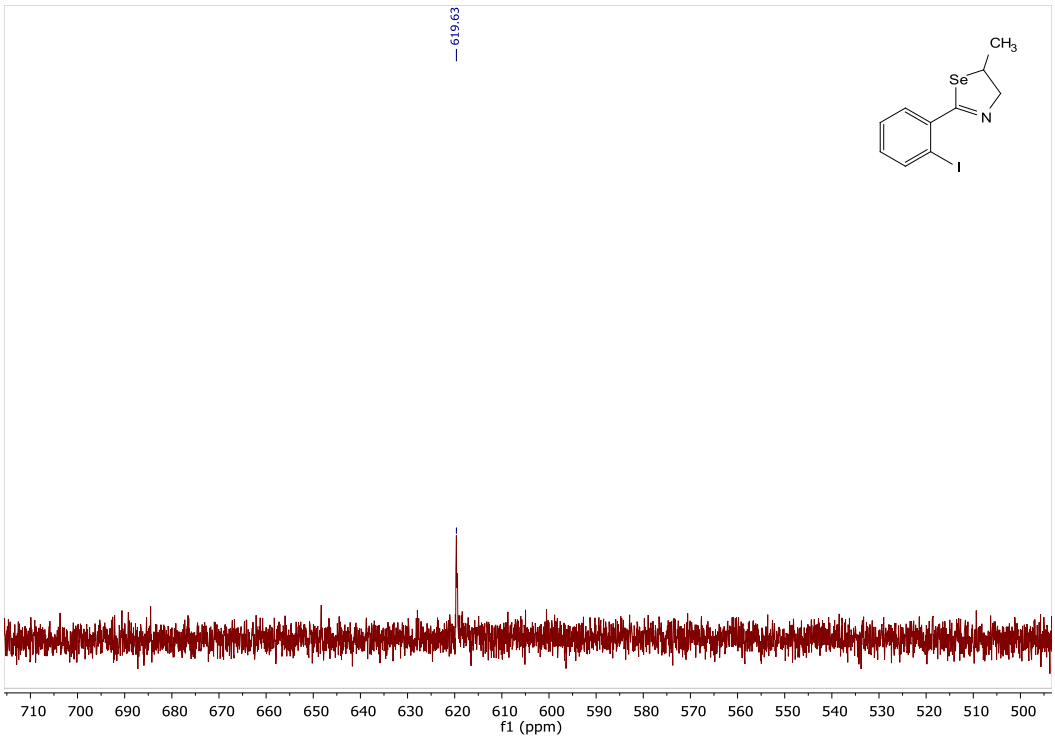
2-(2-iodophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2k**)



^{1}H NMR spectrum of compound **2k** ($CDCl_3$, 500 MHz)

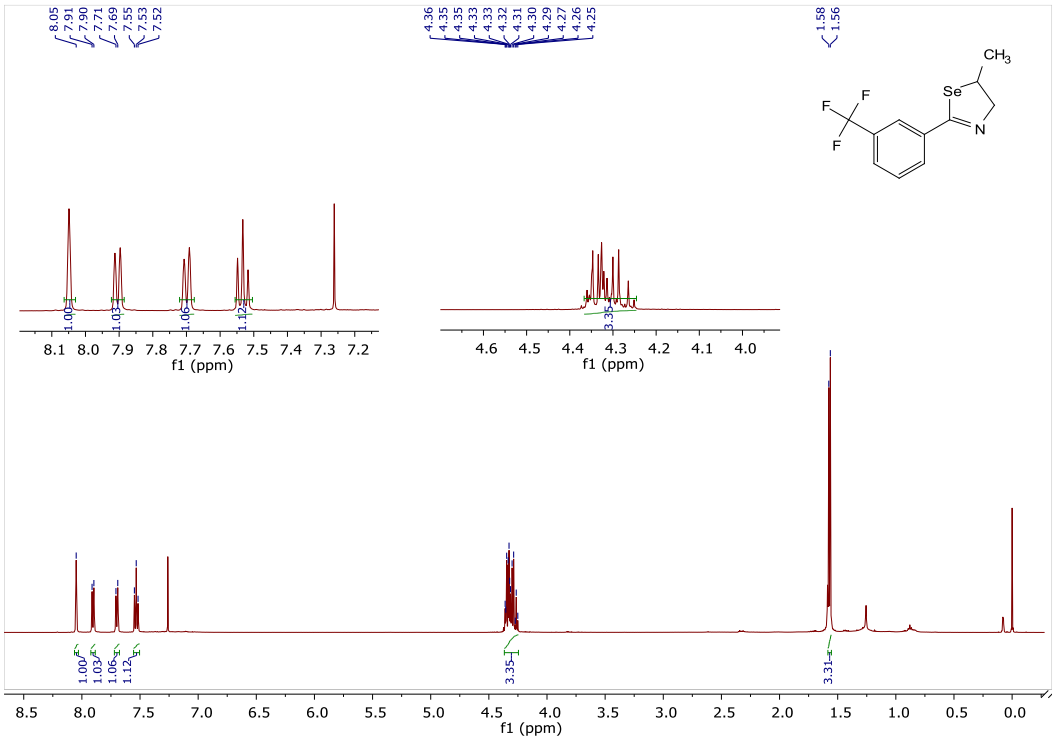


^{13}C NMR spectrum of compound **2k** ($CDCl_3$, 126 MHz)

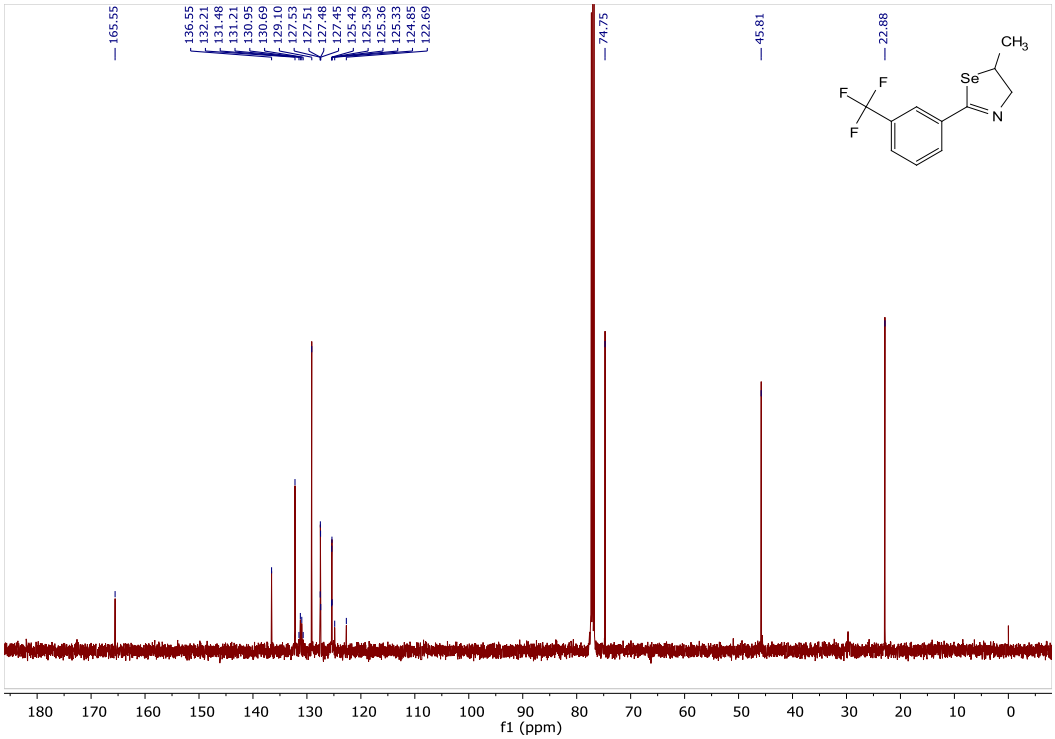


^{77}Se NMR spectrum of compound **2k** ($CDCl_3$, 95 MHz)

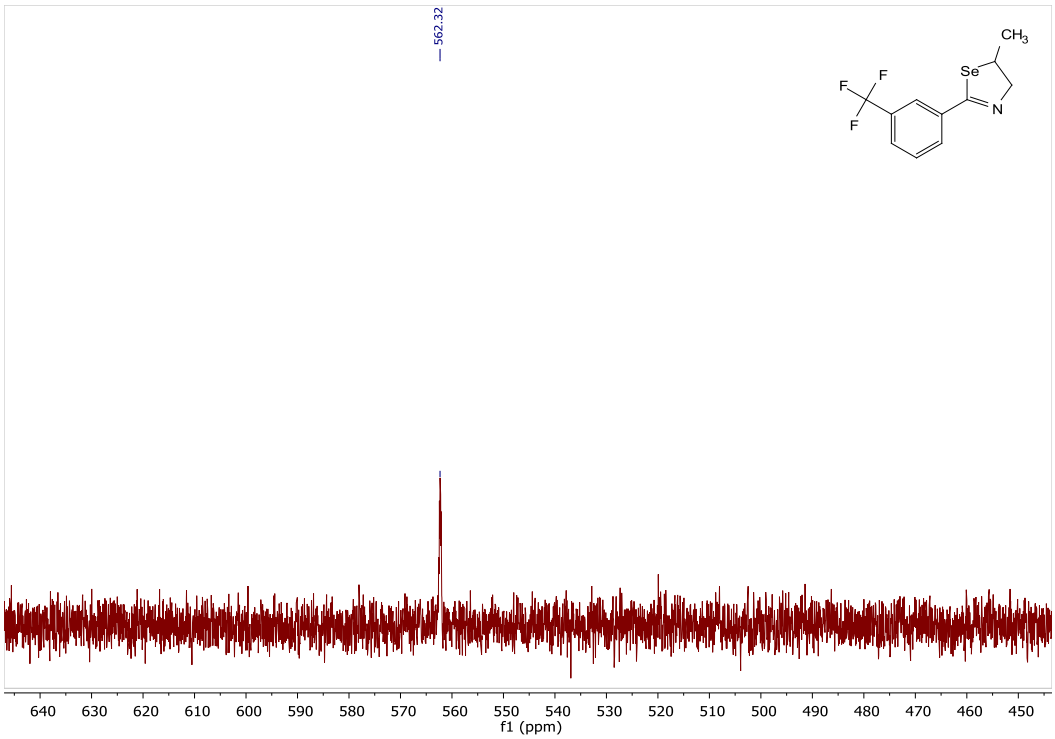
5-methyl-2-(3-(trifluoromethyl)phenyl)-4,5-dihydro-1,3-selenazole (**2l**)



^{1}H NMR spectrum of compound **2l** ($CDCl_3$, 500 MHz)

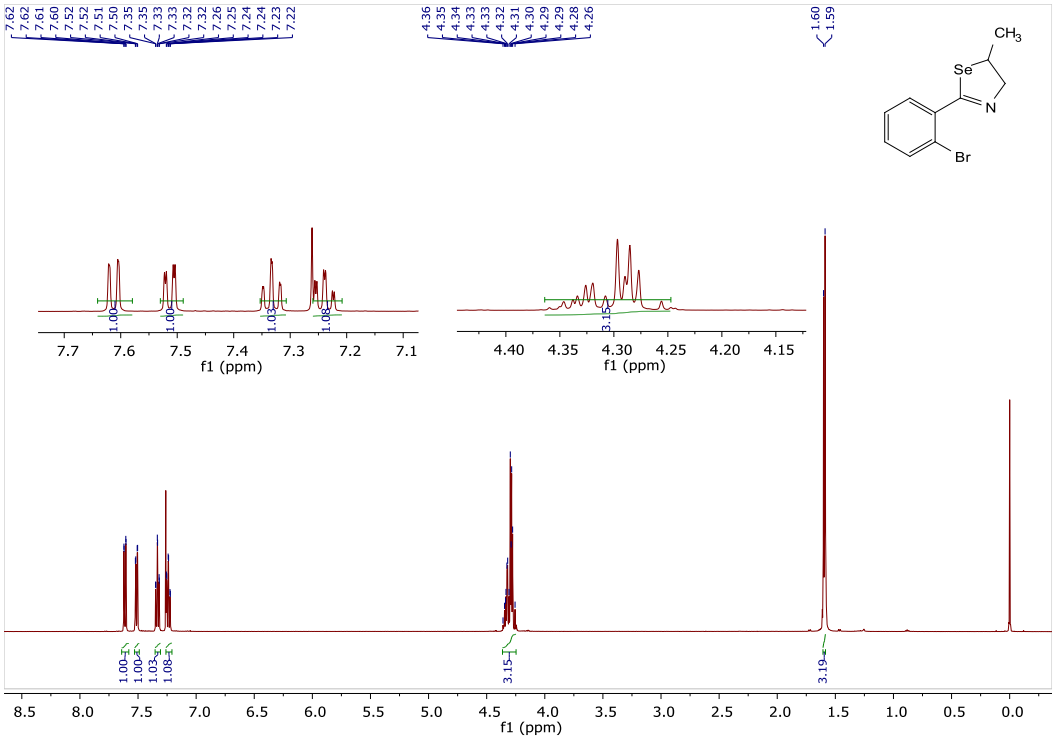


^{13}C NMR spectrum of compound **2l** ($CDCl_3$, 126 MHz)

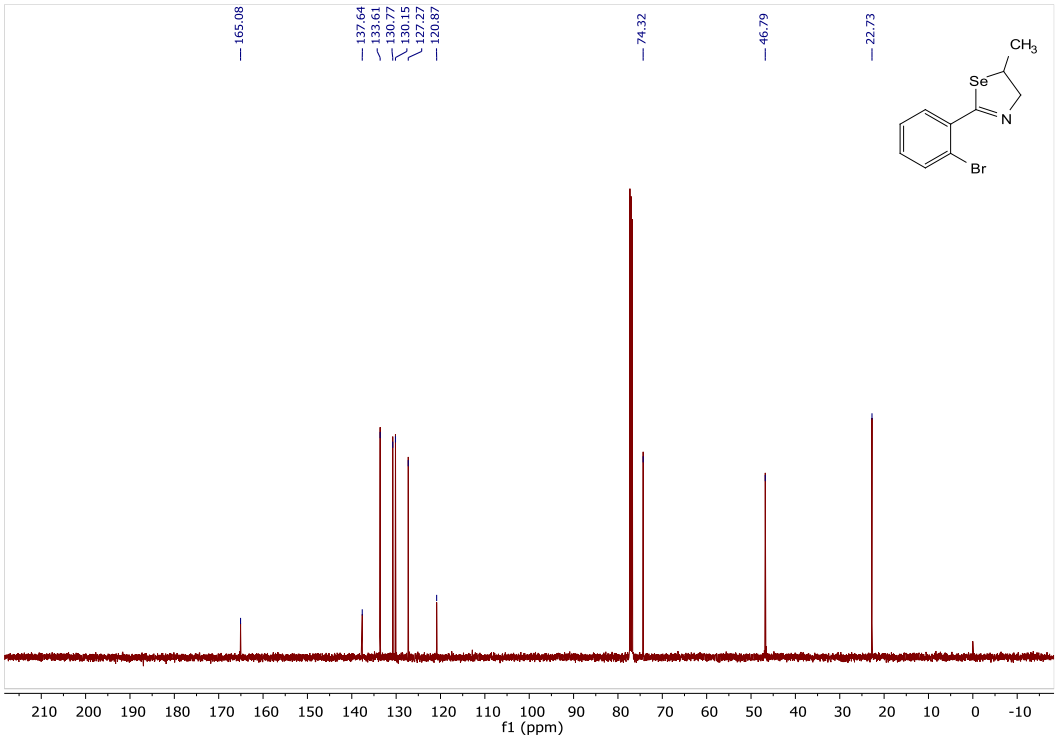


^{77}Se NMR spectrum of compound **2l** ($CDCl_3$, 95 MHz)

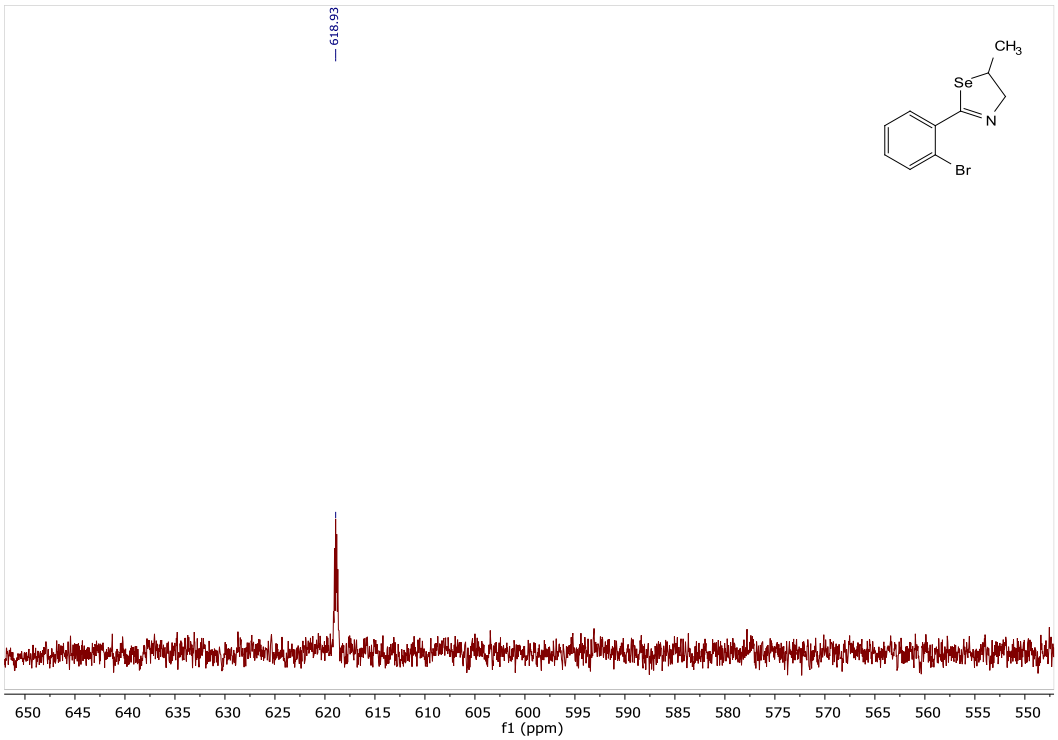
2-(2-bromophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2m**)



^{1}H NMR spectrum of compound **2m** ($CDCl_3$, 500 MHz)

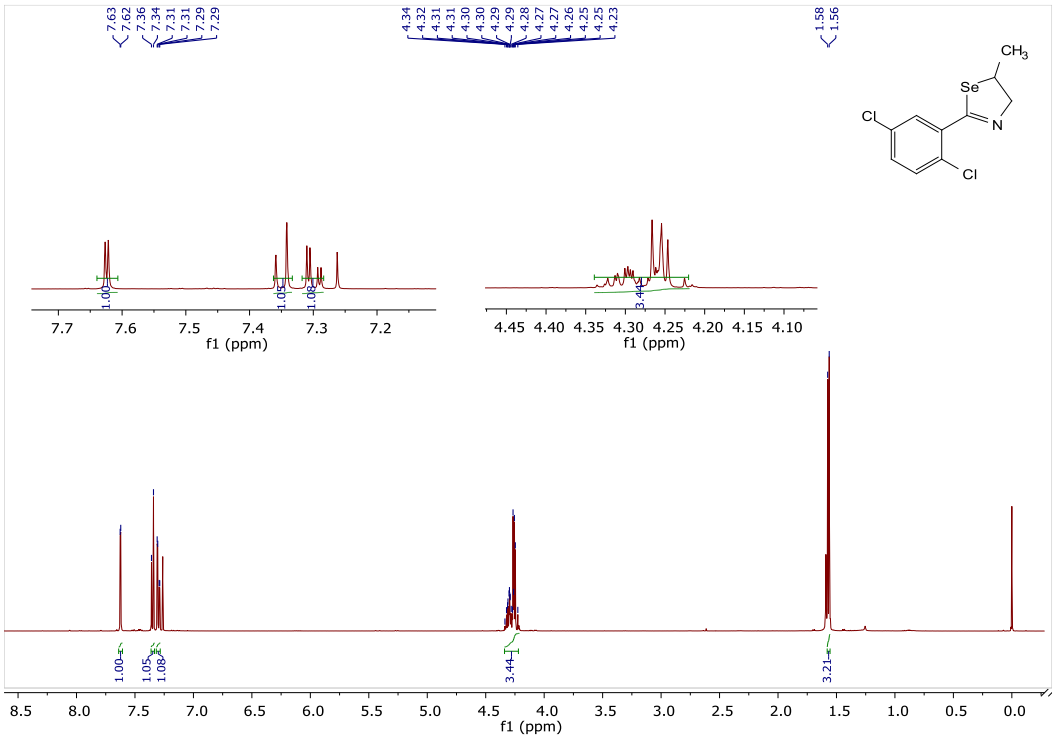


^{13}C NMR spectrum of compound **2m** ($CDCl_3$, 126 MHz)

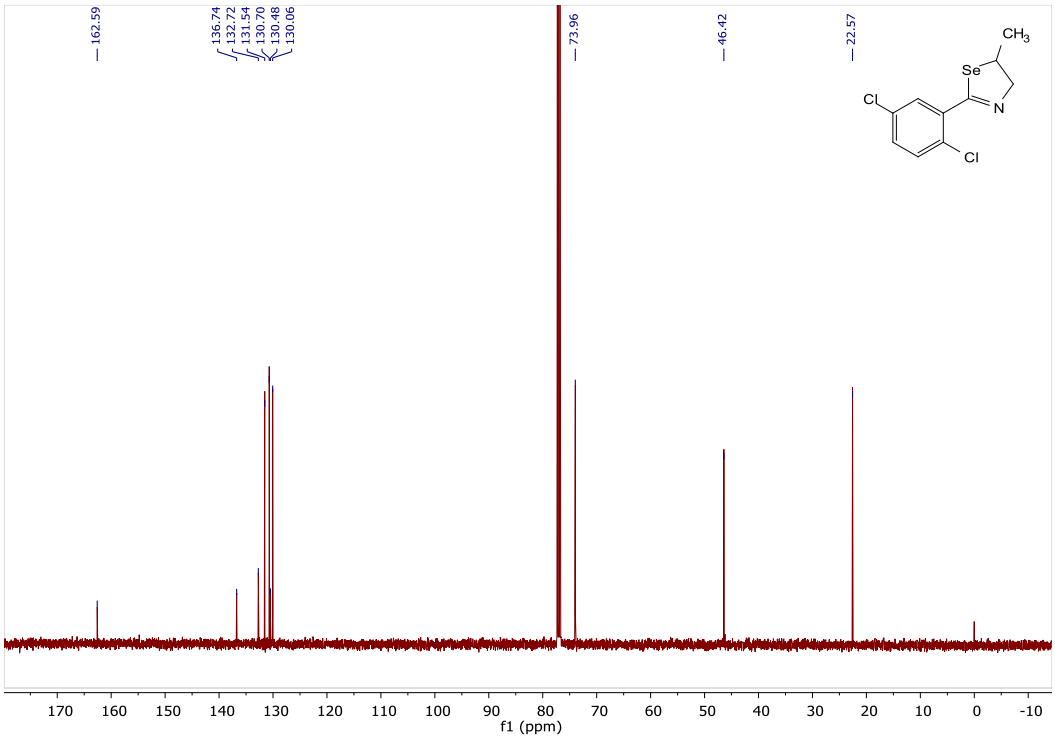


^{77}Se NMR spectrum of compound **2m** ($CDCl_3$, 95 MHz)

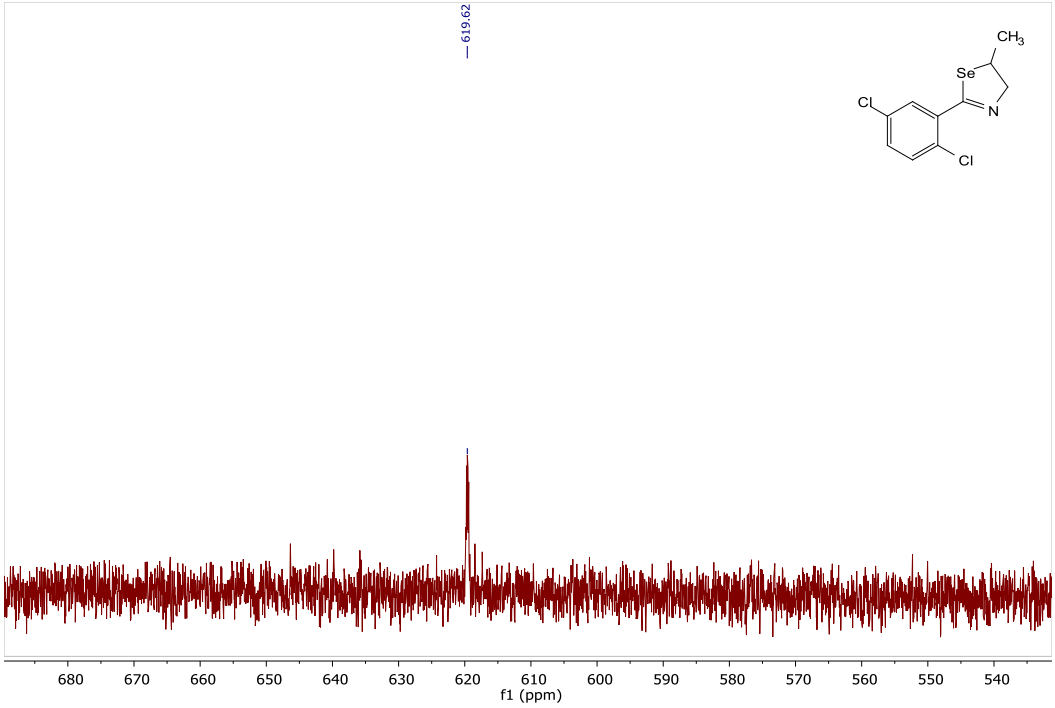
2-(2,5-dichlorophenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2n**)



^{1}H NMR spectrum of compound **2n** ($CDCl_3$, 500 MHz)

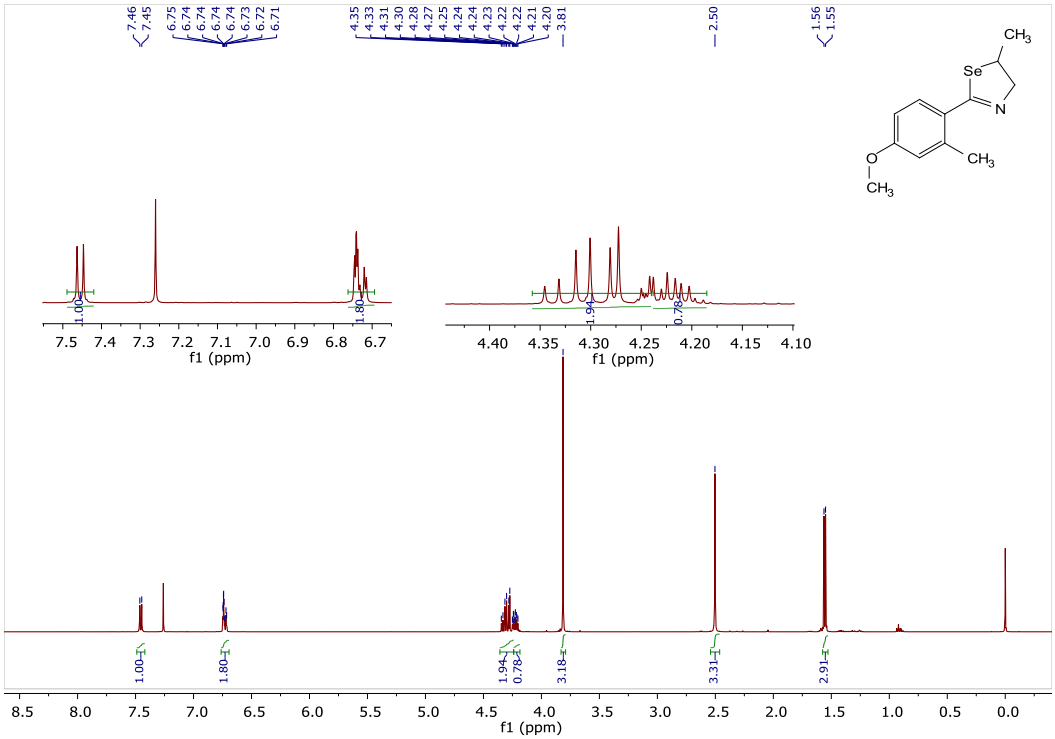


^{13}C NMR spectrum of compound **2n** ($CDCl_3$, 126 MHz)

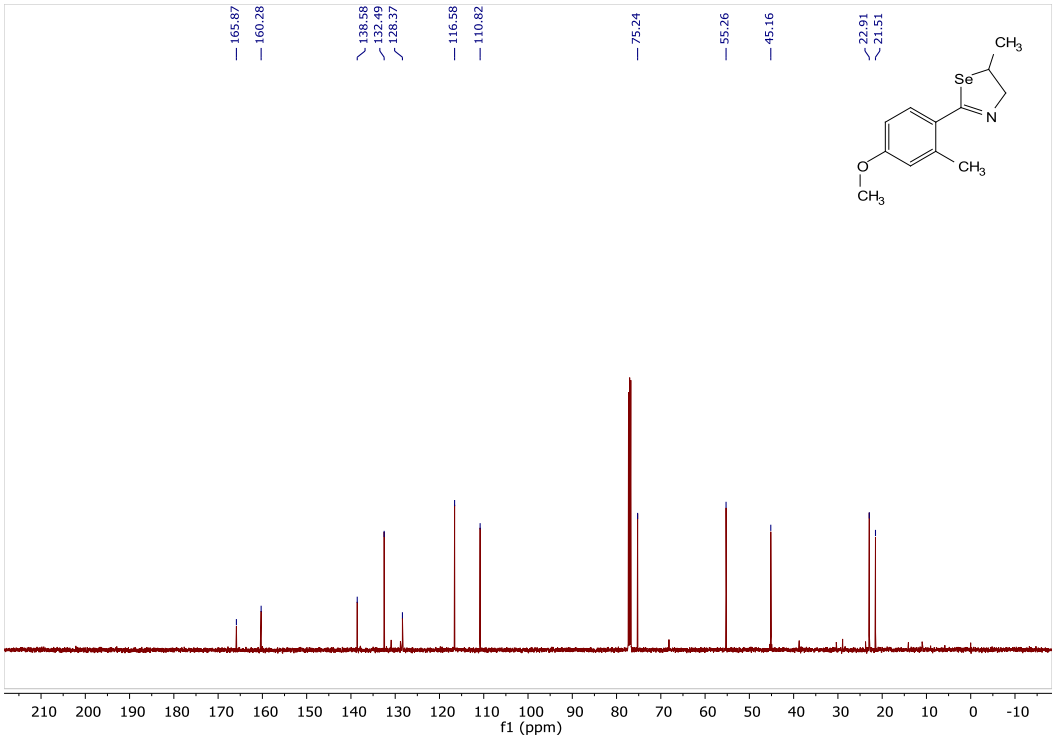


^{77}Se NMR spectrum of compound **2n** ($CDCl_3$, 95 MHz)

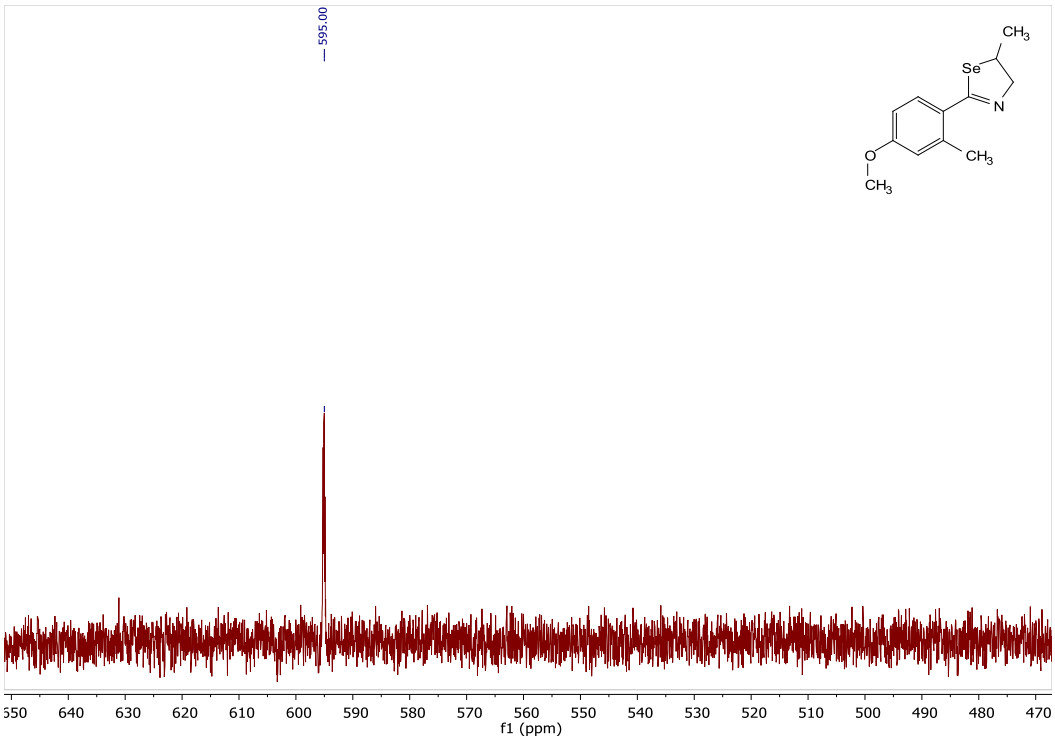
2-(4-methoxy-2-methylphenyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2o**)



^{1}H NMR spectrum of compound **2o** ($CDCl_3$, 500 MHz)

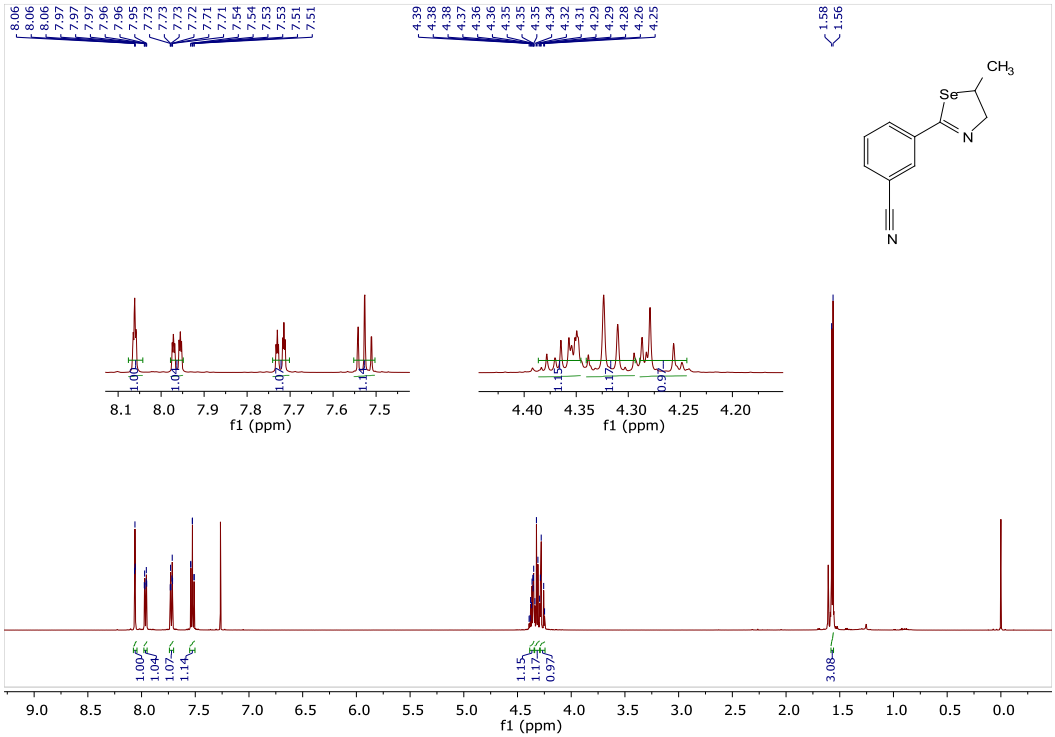


^{13}C NMR spectrum of compound **2o** ($CDCl_3$, 126 MHz)

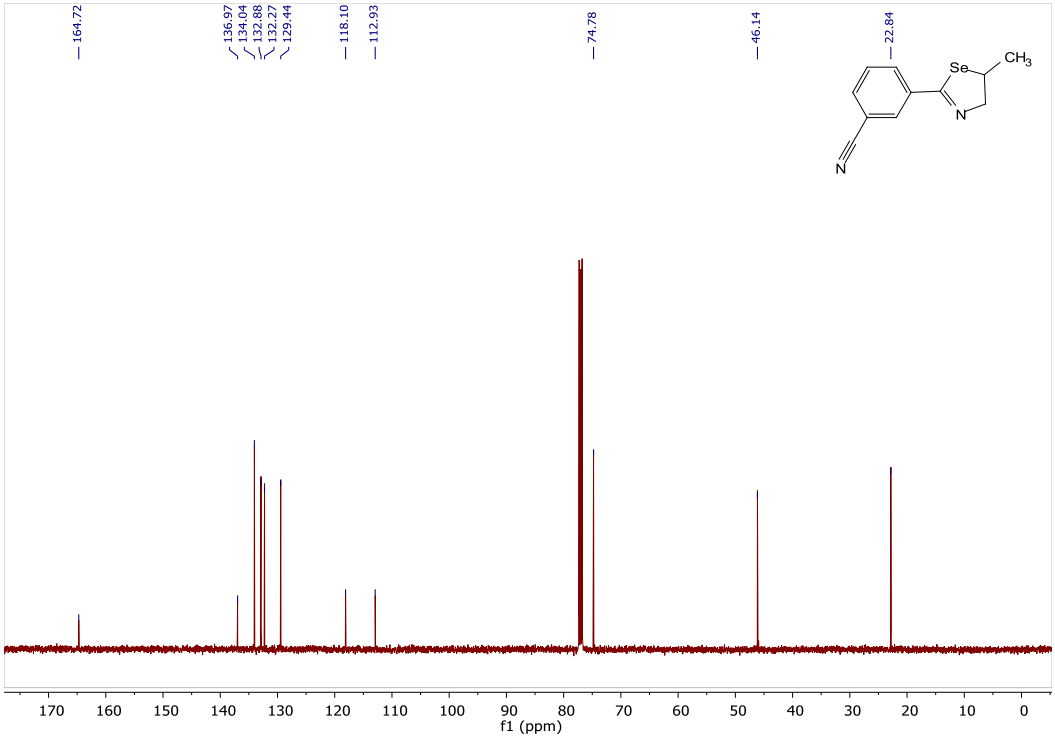


^{77}Se NMR spectrum of compound **2o** ($CDCl_3$, 95 MHz)

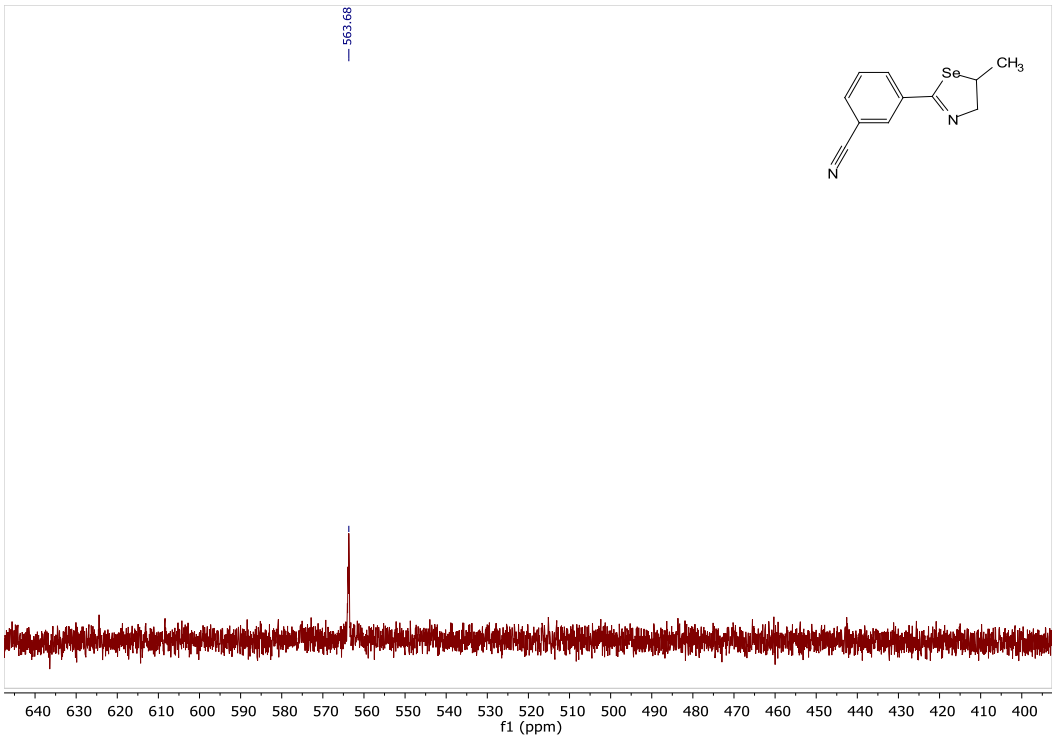
3-(5-methyl-4,5-dihydro-1,3-selenazol-2-yl)benzonitrile (**2p**)



^{1}H NMR spectrum of compound **2p** ($CDCl_3$, 500 MHz)

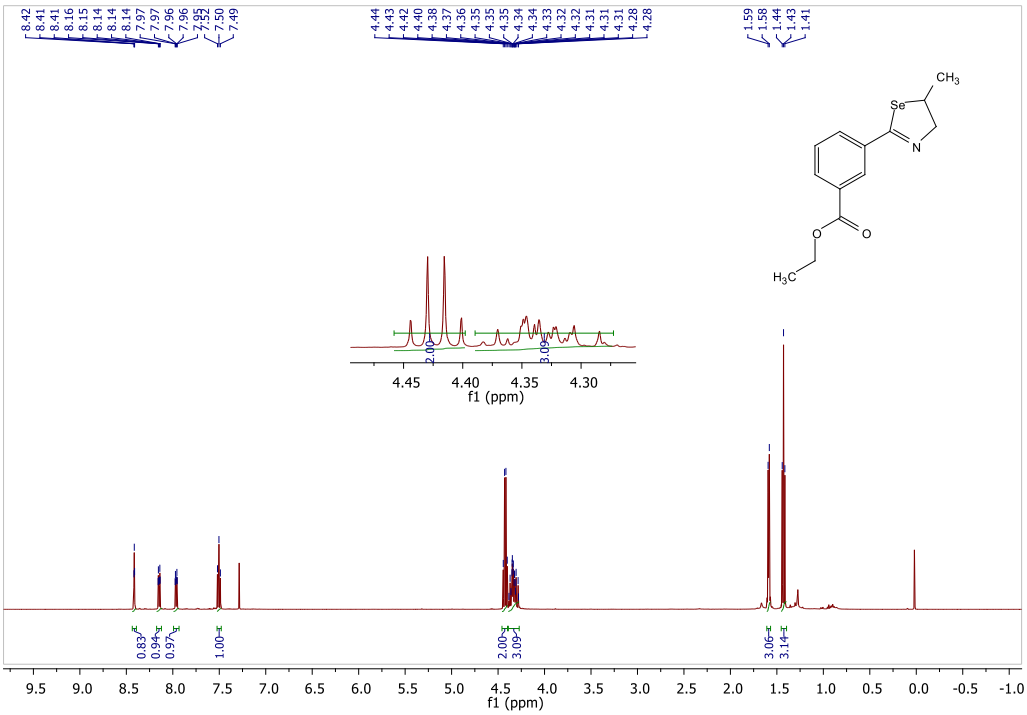


^{13}C NMR spectrum of compound **2p** ($CDCl_3$, 126 MHz)

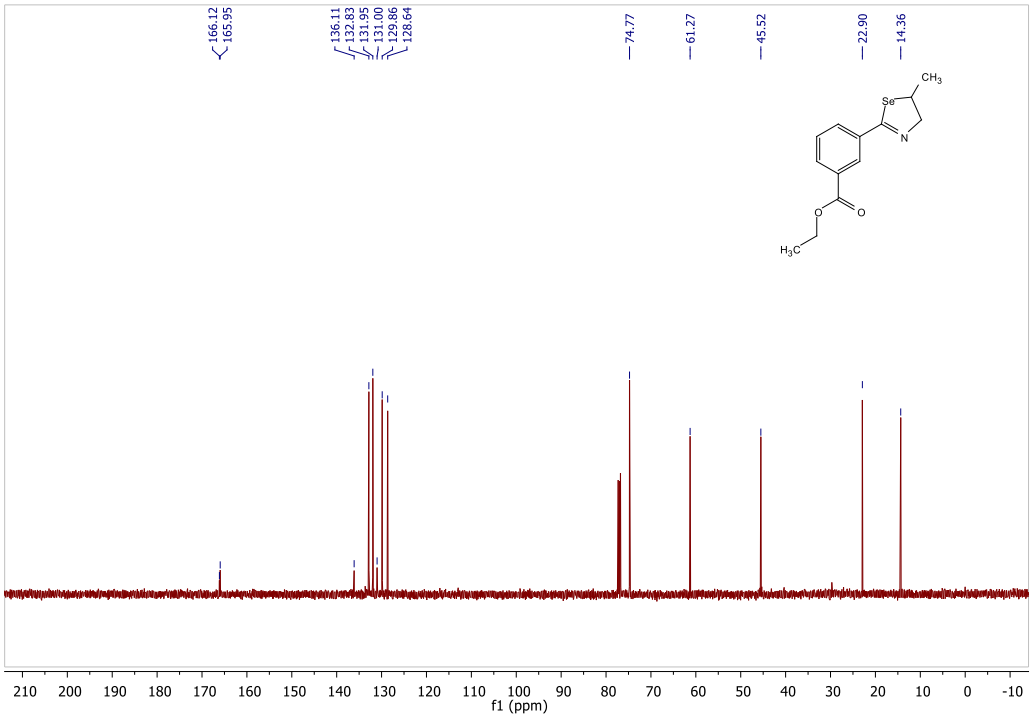


^{77}Se NMR spectrum of compound **2p** ($CDCl_3$, 95 MHz)

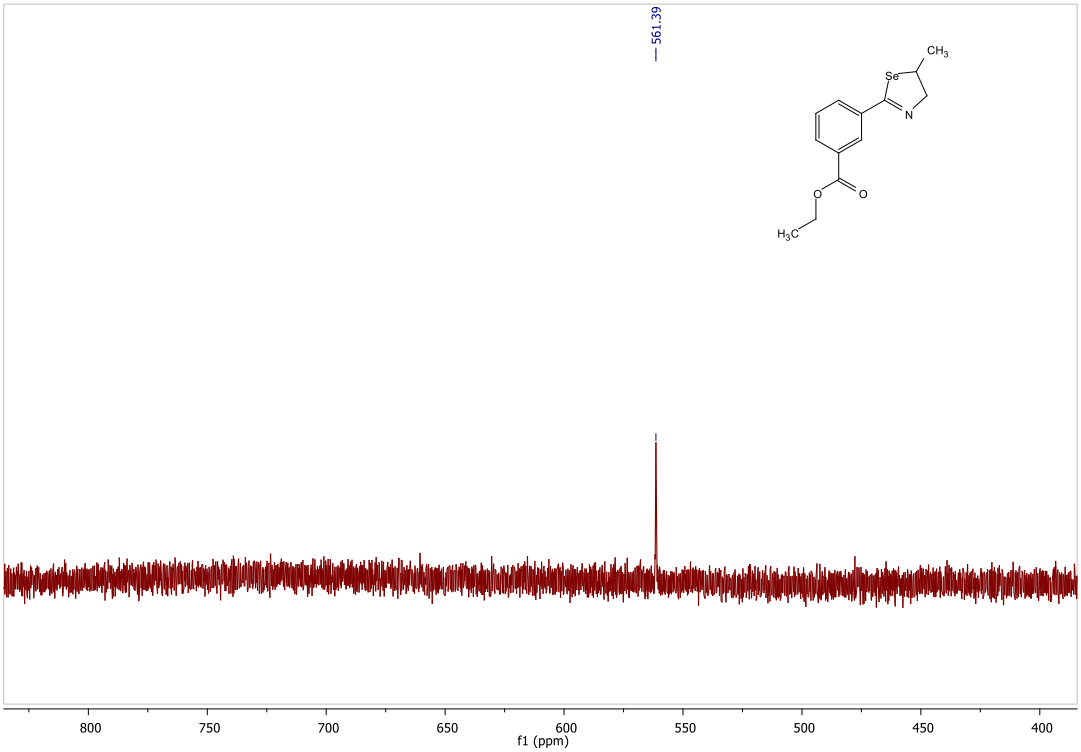
Ethyl 3-(5-methyl-4,5-dihydro-1,3-selenazol-2-yl)benzoate (**2q**)



^{1}H NMR spectrum of compound **2q** ($CDCl_3$, 500 MHz)

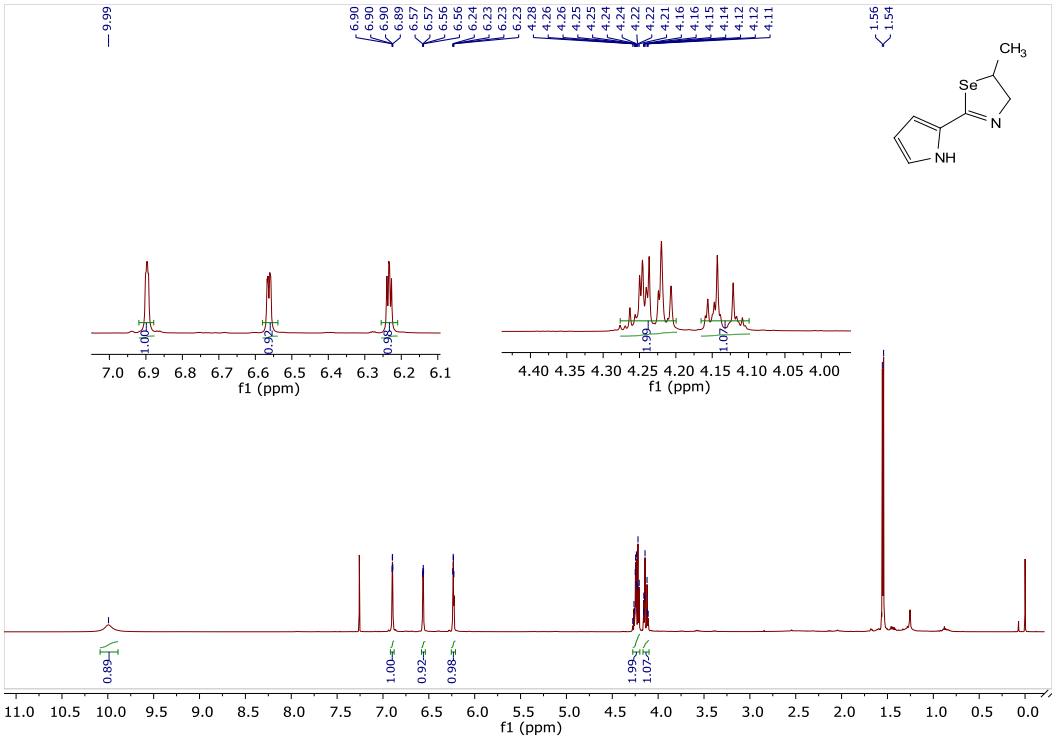


^{13}C NMR spectrum of compound **2q** ($CDCl_3$, 126 MHz)

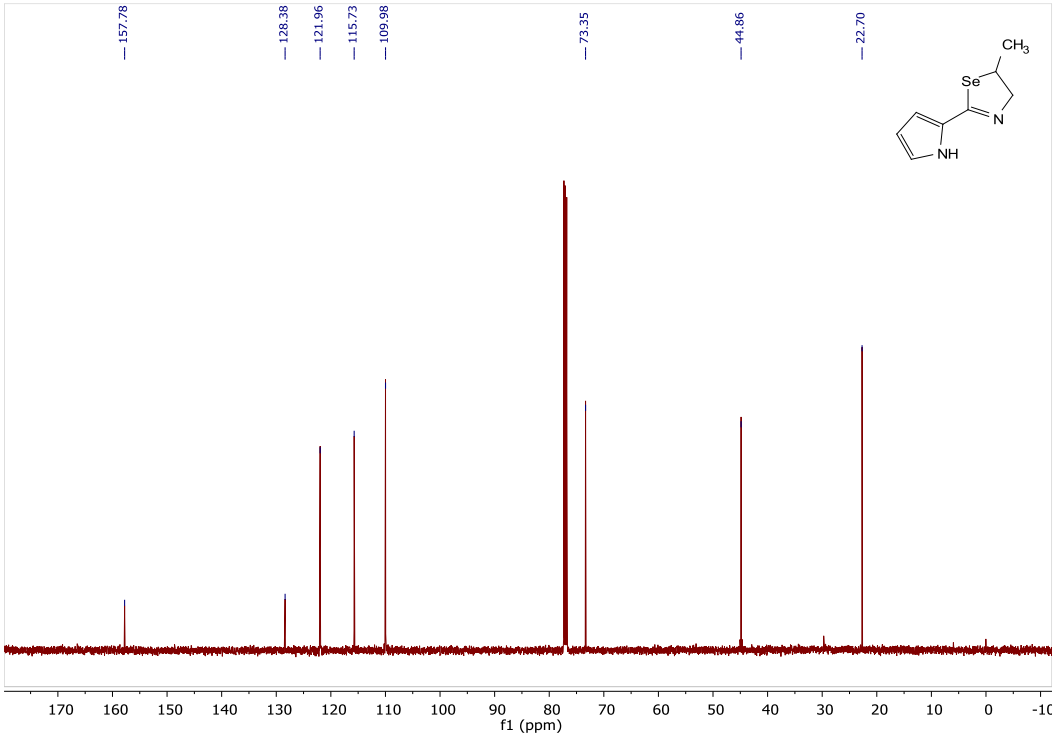


^{77}Se NMR spectrum of compound **2q** ($CDCl_3$, 95 MHz)

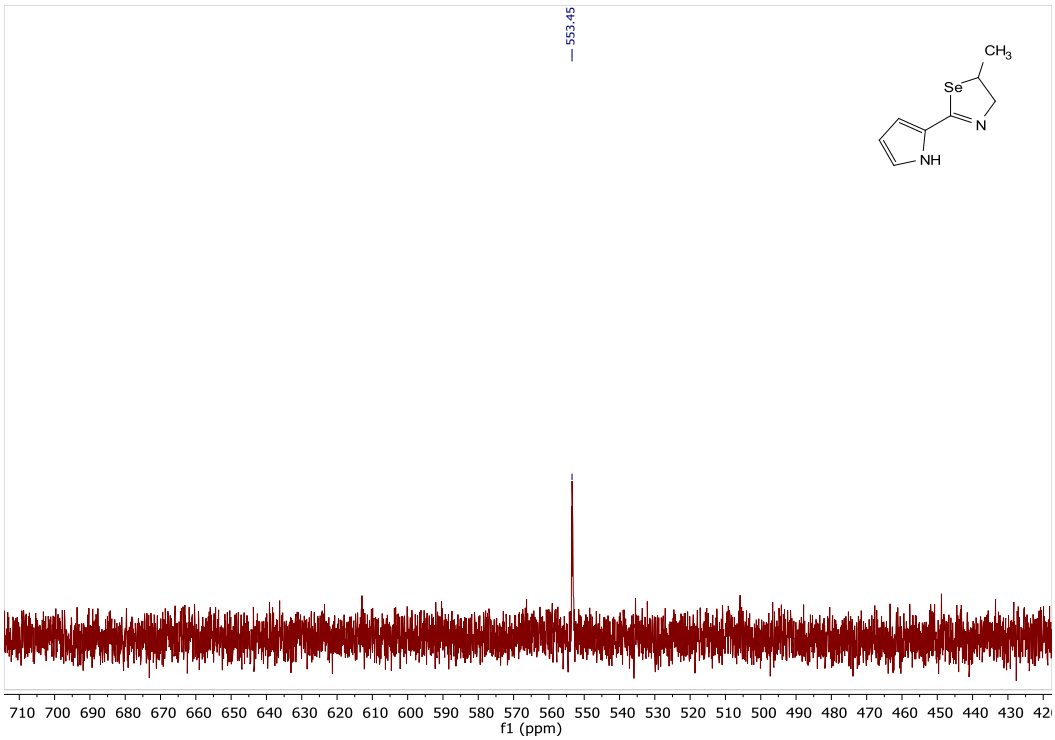
5-methyl-2-(1H-pyrrol-2-yl)-4,5-dihydro-1,3-selenazole (**2r**)



^{1}H NMR spectrum of compound **2r** ($CDCl_3$, 500 MHz)

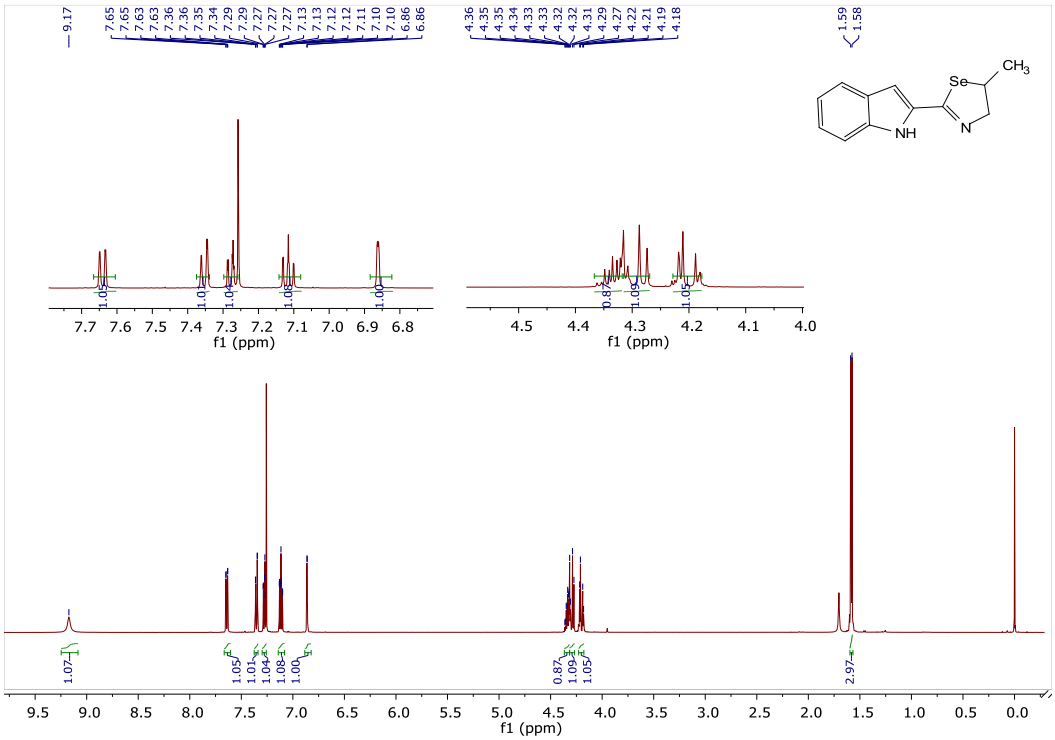


^{13}C NMR spectrum of compound **2r** ($CDCl_3$, 126 MHz)

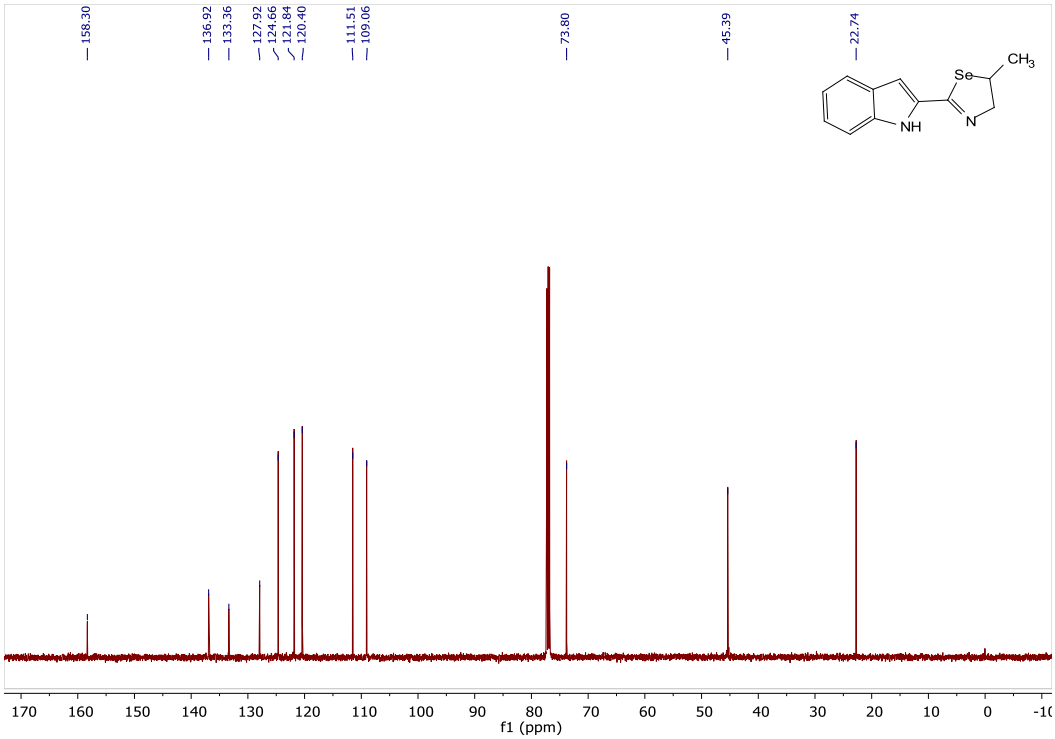


^{77}Se NMR spectrum of compound **2r** ($CDCl_3$, 95 MHz)

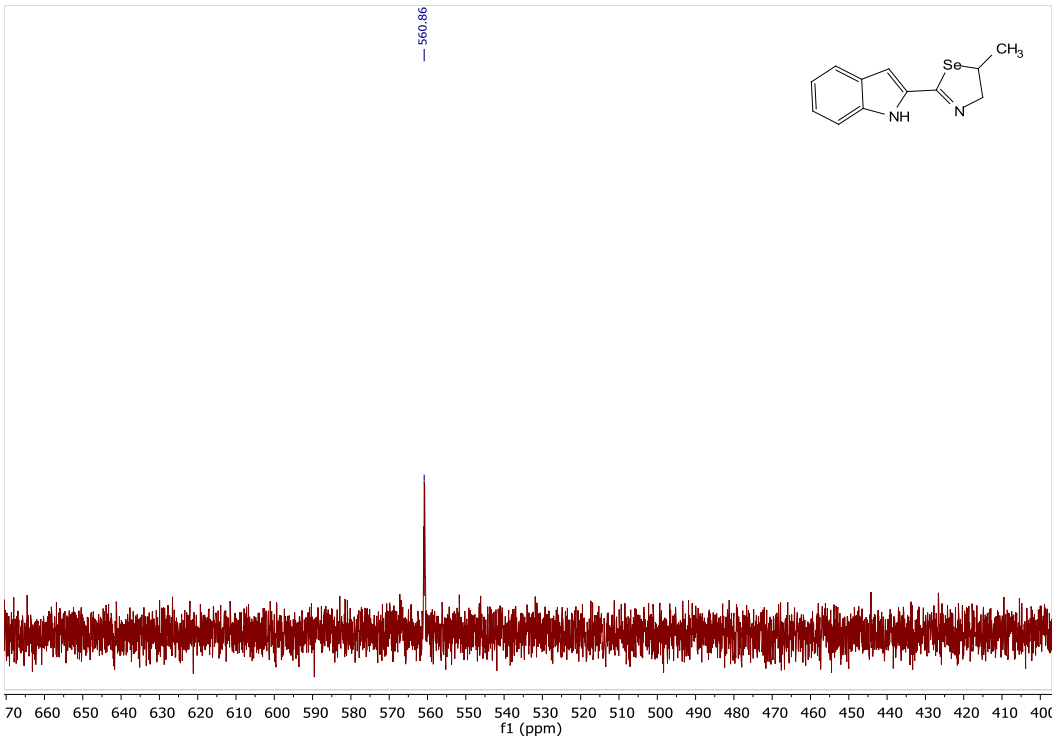
2-(1*H*-indol-2-yl)-5-methyl-4,5-dihydro-1,3-selenazole (**2s**)



^{1}H NMR spectrum of compound **2s** ($CDCl_3$, 500 MHz)

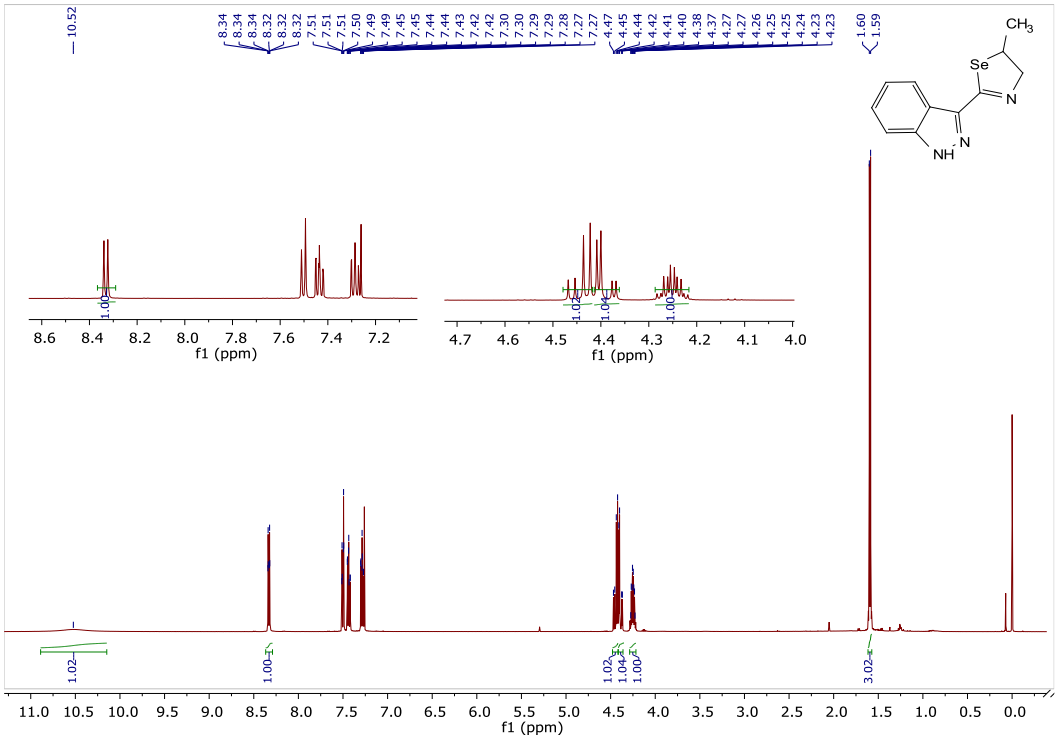


^{13}C NMR spectrum of compound **2s** ($CDCl_3$, 126 MHz)

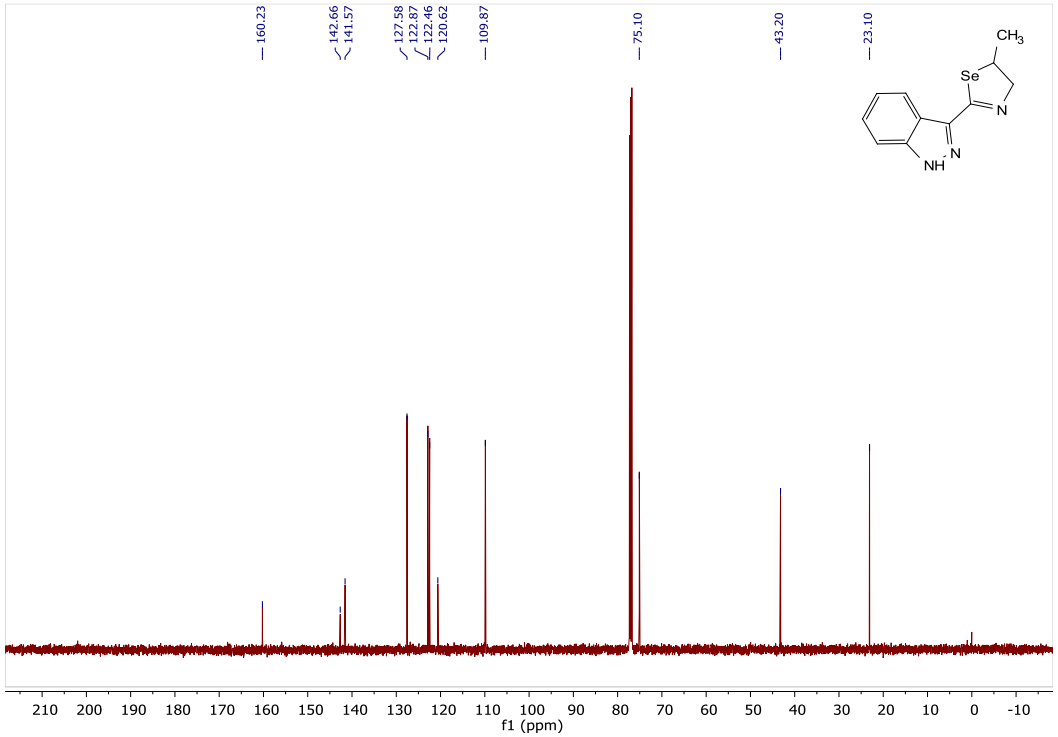


^{77}Se NMR spectrum of compound **2s** ($CDCl_3$, 95 MHz)

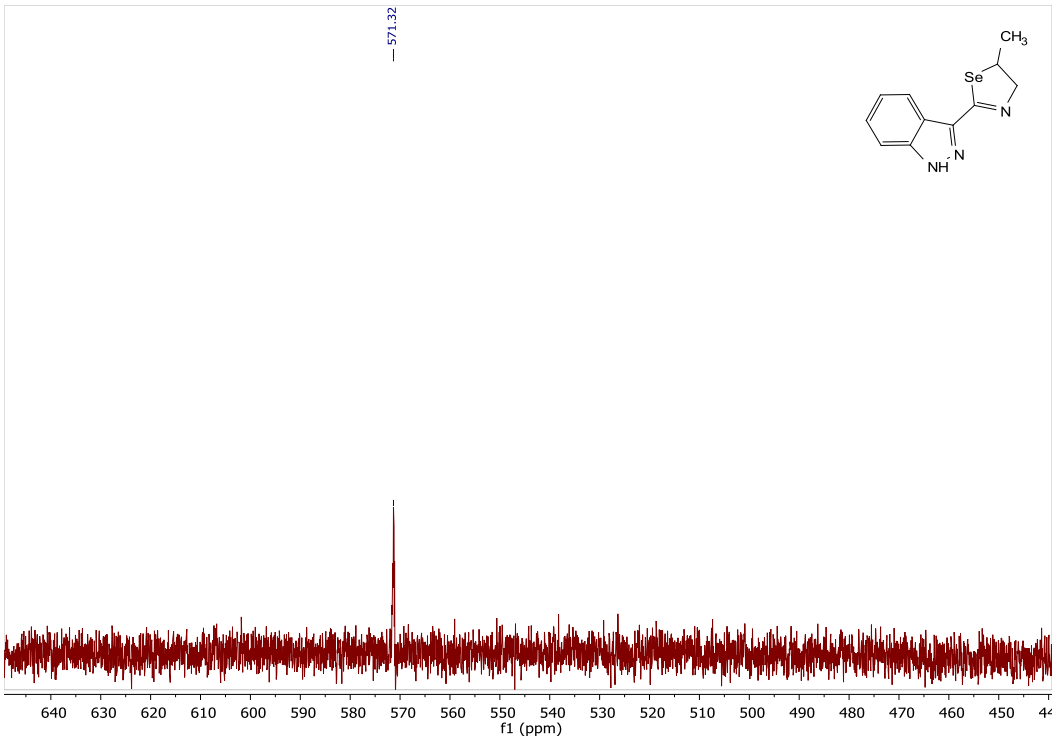
2-(1*H*-indazol-3-yl)-5-methyl-4,5-dihydro-1,3-selenazole (**2t**)



^{1}H NMR spectrum of compound **2t** ($CDCl_3$, 500 MHz)

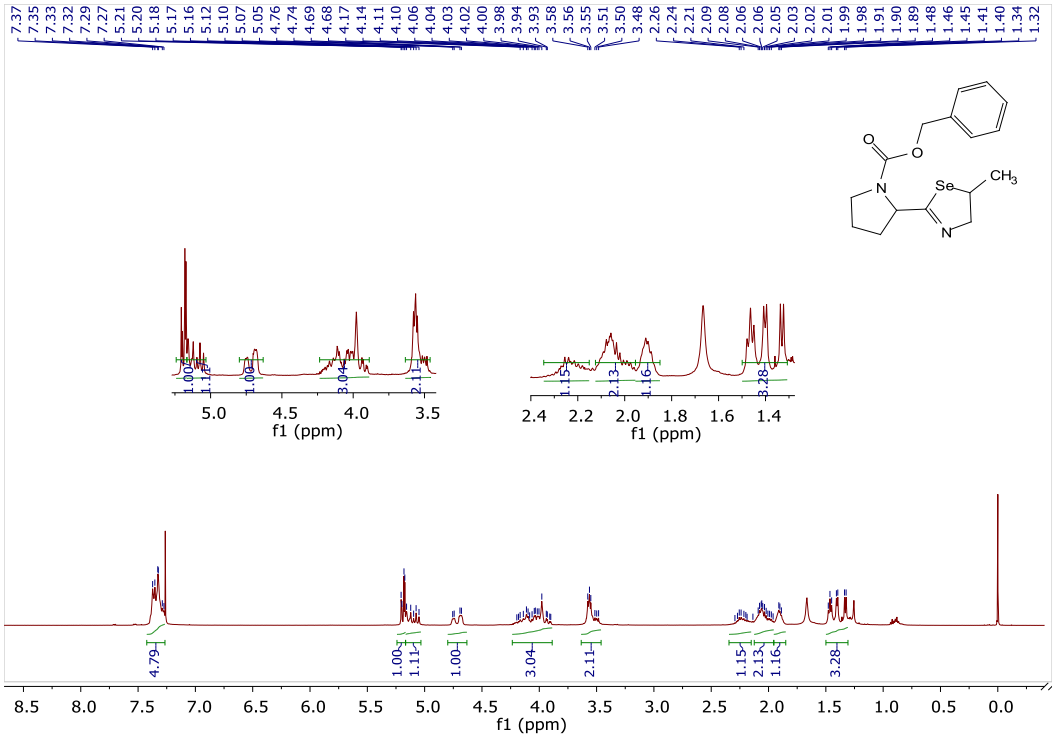


^{13}C NMR spectrum of compound **2t** ($CDCl_3$, 126 MHz)

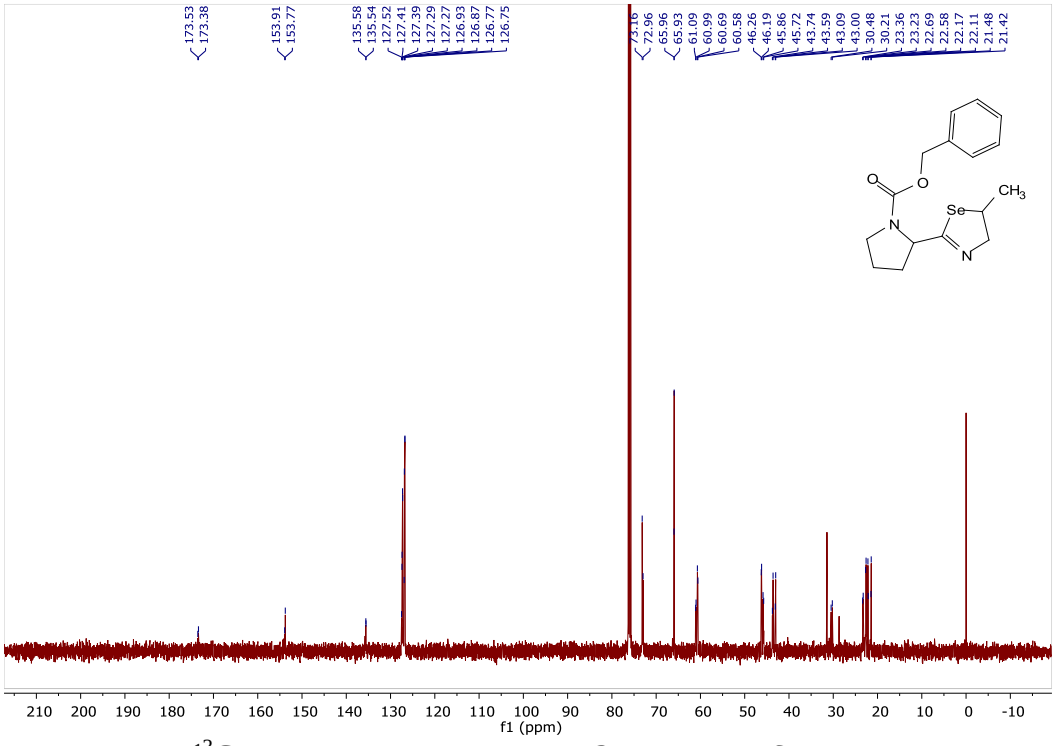


^{77}Se NMR spectrum of compound **2t** ($CDCl_3$, 95 MHz)

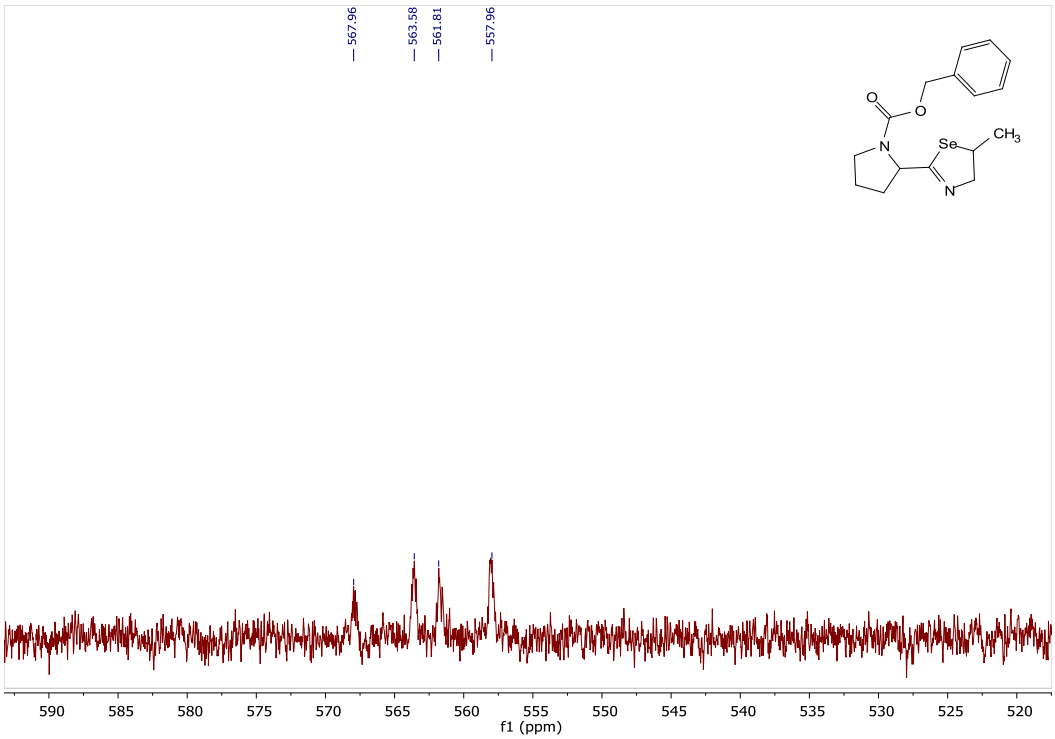
Benzyl 2-(5-methyl-4,5-dihydro-1,3-selenazol-2-yl)pyrrolidine-1-carboxylate (**2u**)



^{1}H NMR spectrum of compound **2u** ($CDCl_3$, 500 MHz)

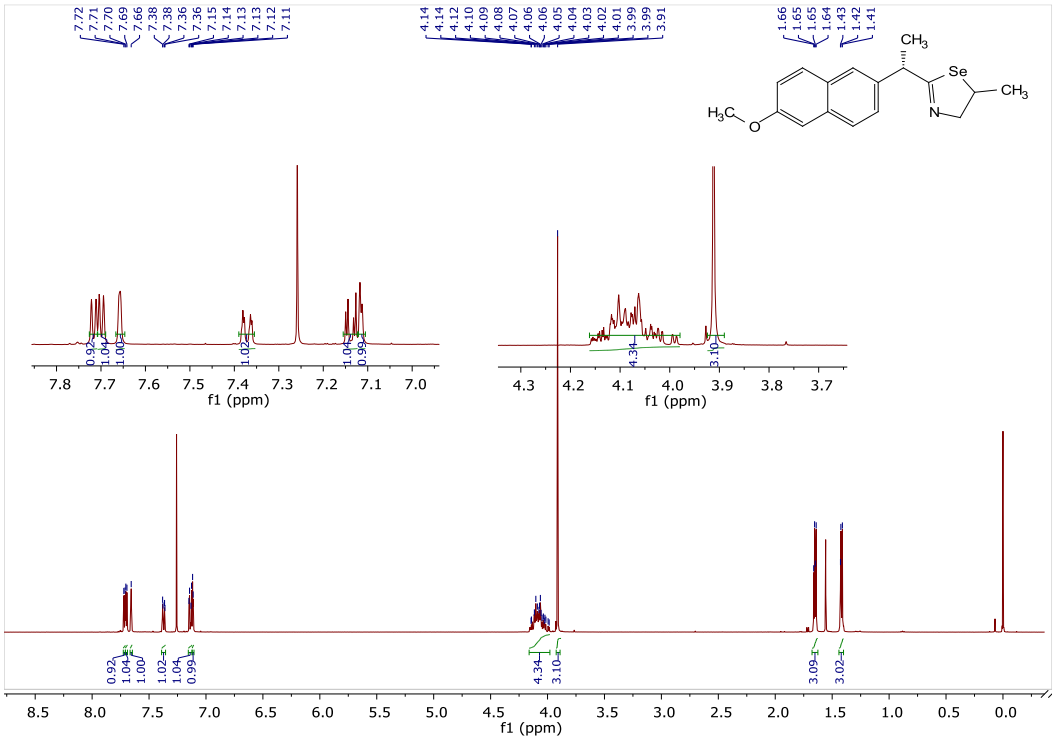


^{13}C NMR spectrum of compound **2u** ($CDCl_3$, 126 MHz)

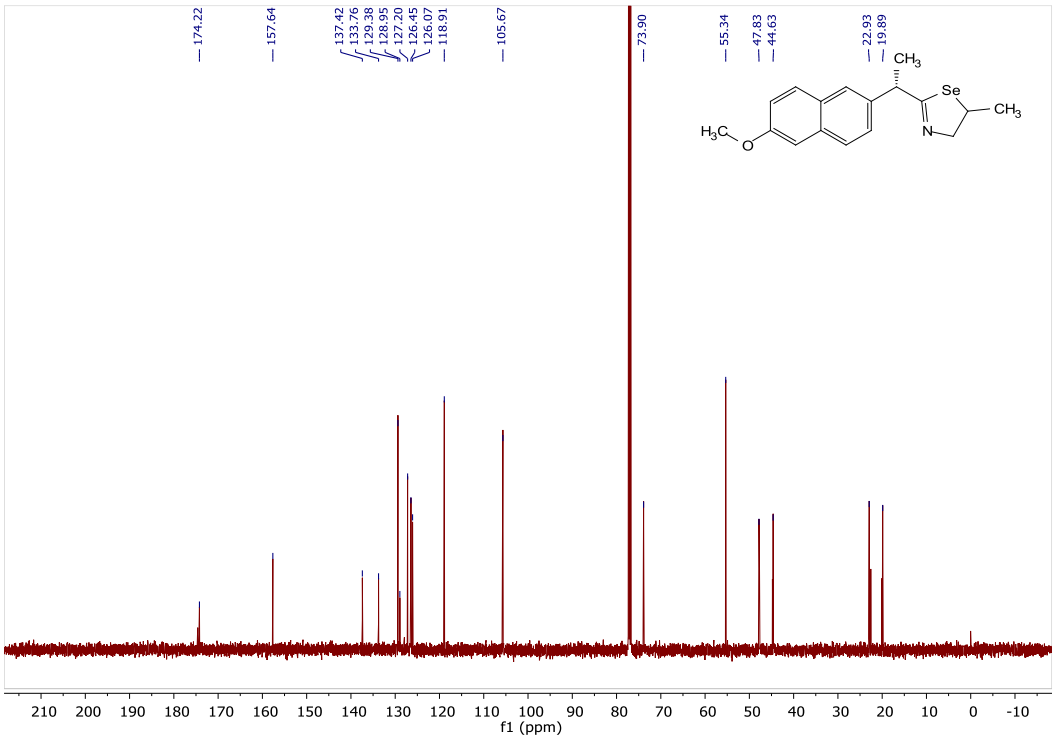


^{77}Se NMR spectrum of compound **2u** ($CDCl_3$, 95 MHz)

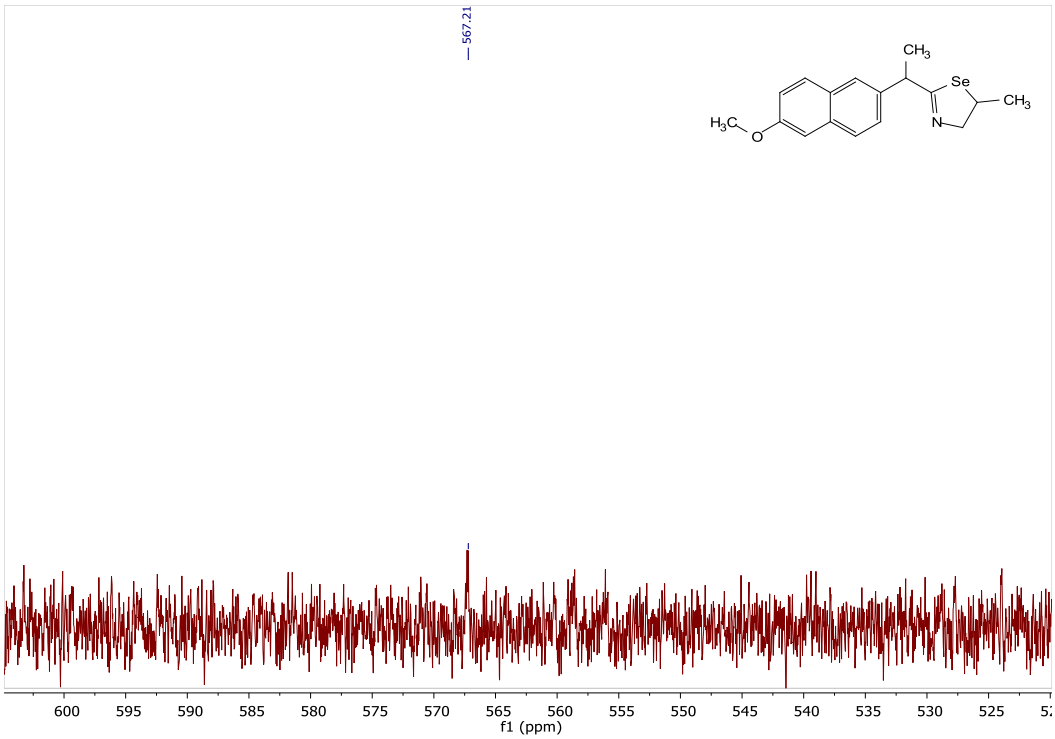
2-(1-(6-methoxynaphthalen-2-yl)ethyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2v**)



^{1}H NMR spectrum of compound **2v** ($CDCl_3$, 500 MHz)

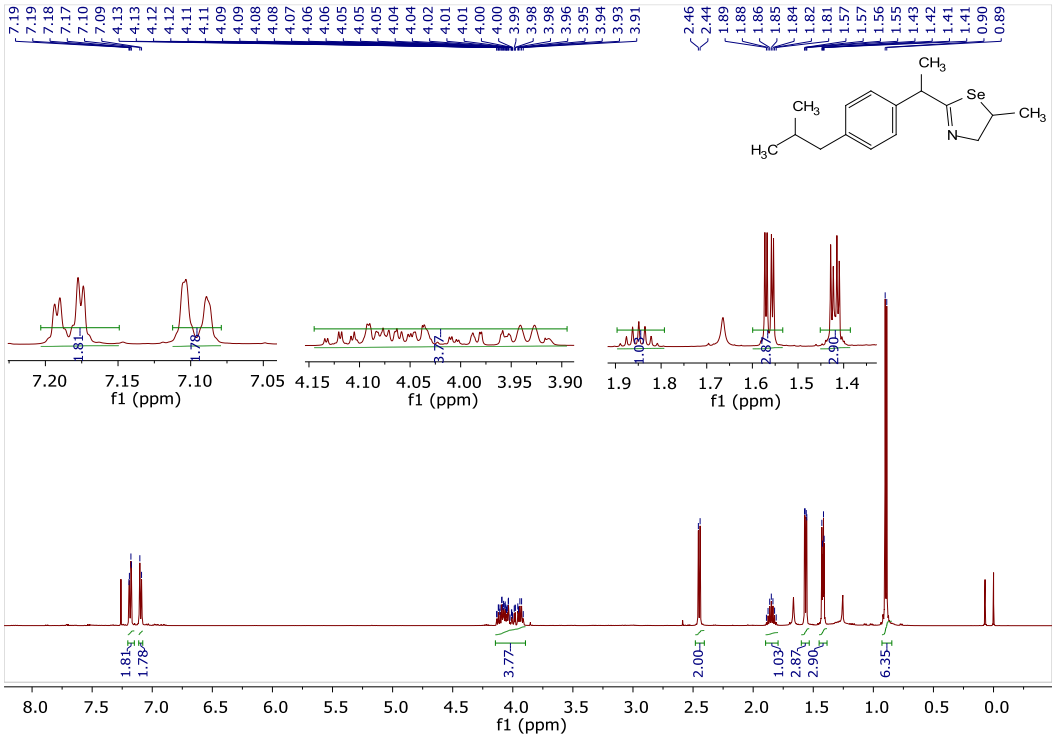


^{13}C NMR spectrum of compound **2v** ($CDCl_3$, 126 MHz)

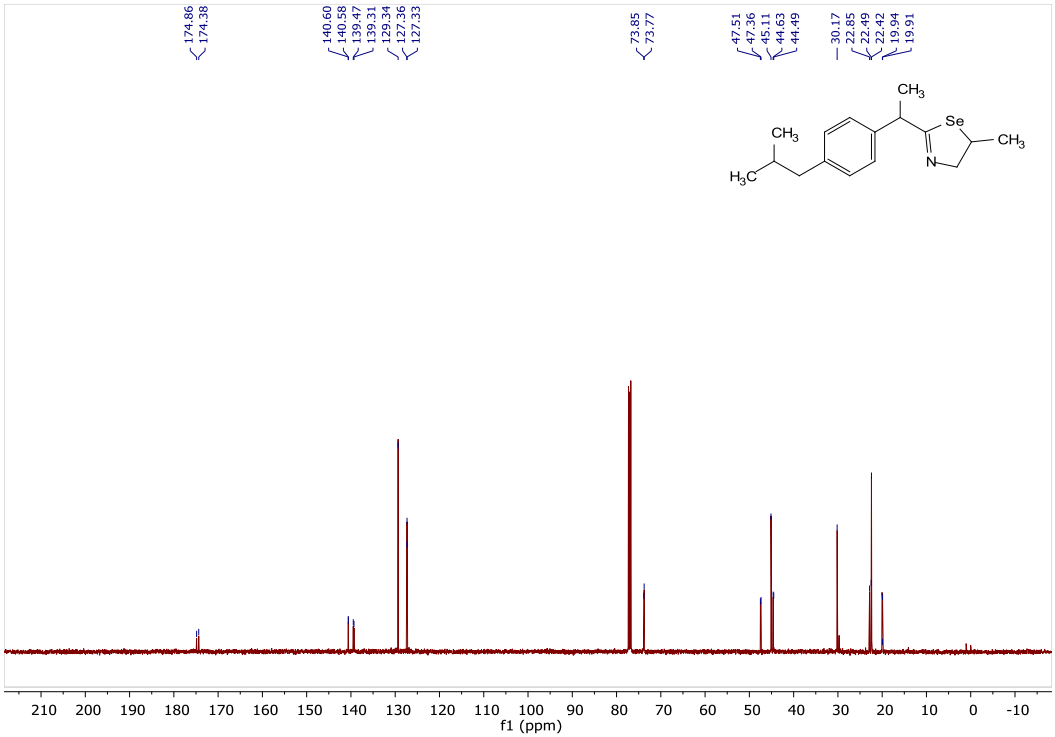


^{77}Se NMR spectrum of compound **2v** ($CDCl_3$, 95 MHz)

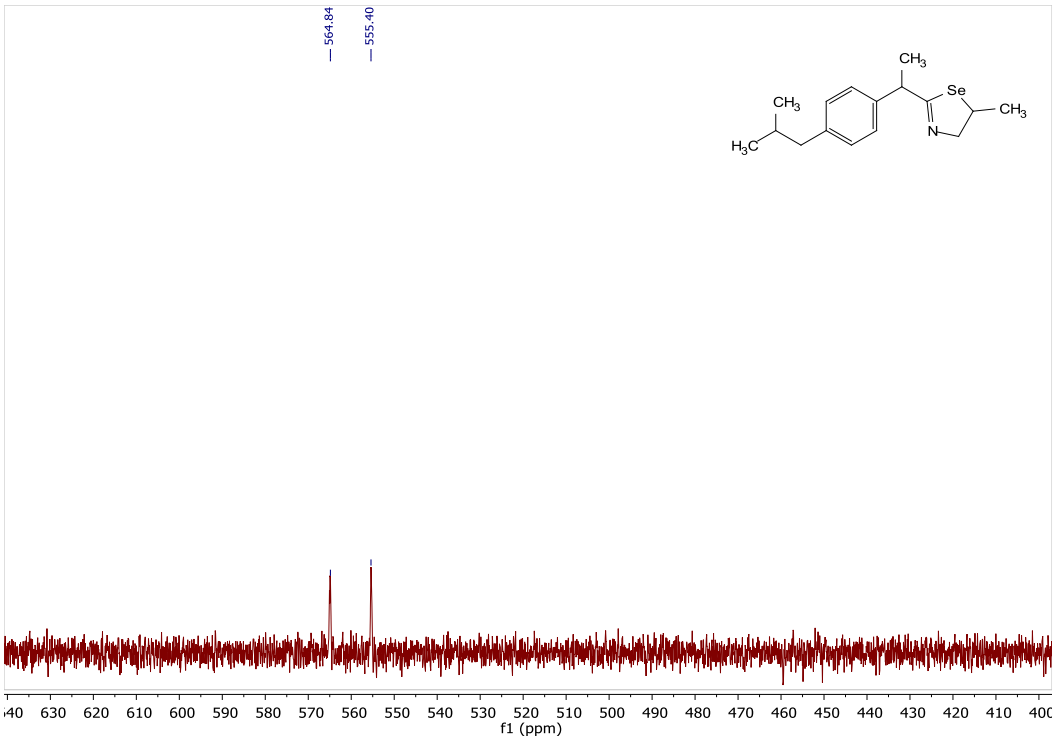
2-(1-(4-isobutylphenyl)ethyl)-5-methyl-4,5-dihydro-1,3-selenazole (**2w**)



^{1}H NMR spectrum of compound **2w** ($CDCl_3$, 500 MHz)

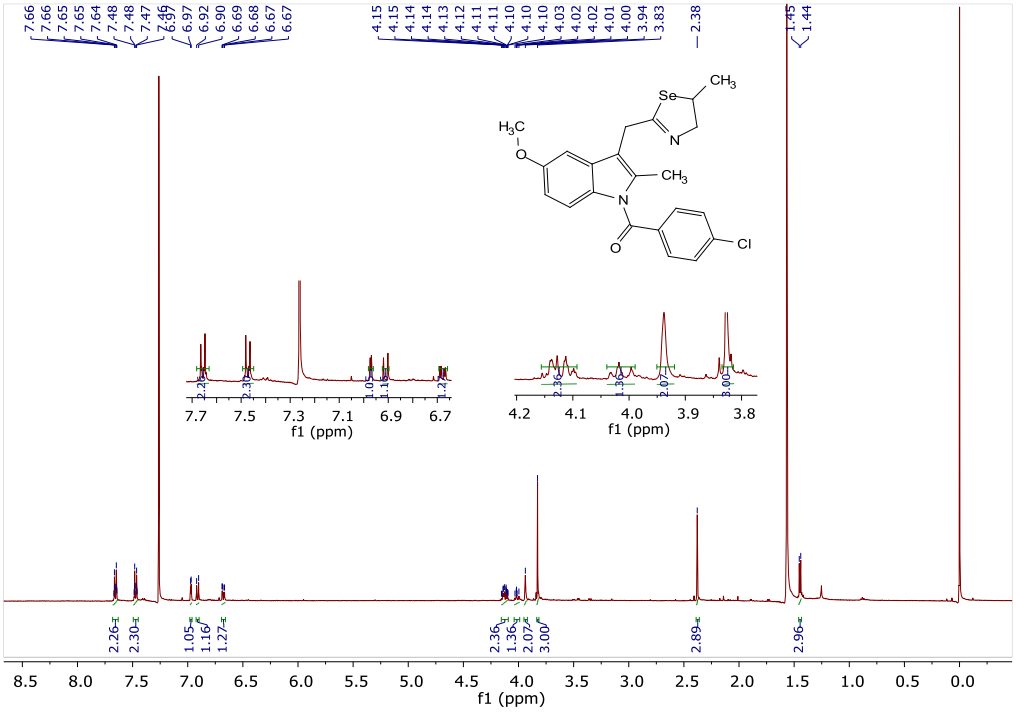


^{13}C NMR spectrum of compound **2w** ($CDCl_3$, 126 MHz)

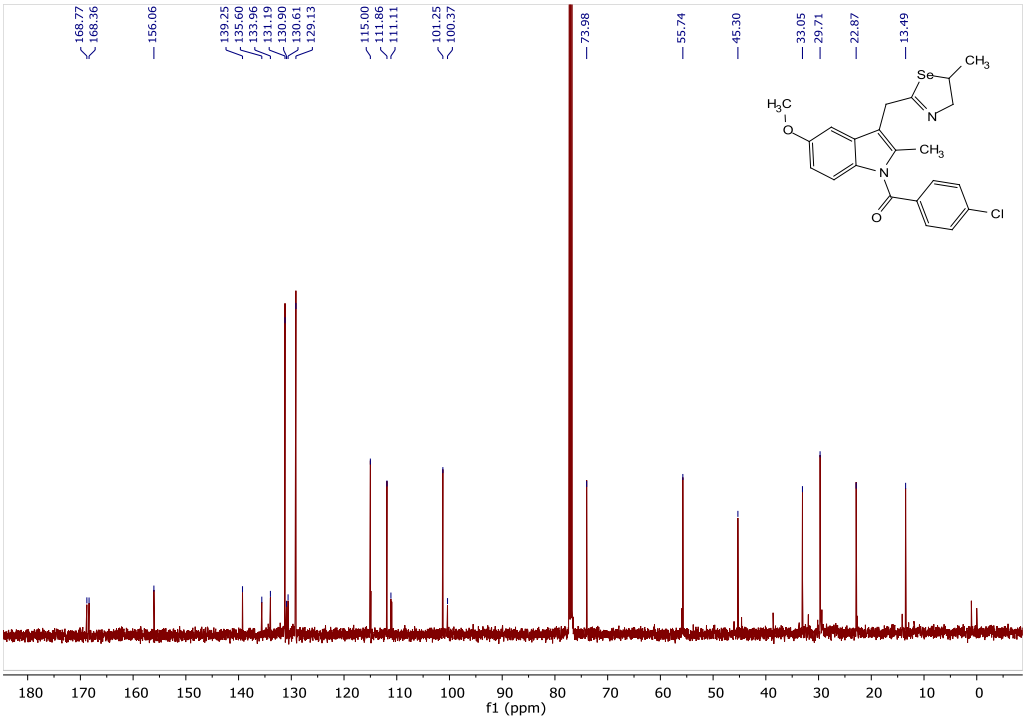


^{77}Se NMR spectrum of compound **2w** ($CDCl_3$, 95 MHz)

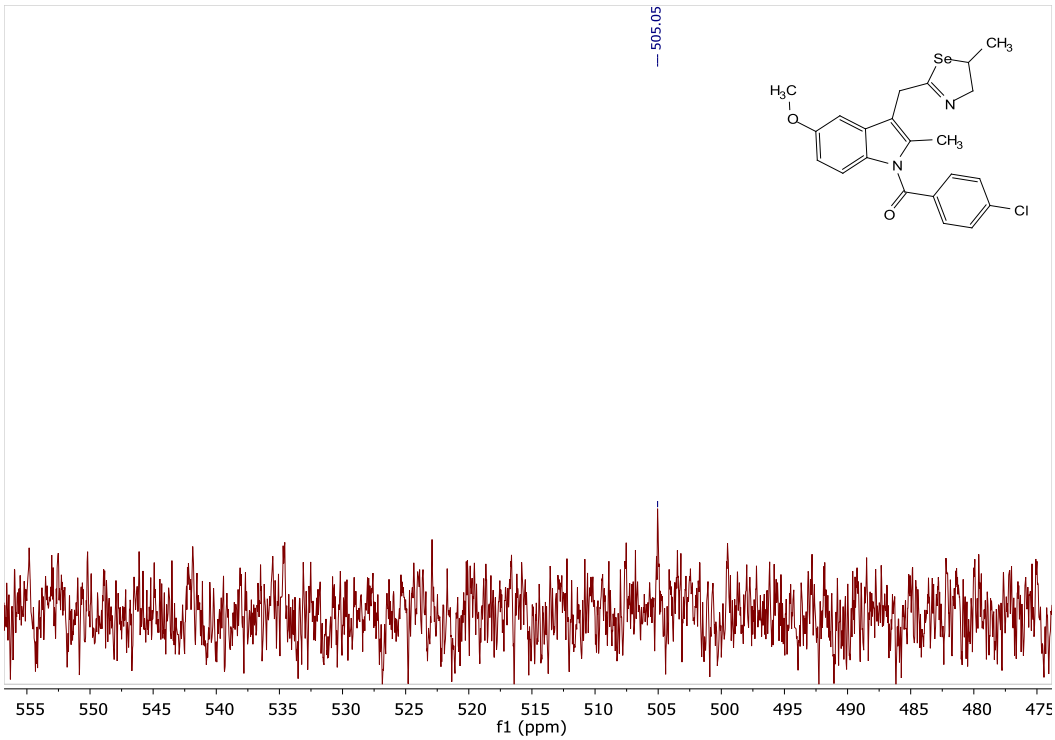
(4-chlorophenyl)(5-methoxy-2-methyl-3-((5-methyl-4,5-dihydro-1,3-selenazol-2-yl)methyl)-1H-indol-1-yl)methanone (**2x**)



^{1}H NMR spectrum of compound **2x** ($CDCl_3$, 500 MHz)



^{13}C NMR spectrum of compound **2x** ($CDCl_3$, 126 MHz)



^{77}Se NMR spectrum of compound **2x** ($CDCl_3$, 95 MHz)

4. Elaborative characterization of compound 2a

The HRMS spectrum showed the presence of the desired $[M + H]^+$ peak at 226.0144 and isotopic distribution (Figure S1). The ^1H NMR spectrum displayed the characteristic peaks: a 3H – doublet at 1.56 ppm (CH_3 group (**a**) adjacent to the CH group) and a broad multiplet at 4.28 ppm (proton attached to the chiral carbon (**b**) and the two diastereotopic protons (**c**) adjacent to nitrogen) (Figure S2). The ^{13}C NMR showed the three aliphatic carbons at 22.87 (**a**), 45.06 (**b**), and 74.72 (**c**) ppm and the quaternary carbon of the selenazoline ring at 166.9 ppm (**d**), corroborating with the spatial arrangement of the carbons (Figure S3). The multiplicity of aliphatic carbons was confirmed by DEPT analysis, wherein DEPT90 displayed a positive peak at 45.06 ppm (chiral CH carbon (**b**)), and DEPT135 displayed two positive peaks at 22.88 (CH_3 (**a**)) and 45.06 ppm (CH (**b**)), one negative peak at 74.70 (CH_2 (**c**)) (Figure S4). Further, a peak at 556.7 ppm was observed in ^{77}Se NMR (Figure S5), which falls in the range reported for the selenazoline selenium atom.[1]

Reference:

1. M. S. Silva, D. Alves, D. Hartwig, R. G. Jacob, G. Perin and E. J. Lenardão, *Asian J. Org. Chem.*, 2021, *10*, 91–128.

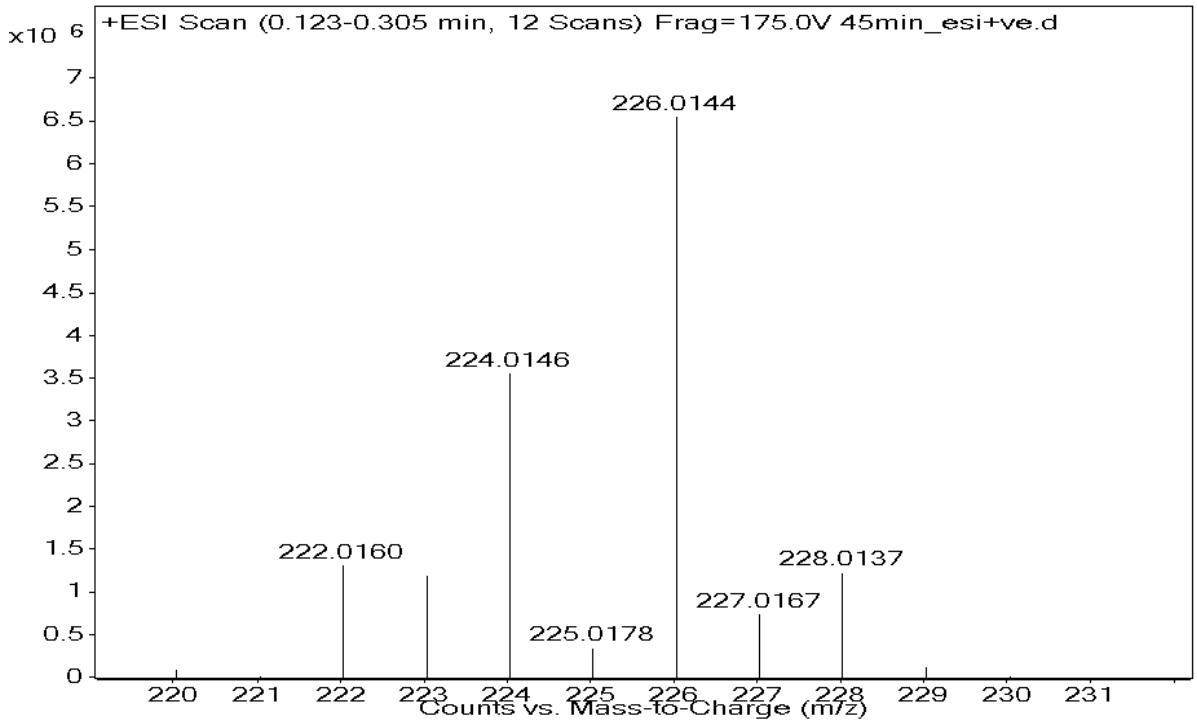


Figure S1. HRMS spectrum of compound **2a**.

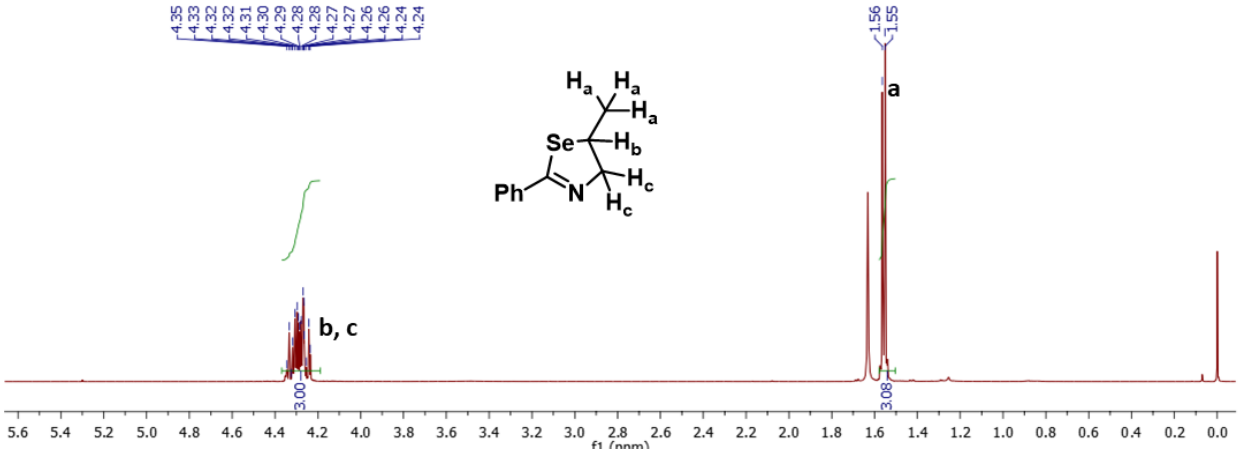


Figure S2. Characteristic peaks in ^{1}H NMR of compound **2a**.

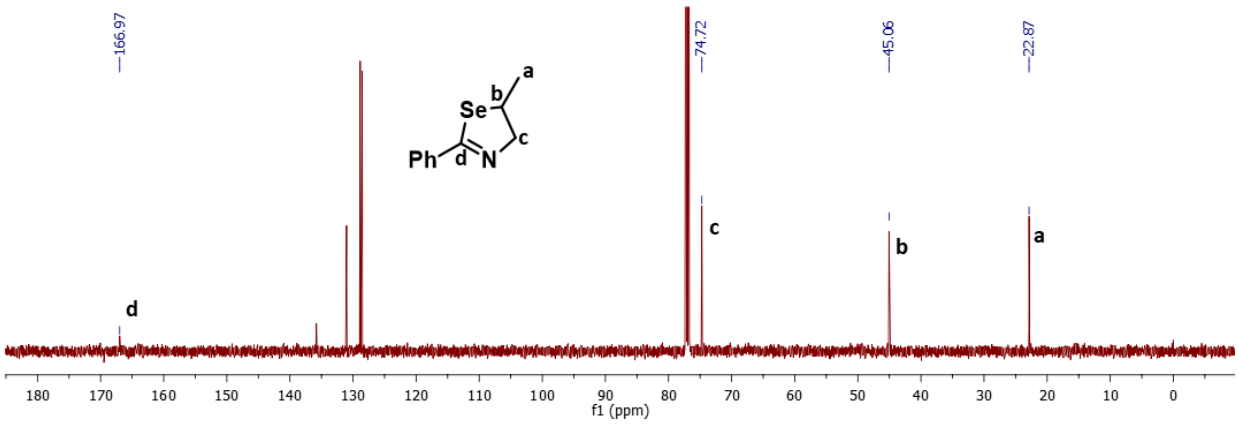


Figure S3. Characteristic peaks in ^{13}C NMR of compound **2a**.

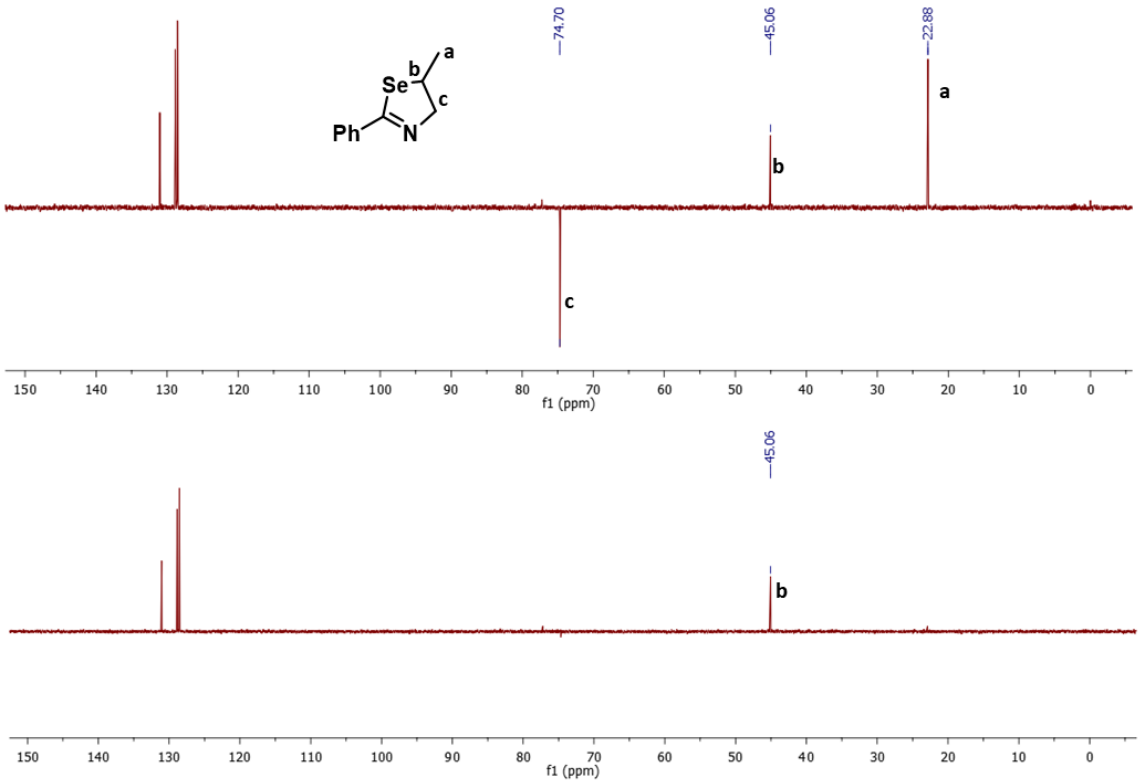


Figure S4. ^{13}C DEPT135 and 90 NMR analysis of compound **2a**.

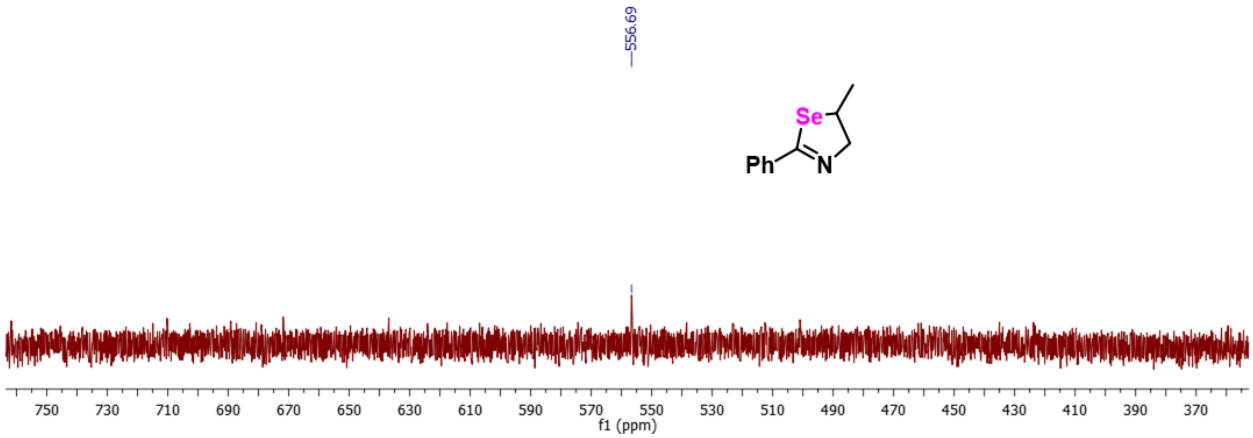


Figure S5. ^{77}Se NMR of compound **2a**.

5. Mechanistic exploration

A) +/- ESI/APCI-MS study (spectral data)

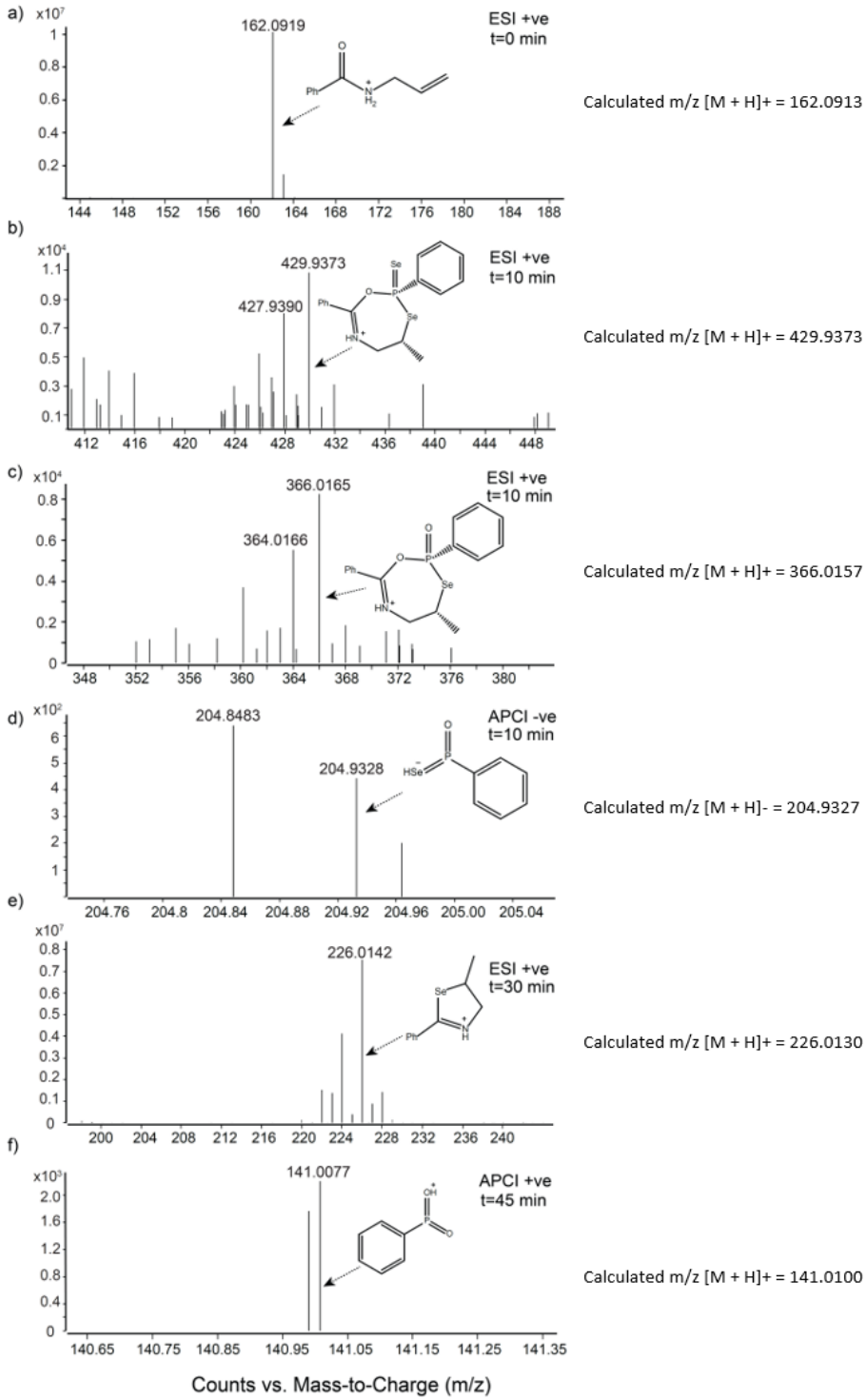


Figure S6. +/- ESI/APCI-MS spectral data of selenation and reductive cyclization of **1a.** The above-mentioned m/z values are the observed $[M+H]^{+/-}$ peaks against the calculated m/z values.

B) ^{31}P NMR study

To proceed with ^{31}P NMR study, the reaction was setup as per the optimized protocol in the microwave reactor. 200 µl of sample was aliquoted at different time intervals of 5, 15, 30 and 45 min and further diluted with $CDCl_3$ to record the NMR right away. As illustrated in figure S7, several peaks were observed downfield to the WR peak. The WR peak was observed at δ = 10.32 in toluene-d_8 and around δ value of 8 in a solvent mixture of xylene and $CDCl_3$, assuming a shift in the δ value with the changing solvent. The downfield appearance of the several peaks indicates the attachment of an electronegative species such as oxygen as postulated in the mechanism (Figure 4, main article), further supporting the mechanism.

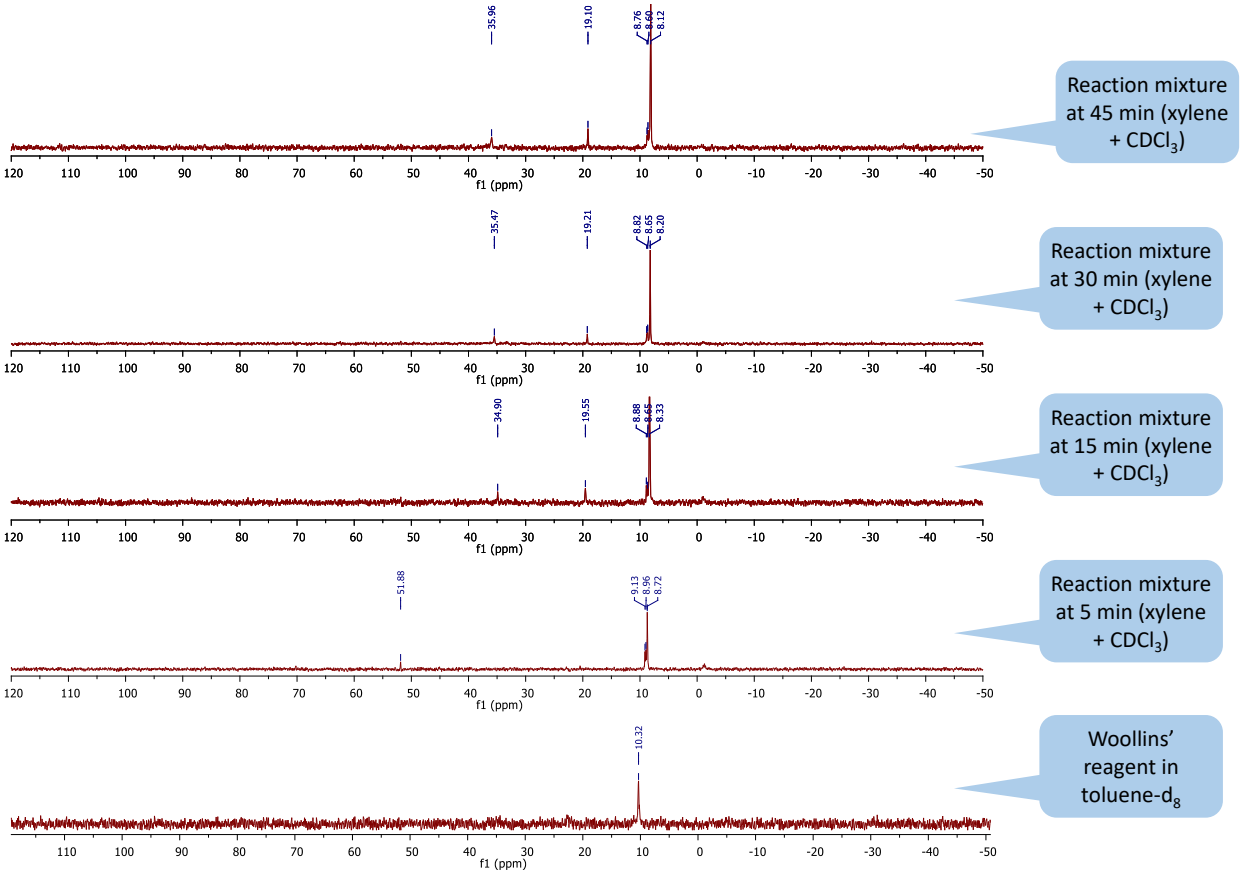


Figure S7. ^{31}P NMR spectra of the Woollins' reagent, and the reaction mixture at different time points.

6.Control experiments

A) Deuterium Exchange Experiment

Substrate **1a** was treated overnight with CD_3OD to replace the amidic hydrogen with deuterium. After evaporation of the excess solvent, deuterated **1a** was subjected to the reaction protocol to get product **2a.** The ^1H NMR exhibited a decrease in the doublet (CH_3 proton) intensity at 1.56 ppm by ~25%, indicating the transfer of the amidic deuterium to the terminal alkene resulting in -CH_2-D. Also, a splitting pattern was observed beside the doublet, might indicate the diastereotopic protons formed owing to the deuteration of the methyl proton (Figure S8). Furthermore, a shift in the aliphatic carbon peaks was observed in the ^{13}C NMR plot. A triplet (*J* = 19.5 Hz) was marked with a shift of 0.20 ppm from 22.90 ppm for C1-D carbon (**a**), a singlet with a shift of 0.08 ppm from 45.07 ppm (**b**) and one with a shift of 0.02 ppm from 74.72 ppm (**c**) was marked for the chiral C2-D and C3-D carbon, respectively (Figure S9). This shift and the splitting pattern imply a deuterated methyl group, inferred from the previously reported data for deuterated carbon signals.[1]

Reference:

1. D. W. Jones and J. D. Shaw, *Magn. Reson. Chem.*, 1985, **23**, 787–789.

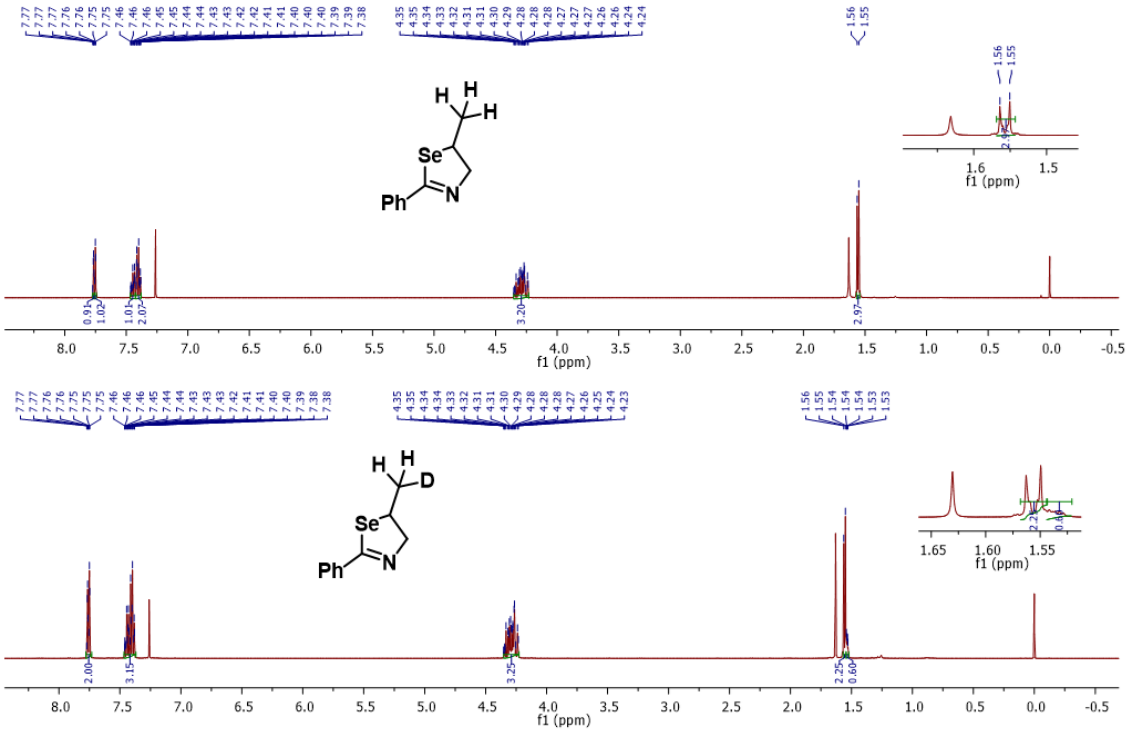


Figure S8. Comparison of the ^{1}H NMR for the deuterium exchange experiment (500 MHz, $CDCl_3$).

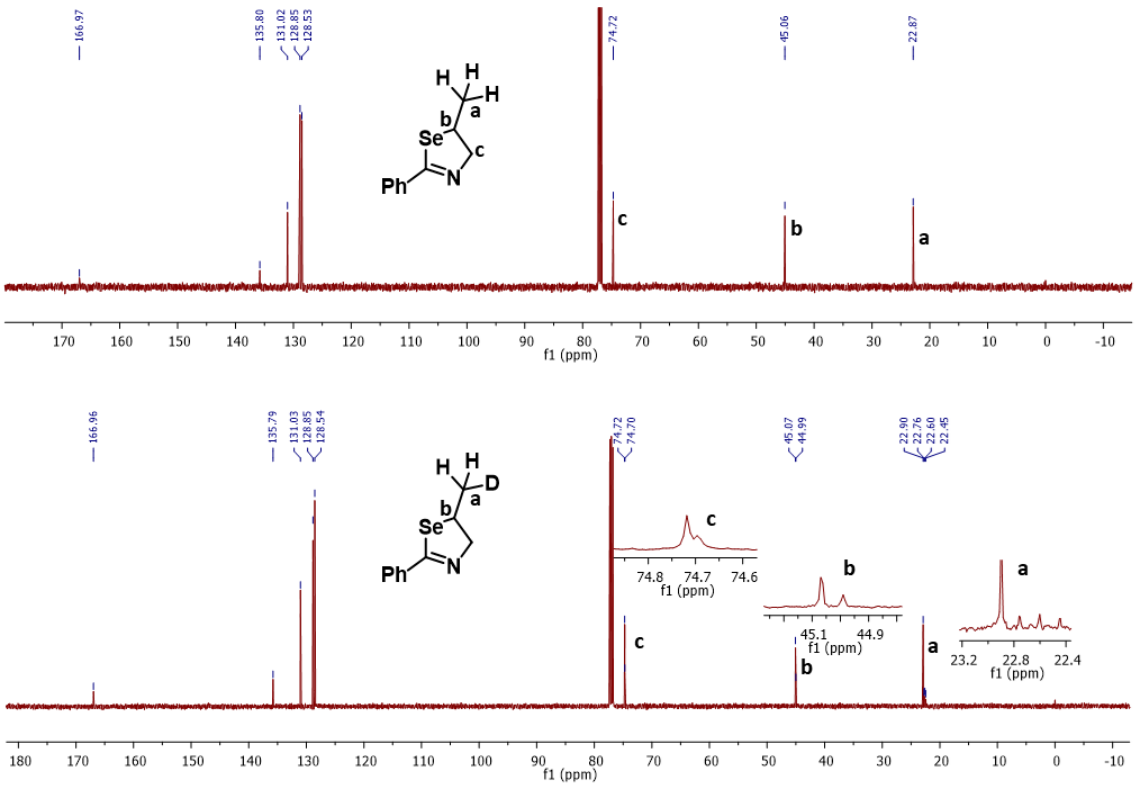
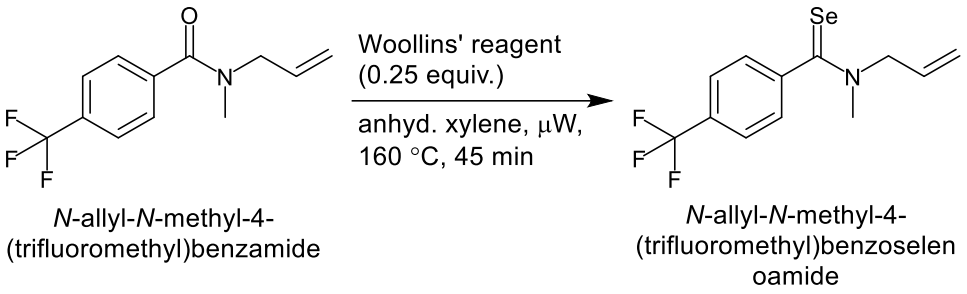


Figure S9. Comparison of the ^{13}C NMR for the deuterium exchange experiment (126 MHz, $CDCl_3$).

B) Fate of the reaction without the amidic N-H proton



N-allyl-*N*-methyl-4-(trifluoromethyl)benzamide

N-allyl-*N*-methyl-4-(trifluoromethyl)benzoselenoamide

Scheme S1. Control experiment for determining the importance of amidic N-H proton.

As a corollary to the above experiment, a reaction was performed with an *N*-allyl-*N*-methyl-4-(trifluoromethyl)benzamide (Scheme S1) wherein the N-H proton was replaced with methyl group using our protocol. As anticipated, it resulted in the selenoamide product rather than the cyclized selenazoline product indicating the importance of the N-H proton in the reaction. ^{1}H, ^{13}C, ^{77}Se NMR and HRMS mass spectra for the selenoamide product is illustrated below (Figure S10 - S13). The two peaks in the ^{77}Se NMR spectrum (Figure S12) for the *S*-cis/trans rotamers lies in the range stipulated for selenoamides.[1]

1. J. Bethke, K. Karaghiosoff and L. A. Wessjohann, *Tetrahedron Lett.*, 2003, **44**, 6911–6913.

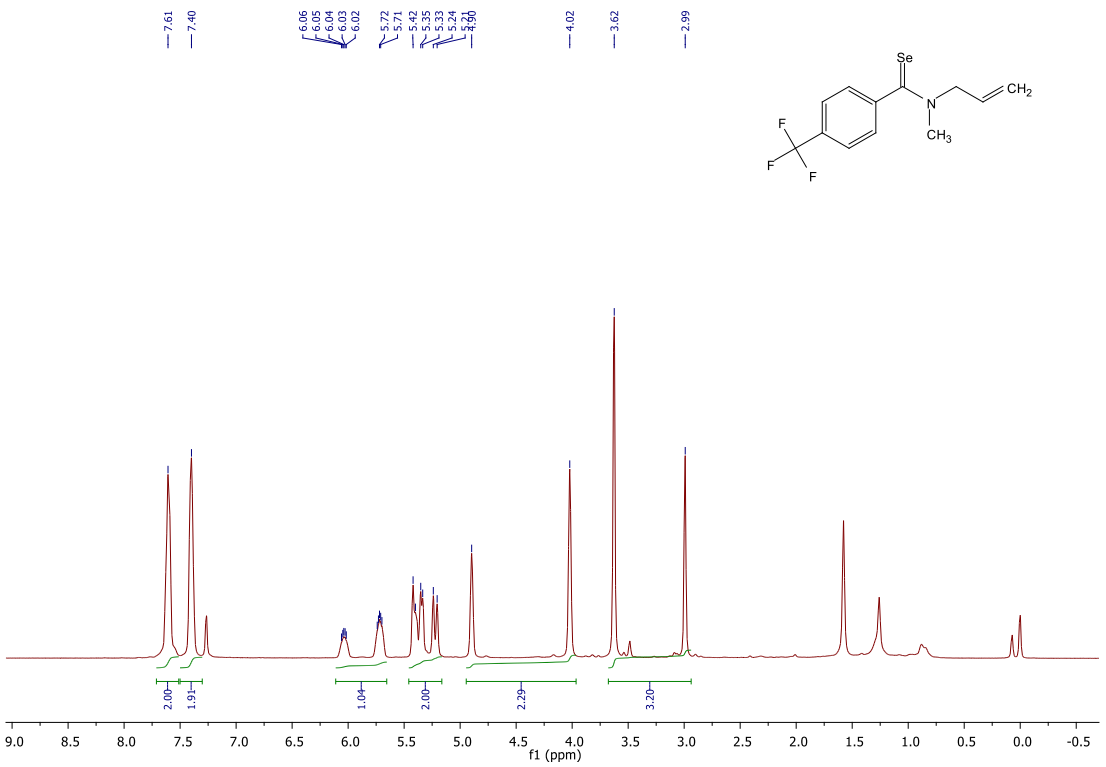


Figure S10. ^{1}H NMR spectrum of *N*-allyl-*N*-methyl-4-(trifluoromethyl)benzoselenoamide.

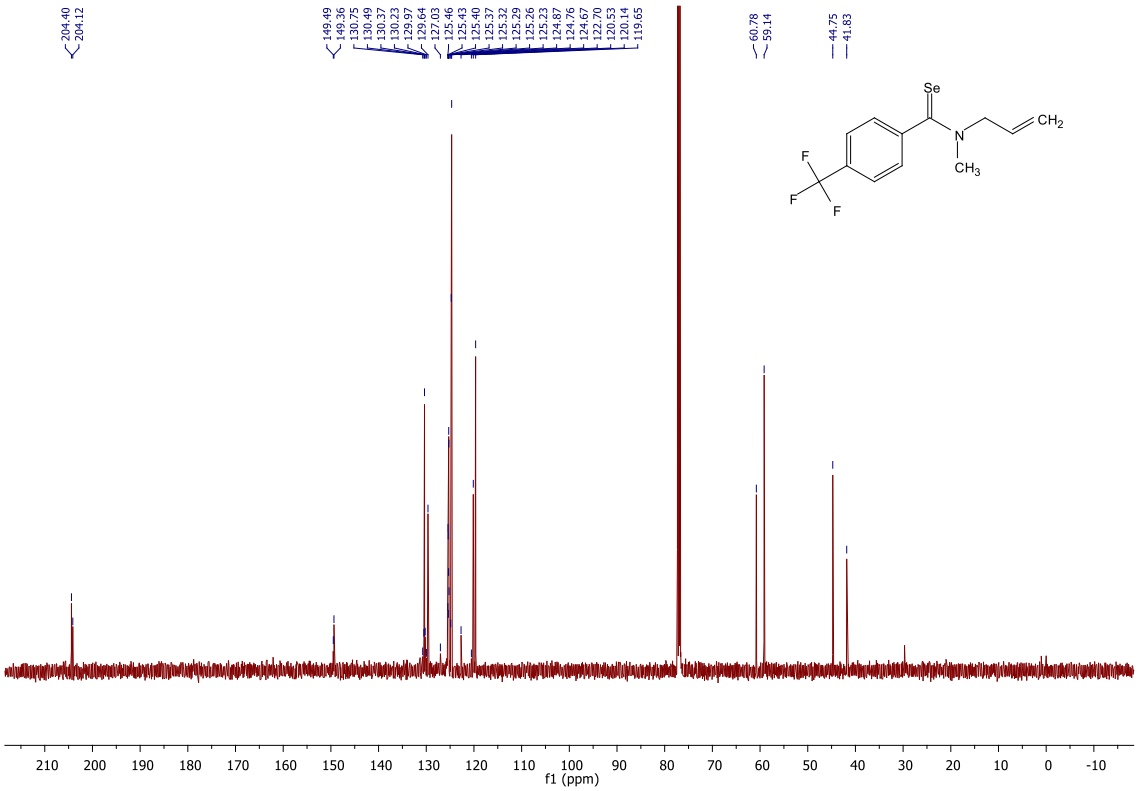


Figure S11. ^{13}C NMR spectrum of *N*-allyl-*N*-methyl-4-(trifluoromethyl)benzoselenoamide

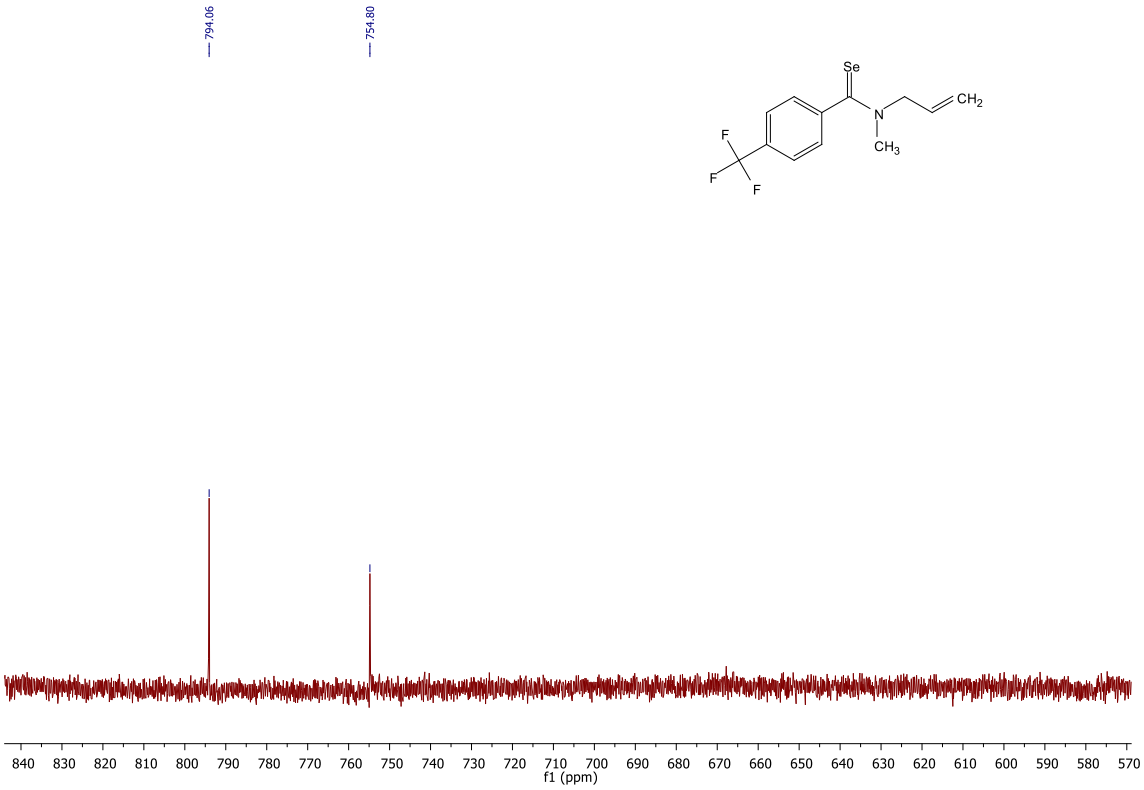


Figure S12. ^{77}Se NMR spectrum of *N*-allyl-*N*-methyl-4-(trifluoromethyl)benzoselenoamide

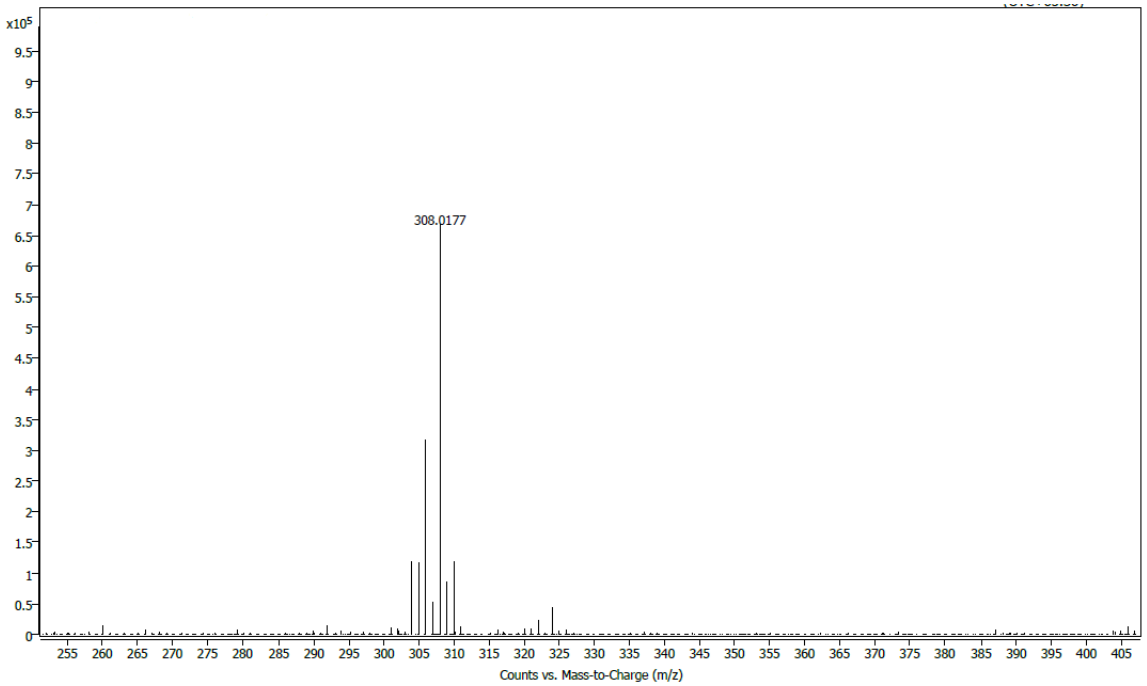


Figure S13. HRMS (ESI-TOF) $[M+H]^+$ calcd for $C_{12}H_{12}F_3NSe$ 308.0160, found 308.0177.

4. Crystal Data

X-ray data for the compounds **2s** were collected at room temperature on a Bruker D8 QUEST instrument with an IμS Mo micro source (λ = 0.7107 A) and a PHOTON-100 detector. The raw data frames were reduced and corrected for absorption effects using the Bruker Apex 3 software suite programs.[1] The structure was solved using intrinsic phasing method[2] and further refined with the SHELXL[2,3] program and expanded using Fourier techniques. Anisotropic displacement parameters were included for all non-hydrogen atoms. All H atoms were positioned geometrically and treated as riding on their parent C atoms [C-H = 0.93-0.97 Å, and Uiso(H) = 1.5Ueq(C) for methyl H or 1.2Ueq(C) for other H atoms].

1. Bruker (2016). APEX3, SAINT and SADABS. Bruker AXS, Inc., Madison, Wisconsin, USA.

2. Sheldrick G. M. (2015).ActaCrystallogr C71: 3-8.

3. Muller, P, Herbst-Imer, R, Spek, A. L, Schneider, T. R, and Sawaya, M. R. Crystal Structure Refinement: A Crystallographer's Guide to SHELXL. Muller, P. Ed. 2006 Oxford University Press: Oxford, New York, pp. 57–91.

A single crystal of **2s** was grown by gradual evaporation of pentane layered over CH_2Cl_2 solution of the compound at a cold temperature. The absolute structure of **2s** is shown in figure S14 and it unambiguously confirms the structure as predicted from the NMR experiments. The compound crystallizes in a monoclinic system, space group P 1 21/n 1 with Z = 8. The structure **2s** has two independent molecules in the asymmetric unit. The crystal data and structure refinement data are detailed in table S1. The C-N bond length of C4 – N4 (C16 – N1) was measured as 1.288 (1.309) Å, which indicates its double bond character. The other bond lengths, C4 – Se2 (C16 – Se1), C2 – Se2 (C14 – Se1), C3 – C2 (C14 – C15), and N4 – C3 (N1 – C15), range from 1.433 to 1.947 Å indicate their single bond character (Table S2).

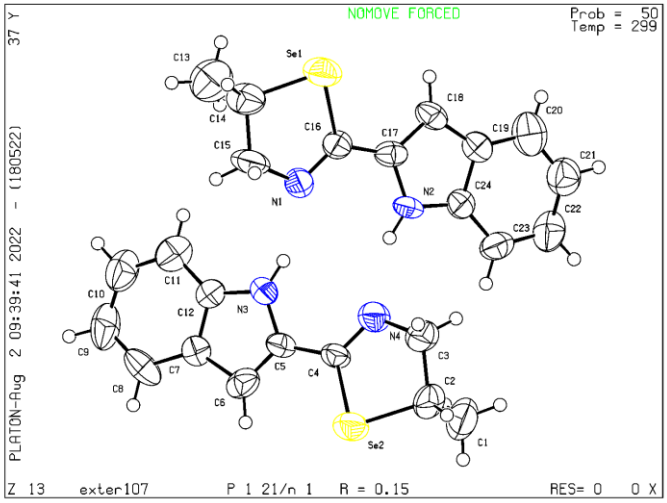


Figure S14. ORTEP drawing of the compound **2s** showing thermal ellipsoids at the 50% probability level (CCDC deposition number 2218367).

Table S1. Crystal data and structure refinement data of compound **2s**

Formula	$C_{12}H_{12}N_2Se$
Formula weight	263.20
Wavelength	0.71073
Temperature	299 K
Crystal system	Monoclinic
Crystal color	Metallic yellowish yellow
Space group	P 1 21/n 1
a (Å)	14.9055 (7)
b (Å)	11.0509 (5)
c (Å)	14.9065 (7)
α (°)	90
β (°)	104.625
γ (°)	90
Volume	2375.8
Z	8
Density, g cm^{-3}	1.472
Absorption coefficient (μ) $(mm)^{-1}$	3.130
F (000)	1056.0
Reflections used.	8487
Independent reflections	4984
Completeness to theta = 26.32°	99.57%
Final R indices	R1 = 0.1466, wR2 = 0.3745
R indices (all data)	R1 = 0.2186, wR2 = 0.4123
GoF (S)	1.036

Table S2. Selected bond distances (Å), angles (°) for compound **2s**

Atoms involved	Measurement	Atoms involved	Measurement
C16 – N1	1.309 (2)	C4 – N4	1.288 (2)
C16 – Se1	1.897 (1)	C4 – Se2	1.918 (1)
C14 – Se1	1.947 (2)	C2 – Se2	1.923 (2)
C14 – C15	1.554 (3)	C3 – C2	1.499 (3)
N1 – C15	1.433 (2)	N4 – C3	1.471 (2)
N1 – C16 – Se1	114.9 (1)	N4 – C4 – Se2	117.0 (1)
C16 – N1 – C15	114.34 (1)	C4 – N4 – C3	112.1 (1)
N1 – C15 – C14	112.3 (2)	N4 – C3 – C2	110.9 (2)
C15 – C14 – Se1	101.9 (1)	C3 – C2 – Se2	105.5 (1)
C14 – Se1 – C16	85.9 (7)	C4 – Se2 – C2	83.5 (8)
N1 – C16 – C17 – N2	7.5 (2)	N3 – C5 – C4 – N4	12.3 (2)
Se1 – C16 – C17 – C18	16.3 (2)	Se2 – C4 – C5 – C6	12.1 (2)

5. HPLC analysis

The proposed diastereomers were separated on the Waters e2695 alliance module equipped with 2998 PDA detector and Empower 3 software. The separation was achieved using reverse phase linear gradient method (T_{min}/B; T_0/10; T_{20}/90) with 0.1 % formic acid-aqueous phase and acetonitrile as organic phase on an Xbridge C18 5µm 4.6 x 250mm column.

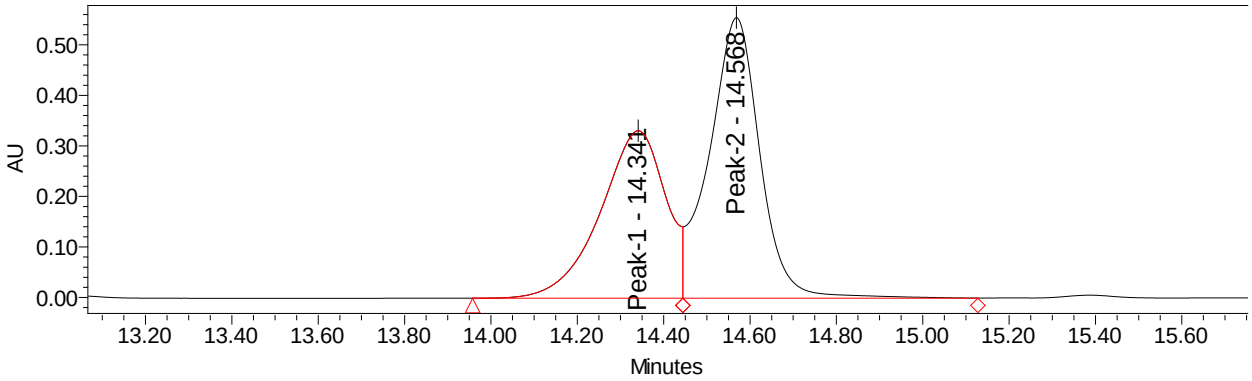


Figure S15. HPLC chromatogram for the proposed diastereomeric mixture of compound **2u.**

Table S3. Percentage area calculation of the peaks obtained in the HPLC chromatogram

	Name	Retention Time	Area	% Area	Height
1	Peak-1	14.341	3470419	43.29	331331
2	Peak-2	14.568	4546462	56.71	555367

6. MTT Assay

MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) is a water-soluble salt that converts into water-insoluble formazan crystal by mitochondrial succinate dehydrogenase enzyme, where MTT assay is a colorimetric assay, thereby measures the reduction of MTT. Metabolically, active cells can reduce the MTT in the cell mitochondria, and the level of activity indicates the cell viability in cytotoxic assay and cell proliferation. Briefly, cells were seeded in 96-well plates at a density of 1000 to 4000 cells per well in 100 µl of complete medium and allowed to grow overnight for attachment onto the wells. After the media was replaced with fresh media, the cells were treated with the selenazoline compounds at 20 micromolar concentrations for % inhibition calculations, and at varying concentrations for dose-response curves determining the IC_{50} values. After treatment, MTT (0.5 mg/ml) was added and incubated for 3 – 4 hr, after which absorbance was recorded at 570 nm.

Table S4. Preliminary antiproliferative activity of the compounds against the standard drug, 5-fluorouracil

Sr. No.	Compound	% Inhibition at 20 µM concentration[a]		IC_{50} values (µM)	
		A549	HCT-116	A549	HCT-116
1	**2a**	81.26	49.45	3.34 ± 0.02	15.25 ± 4.41
2	**2b**	< 20	< 20	N.D.	N.D.
3	**2c**	< 20	< 20	N.D.	N.D.
4	**2d**	24.05	< 20	N.D.	N.D.
5	**2e**	< 20	< 20	N.D.	N.D.
6	**2f**	< 20	23.03	N.D.	N.D.
7	**2g**	28.56	< 20	N.D.	N.D.
8	**2h**	< 20	< 20	N.D.	N.D.
9	**2i**	< 20	< 20	N.D.	N.D.
10	**2j**	< 20	26.02	N.D.	N.D.
11	**2k**	< 20	< 20	N.D.	N.D.
12	**2l**	< 20	< 20	N.D.	N.D.
13	**2m**	< 20	< 20	N.D.	N.D.
14	**2n**	< 20	< 20	N.D.	N.D.
15	**2o**	< 20	30.75	N.D.	N.D.
16	**2r**	< 20	26.12	N.D.	N.D.
17	**2s**	< 20	24.43	N.D.	N.D.
18	**2t**	< 20	< 20	N.D.	N.D.
19	**2u**	48.78	26.07	N.D.	N.D.
21	**2v**	77.97	41.19	7.98 ± 0.12	28.9 ± 9.25
22	**5-Fluorouracil**	30.94	47.08	21.39 ± 0.20	28.52 ± 5.55

[a]Data represents the average of three independent experiments (n =3). N.D. = Not determined