Supporting Information

Ring-Opening Selenation of Cyclobutanols: Synthesis of γ-Selenylated Alkyl Ketones through C-C Bond Cleavage

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1. General experimental details

All reactions were maintained under air unless otherwise stated. Commercially available reagents were used without further purification. Infrared (FT-IR) spectra were recorded on a BRUKER VERTEX 70, ν_{max} in cm^{-1}. ^{1}H-NMR spectra were recorded on a BRUKER AVANCE III HD (400 MHz) spectrometer. Chemical shifts are reported in ppm from tetramethylsilane with the solvent resonance as internal standard ($CDCl_3$: δ 7.26). Data are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quadruplet, br = broad, m = multiplet), coupling constants (Hz) and integration. ^{13}C-NMR spectra were recorded on a BRUKER AVANCE III HD (100 MHz) spectrometer with complete proton decoupling. Chemical shifts are reported in ppm from tetramethylsilane with the solvent resonance as the internal standard ($CDCl_3$: δ 77.16). ^{19}F-NMR spectra were recorded on a BRUKER AVANCE III HD (376 MHz) spectrometer. Mass spectra were measured with an Agelent Technologies 6120 Quadrupole LC/MS. High resolution mass spectrometry (HRMS) were measured with a GCT Premier^{TM} and BRUKER micrOTF-Q III. Melting points were measured using INESA WRR and values are uncorrected.

Tertiary cyclobutanols were prepared by the addition of Grignard reagent to the corresponding cyclobutanones according to the reported procedure.[1]

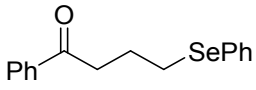
2. General procedure for ring-opening selenation of cyclobutanols

Cyclobutanol **1** (0.20 mmol, 1.0 equiv), $Mn(OAc)_3{\cdot}2H_2O$ (0.40 mmol, 2.0 equiv), and PhSeSePh (0.30 mmol, 1.5 equiv) were loaded in a flask which was subjected to evacuation/

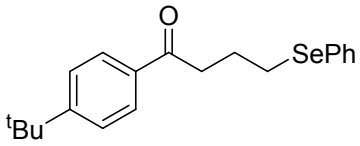
[1] (a) B. M. Casey, C. A. Eakin and R. A. Flowers, II, *Tetrahedron Lett.* 2009, **50,** 1264; (b) H.-J. Xu, F.-F. Zhu, Y.-Y. Shen, X. Wan and Y.-S. Feng, *Tetrahedron* 2012, **68**, 4145; (c) D. Rosa, A. Chtchemelinine and A. Orellana, *Synthesis* 2012, **12**, 1885.

flushing with nitrogen for three times. Toluene (1.5 mL) was added to the mixture via syringe and the mixture was then stirred at 70 °C (or 85 °C) until the starting material had been consumed as determined by TLC. The mixture was extracted with ethyl acetate (3 x 10 mL). The combined organic extracts were washed by brine, dried over Na_2SO_4, filtered, concentrated under vacuum, and purified by flash column chromatography on silica gel (ethyl acetate/petroleum ether) to give the product **2**.

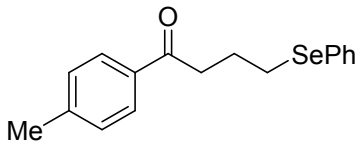
3. Characterization of products



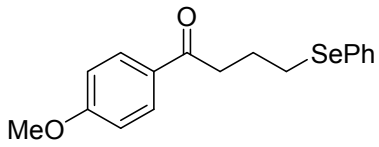
2a: 48.5 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87-7.83 (m, 2H), 7.50-7.40 (m, 3H), 7.39-7.34 (m, 2H), 7.20-7.13 (m, 3H), 3.04 (t, J = 7.2 Hz, 2H), 2.94 (t, J = 7.2 Hz, 2H), 2.11-2.02 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 136.4, 132.6, 132.1, 129.5, 128.6, 128.1, 127.6, 126.4, 37.6, 27.0, 24.0. FT-IR: ν (cm^{-1}) 2987, 2971, 2901, 1682, 1578, 1448, 1219, 1073. HRMS [ESI] calcd for $C_{16}H_{17}OSe$ $[M+H]^+$ 305.0445, found 305.0432.



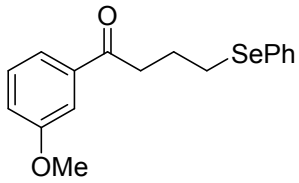
2b: 52.4 mg, yellow solid, m.p. 46-49 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.78 (m, 2H), 7.45-7.41 (m, 2H), 7.41-7.37 (m, 2H), 7.21- 7.13 (m, 3H), 3.03 (t, J = 7.2 Hz, 2H), 2.95 (t, J = 7.2 Hz, 2H), 2.11-2.02 (m, 2H), 1.27 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.6, 156.3, 133.8, 132.1, 129.5, 128.6, 127.5, 126.4, 125.0, 37.5, 34.6, 30.6, 27.0, 24.1. FT-IR: ν (cm^{-1}) 2959, 1674, 1603, 1476, 1402, 1302, 1182, 1022. HRMS [ESI] calcd for $C_{20}H_{25}OSe$ $[M+H]^+$ 361.1071, found 361.1073.



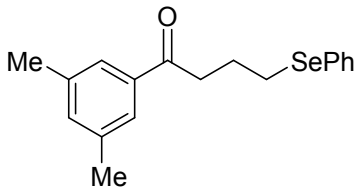
2c: 49.5 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 (d, *J* = 8.4 Hz, 2H), 7.45-7.41 (m, 2H), 7.21-7.14 (m, 5H), 3.02 (t, *J* = 7.2 Hz, 2H), 2.94 (t, *J* = 7.2 Hz, 2H), 2.33 (s, 3H), 2.11-2.01 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.6, 143.4, 133.9, 132.1, 129.5, 128.8, 128.6, 127.7, 126.4, 37.5, 27.0, 24.1, 21.2. FT-IR: ν (cm^{-1}) 2921, 2851, 1679, 1606, 1477, 1437, 1224, 1179. HRMS [ESI] calcd for $C_{17}H_{19}OSe$ $[M+H]^+$ 319.0601, found 319.0593.



2d: 47.9 mg, colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86-7.81 (m, 2H), 7.45-7.40 (m, 2H), 7.21-7.13 (m, 3H), 6.87-6.81 (m, 2H), 3.79 (s, 3H), 2.99 (t, *J* = 7.2 Hz, 2H), 2.94 (t, *J* = 7.2 Hz, 2H), 2.11-2.02 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.5, 163.0, 132.1, 129.8, 129.6, 129.5, 128.6, 126.3, 113.2, 55.0, 37.2, 27.0, 24.2. FT-IR: ν (cm^{-1}) 2931, 2838, 1672, 1598, 1575, 1509, 1257, 1224, 1168. HRMS [ESI] calcd for $C_{17}H_{19}O_2Se$ $[M+H]^+$ 335.0550, found 335.0552.

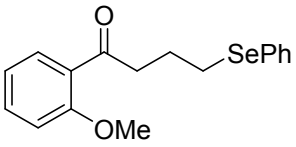


2e: 56.5 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44-7.39 (m, 3H), 7.39-7.36 (m, 1H), 7.26 (dd, *J* = 8.0, 8.0 Hz, 1H), 7.18-7.12 (m, 3H), 7.01 (ddd, *J* = 8.0, 2.4, 0.8 Hz, 1H), 3.75 (s, 3H), 3.02 (t, *J* = 7.2 Hz, 2H), 2.93 (t, *J* = 7.2 Hz, 2H), 2.10-2.01 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.7, 159.4, 137.7, 132.1, 129.5, 129.1, 128.6, 126.4, 120.2, 119.1, 111.8, 55.0, 37.7, 26.9, 24.1. FT-IR: ν (cm^{-1}) 2958, 1683, 1580, 1429, 1255, 1022. HRMS [ESI] calcd for $C_{17}H_{19}O_2Se$ $[M+H]^+$ 335.0550, found 335.0549.

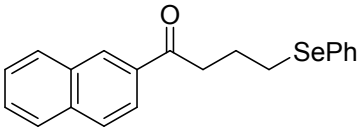


2f: 60.0 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47-

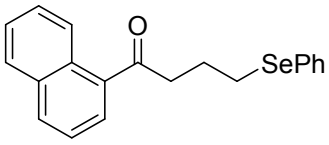
7.41 (m, 4H), 7.20-7.13 (m, 3H), 7.11 (s, 1H), 3.01 (t, *J* = 7.2 Hz, 2H), 2.94 (t, *J* = 7.2 Hz, 2H), 2.28 (s, 6H), 2.11-2.00 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.4, 137.7, 136.5, 134.2, 132.1, 129.6, 128.6, 126.4, 125.4, 37.7, 27.0, 24.1, 20.8. FT-IR: ν (cm^{-1}) 2918, 1679, 1604, 1437, 1188. HRMS [ESI] calcd for $C_{18}H_{21}OSe$ $[M+H]^+$ 333.0758, found 333.0755.



2g: 47.8 mg, yellow oil. 1H NMR (400 MHz, CDCl3) δ 7.58 (dd, *J* = 7.6, 1.6 Hz, 1H), 7.43-7.33 (m, 3H), 7.19-7.09 (m, 3H), 6.91 (dd, *J* = 7.6, 7.6 Hz, 1H), 6.86 (d, *J* = 8.4 Hz, 1H), 3.78 (s, 3H), 3.03 (t, *J* = 7.2 Hz, 2H), 2.91 (t, *J* = 7.2 Hz, 2H), 2.07-1.97 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 201.3, 158.0, 133.0, 131.9, 129.9, 129.8, 128.6, 127.8, 126.2, 120.2, 111.1, 55.0, 43.0, 27.0, 24.4. FT-IR: ν (cm^{-1}) 2987, 2970, 2901, 1682, 1580, 1428, 1254, 1066. HRMS [ESI] calcd for $C_{17}H_{19}O_2Se$ $[M+H]^+$ 335.0550, found 335.0560.

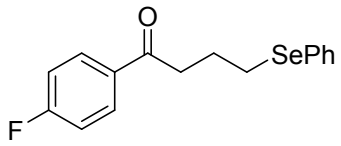


2h: 65.0 mg, white solid, m.p. 68-70 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.35 (s, 1H), 7.92 (dd, *J* = 8.4, 1.6 Hz, 1H), 7.86 (d, *J* = 8.0 Hz, 1H), 7.82-7.77 (m, 2H), 7.54-7.42 (m, 4H), 7.20-7.12 (m, 3H), 3.17 (t, *J* = 7.2 Hz, 2H), 2.98 (t, *J* = 7.2 Hz, 2H), 2.17-2.08 (m,2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.3, 135.6, 134.2, 132.6, 132.5, 130.0, 129.7, 129.6, 129.1, 128.4, 127.8, 126.9, 126.8, 123.8, 38.1, 27.5, 24.7. FT-IR: ν (cm^{-1}) 2987, 2972, 2901, 1667, 1394, 1303, 1057. HRMS [ESI] calcd for $C_{20}H_{19}OSe$ $[M+H]^+$ 355.0601, found 355.0596.

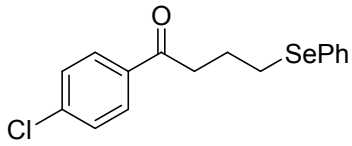


2i: 64.4 mg, brown oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (d, *J* = 8.4 Hz, 1H), 7.90 (d, *J* = 8.0 Hz, 1H), 7.79 (dd, *J* = 8.0, 1.2 Hz,

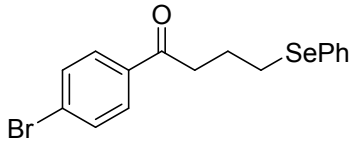
1H), 7.75 (dd, *J* = 7.2, 1.2 Hz, 1H), 7.53-7.44 (m, 2H), 7.44-7.37 (m, 3H), 7.18-7.12 (m, 3H), 3.13 (t, *J* = 7.2 Hz, 2H), 2.97 (t, *J* = 7.2 Hz, 2H), 2.17-2.07 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.2, 135.4, 133.5, 132.2, 132.1, 129.6, 129.5, 128.6, 128.0, 127.4, 127.0, 126.4, 126.0, 125.3, 123.9, 41.1, 26.9, 24.4. FT-IR: ν (cm^{-1}) 2923, 1677, 1577, 1507, 1476, 1461, 1229, 1072. HRMS [ESI] calcd for $C_{20}H_{19}OSe$ $[M+H]^+$ 355.0601, found 355.0599.



2j: 58.1 mg, brown oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90-7.83 (m, 2H), 7.44-7.40 (m, 2H), 7.20-7.13 (m, 3H), 7.06-7.00 (m, 2H), 3.02 (t, *J* = 7.2 Hz, 2H), 2.94 (t, *J* = 7.2 Hz, 2H), 2.11-2.01 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.7, 165.7 (d, *J* = 253.0 Hz), 132.8 (d, *J* = 3.0 Hz), 132.1, 130.2 (d, *J* = 9.2 Hz), 129.4, 128.6, 126.4, 115.2 (d, *J* = 21.7 Hz), 37.4, 26.9, 23.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ -105.3 (s). FT-IR: ν (cm^{-1}) 2921, 1682, 1588, 1477, 1399, 1217, 1090. HRMS [ESI] calcd for $C_{16}H_{16}FOSe$ $[M+H]^+$ 323.0350, found 323.0338.

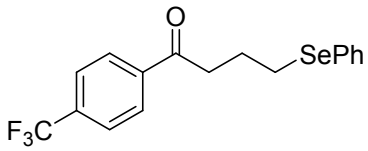


2k: 56.2 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81-7.76 (m, 2H), 7.44-7.40 (m, 2H), 7.36-7.32 (m, 2H), 7.20-7.14 (m, 3H), 3.01 (t, *J* = 7.2 Hz, 2H), 2.94 (t, *J* = 7.2 Hz, 2H), 2.10-2.01 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.7, 139.0, 134.6, 132.2, 129.4, 129.0, 128.6, 128.4, 126.5, 37.5, 26.9, 23.9. FT-IR: ν (cm^{-1}) 2987, 2971, 2901, 1683, 1595, 1407, 1221, 1155, 1066, 1056. HRMS [ESI] calcd for $C_{16}H_{16}ClOSe$ $[M+H]^+$ 339.0055, found 339.0048.

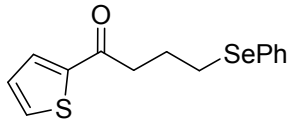


2l: 62.8 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72-7.66 (m, 2H), 7.52-7.46 (m, 2H), 7.43-7.38 (m, 2H), 7.19-7.12 (m,

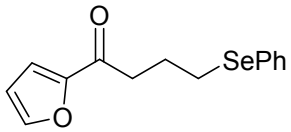
3H), 2.99 (t, J = 7.2 Hz, 2H), 2.93 (t, J = 7.2 Hz, 2H), 2.10-2.00 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.8, 135.0, 132.1, 131.4, 129.4, 129.1, 128.7, 127.7, 126.5, 37.5, 26.9, 23.8. FT-IR: ν (cm^{-1}) 2987, 2971, 2901, 1683, 1583, 1395, 1216, 1068. HRMS [ESI] calcd for $C_{16}H_{16}BrOSe$ $[M+H]^+$ 382.9550, found 382.9539.



2m: 60.8 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (d, J = 8.0 Hz, 2H), 7.64 (d, J = 8.0 Hz, 2H), 7.45-7.41 (m, 2H), 7.20-7.14 (m, 3H), 3.08 (t, J = 7.2 Hz, 2H), 2.96 (t, J = 7.2 Hz, 2H), 2.12-2.04 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.9, 139.0, 133.9 (q, J_{C-F} = 32.5 Hz), 132.2, 129.3, 128.7, 127.9, 126.5, 125.2 (q, J = 3.6 Hz), 123.1 (q, J_{C-F} = 271.1 Hz), 37.8, 26.8, 23.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -63.1 (s). FT-IR: ν (cm^{-1}) 2987, 2972, 2901, 1690, 1437, 1322, 1124, 1065. HRMS [ESI] calcd for $C_{17}H_{16}F_3OSe$ $[M+H]^+$ 373.0318, found 373.0321.

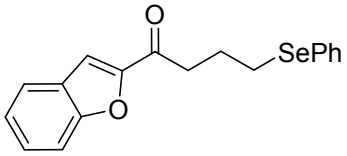


2n: 35.7 mg, brown oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (dd, J = 3.6, 1.2 Hz, 1H), 7.54 (dd, J = 4.8, 1.2 Hz, 1H), 7.45-7.40 (m, 2H), 7.21-7.13 (m, 3H), 7.03 (dd, J = 4.8, 3.6 Hz, 1H), 2.98 (t, J = 7.2 Hz, 2H), 2.93 (t, J = 7.2 Hz, 2H), 2.11-2.02 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 192.3, 144.2, 133.6, 132.6, 131.9, 129.9, 129.1, 128.1, 126.9, 38.7, 27.3, 24.8. FT-IR: ν (cm^{-1}) 2922, 2851, 1735, 1656, 1414, 1233. HRMS [ESI] calcd for $C_{14}H_{15}OSSe$ $[M+H]^+$ 311.0009, found 311.0007.

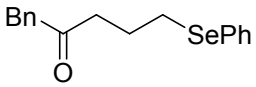


2o: 42.9 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (dd, J = 4.0, 1.2 Hz, 1H), 7.54 (dd, J = 4.8, 0.8 Hz, 1H), 7.44-7.40 (m, 2H),

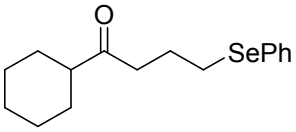
7.20-7.13 (m, 3H), 7.03 (dd, J = 4.8, 4.0 Hz, 1H), 2.98 (t, J = 7.2 Hz, 2H), 2.93 (t, J = 7.2 Hz, 2H), 2.11-2.02 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.9, 143.7, 133.1, 132.2, 131.4, 129.4, 128.6, 127.6, 126.4, 38.2, 26.8, 24.3. FT-IR: ν (cm^{-1}) 2923, 2852, 1671, 1567, 1466, 1021. HRMS [ESI] calcd for $C_{14}H_{14}O_2SeNa$ $[M+Na]^+$ 317.0057, found 317.0060.



2p: 41.4 mg, white solid, m.p. 72-74 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, J = 8.0 Hz, 1H), 7.49 (dd, J = 8.4, 0.8 Hz, 1H), 7.46 -7.36 (m, 4H), 7.23 (ddd, J = 8.0, 7.2, 0.8 Hz, 1H), 7.19-7.10 (m, 3H), 3.04 (t, J = 7.2 Hz, 2H), 2.95 (t, J = 7.2 Hz, 2H), 2.15-2.04 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.0, 155.1, 152.0, 132.2, 129.4, 128.6, 127.8, 126.5, 126.5, 123.4, 122.8, 112.3, 112.0, 37.9, 26.8, 23.8. FT-IR: ν (cm^{-1}) 3115, 2925, 2898, 1685, 1665, 1553, 1449, 1165. HRMS [ESI] calcd for $C_{18}H_{17}O_2Se$ $[M+H]^+$ 345.0394, found 345.0391.

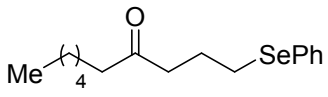


2q: 39.6 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40-7.35 (m, 2H), 7.28-7.21 (m, 2H), 7.21-7.14 (m, 4H), 7.12-7.07 (m, 2H), 3.56 (s, 2H), 2.78 (t, J = 7.2 Hz, 2H), 2.52 (t, J = 7.2 Hz, 2H), 1.91-1.80 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 207.5, 134.1, 132.6, 129.9, 129.4, 129.1, 128.8, 127.1, 126.9, 50.3, 41.3, 27.1, 24.0. FT-IR: ν (cm^{-1}) 2987, 2971, 2916, 1709, 1406, 1394, 1066. HRMS [ESI] calcdfor $C_{17}H_{19}OSe$ $[M+H]^+$ 319.0601, found 319.0593.

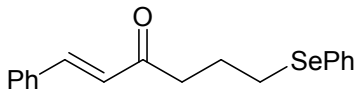


2r: 47.5 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43-7.39 (m, 2H), 7.21-7.14 (m, 3H), 2.84 (t, J = 7.2 Hz, 2H), 2.51 (t, J = 7.2 Hz,

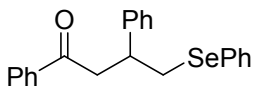
2H), 2.27-2.16 (m, 1H), 1.94-1.82 (m, 2H), 1.78-1.58 (m, 5H), 1.28-1.07 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 212.8, 132.1, 129.6, 128.6, 126.4, 50.4, 39.4, 28.0, 26.9, 25.4, 25.2, 23.4. FT-IR: ν (cm^{-1}) 2926, 2852, 1703, 1578, 1477, 1447, 1437, 1072. HRMS [ESI] calcd for $C_{16}H_{23}OSe$ $[M+H]^+$ 311.0914, found 311.0918.



2s: 39.9 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44-7.39 (m, 2H), 7.21-7.14 (m, 3H), 2.85 (t, *J* = 7.2 Hz, 2H), 2.47 (t, *J* = 7.2 Hz, 2H), 2.27 (t, *J* = 7.6 Hz, 2H), 1.94-1.84 (m, 2H), 1.51-1.42 (m, 2H), 1.22-1.14 (m, 6H), 0.81 (t, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.0, 132.1, 129.5, 128.6, 126.4, 42.5, 41.5, 31.1, 28.4, 26.8, 23.5, 23.3, 22.0, 13.6. FT-IR: ν (cm^{-1}) 2926, 1710, 1477, 1437, 1407, 1372, 1072. HRMS [ESI] calcd for $C_{16}H_{25}OSe$ $[M+H]^+$ 313.1071, found 313.1083.

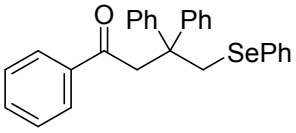


2t: 35.0 mg, yellow solid, m.p. 36-38 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48-7.40 (m, 5H), 7.33-7.29 (m, 3H), 7.20-7.13 (m, 3H), 6.62 (d, *J* = 16.4 Hz, 1H), 2.91 (t, *J* = 7.2 Hz, 2H), 2.74 (t, *J* = 7.2 Hz, 2H), 2.05-1.96 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.0, 142.2, 134.0, 132.1, 130.0, 129.5, 128.6, 128.5, 127.8, 126.4, 125.7, 39.7, 26.9, 24.0. FT-IR: ν (cm^{-1}) 2987, 2971, 1609, 1448, 1406, 1074. HRMS [ESI] calcd for $C_{18}H_{18}OSeNa$ $[M+Na]^+$ 353.0421, found 353.0414.

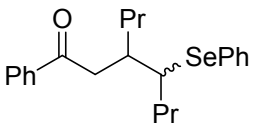


2u: 59.0 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81-7.77 (m, 2H), 7.48- 7.42 (m, 1H), 7.39-7.30 (m, 4H), 7.23-7.12 (m, 8H), 3.64-3.55 (m, 1H), 3.52 (dd, *J* = 16.8, 6.0 Hz, 1H), 3.30 (d, *J* = 16.8, 7.2 Hz, 1H), 3.20 (d, *J* = 7.2 Hz, 2H);

^{13}C NMR (100 MHz, $CDCl_3$) δ 197.8, 142.9, 136.4, 132.6, 132.1, 129.8, 128.6, 128.1, 128.1, 127.6, 127.0, 126.5, 126.4, 44.1, 40.8, 34.2. FT-IR: ν (cm^{-1}) 2987, 2972, 2901, 1682, 1406, 1249, 1066. HRMS [ESI] calcd for $C_{22}H_{21}OSe$ $[M+H]^+$ 381.0758, found 381.0755.

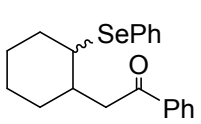


2v: 33.4 mg, colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75-7.71 (m, 2H), 7.48-7.43 (m, 1H), 7.40-7.36 (m, 2H), 7.35-7.30 (m, 2H), 7.29-7.21 (m, 8H), 7.19-7.10 (m, 5H), 4.24 (s, 2H), 4.14 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.4, 146.6, 138.0, 133.2, 132.6, 130.8, 128.8, 128.2, 128.0, 127.8, 127.7, 126.8, 126.4, 49.5, 45.1, 40.5. FT-IR: ν (cm^{-1}) 3056, 2922, 2850, 1688, 1671, 1578, 1446. HRMS [ESI] calcd for $C_{28}H_{25}OSe$ $[M+H]^+$ 457.1071, found 457.1062.

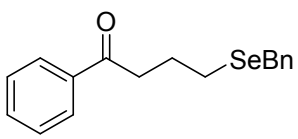


2w (*dr* = 1:1): 52.7 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.95-7.88 (m, 4H, two isomers), 7.59-7.50 (m, 4H, two isomers), 7.49-7.39 (m, 6H, two isomers), 7.25-7.18 (m, 3H, two isomers), 7.16-7.10 (m, 3H, two isomers), 3.49 (dd, *J* = 16.8, 6.8 Hz, 1H, one isomer), 3.44-3.38 (m, 1H, one isomer), 3.38-3.32 (m, 1H, one isomer), 3.10-2.95 (m, 2H, two isomers), 2.87 (dd, *J* = 16.8 Hz, 6.0 Hz, 1H, one isomer), 2.56-2.42 (m, 2H, two isomers), 1.85-1.40 (m, 10H, two isomers), 1.38-1.21 (m, 6H, two isomers), 0.96-0.80 (m, 12H, two isomers); ^{13}C NMR (100 MHz, $CDCl_3$) δ 200.3 & 199.8 (two isomers), 137.3 & 137.2 (two isomers), 134.3 & 133.8 (two isomers), 133.0 & 132.8 (two isomers), 130.6 & 130.5 (two isomers), 128.9 & 128.9 (overlap, two isomers), 128.6 & 128.5 (two isomers), 128.1 & 128.1 (two isomers), 127.1 & 127.0 (two isomers), 52.7 & 52.0 (two isomers), 41.5 & 41.0 (two isomers), 38.6 & 38.2 (two isomers), 36.3 & 35.7 (two isomers), 35.3 & 33.2 (two isomers), 21.8 & 21.6

(two isomers), 20.7 & 20.5 (two isomers), 14.1 & 14.1 (two isomers), 13.9 & 13.8 (two isomers). FT-IR: ν (cm^{-1}) 2956, 2927, 1683, 1579, 1448, 1285. HRMS [ESI] calcd for $C_{20}H_{25}OSe$ $[M+H]^+$ 389.1384, found 389.1401.

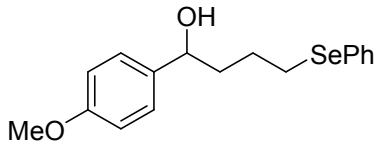


2x (*dr*= 1:1): 54.8 mg, yellow oil. ^1H NMR (400 MHz, $CDCl_3$) δ 7.95 (d, *J* = 7.2 Hz, 2H, one isomer), 7.86 (d, *J* = 7.2 Hz, 2H, one isomer), 7.58-7.50 (m, 4H, two isomers), 7.48-7.37 (m, 6H, two isomers), 7.30-7.25 (m, 3H, two isomers), 7.15-7.10 (m, 3H, two isomers), 3.82-3.70 (m, 2H, two isomers), 3.30 (dd, *J* = 17.2, 6.4 Hz, 1H, one isomer), 3.07-2.90 (m, 2H, two isomers), 2.81 (dd, *J* = 16.4, 9.2 Hz, 1H, one isomer), 2.50-2.38 (m, 1H, one isomer), 2.26-2.15 (m, 2H, two isomers), 2.13-2.02 (m, 1H, one isomer), 1.99-1.87 (m, 2H, two isomers), 1.77-1.51 (m, 7H, two isomers), 1.50-1.35 (m, 2H, two isomers), 1.35-1.21 (m, 2H, two isomers), 1.15-1.05 (m, 1H, one isomer); ^{13}C NMR (100 MHz, $CDCl_3$) 199.8 & 199.5 (two isomers), 137.3 & 137.2 (two isomers), 135.1 & 133.9 (two isomers), 132.9 & 132.8 (two isomers), 130.5 & 129.0 (two isomers), 129.0 & 128.9 (two isomers), 128.6 & 128.4 (two isomers), 128.2 & 128.0 (two isomers), 127.5 & 127.0 (two isomers), 52.3 & 50.3 (two isomers), 45.3 & 43.7 (two isomers), 39.6 & 29.6 (two isomers), 37.6 & 35.6 (two isomers), 33.5 & 33.0 (two isomers), 27.5 & 25.5 (two isomers), 25.2 & 22.9 (two isomers). FT-IR: ν (cm^{-1}) 2925, 2852, 1736, 1682, 1282, 1242. HRMS [ESI] calcd for $C_{20}H_{23}OSe$ $[M+H]^+$ 359.0914, found 359.0903.

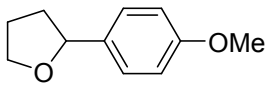


2y: 32.5 mg, yellow solid, m.p. 63-65 °C. ^1H NMR (400 MHz, $CDCl_3$) δ 7.88-7.83 (m, 2H), 7.51-7.44 (m, 1H), 7.40-7.34 (m, 2H), 7.23-7.16 (m, 4H), 7.14-7.07 (m, 1H), 3.70 (s, 2H), 2.97 (t, *J* = 7.2 Hz, 2H), 2.52 (t, *J* = 7.2 Hz, 2H), 2.04 -

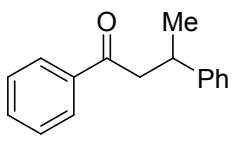
1.93 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.5, 139.4, 136.9, 133.1, 128.8, 128.6, 128.5, 128.1, 126.7, 38.2, 27.0, 24.4, 23.6. FT-IR: ν (cm^{-1}) 2955, 2930, 1737, 1678, 1596, 1447, 1313, 1242. HRMS [ESI] calcd for $C_{17}H_{19}OSe$ $[M+H]^+$ 319.0601, found 319.0600.



3: 64.2 mg, yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41-7.34 (m, 2H), 7.19-7.12 (m, 5H), 6.82-6.75 (m, 2H), 4.58-4.51 (m, 1H), 3.73 (s, 3H), 2.87-2.80 (m, 2H), 1.89-1.51 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.6, 136.1, 132.1, 129.9, 128.5, 126.6, 126.3, 113.4, 73.2, 54.8, 38.3, 27.3, 25.9. FT-IR: ν (cm^{-1}) 3420, 2998, 1610, 1510, 1477, 1437, 1244, 1174. HRMS [ESI] calcd for $C_{17}H_{20}O_2Na$ $[M+Na]^+$ 359.0562, found 359.0549.



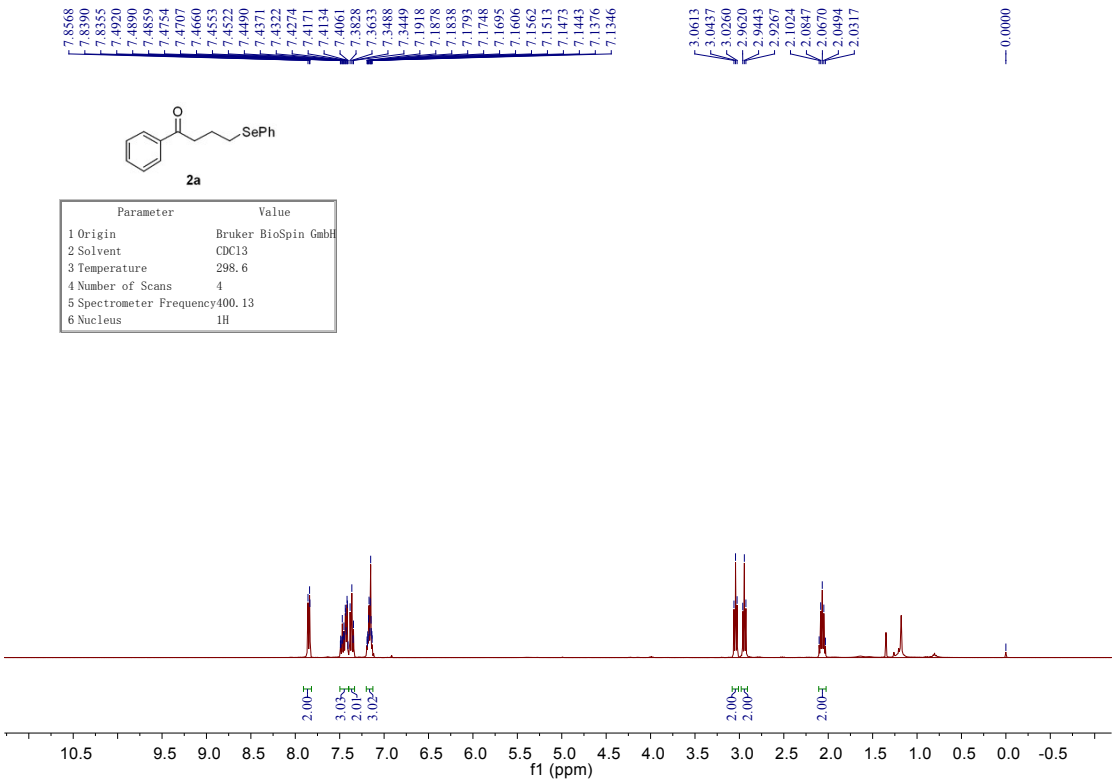
4: 11.4 mg, colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.21-7.16 (m, 2H), 6.82-6.77 (m, 2H), 4.75 (dd, *J* = 7.2, 7.2 Hz, 1H), 4.00 (dd, *J* = 14.4, 7.2 Hz, 1H), 3.88-3.79 (m, 1H), 3.73 (s, 3H), 2.26-2.15 (m, 1H), 2.00-1.86 (m, 2H), 1.78-1.66 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.3, 134.8, 126.5, 113.2, 80.0, 68.0, 54.8, 34.0, 25.6. FT-IR: ν (cm^{-1}) 2929, 2856, 1613, 1512, 1244, 1173, 1058, 1034. HRMS [ESI] calcd for $C_{11}H_{15}O_2$ $[M+H]^+$ 179.1072, found 179.1081.

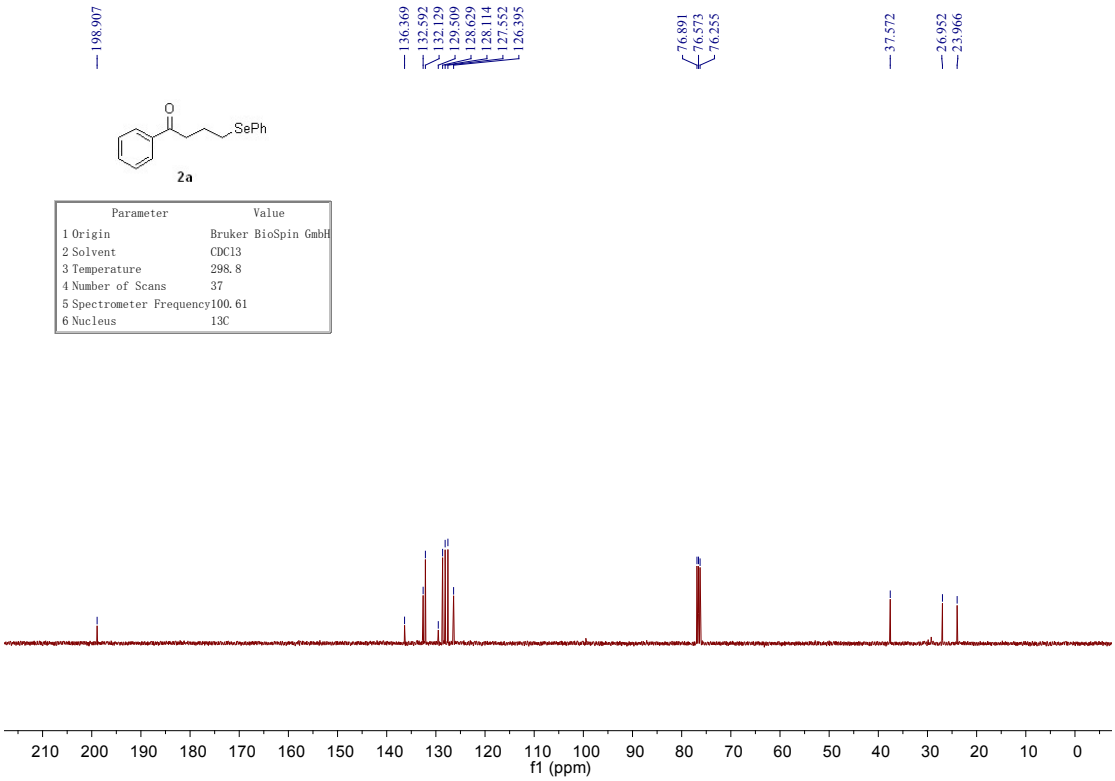


5: 20.1 mg, yellow solid, m.p. 65-67 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88-7.82 (m, 2H), 7.49-7.43 (m, 1H), 7.39-7.33 (m, 2H), 7.26-7.18 (m, 4H), 7.14-7.08 (m, 1H), 3.49-3.37 (m, 1H), 3.22 (dd, *J* = 16.4, 5.6 Hz, 1H), 3.11 (dd, *J* = 16.4, 8.4 Hz, 1H), 1.26 (d, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.6,

146.1, 136.7, 132.5, 128.1, 128.0, 127.6, 126.4, 125.8, 46.6, 35.1, 21.4. FT-IR: ν (cm^{-1}) 2925, 1681, 1595, 1448, 1268, 1203. HRMS [ESI] calcd for $C_{16}H_{17}O$ $[M+H]^+$ 225.1279, found 225.1267.

4. ^{1}H, ^{13}C, and ^{19}F NMR spectra of products





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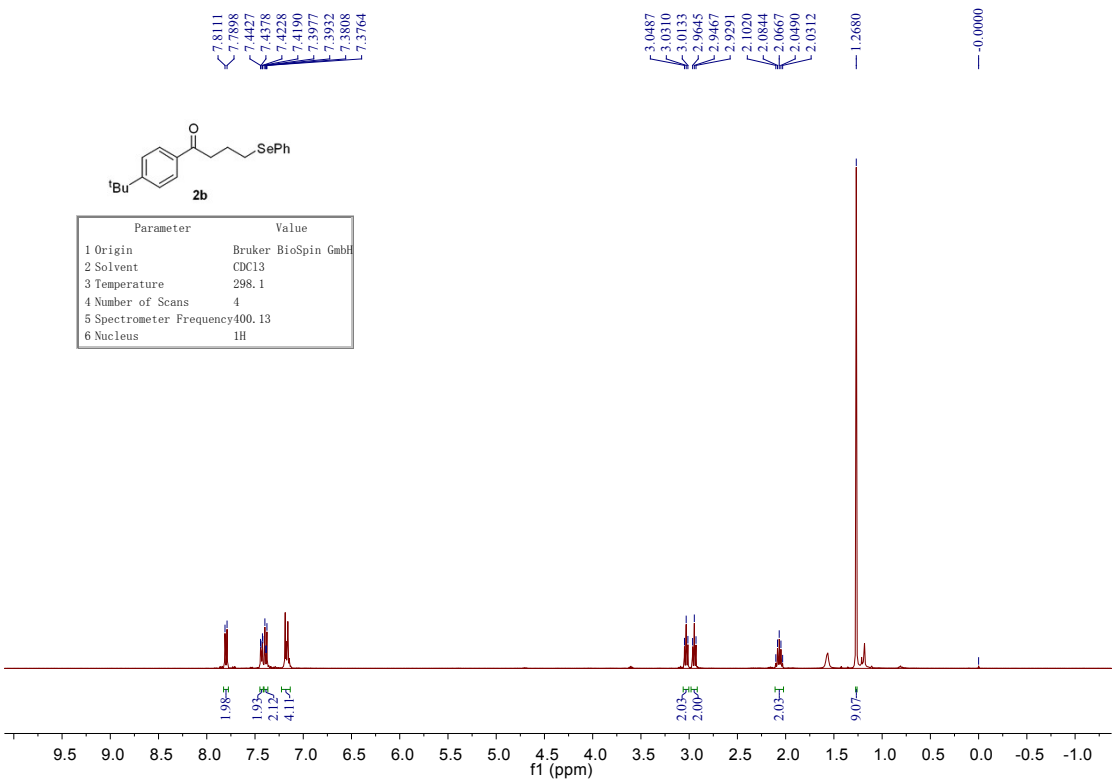
6 Nucleus	13C



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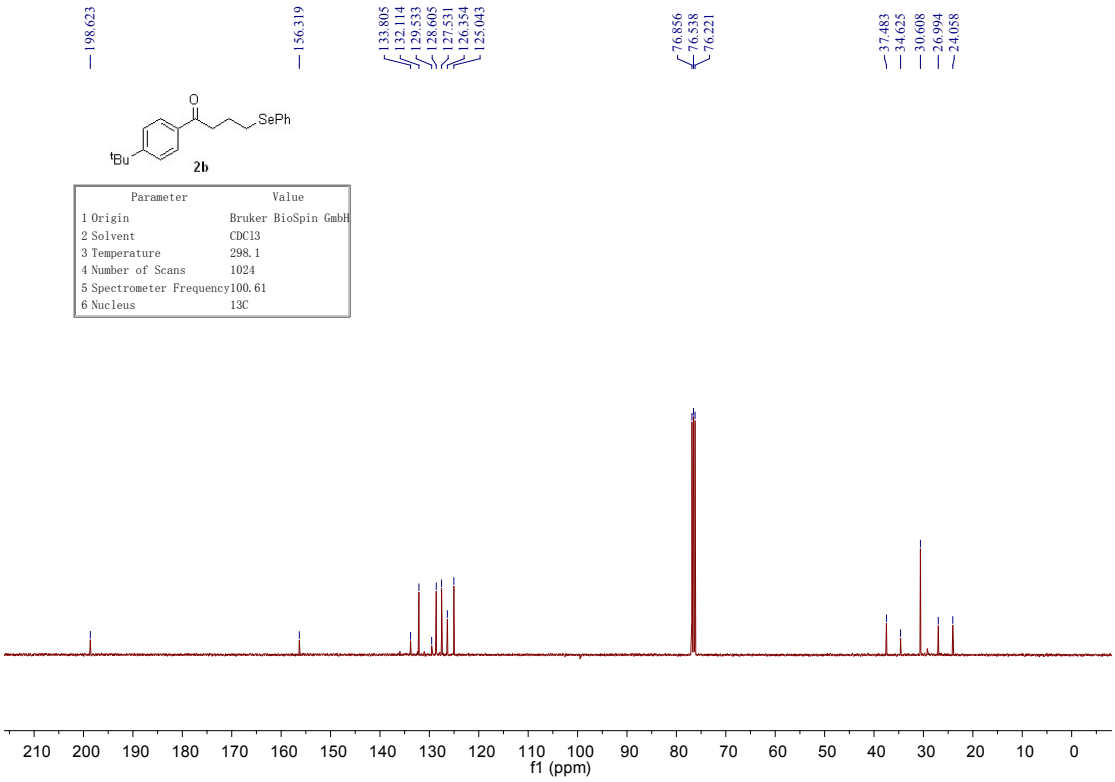
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SePh
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2b
Parameter Value
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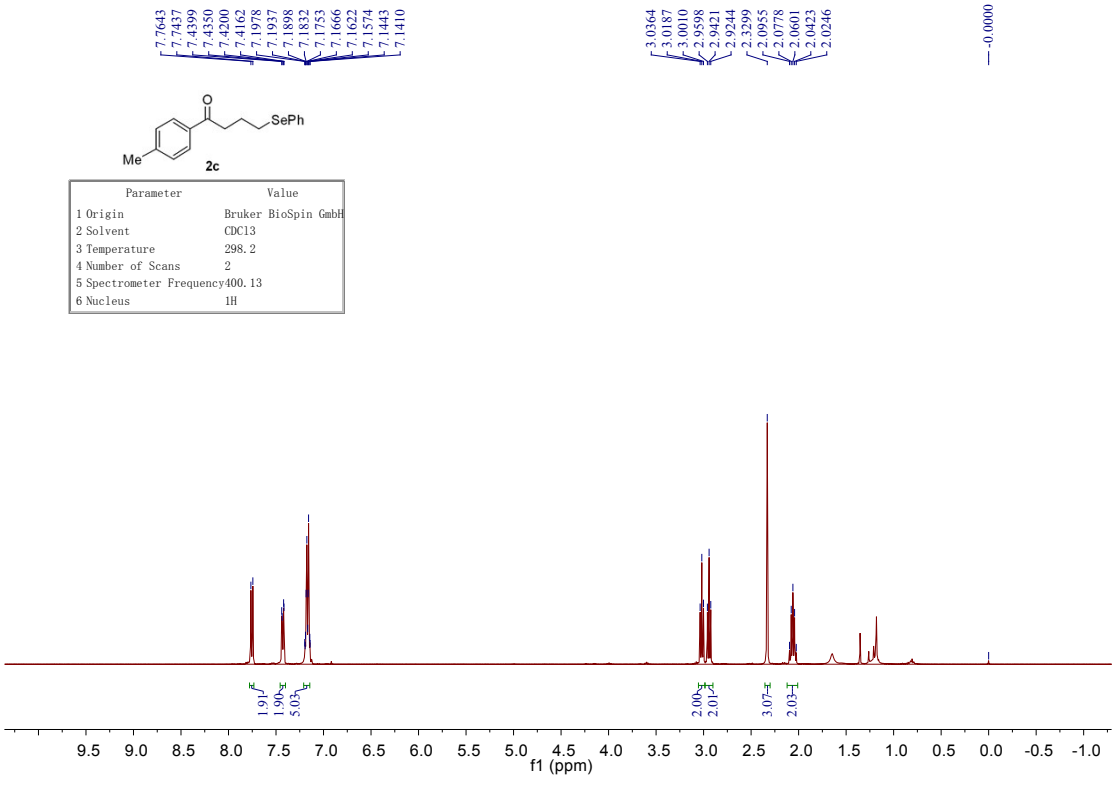
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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SePh
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2c
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6 Nucleus 1H
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2.03
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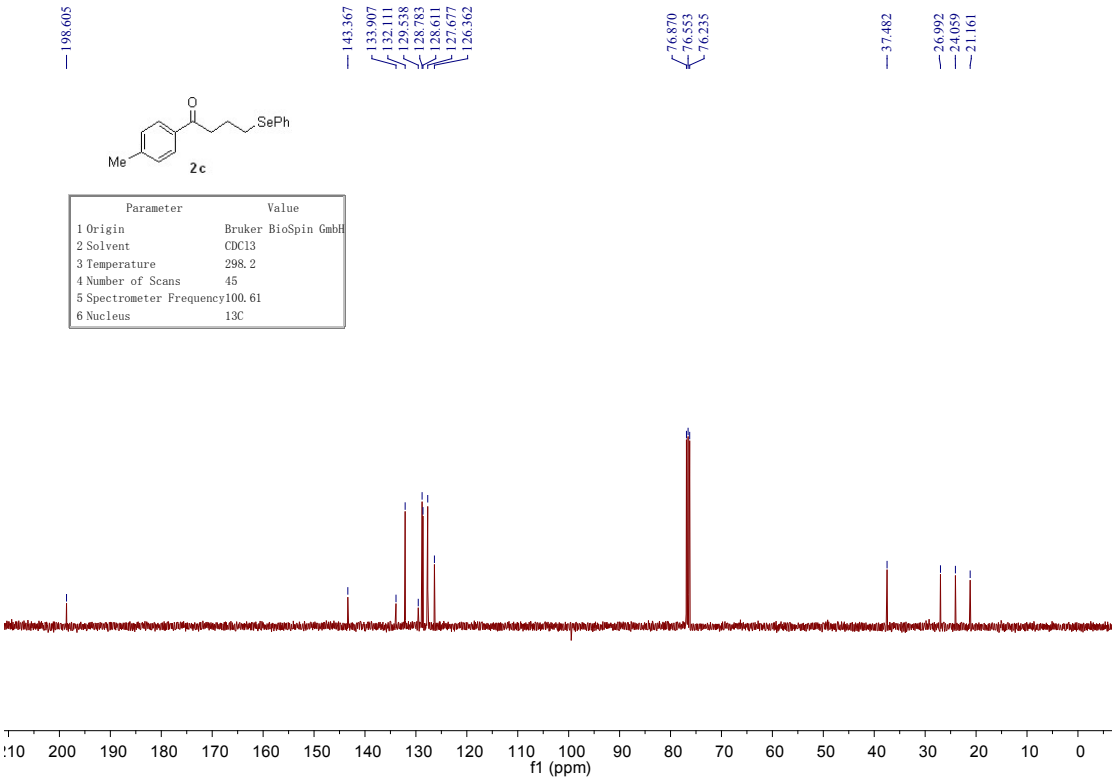
f1 (ppm)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SePh
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2c
Parameter Value
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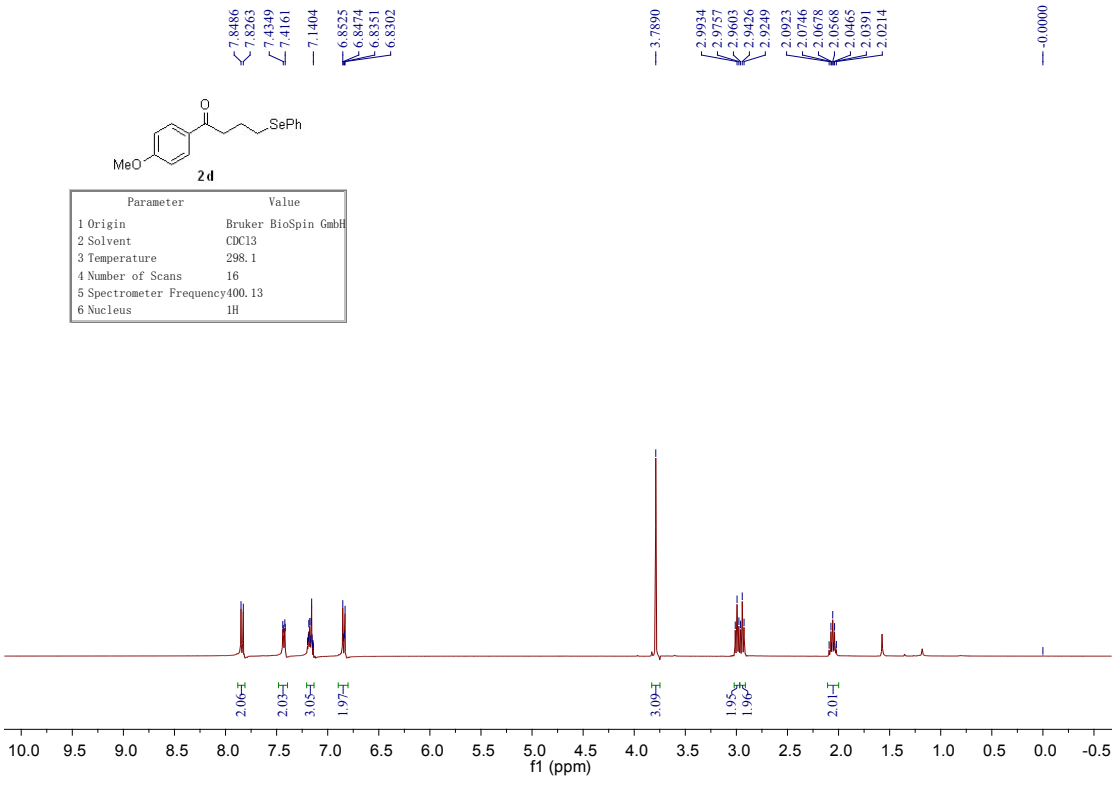
f1 (ppm)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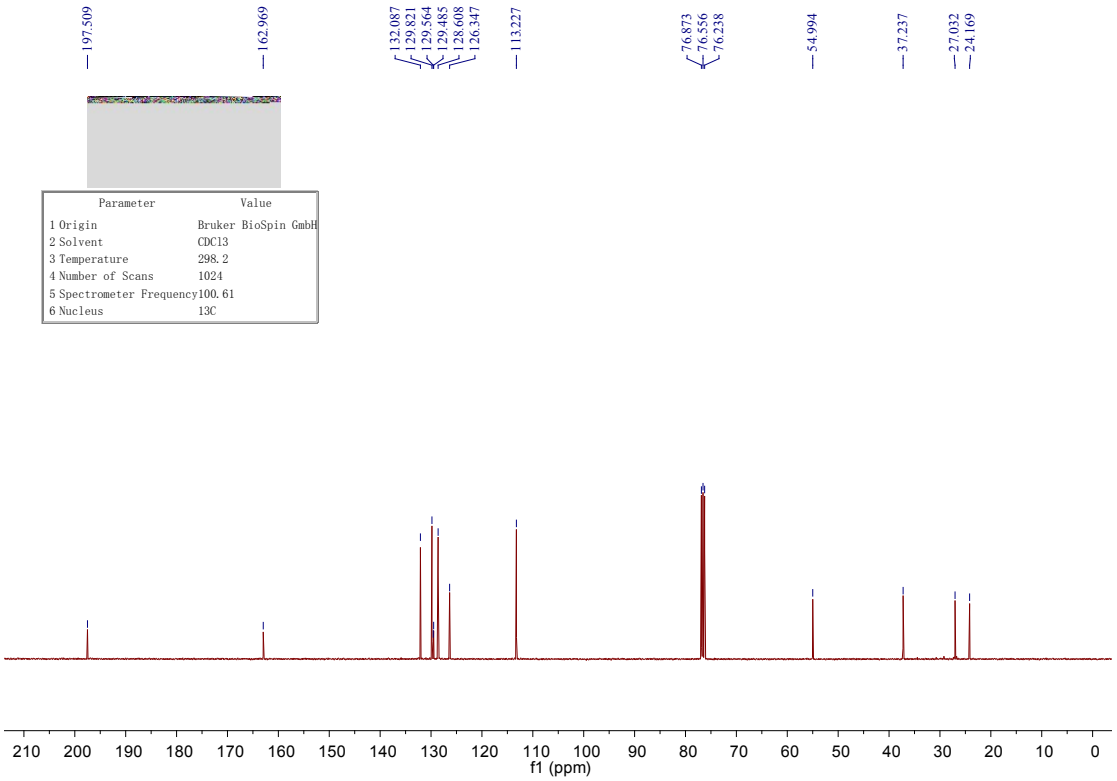
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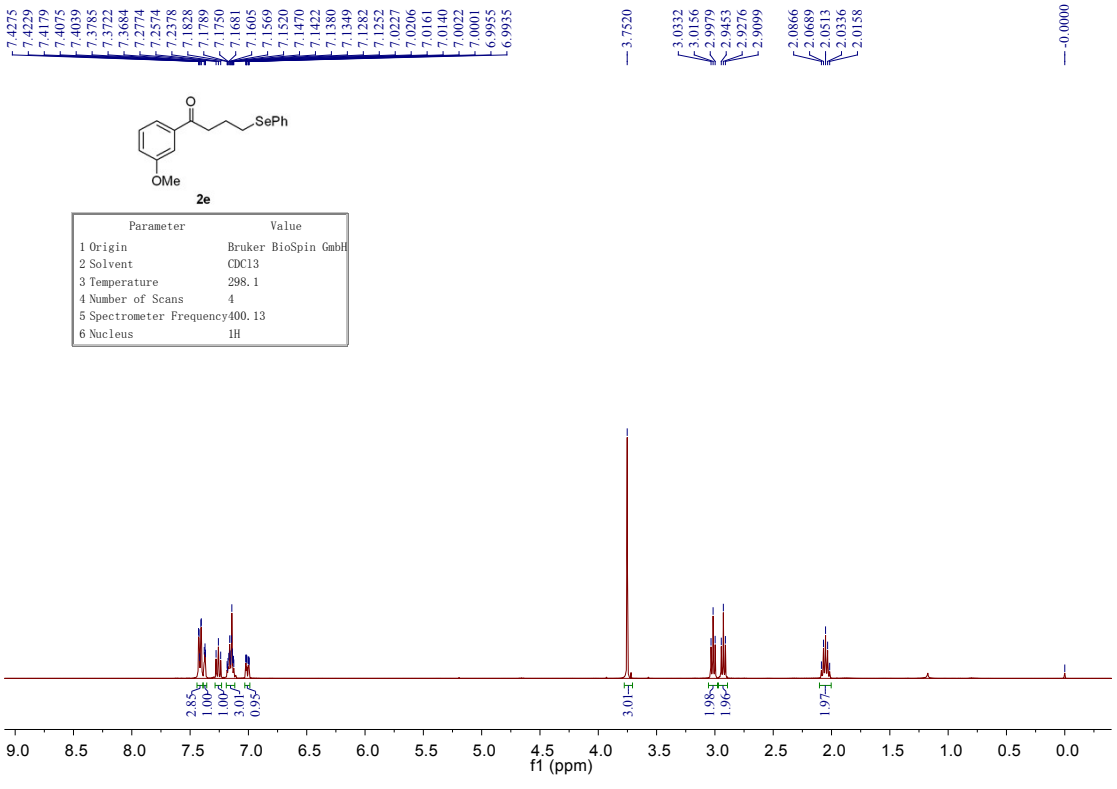
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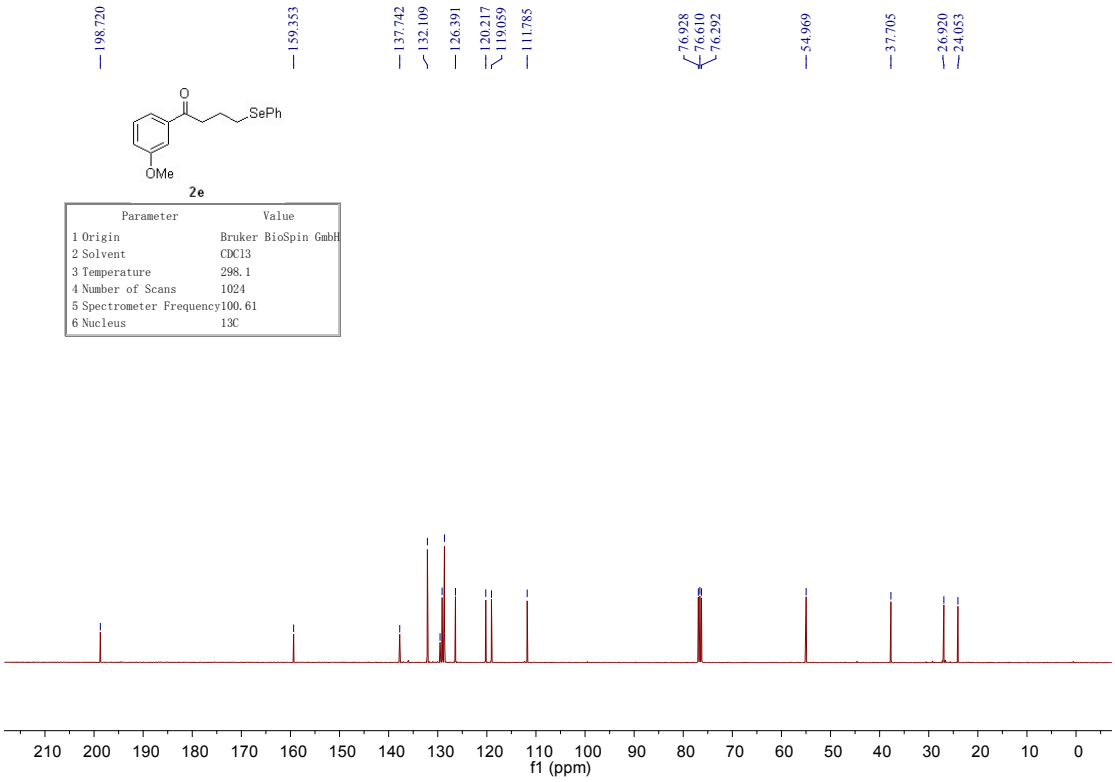
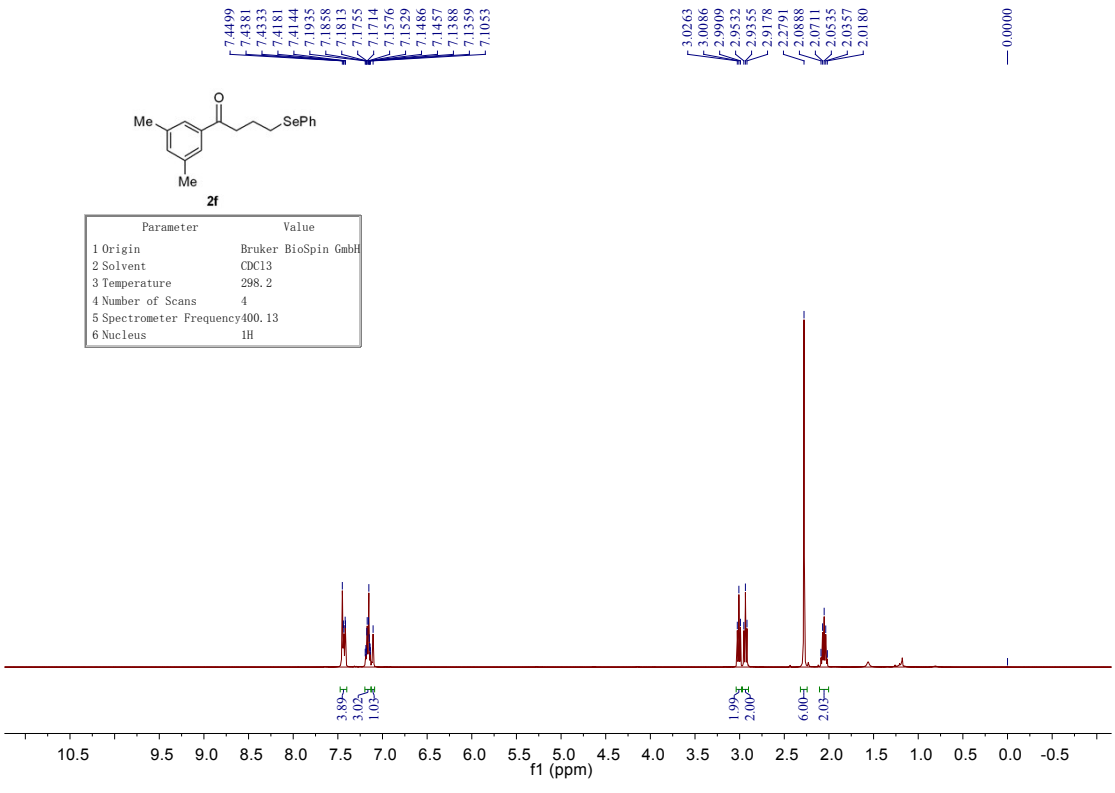
7.1750
7.1681
7.1605
7.1569
7.1520
7.1470
7.1422
7.1380
7.1349
7.1282
7.1252
7.0227
7.0206
7.0161
7.0140
7.0022
7.0001
6.9955
6.9935
3.7520
3.0332
3.0156
2.9979
2.9453
2.9276
2.9099
2.0866
2.0689
2.0513
2.0336
2.0158
-0.0000
SePh
OMe
2e
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.85
1.00
1.00
3.01
0.95
3.01
1.98
1.96
1.97
f1 (ppm)



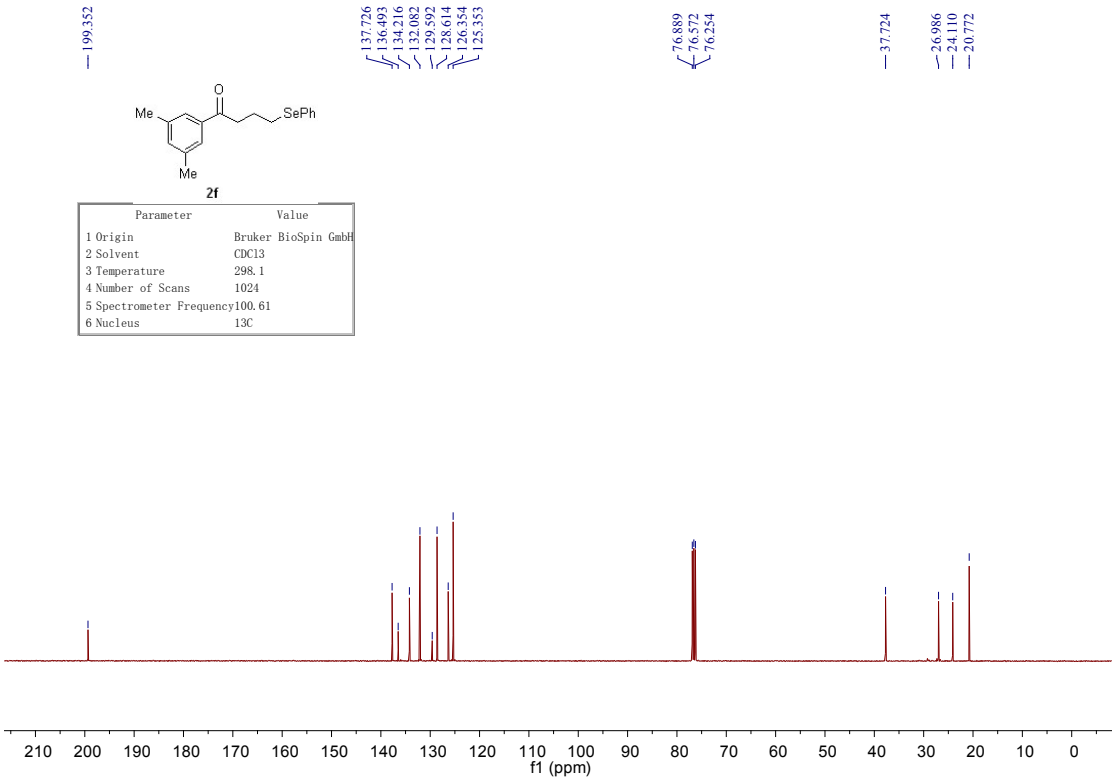
2e

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	1024
5 Spectrometer Frequency	100.61
6 Nucleus	13C

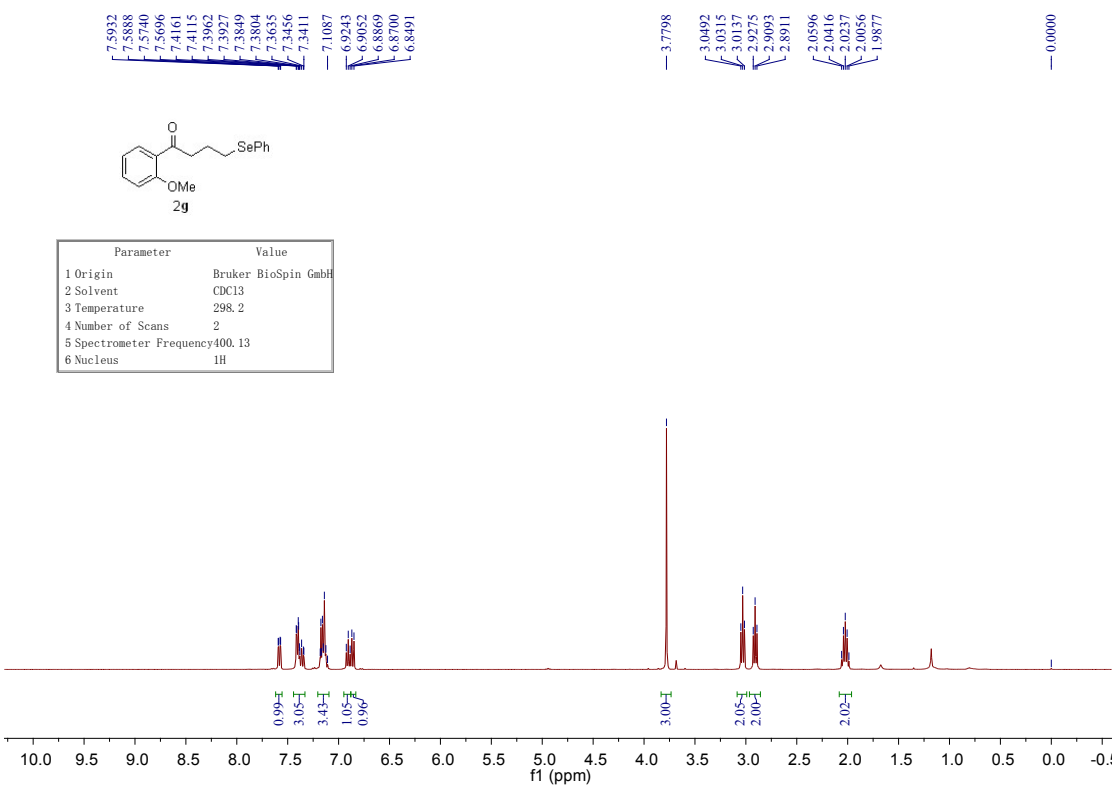


2f

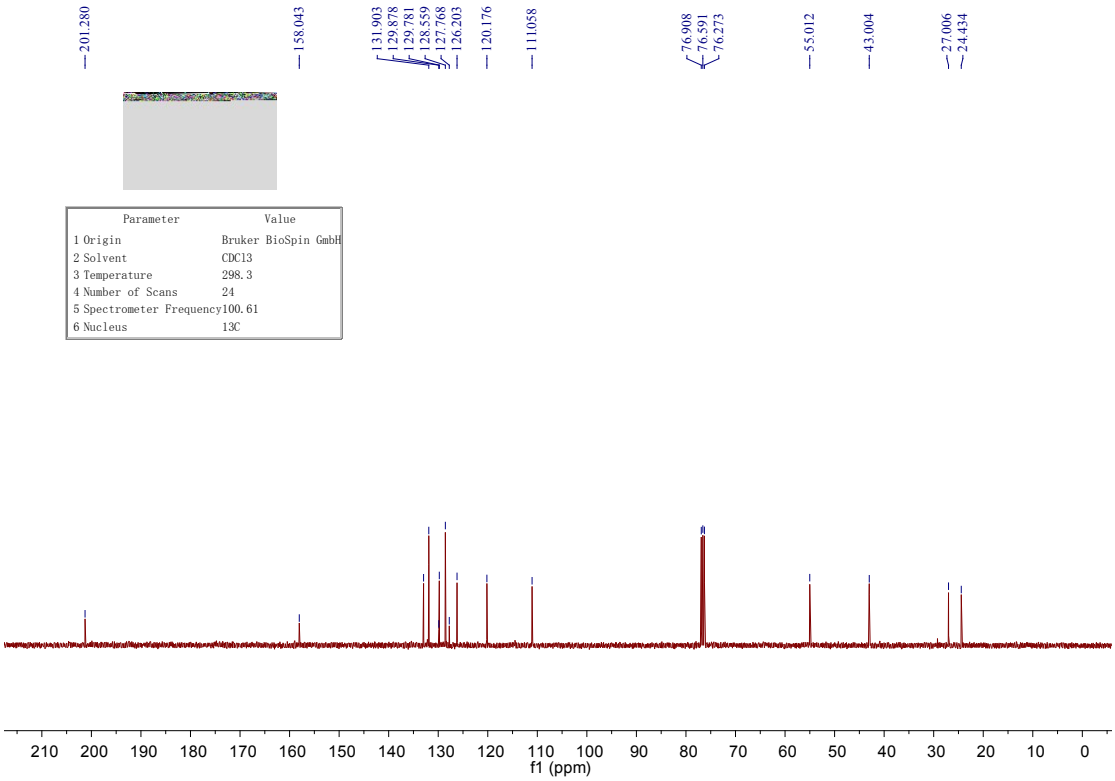
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H



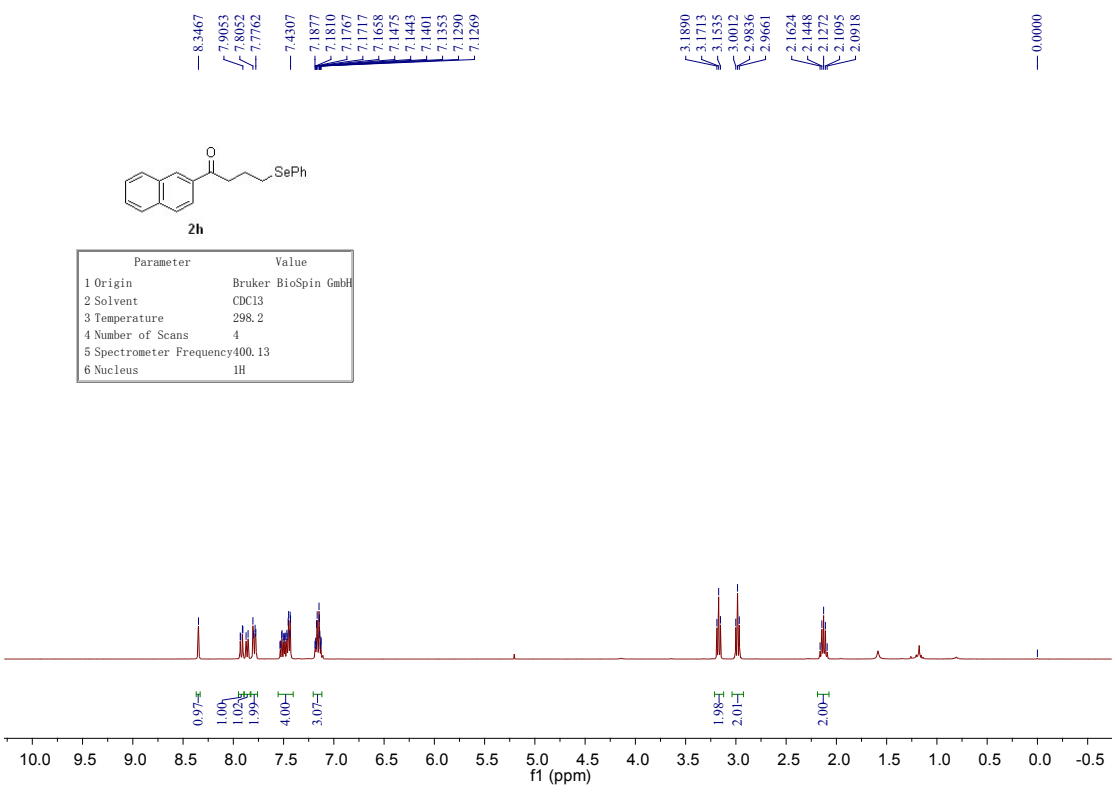
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	1024
5 Spectrometer Frequency	100.61
6 Nucleus	13C



Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	2
5 Spectrometer Frequency	400.13
6 Nucleus	1H

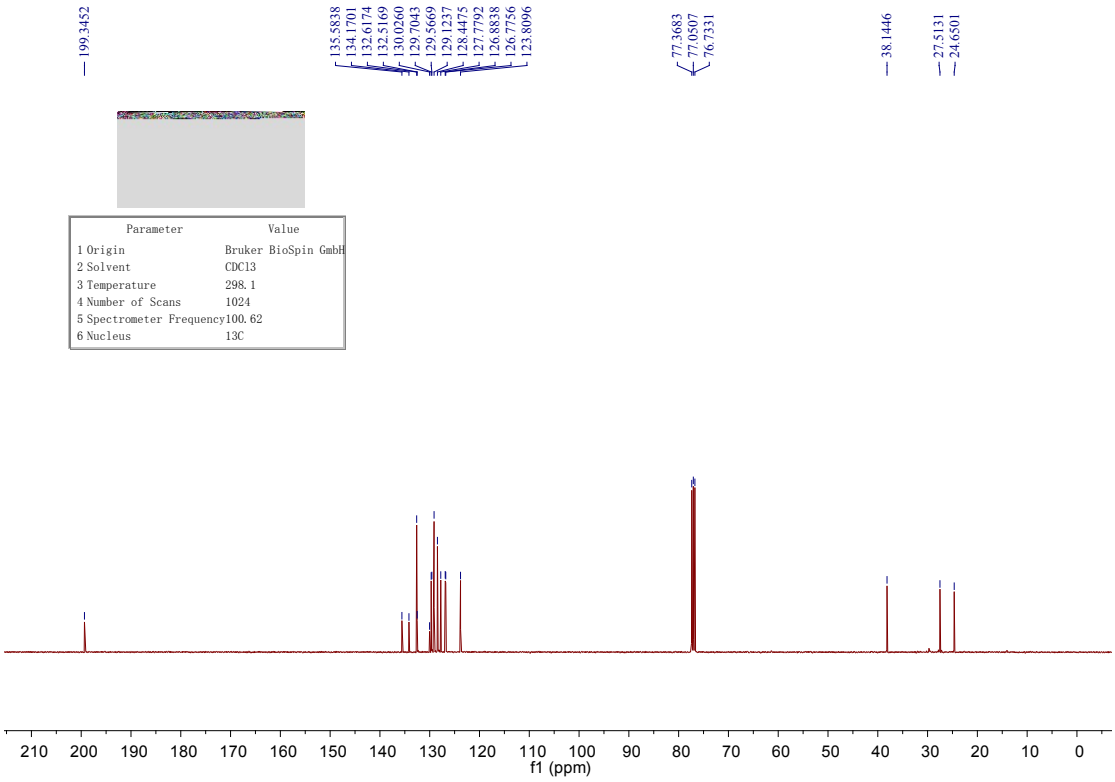


Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.3
4 Number of Scans	24
5 Spectrometer Frequency	100.61
6 Nucleus	13C

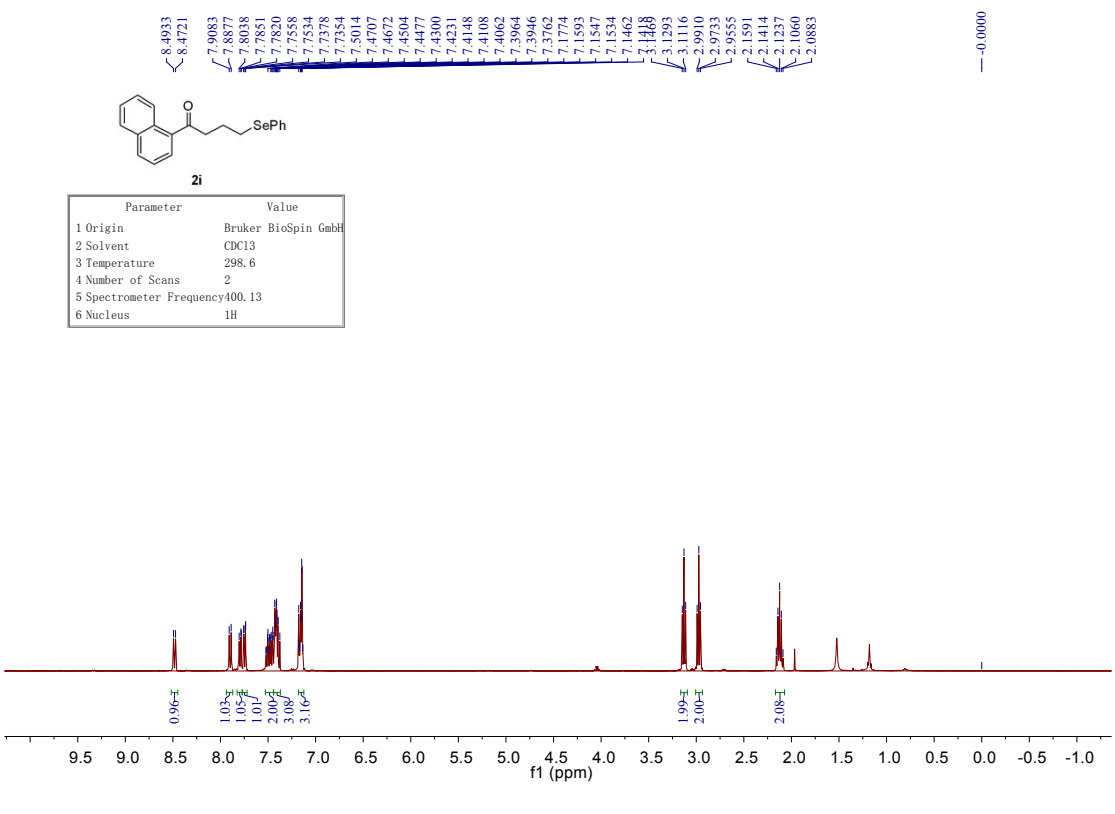


2h

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H

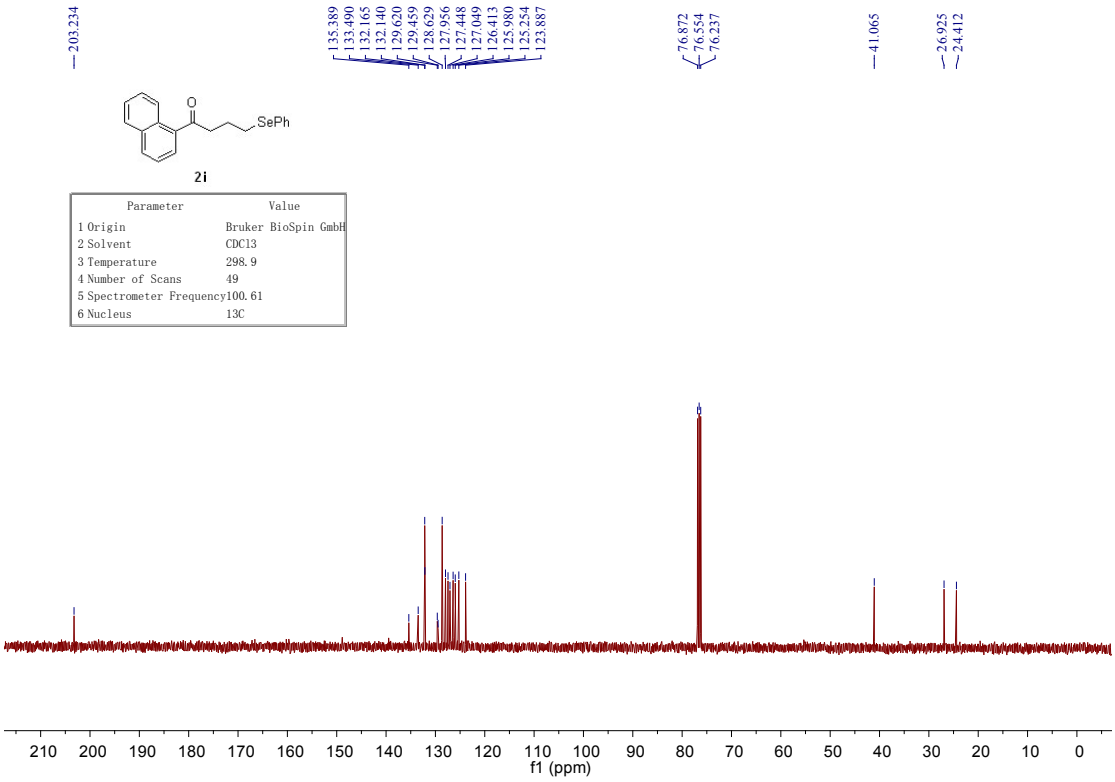


Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	1024
5 Spectrometer Frequency	100.62
6 Nucleus	13C



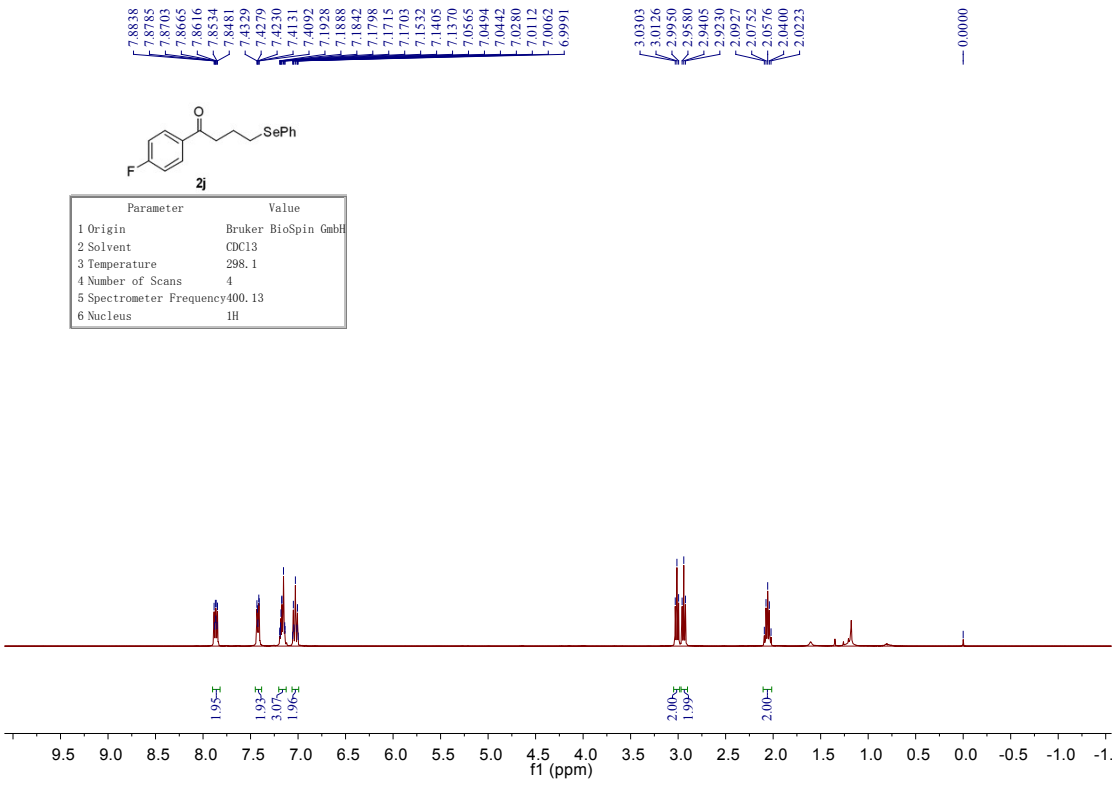
2i

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.6
4 Number of Scans	2
5 Spectrometer Frequency	400.13
6 Nucleus	1H



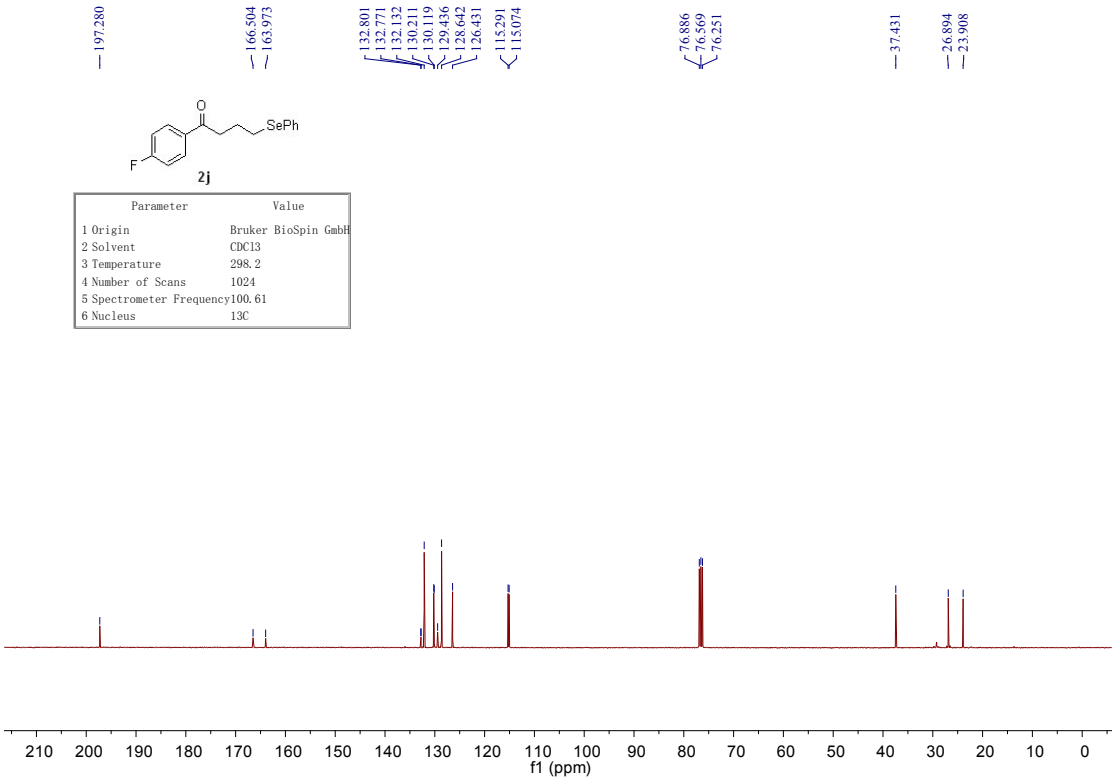
2i

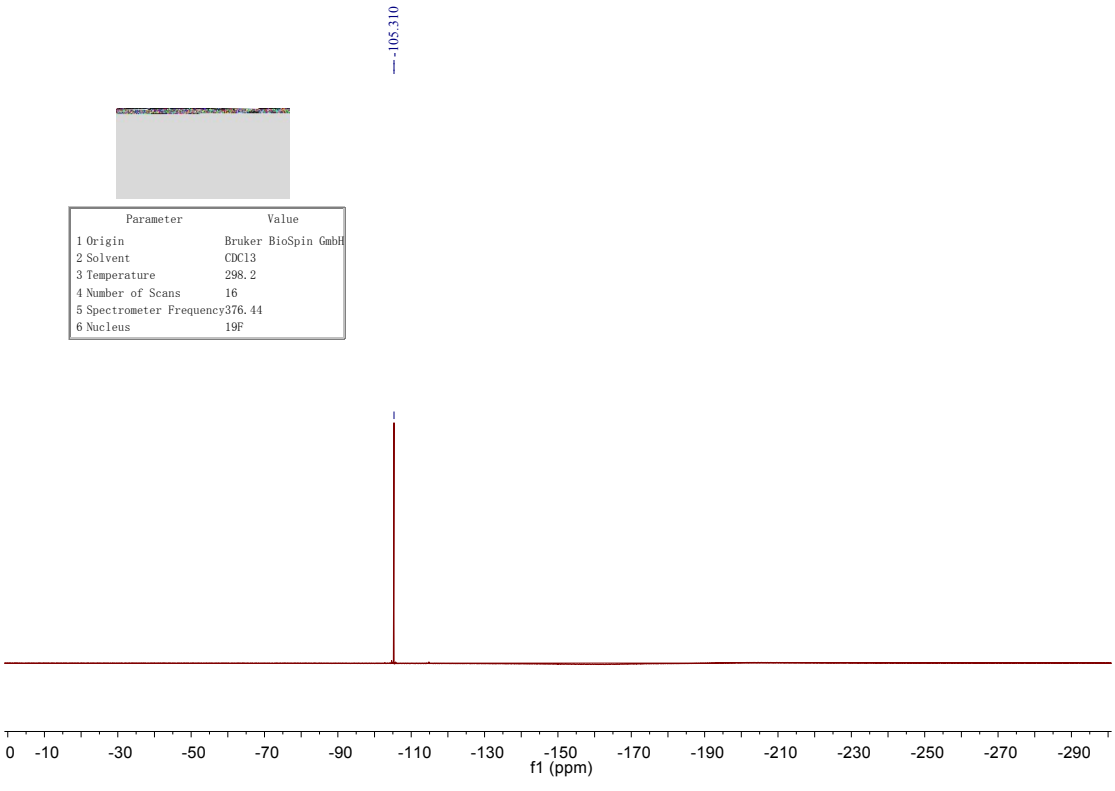
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.9
4 Number of Scans	49
5 Spectrometer Frequency	100.61
6 Nucleus	13C

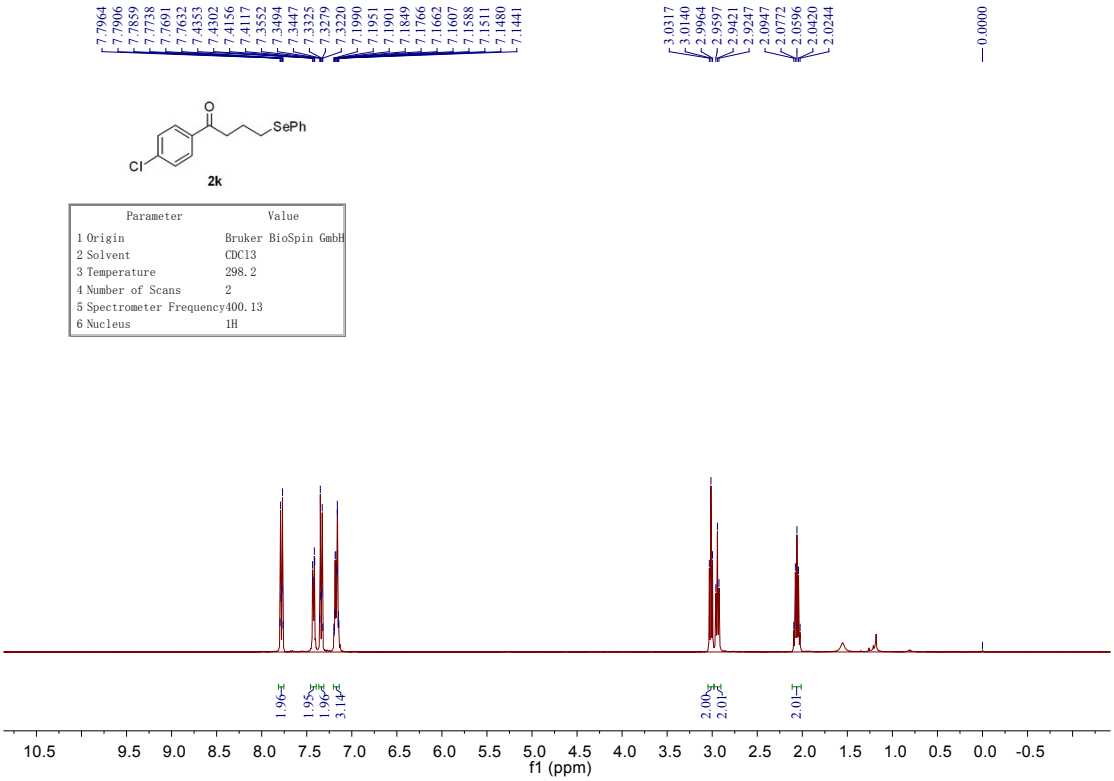


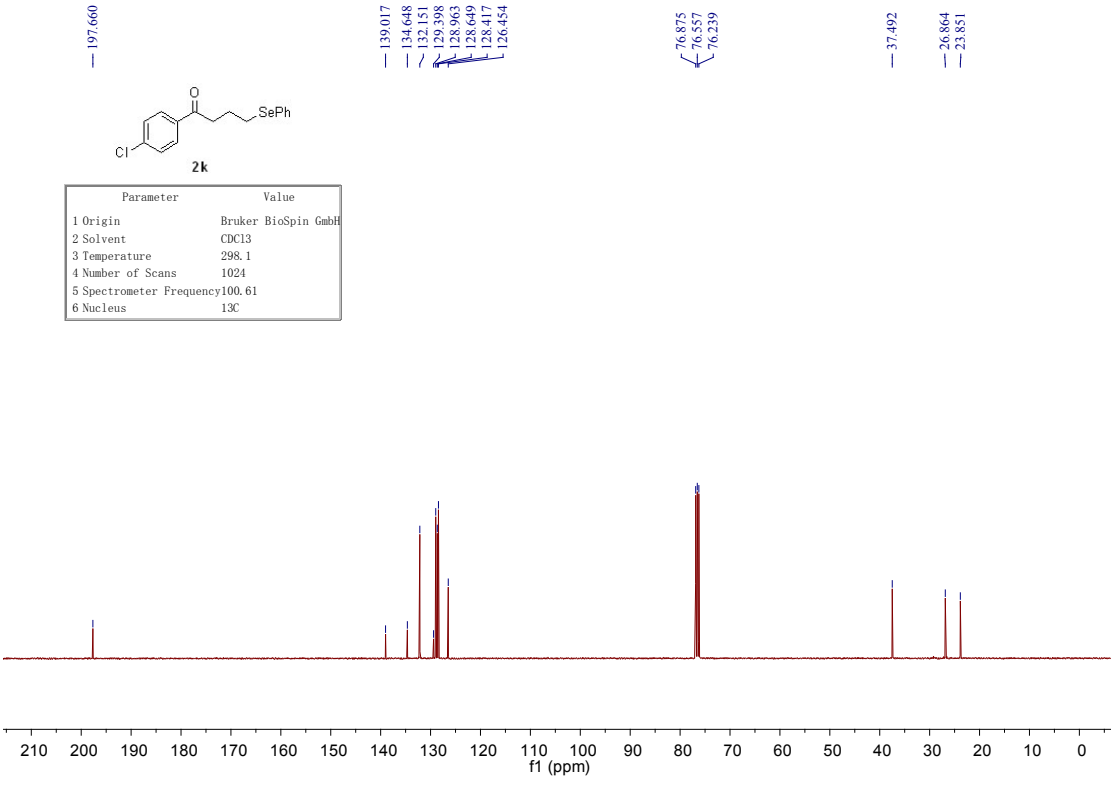
2j

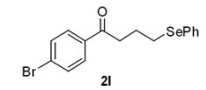
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H


197.280
166.504
163.973
132.801
132.771
132.132
130.211
130.119
129.436
128.642
126.431
115.291
115.074
76.886
76.569
76.251
37.431
26.894
23.908
O
SePh
F
2j
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


-105.310
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 16
5 Spectrometer Frequency 376.44
6 Nucleus 19F
0 -10 -30 -50 -70 -90 -110 -130 -150 -170 -190 -210 -230 -250 -270 -290
f1 (ppm)

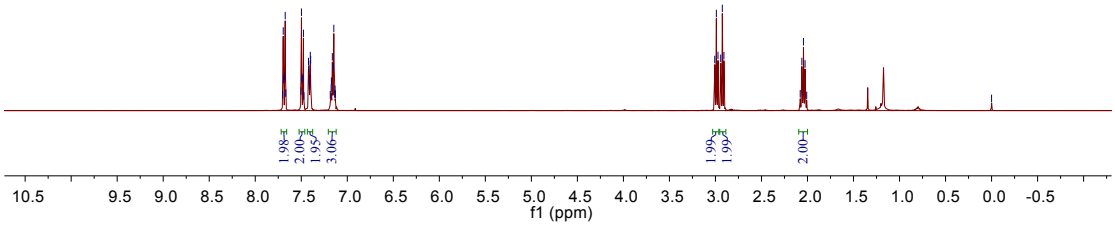

7.7964
7.7906
7.7859
7.7738
7.7691
7.7632
7.4353
7.4302
7.4156
7.4117
7.3552
7.3494
7.3447
7.3325
7.3279
7.3220
7.1990
7.1951
7.1901
7.1849
7.1766
7.1662
7.1607
7.1588
7.1511
7.1480
7.1441
3.0317
3.0140
2.9964
2.9597
2.9421
2.9247
2.0947
2.0772
2.0596
2.0420
2.0244
0.0000
SePh
Cl
2k
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.96
1.95
1.96
3.14
2.00
2.01
2.01
10.5 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

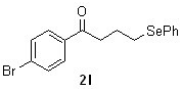

197.660
139.017
134.648
132.151
129.398
128.963
128.649
128.417
126.454
76.875
76.557
76.239
37.492
26.864
23.851
SePh
Cl
2k
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)



2l

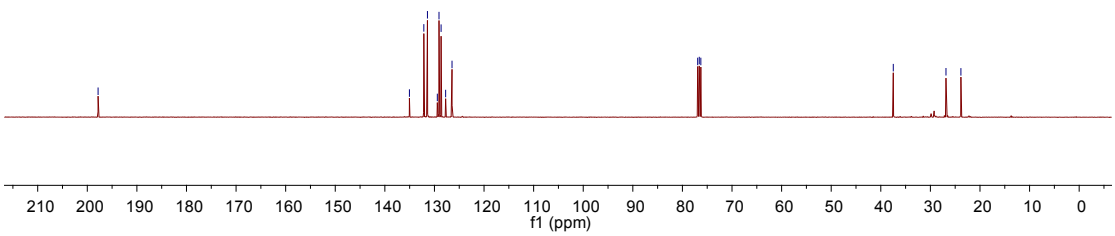
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	8
5 Spectrometer Frequency	400.13
6 Nucleus	1H

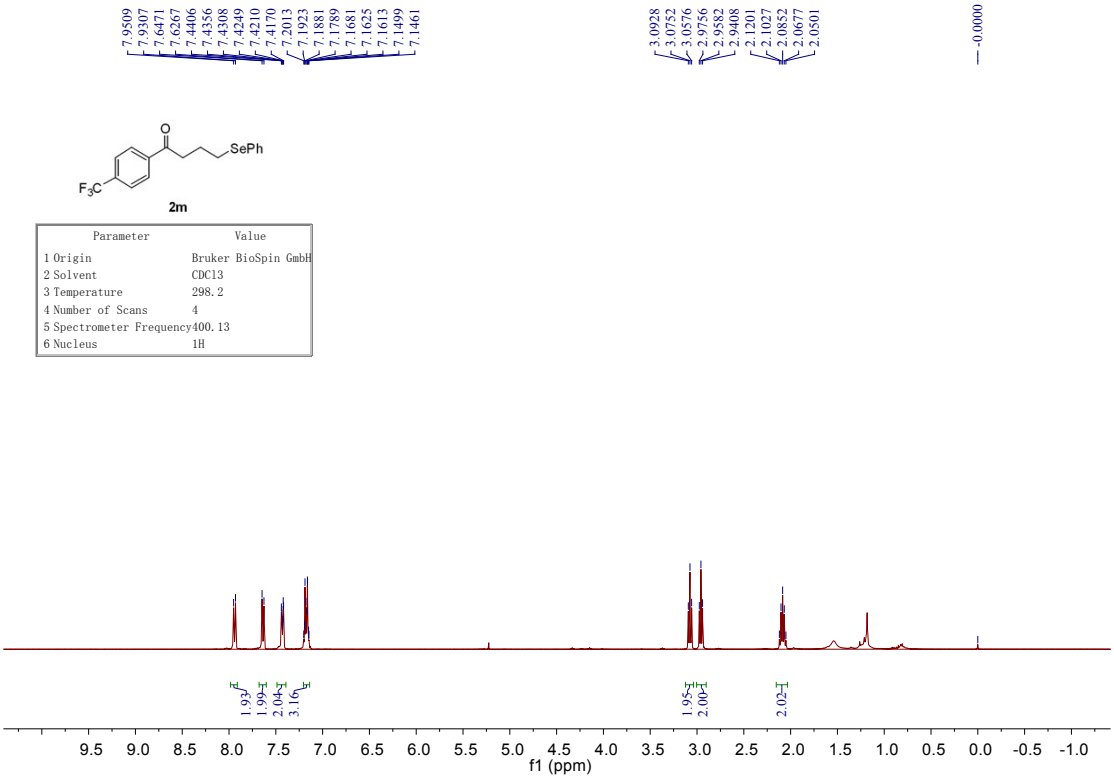


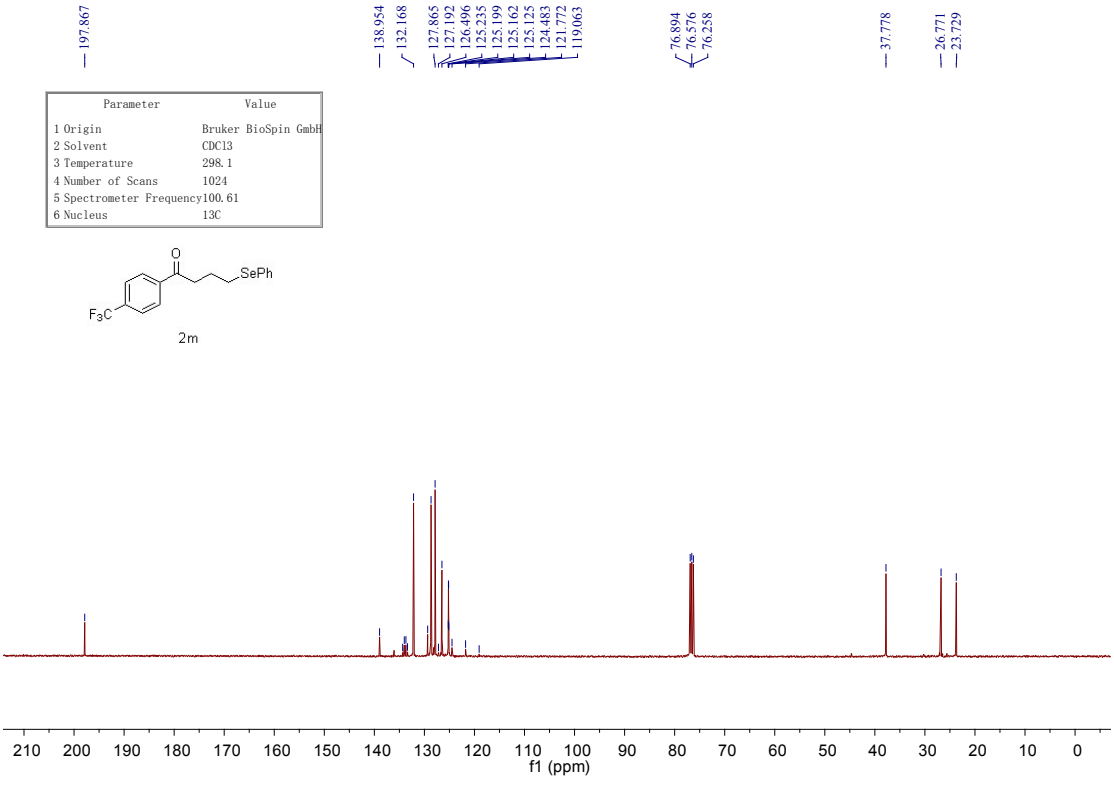


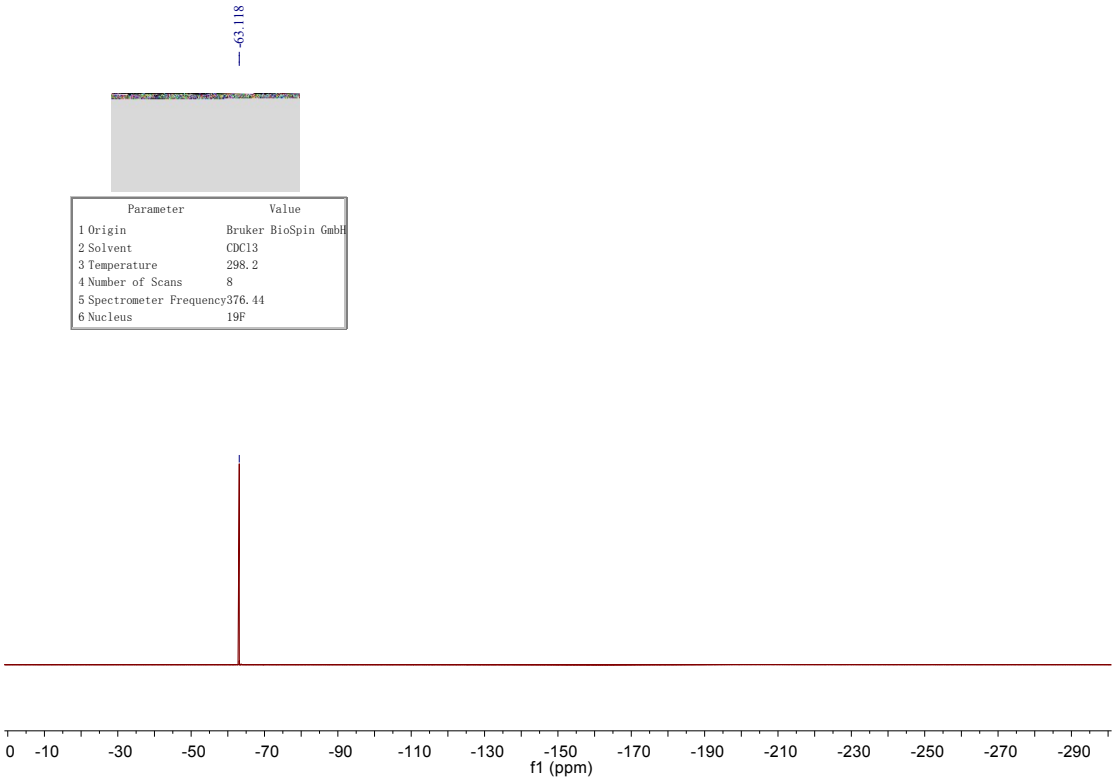
2l

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	1024
5 Spectrometer Frequency	100.61
6 Nucleus	13C

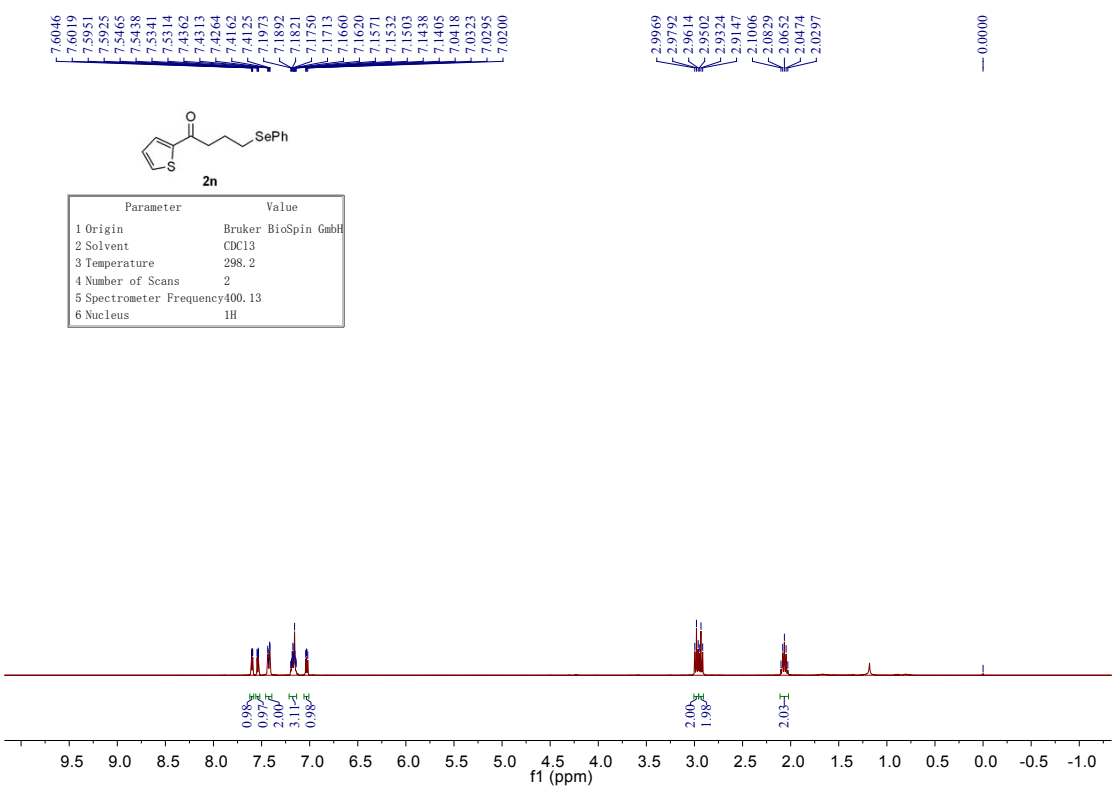



7.9509
7.9307
7.6471
7.6267
7.4406
7.4356
7.4308
7.4249
7.4210
7.4170
7.2013
7.1923
7.1881
7.1789
7.1681
7.1625
7.1613
7.1499
7.1461
3.0928
3.0752
3.0576
2.9756
2.9582
2.9408
2.1201
2.1027
2.0852
2.0677
2.0501
-0.0000
O
SePh
F3C
2m
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.93
1.99
2.04
3.16
1.95
2.00
2.02
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)


197.867
138.954
132.168
127.865
127.192
126.496
125.235
125.199
125.162
125.125
124.483
121.772
119.063
76.894
76.576
76.258
37.778
26.771
23.729
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
O
SePh
F3C
2m
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

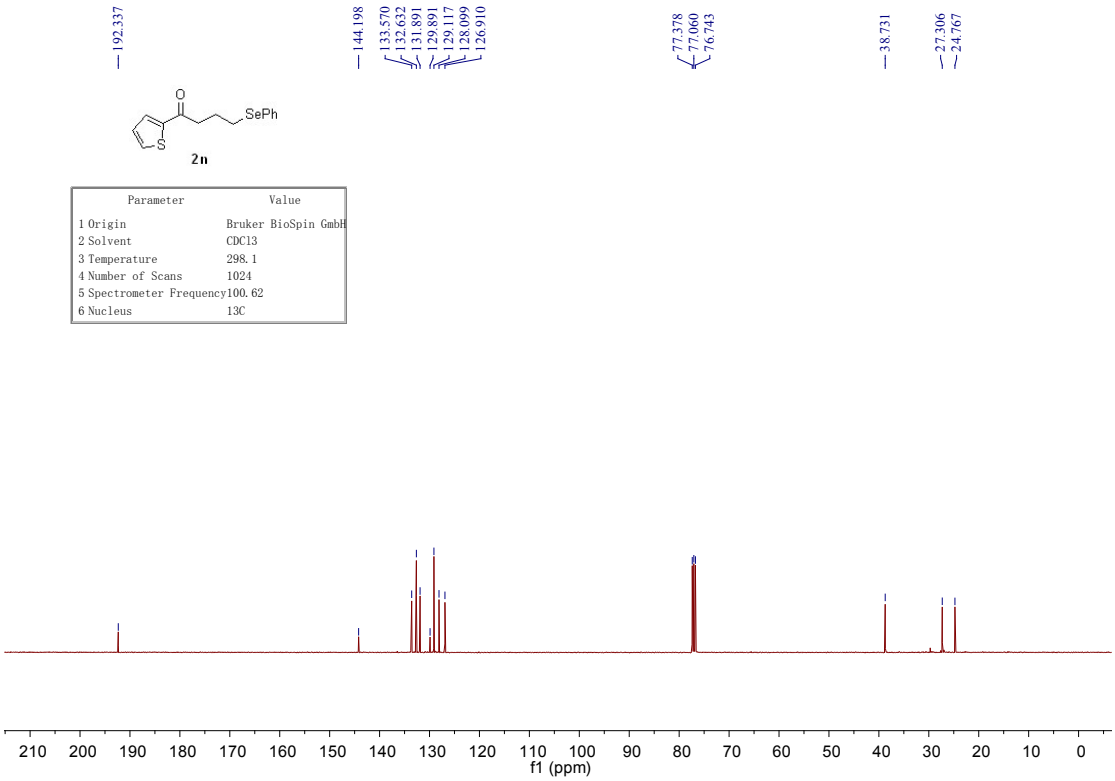


Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	8
5 Spectrometer Frequency	376.44
6 Nucleus	19F

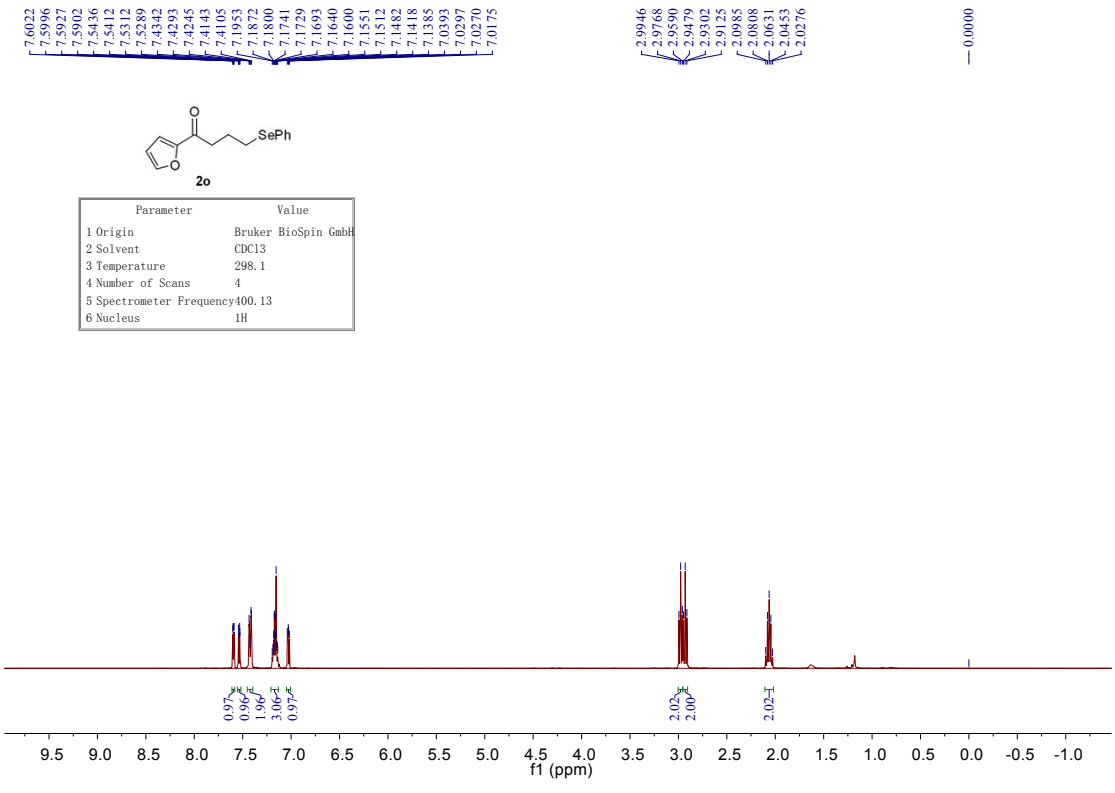


2n

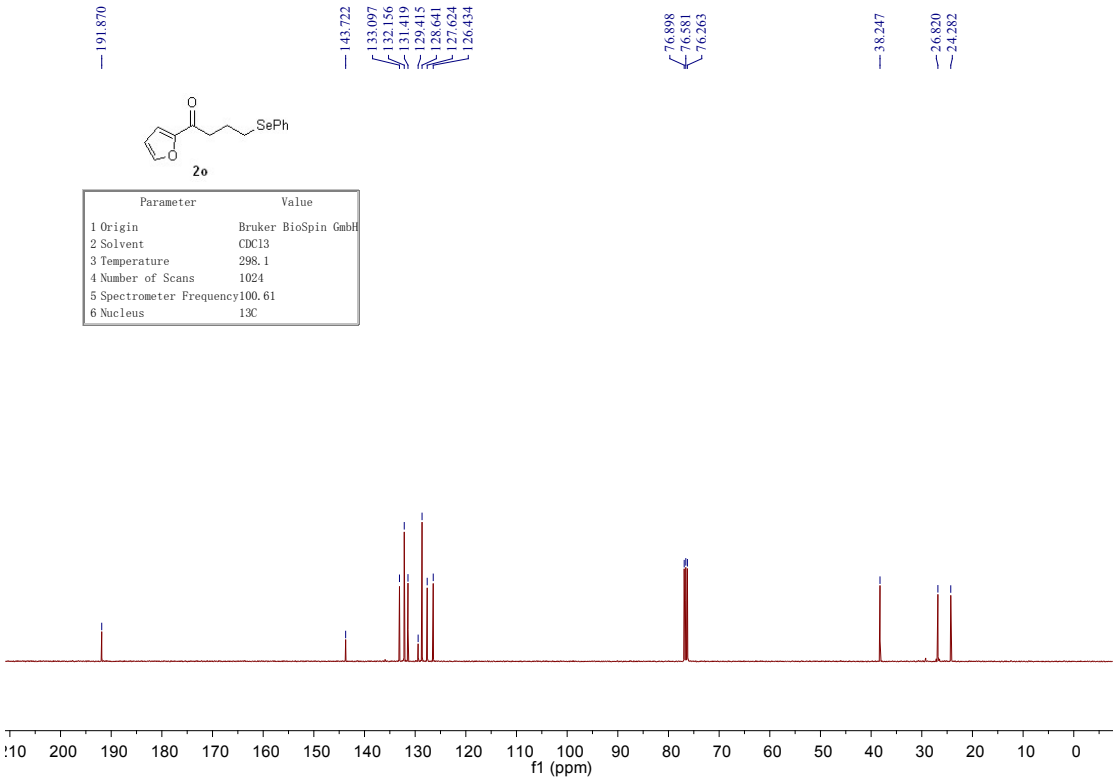
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	2
5 Spectrometer Frequency	400.13
6 Nucleus	1H



Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	1024
5 Spectrometer Frequency	100.62
6 Nucleus	13C

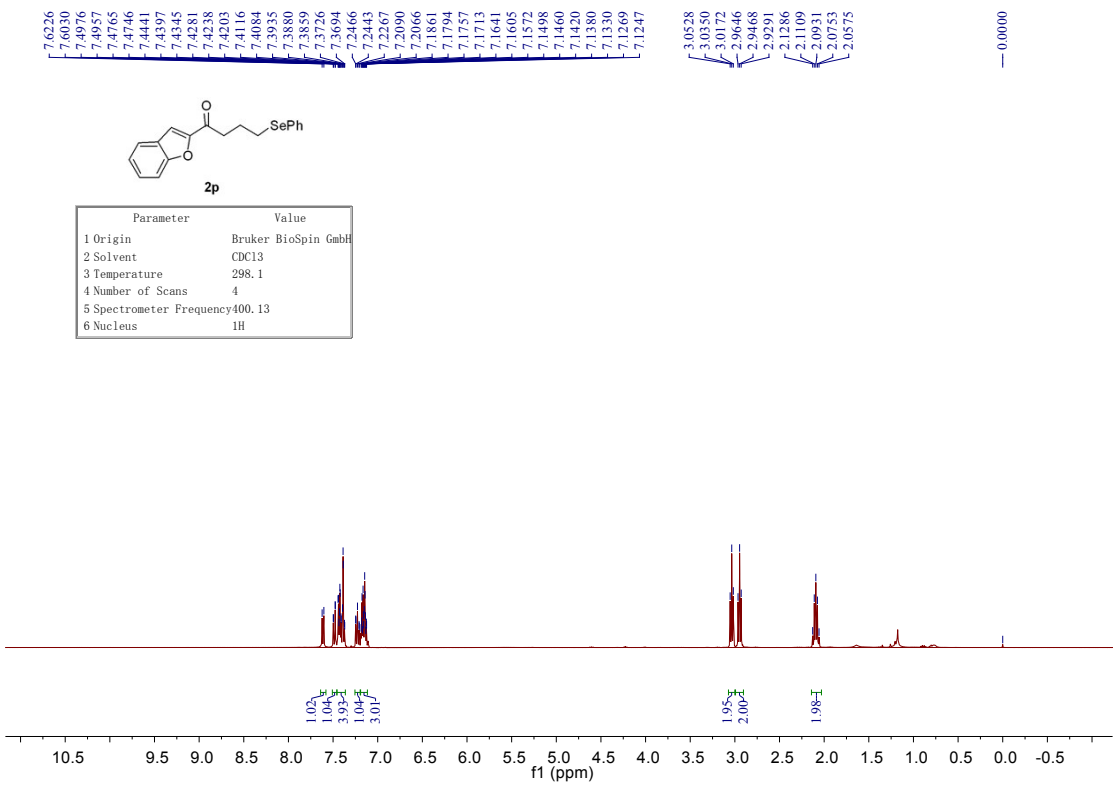


Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H



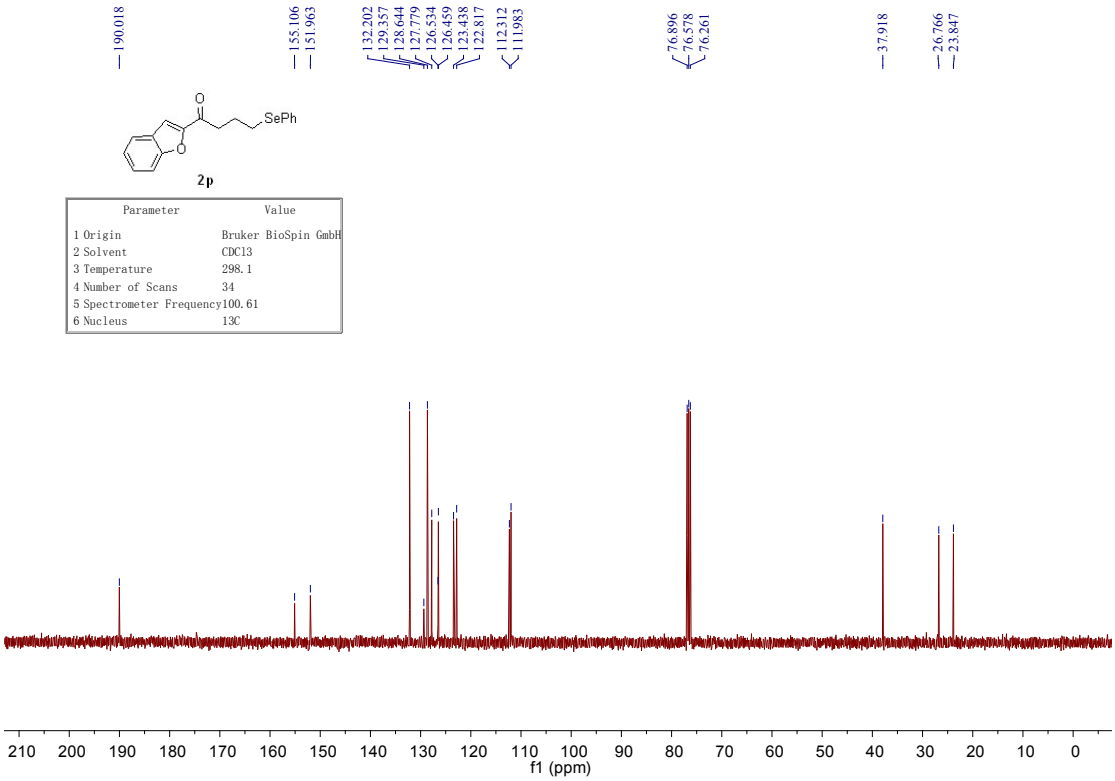
2o

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	1024
5 Spectrometer Frequency	100.61
6 Nucleus	13C



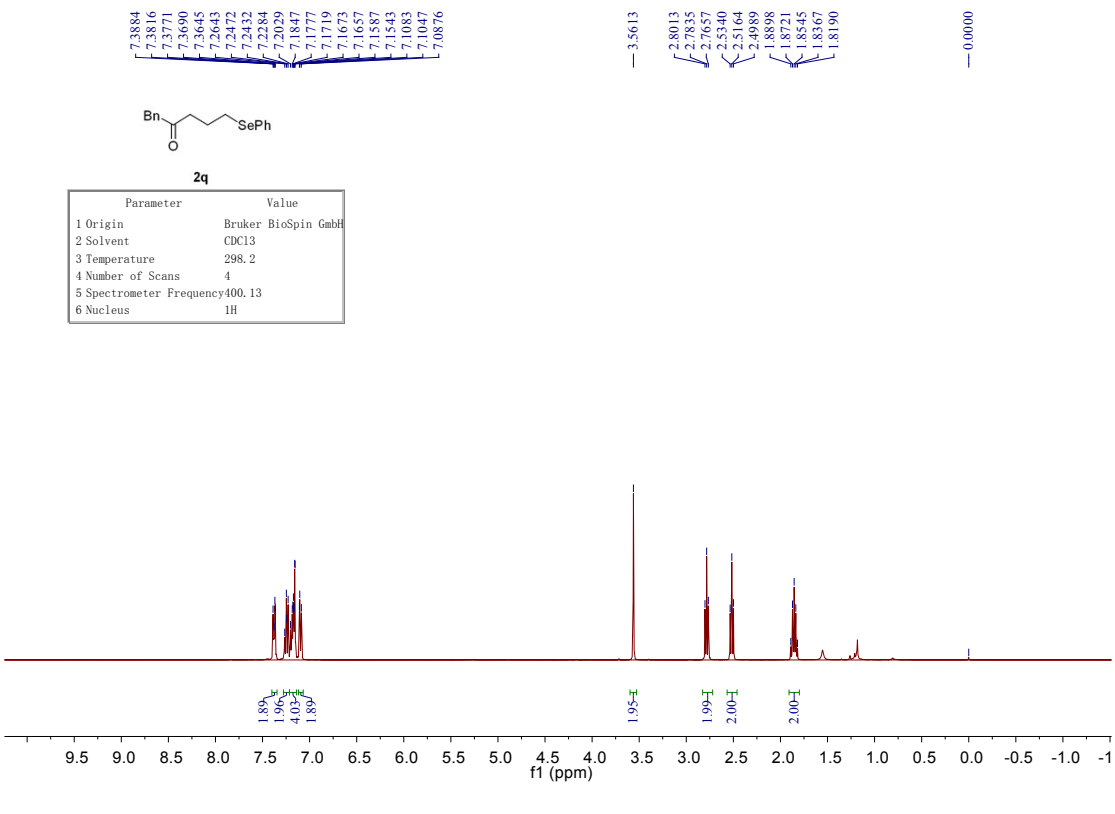
2p

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H



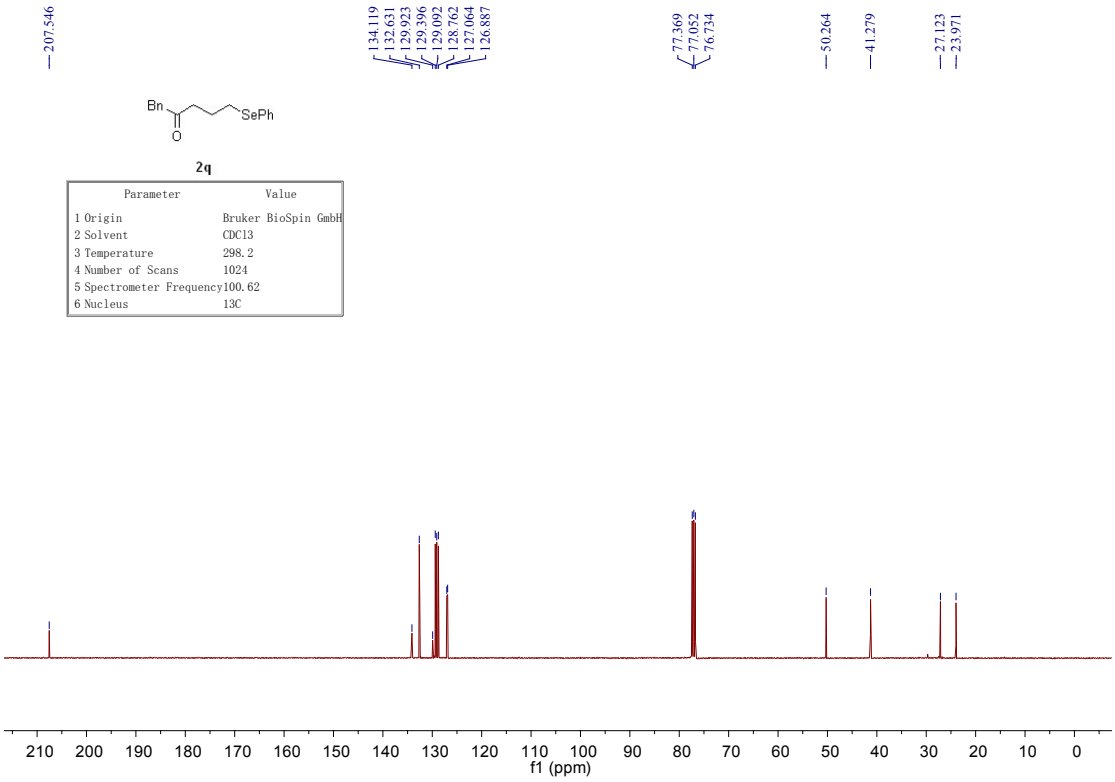
2p

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	34
5 Spectrometer Frequency	100.61
6 Nucleus	13C



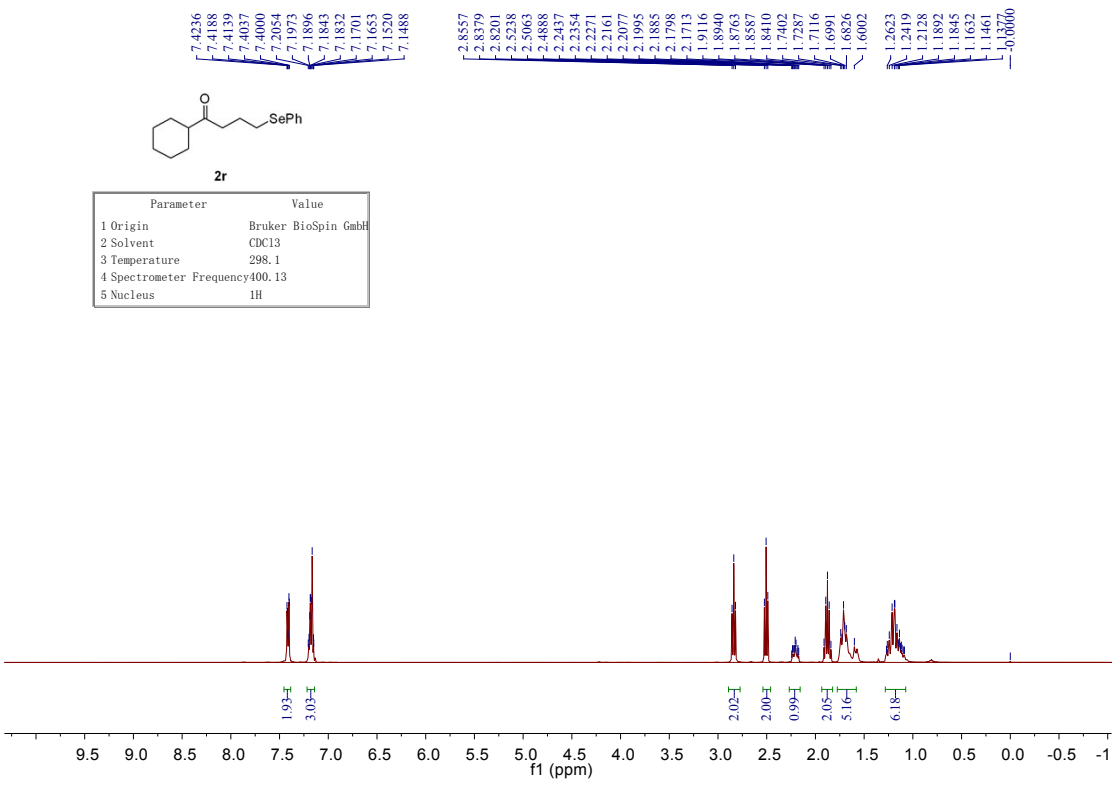
2q

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H



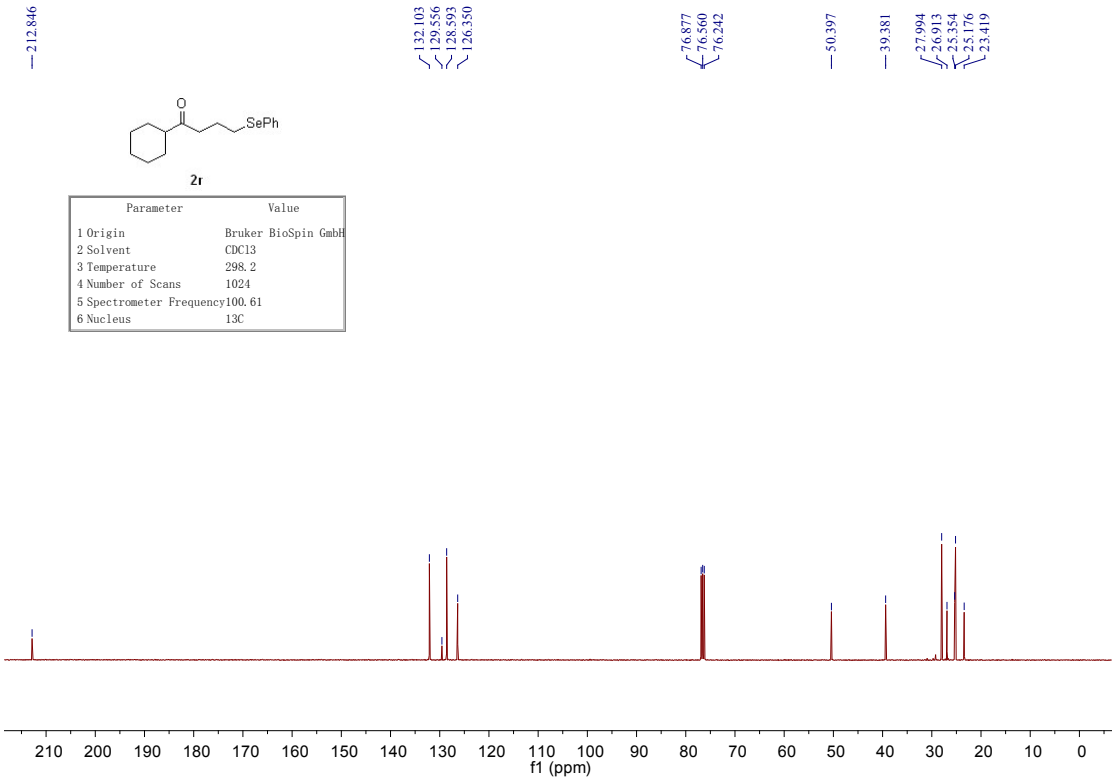
2q

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	1024
5 Spectrometer Frequency	100.62
6 Nucleus	13C



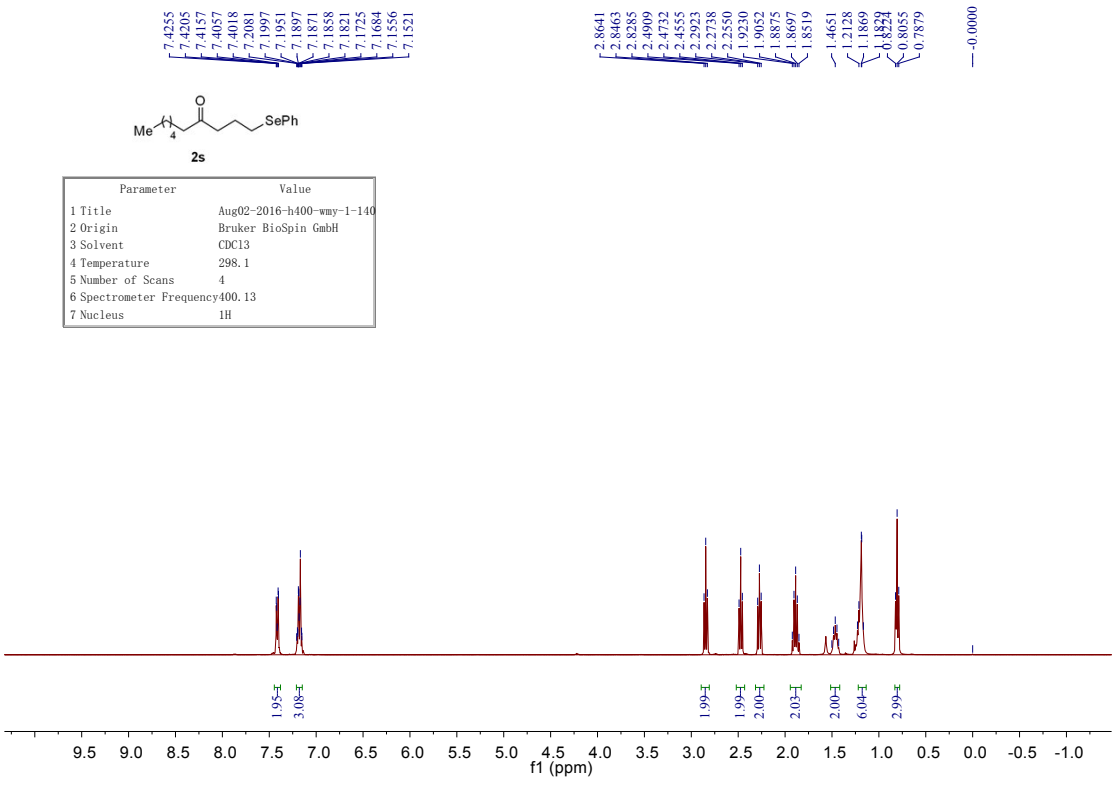
2r

Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Spectrometer Frequency	400.13
5 Nucleus	1H



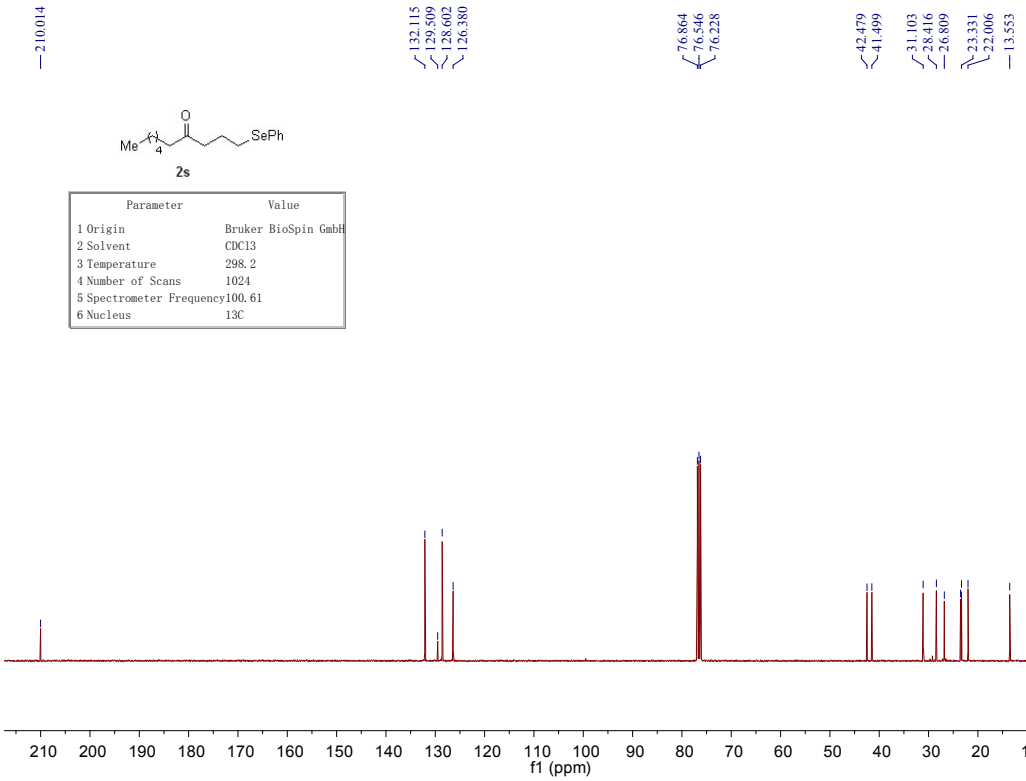
2r

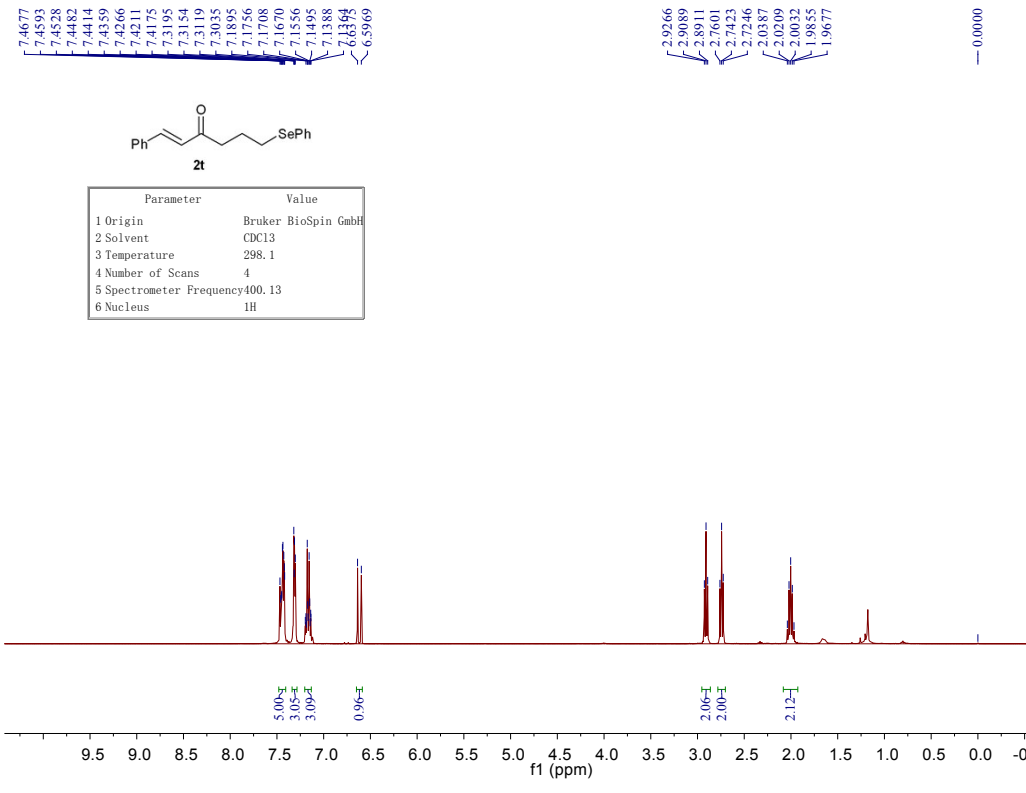
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.2
4 Number of Scans	1024
5 Spectrometer Frequency	100.61
6 Nucleus	13C

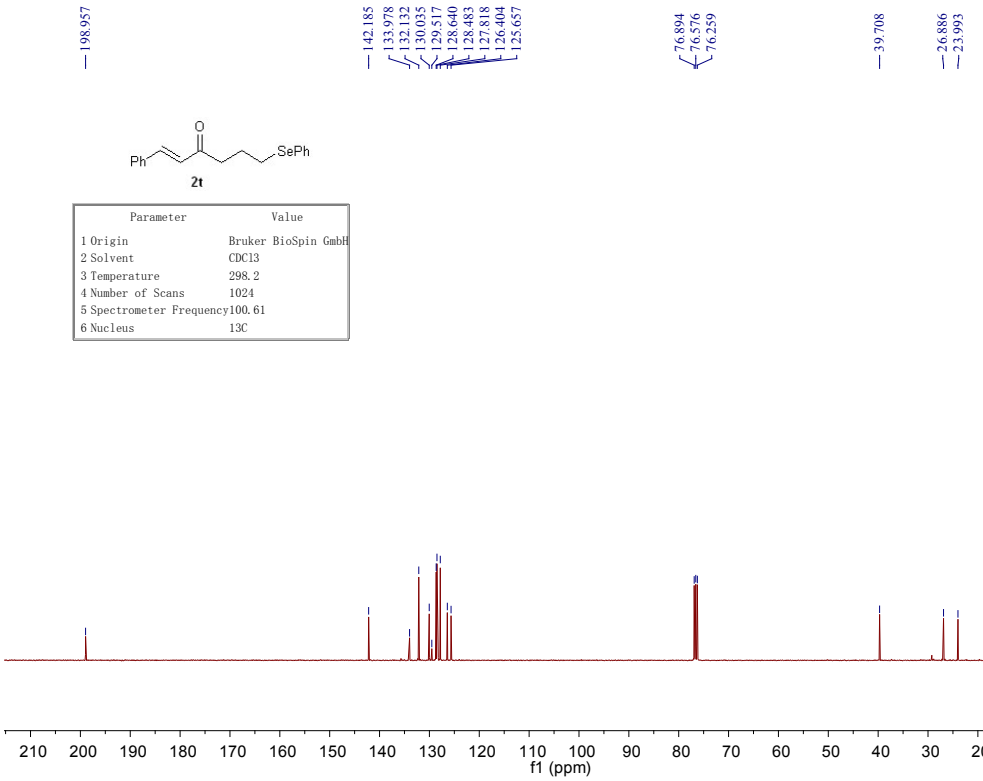


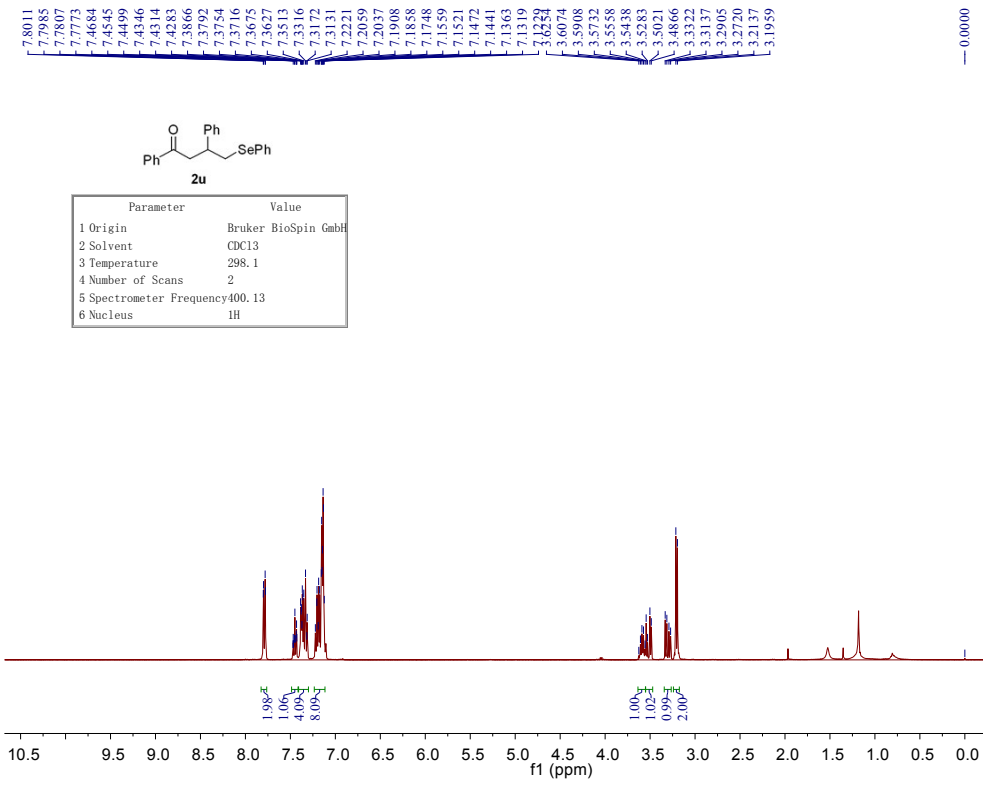
2s

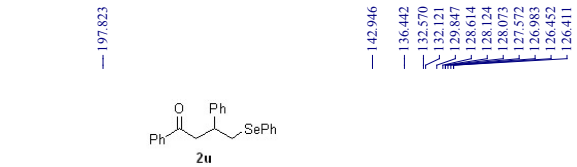
Parameter	Value
1 Title	Aug02-2016-h400-wmy-1-140
2 Origin	Bruker BioSpin GmbH
3 Solvent	CDCl3
4 Temperature	298.1
5 Number of Scans	4
6 Spectrometer Frequency	400.13
7 Nucleus	1H


210.014
132.115
129.509
128.602
126.380
76.864
76.546
76.228
42.479
41.499
31.103
28.416
26.809
23.331
22.006
13.553
Me
4
O
SePh
2s
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.4677
7.4593
7.4528
7.4482
7.4414
7.4359
7.4266
7.4211
7.4175
7.3195
7.3154
7.3119
7.3035
7.1895
7.1756
7.1708
7.1670
7.1556
7.1495
7.1388
7.1364
6.6575
6.5969
2.9266
2.9089
2.8911
2.7601
2.7423
2.7246
2.0387
2.0209
2.0032
1.9855
1.9677
0.0000
Ph
O
SePh
2t
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
5.00
3.05
3.09
0.96
2.06
2.00
2.12
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)

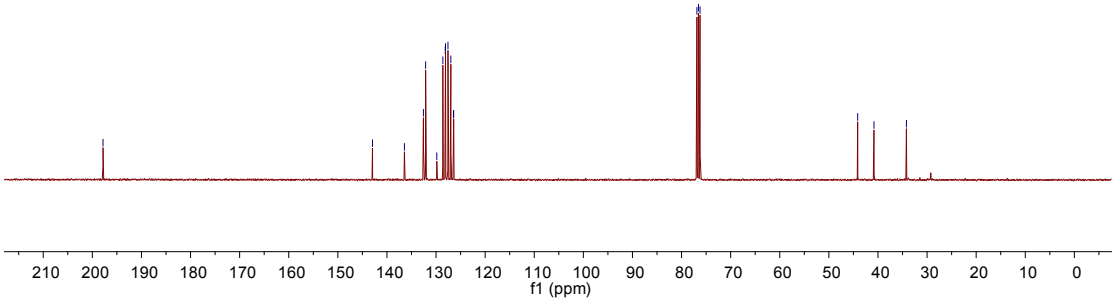

198.957
142.185
133.978
132.132
130.035
129.517
128.640
128.483
127.818
126.404
125.657
76.894
76.576
76.259
39.708
26.886
23.993
O
Ph
SePh
2t
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
f1 (ppm)


7.8011
7.7985
7.7807
7.7773
7.4684
7.4545
7.4499
7.4346
7.4314
7.4283
7.3866
7.3792
7.3754
7.3716
7.3675
7.3627
7.3513
7.3316
7.3172
7.3131
7.2221
7.2059
7.2037
7.1908
7.1858
7.1748
7.1559
7.1521
7.1472
7.1441
7.1363
7.1319
3.6074
3.5908
3.5732
3.5558
3.5438
3.5283
3.5021
3.4866
3.3322
3.3137
3.2905
3.2720
3.2137
3.1959
0.0000
O
Ph
Ph
SePh
2u
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.98
1.06
4.09
8.09
1.00
1.02
0.99
2.00
f1 (ppm)

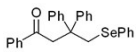


2u

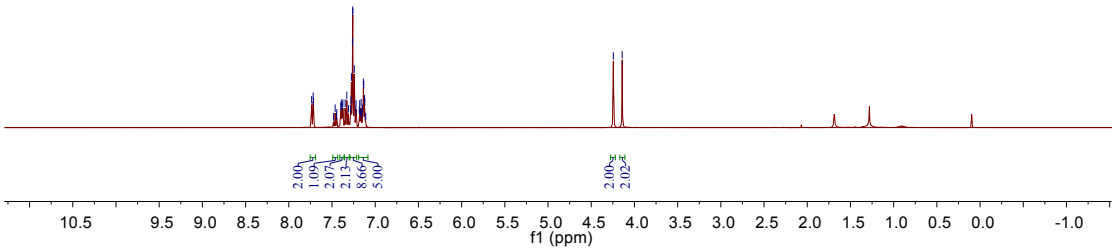
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	1024
5 Spectrometer Frequency	100.61
6 Nucleus	13C

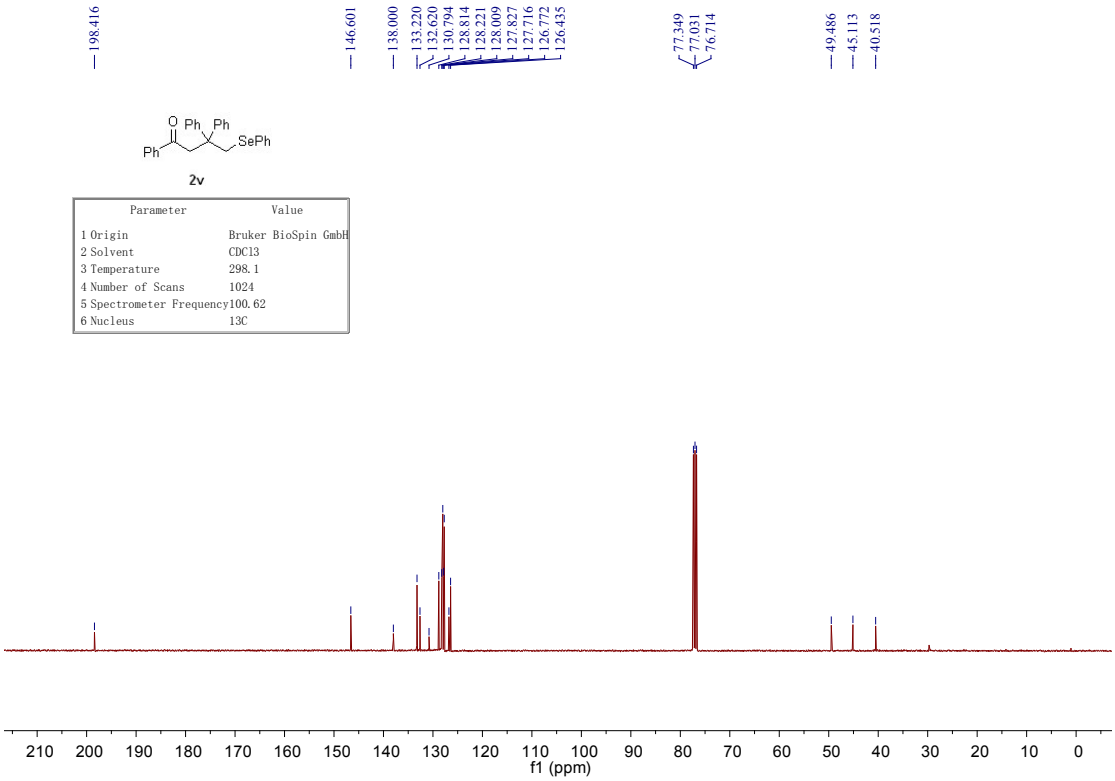


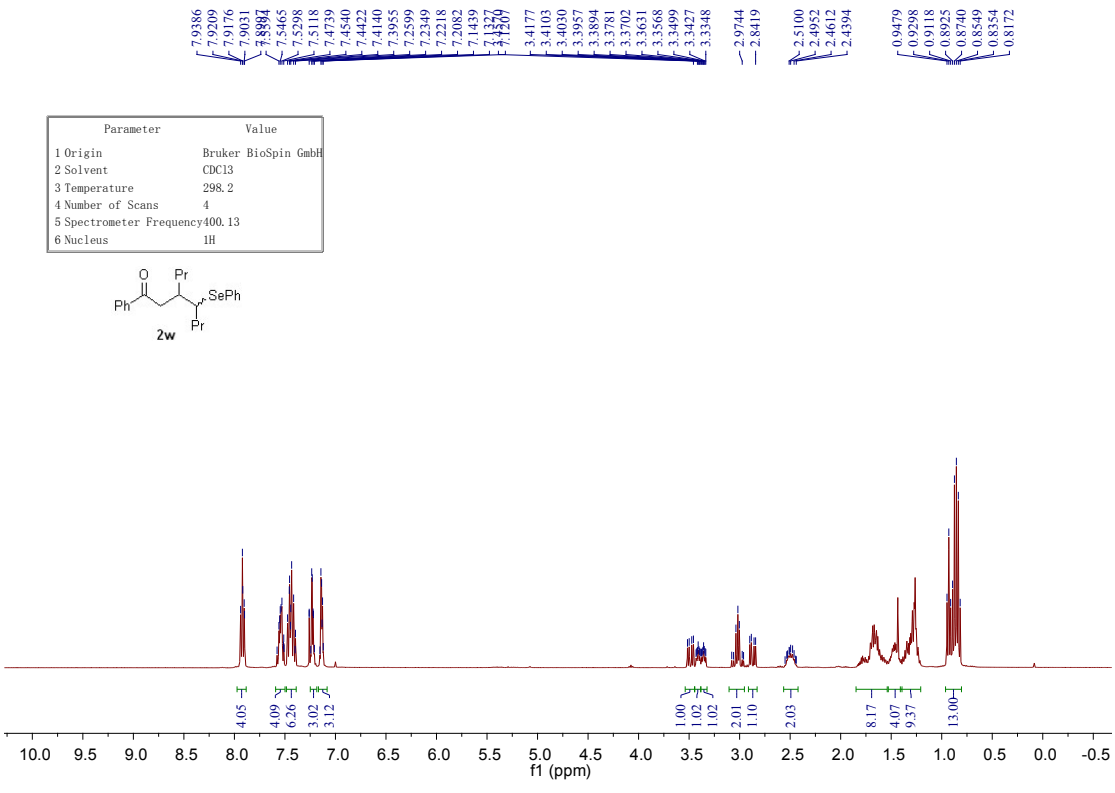
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H

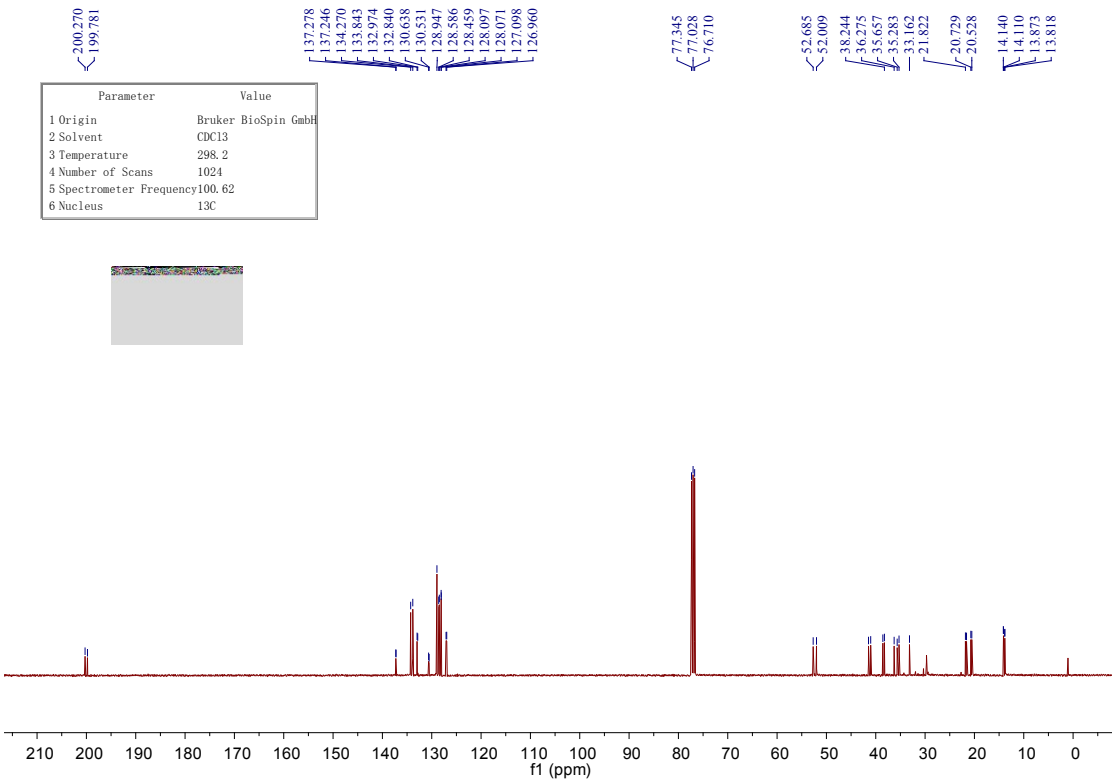


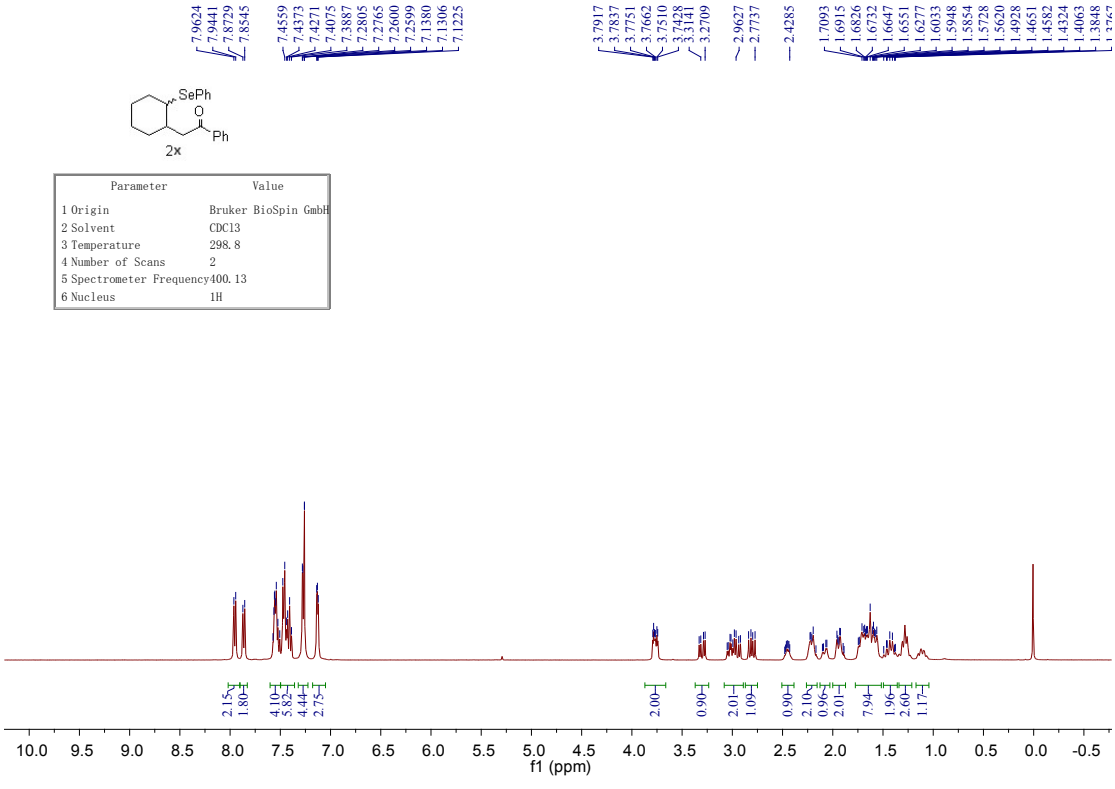
2v

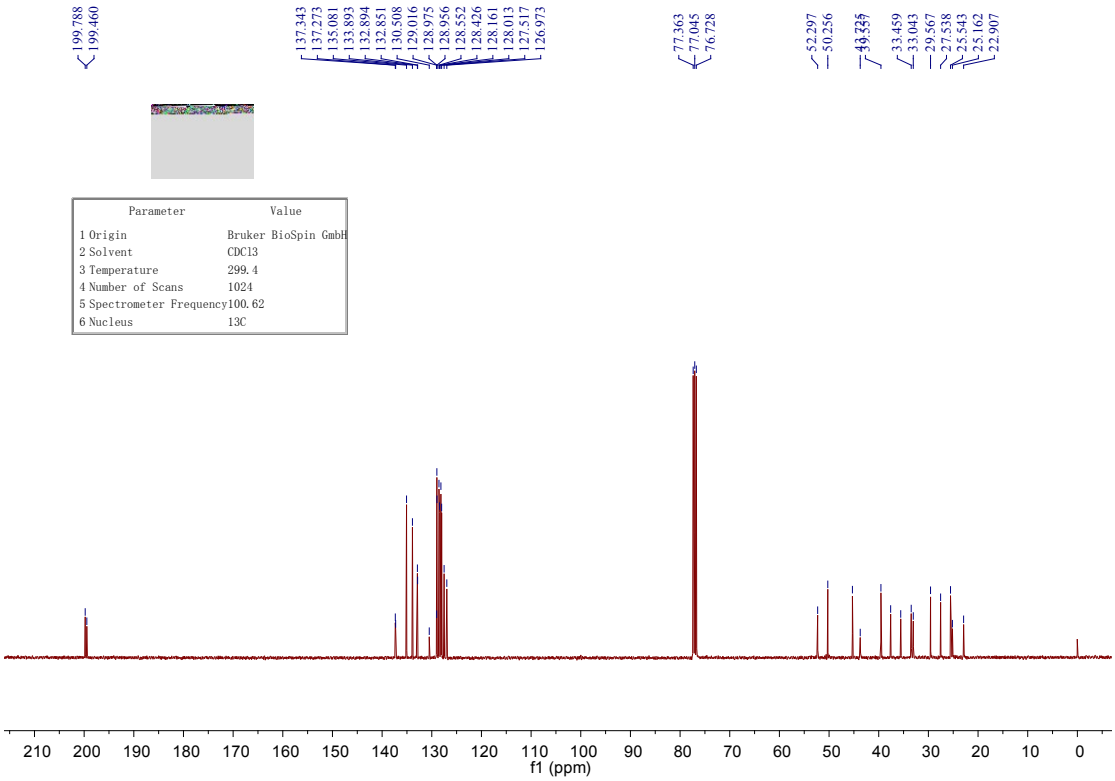


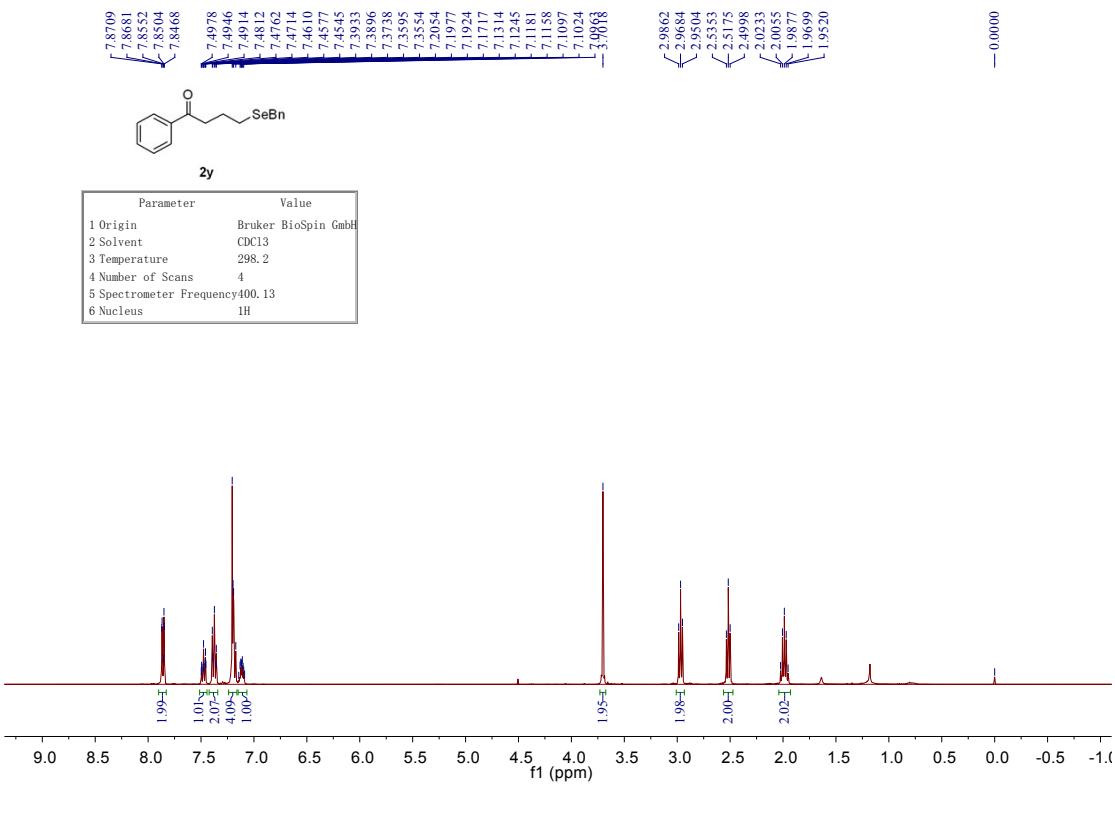

198.416
146.601
138.000
133.220
132.620
130.794
128.814
128.221
128.009
127.827
127.716
126.772
126.435
77.349
77.031
76.714
49.486
45.113
40.518
O
Ph
Ph
Ph
SePh
2v
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

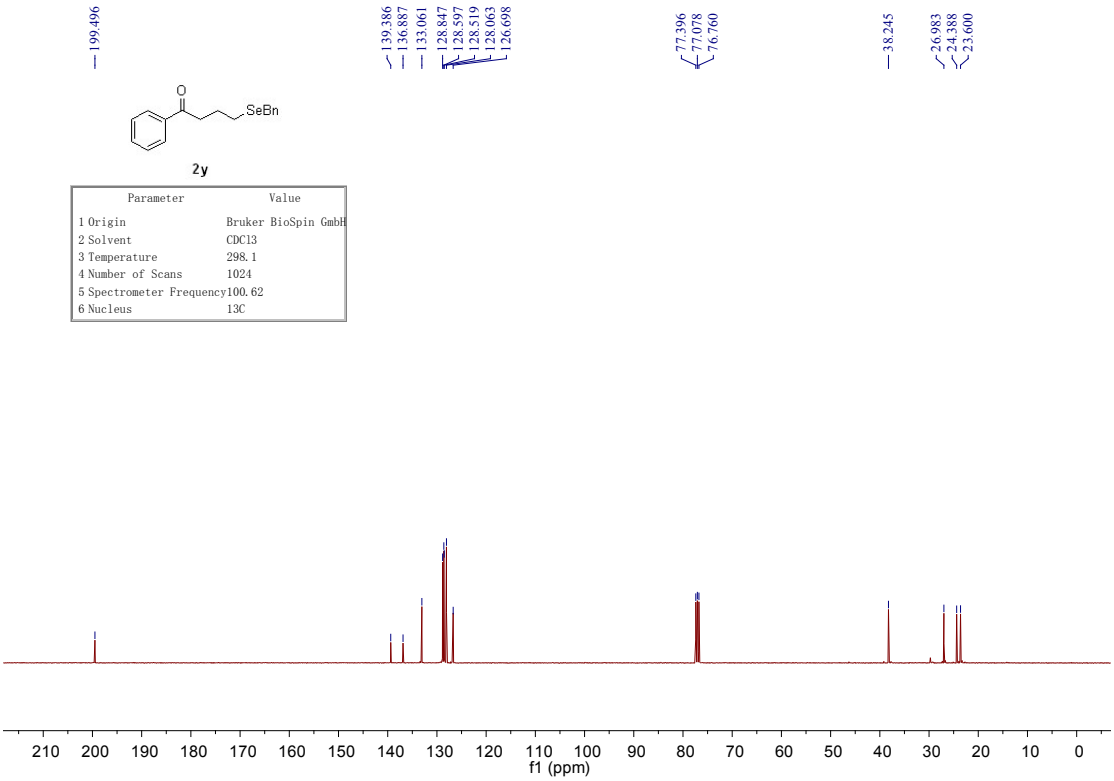

7.9386
7.9209
7.9176
7.9031
7.5465
7.5298
7.5118
7.4739
7.4540
7.4422
7.4140
7.3955
7.2599
7.2349
7.2218
7.2082
7.1439
3.4177
3.4103
3.4030
3.3957
3.3894
3.3781
3.3702
3.3631
3.3568
3.3499
3.3427
3.3348
2.9744
2.8419
2.5100
2.4952
2.4612
2.4394
0.9479
0.9298
0.9118
0.8925
0.8740
0.8549
0.8354
0.8172
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
O
Pr
Ph
SePh
Pr
2w
4.05
4.09
6.26
3.02
3.12
1.00
1.02
1.02
2.01
1.10
2.03
8.17
4.07
9.37
13.00
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


200.270
199.781
137.278
137.246
134.270
133.843
132.974
132.840
130.638
130.531
128.947
128.586
128.459
128.097
128.071
127.098
126.960
77.345
77.028
76.710
52.685
52.009
38.244
36.275
35.657
35.283
33.162
21.822
20.729
20.528
14.140
14.110
13.873
13.818
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)

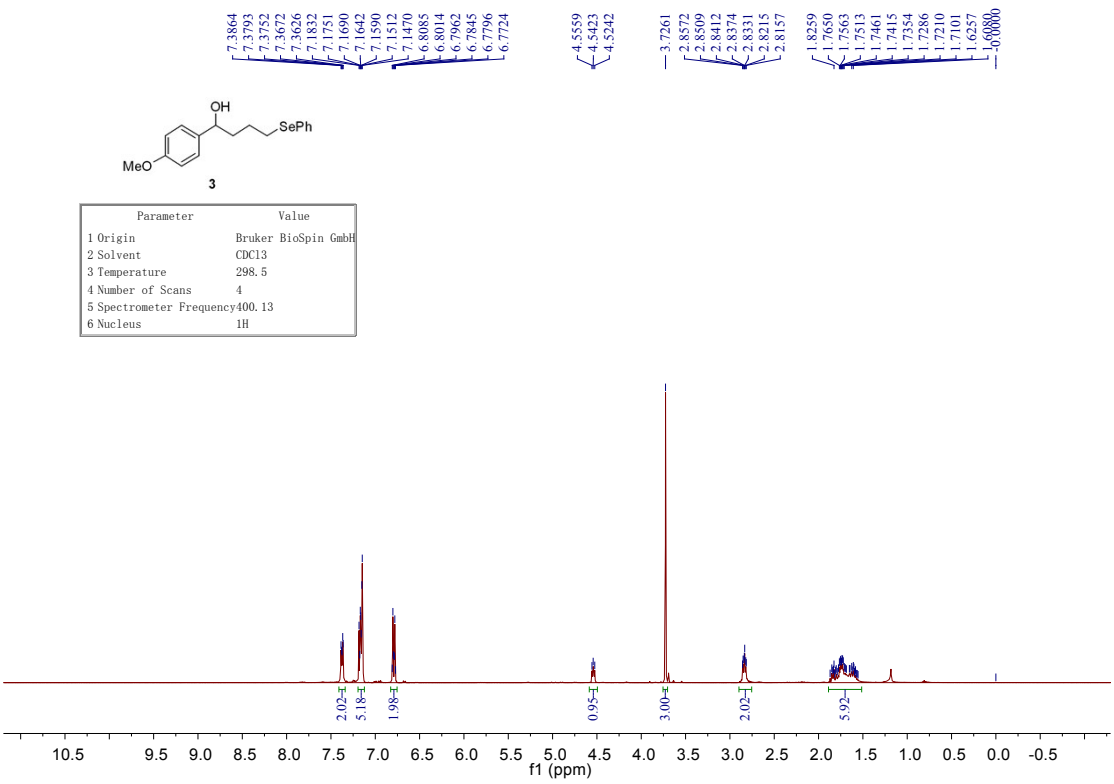

7.9624
7.9441
7.8729
7.8545
7.4559
7.4373
7.4271
7.4075
7.3887
7.2805
7.2765
7.2600
7.2599
7.1380
7.1306
7.1225
3.7917
3.7837
3.7751
3.7662
3.7510
3.7428
3.3141
3.2709
2.9627
2.7737
2.4285
1.7093
1.6915
1.6826
1.6732
1.6647
1.6551
1.6277
1.6033
1.5948
1.5854
1.5728
1.5620
1.4928
1.4651
1.4582
1.4324
1.4063
1.3848
SePh
O
Ph
2x
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.8
4 Number of Scans 2
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.15
1.80
4.10
5.82
4.44
2.75
2.00
0.90
2.01
1.09
0.90
2.10
0.96
2.01
7.94
1.96
2.60
1.17
f1 (ppm)


199.788
199.460
137.343
137.273
135.081
133.893
132.894
132.851
130.508
129.016
128.975
128.956
128.552
128.426
128.161
128.013
127.517
126.973
77.363
77.045
76.728
52.297
50.256
33.459
33.043
29.567
27.538
25.543
25.162
22.907
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 299.4
4 Number of Scans 1024
5 Spectrometer Frequency 100.62
6 Nucleus 13C
f1 (ppm)

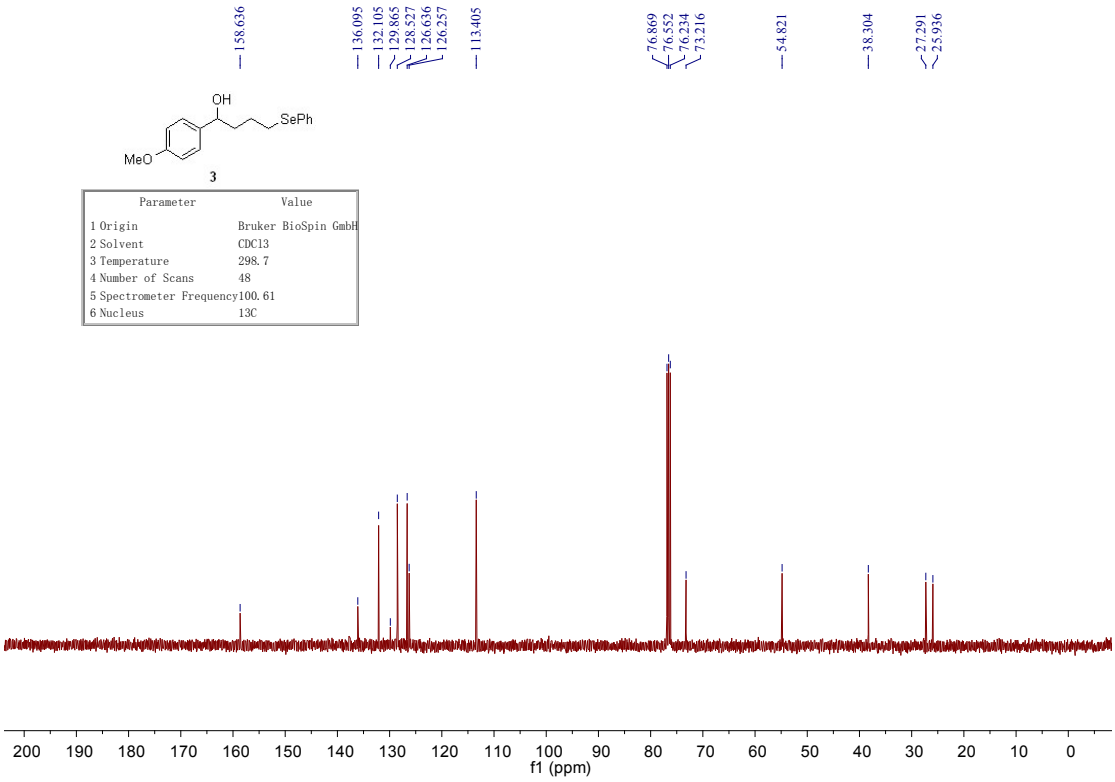

7.8709
7.8681
7.8552
7.8504
7.8468
7.4978
7.4946
7.4914
7.4812
7.4762
7.4714
7.4610
7.4577
7.4545
7.3933
7.3896
7.3738
7.3595
7.3554
7.2054
7.1977
7.1924
7.1717
7.1314
7.1245
7.1181
7.1158
7.1097
7.1024
3.0018
2.9862
2.9684
2.9504
2.5353
2.5175
2.4998
2.0233
2.0055
1.9877
1.9699
1.9520
0.0000
O
SeBn
2y
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
1.99
1.01
2.07
4.09
1.00
1.95
1.98
2.00
2.02
f1 (ppm)

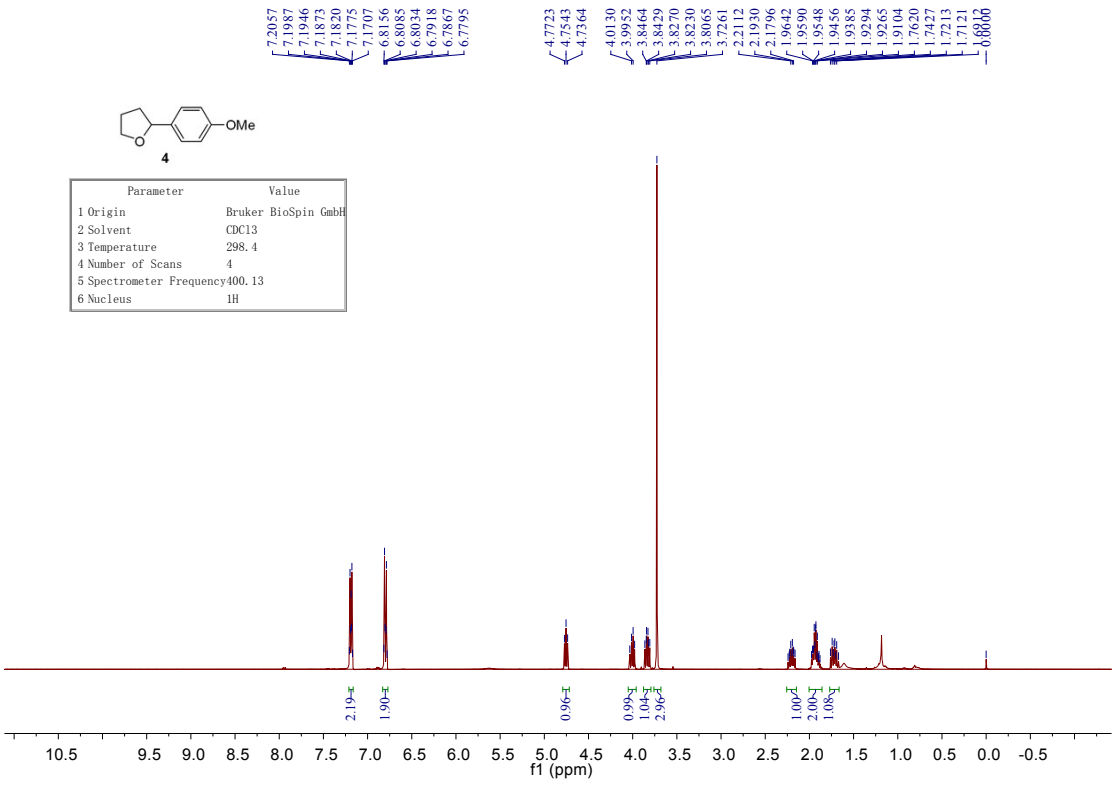


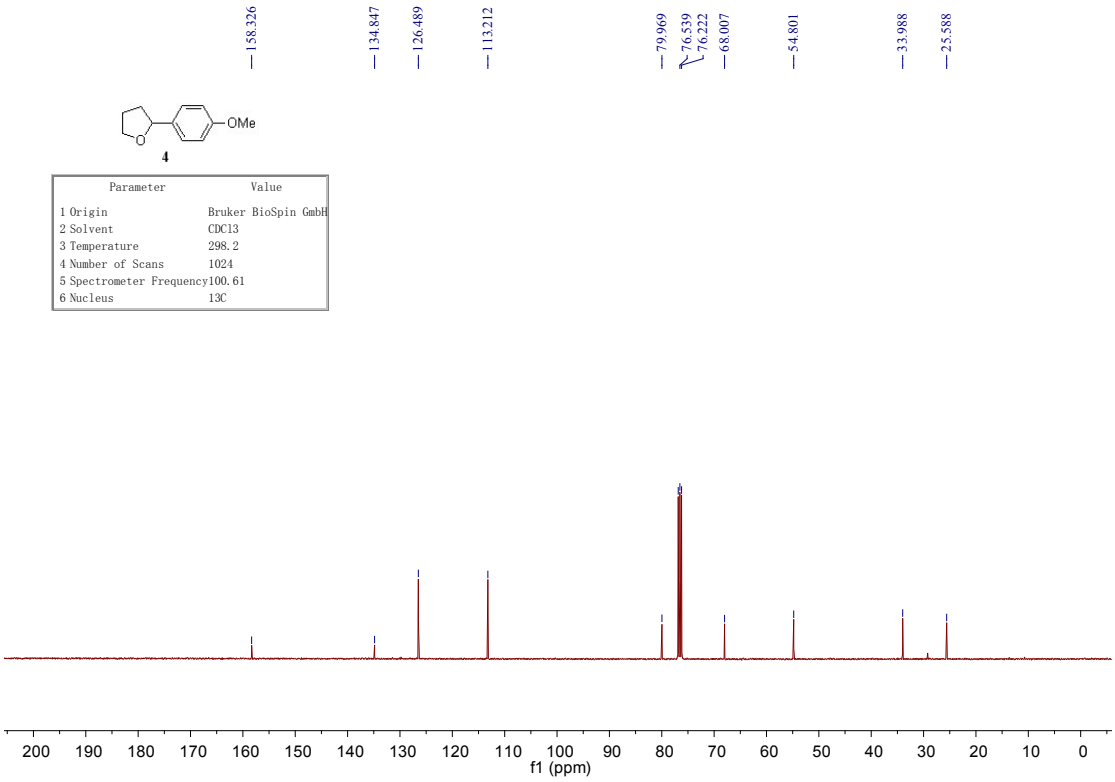
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.1
4 Number of Scans	1024
5 Spectrometer Frequency	100.62
6 Nucleus	13C

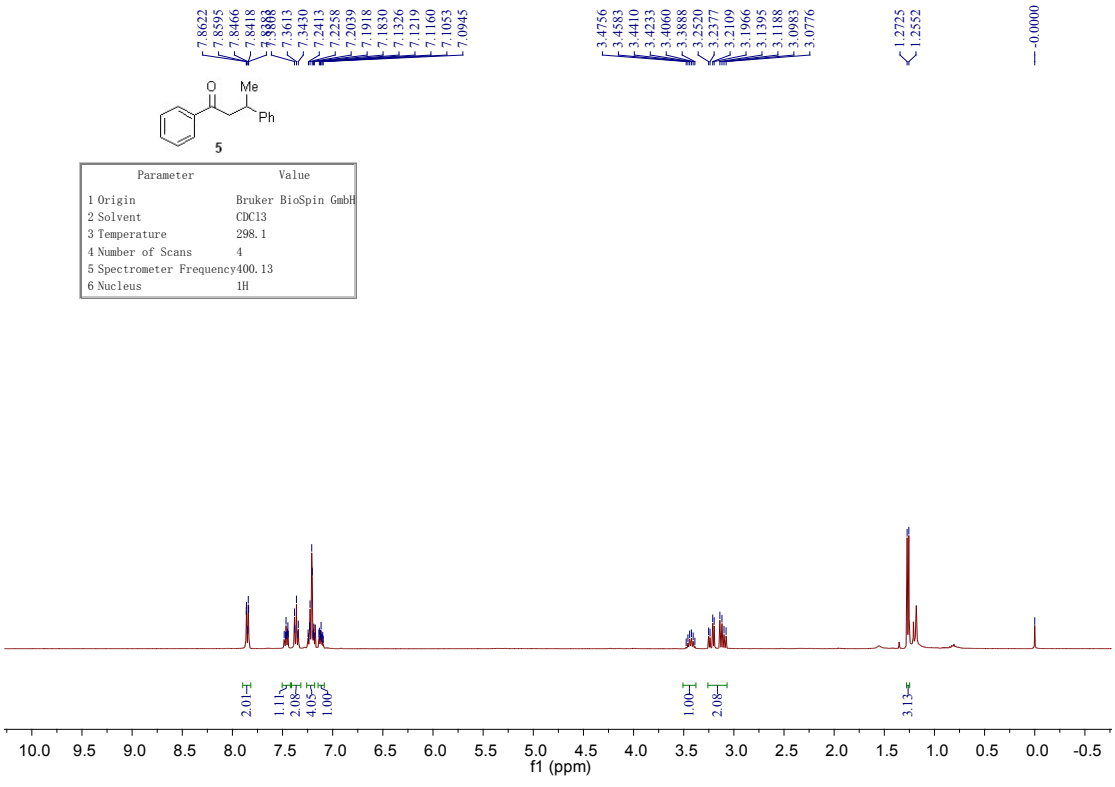


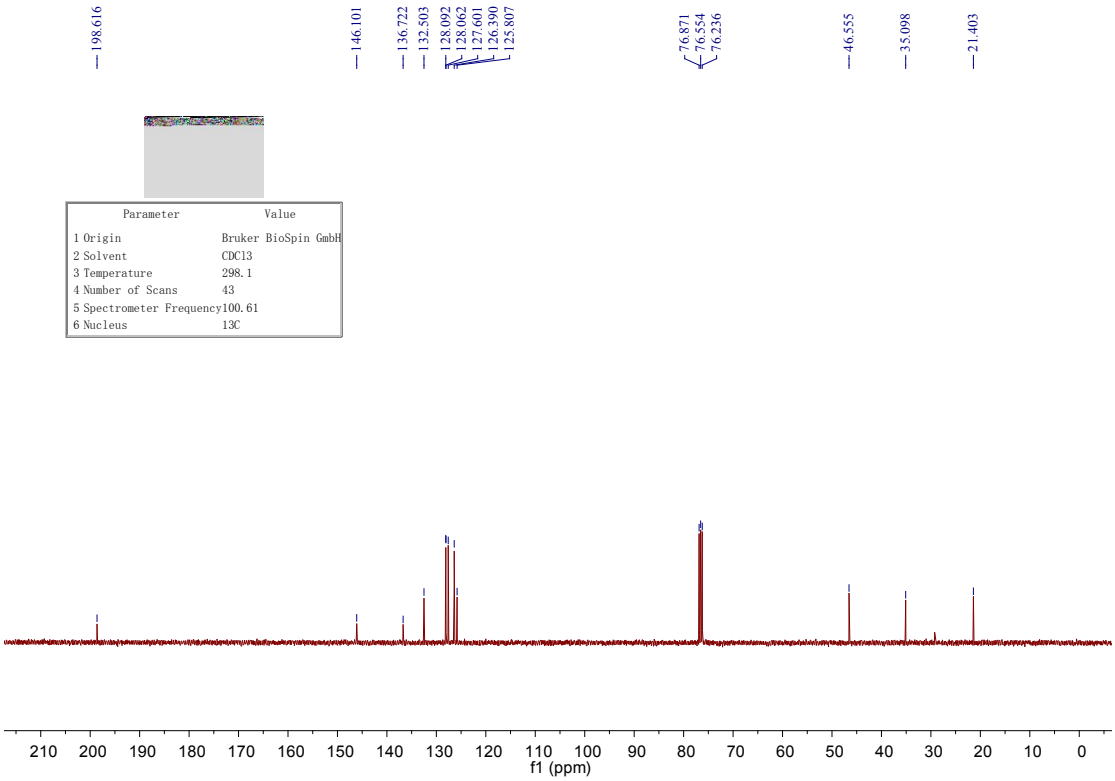
Parameter	Value
1 Origin	Bruker BioSpin GmbH
2 Solvent	CDCl3
3 Temperature	298.5
4 Number of Scans	4
5 Spectrometer Frequency	400.13
6 Nucleus	1H


158.636
136.095
132.105
129.865
128.527
126.636
126.257
113.405
76.869
76.552
76.234
73.216
54.821
38.304
27.291
25.936
OH
SePh
MeO
3
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.7
4 Number of Scans 48
5 Spectrometer Frequency 100.61
6 Nucleus 13C
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.2057
7.1987
7.1946
7.1873
7.1820
7.1775
7.1707
6.8156
6.8085
6.8034
6.7918
6.7867
6.7795
4.7723
4.7543
4.7364
4.0130
3.9952
3.8464
3.8429
3.8270
3.8230
3.8065
3.7261
2.2112
2.1930
2.1796
1.9642
1.9590
1.9548
1.9456
1.9385
1.9294
1.9265
1.9104
1.7620
1.7427
1.7213
1.7121
1.6912
0.0000
OMe
4
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.4
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.19
1.90
0.96
0.99
1.04
2.96
1.00
2.00
1.08
10.5 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


158.326
134.847
126.489
113.212
79.969
76.539
76.222
68.007
54.801
33.988
25.588
OMe
O
4
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.2
4 Number of Scans 1024
5 Spectrometer Frequency 100.61
6 Nucleus 13C
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.8622
7.8595
7.8466
7.8418
7.3613
7.3430
7.2413
7.2258
7.2039
7.1918
7.1830
7.1326
7.1219
7.1160
7.1053
7.0945
3.4756
3.4583
3.4410
3.4233
3.4060
3.3888
3.2520
3.2377
3.2109
3.1966
3.1395
3.1188
3.0983
3.0776
1.2725
1.2552
-0.0000
O
Me
Ph
5
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 4
5 Spectrometer Frequency 400.13
6 Nucleus 1H
2.01
1.11
2.08
4.05
1.00
1.00
2.08
3.13
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


198.616
146.101
136.722
132.503
128.092
128.062
127.601
126.390
125.807
76.871
76.554
76.236
46.555
35.098
21.403
Parameter Value
1 Origin Bruker BioSpin GmbH
2 Solvent CDCl3
3 Temperature 298.1
4 Number of Scans 43
5 Spectrometer Frequency 100.61
6 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)