

Development and Elucidation of a Pd-based Cyclization/Oxygenation Sequence for Natural Product Synthesis

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Supporting Information

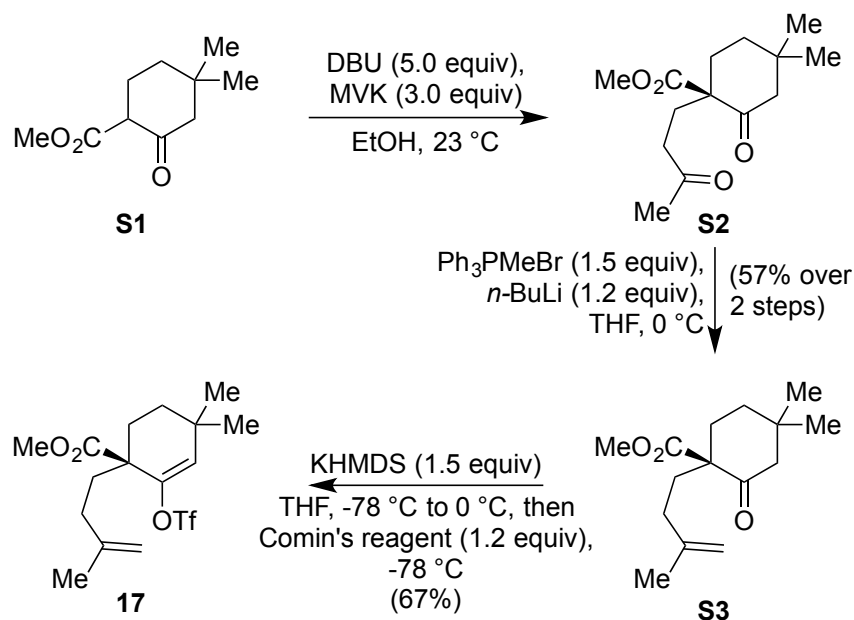
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Experimental Data for Compounds

General Procedures. All reactions were carried out under an argon atmosphere with dry solvents under anhydrous conditions, unless otherwise noted. Dry tetrahydrofuran (THF), toluene, dimethylformamide (DMF), diethyl ether (Et₂O) and dichloromethane (CH₂Cl₂) were obtained by passing commercially available pre-dried, oxygen-free formulations through activated alumina columns. Yields refer to chromatographically and spectroscopically (¹H and ¹³C NMR) homogeneous materials, unless otherwise stated. Reagents were purchased at the highest commercial quality and used without further purification, unless otherwise stated. Reactions were magnetically stirred and monitored by thin-layer chromatography (TLC) carried out on 0.25 mm E. SiliCycle silica gel plates silica gel plates (60F-254) using UV light as visualizing agent, and an ethanolic solution of phosphomolybdic acid and cerium sulfate, and heat as developing agents. SiliCycle silica gel (60, academic grade, particle size 0.040–0.063 mm) was used for flash column chromatography. Preparative thin-layer chromatography separations were carried out on 0.50 mm E. Merck silica gel plates (60F-254). NMR spectra were recorded on Bruker 500 MHz and 400 MHz instruments and calibrated using residual undeuterated solvent as an internal reference. The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, sx = sextet, m = multiplet. IR spectra were recorded on a Perkin-Elmer 1000 series FT-IR spectrometer. High-resolution mass spectra (HRMS) were recorded on an Agilent 6244 Tof-MS using ESI (Electrospray Ionization) or CI (Chemical Ionization) at the University of Chicago Mass Spectroscopy Core Facility.

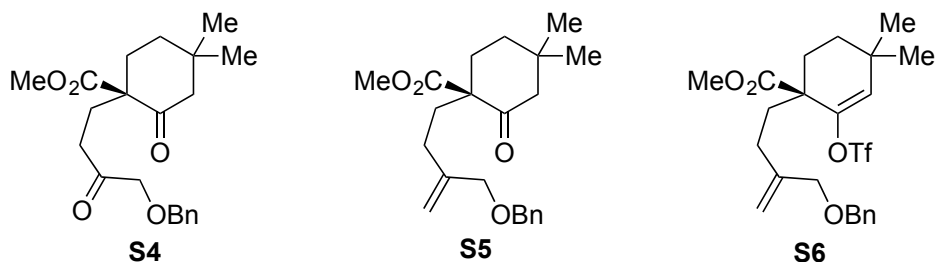
Abbreviations. EtOAc = ethyl acetate, THF = tetrahydrofuran, DBU = 1,8-diazabicyclo[5.4.0]undec-7-ene, MVK = methyl vinyl ketone, EtOH = ethanol, MeOH = methanol, KHMDS = potassium bis(trimethylsilyl)amide, Bn = benzyl, Ac = acetyl, *t*-BuOH = *t*-butanol, *t*-BuOK = potassium *t*-butoxide, LiHMDS = lithium bis(trimethylsilyl)amide, Ad = adamantyl, Phth = phthalimide, Piv = pivaloyl, MPO = 4-methoxypyridine *N*-oxide, LDA = lithium diisopropylamide, TBAF = tetra-*n*-butylammonium fluoride, DIBAL-H = diisobutylaluminum hydride, DMSO = dimethyl sulfoxide, IBX = 2-iodoxybenzoic acid, *n*-BuLi = *n*-butyllithium, *t*-AmylOH = 2-methylbutan-2-ol.

Preparation of triflates



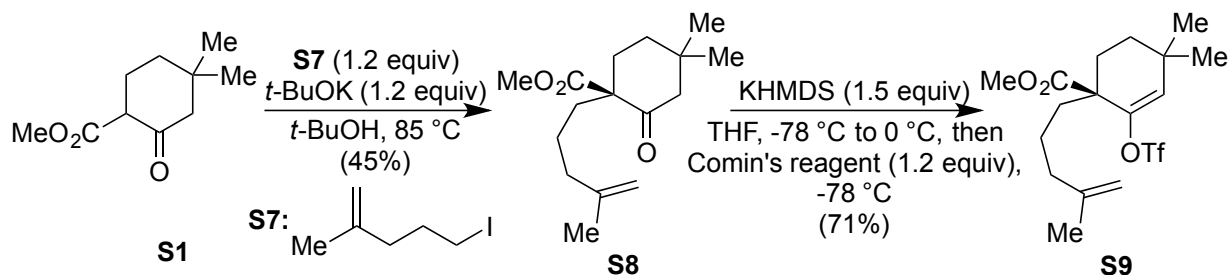
Triflate 17. To a solution of methyl 4,4-dimethyl-2-oxocyclohexane-1-carboxylate (**S1**) (1.84 g, 10.0 mmol, 1.0 equiv) in EtOH (50 mL) at 23 °C was added DBU (7.60 g, 50.0 mmol, 5.0 equiv) and methyl vinyl ketone (2.10 g, 30.0 mmol, 3.0 equiv). The resultant solution was then stirred at 23 °C for 3 h. Upon completion, the reaction contents were diluted with EtOAc (30 mL) and quenched by the addition of saturated aqueous NH_4Cl (30 mL). The resultant mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with EtOAc (2×30 mL). The combined organic layers were washed with H_2O (30 mL) and brine (30 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 5:1) to provide the desired Michael adduct **S2** (2.41 g, 95% yield) as a pale yellow oil. **S2**: $R_f = 0.23$ (silica gel, hexanes:EtOAc = 5:1); IR (film) ν_{max} 3628, 3414, 2956, 1713, 1435, 1369, 1102, 1075, 940, 853 cm^{-1} ; $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 3.72 (s, 3 H), 2.56–2.49 (m, 1 H); 2.43–2.39 (m, 1 H), 2.34 (d, $J = 13.3$ Hz, 1 H), 2.18–2.13 (m, 1 H), 2.12 (s, 3 H), 2.11–2.07 (m, 1 H), 1.89–1.83 (m, 1 H), 1.65–1.49 (m, 2 H), 1.51–1.49 (m, 1 H), 1.02 (s, 3 H), 0.87 (s, 3 H); $^{13}\text{C NMR}$ (125 MHz, CDCl_3) δ 207.7, 207.4, 172.4, 58.8, 53.8, 52.5, 38.8, 36.7, 35.6, 31.9, 31.1, 30.0, 28.1, 25.7; HRMS (ESI) calcd for $\text{C}_{14}\text{H}_{23}\text{O}_4^+$ [$\text{M} + \text{H}^+$] 255.1591, found 255.1593. Next, to a suspension of $\text{Ph}_3\text{PCH}_2\text{Br}$ (2.68 g, 7.50 mmol, 1.5 equiv) in THF (30 mL) at 0 °C was added $n\text{-BuLi}$ (2.40 mL, 2.5 M in THF, 6.00 mmol, 1.2 equiv). The resultant mixture was stirred at 0 °C for 15 min and then a solution of **S2** (1.27 g, 5.00 mmol, 1.0 equiv) in THF (20 mL) was added. The resultant mixture was stirred at 0 °C for 2 h. Upon completion, the reaction contents were diluted with EtOAc (30 mL) and quenched by the addition of saturated aqueous NH_4Cl (30 mL). The mixture was warmed to 23 °C, poured into a separatory funnel, and the resultant layers were separated. The aqueous layer was then extracted with EtOAc (2×30 mL). The combined organic layers were washed with brine (30 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc,

50:1) to provide ketone **S3** (0.756 g, 60% yield) as a pale yellow oil. **S3**: $R_f = 0.68$ (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{\max} 2956, 2857, 1714, 1650, 1454, 1369, 1252, 1199, 1100, 887 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 4.70 (s, 1 H), 4.68 (s, 1 H), 3.72 (s, 3 H), 2.46 (dt, $J = 13.6, 3.7$ Hz, 1 H), 2.31 (d, $J = 13.1$ Hz, 1 H), 2.15 (dd, $J = 13.1, 2.4$ Hz, 1 H), 2.06–2.00 (m, 1 H), 1.92–1.86 (m, 2 H), 1.72 (s, 3 H), 1.70–1.57 (m, 3 H), 1.51–1.47 (m, 1 H), 1.02 (s, 3 H), 0.87 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 207.3, 172.3, 145.3, 110.0, 59.4, 53.9, 52.3, 36.7, 35.7, 32.7, 32.2, 31.4, 31.3, 25.5, 22.6; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{25}\text{O}_3^+ [\text{M} + \text{H}^+]$ 253.1798, found 253.1805. Finally, to a solution of ketone **S3** (1.26 g, 5.00 mmol) in THF (40 mL) at -78 °C was added KHMDS (7.50 mL, 1.0 M in THF, 7.50 mmol, 1.5 equiv). The resultant yellow solution was then stirred at 0 °C for 90 min before being cooled to -78 °C. A solution of Comin's reagent (2.35 g, 6.00 mmol, 1.2 equiv) in THF (10 mL) was then added. The resultant solution was stirred at -78 °C for 1 h before being diluted with EtOAc (30 mL) and quenched by the addition of saturated aqueous NH_4Cl (30 mL). The mixture was warmed to 0 °C, poured into a separatory funnel, and the resultant layers were separated. The aqueous layer was then extracted with EtOAc (2×30 mL). The combined organic layers were washed with brine (30 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (Et_3N -buffered silica gel, hexanes) to provide triflate **17** (1.29 g, 67% yield) as a colorless oil. **17**: $R_f = 0.69$ (silica gel, hexanes: EtOAc, 10:1); IR (film) ν_{\max} 2962, 2869, 1739, 1669, 1651, 1417, 1214, 1144, 1004, 950, 899, 816 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.63 (s, 1 H), 4.73 (s, 1 H), 4.67 (s, 1 H), 3.74 (s, 3 H), 2.23–2.18 (m, 1 H), 2.05–1.92 (m, 3 H), 1.87–1.76 (m, 2 H), 1.73 (s, 3 H), 1.50–1.48 (m, 2 H), 1.10 (s, 3 H), 1.06 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 173.1, 146.8, 144.7, 129.9, 119.3, 117.0, 110.6, 52.3, 50.2, 33.48, 33.46, 33.3, 32.2, 29.9, 29.1, 27.8, 22.3; HRMS (ESI) calcd for $\text{C}_{16}\text{H}_{24}\text{O}_5\text{F}_3\text{S}^+ [\text{M} + \text{H}^+]$ 385.1291, found 385.1298.

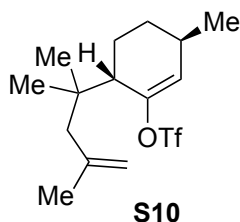


Triflate S6. Prepared as described above starting from 4,4-dimethyl-2-oxocyclohexane-1-carboxylate (0.552 g, 3.00 mmol, 1.0 equiv) and 1-(benzyloxy)but-3-en-2-one^[1] (1.58 g, 9.00 mmol, 3.0 equiv) to afford triflate **S6** (0.139 g, 9% overall yield) as a colorless oil. **S4**: $R_f = 0.29$ (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{\max} 3510, 2954, 2866, 1712, 1454, 1248, 1201, 1101 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 7.42–7.30 (m, 5 H), 4.57 (s, 2 H), 4.04 (s, 2 H), 3.70 (s, 3 H), 2.59–2.52 (m, 1 H), 2.45–2.37 (m, 2 H), 2.34 (d, $J = 13.2$ Hz, 1 H), 2.16–2.11 (m, 2 H), 1.92–1.86 (m, 1 H), 1.62–1.49 (m, 3 H), 1.02 (s, 3 H), 0.87 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 207.6, 207.2, 172.3, 137.2, 128.5, 128.0, 127.9, 74.8, 73.4, 58.8, 53.8, 52.4, 36.7, 35.6, 34.2, 31.8, 31.1, 27.6, 25.6; HRMS (ESI) calcd for $\text{C}_{21}\text{H}_{29}\text{O}_5^+ [\text{M} + \text{H}^+]$ 361.2010, found 361.2009. **S5**: $R_f = 0.50$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 3443, 3030, 2954, 2863, 1713, 1652, 1496, 1368, 1199, 1098, 1028, 904, 698 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 7.37–7.28 (m, 5 H), 5.06 (s, 1 H), 4.96 (s, 1 H), 4.48 (s, 2 H), 3.96 (s, 2 H), 3.70 (s, 3 H), 2.58–2.52 (m, 1 H), 2.45–2.37 (m, 2 H), 2.33 (d, $J = 13.2$ Hz, 1 H), 2.16–2.09 (m, 2 H), 1.91–1.85 (m, 1 H), 1.64–1.56 (m, 2 H), 1.50–1.48 (m, 1 H), 1.01 (s, 3 H), 0.86 (s, 3 H); ^{13}C NMR (125 MHz,

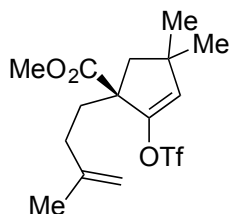
CDCl₃) δ 207.1, 172.2, 145.5, 138.4, 128.3, 128.1, 127.7, 127.5, 73.0, 72.0, 59.4, 53.9, 52.3, 36.7, 35.7, 35.1, 32.7, 31.31, 31.28; HRMS (ESI) calcd for C₂₂H₃₁O₄⁺ [M + H⁺] 359.2217, found 359.2231. **S6**: R_f = 0.62 (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 3032, 2959, 2866, 1738, 1669, 1454, 1416, 1365, 1213, 1144, 1093, 901, 817 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 7.37–7.28 (m, 5 H), 5.63 (s, 1 H), 5.08 (s, 1H), 4.96 (s, 1 H), 4.51–4.46 (m, 2 H), 3.96 (dd, *J* = 16.1, 12.5 Hz, 1 H), 3.72 (s, 3 H), 2.22–2.18 (m, 1 H), 2.12–2.02 (m, 3 H), 1.89–1.83 (m, 1 H), 1.80–1.75 (m, 1 H), 1.51–1.48 (m, 2 H), 1.09 (s, 3 H), 1.05 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 173.1, 146.7, 145.0, 138.2, 130.1, 128.4, 127.7, 127.6, 122.1, 119.6, 117.0, 114.5, 112.6, 73.0, 72.0, 52.4, 50.2, 33.5, 33.4, 33.3, 29.9, 29.0, 27.8, 27.6; HRMS (ESI) calcd for C₂₃H₃₀O₆F₃S⁺ [M + H⁺] 491.1710, found 491.1694.



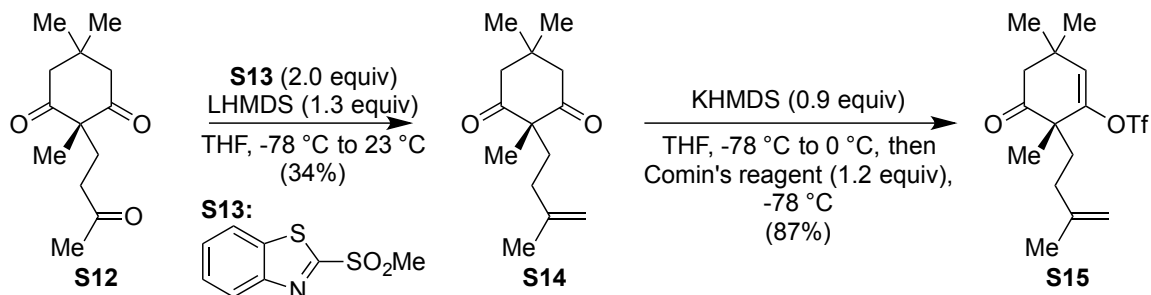
Triflate S9. To *t*-BuOK (2.4 mL, 1.0 M in *t*-BuOH, 2.40 mmol, 1.2 equiv) at 23 °C was added methyl 4,4-dimethyl-2-oxocyclohexane-1-carboxylate (0.368 g, 2.00 mmol, 1.0 equiv). The resultant mixture was stirred at 23 °C for 10 min before 5-iodo-2-methylpent-1-ene (**S7**)^[2] (0.504 g, 2.40 mmol, 1.2 equiv) was added. The resultant mixture was heated to 85 °C and stirred at that temperature for 18 h.^[3] Upon completion, the reaction contents were cooled to 23 °C, diluted with EtOAc (10 mL), and quenched by the addition of saturated aqueous NH₄Cl (10 mL). The mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with EtOAc (2 × 10 mL). The combined organic layers were washed with brine (10 mL) before being dried (Na₂SO₄), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 100:1→50:1) to provide ketone **S8** (0.241 g, 45% yield) as a pale yellow oil. **S8**: R_f = 0.45 (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 3073, 2956, 2869, 1712, 1649, 1456, 1255, 1199, 1168, 1101, 888, 749 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 4.70 (s, 1 H), 4.66 (s, 1 H), 3.72 (s, 3 H), 2.44 (dt, *J* = 13.7, 3.6 Hz, 1 H), 2.30 (d, *J* = 13.1 Hz, 1 H), 2.14 (dd, *J* = 13.1, 2.3 Hz, 1 H), 2.00 (t, *J* = 7.4 Hz, 1 H), 1.88–1.82 (m, 1 H), 1.69 (s, 3 H), 1.65–1.46 (m, 4 H) 1.36–1.30 (m, 1 H), 1.01 (s, 3 H), 0.86 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 207.3, 172.5, 145.2, 110.2, 59.6, 53.9, 52.2, 37.9, 36.7, 35.7, 34.0, 31.4, 31.3, 25.5, 22.2, 22.1; HRMS (ESI) calcd for C₁₆H₂₇O₃⁺ [M + H⁺] 267.1955, found 267.1955. Pressing forward, triflate **S9** was prepared as described above starting from **S8** (0.084 g, 0.31 mmol, 1.0 equiv) to afford triflate **S9** (0.089 g, 71% yield) as a colorless oil. **S9**: R_f = 0.58 (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2960, 2890, 1739, 1670, 1651, 1417, 1212, 1144, 1005, 900, 816 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 5.60 (s, 1 H), 4.71 (s, 1 H), 4.66 (s, 1 H), 3.72 (s, 3 H), 2.22–2.17 (m, 1 H), 2.06–1.97 (m, 2 H), 1.86–1.64 (m, 3 H), 1.68 (s, 3 H), 1.49–1.38 (m, 4 H), 1.09 (s, 3 H), 1.05 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 173.3, 147.0, 144.9, 129.7, 119.6, 117.0, 110.5, 52.3, 50.2, 37.8, 34.6, 33.5, 33.4, 29.9, 29.3, 27.8, 22.1, 22.0; HRMS (ESI) calcd for C₁₇H₂₆O₅F₃S⁺ [M + H⁺] 399.1448, found 399.1454.



Triflate S10. Prepared as described above starting from **54**^[4] (0.694 g, 3.33 mmol, 1.0 equiv) to afford triflate **S10** (0.985 g, 87% yield) as a colorless oil. **S10**: $R_f = 0.48$ (silica gel, hexanes); $[\alpha]_D^{20} = +57.0^\circ$ ($c = 0.53$ in CHCl_3); IR (film) ν_{max} 2963, 2874, 1666, 1643, 1417, 1209, 1144, 969, 893 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.73 (s, 1 H), 4.89–4.87 (m, 1 H), 4.68–4.67 (m, 1 H), 2.46–2.42 (m, 1 H), 2.32–2.26 (m, 1 H), 2.12 (d, $J = 13.2$ Hz, 1 H), 1.97 (d, $J = 13.3$ Hz, 1 H), 1.98–1.92 (m, 1 H), 1.82–1.77 (m, 1 H), 1.78 (s, 3 H), 1.59–1.52 (m, 1 H), 1.15–1.08 (m, 1 H), 1.05 (s, 3 H), 1.04 (d, $J = 7.1$ Hz, 3 H), 1.00 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 151.5, 142.9, 128.2, 121.5, 119.8, 117.2, 114.9, 47.6, 46.6, 37.3, 30.4, 30.1, 26.7, 26.5, 25.6, 25.5, 21.2; HRMS (CI) calcd for $\text{C}_{15}\text{H}_{24}\text{O}_3\text{F}_3\text{S}^+$ $[\text{M} + \text{H}^+]$ 343.1393, found 343.1391.

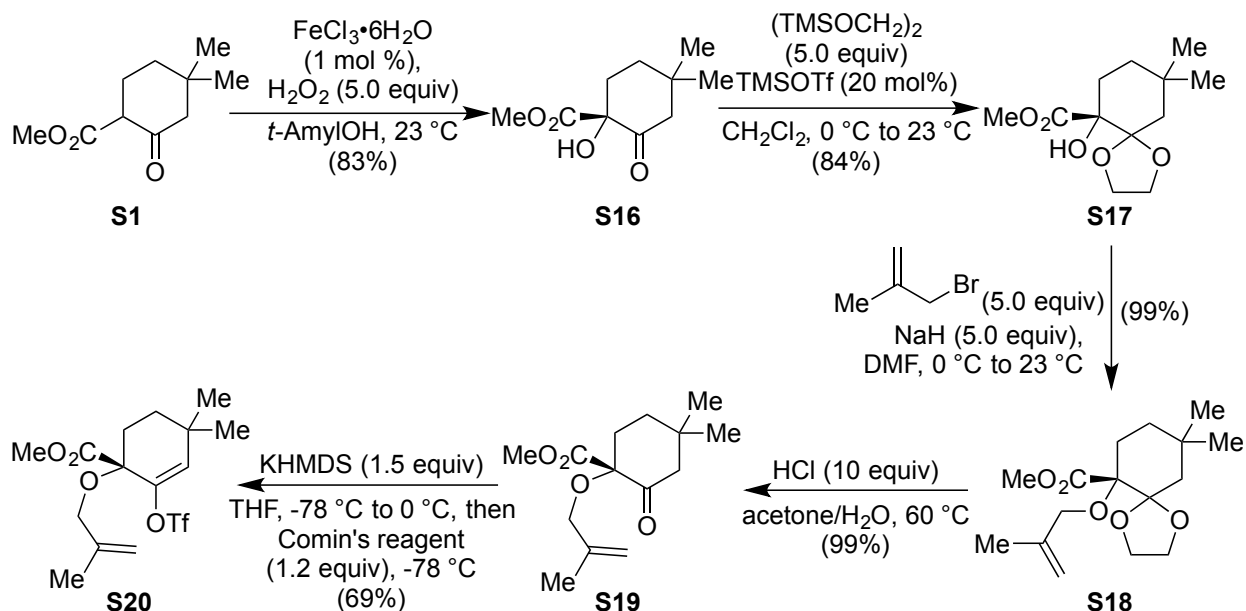


Triflate S11. Prepared as described above starting from methyl 4,4-dimethyl-2-oxocyclopentane-1-carboxylate^[5] (0.200 g, 1.17 mmol, 1.0 equiv) and 5-iodo-2-methylpent-1-ene (0.275 g, 1.40 mmol, 1.2 equiv) to afford triflate **S11** (0.298 g, 69% yield) as a pale yellow oil. **S11**: $R_f = 0.58$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2960, 2870, 1740, 1654, 1424, 1366, 1249, 1215, 1142, 1047, 995, 842, 805, 762, 602 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.60 (s, 1 H), 4.73 (s, 1 H), 4.69 (s, 1 H), 3.74 (s, 3 H), 2.44 (d, $J = 13.5$ Hz, 1H), 2.10–2.04 (m, 1 H), 1.95–1.91 (m, 2 H), 1.78–1.73 (m, 1 H), 1.74 (d, $J = 13.5$ Hz, 1 H), 1.73 (s, 3 H), 1.17 (s, 3 H), 1.14 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 173.5, 145.9, 144.5, 127.2, 122.2, 119.7, 117.2, 114.6, 110.5, 57.9, 52.4, 45.9, 40.0, 34.1, 32.6, 29.9, 28.9, 22.4; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{22}\text{O}_5\text{F}_3\text{S}^+$ $[\text{M} + \text{H}^+]$ 371.1135, found 371.1141.



Triflate S15. To a solution of 2-methanesulfonylbenzothiazole (**S13**, 1.28 g, 6.00 mmol, 2.0 equiv) and 2,5,5-trimethyl-2-(3-oxobutyl)cyclohexane-1,3-dione^[6] (**S12**, 0.672 g, 3.00 mmol,

1.0 equiv) in THF (30 mL) at $-78\text{ }^{\circ}\text{C}$ was added LHMDs (3.90 mL, 1.0 M in THF, 3.90 mmol, 1.3 equiv). The resultant mixture was stirred at $-78\text{ }^{\circ}\text{C}$ for 3 h, and then the mixture was warmed to $23\text{ }^{\circ}\text{C}$ and stirred for an additional 1 h. Upon completion, the reaction mixture was diluted with EtOAc (20 mL), cooled to $0\text{ }^{\circ}\text{C}$, quenched by the addition of saturated aqueous NH_4Cl (20 mL), and warmed to $23\text{ }^{\circ}\text{C}$. The resultant mixture was then poured into a separatory funnel and the layers were separated. The aqueous layer was extracted with EtOAc ($2 \times 30\text{ mL}$). The combined organic layers were washed with brine (30 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 20:1 \rightarrow 10:1) to provide ketone **S14** (0.226 g, 34% yield) as a yellow oil. [Note: **S12** was not stable under strongly basic conditions, thus attempts at a Wittig reaction variant gave only trace product]. **S14**: $R_f = 0.47$ (silica gel, hexanes:EtOAc, 4:1); IR (film) ν_{max} 2955, 2871, 1727, 1693, 1650, 1456, 1373, 1331, 1254, 1070, 955, 889 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 4.69 (s, 1 H), 4.63 (s, 1 H), 2.70 (d, $J = 14.5\text{ Hz}$, 2 H), 2.46 (d, $J = 14.5\text{ Hz}$, 2 H), 1.87–1.80 (m, 4 H), 1.67 (s, 3 H), 1.22 (s, 3 H), 1.06 (s, 3 H), 0.87 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 209.8, 144.6, 110.4, 64.4, 51.4, 35.9, 32.2, 30.6, 29.4, 27.6, 22.5, 17.9; HRMS (ESI) calcd for $\text{C}_{14}\text{H}_{23}\text{O}_2^+$ [$\text{M} + \text{H}^+$] 233.1693, found 233.1699. Pressing forward, triflate **S15** was prepared as described above starting from **S14** (0.044 g, 0.20 mmol, 1.0 equiv) and using KHMDS (0.180 mL, 1.0 M in THF, 0.9 equiv) to afford triflate **S15** (0.063 g, 87% yield) as a colorless oil. **S15**: $R_f = 0.68$ (silica gel, hexanes: EtOAc, 10:1); IR (film) ν_{max} 2966, 2937, 1724, 1673, 1416, 1245, 1214, 1142, 1001, 887, 797 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.88 (s, 1 H), 4.70 (s, 1 H), 4.66 (s, 1 H), 2.52 (d, $J = 14.0\text{ Hz}$, 2 H), 2.37 (d, $J = 13.9\text{ Hz}$, 2 H), 2.04–1.98 (m, 1 H), 1.82–1.78 (m, 2 H), 1.69 (s, 3 H), 1.66–1.61 (m, 1 H), 1.30 (s, 3 H), 1.16 (s, 3 H), 1.13 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 208.2, 149.1, 144.5, 126.7, 119.6, 117.0, 110.5, 51.6, 50.9, 34.0, 33.1, 33.0, 29.8, 29.3, 23.4, 22.3; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{22}\text{O}_4\text{F}_3\text{S}^+$ [$\text{M} + \text{H}^+$] 355.1185, found 355.1194.



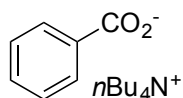
Triflate S20. **S16** (0.423 g, 83% yield b.r.s.m.) was prepared as a pale yellow oil following the reported procedure starting from **S1** (0.736 g, 4.00 mmol, 1.0 equiv).^[7] **S16**: $R_f = 0.26$ (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{max} 3459, 2958, 2870, 1720, 1456, 1436, 1370,

1289, 1258, 1200, 1164, 1123, 1099, 1039, 1006, 978, 796; ^1H NMR (500 MHz, CDCl_3) δ 4.31 (s, 1 H), 3.79 (s, 3 H), 2.60–2.56 (m, 1 H), 2.48–2.39 (m, 2 H), 1.83–1.79 (m, 1 H), 1.63–1.60 (m, 1H), 1.08 (s, 3 H), 0.93 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 207.0, 170.5, 79.9, 53.0, 51.4, 36.9, 35.1, 33.4, 30.6, 26.1; HRMS (ESI) calcd for $\text{C}_{10}\text{H}_{15}\text{O}_3^+$ [$\text{M} + \text{H}^+ - \text{H}_2\text{O}$] 183.1016, found 183.1022. Next, to a solution of **S16** (0.200 g, 1.00 mmol, 1.0 equiv) in CH_2Cl_2 (10 ml) at 0 °C was added 1,2-bis(trimethylsiloxy)ethane (0.618 g, 5.00 mmol, 5.0 equiv) and TMSOTf (44.0 mg, 0.20 mmol, 0.2 equiv). The mixture was then stirred at 23 °C for 20 h. Upon completion, the reaction contents were quenched by the addition of saturated aqueous NaHCO_3 (10 mL). The mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with CH_2Cl_2 (2×10 mL). The combined organic layers were dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (hexanes:EtOAc, 10:1→5:1) to provide ketal **S17** (0.205 g, 84% yield) as a white solid. **S17**: R_f = 0.22 (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{max} 3505, 2952, 1732, 1449, 1388, 1264, 1217, 1168, 1074, 1043, 988, 826, 614; ^1H NMR (500 MHz, CDCl_3) δ 3.94–3.89 (m, 3 H), 3.78–3.74 (m, 1 H), 3.77 (s, 3 H), 3.38 (d, J = 1.7 Hz, 1 H), 2.29–2.22 (m, 1 H), 1.78–1.74 (m, 2 H), 1.58–1.52 (m, 1 H), 1.45 (dd, J = 13.8, 1.4 Hz, 1 H), 1.32 (dtd, J = 13.6, 4.8, 1.3 Hz, 1 H), 1.04 (s, 3 H), 0.96 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 174.3, 110.1, 76.9, 65.8, 64.7, 52.8, 43.7, 32.9, 32.0, 31.2, 28.7, 26.7; HRMS (ESI) calcd for $\text{C}_{12}\text{H}_{19}\text{O}_4^+$ [$\text{M} + \text{H}^+ - \text{H}_2\text{O}$] 227.1278, found 227.1281. Pressing forward, to a suspension of NaH (0.200 g, 60% dispersion in mineral oil, 5.00 mmol, 5.0 equiv) in DMF (5 ml) at 0 °C was added a solution of ketal **S17** (0.244 g, 1.00 mmol, 1.0 equiv) in DMF (5 ml). The resultant mixture was then stirred for 30 min at 0 °C before 3-bromo-2-methylpropene (0.675 g, 5.00 mmol, 5.0 equiv) was added. The reaction contents were then warmed to 23 °C and stirred at that temperature for 2 h. Upon completion, the reaction contents were cooled to 0 °C, diluted with Et_2O (10 ml), and quenched by the slow addition of H_2O . The resultant mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with Et_2O (2×10 mL). The combined organic layers were washed with H_2O (3×10 mL) and brine (10 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 5:1) to provide ketal **S18** (0.298 g, 99% yield) as a colorless oil. **S18**: R_f = 0.28 (silica gel, hexanes:EtOAc = 5:1); IR (film) ν_{max} 2951, 2913, 1735, 1453, 1254, 1214, 1165, 1083, 1057, 900; ^1H NMR (500 MHz, CDCl_3) δ 5.03 (s, 1 H), 4.85 (s, 1 H), 3.96–3.92 (m, 1 H), 3.89–3.85 (m, 2 H), 3.81–3.78 (m, 3 H), 3.75 (s, 3 H), 2.26 (ddd, J = 15.1, 13.6, 3.8 Hz, 1 H), 2.01 (dt, J = 15.2, 3.8 Hz, 1 H), 1.85 (d, J = 13.8 Hz, 1 H), 1.75 (s, 3 H), 1.40 (dd, J = 13.8, 1.7 Hz, 1 H), 1.37 (td, J = 13.5, 3.5 Hz, 1 H), 1.23 (ttt, J = 13.5, 5.6, 1.8 Hz, 1 H), 1.04 (s, 3 H), 0.93 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 172.0, 141.5, 111.4, 110.0, 82.4, 67.5, 65.0, 64.9, 52.2, 43.6, 32.9, 32.6, 31.3, 26.5, 24.7, 19.7; HRMS (ESI) calcd for $\text{C}_{16}\text{H}_{27}\text{O}_5^+$ [$\text{M} + \text{H}^+$] 299.1853, found 299.1870. Next, to a solution of ketal **S18** (0.298 g, 1.00 mmol, 1.0 equiv) in acetone (15 mL) at 23 °C was added HCl (10.0 mL, 1.0 M in H_2O , 10.0 mmol, 10 equiv). The resultant solution was heated to 60 °C for 12 h. Upon completion, the reaction contents were cooled to 23 °C, poured into a separatory funnel, and the resultant layers were separated. The aqueous layer was then extracted with EtOAc (3×10 mL). The combined organic layers were washed with brine (10 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 10:1) to provide ketone **S19** (0.254 g, 99% yield) as a colorless oil. **S19**: R_f = 0.30 (silica gel, hexanes:EtOAc = 10:1); IR (film) ν_{max} 2957, 2928, 2870, 1751, 1724, 1456, 1370, 1298, 1256, 1160, 1127, 1080, 1054, 899; ^1H NMR (500 MHz, CDCl_3) δ 5.03 (s, 1 H),

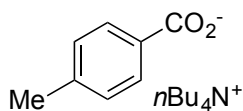
4.89 (s, 1 H), 4.15 (d, $J = 12.0$ Hz, 1 H), 3.79 (s, 3 H), 3.78 (d, $J = 12.0$ Hz, 1 H), 2.54 (d, $J = 13.2$ Hz, 1 H), 2.34 (ddd, $J = 14.8, 5.6, 4.2$ Hz, 1 H), 2.17 (dd, $J = 13.2, 1.6$ Hz, 1 H), 2.12 (ddd, $J = 14.8, 11.3, 4.3$ Hz, 1 H), 1.83 (ddd, $J = 13.9, 11.2, 4.3$ Hz, 1 H), 1.77 (s, 3 H), 1.36 (dddd, $J = 13.8, 5.5, 4.3, 1.6$ Hz, 1 H), 1.04 (s, 3 H), 0.98 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 205.8, 170.6, 141.8, 111.9, 85.4, 69.7, 52.3, 52.2, 36.5, 33.8, 31.3, 30.1, 26.7, 19.6; HRMS (ESI) calcd for $\text{C}_{14}\text{H}_{23}\text{O}_4^+ [\text{M} + \text{H}^+]$ 255.1591, found 255.1599. Pressing forward, triflate **S20** was prepared as described above starting from **S19** (0.079 g, 0.31 mmol, 1.0 equiv) to afford triflate **S20** (0.083 g, 69% yield) as a yellow oil. **S20**: $R_f = 0.32$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2961, 2870, 1759, 1661, 1454, 1419, 1366, 1211, 1145, 1093, 1056, 1007, 952, 901, 811; ^1H NMR (500 MHz, CDCl_3) δ 5.76 (s, 1 H), 5.03 (s, 1 H), 4.88 (s, 1 H), 4.00 (dd, $J = 28.3, 11.6$ Hz, 2 H), 3.79 (s, 3 H), 2.25 (ddd, $J = 13.8, 11.4, 3.4$ Hz, 1 H), 2.10 (ddd, $J = 13.8, 6.9, 3.4$ Hz, 1 H), 1.78 (s, 3 H), 1.71 (ddd, $J = 13.8, 11.2, 3.4$ Hz, 1 H), 1.54 (ddd, $J = 13.8, 6.9, 3.4$ Hz, 1 H), 1.13 (s, 3 H), 1.12 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 170.7, 144.6, 141.9, 123.3, 119.6, 117.0, 112.0, 78.4, 69.6, 52.6, 33.6, 32.0, 30.0, 29.1, 27.6, 19.5; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{21}\text{O}_6\text{F}_3\text{SNa}^+ [\text{M} + \text{Na}^+]$ 409.0903, found 409.0907.

Preparation of nucleophilic salts

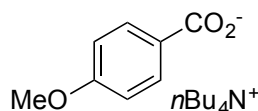
To a solution of corresponding acid or phenol (5.00 mmol) in anhydrous MeOH (5 mL) was added *n*-Bu₄NOH (5.05 mL, 1.0 M in MeOH, 5.05 mmol, 1.01 equiv) at 23 °C, and the resultant solution was stirred at 23 °C for 1 h. Upon completion, the resultant mixture was co-evaporated with benzene under an Ar atmosphere and the residue was dried over P₂O₅ on vacuum overnight. If the dried residue was a liquid, it was cooled to 0 °C to form a solid (>95% yield). The solid was then recrystallized from minimal EtOAc under Ar atmosphere to provide the anhydrous salt (~30–60% yield) for use in subsequent reaction. The salts can be kept stable in dry box for months. [Note: the pentafluorophenoate salt (**S39**) was unstable and should be used immediately].



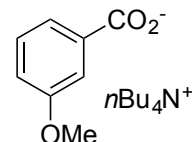
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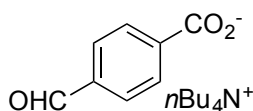
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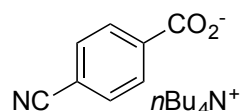
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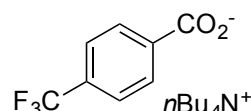
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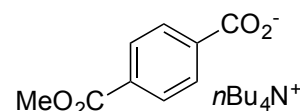
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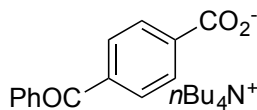
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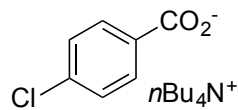
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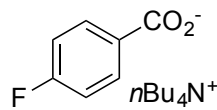
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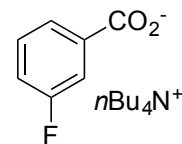
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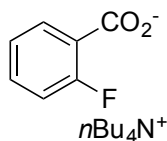
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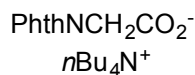
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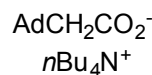
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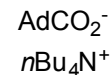
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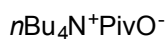
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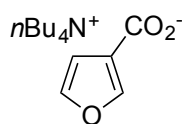
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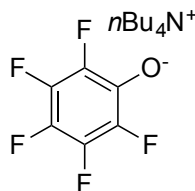
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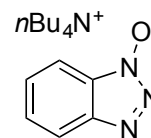
S37



S38



S39



S40

Tetrabutylammonium benzoate (S21). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 8.10–8.08 (m, 2 H), 7.30–7.28 (m, 3 H), 3.56–2.32 (m, 8 H), 1.66–1.59 (m, 8 H), 1.40 (sx, $J = 7.4$ Hz, 8 H), 0.96 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 170.9, 141.4, 129.4, 128.2, 126.9, 58.5, 23.9, 19.6, 13.5.

Tetrabutylammonium 4-methylbenzoate (S22). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, $J = 8.0$ Hz, 2 H), 6.98 (d, $J = 7.8$ Hz, 2 H), 3.04–3.00 (m, 8 H), 2.23 (s, 3 H), 1.41–1.35 (m, 8 H), 1.27–1.19 (m, 8 H), 1.07 (sx, $J = 7.4$ Hz, 8 H), 0.83 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 171.0, 138.3, 137.4, 129.4, 127.8, 58.0, 23.6, 21.1, 19.4, 13.5.

Tetrabutylammonium 4-methoxybenzoate (S23). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 7.87–7.84 (m, 2 H), 6.61–6.58 (m, 2 H), 3.01–2.97 (m, 8 H), 1.36–1.29 (m, 8 H), 1.16 (sx, $J = 7.4$ Hz, 8 H), 0.74 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 170.6, 160.0, 133.9, 130.9, 112.0, 58.3, 55.0, 23.8, 19.5, 13.5.

Tetrabutylammonium 3-methoxybenzoate (S24). White solid; ^1H NMR (500 MHz, CDCl_3) δ 7.56–7.55 (m, 2 H), 7.09–7.06 (m, 1 H), 6.75–6.73 (m, 1 H), 3.71 (s, 3 H), 3.09–3.06 (m, 8 H), 1.46–1.39 (m, 8 H), 1.25 (sx, $J = 7.3$ Hz, 8 H), 0.83 (t, $J = 7.2$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 170.9, 158.9, 142.3, 128.0, 122.0, 115.3, 113.9, 58.4, 55.2, 23.8, 19.6, 13.6.

Tetrabutylammonium 4-formylbenzoate (S25). White solid; ^1H NMR (500 MHz, CDCl_3) δ 9.94 (s, 1 H); 8.12 (d, $J = 8.0$ Hz, 2 H), 7.73 (d, $J = 8.0$ Hz, 2 H), 3.20–3.17 (m, 8 H), 1.55–1.49 (m, 8 H), 1.30 (sx, $J = 7.4$ Hz, 8 H), 0.86 (t, $J = 7.4$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 192.7, 170.1, 146.6, 136.3, 129.8, 129.0, 58.6, 23.9, 19.6, 13.6.

Tetrabutylammonium 4-cyanobenzoate (S26). Yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 7.98 (d, $J = 8.4$ Hz, 2 H), 7.36 (d, $J = 8.4$ Hz, 2 H), 3.09–3.06 (m, 8 H), 1.44–1.37 (m, 8 H), 1.18 (sx, $J = 7.4$ Hz, 8 H), 0.74 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 169.0, 145.6, 131.0, 129.8, 119.6, 111.2, 58.5, 23.8, 19.5, 13.5.

Tetrabutylammonium 4-(trifluoromethyl)benzoate (S27). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 8.17 (d, $J = 7.9$ Hz, 2 H), 7.52 (d, $J = 8.1$ Hz, 2 H), 3.32–3.30 (m, 8 H), 1.64–1.58 (m, 8 H), 1.41–1.34 (m, 8 H), 1.26 (sx, $J = 7.4$ Hz, 8 H), 0.94 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 169.5, 144.7, 130.0, 129.8, 129.5, 125.6, 124.0, 123.9, 58.4, 23.8, 19.5, 13.4.

Tetrabutylammonium 4-(methoxycarbonyl)benzoate (S28). White solid; ^1H NMR (500 MHz, CDCl_3) δ 8.08 (d, $J = 8.0$ Hz, 2 H), 7.92 (d, $J = 8.0$ Hz, 2 H), 3.85 (s, 3 H), 3.26–3.22 (m, 8 H), 1.58–1.52 (m, 8 H), 1.34 (sx, $J = 7.3$ Hz, 8 H), 0.90 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 170.4, 167.5, 145.6, 129.7, 129.2, 128.6, 58.7, 51.8, 24.0, 19.7, 13.6.

Tetrabutylammonium 4-benzoylbenzoate (S29). Yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 8.05–8.03 (m, 2 H), 7.63–7.61 (m, 2 H), 7.45–7.42 (m, 1 H), 7.34–7.31 (m, 2 H), 3.14–3.11 (m, 8 H), 1.49–1.42 (m, 8 H), 1.24 (sx, $J = 7.4$ Hz, 8 H), 0.80 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 197.1, 170.2, 145.0, 137.8, 137.2, 132.2, 129.8, 129.2, 129.1, 128.1, 58.5, 23.8, 19.6, 13.6.

Tetrabutylammonium 4-chlorobenzoate (S30). Green solid; ^1H NMR (500 MHz, CDCl_3) δ 7.95–7.93 (m, 2 H), 7.16–7.13 (m, 2 H), 3.15–3.12 (m, 8 H), 1.51–1.45 (m, 8 H), 1.28 (sx, $J = 7.4$ Hz, 8 H), 0.86 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 170.2, 139.2, 134.4, 130.9, 127.2, 58.5, 23.9, 19.6, 13.6.

Tetrabutylammonium 4-fluorobenzoate (S31). White solid; ^1H NMR (500 MHz, CDCl_3) δ 8.00–7.97 (m, 2 H), 6.86–6.82 (m, 2 H), 3.13–3.10 (m, 8 H), 1.49–1.42 (m, 8 H), 1.27 (sx, $J = 7.4$ Hz, 8 H), 0.85 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 170.2, 164.3, 162.4, 131.4, 131.3, 125.2, 113.6, 113.5, 58.8, 24.1, 19.7, 13.6.

Tetrabutylammonium 3-fluorobenzoate (S32). White solid; ^1H NMR (500 MHz, CDCl_3) δ 7.75–7.73 (m, 1 H), 7.63–7.61 (m, 1 H), 7.13–7.09 (m, 1 H), 6.86–6.83 (m, 1 H), 3.14–3.10 (m, 8 H), 1.47–1.43 (m, 8 H), 1.26–1.21 (m, 8 H), 0.84–0.80 (m, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 169.7, 163.4, 161.4, 143.9, 128.3, 125.0, 116.0, 115.8, 115.1, 115.0, 58.5, 23.9, 19.6, 13.6.

Tetrabutylammonium 2-fluorobenzoate (S33). White solid, ^1H NMR (500 MHz, CDCl_3) δ 7.65–7.62 (m, 1 H), 7.06–7.02 (m, 1 H), 6.91–6.88 (m, 1 H), 6.82–6.78 (m, 1 H), 3.17–3.13 (m, 8 H), 1.49–1.45 (m, 8 H), 1.25 (sx, $J = 7.4$ Hz, 8 H), 0.83 (t, $J = 7.4$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 169.0, 161.2, 159.2, 131.2, 131.1, 128.5, 123.0, 115.4, 115.2, 58.4, 23.9, 19.6, 13.6.

Tetrabutylammonium *N*-Phthaloylglycinate (S34). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 7.77 (dd, $J = 5.4, 3.0$ Hz, 2 H), 7.62 (dd, $J = 5.4, 3.0$ Hz, 2 H), 4.21 (s, 2 H), 3.32–3.28 (m, 8 H), 1.66–1.60 (m, 8 H), 1.40 (sx, $J = 7.4$ Hz, 8 H), 0.97 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 169.7, 168.6, 133.1, 122.7, 58.6, 42.5, 24.0, 19.7, 13.6.

Tetrabutylammonium 2-(adamantan-1-yl)acetate (S35). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 3.30–3.26 (m, 8 H), 1.87 (s, 2 H), 1.81 (s, 3 H), 1.63 (d, $J = 2.2$ Hz, 6 H), 1.59–1.53 (m, 14 H), 1.34 (sx, $J = 7.4$ Hz, 8 H), 0.90 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.9, 58.7, 55.0, 43.0, 37.3, 32.1, 29.0, 24.1, 19.7, 13.7.

Tetrabutylammonium adamantane-1-carboxylate (S36). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 3.28–3.26 (m, 8 H), 1.87–1.84 (m, 9 H), 1.63–1.55 (m, 14 H), 1.37 (sx, $J = 7.4$ Hz, 8 H), 0.94 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 183.2, 8.7, 49.8, 41.8, 40.7, 37.4, 29.0, 24.1, 19.7, 13.7.

Tetrabutylammonium pivalate (S37). Pale yellow solid; ^1H NMR (500 MHz, CDCl_3) δ 3.24–3.20 (m, 8 H), 1.57–1.51 (m, 8 H), 1.33 (sx, $J = 7.4$ Hz, 8 H), 1.04 (s, 9 H), 0.89 (t, $J = 7.4$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 183.4, 58.6, 39.5, 28.9, 24.0, 19.7, 13.7.

Tetrabutylammonium furan-3-carboxylate (S38). Brown solid; ^1H NMR (500 MHz, CDCl_3) δ 7.63–7.62 (m, 1 H), 7.10 (t, $J = 1.6$ Hz, 1 H), 6.53–6.52 (m, 1 H), 3.09–3.06 (m, 8 H), 1.45–1.38 (m, 8 H), 1.22 (sx, $J = 7.4$ Hz, 8 H), 0.79 (t, $J = 7.4$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 179.8, 144.5, 141.5, 128.4, 111.6, 58.4, 23.8, 19.5, 13.5.

Tetrabutylammonium pentafluorophenonate (S39). Pale yellow solid, ^1H NMR (500 MHz, CDCl_3) δ 3.13–3.09 (m, 8 H), 1.53–1.46 (m, 8 H), 1.28 (sx, $J = 7.4$ Hz, 8 H), 0.87 (t, $J =$

7.4 Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 147.0, 142.1, 140.3, 139.7, 137.8, 125.1, 58.4, 23.6, 19.4, 13.3.

Tetrabutylammonium 1H-benzo[d][1,2,3]triazol-1-olate (S40). Brown solid, ^1H NMR (500 MHz, CDCl_3) δ 7.67–7.63 (m, 2 H), 7.07–7.01 (m, 2 H), 3.20–3.17 (m, 8 H), 1.55–1.49 (m, 8 H), 1.31 (sx, $J = 7.4$ Hz, 8 H), 0.89 (t, $J = 7.3$ Hz, 12 H); ^{13}C NMR (125 MHz, CDCl_3) δ 143.8, 127.8, 122.2, 121.1, 118.0, 112.4, 58.5, 23.8, 19.6, 13.6.

General procedure for the Pd-based cyclization

To a flame-dried seal tube was added $\text{Pd}(\text{OAc})_2$ (2.2 mg, 0.010 mmol, 0.1 equiv), *t*-BuMephos (4.7 mg, 0.015 mmol, 0.15 equiv), and the desired tetrabutylammonium salt (0.30 mmol, 3.0 equiv). Next, a solution of the desired vinyl triflate (0.10 mmol, 1.0 equiv) in toluene (1 mL) was added at 23 °C. The resultant mixture was then stirred at 90 °C until palladium black completely crashed out, typically after 5 h. Upon completion, the reaction mixture was cooled to 23 °C and filtered through a pad of silica gel (EtOAc). The filtrate was concentrated, and the resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc) to provide the desired oxygenated product in the amount and form delineated below.

Product Acetate 18. Pale yellow oil, 28.2 mg, 96% yield; $R_f = 0.26$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2955, 2930, 2863, 1739, 1729, 1597, 1564, 1448, 1385, 1274, 1218, 1150, 1034 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.27 (s, 1 H), 4.00 (dd, $J = 27.2, 10.5$ Hz, 2 H), 3.65 (s, 3 H), 2.26–2.22 (m, 1 H), 2.20–2.17 (m, 1 H), 2.06 (s, 3 H), 1.56–1.49 (m, 2 H), 1.47–1.40 (m, 2 H), 1.37–1.28 (m, 2 H), 1.09 (s, 3 H), 0.99 (s, 3 H), 0.92 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.7, 144.1, 133.2, 72.4, 55.5, 51.8, 44.0, 35.8, 35.4, 32.5, 31.8, 30.5, 29.7, 29.4, 28.2, 27.4, 26.1, 21.0; HRMS (ESI) calcd for $\text{C}_{17}\text{H}_{27}\text{O}_4^+$ [$\text{M} + \text{H}^+$] 295.1904, found 295.1907.

Product Benzolate 19. Colorless oil, 28.4 mg, 80% yield; $R_f = 0.26$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2955, 2864, 1722, 1451, 1362, 1274, 1205, 1176, 1151, 1114, 1070, 1026, 961, 711; ^1H NMR (500 MHz, CDCl_3) δ 8.07–8.05 (m, 2 H), 7.56 (tt, $J = 7.4, 1.3$ Hz, 1 H), 7.46–7.43 (m, 2 H), 5.36 (s, 1 H), 4.25 (dd, $J = 16.5, 10.5$ Hz, 2 H), 3.65 (s, 3 H), 2.30–2.27 (m, 1 H), 2.23–2.20 (m, 1 H), 1.71–1.58 (m, 2 H), 1.51–1.45 (m, 2 H), 1.40–1.25 (m, 2 H), 1.20 (s, 3 H), 1.00 (s, 3 H), 0.94 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.8, 166.7, 144.0, 133.4, 132.7, 130.7, 129.6, 128.3, 72.7, 55.5, 51.9, 44.4, 35.8, 35.6, 34.8, 32.6, 31.9, 30.5, 29.4, 26.2; HRMS (ESI) calcd for $\text{C}_{22}\text{H}_{28}\text{O}_4\text{Na}^+$ [$\text{M} + \text{Na}^+$] 379.1880, found 379.1886.

Product 4-Me 20. White oil, 29.2 mg, 79% yield; $R_f = 0.27$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2954, 2864, 1720, 1612, 1458, 1380, 1362, 1273, 1206, 1177, 1151, 1120, 1020, 961, 914, 841; ^1H NMR (500 MHz, CDCl_3) δ 7.94 (d, $J = 8.2$ Hz, 2 H), 7.24 (d, $J = 8.1$ Hz, 2 H), 5.34 (s, 1 H), 4.22 (dd, $J = 18.6, 10.6$ Hz, 2 H), 3.65 (s, 3 H), 2.41 (s, 3 H), 2.30–2.26 (m, 1 H), 2.22–2.19 (m, 1 H), 1.70–1.57 (m, 2 H), 1.49–1.44 (m, 2 H), 1.40–1.27 (m, 2 H), 1.19 (s, 3 H), 1.00 (s, 3 H), 0.94 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.8, 166.8, 144.1, 143.3, 133.3, 129.6, 129.0, 128.0, 72.5, 55.5, 51.9, 44.4, 35.8, 35.6, 34.8, 32.6, 31.9, 30.5, 29.4, 26.2, 21.6; HRMS (ESI) calcd for $\text{C}_{23}\text{H}_{31}\text{O}_4^+$ [$\text{M} + \text{H}^+$] 371.2217, found 371.2226.

Product 4-OMe 21. Pale yellow oil, 14.3 mg, 37% yield; $R_f = 0.25$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2955, 2864, 1716, 1607, 1511, 1459, 1363, 1300, 1256, 1205, 1167, 1102, 1031, 847, 770 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 8.01 (d, $J = 8.8$ Hz, 2 H), 6.92 (d, $J = 8.8$ Hz, 2 H), 5.35 (s, 1 H), 4.21 (dd, $J = 17.8, 10.5$ Hz, 2 H), 3.86 (s, 3 H), 3.65 (s, 3 H), 2.30–2.26 (m, 1 H), 2.22–2.19 (m, 1 H), 1.70–1.57 (m, 2 H), 1.50–1.44 (m, 2 H), 1.40–1.27 (m, 2 H), 1.19 (s, 3 H), 1.00 (s, 3 H), 0.94 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.8, 166.4, 163.2, 144.1, 133.3, 131.5, 123.2, 113.6, 72.4, 55.5, 55.4, 51.8, 44.4, 35.8, 35.6, 34.8, 32.6, 31.9, 30.5, 29.4, 26.2; HRMS (ESI) calcd for $\text{C}_{23}\text{H}_{31}\text{O}_5^+ [\text{M} + \text{H}^+]$ 387.2166, found 387.2179.

Product 3-OMe 22. Pale yellow oil, 23.2 mg, 60% yield; $R_f = 0.44$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2955, 2864, 2838, 1721, 1587, 1457, 1321, 1278, 1151, 1104, 1046, 977, 756 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 7.65 (dt, $J = 7.7, 1.0$ Hz, 1 H), 7.58 (dd, $J = 2.6, 1.5$ Hz, 1 H), 7.35 (t, $J = 7.9$ Hz), 7.10 (ddd, $J = 8.2, 2.6, 0.8$ Hz, 1 H), 5.36 (s, 1 H), 4.24 (dd, $J = 19.1, 10.5$ Hz, 2 H), 3.86 (s, 3 H), 3.65 (s, 3 H), 2.30–2.26 (m, 1 H), 2.23–2.20 (m, 1 H), 1.70–1.58 (m, 2 H), 1.51–1.44 (m, 2 H), 1.40–1.29 (m, 2 H), 1.19 (s, 3 H), 1.00 (s, 3 H), 0.94 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.7, 166.5, 159.6, 144.0, 133.4, 132.0, 129.3, 121.2, 119.2, 114.2, 72.8, 55.5, 55.4, 51.9, 44.4, 35.8, 35.6, 34.8, 32.6, 31.9, 30.5, 29.4, 26.2; HRMS (ESI) calcd for $\text{C}_{23}\text{H}_{31}\text{O}_5^+ [\text{M} + \text{H}^+]$ 387.2166, found 387.2173.

Product 4-CHO 23. Colorless oil, 34.1 mg, 89% yield; $R_f = 0.28$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2955, 2864, 1723, 1709, 1459, 1275, 1202, 1116, 1016, 759 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 10.1 (s, 1 H), 8.21 (d, $J = 8.2$ Hz, 2 H), 7.96 (d, $J = 8.3$ Hz, 2 H), 5.36 (s, 1 H), 4.28 (dd, $J = 12.8, 10.6$ Hz, 2 H), 3.65 (s, 3 H), 2.31–2.27 (m, 1 H), 2.23–2.20 (m, 1 H), 1.68–1.59 (m, 2 H), 1.52–1.45 (m, 2 H), 1.40–1.25 (m, 2 H), 1.21 (s, 3 H), 0.99 (s, 3 H), 0.94 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 191.7, 176.6, 165.6, 143.9, 139.1, 135.7, 133.5, 130.1, 129.5, 73.2, 55.6, 51.9, 44.3, 35.8, 35.5, 34.7, 32.6, 31.8, 30.5, 29.3, 26.2; HRMS (ESI) calcd for $\text{C}_{23}\text{H}_{29}\text{O}_5^+ [\text{M} + \text{H}^+]$ 385.2010, found 385.2009.

Product 4-CN 24. Yellow oil, 29.7 mg, 78% yield; $R_f = 0.19$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2955, 2864, 2231, 1724, 1458, 1275, 1206, 1152, 1118, 1018, 956, 861, 767 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 8.15–8.14 (m, 2 H), 7.76–7.74 (m, 2 H), 5.34 (s, 1 H), 4.28 (dd, $J = 12.0, 10.6$ Hz, 2 H), 3.65 (s, 3 H), 2.30–2.27 (m, 1 H), 2.23–2.20 (m, 1 H), 1.70–1.57 (m, 2 H), 1.52–1.45 (m, 2 H), 1.40–1.25 (m, 2 H), 1.19 (s, 3 H), 0.99 (s, 3 H), 0.94 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.6, 165.0, 143.8, 134.5, 133.6, 132.2, 130.0, 118.0, 116.3, 73.4, 55.6, 51.9, 44.3, 35.8, 35.5, 34.7, 32.6, 31.8, 30.5, 29.3, 26.2; HRMS (ESI) calcd for $\text{C}_{23}\text{H}_{28}\text{O}_4\text{N}^+ [\text{M} + \text{H}^+]$ 382.2013, found 382.2017.

Product 4-CF₃ 25. Colorless oil, 41.1 mg, 97% yield; $R_f = 0.50$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2956, 2865, 1726, 1412, 1357, 1281, 1132, 1066, 1018, 862 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 8.16 (d, $J = 8.1$ Hz, 2 H), 7.71 (d, $J = 8.2$ Hz, 2 H), 5.36 (s, 1 H), 4.28 (dd, $J = 15.2$ Hz, 10.6 Hz, 2 H), 3.66 (s, 3 H), 2.31–2.27 (m, 1 H), 2.23–2.20 (m, 1 H), 1.71–1.58 (m, 2 H), 1.52–1.46 (m, 2 H), 1.37–1.25 (m, 2 H), 1.20 (s, 3 H), 1.00 (s, 3 H), 0.94 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.6, 165.4, 143.9, 134.2, 133.9, 133.5, 139.9, 125.39, 125.36, 73.1, 55.6, 51.9, 44.3, 35.8, 35.5, 34.7, 32.6, 30.5, 29.3, 26.2; HRMS (ESI) calcd for $\text{C}_{23}\text{H}_{28}\text{O}_4\text{F}_3^+ [\text{M} + \text{H}^+]$ 425.1934, found 425.1942.

Product 4-COOMe 26. Yellow solid, 30.6 mg, 74% yield; $R_f = 0.37$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2954, 2864, 1724, 1458, 1272, 1117, 1019, 731 cm^{-1} ; ^1H

NMR (500 MHz, CDCl₃) δ 8.10 (s, 4 H), 5.35 (s, 1 H), 4.26 (dd, $J = 13.7, 10.5$ Hz, 2 H), 3.94 (s, 3 H), 3.64 (s, 3 H), 2.30–2.26 (m, 1 H), 2.22–2.19 (m, 1 H), 1.70–1.58 (m, 2 H), 1.51–1.48 (m, 2 H), 1.39–1.24 (m, 2 H), 1.20 (s, 3 H), 0.98 (s, 3 H), 0.93 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.6, 166.3, 165.8, 143.9, 134.5, 133.8, 133.5, 129.54, 129.51, 73.1, 55.6, 52.4, 52.0, 44.3, 35.8, 35.5, 34.7, 32.6, 31.8, 30.5, 29.3, 26.2; HRMS (ESI) calcd for C₂₄H₃₁O₆⁺ [M + H⁺] 415.2115, found 415.2113.

Product 4-COPh 27. Yellow oil, 42.3 mg, 92% yield; $R_f = 0.37$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2955, 2864, 1710, 1663, 1449, 1297, 1206, 1116, 926, 714 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 8.17–8.15 (m, 2 H), 7.85–7.84 (m, 2 H), 7.81–7.79 (m, 2 H), 7.63–7.60 (m, 1 H), 7.51–7.48 (m, 2 H), 5.37 (s, 1 H), 4.29 (dd, $J = 14.7, 10.5$ Hz, 2 H), 3.66 (s, 3 H), 2.31–2.27 (m, 1 H), 2.23–2.20 (m, 1 H), 1.71–1.59 (m, 2 H), 1.52–1.46 (m, 2 H), 1.40–1.29 (m, 2 H), 1.22 (s, 3 H), 1.00 (s, 3 H), 0.94 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.7, 165.9, 143.9, 141.2, 137.0, 133.8, 133.5, 132.9, 130.1, 129.8, 129.4, 128.5, 73.1, 55.6, 51.9, 44.4, 35.8, 35.4, 34.7, 32.2, 31.8, 30.5, 29.4, 26.2; HRMS (ESI) calcd for C₂₉H₃₂O₅Na⁺ [M + Na⁺] 483.2142, found 483.2146.

Product 4-Cl 28. Yellow oil, 27.4 mg, 70% yield; $R_f = 0.54$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2956, 2864, 124, 1595, 1488, 1459, 1400, 1381, 1363, 1272, 1205, 1151, 1116, 1015, 960, 850, 760 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 7.98 (d, $J = 8.5$ Hz, 2 H), 7.41 (d, $J = 8.5$ Hz, 2 H), 5.34 (s, 1 H), 4.24 (dd, $J = 14.1, 10.6$ Hz, 2 H), 3.65 (s, 3 H), 2.30–2.26 (m, 1 H), 2.22–2.19 (m, 1 H), 1.69–1.58 (m, 2 H), 1.51–1.44 (m, 2 H), 1.40–1.28 (m, 2 H), 1.19 (s, 3 H), 0.99 (s, 3 H), 0.93 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.6, 165.8, 144.0, 139.2, 133.4, 130.9, 129.6, 129.2, 128.7, 128.3, 72.8, 55.5, 51.9, 44.3, 35.8, 35.5, 34.7, 32.6, 31.8, 30.5, 29.3, 26.2; HRMS (ESI) calcd for C₂₂H₂₈O₄Cl⁺ [M + H⁺] 391.1671, found 391.1675.

Product 4-F 29. Pale yellow oil, 33.7 mg, 90% yield; $R_f = 0.51$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2955, 2864, 1724, 1604, 1508, 1458, 1274, 1152, 1116, 854, 767 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 8.08–8.05 (m, 2 H), 7.13–7.09 (m, 2 H), 5.34 (s, 1 H), 4.23 (dd, $J = 13.7, 10.6$ Hz, 2 H), 3.65 (s, 3 H), 2.30–2.26 (m, 1 H), 2.22–2.19 (m, 1 H), 1.70–1.57 (m, 2 H), 1.51–1.44 (m, 2 H), 1.40–1.25 (m, 2 H), 1.19 (s, 3 H), 0.99 (s, 3 H), 0.94 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.7, 166.7, 165.7, 164.7, 144.0, 133.4, 132.1, 132.0, 127.0, 126.9, 115.5, 115.3, 72.8, 55.5, 51.9, 44.4, 35.8, 35.5, 34.7, 32.6, 31.8, 30.5, 29.4, 26.2; HRMS (ESI) calcd for C₂₂H₂₈O₄F⁺ [M + H⁺] 375.1966, found 375.1971.

Product 3-F 30. Colorless oil, 29.9 mg, 80% yield; $R_f = 0.49$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2957, 2864, 1724, 1596, 1561, 1448, 1388, 1276, 1261, 1204, 1151, 1094, 858 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 7.85–7.84 (m, 1 H), 7.74–7.71 (m, 1 H), 7.44–7.40 (m, 1 H), 7.27–7.23 (m, 1 H), 5.35 (s, 1 H), 4.25 (dd, $J = 15.8, 10.5$ Hz, 2 H), 3.65 (s, 3 H), 2.30–2.26 (m, 1 H), 2.23–2.20 (m, 1 H), 1.70–1.58 (m, 2 H), 1.51–1.45 (m, 2 H), 1.40–1.25 (m, 2 H), 1.19 (s, 3 H), 1.00 (s, 3 H), 0.94 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.7, 165.5, 161.6, 143.9, 133.5, 130.0, 129.9, 125.3, 125.2, 119.9, 119.7, 116.5, 116.3, 73.0, 55.5, 51.9, 44.3, 35.8, 35.5, 34.7, 32.6, 31.8, 30.5, 29.3, 26.2; HRMS (ESI) calcd for C₂₂H₂₈O₄F⁺ [M + H⁺] 375.1966, found 375.1971.

Product 2-F 31. Colorless oil, 32.6 mg, 87% yield; $R_f = 0.40$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{\max} 2955, 2864, 1724, 1613, 1486, 1458, 1363, 1297, 1153, 1128, 1033, 960, 758 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 7.95 (td, $J = 7.6, 1.8$ Hz, 1 H), 7.52–7.48 (m, 1 H), 7.19

(dt, $J = 7.8, 0.5$ Hz, 1 H), 7.12 (dd, $J = 10.6, 8.7$ Hz, 1 H), 5.36 (s, 1 H), 4.25 (dd, $J = 12.8, 10.6$ Hz, 2 H), 3.64 (s, 3 H), 2.28–2.24 (m, 1 H), 2.22–2.19 (m, 1 H), 1.70–1.57 (m, 2 H), 1.50–1.43 (m, 2 H), 1.39–1.24 (m, 2 H), 1.19 (s, 3 H), 0.98 (s, 3 H), 0.93 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.8, 164.7, 163.0, 160.9, 143.9, 134.3, 134.2, 133.3, 132.2, 123.9, 123.8, 117.0, 116.8, 73.2, 55.6, 51.9, 44.2, 35.8, 35.6, 34.8, 32.6, 31.8, 30.5, 29.4, 26.2; HRMS (ESI) calcd for $\text{C}_{22}\text{H}_{28}\text{O}_4\text{F}^+$ [$\text{M} + \text{H}^+$] 375.1966, found 375.1959.

Product glycine 32. Colorless oil, 29.8 mg, 68% yield; $R_f = 0.16$ (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{max} 2925, 2857, 1778, 1749, 1724, 1457, 1417, 1388, 1206, 955, 731, 714; ^1H NMR (500 MHz, CDCl_3) δ 7.89 (dd, $J = 5.5, 3.0$ Hz, 2 H), 7.75 (dd, $J = 5.4, 3.1$ Hz, 2 H), 5.20 (s, 1 H), 4.46 (d, $J = 4.1$ Hz, 2 H), 4.09 (s, 1 H), 3.64 (s, 3 H), 2.20–2.16 (m, 2 H), 1.52–1.47 (m, 1H), 1.45–1.37 (m, 3 H), 1.34–1.29 (m, 2 H), 1.04 (s, 3 H), 0.96 (s, 3 H), 0.87 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.6, 167.4, 167.2, 143.8, 134.2, 133.4, 132.1, 123.6, 73.4, 55.5, 51.9, 44.0, 39.0, 35.7, 35.3, 34.8, 32.5, 31.8, 30.4, 29.7, 29.3, 25.9; HRMS (ESI) calcd for $\text{C}_{25}\text{H}_{29}\text{O}_6\text{NNa}^+$ [$\text{M} + \text{Na}^+$] 462.1887, found 462.1889.

Product CH_2Ad 33. Colorless oil, 37.3 mg, 87% yield; $R_f = 0.34$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2953, 2904, 2848, 1730, 1457, 1256, 1201, 1136, 1101, 1003 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.28 (s, 1 H), 3.96 (dd, $J = 15.3, 10.6$ Hz, 2 H), 3.65 (s, 3 H), 2.26–2.22 (m, 1 H), 2.19–2.17 (m, 1 H), 2.08 (s, 2 H), 1.96 (s, 3 H), 1.71–1.62 (m, 12 H), 1.55–1.49 (m, 2 H), 1.47–1.39 (m, 2 H), 1.37–1.27 (m, 2 H), 1.10 (s, 3 H), 0.98 (s, 3 H), 0.92 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.7, 172.1, 144.2, 133.1, 72.1, 55.5, 51.8, 49.3, 43.9, 42.5, 36.8, 35.8, 35.7, 34.8, 32.7, 32.6, 31.9, 30.5, 29.4; HRMS (ESI) calcd for $\text{C}_{27}\text{H}_{41}\text{O}_4^+$ [$\text{M} + \text{H}^+$] 429.2999, found 429.2989.

Product Ad 34. Colorless oil, 38.1 mg, 92% yield; $R_f = 0.65$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2907, 2854, 1727, 1453, 1234, 1150, 1078, 991, 963, 738 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.30 (s, 1 H), 3.93 (dd, $J = 12.6, 10.6$ Hz, 2 H), 3.64 (s, 3 H), 2.26–2.22 (m, 1 H), 2.19–2.16 (m, 1 H), 2.01 (s, 3 H), 1.91–1.90 (m, 6 H), 1.74–1.66 (m, 6 H), 1.54–1.47 (m, 2 H), 1.45–1.38 (m, 2 H), 1.37–1.24 (m, 2 H), 1.10 (s, 3 H), 0.99 (s, 3 H), 0.92 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 177.7, 176.8, 144.0, 133.2, 71.8, 55.4, 51.9, 44.2, 40.9, 39.0, 36.6, 35.8, 35.5, 34.7, 32.6, 31.8, 30.6, 29.4, 28.0, 26.0; HRMS calcd for $\text{C}_{26}\text{H}_{39}\text{O}_4^+$ [$\text{M} + \text{H}^+$] 415.2843, found 415.2847.

Product pivalate 35. Pale yellow oil, 25.5 mg, 76% yield; $R_f = 0.37$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2957, 2866, 1728, 1597, 1563, 1481, 1448, 1396, 1286, 1217, 1150, 858, 798 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.29 (s, 1 H), 3.94 (dd, $J = 12.2, 10.5$ Hz, 2 H), 3.64 (s, 3 H), 2.25–2.22 (m, 1 H), 2.19–2.16 (m, 1 H), 1.54–1.48 (m, 2 H), 1.46–1.39 (m, 2 H), 1.37–1.26 (m, 2 H), 1.20 (s, 9 H), 1.10 (s, 3 H), 0.98 (s, 3 H), 0.91 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 178.6, 176.8, 144.0, 133.2, 76.8, 72.1, 55.5, 51.9, 44.2, 35.7, 35.5, 34.7, 32.6, 31.8, 30.5, 29.4, 27.3, 26.0; HRMS (ESI) calcd for $\text{C}_{20}\text{H}_{33}\text{O}_4^+$ [$\text{M} + \text{H}^+$] 337.2373, found 337.2377.

Product furan 36. Yellow oil, 20.6 mg, 60% yield; $R_f = 0.32$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2955, 2864, 1725, 1579, 1506, 1461, 1304, 1205, 1161, 1076, 980, 874 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 8.01 (dd, $J = 1.4, 0.7$ Hz, 1 H), 7.43 (t, $J = 1.7$ Hz, 1 H), 6.75 (dd, $J = 1.8, 0.7$ Hz, 1 H), 5.32 (s, 1 H), 4.18 (dd, $J = 15.2, 10.6$ Hz, 2 H), 3.65 (s, 3 H), 2.28–2.25 (m, 1 H), 2.22–2.19 (m, 1 H), 1.67–1.52 (m, 2 H), 1.49–1.42 (m, 2 H), 1.39–1.28 (m, 2 H),

1.15 (s, 3 H), 1.00 (s, 3 H), 0.93 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.7, 163.2, 147.5, 144.0, 143.6, 133.3, 119.8, 109.8, 72.1, 55.5, 51.9, 44.3, 35.8, 35.4, 34.7, 32.6, 31.8, 30.5, 29.4, 26.2; HRMS (ESI) calcd for $\text{C}_{20}\text{H}_{27}\text{O}_5^+$ [$\text{M} + \text{H}^+$] 347.1853, found 347.1854.

Product flourophanol 37. Pale yellow oil, 32.6 mg, 78% yield; $R_f = 0.75$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2957, 2865, 1728, 1518, 1463, 1381, 1205, 1151, 1027, 996 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.34 (s, 1 H), 4.08 (d, $J = 8.6$ Hz, 1 H), 4.00 (d, $J = 8.6$ Hz, 1 H), 3.64 (s, 3 H), 2.27–2.23 (m, 1 H), 2.22–2.19 (m, 1 H), 1.69–1.59 (m, 2 H), 1.50–1.44 (m, 2 H), 1.39–1.27 (m, 2 H), 1.26 (s, 3 H), 0.98 (s, 3 H), 0.93 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.6, 143.7, 142.8, 140.7, 139.1, 138.0, 137.1, 136.0, 134.5, 133.6, 83.8, 55.6, 51.8, 45.4, 35.8, 35.3, 34.8, 32.6, 31.6, 30.4, 29.3, 25.5; HRMS (ESI) calcd for $\text{C}_{21}\text{H}_{24}\text{O}_3\text{F}_5^+$ [$\text{M} + \text{H}^+$] 419.1640, found 419.1649.

Product Benzotriazole 38. Pale yellow oil, 3.3 mg, 9% yield; $R_f = 0.16$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2956, 2864, 1725, 1462, 1376, 1358, 1263, 1239, 1206, 1153, 1088, 952, 744; ^1H NMR (500 MHz, CDCl_3) δ 8.00 (d, $J = 8.4$ Hz, 1 H), 7.63 (d, $J = 8.3$ Hz, 1 H), 7.49 (ddd, $J = 8.4, 7.0, 0.7$ Hz, 1 H), 7.37 (ddd, $J = 8.4, 6.9, 0.9$ Hz, 1 H), 5.46 (s, 1 H), 4.44 (dd, $J = 43.2, 7.8$ Hz, 2 H), 3.60 (s, 1 H), 2.33–2.30 (m, 1 H), 2.26–2.23 (m, 1 H), 1.79–1.69 (m, 2 H), 1.56–1.49 (m, 2 H), 1.43–1.30 (m, 2 H), 1.41 (s, 3 H), 1.03 (s, 3 H), 0.96 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 176.5, 143.7, 134.1, 127.7, 127.2, 124.5, 108.9, 88.5, 55.7, 52.0, 44.3, 35.7, 35.4, 34.7, 32.8, 31.6, 30.5, 29.3, 26.0, 20.3, 13.7; HRMS (ESI) calcd for $\text{C}_{21}\text{H}_{28}\text{O}_3\text{N}_3^+$ [$\text{M} + \text{H}^+$] 370.2125, found 370.2113.

Product 39. Colorless oil, 24.0 mg, 96% yield; $R_f = 0.64$ (silica gel, hexanes:EtOAc, 10:1); $[\alpha]_{\text{D}}^{20} = +44.0^\circ$ ($c = 0.55$ in CHCl_3); IR (film) ν_{max} 2955, 2868, 2865, 1744, 1455, 1383, 1370, 1242, 1034 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.30 (s, 1 H), 3.84 (d, $J = 10.4$ Hz, 1 H), 3.72 (d, $J = 10.4$ Hz, 1 H), 3.71 (s, 3 H), 2.20–2.13 (m, 1 H), 2.12–2.08 (m, 1 H), 2.07 (s, 3 H), 1.88–1.84 (m, 1 H), 1.74–1.68 (m, 1 H), 1.56 (d, $J = 13.2$ Hz, 1 H), 1.40 (d, $J = 13.2$ Hz, 1 H), 1.20–1.13 (m, 1 H), 1.16 (s, 3 H), 1.06–1.00 (m, 1 H), 1.03 (s, 3 H), 0.95 (d, $J = 7.0$ Hz, 3 H), 0.79 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 171.5, 148.2, 125.7, 73.5, 52.1, 51.0, 42.5, 39.4, 32.0, 31.2, 28.2, 24.4, 23.8, 23.0, 22.3, 21.0; HRMS (CI) calcd for $\text{C}_{16}\text{H}_{27}\text{O}_2^+$ [$\text{M} + \text{H}^+$] 251.2006, found 251.2002.

Product 40. Yellow oil, 24.2 mg, 87% yield; $R_f = 0.26$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2954, 2866, 1742, 1459, 1384, 1370, 1247, 1152, 1034, 848 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.34 (s, 1 H), 4.00 (dd, $J = 20.2, 10.5$ Hz, 2 H), 3.69 (s, 3 H), 2.27–2.23 (m, 1 H), 2.16 (d, $J = 12.9$ Hz, 1 H), 2.06 (s, 3 H), 1.90 (td, $J = 12.9, 6.9$ Hz, 1 H), 1.72 (d, $J = 13.0$ Hz, 1 H), 1.68 (ddd, $J = 13.3, 7.5, 1.0$ Hz, 1H), 1.44 (td, $J = 12.4, 7.5$ Hz, 1 H), 1.14 (s, 3 H), 1.10 (s, 6 H); ^{13}C NMR (125 MHz, CDCl_3) δ 177.5, 171.2, 10, 134.9, 70.9, 66.2, 52.2, 51.9, 50.9, 40.1, 39.6, 35.7, 30.8, 27.5, 25.9, 21.0; HRMS (CI) calcd for $\text{C}_{16}\text{H}_{25}\text{O}_4^+$ [$\text{M} + \text{H}^+$] 281.1753, found 281.1757.

Product 41. Yellow oil, 26.4 mg, 73% yield; $R_f = 0.29$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2959, 2870, 1742, 1714, 1462, 1384, 1372, 1245, 1036 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.29 (s, 1 H), 3.99 (s, 2 H), 2.73 (d, $J = 14.2$ Hz, 1 H), 2.13 (d, $J = 14.2$ Hz, 1 H), 2.08 (s, 3 H), 1.90 (td, $J = 12.9, 6.8$ Hz, 1 H), 1.72 (td, $J = 12.6, 7.1$ Hz, 1 H), 1.62–1.59 (m, 1 H), 1.53–1.51 (m, 1 H), 1.31 (s, 3 H), 1.17 (s, 3 H), 1.06 (s, 3 H), 1.00 (s, 3H); ^{13}C NMR (125

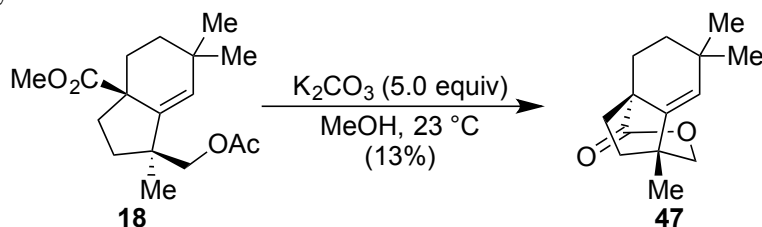
MHz, CDCl₃) δ 213.8, 171.1, 148.6, 130.6, 71.9, 54.2, 49.2, 44.4, 38.8, 33.4, 31.0, 30.9, 30.8, 26.4, 26.0, 20.9; HRMS (ESI) calcd for C₁₆H₂₅O₃⁺ [M + H⁺] 265.1798, found 265.1792.

Product O-tethered 42. Yellow oil, 24.5 mg, 83% yield; R_f = 0.18 (silica gel, hexanes:EtOAc = 10:1); IR (film) ν_{max}; ¹H NMR (500 MHz, CDCl₃) δ 5.33 (s, 1H), 3.94 (dd, *J* = 35.7, 10.9 Hz, 2 H), 3.74 (dd, *J* = 54.8, 9.4 Hz, 2 H), 3.73 (s, 3 H), 2.19–2.15 (m, 1 H), 2.04 (s, 3 H), 1.64–1.59 (m, 1 H), 1.58–1.48 (m, 2 H), 1.20 (s, 3 H), 1.06 (s, 3 H), 0.98 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 173.1, 171.0, 140.0, 133.8, 84.8, 76.8, 69.6, 52.3, 44.3, 33.0, 32.9, 30.3, 30.2, 29.1, 23.8, 20.9; HRMS (ESI) calcd for C₁₆H₂₄O₅Na⁺ [M + Na⁺] 319.1516, found: 319.1523

Product OBn 43. Pale yellow oil, 27.2 mg, 68% yield; R_f = 0.31 (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2953, 2862, 1727, 1454, 1377, 1360, 1244, 1212, 1151, 1100, 1035, 731, 698 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 7.35–7.27 (m, 5 H), 5.39 (s, 1 H), 4.50 (s, 2 H), 4.14 (dd, *J* = 21.0, 10.5 Hz, 2 H), 3.66 (s, 3 H), 3.45 (d, *J* = 8.8 Hz, 1 H), 3.23 (d, *J* = 8.8 Hz, 1 H), 2.22–2.16 (m, 2 H), 2.00 (s, 3 H), 1.90–1.86 (m, 1 H), 1.47–1.31 (m, 5 H), 0.99 (s, 3 H), 0.92 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.8, 171.0, 140.5, 138.8, 134.0, 128.3, 127.4, 127.2, 74.0, 73.2, 67.6, 55.5, 51.9, 48.1, 36.1, 34.9, 32.6, 31.5, 30.7, 30.5, 29.5, 21.0; HRMS (ESI) calcd for C₂₄H₃₂O₅Na⁺ [M + Na⁺] 423.2142, found 423.2117.

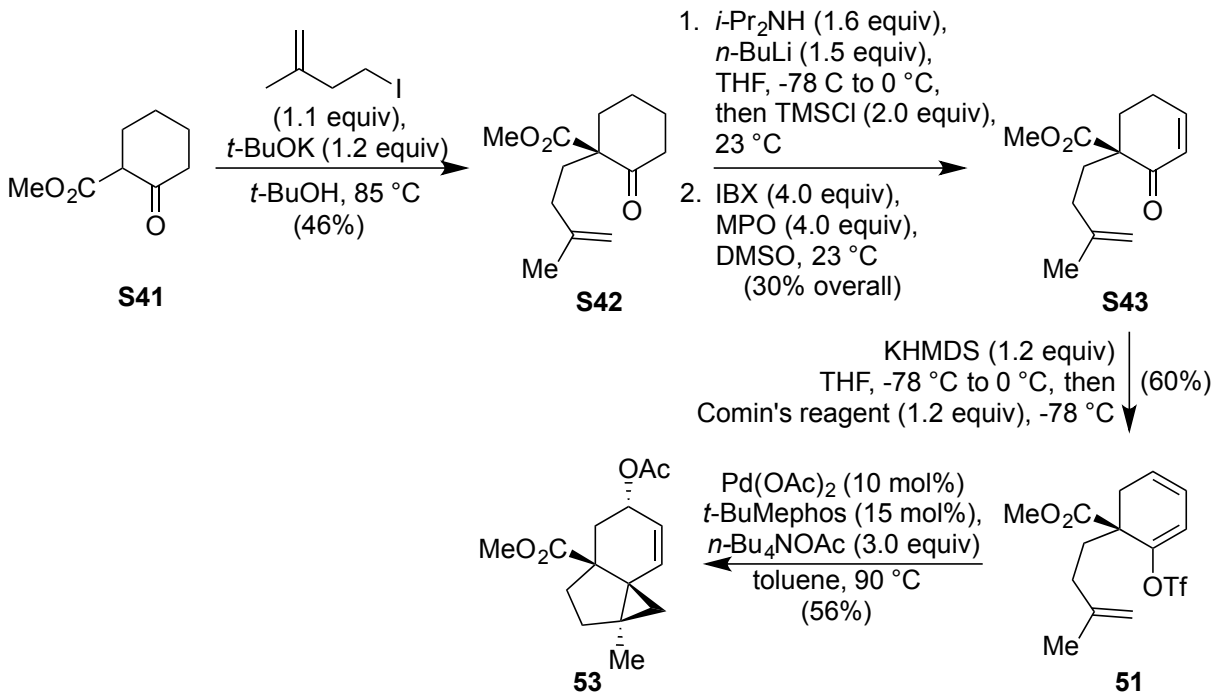
Product 6-membered ring 44. Pale yellow oil, 7.4 mg, 24% yield; R_f = 0.18 (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2951, 2863, 1726, 1453, 1386, 1371, 1241, 1154, 1058, 1031, 1000, 976 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 5.47 (s, 1 H), 3.75 (s, 2 H), 3.63 (s, 3 H), 2.44–2.41 (m, 1 H), 2.03 (s, 3 H), 1.78–1.75 (m, 1 H), 1.68–1.64 (m, 1 H), 1.57–1.47 (m, 4 H), 1.33–1.30 (m, 1 H), 1.24–1.18 (m, 1 H), 1.13–1.06 (m, 1 H), 1.09 (s, 3 H), 1.00 (s, 3 H), 0.96 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.7, 171.2, 136.9, 136.4, 69.6, 51.8, 46.6, 39.0, 37.3, 35.5, 35.4, 32.9, 32.5, 30.8, 29.1, 25.8, 20.9, 19.2; HRMS (ESI) calcd for C₁₈H₂₉O₄⁺ [M + H⁺] 309.2060, found 309.2051.

Mechanism Study



Bicycle 47. To a solution of cyclized product **18** (0.294 g, 1.00 mmol, 1.0 equiv) in MeOH (10 mL) was added K₂CO₃ (0.690 g, 5.00 mmol, 5.0 equiv). The resultant mixture was then stirred for 12 h at 23 °C. The reaction contents were diluted with EtOAc (10 mL) and quenched by the addition of saturated aqueous NH₄Cl (10 mL). The mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with EtOAc (2 × 10 mL). The combined organic layers were washed with H₂O (10 mL) and brine (10 mL) before being dried (Na₂SO₄), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:Et₂O, 20:1→10:1) to provide bicycle **47** (28.4 mg, 13% yield) as a yellow solid. **47**: R_f = 0.66 (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{max} 2955, 2870, 1743, 1597, 1563, 1467, 1395, 1351, 1219, 1126, 1104, 1054, 1034, 992, 880, 864 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 5.28 (s, 1 H), 4.02 (d, *J* = 9.6 Hz, 1 H), 3.83 (dd, *J* = 9.6 Hz, 1.7 Hz, 1 H), 2.60–2.53 (m, 1 H), 2.21 (ddd, *J* = 13.1, 9.6, 4.4 Hz, 1 H), 1.95 (ddd, *J* = 14.7, 9.5, 5.5 Hz, 1 H), 1.74 (tdd, *J* = 12.6, 4.3, 2.0 Hz, 1 H), 1.61 (td, *J* = 18.1 Hz, 5.4 Hz, 1 H), 1.48–1.42 (m, 1 H), 1.40–1.32 (m, 2 H), 1.13 (s, 3 H), 0.99 (s, 3 H), 0.97 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 174.9, 139.5, 126.6, 82.2, 50.7, 42.2, 36.8, 35.8, 35.0, 31.6, 30.6, 28.1, 26.2, 16.6; HRMS (ESI) calcd for C₁₄H₂₁O₂⁺ [M + H⁺] 221.1536, found 221.1539. For the 2D NMR, see final section of the Supporting Information Section.

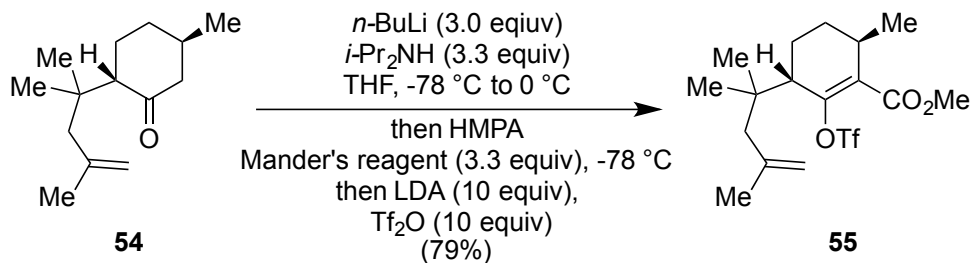
D-labeled 47. The D-labeled variant of **18** was prepared by the described procedure used for **S9**. The D-labeled side chain (*E*)-4-iodo-2-methylbut-1-ene-1-*d* was prepared according to Prof. Brown's method.^[8] D-labeled **47** was prepared as described above. **D-labeled 47**: ¹H NMR (500 MHz, CDCl₃) δ 5.28 (s, 1 H), 3.81 (s, 1 H), 2.62–2.54 (m, 1 H), 2.21 (ddd, *J* = 13.1, 9.6, 4.4 Hz, 1 H), 1.95 (ddd, *J* = 14.7, 9.5, 5.5 Hz, 1 H), 1.75 (tdd, *J* = 12.6, 4.3, 2.0 Hz, 1 H), 1.61 (td, *J* = 18.1 Hz, 5.4 Hz, 1 H), 1.49–1.42 (m, 1 H), 1.40–1.35 (m, 2 H), 1.13 (s, 3 H), 0.99 (s, 3 H), 0.98 (s, 3 H). As shown in COSY and nOe of **47**, the chemical shift of H₁ and H₂ are distinct at 3.83 and 4.02 ppm. In the ¹H NMR of **D-labeled 47**, H₁ is missing; thus, the stereochemistry of **D-labeled 47** is confirmed. See the NMR section itself for the H₁ and H₂ labeled protons.



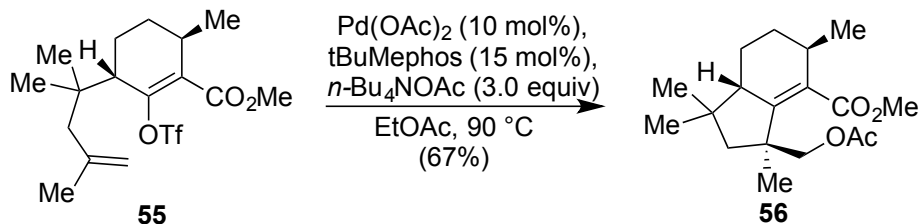
Cyclopropane S45. Ketone **S42** (0.103 g, 46% yield) was prepared as a colorless oil from commercial methyl 2-oxocyclohexane-1-carboxylate (**S41**, 0.156 g, 1.00 mmol, 1.0 equiv) and 4-iodo-2-methylbut-1-ene (0.216 g, 1.10 mmol, 1.1 equiv) by the procedure described above. **S42**: $R_f = 0.29$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2949, 2865, 1714, 1650, 1450, 1215, 1135, 889 cm^{-1} ; $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 4.70 (s, 1 H), 4.68 (s, 1 H), 3.73 (s, 1 H), 2.54–2.51 (m, 1 H), 2.46–2.43 (m, 1 H), 2.05–2.00 (m, 2 H), 1.96–1.84 (m, 1 H), 1.78–1.65 (m, 3 H), 1.72 (s, 3 H), 1.50–1.44 (m, 1 H); $^{13}\text{C NMR}$ (125 MHz, CDCl_3) δ 207.7, 127.5, 145.3, 110.0, 60.1, 52.2, 41.1, 36.0, 32.9, 32.3, 27.6, 22.54, 22.52; HRMS (ESI) calcd for $\text{C}_{13}\text{H}_{21}\text{O}_3^+$ [$\text{M} + \text{H}^+$] 225.1485, found 225.1472. Next, to a solution of $i\text{-Pr}_2\text{NH}$ (0.440 mL, 3.20 mmol, 1.6 equiv) in THF (5 mL) at 0 $^\circ\text{C}$ was added $n\text{-BuLi}$ (1.20 mL, 2.5 M in hexanes, 3.00 mmol, 1.5 equiv), The resultant solution was then stirred for 15 min at 0 $^\circ\text{C}$. The reaction contents were then cooled to –78 $^\circ\text{C}$ and a solution of ketone **S42** (0.448 g, 2.00 mmol, 1.0 equiv) in THF (5 mL) was added dropwise. After warming to 0 $^\circ\text{C}$ and stirring at that temperature for 90 min, the solution was recooled to –78 $^\circ\text{C}$ and TMSCl (0.510 mL, 4.00 mmol, 2.0 equiv) was added. The resultant solution was slowly warmed to 23 $^\circ\text{C}$ and stirred for 12 h. Upon completion, the reaction contents were quenched by the addition of saturated aqueous NH_4Cl (10 mL). The mixture was then poured into a separatory funnel and the layers were separated. The aqueous layer was extracted with EtOAc (2×10 mL). The combined organic layers were then washed with brine (10 mL) before being dried (Na_2SO_4), filtered, and concentrated to provide the desired crude TMS enol ether intermediate (2.00 mmol assumed) directly used for next step without any further purification. Pressing forward, IBX (2.24 g, 8.00 mmol, 4.0 equiv) and MPO (1.00 g, 5.00 mmol, 2.5 equiv) was dissolved in DMSO (20 mL). This solution was then added to a solution of the crude enol ether (2.00 mmol assumed, 1.0 equiv) in DMSO (2.5 mL) at 23 $^\circ\text{C}$. The resultant mixture was stirred at 23 $^\circ\text{C}$ for 6 h. Upon completion, the reaction contents were diluted with Et_2O (10 mL) and quenched by the addition of saturated aqueous NaHCO_3 (10 mL). The mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with Et_2O (2×10 mL). The combined organic layers were washed with

saturated aqueous NaHCO₃ (10 mL), H₂O (10 mL) and brine (10 mL) before being dried (Na₂SO₄), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 20:1→10:1) to provide enone **S43** (0.242 g, 30% yield from ketone **S42**)^[9] as a pale yellow oil. **S43**: *R*_f = 0.46 (silica gel, hexanes:EtOAc, 5:1); IR (film) *v*_{max} 2953, 1723, 1686, 1449, 1386, 1245, 1205, 1081, 889 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 6.91–6.88 (m, 1 H), 6.01 (dt, *J* = 10.1, 1.7 Hz, 1 H), 4.69 (s, 1 H), 4.68 (s, 1 H), 3.68 (s, 3 H), 2.54–2.46 (m, 2 H), 2.37–2.30 (m, 1 H), 2.09–2.03 (m, 1 H), 1.99–1.94 (m, 1 H), 1.87–1.81 (m, 1 H), 1.72 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 196.2, 172.0, 149.5, 145.2, 129.1, 110.2, 56.8, 52.4, 32.6, 31.9, 29.9, 23.6, 22.5; HRMS (ESI) calcd for C₁₃H₁₉O₃⁺ [*M* + H⁺] 223.1329, found 223.1333. Next, triflate **51** was prepared as described above starting from **S43** (0.111 g, 5.00 mmol, 1.0 equiv) to afford triflate **51** (0.104 g, 60% yield) as a colorless oil. **51**: *R*_f = 0.62 (silica gel, hexanes:EtOAc, 10:1); IR (film) *v*_{max} 2956, 1714, 1654, 1416, 1213, 1143, 1060, 891, 702 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 6.05–6.04 (m, 1 H), 5.87–5.82 (m, 1 H), 4.73 (s, 1 H), 4.71 (s, 1 H), 3.74 (s, 3 H), 3.07 (dd, *J* = 17.7, 4.2 Hz, 1 H), 2.53–2.49 (m, 1 H), 2.04–1.98 (m, 3 H), 1.94–1.88 (m, 1 H), 1.72 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 172.7, 148.1, 144.5, 126.1, 120.8, 115.35, 115.34, 115.33, 110.6, 52.6, 49.5, 33.7, 32.7, 32.5, 22.4; HRMS (ESI) calcd for C₁₄H₁₈O₅F₃S⁺ [*M* + H⁺] 355.0822, found 355.0822. Finally, **53** was prepared following the general Pd-cyclization procedure defined above from **51** (35.4 mg, 0.1 mmol) to provide **53** (14.9 mg, 56% yield) as a pale yellow oil. **53**: *R*_f = 0.29 (silica gel, hexanes:EtOAc, 10:1); IR (film) *v*_{max} 2952, 2926, 2863, 1738, 1442, 1370, 1240, 1152, 1113, 1055, 1023 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 5.67–5.65 (m, 1 H), 5.59–5.55 (m, 1 H), 5.36 (dd, *J* = 10.0, 1.5 Hz, 1 H), 3.69 (s, 3H), 2.35–2.32 (m, 1 H), 2.06 (s, 3 H), 1.92–1.82 (m, 2 H), 1.71–1.62 (m, 2 H), 1.53–1.49 (m, 1 H), 1.29 (d, *J* = 5.8 Hz, 1 H), 1.16 (s, 3 H), 0.62 (d, *J* = 5.7 Hz, 1 H); ¹³C NMR (125 MHz, CDCl₃) δ 176.0, 170.6, 132.2, 126.7, 69.6, 54.2, 51.9, 35.82, 35.76, 32.6, 31.7, 31.3, 22.3, 21.3, 19.6; HRMS (ESI) calcd for C₁₅H₂₀O₄Na⁺ [*M* + Na⁺] 287.1254, found 287.1246.

Total Synthesis of Members of the Botrydial Family of Natural Products

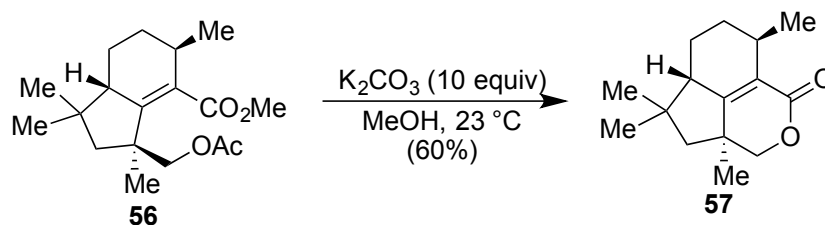


Triflate 55. To a solution of $i\text{-Pr}_2\text{NH}$ (0.440 mL, 3.20 mmol, 3.2 equiv) in THF (3 mL) at $0\text{ }^\circ\text{C}$ was added $n\text{-BuLi}$ (1.20 mL, 2.5 M in hexanes, 3.00 mmol, 3.0 equiv) and the resultant solution was stirred at $0\text{ }^\circ\text{C}$ for 15 min. The reaction contents were then cooled to $-78\text{ }^\circ\text{C}$ and a solution of **54** (0.208 g, 1.00 mmol, 1.0 equiv) in THF (5 mL) was added dropwise over the course of 5 min. The reaction mixture was then warmed to $0\text{ }^\circ\text{C}$ and kept at that temperature for 90 min before being cooled to $-78\text{ }^\circ\text{C}$. HMPA (0.50 mL) and a solution of Mander's reagent (0.280 g, 3.30 mmol, 3.3 equiv) in THF (2 mL) were then added sequentially. After stirring the resultant mixture at $-78\text{ }^\circ\text{C}$ for 1 h, LDA (prepared from $n\text{-BuLi}$ and $i\text{-Pr}_2\text{NH}$ as described, 10.0 mL, 1.0 M in THF, 10.0 mmol, 10 equiv) was added at $-78\text{ }^\circ\text{C}$ and was followed by the addition of Tf_2O (1.68 mL, 10.0 mmol, 10 equiv). The reaction contents were stirred at $-78\text{ }^\circ\text{C}$ for 4 h before being quenched by the addition of saturated aqueous NaHCO_3 (10 mL). The mixture was then warmed to $23\text{ }^\circ\text{C}$, H_2O (10 mL) was added to dissolve any remaining solids, and the reaction contents was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with Et_2O ($2 \times 10\text{ mL}$). The combined organic layers were washed with saturated aqueous NaHCO_3 (100 mL), H_2O (10 mL), and brine (10 mL), dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (Et_3N -buffered silica gel, hexanes) to provide triflate **55** (0.314 g, 79% yield) as a colorless oil. **55**: $R_f = 0.65$ (silica gel, hexanes: EtOAc , 15:1); $[\alpha]_D^{20} = +94.0^\circ$ ($c = 0.53$, CHCl_3); IR (film) ν_{max} 2968, 1731, 1421, 1245, 1203, 1142, 1065, 1048, 961, 891, 810 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 4.91 (s, 1 H), 4.68 (s, 1 H), 3.80 (s, 3 H), 2.75–2.72 (m, 1 H), 2.41–2.39 (m, 1 H), 2.16 (d, $J = 13.1\text{ Hz}$, 1 H), 1.98 (d, $J = 13.1\text{ Hz}$, 1 H), 1.91–1.87 (m, 3 H), 1.78 (s, 3 H), 1.38–1.33 (m, 1 H), 1.18 (d, $J = 7.0\text{ Hz}$, 3 H), 1.05 (s, 3 H), 1.01 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 165.6, 151.4, 142.5, 131.9, 122.1, 119.6, 117.0, 115.3, 114.5, 52.0, 48.2, 45.9, 39.0, 31.5, 27.5, 27.2, 26.6, 25.5, 22.3, 20.9; HRMS (ESI) calcd for $\text{C}_{17}\text{H}_{26}\text{O}_5\text{F}_3\text{S}^+ [\text{M} + \text{H}^+]$ 399.1448, found 399.1436.

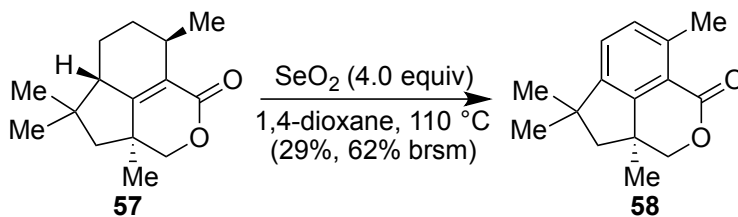


Acetate 56. To a flame-dried sealed tube was added $\text{Pd}(\text{OAc})_2$ (0.112 g, 0.500 mmol, 10 mol %), $t\text{-BuMephos}$ (0.234 g, 0.75 mmol, 15 mol %), and $n\text{-Bu}_4\text{NOAc}$ (4.52 g, 15.0 mmol, 3.0 equiv). A solution of triflate **55** (1.99 g, 5.00 mmol, 1.0 equiv) in EtOAc (50 mL) was then added at $23\text{ }^\circ\text{C}$. The mixture was heated to $90\text{ }^\circ\text{C}$ and stirred at this temperature for 12 h. Upon

completion, the reaction contents were cooled to 23 °C and filtered through a pad of silica gel (EtOAc). The filtrate was concentrated and the resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 30:1) to provide acetate **56** (1.03 g, 67% yield) as a pale yellow oil. **56**: $R_f = 0.48$ (silica gel, hexanes:EtOAc, 10:1); $[\alpha]_D^{20} = +23.0^\circ$ ($c = 1.0$ in CHCl_3); IR (film) ν_{max} 2932, 2865, 1742, 1726, 1373, 1226, 1061, 1030 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 4.24 (d, $J = 10.3$ Hz, 1 H), 4.05 (d, $J = 10.3$ Hz, 1 H), 3.71 (s, 3 H), 2.56–2.48 (m, 1 H), 2.15–2.11 (m, 1 H), 2.06 (s, 3 H), 1.93–1.88 (m, 1 H), 1.73 (d, $J = 13.3$ Hz, 1 H), 1.71–1.66 (m, 1 H), 1.40 (d, $J = 13.2$ Hz, 1 H), 1.25–1.06 (m, 2 H), 1.11 (s, 3 H), 1.00 (s, 3 H), 0.91 (d, $J = 6.8$ Hz, 3 H), 0.78 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 171.2, 170.8, 149.8, 131.5, 73.1, 53.7, 53.1, 51.1, 44.1, 39.0, 33.1, 31.4, 27.9, 23.7, 22.9, 22.1, 21.0, 20.1; HRMS (ESI) calcd for $\text{C}_{18}\text{H}_{29}\text{O}_4^+ [\text{M} + \text{H}^+]$ 309.2060, found 309.2063.



Lactone 57. To a solution of acetate **56** (0.616 g, 2.00 mmol, 1.0 equiv) in MeOH (20 mL) at 23 °C was added K_2CO_3 (2.76 g, 20 mmol, 10 equiv), and the resultant mixture was stirred at 23 °C for 10 h. Upon completion, the reaction contents were diluted with EtOAc (10 mL) and quenched by the addition of saturated aqueous NH_4Cl (10 mL). The mixture was poured into a separatory funnel and the layers were separated. The aqueous layer was then extracted with EtOAc (2×10 mL). The combined organic layers were washed with H_2O (2×10 mL) and brine (10 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 20:1→10:1) to provide lactone **57** (0.281 g, 60% yield) as a colorless solid. **57**: $R_f = 0.58$ (silica gel, hexanes:EtOAc, 5:1); $[\alpha]_D^{20} = -53.0^\circ$ ($c = 0.30$ in CHCl_3); IR (film) ν_{max} 2957, 2869, 1714, 1462, 1388, 1368, 1256, 1209, 1165, 1070, 1049, 1000, 974, 788 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 4.08 (d, $J = 10.4$ Hz, 1 H), 4.01 (d, $J = 10.4$ Hz, 1 H), 2.78–2.72 (m, 1 H), 2.45 (ddd, $J = 10.3, 6.8, 2.3$ Hz, 1 H), 1.68–1.58 (m, 1 H), 1.56 (d, $J = 14.1$ Hz, 1 H), 1.50 (d, $J = 13.9$ Hz, 1 H), 1.39–1.31 (m, 1 H), 1.24 (s, 3 H), 1.16 (s, 3 H), 1.02 (d, $J = 7.0$ Hz, 1 H), 0.83 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 166.5, 124.6, 50.4, 49.1, 41.6, 38.4, 29.3, 29.2, 25.9, 25.1, 25.0, 19.3, 16.1; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{23}\text{O}_2^+ [\text{M} + \text{H}^+]$ 235.1693, found 235.1700.



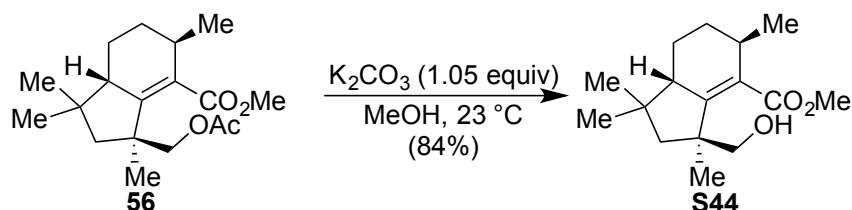
10-oxodehydrodihydrobotrydial (58).^[10a] Lactone **57** (46.8 mg, 0.200 mmol, 1.0 equiv) in 1,4-dioxane (2 mL) was treated with SeO_2 (88.8 mg, 0.800 mmol, 4.0 equiv). The resultant mixture was then heated at 110 °C for 12 h. Upon completion, the resultant mixture was cooled to 23 °C and filtered through a pad of silica gel (EtOAc). The filtrate was then

concentrated and the resultant residue was purified by column chromatography (hexanes: EtOAc = 100:1→50:1) to provide recovered starting material (24.9 mg) along with 10-oxodehydrodihydrobotrydial (**58**, 13.3 mg, 29% yield, 62% yield brsm) as a white solid. **58**: R_f = 0.68 (silica gel, hexanes: EtOAc = 5:1); $[\alpha]_D^{20} = -95.0^\circ$ ($c = 1.0$ in CHCl_3); lit: $[\alpha]_D^{28} = -166.5^\circ$ ($c = 1.0$ in CHCl_3)^[10b]; as such the rotation data showed this should be the enantiomer of the originally proposed structure for **58**, but the same absolute configuration as the reassignment by the Li group following their synthesis; IR (film) ν_{max} 2961, 2927, 2867, 1759, 1584, 1484, 1245, 1067, 829, 801, 532 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 7.21 (d, $J = 7.7$ Hz, 1 H), 7.15 (d, $J = 7.7$ Hz, 1 H), 4.36 (d, $J = 10.0$ Hz, 1 H), 4.13 (d, $J = 10.0$ Hz, 1 H), 2.62 (s, 3 H), 1.98 (d, $J = 12.8$ Hz, 1 H), 1.86 (d, $J = 12.9$ Hz, 1 H), 1.51 (s, 3 H), 1.45 (s, 3 H), 1.32 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 164.0, 151.4, 147.0, 139.6, 131.7, 127.2, 119.6, 79.2, 52.1, 45.1, 40.8, 30.8, 30.7, 24.7, 20.2; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{19}\text{O}_2^+$ $[\text{M} + \text{H}^+]$ 231.1380, found 231.1388.

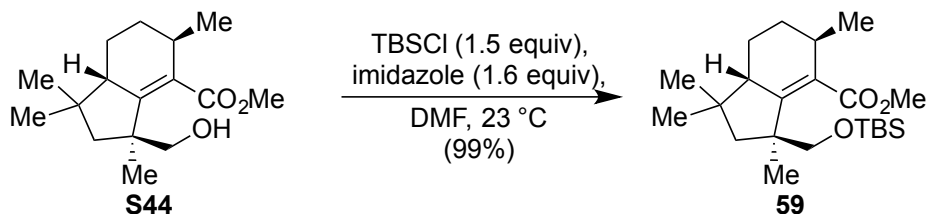
Table S1. Comparison of literature and obtained spectral values for 10-oxodehydrodihydrobotrydial (**58**)^[10a]

^1H NMR in CDCl_3	
Natural (Collado, 400 MHz)	Synthetic (This work, 500 MHz)
7.20 (d, $J = 7.8$ Hz, 1 H)	7.21 (d, $J = 7.7$ Hz, 1 H)
7.14 (d, $J = 7.8$ Hz, 1 H)	7.15 (d, $J = 7.7$ Hz, 1 H)
4.35 (d, $J = 10.1$ Hz, 1 H)	4.36 (d, $J = 10.0$ Hz, 1 H)
4.12 (d, $J = 10.1$ Hz, 1 H)	4.13 (d, $J = 10.0$ Hz, 1 H)
2.61 (s, 3 H)	2.62 (s, 3 H)
1.96 (d, $J = 13.0$ Hz, 1 H)	1.98 (d, $J = 13.0$ Hz, 1 H)
1.84 (d, $J = 13.0$ Hz, 1 H)	1.86 (d, $J = 13.0$ Hz, 1 H)
1.50 (s, 3 H)	1.50 (s, 3 H)
1.44 (s, 3 H)	1.45 (s, 3 H)
1.31 (s, 3 H)	1.32 (s, 3 H)
^{13}C NMR in CDCl_3	
Natural (Collado, 100 MHz)	Synthetic (This work, 125 MHz)
164.0	164.0
151.4	151.4
147.0	147.0
139.6	139.6
131.7	131.7
127.3	127.2
119.6	119.6
79.2	79.2

52.1	52.1
45.1	45.1
40.4	40.5
30.7	30.8
30.7	30.7
24.7	24.7
20.3	20.2

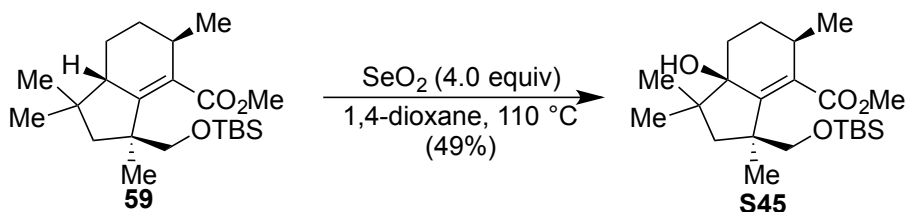


Alcohol S44. To a solution of acetate **56** (1.23 g, 4.00 mmol, 1.0 equiv) in MeOH (40 mL) at 23 °C was added K_2CO_3 (0.580 g, 4.20 mmol, 1.05 equiv), and the resultant mixture was stirred at 23 °C for 10 h. Upon completion, the reaction mixture was quenched by the addition of saturated aqueous NH_4Cl (30 mL), poured into a separatory funnel, and the resultant layers were separated. The aqueous layer was then extracted with EtOAc (2×30 mL). The combined organic layers were washed with H_2O (30 mL) and brine (30 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 10:1→5:1) to provide alcohol **S44** (0.894 g, 84% yield) as a white solid. **S44**: $R_f = 0.33$ (silica gel, hexanes: EtOAc = 5:1); $[\alpha]_D^{20} = -19.0^\circ$ ($c = 0.53$ in $CHCl_3$); IR (film) ν_{max} 3438, 2921, 2864, 1718, 1656, 1446, 1366, 1261, 1225, 1060, 981, 750 cm^{-1} ; 1H NMR (500 MHz, $CDCl_3$) 3.75 (s, 3 H), 3.45–3.40 (m, 2 H), 3.21 (dd, $J = 6.6, 5.8$ Hz, 1 H), 2.56–2.48 (m, 1 H), 2.14–2.10 (m, 1 H), 1.93–1.88 (m, 1 H), 1.72–1.68 (m, 1 H), 1.59 (d, $J = 13.0$ Hz, 1 H), 1.40 (d, $J = 12.9$ Hz, 1 H), 1.25–1.08 (m, 2 H), 1.10 (s, 3 H), 1.01 (s, 3 H), 0.93 (d, $J = 6.8$ Hz, 3 H), 0.79 (s, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.2, 151.2, 131.2, 71.7, 54.1, 53.0, 51.6, 46.6, 38.5, 33.2, 31.4, 27.8, 23.9, 22.4, 22.1, 20.2; HRMS (ESI) calcd for $C_{16}H_{27}O_3^+$ [$M + H^+$] 267.1955, found 267.1965.

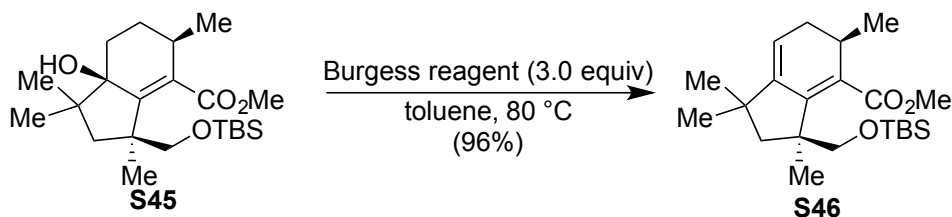


TBS-Protected Ether 59. To a solution of alcohol **S44** (0.266 g, 1.00 mmol, 1.0 equiv) in DMF (10 mL) at 23 °C was sequentially added imidazole (0.109 g, 1.60 mmol, 1.6 equiv) and TBSCl (0.225 g, 1.50 mmol, 1.5 equiv). The resultant solution was stirred at 23 °C for 12 h. Upon completion, the reaction contents were quenched by the addition of saturated aqueous NH_4Cl (10 mL), poured into a separatory funnel, and the resultant layers were separated. The aqueous layer was then extracted with Et_2O (2×10 mL). The combined organic layers were

washed with H₂O (4 × 10 mL) and brine (10 mL) before being dried (Na₂SO₄), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 20:1) to provide **59** (0.380 g, 99% yield). **59**: R_f = 0.39 (silica gel, hexanes:EtOAc, 20:1); [α]_D²⁰ = +30.0° (c = 1.0 in CHCl₃); IR (film) ν_{max} 2930, 2857, 1727, 1432, 1385, 1254, 1226, 1212, 1060, 837 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 3.80 (d, *J* = 8.7 Hz, 1 H), 3.70 (s, 3 H), 3.39 (d, *J* = 8.7 Hz, 1 H), 2.54–2.48 (m, 1 H), 2.18–2.14 (m, 1 H), 2.04 (d, *J* = 12.7 Hz, 1 H), 1.90–1.86 (m, 1 H), 1.68–1.63 (m, 1 H), 1.23 (d, *J* = 12.8 Hz, 1 H), 1.17–1.08 (m, 2 H), 1.001 (s, 3 H), 0.995 (s, 3 H), 0.90 (d, *J* = 6.8 Hz, 3 H), 0.88 (s, 9 H), 0.77 (s, 3 H), 0.04 (s, 3 H), 0.03 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 171.2, 152.2, 129.4, 71.6, 53.9, 52.7, 50.9, 46.3, 38.9, 33.1, 27.9, 24.0, 22.8, 22.3, 20.1, 18.2, -5.3, -5.4; HRMS (ESI) calcd for C₂₂H₄₁O₃Si⁺ [M + H⁺] 381.2819, found 381.2826.

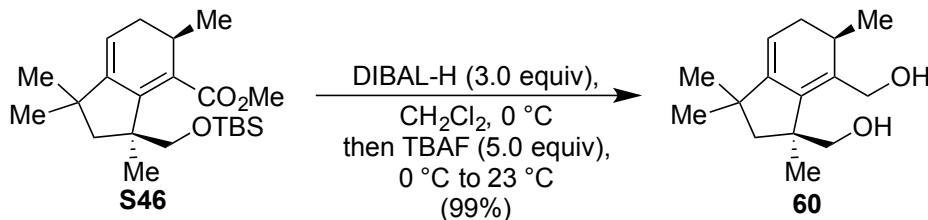


Allylic alcohol S45. To a solution of **59** (0.076 g, 0.200 mmol, 1.0 equiv) in 1,4-dioxane (2 mL) at 23 °C was added SeO₂ (0.089 g, 0.800 mmol, 4.0 equiv). The resultant mixture was then heated at 110 °C for 12 h. Upon completion, the resultant mixture was cooled to 23 °C and filtered through a pad of silica gel (EtOAc). The filtrate was then concentrated and the resultant residue was purified by column chromatography (hexanes: EtOAc = 100:1→50:1) to provide allylic alcohol **S45** (0.039 g, 49% yield) as a colorless oil. **S45**: R_f = 0.53 (silica gel, hexanes:EtOAc, 10:1); [α]_D²⁰ = +10.0° (c = 0.21 in CHCl₃); IR (film) ν_{max} 3426, 2951, 2931, 2860, 1720, 1471, 1251, 1215, 1065, 782 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 4.59 (d, *J* = 2.0 Hz, 1 H), 4.02 (d, *J* = 8.5 Hz, 1 H), 3.72 (s, 3 H), 3.21 (d, *J* = 8.5 Hz, 1 H), 2.49–2.44 (m, 1 H), 2.20 (d, *J* = 12.8 Hz, 1 H), 1.73–1.54 (m, 2 H), 1.39–1.34 (m, 1 H), 1.15 (d, *J* = 12.8 Hz, 1 H), 1.023 (s, 3 H), 1.017 (s, 3 H), 0.93 (d, *J* = 6.9 Hz, 1 H), 0.92 (s, 3 H), 0.85 (s, 3 H), 0.113 (s, 3 H), 0.111 (s, 3 H); ¹³C NMR (125 MHz, CDCl₃) δ 170.8, 148.8, 134.2, 79.6, 71.8, 51.1, 49.7, 45.2, 43.4, 33.7, 27.0, 26.9, 26.7, 25.9, 23.3, 21.6, 19.8, 18.4, -5.5, -5.6; HRMS (ESI) calcd for C₂₂H₃₉O₃Si⁺ [M + H⁺ - H₂O] 379.2663, found 379.2665.

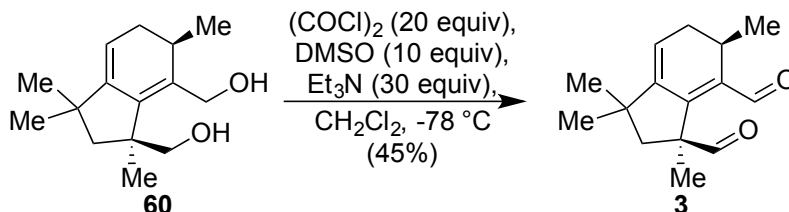


Diene S46. To a solution of allylic alcohol **S45** (0.070 g, 0.180 mmol, 1.0 equiv) in toluene (8 mL) at 23 °C was added the Burgess reagent (0.120 g, 0.500 mmol, 3.0 equiv). The resultant flask was then immersed in a pre-heated oil bath at 80 °C and stirring of the mixture was continued at 80 °C for 12 h. Upon completion, the reaction contents were cooled to 23 °C, diluted with Et₂O (10 mL), and poured into a separatory funnel. This organic layer was washed with saturated aqueous NaHCO₃ (10 mL) and brine (10 mL). The organic phase was then dried (Na₂SO₄) and concentrated. The resultant residue was purified by flash column chromatography

(silica gel, hexanes:EtOAc, 10:1) to provide diene **S46** (0.064 g, 96% yield) as a pale yellow oil. **S46**: $R_f = 0.62$ (silica gel, hexanes: EtOAc = 10:1); $[\alpha]_D^{20} = +28^\circ$ ($c = 1.0$ in CHCl_3); IR (film) ν_{max} 2955, 2928, 2859, 1711, 1463, 1432, 1230, 1096, 852, 836, 775 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.59 (dd, $J = 5.6, 3.5$ Hz, 1 H), 3.78 (d, $J = 9.4$ Hz, 1 H), 3.74 (s, 3 H), 3.58 (d, $J = 9.4$ Hz, 1 H), 2.67–2.62 (m, 1 H), 2.42–2.36 (m, 1 H), 2.20 (d, $J = 13.2$ Hz, 1 H), 2.06–2.00 (m, 1 H), 1.40 (d, $J = 13.2$ Hz, 1 H), 1.24 (s, 3 H), 1.16 (s, 3 H), 1.11 (s, 3 H), 1.04 (d, $J = 6.9$ Hz, 1 H), 0.04 (s, 3 H), 0.02 (s, 3 H); ^{13}C NMR (125 MHz, CDCl_3) δ 169.4, 151.4, 151.0, 126.0, 118.5, 67.7, 52.3, 50.69, 47.9, 38.5, 31.4, 31.3, 31.0, 30.2, 25.8, 24.1, 18.4, -5.5, -5.6; HRMS (ESI) calcd for $\text{C}_{22}\text{H}_{39}\text{O}_3\text{Si}^+ [\text{M} + \text{H}^+]$ 379.2663, found 379.2669.



Botrydienol (60). To a solution of diene **S46** (37.8 mg, 0.100 mmol, 1.0 equiv) in CH_2Cl_2 (0.7 mL) at 0°C was added DIBAL-H (0.3 mL, 1.0 M in CH_2Cl_2 , 0.300 mmol, 3.0 equiv) dropwise over the course of 10 min. The resultant solution was then stirred at 0°C for 1 h. Next, TBAF (0.500 mL, 1.0 M in THF, 0.500 mmol, 5.0 equiv) was added dropwise over the course of 10 min. The resultant mixture was then warmed to 23°C and stirred at that temperature for an additional 3 h. Upon completion, the reaction contents were quenched by the slow addition of solid $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ at 0°C until no further gas was released. The mixture was then filtered through Celite and the residual solids were washed with EtOAc (5×1 mL). The combined organic layers were washed with saturated H_2O (3×5 mL) and brine (5 mL) before being dried (Na_2SO_4), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 5:1→1:1) to provide botrydienol (**60**, 23.6 mg, 99% yield) as a white solid. **60**: $R_f = 0.21$ (silica gel, hexanes: EtOAc, 3:1); $[\alpha]_D^{20} = +53.0^\circ$ ($c = 0.80$ in CHCl_3); IR (film) ν_{max} 3337, 2955, 2924, 2862, 1597, 1563, 1449, 1395, 1219, 1119, 1034 cm^{-1} ; ^1H NMR (500 MHz, CDCl_3) δ 5.38 (dd, $J = 5.3, 3.1$ Hz, 1 H), 4.35 (d, $J = 11.3$ Hz, 1 H), 4.20 (d, $J = 11.3$ Hz, 1 H), 3.65 (d, $J = 11.1$ Hz, 1 H), 3.53 (d, $J = 11.1$ Hz, 1 H), 2.42–2.30 (m, 2 H), 2.02 (dt, $J = 17.1, 4.5$ Hz, 1 H), 1.95 (d, $J = 13.2$ Hz, 1 H), 1.46 (d, $J = 13.2$ Hz, 1 H), 1.25 (s, 3 H), 1.15 (s, 3 H), 1.10 (s, 3 H), 1.08 (d, $J = 6.8$ Hz, 1 H); ^{13}C NMR (125 MHz, CDCl_3) δ 150.3, 141.1, 134.2, 114.1, 70.4, 61.9, 53.1, 47.0, 39.7, 32.6, 31.7, 31.0, 30.7, 25.8, 18.8; HRMS (CI) calcd for $\text{C}_{15}\text{H}_{23}\text{O}^+ [\text{M} + \text{H}^+ - \text{H}_2\text{O}]$ 219.1743, found 219.1746.



Botrydienal (3). To a solution of $(\text{COCl})_2$ (0.110 mL, 1.28 mmol, 20 equiv) in CH_2Cl_2 (0.5 mL) at -78°C was added DMSO (0.045 mL, 0.64 mmol, 10 equiv) dropwise over the course of 5 min. After stirring the resultant solution at -78°C for 15 min, a solution of

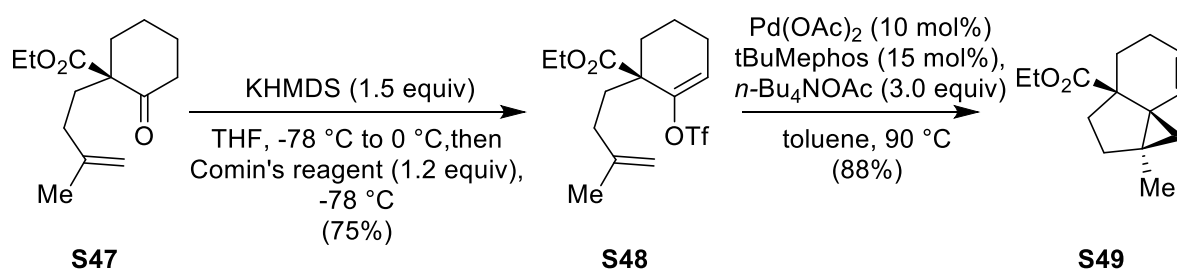
botrydienol (**60**, 15.0 mg, 0.064 mmol, 1.0 equiv) in CH₂Cl₂ (0.5 mL) was added dropwise over the course of 10 min. The resultant solution was then stirred at -78 °C for 3 h, at which time Et₃N (0.26 mL, 1.9 mmol, 30 equiv) was added the reaction contents were stirred at -78 °C for another 30 min. Upon completion, the reaction contents were quenched by the addition of H₂O (2 mL), warmed to 23 °C, poured into a separatory funnel, and the resultant layers were separated. The aqueous layer was then extracted with CH₂Cl₂ (2 × 2 mL). The combined organic layers were washed with H₂O (3 mL) before being dried (Na₂SO₄), filtered, and concentrated. The resultant residue was purified by flash column chromatography (silica gel, hexanes:EtOAc, 10:1→5:1) to provide botrydienal (**3**, 8.2 mg, 55% yield) as a white solid. **3**: R_f = 0.55 (silica gel, hexanes:EtOAc, 5:1); [α]_D²⁰ = +167.0° (*c* = 0.18 in *n*-hexane); lit: [α]_D³⁰ = +190° (*c* = 0.18 in *n*-hexane);^[11] IR (film) ν_{max} 2959, 2926, 2853, 2819, 2807, 2712, 1723, 1658, 1640, 1570, 1453, 1143, 924, 797, 404 cm⁻¹; ¹H NMR (500 MHz, CDCl₃) δ 9.74 (s, 1 H), 9.67 (s, 1 H), 5.88 (dd, *J* = 6.3, 2.8 Hz, 1 H), 3.00–2.97 (m, 1 H), 2.45 (ddd, *J* = 18.4, 8.7, 6.7 Hz, 1 H); 2.23 (d, *J* = 13.6 Hz, 1H), 2.20 (dd, *J* = 19.2, 6.3 Hz, 1 H); 1.63 (d, *J* = 13.7 Hz, 1 H); 1.53 (s, 3 H), 1.26 (s, 3 H), 1.06 (s, 3 H), 0.92 (d, *J* = 7.0 Hz, 1 H); ¹³C NMR (125 MHz, CDCl₃) δ 199.9, 189.8, 155.2, 149.5, 136.0, 123.7, 56.5, 50.6, 40.5, 30.62, 30.61, 28.8, 25.3, 24.2, 18.3; HRMS (ESI) calcd for C₁₅H₂₁O₂⁺ [M + H⁺] 233.1536, found 233.1542.

Table S2. Comparison of literature and obtained spectral values for botrydienal (**3**)^[11]

¹ H NMR in CDCl ₃	
Natural (Marumo, 100 MHz)	Synthetic (this work, 500 MHz)
9.74 (s, 1 H)	9.74 (s, 1 H)
9.67 (s, 1 H)	9.67 (s, 1 H)
5.87 (ddd, <i>J</i> = 6.1, 3.2, 0.5 Hz, 1 H)	5.88 (dd, <i>J</i> = 6.3, 2.8 Hz, 1 H)
2.98 (m, 1 H)	3.00–2.97 (m, 1 H)
2.48 (ddd, <i>J</i> = 18, 8.1, 6.1 Hz, 2 H)	2.48 (ddd, <i>J</i> = 18.4, 8.7, 6.7 Hz, 2 H)
2.24 (d, <i>J</i> = 13.9 Hz, 2 H)	2.24 (d, <i>J</i> = 13.6 Hz, 2 H)
1.63 (d, <i>J</i> = 13.9 Hz, 3 H)	1.63 (d, <i>J</i> = 13.7 Hz, 3 H)
1.54 (s, 3 H)	1.53 (s, 3 H)
1.25 (s, 3 H)	1.26 (s, 3 H)
1.06 (s, 3 H)	1.06 (s, 3 H)
¹³ C NMR in CDCl ₃	
Natural (Marumo, 25 MHz)	Synthetic (This work, 125 MHz)
199.5	199.9
189.5	189.8
154.9	155.2
149.2	149.5
135.7	136.0
123.5	123.7
56.3	56.5
50.4	50.6

40.4	40.5
30.5	30.6
30.5	30.5
28.7	28.8
25.3	25.3
24.2	24.2
18.3	18.3

Select Substrate Limitations for a Terminating Oxygenation



β -H elimination: **S47** was prepared as a colorless oil following the described procedure toward **S42** (0.119 g, 50% yield) from ethyl 2-oxocyclohexane-1-carboxylate (0.170 g, 1.00 mmol, 1.0 equiv) and 4-iodo-2-methylbut-1-ene (0.216 g, 1.10 mmol, 1.1 equiv). **S47**: $R_f = 0.54$ (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{max} 2939, 2866, 1714, 1450, 1214, 1187, 1134, 1094, 1022, 867 cm^{-1} ; $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 4.70 (s, 1 H), 4.68 (s, 1 H), 4.21 (q, $J = 7.1$ Hz, 2 H), 2.55–2.52 (m, 1 H), 2.47–2.44 (m, 2 H), 2.05–1.99 (m, 2 H), 1.98–1.85 (m, 2 H), 1.78–1.62 (m, 4 H), 1.72 (s, 3 H), 1.49–1.43 (m, 1 H), 1.27 (t, $J = 7.1$ Hz, 3 H); $^{13}\text{C NMR}$ (125 MHz, CDCl_3) δ 207.9, 171.9, 145.4, 110.0, 61.2, 60.6, 41.1, 36.1, 33.0, 32.3, 27.6, 22.6, 22.5, 14.2; HRMS (ESI) calcd for $\text{C}_{14}\text{H}_{23}\text{O}_3^+$ [$\text{M} + \text{H}^+$] 239.1642, found 239.1646. **S48** was prepared as a colorless oil following the described procedure (83.2 mg, 75% yield). **S48**: $R_f = 0.65$ (silica gel, hexanes:EtOAc, 5:1); IR (film) ν_{max} 2941, 1734, 1416, 1248, 1210, 1145, 1032, 909 cm^{-1} ; $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 5.89 (dd, $J = 5.1, 3.1$ Hz, 1 H), 4.72 (s, 1 H), 4.69 (s, 1H), 4.25–4.17 (m, 2 H), 2.30–2.25 (m, 2 H), 2.22–2.19 (m, 1 H), 2.04–1.95 (m, 3 H), 1.88–1.83 (m, 1 H), 1.74–1.70 (m, 1 H), 1.72 (s, 2 H), 1.67–1.60 (m, 2 H), 1.29 (t, $J = 7.1$ Hz, 3 H); $^{13}\text{C NMR}$ (125 MHz, CDCl_3) δ 172.9, 148.3, 144.8, 120.1, 119.6, 110.6, 61.7, 50.2, 33.5, 32.3, 32.0, 24.4, 22.4, 18.8, 14.0; HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{22}\text{OSF}_3^+$ [$\text{M} + \text{H}^+$] 371.1135, found 371.1147. **S49** was prepared as a colorless oil following the described standard cyclization cascade procedure (19.4 mg, 88% yield). **S49**: $R_f = 0.56$ (silica gel, hexanes:EtOAc, 10:1); IR (film) ν_{max} 2921, 2860, 1722, 1445, 1264, 1218, 1195, 1170, 1076, 1028, 681 cm^{-1} ; $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 5.75–5.72 (m, 1 H), 5.27–5.24 (m, 1 H), 4.16–4.07 (m, 2 H), 2.21–2.13 (m, 1 H), 2.10–1.99 (m, 2 H), 1.84–1.71 (m, 2 H), 1.63–1.51 (m, 3 H), 1.22 (t, $J = 7.1$ Hz, 3 H); 1.19 (d, $J = 5.5$ Hz, 1 H), 1.12 (s, 3 H), 0.54 (d, $J = 5.5$ Hz, 1 H); $^{13}\text{C NMR}$ (125 MHz, CDCl_3) δ 176.3, 128.9, 126.6, 125.1, 60.0, 52.5, 32.3, 32.3, 30.8, 27.0, 23.7, 22.3, 19.6, 14.3; HRMS (ESI) $\text{C}_{14}\text{H}_{21}\text{O}_2^+$ [$\text{M} + \text{H}^+$] 221.1536, found 221.1534.

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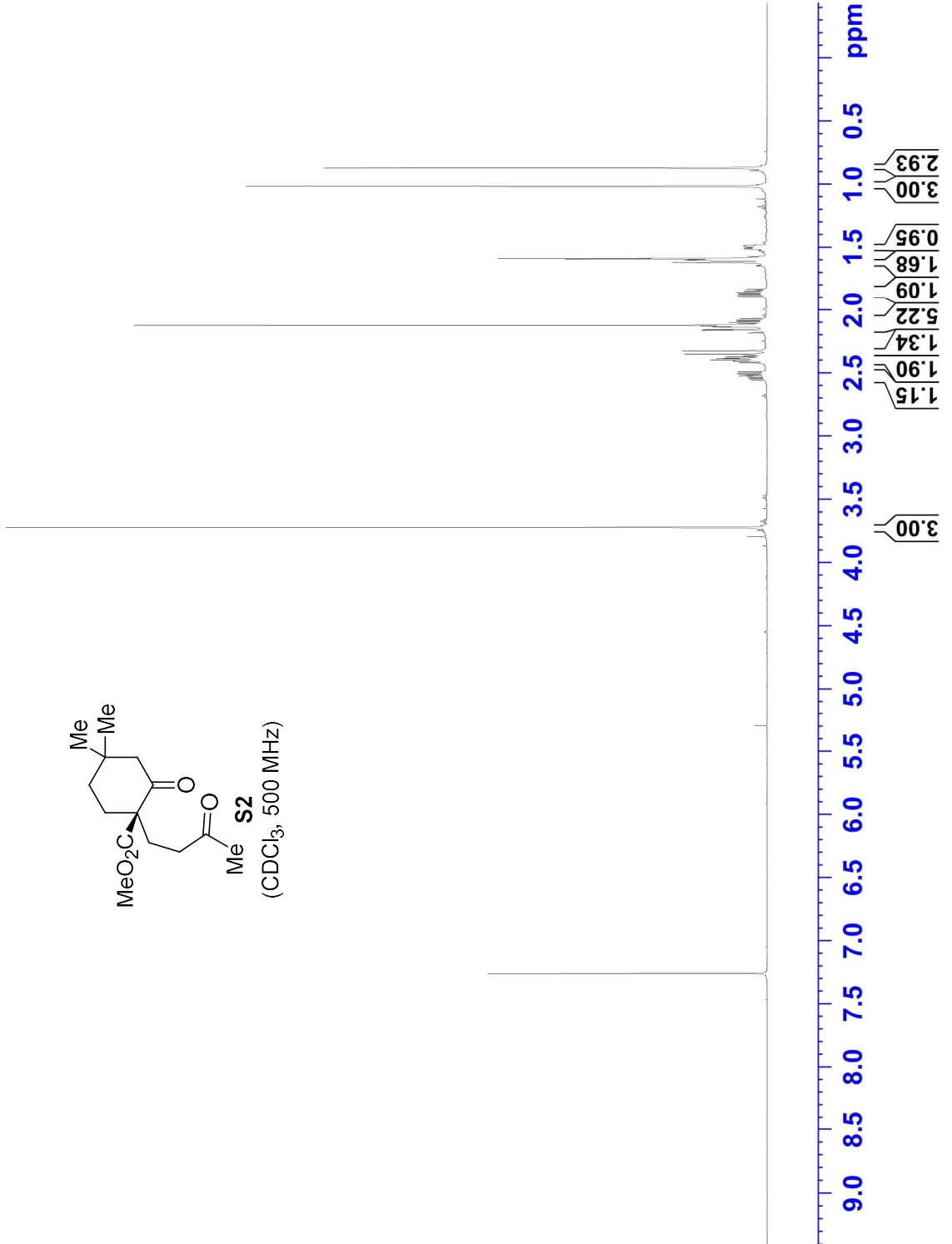
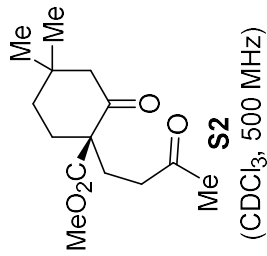
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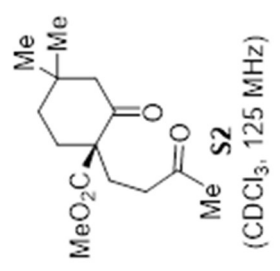
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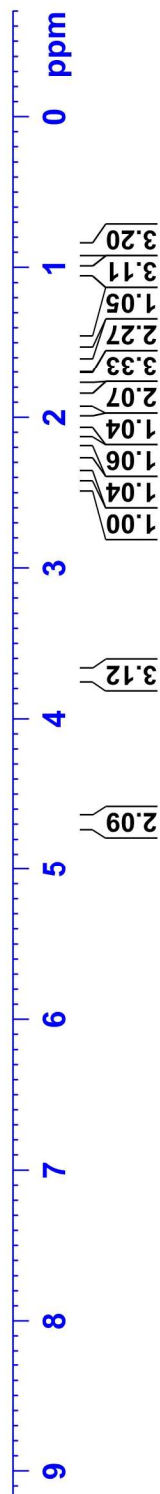
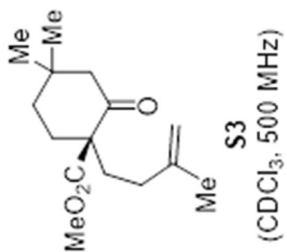
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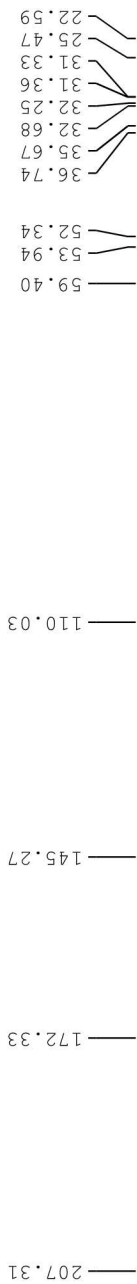
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 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME OTf(SM)
 EXPNO 1
 PROCNO 1

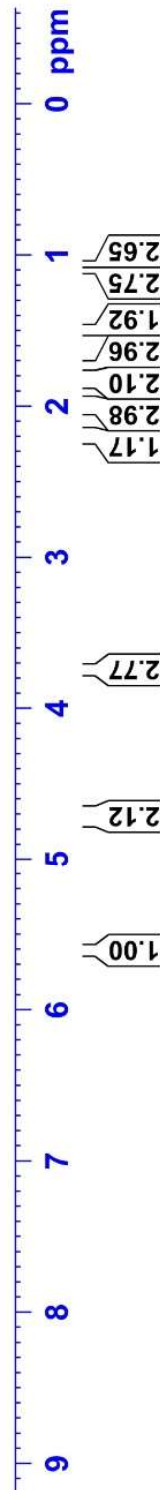
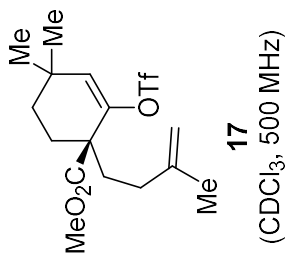
F2 - Acquisition Parameters

Date 20180730
 Time 14.32
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 118.99
 DW 50.000 usec
 DE 6.50 usec
 TE 295.5 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

4.73
 4.70
 3.74
 2.23
 2.22
 2.21
 2.20
 2.19
 2.18
 2.04
 2.03
 2.02
 2.02
 2.01
 2.00
 1.99
 1.98
 1.98
 1.97
 1.95
 1.86
 1.84
 1.83
 1.83
 1.82
 1.81
 1.80
 1.80
 1.79
 1.78
 1.78
 1.77
 1.73
 1.50
 1.46
 1.48



Current Data Parameters
 NAME OTf(SM)
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180730
 Time_ 22.15
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 490
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.7 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

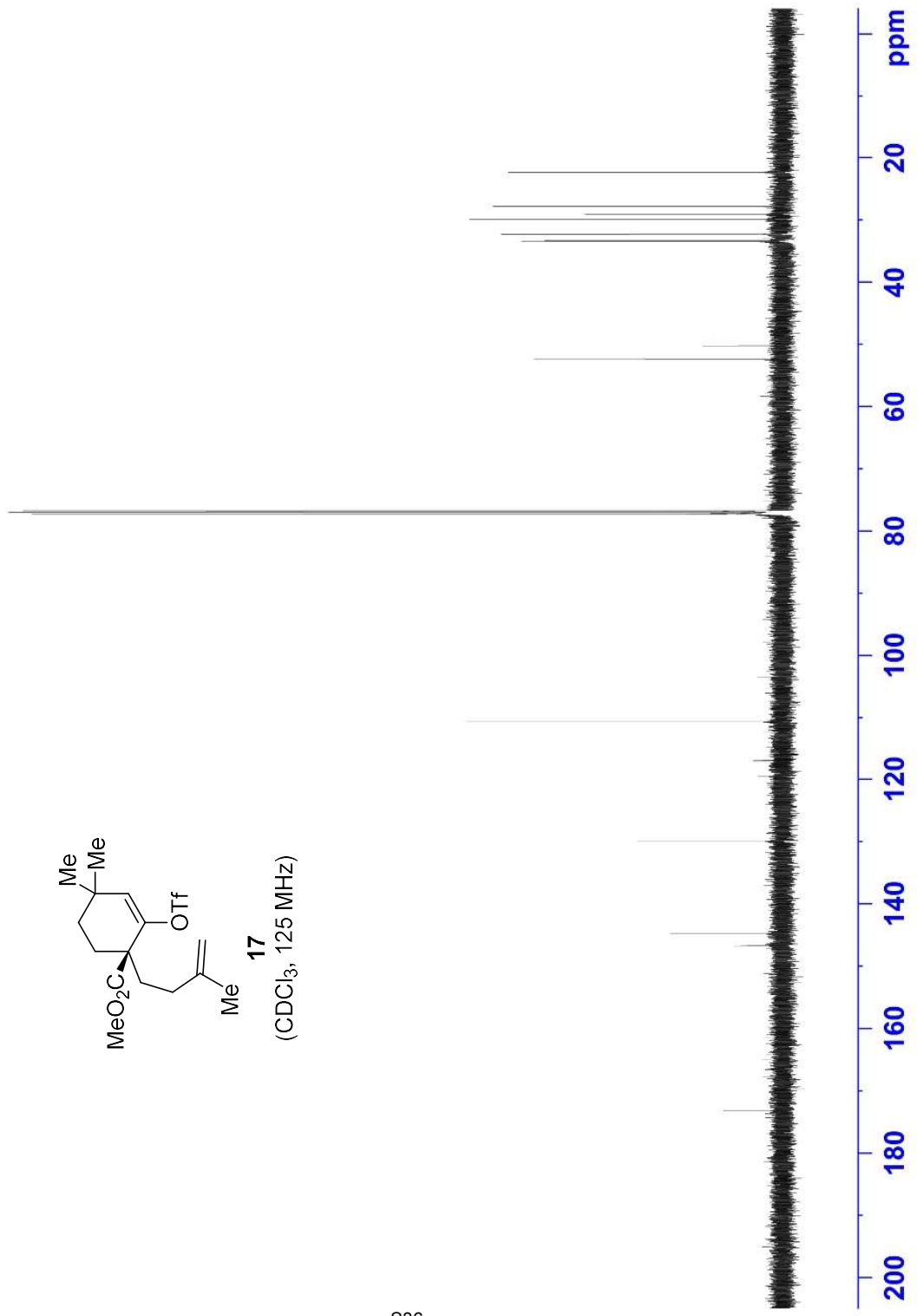
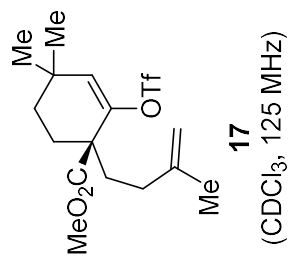
==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

52.34
 50.22
 33.49
 33.46
 33.34
 32.28
 29.88
 29.09
 27.84
 22.33

173.15
 146.73
 144.70
 129.88
 117.03
 110.59



Current Data Parameters
 NAME yh-2-160-b
 EXPNO 1
 PROCNO 1

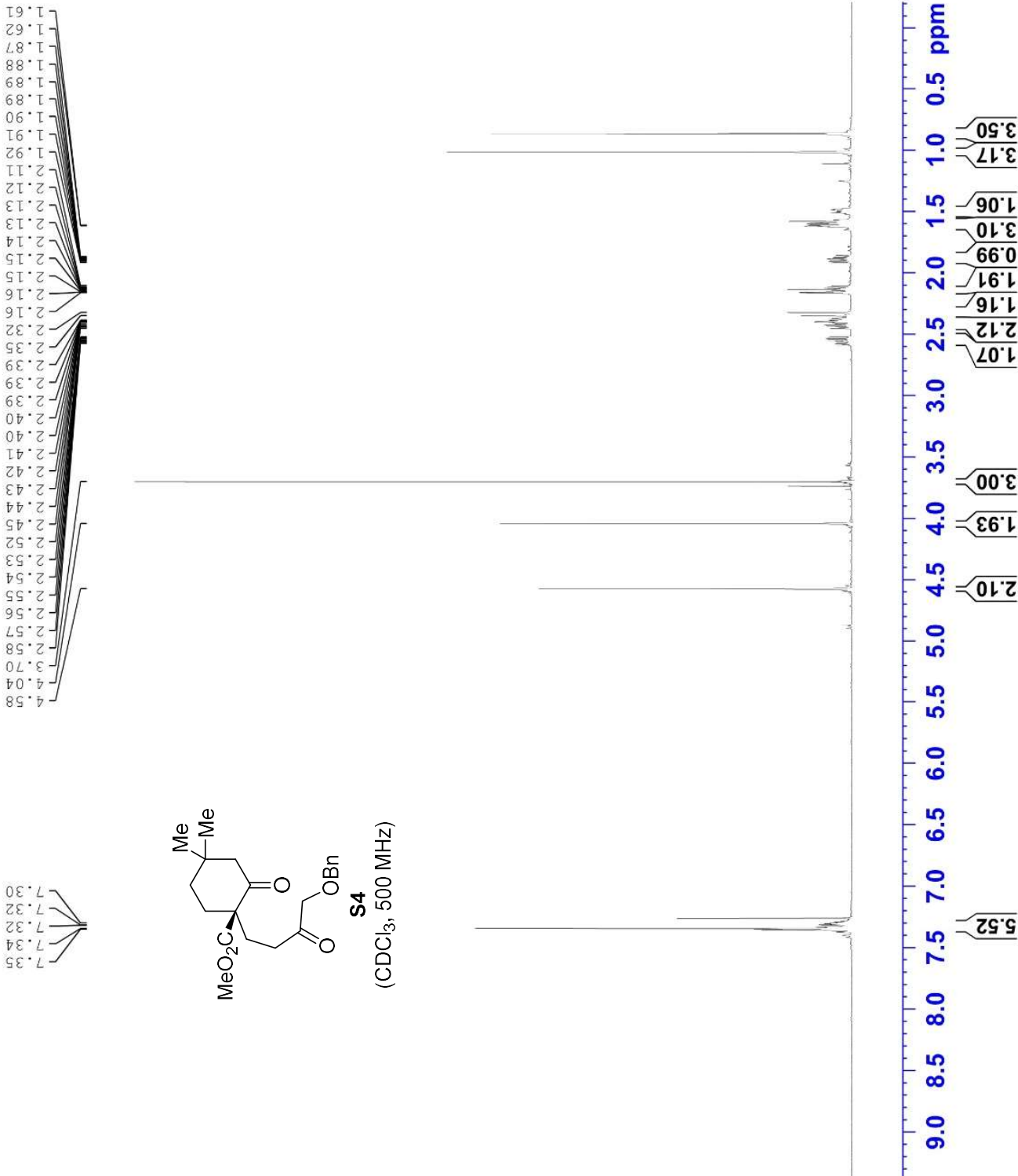
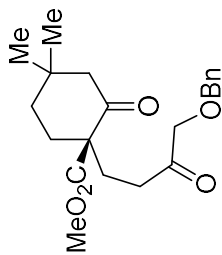
F2 - Acquisition Parameters

Date_ 20191020
 Time_ 18.31
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 110.37
 DW 50.000 usec
 DE 10.00 usec
 TE 297.0 K
 D1 2.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 9.90 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300133 MHz
 WDW EM
 SSB 0
 LB 0
 GB 0
 PC 1.00

4.58
4.04
3.70
2.58
2.57
2.56
2.55
2.54
2.53
2.52
2.45
2.44
2.43
2.42
2.41
2.40
2.39
2.39
2.39
2.35
2.32
2.16
2.15
2.15
2.14
2.13
2.13
2.12
2.11
1.92
1.91
1.90
1.89
1.88
1.87
1.86
1.85
1.84
1.83
1.82
1.81
1.80
1.79
1.78
1.77
1.76
1.75
1.74
1.73
1.72
1.71
1.70
1.69
1.68
1.67
1.66
1.65
1.64
1.63
1.62
1.61
1.60
1.59
1.58
1.57
1.56
1.55
1.54
1.53
1.52
1.51
1.50
1.49
1.48
1.47
1.46
1.45
1.44
1.43
1.42
1.41
1.40
1.39
1.38
1.37
1.36
1.35
1.34
1.33
1.32
1.31
1.30
1.29
1.28
1.27
1.26
1.25
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
1.07
1.06
1.05
1.04
1.03
1.02
1.01
1.00
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
0.91
0.90
0.89
0.88
0.87
0.86
0.85
0.84
0.83
0.82
0.81
0.80
0.79
0.78
0.77
0.76
0.75
0.74
0.73
0.72
0.71
0.70
0.69
0.68
0.67
0.66
0.65
0.64
0.63
0.62
0.61
0.60
0.59
0.58
0.57
0.56
0.55
0.54
0.53
0.52
0.51
0.50
0.49
0.48
0.47
0.46
0.45
0.44
0.43
0.42
0.41
0.40
0.39
0.38
0.37
0.36
0.35
0.34
0.33
0.32
0.31
0.30
0.29
0.28
0.27
0.26
0.25
0.24
0.23
0.22
0.21
0.20
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00



Current Data Parameters
 NAME yh-2-160-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters

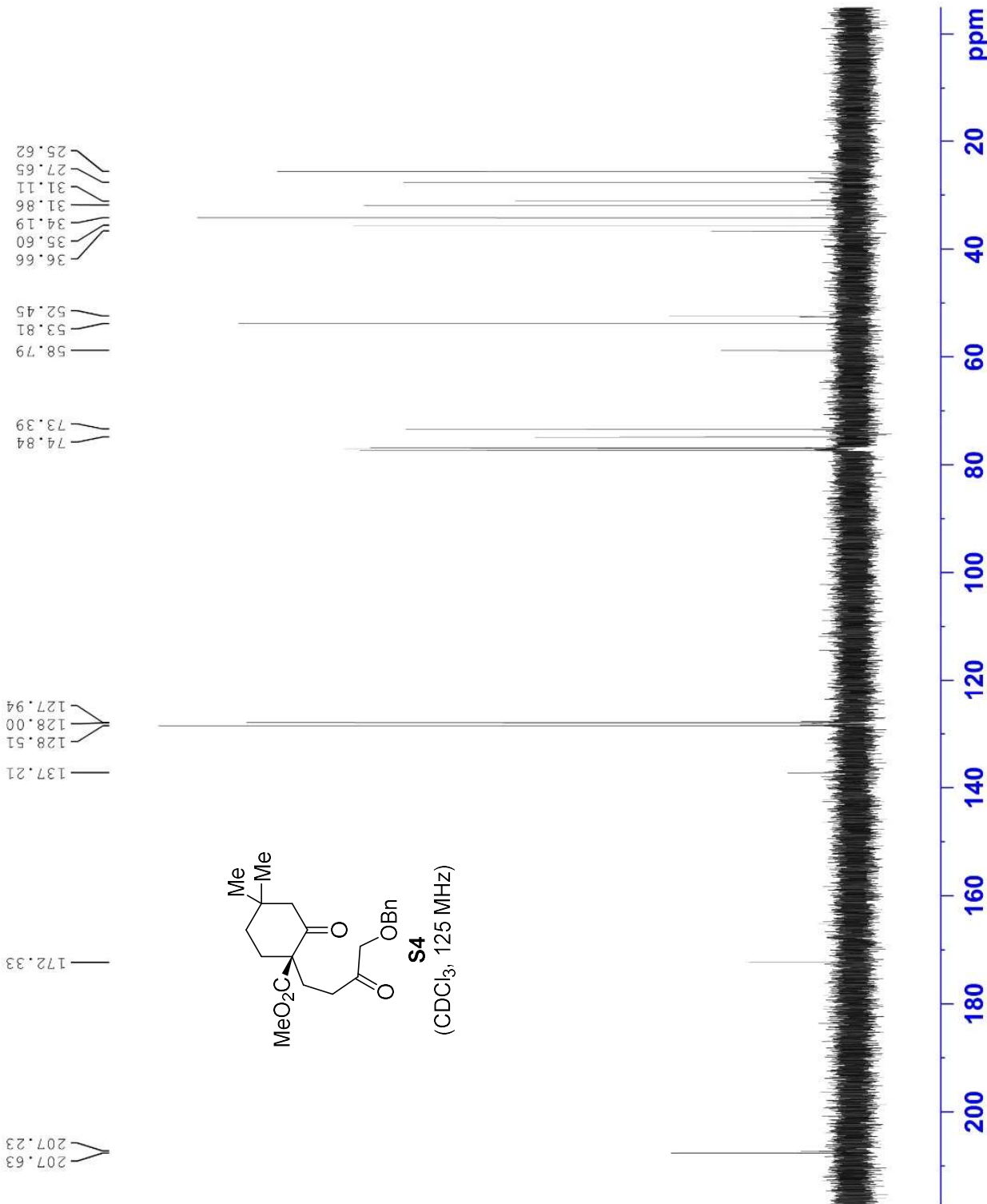
Date_ 20180802
 Time_ 15.50
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 87
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.6 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters

SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



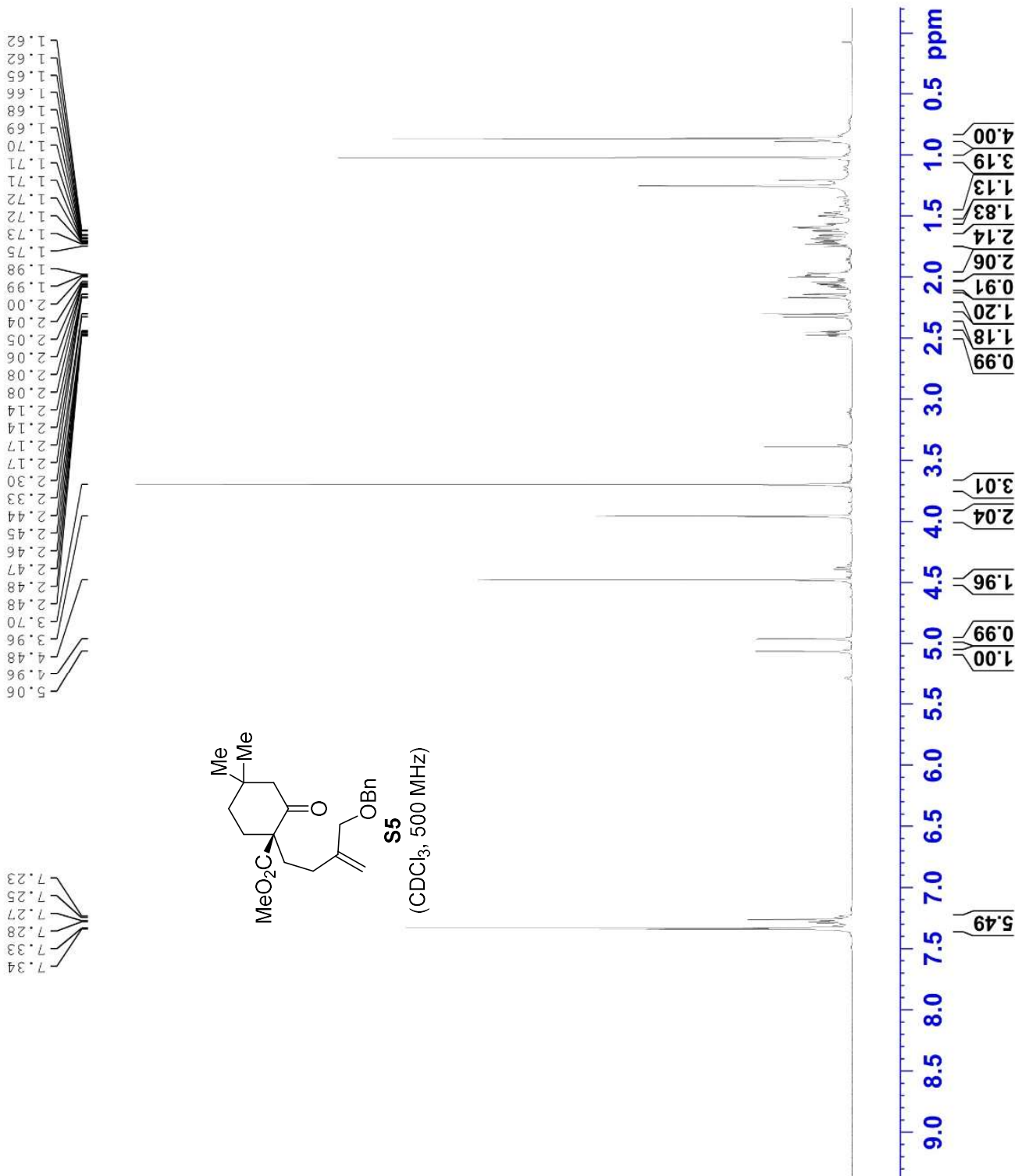
Current Data Parameters
 NAME yh-3-1-b
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20191020
 Time_ 18.37
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 71.78
 DW 50.000 usec
 DE 10.00 usec
 TE 296.9 K
 D1 2.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 9.90 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300134 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



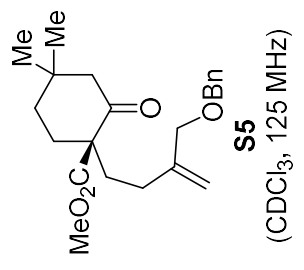
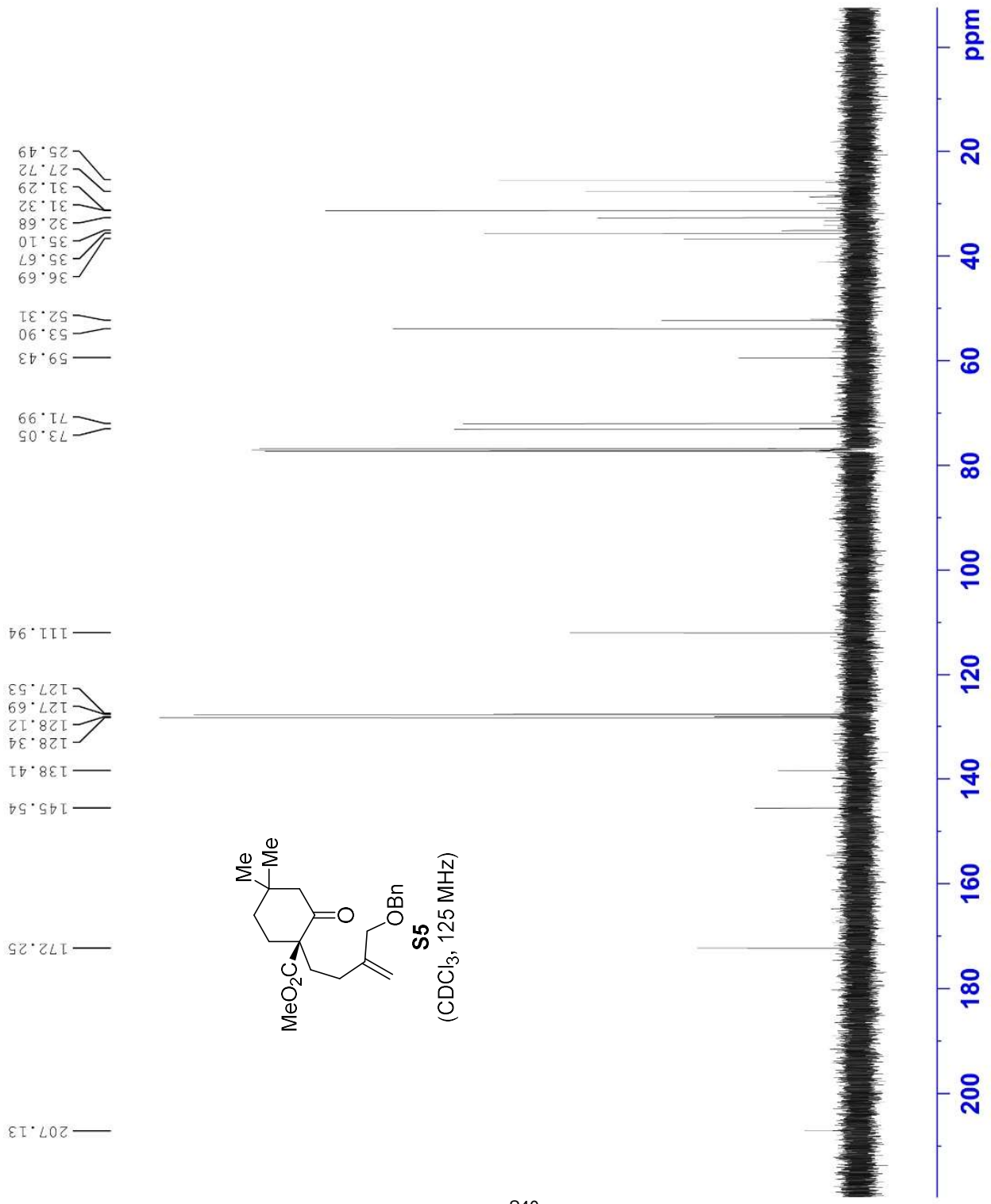
Current Data Parameters
 NAME Yh-3-1-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180802
 Time_ 16.08
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 121
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.0 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.0000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-3-2-r
 EXPNO 1
 PROCNO 1

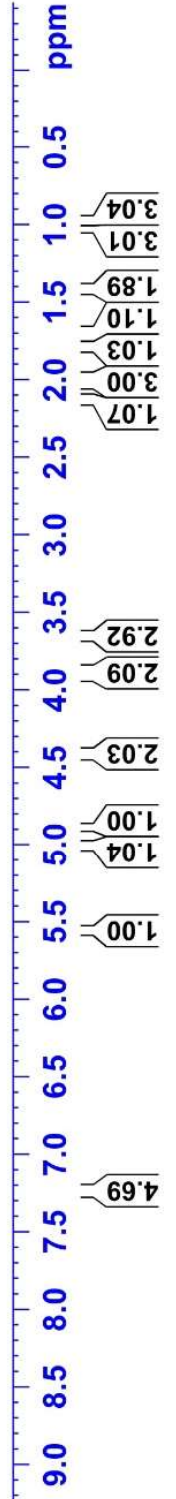
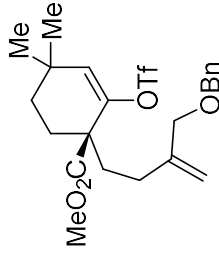
F2 - Acquisition Parameters

Date_ 20180730
 Time_ 19.39
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 86.16
 DW 50.000 usec
 DE 6.50 usec
 TE 295.8 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700490 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

7.27
7.27
7.26
7.22
7.22
7.21
7.21
7.21
7.21
7.21
7.20
5.55
5.00
4.89
4.41
3.89
3.88
3.65
2.15
2.14
2.13
2.12
2.12
2.11
2.11
2.03
2.01
2.00
1.99
1.97
1.82
1.80
1.79
1.78
1.73
1.72
1.71
1.71
1.70
1.70
1.69
1.67
1.44
1.43
1.43
1.42
1.41
1.41



Current Data Parameters
 NAME yh-3-2-r
 EXPNO 2
 PROCNO 2

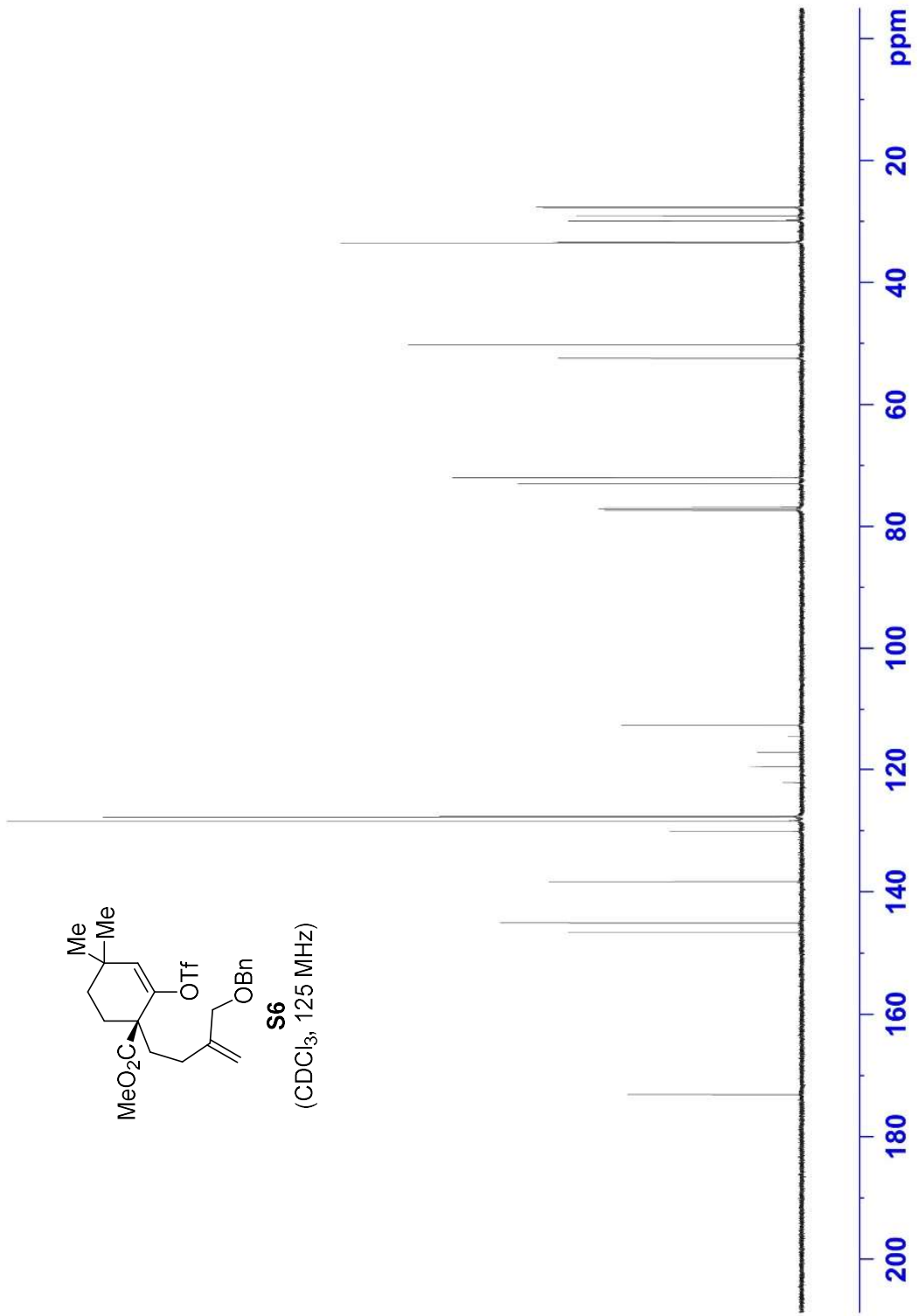
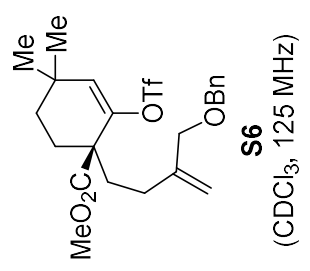
F2 - Acquisition Parameters
 Date_ 20180731
 Time 21.00
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDCl3
 NS 61
 DS 4
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 292.7 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TDO 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 8.00 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG12 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

173.10
 146.67
 145.05
 138.28
 130.12
 128.39
 127.73
 127.61
 122.09
 119.56
 117.02
 114.48
 112.60
 72.98
 71.97
 52.42
 50.17
 33.49
 33.44
 33.31
 29.88
 29.04
 27.81
 27.62



Current Data Parameters
 NAME yh-5-17-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

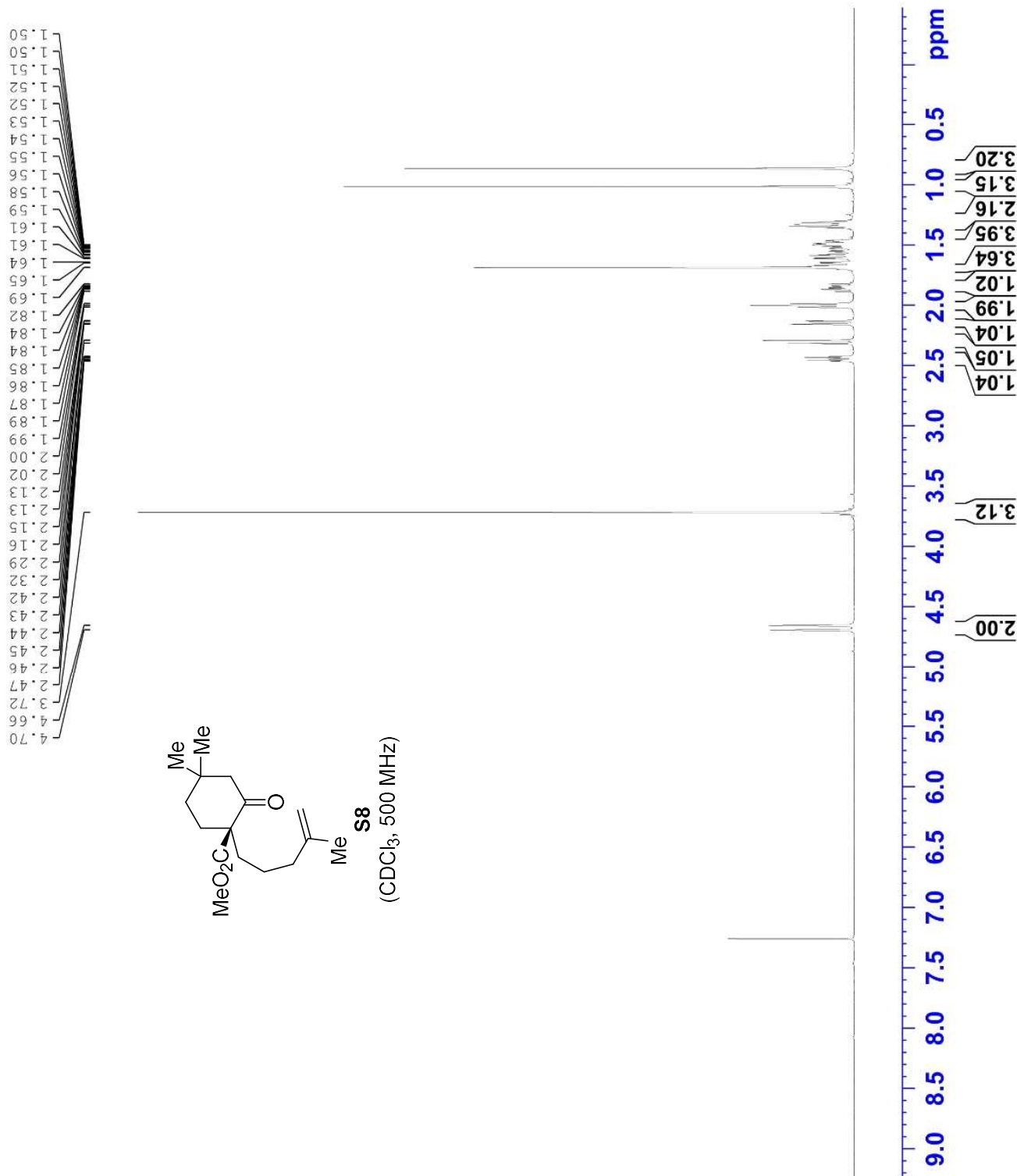
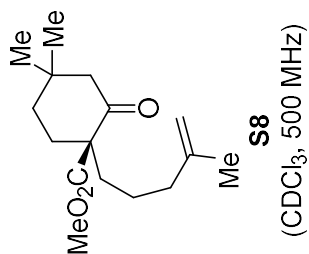
Date_ 20180812
 Time_ 20.00
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 3
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 141.13
 DW 50.000 usec
 DE 10.00 usec
 TE 294.3 K
 D1 3.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.19999981 W

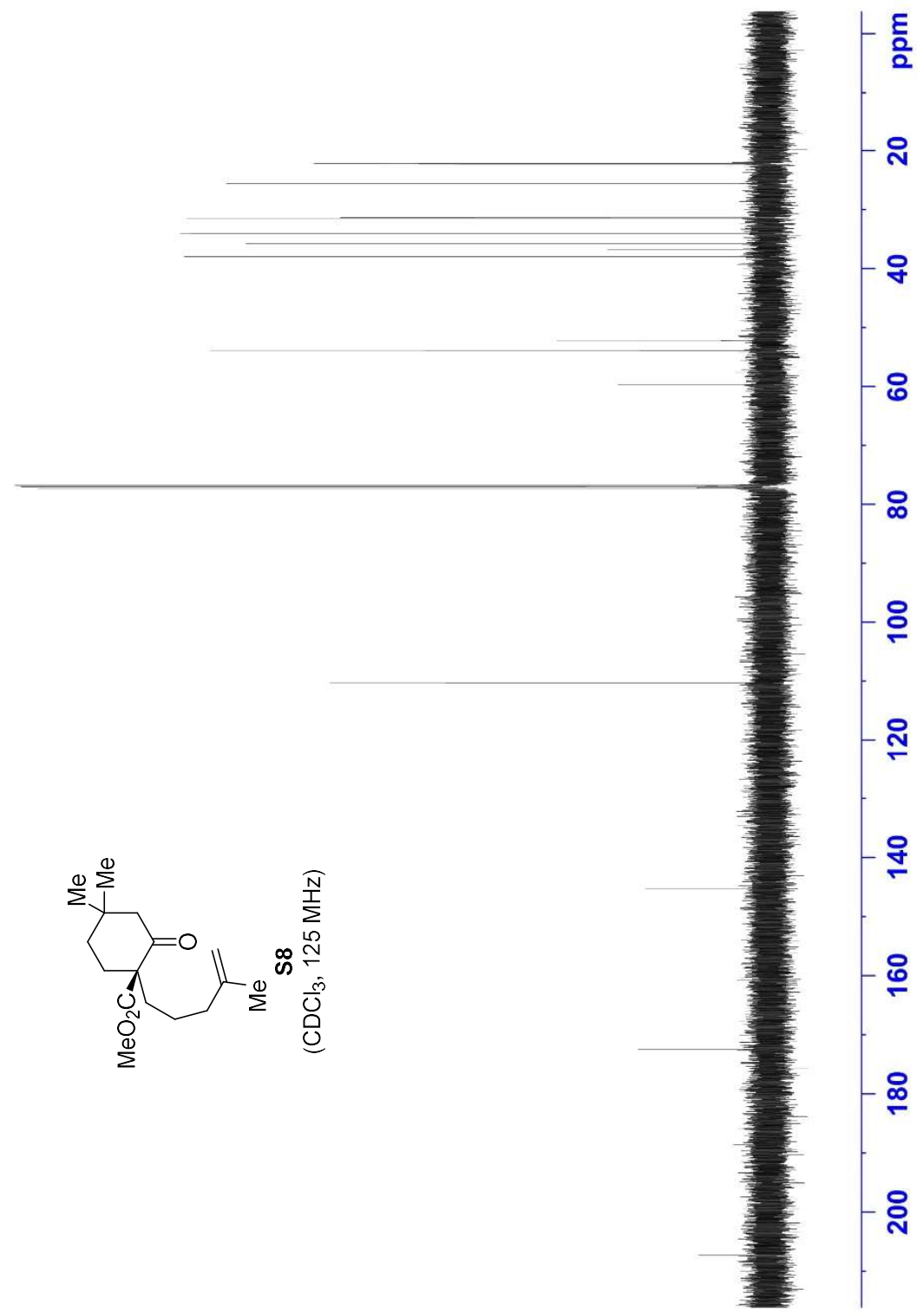
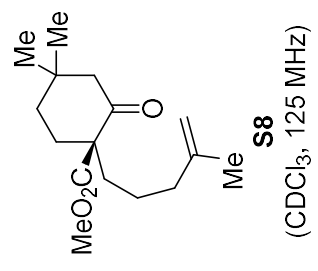
F2 - Processing parameters

SI 65536
 SF 500.1300138 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

4.70
4.66
3.72
2.47
2.46
2.45
2.44
2.43
2.42
2.32
2.29
2.16
2.15
2.13
2.13
2.02
2.00
1.99
1.89
1.87
1.86
1.85
1.84
1.84
1.82
1.82
1.69
1.65
1.64
1.61
1.61
1.59
1.58
1.56
1.55
1.54
1.53
1.52
1.51
1.51
1.50
1.50



207.34
172.49
145.23
110.25
59.64
53.93
52.23
37.93
36.69
35.71
34.01
31.41
31.28
25.51
22.21
22.12



Current Data Parameters
 NAME Yh-5-17-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180812
 Time_ 21.14
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 153
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.2 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

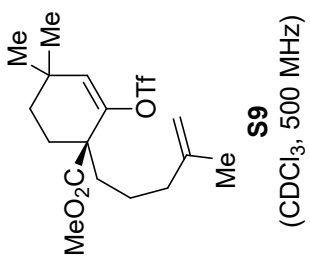
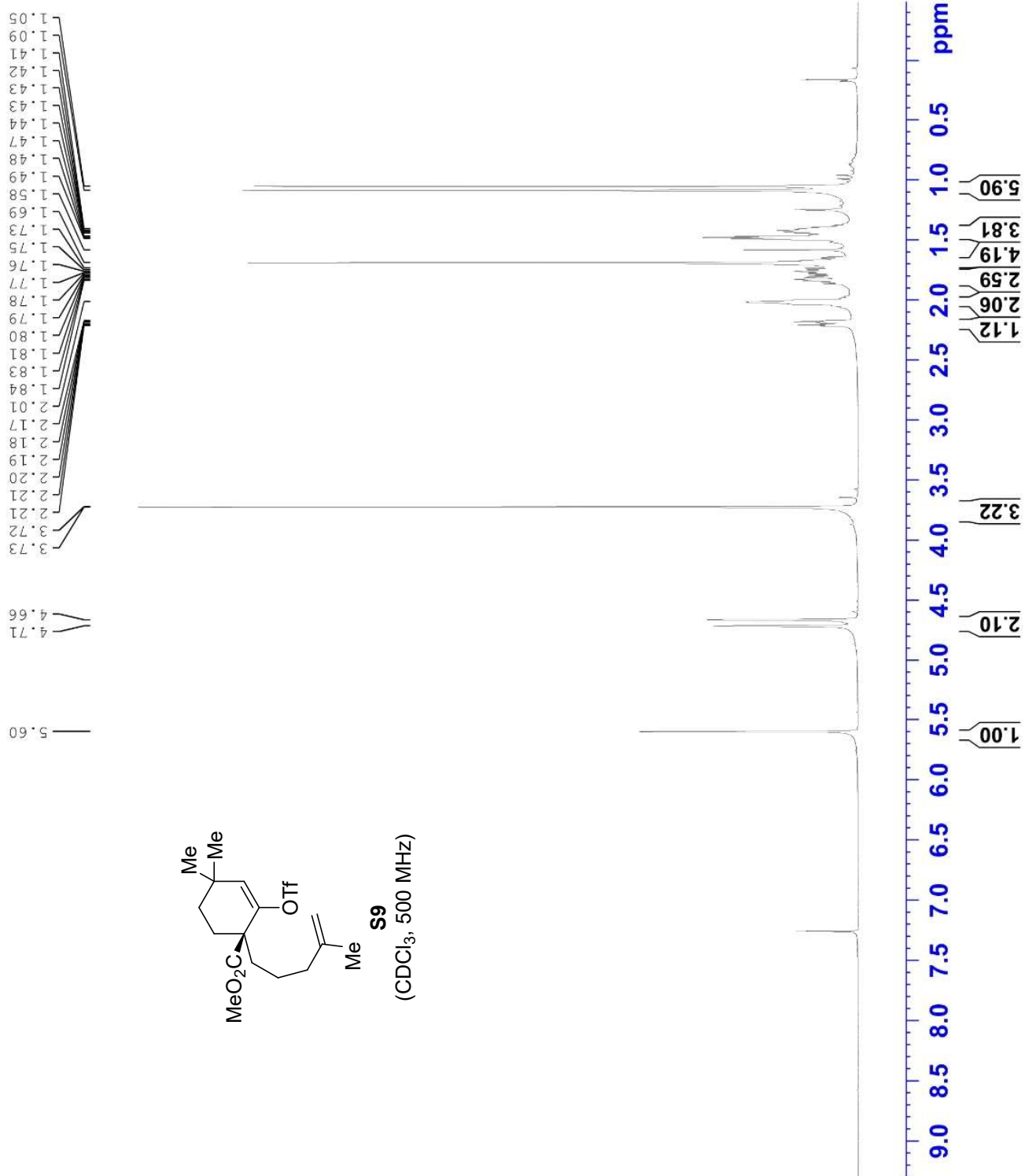
F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME Yh-5-18-I
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180730
 Time_ 15.21
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 51.11
 DW 50.000 usec
 DE 6.50 usec
 TE 295.6 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700129 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-5-18-I
 EXPNO 2
 PROCNO 2

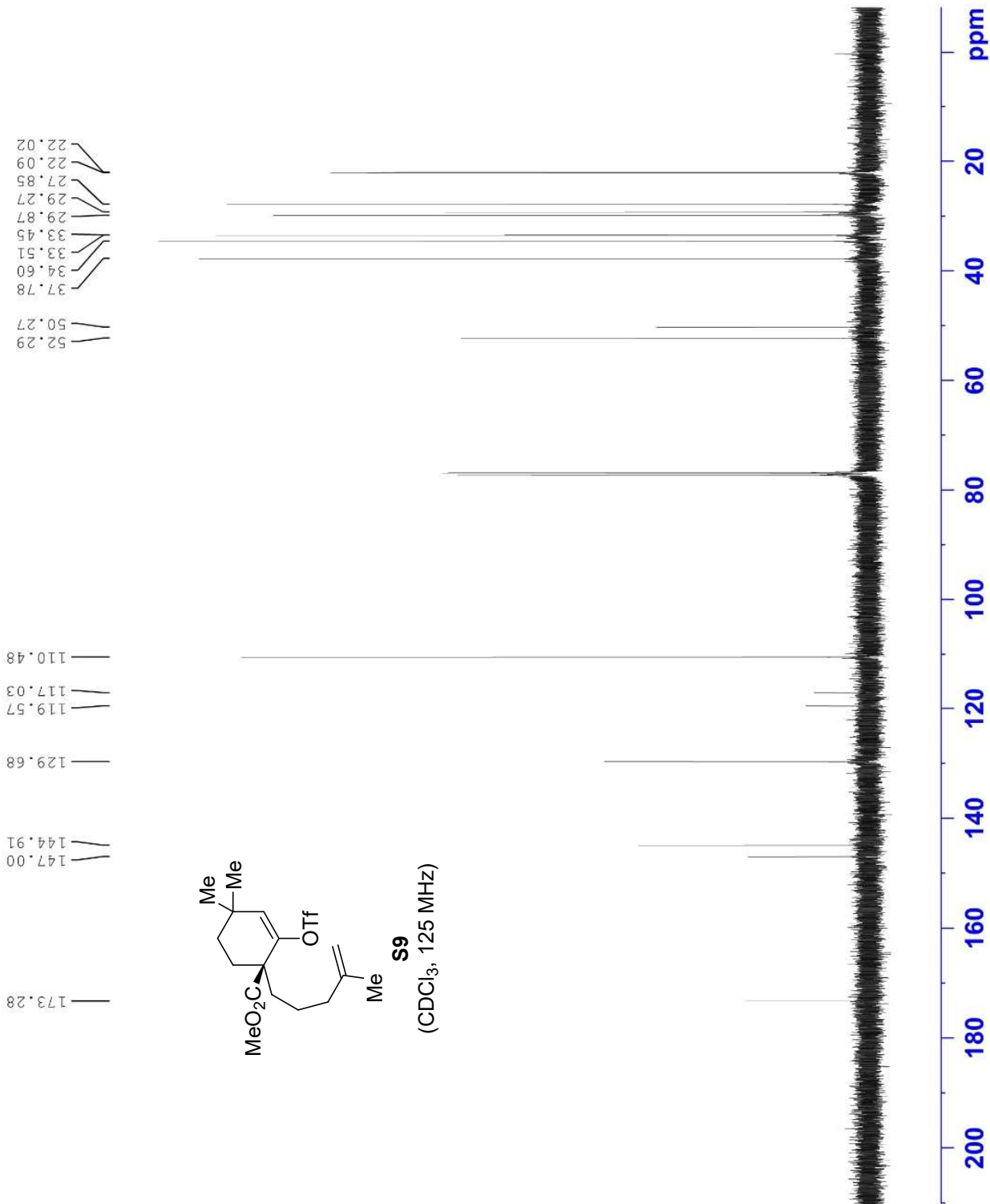
F2 - Acquisition Parameters

Date_ 20180730
 Time_ 21.08
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 191
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.3 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-4-1-1
 EXPNO 1
 PROCNO 1

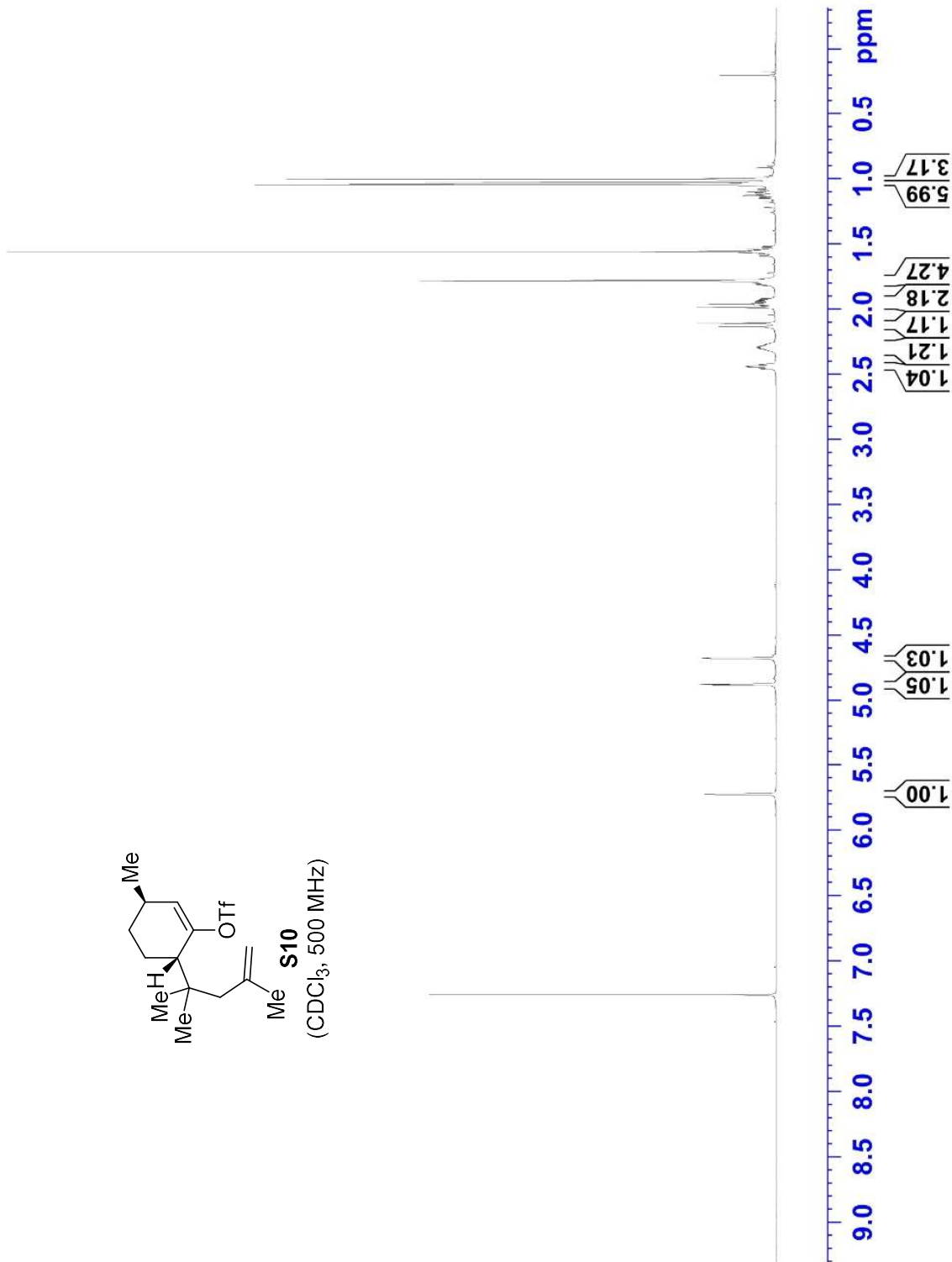
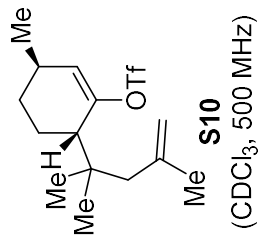
F2 - Acquisition Parameters

Date 20180730
 Time 19.46
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 100.96
 DW 50.000 usec
 DE 6.50 usec
 TE 295.8 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

5.73
 4.88
 4.88
 4.88
 4.88
 4.68
 4.68
 4.68
 4.68
 4.68
 4.67
 2.45
 2.44
 2.44
 2.44
 2.44
 2.43
 2.42
 2.31
 2.30
 2.30
 2.29
 2.29
 2.28
 2.13
 2.11
 1.99
 1.96
 1.95
 1.94
 1.94
 1.94
 1.93
 1.93
 1.92
 1.92
 1.78
 1.57
 1.57
 1.55
 1.54
 1.05
 1.04



Current Data Parameters
 NAME Yh-4-1-I
 EXPNO 3
 PROCNO 3

F2 - Acquisition Parameters
 Date_ 20180730
 Time_ 21.45
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 306
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.7 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

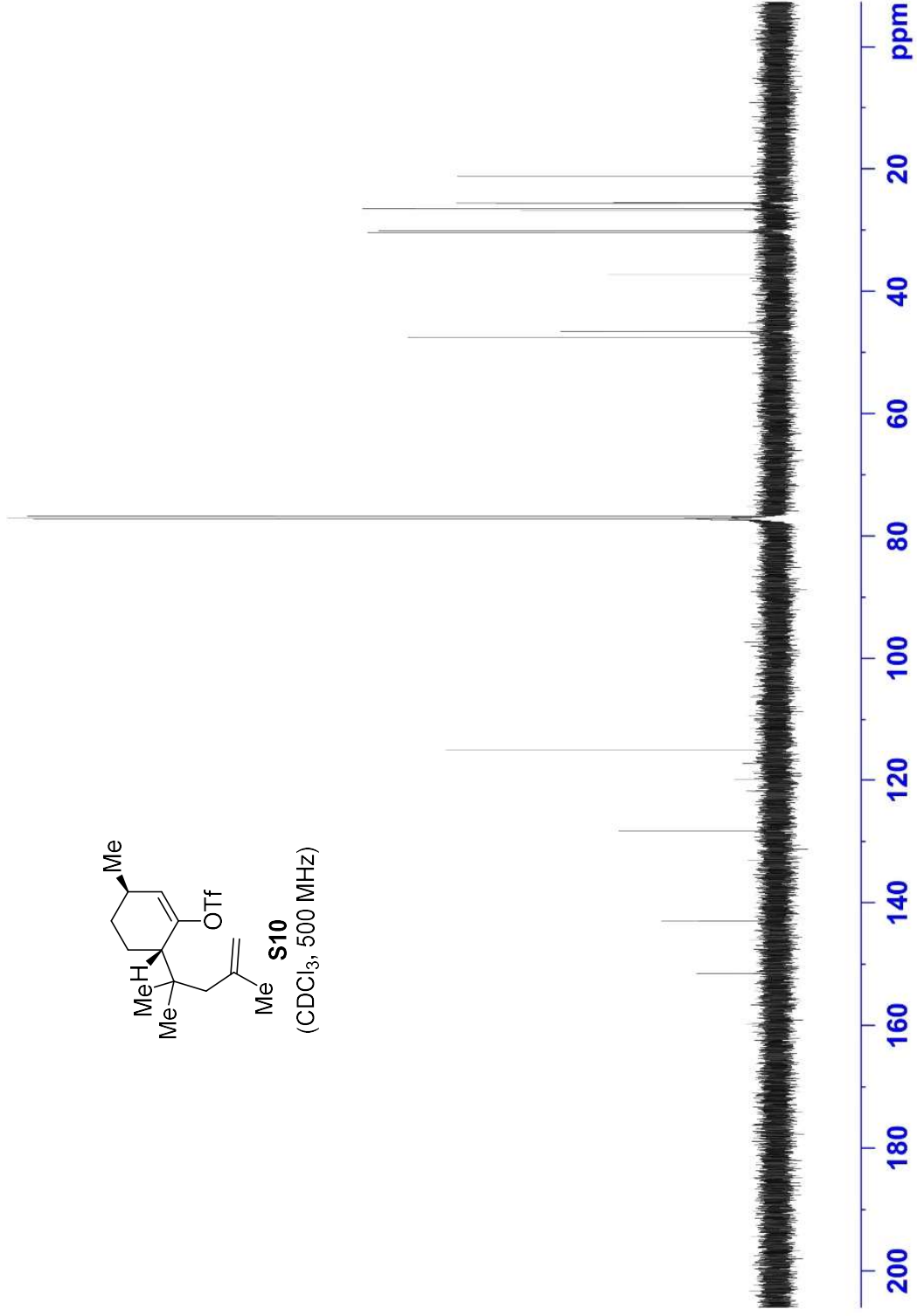
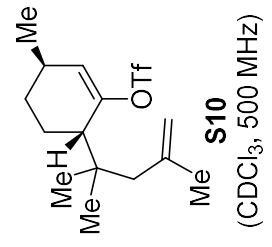
==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

47.61
 46.56
 37.27
 30.43
 30.11
 26.71
 26.51
 25.59
 25.47
 21.25

151.51
 142.95
 128.24
 119.85
 114.87



Current Data Parameters
 NAME 5-member-ring-OTf
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190812
 Time_ 14.30
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 196.79
 DW 50.000 usec
 DE 10.00 usec
 TE 293.4 K
 D1 4.00000000 sec
 TD0 1

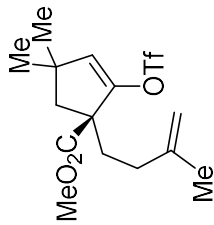
==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300138 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

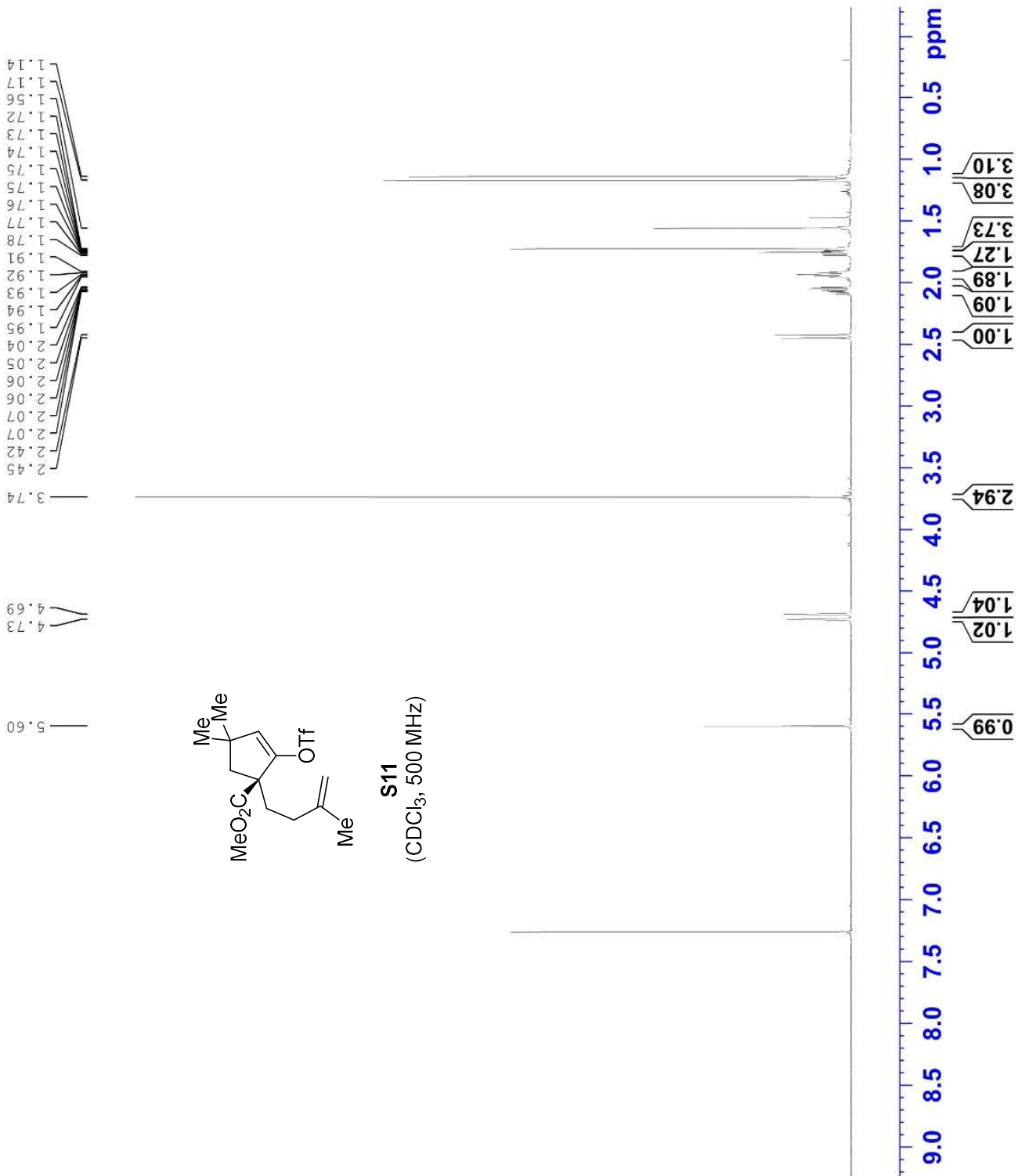
1.14
1.17
1.56
1.72
1.73
1.74
1.75
1.75
1.76
1.77
1.78
1.91
1.92
1.93
1.94
1.95
2.04
2.05
2.06
2.06
2.07
2.07
2.42
2.45
3.74

4.69
4.73

5.60



S11
 (CDCl₃, 500 MHz)



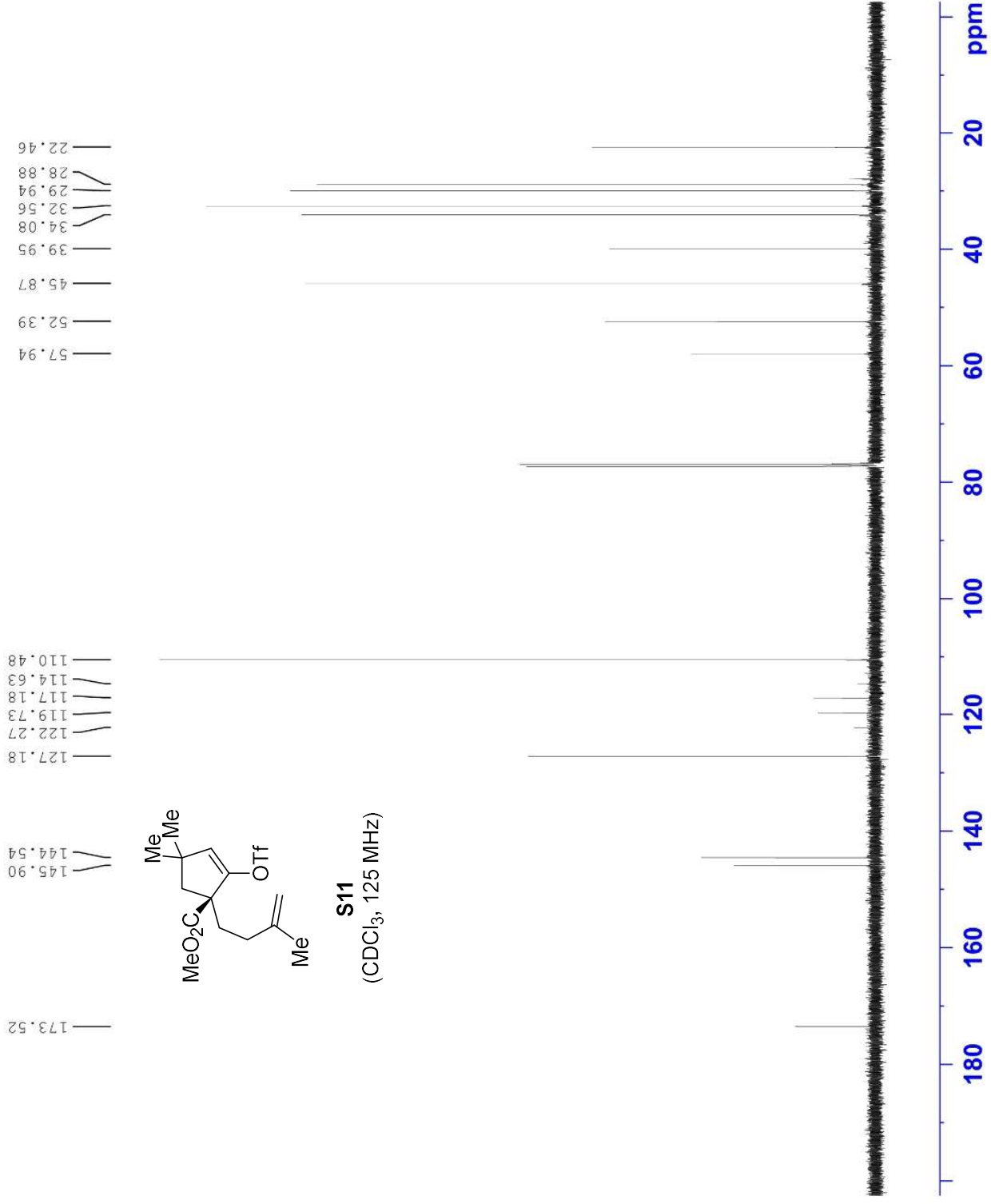
Current Data Parameters
 NAME 5-member-ring-OTf
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20190812
 Time_ 21.48
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 329
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.3 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-5-36-I
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

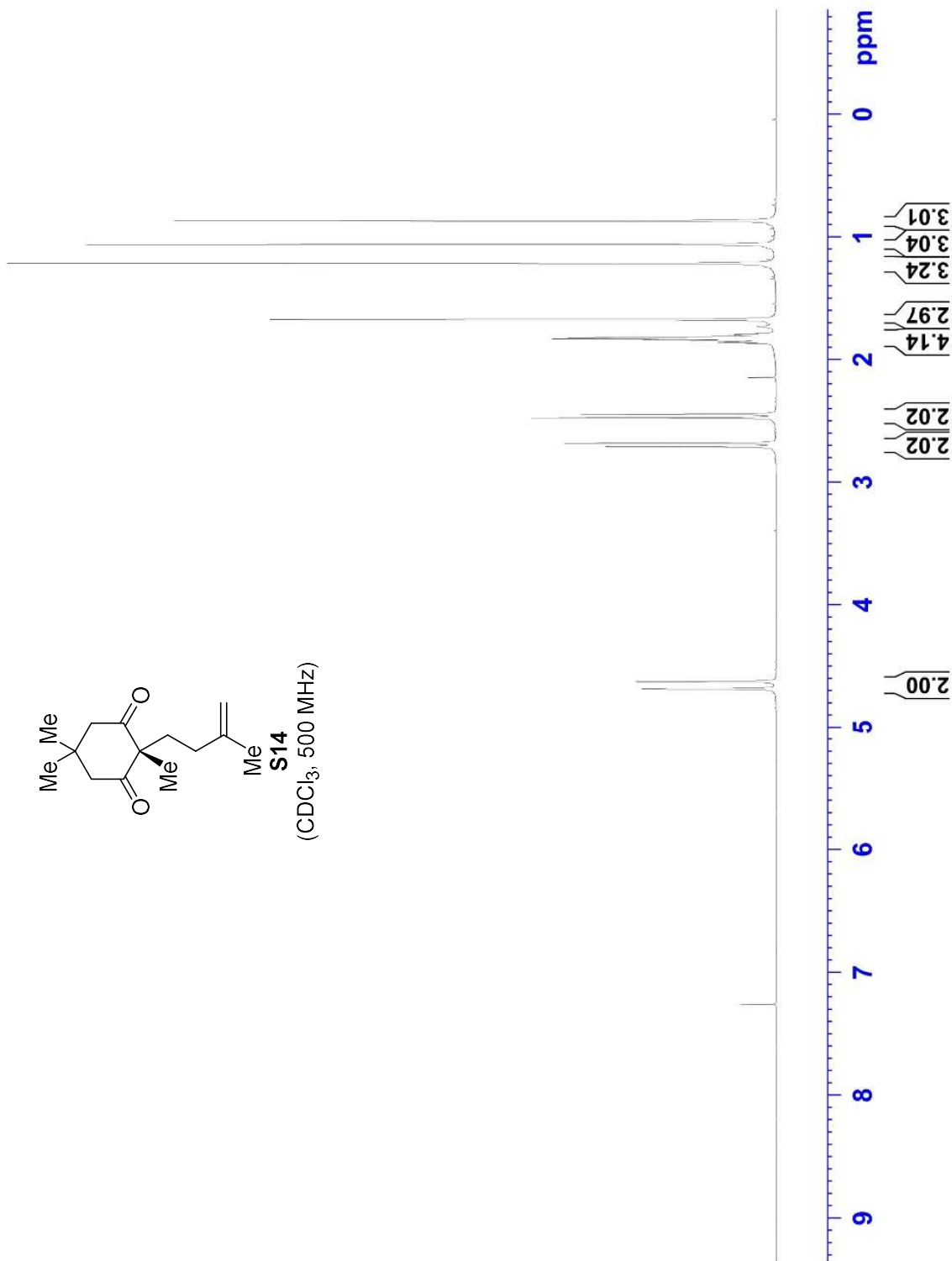
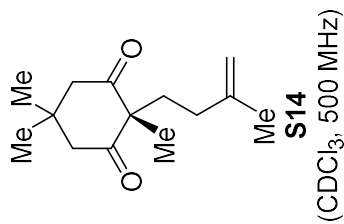
Date_ 20180801
 Time_ 13.14
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 6
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 30.11
 DW 50.000 usec
 DE 10.000 usec
 TE 294.1 K
 D1 3.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300136 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

2.71
2.68
2.48
2.45
1.87
1.86
1.85
1.84
1.83
1.82
1.80
1.80
1.67
1.22
1.06
0.87

4.69
4.63



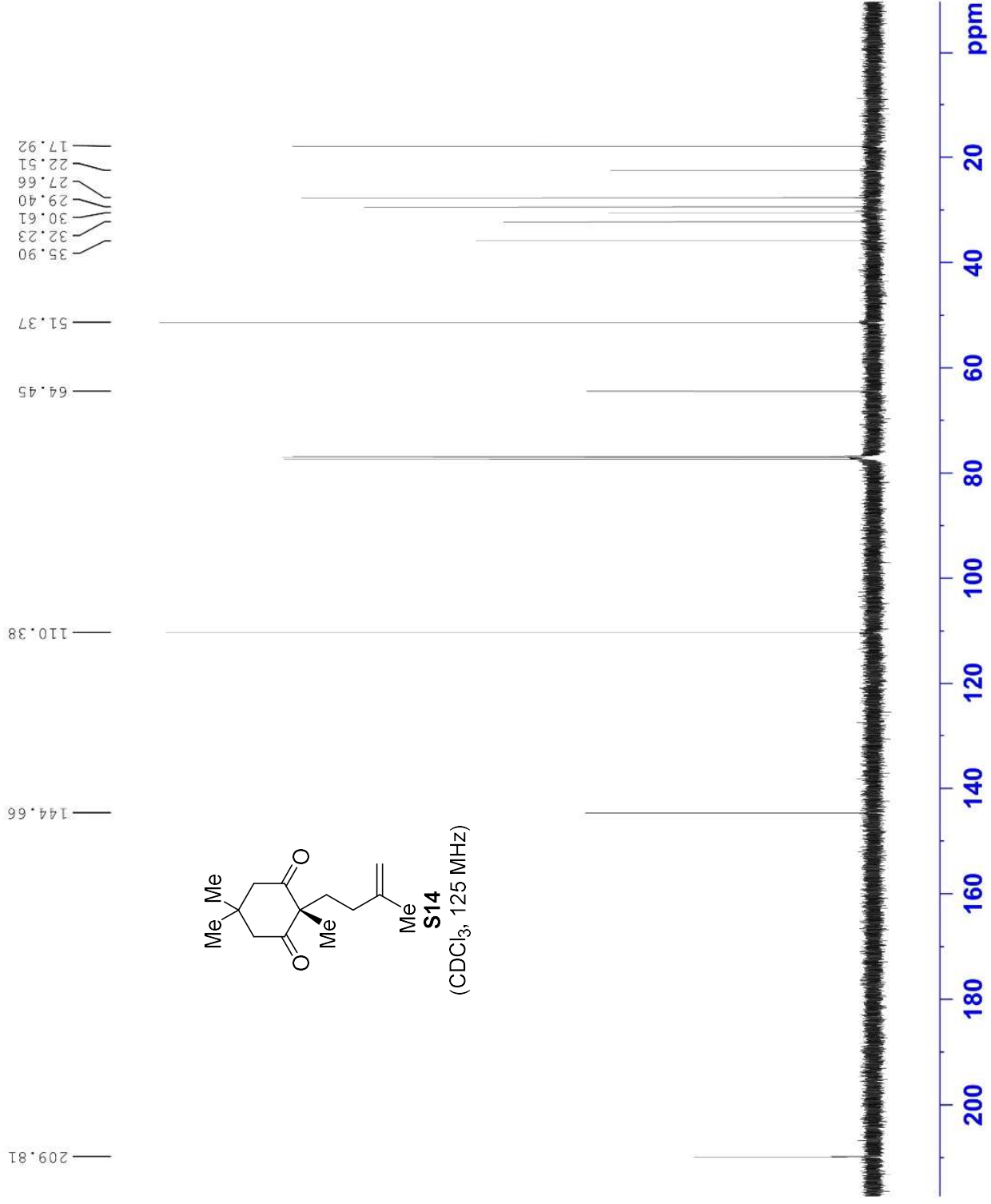
Current Data Parameters
 NAME Yh-5-36-I
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180801
 Time_ 13.41
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 97
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.6 K
 D1 4.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 3.58 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-5-38-1
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

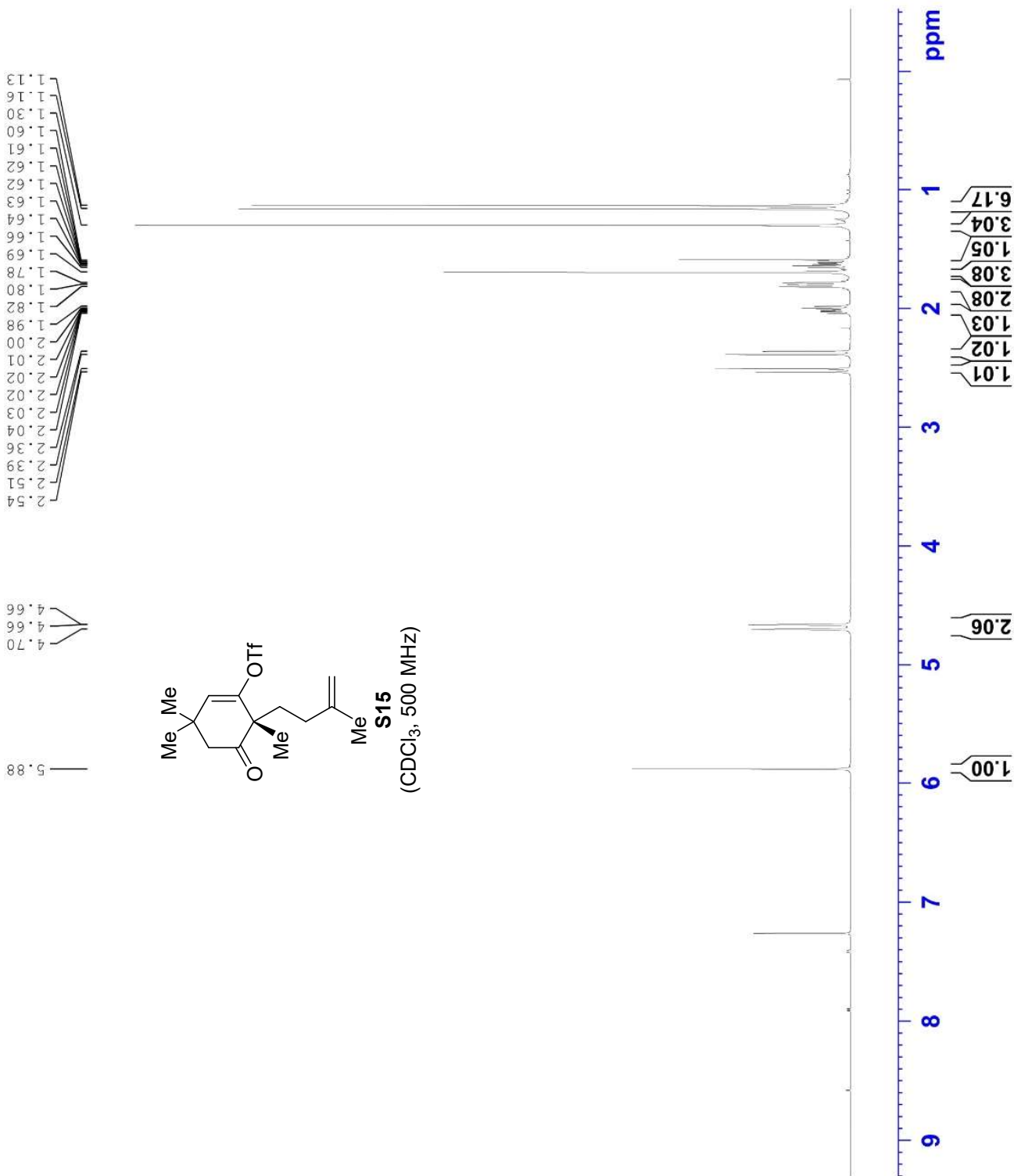
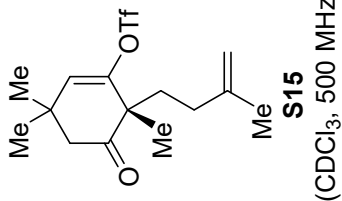
Date_ 20180801
 Time_ 13.54
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 97.37
 DW 50.000 usec
 DE 10.00 usec
 TE 294.2 K
 D1 3.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300138 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

2.54
2.51
2.39
2.36
2.04
2.03
2.02
2.02
2.01
2.00
1.98
1.82
1.80
1.78
1.69
1.66
1.64
1.63
1.62
1.61
1.60
1.30
1.16
1.13

4.70
4.66
4.66



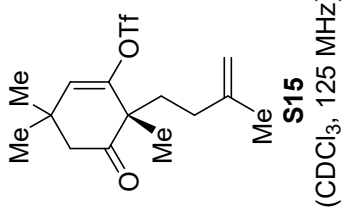
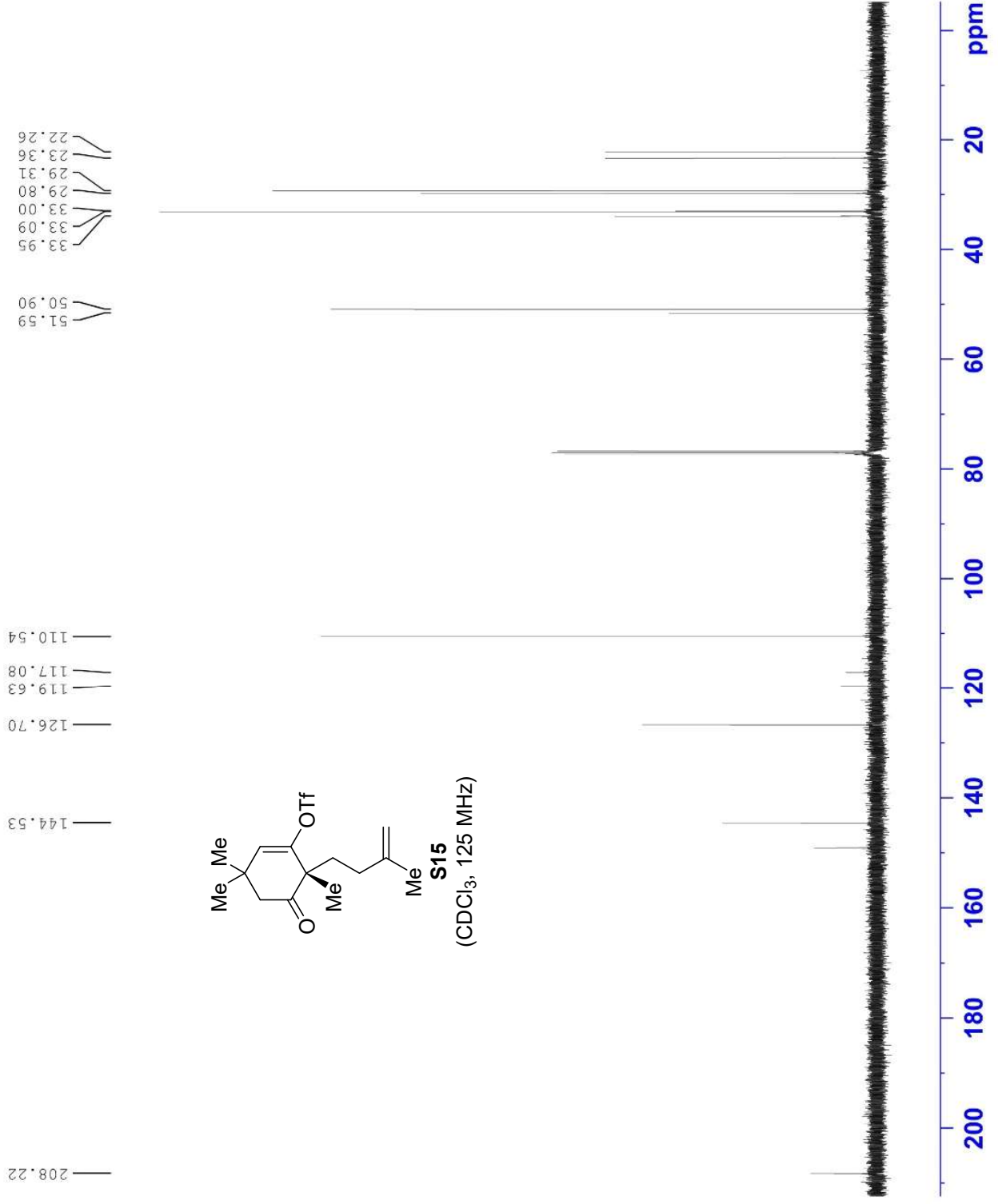
Current Data Parameters
 NAME Yh-5-38-1
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180801
 Time_ 14.37
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 158
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.1 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



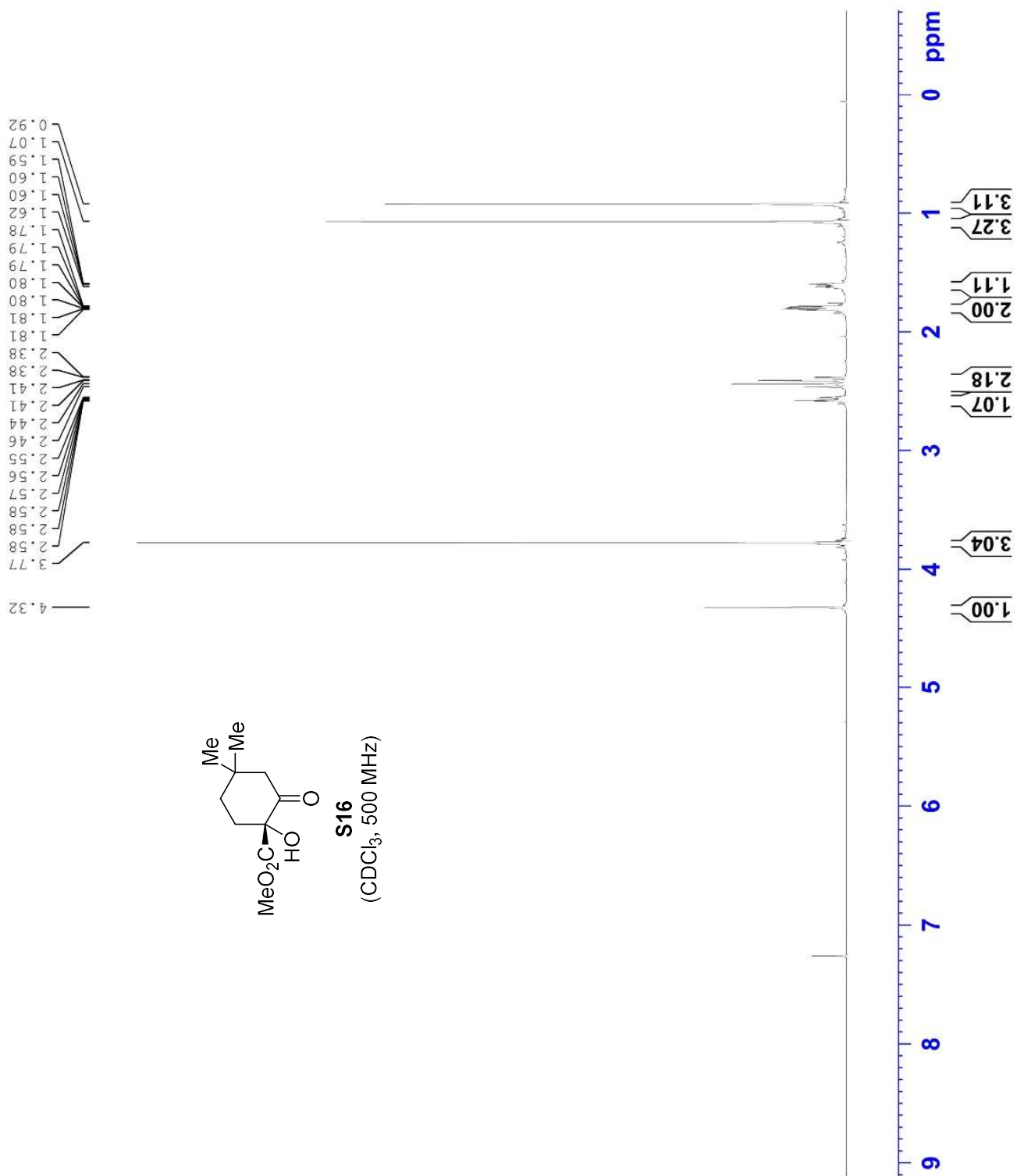
Current Data Parameters
 NAME Yh-5-52-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20190711
 Time_ 23.52
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 56.75
 DW 50.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700118 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-5-52-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters

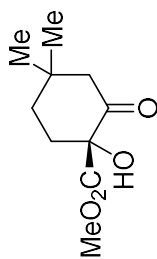
Date_ 20190711
 Time_ 23.58
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 7
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.3 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

206.95
 170.51
 79.93
 53.01
 51.44
 36.94
 35.08
 33.36
 30.65
 26.10



S16
 (CDCl₃, 125 MHz)

ppm

20

40

60

80

100

120

140

160

180

200

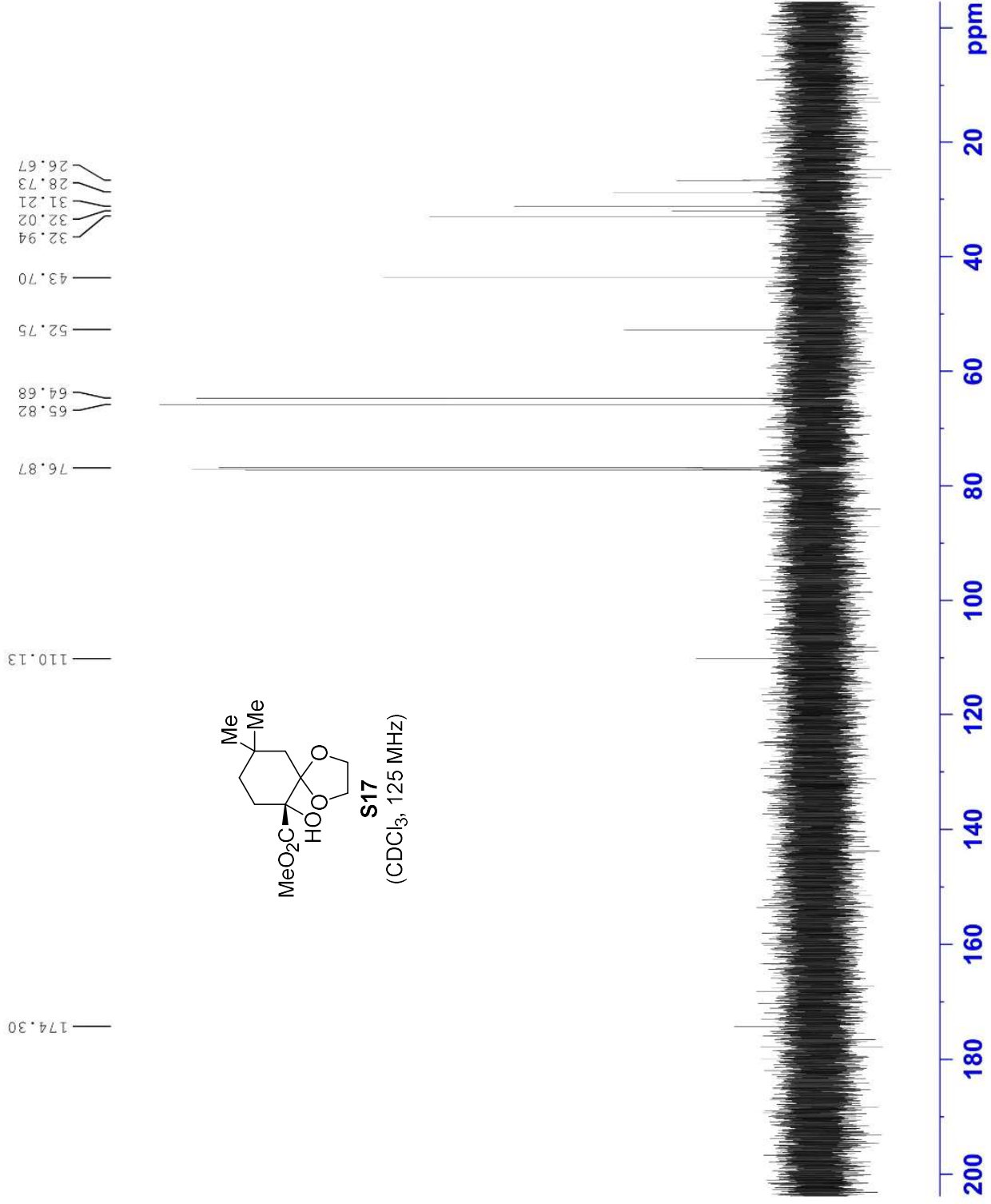
Current Data Parameters
 NAME Yh-5-77-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20190711
 Time_ 15.02
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 21
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 295.8 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-5-78-C
 EXPNO 1
 PROCNO 1

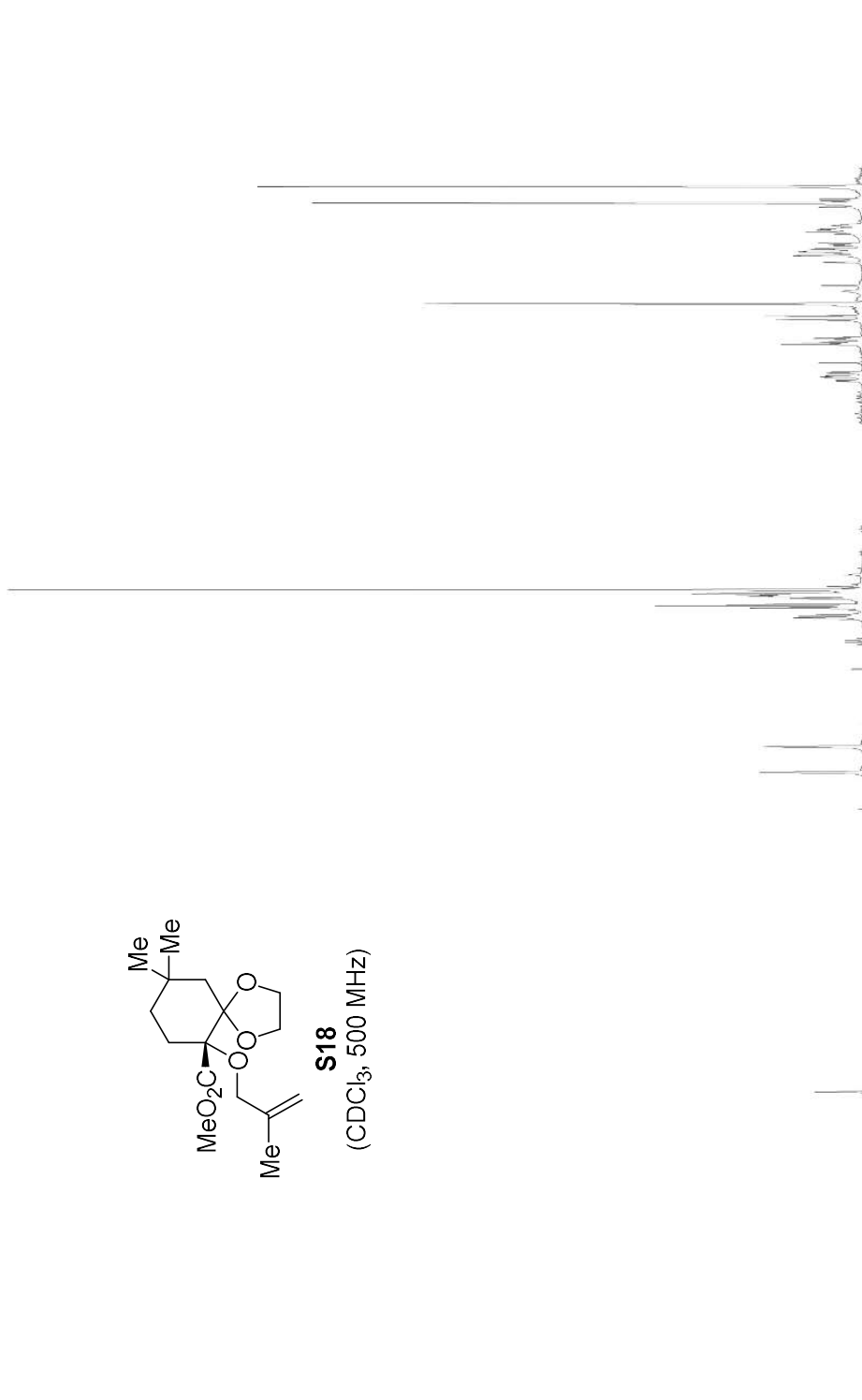
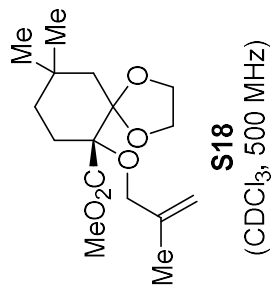
F2 - Acquisition Parameters

Date 20190712
 Time 17.20
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 44.57
 DW 50.000 usec
 DE 6.50 usec
 TE 297.0 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700120 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

5.02
4.84
3.95
3.94
3.93
3.92
3.87
3.86
3.86
3.85
3.81
3.80
3.79
3.79
3.78
3.77
2.03
2.02
2.01
2.00
1.99
1.98
1.86
1.83
1.74
1.41
1.41
1.39
1.38
1.38
1.38
1.37
1.36
1.34
1.33
1.32
1.26
1.25
1.22



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 ppm

1.01
1.02
1.08
1.11
1.16
1.27
1.27
1.30
1.31
1.39
2.45
2.17
2.17
3.17
3.30
3.79
3.79
3.80
3.81
3.85
3.86
3.86
3.87
3.92
3.93
3.94
3.95
4.84
5.02

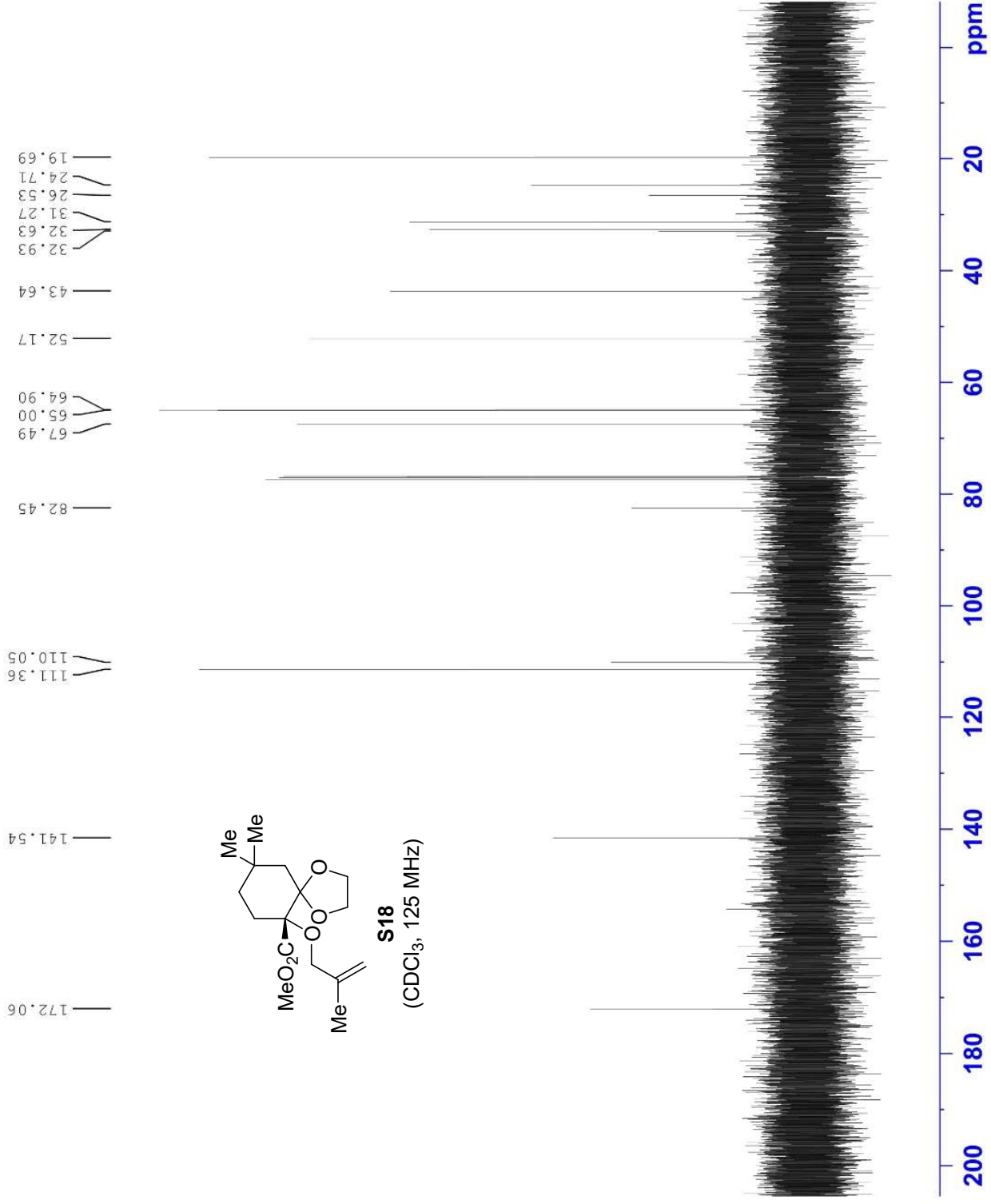
Current Data Parameters
 NAME Yh-5-78-C
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20190712
 Time_ 17.23
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.1 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG|2 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



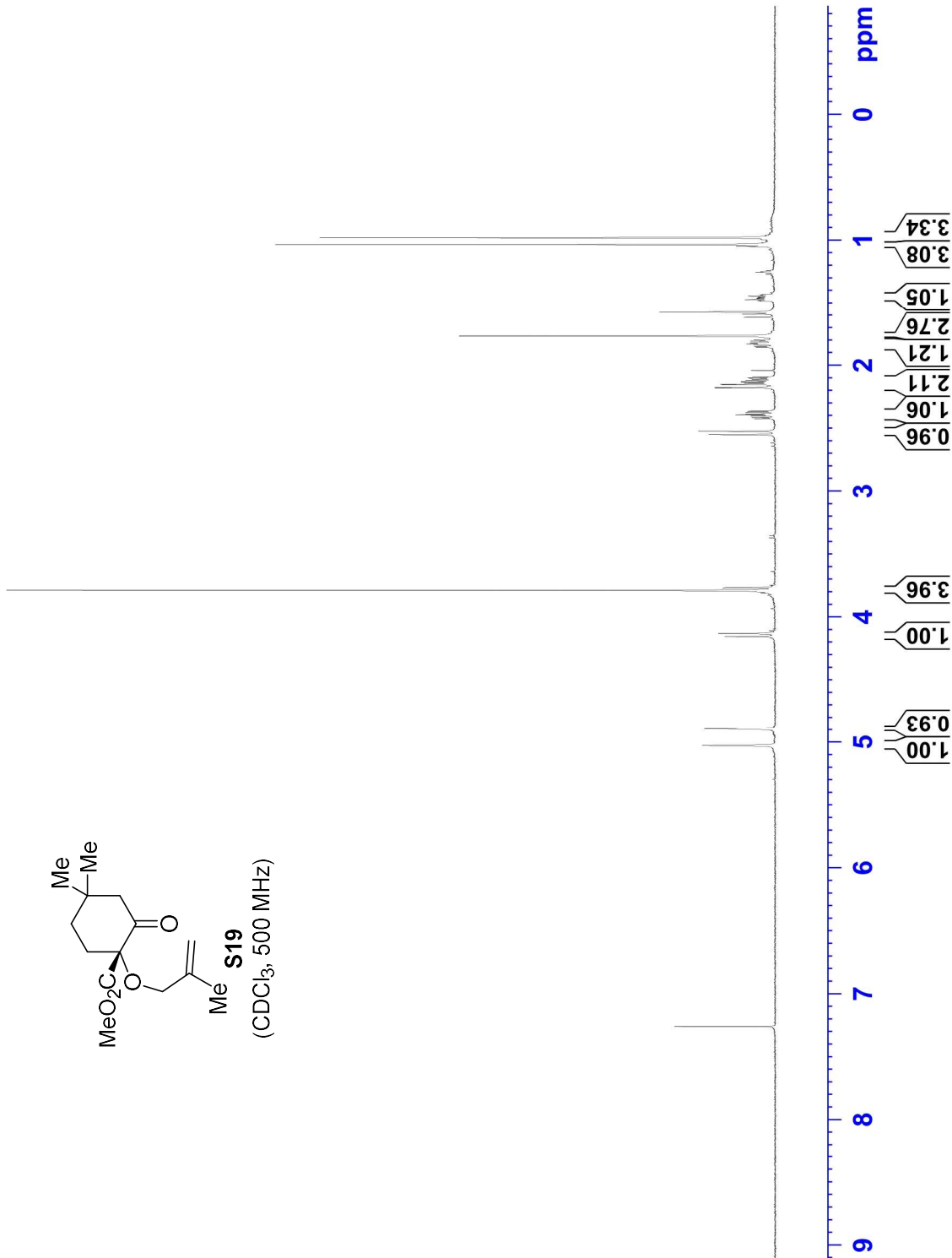
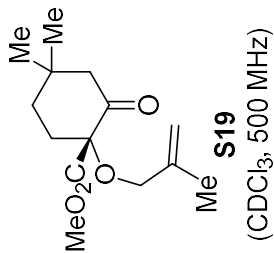
Current Data Parameters
 NAME Yh-5-86-b
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190712
 Time_ 17.30
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 0.98
 DW 50.000 usec
 DE 6.50 usec
 TE 297.1 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700121 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

5.03
4.89
4.16
4.13
3.79
3.77
2.55
2.53
2.42
2.42
2.40
2.39
2.39
2.37
2.36
2.18
2.18
2.15
2.15
2.14
2.13
2.13
2.12
2.11
2.10
2.10
2.09
1.86
1.85
1.84
1.83
1.82
1.81
1.62
1.59
1.47
1.44
1.04
0.98



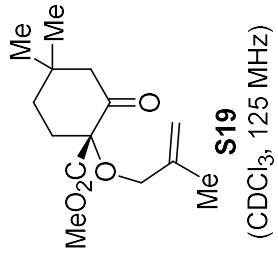
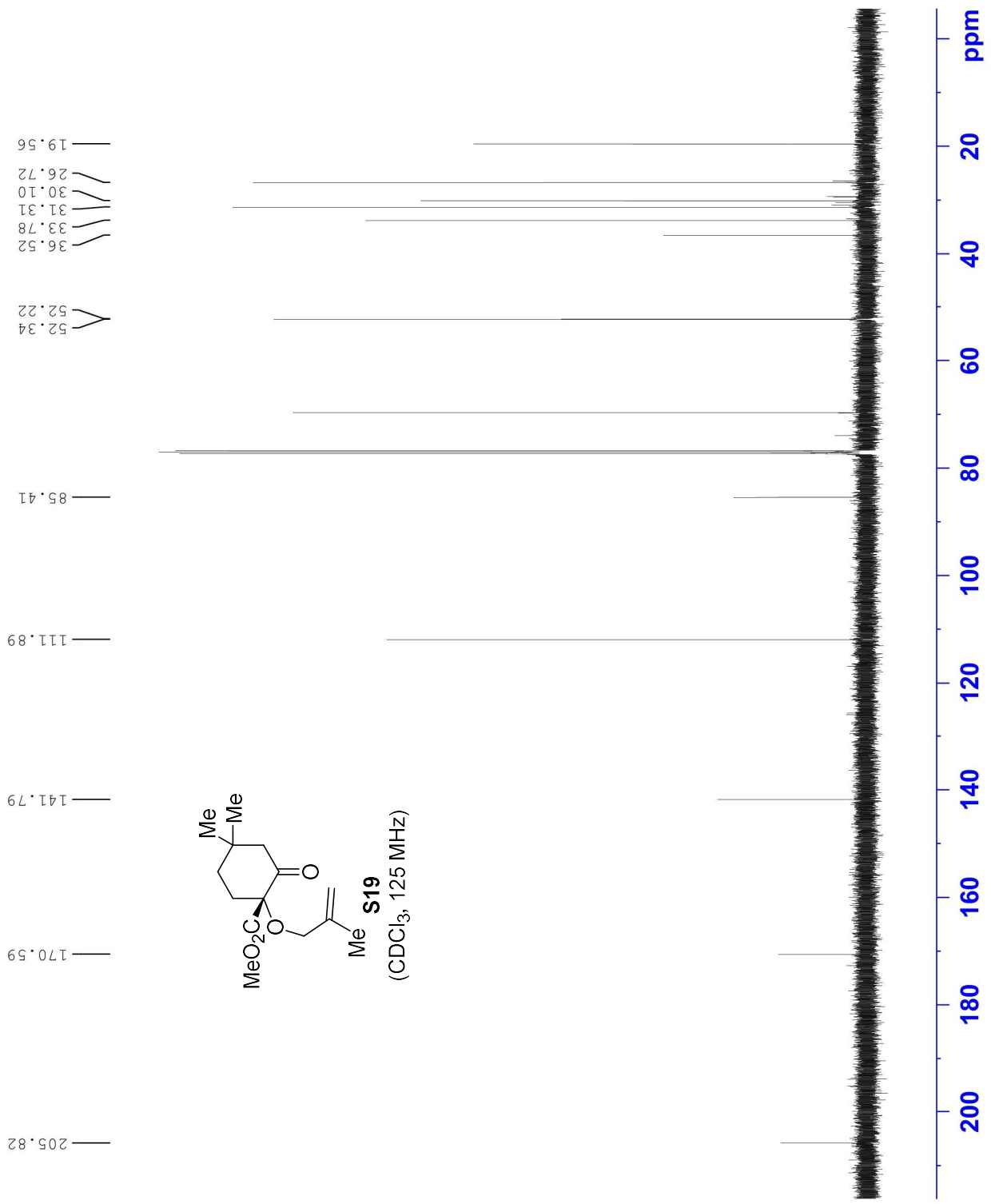
Current Data Parameters
 NAME Yh-5-86-b
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20190712
 Time_ 22.36
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 387
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 299.3 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

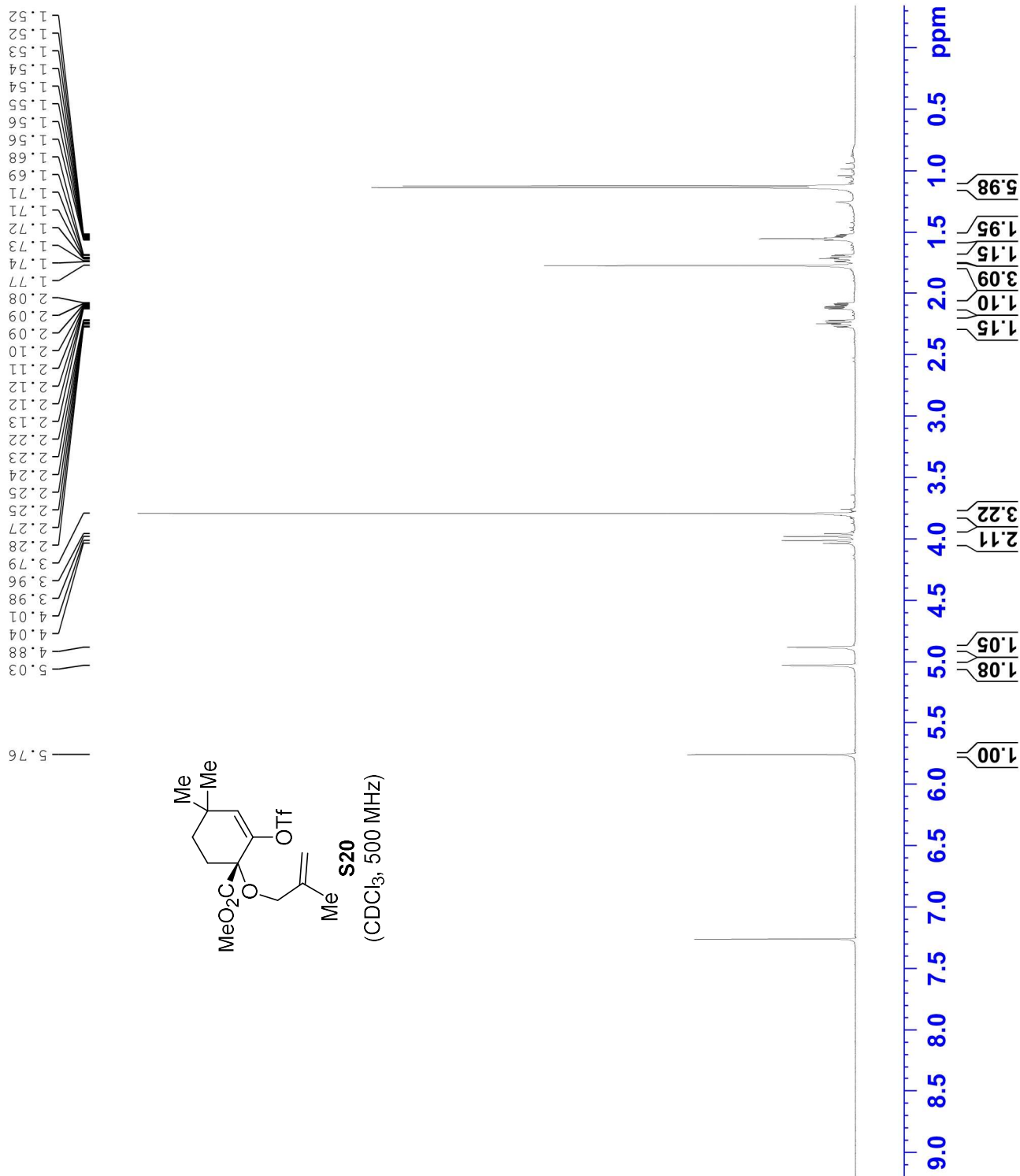


Current Data Parameters
 NAME Yh-5-87-C
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190712
 Time_ 21.21
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 100.96
 DW 50.000 usec
 DE 6.50 usec
 TE 297.5 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



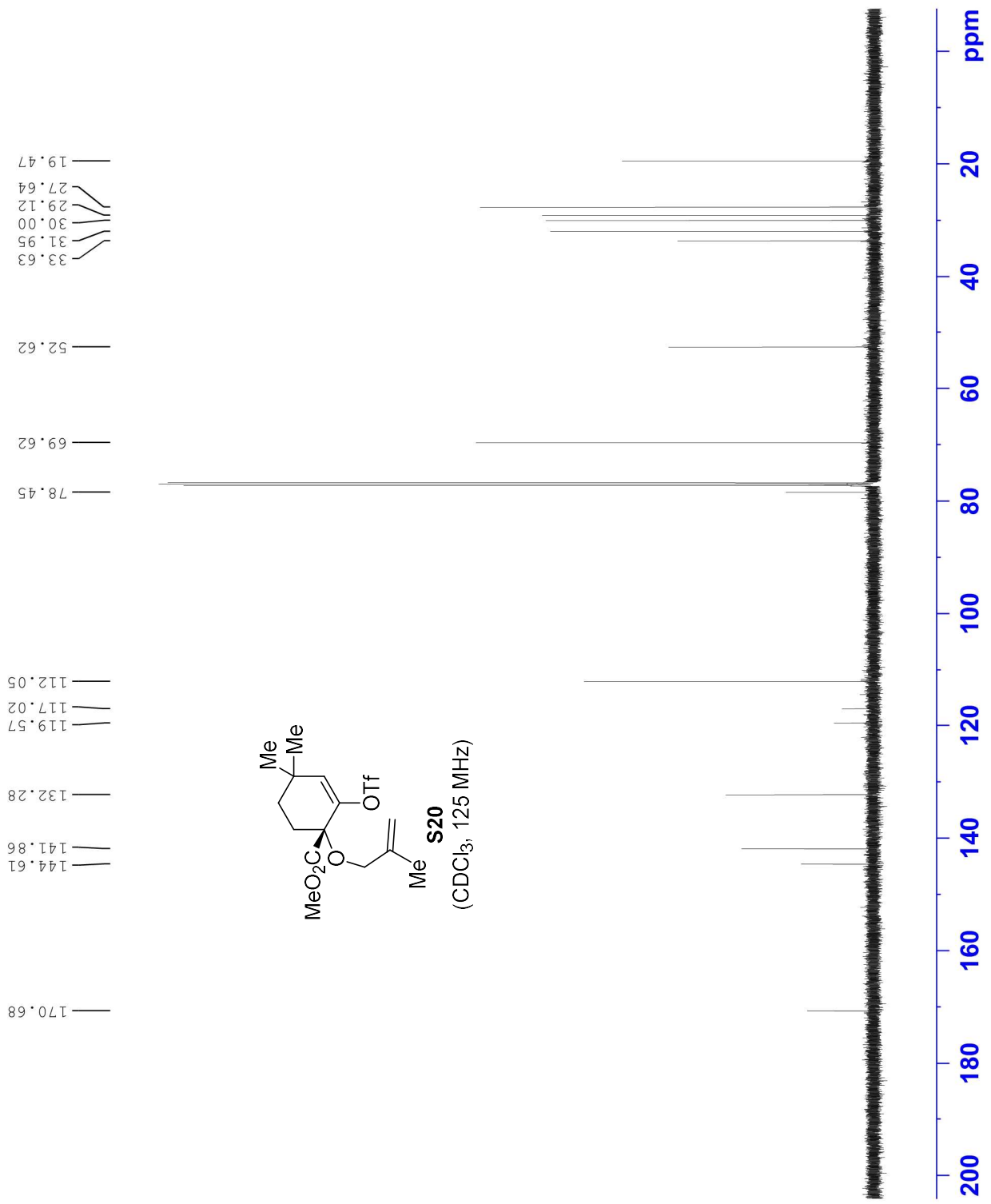
Current Data Parameters
 NAME Yh-5-87-C
 EXPNO 3
 PROCNO 3

F2 - Acquisition Parameters
 Date_ 20190713
 Time_ 0.02
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 803
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 299.5 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-7-32-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20191010
 Time_ 13.42
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 196.79
 DW 50.000 usec
 DE 10.00 usec
 TE 297.0 K
 D1 4.00000000 sec
 TD0 1

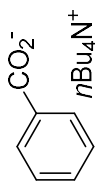
==== CHANNEL f1 =====
 SF01 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300135 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

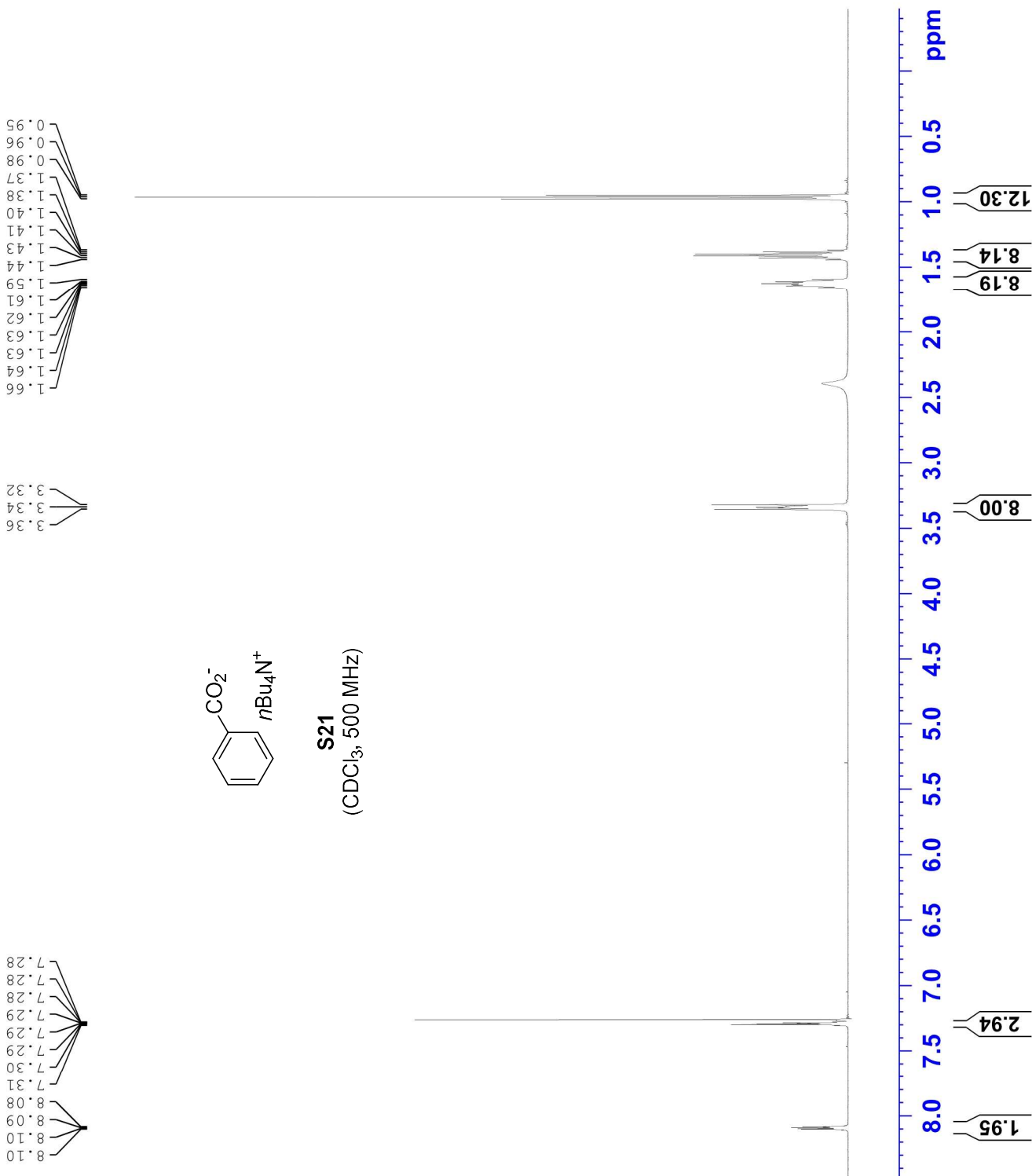
1.66
1.64
1.63
1.63
1.62
1.61
1.59
1.44
1.43
1.41
1.40
1.38
1.37
1.09
1.06

3.36
3.34
3.32

8.10
8.09
8.08
7.31
7.30
7.29
7.29
7.29
7.28
7.28
7.28



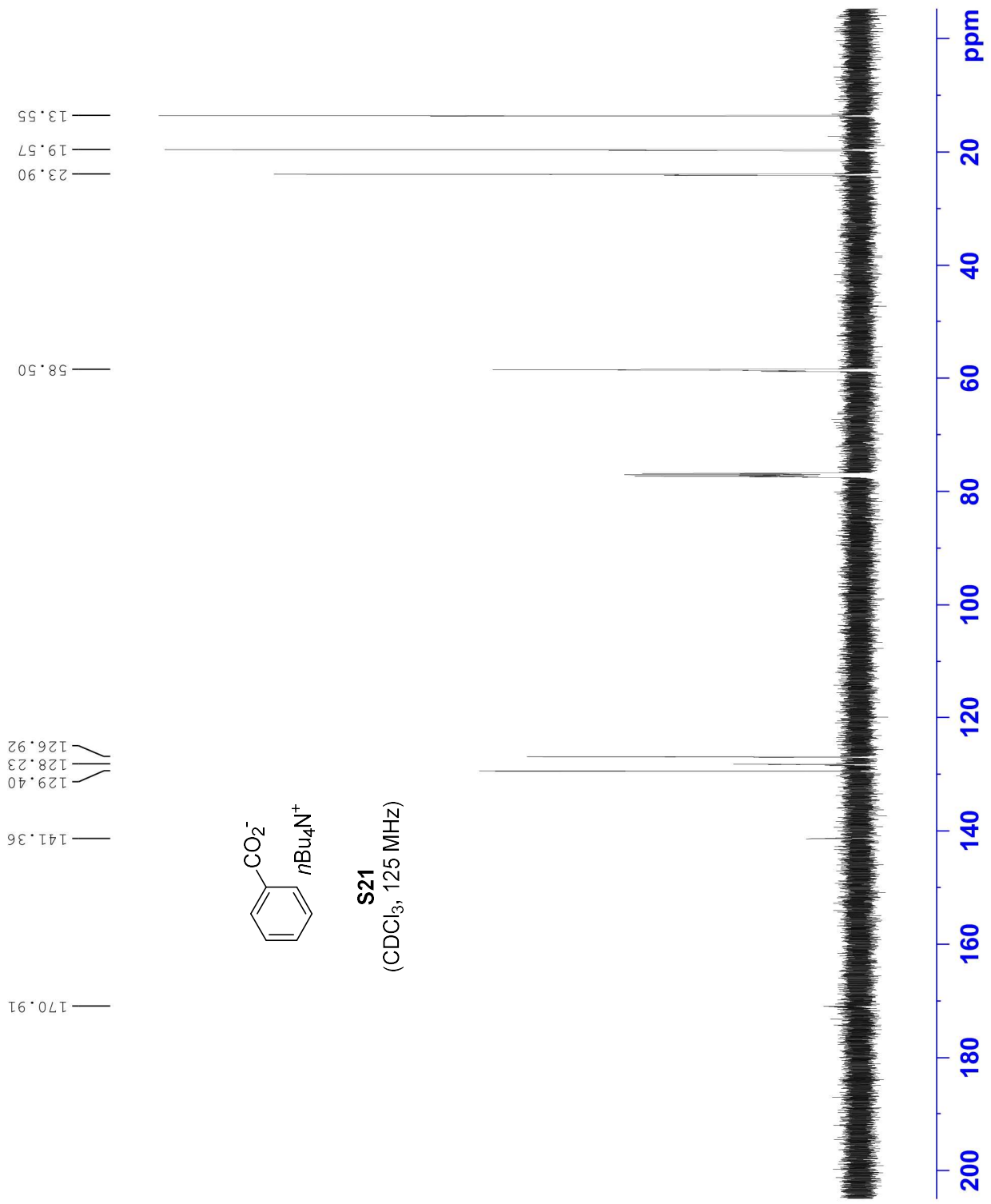
S21
 (CDCl₃, 500 MHz)



Current Data Parameters
 NAME Yh-7-32
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191005
 Time_ 15.02 h
 INSTRUM spect
 PROBHD Z113652_0187 (
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 153
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.333340 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG12 waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-2-41
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 14.39
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 9.88
 DW 50.000 usec
 DE 10.00 usec
 TE 294.3 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

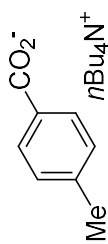
F2 - Processing parameters
 SI 65536
 SF 500.1299379 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

2.23
 1.40
 1.39
 1.38
 1.36
 1.35
 1.25
 1.24
 1.22
 1.21
 0.84
 0.83
 0.81

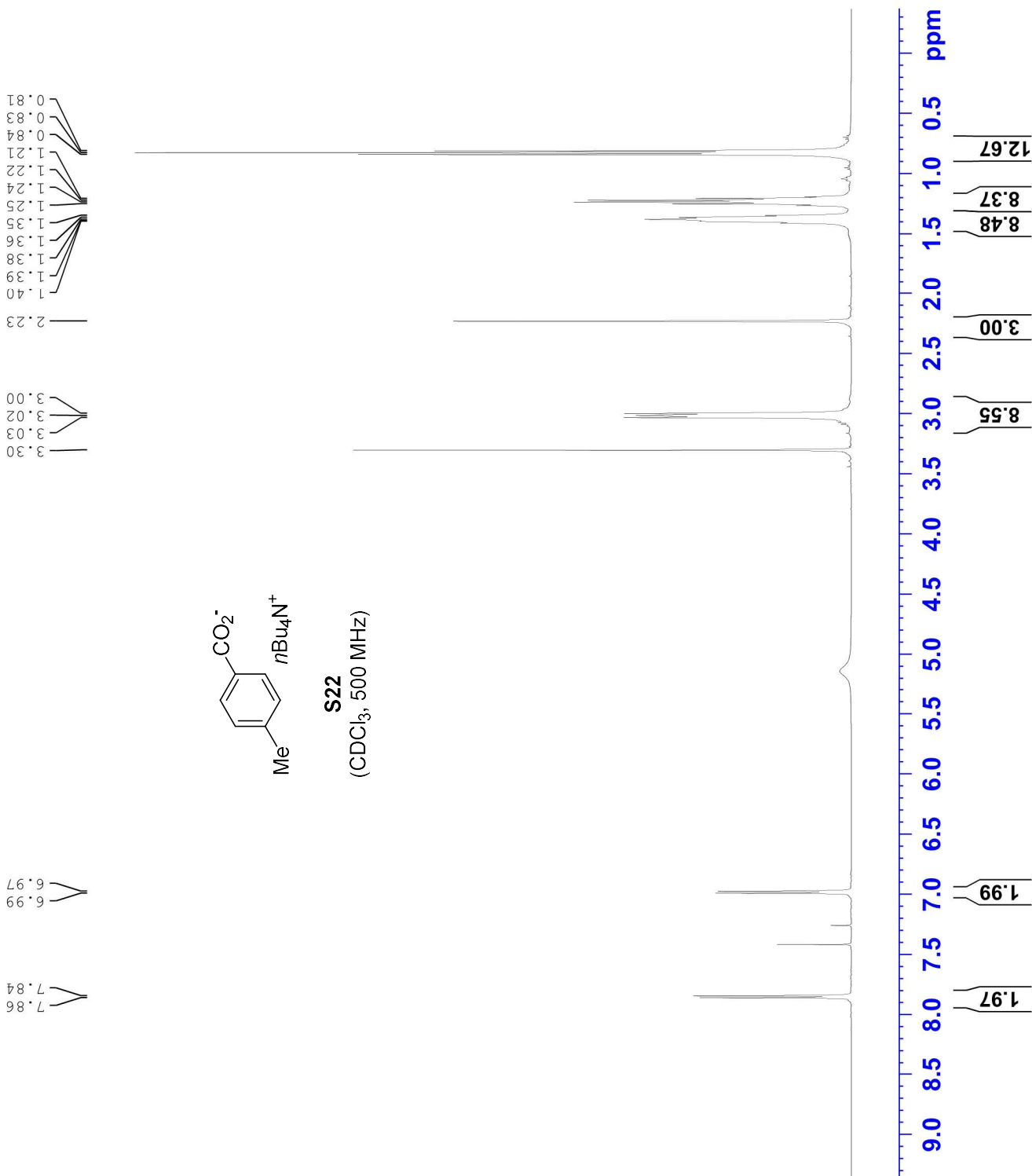
3.30
 3.03
 3.02
 3.00

6.99
 6.97

7.86
 7.84



S22
 (CDCl₃, 500 MHz)



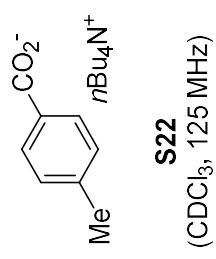
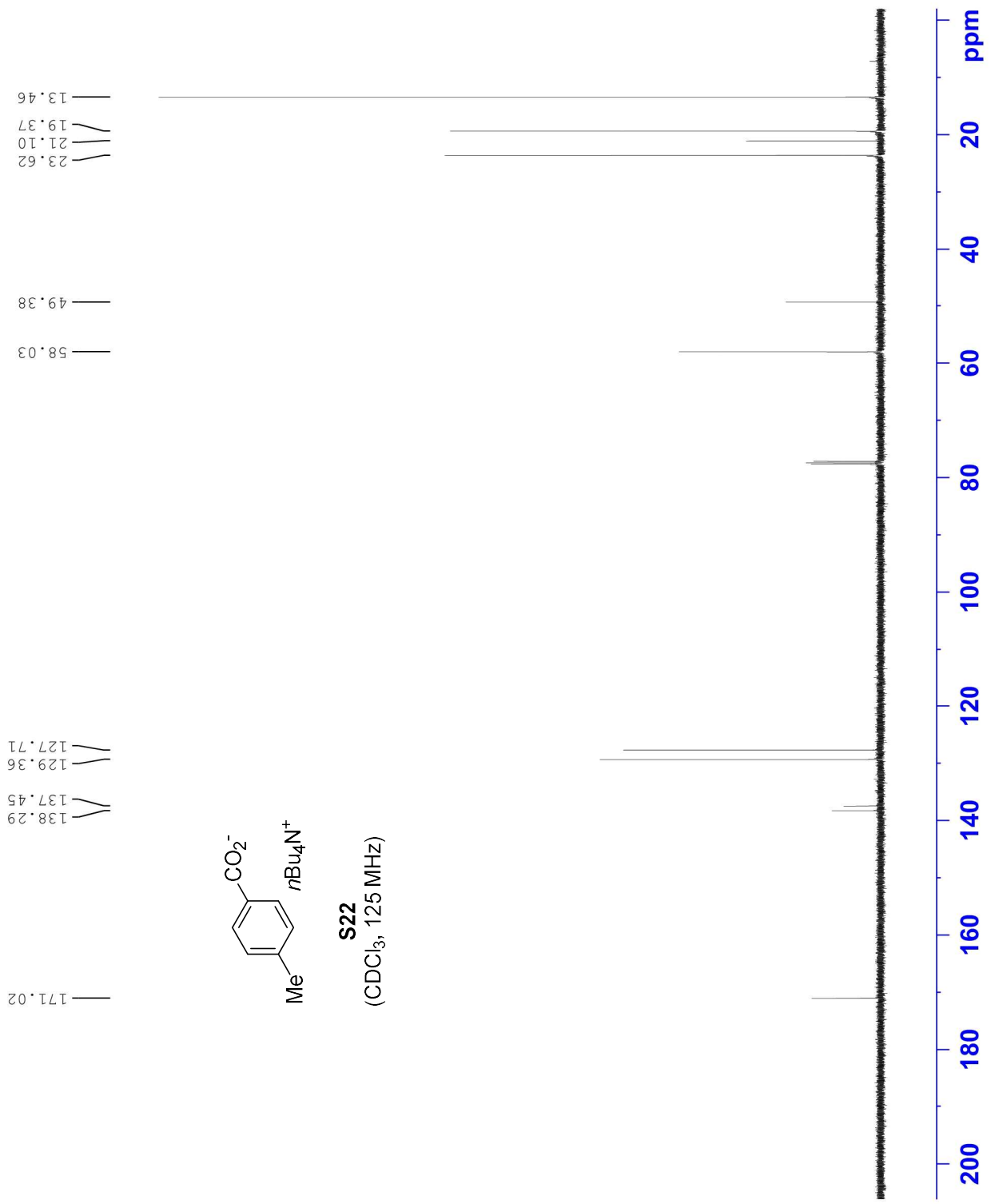
Current Data Parameters
 NAME Yh-2-41
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 15.10
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 5
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 295.9 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-2-29
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180827
 Time_ 20.40
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 13.94
 DW 50.000 usec
 DE 6.50 usec
 TE 296.3 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

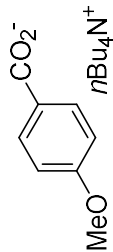
F2 - Processing parameters
 SI 65536
 SF 499.8700148 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1.36
1.34
1.33
1.32
1.32
1.32
1.31
1.29
1.19
1.18
1.16
1.15
1.13
1.12
0.74

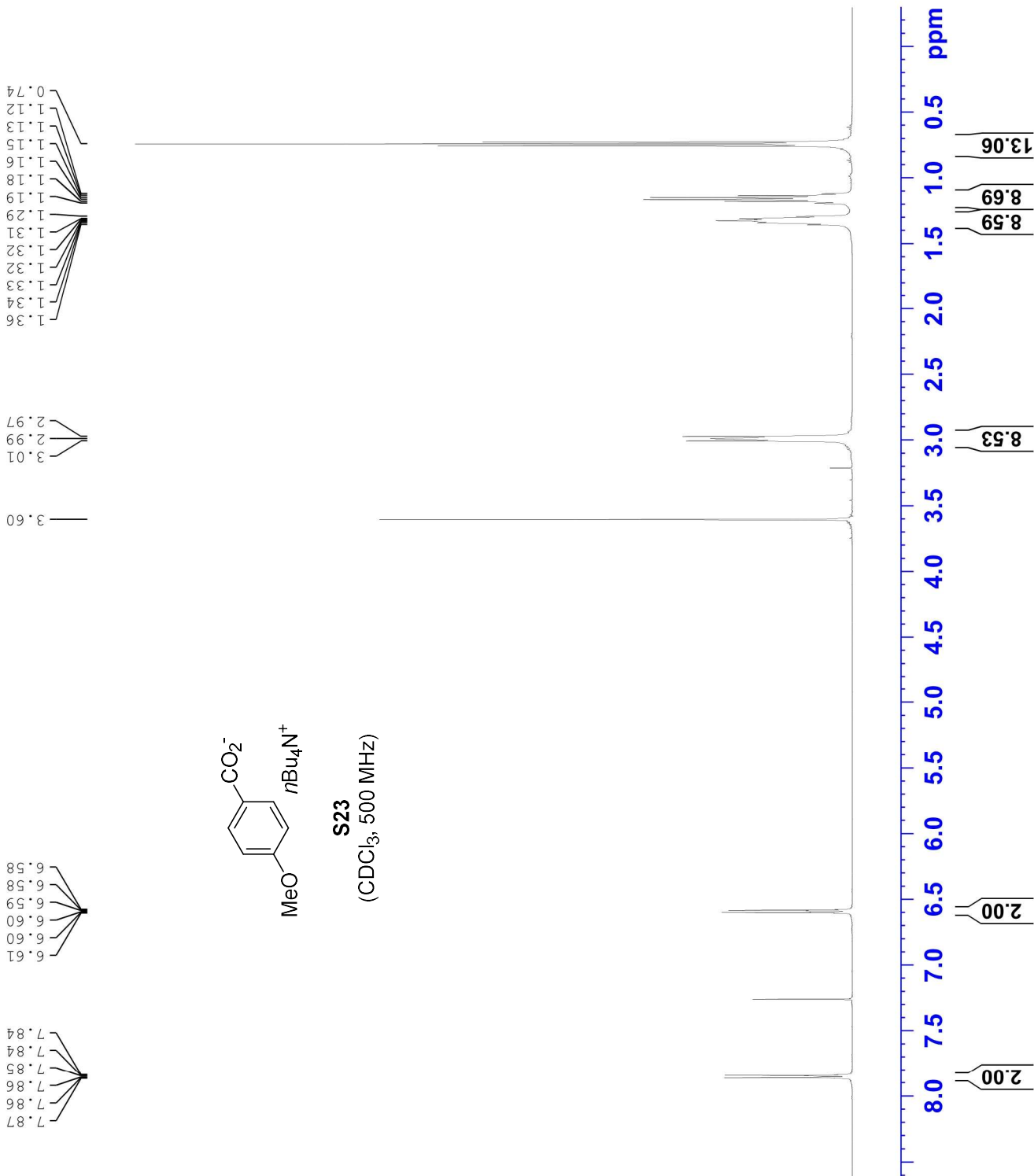
3.60
3.01
2.99
2.97

6.61
6.60
6.60
6.60
6.59
6.58
6.58

7.87
7.86
7.86
7.85
7.84
7.84



S23
 (CDCl₃, 500 MHz)



Current Data Parameters
 NAME Yh-2-29
 EXPNO 2
 PROCNO 2

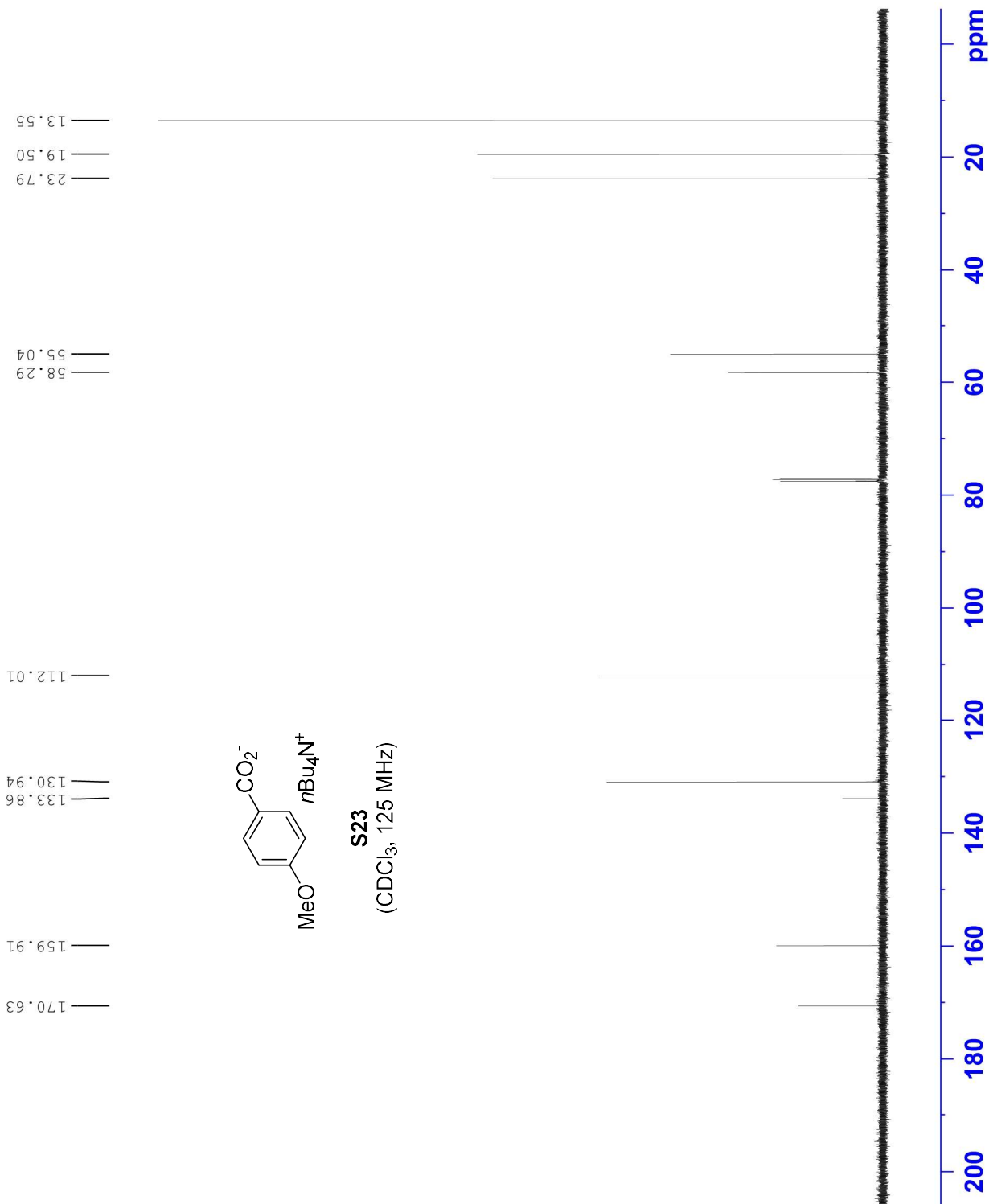
F2 - Acquisition Parameters

Date_ 20180827
 Time_ 20.44
 INSTRUM spect
 PROBD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.3 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

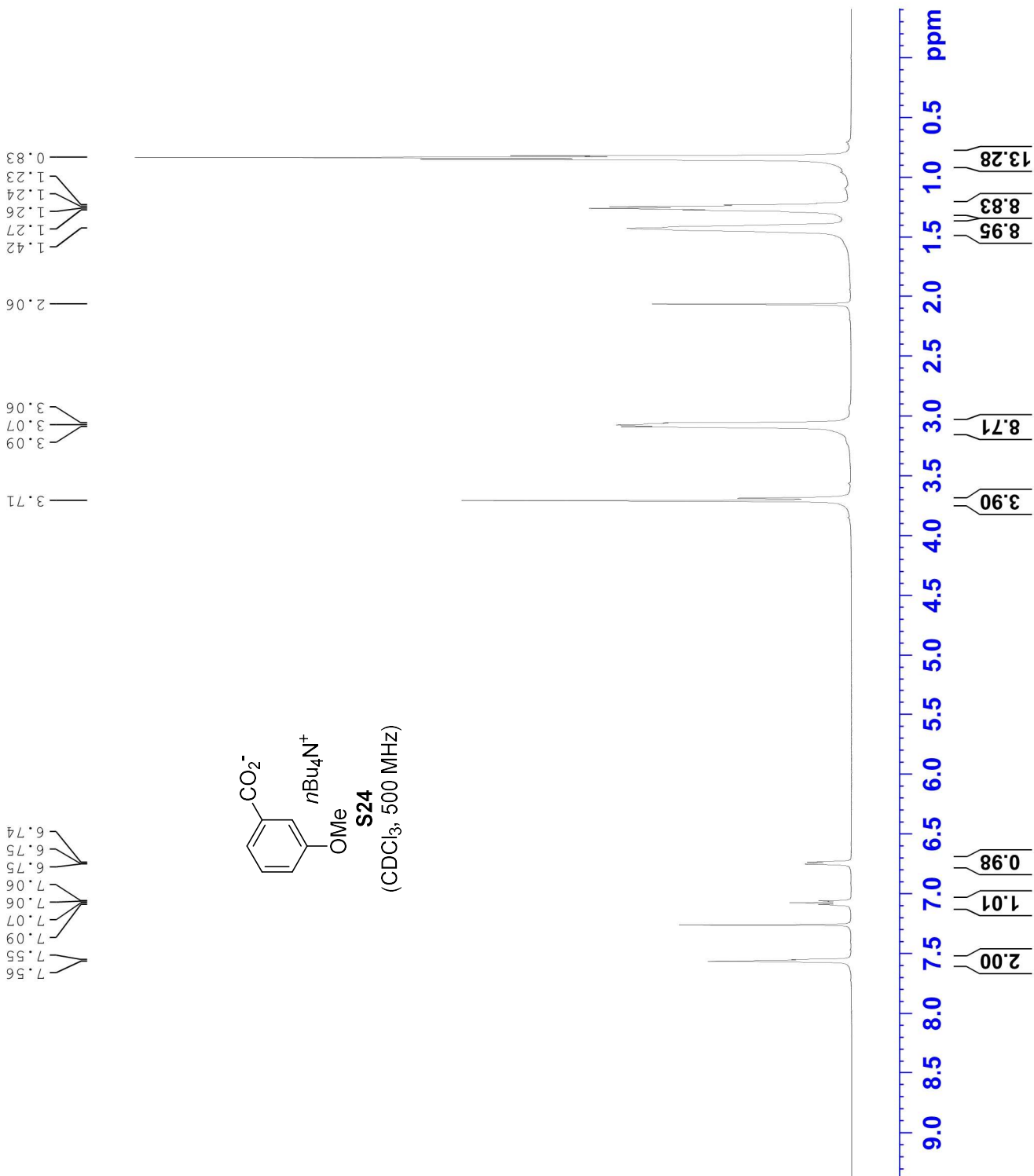


Current Data Parameters
 NAME yh-2-58
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 21.20
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 22.37
 DW 50.000 usec
 DE 6.50 usec
 TE 295.9 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700130 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-2-58
 EXPNO 2
 PROCNO 2

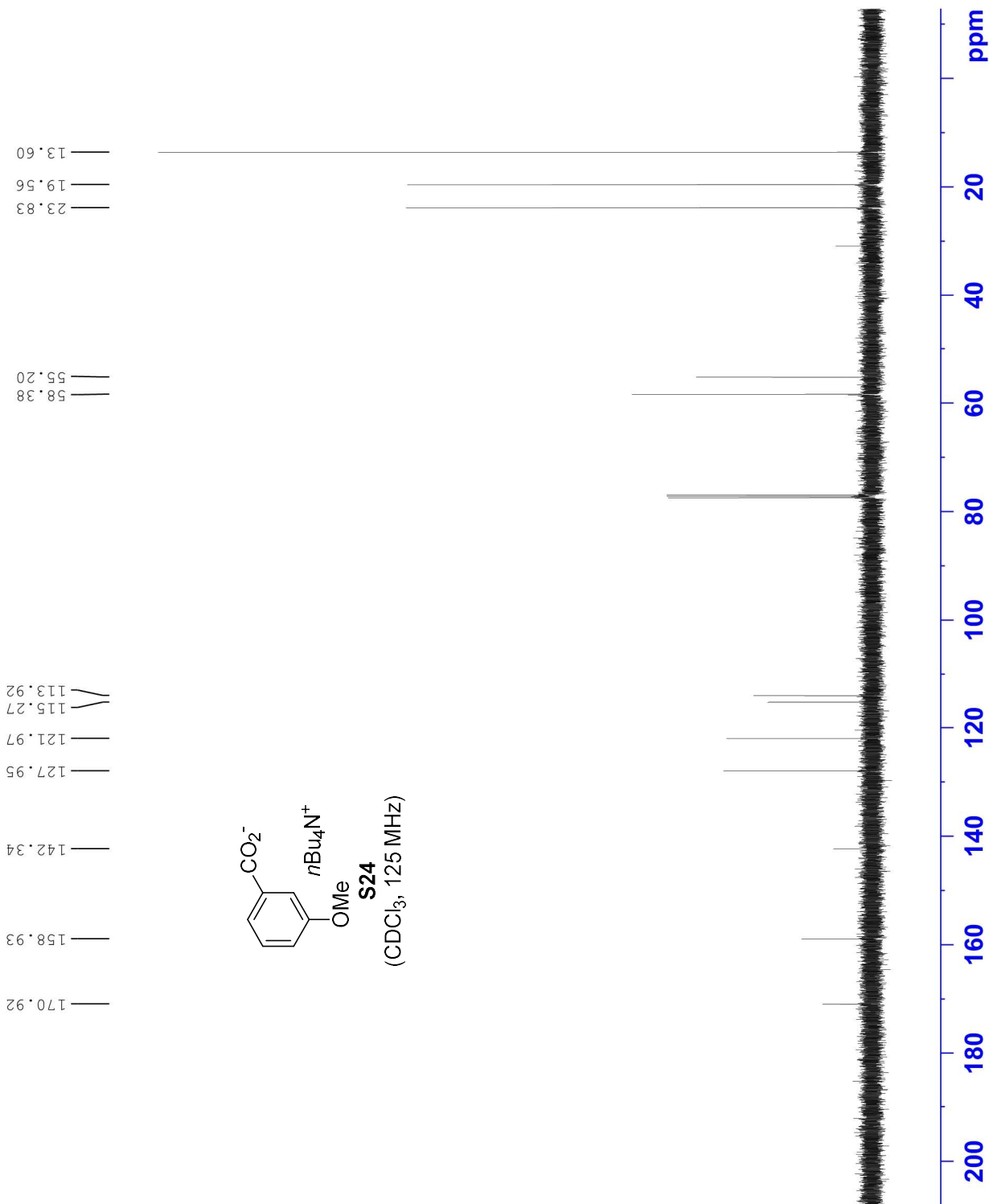
F2 - Acquisition Parameters

Date_ 20180814
 Time_ 21.25
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 6
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-2-75
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 22.45
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 25.24
 DW 50.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

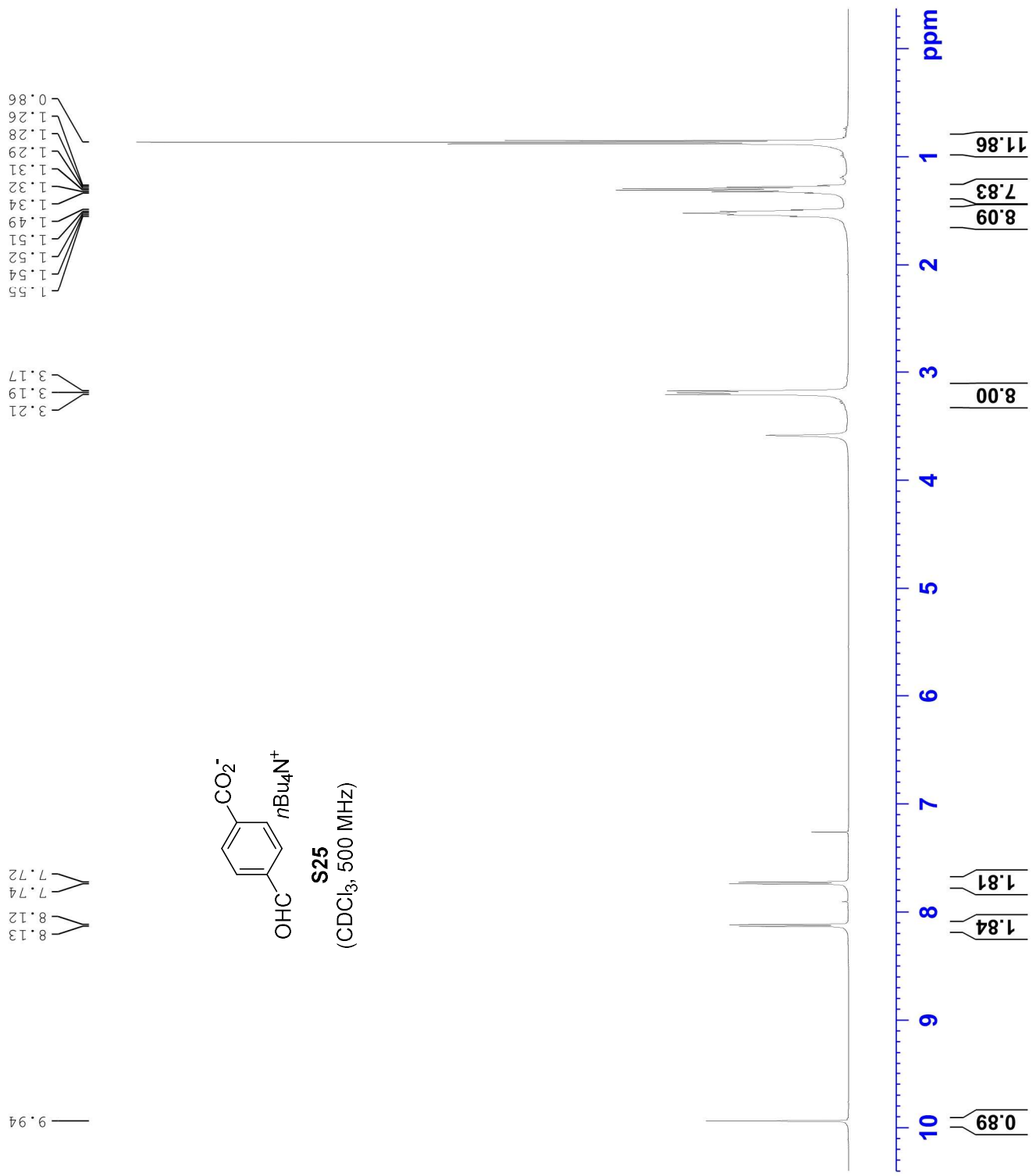
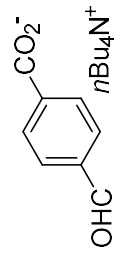
F2 - Processing parameters
 SI 65536
 SF 499.8700126 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1.55
1.54
1.52
1.51
1.49
1.34
1.32
1.31
1.29
1.28
1.26
0.86

3.21
3.19
3.17

8.13
8.12
7.74
7.72

9.94



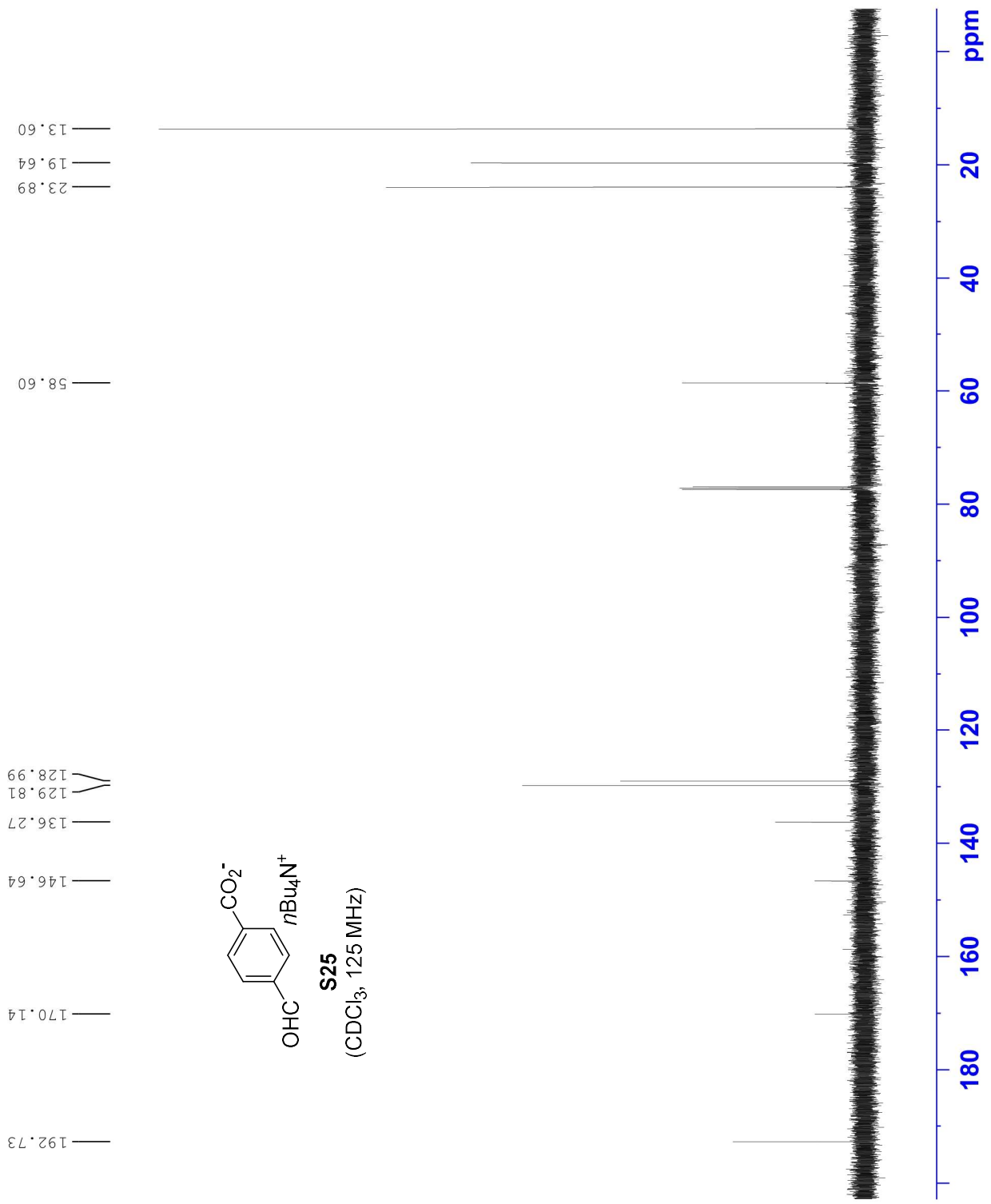
Current Data Parameters
 NAME Yh-2-75
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 22.48
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-2-53
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 16.03
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 13.94
 DW 50.000 usec
 DE 6.50 usec
 TE 295.8 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.2500000 W

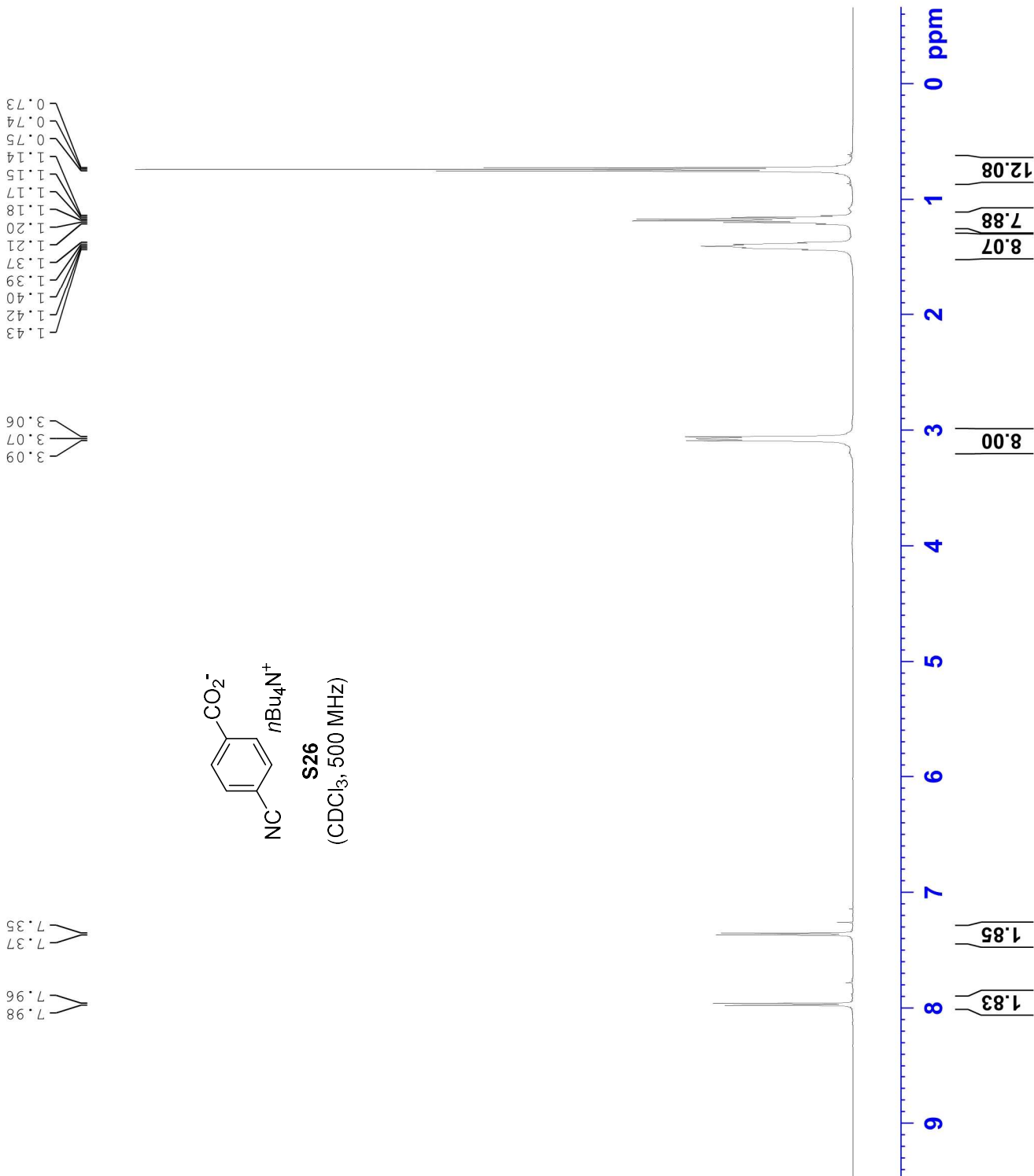
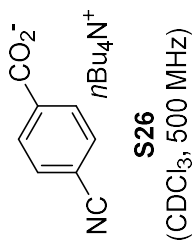
F2 - Processing parameters
 SI 65536
 SF 499.8700143 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1.43
1.42
1.40
1.39
1.37
1.21
1.20
1.18
1.17
1.15
1.14
0.75
0.74
0.73

3.09
3.07
3.06

7.37
7.35

7.96
7.98



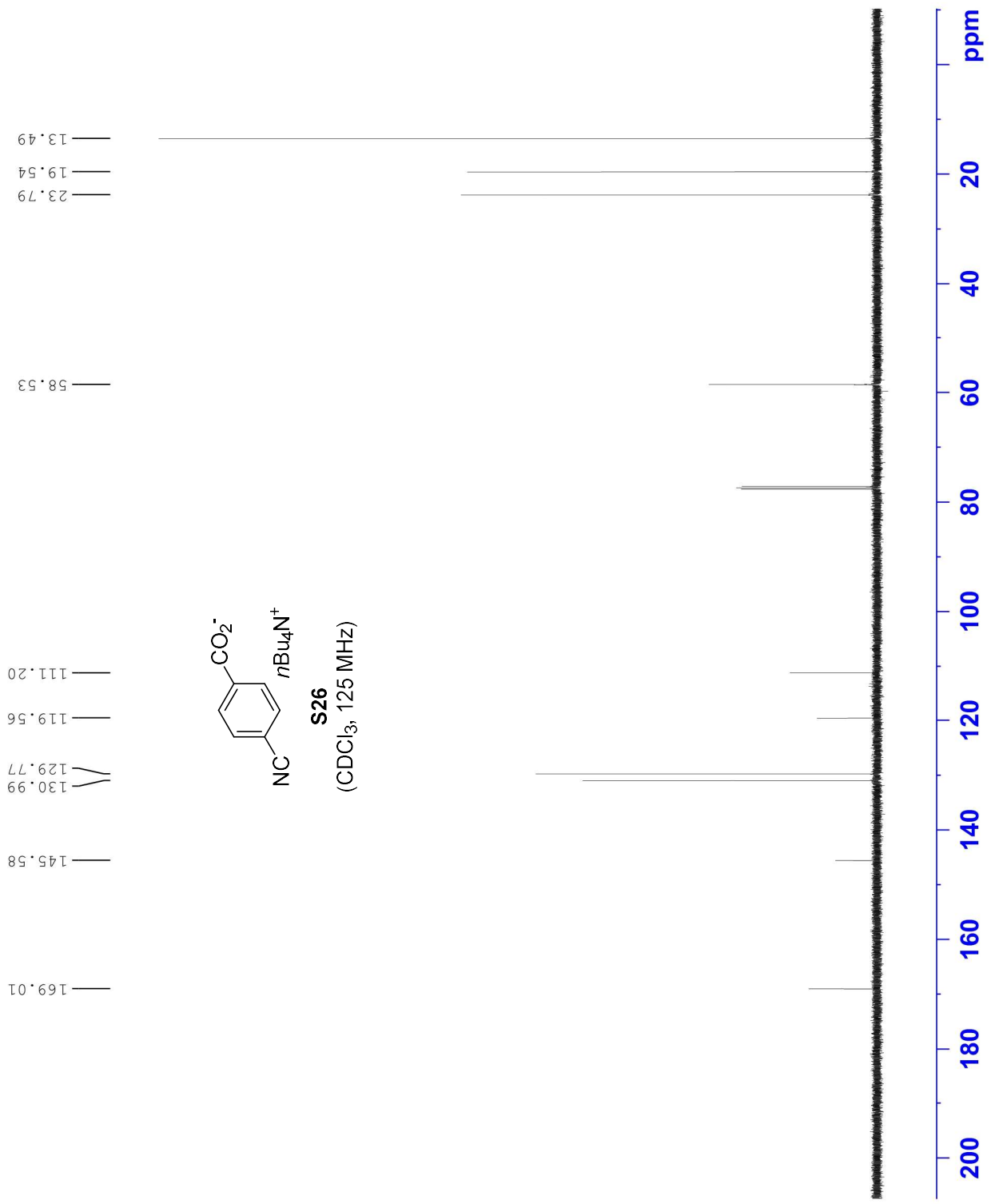
Current Data Parameters
 NAME Yh-2-53
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 16.07
 INSTRUM spect
 PROBD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 295.8 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-2-40-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180829
 Time_ 22.24
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 97.37
 DW 50.000 usec
 DE 10.00 usec
 TE 294.1 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

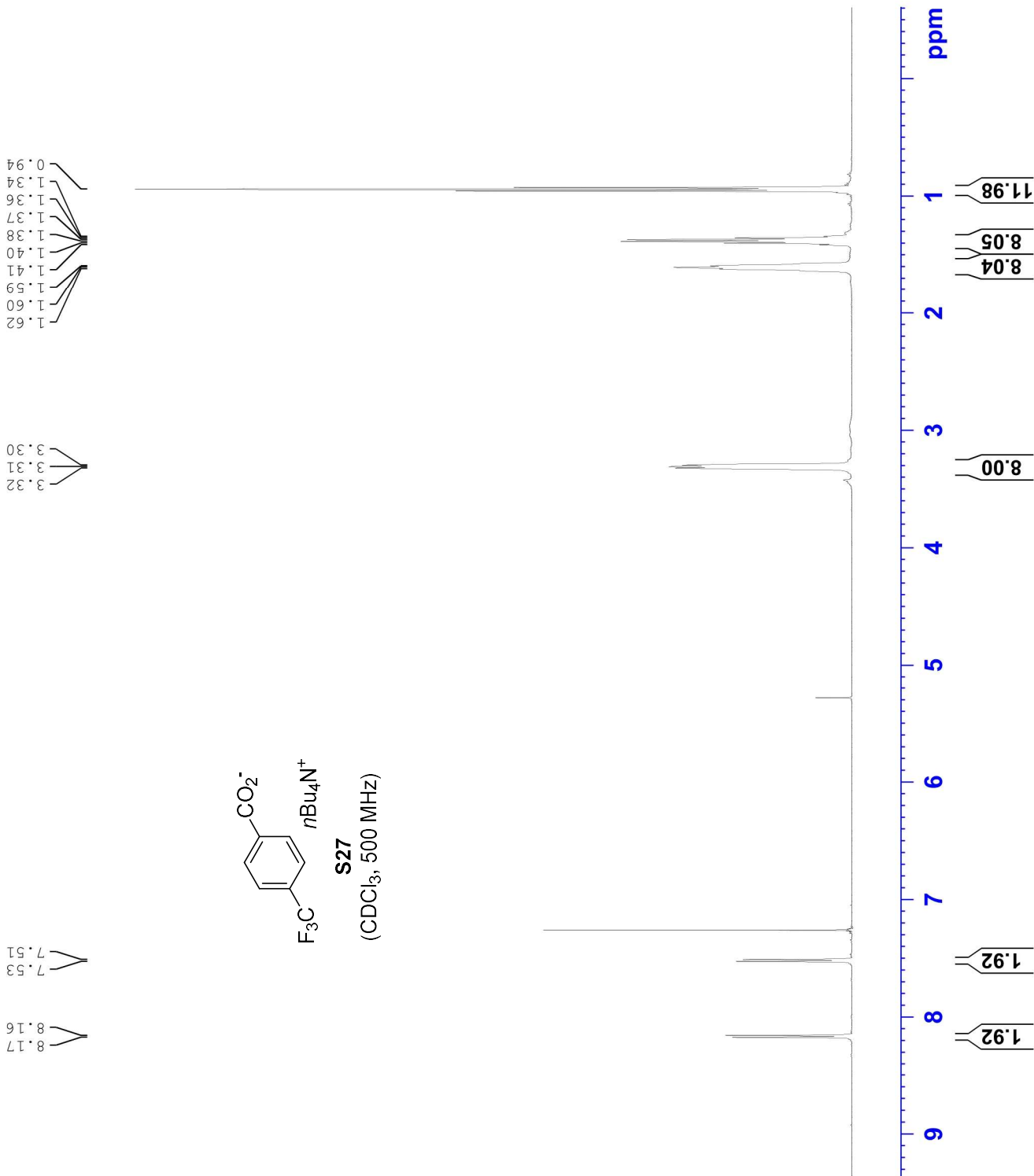
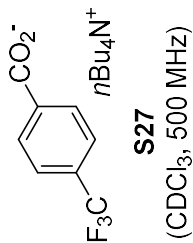
F2 - Processing parameters
 SI 65536
 SF 500.1300140 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1.62
1.60
1.59
1.41
1.40
1.38
1.37
1.36
1.34
0.94

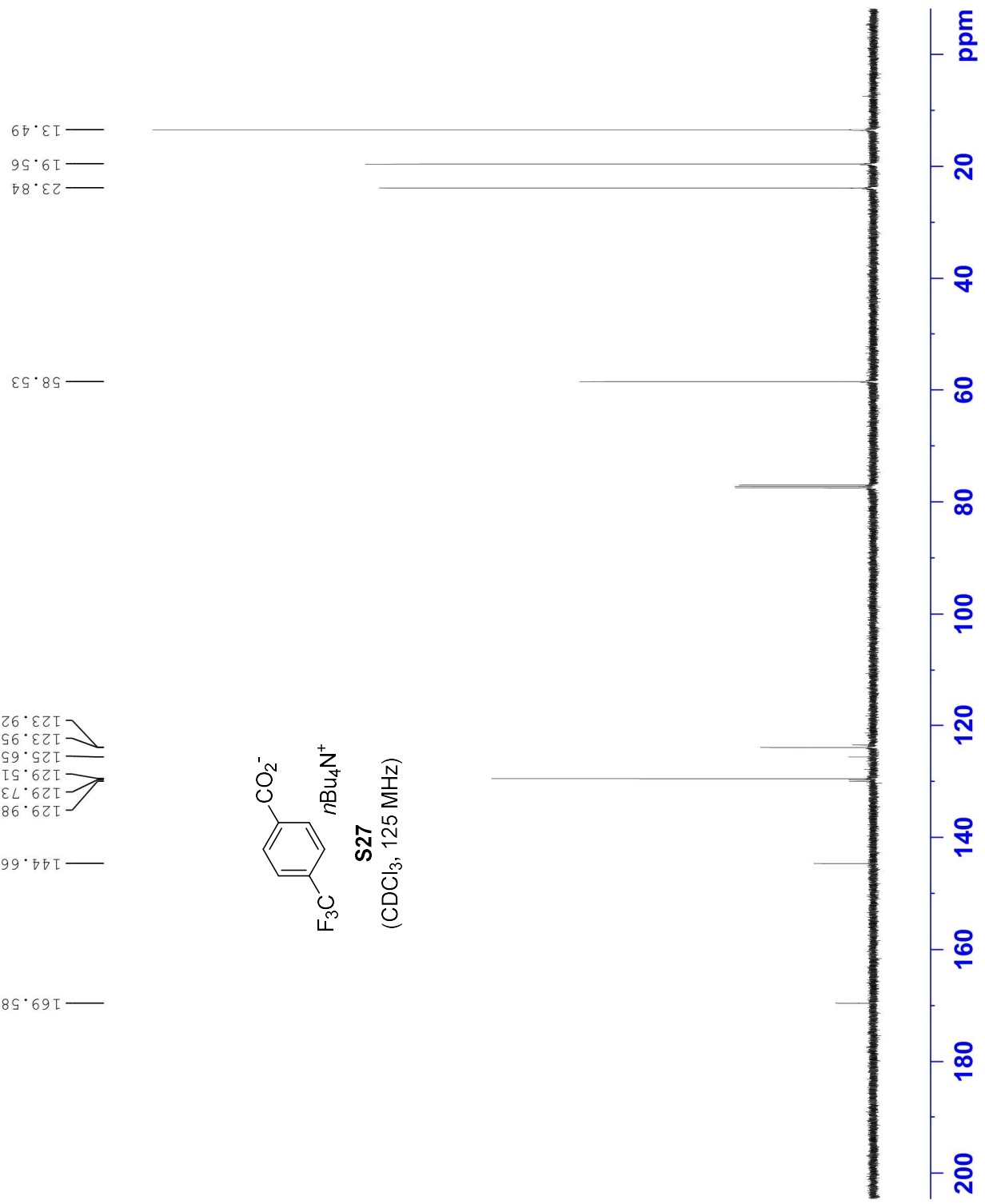
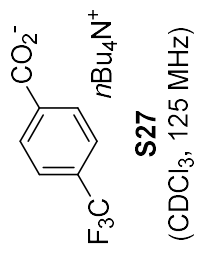
3.32
3.31
3.30

7.53
7.51

8.17
8.16



169.58
144.66
129.98
129.73
129.51
125.65
123.95
123.92



Current Data Parameters
 NAME yh-2-40-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180829
 Time 22.11
 INSTRUM spect
 PROBHD 5 mm FAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 42
 DS 0
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 295.8 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TDO 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 9.90 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SF01 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SF02 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-2-65
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180814
 Time_ 21.31
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 44.57
 DW 50.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 4.0000000 sec
 TD0 1

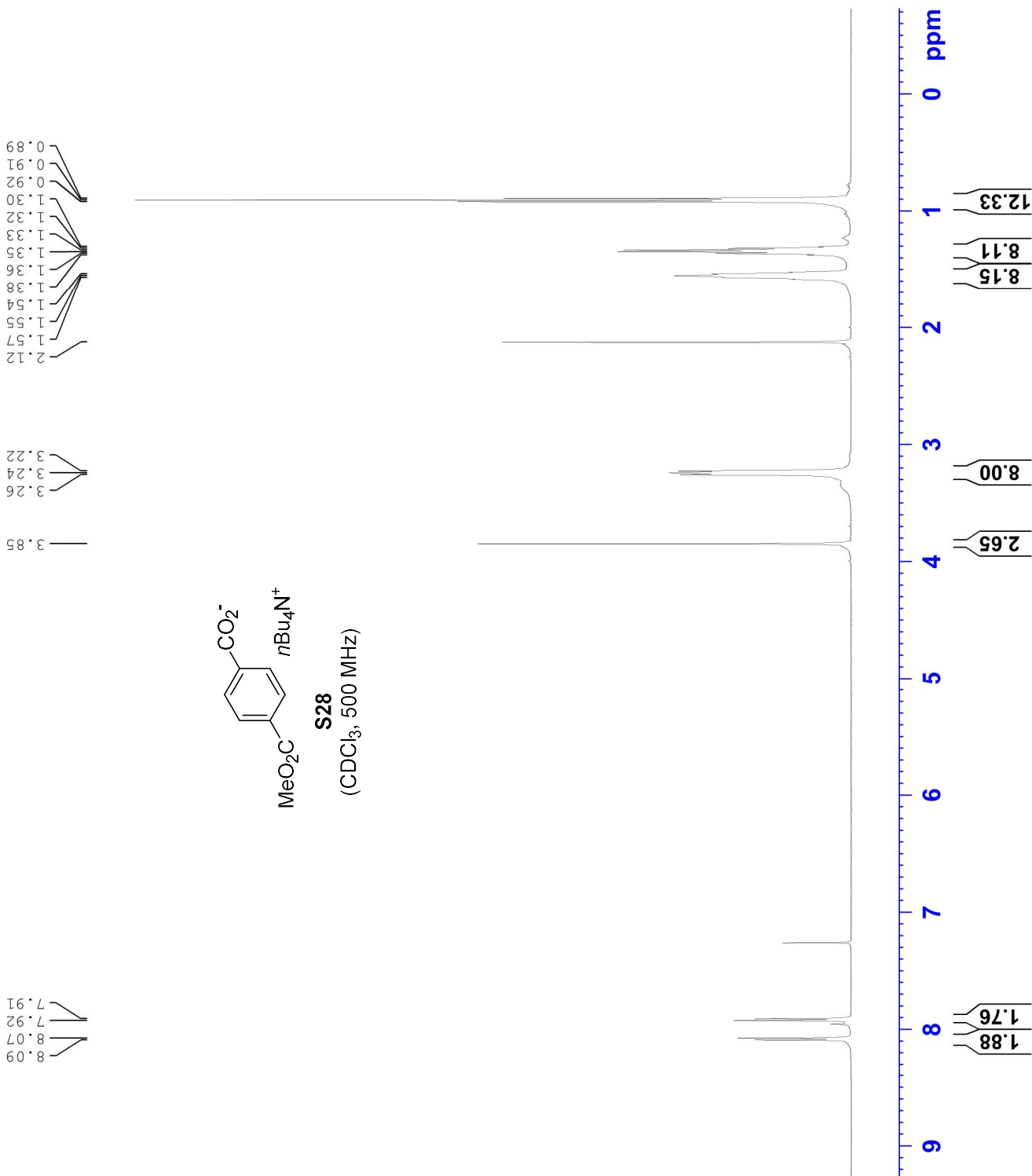
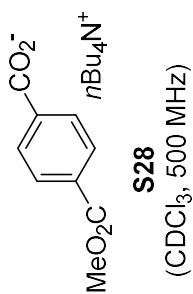
==== CHANNEL f1 =====
 SF01 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

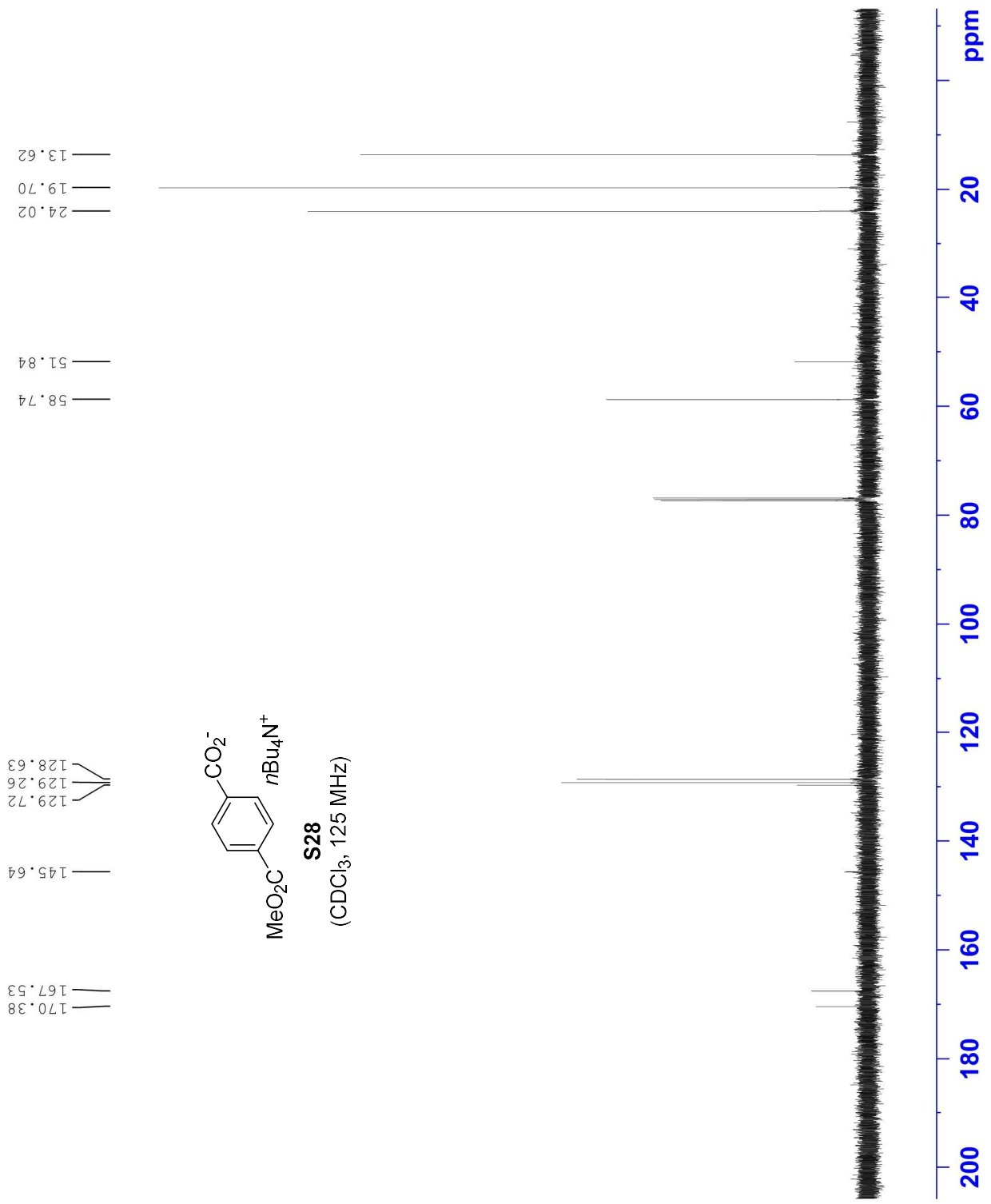
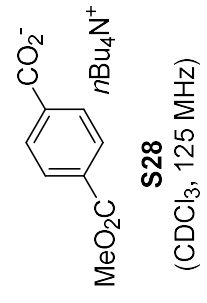
0.89
 0.91
 0.92
 1.30
 1.32
 1.33
 1.35
 1.36
 1.38
 1.54
 1.55
 1.57
 2.12

3.22
 3.24
 3.26
 3.85

7.91
 7.92
 8.07
 8.09



170.38
167.53
145.64
129.72
129.26
128.63



Current Data Parameters
 NAME Yh-2-65
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 21.45
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 47
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.8 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

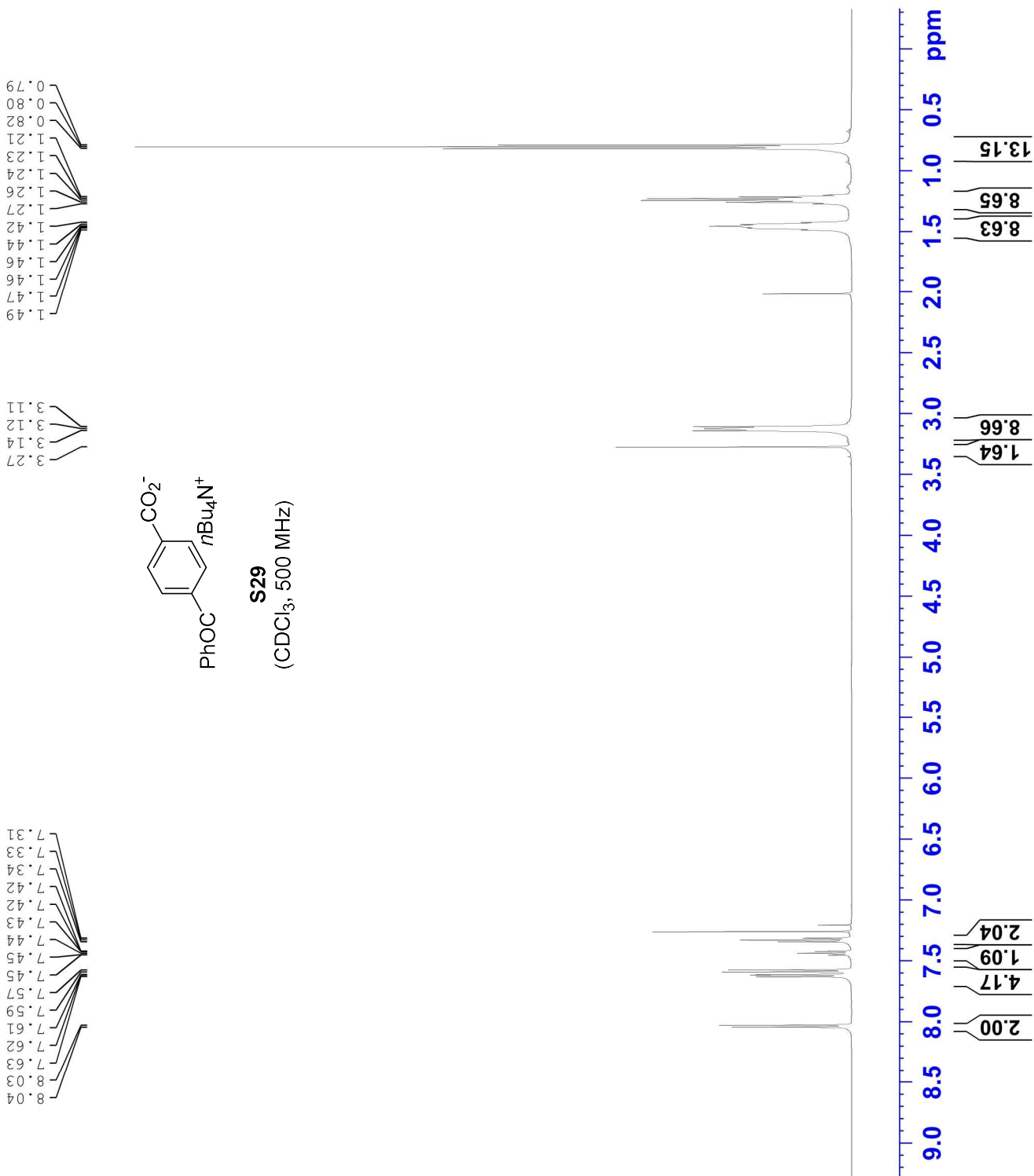
F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-2-70
 EXPNO 1
 PROCNO 1

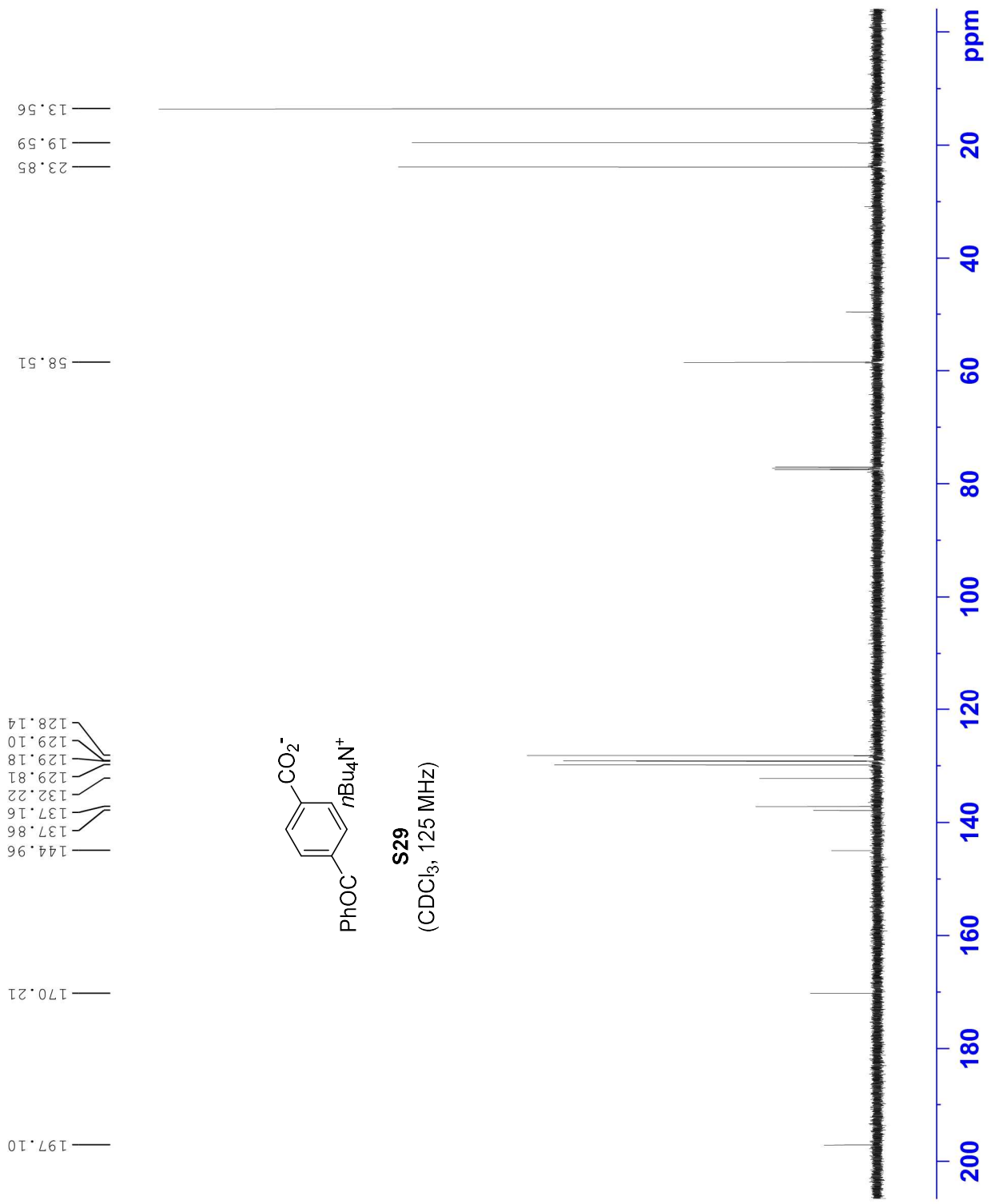
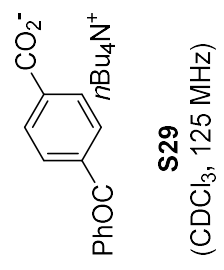
F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 21.49
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 15.35
 DW 50.000 usec
 DE 6.50 usec
 TE 296.4 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700134 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



197.10
170.21
144.96
137.86
137.16
132.22
129.81
129.18
129.10
128.14



Current Data Parameters
 NAME Yh-2-70
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 21.59
 INSTRUM spect
 PROBD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 6
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.4 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

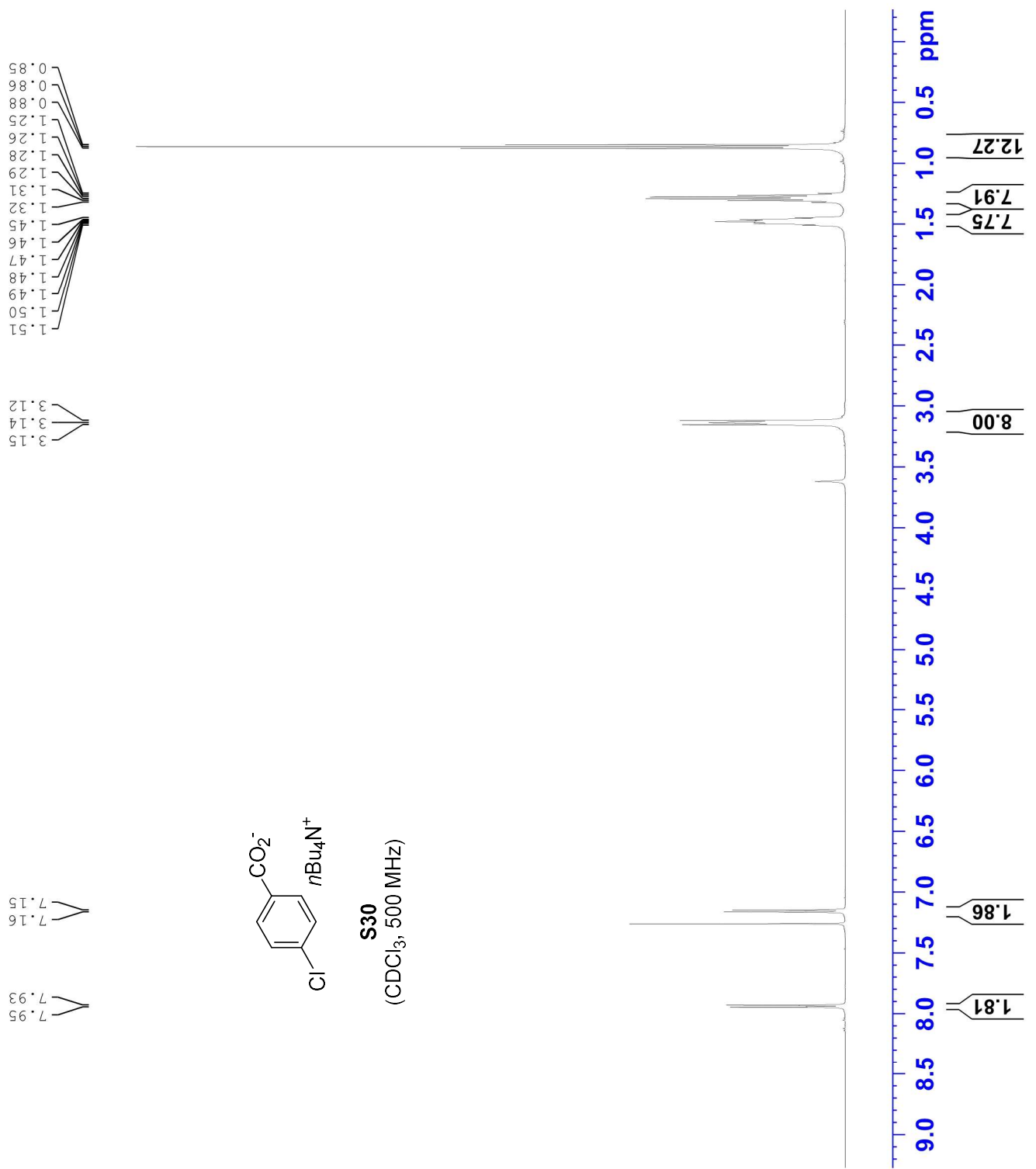
F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-2-44
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 15.54
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 6
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 25.24
 DW 50.000 usec
 DE 6.50 usec
 TE 295.7 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700130 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



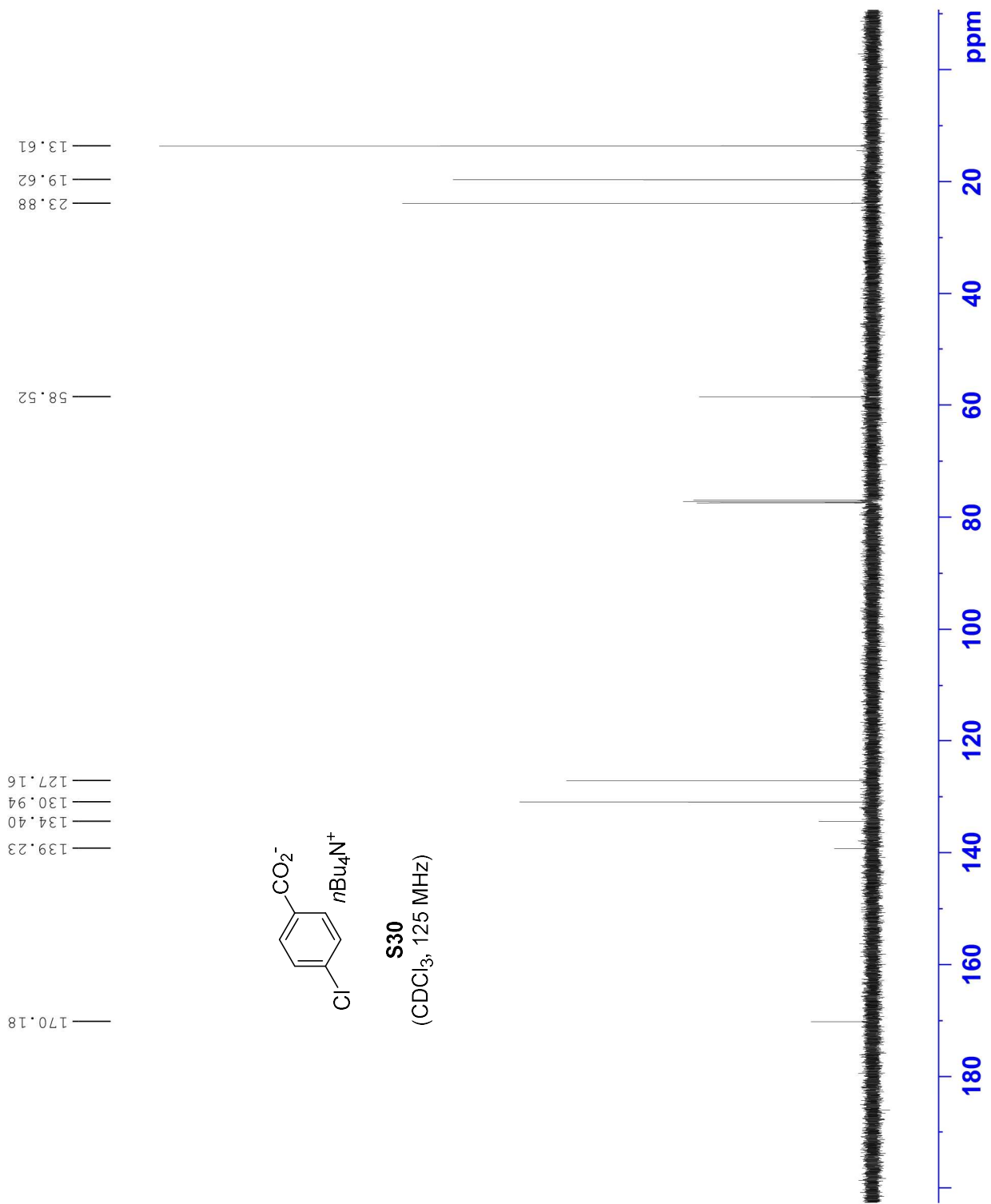
Current Data Parameters
 NAME Yh-2-44
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 15.58
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 4
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 295.8 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-2-51-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180829
 Time_ 19.37
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 71.78
 DW 50.000 usec
 DE 10.000 usec
 TE 294.2 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

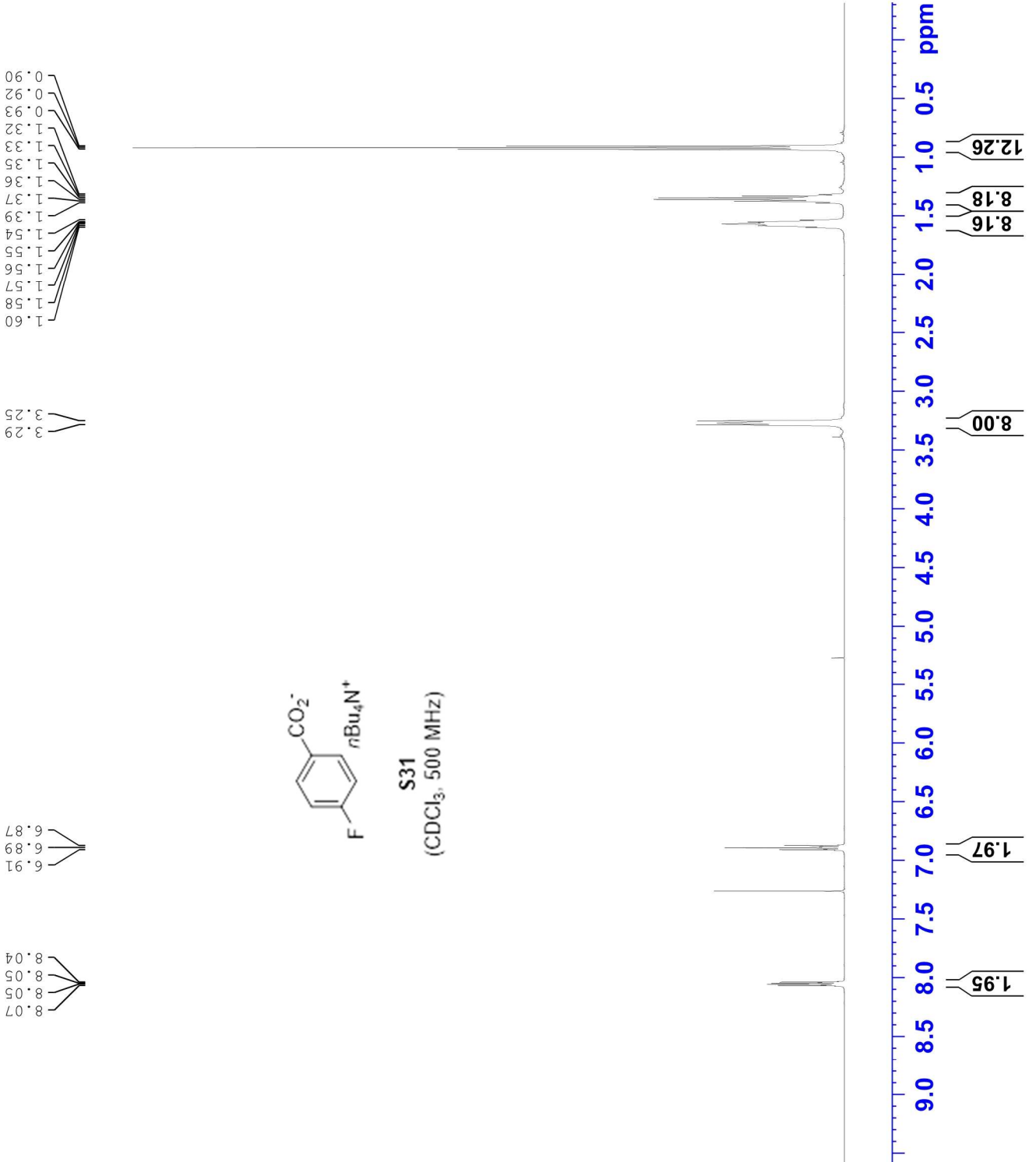
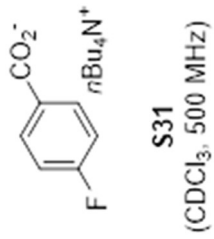
F2 - Processing parameters
 SI 65536
 SF 500.1300143 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1.60
1.58
1.57
1.56
1.55
1.54
1.39
1.37
1.36
1.35
1.34
1.33
1.32
1.31
1.30
1.29
1.28
1.27
1.26
1.25
1.24
1.23
1.22
1.21
1.20

3.29
3.25

6.91
6.89
6.87

8.07
8.05
8.05
8.05
8.04



Current Data Parameters
 NAME Yh-2-51-a
 EXPNO 2
 PROCNO 2

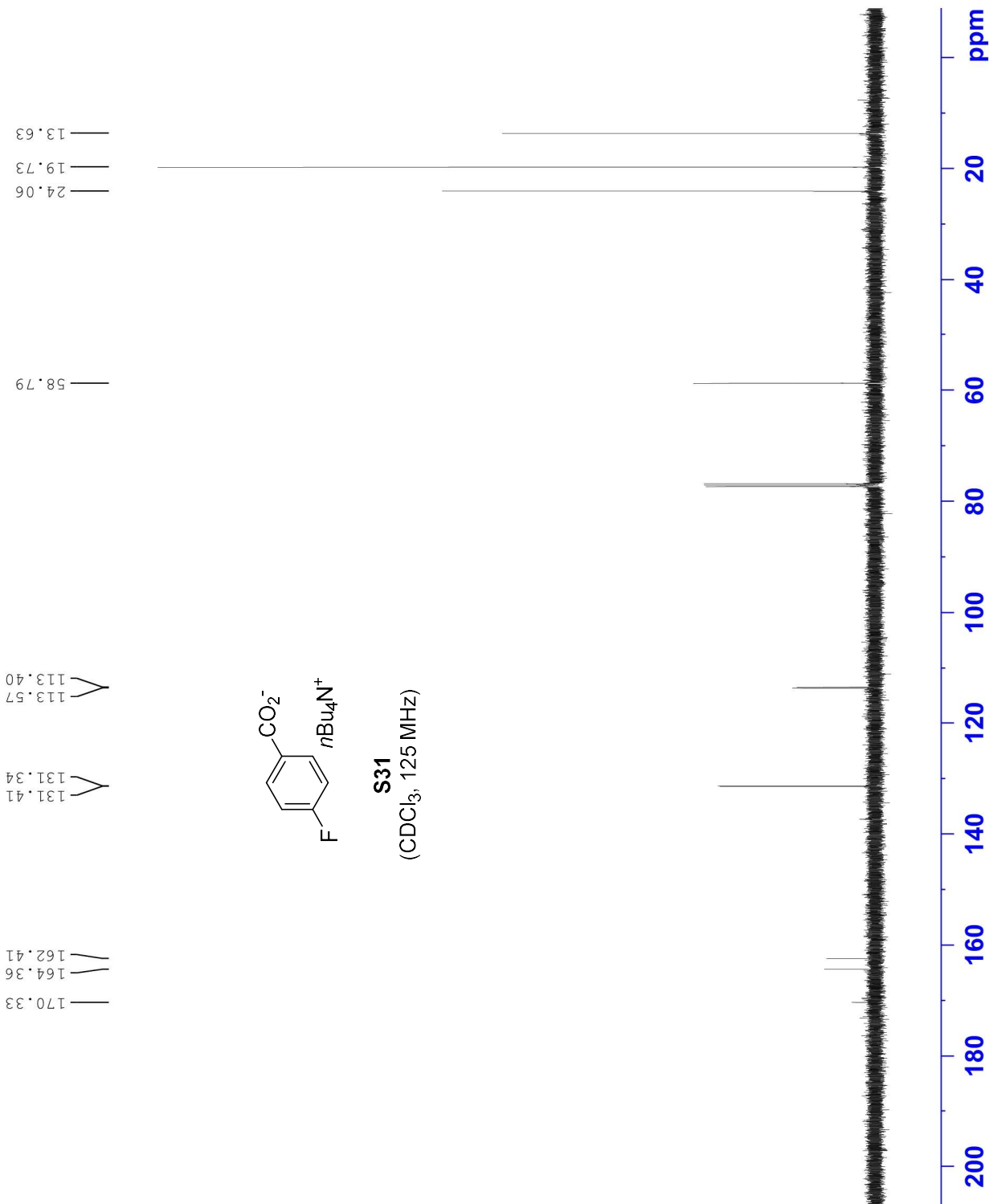
F2 - Acquisition Parameters

Date_ 20180829
 Time_ 19.56
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 52
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

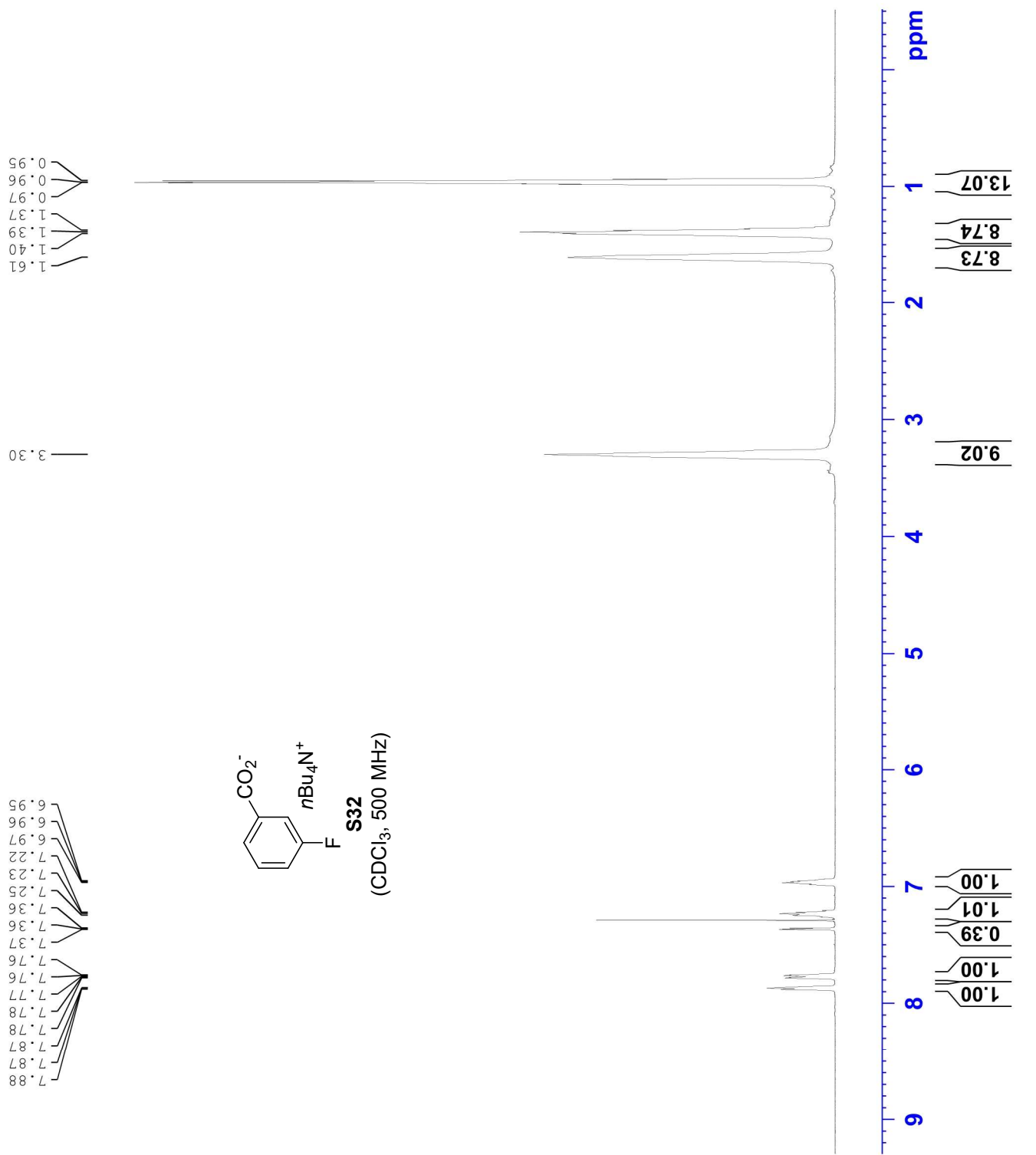


Current Data Parameters
 NAME Yh-2-66-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180829
 Time_ 22.43
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 79.04
 DW 50.000 usec
 DE 10.00 usec
 TE 294.2 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300000 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



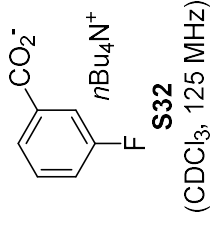
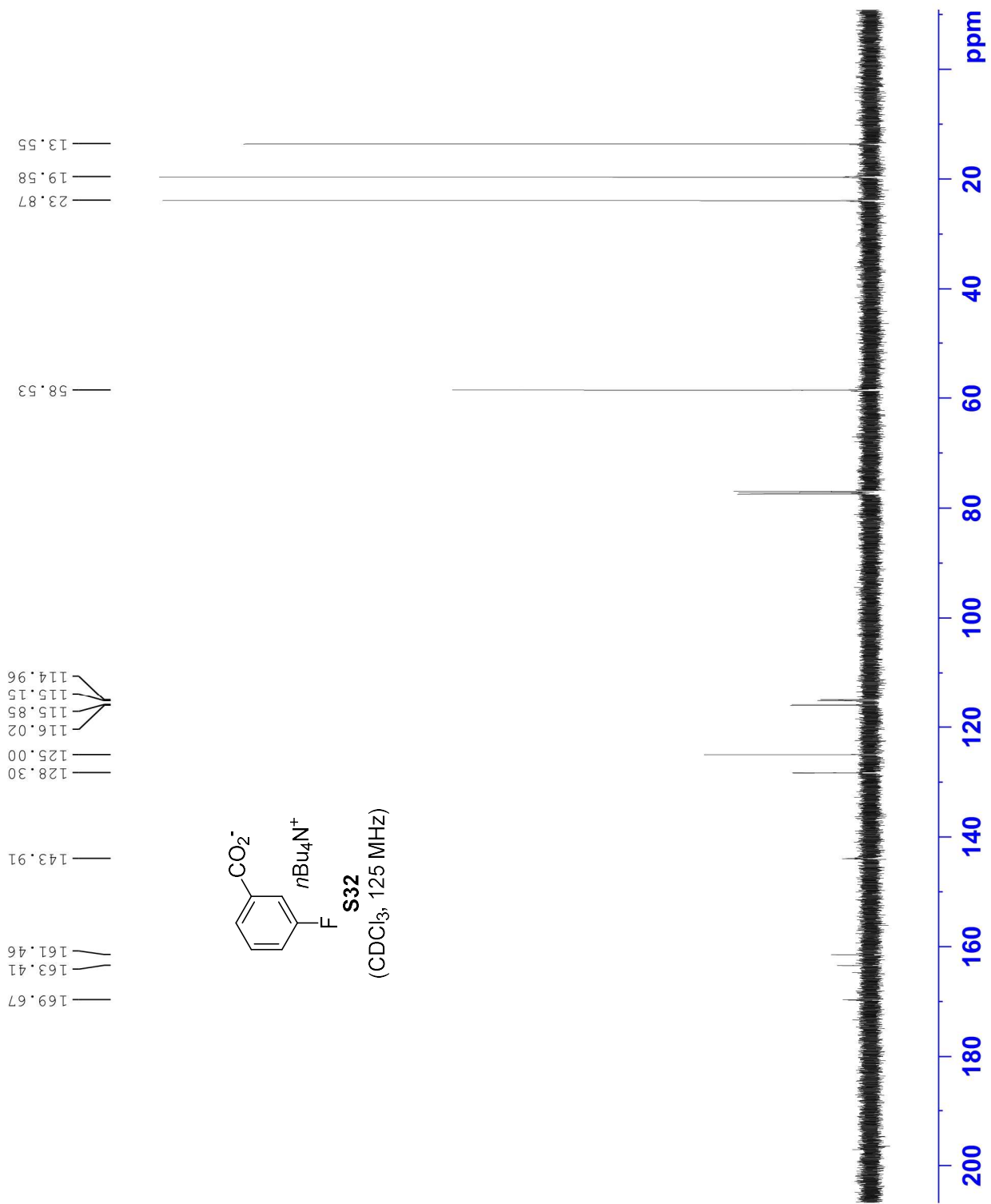
Current Data Parameters
 NAME Yh-2-66
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180827
 Time_ 13.47
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 43
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.4 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



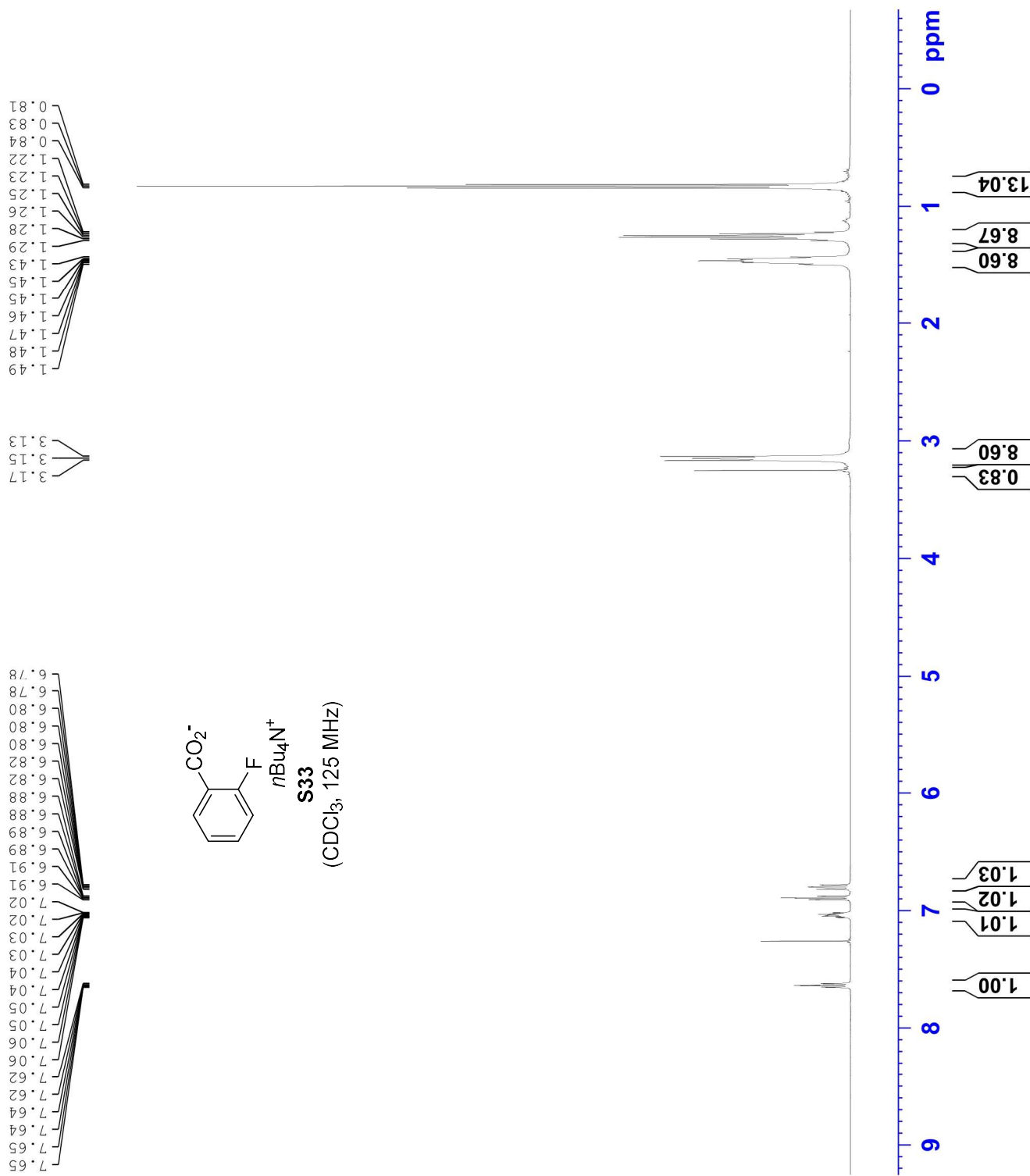
Current Data Parameters
 NAME yh-2-33
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180814
 Time_ 14.28
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 20.66
 DW 50.000 usec
 DE 10.00 usec
 TE 294.3 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300150 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



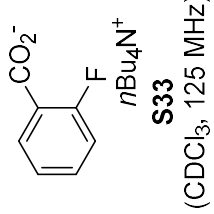
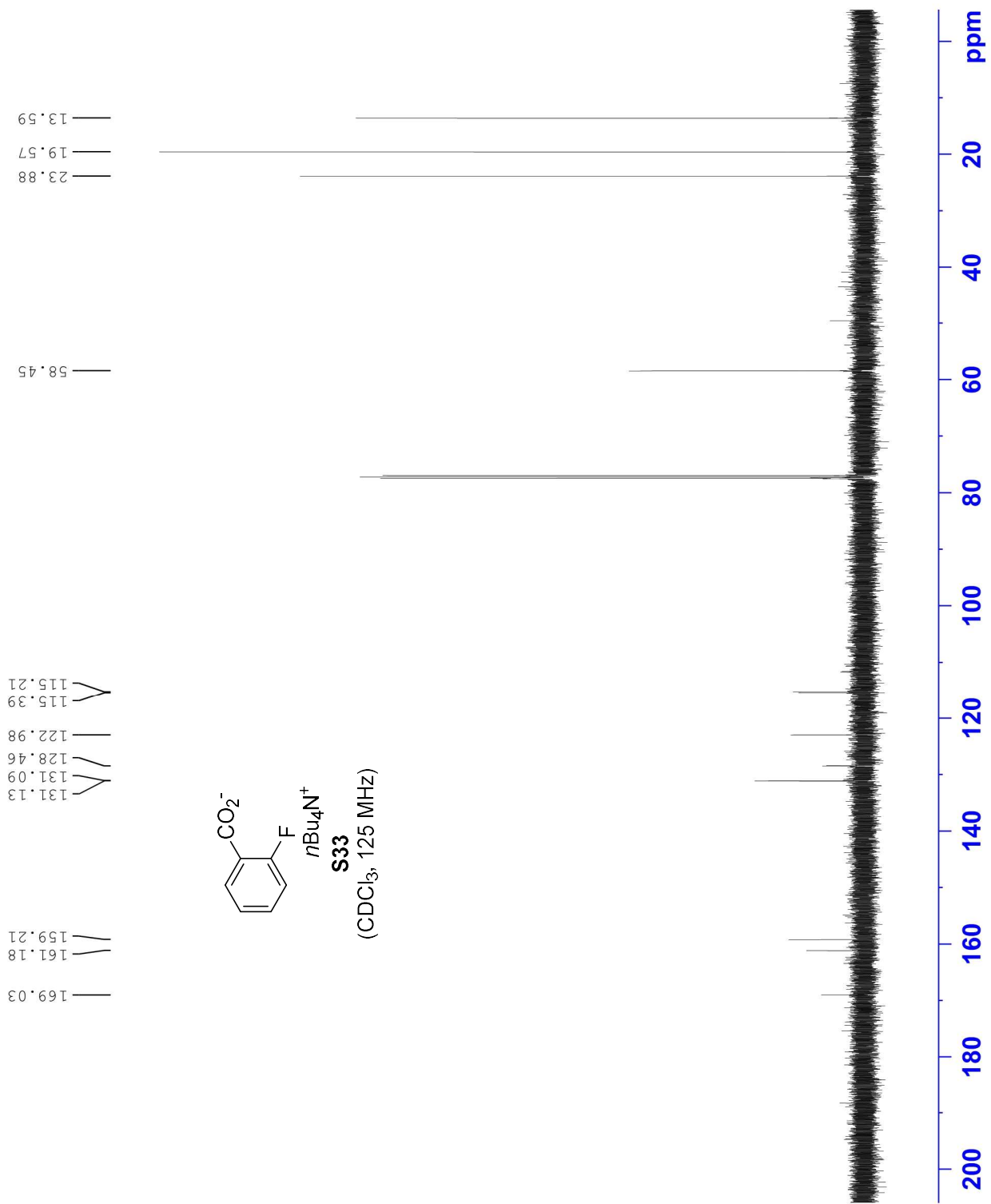
Current Data Parameters
 NAME Yh-2-33
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 14.55
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 17
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 4.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 3.33 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

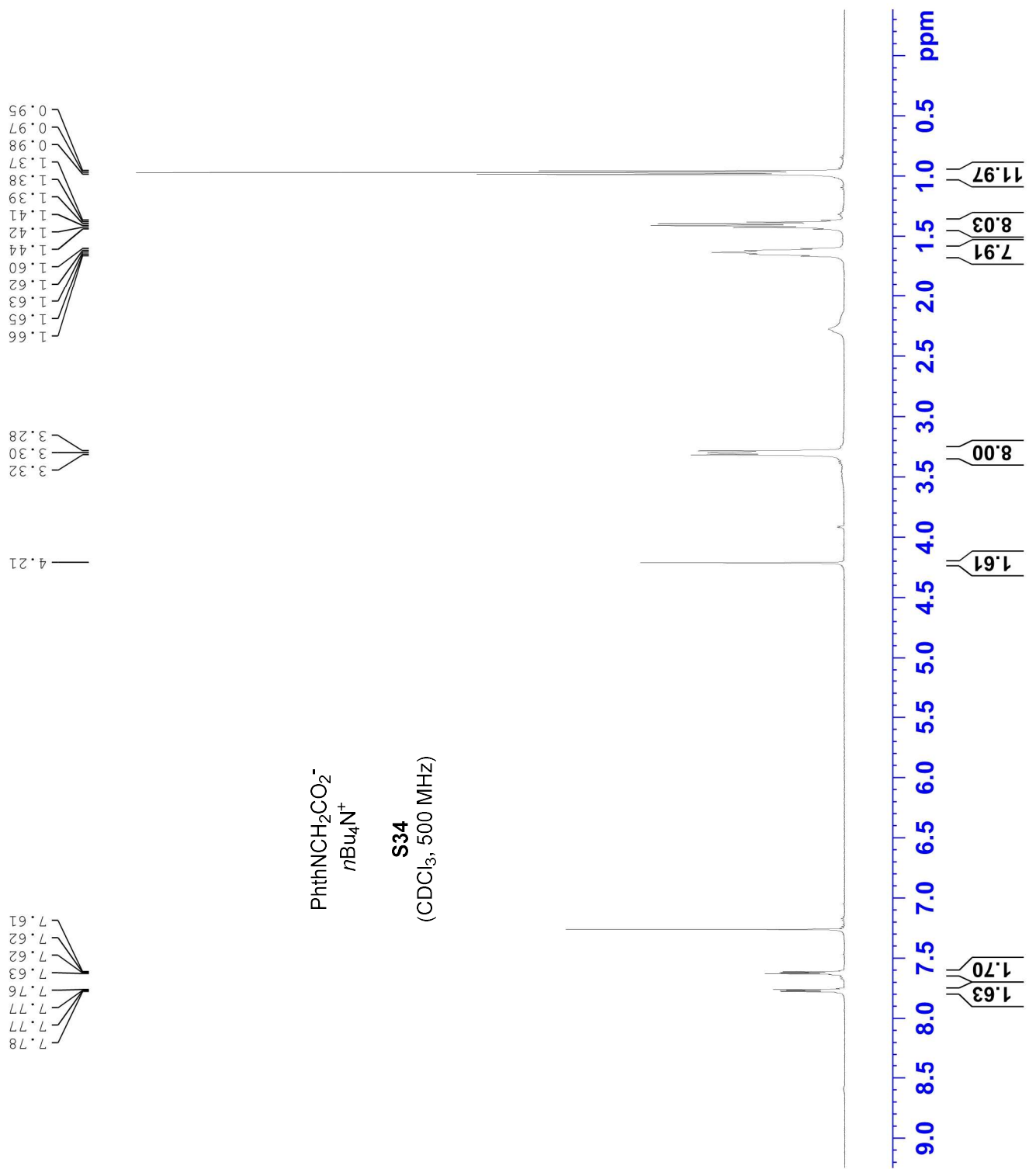


Current Data Parameters
 NAME glycinate
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190715
 Time_ 11.52
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 159.35
 DW 50.000 usec
 DE 6.50 usec
 TE 295.7 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700120 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



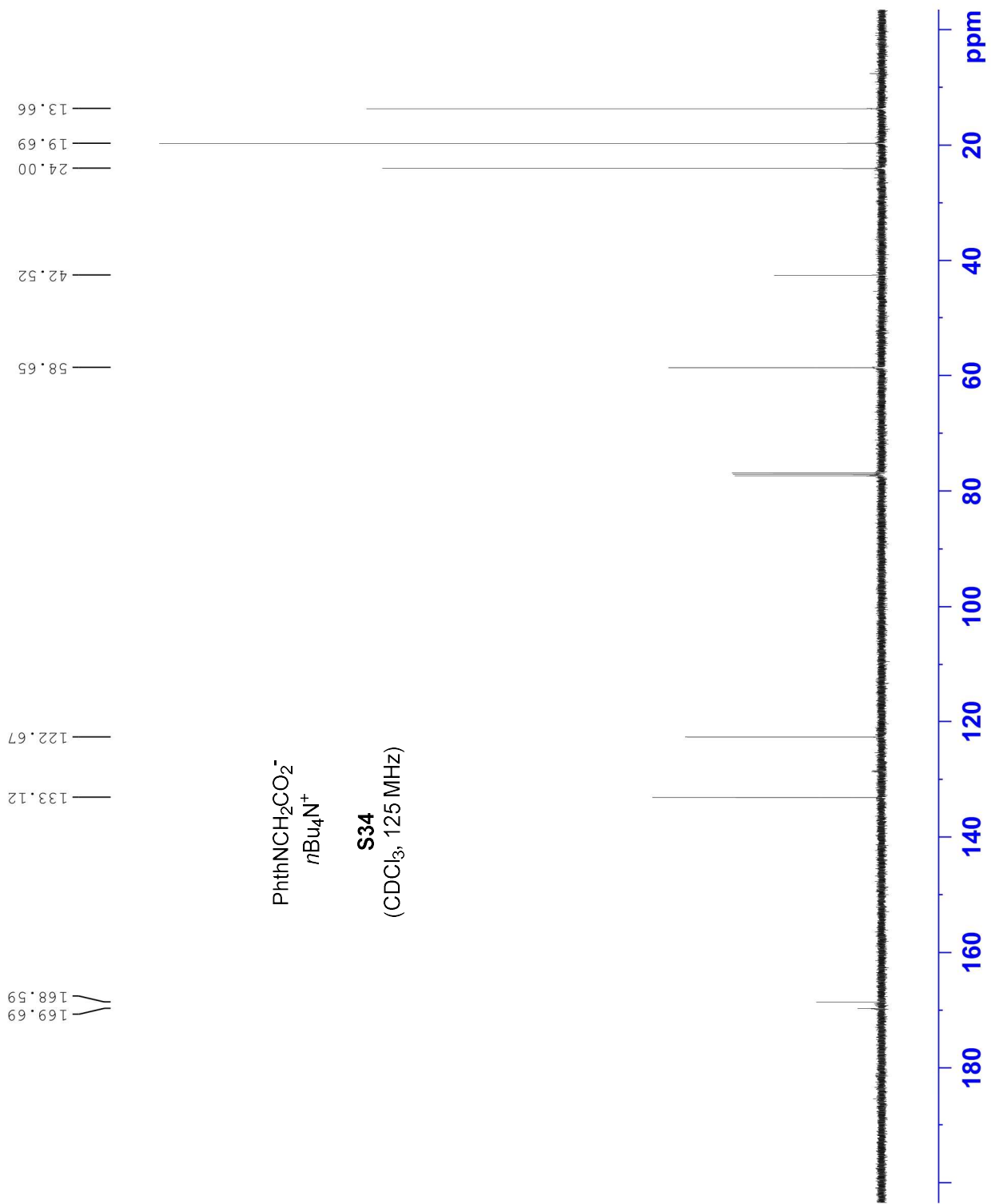
Current Data Parameters
 NAME glycinate
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20190715
 Time_ 12.27
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 102
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.5 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-2-23
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180829
 Time_ 11.09
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zg
 TD 44998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 7500.000 Hz
 FIDRES 0.166674 Hz
 AQ 2.9998667 sec
 RG 16
 DW 66.667 usec
 DE 71.43 usec
 TE 295.0 K
 D1 3.0000000 sec
 TD0 1

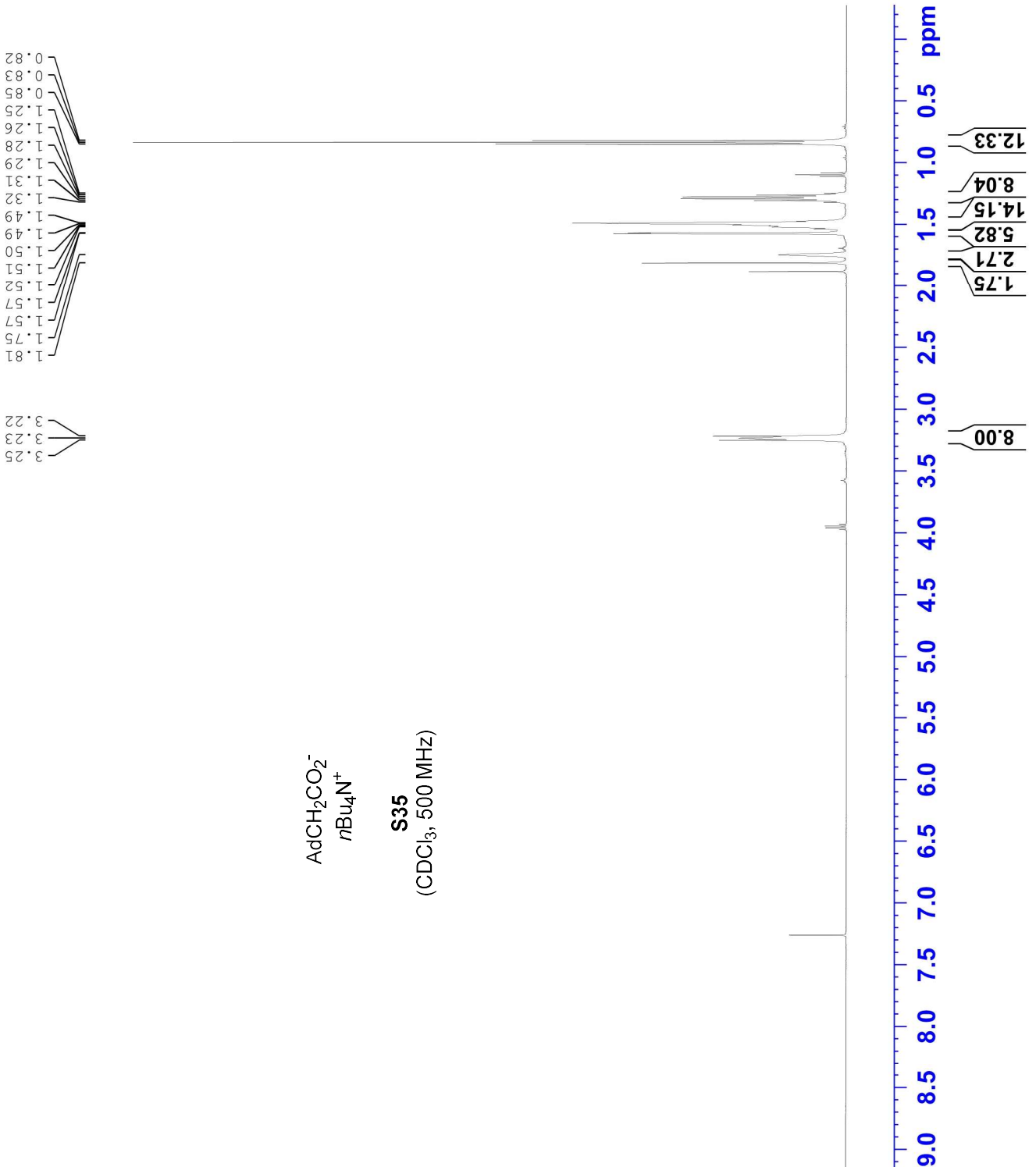
==== CHANNEL f1 =====
 NUC1 1H
 P1 14.50 usec
 PL1 0 dB
 PL1W 24.54113007 W
 SFO1 500.1330008 MHz

F2 - Processing parameters
 SI 32768
 SF 500.1300168 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1.81
1.75
1.57
1.57
1.52
1.51
1.50
1.49
1.49
1.32
1.31
1.29
1.28
1.26
1.25
1.25
1.00
1.00
1.00
1.00
1.00
1.00

3.25
3.23
3.22

AdCH₂CO₂⁻
*n*Bu₄N⁺
S35
 (CDCl₃, 500 MHz)



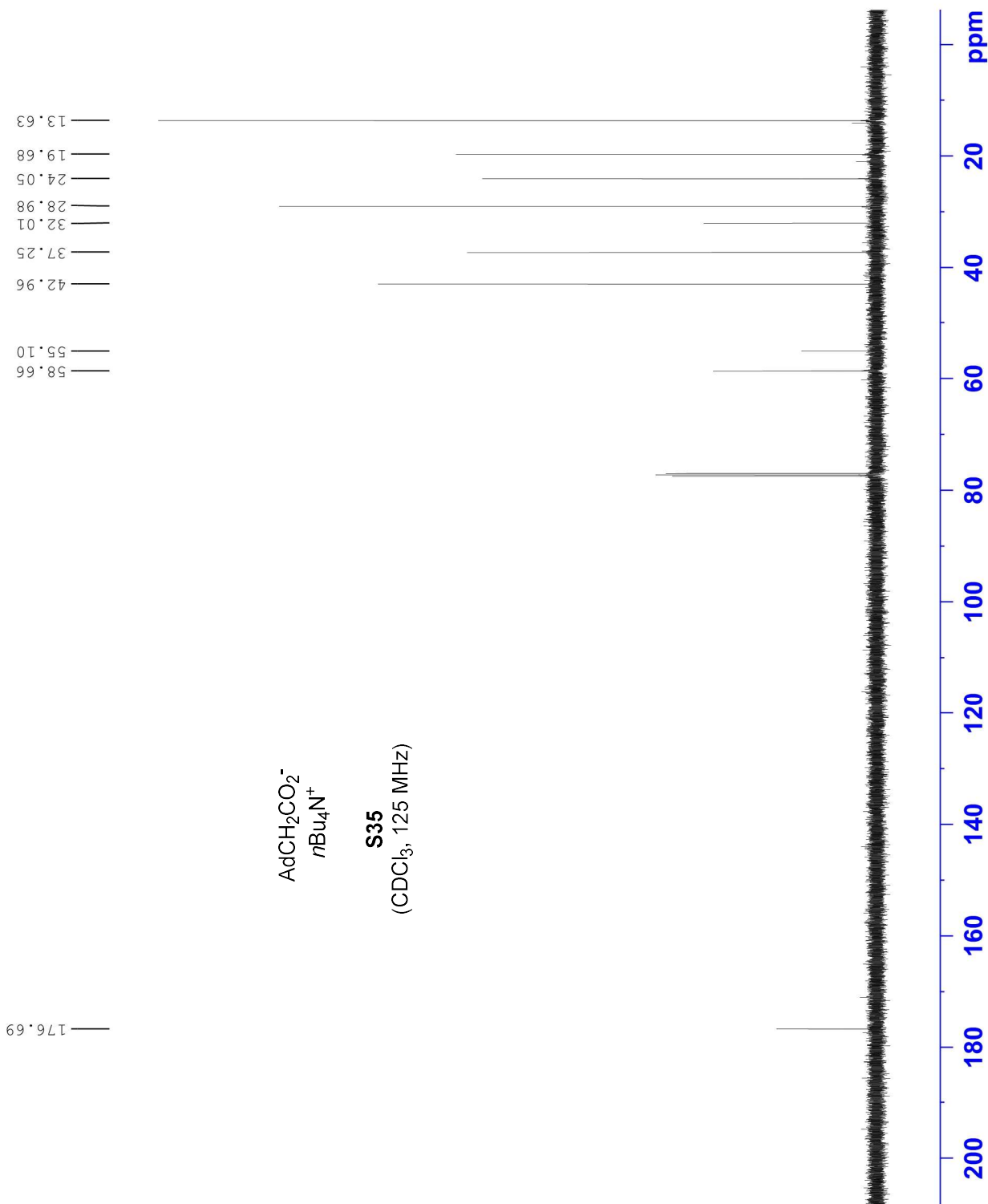
Current Data Parameters
 NAME yh-2-23
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180829
 Time_ 11.15
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 295.3 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 9.90 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-2-71
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

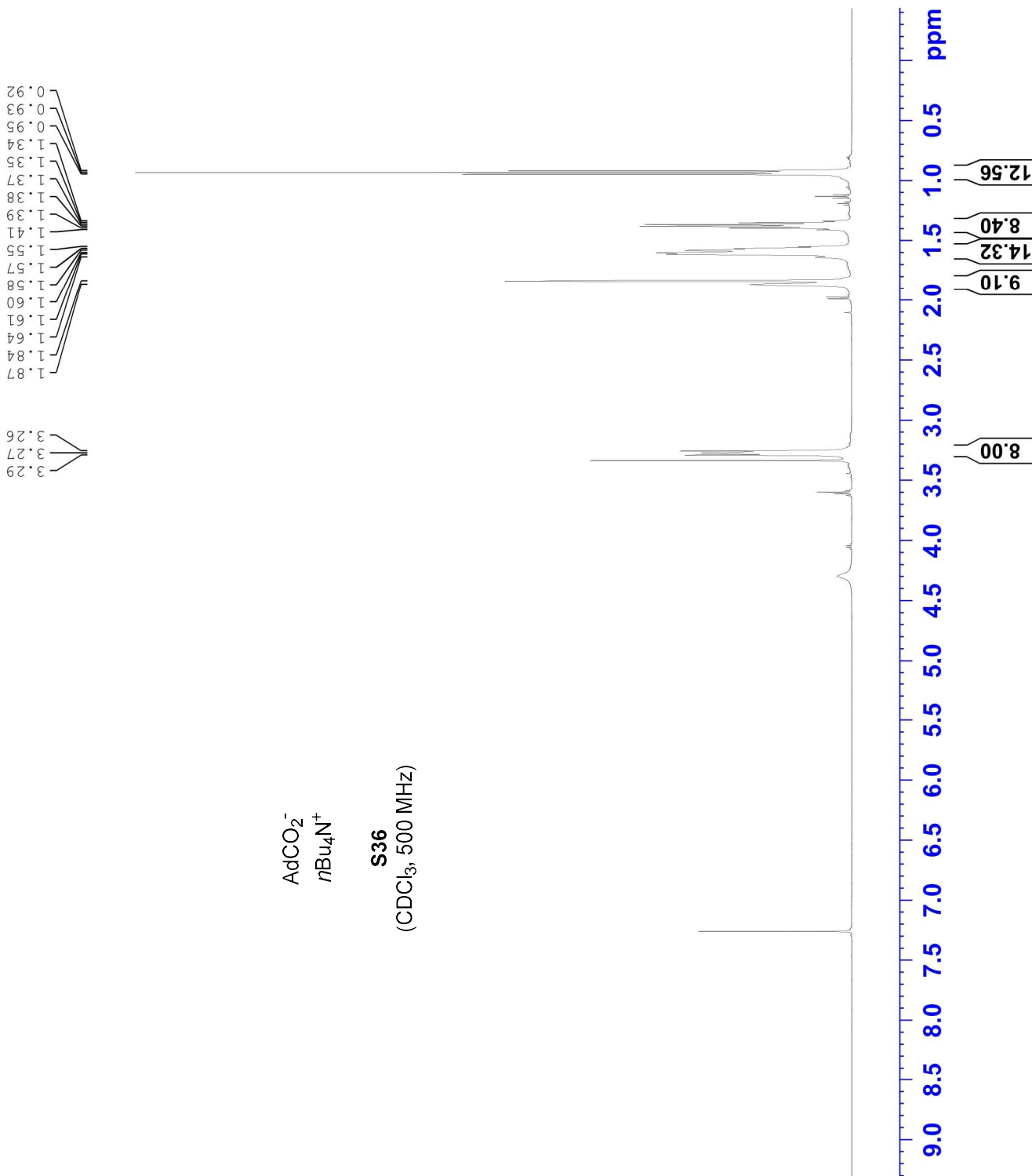
Date_ 20180814
 Time_ 22.35
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 22.37
 DW 50.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700132 MHz
 EM
 WDW 0
 SSB 0.30 Hz
 LB 0
 GB 0
 PC 1.00

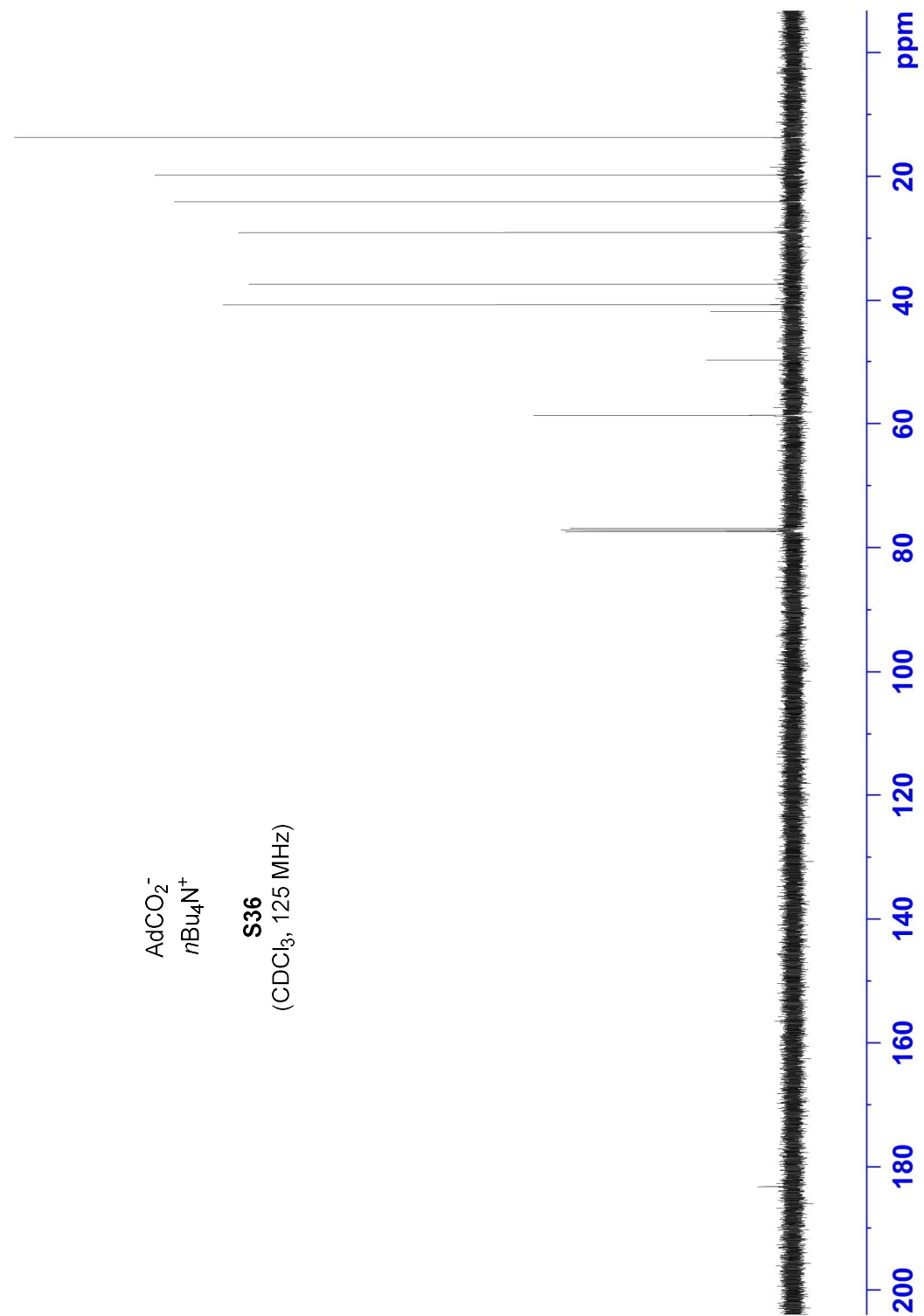
3.26
 3.27
 3.29
 1.87
 1.84
 1.64
 1.61
 1.60
 1.58
 1.57
 1.55
 1.41
 1.39
 1.38
 1.38
 1.37
 1.35
 1.34
 1.31
 1.29
 1.28
 1.27
 1.26

AdCO₂⁻
 nBu₄N⁺
S36
 (CDCl₃, 500 MHz)



183.17

58.70
49.76
41.80
40.69
37.36
29.03
24.07
19.74
13.71



AdCO₂⁻
*n*Bu₄N⁺
S36
 (CDCl₃, 125 MHz)

Current Data Parameters
 NAME Yh-2-71
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 22.40
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 7
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-3-15
 EXPNO 1
 PROCNO 1

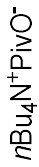
F2 - Acquisition Parameters

Date_ 20180815
 Time_ 20.23
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 19.64
 DW 50.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 4.0000000 sec
 TD0 1

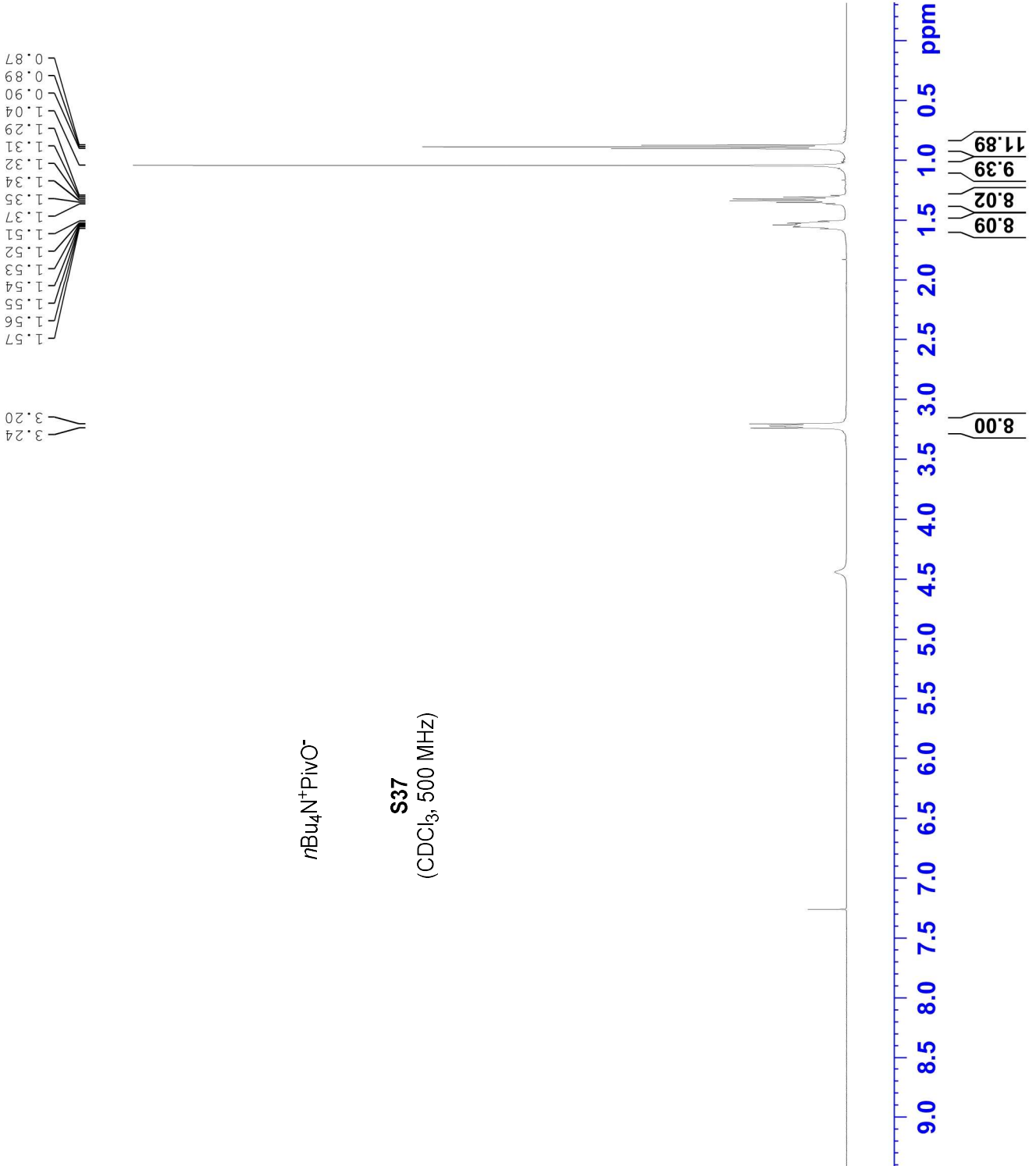
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700134 MHz
 EM
 WDW 0
 SSB 0.30 Hz
 LB 0
 GB 0
 PC 1.00

3.24
 3.20
 1.57
 1.56
 1.55
 1.54
 1.53
 1.52
 1.51
 1.37
 1.35
 1.34
 1.31
 1.29
 1.04
 0.90
 0.89
 0.87



S37
 (CDCl_3 , 500 MHz)



183.44

58.59

39.52

28.91

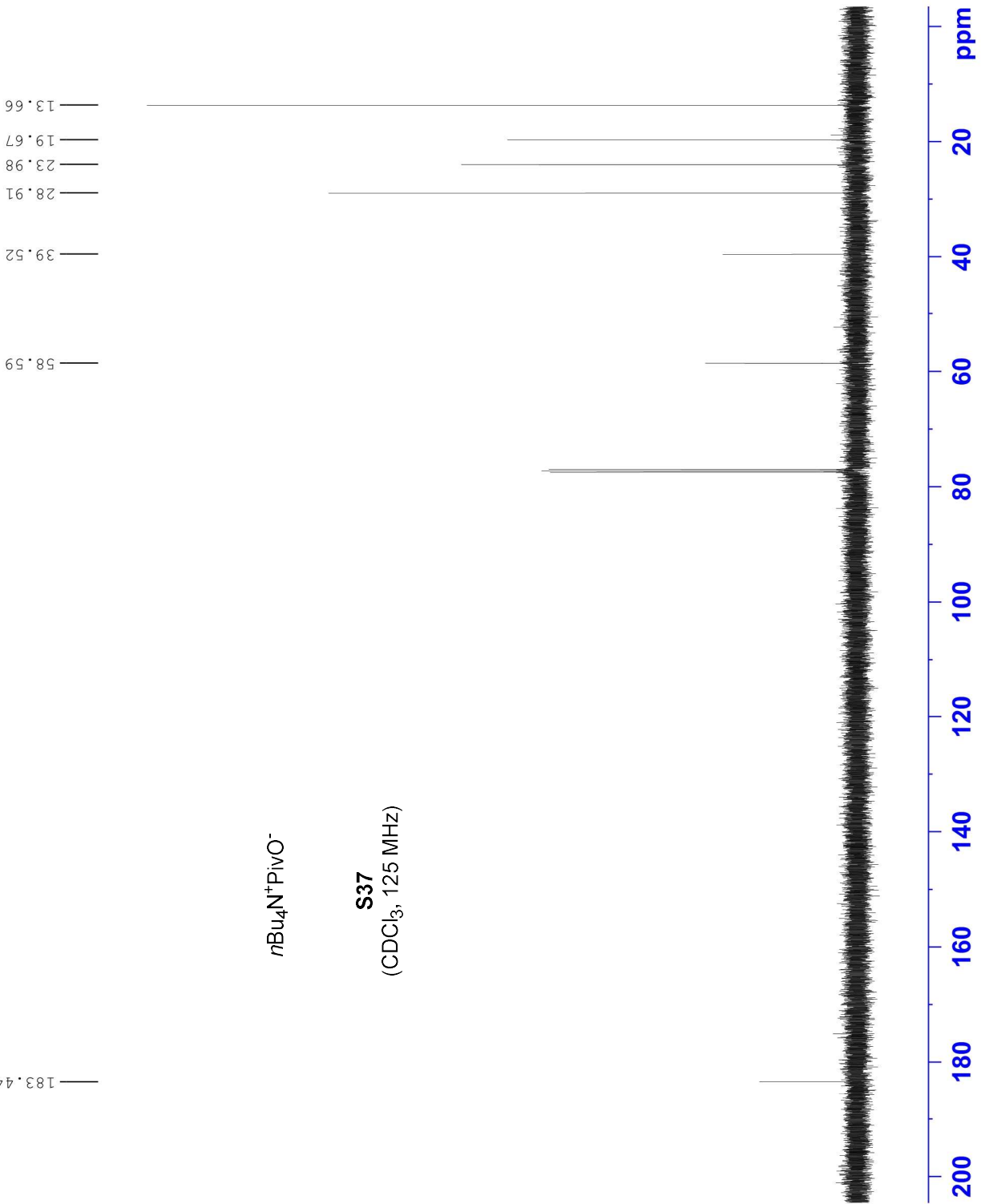
23.98

19.67

13.66

$n\text{Bu}_4\text{N}^+\text{PivO}^-$

S37
(CDCl_3 , 125 MHz)



Current Data Parameters
 NAME Yh-3-15
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180815
 Time 20.38
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 294.4 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 9.90 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

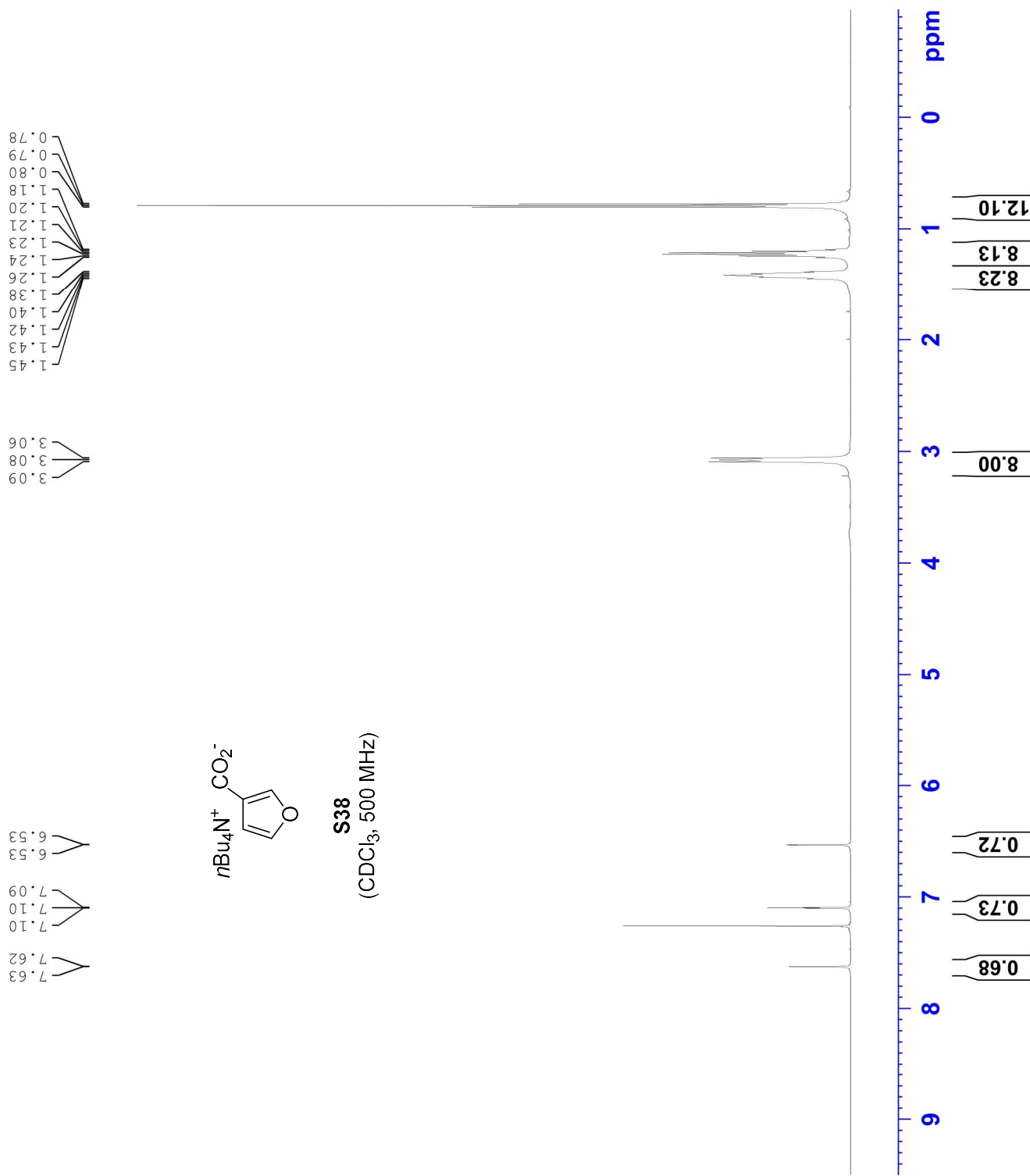
F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-2-139
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180814
 Time_ 22.52
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 5.87
 DW 50.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700140 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-2-139
 EXPNO 2
 PROCNO 2

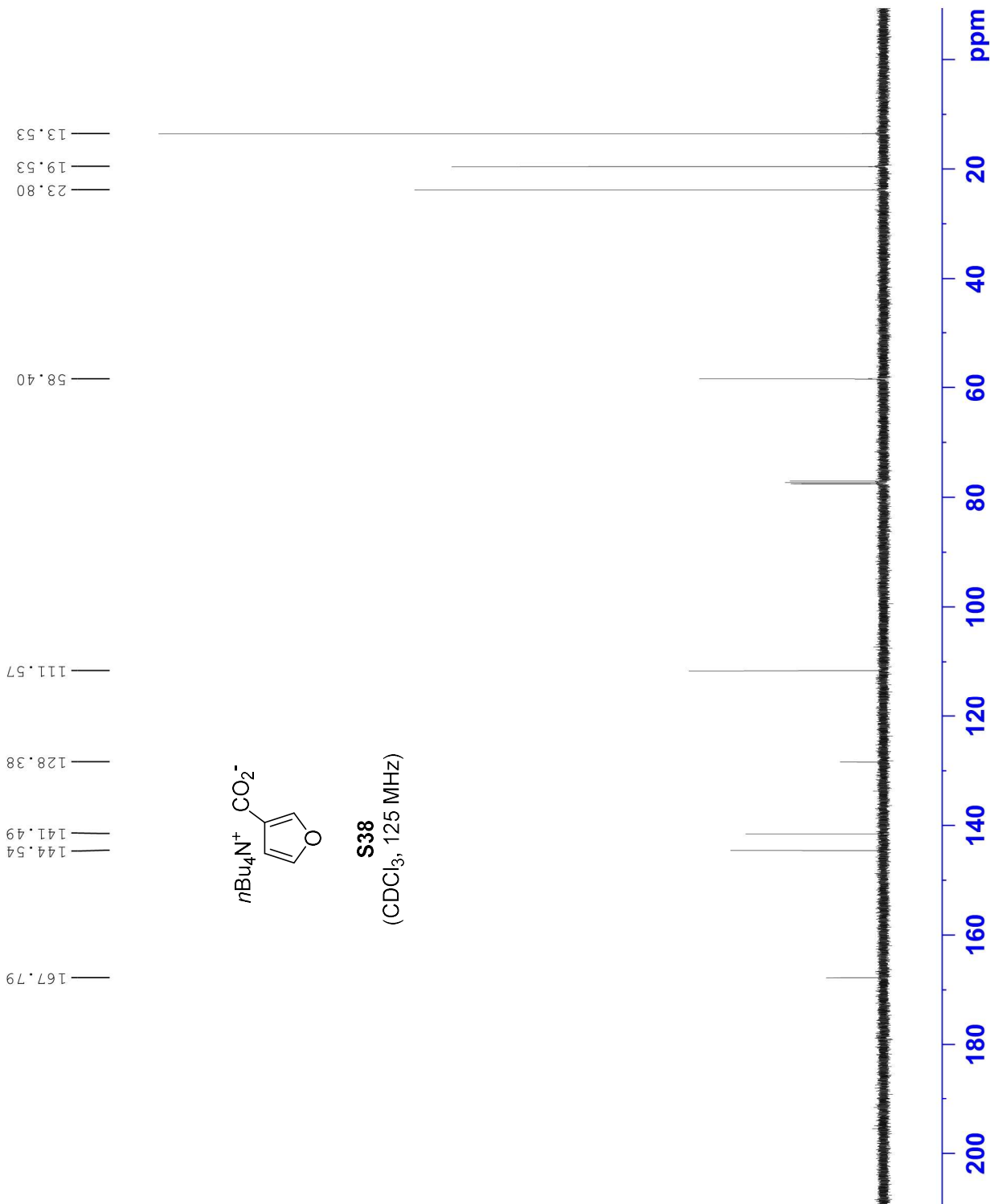
F2 - Acquisition Parameters

Date_ 20180814
 Time_ 22.55
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SF02 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



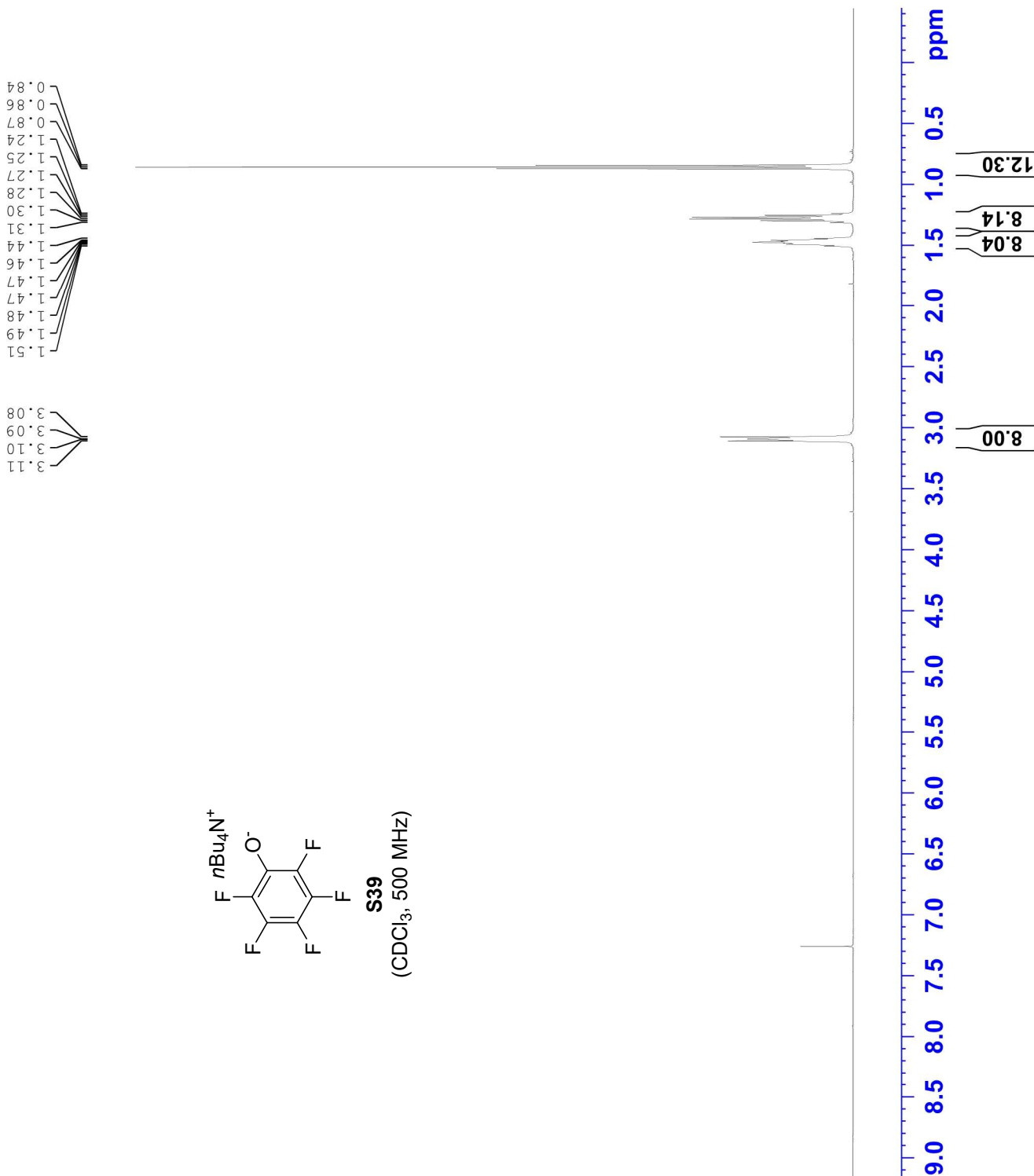
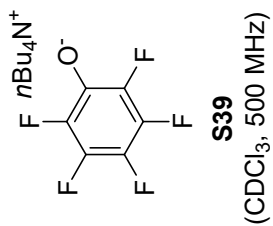
Current Data Parameters
 NAME Yh-2-61-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180829
 Time_ 15.56
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zg
 TD 44998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 7500.000 Hz
 FIDRES 0.166674 Hz
 AQ 2.9998667 sec
 RG 22.6
 DW 66.667 usec
 DE 71.43 usec
 TE 295.2 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 1H
 P1 14.50 usec
 PL1 0 dB
 PL1W 24.54113007 W
 SFO1 500.1330008 MHz

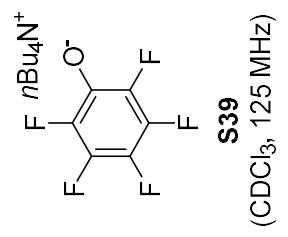
F2 - Processing parameters
 SI 32768
 SF 500.1300156 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.11
3.10
3.09
3.08
1.51
1.49
1.48
1.47
1.47
1.46
1.44
1.31
1.30
1.28
1.27
1.25
1.24
0.87
0.86
0.84



147.28
142.22
140.39
139.83
139.77
138.02
137.98
137.93
137.88
127.00

58.55
23.76
19.53
13.43



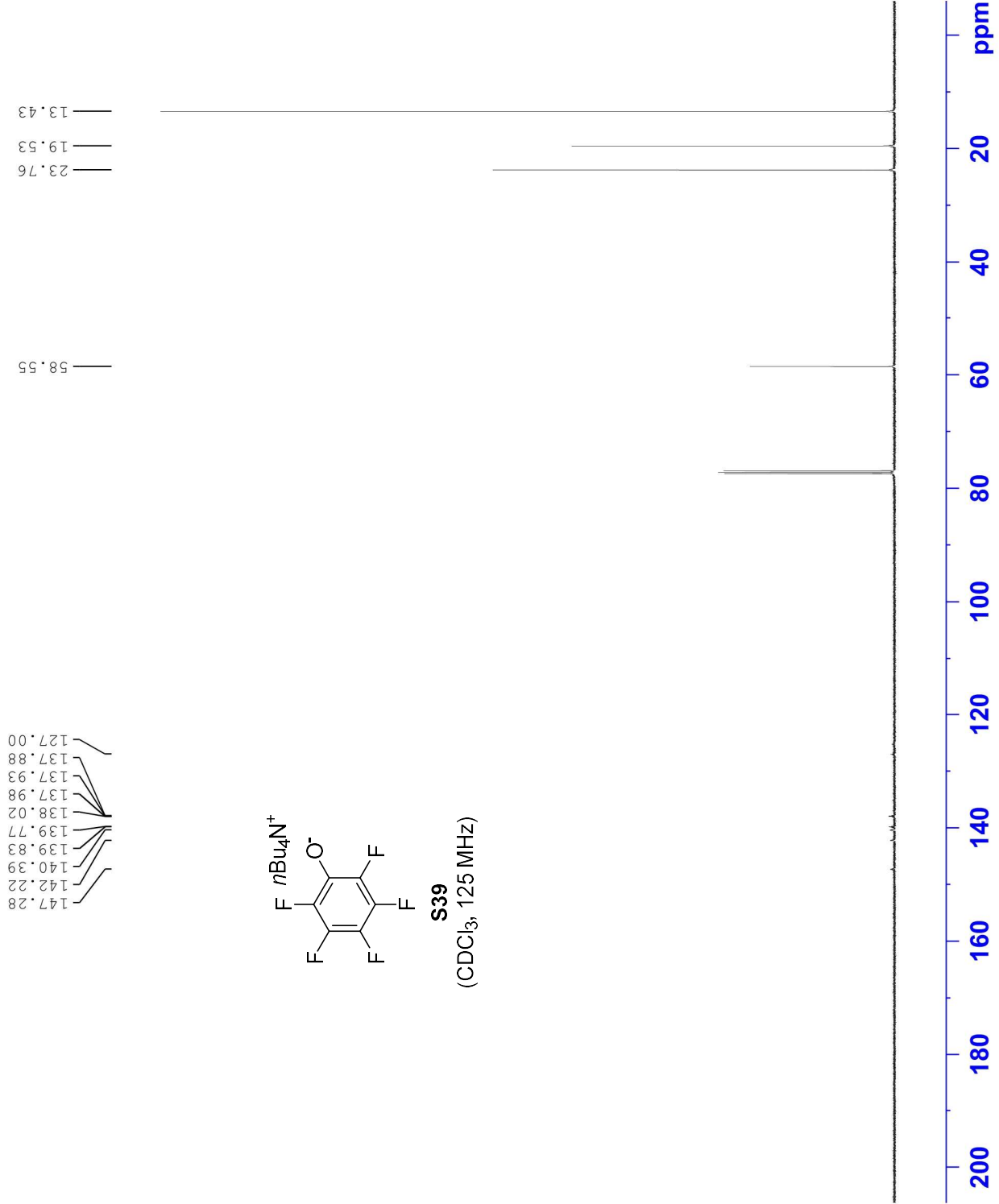
Current Data Parameters
 NAME yh-2-61-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180829
 Time 16.23
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 100
 DS 0
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 296.0 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 9.90 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SF01 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME HOBt salt
 EXPNO 2
 PROCNO 2

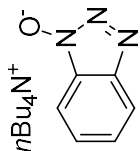
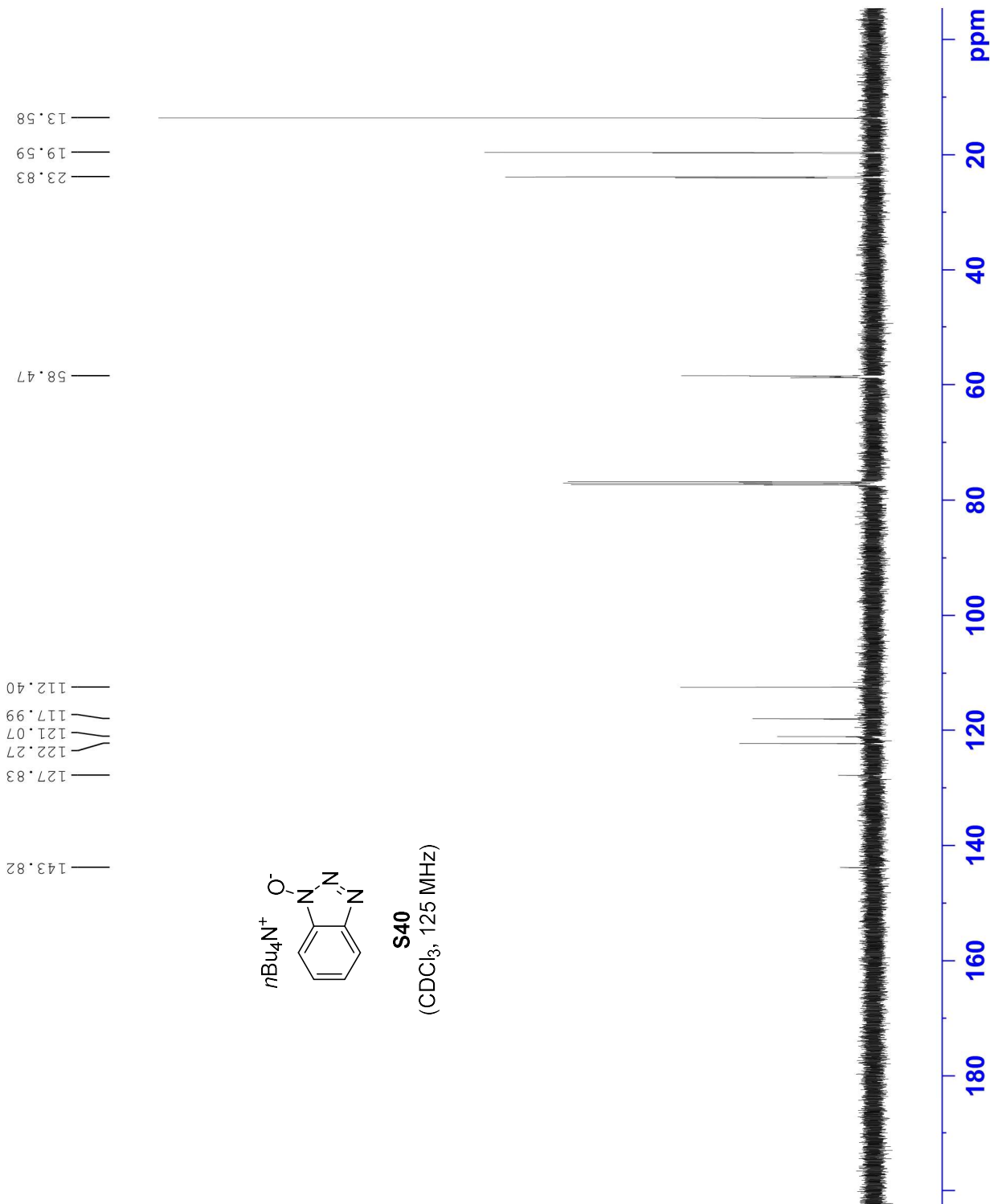
F2 - Acquisition Parameters

Date_ 20190930
 Time_ 16.46
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 151
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.0 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



S40
 (CDCl₃, 125 MHz)

Current Data Parameters
 NAME acetate product
 EXPNO 1
 PROCNO 1

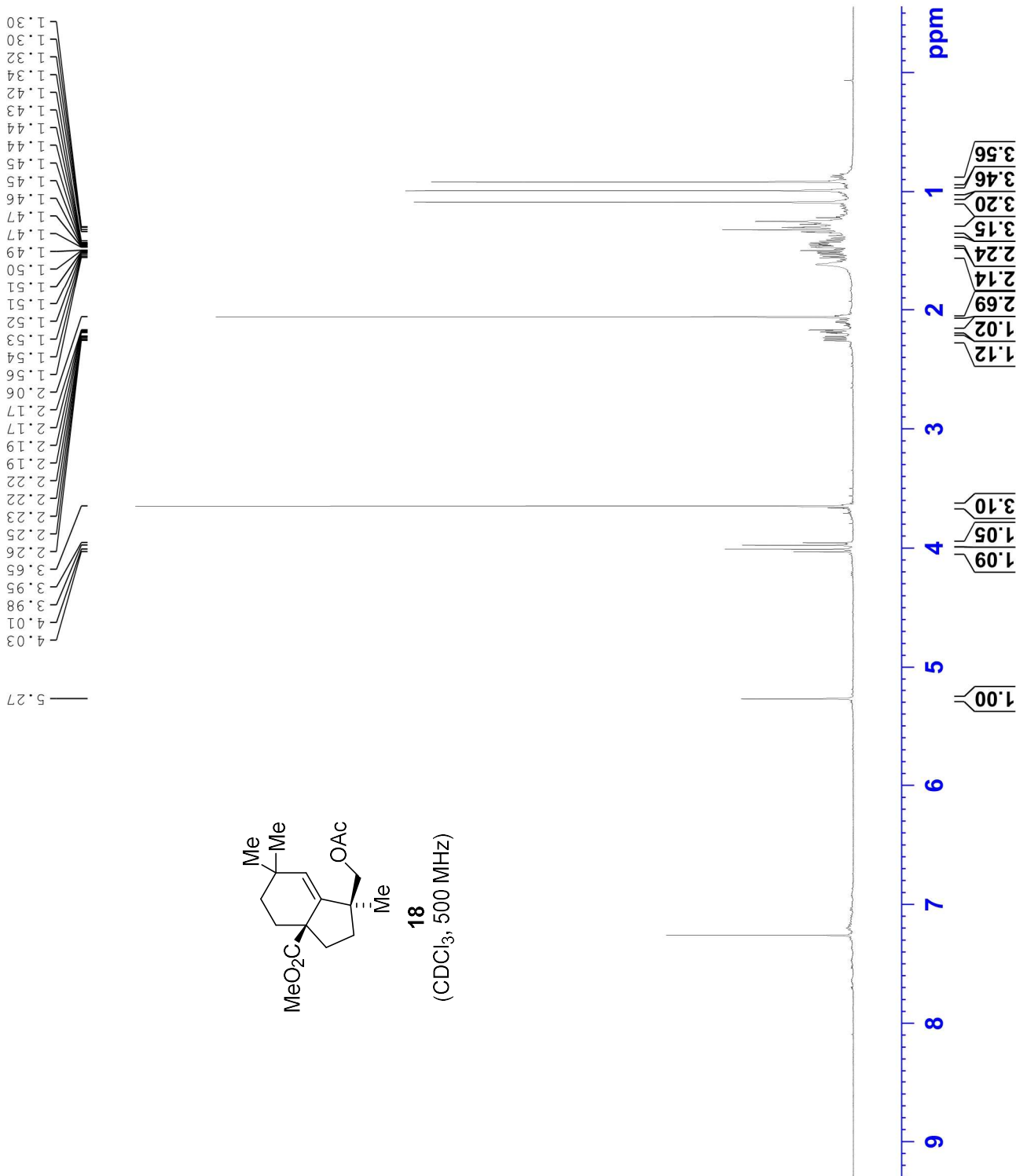
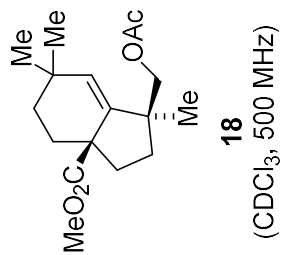
F2 - Acquisition Parameters

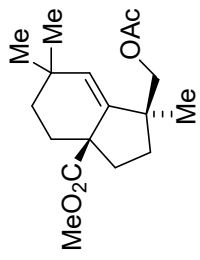
Date_ 20180820
 Time_ 15.39
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 77.07
 DW 50.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 EM
 WDW 0
 SSB 0.30 Hz
 LB 0
 GB 0
 PC 1.00

4.03
4.01
3.98
3.95
3.65
2.26
2.25
2.23
2.22
2.22
2.22
2.19
2.19
2.17
2.17
2.06
1.56
1.54
1.53
1.52
1.51
1.51
1.50
1.49
1.47
1.47
1.46
1.45
1.45
1.44
1.44
1.43
1.42
1.34
1.32
1.30
1.30





18
(CDCl₃, 125 MHz)

Current Data Parameters
 NAME acetate product
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180820
 Time_ 15.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 159
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.3 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-7-35-b
 EXPNO 1
 PROCNO 1

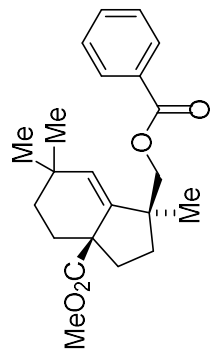
F2 - Acquisition Parameters

Date_ 20191005
 Time_ 15.10 h
 INSTRUM spect
 PROBHD Z113652_0187 (
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.333344 Hz
 AQ 2.9999001 sec
 RG 37.92
 DW 50.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 3.0000000 sec
 TD0 1
 SFO1 499.8730869 MHz
 NUC1 ¹H
 P1 10.75 usec
 PLW1 18.2500000 W

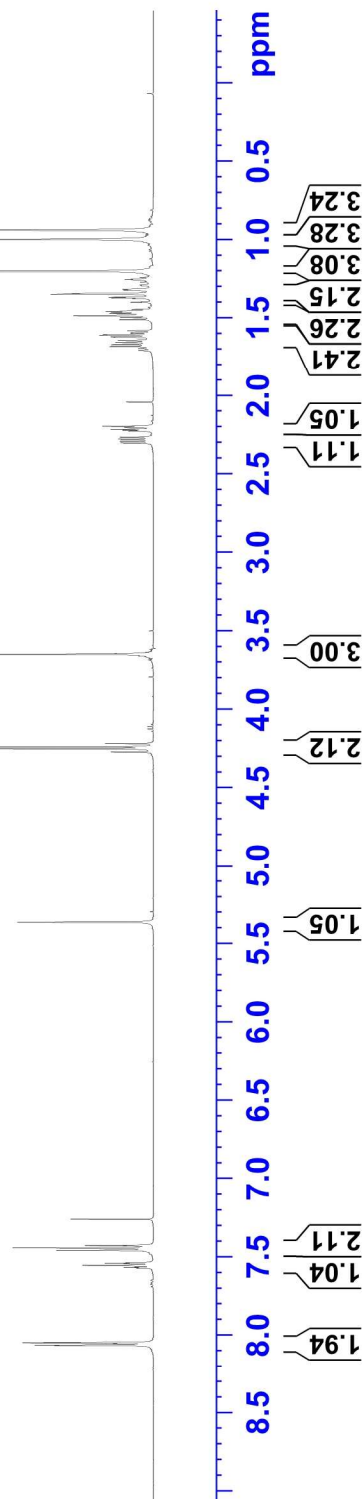
F2 - Processing parameters

SI 65536
 SF 499.8700125 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

8.07
8.06
8.05
8.05
7.57
7.57
7.57
7.55
7.55
7.54
7.54
7.54
7.46
7.44
7.43
5.36
5.36
4.27
4.25
4.24
4.22
3.65
2.30
2.29
2.29
2.28
2.28
2.27
2.23
2.22
2.22
2.20
2.20
1.71
1.70
1.68
1.67
1.66
1.64
1.62
1.62
1.61
1.61
1.60
1.59
1.58
1.58
1.51
1.50
1.49
1.47
1.46
1.46
1.45
1.40
1.38
1.37
1.37
1.35
1.34
1.34
1.32
1.20
1.00
0.94



19
 (CDCl₃, 500 MHz)



Current Data Parameters
 NAME Yh-7-35-b
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191005
 Time_ 15.28 h

INSTRUM spect
 PROBHD Z113652_0187 (
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 56
 DS 0

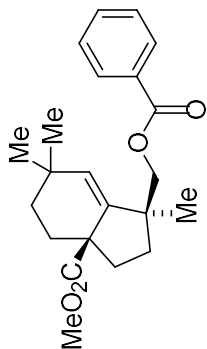
SWH 31250.000 Hz
 FIDRES 0.333340 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.7 K

D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1
 SF01 125.7049802 MHz
 NUC1 13C

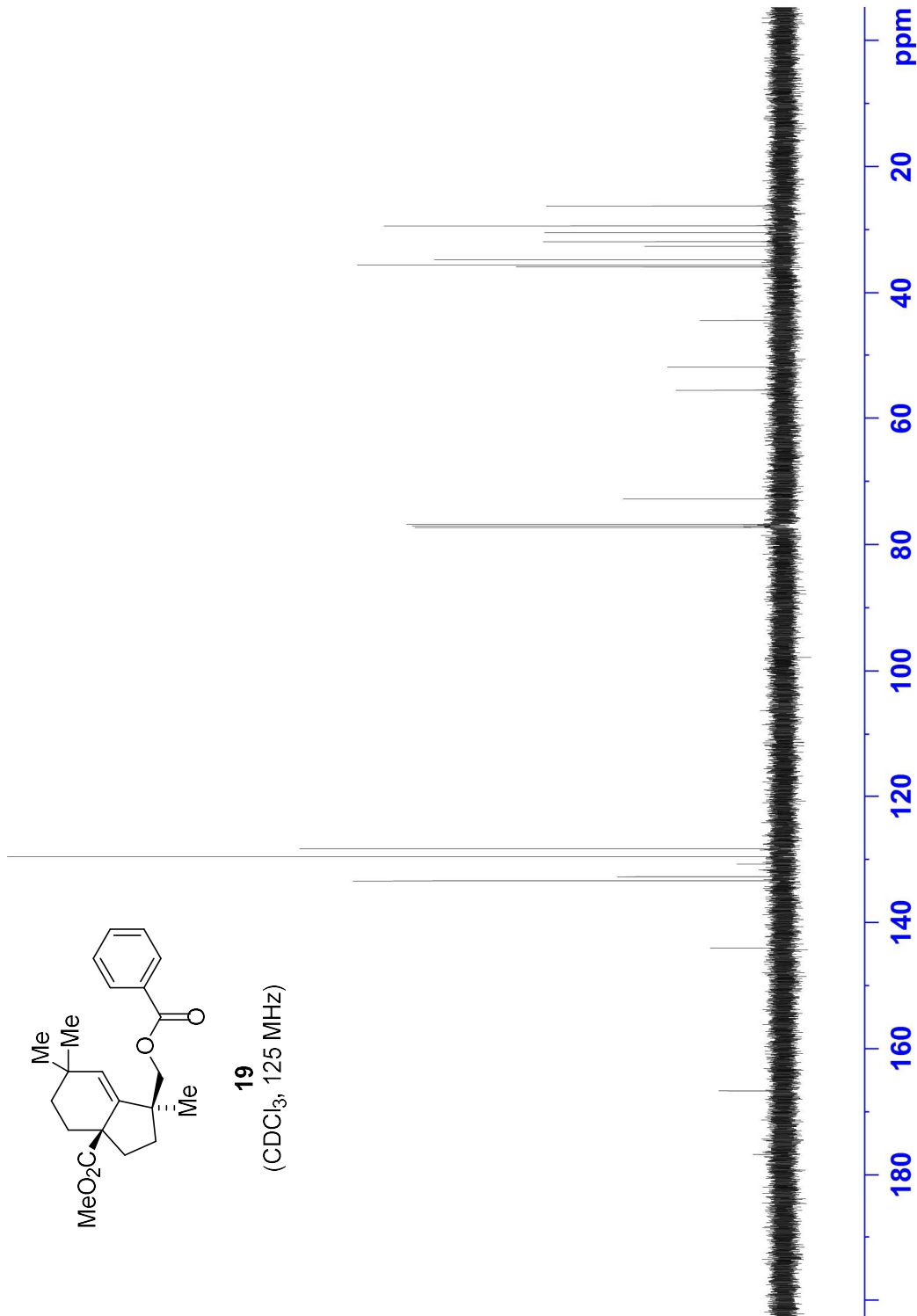
P1 10.00 usec
 PLW1 72.83999634 W
 SF02 499.8724993 MHz
 NUC2 1H
 CPDPRG12 waltz16
 PCPD2 80.00 usec
 PLW2 19.0000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

176.77
 166.69
 144.03
 133.36
 132.74
 130.72
 129.56
 128.32
 72.71
 55.54
 51.90
 44.39
 35.85
 35.57
 34.76
 32.60
 31.88
 30.49
 29.38
 26.24



19
 (CDCl₃, 125 MHz)



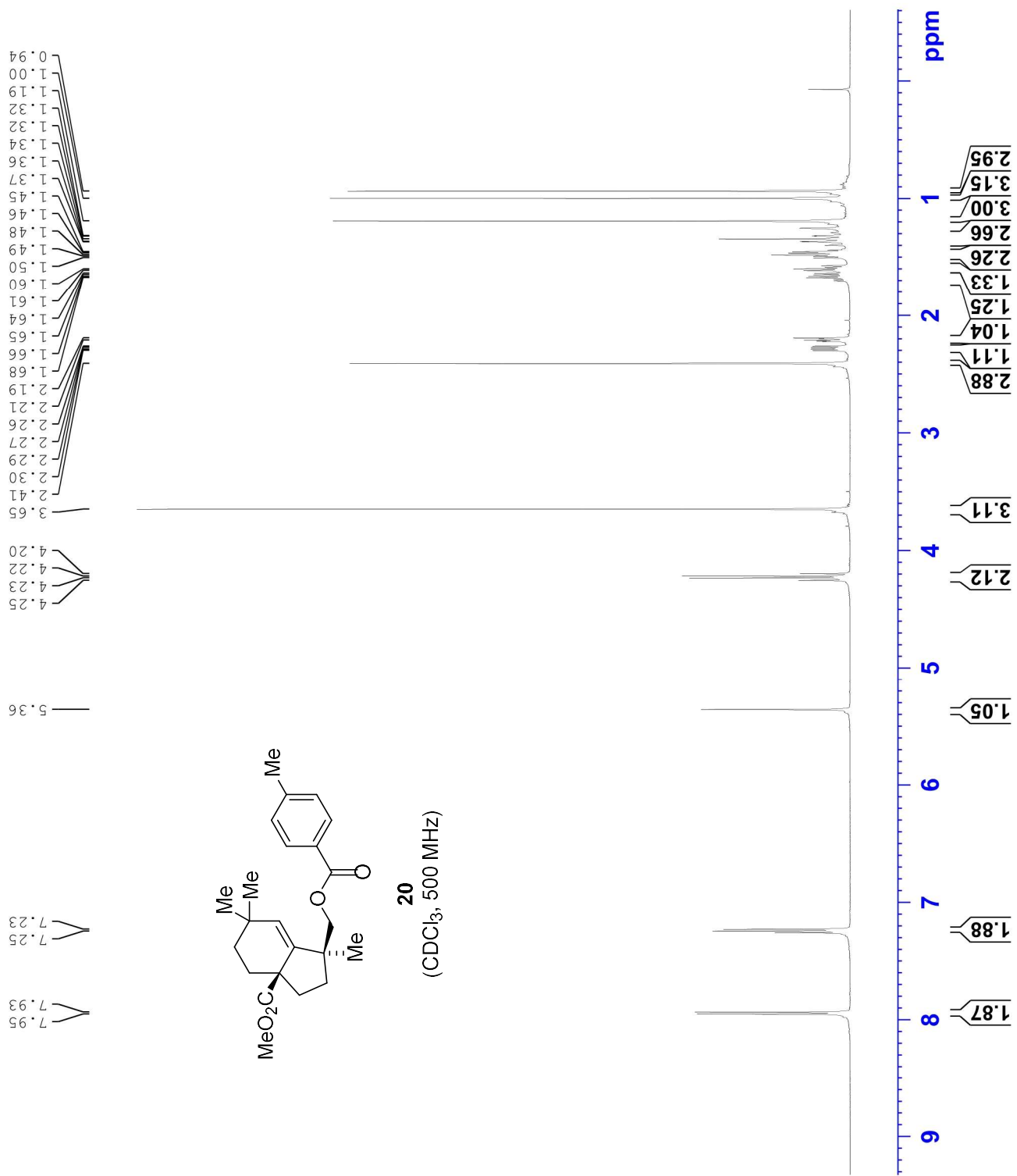
Current Data Parameters
 NAME Yh-2-42-a
 EXPNO 1
 PROCNO 1

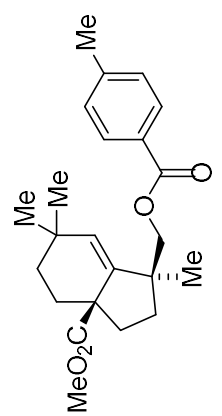
F2 - Acquisition Parameters

Date_ 20171226
 Time_ 21.24
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 28.76
 DW 50.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





20
(CDCl₃, 125 MHz)

Current Data Parameters
 NAME Yh-2-42-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20171226
 Time_ 22.26
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 482
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

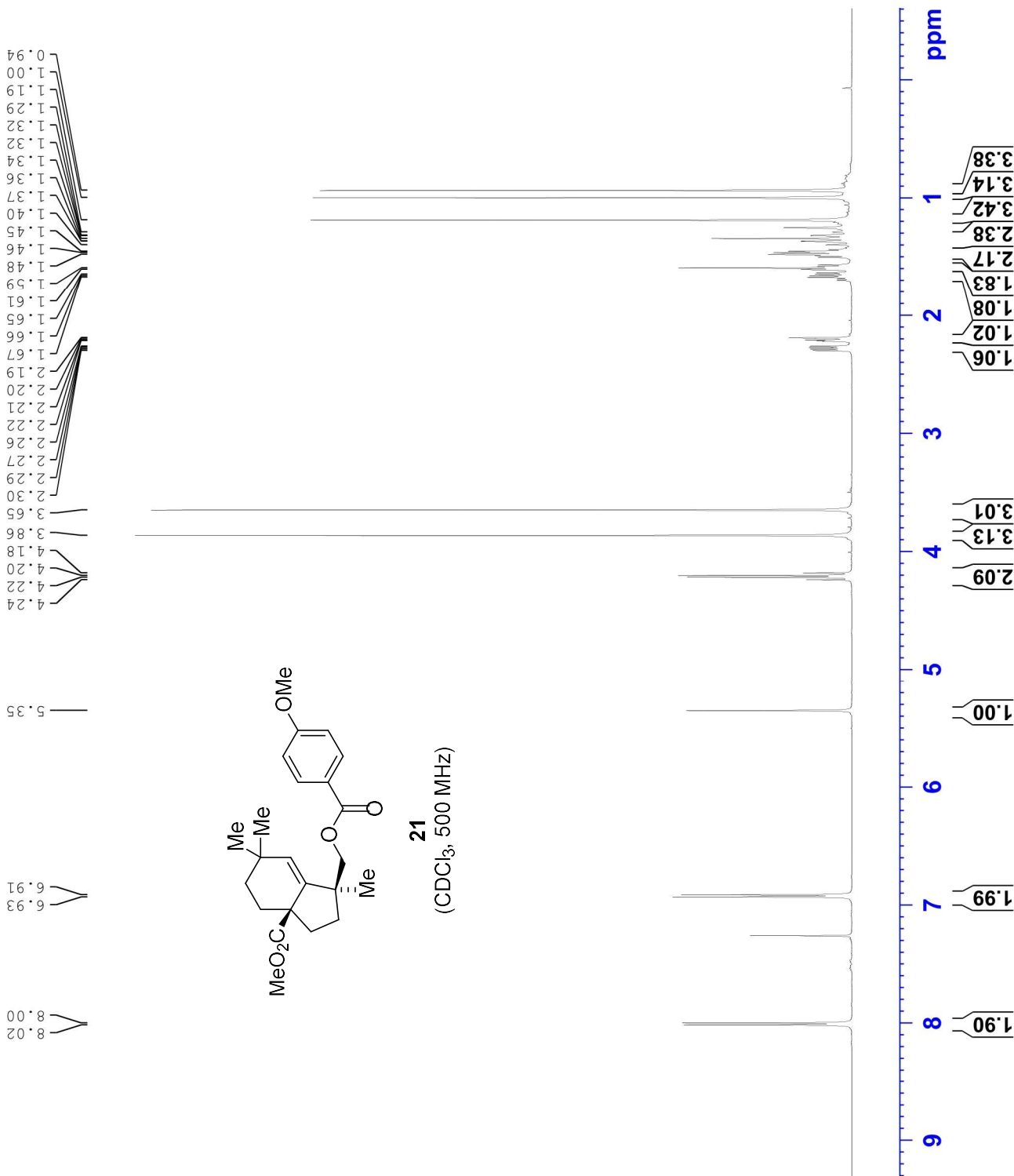
Current Data Parameters
 NAME yh-2-31-1-f
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

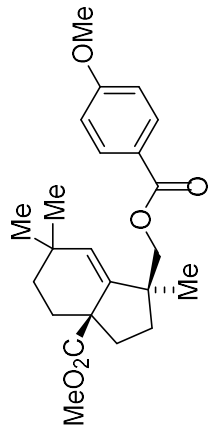
Date_ 20171114
 Time_ 17.29
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 79.04
 DW 50.000 usec
 DE 10.00 usec
 TE 294.6 K
 D1 2.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 8.00 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300132 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



26.24
 29.39
 30.49
 31.91
 32.58
 34.76
 35.57
 35.89
 44.43
 51.86
 55.40
 55.52
 72.39
 113.57
 123.20
 131.54
 133.28
 144.11
 163.25
 166.44
 176.76



21
 (CDCl₃, 125 MHz)

Current Data Parameters
 NAME Yh-2-31-f
 EXPNO 2
 PROCNO 2
 F2 - Acquisition Parameters
 Date_ 20171122
 Time_ 21.57
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 559
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.8 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1
 ===== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W
 ===== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W
 F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

ppm

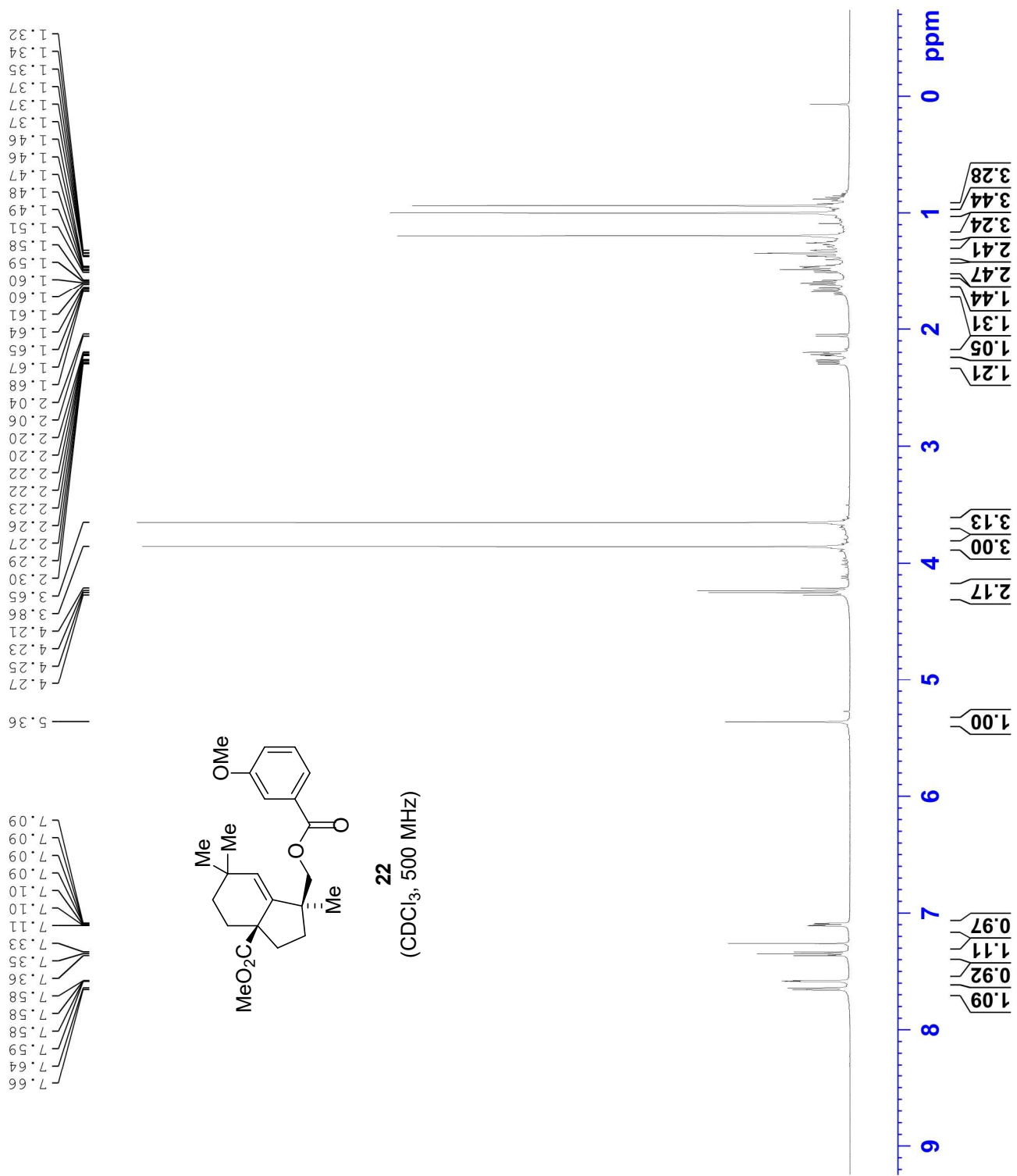
Current Data Parameters
 NAME Yh-2-62-a
 EXPNO 1
 PROCNO 1

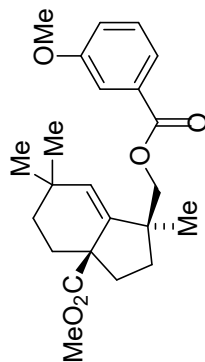
F2 - Acquisition Parameters

Date_ 20180104
 Time_ 22.12
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 37.92
 DW 50.000 usec
 DE 6.50 usec
 TE 296.0 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





22
(CDCl₃, 125 MHz)

Current Data Parameters
 NAME Yh-2-62-a
 EXPNO 4
 PROCNO 4

F2 - Acquisition Parameters

Date_ 20180104
 Time_ 22.55
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 366
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SF02 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

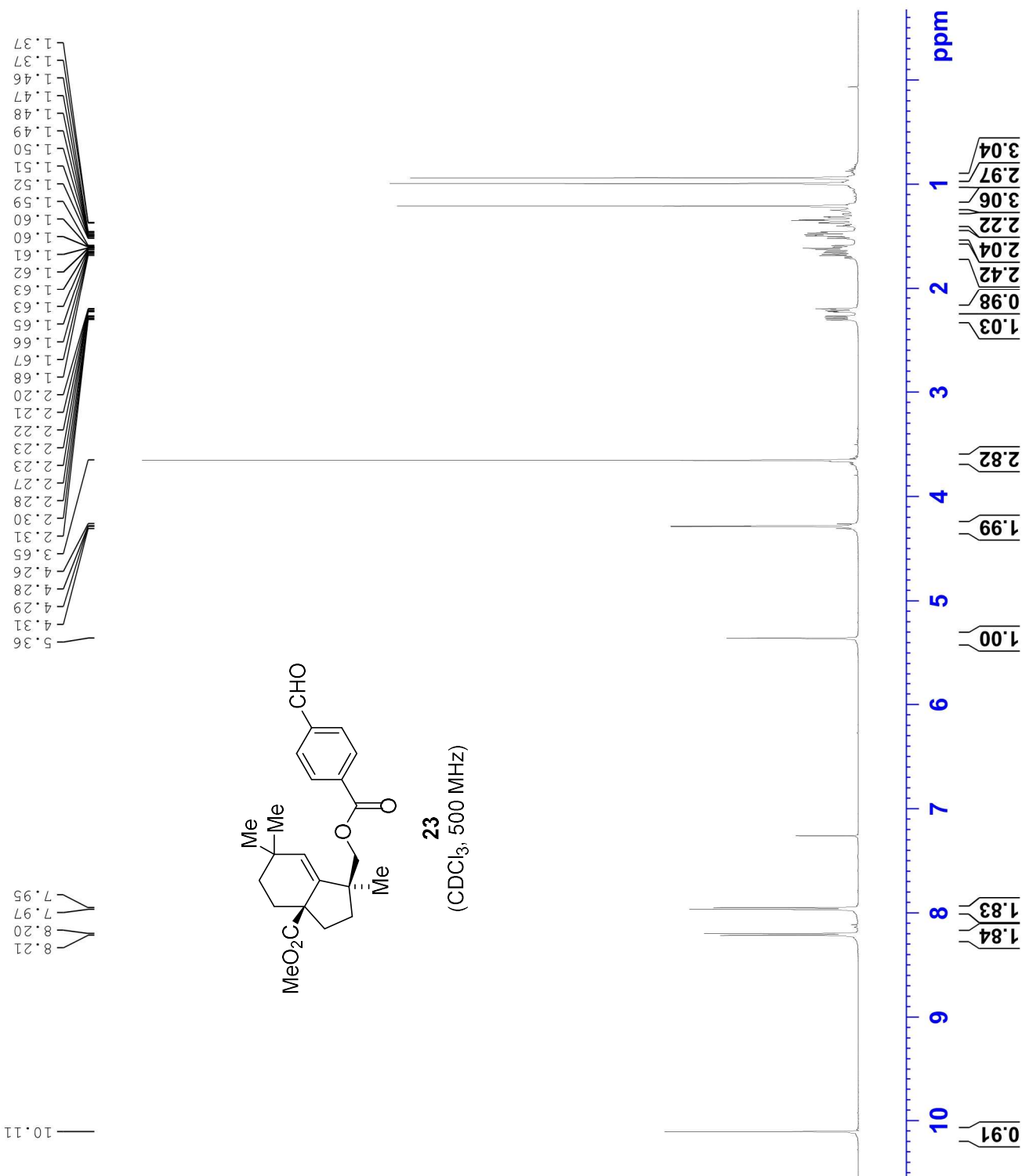
Current Data Parameters
 NAME Yh-2-77-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180124
 Time_ 22.13
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 35.92
 DW 50.000 usec
 DE 6.50 usec
 TE 296.9 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700124 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



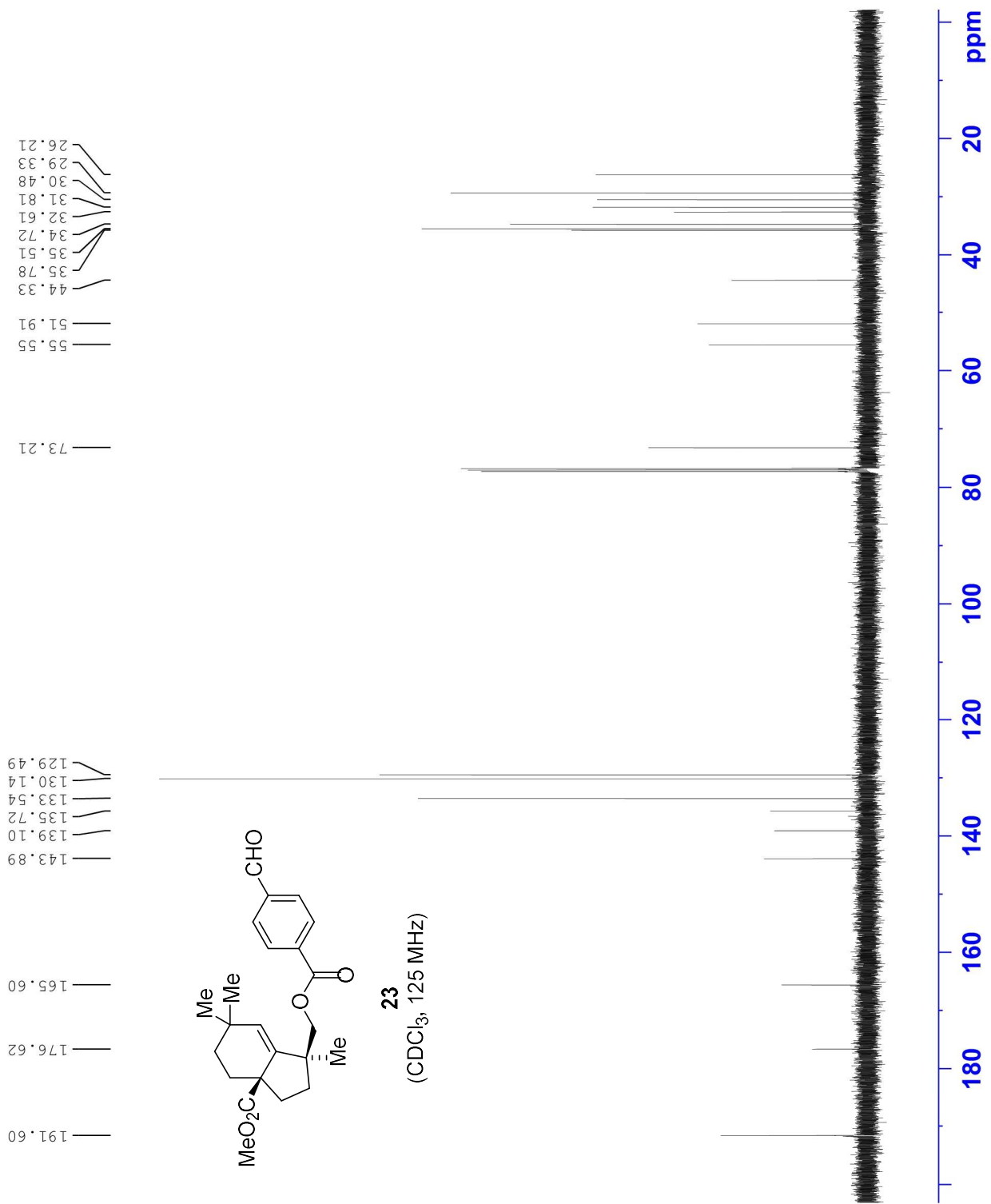
Current Data Parameters
 NAME Yh-2-77-a
 EXPNO 3
 PROCNO 3

F2 - Acquisition Parameters
 Date_ 20180124
 Time_ 22.35
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 135
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.2 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-2-53-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

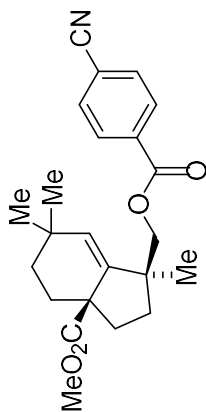
Date_ 20180102
 Time_ 21.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 35.92
 DW 50.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.25000000 W

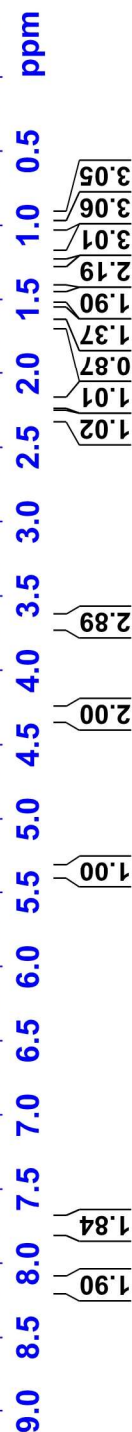
F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

2.30
2.29
2.28
2.27
2.23
2.22
2.20
1.67
1.66
1.64
1.63
1.61
1.60
1.49
1.48
1.47
1.37
1.36
1.34
1.19
1.09
0.99
0.94

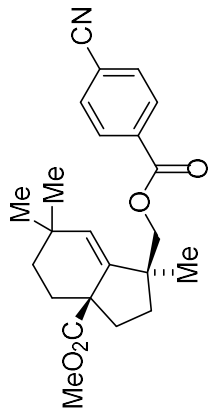
8.15
8.14
7.76
7.74
5.34
4.31
4.28
4.28
4.26
3.65
2.30



24
 (CDCl₃, 500 MHz)



176.56
 164.97
 143.83
 134.55
 133.58
 132.20
 130.05
 118.01
 116.27
 73.37
 55.55
 51.92
 44.30
 35.74
 35.48
 34.70
 32.61
 31.77
 30.47
 29.31
 26.17

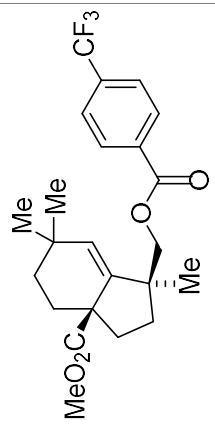


24
 (CDCl₃, 125 MHz)

Current Data Parameters
 NAME Yh-2-53-a
 EXPNO 2
 PROCNO 2
 F2 - Acquisition Parameters
 Date_ 20180102
 Time_ 22.29
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 273
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.5 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1
 ===== CHANNEL f1 =====
 SF01 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W
 ===== CHANNEL f2 =====
 SF02 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W
 F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

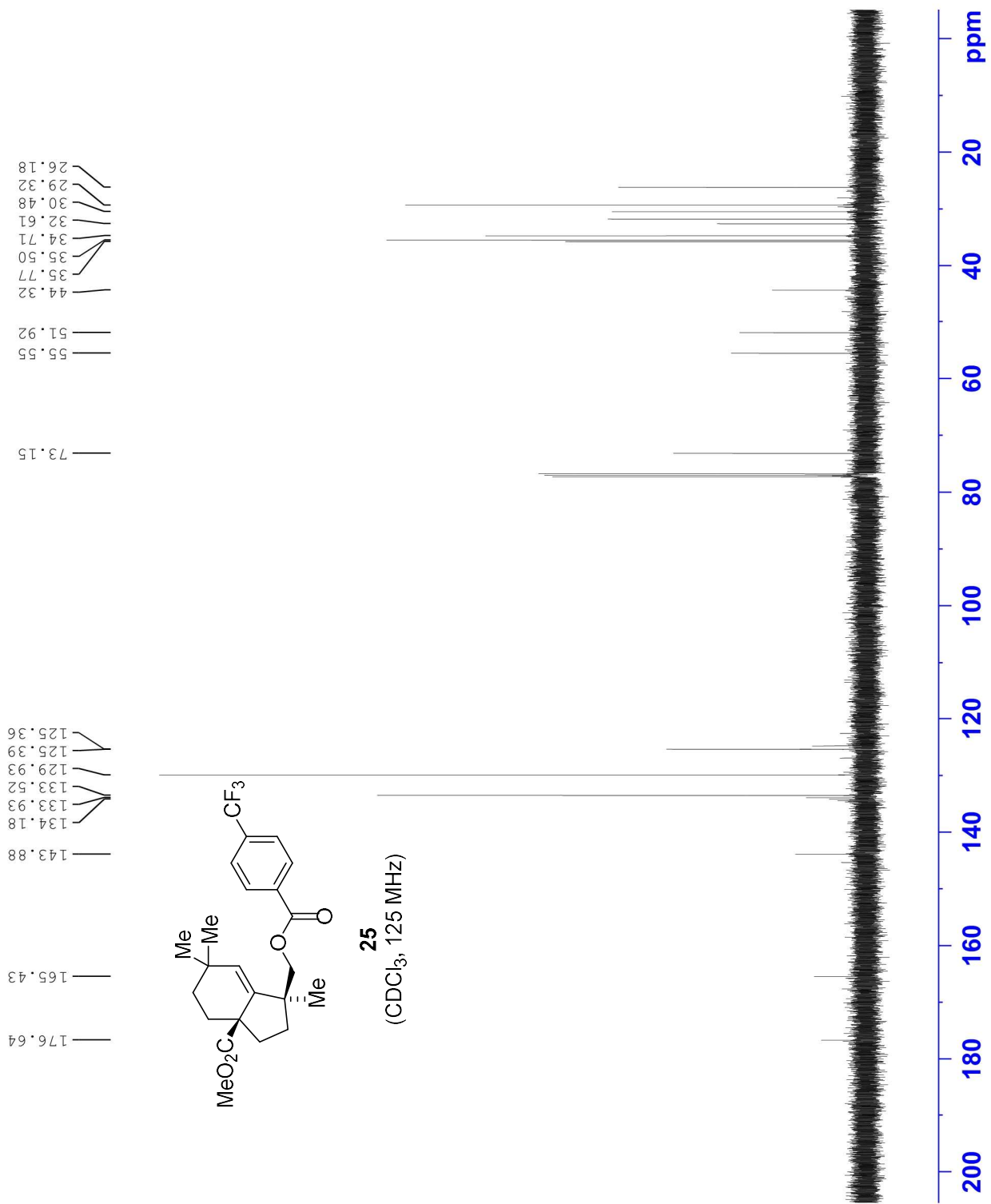
ppm

176.64
165.43
143.88
134.18
133.93
133.52
129.93
125.39
125.36



25
(CDCl₃, 125 MHz)

73.15
55.55
51.92
44.32
44.32
35.77
35.50
34.71
32.61
30.48
29.32
26.18



Current Data Parameters
NAME Yh-2-43-a
EXPNO 2
PROCNO 2

F2 - Acquisition Parameters

Date_ 20180812
Time_ 22.23
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgdc
TD 187496
SOLVENT CDCl3
NS 64
DS 0
SWH 31250.000 Hz
FIDRES 0.166670 Hz
AQ 2.9999361 sec
RG 2050
DW 16.000 usec
DE 6.50 usec
TE 297.2 K
D1 3.00000000 sec
D11 0.03000000 sec
TD0 1

==== CHANNEL f1 =====
SFO1 125.7049802 MHz
NUC1 13C
P1 10.00 usec
PLW1 72.83999634 W

==== CHANNEL f2 =====
SFO2 499.8724993 MHz
NUC2 1H
CPDPRG[2] waltz16
PCPD2 80.00 usec
PLW2 19.00000000 W
PLW12 0.29688001 W

F2 - Processing parameters
SI 1048576
SF 125.6924115 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.40

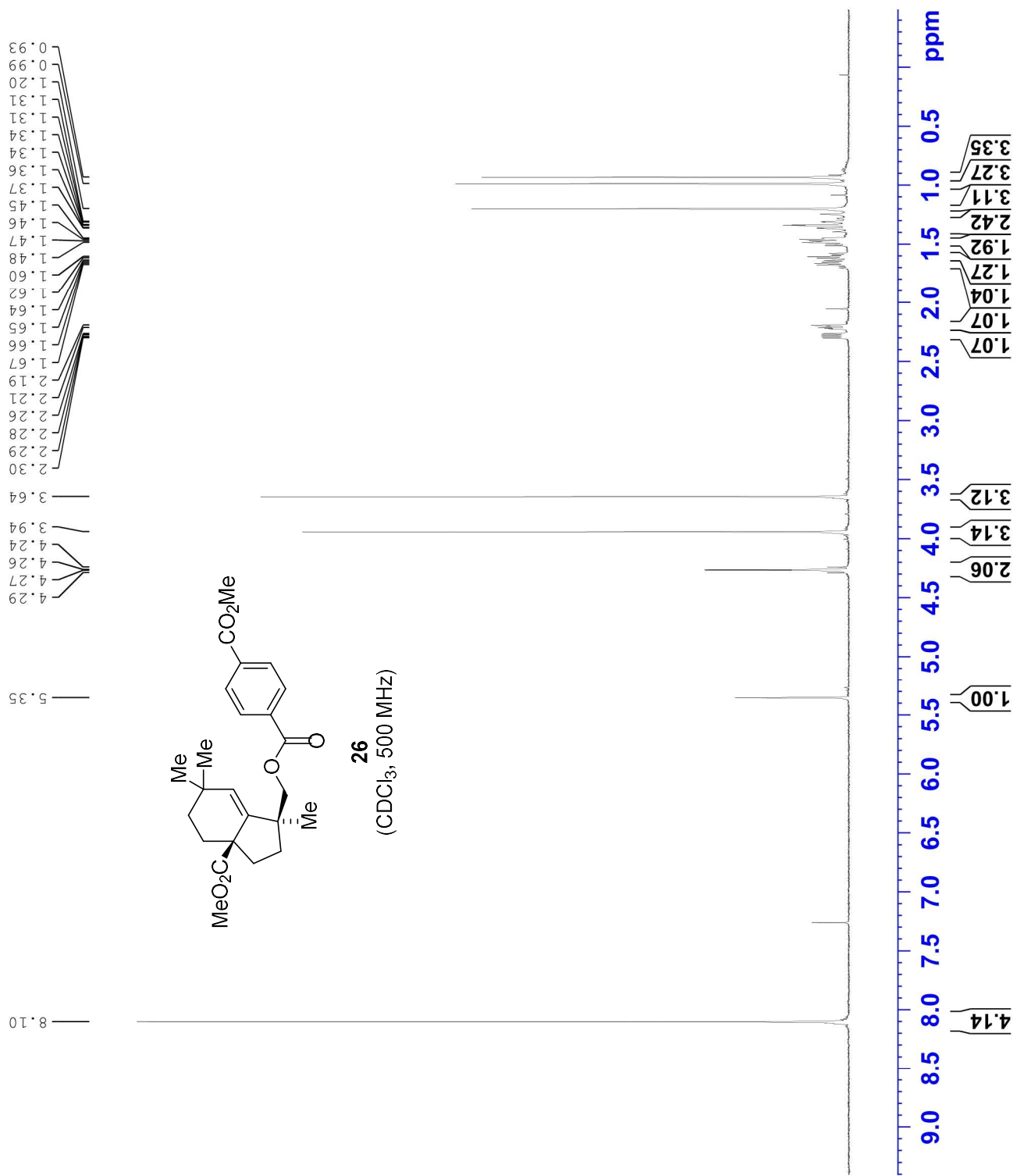
Current Data Parameters
 NAME Yh-2-69-a
 EXPNO 1
 PROCNO 1

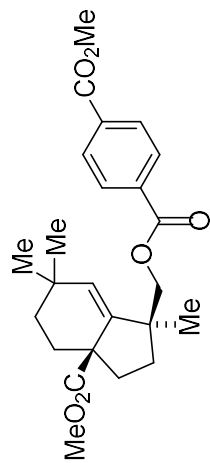
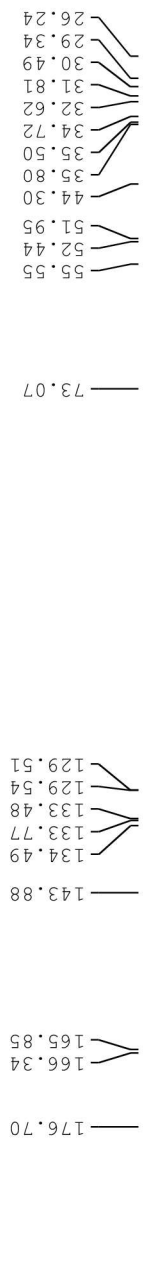
F2 - Acquisition Parameters

Date_ 20180119
 Time_ 21.15
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 893.6
 DW 50.000 usec
 DE 6.50 usec
 TE 297.2 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





Current Data Parameters
 NAME yh-2-69-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180119
 Time_ 21.22
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 6
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.2 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME Yh-2-72-a
 EXPNO 1
 PROCNO 1

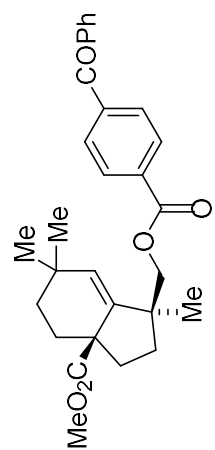
F2 - Acquisition Parameters

Date_ 20180111
 Time_ 22.37
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 28.76
 DW 50.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 3.0000000 sec
 TD0 1

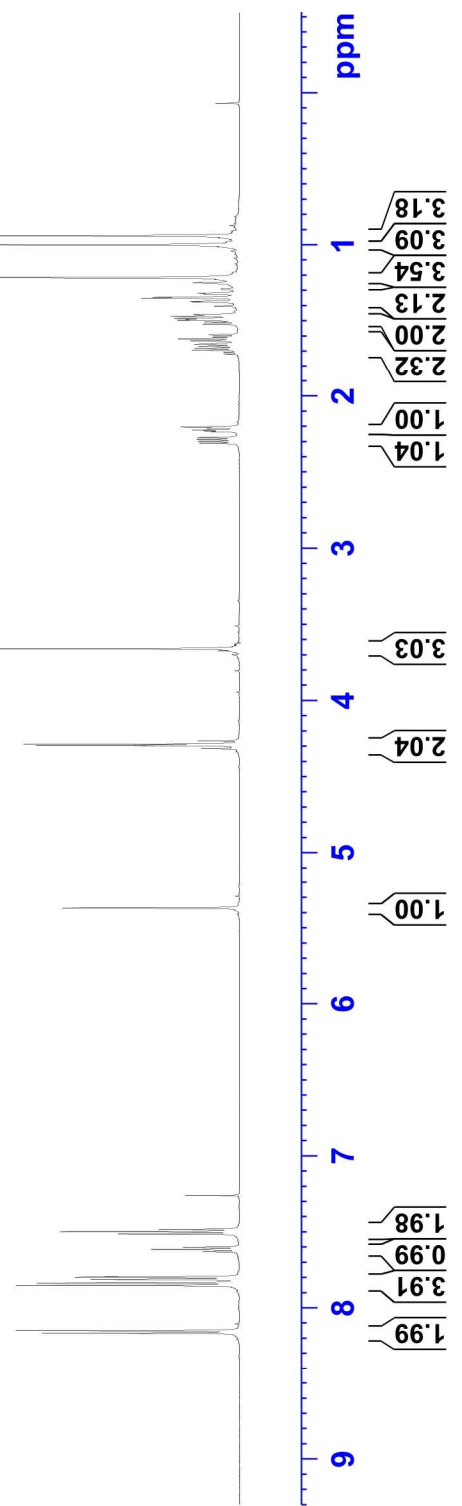
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700124 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

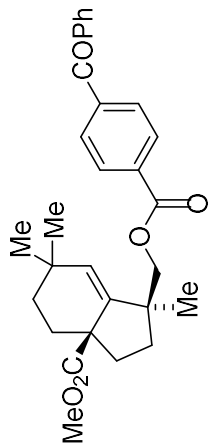
8.17
8.15
7.85
7.84
7.81
7.80
7.79
7.62
7.51
7.50
7.48
5.37
4.32
4.29
4.29
4.27
3.66
2.31
2.30
2.28
2.27
2.27
2.22
2.20
1.69
1.68
1.67
1.65
1.63
1.62
1.52
1.51
1.50
1.49
1.48
1.47
1.46
1.40
1.38
1.37
1.35
1.35
1.35
1.32
1.32
1.21
1.00



27
 (CDCl₃, 500 MHz)



196.05
176.69
165.88
143.93
141.21
137.04
133.81
133.49
132.91
130.11
129.76
129.46
128.46



27
(CDCl₃, 125 MHz)

73.10
55.56
51.94
44.35
35.81
35.54
34.74
32.62
31.82
30.51
29.35
26.23

Current Data Parameters
NAME Yh-2-72-a
EXPNO 2
PROCNO 2

F2 - Acquisition Parameters
Date_ 20180111
Time_ 22.44
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgdc
TD 187496
SOLVENT CDC13
NS 43
DS 0
SWH 31250.000 Hz
FIDRES 0.166670 Hz
AQ 2.9999361 sec
RG 2050
DW 16.000 usec
DE 6.50 usec
TE 297.4 K
D1 3.0000000 sec
D11 0.0300000 sec
TD0 1

==== CHANNEL f1 =====
SFO1 125.7049802 MHz
NUC1 13C
P1 10.00 usec
PLW1 72.83999634 W

==== CHANNEL f2 =====
SFO2 499.8724993 MHz
NUC2 1H
CPDPRG[2] waltz16
PCPD2 80.00 usec
PLW2 19.00000000 W
PLW12 0.29688001 W

F2 - Processing parameters
SI 1048576
SF 125.6924115 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.40

200 180 160 140 120 100 80 60 40 20 ppm

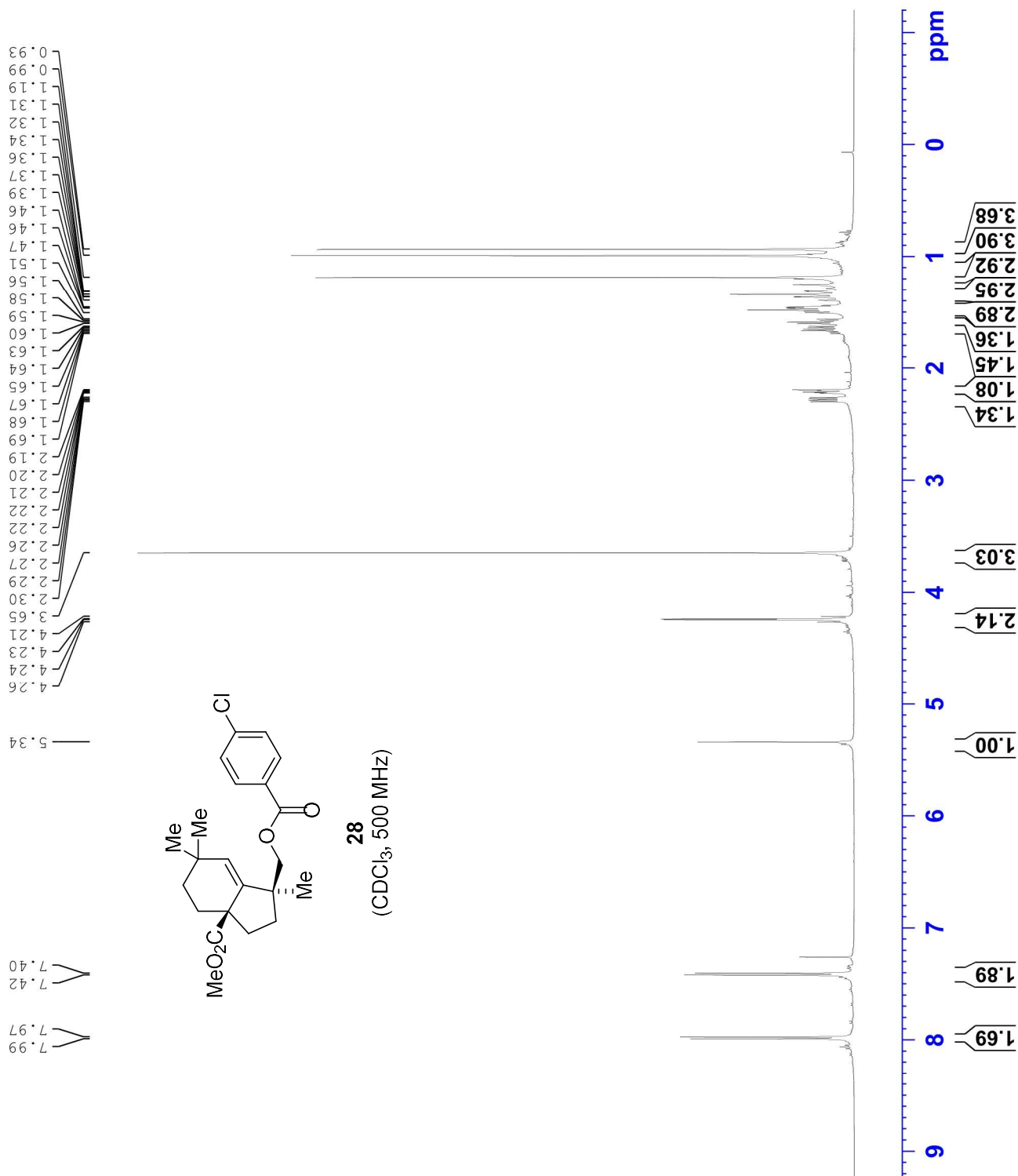
Current Data Parameters
 NAME Yh-2-47-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180101
 Time_ 21.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 28.76
 DW 50.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



```

Current Data Parameters
NAME      Yh-2-47-a
EXPNO    2
PROCNO   2

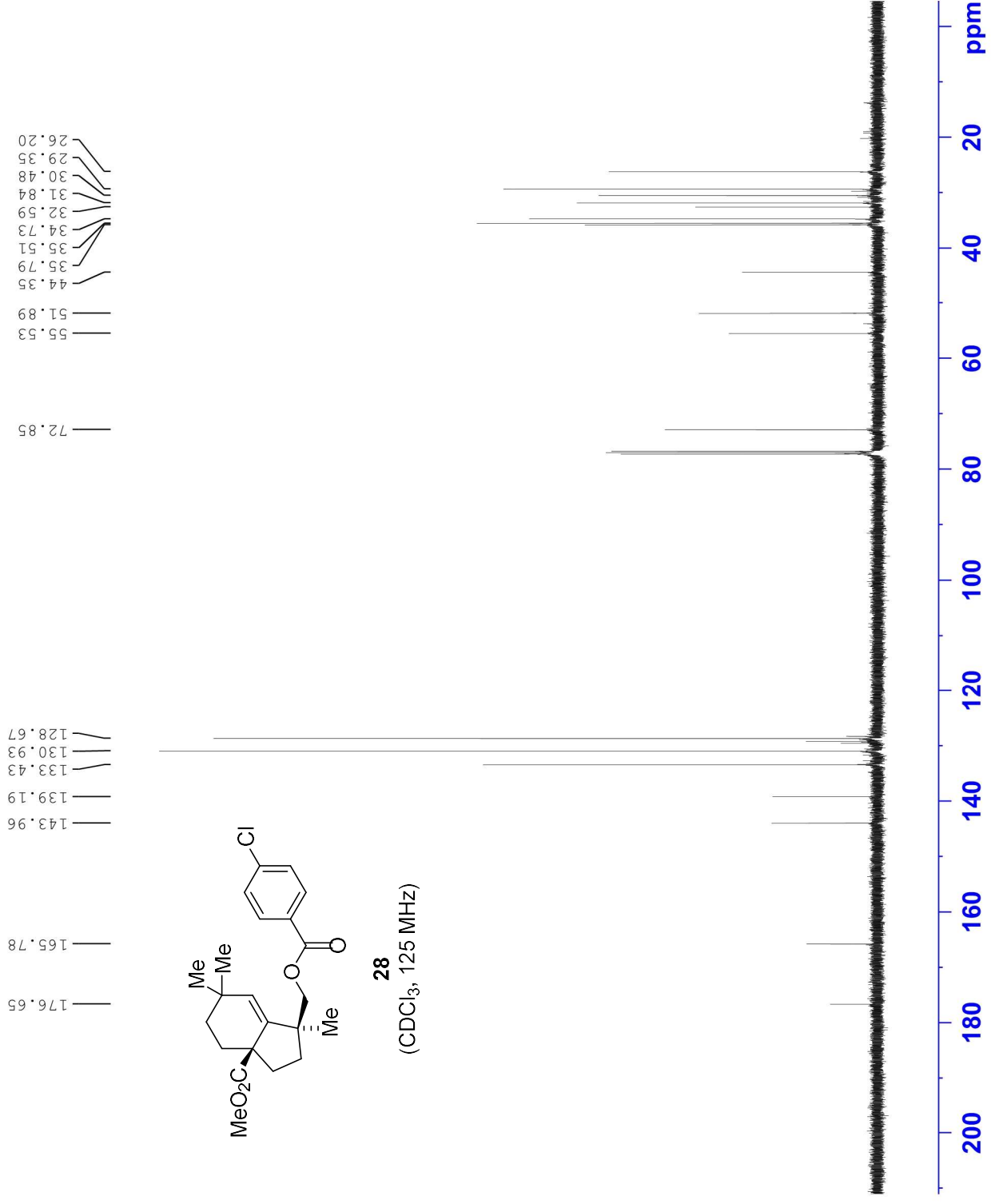
F2 - Acquisition Parameters
Date_    20180101
Time_    22.30
INSTRUM  spect
PROBHD   5 mm PABBO BB/
PULPROG  zgdc
TD       187496
SOLVENT  CDCl3
NS       261
DS       0
SWH      31250.000 Hz
FIDRES   0.166670 Hz
AQ       2.9999361 sec
RG       2050
DW       16.000 usec
DE       6.50 usec
TE       297.7 K
D1       3.0000000 sec
D11      0.0300000 sec
TD0      1

===== CHANNEL f1 =====
SFO1    125.7049802 MHz
NUC1    13C
P1      10.00 usec
PLW1    72.83999634 W

===== CHANNEL f2 =====
SFO2    499.8724993 MHz
NUC2    1H
CPDPRG2 waltz16
PCPD2   80.00 usec
PLW2    19.0000000 W
PLW12   0.29688001 W

F2 - Processing parameters
SI      1048576
SF      125.6924115 MHz
WDW     EM
SSB     0
LB      0.30 Hz
GB      0
PC      1.40

```



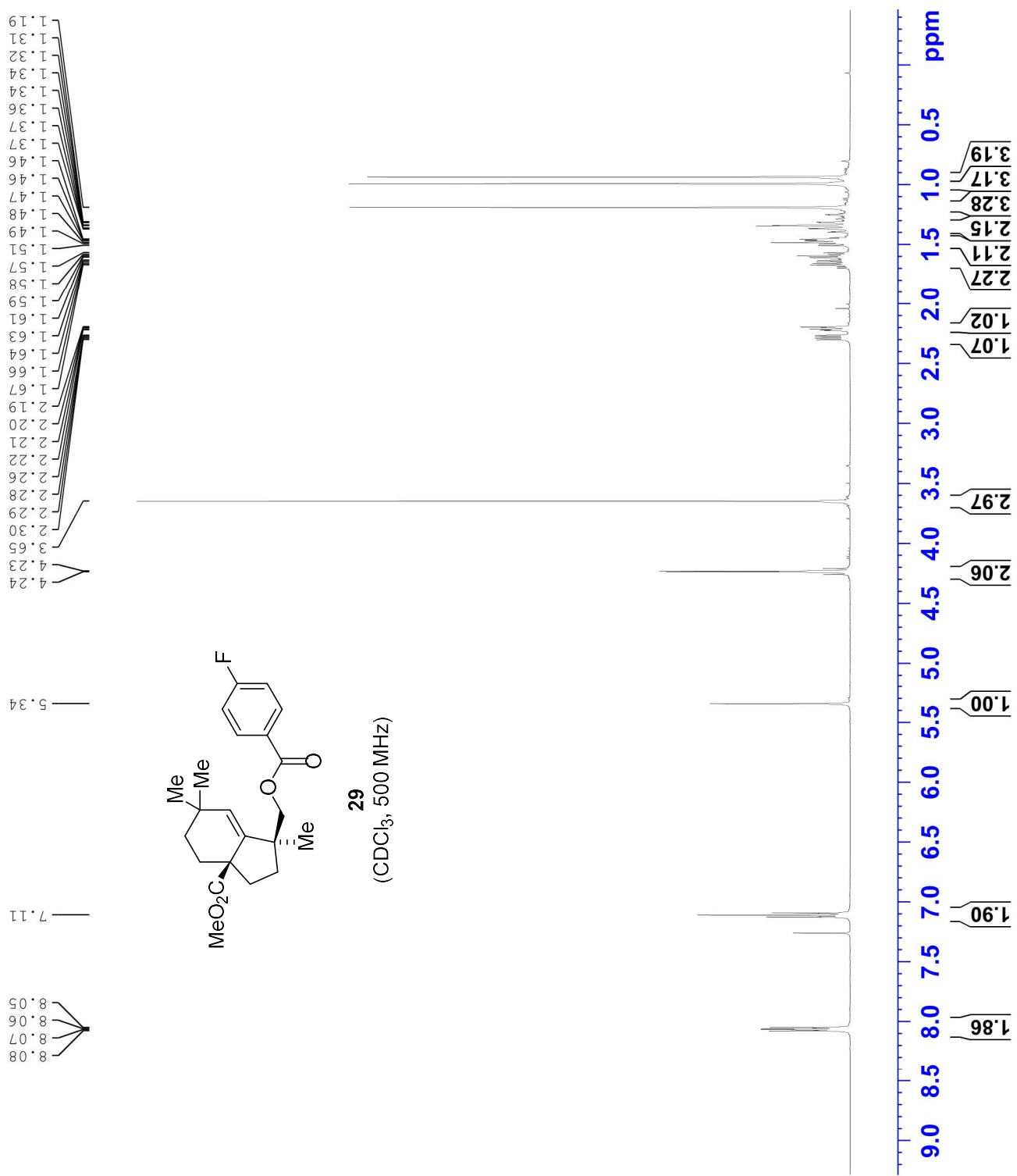
Current Data Parameters
 NAME Yh-2-55-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180103
 Time_ 21.58
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 29.95
 DW 50.000 usec
 DE 6.50 usec
 TE 296.2 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-2-55-a
 EXPNO 2
 PROCNO 2

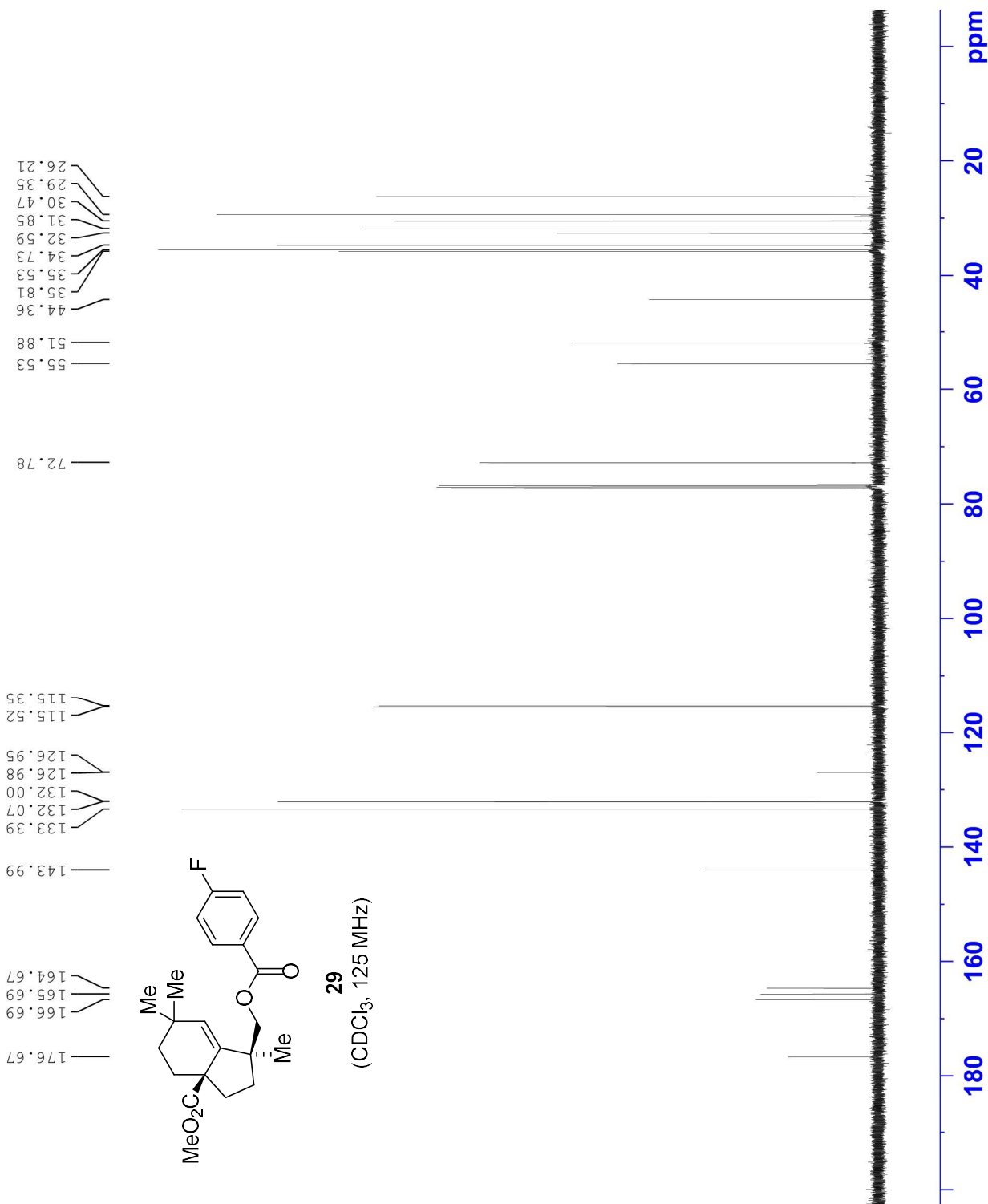
F2 - Acquisition Parameters

Date_ 20180103
 Time_ 22.36
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 354
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.9 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-2-68-a
 EXPNO 1
 PROCNO 1

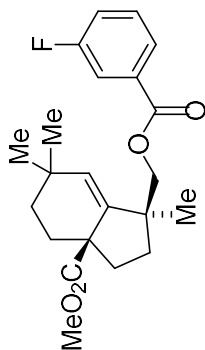
F2 - Acquisition Parameters

Date_ 20180821
 Time_ 16.51
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 5
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 62.78
 DW 50.000 usec
 DE 6.50 usec
 TE 295.7 K
 D1 4.0000000 sec
 TD0 1

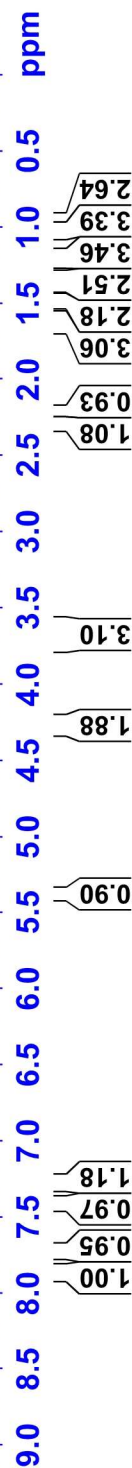
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

7.85
7.84
7.73
7.72
7.71
7.44
7.43
7.42
7.41
7.41
7.40
7.27
7.27
7.26
7.26
7.26
7.25
7.24
7.23
5.35
4.27
4.25
4.24
4.22
3.65
2.30
2.29
2.28
2.28
2.26
2.22
2.22
2.20
2.20
1.67
1.66
1.64
1.63
1.62
1.60
1.49
1.47
1.46
1.37
1.36
1.34
1.34
1.32
1.31
1.19
1.10
0.94



30
 (CDCl₃, 500 MHz)



Current Data Parameters
 NAME Yh-2-68-a
 EXPNO 2
 PROCNO 2

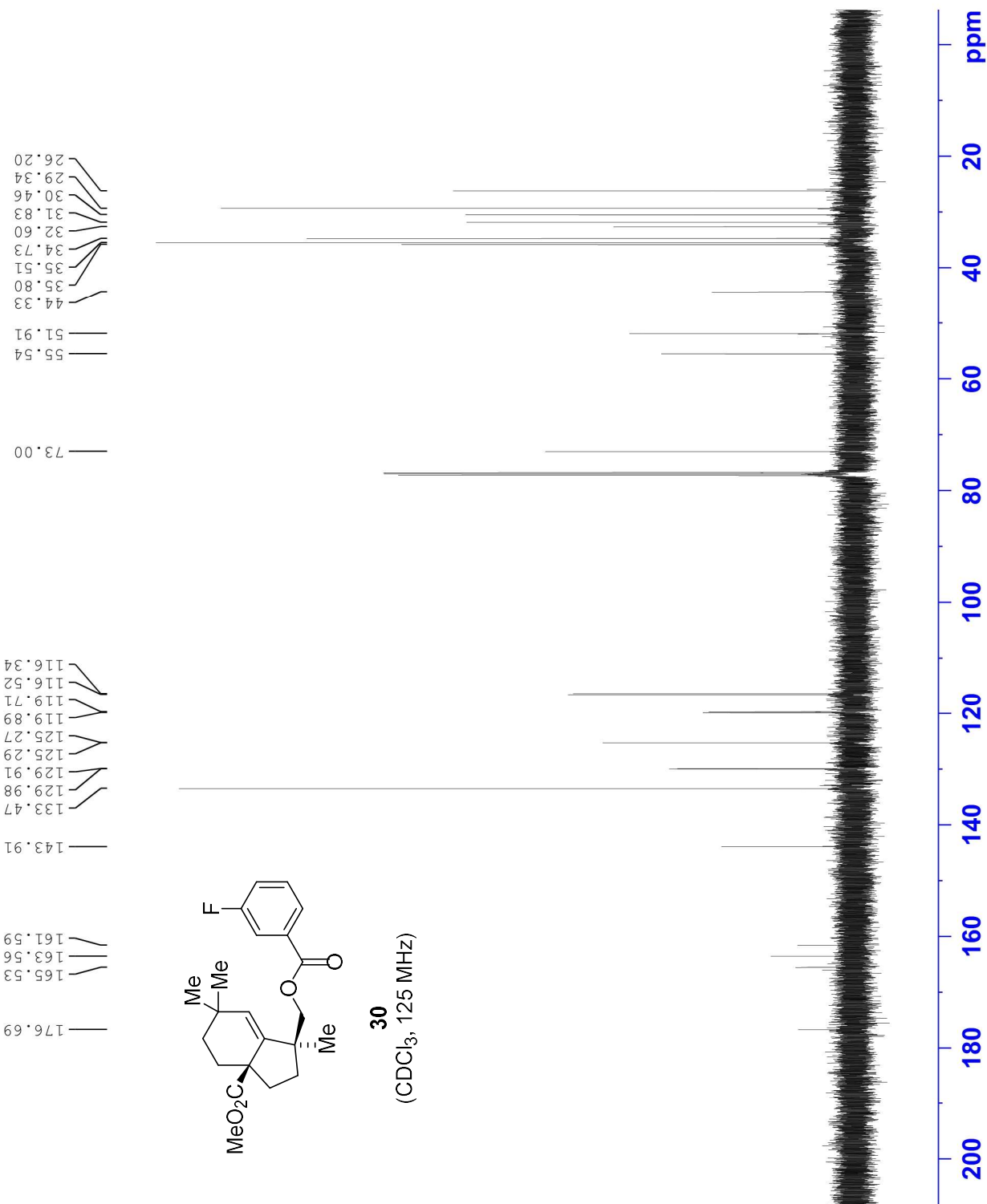
F2 - Acquisition Parameters

Date_ 20180821
 Time_ 17.07
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 115
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.0 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



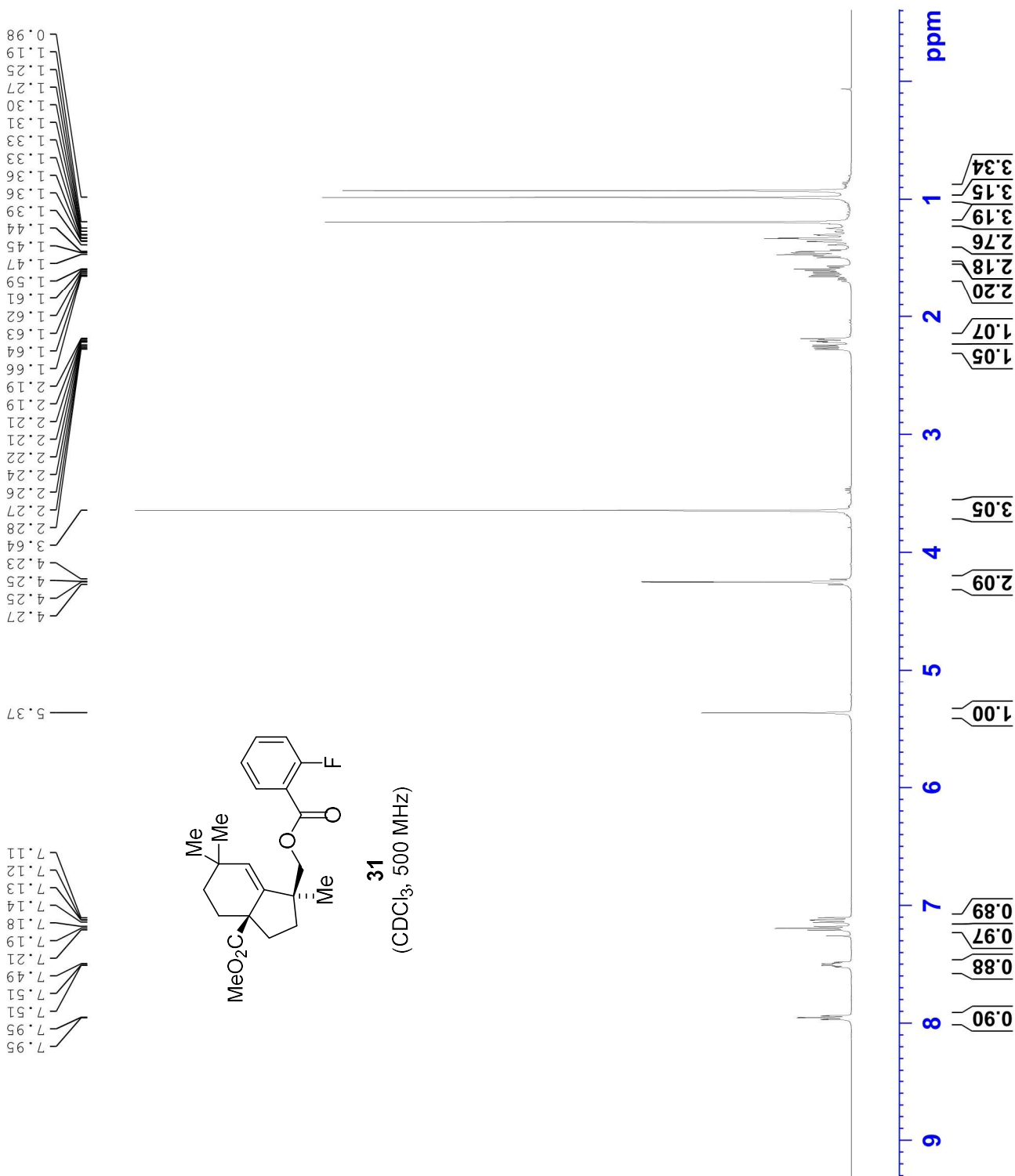
Current Data Parameters
 NAME Yh-2-34-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20171218
 Time_ 21.22
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 16.71
 DW 50.000 usec
 DE 6.50 usec
 TE 296.8 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-2-34-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters

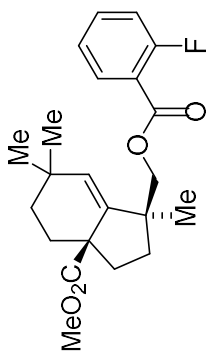
Date_ 20171218
 Time_ 21.35
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 52
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.6 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

176.80
 176.76
 164.67
 164.64
 163.01
 160.94
 143.90
 134.27
 134.20
 133.38
 132.20
 123.88
 123.85
 117.04
 116.86
 73.20
 55.57
 51.87
 44.18
 35.84
 35.58
 34.77
 32.58
 31.84
 30.46
 29.36
 26.17



31

(CDCl₃, 125 MHz)

ppm

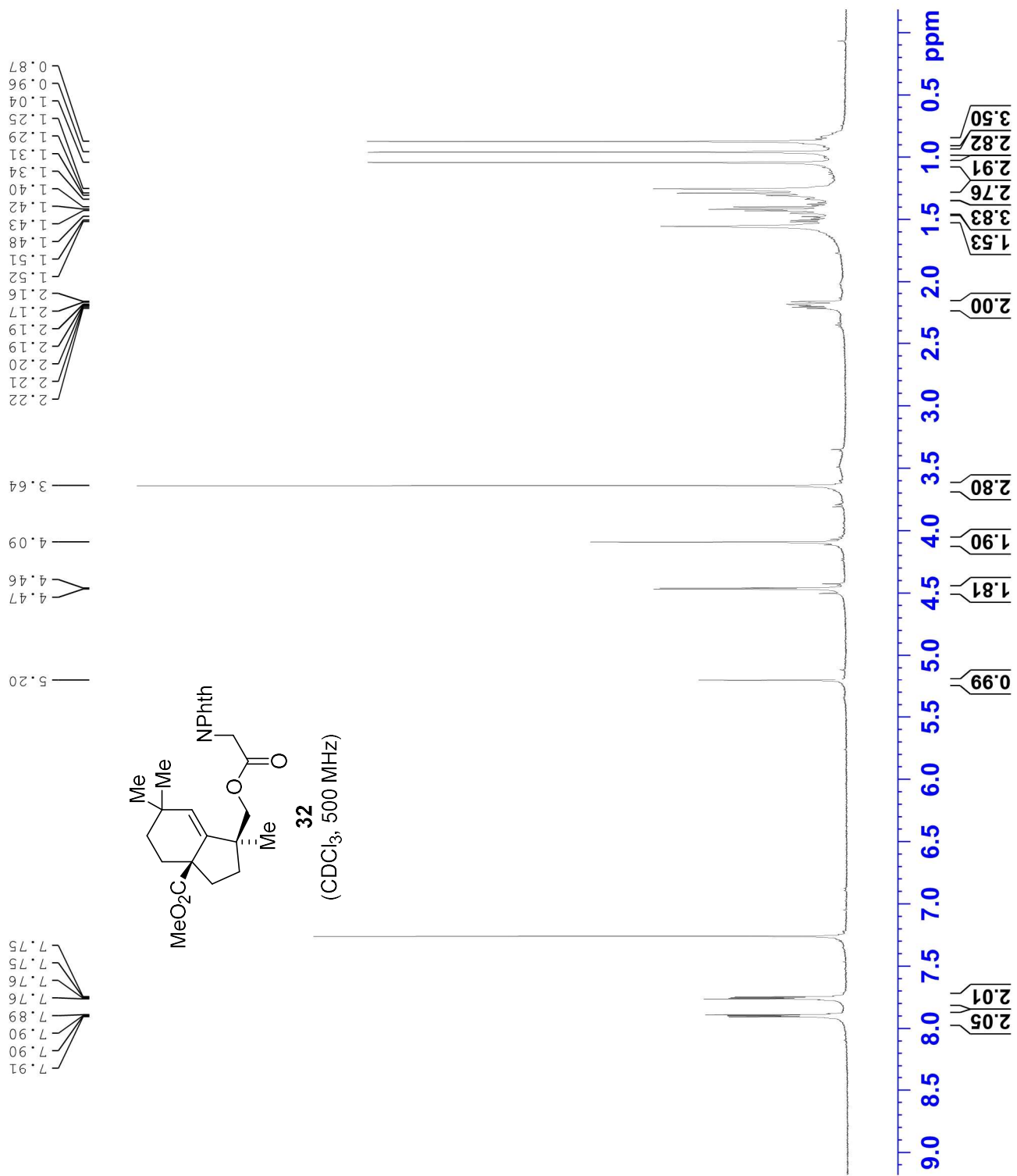
Current Data Parameters
 NAME yh-5-55-d
 EXPNO 1
 PROCNO 1

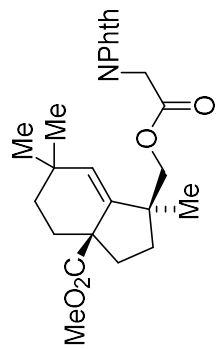
F2 - Acquisition Parameters

Date_ 20190712
 Time_ 21.14
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 105.66
 DW 50.000 usec
 DE 6.50 usec
 TE 297.5 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700124 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





Current Data Parameters
 NAME Yh-5-51-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180926
 Time_ 23.03
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 1083
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 301.2 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME Yh-2-25-a
 EXPNO 1
 PROCNO 1

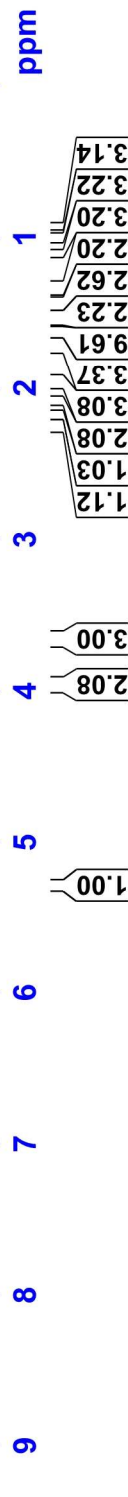
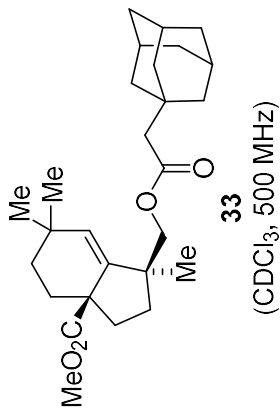
F2 - Acquisition Parameters

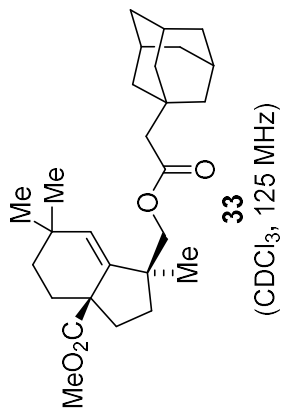
Date_ 20171214
 Time_ 21.05
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 28.76
 DW 50.000 usec
 DE 6.50 usec
 TE 296.9 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.98
3.96
3.95
3.93
3.65
3.26
2.25
2.23
2.23
2.18
2.17
2.08
1.96
1.71
1.68
1.62
1.62
1.52
1.51
1.50
1.50
1.46
1.45
1.44
1.43
1.34
1.34
1.32
1.30
1.29
1.10
0.98





Current Data Parameters
 NAME Yh-2-25-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20171214
 Time_ 22.48
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 978
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.9 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

===== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

===== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

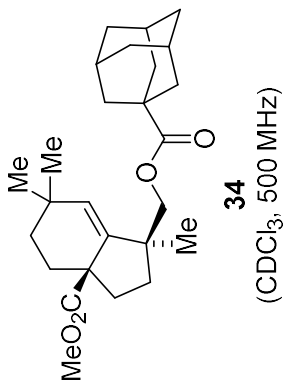
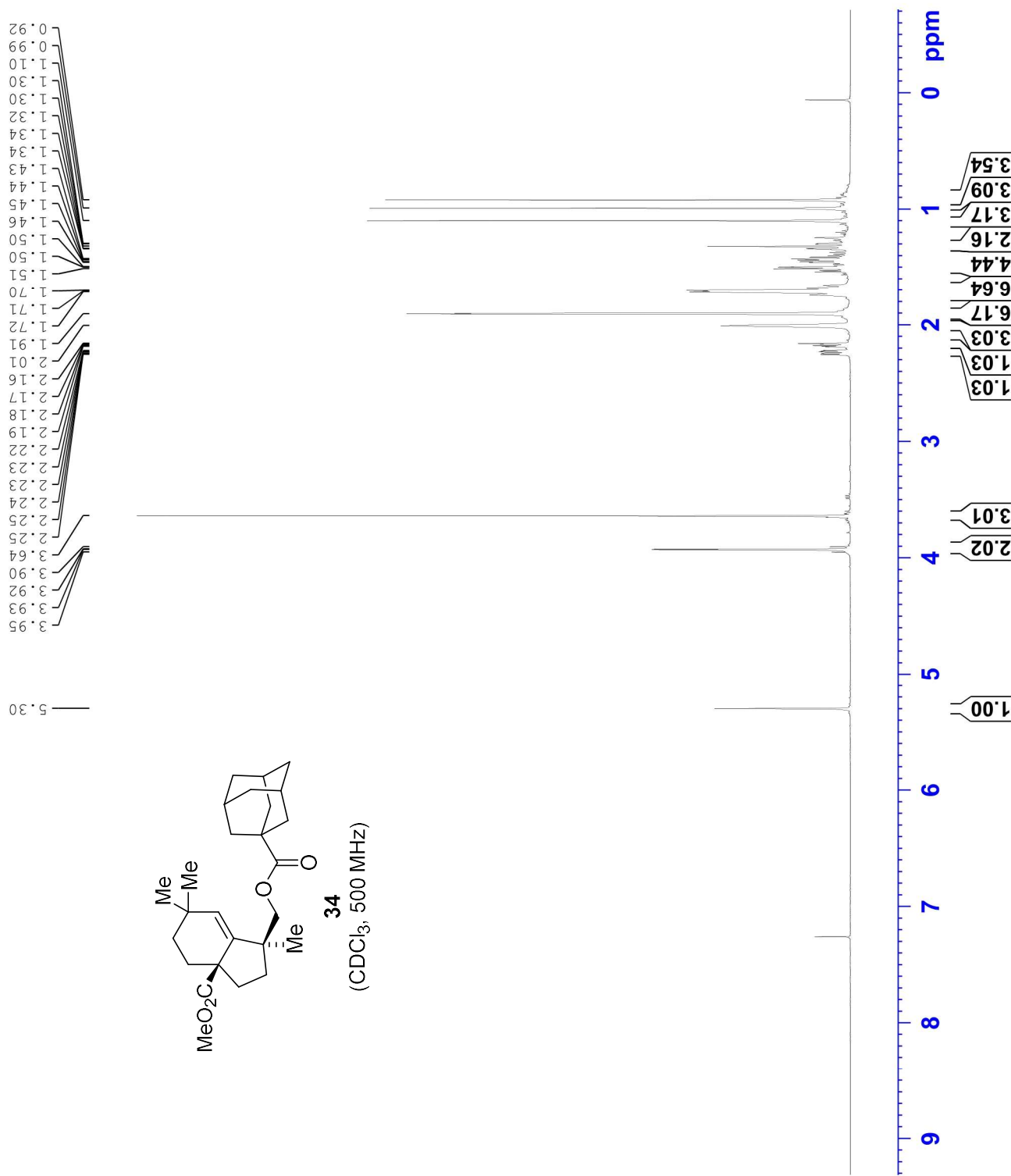
Current Data Parameters
 NAME Yh-2-73-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

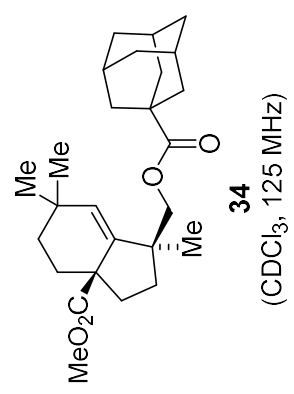
Date_ 20180121
 Time_ 22.32
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 19.64
 DW 50.000 usec
 DE 6.50 usec
 TE 296.8 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700124 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



177.70
176.82
133.20
143.96
71.80
55.45
51.91
44.25
40.94
38.99
36.59
35.77
35.53
34.72
32.86
31.88
30.58
29.58
28.01
26.03



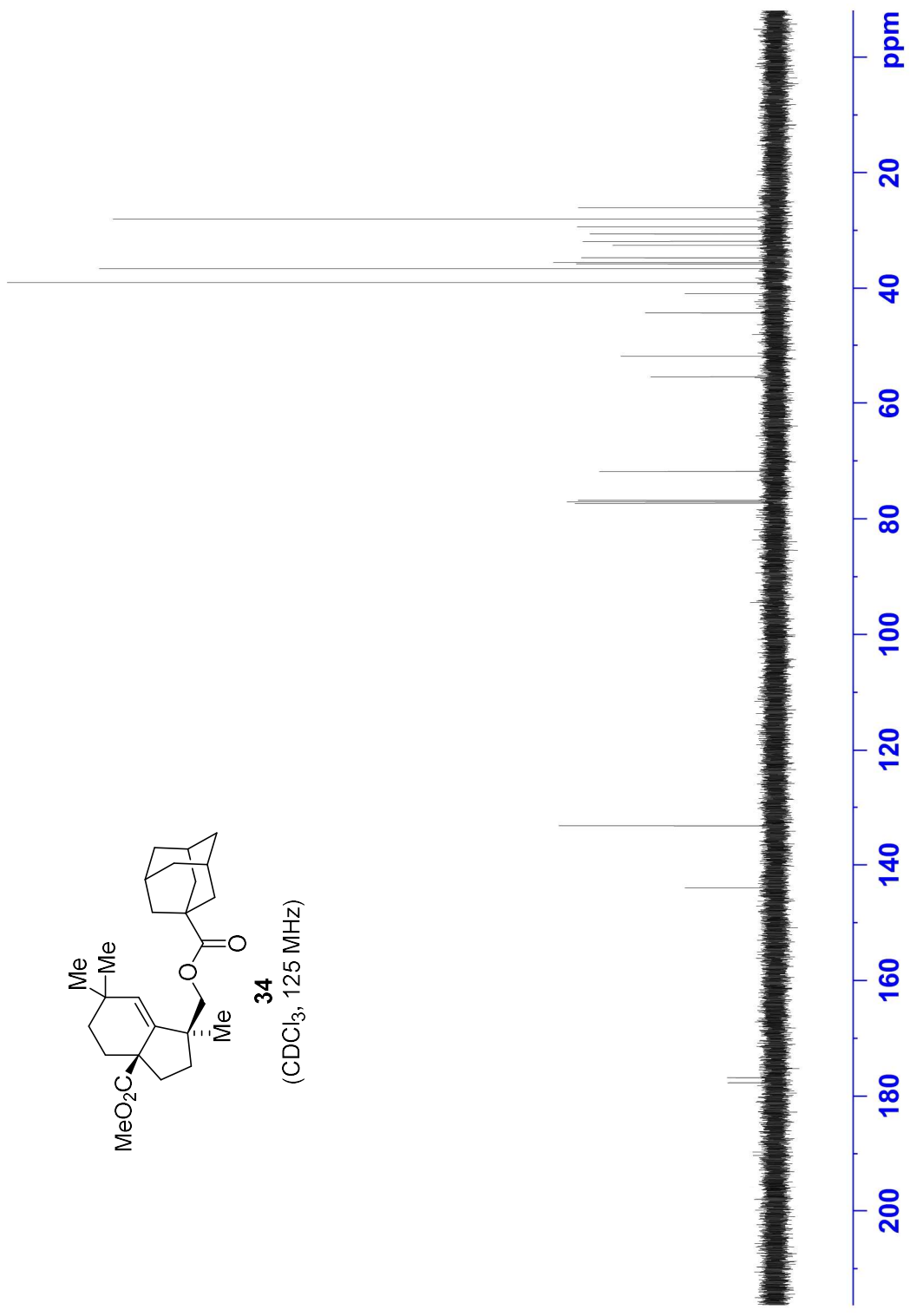
Current Data Parameters
 NAME Yh-2-73-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180121
 Time_ 22.35
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 7
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.9 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



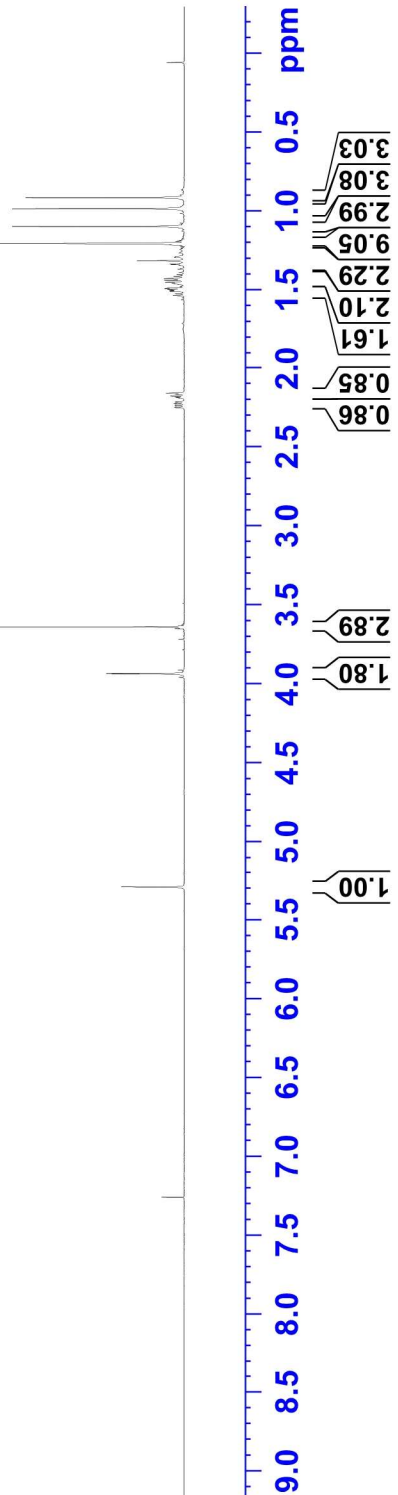
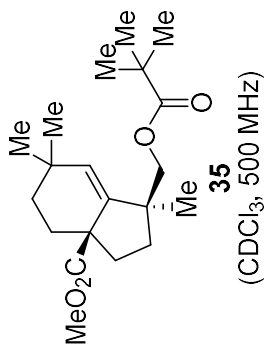
Current Data Parameters
 NAME Yh-3-18-a
 EXPNO 1
 PROCNO 1

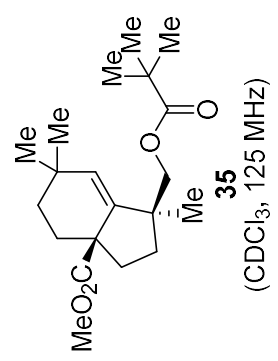
F2 - Acquisition Parameters
 Date_ 20180815
 Time_ 16.03
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zg
 TD 44998
 SOLVENT CDC13
 NS 1
 DS 0
 SWH 7500.000 Hz
 FIDRES 0.166674 Hz
 AQ 2.9998667 sec
 RG 50.8
 DW 66.667 usec
 DE 71.43 usec
 TE 294.5 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 1H
 P1 14.50 usec
 PL1 0 dB
 PL1W 24.54113007 W
 SFO1 500.1330008 MHz

F2 - Processing parameters
 SI 32768
 SF 500.1300138 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.96
3.94
3.93
3.91
3.64
2.25
2.24
2.24
2.24
2.24
2.23
2.23
2.23
2.22
2.22
2.21
2.19
2.19
2.18
2.17
2.16
2.16
2.16
1.51
1.51
1.51
1.50
1.50
1.49
1.49
1.49
1.46
1.45
1.45
1.44
1.43
1.37
1.34
1.34
1.34
1.34
1.33
1.33
1.33
1.29





Current Data Parameters
 NAME yh-3-18-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180815
 Time 16.16
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 15
 DS 0
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 295.0 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 9.90 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-2-143-a
 EXPNO 1
 PROCNO 1

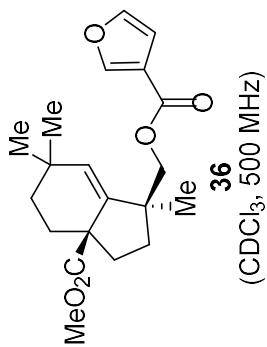
F2 - Acquisition Parameters

Date_ 20180419
 Time_ 20.41
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zg
 TD 44998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 7500.000 Hz
 FIDRES 0.166674 Hz
 AQ 2.9998667 sec
 RG 181
 DW 66.667 usec
 DE 71.43 usec
 TE 295.1 K
 D1 3.0000000 sec
 TD0 1

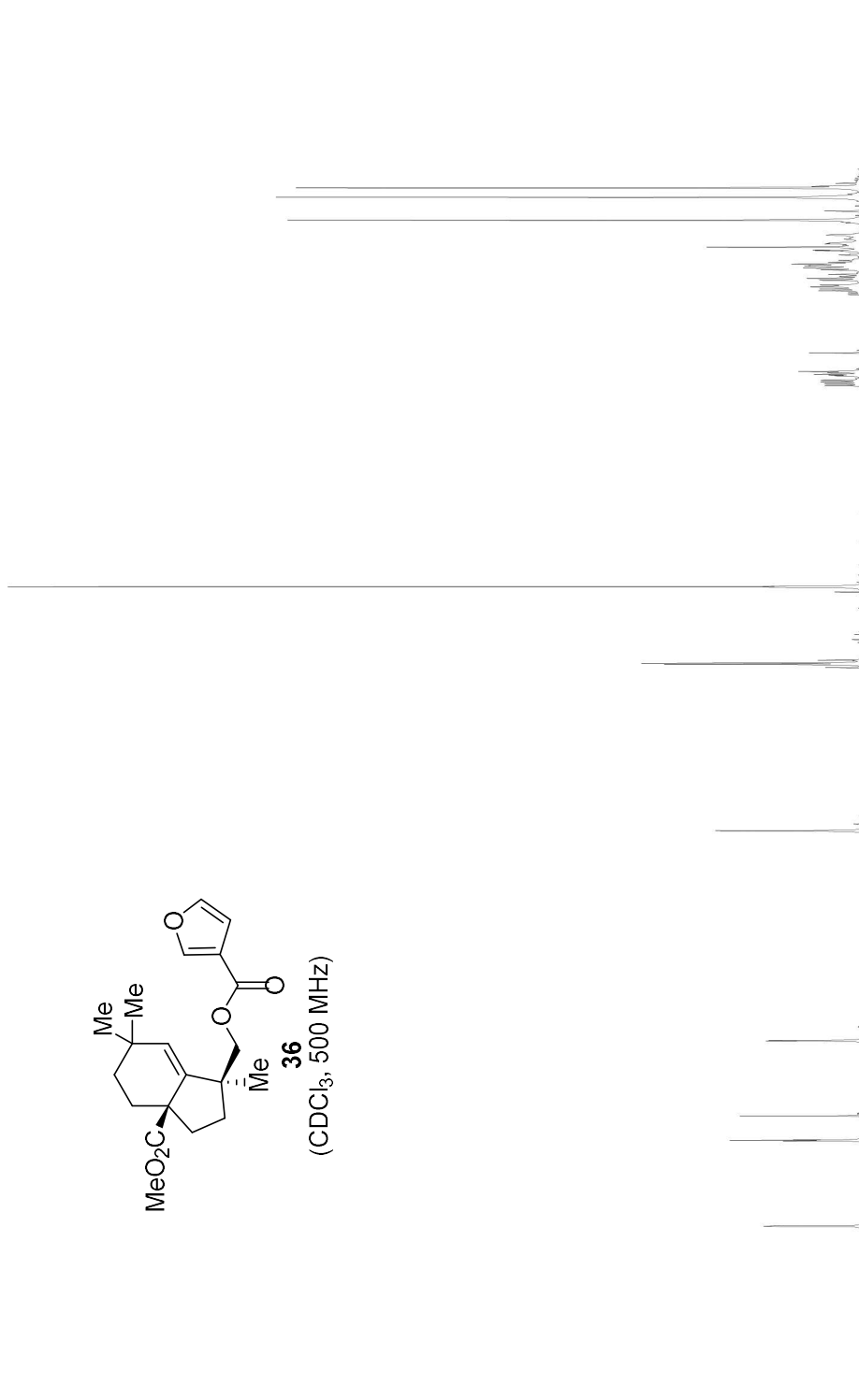
==== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 0 dB
 PL1W 24.54113007 W
 SFO1 500.1330008 MHz

F2 - Processing parameters
 SI 16384
 SF 500.1300133 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

4.20
4.18
4.17
4.15
3.65
2.28
2.27
2.26
2.25
2.21
2.21
2.19
2.19
1.63
1.62
1.60
1.59
1.56
1.55
1.52
1.49
1.48
1.47
1.46
1.46
1.45
1.44
1.42
1.36
1.35
1.33
1.31

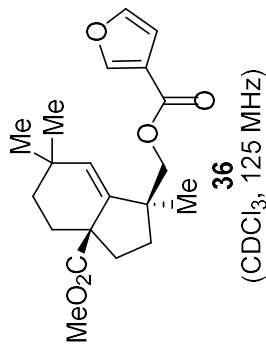


8.01
8.01
7.43
6.75
6.75
5.32



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 ppm

0.70
0.68
0.67
0.93
1.90
3.11
1.00
1.06
0.13
1.42
1.03
2.29
2.53
3.10
3.65
3.33



Current Data Parameters
 NAME yh-2-143-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180419
 Time_ 20.58
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 27
 DS 4
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 295.6 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TDO 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 8.00 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

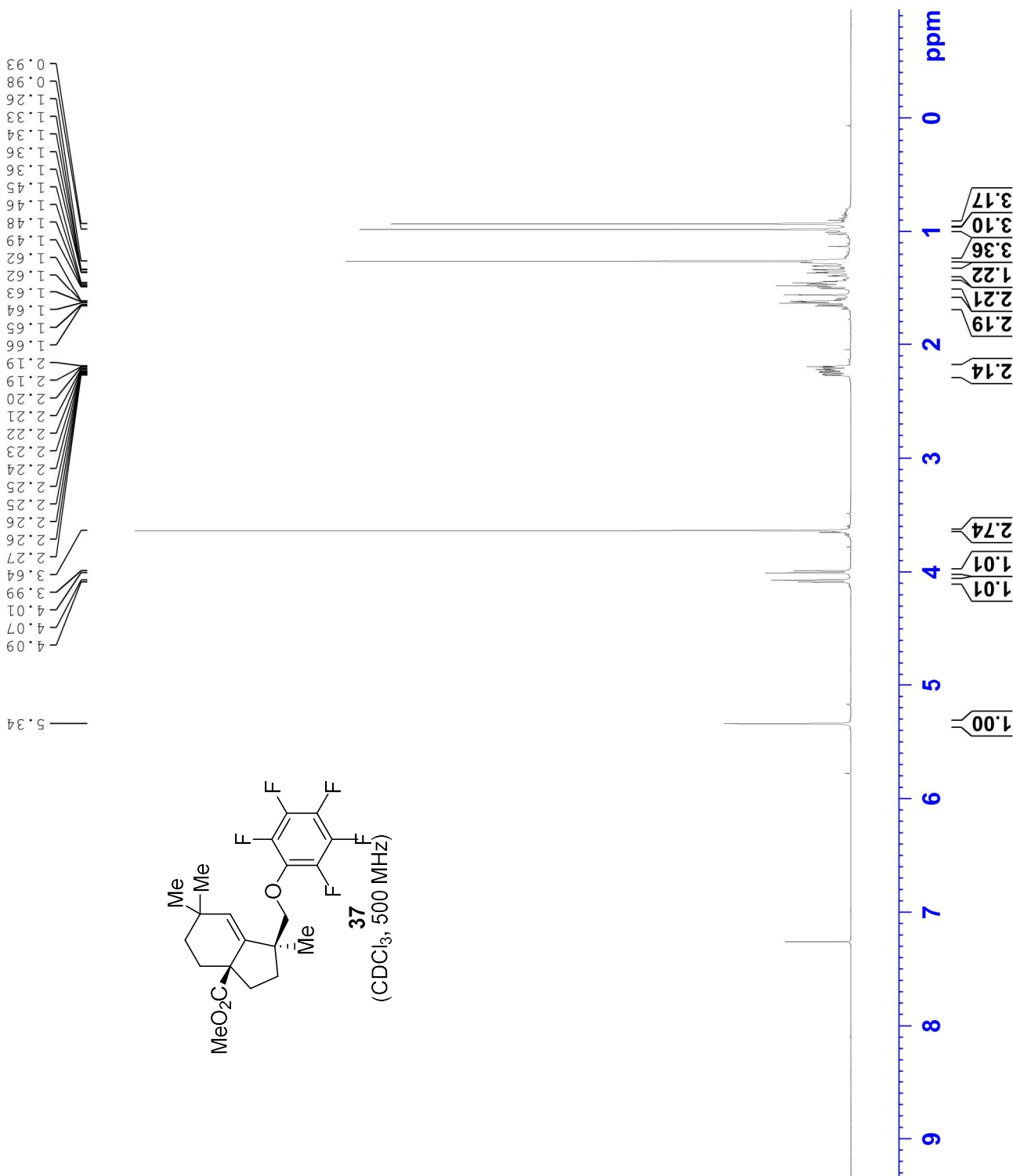
Current Data Parameters
 NAME Yh-2-63-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180110
 Time_ 21.27
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 37.92
 DW 50.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



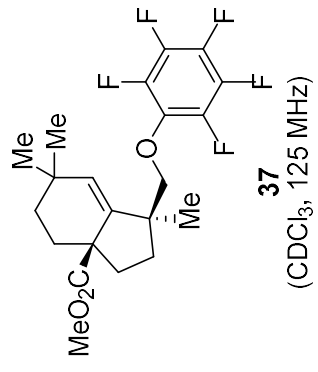
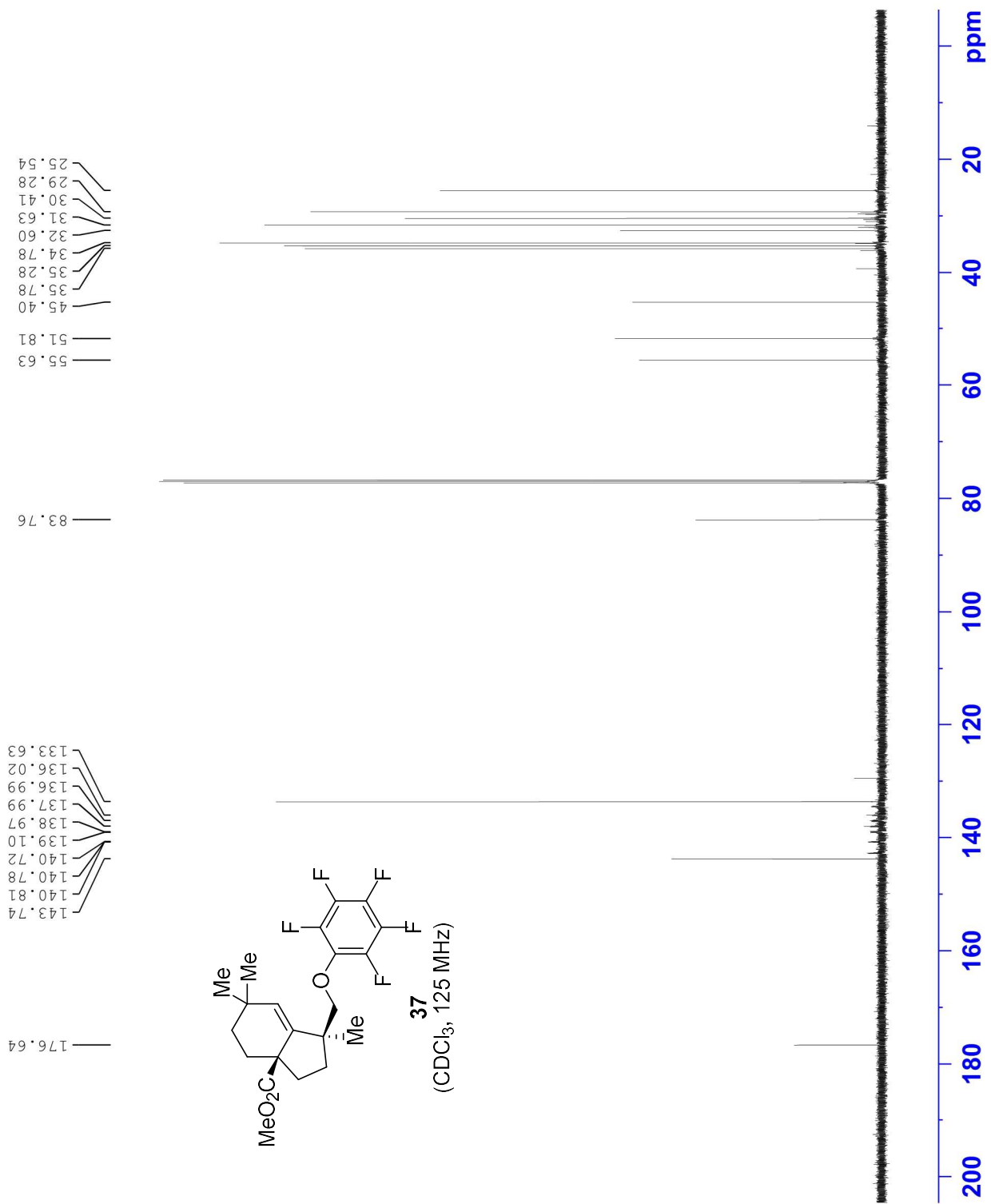
Current Data Parameters
 NAME Yh-2-63-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180111
 Time_ 0.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 2048
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



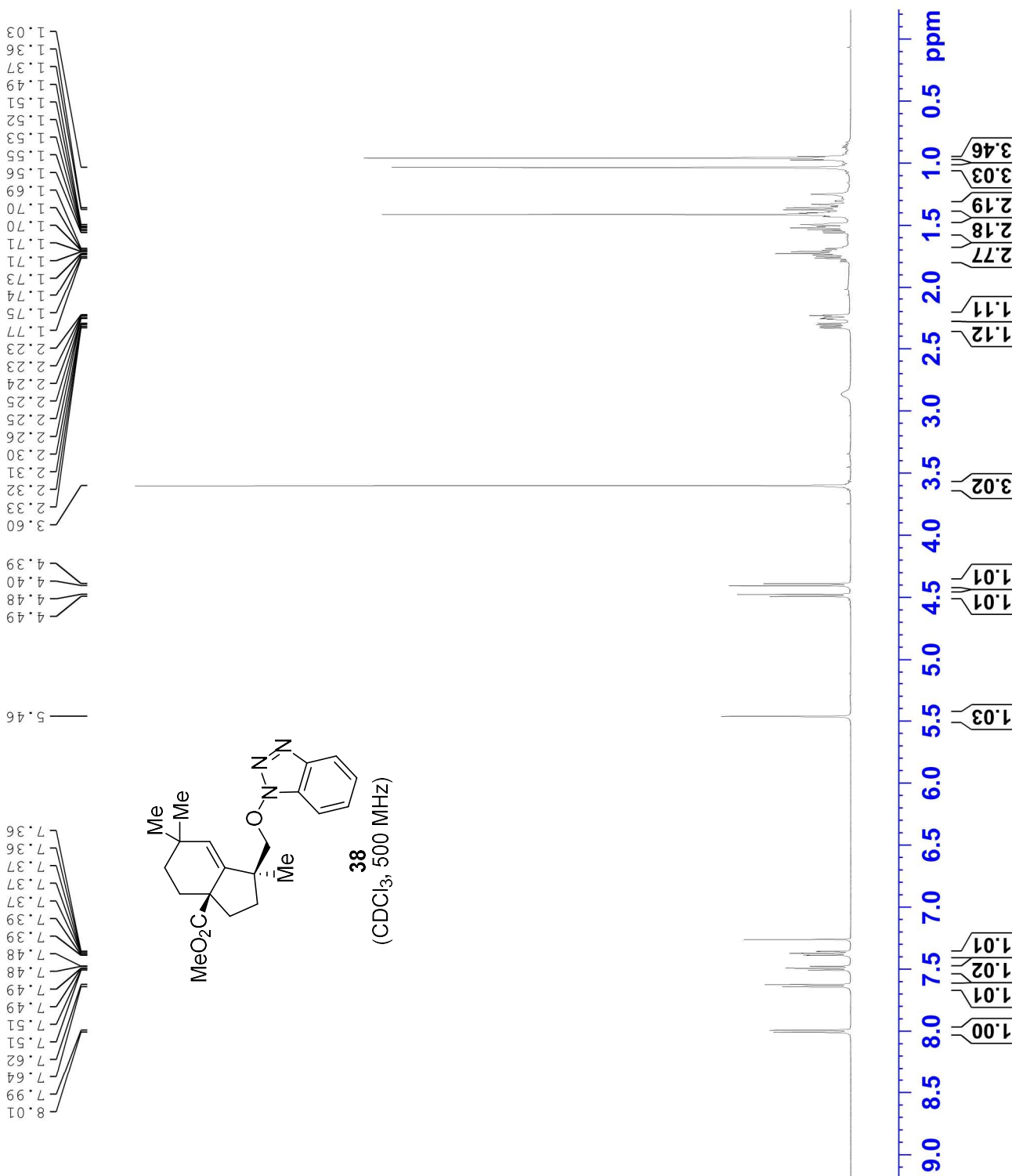
Current Data Parameters
 NAME Yh-7-27-b
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20190930
 Time_ 15.25
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 70.49
 DW 50.000 usec
 DE 6.50 usec
 TE 298.0 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700109 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



```

Current Data Parameters
NAME      Yh-7-27-b
EXPNO    2
PROCNO   2

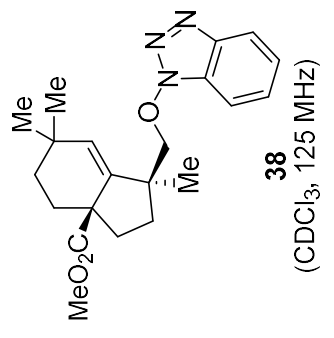
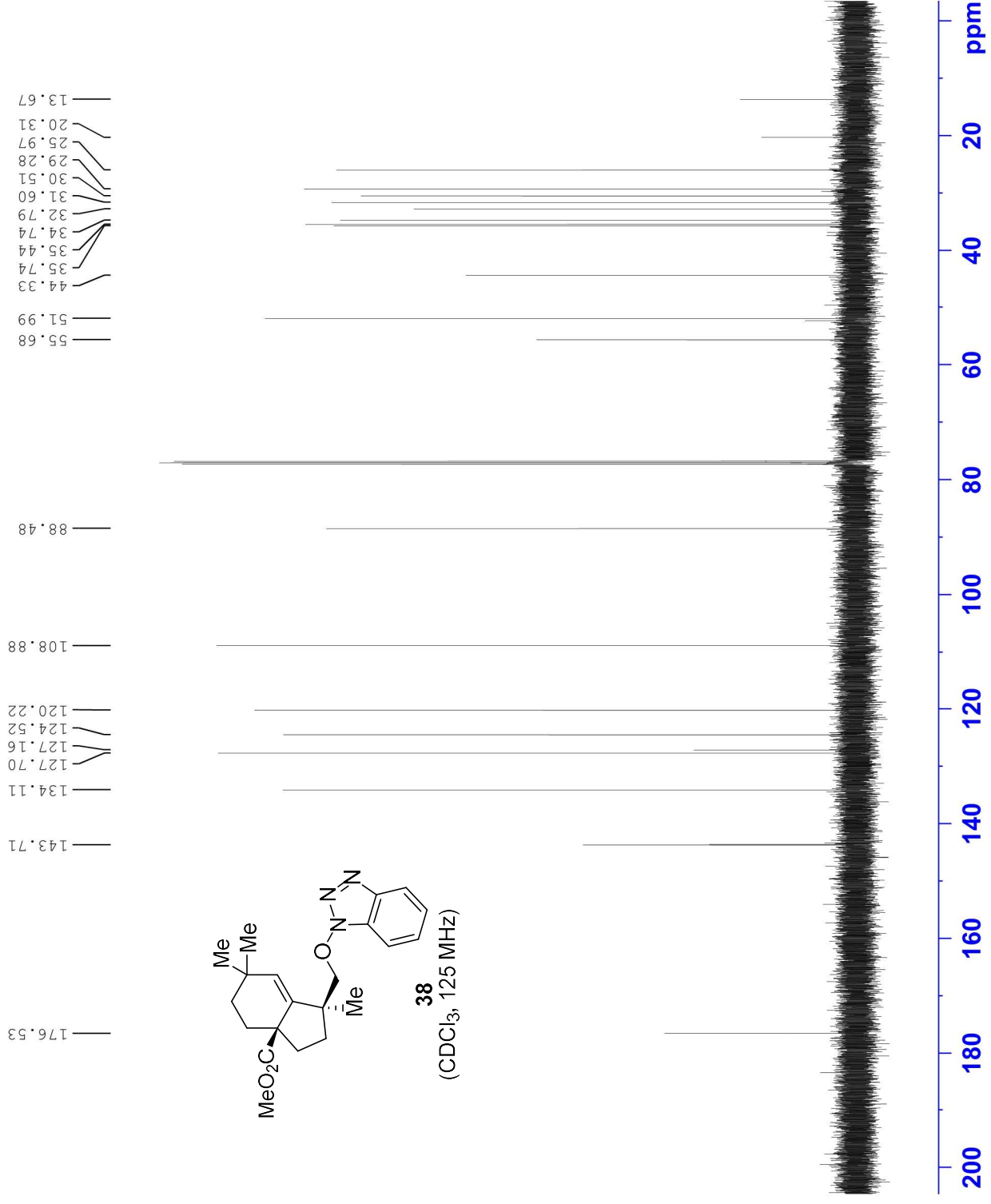
F2 - Acquisition Parameters
Date_     20190930
Time_     16.10
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgdc
TD         187496
SOLVENT   CDCl3
NS         67
DS         0
SWH        31250.000 Hz
FIDRES     0.166670 Hz
AQ         2.9999361 sec
RG         2050
DW         16.000 usec
DE         6.50 usec
TE         298.0 K
D1         3.00000000 sec
D11        0.03000000 sec
TD0        1

===== CHANNEL f1 =====
SFO1      125.7049802 MHz
NUC1       13C
P1         10.00 usec
PLW1      72.83999634 W

===== CHANNEL f2 =====
SFO2      499.8724993 MHz
NUC2       1H
CPDPRG[2] waltz16
PCPD2     80.00 usec
PLW2      19.00000000 W
PLW12     0.29688001 W

F2 - Processing parameters
SI         1048576
SF         125.6924115 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.40

```



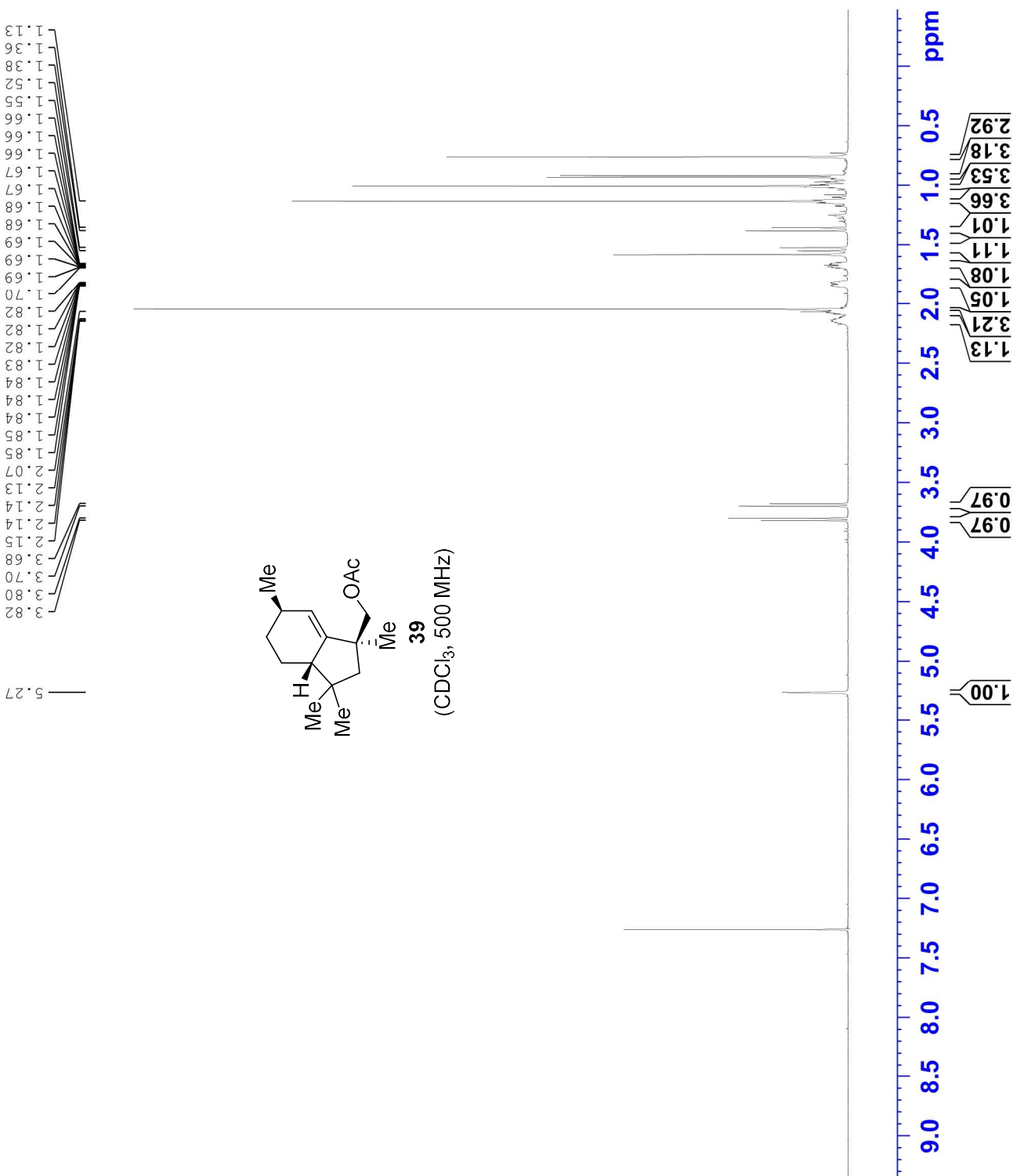
Current Data Parameters
 NAME Yh-5-46-f
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

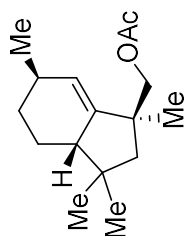
Date_ 20180731
 Time_ 20.07
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 196.79
 DW 50.000 usec
 DE 10.00 usec
 TE 294.1 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.19999981 W

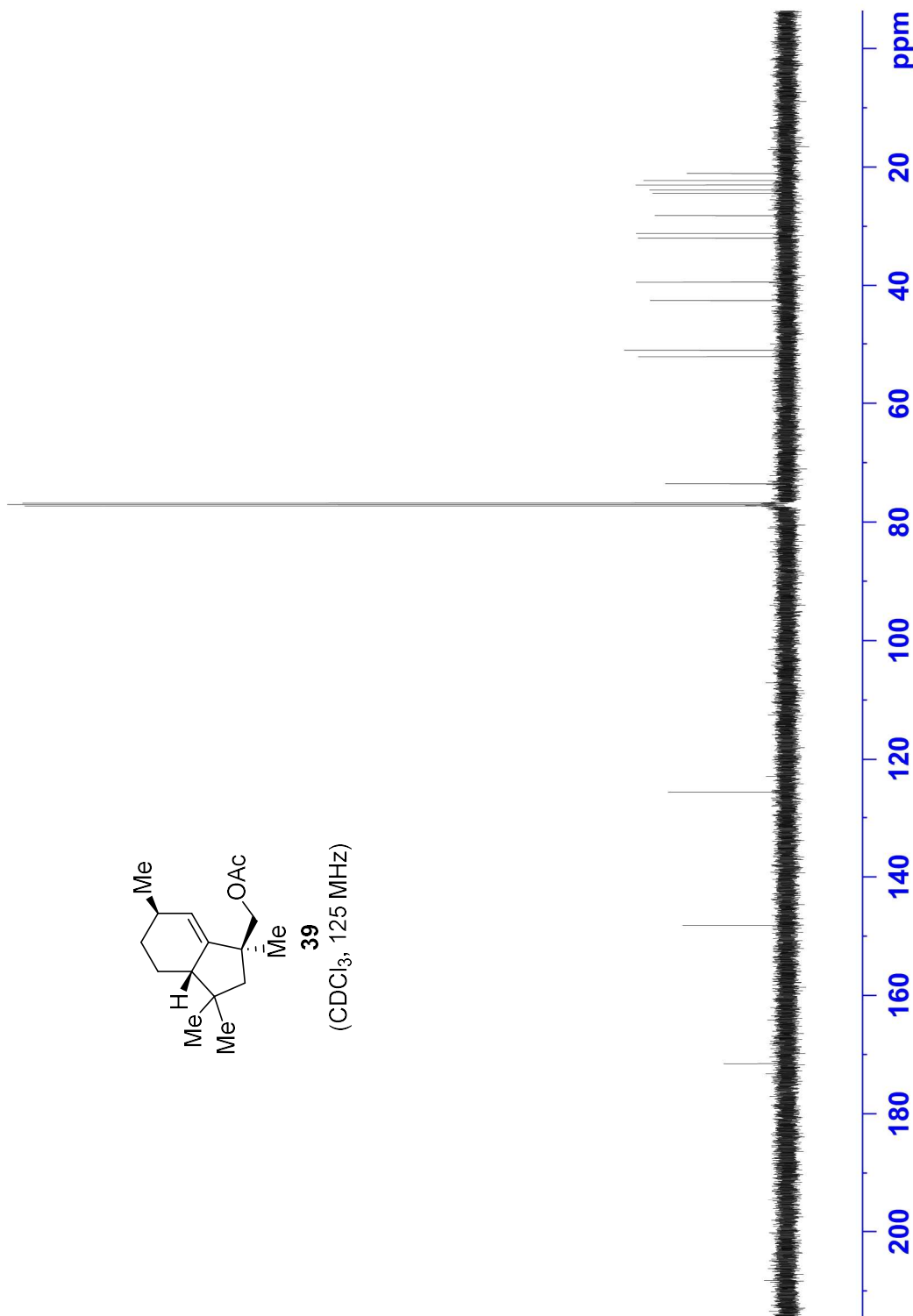
F2 - Processing parameters
 SI 65536
 SF 500.1300138 MHz
 EM
 WDW 0
 SSB 0.30 Hz
 LB 0
 GB 0
 PC 1.00



171.50
 148.17
 125.68
 73.53
 52.11
 51.04
 42.50
 39.38
 31.96
 31.17
 28.16
 24.42
 23.85
 22.98
 22.26
 21.05



39
 (CDCl₃, 125 MHz)



Current Data Parameters
 NAME yh-5-46-r
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180731
 Time 20.37
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 41
 DS 4
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 292.6 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 8.00 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

===== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME 5-member-ring
 EXPNO 1
 PROCNO 1

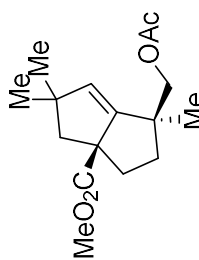
F2 - Acquisition Parameters

Date_ 20190812
 Time_ 11.28
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 6
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 196.79
 DW 50.000 usec
 DE 10.00 usec
 TE 294.4 K
 D1 4.0000000 sec
 TD0 1

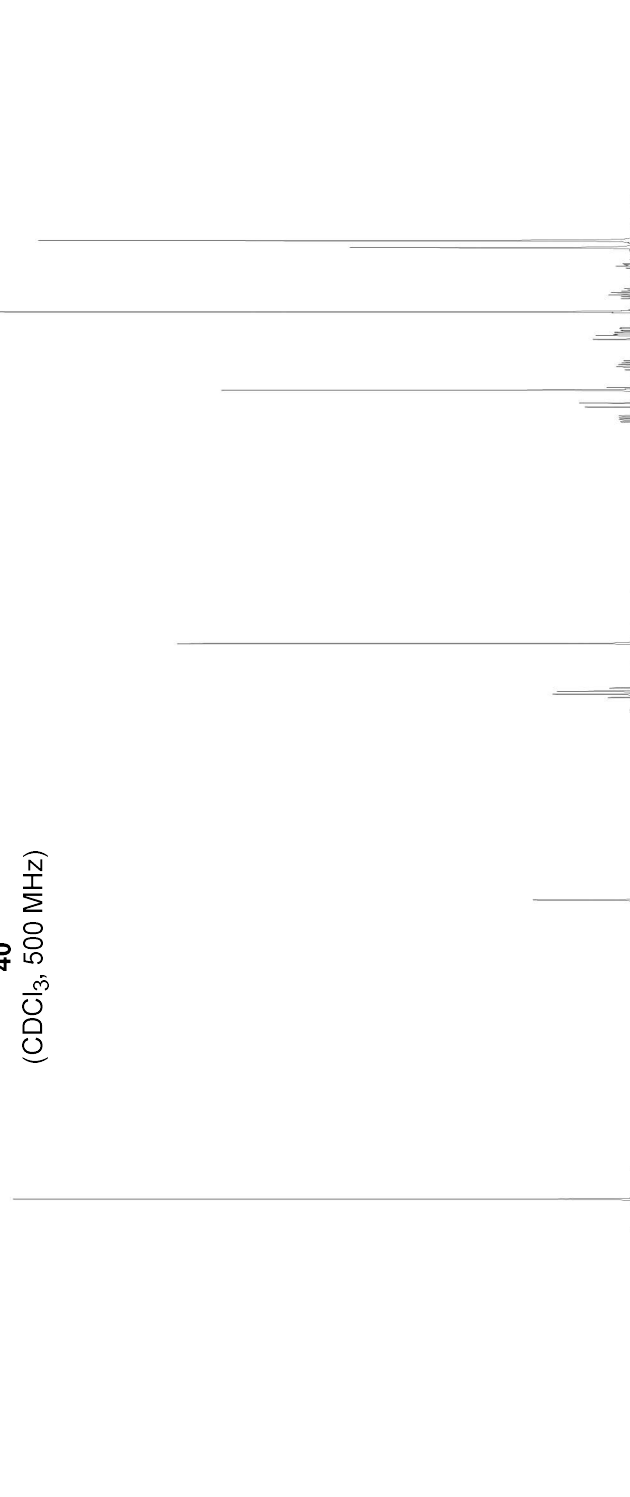
==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 3.30 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300138 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1.10
1.14
1.42
1.44
1.66
1.67
1.68
1.70
1.73
1.77
1.87
1.88
1.89
1.91
1.93
2.06
2.15
2.23
2.24
2.25
2.26
3.69
3.99
4.01



40
 (CDCl₃, 500 MHz)



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 ppm

5.97
3.19
1.30
2.10
1.13
2.89
1.02
0.99

Current Data Parameters
 NAME 5-member-ring
 EXPNO 2
 PROCNO 2

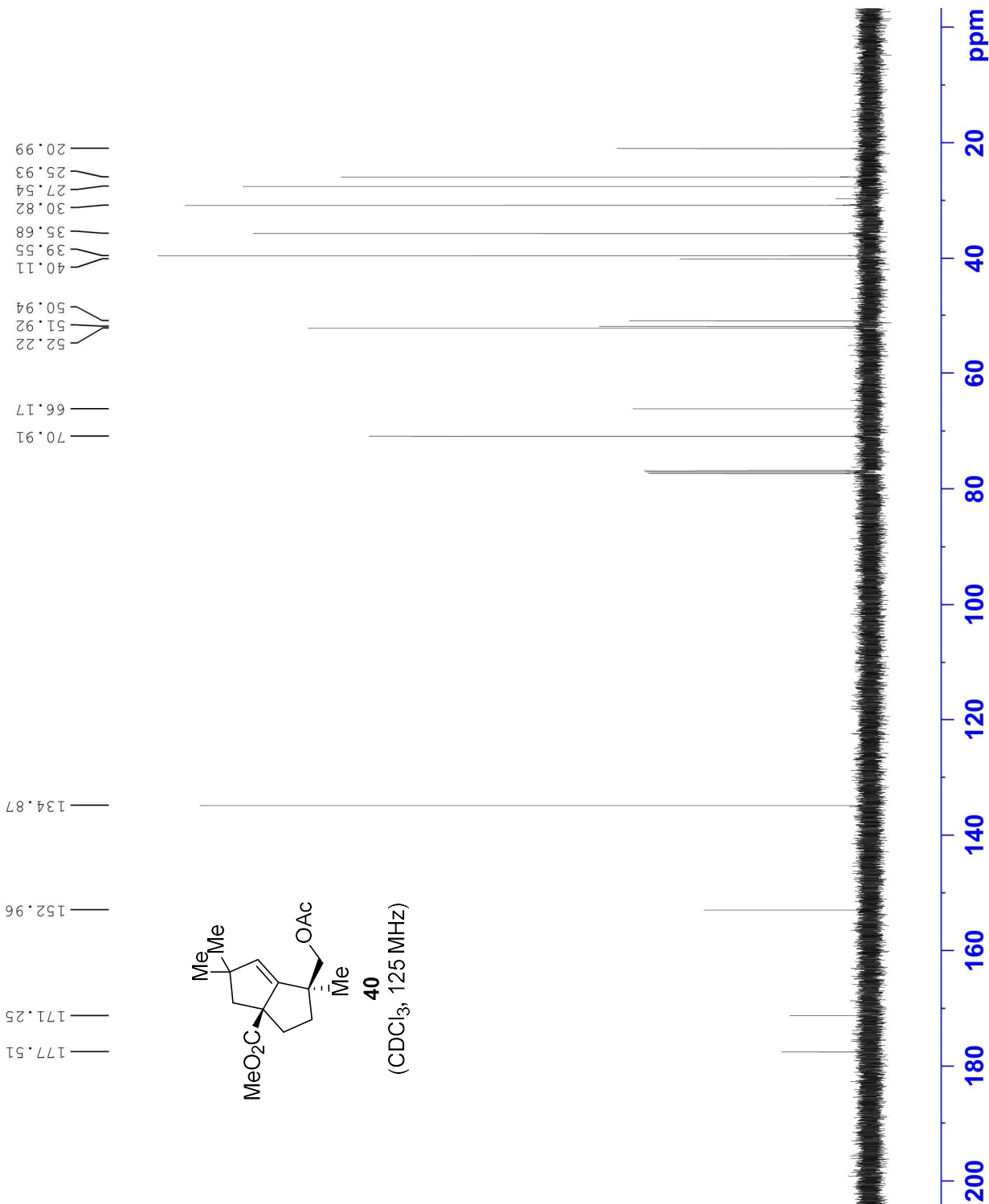
F2 - Acquisition Parameters

Date_ 20190812
 Time_ 21.07
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 15
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 294.5 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



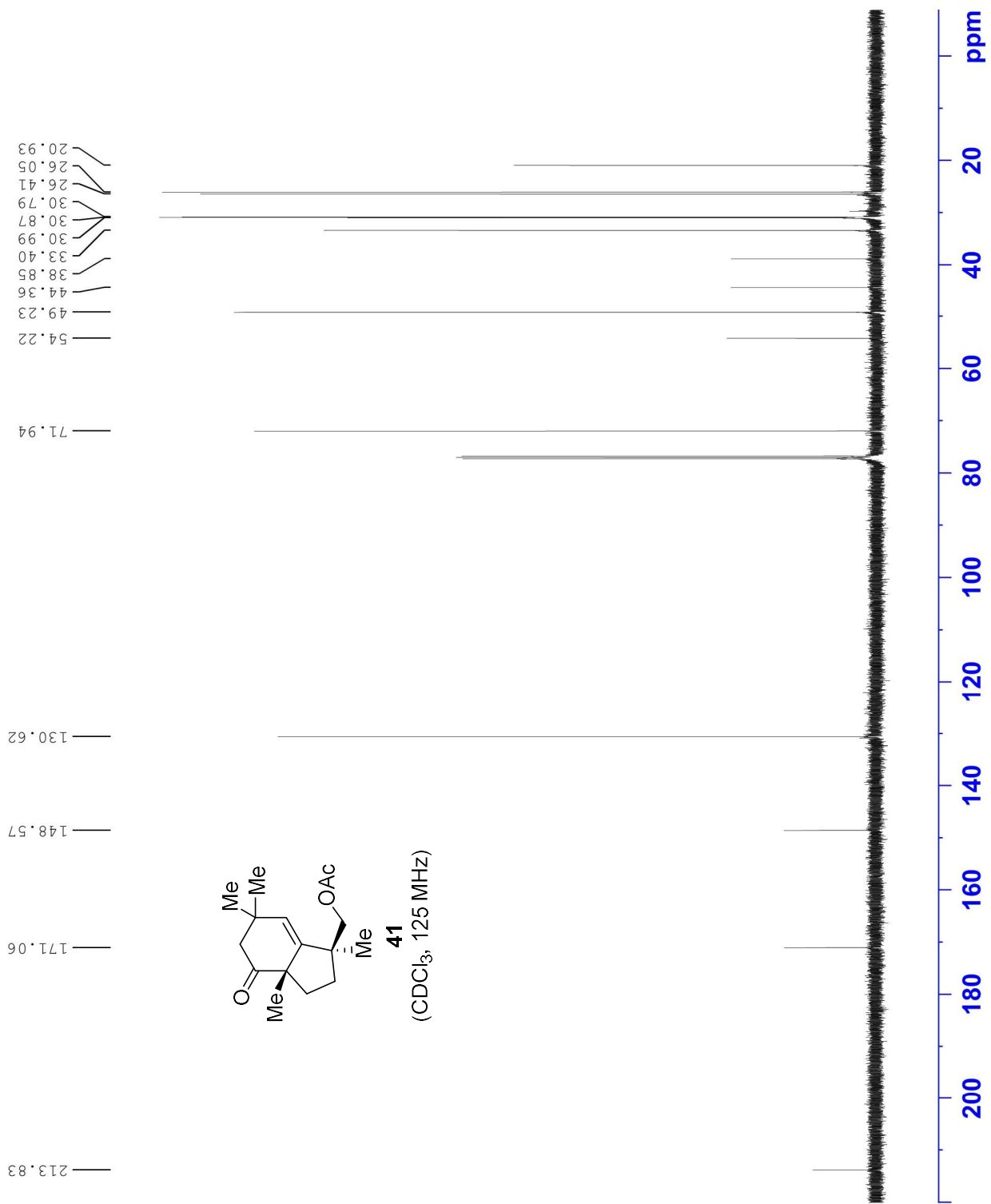
Current Data Parameters
 NAME Yh-5-39
 EXPNO 3
 PROCNO 3

F2 - Acquisition Parameters
 Date_ 20180725
 Time_ 22.44
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 507
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.2 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-5-88-a
 EXPNO 1
 PROCNO 1

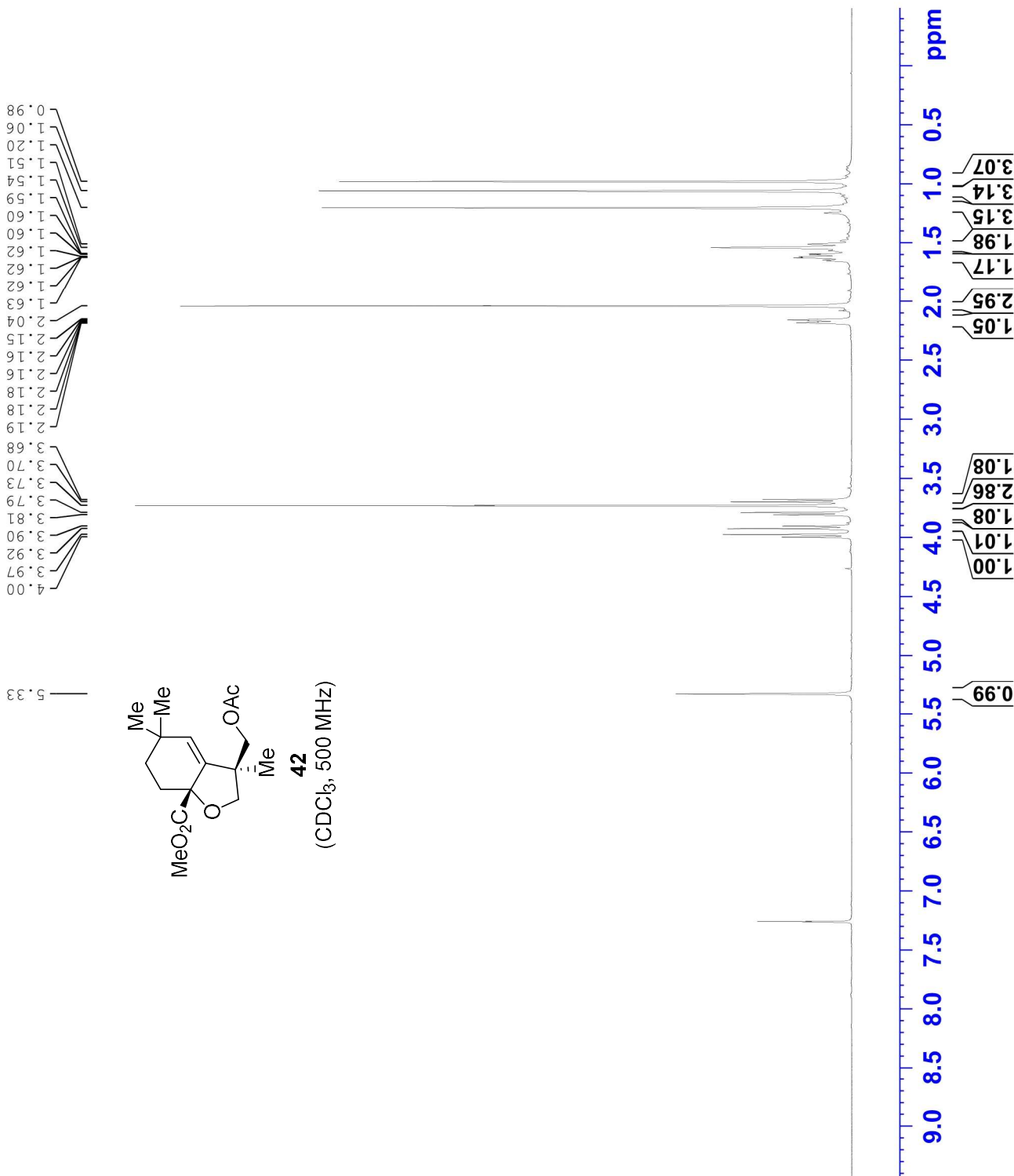
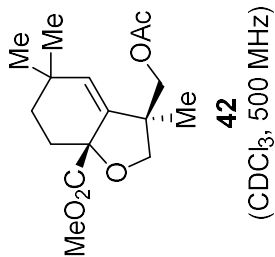
F2 - Acquisition Parameters

Date_ 20181022
 Time_ 11.53
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 56.75
 DW 50.000 usec
 DE 6.50 usec
 TE 297.2 K
 D1 4.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700120 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

4.00
3.97
3.92
3.90
3.81
3.79
3.73
3.70
3.68
2.19
2.18
2.18
2.16
2.16
2.16
2.15
2.04
1.63
1.62
1.62
1.62
1.60
1.60
1.59
1.54
1.51
1.20
1.11
0.90



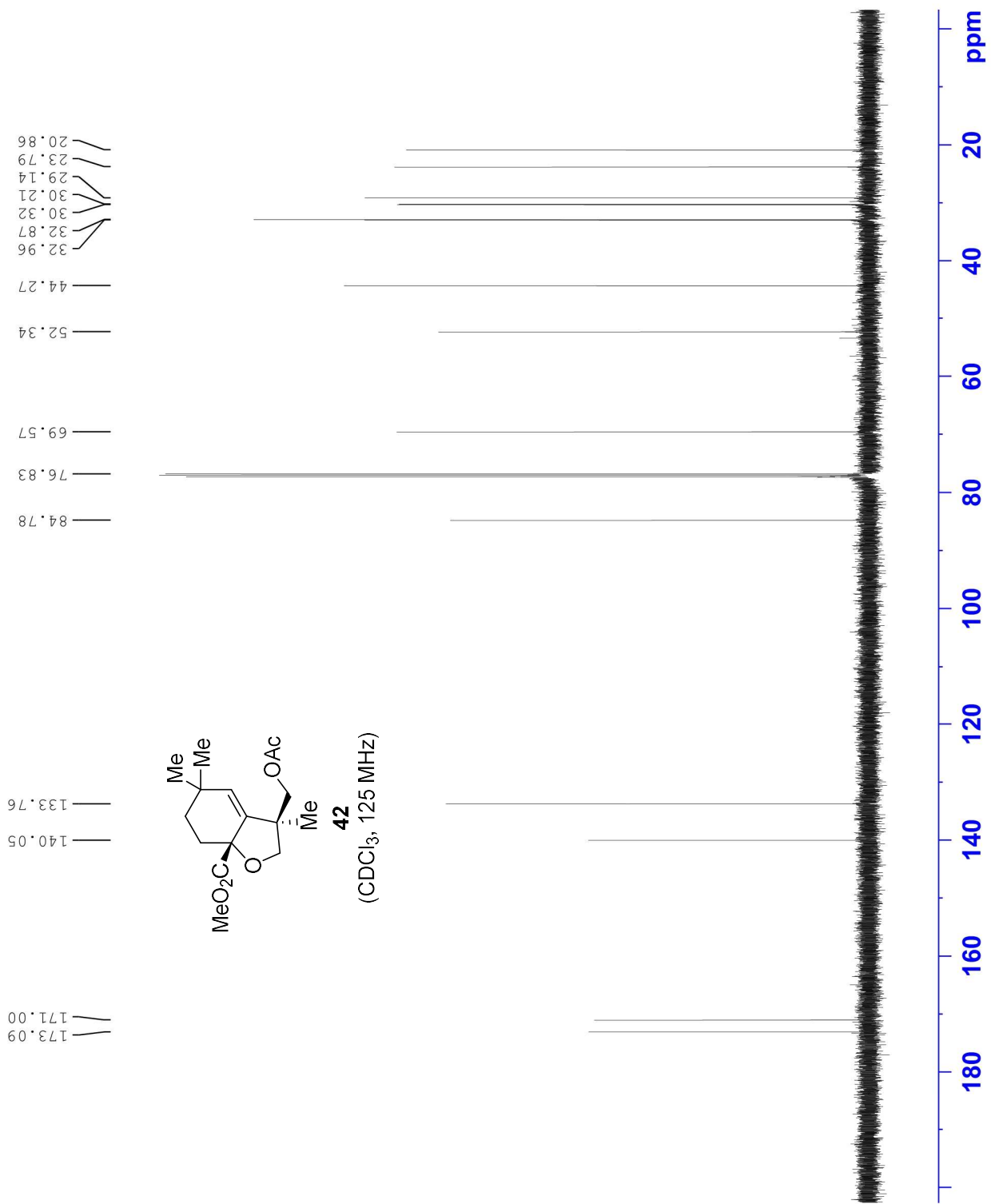
Current Data Parameters
 NAME yh-5-88-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20181022
 Time_ 13.52
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 64
 DS 0
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 295.5 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 9.90 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SFO1 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-3-3-a
 EXPNO 1
 PROCNO 1

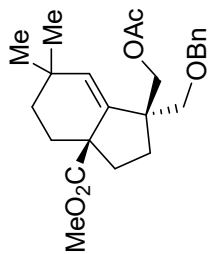
F2 - Acquisition Parameters

Date_ 20180131
 Time_ 22.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 22.37
 DW 50.000 usec
 DE 6.50 usec
 TE 296.8 K
 D1 3.0000000 sec
 TD0 1

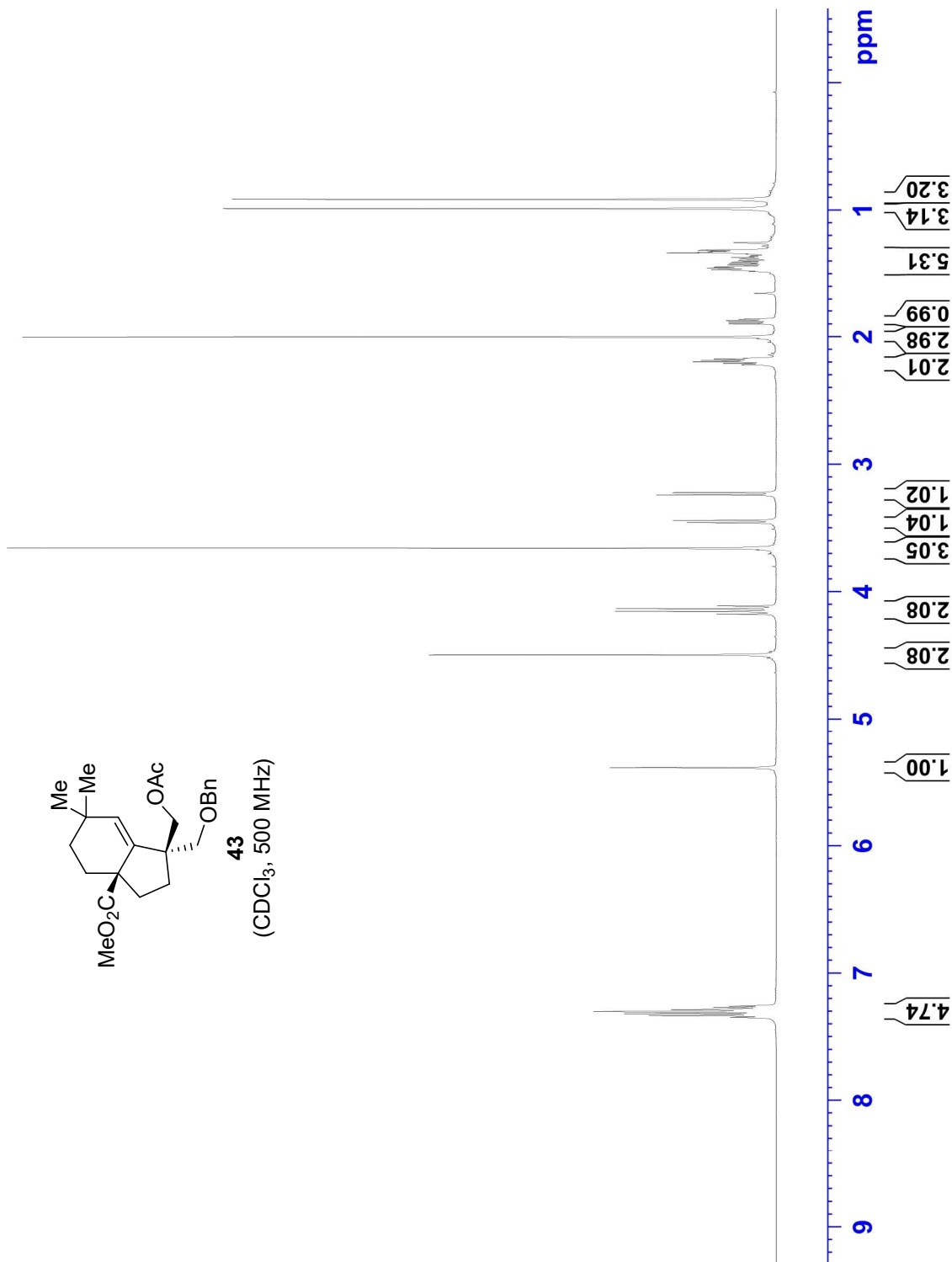
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700120 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

7.35
7.33
7.32
7.30
7.29
7.27
7.26
4.99
4.15
4.13
3.66
3.46
3.44
3.24
3.22
2.21
2.20
2.19
2.00
1.90
1.89
1.87
1.86
1.47
1.45
1.45
1.44
1.43
1.42
1.41
1.34
1.33
1.33
1.31
1.31
1.31
1.31
0.99
0.99
0.91



(CDCl₃, 500 MHz)



Current Data Parameters
 NAME yh-3-3-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180131
 Time_ 23.09
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 18
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.1 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

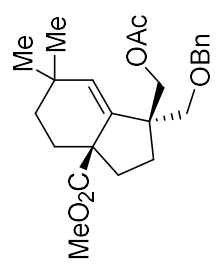
==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

20.97
 29.50
 30.47
 30.74
 31.52
 32.65
 34.89
 36.10
 48.11
 51.92
 55.53
 67.61
 73.23
 74.01

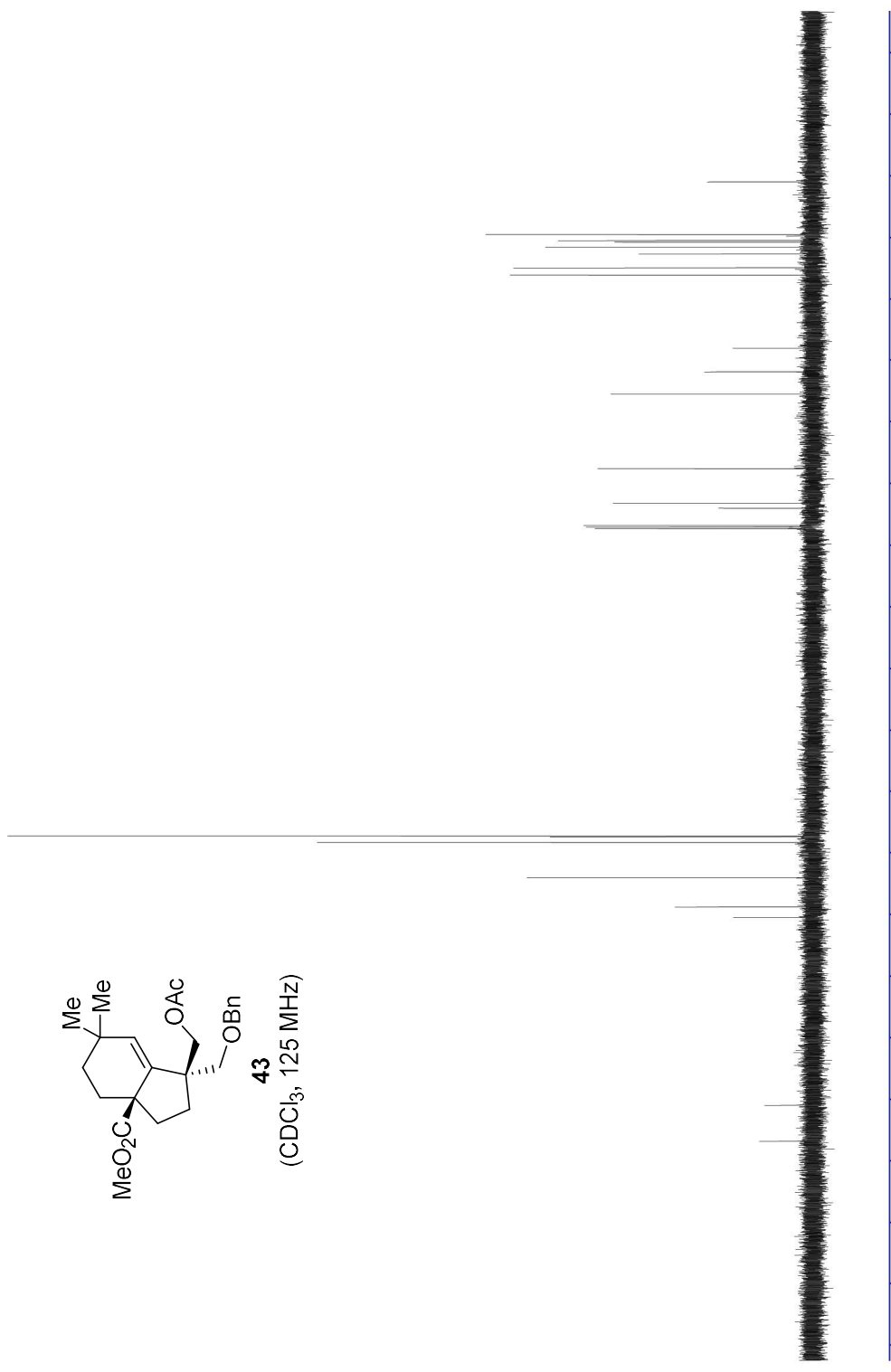
127.26
 127.38
 128.29
 133.98
 138.76
 140.48

170.96
 176.79



(CDCl₃, 125 MHz)

ppm



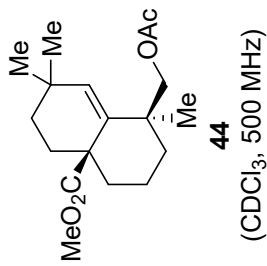
Current Data Parameters
 NAME yh-5-21
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180711
 Time_ 21.11
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 16
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 77.07
 DW 50.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 4.0000000 sec
 TD0 1

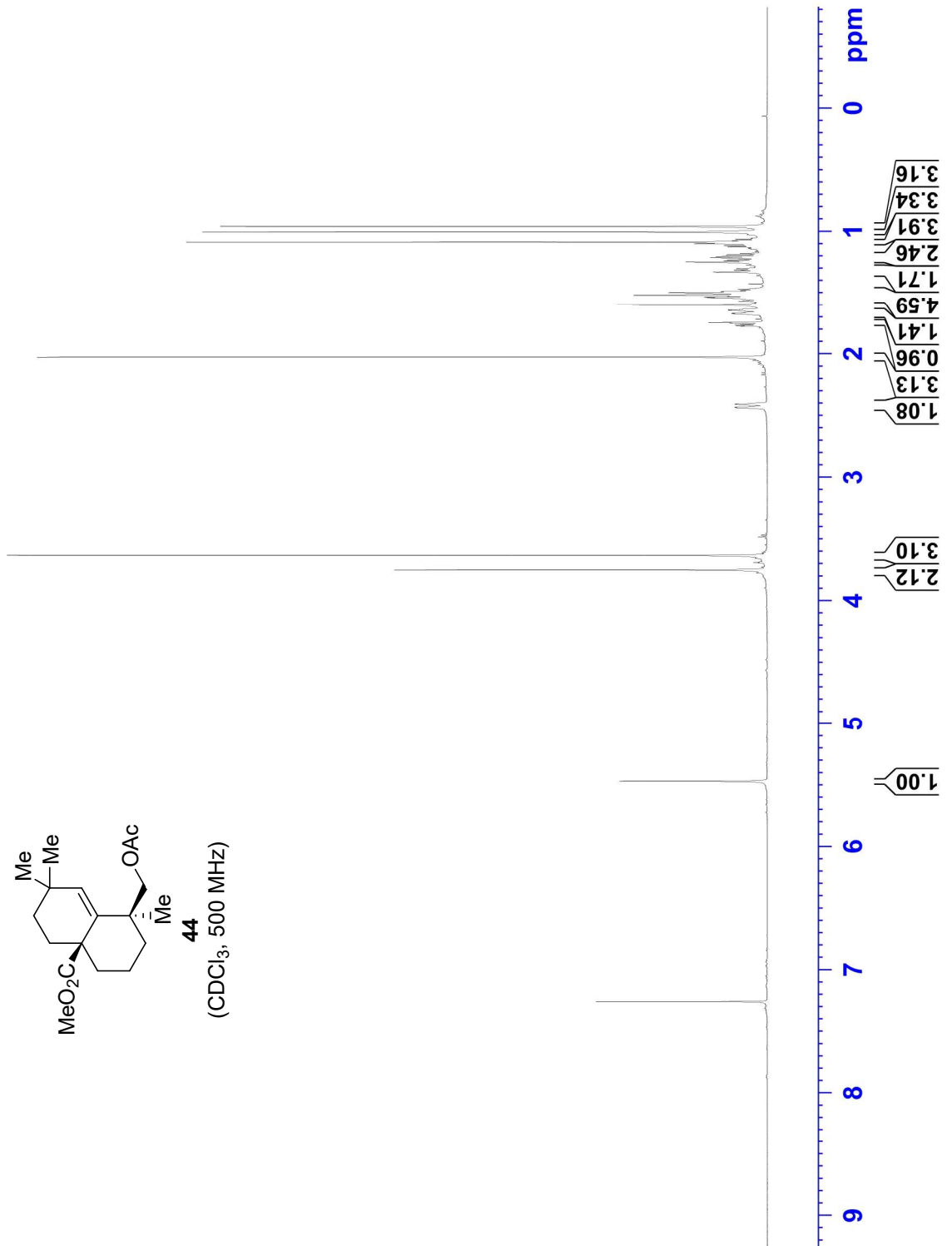
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.75
3.63
2.44
2.43
2.41
2.41
2.03
1.78
1.77
1.76
1.75
1.75
1.75
1.67
1.67
1.67
1.65
1.64
1.64
1.52
1.50
1.33
1.32
1.25
1.24
1.22
1.21
1.20
1.19
1.09
1.00
0.96



5.47



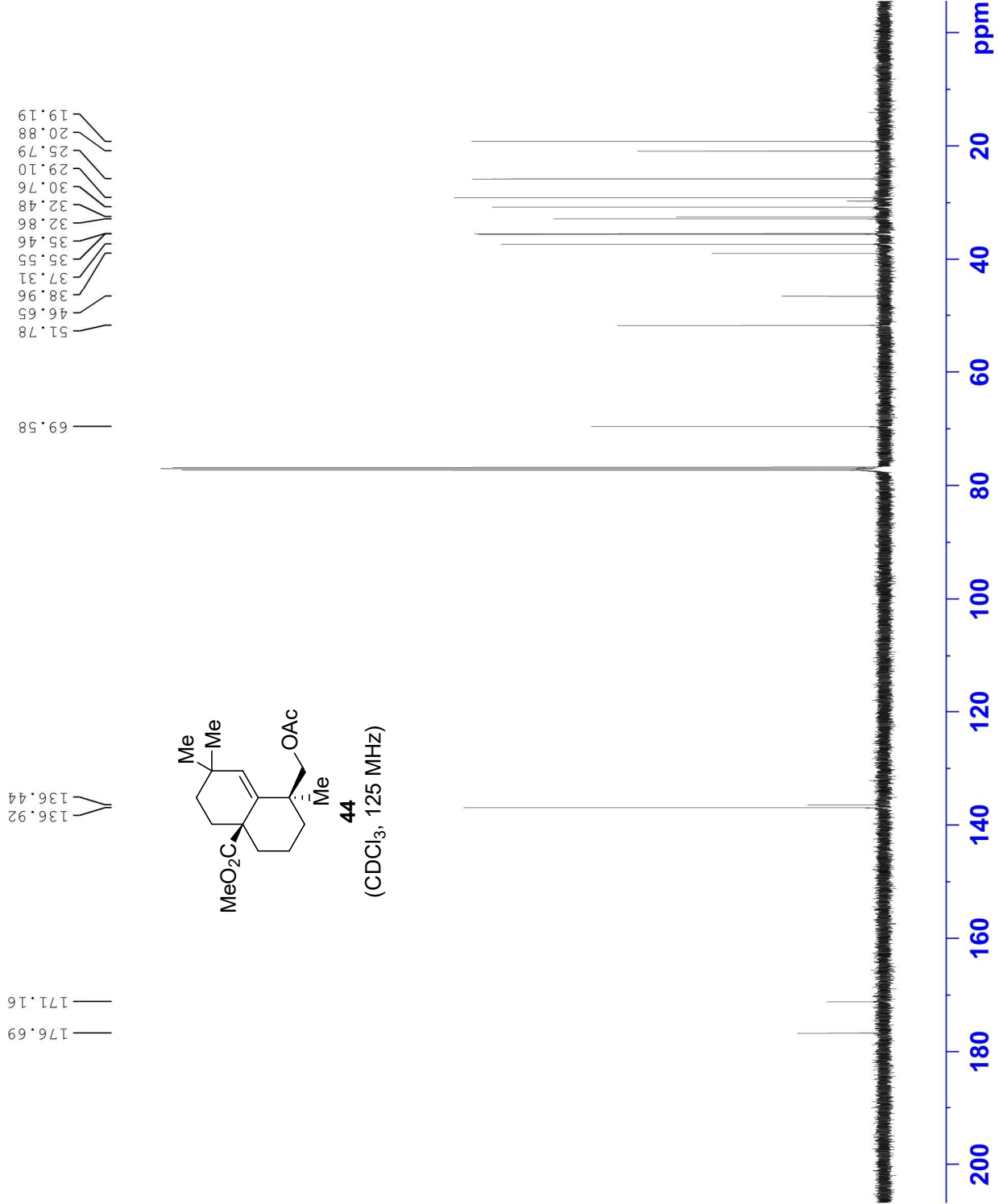
Current Data Parameters
 NAME Yh-5-21
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180711
 Time_ 22.40
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 810
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.4 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.0000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



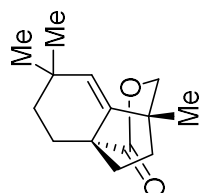
Current Data Parameters
 NAME yh-3-36-rH
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20171104
 Time_ 21.34
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 55.8
 DW 50.000 usec
 DE 10.00 usec
 TE 294.7 K
 D1 2.0000000 sec
 TD0 1

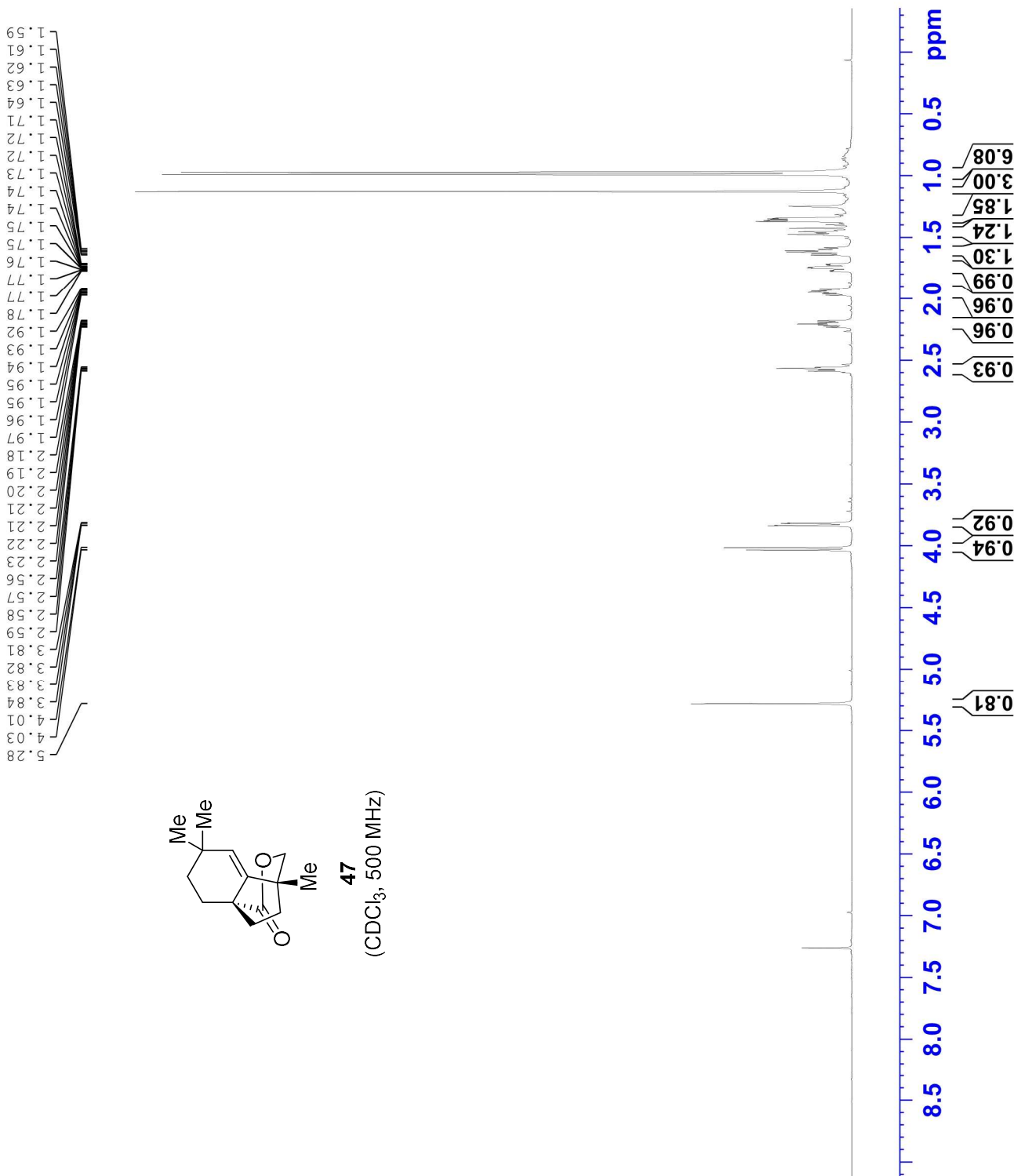
==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 8.00 usec
 PLW1 12.19999981 W

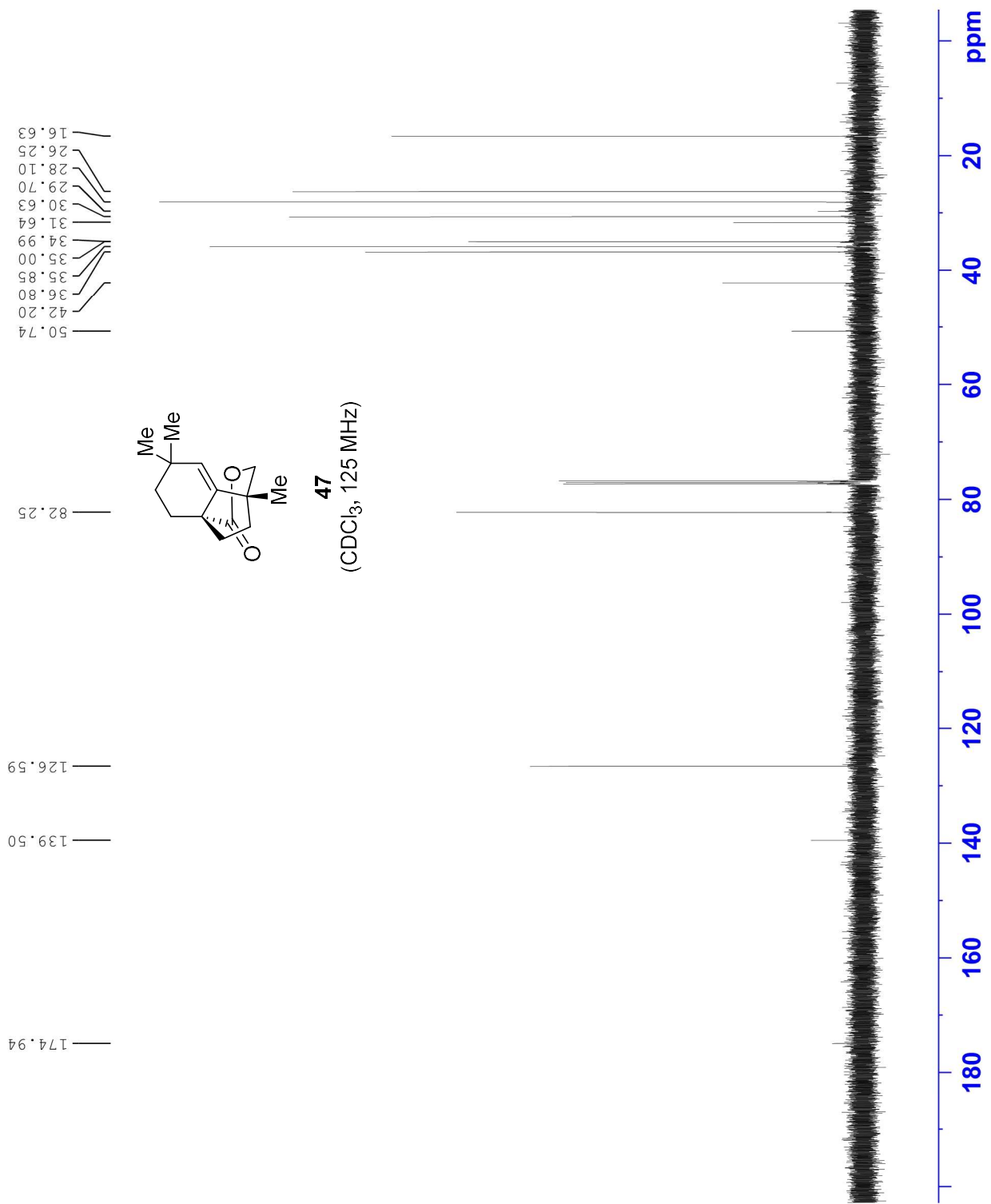
F2 - Processing parameters
 SI 65536
 SF 500.1300131 MHz
 EM
 WDW 0
 SSB 0 0.30 Hz
 LB 0
 GB 0
 PC 1.00

5.28
4.03
4.01
3.84
3.83
3.82
3.81
2.59
2.58
2.57
2.56
2.23
2.22
2.21
2.20
2.19
2.18
1.97
1.96
1.95
1.94
1.93
1.92
1.78
1.77
1.77
1.76
1.75
1.75
1.74
1.74
1.73
1.72
1.71
1.64
1.63
1.62
1.61
1.59



47
 (CDCl₃, 500 MHz)





Current Data Parameters
 NAME Yh-3-36-1C
 EXPNO 1
 PROCNO 1

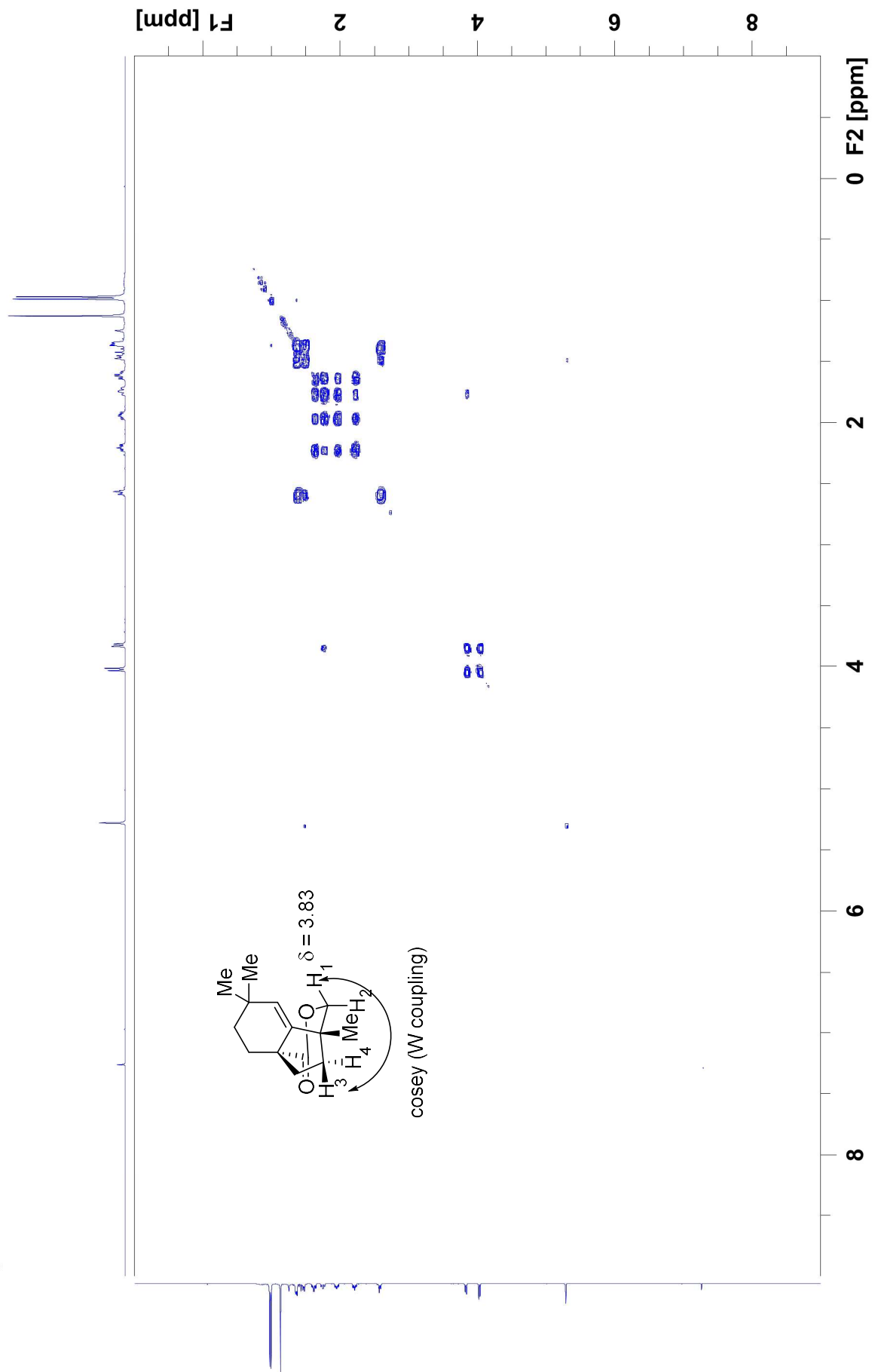
F2 - Acquisition Parameters
 Date_ 20180822
 Time_ 14.15
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 147
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

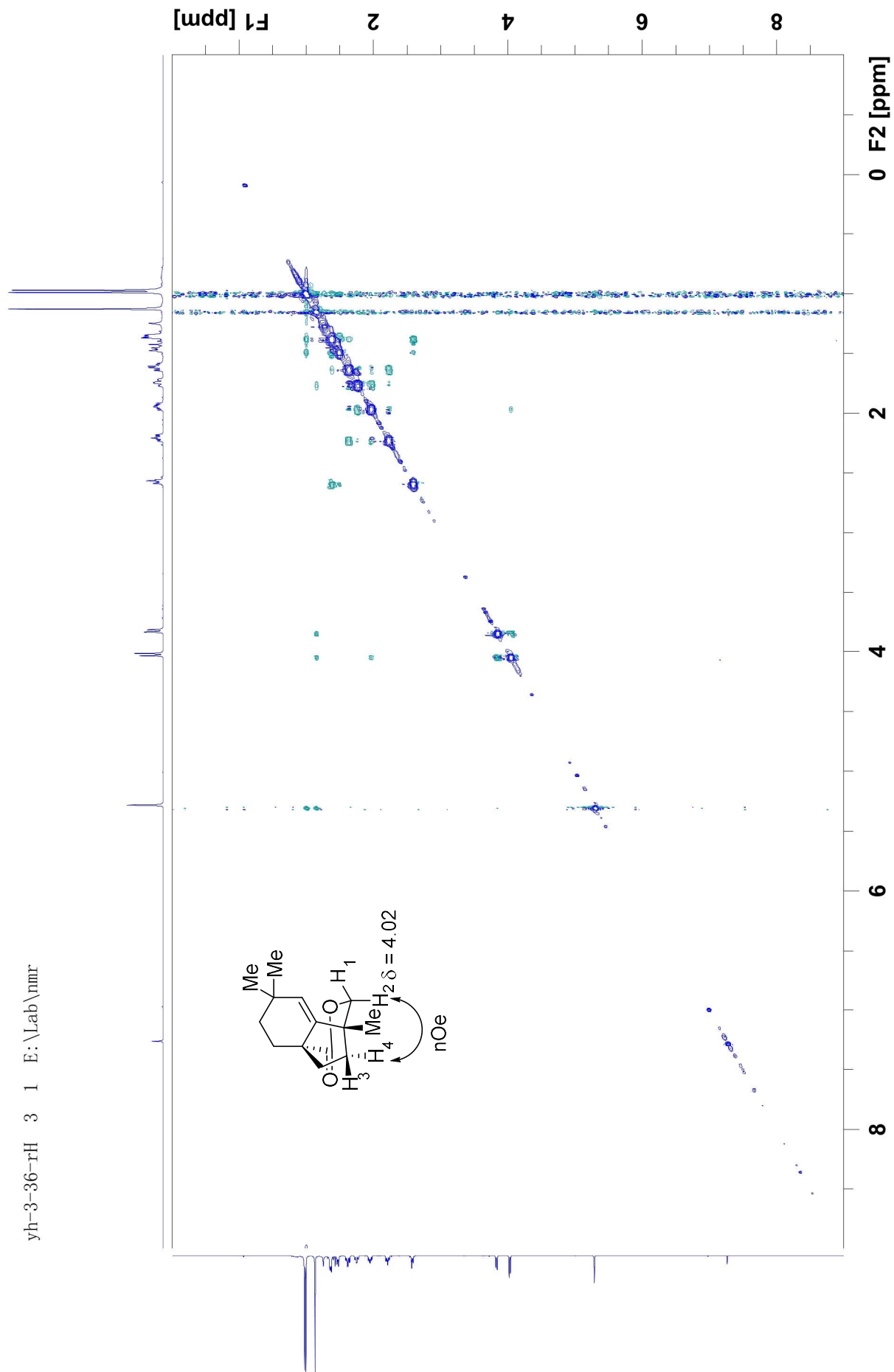
==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

yh-3-36-rH 2 1 E:\Lab\nmr



yh-3-36-rH 3 1 E:\Lab\nmr



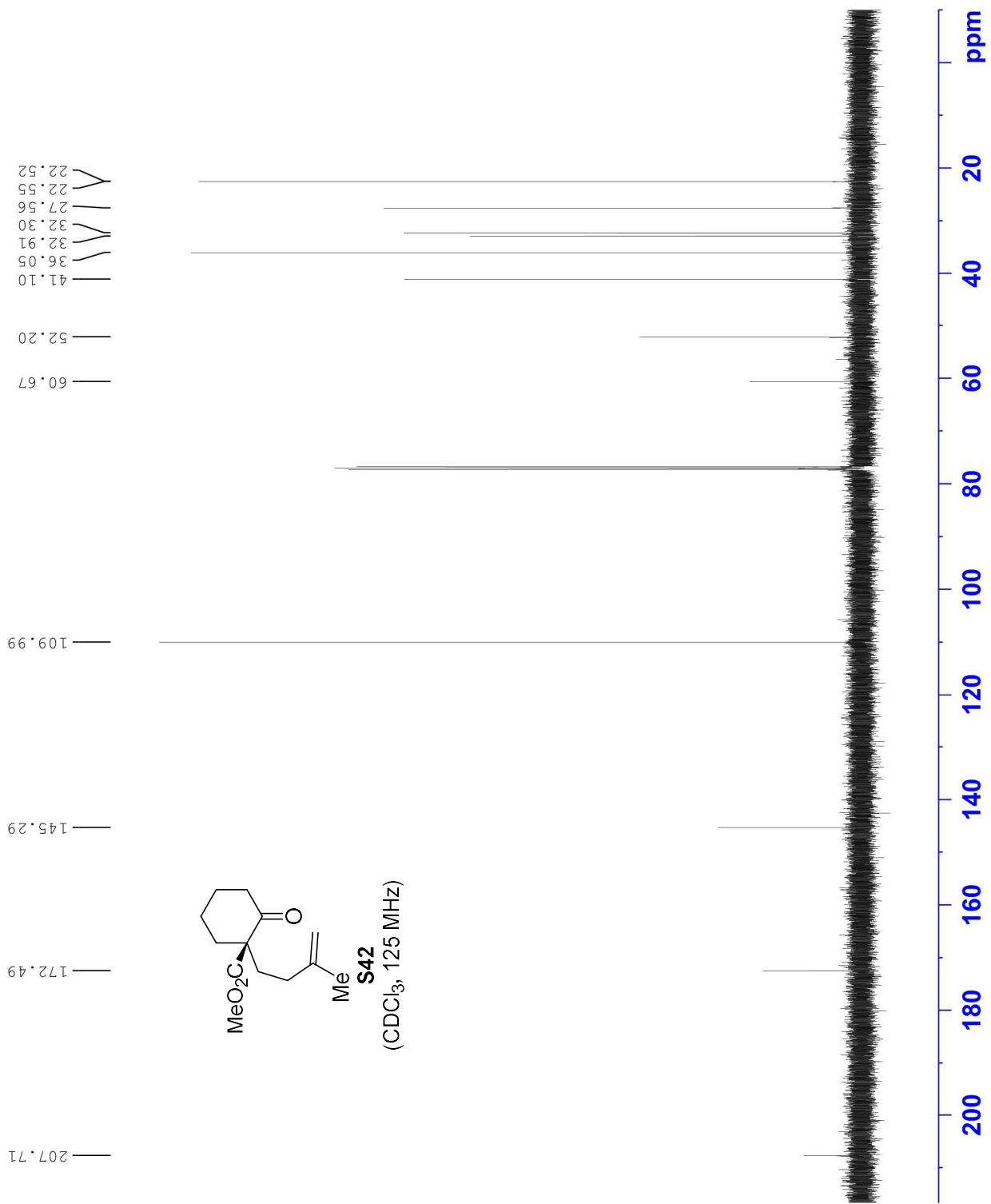
Current Data Parameters
 NAME Yh-5-49
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180813
 Time_ 20.19
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 165
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.3 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-4-22-a
 EXPNO 1
 PROCNO 1

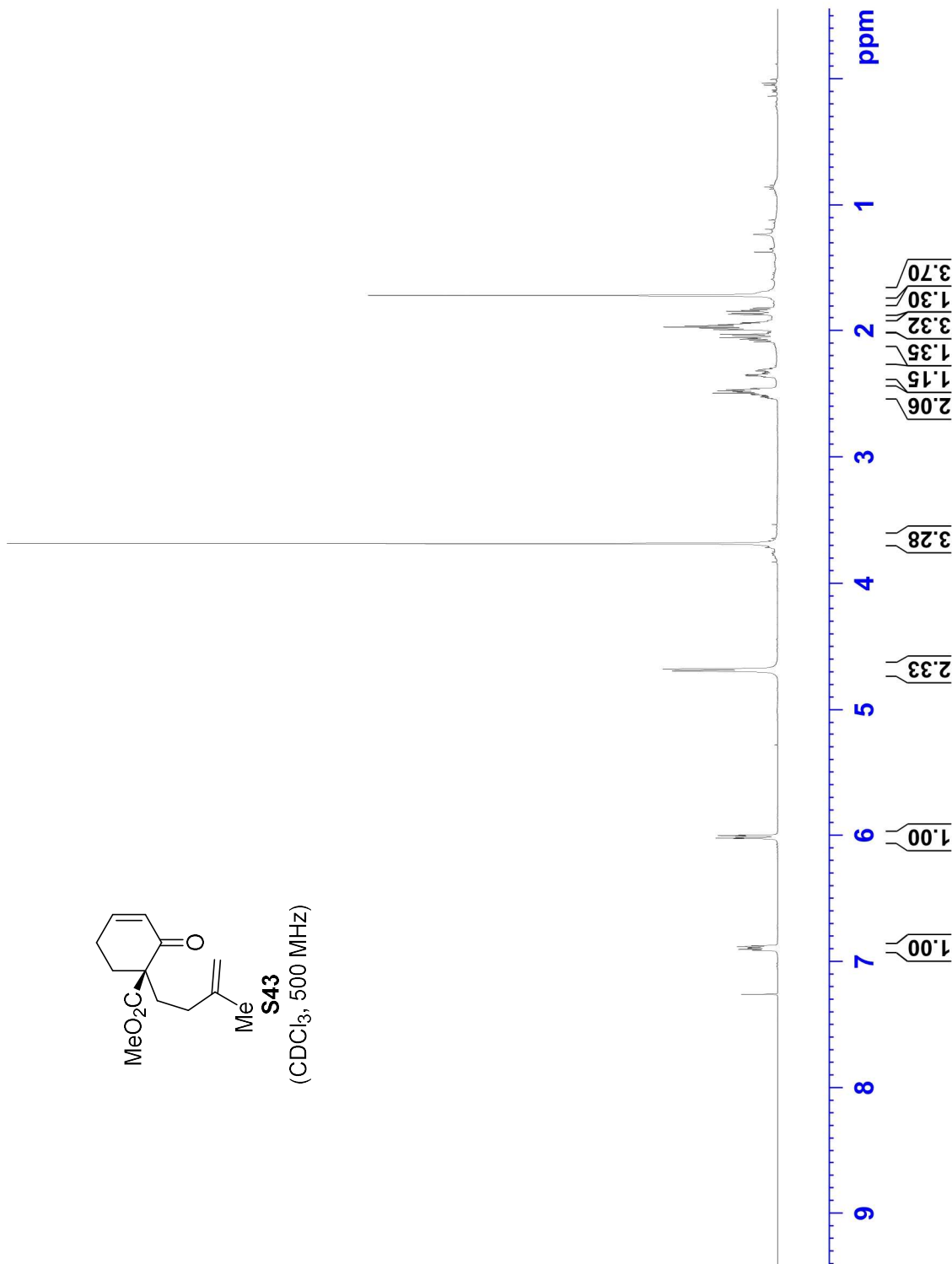
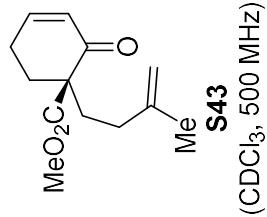
F2 - Acquisition Parameters

Date_ 20180812
 Time_ 20.18
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 52.86
 DW 50.000 usec
 DE 10.00 usec
 TE 294.2 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.1999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300136 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

6.90
6.89
6.88
6.88
6.89
6.90
6.02
6.00
4.68
3.68
2.51
2.50
2.50
2.49
2.48
2.48
2.47
2.46
2.36
2.36
2.35
2.35
2.09
2.08
2.07
2.06
2.06
2.06
2.04
1.98
1.97
1.96
1.94
1.87
1.86
1.86
1.85
1.84
1.84
1.84
1.72



Current Data Parameters
 NAME Yh-4-22-a
 EXPNO 2
 PROCNO 2

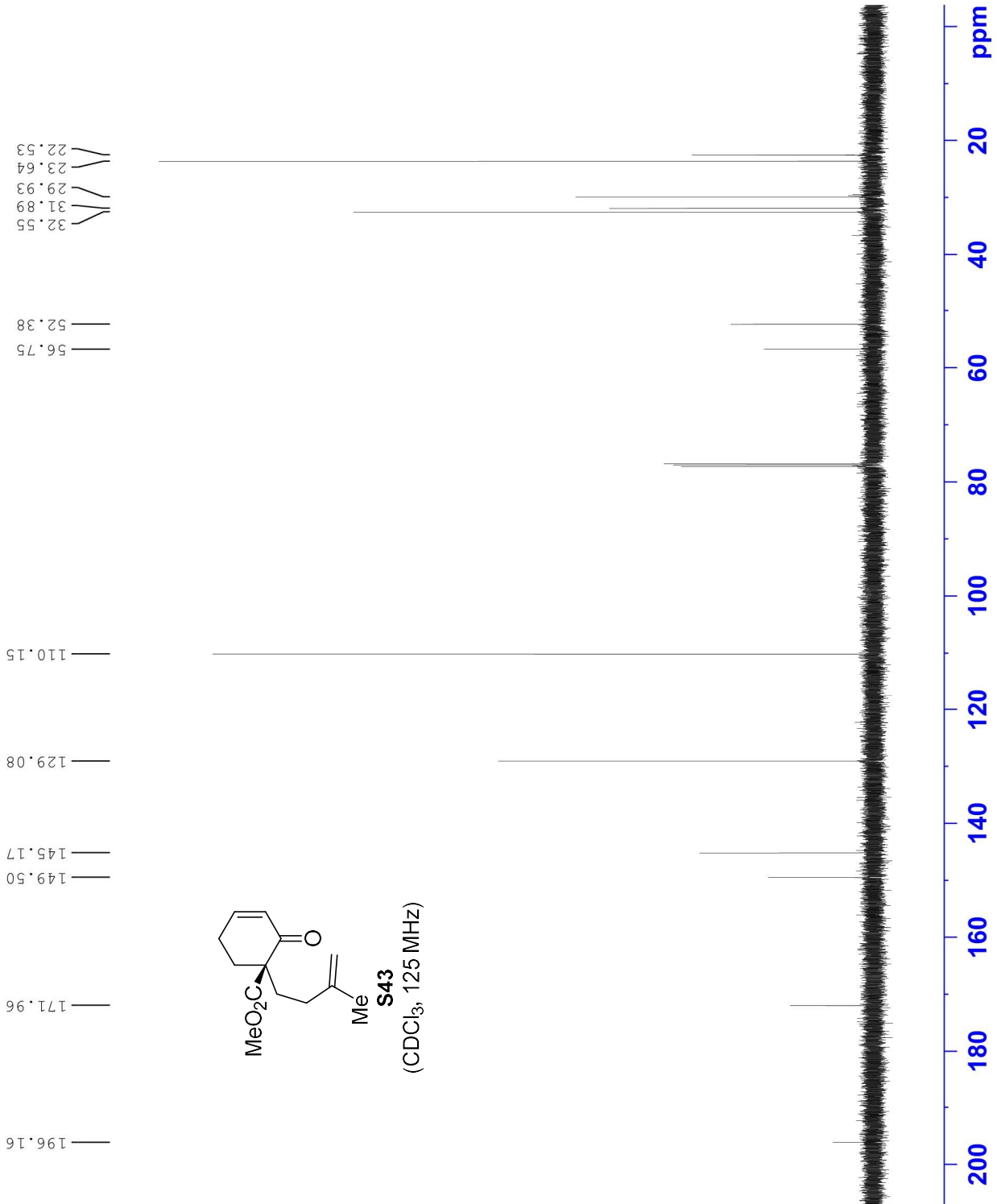
F2 - Acquisition Parameters

Date_ 20180812
 Time_ 20.53
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 23
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.3 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



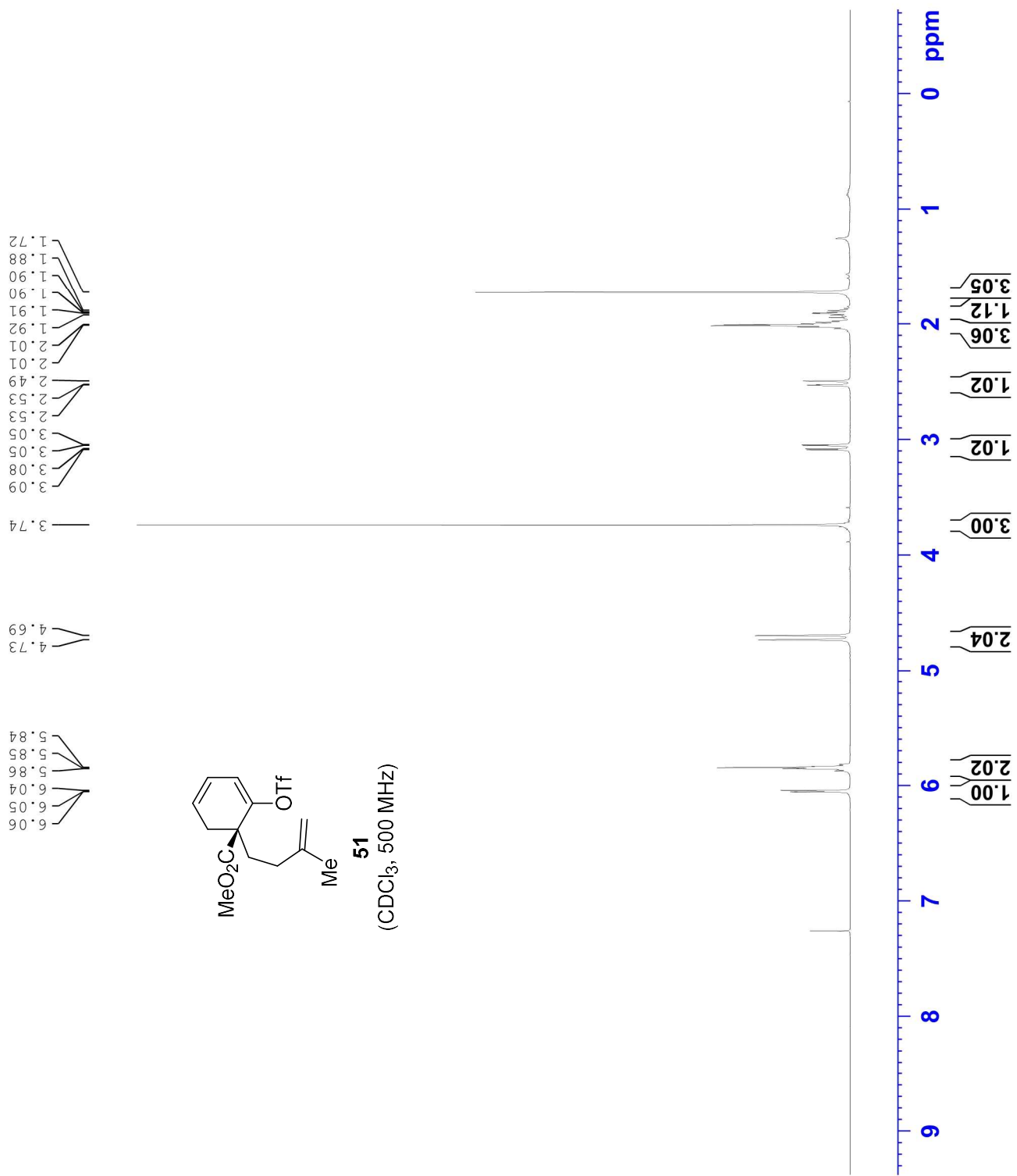
Current Data Parameters
 NAME Yh-4-24-a
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20180314
 Time_ 22.08
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 29.95
 DW 50.000 usec
 DE 6.50 usec
 TE 296.7 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 32768
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-4-24-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters

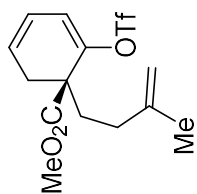
Date_ 20180314
 Time_ 22.16
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.9 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

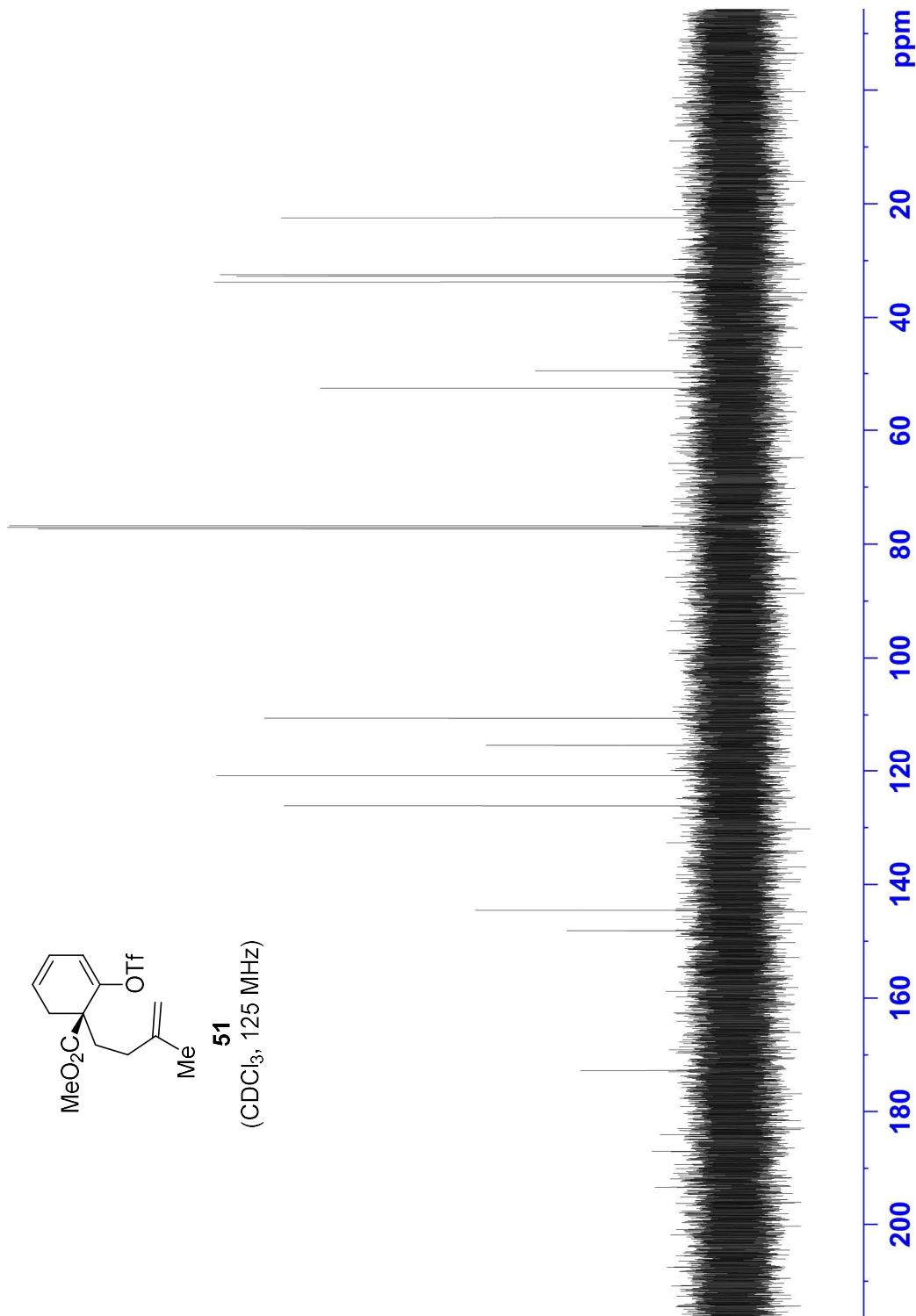
==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

172.75
 148.14
 144.53
 126.13
 120.83
 115.34
 110.58
 52.57
 49.49
 33.71
 32.70
 32.48
 22.42



51
 (CDCl₃, 125 MHz)



Current Data Parameters
 NAME yh-4-25-2-a
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters

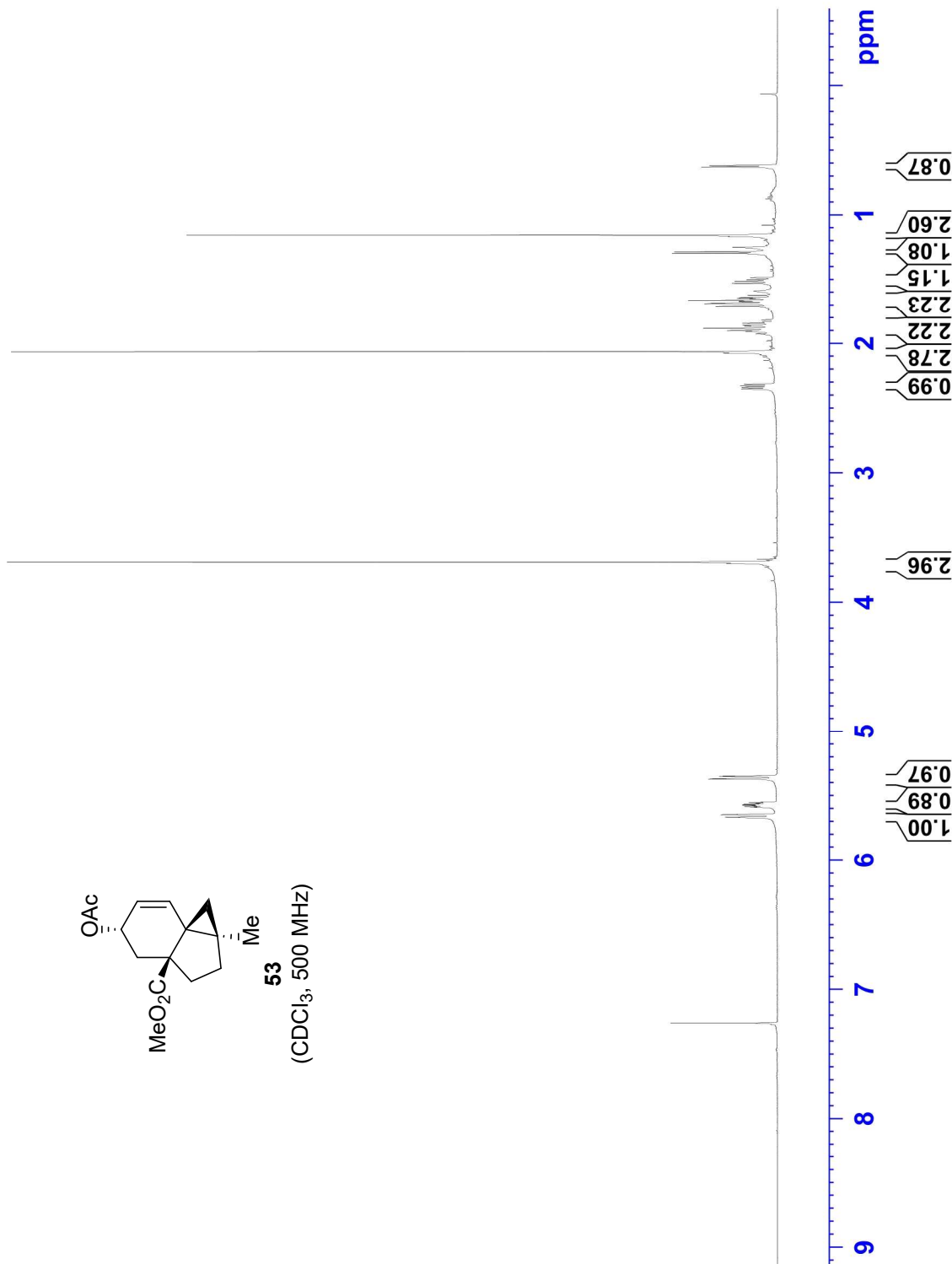
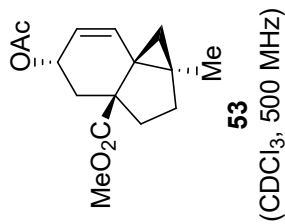
Date_ 20180313
 Time_ 21.11
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 51.11
 DW 50.000 usec
 DE 6.50 usec
 TE 296.9 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.66
3.34
2.32
2.06
1.92
1.91
1.90
1.88
1.86
1.84
1.71
1.69
1.68
1.67
1.67
1.67
1.67
1.65
1.64
1.64
1.64
1.64
1.51
1.50
1.49
1.30
1.29
1.16
1.10

5.67
5.65
5.37
5.37
5.35
5.35



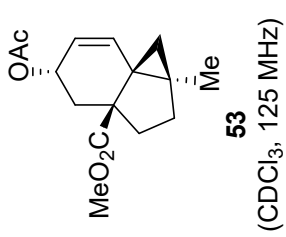
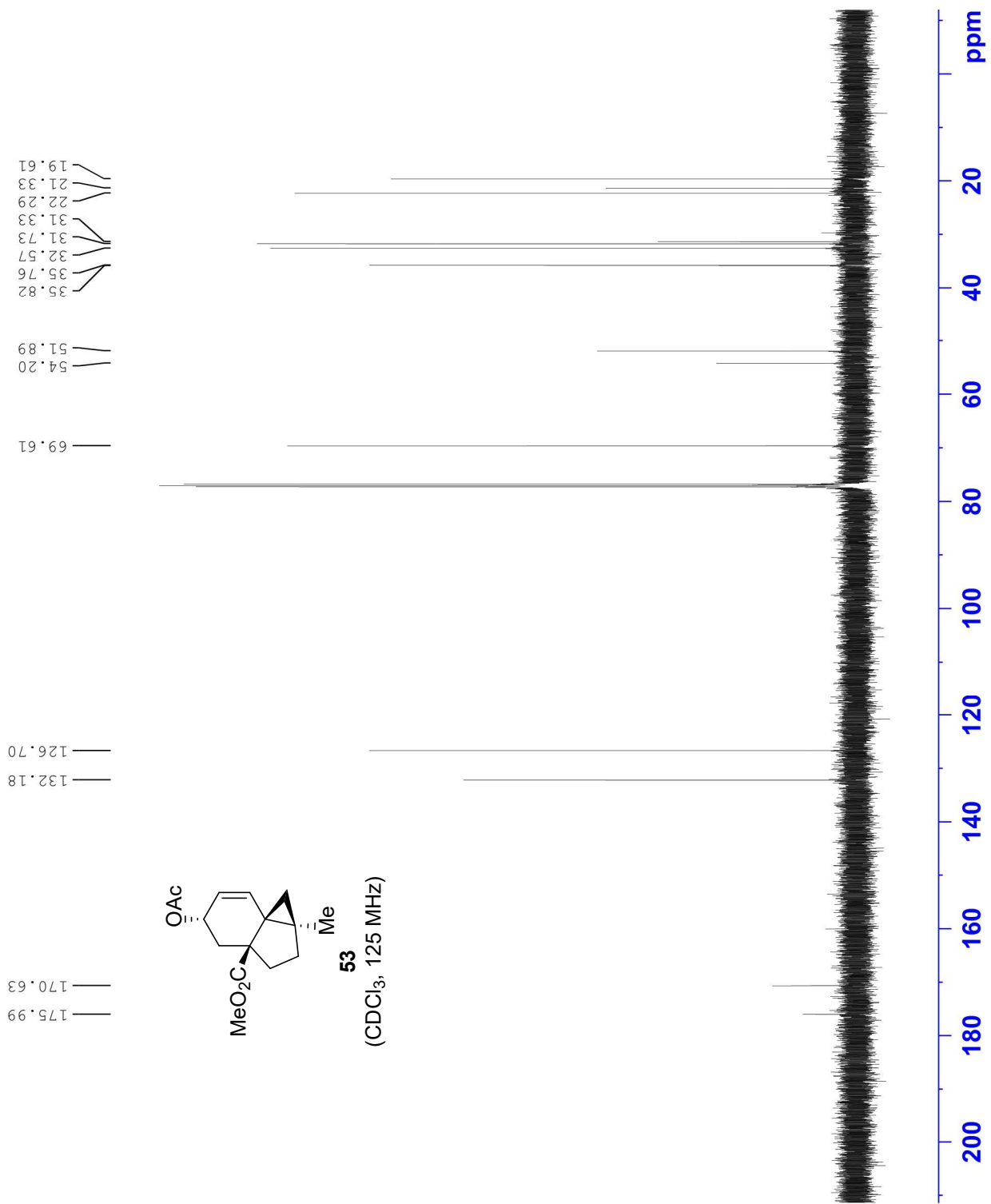
Current Data Parameters
 NAME yh-4-25-2-a
 EXPNO 3
 PROCNO 3

F2 - Acquisition Parameters
 Date_ 20180313
 Time_ 21.47
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 329
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.5 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-4-121
 EXPNO 1
 PROCNO 1

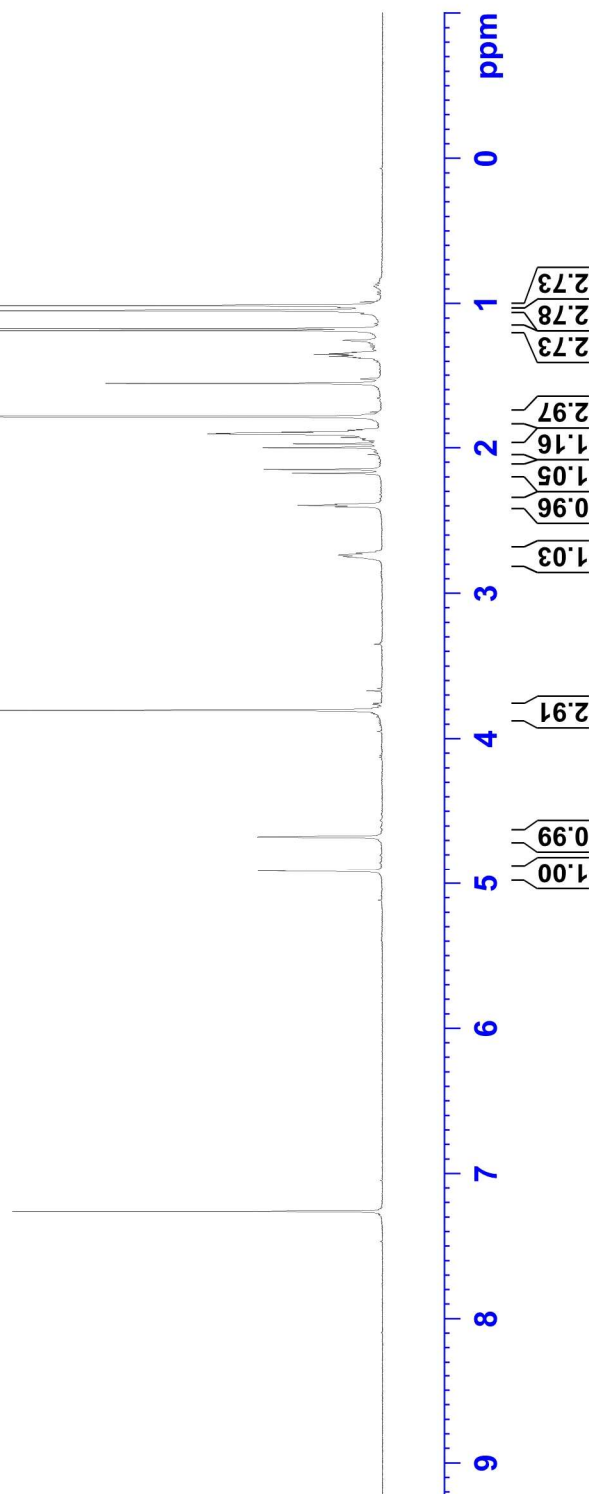
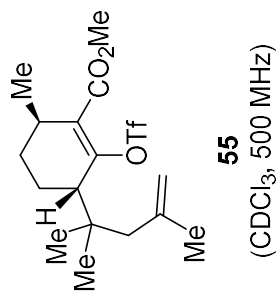
F2 - Acquisition Parameters

Date_ 20180725
 Time_ 21.16
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 105.66
 DW 50.000 usec
 DE 6.50 usec
 TE 296.5 K
 D1 4.0000000 sec
 TD0 1

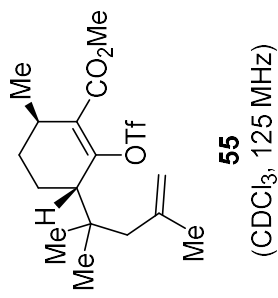
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

2.75
2.74
2.72
2.40
2.39
2.39
2.17
2.15
2.00
1.97
1.90
1.90
1.89
1.78
1.18
1.17
1.05
1.01



165.60
151.44
142.47
131.95
122.13
119.58
117.04
115.32
114.49



52.00
48.20
45.94
38.99
31.50
27.51
27.25
26.60
25.47
22.31
20.89

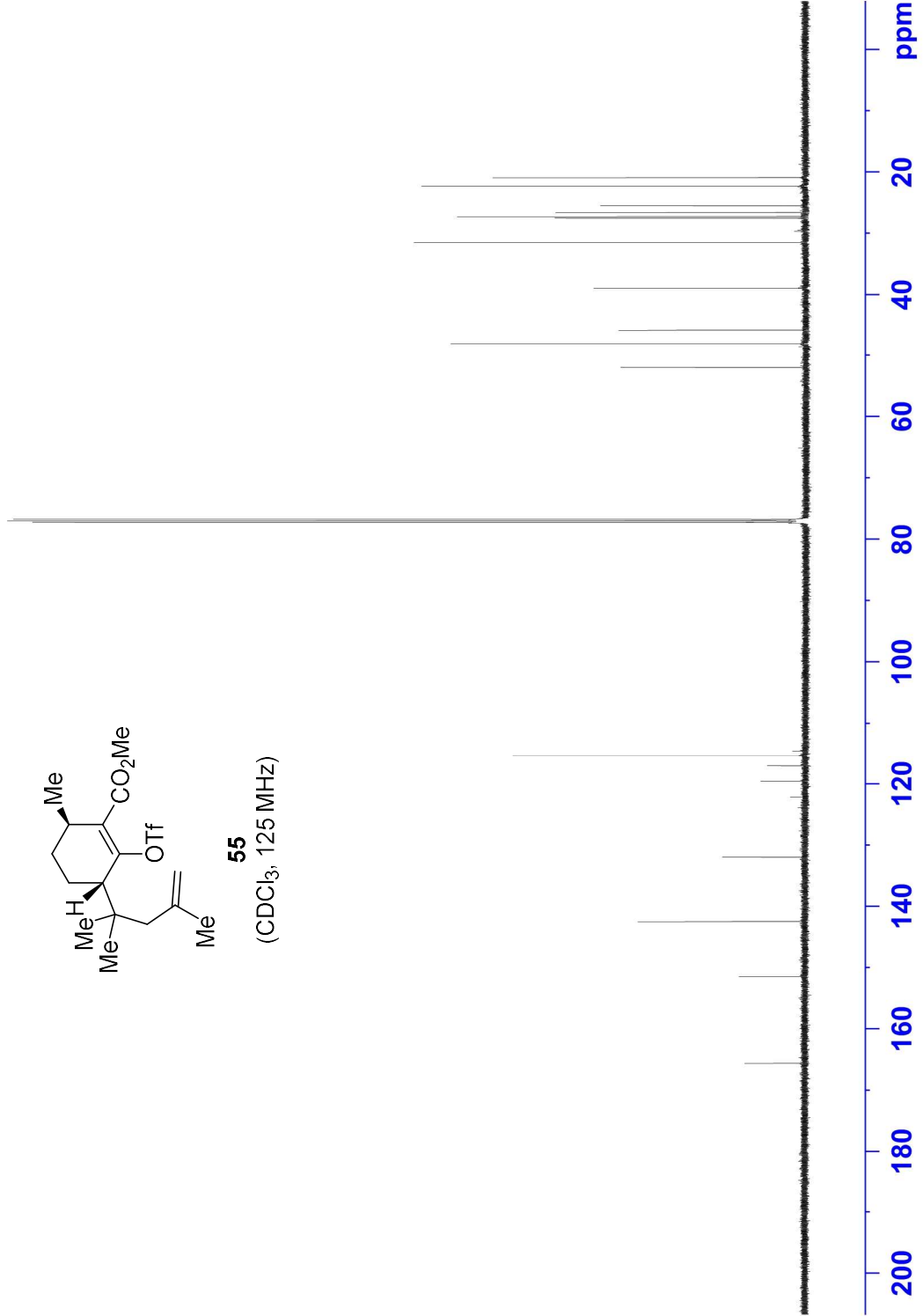
Current Data Parameters
 NAME Yh-4-121
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180726
 Time_ 7.14
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 5000
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 298.4 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-5-48
 EXPNO 1
 PROCNO 1

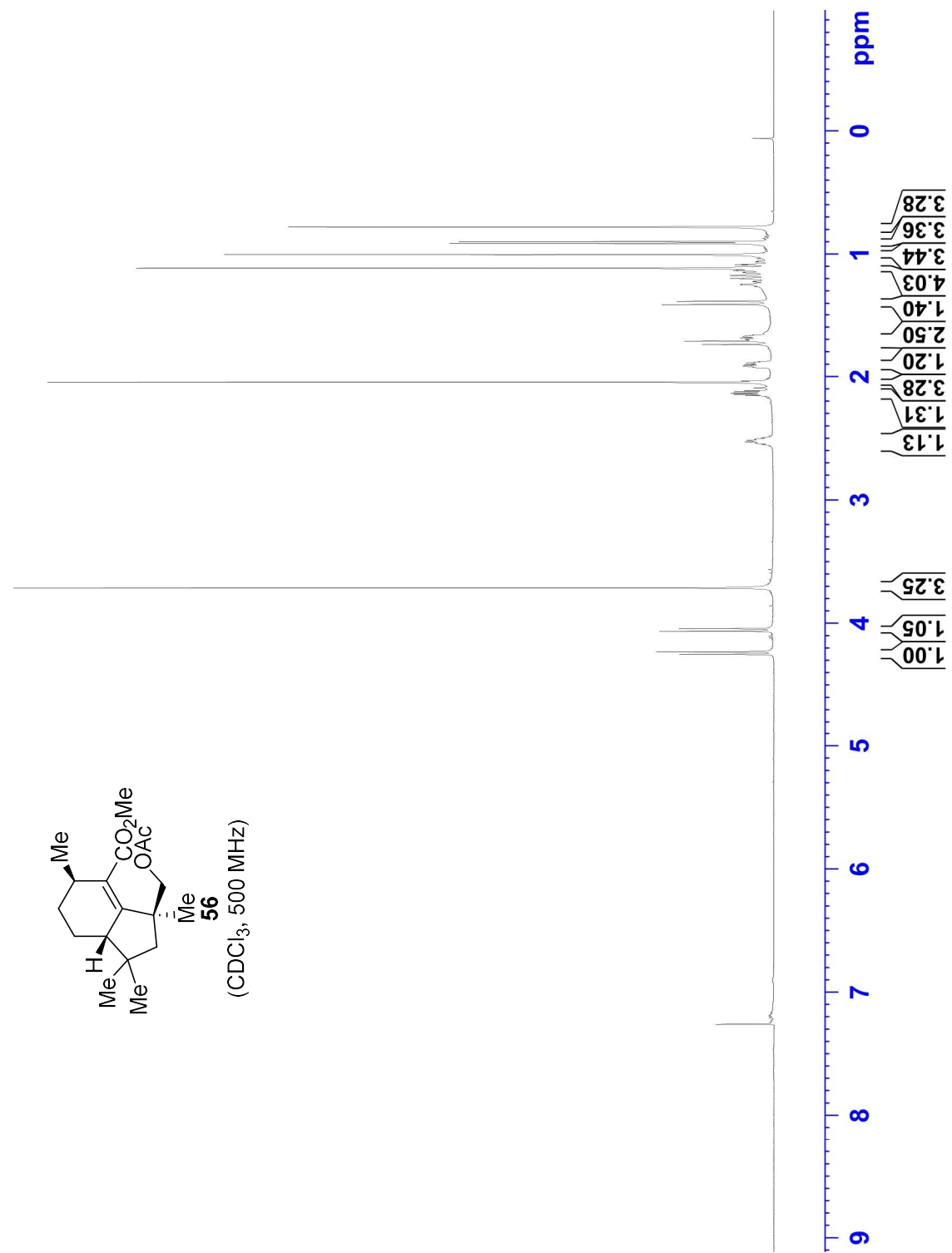
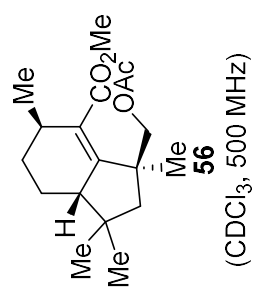
F2 - Acquisition Parameters

Date_ 20180809
 Time_ 21.01
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 3
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 51.11
 DW 50.000 usec
 DE 6.50 usec
 TE 296.3 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

4.25
4.23
4.06
4.04
3.71
2.55
2.54
2.53
2.52
2.51
2.50
2.15
2.14
2.13
2.12
2.11
2.05
1.92
1.91
1.90
1.89
1.74
1.71
1.71
1.70
1.69
1.68
1.66
1.41
1.38
1.25
1.24
1.20
1.19
1.17
1.11
1.00
0.91
0.90



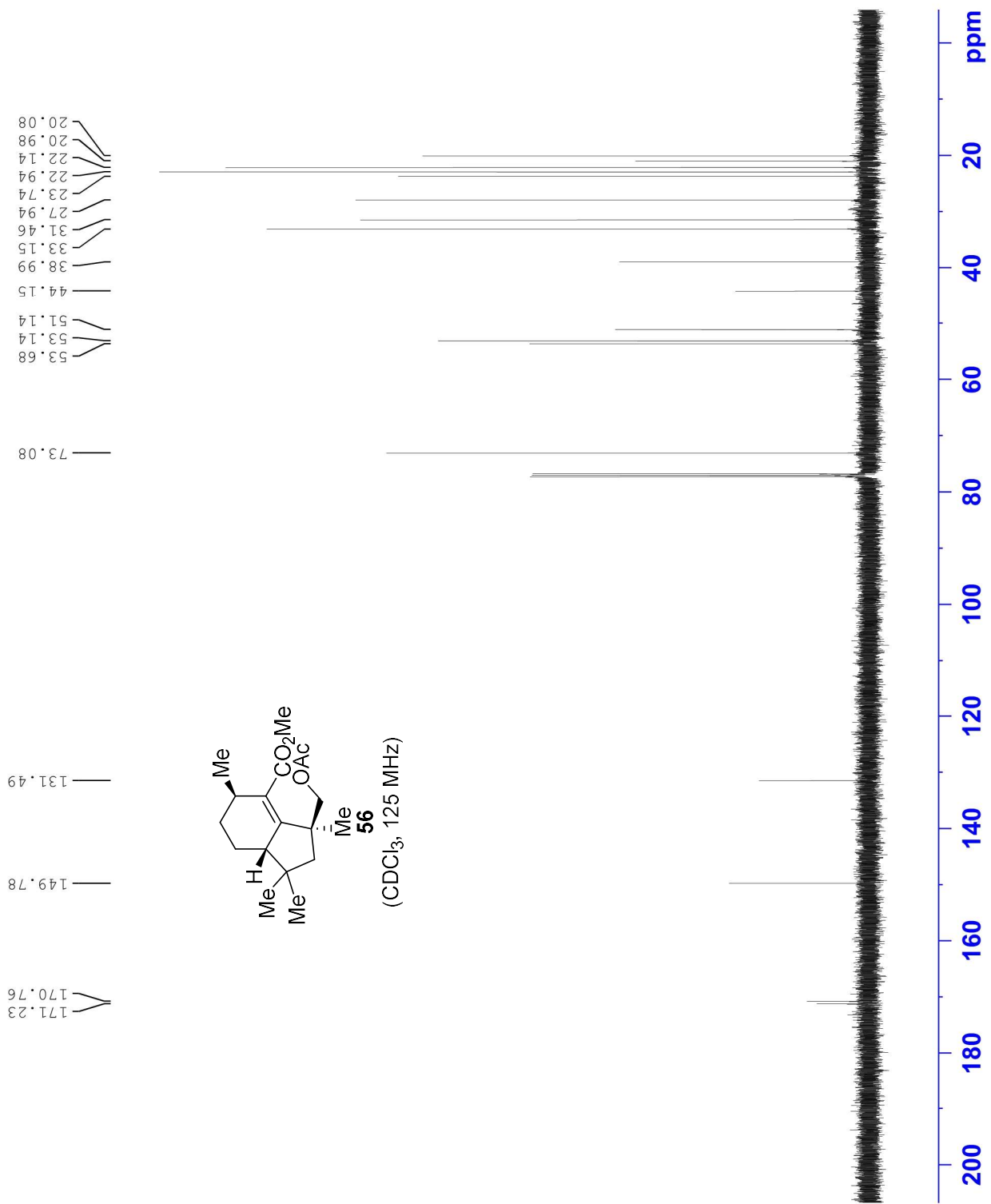
Current Data Parameters
 NAME Yh-5-48
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180809
 Time_ 21.22
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 149
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.3 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-4-57-b
 EXPNO 1
 PROCNO 1

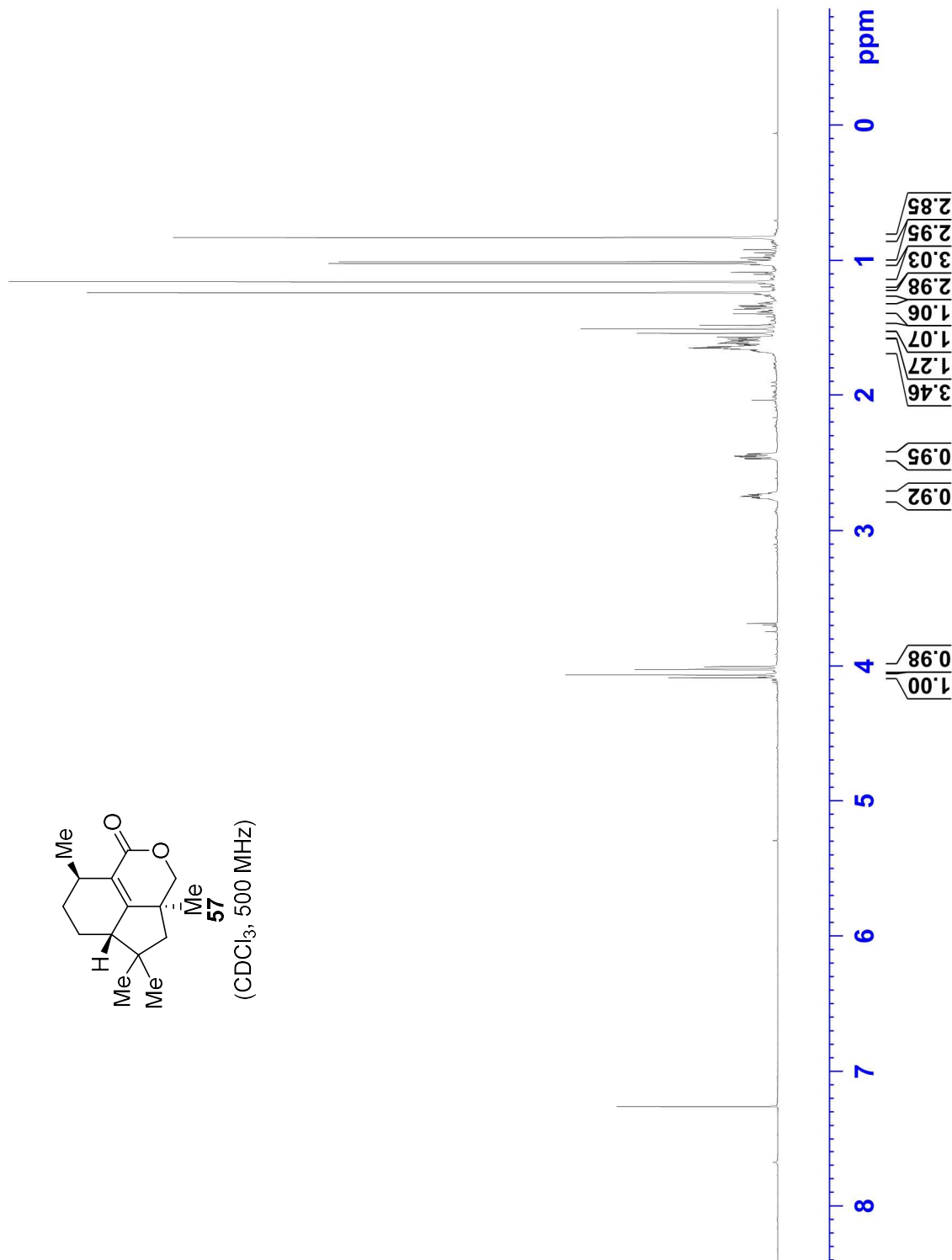
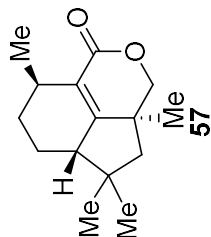
F2 - Acquisition Parameters

Date_ 20180803
 Time_ 11.05
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDCl3
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 110.37
 DW 50.000 usec
 DE 10.00 usec
 TE 294.1 K
 D1 3.0000000 sec
 TD0 1

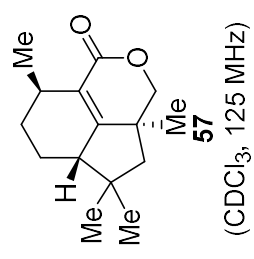
==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300137 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

4.09
4.06
4.02
4.00
2.76
2.76
2.75
2.75
2.75
2.74
2.74
2.74
2.73
2.73
2.47
2.47
2.46
2.45
2.45
2.45
2.44
2.44
2.43
1.66
1.65
1.65
1.65
1.64
1.62
1.62
1.62
1.59
1.59
1.57
1.54
1.51
1.48
1.40
1.36
1.35
1.34
1.34
1.33
1.24
1.16
1.02



166.48
164.23
124.58
76.70
50.45
49.12
41.65
38.40
29.31
29.25
25.86
25.07
25.01
19.31
16.06



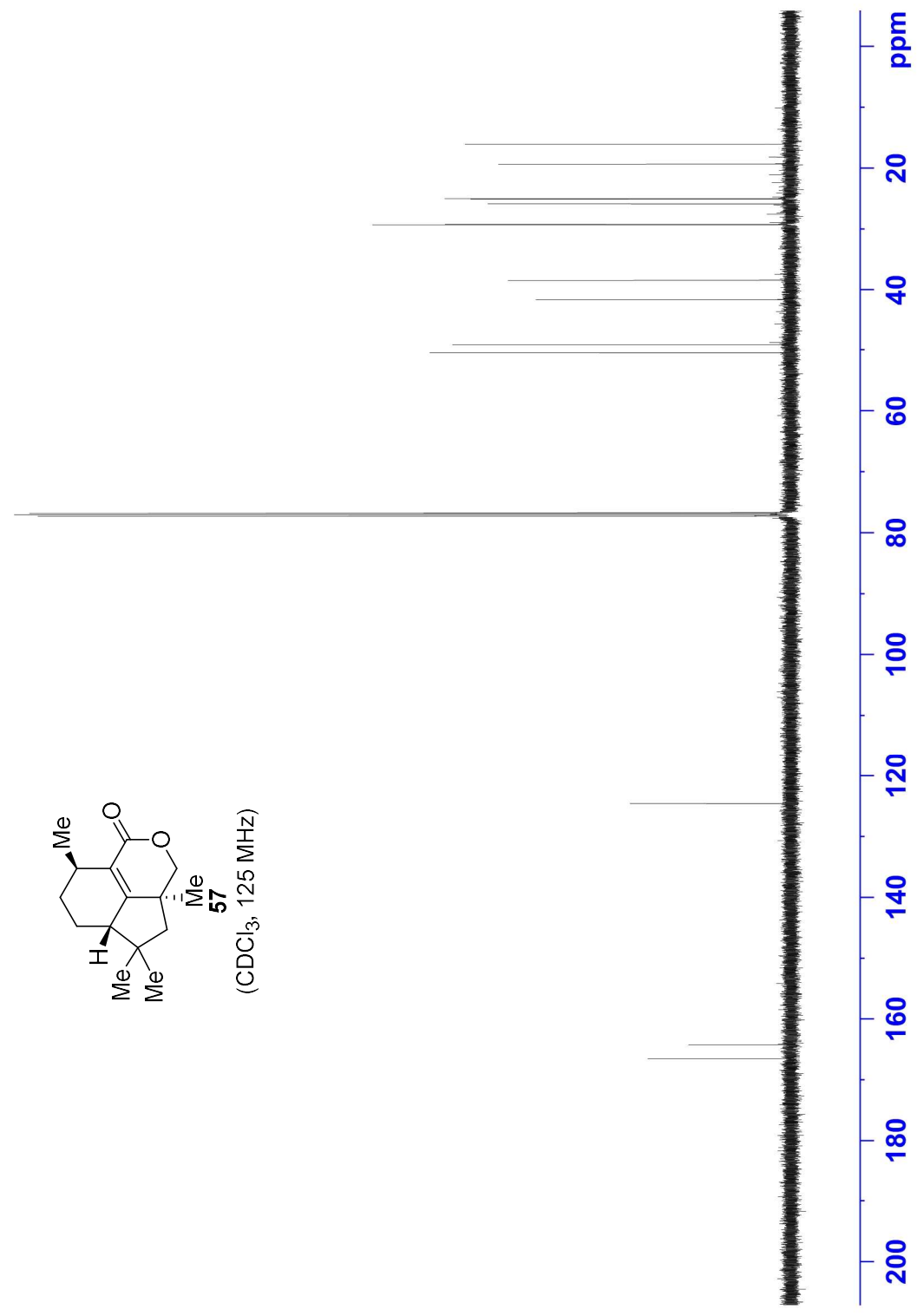
Current Data Parameters
 NAME yh-4-57-b
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180803
 Time 16.18
 INSTRUM spect
 PROBHD 5 mm PAQNP 1H/
 PULPROG zgpg
 TD 197364
 SOLVENT CDC13
 NS 91
 DS 4
 SWH 32894.738 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999328 sec
 RG 2050
 DW 15.200 usec
 DE 6.00 usec
 TE 294.9 K
 D1 10.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 13C
 P1 8.00 usec
 PL1 1.00 dB
 PL1W 72.42802429 W
 SF01 125.7716224 MHz

==== CHANNEL f2 =====
 CPDPRG[2] waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 0 dB
 PL12 16.50 dB
 PL13 17.00 dB
 PL2W 24.54113007 W
 PL12W 0.54940748 W
 PL13W 0.48965994 W
 SFO2 500.1325006 MHz

F2 - Processing parameters
 SI 131072
 SF 125.7577890 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

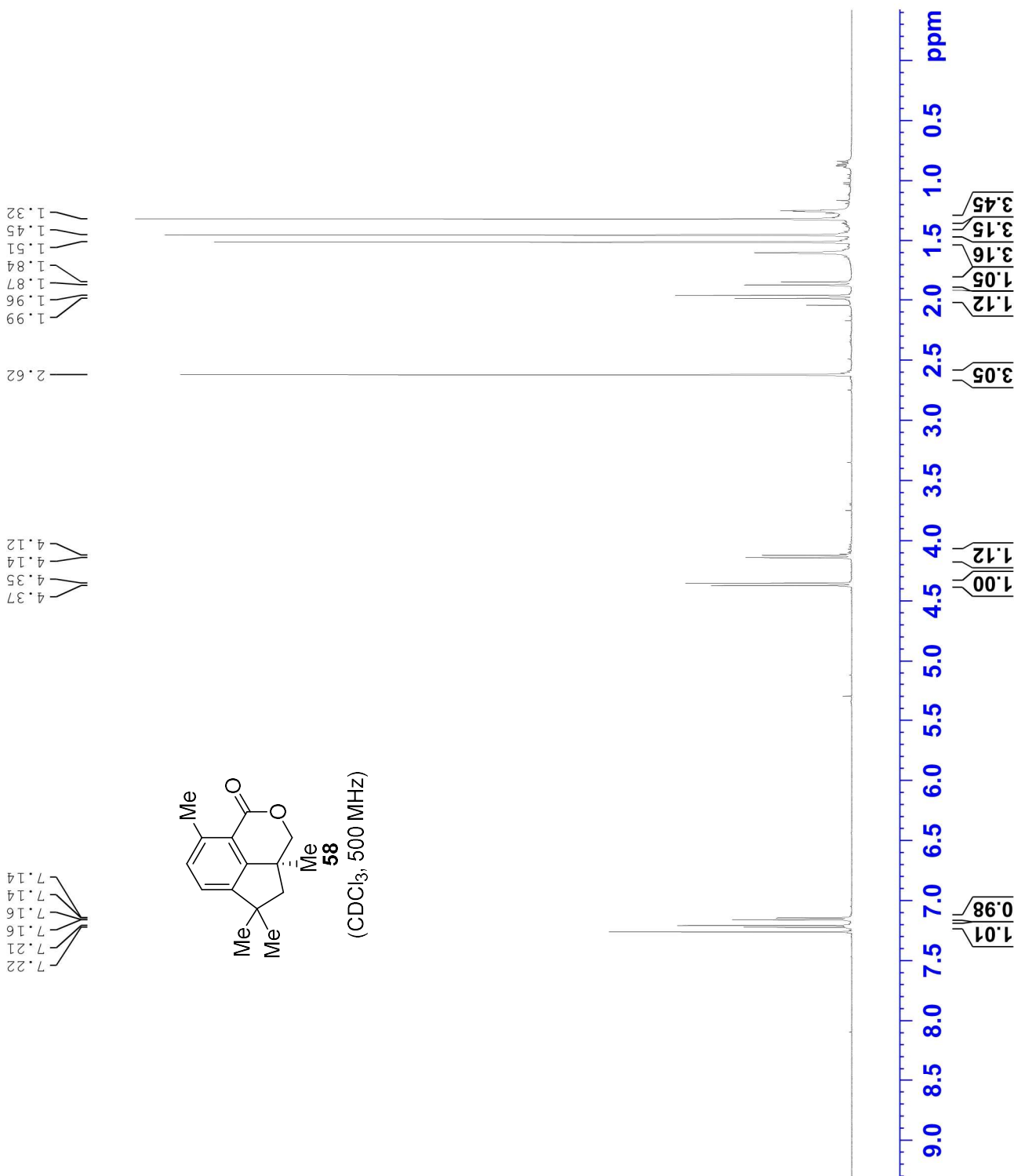


Current Data Parameters
 NAME yh-5-47
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180804
 Time_ 22.32
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 196.79
 DW 50.000 usec
 DE 10.00 usec
 TE 294.4 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300138 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-5-47-a
 EXPNO 2
 PROCNO 2

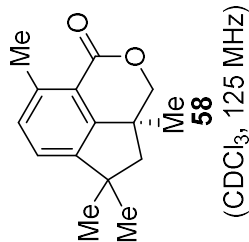
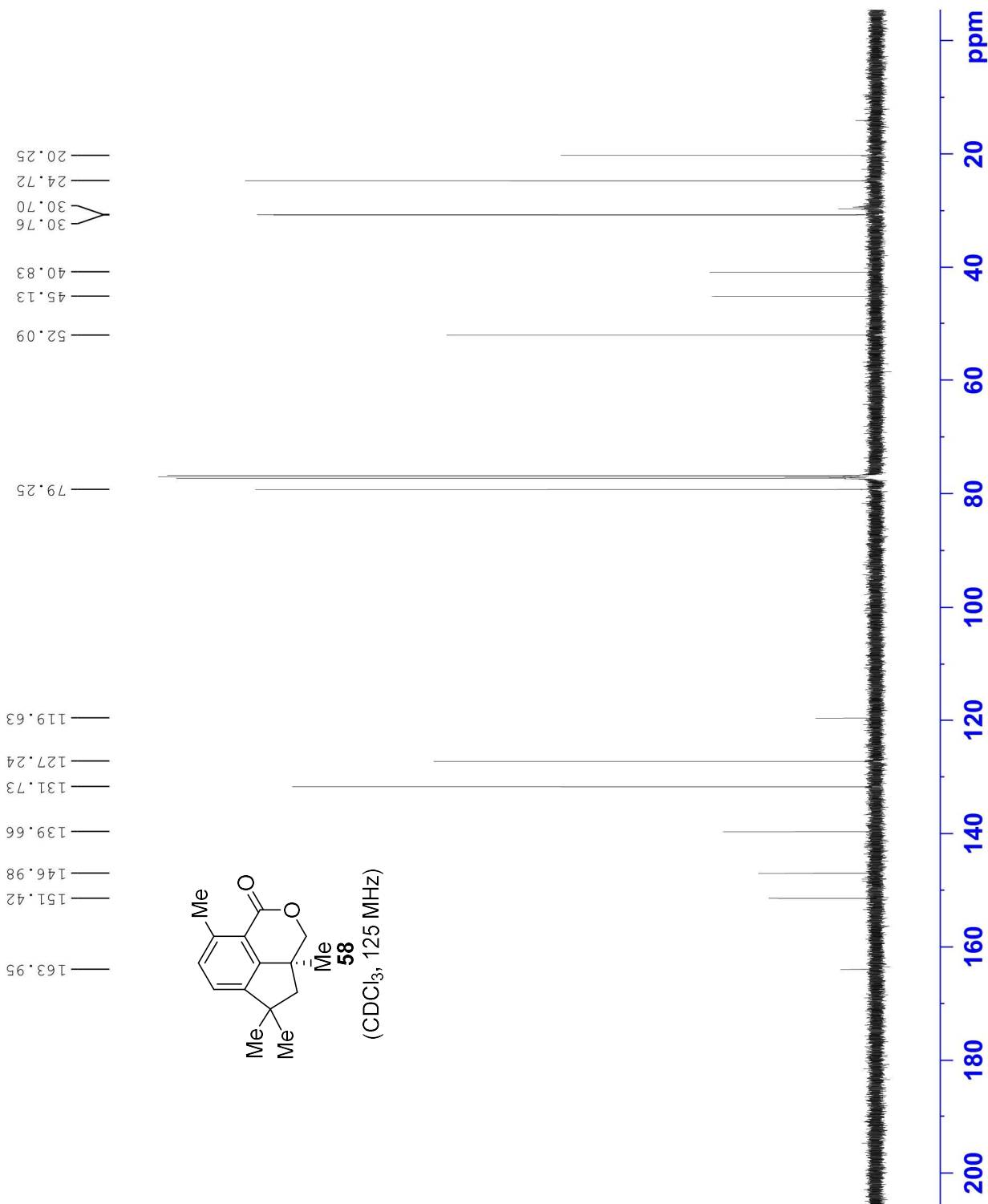
F2 - Acquisition Parameters

Date_ 20180805
 Time_ 20.54
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 872
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.9 K
 D1 3.00000000 sec
 D11 0.03000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-4-107
 EXPNO 1
 PROCNO 1

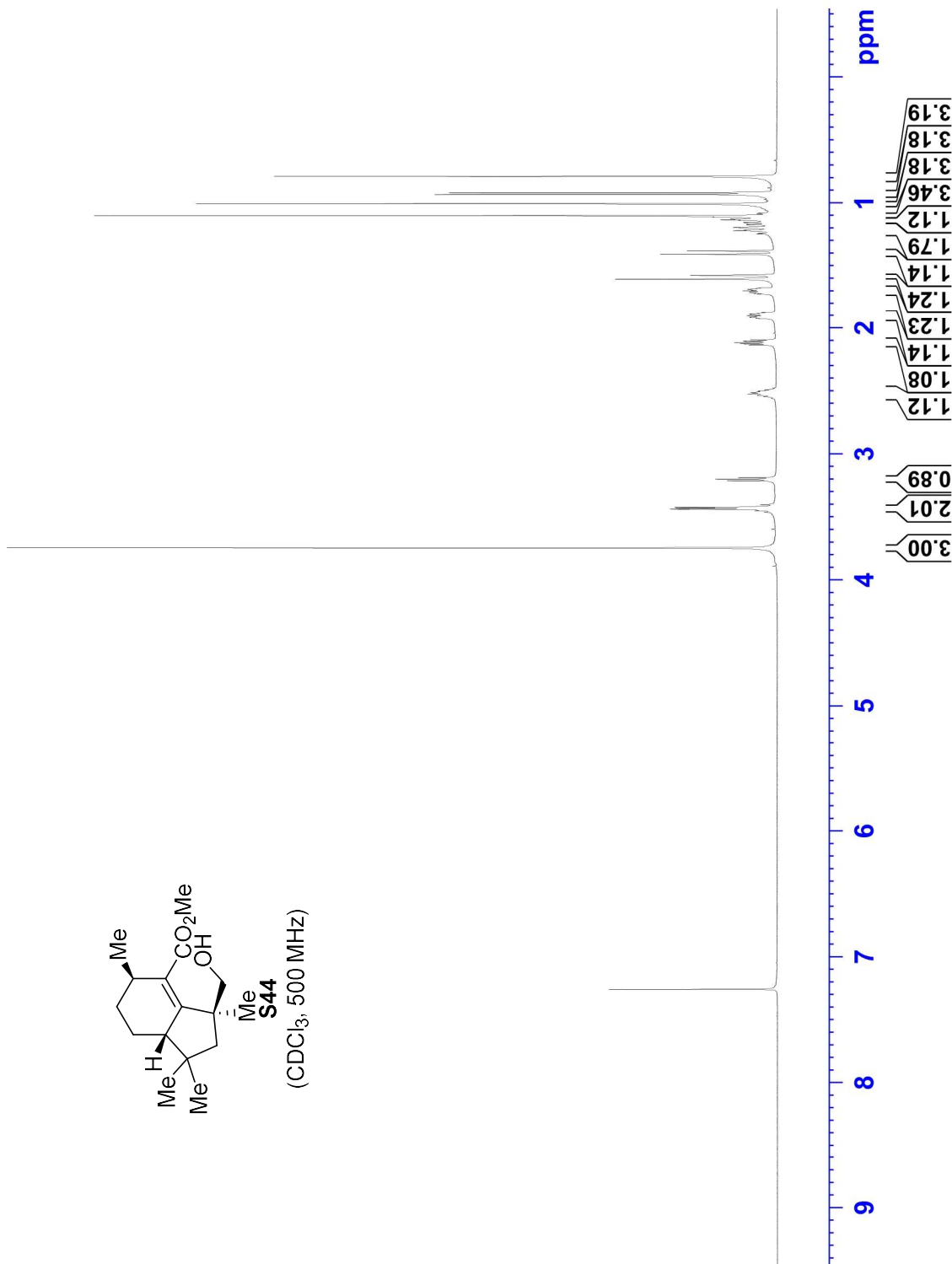
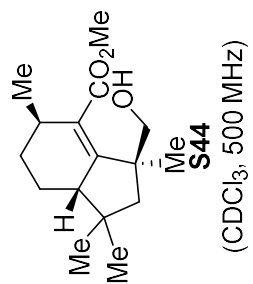
F2 - Acquisition Parameters

Date 20180525
 Time 21.45
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 7
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 77.07
 DW 50.000 usec
 DE 6.50 usec
 TE 296.3 K
 D1 4.0000000 sec
 TD0 1

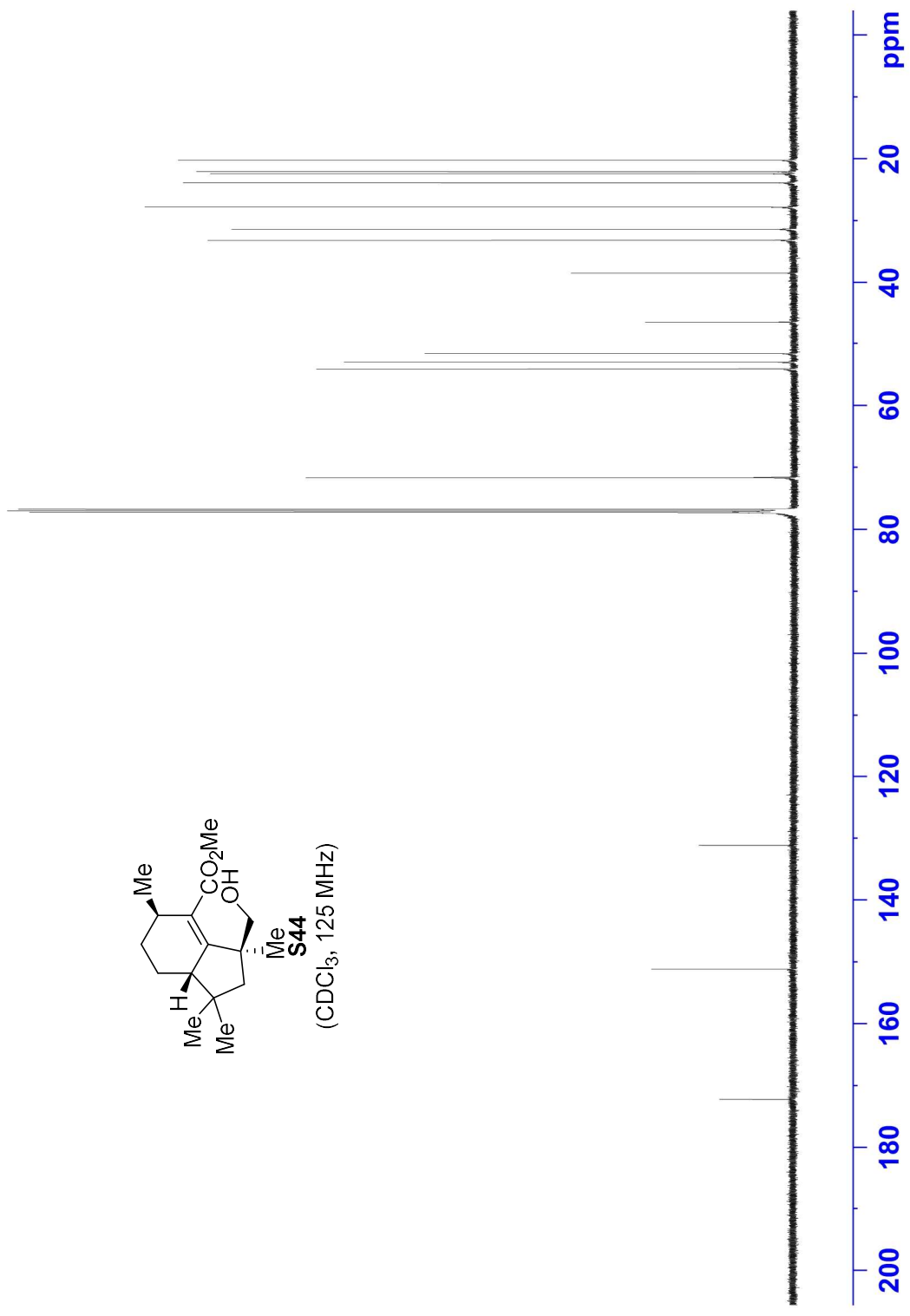
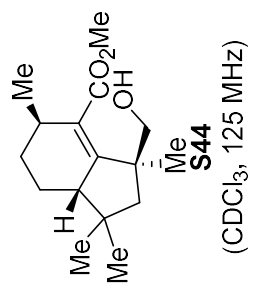
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700122 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.75
3.74
3.74
3.44
3.43
3.42
3.21
3.20
3.19
2.55
2.54
2.52
2.51
2.51
2.50
2.49
2.14
2.13
2.13
2.12
2.11
2.10
2.10
1.92
1.92
1.91
1.91
1.90
1.89
1.89
1.88
1.72
1.71
1.70
1.70
1.69
1.61
1.58
1.41
1.38
1.22



172.22 —
 151.17 —
 131.15 —
 71.68 —
 54.10 —
 52.98 —
 51.61 —
 46.56 —
 38.46 —
 33.15 —
 31.37 —
 27.80 —
 23.87 —
 22.41 —
 22.07 —
 20.21 —



Current Data Parameters
 NAME yh-4-107
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180526
 Time_ 8.04
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 6000
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME yh-4-92
 EXPNO 1
 PROCNO 1

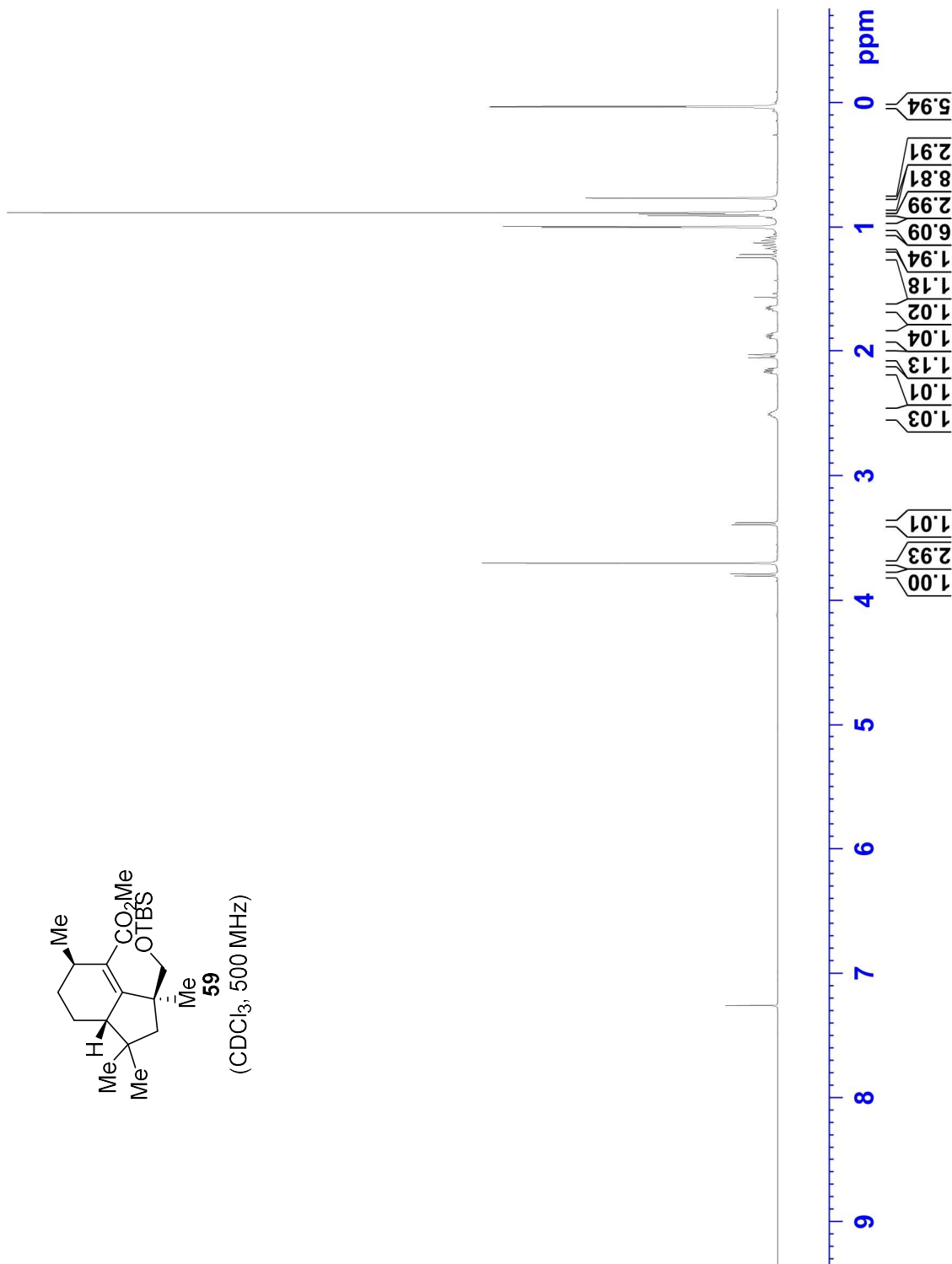
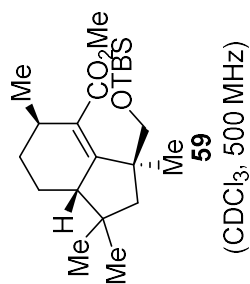
F2 - Acquisition Parameters

Date_ 20180525
 Time_ 21.06
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 56.75
 DW 50.000 usec
 DE 6.50 usec
 TE 295.6 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.81
3.79
3.70
3.39
3.38
2.51
2.50
2.17
2.16
2.15
2.05
2.03
1.90
1.88
1.88
1.88
1.87
1.86
1.86
1.86
1.66
1.66
1.65
1.65
1.64
1.63
1.24
1.22
1.17
1.17
1.15
1.15
1.13
1.11
1.11
1.10
1.09
1.08
1.00
0.99



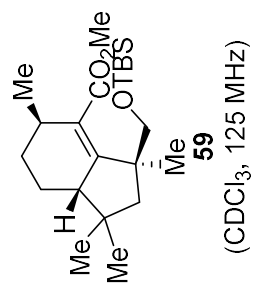
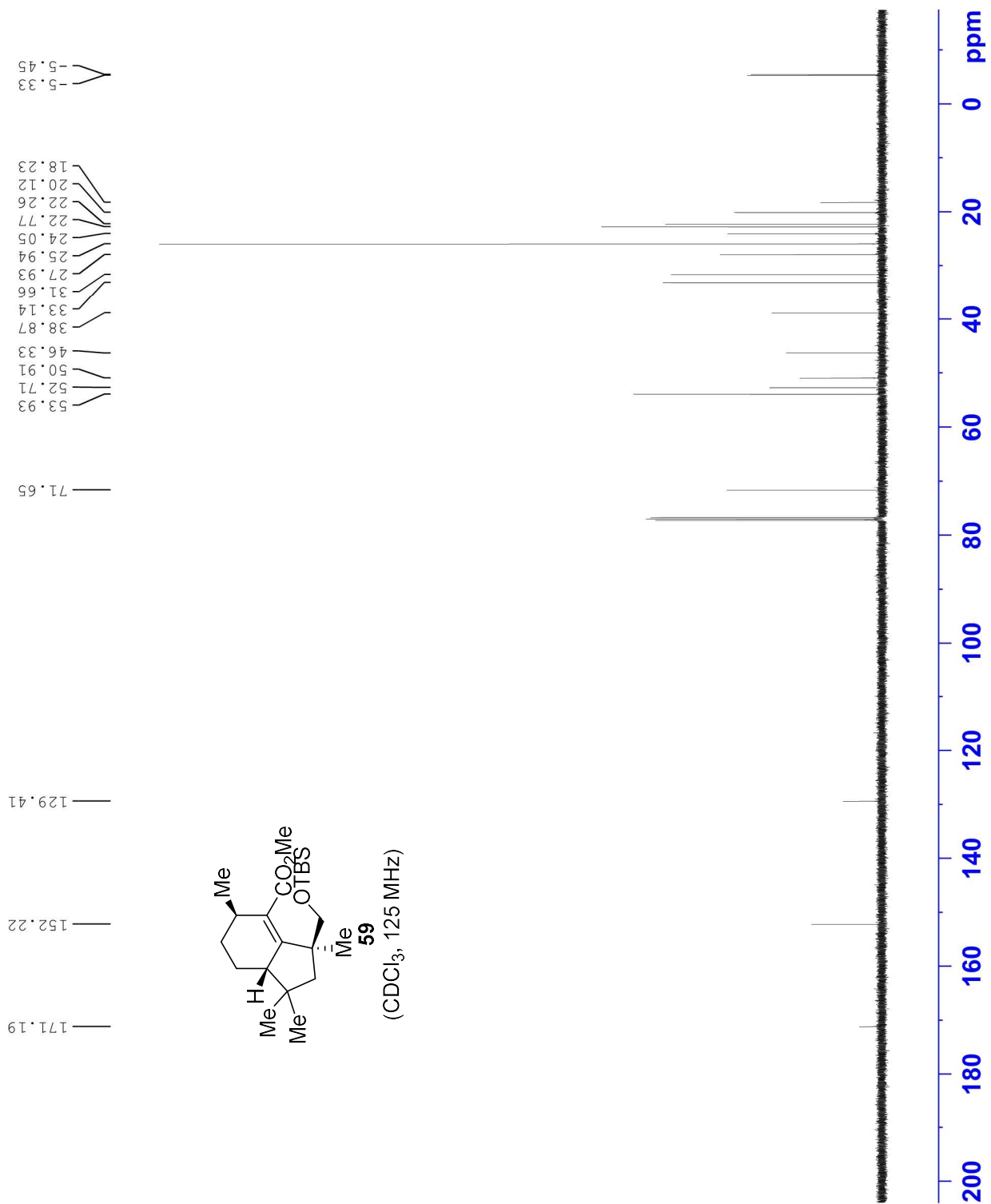
Current Data Parameters
 NAME Yh-4-92
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180525
 Time_ 21.38
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 245
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.2 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



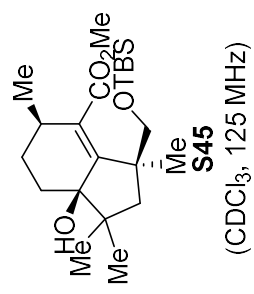
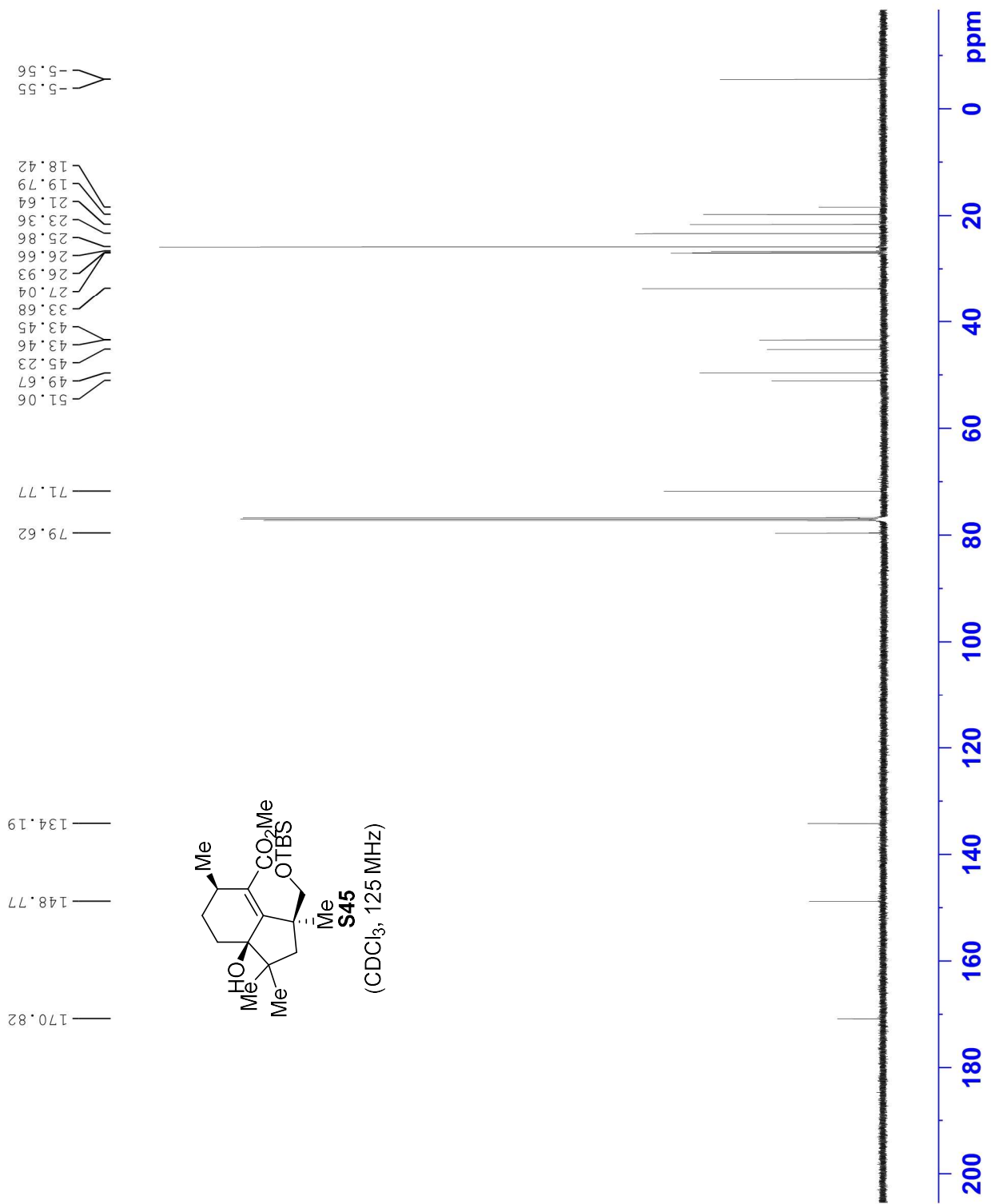
Current Data Parameters
 NAME Yh-4-112
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180527
 Time_ 7.01
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 4661
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.6 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



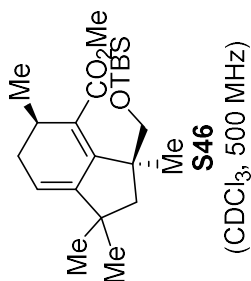
Current Data Parameters
 NAME yh-4-114
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180529
 Time_ 23.38
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 2
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 105.66
 DW 50.000 usec
 DE 6.50 usec
 TE 296.1 K
 D1 4.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700000 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.79
3.77
3.74
3.59
3.57
2.67
2.66
2.65
2.64
2.64
2.63
2.42
2.41
2.41
2.40
2.39
2.38
2.37
2.36
2.21
2.19
2.07
2.06
2.05
2.04
2.02
2.02
2.01
2.00
1.57
1.41
1.39
1.17
1.11
1.05
1.03
0.89
0.84



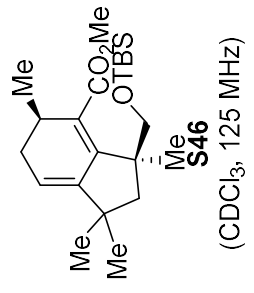
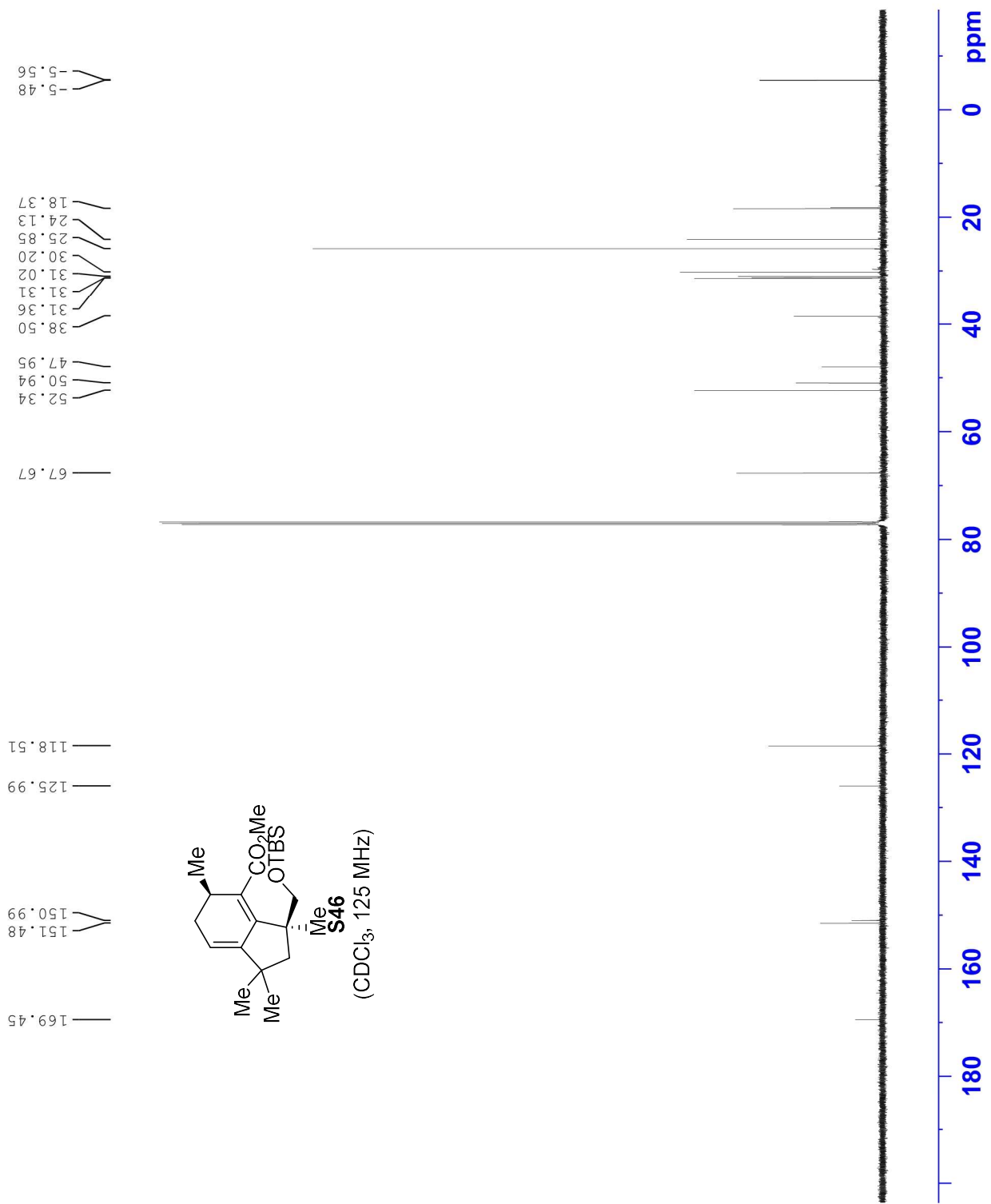
Current Data Parameters
 NAME yh-4-114
 EXPNO 2
 PROCNO 2

F2 - Acquisition Parameters
 Date_ 20180530
 Time_ 8.10
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 5000
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME yh-4-116
 EXPNO 1
 PROCNO 1

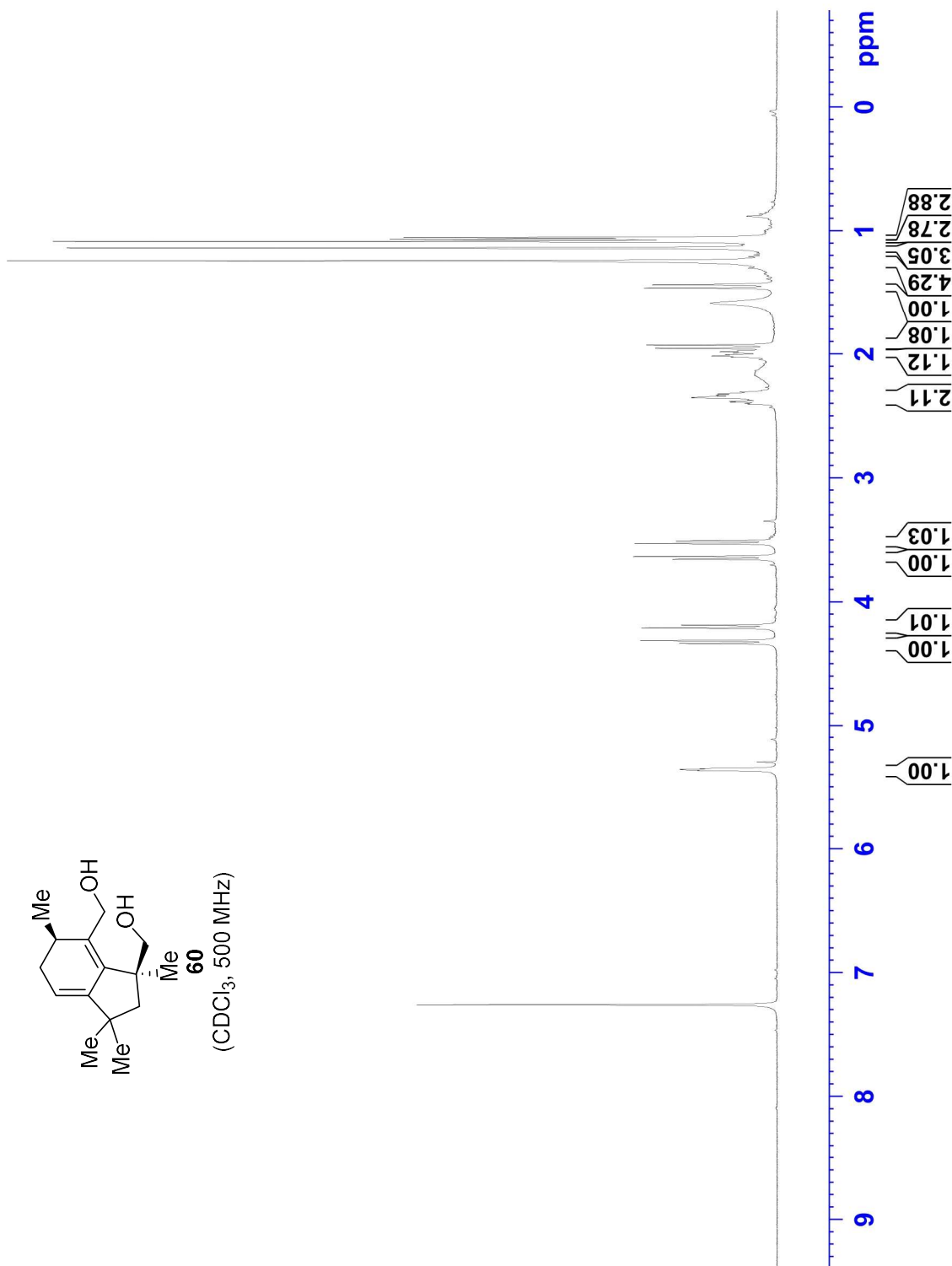
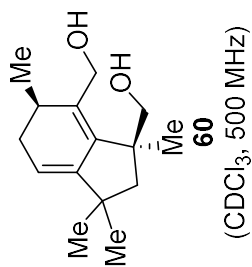
F2 - Acquisition Parameters

Date_ 20180528
 Time_ 15.46
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 8
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 196.79
 DW 50.000 usec
 DE 10.000 usec
 TE 293.8 K
 D1 3.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 500.1330885 MHz
 NUC1 1H
 P1 2.67 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300137 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

5.37
 5.36
 5.36
 5.36
 5.35
 4.34
 4.31
 4.21
 4.19
 3.66
 3.63
 3.53
 3.53
 3.51
 2.39
 2.38
 2.35
 2.35
 2.35
 2.34
 2.33
 2.33
 2.32
 2.03
 2.02
 2.01
 1.99
 1.98
 1.97
 1.95
 1.93
 1.46
 1.44
 1.24
 1.14
 1.09
 1.07
 1.05



Current Data Parameters
 NAME Yh-4-116
 EXPNO 2
 PROCNO 2

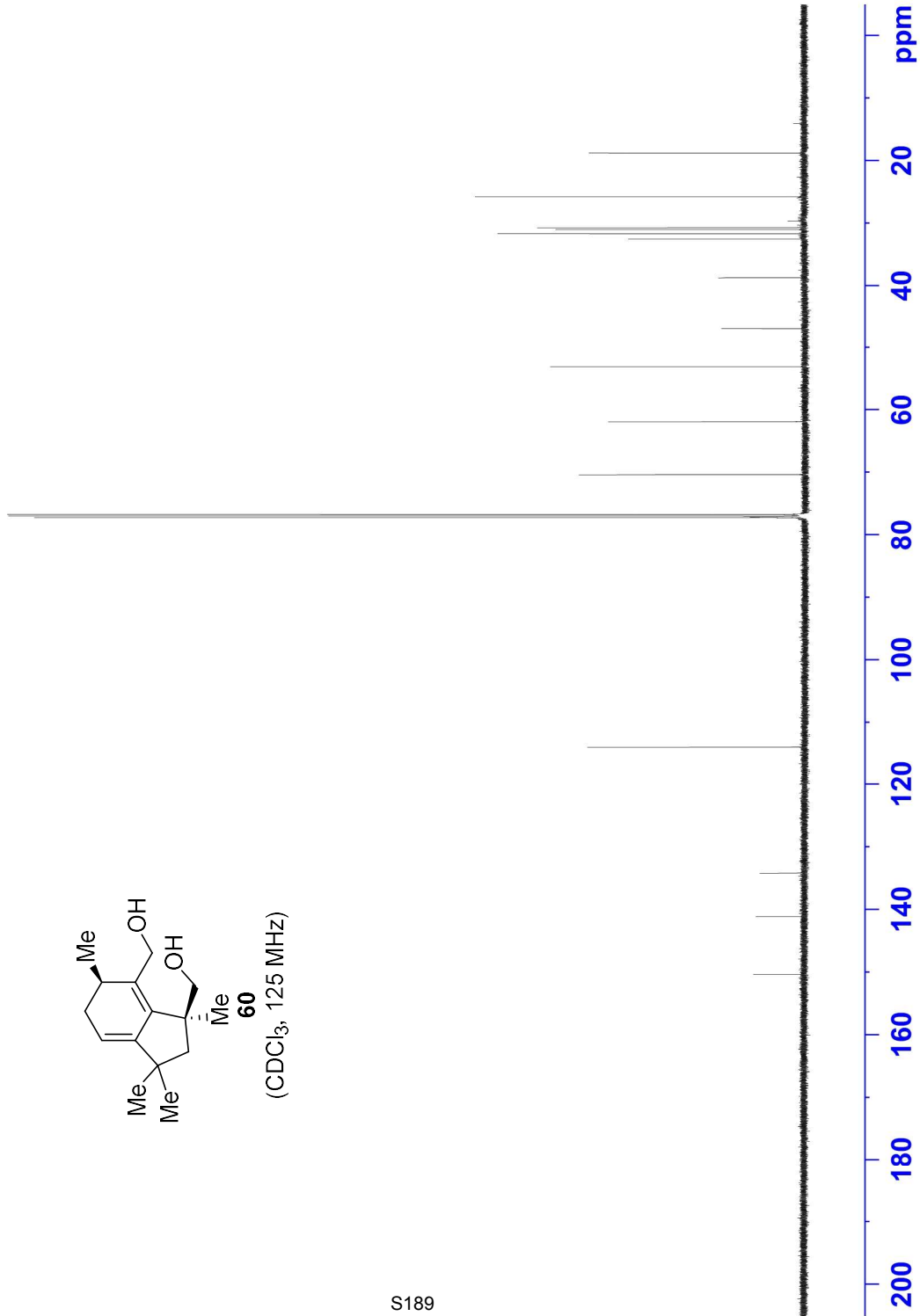
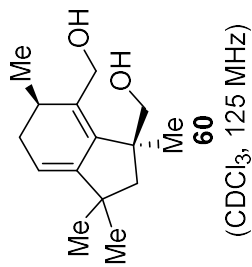
F2 - Acquisition Parameters
 Date_ 20180529
 Time_ 5.53
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 5000
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

18.81
 25.78
 30.73
 31.03
 31.70
 32.55
 38.73
 47.00
 53.13
 61.91
 70.37
 114.09
 134.19
 141.14
 150.33



Current Data Parameters
 NAME yh-4-106-2
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180523
 Time_ 21.50
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 133.95
 DW 50.000 usec
 DE 6.50 usec
 TE 295.5 K
 D1 4.0000000 sec
 TD0 1

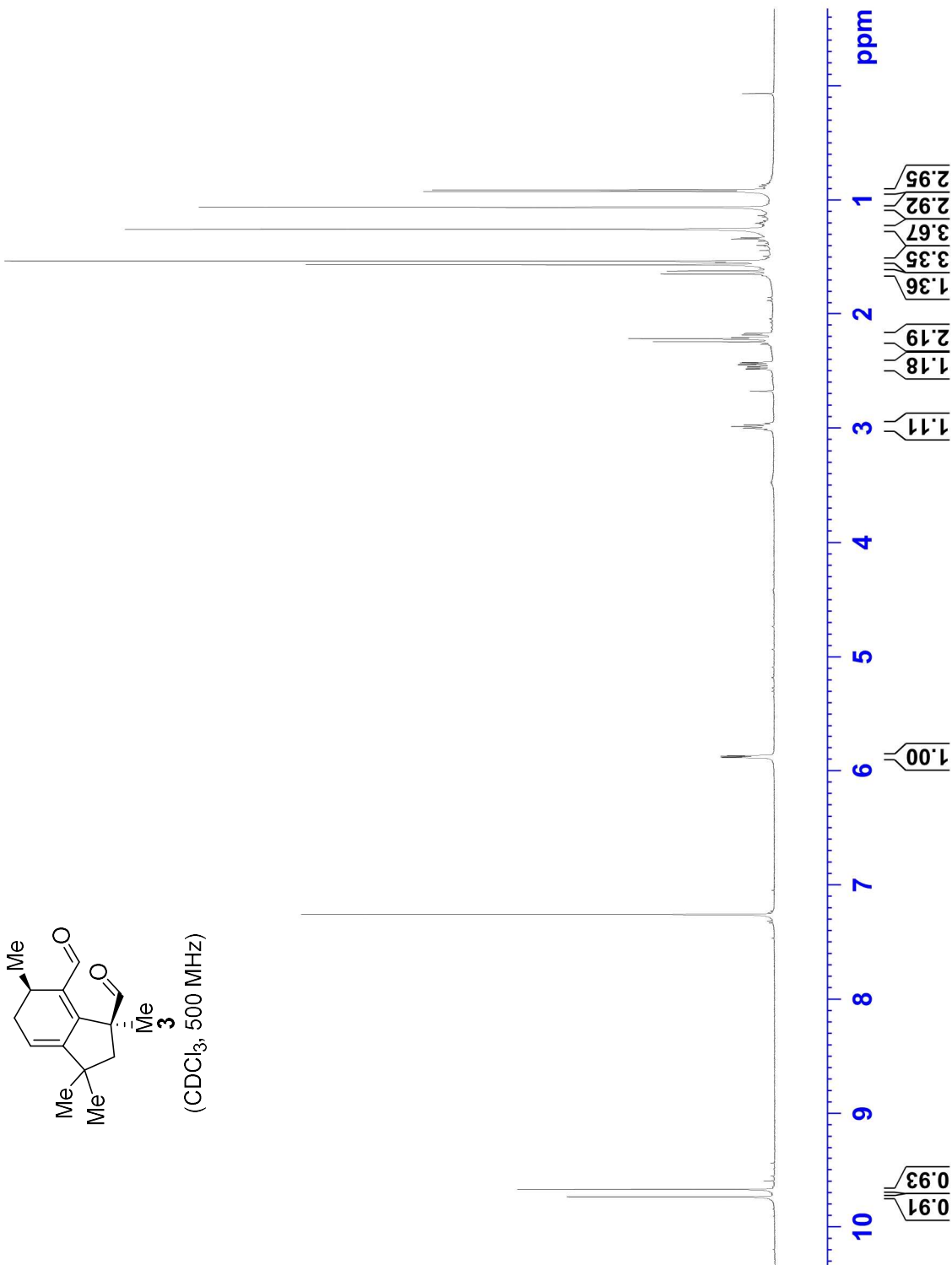
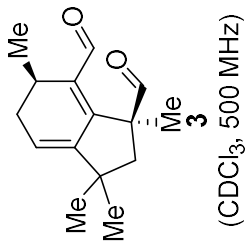
==== CHANNEL f1 =====
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 3.58 usec
 PLW1 18.25000000 W

F2 - Processing parameters
 SI 65536
 SF 499.8700123 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

3.00
2.99
2.97
2.99
2.49
2.48
2.47
2.46
2.45
2.44
2.43
2.43
2.25
2.22
1.65
1.62
1.53
1.25
1.06
0.96
0.91

5.89
5.88
5.87
5.87
5.87

9.74
9.67



Current Data Parameters
 NAME Yh-4-106-2
 EXPNO 2
 PROCNO 2

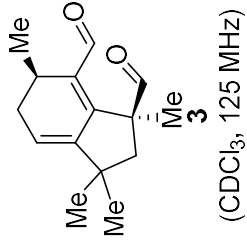
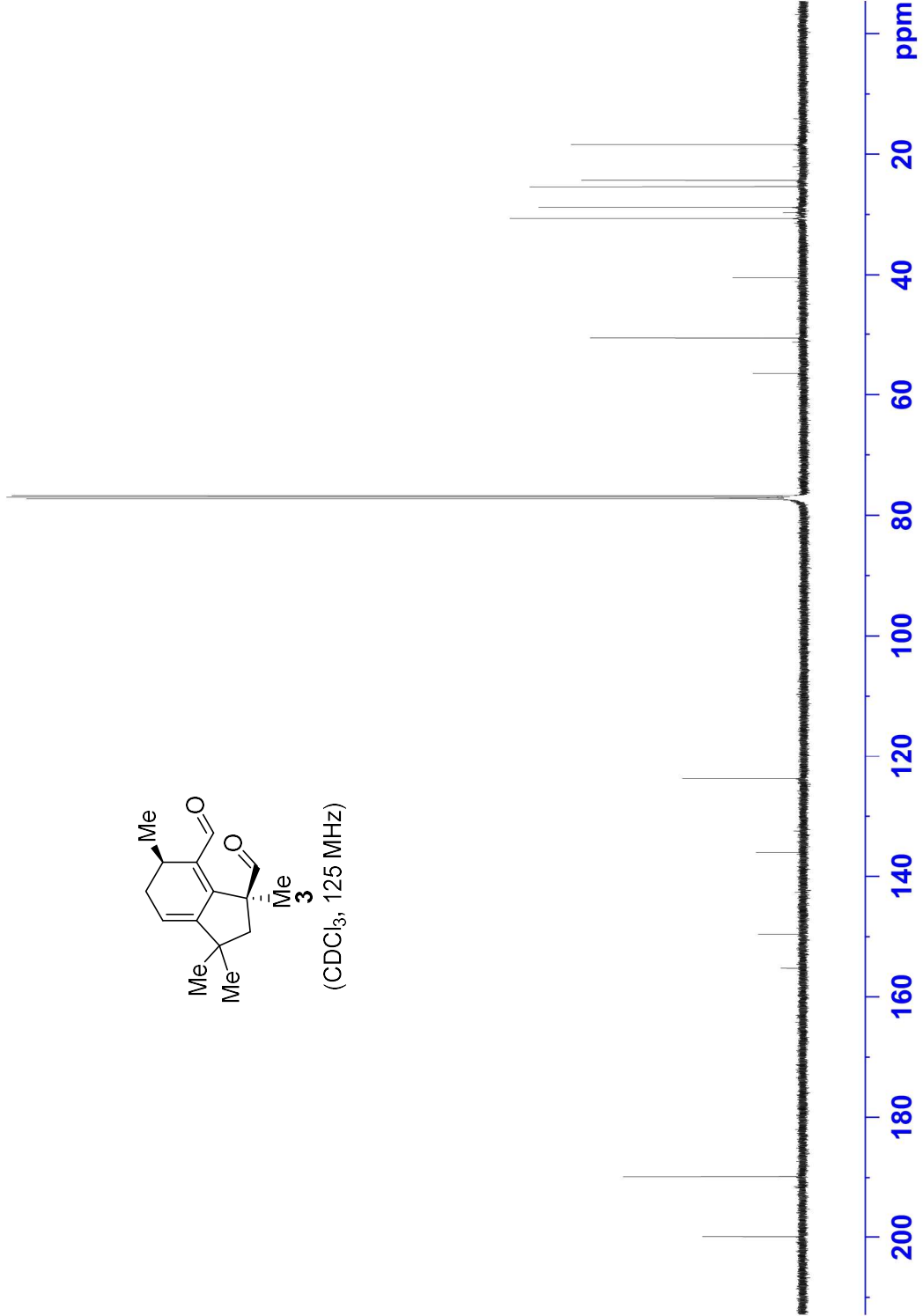
F2 - Acquisition Parameters
 Date_ 20180524
 Time_ 6.47
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgdc
 TD 187496
 SOLVENT CDC13
 NS 5200
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.166670 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 297.5 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W

==== CHANNEL f2 =====
 SFO2 499.8724993 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 80.00 usec
 PLW2 19.00000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

199.91
 189.82
 155.24
 149.57
 136.01
 123.72
 56.48
 50.62
 40.47
 30.62
 30.61
 28.76
 25.34
 24.29
 18.35



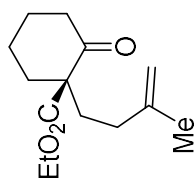
Current Data Parameters
 NAME yh-7-74-sm
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191106
 Time_ 15.07
 INSTRUM spect
 PROBHD 5 mm PATXI 1H/
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.166672 Hz
 AQ 2.9999001 sec
 RG 196.79
 DW 50.000 usec
 DE 10.00 usec
 TE 294.4 K
 D1 2.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 500.1330885 MHz
 NUC1 1H
 P1 9.90 usec
 PLW1 12.19999981 W

F2 - Processing parameters
 SI 65536
 SF 500.1300135 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

4.70
4.68
4.23
4.22
4.20
4.19
2.55
2.54
2.52
2.51
2.45
2.45
2.44
2.04
2.03
2.02
2.01
2.00
1.99
1.94
1.94
1.93
1.91
1.90
1.89
1.88
1.76
1.72
1.68
1.67
1.67
1.66
1.66
1.65
1.46
1.48
1.46
1.45
1.45
1.45



S47
 (CDCl₃, 500 MHz)



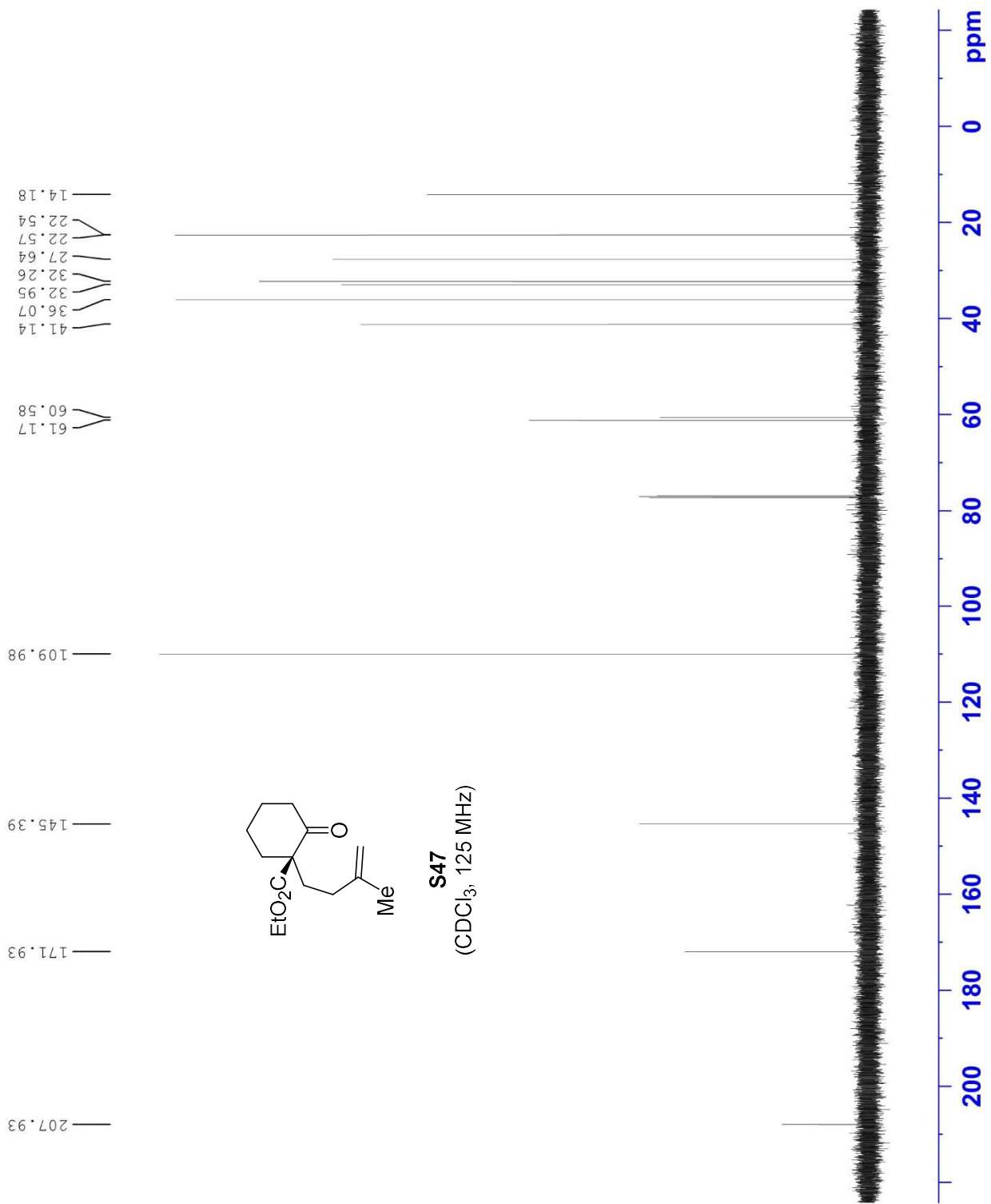
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm

3.30
1.16
7.58
2.15
2.37
2.04
1.23
1.97
2.00

Current Data Parameters
 NAME Yh-7-74-sm
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191107
 Time_ 22.12 h
 INSTRUM spect
 PROBHD Z113652_0187 (zgd)
 PULPROG 187496
 TD 11
 SOLVENT CDC13
 NS 0
 DS 31250.000 Hz
 SWH 0.333340 Hz
 FIDRES 2.9999361 sec
 AQ 2050
 RG 16.000 usec
 DE 6.50 usec
 TE 295.5 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1
 SF01 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W
 SF02 499.8724993 MHz
 NUC2 1H
 CPDPRG12 waltz16
 PCPD2 80.00 usec
 PLW2 19.0000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



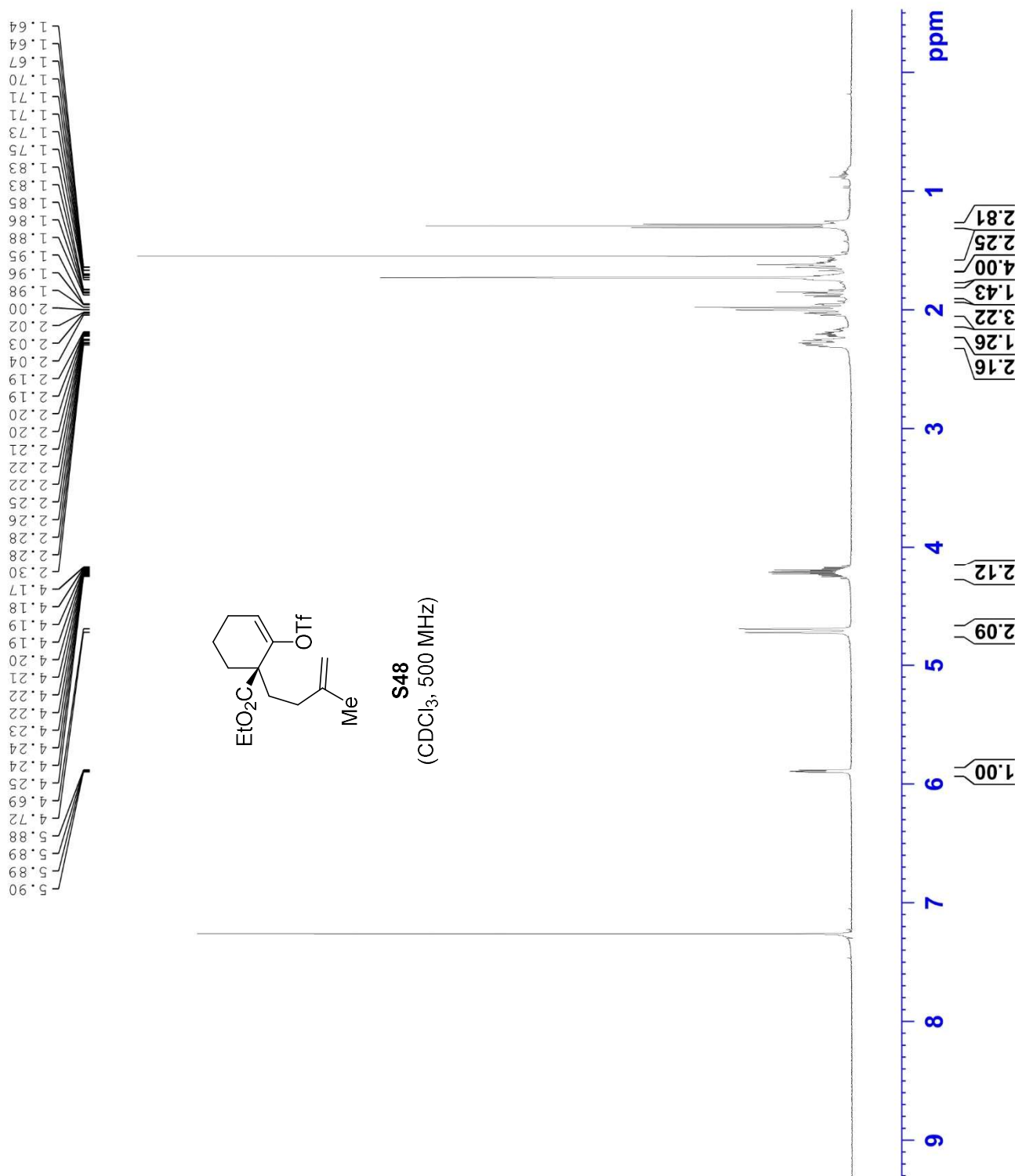
Current Data Parameters
 NAME yh-7-74
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20191106
 Time_ 22.58 h
 INSTRUM spect
 PROBHD Z113652_0187 (zg)
 PULPROG 59998
 TD CDC13
 SOLVENT 4
 NS 0
 DS 10000.000 Hz
 SWH 0.333344 Hz
 FIDRES 2.9999001 sec
 AQ 77.07
 RG 50.000 usec
 DE 6.50 usec
 TE 295.3 K
 D1 3.0000000 sec
 TD0 1
 SFO1 499.8730869 MHz
 NUC1 ¹H
 P1 10.75 usec
 PLW1 18.2500000 W

F2 - Processing parameters

SI 65536
 SF 499.8700121 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Yh-7-74
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191107
 Time_ 22.20 h
 INSTRUM spect
 PROBHD Z113652_0187 (

PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 13
 DS 0

SWH 31250.000 Hz
 FIDRES 0.333340 Hz
 AQ 2.9999361 sec
 RG 2050

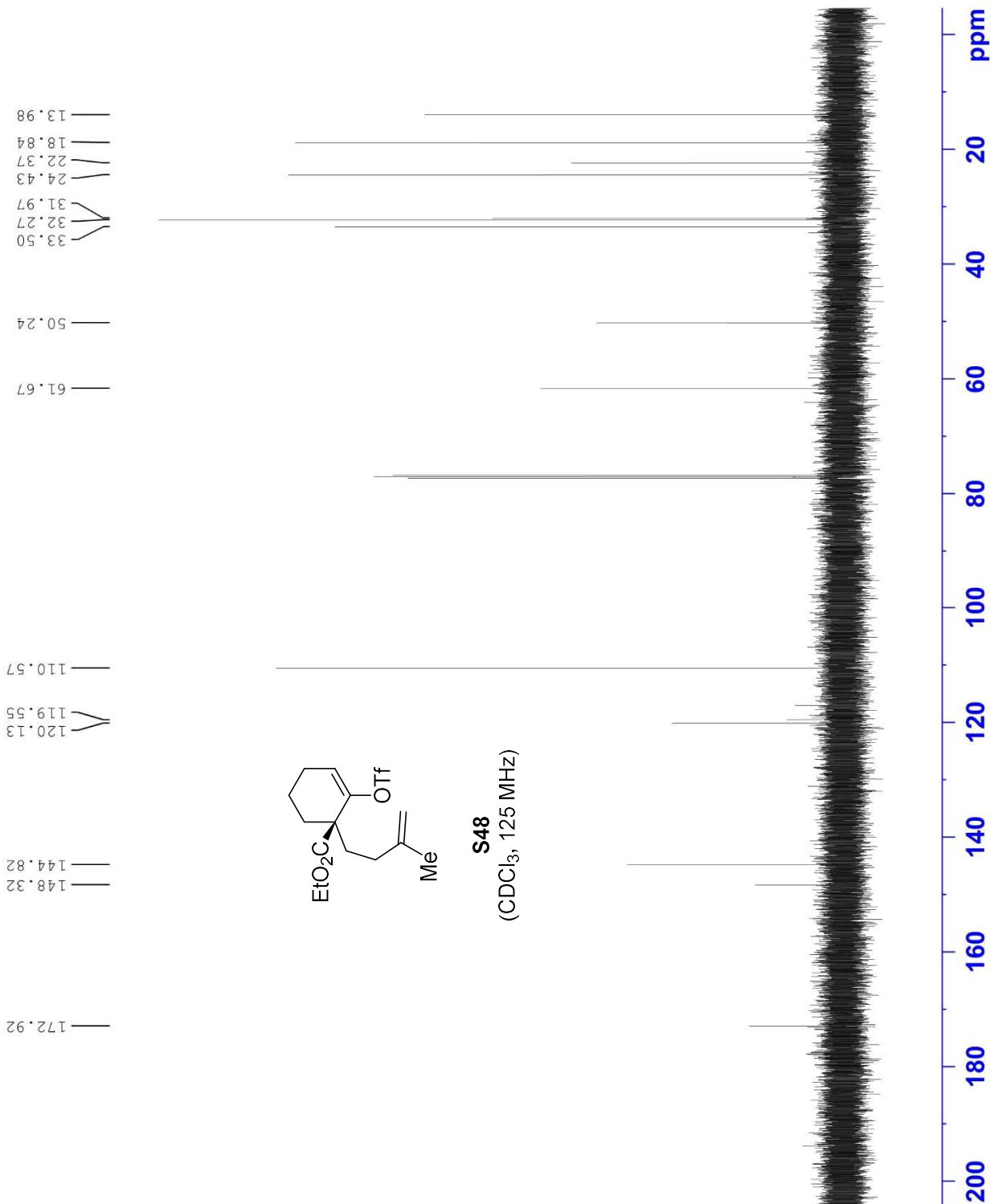
DW 16.000 usec
 DE 6.50 usec
 TE 295.7 K
 D1 3.0000000 sec
 D11 0.0300000 sec

TD0 1
 SF01 125.7049802 MHz
 NUC1 13C

P1 10.00 usec
 PLW1 72.83999634 W
 SF02 499.8724993 MHz
 NUC2 1H

CPDPRG12 waltz16
 PCPD2 80.00 usec
 PLW2 19.0000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME Yh-7-76-a
 EXPNO 1
 PROCNO 1

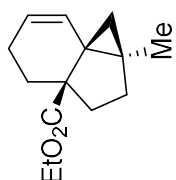
F2 - Acquisition Parameters

Date_ 20191108
 Time_ 0.02 h
 INSTRUM spect
 PROBHD Z113652_0187 (
 PULPROG zg
 TD 59998
 SOLVENT CDC13
 NS 4
 DS 0
 SWH 10000.000 Hz
 FIDRES 0.333344 Hz
 AQ 2.9999001 sec
 RG 29.95
 DW 50.000 usec
 DE 6.50 usec
 TE 295.4 K
 D1 3.0000000 sec
 TD0 1
 SFO1 499.8730869 MHz
 NUC1 1H
 P1 10.75 usec
 PLW1 18.2500000 W

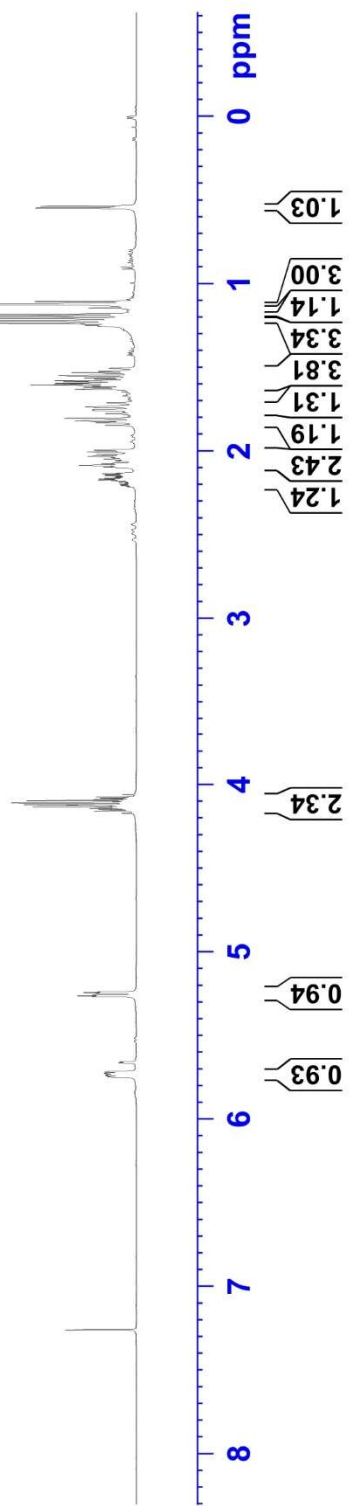
F2 - Processing parameters

SI 65536
 SF 499.8700125 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

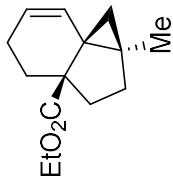
5.73
5.72
5.27
5.26
5.25
5.24
5.24
5.24
4.16
4.15
4.14
4.14
4.14
4.12
4.12
4.11
4.11
4.10
4.09
4.08
4.07
2.17
2.17
2.16
2.15
2.14
2.14
2.10
2.09
2.07
2.05
2.03
2.02
2.01
1.99
1.85
1.83
1.82
1.80
1.78
1.76
1.74
1.63
1.63
1.62
1.61
1.61
1.60
1.59
1.59
1.58
1.57
1.56
1.56
1.55
1.53
1.52
1.24
1.22
1.21
1.19
1.18
1.12
1.00
0.54



S49
 (CDCl₃, 500 MHz)



176.31



S49
(CDCl₃, 125 MHz)

128.92
126.63
125.07

59.98
52.51

32.91
32.28
30.81
27.03
23.68
22.26
19.61
14.27

200 180 160 140 120 100 80 60 40 20 ppm

Current Data Parameters
 NAME Yh-7-76-a
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191108
 Time_ 0.24 h
 INSTRUM spect
 PROBHD Z113652_0187 (
 PULPROG zgdc
 TD 187496
 SOLVENT CDCl3
 NS 103
 DS 0
 SWH 31250.000 Hz
 FIDRES 0.333340 Hz
 AQ 2.9999361 sec
 RG 2050
 DW 16.000 usec
 DE 6.50 usec
 TE 296.6 K
 D1 3.0000000 sec
 D11 0.0300000 sec
 TD0 1
 SF01 125.7049802 MHz
 NUC1 13C
 P1 10.00 usec
 PLW1 72.83999634 W
 SF02 499.8724993 MHz
 NUC2 1H
 CPDPRG12 waltz16
 PCPD2 80.00 usec
 PLW2 19.0000000 W
 PLW12 0.29688001 W

F2 - Processing parameters
 SI 1048576
 SF 125.6924115 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40