

# Mn-Catalyzed Remote C(sp<sup>3</sup>)-H Bond Peroxidation Triggered by Radical Trifluoromethylation of Unactivated Alkene

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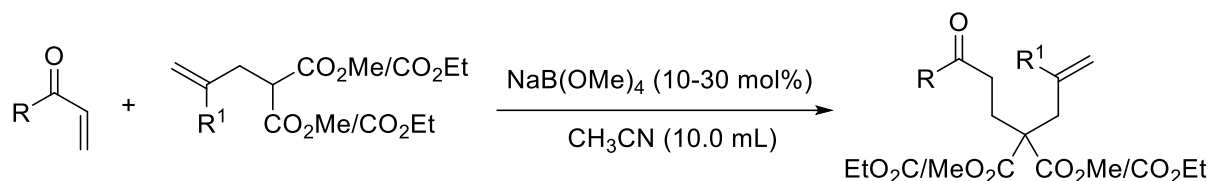
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## 1. General information

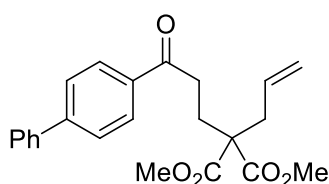
<sup>1</sup>H NMR spectra were recorded on Bruker 400 MHz and 600 MHz spectrometer and the chemical shifts were reported in parts per million ( $\delta$ ) relative to internal standard TMS (0 ppm) for CDCl<sub>3</sub>. TGA analysis was carried out at thermogravimetric analyzer Q500 (TAInstrument company, USA). The peak patterns are indicated as follows: s, singlet; d, doublet; dd, doublet of doublet; t, triplet; m, multiplet; q, quartet. The coupling constants, *J*, are reported in Hertz (Hz). <sup>13</sup>C NMR spectra were obtained at Bruker 100 MHz, 150 MHz and referenced to the internal solvent signals (central peak is 77.0 ppm in CDCl<sub>3</sub>). <sup>19</sup>F NMR spectra were obtained at Bruker 376 MHz, 564 MHz. CDCl<sub>3</sub> was used as the NMR solvent. APEX II (Bruker Inc.) was used for ESI-MS and EI-MS. IR spectra were recorded by a Bruker Tensor 27 infrared spectrometer. Flash column chromatography was performed over silica gel 200-300. All reagents were weighed and handled in air at room temperature. All chemical reagents were purchased from Alfa, Acros, Aldrich, TCI, and J&K and used without further purification.

**CAUTION-1:** Mixing a metal salt and peroxide can cause explosion. See: Jones, A. K.; Wilson, T. E.; Nikam, S. S. *In Encyclopedia of Reagents for Organic Synthesis*, Paquette, L. A. Ed.; John Wiley & Sons, Inc. **1995**, 2, 880.

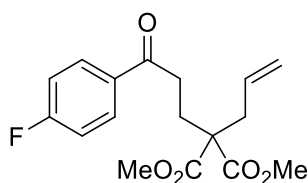
## 2. General procedure for synthesis of 1



The alkene substrates were synthesized according to the reported literatures. <sup>[1-5]</sup> To a solution of Michael donor (2.0 mmol) and NaB(OMe)<sub>4</sub> (10-30 mol %) in MeCN (10 mL) was added  $\alpha,\beta$ -unsaturated ketone (2.0-4.0 mmol) at room temperature. The resulting solution was stirred at room temperature or 50 °C under air atmosphere and monitored by TLC. Upon completion, solvent was removed under reduced pressure, and the residue was purified by flash column chromatography on silica gel (ethyl acetate/petroleum ether = 1/12-1/4) to give the desired products. (**1a**, **1b**, **1d**, **1e**, **1f**, **1h**, **1i**, **1l**, **1p**, **1q**, **1r**, **1s**, **1t**, **1u** were synthesized according to the reported literature <sup>[1-5]</sup>)

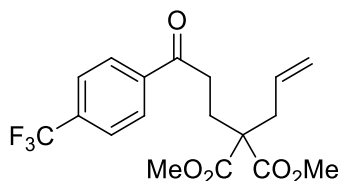


**Dimethyl 2-allyl-2-(3-(biphenyl-4-yl)-3-oxopropyl)malonate (1c)** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 10:1,  $R_f$  = 0.3) in 74% yield (280 mg); White solid. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  8.02 (d,  $J$  = 8.4 Hz, 2H), 7.67 (d,  $J$  = 8.4 Hz, 2H), 7.62 (d,  $J$  = 7.2 Hz, 2H), 7.46 (t,  $J$  = 7.4 Hz, 2H), 7.39 (t,  $J$  = 7.4 Hz, 1H), 5.75-5.68 (m, 1H), 5.17-5.12 (m, 2H), 3.73 (s, 6H), 3.04 (t,  $J$  = 7.7 Hz, 2H), 2.74 (d,  $J$  = 7.4 Hz, 2H), 2.35 (t,  $J$  = 7.9 Hz, 2H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  198.4, 171.5, 145.8, 139.9, 135.4, 132.2, 129.0, 128.7, 128.3, 127.3, 127.26, 119.4, 57.1, 52.5, 38.5, 33.8, 27.4; HRMS (ESI) calcd for C<sub>22</sub>H<sub>29</sub>F<sub>3</sub>O<sub>7</sub>Na (M+Na)<sup>+</sup>: 403.1516; found: 403.1512.

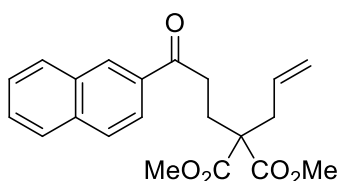


**Dimethyl 2-allyl-2-(3-(4-fluorophenyl)-3-oxopropyl)malonate (1g)** Isolated by flash column

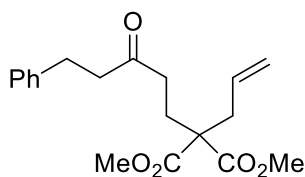
chromatography (ethyl acetate/petroleum ether = 10:1,  $R_f = 0.3$ ) in 78% yield (250 mg); White solid.  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.99 (d,  $J = 5.6, 8.1$  Hz, 2H), 7.60 (t,  $J = 8.5$  Hz, 2H), 5.73-5.66 (m, 1H), 5.16-5.11 (m, 2H), 3.73 (s, 6H), 3.00 (t,  $J = 7.6$  Hz, 2H), 2.72 (d,  $J = 7.4$  Hz, 2H), 2.31 (t,  $J = 8.0$  Hz, 2H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.2, 171.3, 165.7 (d,  $J = 7.4$  Hz), 133.1, 132.1, 130.7 (d,  $J = 7.4$  Hz), 119.4, 115.6 (d,  $J = 7.4$  Hz), 57.0, 52.5, 38.5, 33.7, 27.4; HRMS (ESI) calcd for  $\text{C}_{17}\text{H}_{19}\text{FO}_5\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 345.1109; found: 345.1108.



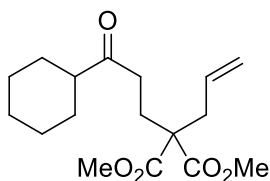
**Dimethyl 2-allyl-2-(3-oxo-3-(4-(trifluoromethyl)phenyl)propyl)malonate (1j)** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 10:1,  $R_f = 0.3$ ) in 72% yield (268 mg); Colorless oil.  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.06 (d,  $J = 8.0$  Hz, 2H), 7.73 (d,  $J = 8.0$  Hz, 2H), 5.72-5.66 (m, 1H), 5.17-5.12 (m, 2H), 3.74 (s, 6H), 3.06 (t,  $J = 7.5$  Hz, 2H), 2.73 (d,  $J = 7.4$  Hz, 2H), 2.33 (t,  $J = 7.6$  Hz, 2H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.9, 171.3, 139.3, 134.4 (q,  $J = 32.5$  Hz), 132.1, 128.4, 125.7 (q,  $J = 2.9$  Hz), 123.6 (q,  $J = 271.1$  Hz), 119.5, 56.9, 52.5, 38.6, 34.2, 27.3; HRMS (ESI) calcd for  $\text{C}_{18}\text{H}_{19}\text{F}_3\text{O}_5\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 395.1077; found: 395.1079.



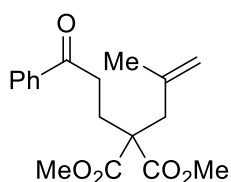
**Dimethyl 2-allyl-2-(3-(naphthalen-2-yl)-3-oxopropyl)malonate (1k)** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 10:1,  $R_f = 0.3$ ) in 71% yield (250 mg); White solid.  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.46 (s, 1H), 8.01 (d,  $J = 8.6$  Hz, 1H), 7.96 (d,  $J = 8.1$  Hz, 1H), 7.87 (t,  $J = 9.2$  Hz, 2H), 7.59 (t,  $J = 7.0$  Hz, 1H), 7.54 (t,  $J = 7.6$  Hz, 1H), 5.76-5.69 (m, 2H), 5.18-5.12 (m, 1H), 3.74 (s, 6H), 3.15 (t,  $J = 7.6$  Hz, 2H), 2.76 (d,  $J = 7.4$  Hz, 2H), 2.39 (t,  $J = 7.9$  Hz, 2H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  198.7, 171.4, 135.5, 133.9, 132.5, 132.2, 129.7, 129.5, 128.4, 128.4, 127.7, 126.7, 123.8, 119.4, 57.1, 52.5, 38.5, 33.8, 27.5; HRMS (ESI) calcd for  $\text{C}_{21}\text{H}_{22}\text{O}_5\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 377.1359; found: 377.1353.



**Dimethyl 2-allyl-2-(3-oxo-5-phenylpentyl)malonate (1m)** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 8:1,  $R_f$  = 0.3) in 66% yield (220 mg); Colorless oil.  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.28-7.26 (m, 2H), 7.20-7.16 (m, 3H), 5.66-5.59 (m, 1H), 5.10-5.07 (m, 2H), 3.69 (s, 6H), 2.88 (t,  $J$  = 7.4 Hz, 2H), 2.72 (t,  $J$  = 7.9 Hz, 2H), 2.61 (d,  $J$  = 7.4 Hz, 2H), 2.40 (t,  $J$  = 7.4 Hz, 2H), 2.13 (t,  $J$  = 8.0 Hz, 2H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  208.4, 171.4, 140.9, 132.1, 128.5, 128.3, 126.1, 119.4, 56.8, 52.5, 44.2, 38.2, 37.9, 29.8, 26.6; HRMS (ESI) calcd for  $\text{C}_{19}\text{H}_{24}\text{O}_5\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 355.1516; found: 355.1513.



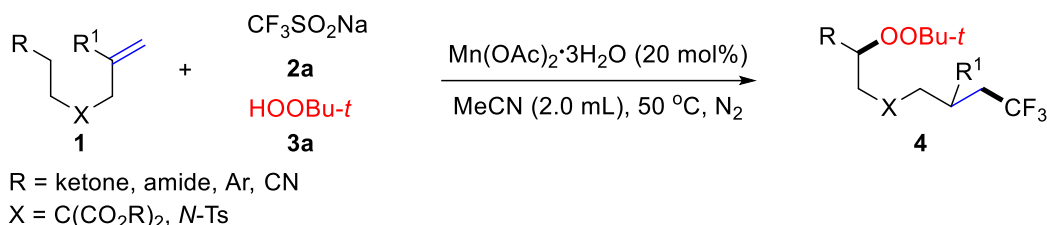
**Dimethyl 2-allyl-2-(3-cyclohexyl-3-oxopropyl)malonate (1n)** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 8:1,  $R_f$  = 0.3) in 64% yield (200 mg); Colorless oil.  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  5.69-5.62 (m, 1H), 5.12-5.09 (m, 2H), 3.71 (s, 6H), 2.63 (d,  $J$  = 7.4 Hz, 2H), 2.46 (t,  $J$  = 7.5 Hz, 2H), 2.34-2.29 (m, 1H), 2.13 (t,  $J$  = 7.9 Hz, 2H), 1.82-1.76 (m, 4H), 1.66 (t,  $J$  = 12.7 Hz, 1H), 1.34-1.17 (m, 5H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  212.4, 171.4, 132.2, 119.2, 56.9, 52.4, 50.8, 38.2, 35.4, 28.5, 26.6, 25.8, 25.6; HRMS (ESI) calcd for  $\text{C}_{17}\text{H}_{26}\text{O}_5\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 333.1673; found: 333.1669.



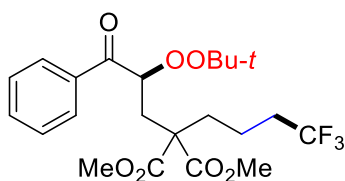
**Dimethyl 2-(2-methylallyl)-2-(3-oxo-3-phenylpropyl)malonate (1o)** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 10:1,  $R_f$  = 0.3) in 76% yield (241 mg); White solid.  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.95 (d,  $J$  = 8.0 Hz, 2H), 7.55 (t,  $J$  = 7.4 Hz, 1H), 7.45 (t,  $J$  = 7.5 Hz, 2H), 4.88 (s, 1H), 4.77 (s, 1H), 3.72 (s, 6H), 3.00 (t,  $J$  = 7.6 Hz, 2H), 2.79 (s, 2H), 2.34 (t,  $J$  = 7.8

Hz, 2H), 1.67 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  198.6, 171.6, 140.1, 136.5, 132.1, 132.9, 128.4, 127.9, 115.8, 56.4, 52.3, 41.6, 33.7, 27.2, 22.9; HRMS (ESI) calcd for  $\text{C}_{18}\text{H}_{22}\text{O}_5\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 341.1359; found: 341.1353.

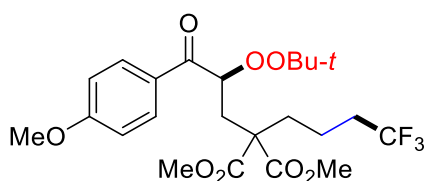
### 3 General procedure for synthesis of 4



To a 25 mL Schlenk tube were added unactivated alkenes **1** (0.2 mmol),  $\text{Mn}(\text{OAc})_3\cdot\text{H}_2\text{O}$  (0.04 mmol),  $\text{CF}_3\text{SO}_2\text{Na}$  (0.4 mmol), MeCN (2.0 mL) and *t*-BuOOH (T-hydro, 70% in water, 1.0 mmol) under  $\text{N}_2$  atmosphere at room temperature, and the resulting solution was stirred at 50°C for 3 h. The resulting mixture and the solvent were evaporated under vacuum. The residue was purified by flash column chromatography on silica gel (eluent: ethyl acetate/petroleum ether) to give the peroxides **4a-4u**.

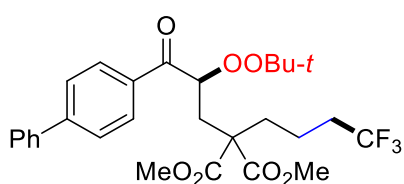


**2-(2-(*tert*-butylperoxy)-3-oxo-3-phenylpropyl)-2-(4,4,4-trifluorobutyl)malonate (4a):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f$  = 0.4) in 72% yield (67 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.05 (d,  $J$  = 7.9 Hz, 2H), 7.58 (t,  $J$  = 7.3 Hz, 1H), 7.47 (t,  $J$  = 7.6 Hz, 2H), 5.17 (dd,  $J$  = 8.1, 4.2 Hz, 1H), 3.73 (s, 6H), 2.50-2.43 (m, 2H), 2.18-2.06 (m, 4H), 1.61-1.53 (m, 1H), 1.47-1.40 (m, 1H), 1.13 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.6, 171.0, 170.9, 135.2, 133.4, 129.0, 128.5, 126.8 (q,  $J$  = 274.7 Hz), 81.3, 80.8, 55.9, 52.7, 52.6, 33.9 (q,  $J$  = 28.8 Hz), 33.1, 32.2, 26.3, 17.2 (q,  $J$  = 2.6 Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{22}\text{H}_{29}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 485.1758; found: 485.1760.



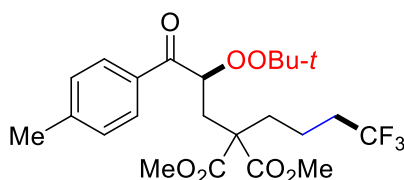
**Dimethyl-2-(2-(*tert*-butylperoxy)-3-oxo-3-*p*-tolylpropyl)-2-(4,4,4-trifluorobutyl)malonate (4b):**

Isolated by flash column chromatography (ethyl acetate/petroleum ether = 6:1,  $R_f = 0.4$ ) in 72% yield (66 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.06 (d,  $J = 8.5$  Hz, 2H), 6.95 (d,  $J = 8.5$  Hz, 2H), 5.12 (t,  $J = 6.2$  Hz, 1H), 3.88 (s, 3H), 3.73 (s, 6H), 2.45 (d,  $J = 6.1$  Hz, 2H), 2.17-2.05 (m, 4H), 1.58-1.52 (m, 1H), 1.47-1.41 (m, 1H), 1.14 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  195.9, 171.0, 170.9, 163.7, 131.4, 128.1, 126.8 (q,  $J = 274.6$  Hz), 113.7, 81.4, 80.8, 55.9, 55.4, 52.7, 52.6, 33.9 (q,  $J = 28.8$  Hz), 33.3, 32.2, 26.4, 17.2 (q,  $J = 2.3$  Hz).  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{23}\text{H}_{31}\text{F}_3\text{O}_8\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 515.1863; found: 515.1865.



**Dimethyl-2-(3-(biphenyl-4-yl)-2-(*tert*-butylperoxy)-3-oxopropyl)-2-(4,4,4-**

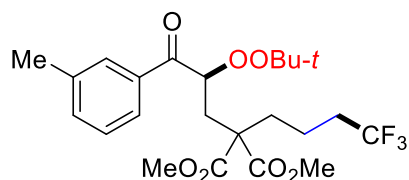
**trifluorobutyl)malonate (4c):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 70% yield (75 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.15 (d,  $J = 8.4$  Hz, 2H), 7.70 (d,  $J = 8.5$  Hz, 2H), 7.60 (d,  $J = 7.1$  Hz, 2H), 7.48 (t,  $J = 7.4$  Hz, 2H), 7.41 (t,  $J = 7.4$  Hz, 1H), 5.19 (dd,  $J = 7.9, 4.4$  Hz, 1H), 3.74 (s, 3H), 3.74 (s, 3H), 2.52-2.46 (m, 2H), 2.20-2.08 (m, 4H), 1.62-1.54 (m, 1H), 1.49-1.41 (m, 1H), 1.15 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.1, 171.0, 170.9, 146.0, 139.8, 133.8, 129.6, 129.0, 128.3, 127.3, 127.2, 126.8 (q,  $J = 274.6$  Hz), 81.5, 80.9, 55.9, 52.8, 52.7, 33.9 (q,  $J = 28.5$  Hz), 33.2, 32.2, 26.4, 17.2 (q,  $J = 2.9$  Hz).  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.2 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{28}\text{H}_{33}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 561.2071; found: 561.2071.



**Dimethyl-2-(2-(*tert*-butylperoxy)-3-oxo-3-*p*-tolylpropyl)-2-(4,4,4-trifluorobutyl)malonate (4d):**

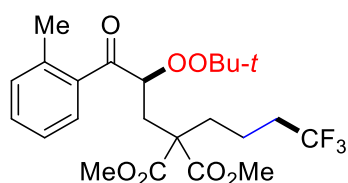
Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 75% yield (71 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.96 (d,  $J = 7.6$  Hz, 2H), 7.27 (d,  $J = 8.0$  Hz, 2H), 5.15 (dd,  $J = 7.2, 5.2$  Hz, 1H), 3.72 (s, 6H), 2.45-2.40 (m, 5H), 2.17-2.05 (m, 4H), 1.60-1.52

(m, 1H), 1.46-1.40 (m, 1H), 1.13 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.0, 171.0, 170.9, 144.2, 132.7, 129.2, 129.1, 126.8 (q,  $J = 274.9$  Hz), 81.3, 80.8, 55.9, 52.7, 52.6, 33.9 (q,  $J = 28.5$  Hz), 33.2, 32.2, 26.4, 21.7, 17.2 (q,  $J = 2.5$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{23}\text{H}_{31}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 499.1914; found: 499.1913.



**Dimethyl-2-(2-(*tert*-butylperoxy)-3-oxo-3-*m*-tolylpropyl)-2-(4,4,4-trifluorobutyl)malonate (4e):**

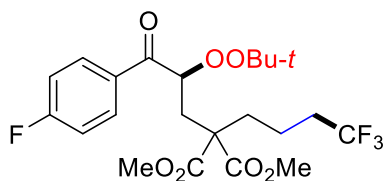
Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 70% yield (67 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.84 (d,  $J = 8.3$  Hz, 2H), 7.40 (d,  $J = 7.4$  Hz, 1H), 7.36 (t,  $J = 7.4$  Hz, 1H), 5.16 (dd,  $J = 7.6, 4.9$  Hz, 1H), 3.730 (s, 3H), 3.725 (s, 3H), 2.45-2.42 (m, 5H), 2.16-2.08 (m, 4H), 1.59-1.52 (m, 1H), 1.48-1.43 (m, 1H), 1.14 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.7, 171.0, 170.9, 138.4, 135.2, 134.2, 129.5, 128.4, 126.8 (q,  $J = 274.7$  Hz), 126.2, 81.2, 80.8, 55.9, 52.8, 52.7, 33.9 (q,  $J = 28.5$  Hz), 33.1, 32.2, 26.4, 21.4, 17.2 (q,  $J = 2.9$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{23}\text{H}_{31}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 499.1914; found: 499.1914.



**Dimethyl-2-(2-(*tert*-butylperoxy)-3-oxo-3-*o*-tolylpropyl)-2-(4,4,4-trifluorobutyl)malonate (4f):**

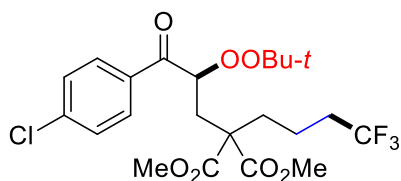
Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 73% yield (69 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.65 (d,  $J = 7.6$  Hz, 1H), 7.38 (t,  $J = 7.6$  Hz, 1H), 7.26 (d,  $J = 8.5$  Hz, 2H), 5.03 (dd,  $J = 8.9, 2.8$  Hz, 1H), 3.73 (s, 3H), 3.67 (s, 3H), 2.48-2.44 (m, 4H), 2.48-2.44 (m, 4H), 2.39-2.35 (m, 1H), 1.58-1.51 (m, 1H), 1.41-1.34 (m, 1H), 1.09 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  201.8, 171.0, 170.9, 138.6, 136.3, 131.7, 131.3, 128.3, 126.8 (q,  $J = 274.7$  Hz), 125.3, 81.8, 80.7, 56.0, 52.7, 52.6, 33.9 (q,  $J = 28.5$  Hz), 32.5, 32.0, 26.3, 20.6, 17.1 (q,  $J = 2.9$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{23}\text{H}_{31}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 499.1914; found: 499.1916.





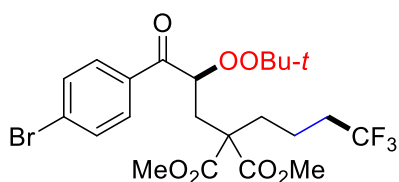
**Dimethyl-2-(2-(*tert*-butylperoxy)-3-(4-fluorophenyl)-3-oxopropyl)-2-(4,4,4-**

**trifluorobutyl)malonate (4g):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 69% yield (66 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.12 (dd,  $J = 8.7, 5.5$  Hz, 2H), 7.15 (t,  $J = 8.5$  Hz, 2H), 5.09 (dd,  $J = 8.1, 4.3$  Hz, 1H), 3.74 (s, 6H), 2.49-2.42 (m, 2H), 2.17-2.05 (m, 4H), 1.60-1.53 (m, 1H), 1.47-1.41 (m, 1H), 1.12 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  196.0, 170.9, 170.8, 165.9 (d,  $J = 253.9$  Hz), 131.8 (d,  $J = 9.0$  Hz), 131.5 (d,  $J = 2.7$  Hz), 126.8 (q,  $J = 275.0$  Hz), 115.6 (d,  $J = 21.8$  Hz), 81.8, 80.9, 55.9, 52.8, 52.7, 33.9 (q,  $J = 28.6$  Hz), 33.1, 32.2, 26.3, 17.2 (q,  $J = 2.9$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F), -104.5 (s, 1F); HRMS (ESI) calcd for  $\text{C}_{22}\text{H}_{28}\text{F}_4\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 503.1663; found: 503.1667.



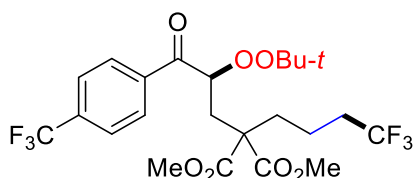
**Dimethyl-2-(2-(*tert*-butylperoxy)-3-(4-chlorophenyl)-3-oxopropyl)-2-(4,4,4-**

**trifluorobutyl)malonate (4h):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 67% yield (66 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.03 (d,  $J = 8.5$  Hz, 2H), 7.45 (d,  $J = 8.5$  Hz, 2H), 5.08 (dd,  $J = 8.1, 4.1$  Hz, 1H), 3.73 (s, 6H), 2.49-2.41 (m, 2H), 2.16-2.05 (m, 4H), 1.60-1.53 (m, 1H), 1.47-1.41 (m, 1H), 1.12 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  196.5, 170.9, 170.8, 139.8, 133.4, 130.5, 128.8, 126.8 (q,  $J = 274.6$  Hz), 81.8, 81.0, 55.8, 52.8, 52.7, 33.8 (q,  $J = 28.6$  Hz), 33.1, 32.2, 26.3, 17.2 (q,  $J = 2.4$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.2 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{22}\text{H}_{28}\text{ClF}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 519.1368; found: 519.1373.



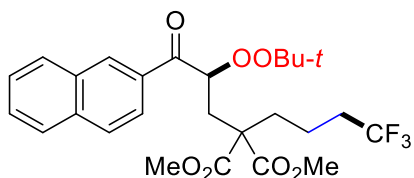
**Dimethyl-2-(3-(4-bromophenyl)-2-(*tert*-butylperoxy)-3-oxopropyl)-2-(4,4,4-**

**trifluorobutyl)malonate (4i):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 69% yield (74 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.95 (d,  $J = 8.3$  Hz, 2H), 7.62 (d,  $J = 8.3$  Hz, 2H), 5.07 (dd,  $J = 8.2, 4.1$  Hz, 1H), 3.73 (s, 6H), 2.49-2.41 (m, 2H), 2.16-2.06 (m, 4H), 1.59-1.53 (m, 1H), 1.47-1.40 (m, 1H), 1.12 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  196.6, 170.9, 170.8, 133.8, 131.8, 130.6, 128.6, 126.8 (q,  $J = 274.6$  Hz), 81.8, 81.0, 55.9, 52.8, 52.7, 33.8 (q,  $J = 28.6$  Hz), 33.1, 32.3, 26.3, 17.2 (q,  $J = 3.0$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.2 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{22}\text{H}_{28}\text{BrF}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 563.0863; found: 563.0870.



**Dimethyl-2-(2-(*tert*-butylperoxy)-3-oxo-3-(4-(trifluoromethyl)phenyl)propyl)-2-(4,4,4-**

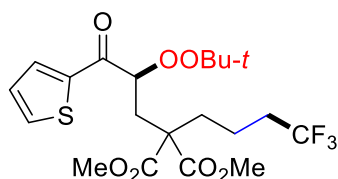
**trifluorobutyl)malonate (4j):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 59% yield (63 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.20 (d,  $J = 8.2$  Hz, 2H), 7.74 (d,  $J = 8.3$  Hz, 2H), 5.11 (dd,  $J = 8.3, 4.0$  Hz, 1H), 3.74 (s, 6H), 2.52-2.43 (m, 2H), 2.17-2.05 (m, 4H), 1.61-1.53 (m, 1H), 1.48-1.41 (m, 1H), 1.11 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  196.9, 170.9, 137.8, 134.5 (q,  $J = 32.6$  Hz), 129.4, 126.8 (q,  $J = 275.0$  Hz), 125.5 (q,  $J = 3.4$  Hz), 123.6 (q,  $J = 270.8$  Hz), 82.1, 81.2, 55.8, 52.9, 52.8, 33.8 (q,  $J = 28.9$  Hz), 33.0, 32.3, 26.3, 17.2 (q,  $J = 2.8$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -63.2 (s, 3F), -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{23}\text{H}_{28}\text{F}_6\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 553.1631; found: 553.1631.



**Dimethyl-2-(2-(*tert*-butylperoxy)-3-(naphthalen-2-yl)-3-oxopropyl)-2-(4,4,4-**

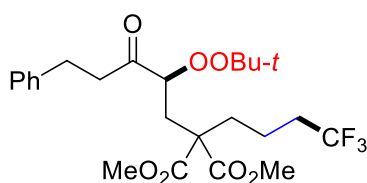
**trifluorobutyl)malonate (4k):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 36% yield (37 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.66 (s, 1H), 8.09 (dd,  $J = 8.6, 1.5$  Hz, 1H), 7.97 (d,  $J = 8.1$  Hz, 1H), 7.91 (d,  $J = 8.6$  Hz, 1H), 7.88 (d,  $J = 8.1$

Hz, 1H), 7.62 (t,  $J = 7.0$  Hz, 1H), 7.57 (t,  $J = 7.9$  Hz, 1H), 5.29 (dd,  $J = 7.3, 5.3$  Hz, 1H), 3.74 (s, 3H), 3.73 (s, 3H), 2.56-2.50 (m, 2H), 2.21-2.09 (m, 4H), 1.63-1.56 (m, 1H), 1.50-1.43 (m, 1H), 1.14 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.4, 171.0, 170.9, 135.7, 132.5, 132.4, 131.0, 129.8, 128.7, 128.4, 127.8, 126.8 (q,  $J = 274.7$  Hz), 126.8, 124.6, 81.5, 80.9, 55.9, 52.8, 52.7, 33.9 (q,  $J = 28.5$  Hz), 33.3, 32.2, 26.4, 17.3 (q,  $J = 2.5$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ )  $\delta$  -66.2 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{26}\text{H}_{31}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 535.1914; found: 535.1921.



**Dimethyl 2-(2-(*tert*-butylperoxy)-3-oxo-3-(thiophen-2-yl)propyl)-2-(4,4,4-**

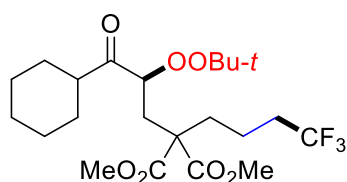
**trifluorobutyl)malonate (4l):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.3$ ) in 41% yield (38 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.99 (d,  $J = 3.8$  Hz, 1H), 7.69 (d,  $J = 4.9$  Hz, 1H), 7.16 (t,  $J = 4.1$  Hz, 1H), 4.88 (dd,  $J = 9.0, 3.8$  Hz, 1H), 3.76 (s, 3H), 3.74 (s, 3H), 2.51-2.42 (m, 2H), 2.19-2.05 (m, 4H), 1.59-1.51 (m, 1H), 1.49-1.43 (m, 1H), 1.17 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  191.0, 170.8, 140.7, 134.3, 133.6, 128.1, 126.8 (q,  $J = 274.7$  Hz), 83.1, 81.2, 55.8, 52.8, 52.7, 33.9 (q,  $J = 28.6$  Hz), 33.8, 31.9, 26.4, 17.2 (q,  $J = 2.6$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.2 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{20}\text{H}_{27}\text{F}_3\text{O}_7\text{SNa}$  ( $\text{M}+\text{Na}$ ) $^+$ : 491.1322; found: 491.1328.



**Dimethyl 2-(2-(*tert*-butylperoxy)-3-oxo-5-phenylpentyl)-2-(4,4,4-trifluorobutyl)malonate (4m):**

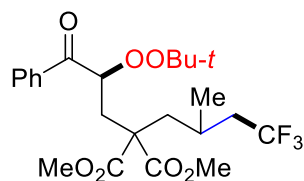
Isolated by flash column chromatography (ethyl acetate/petroleum ether = 6:1,  $R_f = 0.4$ ) in 58% yield (57 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.28 (t,  $J = 7.6$  Hz, 2H), 7.22-7.18 (m, 3H), 4.24 (dd,  $J = 8.4, 4.2$  Hz, 1H), 3.730 (s, 3H), 3.726 (s, 3H), 3.10-3.03 (m, 1H), 2.94-2.88 (m, 3H), 2.20-2.14 (m, 2H), 2.12-2.05 (m, 3H), 2.01-1.96 (m, 1H), 1.51-1.38 (m, 2H), 1.19 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  209.9, 170.8, 141.2, 128.5, 128.4, 126.8 (q,  $J = 274.9$  Hz), 126.1, 84.5, 81.2, 55.6, 52.9, 52.7, 38.8, 33.8 (q,  $J = 28.6$  Hz), 32.5, 31.6, 29.2, 26.4, 17.1 (q,  $J = 2.8$  Hz);  $^{19}\text{F}$  NMR (564

MHz, CDCl<sub>3</sub>, ppm)  $\delta$  -66.2 (s, 3F); HRMS (ESI) calcd for C<sub>24</sub>H<sub>33</sub>F<sub>3</sub>O<sub>7</sub>Na (M+Na)<sup>+</sup>: 513.2071; found: 513.2059.



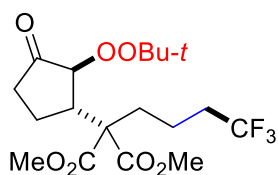
**Dimethyl 2-(2-(*tert*-butylperoxy)-3-cyclohexyl-3-oxopropyl)-2-(4,4,4-trifluorobutyl)malonate**

**(4n):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 6:1, R<sub>f</sub> = 0.4) in 68% yield (64 mg); Colorless oil; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  4.34 (dd, *J* = 8.9, 3.4 Hz, 1H), 3.75 (s, 3H), 3.746 (s, 3H), 2.87-2.82 (m, 1H), 2.26-2.20 (m, 2H), 2.15-2.06 (m, 3H), 2.04-1.99 (m, 1H), 1.85-1.78 (m, 4H), 1.56-1.49 (m, 1H), 1.47-1.41 (m, 1H), 1.40-1.23 (m, 6H), 1.20 (s, 9H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  213.2, 171.0, 170.90, 126.8 (q, *J* = 274.7 Hz), 83.1, 80.8, 55.8, 52.8, 52.7, 45.8, 33.8 (q, *J* = 28.9 Hz), 32.5, 31.7, 29.2, 28.2, 26.4, 25.8, 25.5, 17.1 (q, *J* = 2.4 Hz); <sup>19</sup>F NMR (564 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for C<sub>22</sub>H<sub>35</sub>F<sub>3</sub>O<sub>7</sub>Na (M+Na)<sup>+</sup>: 491.2227; found: 491.2229.



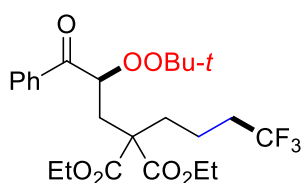
**Dimethyl 2-(2-(*tert*-butylperoxy)-3-oxo-3-phenylpropyl)-2-(4,4,4-trifluoro-2-methylbutyl)malonate**

**(4o):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1, R<sub>f</sub> = 0.4) in 68% yield (65 mg); Colorless oil (d:r = 1:1); <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  8.07-8.05 (m, 2H), 7.58 (t, *J* = 7.4 Hz, 1H), 7.47 (t, *J* = 7.4 Hz, 2H), 5.19-5.15 (m, 1H), 3.72 (s, 3H), 3.71 (d, *J* = 1.6 Hz, 3H), 2.56-2.51 (m, 1H), 2.47-2.41 (m, 1H), 2.23-2.11 (m, 2H), 2.08-1.96 (m, 3H), 1.12 (d, *J* = 4.0 Hz, 9H), 0.99 (d, *J* = 5.4 Hz, 3H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  197.7, 197.5, 171.5, 171.1, 171.0, 135.2, 135.1, 133.4, 133.3, 129.1, 129.0, 128.5, 128.4, 126.7 (q, *J* = 275.7 Hz), 81.4, 81.3, 80.9, 80.8, 55.2, 55.0, 52.8, 52.7, 52.6, 52.5, 41.2 (q, *J* = 26.6 Hz), 41.1 (q, *J* = 27.0 Hz), 40.3, 39.9, 33.9, 33.8, 26.4, 24.3 (q, *J* = 1.6 Hz), 20.4, 20.2; <sup>19</sup>F NMR (564 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  -63.0 (s, 3F), -66.1 (s, 3F); HRMS (ESI) calcd for C<sub>23</sub>H<sub>31</sub>F<sub>3</sub>O<sub>7</sub>Na (M+Na)<sup>+</sup>: 499.1914; found: 499.1914.



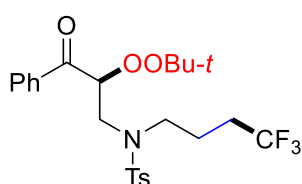
**Dimethyl 2-((2R)-2-(*tert*-butylperoxy)-3-oxocyclopentyl)-2-(4,4,4-trifluorobutyl)malonate (4p):**

Isolated by flash column chromatography (ethyl acetate/petroleum ether = 6:1,  $R_f = 0.4$ ) in 52% yield (43 mg); Colorless oil (dr > 20:1);  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  4.25 (d,  $J = 8.4$  Hz, 1H), 3.77 (s, 3H), 3.74 (s, 3H), 3.15-3.11 (m, 1H), 2.34-2.25 (m, 3H), 2.16-2.03 (m, 4H), 1.88-1.80 (m, 1H), 1.67-1.60 (m, 1H), 1.52-1.44 (m, 1H), 1.20 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  211.1, 169.8, 169.7, 125.8 (q,  $J = 274.7$  Hz), 83.8, 79.7, 58.8, 51.4, 51.4, 41.0, 35.6, 32.9 (q,  $J = 28.5$  Hz), 32.6, 25.3, 19.9, 16.5 (q,  $J = 2.5$  Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.1 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{18}\text{H}_{27}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 435.1601; found: 435.1604.



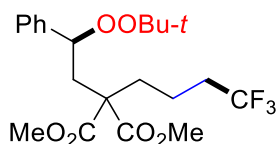
**Diethyl 2-(2-(*tert*-butylperoxy)-3-oxo-3-phenylpropyl)-2-(4,4,4-trifluorobutyl)malonate (4q):**

Isolated by flash column chromatography (ethyl acetate/petroleum ether = 7:1,  $R_f = 0.4$ ) in 70% yield (69 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.06 (d,  $J = 7.9$  Hz, 2H), 7.58 (t,  $J = 7.1$  Hz, 1H), 7.46 (t,  $J = 7.6$  Hz, 2H), 5.14 (dd,  $J = 7.7, 4.4$  Hz, 1H), 4.23-4.15 (m, 4H), 2.49-2.42 (m, 2H), 2.17-2.05 (m, 4H), 1.63-1.55 (m, 1H), 1.49-1.41 (m, 1H), 1.25-1.21 (m, 6H), 1.12 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  197.7, 170.5, 170.4, 135.3, 133.3, 129.0, 128.5, 126.8 (q,  $J = 274.5$  Hz), 81.6, 80.8, 61.7, 61.6, 56.0, 34.0 (q,  $J = 28.7$  Hz), 32.9, 32.0, 26.3, 17.2 (q,  $J = 2.6$  Hz), 13.9;  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{24}\text{H}_{33}\text{F}_3\text{O}_7\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 513.2071; found: 513.2070.

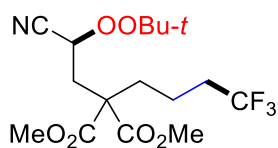


**N-(2-(*tert*-butylperoxy)-3-oxo-3-phenylpropyl)-4-methyl-N-(4,4,4-**

**trifluorobutyl)benzenesulfonamide (4r):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 6:1,  $R_f$  = 0.4) in 42% yield (42 mg); Yellow oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  8.06 (d,  $J$  = 7.2 Hz, 2H), 7.67 (d,  $J$  = 8.3 Hz, 2H), 7.62 (t,  $J$  = 7.4 Hz, 1H), 7.51 (t,  $J$  = 8.0 Hz, 2H), 7.29 (d,  $J$  = 8.0 Hz, 2H), 5.65 (dd,  $J$  = 8.0, 3.6 Hz, 1H), 3.73 (dd,  $J$  = 15.7, 3.5 Hz, 1H), 3.43-3.38 (m, 1H), 3.34 (dd,  $J$  = 15.7, 8.1 Hz, 1H), 3.24-3.19 (m, 1H), 2.42 (s, 3H), 2.13-2.03 (m, 2H), 1.92-1.85 (m, 2H), 1.10 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  196.4, 143.9, 135.8, 135.3, 133.8, 129.9, 129.0, 128.7, 127.3, 126.9 (q,  $J$  = 274.6 Hz), 83.2, 81.1, 49.4, 47.8, 31.2 (q,  $J$  = 29.2 Hz), 26.3, 21.5, 21.1 (q,  $J$  = 2.4 Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.0 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{24}\text{H}_{30}\text{F}_3\text{NO}_5\text{SNa}$  ( $\text{M}+\text{Na}$ ) $^+$ : 524.1689; found: 524.1689.

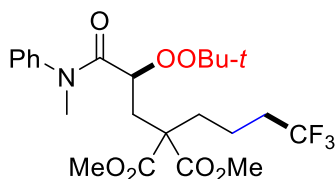


**Dimethyl 2-(2-(tert-butylperoxy)-2-phenylethyl)-2-(4,4,4-trifluorobutyl)malonate (4s):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 10:1,  $R_f$  = 0.5) in 61% yield (53 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  7.35-7.28 (m, 5H), 4.78 (dd,  $J$  = 7.4, 5.6 Hz, 1H), 3.72 (s, 3H), 3.56 (s, 3H), 2.61 (dd,  $J$  = 15.2, 7.9 Hz, 1H), 2.37 (dd,  $J$  = 15.2, 5.2 Hz, 1H), 2.16-2.00 (m, 4H), 1.58-1.50 (m, 1H), 1.41-1.34 (m, 1H), 1.11 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  171.2, 171.1, 140.8, 128.2, 128.0, 127.3, 126.8 (q,  $J$  = 275.0 Hz), 81.9, 80.0, 55.9, 52.6, 52.5, 37.1, 33.9 (q,  $J$  = 28.5 Hz), 31.5, 26.5, 17.1 (q,  $J$  = 2.9 Hz);  $^{19}\text{F}$  NMR (564 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for  $\text{C}_{21}\text{H}_{29}\text{F}_3\text{O}_6\text{Na}$  ( $\text{M}+\text{Na}$ ) $^+$ : 457.1808; found: 457.1804.



**Dimethyl 2-(2-(tert-butylperoxy)-2-cyanoethyl)-2-(4,4,4-trifluorobutyl)malonate (4t):** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 10:1,  $R_f$  = 0.4) in 22% yield (17 mg); Colorless oil;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  4.75 (dd,  $J$  = 7.7, 4.9 Hz, 1H), 3.774 (s, 3H), 3.77 (s, 3H), 2.55-2.47 (m, 2H), 2.15-2.08 (m, 2H), 2.05-1.99 (m, 2H), 1.56-1.51 (m, 1H), 1.46-1.39 (m, 1H), 1.26 (s, 9H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ , ppm)  $\delta$  170.2 (d), 126.7 (q,  $J$  = 274.7 Hz), 117.7, 82.2, 68.6, 55.3, 53.1, 53.0, 51.9, 34.4, 33.7 (q,  $J$  = 28.8 Hz), 32.4, 26.3, 17.2 (q,  $J$  = 2.9 Hz);  $^{19}\text{F}$  NMR (564

MHz, CDCl<sub>3</sub>, ppm)  $\delta$  -66.3 (s, 3F); HRMS (ESI) calcd for C<sub>16</sub>H<sub>24</sub>F<sub>3</sub>NO<sub>6</sub>Na (M+Na)<sup>+</sup>: 406.1448; found: 406.1446.



**Dimethyl-2-(2-(tert-butylperoxy)-3-(methyl(phenyl)amino)-3-oxopropyl)-2-(4,4,4-trifluorobutyl)malonate (4a)** Isolated by flash column chromatography (ethyl acetate/petroleum ether = 5:1,  $R_f$  = 0.4) in 43% yield (42 mg); Colorless oil; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  7.42 (t,  $J$  = 7.3 Hz, 2H), 7.36 (t,  $J$  = 7.4 Hz, 1H), 7.25 (d,  $J$  = 7.3 Hz, 2H), 4.45 (dd,  $J$  = 10.4, 2.8 Hz, 1H), 3.68 (s, 3H), 3.57 (s, 3H), 3.30 (s, 3H), 2.49 (dd,  $J$  = 15.6, 7.0 Hz, 1H), 2.19 (dd,  $J$  = 15.6, 2.8 Hz, 1H), 1.94-1.88 (m, 2H), 1.87-1.80 (m, 1H), 1.69-1.63 (m, 1H), 1.37-1.30 (m, 1H), 1.17 (s, 9H), 1.12-1.06 (m, 1H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  170.8 (d), 169.9, 143.1, 129.7, 128.0, 127.3, 127.2 (q,  $J$  = 275.1 Hz), 80.9, 75.4, 55.3, 52.64, 52.6, 37.9, 33.8 (q,  $J$  = 28.6 Hz), 33.4, 31.5, 26.3, 17.0 (q,  $J$  = 2.3 Hz); <sup>19</sup>F NMR (564 MHz, CDCl<sub>3</sub>, ppm)  $\delta$  -66.2 (s, 3F); HRMS (ESI) calcd for C<sub>16</sub>H<sub>24</sub>F<sub>3</sub>NO<sub>6</sub>Na (M+Na)<sup>+</sup>: 514.2023; found: 514.2022.

#### 4. TGA of the compound 4a

In order to investigate the decomposition of the peroxide, we carried out the TGA (thermal gravimetric analysis) test of the peroxide **4a** (Figure S1). The sharp peak at 240 °C indicated that the decomposition temperature the peroxid **4a** is 240 °C.

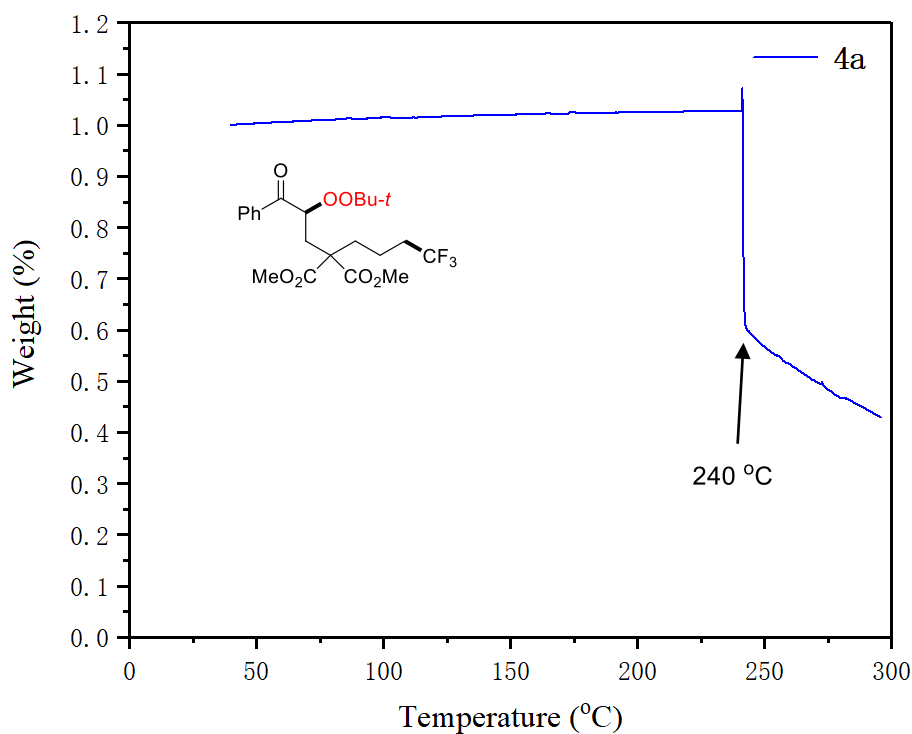
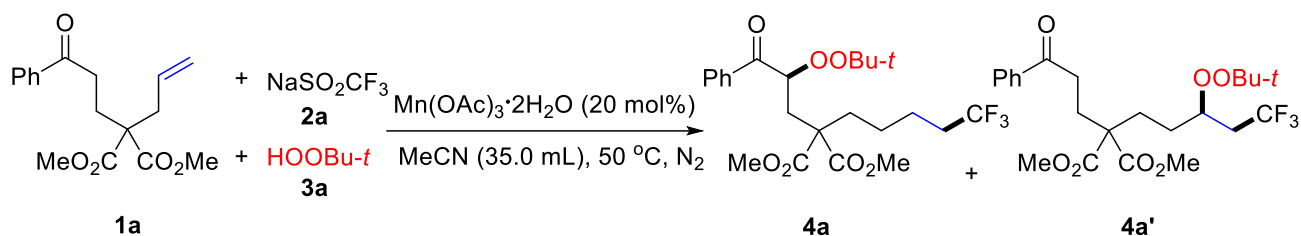
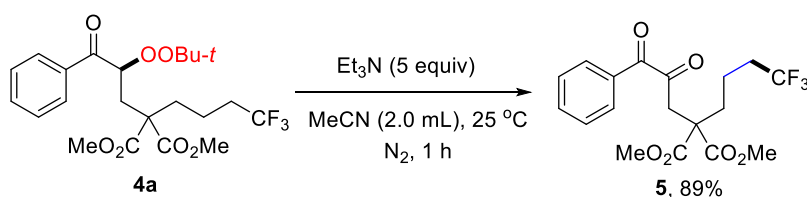


Figure S1. TGA test for the peroxide **4a**

## 5. Large scale synthesis and transformations



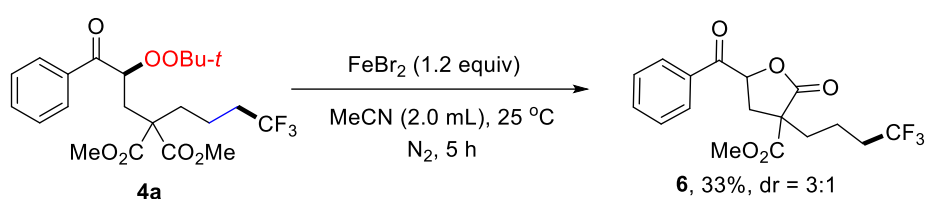
To a 50 mL Schlenk tube were added unactivated alkenes **1a** (3.5 mmol),  $\text{Mn}(\text{OAc})_3 \cdot 2\text{H}_2\text{O}$  (0.7 mmol),  $\text{CF}_3\text{SO}_2\text{Na}$  (7.0 mmol), MeCN (35.0 mL) and *t*-BuOOH (70% in water, 17.5 mmol) under  $\text{N}_2$  atmosphere at room temperature, and the resulting solution was stirred at 50 °C for 3 h. The resulting mixture and the solvent were evaporated under vacuum. The residue was purified by flash column chromatography on silica gel (eluent: ethyl acetate/petroleum ether) to give the peroxides **4a** and **4a'** in 52% yield (0.84 g, **4a:4a'** = 16:1).



To a 25 mL Schlenk tube with a magnetic stir bar were added **4a** (46.2 mg, 0.1 mmol),  $\text{Et}_3\text{N}$  (69  $\mu\text{L}$ ,



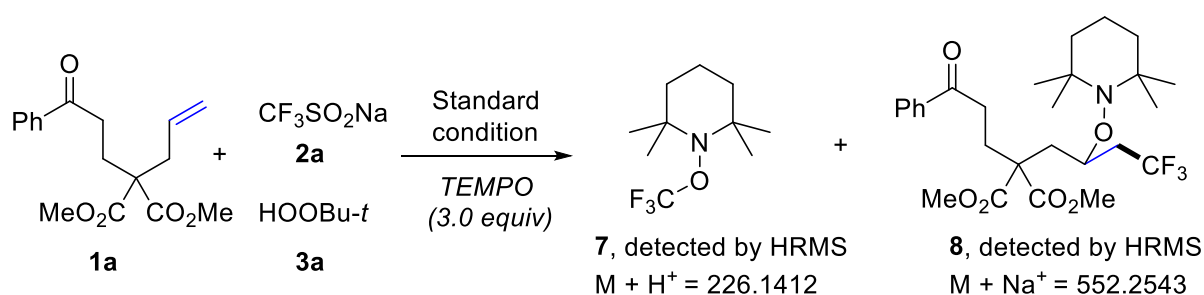
0.5 mmol) in MeCN (2.0 ml) and then allowed to stir at room temperature under N<sub>2</sub> atmosphere for 1 h. The resultant residue was purified by flash chromatography (ethyl acetate/petroleum ether = 1/10-1/8) to afford dimethyl 2-(2,3-dioxo-3-phenylpropyl)-2-(4,4,4-trifluorobutyl)malonate (**5**) (34.5 mg, 89% yield) as a yellow oil. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>, ppm) δ 8.00 (d, *J* = 7.9 Hz, 2H), 7.65 (t, *J* = 7.4 Hz, 1H), 7.50 (t, *J* = 7.9 Hz, 2H), 3.78 (s, 6H), 3.51 (s, 2H), 2.17-2.07 (m, 4H), 1.63-1.55 (m, 2H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>, ppm) δ 198.7, 190.7, 170.6, 134.7, 131.7, 130.5, 128.8, 126.7 (q, *J* = 274.8 Hz), 55.7, 53.0, 41.2, 33.8 (q, *J* = 28.8 Hz), 32.2, 17.7; HRMS (ESI) calcd for C<sub>18</sub>H<sub>19</sub>F<sub>3</sub>O<sub>6</sub>Na (M+Na)<sup>+</sup>: 411.1026; found: 411.1025.



To a 25 mL Schlenk tube equipped with a magnetic stir bar were added **4a** (46.2 mg, 0.1 mmol), FeBr<sub>2</sub> (25.9 mg, 0.12 mmol) in MeCN (2.0 ml) and then allowed to stir at room temperature under N<sub>2</sub> atmosphere for 5 h. The resultant residue was purified by flash chromatography (ethyl acetate/petroleum ether = 1/12-1/8) to afford methyl 5-benzoyl-2-oxo-3-(4,4,4-trifluorobutyl) tetrahydrofuran-3-carboxylate (**6**) (12 mg, 33% yield) as a colourless oil.<sup>[5]</sup> <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>, ppm) δ 8.02 (d, *J* = 7.4 Hz, 2H), 7.66 (d, *J* = 7.4 Hz, 1H), 7.50 (t, *J* = 7.8 Hz, 2H), 5.77 (dd, *J* = 9.0, 7.3 Hz, 1H), 3.86 (s, 3H), 3.04 (dd, *J* = 13.6, 7.2 Hz, 1H), 2.46 (dd, *J* = 13.6, 9.2 Hz, 1H), 2.15-2.08 (m, 2H), 1.72-1.47 (m, 4H). HRMS (ESI) calcd for C<sub>17</sub>H<sub>17</sub>F<sub>3</sub>O<sub>5</sub>Na (M+Na)<sup>+</sup>: 381.0920; found: 381.0919.

## 6. Mechanistic studies

### Control experiments



To a 25 mL Schlenk tube were added **1a** (0.2 mmol), Mn(OAc)<sub>3</sub>·2H<sub>2</sub>O (0.04 mmol), CF<sub>3</sub>SO<sub>2</sub>Na (0.4 mmol), TEMPO (0.6 mmol), MeCN (2.0 mL) and *t*-BuOOH (70% in water, 1.0 mmol) under N<sub>2</sub> atmosphere at room temperature, and the resulting solution was stirred at 50°C for 3 h. The model reaction was totally suppressed where alkene **1a** was almost fully recovered, and we can detect the molecular weight of compounds **7** and **8**.

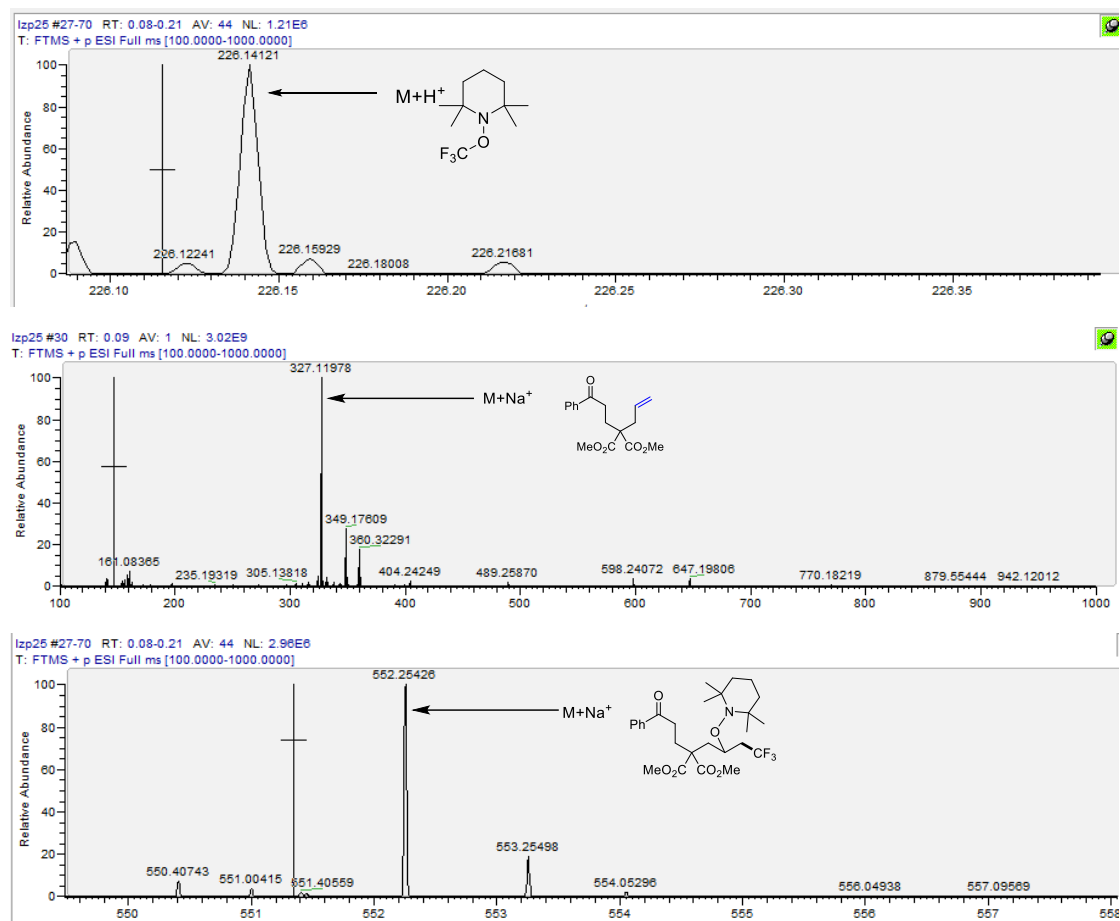
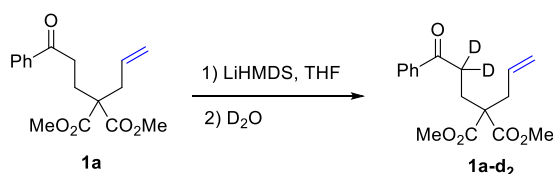


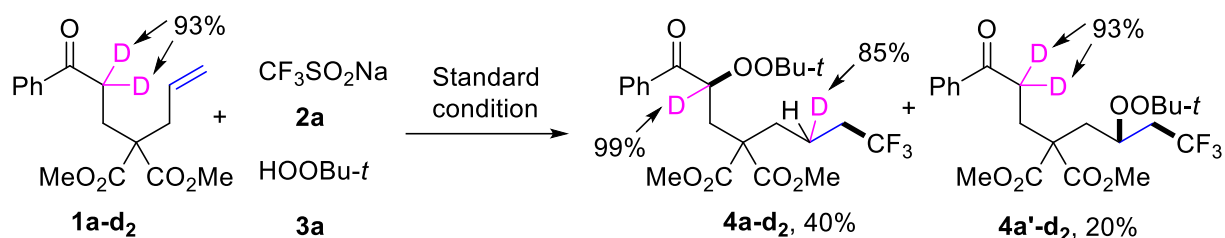
Figure S2. HRMS of the reaction solution

## Deuterium labeling experiments



Experimental procedures for the synthesis of **1a-d<sub>2</sub>**<sup>[5]</sup>: To a solution of **1a** (608.0 mg, 2.0 mmol) in THF (3.0 mL) at -78 °C was slowly added a solution of LiHMDS (5.0 mL, 1.0 M in THF) under N<sub>2</sub>. After being stirred for 1 h at -78 °C, the reaction mixture was quenched by slowly sequential addition

of D<sub>2</sub>O (2.0 mL). Then the mixture was warmed to room temperature, stirred for an additional 30 mins, and extracted with ethyl acetate (3 x 5.0 mL). The combined organic extracts were washed with brine (5.0 mL), dried over Na<sub>2</sub>SO<sub>4</sub>, filtered, and concentrated. The residue was repeated three times as the procedure described above and purified by flash chromatography on silica gel (ethyl acetate/petroleum ether = 1/12-1/6) to give the dimethyl 2-allyl-2-(3-(4-bromophenyl)-3-oxopropyl) malonate-d<sub>2</sub> (**1a-d<sub>2</sub>**) (535.0 mg, 88% yield) as a colorless oil. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>, ppm) δ 7.95 (d, *J* = 7.2 Hz, 2H), 7.56 (t, *J* = 7.4 Hz, 1H), 7.46 (t, *J* = 7.8 Hz, 2H), 5.75-5.65 (m, 1H), 5.17-5.11 (m, 2H), 3.73 (s, 6H), 3.03-2.92 (m, 0.14H), 2.72 (d, *J* = 7.4 Hz, 2H), 2.05 (s, 2H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>, ppm) δ 198.9, 171.4, 136.7, 133.1, 132.2, 128.6, 128.1, 119.4, 57.1, 52.5, 38.5, 27.3; HRMS (ESI) calcd for C<sub>18</sub>H<sub>19</sub>F<sub>3</sub>O<sub>6</sub>Na (M+Na)<sup>+</sup>: 411.1026; found: 411.1026.



To a 25 mL Schlenk tube were added unactivated alkenes **1** (0.2 mmol), Mn(OAc)<sub>3</sub>·2H<sub>2</sub>O (0.04 mmol), CF<sub>3</sub>SO<sub>2</sub>Na (0.4 mmol), MeCN (2.0 mL) and *t*-BuOOH (70% in water, 1.0 mmol) under N<sub>2</sub> atmosphere at room temperature, and the resulting solution was stirred at 50°C for 3 h. Solvent was removed under reduced pressure, and the crude residue was purified by silica gel column chromatography (ethyl acetate/petroleum ether = 1/20-1/15) to give **4a-d<sub>2</sub>** and **4a'-d<sub>2</sub>** in 40% and 20% yields, respectively.

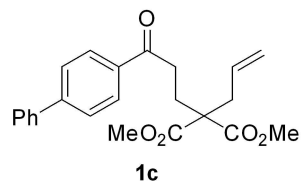
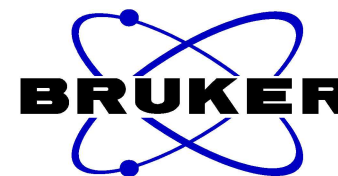
**4a-d<sub>2</sub>**: Colorless oil; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>, ppm) δ 8.05 (d, *J* = 7.9 Hz, 2H), 7.58 (t, *J* = 7.3 Hz, 1H), 7.47 (t, *J* = 7.6 Hz, 2H), 5.17 (dd, *J* = 8.1, 4.2 Hz, 0.016H), 3.73 (s, 6H), 2.50-2.43 (m, 2H), 2.18-2.06 (m, 4H), 1.61-1.53 (m, 1H), 1.47-1.40 (m, 1H), 1.13 (s, 9H); <sup>19</sup>F NMR (564 MHz, CDCl<sub>3</sub>, ppm) δ -66.3 (s, 3F); HRMS (ESI) calcd for C<sub>22</sub>H<sub>27</sub>D<sub>2</sub>F<sub>3</sub>O<sub>7</sub>Na (M+Na)<sup>+</sup>: 487.1883; found: 487.1880.

**4a'-d<sub>2</sub>**: Colorless oil; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>, ppm) δ 7.95 (d, *J* = 7.9 Hz, 1.0H), 7.56 (t, *J* = 7.3 Hz, 0.5H), 7.46 (t, *J* = 7.6 Hz, 1.0H), 4.28-4.24 (m, 0.5H), 3.73 (d, *J* = 2.8 Hz, 3.0H), 2.89-2.80 (m, 0.5H), 2.44-2.32 (m, 2.0H), 2.28-2.23 (m, 0.5H), 1.16 (s, 4.5H); <sup>19</sup>F NMR (564 MHz, CDCl<sub>3</sub>, ppm) δ -62.9 (s, 3F); HRMS (ESI) calcd for C<sub>22</sub>H<sub>27</sub>D<sub>2</sub>F<sub>3</sub>O<sub>7</sub>Na (M+Na)<sup>+</sup>: 487.1883; found: 487.1880.

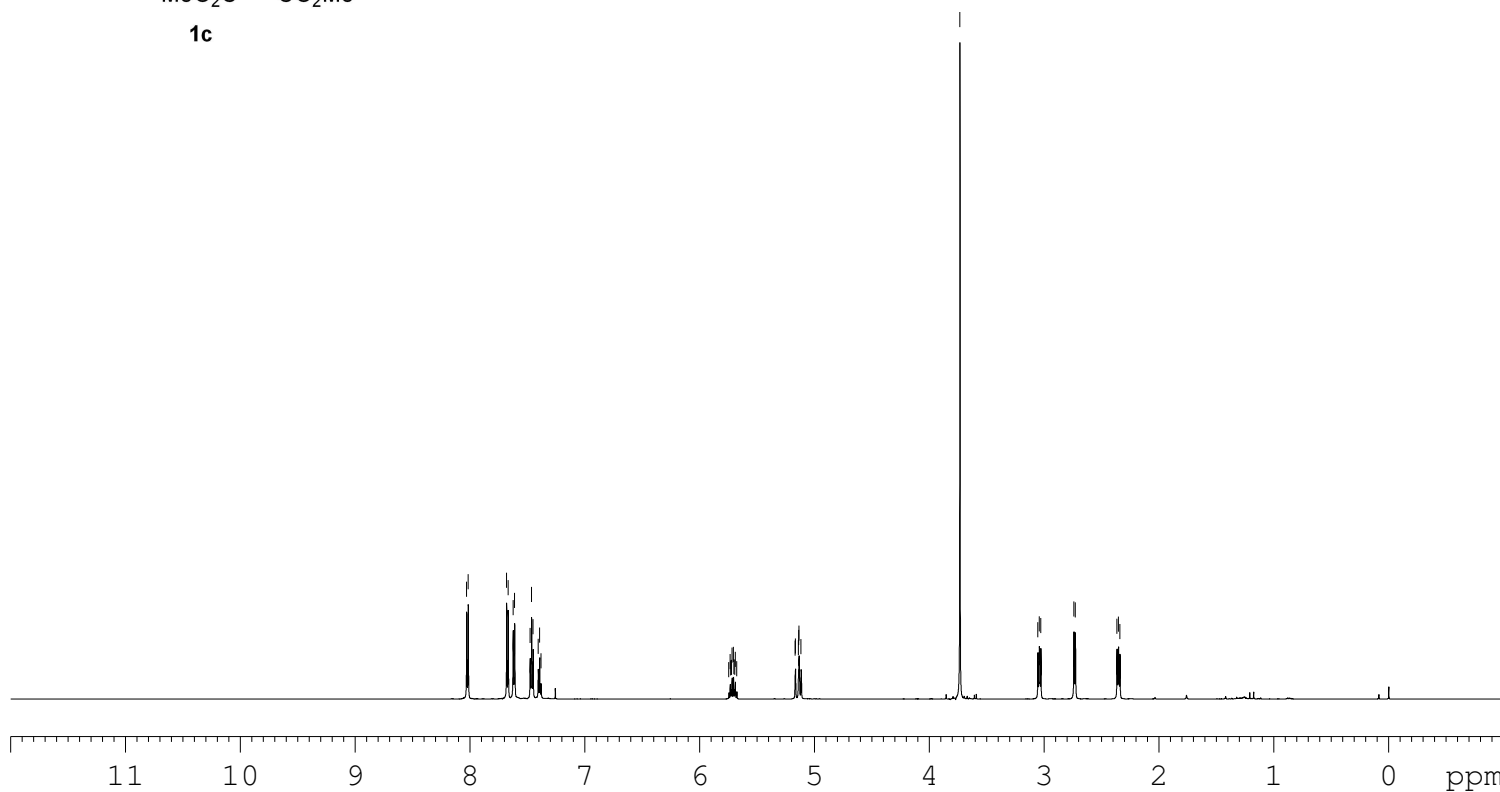
## 7. References

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## 8. Copies of $^1\text{H}$ NMR and $^{13}\text{C}$ NMR, $^{19}\text{F}$ NMR spectra for all products



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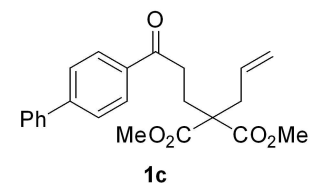
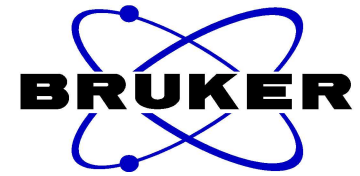
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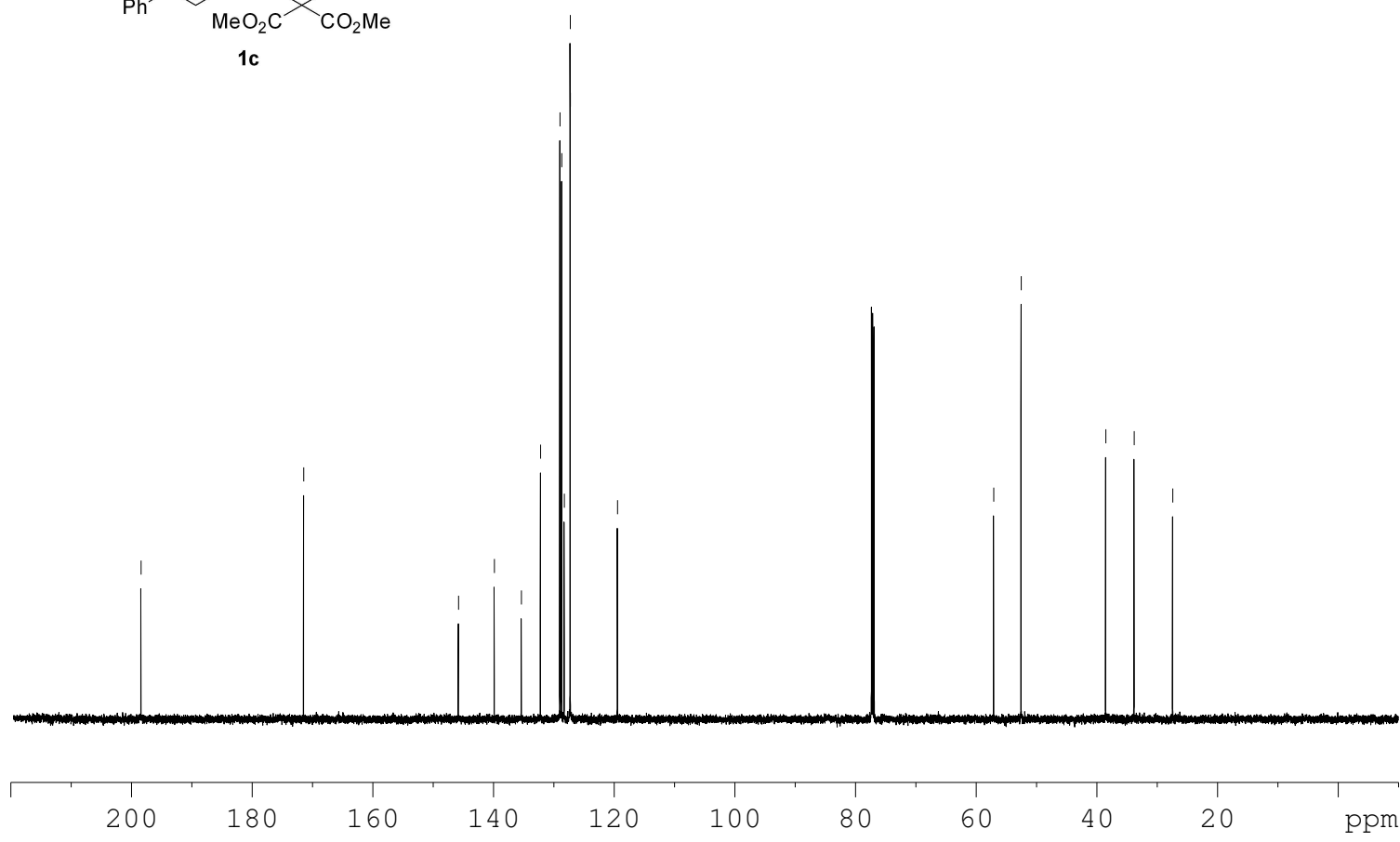
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D11       0.03000000 sec
TD0       1

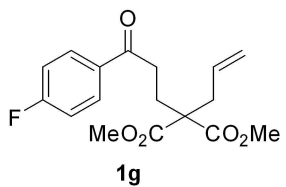
```

```

===== CHANNEL f1 =====
SFO1     150.9279571 MHz
NUC1     13C
P1       11.90 usec
SI       32768
SF       150.9128665 MHz
WDW      EM
SSB      0
LB       1.00 Hz
GB       0
PC       1.40

```



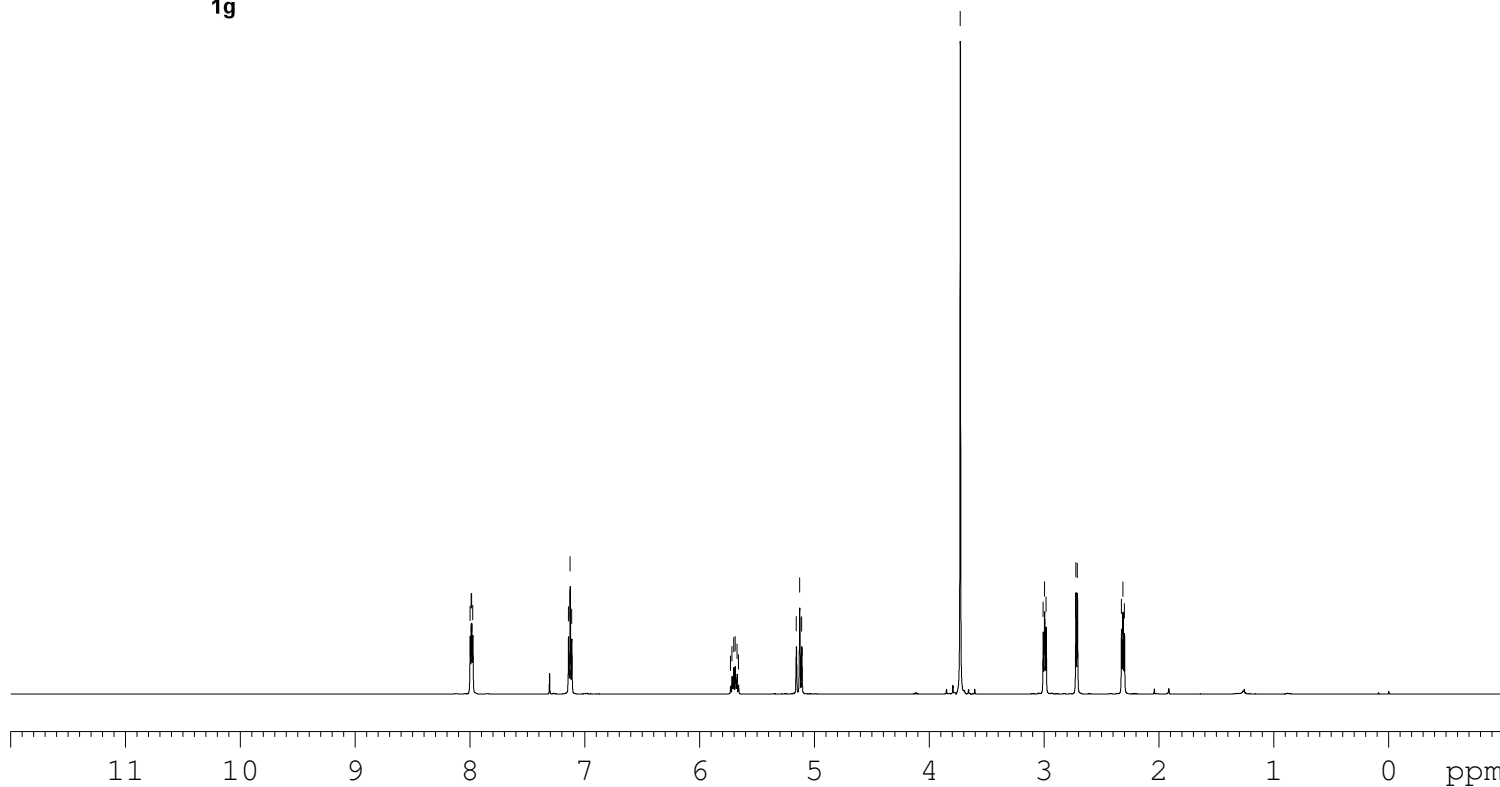


7.999  
7.990  
7.986  
7.976  
7.143  
7.129  
7.115  
5.732  
5.719  
5.703  
5.691  
5.675  
5.662  
5.159  
5.129  
5.112  
3.731  
3.009  
2.997  
2.983  
2.724  
2.712  
2.327  
2.314  
2.301



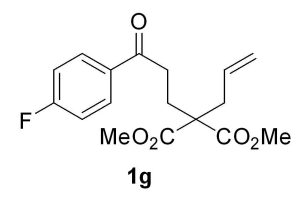
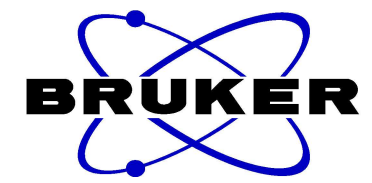
NAME w11-368p-20201019  
EXPNO 1  
PROCNO 1  
Date\_ 20201019  
Time 10.15  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDC13  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 15.49  
DW 52.000 usec  
DE 6.50 usec  
TE 295.9 K  
D1 1.0000000 sec  
TD0 1

==== CHANNEL f1 =====  
SF01 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1699866 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



2.000  
1.979  
0.998  
2.033  
5.955  
2.000  
1.969  
1.983

— 197.161  
 — 171.347  
 — 166.551  
 — 164.865  
 — 133.096  
 — 132.111  
 — 130.704  
 — 130.642  
 — 119.381  
 — 115.719  
 — 115.574  
 — 56.969  
 — 52.454  
 — 38.508  
 — 33.663  
 — 27.351

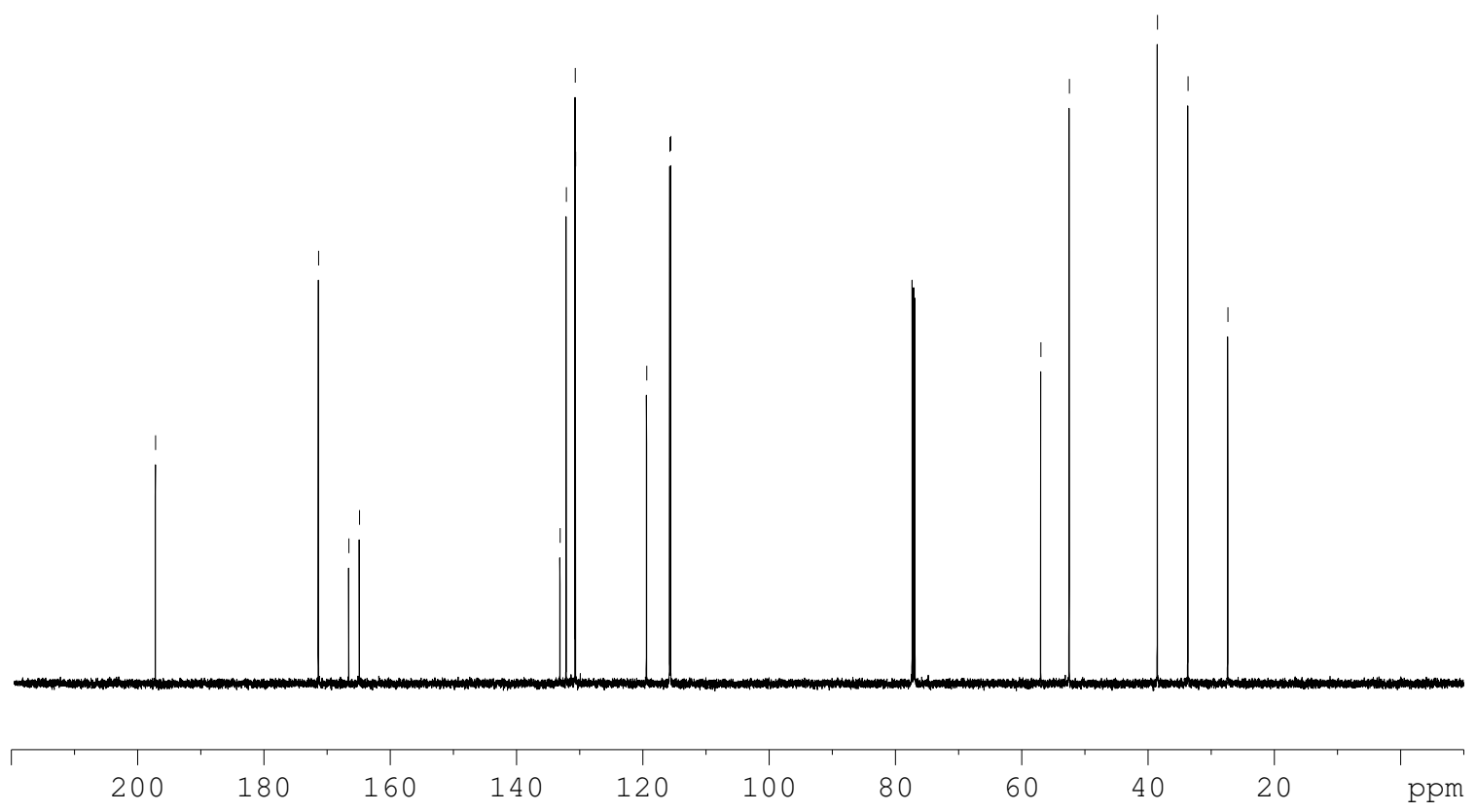


```

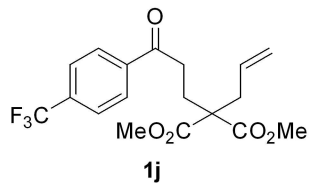
NAME      w11-368p-20201019
EXPNO     3
PROCNO    1
Date_     20201019
Time      10.22
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDC13
NS         72
DS         4
SWH       36057.691 Hz
FIDRES    0.550197 Hz
AQ         0.9088159 sec
RG         190.02
DW         13.867 usec
DE         6.50 usec
TE         296.4 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      150.9279571 MHz
NUC1       13C
P1         11.90 usec
SI         32768
SF         150.9128665 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```







8.070  
8.057  
7.737  
7.723

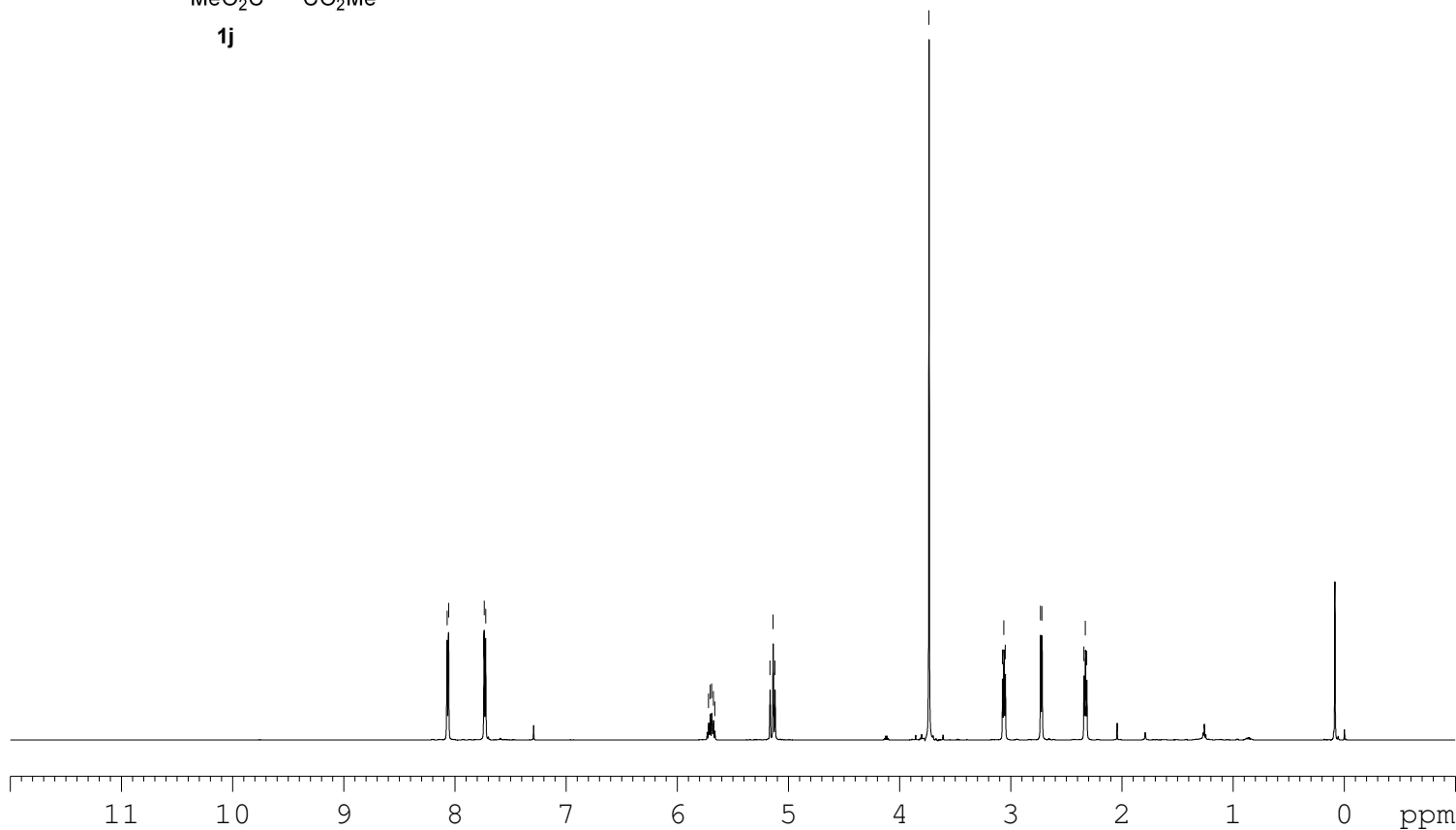
5.720  
5.704  
5.691  
5.675  
5.663  
5.167  
5.139  
5.122

3.736  
3.076  
3.063  
3.050  
2.733  
2.721  
2.343  
2.330  
2.317



NAME wll-414p-20201102  
EXPNO 1  
PROCNO 1  
Date\_ 20201102  
Time 21.47  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 28.69  
DW 52.000 usec  
DE 6.50 usec  
TE 295.6 K  
D1 1.00000000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1699970 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



2.001  
2.040

1.000  
2.064

6.041

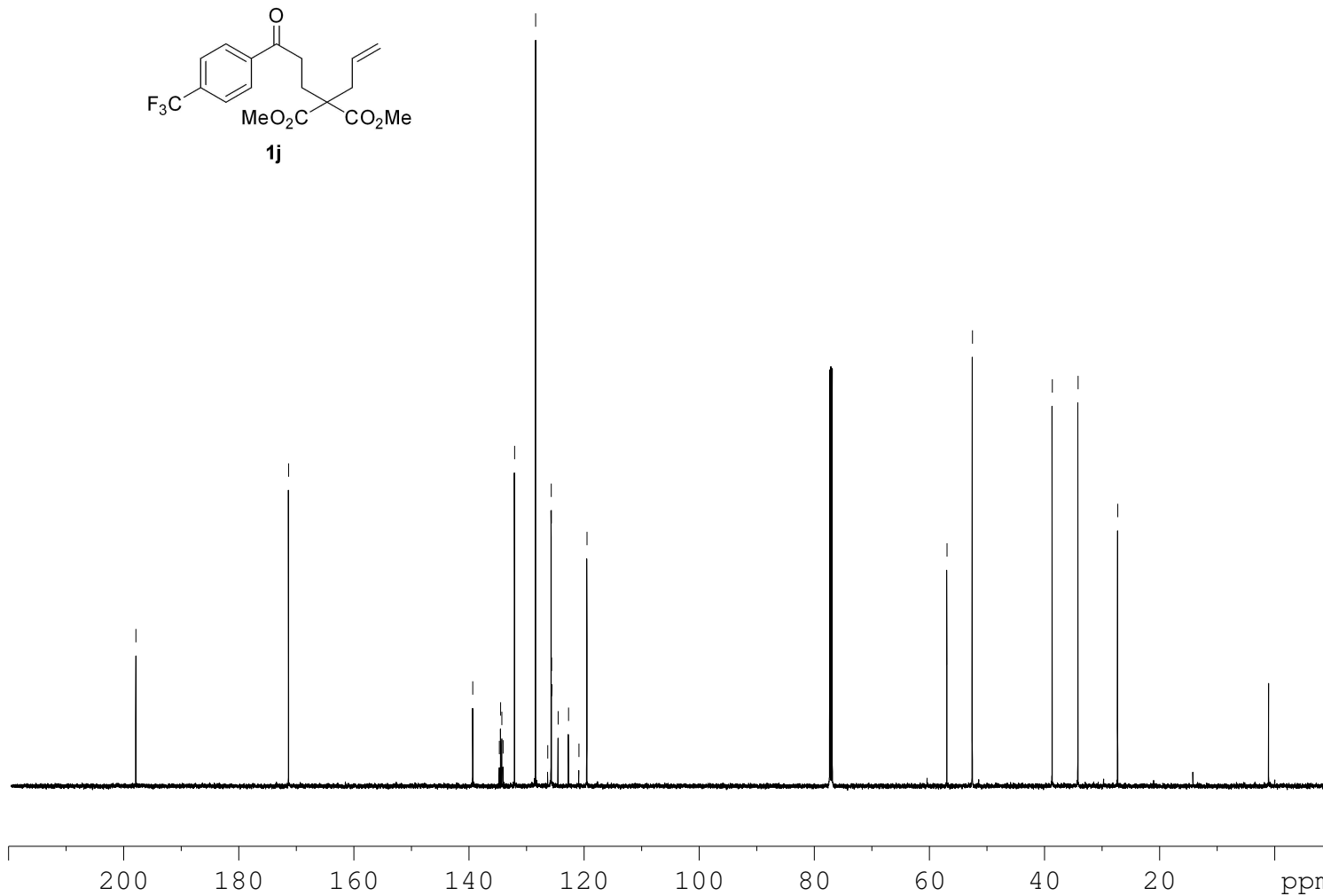
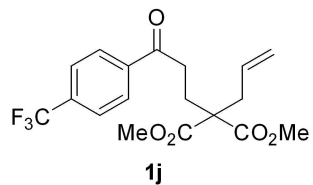
2.032  
2.023  
2.052

— 197.875

— 171.347  
— 139.348  
— 134.726  
— 134.509  
— 134.292  
— 134.077  
— 132.072  
— 128.420  
— 126.317  
— 125.727  
— 125.708  
— 125.684  
— 125.659  
— 124.511  
— 122.703  
— 120.895  
— 119.496

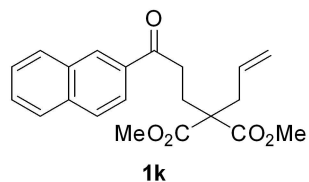
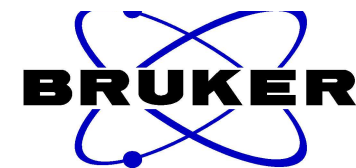
— 56.940  
— 52.517

— 38.645  
— 34.167  
— 27.272



NAME w11-414p-20201102  
EXPNO 3  
PROCNO 1  
Date\_ 20201102  
Time 22.02  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 240  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.7 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

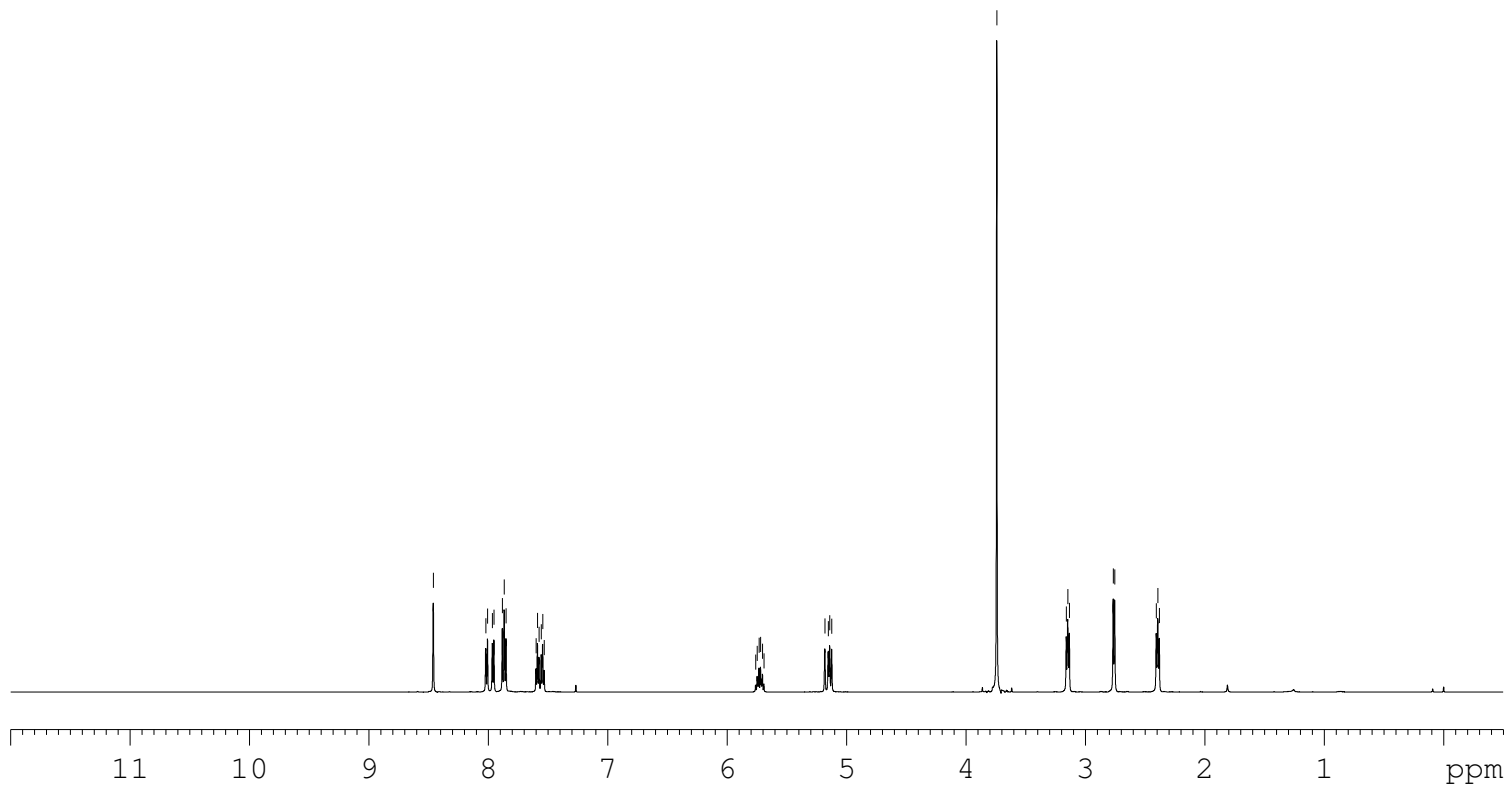
==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128624 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



8.460  
8.021  
8.007  
7.966  
7.953  
7.882  
7.867  
7.852  
7.600  
7.588  
7.575  
7.557  
7.544  
7.532  
5.761  
5.749  
5.732  
5.720  
5.704  
5.692  
5.181  
5.153  
5.141  
5.125  
3.742  
3.160  
3.147  
3.134  
2.767  
2.755  
2.407  
2.394  
2.381

NAME w11-372p-20201019  
EXPNO 1  
PROCNO 1  
Date\_ 20201019  
Time 19.39  
INSTRUM spect  
PROBHD 5 mm PABBO BE/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 28.69  
DW 52.000 usec  
DE 6.50 usec  
TE 295.8 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700118 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



0.992  
0.999  
1.026  
2.054  
1.003  
1.026  
1.000  
2.030  
6.024  
1.986  
2.019  
2.035

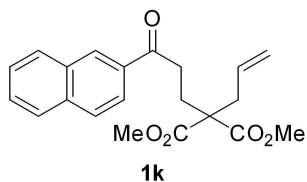
— 198.676

— 171.423

{ 135.548  
 { 133.927  
 { 132.461  
 { 132.160  
 { 129.671  
 { 129.532  
 { 128.429  
 { 128.411  
 { 127.724  
 { 126.743  
 { 123.763  
 { 119.386

— 57.074  
 — 52.490

— 38.469  
 — 33.768  
 — 27.454

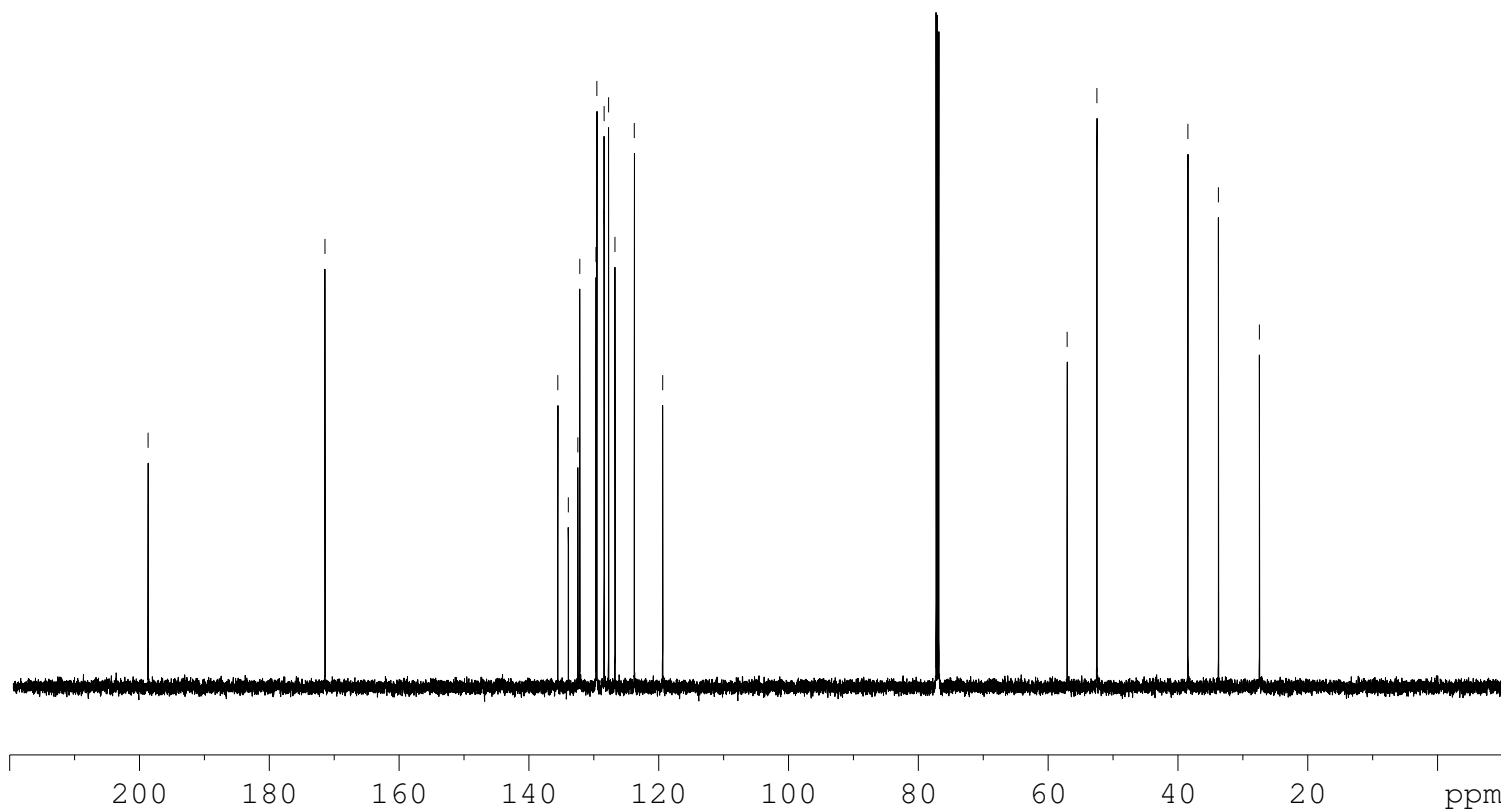


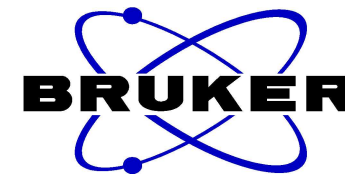
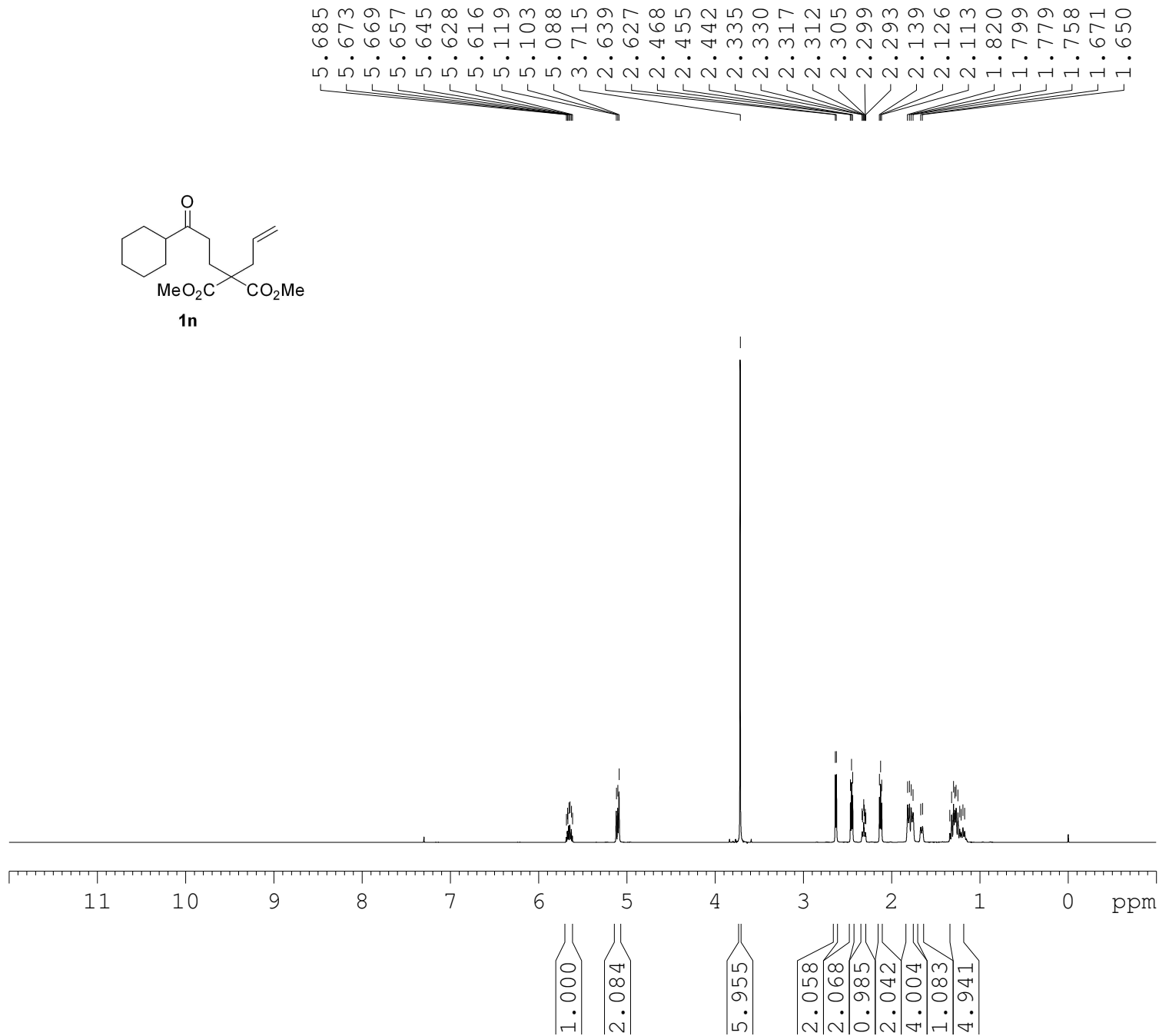
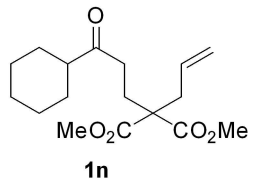
```

NAME      w11-372p-20201019
EXPNO     2
PROCNO    1
Date_     20201019
Time      19.41
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         48
DS         4
SWH        36057.691 Hz
FIDRES     0.550197 Hz
AQ         0.9088159 sec
RG         190.02
DW         13.867 usec
DE         6.50 usec
TE         295.9 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      150.9279571 MHz
NUC1       13C
P1         11.90 usec
SI         32768
SF         150.9128750 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```





```

NAME      w11-381p-20201026
EXPNO     1
PROCNO    1
Date_     20201026
Time      15.58
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         8
DS         0
SWH        9615.385 Hz
FIDRES     0.146719 Hz
AQ         3.4079220 sec
RG         15.49
DW         52.000 usec
DE         6.50 usec
TE         295.7 K
D1         1.00000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      600.1739011 MHz
NUC1       1H
P1         9.77 usec
SI         65536
SF         600.1699929 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```

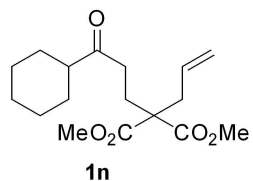
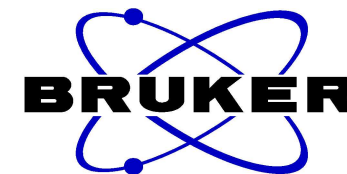
— 212.413

— 171.388

— 132.177

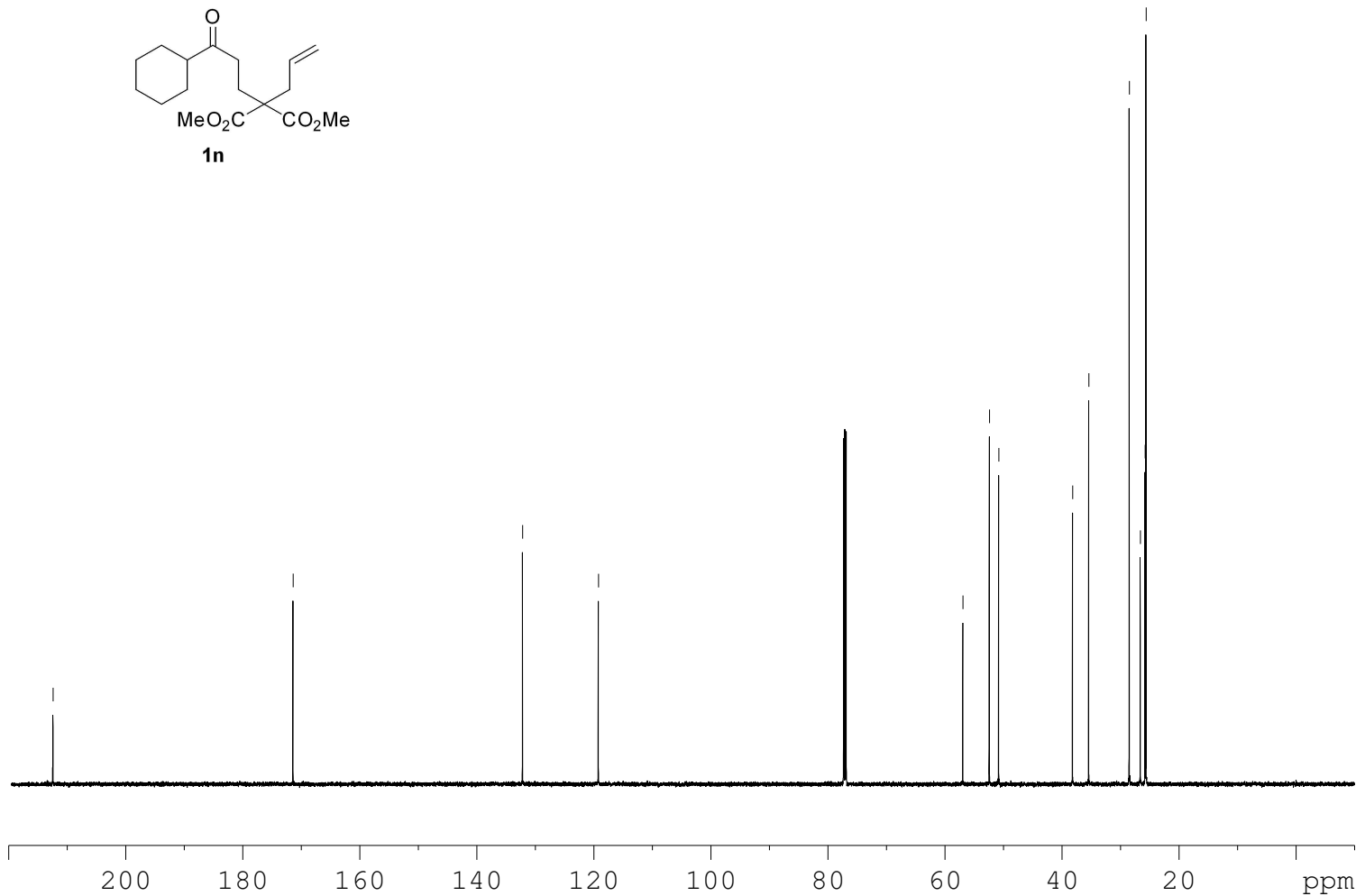
— 119.205

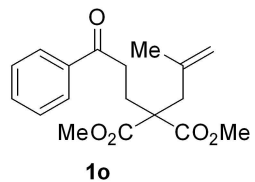
56.928  
52.388  
50.794  
38.177  
35.411  
28.485  
26.602  
25.797  
25.618



NAME w11-381p-20201026  
EXPNO 2  
PROCNO 1  
Date\_ 20201026  
Time 16.12  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 240  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.8 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

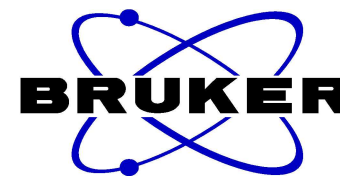




7.953  
7.940  
7.565  
7.552  
7.540  
7.465  
7.452  
7.440

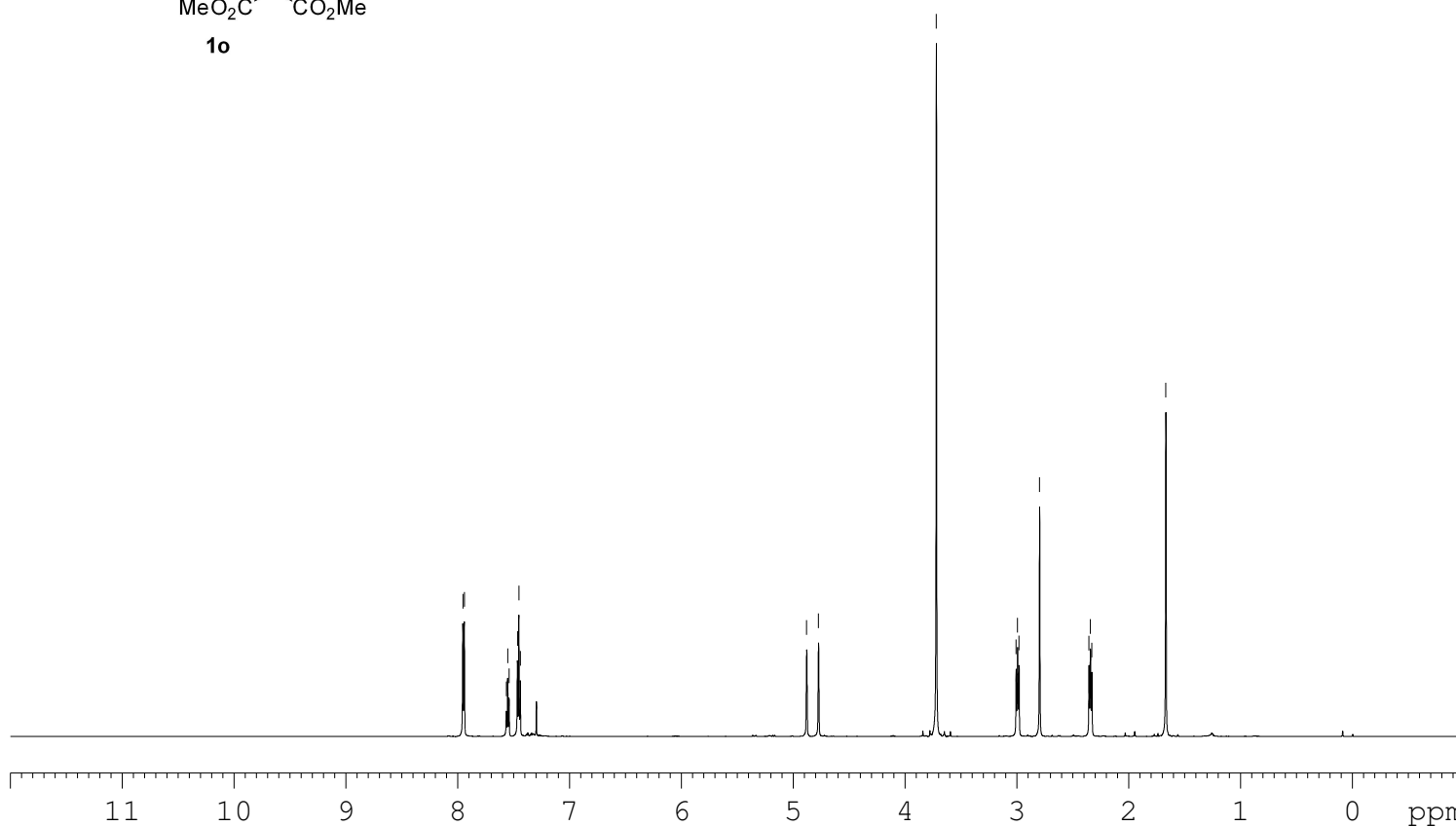
4.881  
4.775

3.721  
3.008  
2.995  
2.982  
2.798  
2.356  
2.343  
2.330  
1.669



NAME w11-384p-20201023  
EXPNO 1  
PROCNO 1  
Date\_ 20201023  
Time 20.38  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 15.49  
DW 52.000 usec  
DE 6.50 usec  
TE 295.8 K  
D1 1.00000000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1699944 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



1.978  
1.000  
2.010

1.008  
1.010

5.943

1.998  
1.987  
1.962

3.003

— 198.587

— 171.616

— 140.143

— 136.549

— 132.944

— 128.446

— 127.873

— 115.850

— 77.213

— 77.001

— 76.789

— 56.352

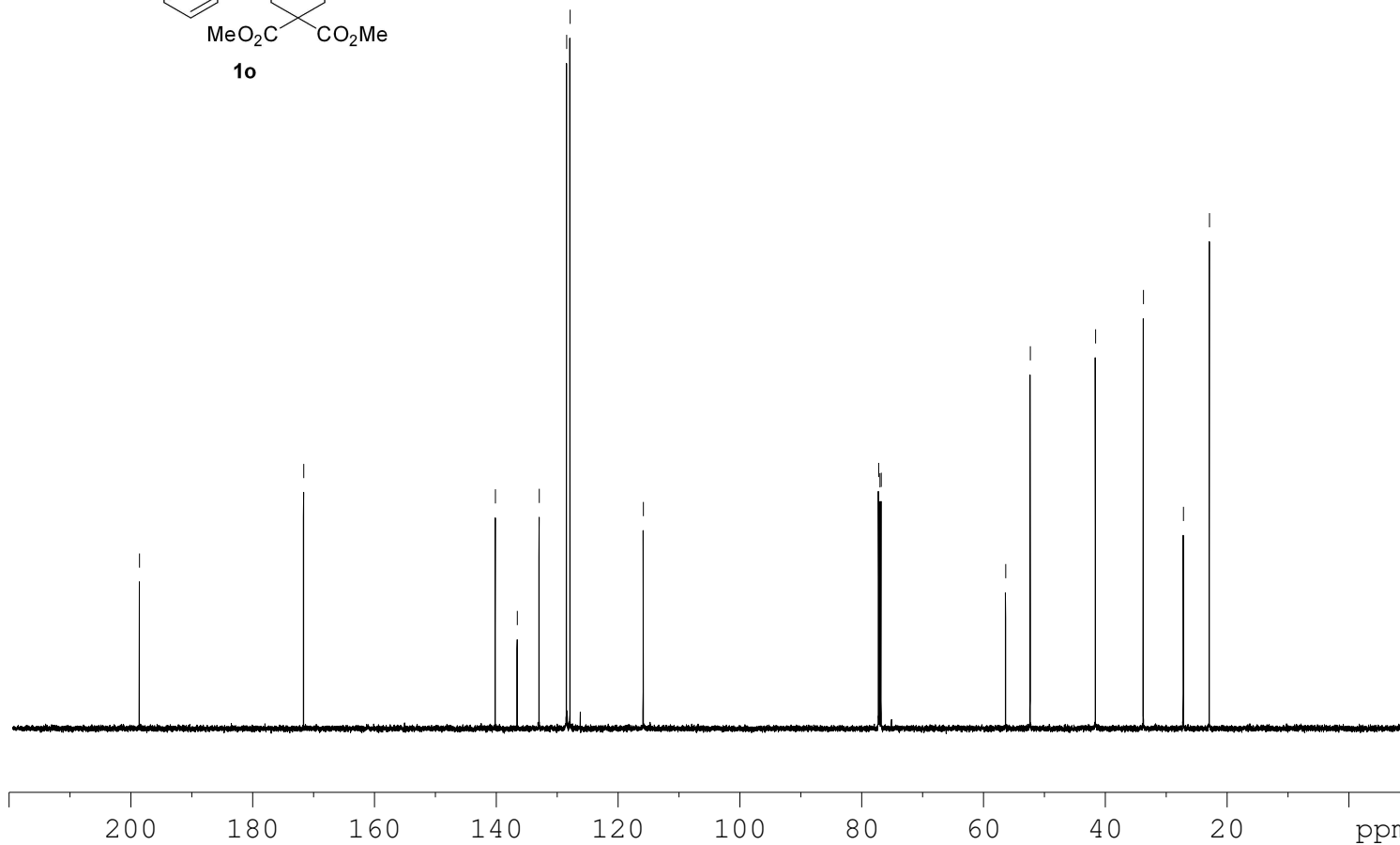
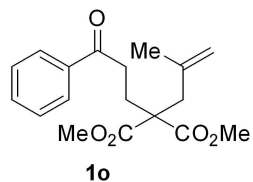
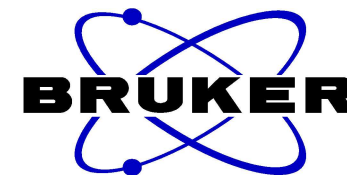
— 52.310

— 41.597

— 33.737

— 27.168

— 22.895

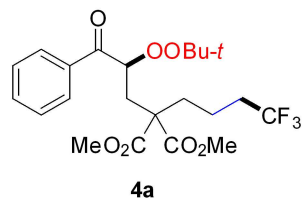


```
NAME      w11-384p-20201023
EXPNO     2
PROCNO    1
Date_     20201023
Time      20.41
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD        65536
SOLVENT   CDCl3
NS        48
DS        4
SWH       36057.691 Hz
FIDRES    0.550197 Hz
AQ        0.9088159 sec
RG        190.02
DW        13.867 usec
DE        6.50 usec
TE        296.2 K
D1        2.00000000 sec
D11       0.03000000 sec
TD0       1
```

```
===== CHANNEL f1 =====
SFO1     150.9279571 MHz
NUC1     13C
P1       11.90 usec
SI       32768
SF       150.9128879 MHz
WDW      EM
SSB      0
LB       1.00 Hz
GB       0
PC       1.40
```



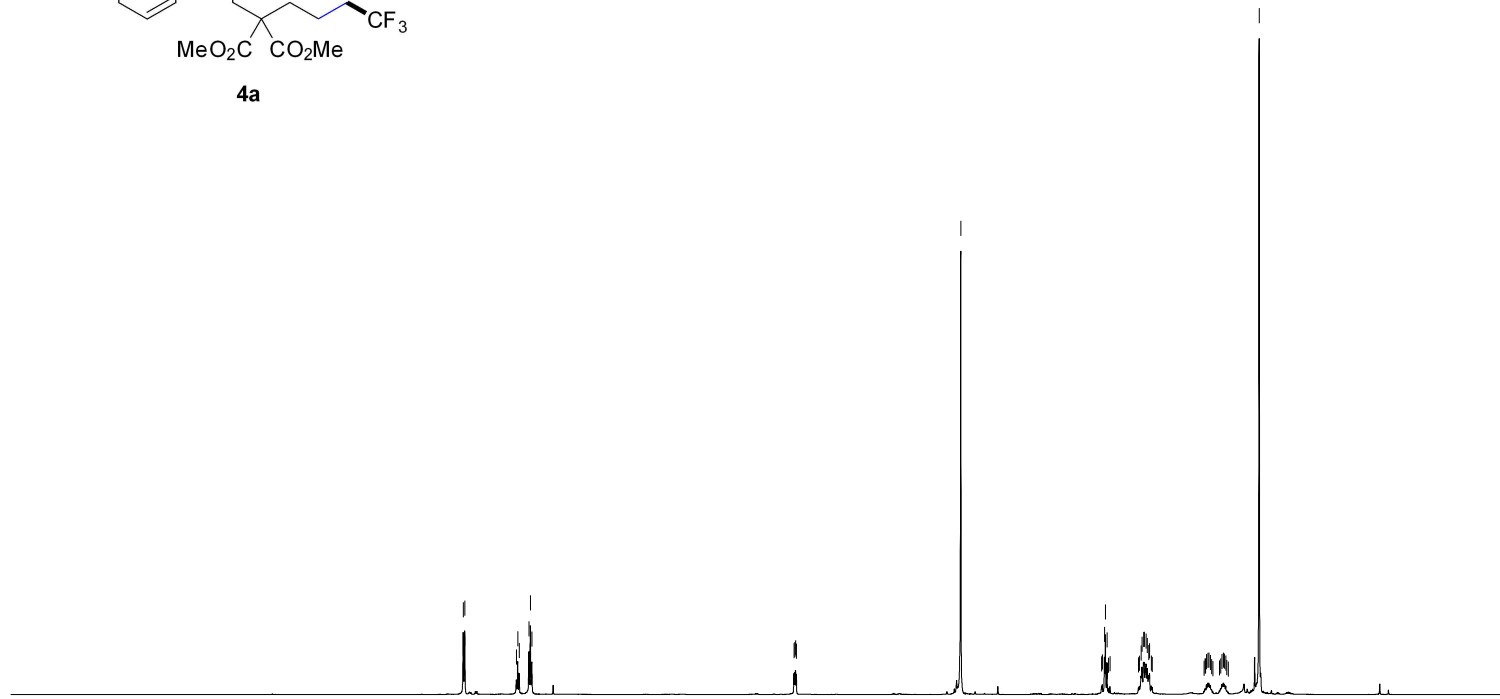
8.058  
8.045  
7.595  
7.583  
7.571  
7.486  
7.473  
7.460  
5.178  
5.171  
5.164  
5.157  
3.725  
2.499  
2.493  
2.474  
2.466  
2.452  
2.439  
2.426  
2.178  
2.170  
2.155  
2.147  
2.133  
2.127  
2.112  
2.102  
2.089  
2.082  
2.066  
2.059  
1.599  
1.594  
1.586  
1.573  
1.565  
1.552  
1.462  
1.451  
1.439  
1.430  
1.418  
1.127



```

NAME      w11-313ap-20200923
EXPNO     1
PROCNO    1
Date_     20200923
Time      14.27
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD        65536
SOLVENT   CDCl3
NS        8
DS        0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ        3.4079220 sec
RG        36.09
DW        52.000 usec
DE        6.50 usec
TE        296.7 K
D1        1.00000000 sec
TD0       1

===== CHANNEL f1 =====
SFO1      600.1739011 MHz
NUC1      1H
P1        9.77 usec
SI        65536
SF        600.1700076 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```



11 10 9 8 7 6 5 4 3 2 1 0 ppm

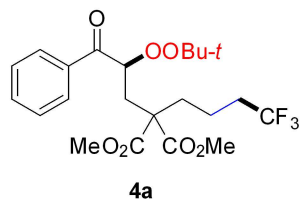
2.035  
1.053  
2.015  
1.000  
6.007  
2.170  
4.124  
1.137  
1.057  
8.994

— 197.552

< 170.961  
170.909

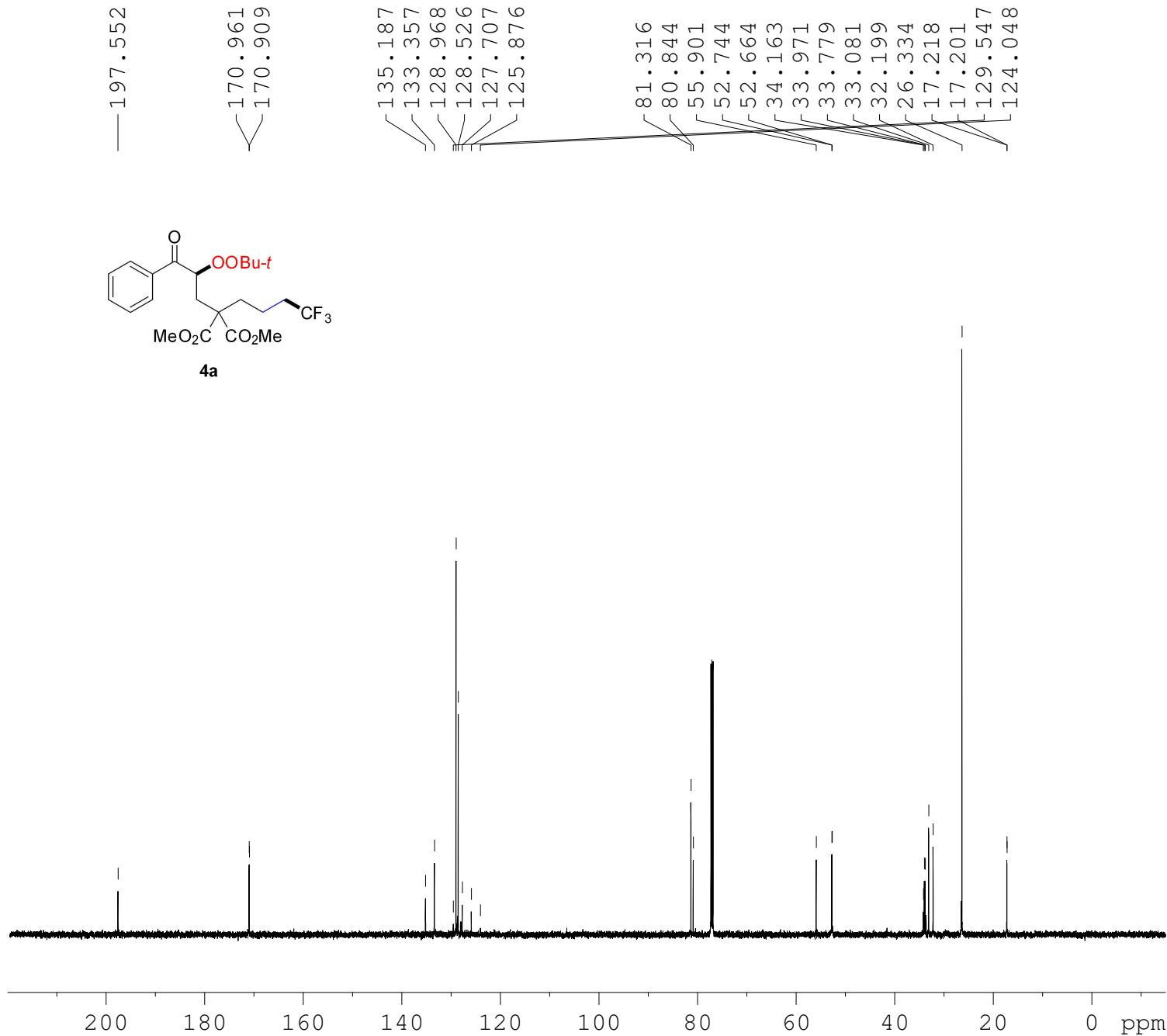
135.187  
133.357  
128.968  
128.526  
127.707  
125.876

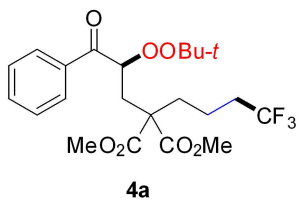
81.316  
80.844  
55.901  
52.744  
52.664  
34.163  
33.971  
33.779  
33.081  
32.199  
26.334  
17.218  
17.201  
129.547  
124.048



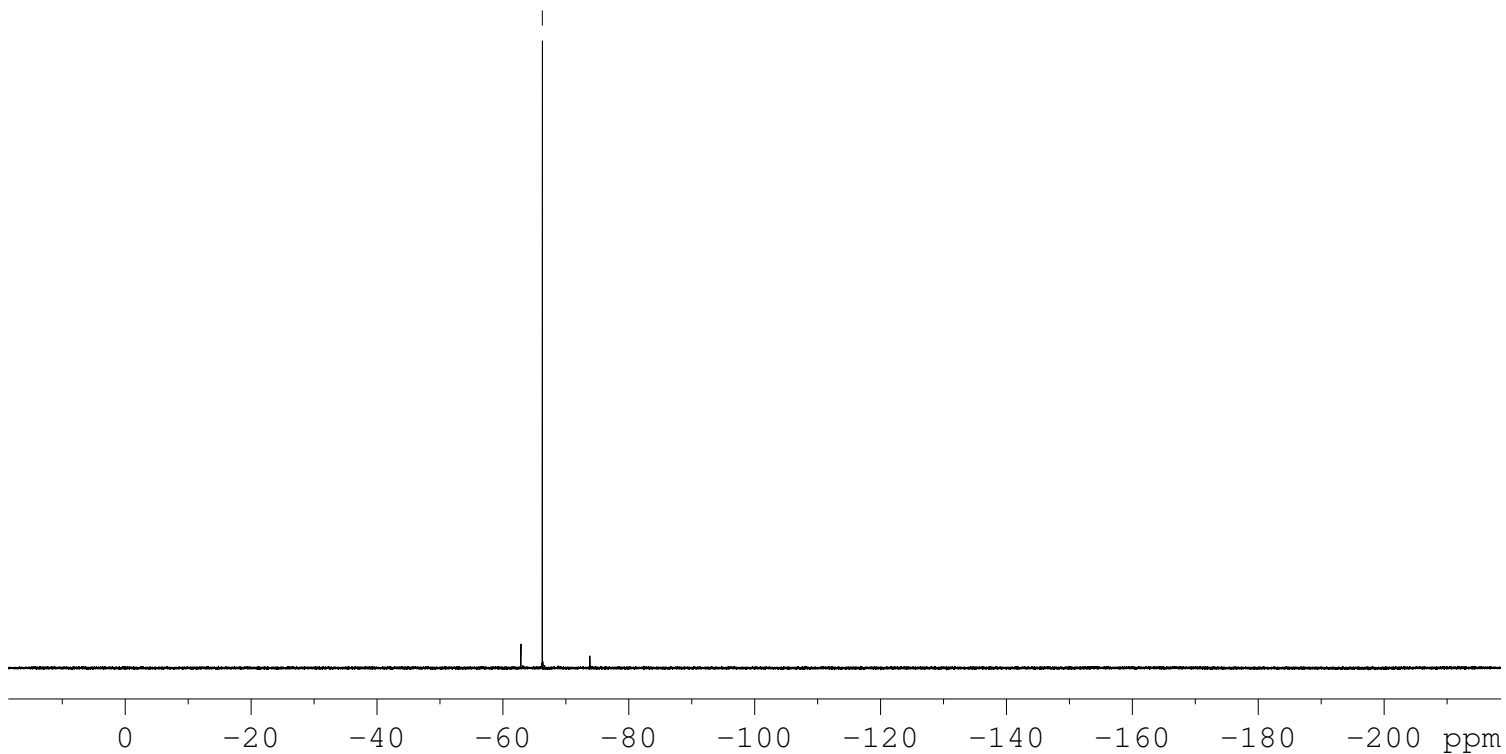
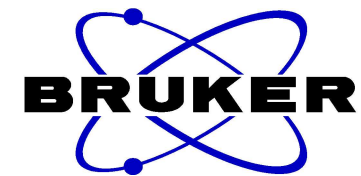
NAME w11-313ap-20200924  
EXPNO 1  
PROCNO 1  
Date\_ 20200924  
Time 10.39  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 120  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.1 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40





---66.264



```

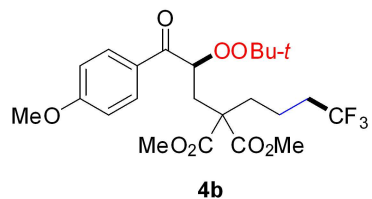
NAME      w11-313ap-20200923
EXPNO     2
PROCNO    1
Date_     20200923
Time      14.29
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD         131072
SOLVENT   CDCl3
NS         16
DS         4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ         0.4893855 sec
RG         15.49
DW         3.733 usec
DE         6.50 usec
TE         296.6 K
D1         1.00000000 sec
D11        0.03000000 sec
D12        0.00002000 sec
TD0        1

```

```

===== CHANNEL f1 =====
SFO1      564.6675534 MHz
NUC1       19F
P1         11.90 usec
SI         65536
SF         564.7240258 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00

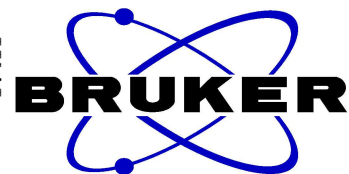
```



8.072  
8.058

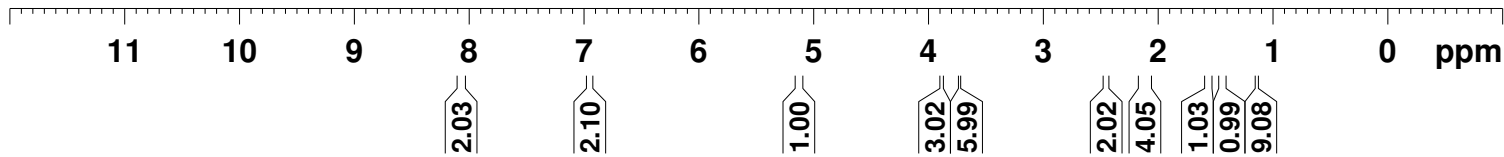
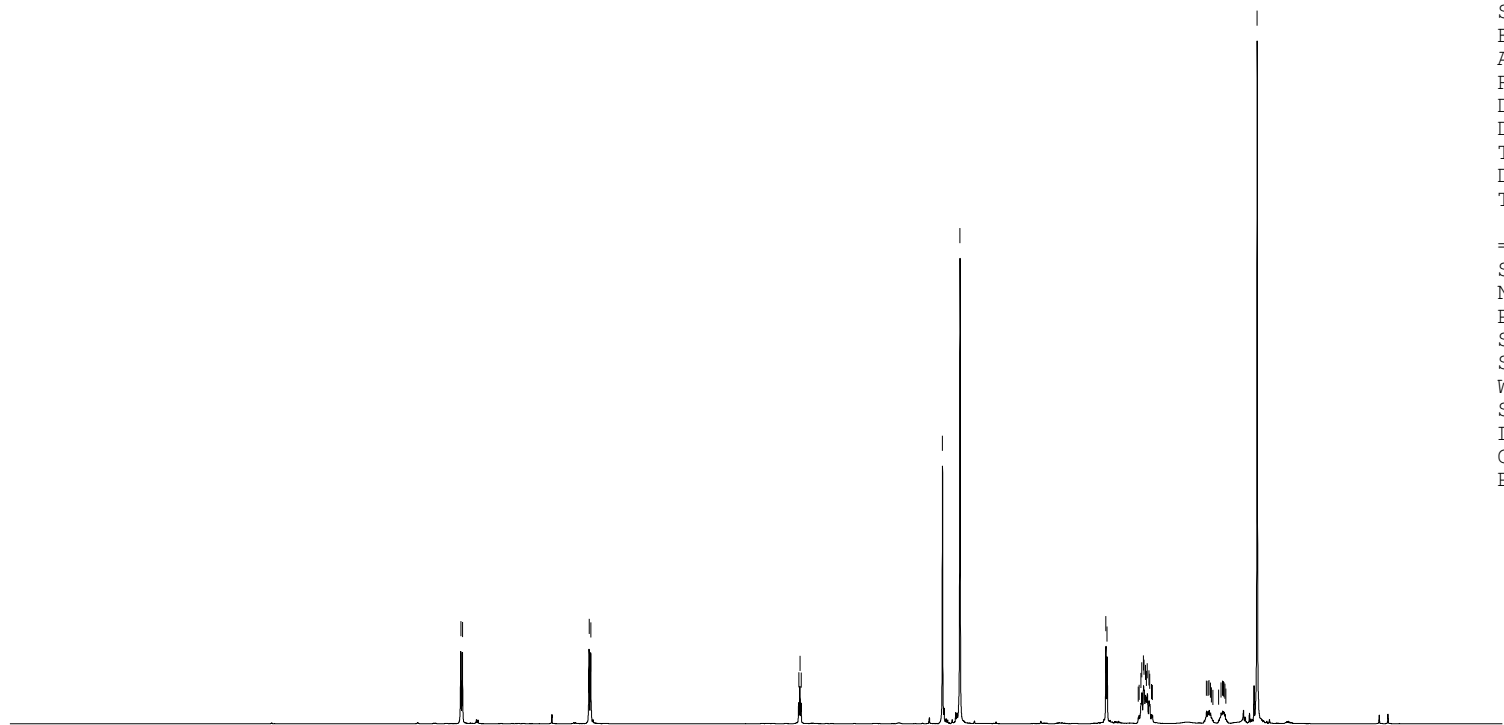
6.955  
6.941

5.129  
5.119  
5.109  
3.879  
3.727  
2.456  
2.446  
2.174  
2.166  
2.151  
2.143  
2.129  
2.123  
2.111  
2.103  
2.096  
2.080  
2.074  
2.058  
2.051  
1.580  
1.566  
1.558  
1.545  
1.537  
1.524  
1.474  
1.453  
1.440  
1.431  
1.427  
1.419  
1.411



NAME w11-326p-20201001  
 EXPNO 1  
 PROCNO 1  
 Date\_ 20201001  
 Time 22.03  
 INSTRUM spect  
 PROBHD 5 mm PABBO BB/  
 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 8  
 DS 0  
 SWH 9615.385 Hz  
 FIDRES 0.146719 Hz  
 AQ 3.4079220 sec  
 RG 30.73  
 DW 52.000 usec  
 DE 6.50 usec  
 TE 297.9 K  
 D1 1.00000000 sec  
 TD0 1

==== CHANNEL f1 =====  
 SFO1 600.1739011 MHz  
 NUC1 1H  
 P1 9.77 usec  
 SI 65536  
 SF 600.1700046 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00



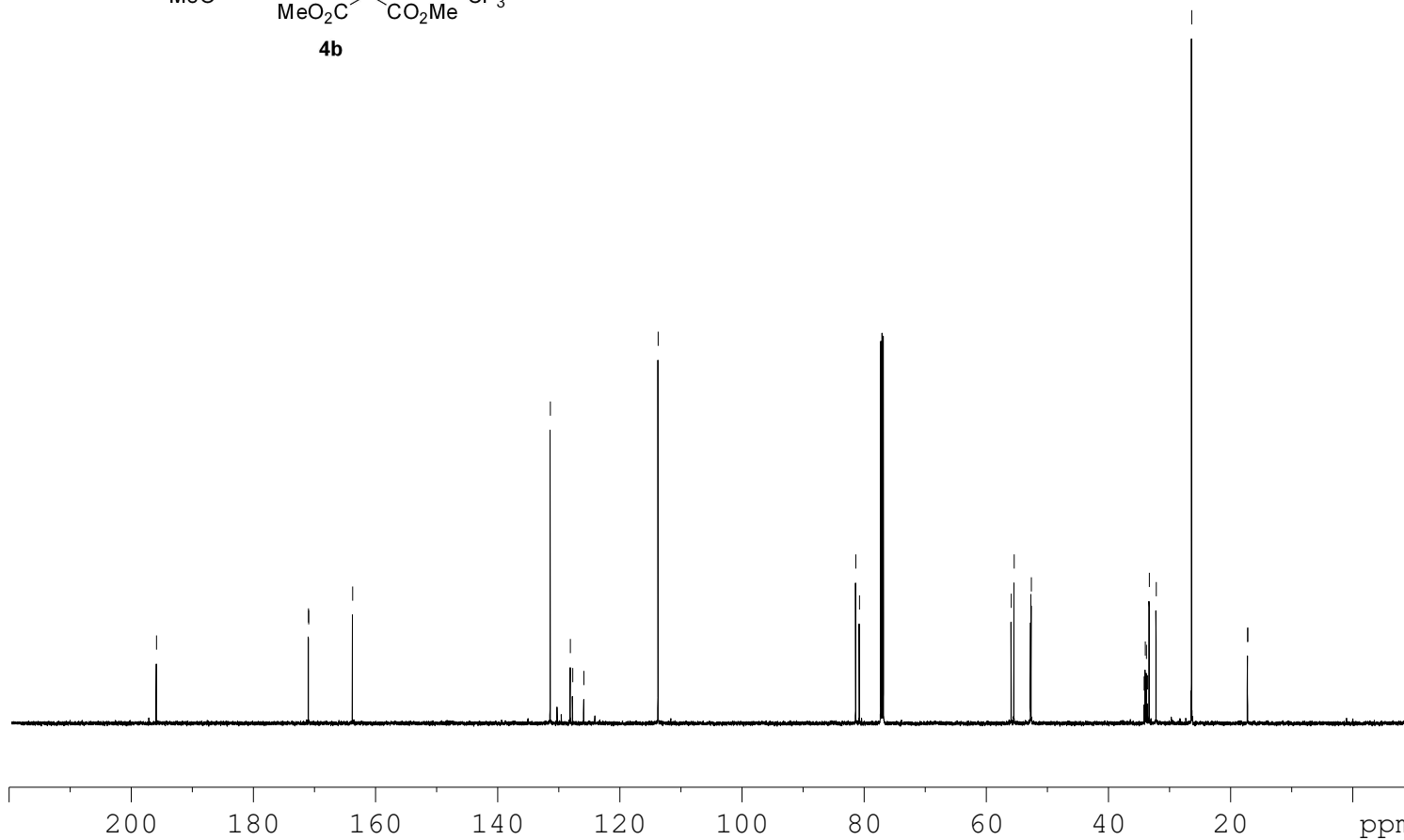
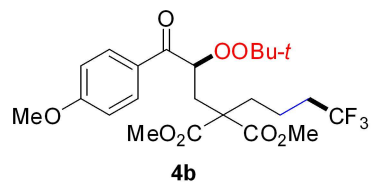
— 195.863

< 170.983  
< 170.946  
— 163.749

< 131.381  
< 128.107  
< 127.715  
< 125.884  
— 113.729

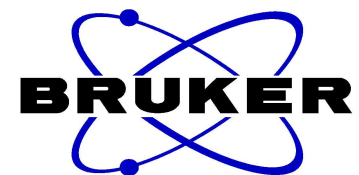
< 81.368  
< 80.764

< 55.913  
< 55.436  
< 52.709  
< 52.625  
< 34.162  
< 33.972  
< 33.780  
< 33.589  
< 33.307  
< 32.172  
< 26.369  
< 17.211  
< 17.195



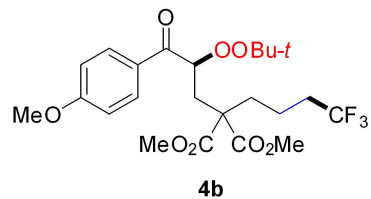
NAME w11-326p-20201001  
EXPNO 3  
PROCNO 1  
Date\_ 20201001  
Time 22.22  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 300  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 298.4 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

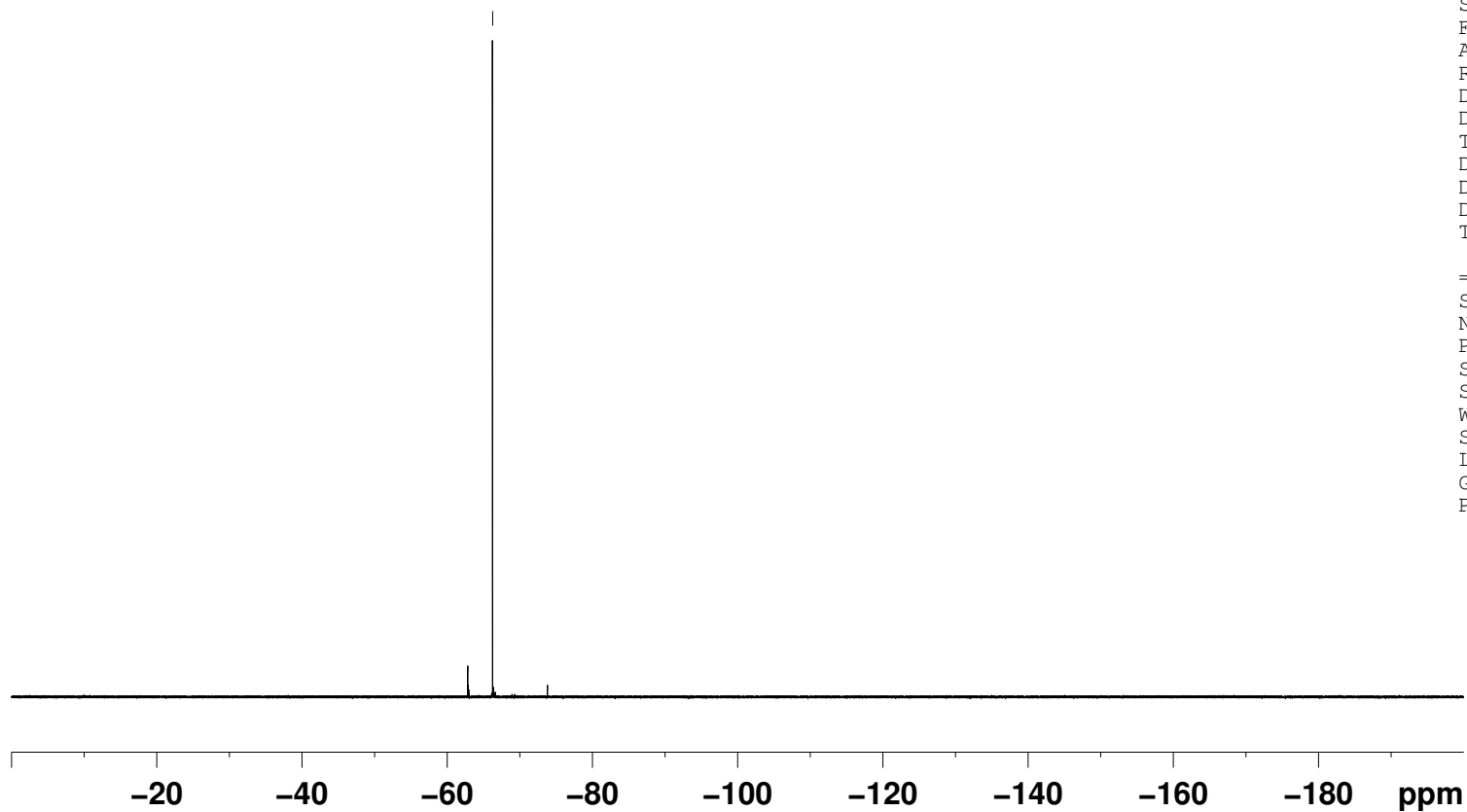


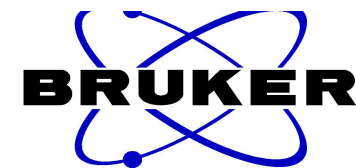
NAME w11-326p-20201001  
EXPNO 2  
PROCNO 1  
Date\_ 20201001  
Time 22.05  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgfhigqn.2  
TD 131072  
SOLVENT CDCl3  
NS 16  
DS 4  
SWH 133928.578 Hz  
FIDRES 1.021794 Hz  
AQ 0.4893855 sec  
RG 17.32  
DW 3.733 usec  
DE 6.50 usec  
TE 297.8 K  
D1 1.00000000 sec  
D11 0.03000000 sec  
D12 0.00002000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 564.6675534 MHz  
NUC1 19F  
P1 11.90 usec  
SI 65536  
SF 564.7240258 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



--66.261

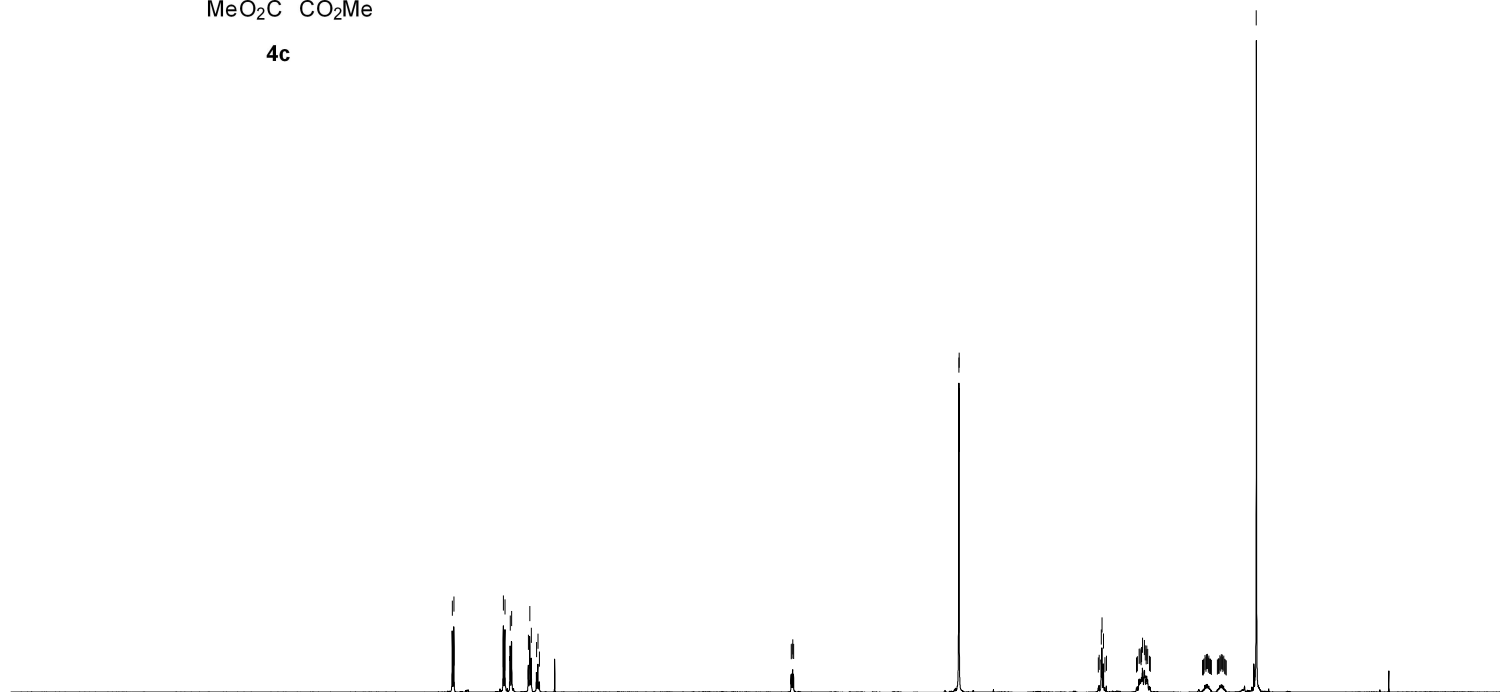
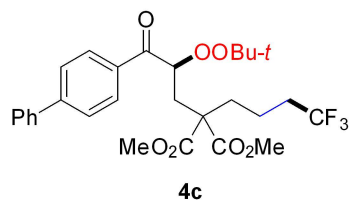




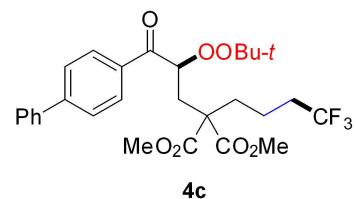
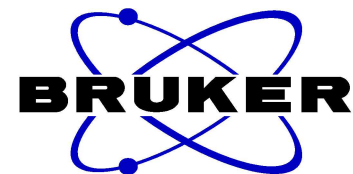
NAME w11-526p-20201230  
EXPNO 1  
PROCNO 1  
Date\_ 20201230  
Time 14.24  
INSTRUM spect  
PROBHD 5 mm PABBO BE/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 38.1  
DW 52.000 usec  
DE 6.50 usec  
TE 294.5 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700149 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

8.154  
8.140  
7.709  
7.695  
7.649  
7.637  
7.491  
7.479  
7.466  
7.420  
7.408  
7.395  
5.202  
5.195  
5.189  
5.182  
3.742  
3.740  
2.521  
2.502  
2.496  
2.483  
2.457  
2.188  
2.173  
2.165  
2.156  
2.152  
2.143  
2.127  
2.119  
2.111  
2.106  
2.098  
2.083  
1.599  
1.587  
1.578  
1.565  
1.470  
1.457  
1.448  
1.436  
1.153



1.967  
2.074  
2.041  
2.078  
1.047  
1.000  
2.955  
2.976  
2.077  
4.036  
1.067  
1.036  
9.012



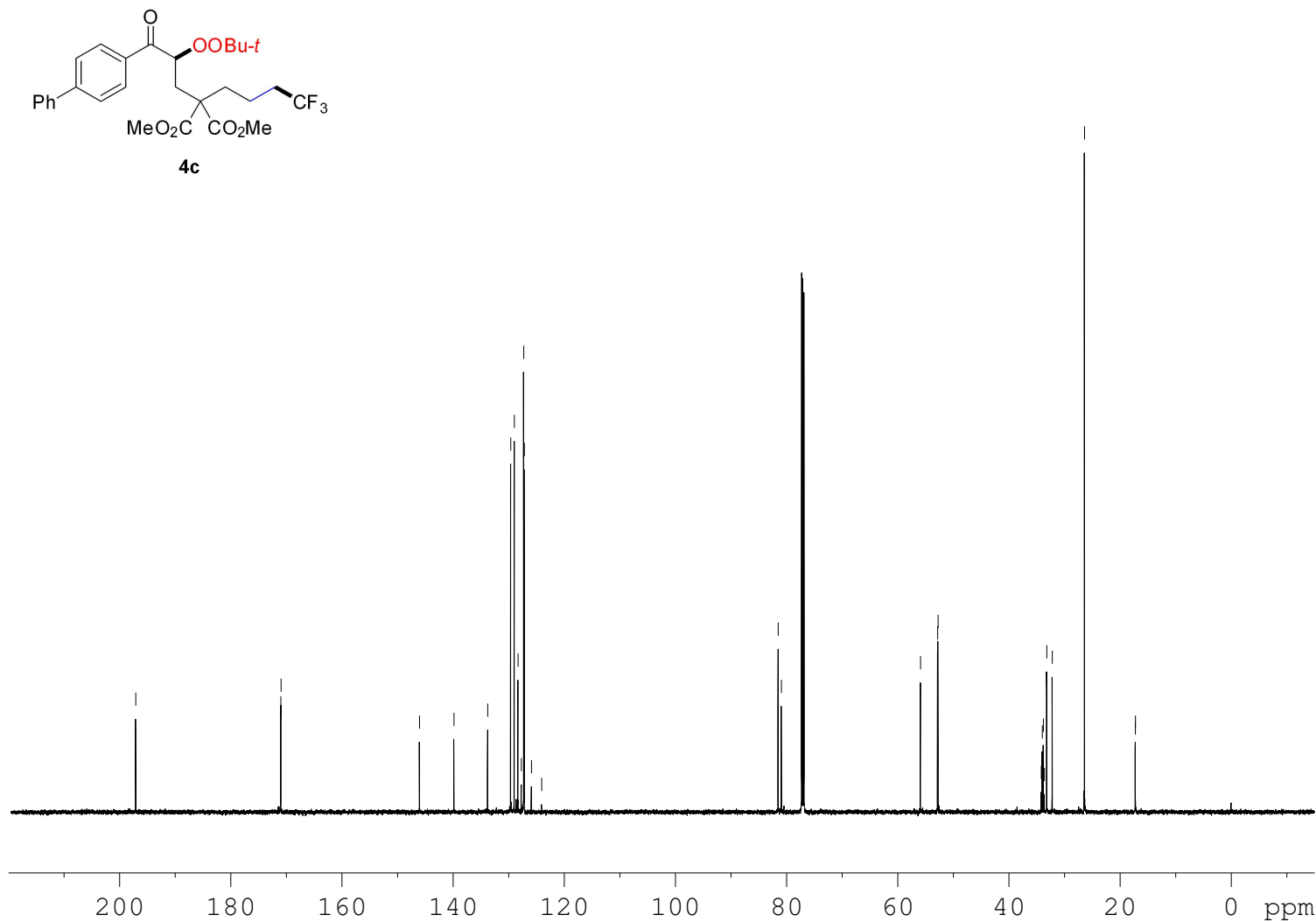
— 197.094

< 170.996  
< 170.953

146.043  
139.842  
133.774  
129.632  
128.989  
128.314  
127.729  
127.291  
127.182  
125.899  
124.067

< 81.515  
< 80.935

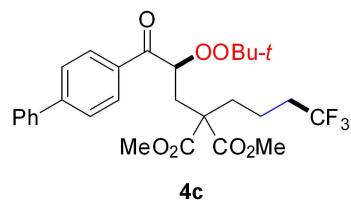
55.901  
52.829  
52.743  
34.186  
33.996  
33.805  
33.614  
33.184  
32.202  
26.398  
17.259  
17.240



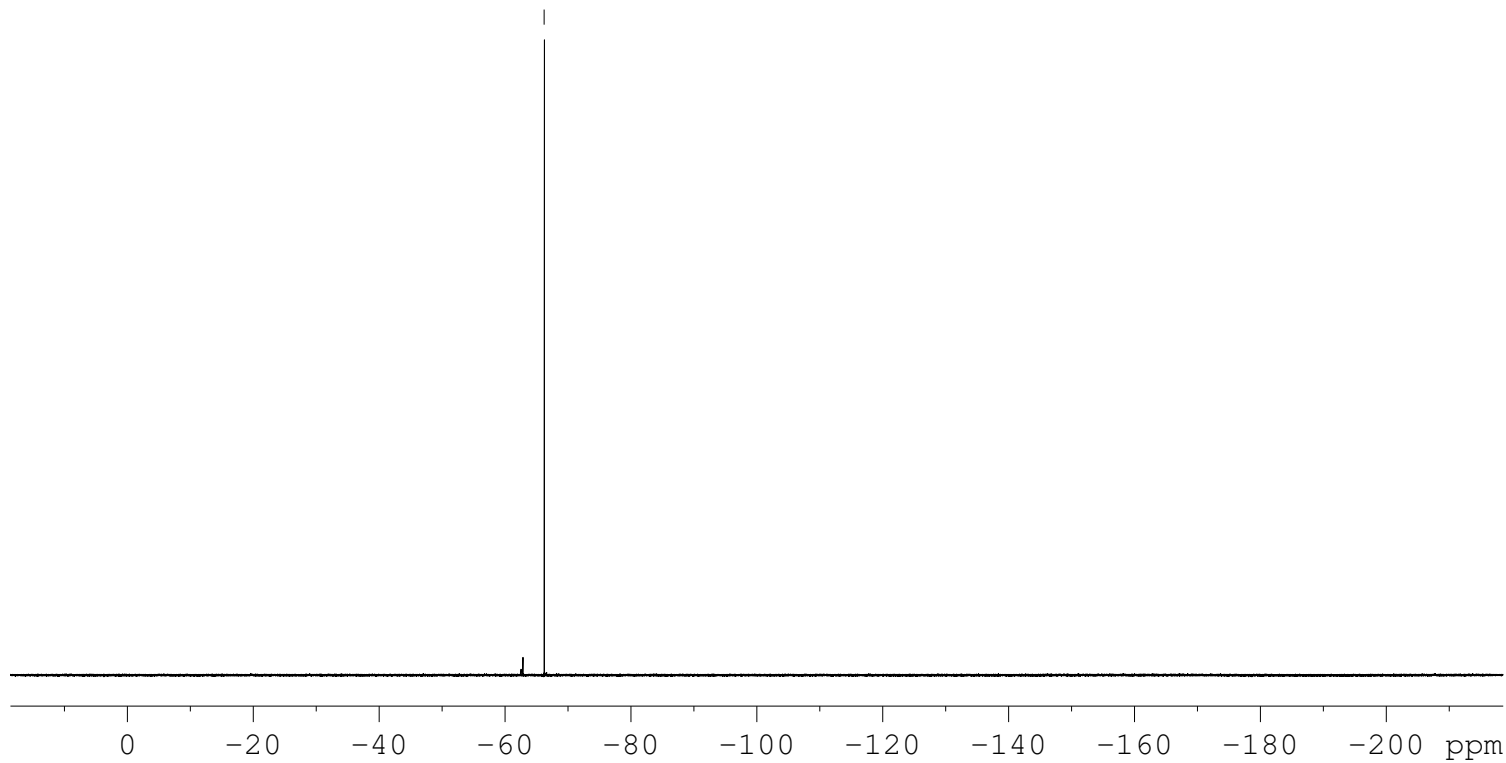
NAME w11-526p-20201230  
EXPNO 3  
PROCNO 1  
Date\_ 20201230  
Time 14.47  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 400  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 295.7 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40





---66.206

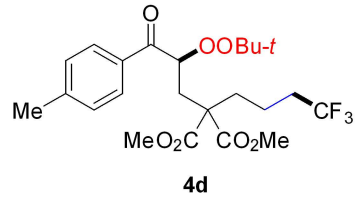
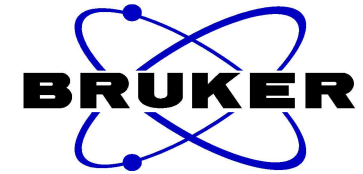


```

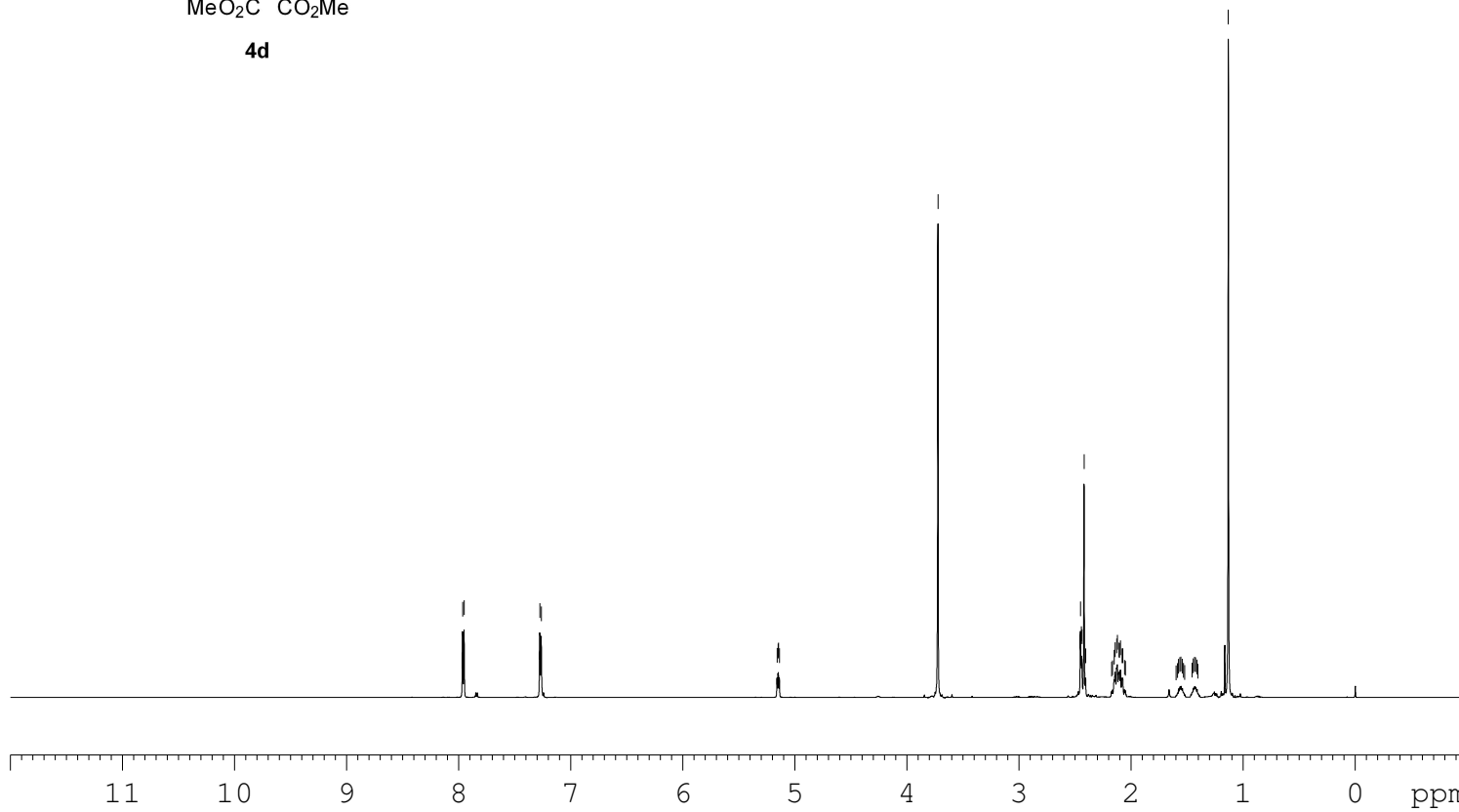
NAME      w11-526p-20201230
EXPNO     2
PROCNO    1
Date_     20201230
Time      14.26
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD         131072
SOLVENT   CDC13
NS         16
DS         4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG         15.49
DW         3.733 usec
DE         6.50 usec
TE         294.6 K
D1         1.00000000 sec
D11        0.03000000 sec
D12        0.00002000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      564.6675534 MHz
NUC1       19F
P1         11.90 usec
SI         65536
SF         564.7240258 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```



7.964  
7.951  
7.275  
7.262  
5.158  
5.149  
5.146  
5.137  
3.722  
2.451  
2.443  
2.438  
2.418  
2.405  
2.173  
2.165  
2.150  
2.142  
2.128  
2.122  
2.107  
2.104  
2.094  
2.080  
2.074  
2.058  
2.050  
1.598  
1.585  
1.577  
1.565  
1.556



NAME wll-415p-20201106  
EXPNO 1  
PROCNO 1  
Date\_ 20201106  
Time 15.52  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 38.1  
DW 52.000 usec  
DE 6.50 usec  
TE 298.1 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700100 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

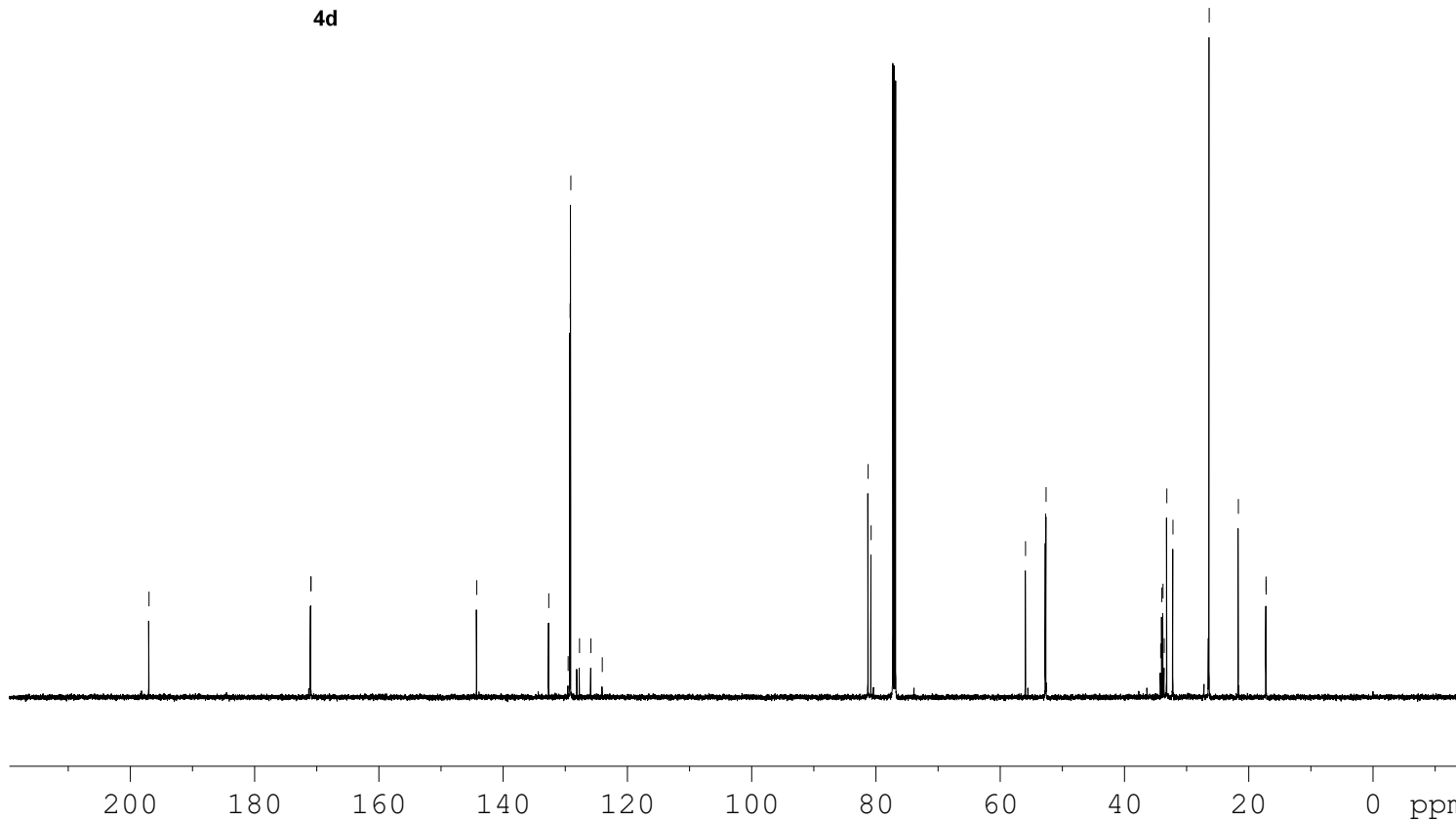
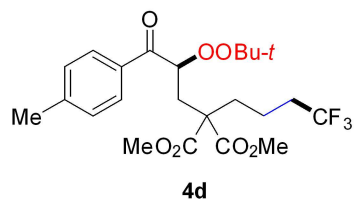
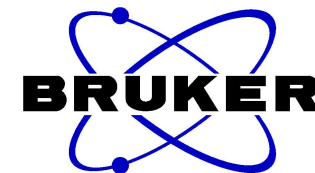
— 196.997

< 170.966  
< 170.912

< 144.245  
< 132.659  
< 129.544  
< 129.226  
< 129.107  
< 127.711  
< 125.878  
< 124.047

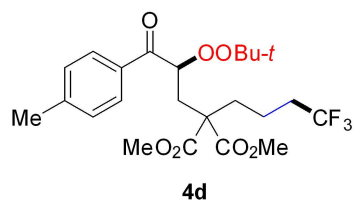
< 81.259  
< 80.778

< 55.926  
< 52.701  
< 52.620  
< 34.180  
< 33.989  
< 33.798  
< 33.608  
< 33.188  
< 32.198  
< 26.366  
< 21.673  
< 17.218  
< 17.202

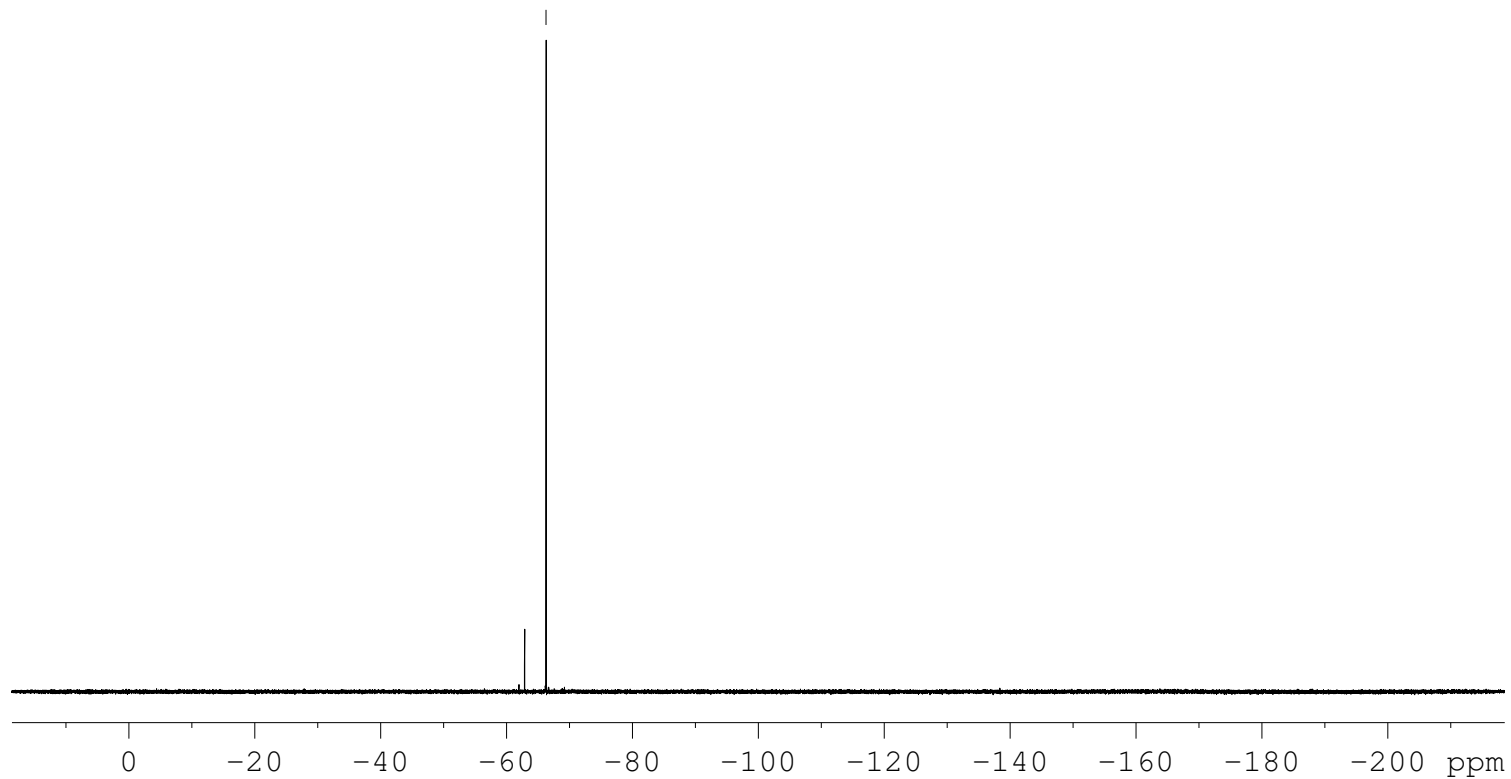


NAME w11-415p-20201106  
EXPNO 3  
PROCNO 1  
Date\_ 20201106  
Time 16.20  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 500  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 299.3 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



---66.266



```

NAME      w11-415p-20201106
EXPNO     2
PROCNO    1
Date_     20201106
Time      15.54
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDC13
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        298.1 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1

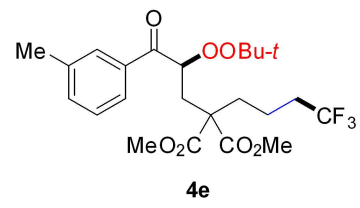
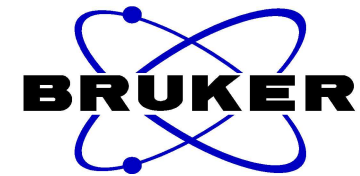
```

```

===== CHANNEL f1 =====
SFO1     564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00

```

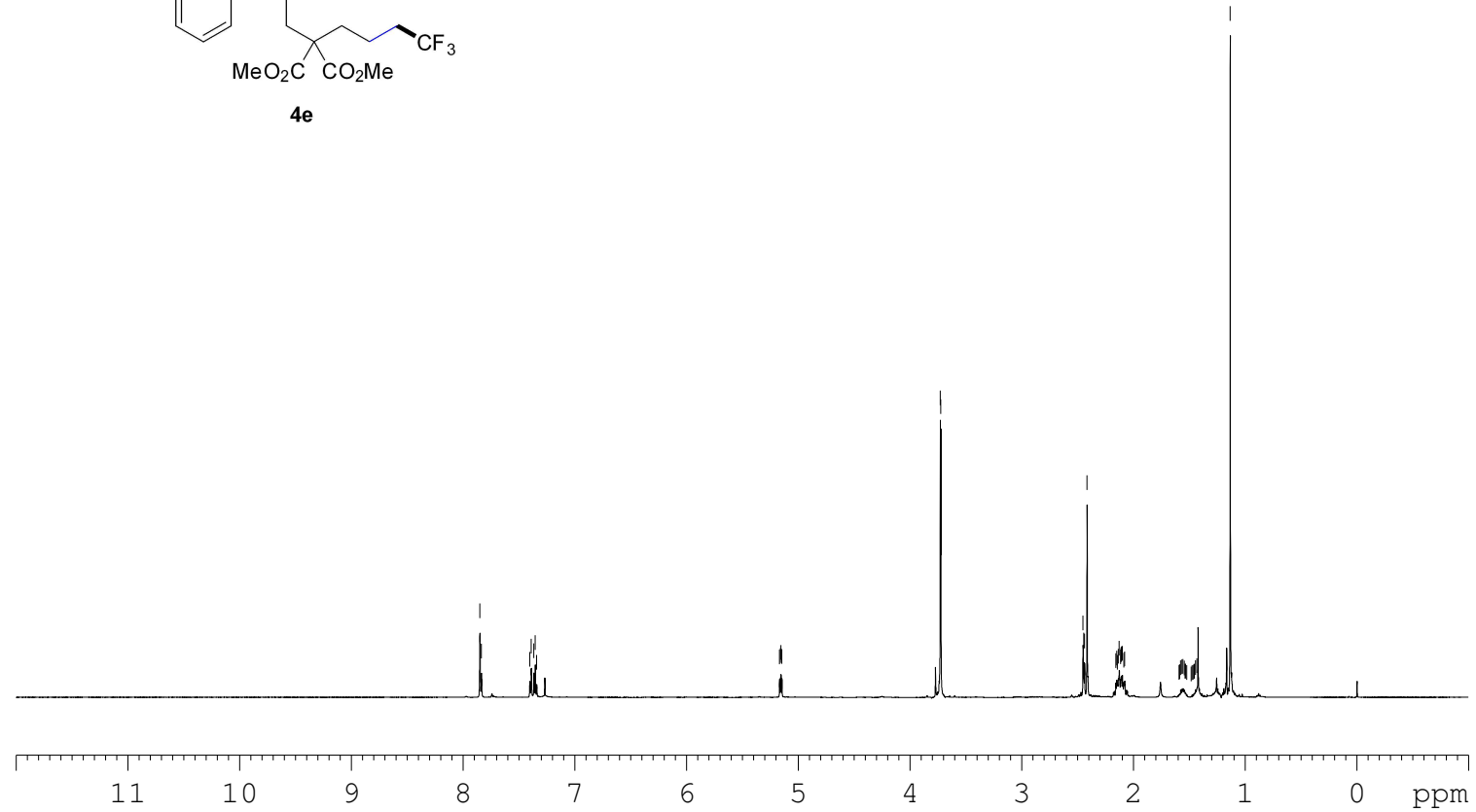
7.851  
7.837  
7.403  
7.391  
7.368  
7.355  
7.343  
5.168  
5.160  
5.156  
5.148  
3.729  
3.725  
2.453  
2.445  
2.438  
2.416  
2.158  
2.150  
2.144  
2.136  
2.129  
2.115  
2.112  
2.108  
2.100  
2.086  
2.079  
1.592  
1.587  
1.579  
1.567  
1.558  
1.545  
1.538  
1.534  
1.524  
1.476  
1.467  
1.459  
1.456  
1.445  
1.433  
1.135



```

NAME      wll-456p-again-20201118
EXPNO     1
PROCNO    1
Date_     20201118
Time      13.31
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         8
DS         0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ         3.4079220 sec
RG         44.5
DW         52.000 usec
DE         6.50 usec
TE         295.5 K
D1         1.00000000 sec
TD0        1

===== CHANNEL f1 =====
SFO1      600.1739011 MHz
NUC1       1H
P1         9.77 usec
SI         65536
SF         600.1700096 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```



2.036  
 1.024  
 1.044  
 1.000  
 3.091  
 2.970  
 4.979  
 4.089  
 1.077  
 1.043  
 9.035

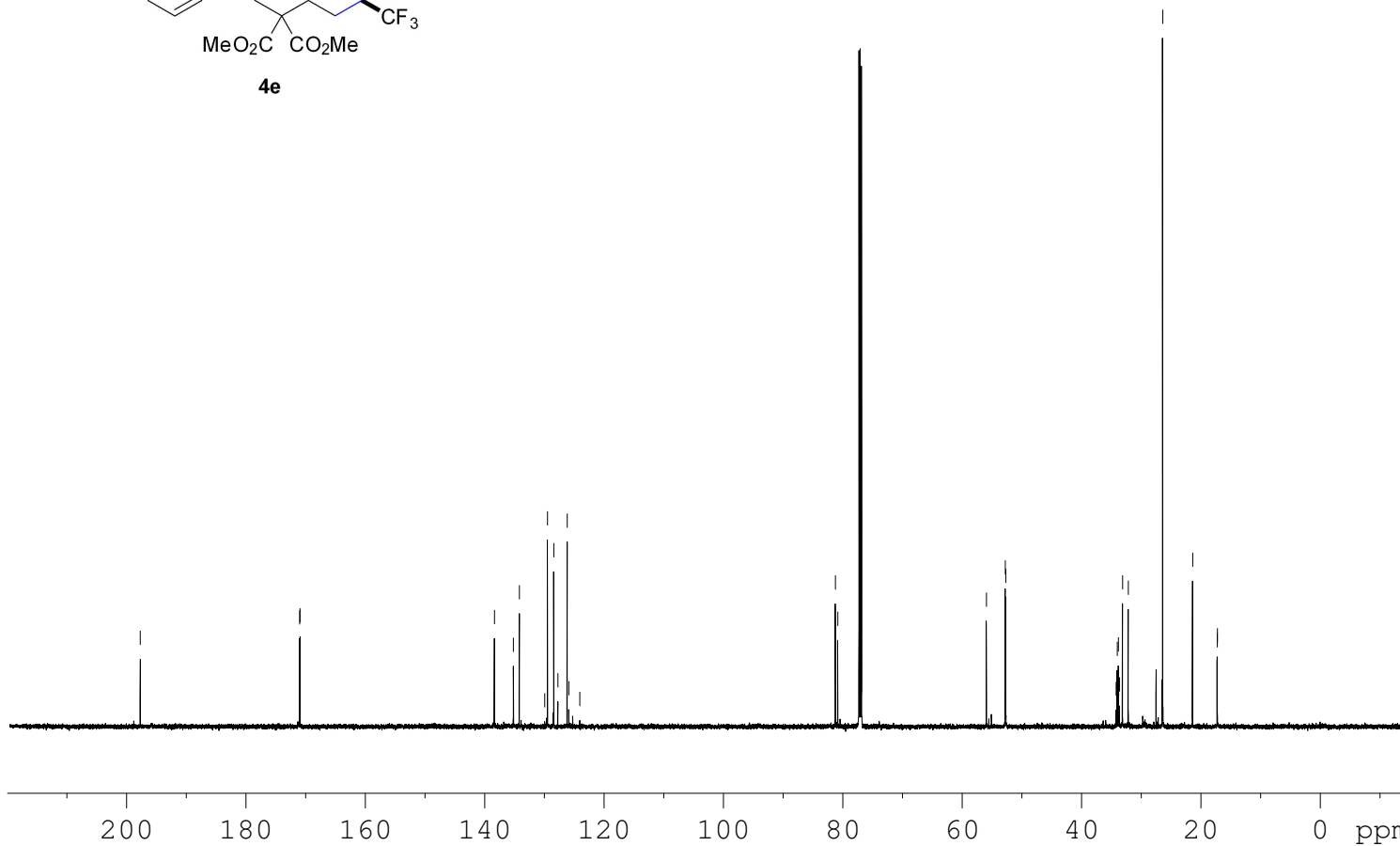
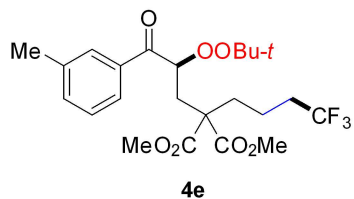
— 197.711

< 171.002  
< 170.937

138.358  
135.193  
134.186  
129.476  
128.420  
127.733  
126.174  
125.900  
124.068  
129.944

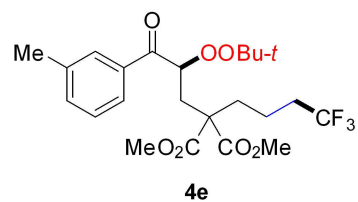
< 81.239  
< 80.837

55.934  
52.777  
52.691  
34.206  
34.016  
33.825  
33.783  
33.635  
33.123  
32.163  
26.388  
21.372  
17.257  
17.238

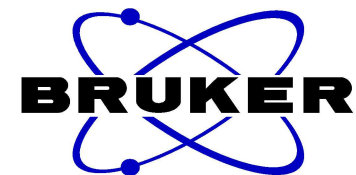


NAME w11-456p-again-20201118  
EXPNO 3  
PROCNO 1  
Date\_ 20201118  
Time 14.00  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 500  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.2 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128625 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



---66.254

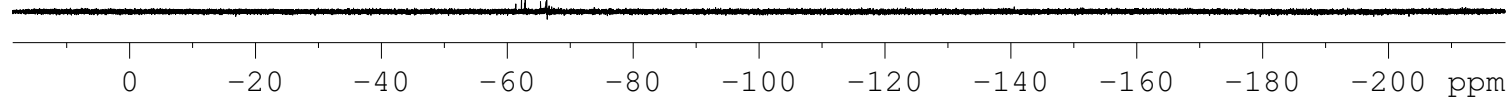


```

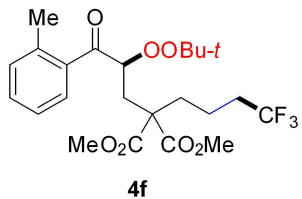
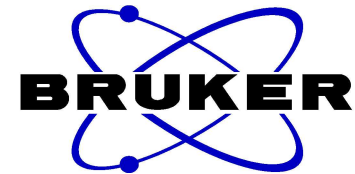
NAME      w11-456p-again-20201118
EXPNO     2
PROCNO    1
Date_     20201118
Time      13.33
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD         131072
SOLVENT   CDC13
NS         16
DS         4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ         0.4893855 sec
RG         15.49
DW         3.733 usec
DE         6.50 usec
TE         295.4 K
D1         1.00000000 sec
D11        0.03000000 sec
D12        0.00002000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      564.6675534 MHz
NUC1       19F
P1         11.90 usec
SI         65536
SF         564.7240258 MHz
WDW        EM
SSB         0
LB          0.30 Hz
GB          0
PC          1.00
  
```



7.657  
7.644  
7.388  
7.376  
7.364  
7.269  
7.254  
5.039  
5.035  
5.025  
5.020  
3.726  
3.667  
2.482  
2.462  
2.443  
2.438  
2.391  
2.376  
2.365  
2.350  
2.138  
2.123  
2.114  
2.102  
2.094  
2.087  
2.079  
2.066  
2.059  
2.043  
2.035  
1.562  
1.553  
1.545  
1.538  
1.531  
1.390  
1.386  
1.377  
1.370  
1.362  
1.353  
1.089

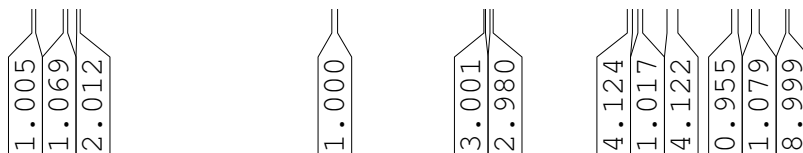
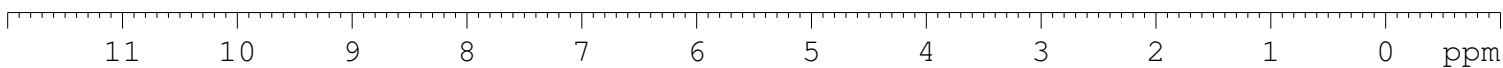


```

NAME      w11-455p-again-20201118
EXPNO     1
PROCNO    1
Date_     20201118
Time      12.59
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDC13
NS         8
DS         0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ         3.4079220 sec
RG         36.09
DW         52.000 usec
DE         6.50 usec
TE         295.1 K
D1         1.00000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      600.1739011 MHz
NUC1       1H
P1         9.77 usec
SI         65536
SF         600.1700083 MHz
WDW        EM
SSB         0
LB         0.30 Hz
GB         0
PC         1.00
  
```





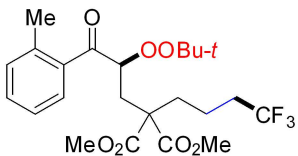
— 201.752

< 170.986  
< 170.897

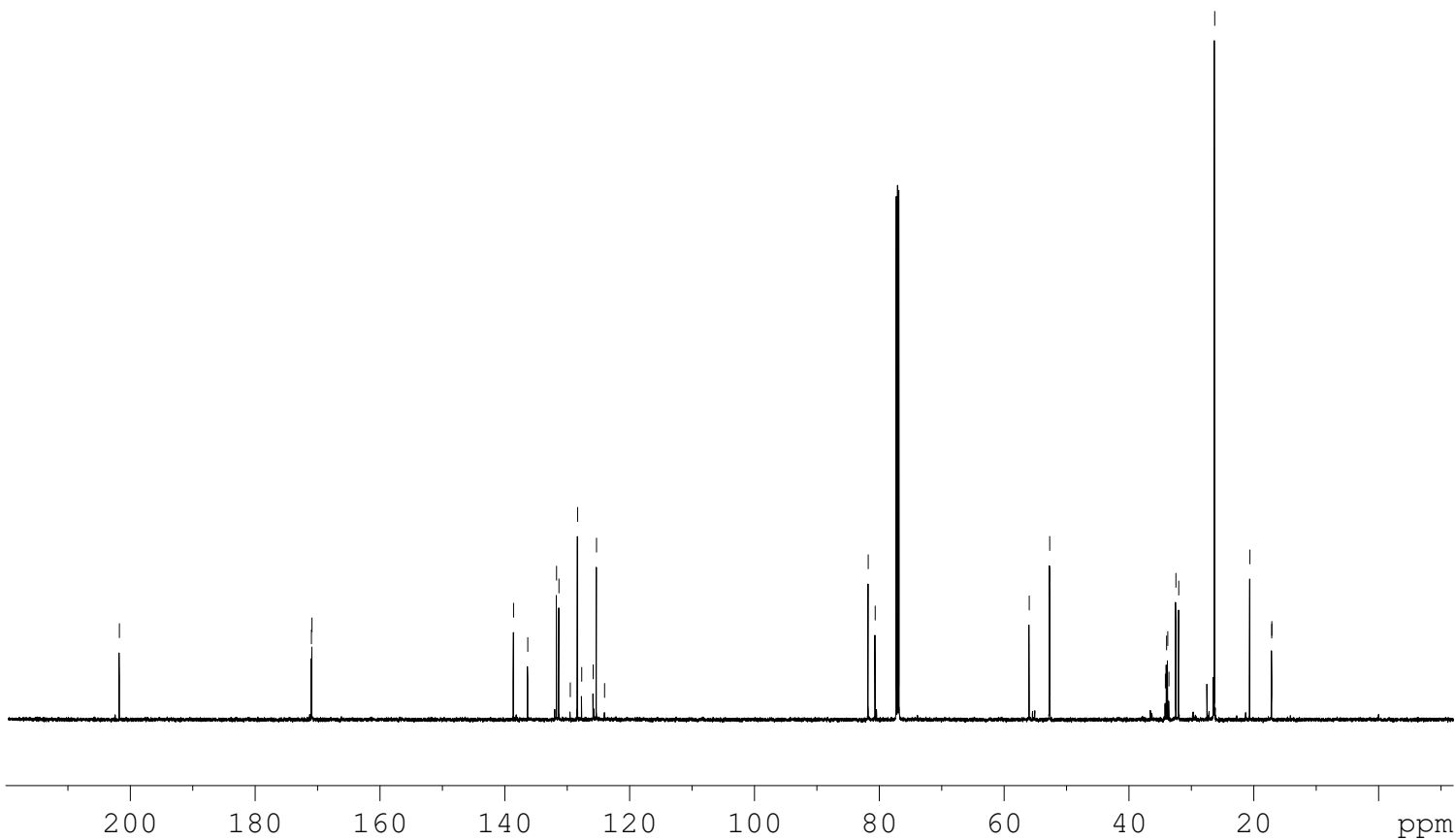
138.601  
136.324  
131.715  
131.327  
129.512  
128.341  
127.679  
125.848  
125.308  
124.017

< 81.776  
< 80.659

55.977  
52.699  
52.672  
34.166  
33.974  
33.784  
33.594  
32.477  
32.024  
26.259  
20.623  
17.128  
17.109

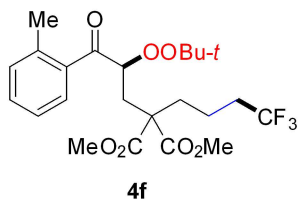


4f

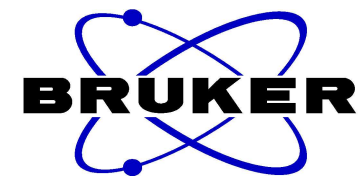
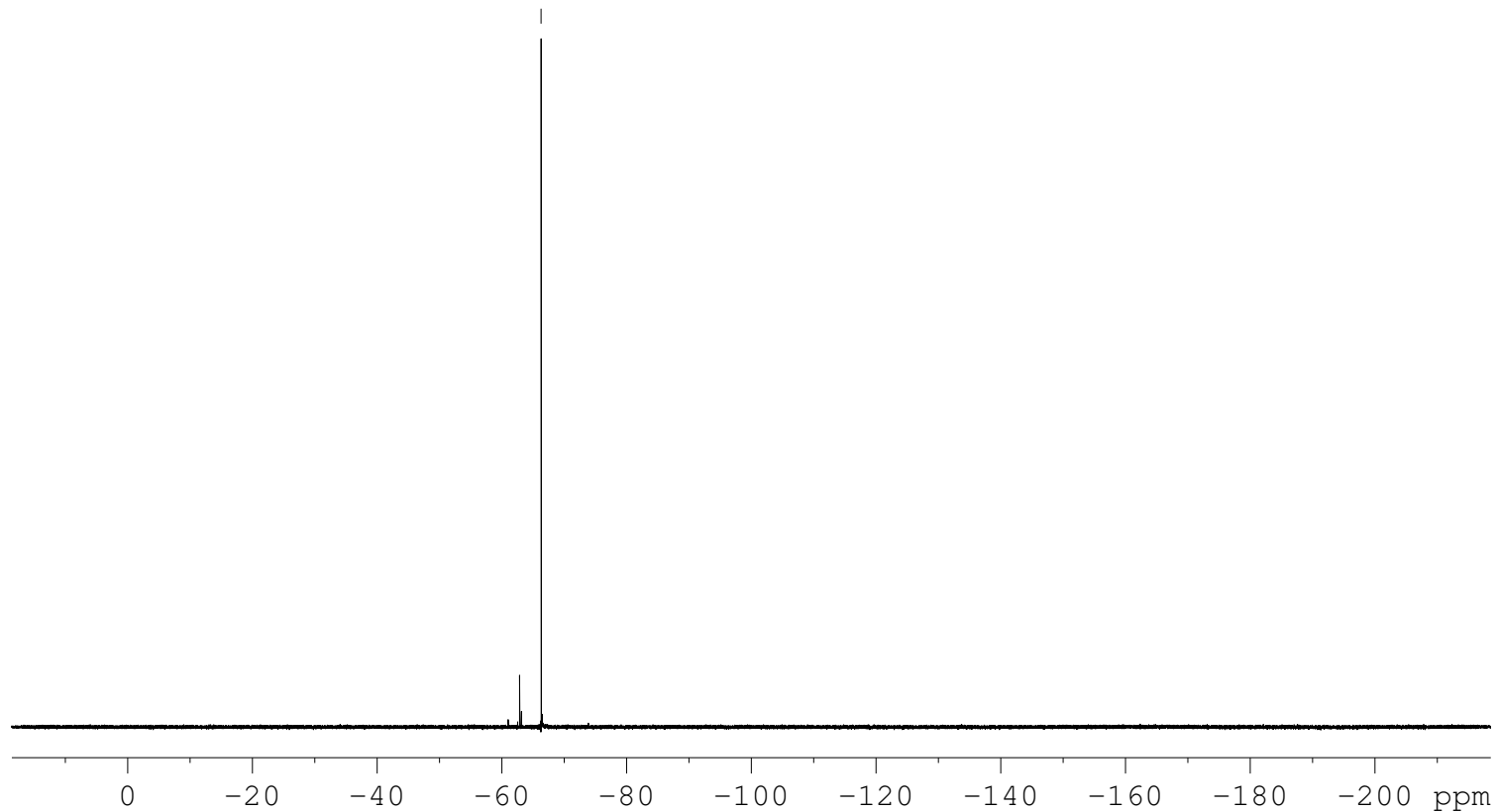


NAME w11-455p-again-20201118  
EXPNO 4  
PROCNO 1  
Date\_ 20201118  
Time 13.27  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 500  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.2 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



---66.282

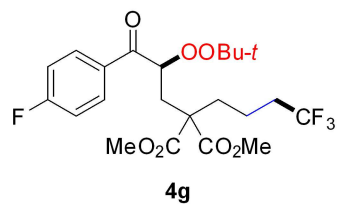
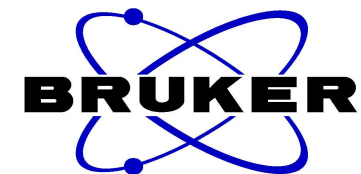


```

NAME      w11-455p-again-20201118
EXPNO     3
PROCNO    1
Date_     20201118
Time      13.01
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD         131072
SOLVENT   CDCl3
NS         16
DS         4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG         15.49
DW         3.733 usec
DE         6.50 usec
TE         295.1 K
D1         1.00000000 sec
D11        0.03000000 sec
D12        0.00002000 sec
TD0        1
  
```

```

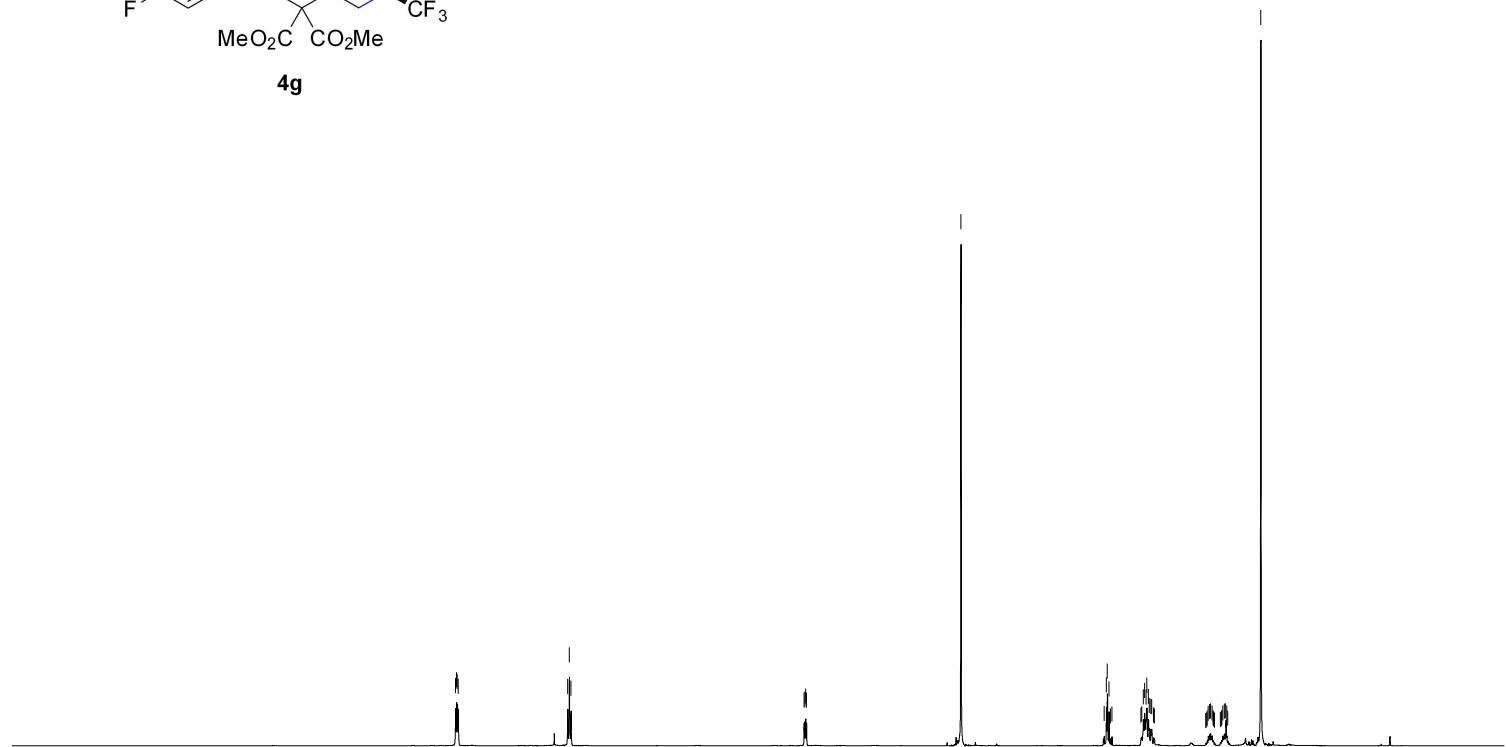
===== CHANNEL f1 =====
SFO1      564.6675534 MHz
NUC1       19F
P1         11.90 usec
SI         65536
SF         564.7240258 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```



8.137  
8.128  
8.122  
8.113  
7.160  
7.146  
7.132  
5.101  
5.094  
5.088  
5.081  
3.736  
2.488  
2.469  
2.461  
2.446  
2.434  
2.420  
2.168  
2.160  
2.147  
2.136  
2.123  
2.116  
2.103  
2.095  
2.081  
2.074  
2.058  
2.051  
1.604  
1.595  
1.591  
1.582  
1.570  
1.561  
1.548  
1.540  
1.535  
1.527  
1.476  
1.468  
1.463

NAME w11-459p-20201120  
EXPNO 1  
PROCNO 1  
Date\_ 20201120  
Time 23.08  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDC13  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 36.09  
DW 52.000 usec  
DE 6.50 usec  
TE 294.7 K  
D1 1.00000000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700050 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



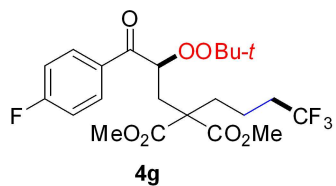
11 10 9 8 7 6 5 4 3 2 1 0 ppm

2.03  
2.02  
1.00  
6.03  
2.05  
4.10  
1.06  
1.02  
9.08

— 196.030  
 { 170.903  
 { 170.887  
 { 166.712  
 { 165.019  
 { 131.835  
 { 131.774  
 { 131.497  
 { 131.479  
 { 129.522  
 { 127.691  
 { 125.857  
 { 124.025  
 { 115.705  
 { 115.560

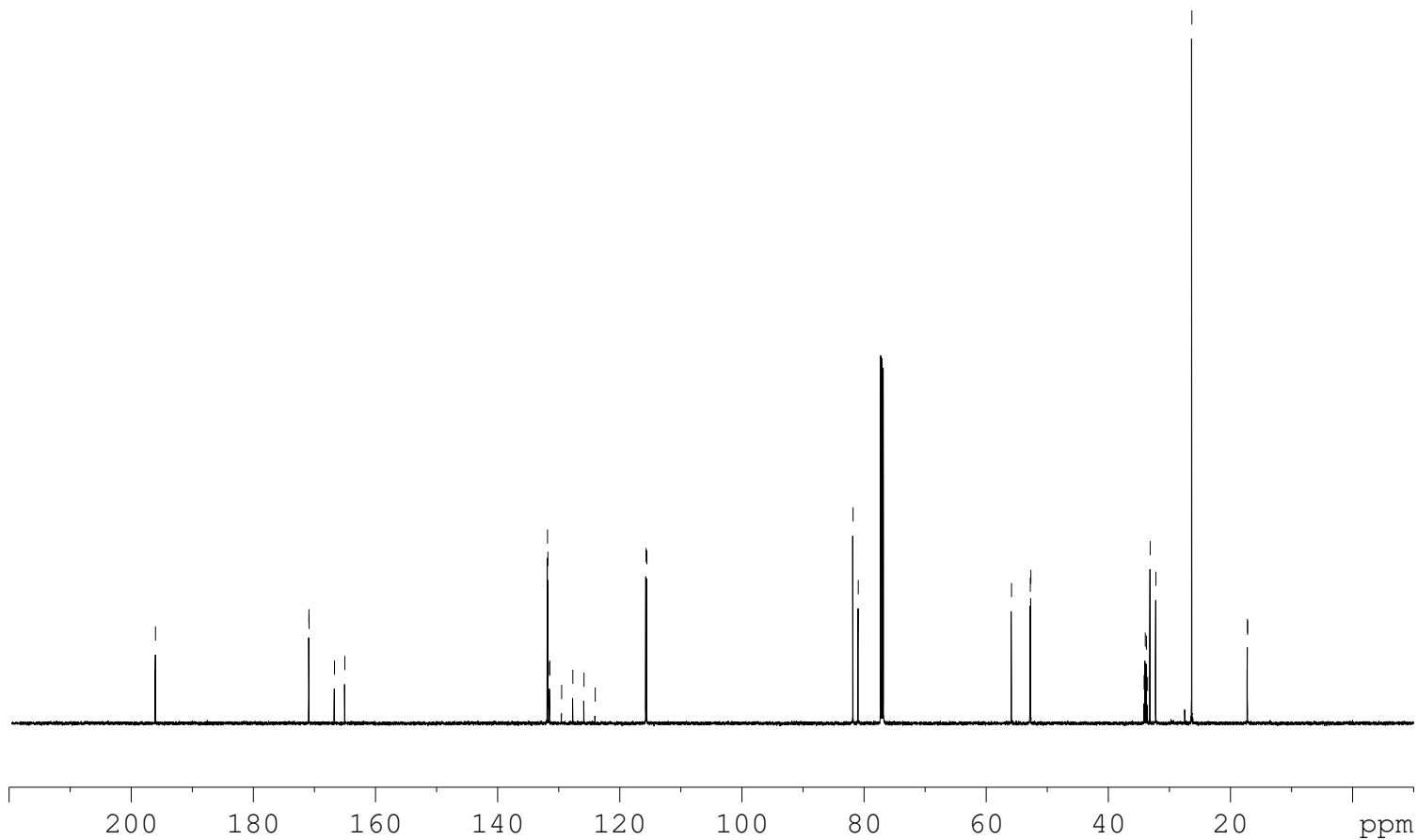
< 81.800  
 < 80.947

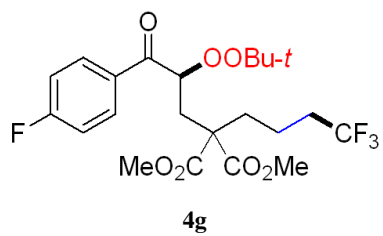
{ 55.855  
 { 52.774  
 { 52.686  
 { 34.142  
 { 33.951  
 { 33.761  
 { 33.569  
 { 33.149  
 { 32.214  
 { 26.318  
 { 17.217  
 { 17.198



NAME w11-459p-20201121  
 EXPNO 1  
 PROCNO 1  
 Date\_ 20201121  
 Time 11.51  
 INSTRUM spect  
 PROBHD 5 mm PABBO BB/  
 PULPROG zgpg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 400  
 DS 4  
 SWH 36057.691 Hz  
 FIDRES 0.550197 Hz  
 AQ 0.9088159 sec  
 RG 190.02  
 DW 13.867 usec  
 DE 6.50 usec  
 TE 296.5 K  
 D1 2.00000000 sec  
 D11 0.03000000 sec  
 TD0 1

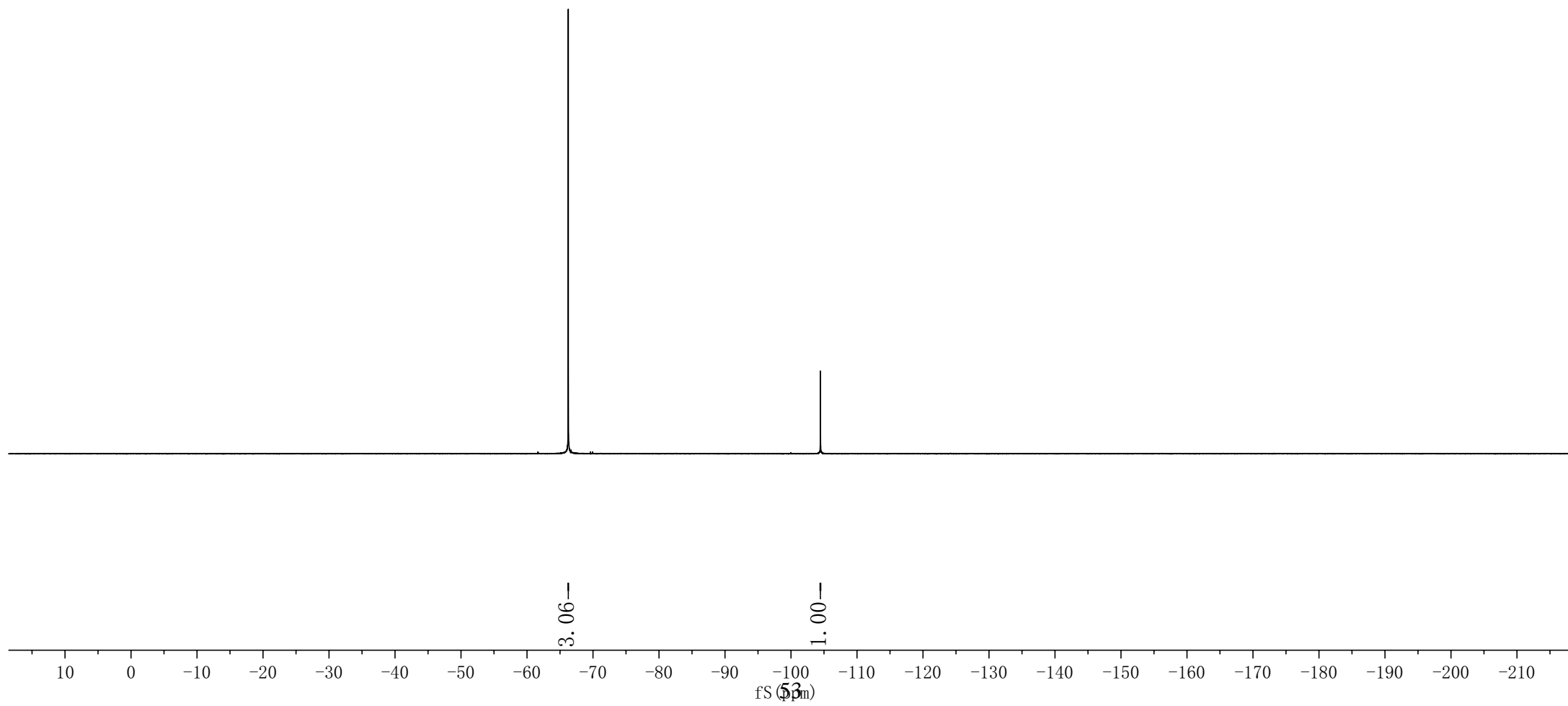
===== CHANNEL f1 =====  
 SFO1 150.9279571 MHz  
 NUC1 13C  
 P1 11.90 usec  
 SI 32768  
 SF 150.9128665 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40



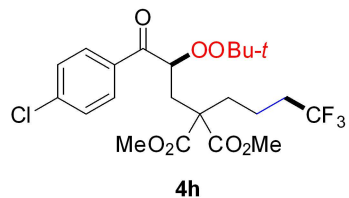
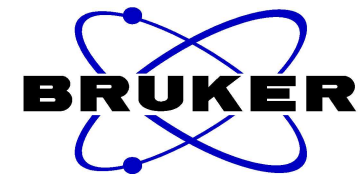


— -66.2557

— -104.4634



8.040  
8.026  
7.458  
7.444  
5.092  
5.085  
5.079  
5.072  
3.734  
2.492  
2.485  
2.466  
2.459  
2.453  
2.439  
2.427  
2.414  
2.164  
2.151  
2.147  
2.140  
2.133  
2.118  
2.111  
2.103  
2.098  
2.090  
2.077  
2.069  
2.054  
2.046  
1.581  
1.568  
1.560  
1.547  
1.462  
1.453  
1.445  
1.440  
1.431  
1.427  
1.419  
1.411  
1.121

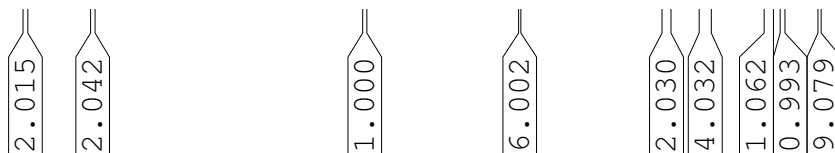
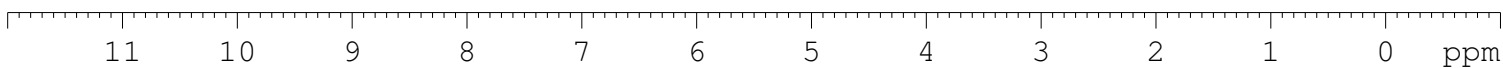


```

NAME      w11-454p-20201118
EXPNO     1
PROCNO    1
Date_     20201118
Time      9.36
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD        65536
SOLVENT   CDCl3
NS         8
DS         0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ        3.4079220 sec
RG        30.73
DW        52.000 usec
DE        6.50 usec
TE        294.5 K
D1        1.00000000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
SFO1     600.1739011 MHz
NUC1      1H
P1        9.77 usec
SI        65536
SF        600.1700046 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```



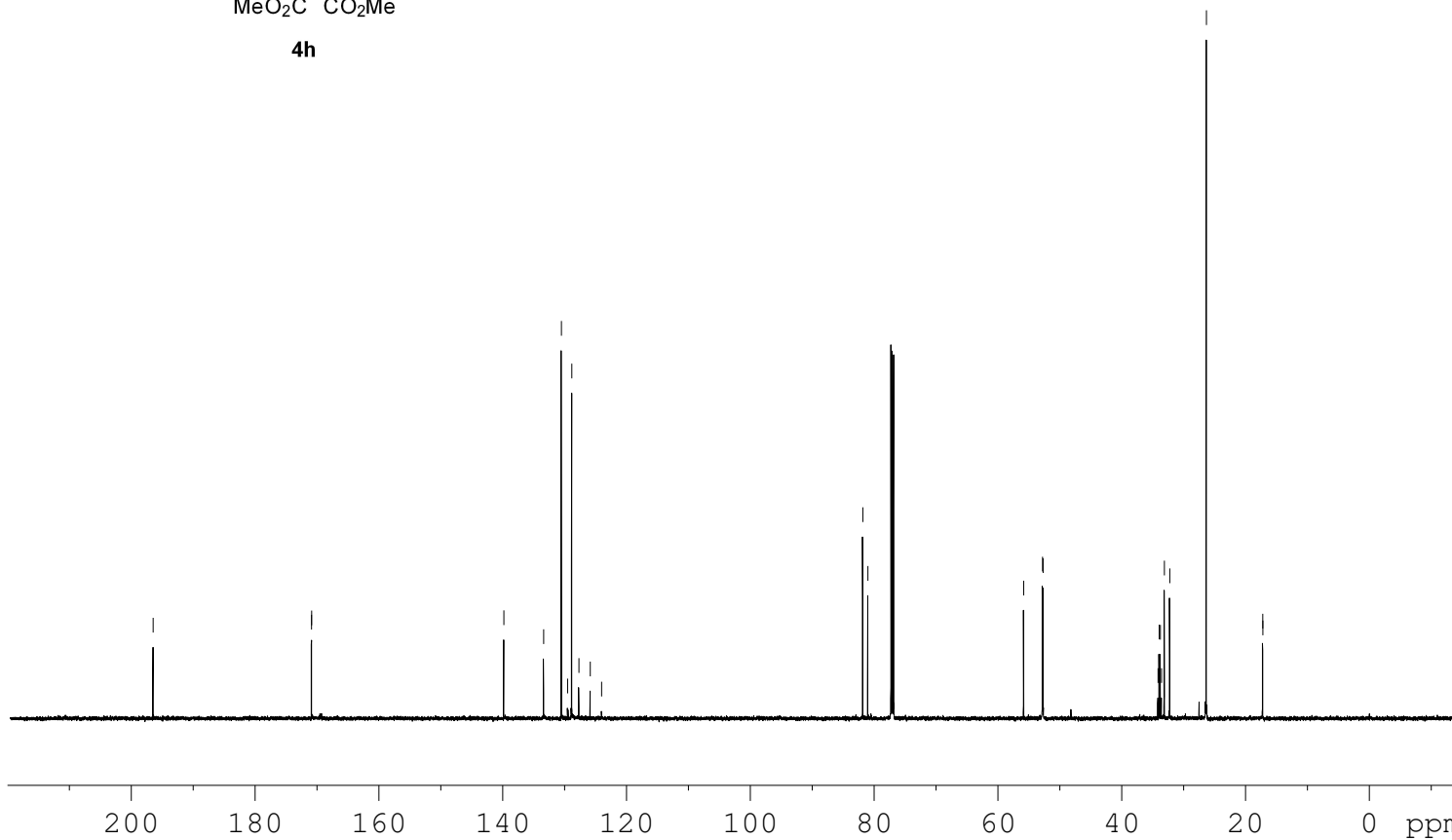
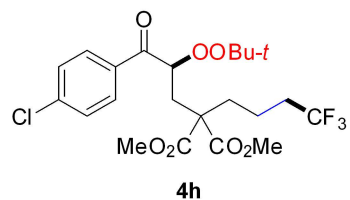
— 196.467

< 170.885  
< 170.864

< 139.812  
< 133.385  
< 130.514  
< 129.516  
< 128.837  
< 127.685  
< 125.855  
< 124.023

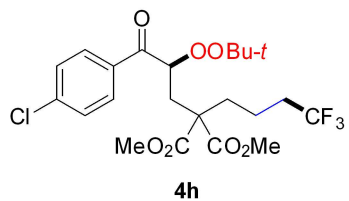
< 81.820  
< 81.005

< 55.839  
< 52.794  
< 52.700  
< 34.136  
< 33.945  
< 33.754  
< 33.563  
< 33.110  
< 32.236  
< 26.317  
< 17.218  
< 17.202

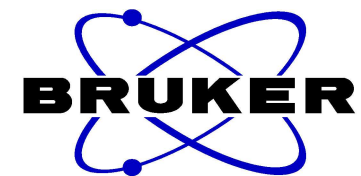
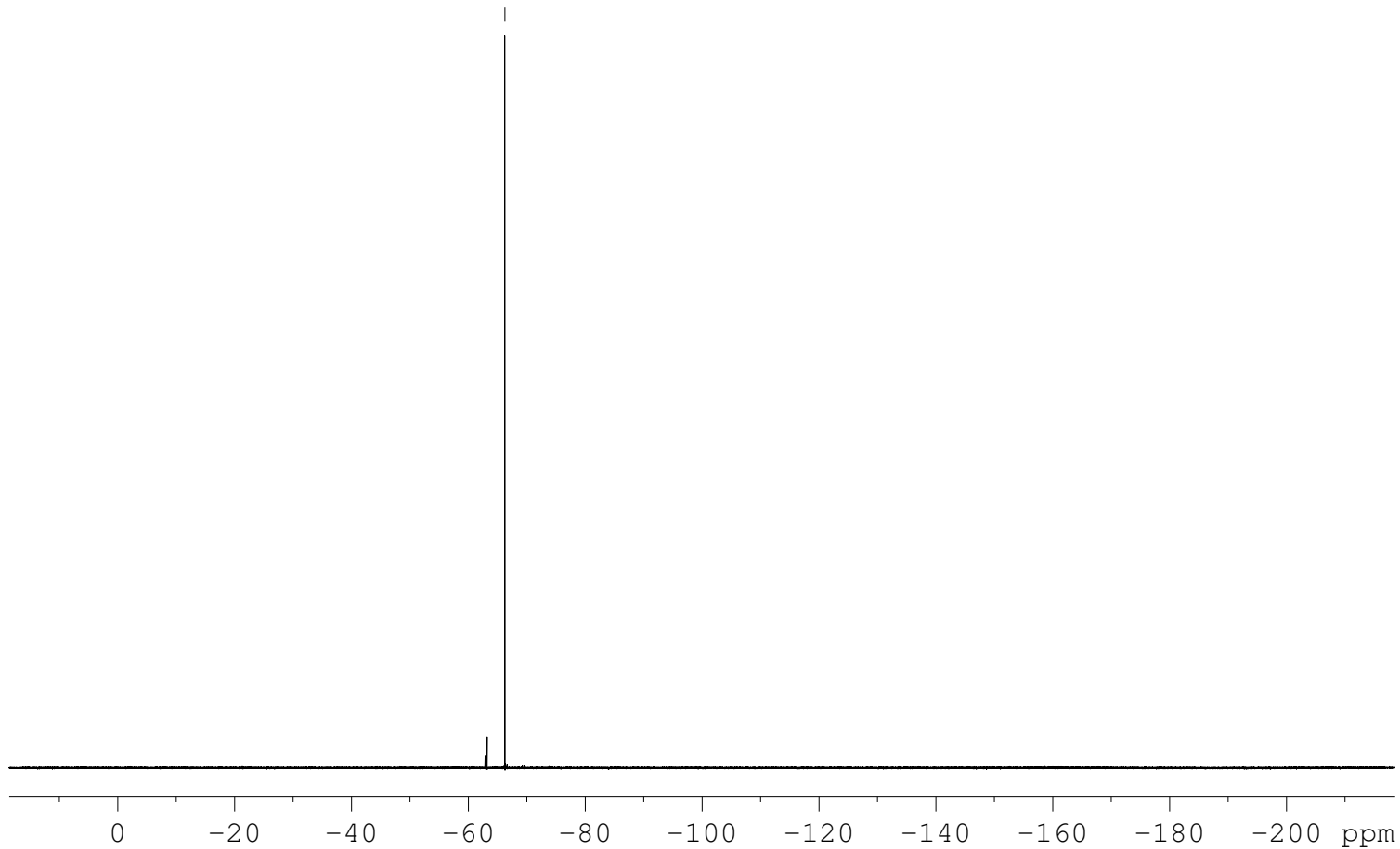


NAME w11-454p-20201118  
EXPNO 2  
PROCNO 1  
Date\_ 20201118  
Time 14.18  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 300  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.2 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



---66.246



```

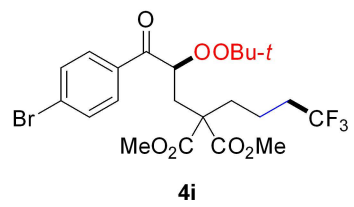
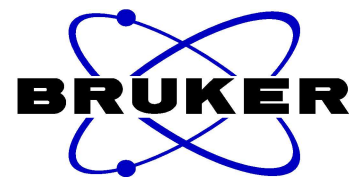
NAME      w11-454p-20201118
EXPNO     3
PROCNO    1
Date_     20201118
Time      14.25
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDC13
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        295.4 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
SFO1    564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
  
```



7.957  
7.943  
7.623  
7.609  
5.081  
5.074  
5.067  
5.060  
3.730  
2.489  
2.482  
2.463  
2.457  
2.446  
2.432  
2.420  
2.406  
2.156  
2.146  
2.141  
2.127  
2.111  
2.104  
2.096  
2.092  
2.084  
2.070  
2.063  
1.589  
1.580  
1.568  
1.559  
1.546  
1.538  
1.525  
1.475  
1.462  
1.454  
1.441  
1.432  
1.428  
1.419  
1.411  
1.118

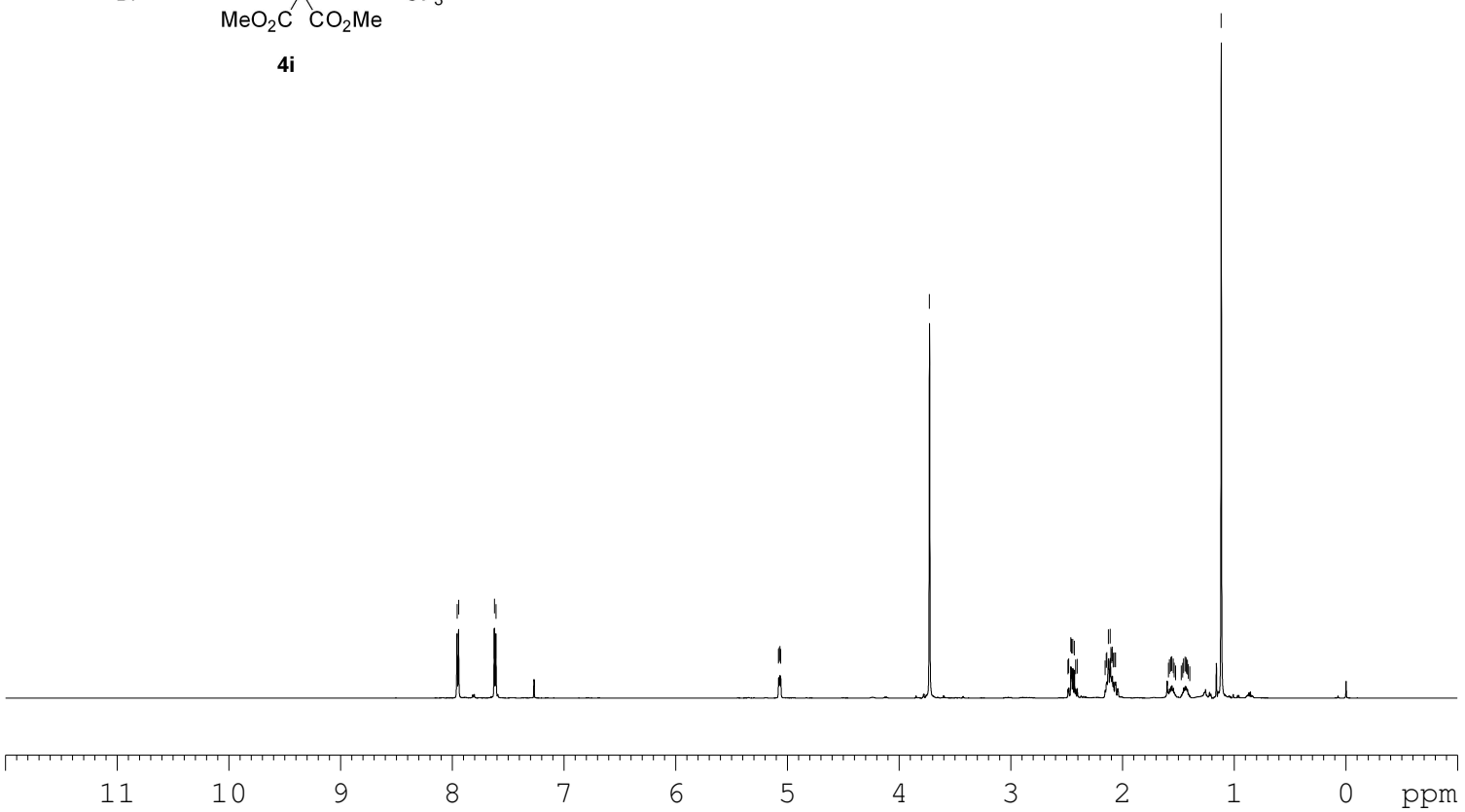


```

NAME      w11-416p-20201106
EXPNO     1
PROCNO    1
Date_     20201106
Time      16.24
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD        65536
SOLVENT   CDC13
NS        8
DS        0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ        3.4079220 sec
RG        62.22
DW        52.000 usec
DE        6.50 usec
TE        298.6 K
D1        1.00000000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
SF01     600.1739011 MHz
NUC1     1H
P1       9.77 usec
SI       65536
SF       600.1700113 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
  
```



2.000  
2.048  
1.031  
6.096  
2.098  
4.031  
1.081  
1.036  
9.077

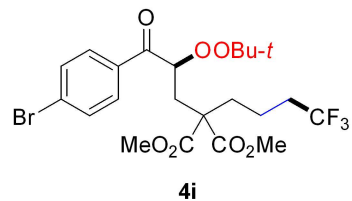
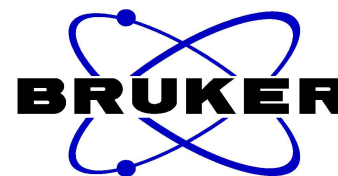
— 196.649

< 170.874  
< 170.852

< 133.823  
< 131.835  
< 130.607  
< 128.576  
< 127.685  
< 125.855

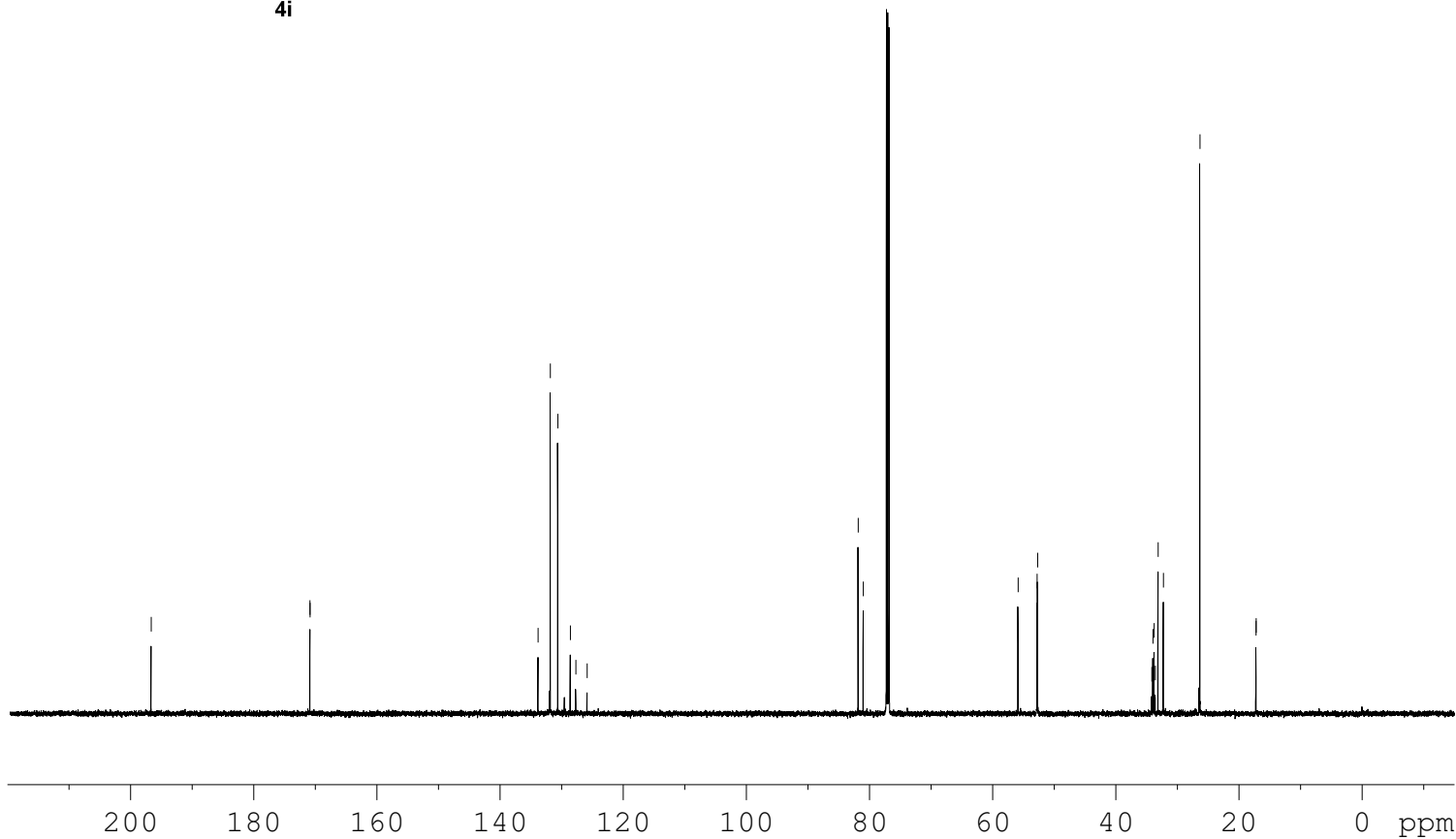
< 81.835  
< 81.013

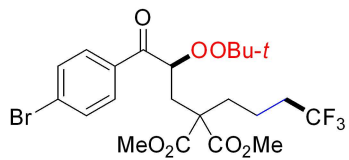
< 55.862  
< 52.785  
< 52.692  
< 34.158  
< 33.967  
< 33.777  
< 33.585  
< 33.127  
< 32.270  
< 26.331  
< 17.231  
< 17.211



NAME w11-416p-20201106  
EXPNO 3  
PROCNO 1  
Date\_ 20201106  
Time 16.52  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 500  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 299.4 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

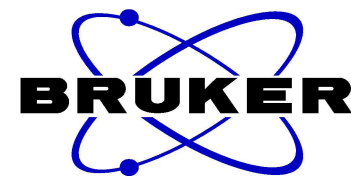
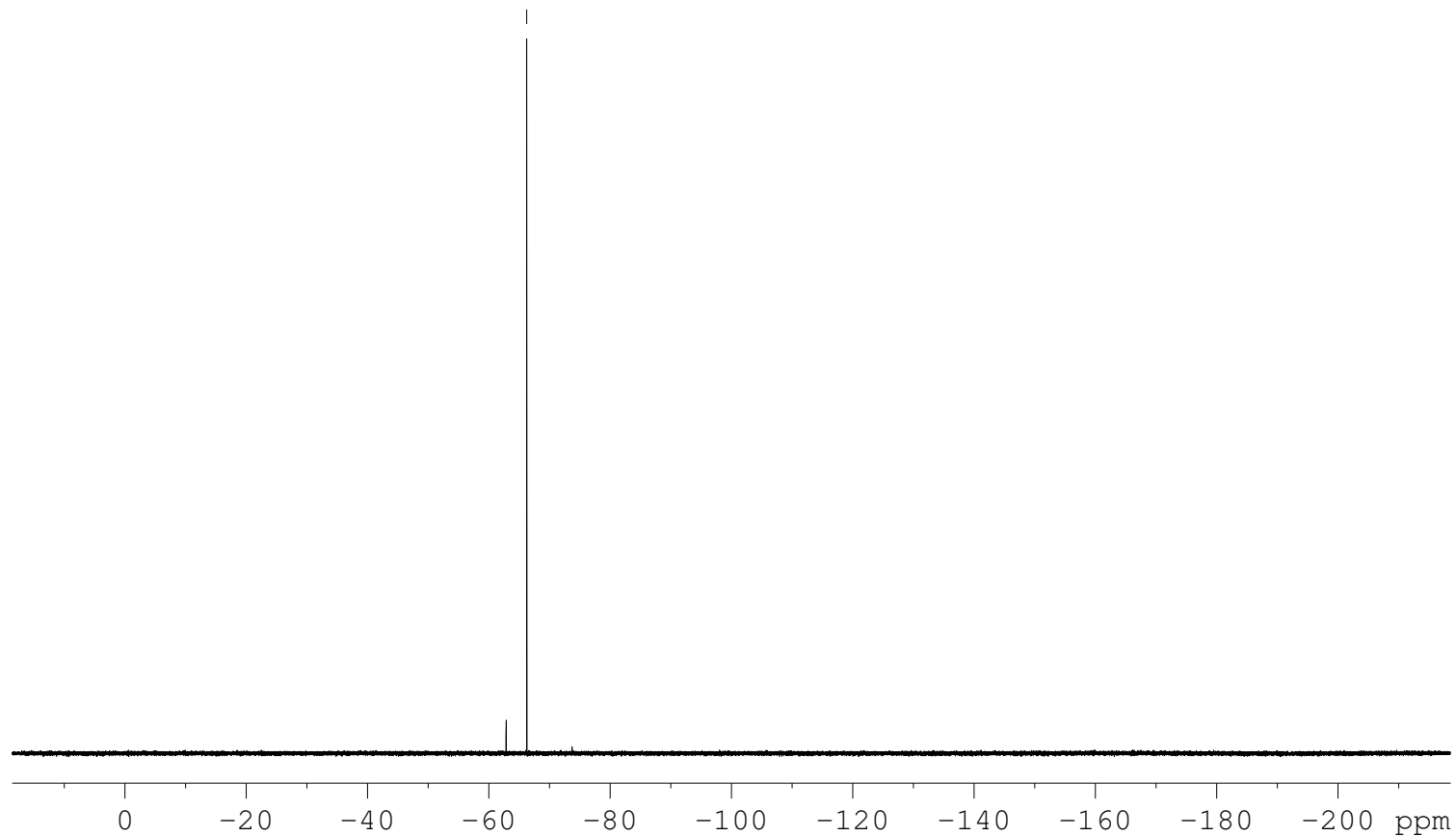
==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40





4i

66.239



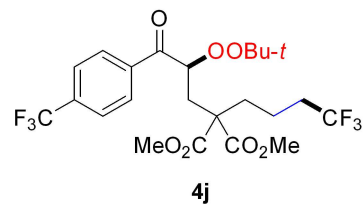
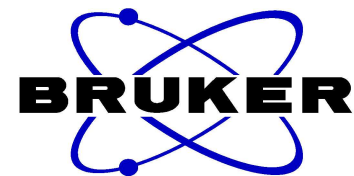
```

NAME      w11-416p-20201106
EXPNO      2
PROCNO     1
Date_      20201106
Time       16.26
INSTRUM    spect
PROBHD     5 mm PABBO BB/
PULPROG    zgfhigqn.2
TD         131072
SOLVENT    CDCl3
NS         16
DS         4
SWH        133928.578 Hz
FIDRES     1.021794 Hz
AQ         0.4893855 sec
RG         15.49
DW         3.733 usec
DE         6.50 usec
TE         298.5 K
D1         1.00000000 sec
D11        0.03000000 sec
D12        0.00002000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      564.6675534 MHz
NUC1      19F
P1         11.90 usec
SI         65536
SF         564.7240258 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```

8.203  
8.189  
7.751  
7.737  
5.124  
5.117  
5.110  
5.103  
3.742  
2.521  
2.515  
2.495  
2.489  
2.468  
2.454  
2.443  
2.429  
2.169  
2.157  
2.153  
2.145  
2.139  
2.122  
2.116  
2.108  
2.099  
2.091  
2.086  
2.078  
2.063  
2.055  
1.590  
1.581  
1.577  
1.569  
1.560  
1.555  
1.462  
1.453  
1.448  
1.440  
1.435  
1.427  
1.114

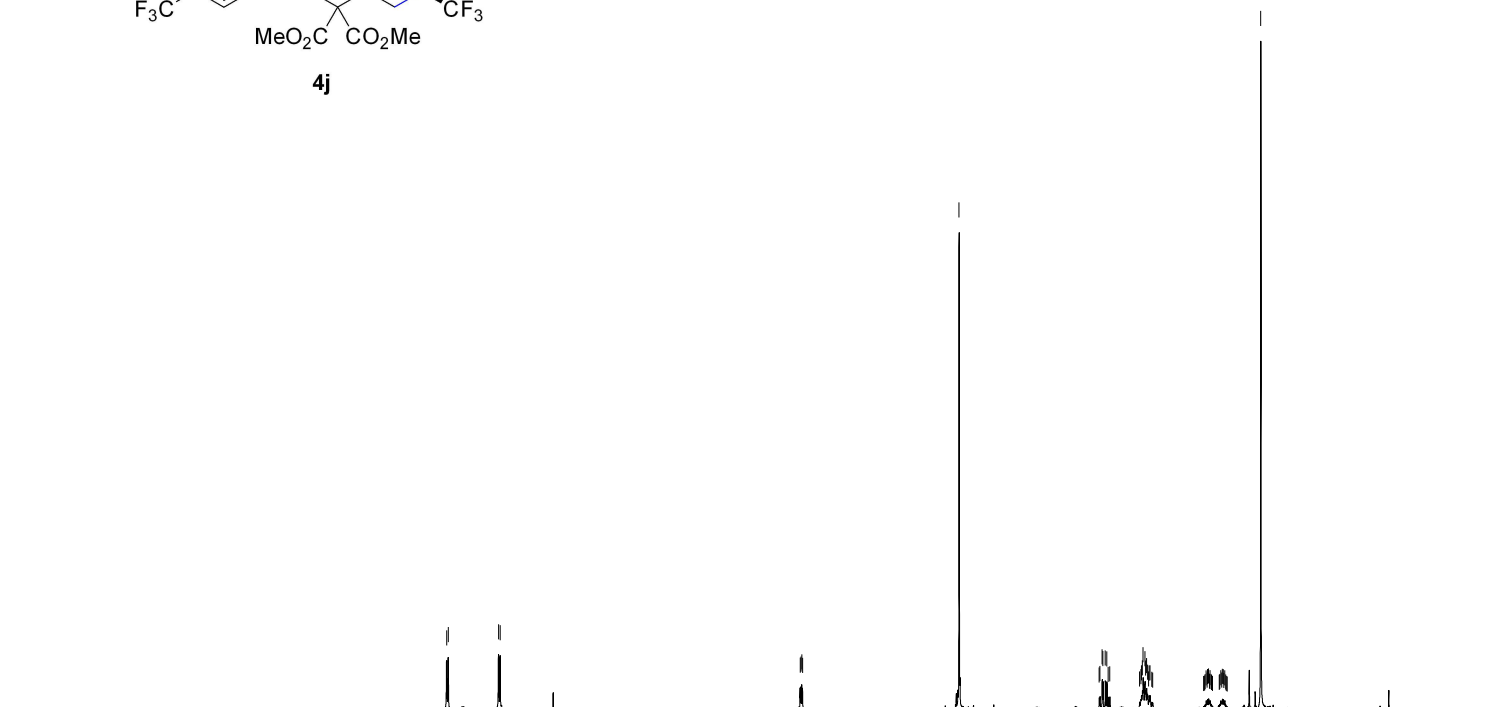


```

NAME      w11-523p-20201230
EXPNO     1
PROCNO    1
Date_     20201230
Time      13.29
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDC13
NS         8
DS         0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ        3.4079220 sec
RG         38.1
DW        52.000 usec
DE         6.50 usec
TE        294.1 K
D1         1.00000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1     600.1739011 MHz
NUC1      1H
P1        9.77 usec
SI        65536
SF        600.1700072 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB         0
PC         1.00
  
```



11 10 9 8 7 6 5 4 3 2 1 0 ppm

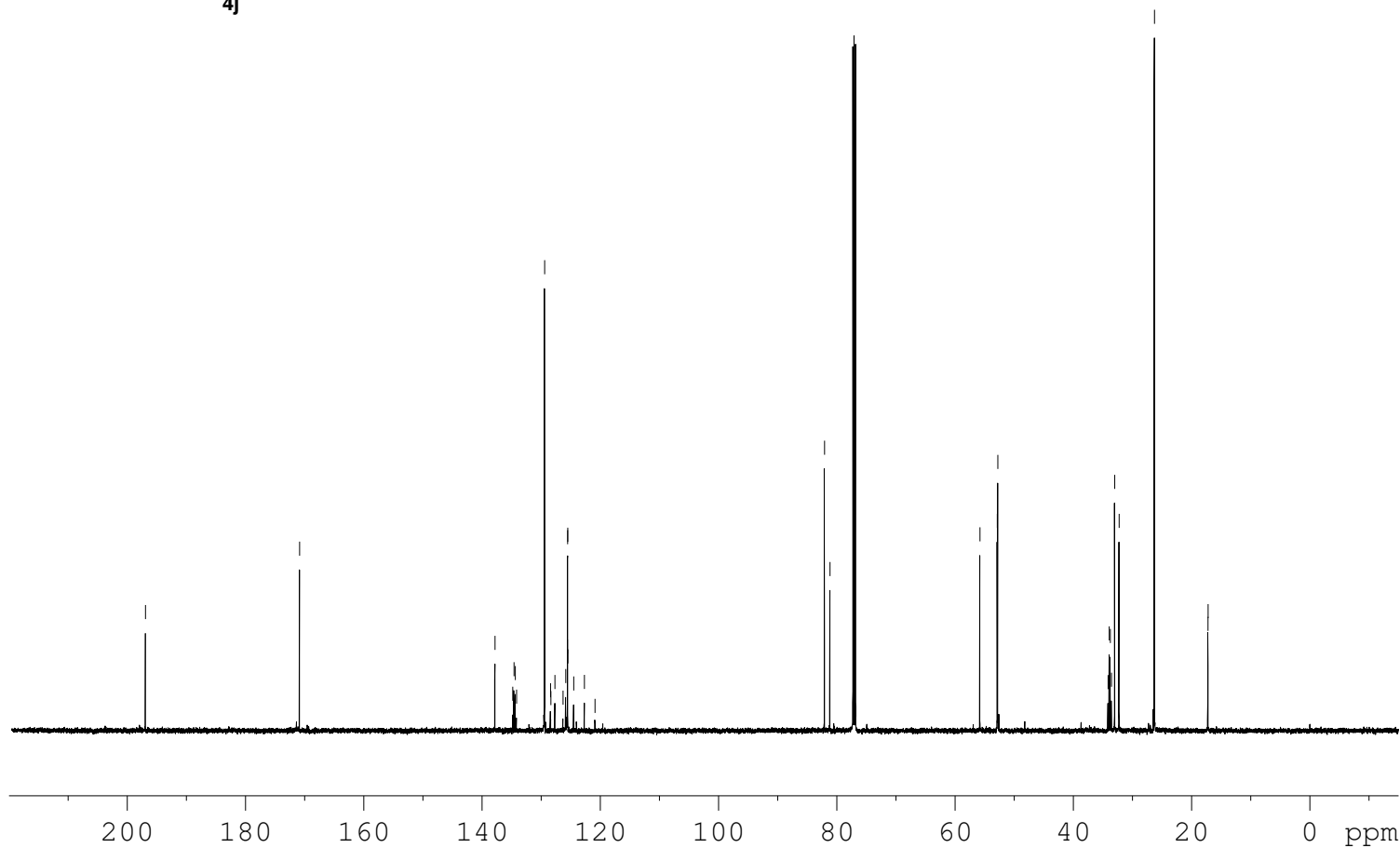
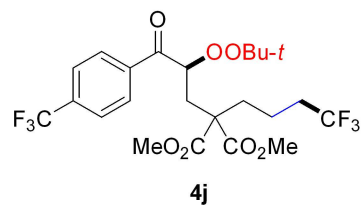
2.006  
2.062  
1.000  
6.033  
2.050  
4.034  
1.026  
1.035  
9.047

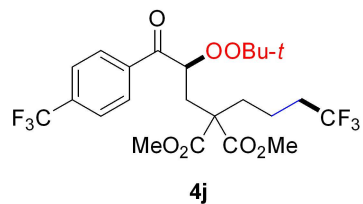


NAME w11-523p-20201230  
EXPNO 2  
PROCNO 1  
Date\_ 20201230  
Time 13.50  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 400  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 295.5 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1

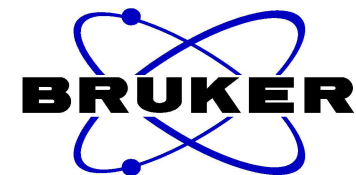
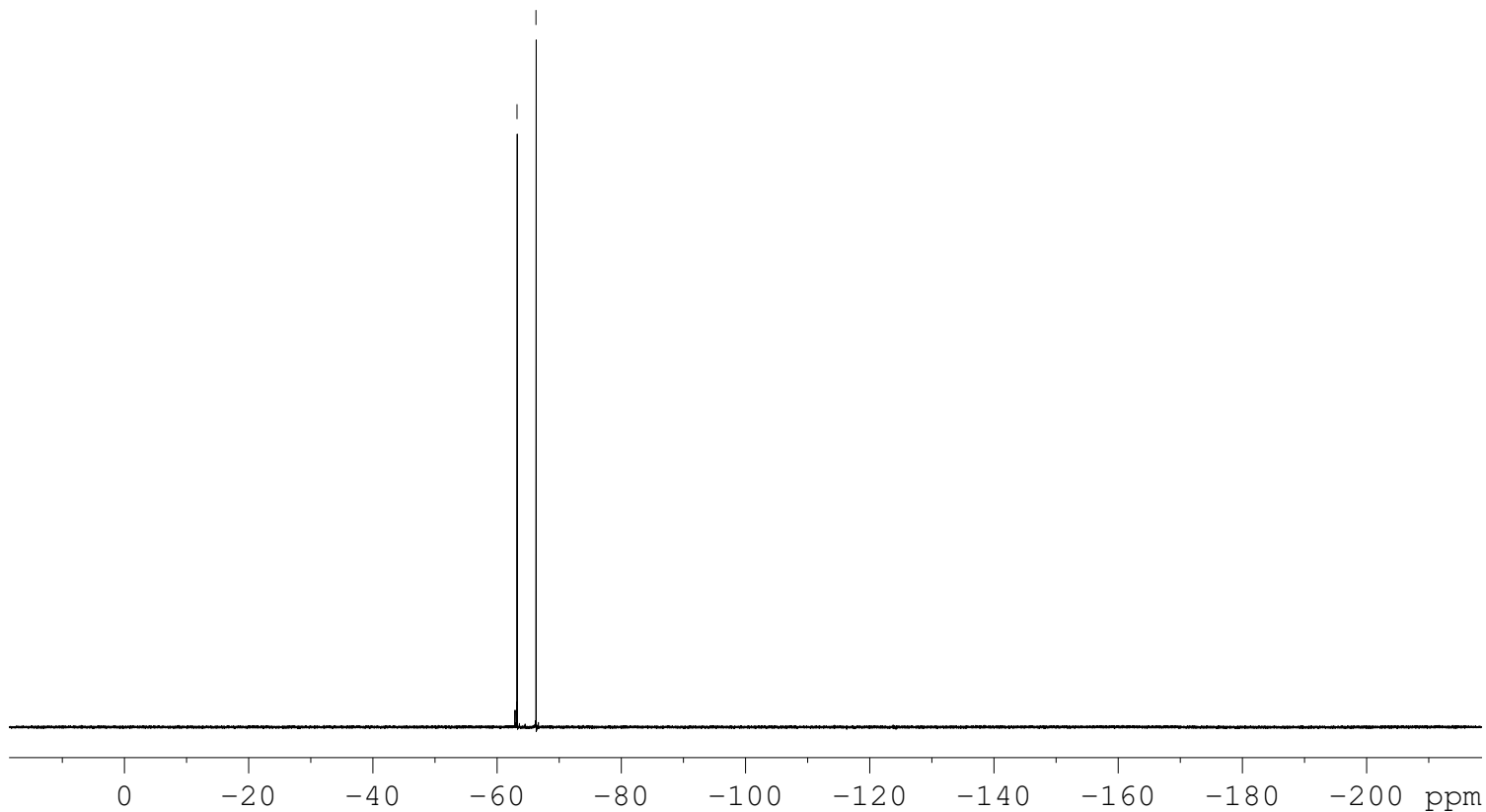
===== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

196.917  
170.855  
137.806  
134.809  
134.590  
134.373  
134.159  
129.412  
128.414  
128.357  
127.675  
126.301  
125.842  
125.528  
125.505  
125.480  
124.494  
122.689  
82.077  
81.154  
55.792  
52.863  
52.772  
34.126  
33.936  
33.743  
33.552  
33.003  
32.255  
26.277  
17.230  
17.211  
129.506  
120.895  
125.550





-63.206  
 -66.257



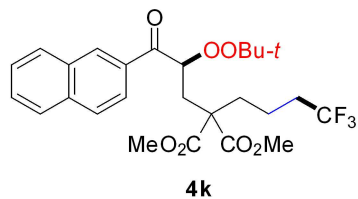
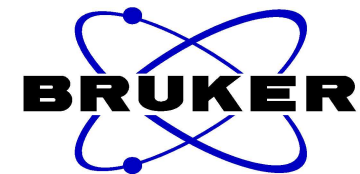
```

NAME      w11-523p-20201230
EXPNO     3
PROCNO    1
Date_     20201230
Time      13.52
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDCl3
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        294.7 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
SFO1     564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
  
```

8.660  
8.094  
8.091  
8.079  
8.077  
7.981  
7.967  
7.917  
7.902  
7.892  
7.878  
7.630  
7.619  
7.607  
7.579  
7.566  
7.554  
7.263  
5.305  
5.296  
5.293  
5.284  
3.744  
3.733  
2.542  
2.534  
2.530  
2.191  
2.183  
2.169  
2.162  
2.149  
2.145  
2.137  
2.132  
2.124  
2.118  
2.101  
1.611  
1.604  
1.600  
1.591  
1.470  
1.138



NAME wll-525p-20210105  
EXPNO 1  
PROCNO 1  
Date\_ 20210105  
Time 20.27  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 62.22  
DW 52.000 usec  
DE 6.50 usec  
TE 294.6 K  
D1 1.0000000 sec  
TD0 1

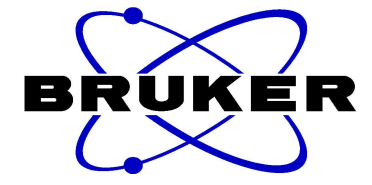
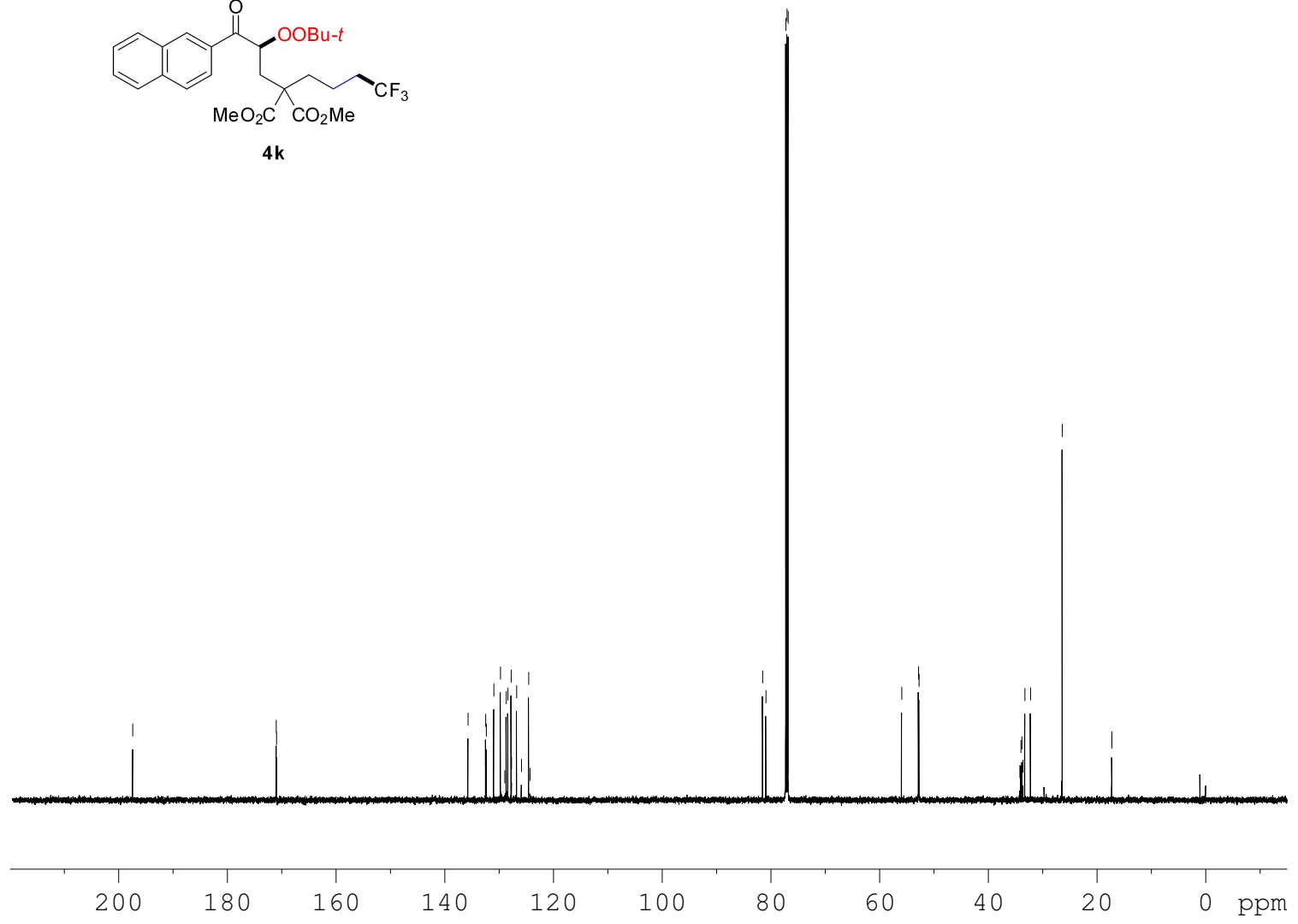
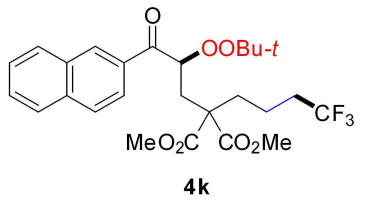
===== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700142 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



1.009  
0.985  
1.003  
1.001  
1.091  
1.073  
1.031  
1.000  
3.007  
2.988  
2.081  
4.131  
1.285  
1.067  
9.003

— 197.417

17.280  
 17.263  
 171.012  
 170.951  
 135.722  
 132.477  
 132.359  
 130.976  
 129.757  
 128.691  
 128.384  
 127.789  
 127.724  
 126.781  
 125.892  
 124.566  
 81.515  
 80.911  
 77.246  
 77.034  
 76.822  
 55.930  
 52.838  
 52.743  
 34.196  
 34.005  
 33.814  
 33.624  
 33.272  
 32.233  
 26.398  
 128.968  
 124.311

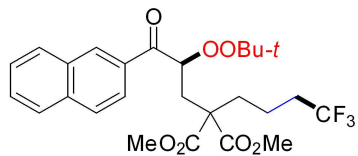


```

NAME      w11-525p-20210105
EXPNO     3
PROCNO    1
Date_     20210105
Time      20.48
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD        65536
SOLVENT   CDC13
NS        350
DS        4
SWH       36057.691 Hz
FIDRES    0.550197 Hz
AQ        0.9088159 sec
RG        190.02
DW        13.867 usec
DE        6.50 usec
TE        295.8 K
D1        2.00000000 sec
D11       0.03000000 sec
TD0       1

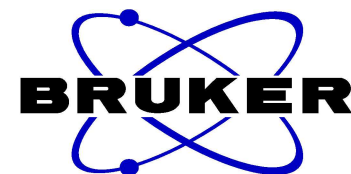
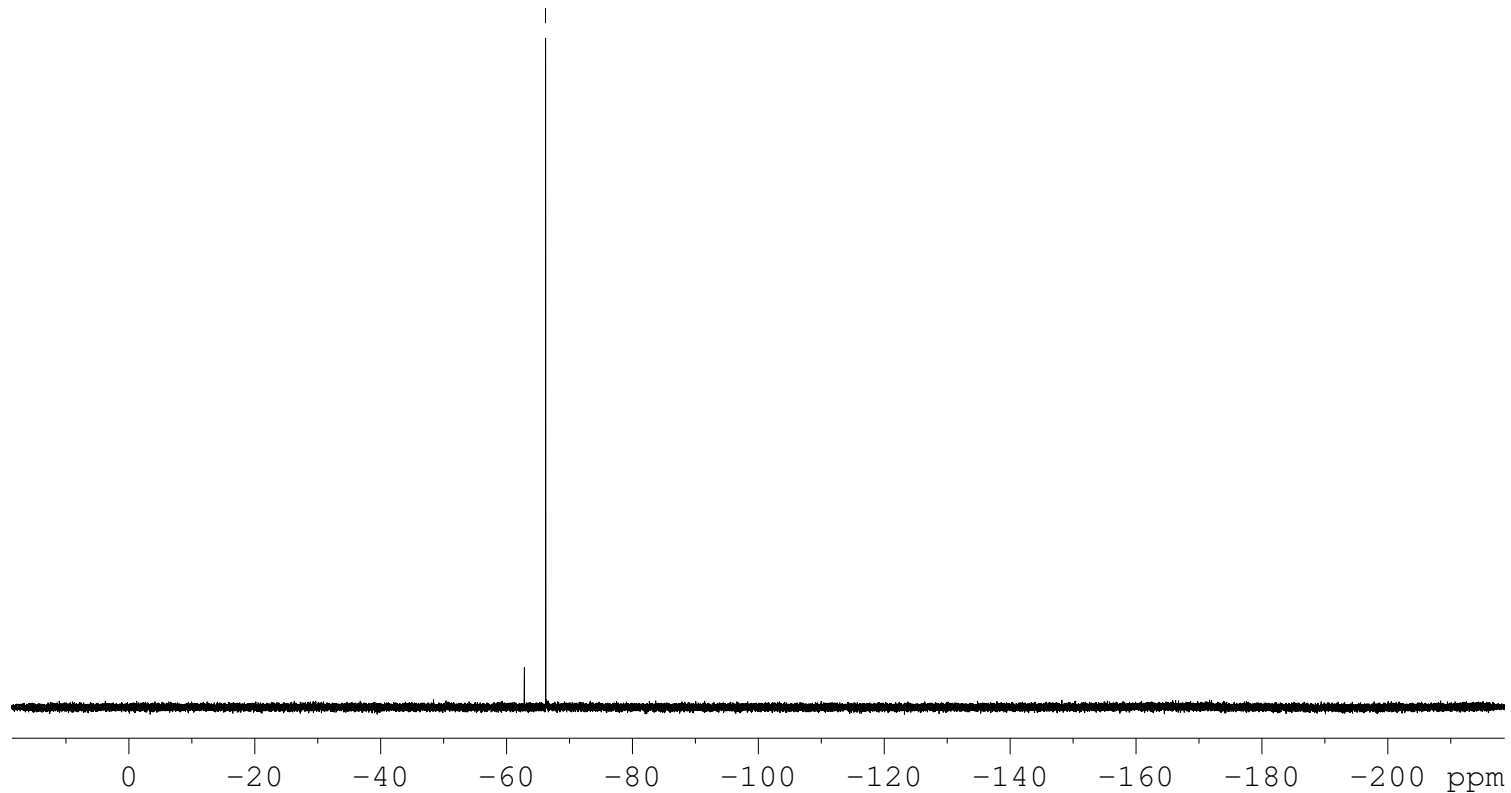
===== CHANNEL f1 =====
SFO1     150.9279571 MHz
NUC1     13C
P1       11.90 usec
SI       32768
SF       150.9128675 MHz
WDW      EM
SSB      0
LB       1.00 Hz
GB       0
PC       1.40
  
```





4k

---66.185



```

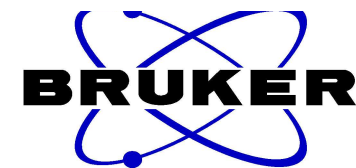
NAME      w11-525p-20210105
EXPNO     2
PROCNO    1
Date_     20210105
Time      20.29
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD         131072
SOLVENT   CDCl3
NS         16
DS         4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ         0.4893855 sec
RG         15.49
DW         3.733 usec
DE         6.50 usec
TE         294.7 K
D1         1.00000000 sec
D11        0.03000000 sec
D12        0.00002000 sec
TD0        1

```

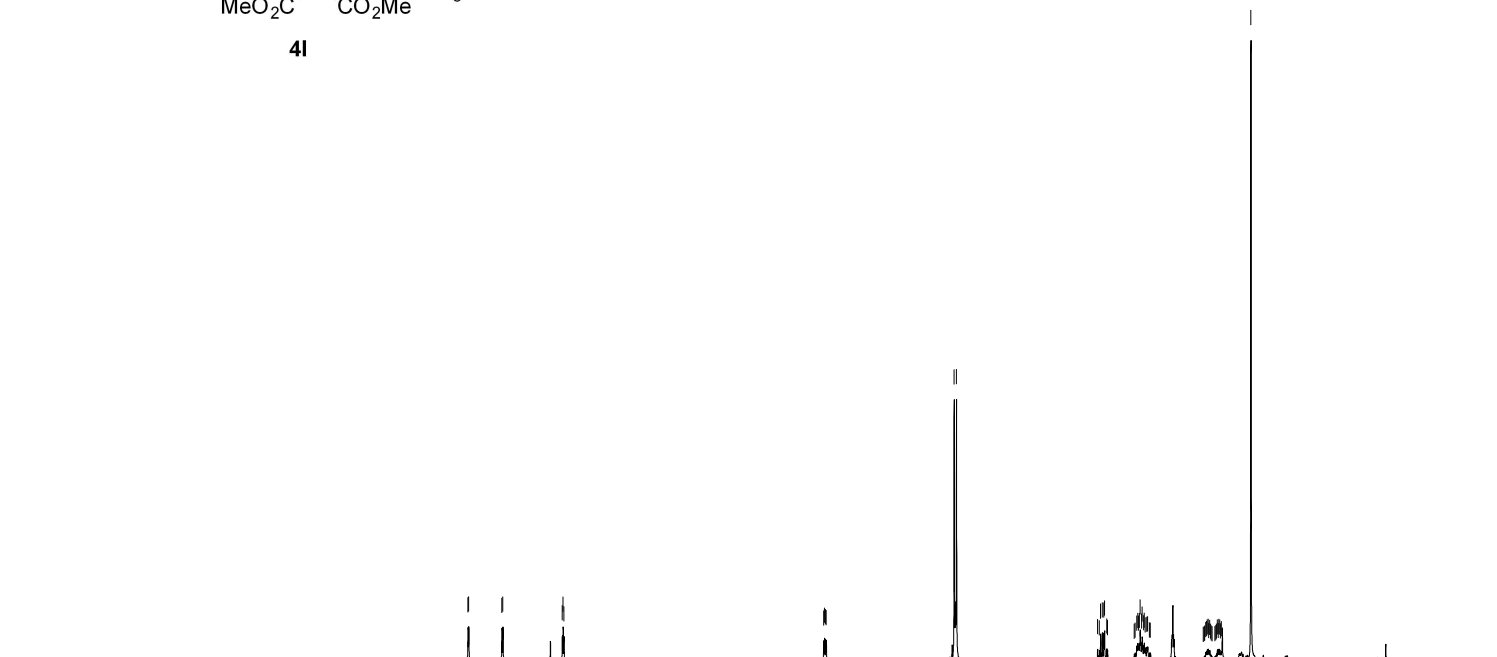
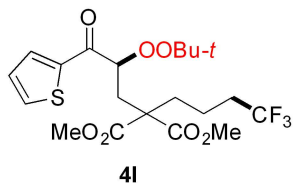
```

===== CHANNEL f1 =====
SFO1     564.6675534 MHz
NUC1      19F
P1        11.90 usec
SI        65536
SF        564.7240258 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00

```



7.992  
7.986  
7.697  
7.689  
7.171  
7.164  
7.156  
4.894  
4.887  
4.879  
4.872  
3.758  
3.738  
2.509  
2.494  
2.483  
2.468  
2.454  
2.448  
2.429  
2.422  
2.167  
2.158  
2.152  
2.145  
2.138  
2.125  
2.121  
2.107  
2.102  
2.094  
2.080  
2.073  
2.050  
1.567  
1.559  
1.554  
1.546  
1.533  
1.466  
1.453  
1.445  
1.431  
1.174

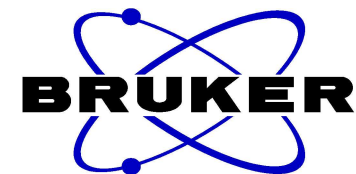
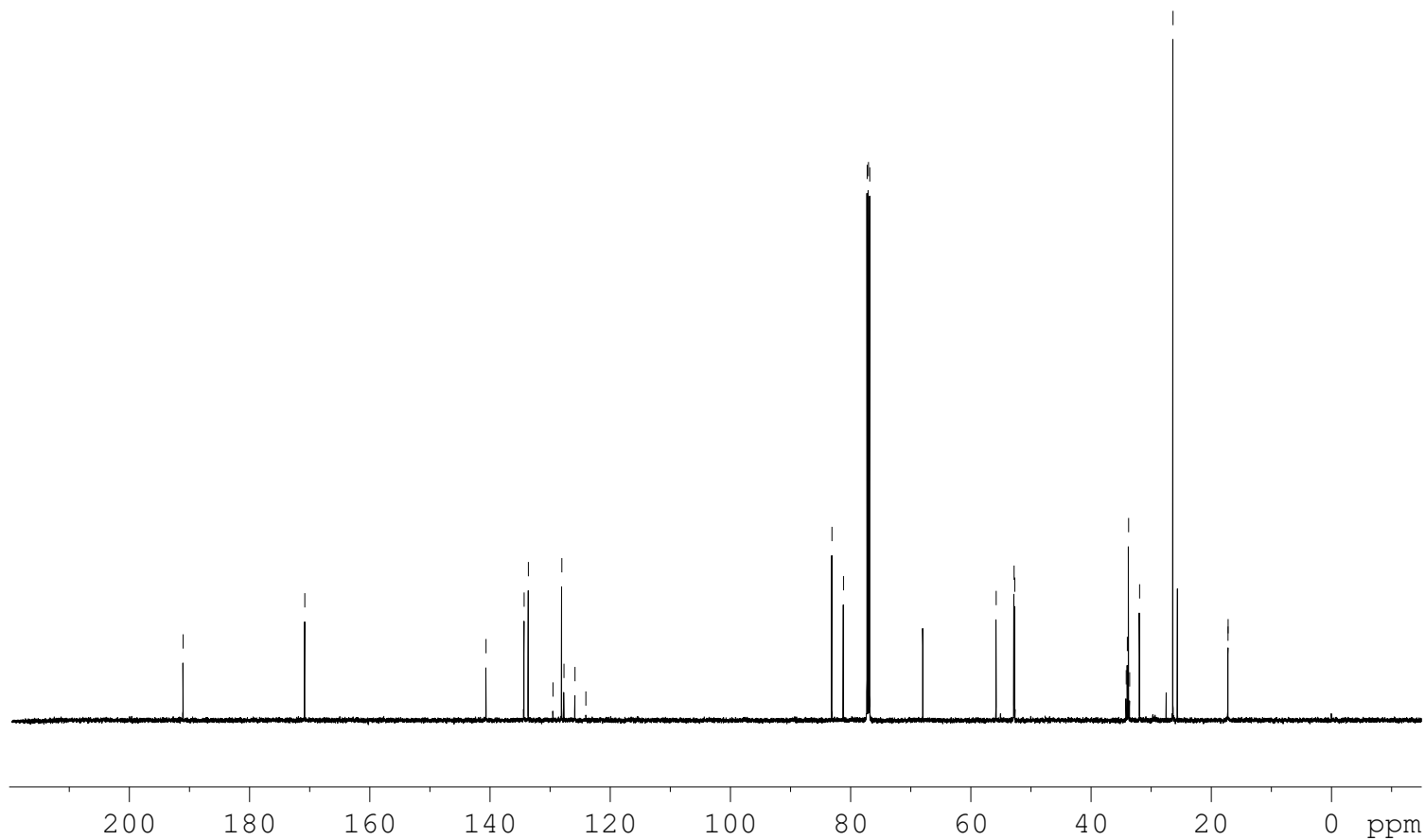
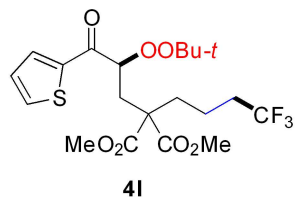


1.023  
1.000  
1.027  
1.032  
3.054  
3.057  
2.047  
3.991  
1.041  
1.041  
9.050

NAME w11-460p-20201120  
EXPNO 1  
PROCNO 1  
Date\_ 20201120  
Time 23.14  
INSTRUM spect  
PROBHD 5 mm PABBO BE/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 44.5  
DW 52.000 usec  
DE 6.50 usec  
TE 294.5 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700070 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

— 191.050  
 — 170.811  
 140.663  
 134.326  
 133.615  
 129.523  
 128.051  
 127.693  
 125.862  
 83.106  
 81.187  
 77.243  
 77.031  
 76.820  
 55.788  
 52.809  
 52.697  
 34.155  
 33.964  
 33.755  
 33.581  
 31.929  
 26.368  
 124.049  
 17.220  
 17.203

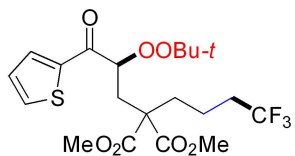


```

NAME      w11-460p-20201121
EXPNO      1
PROCNO     1
Date_      20201121
Time       12.24
INSTRUM    spect
PROBHD     5 mm PABBO BB/
PULPROG    zgpg30
TD          65536
SOLVENT    CDC13
NS          400
DS          4
SWH         36057.691 Hz
FIDRES     0.550197 Hz
AQ          0.9088159 sec
RG          190.02
DW          13.867 usec
DE          6.50 usec
TE          296.6 K
D1          2.0000000 sec
D11         0.0300000 sec
TD0         1
  
```

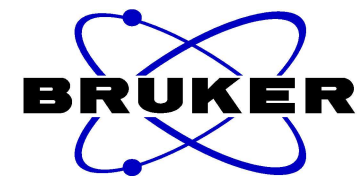
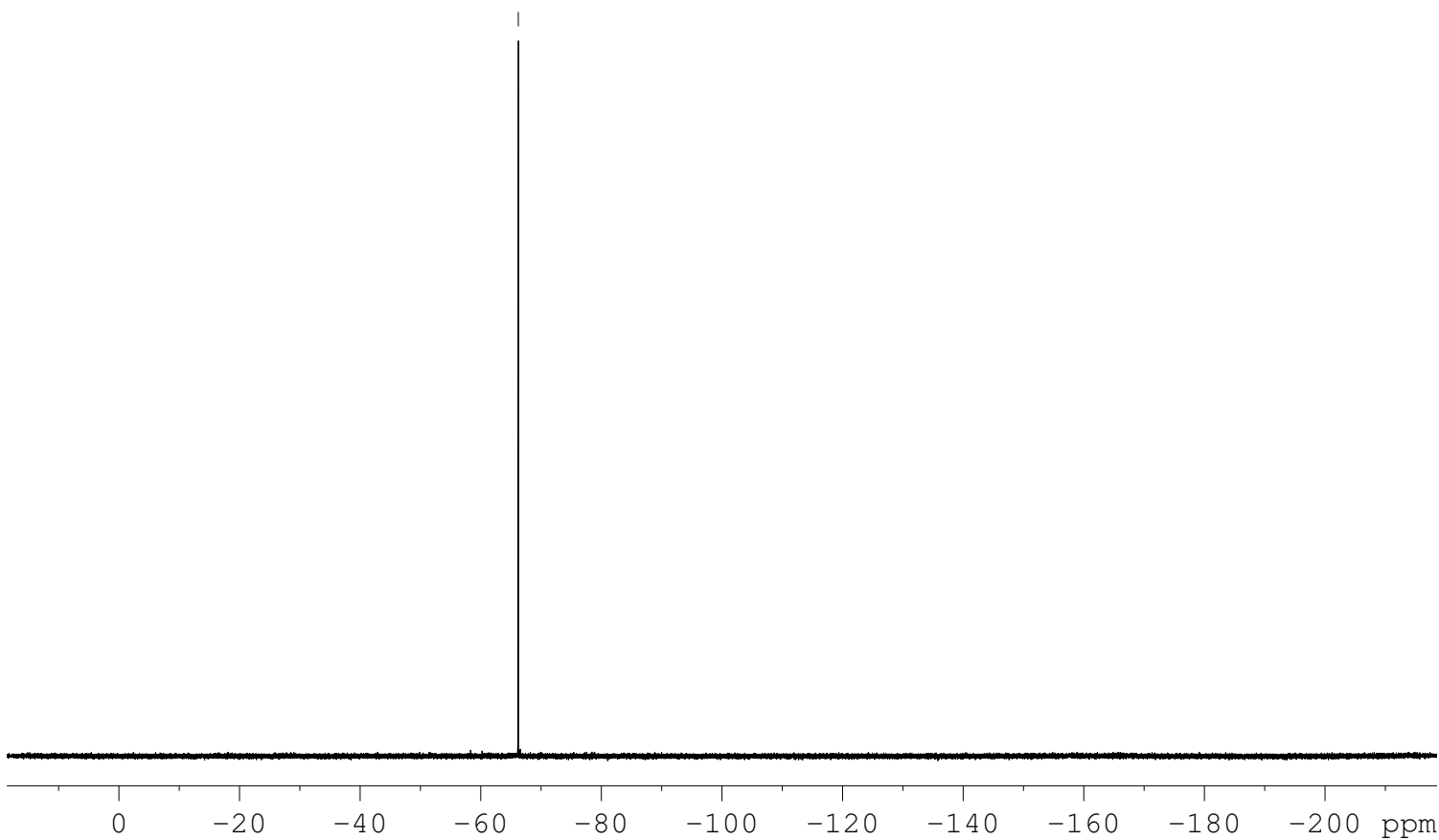
```

===== CHANNEL f1 =====
SFO1       150.9279571 MHz
NUC1        13C
P1          11.90 usec
SI          32768
SF          150.9128665 MHz
WDW         EM
SSB         0
LB          1.00 Hz
GB          0
PC          1.40
  
```



41

---66.226



```

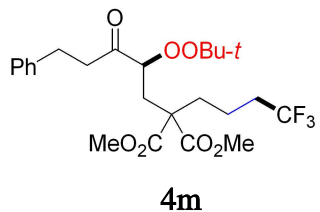
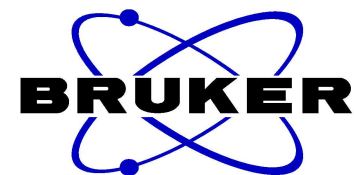
NAME      w11-460p-20201120
EXPNO     2
PROCNO    1
Date_     20201120
Time      23.15
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDCl3
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        294.5 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1

```

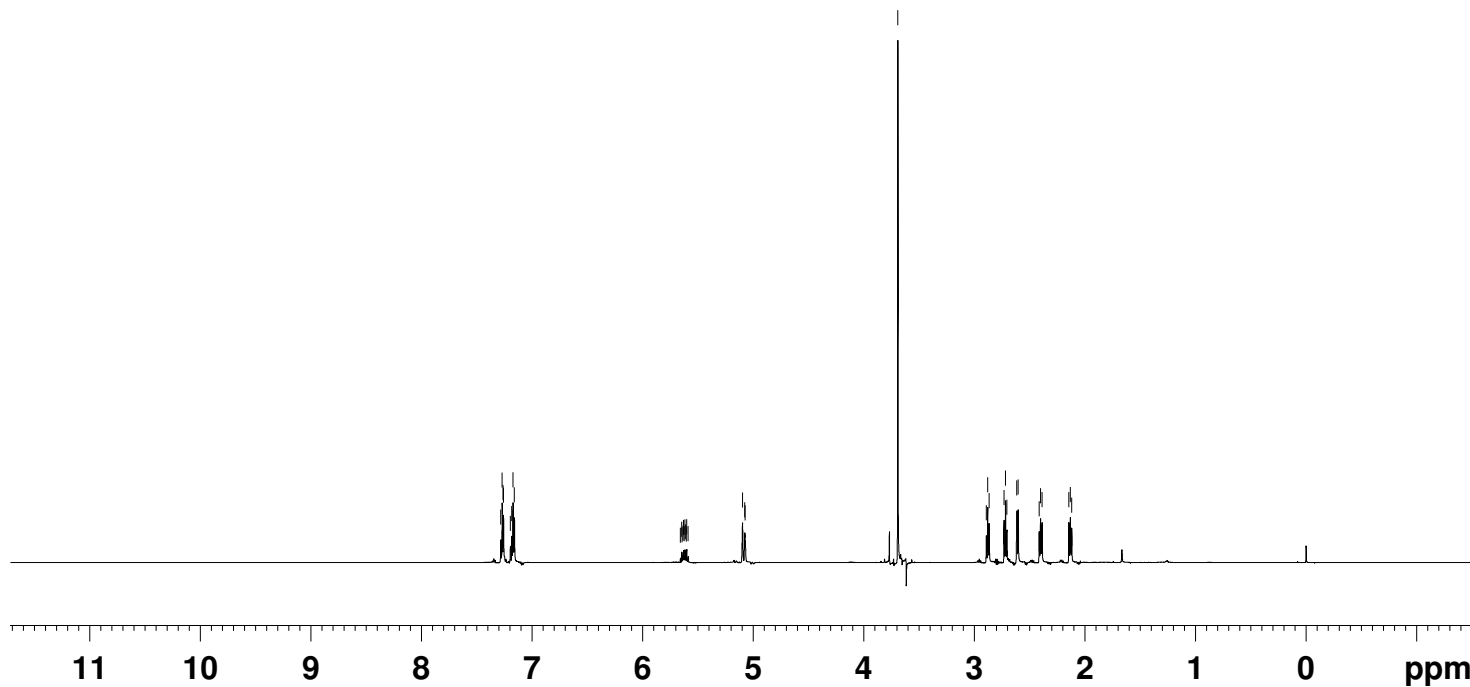
```

===== CHANNEL f1 =====
SFO1     564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00

```



7.284  
7.271  
7.263  
7.259  
7.197  
7.184  
7.173  
7.161  
5.659  
5.647  
5.643  
5.635  
5.631  
5.624  
5.618  
5.614  
5.605  
5.602  
5.589  
5.097  
5.077  
5.073  
3.693  
2.892  
2.880  
2.867  
2.732  
2.719  
2.706  
2.617  
2.605  
2.414  
2.402  
2.388  
2.146  
2.132  
2.120

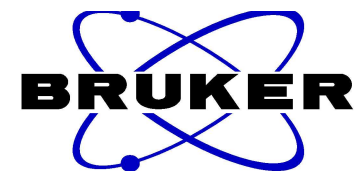


1.95  
3.00  
1.05  
2.15  
6.04  
2.05  
2.04  
2.05  
2.07  
2.04

S69

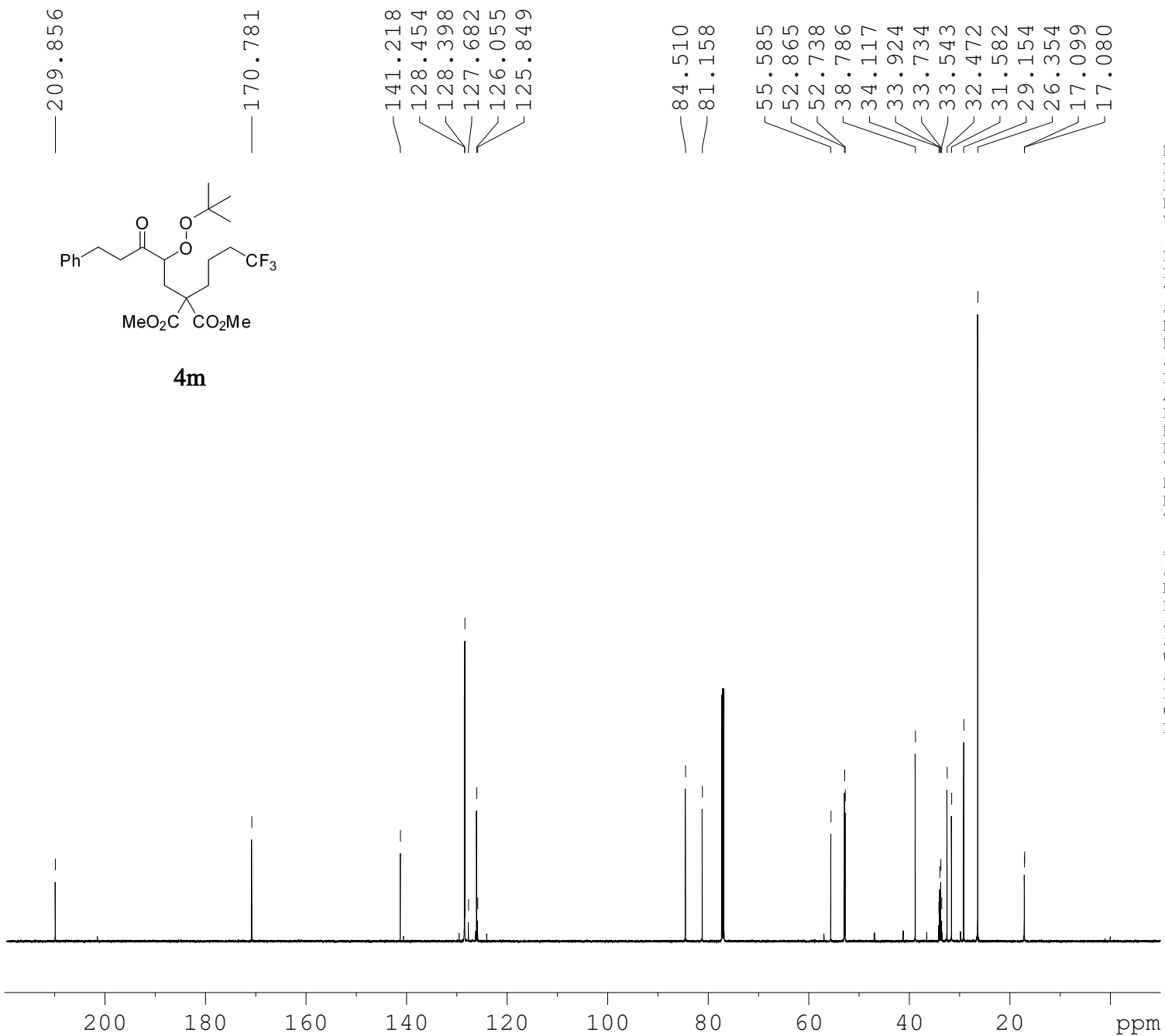
NAME w11-4-16-1-20210612  
EXPNO 1  
PROCNO 1  
Date\_ 20210612  
Time 11.15  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 44.5  
DW 52.000 usec  
DE 6.50 usec  
TE 296.1 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.96 usec  
SI 65536  
SF 600.1700136 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

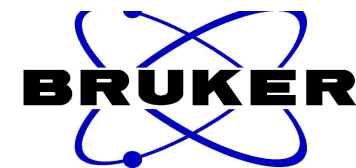


NAME wll-4-17-1p-20210420  
EXPNO 3  
PROCNO 1  
Date\_ 20210420  
Time 15.15  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.1 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 14.00 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



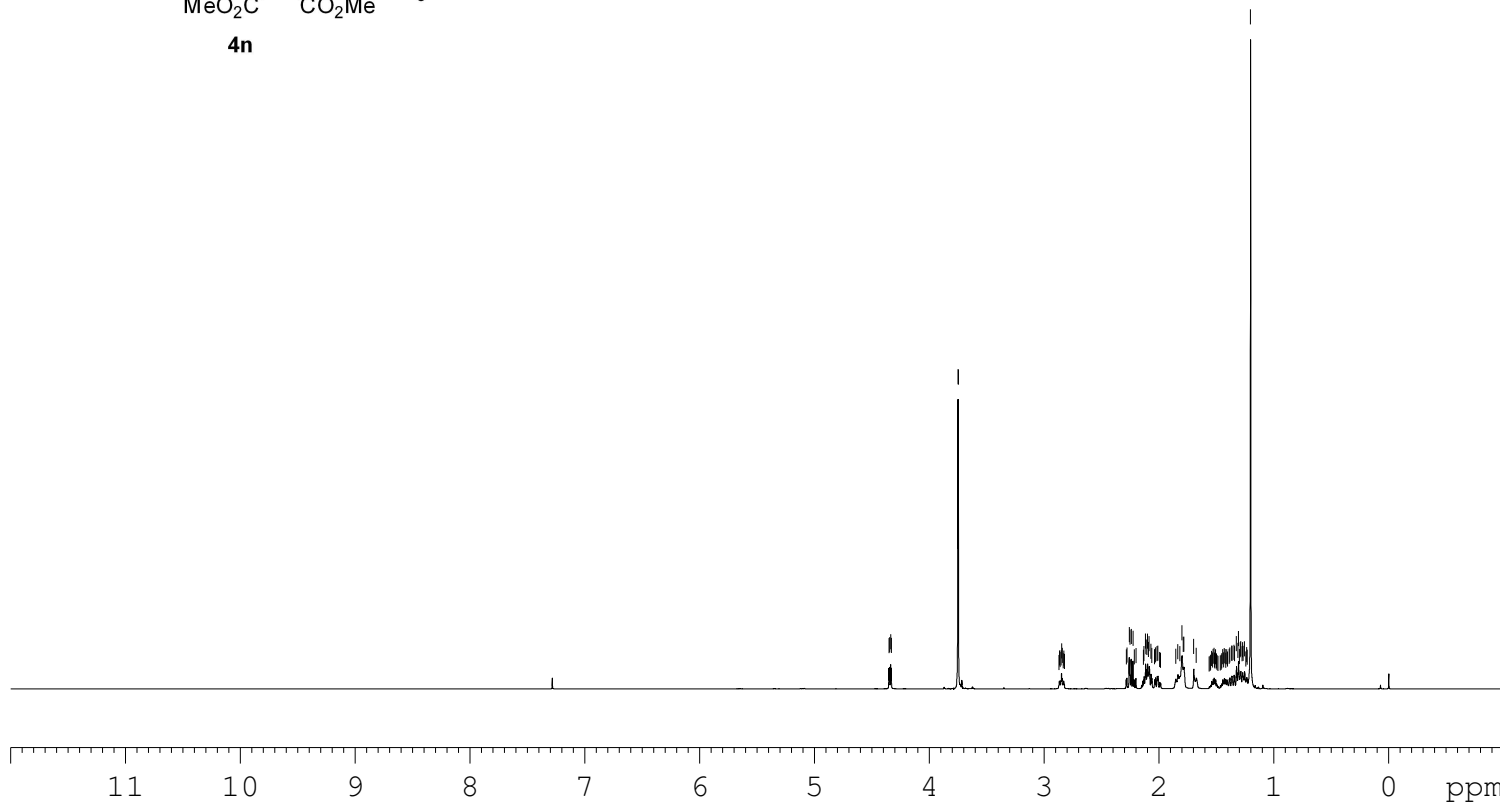
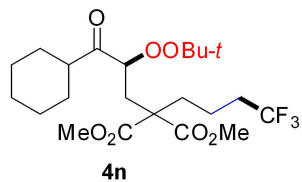




NAME w11-535-1-20210112  
EXPNO 1  
PROCNO 1  
Date\_ 20210113  
Time 1.45  
INSTRUM spect  
PROBHD 5 mm PABBO BE/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 28.69  
DW 52.000 usec  
DE 6.50 usec  
TE 294.5 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700026 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

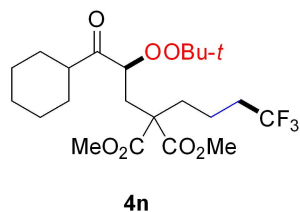
4.351  
4.345  
4.336  
4.330  
3.750  
3.746  
2.847  
2.258  
2.252  
2.240  
2.225  
2.131  
2.118  
2.114  
2.105  
2.100  
2.092  
2.087  
2.070  
2.031  
2.017  
2.010  
1.836  
1.818  
1.800  
1.789  
1.783  
1.698  
1.383  
1.367  
1.364  
1.347  
1.342  
1.327  
1.313  
1.308  
1.293  
1.288  
1.277  
1.272  
1.268  
1.256  
1.236  
1.204



0.975  
6.075  
0.973  
2.041  
3.097  
1.052  
4.157  
1.067  
0.996  
5.842  
9.084



— 213.157



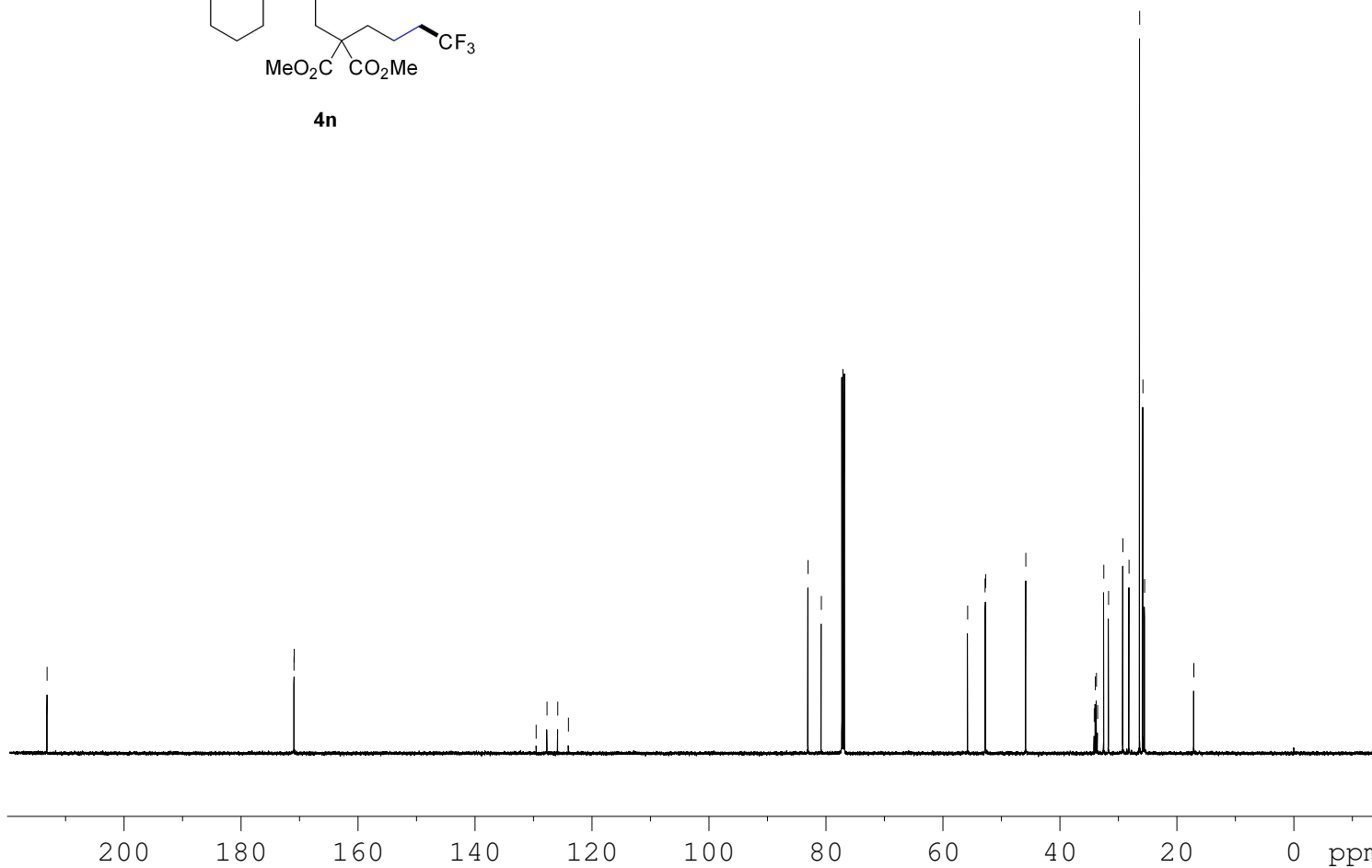
129.544  
124.024  
170.943  
170.908  
127.686  
125.855

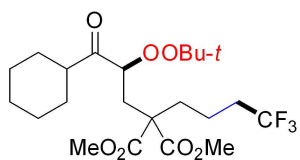
83.062  
80.794  
55.776  
52.802  
52.700  
45.830  
34.133  
33.942  
33.749  
33.559  
32.501  
31.684  
29.234  
28.182  
26.369  
25.807  
25.520  
17.116  
17.100



NAME wll-535-1-20210112  
EXPNO 3  
PROCNO 1  
Date\_ 20210113  
Time 9.31  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 300  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 295.9 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

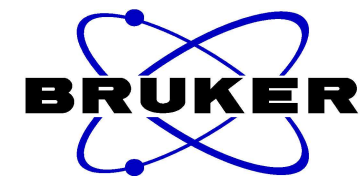
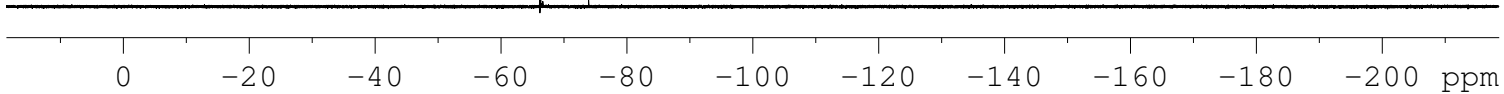
==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40





4n

66.283



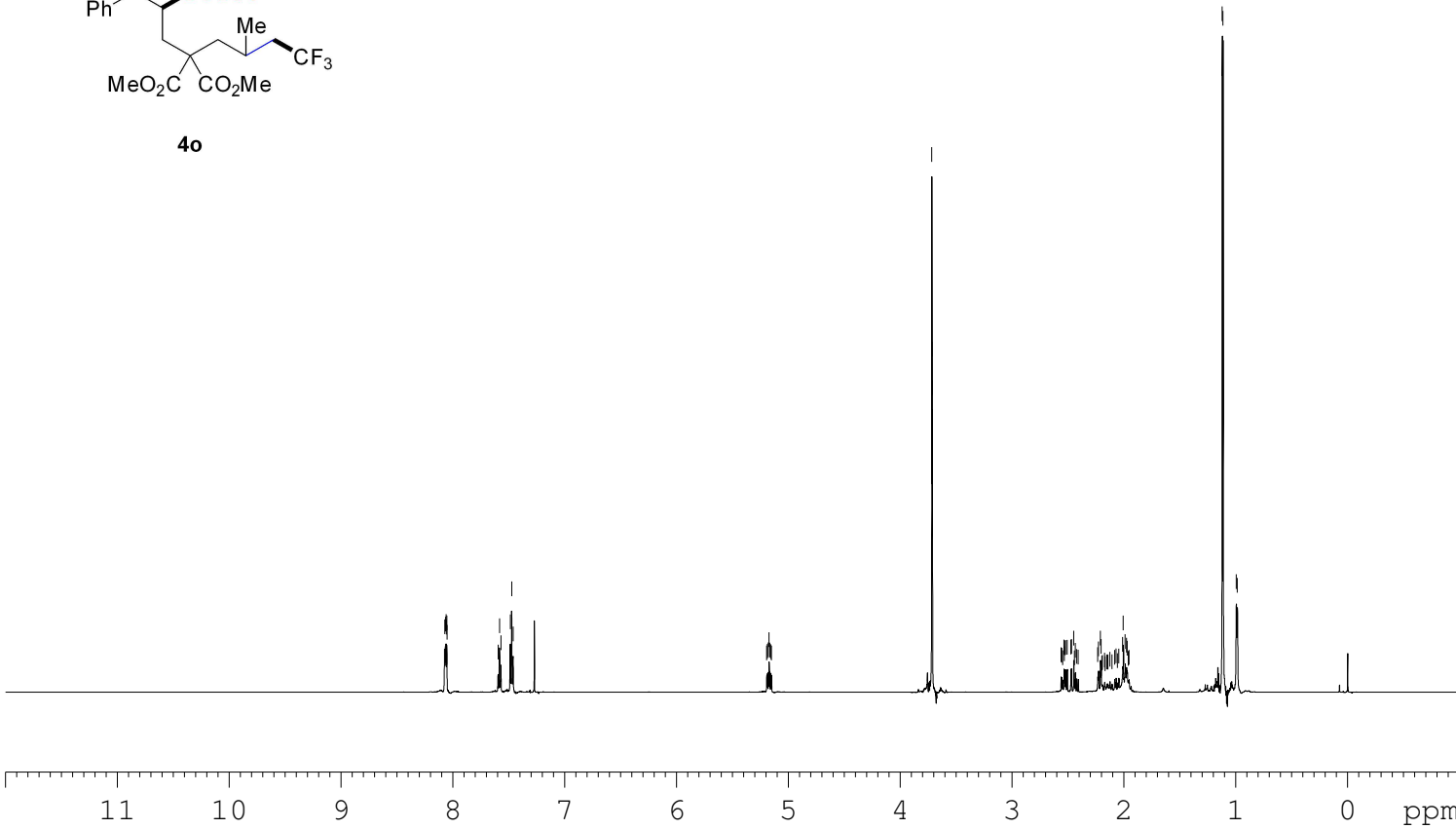
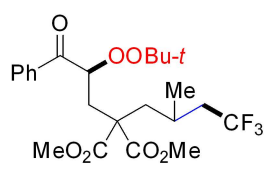
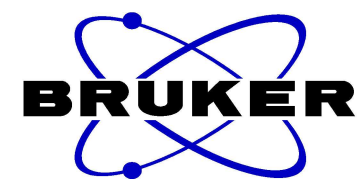
```

NAME      w11-535-1-20210112
EXPNO     2
PROCNO    1
Date_     20210113
Time      1.47
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDCl3
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        294.6 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
SF01     564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
  
```

8.072  
8.066  
8.060  
8.058  
8.054  
8.052  
7.594  
7.582  
7.570  
7.486  
7.473  
7.461  
5.194  
5.188  
5.180  
5.173  
5.166  
5.158  
5.152  
3.718  
3.716  
3.713  
2.536  
2.533  
2.530  
2.522  
2.507  
2.474  
2.468  
2.449  
2.434  
2.234  
2.227  
2.210  
2.204  
2.011  
2.006  
1.989  
1.976  
1.971  
1.121  
1.114  
0.995  
0.986



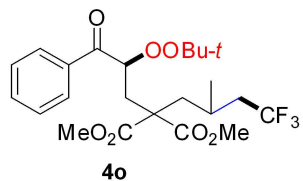
```

NAME      w11-521p-20201230
EXPNO     1
PROCNO    1
Date_     20201230
Time      14.51
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         8
DS         0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ        3.4079220 sec
RG         44.5
DW        52.000 usec
DE        6.50 usec
TE        294.6 K
D1        1.00000000 sec
TD0       1
  
```

```

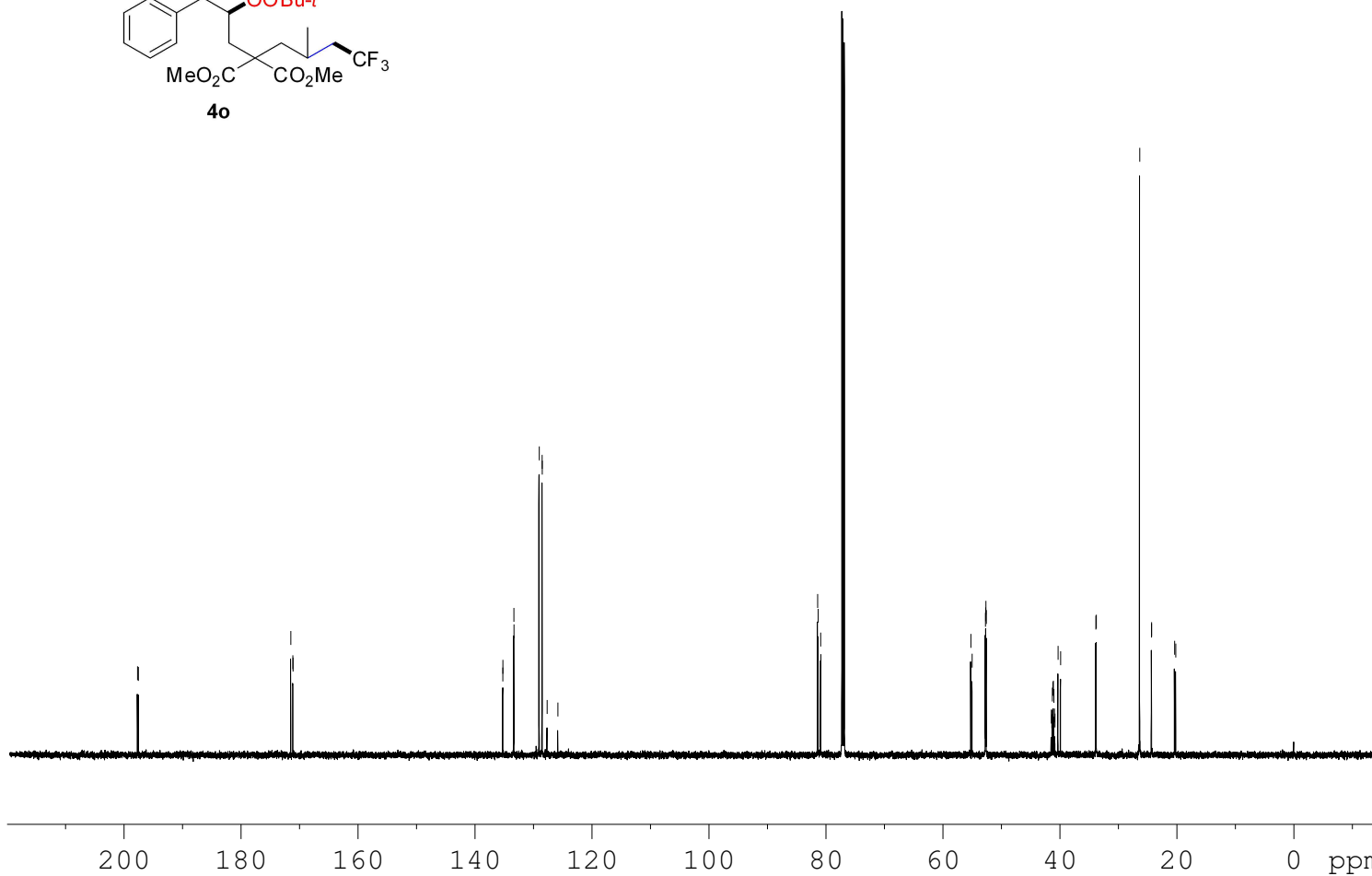
===== CHANNEL f1 =====
SFO1      600.1739011 MHz
NUC1      1H
P1        9.77 usec
SI        65536
SF        600.1700097 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```

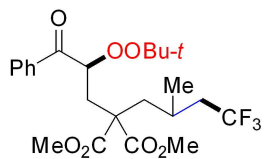
197.691  
 197.545  
 171.488  
 171.143  
 171.106  
 135.245  
 135.233  
 133.351  
 133.335  
 129.048  
 129.012  
 128.524  
 128.502  
 127.667  
 125.829  
 81.421  
 81.331  
 80.903  
 80.863  
 55.222  
 55.008  
 52.728  
 52.700  
 52.655  
 52.583  
 41.477  
 41.386  
 41.296  
 41.206  
 41.119  
 41.027  
 40.937  
 40.847  
 40.315  
 39.881  
 33.858  
 33.777  
 26.355



NAME w11-521p-20201230  
 EXPNO 3  
 PROCNO 1  
 Date\_ 20201230  
 Time 17.34  
 INSTRUM spect  
 PROBHD 5 mm PABBO BB/  
 PULPROG zgpg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 300  
 DS 4  
 SWH 36057.691 Hz  
 FIDRES 0.550197 Hz  
 AQ 0.9088159 sec  
 RG 190.02  
 DW 13.867 usec  
 DE 6.50 usec  
 TE 295.9 K  
 D1 2.0000000 sec  
 D11 0.0300000 sec  
 TD0 1

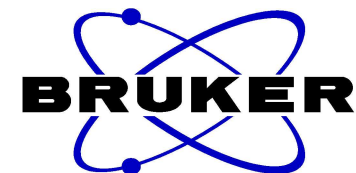
===== CHANNEL f1 =====  
 SFO1 150.9279571 MHz  
 NUC1 13C  
 P1 11.90 usec  
 SI 32768  
 SF 150.9128665 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40





4o

--63.007  
--63.091

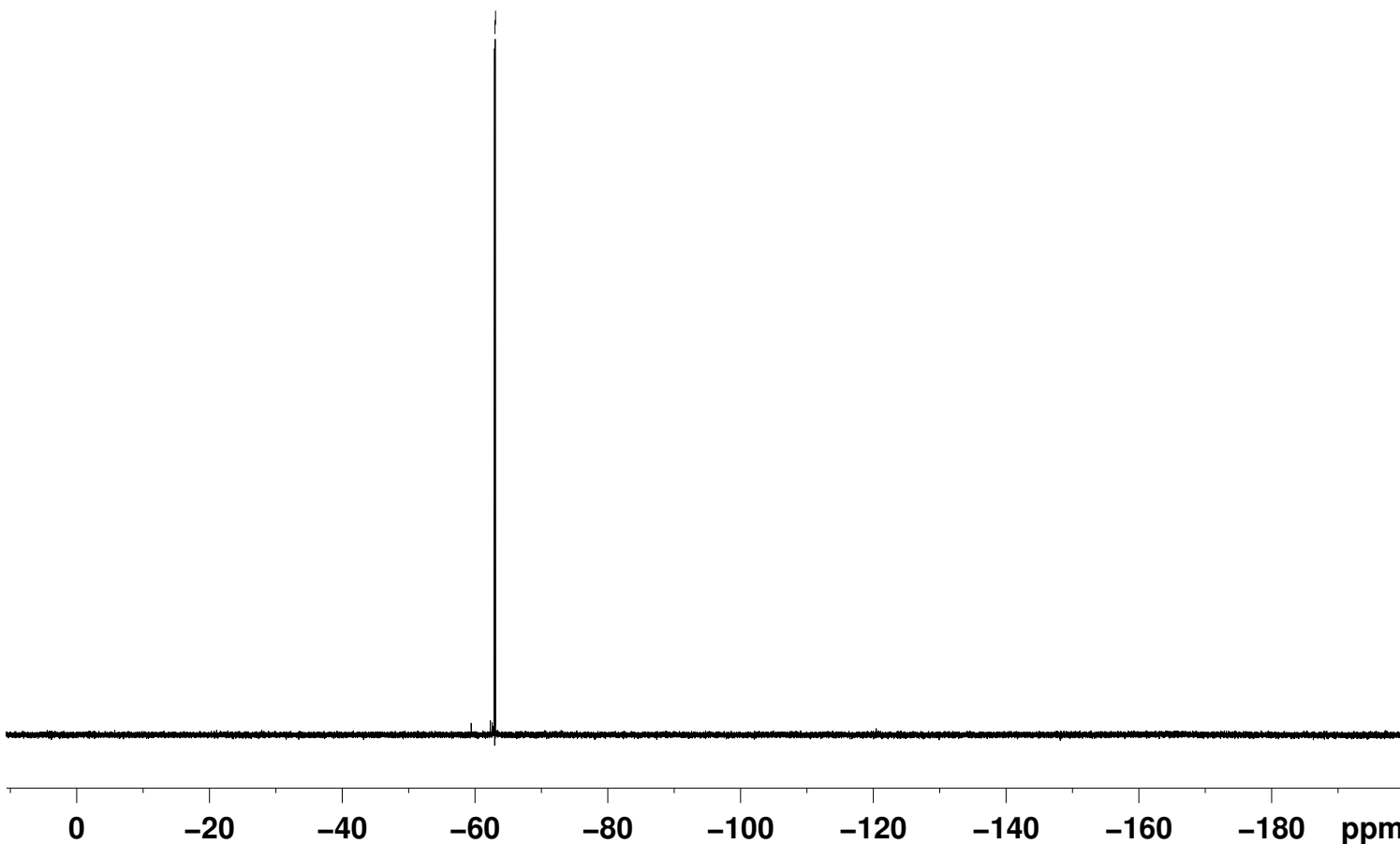


```

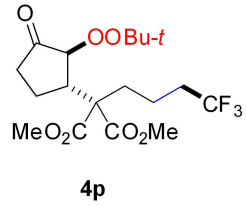
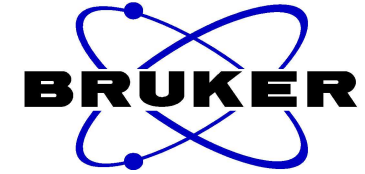
NAME      w11-521p-20201228
EXPNO     2
PROCNO    1
Date_     20201228
Time      18.21
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDC13
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        296.1 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
SFO1     564.6675534 MHz
NUC1      19F
P1        11.90 usec
SI        65536
SF        564.7240258 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```

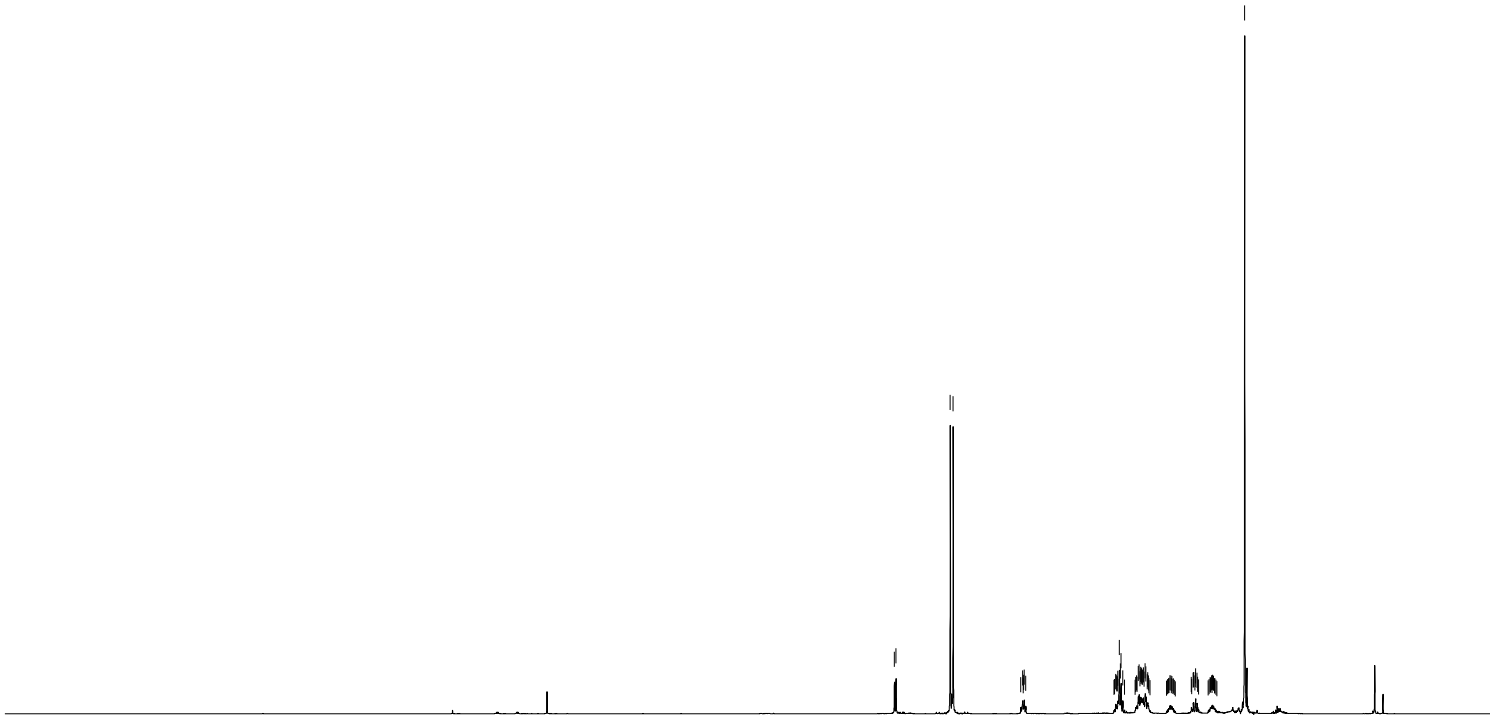


4.254  
4.240  
3.768  
3.743  
3.154  
3.137  
3.132  
3.128  
3.123  
3.110  
2.337  
2.327  
2.322  
2.317  
2.312  
2.308  
2.295  
2.286  
2.280  
2.265  
2.152  
2.145  
2.140  
2.130  
2.123  
2.115  
2.109  
2.106  
2.101  
2.098  
2.092  
2.085  
2.079  
2.071  
2.064  
2.052  
2.047  
2.042  
2.038  
1.866  
1.863  
1.854  
1.845  
1.842  
1.837  
1.828  
1.825  
1.668  
1.652  
1.648  
1.637  
1.634  
1.631  
1.619  
1.613  
1.605  
1.513  
1.504  
1.500  
1.492  
1.488  
1.483  
1.475  
1.466  
1.462  
1.204



NAME w11-524p-20201230  
EXPNO 1  
PROCNO 1  
Date\_ 20201230  
Time 13.56  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 38.1  
DW 52.000 usec  
DE 6.50 usec  
TE 294.3 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700053 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



1.00  
3.03  
3.00  
0.97  
3.01  
4.08  
0.95  
1.07  
1.01  
9.04

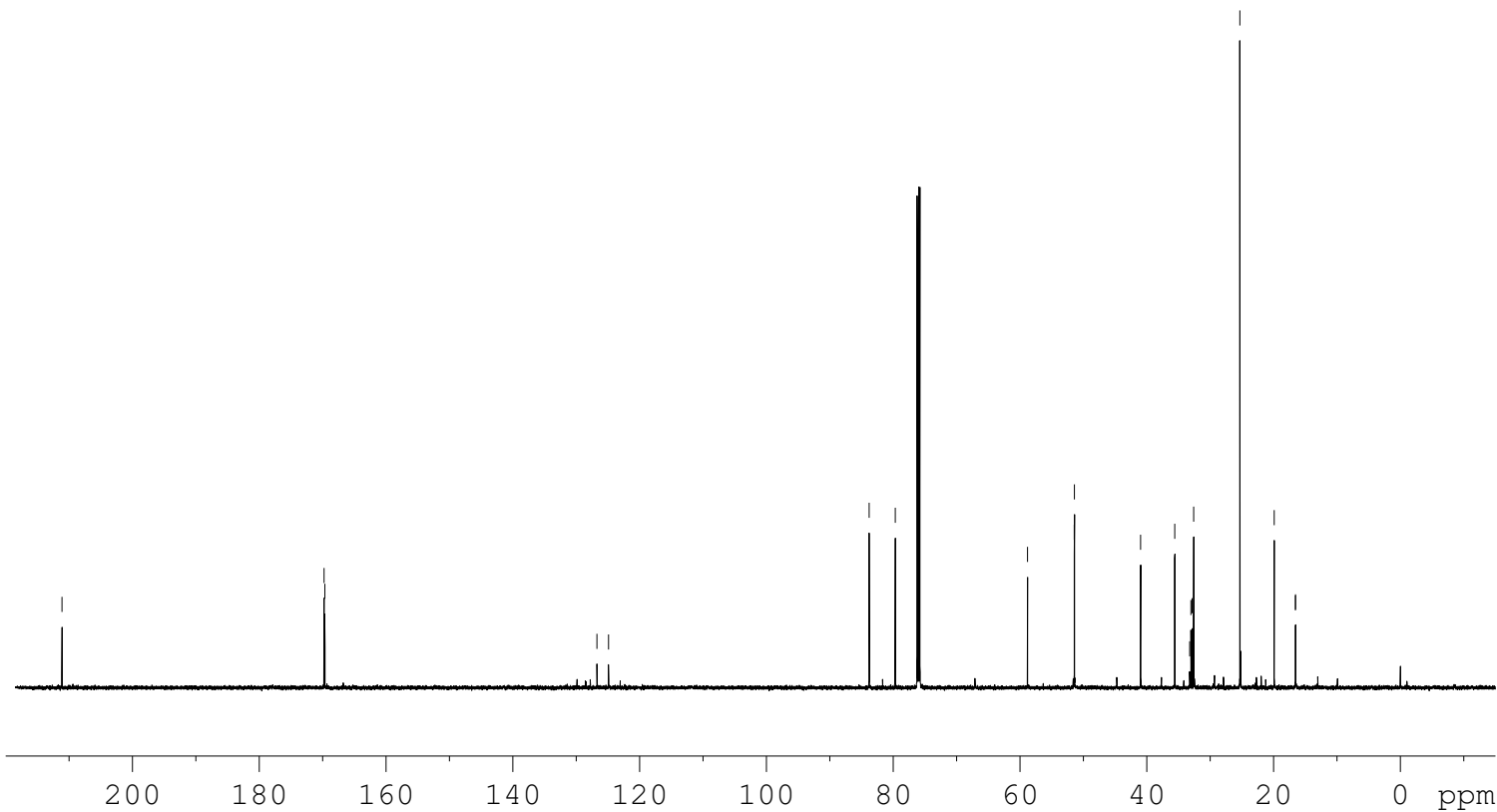
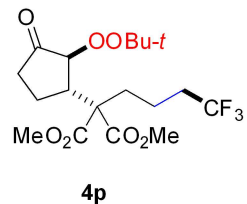
—211.116

< 169.775  
< 169.650

< 126.734  
< 124.903

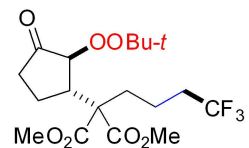
— 83.795  
— 79.673

< 58.813  
< 51.444  
< 51.418  
< 40.979  
< 35.592  
< 33.234  
< 33.044  
< 32.854  
< 32.664  
< 32.605  
< 25.322  
< 19.901  
< 16.558  
< 16.541



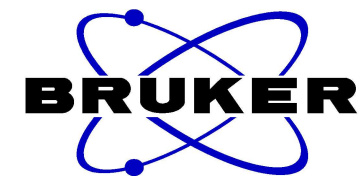
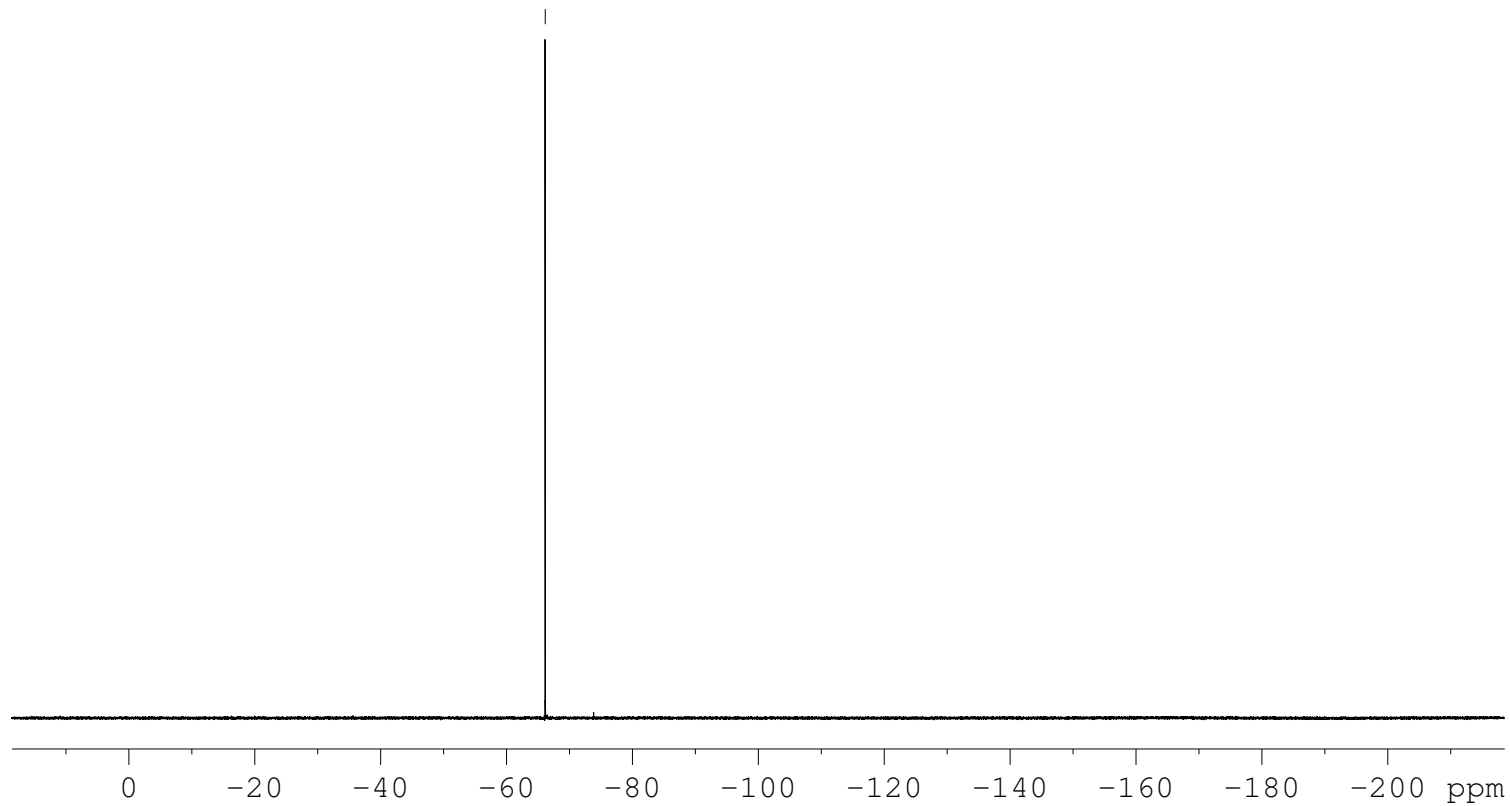
NAME w11-524p-20201230  
EXPNO 2  
PROCNO 1  
Date\_ 20201230  
Time 14.17  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 400  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 295.6 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9130212 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



4p

---66.145



```

NAME      w11-524p-20201230
EXPNO     3
PROCNO    1
Date_     20201230
Time      14.19
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD         131072
SOLVENT   CDC13
NS         16
DS         4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG         15.49
DW         3.733 usec
DE         6.50 usec
TE         294.9 K
D1         1.00000000 sec
D11        0.03000000 sec
D12        0.00002000 sec
TD0        1

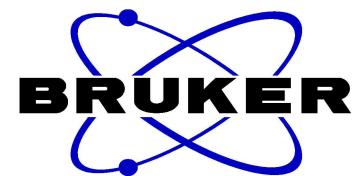
```

```

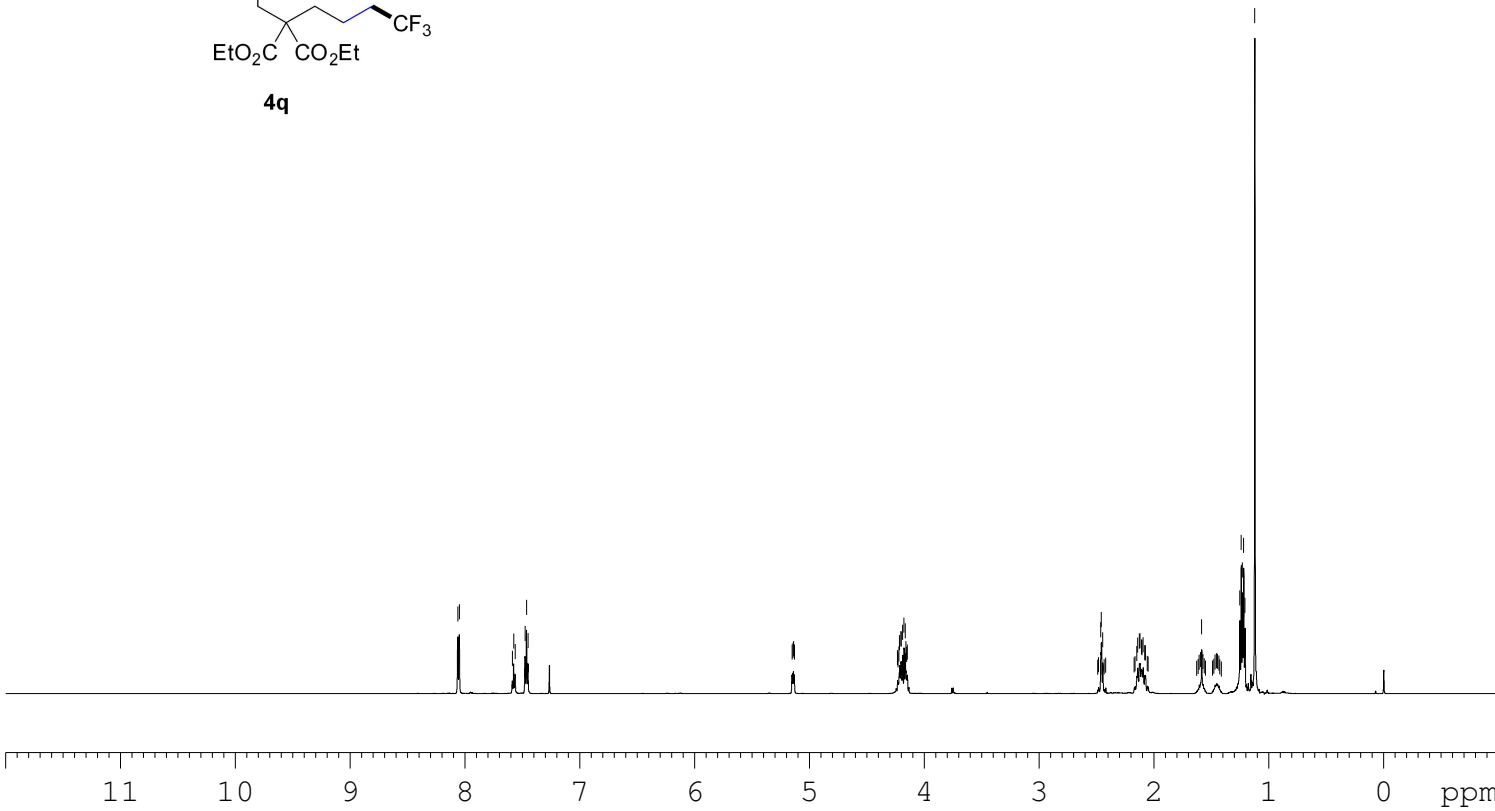
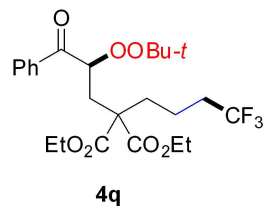
===== CHANNEL f1 =====
SFO1      564.6675534 MHz
NUC1       19F
P1         11.90 usec
SI         65536
SF         564.7240258 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00

```





8.062  
8.049  
7.587  
7.575  
7.563  
7.476  
7.463  
7.451  
5.151  
5.144  
5.138  
5.131  
4.234  
4.229  
4.221  
4.216  
4.204  
4.201  
4.189  
4.178  
4.166  
4.160  
4.154  
4.148  
2.464  
2.459  
2.447  
2.150  
2.142  
2.128  
2.122  
2.108  
2.104  
2.095  
2.081  
2.075  
1.594  
1.585  
1.253  
1.241  
1.230  
1.220  
1.208  
1.123



NAME wll-418p-20201106  
EXPNO 1  
PROCNO 1  
Date\_ 20201106  
Time 16.56  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 69.87  
DW 52.000 usec  
DE 6.50 usec  
TE 298.7 K  
D1 1.00000000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700135 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

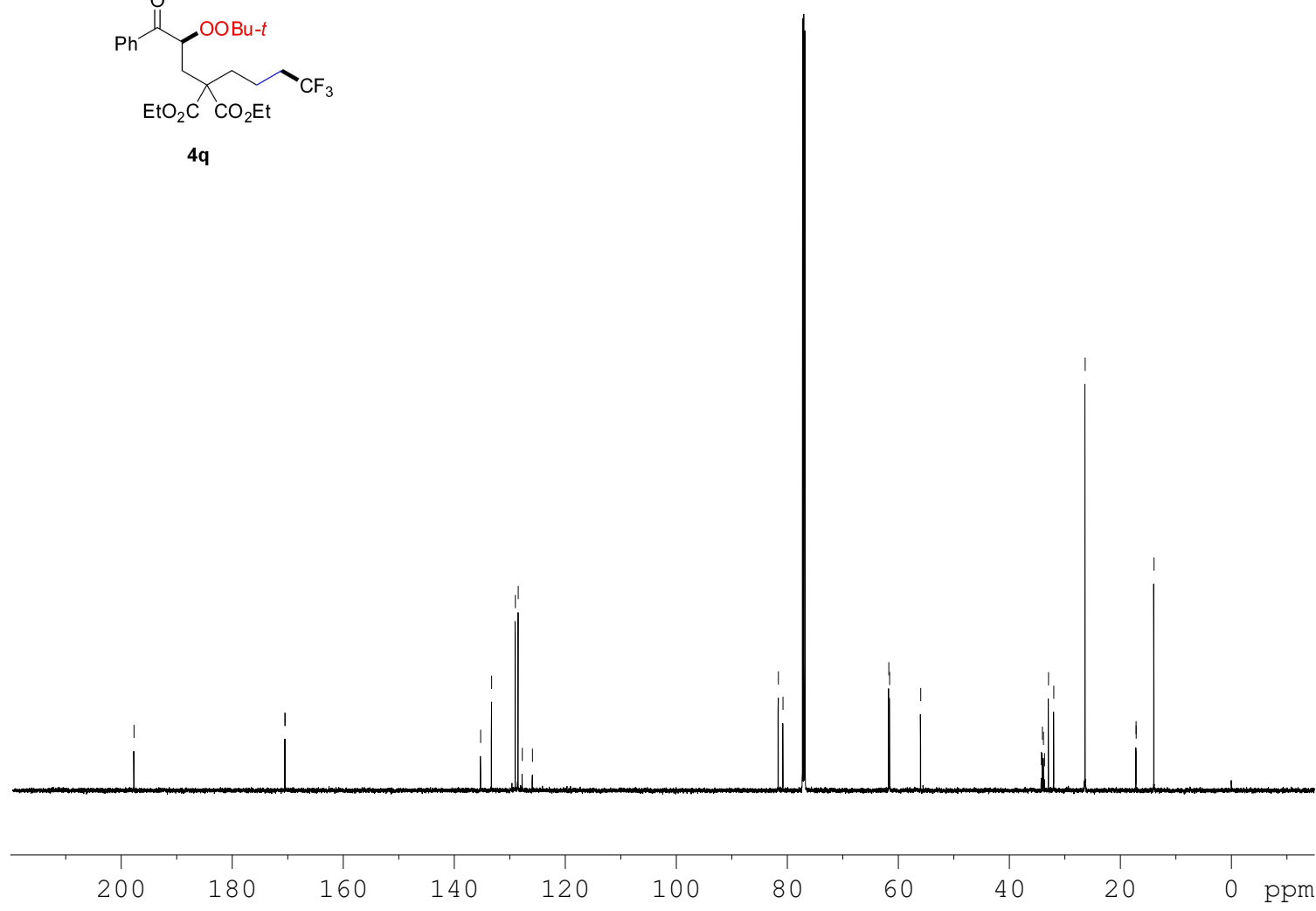
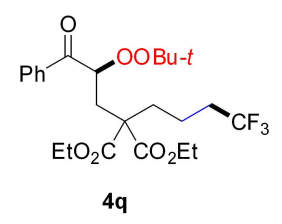
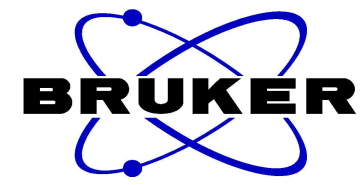
— 197.695

< 170.530  
< 170.459

< 135.250  
< 133.271  
< 128.995  
< 128.479  
< 127.744  
< 125.914

< 81.612  
< 80.780

< 61.718  
< 61.571  
— 55.965  
< 34.236  
< 34.046  
< 33.855  
< 33.663  
< 32.944  
< 31.997  
< 26.346  
< 17.174  
< 17.156  
< 13.937



```

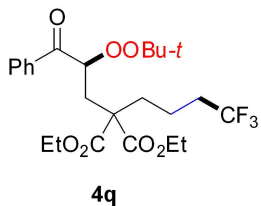
NAME      w11-418p-20201106
EXPNO      3
PROCNO     1
Date_      20201106
Time       17.39
INSTRUM    spect
PROBHD     5 mm PABBO BB/
PULPROG    zgpg30
TD         65536
SOLVENT    CDC13
NS         800
DS         4
SWH        36057.691 Hz
FIDRES     0.550197 Hz
AQ         0.9088159 sec
RG         190.02
DW         13.867 usec
DE         6.50 usec
TE         299.5 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1

```

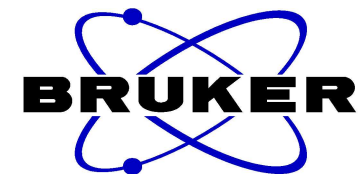
```

===== CHANNEL f1 =====
SFO1      150.9279571 MHz
NUC1       13C
P1         11.90 usec
SI         32768
SF         150.9128665 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40

```



--66.281



```

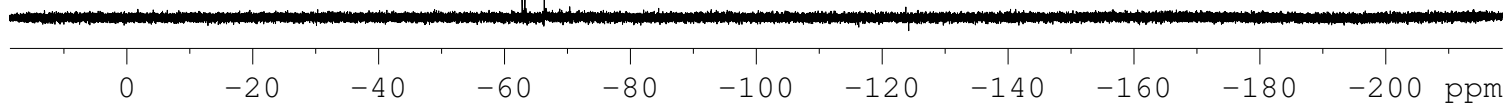
NAME      w11-418p-20201106
EXPNO     2
PROCNO    1
Date_     20201106
Time      16.58
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDCl3
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        298.6 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1

```

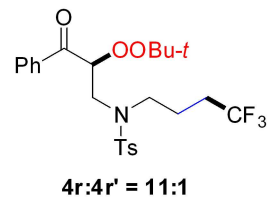
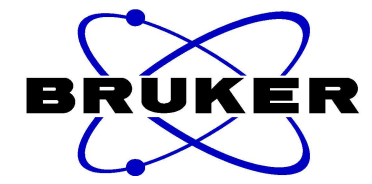
```

===== CHANNEL f1 =====
SFO1      564.6675534 MHz
NUC1      19F
P1        11.90 usec
SI        65536
SF        564.7240258 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00

```



8.064  
8.052  
7.681  
7.667  
7.629  
7.617  
7.604  
7.519  
7.505  
7.493  
7.301  
7.287  
5.659  
5.653  
5.646  
5.640  
3.749  
3.743  
3.723  
3.717  
3.414  
3.404  
3.393  
3.390  
3.359  
3.345  
3.333  
3.319  
3.228  
3.225  
3.215  
2.417  
2.108  
2.097  
2.090  
2.083  
2.080  
2.075  
2.072  
1.904  
1.890  
1.879  
1.863  
1.101

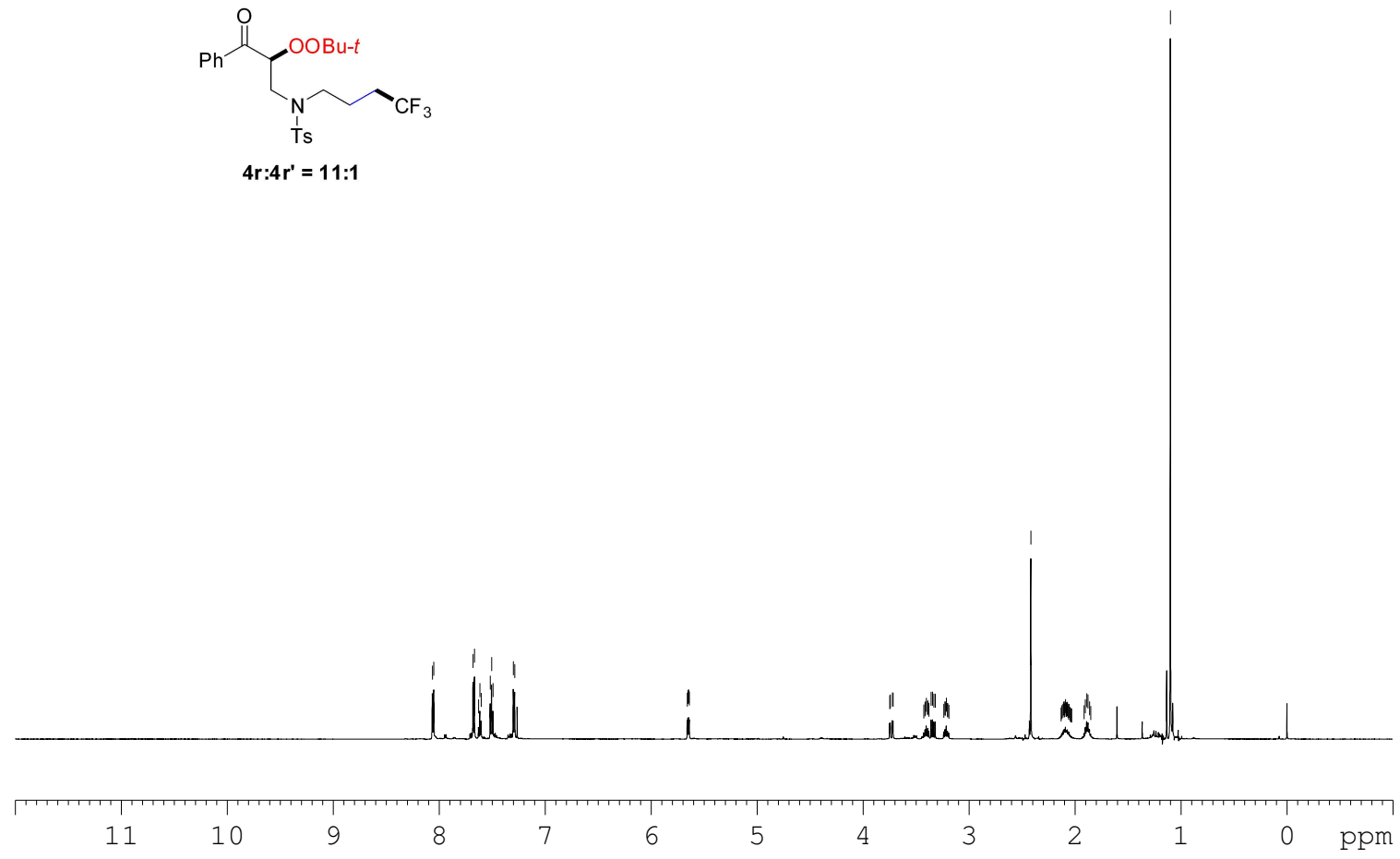


```

NAME      w11-1-21-3-a-20210121
EXPNO     1
PROCNO    1
Date_     20210121
Time      20.27
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD        65536
SOLVENT   CDC13
NS        8
DS        0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ        3.4079220 sec
RG        62.22
DW        52.000 usec
DE        6.50 usec
TE        294.5 K
D1        1.00000000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
SFO1     600.1739011 MHz
NUC1     1H
P1       9.77 usec
SI       65536
SF       600.1700131 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
  
```



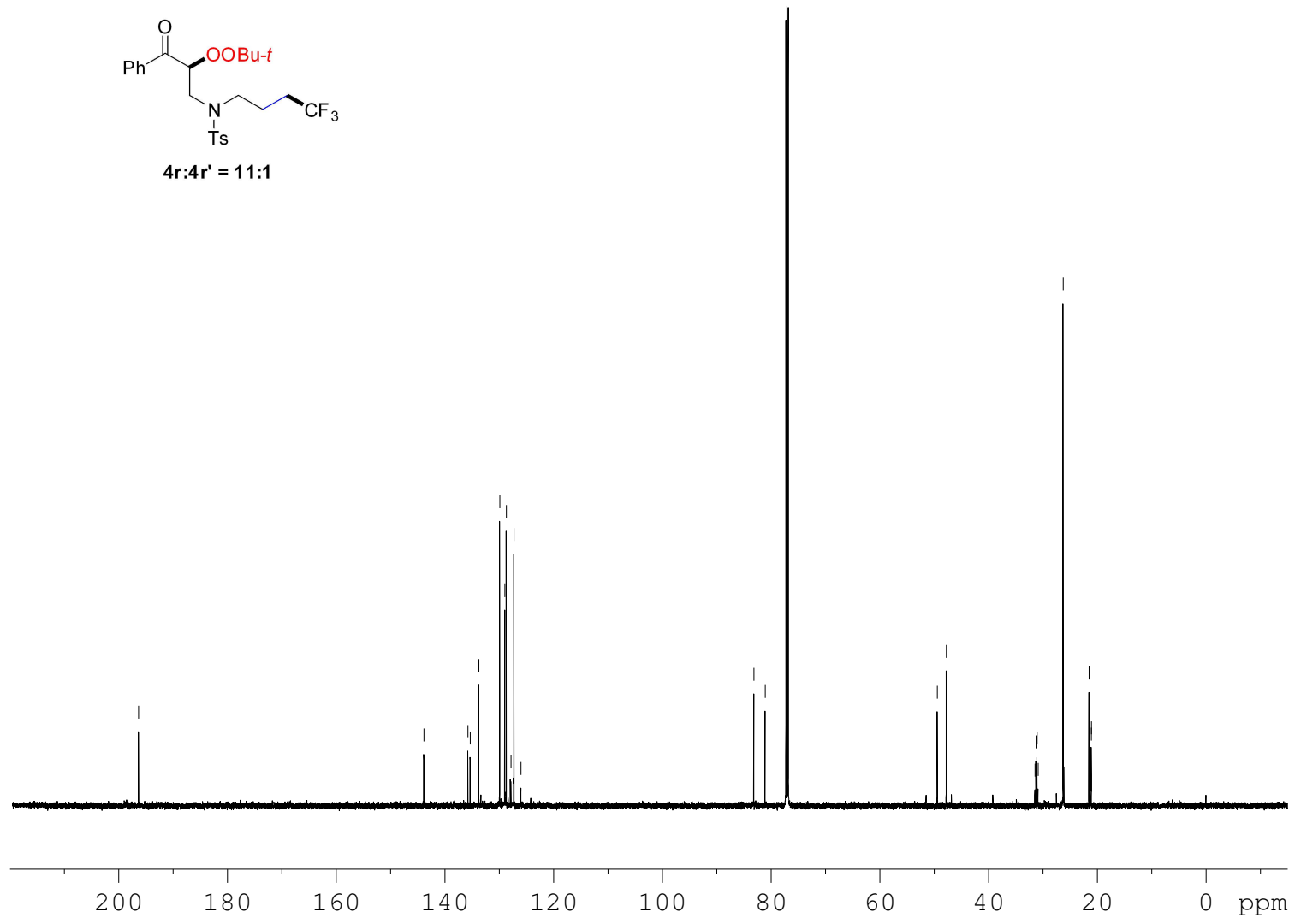
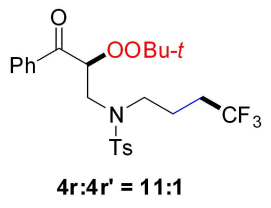
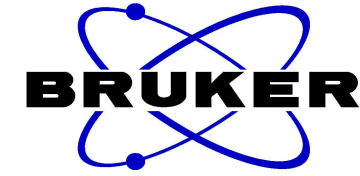
1.975  
0.181  
2.041  
1.088  
2.149  
2.053  
1.000  
0.091  
1.080  
1.158  
1.077  
1.065  
3.100  
2.082  
2.121  
9.051

— 196.350

143.862  
135.773  
135.345  
133.759  
129.902  
128.979  
128.699  
127.846  
127.293  
126.015

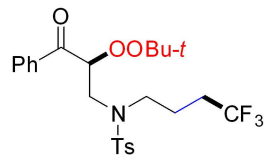
83.166  
81.084

49.435  
47.770  
31.467  
31.275  
31.080  
30.887  
26.282  
21.521  
21.106  
21.090



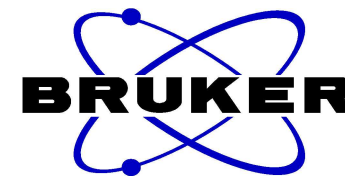
NAME w11-1-21-3-a-20210121  
EXPNO 2  
PROCNO 1  
Date\_ 20210121  
Time 22.49  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 400  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 296.0 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



4r:4r' = 11:1

-63.319  
-66.022

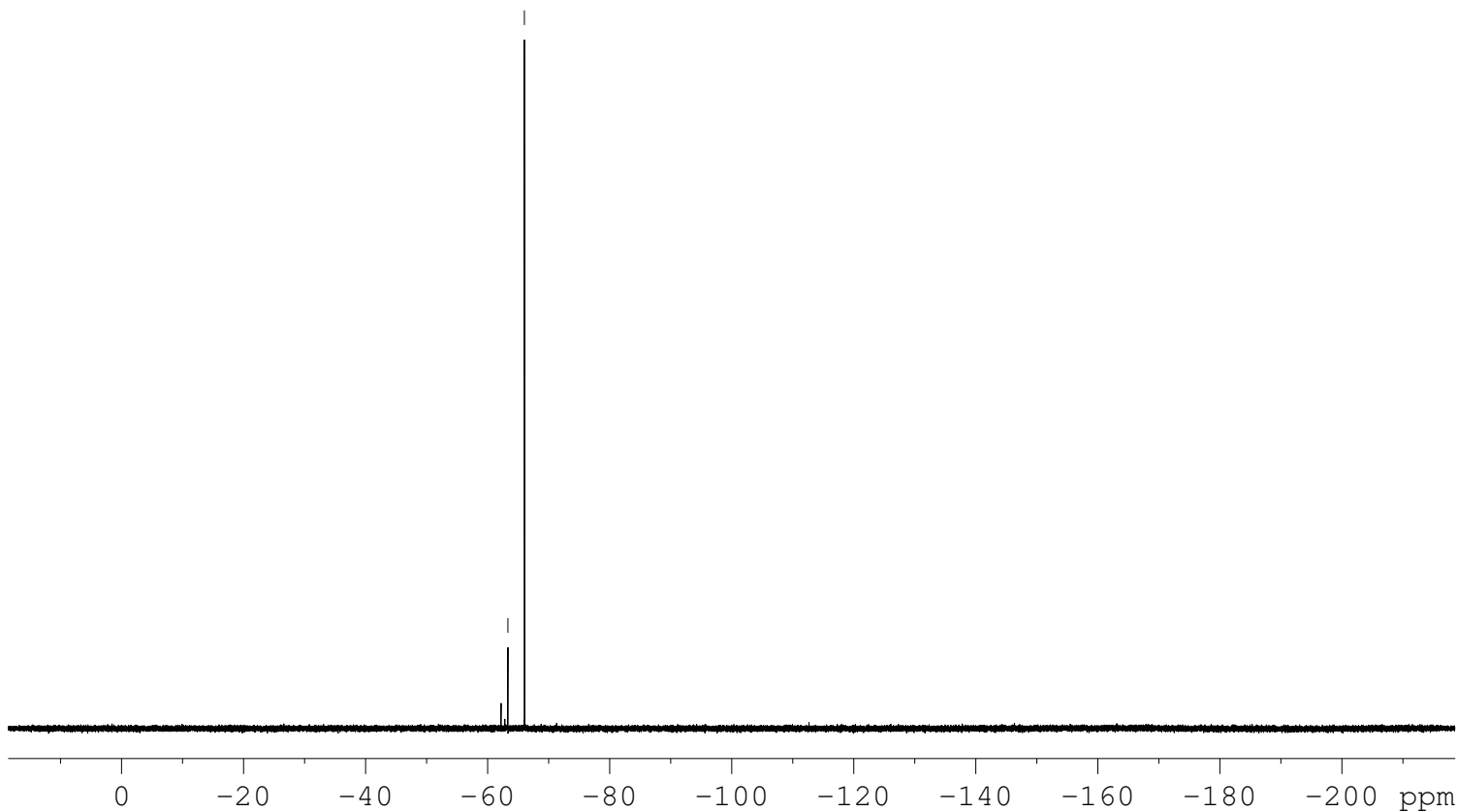


```

NAME      w11-1-21-3-a-20210121
EXPNO     3
PROCNO    1
Date_     20210121
Time      22.51
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDC13
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        295.3 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1
  
```

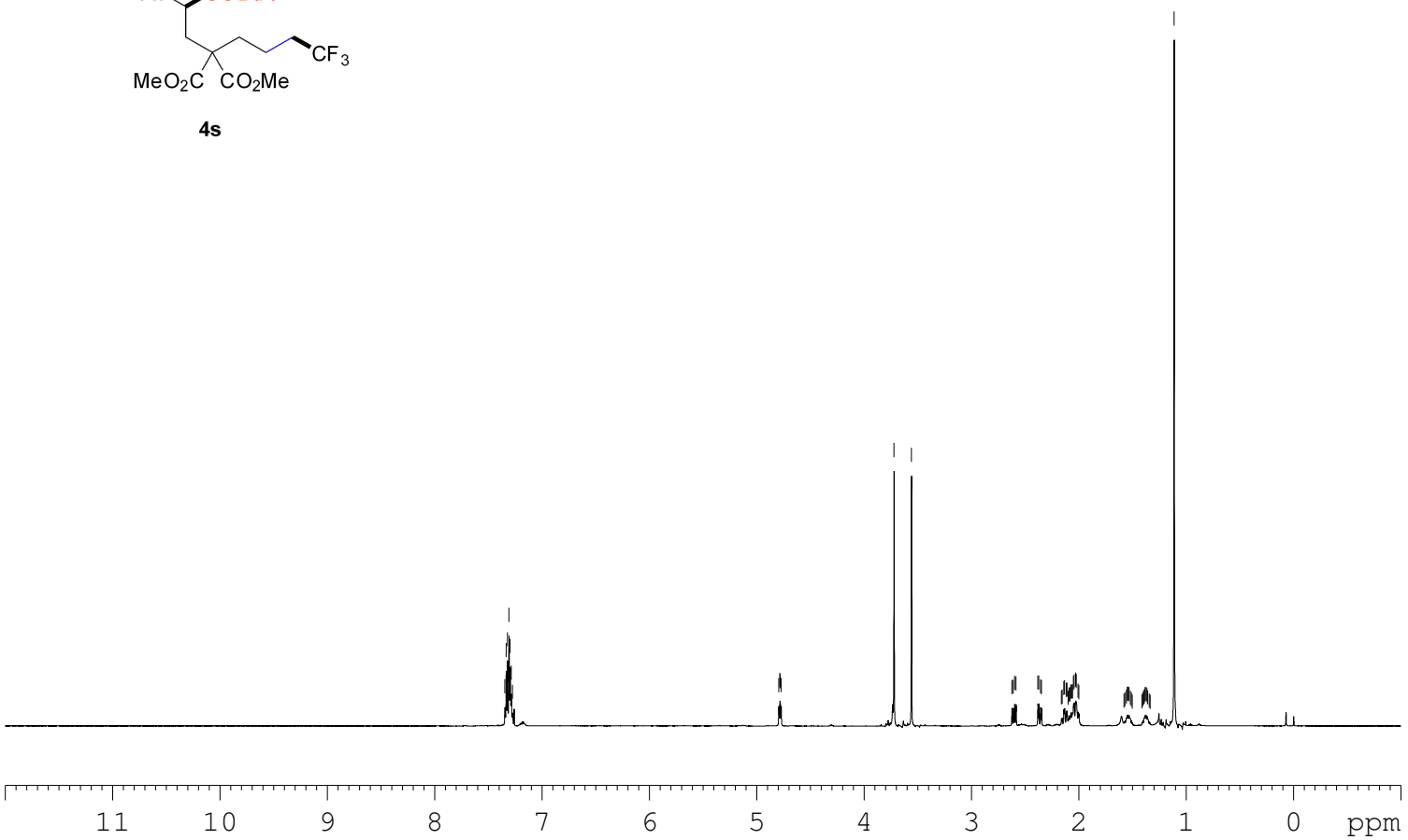
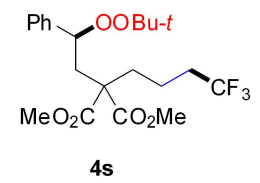
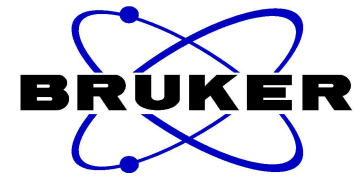
```

===== CHANNEL f1 =====
SFO1    564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
  
```



1.000  
11.027

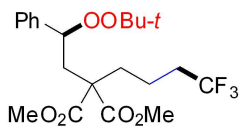
7.347  
7.334  
7.322  
7.309  
7.298  
7.287  
7.276  
4.795  
4.786  
4.783  
4.774  
3.723  
3.560  
2.624  
2.611  
2.599  
2.586  
2.383  
2.374  
2.357  
2.349  
2.140  
2.133  
2.118  
2.111  
2.092  
2.083  
2.075  
2.066  
2.059  
2.051  
2.044  
2.030  
2.024  
2.008  
2.000  
1.550  
1.541  
1.533  
1.390  
1.383  
1.375  
1.366  
1.113



```

NAME      w11-301p-20200923
EXPNO     1
PROCNO    1
Date_     20200923
Time      14.33
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         8
DS         0
SWH       9615.385 Hz
FIDRES    0.146719 Hz
AQ        3.4079220 sec
RG        56.75
DW        52.000 usec
DE        6.50 usec
TE        296.6 K
D1        1.00000000 sec
TD0       1

===== CHANNEL f1 =====
SFO1     600.1739011 MHz
NUC1     1H
P1       9.77 usec
SI       65536
SF       600.1700147 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00
  
```



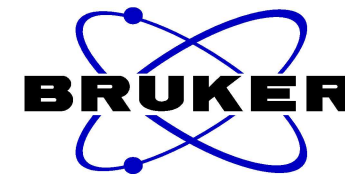
4s

171.246  
171.123

140.766  
128.189  
128.042  
127.733  
127.321  
125.900

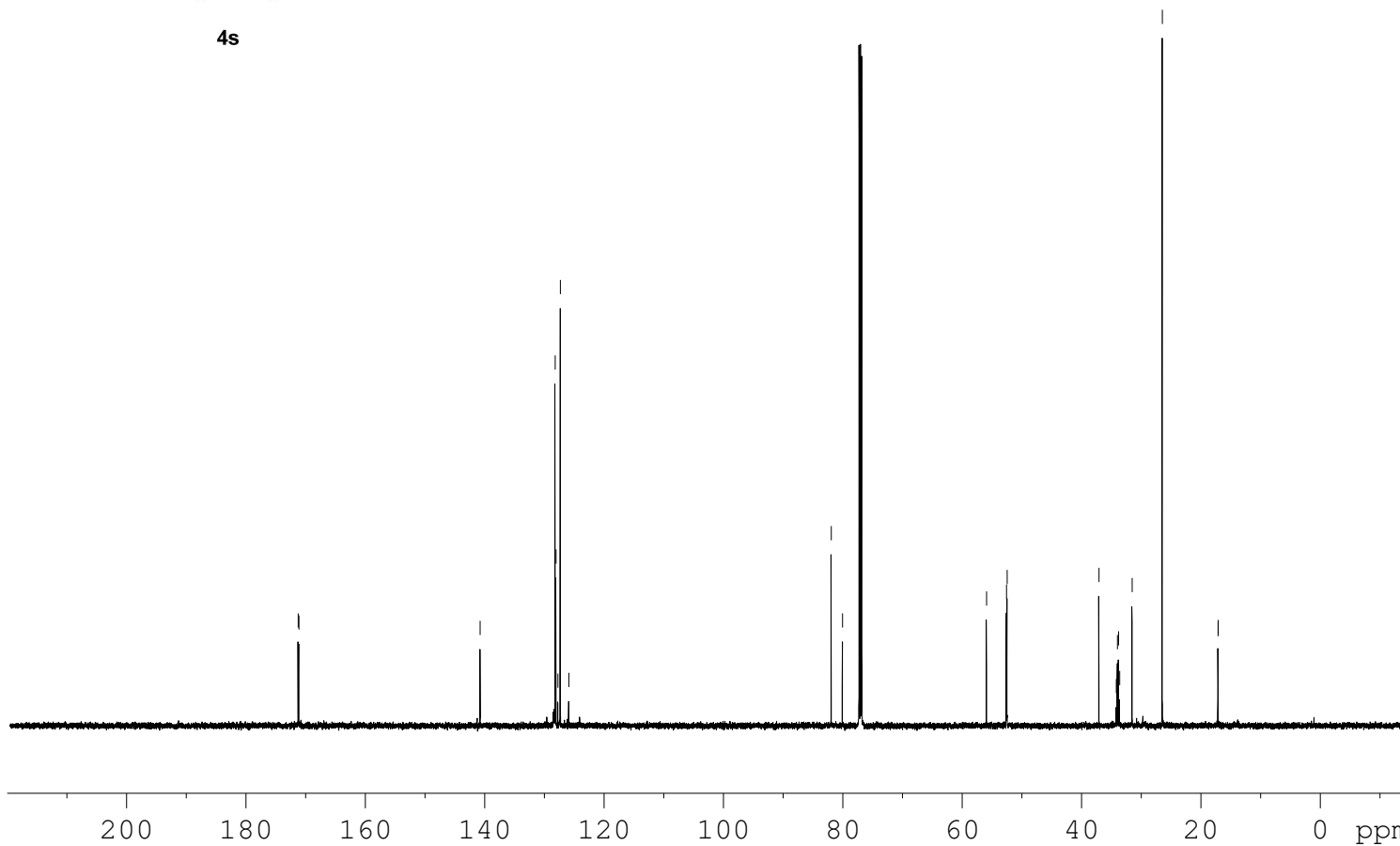
81.933  
80.046

55.914  
52.572  
52.464  
37.078  
34.180  
33.989  
33.799  
33.609  
31.521  
26.464  
17.129  
17.110

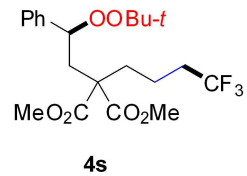


NAME w11-301p-20200923  
EXPNO 3  
PROCNO 1  
Date\_ 20200923  
Time 14.56  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 400  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 297.7 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

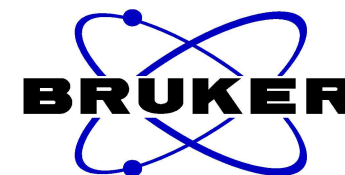
===== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40







---66.322



```

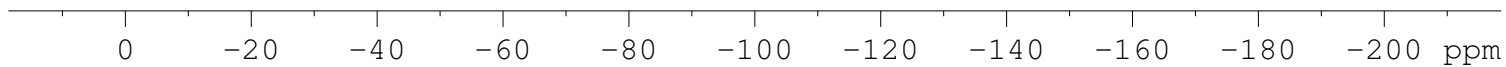
NAME      w11-301p-20200923
EXPNO     2
PROCNO    1
Date_     20200923
Time      14.34
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDCl3
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        296.6 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1

```

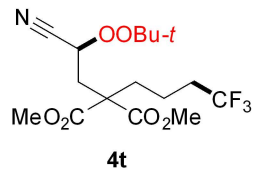
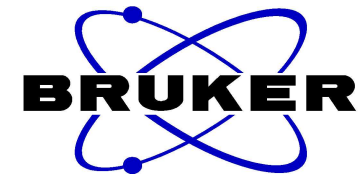
```

===== CHANNEL f1 =====
SFO1    564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00

```

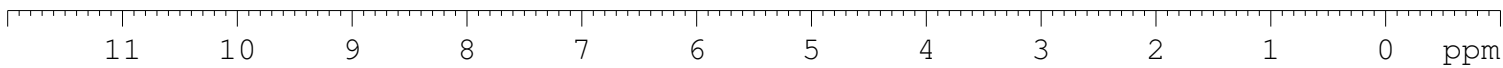


4.762  
4.754  
4.749  
4.741  
3.775  
3.770  
2.547  
2.539  
2.521  
2.513  
2.500  
2.487  
2.474  
2.133  
2.129  
2.116  
2.111  
2.102  
2.098  
2.085  
2.080  
2.067  
2.046  
2.039  
2.029  
2.017  
2.011  
1.997  
1.561  
1.547  
1.543  
1.538  
1.530  
1.519  
1.509  
1.446  
1.443  
1.434  
1.424  
1.414  
1.409  
1.404  
1.392  
1.262

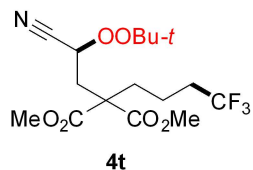


NAME w11-3-8-2-a-20210319  
EXPNO 1  
PROCNO 1  
Date\_ 20210319  
Time 18.16  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 8  
DS 0  
SWH 9615.385 Hz  
FIDRES 0.146719 Hz  
AQ 3.4079220 sec  
RG 87.54  
DW 52.000 usec  
DE 6.50 usec  
TE 296.1 K  
D1 1.00000000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 600.1739011 MHz  
NUC1 1H  
P1 9.77 usec  
SI 65536  
SF 600.1700125 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



1.000  
3.011  
2.941  
1.971  
2.010  
2.086  
0.968  
1.148  
8.930



170.221  
170.197

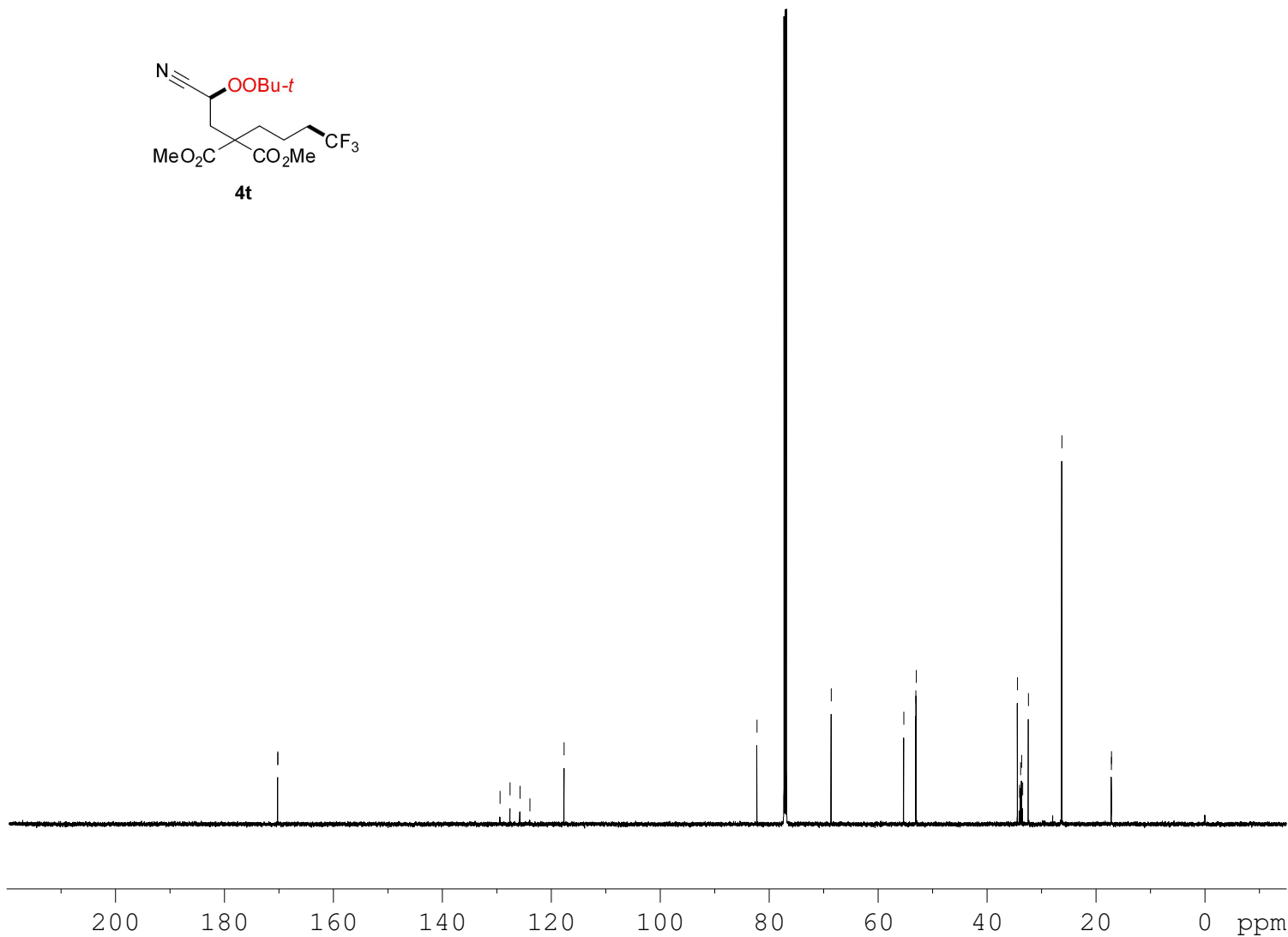
129.406  
127.575  
125.744  
117.652

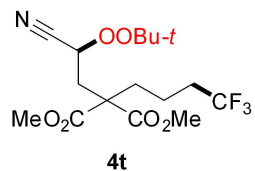
82.238  
68.607  
55.286  
53.079  
52.990  
34.419  
34.038  
33.845  
33.653  
33.462  
32.407  
26.265  
17.179  
17.159  
123.926



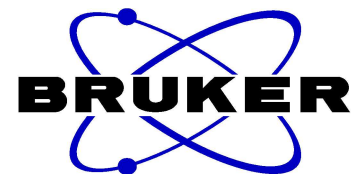
NAME w11-3-8-2-a-20210319  
EXPNO 3  
PROCNO 1  
Date\_ 20210319  
Time 19.10  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 1024  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 297.2 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

===== CHANNEL f1 =====  
SFO1 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40





---66.290



```

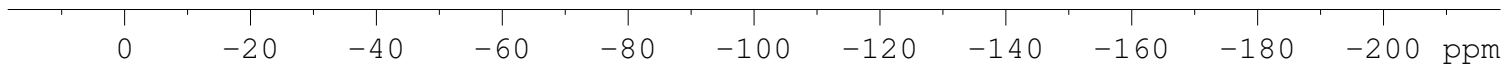
NAME      w11-3-8-2-a-20210319
EXPNO     2
PROCNO    1
Date_     20210319
Time      18.18
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgfhigqn.2
TD        131072
SOLVENT   CDCl3
NS        16
DS        4
SWH       133928.578 Hz
FIDRES    1.021794 Hz
AQ        0.4893855 sec
RG        15.49
DW        3.733 usec
DE        6.50 usec
TE        296.2 K
D1        1.00000000 sec
D11       0.03000000 sec
D12       0.00002000 sec
TD0       1

```

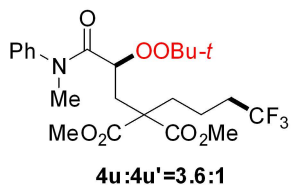
```

===== CHANNEL f1 =====
SFO1     564.6675534 MHz
NUC1     19F
P1       11.90 usec
SI       65536
SF       564.7240258 MHz
WDW      EM
SSB      0
LB       0.30 Hz
GB       0
PC       1.00

```

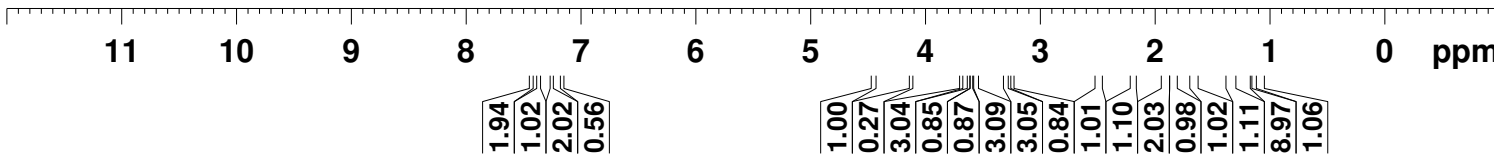


7.441  
7.429  
7.415  
7.377  
7.364  
7.352  
7.261  
7.249  
7.249  
4.466  
4.461  
4.449  
4.444  
3.685  
3.567  
3.300  
2.510  
2.493  
2.484  
2.467  
2.203  
2.198  
2.177  
2.172  
1.937  
1.930  
1.924  
1.915  
1.907  
1.898  
1.892  
1.885  
1.880  
1.872  
1.862  
1.855  
1.845  
1.837  
1.830  
1.827  
1.820  
1.687  
1.679  
1.664  
1.657  
1.642  
1.634  
1.358  
1.353  
1.350  
1.345  
1.337  
1.328  
1.323  
1.320  
1.315  
1.167  
1.107  
1.103  
1.099  
1.094  
1.086  
1.078  
1.072  
1.069  
1.064  
1.060



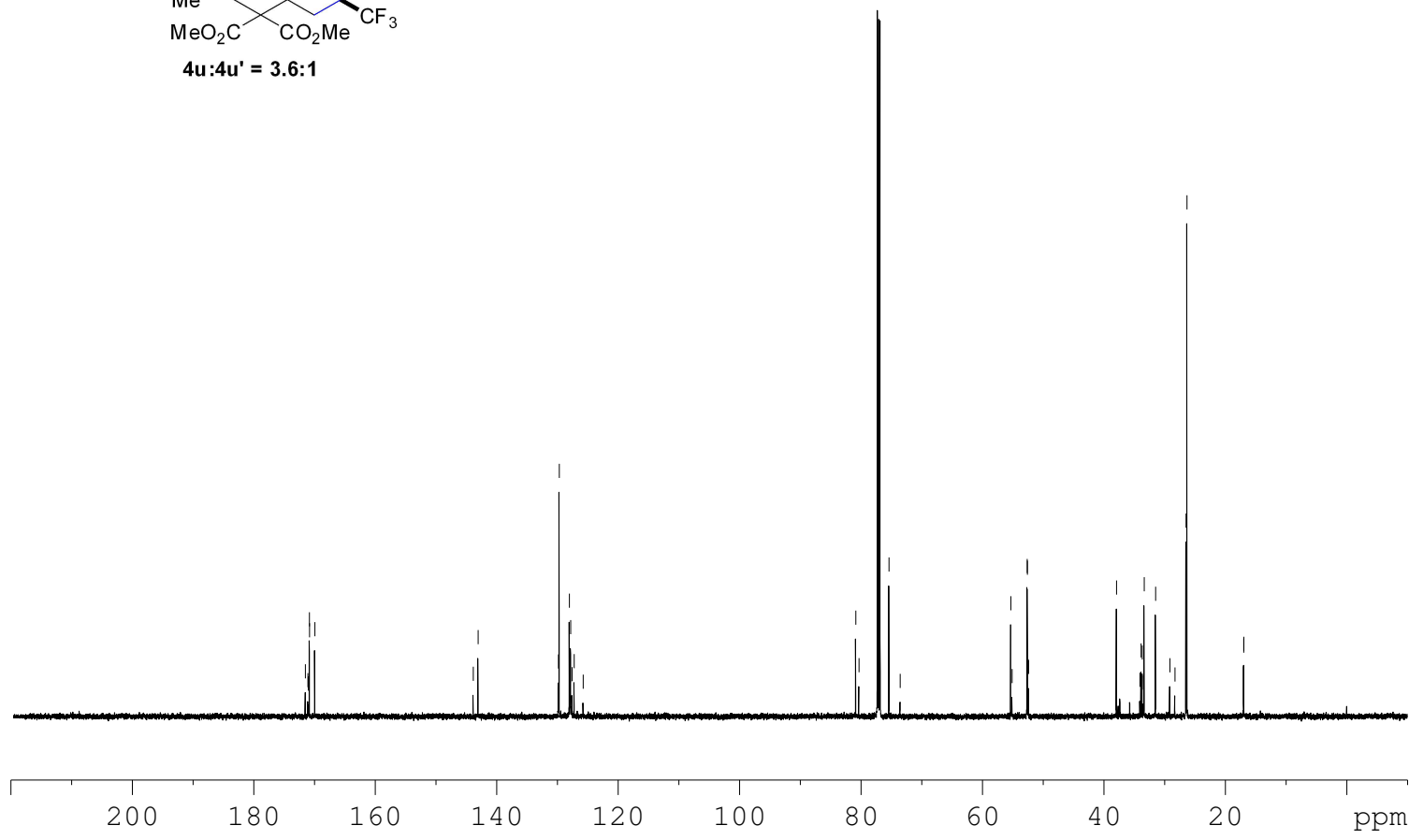
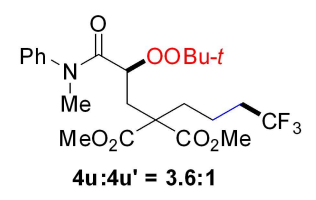
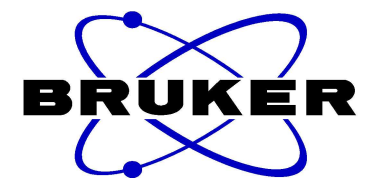
NAME w11-519p-20201228  
 EXPNO 1  
 PROCNO 1  
 Date\_ 20201228  
 Time 18.41  
 INSTRUM spect  
 PROBHD 5 mm PABBO BB/  
 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 8  
 DS 0  
 SWH 9615.385 Hz  
 FIDRES 0.146719 Hz  
 AQ 3.4079220 sec  
 RG 44.5  
 DW 52.000 usec  
 DE 6.50 usec  
 TE 296.0 K  
 D1 1.00000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 SFO1 600.1739011 MHz  
 NUC1 1H  
 P1 9.77 usec  
 SI 65536  
 SF 600.1700056 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00



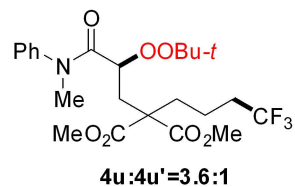
171.508  
171.092  
171.035  
170.843  
170.824  
169.941  
143.857  
143.058  
129.830  
129.691  
128.031  
127.817  
127.590  
127.240  
125.756

80.861  
80.334  
75.397  
73.554  
55.329  
55.123  
52.641  
52.603  
52.524  
52.407  
37.925  
34.075  
33.886  
33.695  
33.503  
33.363  
31.488  
29.137  
28.299  
26.478  
26.324

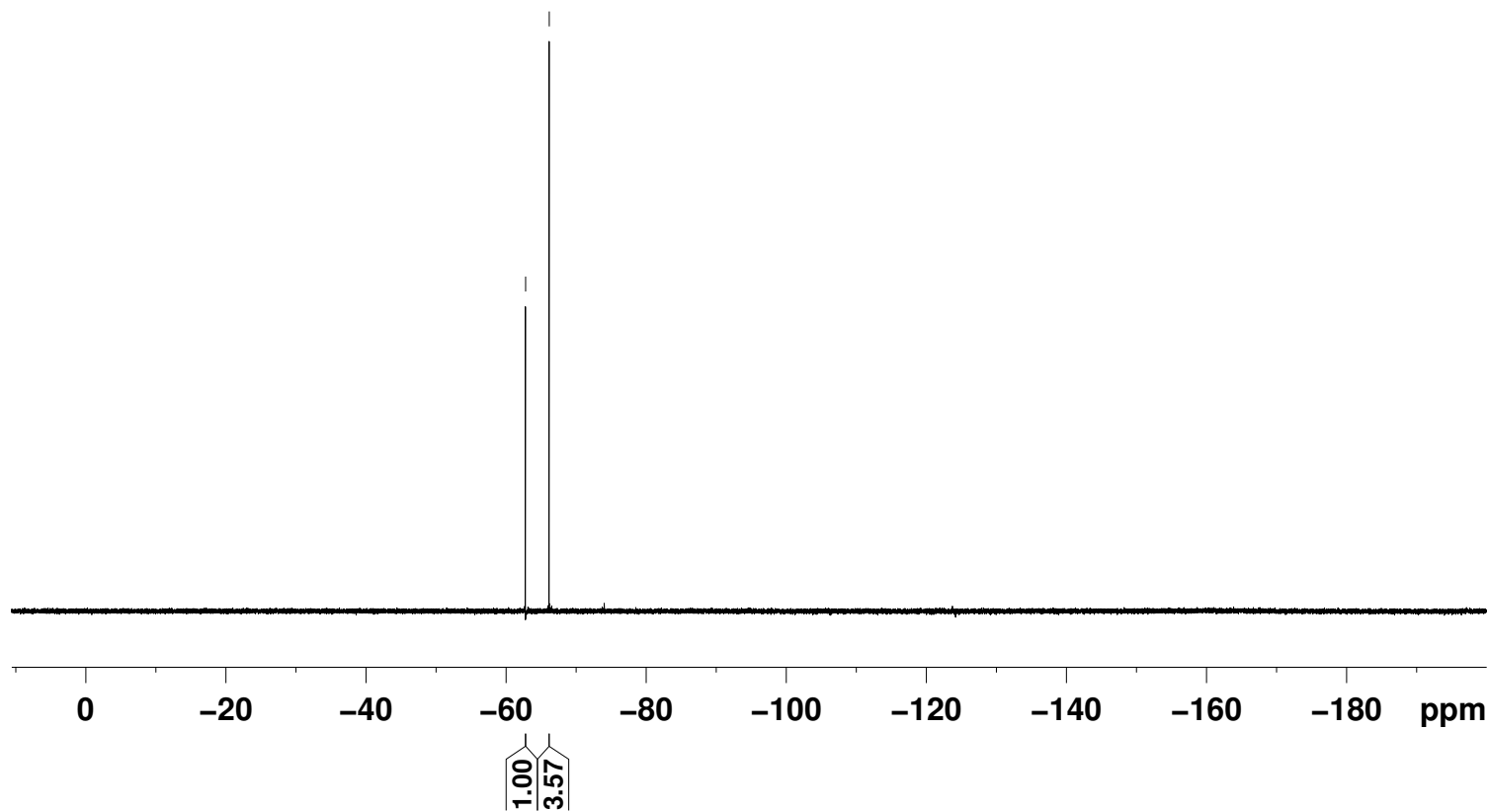


NAME w11-519p-20201228  
EXPNO 2  
PROCNO 1  
Date\_ 20201228  
Time 18.57  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 300  
DS 4  
SWH 36057.691 Hz  
FIDRES 0.550197 Hz  
AQ 0.9088159 sec  
RG 190.02  
DW 13.867 usec  
DE 6.50 usec  
TE 297.0 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

==== CHANNEL f1 =====  
SF01 150.9279571 MHz  
NUC1 13C  
P1 11.90 usec  
SI 32768  
SF 150.9128665 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

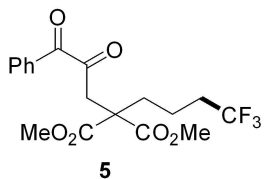


--62.786  
--66.162



NAME w11-519p-20201228  
EXPNO 3  
PROCNO 1  
Date\_ 20201228  
Time 18.59  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgfhigqn.2  
TD 131072  
SOLVENT CDC13  
NS 16  
DS 4  
SWH 133928.578 Hz  
FIDRES 1.021794 Hz  
AQ 0.4893855 sec  
RG 15.49  
DW 3.733 usec  
DE 6.50 usec  
TE 296.3 K  
D1 1.00000000 sec  
D11 0.03000000 sec  
D12 0.00002000 sec  
TD0 1

==== CHANNEL f1 =====  
SFO1 564.6675534 MHz  
NUC1 19F  
P1 11.90 usec  
SI 65536  
SF 564.7240258 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00



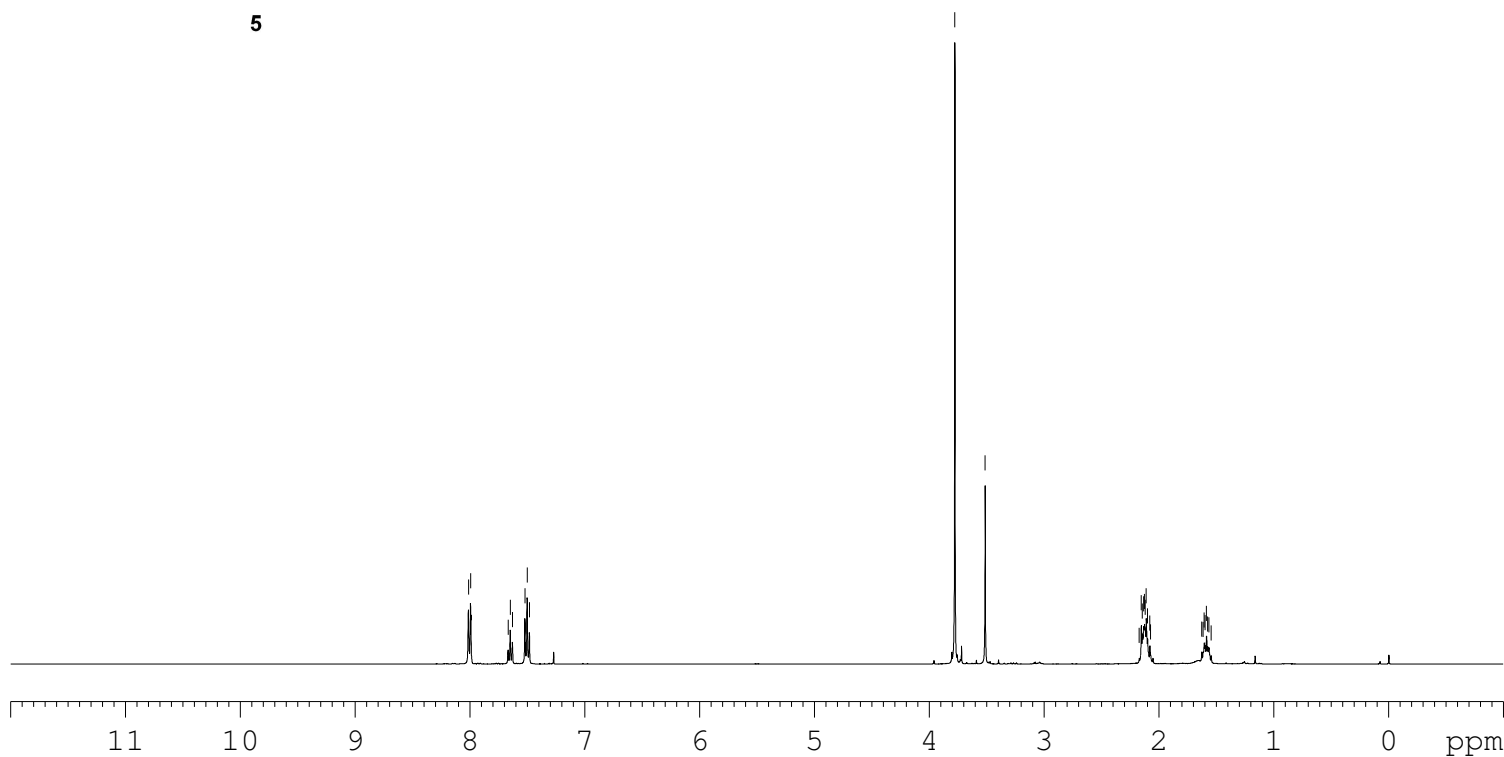
8.012  
 7.994  
 7.667  
 7.649  
 7.630  
 7.521  
 7.501  
 7.482

3.779  
 3.515  
 2.173  
 2.155  
 2.146  
 2.134  
 2.127  
 2.120  
 2.112  
 2.100  
 2.080  
 2.074  
 1.628  
 1.616  
 1.607  
 1.599  
 1.587  
 1.577  
 1.565  
 1.546



NAME w11-3-25-4-20210327  
 EXPNO 1  
 PROCNO 1  
 Date\_ 20210327  
 Time 10.14  
 INSTRUM spect  
 PROBHD 5 mm PADUL 13C  
 PULPROG zg30  
 TD 32768  
 SOLVENT CDCl3  
 NS 8  
 DS 0  
 SWH 6393.862 Hz  
 FIDRES 0.195125 Hz  
 AQ 2.5625076 sec  
 RG 128  
 DW 78.200 usec  
 DE 6.50 usec  
 TE 295.0 K  
 D1 1.00000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 1H  
 P1 10.40 usec  
 PL1 -1.00 dB  
 PL1W 17.01305389 W  
 SFO1 400.1326008 MHz  
 SI 32768  
 SF 400.1300061 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00



1.967  
 1.000  
 2.041

5.975  
 1.989

4.009  
 2.055



— 198.677

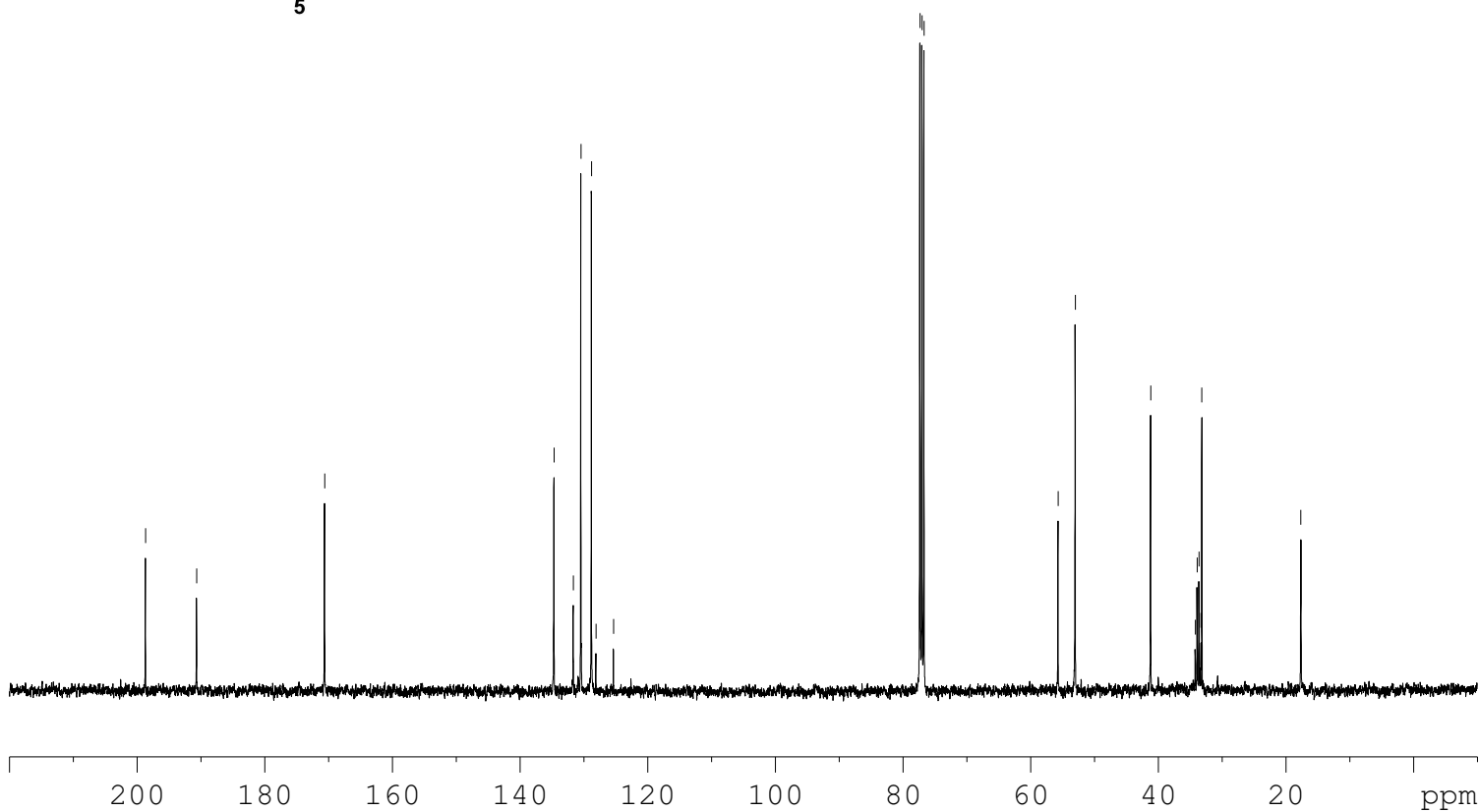
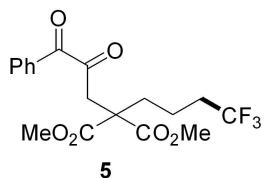
— 190.672

— 170.609

134.669  
131.656  
130.454  
128.804  
128.098  
125.351

77.337  
77.020  
76.702

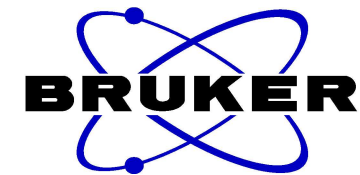
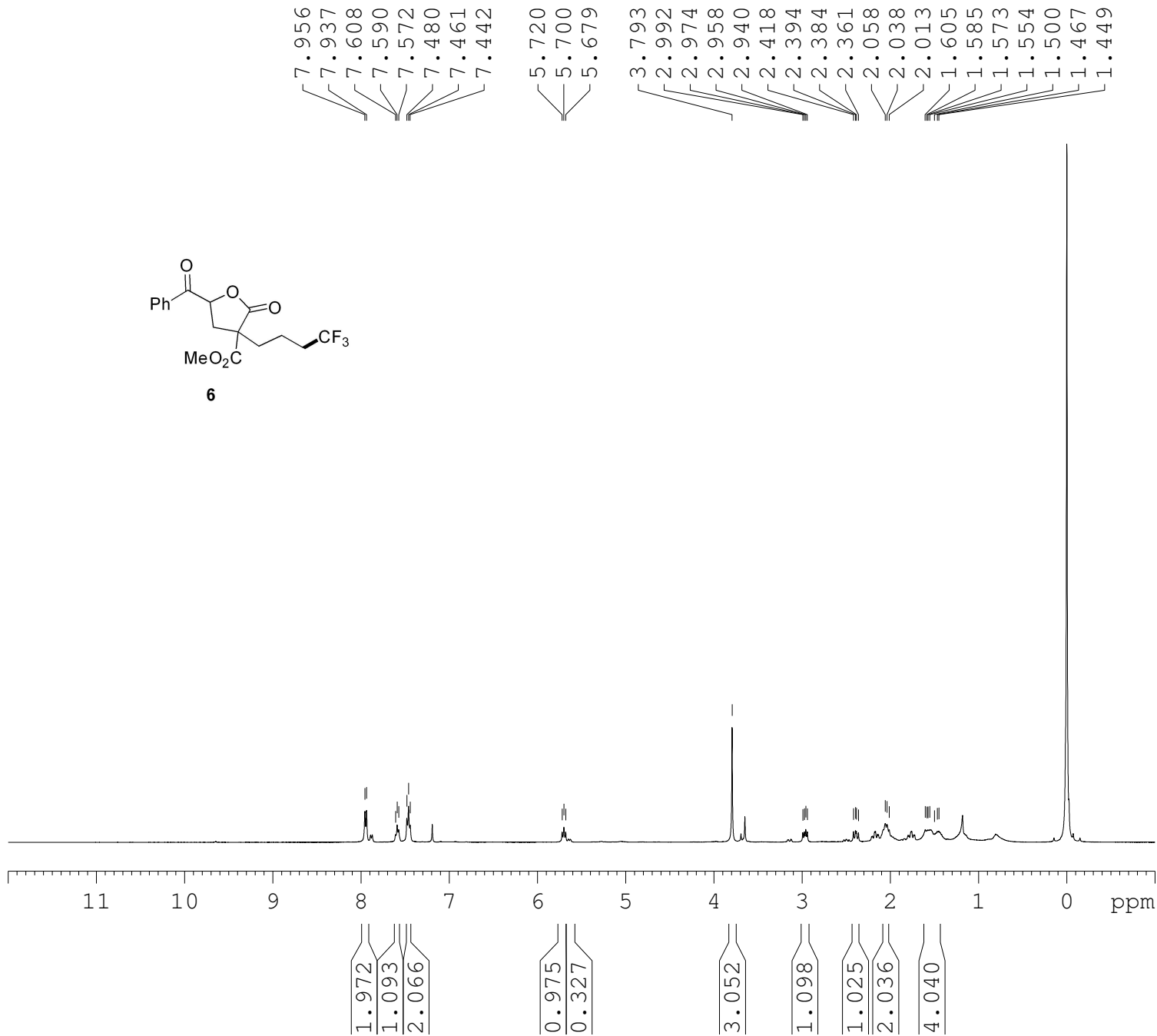
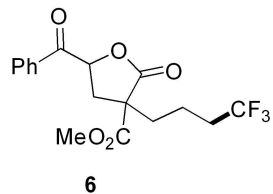
55.695  
52.999  
41.187  
34.200  
33.913  
33.624  
33.335  
33.200  
17.686



NAME w11-3-25-4-20210327  
EXPNO 2  
PROCNO 1  
Date\_ 20210327  
Time 10.22  
INSTRUM spect  
PROBHD 5 mm PADUL 13C  
PULPROG zgpg30  
TD 65536  
SOLVENT CDC13  
NS 200  
DS 4  
SWH 25252.525 Hz  
FIDRES 0.385323 Hz  
AQ 1.2976629 sec  
RG 181  
DW 19.800 usec  
DE 6.50 usec  
TE 296.7 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 3

===== CHANNEL f1 =====  
NUC1 13C  
P1 15.00 usec  
PL1 2.00 dB  
PL1W 55.31277084 W  
SFO1 100.6238364 MHz

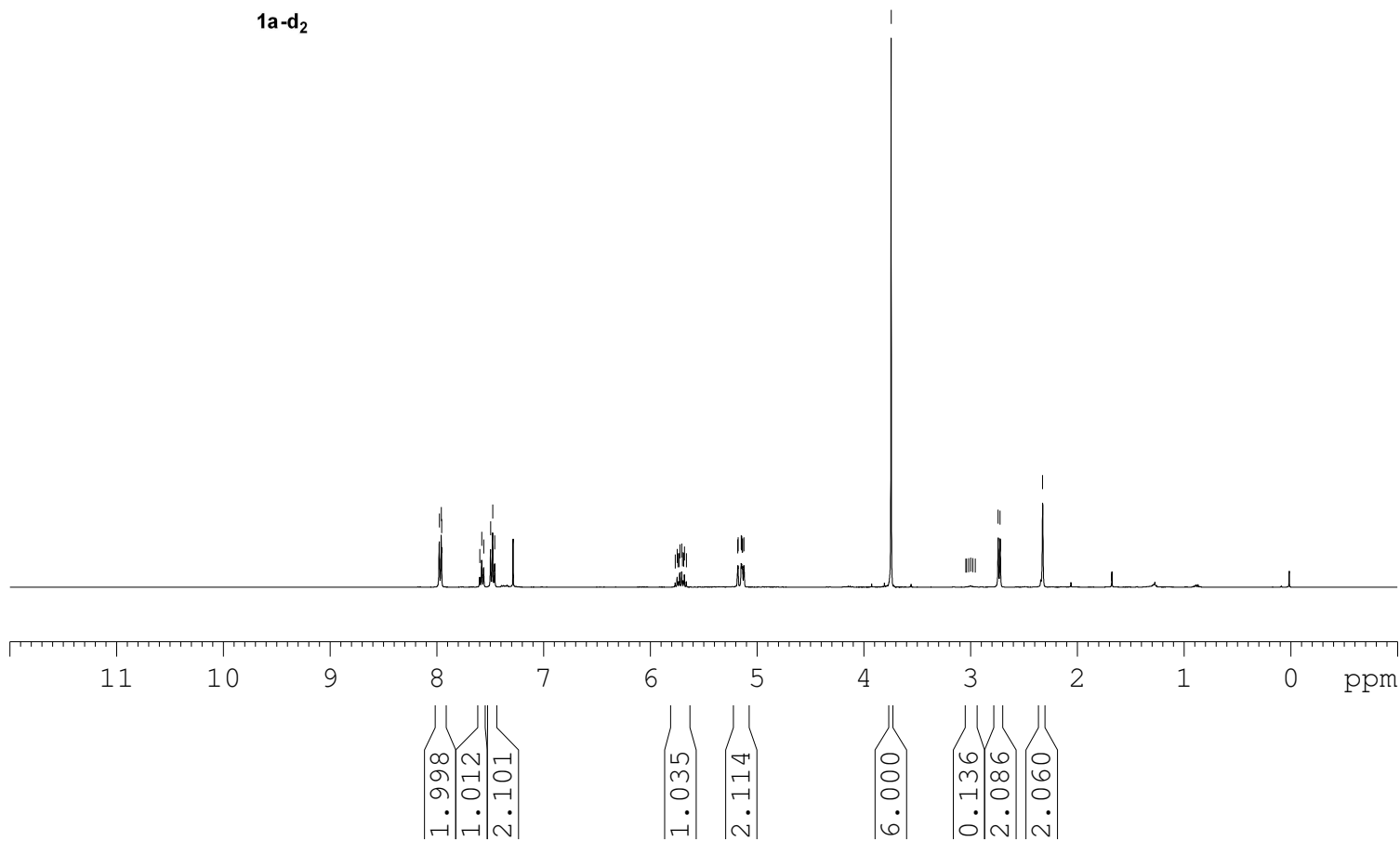
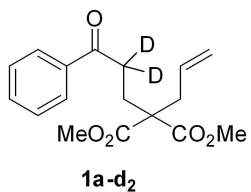
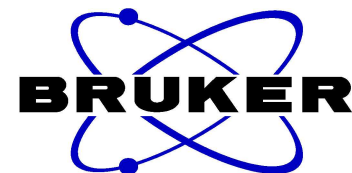
===== CHANNEL f2 =====  
CPDPRG2 waltz16  
NUC2 1H  
PCPD2 80.00 usec  
PL2 -1.00 dB  
PL12 16.72 dB  
PL13 15.50 dB  
PL2W 17.01305389 W  
PL12W 0.28759566 W  
PL13W 0.38087484 W  
SFO2 400.1316005 MHz  
SI 32768  
SF 100.6127690 MHz



NAME w11-3-25-3-20210406  
 EXPNO 1  
 PROCNO 1  
 Date\_ 20210406  
 Time 9.42  
 INSTRUM spect  
 PROBHD 5 mm PADUL 13C  
 PULPROG zg30  
 TD 32768  
 SOLVENT CDC13  
 NS 8  
 DS 0  
 SWH 6393.862 Hz  
 FIDRES 0.195125 Hz  
 AQ 2.5625076 sec  
 RG 181  
 DW 78.200 usec  
 DE 6.50 usec  
 TE 292.1 K  
 D1 1.00000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 1H  
 P1 10.40 usec  
 PL1 -1.00 dB  
 PL1W 17.01305389 W  
 SFO1 400.1326008 MHz  
 SI 32768  
 SF 400.1300380 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00

7.976  
7.959  
7.955  
7.598  
7.580  
7.561  
7.496  
7.477  
7.458  
5.767  
5.749  
5.742  
5.730  
5.724  
5.706  
5.699  
5.688  
5.681  
5.663  
5.182  
5.178  
5.149  
5.147  
5.144  
5.140  
5.136  
5.124  
3.744  
3.045  
3.038  
3.018  
2.999  
2.980  
2.957  
2.743  
2.725  
2.327



```

NAME      w11-3-22-1-20210323
EXPNO     1
PROCNO    1
Date_     20210323
Time      15.14
INSTRUM   spect
PROBHD    5 mm PADUL 13C
PULPROG   zg30
TD         32768
SOLVENT   CDCl3
NS         8
DS         0
SWH       6393.862 Hz
FIDRES    0.195125 Hz
AQ        2.5625076 sec
RG         161
DW        78.200 usec
DE         6.50 usec
TE         294.9 K
D1         1.00000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        10.40 usec
PL1       -1.00 dB
PL1W      17.01305389 W
SFO1     400.1326008 MHz
SI        32768
SF        400.1300000 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```

—198.901

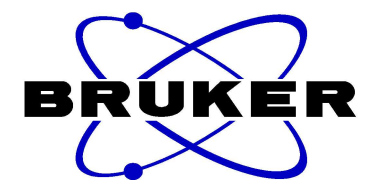
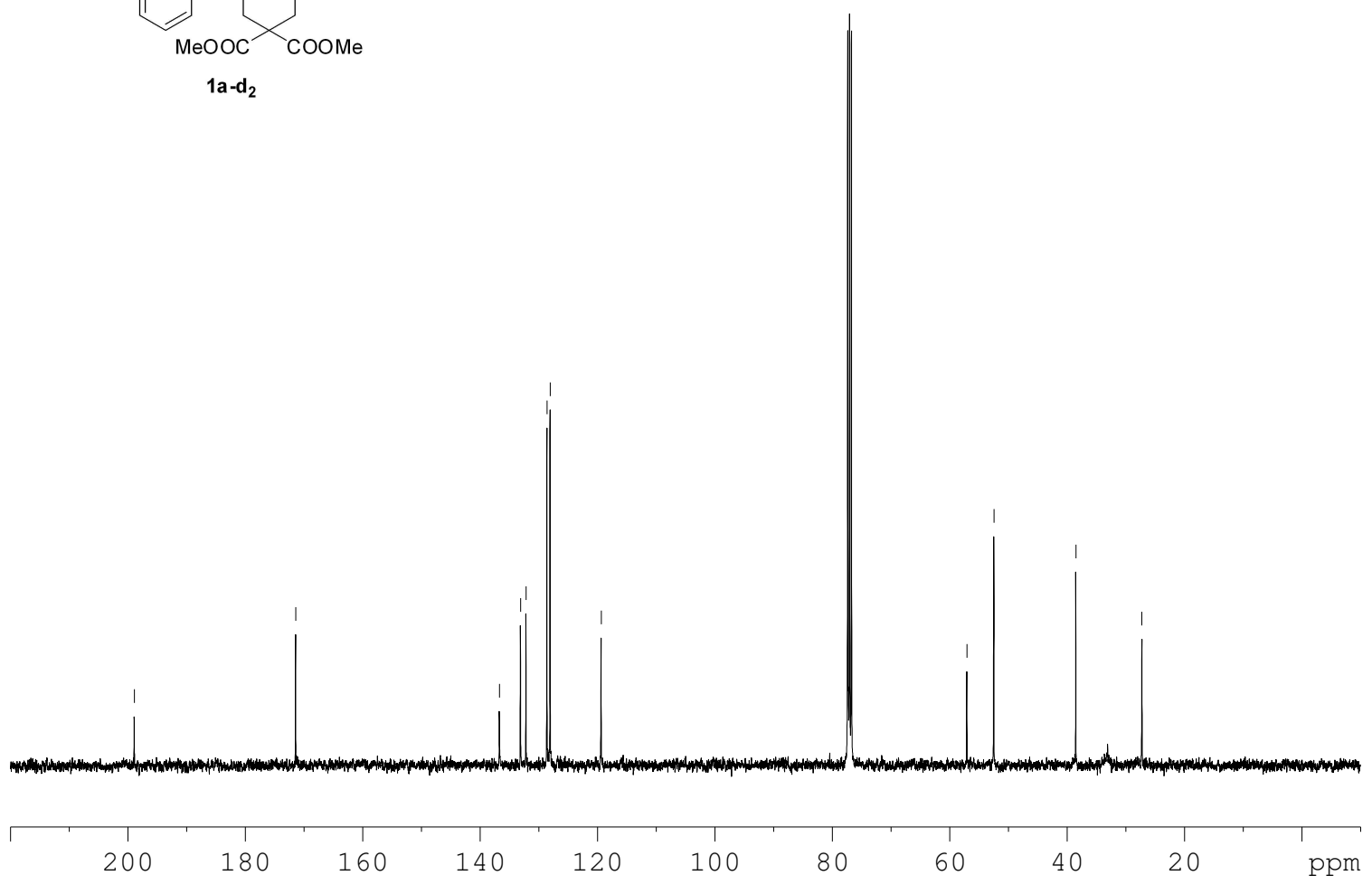
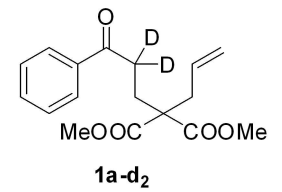
—171.411

136.705  
133.104  
132.173  
128.602  
128.059  
119.357

57.065  
52.457

—38.494

—27.283



```

NAME      w11-3-22-1-20210323
EXPNO     2
PROCNO    1
Date_     20210323
Time      15.20
INSTRUM   spect
PROBHD    5 mm PADUL 13C
PULPROG   zgpg30
TD         65536
SOLVENT   CDC13
NS         150
DS         4
SWH       25252.525 Hz
FIDRES    0.385323 Hz
AQ         1.2976629 sec
RG         181
DW         19.800 usec
DE         6.50 usec
TE         295.4 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        3

```

```

===== CHANNEL f1 =====
NUC1      13C
P1        15.00 usec
PL1       2.00 dB
PL1W      55.31277084 W
SFO1      100.6238364 MHz

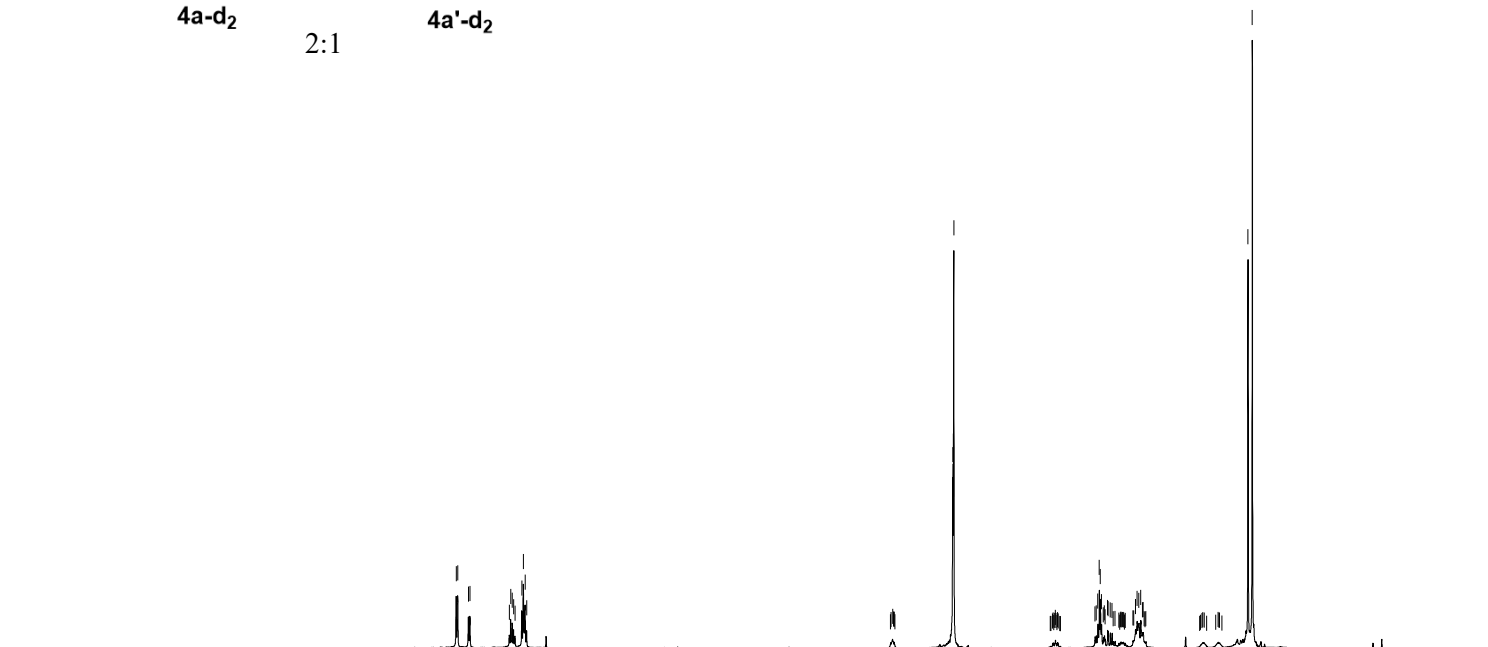
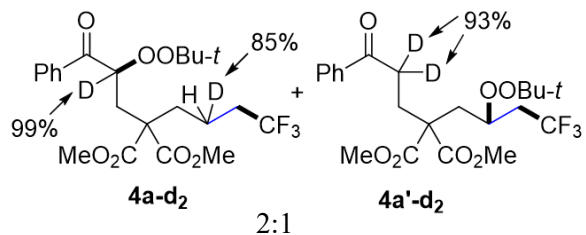
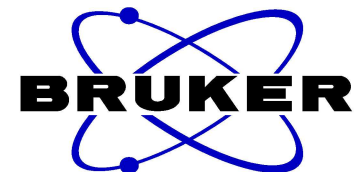
```

```

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
PCPD2     80.00 usec
PL2       -1.00 dB
PL12      16.72 dB
PL13      15.50 dB
PL2W      17.01305389 W
PL12W     0.28759566 W
PL13W     0.38087484 W
SFO2      400.1316005 MHz
ST        32768

```

8.058  
8.046  
7.952  
7.939  
7.596  
7.584  
7.571  
7.559  
7.546  
7.487  
7.474  
7.458  
7.445  
4.258  
3.735  
3.730  
3.725  
2.842  
2.497  
2.486  
2.472  
2.460  
2.450  
2.440  
2.424  
2.415  
2.408  
2.387  
2.382  
2.364  
2.348  
2.322  
2.166  
2.159  
2.144  
2.130  
2.115  
2.098  
2.083  
2.077  
2.068  
2.054  
1.165  
1.128

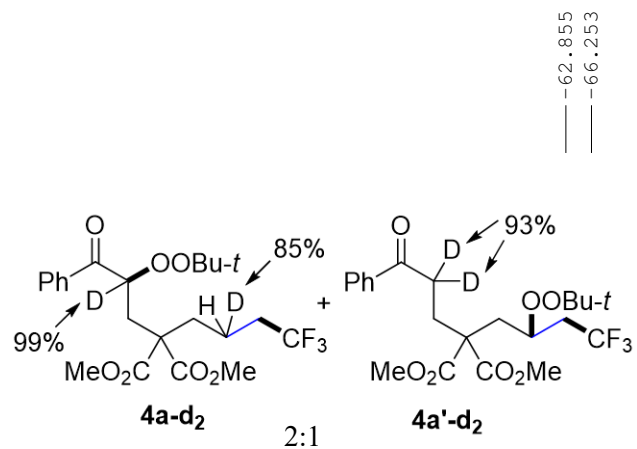
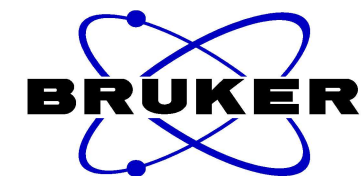


NAME w11-3-23-1-20210324  
 EXPNO 1  
 PROCNO 1  
 Date\_ 20210324  
 Time 10.59  
 INSTRUM spect  
 PROBHD 5 mm PABBO BB/  
 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 8  
 DS 0  
 SWH 9615.385 Hz  
 FIDRES 0.146719 Hz  
 AQ 3.4079220 sec  
 RG 30.73  
 DW 52.000 usec  
 DE 6.50 usec  
 TE 296.3 K  
 D1 1.00000000 sec  
 TD0 1

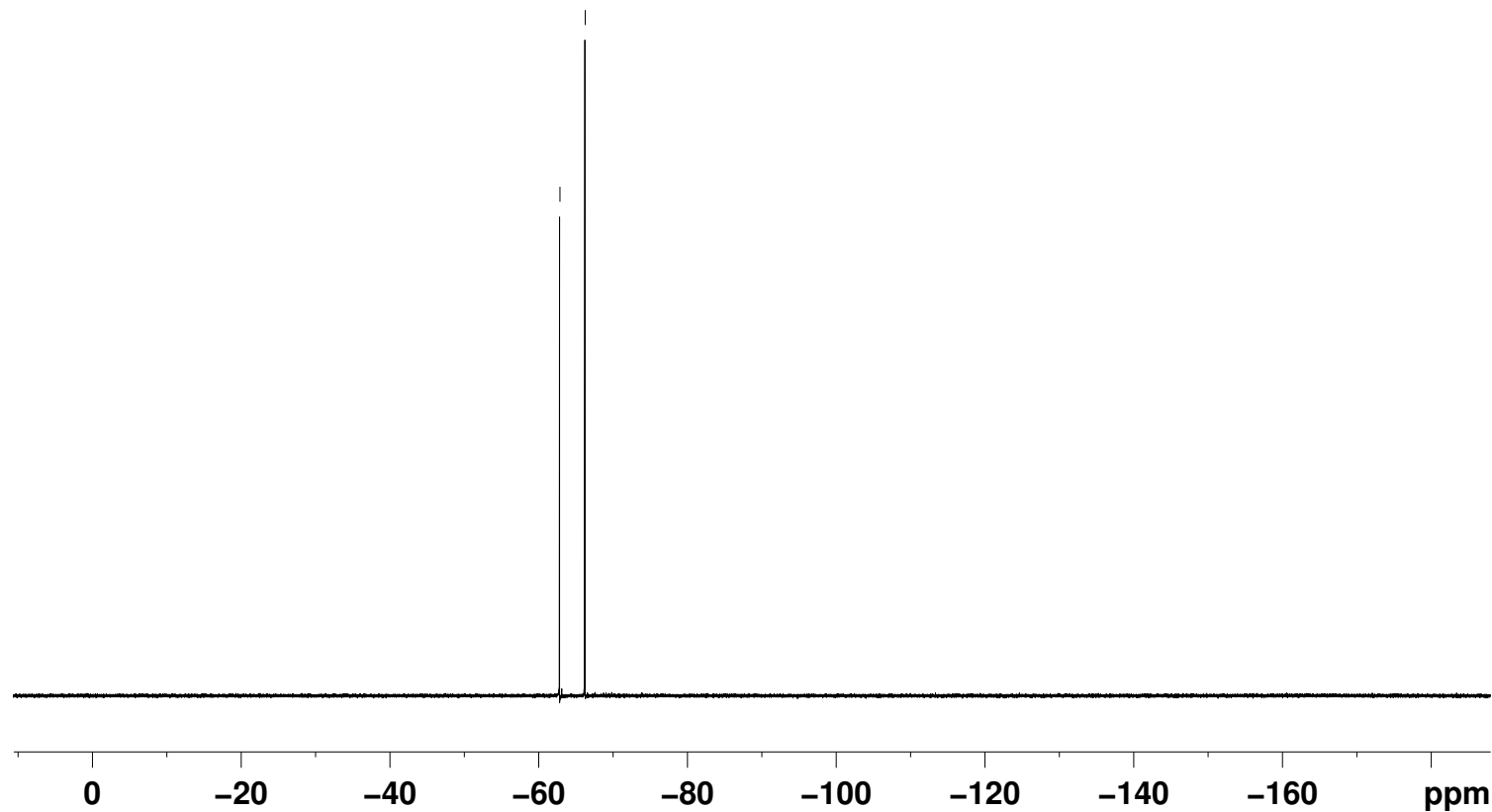
===== CHANNEL f1 =====  
 SFO1 600.1739011 MHz  
 NUC1 1H  
 P1 9.77 usec  
 SI 65536  
 SF 600.1700070 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00

11 10 9 8 7 6 5 4 3 2 1 0 ppm

2.000  
 0.990  
 1.063  
 0.507  
 2.040  
 1.056  
 0.016  
 0.506  
 3.015  
 6.001  
 0.504  
 2.190  
 1.976  
 0.498  
 4.049  
 0.575  
 0.575  
 4.559  
 9.000



---62.855  
---66.253



NAME w11-3-23-1-20210324  
EXPNO 3  
PROCNO 1  
Date\_ 20210324  
Time 11.22  
INSTRUM spect  
PROBHD 5 mm PABBO BB/  
PULPROG zgfhigqn.2  
TD 131072  
SOLVENT CDC13  
NS 16  
DS 4  
SWH 133928.578 Hz  
FIDRES 1.021794 Hz  
AQ 0.4893855 sec  
RG 17.32  
DW 3.733 usec  
DE 6.50 usec  
TE 296.8 K  
D1 1.00000000 sec  
D11 0.03000000 sec  
D12 0.00002000 sec  
TD0 1

==== CHANNEL f1 =====  
SF01 564.6675534 MHz  
NUC1 19F  
P1 11.90 usec  
SI 65536  
SF 564.7240258 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00