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Supporting Information

for

Preparation of mono-substituted malonic acid half oxyesters (SMAHOs)

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Experimental procedures, compound characterization data, and NMR spectra for all compounds

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1. General information

All commercially available reagents, including solvents (ethyl acetate = EA, petroleum ether = PE, cyclohexane = Cy, diethyl ether, dichloromethane, *N*,*N*-dimethylformamide = DMF, ethanol, methanol, and tetrahydrofuran = THF), were used as received. Room temperature means 18–25 °C. Melting points (mp) are uncorrected and were measured on a Büchi B-545 apparatus. Analytical thin layer chromatography (TLC) was performed on TLC silica gel plates (0.25 mm) precoated with a fluorescent indicator (Merck 60F254). Visualization was effected using ultraviolet light (λ = 254 nm) and/or a aqueous solution of $KMnO_4$. Flash chromatography (FC) was performed on 40–63 µm silica gel with mixtures of solvents. High-resolution mass spectra were obtained at the ICOA of the Université of Orléans by electrospray ionization using a Q-TOF analyzer. NMR spectra were recorded on a Bruker Avance II 400 MHz spectrometer. ^{1}H NMR chemical shifts were referenced to the residual solvent signal; ^{13}C NMR chemical shifts were referenced to the deuterated solvent signal. Multiplicity was defined by DEPT 135 analysis. Data are presented as follows: chemical shift δ (ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, quint = quintet, hept = heptuplet, m = multiplet, br = broad), coupling constant *J* (Hz), integration.

2. Preparation of substituted malonates 3

General procedure 1 (GP1) - alkylation: A RBF equipped with a stirring bar was charged with NaH 60% (1.0 equiv) and purged with argon. DMF (V mL) was added and the RBF was cooled to 0 °C (ice/water bath). Malonate **1** (1.1 equiv) was added dropwise with a syringe and the mixture was stirred for 15 min. The alkyl halide **2** (1.0 equiv) was then added dropwise with a syringe. The reaction mixture was allowed to warm to room temperature and stirred for 2 h. Then, the resulting mixture was poured in sat aq NH_4Cl (3 V) and the resulting solution was extracted with Et_2O (3 × 2 V). The combined organic layers were washed with water (10 V) and brine (5 V), dried (Na_2SO_4), and evaporated. Purification by FC afforded the expected product **3**.

Compound **3aa**:[1] Following *GP1* performed with dimethyl malonate (**1a**, 1.0 mL, 8.8 mmol, 1.1 equiv), sodium hydride (0.32 g, 8.0 mmol, 1.0 equiv), and iodomethane (**2a**, 0.2 mL, 8.0 mmol, 1.0 equiv) in DMF (8 mL, *c* = 1 M) for 2 h, the desired product **3aa** was obtained after purification by FC [V(SiO_2) = 50 mL, PE/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (0.591 g, 50%).
R*f* (PE/EA : 90/10, UV+KMnO4): 0.27
^{1}H NMR (400 MHz, CDCl3): δ 3.71 (s, 6H), 3.44 (q, *J* = 7.3 Hz, 1H), 1.40 (d, *J* = 7.3 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl3): δ 170.6 (2 C), 52.6 (2 CH_3), 45.9 (CH), 13.7 (CH_3).

Compound **3ba**:[2] Following *GP1* performed with diethyl malonate (**1b**, 6.7 mL, 44.0 mmol, 1.1 equiv), sodium hydride (1.92 g, 48.0 mmol, 1.2 equiv), and iodomethane (**2a**, 2.5 mL, 40.0 mmol, 1.0 equiv) in DMF (40 mL, *c* = 1 M) for 16 h, the desired product **3ba** was obtained after purification by FC [V(SiO_2) = 100 mL, PE/EA98:2 (1000 mL)] as a colorless oil (5.302 g, 76%).
R*f* (PE/EA : 90/10, UV+KMnO4): 0.45
^{1}H NMR (400 MHz, CDCl3): δ 4.14 (q, *J* = 7.2 Hz, 4H), 3.36 (q, *J* = 7.3 Hz, 1H), 1.35 (d, *J* = 7.3 Hz, 3H), 1.21 (t, *J* = 7.2 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl3): δ 170.2 (2 C), 61.3 (2 CH_2), 46.2 (CH), 14.1 (2 CH_3), 13.6 (CH_3).

Compound **3ab**:[3] Following *GP1* performed with dimethyl malonate (**1a**, 0.60 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and ethyl bromide (**2b**, 0.37 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M), the desired product **3ab** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (318 mg, 40%).
R*f* (Cy/EA : 90/10, UV+KMnO4): 0.22
^{1}H NMR (400 MHz, CDCl3): δ 3.72 (s, 6H), 3.28 (t, *J* = 7.4 Hz, 1H), 1.92 (quint, *J* = 7.4 Hz, 2H), 0.94 (t, *J* = 7.4 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl3): δ 170.0 (2 C), 53.3 (CH), 52.5 (2 CH_3), 22.4 (CH_2), 12.0 (CH_3).

Compound **3ac**:[4] Following *GP1* performed with dimethyl malonate (**1a**, 0.63 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and 1-iodobutane (**2c**, 0.57 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M), the desired product **3ac** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (710 mg, 75%).
R*f* (Cy/EA : 90/10, UV+KMnO4): 0.31
^{1}H NMR (400 MHz, CDCl3): δ 3.71 (s, 6H), 3.33 (t, *J* = 7.5 Hz, 1H), 1.87 (q, *J* = 7.5 Hz, 2H), 1.46–1.19 (m, 4H), 0.87 (t, *J* = 6.6 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl3): δ 170.1 (2 C), 52.5 (2 CH_3), 51.8 (CH), 29.6 (CH_2), 28.7 (CH_2), 22.4 (CH_2), 13.9 (CH_3).

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Compound **3bd**:[5] Following *GP1* performed with diethyl malonate (**1b**, 0.84 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and 1-iodooctane (**2d**, 0.90 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M), the desired product **3bd** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (1.329 g, 93%).
R_f (PE/EA : 90/10, UV+$KMnO_4$): 0.63
^{1}H NMR (400 MHz, $CDCl_3$): δ 4.16 (q, *J* = 7.1 Hz, 4H), 3.28 (t, *J* = 7.5 Hz, 1H), 1.89–1.80 (m, 2H), 1.31–1.18 (m, 18H), 0.84 (t, *J* = 6.6 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 169.7 (2 C), 61.3 (2 CH_2), 52.2 (CH), 31.9 (CH_2), 29.4 (CH_2), 29.3 (CH_2), 29.3 (CH_2), 28.8 (CH_2), 27.4 (CH_2), 22.7 (CH_2), 14.2 (3 CH_3).

Compound **3be**:[6] Following *GP1* performed with diethyl malonate (**1b**, 0.84 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and 2-iodopropane (**2e**, 0.50 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M), the desired product **3be** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (524 mg, 52%).
R_f (Cy/EA : 90/10, UV+$KMnO_4$): 0.37
^{1}H NMR (400 MHz, $CDCl_3$): δ 4.15 (q, *J* = 7.1 Hz, 4H), 3.06 (d, *J* = 8.7 Hz, 1H), 2.41–2.28 (m, 1H), 1.22 (t, *J* = 7.1 Hz, 6H), 0.96 (d, *J* = 6.9 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 168.9 (2 C), 61.2 (2 CH_2), 59.2 (CH), 28.8 (CH), 20.4 (2 CH_3), 14.2 (2 CH_3).

Compound **3bf**:[7] Following *GP1* performed with diethyl malonate (**1b**, 0.84 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and allyl bromide (**2f**, 0.43 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M), the desired product **3bf** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (807 mg, 81%).
R_f (Cy/EA : 90/10, UV+$KMnO_4$): 0.29
^{1}H NMR (400 MHz, $CDCl_3$): δ 5.76 (ddt, *J* = 17.1, 10.3, 7.2 Hz, 1H), 5.10 (d, *J* = 17.1 Hz, 1H), 5.04 (d, *J* = 10.3 Hz, 1H), 4.18 (q, *J* = 7.1 Hz, 4H), 3.40 (t, *J* = 7.2 Hz, 1H), 2.63 (t, *J* = 7.2 Hz, 2H), 1.24 (t, *J* = 7.1 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 169.0 (2 C), 134.2 (CH), 117.6 (CH_2), 61.5 (2 CH_2), 51.8 (CH), 32.9 (CH_2), 14.2 (2 CH_3).

Compound **3bg**:[8] Following *GP1* performed with diethyl malonate (**1b**, 0.84 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and propargyl bromide (**2g**, 0.74 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M), the desired product **3bg** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (572 mg, 58%).
R_f (Cy/EA : 90/10, UV+$KMnO_4$): 0.34
^{1}H NMR (400 MHz, $CDCl_3$): δ 4.20 (q, *J* = 7.2 Hz, 4H), 3.53 (t, *J* = 7.5 Hz, 1H), 2.78–2.71 (m, 2H), 2.02–1.97 (m, 1H), 1.25 (t, *J* = 7.2 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 167.9 (2 C), 80.0 (C), 70.5 (CH), 61.8 (2 CH_2), 51.2 (CH), 18.5 (CH_2), 14.1 (2 CH_3).

Compound **3bh**:[9] Following *GP1* performed with diethyl malonate (**1b**, 0.84 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and benzyl bromide (**2h**, 0.59 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M), the desired product **3bh** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (959 mg, 76%).
R_f (Cy/EA : 90/10, UV+$KMnO_4$): 0.25
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.33–7.27 (m, 2H), 7.26–7.21 (m, 3H), 4.19 (q, *J* = 7.2 Hz, 4H), 3.67 (t, *J* = 7.9 Hz, 1H), 3.24 (d, *J* = 7.9 Hz, 2H), 1.23 (t, *J* = 7.2 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 169.0 (2 C), 138.0 (C), 128.9 (2 CH), 128.6 (2 CH), 126.8 (CH), 61.5 (2 CH_2), 54.0 (CH), 34.8 (CH_2), 14.1 (2 CH_3).

Compound **3bi**:[10] Following *GP1* performed with diethyl malonate (**1b**, 0.46 mL, 3.0 mmol, 1.0 equiv), sodium hydride (0.12 g, 3.0 mmol, 1.0 equiv), and 2-(bromomethyl)thiophene (**2i**, 0.53 g, 3.0 mmol, 1.0 equiv) in DMF (3 mL, *c* = 1 M) for 16 h, the desired product **3bi** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (500 mL)] as a yellow oil (229 mg, 30%).
R_f (Cy/EA : 80/20, UV+$KMnO_4$): 0.53
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.25–7.21 (m, 1H), 7.03–7.00 (m, 1H), 6.93 (d, *J* = 4.9 Hz, 1H), 4.16 (q, *J* = 7.1 Hz, 4H), 3.63 (t, *J* = 7.8 Hz, 1H), 3.24 (d, *J* = 7.8 Hz, 2H), 1.22 (t, *J* = 7.1 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 169.0 (2 C), 138.2 (C), 128.3 (CH), 125.8 (CH), 122.1 (CH), 61.6 (CH_2), 53.3 (CH_3), 29.3 (CH_2), 14.1 (CH_3).

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Compound **3bj**:[1] Following *GP1* performed with diethyl malonate (**1b**, 0.84 mL, 5.5 mmol, 1.1 equiv), sodium hydride (0.20 g, 5.0 mmol, 1.0 equiv), and 1-bromo-3-chloropropane (**2j**, 0.49 mL, 5.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M) for 16 h, the desired product **3bj** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (1.077 g, 91%).
R*f* (PE/EA : 90/10, UV+KMnO$_4$): 0.48
^{1}H NMR (400 MHz, CDCl$_3$): δ 4.17 (q, *J* = 7.1 Hz, 4H), 3.51 (t, *J* = 6.5 Hz, 2H), 3.31 (t, *J* = 7.5 Hz, 1H), 2.01 (q, *J* = 7.5 Hz, 2H), 1.84–1.75 (m, 2H), 1.24 (t, 7.1 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 169.1 (2 C), 61.5 (2 CH_2), 51.3 (CH), 44.2 (CH_2), 30.2 (CH_2), 26.2 (CH_2), 14.1 (2 CH_3).

Compound **3ak**:[11] Following *GP1* performed with dimethyl malonate (**1a**, 0.56 mL, 4.9 mmol, 1.1 equiv), sodium hydride (0.18 g, 4.5 mmol, 1.0 equiv), and *tert*-butyl (2-bromoethyl)carbamate (**2k**, 1.00 g, 4.5 mmol, 1.0 equiv) in DMF (10 mL, *c* = 0.5 M) for 16 h, the desired product **3ak** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 90:10 (250 mL), 80:20 (250 mL)] as a colorless oil (507 mg, 41%).
R*f* (Cy/EA : 80/20, UV+KMnO$_4$): 0.11
^{1}H NMR (400 MHz, CDCl$_3$): δ 4.68 (br s, 1H), 3.72 (s, 6H), 3.42 (t, *J* = 7.1 Hz, 1H), 3.19 - 3.13 (m, 2H), 2.07 (q, *J* = 6.6 Hz, 2H), 1.40 (s, 9H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 169.7 (2 C), 155.9 (C), 79.4 (C), 52.7 (2 CH_3), 49.2 (CH), 38.5 (CH_2), 29.1 (CH_2), 28.4 (3 CH_3).

Compound **3bl**: Following *GP1* performed with diethyl malonate (**1b**, 1.5 mL, 10.0 mmol, 1.0 equiv), sodium hydride (0.40 g, 10.0 mmol, 1.0 equiv), and 2-bromoethyl 4-methylbenzoate (**2l**, 2.431 g, 10.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 1 M) at 80 °C for 16 h, the desired product **3bl** was obtained after purification by FC [V(SiO_2) = 100 mL, PE/EA 98:2 (500 mL), 95:5 (250 mL), 90:10 (250 mL), 80/20 (250 mL)] as a colorless oil (1.425 g, 44%).
R*f* (PE/EA : 90/10, UV+KMnO$_4$): 0.34
HRMS (ESI$^+$): [M+Na]$^+$ Calcd. for $C_{17}H_{22}NaO_6$: 345.1308. Found: 345.1309.
^{1}H NMR (400 MHz, CDCl$_3$): δ 7.88 (d, *J* = 7.5 Hz, 2H), 7.21 (d, *J* = 7.5 Hz, 2H), 4.35 (t, *J* = 6.1 Hz, 2H), 4.16 (t, *J* = 7.1 Hz, 4H), 3.55 (t, *J* = 7.3 Hz, 1H), 2.52–2.29 (m, 5H), 1.23 (t, *J* = 7.1 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 169.0 (2 C), 166.4 (C), 143.8 (C), 129.7 (2 CH), 129.1 (2 CH), 127.3 (C), 62.3 (CH_2), 61.7 (2 CH_2), 49.2 (CH), 28.0 (CH_2), 21.7 (CH_3), 14.1 (2 CH_3).

Compound **3bm**: Following *GP1* performed with diethyl malonate (**1b**, 1.67 mL, 11.0 mmol, 1.1 equiv), sodium hydride (0.40 g, 10.0 mmol, 1.0 equiv), and (2-bromoethoxy)(*tert*-butyl)dimethylsilane (**2m**, 2.392 g, 10.0 mmol, 1.0 equiv) in DMF (10 mL, *c* = 1 M) for 16 h, the desired product **3bm** was obtained after purification by FC [V(SiO_2) = 50 mL, PE/EA 98:2 (250 mL), 95:5 (250 mL)] as a colorless oil (1.655 g, 51%).
R*f* (PE/EA : 90/10, UV+KMnO$_4$): 0.41
HRMS (ESI$^+$): [M+Na]$^+$ Calcd. for $C_{15}H_{30}NaO_5Si$: 341.1754. Found: 341.1750.
^{1}H NMR (400 MHz, CDCl$_3$): δ 4.25–4.10 (m, 4H), 3.63 (t, *J* = 6.4 Hz, 2H), 3.56 (t, *J* = 6.4 Hz, 1H), 2.09 (q, *J* = 6.4 Hz, 2H), 1.25 (t, *J* = 7.7 Hz, 6H), 0.86 (s, 9H), 0.01 (s, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 169.7 (2 C), 61.4 (2 CH_2), 60.4 (CH_2), 48.6 (CH), 31.8 (CH_2), 26.0 (3 CH_3), 18.4 (C), 14.2 (2 CH_3). [2 $\underline{C}H_3$ not detected]

Compound **3bn**: Following *GP1* performed with diethyl malonate (**1b**, 3.4 mL, 22.0 mmol, 1.1 equiv), sodium hydride (0.98 g, 24.0 mmol, 1.2 equiv), and bromoacetonitrile (**2n**, 1.4 mL, 20.0 mmol, 1.0 equiv) in THF (40 mL), the desired product **3bn** was obtained after purification by FC [V(SiO_2) = 100 mL, PE/EA 80:20 (500 mL), 70:30 (500 mL)] as a colorless oil (990 mg, 24%).
R*f* (PE/EA : 80/20, UV+KMnO$_4$): 0.15
HRMS (ESI$^+$): [M+H]$^+$ Calcd. for $C_9H_{14}NO_4$: 200.0917. Found: 200.0916.
^{1}H NMR (400 MHz, CDCl$_3$): δ 4.29–4.20 (m, 4H), 3.68 (t, *J* = 7.3 Hz, 1H), 2.90 (d, *J* = 7.3 Hz, 2H), 1.28 (t, *J* = 7.1 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 166.5 (2 C), 116.9 (C), 62.7 (2 CH_2), 48.1 (CH), 17.0 (CH_2), 14.0 (2 CH_3).

Compound **3ao**: Following *GP1* performed with dimethyl malonate (**1a**, 0.47 mL, 4.1 mmol, 1.1 equiv), sodium hydride (0.15 g, 3.7 mmol, 1.0 equiv), and 2-(iodomethyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**2o**, 1.00 g, 3.7 mmol, 1.0 equiv) in DMF (5 mL, *c* = 1 M), the desired product **3ao** was obtained after purification by FC [V(SiO_2) = 50 mL, PE/EA 80:20 (250 mL), 60:40 (250 mL)] as a colorless oil (714 mg, 70%).
R*f* (PE/EA : 80/20, UV+KMnO$_4$): 0.20
HRMS (ESI$^+$): [M+H]$^+$ Calcd. for $C_{12}H_{22}BO_6$: 273.1503. Found: 273.1506.
^{1}H NMR (400 MHz, CDCl$_3$): δ 3.67 (s, 6H), 3.55 (t, *J* = 8.0 Hz, 1H), 1.27 (d, *J* = 8.0 Hz, 2H), 1.18 (s, 12H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 171.0 (2 C), 83.6 (2 C), 52.5 (2 CH_2), 47.4 (CH), 24.7 (4 CH_3), 11.7 (br CH_2).

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Compound **3ap**: Following *GP1* performed with dimethyl malonate (**1a**, 0.9 mL, 7.9 mmol, 1.1 equiv), sodium hydride (0.29 g, 7.2 mmol, 1.0 equiv), (chloromethyl)trimethylsilane (**2p**, 1.0 mL, 7.2 mmol, 1.0 equiv) and sodium iodide (3.2 g, 21.5 mmol, 3.0 equiv) in THF (15 mL, *c* = 0.5 M) at reflux for 24 h, the desired product **3ap** was obtained after purification by FC [V(SiO_2) = 50 mL, Cy/EA 95:5 (250 mL), 90:10 (250 mL)] as a colorless oil (333 mg, 21%).
R_f (PE/EA : 90/10, UV+$KMnO_4$): 0.48
HRMS (ESI^+): $[M+Na]^+$ Calcd. for $C_9H_{18}NaO_4Si$: 241.0866. Found: 241.0866.
^{1}H NMR (400 MHz, $CDCl_3$): δ 3.71 (s, 6H), 3.38 (t, *J* = 7.9 Hz, 1H), 1.18 (d, *J* = 7.9 Hz, 2H), 0.00 (s, 9H).
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 171.2 (2 C), 52.7 (2 CH_3), 47.6 (CH), 16.3 (CH_2), –1.54 (3 CH_3).

3. Preparation of substituted malonic acids 9

General procedure 2 (GP2) - saponification: A RBF equipped with a stirring bar was charged with malonate **3** (1.0 equiv) and MeOH (*c* = 2 M). After addition of a 6 M aqueous solution of NaOH (5.0 equiv), the reaction mixture was stirred at 70 °C for 1 h. The resulting mixture was then acidified to pH 1 with 1 M aq HCl, and extracted twice with EA (20 mL). The combined organic layers were dried (Na_2SO_4) and evaporated to afford the expected product **9**.

Compound **9a**:[12] Following *GP2* performed with **3aa** (0.40 mL, 3.0 mmol, 1.0 equiv) and NaOH (0.60 g, 15.0 mmol, 5.0 equiv) in MeOH (2.5 mL, *c* = 2 M), the desired product **9a** was obtained as an off-white solid (314 mg, 89%).
mp: 136–138 °C (lit.: 131–134°C)
^{1}H NMR (400 MHz, CD_3COCD_3): δ 10.42 (br s, 2H), 3.47 (q, *J* = 7.2 Hz, 1H), 1.35 (d, *J* = 7.2 Hz, 3H).
$^{13}C\{^1H\}$ NMR (100 MHz, CD_3COCD_3): δ 171.8 (2 C), 46.1 (CH), 14.0 (CH_3).

Compound **9c**:[1] Following *GP2* performed with **3ac** (565 mg, 3.0 mmol, 1.0 equiv) and NaOH (0.60 g, 15.0 mmol, 5.0 equiv) in MeOH (2.5 mL, *c* = 2 M), the desired product **9c** was obtained as a white solid (439 mg, 91%).
mp: 101–103 °C (lit.: 102–103°C)
^{1}H NMR (400 MHz, CD_3SOCD_3): δ 12.62 (br s, 2H), 3.17 (t, *J* = 7.4 Hz, 1H), 1.69 (q, *J* = 7.4 Hz, 2H), 1.36–1.14 (m, 4H), 0.84 (t, *J* = 6.8 Hz, 3H).
$^{13}C\{^1H\}$ NMR (100 MHz, CD_3SOCD_3): δ 171.1 (2 C), 51.7 (CH), 29.2 (CH_2), 28.3 (CH_2), 22.1 (CH_2), 13.9 (CH_3).

Compound **9d**:[13] Following *GP2* performed with **3bd** (817 mg, 3.0 mmol, 1.0 equiv) and NaOH (0.60 g, 15.0 mmol, 5.0 equiv) in MeOH (2.5 mL, *c* = 2 M), the desired product **9d** was obtained as a white solid (647 mg, quantitative).
mp: 110–113 °C (lit.: 113–114°C)
^{1}H NMR (400 MHz, CD_3SOCD_3): δ 12.64 (br s, 2H), 3.17 (t, *J* = 7.4 Hz, 1H), 1.68 (q, *J* = 7.4 Hz, 2H), 1.28–1.19 (m, 12H), 0.85 (t, *J* = 6.2 Hz, 3H).
$^{13}C\{^1H\}$ NMR (100 MHz, CD_3SOCD_3): δ 171.0 (2 C), 51.7 (CH), 31.3 (CH_2), 28.9 (CH_2), 28.8 (CH_2), 28.7 (CH_2), 28.5 (CH_2), 26.9 (CH_2), 22.2 (CH_2), 14.0 (CH_3).

Compound **9f**:[14] Following *GP2* performed with **3bf** (100 mg, 0.5 mmol, 1.0 equiv) and NaOH (0.10 g, 2.5 mmol, 5.0 equiv) in MeOH (0.4 mL, *c* = 2 M), the desired product **9f** was obtained as a white solid (61 mg, 85%).
mp: 101-104 °C (lit.: 102–105°C)
^{1}H NMR (400 MHz, CD_3COCD_3): δ 9.90 (br s, 2H), 5.91–5.75 (m, 1H), 5.12 (dd, *J* = 17.1, 3.0 Hz, 1H), 5.02 (dd, *J* = 10.3, 3.0 Hz, 1H), 3.46 (t, *J* = 7.5 Hz, 1H), 2.59 (t, *J* = 7.5 Hz, 2H).
$^{13}C\{^1H\}$ NMR (100 MHz, CD_3COCD_3): δ 170.5 (2 C), 135.7 (CH), 117.4 (CH_2), 51.8 (CH), 33.6 (CH_2).

Compound **9h**:[15] Following *GP2* performed with **3bh** (222 mg, 0.89 mmol, 1.0 equiv) and NaOH (0.18 g, 5.0 mmol, 5.0 equiv) in MeOH (0.8 mL, *c* = 2 M), the desired product **9h** was obtained as an off-white solid (151 mg, 87%).
^{1}H NMR (400 MHz, CD_3COCD_3): δ 9.78 (br s, 2H), 7.34–7.24 (m, 4H), 7.24–7.17 (m, 1H), 3.73 (t, *J* = 7.8 Hz, 1H), 3.19 (d, *J* = 7.8 Hz, 2H).
$^{13}C\{^1H\}$ NMR (100 MHz, CD_3COCD_3): δ 170.4 (2 C), 139.5 (C), 129.7 (2 CH), 129.2 (2 CH), 127.3 (CH), 54.0 (CH), 35.4 (CH_2).

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4. Preparation of substituted meldrum acid derivatives 7

Compound **7h**:[16] A flame-dried 100 mL RBF equipped with a stirring bar was charged with meldrum acid (**5**, 1.44 g, 10.0 mmol, 1.0 equiv), closed with a septum, and purged with argon. After the addition of benzaldehyde (**6h**, 1.00 mL, 10.0 mmol, 1.0 equiv) with a syringe, and abs. EtOH (20 mL, *c* = 0.5 M) by quick removal of the septum, the mixture was stirred (by heating with a heat gun, if necessary) until complete solubilization of the solid. Then, piperidine (99 µL, 1.0 mmol, 10 mol %) and acetic acid (57 µL, 1.0 mmol, 10 mol %) were added through the septum with syringes, and the reaction was stirred at rt for 30 min. $NaBH(OAc)_3$ (4.24 g, 20.0 mmol, 2.0 equiv) was added in 4 equal portions, one after the other on a 30 min interval by temporary removal of the septum and the reaction was stirred for 60 min at rt. Then, the resulting mixture was quenched with a sat. aq. NH_4Cl (50 mL) and extracted with DCM (3 × 20 mL). The combined organic layers were dried over Na_2SO_4 and evaporated. Purification by recrystallization ($MeOH/H_2O$) afforded the expected product **7h** as an off-white solid (1.321 g, 56%).
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.39–7.22 (m, 5H), 3.79 (t, *J* = 4.7 Hz, 1H), 3.52 (d, *J* = 4.7 Hz, 2H), 1.76 (s, 3H), 1.51 (s, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 165.4 (2 C), 137.4 (C), 129.9 (2 CH), 128.8 (2 CH), 127.3 (CH), 105.4 (C), 48.3 (CH), 32.3 (CH_2), 28.6 (CH_3), 27.4 (CH_3).

General procedure 3 (GP3) - preparation of meldrum acid derivatives: A RBF equipped with a stirring bar was charged with the malonic acid derivative **9** (1.0 equiv) and Ac_2O (5–8 M), and cooled to 0 °C (ice/water bath). After the addition of 2–3 drops of concentrated H_2SO_4, acetone (1.1 equiv) was added dropwise to the stirred mixture with a pressure-equalizing dropping funnel. The reaction was allowed to warm to room temperature and stirred for 6 h. Then, the resulting mixture was placed in the refrigerator for 2 h, and the resulting solid was collected by filtration on a fritted funnel and rinsed with cold water (2 times) and Et_2O (3 times). Traces of water were removed by addition of toluene (10 mL) and evaporation (3 times) to afford the desired product **7**.

Compound **7a**:[17] Following *GP3* performed with methylmalonic acid **9a** (2.95 g, 25.0 mmol, 1.5 equiv) and acetone (2.0 mL, 27.5 mmol, 1.1 equiv) in Ac_2O (3.2 mL, *c* = 8.0 M), the desired product **7a** was obtained as a white solid (3.354 g, 84%).
mp: 114–116 °C (lit.: 113–114 °C)
^{1}H NMR (400 MHz, $CDCl_3$): δ 3.61 (q, *J* = 7.0 Hz, 1H), 1.80 (s, 3H), 1.74 (s, 3H), 1.54 (d, *J* = 7.0 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 166.2 (2 C), 105.0 (C), 41.4 (CH), 28.6 (CH_3), 26.5 (CH_3), 10.8 (CH_3).

Compound **7s**:[18] Following *GP3* performed with phenylmalonic acid **9s** (4.50 g, 25.0 mmol, 1.5 equiv) and acetone (2.0 mL, 27.5 mmol, 1.1 equiv) in Ac_2O (5.0 mL, *c* = 5.0 M), the desired product **7s** was obtained as a pale yellow solid (4.690 g, 84%).
mp: 135–138 °C (lit.: 135–137°C)
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.50–7.39 (m, 3H), 7.37–7.24 (m, 2H), 4.82 (s, 1H), 1.88 (s, 3H), 1.78 (s, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 164.9 (2 C), 130.7 (C), 129.3 (2 CH), 129.2 (2 CH), 128.9 (CH), 105.9 (C), 52.9 (CH), 28.6 (CH_3), 27.5 (CH_3).

5. Preparation of SMAHOs 4

General procedure 4 (GP4) - monosaponification: In a manner similar to [19], a RBF equipped with a stirring bar was charged with the malonate derivative **3** (1.0 equiv) and the solvent (*c* = 0.5 M, V mL). A 5 M aqueous solution of KOH (1.0 equiv) was added with a syringe and the reaction mixture was stirred at rt for 2 h. Then, the mixture was concentrated, diluted with water (V mL), and the resulting aqueous layer was washed with Et_2O (3*V/4 mL), acidified to pH 1 by the addition of 1 M aq HCl, saturated with NaCl, and extracted with EA (3*V/4 mL). The combined organic layers were dried (Na_2SO_4) and evaporated to afford the expected product **4**.

Compound **4aa**:[20] Following *GP4* performed with **3aa** (6.70 mL, 50.0 mmol, 1.0 equiv) and potassium hydroxide (3.37 g, 60.0 mmol, 1.2 equiv) in MeOH (100 mL), the desired product **4aa** was obtained as a colorless oil (6.011 g, 91%).
Characterization date are in agreement with those reported in [19].

Compound **4ba**:[20] Following *GP4* performed with **3ba** (3.00 g, 17.2 mmol, 1.0 equiv) and potassium hydroxide (0.96 g, 17.2 mmol, 1.0 equiv) in EtOH (34 mL), the desired product **4ba** was obtained as a colorless oil (1.818 g, 72%).
^{1}H NMR (400 MHz, $CDCl_3$): δ 10.15 (br s, 1H), 4.18 (q, *J* = 7.1 Hz, 2H), 3.45 (q, *J* = 7.4 Hz, 1H), 1.41 (d, *J* = 7.4 Hz, 3H), 1.25 (t, *J* = 7.1 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 175.9 (C), 170.1 (C), 61.9 (CH_2), 46.1 (CH), 14.0 (CH_3), 13.6 (CH_3).

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Compound **4ab**:[21] Following *GP4* performed with **3ab** (1.28 g, 8.0 mmol, 1.0 equiv) and potassium hydroxide (0.54 g, 10.0 mmol, 1.2 equiv) in MeOH (15 mL), the desired product **4ab** was obtained as a colorless oil (1.052 g, 90%).
^{1}H NMR (400 MHz, CDCl$_3$): δ 10.62 (br s, 1H), 3.75 (s, 3H), 3.32 (t, *J* = 7.4 Hz, 1H), 1.95 (quint, *J* = 7.4 Hz, 2H), 0.98 (t, *J* = 7.4 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 175.4 (C), 169.8 (C), 53.2 (CH), 52.8 (CH_3), 22.4 (CH_2), 11.9 (CH_3).

Compound **4ac**:[22] Following *GP4* performed with **3ac** (1.02 g, 6.4 mmol, 1.0 equiv) and potassium hydroxide (0.43 g, 7.7 mmol, 1.2 equiv) in MeOH (11 mL), the desired product **4ac** was obtained as a colorless oil (0.871 g, 78%).
Characterization date are in agreement with those reported in 19.

Compound **4bd**:[23] Following *GP4* performed with **3bd** (5.50 g, 20.2 mmol, 1.0 equiv) and potassium hydroxide (1.13 g, 20.2 mmol, 1.0 equiv) in EtOH (40 mL), the desired product **4bd** was obtained as a colorless oil (3.560 g, 72%).
Characterization date are in agreement with those reported in 19.

Compound **4be**: Following *GP4* performed with **3be** (2.70 g, 13.3 mmol, 1.0 equiv) and potassium hydroxide (0.75 g, 13.3 mmol, 1.0 equiv) in EtOH (27 mL), the desired product **4be** was obtained as a colorless oil (1.716 g, 74%).
HRMS (ESI$^+$): m/z $[M+Na]^+$ Calcd. for $C_8H_{14}NaO_4$: 197.0784. Found: 197.0783.
^{1}H NMR (400 MHz, CDCl$_3$): δ 10.76 (br s, 1H), 4.19 (q, *J* = 7.1 Hz, 2H), 3.15 (d, *J* = 8.3 Hz, 1H), 2.37 (m, 1H), 1.26 (t, *J* = 7.1 Hz, 3H), 1.01 (t, *J* = 7.4 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 174.6 (C), 169.1 (C), 61.7 (CH_2), 58.7 (CH), 29.1 (CH), 20.4 (CH_3), 20.3 (CH_3), 14.1 (CH_3).

Compound **4bf**: Following *GP4* performed with **3bf** (0.98 g, 4.9 mmol, 1.0 equiv) and potassium hydroxide (0.27 g, 4.9 mmol, 1.0 equiv) in EtOH (10 mL), the desired product **4bf** was obtained as a colorless oil (0.603 g, 71%).
Characterization date are in agreement with those reported in 19.

Compound **4bg**:[24] Following *GP4* performed with **3bg** (1.70 g, 8.6 mmol, 1.0 equiv) and potassium hydroxide (0.48 g, 8.6 mmol, 1.0 equiv) in EtOH (18 mL), the desired product **4bg** was obtained as a colorless oil (0.963 g, 65%).
Characterization date are in agreement with those reported in 19.

Compound **4bh**: Following *GP4* performed with **3bh** (1.07 g, 4.3 mmol, 1.0 equiv) and potassium hydroxide (0.24 g, 4.3 mmol, 1.0 equiv) in EtOH (10 mL), the desired product **4bh** was obtained as a colorless oil (0.657 g, 69%).
Characterization date are in agreement with those reported in 19.

Compound **4bi**:[25] Following *GP4* performed with **3bi** (0.19 g, 0.73 mmol, 1.0 equiv) and potassium hydroxide (49 mg, 0.88 mmol, 1.2 equiv) in EtOH (2 mL), the desired product **4bi** was obtained as a colorless oil (0.118 g, 71%).
^{1}H NMR (400 MHz, CDCl$_3$): δ 9.03 (br s, 1H), 7.40–7.19 (m, 1H), 7.06 (m, 1H), 6.97 (d, *J* = 4.9 Hz, 1H), 4.21 (q, *J* = 7.2 Hz, 2H), 3.73 (t, *J* = 7.6 Hz, 1H), 3.29 (d, *J* = 7.6 Hz, 2H), 1.24 (t, *J* = 7.2 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 174.1 (C), 168.8 (C), 137.7 (C), 128.1 (CH), 125.9 (CH), 122.2 (CH), 62.0 (CH_2), 53.0 (CH), 29.2 (CH_2), 14.0 (CH_3).

Compound **4bj**: Following *GP4* performed with **3bj** (1.62 g, 6.8 mmol, 1.0 equiv) and potassium hydroxide (0.38 g, 6.8 mmol, 1.0 equiv) in EtOH (14 mL), the desired product **4bj** was obtained as a colorless oil (0.890 g, 62%).
HRMS (ESI$^+$): m/z $[M+Na]^+$ Calcd. for $C_8H_{13}NaO_4$: 231.0394. Found: 231.0391.
^{1}H NMR (400 MHz, CDCl$_3$): δ 10.05 (br s, 1H), 4.22 (q, *J* = 7.1 Hz, 2H), 3.54 (t, *J* = 6.4 Hz, 2H), 3.40 (t, *J* = 7.4 Hz, 1H), 2.11–2.02 (m, 2H), 1.89–1.79 (m, 2H), 1.27 (t, *J* = 7.1 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 174.8 (C), 169.0 (C), 62.0 (CH_2), 51.1 (CH), 44.2 (CH_2), 30.1 (CH_2), 26.2 (CH_2), 14.1 (CH_3).

Compound **4ak**: Following *GP4* performed with **3ak** (0.50 g, 1.8 mmol, 1.0 equiv) and potassium hydroxide (0.10 g, 1.8 mmol, 1.0 equiv) in MeOH (5 mL), the desired product **4ak** was obtained as a colorless oil (0.366 g, 76%).

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HRMS (ESI⁺): $[M+K]^+$ Calcd. for $C_{11}H_{19}KNO_6$: 300.0843. Found: 300.0843.
^{1}H NMR (400 MHz, CD_3COCD_3,): δ 6.09 (br s, 1H), 3.71 (s, 3H), 3.48 (t, *J* = 7.2 Hz, 1H), 3.16 (q, *J* = 6.4 Hz, 2H), 2.10–2.06 (m, 2H), 1.40 (s, 9H). [$CO_2\underline{H}$ not detected]
^{13}C{^{1}H} NMR (100 MHz, CD_3COCD_3,): δ 170.5 (C), 170.4 (C), 156.7 (C), 78.6 (C), 52.4 (CH_3), 49.5 (CH), 38.9 (CH_2), 30.5 (CH_2), 28.5 (3 CH_3).

Compound **4bl**: Following *GP4* performed with **3bl** (1.40 g, 4.4 mmol, 1.0 equiv) and potassium hydroxide (0.30 g, 5.3 mmol, 1.2 equiv) in EtOH (9 mL), the desired product **4bl** was obtained as a colorless oil (0.825 g, 63%).
Characterization date are in agreement with those reported in 19.

Compound **4bm**: Following *GP4* performed with **3bm** (0.98 g, 3.1 mmol, 1.0 equiv) and potassium hydroxide (0.21 g, 3.7 mmol, 1.2 equiv) in EtOH (6 mL), the desired product **4bm** was obtained as a colorless oil (0.633 g, 70%).
HRMS (ESI⁺): $[M+Na]^+$ Calcd. for $C_{13}H_{26}NaO_5Si$: 313.1442. Found: 313.1444.
^{1}H NMR (400 MHz, $CDCl_3$): δ 9.30 (br s, 1H), 4.20 (q, *J* = 7.0 Hz, 2H), 3.75–3.61 (m, 2H), 3.61 (t, *J* = 6.6 Hz, 1H), 2.13 (q, *J* = 6.0 Hz, 2H), 1.27 (t, *J* = 7.0 Hz, 3H), 0.87 (s, 9H), 0.02 (s, 6H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 175.1 (C), 169.5 (C), 61.8 (CH_2), 60.4 (CH_2), 48.6 (CH), 31.7 (CH_2), 26.0 (3 CH_3), 18.4 (C), 14.1 (CH_3). [2 $\underline{C}H_3$ not detected]

Compound **4bn**: Following *GP4* performed with **3bn** (0.94 g, 4.7 mmol, 1.0 equiv) and potassium hydroxide (0.26 g, 4.7 mmol, 1.0 equiv) in EtOH (20 mL), the desired product **4bn** was obtained as a colorless oil (0.528 g, 65%).
HRMS (ESI⁺): $[M+Na]^+$ Calcd. for $C_7H_9NNaO_4$: 194.0424. Found: 194.0428.
^{1}H NMR (400 MHz, $CDCl_3$): δ 9.31 (br s, 1H), 4.30 (q, *J* = 7.1 Hz, 2H), 3.78 (t, *J* = 7.3 Hz, 1H), 2.94 (d, *J* = 7.3 Hz, 2H), 1.32 (t, *J* = 7.1 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 170.8 (C), 166.5 (C), 116.8 (C), 63.2 (CH_2), 47.9 (CH), 17.0 (CH_2), 14.0 (CH_3).

Compound **4ao**: Following *GP4* performed with **3ao** (0.41 g, 1.5 mmol, 1.0 equiv) and potassium hydroxide (0.10 g, 1.8 mmol, 1.2 equiv) in MeOH (3 mL), the desired product **4ao** was obtained as a colorless oil (0.300 g, 77%).
HRMS (ESI⁺): $[M+Na]^+$ Calcd. for $C_{11}H_{19}BNaO_6$: 281.1167. Found: 281.1165.
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.62 (br s, 1H), 3.72 (s, 3H), 3.61 (t, *J* = 7.9 Hz, 1H), 1.32 (d, *J* = 7.9 Hz, 2H), 1.20 (s, 12H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 175.5 (C), 170.9 (C), 83.9 (2 C), 52.7 (CH_3), 47.4 (CH), 24.7 (4 CH_3), 11.5 (CH_2).

Compound **4ap**: Following *GP4* performed with **3ap** (92 mg, 0.57 mmol, 1.0 equiv) and potassium hydroxide (39 mg, 0.69 mmol, 1.2 equiv) in MeOH (2 mL), the desired product **4ap** was obtained as a colorless oil (73 mg, 62%).
HRMS (ESI⁺): $[M+Na]^+$ Calcd. for $C_8H_{16}NaO_4Si$: 227.0710. Found: 227.0713.
^{1}H NMR (400 MHz, $CDCl_3$): δ 10.16 (br s, 1H), 3.73 (s, 3H), 3.40 (t, *J* = 7.8 Hz, 1H), 1.18 (t, *J* = 7.8 Hz, 2H), 0.01 (s, 9H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 176.7 (C), 170.8 (C), 52.8 (CH_3), 47.6 (CH), 16.2 (CH_2), –1.54 (3 CH_3).

Compound **4aq**: Following *GP4* performed with dimethyl chloromalonate **3aq** (2.5 mL, 20.0 mmol, 1.0 equiv) and potassium hydroxide (1.12 g, 20.0 mmol, 1.0 equiv) in MeOH (40 mL), the desired product **4aq** was obtained as a colorless oil (2.160 g, 70%).
HRMS (ESI⁺): m/z $[M+Na]^+$ Calcd. for $C_4H_5NaO_4$: 174.9768. Found: 174.9768.
^{1}H NMR (400 MHz, $CDCl_3$): δ 11.17 (br s, 1H), 4.95 (s, 1H), 3.86 (s, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 169.6 (C), 164.9 (C), 54.9 (CH), 54.3 (CH_3).

Compound **4br**: Following *GP4* performed with diethyl bromomalonate **3br** (1.7 mL, 10.0 mmol, 1.0 equiv) and potassium hydroxide (0.56 g, 10.0 mmol, 1.0 equiv) in EtOH (20 mL), the desired product **4br** was obtained as a colorless oil (1.001 g, 47%).
HRMS (ESI⁺): m/z $[M+Na]^+$ Calcd. for $C_5H_7BrNaO_4$: 232.9419. Found: 232.9418.
^{1}H NMR (400 MHz, $CDCl_3$): δ 10.66 (br s, 1H), 4.91 (s, 1H), 4.34 (q, *J* = 7.1 Hz, 2H), 1.35 (t, *J* = 7.1 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 169.8 (C), 164.7 (C), 63.9 (CH_2), 41.4 (CH), 13.9 (CH_3).

General procedure 5 (GP5) - monoesterification: A 50 mL RBF equipped with a stirring bar was charged with the methyl malonic acid (**9a**, 0.50 g, 4.2 mmol, 1.0 equiv), DMAP (26 mg, 0.21 mmol, 5 mol %), CH_3CN (10 mL), and the requisite alcohol **8** (1.1 equiv) and cooled at −15 °C (ice/salt bath). A solution of DCC (0.87 g, 4.2 mmol, 1.0 equiv) in CH_3CN (10 mL) was added dropwise to the stirred mixture with a pressure-equalizing dropping funnel. The reaction was allowed to warm to rt and stirred for 14 h. Then, the reaction mixture was filtered through a fritted funnel (rinsed with CH_2Cl_2), and the filtrate was evaporated. To the resulting crude oil were added 30 mL of sat aq $NaHCO_3$. The resulting solution was washed with Et_2O (2 × 10 mL), acidified to pH 1 with 1 M aq HCl, and extracted with CH_2Cl_2 (2 × 20 mL). The combined organic layers were dried (Na_2SO_4) and evaporated to afford the expected product **4**.

Compound **4ca**: Following *GP5* performed with isopropanol (**8c**, 0.35 mL, 4.6 mmol, 1.1 equiv), the desired product **4ca** was obtained as a colorless oil (0.341 g, 51%).
HRMS (ESI$^+$): $[M+Na]^+$ Calcd. for $C_7H_{12}NaO_4$: 183.0627. Found: 183.0633.
^{1}H NMR (400 MHz, CDCl$_3$): δ 9.80 (br s, 1H), 5.03 (hept, *J* = 6.5 Hz, 1H), 3.42 (q, *J* = 7.3 Hz, 1H), 1.40 (d, *J* = 7.3 Hz, 3H), 1.22 (d, *J* = 6.5 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 175.9 (C), 169.7 (C), 69.5 (CH), 46.2 (CH), 21.6 (CH_3), 21.5 (CH_3), 13.5 (CH_3).

Compound **4da**: Following *GP5* performed with benzyl alcohol (**8d**, 0.48 mL, 4.6 mmol, 1.1 equiv), the desired product **4da** was obtained as a colorless oil (0.462 g, 53%).
Characterization date are in agreement with those reported in 19.

Compound **4fa**: Following *GP5* performed with allyl alcohol (**8f**, 0.31 mL, 4.6 mmol, 1.1 equiv), the desired product **4fa** was obtained as a colorless oil (0.345 g, 52%).
HRMS (ESI$^+$): $[M+Na]^+$ Calcd. for $C_7H_{10}NaO_4$: 181.0471. Found: 181.0477.
^{1}H NMR (400 MHz, CDCl$_3$): δ 11.01 (br s, 1H), 5.89 (ddt, *J* = 16.2, 10.6, 5.7 Hz, 1H), 5.31 (dt, *J* = 16.2, 1.6 Hz, 1H), 5.27–5.18 (m, 1H), 4.63 (d, *J* = 5.7 Hz, 2H), 3.51 (q, *J* = 7.3 Hz, 1H), 1.44 (d, *J* = 7.3 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 176.1 (C), 169.6 (C), 131.5 (CH), 118.8 (CH_2), 66.3 (CH_2), 46.04 (CH), 13.6 (CH_3).

Compound **4ga**:[26] Following *GP5* performed with *tert*-butanol **8g** (0.44 mL, 4.6 mmol, 1.1 equiv), the desired product **4ga** was obtained as a colorless oil (0.271 g, 37%).
^{1}H NMR (400 MHz, CDCl$_3$): δ 10.90 (br s, 1H), 3.37 (q, *J* = 7.3 Hz, 1H), 1.44 (s, 9H), 1.38 (d, *J* = 7.3 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 176.5 (C), 169.3 (C), 82.4 (C), 47.0 (CH), 27.9 (3 CH_3), 13.7 (CH_3).

Compound **4ha**: Following *GP5* performed with 2,2,2-trifluoroethanol (**8h**, 0.33 mL, 4.6 mmol, 1.1 equiv), the desired product **4ha** was obtained as a colorless oil (0.285 g, 34%).
HRMS (ESI$^+$): $[M+Na]^+$ Calcd. for $C_6H_7F_3NaO_4$: 223.0188. Found: 223.0189.
^{1}H NMR (400 MHz, CDCl$_3$): δ 10.51 (br s, 1H), 4.59–4.49 (m, 2H), 3.62 (q, *J* = 7.2 Hz, 1H), 1.51 (d, *J* = 7.2 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 175.4 (C), 168.3 (C), 122.7 (q, $^1J_{C\text{-}F}$ = 277.3 Hz, CF_3), 61.2 (q, $^2J_{C\text{-}F}$ = 37.0 Hz, CH_2), 45.7 (CH), 13.5 (CH_3).
^{19}F{^{1}H} NMR (377 MHz, CDCl$_3$): δ –73.8 (s, 3 F).

Compound **4ea**:[27] Following *GP5* performed with (−)-menthol (**8e**, 722 mg, 4.6 mmol, 1.1 equiv), the desired product **4ea** was obtained as a colorless oil (0.297 g, 28%).
^{1}H NMR (400 MHz, CDCl$_3$): *(2 diastereomers)* δ 9.94 (br s, 2H), 4.76–4.66 (m, 2H), 3.51–3.40 (m, 2H), 2.06–1.95 (m, 2H), 1.92–1.79 (m, 2H), 1.72–1.62 (m, 4H), 1.53–1.35 (m, 10H), 1.12–0.92 (m, 4H), 0.93–0.82 (m, 14H), 0.78–0.68 (m, 6H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): *(2 diastereomers)* δ 176.2 (C), 176.1 (C), 169.7 (C), 169.6 (C), 76.0 (CH), 76.0 (CH), 47.0 (CH), 47.0 (CH), 46.3 (CH), 46.3 (CH), 40.6 (CH_2), 40.4 (CH_2), 34.3 (2 CH_2), 31.5 (2 CH), 26.3 (CH), 26.1 (CH), 23.4 (CH_2), 23.4 (CH_2), 22.1 (2 CH_3), 20.8 (2 CH_3), 16.3 (CH_3), 16.1 (CH_3), 13.8 (CH_3), 13.7 (CH_3).

Compound **4ia**: Following *GP5* performed with phenol (**8i**, 440 mg, 4.6 mmol, 1.1 equiv), the desired product **4ia** was obtained as a colorless oil (0.136 g, 17%).
HRMS (ESI$^+$): $[M+Na]^+$ Calcd. for $C_{10}H_{10}NaO_4$: 217.0471. Found: 217.0471.
^{1}H NMR (400 MHz, CDCl$_3$): δ 10.92 (br s, 1H), 7.40 (t, *J* = 7.3 Hz, 2H), 7.26 (t, *J* = 7.3 Hz, 1H), 7.13 (d, *J* = 8.0 Hz, 2H), 3.77 (q, *J* = 7.2 Hz, 1H), 1.61 (d, *J* = 7.2 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 176.1 (C), 168.4 (C), 150.5 (C), 129.6 (2 CH), 126.3 (CH), 121.4 (2 CH), 46.2 (CH), 13.6 (CH_3).

Compound **4ja**: Following *GP5* performed with (+)-citronellol (**8j**, 0.85 mL, 4.6 mmol, 1.1 equiv), the desired product **4ja** was obtained as a pale yellow oil (0.625 g, 58%).
HRMS (ESI$^+$): $[M+H]^+$ Calcd. for $C_{14}H_{25}O_4$: 257.1747. Found: 257.1750.
^{1}H NMR (400 MHz, CDCl$_3$): δ 9.20 (br s, 1H), 5.07 (t, *J* = 6.4 Hz, 1H), 4.19 (br s, 2H), 3.47 (q, *J* = 7.3 Hz, 1H), 2.00–1.92 (m, 2H), 1.71–1.66 (m, 1H), 1.67 (s, 3H), 1.59 (s, 3H), 1.56–1.40 (m, 2H), 1.44 (d, *J* = 7.3 Hz, 3H), 1.37–1.14 (m, 2H), 0.90 (d, *J* = 6.4 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$): δ 175.9 (C), 170.1 (C), 131.5 (C), 124.6 (CH), 66.4 (CH_2), 46.1 (CH), 37.0 (CH_2), 35.3 (CH_2), 29.5 (CH), 25.8 (CH_3), 25.5 (CH_2), 19.4 (CH_3), 17.8 (CH_3), 13.7 (CH_3).

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[26] Park, C.; Ha, M.W.; Kim, B.; Hong, S.; Kim, D.; Park, Y.; Kim, M.H.; Lee, J. K.; Lee, J.; Park, H.G. *Adv. Synth. Catal.* **2015**, *357*, 2841-2848.
[27] Ihara, M.; Takahashi, M.; Taniguchi, N.; Yasui, K.; Fukumoto, K.; Kametani, T *J. Chem. Soc., Perkin Trans. 1*, **1989**, 897-903.

Compound **4ka**: Following *GP5* performed with (*S*)-ethyl lactate (**8k**, 0.58 mL, 4.6 mmol, 1.1 equiv), the desired product **4ka** was obtained as a colorless oil (0.298 g, 32%).
HRMS (ESI⁺): $[M+H]^+$ Calcd. for $C_9H_{15}O_6$: 219.0863. Found: 219.0864.
^{1}H NMR (400 MHz, $CDCl_3$): *(2 diastereomers)* δ 7.51 (br s, 2H), 5.12 (q, *J* = 7.0 Hz, 2H), 4.19 (q, *J* = 7.1 Hz, 4H), 3.62–3.51 (m, 2H), 1.50 (d, *J* = 7.2 Hz, 6H), 1.47 (d, *J* = 7.4 Hz, 6H), 1.26 (t, *J* = 7.1 Hz, 6H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): *(2 diastereomers)* δ 174.9 (C), 174.6 (C), 170.6 (C), 170.5 (C), 169.6 (C), 169.4 (C), 69.7 (CH), 69.7 (CH), 61.7 (CH_2), 61.7 (CH_2), 46.0 (CH), 45.7 (CH), 16.8 (2 CH_3), 14.1 (CH_3), 14.1 (CH_3), 13.7 (CH_3), 13.6 (CH_3).

General procedure 6 (GP6) - opening of meldrum acid derivatives: In a manner similar to [19], a RBF equipped with a stirring bar was charged with the substituted meldrum acid **7** (1.0 equiv), the alcohol **8** (1.0 equiv), and toluene (*c* = 0.25 M). The reaction mixture was stirred at reflux for 4 h (or at 80 °C for 24 h). Then, the mixture was diluted with Et_2O (20 mL), and the resulting organic layer was extracted with saturated aqueous $NaHCO_3$ (2 times). The combined aqueous layers were cooled to 0 °C (ice/water bath) and acidified to pH 1 with 1 M aq HCl, saturated with NaCl, and extracted with Et_2O (3 × 20 mL). The combined organic layers were dried (Na_2SO_4) and evaporated to afford the expected product **4**.

Compound **4ch**: Following *GP6* performed with **7h** (0.50 g, 2.1 mmol, 1.0 equiv) and propan-2-ol (**8c**, 0.19 mL, 2.5 mmol, 1.0 equiv) in toluene at 80 °C for 24 h, the desired product **4ch** was obtained as a pale yellow oil (0.462 g, 93%).
HRMS (ESI⁺): m/z $[M+Na]^+$ Calcd. for $C_{13}H_{16}NaO_4$: 259.0940. Found: 259.0938.
^{1}H NMR (400 MHz, $CDCl_3$): δ 10.61 (br s, 1H), 7.35–7.29 (m, 2H), 7.28–7.23 (m, 3H), 5.05 (hept, *J* = 6.3 Hz, 1H), 3.72 (t, *J* = 7.8 Hz, 1H), 3.27 (d, *J* = 7.8 Hz, 2H), 1.25 (d, *J* = 6.3 Hz, 3H), 1.16 (d, *J* = 6.3 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 174.8 (C), 168.3 (C), 137.5 (C), 128.9 (2 CH), 128.7 (2 CH), 127.0 (CH), 69.7 (CH), 53.8 (CH), 34.7 (CH_2), 21.6 (2 CH_3).

Compound **4dh**: Following *GP6* performed with **7h** (0.50 g, 2.1 mmol, 1.0 equiv) and benzyl alcohol (**8d**, 0.22 mL, 2.1 mmol, 1.0 equiv) in refluxing toluene for 4 h, the desired product **4dh** was obtained as a pale yellow oil contaminated by ca. 13% of the decarboxylated product (0.392 g, 57%).
HRMS (ESI⁺): m/z $[M+Na]^+$ Calcd. for $C_{17}H_{16}NaO_4$: 307.0940. Found: 307.0941.
^{1}H NMR (400 MHz, $CDCl_3$): δ 10.71 (br s, 1H), 7.41–7.21 (m, 10H), 5.19 (s, 2H), 3.84 (t, *J* = 7.7 Hz, 1H), 3.31 (d, *J* = 7.7 Hz, 2H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 174.6 (C), 168.6 (C), 137.3 (C), 135.1 (C), 128.9 (2 CH), 128.7 (2 CH), 128.7 (2 CH), 128.5 (CH), 128.3 (2 CH), 127.0 (CH), 67.5 (CH_2), 53.7 (CH), 34. 8 (CH_2).

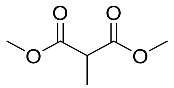
Compound **4da**: Following *GP6* performed with **7a** (0.32 g, 2.0 mmol, 1.0 equiv) and benzyl alcohol (**8d**, 0.21 mL, 2.0 mmol, 1.0 equiv) in refluxing toluene for 8 h, the desired product **4da** was obtained as a pale yellow oil (0.357 g, 85%).

Compound **4ea**: Following *GP6* performed with **7a** (0.32 g, 2.0 mmol, 1.0 equiv) and (−)-menthol (**8e**, 0.312 g, 2.0 mmol, 1.0 equiv) in refluxing toluene for 5 h, the desired product **4ea** was obtained as a colorless oil (0.375 g, 58%).

Compound **4bs**:[28] Following *GP6* performed with **7s** (0.440 g, 2.0 mmol, 1.0 equiv) in a refluxing mixture of toluene and EtOH 1:1 for 8 h, the desired product **4bs** was obtained as white solid (0.272 g, 65%).
^{1}H NMR (400 MHz, $CDCl_3$): δ 9.52 (br s, 1H), 7.46–7.29 (m, 5H), 4.65 (s, 1H), 4.30–4.15 (m, 2H), 1.26 (t, *J* = 7.1 Hz, 3H).
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 173.5 (C), 168.3 (C), 132.3 (C), 129.3 (2 CH), 128.9 (2 CH), 128.6 (CH), 62.3 (CH_2), 57.7 (CH), 14.1 (CH_3).

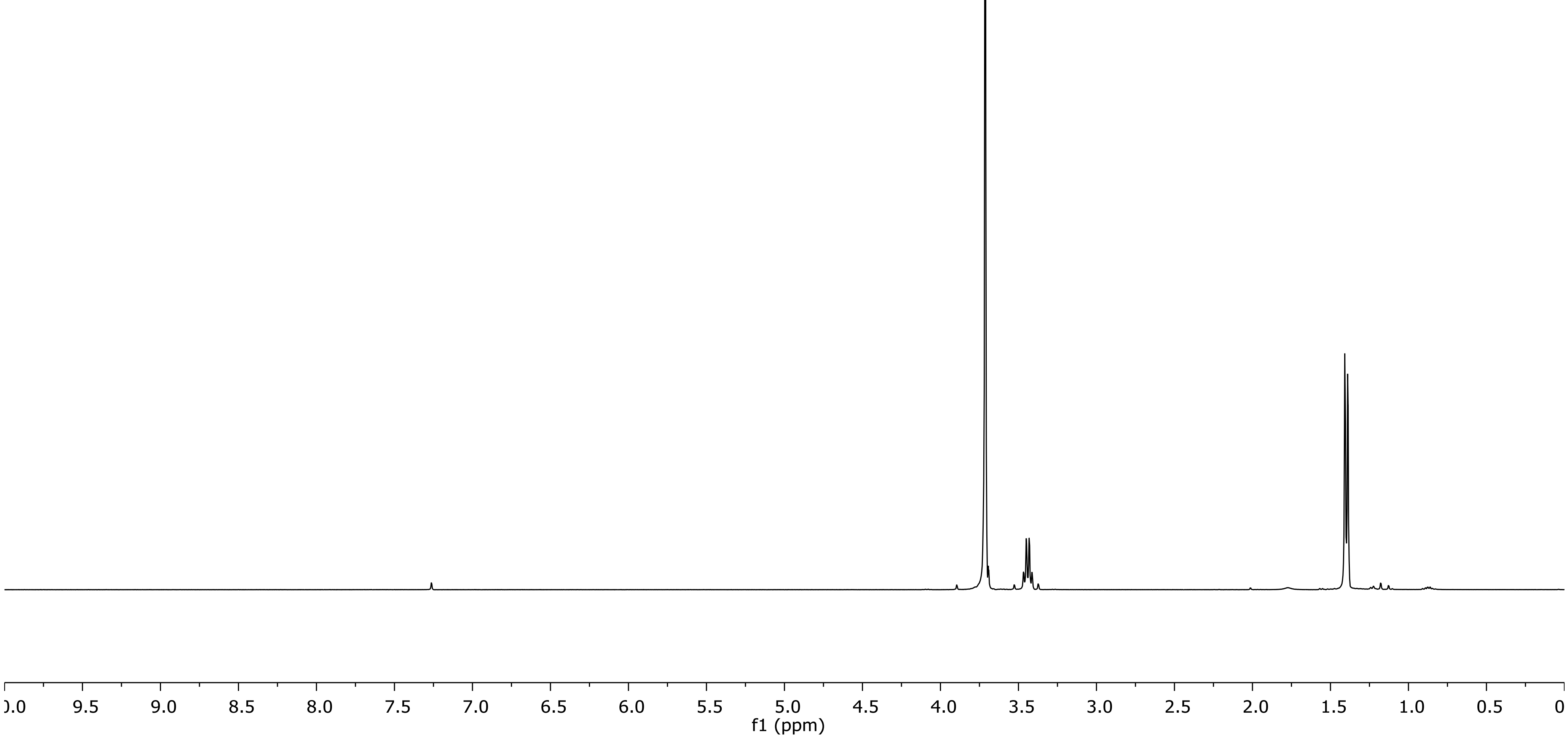
6. Copies of NMR spectra

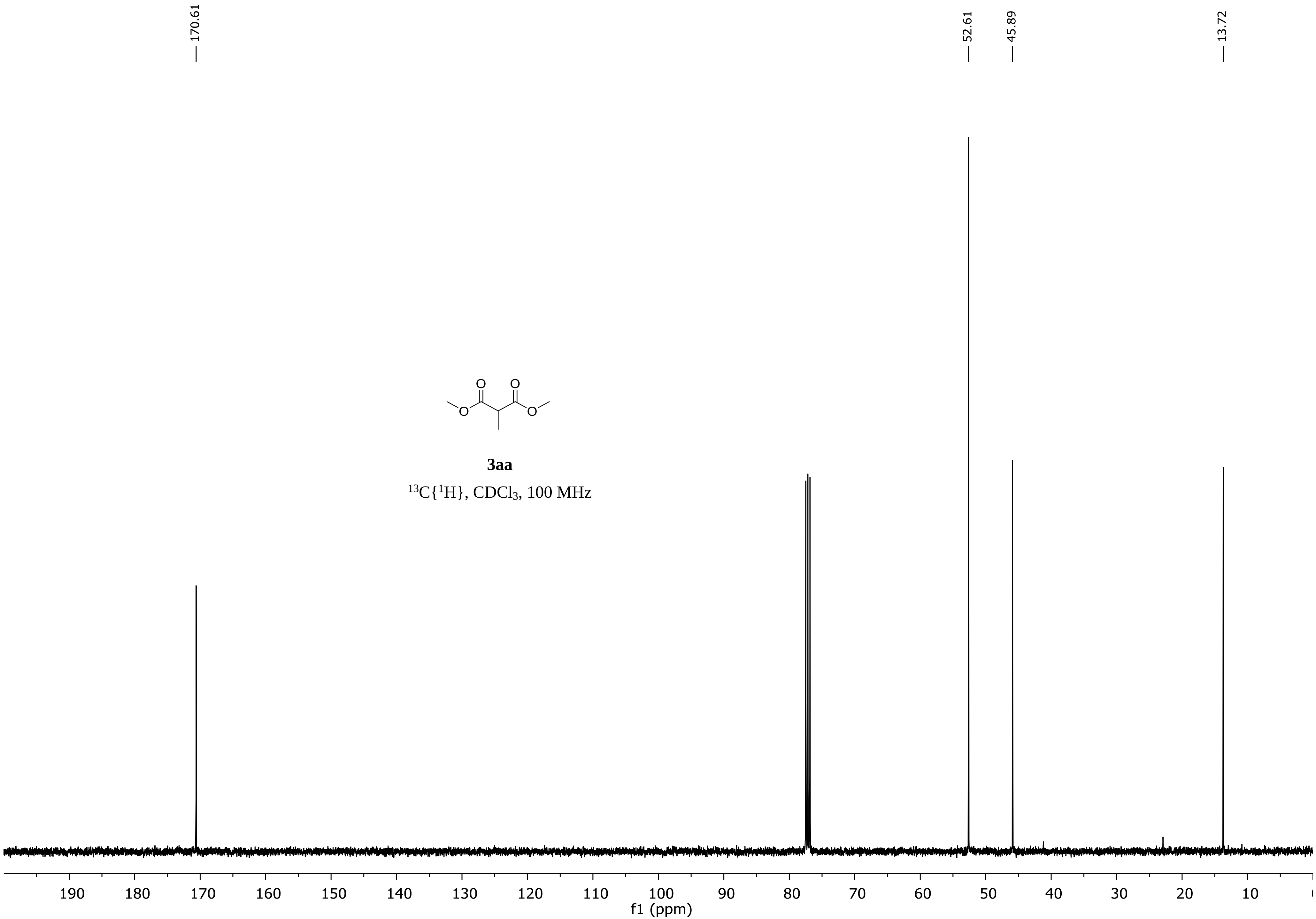
[28] Bagum, H.; Christensen, K.E.; Genov, M.; Pretsch, A.; Pretsch, D.; Moloney, M. G. *Tetrahedron* **2019**, *75*, 130561.

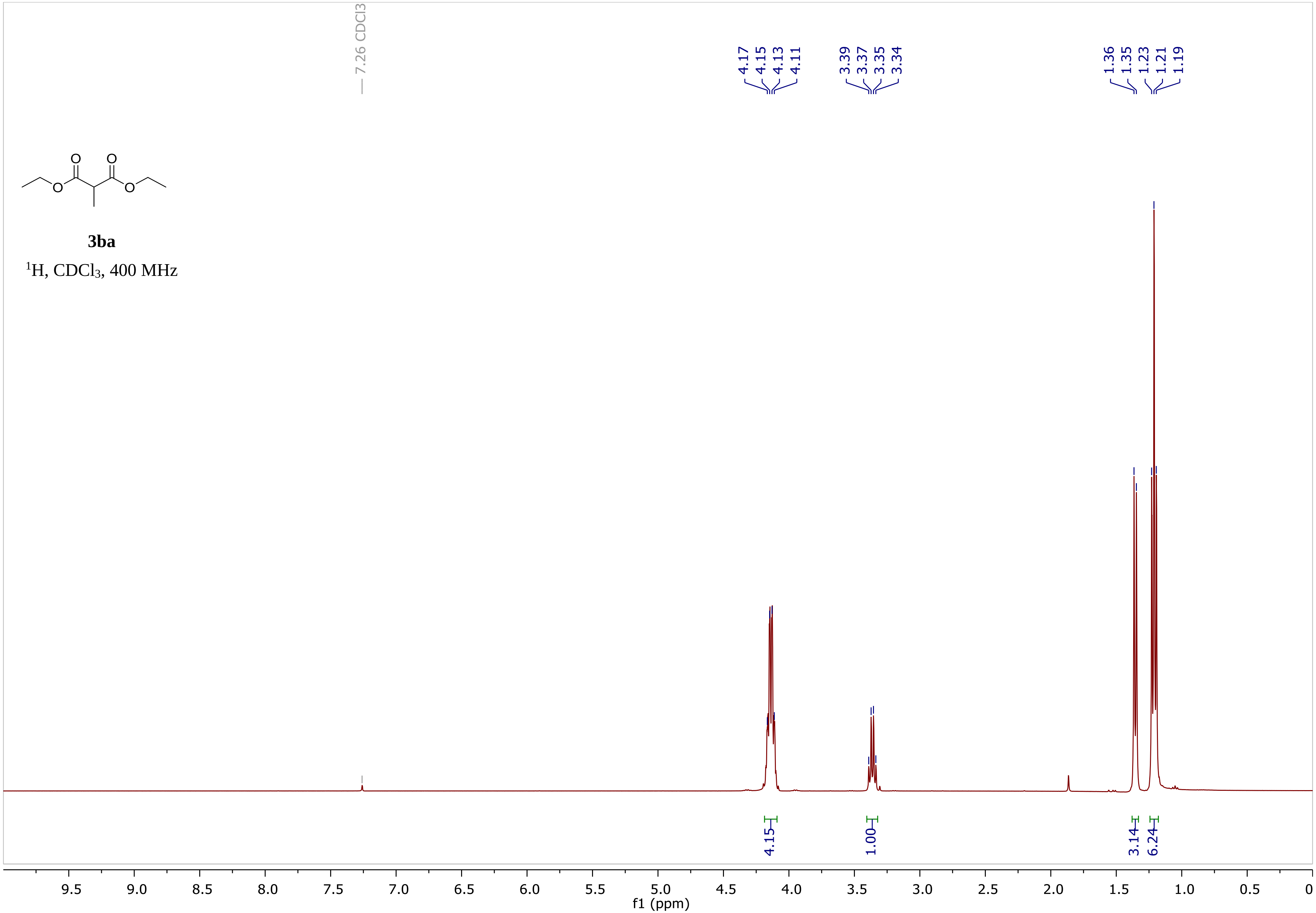


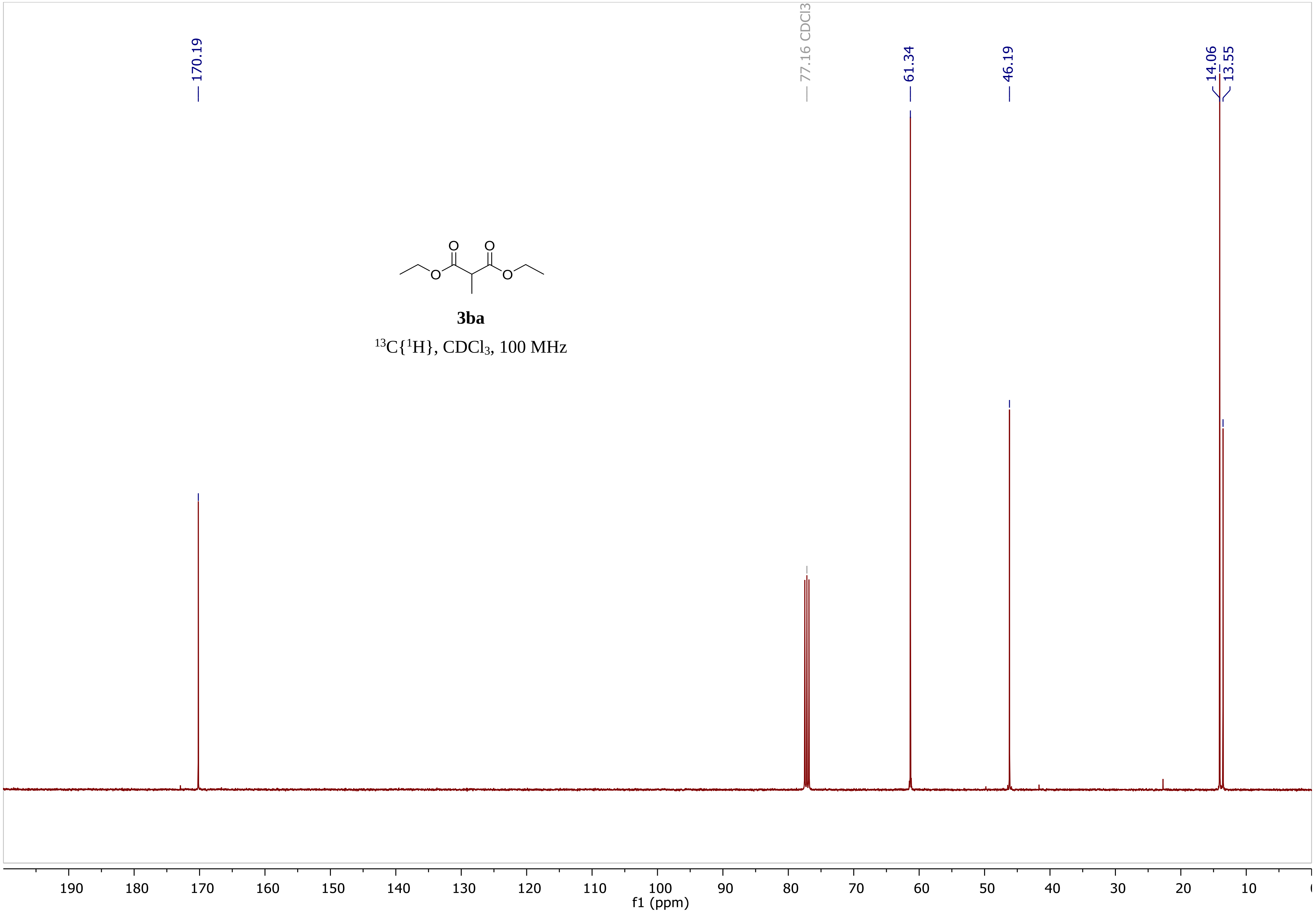
3aa

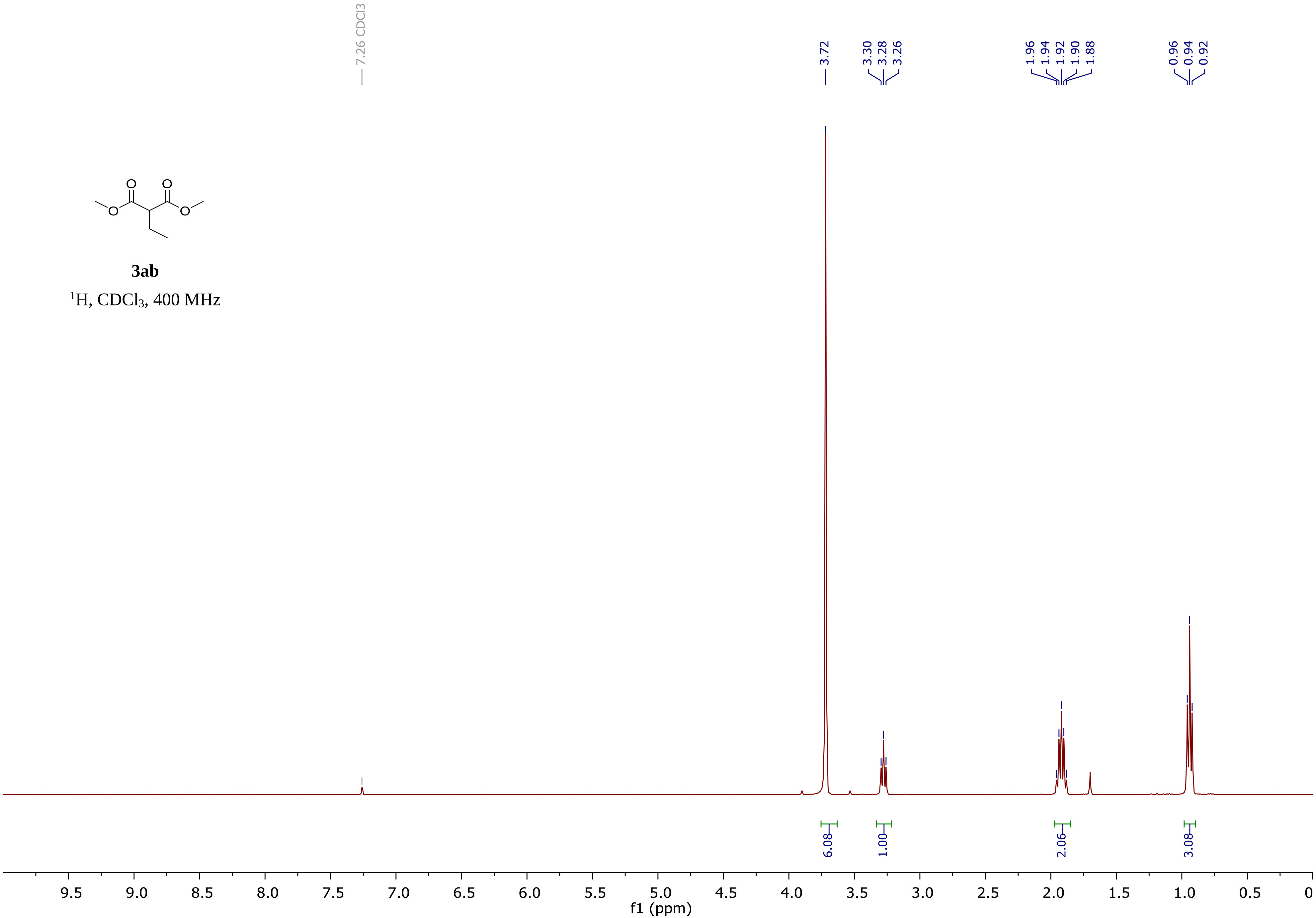
^{1}H, $CDCl_3$, 400 MHz




170.61
52.61
45.89
13.72
3aa
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

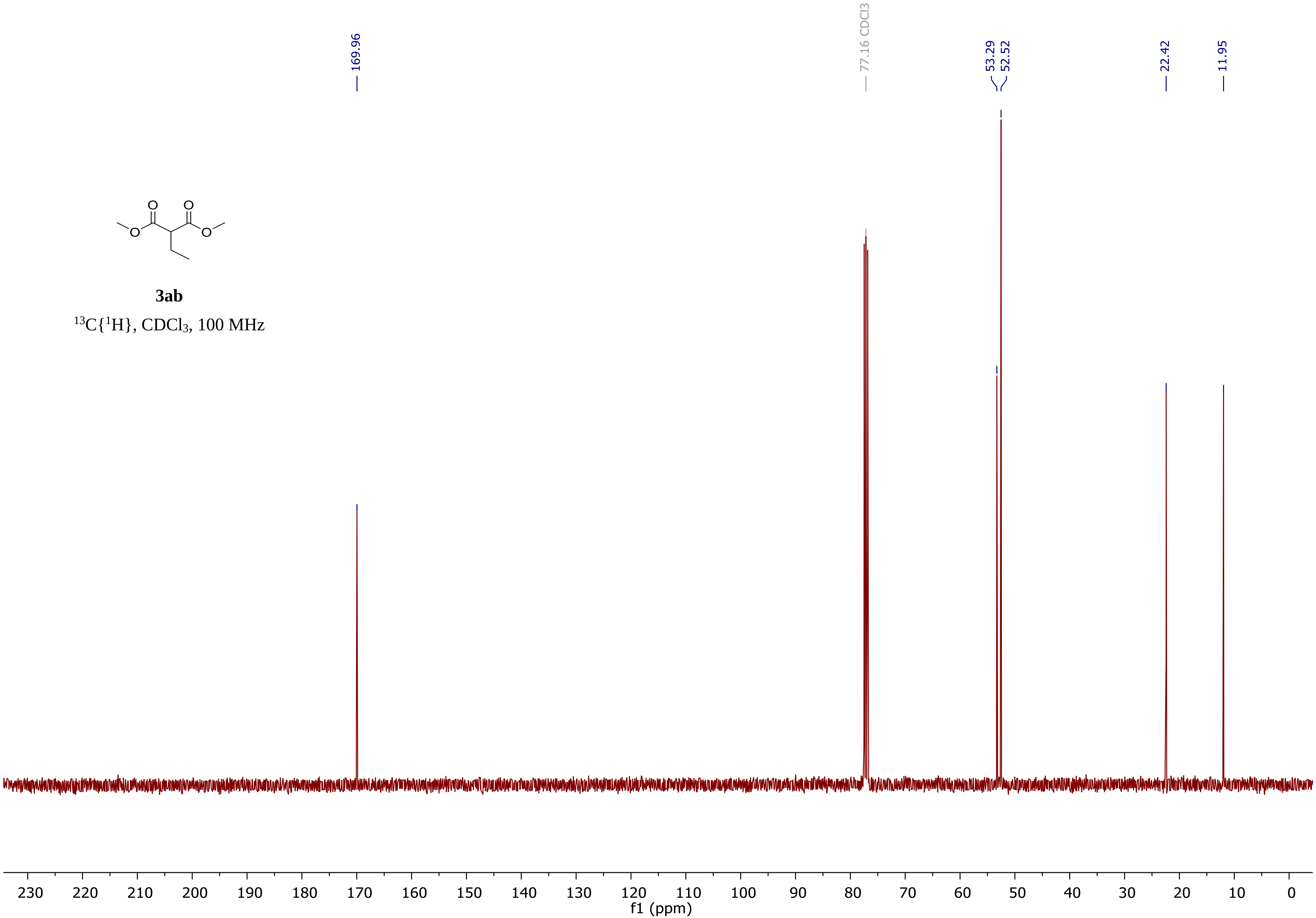

3ba
1H, CDCl3, 400 MHz
7.26 CDCl3
4.17
4.15
4.13
4.11
3.39
3.37
3.35
3.34
1.36
1.35
1.23
1.21
1.19
4.15
1.00
3.14
6.24
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)


170.19
77.16 CDCl3
61.34
46.19
14.06
13.55
3ba
13C{1H}, CDCl3, 100 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



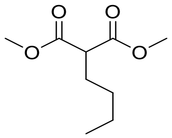
3ab

^1H, $CDCl_3$, 400 MHz



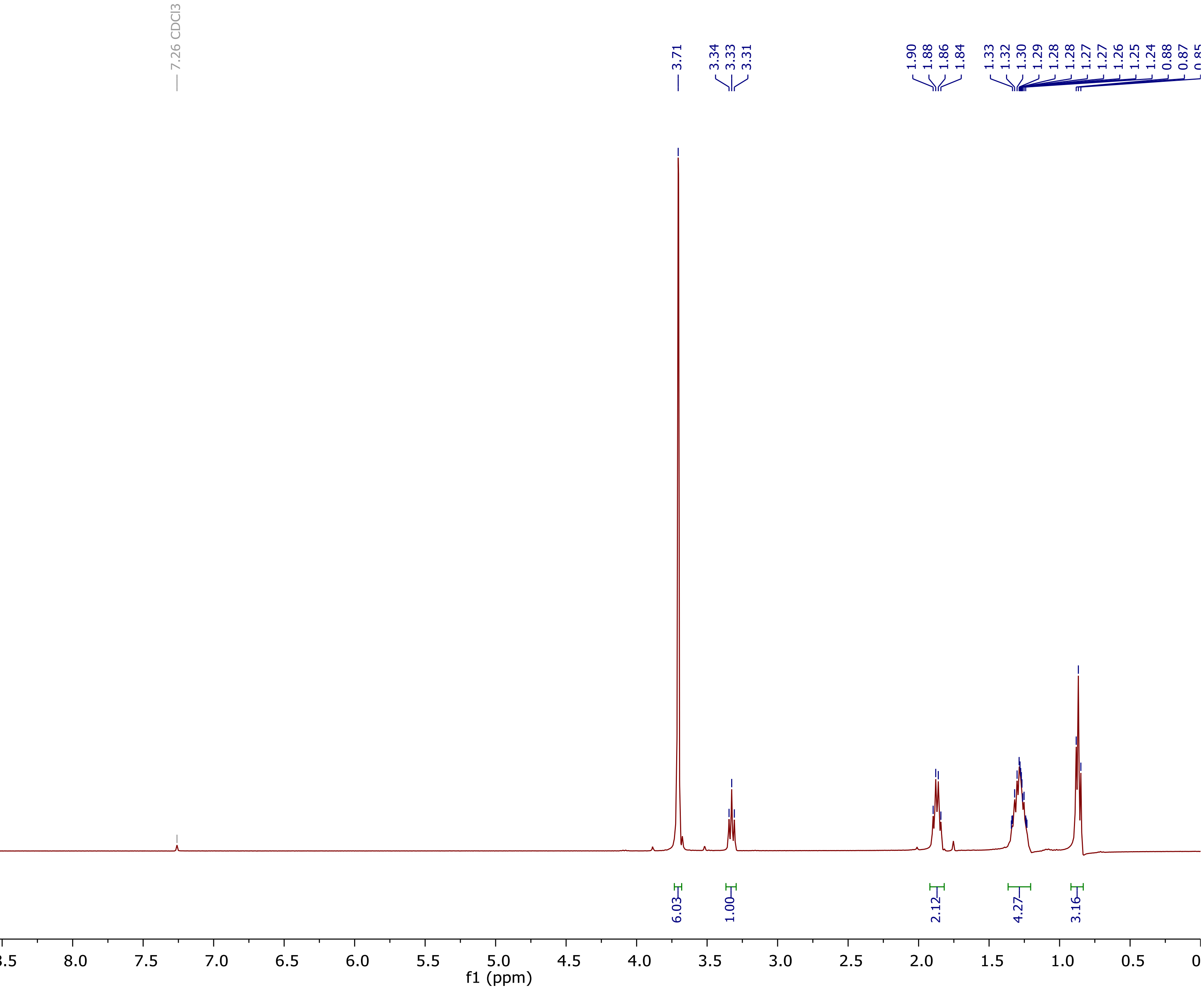
3ab

$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz



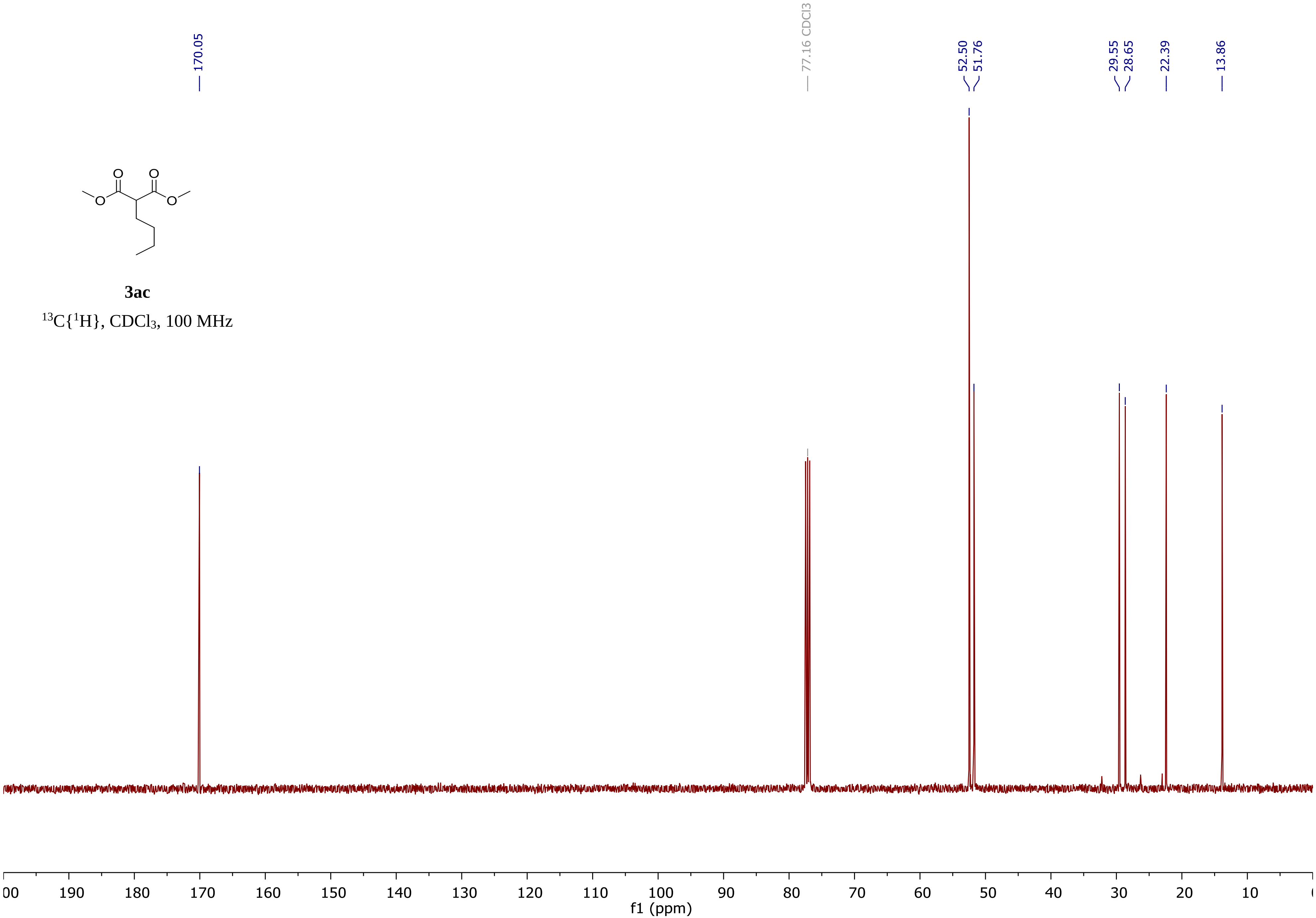
3ac

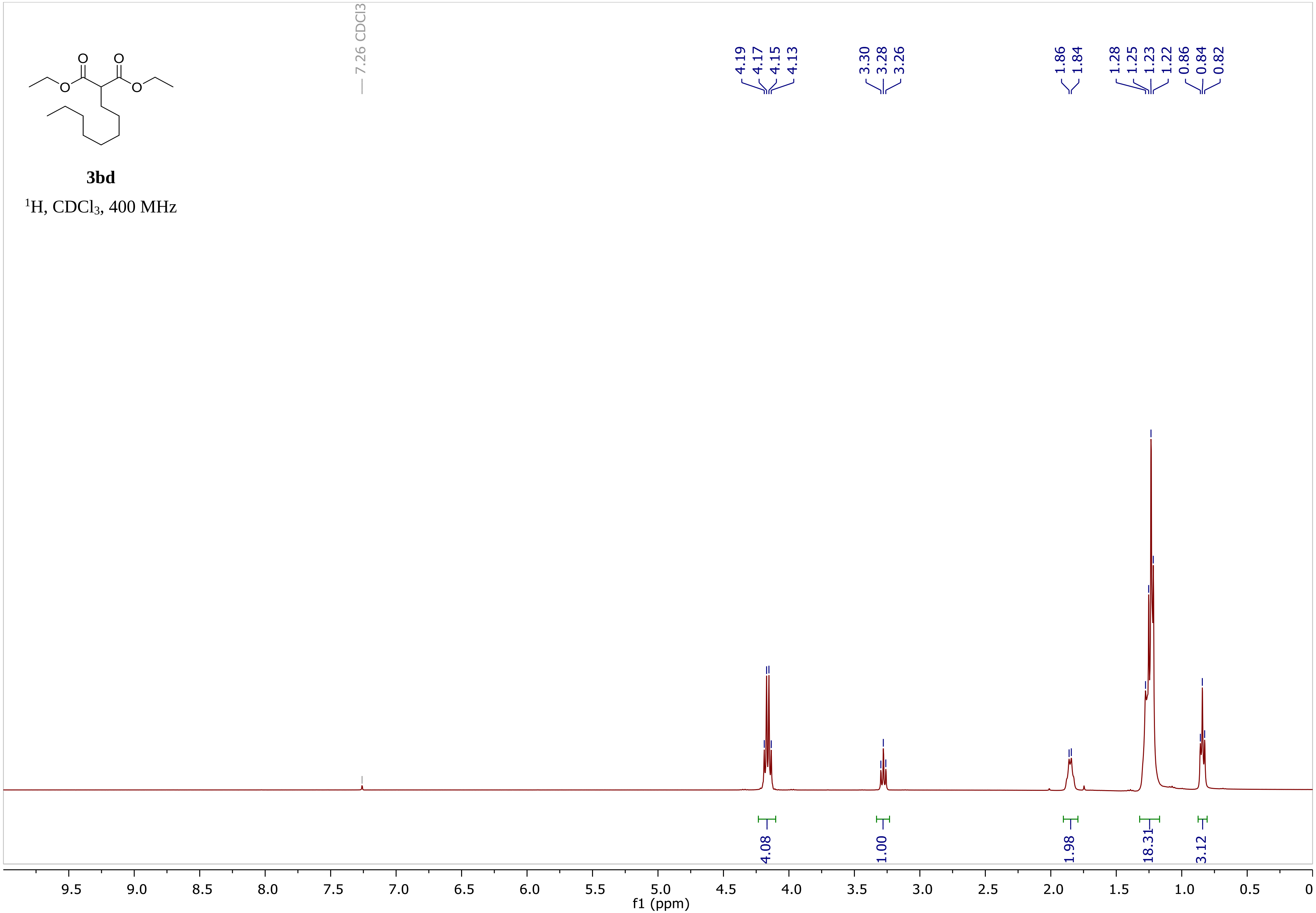
^{1}H, $CDCl_3$, 400 MHz

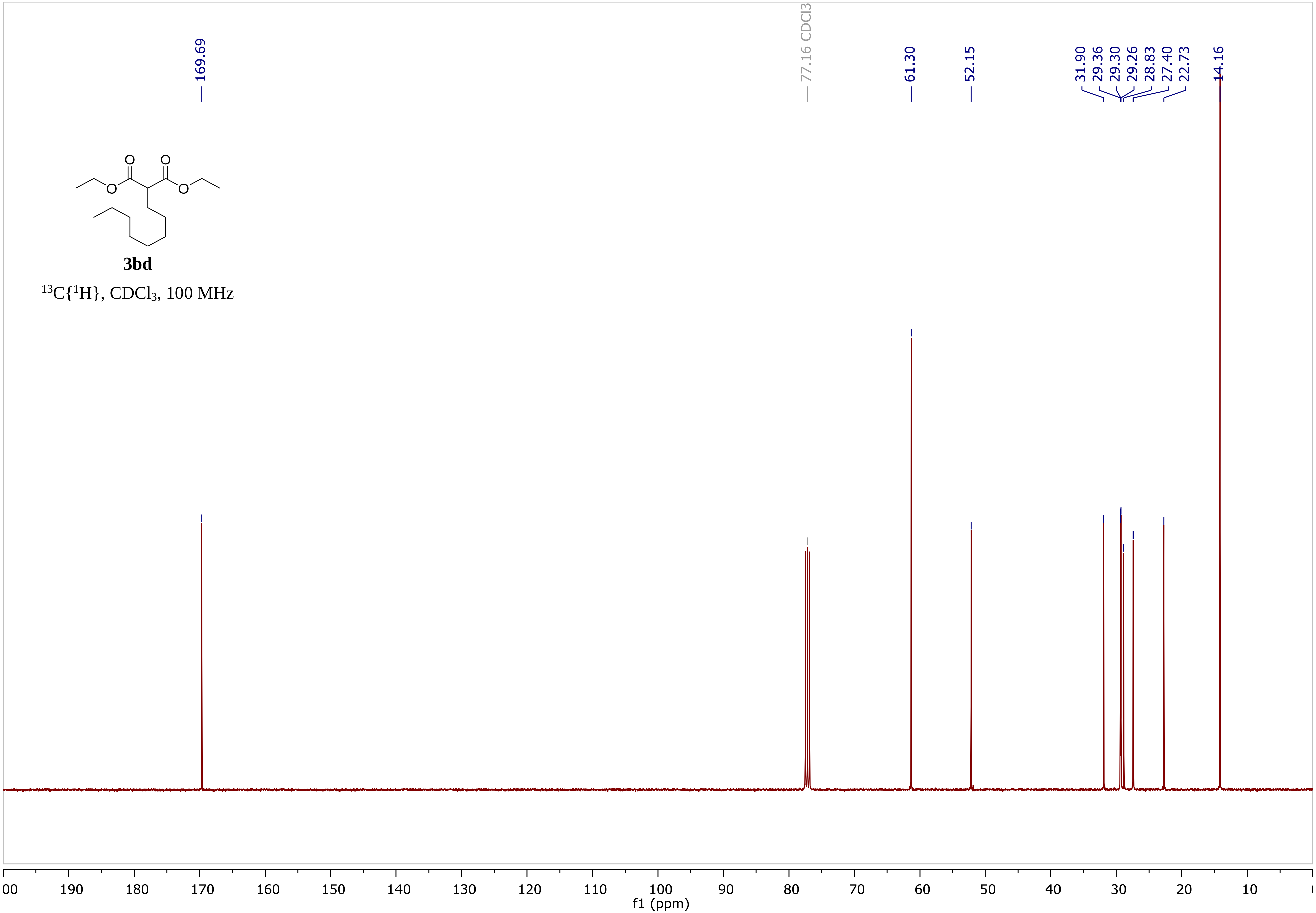


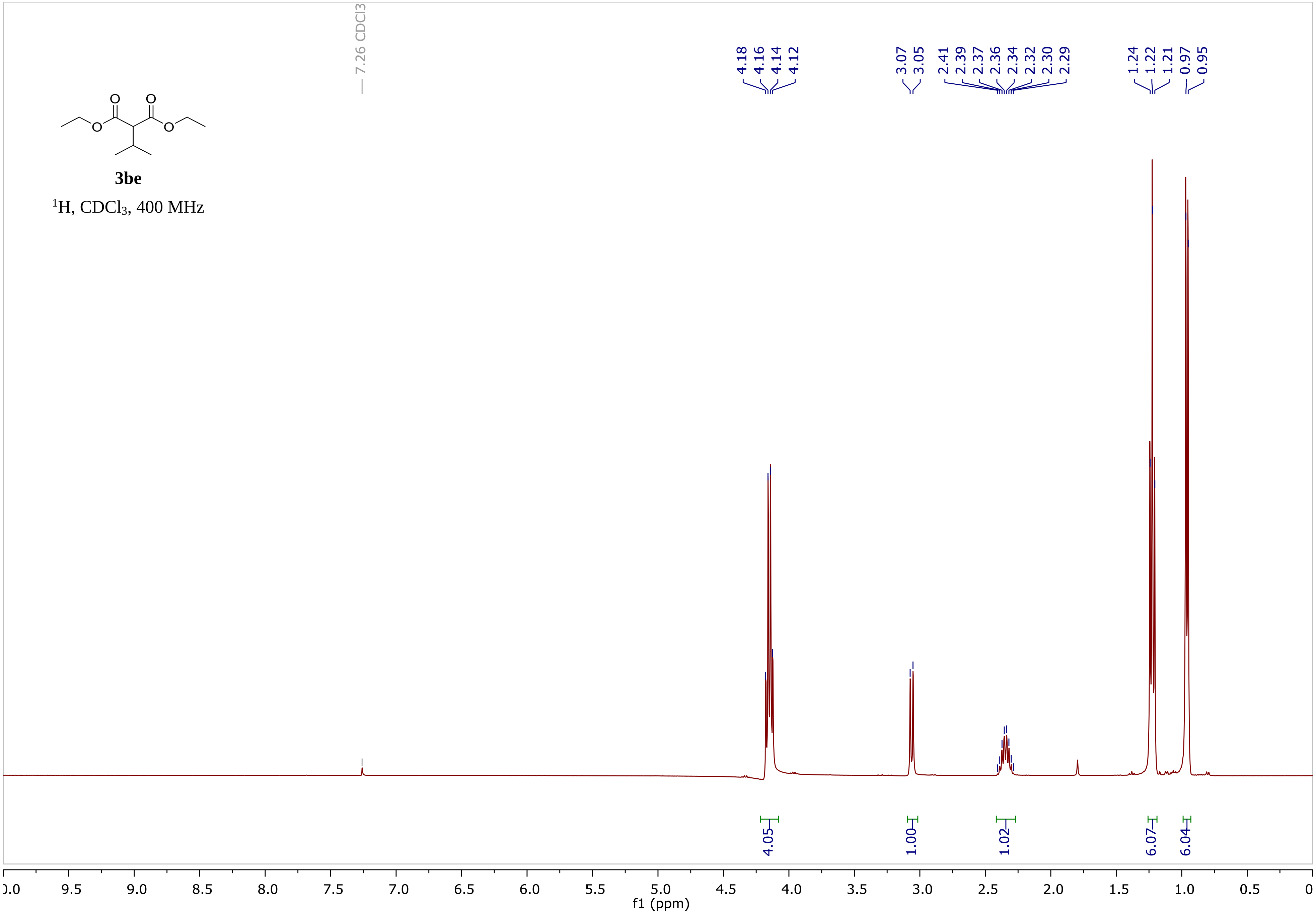
3ac

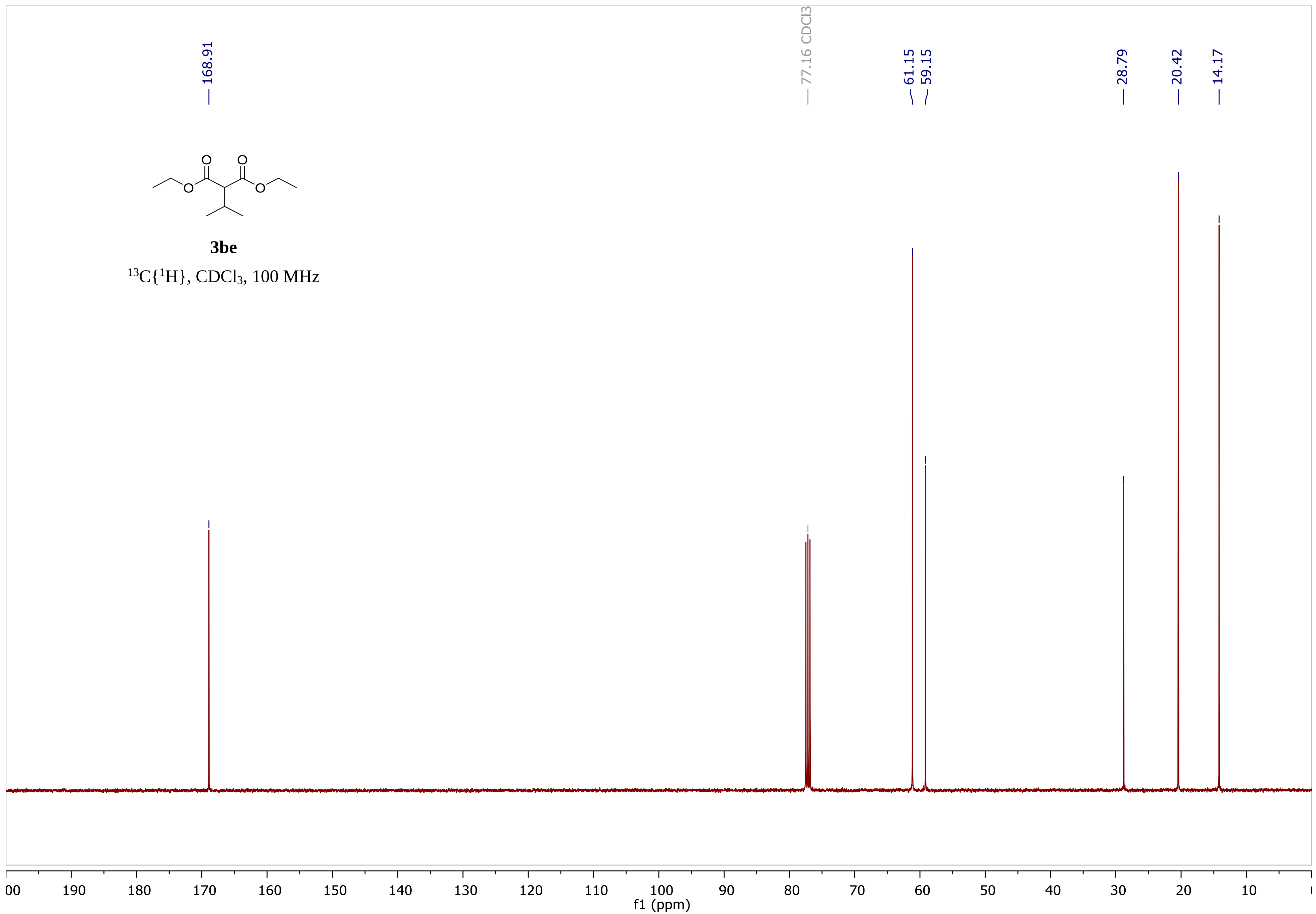
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

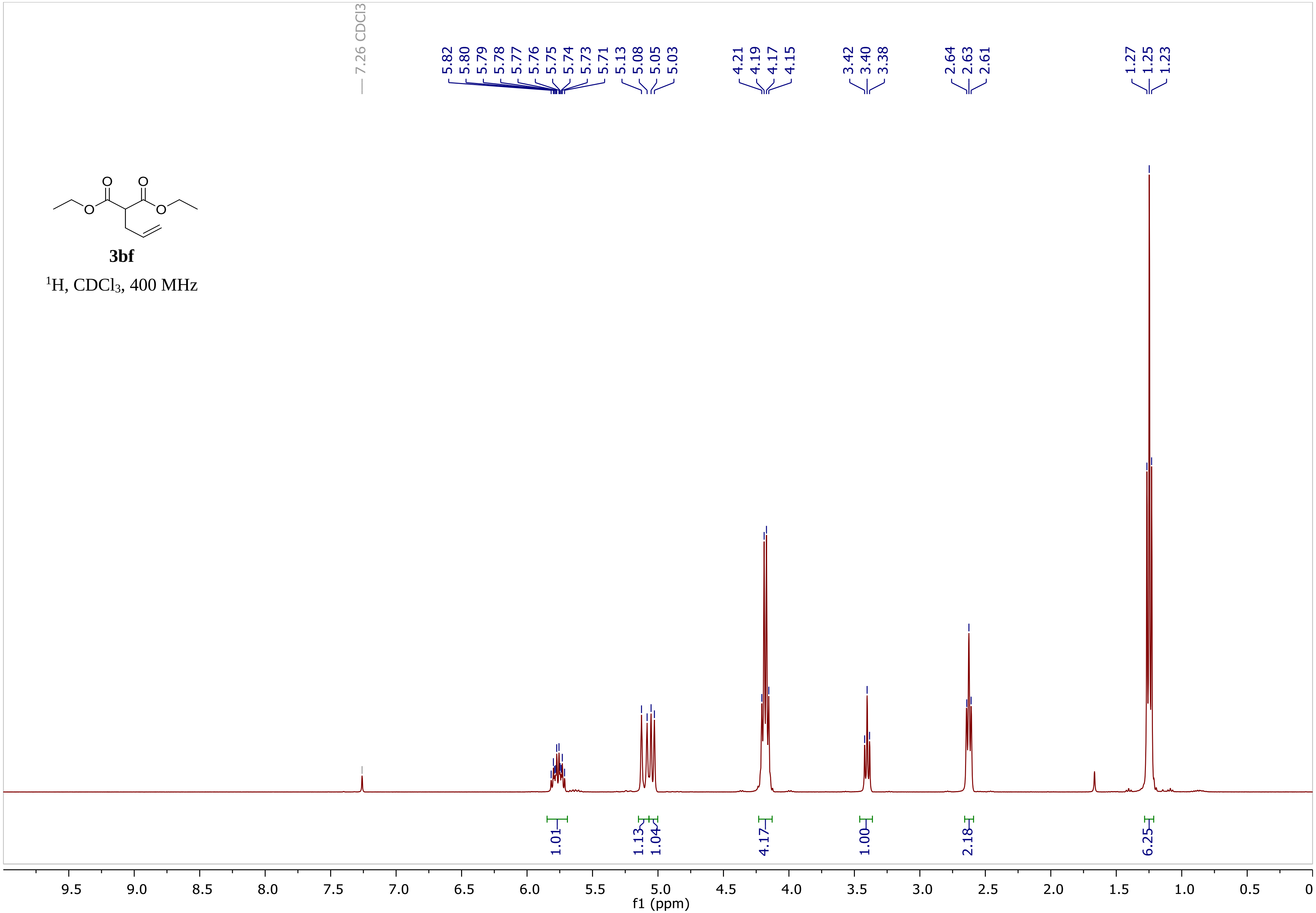



3bd
^{1}H, $CDCl_3$, 400 MHz
7.26 CDCl3
4.19
4.17
4.15
4.13
3.30
3.28
3.26
1.86
1.84
1.28
1.25
1.23
1.22
0.86
0.84
0.82
4.08
1.00
1.98
18.31
3.12
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)


169.69
77.16 CDCl3
61.30
52.15
31.90
29.36
29.30
29.26
28.83
27.40
22.73
14.16
O
O
O
O
3bd
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

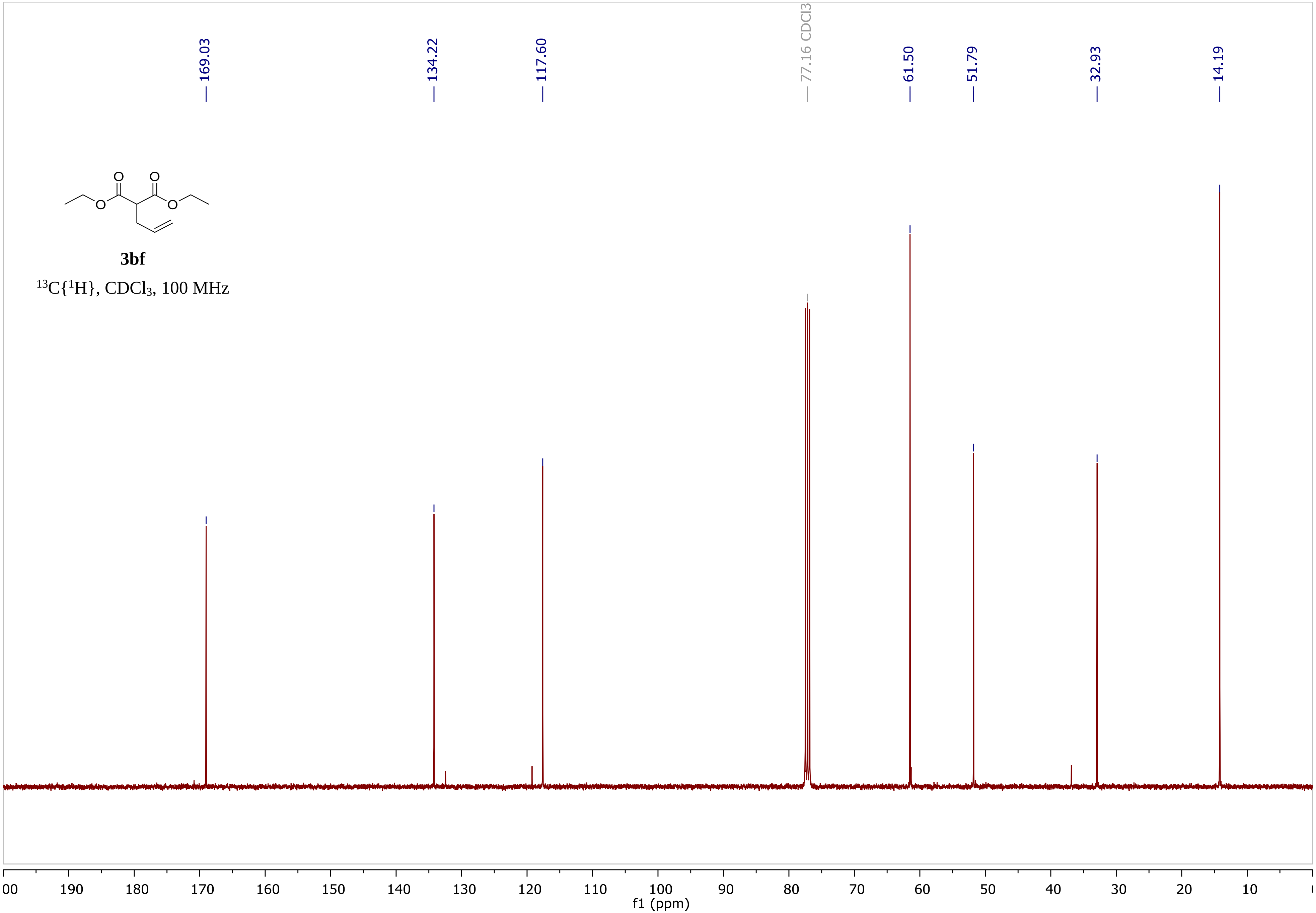

3be
^{1}H, $CDCl_3$, 400 MHz
7.26 CDCl3
4.18
4.16
4.14
4.12
3.07
3.05
2.41
2.39
2.37
2.36
2.34
2.32
2.30
2.29
1.24
1.22
1.21
0.97
0.95
4.05
1.00
1.02
6.07
6.04
f1 (ppm)


168.91
77.16 CDCl3
61.15
59.15
28.79
20.42
14.17
3be
13C{1H}, CDCl3, 100 MHz
f1 (ppm)



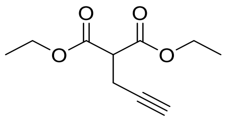
3bf

^{1}H, $CDCl_3$, 400 MHz



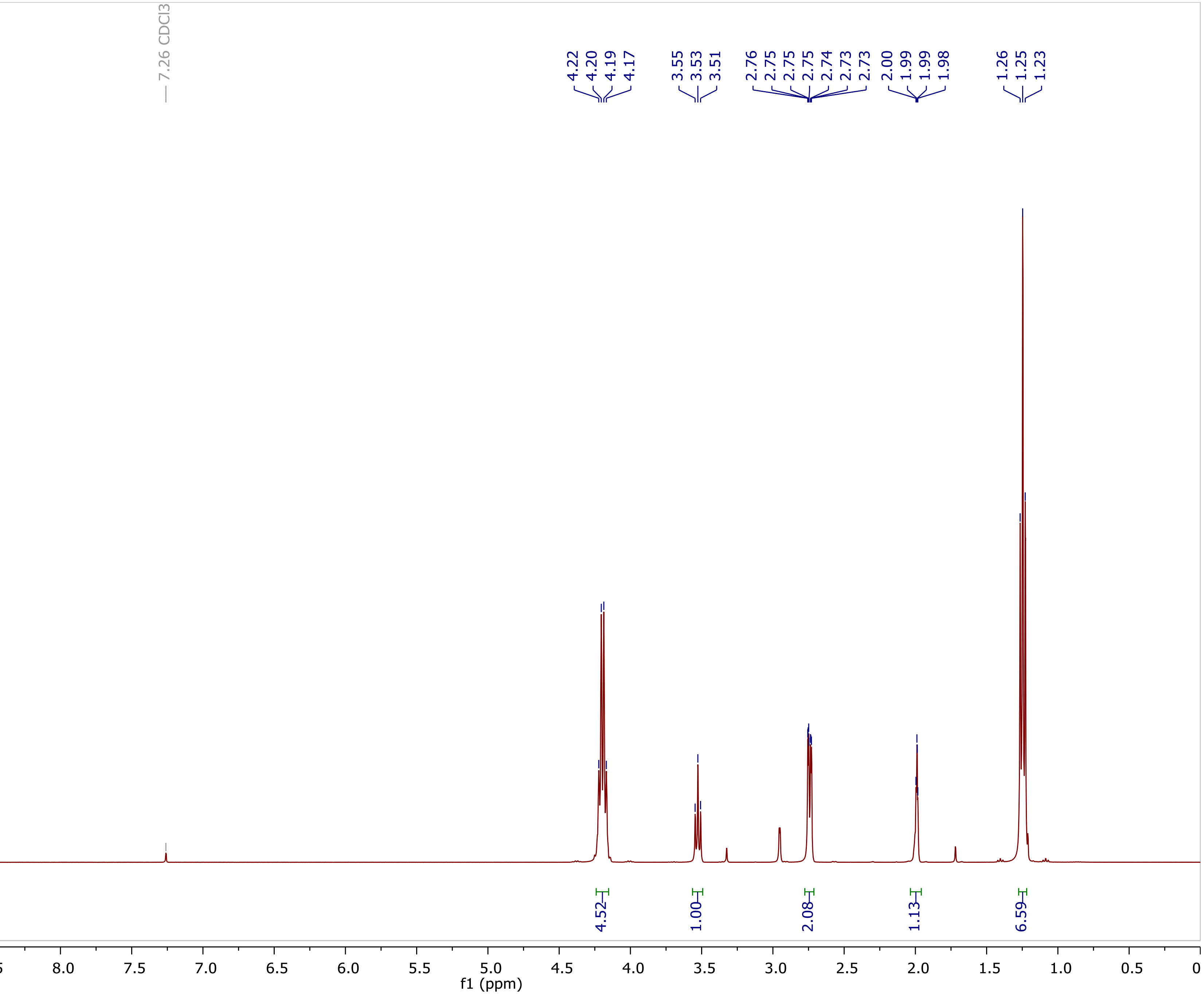
3bf

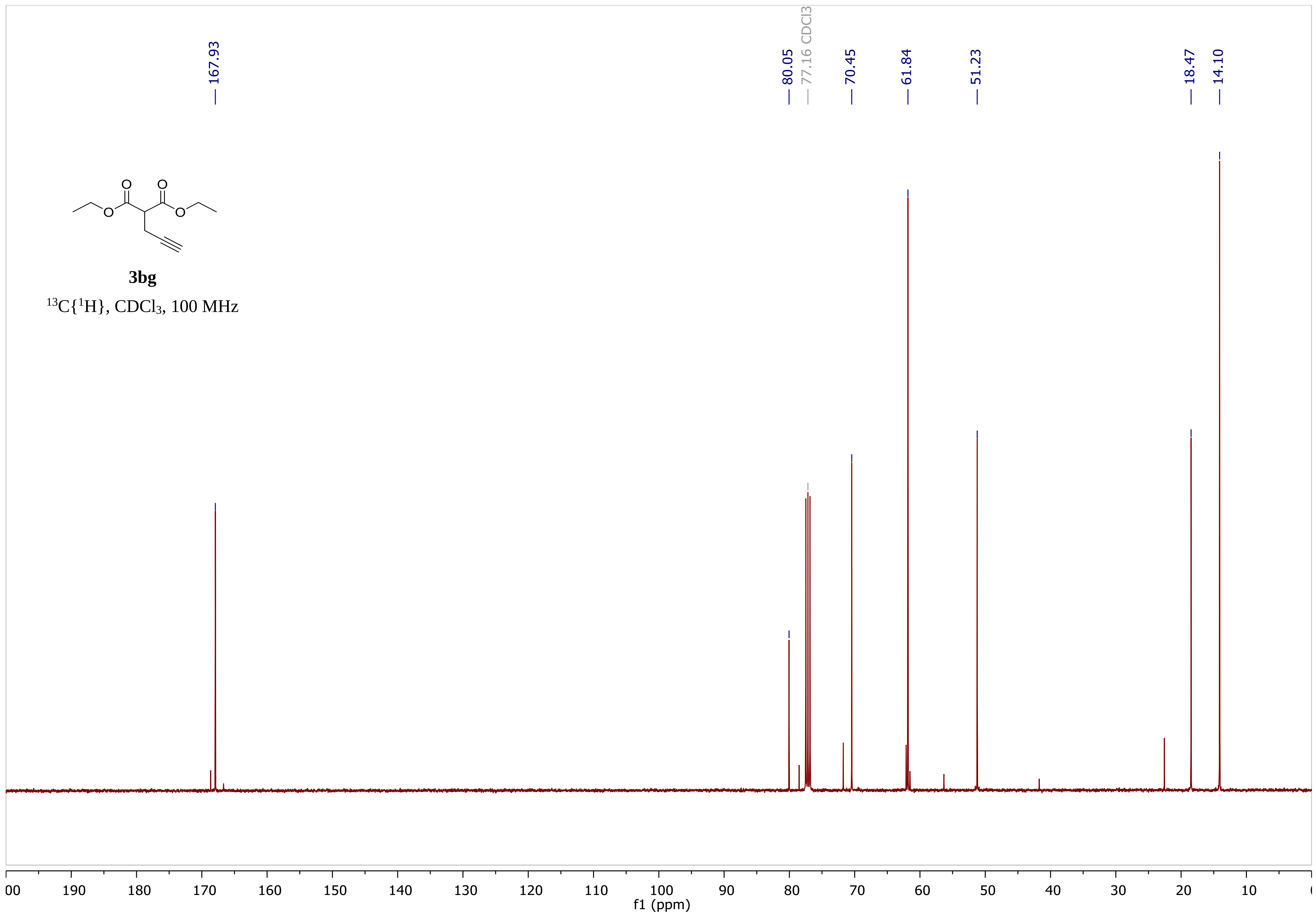
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

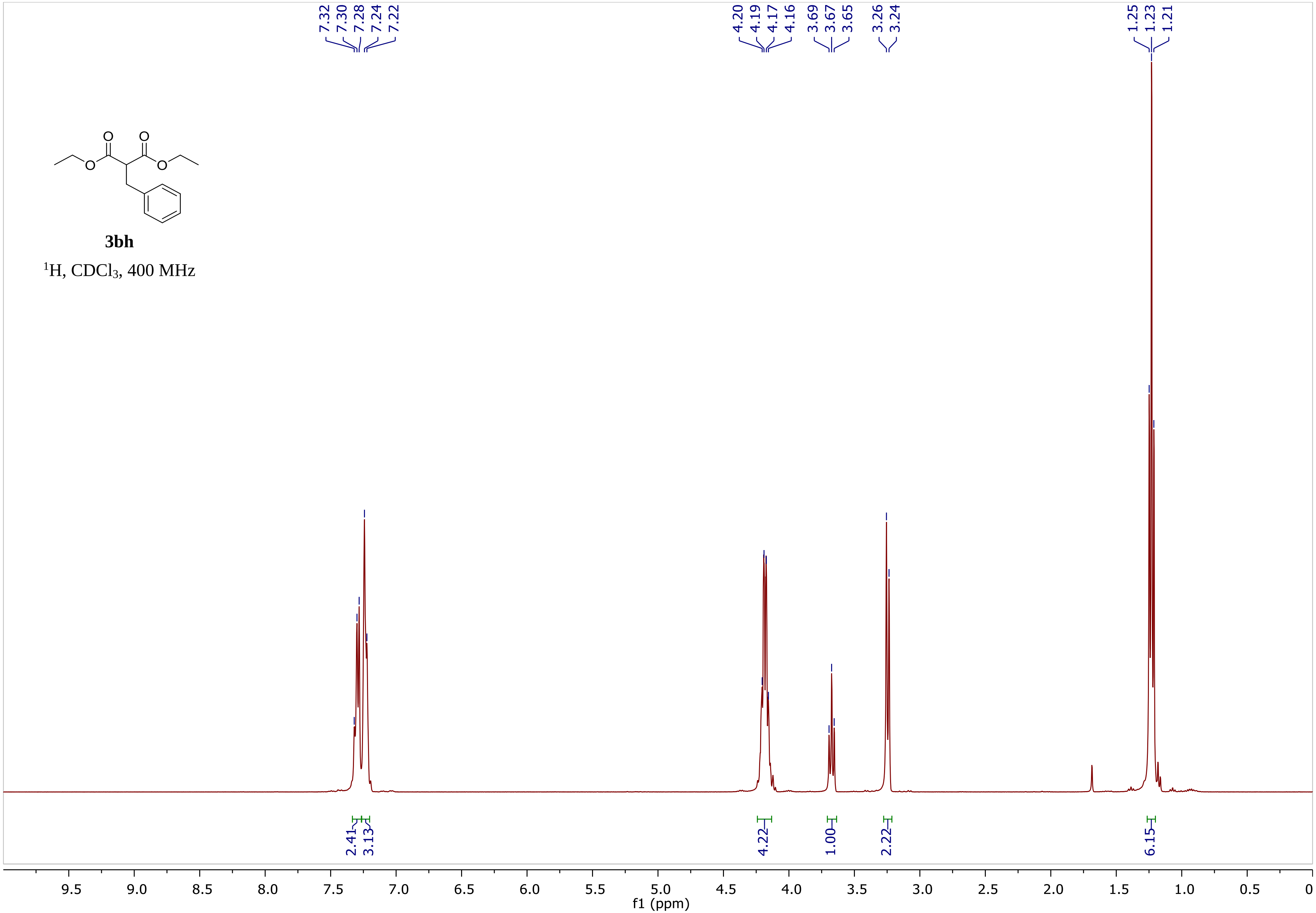


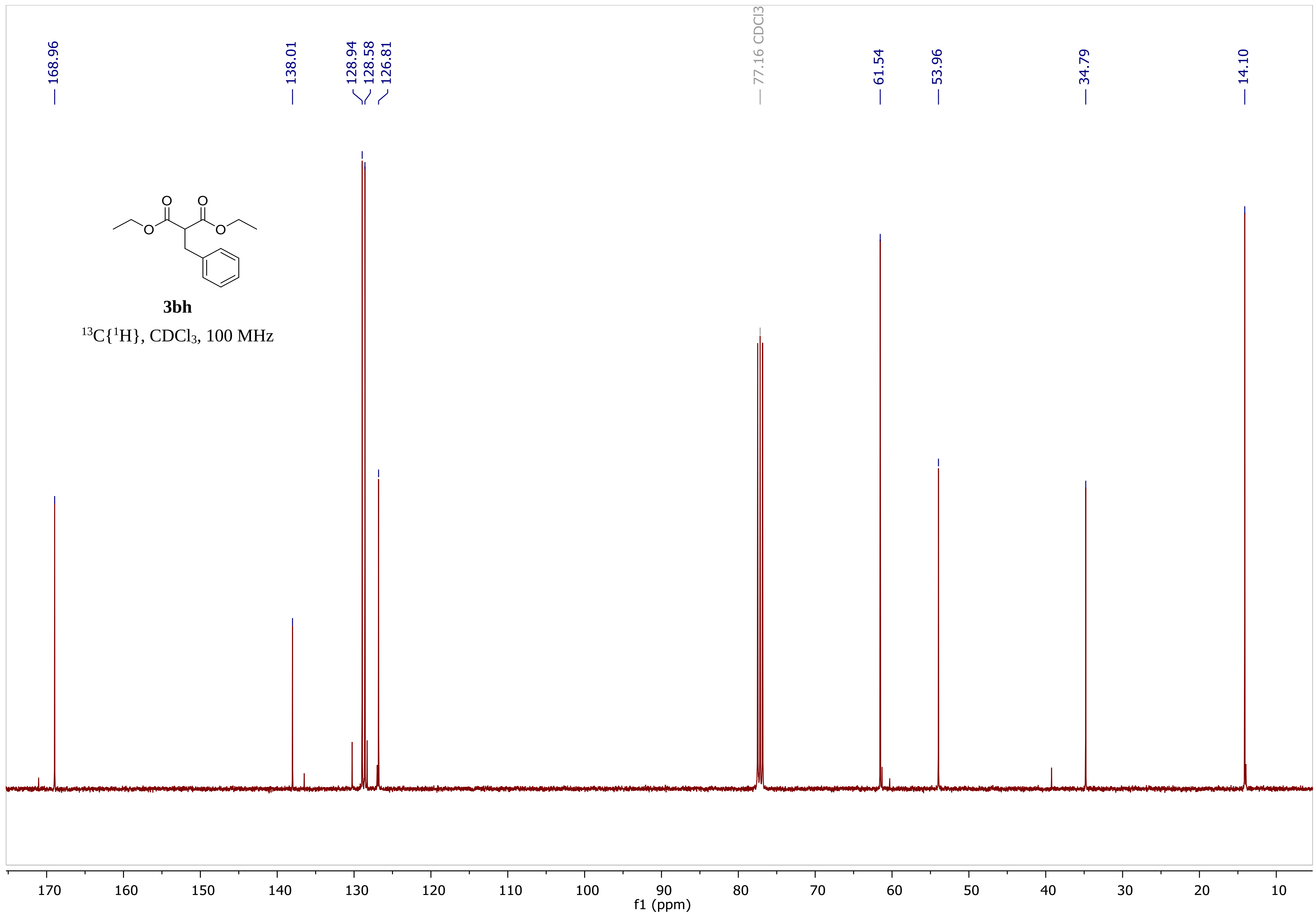
3bg

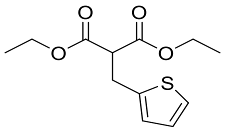
^{1}H, $CDCl_3$, 400 MHz




167.93
80.05
77.16 CDCl3
70.45
61.84
51.23
18.47
14.10
3bg
$^{13}C\{^1H\}$, $CDCl_3$, 100 MHz
f1 (ppm)

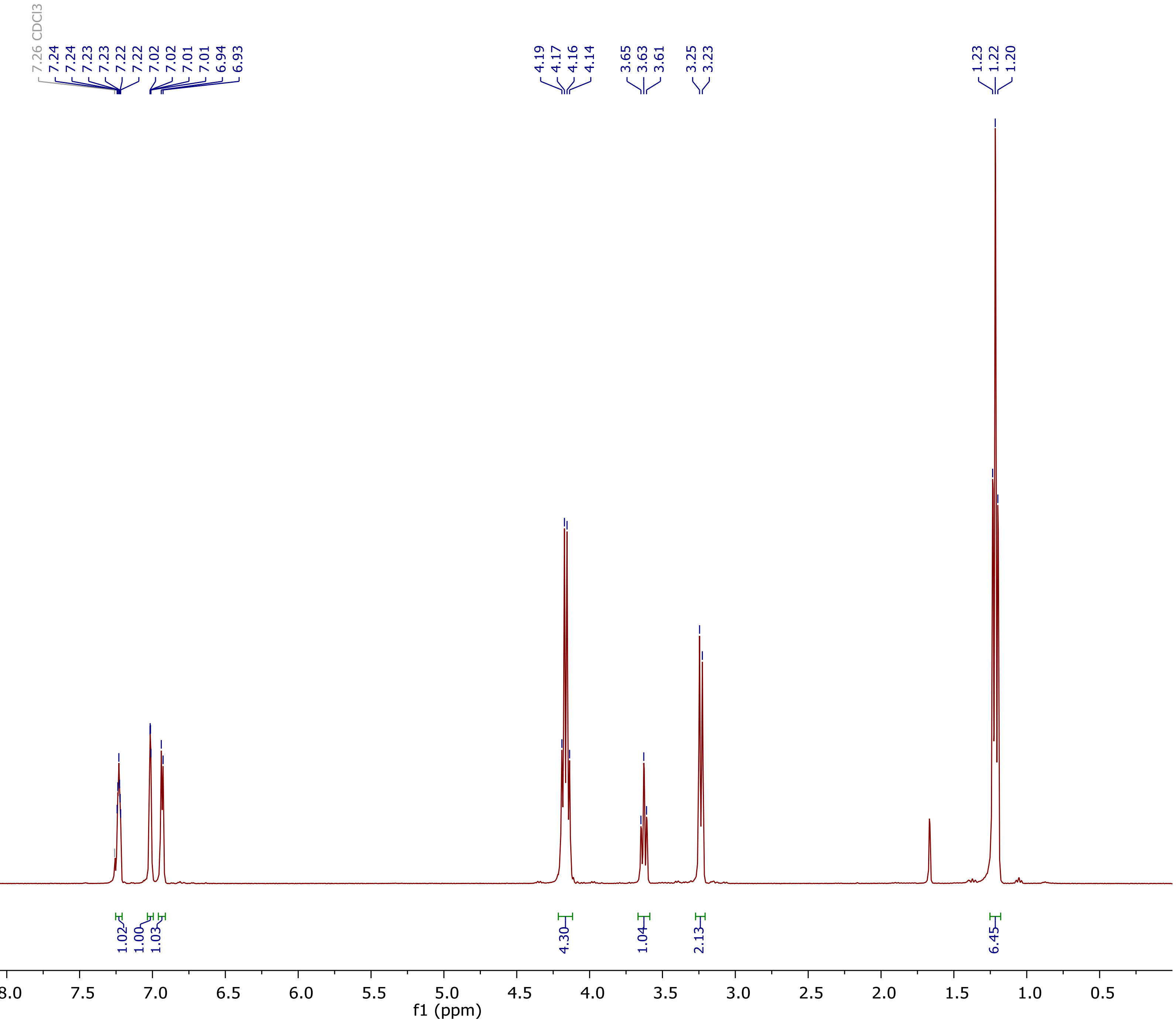

7.32
7.30
7.28
7.24
7.22
4.20
4.19
4.17
4.16
3.69
3.67
3.65
3.26
3.24
1.25
1.23
1.21
3bh
1H, CDCl3, 400 MHz
2.41
3.13
4.22
1.00
2.22
6.15
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
f1 (ppm)

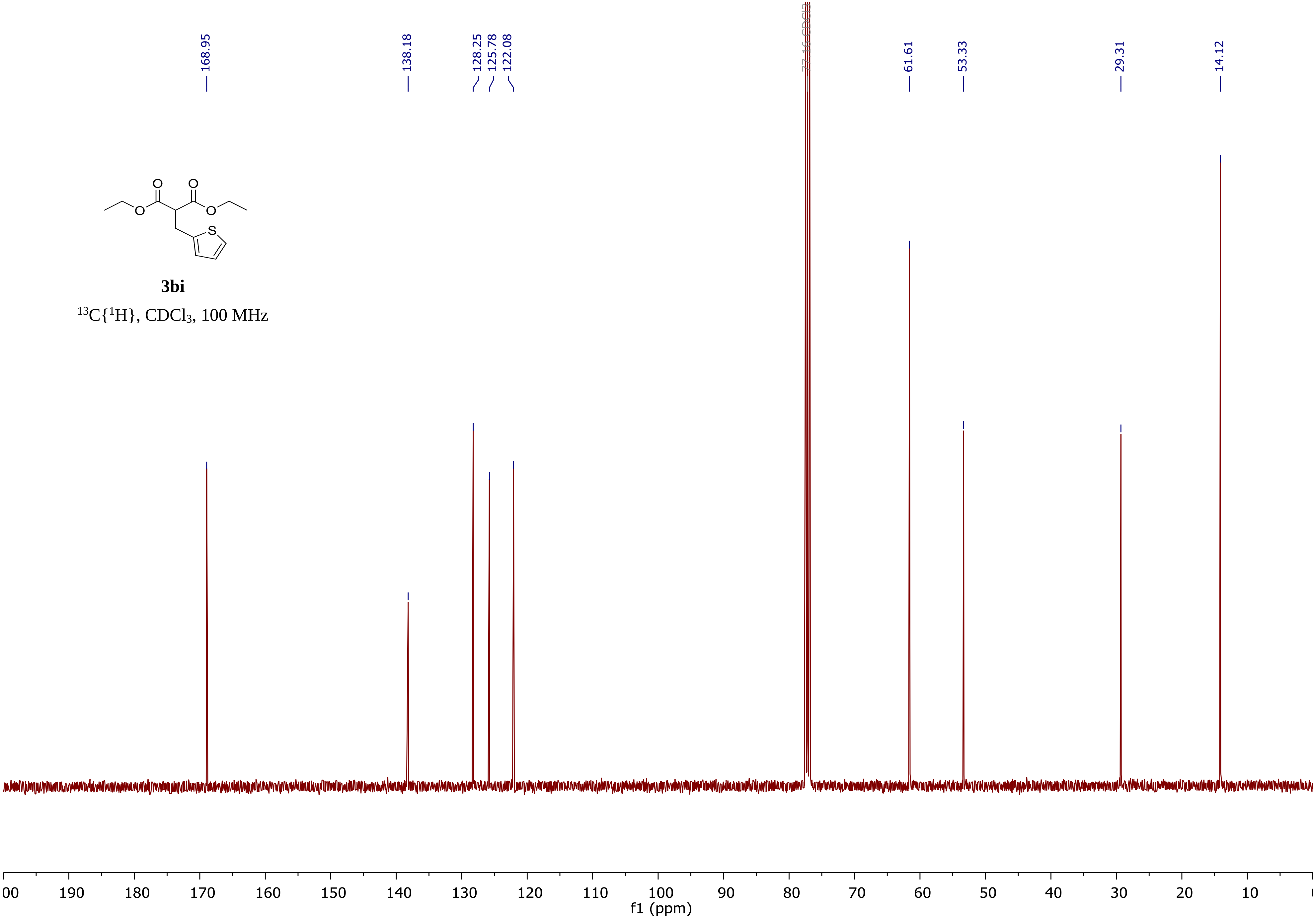

168.96
138.01
128.94
128.58
126.81
77.16 CDCl3
61.54
53.96
34.79
14.10
3bh
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



3bi

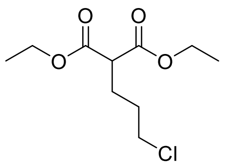
^{1}H, $CDCl_3$, 400 MHz





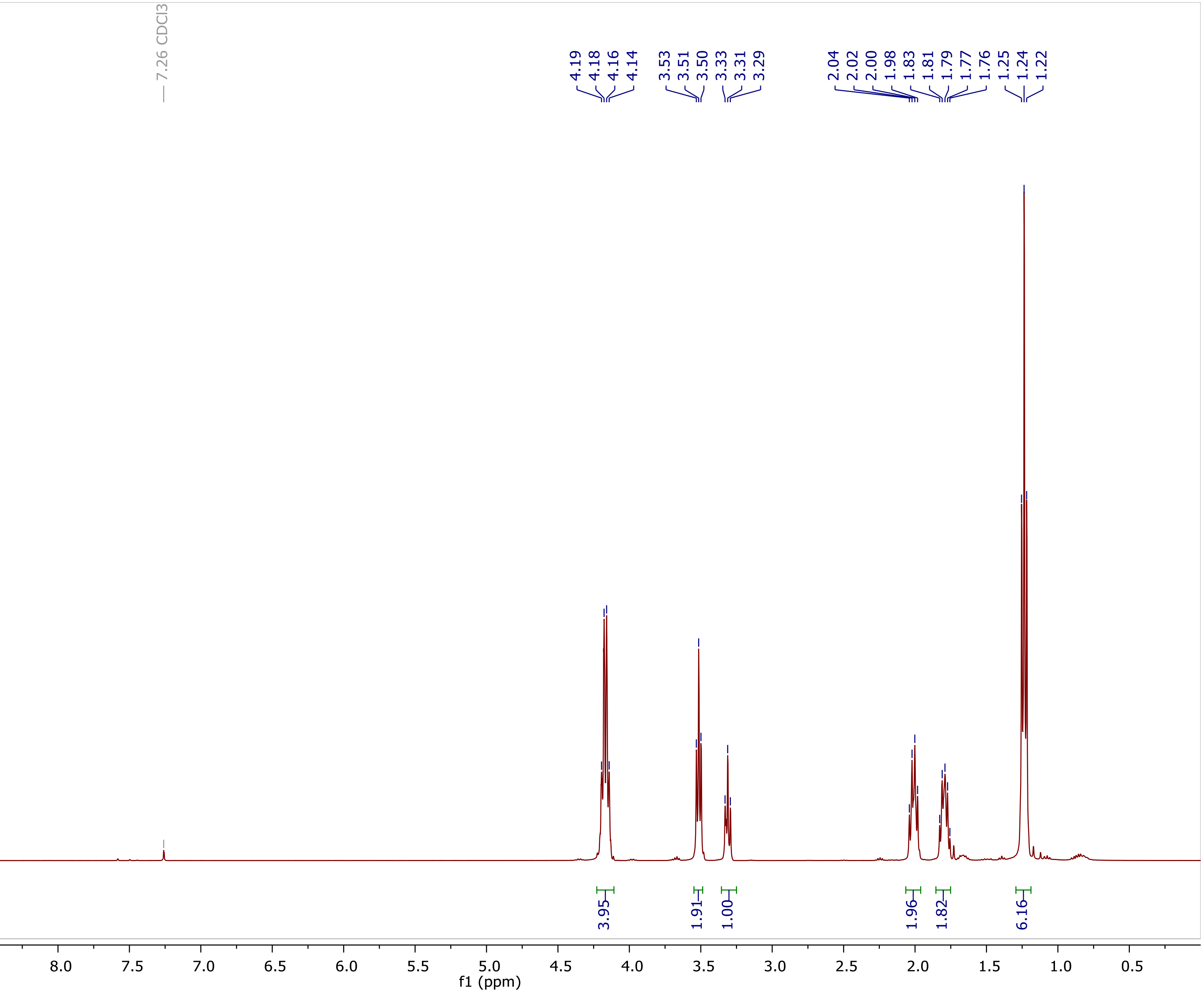
3bi

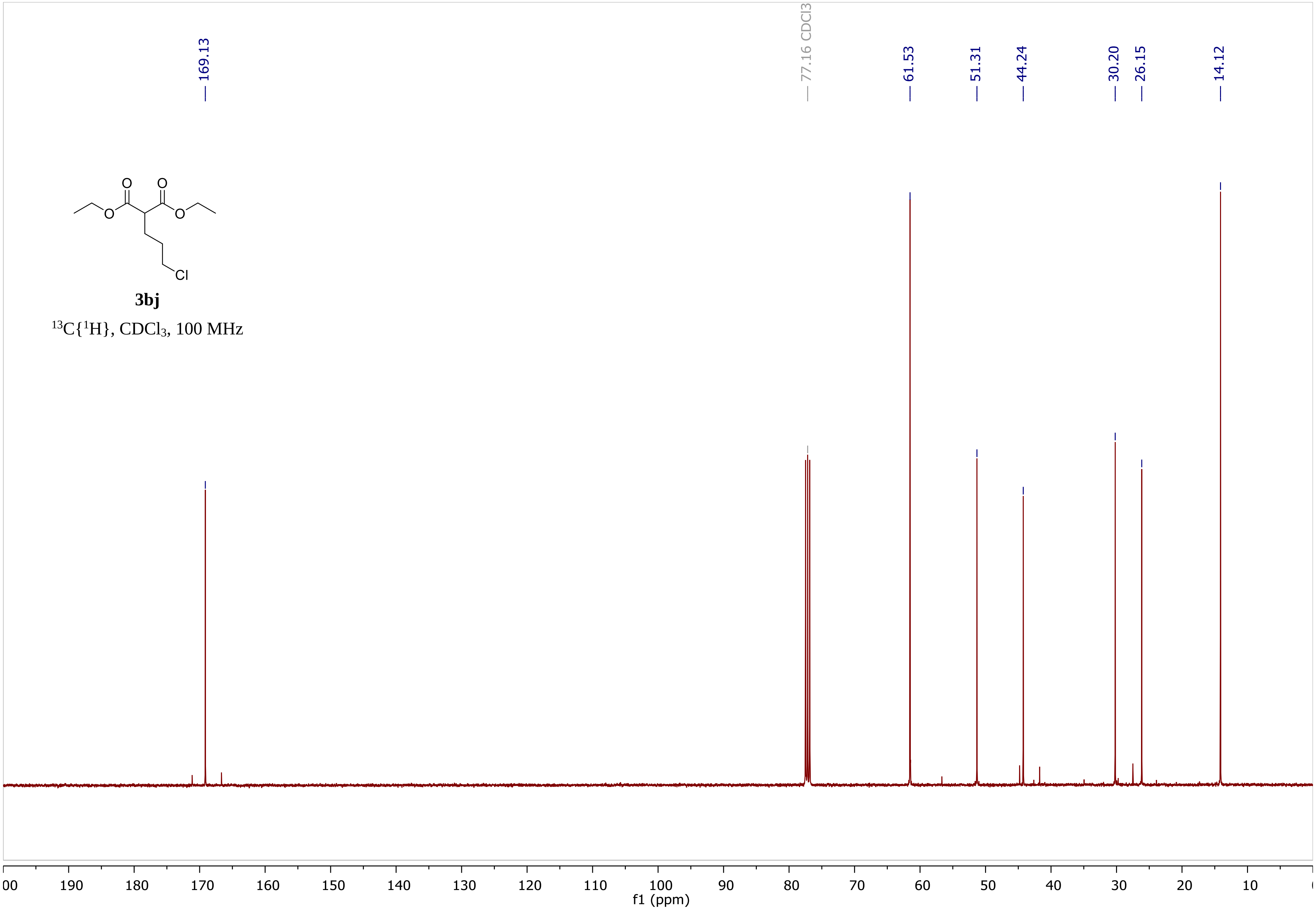
$^{13}C\{^1H\}$, $CDCl_3$, 100 MHz

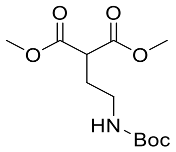


3bj

^{1}H, $CDCl_3$, 400 MHz

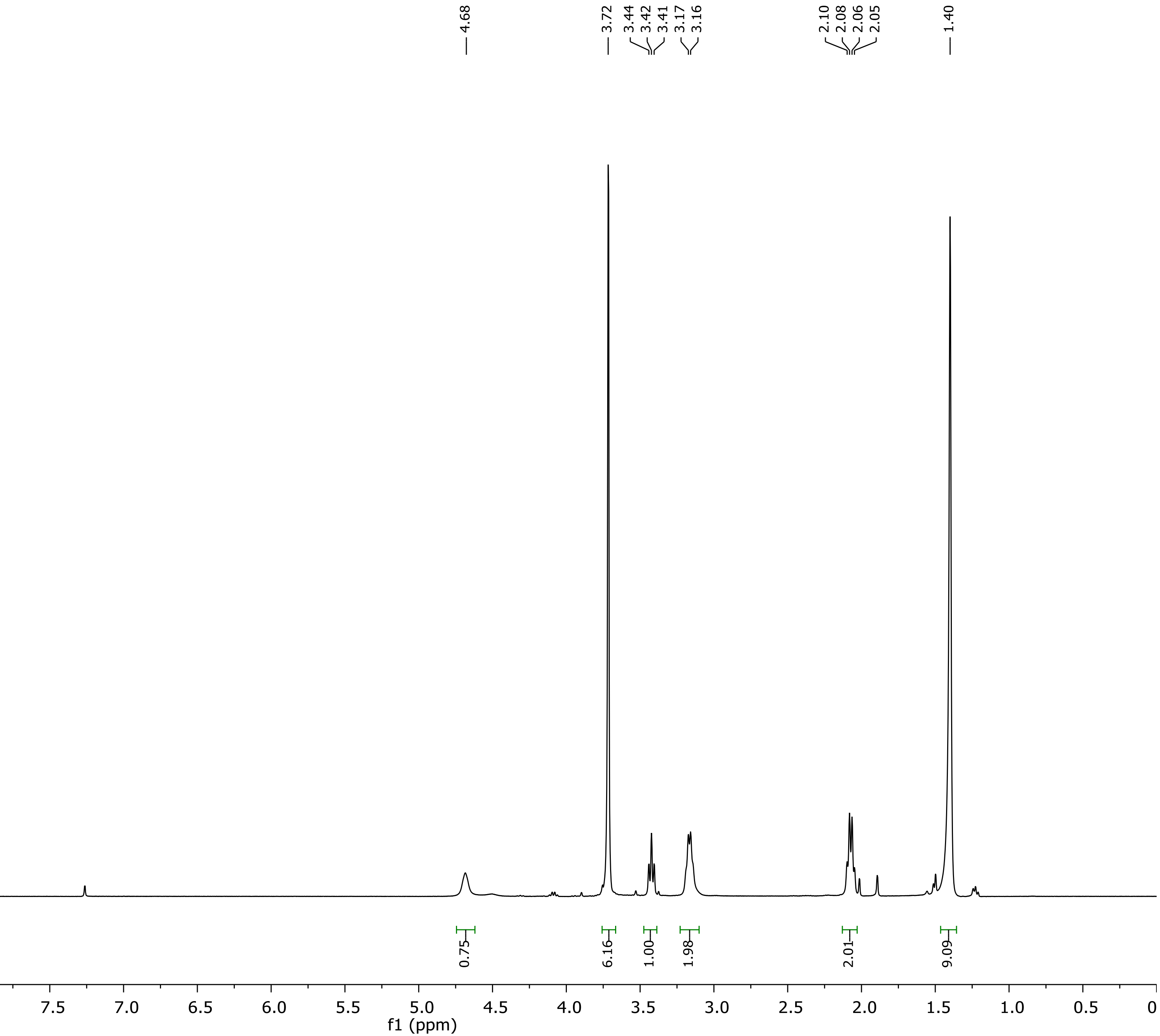


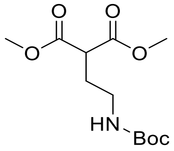

169.13
77.16 CDCl3
61.53
51.31
44.24
30.20
26.15
14.12
O
O
O
O
Cl
3bj
$^{13}C\{^1H\}$, $CDCl_3$, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



3ak

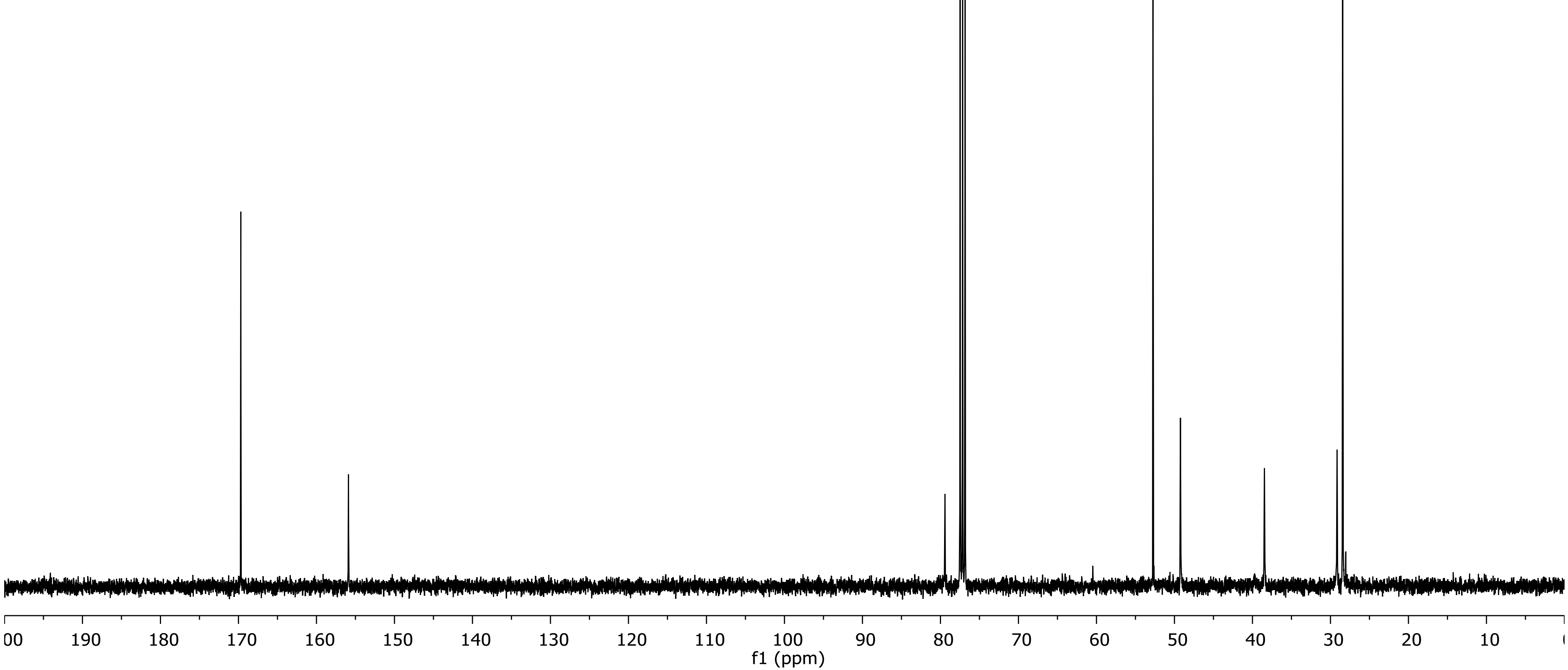
^{1}H, $CDCl_3$, 400 MHz

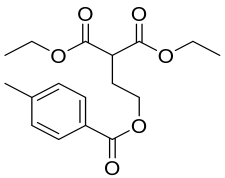




3ak

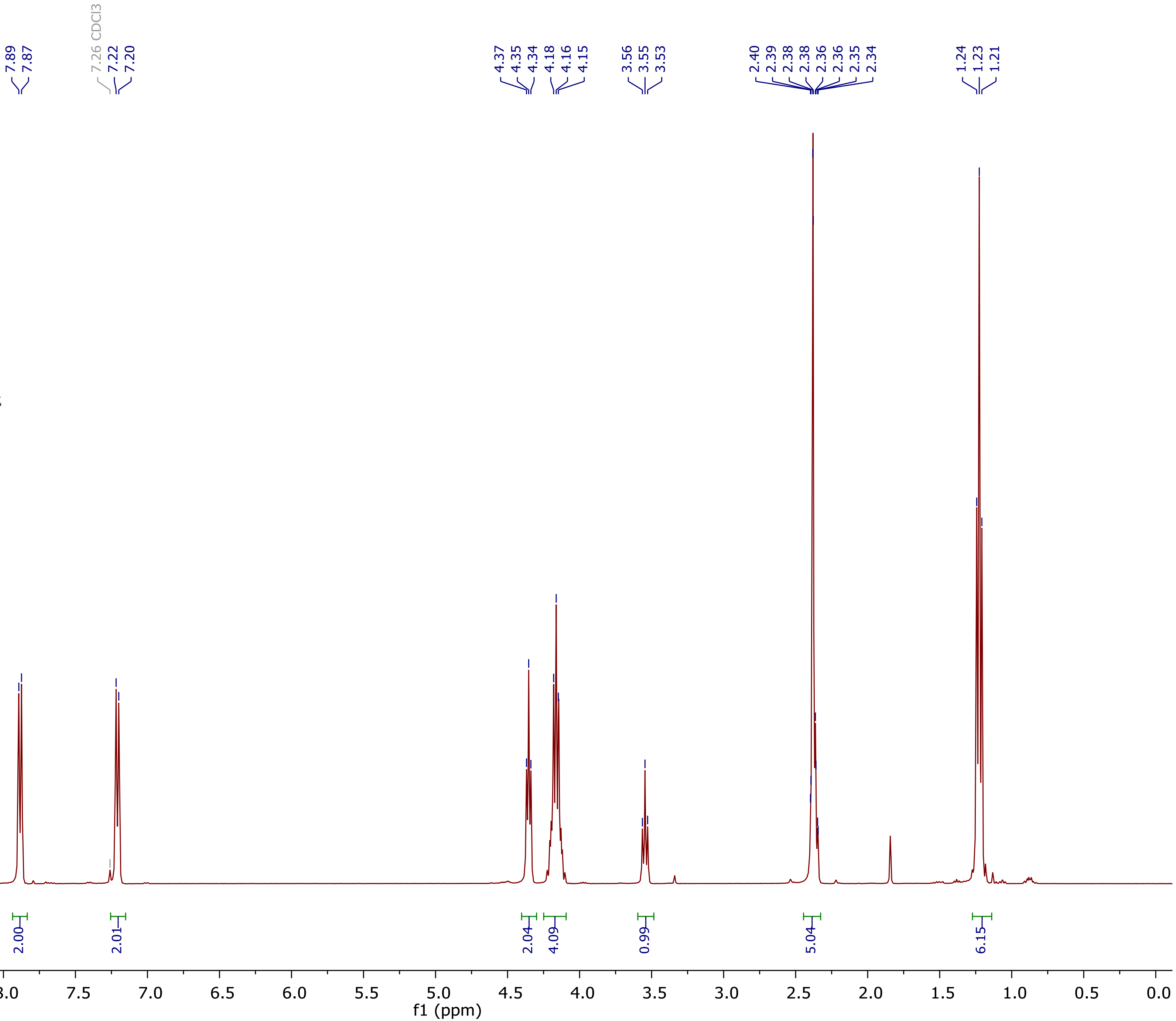
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

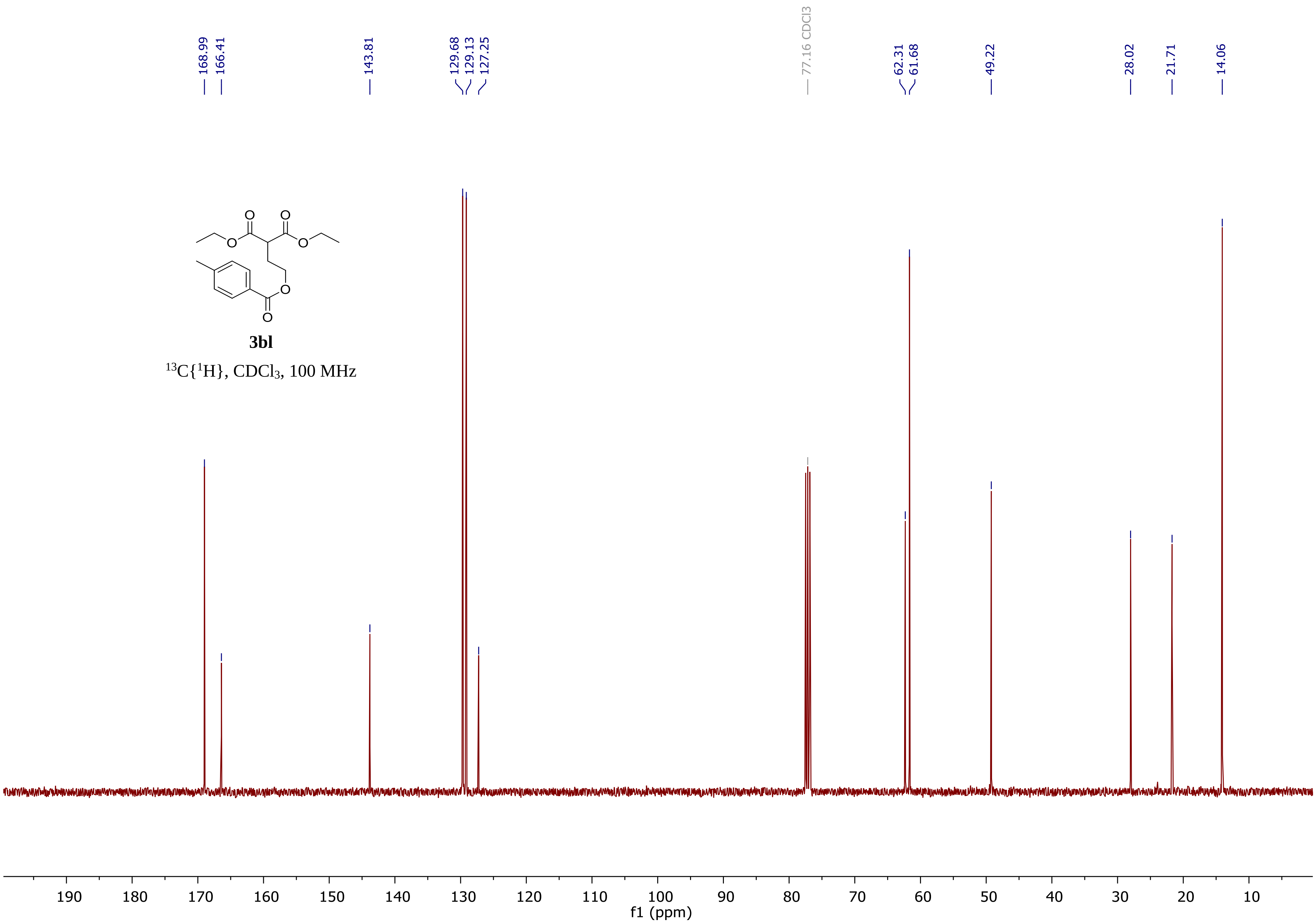




3bl

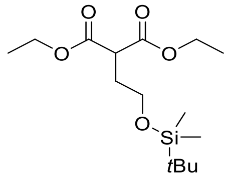
^{1}H, $CDCl_3$, 400 MHz





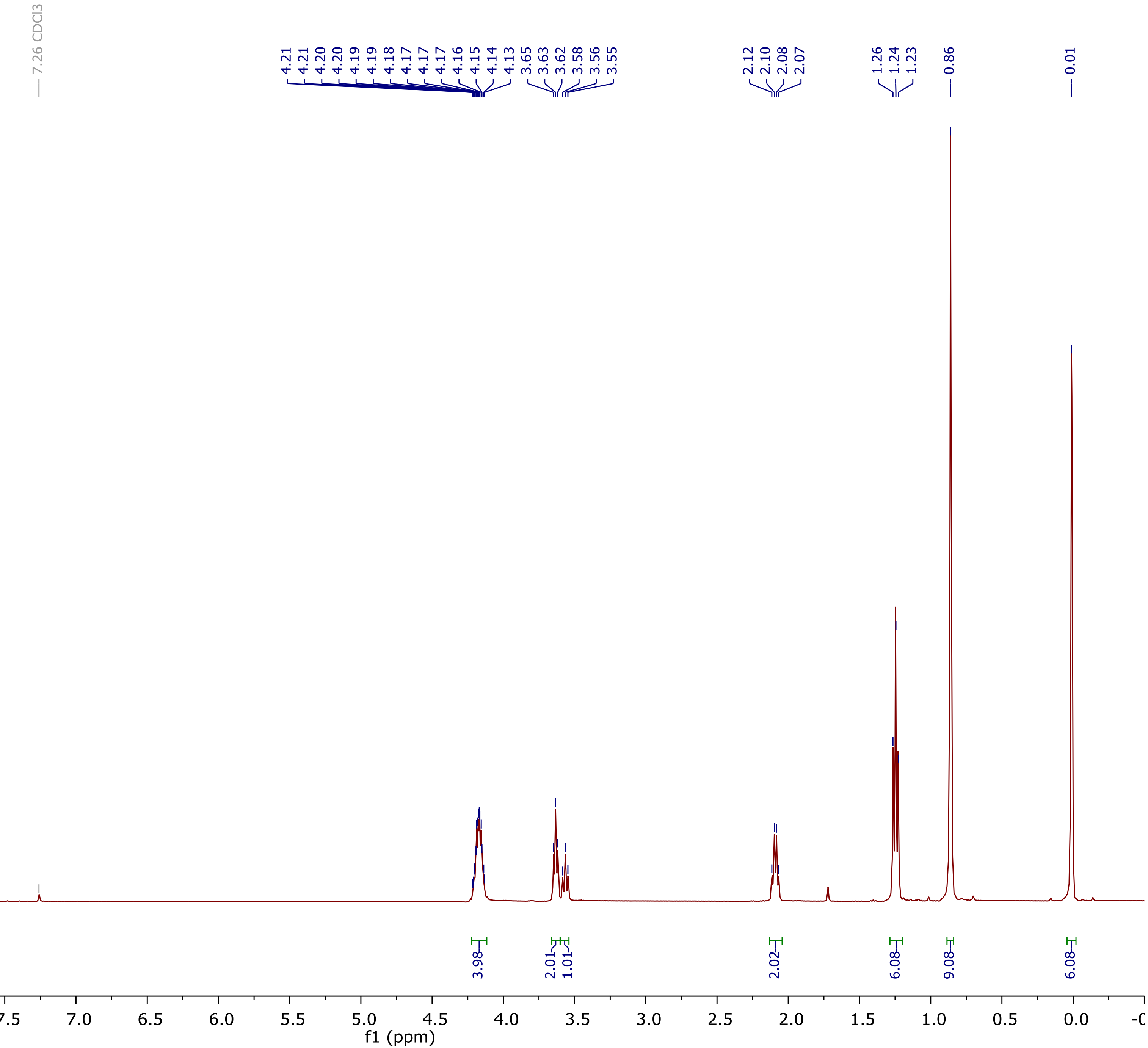
3bl

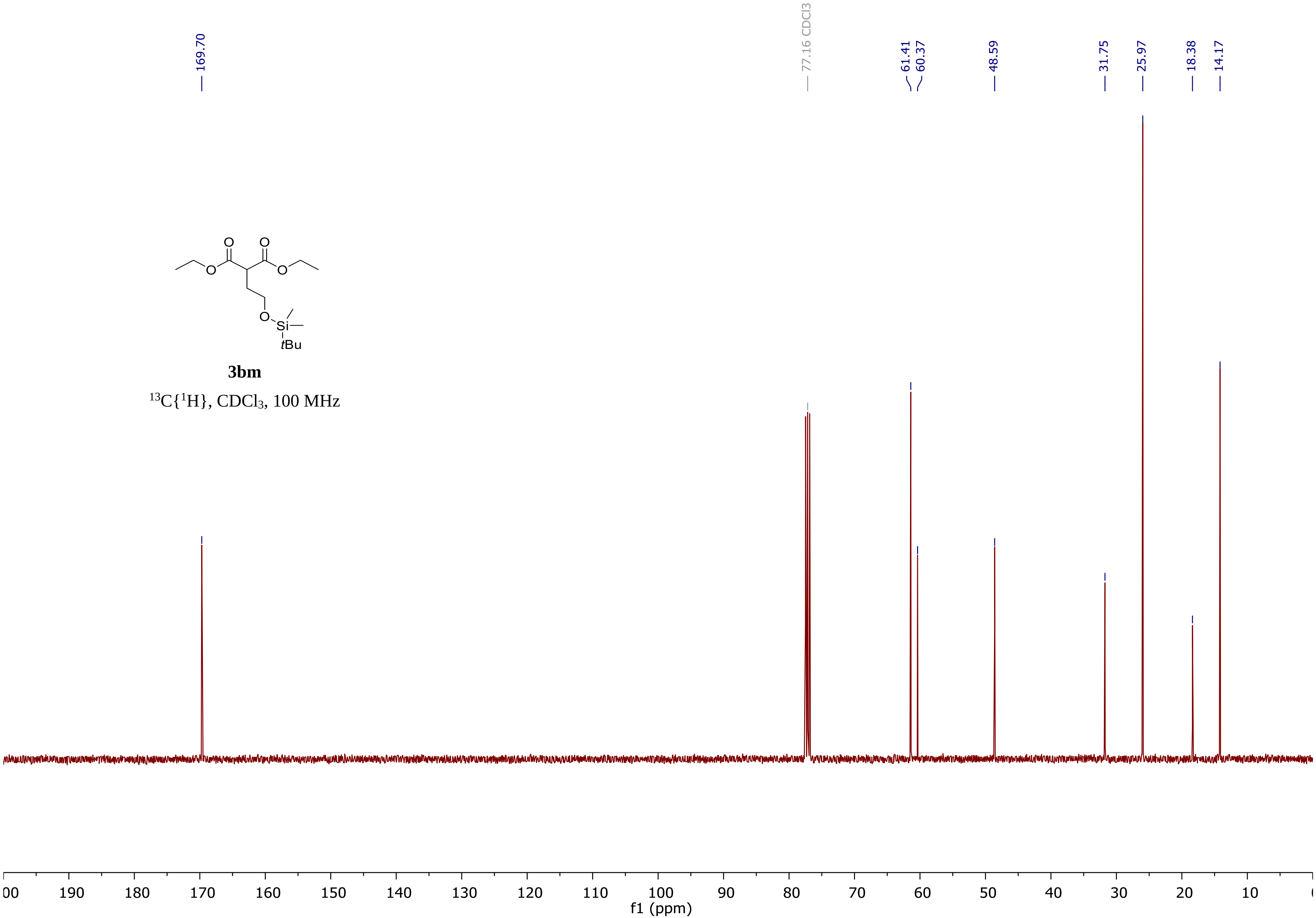
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

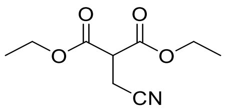


3bm

^{1}H, $CDCl_3$, 400 MHz

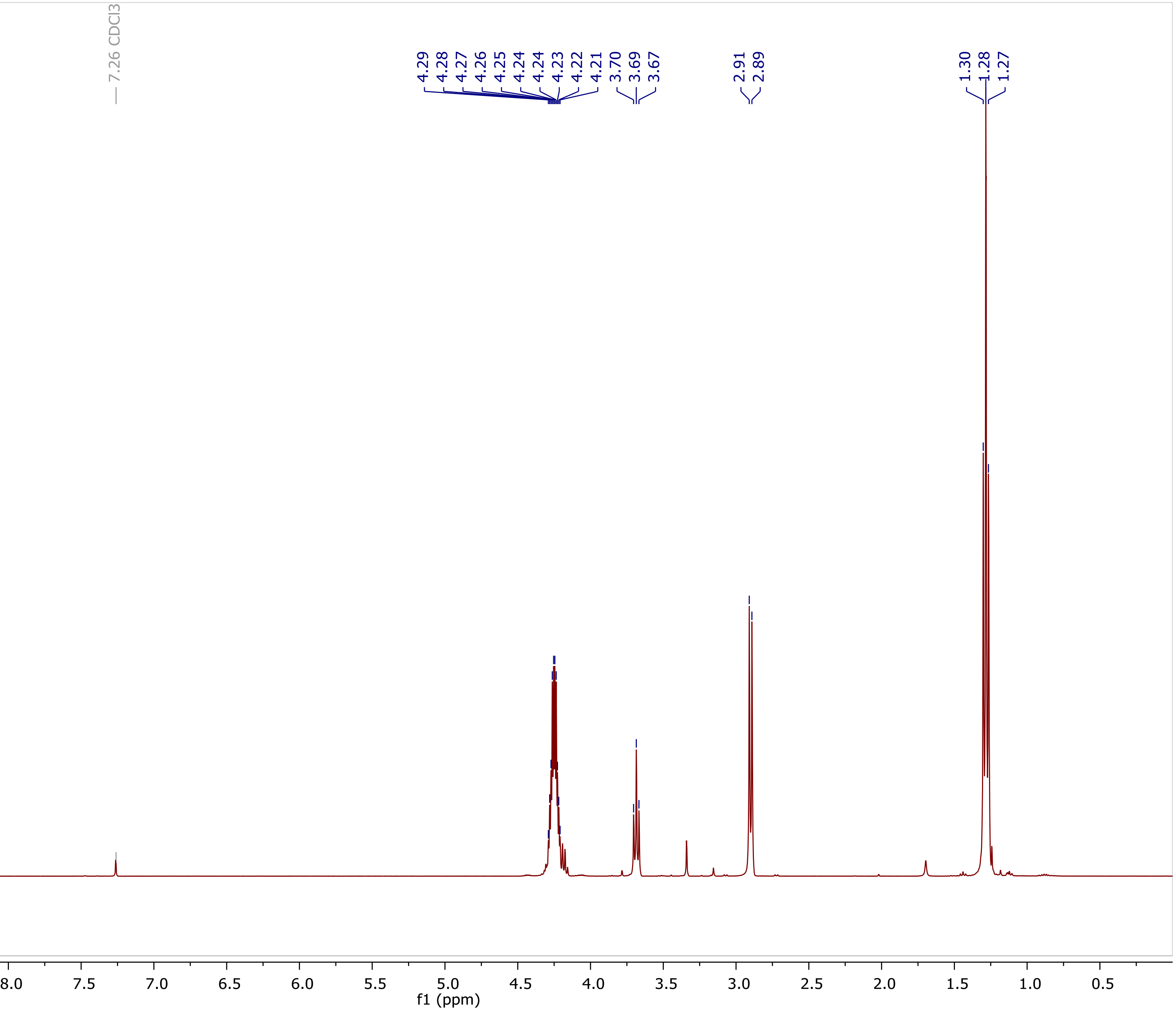


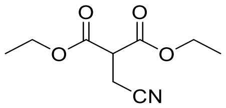

169.70
77.16 CDCl3
61.41
60.37
48.59
31.75
25.97
18.38
14.17
O
O
O
O
O
Si
tBu
3bm
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



3bn

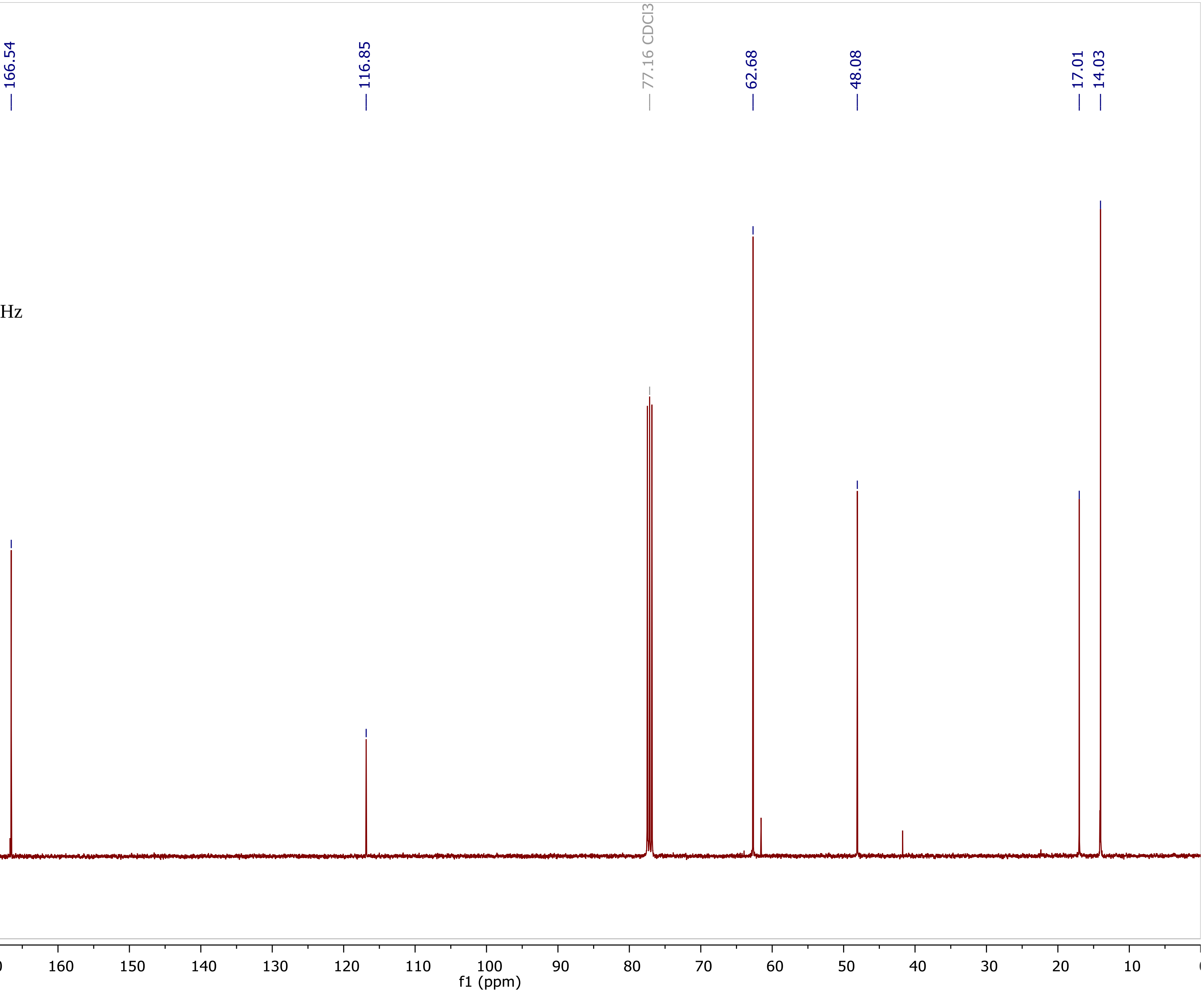
^{1}H, $CDCl_3$, 400 MHz

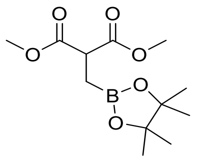




3bn

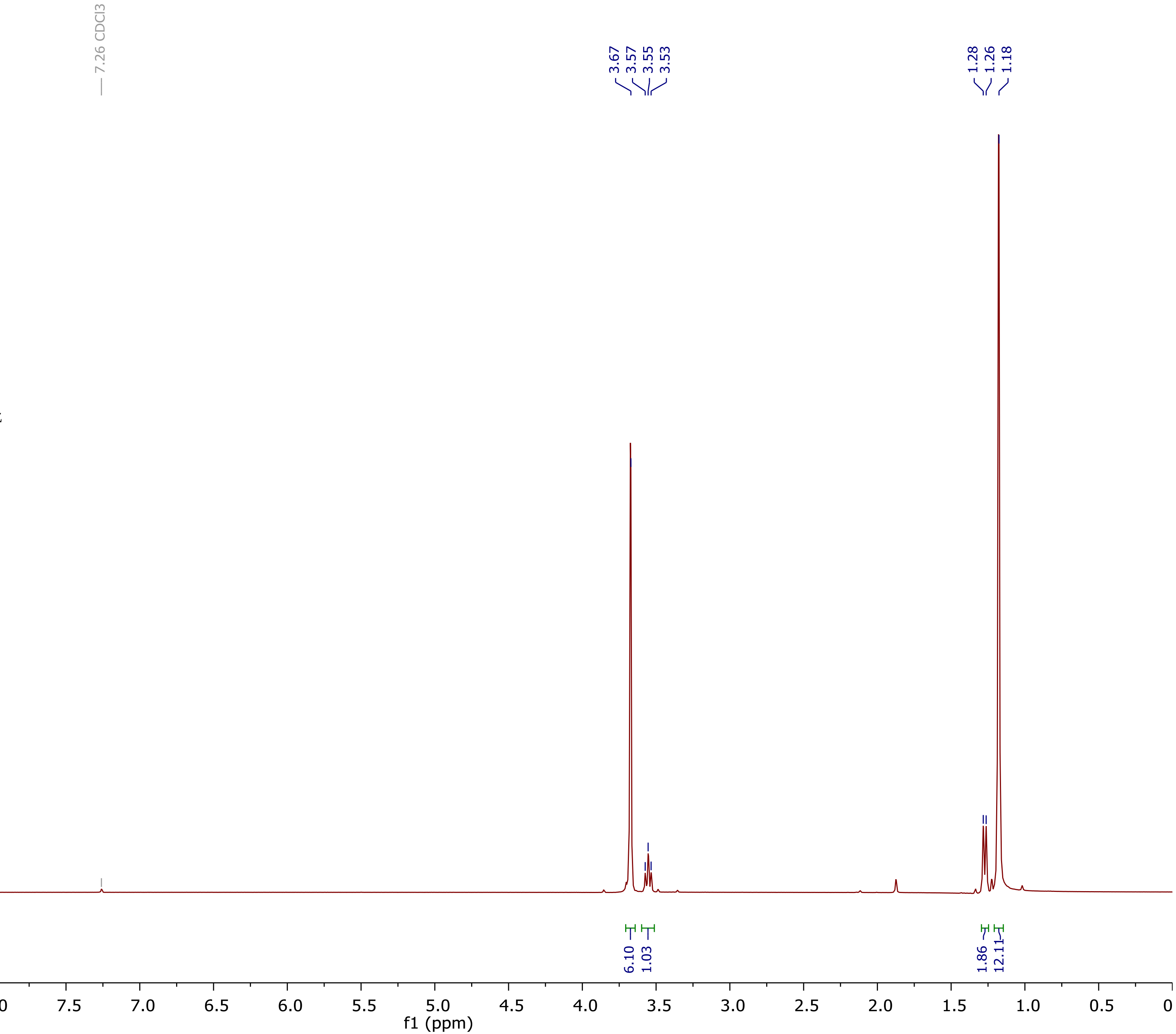
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

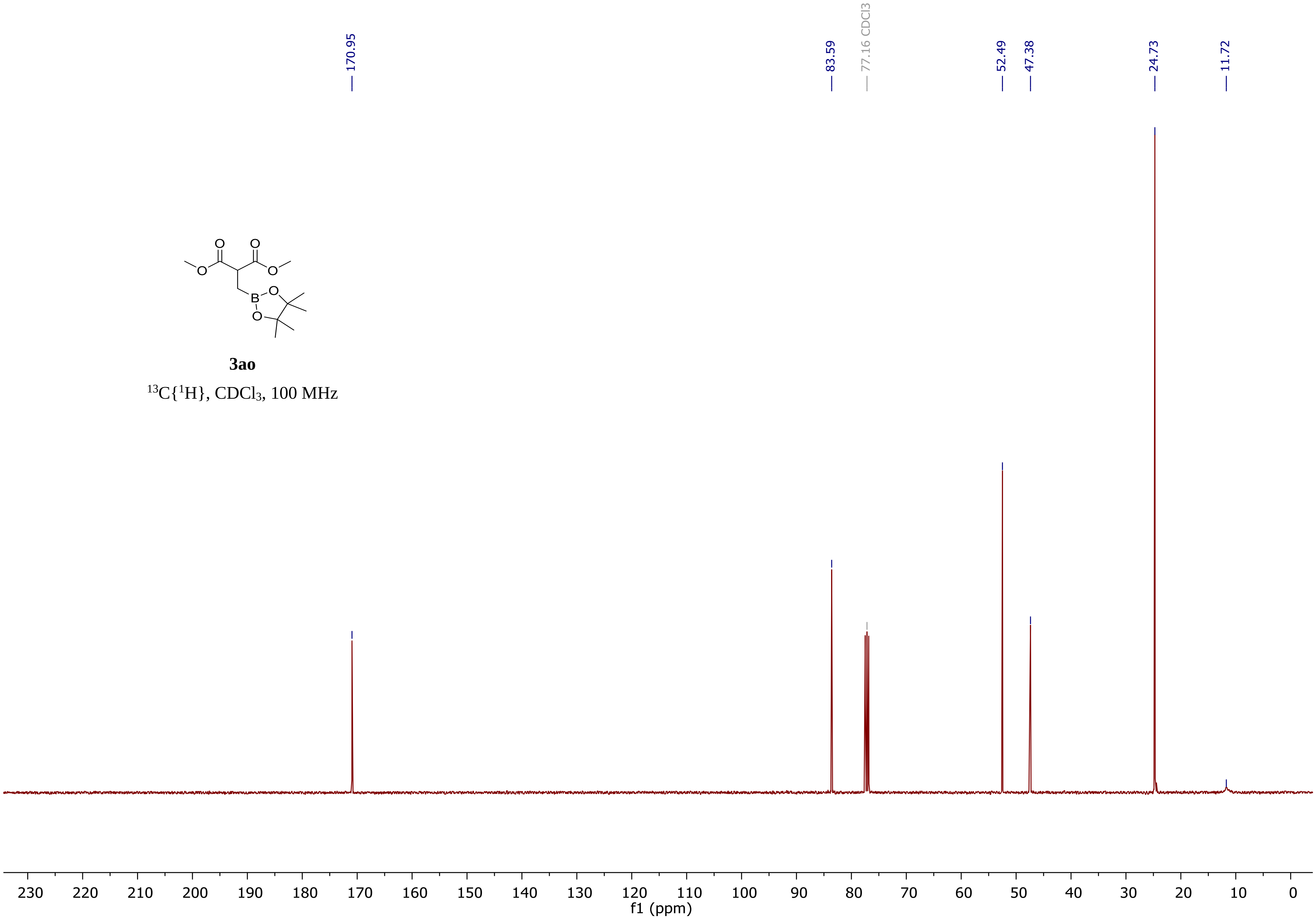




3ao

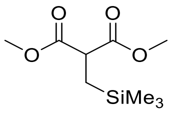
^{1}H, $CDCl_3$, 400 MHz





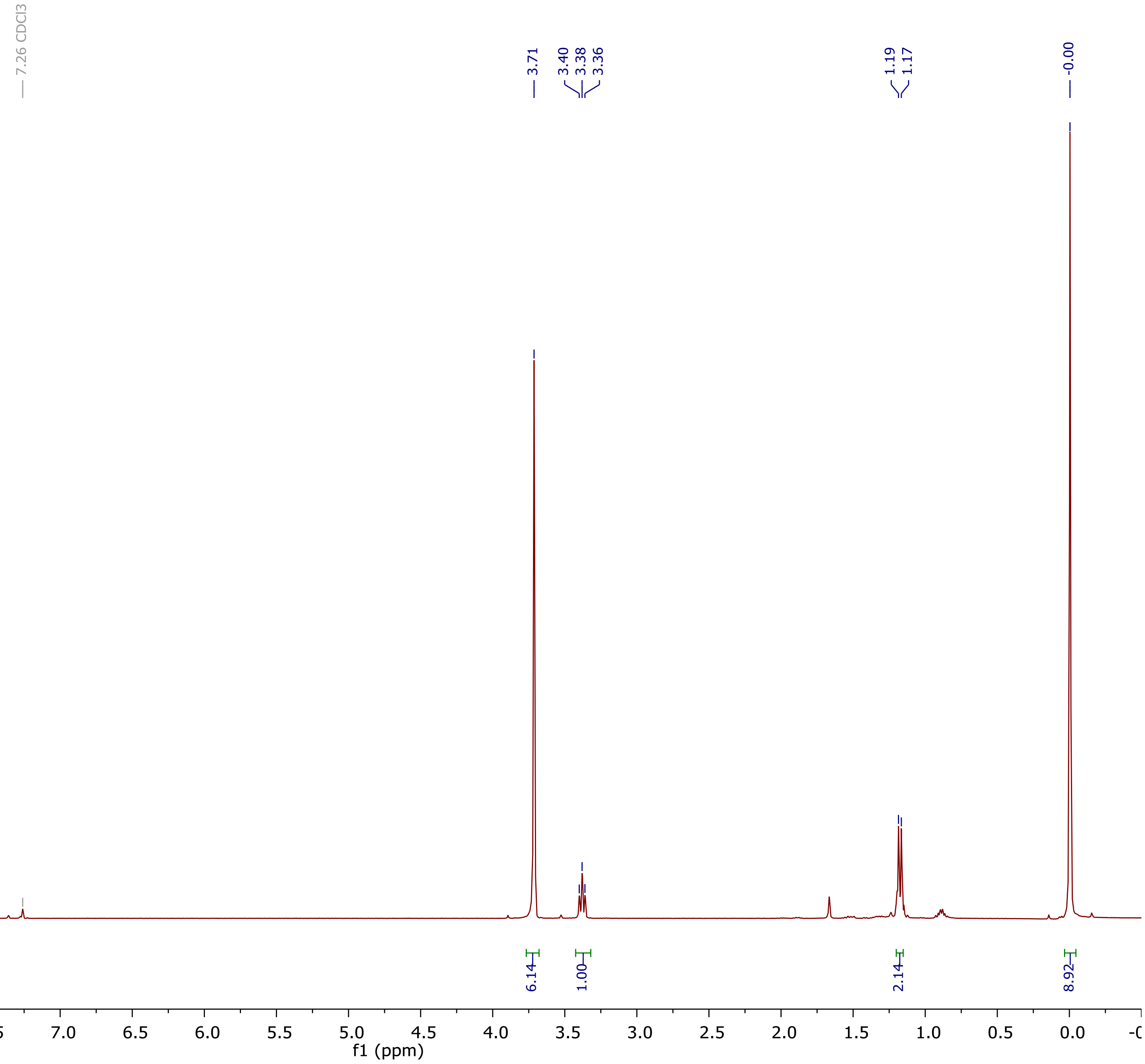
3ao

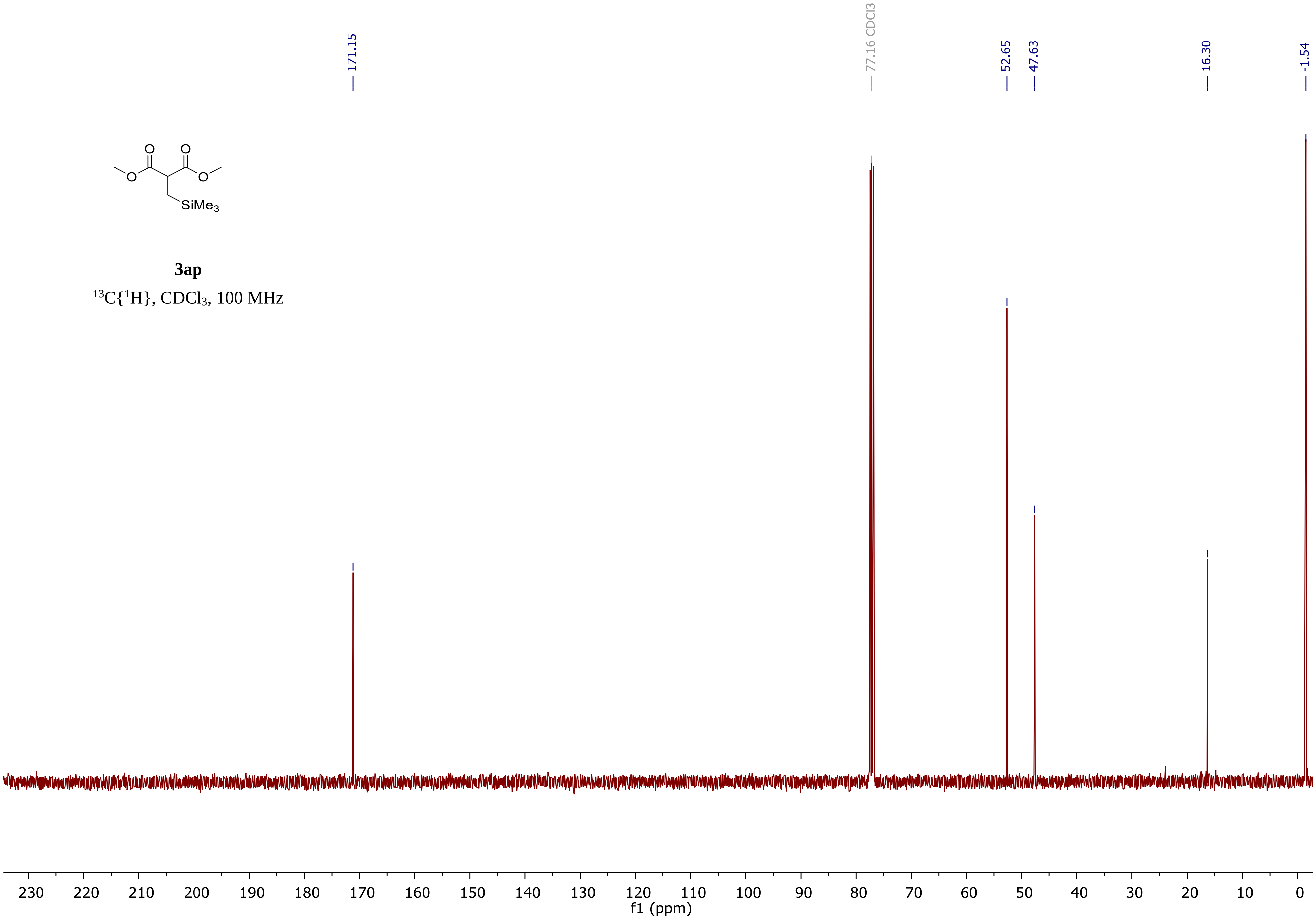
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz



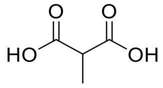
3ap

^{1}H, $CDCl_3$, 400 MHz



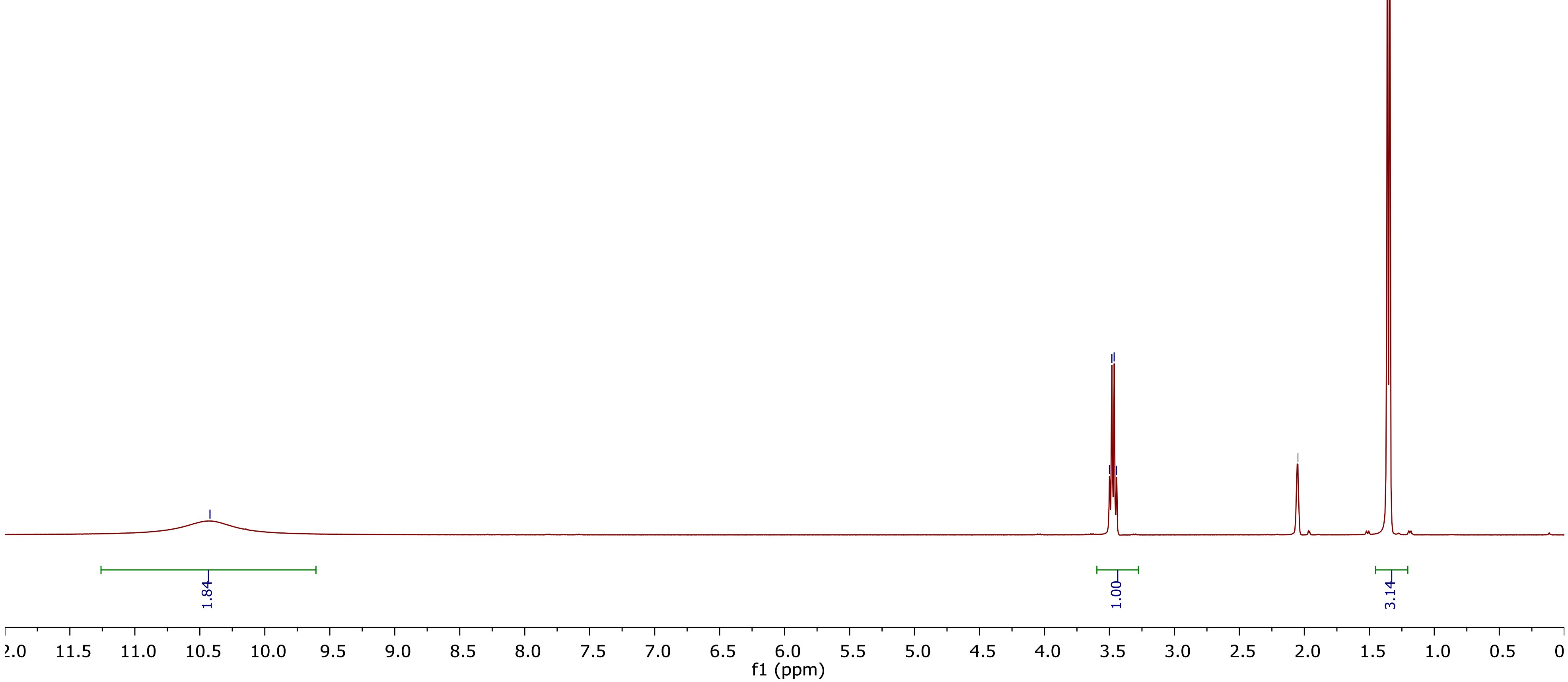


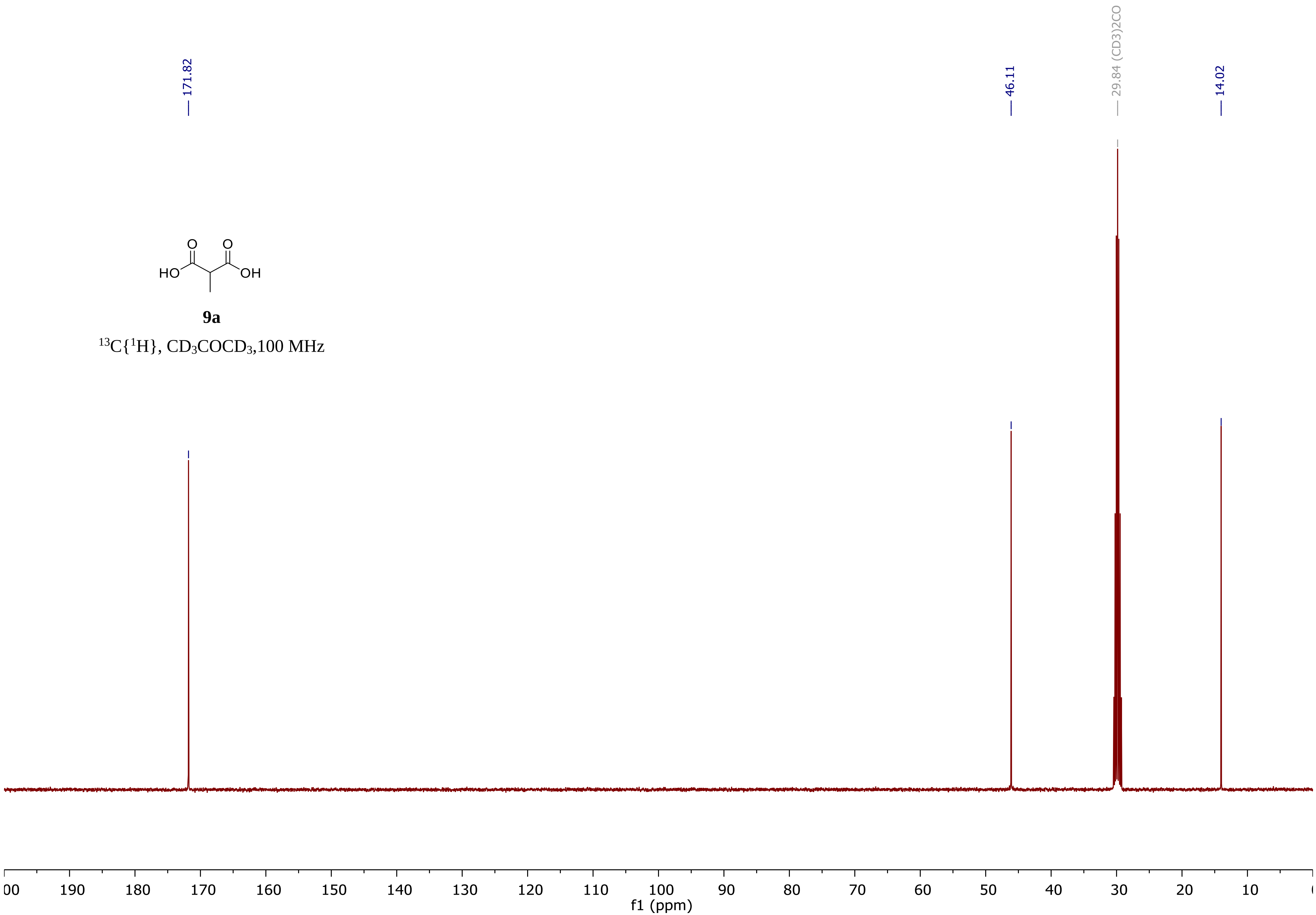
171.15
77.16 CDCl3
52.65
47.63
16.30
-1.54
SiMe3
3ap
13C{1H}, CDCl3, 100 MHz
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)



9a

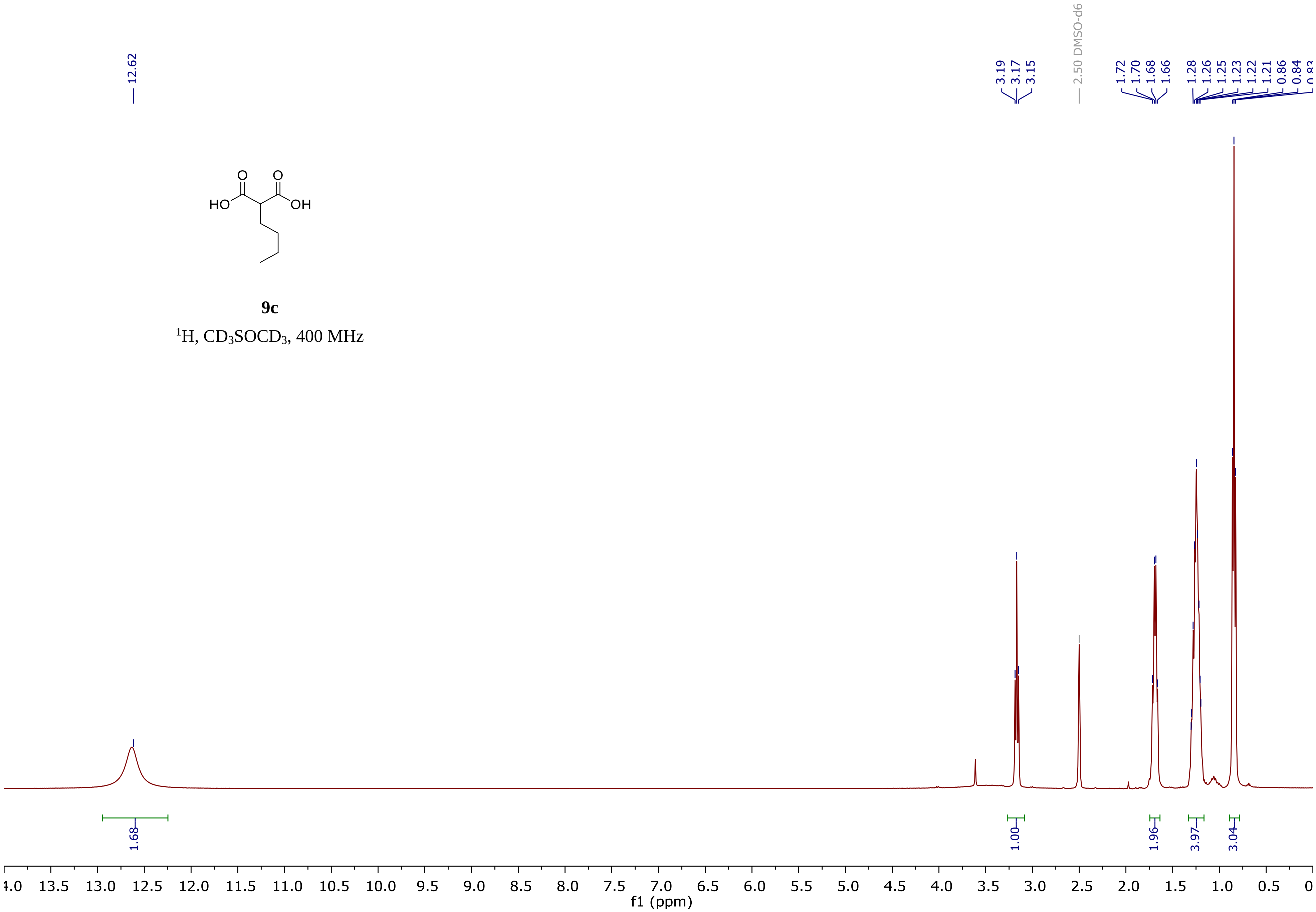
^{1}H, CD_3COCD_3, 400 MHz

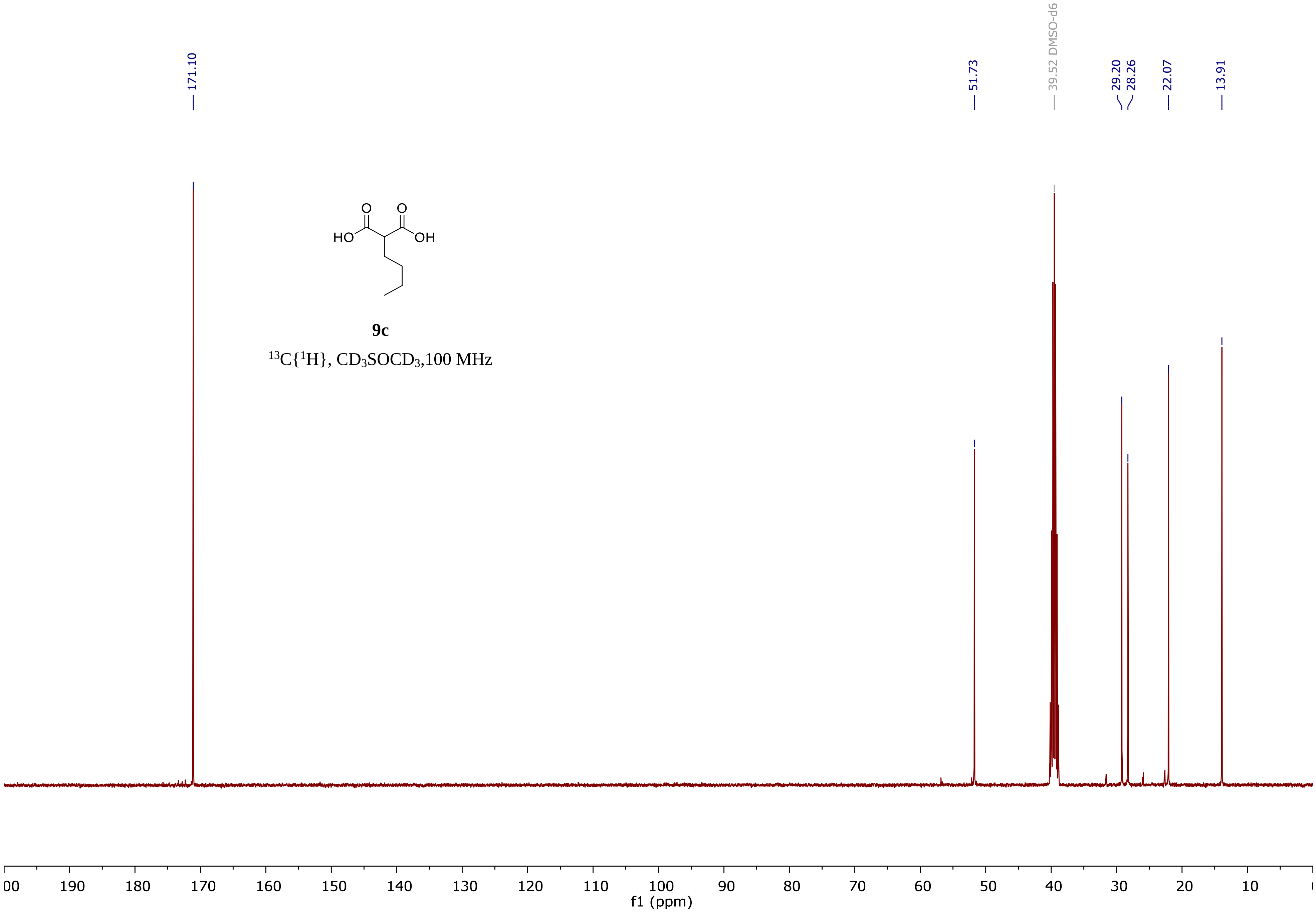


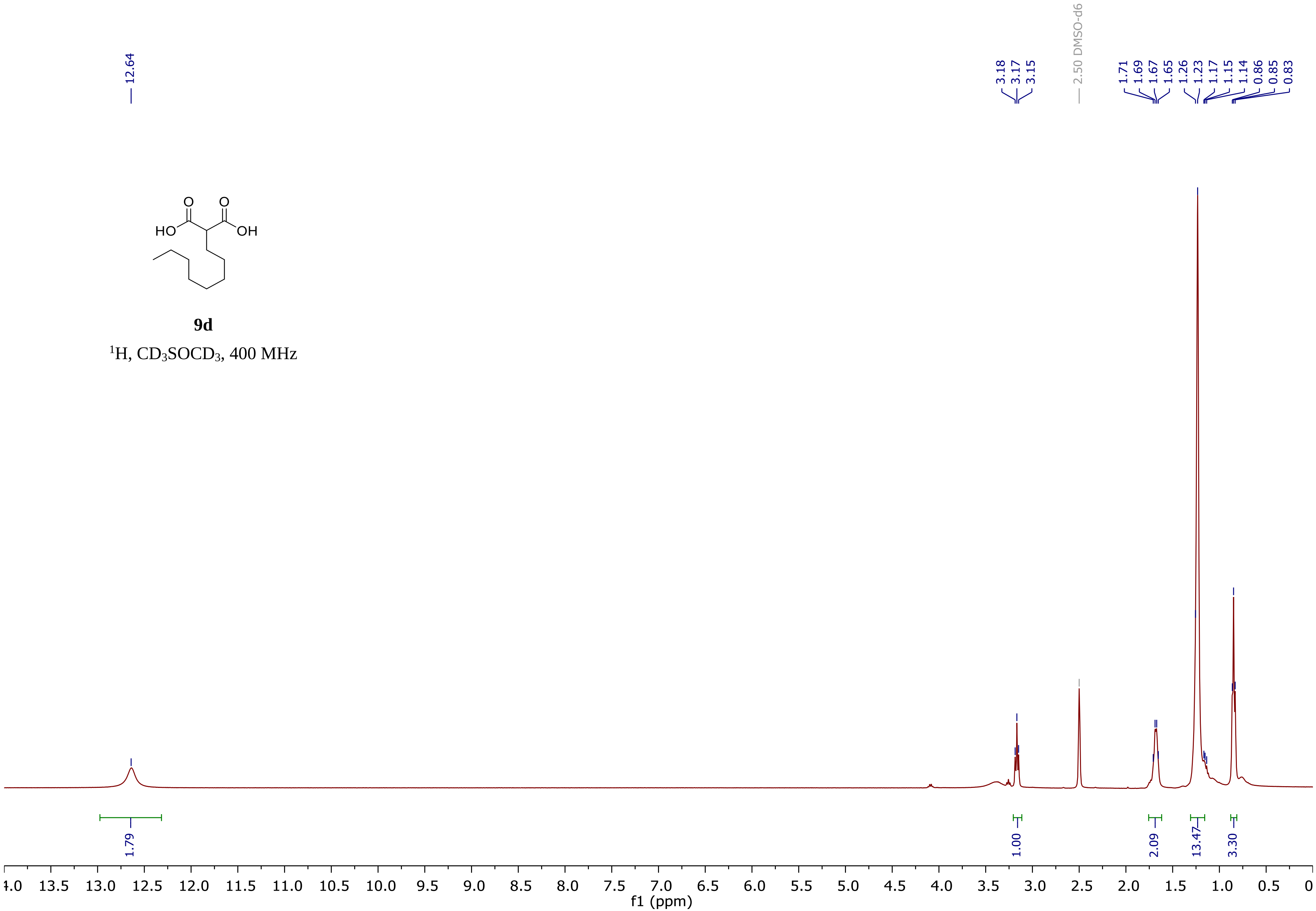


9a

$^{13}C\{^1H\}$, CD_3COCD_3,100 MHz

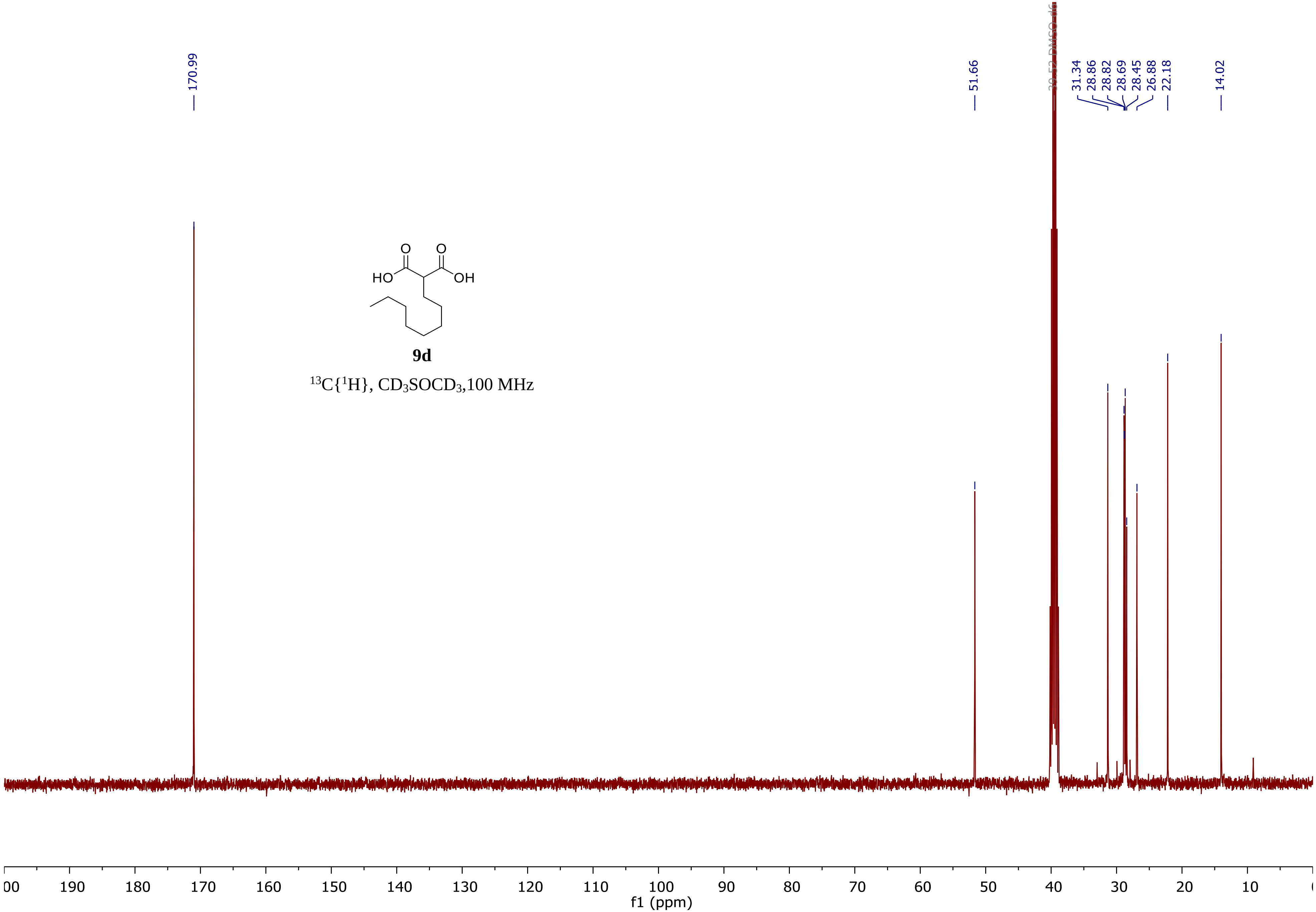

12.62
3.19
3.17
3.15
2.50 DMSO-d6
1.72
1.70
1.68
1.66
1.28
1.26
1.25
1.23
1.22
1.21
0.86
0.84
HO
O
O
OH
9c
1H, CD3SOCD3, 400 MHz
1.68
1.00
1.96
3.97
3.04
13.5 13.0 12.5 12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
f1 (ppm)


171.10
51.73
39.52 DMSO-d6
29.20
28.26
22.07
13.91
HO
OH
O
O
9c
$^{13}C\{^{1}H\}$, CD_3SOCD_3,100 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



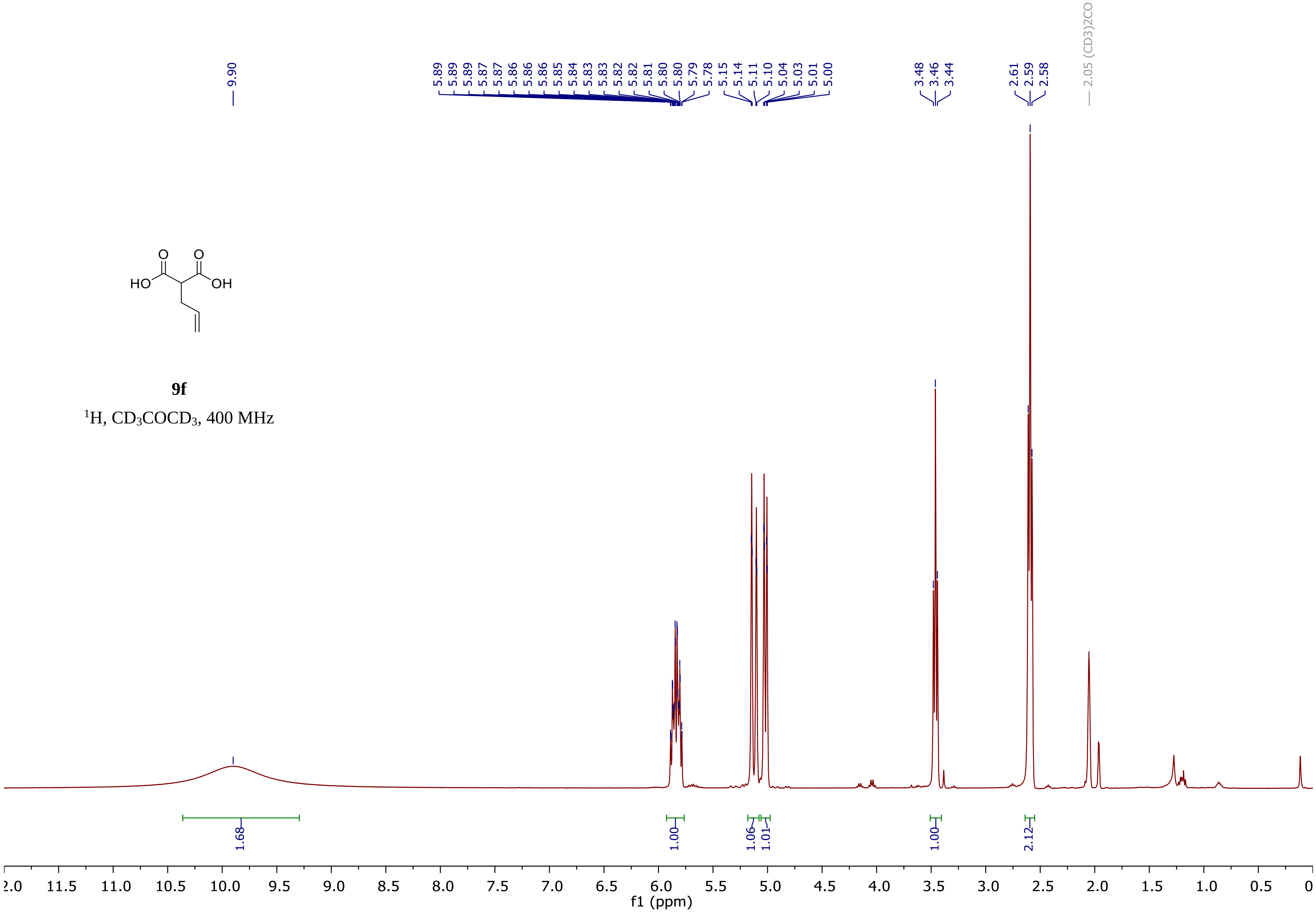
9d

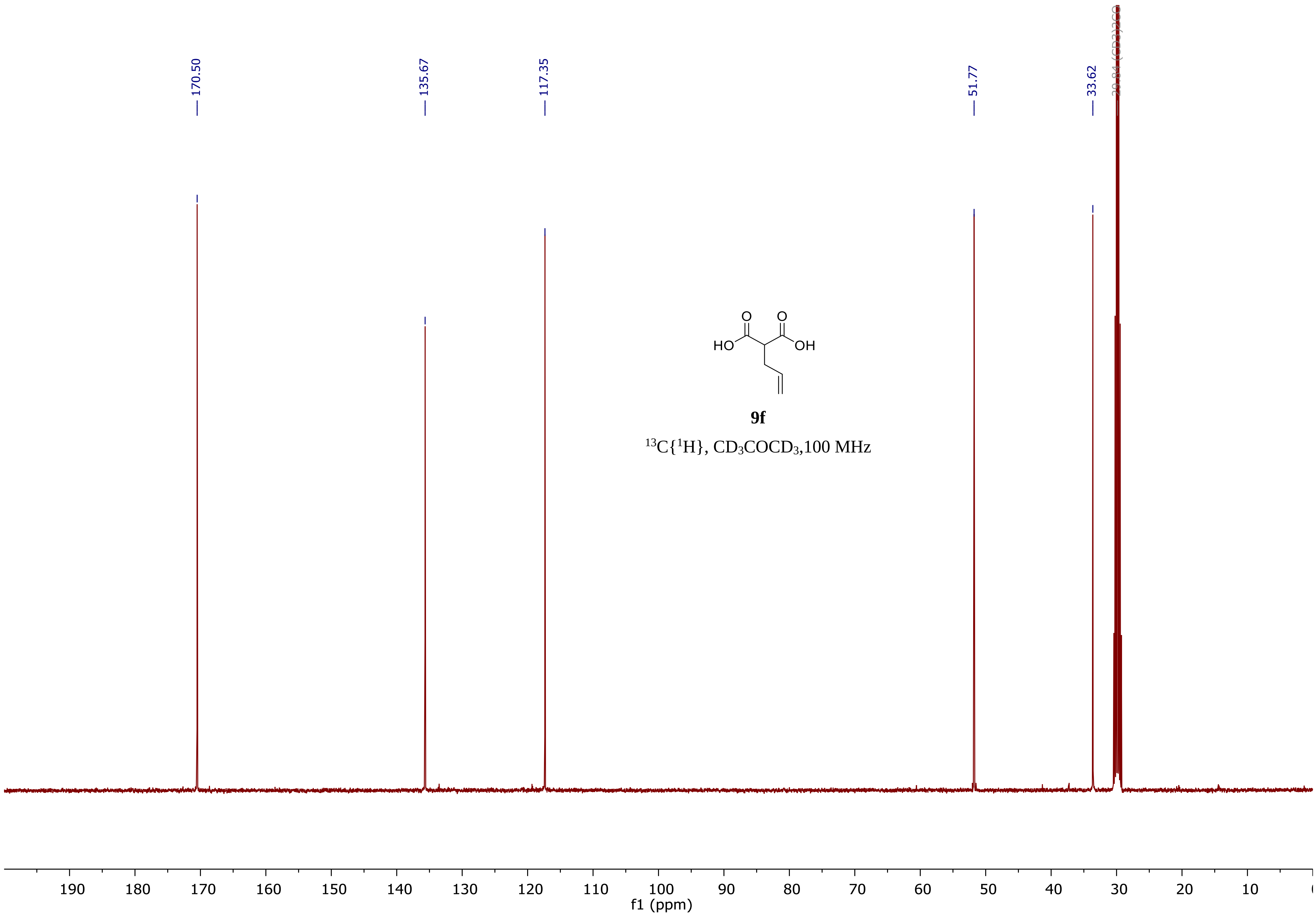
^{1}H, CD_3SOCD_3, 400 MHz

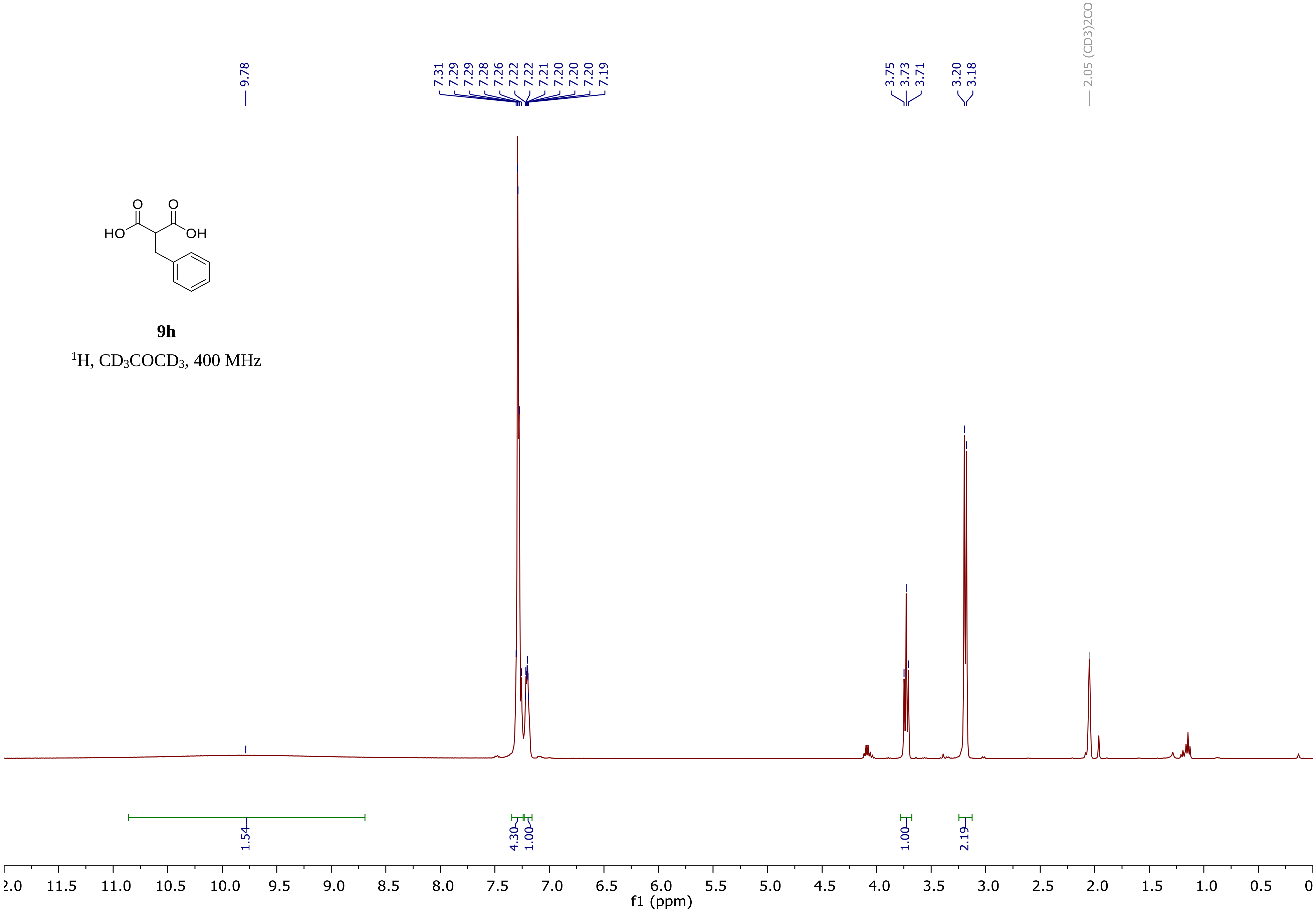

170.99
51.66
39.52 DMSO-d6
31.34
28.86
28.82
28.69
28.45
26.88
22.18
14.02
HO
OH
O
O
9d
$^{13}C\{^{1}H\}$, CD_3SOCD_3,100 MHz
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

9f

^{1}H, CD_3COCD_3, 400 MHz

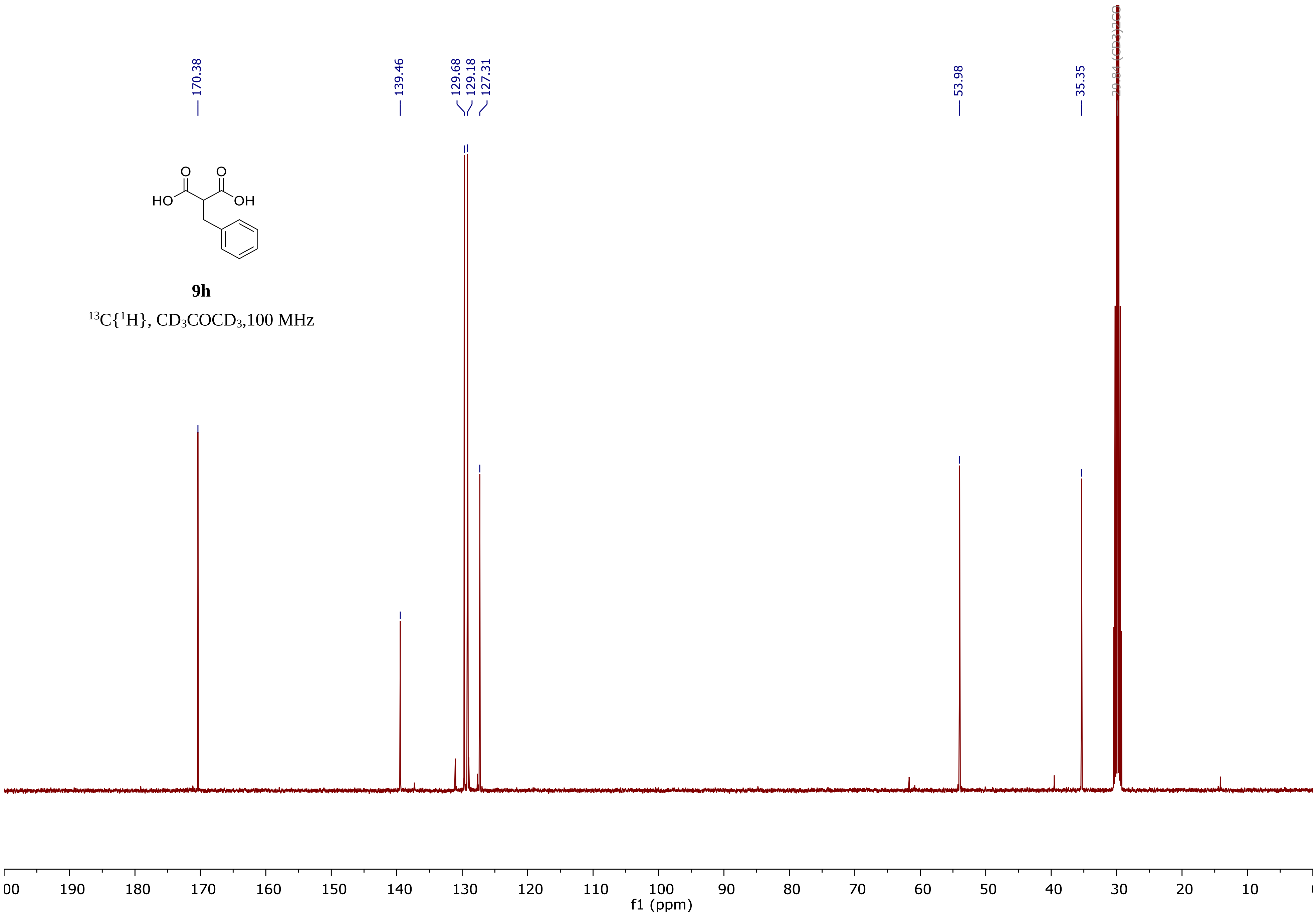


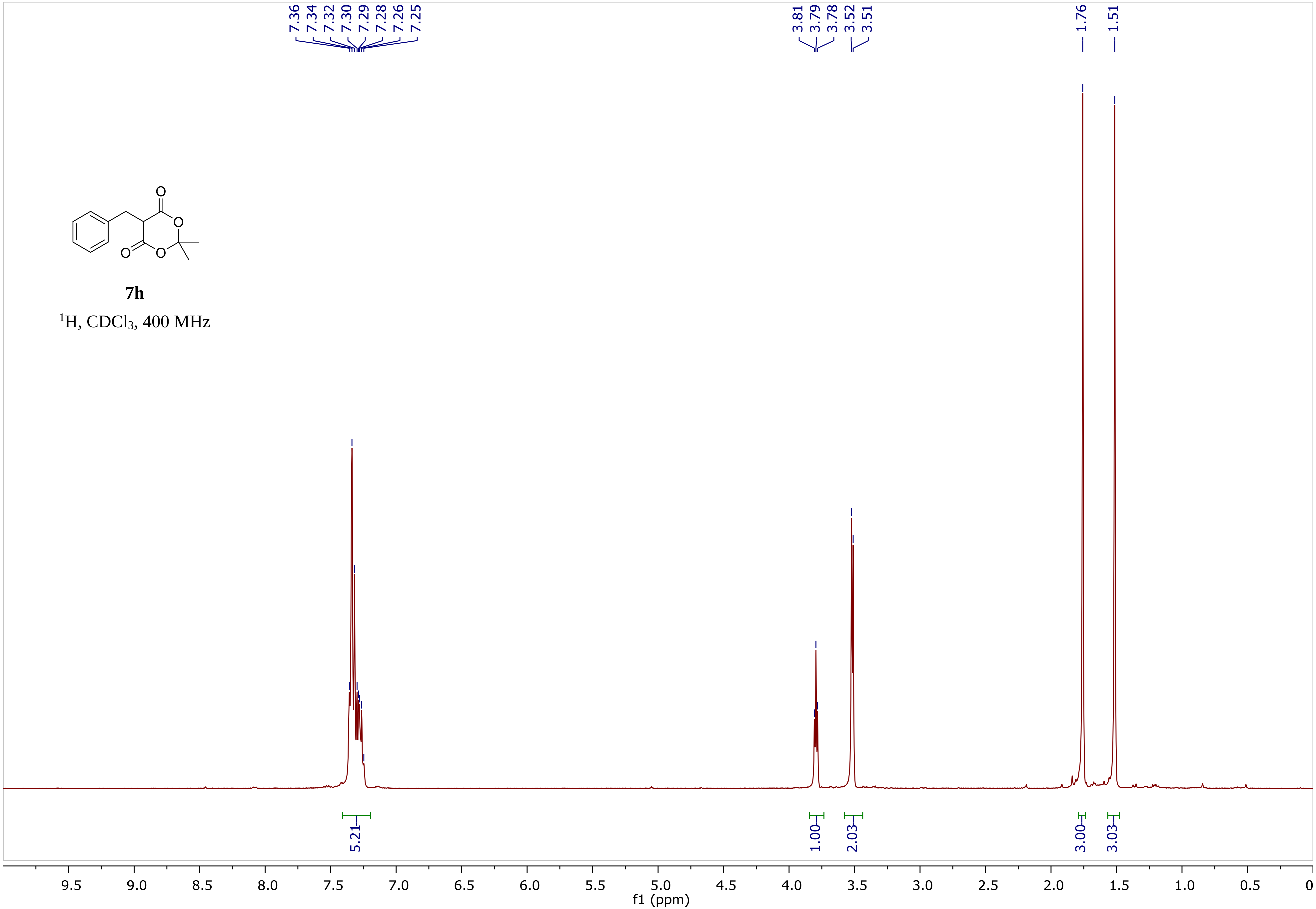

170.50
135.67
117.35
51.77
33.62
29.84 (CD3)2CO
HO
O
O
OH
9f
13C{1H}, CD3COCD3,100 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

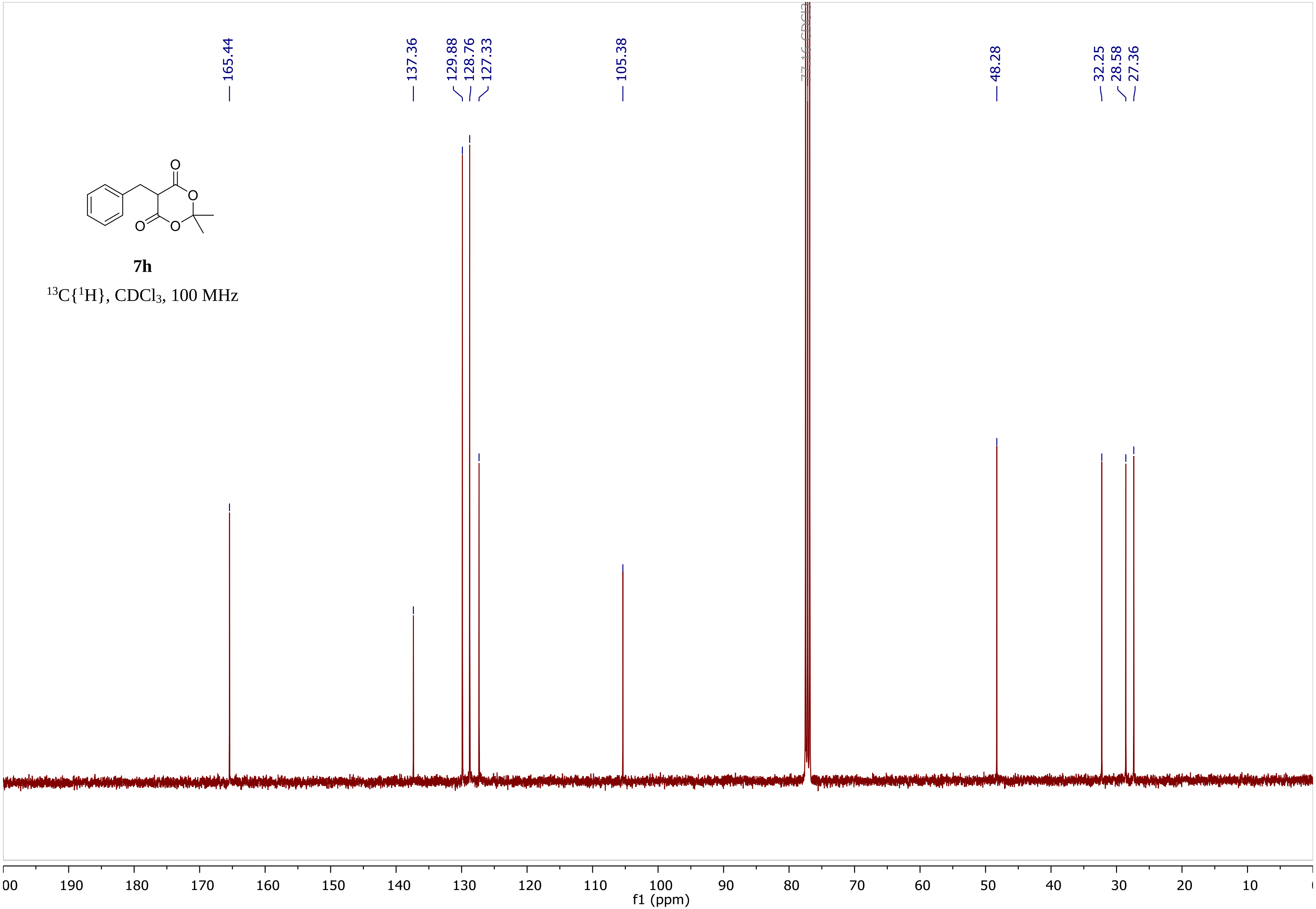


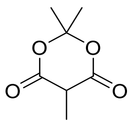
9h

^{1}H, CD_3COCD_3, 400 MHz


170.38
139.46
129.68
129.18
127.31
53.98
35.35
29.84 (CD3)2CO
HO
OH
O
O
9h
13C{1H}, CD3COCD3,100 MHz
f1 (ppm)

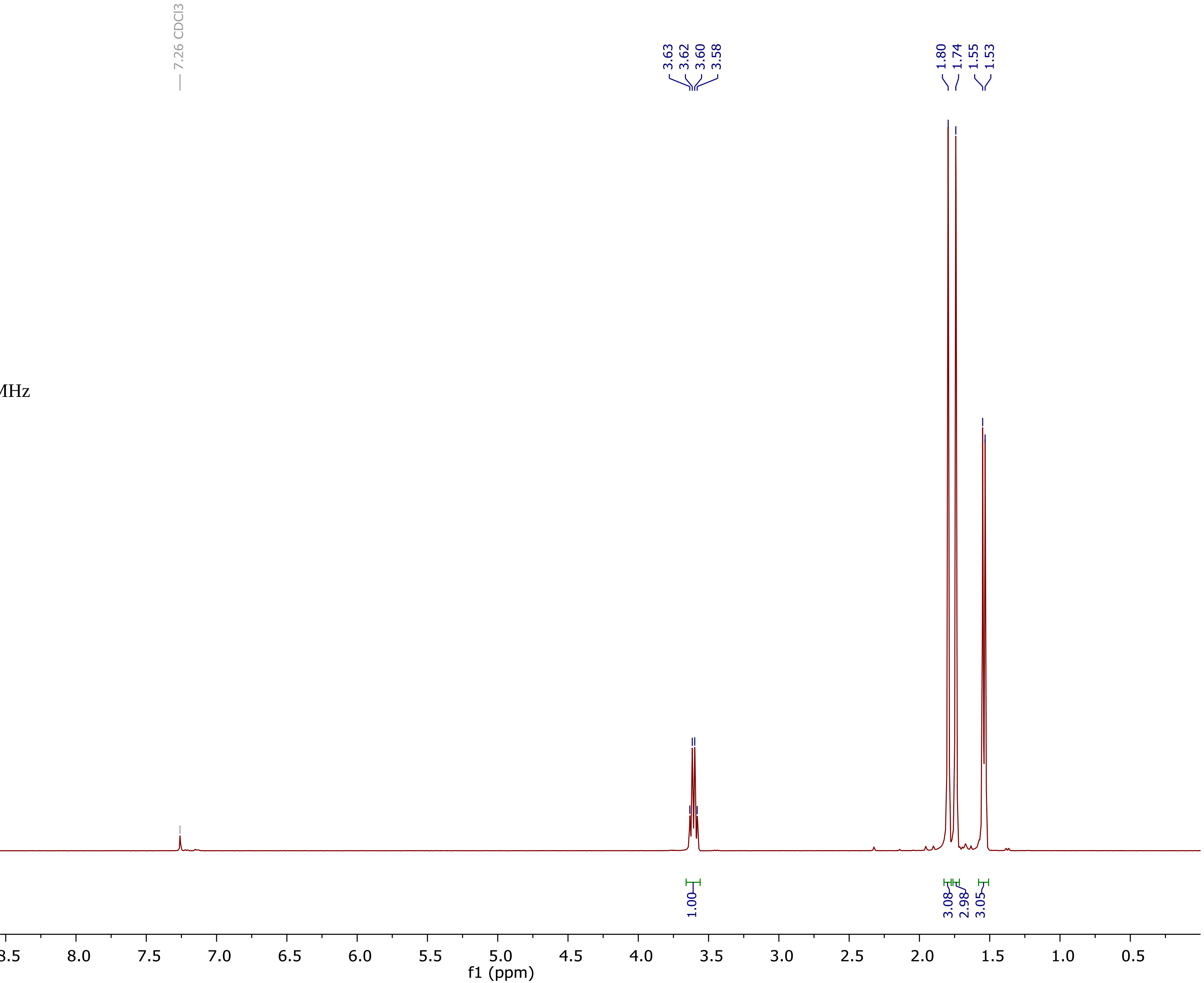

7.36
7.34
7.32
7.30
7.29
7.28
7.26
7.25
3.81
3.79
3.78
3.52
3.51
1.76
1.51
7h
1H, CDCl3, 400 MHz
5.21
1.00
2.03
3.00
3.03
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)

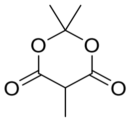

165.44
137.36
129.88
128.76
127.33
105.38
48.28
32.25
28.58
27.36
7h
$^{13}C\{^1H\}$, $CDCl_3$, 100 MHz
f1 (ppm)



7a

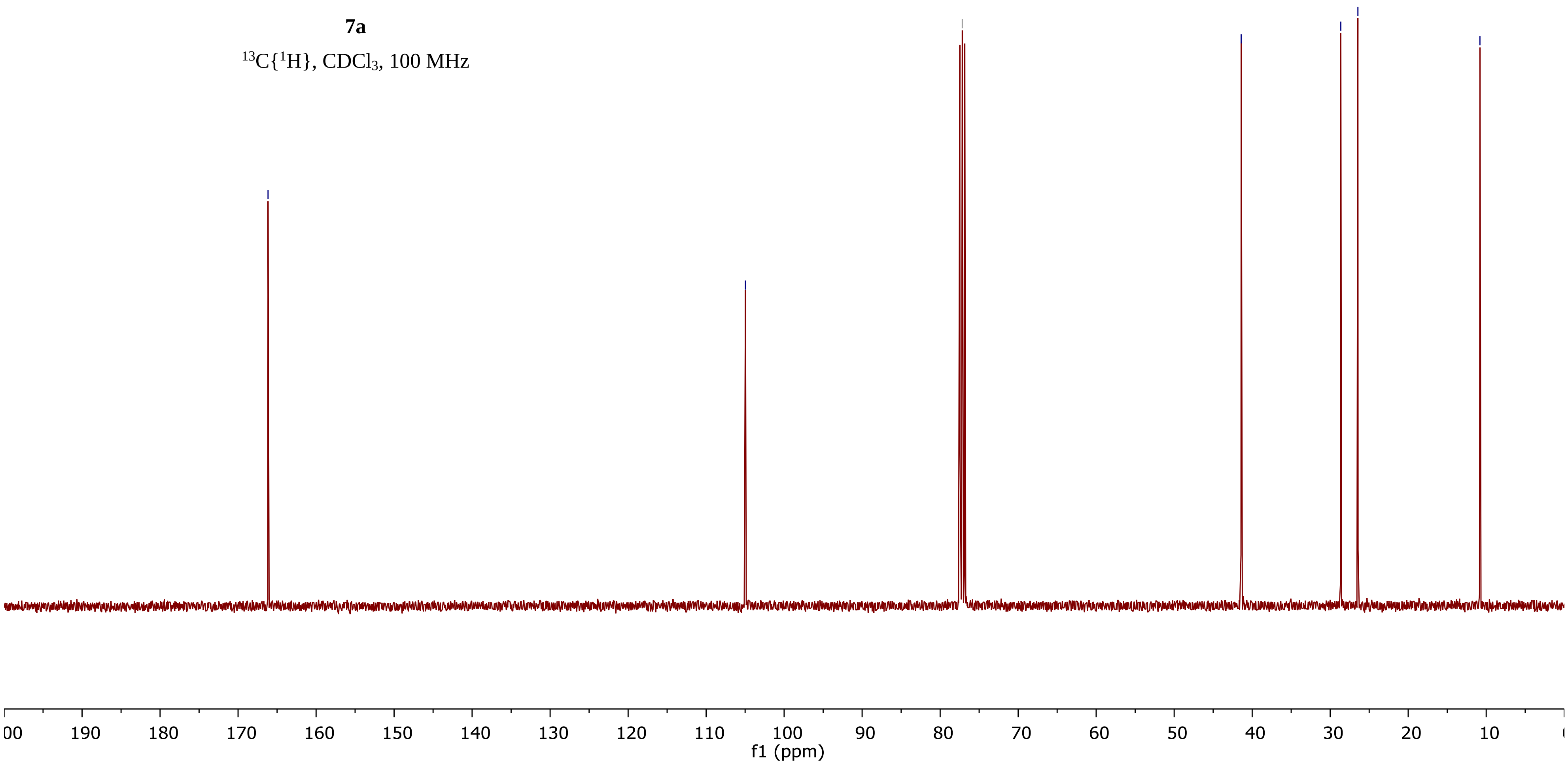
^{1}H, $CDCl_3$, 400 MHz

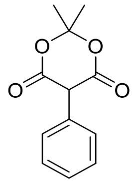




7a

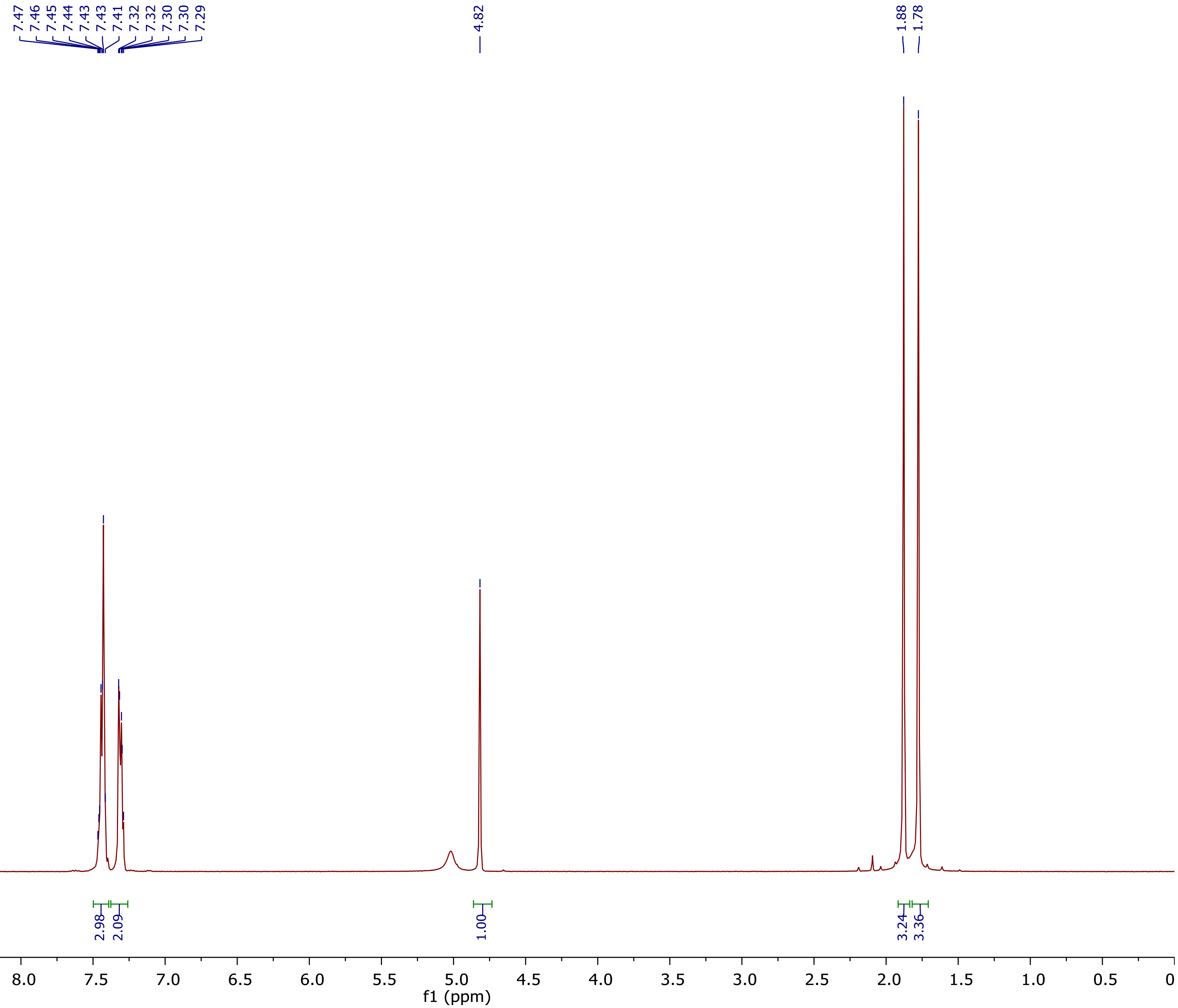
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

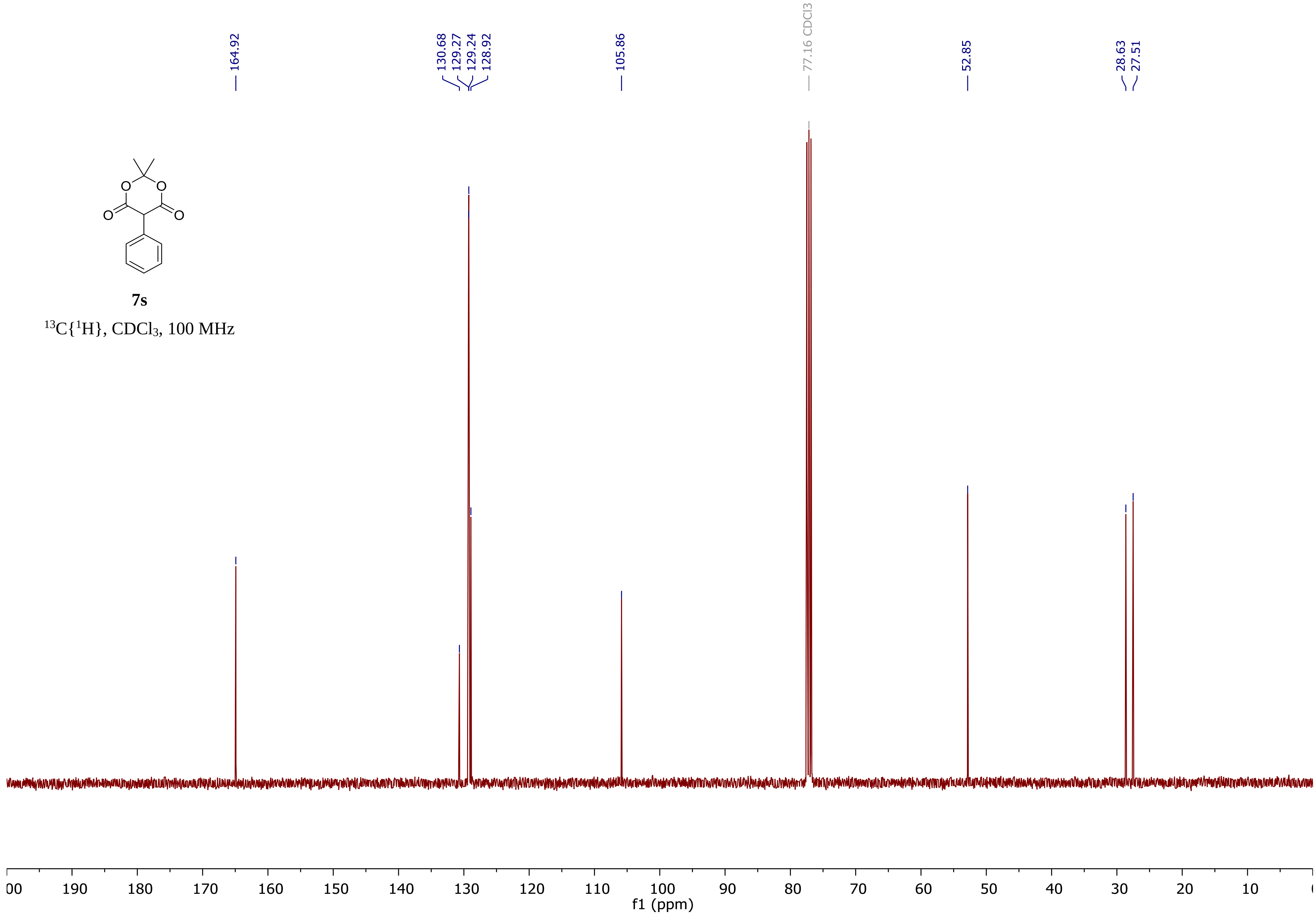




7s

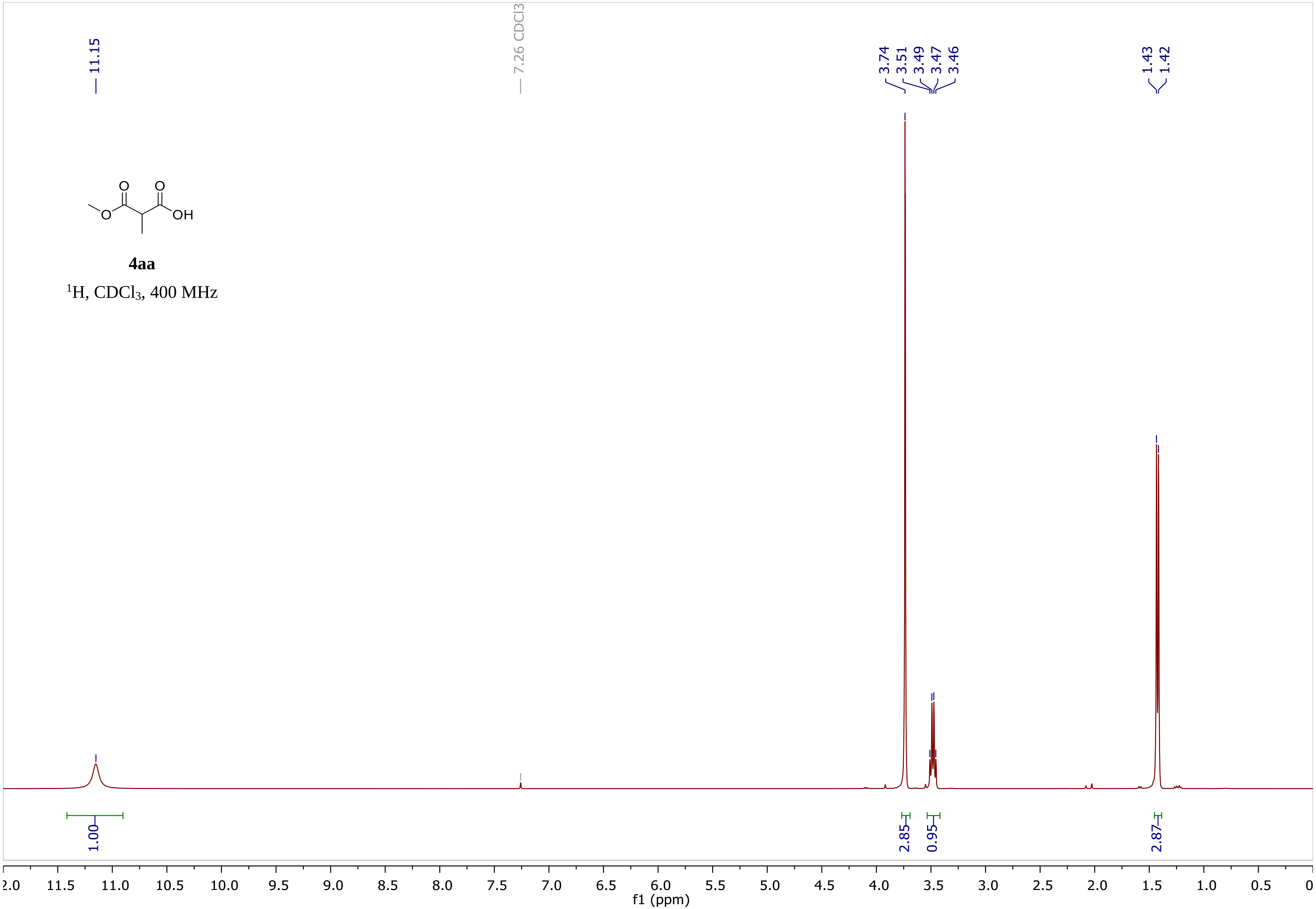
^1H, $CDCl_3$, 400 MHz





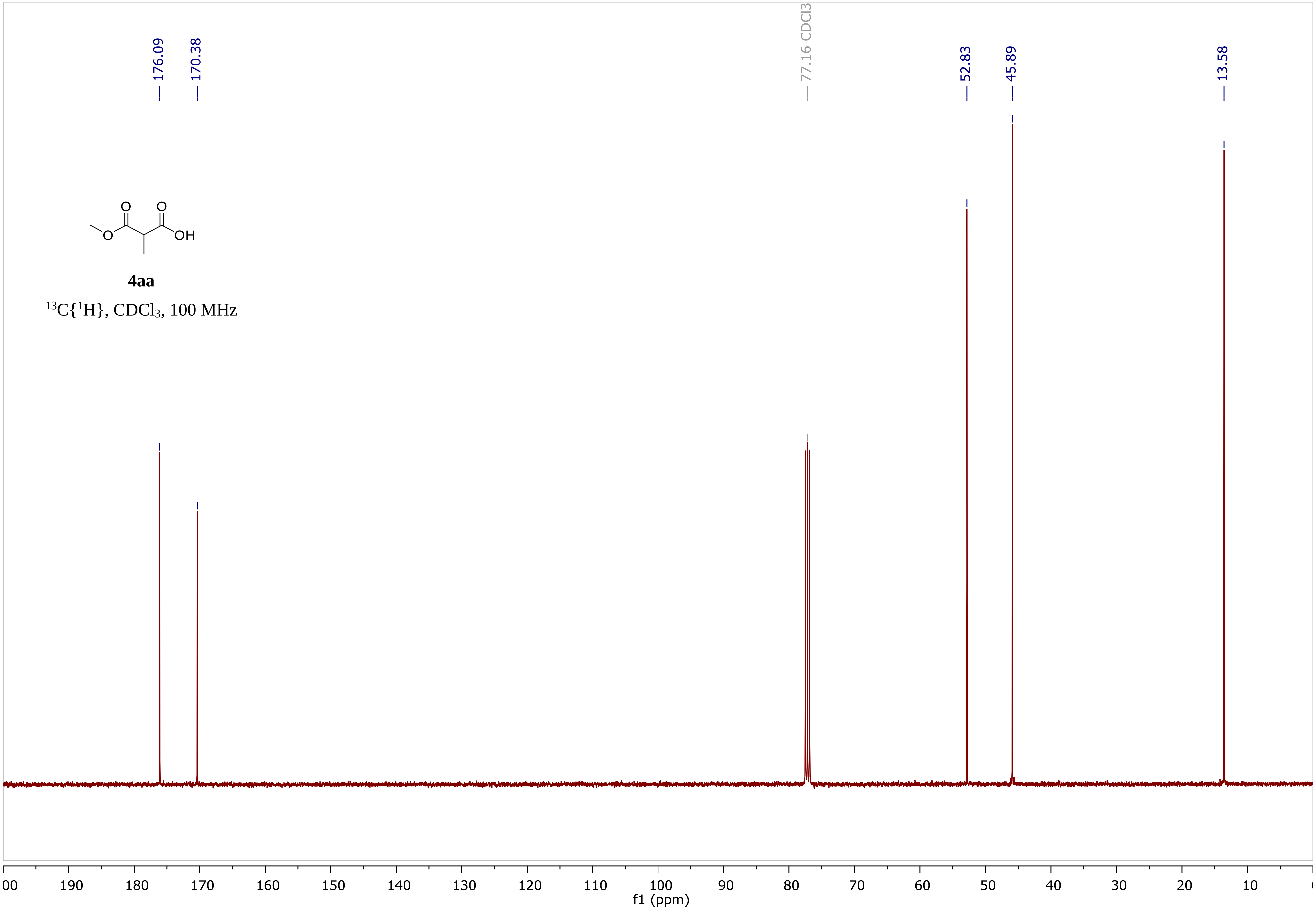
7s

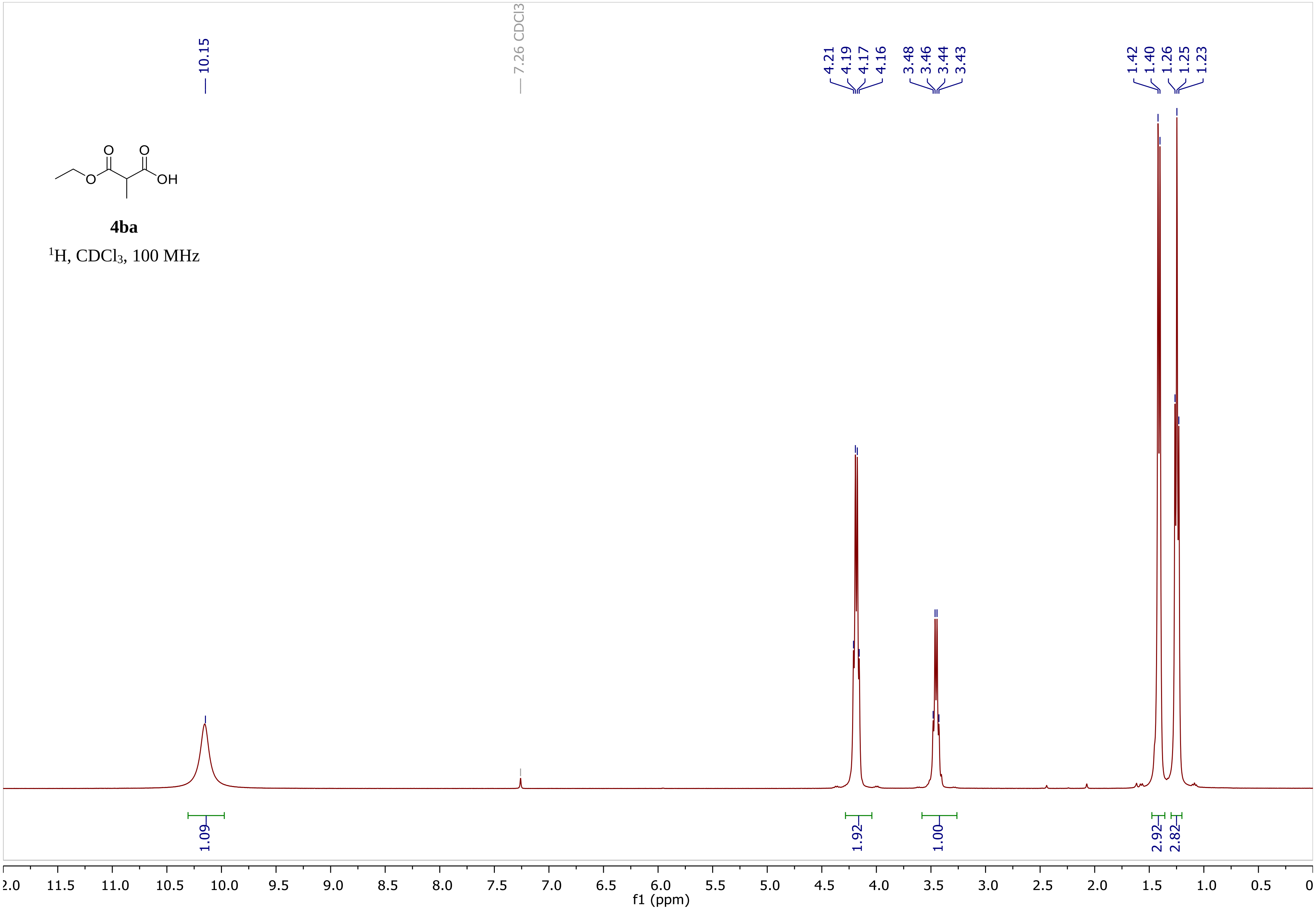
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz



4aa

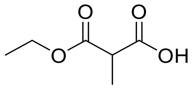
^{1}H, $CDCl_3$, 400 MHz


176.09
170.38
77.16 CDCl3
52.83
45.89
13.58
4aa
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



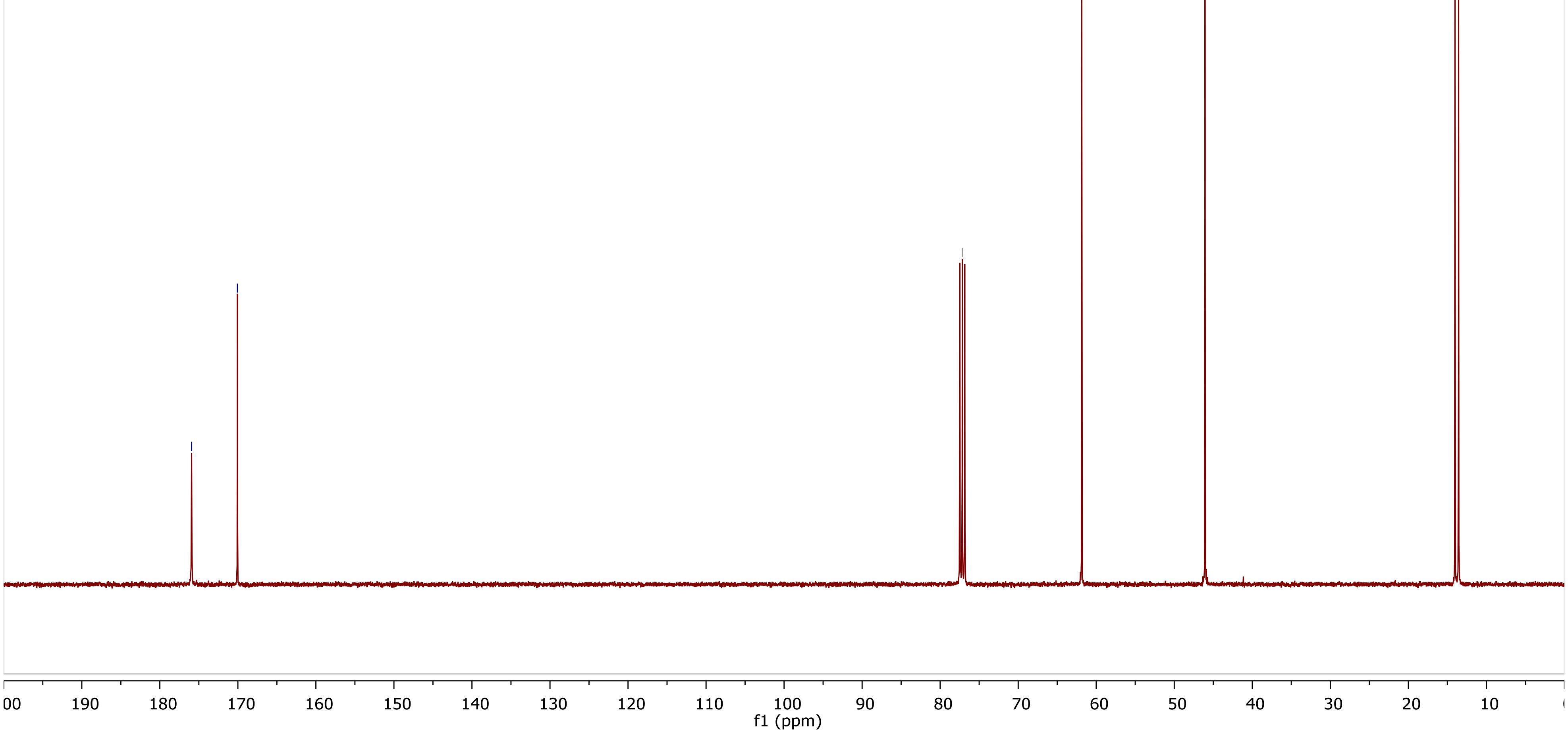
4ba

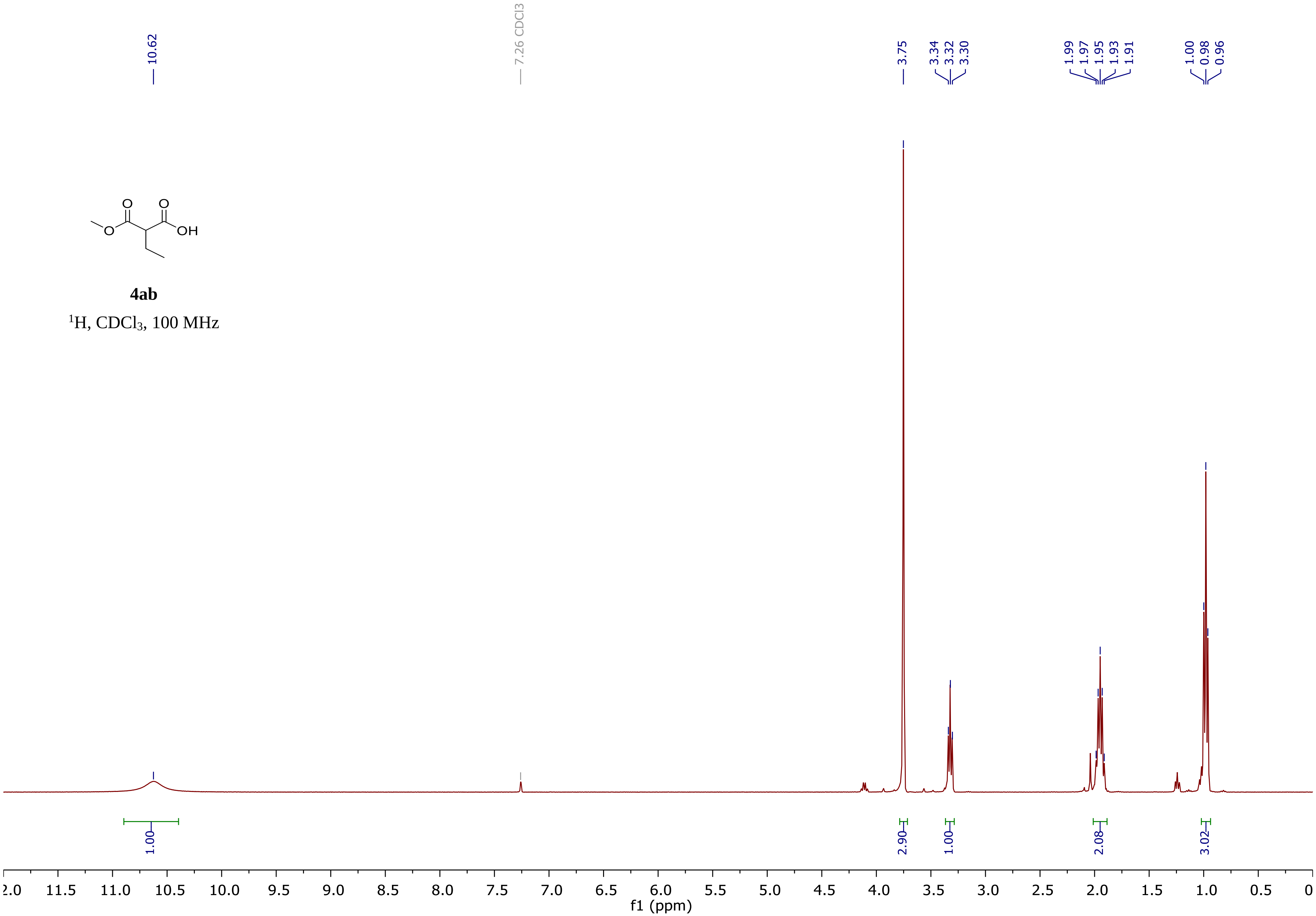
^{1}H, $CDCl_3$, 100 MHz



4ba

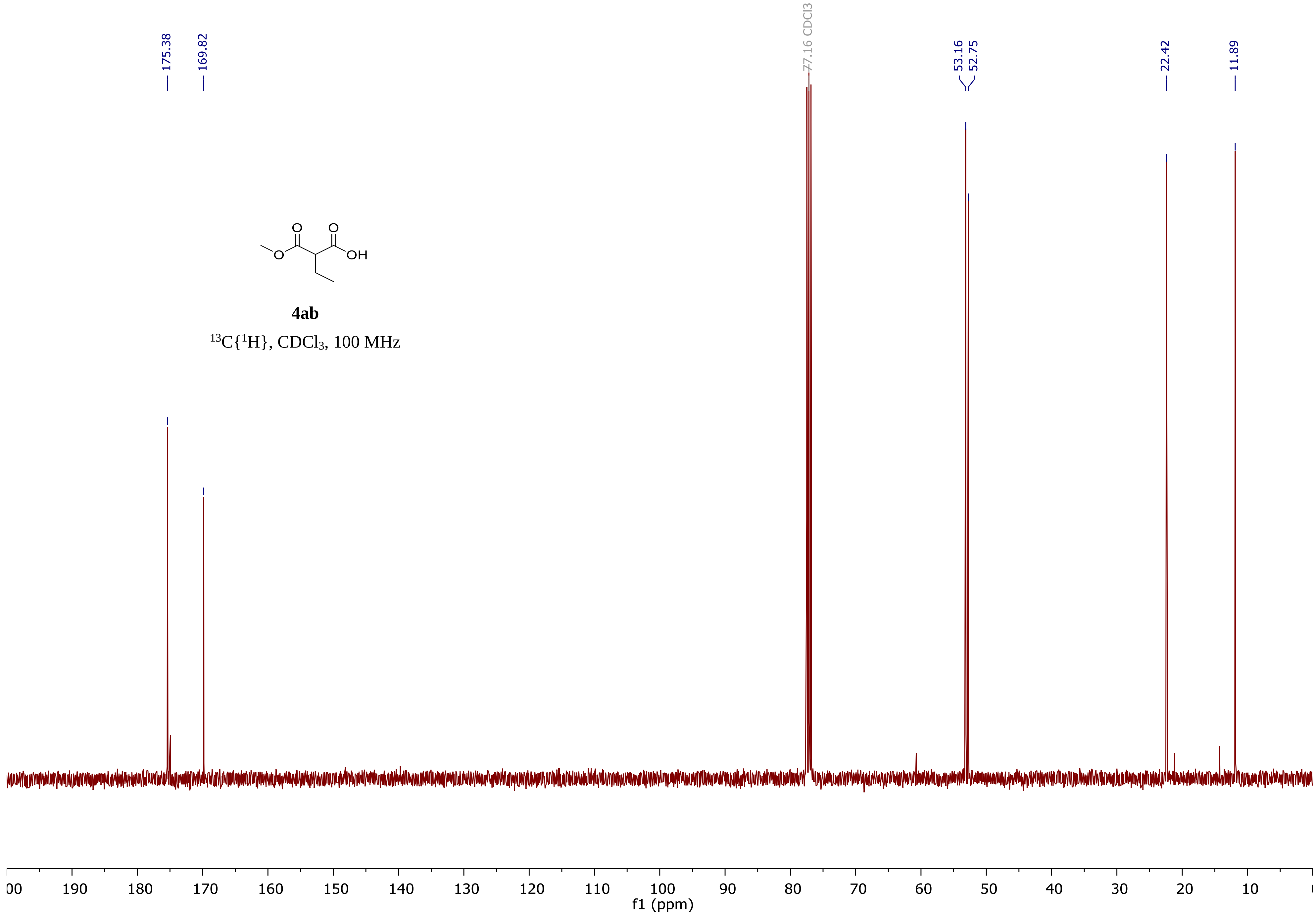
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

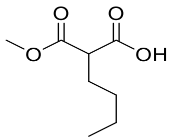




4ab

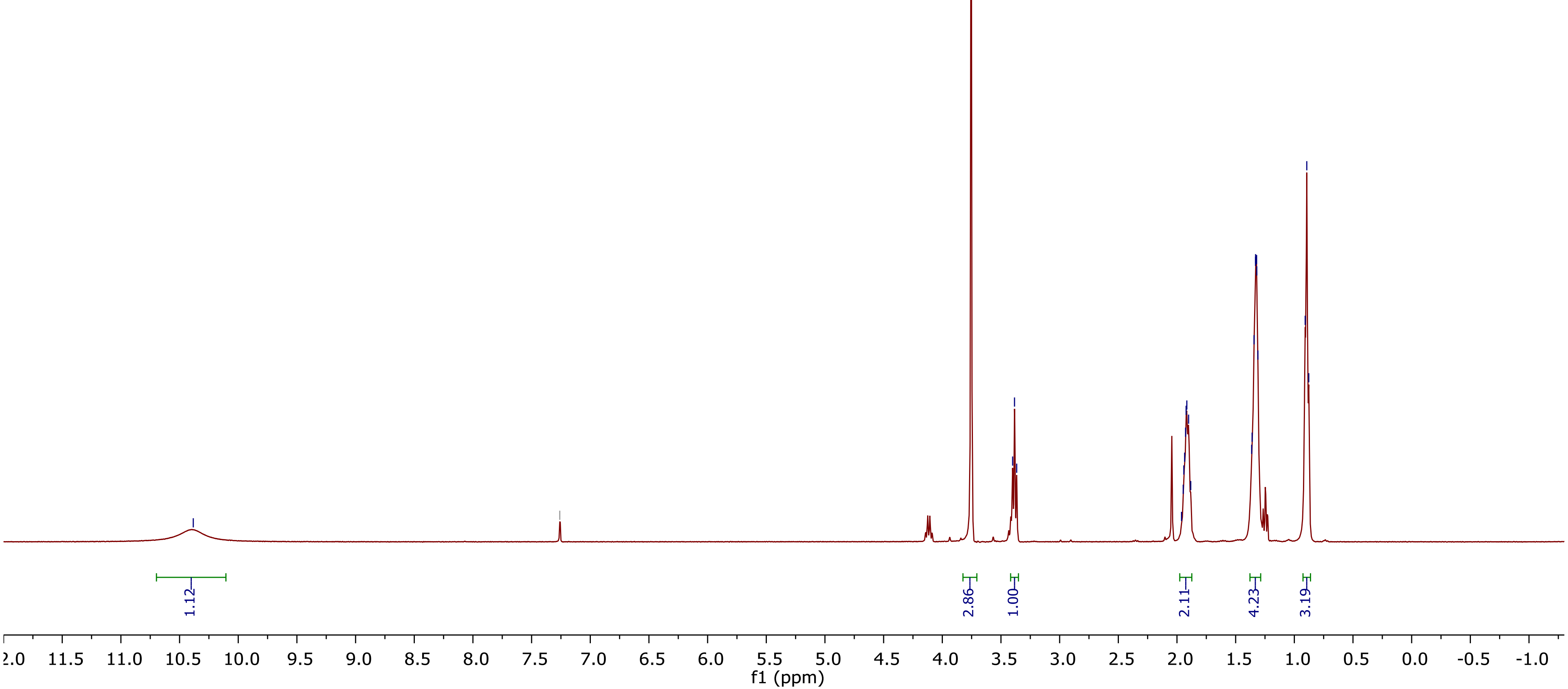
^{1}H, $CDCl_3$, 100 MHz

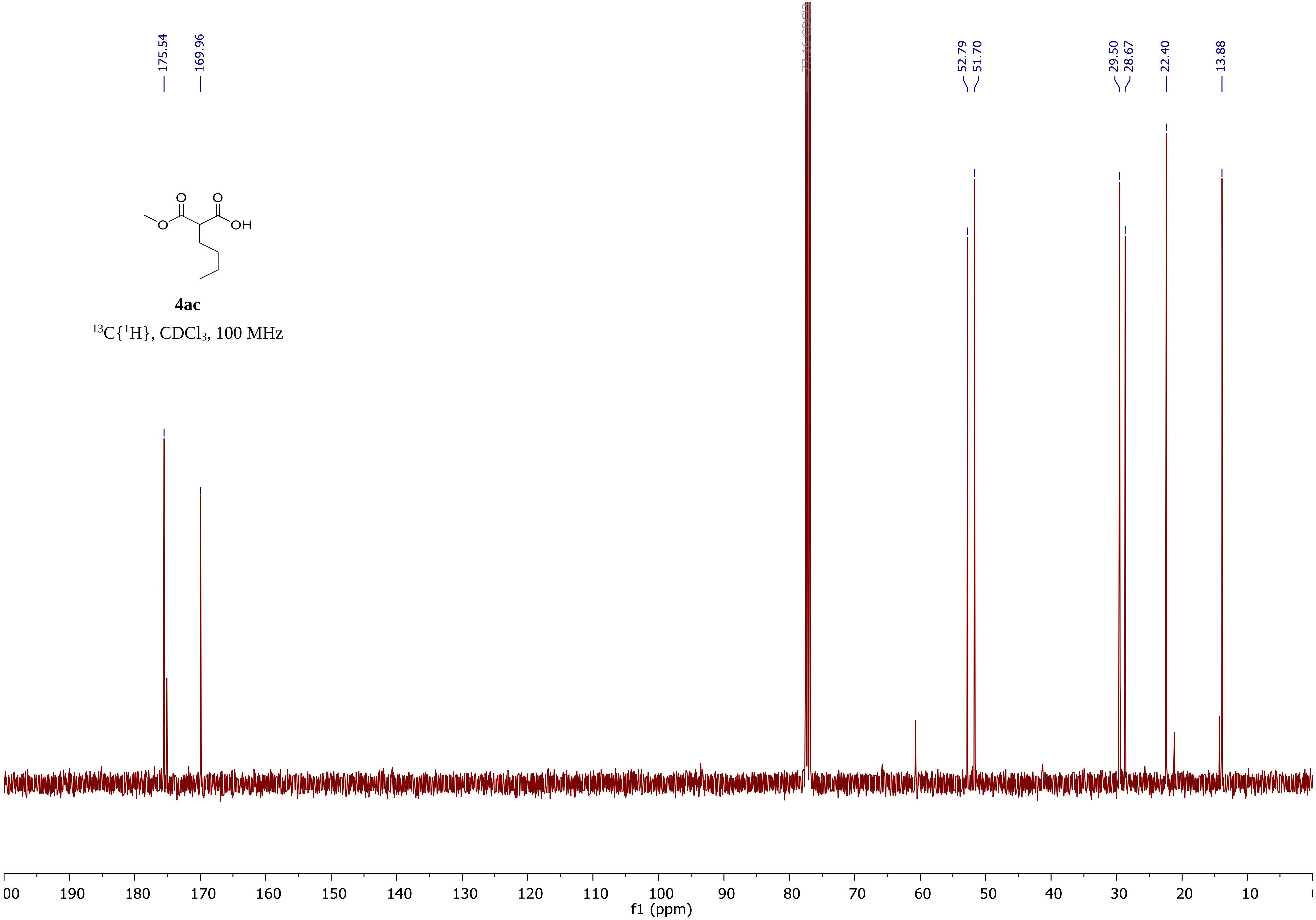

175.38
169.82
77.16 CDCl3
53.16
52.75
22.42
11.89
4ab
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



4ac

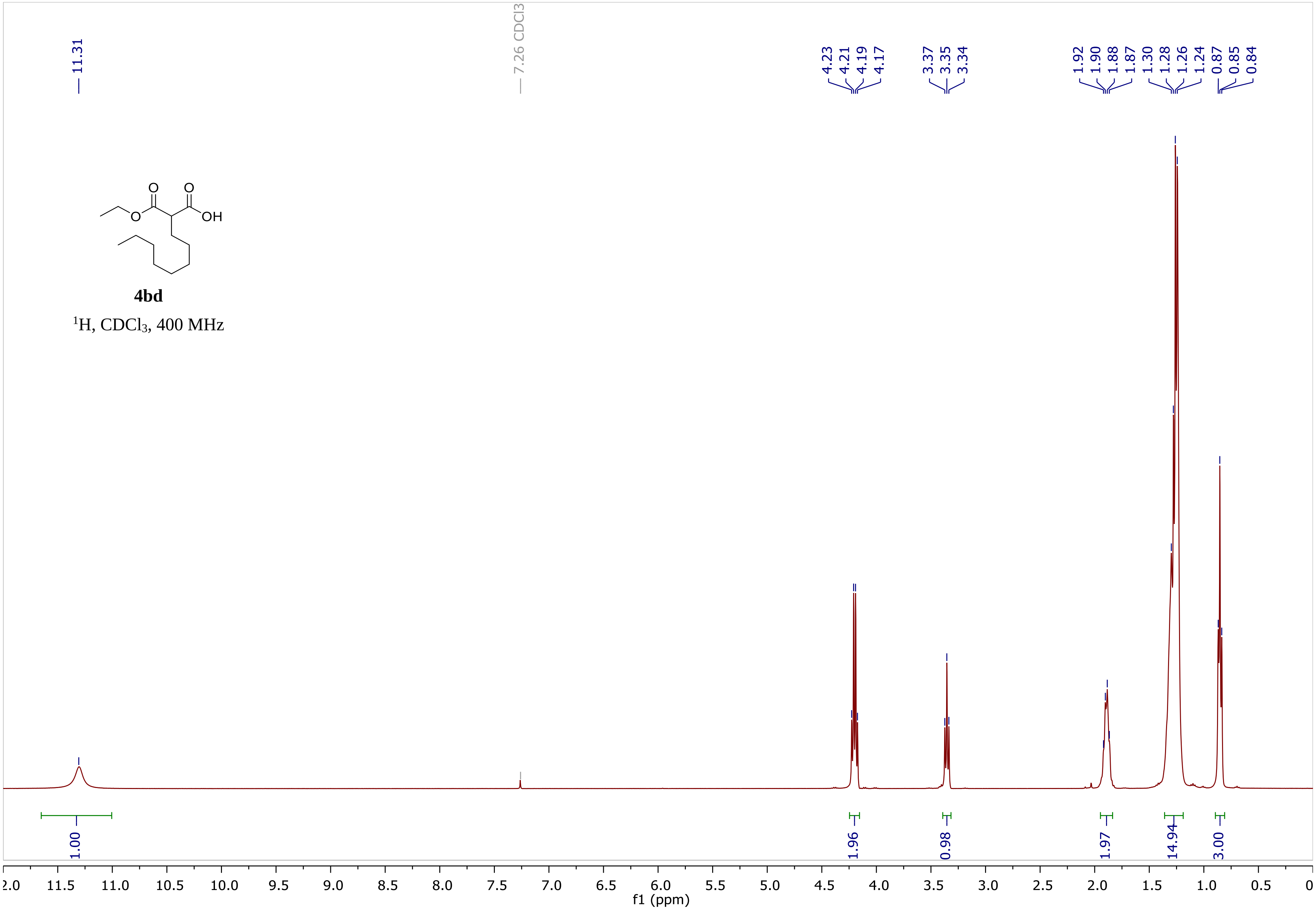
^{1}H, $CDCl_3$, 400 MHz



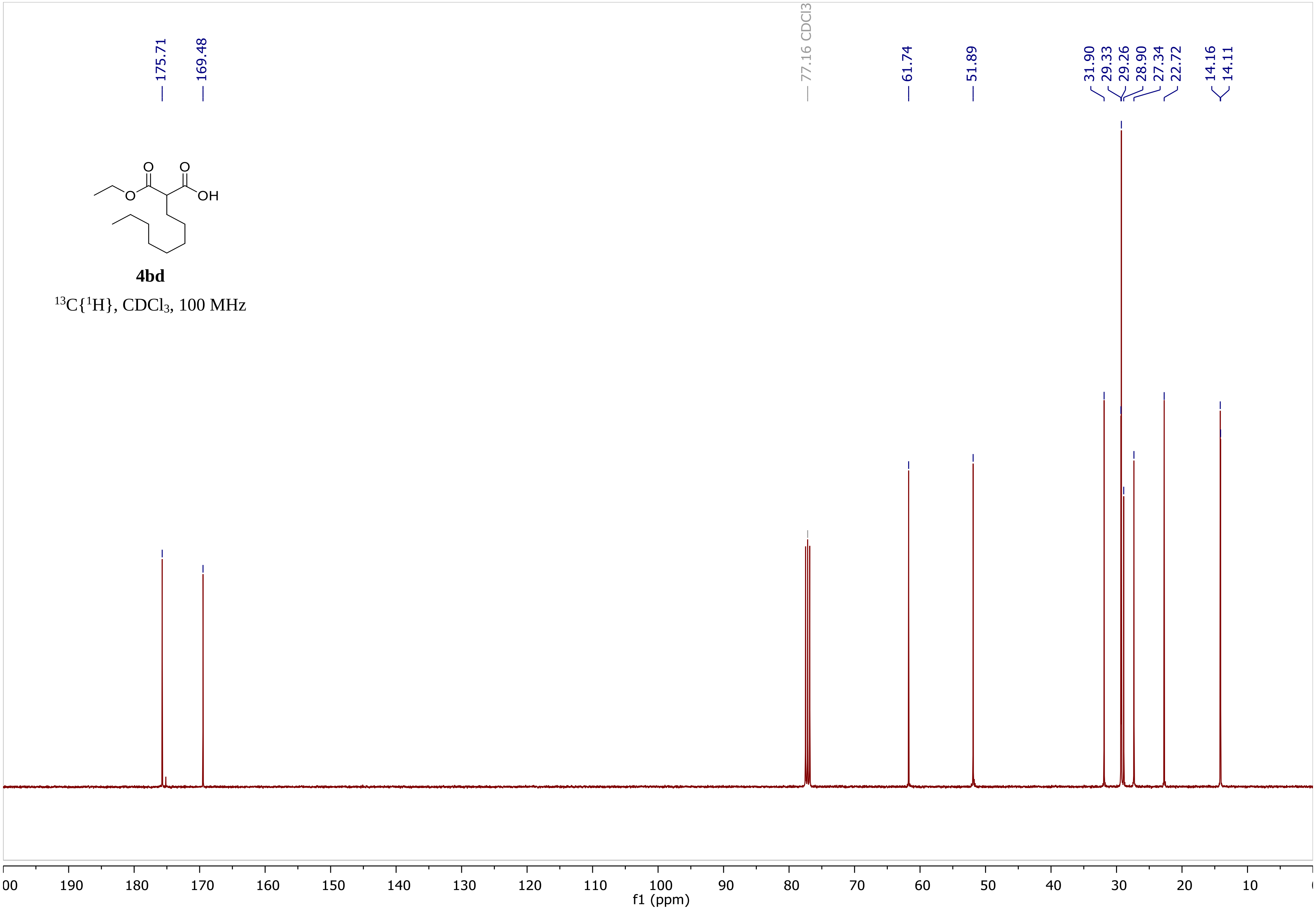


4ac

$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

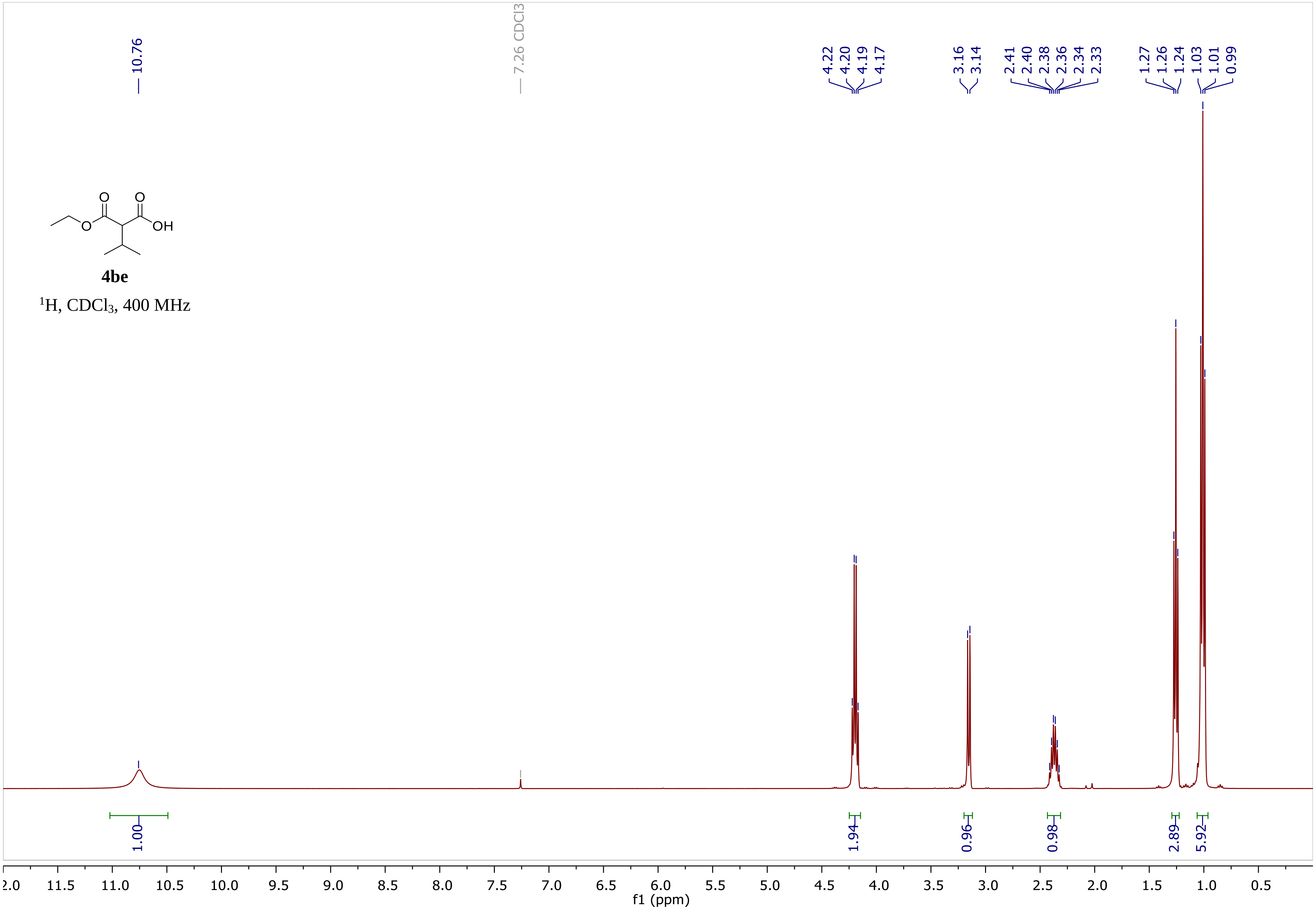


11.31
7.26 CDCl3
4.23
4.21
4.19
4.17
3.37
3.35
3.34
1.92
1.90
1.88
1.87
1.30
1.28
1.26
1.24
0.87
0.85
0.84
O
O
O
OH
4bd
1H, CDCl3, 400 MHz
1.00
1.96
0.98
1.97
14.94
3.00
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)



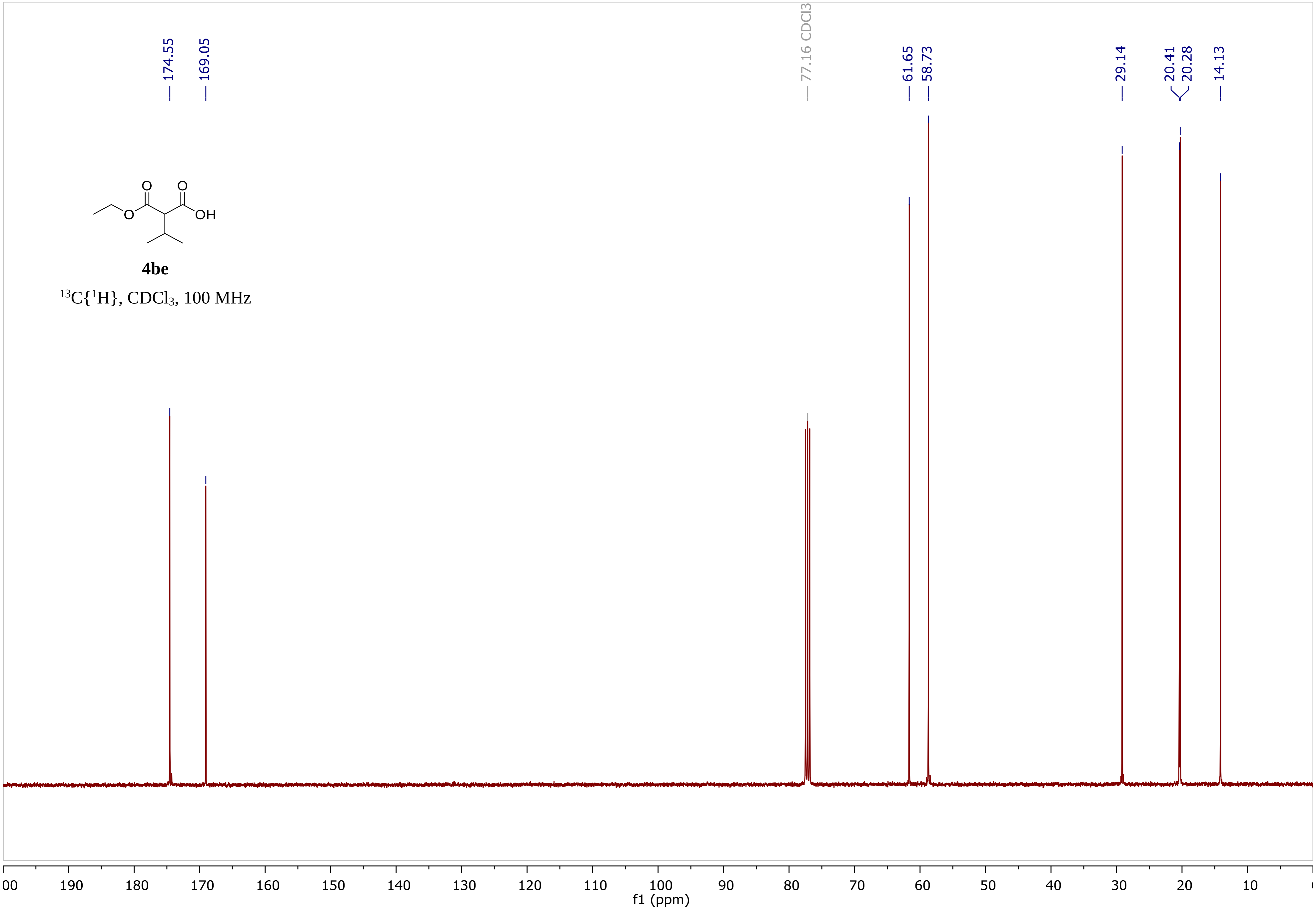
4bd

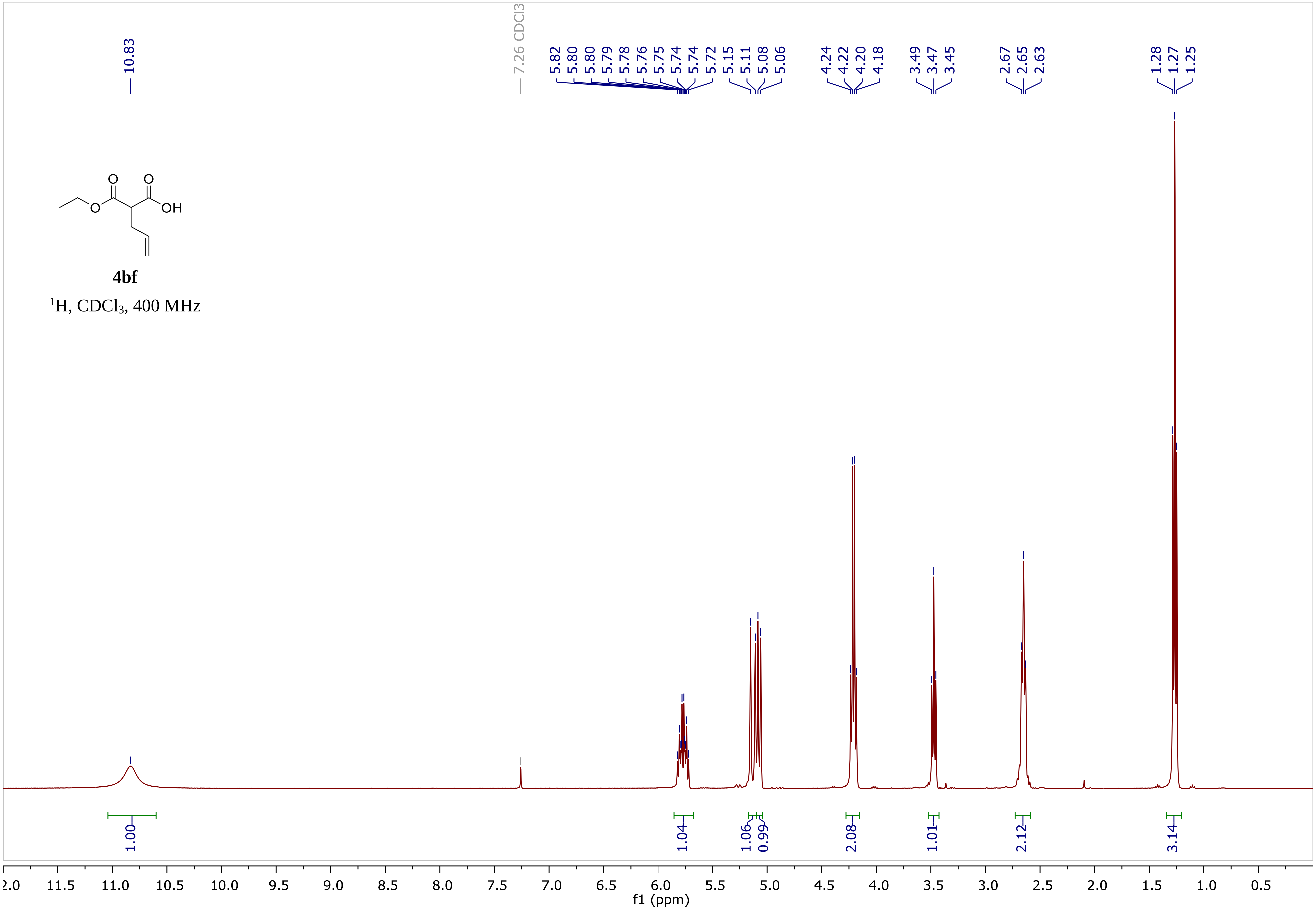
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz



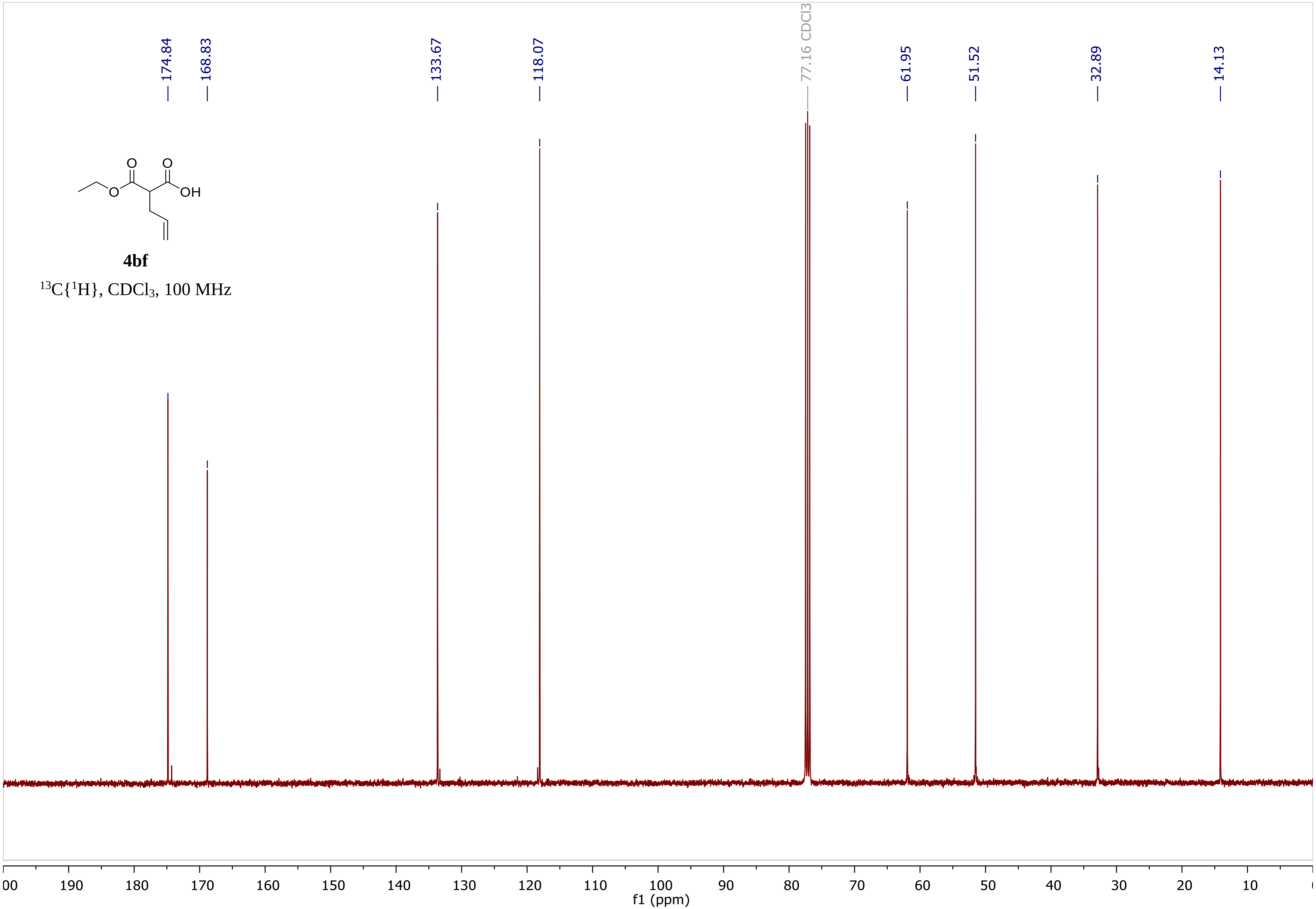
4be

^{1}H, $CDCl_3$, 400 MHz

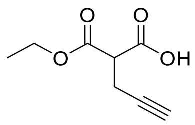

174.55
169.05
77.16 CDCl3
61.65
58.73
29.14
20.41
20.28
14.13
O
O
O
OH
4be
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



4bf
[1]H, CDCl3, 400 MHz
10.83
7.26 CDCl3
5.82
5.80
5.80
5.79
5.78
5.76
5.75
5.74
5.74
5.72
5.15
5.11
5.08
5.06
4.24
4.22
4.20
4.18
3.49
3.47
3.45
2.67
2.65
2.63
1.28
1.27
1.25
1.00
1.04
1.06
0.99
2.08
1.01
2.12
3.14
f1 (ppm)

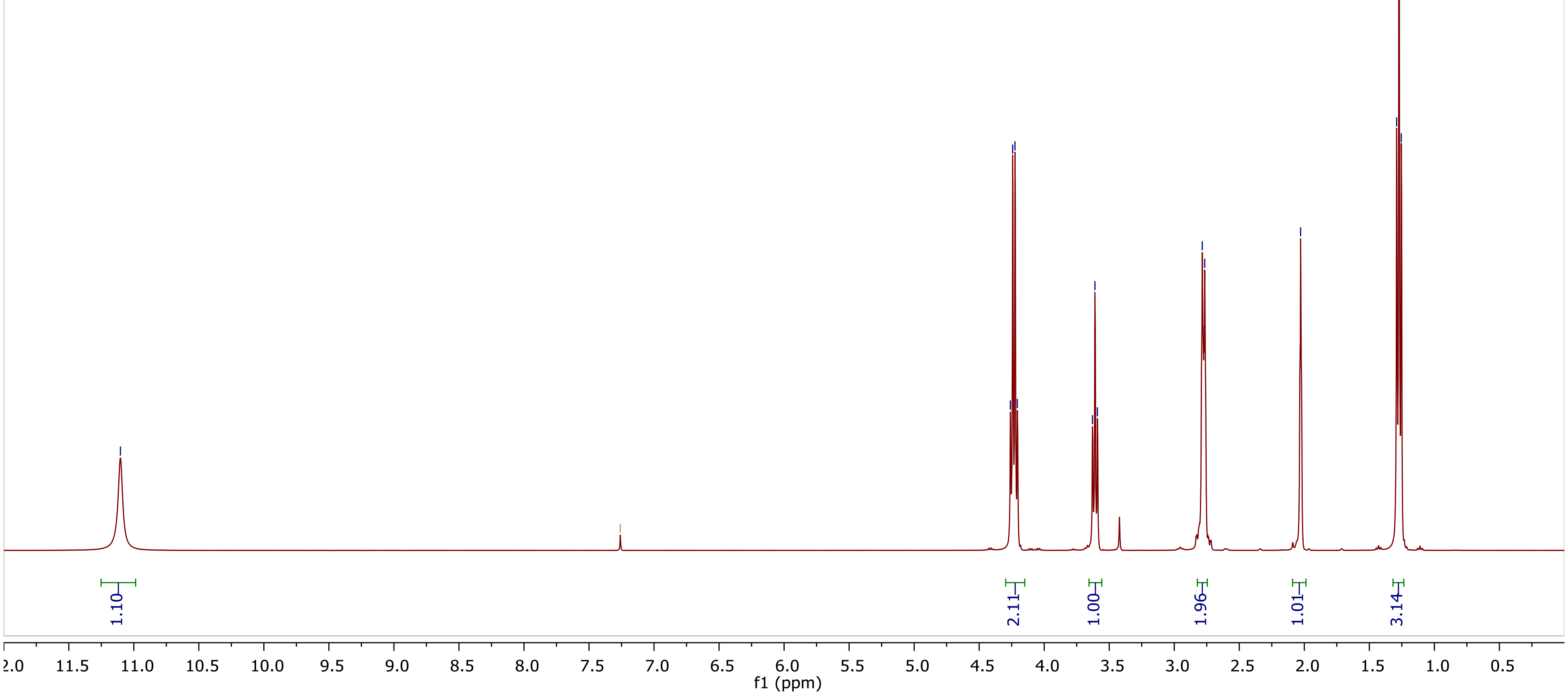


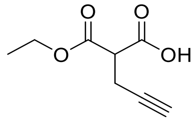
174.84
168.83
133.67
118.07
77.16 CDCl3
61.95
51.52
32.89
14.13
O
O
O
OH
4bf
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



4bg

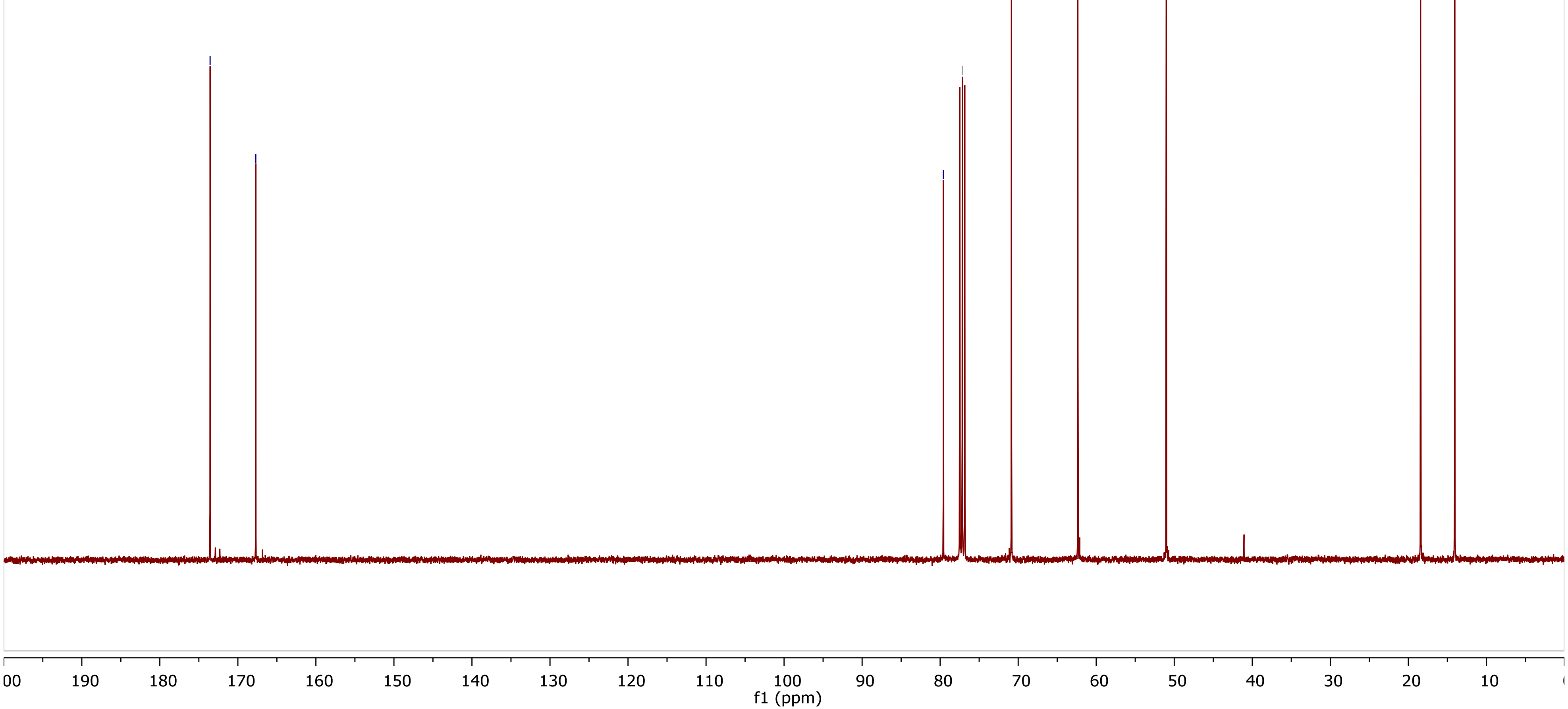
^{1}H, $CDCl_3$, 400 MHz

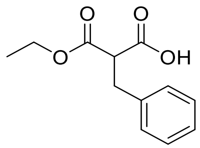




4bg

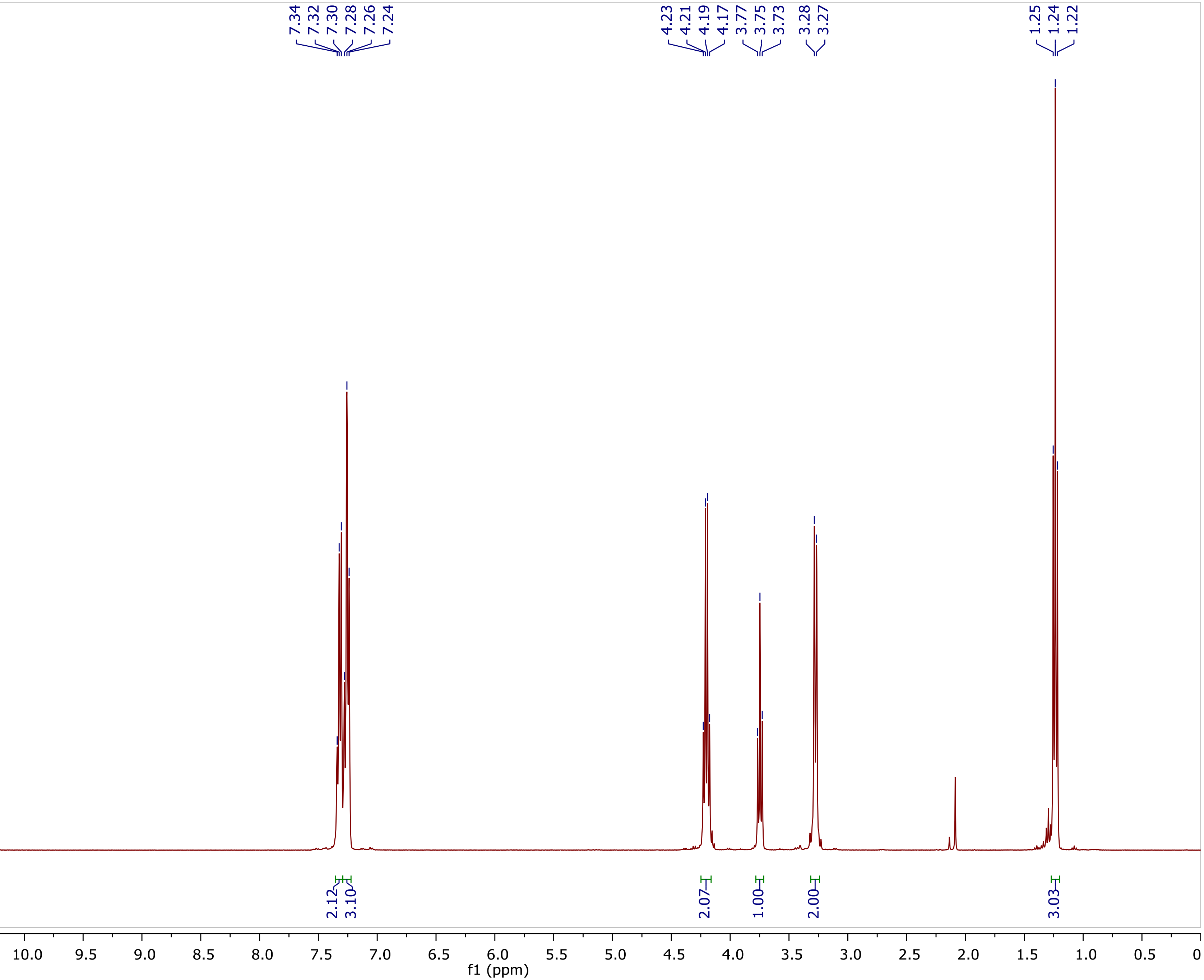
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

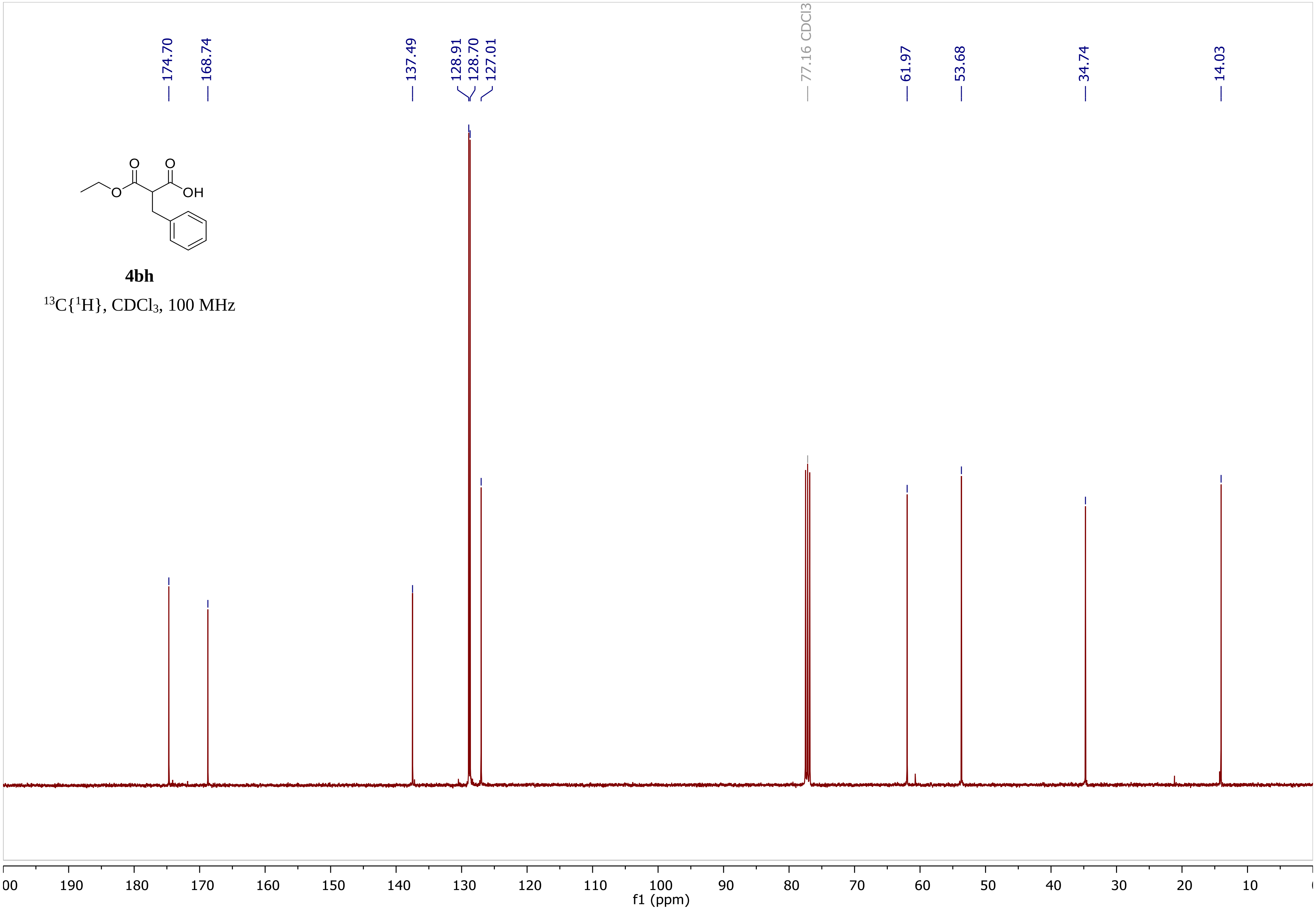




4bh

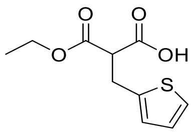
^{1}H, $CDCl_3$, 400 MHz





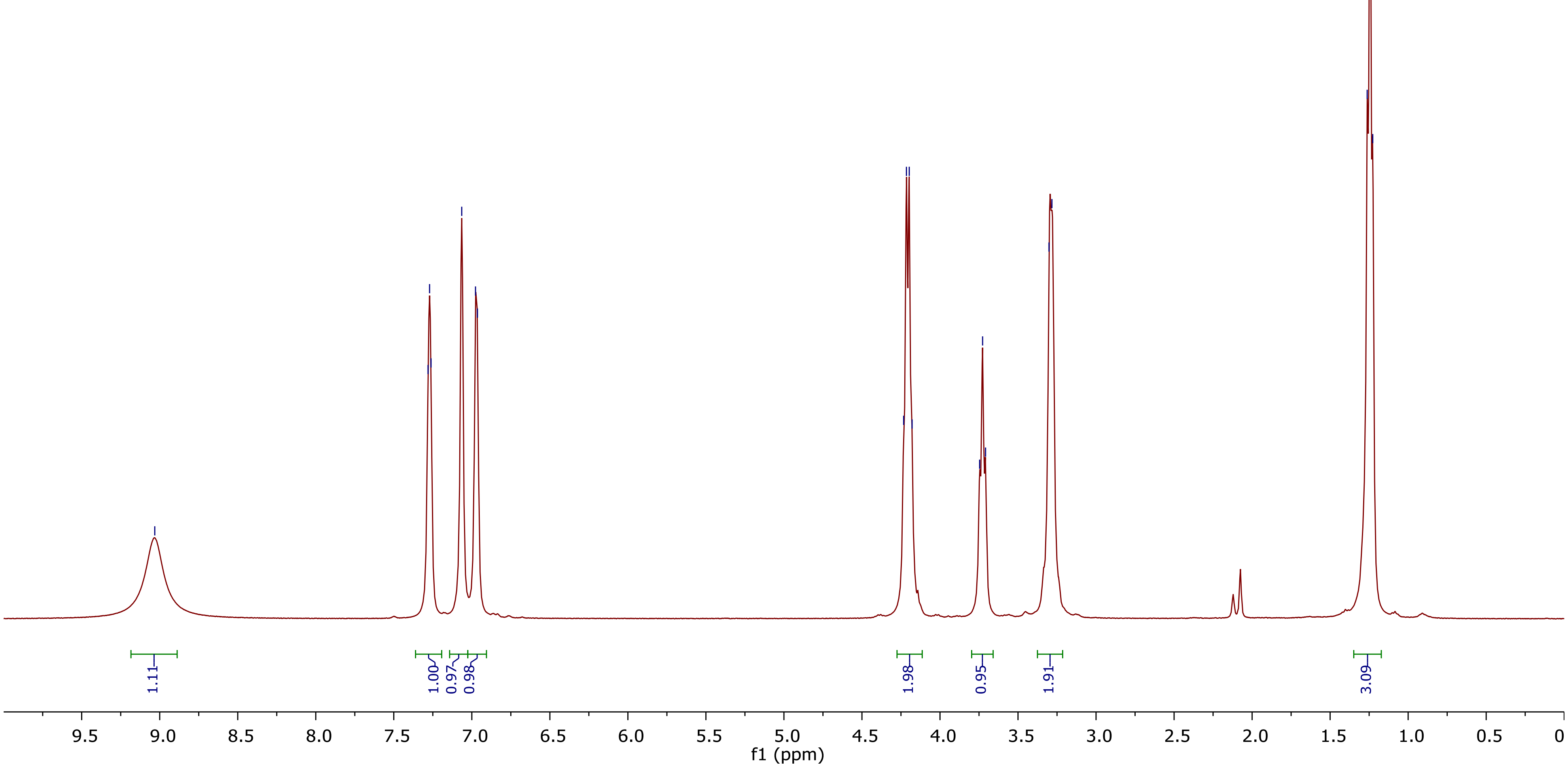
4bh

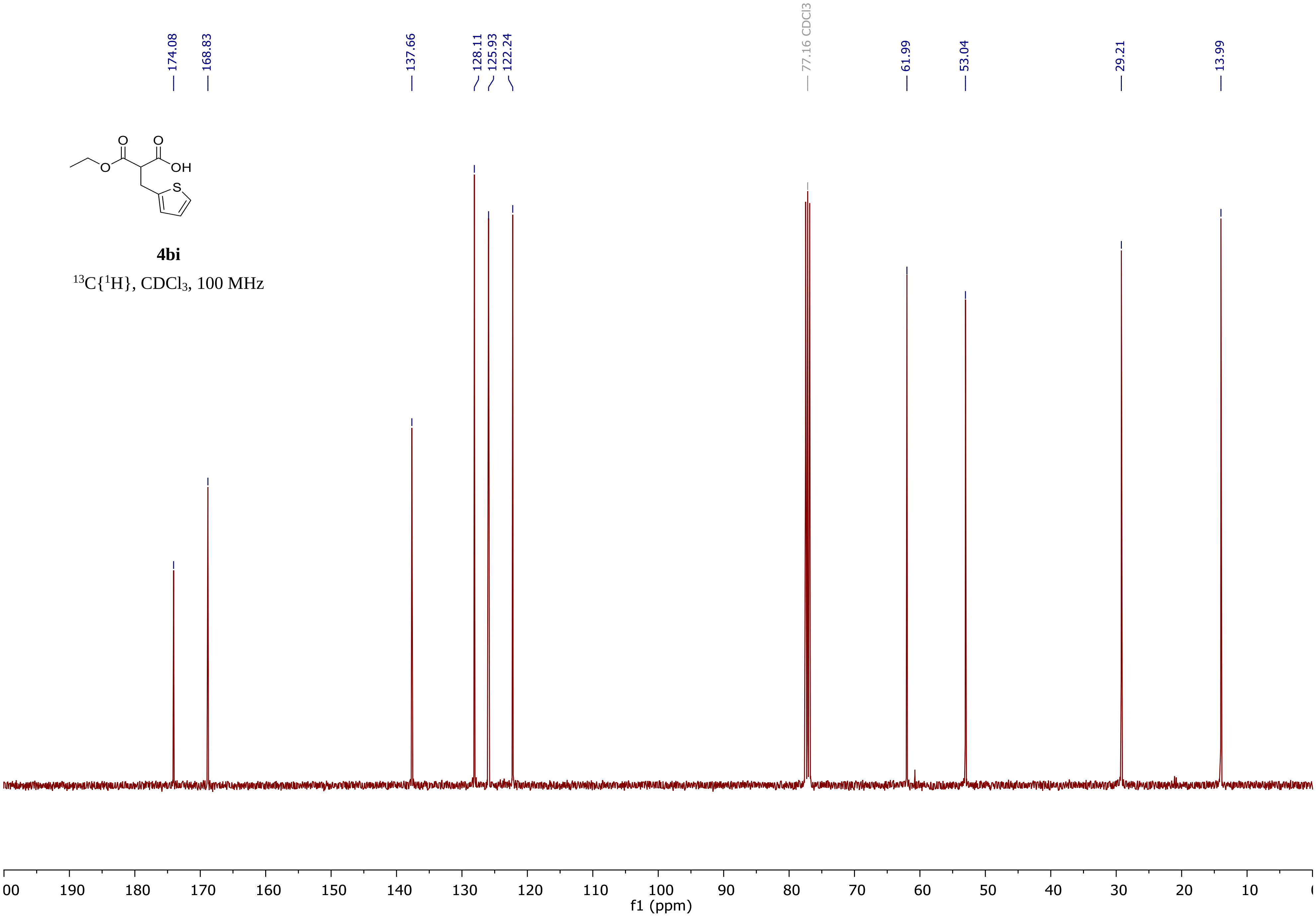
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz



4bi

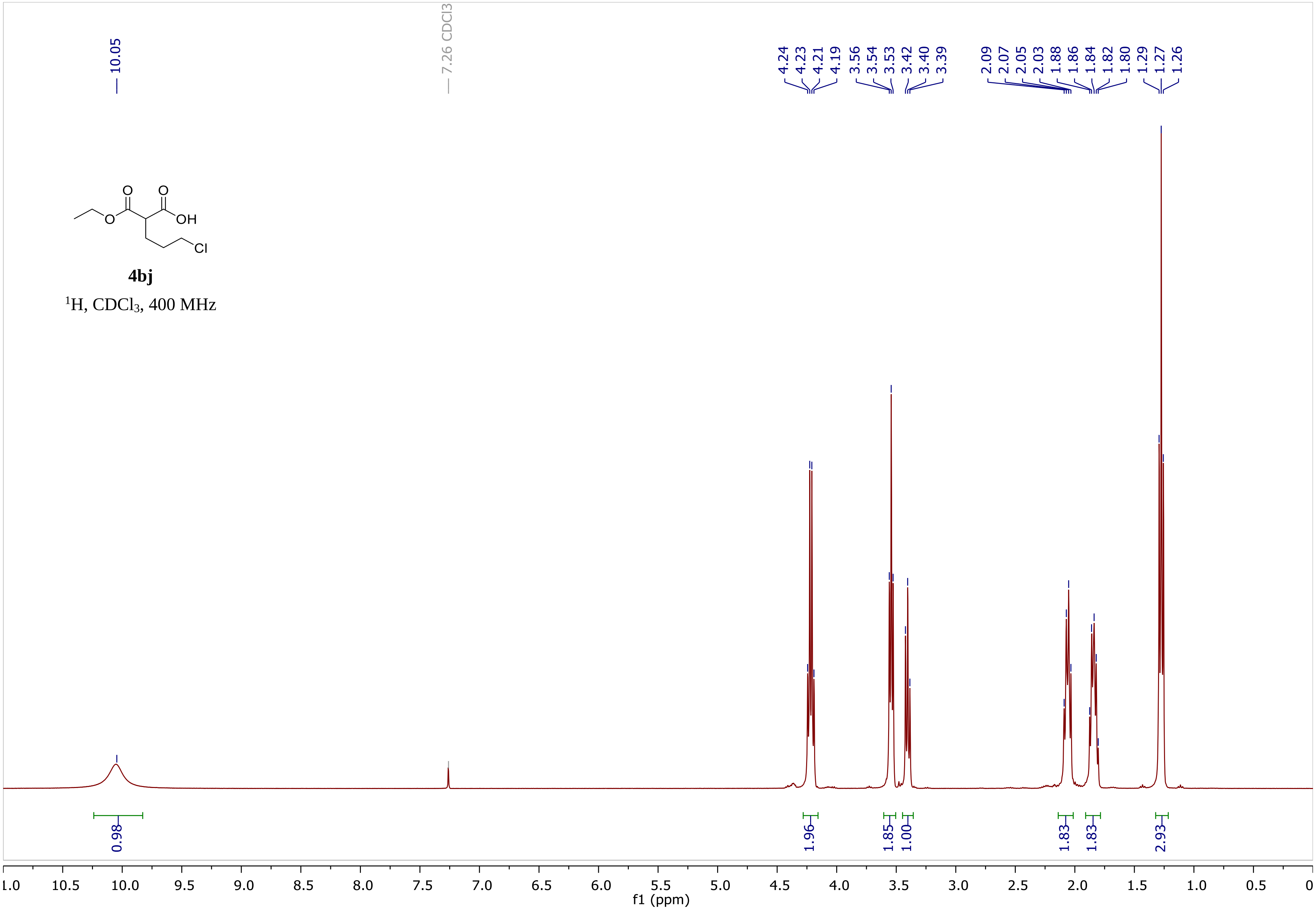
^{1}H, $CDCl_3$, 400 MHz

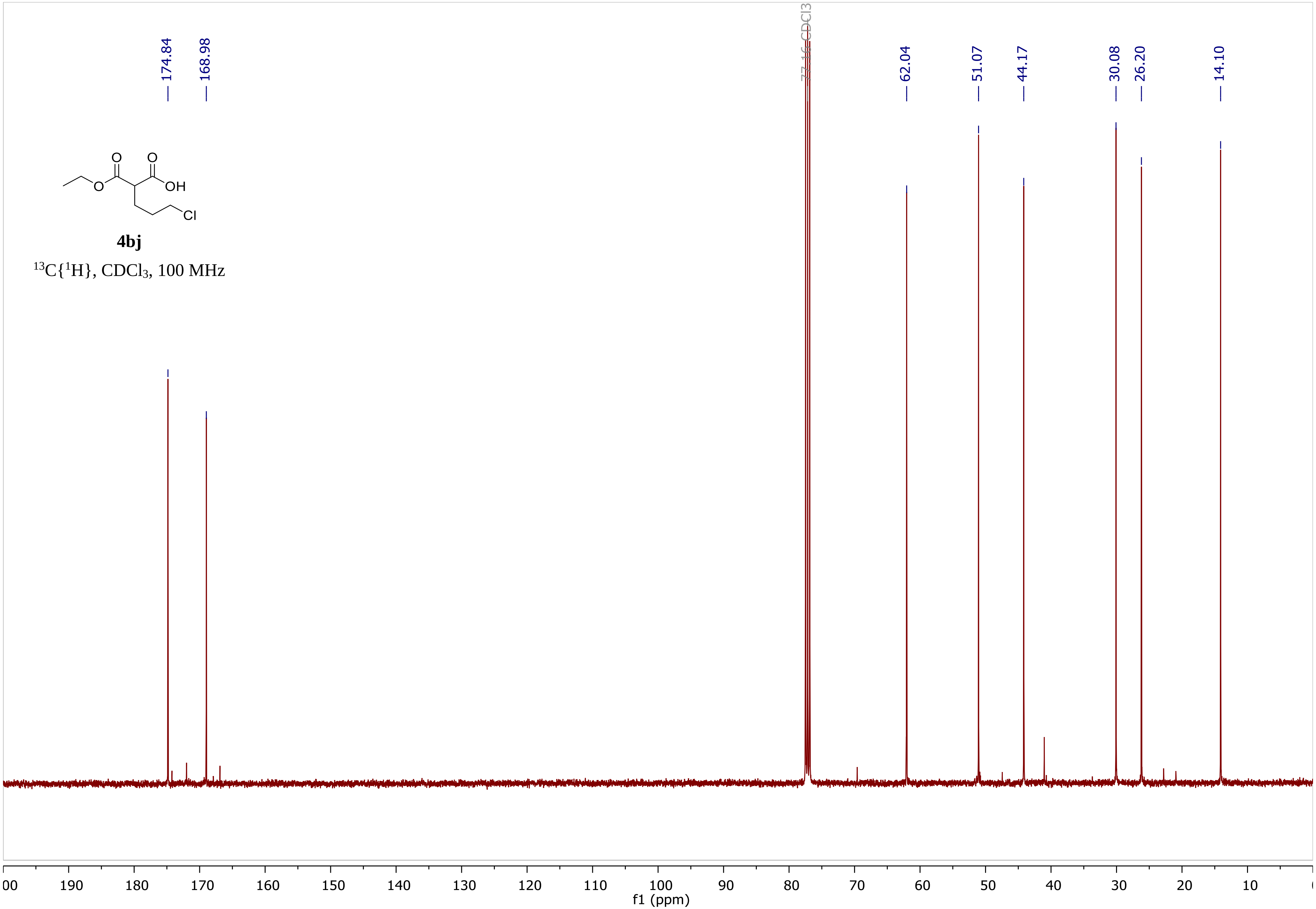




4bi

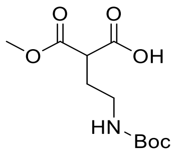
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz


10.05
7.26 CDCl3
4.24
4.23
4.21
4.19
3.56
3.54
3.53
3.42
3.40
3.39
2.09
2.07
2.05
2.03
1.88
1.86
1.84
1.82
1.80
1.29
1.27
1.26
0.98
1.96
1.85
1.00
1.83
1.83
2.93
f1 (ppm)
O
O
O
OH
Cl
4bj
[1]H, CDCl3, 400 MHz



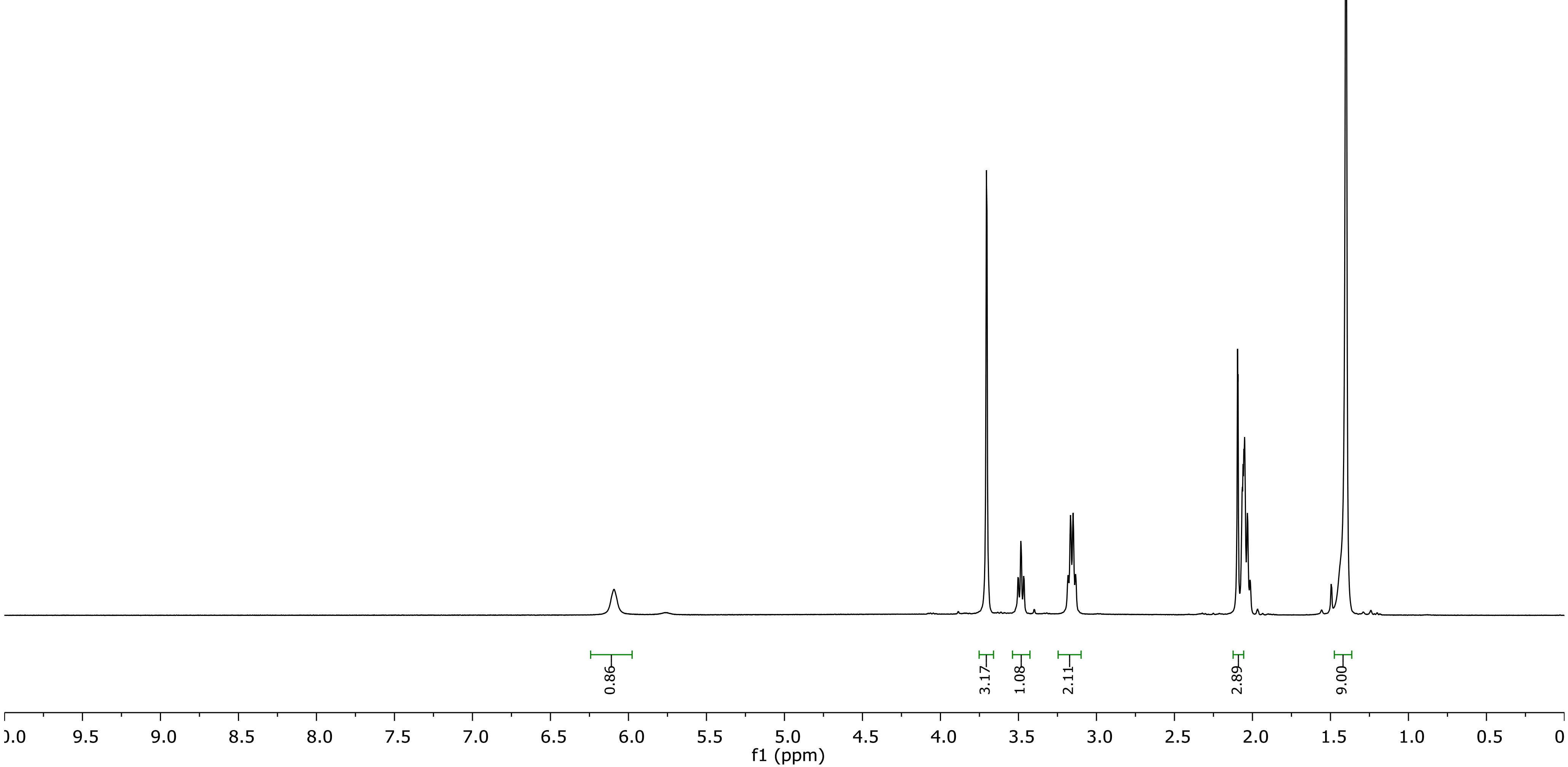
4bj

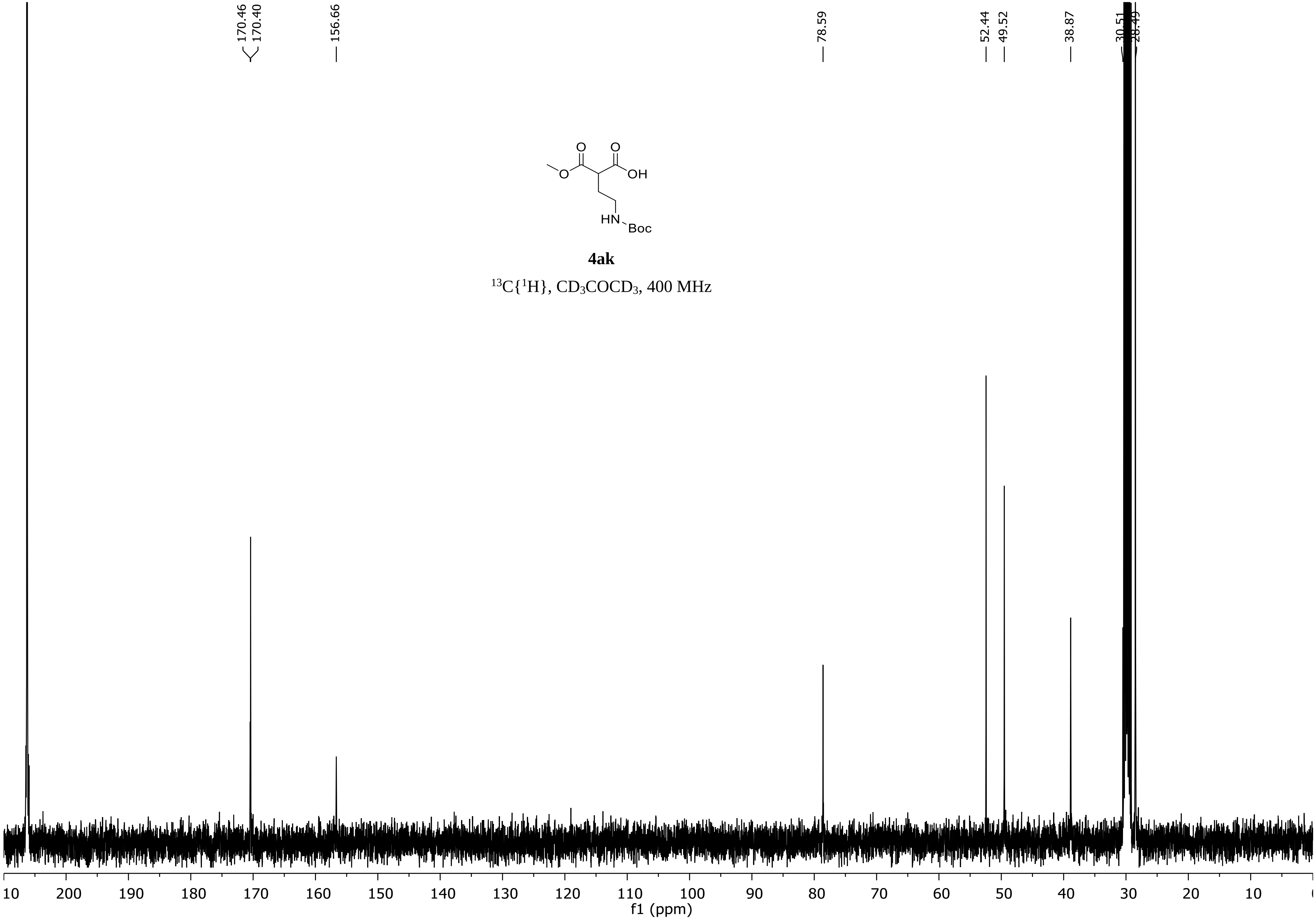
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

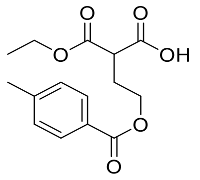


4ak

^{1}H, CD_3COCD_3, 400 MHz

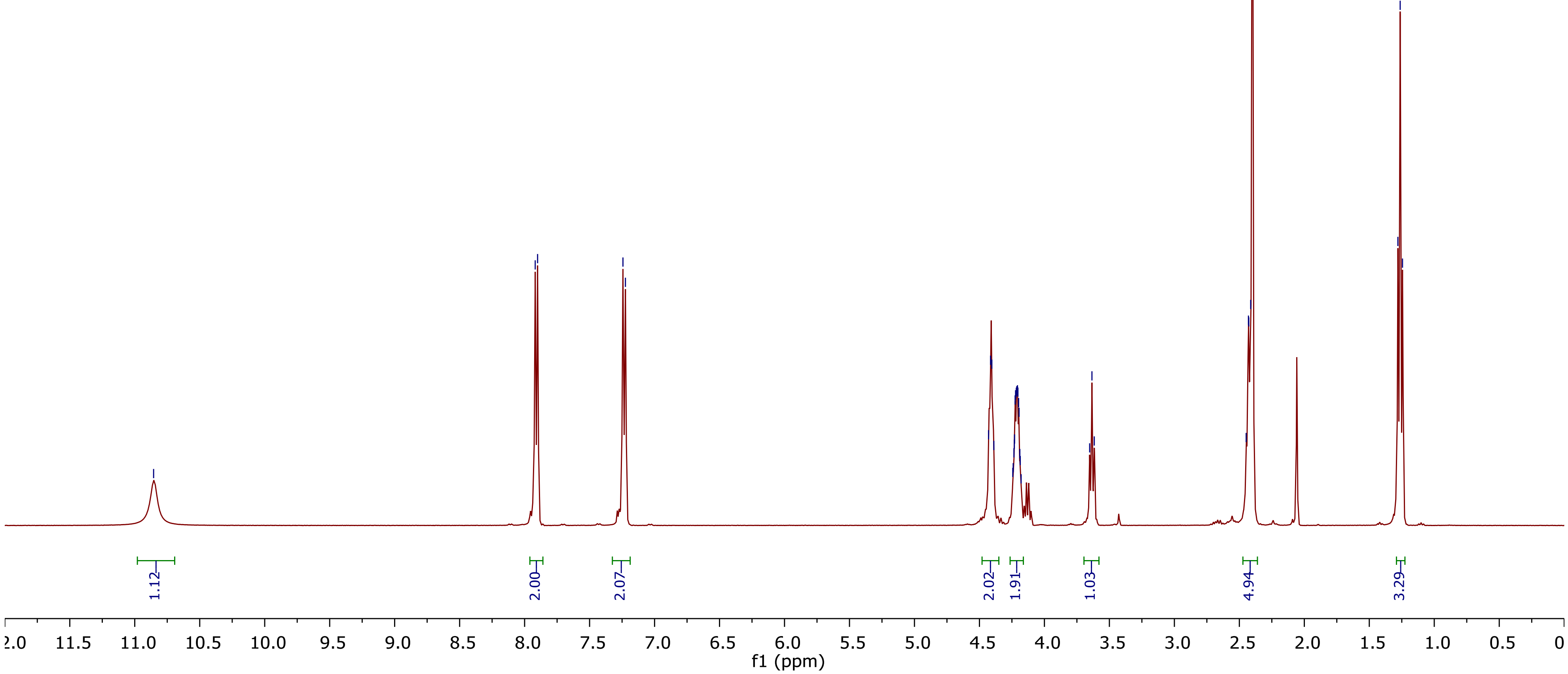


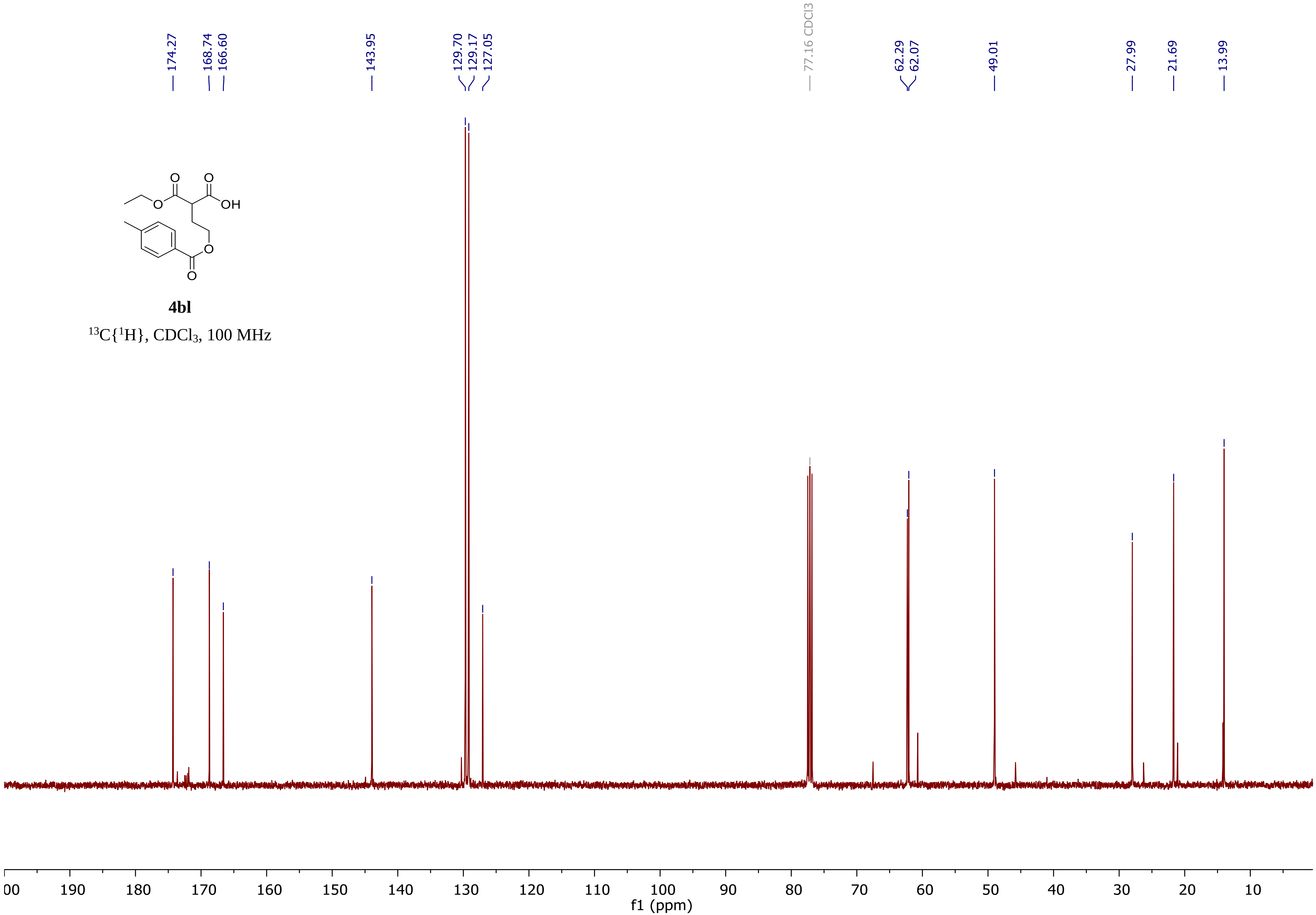

170.46
170.40
156.66
78.59
52.44
49.52
38.87
30.51
28.49
O
O
O
OH
HN
Boc
4ak
$^{13}C\{^1H\}$, CD_3COCD_3, 400 MHz
f1 (ppm)



4bl

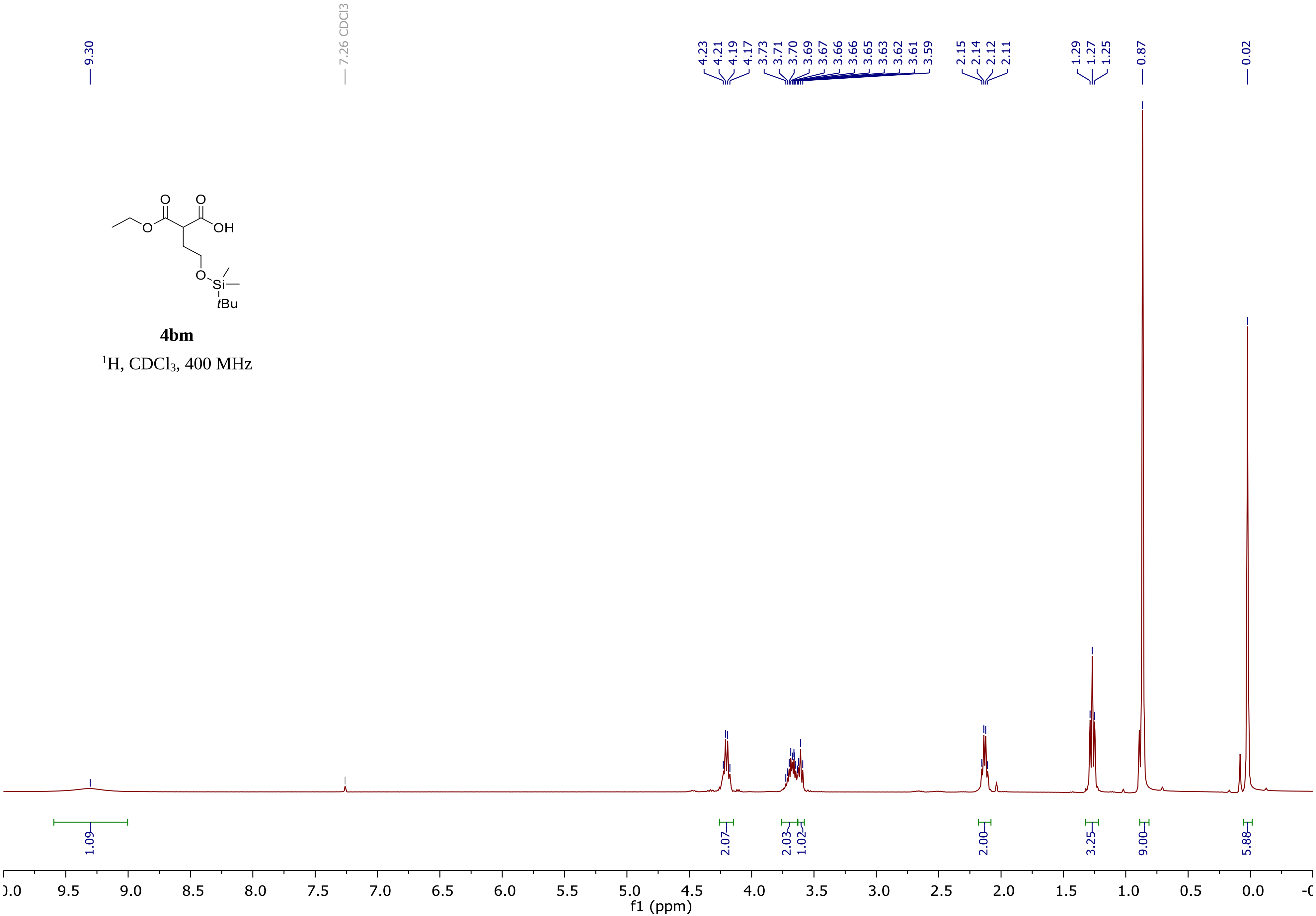
^{1}H, $CDCl_3$, 400 MHz





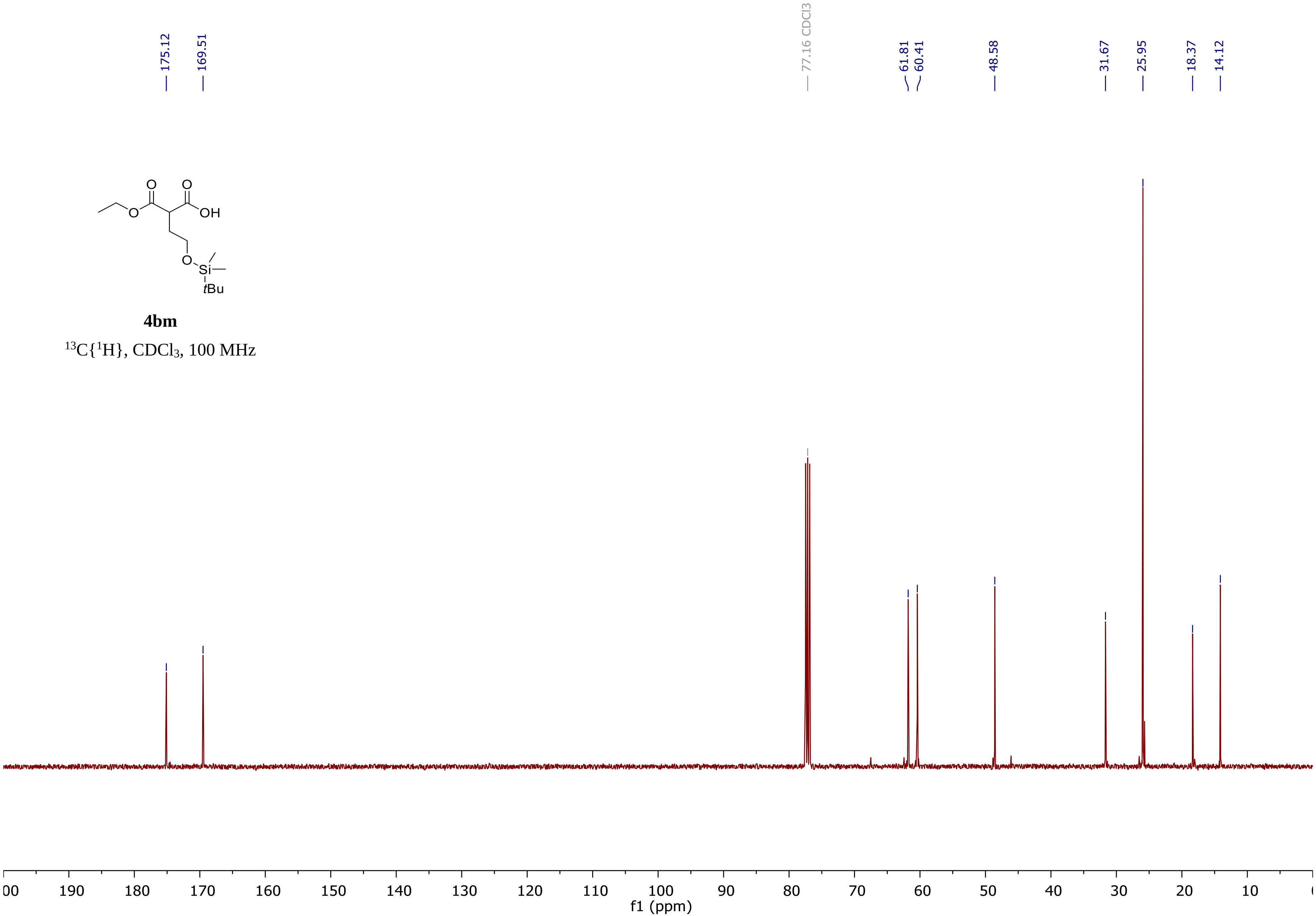
4bl

$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz



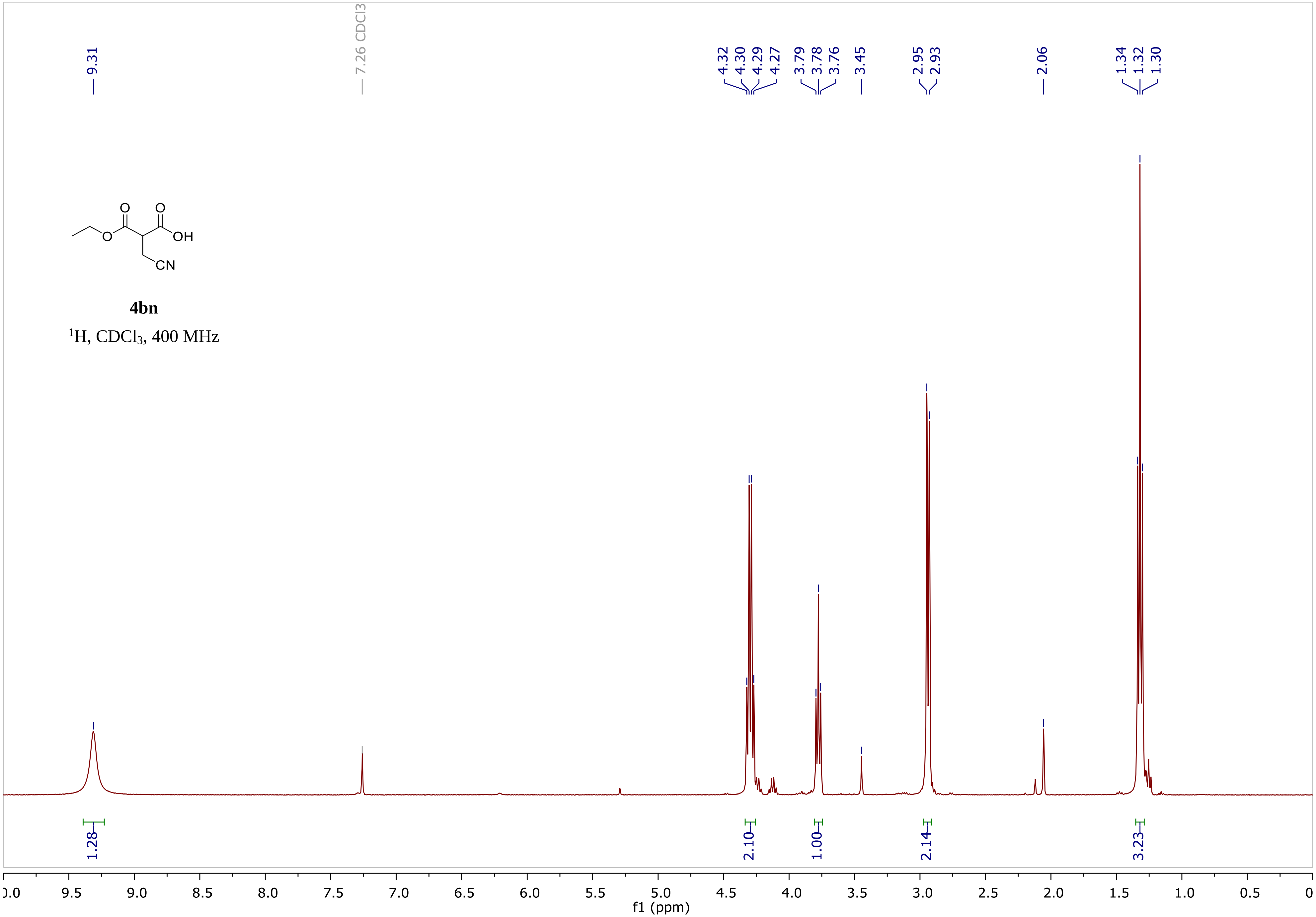
4bm

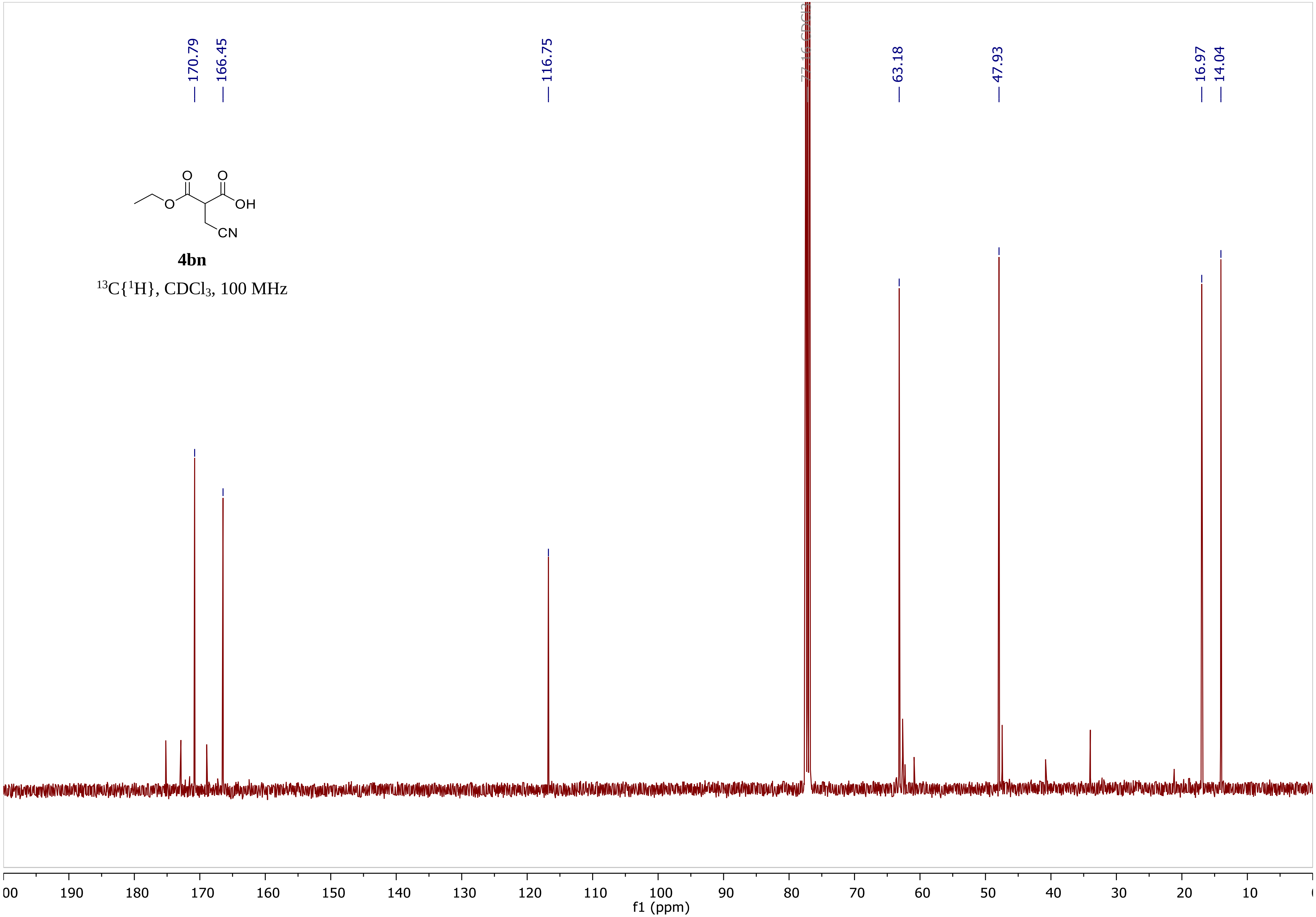
^1H, $CDCl_3$, 400 MHz



4bm

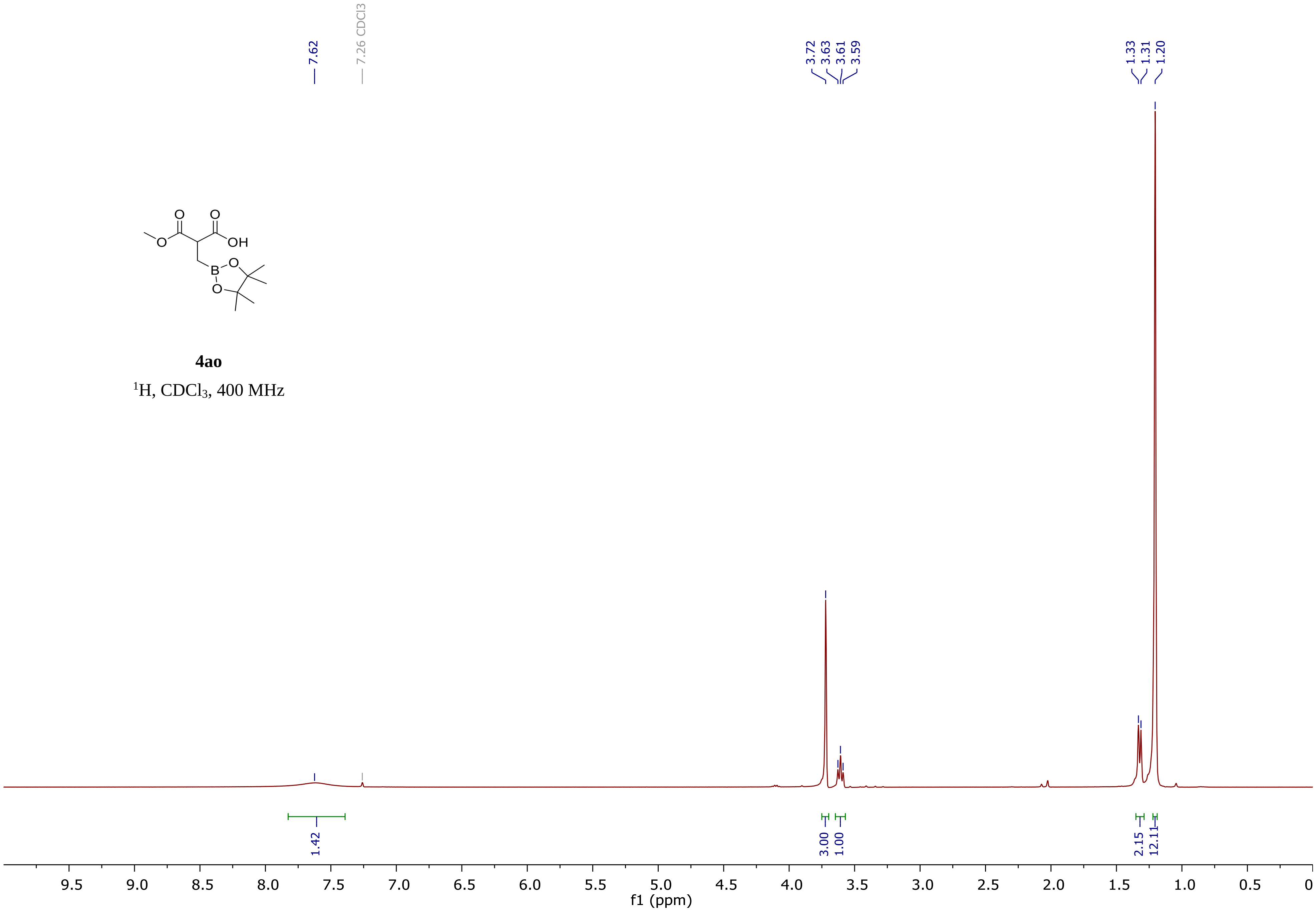
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz


9.31
7.26 CDCl3
4.32
4.30
4.29
4.27
3.79
3.78
3.76
3.45
2.95
2.93
2.06
1.34
1.32
1.30
O
O
O
OH
CN
4bn
1H, CDCl3, 400 MHz
1.28
2.10
1.00
2.14
3.23
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)



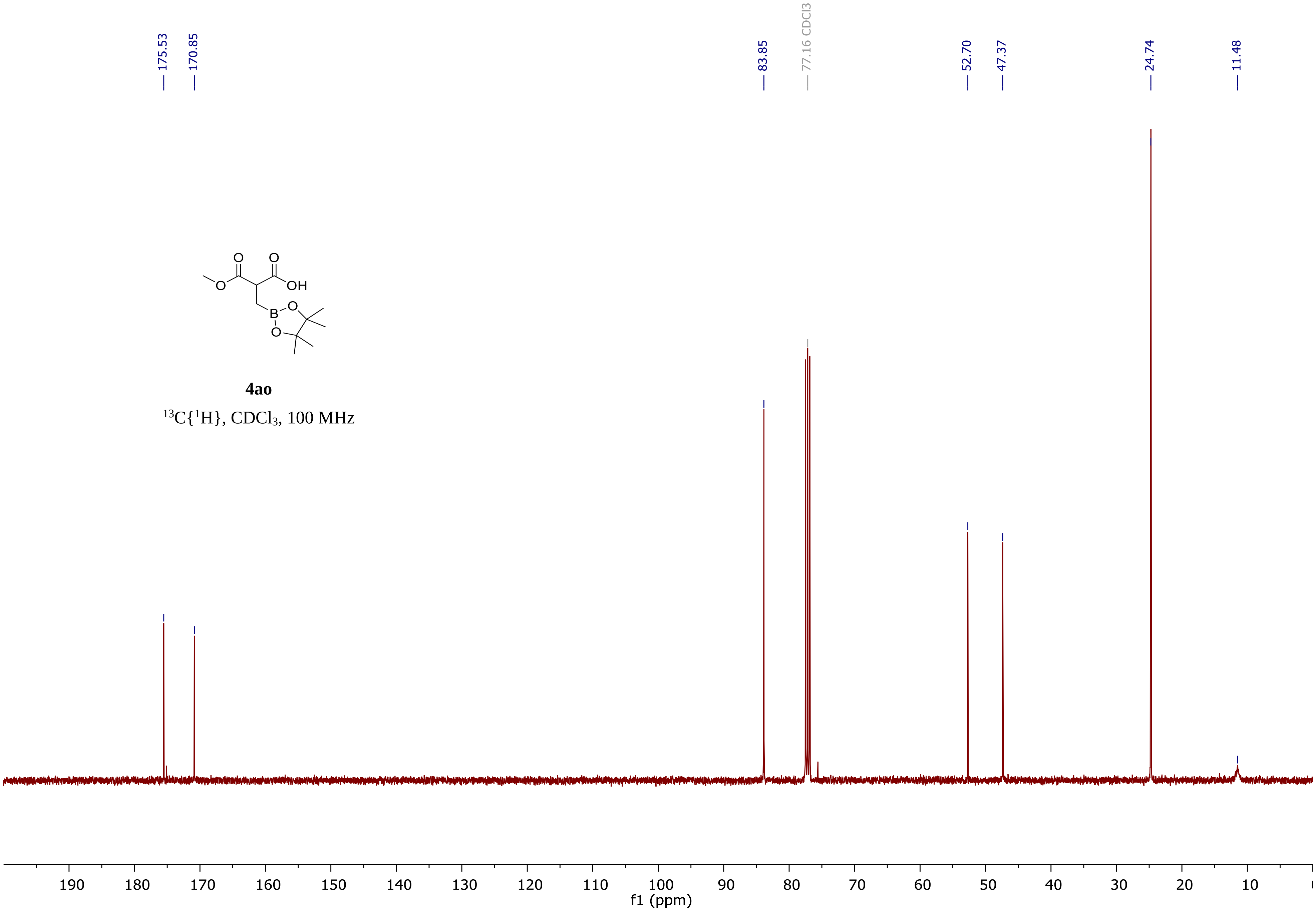
4bn

$^{13}C\{^1H\}$, $CDCl_3$, 100 MHz

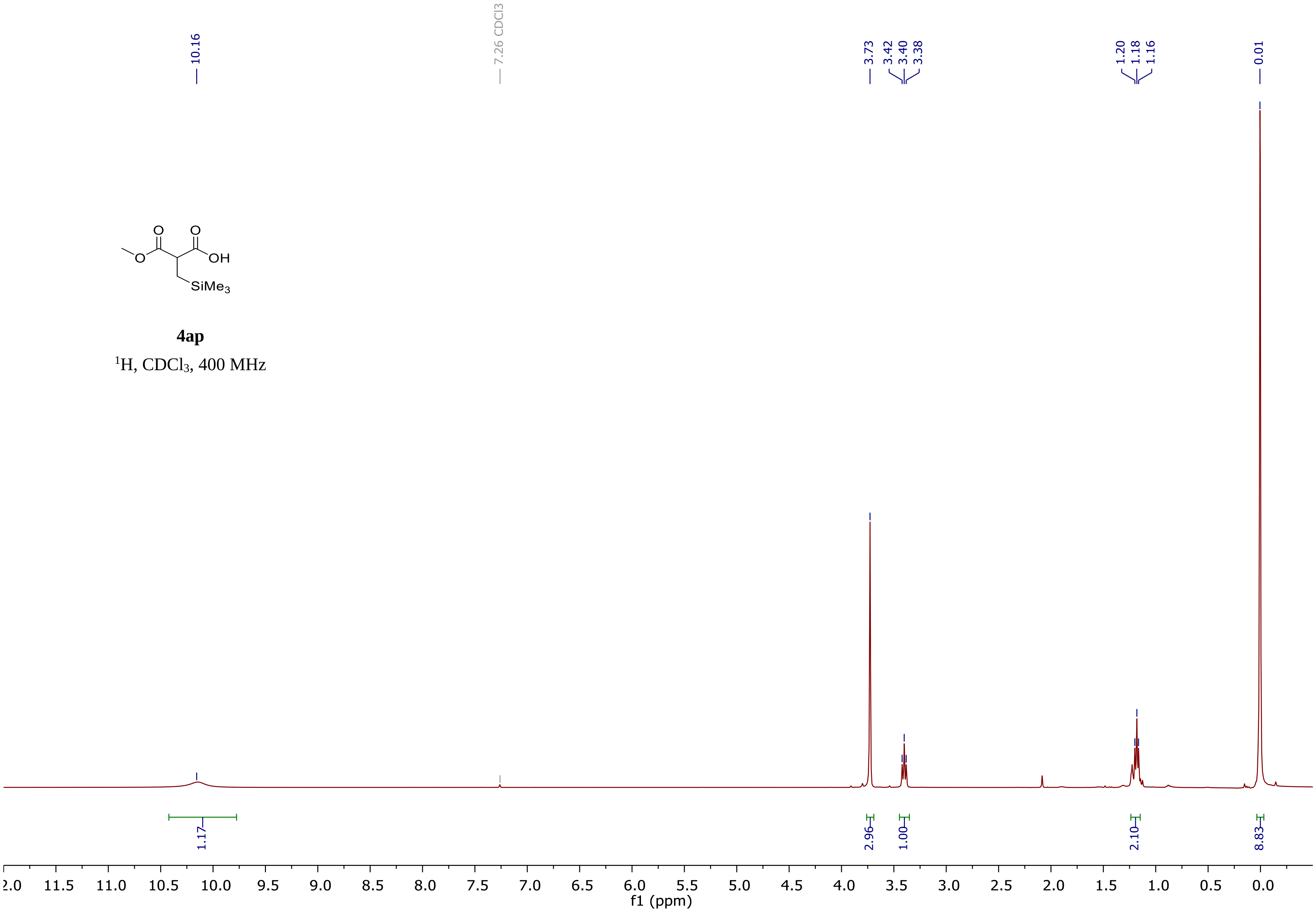


4ao

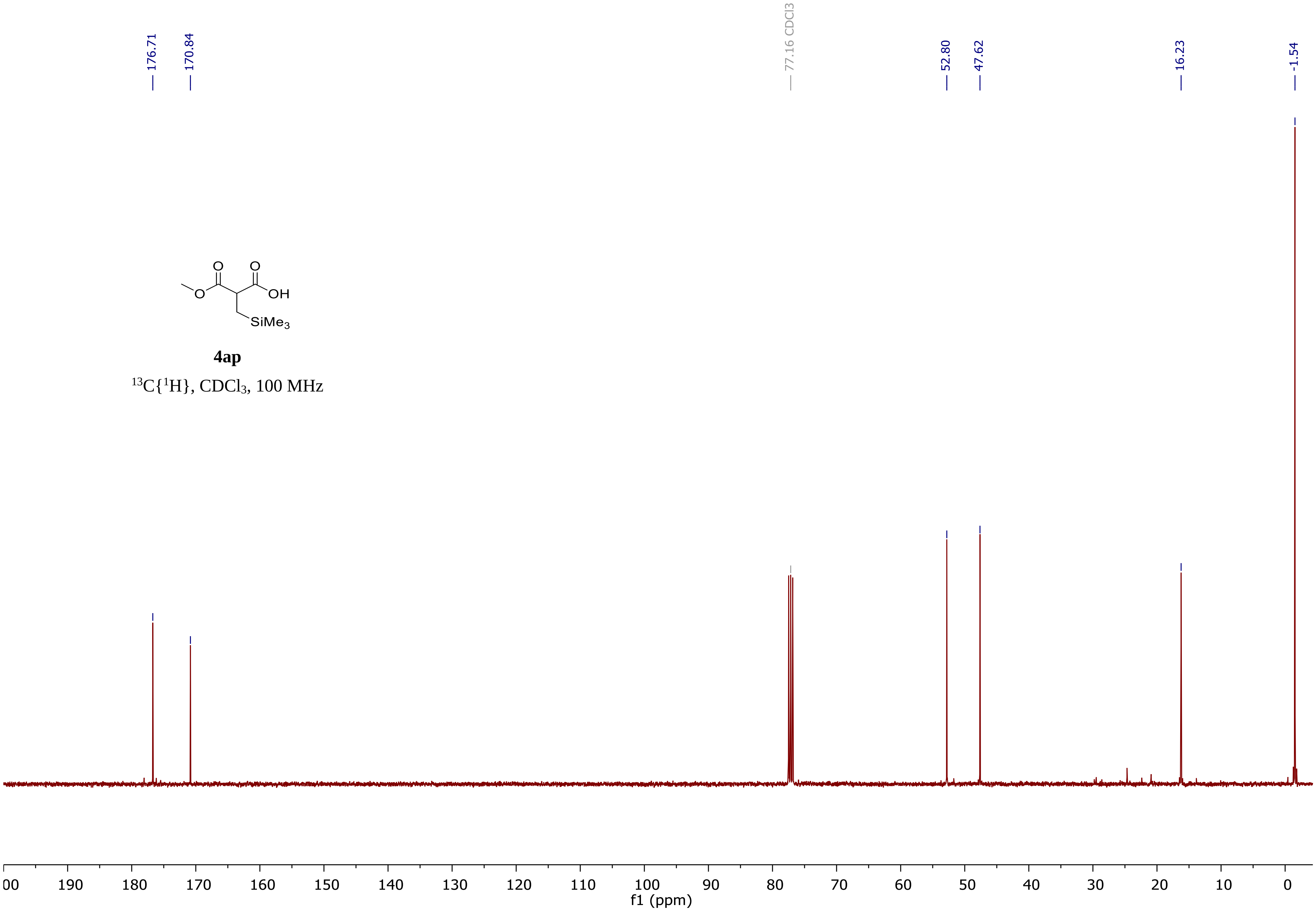
^{1}H, $CDCl_3$, 400 MHz



175.53
170.85
83.85
77.16 CDCl3
52.70
47.37
24.74
11.48
O
O
O
OH
B
O
O
4ao
13C{1H}, CDCl3, 100 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

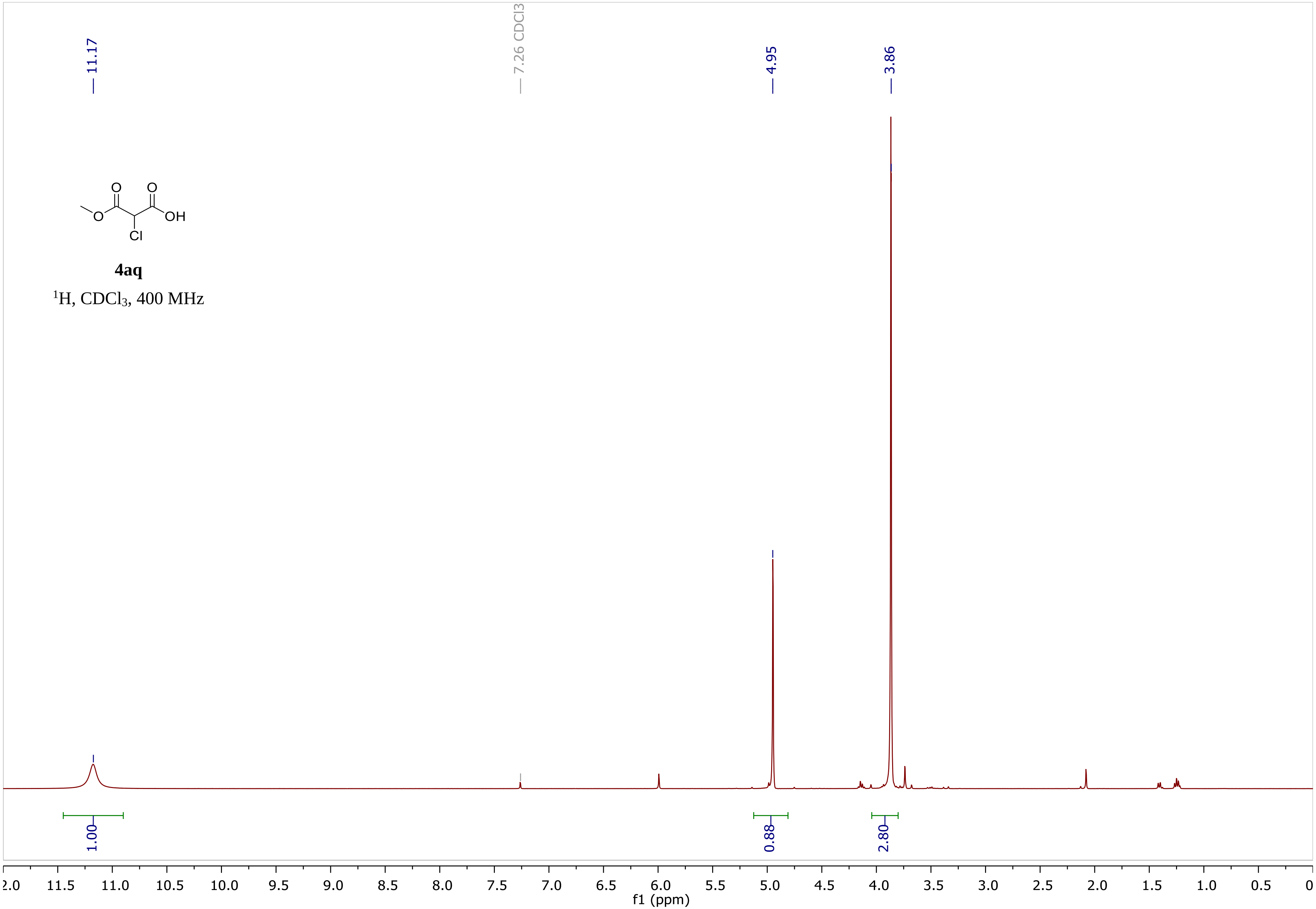


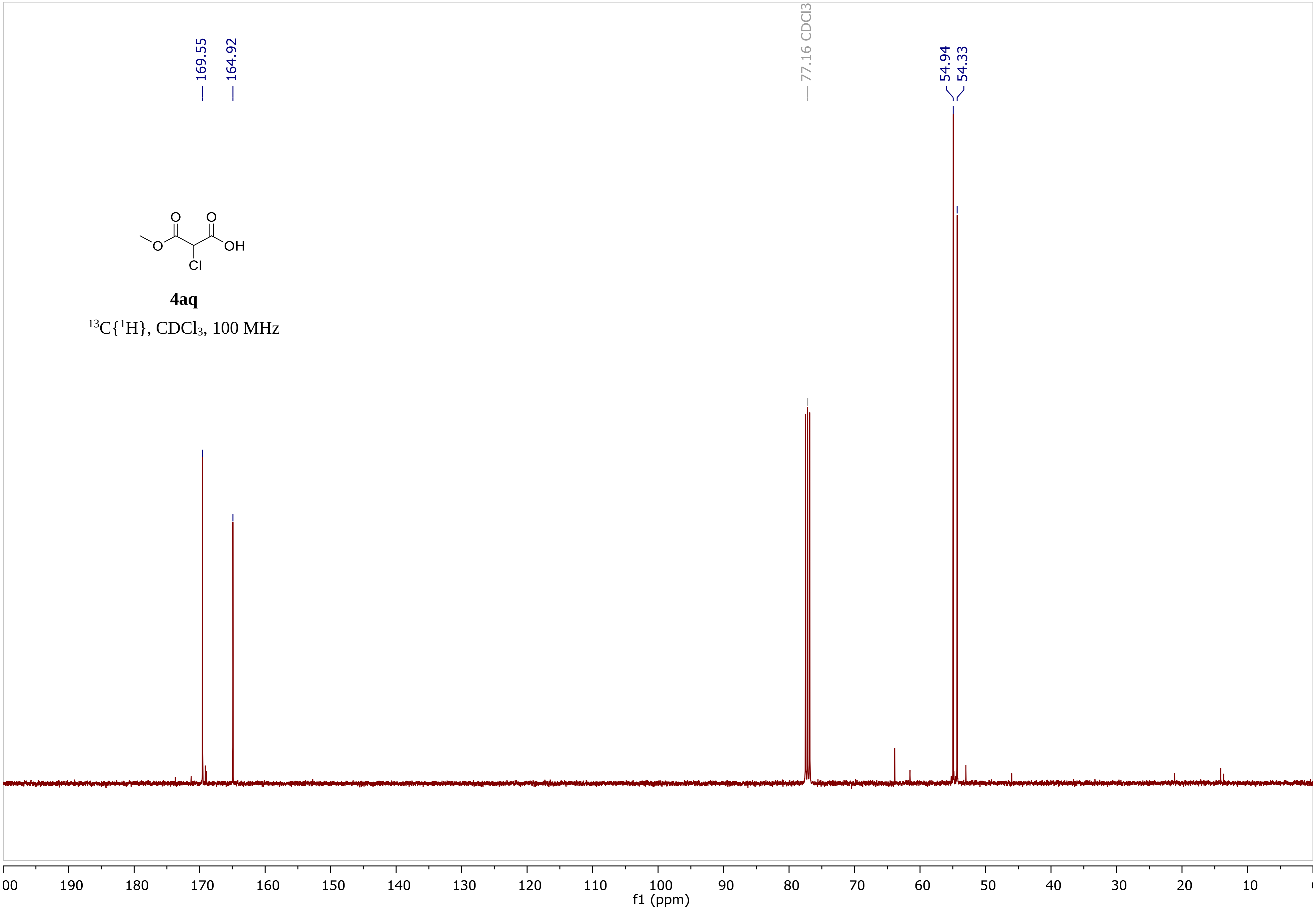
10.16
7.26 CDCl3
3.73
3.42
3.40
3.38
1.20
1.18
1.16
0.01
O
O
O
OH
SiMe3
4ap
1H, CDCl3, 400 MHz
1.17
2.96
1.00
2.10
8.83
f1 (ppm)

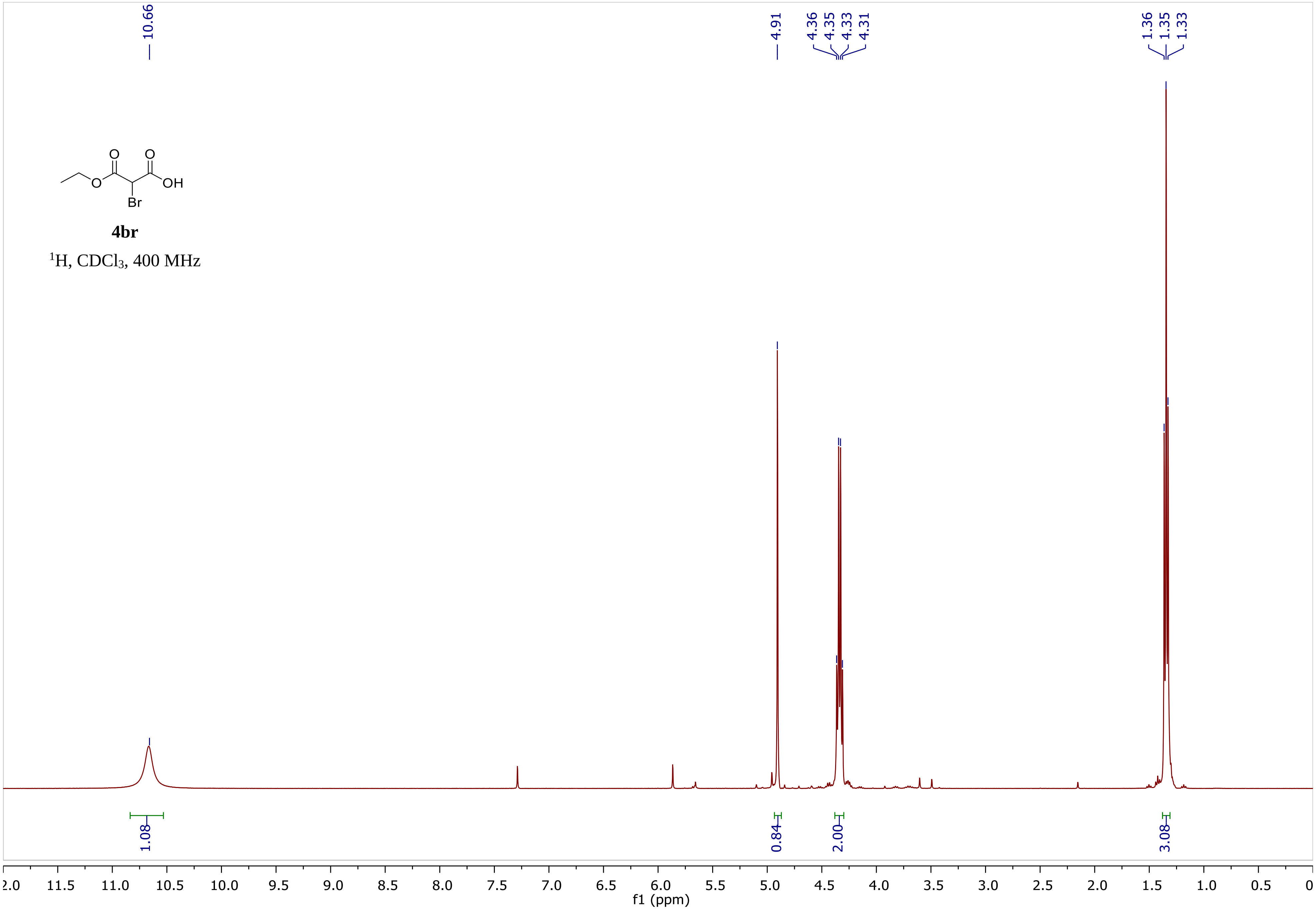


4ap

$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

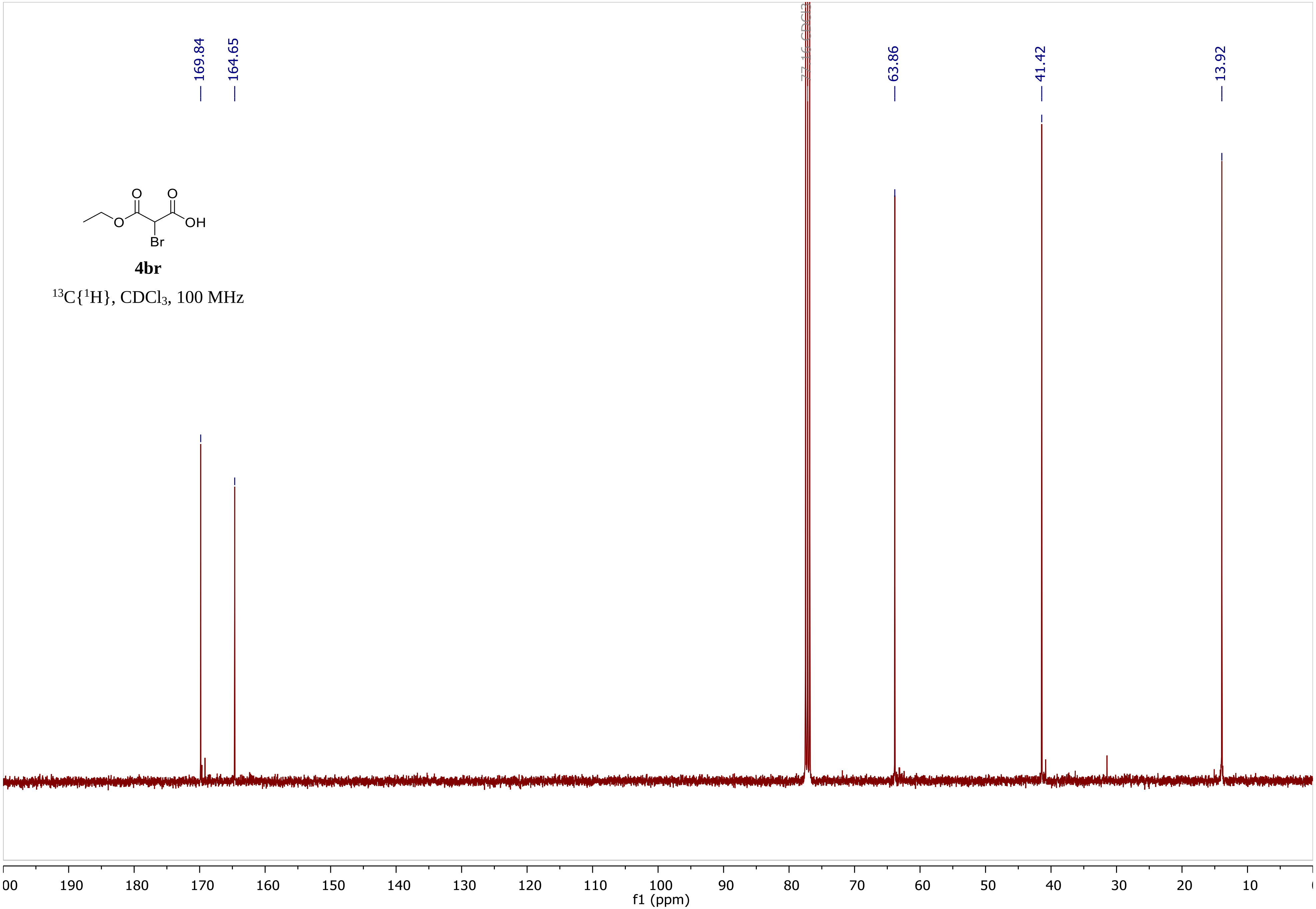

11.17
7.26 CDCl3
4.95
3.86
O
O
O
OH
Cl
4aq
1H, CDCl3, 400 MHz
1.00
0.88
2.80
2.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)


169.55
164.92
77.16 CDCl3
54.94
54.33
O
O
O
OH
Cl
4aq
13C{1H}, CDCl3, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



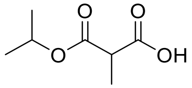
4br

^{1}H, $CDCl_3$, 400 MHz



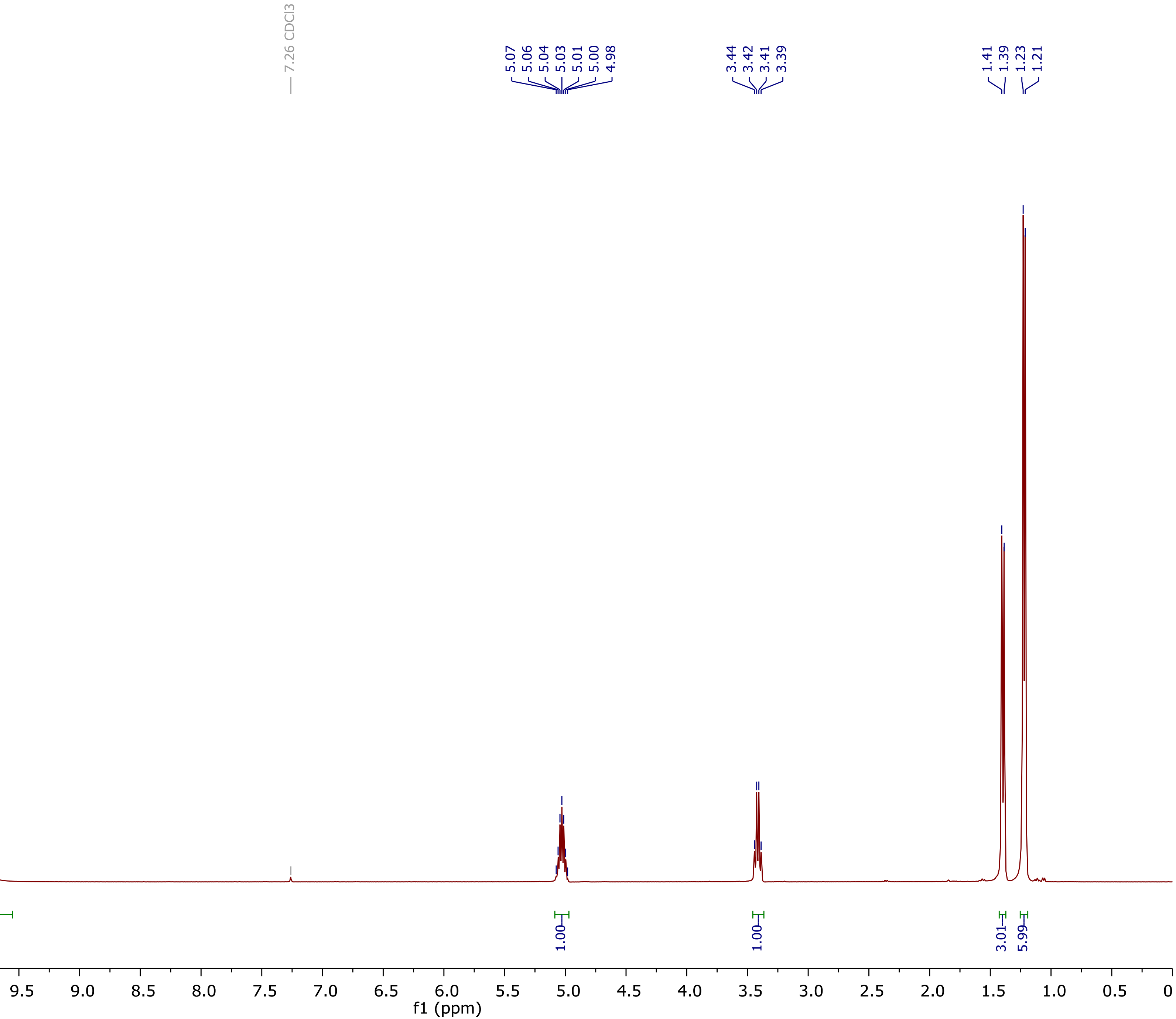
4br

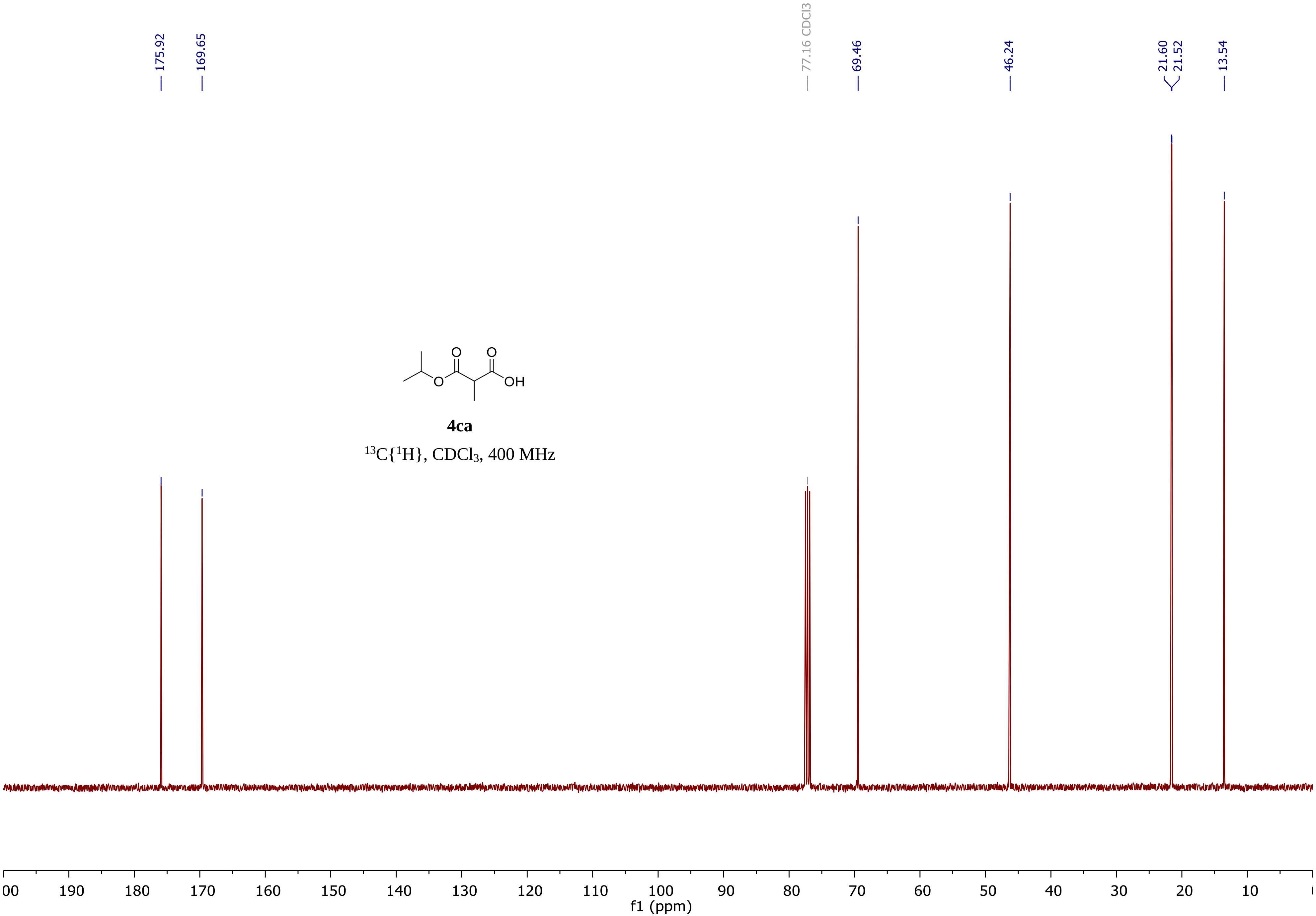
$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz



4ca

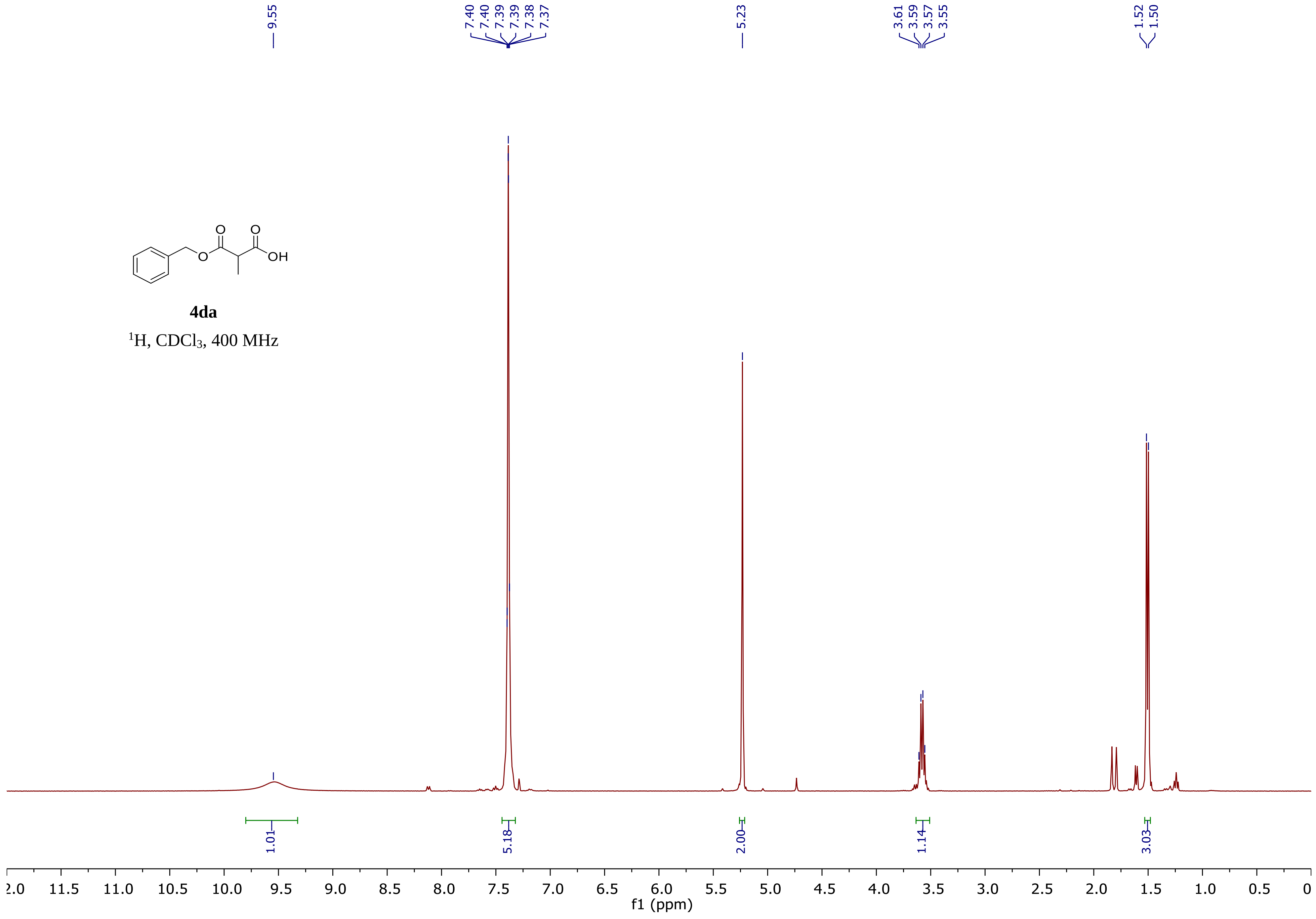
^{1}H, $CDCl_3$, 400 MHz





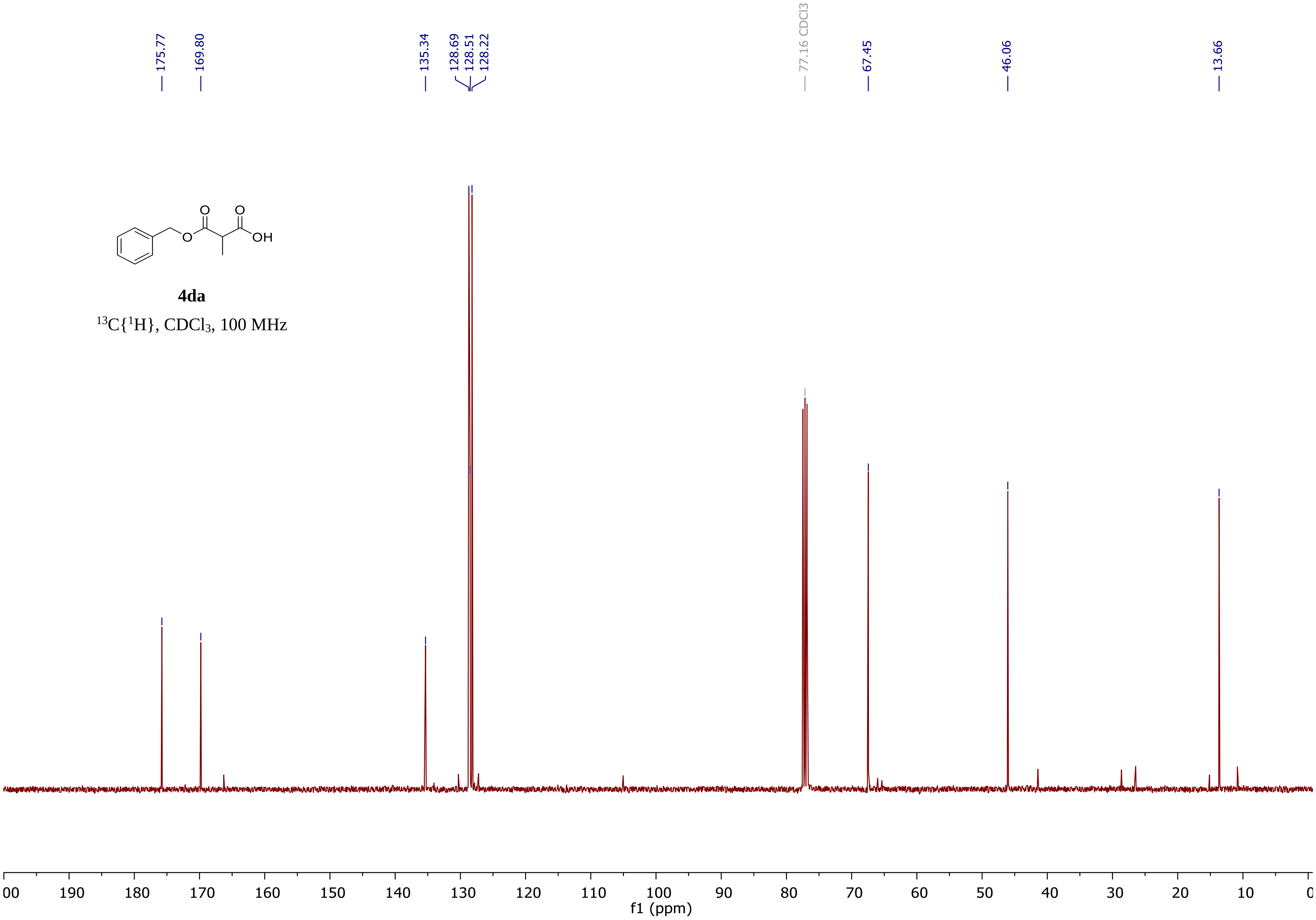
4ca

$^{13}C\{^{1}H\}$, $CDCl_3$, 400 MHz



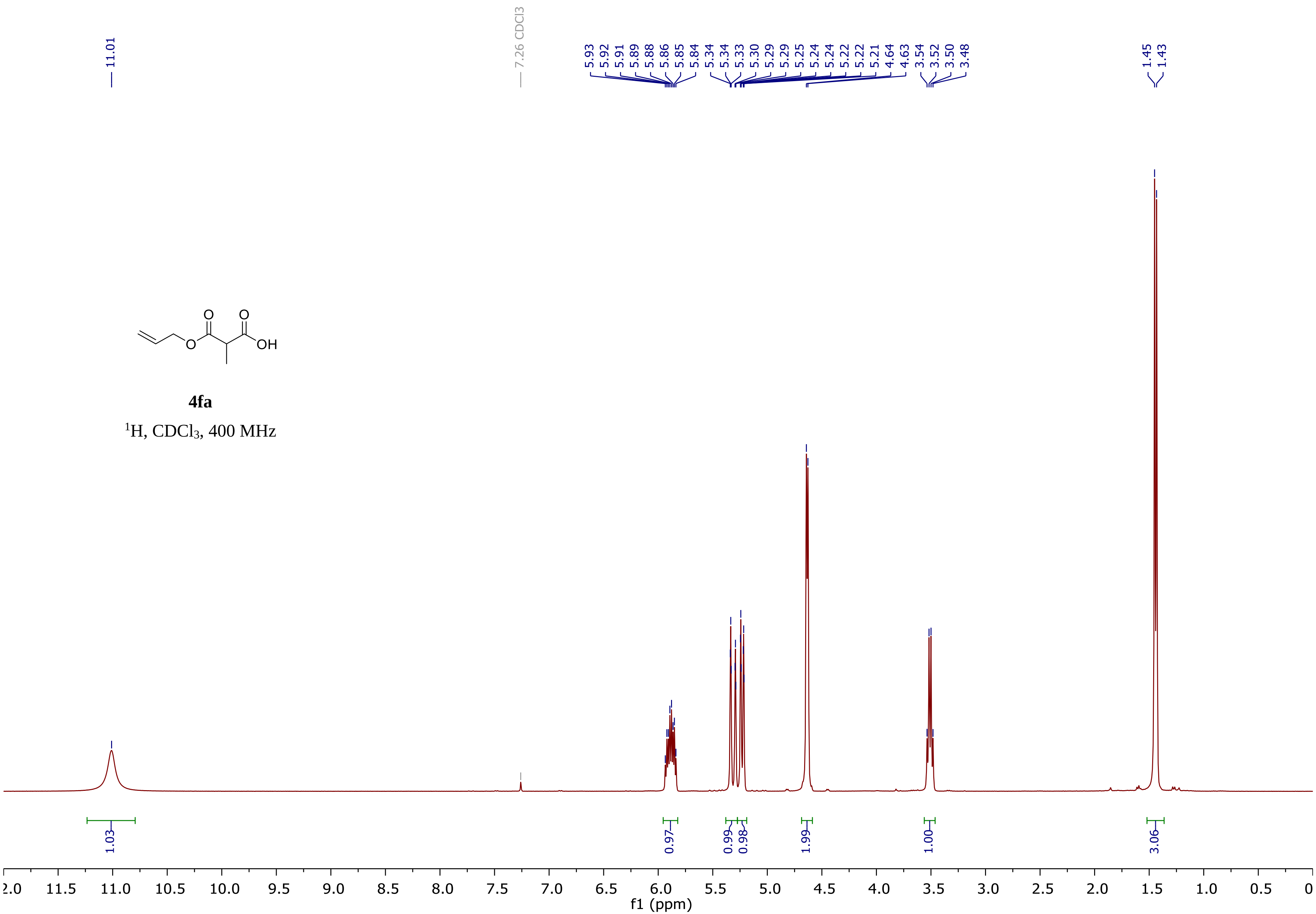
4da

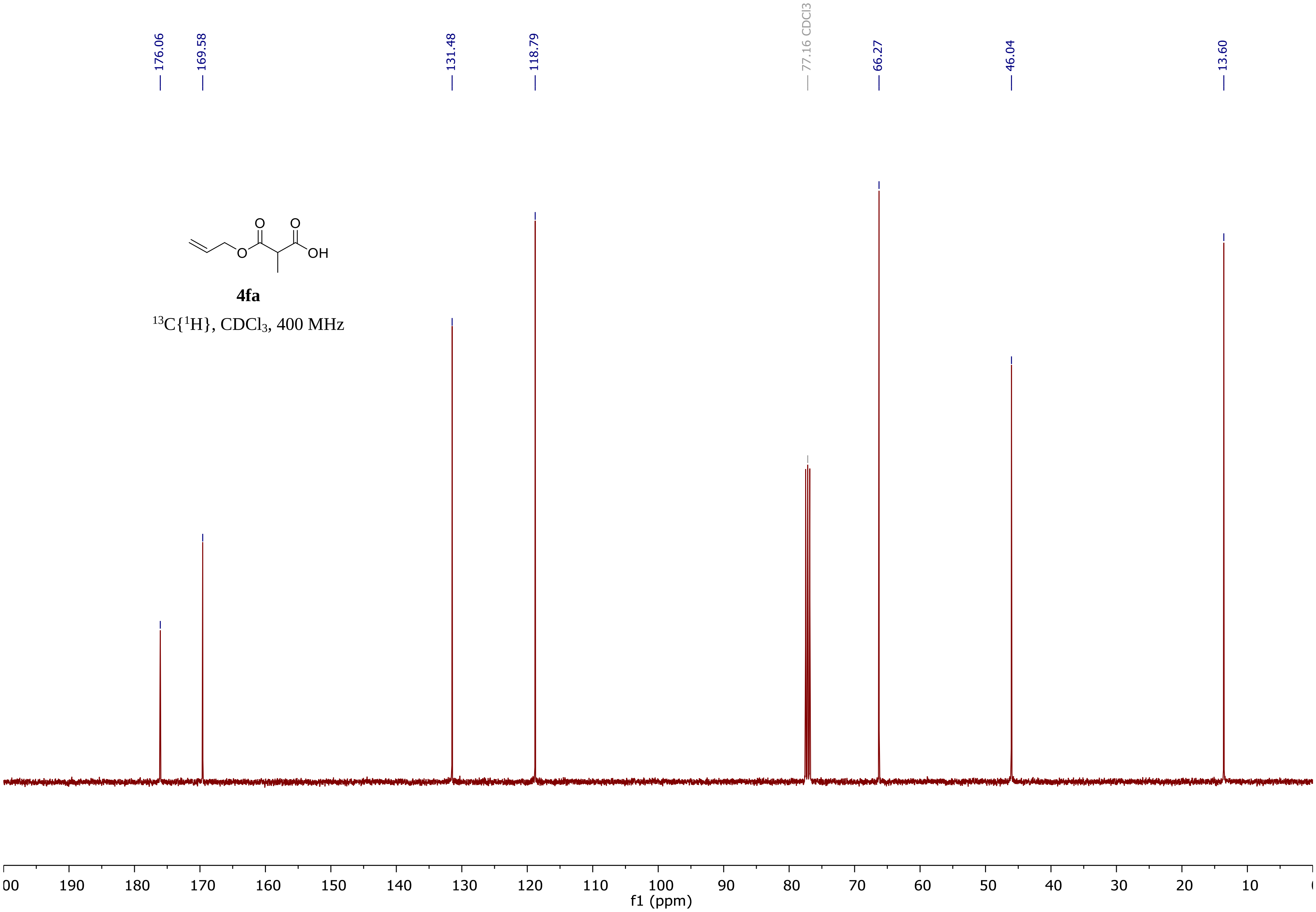
^{1}H, $CDCl_3$, 400 MHz

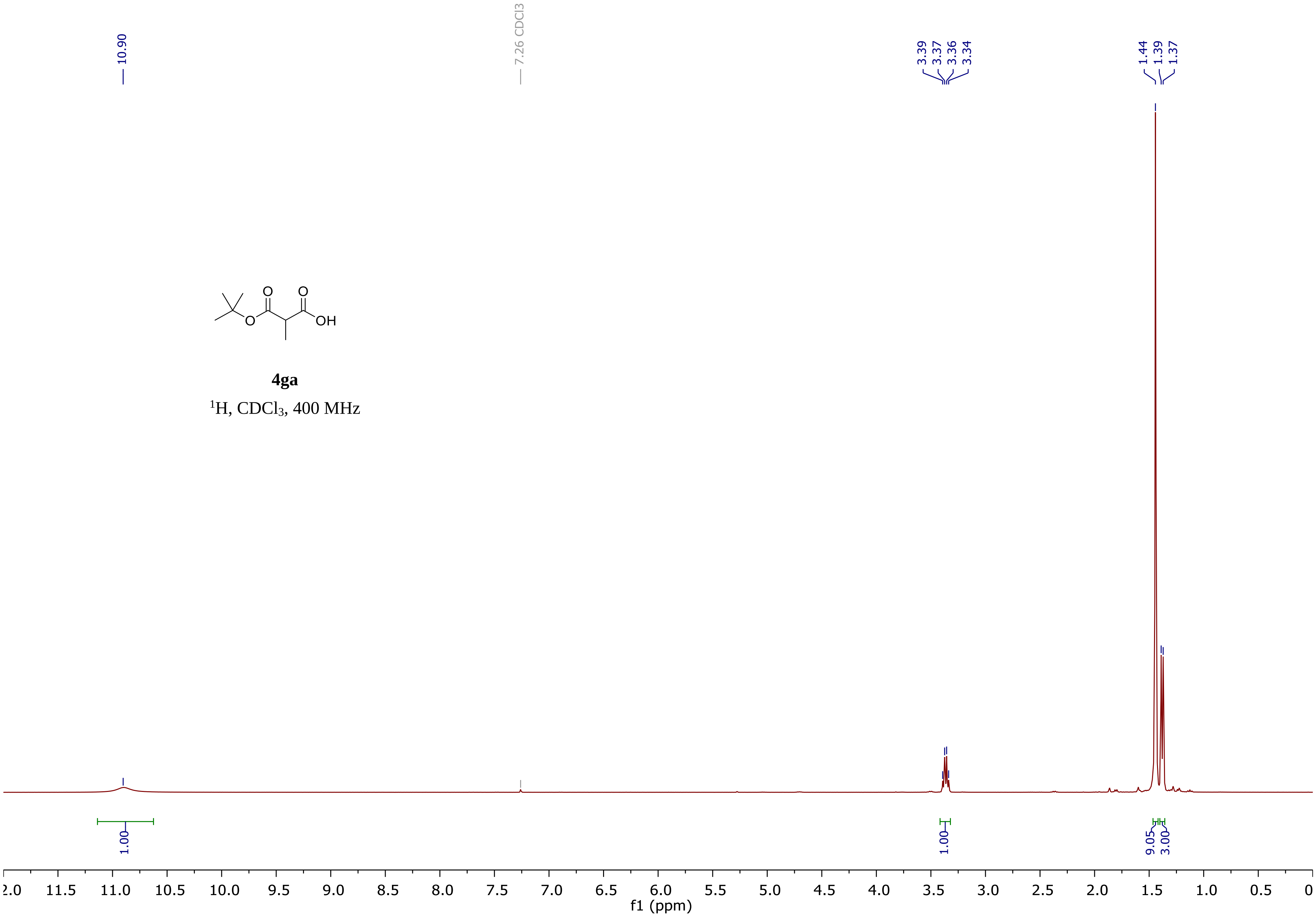


4da

$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz

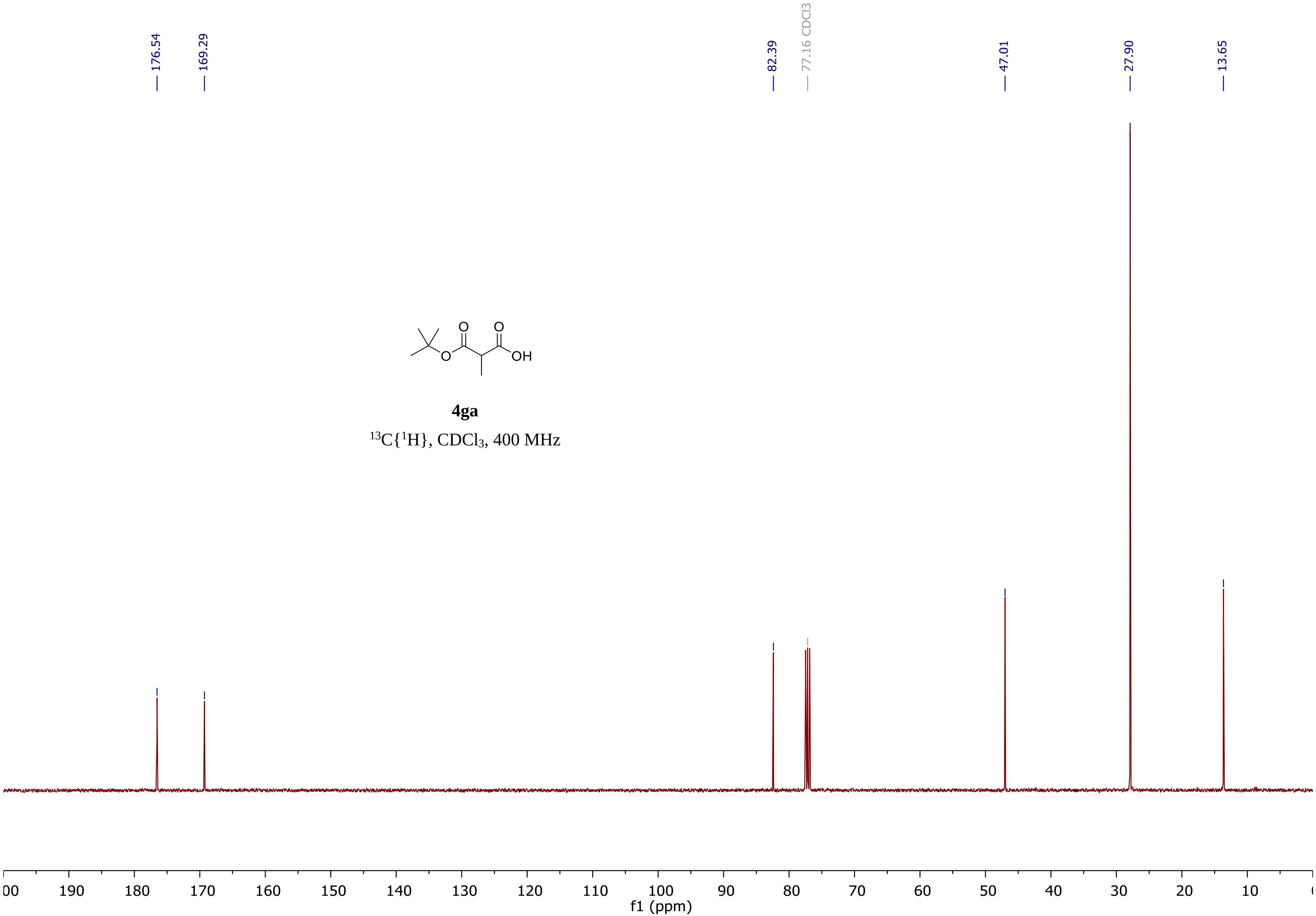

11.01
7.26 CDCl3
5.93
5.92
5.91
5.89
5.88
5.86
5.85
5.84
5.34
5.34
5.33
5.30
5.29
5.29
5.25
5.24
5.24
5.22
5.22
5.21
4.64
4.63
3.54
3.52
3.50
3.48
1.45
1.43
O
O
O
OH
4fa
1H, CDCl3, 400 MHz
1.03
0.97
0.99
0.98
1.99
1.00
3.06
f1 (ppm)

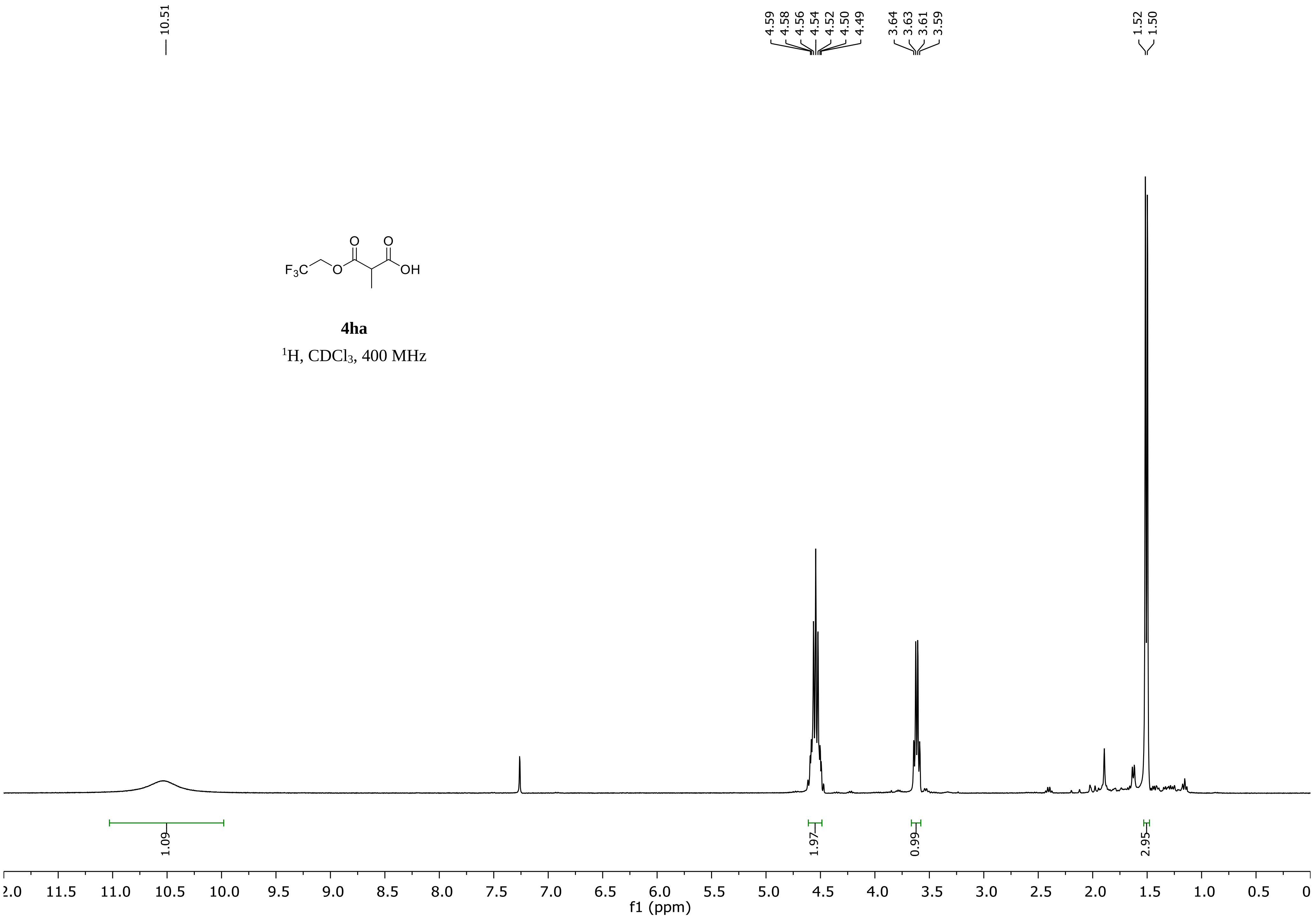

176.06
169.58
131.48
118.79
77.16 CDCl3
66.27
46.04
13.60
O
O
O
OH
4fa
13C{1H}, CDCl3, 400 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

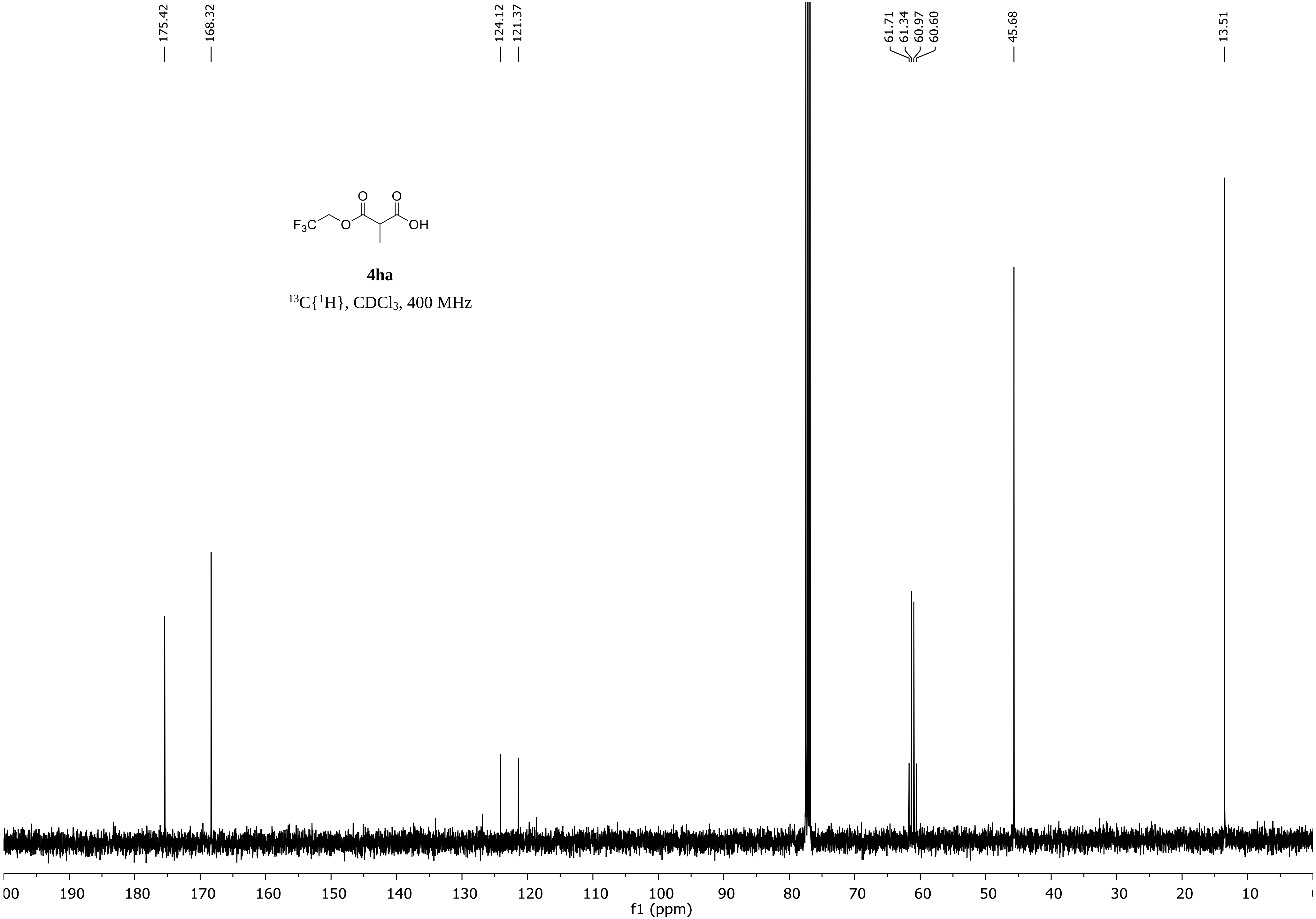


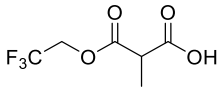
4ga

^{1}H, $CDCl_3$, 400 MHz


176.54
169.29
82.39
77.16 CDCl3
47.01
27.90
13.65
O
O
O
OH
4ga
13C{1H}, CDCl3, 400 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

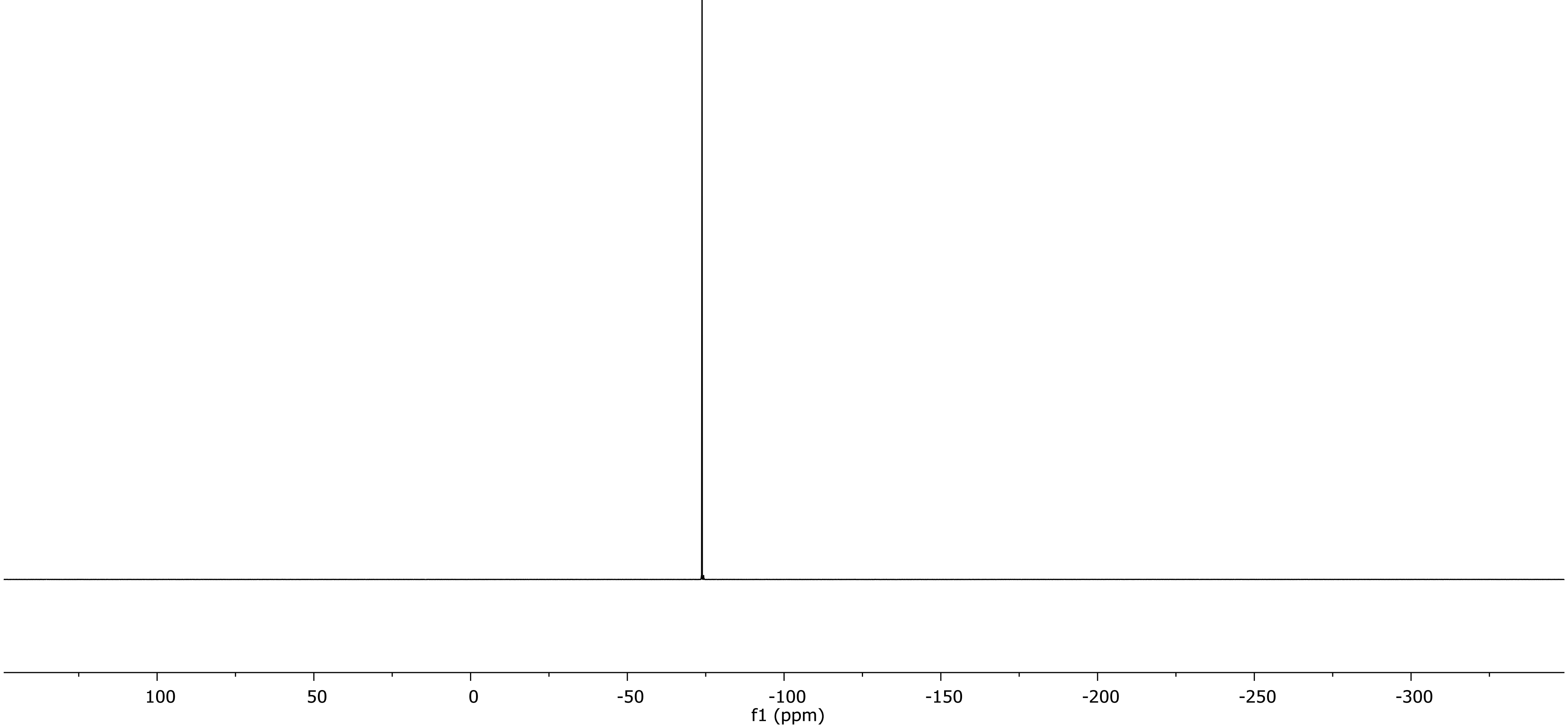

10.51
4.59
4.58
4.56
4.54
4.52
4.50
4.49
3.64
3.63
3.61
3.59
1.52
1.50
F3C
O
O
O
OH
4ha
1H, CDCl3, 400 MHz
1.09
1.97
0.99
2.95
2.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)

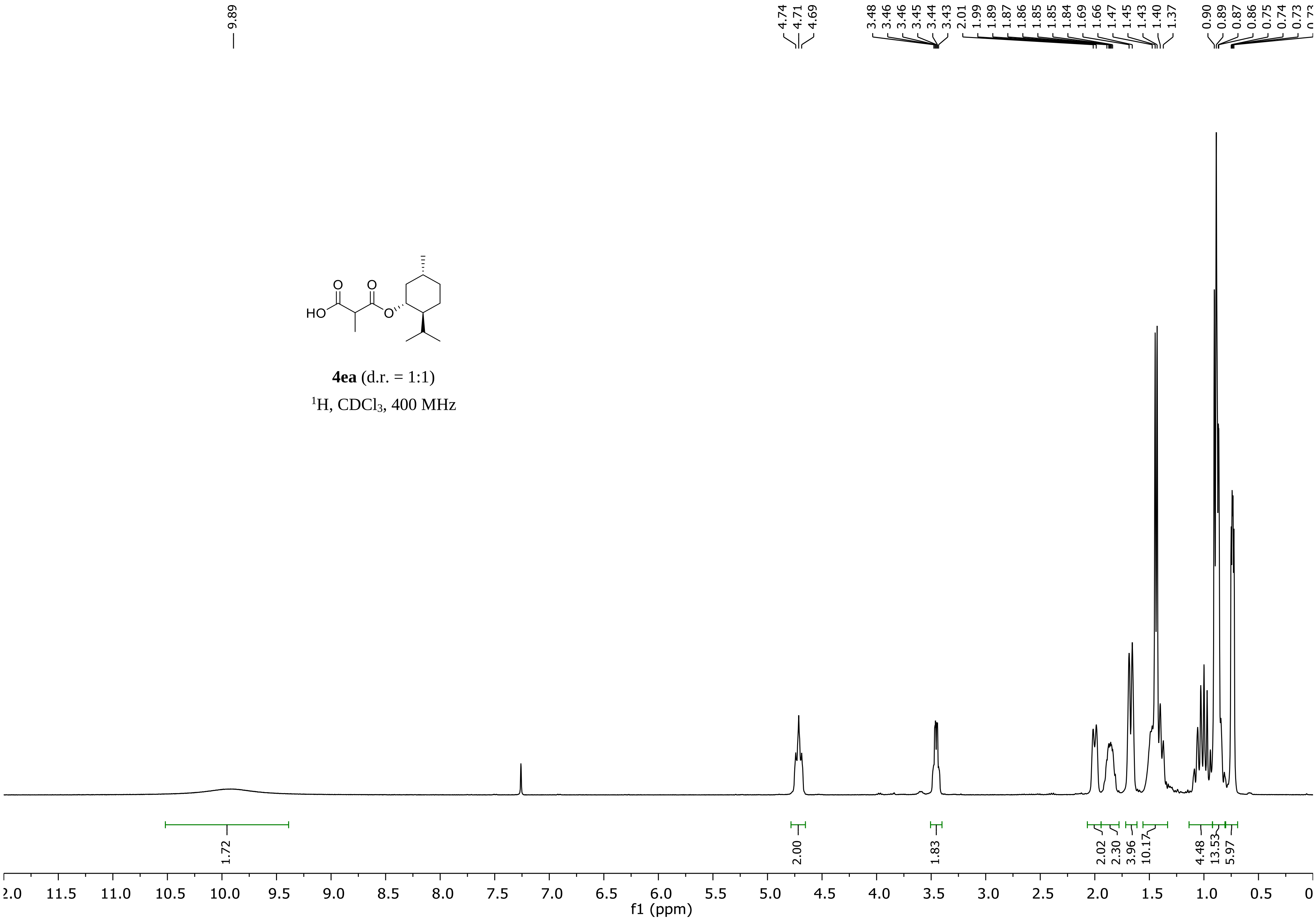

175.42
168.32
124.12
121.37
61.71
61.34
60.97
60.60
45.68
13.51
O
O
F3C
O
OH
4ha
13C{1H}, CDCl3, 400 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

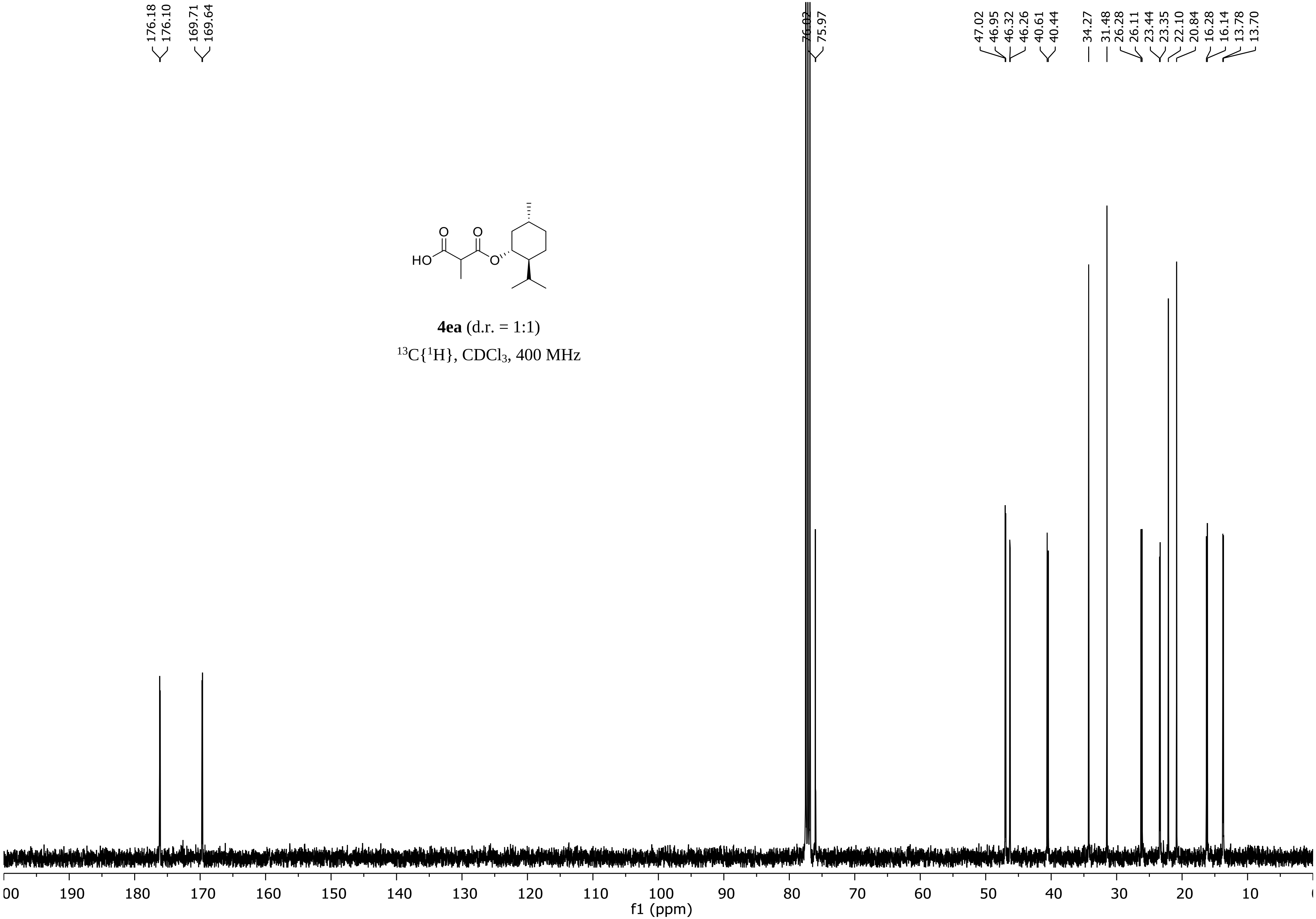


4ha

$^{19}F\{^1H\}$, $CDCl_3$, 377 MHz

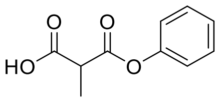



9.89
4.74
4.71
4.69
3.48
3.46
3.46
3.45
3.44
3.43
2.01
1.99
1.89
1.87
1.86
1.85
1.85
1.84
1.69
1.66
1.47
1.45
1.43
1.40
1.37
0.90
0.89
0.87
0.86
0.75
0.74
0.73
HO
O
O
O
4ea (d.r. = 1:1)
¹H, CDCl3, 400 MHz
1.72
2.00
1.83
2.02
2.30
3.96
10.17
4.48
13.53
5.97
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
f1 (ppm)



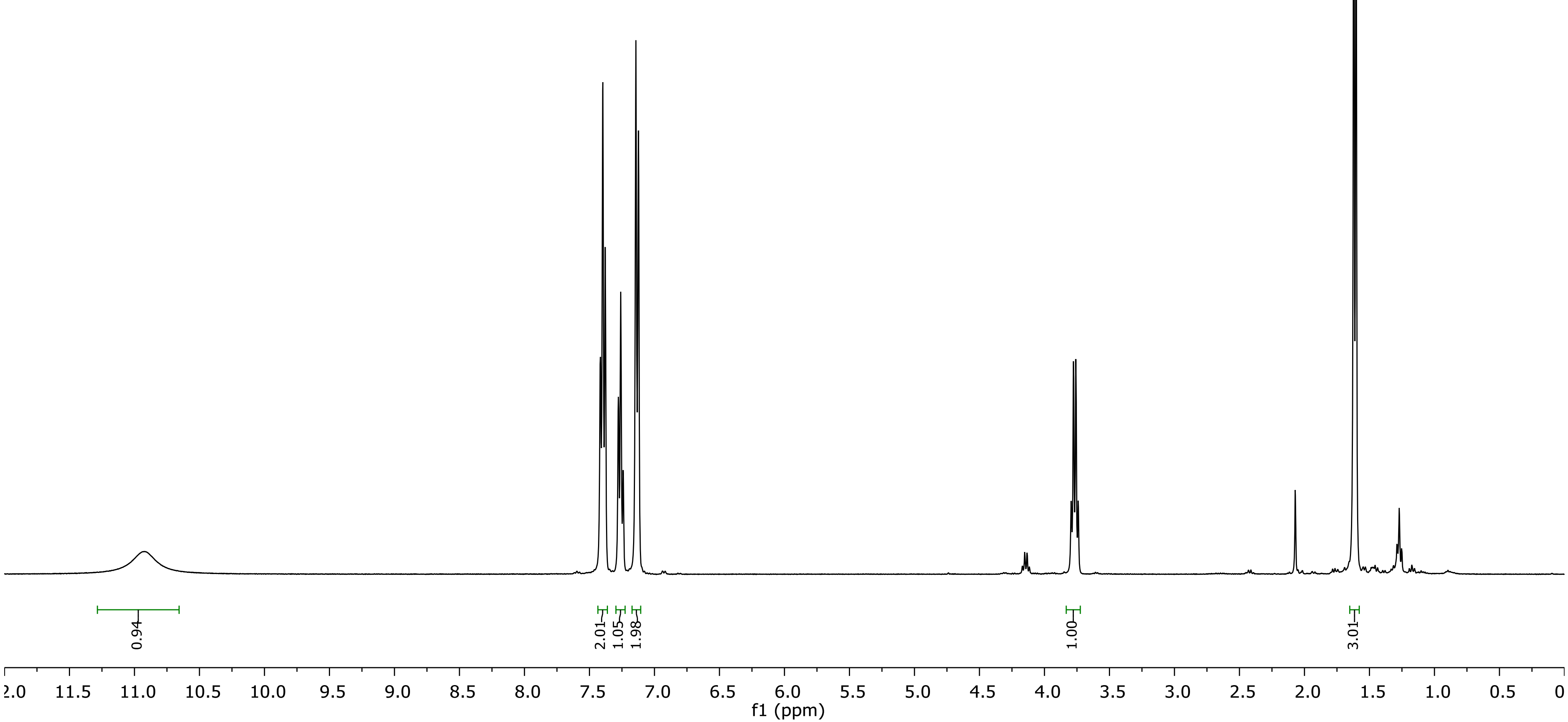
4ea (d.r. = 1:1)

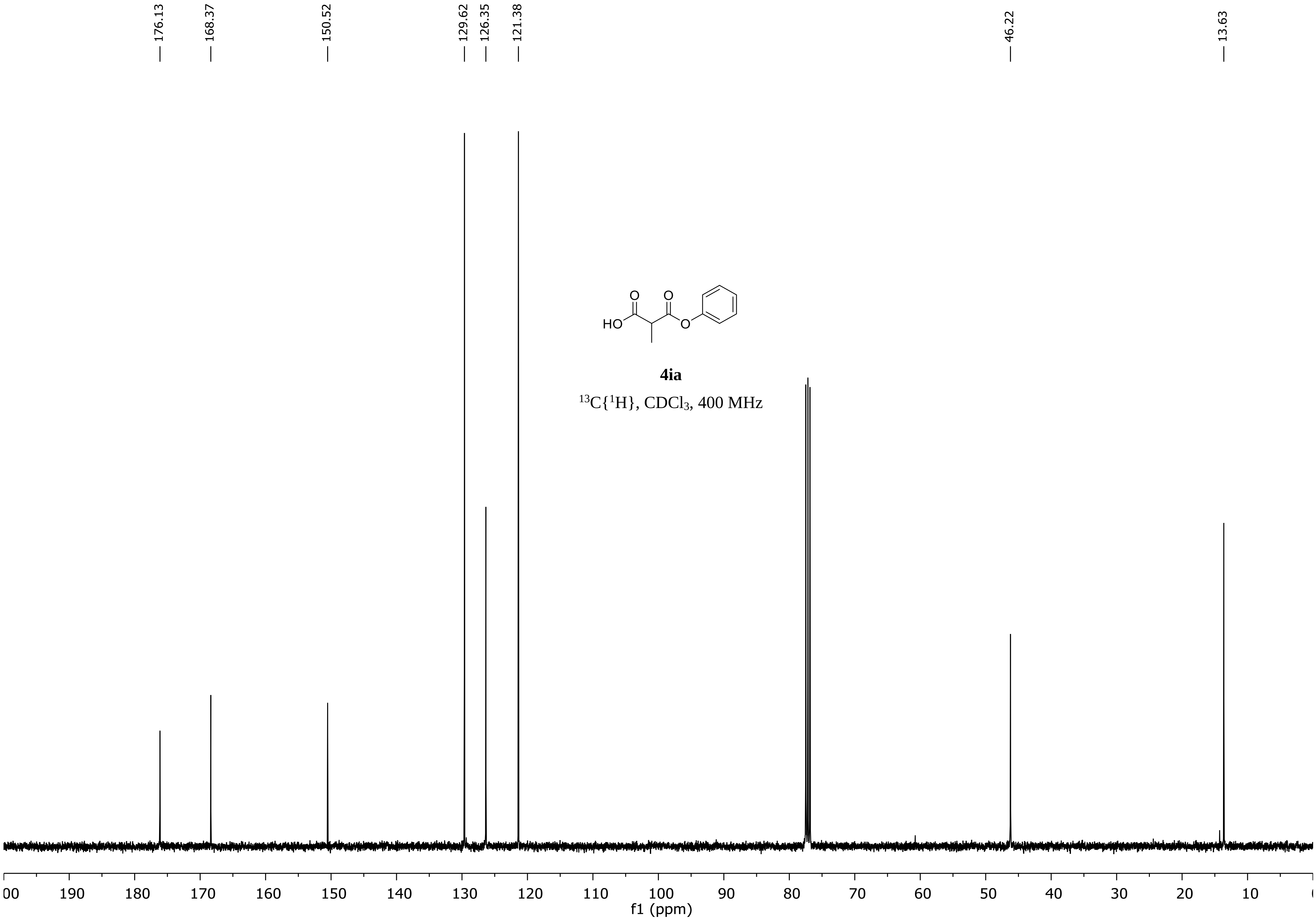
$^{13}C\{^{1}H\}$, $CDCl_3$, 400 MHz

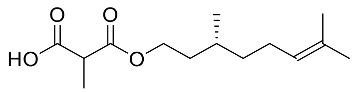


4ia

^{1}H, $CDCl_3$, 400 MHz

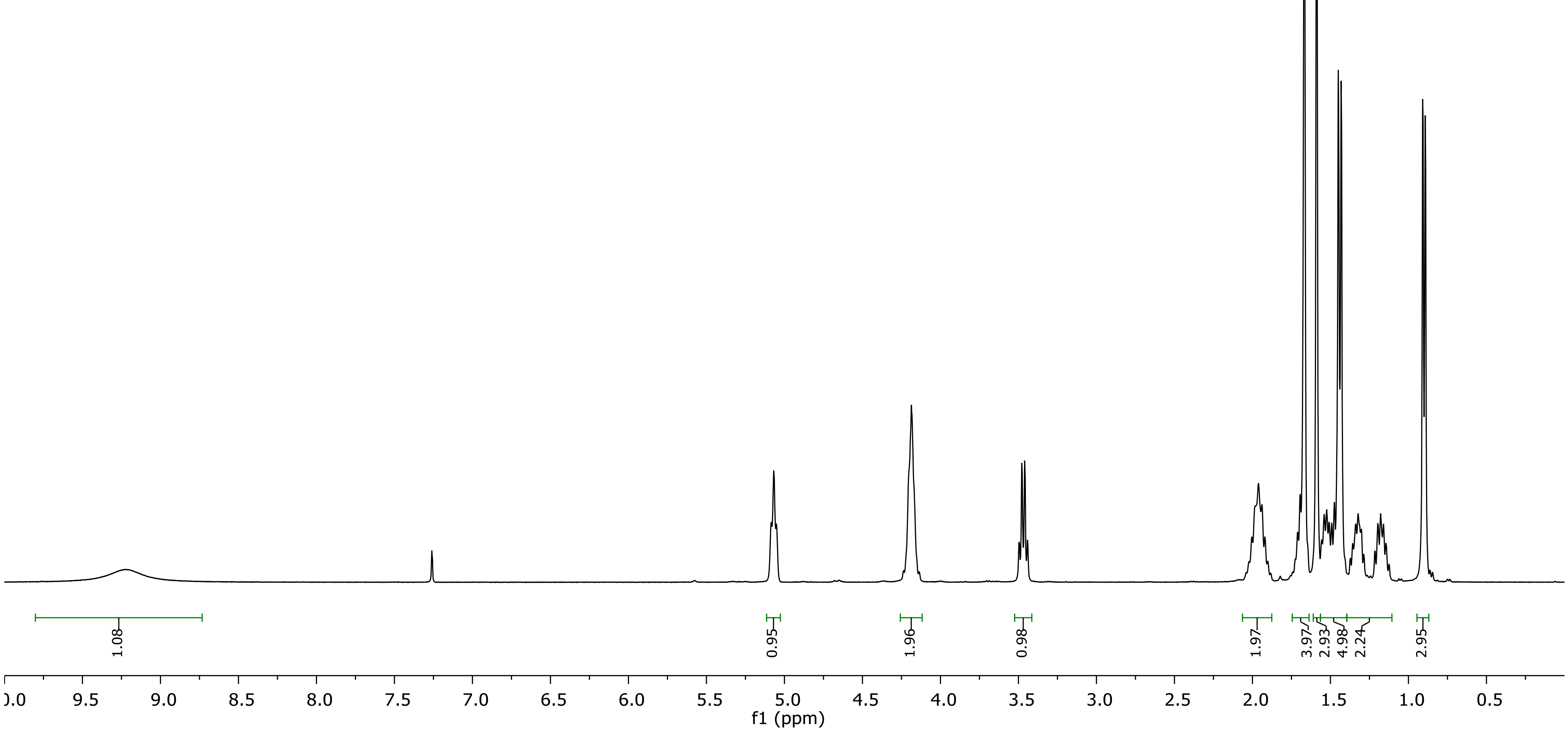


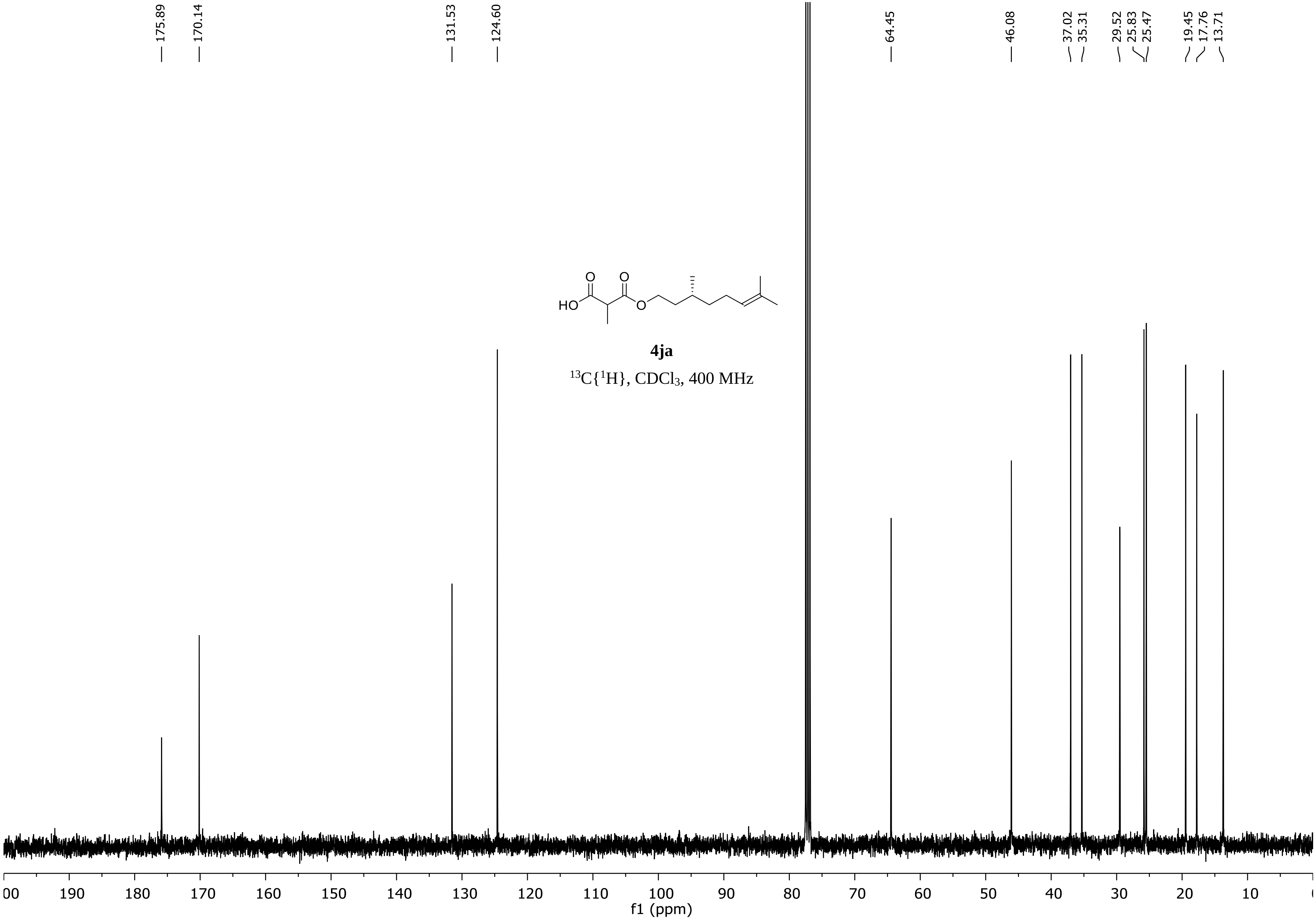

176.13
168.37
150.52
129.62
126.35
121.38
46.22
13.63
HO
O
O
O
4ia
$^{13}C\{^1H\}$, $CDCl_3$, 400 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



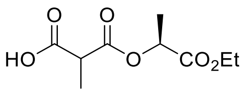
4ja

^{1}H, $CDCl_3$, 400 MHz



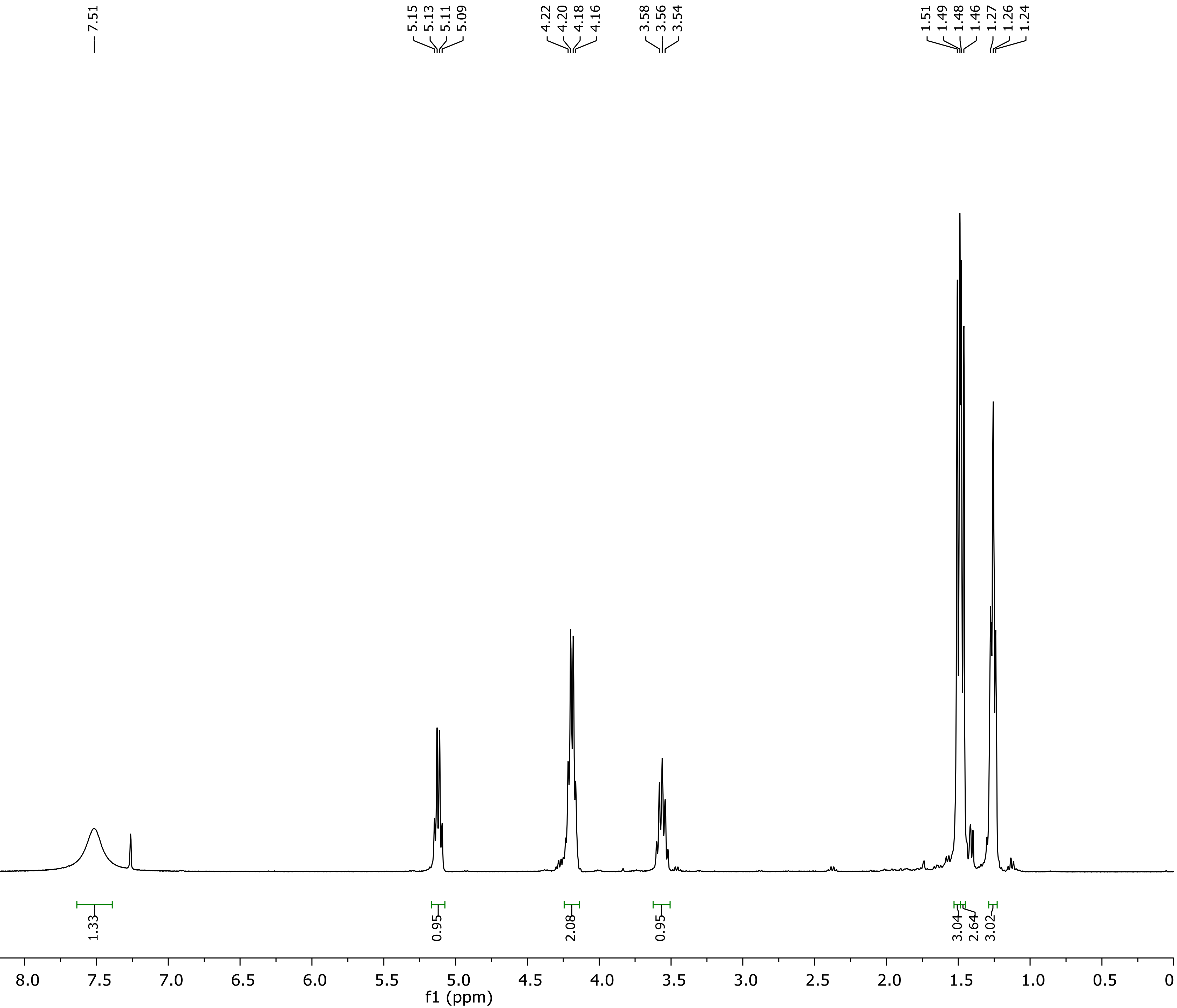


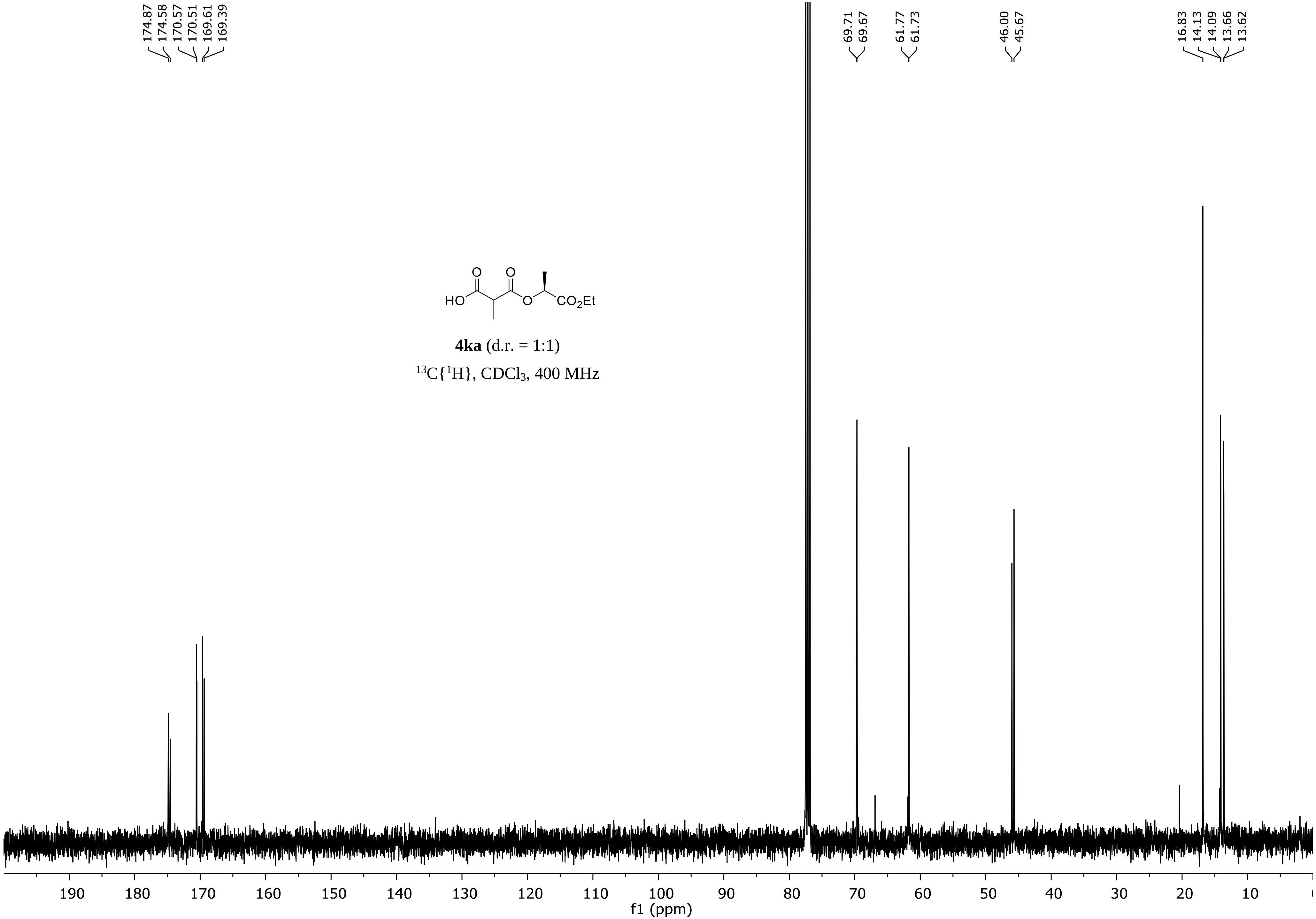
175.89
170.14
131.53
124.60
64.45
46.08
37.02
35.31
29.52
25.83
25.47
19.45
17.76
13.71
HO
O
O
O
4ja
$^{13}C\{^{1}H\}$, $CDCl_3$, 400 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

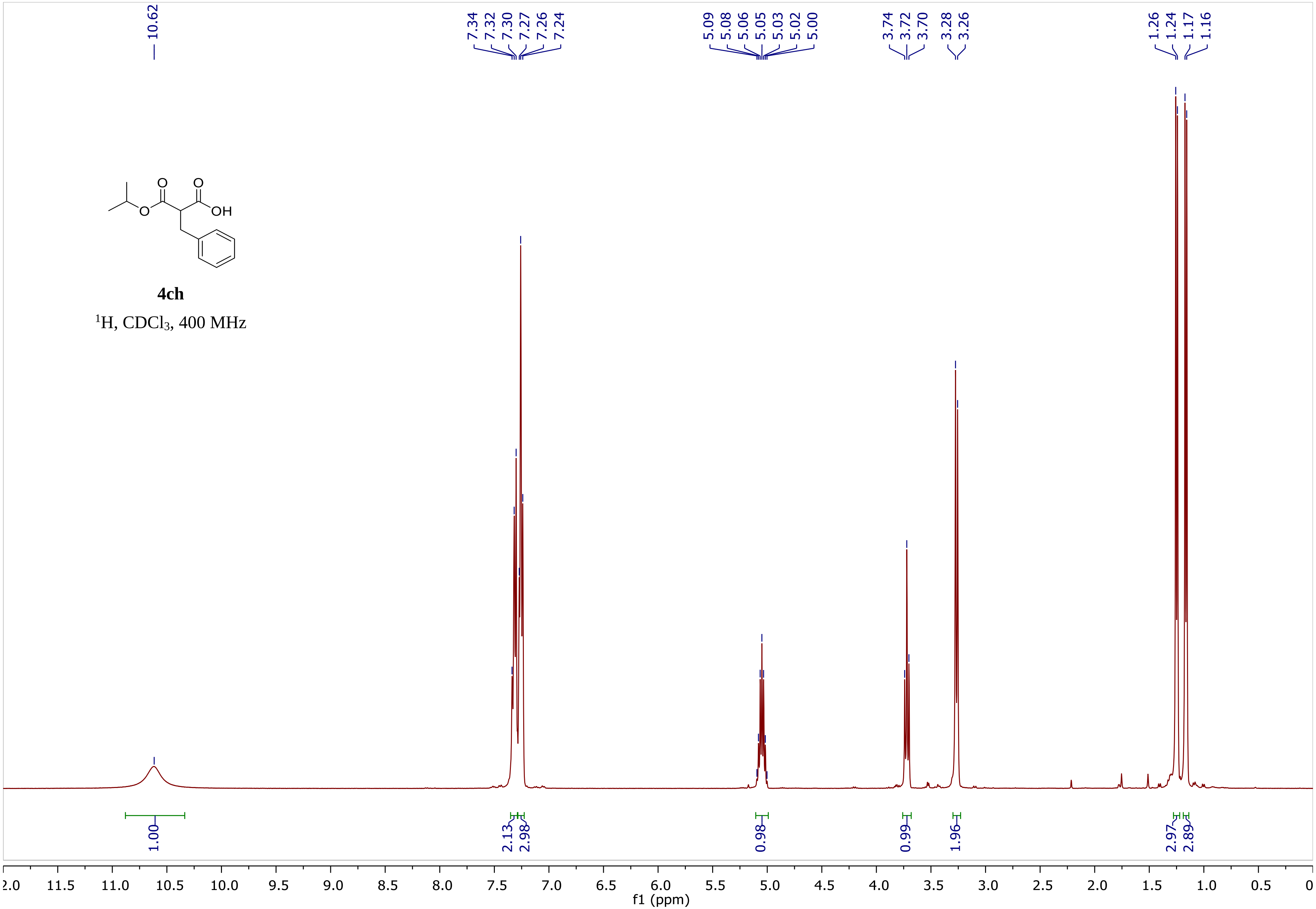


4ka (d.r. = 1:1)

^{1}H, $CDCl_3$, 400 MHz

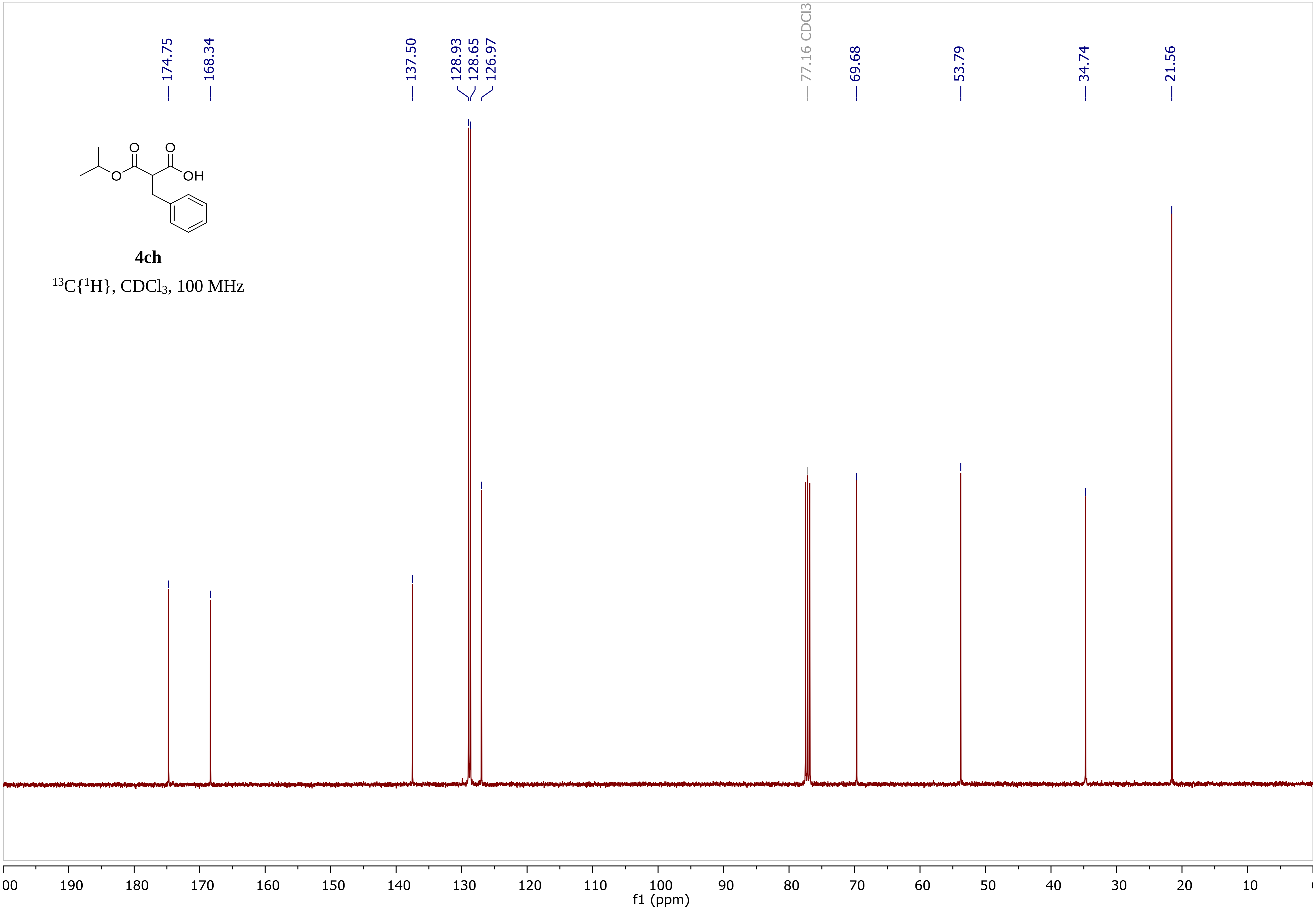



174.87
174.58
170.57
170.51
169.61
169.39
69.71
69.67
61.77
61.73
46.00
45.67
16.83
14.13
14.09
13.66
13.62
HO
O
O
O
CO_2Et
4ka (d.r. = 1:1)
$^{13}C\{^1H\}$, $CDCl_3$, 400 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



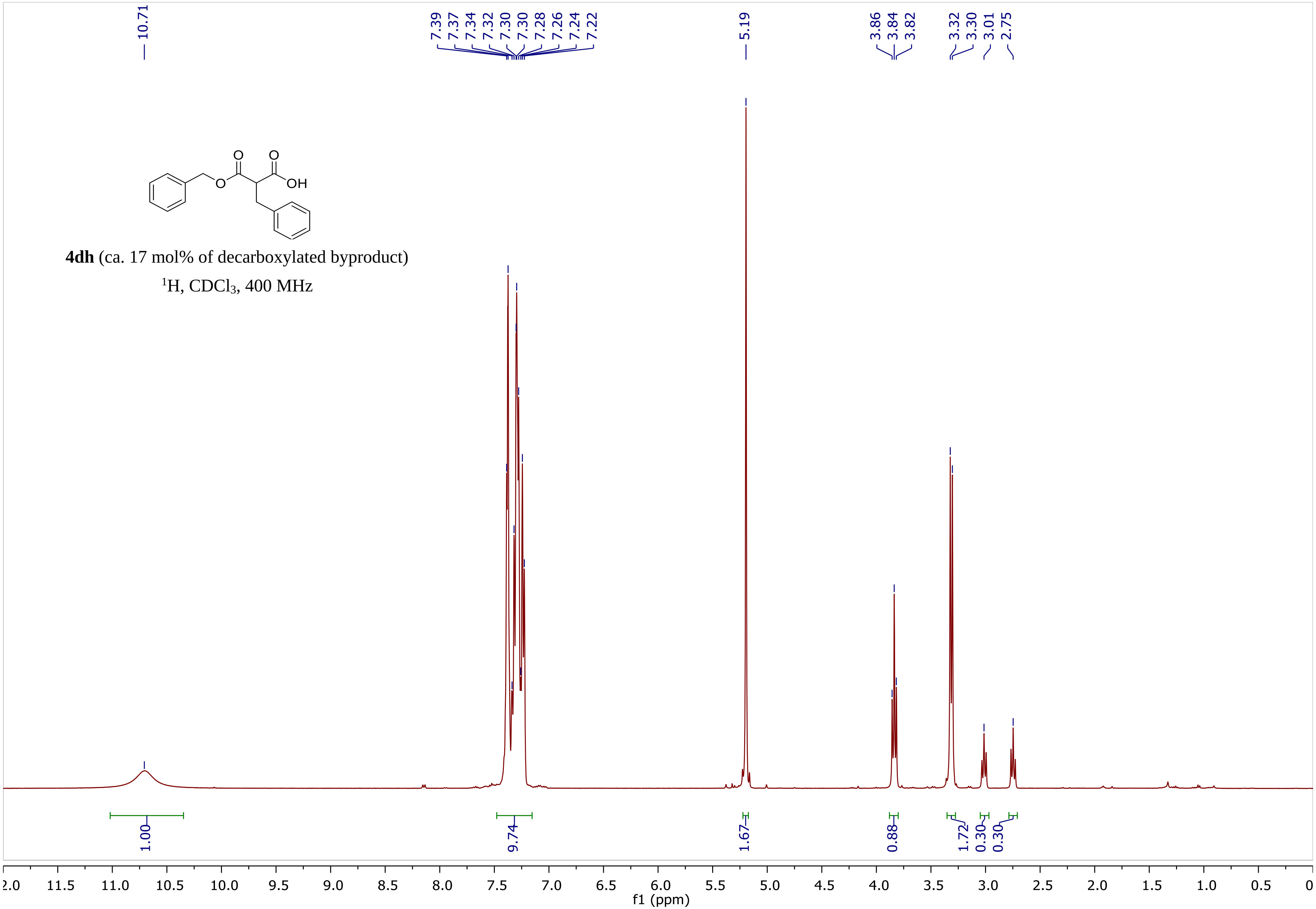
4ch

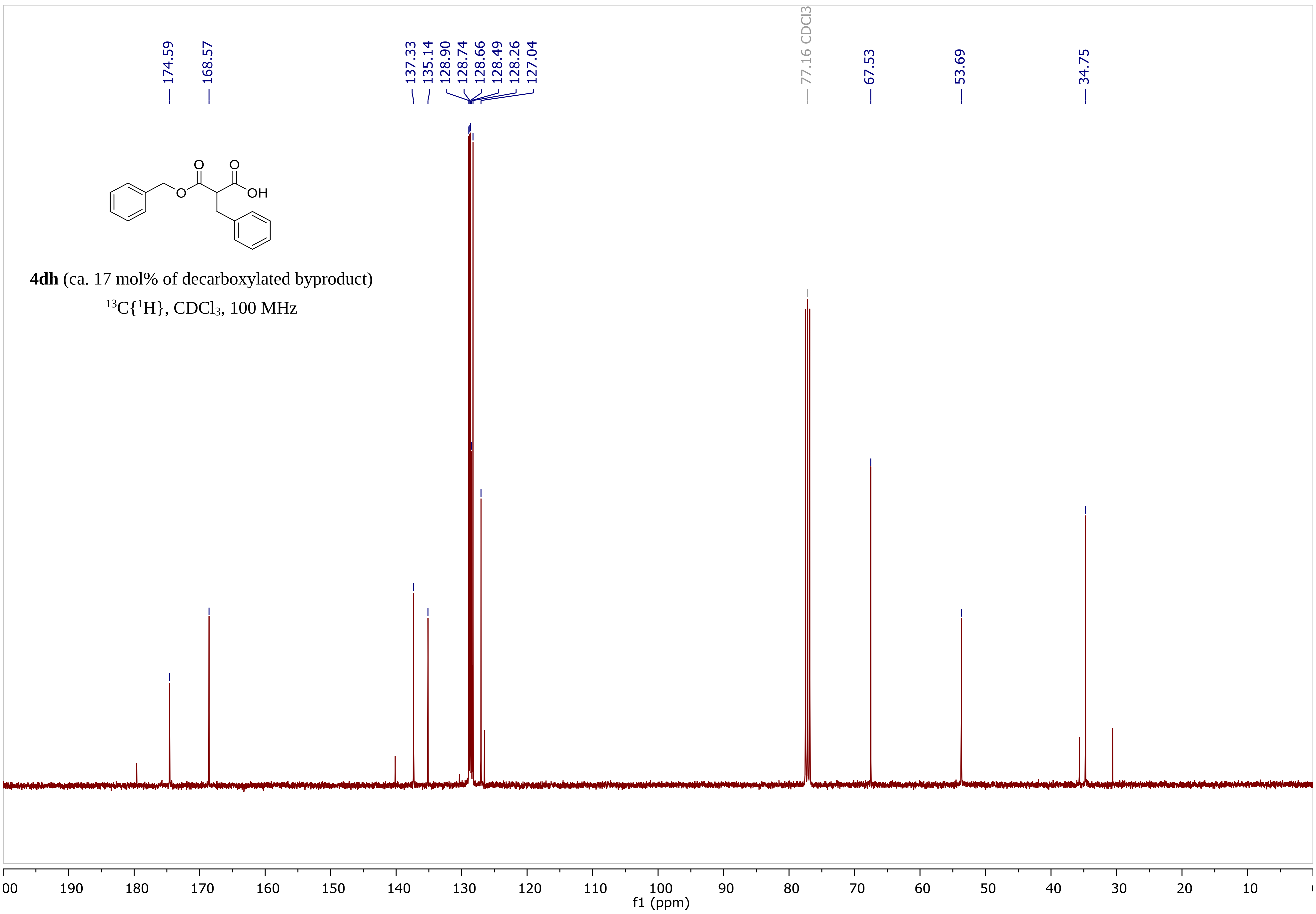
[1]H, $CDCl_3$, 400 MHz



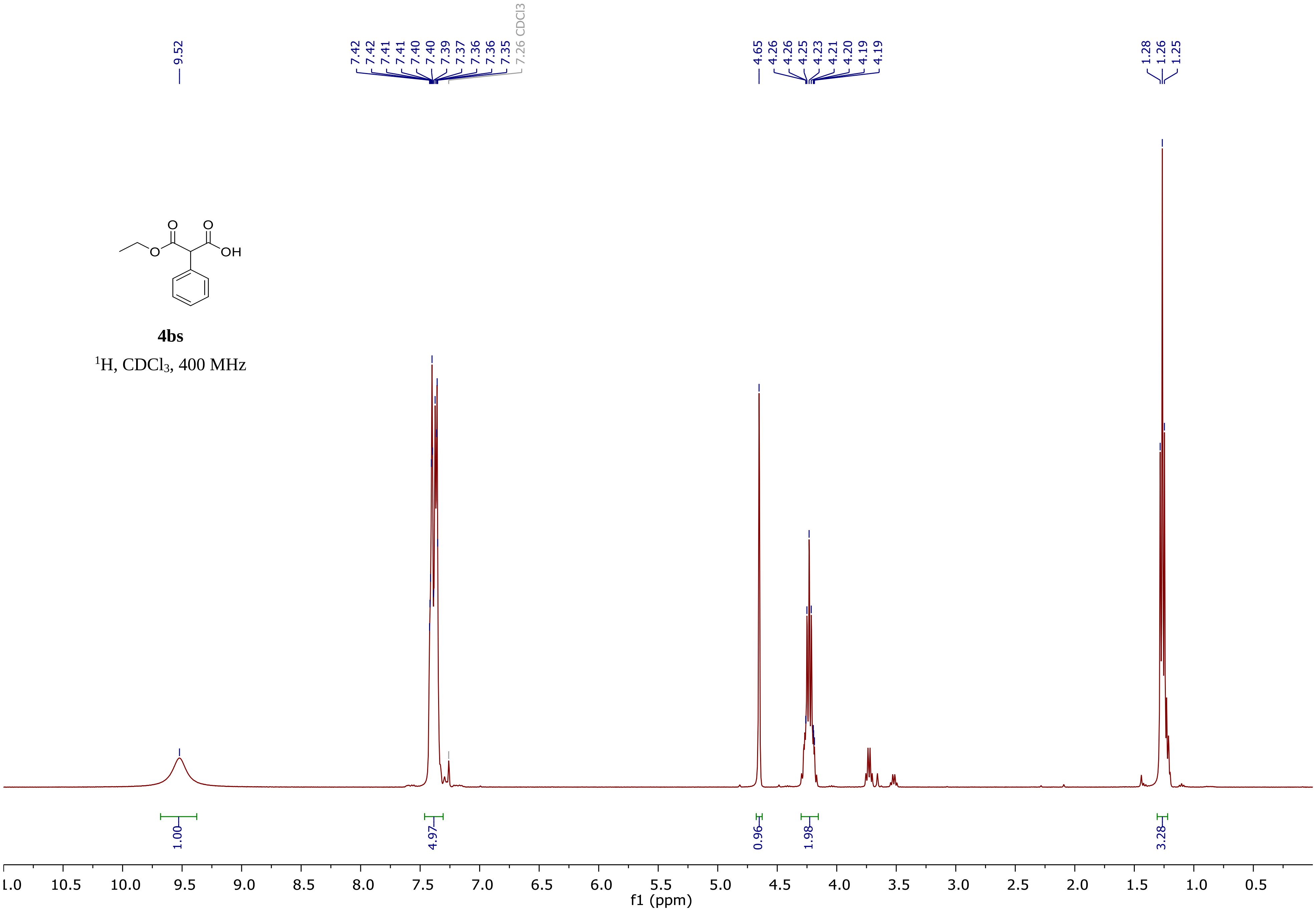
4ch

$^{13}C\{^{1}H\}$, $CDCl_3$, 100 MHz


4dh (ca. 17 mol% of decarboxylated byproduct)
^{1}H, $CDCl_3$, 400 MHz
O
O
O
OH
10.71
7.39 7.37 7.34 7.32 7.30 7.30 7.28 7.26 7.24 7.22
5.19
3.86 3.84 3.82
3.32 3.30 3.01 2.75
1.00
9.74
1.67
0.88
1.72
0.30
0.30
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
f1 (ppm)

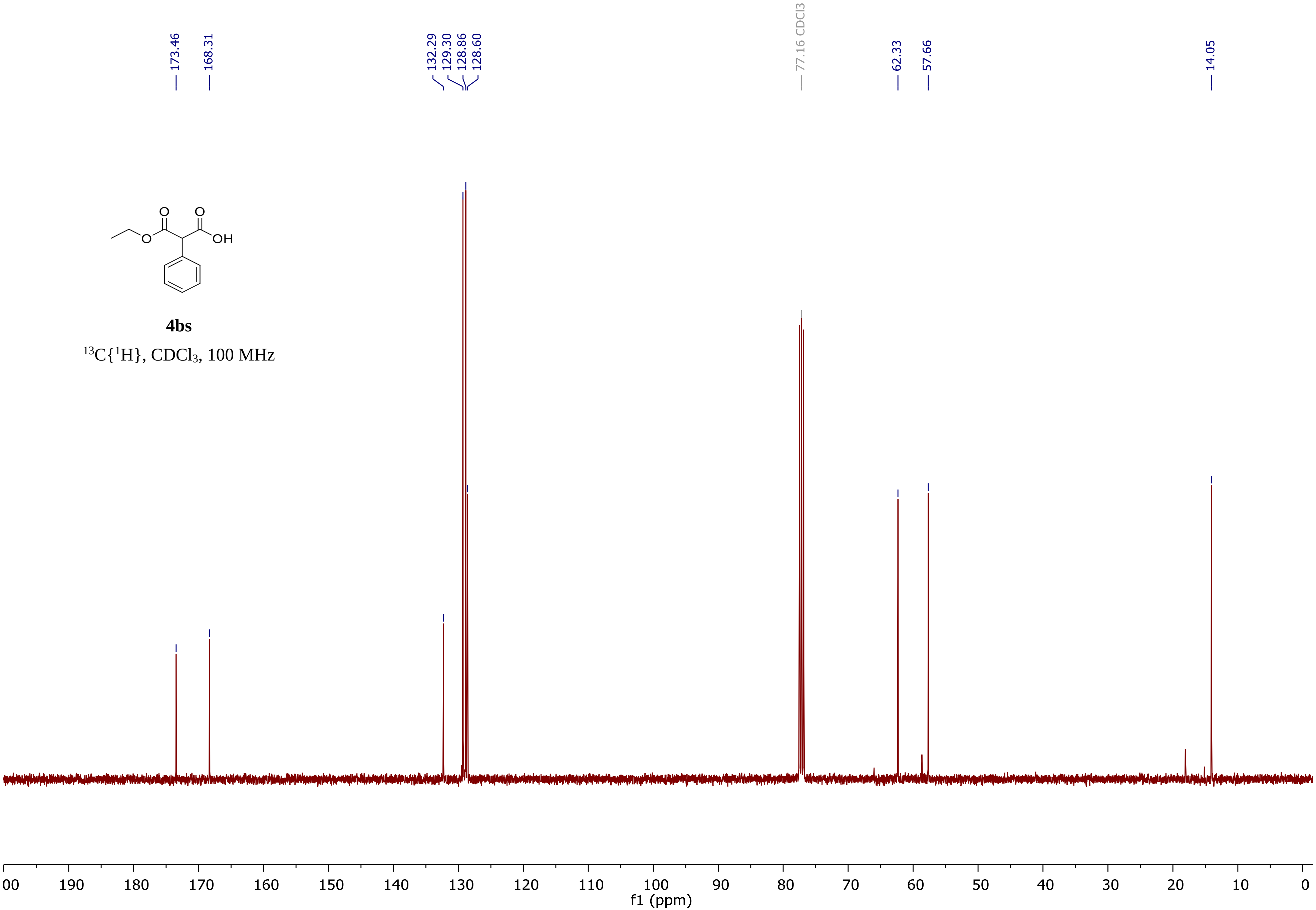


174.59
168.57
137.33
135.14
128.90
128.74
128.66
128.49
128.26
127.04
77.16 CDCl3
67.53
53.69
34.75
4dh (ca. 17 mol% of decarboxylated byproduct)
13C{1H}, CDCl3, 100 MHz
f1 (ppm)



4bs

^{1}H, $CDCl_3$, 400 MHz


173.46
168.31
132.29
129.30
128.86
128.60
77.16 CDCl3
62.33
57.66
14.05
OH
O
4bs
13C{1H}, CDCl3, 100 MHz
00
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)