**SUPPORTING INFORMATION FOR:**

# Antiproliferative activities of tricyclic amides derived from β-caryophyllene via Ritter reactions against MDA-MB-231 breast cancer cells

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## EXPERIMENTAL SECTION

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## Chemistry

***Materials***: Reagents and analytical grade solvents and Caryophyllene **1** were purchased from Sigma–Aldrich (Castle Hill, NSW, Australia). Monoepoxide **4** was prepared from **1** according to the reported method.[25] Compounds were purified by column chromatography using flash silica gel (60 – 80 µm, Merck) with isocratic elution. TLC was performed on silica gel 60 $F_{254}$ plates (Merck). Melting points were measured on a Stuart SMP10 melting point apparatus. The purity of compounds was determined by $^{1}$H NMR and GC/MS. $^{1}$H and $^{13}$C NMR spectra were recorded on an Agilent 500 MHz spectrometer (500 MHz 1H, 125 MHz $^{13}$C) in deuterated chloroform ($CDCl_3$) unless otherwise specified. NMR assignments were based on COSY, HSQC, NOESY and DEPT experiments. $^{1}$H and $^{13}$C NMR assignments are based on the numbering system used in the systematic name. Low-resolution mass spectra were obtained on an Agilent 6890GC fitted with 5% polysilphenylene, 95% polydimethylsiloxane column, and an Agilent 5973n MS (EI) spectrometer. High-resolution mass spectra were obtained on an Agilent 6510 Accurate-Mass Q-TOF Mass Spectrometer, equipped with an ESI source.

*4.2 Chemistry*

**General Procedure for the Preparation of Ritter Compounds Using Caryophyllene 1***:* A mixture of 98 % $H_2SO_4$ (2 mL) and nitrile reagent (5-time excess) in 100 mL round-bottomed flask fitted with a condenser and drying tube was stirred at 0 $^{o}$C. Caryophyllene **1** (1.00 g, 4.89 mmol) was dissolved in benzene (5 mL) and added to the mixture drop-wise but rapidly. The reaction mixture was stirred at 0 ˚C for 30 min, then at room temperature overnight. Water was added to the mixture and stirring was continued for a further 30 min. The mixture was extracted with diethyl ether. The aqueous layer was washed with NaOH (18 mL, 1 M) or saturated $NaHCO_3$ solution, and extracted with chloroform. The organic layer was dried over $Na_2SO_4$ and the solvent removed under reduced pressure to give the crude product, which was purified by column silica flash chromatography using 60% ethyl acetate: hexane as the eluent to yield the amide product.

***N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]acetamide*** **(2a):** Yield (0.46 g, 36 %) as a white waxy solid. $R_f$ (7:3 ethyl acetate/hexane) 0.46; $[\alpha]_{589}^{20}$ 49.6º (*c* 1.0, $CHCl_3$); $^{1}$H NMR $\delta$ 5.40 (br s, 1H, NH), 2.26-2.36 (m, 2H, H-2, H-11a), 1.87 (s, 3H, C$\underline{H}_3$-18), 1.65-1.80 (m, 3H, H-5, H-3a, H-10a), 1.24-1.60 (m, 8H, 2H-6, 2H-7, 2H-9, H-10b, H-11b), 1.10 (s, 2H, 2H-12), 1.00-1.08 (m, 1H, H-3b), 0.93 (s, 3H, C$\underline{H}_3$-13), 0.92 (s, 3H, C$\underline{H}_3$-14), 0.82 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 169.2 (C=O), 55.6 (C-1), 46.4 ($CH_2$-12), 46.3 (CH-5), 41.3 (CH-2), 38.3 ($CH_2$-3), 38.2 ($CH_2$-7), 37.6 ($CH_2$-9), 35.9 ($CH_2$-11), 34.4 (C-8), 34.4 (C-4), 34.2 ($CH_3$-15), 30.7 ($CH_3$-14), 24.5 ($CH_3$-18), 23.2 ($CH_2$-6), 20.9 ($CH_3$-13), 20.2 ($CH_2$-10); FT-IR $\nu_{max}$ (neat) 3254, 3067, 2945, 2926, 2915, 2861, 1637, 1558, 1457, 1364, 1303, 1221, 1181, 1092, 965, 749 cm$^{-1}$; HRMS (ESI): found 264.2340 $[M+H]^+$, $C_{17}H_{30}NO$ required 264.2327, $[M+H]^+$.

***N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]acetamide*** **(3a):** Yield (0.46 g, 36 %) as a white waxy solid. $R_f$ (7:3 ethyl acetate/methanol) 0.34; $[\alpha]_{589}^{21}$ -24.4º (*c* 1.0, $CHCl_3$); $^{1}$H NMR $\delta$ 5.27 (br d, *J* = 8.5, 1H, NH), 4.12 (ddd, *J* = 12.5, 8.5, 6.0 Hz, 1H, H-2), 1.99 (s, 3H, C$\underline{H}_3$-18), 1.61 (dd, *J* = 12.5, 6.0 Hz, 1H, H-3a), 1.40-1.58 (m, 2H, 2H-10), 1.05-1.41 (m, 10H,

H-3b, H-5, 2H-6, 2H-7, H-9a, 2H-11, H-12a), 1.01-1.16 (m, 1H, H-12b), 1.02 (s, 3H, C$\underline{H}_3$-14), 0.94-1.00 (m, 1H, H-9b), 0.90 (s, 3H, C$\underline{H}_3$-13), 0.87 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 169.7 (C=O), 58.2 (CH-2), 51.5 (CH-5), 46.3 ($CH_2$-3), 44.1 (C-1), 43.5 ($CH_2$-12), 40.7 ($CH_2$-9), 37.9 (C-4), 33.6 ($CH_2$-11), 33.3 ($CH_2$-7), 32.9 ($CH_3$-15), 31.1 ($CH_3$-14), 30.4 (C-8), 24.9 ($CH_3$-13), 23.8 ($CH_3$-18), 23.9 ($CH_2$-6), 19.0 ($CH_2$-10); FT-IR $\nu_{max}$ (neat) 3285, 3083, 2921, 2860, 1643, 1554, 1457, 1375, 1294, 1177, 1111, 1004, 968, 733 cm$^{-1}$; HRMS (ESI): found 264.2334, $[M+H]^+$, $C_{17}H_{30}NO$ required 264.2327, $[M+H]^+$.

***N-[(1R,2S,5R,8R)*-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]propanamide (2b):** Yield (0.75 g, 55 %) as a pale yellow waxy solid. $R_f$ (4:6 diethyl ether/hexane) 0.40;$[\alpha]_{589}^{21}$ 42.9º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.11 (br s, 1H, NH), 2.27-2.31 (m, 2H, H-2, H-11a), 2.13 (q, *J* = 7.5 Hz, 2H, 2H-18), 1.78-1.82 (m, 1H, H-5), 1.74-1.77 (m, 1H, H-10a), 1.71 (dd, *J* = 10.0, 8.0 Hz, 1H, H-7a), 1.11-1.62 (m, 9H, 2H-3, 2H-6, H-7b, 2H-9, H-10b, H-11b), 1.24 (s, 2H, 2H-12), 1.12 (t, *J* = 7.5 Hz, 3H, C$\underline{H}_3$-19), 0.98 (s, 3H, C$\underline{H}_3$-13), 0.97 (s, 3H, C$\underline{H}_3$-14), 0.88 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 172.9 (C=O), 55.3 (C-1), 46.3 (CH-5), 46.3 ($CH_2$-18), 41.3 (CH-2), 38.2 ($CH_2$-12), 38.1 ($CH_2$-3), 37.6 ($CH_2$-7), 36.0 ($CH_3$-15), 34.5 ($CH_2$-9), 34.4 (C-8), 34.2 (C-4), 30.8 ($CH_3$-13), 30.7 ($CH_2$-11), 23.1 ($CH_2$-6), 21.9 ($CH_3$-14), 20.2 ($CH_2$-10), 10.4 ($CH_3$-19); FT-IR $\nu_{max}$ (neat) 3282, 3070, 2946, 2922, 2863, 1642, 1547, 1457, 1360, 1285, 1237, 1180, 1071, 938, 691 cm$^{-1}$; HRMS (ESI): found 278.2475, $[M+H]^+$, $C_{18}H_{32}NO$ required 278.2383, $[M+H]^+$.

***N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]propanamide* (3b):** Yield (0.38 g, 28 %) as a pale yellow waxy solid. $R_f$ (4:6 diethyl ether/hexane) 0.34; $[\alpha]_{589}^{22}$ -4.3º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.25 (br d, *J* = 8.5, 1H, NH), 4.14 (ddd, *J* = 12.5, 8.5, 6.0 Hz, 1H, H-2), 2.21 (q, *J* = 7.5 Hz, 2H, 2H-18), 1.61 (dd, *J* = 11.5, 6.0 Hz, 1H, H-3a), 1.46-1.59 (m, 2H, 2H-10), 1.65 (t, *J* = 7.5 Hz, 3H, C$\underline{H}_3$-19), 1.02 (s, 3H, C$\underline{H}_3$-15), 1.10-1.42 (m, 8H, H-3b, H-5, H-6a, 2H-7, H-9a, H-11a, H-12a), 0.94-1.08 (m, 4H, H-6b, H-9b, H-11b, H-12b), 0.90 (s, 3H, C$\underline{H}_3$-13), 0.87 (s, 3H, C$\underline{H}_3$-14); $^{13}$C NMR $\delta$ 173.3 (C=O), 57.9 (CH-2), 51.5 (CH-5), 46.3 ($CH_2$-3), 44.2 (C-1), 43.5 ($CH_2$-12), 40.7 ($CH_2$-9), 47.9 (C-4), 33.6 ($CH_2$-11), 33.4 ($CH_2$-7), 33.0 ($CH_3$-14), 31.8 ($CH_3$-15), 31.1 (C-8), 30.4 ($CH_2$-18), 24.9 ($CH_3$-13), 20.8 ($CH_2$-6), 19.1 ($CH_2$-10), 10.2 ($CH_3$-19); FT-IR $\nu_{max}$ (neat) 3258, 3082, 2944, 2920, 2860, 1639, 1559, 1460, 1379, 1332, 1277, 1198, 1070, 965, 774 cm$^{-1}$; HRMS (ESI): found 278.2371, $[M+H]^+$, $C_{18}H_{32}NO$ required 278.2383, $[M+H]^+$.

***2-chloro-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]acetamide* (2c):** Yield (0.92 g, 63 %) as a yellow waxy solid. $R_f$ (7:3 chloroform/ethyl acetate) 0.50;$[\alpha]_{589}^{21}$ 30.6º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 6.31 (br s, 1H, NH), 3.95 (s, 2H, 2H-18), 2.38 (ddd, *J* = 19.0, 11.0, 8.0 Hz, 1H, H-2), 2.19-2.24 (m, 1H, H-11a), 1.75-1.85 (m, 2H, H-5, H-10a), 1.72 (dd, *J* = 9.5, 8.0 Hz, 1H, H-9a), 1.42-1.68 (m, 6H, H-3a, H-6a, 2H-7, H-10b, H-11b), 1.32-1.40 (m, 3H, H-6b, 2H-12,), 1.26 (dd, *J* = 11.0, 8.0 Hz, 1H, H-3b), 1.10-1.19 (m, 1H, H-9b), 1.00 (s, 3H, C$\underline{H}_3$-13), 0.99 (s, 3H, C$\underline{H}_3$-14), 0.90 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 164.8 (C=O), 56.0 (C-1), 46.4 (CH-5), 45.6 ($CH_2$-12), 43.2 ($CH_2$-18), 41.3 (CH-2), 38.2 ($CH_2$-3), 37.8 ($CH_2$-7), 37.4 ($CH_2$-9), 35.3 ($CH_2$-11), 34.54 (C-8), 34.5 (C-4), 34.2 ($CH_3$-15), 30.7 ($CH_3$-14), 23.1 ($CH_2$-6), 20.8 ($CH_3$-13), 20.1 ($CH_2$-10); FT-IR $\nu_{max}$

(neat) 3287, 3069, 2946, 2921, 2862, 1657, 1547, 1457, 1357, 1337, 127, 1058, 964, 809, 780, 679 $cm^{-1}$; HRMS (ESI): found 298.1929, $[M+H]^+$, $C_{17}H_{29}ClNO$ required 298.1938, $[M+H]^+$.

***2-chloro-N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]acetamide*** **(3c):** Yield (0.41 g, 28 %) as a yellow waxy solid. $R_f$ (7:3 chloroform/ethyl acetate) 0.43;$[\alpha]_D^{22}$ 3.9º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 6.46 (br d, *J* = 8.5, 1H, NH), 4.00-4.15 (m, 1H, H-2), 4.07 (s, 2H, 2H-18), 1.65 (dd, *J* = 11.5, 6.0 Hz, 1H, H-3a), 1.50-1.60 (m, 2H, 2H-10), 1.43-1.48 (m, 1H, H-3b), 1.15-1.43 (m, 9H, H-5, 2H-6, 2H-7, H-9a, 2H-11, H-12a), 1.05 (s, 3H, C$\underline{H}_3$-15), 0.96-0.99 (m, 2H, H-9b, H-12b), 0.92 (s, 3H, C$\underline{H}_3$-13), 0.88 (s, 3H, C$\underline{H}_3$-14); $^{13}$C NMR $\delta$ 165.4 (C=O), 58.5 (CH-2), 51.4 (CH-5), 46.0 ($CH_2$-3), 44.4 (C-1), 43.5 ($CH_2$-12), 45.6 ($CH_2$-18), 40.6 ($CH_2$-9) 38.1 (C-4), 33.4 ($CH_2$-11), 33.3 ($CH_2$-7), 33.0 ($CH_3$-14), 31.1 ($CH_3$-15), 30.8 (C-8), 24.9 ($CH_3$-13), 20.8 ($CH_2$-6), 19.0 ($CH_2$-10); FT-IR $v_{max}$ (neat) 3283, 3084, 2945, 2921, 2862, 1652, 1541, 1457, 1364, 1334, 1237, 1153, 1095, 968, 856, 778, 711 $cm^{-1}$; HRMS (ESI): found 298.1943, $[M+H]^+$, $C_{17}H_{29}ClNO$ required 298.1938, $[M+H]^+$.

***N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]benzamide*** **(2d) :** Yield (0.91 g, 57 %) as a white glassy solid. $R_f$ (3:2 ethyl acetate/hexane) 0.70;$[\alpha]_D^{21}$ 27.3º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 7.70-7.773 (m, 1H, H-21), 7.44-7.48 (m, 2H, H-19), 7.38-7.43 (m, 2H, H-20), 5.86 (br s, 1H, NH), 2.40-2.50 (m, 2H, H-2, H-11a), 1.92 (dt, *J* = 13.0, 2.0 Hz, 1H, H-12a), 1.78-1.89 (m, 3H, H-5, H-3a, H-10a), 1.63-1.70 (m, 1H, H-10b), 1.12-1.62 (m, 9H, H-3b, 2H-6, 2H-7, 2H-9, H-11b, H-12b), 1.01 (s, 3H, C$\underline{H}_3$-13), 0.97 (s, 3H, C$\underline{H}_3$-14), 0.92 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 166.8 (C=O), 136.8 (C-18), 131,1 (2CH-19), 128.6 (2CH-20), 126.9 (CH-21), 56.0 (C-1), 46.5 ($CH_2$-12), 46.3 (CH-5), 41.7 (CH-2), 38.3 ($CH_2$-3), 38.27 ($CH_2$-7), 37.5 ($CH_2$-9), 35.9 ($CH_2$-11), 34.5 (C-8), 34.47 (C-4), 34.2 ($CH_3$-15), 30.7 ($CH_3$-14), 23.2 ($CH_2$-6), 20.9 ($CH_3$-13), 20.2 ($CH_2$-10); FT-IR $v_{max}$ (neat) 3306, 2945, 2917, 2861, 1638, 1601, 1527, 1486, 1457, 1358, 1304, 1190, 1148, 1072, 1000, 919, 859, 798, 710, 690 $cm^{-1}$; HRMS (ESI): found 326.2495, $[M+H]^+$, $C_{22}H_{32}NO$ required 326.2484, $[M+H]^+$.

***N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]benzamide*** **(3d):** Yield (0.30 g, 19 %) as a white glassy solid. $R_f$ (3:2 ethyl acetate/hexane) 0.66; $[\alpha]_D^{22}$ 18.0º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 7.70-7.79 (m, 1H, H-21), 7.47-7.52 (m, 2H, H-19), 7.39-7.46 (m, 2H, H-20), 6.00 (br d, *J* = 8.5, 1H, NH), 4.35 (ddd, *J* = 12.5, 8.5, 6.0 Hz, 1H, H-2), 1.72 (dd, *J* = 12.5, 6.0 Hz, 1H, H-3a), 1.52-1.57 (m, 2H, 2H-10), 1.48-1.51 (m, 1H, H-3b), 1.12-1.44 (m, 10H, H-5, 2H-6, 2H-7, H-9a, 2H-11, 2H-12), 1.06 (s, 3H, C$\underline{H}_3$-14), 0.96-1.00 (m, 1H, H-9b), 0.96 (s, 3H, C$\underline{H}_3$-13), 0.89 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 165.2 (C=O), 135.3 (C-18), 131.5 (2CH-19), 128.7 (2CH-20), 127.0 (CH-21), 58.5 (CH-2), 51.5 (CH-5), 46.3 ($CH_2$-3), 44.7 (C-1), 43.6 ($CH_2$-12), 40.69 ($CH_2$-9), 38.1 (C-4), 33.7 ($CH_2$-11), 33.4 ($CH_2$-7), 32.9 ($CH_3$-15), 31.1 ($CH_3$-14), 30.4 (C-8), 24.9 ($CH_3$-13), 20.8 ($CH_2$-6), 19.1 ($CH_2$-10); FT-IR $v_{max}$ (neat) 3309, 2942, 2921, 2861, 1631, 1534, 1488, 1457, 1371, 1309, 1290, 1216, 1155, 1071, 923, 800, 691 $cm^{-1}$; HRMS (ESI): found 326.2469, $[M+H]^+$, $C_{22}H_{31}NO$ required 326.2484, $[M+H]^+$.

***N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]pentanamide (*2e):** Yield (0.87 g, 58 %) as a pale yellow waxy solid. $R_f$ (7:3 ethyl acetate/hexane) 0.51; $[\alpha]_{589}^{21}$ 50.7º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.15 (br s, 1H, NH), 2.26-2.36 (m, 2H, H-2, H-11a), 2.10 (t, *J* = 8.0 Hz, 2H, H-18), 1.74-1.83 (m, 2H, H-5, H-10a), 1.71 (dd, *J* = 9.5, 8.0 Hz, 1H, H-7a), 1.06-1.62 (m, 15H, 2H-3, 2H-6, H-7b, 2H-9, H-10b, H-11b, 2H-12, 2H-19, 2H-20), 0.98 (s, 3H, $CH_3$-13), 0.97 (s, 3H, $CH_3$-14), 0.92 (t, *J* = 7.5 Hz, 3H, $CH_3$-21), 0.88 (s, 3H, $CH_3$-15); $^{13}$C NMR $\delta$ 172.6 (C=O), 55.4 (C-1), 46.3 ($CH_2$-12), 46.28 (CH-5), 41.3 (CH-2), 38.3 ($CH_2$-18), 38.2 ($CH_2$-3), 37.6 ($CH_2$-7), 37.5 ($CH_2$-9), 36.0($CH_2$-11), 34.4 (C-8), 34.3 (C-4), 34.2 ($CH_3$-15), 30.7 ($CH_3$-14), 28.3 ($CH_2$-19), 23.1 ($CH_2$-20), 22.6 ($CH_2$-6), 20.9 ($CH_3$-21), 20.2 ($CH_2$-10), 14.0 ($CH_3$-13); FT-IR $v_{max}$ (neat) 3276, 2946, 2924, 2860, 1637, 1544, 1457, 1362, 1341, 1269, 1204, 1105, 937, 809, 728, 691 $cm^{-1}$; HRMS (ESI): found 306.2786, $[M+H]^+$, $C_{20}H_{36}NO$ required 306.2797, $[M+H]^+$.

***5-chloro-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]pentanamide* (2f):** Yield (0.98 g, 59 %) as a pale yellow waxy solid. $R_f$ (7:3 ethyl acetate/hexane) 0.49; $[\alpha]_{589}^{21}$ 27.7º (*c* 1.0, $CHCl_3$); $^1$H NMR (500 MHz, $CDCl_3$) $\delta$ 5.13 (br s, 1H, NH), 3.59 (t, *J* = 6.0 Hz, 2H, 2H-21), 3.55 (t, *J* = 6.0 Hz, 2H, 2H-18), 2.27-2.36 (m, 2H, H-2, H-11a), 1.92-1.98 (m, 2H, 2H-20), 1.69-1.89 (m, 6H, 2H-19, 2H-12, H-7a, H-10a), 1.30-1.64 (m, 6H, H-10b, 2H-6, H-11b, H-9a, H-7b), 1.21-1.25 (m, 2H, H-3a, H-5), 1.08-1.17 (m, 2H, H-3b, H-9b), 0.98 (s, 3H, $CH_3$-13), 0.97 (s, 3H, $CH_3$-14), 0.88 (s, 3H, $CH_3$-15); $^{13}$C NMR $\delta$ 171.4 (C=O), 55.6 (C-1), 46.4 (CH-5), 46.3 ($CH_2$-12), 44.9 ($CH_2$-21), 43.8 ($CH_2$-20), 41.3 (CH-2), 38.3 ($CH_2$-3), 38.2 ($CH_2$-7), 37.5 ($CH_2$-9), 36.6 ($CH_2$-11), 36.1 (C-8), 34.4 (C-4), 34.39 ($CH_3$-15), 34.3 ($CH_2$-19), 31.2 ($CH_2$-18), 30.7 ($CH_3$-14), 22.9 ($CH_2$-6), 20.9 ($CH_3$-13), 20.2 ($CH_2$-10); FT-IR $v_{max}$ (neat) 3295, 2946, 2926, 2864, 1643, 1541, 1457, 1362, 1341, 1281, 1134, 1101, 963, 727 $cm^{-1}$; HRMS (ESI): found 340.2420, $[M+H]^+$, $C_{20}H_{35}ClNO$ required 340.2407, $[M+H]^+$.

***3-chloro-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]propanamide* (2g):** Yield (0.44 g, 29%) as a yellow viscous liquid; $R_f$ (7:3 ethyl acetate/hexane) 0.44; $[\alpha]_{589}^{21}$ 32.3º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.25 (br s, 1H, NH), 3.78 (t, *J* = 6.5 Hz, 2H, 2H-19), 2.55 (t, *J* = 6.5 Hz, 2H, 2H-18), 2.32 (m, 2H, H-2, H-11a), 1.80-1.85 (m, 1H, H-5), 1.73-1.80 (m, 1H, H-10a), 1.71 (dd, *J* = 10.0, 8.0 Hz, 1H, H-3a), 1.61-1.66 (m, 1H, H-10b), 1.26-1.60 (m, 6H, H-3b, 2H-6, H-7a, H-9a, H-11b), 1.24 (s, 2H, H-12), 1.08-1.18 (m, 2H, H-7b, H-9b), 0.99 (s, 3H, $CH_3$-13), 0.97 (s, 3H, $CH_3$-14), 0.88 (s, 3H, $CH_3$-15); $^{13}$C NMR $\delta$ 170.8 (C=O), 58.6 (C-1), 48.8 ($CH_2$-12), 48.7 (CH-5), 43.6 (CH-2), 43.2 ($CH_2$-19), 43.1 ($CH_2$-18), 40.7 ($CH_2$-3), 40.6 ($CH_2$-7), 40.0 ($CH_2$-9), 38.4 ($CH_2$-11), 36.9 (C-8), 36.9 (C-4), 36.6 ($CH_3$-15), 33.2 ($CH_3$-14), 25.5 ($CH_2$-6), 23.4 ($CH_3$-13), 22.6 ($CH_2$-10); FT-IR $v_{max}$ (neat) 3293, 2945, 2923, 2863, 1644, 1551, 1457, 1376, 1333, 1286, 1219, 1154, 1101, 988, 944, 813, 778, 654 $cm^{-1}$; HRMS (ESI): found 312.2097, $[M+H]^+$, $C_{18}H_{31}ClNO$ required 312.2094, $[M+H]^+$.

***2-amino-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]acetamide* (2h):** The amide was synthesised from caryophyllene **1** (1.00 g, 4.89 mmol) and aminoacetonitrile hydrogen sulfate (5-mole equiv.) *via* the Ritter reaction as described in the general procedure. The product was purified by column chromatography to yield amide (1.09 g, 75 %) as a brown

viscous liquid. $R_f$ (4:1 ethyl acetate/methanol) 0.33; $[\alpha]_{589}^{21}$ -21.0º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 7.54 (br s, 1H, NH), 3.29 (br s, 2H, 2H-18), 2.47-2.53 (m, 2H, H-2, H-11a), 1.80-1.90 (m, 1H, H-3a), 1.56-1.67 (m, 4H, H-7a, 2H-10, H-11b), 1.40-1.55 (m, 2H, 2H-9), 1.16-1.40 (m, 7H, H-3b, H-5, 2H-6, H-7b, 2H-12), 1.28 (s, 3H, C$\underline{H}_3$-13), 1.24 (s, 3H, C$\underline{H}_3$-14), 1.05 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 170.5 (C=O), 57.1 (CH-5), 56.0 (C-1), 53.6 (C-8), 49.1 ($CH_2$-18), 44.2 ($CH_2$-12), 35.8 (C-4), 31.8 ($CH_3$-14), 31.5 ($CH_3$-15), 30.6 ($CH_2$-3), 30.4 ($CH_2$-7), 29.9 ($CH_2$-9), 29.1 (CH-2), 22.2 ($CH_3$-13), 21.9 ($CH_2$-11), 21.7 ($CH_2$-6), 28.0 ($CH_2$-10); FT-IR $v_{max}$ (neat) 3391, 2921, 2867, 1654, 1521, 1449, 1370, 1241, 1223, 1189, 1020, 992, 919, 807, 729 cm$^{-1}$; HRMS (ESI): found 279.2446, $[M+H]^+$, $C_{17}H_{31}N_2O$ required 279.2436, $[M+H]^+$.

***S-methyl-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]carbamothioate* (2i):** The amide was synthesised from caryophyllene **1** (1.00 g, 4.89 mmol) and methyl thiocyanate (5-mole equiv.) *via* the Ritter reaction as described in the general procedure. The product was purified by column chromatography to yield amide (0.015 g, 1 %) as an orange viscous liquid. $R_f$ (7:3 ethyl acetate/hexane) 0.42; $[\alpha]_{589}^{21}$ 31.0º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.30 (s, 3H, C$\underline{H}_3$-18), 2.16-2.22 (m, 2H, H-2, H-11a), 1.82-1.86 (m, 2H, H-3a, H-5), 1.50-1.80 (m, 6H, 2H-6, H-9a, H-11b, 2H-10), 1.44-1.50 (m, 1H, H-3b), 1.34-1.42 (m, 3H, 2H-7, H-9b), 1.12-1.20 (m, 2H, H-12), 1.02 (br s, 6H, C$\underline{H}_3$-15, C$\underline{H}_3$-14), 0.98 (s, 3H, C$\underline{H}_3$-13); $^{13}$C NMR $\delta$ 209.4 (C=O), 68.9 (C-1), 46.9 (CH-5), 44.8 (CH-2), 43.0 ($CH_2$-12), 33.6 ($CH_2$-3), 32.9 ($CH_2$-7), 32.1 ($CH_2$-9), 31.4 ($CH_3$-15), 31.3 (C-8), 30.0 (C-4), 26.3 ($CH_2$-11), 24.6 ($CH_3$-13), 23.0 ($CH_3$-14), 17.4 ($CH_2$-6), 14.3 ($CH_2$-10), 12.1 ($CH_3$-18); FT-IR $v_{max}$ (neat) 3196, 2924, 2861, 1647, 1558, 1449, 1396, 1363, 1190, 1165, 1070, 1037, 963, 789 cm$^{-1}$; HRMS (ESI): found 296.2057, $[M+H]^+$, $C_{17}H_{30}NOS$ required 296.2048, $[M+H]^+$.

***N-[(1S,2S,5S,8S)-9-hydroxy-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]acetamide (5a):*** A mixture of 98 % $H_2SO_4$ (2 mL), and acetonitrile (5-time excess) in 100 mL round-bottomed flask fitted with a condenser and drying tube, was stirred at 0 $^o$C. Monoepoxide **4** (0.250 g, 1.14 mmol) was dissolved in benzene (5 mL) and added to the mixture drop-wise but rapidly. The reaction mixture was stirred at 0 ˚C for 4 min. The reaction mixture was stirred for 4 min at 0º C then washed with saturated $NaHCO_3$ and extracted with chloroform. The organic layer was dried over $Na_2SO_4$ and the solvent removed under reduced pressure. The product was purified by column chromatography to yield the amide product.

Yield (0.06 g, 20%) as a white glassy solid. $R_f$ (1:1 ethyl acetate/hexane) 0.28; $[\alpha]_{589}^{22}$ -28.7º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.31 (br d, *J* = 9.5, 1H, NH), 4.14 (ddd, *J* = 12.5, 9.5, 6.0 Hz, 1H, H-2), 3.47 (q, *J* = 7.0 Hz, 1H, H-9), 1.98 (s, 3H, C$\underline{H}_3$-18), 1.80-2.00 (m, 1H, H-10a), 1.71 (br s, OH), 1.56 (d, *J* = 13.0 Hz, 1H, H-12a), 1.54-1.66 (m, 2H, H-3a, H-10b), 1.44-1.50 (m ,1H, H-11a), 1.35-1.45(m, 5H, H-3b, H-5, 2H-6, H-7a), 1.06-1.14 (m, 2H, H-7b, H-12b), 1.02 (s, 3H, C$\underline{H}_3$-14), 0.94 (s, 3H, C$\underline{H}_3$-15), 0.91 (s, 3H,C$\underline{H}_3$-13), 0.84-1.00 (m, 1H, H-11b); $^{13}$C NMR $\delta$ 169.9 (C=O), 75.3 (CH-9), 57.8 (CH-2), 50.7 (CH-5), 46.1 ($CH_2$-3), 43.70 (C-1), 37.8 (C-4), 35.7 ($CH_2$-12), 35.0 (C-8), 33.2 ($CH_2$-7), 31.1 ($CH_3$-14), 28.33 ($CH_3$-15), 27.8 ($CH_2$-11), 25.6 ($CH_2$-10), 24.8 ($CH_3$-13), 23.9 ($CH_3$-18), 20.7 ($CH_2$-6); FT-IR $v_{max}$ (neat) 3586, 3288, 2950, 2930, 2867, 1650, 1544, 1532, 1456,

1366, 1222, 1219, 1160, 1033, 966, 911, 775, 725 $cm^{-1}$; HRMS (ESI): found 280.2273, $[M+H]^+$, $C_{17}H_{30}NO_2$ required 280.2276, $[M+H]^+$.

***General Procedure for the Preparation of diamides from Monoepoxide 4:*** A mixture of 98 % $H_2SO_4$ (2 mL) and nitrile reagent (5-time excess) in 100 mL round-bottomed flask fitted with a condenser and drying tube was stirred at 0 °C. Monoepoxide **4** (1.00 g, 4.89 (0.250 g, 1.14 mmol) was dissolved in benzene (5 mL) and added to the mixture drop-wise but rapidly. The reaction mixture was stirred at 0 ˚C for 30 min, then at room temperature overnight. Water was added to the mixture and stirring was continued for a further 30 min. The mixture was extracted with diethyl ether. The aqueous layer was washed with NaOH (18 mL, 1 M) or saturated $NaHCO_3$ solution, and extracted with chloroform. The organic layer was dried over $Na_2SO_4$ and the solvent removed under reduced pressure. The product was purified by column chromatography to yield the amide product.

***N-[(1S,2S,5S,8S)-2-acetamido-4,4,8-trimethyl-9-tricyclo[6.3.1.01,5]dodecanyl]acetamide* (6a):** Yield (0.26 g, 71%) as a white glassy solid. $R_f$ (7:3 ethyl acetate/hexane) 0.51; $[\alpha]_{589}^{22}$ -54.4º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.73 (br d, *J* = 9.0 Hz, 1H, H-16/19), 5.36 (br d, *J* = 9.0, 1H, H-16/19), 4.12 (ddd, *J* = 12.5, 9.0, 5.5 Hz, 1H, H-2), 3.67 (br d, *J* = 9.0 Hz, 1H, H-9), 2.03 (s, C$\underline{H}_3$-18/21), 1.99 (C$\underline{H}_3$-18/21), 1.50-1.64 (m, 4H, H-3a, 2H-10, H-7a), 1.40-1.50 (m, 1H, H-6a), 1.24-1.45 (m, 4H, H-7b, H-3b, H-5, H-12a), 1.18-1.24 (m, 1H, H-11a), 1.03 (s, 3H, C$\underline{H}_3$-15), 0.96-1.04 (m, 2H, H-6b, H-11b), 0.91 (s, 3H, C$\underline{H}_3$-13), 0.87 (s, 3H, C$\underline{H}_3$-14), 0.86-0.89 (m, 1H, H-12b); $^{13}$C NMR $\delta$ 170.2 (C-17/20), 169.9 (C-17/20), 58.4 (CH-2), 53.4 (CH-9), 51.1 (CH-5), 46.2 ($CH_2$-3), 43.8 (C-1), 37.94 (C-4), 37.9 ($CH_2$-12), 34.3 ($CH_2$-7), 33.5 (C-8), 30.8 ($CH_3$-15), 29.0 ($CH_2$-11), 28.7 ($CH_3$-14), 24.8 ($CH_3$-13), 23.9 ($CH_3$-18/21), 23.84 ($CH_3$-18/21), 23.8 ($CH_2$-10), 20.6 ($CH_2$-6); FT-IR $v_{max}$ (neat) 3289, 2935, 2859, 1635, 1540, 1455, 1372, 1222, 1102, 1030, 911, 859, 736 $cm^{-1}$; HRMS (ESI): found 321.2551, $[M+H]^+$, $C_{19}H_{33}N_2O_2$ required 321.2542, $[M+H]^+$.

***2-chloro-N-[(1S,2S,5S,8S)-2-[(2-chloroacetyl)amino]-4,4,8-trimethyl-9-tricyclo[6.3.1.01,5]dodecanyl]acetamide* (6b):** Yield (0.15 g, 34%) as a yellow glassy solid; $R_f$ (7:3 ethyl acetate/hexane) 0.52; $[\alpha]_{589}^{22}$ -15.4º (*C* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 6.78 (d, *J* = 9.0 Hz, 1H, H-16), 6.44 (d, *J* = 9.5 Hz, 1H, H-19), 4.12 (ddd, *J* = 12.5, 9.0, 6.0 Hz, 1H, H-2), 4.07 (s, 2H, H-18), 4.05 (s, 2H, H-21), 3.52 (br d, *J* = 9.5 Hz, 1H, H-9), 2.01-2.08 (m, 1H, H-10a), 1.68 (dd, *J* = 11.5, 6.0 Hz, 1H, H-3a), 1.60-1.65 (m, 1H, H-10b), 1.52-1.58 (m, 1H, H-7a), 1.42-1.52 (m, 4H, H-3b, H-5, 2H-6), 1.30-1.35 (m, 1H, H-7b), 1.24-1.28 (m, 2H, 2H-12), 1.10-1.20 (m, 2H, 2H-11), 1.07 (s, 3H, C$\underline{H}_3$-15), 0.94 (s, C$\underline{H}_3$-13), 0.89 (s, C$\underline{H}_3$-14); $^{13}$C NMR $\delta$ 165.9 (C-17/20), 165.4 (C-17/20), 58.3 (CH-2), 53.4 (CH-9), 50.9 (CH-5), 45.6 ($CH_2$-3), 44.0 (C-1), 43.2 ($CH_2$-18/21), 43.0 ($CH_2$-18/21), 38.2 (C-4), 47.6 ($CH_2$-12), 34.0 ($CH_2$-7), 33.7 (C-8), 30.9 ($CH_3$-15), 28.7 ($CH_2$-11), 28.5 ($CH_3$-14), 24.7 ($CH_3$-13), 23.5 ($CH_2$-10), 20.5 ($CH_2$-6); FT-IR $v_{max}$ (neat) 3284, 2949, 2928, 2865, 1653, 1540, 1533, 1457, 1410, 1365, 1229, 1167, 1037, 968, 773, 730 $cm^{-1}$; HRMS (ESI): found 389.1746, $[M+H]^+$, $C_{19}H_{31}Cl_2N_2O_2$ required 389.1762, $[M+H]^+$.

***N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-(pentanoylamino)-9-tricyclo[6.3.1.01,5]dodecanyl]pentanamide*** **(6c):** Yield (0.04 g, 9%) as a white glassy solid; $R_f$ (7:3 ethyl acetate/hexane) 0.67; $[\alpha]_{589}^{22}$ -63.9º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.60 (d, *J* = 9.0 Hz, 1H, H-16/22), 5.35 (d, *J* = 9.0 Hz, 1H, H-16/22), 4.12 (ddd, *J* = 12.5, 9.0, 6.0 Hz, 1H, H-2), 3.64 (br d, *J* = 9.0 Hz, 1H, H-9), 2.20 (t, *J* = 7.5 Hz, 2H, H-18/24), 2.13 (t, *J* = 7.5 Hz, 2H, H-18/24), 1.92-2.00 (m, 1H, H-10a), 1.52-1.67 (m, 6H, H-3a, H-10b, 2H-19, 2H-25), 1.46-1.52 (m, 2H, 2H-7), 1.40-1.46 (m, 2H, 2H-6), 1.28-1.40 (m, 10H, H-3b, H-5, 2H-11, 2H-12, 2H-20, 2H-26), 1.02 (s, 3H, C$\underline{H}_3$-15), 0.92 (t, *J* = 7.0 Hz, 3H, C$\underline{H}_3$-21/27), 0.90 (t, *J* = 7.0 Hz, 3H, C$\underline{H}_3$-21/27), 0.90 (s, 3H, C$\underline{H}_3$-13), 0.85 (s, C$\underline{H}_3$-14); $^{13}$C NMR $\delta$ 173.3 (C-17/23), 172.9 (C-17/23), 58.2 (CH-2), 53.2 (CH-9), 51.1 (CH-5), 46.2 ($CH_2$-3), 43.9 (C-1), 38.0 (C-4), 37.9 ($CH_2$-12), 37.1 ($CH_2$-18/24), 36.9 ($CH_2$-18/24), 34.3 ($CH_2$-7), 33.4 (C-8), 30.8 ($CH_3$-15), 28.9 ($CH_2$-11), 28.8 ($CH_3$-14), 28.3 ($CH_2$-19/25), 28.1 ($CH_2$-19/25), 24.8 ($CH_3$-13), 23.8 ($CH_2$-10), 22.61 ($CH_2$-20/26), 22.6 ($CH_2$-20/26), 20.6 ($CH_2$-6), 14.0 ($CH_3$-21 and $CH_3$-27); FT-IR $v_{max}$ (neat) 3296, 2952, 2925, 2860, 1636, 1541, 1458, 1376, 1270, 1223, 1193, 1106, 993, 950, 853 cm$^{-1}$; HRMS (ESI): found 405.3478, $[M+H]^+$, $C_{25}H_{45}N_2O_2$ required 405.3481, $[M+H]^+$.

***N-[(1S,2S,5S,8S)-2-benzamido-4,4,8-trimethyl-9-tricyclo[6.3.1.01,5]dodecanyl]benzamide*** **(6d):** Yield (0.09 g, 17%) as a yellow viscous liquid; $R_f$ (3:2 ethyl acetate/hexane) 0.80; $[\alpha]_{589}^{22}$ 0.36º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 7.75 (d, *J* = 7.0 Hz, 2H, 2H-19/27), 7.66 (d, *J* = 7.0 Hz, 2H, 2H-19/27), 7.50 (t, *J* = 7.0 Hz, 1H, H-21/29), 7.46 (t, *J* = 7.0 Hz, 1H, H-21/29), 7.40 (t, *J* = 7.0 Hz, 2H, 2H-20/28), 7.33 (t, *J* = 7.0 Hz, 2H, 2H-20/28), 6.31 (d, *J* = 9.0 Hz, 1H, H-24), 5.32 (d, *J* = 8.5 Hz, 1H, H-16), 4.36 (ddd, *J* = 12.5, 8.5, 6.0 Hz, 1H, H-2), 3.86 (br d, *J* = 9.0 Hz, 1H, H-9), 2.10-2.03 (m, 1H, H-10a), 1.68-1.76 (m, 2H, H-3a, H-10b), 1.56-1.62 (m, 2H, H-7a, H-12a), 1.46-1.56 (m, 3H, H-6a, H-3b, H-5), 1.34-1.44 (m, 4H, H-6b, H-11a, H-7b, H-12b), 1.12-1.20 (m, 1H, H-11b), 1.07 (s, 3H, C$\underline{H}_3$-15), 0.97 (s, 3H, C$\underline{H}_3$-13), 0.96 (s, 3H, C$\underline{H}_3$-14); $^{13}$C NMR $\delta$ 167.7 (C-17/25), 167.3 (C-17/25), 135.3 (C-18/26), 134.8 (C-18/26), 131.7 (CH-21/29), 131.4 (CH-21/29), 128.8 (2CH-20), 128.7 (2CH-28), 127.0 (2CH-19), 126.9 (2CH-27), 58.8 (CH-2), 53.9 (CH-9), 51.3 (CH-5), 46.1 ($CH_2$-3), 44.4 (C-1), 38.2 (C-4), 38.1 ($CH_2$-12), 34.2 ($CH_2$-7), 33.8 (C-8), 30.8 ($CH_3$-15), 29.0 ($CH_2$-11), 28.9 ($CH_3$-14), 24.8 ($CH_3$-13), 23.7 ($CH_2$-10), 20.6 ($CH_2$-6); FT-IR $v_{max}$ (neat) 3296, 2947, 2923, 2863, 1633, 1577, 1521, 1486, 1464, 1309, 1287, 1222, 1026, 995, 840, 798, 690 cm$^{-1}$; HRMS (ESI): found 445.2870, $[M+H]^+$, $C_{29}H_{37}N_2O_2$ required 445.2855, $[M+H]^+$.

***N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-(propanoylamino)-9-tricyclo[6.3.1.01,5]dodecanyl]propanamide*** **(6e):** Yield (0.22 g, 56%) as a white glassy solid; $R_f$ (1:1 chloroform/ethyl acetate) 0.57; $[\alpha]_{589}^{22}$ -33.4º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 5.65 (d, *J* = 8.5 Hz, 1H, H-16), 5.32 (d, *J* = 9.0 Hz, 1H, H-20), 4.13 (ddd, *J* = 12.0, 8.5, 6.0 Hz, 1H, H-2), 3.67 (br d, *J* = 9.0 Hz, 1H, H-9), 2.24 (q, *J* = 7.5 Hz, 2H, 2H-18), 2.19 (q, *J* = 7.5 Hz, 2H, 2H-22), 1.94-2.02 (m, 1H, H-10a), 1.63 (dd, *J* = 12.0, 6.0 Hz, 1H, H-3a), 1.54-1.60 (m, 1H, H-10b), 1.51 (dt, *J* = 11.0, 2.5 Hz, 1H, H-7a), 1.43-1.48 (m, 1H, H-6a), 1.35-1.42 (m, 2H, H-3b, H-5), 1.22-1.34 (m, 3H, H-7b, 2H-12), 1.18 (t, *J* = 7.5 Hz, 3H, C$\underline{H}_3$-19), 1.14 (t, *J* = 7.5 Hz, 3H, C$\underline{H}_3$-23), 1.14-1.18 (m, 1H, H-11a), 1.03 (s, 3H, C$\underline{H}_3$-15), 0.98-1.00 (m, 1H, H-11b), 0.94-0.98 (m, 1H, H-6b), 0.91 (s, C$\underline{H}_3$-13), 0.87 (s, C$\underline{H}_3$-14); $^{13}$C NMR $\delta$ 174.0 (C-17), 173.5 (C-21), 77.4 (CH-2), 58.2 (CH-9), 53.2

(CH-5), 51.1 ($CH_2$-3), 46.2 (C-1), 38.0 (C-4), 37.9 ($CH_2$-12), 34.3 ($CH_2$-7), 33.5 (C-8), 30.8 ($CH_3$-15), 30.3 ($CH_2$-18/22), 30.1 ($CH_2$-18/22), 28.9 ($CH_2$-11), 28.7 ($CH_3$-14), 24.7 ($CH_3$-13), 23.8 ($CH_2$-10), 20.6 ($CH_2$-6), 10.3 ($CH_3$-19/23), 10.2 ($CH_3$-19/23); FT-IR $\nu_{max}$ (neat) 3297, 2937, 2864, 1637, 1541, 1459, 1375, 1223, 1173, 1102, 1020, 907, 804, 728 $cm^{-1}$; HRMS (ESI): found 349.2864, $[M+H]^+$, $C_{21}H_{37}N_2O_2$ required 349.2855 $[M+H]^+$.

***General procedure for amide cleavage under mild conditions using thiourea:*** Amide **2c**, **3c** (0.10 g, 0.34 mmol) or **6a** (0.10 g, 0.26 mmol) was dissolved in dry EtOH (15 mL) and placed in a round bottom flask fitted with a drying tube, thiourea (5 mol eqv.), and $NaBH_4$ (10 mol eqv.) was added slowly. A few drops of acetic acid were added, and the mixture was stirred overnight at room temperature. The reaction was quenched with saturated $NaHCO_3$ (20 mL), extracted with $CHCl_3$ (20 mL x 2), and washed with saturated NaCl (20 mL). The organic layer was dried with $Na_2CO_3$ and solvent was removed under reduced pressure. The product was purified by washing with hexane to yield the amine product.

***(1R,2S,5R,8R)-4,4,8-trimethyltricyclo[6.3.1.02,5]dodecan-1-amine* (7):**

Yield (0.04 g, 58 %) as a brown viscous liquid; $[\alpha]_{589}^{22}$ -8.6º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.37 (ddd, *J* = 12.0, 11.0, 8.0 Hz, 1H, H-2), 1.84-1.96 (m, 2H, H-5, H-10a), 1.73-1.78 (m, 2H, 2H-12), 1.67-1.73 (m, 1H, H-10b), 1.1-1.66 (m, 10H, 2H-3, 2H-6, 2H-7, 2H-9, 2H-11), 1.05 (s, 3H, C$\underline{H}_3$-13), 1.04 (s, 3H, C$\underline{H}_3$-14), 0.92 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 54.0 (C-1), 47.9 ($CH_2$-12), 46.4 (CH-5), 39.8 (CH-2), 38.5 ($CH_2$-3), 38.2 ($CH_2$-7), 37.7 ($CH_2$-9), 36.3 ($CH_2$-11), 36.0 (C-8), 35.5 (C-4), 34.1 ($CH_3$-15), 30.7 ($CH_3$-14), 23.3 ($CH_2$-6), 21.1 ($CH_3$-13), 20.0 ($CH_2$-10); FT-IR $\nu_{max}$ (neat) 3296, 3190, 2945, 2921, 2862, 1638, 1542, 1457, 1376, 1363, 1286, 1223, 1199, 1100, 1064, 987, 922, 871, 733, 655 $cm^{-1}$; HRMS (ESI): found 222.2214, $[M+H]^+$, $C_{15}H_{28}N$ required 222.2222 $[M+H]^+$.

***(1S,2S,5S,8S)-4,4,8-trimethyltricyclo[6.3.1.01,5]dodecan-2-amine* (8):** Yield (0.05 g, 65%) as a brown viscous liquid; $[\alpha]_{589}^{22}$ 9.2º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.86 (dd, *J* = 12.0, 5.5 Hz, 1H, H-2), 1.57 (dd, *J* = 12.0, 5.5 Hz, 1H, H-3a), 1.50-1.60 (m, 2H, 2H-10), 1.04-1.26 (m, 9H, H-3b, H-5, 2H-6, 2H-7, H-9a, H-11a, H-12a), 1.01 (s, 3H, C$\underline{H}_3$-14), 0.89 (s, 3H, C$\underline{H}_3$-13), 0.84 (s, 3H, C$\underline{H}_3$-15), 0.85-0.96 (m, 3H, H-9b, H-11b, H-12b); $^{13}$C NMR $\delta$ 61.7 (CH-2), 51.8 (CH-5), 49.5 ($CH_2$-3), 43.5 (C-1), 41.2 ($CH_2$-12), 37.5 ($CH_2$-9), 33.4 (C-4), 33.2 ($CH_2$-11), 31.5 ($CH_2$-7), 31.4 ($CH_3$-15), 30.6 ($CH_3$-14), 25.3 (C-8), 20.9 ($CH_3$-13), 19.0 ($CH_2$-10), 14.3 ($CH_2$-6); FT-IR $\nu_{max}$ (neat) 3294, 2942, 2928, 2860, 1641, 1552, 1467, 1388, 1366, 1276, 1202, 1100, 1064, 998, 852, 781, 667 $cm^{-1}$; HRMS (ESI): found 222.2213, $[M+H]^+$, $C_{15}H_{28}N$ required 222.2222 $[M+H]^+$.

***(1S,2S,5S,8S,9R)-4,4,8-trimethyltricyclo[6.3.1.01,5]dodecan-2,9-diamine* (9):** Yield (0.02 g, 33 %) as a brown viscous liquid; $[\alpha]_{589}^{23}$ -13.3º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.87 (dd, *J* = 12.5, 6.0 Hz, 1H, H-2), 2.50 (br s, 1H, H-9), 1.97-2.05 (m, 1H, H-10a), 1.38-1.60 (m, 6H, H-3a, H-6a, H-

7a, H-10b, H-11a, H-12a), 1.30-1.36 (m, 2H, H-3b, H-5), 1.16-1.21 (m, 1H, H-7b), 1.01 (s, 3H, C$\underline{H}_3$-15), 0.91 (s, 3H, C$\underline{H}_3$-14), 0.86-0.910 (m, 1H, H-11b), 0.84 (s, 3H, C$\underline{H}_3$-13), 0.75-0.85 (m, 2H, H-6b, H-12b); $^{13}$C NMR $\delta$ 61.6 (CH-2), 56.4 (CH-9), 51.5 (CH-5), 49.4 ($CH_2$-3), 43.6 (C-1), 37.4 (C-4), 35.6 ($CH_2$-12), 34.8 ($CH_2$-7), 34.5 (C-8), 31.3 ($CH_3$-15), 29.8 ($CH_3$-14), 29.1 ($CH_2$-11), 26.2 ($CH_2$-10), 25.2 ($CH_3$-13), 20.9 ($CH_2$-6); FT-IR $\nu_{max}$ (neat) 2923, 2861, 1560, 1458, 1377, 1364, 1284, 1228, 1021, 989, 816, 700 cm$^{-1}$; HRMS (ESI): found 237.2341, $[M+H]^+$, $C_{15}H_{29}N_2$ required 237.2331, $[M+H]^+$.

***General Procedure for the Reductive Alkylation of Amine* 7:** Amine **7** (0.10 g, 0.45 mmol) was dissolved in DCM (5 mL) and placed in a round bottom flask fitted with a drying tube, aldehyde (5 mol equiv.), and $NaBH(OAc)_3$ (10 mol equiv.) was added slowly. The pH of the reaction mixture was adjusted to pH = 4 *via* the addition of acetic acid. The mixture was stirred overnight at room temperature. The reaction was quenched with saturated $NaHCO_3$ (20 mL), extracted with $CHCl_3$ (20 mL x 2), and washed with saturated NaCl (20 mL). The organic layer was dried with $Na_2CO_3$ and solvent was removed under reduced pressure. The product was purified by column chromatography to yield the amine.

***(1R,2S,5R,8R)-N,N,4,4,8-pentamethyltricyclo[6.3.1.02,5]dodecan-1-amine (10a):*** Yield (0.08 g, 71 %) as a viscous liquid; $R_f$ (1:1 diethyl ether/hexane) 0.62; $[\alpha]_{589}^{22}$ -8.6º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.21 (br s, 6H, C$\underline{H}_3$-17, C$\underline{H}_3$-18), 2.16 (ddd, *J* = 14.5, 12.0, 9.0 Hz, 1H, H-2), 1.85 (ddd, *J* = 14.5, 12.5, 7.0 Hz, 1H, H-5), 1.72-1.80 (m, 1H, H-10a), 1.68-1.72 (m, 2H, 2H-3), 1.59-1.65 (m, 1H, H-10b), 1.51-1.58 (m, 2H, H-9a, H-12a), 1.36-1.48 (m, 3H, H-6a, H-7a, H-11a), 1.22-1.35 (m, 2H, H-6b, H-11b), 1.16-1.12 (m, 1H, H-9b), 1.10-1.08 (m 2H, H-7b, H-12b), 0.99 (s, 3H, C$\underline{H}_3$-13), 0.96 (s, 3H, C$\underline{H}_3$-14), 0.87 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 57.9 (C-1), 46.1 (CH-5), 45.3 ($CH_2$-12), 40.7 (CH-2), 39.7 (2$CH_3$-17 and 18), 38.9 ($CH_2$-3), 37.2 ($CH_2$-7), 35.0 ($CH_2$-9), 34.4 (C-8), 34.2 (C-4), 30.4 ($CH_3$-15), 30.4 ($CH_3$-13), 28.1 ($CH_2$-11), 22.4 ($CH_2$-10), 21.0 ($CH_3$-14), 20.2 ($CH_2$-6); FT-IR $\nu_{max}$ (neat) 2920, 2858, 2817, 2774, 1457, 1345, 1361, 1333, 1281, 1249, 1188, 1102, 1019, 968, 870, 797, 732 cm$^{-1}$; HRMS (ESI): found 250.2547, $[M+H]^+$, $C_{17}H_{32}N$ required 250.2535, $[M+H]^+$.

***(1R,2S,5R,8R)-4,4,8-trimethyl-N-propyl-tricyclo[6.3.1.02,5]dodecan-1-amine (10b)*:** Yield (0.08 g, 69 %) as a viscous liquid; $R_f$ (7:3 diethyl ether/hexane) 0.45; $[\alpha]_{589}^{22}$ 0.1º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.68 (ddd, *J* = 16.0, 11.0, 6.0 Hz, 1H, H-17a, splitting due to slow rotation), 2.43 (ddd, *J* = 16.0, 11.0, 6.0 Hz, 1H, H-17b, splitting due to slow rotation), 2.13-2.20 (m, 1H, H-2), 1.94-2.02 (m, 1H, H-5), 1.84-1.88 (m, 1H, H-12a), 1.62-1.74 (m, 6H, H-7a, H-9a, 2H-10, 2H-18), 1.38-1.54 (m, 4H, H-3a, H-6a, H-7b, H-9b), 1.26-1.34 (m, 1H, H-6b), 1.20-1.22 (m, 1H, H-12b), 1.07-1.16 (m, 2H, H-3b, H-11a), 1.03 (s, 3H, C$\underline{H}_3$-13), 0.98-0.99 (m, 1H, H-11b), 0.97 (s, 3H, C$\underline{H}_3$-14), 0.89 (t, *J* = 7.0 Hz, 3H, C$\underline{H}_3$-19), 0.86 (s, 3H, C$\underline{H}_3$-15); $^{13}$C NMR $\delta$ 57.5 (C-1), 46.0 ($CH_2$-12), 44.2 (CH-5), 39.8 ($CH_2$-17), 38.2 (CH-2), 37.5 ($CH_2$-3), 37.4 ($CH_2$-7), 35.2 (C-8), 34.5 (C-4), 34.4 ($CH_2$-9), 34.2 ($CH_3$-15), 32.7 ($CH_2$-11), 30.2 ($CH_3$-13), 23.3 ($CH_2$-6), 22.3 ($CH_2$-18), 20.7

($CH_3$-14), 20.2 ($CH_2$-10), 12.0 ($CH_3$-19); FT-IR $v_{max}$ (neat) 2921, 2863, 1559, 1457, 1397, 1378, 1288, 1222, 1121, 1020, 964, 752 $cm^{-1}$; HRMS (ESI): found 264.2688, $[M+H]^+$, $C_{18}H_{34}N$ required 264.2691, $[M+H]^+$.

***(1R,2S,5R,8R)-N-butyl-4,4,8-trimethyl-tricyclo[6.3.1.02,5]dodecan-1-amine (10c)*:** Yield (0.06 g, 50 %) as a viscous liquid; $R_f$ (7:3 diethyl ether/hexane) 0.50; $[\alpha]_{589}^{23}$ 0.8º (*c* 1.0, $CHCl_3$); $^1H$ NMR $\delta$ 2.88 (ddd, *J* = 16.5, 11.5, 6.5 Hz, 1H, H-17a, due to slow rotation), 2.59 (ddd, *J* = 16.5, 11.5, 6.5 Hz, 1H, H-17b, due to slow rotation), 2.24 (ddd, *J* = 12.5, 8.0, 5.0 Hz, 1H, H-2), 2.16-2.28 (m, 2H, H-5, H-12a), 1.90-2.00 (m, 2H, H-18), 1.82-1.90 (m, 4H, 2H-7, 2H-19), 1.70-1.76 (m, 2H, H-10a, H-11a), 1.57-1.66 (m, 1H, H-11b), 1.48-1.54 (m, 3H, H-3a, H-6a, H-12b), 1.40-1.46 (m, 1H, H-9a), 1.28-1.38 (m, 2H, H-6b, H-10b), 1.16-1.22 (m, 2H, H-3b, H-9b), 1.10 (s, 3H, $CH_3$-14), 0.99 (s, 3H, $CH_3$-13), 0.92 (s, 3H, $CH_3$-15), 0.92 (t, *J* = 8.0 Hz, 3H, $CH_3$-20); $^{13}C$ NMR $\delta$ 60.8 (C-1), 46.0 (CH-5), 44.1 ($CH_2$-12), 42.3 ($CH_2$-17), 39.3 (CH-2), 38.4 ($CH_2$-3), 37.6 ($CH_2$-7), 36.8 ($CH_2$-9), 35.4 (C-8), 34.5 (C-4), 34.3 ($CH_3$-15), 32.9 ($CH_2$-11), 29.9 ($CH_3$-14), 28.5 ($CH_2$-18), 23.4 ($CH_2$-19), 20.5 ($CH_2$-6), 19.8 ($CH_3$-13), 18.5 ($CH_2$-10), 13.6 ($CH_3$-21); FT-IR $v_{max}$ (neat) 2949, 2925, 2865, 2728, 1583, 1458, 1379, 1363, 1264, 1121, 1093, 1001, 965, 897, 797, 735 $cm^{-1}$; HRMS (ESI): found 278.2835, $[M+H]^+$, $C_{19}H_{36}N$ required 278.2848, $[M+H]^+$.

***(1R,2S,5R,8R)-4,4,8-trimethyl-N-pentyl-tricyclo[6.3.1.02,5]dodecan-1-amine* (10d):** Yield (0.10 g, 79 %) as a viscous liquid; $R_f$ (1:1 diethyl ether/hexane) 0.53; $[\alpha]_{589}^{23}$ 2.0º (*c* 1.0, $CHCl_3$); $^1H$ NMR $\delta$ 5.65 (br s, 1H, NH), 2.64 (ddd, *J* = 16.5, 11.0, 9.0 Hz, 1H, H-17a, splitting due to slow rotation), 2.41 (ddd, *J* = 16.5, 11.0, 9.0 Hz, 1H, H-17b, splitting due to slow rotation), 2.18 (ddd, *J* = 12.0, 8.0, 5.5 Hz, 1H, H-2), 1.86-1.96 (m, 1H, H-5), 1.67-1.80 (m, 6H, 2H-10, H-11a, H-12a, 2H-9),1.65 (dd, *J* = 12.0, 3.0 Hz, 1H, H-11b), 1.06-1.62 (m, 11H, H-3a, 2H-7, H-11b, H-12b, 2H-18, 2H-19, 2H-20), 1.06-1.13 (m, 1H, H-3b), 1.02 (s, 3H, $CH_3$-14), 0.99 (s, 3H, $CH_3$-13), 0.89 (t, *J* = 7.0 Hz, 3H, $CH_3$-21), 0.87 (s, 3H, $CH_3$-15); $^{13}C$ NMR $\delta$ 47.3 (C-1), 46.1 (CH-5), 42.6 ($CH_2$-12), 40.0 ($CH_2$-17), 37.9 (CH-2), 37.2 ($CH_2$-3), 35.2 ($CH_2$-7), 34.5 ($CH_2$-9), 34.3 ($CH_2$-11), 30.5 (C-8), 30.0 (C-4), 23.1 ($CH_3$-15), 22.8 ($CH_3$-14), 22.7 ($CH_2$-18,19 and 20), 20.8 ($CH_3$-13 and $CH_2$-6), 20.4 ($CH_2$-10), 14.3 ($CH_3$-21); FT-IR $v_{max}$ (neat) 2947, 2921, 2857, 1668, 1457, 1376, 1364, 1217, 1122, 1021, 997, 892, 752, 698 $cm^{-1}$; HRMS (ESI): found 292.3008 $[M+H]^+$, $C_{20}H_{38}N$ required 292.3004, $[M+H]^+$.

**General Procedure for the Reductive Alkylation of Amine 8:** Amine **8** (0.10 g, 0.45 mmol) was dissolved in DCM (5 mL) and placed in a round bottom flask fitted with a drying tube, aldehyde (5 mol eqv.), and $NaBH(OAc)_3$ (10 mol eqv.) was added slowly. The pH of the reaction mixture was adjusted to pH = 4 *via* the addition of acetic acid. The mixture was stirred overnight at room temperature. The reaction was quenched with saturated $NaHCO_3$ (20 mL), extracted with $CHCl_3$ (20 mL x 2), and washed with saturated NaCl (20 mL). The organic layer was dried with $Na_2CO_3$ and solvent was removed under reduced pressure. The product was purified by column chromatography to yield the amine product.

***(1S,2S,5S,8S)-N,N,4,4,8-pentamethyltricyclo[6.3.1.01,5]dodecan-2-amine*** **(11a):** Yield (0.10 g, 91 %) as a viscous liquid; $R_f$ (1:1 diethyl ether/hexane) 0.56; $[\alpha]_{589}^{23}$ 17.3º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.31 (br s, 6H, C<u>H</u>$_3$-17, C<u>H</u>$_3$-18), 2.20 (br m, *J* = 12.0, 6.0 Hz, 1H, H-2), 1.46-1.58 (m, 4H, 2H-3, 2H-10), 1.16-1.40 (m, 10H, H-5, 2H-6, 2H-7, H-9a, 2H-11, 2H-12), 1.02 (s, 3H, C<u>H</u>$_3$-15), 0.96-0.99 (m, 1H, H-9b), 0.88 (s, 3H, C<u>H</u>$_3$-13), 0.84 (s, 3H, C<u>H</u>$_3$-14); $^{13}$C NMR $\delta$ 76.4 (CH-2), 52.6 (CH-5), 46.6 (2$CH_3$-17 and 18), 45.1 ($CH_2$-3), 44.9 ($CH_2$-12), 44.4 (C-1), 41.2 (C-4), 37.2 ($CH_2$-9,), 33.3 ($CH_3$-13), 33.0 ($CH_2$-11), 32.7 ($CH_2$-7), 31.3 ($CH_3$-15), 30.5 (C-8), 25.4 ($CH_3$-14), 20.8 ($CH_2$-10), 18.9 ($CH_2$-6); FT-IR $\nu_{max}$ (neat) 2942, 2922, 2861, 2813, 2764, 1457, 1364, 1278, 1247, 1163, 1059, 1037, 966, 876, 778 cm$^{-1}$; HRMS (ESI): found 250.2543, $[M+H]^+$, $C_{17}H_{32}N$ required 250.2535, $[M+H]^+$.

***(1S,2S,5S,8S)-N,N-dibutyl-4,4,8-trimethyl-tricyclo[6.3.1.01,5]dodecan-2-amine*** **(11b):** Yield (0.09 g, 57 %) as a viscous liquid; $R_f$ (1:1 diethyl ether/hexane) 0.66; $[\alpha]_{589}^{23}$ 13.9º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 2.59 (dd, *J* = 13.0, 5.5 Hz, 1H, H-2), 2.46-2.53 (m, 2H, 2H-17/18), 2.34-2.30 (m, 2H, 2H-17/18), 1.46-1.52 (m, 3H, 2H-10, H-12a), 1.12-1.42 (m, 17H, H-5, 2H-6, 2H-7, H-9a, 2H-11, H-12b, 2H-19, 2H-20, 2H-21, 2H-22), 1.14-1.17 (m, 2H, 2H-3), 1.02 (s, 3H, $CH_3$-14), 0.93-1.00 (m, 1H, H-9b), 0.90 (t, *J* = 7.5 Hz, 6H, $CH_3$-23, $CH_3$-24), 0.86 (s, 3H, $CH_3$-15), 0.83 (s, 3H, $CH_3$-13); $^{13}$C NMR $\delta$ 71.3 (CH-2), 55.2 (2$CH_2$-17 and 18), 51.3 (CH-5), 45.3 (C-1), 44.7 ($CH_2$-3), 41.1 ($CH_2$-12), 41.0 ($CH_2$-9), 37.1 (C-4), 33.4 ($CH_2$-11), 33.37 ($CH_2$-7), 33.3 ($CH_3$-15), 31.8 ($CH_3$-14), 30.4 (2$CH_2$-19 and 20), 30.3 (C-8), 25.3 ($CH_3$-13), 20.9 ($CH_2$-10), 20.8 (2$CH_2$-21 and 22), 19.1 ($CH_2$-6), 14.4 (2$CH_3$-23 and 24); FT-IR $\nu_{max}$ (neat) 2925, 2863, 1653, 1541, 1457, 1364, 1232, 1182, 1076, 1005, 989, 813, 778, 734 cm$^{-1}$; HRMS (ESI): found 334.3486, $[M+H]^+$, $C_{23}H_{44}N$ required 334.3474, $[M+H]^+$.

***(1S,2S,5S,8S)-N-benzyl-4,4,8-trimethyl-tricyclo[6.3.1.01,5]dodecan-2-amine*** ***(*****11c):** Yield (0.09 g, 66 %) as a viscous liquid; $R_f$ (1:1 diethyl ether/hexane) 0.58; $[\alpha]_{589}^{23}$ 32.4º (*c* 1.0, $CHCl_3$); $^1$H NMR $\delta$ 7.40 (d, *J* = 7.5 Hz, 2H, 2H-19), 7.33 (t, *J* = 7.5 Hz, 2H, 2H-20), 7.28 (t, *J* = 7.5 Hz, 1H, H-21), 3.98 (d, *J* = 13.0 Hz, 1H, H-17a), 3.84 (d, *J* = 13.0 Hz, 1H, H-17b), 2.76 (dd, *J* = 12.0, 5.5 Hz, 1H, H-2), 1.70 (dd, *J* = 12.0, 5.5 Hz, 1H, H-3a), 1.43-1.60 (m, 3H, H-3b, 2H-10), 1.30-1.40 (m, 5H, H-5, H-6a, 2H-7, H-11a), 1.10-1.30 (m, 5H, H-6b, H-9a, H-11b, 2H-12), 1.02 (s, 3H, $CH_3$-15), 0.96-1.00 (m, 1H, H-9b), 0.87 (s, $CH_3$-13), 0.77 (s, $CH_3$-14); $^{13}$C NMR $\delta$ 128.8 (2CH-19), 128.7 (2CH-20 and CH-21), 127.6 (C-18), 77.4 (CH-2), 53.1 (CH-5), 51.9 ($CH_2$-17), 44.0 ($CH_2$-3), 43.9 (C-1), 43.2 (C-4), 40.9 ($CH_2$-12), 37.9 ($CH_2$-9), 33.3 ($CH_2$-11), 33.1 ($CH_3$-13), 32.7 ($CH_2$-7), 31.2 ($CH_3$-15), 30.4 (C-8), 25.2 ($CH_3$-14), 20.7 ($CH_2$-10), 18.9 ($CH_2$-6); FT-IR $\nu_{max}$ (neat) 2921, 2861, 1494, 1452, 1381, 1331, 1131, 1064, 1026, 967, 746, 696 cm$^{-1}$; HRMS (ESI): found 312.2681, $[M+H]^+$, $C_{22}H_{34}N$ required 312.2691, $[M+H]^+$.

**Cell Biology**

***General reagents for cell culture:*** Penicillin and Streptomycin, Trypsin and fetal bovine serum were purchased from Thermo Fisher Scientific (Scoresby, Vic, Australia). Dulbecco's Modified Eagle's Medium (DMEM), phosphate-buffered saline (PBS) and DMSO were purchased from Sigma-Aldrich (Castle Hill, NSW, Australia). The CellTiter 96® AQueous One Solution Reagent was purchased from Promega (Alexandria, NSW, Australia). Human MDA-MB-231 breast cancer cells were obtained as a gift from Prof. Michael Murray (University of Sydney), who purchased them from American Type Culture Collection (ATCC). Cells were grown at 37$^{o}$C in a humidified atmosphere of 5% $CO_2$ in DMEM supplemented with 10 % fetal bovine serum and 1% Penicillin/Streptomycin. Confluent cells (80 – 90%) were harvested using trypsin/EDTA after washing with PBS.

***Cell Viability Assays:*** For the MTS assay, cells were seeded in 96-well flat-bottom plates at a density of 7 x $10^3$ cells/well. Serum was removed after 24 hours, after which cells were treated with various concentrations of drug candidates (1 – 50 μM) in DMSO (maximum concentration 0.1%) for 48 hours; control cells received solvent alone. MTS activity was determined spectrophotometrically. The absorbance of all wells was determined by measuring optical density at 550 nm after 4 hours incubation at 37$^{o}$C. Each compound was tested in triplicates of triplicates for each concentration.

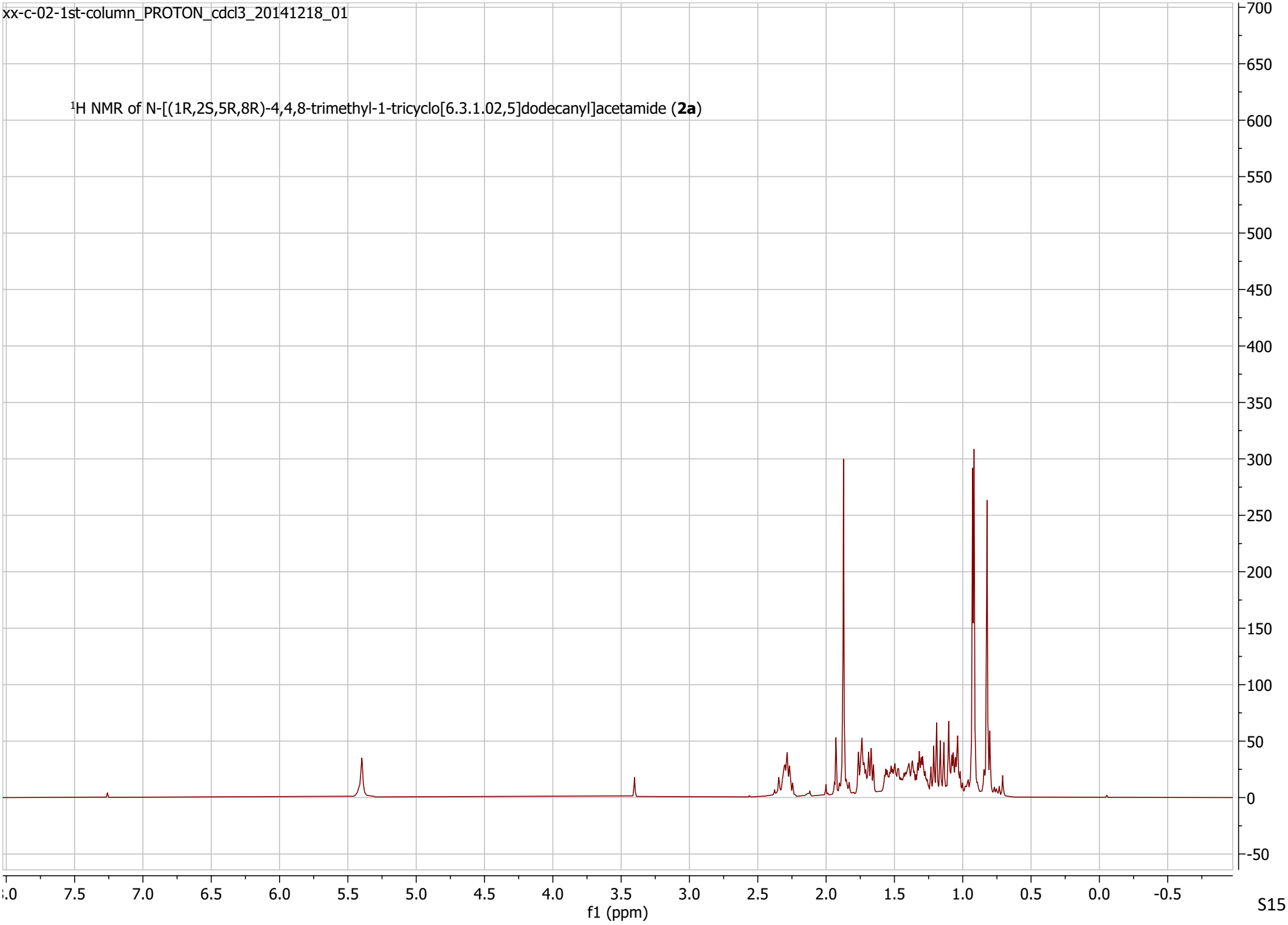
***Flow Cytometry Assays:*** Cell cycle distribution was evaluated in MDA-MB-231 cells that were seeded in 6-well flat-bottom plates at a density of 5 x $10^5$ cells/well. Serum was removed after 24 hours, after which the cells were treated with **3c** (10 μM) or **6b** (9 μM) for 24 hours. Treated cells were fixed overnight at 0˚C in 80% ethanol, centrifuged at 500 g for 10 minutes at 4 ˚C and 0.1 M PBS containing 0.1 NP40 and 0.1 mg/mL RNAse A was added. After staining with PI (50 μg/mL), cells were incubated for 30 minutes and subjected to flow cytometry (BD LSRFortessa X-20).

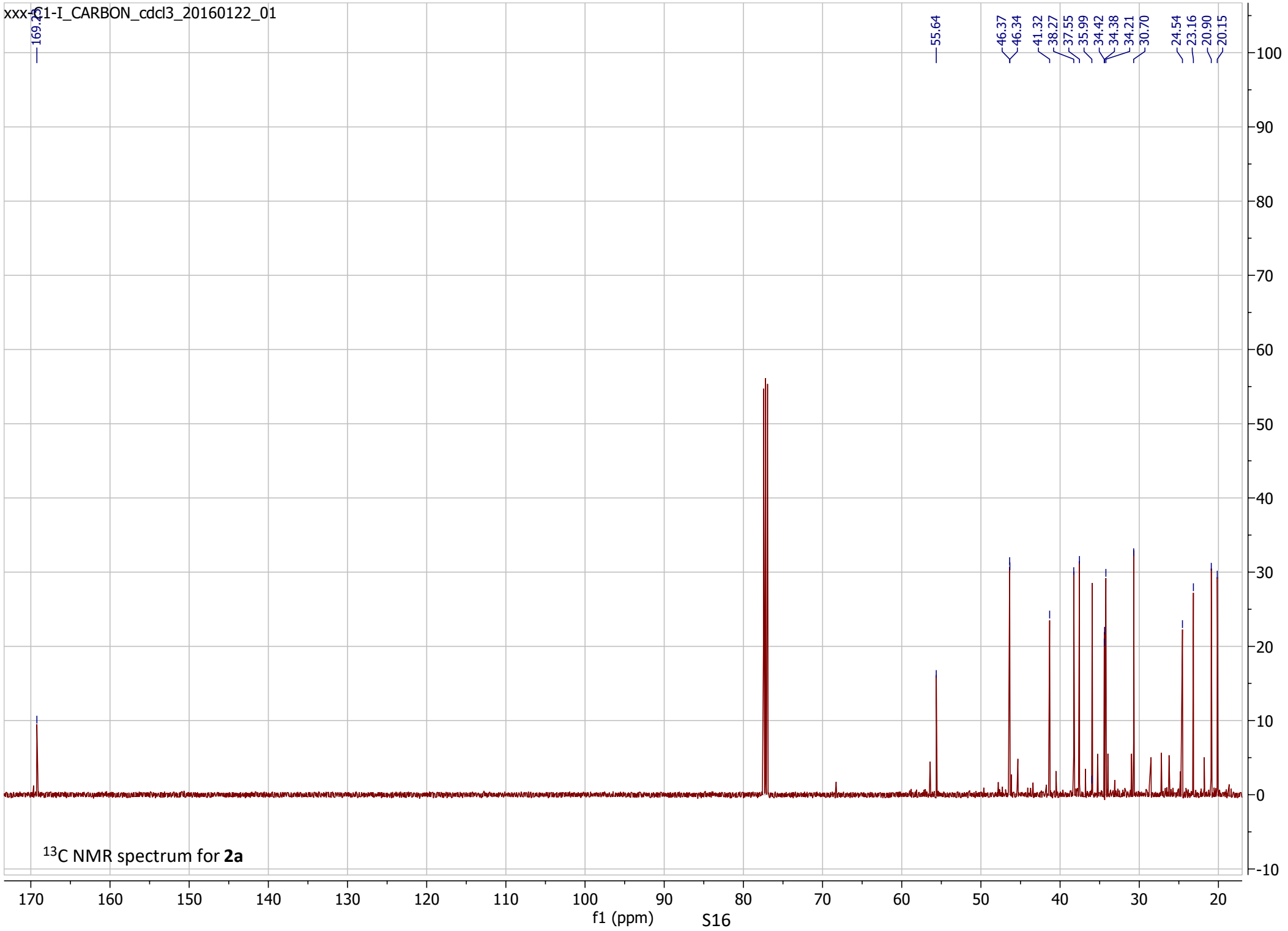
***Apoptosis/Necrosis****:* Annexin-V-FITC/PI staining was evaluated in MDA-MB-231 cells that were seeded in 6-well plates at a density of 1 x $10^5$ cells/well. 24 hours after serum removal the cells were then treated with **3c** (20 μM) or **6b** (20 μM) for 48 hours. Treated cells were trypsinised and washed twice with cold PBS. The cells were then resuspended in binding buffer (0.1 mL) and transferred to 96 well plates. Annexin V-FITC reagent (Beckman Coulter Australia) and PI (50 μg/mL) were added. The cells were subjected to flow cytometry, as described above.

***Cytotoxicity against VERO cells:*** Cytotoxicity of Compounds **3c** and **6b** against VERO cells (African Green Monkey kidney cell lines) was determined externally by Bioassay Laboratory,

BIOTEC, Thailand.[29] Briefly, VERO cells were treated with test compounds at a single concentration of 50 µl/ml in media/DMSO (final DMSO concentration 0.5%) for 72 h; control cells were treated with 0.5% DMSO alone. Cell viability was assessed using the resazurin assay and was reported as a percentage of control.

***Statistical Analysis:*** All measurements were performed at least in triplicates unless otherwise stated. Data from multiple treatments were analysed by one-way ANOVA in combination with Fisher's Protected Least Significant Difference test.


xx-c-02-1st-column_PROTON_cdcl3_20141218_01
$^1$H NMR of N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]acetamide (**2a**)
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

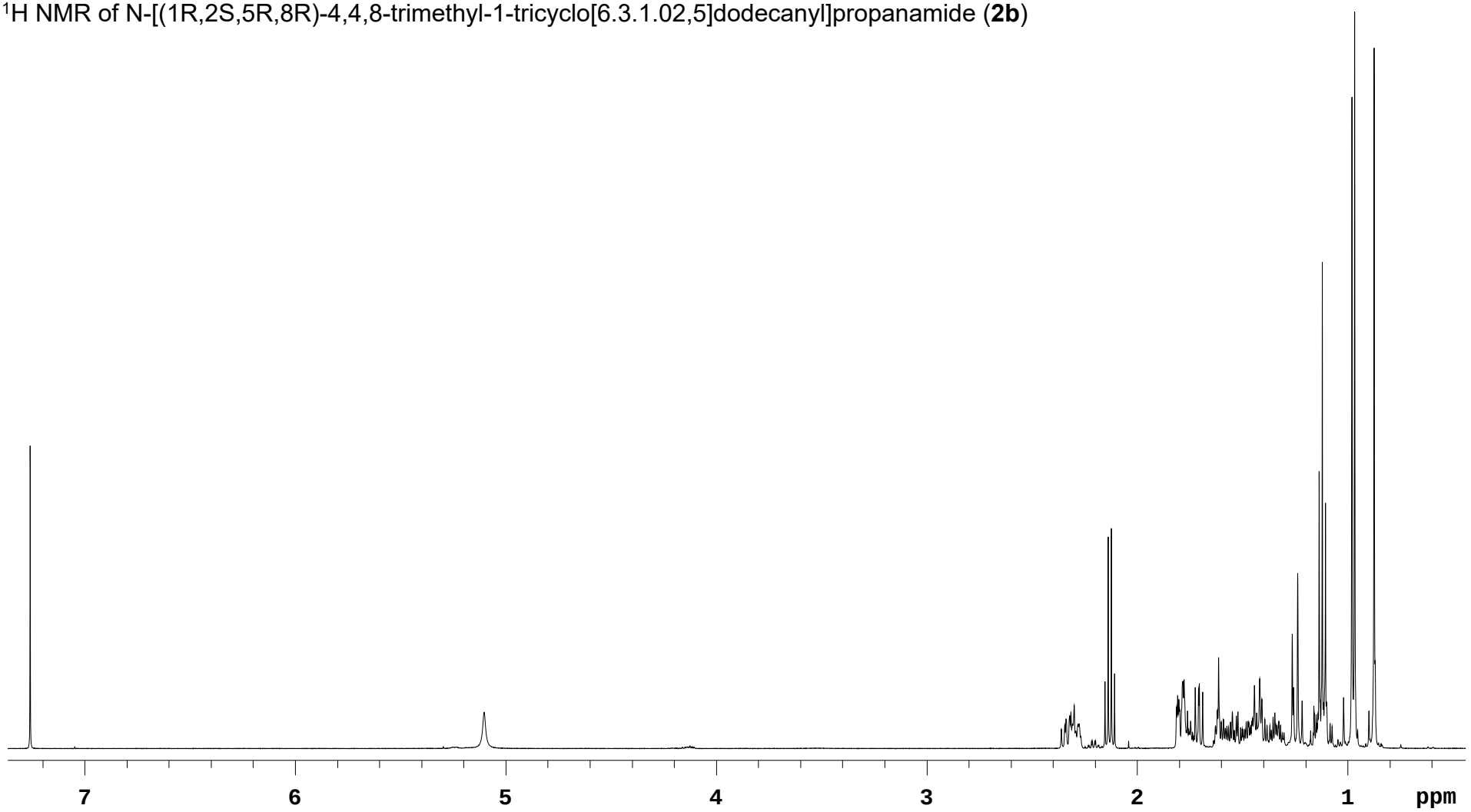



$^{13}$C NMR spectrum for **2a**

**xxx-1H-recrystallised**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C13-recrystallised** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-08-03** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

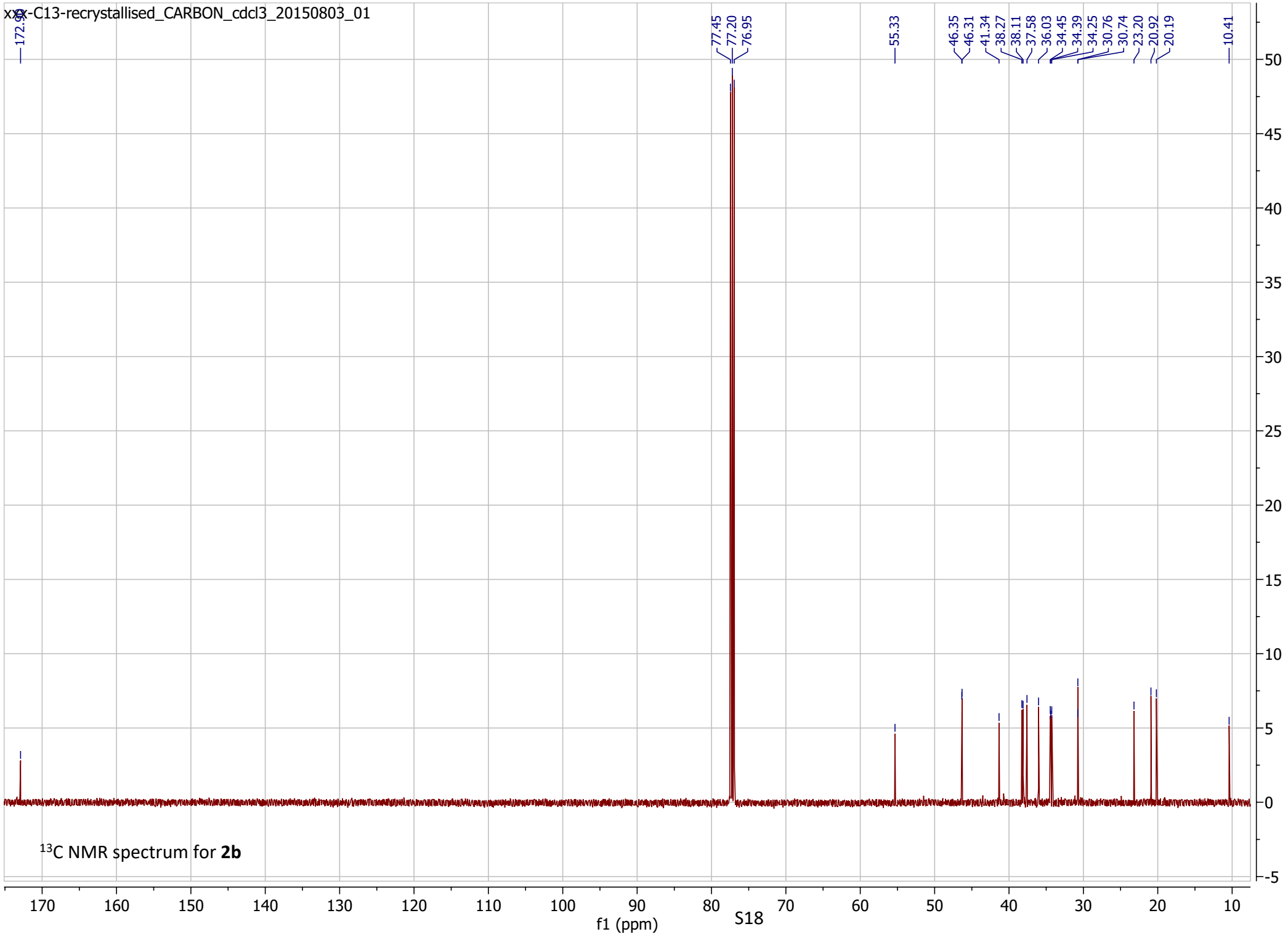
$^{1}$H NMR of N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]propanamide (**2b**)






Data file /home/walkup/Desktop/for Alison/compound 2b/xxx-C13-recrystallised_PROTON_cdcl3_20150803_01.fid

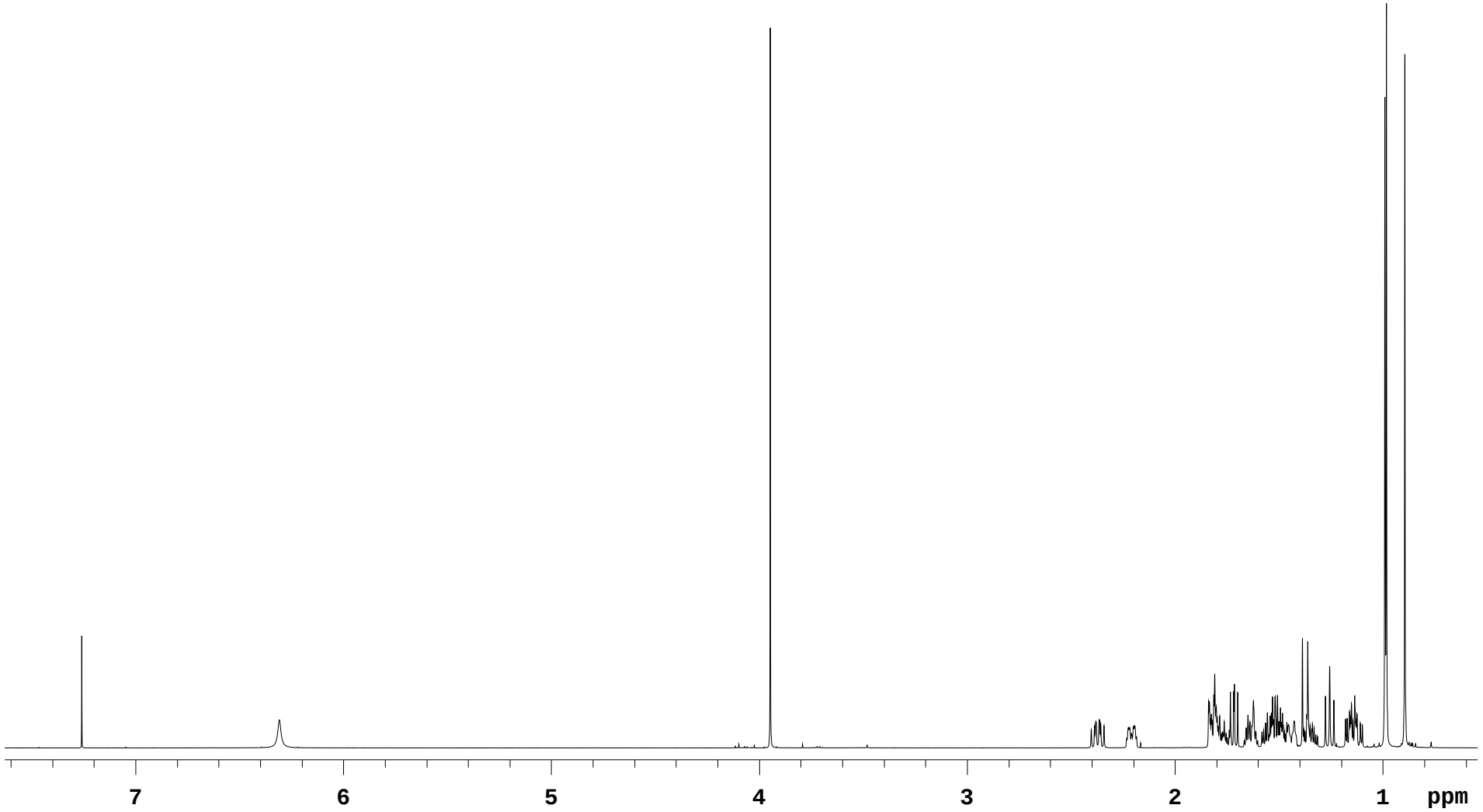
Plot date 2019-08-24

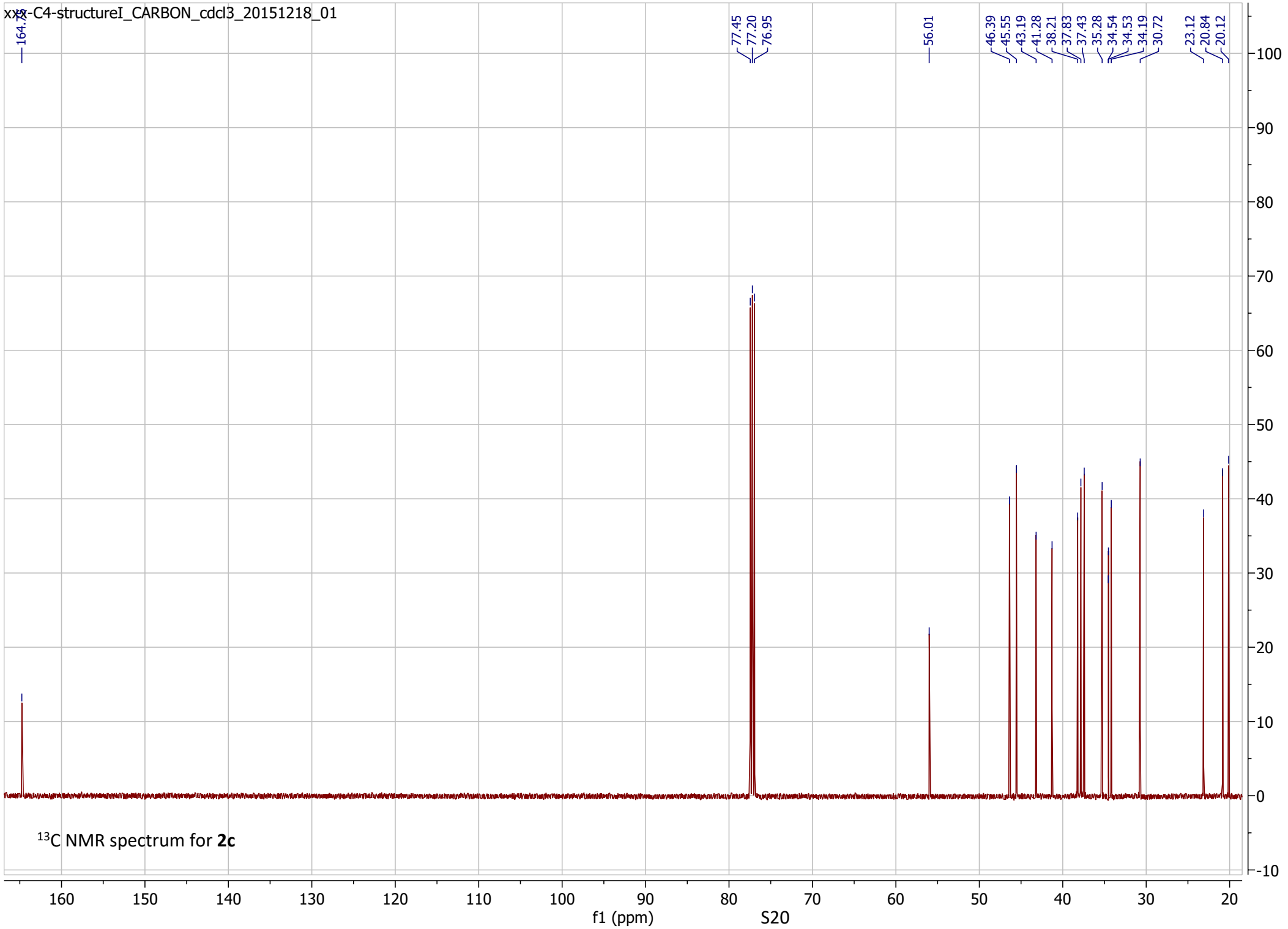



$^{13}$C NMR spectrum for **2b**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C4-structurel** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-12-18** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

$^{1}$H NMR 2-chloro-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]acetamide (**2c**)



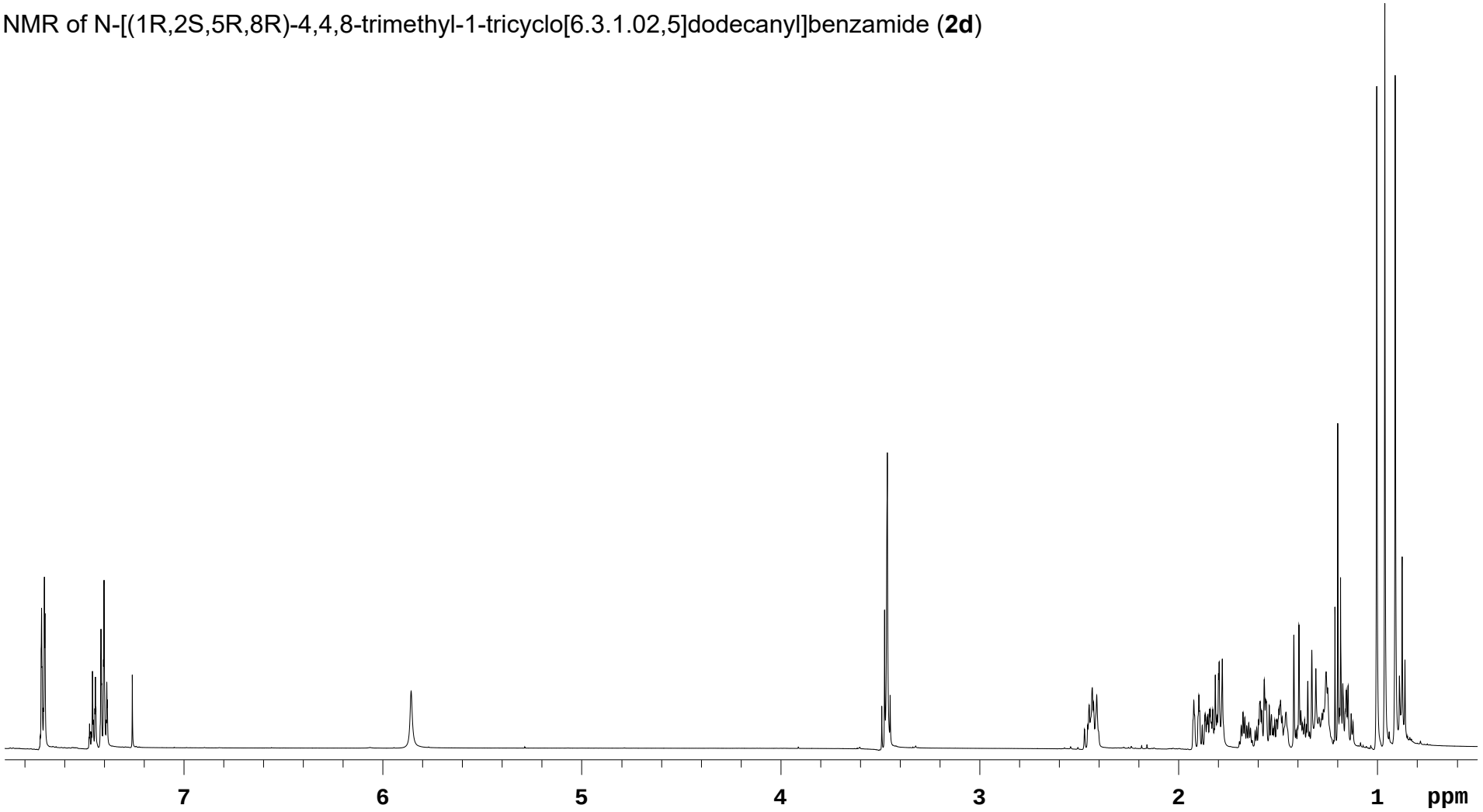



$^{13}$C NMR spectrum for **2c**

**xxx-X8-I**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-X8-I** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-07-21** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

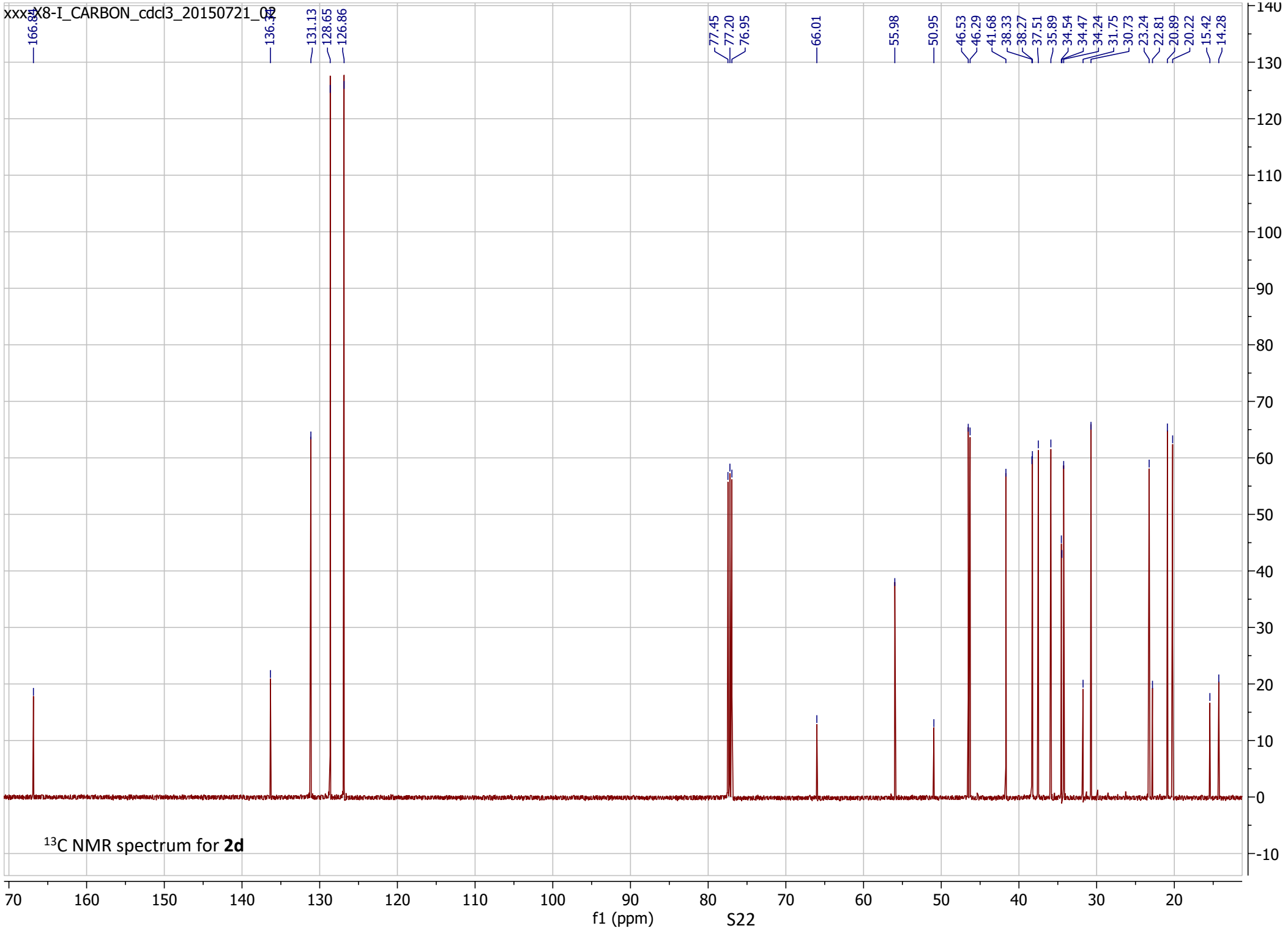
$^{1}$H NMR of N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]benzamide (**2d**)






Data file /home/walkup/Desktop/for Alison/compound 2d/xxx-X8-I_PROTON_cdcl3_20150721_01.fid

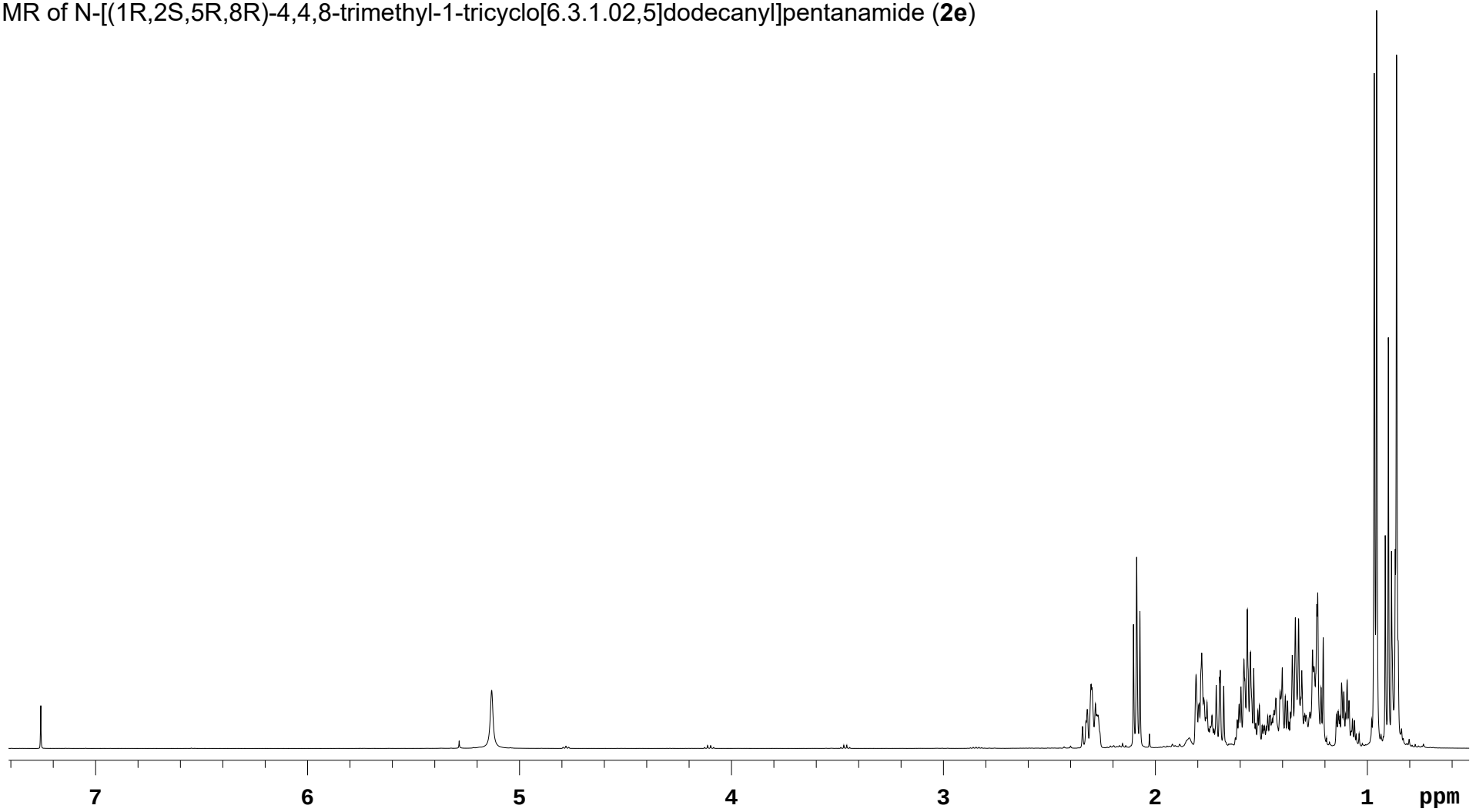
Plot date 2019-08-24




$^{13}$C NMR spectrum for **2d**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C7-I** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-07-20** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

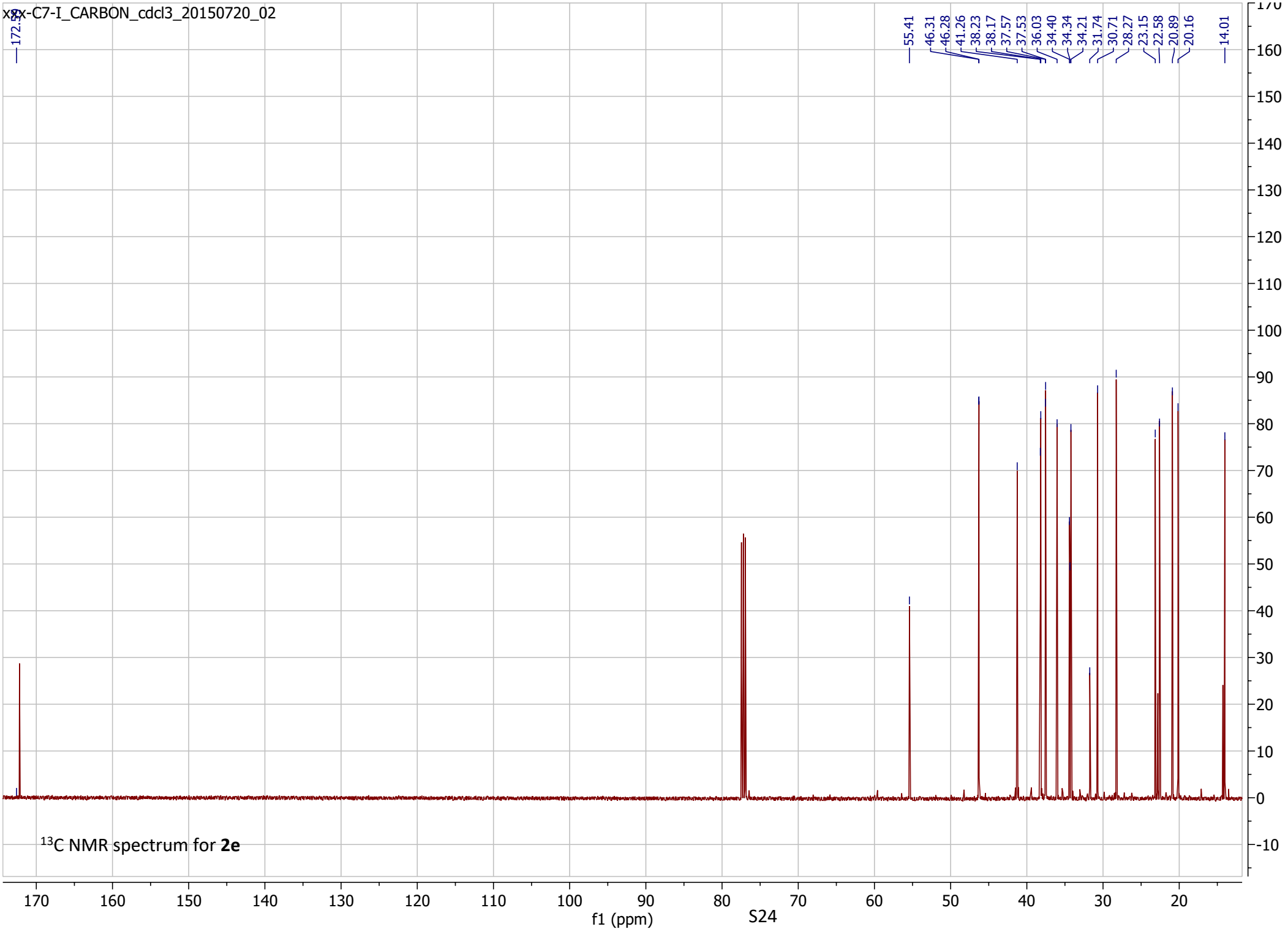
$^{1}$H NMR of N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]pentanamide (**2e**)






Data file /home/walkup/Desktop/for Alison/compound 2e/xxx-C7-I_PROTON_cdcl3_20150720_01.fid

Plot date 2019-08-24



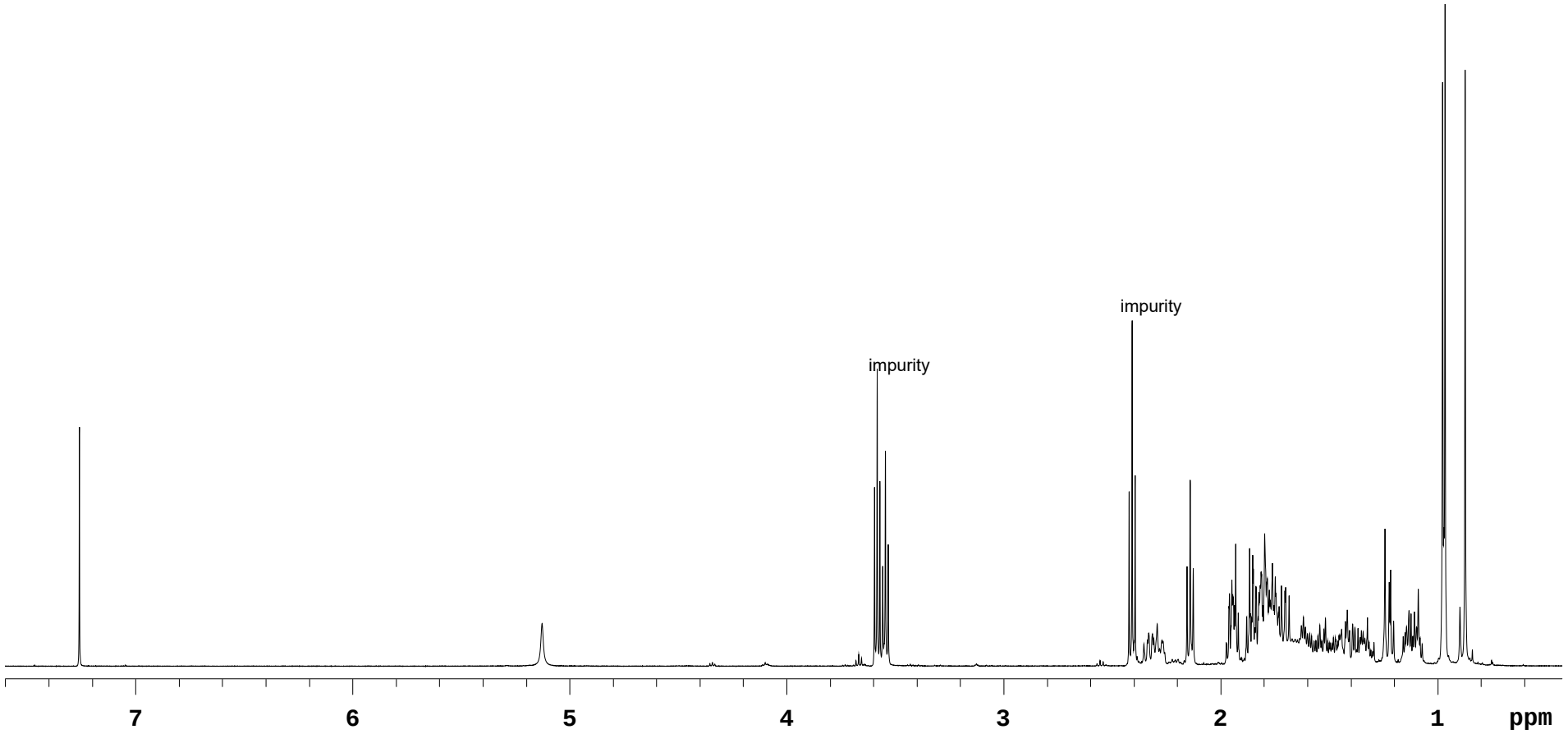

$^{13}$C NMR spectrum for **2e**

**xxx-C9-pure**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C9-pure** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-03-22** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

# $^{1}$H NMR of 5-chloro-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]pentanamide (**2f**)

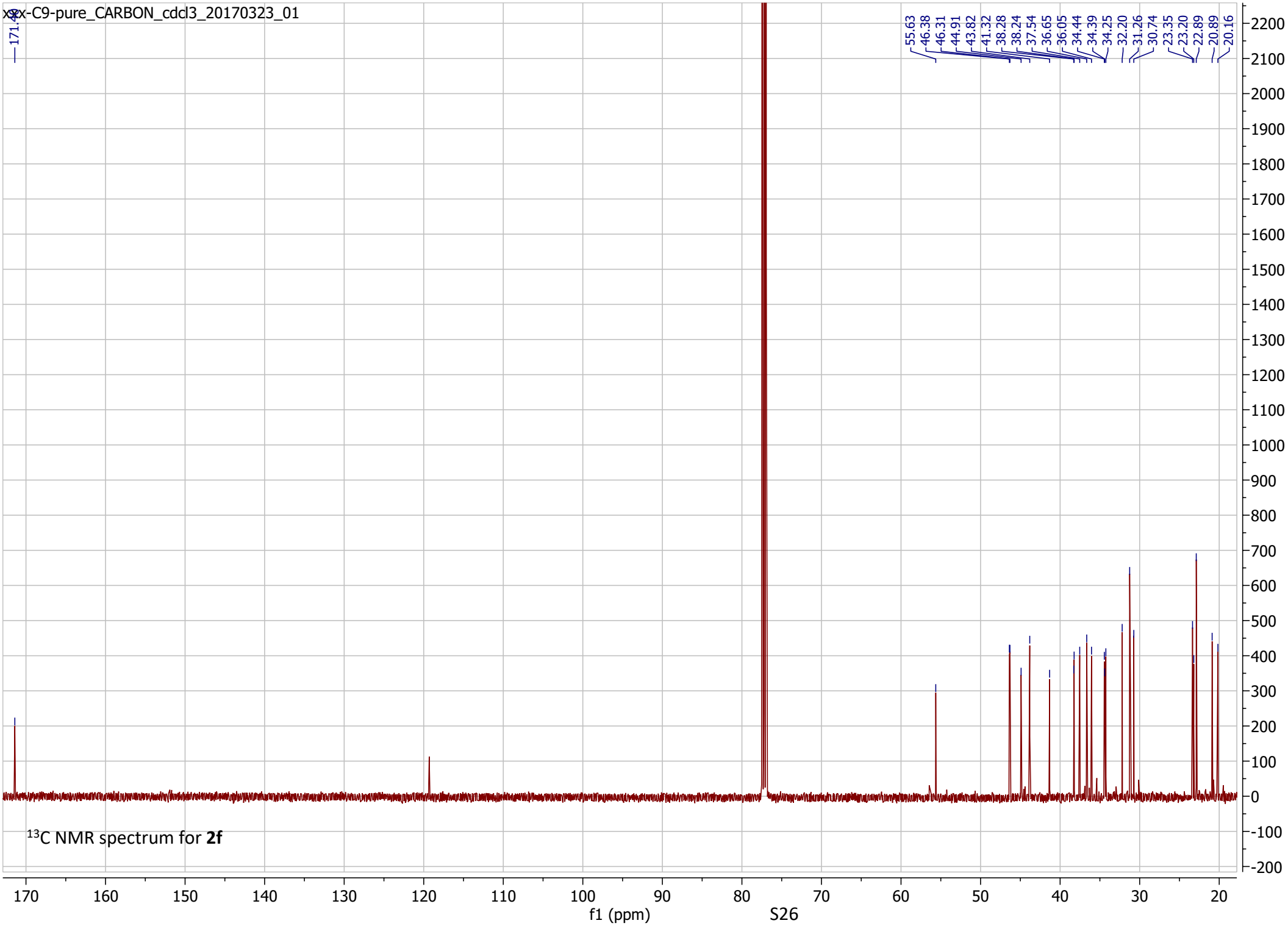
compound 2f is contaminated with $Cl(CH_2)_4CONH_2$, signal at 3.59 (t) and 2.35 (t)






Data file /home/walkup/Desktop/for Alison/compound 2f/xxx-C9-pure_PROTON_cdcl3_20170322_01.fid

Plot date 2019-08-24

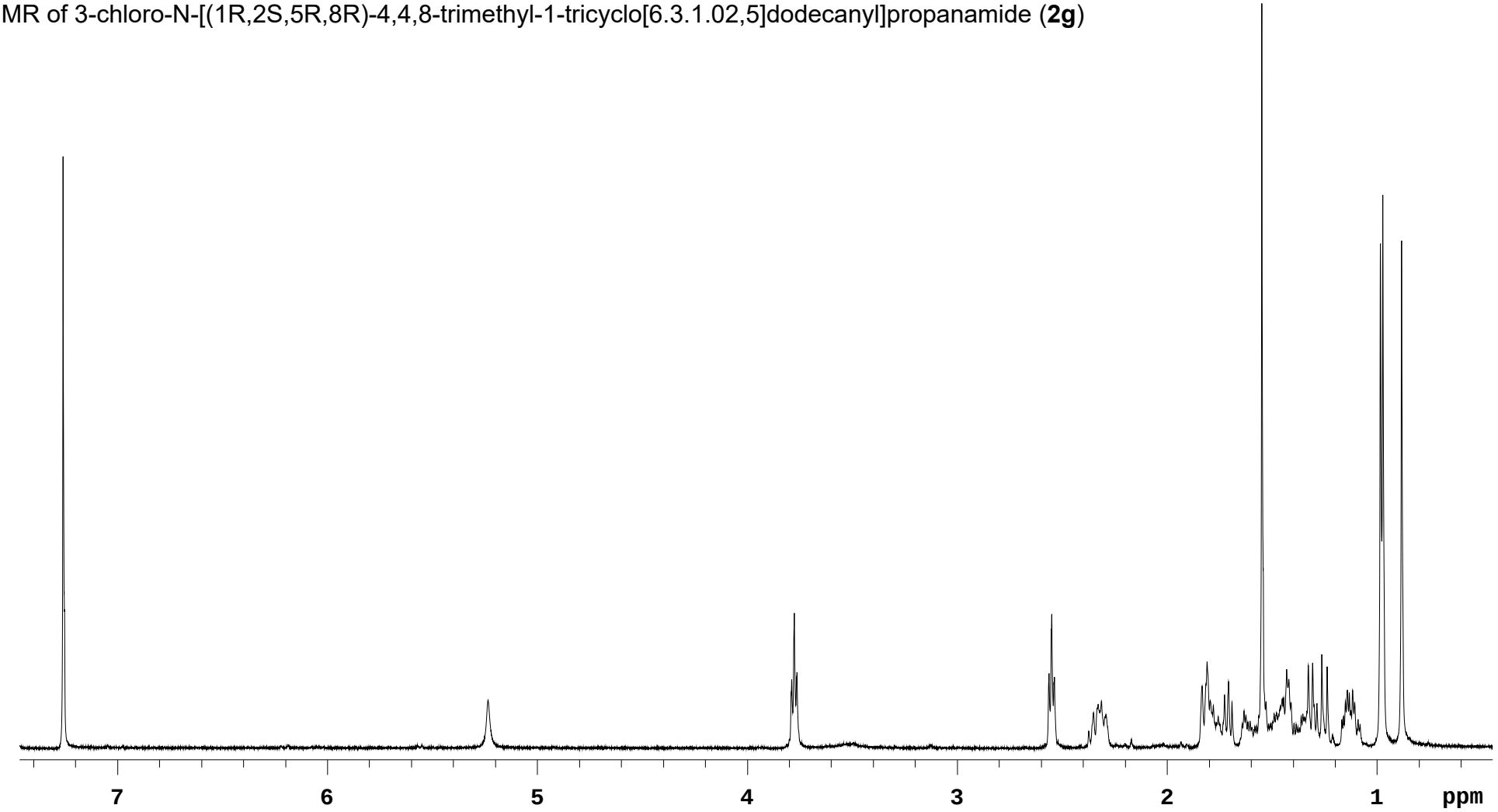



$^{13}$C NMR spectrum for **2f**

**c15-column-I**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **c15-column-I** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-09-29** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

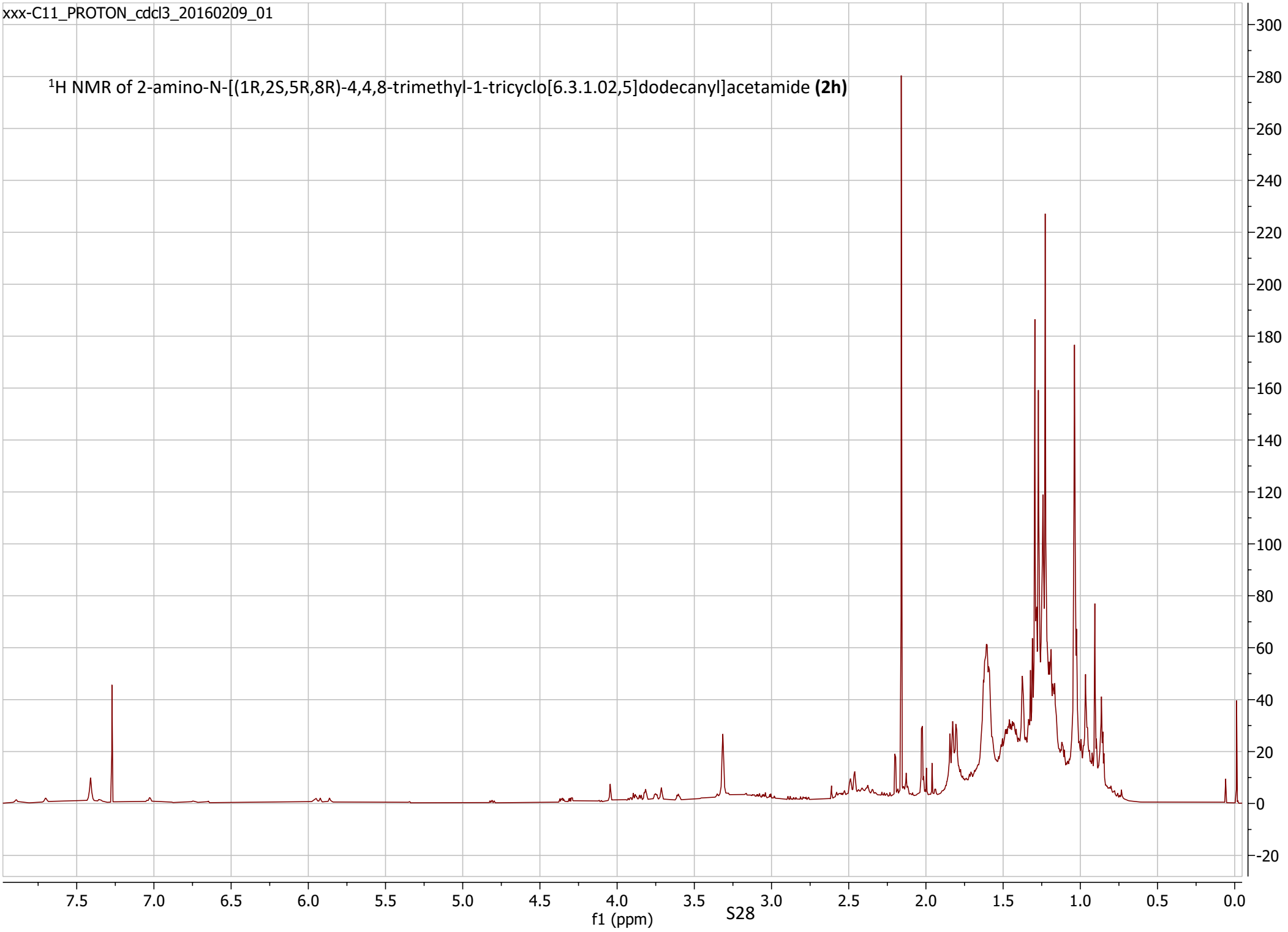
$^{1}$H NMR of 3-chloro-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]propanamide (**2g**)

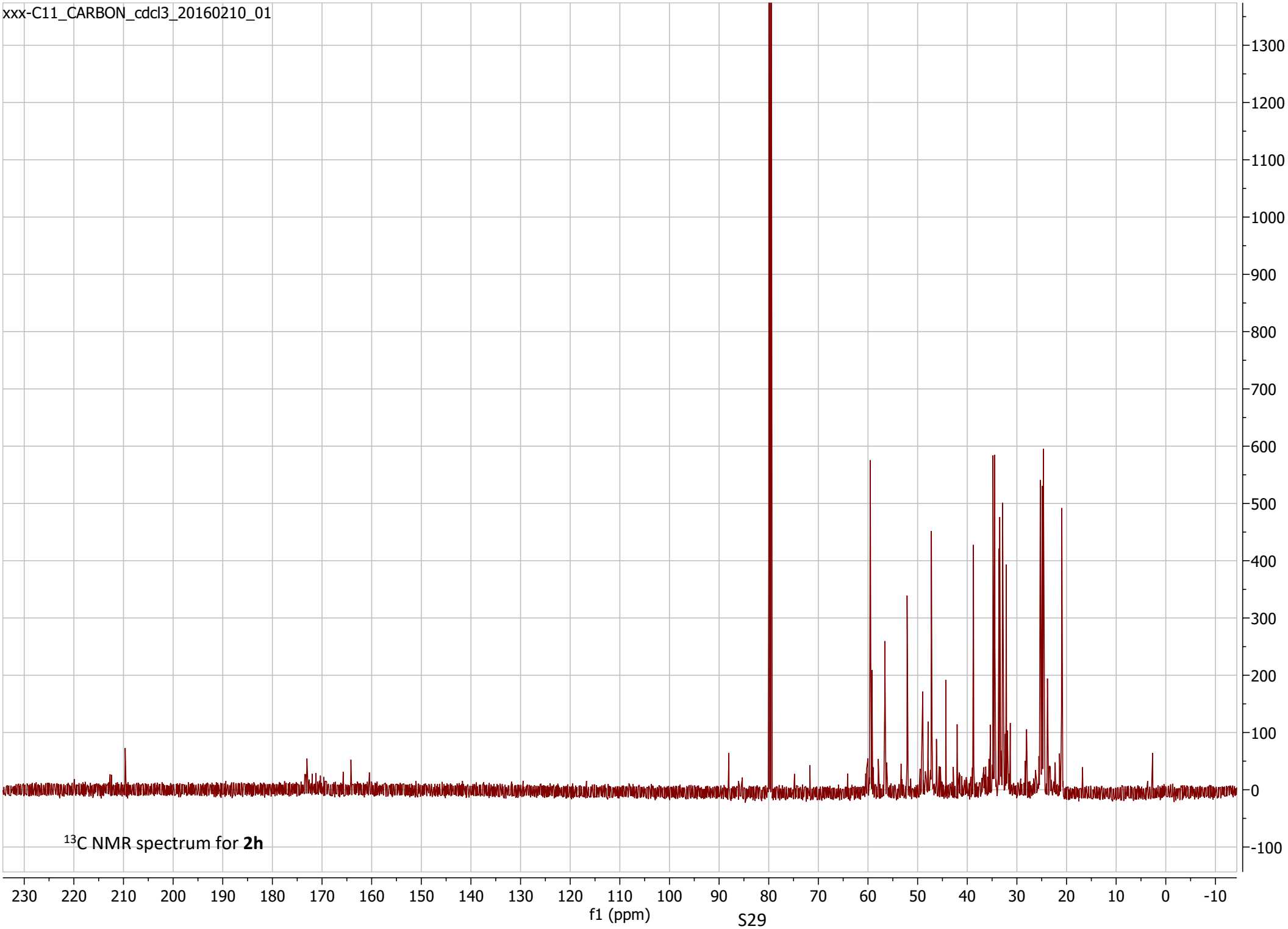




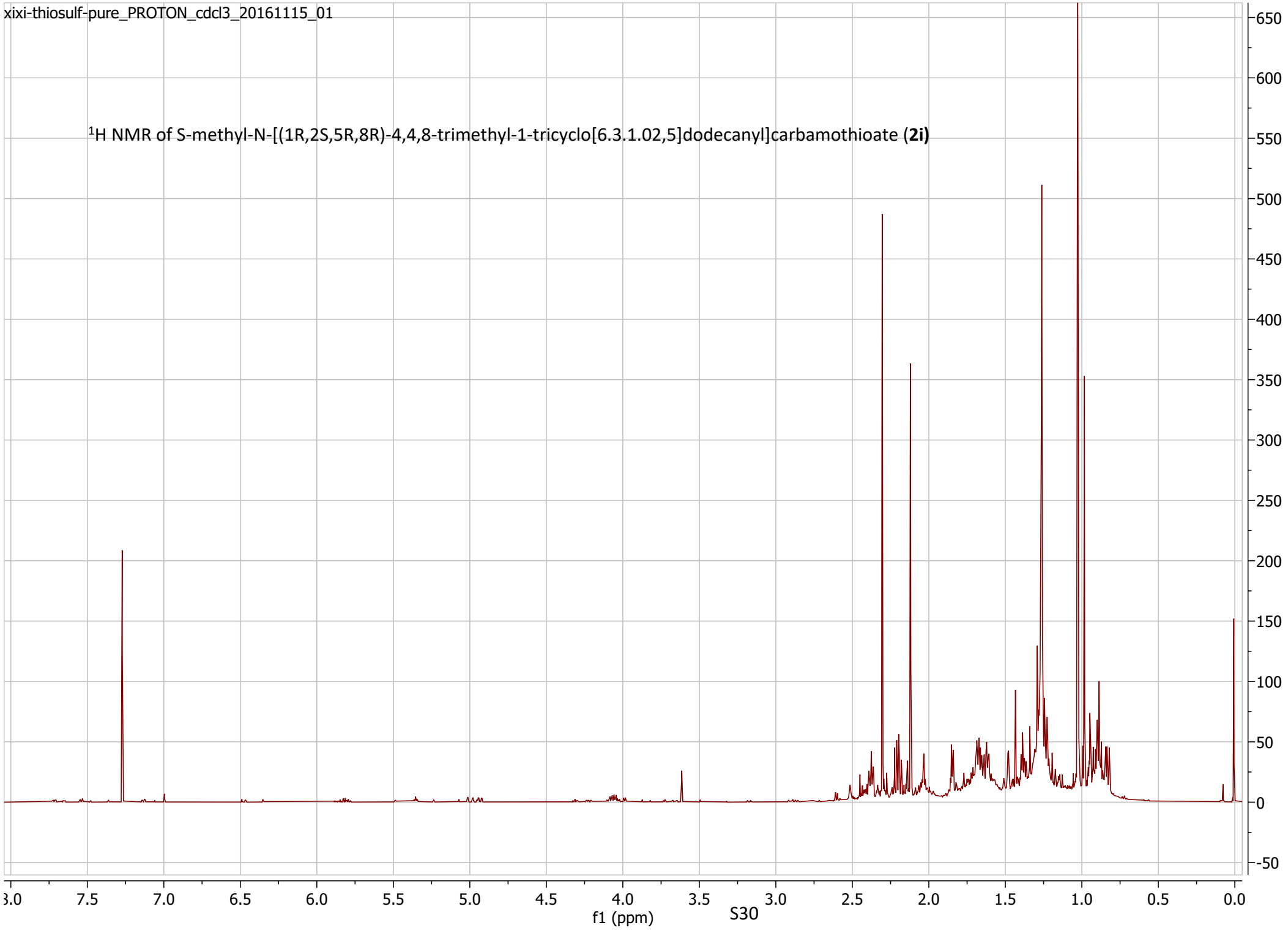

Data file /home/walkup/Desktop/for Alison/compound 2g/c15-column-I_PROTON_cdcl3_20150929_01.fid

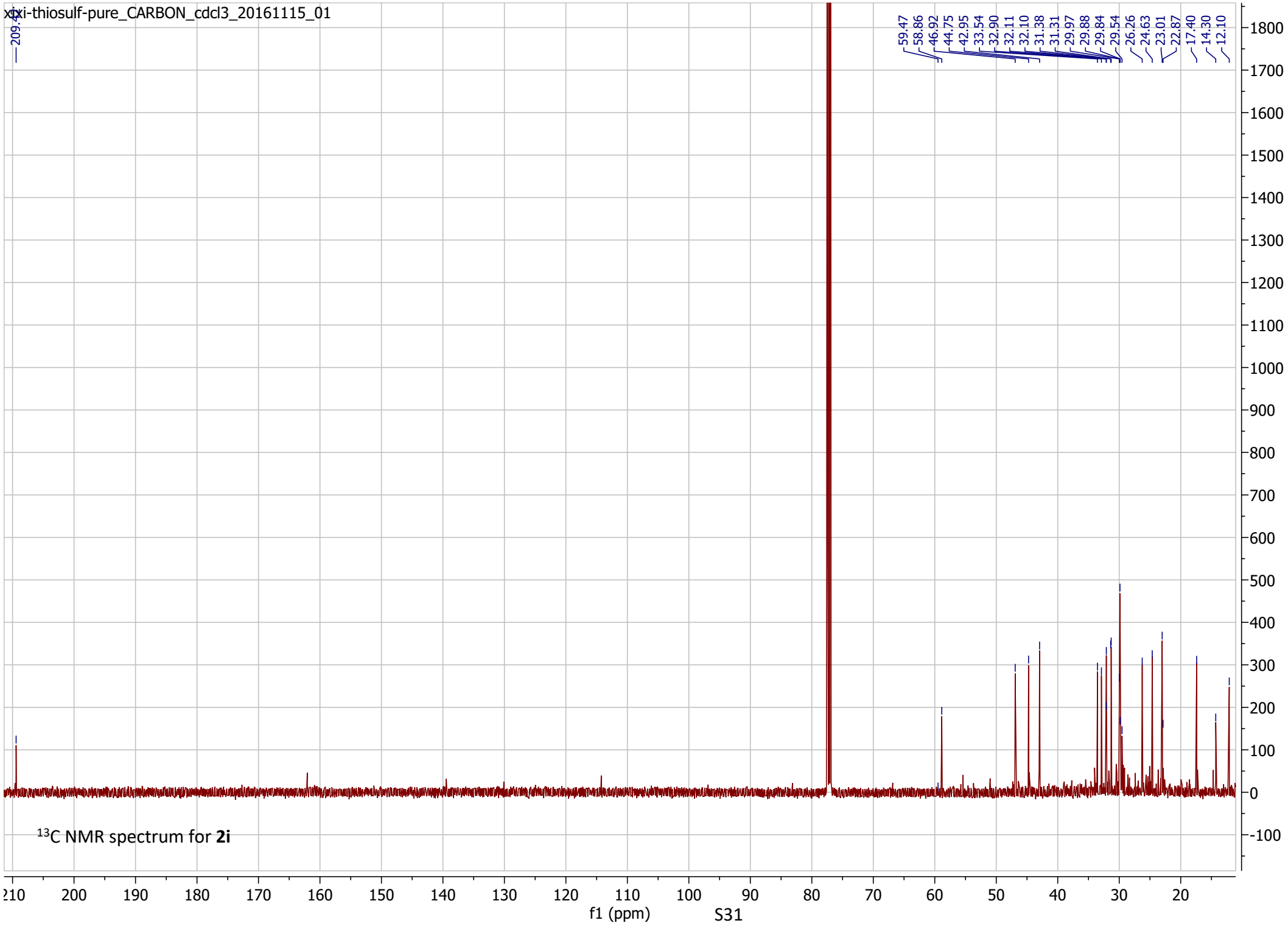
Plot date 2019-08-24


xxx-C11_PROTON_cdcl3_20160209_01
$^{1}$H NMR of 2-amino-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]acetamide **(2h)**
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)




$^{13}$C NMR spectrum for **2h**


xixi-thiosulf-pure_PROTON_cdcl3_20161115_01
$^1$H NMR of S-methyl-N-[(1R,2S,5R,8R)-4,4,8-trimethyl-1-tricyclo[6.3.1.02,5]dodecanyl]carbamothioate (**2i**)
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

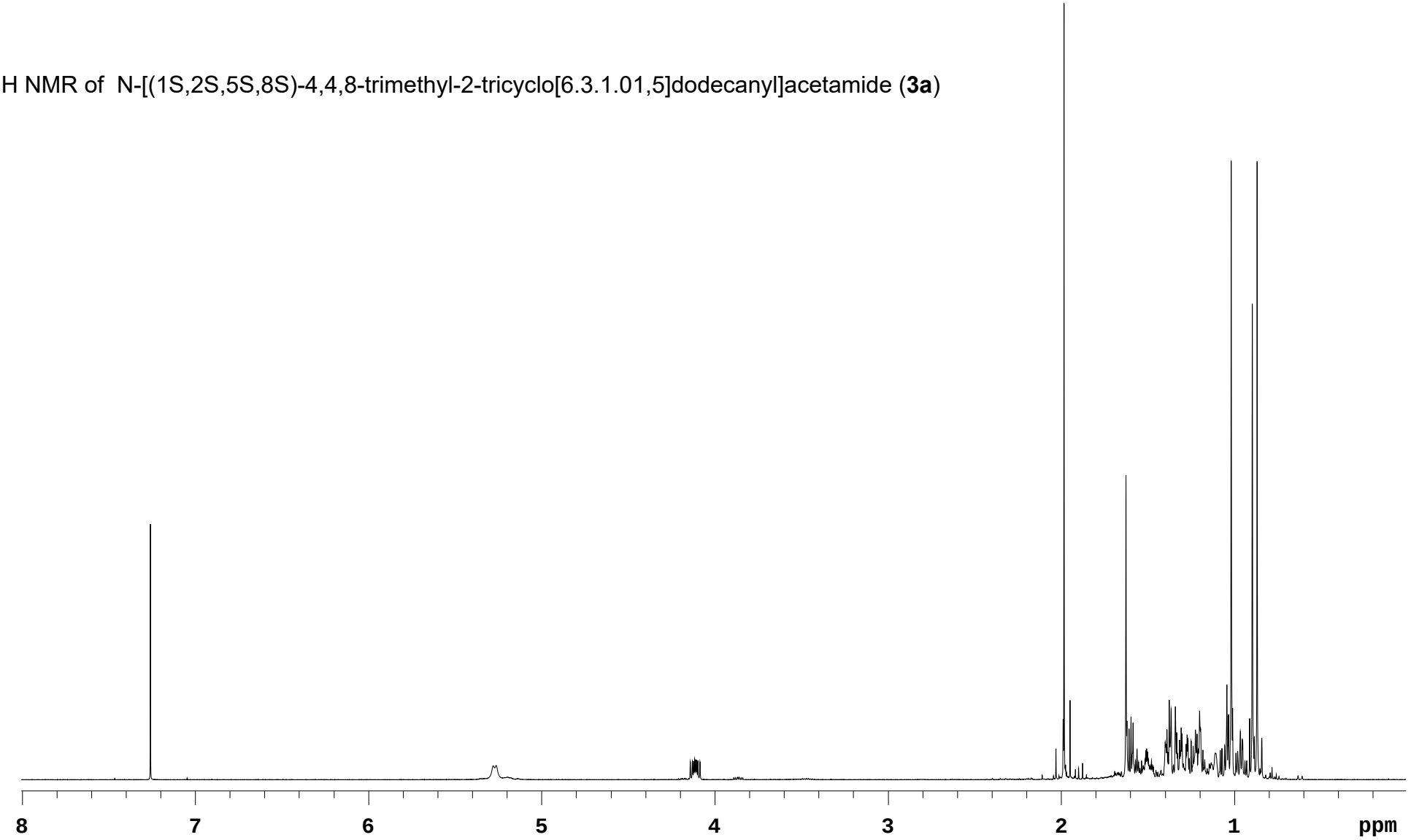



$^{13}$C NMR spectrum for **2i**

**xxx-c2-structureII**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-c2-structureII** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-12-15** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

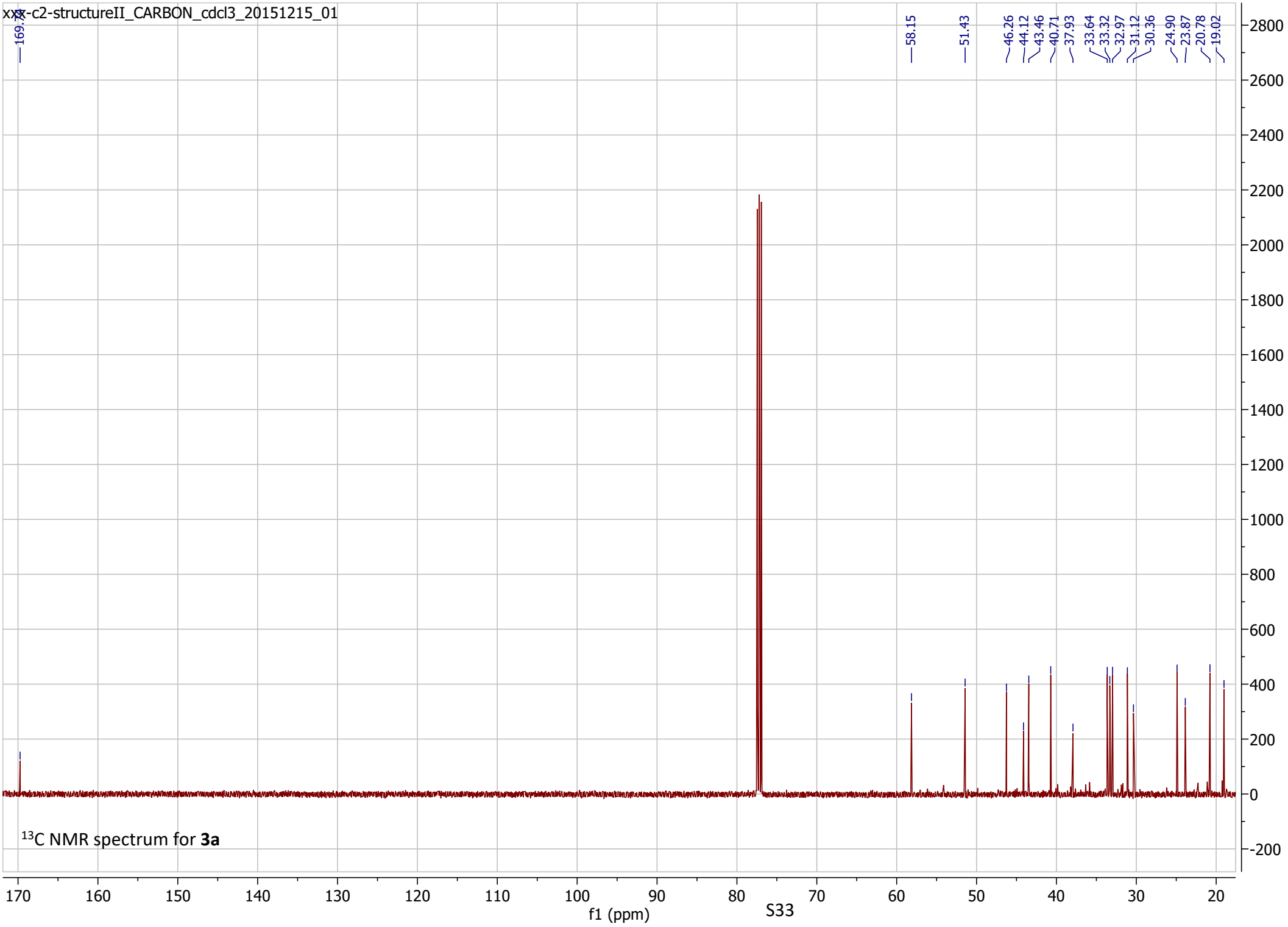
$^{1}$H NMR of N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]acetamide (**3a**)





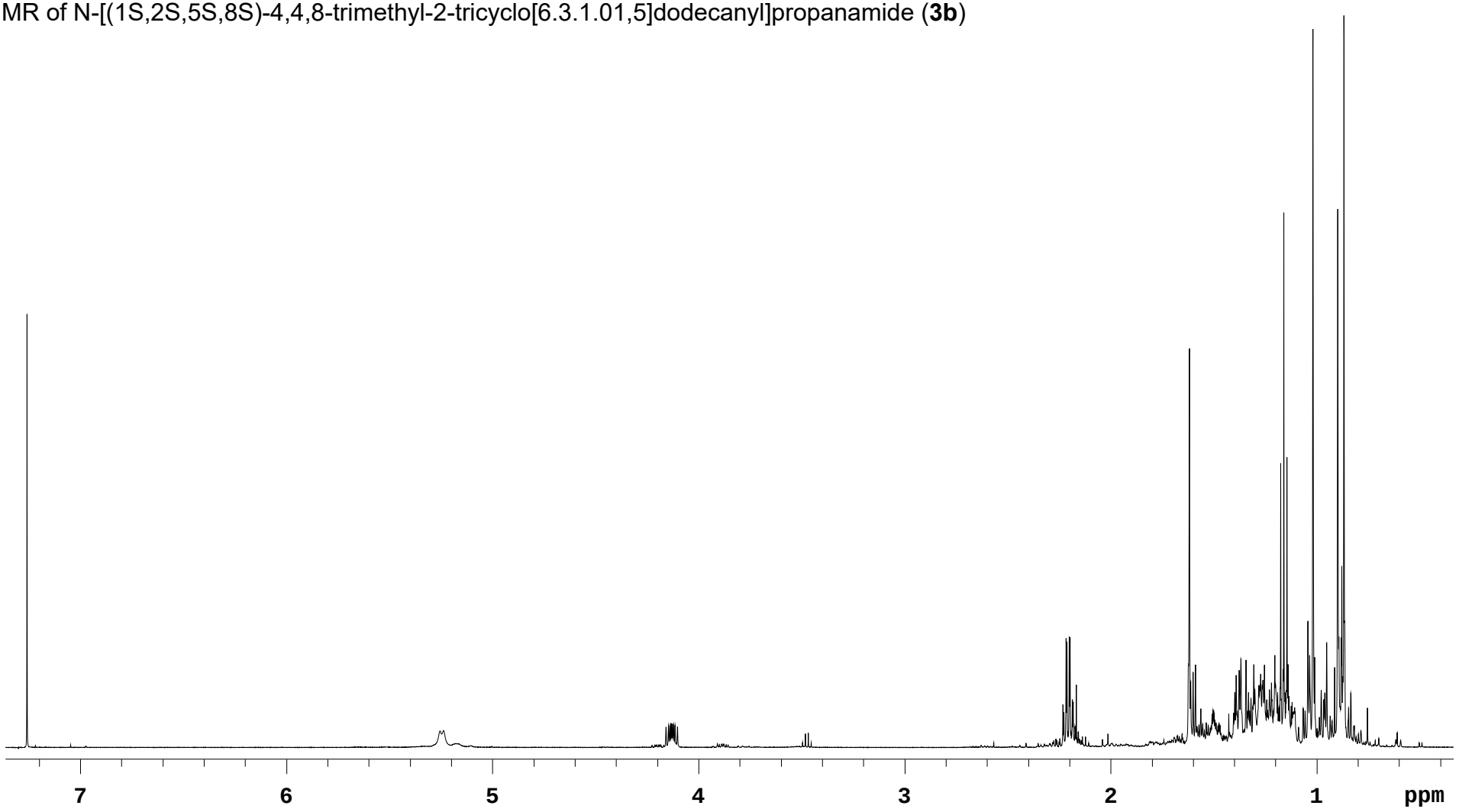

Data file /home/walkup/Desktop/for Alison/compound 3a/xxx-c2-structureII_PROTON_cdcl3_20151215_01.fid

Plot date 2019-08-24


xxx-c2-structureII_CARBON_cdcl3_20151215_01
169.74
58.15
51.43
46.26
44.12
43.46
40.71
37.93
33.64
33.32
32.97
31.12
30.36
24.90
23.87
20.78
19.02
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
f1 (ppm)
S33
13C NMR spectrum for 3a

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C13-II** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2016-01-22** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

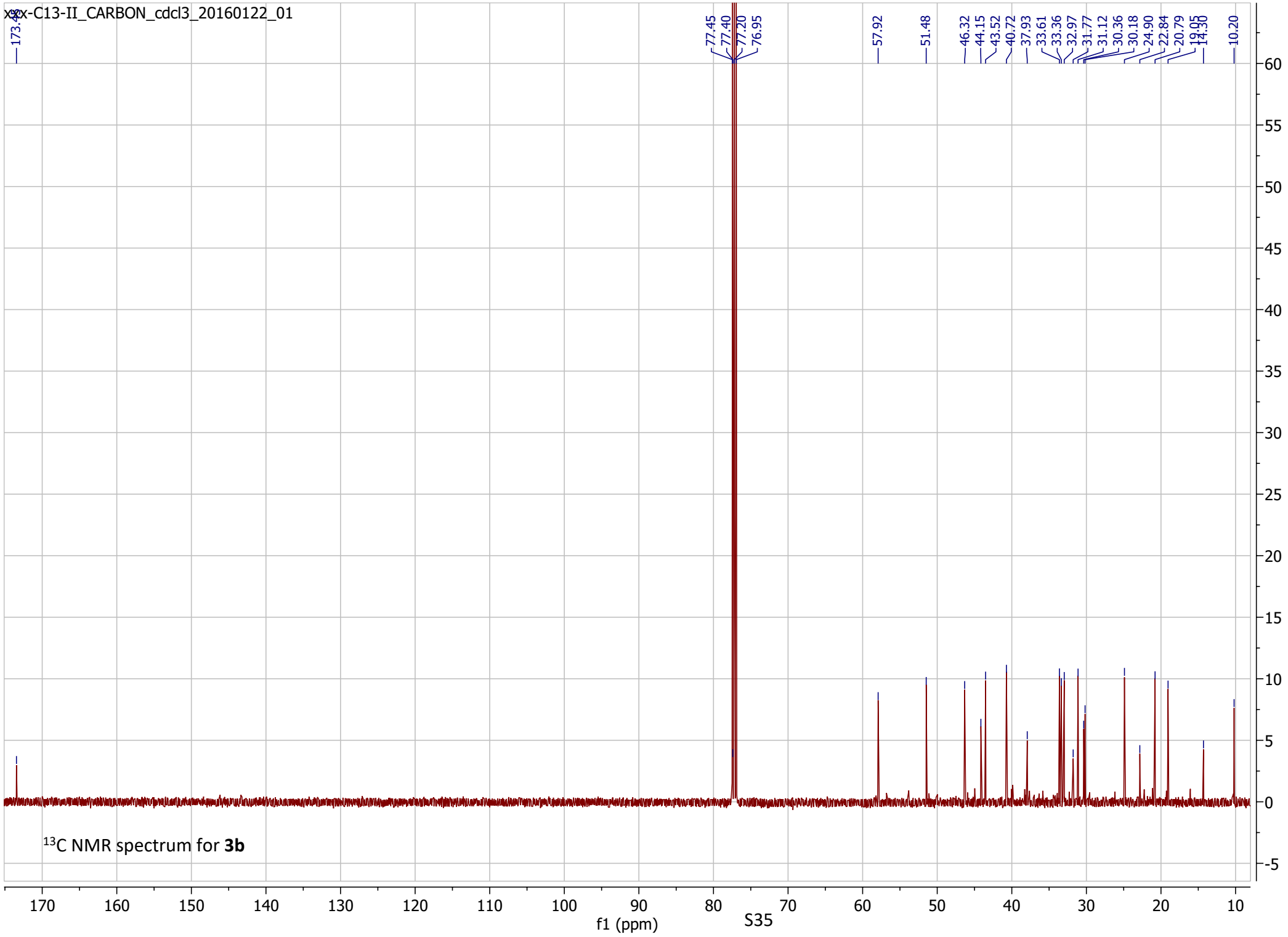
$^{1}$H NMR of N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]propanamide (**3b**)






Data file /home/walkup/Desktop/for Alison/compound 3b/xxx-C13-II_PROTON_cdcl3_20160122_01.fid

Plot date 2019-08-24

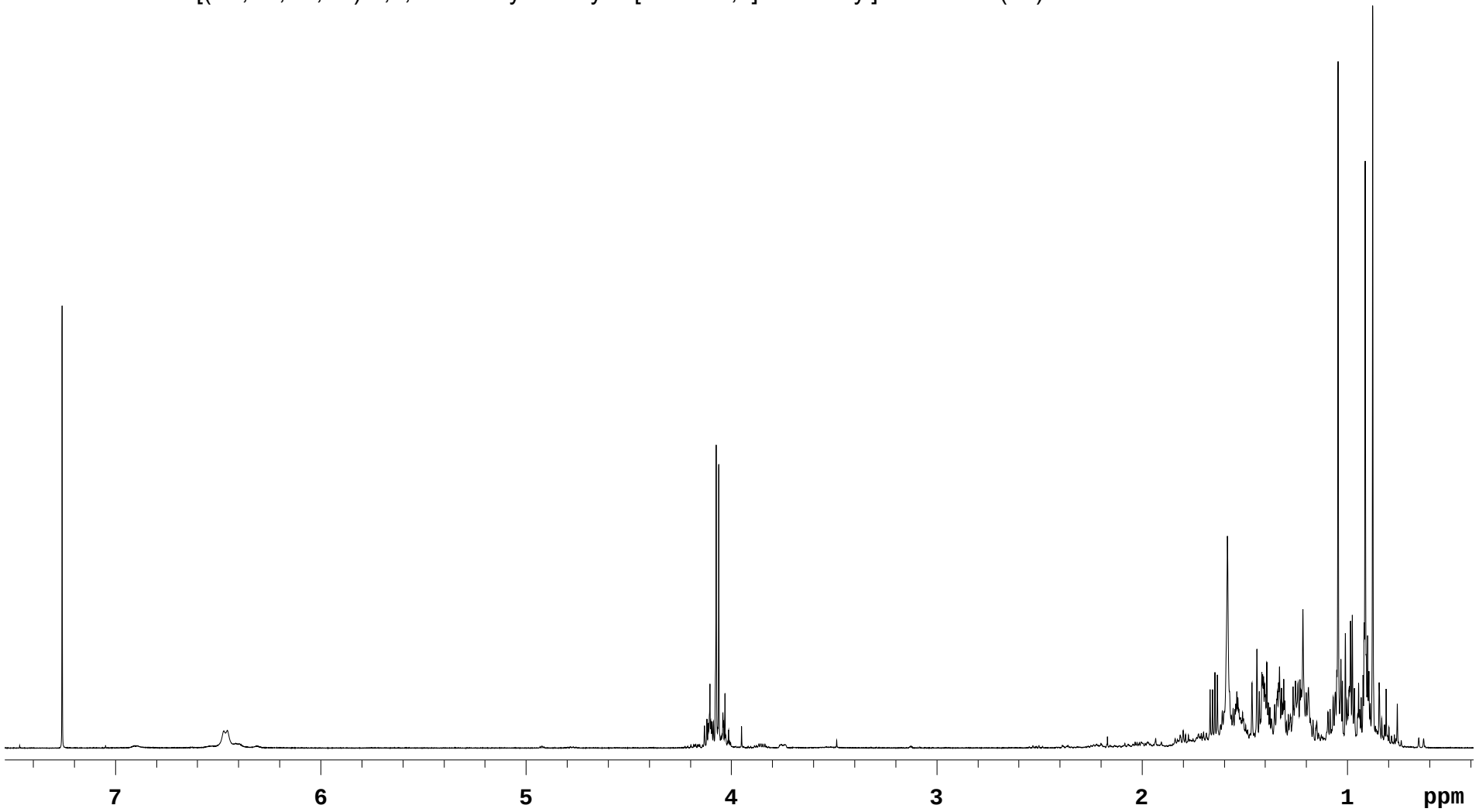



$^{13}$C NMR spectrum for **3b**

**xxx-C4-structureII**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C4-structureII** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-12-18** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

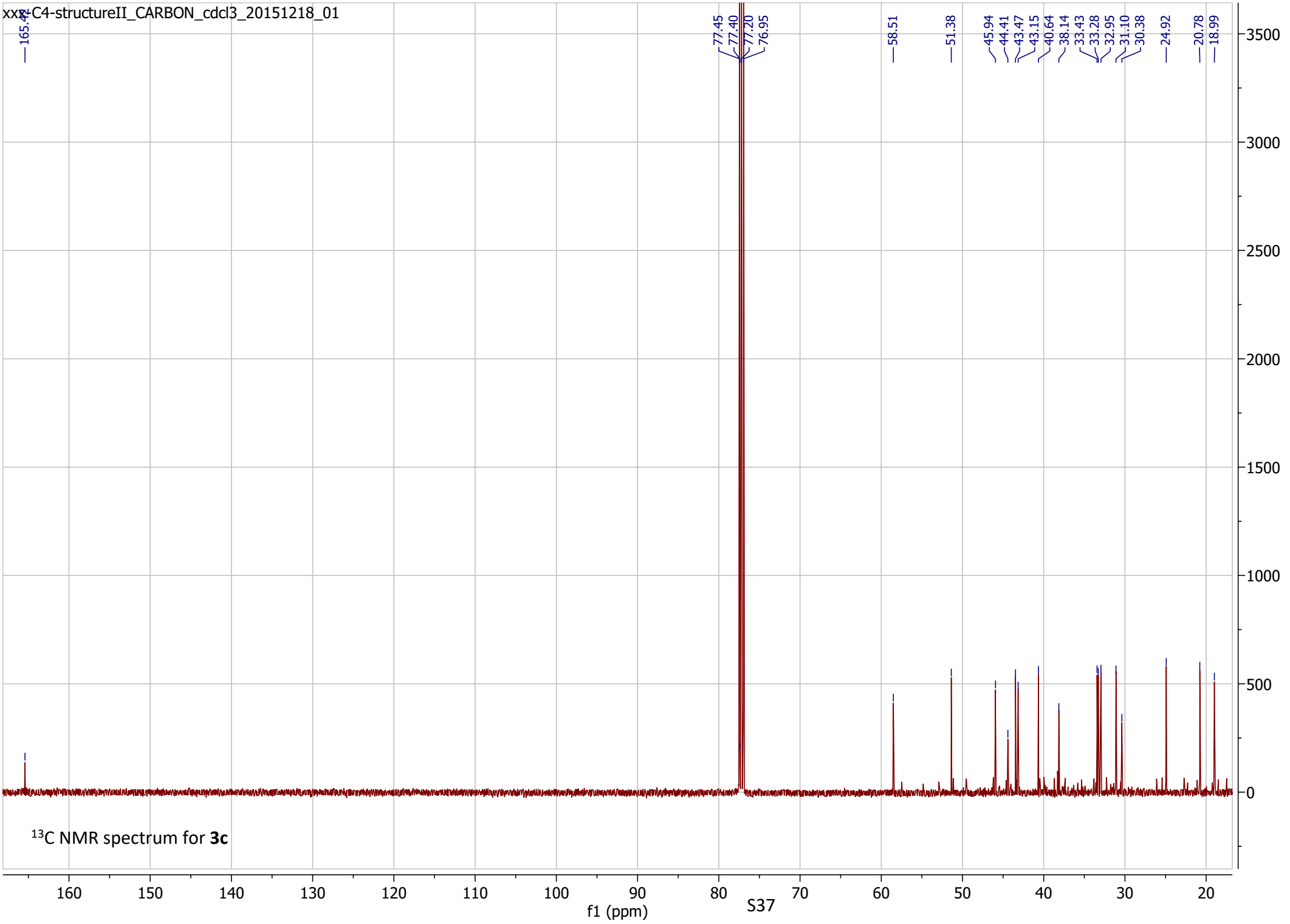
$^{1}$H NMR of 2-chloro-N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]acetamide (**3c**)






Data file /home/walkup/Desktop/for Alison/compound 3c/xxx-C4-structureII_PROTON_cdcl3_20151218_01.fid

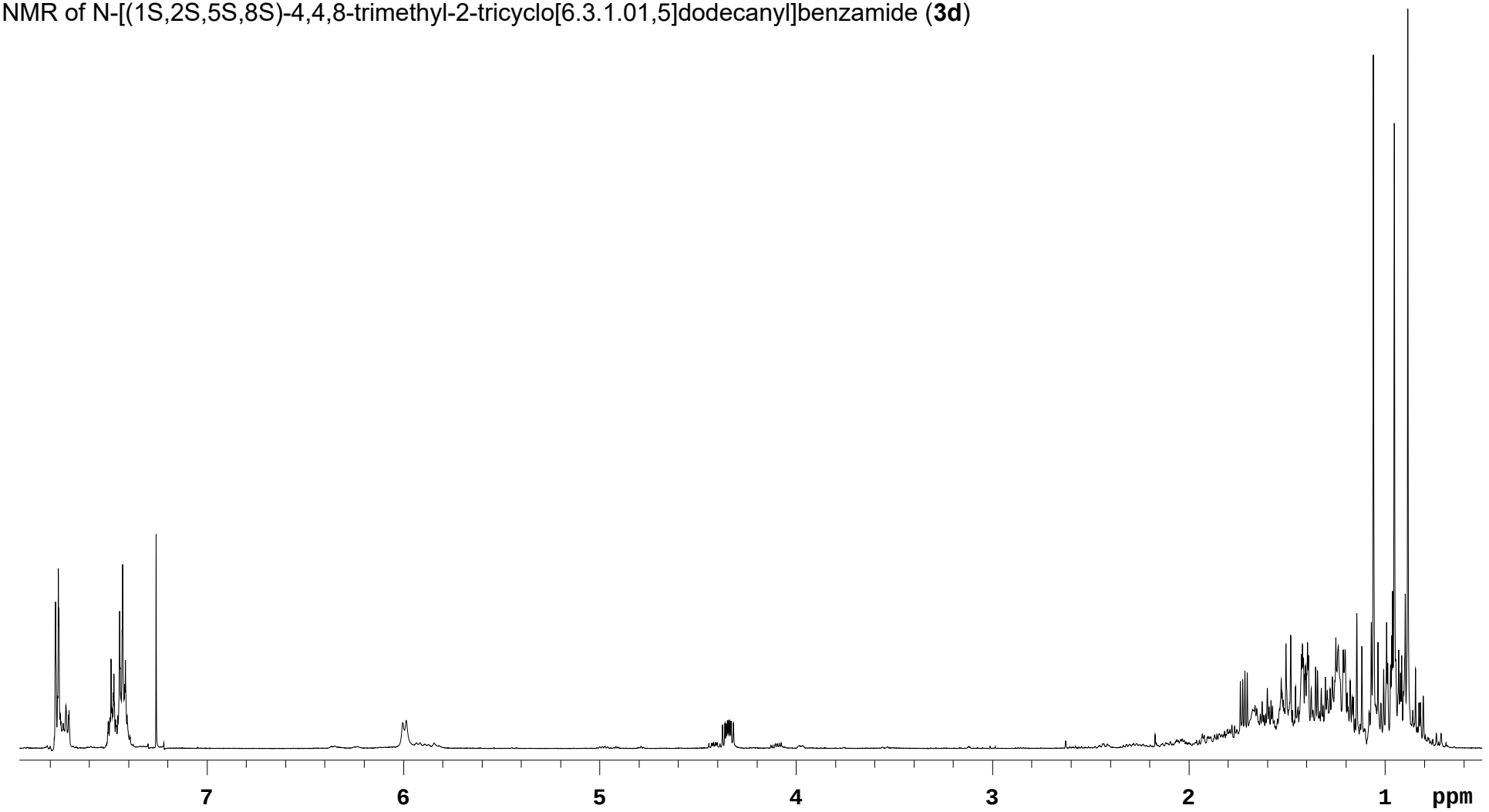
Plot date 2019-08-24


xxx-C4-structureII_CARBON_cdcl3_20151218_01
165.47
77.45
77.40
77.20
76.95
58.51
51.38
45.94
44.41
43.47
43.15
40.64
38.14
33.43
33.28
32.95
31.10
30.38
24.92
20.78
18.99
3500
3000
2500
2000
1500
1000
500
0
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
f1 (ppm)
$^{13}$C NMR spectrum for **3c**

**xxx-C8-II**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C8-II** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2016-01-19** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

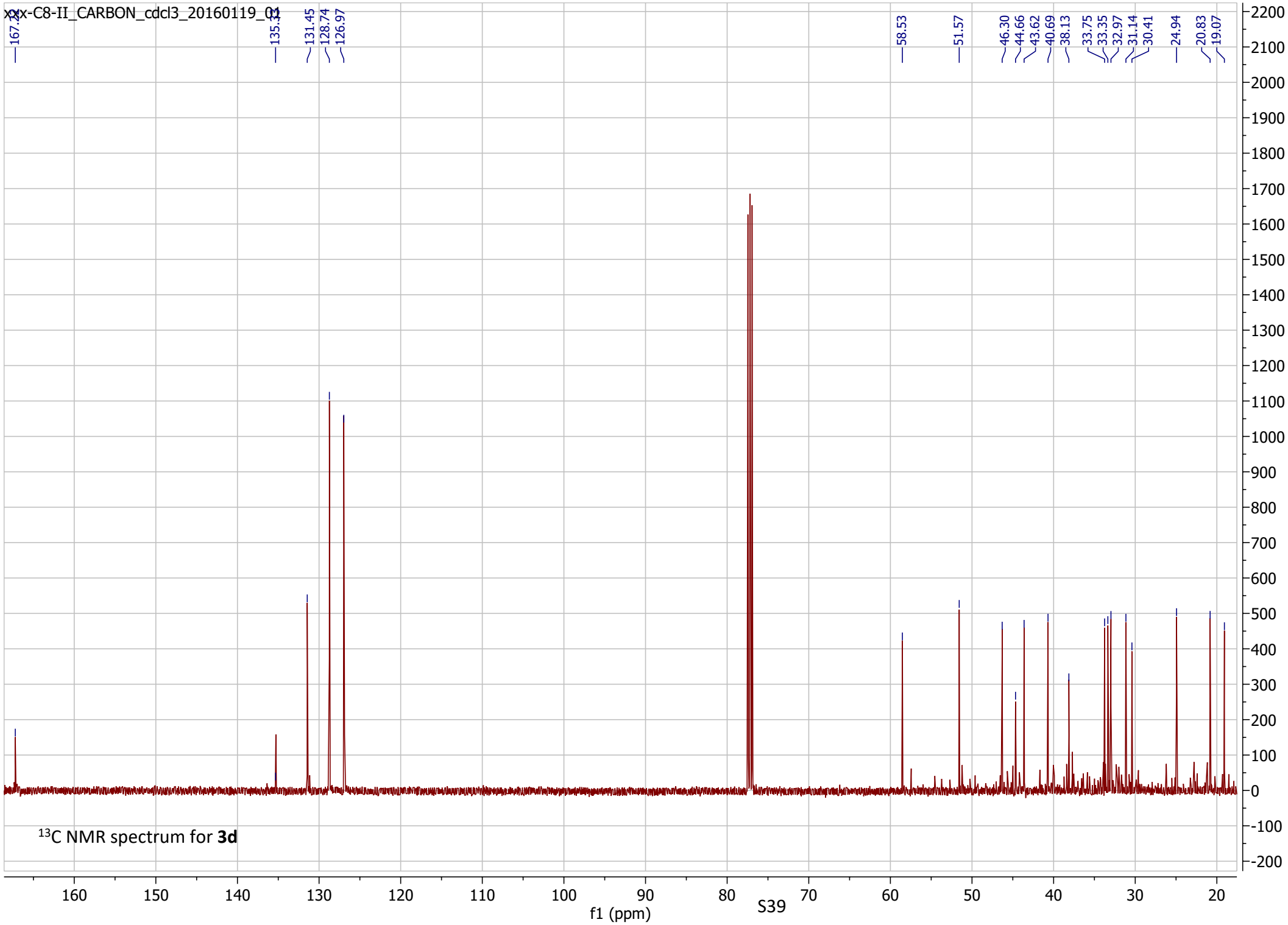
$^{1}$H NMR of N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]benzamide (**3d**)






Data file /home/walkup/Desktop/for Alison/compound 3d/xxx-C8-II_PROTON_cdcl3_20160119_01.fid

Plot date 2019-08-24

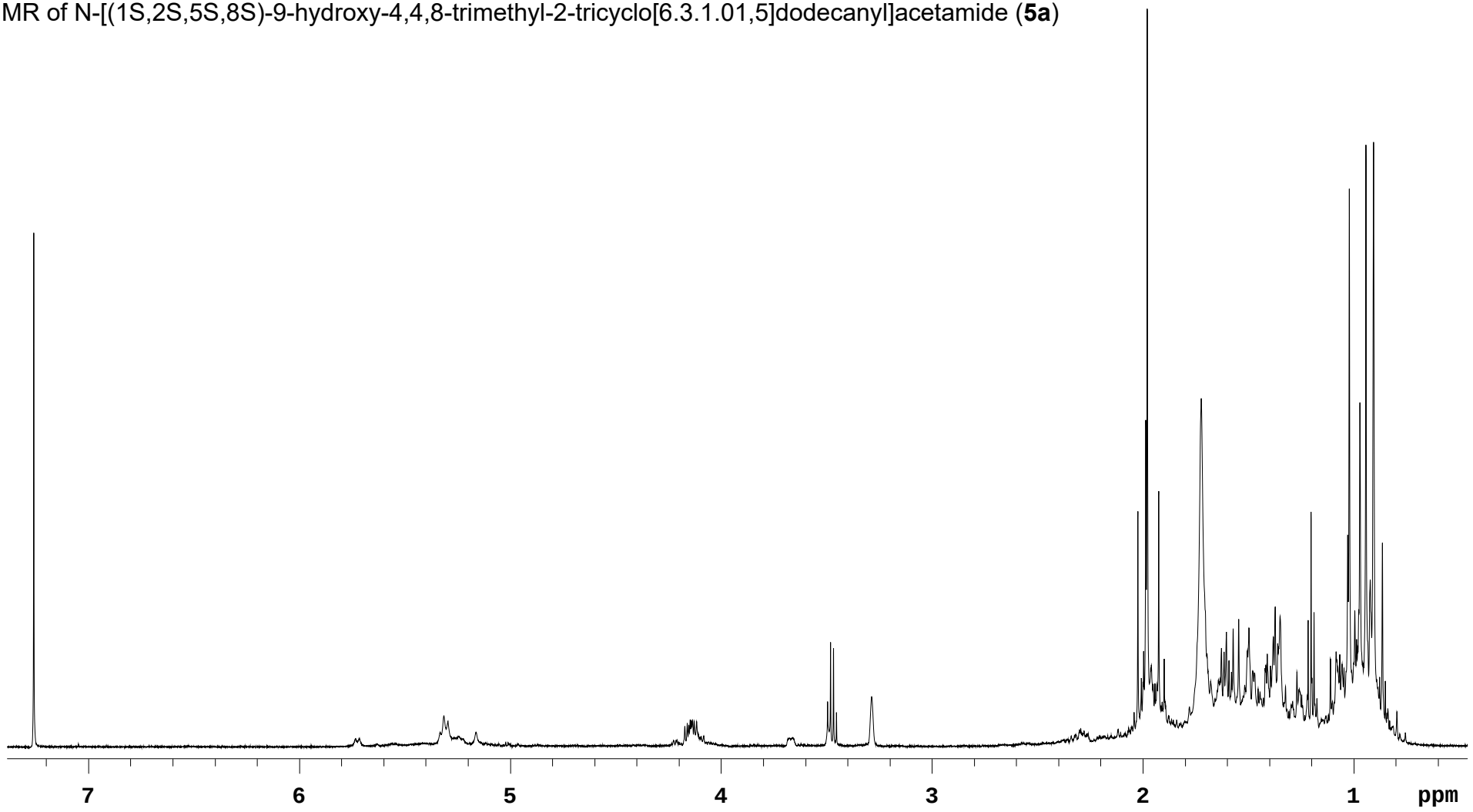



$^{13}$C NMR spectrum for **3d**

**E2-4min**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **E2-4min** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-03-01** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

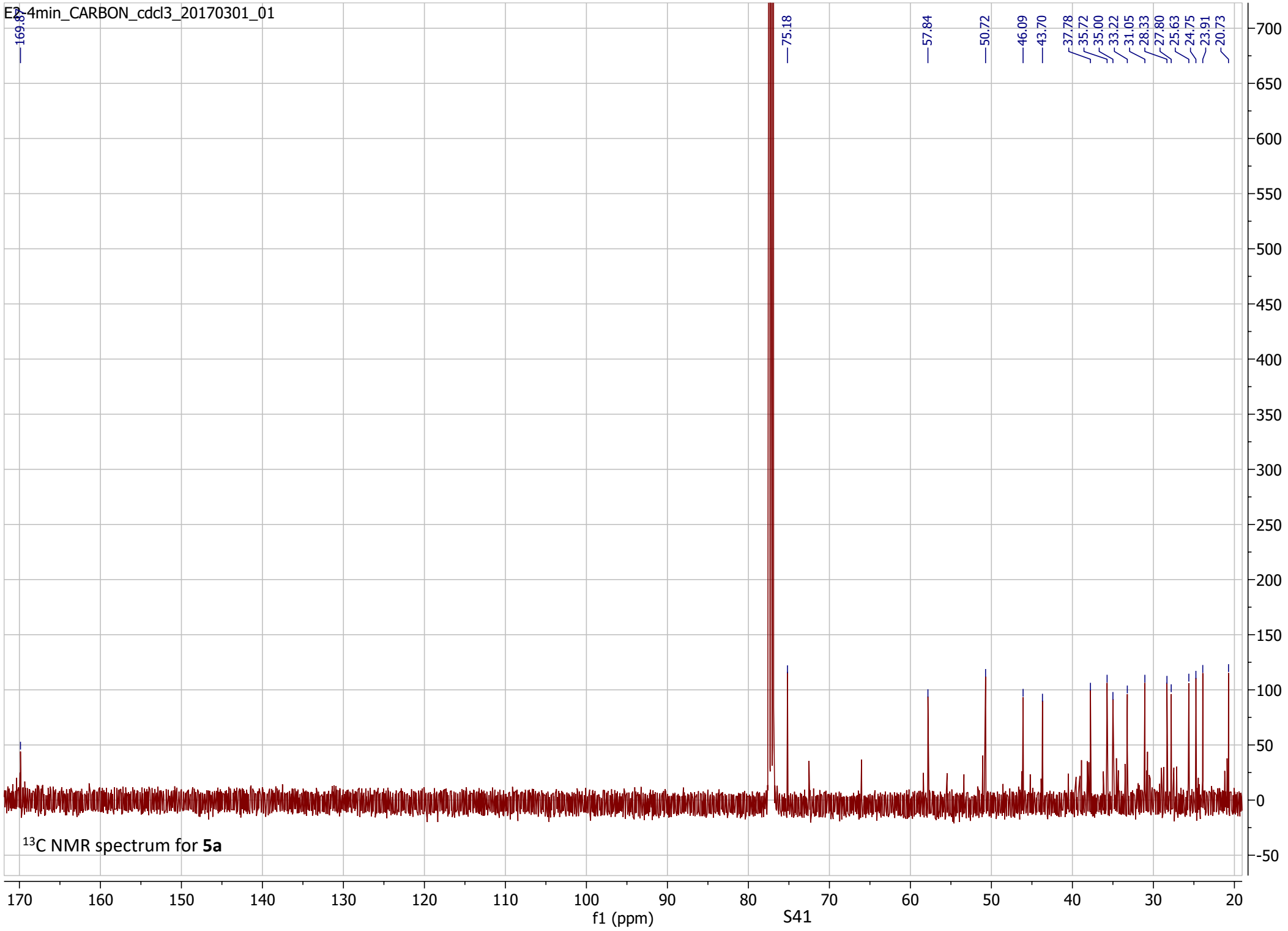
$^{1}$H NMR of N-[(1S,2S,5S,8S)-9-hydroxy-4,4,8-trimethyl-2-tricyclo[6.3.1.01,5]dodecanyl]acetamide (**5a**)






Data file /home/walkup/Desktop/for Alison/compound 5a/E2-4min_PROTON_cdcl3_20170301_02.fid

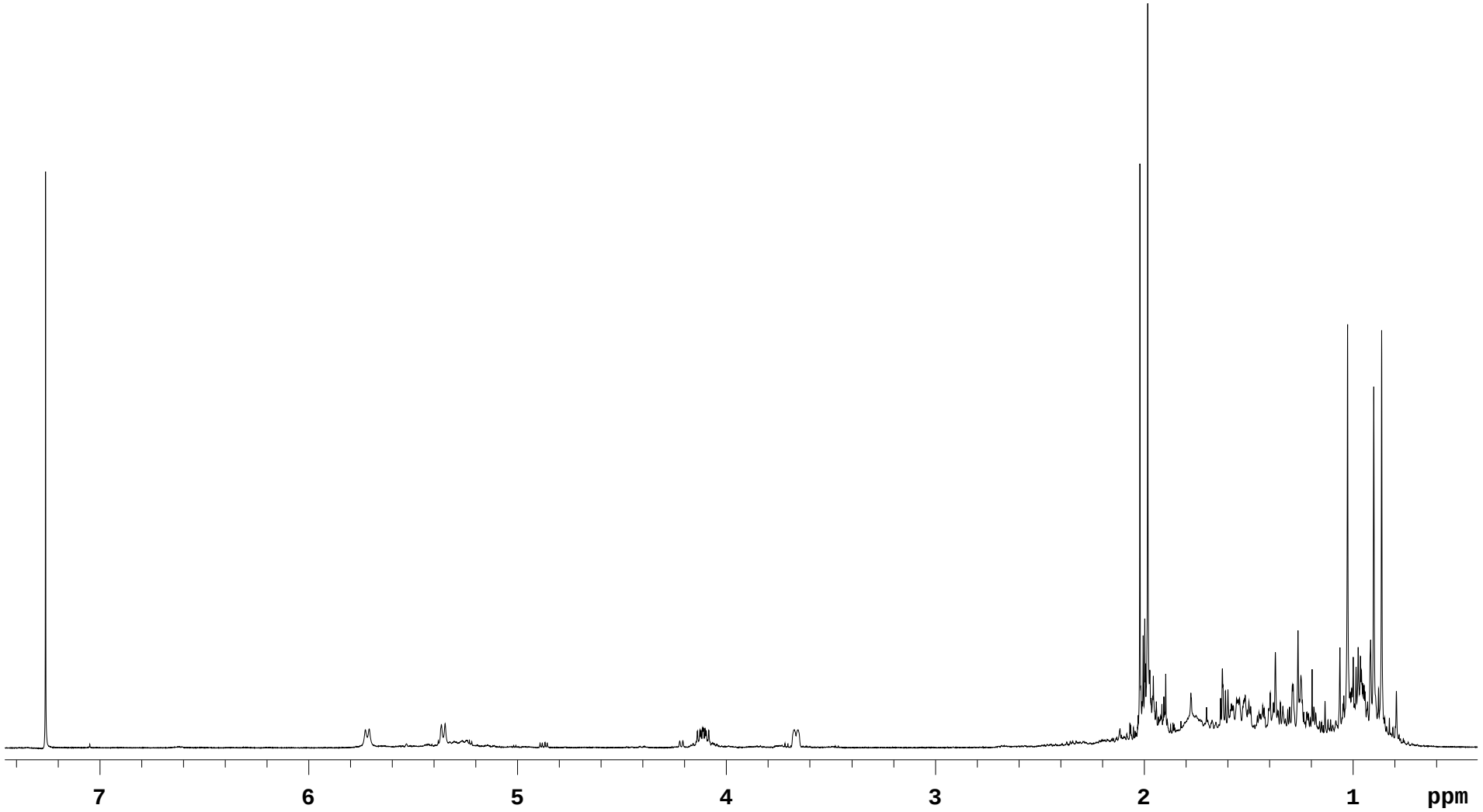
Plot date 2019-08-24


E2-4min_CARBON_cdcl3_20170301_01
169.87
75.18
57.84
50.72
46.09
43.70
37.78
35.72
35.00
33.22
31.05
28.33
27.80
25.63
24.75
23.91
20.73
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
f1 (ppm)
$^{13}$C NMR spectrum for **5a**

**E2-pure**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **E2-pure** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-02-06** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

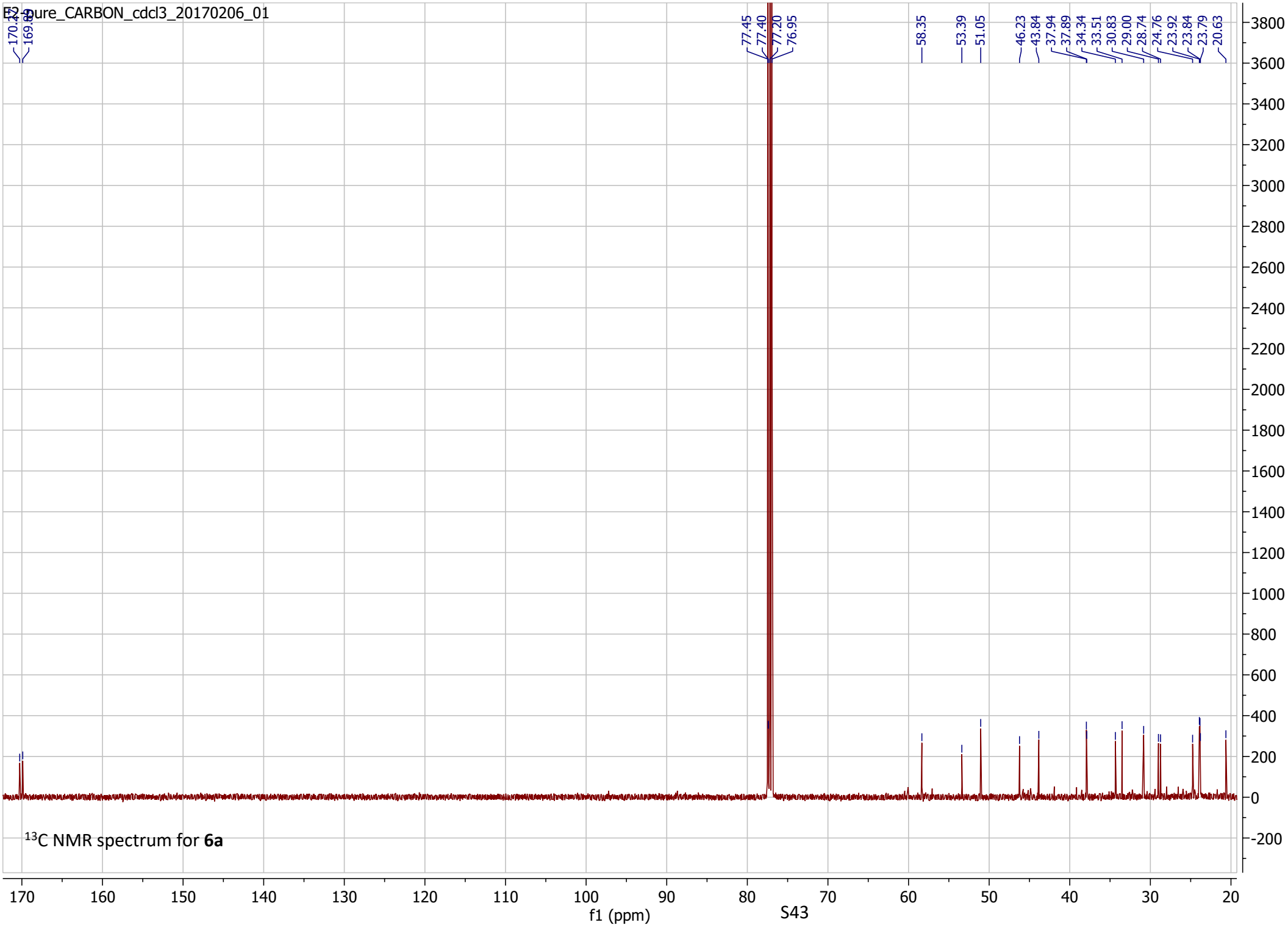
$^{1}$H NMR of N-[(1S,2S,5S,8S)-2-acetamido-4,4,8-trimethyl-9-tricyclo[6.3.1.01,5]dodecanyl]acetamide (**6a**)






Data file /home/walkup/Desktop/for Alison/compound 6a/E2-pure_PROTON_cdcl3_20170206_01.fid

Plot date 2019-08-24

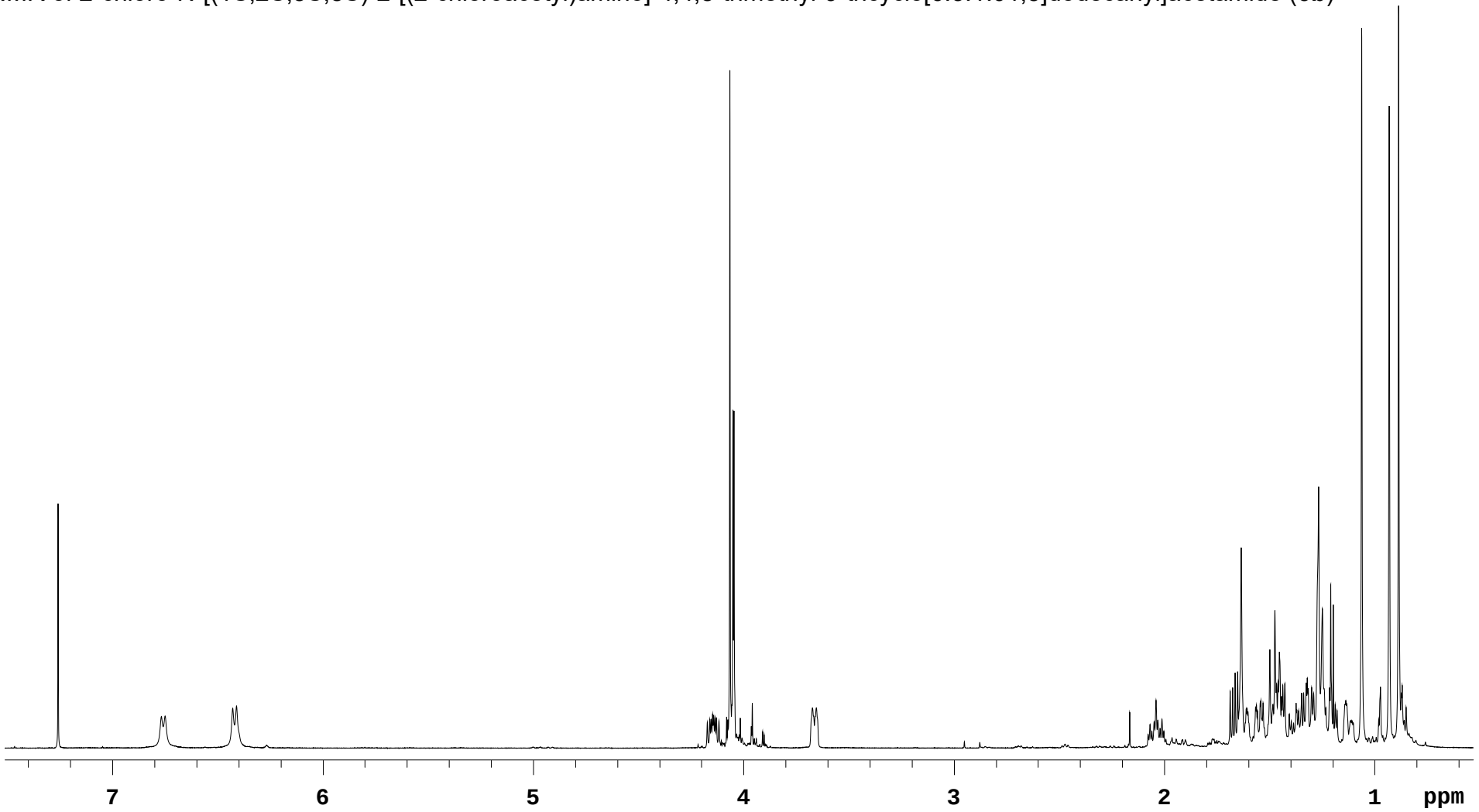



$^{13}$C NMR spectrum for **6a**

**E3-2ndcoulmn**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **E3-2ndcoulmn** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-01-20** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

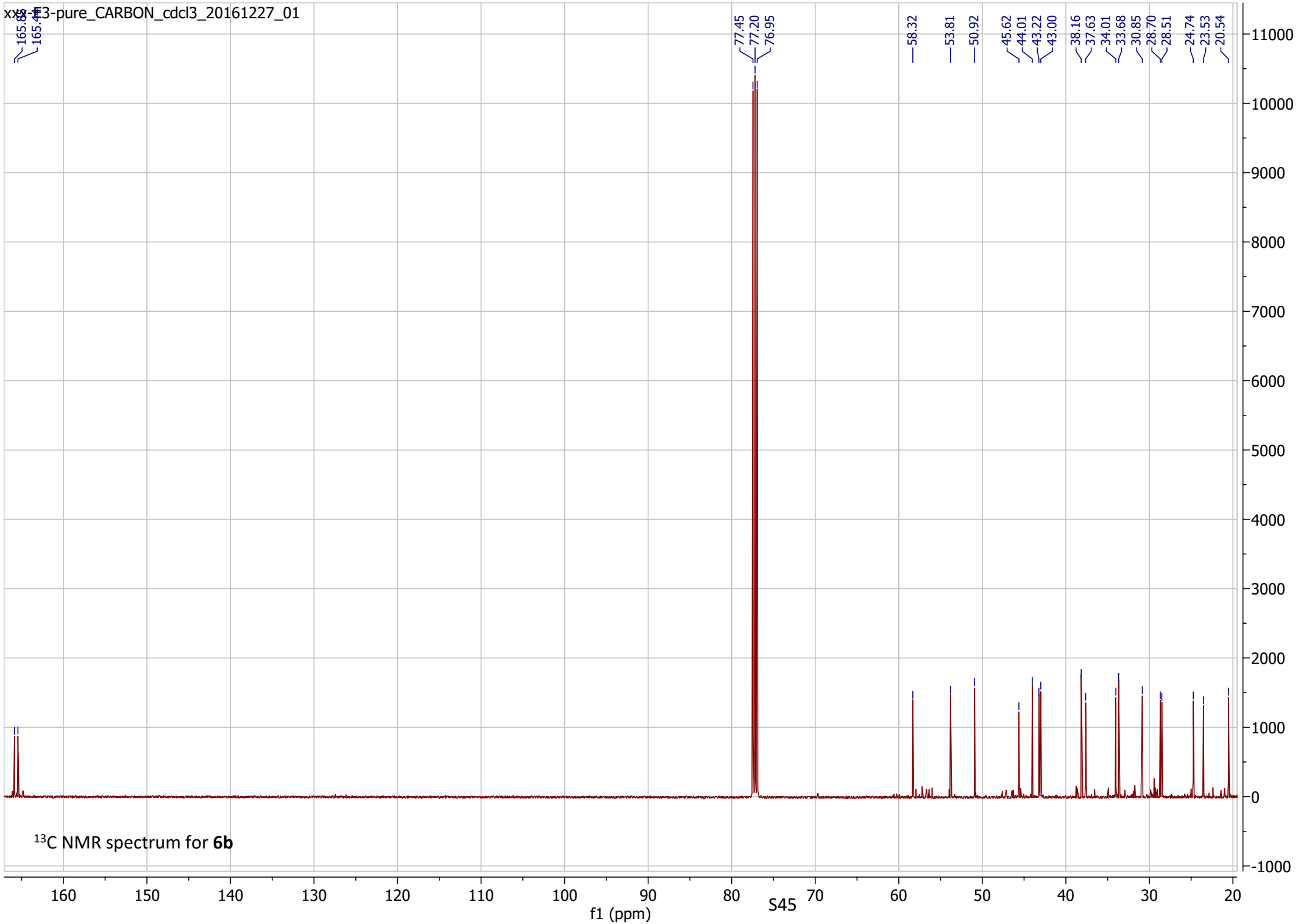
$^{1}$H NMR of 2-chloro-N-[(1S,2S,5S,8S)-2-[(2-chloroacetyl)amino]-4,4,8-trimethyl-9-tricyclo[6.3.1.01,5]dodecanyl]acetamide (**6b**)






Data file /home/walkup/Desktop/for Alison/compound 6b/E3-2ndcoulmn_PROTON_cdcl3_20170120_01.fid

Plot date 2019-08-24

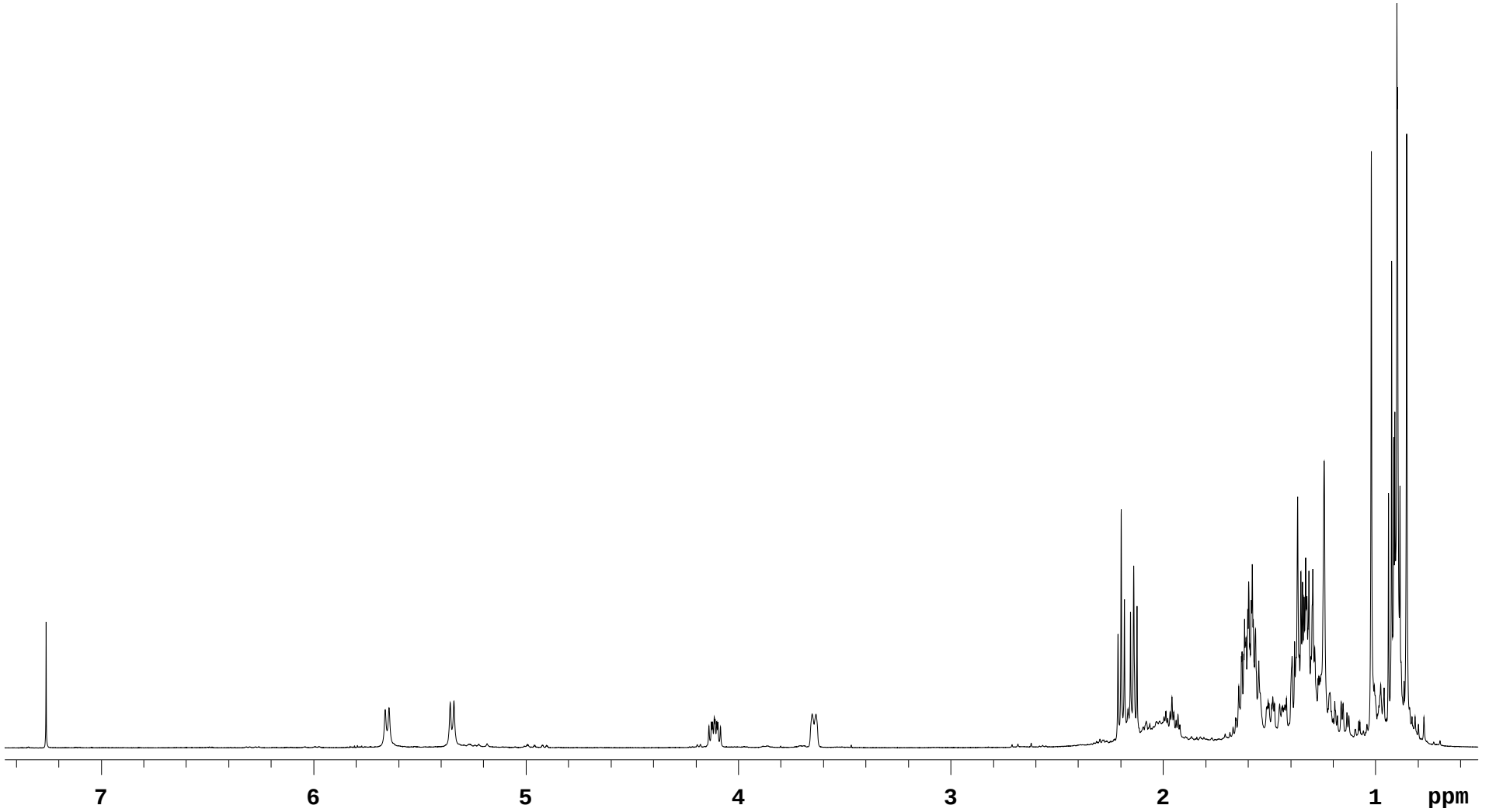



$^{13}$C NMR spectrum for **6b**

**E4**

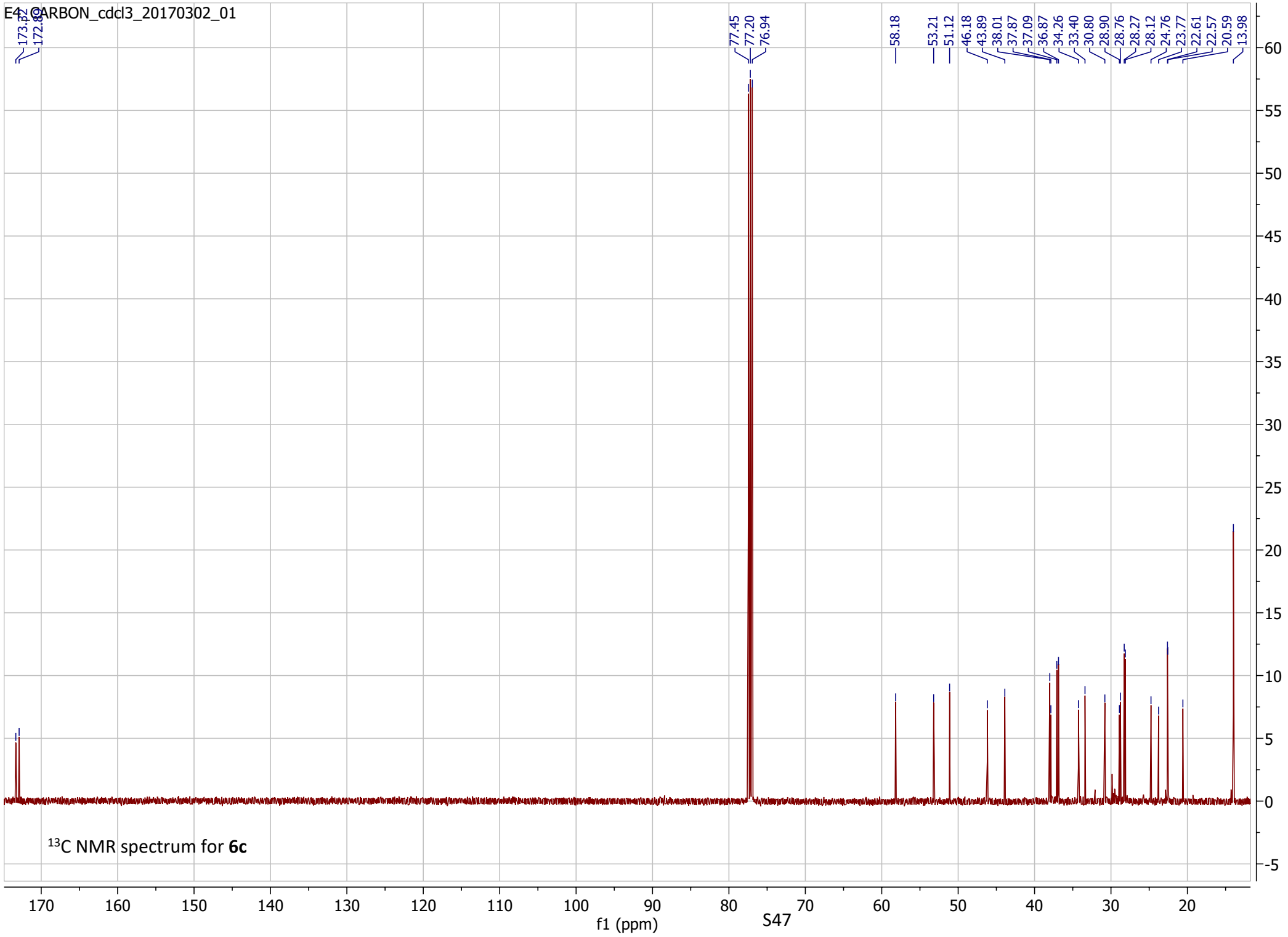
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **E4** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-03-02** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

$^{1}$H NMR of N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-(pentanoylamino)-9-tricyclo[6.3.1.01,5]dodecanyl]pentanamide (**6c**)





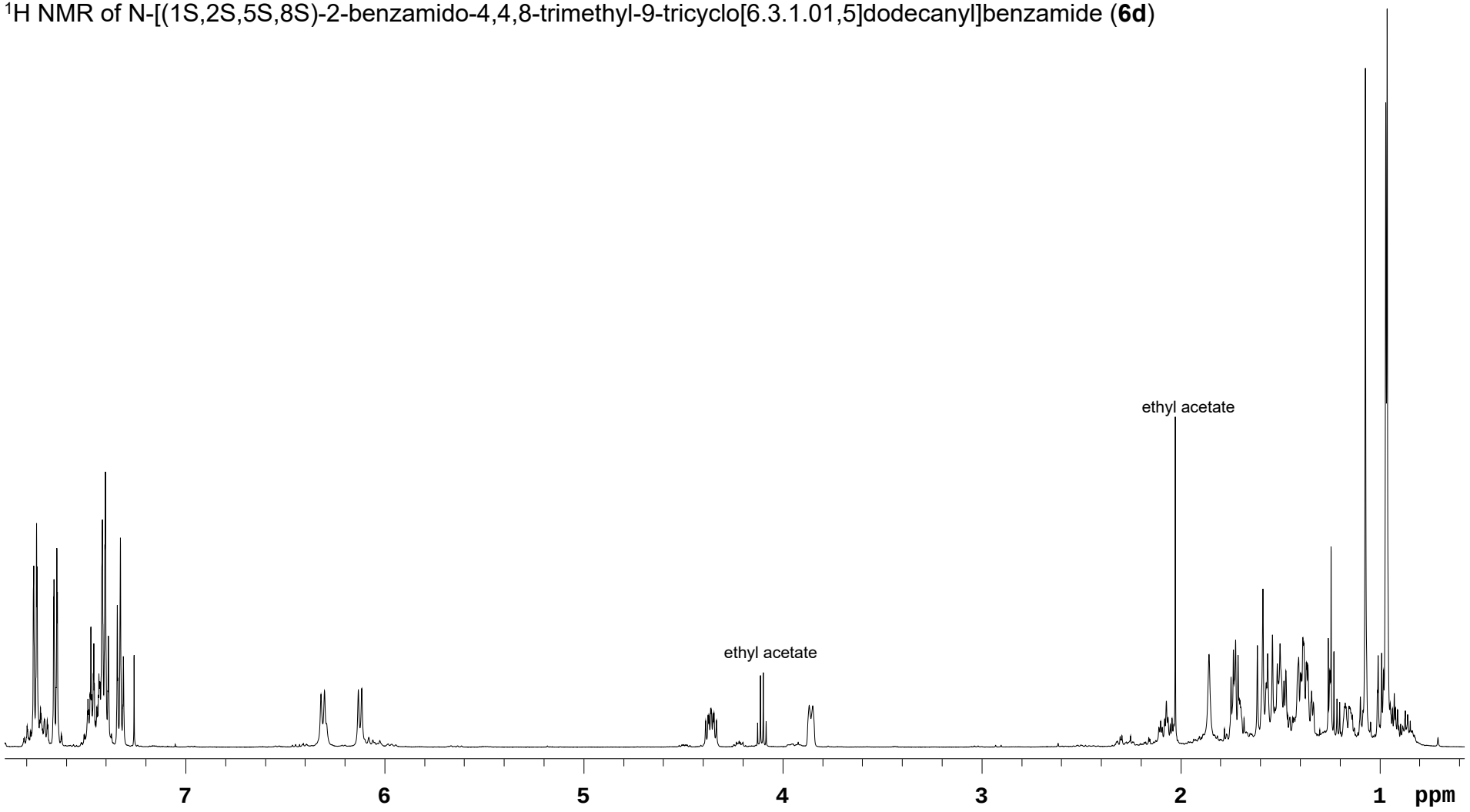

Plot date 2019-08-24

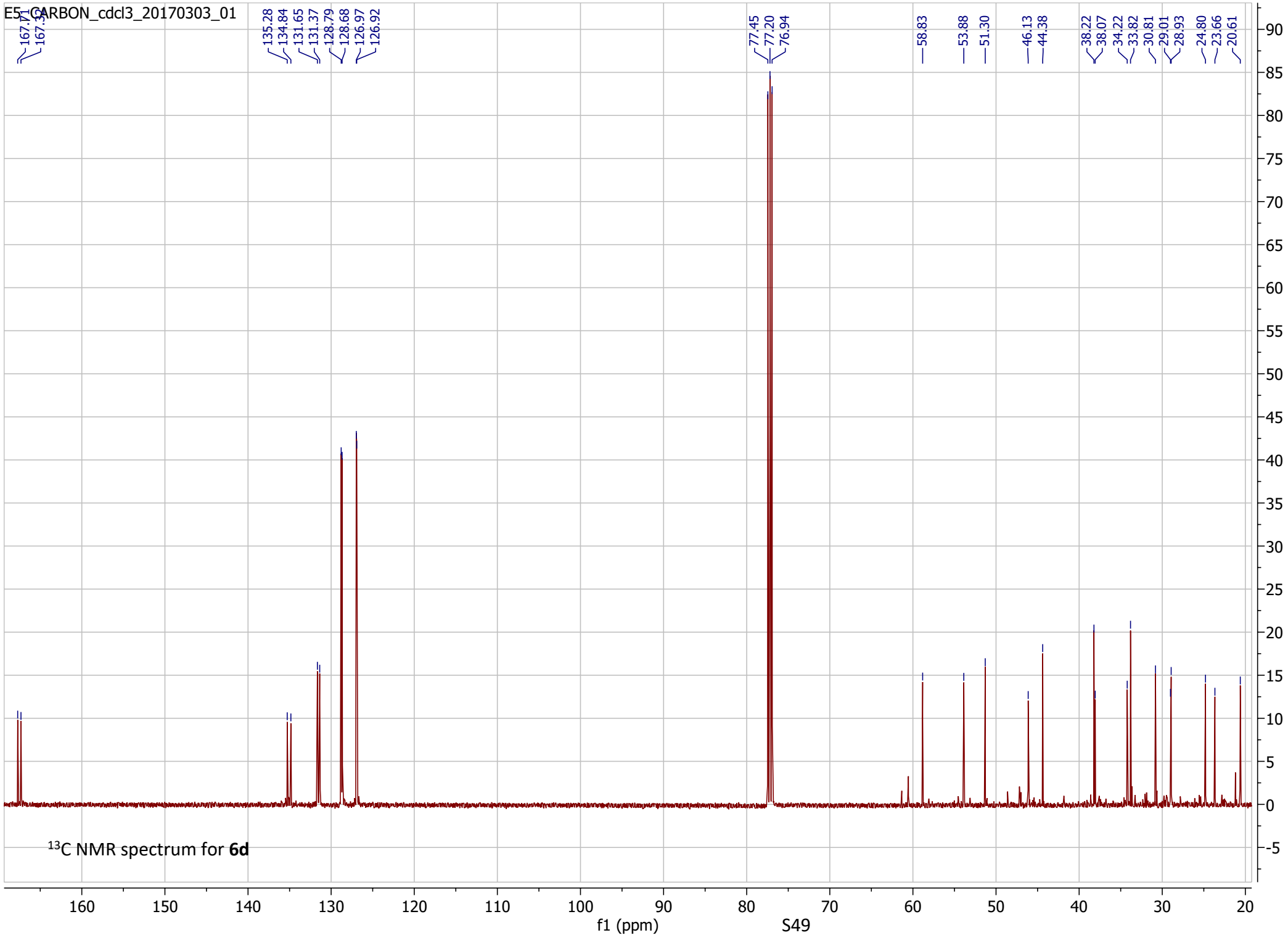



$^{13}$C NMR spectrum for **6c**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **E5** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-03-03** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

$^{1}$H NMR of N-[(1S,2S,5S,8S)-2-benzamido-4,4,8-trimethyl-9-tricyclo[6.3.1.01,5]dodecanyl]benzamide (**6d**)

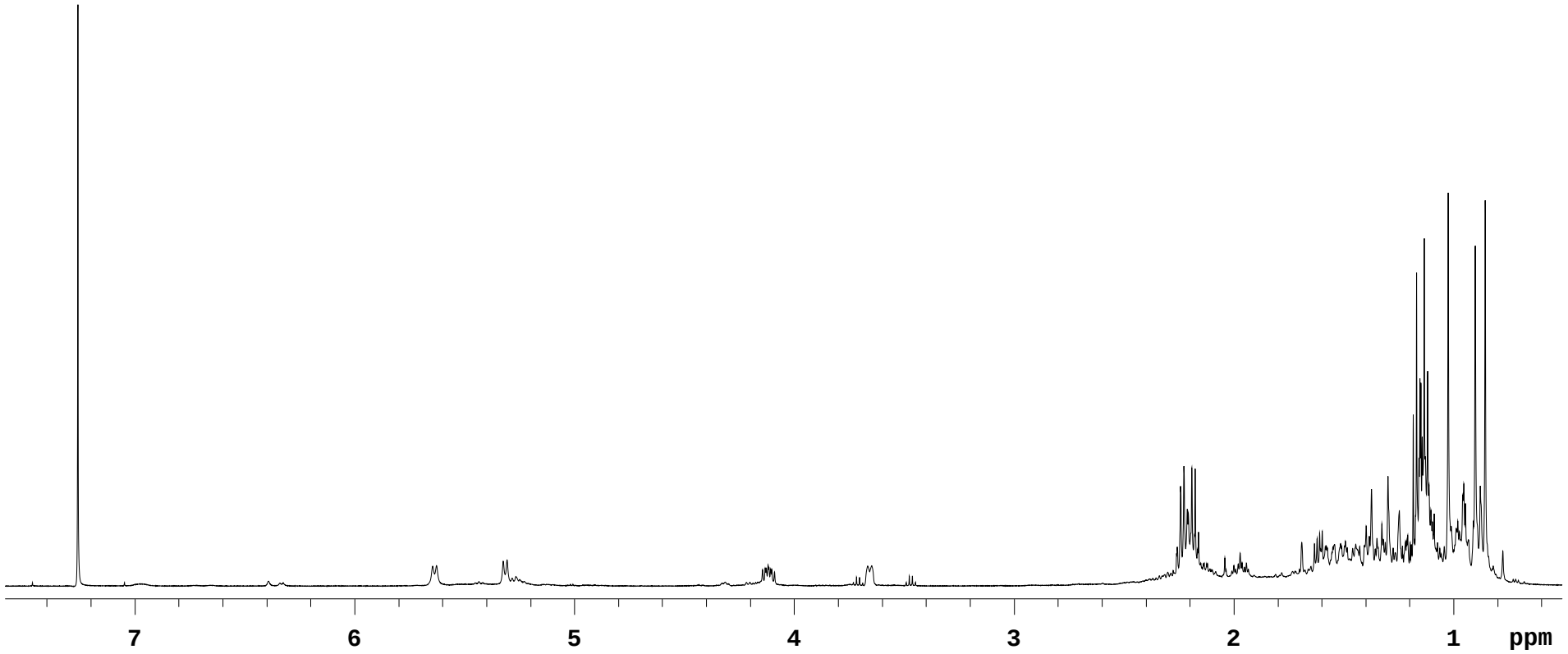


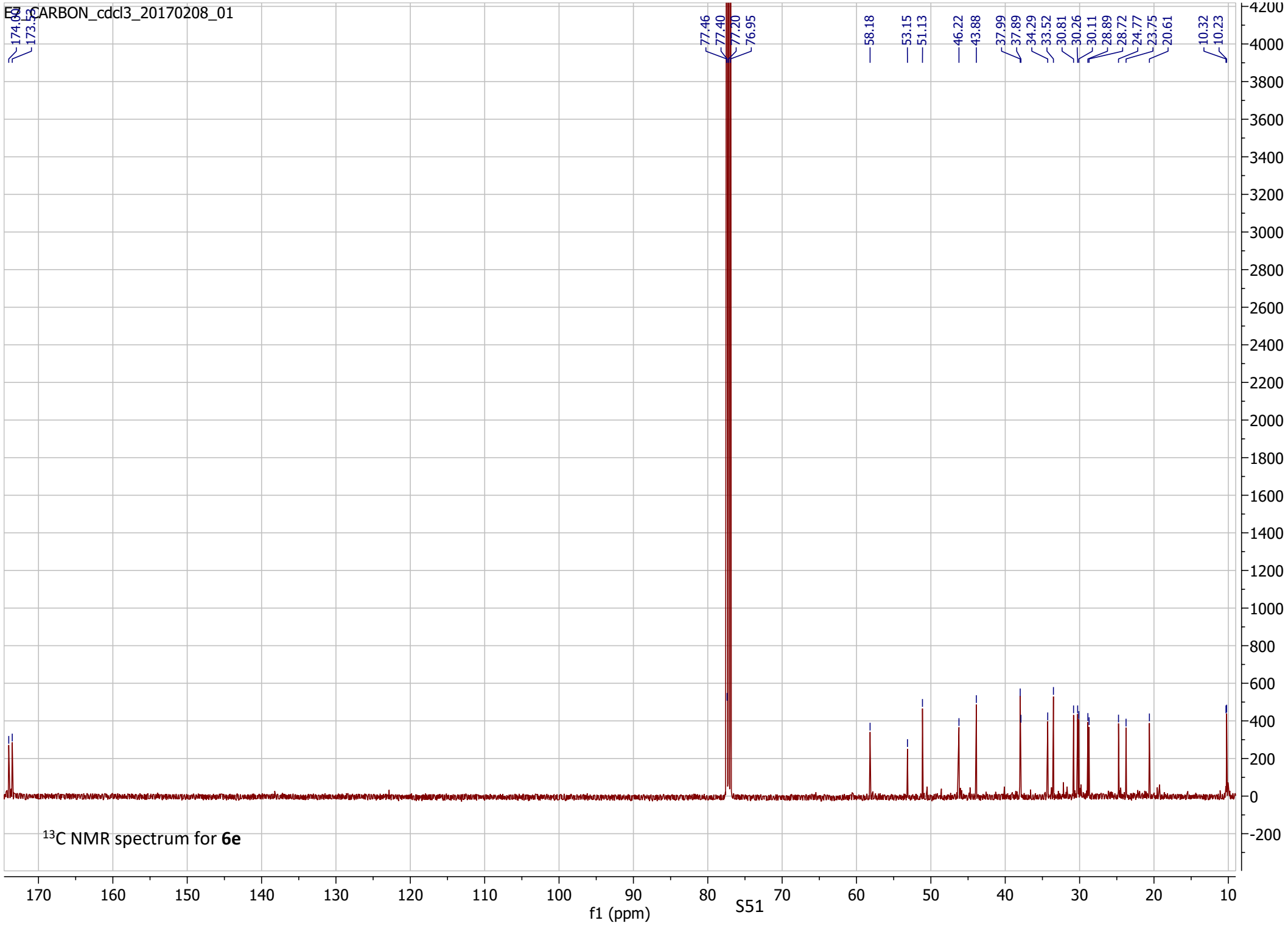



$^{13}$C NMR spectrum for **6d**

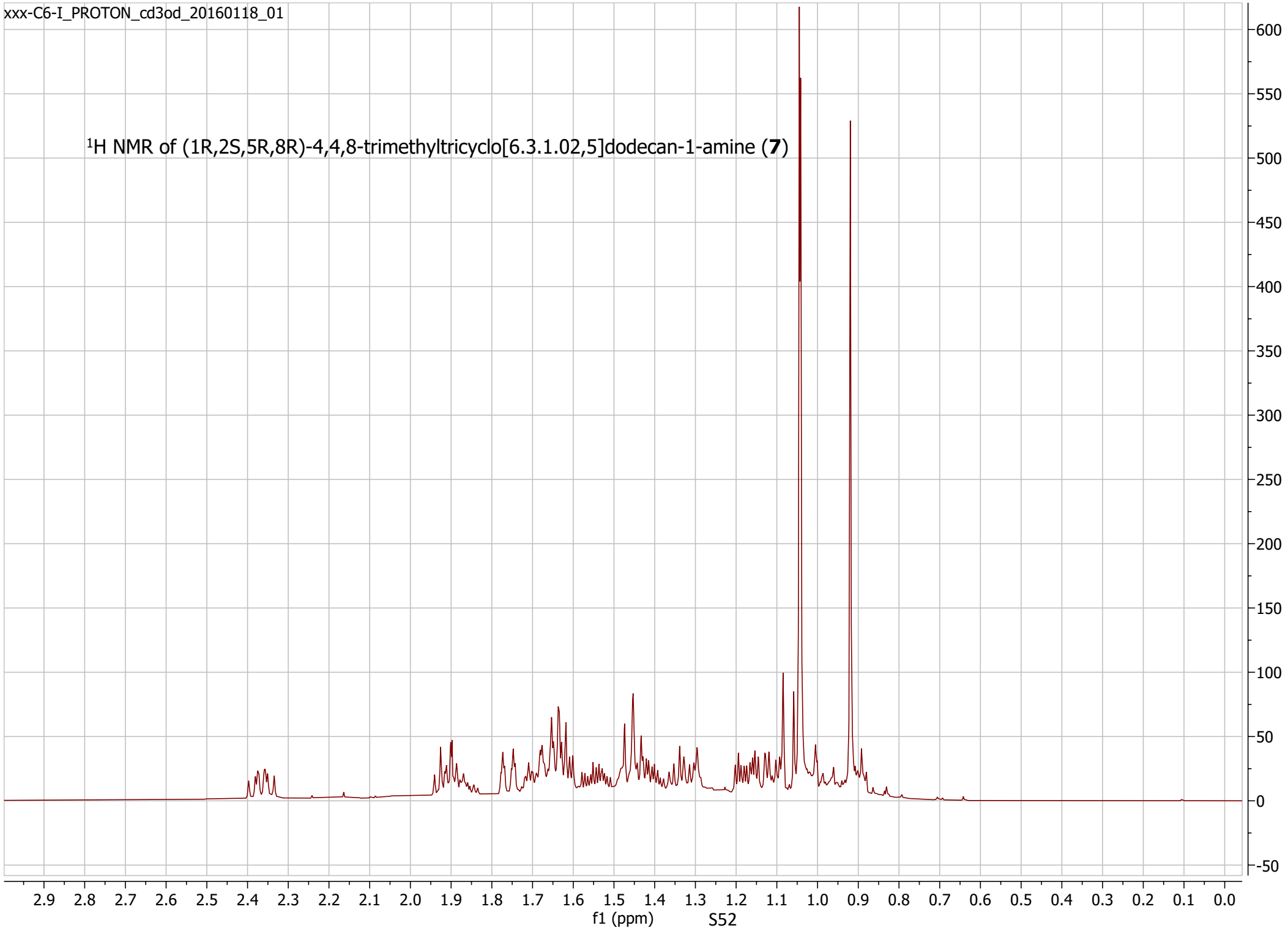
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **E7** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-02-08** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

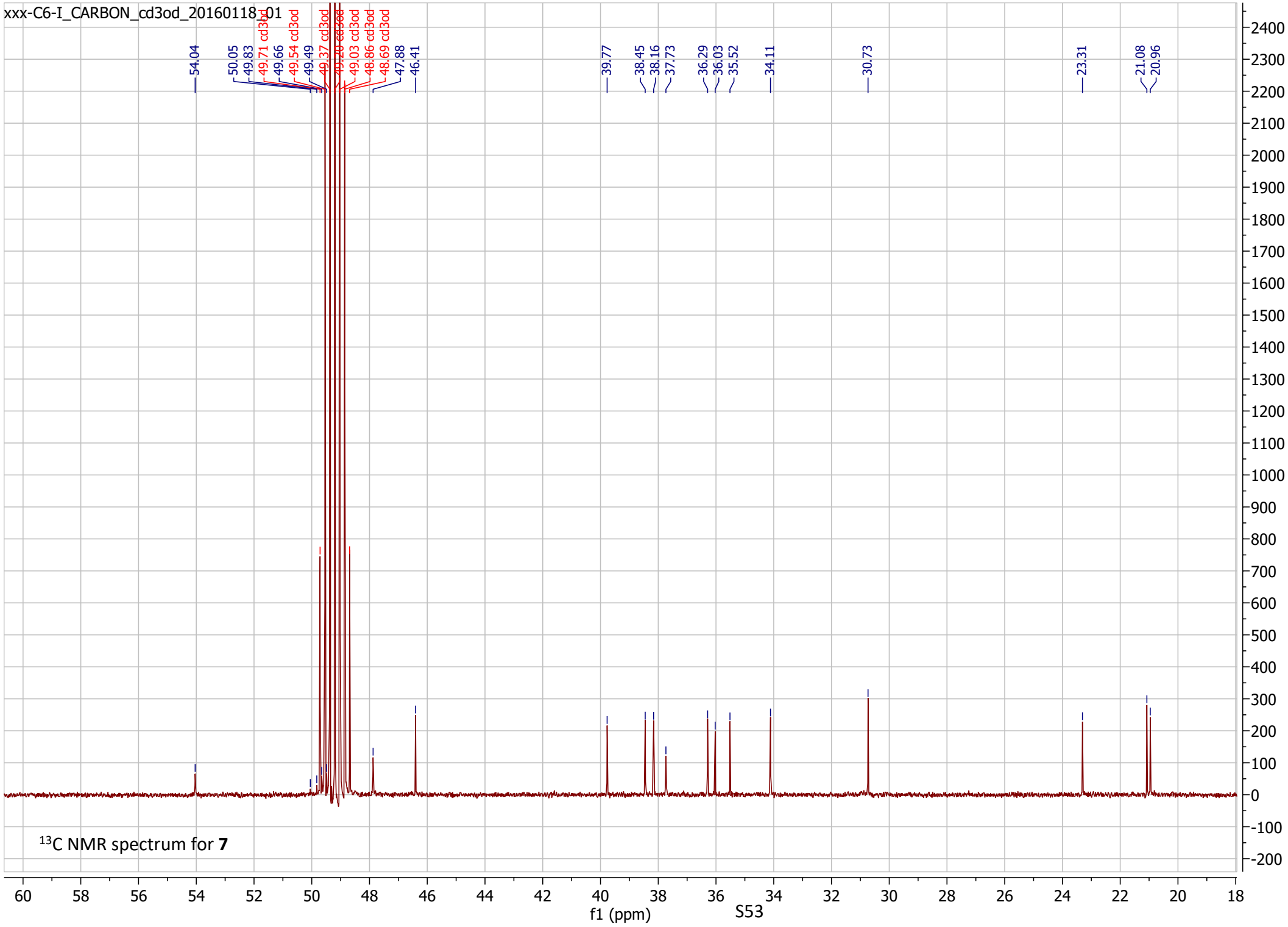
$^{1}$H NMR of N-[(1S,2S,5S,8S)-4,4,8-trimethyl-2-(propanoylamino)-9-tricyclo[6.3.1.01,5]dodecanyl]propanamide (**6e**)






$^{13}$C NMR spectrum for **6e**

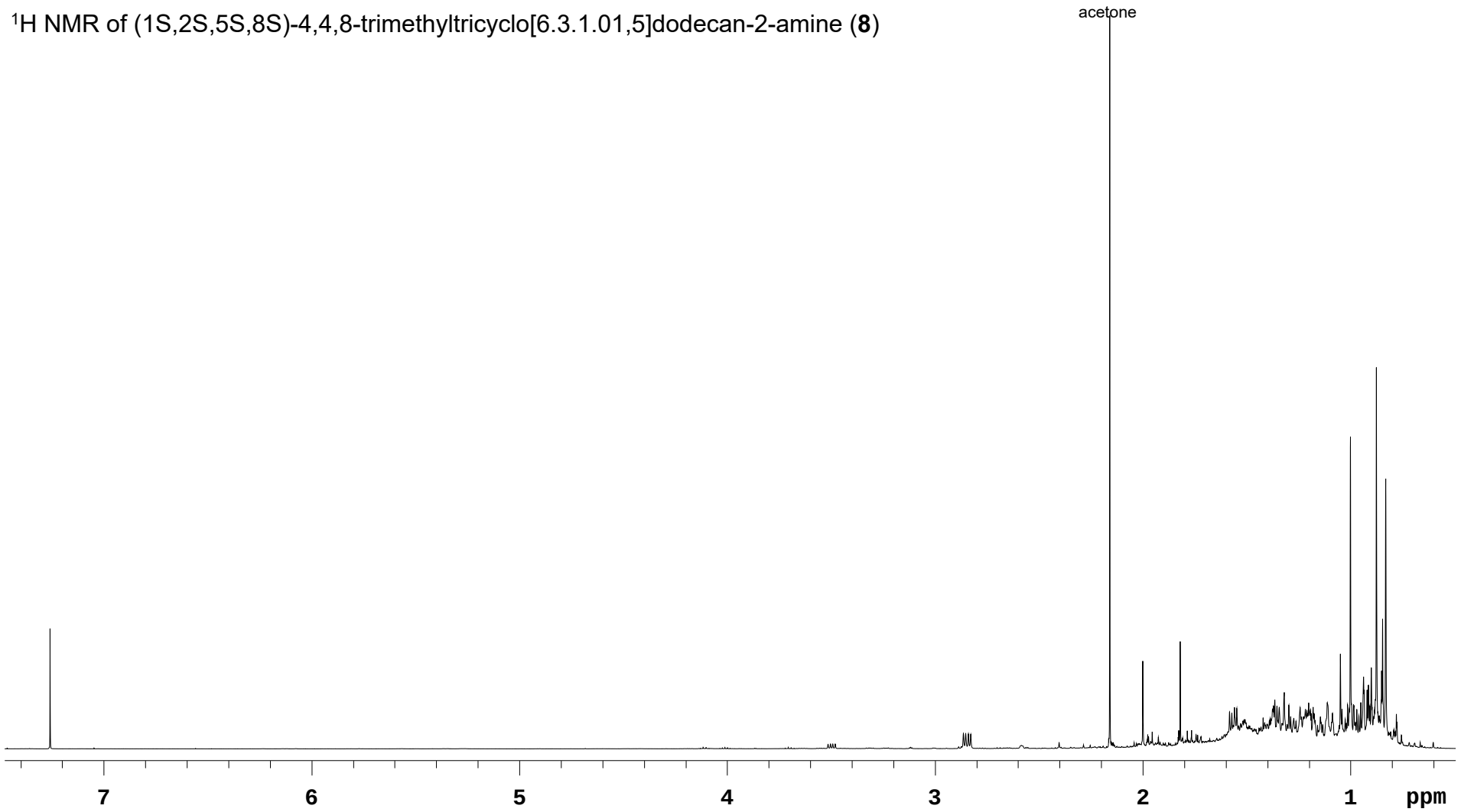

xxx-C6-I_PROTON_cd3od_20160118_01
$^1$H NMR of (1R,2S,5R,8R)-4,4,8-trimethyltricyclo[6.3.1.02,5]dodecan-1-amine (**7**)
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
2.9 2.8 2.7 2.6 2.5 2.4 2.3 2.2 2.1 2.0 1.9 1.8 1.7 1.6 1.5 1.4 1.3 1.2 1.1 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0
f1 (ppm)
S52




$^{13}$C NMR spectrum for **7**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C6-II** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2016-02-02** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

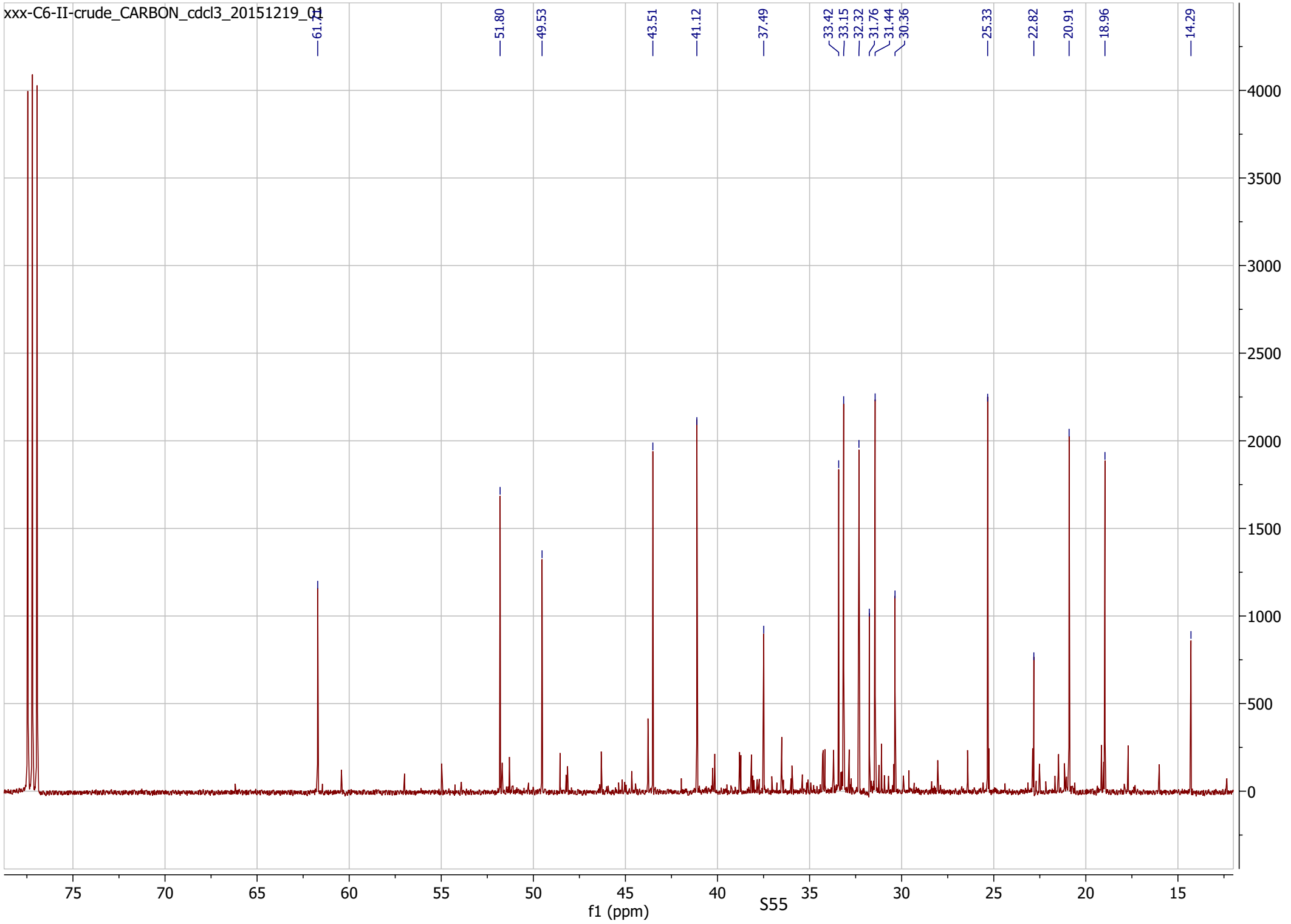
$^{1}$H NMR of (1S,2S,5S,8S)-4,4,8-trimethyltricyclo[6.3.1.01,5]dodecan-2-amine (**8**)






Data file /home/walkup/Desktop/for Alison/compound 8/xxx-C6-II_PROTON_cdcl3_20160202_01.fid

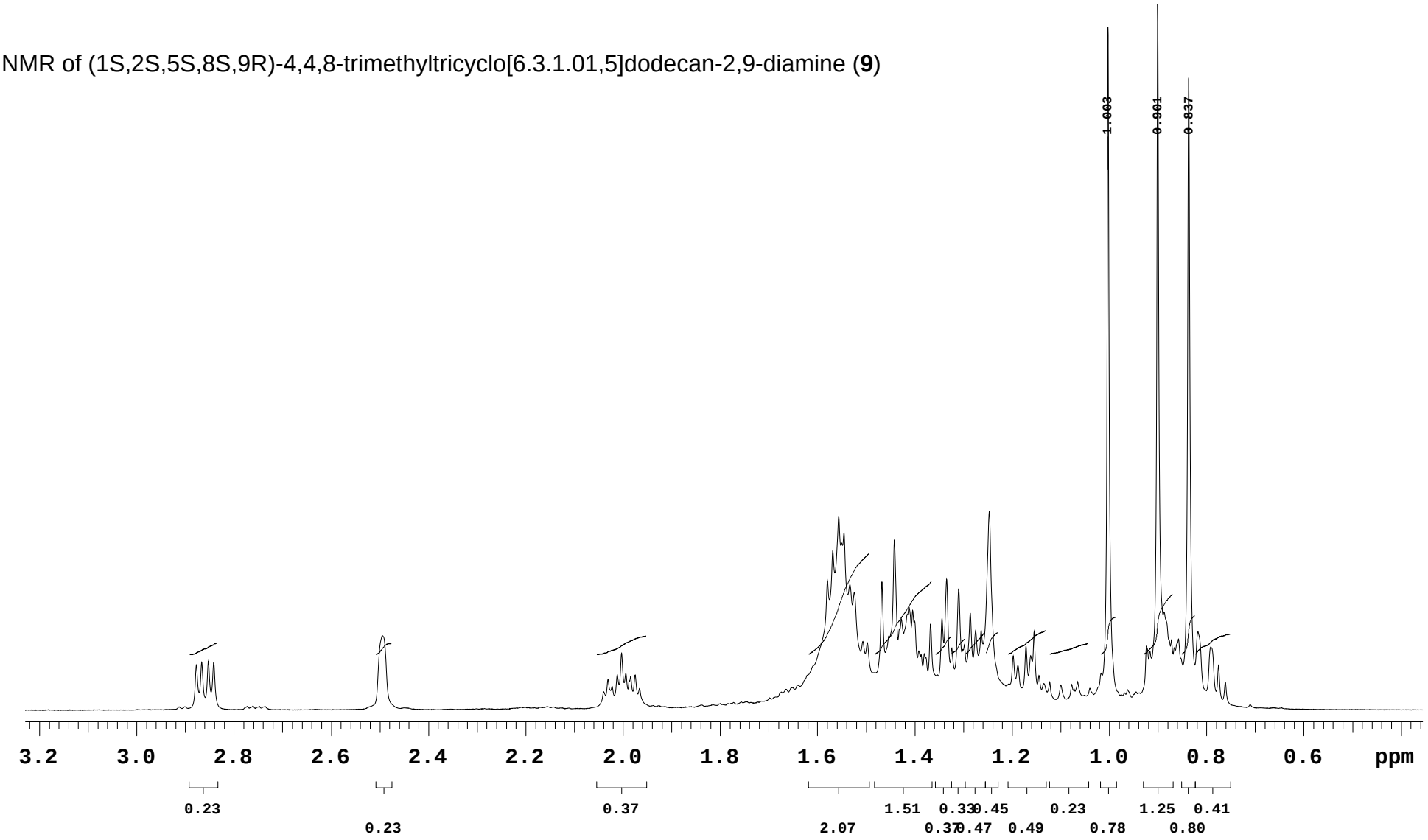
Plot date 2019-08-24


xxx-C6-II-crude_CARBON_cdcl3_20151219_01
61.71
51.80
49.53
43.51
41.12
37.49
33.42
33.15
32.32
31.76
31.44
30.36
25.33
22.82
20.91
18.96
14.29
4000
3500
3000
2500
2000
1500
1000
500
0
75
70
65
60
55
50
45
40
35
30
25
20
15
f1 (ppm)
S55

**E11**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **E11** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2017-02-15** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

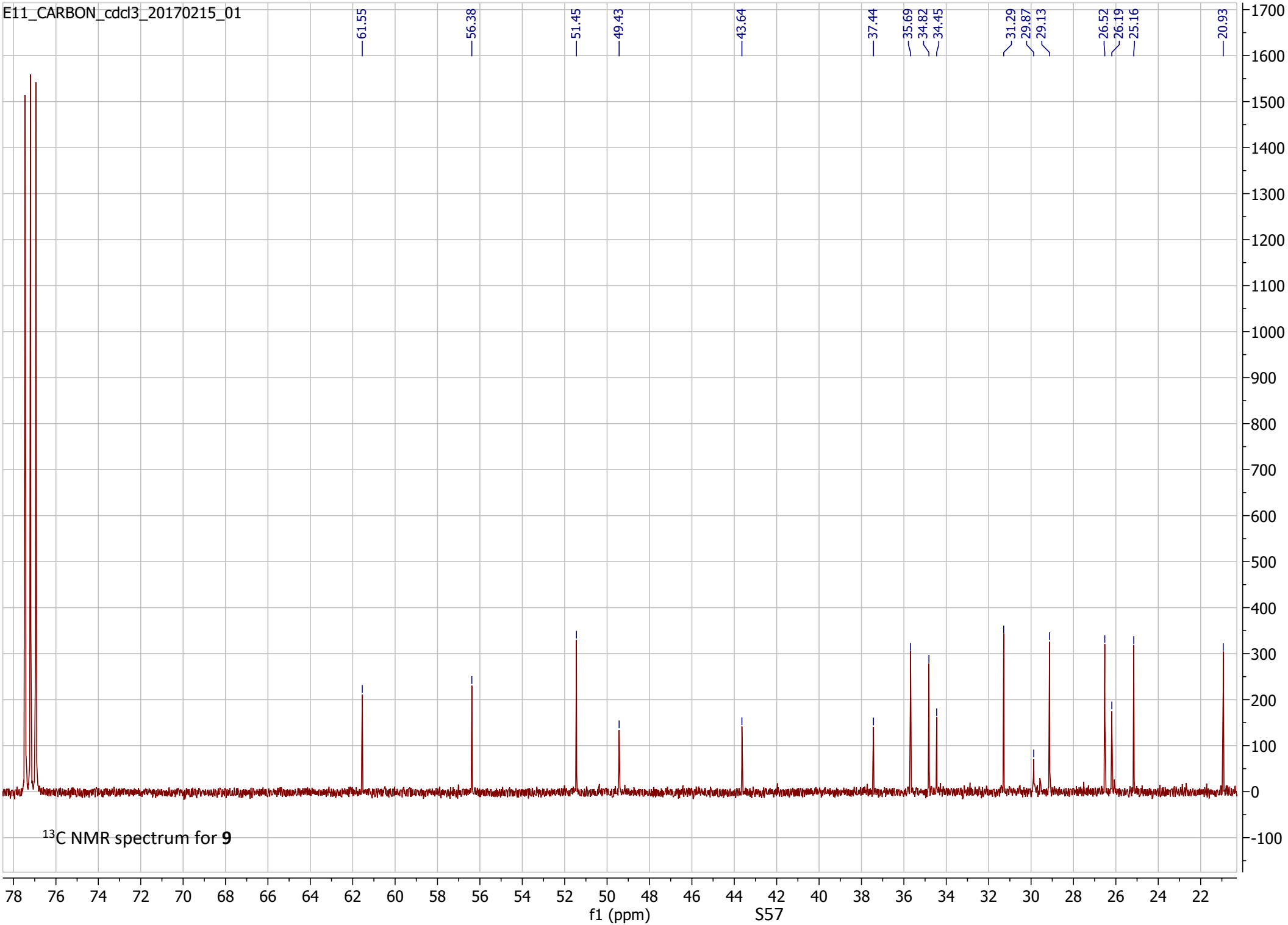
$^{1}$H NMR of (1S,2S,5S,8S,9R)-4,4,8-trimethyltricyclo[6.3.1.01,5]dodecan-2,9-diamine (**9**)





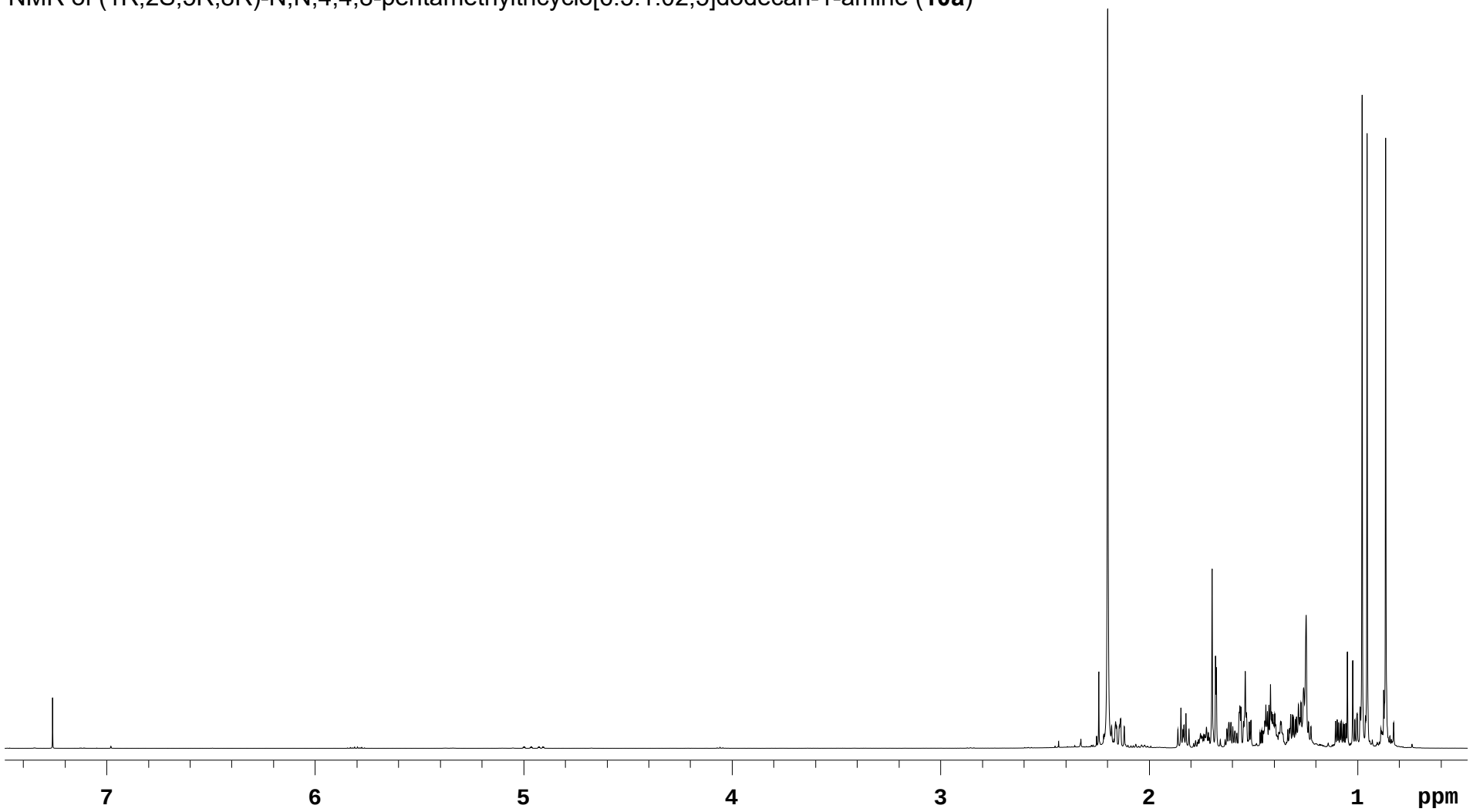

Data file /home/walkup/vnmrsys/data/XiXi/E11/E11_PROTON_cdcl3_20170215_01

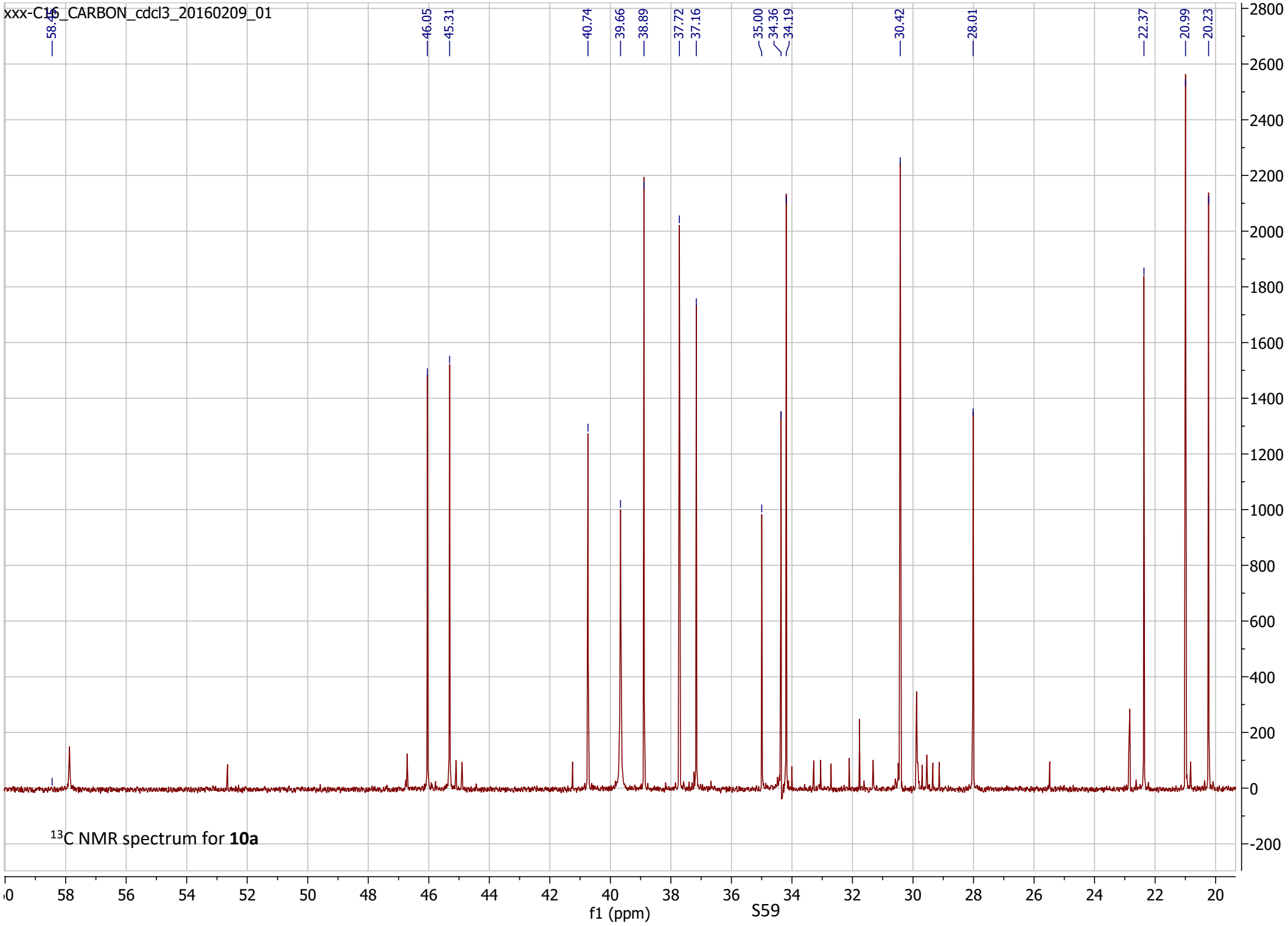
Plot date 2017-02-15


E11_CARBON_cdcl3_20170215_01
61.55
56.38
51.45
49.43
43.64
37.44
35.69
34.82
34.45
31.29
29.87
29.13
26.52
26.19
25.16
20.93
$^{13}$C NMR spectrum for **9**
f1 (ppm)
S57

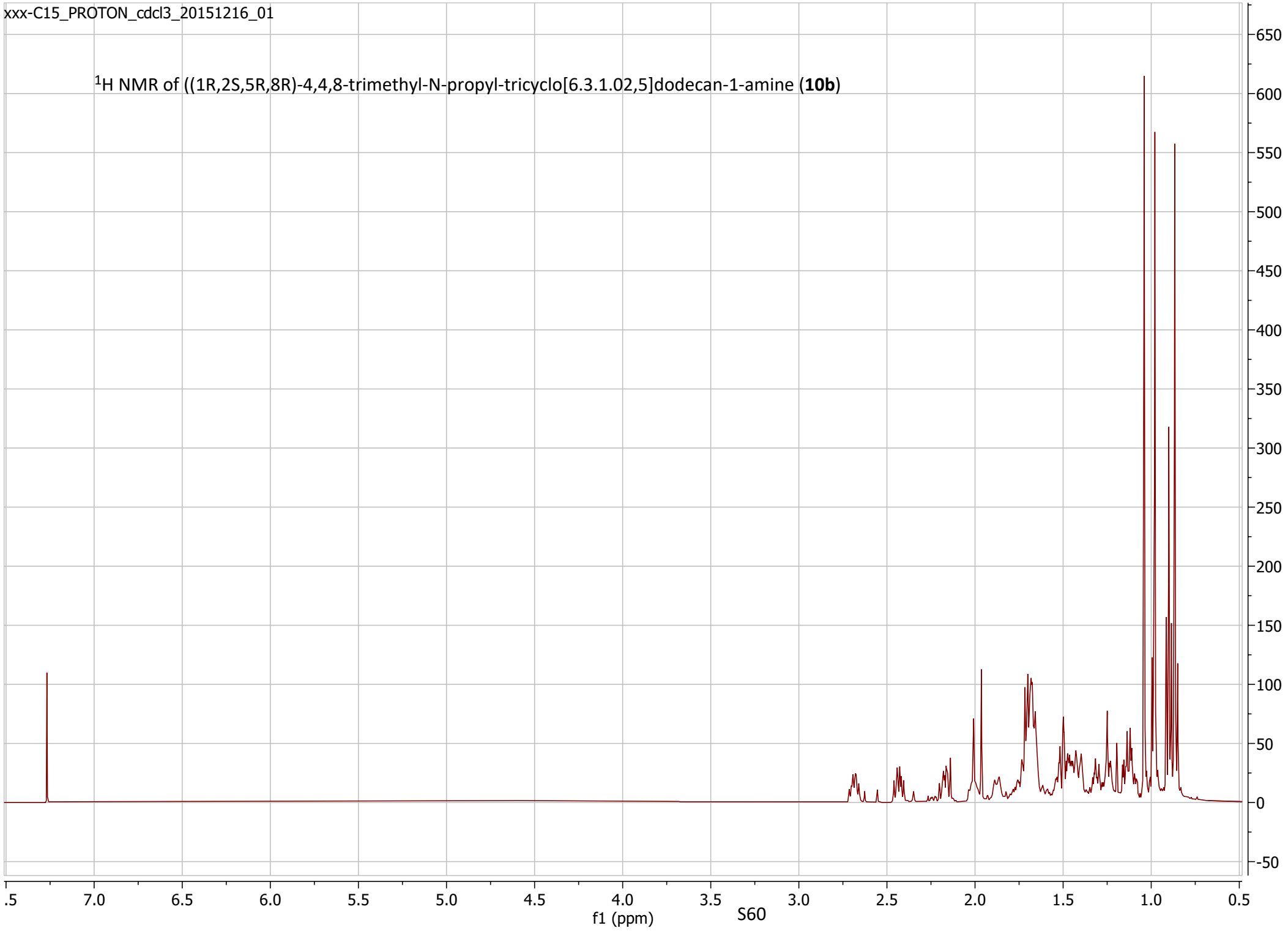
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C16** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2016-02-09** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

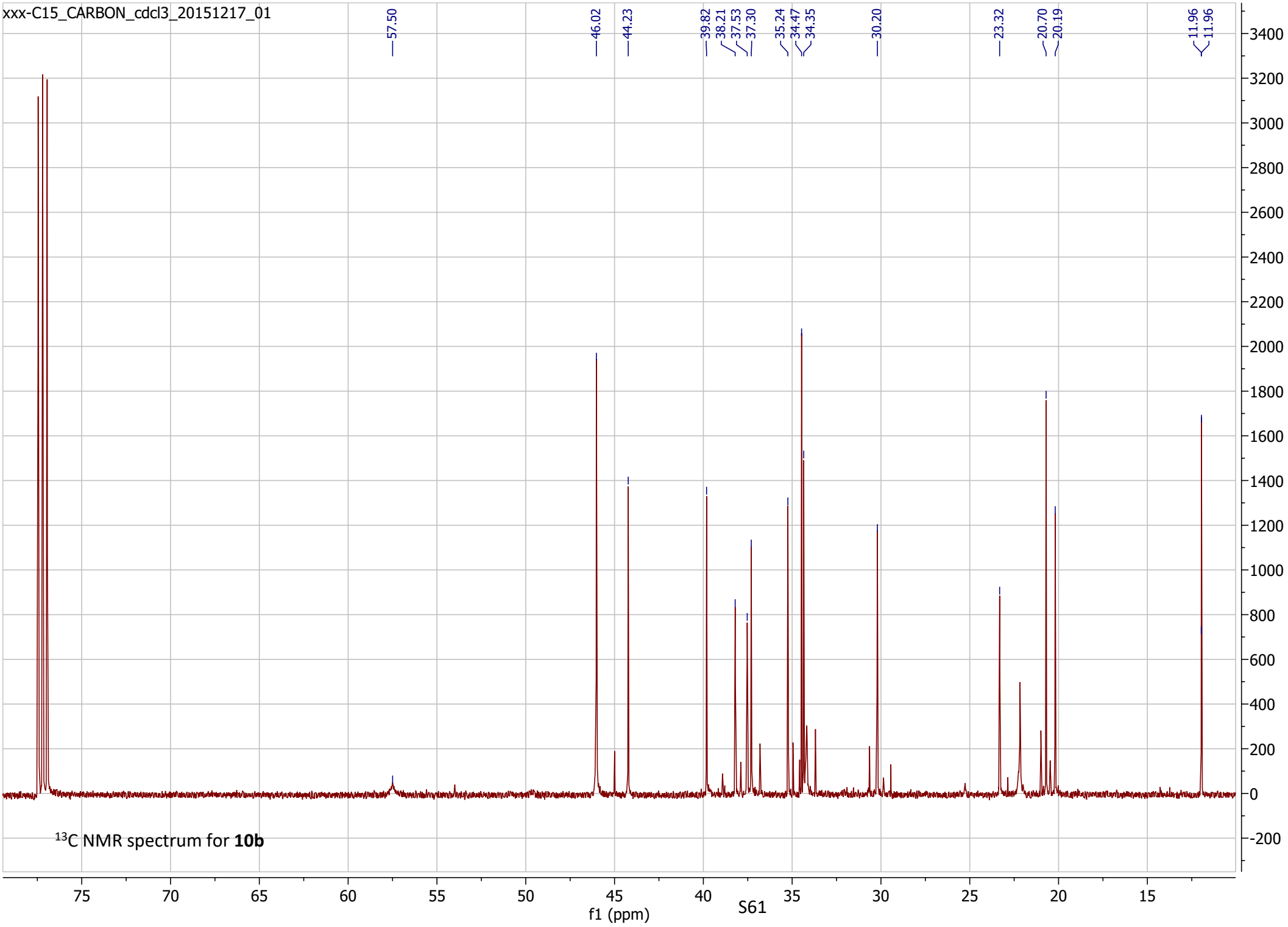
$^{1}$H NMR of (1R,2S,5R,8R)-N,N,4,4,8-pentamethyltricyclo[6.3.1.02,5]dodecan-1-amine (**10a**)






$^{13}$C NMR spectrum for **10a**

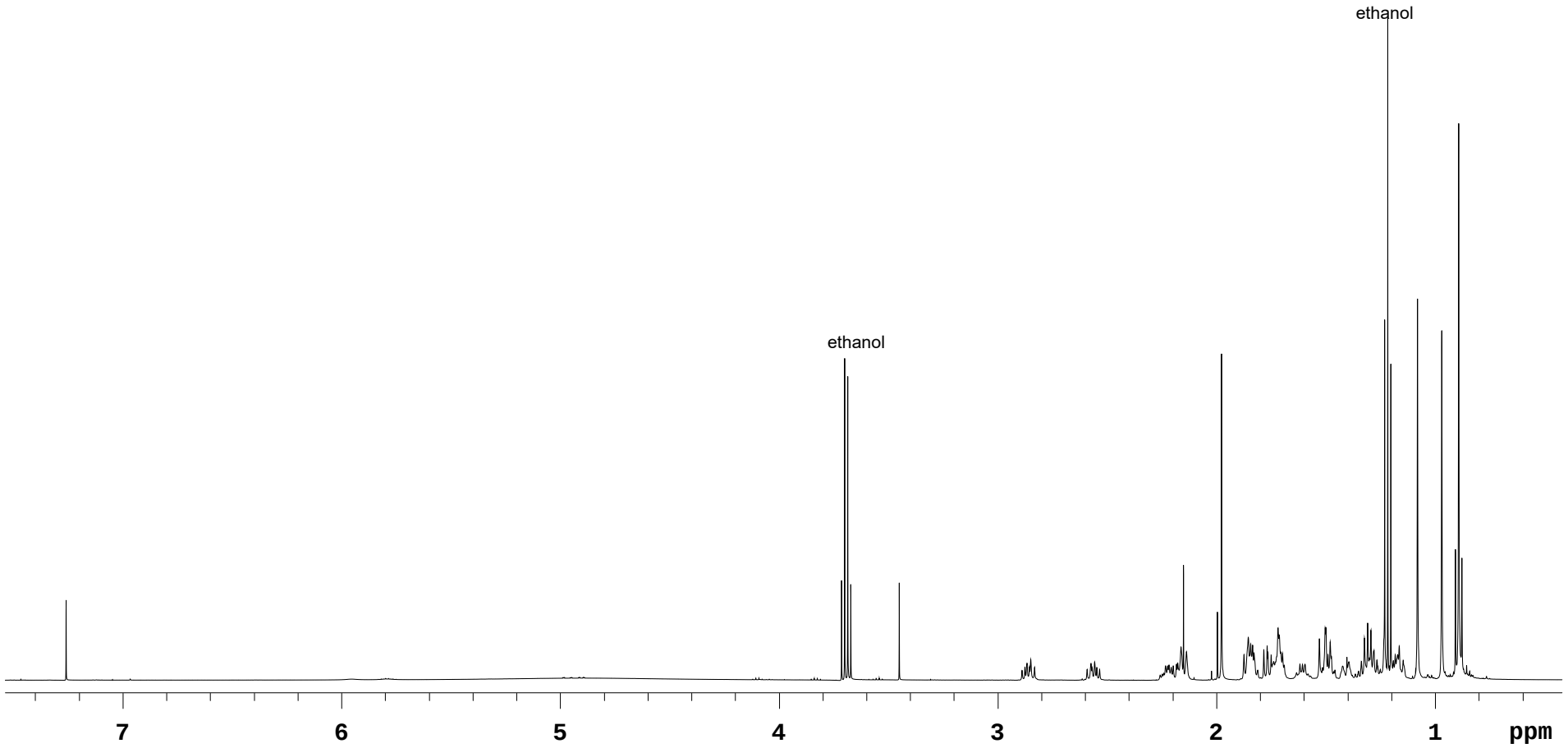

xxx-C15_PROTON_cdcl3_20151216_01
$^{1}$H NMR of ((1R,2S,5R,8R)-4,4,8-trimethyl-N-propyl-tricyclo[6.3.1.02,5]dodecan-1-amine (**10b**)
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)
S60

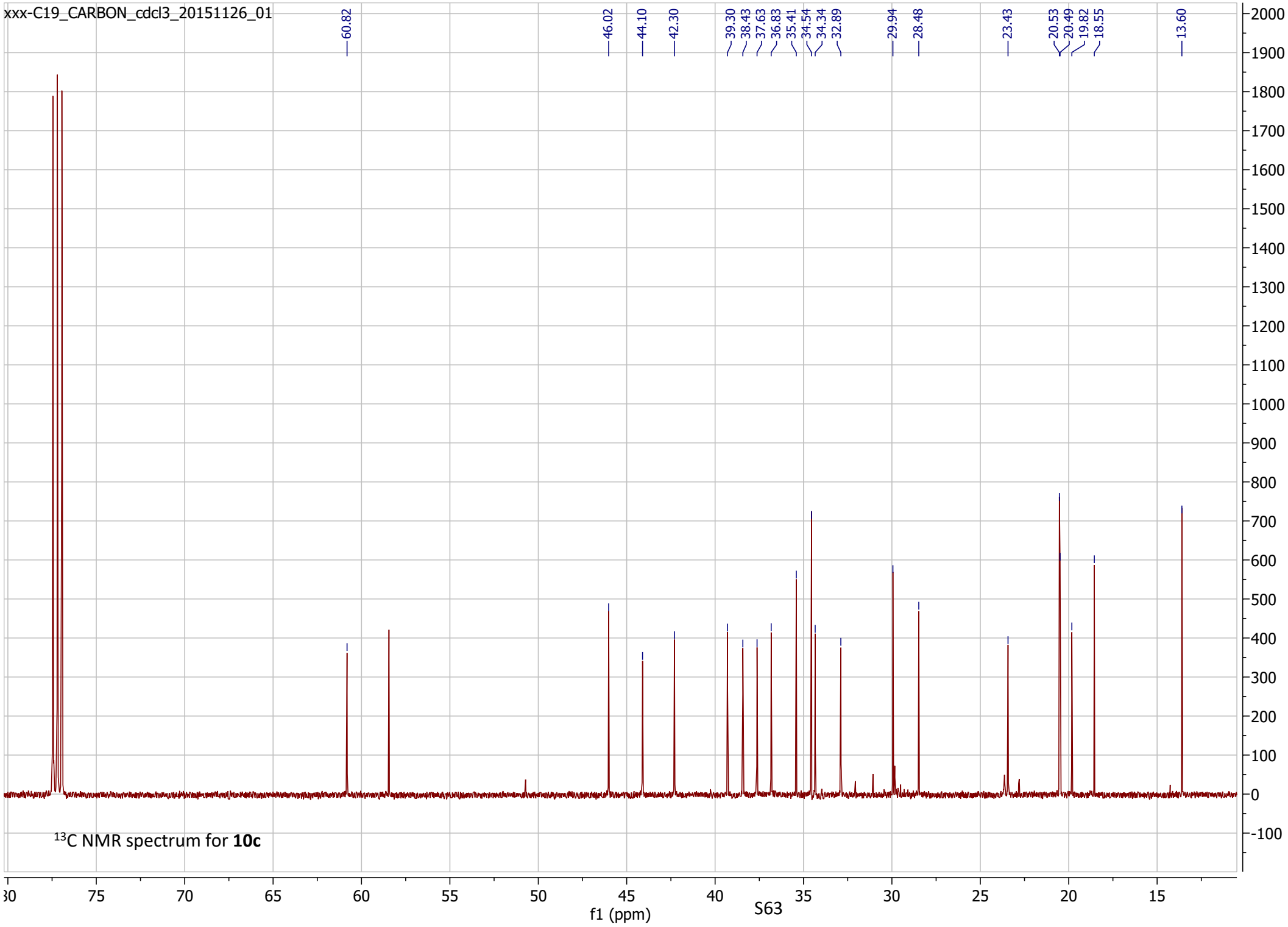



$^{13}$C NMR spectrum for **10b**

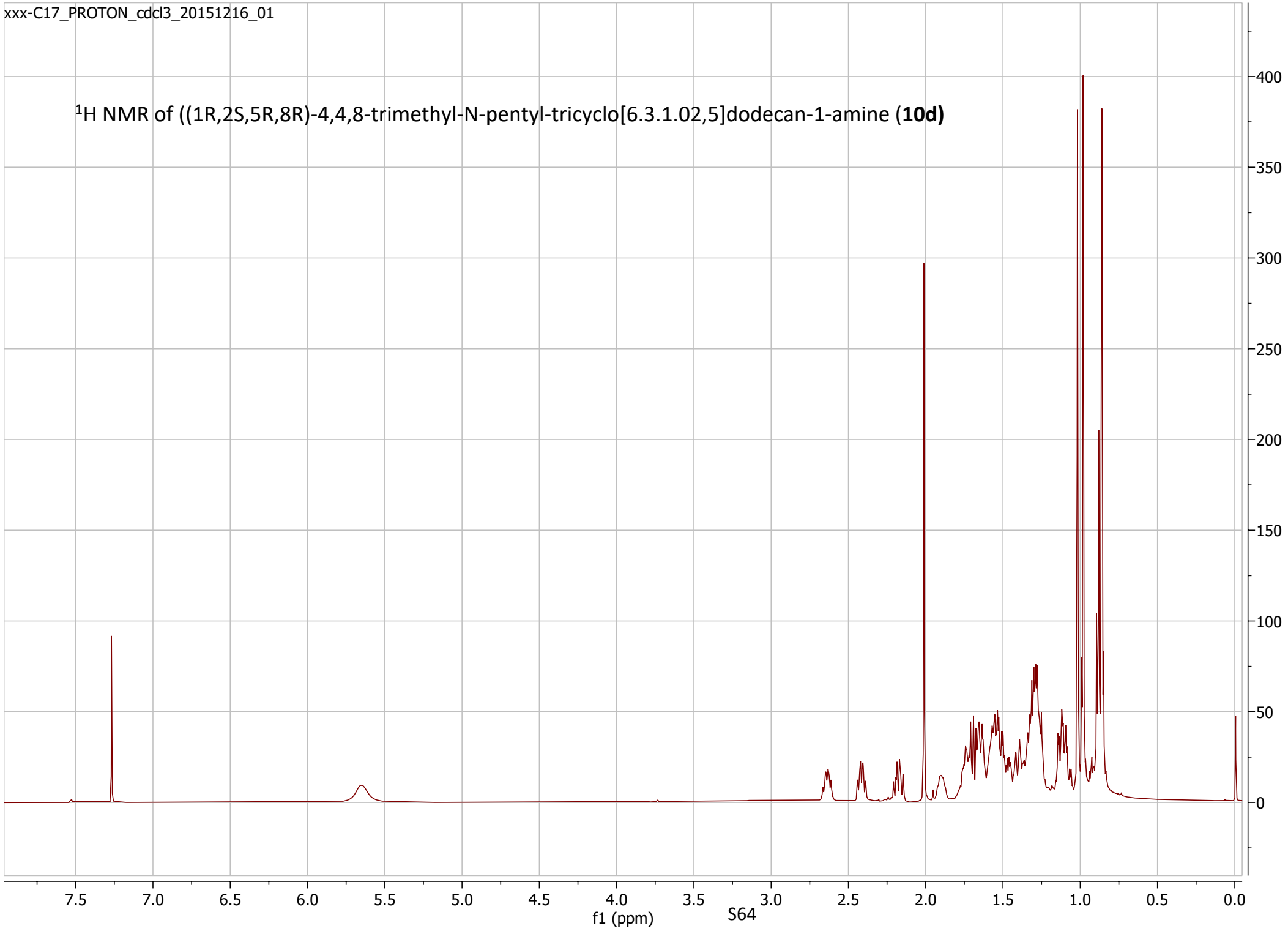
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C19** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2015-11-26** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

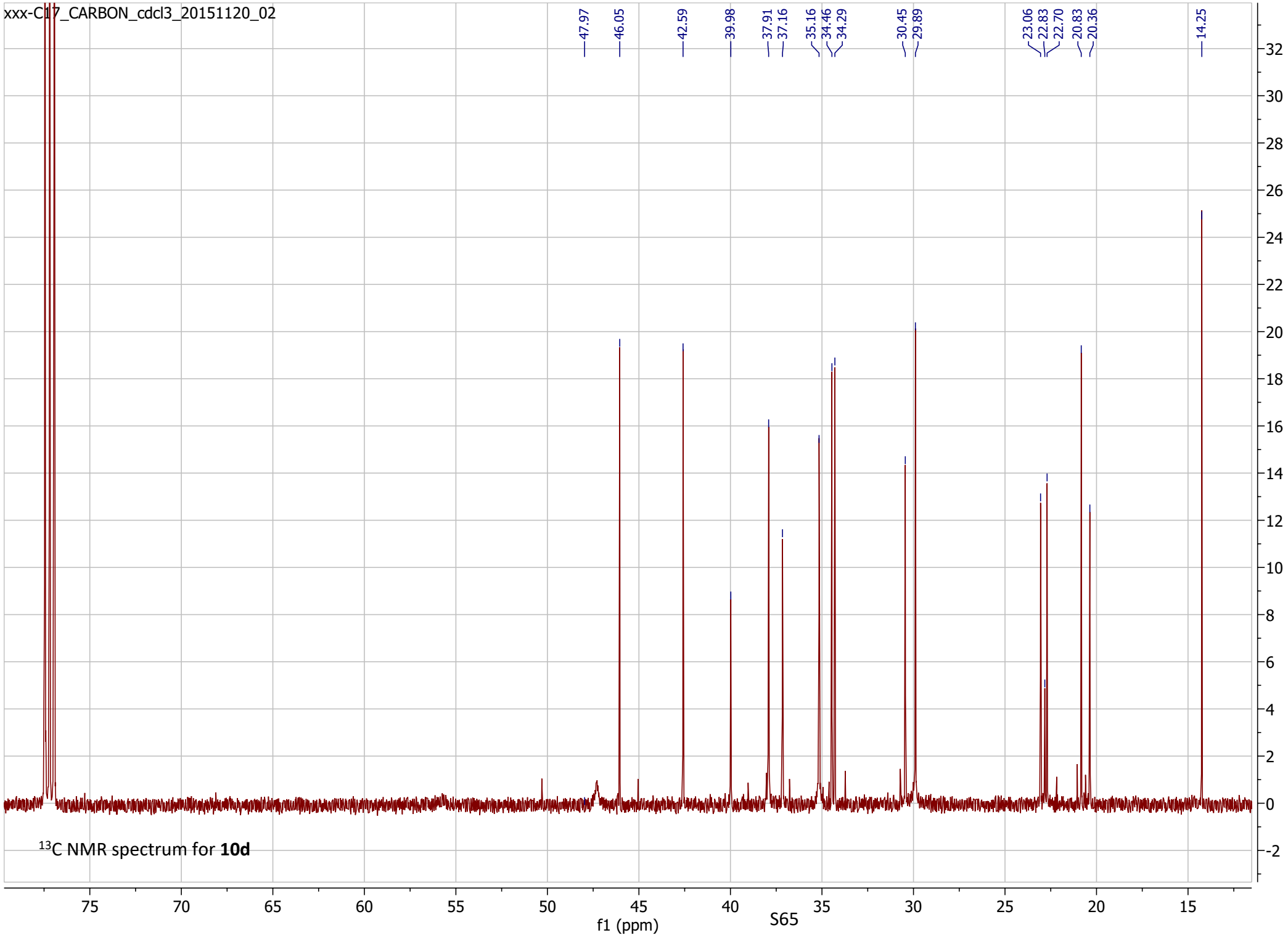
$^{1}$H NMR of (1R,2S,5R,8R)-N-butyl-4,4,8-trimethyl-tricyclo[6.3.1.02,5]dodecan-1-amine (**10c**)






$^{13}$C NMR spectrum for **10c**

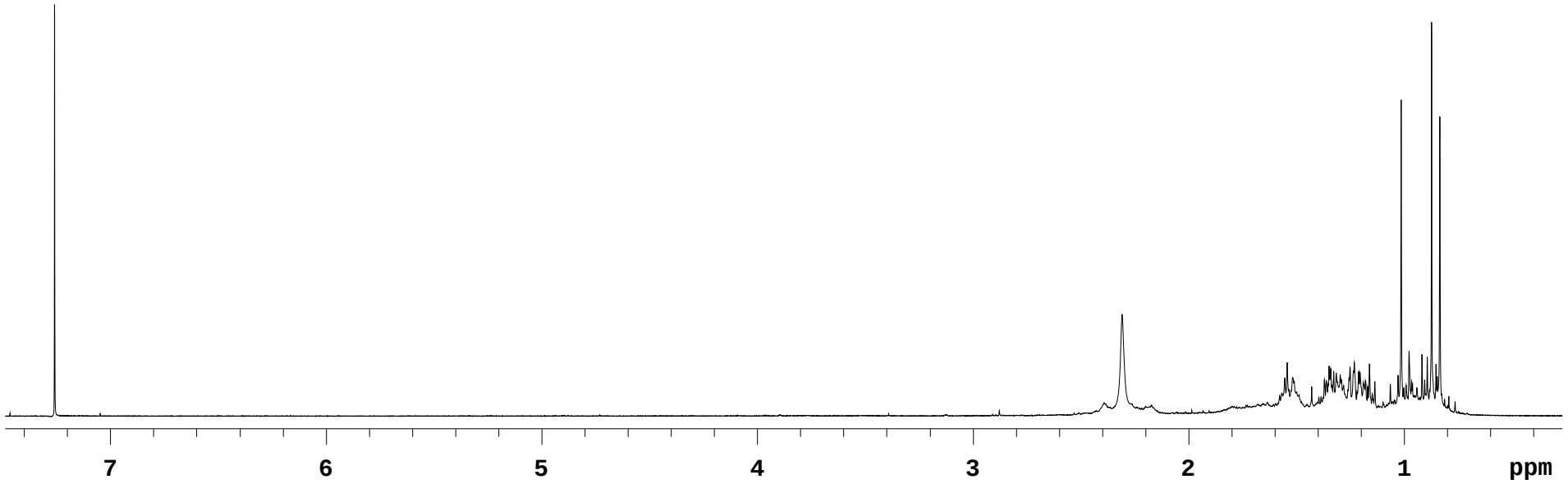

xxx-C17_PROTON_cdcl3_20151216_01
$^{1}$H NMR of ((1R,2S,5R,8R)-4,4,8-trimethyl-N-pentyl-tricyclo[6.3.1.02,5]dodecan-1-amine (**10d)**
400
350
300
250
200
150
100
50
0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

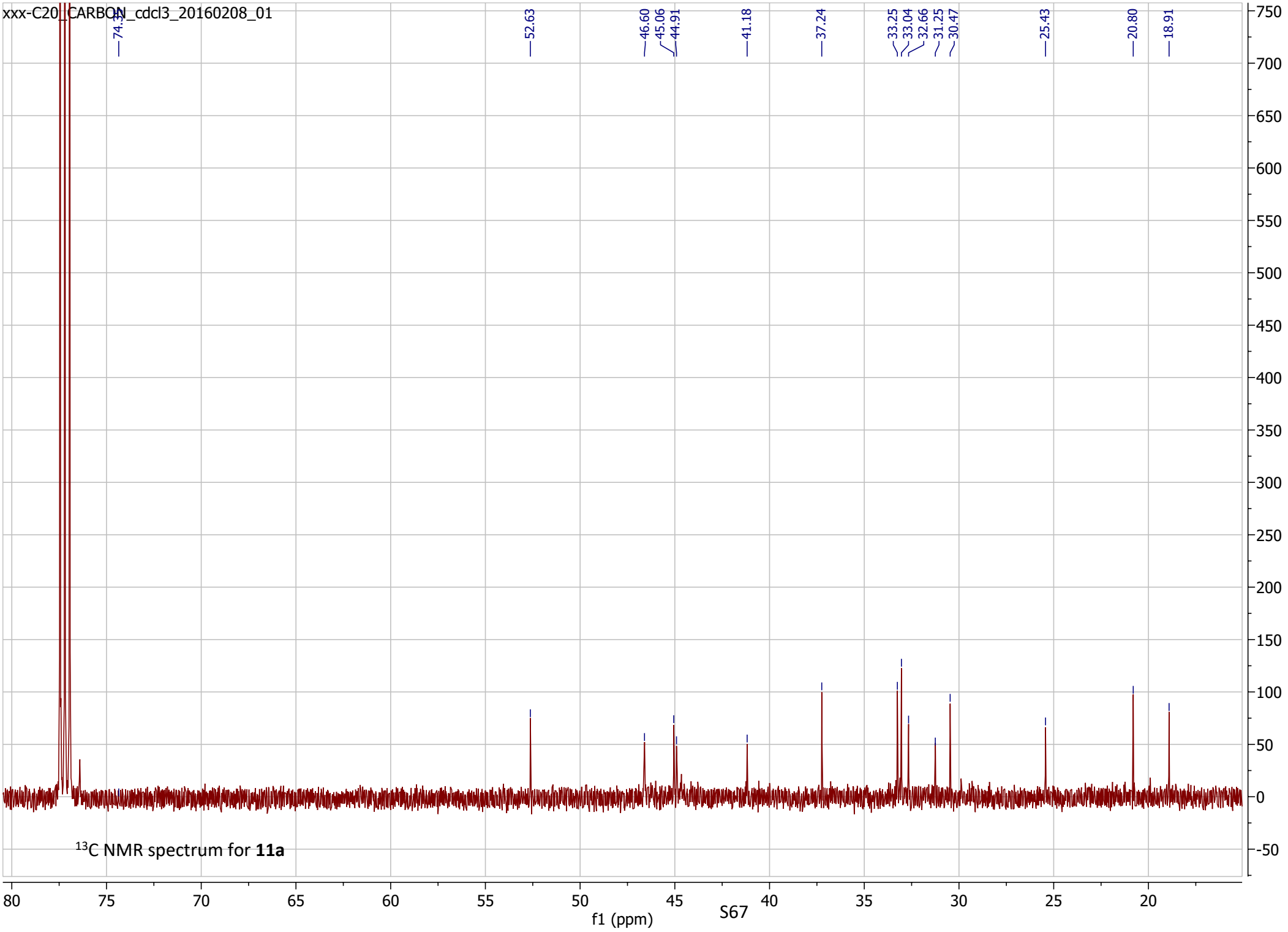



$^{13}$C NMR spectrum for **10d**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C20** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2016-02-08** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

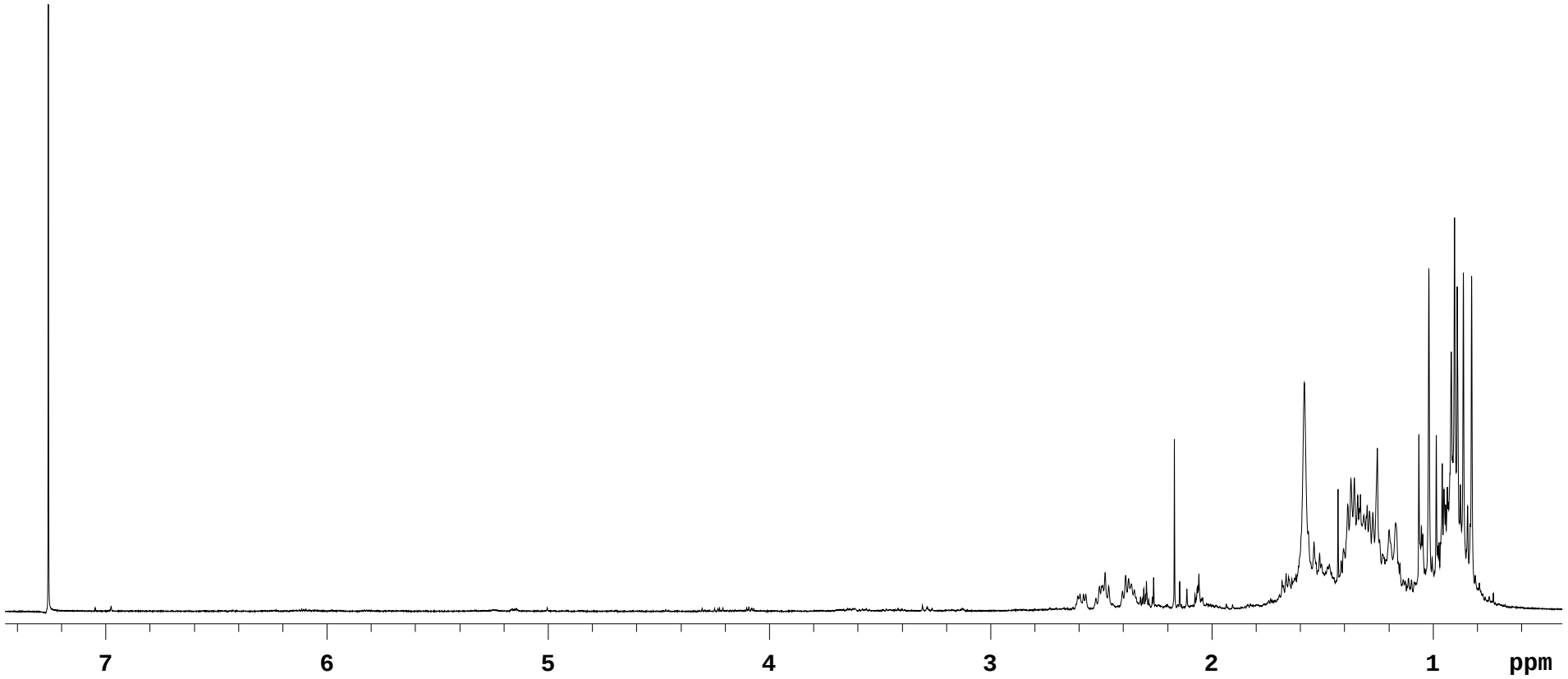
$^{1}$H NMR of ((1S,2S,5S,8S)-N,N,4,4,8-pentamethyltricyclo[6.3.1.01,5]dodecan-2-amine (**11a**)

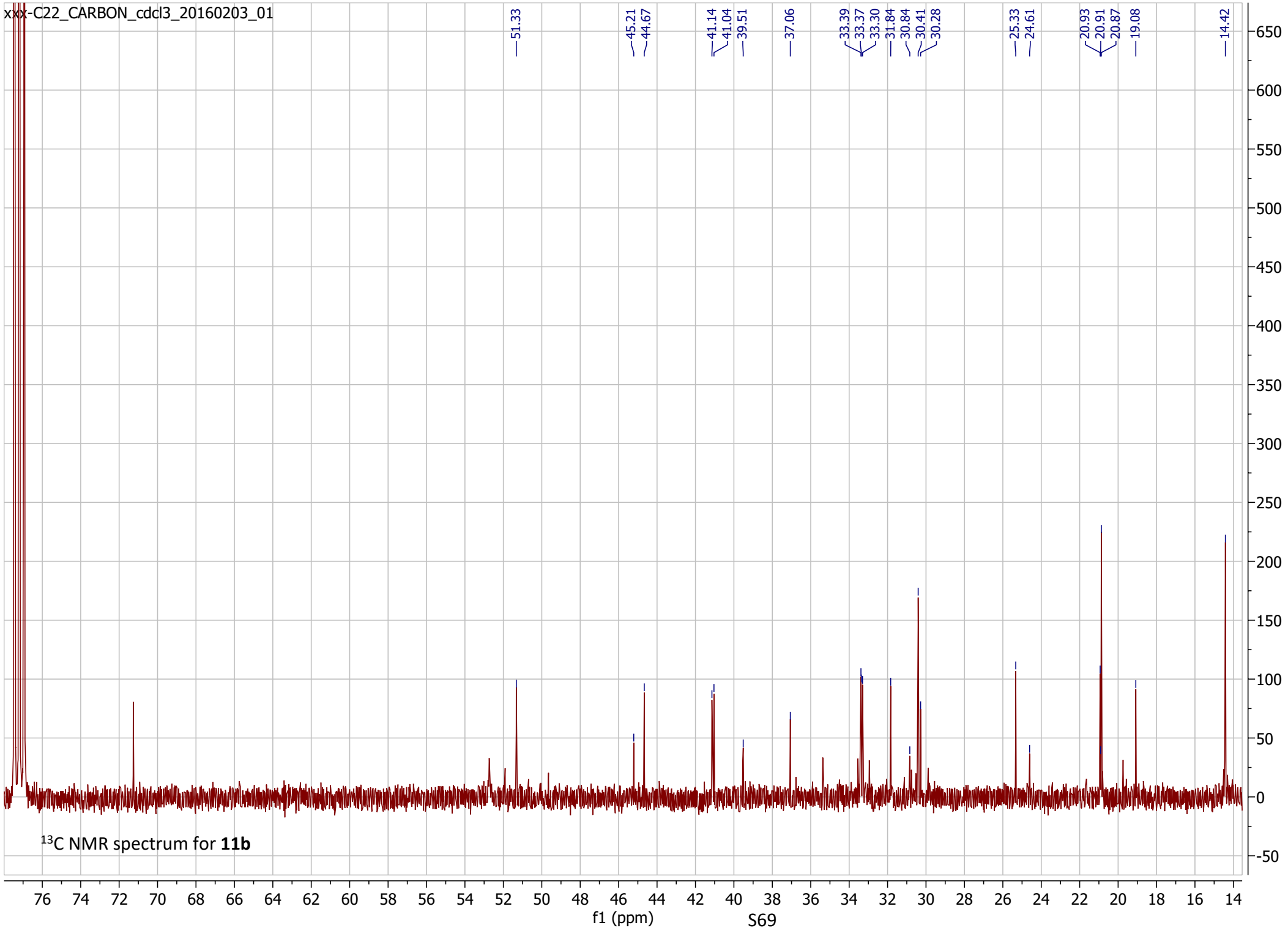



xxx-C20_CARBON_cdcl3_20160208_01
52.63
46.60
45.06
44.91
41.18
37.24
33.25
33.04
32.66
31.25
30.47
25.43
20.80
18.91
$^{13}$C NMR spectrum for **11a**
f1 (ppm)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C22** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2016-02-08** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

$^{1}$H NMR of (1S,2S,5S,8S)-N,N-dibutyl-4,4,8-trimethyl-tricyclo[6.3.1.01,5]dodecan-2-amine (**11b**)

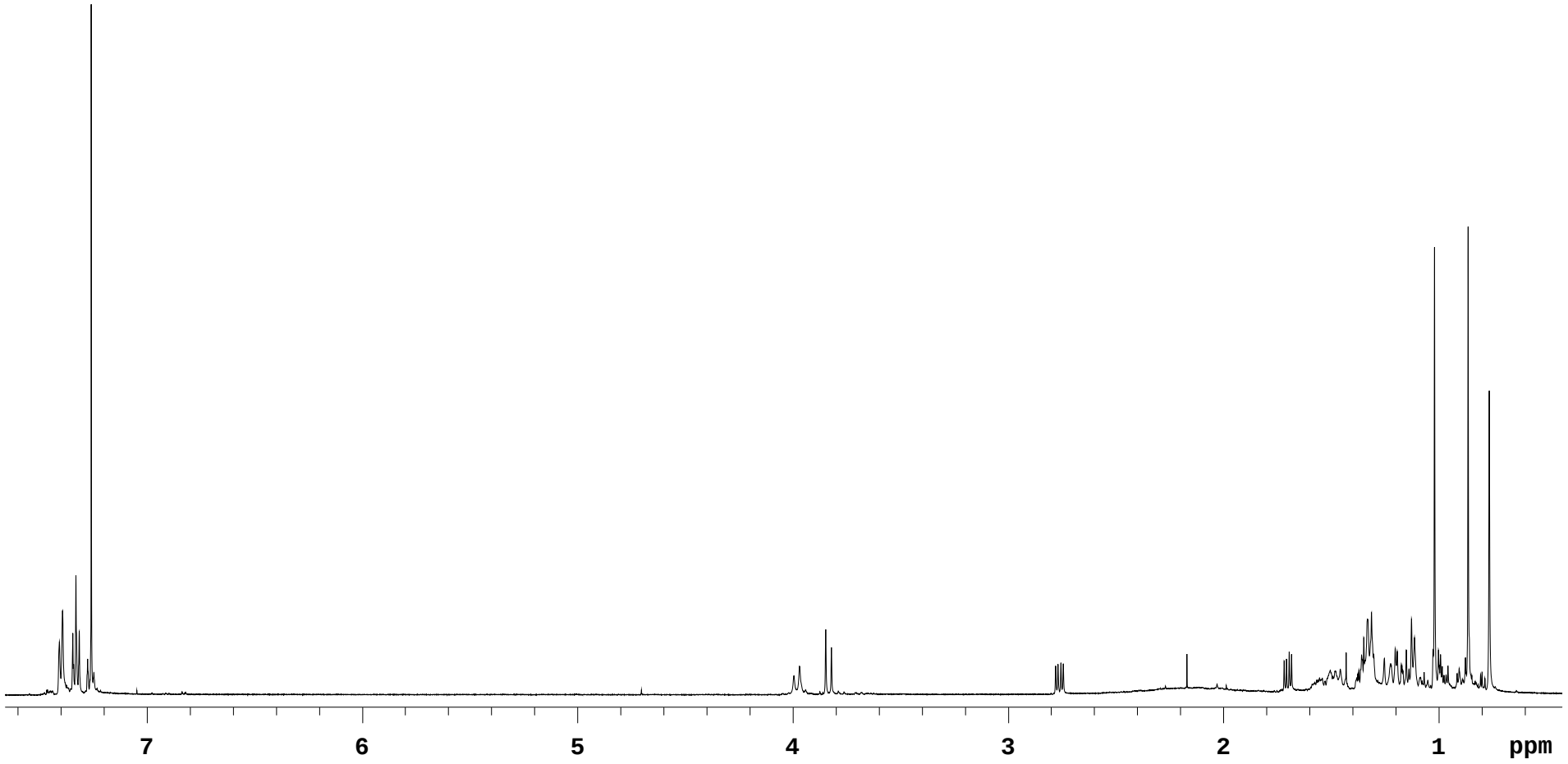


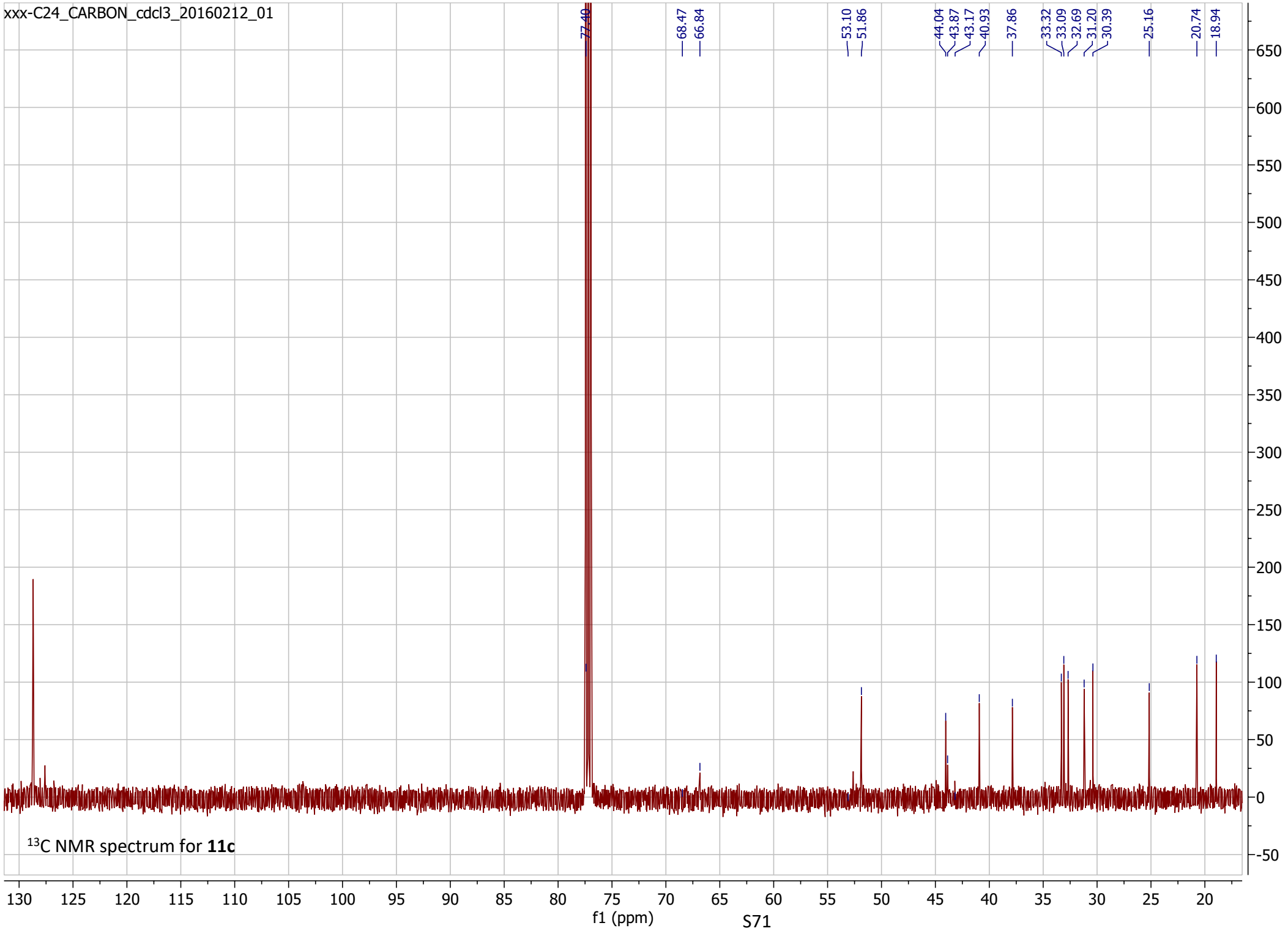



$^{13}$C NMR spectrum for **11b**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Name | **xxx-C24** | Pulse sequence | **PROTON** | Temperature | **25** | Study owner | **XiXi** |
| Date collected | **2016-02-12** | Solvent | **cdcl3** | Spectrometer | **nmr500.science.uts.edu.au-vnmrs500** | Operator | **XiXi** |

$^{1}$H NMR of (1S,2S,5S,8S)-N-benzyl-4,4,8-trimethyl-tricyclo[6.3.1.01,5]dodecan-2-amine (**11c**)






$^{13}$C NMR spectrum for **11c**