THE SYNTHESIS OF CURVED AND LINEAR STRUCTURES FROM A MINIMAL SET OF MONOMERS.

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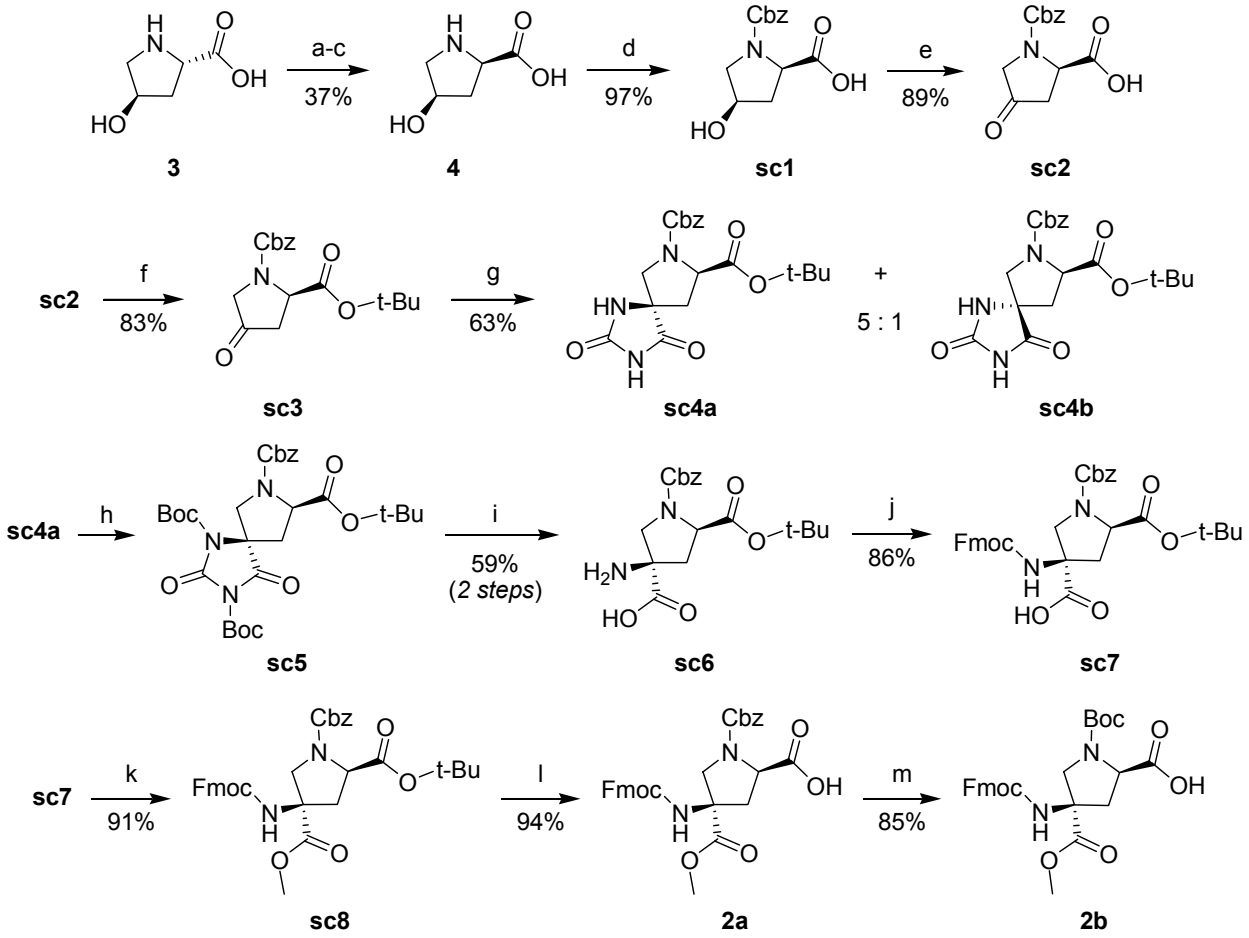
General Procedures

THF was dried by distillation from sodium and benzophenone under nitrogen. Dichloromethane (CH_2Cl_2) was dried by distillation over CaH_2 under nitrogen. Reactions were carried out under nitrogen using oven dried glassware unless otherwise noted. Column chromatography was performed using 32 – 63 D silica gel (60 Å particle size) and analytical thin-layer chromatography (TLC) analyses were performed on glass plates pre-coated with silica gel 60 (250 μm layer thickness). NMR experiments were performed on either 300 MHz or 500 MHz instruments. Chemical shifts are reported in parts per million (ppm) on the δ scale, and were referenced to residual protonated solvent peaks: spectra obtained in DMSO-d_6 were referenced to (CHD_2)(CD_3)SO at δ_H 2.50 and (CD_3)$_2$SO at δ_C 39.5; spectra obtained in acetic acid-d_4 were referenced to (CHD_2)COOD at δ_H 2.07 and (CD_3)COOD at δ_C 20.0. If possible, rotational isomers were resolved by obtaining spectra at 75 °C in DMSO-d_6. IR spectra were obtained using an FTIR spectrophotometer. Optical rotations were measured at 25 °C (± 2 °C) in chloroform, unless otherwise noted, using a cell with a path length of 10 cm. Mass spectrometry was performed either on a high resolution mass spectrometer with an electron impact ion source (HRMS-EI), or on a high resolution mass spectrometer using an electrospray ion source (HRESIQTOFMS). HPLC analysis was performed on an analytical HPLC instrument with a diode array detector, using a C_{18} column (5 μm packing, 4.6 mm x 250 mm). Preparative HPLC was performed on a preparative scale HPLC system with a C_{18} column (8 μm packing, 21.5 mm x 50 mm). HPLC-MS analysis was performed on an HPLC instrument with diode array detector and LC-MSD detector (ES ion source) using an C_{18} column (3.5 μm packing, 4.6 mm x 100 mm).

Solid phase chemistry was executed by hand, under argon, using a home-made solid phase peptide synthesis apparatus. Anhydrous DMF used in coupling reactions was used as received. Diisopropylethylamine (DIPEA) was distilled under nitrogen sequentially from ninhydrin and potassium hydroxide and stored over molecular sieves. After the completion of each solid phase coupling reaction, coupling yields were determined quantitatively by measuring the concentration of the piperidine-dibenzofulvene adduct (λ_{max} = 301 nm, ε = 7800 M^{-1} cm^{-1}).

Fluorescence excitation spectra were obtained on a fluorescence spectrophotometer. The excitation and emission slits were both set to 5 nm. Excitation was monitored at 520 nm and samples were irradiated between 270 and 450 nm at a scan rate of 120 nm/min. Samples were measured in a 1 cm quartz cell. Fluorescence samples were prepared such that their concentrations were approximately 2 μM; this was determined based upon theoretical yields from the solid phase resin. Each sample was scanned ten times sequentially, and the ten scans were averaged. The excitation spectra were normalized such that the emission maximum of the dansyl group (337 nm) was 100 arbitrary units for all samples.

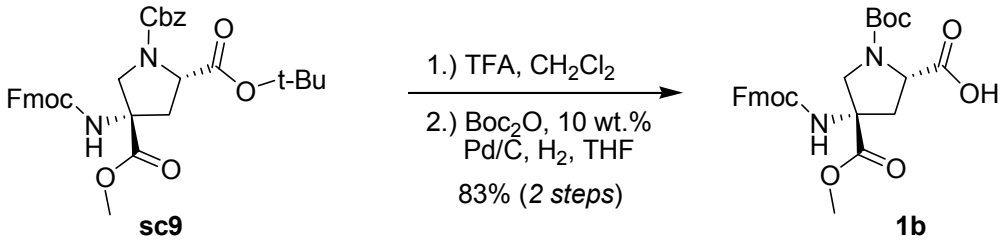
Monomer Synthesis



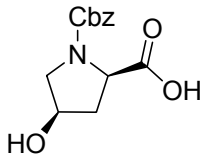
Conditions:

(a) Ac_2O, AcOH, reflux; (b) 2M HCl (aq.), reflux; (c) (i) 40:2:1 EtOH/H_2O/TEA; (ii) recryst. from H_2O/EtOH; (d) (i) TMS-Cl, DIPEA, CH_2Cl_2, reflux; (ii) Cbz-Cl, 0 °C to rt.; (e) Jones reagent, acetone, 20 °C; (f) Isobutylene, H_2SO_4 (cat.), CH_2Cl_2; (g) $(NH_4)_2CO_3$, KCN, 1:1 DMF/H_2O, 60 °C, sealed tube; (h) $(Boc)_2O$, DMAP, THF, rt.; (i) KOH, 1:1 H_2O/THF, rt.; (j) (i) TMS-Cl, DIPEA, CH_2Cl_2, reflux; (ii) Fmoc-Cl, 0 °C to rt.; (k) $TMSCHN_2$, MeOH, Et_2O; (l) TFA/CH_2Cl_2; (m) H_2, 10 wt.% Pd/C, Boc_2O, THF.

Supplemental Scheme 1: Synthesis of monomers **2a** and **2b**



Supplemental Scheme 2: Synthesis of the *pro4(2S,4S) (Boc)* (**1b**) monomer

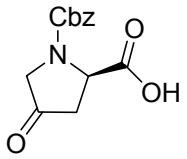


(2*R*,4*R*)-4-Hydroxypyrrolidine-1,2-dicarboxylic acid 1-benzyl ester (sc1)

Commercially available *trans*-4-hydroxy-L-proline (**3**) was converted in modest yield to *cis*-4-hydroxy-D-proline (**4**) using a method described elsewhere.[1] *cis*-4-Hydroxy-D-proline (**4**, 9.50 g, 72.4 mmol) and a magnetic stir bar were added to a 250 mL three neck round bottom flask fitted with a reflux condenser, rubber septum and nitrogen inlet adapter. The flask was flushed with nitrogen, and then the amino acid was suspended in CH_2Cl_2 (155 mL). Diisopropylethylamine (36.8 mL, 212 mmol) was added to the suspension followed by chlorotrimethylsilane (TMS-Cl, 27.7 mL, 217 mmol), which was added slowly via syringe through the rubber septum. The reaction mixture was heated to reflux and stirred vigorously for 1.5 hours. The resulting red-orange solution was cooled to 0 °C using an ice bath. Benzyl chloroformate (Cbz-Cl, 9.8 mL, 69 mmol) was added to the solution in one portion while nitrogen was flushed through the flask. The solution was allowed to warm to room temperature overnight with stirring, and was then concentrated by rotary evaporation. The resulting paste was dissolved in 2.5% aqueous $NaHCO_3$ (700 mL) and diethyl ether (600 mL) and transferred to a 2000 mL separatory funnel. The aqueous layer was separated and washed with ether (2 × 150 mL). The ether layers were

[1] Lowe, G.; Vilaivan, T. *J. Chem. Soc., Perkin Trans. 1* **1997**, *4*, 539.

combined and backwashed with water (2 × 60 mL). All of the aqueous layers were combined and acidified to pH 2 with 1M aqueous HCl. The aqueous solution was transferred to another separatory funnel, and the product was extracted with ethyl acetate (3 × 250 mL). The ethyl acetate layers were combined, dried over Na_2SO_4, and filtered. The solvent was removed by rotary evaporation and then under reduced pressure overnight yielding the desired product **sc1** (17.8 g, 67.5 mmol, 97.6%) as a straw colored foamy solid which was used without further purification: ^{1}H NMR (300 MHz, 75 °C, DMSO-d_6): δ 7.29-7.35 (m, 5H), 5.07 (s, 2H), 4.24-4.30 (m, 2H), 3.63 (dd, J = 10.8, 5.7 Hz, 1H), 3.24 (dd, J = 10.8, 3.9 Hz, 1H), 2.38 (ddd, J = 13.7, 9.1, 5.7 Hz, 1H), 1.92 (m, 1H); ^{13}C NMR (75.4 MHz, DMSO-d_6): mixture of rotamers δ 173.4 and 173.1, 154.1 and 153.9, 137.0, 128.4 and 128.3 (2C), 127.8 and 127.6, 127.5 and 127.1 (2C), 68.6 and 67.7, 65.9, 57.7 and 57.3, 54.6 and 54.1, 37.7; IR (neat film) 3419, 2953, 1685, 1498, 1428, 1358, 1210, 1123, 1084, 1003, 969 cm^{-1}; $[\alpha]_D$ 28.1° (*c* 9.71, CH_3Cl); EI-MS *m/z* (relative intensity) 265 (20%), 220 (83%), 176 (34%), 130 (35%), 108 (5.5%), 91 (100%); HRMS-EI calcd for $C_{13}H_{15}NO_5$ ($M^{\bullet+}$) 265.0950, found 265.0954.



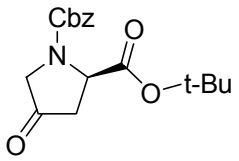
sc2

(*R*)-4-Oxo-pyrrolidine-1,2-dicarboxylic acid 1-benzyl ester (sc2)

An 8 molar solution of Jones reagent was prepared as described elsewhere.[2] Compound **sc1** (17.8 g, 67.1 mmol) was dissolved in acetone (1350 mL) and transferred to a 2 L Erlenmeyer flask. The solution was mixed with an overhead mechanical stirrer while adding the Jones reagent (72.2 mL, 577 mmol) slowly over approximately 10 minutes. As the reaction mixture was stirred, the color of the solution changed from bright red to dark brown. This solution was

[2] Hudlicky, M. *Oxidations in Organic Chemistry*; American Chemical Society: Washington, DC, 1990.

stirred for an additional 3 hours, and then the excess oxidant was consumed by slow addition of MeOH (~ 50 mL). The solution was filtered through a Celite packed chromatography column in order to remove precipitated chromium salts, concentrated by rotary evaporation, and diluted with EtOAc (1000 mL). The resulting solution was transferred to a 2 L separatory funnel, washed with brine (6 × 250 mL), dried over Na_2SO_4, filtered, and concentrated by rotary evaporation. Residual solvent was evaporated under reduced pressure, yielding the product **sc2** (15.7 g, 59.9 mmol, 89.3%) as a pale yellow oil, which was used without further purification: ^{1}H NMR (300 MHz, 75 °C, DMSO-d_6): δ 12.42 (br s, 1H), 7.13-7.05 (m, 5H), 4.90 (s, 2H), 4.47 (dd, J = 10.5, 2.4 Hz, 1H), 3.69 (d, J = 18.3 Hz, 1H), 3.52 (d, J = 18.3 Hz, 1H), 2.89 (dd, J = 18.6, 10.5 Hz, 1H), 2.28 (dd, J = 18.6, 2.4 Hz, 1H); ^{13}C NMR (75.4 MHz, 75 °C, DMSO-d_6): δ 207.6, 172.3, 153.7, 136.1, 127.9 (CH, 2C), 127.3 (CH), 126.9 (CH, 2C), 66.1 (CH_2), 55.7 (CH), 52.0 (CH_2), 40.3 (CH_2); IR (neat film) 3035, 1766, 1713, 1587, 1499, 1433, 1360, 1264, 1163, 1028, 959, 874, 699 cm^{-1}; EI-MS *m/z* (relative intensity) 263 (6.5%), 218 (9.5%), 174 (12%), 128 (58%), 108 (31%), 91 (100%); HRMS-EI calcd for $C_{13}H_{13}NO_5$ ($M^{\bullet+}$) 263.0794, found 263.0803.

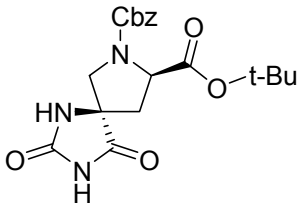


sc3

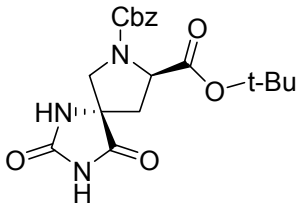
(*R*)-4-Oxo-pyrrolidine-1,2-dicarboxylic acid 1-benzyl ester 2-*tert*-butyl ester (sc3)

A 500 mL round bottom flask containing a stir bar was charged with a solution of **sc2** (17.0 g, 64.6 mmol) in CH_2Cl_2 (130 mL). The solution was cooled to 0 °C using an ice bath, and concentrated sulfuric acid (645 μl) was added with stirring. Isobutylene was bubbled into the solution until the volume of the mixture had increased by approximately 50%. The flask was sealed with a rubber septum, and the reaction mixture was stirred overnight while warming to

room temperature. The septum was then carefully punctured, allowing the isobutylene to evaporate. The remaining solution was concentrated by rotary evaporation, and the resulting residue was distributed between EtOAc (500 mL) and 2.5% aqueous $NaHCO_3$ (125 mL). The EtOAc was washed with additional $NaHCO_3$ solution (2 × 125 mL), and the aqueous layers were combined and backwashed with EtOAc (250 mL). The combined organic layers were washed with brine, dried over Na_2SO_4, filtered, and concentrated by rotary evaporation. Residual solvent was evaporated under reduced pressure overnight, yielding the desired product **sc3** (17.2 g, 53.9 mmol, 83.4%) as a yellow oil that was used without further purification. An analytical sample was prepared by silica column chromatography (1:2 EtOAc/hexanes, R_f = 0.33): ^{1}H NMR (300 MHz, 75 °C, DMSO-d_6): δ 7.33-7.36 (m, 5H), 5.14 (s, 2H), 4.63 (d, J = 10.3 Hz, 1H), 3.93 (d, J = 18.1 Hz, 1H), 3.73 (d, J = 18.1 Hz, 1H), 3.13 (dd, J = 18.5, 10.3 Hz, 1H), 2.46 (d, J = 18.5 Hz, 1H), 1.35 (s, 9H); ^{13}C NMR (75.4 MHz, DMSO-d_6): mixture of rotamers δ 208.6, 208.0, 170.8, 170.6, 154.3, 153.7, 136.5, 136.3, 128.4, 128.3, 127.9, 127.5, 81.7, 81.6, 66.5, 56.8, 56.6, 52.6, 52.3, 40.8, 27.4, 27.3; IR (neat film) 3066, 3034, 2979, 2934, 1767, 1713, 1499, 1414, 1368, 1297, 1258, 1211, 1152, 1114, 1027, 967, 912, 836, 768, 699 cm^{-1}; EI-MS *m/z* (relative intensity) 263 (11%), 218 (27%), 174 (39%), 128 (53%), 91 (100%); HRMS-EI calcd for $C_{13}H_{13}NO_5$ ($M - C_4H_9^{\bullet} + H^+$) 263.0794, found 263.0789.



sc4a



sc4b

(5*R*,8*R*)-2,4-Dioxo-1,3,7-triaza-spiro[4.4]nonane-7,8-dicarboxylic acid 7-benzyl ester 8-*tert*-butyl ester (sc4a) and (5*S*,8*R*)-2,4-Dioxo-1,3,7-triaza-spiro[4.4]nonane-7,8-dicarboxylic acid 7-benzyl ester 8-*tert*-butyl ester (sc4b)

A 350 mL pressure vessel was charged with ammonium carbonate (10.3 g, 107.2 mmol), potassium cyanide (2.10 g, 32.2 mmol) deionized water (54 mL) and a magnetic stir bar. Compound **sc3** (6.9 g, 22 mmol) was dissolved in DMF (54 mL) and added to the pressure vessel. After sealing the vessel, the flask was warmed to 60 °C in an oil bath and the solution stirred for 4 hours. The pressure vessel was then cooled to room temperature, opened cautiously, and the solution and stir bar were transferred to a 250 mL Erlenmeyer flask. The solution was adjusted to pH 6.5 by slow addition of 1M aqueous HCl, and diluted with EtOAc (200 mL) and water (~600 mL). The aqueous layer was removed and extracted with additional EtOAc (2 × 200 mL). The organic layers were combined, washed with brine (2 × 100 mL), dried over $MgSO_4$, and concentrated by rotary evaporation yielding a crude mixture of the products **sc4a** and **sc4b** in a ratio of 5:1 (determined by ^{1}H NMR by integration of the hydantoin amide proton). The crude mixture of products was purified by flash chromatography on silica (gradient elution from CH_2Cl_2 to 95:5 CH_2Cl_2/MeOH). Fractions containing the less polar diastereomer (determined by TLC, 95:5 CH_2Cl_2/MeOH, R_f = 0.21) were concentrated by rotary evaporation and then under reduced pressure overnight yielding **sc4a** (4.3 g, 11 mmol, 52% recovered yield). The fractions containing the more polar diastereomer (determined by TLC, 95:5 CH_2Cl_2/MeOH, R_f = 0.10) were similarly treated yielding **sc4b** (1.0 g, 2.6 mmol, 12% recovered yield). The

stereochemical assignment of **sc4a** and **sc4b** was based upon the 2D-NMR analysis of their respective enantiomers.[3]

Less polar **sc4a:**

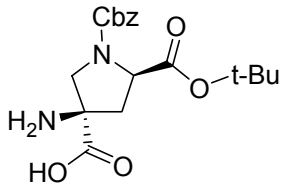
^{1}H NMR (300 MHz, 75 °C, DMSO-d_6): δ 10.64 (s, 1H), 7.64 (s, 1H), 7.34 (m, 5H), 5.10 (s, 2H), 4.35 (apparent t, J = 7.8 Hz, 1H), 3.86 (d, J = 11.1 Hz, 1H), 3.49 (d, J = 11.1 Hz, 1H), 2.65 (dd, J = 13.1, 8.3 Hz, 1H), 2.09 (dd, J = 13.1, 7.7 Hz, 1H), 1.38 (s, 9H); ^{13}C NMR (75.4 MHz, 75 °C, DMSO-d_6): δ 176.1, 170.3, 155.5, 153.2, 136.2, 127.9 (2C), 127.4, 127.0 (2C), 81.0, 66.1, 64.1, 58.4, 52.3, 37.6, 27.2 (3C); IR (neat film) 3242, 3068, 2979, 1783, 1724, 1499, 1417, 1356, 1293, 1233, 1156, 1113, 1014, 833, 767, 698 cm^{-1}; $[\alpha]_D$ +11.9° (*c* 3.9, $CHCl_3$); EI-MS *m/z* (relative intensity) 333 (13%), 288 (11%), 244 (16%), 198 (7.0%), 154 (9.5%), 91 (100%); HRMS-EI calcd for $C_{15}H_{15}N_3O_6$ ($M - C_4H_9^{\bullet} + H^+$) 333.0955, found 333.0967.

More polar **sc4b:**

^{1}H NMR (300 MHz, 75 °C, DMSO-d_6): δ 10.68 (s, 1H), 8.40 (s, 1H), 7.36 (m, 5H), 5.10 (s, 2H), 4.40 (apparent t, J = 8.4 Hz, 1H), 3.75 (dd, J = 11.2, 1.7 Hz, 1H), 3.58 (d, J = 11.2 Hz, 1H), 2.44 (ddd, J = 13.2, 8.0, 1.7 Hz, 1H), 2.25 (dd, J = 13.2, 8.9, 1H), 1.37 (s, 9H); ^{13}C NMR (75.4 MHz, DMSO-d_6): mixture of rotamers δ 173.9 and 173.8, 170.4 and 170.0, 156.0 and 155.9, 153.4 and 153.3, 136.5 and 136.3, 128.3 and 128.2 (CH, 2C), 127.8 (CH), 127.4 and 127.3 (CH, 2C), 81.2 and 81.0, 66.6 and 65.8, 66.4 and 66.2 (CH_2), 58.9 and 58.3 (CH), 55.9 and 55.5 (CH_2), 40.3 and 39.3 (CH_2), 27.5 and 27.3 (CH_3, 3C); IR (neat film) 3246, 2980, 1781, 1733, 1498, 1418, 1367, 1312, 1217, 1192, 1159, 1138, 1060, 1014, 977, 836, 755, 698 cm^{-1}; $[\alpha]_D$ +23.9° (*c* 2.5, $CHCl_3$);

[3] Levins, C.G.; Schafmeister, C.E. *J. Am. Chem. Soc.* **2003**, *126*, 4702.

EI-MS *m/z* (relative intensity) 333 (0.5%), 288 (3.0%), 244 (5.2%), 198 (1.5%), 154 (5.2%), 121 (6.2), 91 (100%); HRMS-EI calcd for $C_{15}H_{15}N_3O_6$ ($M - C_4H_9^{\bullet} + H^+$) 333.0955, found 333.0963.

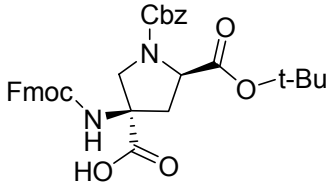


sc6

(2*R*,4*R*)-4-Amino-pyrrolidine-1,2,4-tricarboxylic acid 1-benzyl ester 2-*tert*-butyl ester (sc6)

Compound **sc4a** (16.8 g, 43.1 mmol) was dissolved in THF (647 mL) and transferred to a 1 L round bottom flask containing a magnetic stir bar. The solution was cooled to 0 °C, and DMAP (263 mg, 2.16 mmol) was added to the flask followed by di-*tert*-butyl dicarbonate (28.2 g, 129 mmol). The reaction mixture was stirred under nitrogen while warming to room temperature. After three hours, the starting material **sc4a** had been completely consumed (by TLC). The solution was concentrated by rotary evaporation, and then filtered through a plug of silica with 1:2 EtOAc/hexanes to remove DMAP from product **sc5**. The filtrate was concentrated and the resulting yellow oily residue was dissolved in THF (172 mL) and transferred to a 500 mL round bottom flask containing a magnetic stir bar. To this solution was added a 2.0 M aqueous solution of potassium hydroxide (172 mL). The reaction mixture was stirred vigorously for 30 minutes. The solution was then transferred to a 1 L separatory funnel with an additional volume of ether (172 mL) and agitated. After the aqueous and organic layers had completely separated, the aqueous layer was transferred to a 250 mL beaker and cooled to 0 °C using an ice bath. With mechanical stirring, this solution was acidified to pH 6.5 by slow addition of 2.0 M aqueous HCl, causing the precipitation of a fine, white solid. The solution was filtered and the precipitate was washed with cold water (~100 mL). The precipitate was crystallized from ~150 mL of a hot 2:1 water/ethanol solution, yielding white needle-like crystals. These were dried in a vacuum oven at 60 °C yielding **sc6** (mp 187 °C dec) (9.32 g, 25.6 mmol, 59.4% yield from **sc4a**): ^{1}H NMR

(300 MHz, CD_3COOD): mixture of rotamers δ 7.41-7.38 (m, 5H), 5.25-5.20 (m, 2H), 4.56-4.52 (m, 1H), 4.14 (br s, 2H), 3.25-3.10 (m, 1H), 2.47-2.42 (m, 1H), 1.55 and 1.36 (s, 9H, rotameric); ^{13}C NMR (75.4 MHz, CD_3COOD): mixture of rotamers δ 176.0, 172.7, 156.0 and 155.8, 137.0, 129.5, 129.2, 129.1, 85.0, 69.2, 67.2 and 66.2 (CH_2), 60.5 and 60.0 (CH), 55.8 and 55.4 (CH_2), 39.1 and 38.1 (CH_2), 28.0 (CH_3, 3C); IR (crushed powder) 3500, 2977, 1707, 1659, 1656, 1500, 1464, 1421, 1392, 1354, 1311, 1261, 1238, 1170, 1150, 1150, 1131, 1100, 730; $[\alpha]_D$ +25.8° (*c* 1.0, methanol); ESI-MS *m/z* (relative intensity, ion) 387 (19%, M + Na^+), 331 (100%, M – $C_4H_9^+$ + H^+ + Na^+), 309 (11%, M – $C_4H_9^+$ + H^+), 265 (34%); HRESIQTOFMS calcd for $C_{14}H_{16}N_2O_6$ (M – $C_4H_9^+$ + H^+ + Na^+) 331.0906, found 331.0894.

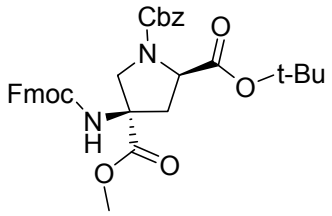


sc7

(2*R*,4*R*)-4-(9*H*-Fluoren-9-ylmethoxycarbonylamino)-pyrrolidine-1,2,4-tricarboxylic acid 1-benzyl ester 2-*tert*-butyl ester (sc7)

Finely divided **sc6** (3.90 g, 10.7 mmol) was transferred to an oven dried 500 mL three neck flask with a magnetic stir bar. This flask was placed in a vacuum oven for 4 hours under reduced pressure (50 °C, ~0.5 mm Hg) to remove any residual moisture. After backfilling with nitrogen, the flask was fitted with a reflux condenser, nitrogen inlet adapter, glass stopper, and rubber septum. After suspending the solid in CH_2Cl_2 (215 mL), diisopropylethylamine (4.50 mL, 25.8 mmol) was added to the suspension via syringe through the rubber septum. This was followed by similar addition of TMS-Cl (2.73 mL, 21.5 mmol). The flask was flushed with nitrogen, and the solution was refluxed for 1.5 hours. The solution was cooled to 0 °C in an ice bath and 9-fluorenylmethyl chloroformate (Fmoc-Cl, 2.5 g, 9.7 mmol) was added in one portion. The

reaction mixture was allowed to stir overnight while warming to room temperature. The reaction mixture was concentrated by rotary evaporation to an oil which was dissolved in EtOAc (500 mL) and transferred to a 1 L separatory funnel. This solution was washed with 1M aqueous HCl (2 × 250 mL), then brine (250 mL). The organic layer was dried over Na_2SO_4, filtered, and concentrated by rotary evaporation. Residual solvent was removed under reduced pressure to give the desired product **sc7** (5.0 g, 8.5 mmol, 87%) as a white foamy solid which was used without further purification. An analytical sample was prepared by chromatography on silica (gradient elution from $CHCl_3$ to 95:5 $CHCl_3$/MeOH): ^{1}H NMR (300 MHz, 75 °C, DMSO-d_6): δ 12.46 (br s, 1H), 7.85 (d, J = 7.5 Hz, 2H), 7.74 (br s, Fmoc-N*H*-, 1H), 7.69 (d, J = 7.4 Hz, 2H), 7.42-7.29 (m, 9H), 5.09 (s, 2H), 4.50-4.20 (m, 4H), 4.02 (d, J = 11.2 Hz, 1H), 3.64 (d, J = 11.2 Hz, 1H), 2.84 (m, 1H), 2.32 (dd, J = 13.4, 5.5 Hz, 1H), 1.37 (s, 9H); ^{13}C NMR (75.4 MHz, DMSO-d_6): mixture of rotamers δ 172.9, 170.2 and 169.9, 155.6, 153.5 and 153.3, 143.5, 140.7, 136.6 and 136.4, 128.2, 128.1, 127.8, 127.6, 127.5, 127.2, 127.1, 126.9, 125.1, 119.9, 80.8 and 80.7, 66.1 (CH_2), 65.6 (CH_2), 62.7 and 61.9, 58.6 and 58.3 (CH), 54.9 and 54.5 (CH_2), 46.5 (CH), 41.5 (CH_2), 37.5 and 37.5 (CH_2), 27.4 and 27.3 (CH_3, 3C); IR (neat film) 3319, 2978, 1713, 1530, 1450, 1423, 1357, 1257, 1188, 1157, 1119, 1087, 1045, 957, 911, 877, 841, 760, 739, 698 cm^{-1}; $[\alpha]_D$ -3.3° (c 2.4, $CHCl_3$); ESI-MS *m/z* (relative intensity): 767.2 (7.5%), 699.2 (12%), 631.2 (33%), 609.2 (100%), 553.2 (70%), 487.2 (17%); HRESIQTOFMS calcd for $C_{33}H_{34}N_2NaO_8$ (M + Na$^+$) 609.2213, found 609.2225.



sc8

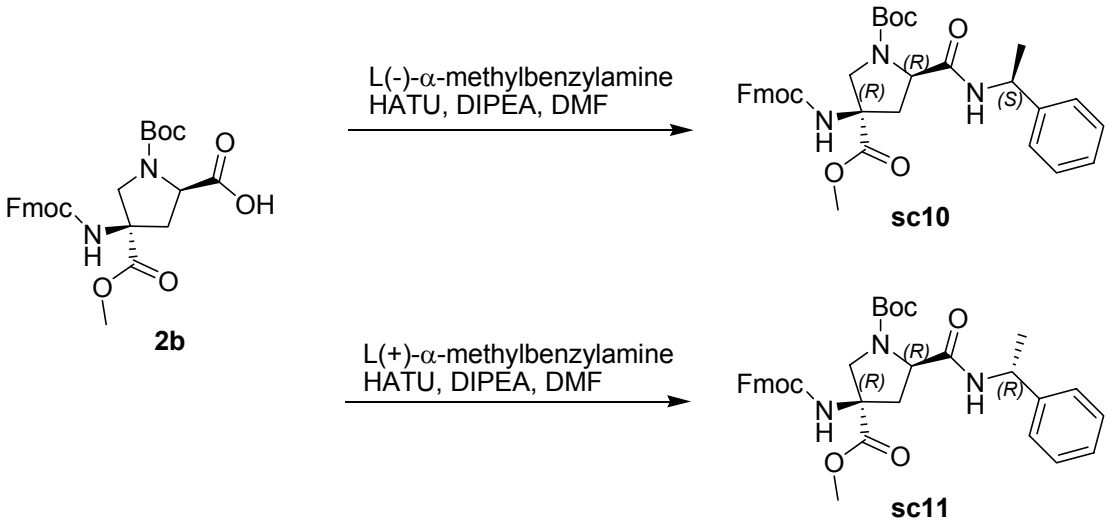
(2*R*,4*R*)-4-(9*H*-Fluoren-9-ylmethoxycarbonylamino)-pyrrolidine-1,2,4-tricarboxylic acid 1-benzyl ester 2-*tert*-butyl ester 4-methyl ester (sc8)

A solution of **sc7** (14.2 g, 24.3 mmol) in anhydrous diethyl ether (150 mL) was transferred into a 500 mL three neck flask containing a magnetic stir bar and equipped with a pressure equalizing dropping funnel. Anhydrous methanol (98 mL, 2.4 mol) was added to the solution by syringe. A 2M ethereal solution of trimethylsilyldiazomethane ($TMSCHN_2$, ~20 mL, 40 mmol) was loaded into the dropping funnel under a N_2 atmosphere. The $TMSCHN_2$ solution was added to the reaction mixture dropwise until the solution developed a persistent yellow color, at which time the starting material had been completely consumed (determined by TLC, 1:2 EtOAc/hexanes, R_f = 0.2). The flask was immersed in an ice bath and a 9:1 MeOH/AcOH solution (48 mL) was slowly added to quench residual $TMSCHN_2$. The reaction mixture was concentrated by rotary evaporation to a yellow oil which was purified by chromatography on silica (gradient elution from hexanes to 1:1 EtOAc/hexanes). Fractions containing the desired product were concentrated by rotary evaporation. Residual solvent was removed under reduced pressure overnight giving the product **sc8** (13.4 g, 22.2 mmol, 91%): ^{1}H NMR (300 MHz, 75 °C, DMSO-d_6): δ 7.86 (d, J = 7.4 Hz, 3H, overlap with Fmoc-N*H*-), 7.66 (d, J = 7.5 Hz, 2H), 7.41-7.32 (m, 9H), 5.09 (s, 2H), 4.40-4.20 (m, 4H), 3.97 (d, J = 11.3 Hz, 1H), 3.60 (m, 4H), 2.80 (br m, 1H), 2.27 (br m, 1H), 1.36 (s, 9H); ^{13}C NMR (75.4 MHz, DMSO-d_6): mixture of rotamers δ 171.8 and 171.7, 170.2 and 169.8, 155.7, 153.5 and 153.3, 143.5, 140.6, 136.6 and 136.4, 128.3, 128.1, 127.8, 127.7, 127.5, 127.4, 127.2, 126.9, 125.1, 125.0, 120.0, 80.9 and 80.8, 66.2 (CH_2),

65.6 (CH_2), 63.0 and 62.1, 58.4 and 58.0 (CH), 54.7 and 54.3 (CH_2), 52.6 (CH_3), 46.5 (CH), 38.4 and 37.4 (CH_2), 27.4 and 27.3 (CH_3, 3C); IR (neat film) 3320, 2977, 1743, 1711, 1526, 1450, 1417, 1356, 1296, 1246, 1157, 1114, 1084, 979, 918, 843, 760, 740, 698 cm^{-1}; $[\alpha]_D$ -3.6° (*c* 2.0, $CHCl_3$); ESI-MS *m/z* (relative intensity): 681.5 (4.5%), 623.4 (100%), 567.4 (45%), 501.4 (13%); HRESITOFMS calcd for $C_{34}H_{36}N_2NaO_8$ ($M + Na^+$) 623.2369, found 623.2360.

Determining the enantiopurity of compound 2b

2b was derivatized with both enantiomers of α-methylbenzyl amine. Both (*S*) and (*R*) methylbenzylamine derivatives were prepared on analytical scale (supplemental scheme 3); **sc10** and **sc11** were separable by HPLC.

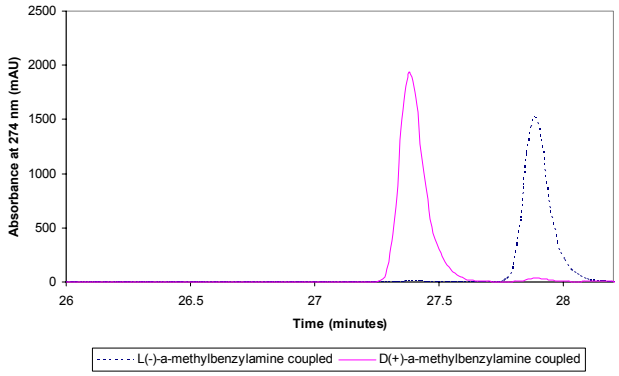


Supplemental Scheme 3: Synthesis of α-methylbenzylamine derivatives of **2b**

Synthesis of sc10 and sc11

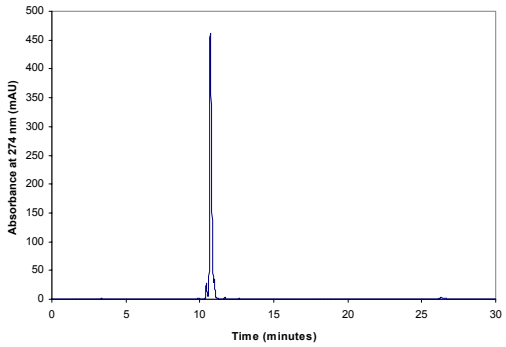
Two 4 mL conical vials with magnetic spin vanes were dried in an oven. To each vial was added the monomer **2b** (10.0 mg, 19.5 μmol), HATU (7.4 mg,19.5 μmol) and DMF (250 μL). (*S*)-(-)-α-methylbenzylamine (5 μL, 39 μmol) was added to the solution in the first vial, and (*R*)-(+)-α-methylbenzylamine (5 μL, 39 μmol) was added to the second. The addition of the amine to the

solution caused an immediate color change from pale to bright yellow. Both vials were sealed with a rubber septum, and the solutions were stirred for an additional 30 minutes at room temperature. 1M aqueous HCl (2 mL) was added to each vial and the mixture was extracted with $CHCl_3$ (2 mL). The $CHCl_3$ extracts were washed with brine and dried over Na_2SO_4. Both solutions were concentrated by centrifugal evaporation (Savant SpeedVac), and the residues were dissolved in MeOH (2 mL), filtered through a 0.2 μm nylon filter into vials, and analyzed by HPLC. The sample of **sc10** contained less than 1.7% of a compound with the retention time of **sc11**; **sc11** contained less than 0.4% of a compound with the retention time of **sc10**.



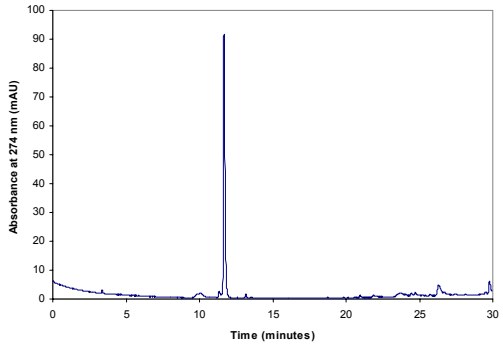
HPLC: C_{18} column; mobile phase, MeCN (0.05% TFA) / water (0.1% TFA), 5% to 95% MeCN over 30 min; flow rate, 1.00 mL/min; UV detection at 274 nm; t_R for **sc10**, 27.9 min; t_R for **sc11**, 27.4 min.

Supplemental Figure 1: 274 nm absorbance chromatogram from HPLC analysis of α-methylbenzylamine derivatives of **2b**



HPLC: C_{18} column; mobile phase, MeCN (0.05% TFA) / water (0.1% TFA), 5% to 95% MeCN over 30 min; flow rate, 0.40 mL/min; UV detection at 274 nm; t_R for **7**, 10.70 min; ESI-MS *m/z* (ion): 799.2 ($M + H^+$).

Supplemental Figure 2: 274 nm absorbance chromatogram from HPLC analysis of purified scaffold **7**



HPLC: C_{18} column; mobile phase, MeCN (0.05% TFA) / water (0.1% TFA), 5% to 95% MeCN over 30 min; flow rate, 0.40 mL/min; UV detection at 274 nm; t_R for **8**, 11.67 min; ESI-MS *m/z* (ion): 799.3 ($M + H^+$).

Supplemental Figure 3: 274 nm absorbance chromatogram from HPLC analysis of purified scaffold **8**

Preparation of NMR samples of compounds 7 and 8

The NMR samples of **7** and **8** were prepared by dissolving each in approximately 450 μL of degassed 9:1 H_2O/D_2O with 0.025 M ND_4COOD:CD_3COOD buffer (pH 4-5). The samples were filtered through 0.2 μm Nylon frit centrifugal filters and transferred to a D_2O matched Shigemi NMR tube. Experiments were acquired on a 500 MHz spectrometer at 2 °C. COSY, ROESY (mixing time of 300 ms), HMQC and HMBC experiments were performed. Processed data sets were analyzed using Sparky.[4] The chemical shift assignments are based upon the COSY, HMBC, and ROESY cross-peaks.

Explanation of abbreviations in the 2D-NMR data tables:

Group: the number corresponding to the place of the monomer in the sequence. 1 corresponds to the naphthylalanine; 2, 3, 4 and 5 correspond with the monomers in the order they were attached to the resin.

Heavy atom number: the numerical designation of the atoms in structures **7** and **8** as shown in the text of the paper.

H Stereochemistry: the α and β designation of geminal protons on a given carbon atom, as designated in the paper.

Atom: the first letter (C or H) designates the nucleus. The following letters are coded as follows;

- A = alpha
- B = beta
- C = gamma

[4] Goddard, T. D.; Kneller, D. G. *SPARKY 3*; UCSF: San Francisco, California, 2004.

- D = delta
- AC = carbonyl carbon adjacent to alpha carbon
- GC = carbonyl carbon adjacent to gamma carbon
- N = amide nitrogen

Shift: chemical shift (on the δ scale)
#: number of cross-peaks in the COSY/ROESY/HMBC/HMQC used to determine the resonance
StDev: the standard deviation of the calculated chemical shift of each resonance

Group	Heavy Atom	H Stero.	Atom	Nuc	Shift	SDev	#	Group	Heavy Atom	Atom	Nuc	Shift	SDev	#
1			HB1	1H	2.86	0.004	7	1	2	CA	13C	55.4	0.010	3
1			HB2	1H	2.92	0.004	6	1	1	CAC	13C	175.5	0.021	4
1	2		HA	1H	4.22	0.007	3	2	6	CB	13C	40.1	0.041	4
1	3		HN	1H	8.52	0.009	9	2	5	CA	13C	59.1	0.064	4
2	6	β	HB2	1H	1.48	0.018	10	2	7	CG	13C	64.4	0.050	4
2	6	α	HB1	1H	2.10	0.005	7	2	17	CGC	13C	166.0	0.049	5
2	8	β	HD2	1H	3.00	0.006	6	2	4	CAC	13C	167.8	0.046	4
2	8	α	HD1	1H	3.53	0.002	6	3	13	CB	13C	37.1	0.000	1
2	5		HA	1H	3.92	0.003	7	3	12	CA	13C	58.5	0.024	6
2	10		HN	1H	8.34	0.011	7	3	14	CG	13C	62.0	0.019	4
3	13	β	HB2	1H	1.88	0.006	8	3	25	CGC	13C	167.4	0.025	4
3	13	α	HB1	1H	2.50	0.005	5	3	11	CAC	13C	170.1	0.030	3
3	15	β	HD2	1H	3.37	0.003	6	4	20	CA	13C	57.5	0.051	5
3	15	α	HD1	1H	3.56	0.008	5	4	22	CG	13C	62.5	0.021	5
3	12		HA	1H	4.18	0.004	8	4	33	CGC	13C	166.9	0.015	4
3	18		HN	1H	8.44	0.011	7	4	19	CAC	13C	170.2	0.028	4
4	21	α	HB2	1H	2.03	0.008	8	5	29	CB	13C	37.0	0.023	2
4	21	β	HB1	1H	2.45	0.011	6	5	28	CA	13C	52.9	0.131	2
4	23	α	HD2	1H	3.34	0.005	5	5	30	CG	13C	60.4	0.008	3
4	23	β	HD1	1H	3.71	0.008	6	5	27	CAC	13C	169.6	0.071	2
4	20		HA	1H	4.23	0.004	7							
4	26		HN	1H	8.65	0.011	7							
5	29	α	HB2	1H	2.13	0.006	5							
5	29	β	HB1	1H	2.62	0.007	4							
5	31	α	HD2	1H	3.69	0.003	2							
5	28		HA	1H	4.54	0.013	6							

Table 1: Resonance Assignments for Scaffold **7**

Resonance 1	Shift	Resonance 2	Shift	Integrated Volume
01HB1	2.85	HN	8.52	3.39E+06
01HB2	2.91	HN	8.52	1.89E+06
02HA	3.92	01HN	8.52	1.24E+07
02HB1	2.11	01HN	8.52	1.57E+06
02HB1	2.11	03HA	4.18	6.72E+06
02HB2	1.48	01HN	8.52	1.37E+06
02HB2	1.48	HD2	2.99	2.17E+07
02HB2	1.48	HN	8.33	2.94E+06
02HD1	3.53	HA	3.91	4.18E+06
02HD2	3.00	HN	8.33	1.10E+07
03HA	4.18	02HN	8.33	8.61E+05
03HB2	1.88	HD2	3.36	6.10E+06
03HB2	1.88	HN	8.43	1.53E+07
03HD1	3.55	HA	4.17	4.42E+06
03HD1	3.56	04HA	4.23	1.25E+07
03HD2	3.37	HN	8.43	4.13E+06
03HD2	3.37	04HA	4.23	4.49E+06
04HA	4.23	03HN	8.43	1.30E+06
04HB1	2.48	05HA	4.56	1.01E+08
04HB2	2.02	HD2	3.35	8.88E+06
04HB2	2.03	HN	8.64	3.88E+06
04HD1	3.70	HA	4.23	6.47E+06
04HD2	3.34	HN	8.64	1.56E+07
05HA	4.54	04HN	8.64	4.51E+05
05HB2	2.14	HD2	3.69	4.01E+06

Table 2: Cross-peaks in the ROESY spectrum of Scaffold **7**

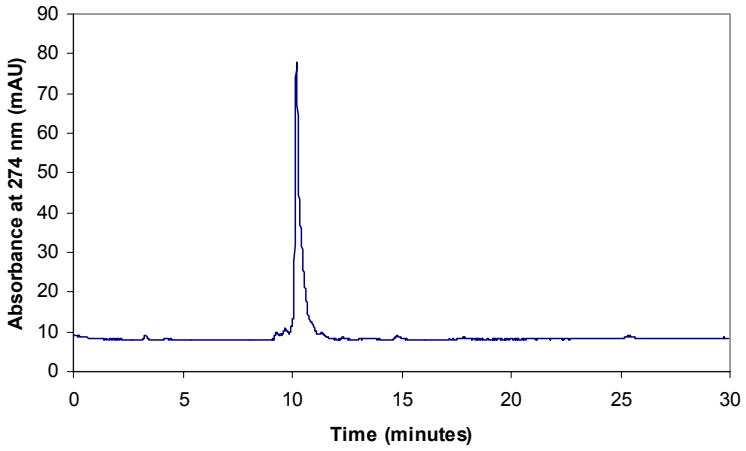
Group	Heavy Atom	H Stero.	Atom	Nuc	Shift	SDev	#	Group	Heavy Atom	Atom	Nuc	Shift	SDev	#
1			HB1	1H	2.779	0.013	8	1		CB	13C	36.8	0.019	3
1			HB2	1H	2.837	0.012	5	1	2	CA	13C	55.0	0.043	5
1	2		HA	1H	4.24	0.01	10	1	1	CAC	13C	175.0	0.049	4
1	3		HN	1H	8.601	0.002	9	2	6	CB	13C	38.0	0.051	5
2	6	β	HB2	1H	1.69	0.004	9	2	8	CD	13C	52.9	0.023	4
2	6	α	HB1	1H	2.648	0.005	7	2	5	CA	13C	59.1	0.008	4
2	8	β	HD2	1H	3.071	0.005	9	2	7	CG	13C	63.8	0.016	6
2	8	α	HD1	1H	3.356	0.003	8	2	17	CGC	13C	165.0	0.014	5
2	5		HA	1H	4.187	0.007	8	2	4	CAC	13C	167.9	0.029	5
2	10		HN	1H	8.28	0.001	8	3	13	CB	13C	36.9	0.026	2
3	13	α	HB2	1H	1.864	0.012	10	3	15	CD	13C	55.0	0.000	1
3	13	β	HB1	1H	2.491	0.004	5	3	12	CA	13C	57.9	0.050	2
3	15	α	HD2	1H	3.402	0.012	7	3	14	CG	13C	61.6	0.081	3
3	15	β	HD1	1H	3.487	0.006	3	3	25	CGC	13C	166.7	0.019	3
3	12		HA	1H	4.401	0.003	7	3	11	CAC	13C	169.7	0.019	3
3	18		HN	1H	8.428	0.001	8	4	21	CB	13C	37.3	0.029	2
4	21	β	HB2	1H	1.91	0.009	9	4	23	CD	13C	55.1	0.000	1
4	21	α	HB1	1H	2.533	0.004	5	4	20	CA	13C	57.7	0.099	3
4	23	β	HD2	1H	3.456	0.008	4	4	22	CG	13C	61.7	0.094	4
4	23	α	HD1	1H	3.52	0.006	3	4	33	CGC	13C	166.6	0.067	3
4	20		HA	1H	4.479	0.007	6	4	19	CAC	13C	169.9	0.019	3
4	26		HN	1H	8.542	0	9	5	29	CB	13C	36.4	0.000	1
5	29	α	HB2	1H	2.083	0.012	8	5	31	CD	13C	52.1	0.000	1
5	29	β	HB1	1H	2.575	0.001	6	5	28	CA	13C	56.9	0.012	4
5	36		HME	1H	3.447	0	1	5	30	CG	13C	59.8	0.006	3
5	31	β	HD1	1H	3.646	0.003	4	5	27	CAC	13C	168.7	0.036	3
5	28		HA	1H	4.453	0.006	7	5	34	CGC	13C	169.6	0.015	4
5	37		HN	1H	8.575	0	1							

Table 3: Resonance Assignments for Scaffold **8**

Resonance 1	Shift	Resonance 2	Shift	Integrated Volume
01H1	7.31	HN	8.60	2.15E+06
01H3	7.00	HN	8.60	1.76E+06
01HA	4.24	H1	7.31	1.22E+07
01HA	4.24	H3	6.99	3.55E+07
01HA	4.24	H4	7.40	2.39E+07
01HB1	2.80	H1	7.31	3.42E+07
01HB1	2.80	H3	6.98	4.31E+07
01HB1	2.79	HN	8.60	1.51E+07
02HB1	2.64	01HN	8.60	3.24E+06
02HB2	1.68	HD2	3.07	4.78E+07
02HB2	1.69	HN	8.28	2.18E+07
02HD1	3.35	HA	4.18	8.53E+06
02HD1	3.35	03HA	4.40	2.22E+07
02HD2	3.07	HN	8.28	5.99E+06
02HD2	3.07	03HA	4.40	1.14E+07
03HA	4.41	02HN	8.28	2.03E+06
03HB2	1.85	HD2	3.39	1.10E+07
03HB2	1.87	HN	8.43	2.24E+07
03HD1	3.49	HA	4.40	
03HD1	3.49	04HA	4.49	
03HD2	3.40	HB2	1.88	6.41E+07
03HD2	3.40	HN	8.43	5.45E+06
03HD2	3.40	04HA	4.47	
04HA	4.47	03HN	8.43	3.83E+06
04HB2	1.90	HN	8.54	2.18E+07
04HD1	3.52	HN	8.54	1.51E+06
04HD1	3.52	05HA	4.46	
04HD2	3.47	HB2	1.91	2.11E+08
04HD2	3.45	HN	8.54	5.85E+06
04HD2	3.46	05HA	4.46	
05HA	4.46	04HN	8.54	1.86E+06
05HB2	2.06	HN	8.58	2.58E+06
05HD1	3.64	HA	4.45	2.28E+07

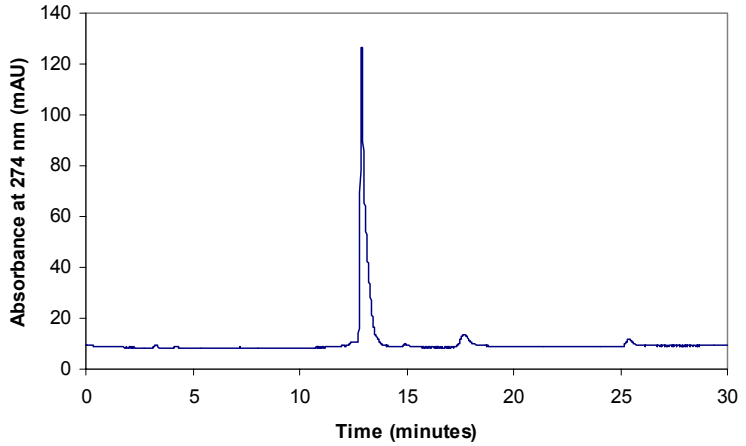
Table 4: Cross-peaks in the ROESY spectrum of scaffold **8**

HPLC Analysis and Excitation Spectra of Compounds in the Fluorescence Study



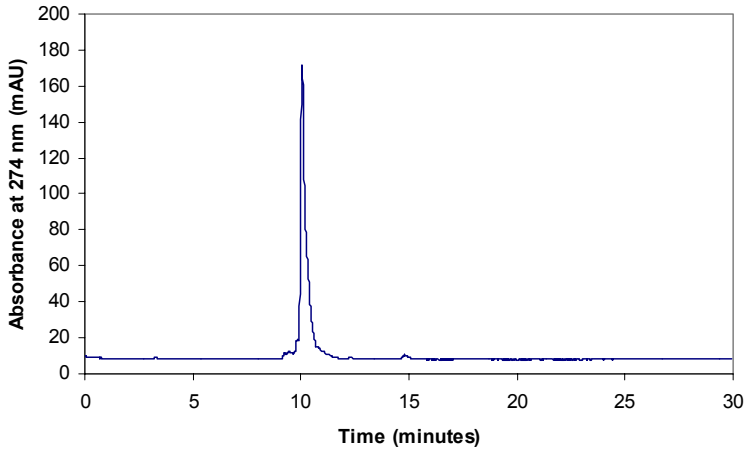
HPLC-MS: C_{18} column; mobile phase, MeCN (0.05% HCOOH) / water (0.1% HCOOH), 5% to 95% MeCN over 30 min; flow rate, 0.40 mL/min; UV detection at 274 nm; t_R for **9**, 10.19 min; ESI-MS *m/z* (ion): 1309.0 ($M + H^+$).

Supplemental Figure 4: 274 nm absorbance chromatogram from HPLC analysis of **9**



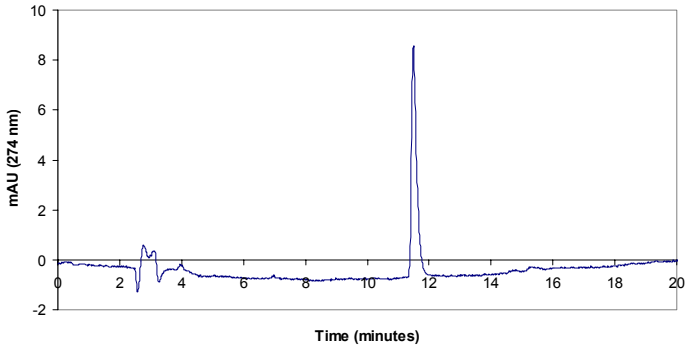
HPLC-MS: C_{18} column; mobile phase, MeCN (0.05% HCOOH) / water (0.1% HCOOH), 5% to 95% MeCN over 30 min; flow rate, 0.40 mL/min; UV detection at 274 nm; t_R for **10**, 12.90 min; ESI-MS *m/z* (ion): 1181.0 ($M + H^+$).

Supplemental Figure 5: 274 nm absorbance chromatogram from HPLC analysis of **10**



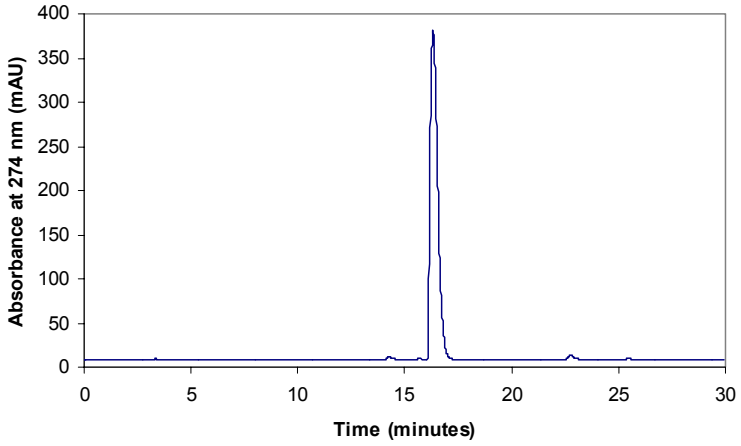
HPLC-MS: C_{18} column; mobile phase, MeCN (0.05% HCOOH) / water (0.1% HCOOH), 5% to 95% MeCN over 30 min; flow rate, 0.40 mL/min; UV detection at 274 nm; t_R for **11**, 10.05 min; ESI-MS *m/z* (ion): 1309.0 ($M + H^+$).

Supplemental Figure 6: 274 nm absorbance chromatogram from HPLC analysis of **11**



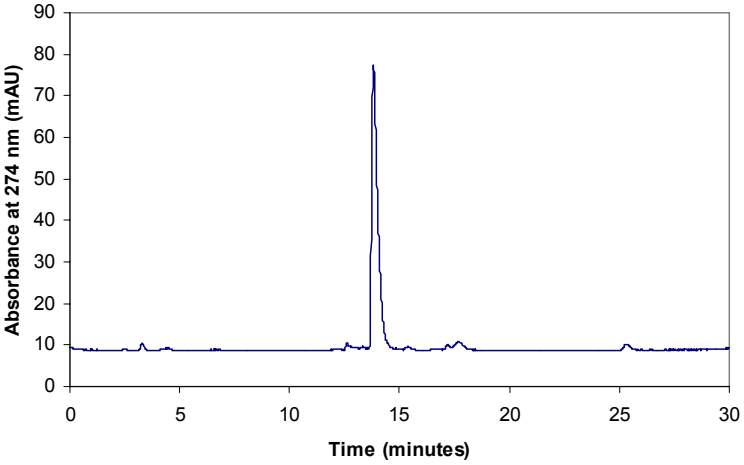
HPLC-MS: C_{18} column; mobile phase, MeCN (0.05% HCOOH) / water (0.1% HCOOH), 5% to 95% MeCN over 30 min; flow rate, 0.80 mL/min; UV detection at 274 nm; t_R for **12**, 11.48 min; ESI-MS *m/z* (ion): 1181.0 ($M + H^+$).

Supplemental Figure 7: 274 nm absorbance chromatogram from HPLC analysis of **12**



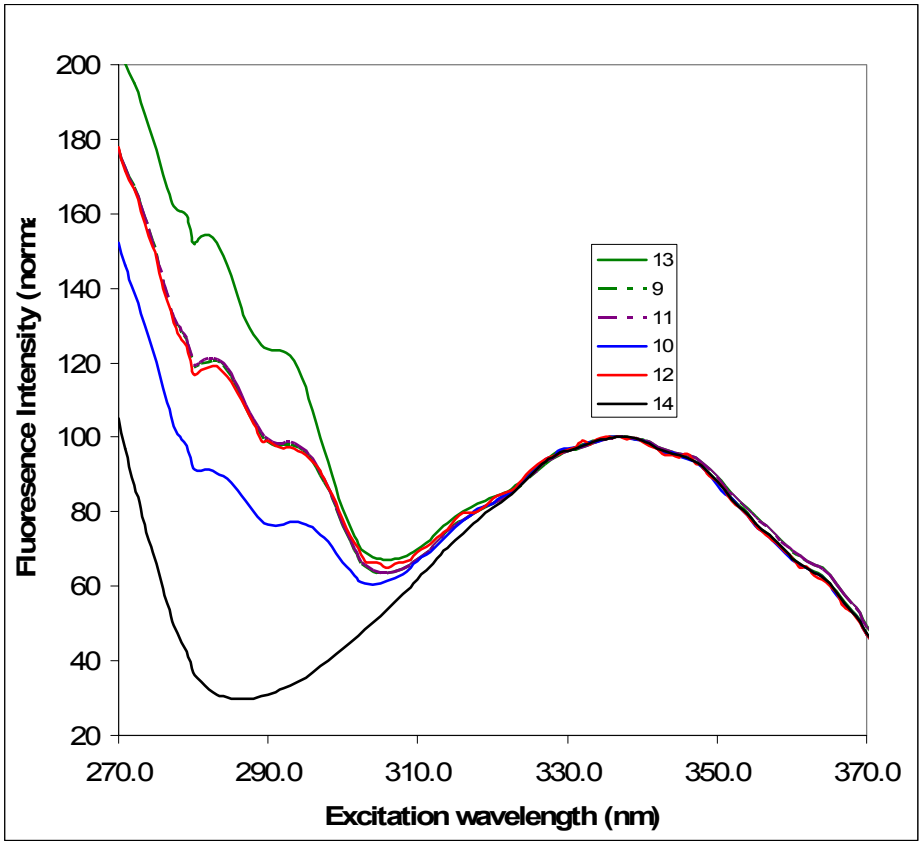
HPLC-MS: C_{18} column; mobile phase, MeCN (0.05% TFA) / water (0.1% TFA), 5% to 95% MeCN over 30 min; flow rate, 0.40 mL/min; UV detection at 274 nm; t_R for **13**, 16.32 min; ESI-MS *m/z* (ion): 491.0 ($M + H^+$).

Supplemental Figure 8: 274 nm absorbance chromatogram from HPLC analysis of **13**



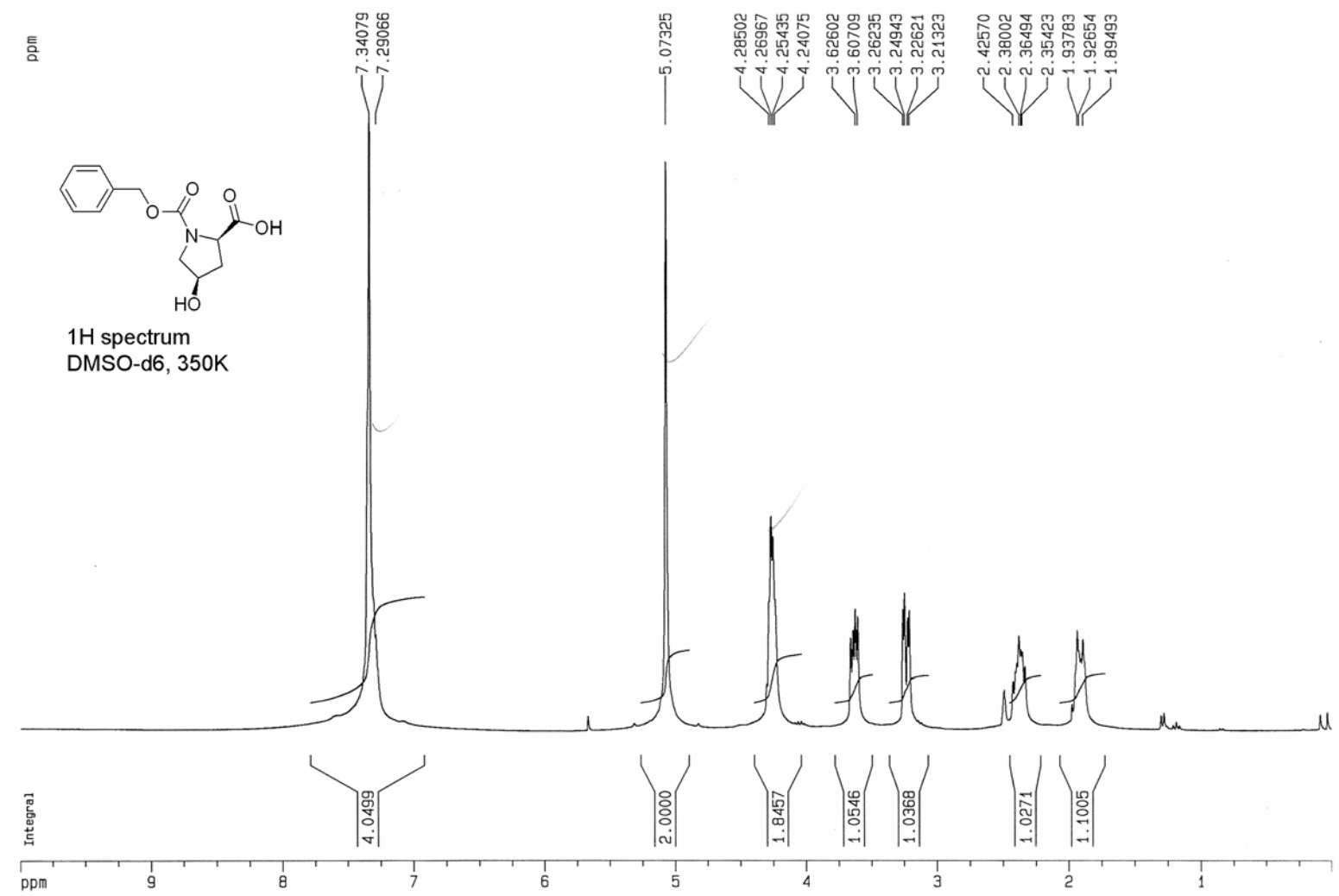
HPLC-MS: C_{18} column; mobile phase, MeCN (0.05% TFA) / water (0.1% TFA), 5% to 95% MeCN over 30 min; flow rate, 0.40 mL/min; UV detection at 274 nm; t_R for **14**, 13.82 min; ESI-MS *m/z* (ion): 545.2 ($M + H^+$).

Supplemental Figure 9: 274 nm absorbance chromatogram from HPLC analysis of **14**

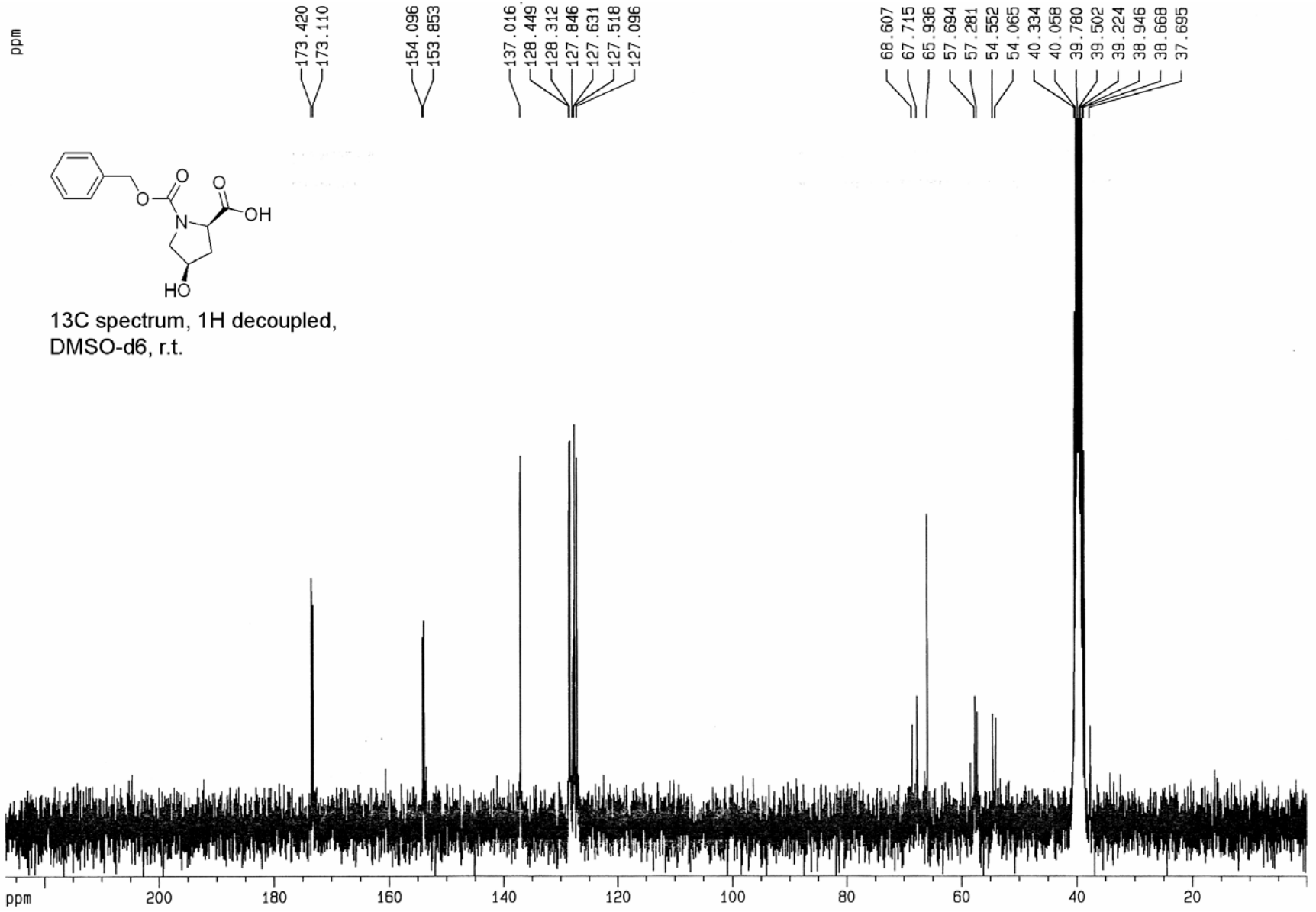


Supplemental Figure 10: Excitation spectra for compounds **9**, **10**, **11**, **12**, **13**, **14**

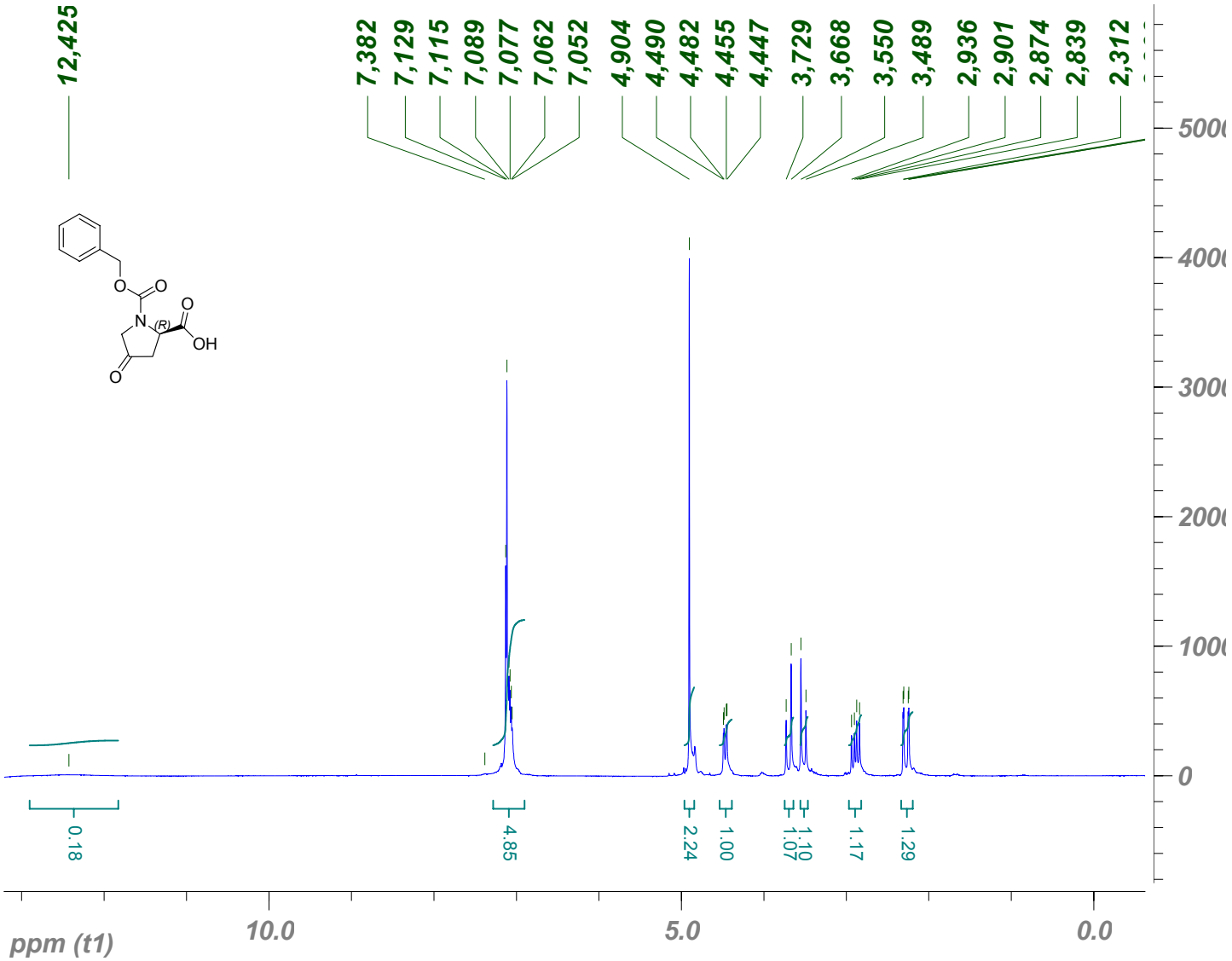
NMR Spectra of Monomer Intermediates



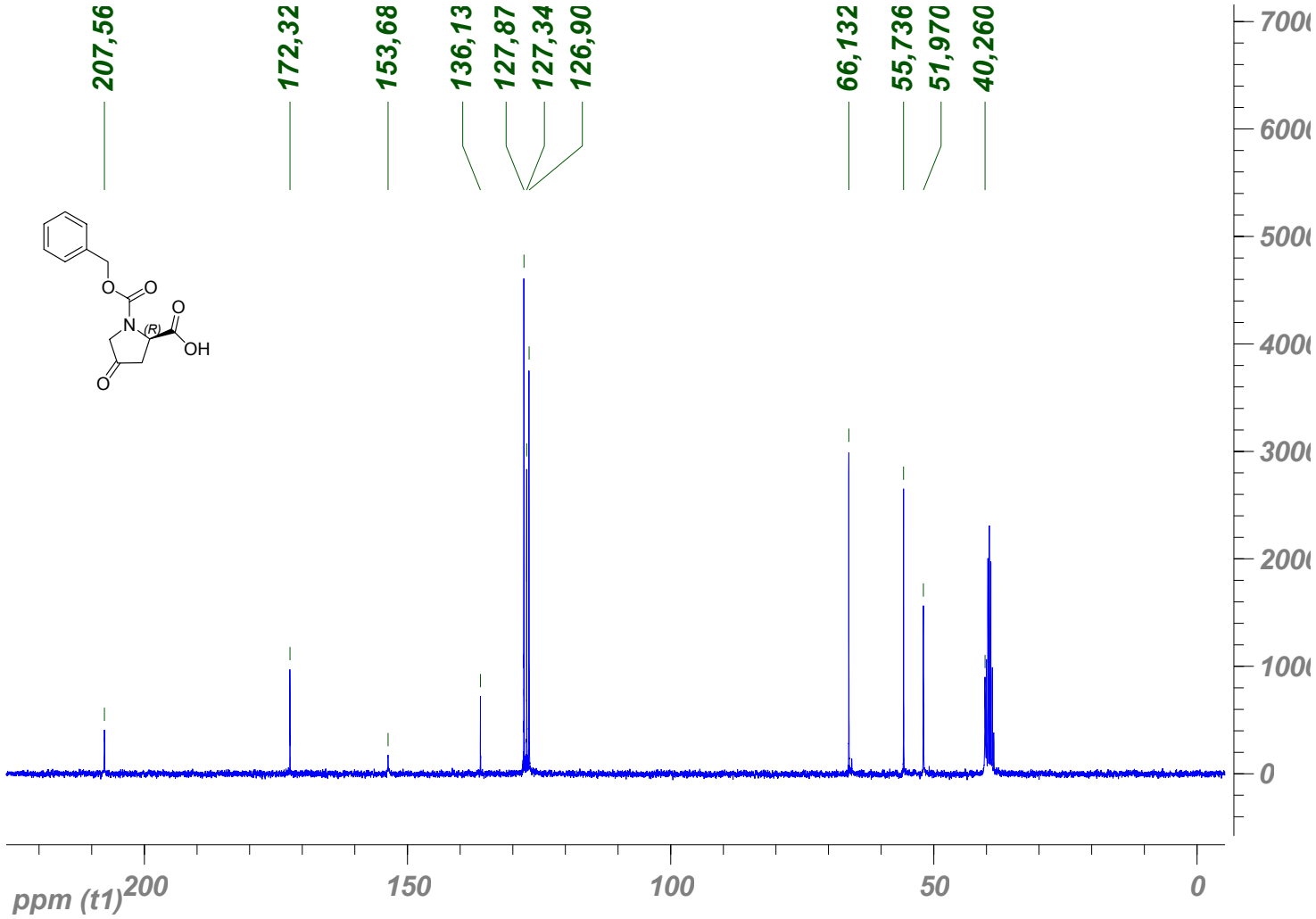
Supplemental Figure 11: ^{1}H spectrum of compound **sc1**, 300 MHz, DMSO-d_6, 350K



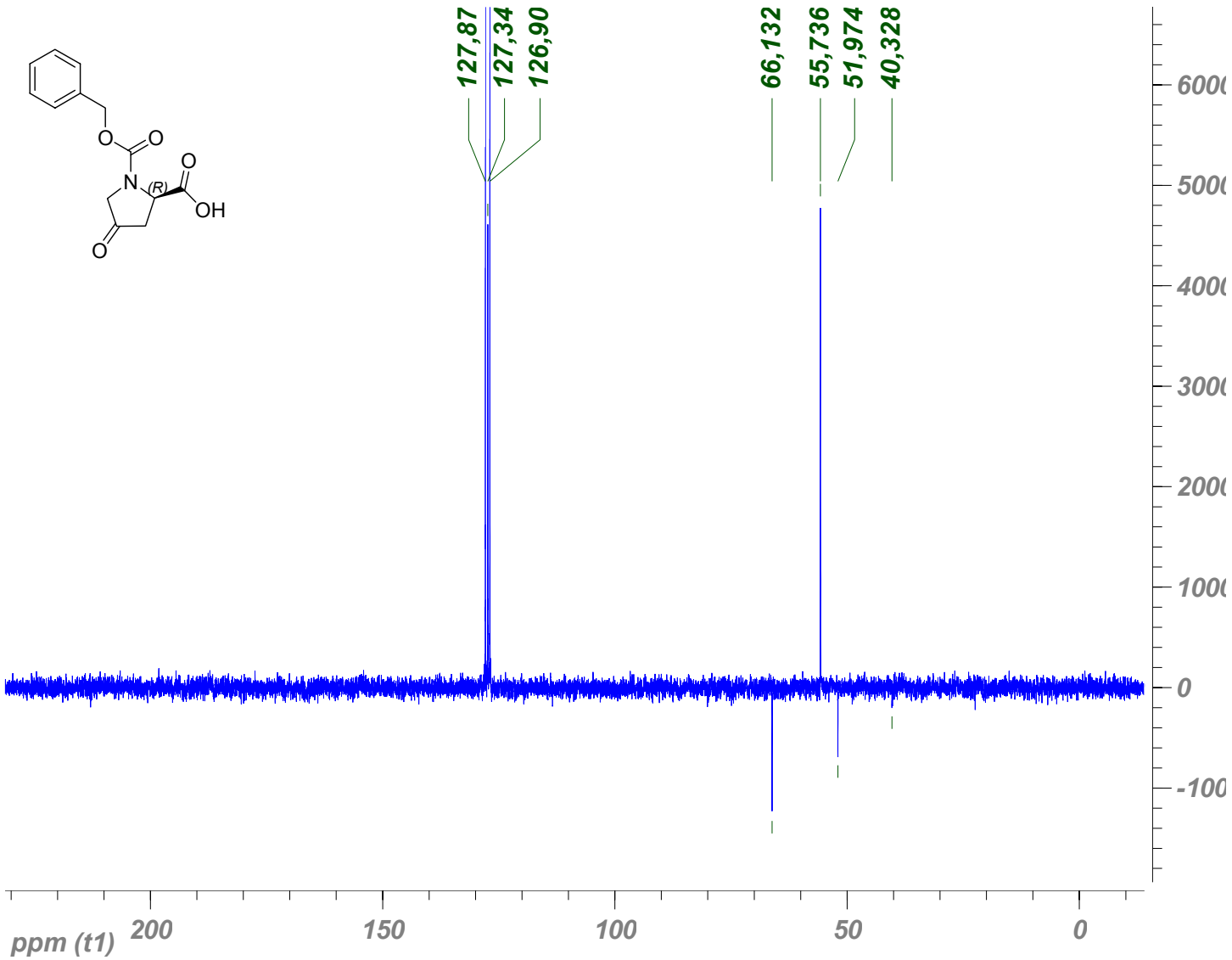
Supplemental Figure 12: Proton decoupled ^{13}C spectrum of compound **sc1**, 75.4 MHz, DMSO-d_6, room temperature



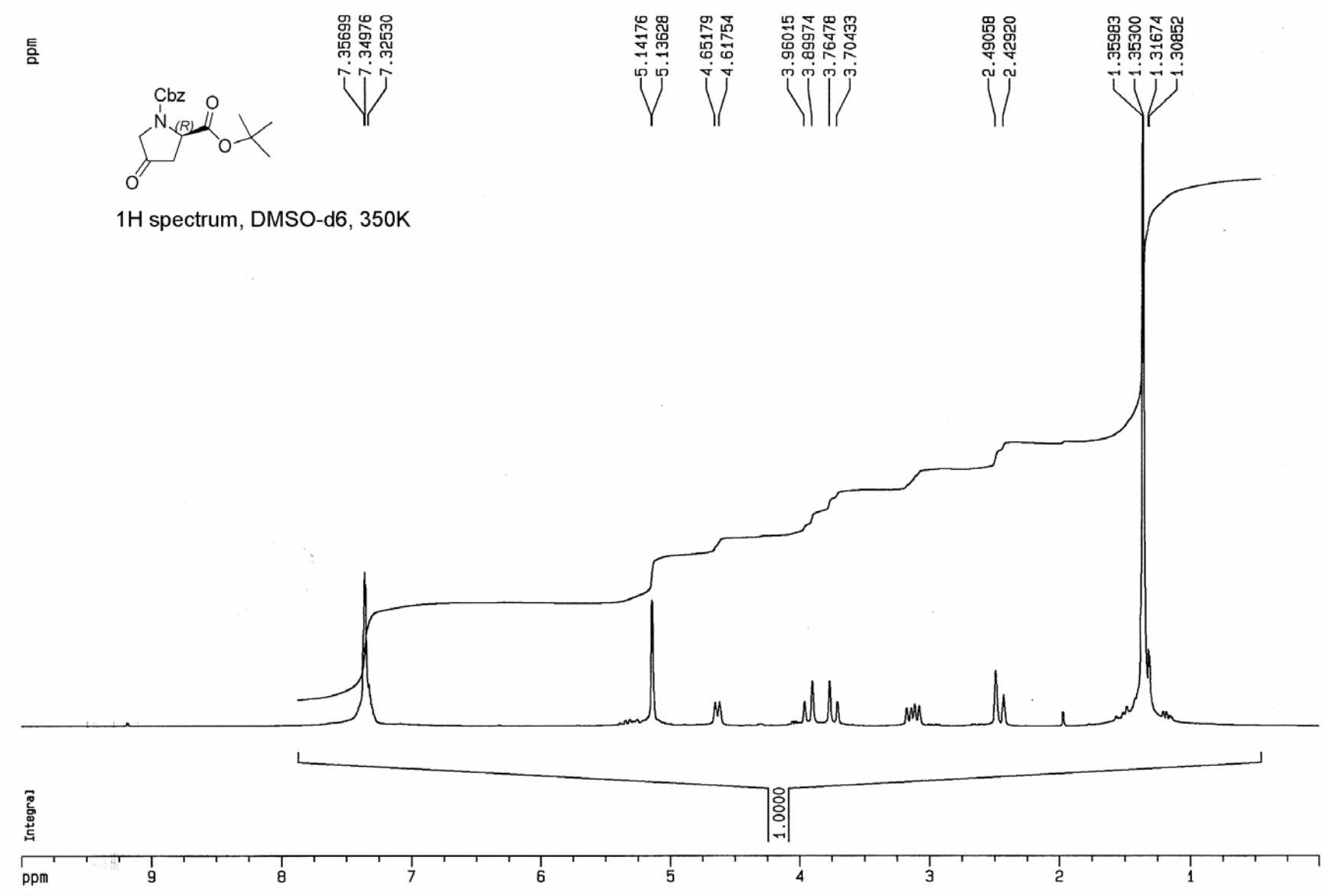
Supplemental Figure 13: ^{1}H spectrum of compound **sc2**, 300 MHz, DMSO-d_6, 350K



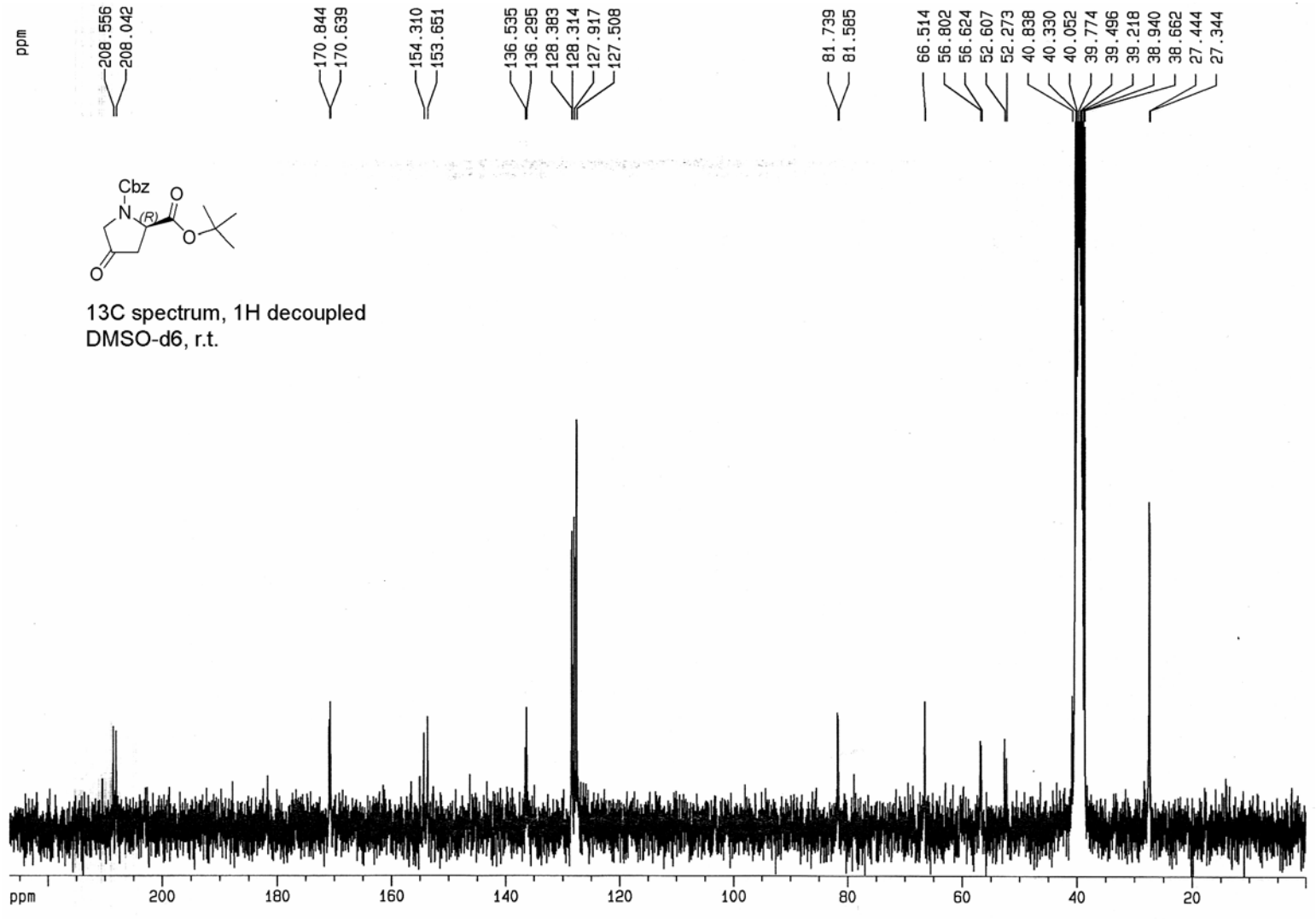
Supplemental Figure 14: Proton decoupled ^{13}C spectrum of compound **sc2**, 75.4 MHz, DMSO-d_6, 350K



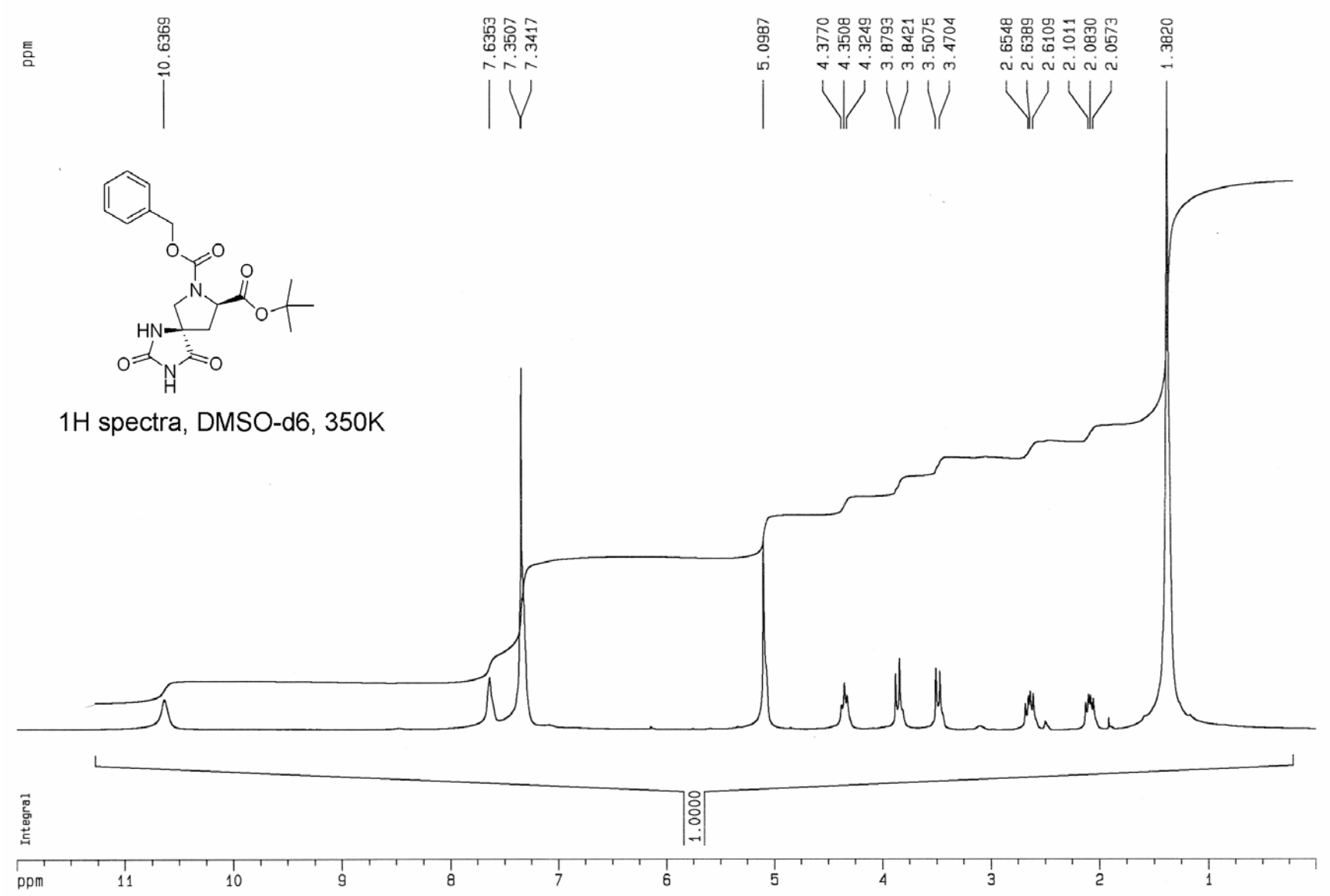
Supplemental Figure 15: dept135 spectrum of compound **sc2**, 75.4 MHz, DMSO-d_6, 350K



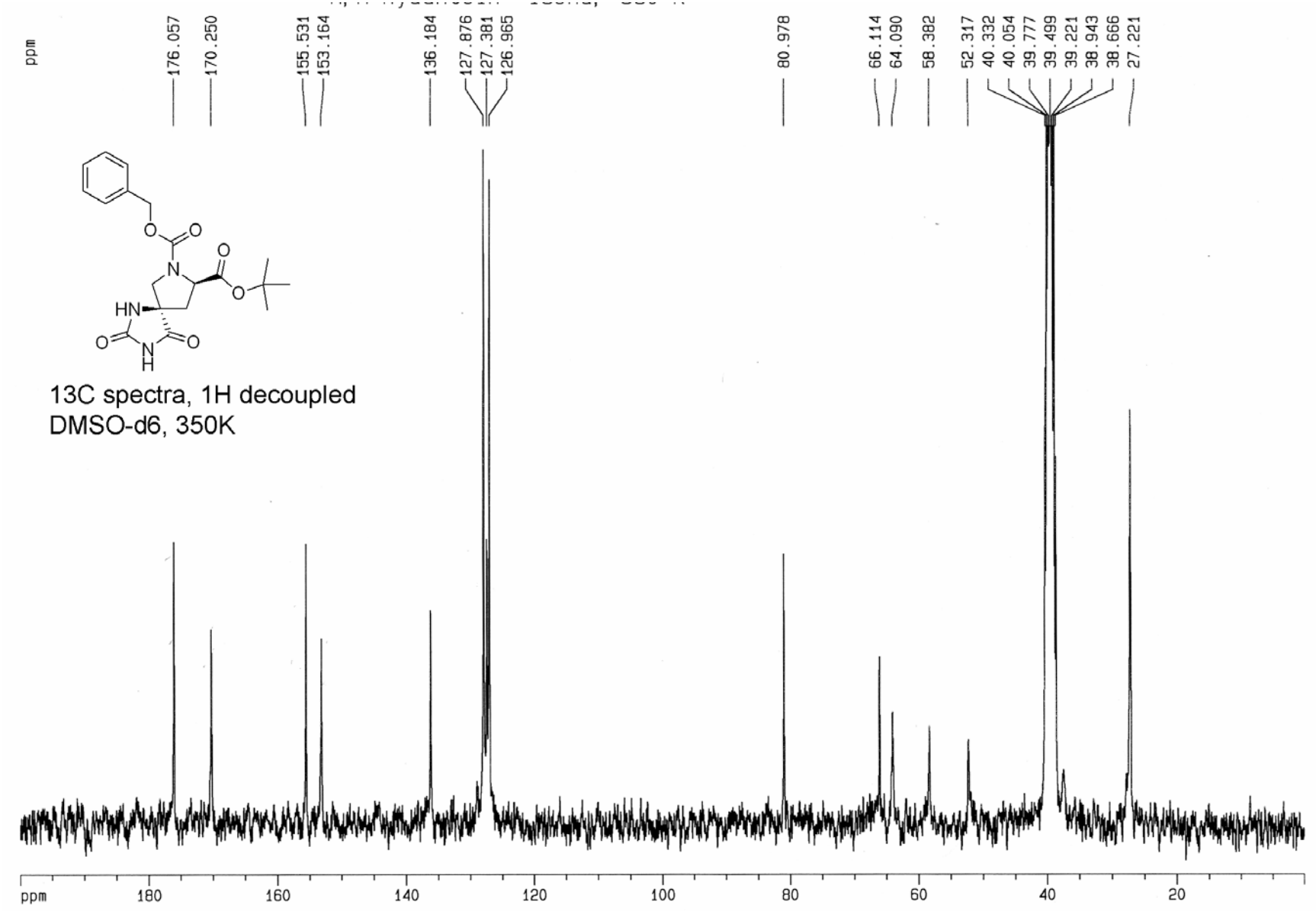
Supplemental Figure 16: ^{1}H spectrum of compound **sc3**, 300 MHz, DMSO-d_6, 350K



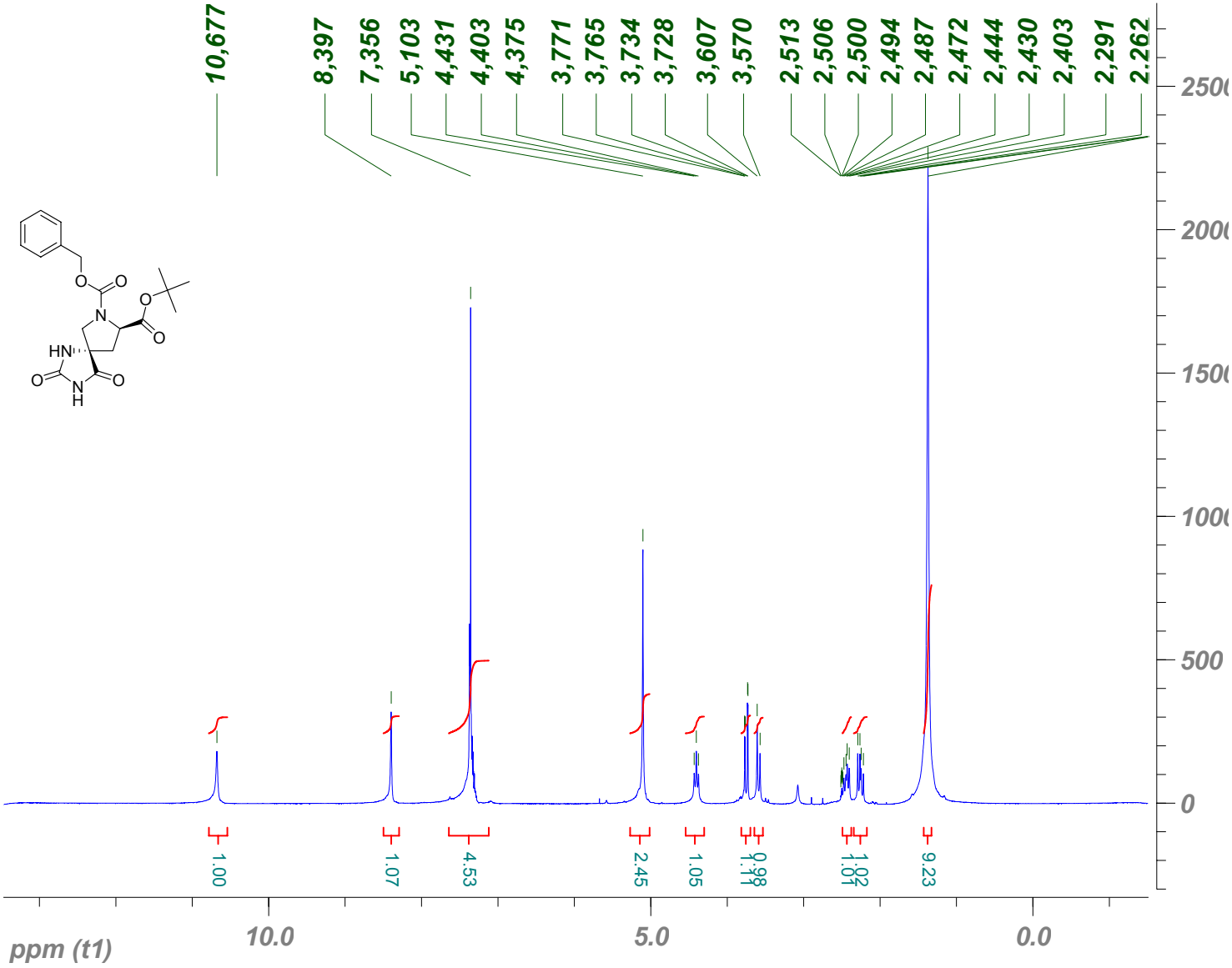
Supplemental Figure 17: Proton decoupled ^{13}C spectrum of compound **sc3**, 75.4 MHz, DMSO-d_6, room temperature



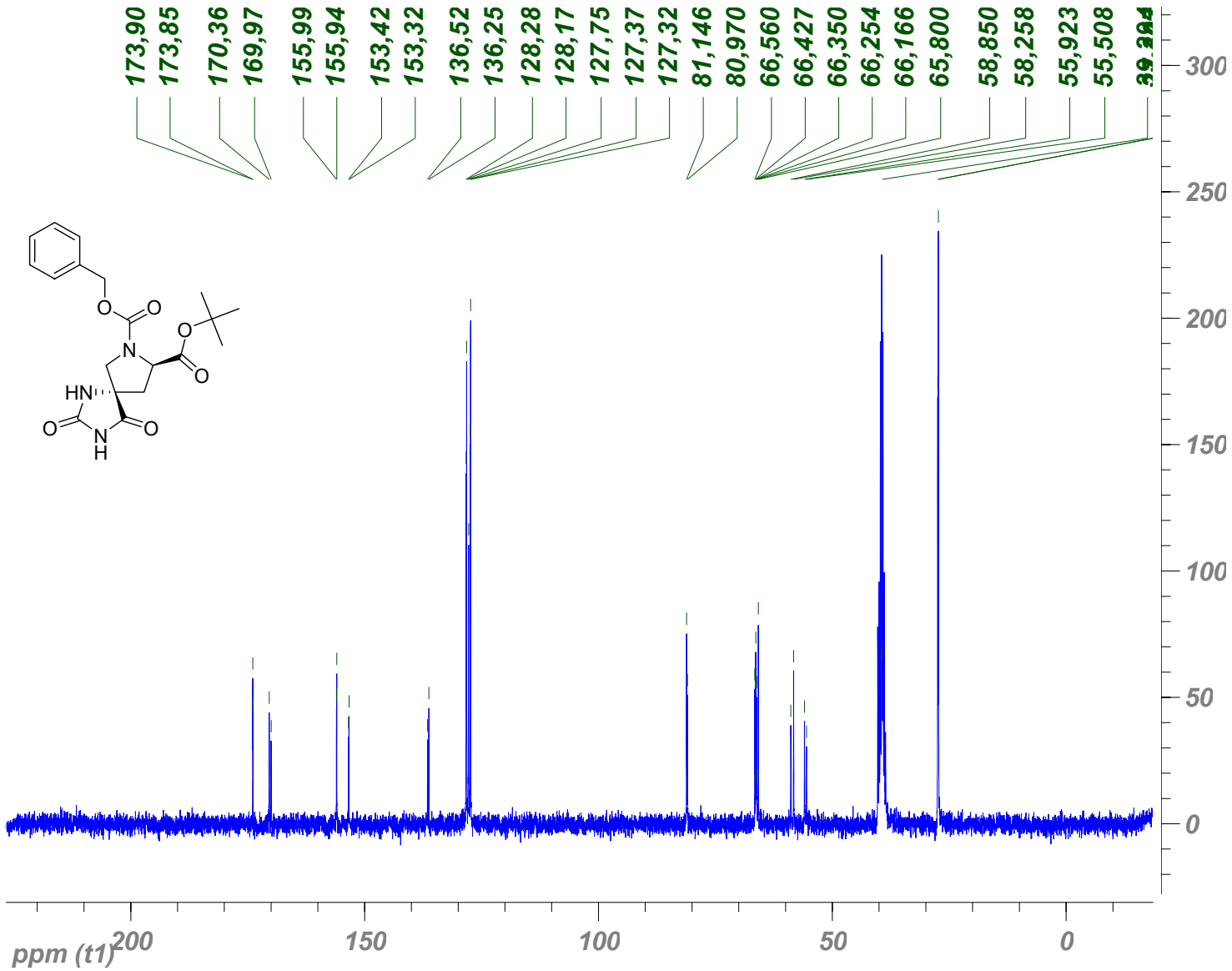
Supplemental Figure 18: ^{1}H spectrum of compound **sc4a**, 300 MHz, DMSO-d_6, 350K



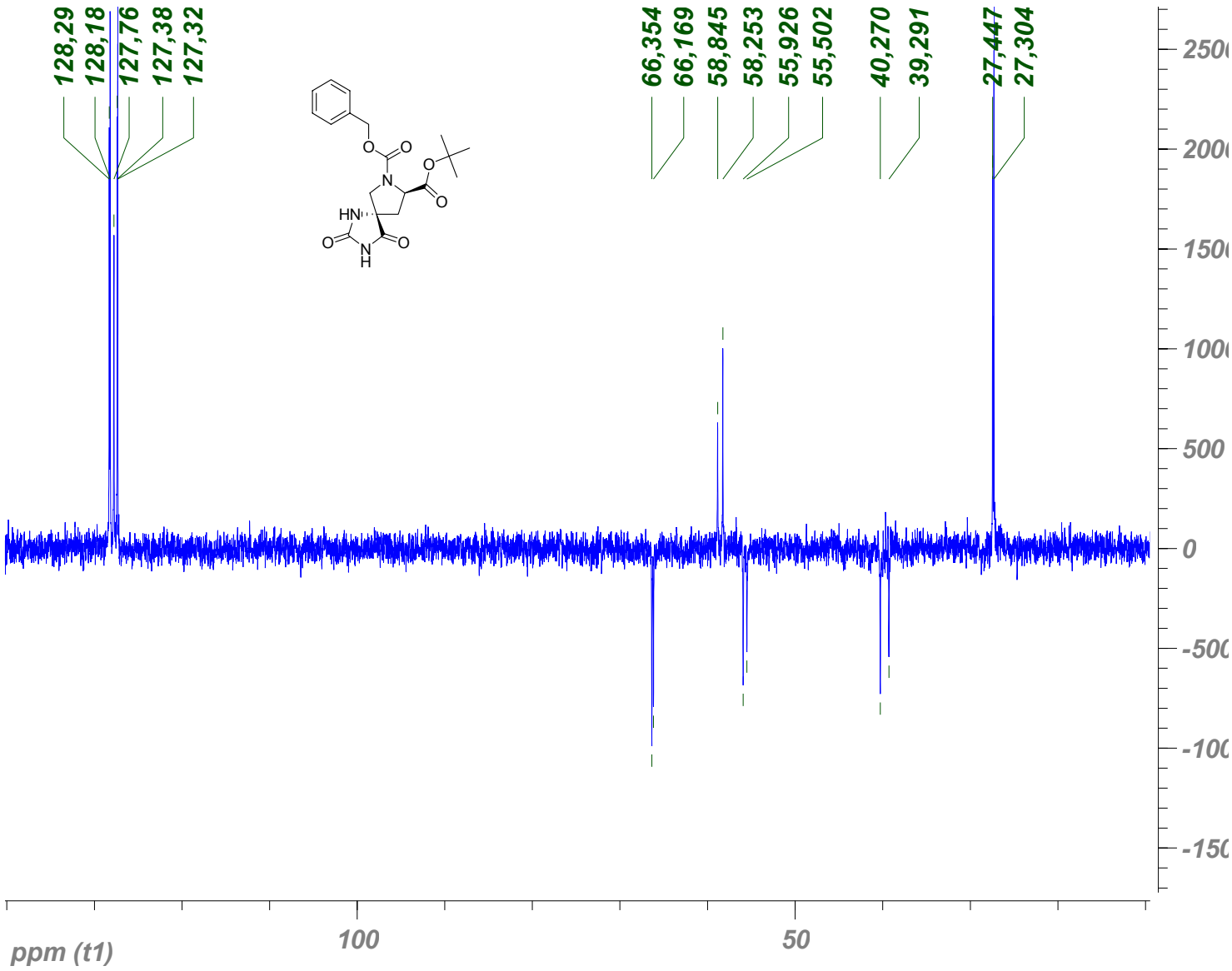
Supplemental Figure 19: Proton decoupled ^{13}C spectrum of compound **sc4a**, 75.4 MHz, DMSO-d_6, 350K



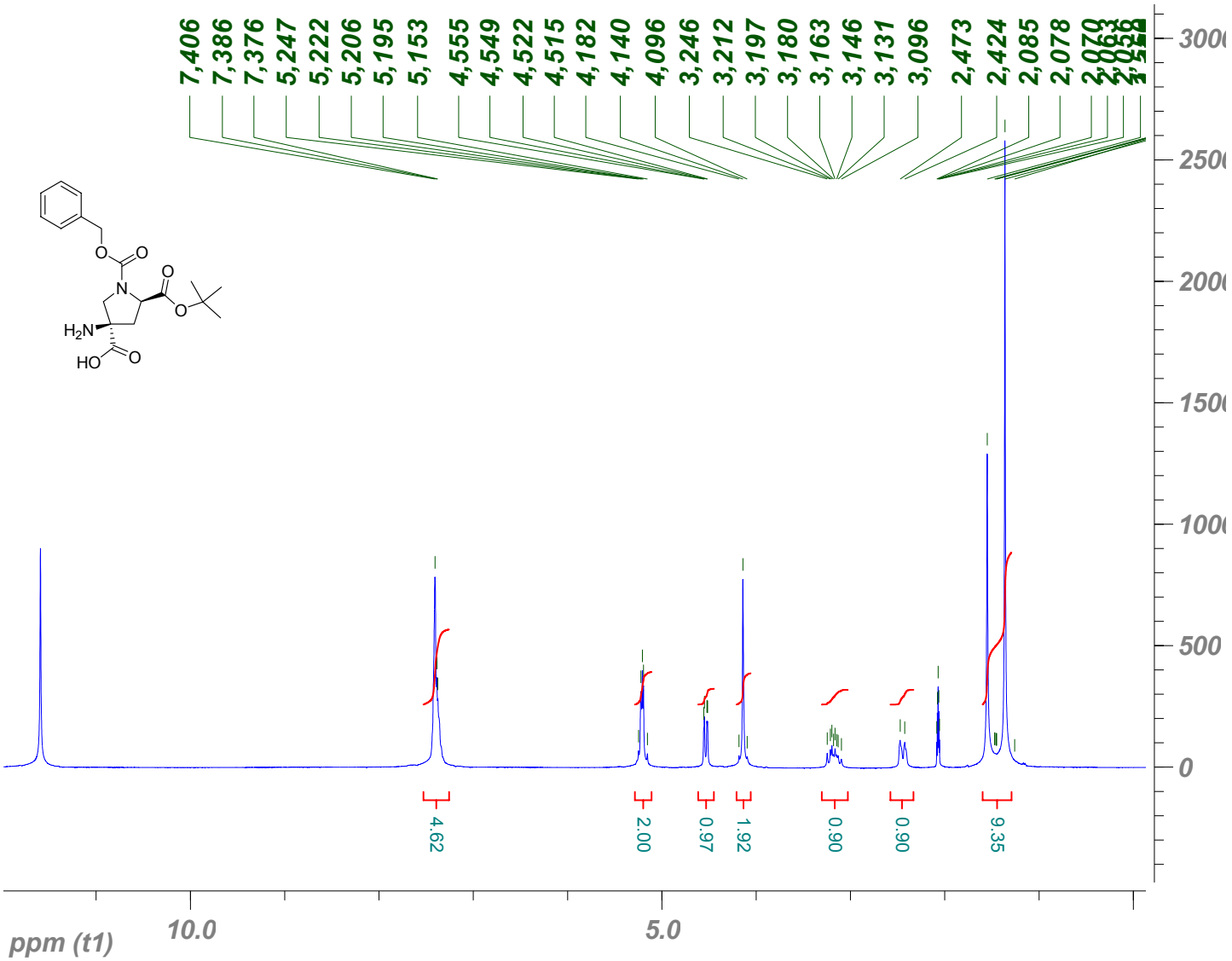
Supplemental Figure 20: ^{1}H spectrum of compound **sc4b**, 300 MHz, DMSO-d_6, 350K



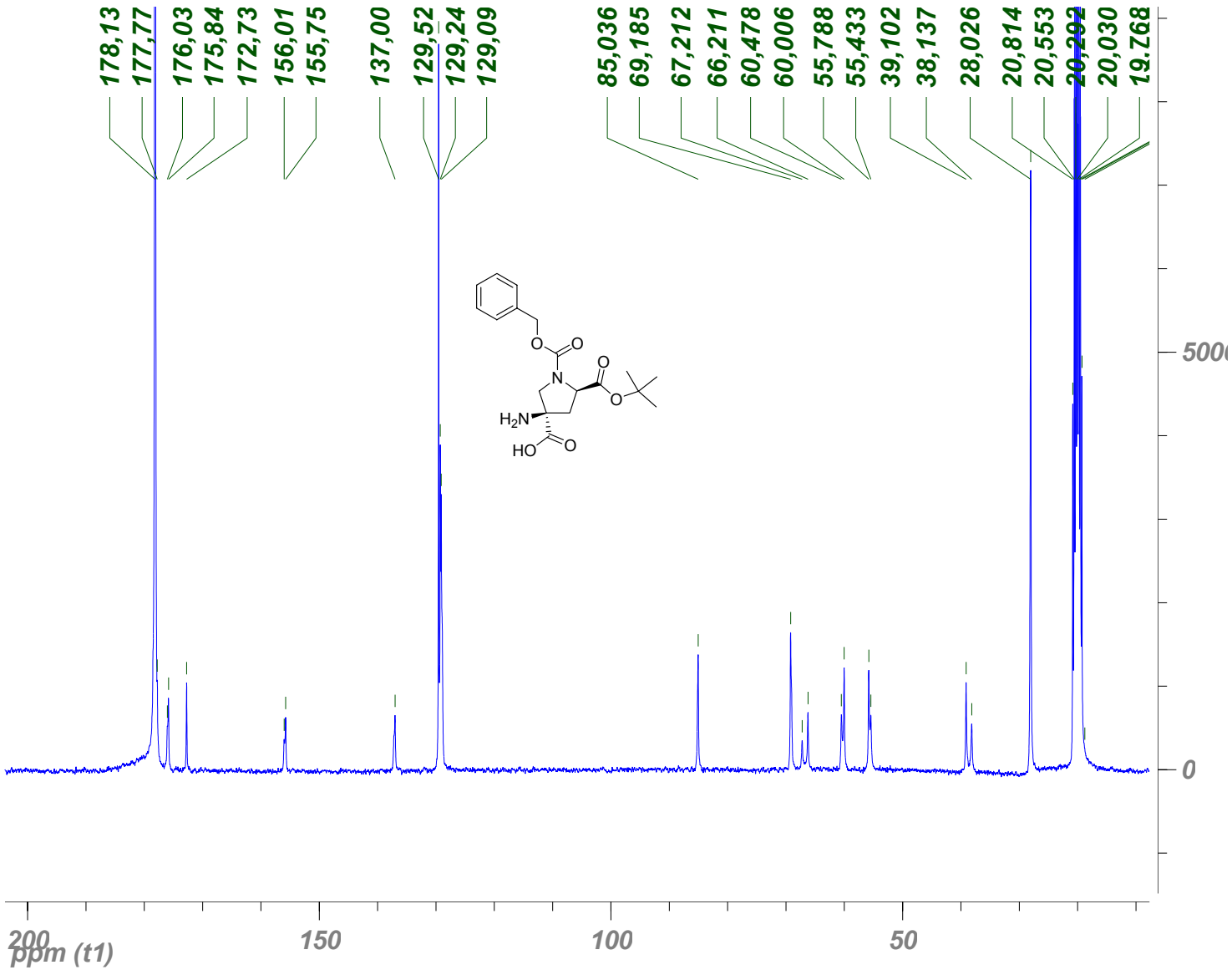
Supplemental Figure 21: Proton decoupled ^{13}C spectrum of compound **sc4b**, 75.4 MHz, DMSO-d_6, room temperature



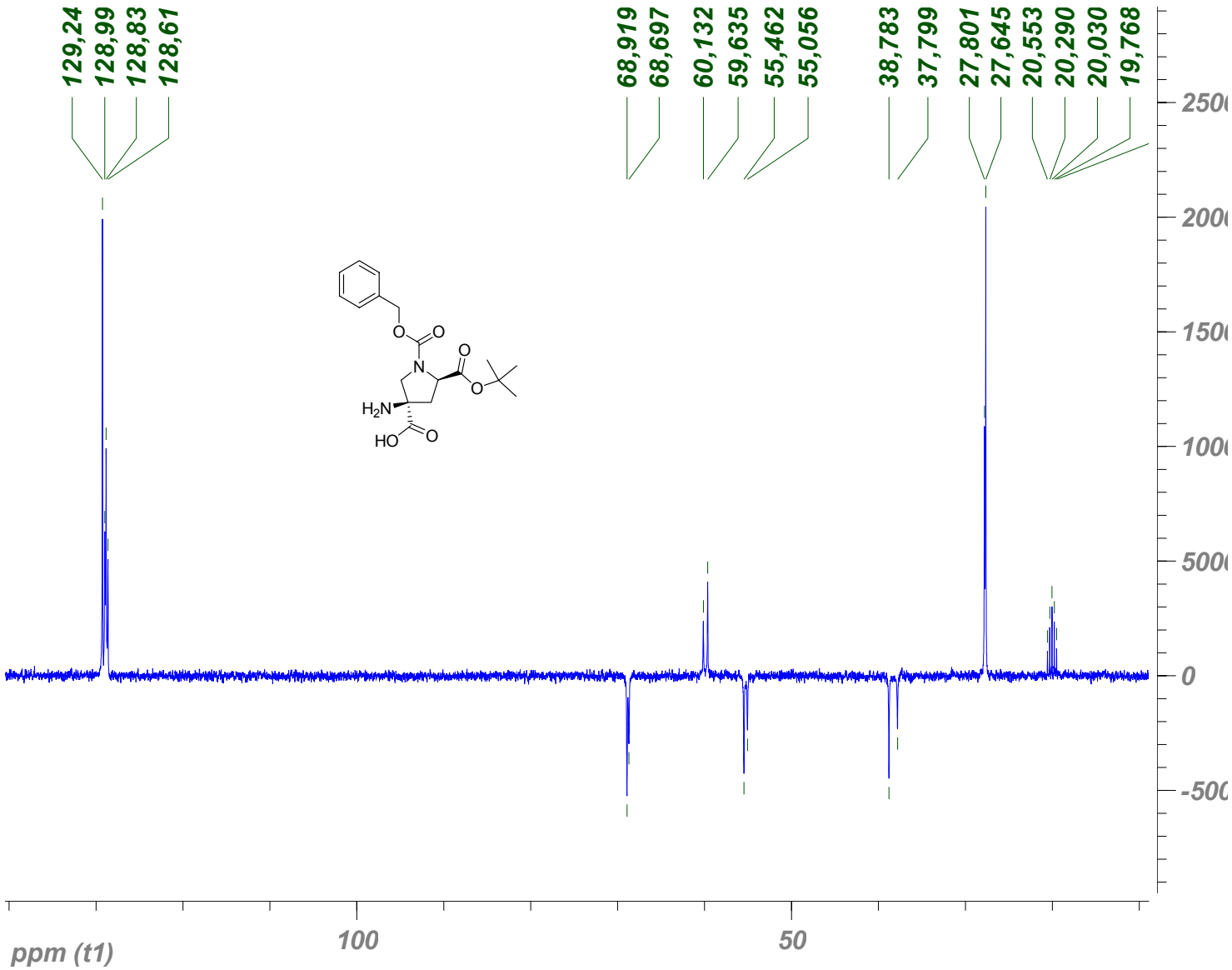
Supplemental Figure 22: dept135 spectrum of compound **sc4b**, 75.4 MHz, DMSO-d_6, room temperature



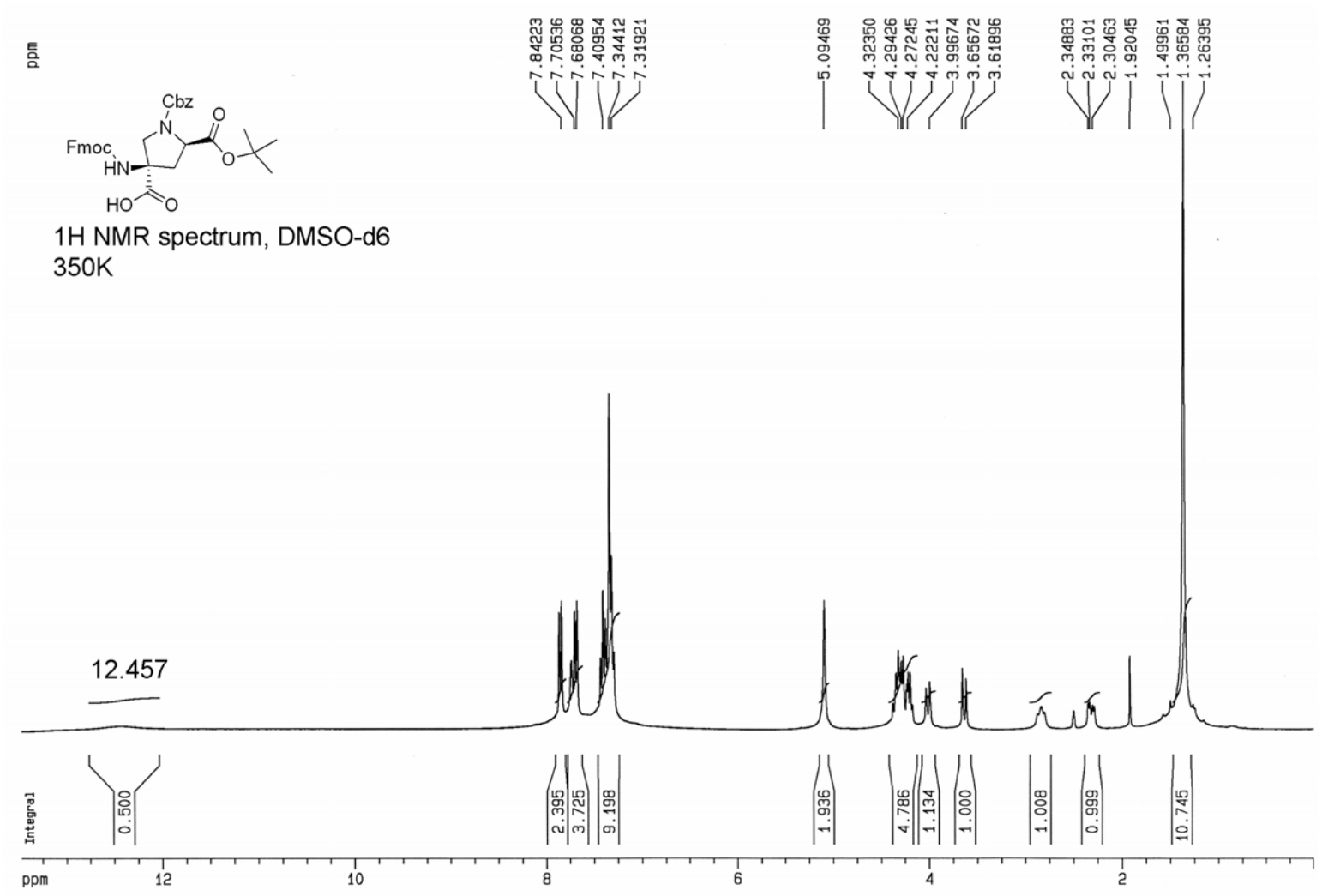
Supplemental Figure 23: ^{1}H spectrum of compound **sc6**, 300 MHz, acetic acid-d_4, room temperature



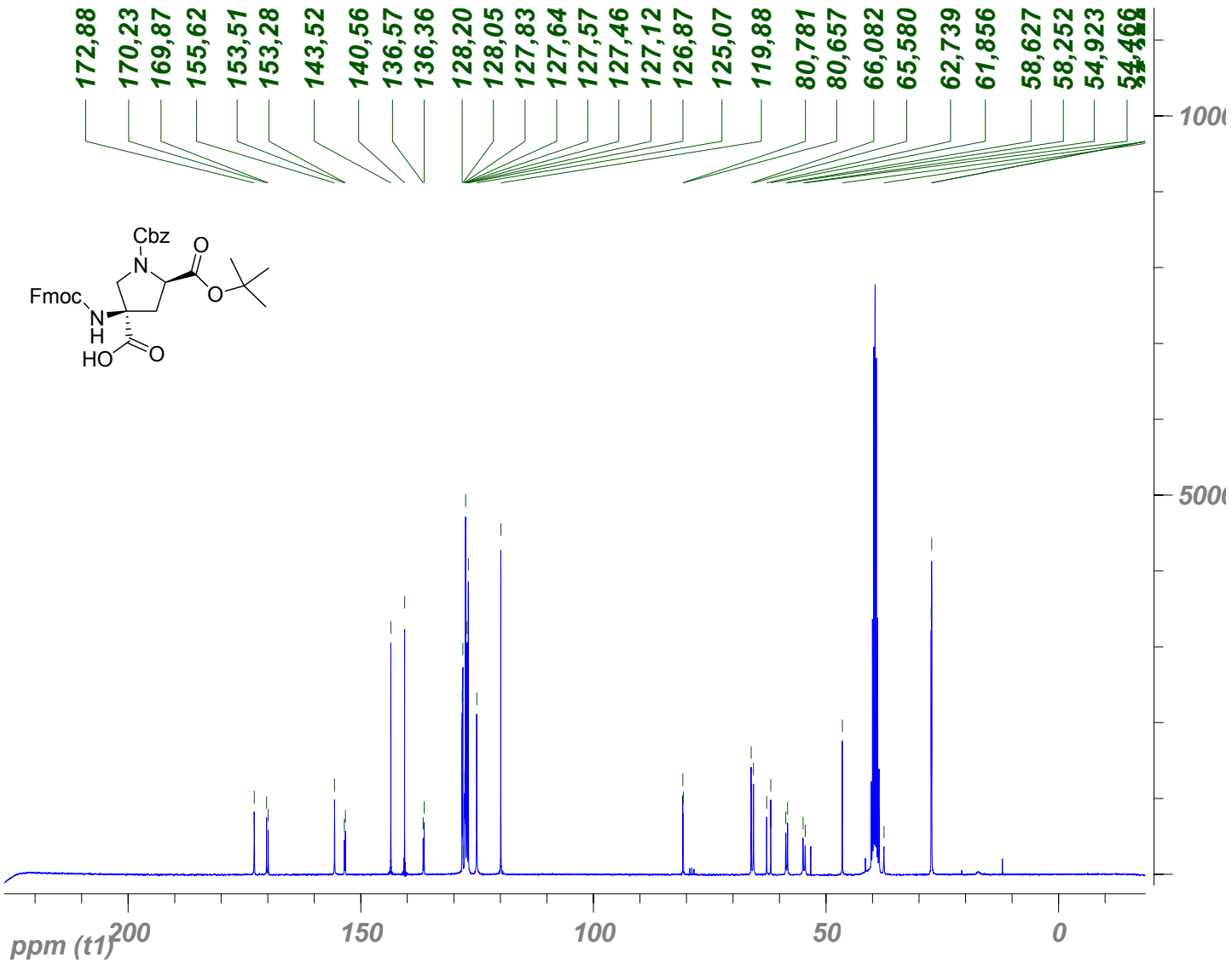
Supplemental Figure 24: Proton decoupled ^{13}C spectrum of compound **sc6**, 75.4 MHz, acetic acid-d_4, room temperature



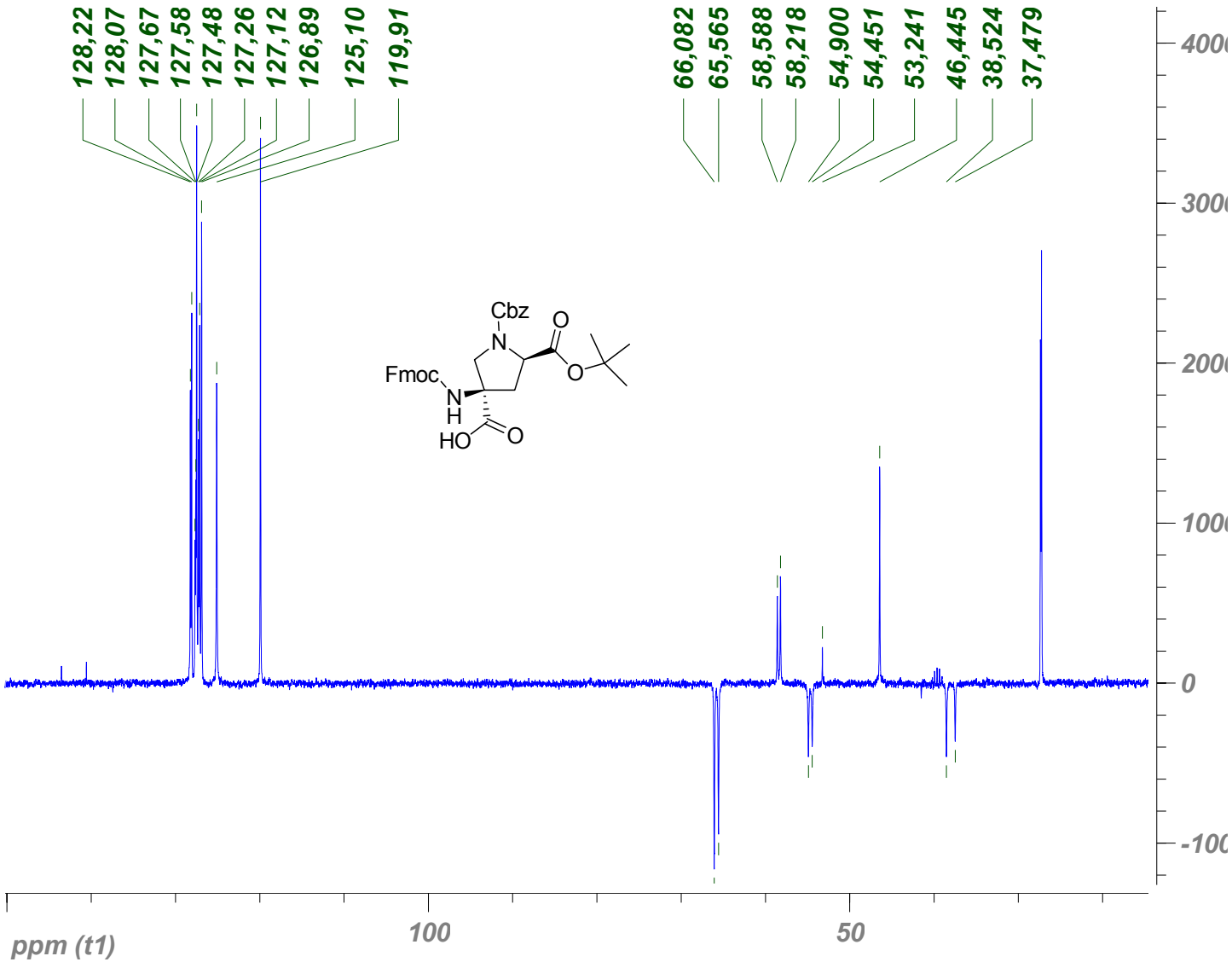
Supplemental Figure 25: dept135 spectrum of compound **sc6**, 75.4 MHz, acetic acid-d_4, room temperature



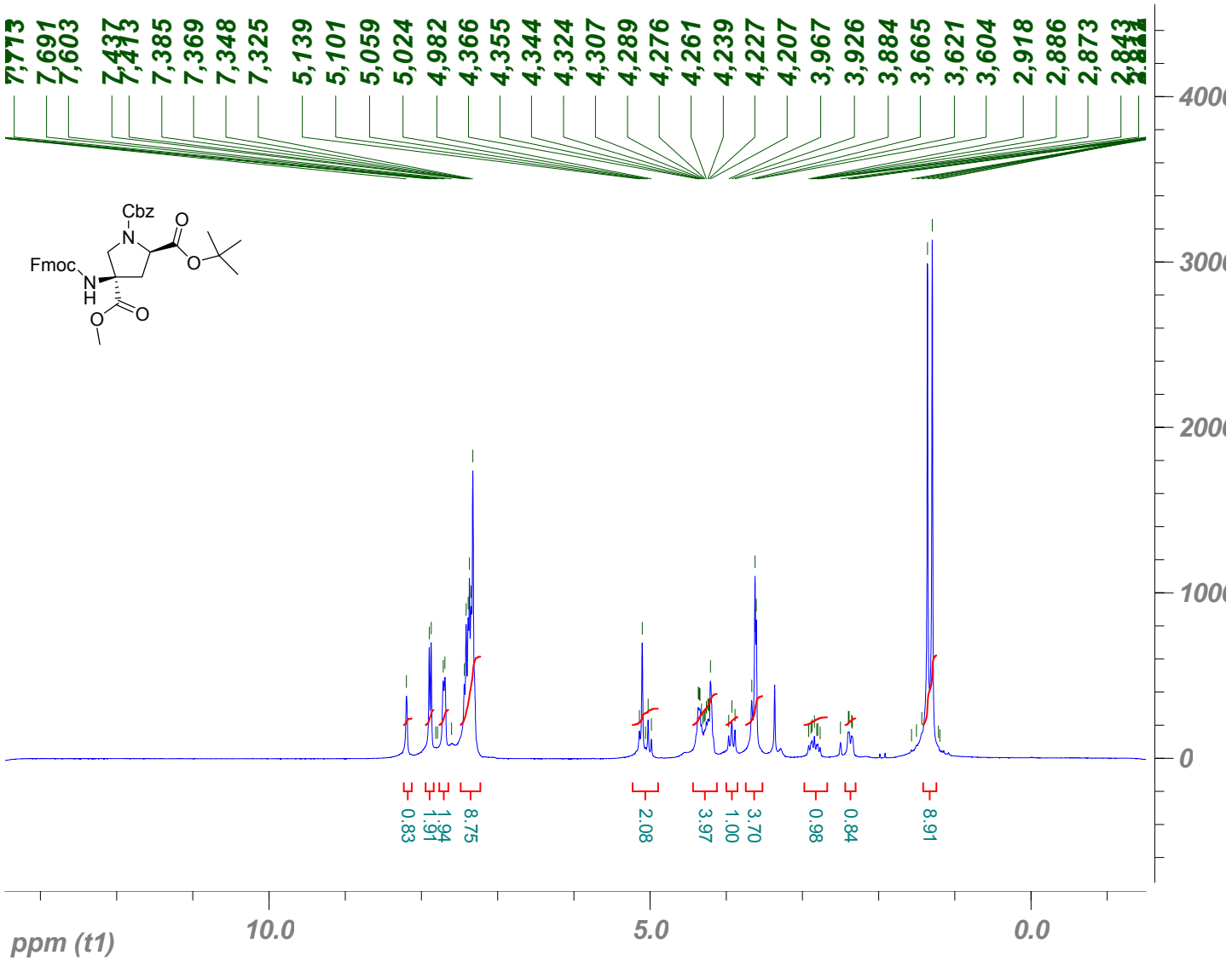
Supplemental Figure 26: ^{1}H spectrum of compound **sc7**, 300 MHz, DMSO-d_6, 350K



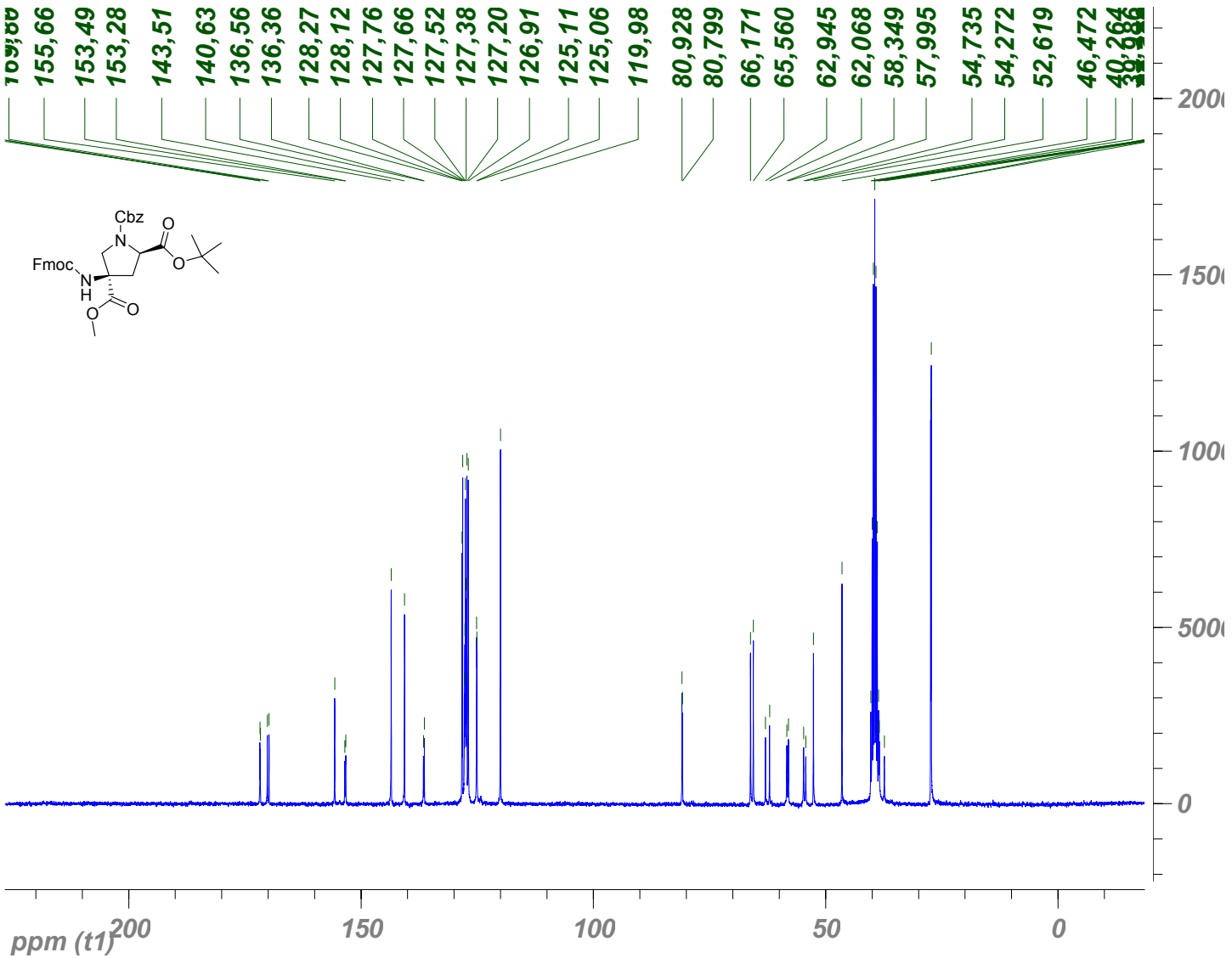
Supplemental Figure 27: Proton decoupled ^{13}C spectrum of compound **sc7**, 75.4 MHz, DMSO-d_6, room temperature



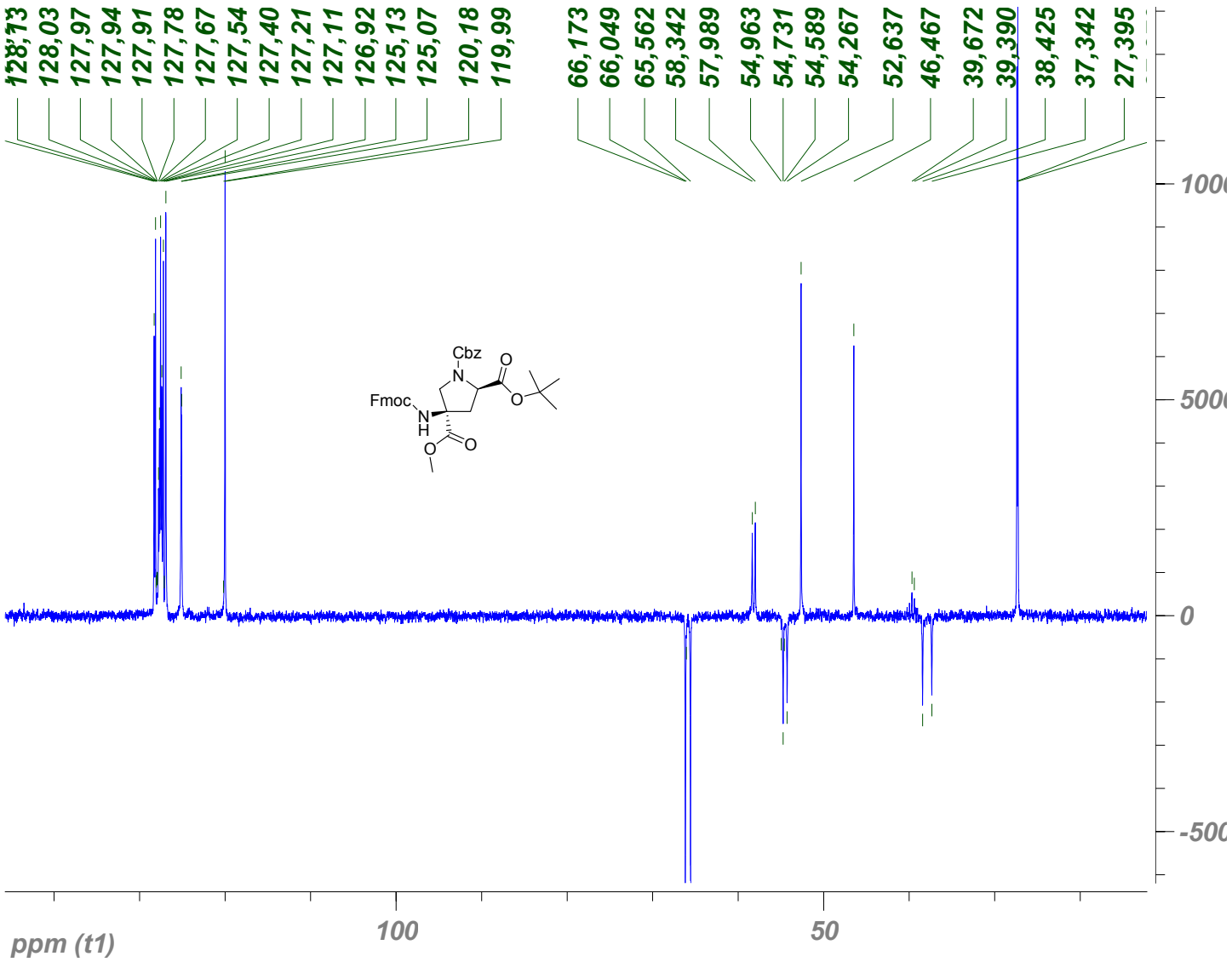
Supplemental Figure 28: dept135 spectrum of compound **sc8**, 75.4 MHz, DMSO-d_6, room temperature



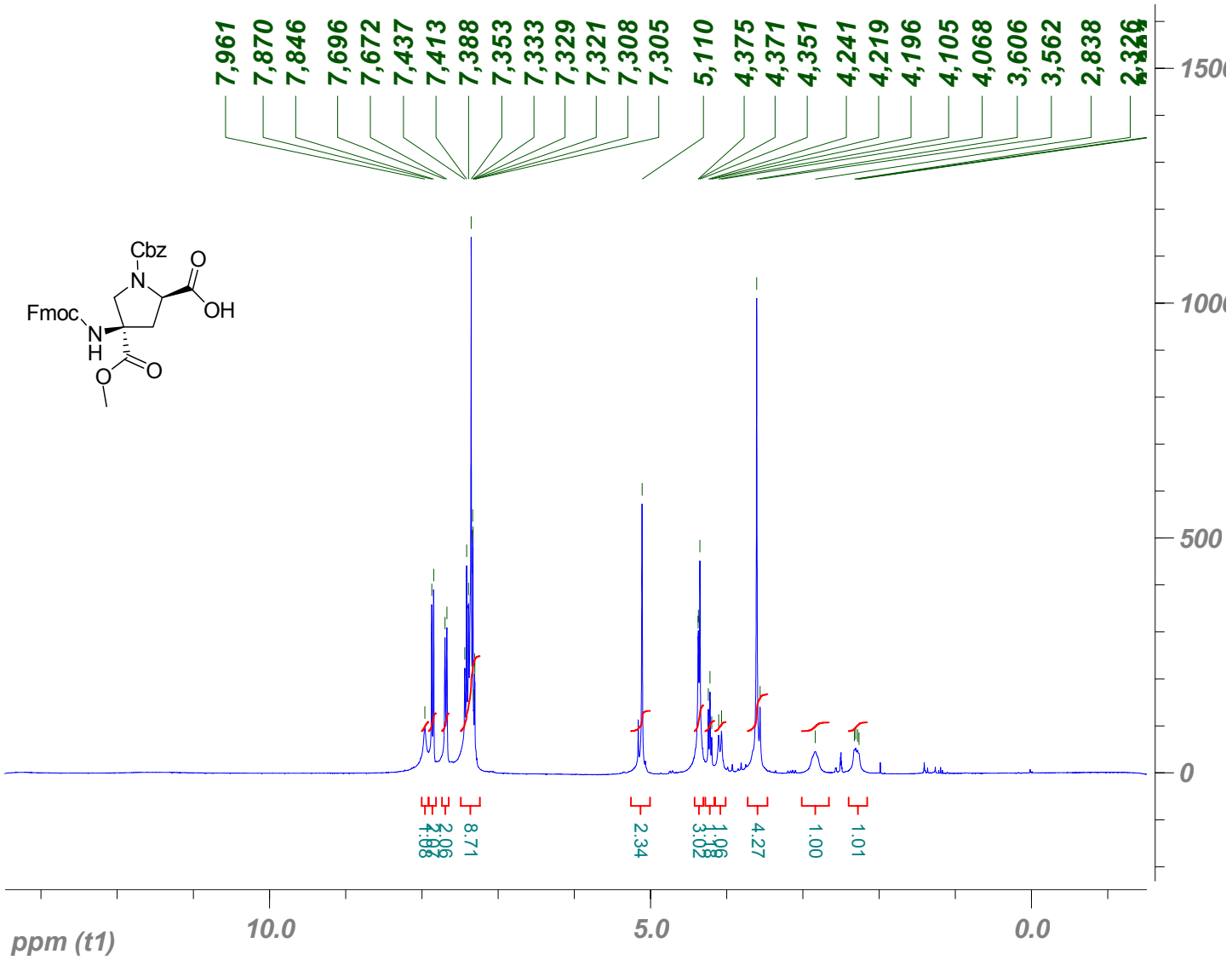
Supplemental Figure 29: ^{1}H spectrum of compound **sc8**, 300 MHz, DMSO-d_6, room temperature



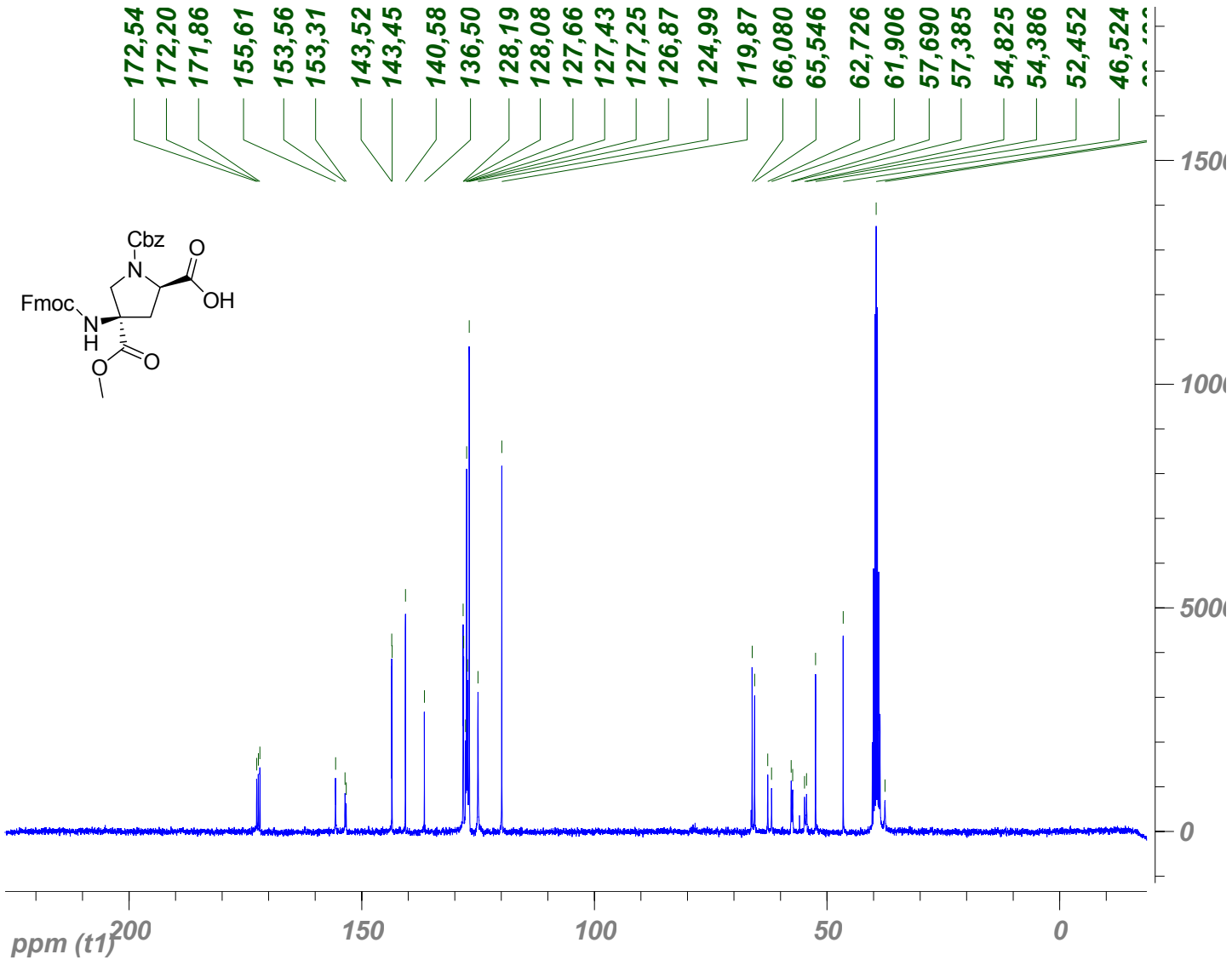
Supplemental Figure 30: proton decoupled ^{13}C spectrum of compound **sc9**, 75.4 MHz, DMSO-d_6, room temperature



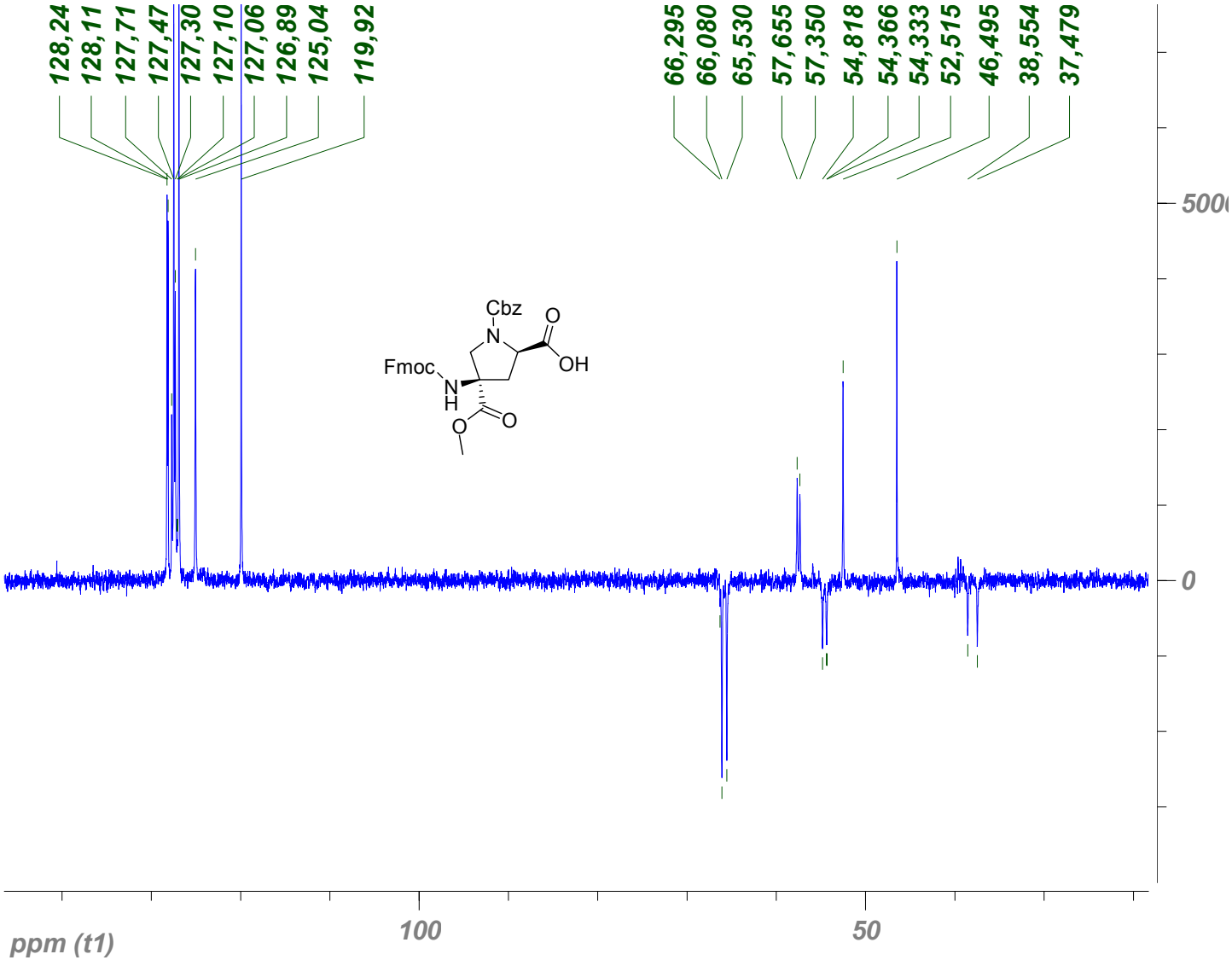
Supplemental Figure 31: dept135 spectrum of compound **sc9**, 75.4 MHz, DMSO-d_6, room temperature



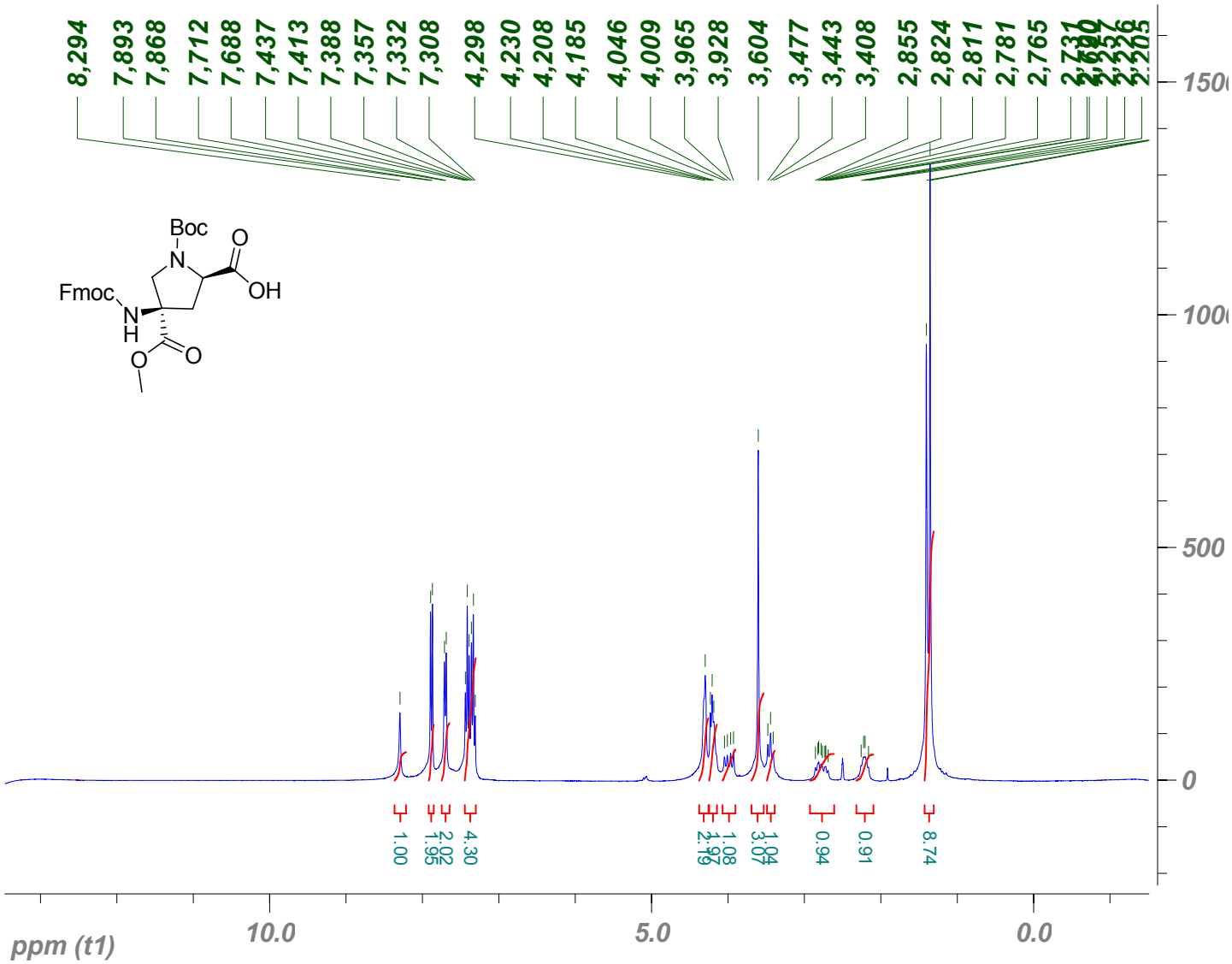
Supplemental Figure 32: ^{1}H spectrum of compound **2a**, 300 MHz, DMSO-d_6, 350K



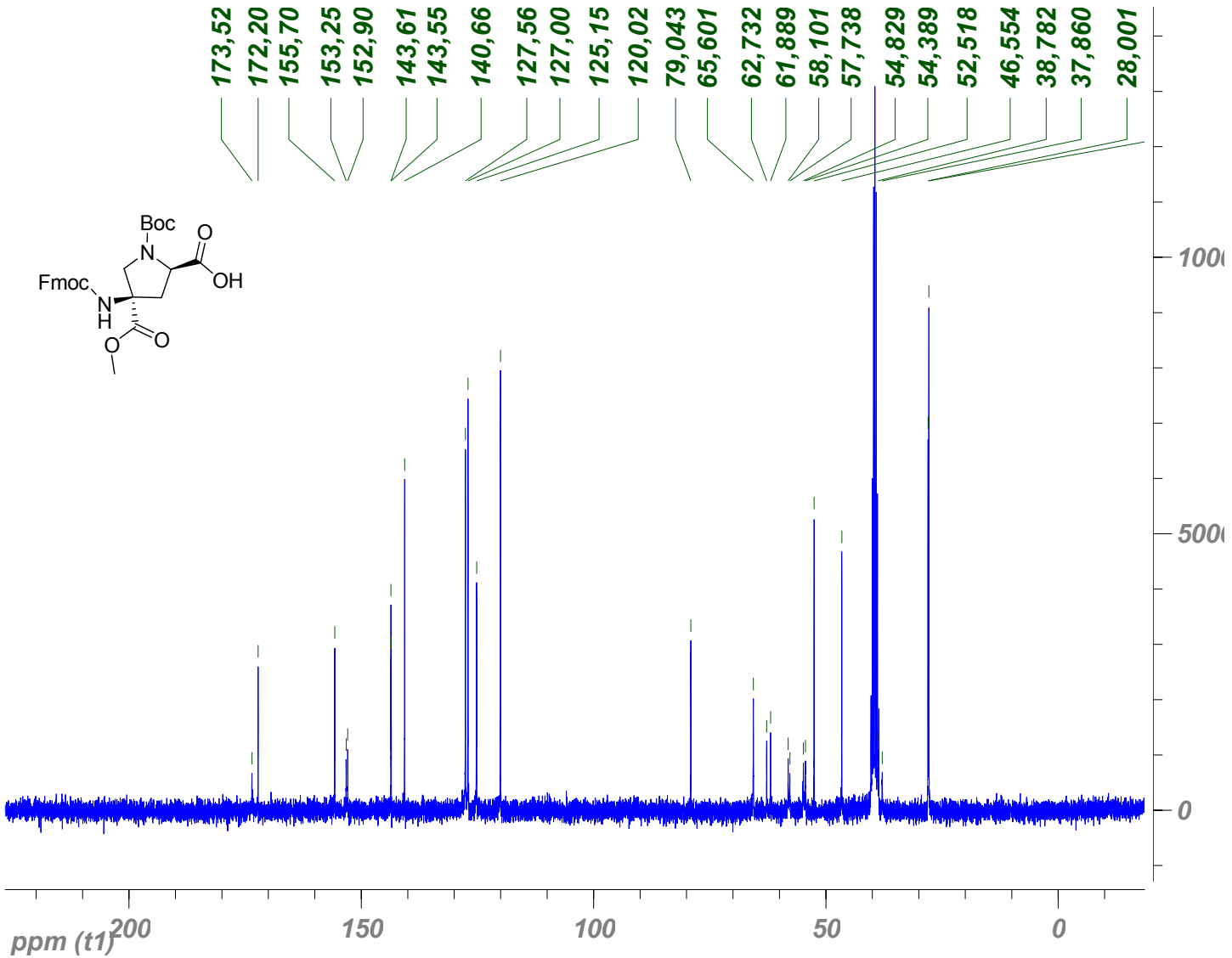
Supplemental Figure 33: Proton decoupled ^{13}C spectrum of compound **2a**, 75.4 MHz, DMSO-d_6, room temperature



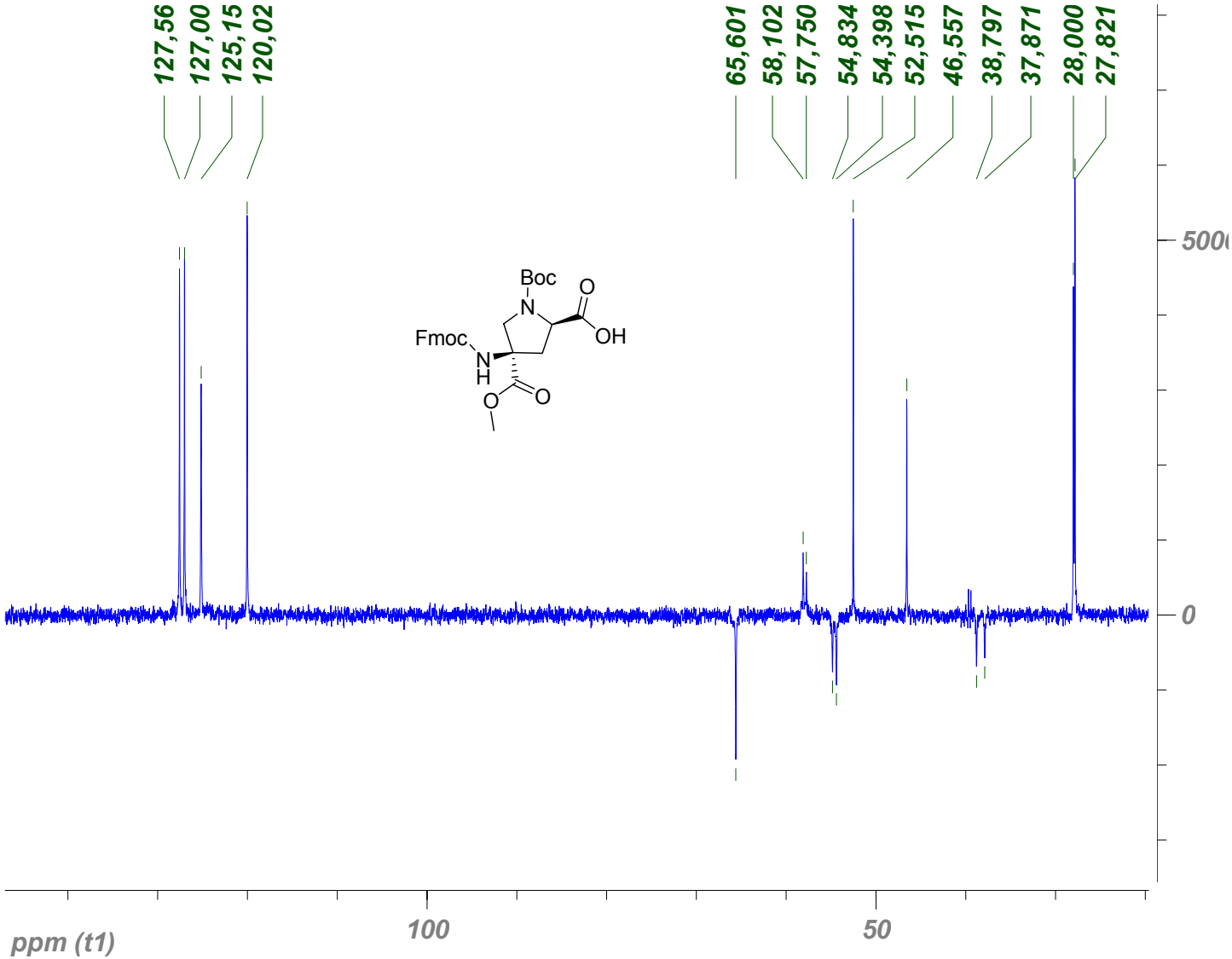
Supplemental Figure 34: dept135 spectrum of compound **2a**, 75.4 MHz, DMSO-d_6, room temperature



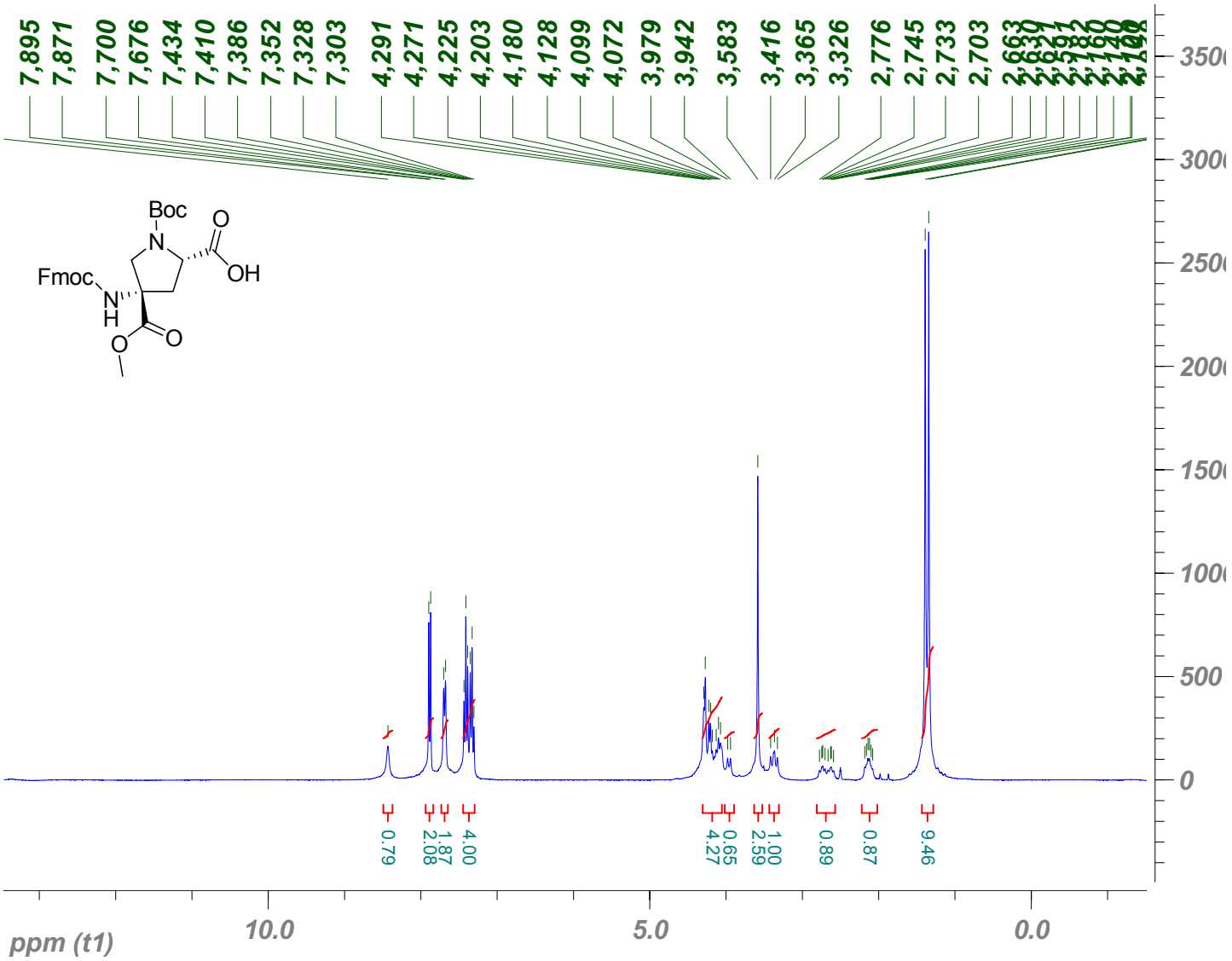
Supplemental Figure 35: 1H spectrum of compound **2b**, 300 MHz, DMSO-d_6, room temperature



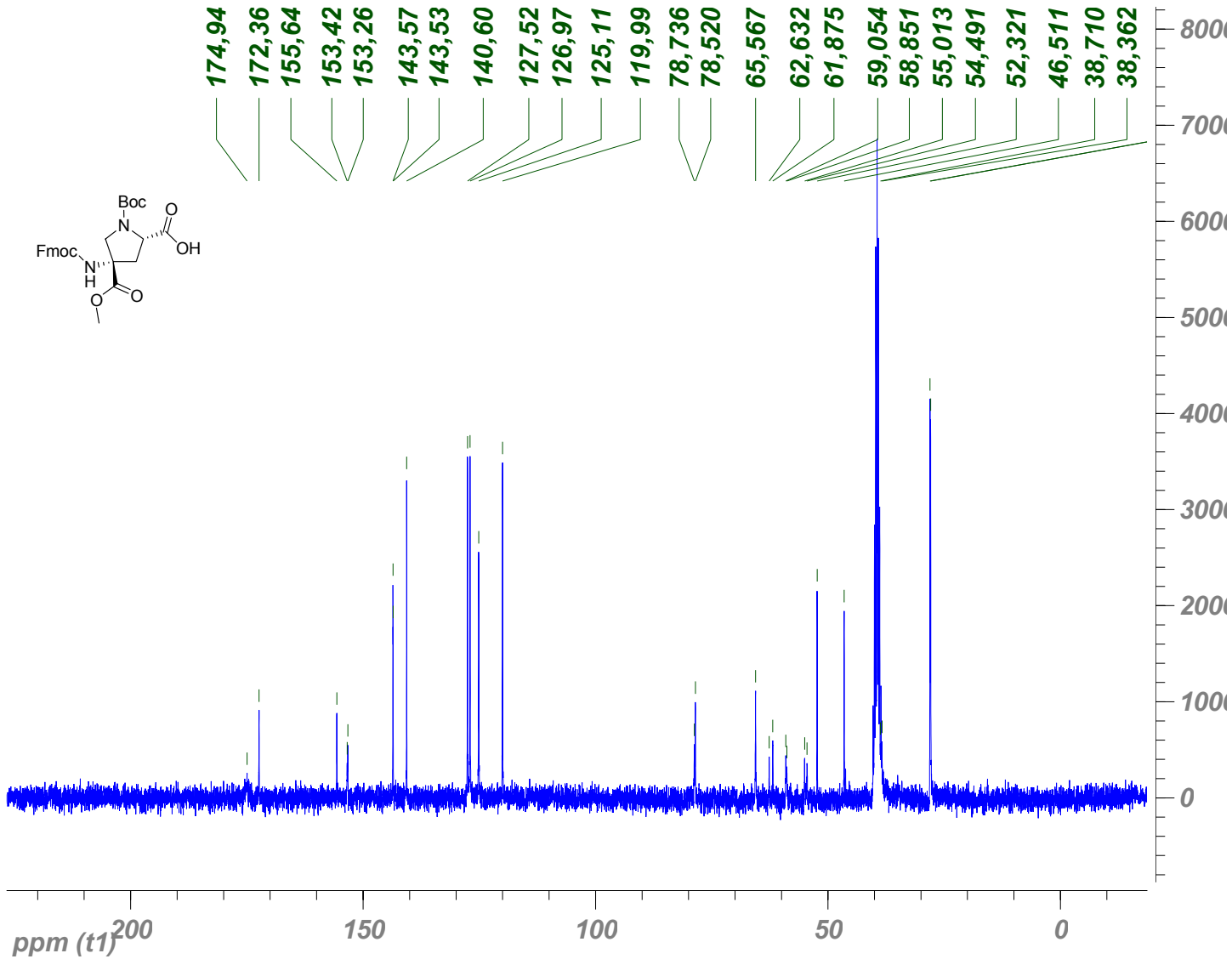
Supplemental Figure 36: Proton decoupled ^{13}C spectrum of compound **2b**, 75.4 MHz, DMSO-d_6, room temperature



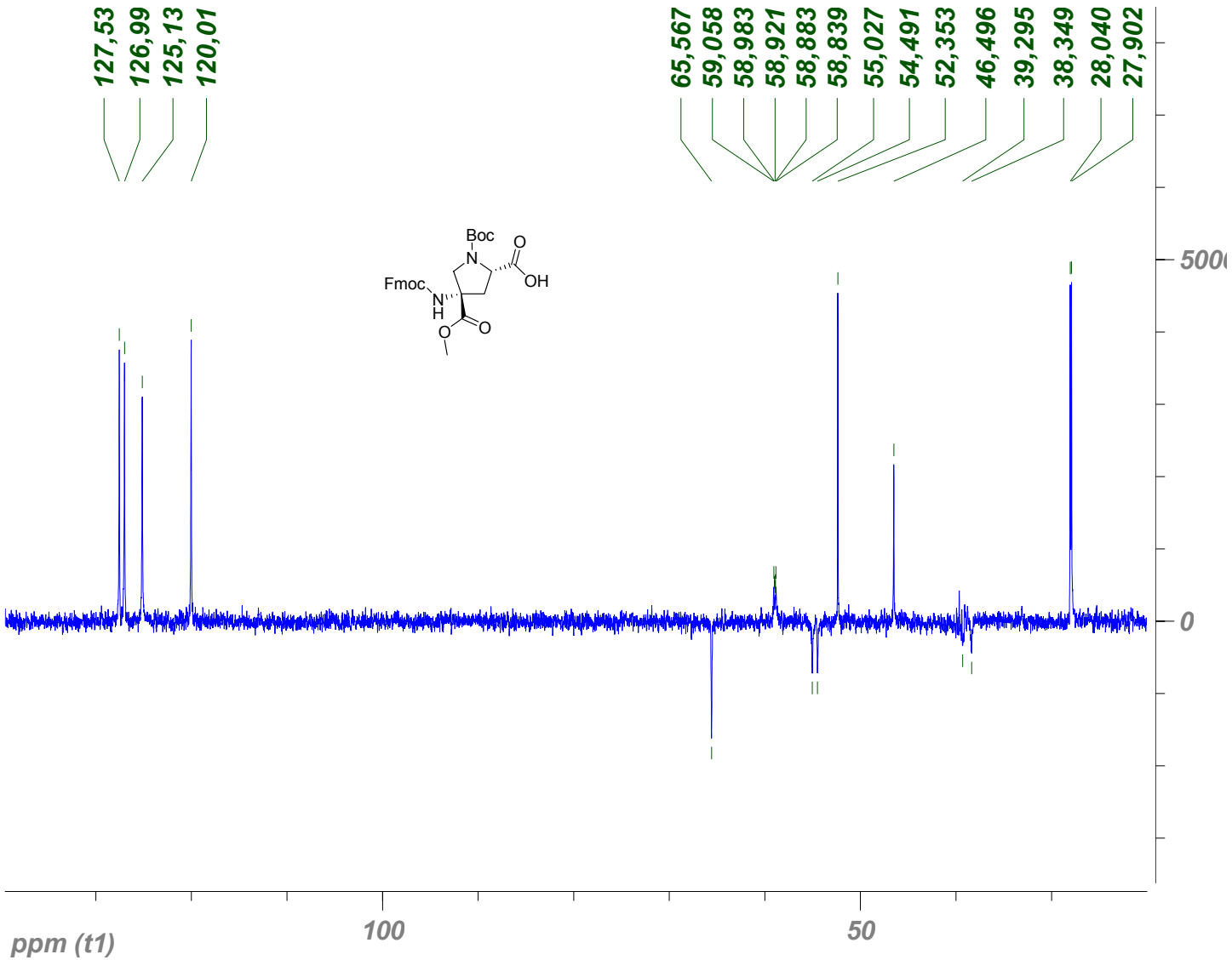
Supplemental Figure 37: dept135 spectrum of compound **2b**, 75.4 MHz, DMSO-d_6, room temperature



Supplemental Figure 38: ^{1}H spectrum of compound **1b**, 300 MHz, DMSO-d_6, room temperature



Supplemental Figure 39: Proton decoupled ^{13}C spectrum of compound **1b**, 75.4 MHz, DMSO-d_6, room temperature



Supplemental Figure 40: dept135 of compound **1b**, 75.4 MHz, DMSO-d_6, room temperature