Electronic Supplementary Information

for

Synthesis of 1,4-Amino Alcohols by Grignard Reagent Addition to THF and *N*-Tosyliminobenzyliodinane

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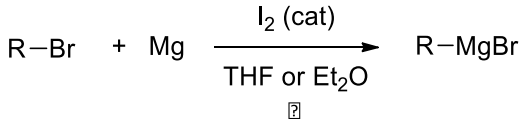
1. Experimental Section

1.1. General Consideration

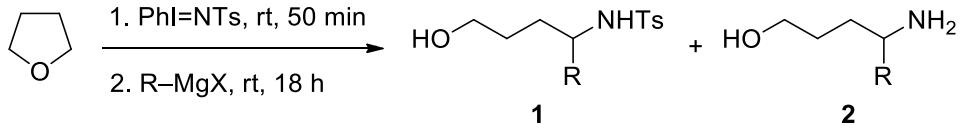
All reactions were performed under a nitrogen atmosphere unless otherwise stated. Unless specified, all reagents and starting materials were purchased from commercial sources and used as received. PhI=NTs were synthesized following literature procedure.[S1] Diethyl ether and THF were distilled over Na/benzophenone. Analytical thin layer chromatography (TLC) was performed using pre-coated silica gel plates. Visualization was achieved by UV–vis light (254 nm) followed by staining with ninhydrin or $KMnO_4$ and heating. Flash chromatography was performed using silica gel and gradient solvent system (eluent: *n*-hexane:EtOAc). ^1H and ^{13}C NMR spectra were measured on Bruker Avance 300 and 400 MHz spectrometers. Chemical shifts (ppm) were recorded with tetramethylsilane (TMS) as the internal reference standard. Multiplicities are given as: s (singlet), brs (broad singlet), d (doublet), t (triplet), q (quartet), dd (doublet of doublets), dt (doublet of triplets) or m (multiplet). The number of protons (*n*) for a given resonance is indicated by *n*H and coupling constants are reported as a *J* value in Hz. Infrared spectra were recorded on a Shimadzu IR Prestige-21 FTIR spectrometer. All samples were examined as a thin film between NaCl salt plates. Solid samples were examined as a thin film between NaCl salt plates using dichloromethane as the solvent. Low resolution mass spectra (LCMS) were determined on a Finnigan LCQ XP MAX mass spectrometer. High resolution mass spectra (HRMS) were obtained using a Q-Tof Premier LC/HRMS mass spectrometer using simultaneous electrospray (ESI).

1.2. General Procedure for the Preparation of Grignard Reagents



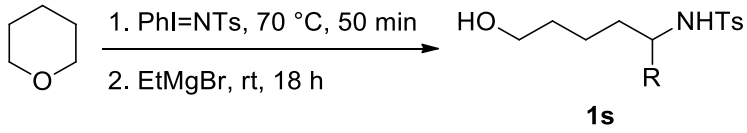
To a 25 mL two-necked round-bottomed flask fitted with condenser and magnetic stir bar, was charged with Mg turnings (4.4 mmol, 106 mg) and ethereal solvent (4 mL). Catalytic amount of iodine was added and the suspension was brought to reflux. Alkyl or aryl bromide solution (4 mmol) in ethereal solvent (2 mL) was added dropwise over 30 min. The reaction was then stirred at reflux for 4 hours. The reaction was cooled down to ambient temperature. The solution was subsequently titrated and used immediately.

1.3. General Procedure for the Iminoiodane-Mediated Synthesis of 1,4-Amino Alcohol with Grignard Reagents



Tetrahydrofuran (2 mL) was added to PhI=NTs (0.5 mmol, 197 mg) in a 25 mL round-bottomed flask and stirred for 50 min under N_2 atmosphere at room temperature. After the full consumption of the PhI=NTs, $Cu(OTf)]_2 \cdot PhMe$ (0.025 mmol, 6.5 mg) was added into the reaction mixture when necessary. The Grignard reagent (2.5 mmol) was subsequently added over 5 min. The reaction mixture was stirred at room temperature for 18 h. The reaction was quenched with the addition of saturated solution of NH_4Cl (5 mL), the two layers were then separated. The aqueous layer was then extracted with EtOAc (3 × 10 mL) and the combined organic layer was dried over $MgSO_4$, filtered and concentrated under vacuum to give the crude mixture. The latter was subsequently purified by flash column chromatography (eluent: *n*-hexane/EtOAc, 2:1 to 1:3) to give the corresponding *N*-tosylamino alcohol **1** or amino alcohol **2**.

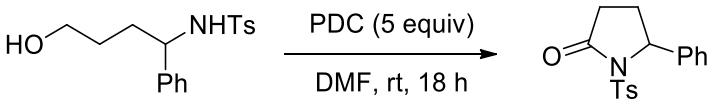
1.4. General Procedure for the Iminoiodane-Mediated Synthesis of 1,5-Amino Alcohol 1s with Ethylmagnesium Bromide



1s

Tetrahydropyran (2 mL) was added to PhI=NTs (0.5 mmol, 197 mg) in a 25 mL round-bottomed flask and stirred for 30 min under N_2 atmosphere at 70 °C. After the full consumption of the PhI=NTs, the reaction mixture was cooled down to ambience temperature giving a solution of 2-tosylamino tetrahydropyran with 40% conversion. Subsequently, the ethylmagnesium bromide (1.6 mmol, 2.0 M in Et_2O, 0.8 mL) was added over 5 min. The reaction mixture was stirred at room temperature for 18 h. The reaction was quenched with the addition of saturated solution of NH_4Cl (5 mL), the two layers were then separated. The aqueous layer was then extracted with EtOAc (3 × 10 mL) and the combined organic layer was dried over $MgSO_4$, filtered and concentrated under vacuum to give the crude mixture. The latter was subsequently purified by flash column chromatography (eluent: *n*-hexane/EtOAc, 2:1 to 1:3) to give the corresponding *N*-tosylamino alcohol **1s**.

1.5. Procedure for the Synthesis of 3a

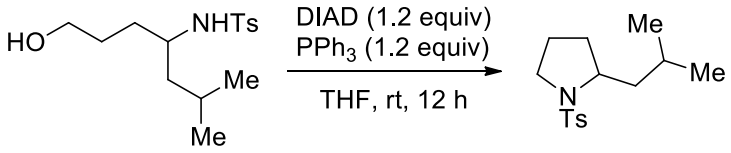


1a **3a**

To a degassed round-bottomed flask equipped with a magnetic stir bar was added **1a** (0.1 mmol, 31.9 mg) and pyridinium dichromate (0.5 mmol, 200 mg). DMF was then added subsequently and the reaction mixture was stirred at ambient temperature for 18 h. The reaction was then quenched with the addition of water (20 mL) and extracted with EtOAc (3 × 15 mL). The combined organic phase was washed with water (3 × 20 mL). The organic

layer was then dried over $MgSO_4$, filtered and concentrated under reduced pressure. The crude mixture was then purified by flash column chromatography (eluent: *n*-hexane/EtOAc, 4:1) to furnish the lactam **3a**.

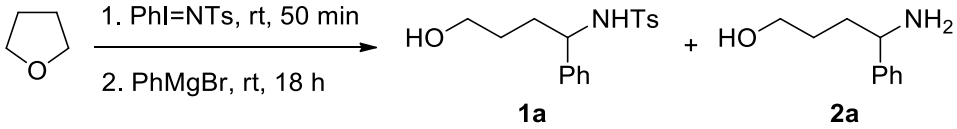
1.6. Procedure for the Synthesis of 4f



1f **4f**

To a degassed round-bottomed flask was added **1f** (0.1 mmol, 29.9 mg), triphenylphosphine (0.12 mmol, 31 mg) and THF (3 mL). The reaction was cooled to 0 °C and diisopropylazodicarboxylate (0.12 mmol, 24 μL) was subsequently added in one portion and the reaction mixture was stirred at ambient temperature for 18 h. Upon completion, based on TLC analysis, the reaction mixture was concentrated under reduced pressure. The latter was then purified by flash column chromatography (eluent: *n*-hexane/EtOAc, 4:1) to furnish the corresponding pyrrolidine **4f**.

1.7. Procedure for the Control Reaction with Phenylmagnesium Bromide

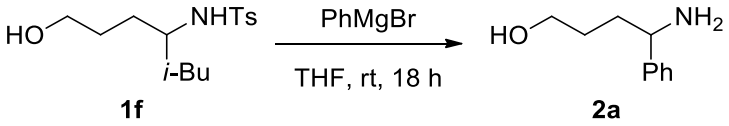


1a **2a**

Tetrahydrofuran (2 mL) was added to PhI=NTs (0.5 mmol, 197 mg) in a 25 mL round-bottomed flask and stirred for 50 min under N_2 atmosphere at room temperature. After the full consumption of the PhI=NTs, the phenylmagnesium bromide (3.5 mmol, 1.0 M in THF, 3.5 mL) was slowly added over 5 min. The reaction was stirred at room temperature for 18 h. The reaction mixture was quenched with the addition of saturated solution of NH_4Cl (5 mL), the two layers were then separated. The aqueous layer was then extracted with EtOAc (3 × 10

mL) and the combined organic layer was dried over $MgSO_4$, filtered and concentrated under vacuum to give the crude mixture. The latter was subsequently purified by flash column chromatography (eluent: *n*-hexane/EtOAc, 2:1 to 1:3) to give the corresponding *N*-tosylamino alcohol **1a** and amino alcohol **2a**.

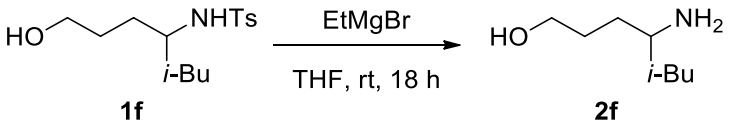
1.8. Procedure for the Reaction of 1f with Phenylmagnesium Bromide



1f **2a**

To a degassed round-bottomed flask was added **1f** (0.1 mmol, 29.9 mg) was added THF (1 mL). Subsequently, the phenylmagnesium bromide (0.4 mmol, 1.0 M in THF, 0.4 mL) was slowly added over 5 min. The reaction was stirred at room temperature for 18 h. The reaction mixture was quenched with the addition of saturated solution of NH_4Cl (5 mL), the two layers were then separated. The aqueous layer was then extracted with EtOAc (3 × 10 mL) and the combined organic layer was dried over $MgSO_4$, filtered and concentrated under vacuum to give the crude mixture. The latter was subsequently purified by flash column chromatography (eluent: *n*-hexane/EtOAc, 2:1 to 1:3) to give the amino alcohol **2a**.

1.9. Procedure for the Reaction of 1f with Phenylmagnesium Bromide



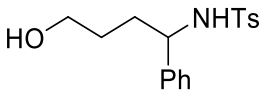
1f **2f**

To a degassed round-bottomed flask was added **1f** (0.1 mmol, 29.9 mg) was added THF (1 mL). Subsequently, the ethylmagnesium bromide (0.4 mmol, 2.0 M in Et_2O, 0.2 mL) was slowly added over 5 min. The reaction was stirred at room temperature for 18 h. The reaction mixture was quenched with the addition of saturated solution of NH_4Cl (5 mL), the two layers were then separated. The aqueous layer was then extracted with EtOAc (3 × 10 mL)

and the combined organic layer was dried over $MgSO_4$, filtered and concentrated under vacuum to give the crude mixture. The latter was analyzed by ^1H NMR analysis.

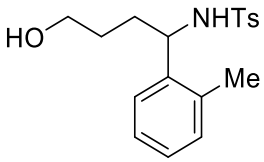
2. Characterization Data and NMR Spectra

_N_-(4-hydroxy-1-phenylbutyl)-4-methylbenzenesulfonamide 1a[S2]



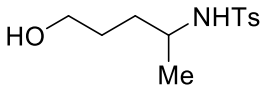
Yield 86%; white solid; ^1H NMR (300 MHz, $CDCl_3$) δ 7.52 (d, J = 8.3 Hz, 2H), 7.11–7.00 (m, 7H), 6.05 (d, J = 7.6 Hz, 1H), 4.29 (q, J = 7.3 Hz, 1H), 3.59–3.54 (dt, J = 6.2 Hz, 2.6 Hz, 2H), 2.40 (brs, 1H), 2.33 (s, 3H), 1.94–1.71 (m, 2H), 1.69–1.39 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 142.8, 141.0, 137.7, 129.2, 128.3, 127.1, 127.0, 126.5, 62.1, 58.2, 34.2, 28.8, 21.4.

_N_-(4-hydroxy-1-(*o*-tolyl)butyl)-4-methylbenzenesulfonamide 1b



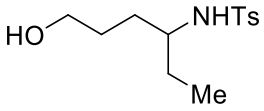
Yield 72%; white solid; mp 88–90 °C; ^1H NMR (300 MHz, $CDCl_3$) δ 7.49 (d, J = 8.0 Hz, 2H), 7.06–7.01 (m, 3H), 6.99–6.93 (m, 3H), 5.91 (d, J = 7.6 Hz, 1H), 4.59 (q, J = 7.2 Hz, 1H), 3.63–3.53 (m, 2H), 2.31 (s, 3H), 2.17 (s, 4H), 1.88–1.84 (m, 1H), 1.82–1.66 (m, 1H), 1.64–1.52 (m, 1H), 1.50–1.44 (m, 1H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 142.8, 139.5, 137.6, 134.5, 130.1, 129.1, 126.8, 126.8, 126.2, 125.9, 62.1, 53.8, 33.7, 28.9, 21.4, 19.1; IR (NaCl, neat) v 3491, 3280, 3055, 2926, 2874, 1449 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{23}NNaO_3S$ [M + Na]$^+$ 356.1296, found 356.1302.

***N*-(5-hydroxypentan-2-yl)-4-methylbenzenesulfonamide 1c**



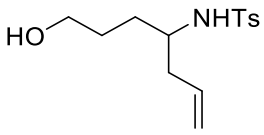
Yield 88%; yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, J = 8.0 Hz, 2H), 7.29 (d, J = 8.0 Hz, 2H), 5.26 (d, J = 8.0 Hz, 1H), 3.57 (t, J = 8.0 Hz, 2H), 3.33 (m, 1H), 2.42 (s, 3H), 1.54–1.45 (m, 4H), 1.01 (d, J = 4.0 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.1, 138.2, 129.6, 127.0, 62.2, 49.8, 33.7, 28.4, 21.4; IR (NaCl, neat) ν 3500, 3280, 2933, 2873, 1449, 1433 cm^{-1}; HRMS (ESI) calcd for $C_{12}H_{19}NNaO_3S$ $[M + Na]^+$ 280.0983, found 280.0984.

***N*-(6-hydroxyhexan-3-yl)-4-methylbenzenesulfonamide 1d**



Yield 68%; yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.77 (d, J = 8.2 Hz, 2H), 7.29 (d, J = 6.5 Hz, 2H), 5.24 (d, J = 8.2 Hz, 1H), 3.54 (t, J = 5.4 Hz, 2H), 3.18 (t, J = 6.1 Hz, 1H), 2.19 (s, 1H), 2.42 (s, 3H), 1.50–1.46 (m, 2H), 1.45–1.37 (m, 2H), 1.37–1.30 (m, 2H), 0.73 (t, J = 7.4 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.1, 138.4, 129.6, 127.0, 62.5, 55.2, 30.8, 28.1, 27.8, 21.5, 9.7; IR (NaCl, neat) ν 3491, 3286, 2963, 2936, 2876, 1449 cm^{-1}; HRMS (ESI) calcd for $C_{13}H_{21}NNaO_3S$ $[M + Na]^+$ 294.1140, found 294.1145.

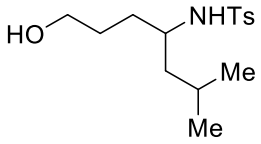
***N*-(7-hydroxyhept-1-en-4-yl)-4-methylbenzenesulfonamide 1e**



Yield 86%; yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, J = 8.3 Hz, 2H), 7.30 (d, J = 8.2 Hz, 2H), 5.61–5.47 (m, 1H), 5.14 (d, J = 8.0 Hz, 1H), 4.98 (d, J = 10.4 Hz, 1H), 4.94 (d, J

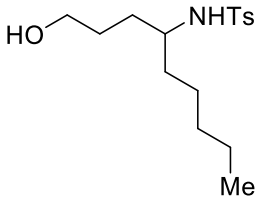
= 17.1 Hz, 1H), 3.56 (t, *J* = 5.5 Hz, 2H), 3.30 (t, *J* = 5.8 Hz, 1H), 2.42 (s, 3H), 2.27–2.07 (m, 3H), 1.57–1.50 (m, 2H), 1.49–1.41 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.3, 138.1, 133.4, 129.6, 127.1, 118.7, 62.4, 53.2, 39.3, 30.9, 28.2, 21.5; IR (NaCl, neat) ν 3491, 3283, 2926, 2874, 1449, 1321 cm^{-1}; HRMS (ESI) calcd for $C_{14}H_{21}NNaO_3S$ $[M + Na]^+$ 306.1140, found 306.1145.

***N*-(1-hydroxy-6-methylheptan-4-yl)-4-methylbenzenesulfonamide 1f**



Yield 82%; white solid; mp 76–77 °C ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.77 (d, *J* = 8.2 Hz, 2H), 7.29 (d, *J* = 8.0 Hz, 2H), 5.37 (s, 1H), 3.54–3.51 (m, 2H), 3.28–3.26 (m, 1H), 2.49 (brs, 1H), 2.41 (s, 3H), 1.54–1.36 (m, 5H), 1.18 (t, *J* = 7.0 Hz, 2H), 0.75 (d, *J* = 6.6 Hz, 3H), 0.68 (d, *J* = 6.6 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.1, 138.4, 129.5, 127.1, 62.5, 52.0, 44.5, 31.7, 27.9, 24.5, 22.5, 22.3, 21.5; IR (NaCl, neat) ν 3493, 3283, 2954, 2931, 2868, 1449, 1319 cm^{-1}; HRMS (ESI) calcd for $C_{15}H_{25}NNaO_3S$ $[M + Na]^+$ 322.1453, found 322.1465.

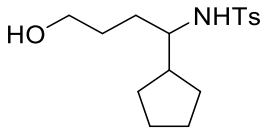
***N*-(1-hydroxynonan-4-yl)-4-methylbenzenesulfonamide 1g**



Yield 71%; yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, *J* = 8.4 Hz, 2H), 7.29 (d, *J* = 8.1 Hz, 2H), 5.12 (d, *J* = 8.4 Hz, 1H), 3.58–3.53 (m, 2H), 3.25–3.20 (m, 1H), 2.86 (brs, 1H), 2.42 (s, 3H), 1.60–1.45 (m, 2H), 1.40–1.28 (m, 2H), 1.21–1.14 (m, 2H), 0.79 (t, *J* = 10.4 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.1, 138.4, 129.5, 127.0, 62.5, 53.9, 35.0, 31.5, 28.1,

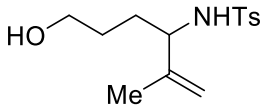
25.0, 22.4, 21.5, 13.9; IR (NaCl, neat) ν 3501, 3283, 2953, 2930, 1717, 1354, 1449, 1429, 1321 cm^{-1}; HRMS (ESI) calcd for $C_{16}H_{27}NNaO_3S$ $[M + Na]^+$ 336.1609, found 336.1612.

_N_-(1-cyclopentyl-4-hydroxybutyl)-4-methylbenzenesulfonamide 1h



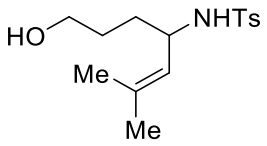
Yield 72%; yellow oil; ^1H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, J = 8.2 Hz, 2H), 7.28 (d, J = 8.2 Hz, 2H), 5.28 (d, J = 8.5 Hz, 1H), 3.56–3.46 (m, 2H), 3.17–3.13 (m, 1H), 2.41 (s, 3H), 2.34 (brs, 1H), 1.91–1.80 (m, 1H), 1.61–1.40 (m, 10H), 1.15–1.05 (m, 1H), 1.06–0.97 (m, 1H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.0, 138.6, 129.5, 127.0, 62.6, 57.9, 44.1, 30.3, 29.2, 29.1, 27.9, 25.3, 25.0, 21.5; IR (NaCl, neat) ν 3374, 3055, 3026, 2926, 2598, 1495, 1452, 1331 cm^{-1}; HRMS (ESI) calcd for $C_{16}H_{26}NO_3S$ $[M + H]^+$ 312.1633, found 312.1631.

_N_-(6-hydroxy-2-methylhex-1-en-3-yl)-4-methylbenzenesulfonamide 1i



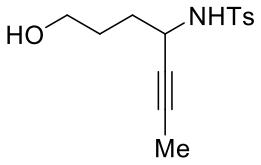
Yield 66%; yellow oil; ^1H NMR (300 MHz, $CDCl_3$) δ 7.73 (d, J = 8.3 Hz, 2H), 7.26 (d, J = 8.5 Hz, 2H), 5.46 (d, J = 4.5 Hz, 1H), 4.71 (d, J = 15.4 Hz, 1H), 4.68 (d, J = 1.4 Hz, 1H), 3.73 (q, J = 6.9 Hz, 1H), 3.59 (t, J = 5.9 Hz, 2H), 2.41 (s, 3H), 1.68–1.54 (m, 7H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.4, 143.1, 137.9, 129.4, 127.2, 113.3, 76.6, 62.2, 59.5, 30.4, 28.6, 21.5, 17.5; IR (NaCl, neat) ν 3485, 3285, 2954, 2874, 1651, 1599, 1454, 1319 cm^{-1}; HRMS (ESI) calcd for $C_{14}H_{21}NNaO_3S$ $[M + Na]^+$ 306.1140, found 306.1146.

***N*-(7-hydroxy-2-methylhept-2-en-4-yl)-4-methylbenzenesulfonamide 1j**



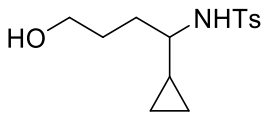
Yield 72%; yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.69 (d, J = 8.2 Hz, 2H), 7.23 (d, J = 8.1 Hz, 2H), 5.57 (d, J = 7.5 Hz, 1H), 4.68 (d, J = 9.3 Hz, 1H), 3.97–3.90 (m, 1H), 3.57 (t, J = 6.1 Hz, 2H), 2.73 (brs, 1H), 2.38 (s, 3H), 1.64–1.51 (m, 4H), 1.40 (s, 3H), 1.37 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 142.8, 138.4, 134.3, 129.2, 127.2, 125.0, 62.2, 52.2, 32.7, 28.5, 25.3, 21.4, 17.9; IR (NaCl, neat) ν 3491, 3281, 2930, 2872, 1599, 1449, 1321 cm^{-1}; HRMS (ESI) calcd for $C_{15}H_{23}NNaO_3S$ $[M + Na]^+$ 320.1296, found 320.1299.

***N*-(7-hydroxyhept-2-yn-4-yl)-4-methylbenzenesulfonamide 1k**



Yield 66%; pale yellow solid; mp 119–121 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.78 (d, J = 8.3 Hz, 2H), 7.30 (d, J = 8.2 Hz, 2H), 5.22 (d, J = 8.9 Hz, 1H), 4.05 (d, J = 6.1 Hz, 1H), 3.74–3.60 (m, 2H), 2.42 (s, 3H), 2.05 (brs, 1H), 1.75–1.63 (m, 4H), 1.50 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.2, 137.5, 129.3, 127.5, 80.7, 62.1, 45.7, 33.3, 28.3, 21.5, 3.2; HRMS (ESI) calcd for $C_{14}H_{19}NNaO_3S$ $[M + Na]^+$ 304.0983, found 304.0995.

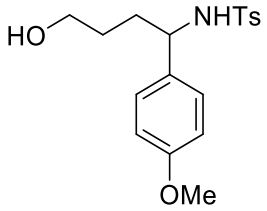
***N*-(1-cyclopropyl-4-hydroxybutyl)-4-methylbenzenesulfonamide 1l**



Yield 29%; yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, J = 8.3 Hz, 2H), 7.29 (d, J = 7.4 Hz, 2H), 5.25 (d, J = 7.1 Hz, 1H), 3.59 (m, 2H), 2.57 (t, J = 7.8 Hz, 1H), 2.42 (s, 3H),

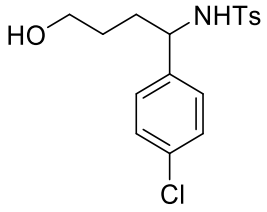
2.02 (brs, 1H), 1.69–1.53 (m, 4H), 0.78–0.68 (m, 1H), 0.48–0.39 (m, 1H), 0.27–0.18 (m, 1H), 0.16–0.07 (m, 1H), -0.08–-0.16 (m, 1H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.1, 138.4, 129.5, 127.1, 62.6, 58.7, 32.2, 28.2, 21.5, 16.3, 3.8, 3.5; IR (NaCl, neat) v 3491, 3287, 2926, 2874, 1449 cm^{-1}; HRMS (ESI) calcd for $C_{14}H_{21}NNaO_3S$ $[M + Na]^+$ 306.1140, found 306.1143.

***N*-(4-hydroxy-1-(4-methoxyphenyl)butyl)-4-methylbenzenesulfonamide 1m**



Yield 62%; white solid; mp 116–118 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.52 (d, J = 8.3 Hz, 2H), 7.09 (d, J = 8.1 Hz, 2H), 6.93 (d, J = 8.4 Hz, 2H), 6.64 (d, J = 8.7 Hz, 2H), 5.85 (d, J = 7.4 Hz, 1H), 4.24 (q, J = 7.2 Hz, 1H), 3.72 (s, 3H), 3.56 (dt, J = 6.2 Hz, 1.7 Hz, 2H), 2.34 (s, 3H), 2.24 (brs, 1H), 1.92–1.81 (m, 1H), 1.81–1.67 (m, 1H), 1.59–1.41 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 158.7, 142.7, 137.8, 133.2, 129.2, 127.7, 127.0, 113.7, 62.1, 57.7, 55.2, 34.1, 28.9, 21.4; IR (NaCl, neat) v 3491, 3225, 2952, 2936, 1750, 1449, 1319 cm^{-1}; HRMS (ESI) calcd for $C_{18}H_{24}NO_3S$ $[M + H]^+$ 334.1477, found 334.1461.

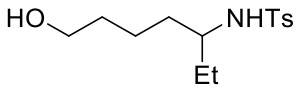
***N*-(1-(4-chlorophenyl)-4-hydroxybutyl)-4-methylbenzenesulfonamide 1n**



Yield 28%; white solid; mp 105–106 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.50 (d, J = 8.3 Hz, 2H), 7.11–7.05 (m, 4H), 6.95 (d, J = 6.6 Hz, 2H), 6.08 (d, J = 7.4 Hz, 1H), 4.28 (q, J = 7.2 Hz, 1H), 3.58 (td, J_1 = 8.1 Hz, J_2 = 3.9 Hz, 2H), 2.36 (s, 3H), 2.23 (brs, 1H), 1.90–1.81

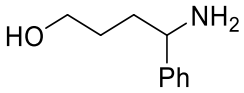
(m, 1H), 1.80–1.69 (m, 1H), 1.67–1.40 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.2, 139.5, 137.5, 133.0, 129.3, 128.4, 128.0, 127.0, 62.1, 57.6, 34.1, 28.6, 21.4; IR (NaCl, neat) ν 3503, 3275, 3156, 3055, 2926, 1609, 1494, 1319 cm^{-1}; HRMS (ESI) calcd for $C_{17}H_{21}{}^{35}ClNO_3S$ $[M + H]^+$ 354.0931, found 354.0945.

_N_-(7-hydroxyheptan-3-yl)-4-methylbenzenesulfonamide 1s



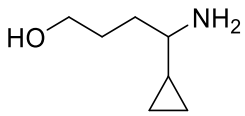
Yield 24%; pale yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, J = 8.4 Hz, 2H), 7.76 (d, J = 7.8 Hz, 2H), 4.53 (bs, 1H), 3.55 (t, J = 6.3 Hz, 2H), 3.20–3.13 (m, 1H), 2.42 (s, 3H), 1.65 (bs, 1H), 1.51–1.22 (m, 8H), 0.74 (t, J = 7.4 Hz, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.2, 138.2, 129.6, 127.0, 62.5, 55.3, 34.2, 32.3, 27.8, 21.5, 21.4, 9.6; IR (NaCl, neat) ν 3356, 3260, 3055, 2957, 2926, 2855, 1736, 1597 cm^{-1}; HRMS (ESI) calcd for $C_{14}H_{23}NO_3SNa$ $[M + H]^+$ 308.1296, found 308.1296.

4-Amino-4-phenylbutan-1-ol 2a[S3]



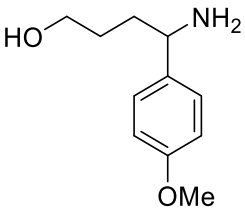
Yield 49%; white solid; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33–7.23 (m, 5H), 4.68 (t, J = 6.3 Hz, 1H), 3.69–3.56 (m, 2H), 3.00 (brs, 2H), 1.86–1.79 (m, 2H), 1.71–1.56 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 144.7, 128.4, 127.4, 125.8, 74.3, 62.7, 36.3, 29.2.

4-Amino-4-cyclopropylbutan-1-ol 2l[S3]



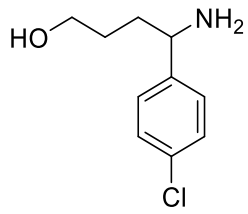
Yield 33%; pale-yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.70–3.64 (m, 2H), 2.94–2.87 (m, 1H), 2.25 (brs, 2H), 1.87–1.58 (m, 4H), 1.02–0.90 (m, 1H), 0.55–0.48 (m, 2H), 0.32–0.18 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 76.6, 63.1, 34.0, 29.3, 18.0, 2.8, 2.7; IR (NaCl, neat) ν 3375, 2928, 2874, 1265 cm^{-1}; HRMS (ESI) calcd for $C_7H_{15}NNaO$ $[M + H]^+$ 152.1051, found 152.1052.

4-Amino-4-(4-methoxyphenyl)butan-1-ol 2m[S4]



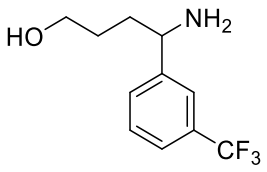
Yield 37%; white solid; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.25 (d, J = 8.7 Hz, 2H), 6.88–6.84 (m, 2H), 4.63 (t, J = 6.3 Hz, 1H), 3.79 (s, 3H), 3.68–3.60 (m, 2H), 2.92 (brs, 2H), 1.85–1.78 (m, 2H), 1.68–1.57 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 158.9, 136.9, 127.0, 113.8, 73.9, 62.8, 55.3, 36.2, 29.3.

4-Amino-4-(4-chlorophenyl)butan-1-ol 2n[S5]



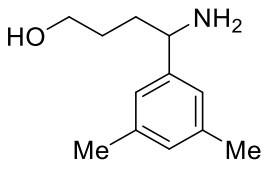
Yield 59%; white solid; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.31–7.23 (m, 4H), 4.65 (t, J = 6.2 Hz, 1H), 3.69–3.56 (m, 2H), 3.25 (brs, 2H), 1.83–1.76 (m, 2H), 1.67–1.60 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 143.2, 133.0, 128.5, 127.2, 73.5, 62.6, 36.5, 28.9.

4-Amino-4-(3-(trifluoromethyl)phenyl)butan-1-ol 2o[S6]



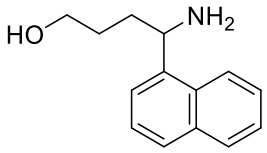
Yield 44%; brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (s, 1H) 7.51–7.47 (m, 2H), 7.55 – 7.38 (s, 3H), 4.71 (dd, J = 7.2 Hz, 4.8 Hz, 1H), 3.68–3.54 (m, 3H), 1.85–1.76 (m, 2H), 1.68–1.62 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.8, 130.6 (q, J = 32.0 Hz), 129.1, 128.8, 124.2 (q, J = 270.6 Hz), 124.1 (d, J = 3.6 Hz), 122.5 (d, J = 3.7 Hz), 73.5, 62.5, 36.6, 28.8; ^{19}F NMR (225 MHz, $CDCl_3$) δ -62.5.

4-Amino-4-(3,5-dimethylphenyl)butan-1-ol 2p[S7]



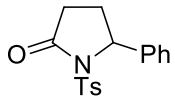
Yield 62%; white solid; ^{1}H NMR (300 MHz, $CDCl_3$) δ 6.92 (s, 2H), 6.88 (s, 1H), 4.58 (t, J = 6.2 Hz, 1H), 3.65–3.58 (m, 2H), 3.16 (brs, 2H), 2.29 (s, 6H), 1.82–1.75 (m, 2H), 1.62 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 144.8, 137.9, 129.0, 123.6, 74.3, 62.7, 36.3, 29.3, 21.3.

4-Amino-4-(naphthalen-1-yl)butan-1-ol 2q[S8]



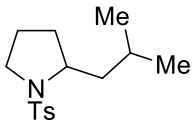
Yield 85%; white solid; ^{1}H NMR (300 MHz, $CDCl_3$/MeOD) δ 8.11 (d, J = 8.0 Hz, 1H), 7.82 (dd, J = 7.4 Hz, 2.1 Hz, 1H), 7.72 (d, J = 8.2 Hz, 1H), 7.65 (d, J = 7.0 Hz, 1H), 7.50–7.40 (m, 3H), 5.46 (q, J = 4.1 Hz, 1H), 4.79 (brs, 2H), 3.58 (t, J = 6.5 Hz, 2H), 2.10–1.98 (m, 1H), 1.94–1.85 (m, 1H), 1.82–1.60 (m, 2H); ^{13}C NMR (75 MHz, $CDCl_3$/MeOD) δ 140.6, 133.9, 130.5, 128.6, 127.3, 125.6, 125.1, 123.0, 122.7, 70.1, 61.8, 34.9, 29.0.

5-Phenyl-1-tosylpyrrolidin-2-one 3a[S9]



Yield 75%; light-yellow solid; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.57 (d, J = 6.7 Hz, 2H), 7.31–7.24 (m, 3H), 7.18–7.11 (m, 4H), 5.46–5.43 (m, 1H), 2.75–2.46 (m, 3H), 2.39 (s, 3H), 2.01–1.94 (m, 1H); ^{13}C NMR δ 173.5, 144.9, 140.7, 135.5, 129.1, 128.8, 128.5, 128.1, 126.1, 63.0, 30.6, 28.3, 21.6.

2-Isobutyl-1-tosylpyrrolidine 4f



Yield 89%; white solid; mp 69–70 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, J = 8.0 Hz, 2H), 7.31 (d, J = 8.0 Hz, 2H), 3.69–3.63 (m, 1H), 3.40–3.35 (m, 1H), 3.23–3.17 (m, 1H), 2.43 (s, 3H), 1.80–1.70 (m, 2H), 1.65–1.45 (m, 4H), 1.36–1.28 (m, 1H), 0.94 (d, J = 6.4 Hz, 2H); ^{13}C NMR δ 143.2, 135.0, 129.6, 127.5, 58.9, 48.7, 45.6, 31.0, 29.7,

25.5, 24.0, 23.5, 21.9, 21.5; IR (NaCl, neat) ν 3491, 3055, 2957, 2926, 2853, 1473, 1339 cm^{-1}; HRMS (ESI) calcd for $C_{15}H_{24}NO_2S$ $[M + H]^+$ 282.1528, found 282.1529.

Figure S1. ^{1}H and ^{13}C NMR spectra of *N*-(4-hydroxy-1-phenylbutyl)-4-methylbenzenesulfonamide **2a**

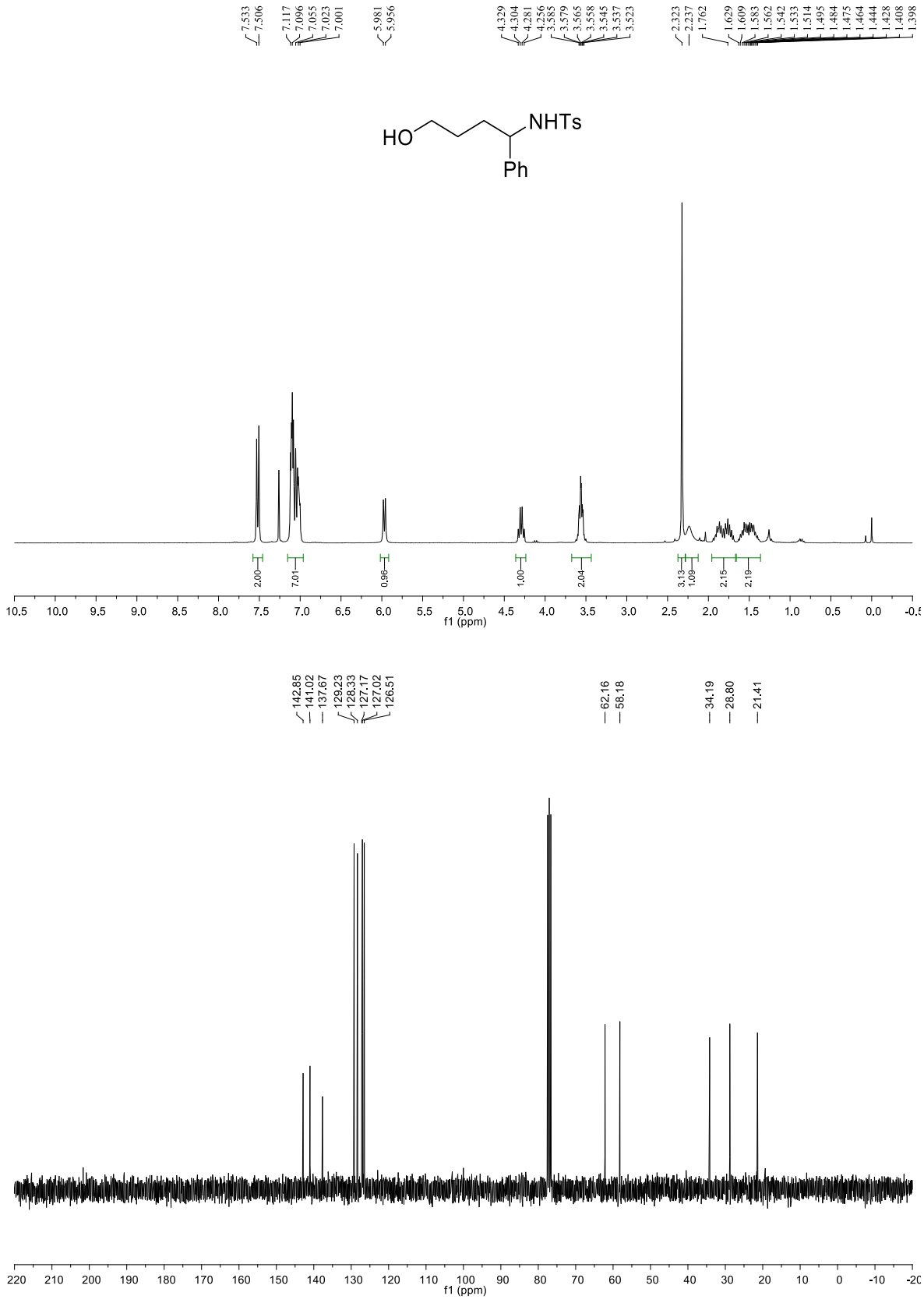


Figure S2. ^{1}H and ^{13}C NMR spectra of *N*-(4-hydroxy-1-(*o*-tolyl)butyl)-4-methylbenzenesulfonamide **1b**

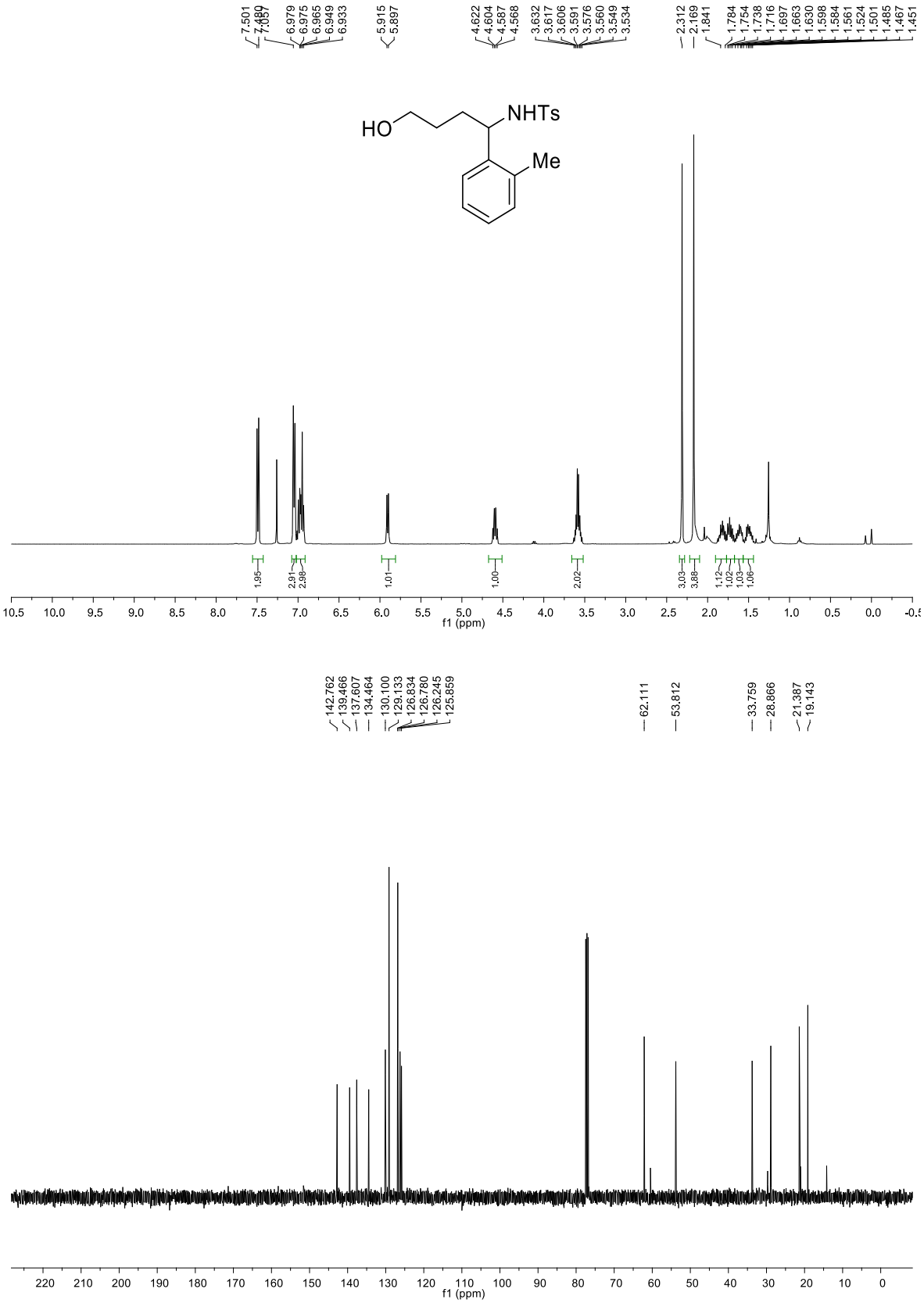


Figure S3. ^{1}H and ^{13}C NMR spectra of *N*-(5-hydroxypentan-2-yl)-4-methylbenzenesulfonamide **1c**

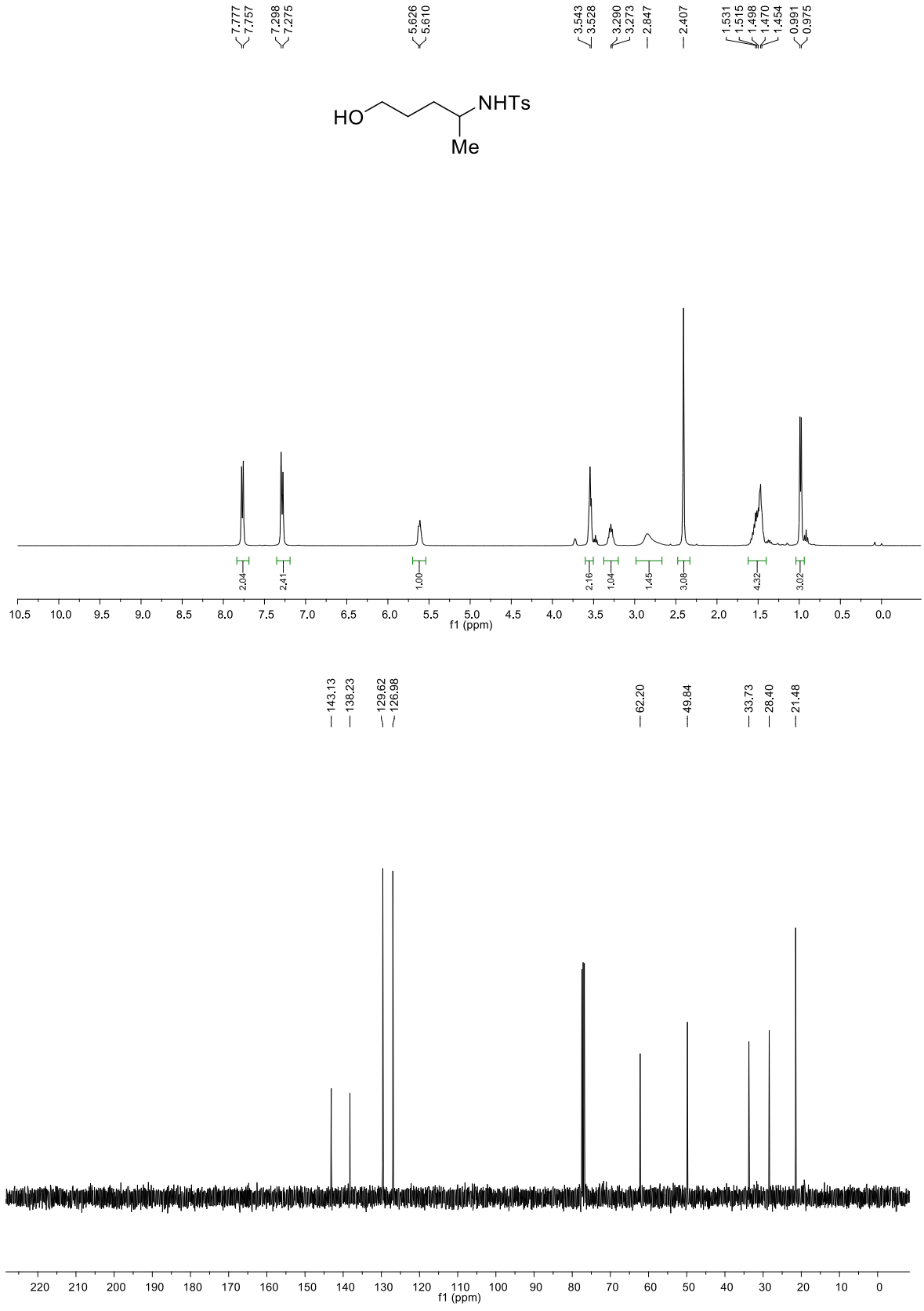


Figure S4. ^{1}H and ^{13}C NMR spectra of *N*-(6-hydroxyhexan-3-yl)-4-methylbenzenesulfonamide **1d**

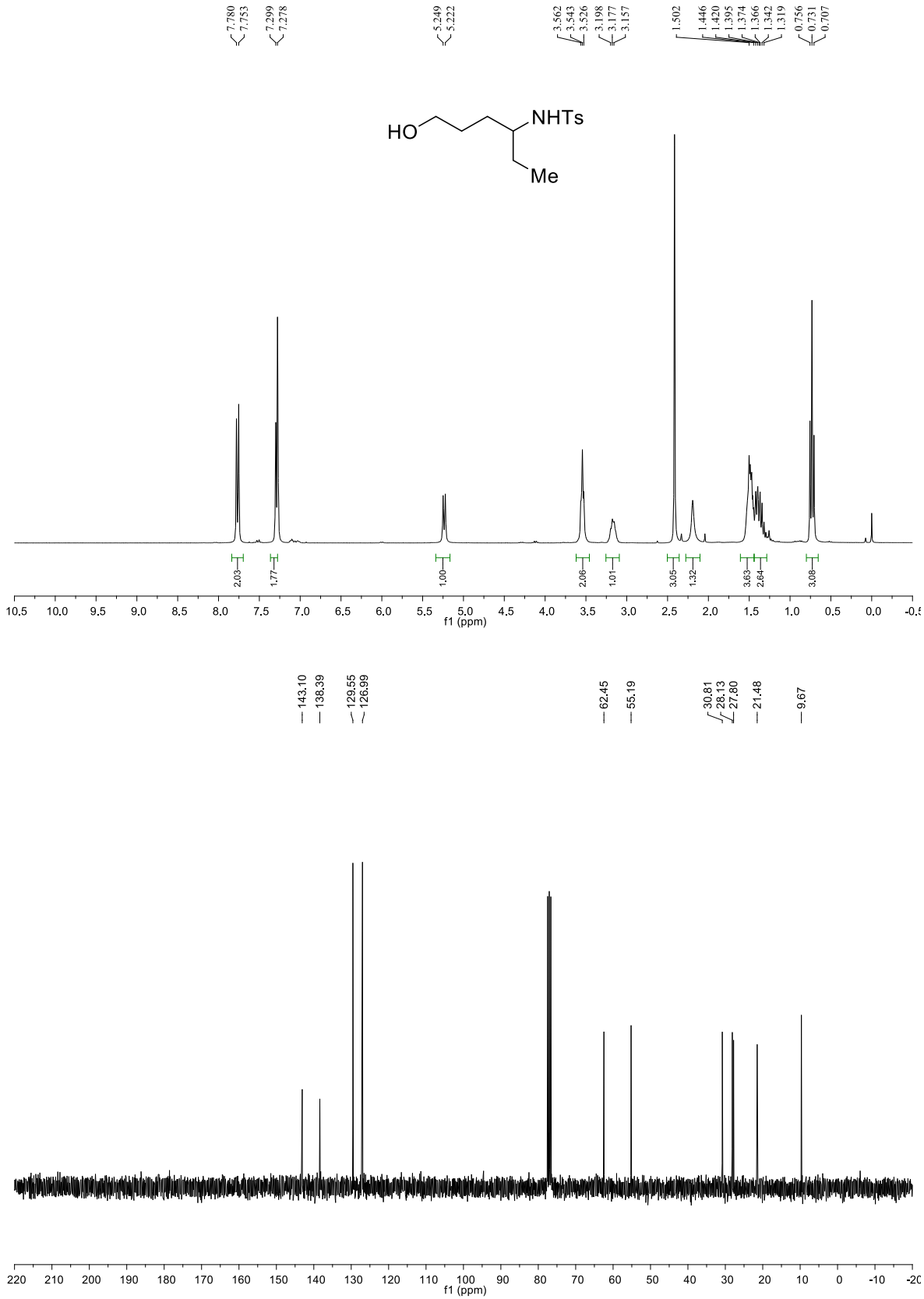


Figure S5. ^{1}H and ^{13}C NMR spectra of *N*-(7-hydroxyhept-1-en-4-yl)-4-methylbenzenesulfonamide **1e**

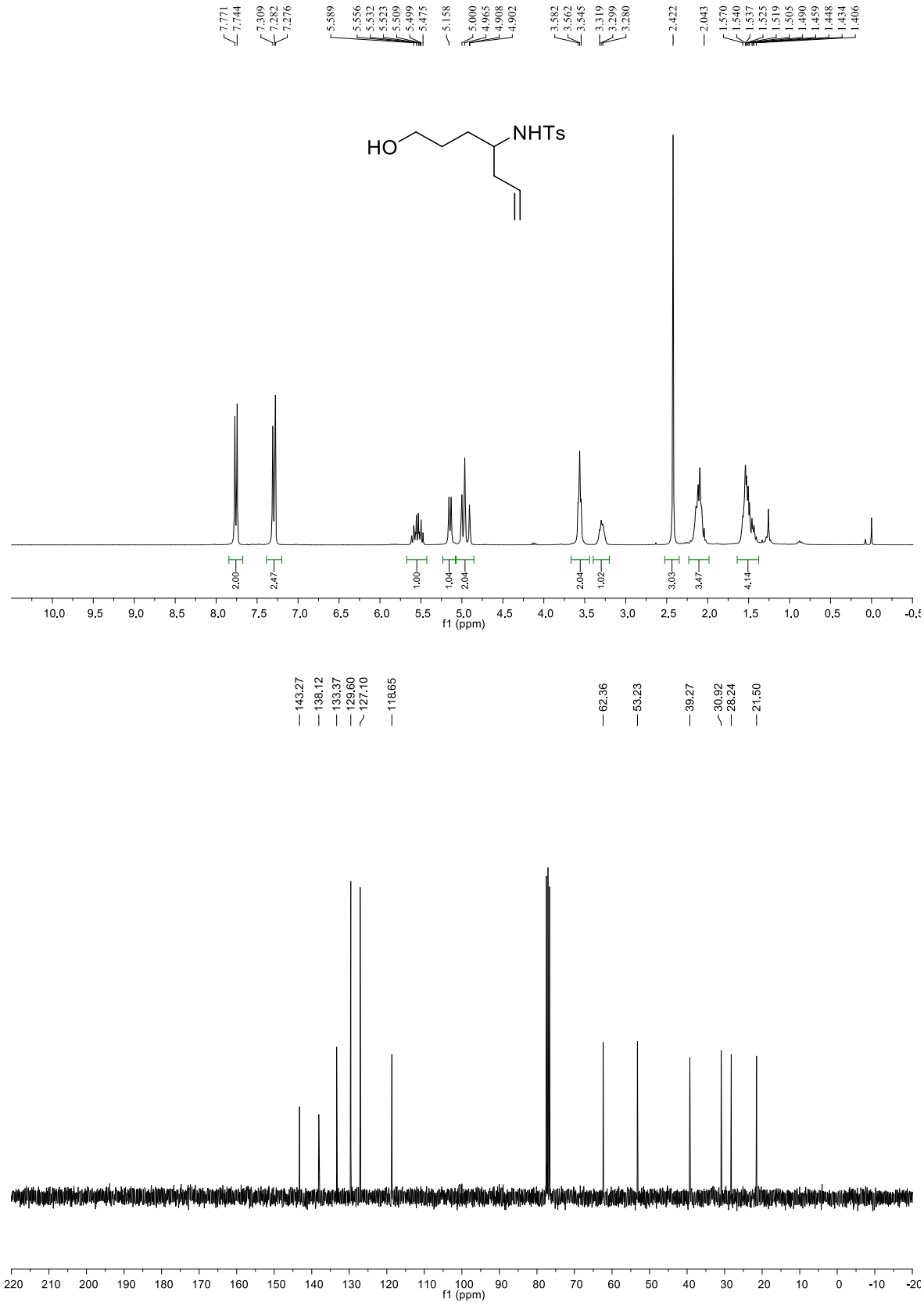


Figure S6. ^{1}H and ^{13}C NMR spectra of *N*-(1-hydroxy-6-methylheptan-4-yl)-4-methylbenzenesulfonamide **1f**

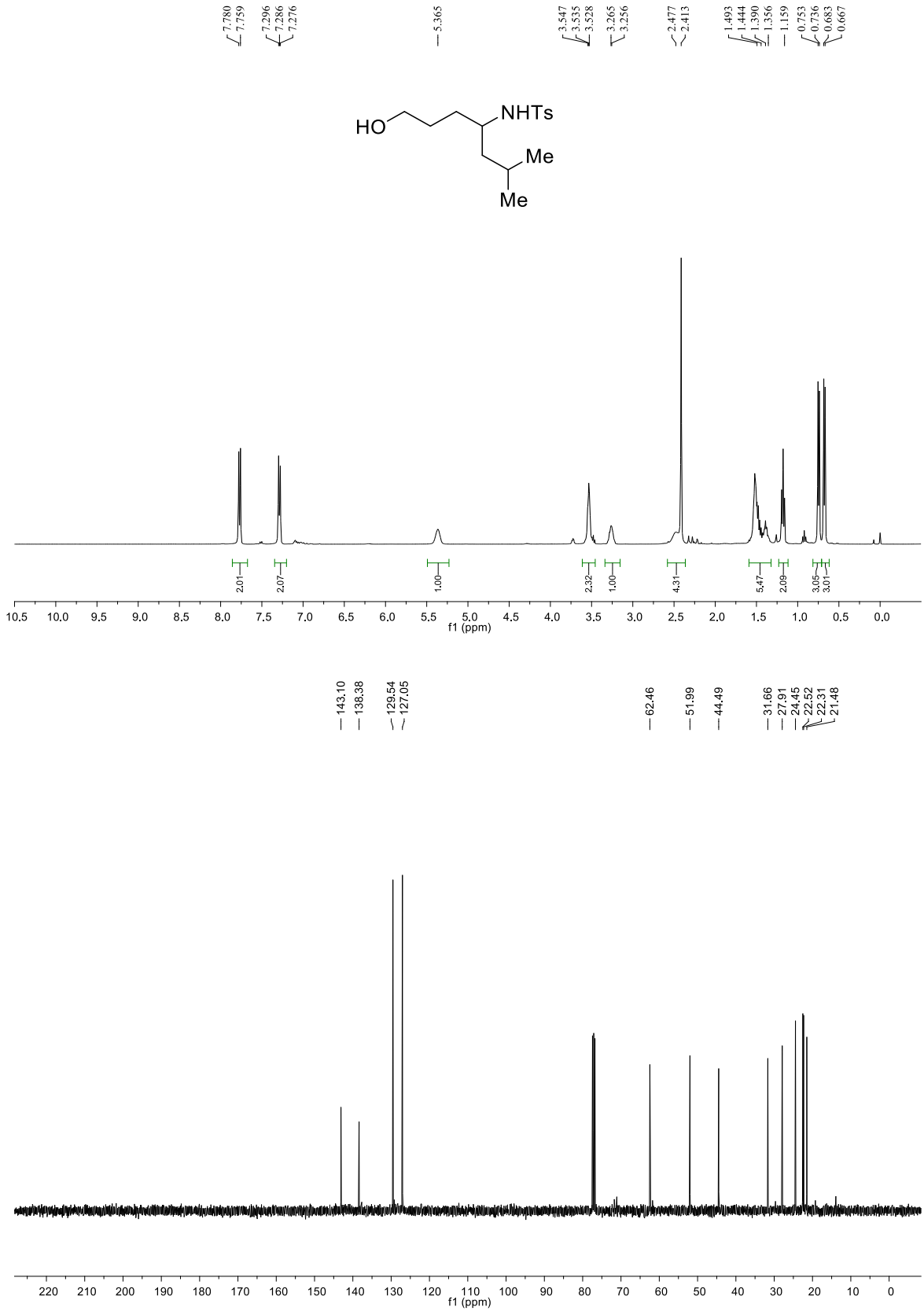


Figure S7. ^{1}H and ^{13}C NMR spectra of *N*-(1-hydroxynonan-4-yl)-4-methylbenzenesulfonamide **1g**

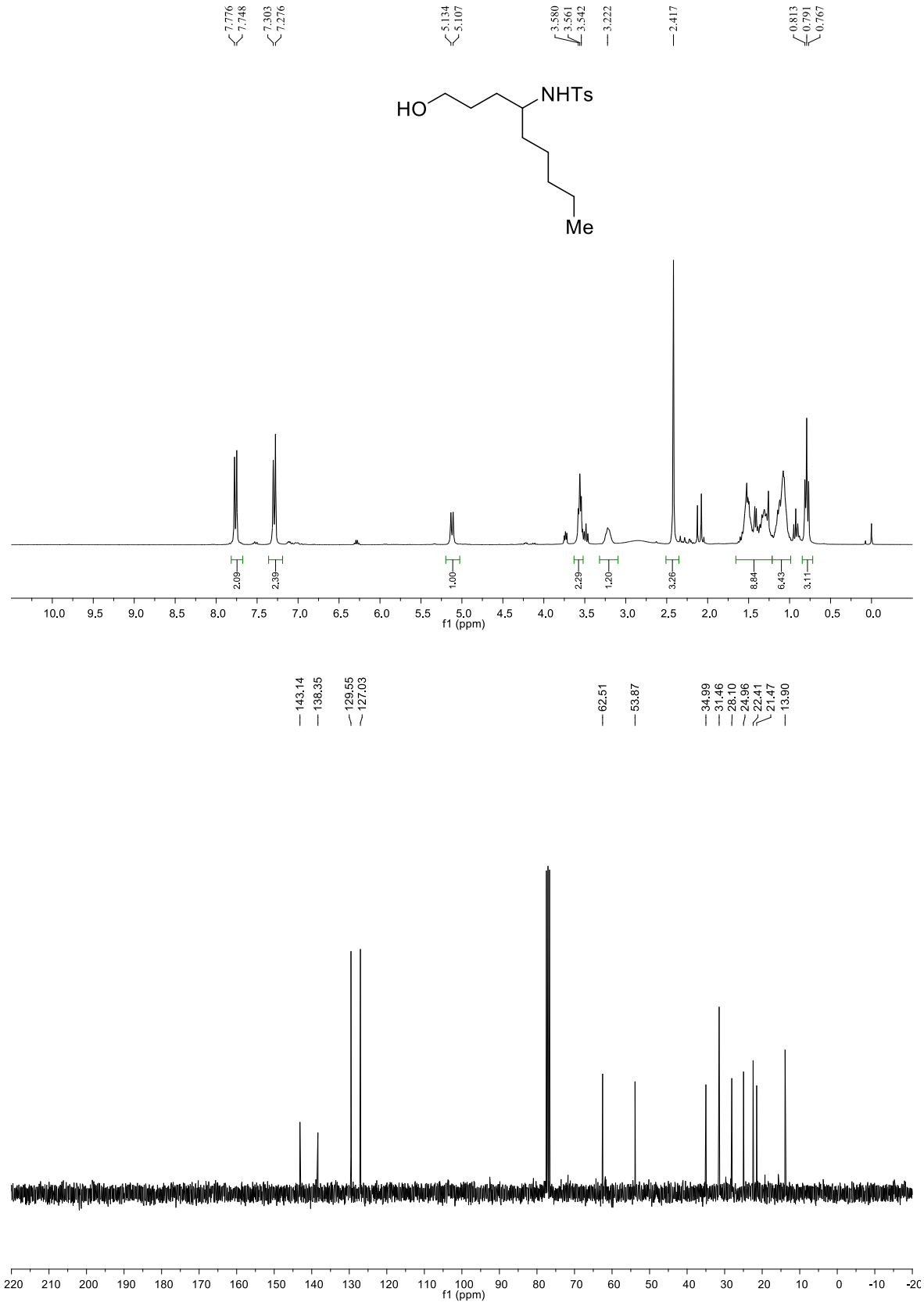


Figure S8. ^{1}H and ^{13}C NMR spectra of *N*-(1-cyclopentyl-4-hydroxybutyl)-4-methylbenzenesulfonamide **1h**

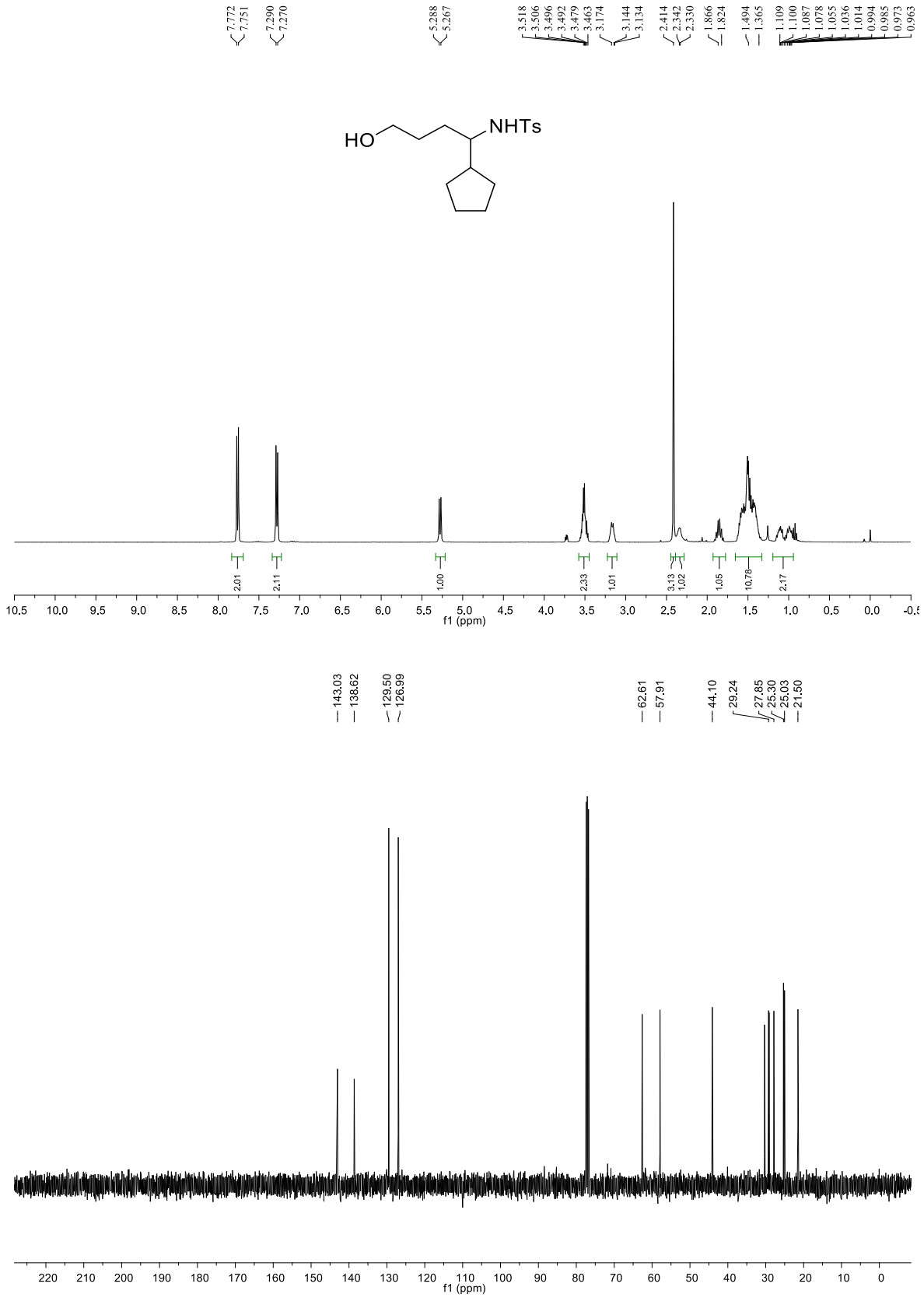


Figure S9. ^{1}H and ^{13}C NMR spectra of *N*-(6-hydroxy-2-methylhex-1-en-3-yl)-4-methylbenzenesulfonamide **1i**

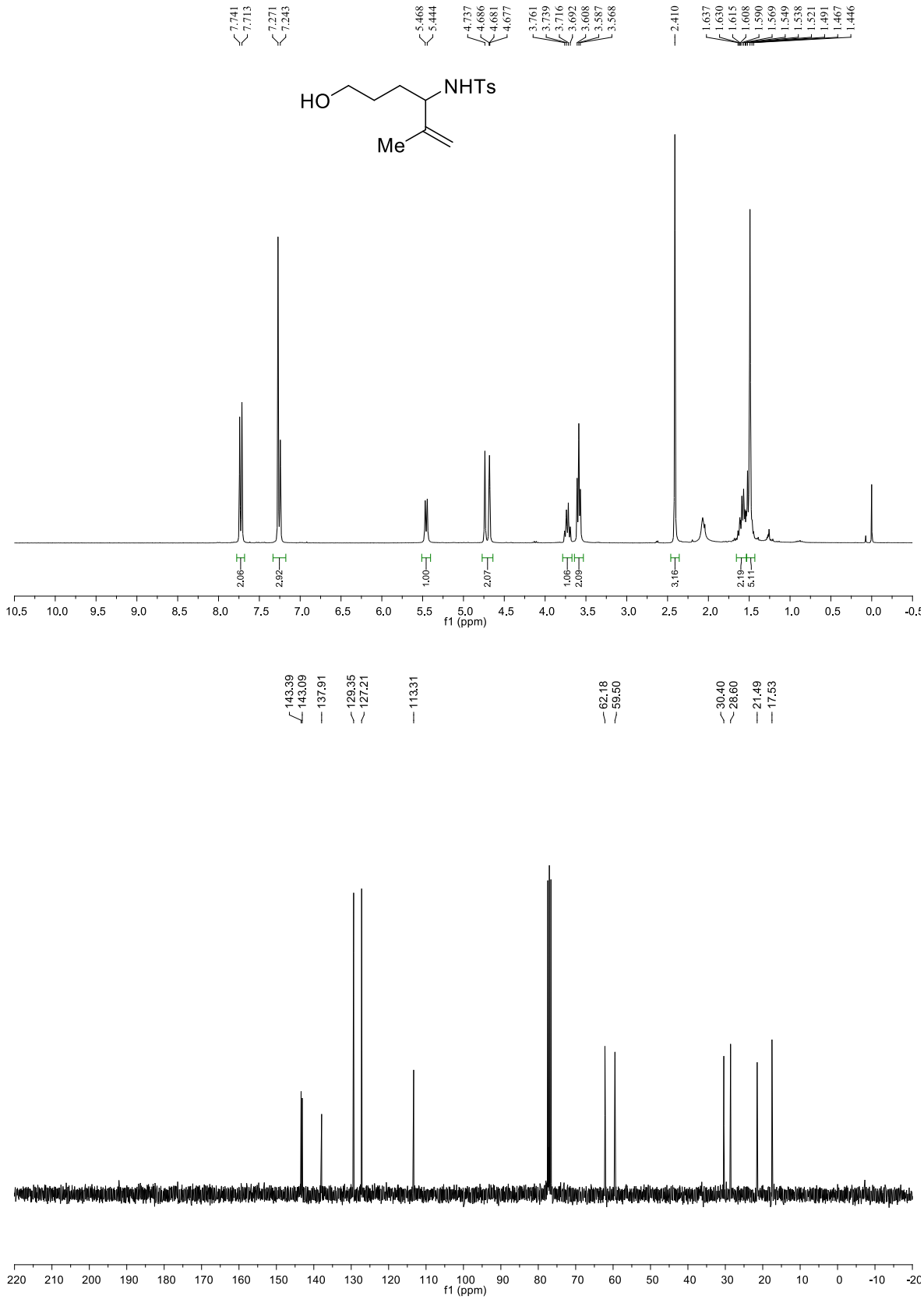


Figure S10. ^{1}H and ^{13}C NMR spectra of *N*-(7-hydroxy-2-methylhept-2-en-4-yl)-4-methylbenzenesulfonamide **1j**

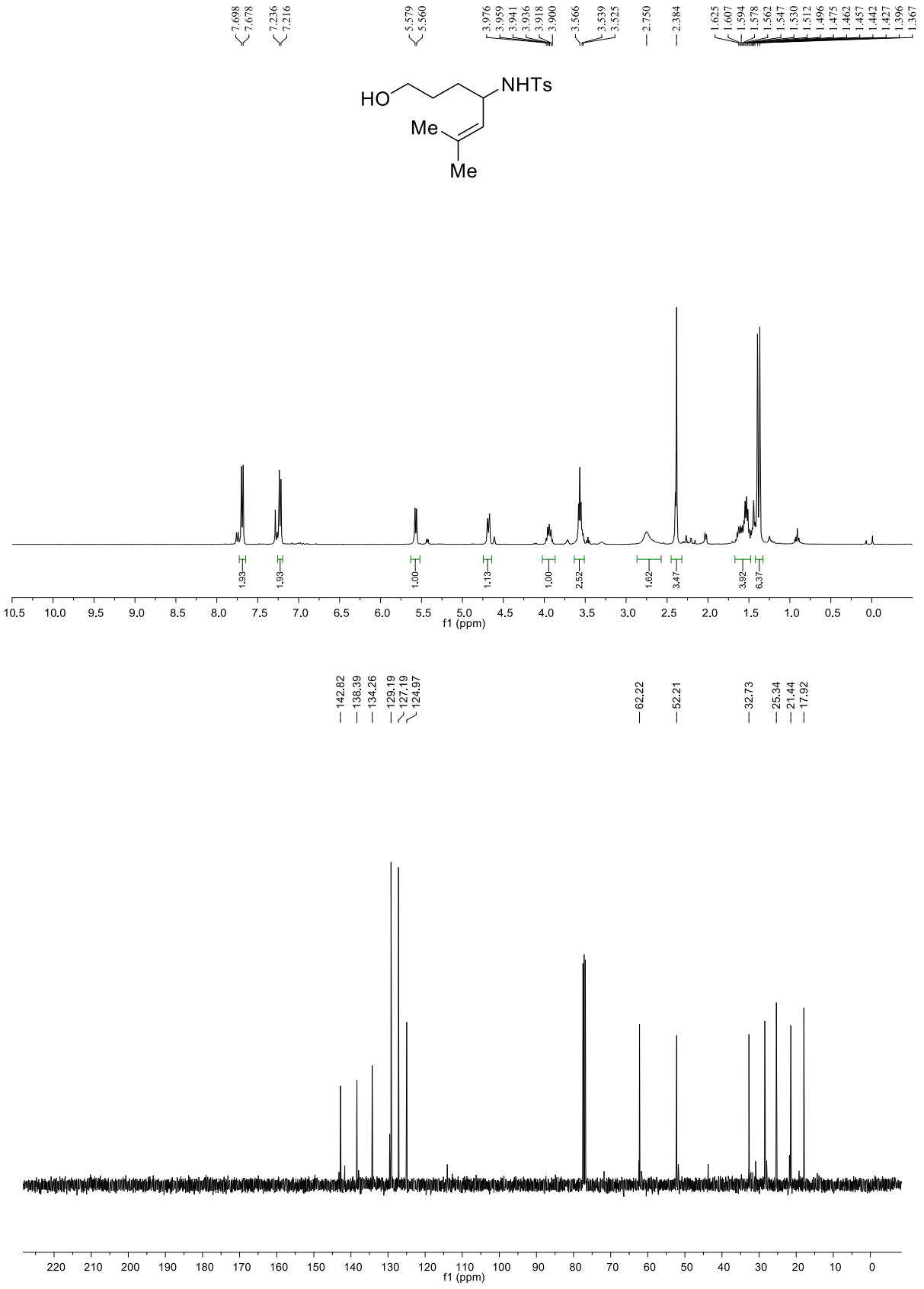
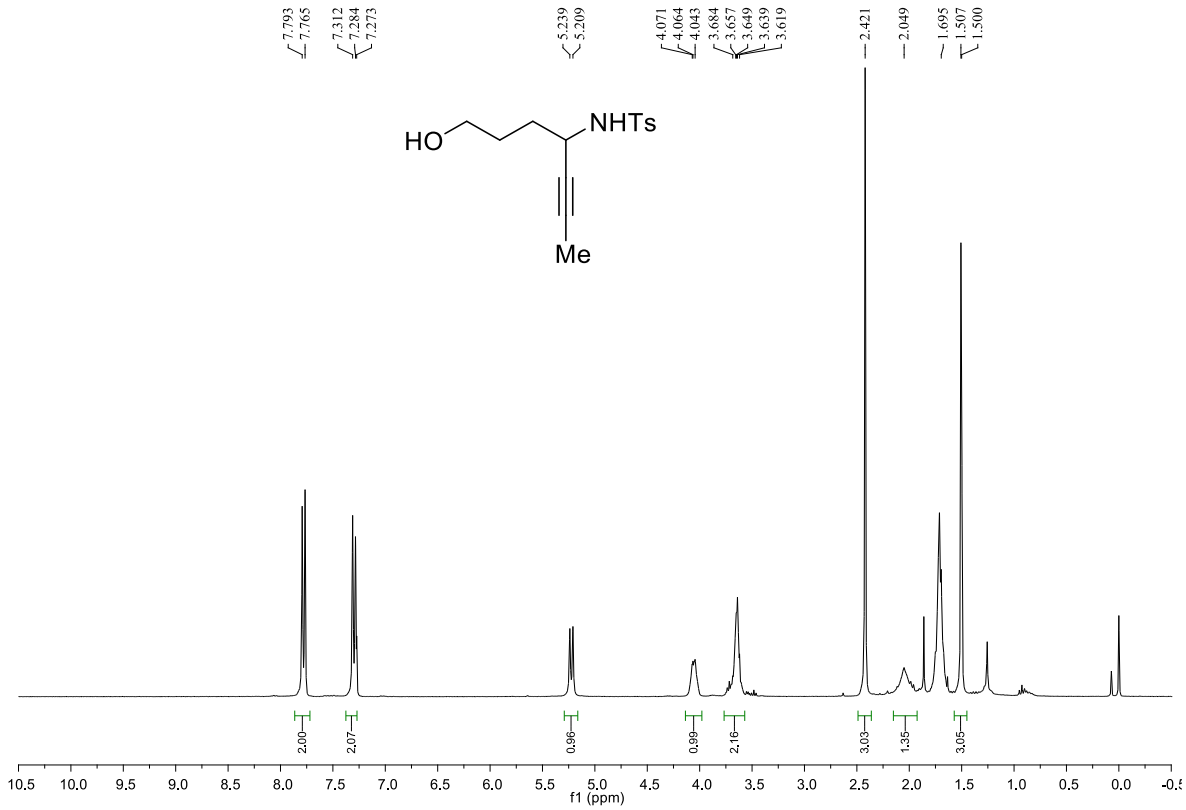


Figure S11. ^{1}H and ^{13}C NMR spectra of *N*-(7-hydroxyhept-2-yn-4-yl)-4-methylbenzenesulfonamide **2k**



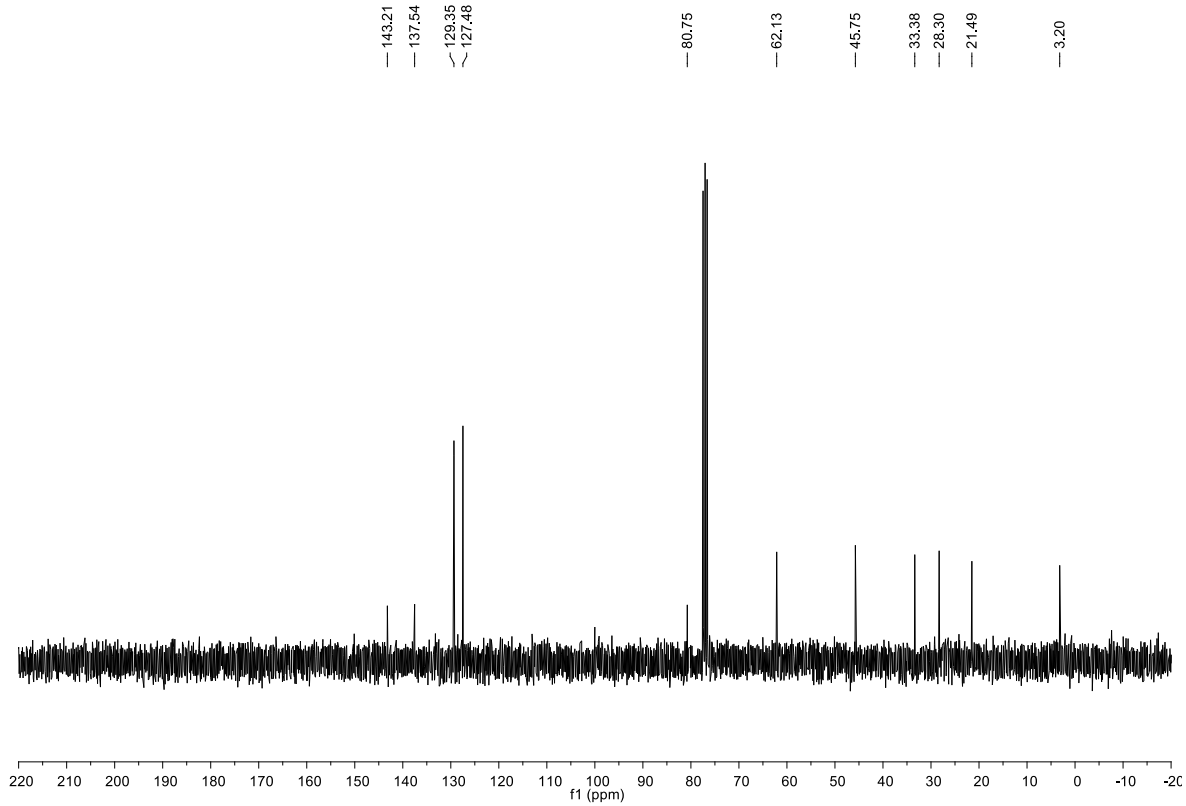


Figure S12. ^{1}H and ^{13}C NMR spectra of *N*-(1-cyclopropyl-4-hydroxybutyl)-4-methylbenzenesulfonamide **1l**

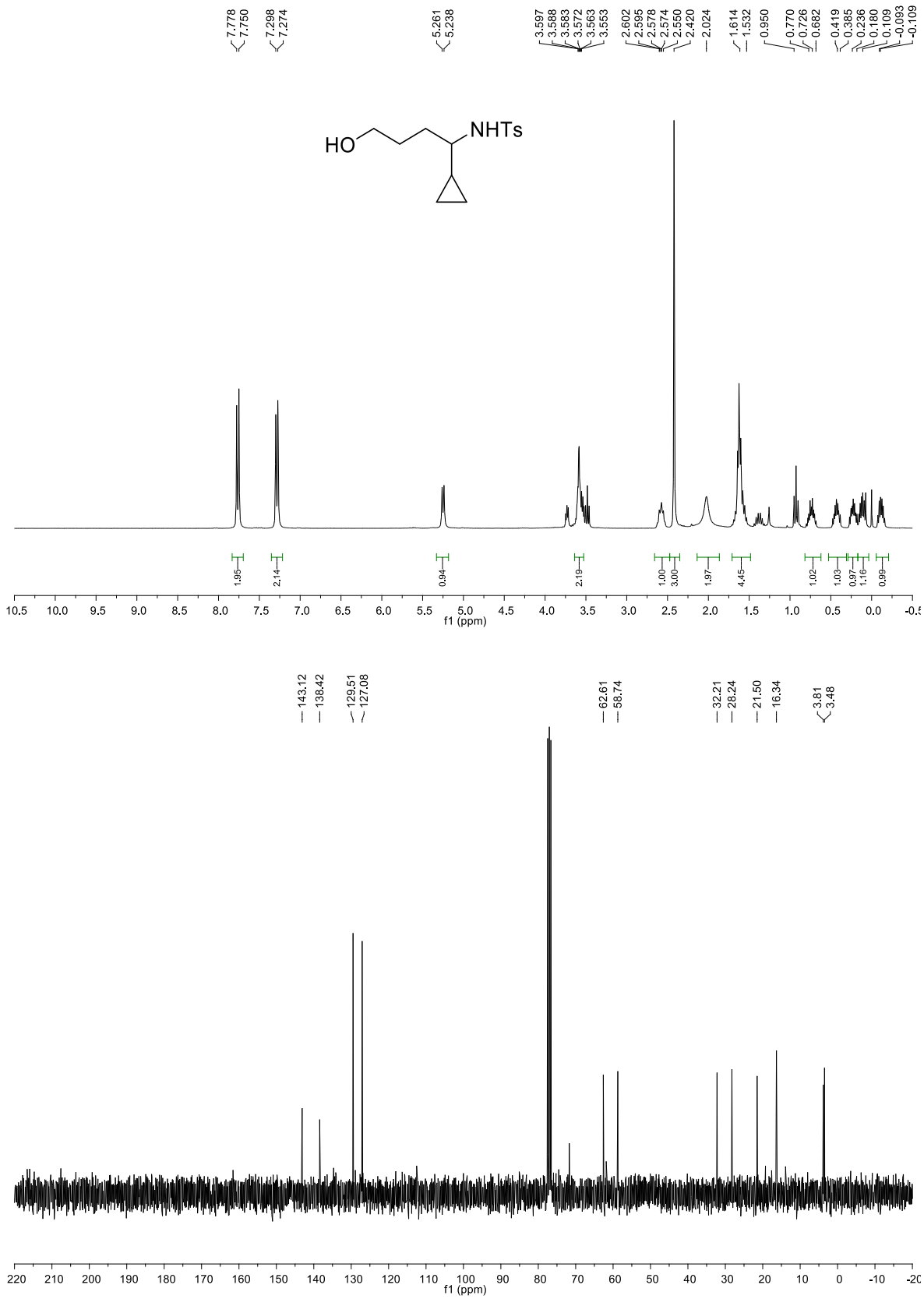


Figure S13. ^{1}H and ^{13}C NMR spectra of *N*-(4-hydroxy-1-(4-methoxyphenyl)butyl)-4-methylbenzenesulfonamide **1m**

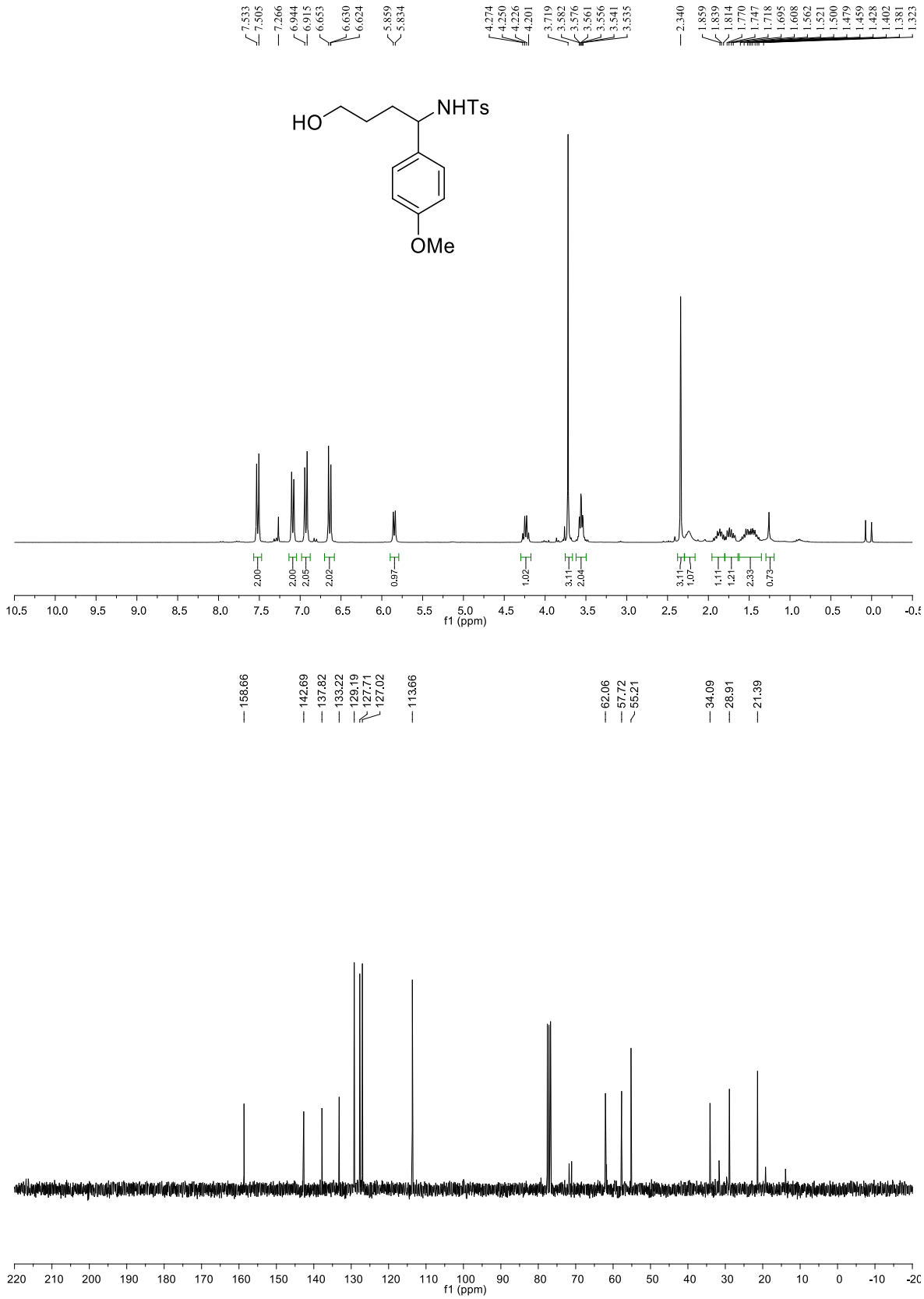


Figure S14. ^{1}H and ^{13}C NMR spectra of *N*-(1-(4-chlorophenyl)-4-hydroxybutyl)-4-methylbenzenesulfonamide **1n**

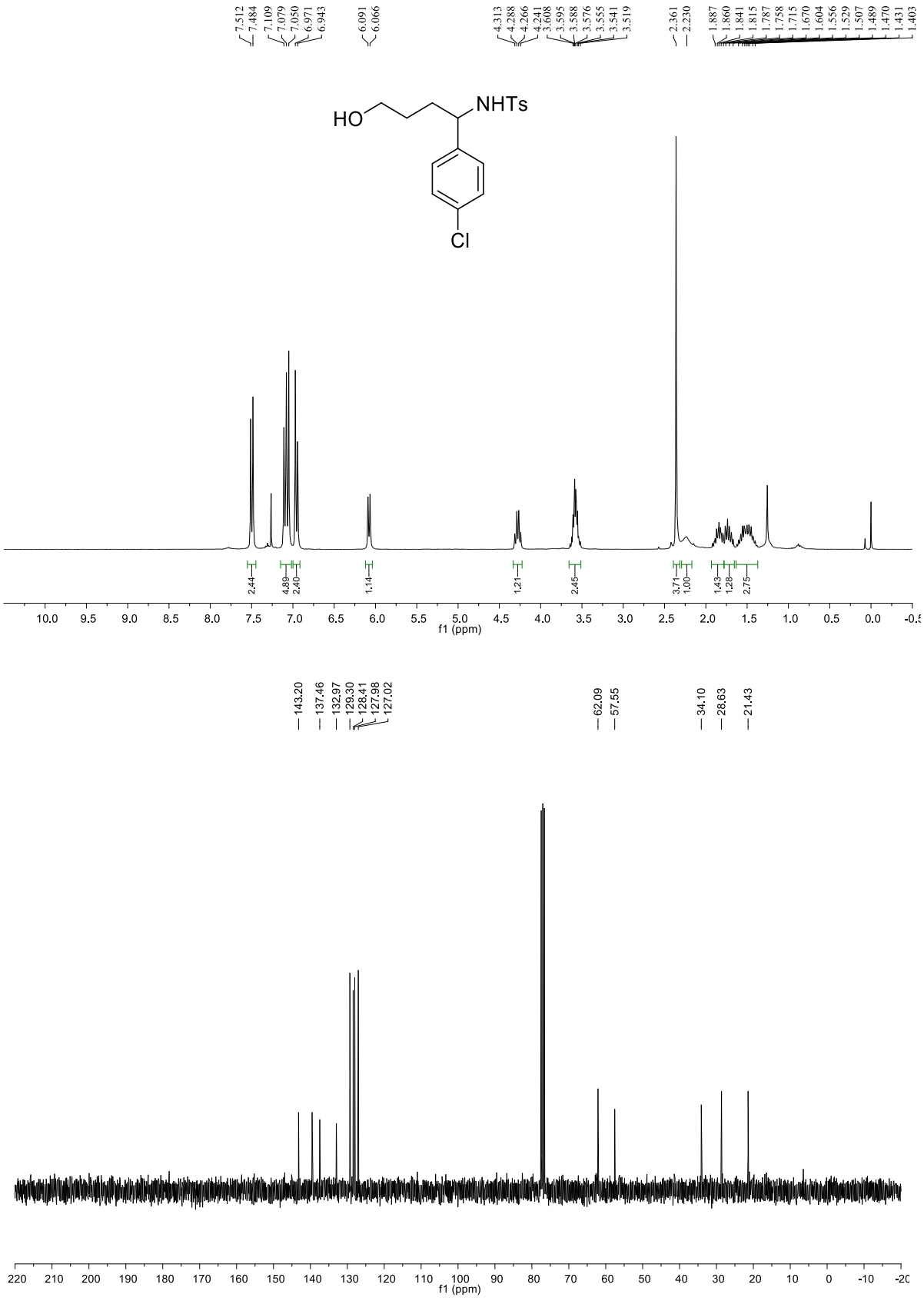


Figure S15. ^{1}H and ^{13}C NMR spectra of *N*-(7-hydroxyheptan-3-yl)-4-methylbenzenesulfonamide **1s**

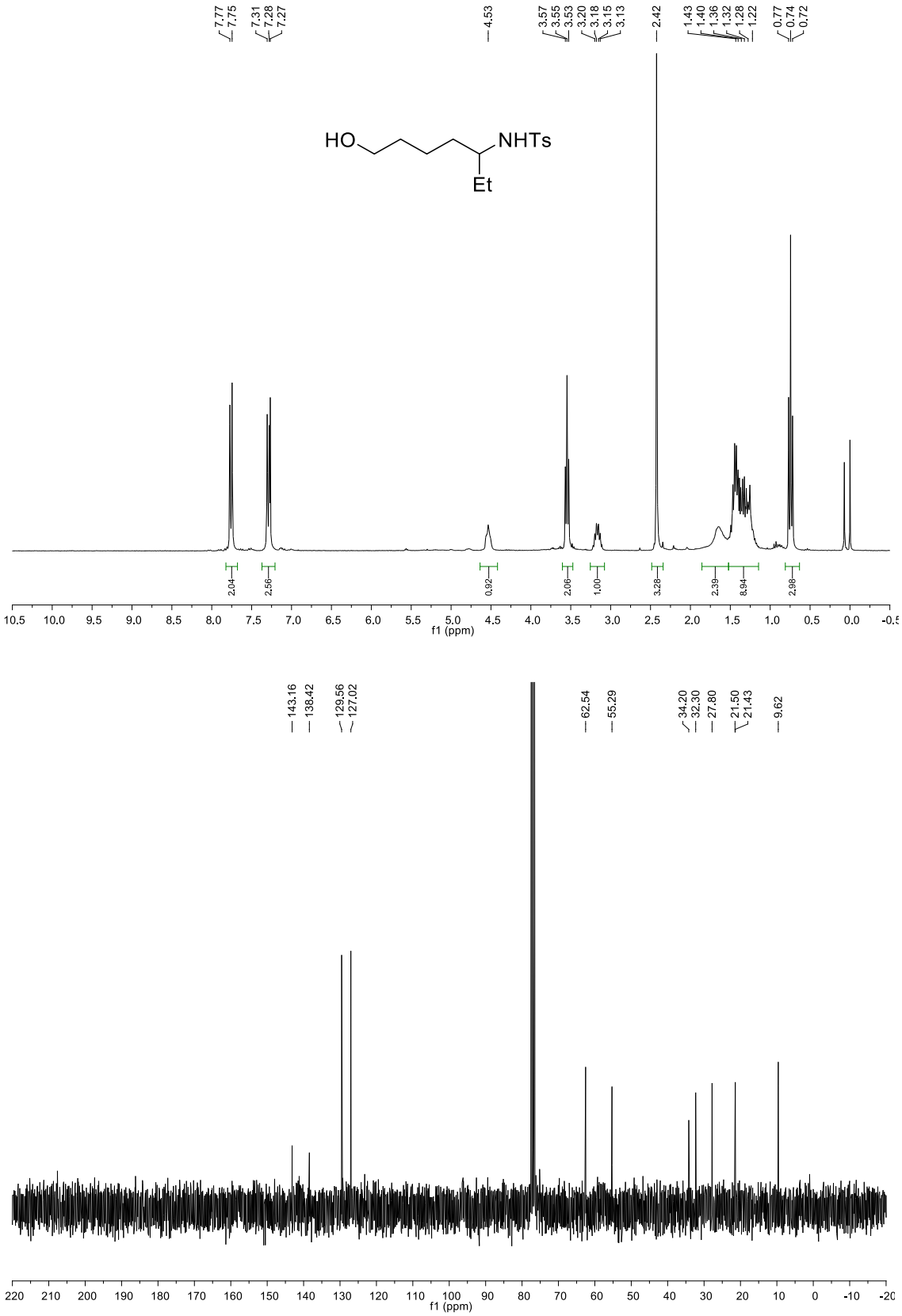


Figure S16. ^{1}H and ^{13}C NMR spectra of 4-amino-4-phenylbutan-1-ol **2a**

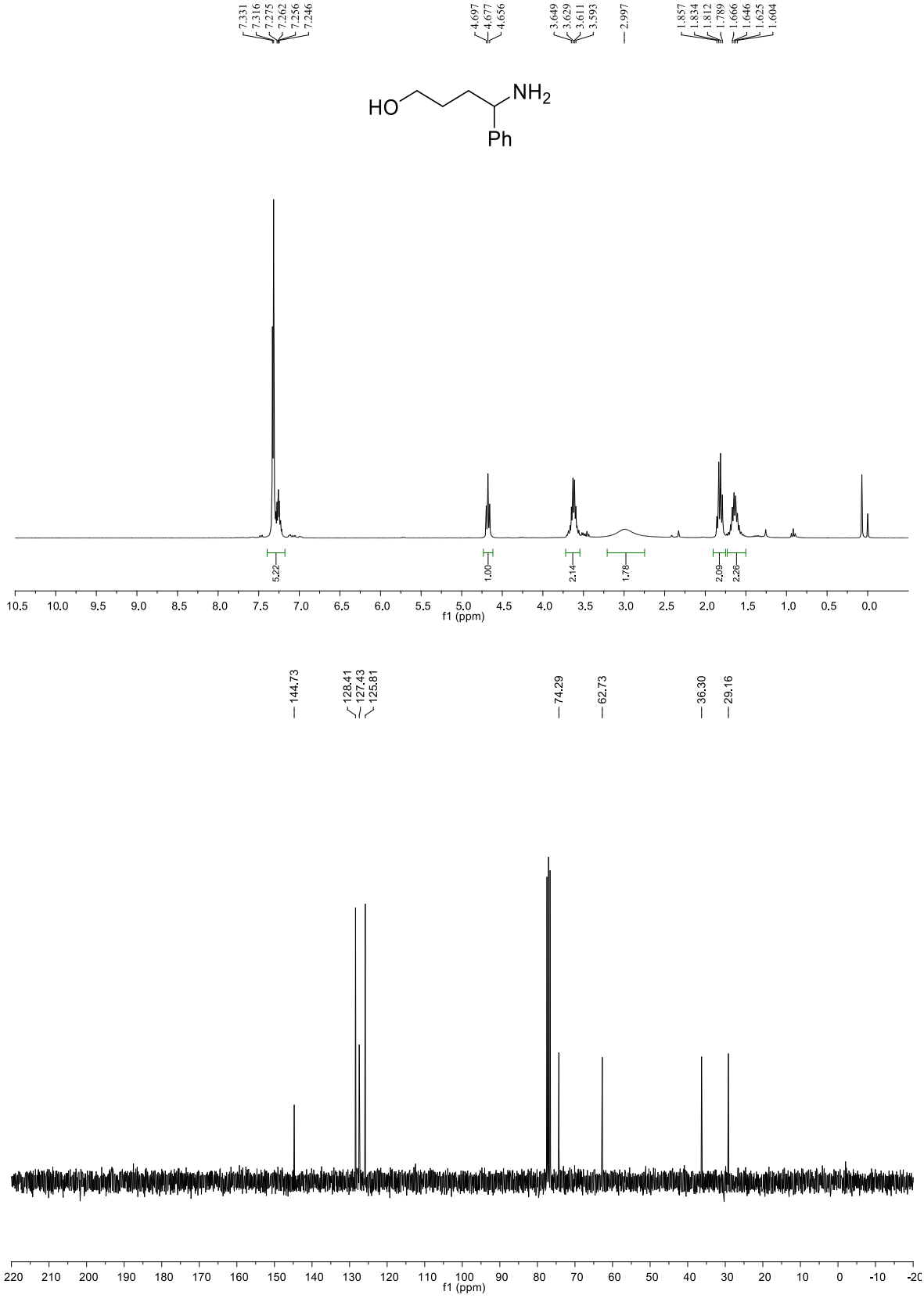


Figure S17. ^{1}H and ^{13}C NMR spectra of 4-amino-4-cyclopropylbutan-1-ol **2l**

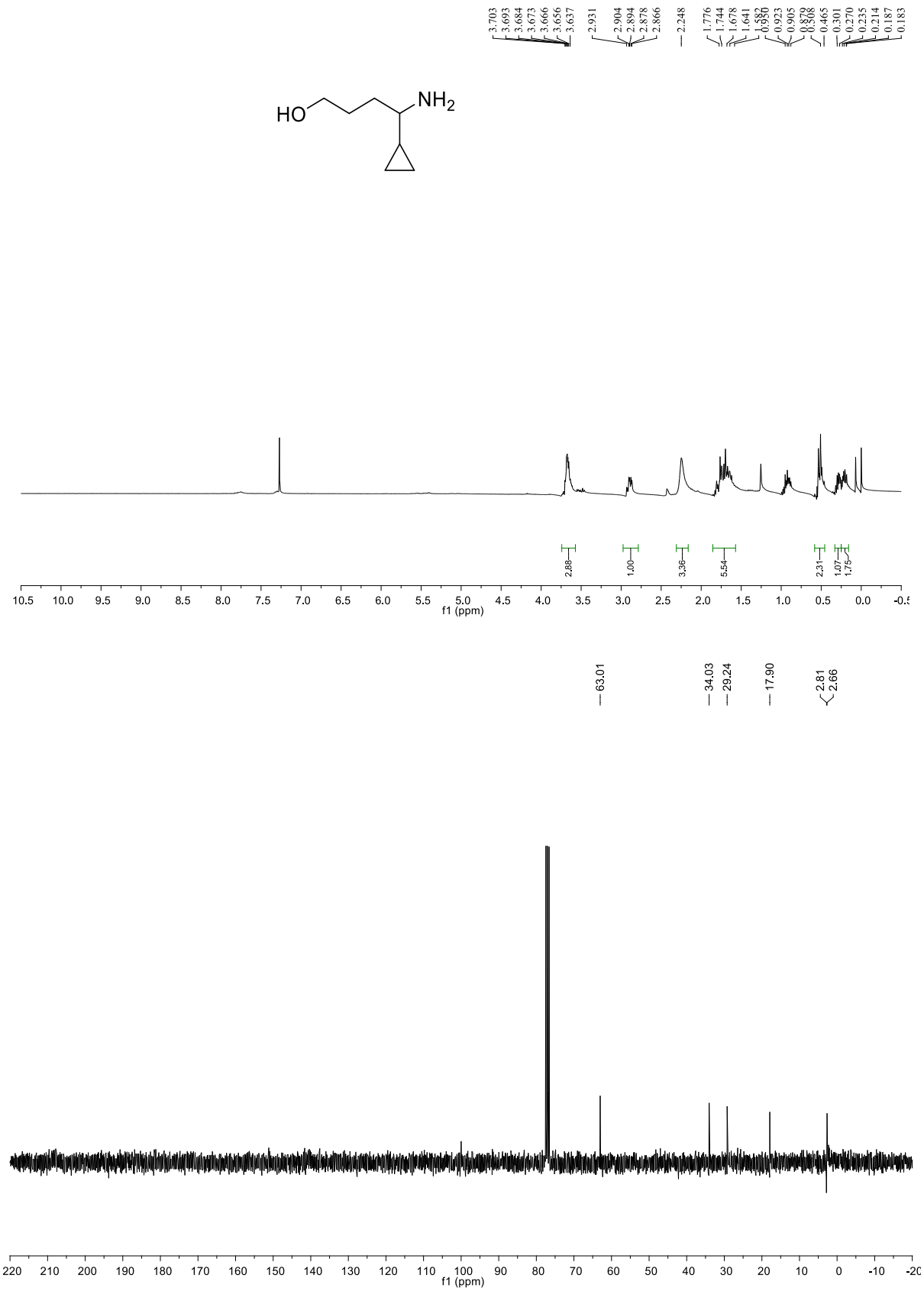


Figure S18. ^{1}H and ^{13}C NMR spectra of 4-amino-4-(4-methoxyphenyl)butan-1-ol **2m**

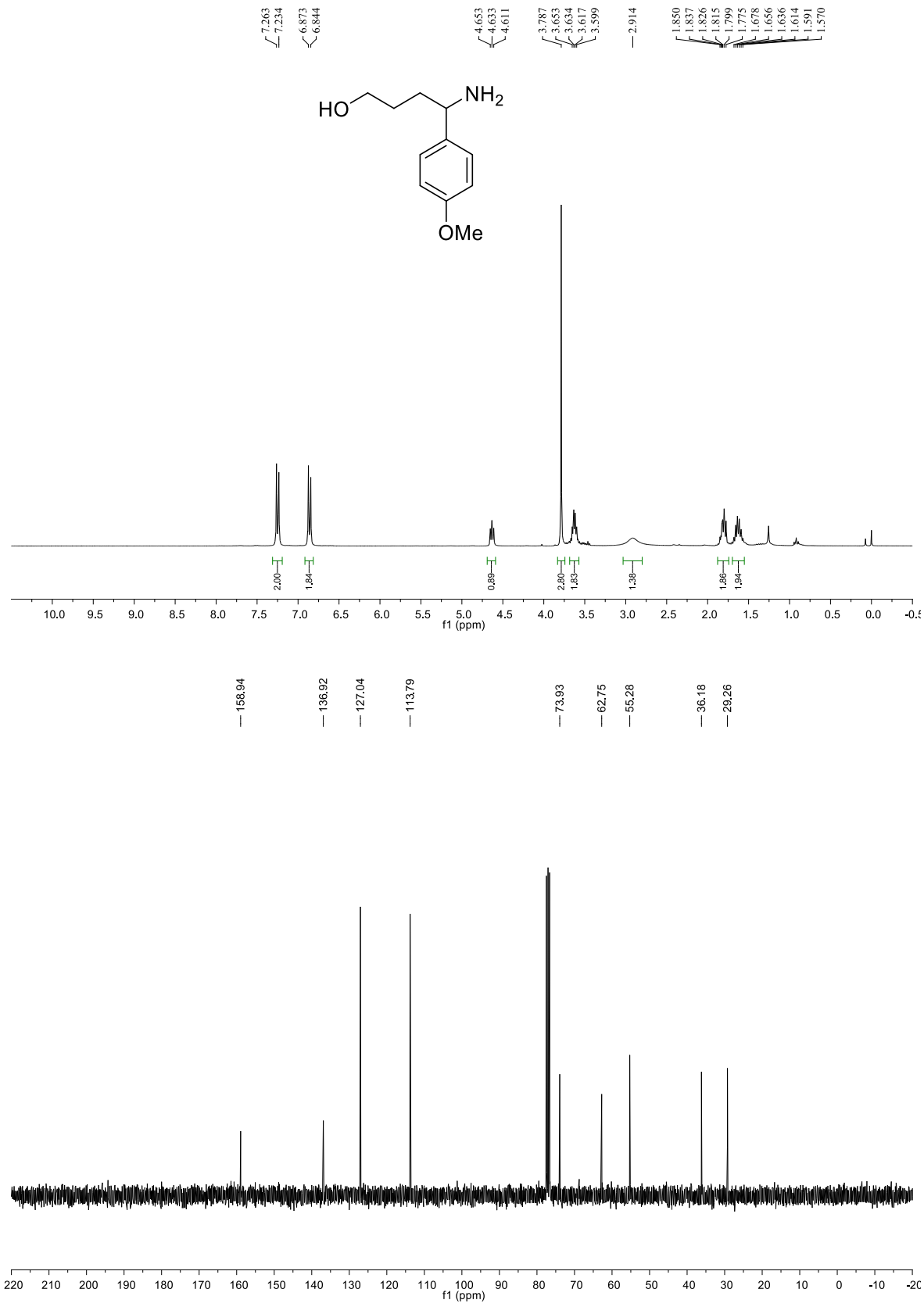


Figure S19. ^{1}H and ^{13}C NMR spectra of 4-amino-4-(4-chlorophenyl)butan-1-ol **2n**

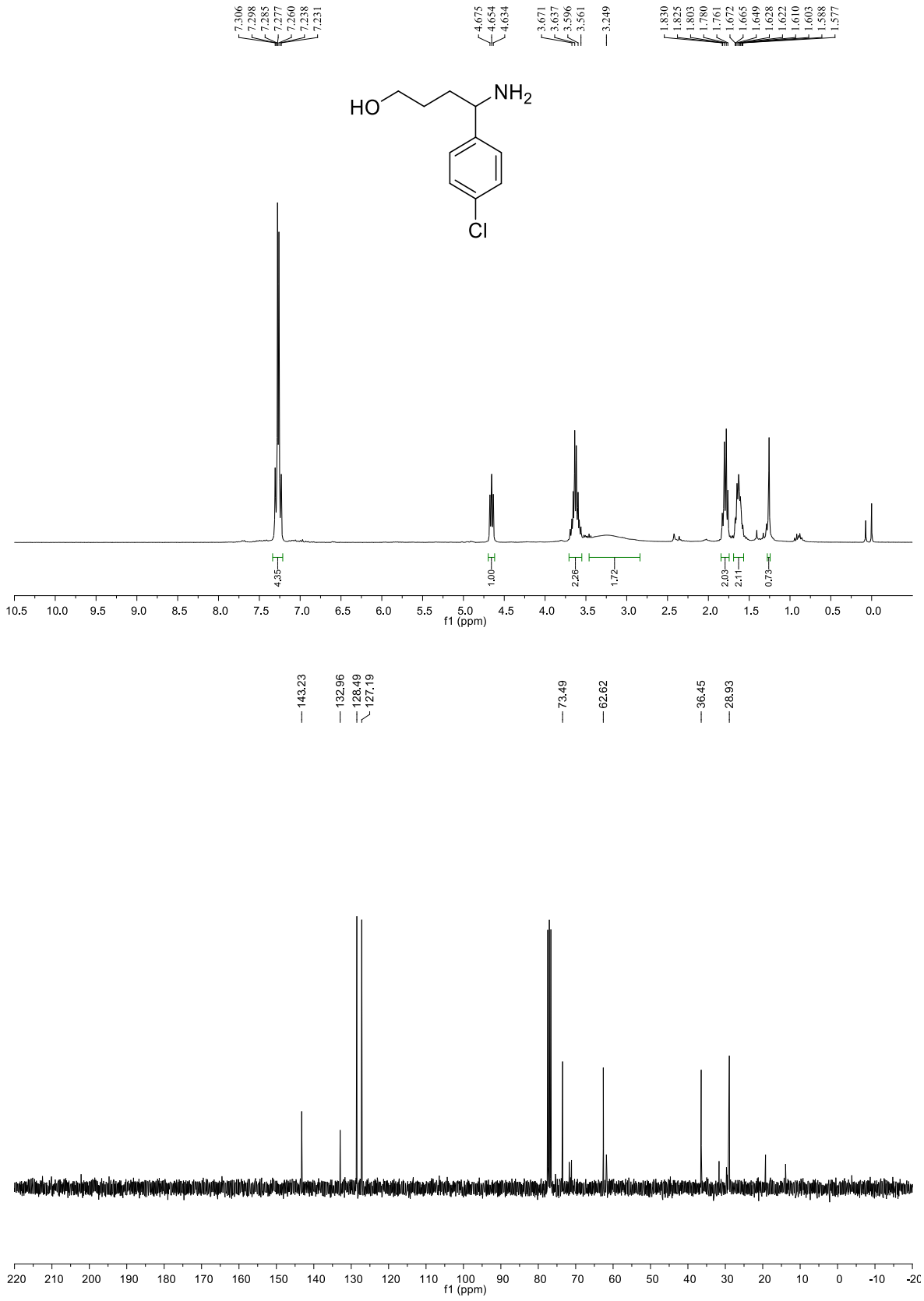
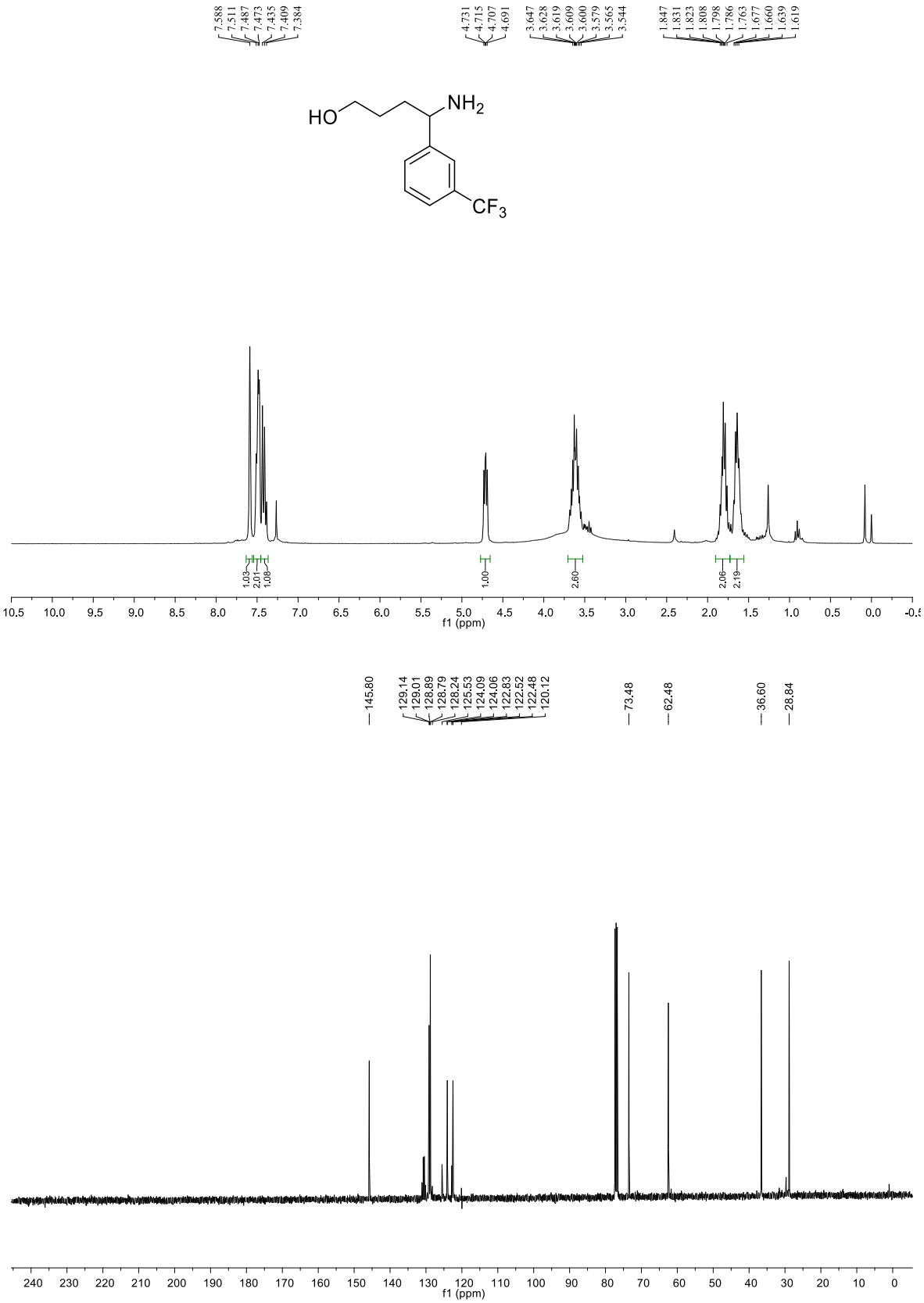


Figure S20. ^{1}H, ^{13}C and ^{19}F NMR spectra of 4-amino-4-(3-(trifluoromethyl)phenyl)butan-1-ol **2o**



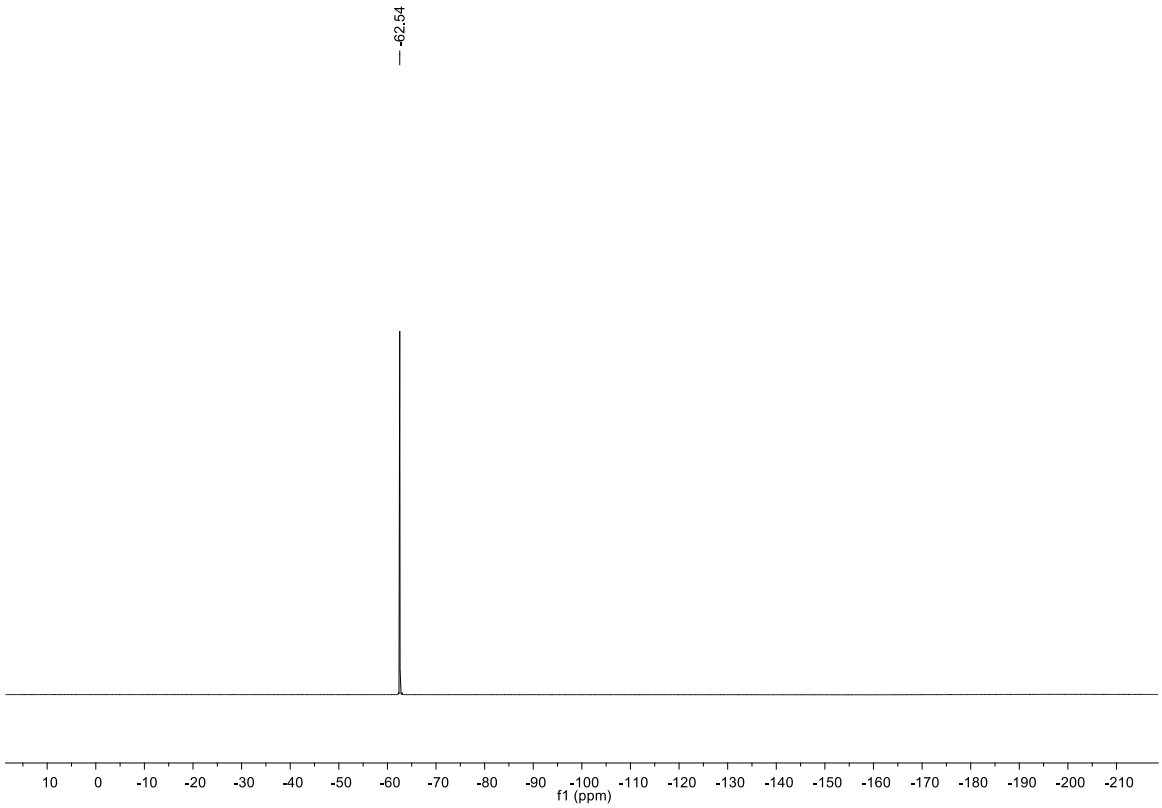

-62.54
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

Figure S21. ^{1}H and ^{13}C NMR spectra of 4-amino-4-(3,5-dimethylphenyl)butan-1-ol **2p**

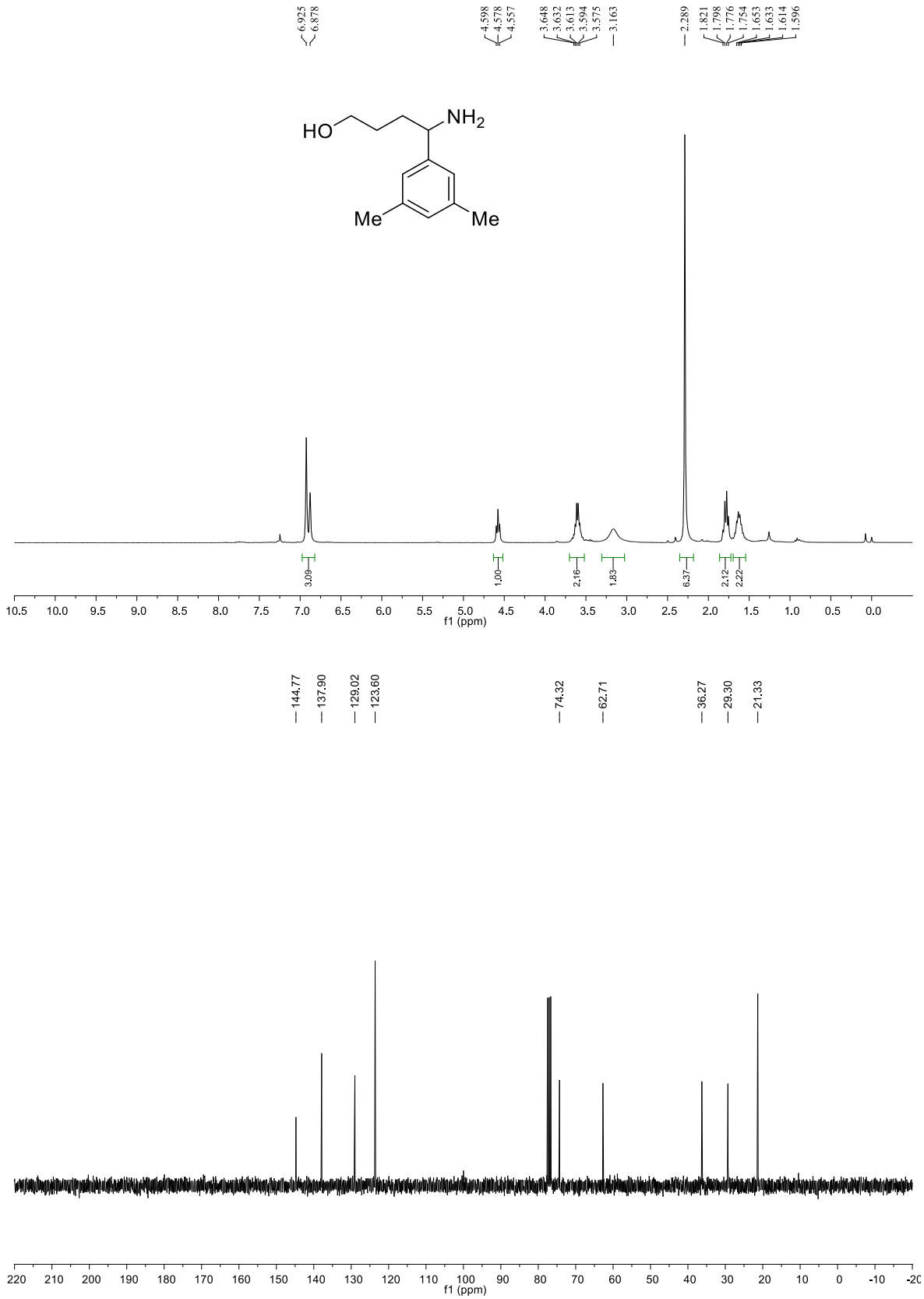


Figure S22. ^{1}H and ^{13}C NMR spectra of 4-amino-4-(naphthalen-1-yl)butan-1-ol **2q**

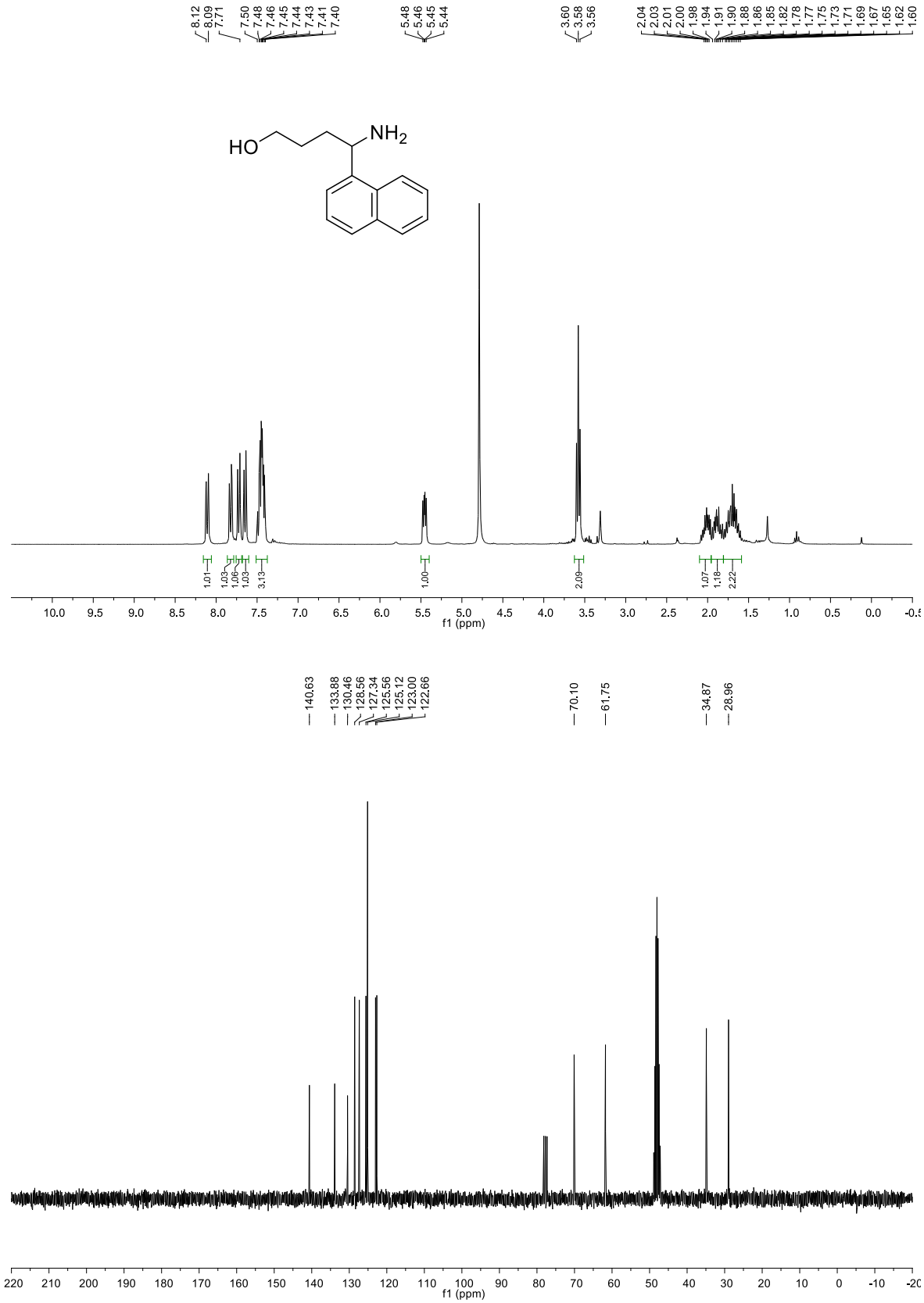


Figure S23. ^{1}H and ^{13}C NMR spectra of 5-phenyl-1-tosylpyrrolidin-2-one **3a**

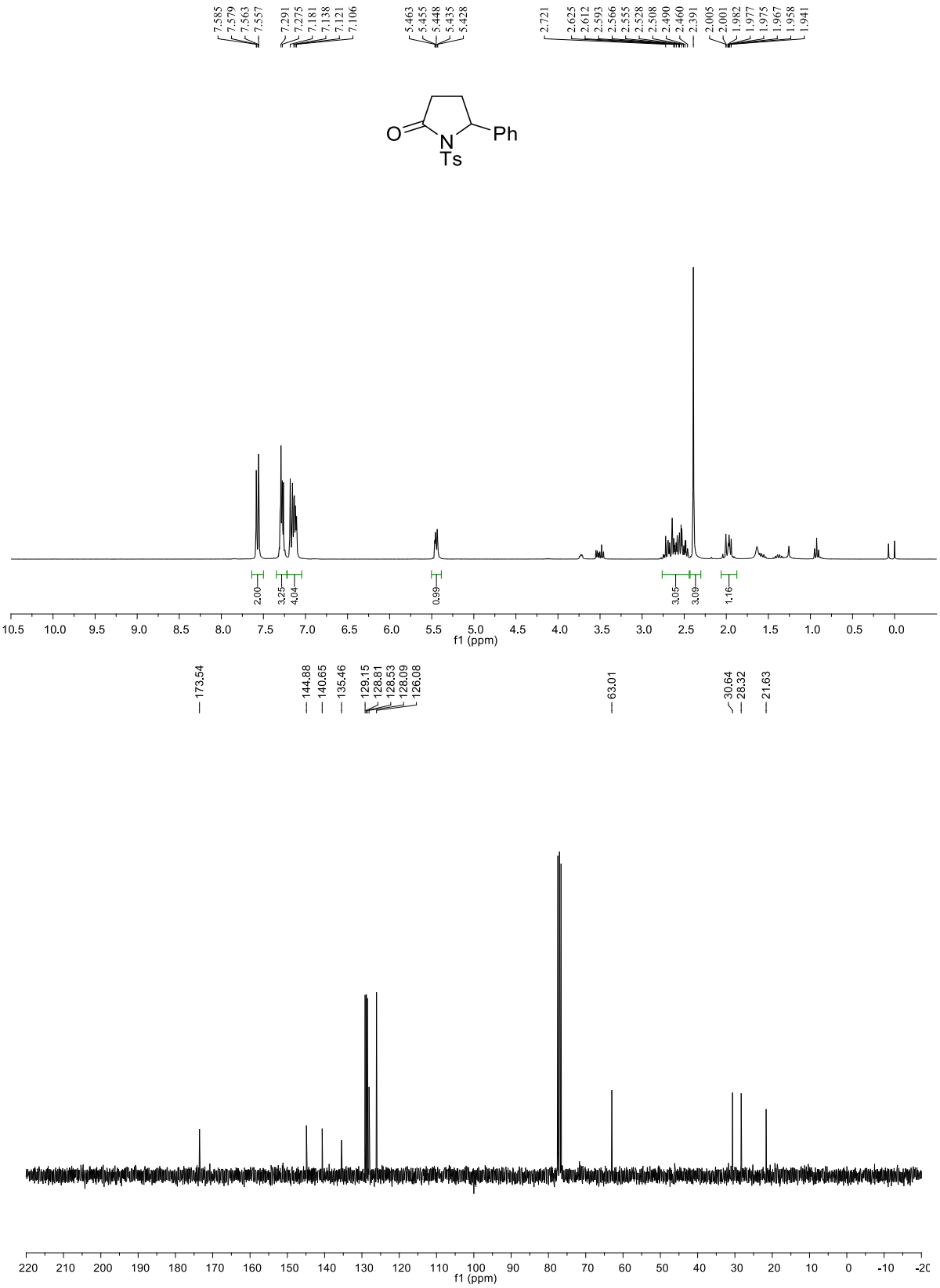
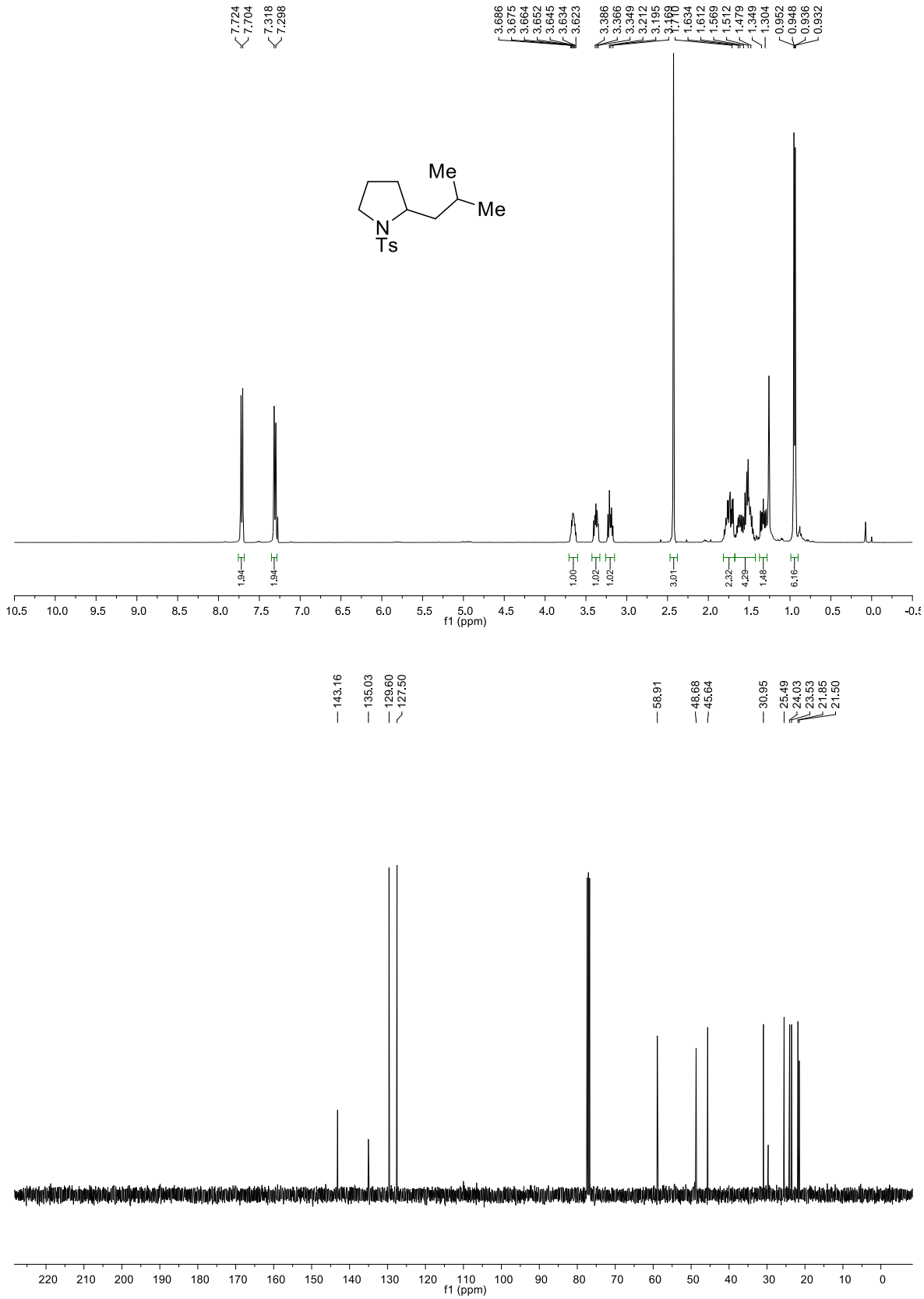


Figure S24. ^{1}H and ^{13}C NMR spectra of 2-Isobutyl-1-tosylpyrrolidine **4f**



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