

Supporting Information

Pd(PPh₃)₄-Catalyzed Regioselective C–H *para*-Allylation of *N,N*-Dialkylanilines using Vinyl Benzoxazinanones

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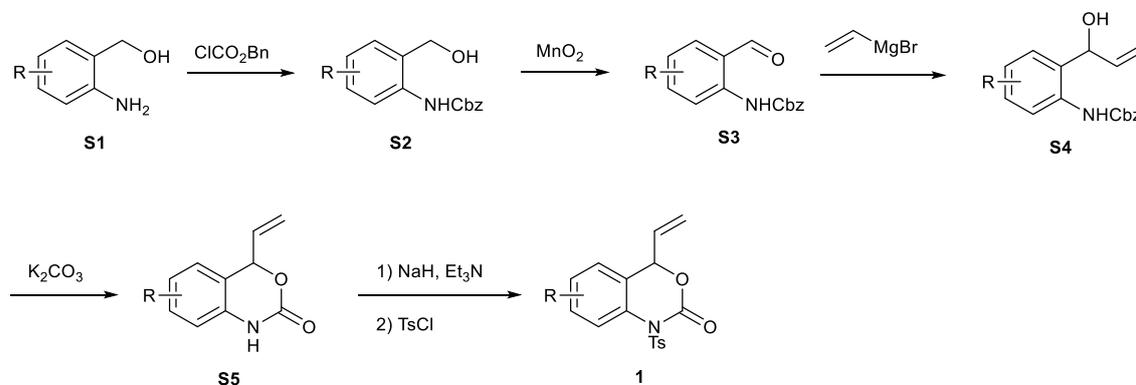
1. General Information

All commercially available reagents were used without further purification. Reactions were monitored by thin layer chromatography (TLC) on glass plates coated with silica gel with a fluorescent indicator. Flash chromatography was performed on silica gel (300–400) with petroleum/EtOAc. HRMS were measured on an LTQ-Orbit. Melting points were measured using a micro melting point apparatus and are uncorrected. ^1H NMR (400 MHz) chemical shifts were reported in ppm (δ) relative to tetramethylsilane (TMS) with the solvent resonance employed as the internal standard. ^{13}C NMR (100 MHz) chemical shifts were reported in ppm (δ) from tetramethylsilane (TMS) with the solvent resonance as the internal standard and ^{19}F NMR at (376 MHz) chemical shifts were reported in ppm (δ) relative to tetramethylsilane (TMS) with the solvent resonance employed as the internal standard.

2. Experimental Details

2.1 General Procedure for Synthesis of vinyl benzoxazinanes (**1a–1c**)¹.

substrates **1** were synthesized according to reported procedures. The general procedure for the synthesis of substituted vinyl benzoxazinanes were shown as below.



S1 to **S2**: To a stirring solution of 2-aminobenzyl alcohol **S1** (81.20 mmol) and K_2CO_3

(162.40 mmol) in THF (120 mL) and H₂O (120 mL), benzyl chloroformate (146.16 mmol) was slowly added dropwise. The resulting mixture was stirred at room temperature for 15 h. The reaction was quenched with saturated NaHCO₃ aqueous (250 mL), washed with brine (3×100 mL), dried with MgSO₄ and evaporated under reduced pressure. The obtained crude product **S2** was used directly without further purification.

S2 to S3: To a solution of crude product **S2** (81.20 mmol) mentioned above in CH₂Cl₂ (200 mL), MnO₂ (649.60 mmol) was added. The mixture was stirred at room temperature for 15 h and then filtered through a bed of silica. The filtrate was concentrated under reduced pressure and purified by column chromatography on silica gel (petrol ether/EtOAc = 20/1) to give product **S3** as a white or yellow solid.

S3 to S4: Vinyl magnesium bromide in THF (1 M, 203.00 mmol) was added to a solution of **S3** (81.20 mmol) in dry THF (200 mL) at 0 °C. Then the reacted mixture was naturally warmed to room temperature and stirred for 2.5 h. The reaction was quenched with brine (200 mL), extracted with ethyl acetate (3×100 mL) and washed with brine (3×100 mL). The combined organic layer was dried with MgSO₄, and evaporated under reduced pressure. The next step continued with obtained crude product **S4** directly without further purification.

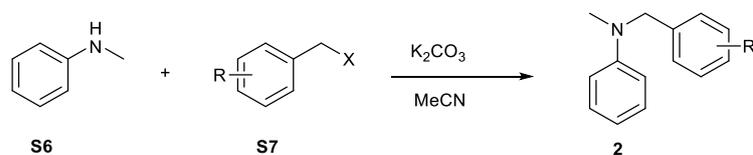
S4 to S5: K₂CO₃ (121.80 mmol) was added to a solution of **S4** (81.20 mmol) in methanol (250 mL), and the mixture was stirred at room temperature for 12 h. Then the mixture of reaction was quenched with saturated aqueous NH₄Cl solution (250 mL). The methanol was evaporated under reduced pressure and the residues were extracted with ethyl acetate (3×150 mL) and washed with brine (3×100 mL). Then the mixture was purified by column chromatography on silica gel (petrol ether/EtOAc =5/1). The product of **S5** was given to a white or yellow solid.

S5 to 1: To a solution of **S5** (81.20 mmol) and triethylamine in THF (400.0 mL), NaH (162.40 mmol) was slowly added at 0 °C. The stirred mixture was warmed to room temperature naturally and reacted for 1 h. TsCl (243.60 mmol) was added portionwise slowly and then reacted at 60 °C for 36 h. The reaction was quenched with saturated aqueous NH₄Cl solution (250 mL) and washed with saturated brine (3×150 mL). Then

the organic layer was dried with MgSO₄. Then the mixture of production was purified by column chromatography on silica gel (petrol ether/EtOAc = 7/1). The product was given to a white solid.

2.2 General Procedure for Synthesis of *N*-methyl-*N*-benzylaniline (2m–2q)².

substrates **2** were synthesized according to reported procedures. The general procedure for the synthesis of substituted *N*-methyl-*N*-benzylaniline were shown as below.



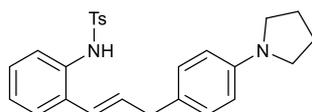
To a stirring solution of *N*-methylaniline (2.50 mmol) and K₂CO₃ (7.50 mmol) in MeCN (10.0 mL), compound **S7** (3.25 mmol) was added dropwise. The mixture was stirred at 60 °C for 8 h, and the reaction progress was monitored by TLC. Upon completion, the reaction was quenched with water (10.0 mL) and extracted with DCM (3×10.0 mL). The combined organic extracts were washed with brine (3×10.0 mL), dried over anhydrous MgSO₄, and concentrated under reduced pressure. Purification by column chromatography on silica gel (petrol ether/EtOAc = 10/1) afforded the product as an orange viscous oil.

2.3 General Procedure for Synthesis of **3**

Under an argon atmosphere, a solution of dry HFIP (3.0 mL, 0.2 M) and *N,N*-dialkylaniline **2** (0.91 mmol, 1.5 equiv) was added dropwise simultaneously to a mixture of vinyl benzoxazinone **1** (0.61 mmol, 1.0 equiv) and Pd(PPh₃)₄ (0.06 mmol, 0.1 equiv). The reaction was stirred at 60 °C for 4 h, and the progress was monitored by TLC. Upon completion, the reaction mixture was quenched with saturated brine (5.0 mL) and extracted with ethyl acetate (5.0 mL × 3). The organic layer was washed with saturated brine (5.0 mL × 3), dried over anhydrous MgSO₄, and filtered under reduced

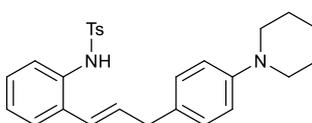
pressure. The filtrate was concentrated under reduced pressure to afford the crude product. The crude product was purified by flash column chromatography on silica gel (petroleum ether/EtOAc = 5:1) to afford the product **3** as a white to off-white crystalline solid.

(E)-4-Methyl-N-(2-(3-(4-(pyrrolidin-1-yl)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3a).



The title compound was purified by column chromatography (219 mg, 83%, petroleum ether/EtOAc = 5:1 v/v). Grey Solid, mp 147.4–149.4 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.65 (s, 1H), 7.54–7.49 (m, 2H), 7.49–7.43 (m, 1H), 7.34–7.28 (m, 2H), 7.18–7.07 (m, 2H), 7.03–6.93 (m, 3H), 6.53–6.44 (m, 3H), 6.11 (dt, *J* = 15.1, 7.1 Hz, 1H), 3.23 (d, *J* = 7.1 Hz, 2H), 3.21–3.15 (m, 4H), 2.34 (s, 3H), 1.97–1.88 (m, 4H) ppm; ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ 21.5, 25.4, 38.7, 47.9, 112.2, 125.4, 126.1, 126.6, 127.2, 127.3, 127.8, 128.1, 129.5, 130.0, 131.9, 133.6, 134.6, 138.0, 143.4, 146.8 ppm; HRMS (ESI) *m/z* calcd for C₂₆H₂₈N₂O₂SNa⁺[M + Na]⁺ 455.1764, found 455.1760.

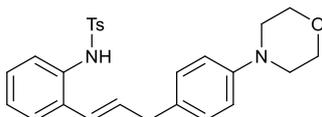
(E)-4-Methyl-N-(2-(3-(4-(piperidin-1-yl)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3b).



The title compound was purified by column chromatography (196 mg, 72%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 114.8–116.8 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.65 (s, 1H), 7.54–7.49 (m, 2H), 7.49–7.46 (m, 1H), 7.35–7.28 (m, 2H), 7.16–7.09 (m, 2H), 7.03–6.96 (m, 3H), 6.89–6.83 (m, 2H), 6.50 (d, *J* = 15.6 Hz, 1H), 6.13 (dt, *J* = 15.1, 7.1 Hz, 1H), 3.24 (d, *J* = 7.1 Hz, 2H), 3.07 (t, *J* = 5.4 Hz, 4H), 2.33 (s, 3H), 1.65–1.57 (m, 4H), 1.55–1.47 (m, 2H) ppm ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ

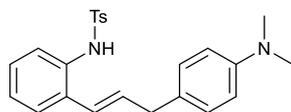
21.5, 24.4, 25.8, 38.7, 50.5, 116.6, 125.8, 126.1, 127.2, 127.3, 127.9, 128.1, 129.4, 130.0, 130.2, 131.5, 133.6, 134.5, 138.0, 143.4, 150.7 ppm; HRMS (ESI) m/z calcd for $C_{27}H_{30}N_2O_2SNa^+[M + Na]^+$ 469.1920, found 469.1921.

(E)-4-Methyl-N-(2-(3-(4-morpholinophenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3c).



The title compound was purified by column chromatography (174 mg, 64%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 121.4–123.4 °C; 1H NMR (400 MHz, DMSO- d_6) δ 9.66 (s, 1H), 7.56–7.50 (m, 2H), 7.49–7.44 (m, 1H), 7.34–7.28 (m, 2H), 7.18–7.08 (m, 2H), 7.07–7.01 (m, 2H), 7.01–6.96 (m, 1H), 6.92–6.84 (m, 2H), 6.51 (d, J = 15.6 Hz, 1H), 6.13 (dt, J = 15.6, 7.1 Hz, 1H), 3.76–3.69 (m, 4H), 3.26 (d, J = 7.1 Hz, 2H), 3.09–3.02 (m, 4H), 2.33 (s, 3H) ppm; ^{13}C $\{^1H\}$ NMR (100 MHz, DMSO- d_6) δ 21.5, 38.7, 49.3, 66.6, 115.9, 125.9, 126.1, 127.2, 127.3, 127.9, 128.1, 129.5, 130.0, 131.0, 131.4, 133.6, 134.5, 137.9, 143.4, 150.0 ppm; HRMS (ESI) m/z calcd for $C_{26}H_{28}N_2O_3SNa^+[M + Na]^+$ 471.1713, found 471.1714.

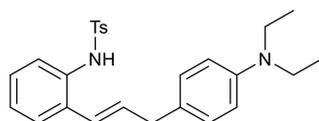
(E)-N-(2-(3-(4-(Dimethylamino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3d).



The title compound was purified by column chromatography (174 mg, 70%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 131.8–133.8 °C; 1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 7.56–7.48 (m, 2H), 7.50–7.43 (m, 1H), 7.34–7.27 (m, 2H), 7.16–7.09 (m, 2H), 7.03–6.95 (m, 3H), 6.71–6.64 (m, 2H), 6.51 (d, J = 15.6 Hz, 1H), 6.12 (dt, J = 14.3, 7.0 Hz, 1H), 3.24 (d, J = 7.0 Hz, 2H), 2.88–2.82 (m, 6H), 2.33 (s, 3H) ppm; ^{13}C $\{^1H\}$ NMR (100 MHz, DMSO- d_6) δ 21.5, 38.6, 40.9, 113.2, 125.6, 126.1, 127.2, 127.3,

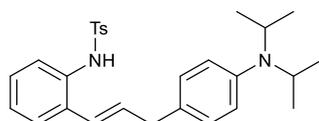
127.8, 128.1, 129.4, 130.0, 131.7, 133.6, H 134.5, 138.0, 143.4, 149.6 ppm; HRMS (ESI) m/z calcd for $C_{24}H_{26}N_2O_2SNa^+[M + Na]^+$ 429.1607, found 429.1607.

(E)-N-(2-(3-(4-(Diethylamino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3e).



The title compound was purified by column chromatography (223 mg, 84%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 152.5–154.5 °C; 1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 7.55–7.50 (m, 2H), 7.49–7.45 (m, 1H), 7.34–7.28 (m, 2H), 7.16–7.09 (m, 2H), 7.02–6.98 (m, 1H), 6.97–6.92 (m, 2H), 6.64–6.56 (m, 2H), 6.50 (d, J = 15.6 Hz, 1H), 6.11 (dt, J = 15.2, 7.1 Hz, 1H), 3.29 (q, J = 9.2, 7.3 Hz, 4H), 3.21 (d, J = 7.2 Hz, 2H), 2.33 (s, 3H), 1.06 (t, J = 7.1 Hz, 6H) ppm; ^{13}C $\{^1H\}$ NMR (100 MHz, DMSO- d_6) δ 12.9, 21.5, 38.6, 44.2, 112.4, 125.5, 126.1, 126.5, 127.2, 127.3, 127.8, 128.1, 129.7, 130.0, 131.9, 133.6, 134.5, 138.0, 143.4, 146.4 ppm; HRMS (ESI) m/z calcd for $C_{26}H_{30}N_2O_2SNa^+[M + Na]^+$ 457.1920, found 457.1921.

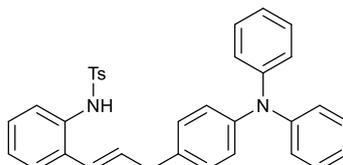
(E)-N-(2-(3-(4-(Diisopropylamino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3f).



The title compound was purified by column chromatography (214 mg, 76%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 124.0–126.0 °C; 1H NMR (400 MHz, DMSO- d_6) δ 9.66 (s, 1H), 7.54–7.50 (m, 2H), 7.50–7.47 (m, 1H), 7.34–7.28 (m, 2H), 7.15–7.10 (m, 2H), 7.01–6.98 (m, 1H), 6.98–6.93 (m, 2H), 6.83–6.76 (m, 2H), 6.51 (d, J = 15.7 Hz, 1H), 6.14 (dt, J = 15.1, 7.1 Hz, 1H), 3.77–3.62 (m, 2H), 3.24 (d, J = 7.1 Hz, 2H), 2.33 (s, 3H), 1.12 (d, J = 6.6 Hz, 12H). ppm; ^{13}C $\{^1H\}$ NMR (100 MHz, DMSO- d_6) δ

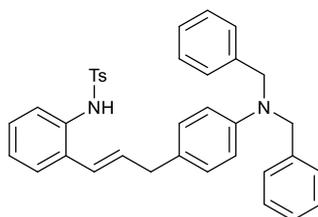
21.5, 21.7, 38.7, 47.5, 120.1, 125.7, 126.1, 127.2, 127.3, 127.8, 128.2, 128.9, 129.9, 130.0, 131.5, 133.6, 134.4, 137.9, 143.4, 146.3 ppm; HRMS (ESI) m/z calcd for $C_{28}H_{34}N_2O_2SNa^+[M + Na]^+$ 485.2233, found 485.2232.

(E)-N-(2-(3-(4-(Diphenylamino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3g).



The title compound was purified by column chromatography (165 mg, 51%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 143.3–145.3 °C; 1H NMR (400 MHz, $DMSO-d_6$) δ 9.67 (s, 1H), 7.55–7.48 (m, 3H), 7.34–7.22 (m, 6H), 7.17–7.08 (m, 4H), 7.04–6.92 (m, 9H), 6.55 (d, $J = 15.6$ Hz, 1H), 6.20 (dt, $J = 15.1, 7.1$ Hz, 1H), 3.33 (d, $J = 7.5$ Hz, 2H), 2.29 (s, 3H) ppm; ^{13}C $\{^1H\}$ NMR (100 MHz, $DMSO-d_6$) δ 21.5, 38.9, 123.1, 123.8, 124.9, 126.2, 126.4, 127.2, 127.3, 128.0, 128.2, 129.9, 130.0, 130.1, 130.7, 133.7, 134.3, 135.3, 137.9, 143.4, 145.8, 147.9 ppm; HRMS (ESI) m/z calcd for $C_{34}H_{30}N_2O_2SNa^+[M + Na]^+$ 553.1920, found 553.1921.

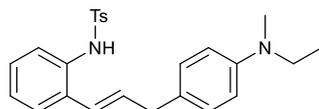
(E)-N-(2-(3-(4-(Dibenzylamino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3h).



The title compound was purified by column chromatography (276 mg, 81%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 137.8–139.8 °C; 1H NMR (400 MHz, $DMSO-d_6$) δ 9.64 (s, 1H), 7.52–7.45 (m, 2H), 7.48–7.41 (m, 1H), 7.36–7.20 (m, 12H), 7.15–7.07 (m, 2H), 7.04–6.96 (m, 1H), 6.91–6.85 (m, 2H), 6.65–6.58 (m, 2H), 6.45 (d, $J =$

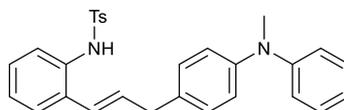
15.6 Hz, 1H), 6.09 (dt, $J = 14.8, 7.1$ Hz, 1H), 4.66 (s, 4H), 3.17 (d, $J = 7.1$ Hz, 2H), 2.25 (s, 3H) ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, DMSO- d_6) δ 21.4, 38.6, 54.9, 113.0, 125.6, 126.1, 127.2, 127.3, 127.6, 127.8, 128.2, 129.0, 129.5, 130.0, 131.5, 133.6, 134.4, 137.9, 139.7, 143.4, 147.1 ppm; HRMS (ESI) m/z calcd for $\text{C}_{36}\text{H}_{34}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 581.2233, found 581.2234.

(E)-N-(2-(3-(4-(Ethyl(methyl)amino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3i).



The title compound was purified by column chromatography (198 mg, 77%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 140.5–142.5 °C;MPMP ^1H NMR (400 MHz, DMSO- d_6) δ 9.66 (s, 1H), 7.54–7.50 (m, 2H), 7.49–7.45 (m, 1H), 7.34–7.27 (m, 2H), 7.15–7.08 (m, 2H), 7.02–6.93 (m, 3H), 6.67–6.61 (m, 2H), 6.50 (d, $J = 15.6$ Hz, 1H), 6.12 (dt, $J = 15.5, 7.1$ Hz, 1H), 3.35 (q, $J = 6.0$ Hz, 2H), 3.22 (d, $J = 7.1$ Hz, 2H), 2.81 (s, 3H), 2.33 (s, 3H), 1.00 (t, $J = 6.9$ Hz, 3H) ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, DMSO- d_6) δ 11.1, 21.5, 37.7, 38.6, 46.6, 113.0, 125.5, 126.1, 127.2, 127.3, 127.8, 128.1, 129.6, 130.0, 131.8, 133.6, 134.5, 138.0, 143.4, 147.8 ppm; HRMS (ESI) m/z calcd for $\text{C}_{25}\text{H}_{28}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 443.1764, found 443.1763.

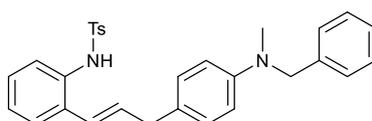
(E)-4-Methyl-N-(2-(3-(4-(methyl(phenyl)amino)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3j).



The title compound was purified by column chromatography (163 mg, 57%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 121.2–123.2 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.67 (s, 1H), 7.56–7.47 (m, 3H), 7.34–7.28 (m, 2H), 7.27–7.19 (m, 2H), 7.18–7.08 (m, 4H), 7.03–6.95 (m, 3H), 6.96–6.89 (m, 2H), 6.90–6.82 (m, 1H), 6.54 (d, $J = 15.7$ Hz, 1H), 6.18 (dt, $J = 15.1, 7.1$ Hz, 1H), 3.32 (d, $J = 6.7$ Hz, 2H), 3.23 (s, 3H), 2.31 (s,

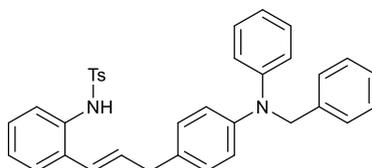
3H). ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, DMSO- d_6) δ 21.5, 38.8, 40.6, 119.1, 120.7, 122.1, 126.2, 126.2, 127.2, 127.3, 127.9, 128.2, 129.6, 129.9, 130.0, 131.0, 133.7, 133.9, 134.4, 137.9, 143.4, 147.3, 149.3 ppm; HRMS (ESI) m/z calcd for $\text{C}_{29}\text{H}_{28}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 491.1764, found 491.1764.

(*E*)-*N*-(2-(3-(4-(Benzyl(methyl)amino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3k).



The title compound was purified by column chromatography (221 mg, 75%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 97.7–99.7 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.67 (s, 1H), 7.56–7.50 (m, 2H), 7.50–7.45 (m, 1H), 7.35–7.27 (m, 4H), 7.26–7.18 (m, 3H), 7.18–7.10 (m, 2H), 7.06–6.99 (m, 1H), 6.99–6.94 (m, 2H), 6.72–6.65 (m, 2H), 6.51 (d, J = 15.6 Hz, 1H), 6.13 (dt, J = 15.1, 7.1 Hz, 1H), 4.54 (s, 2H), 3.23 (d, J = 7.1 Hz, 2H), 2.99 (s, 3H), 2.32 (s, 3H). ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, DMSO- d_6) δ 21.5, 38.6, 39.2, 56.0, 112.8, 125.6, 126.1, 127.1, 127.2, 127.3, 127.5, 127.8, 128.2, 128.9, 129.5, 130.0, 131.7, 133.6, 134.5, 137.9, 139.7, 143.4, 148.1 ppm; HRMS (ESI) m/z calcd for $\text{C}_{30}\text{H}_{30}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 505.1920, found 505.1921.

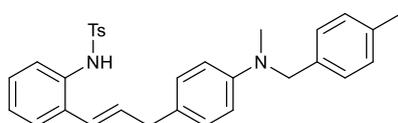
(*E*)-*N*-(2-(3-(4-(Benzyl(phenyl)amino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3l).



The title compound was purified by column chromatography (223 mg, 67%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 140.3–142.3 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.66 (s, 1H), 7.53–7.48 (m, 3H), 7.34–7.28 (m, 6H), 7.23–7.17 (m, 3H), 7.15–7.11 (m, 2H), 7.10–7.04 (m, 4H), 7.01–6.95 (m, 3H), 6.88–6.80 (m, 1H), 6.52 (d, J = 15.7

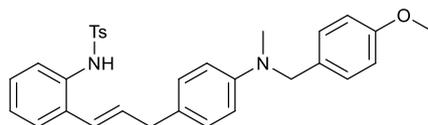
Hz, 1H), 6.17 (dt, $J = 15.6, 7.1$ Hz, 1H), 4.99 (s, 2H), 3.29 (d, $J = 7.1$ Hz, 2H), 2.28 (s, 3H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.5, 38.8, 55.8, 119.4, 120.8, 122.1, 126.1, 126.2, 127.0, 127.2, 127.3, 127.9, 128.2, 129.0, 129.7, 129.9, 130.0, 130.9, 133.6, 133.8, 134.3, 137.9, 139.7, 143.4, 146.1, 148.3 ppm; HRMS (ESI) m/z calcd for $\text{C}_{35}\text{H}_{32}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 567.2077, found 567.2076.

(*E*)-4-Methyl-*N*-(2-(3-(4-(methyl(4-methylbenzyl)amino)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3m).



The title compound was purified by column chromatography (251 mg, 83%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 105.7–107.7 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 7.55–7.47 (m, 2H), 7.50–7.42 (m, 1H), 7.33–7.24 (m, 2H), 7.22–7.07 (m, 3H), 7.05–6.91 (m, 6H), 6.70–6.61 (m, 2H), 6.49 (d, $J = 15.7$ Hz, 1H), 6.11 (dt, $J = 16.4, 8.9$ Hz, 1H), 4.48 (s, 2H), 3.21 (d, $J = 7.0$ Hz, 2H), 2.96 (s, 3H), 2.30 (s, 3H), 2.25 (s, 3H). ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.5, 21.6, 38.6, 39.2, 56.1, 112.8, 124.3, 125.6, 126.1, 127.2, 127.3, 127.4, 127.8, 127.9, 128.2, 128.8, 129.5, 130.0, 131.7, 133.6, 134.5, 138.0, 139.7, 143.4, 148.2 ppm; HRMS (ESI) m/z calcd for $\text{C}_{31}\text{H}_{32}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 519.2077, found 519.2076.

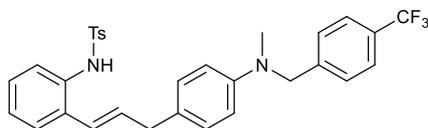
(*E*)-*N*-(2-(3-(4-(4-Methoxybenzyl)(methyl)amino)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3n).



The title compound was purified by column chromatography (247 mg, 79%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 115.6–117.6 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 7.53–7.49 (m, 2H), 7.49–7.45 (m, 1H), 7.33–7.26 (m, 2H), 7.17–7.07

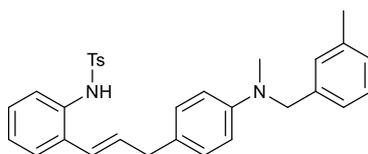
(m, 4H), 7.01–6.97 (m, 1H), 6.97–6.93 (m, 2H), 6.90–6.81 (m, 2H), 6.71–6.63 (m, 2H), 6.49 (d, $J = 15.6$ Hz, 1H), 6.11 (dt, $J = 15.5, 7.1$ Hz, 1H), 4.45 (s, 2H), 3.70 (s, 3H), 3.22 (d, $J = 7.0$ Hz, 2H), 2.93 (s, 3H), 2.31 (s, 3H) ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, DMSO- d_6) δ 21.5, 38.6, 39.0, 55.5, 113.0, 114.3, 125.6, 126.1, 127.2, 127.3, 127.5, 127.8, 128.2, 128.6, 129.5, 130.0, 131.3, 131.7, 133.6, 134.5, 137.9, 143.4, 148.2, 158.6 ppm; HRMS (ESI) m/z calcd for $\text{C}_{31}\text{H}_{32}\text{N}_2\text{O}_3\text{SNa}^+[\text{M} + \text{Na}]^+$ 535.2026, found 535.2027.

(*E*)-4-Methyl-*N*-(2-(3-(4-(methyl(4-(trifluoromethyl)benzyl)amino)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3o).



The title compound was purified by column chromatography (178 mg, 53%, petroleum ether/EtOAc = 5:1 v/v). Pale yellow solid, mp 132.9–134.9 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 7.70–7.63 (m, 2H), 7.54–7.49 (m, 2H), 7.48–7.45 (m, 1H), 7.43–7.38 (m, 2H), 7.32–7.26 (m, 2H), 7.17–7.07 (m, 2H), 7.03–6.93 (m, 3H), 6.70–6.61 (m, 2H), 6.49 (d, $J = 15.6$ Hz, 1H), 6.11 (dt, $J = 15.1, 7.1$ Hz, 1H), 4.63 (s, 2H), 3.22 (d, $J = 7.0$ Hz, 2H), 3.01 (s, 3H), 2.29 (s, 3H) ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, DMSO- d_6) δ 21.4, 38.6, 39.3, 55.7, 112.8, 125.6, 125.8, 125.8, 126.1, 127.2, 127.3, 127.8, 127.8, 128.0, 128.2, 129.6, 130.0, 131.6, 133.6, 134.5, 137.9, 143.4, 144.9, 147.8 ppm; HRMS (ESI) m/z calcd for $\text{C}_{31}\text{H}_{29}\text{F}_3\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 573.1794, found 573.1793.

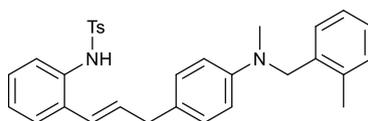
(*E*)-4-Methyl-*N*-(2-(3-(4-(methyl(3-methylbenzyl)amino)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3p).



The title compound was purified by column chromatography (200 mg, 66%, petroleum

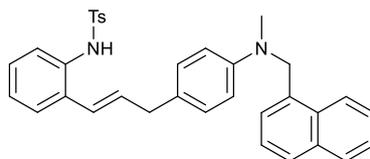
ether/EtOAc = 5:1 v/v). White solid, mp 93.6–95.6 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.65 (s, 1H), 7.53–7.48 (m, 2H), 7.48–7.43 (m, 1H), 7.32–7.26 (m, 2H), 7.15–7.05 (m, 6H), 7.01–6.97 (m, 1H), 6.97–6.92 (m, 2H), 6.68–6.62 (m, 2H), 6.48 (d, *J* = 15.6 Hz, 1H), 6.10 (dt, *J* = 15.0, 7.1 Hz, 1H), 4.47 (s, 2H), 3.21 (d, 2H), 2.94 (s, 3H), 2.30 (s, 3H), 2.24 (s, 3H) ppm; ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ 21.2, 21.5, 38.6, 39.1, 55.8, 112.9, 125.6, 126.1, 127.2, 127.3, 127.3, 127.4, 127.8, 128.2, 129.5, 129.5, 130.0, 131.7, 133.6, 134.5, 136.2, 136.5, 137.9, 143.4, 148.1 ppm; HRMS (ESI) *m/z* calcd for C₃₁H₃₂N₂O₂SNa⁺[M + Na]⁺ 519.2077, found 519.2078.

(*E*)-4-Methyl-*N*-(2-(3-(4-(methyl(2-methylbenzyl)amino)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3q).



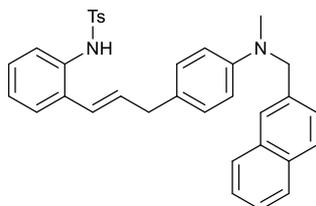
The title compound was purified by column chromatography (176 mg, 58%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 142.8–144.8 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.65 (s, 1H), 7.53–7.49 (m, 2H), 7.48–7.44 (m, 1H), 7.32–7.25 (m, 2H), 7.20–7.15 (m, 1H), 7.13–7.06 (m, 4H), 7.01–6.97 (m, 1H), 6.97–6.90 (m, 3H), 6.65–6.57 (m, 2H), 6.49 (d, *J* = 15.6 Hz, 1H), 6.12 (dt, *J* = 15.4, 7.2 Hz, 1H), 4.46 (s, 2H), 3.22 (d, *J* = 7.1 Hz, 2H), 2.97 (s, 3H), 2.29 (s, 3H), 2.28 (s, 2H) ppm; ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ 19.1, 21.5, 38.6, 38.9, 54.1, 112.4, 125.6, 126.1, 126.2, 126.4, 126.9, 127.2, 127.3, 127.3, 127.8, 128.2, 129.6, 130.0, 130.7, 131.7, 133.6, 134.5, 136.0, 137.0, 137.9, 143.4, 148.2 ppm; HRMS (ESI) *m/z* calcd for C₃₁H₃₂N₂O₂SNa⁺[M + Na]⁺ 519.2077, found 519.2078.

(*E*)-4-Methyl-*N*-(2-(3-(4-(methyl(naphthalen-1-ylmethyl)amino)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3r).



The title compound was purified by column chromatography (240 mg, 74%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 141.1–143.1 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 8.11–8.05 (m, 1H), 7.99–7.93 (m, 1H), 7.84–7.79 (m, 1H), 7.60–7.53 (m, 2H), 7.52–7.48 (m, 2H), 7.48–7.45 (m, 1H), 7.43–7.38 (m, 1H), 7.30–7.26 (m, 2H), 7.19–7.16 (m, 1H), 7.15–7.10 (m, 2H), 7.01–6.98 (m, 1H), 6.98–6.95 (m, 2H), 6.70–6.64 (m, 2H), 6.49 (d, J = 15.7 Hz, 1H), 6.12 (dt, J = 15.1, 7.1 Hz, 1H), 4.99 (s, 2H), 3.22 (d, J = 7.1 Hz, 2H), 3.03 (s, 3H), 2.27 (s, 3H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.4, 38.6, 39.0, 54.0, 112.5, 123.6, 124.1, 125.6, 126.0, 126.1, 126.3, 126.6, 127.2, 127.3, 127.5, 127.6, 127.8, 128.1, 129.1, 129.6, 130.0, 131.4, 131.7, 133.6, 134.0, 134.1, 134.5, 138.0, 143.4, 148.2 ppm; HRMS (ESI) m/z calcd for $\text{C}_{34}\text{H}_{32}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 555.2077, found 555.2078.

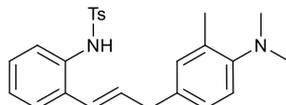
(*E*)-4-Methyl-*N*-(2-(3-(4-(methyl(naphthalen-2-ylmethyl)amino)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3s).



The title compound was purified by column chromatography (266 mg, 82%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 135.0–137.0 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 7.89–7.83 (m, 2H), 7.83–7.79 (m, 1H), 7.72–7.67 (m, 1H), 7.53–7.49 (m, 2H), 7.49–7.43 (m, 3H), 7.41–7.35 (m, 1H), 7.31–7.24 (m, 2H), 7.15–7.09 (m, 2H), 7.02–6.98 (m, 1H), 6.98–6.93 (m, 2H), 6.75–6.69 (m, 2H), 6.49 (d, J = 15.6 Hz, 1H), 6.10 (dt, J = 15.1, 7.1 Hz, 1H), 4.68 (s, 2H), 3.21 (d, J = 7.1 Hz, 2H), 3.04 (s, 3H), 2.27 (s, 3H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.4, 38.6, 39.3, 56.4, 112.9, 125.4, 125.6, 126.0, 126.0, 126.1, 126.6, 127.2, 127.3, 127.6, 127.8, 128.0, 128.0, 128.2,

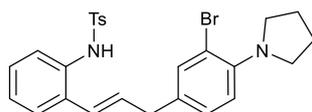
128.6, 129.6, 130.0, 131.7, 132.7, 133.5, 133.6, 134.5, 137.5, 138.0, 143.4, 148.2 ppm;
HRMS (ESI) m/z calcd for $C_{34}H_{33}N_2O_2S^+[M + H]^+$ 533.2257, found 533.2260.

(E)-N-(2-(3-(4-(Dimethylamino)-3-methylphenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3t).



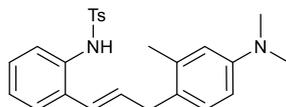
The title compound was purified by column chromatography (128 mg, 50%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 139.9–141.9 °C; 1H NMR (400 MHz, DMSO- d_6) δ 9.65 (s, 1H), 7.52 (d, J = 8.2 Hz, 2H), 7.50–7.46 (m, 1H), 7.30 (d, J = 8.0 Hz, 2H), 7.17–7.08 (m, 2H), 7.02–6.89 (m, 4H), 6.53 (d, J = 15.8 Hz, 1H), 6.14 (dt, J = 15.7, 7.1 Hz, 1H), 3.26 (d, J = 7.1 Hz, 2H), 2.59 (s, 6H), 2.32 (s, 3H), 2.24 (s, 3H) ppm; ^{13}C { 1H } NMR (100 MHz, DMSO- d_6) δ 18.5, 21.5, 38.9, 44.5, 118.8, 126.0, 126.2, 126.9, 127.2, 127.3, 127.9, 128.1, 130.0, 131.2, 131.5, 131.9, 133.6, 134.1, 134.5, 137.9, 143.4, 151.1 ppm; HRMS (ESI) m/z calcd for $C_{25}H_{28}N_2O_2SNa^+[M + Na]^+$ 443.1764, found 443.1763.

(E)-N-(2-(3-(3-Bromo-4-(pyrrolidin-1-yl)phenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3u).



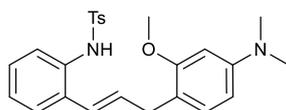
The title compound was purified by column chromatography (200 mg, 64%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 136.9–138.9 °C; 1H NMR (400 MHz, DMSO- d_6) δ 9.66 (s, 1H), 7.54–7.46 (m, 3H), 7.36–7.33 (m, 1H), 7.32–7.27 (m, 2H), 7.17–7.10 (m, 2H), 7.08–7.04 (m, 1H), 7.02–6.98 (m, 1H), 6.97–6.93 (m, 1H), 6.51 (d, J = 15.7 Hz, 1H), 6.13 (dt, J = 15.6, 7.1 Hz, 1H), 3.27 (d, J = 7.0 Hz, 2H), 3.25–3.20 (m, 4H), 2.32 (s, 3H), 1.91–1.79 (m, 4H) ppm; ^{13}C { 1H } NMR (100 MHz, DMSO- d_6) δ 20.9, 24.5, 37.6, 50.8, 113.5, 118.4, 125.6, 125.8, 126.7, 126.8, 127.5, 127.6, 128.2, 129.5, 130.1, 133.1, 133.4, 133.7, 137.3, 142.9, 146.5 ppm; HRMS (ESI) m/z calcd for $C_{26}H_{27}BrN_2O_2SNa^+[M + Na]^+$ 533.0869, found 533.0867.

(E)-N-(2-(3-(4-(Dimethylamino)-2-methylphenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3v).



The title compound was purified by column chromatography (139 mg, 54%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 132.3–134.3 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.62 (s, 1H), 7.50 (d, *J* = 7.8 Hz, 2H), 7.48–7.43 (m, 1H), 7.30 (d, *J* = 7.8 Hz, 2H), 7.15–7.08 (m, 2H), 6.98–6.93 (m, 1H), 6.93–6.89 (m, 1H), 6.57–6.49 (m, 3H), 6.07 (dt, *J* = 15.0, 6.9 Hz, 1H), 3.23 (d, *J* = 6.9 Hz, 2H), 2.84 (s, 6H), 2.34 (s, 3H), 2.21 (s, 3H) ppm; ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ 20.2, 21.5, 36.3, 40.9, 111.0, 115.0, 125.6, 126.2, 126.3, 127.2, 127.3, 127.8, 128.1, 130.0, 131.3, 133.5, 134.8, 136.6, 138.0, 143.4, 149.7 ppm; HRMS (ESI) *m/z* calcd for C₂₅H₂₈N₂O₂SNa⁺[M + Na]⁺ 443.1764, found 443.1764.

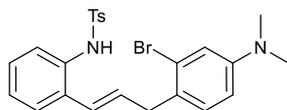
(E)-N-(2-(3-(4-(Dimethylamino)-2-methoxyphenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3w).



The title compound was purified by column chromatography (173 mg, 65%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 112.8–114.8 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.61 (s, 1H), 7.51 (d, *J* = 8.0 Hz, 2H), 7.46–7.40 (m, 1H), 7.33–7.26 (m, 2H), 7.16–7.07 (m, 2H), 6.99–6.92 (m, 1H), 6.85 (d, *J* = 8.3 Hz, 1H), 6.52 (d, *J* = 15.6 Hz, 1H), 6.35–6.29 (m, 1H), 6.28–6.22 (m, 1H), 6.08 (dt, *J* = 15.7, 7.1 Hz, 1H), 3.79 (s, 3H), 3.20 (d, *J* = 6.9 Hz, 2H), 2.87 (s, 6H), 2.33 (s, 3H) ppm; ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ 21.5, 32.9, 41.0, 55.7, 96.9, 105.1, 116.1, 125.6, 126.1, 127.2, 127.3, 127.7, 128.0, 130.0, 130.2, 131.4, 133.5, 134.8, 138.0, 143.4, 151.1, 157.9 ppm; HRMS (ESI) *m/z* calcd for C₂₅H₂₈N₂O₃SNa⁺[M + Na]⁺ 459.1713, found 459.1712.

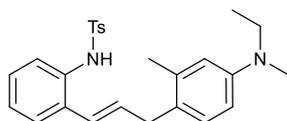
(E)-N-(2-(3-(2-Bromo-4-(dimethylamino)phenyl)prop-1-en-1-yl)phenyl)-4-

methylbenzenesulfonamide (3x).



The title compound was purified by column chromatography (225 mg, 76%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 134.4–136.4 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.64 (s, 1H), 7.50 (d, 2H), 7.47–7.43 (m, 1H), 7.30 (d, 2H), 7.17–7.11 (m, 2H), 7.08–7.03 (m, 1H), 7.01–6.98 (m, 1H), 6.89–6.86 (m, 1H), 6.74–6.68 (m, 1H), 6.55 (d, *J* = 15.7 Hz, 1H), 6.07 (dt, *J* = 15.6, 7.0 Hz, 1H), 3.33 (d, *J* = 6.6 Hz, 2H), 2.87 (s, 6H), 2.33 (s, 3H) ppm; ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ 21.5, 38.5, 40.6, 112.7, 115.9, 124.9, 126.1, 126.2, 126.6, 127.2, 127.3, 128.0, 128.1, 129.9, 130.0, 131.2, 133.6, 134.5, 137.9, 143.4, 150.6 ppm; HRMS (ESI) *m/z* calcd for C₂₄H₂₅BrN₂O₂SNa⁺[M + Na]⁺ 507.0712, found 507.0715.

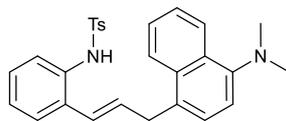
(*E*)-*N*-(2-(3-(4-(Diethylamino)-2-methylphenyl)prop-1-en-1-yl)phenyl)-4-methylbenzenesulfonamide (3y).



The title compound was purified by column chromatography (213 mg, 78%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 143.5–145.5 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.62 (s, 1H), 7.51 (d, 2H), 7.48–7.44 (m, 1H), 7.30 (d, 2H), 7.15–7.08 (m, 2H), 7.00–6.92 (m, 1H), 6.90–6.85 (m, 1H), 6.55–6.49 (m, 1H), 6.49–6.42 (m, 2H), 6.07 (dt, *J* = 15.2, 7.1 Hz, 1H), 3.28 (q, *J* = 7.2 Hz, 4H), 3.21 (d, *J* = 7.0 Hz, 2H), 2.33 (s, 3H), 2.19 (s, 3H), 1.06 (t, *J* = 7.1 Hz, 6H) ppm; ¹³C {¹H} NMR (100 MHz, DMSO-*d*₆) δ 13.0, 20.3, 21.5, 36.3, 44.1, 110.2, 114.2, 125.1, 125.5, 126.2, 127.2, 127.3, 127.7, 128.1, 130.0, 130.3, 131.4, 133.5, 134.8, 136.8, 138.0, 143.4, 146.5 ppm; HRMS (ESI) *m/z* calcd for C₂₇H₃₂N₂O₂SNa⁺[M + Na]⁺ 471.2077, found 471.2075.

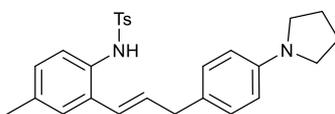
(*E*)-*N*-(2-(3-(4-(Dimethylamino)naphthalen-1-yl)prop-1-en-1-yl)phenyl)-4-

methylbenzenesulfonamide (3z).



The title compound was purified by column chromatography (148 mg, 53%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 151.5–153.5 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.67 (s, 1H), 8.25–8.17 (m, 1H), 8.10–8.03 (m, 1H), 7.58–7.47 (m, 4H), 7.46–7.42 (m, 1H), 7.29–7.23 (m, 3H), 7.15–7.06 (m, 3H), 7.02–6.95 (m, 1H), 6.71 (d, J = 15.7 Hz, 1H), 6.24 (dt, J = 15.1, 6.9 Hz, 1H), 3.74 (d, J = 6.9 Hz, 2H), 2.80 (s, 6H), 2.28 (s, 3H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.5, 36.4, 45.5, 124.8, 124.9, 125.4, 126.2, 126.4, 126.6, 126.7, 127.2, 127.3, 127.9, 128.0, 129.0, 130.0, 130.9, 131.0, 133.1, 133.6, 134.4, 137.9, 143.4, 149.9 ppm; HRMS (ESI) m/z calcd for $\text{C}_{28}\text{H}_{28}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 479.1764, found 479.1764.

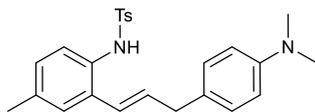
(*E*)-4-Methyl-*N*-(2-methyl-6-(3-(4-(pyrrolidin-1-yl)phenyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (3ba).



The title compound was purified by column chromatography (223 mg, 82%, petroleum ether/EtOAc = 5:1 v/v). Pale brown solid, mp 170.8–172.8°C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.52 (s, 1H), 7.54–7.47 (m, 2H), 7.31 (d, J = 7.9 Hz, 2H), 7.27 (s, 1H), 6.95 (d, J = 8.2 Hz, 2H), 6.92 (d, J = 8.0 Hz, 1H), 6.84 (d, J = 8.1 Hz, 1H), 6.51–6.40 (m, 3H), 6.09 (dt, J = 15.1, 7.1 Hz, 1H), 3.24–3.14 (m, 6H), 2.34 (s, 3H), 2.21 (s, 3H), 1.99–1.88 (m, 4H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.1, 21.5, 25.4, 38.7, 47.9, 112.3, 125.5, 126.4, 126.7, 127.2, 128.4, 128.5, 129.5, 130.0, 131.0, 131.6, 134.5, 136.6, 138.0, 143.3, 146.8 ppm; HRMS (ESI) m/z calcd for $\text{C}_{27}\text{H}_{30}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 469.1920, found 469.1921.

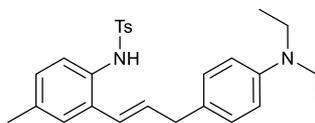
(*E*)-*N*-(2-(3-(4-(Dimethylamino)phenyl)prop-1-en-1-yl)-6-methylphenyl)-4-

methylbenzenesulfonamide (3be).



The title compound was purified by column chromatography (156 mg, 61%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 184.8–186.8 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.52 (s, 1H), 7.53–7.46 (m, 2H), 7.34–7.25 (m, 3H), 7.02–6.95 (m, 2H), 6.92 (d, J = 8.2 Hz, 1H), 6.84 (d, J = 8.2 Hz, 1H), 6.71–6.63 (m, 2H), 6.45 (d, J = 15.6 Hz, 1H), 6.09 (dt, J = 14.9, 7.1 Hz, 1H), 3.21 (d, J = 7.0 Hz, 2H), 2.85 (s, 6H), 2.34 (s, 3H), 2.21 (s, 3H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.0, 21.5, 38.6, 40.9, 113.2, 125.6, 126.4, 127.2, 127.9, 128.4, 128.5, 129.4, 130.0, 131.0, 131.4, 134.5, 136.6, 138.0, 143.3, 149.6 ppm; HRMS (ESI) m/z calcd for $\text{C}_{25}\text{H}_{28}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 443.1764, found 443.1765.

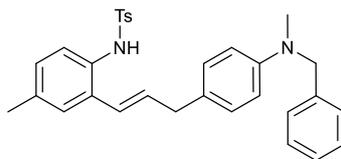
(E)-N-(2-(3-(4-(Diethylamino)phenyl)prop-1-en-1-yl)-6-methylphenyl)-4-methylbenzenesulfonamide (3bf).



The title compound was purified by column chromatography (203 mg, 74%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 132.3–134.3 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.53 (s, 1H), 7.51 (d, J = 7.9 Hz, 2H), 7.30 (d, J = 8.2 Hz, 2H), 7.28 (s, 1H), 6.98–6.89 (m, 3H), 6.89–6.82 (m, 1H), 6.63–6.56 (m, 2H), 6.45 (d, J = 15.6 Hz, 1H), 6.09 (dt, J = 15.1, 7.1 Hz, 1H), 3.29 (q, J = 7.1 Hz, 4H), 3.19 (d, J = 7.1 Hz, 2H), 2.33 (s, 3H), 2.21 (s, 3H), 1.06 (t, J = 6.9 Hz, 6H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 12.9, 21.0, 21.5, 38.6, 44.2, 112.4, 125.5, 126.4, 126.6, 127.2, 128.4, 128.5, 129.7, 130.0, 131.0, 131.5, 134.5, 136.6, 138.0, 143.3, 146.4 ppm; HRMS (ESI) m/z calcd for $\text{C}_{27}\text{H}_{32}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 471.2077, found 471.2077.

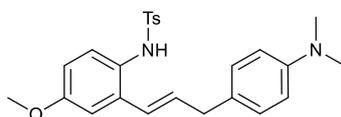
(E)-N-(2-(3-(4-(Benzyl(methyl)amino)phenyl)prop-1-en-1-yl)-6-methylphenyl)-4-

methylbenzenesulfonamide (3bk).



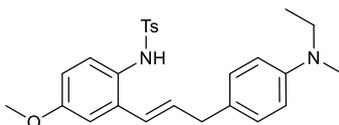
The title compound was purified by column chromatography (203 mg, 67%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 136.1–138.1 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.52 (s, 1H), 7.53–7.46 (m, 2H), 7.32–7.26 (m, 5H), 7.24–7.16 (m, 3H), 6.97–6.89 (m, 3H), 6.85 (d, J = 8.4 Hz, 1H), 6.70–6.63 (m, 2H), 6.43 (d, J = 15.7 Hz, 1H), 6.09 (dt, J = 15.0, 7.1 Hz, 1H), 4.53 (s, 2H), 3.19 (d, J = 7.1 Hz, 2H), 2.97 (s, 3H), 2.30 (s, 3H), 2.20 (s, 3H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.0, 21.5, 38.6, 39.2, 56.0, 112.8, 125.6, 126.4, 127.1, 127.2, 127.3, 127.5, 128.4, 128.5, 128.9, 129.5, 130.0, 131.0, 131.4, 134.4, 136.6, 138.0, 139.7, 143.3, 148.1 ppm; HRMS (ESI) m/z calcd for $\text{C}_{31}\text{H}_{32}\text{N}_2\text{O}_2\text{SNa}^+[\text{M} + \text{Na}]^+$ 519.2077, found 519.2080.

(E)-N-(2-(3-(4-(Dimethylamino)phenyl)prop-1-en-1-yl)-4-methoxyphenyl)-4-methylbenzenesulfonamide (3ce).



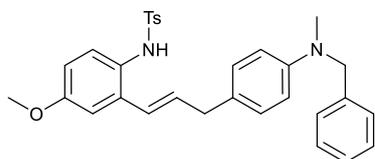
The title compound was purified by column chromatography (173 mg, 65%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 148.6–150.6 °C; ^1H NMR (400 MHz, DMSO- d_6) δ 9.43 (s, 1H), 7.52–7.47 (m, 2H), 7.34–7.29 (m, 2H), 7.01–6.95 (m, 3H), 6.87–6.81 (m, 1H), 6.74–6.64 (m, 3H), 6.43 (d, J = 15.7 Hz, 1H), 6.17 (dt, J = 15.1, 7.1 Hz, 1H), 3.70 (s, 3H), 3.21 (d, J = 7.0 Hz, 2H), 2.85 (s, 6H), 2.34 (s, 3H) ppm; ^{13}C { ^1H } NMR (100 MHz, DMSO- d_6) δ 21.5, 38.6, 40.9, 55.7, 109.9, 113.2, 114.1, 125.7, 126.4, 127.3, 127.8, 129.5, 130.0, 130.4, 131.8, 136.5, 138.0, 143.3, 149.6, 158.5 ppm; HRMS (ESI) m/z calcd for $\text{C}_{25}\text{H}_{28}\text{N}_2\text{O}_3\text{SNa}^+[\text{M} + \text{Na}]^+$ 459.1713, found 459.1713.

(E)-N-(2-(3-(4-(Diethylamino)phenyl)prop-1-en-1-yl)-4-methoxyphenyl)-4-methylbenzenesulfonamide (3cf).



The title compound was purified by column chromatography (232 mg, 82%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 107.9–109.9 °C; ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 9.44 (s, 1H), 7.53–7.46 (m, 2H), 7.34–7.28 (m, 2H), 7.00–6.91 (m, 3H), 6.88–6.81 (m, 1H), 6.74–6.66 (m, 1H), 6.63–6.56 (m, 2H), 6.42 (d, J = 15.6 Hz, 1H), 6.17 (dt, J = 15.0, 7.0 Hz, 1H), 3.70 (s, 3H), 3.34–3.24 (m, 4H), 3.19 (d, J = 7.0 Hz, 2H), 2.33 (s, 3H), 1.10–1.01 (m, 6H) ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, $\text{DMSO-}d_6$) δ 12.9, 21.5, 38.6, 44.2, 55.7, 109.9, 112.4, 114.1, 125.5, 126.4, 126.5, 127.3, 129.8, 130.0, 130.4, 131.9, 136.4, 137.9, 143.3, 146.4, 158.5 ppm; HRMS (ESI) m/z calcd for $\text{C}_{27}\text{H}_{32}\text{N}_2\text{O}_3\text{SNa}^+[\text{M} + \text{Na}]^+$ 487.2026, found 487.2030.

(*E*)-*N*-(2-(3-(4-(Diethylamino)phenyl)prop-1-en-1-yl)-4-methoxyphenyl)-4-methylbenzenesulfonamide (3ck).



The title compound was purified by column chromatography (231 mg, 72%, petroleum ether/EtOAc = 5:1 v/v). White solid, mp 113.4–115.4 °C; ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 9.43 (s, 1H), 7.52–7.45 (m, 2H), 7.32–7.27 (m, 4H), 7.25–7.16 (m, 3H), 7.00–6.91 (m, 3H), 6.88–6.81 (m, 1H), 6.74–6.62 (m, 3H), 6.41 (d, J = 15.7 Hz, 1H), 6.17 (dt, J = 15.1, 7.1 Hz, 1H), 4.53 (s, 2H), 3.70 (s, 3H), 3.19 (d, J = 7.0 Hz, 2H), 2.97 (s, 3H), 2.30 (s, 3H) ppm; ^{13}C $\{^1\text{H}\}$ NMR (100 MHz, $\text{DMSO-}d_6$) δ 21.5, 38.6, 39.2, 55.7, 56.0, 109.9, 112.8, 114.1, 125.7, 126.4, 127.1, 127.3, 127.3, 127.4, 128.9, 129.6, 130.0, 130.4, 131.7, 136.4, 138.0, 139.7, 143.2, 148.1, 158.5 ppm; HRMS (ESI) m/z calcd for $\text{C}_{32}\text{H}_{34}\text{N}_2\text{O}_3\text{SNa}^+[\text{M} + \text{Na}]^+$ 549.2182, found 549.2183.

3. References

1 K. Wang, B. Wang, X. Liu, H. Fan, Y. Liu and C. Li, Palladium-Catalyzed Enantioselective Linear Allylic Alkylation of Vinyl Benzoxazinanes: An Inner-Sphere Mechanism, *Chin. J. Catal.*, 2021, **42**, 1227–1237.

2 (a) A. Runemark, S. C. Zacharias and H. Sundén, Visible-Light-Driven Stereoselective Annulation of Alkyl Anilines and Dibenzoylethylenes via Electron Donor–Acceptor Complexes, *J. Org. Chem.*, 2021, **86**, 1901–1910; (b) G. Perumal, M. Kandasamy, B. Ganesan, K. Govindan, H. Sathya, G. C. Senadi, Y.-C. Wu and W.-Y. Lin, Visible Light-Induced *N*-Methyl Activation of Unsymmetric Tertiary Amines, *Tetrahedron*, 2021, **80**, 131891.

4. X-Ray Structure for compounds

(1) ORTEP drawing of the X-ray crystallographic structure of compound **3a** (40% probability ellipsoids)

The single crystal of compound **3a** was prepared from its solution in petrol ether/ ethyl acetate (2:1) by slow evaporation of the solvent (Table 1). Crystal structure information has been deposited at the Cambridge Crystallographic Data Centre, CCDC: 2503683.

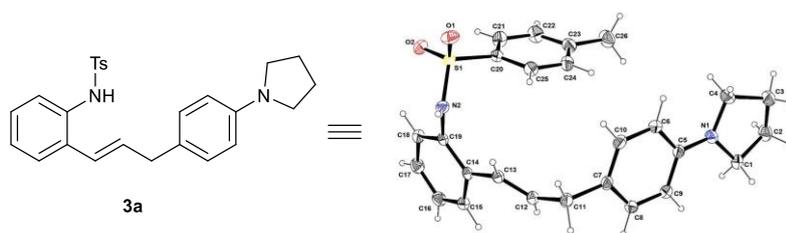


Table 1. Crystal data and structure refinement for **3a**

identification code	3a
Empirical formula	C ₂₆ H ₂₈ N ₂ O ₂ S

Formula weight	432.56
Temperature/K	170.00
Crystal system	triclinic
Space group	P-1
a/Å	9.0572(2)
b/Å	10.2952(2)
c/Å	12.7767(2)
α /°	103.5580(10)
β /°	103.1660(10)
γ /°	91.4260(10)
Volume/Å ³	1123.87(4)
Z	2
$\rho_{\text{calc}}/\text{cm}^3$	1.278
μ/mm^{-1}	0.986
F(000)	460.0
Crystal size/mm ³	0.17 × 0.11 × 0.08
Radiation	GaK α (λ = 1.34139)
2 Θ range for data collection/°	8.714 to 109.97
Index ranges	-11 ≤ h ≤ 11, -12 ≤ k ≤ 12, -15 ≤ l ≤ 15
Reflections collected	25793
Independent reflections	4219 [R_{int} = 0.0375, R_{sigma} = 0.0259]
Data/restraints/parameters	4219/0/281
Goodness-of-fit on F ²	1.064
Final R indexes [$I \geq 2\sigma(I)$]	R_1 = 0.0359, wR_2 = 0.0961
Final R indexes [all data]	R_1 = 0.0371, wR_2 = 0.0969
Largest diff. peak/hole / e Å ⁻³	0.45/-0.39

For detailed crystallographic data, please refer to the Cambridge Crystallographic Data

Centre at <http://ccdc.cam.ac.uk>.

(2) ORTEP drawing of the X-ray crystallographic structure of compound 3cf (40% probability ellipsoids)

The single crystal of compound **3cf** was prepared from its solution in petrol ether/ ethyl acetate (2:1) by slow evaporation of the solvent (Table 2). Crystal structure information has been deposited at the Cambridge Crystallographic Data Centre, CCDC: 2503680.

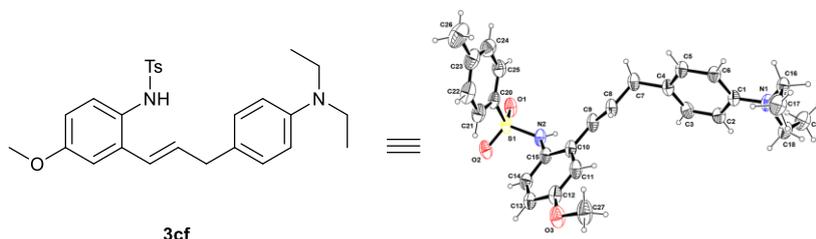


Table 2. Crystal data and structure refinement for **3cf**

Identification code	3cf
Empirical formula	C₂₇H₃₂N₂O₃S
Formula weight	464.60
Temperature/K	170.00
Crystal system	triclinic
Space group	P-1
a/Å	12.2265(5)
b/Å	15.2362(7)
c/Å	21.6873(10)
α /°	99.087(2)
β /°	95.790(2)
γ /°	107.587(2)
Volume/Å ³	3755.2(3)
Z	6

$\rho_{\text{calc}}/\text{cm}^3$	1.233
μ/mm^{-1}	0.927
F(000)	1488.0
Crystal size/ mm^3	$0.15 \times 0.12 \times 0.05$
Radiation	GaK α ($\lambda = 1.34139$)
2Θ range for data collection/ $^\circ$	5.402 to 110.264
Index ranges	$-14 \leq h \leq 14, -18 \leq k \leq 18, -25 \leq l \leq 26$
Reflections collected	63335
Independent reflections	14257 [$R_{\text{int}} = 0.0766, R_{\text{sigma}} = 0.0601$]
Data/restraints/parameters	14257/609/1050
Goodness-of-fit on F^2	1.032
Final R indexes [$I \geq 2\sigma(I)$]	$R_1 = 0.0704, wR_2 = 0.1903$
Final R indexes [all data]	$R_1 = 0.1140, wR_2 = 0.2238$
Largest diff. peak/hole / $e \text{ \AA}^{-3}$	0.61/-0.68

For detailed crystallographic data, please refer to the Cambridge Crystallographic Data Centre at <http://ccdc.cam.ac.uk>.

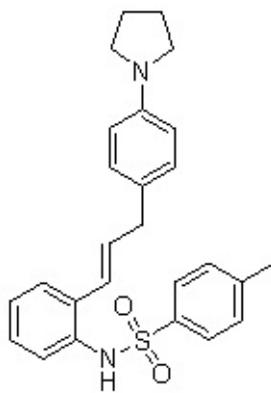
5. Copies of NMR Reports of New Compounds

NMR spectra of compound 3a

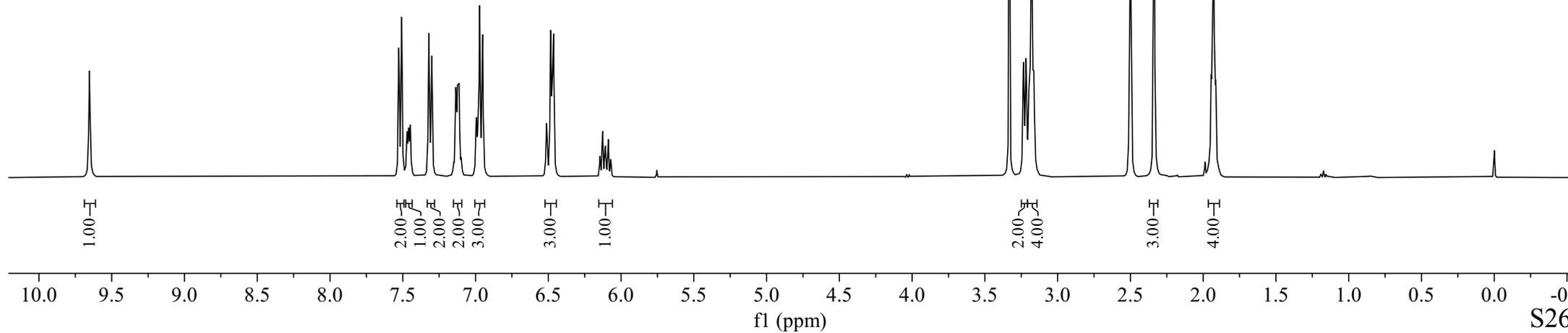
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7.136
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7.124
7.117
7.112
7.099
6.995
6.990
6.983
6.972
6.951
6.512
6.485
6.472
6.464
6.145
6.127
6.108
6.088
6.070

3.235
3.217
3.195
3.179
3.163

2.338
1.946
1.938
1.930
1.921
1.913



(¹H NMR, 400 MHz, DMSO-d₆)



NMR spectra of compound 3a

146.838
143.392
137.976
134.566
133.586
131.947
130.020
129.529
128.130
127.800
127.287
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126.558
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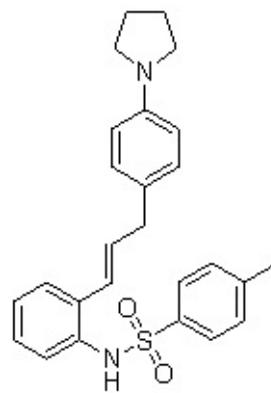
112.239

47.923

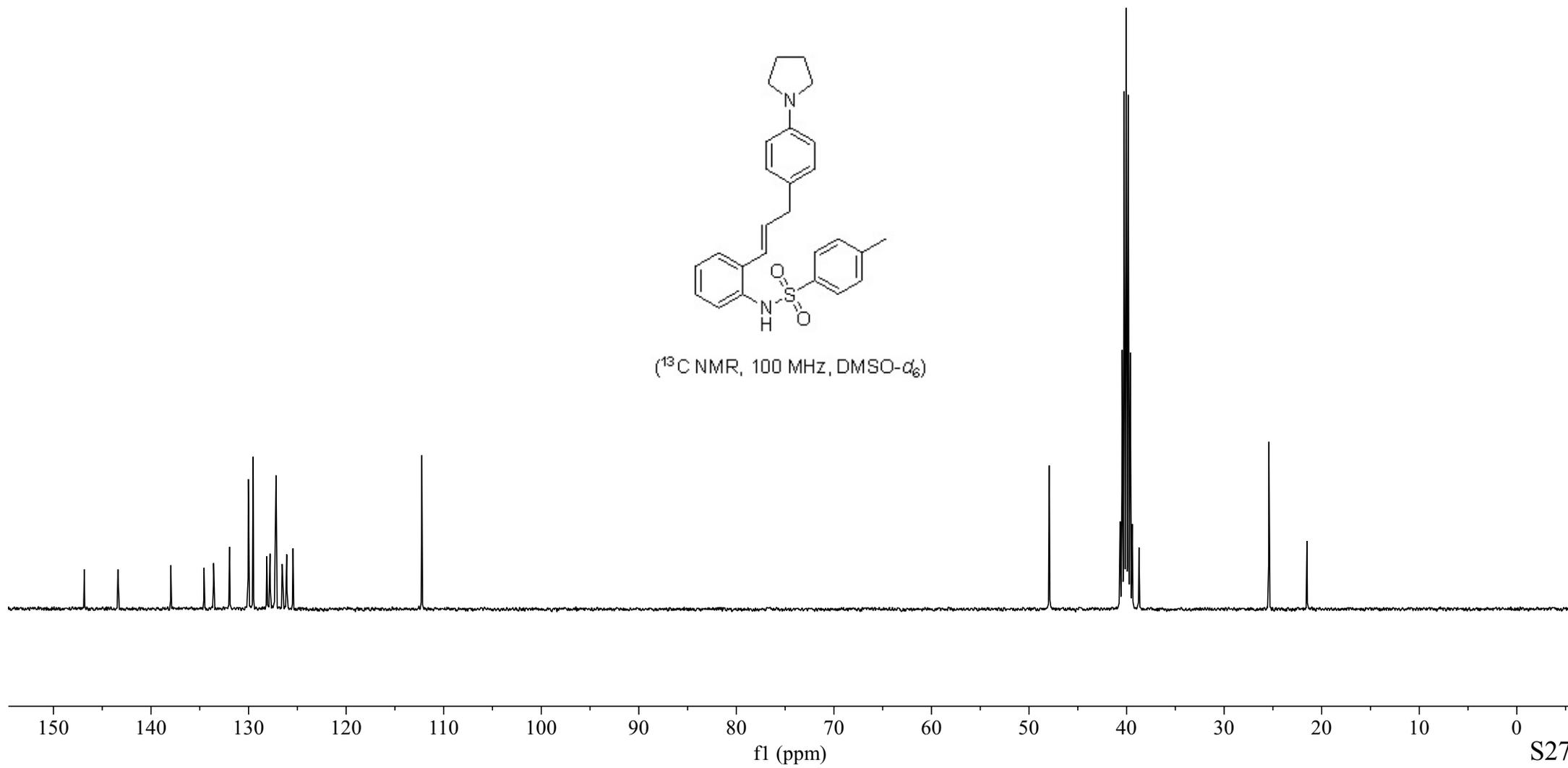
38.731

25.416

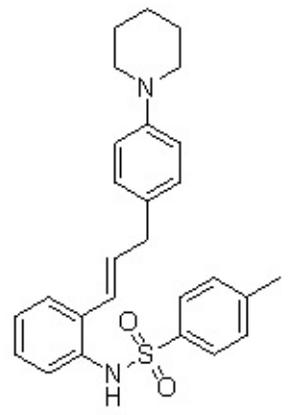
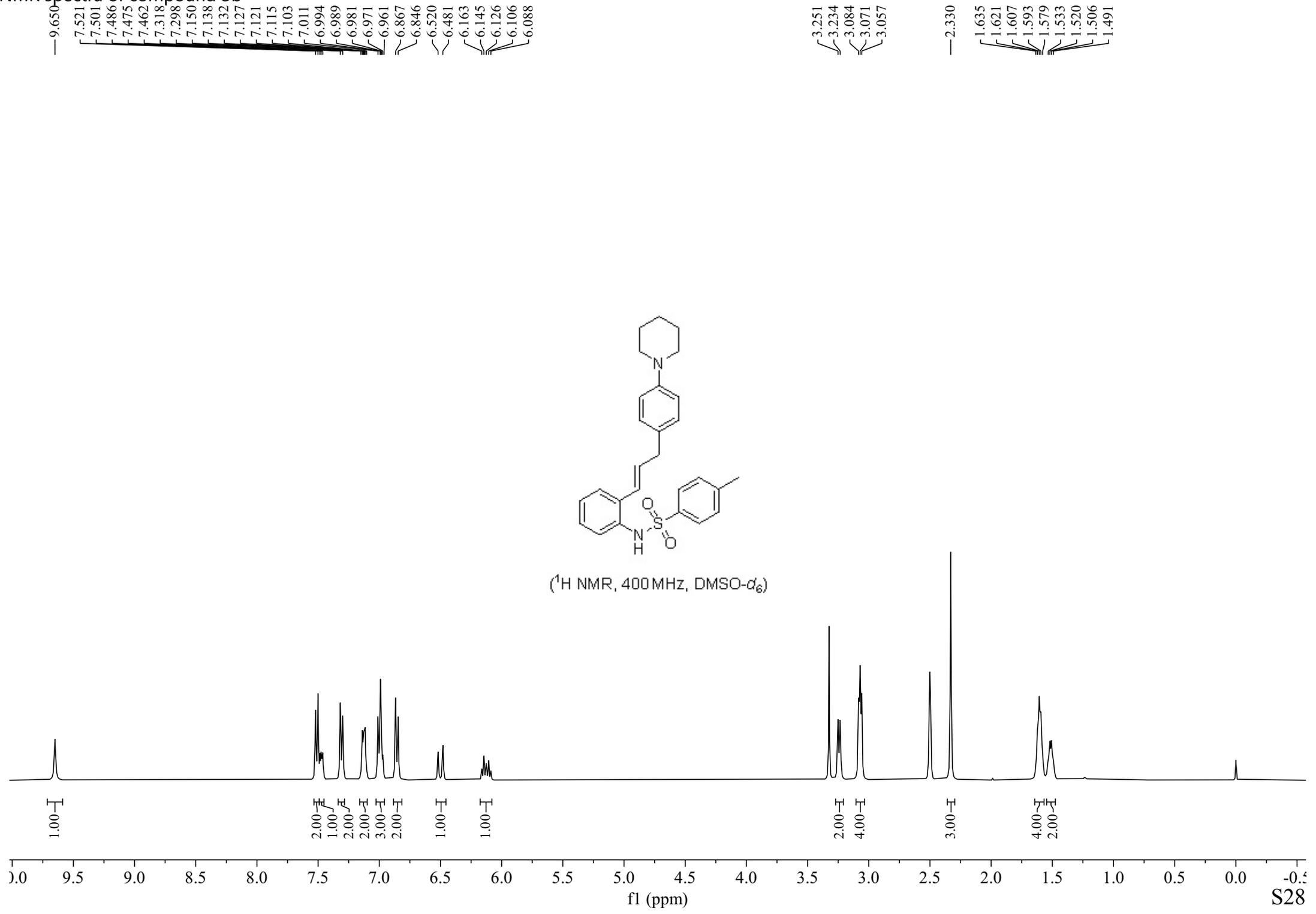
21.508



(¹³C NMR, 100 MHz, DMSO-*d*₆)



NMR spectra of compound 3b



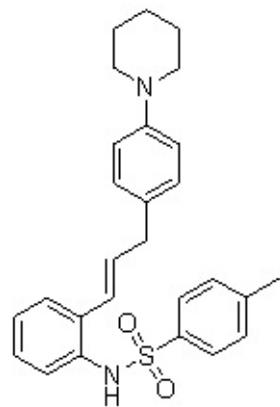
NMR spectra of compound 3b

— 150.715
— 143.397
/ 137.955
/ 134.458
/ 133.638
/ 131.463
/ 130.235
/ 130.016
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/ 128.133
/ 127.863
/ 127.269
/ 127.184
/ 126.117
/ 125.783
/ 116.642

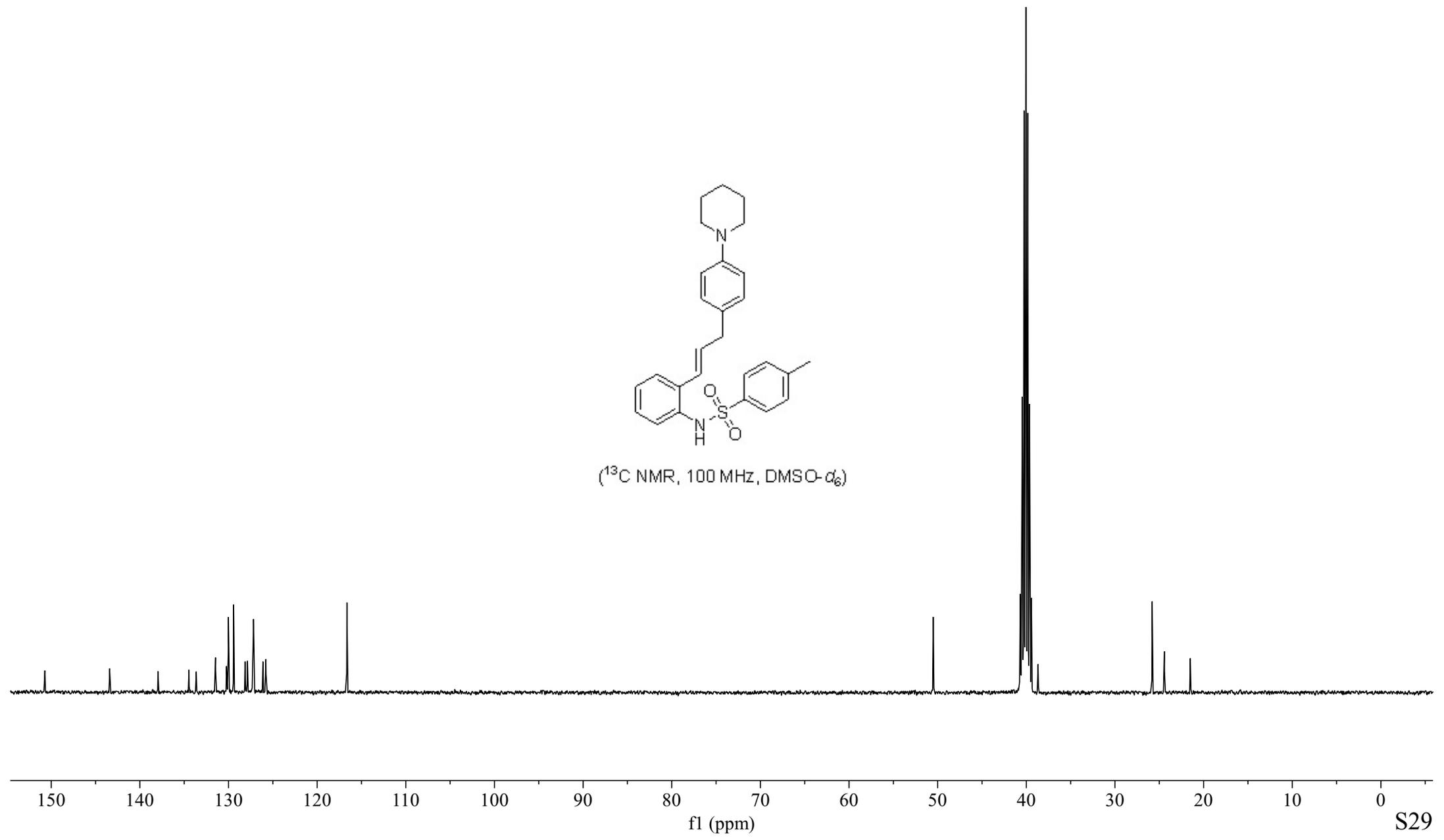
— 50.498

— 38.678

~ 25.803
~ 24.428
— 21.499



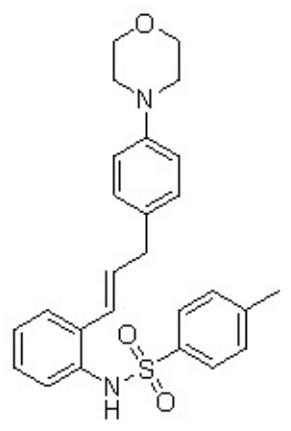
(¹³C NMR, 100 MHz, DMSO-*d*₆)



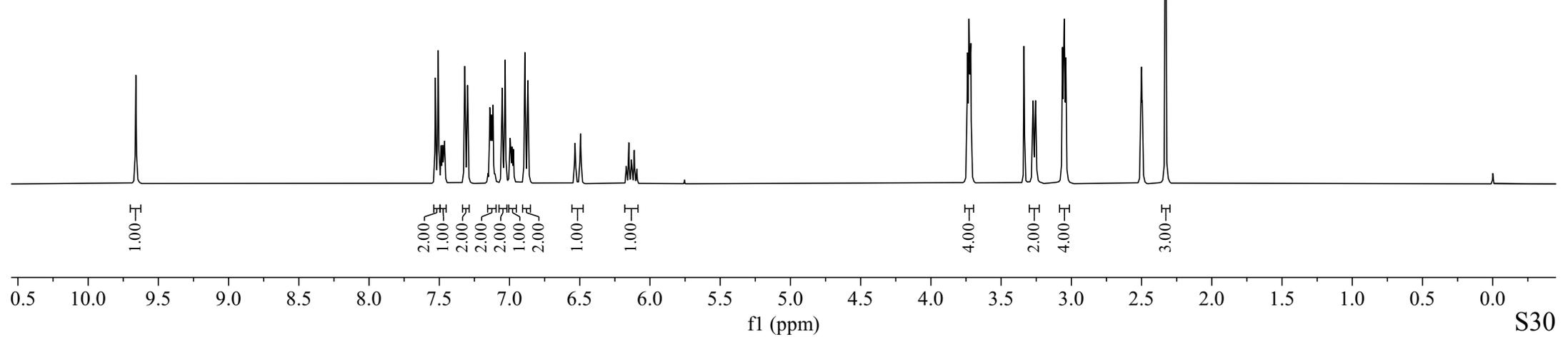
NMR spectra of compound 3c

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6.972
6.962
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6.874
6.869
6.533
6.495
6.169
6.151
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6.129
6.112
6.094

3.740
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3.056
3.051
3.046
3.039



(¹H NMR, 400 MHz, DMSO-d₆)



NMR spectra of compound 3c

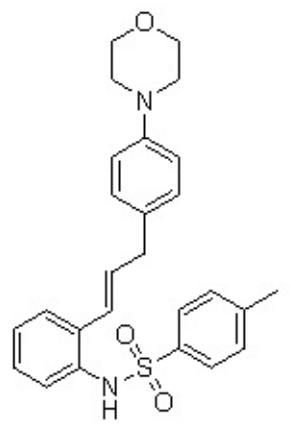
— 150.048
— 143.419
— 137.919
— 134.468
— 133.612
— 131.391
— 130.980
— 130.020
— 129.495
— 128.147
— 127.885
— 127.302
— 127.189
— 126.128
— 125.855
— 115.857

— 66.634

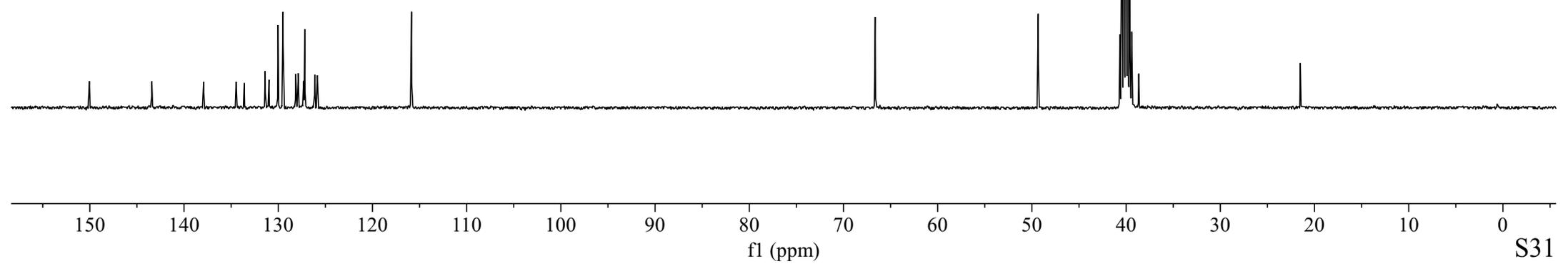
— 49.328

— 38.658

— 21.508



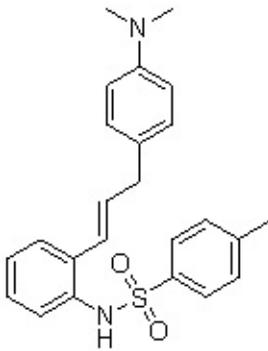
(¹³C NMR, 100 MHz, DMSO-d₆)



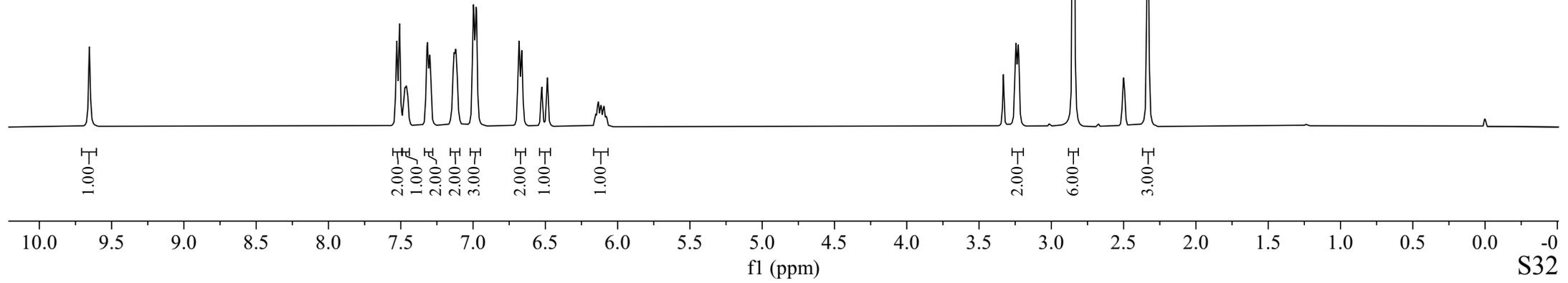
NMR spectra of compound 3d

9.653
7.534
7.528
7.513
7.507
7.481
7.472
7.461
7.454
7.449
7.321
7.313
7.299
7.292
7.141
7.132
7.120
7.114
7.109
7.003
6.997
6.982
6.975
6.688
6.681
6.667
6.663
6.659
6.525
6.486
6.153
6.139
6.133
6.115
6.101
6.096
6.092
6.080
6.074

3.245
3.228
2.852
2.848
2.843
2.337
2.329



(¹H NMR, 400 MHz, DMSO-*d*₆)

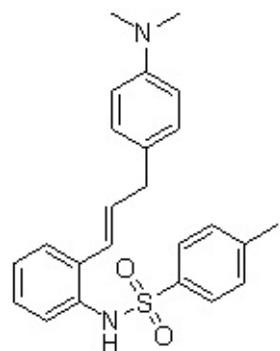


NMR spectra of compound 3d

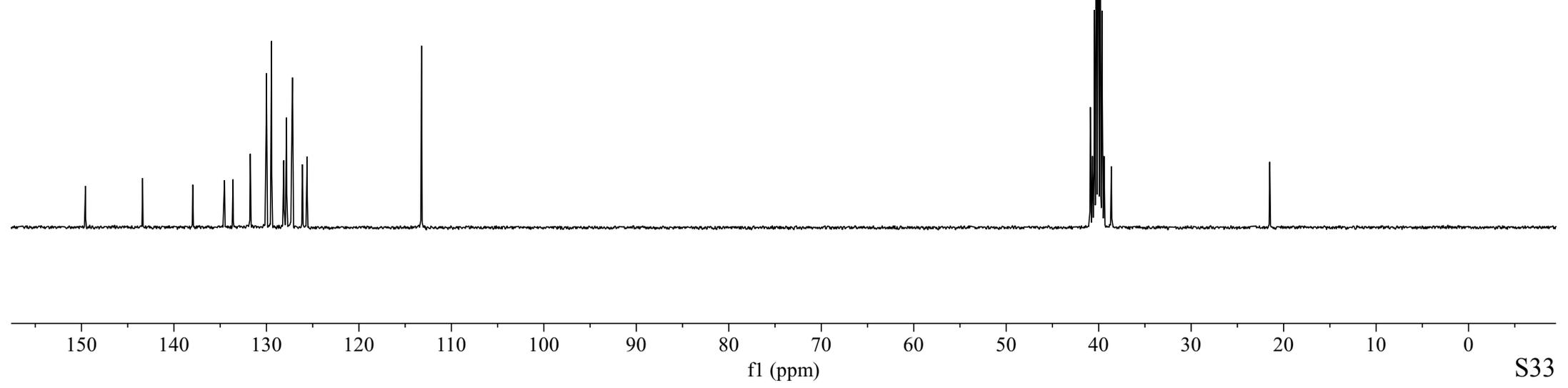
— 149.576
— 143.391
— 137.968
— 134.533
— 133.612
— 131.749
— 130.014
— 129.447
— 128.124
— 127.829
— 127.280
— 127.186
— 126.113
— 125.600
— 113.229

— 40.900
— 38.630

— 21.500



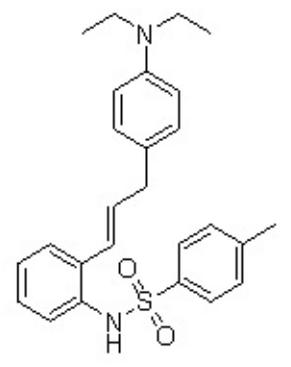
(¹³C NMR, 100 MHz, DMSO-*d*₆)



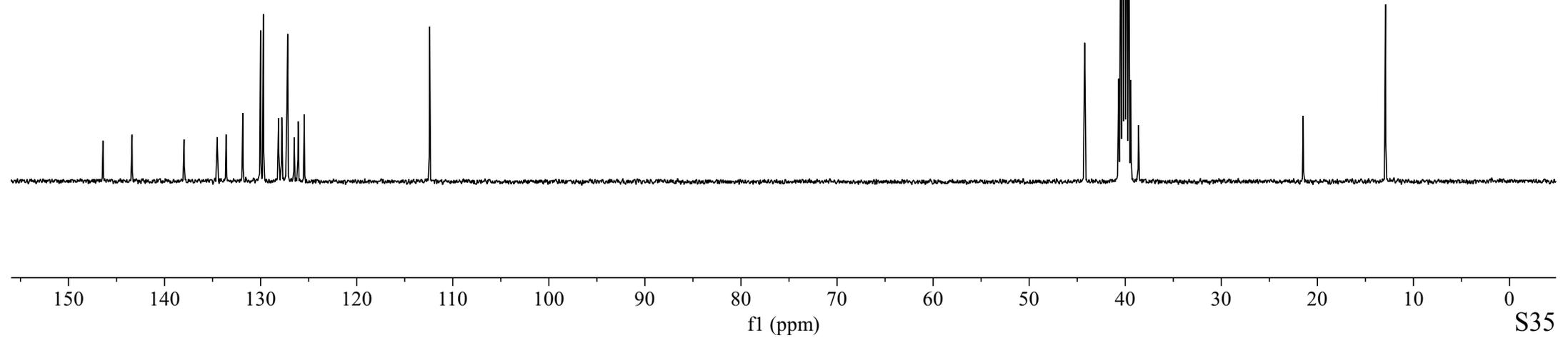
NMR spectra of compound 3e

— 146.414
— 143.383
— 137.964
— 134.525
— 133.585
— 131.856
— 130.010
— 129.714
— 128.133
— 127.800
— 127.273
— 127.190
— 126.518
— 126.093
— 125.463
— 112.405

— 44.221
— 38.619
— 21.479
— 12.915

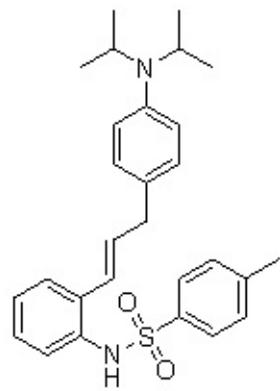


(¹³C NMR, 100 MHz, DMSO-d₆)

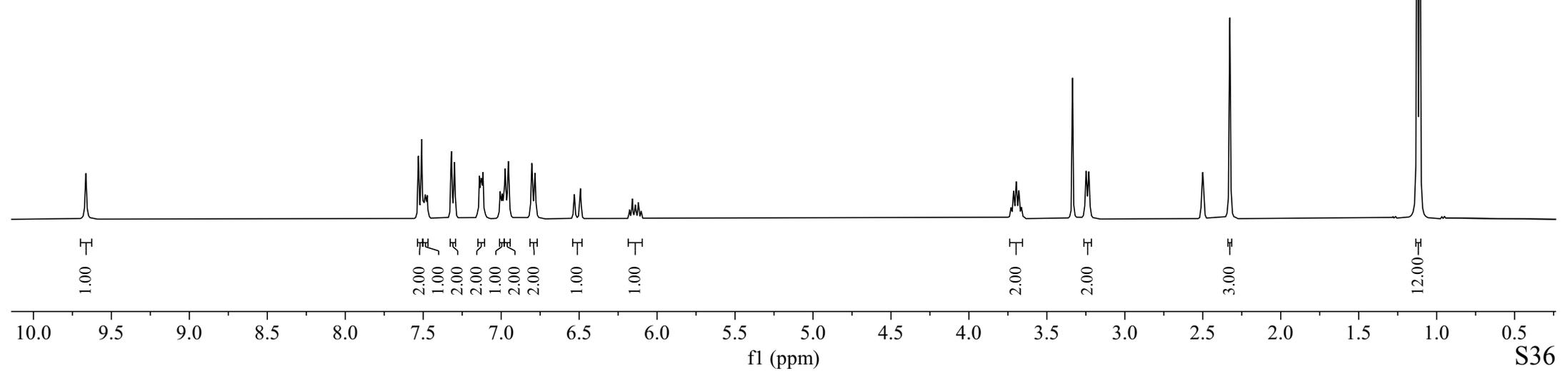


NMR spectra of compound 3f

9.664
 7.531
 7.510
 7.498
 7.487
 7.474
 7.319
 7.299
 7.152
 7.140
 7.134
 7.128
 7.122
 7.116
 7.105
 7.018
 7.006
 7.000
 6.993
 6.983
 6.974
 6.954
 6.803
 6.783
 6.531
 6.492
 6.177
 6.159
 6.140
 6.120
 6.102
 3.746
 3.730
 3.713
 3.696
 3.680
 3.663
 3.646
 3.249
 3.231
 2.326
 1.125
 1.109



(¹H NMR, 400 MHz, DMSO-d₆)



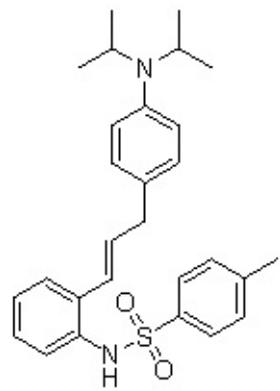
NMR spectra of compound 3f

146.333
143.379
137.942
134.435
133.602
131.479
130.012
129.857
128.914
128.155
127.850
127.275
127.197
126.105
125.726
120.067

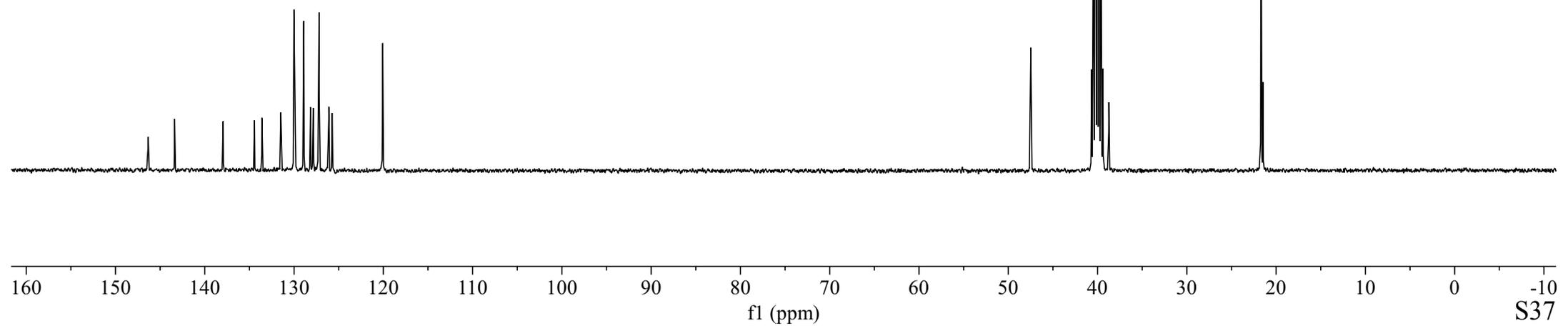
47.482

38.736

21.688
21.475



(¹³C NMR, 100 MHz, DMSO-d₆)

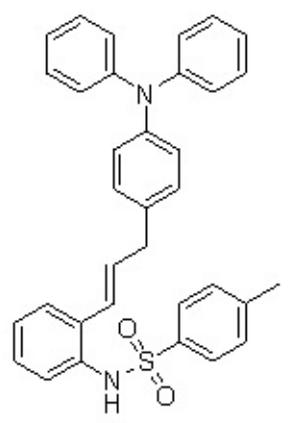


NMR spectra of compound 3g

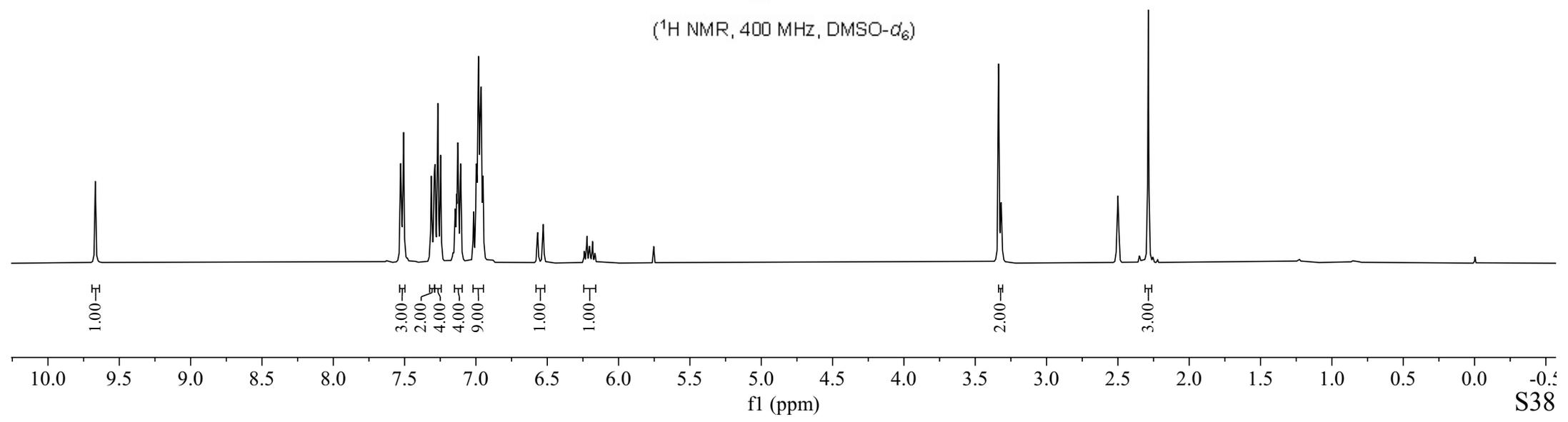
9.668
7.528
7.522
7.507
7.313
7.292
7.286
7.282
7.268
7.265
7.251
7.247
7.149
7.145
7.135
7.128
7.122
7.108
7.016
6.998
6.991
6.985
6.982
6.970
6.963
6.950
6.968
6.529
6.240
6.222
6.203
6.183
6.165

3.337
3.318

2.287



(¹H NMR, 400 MHz, DMSO-*d*₆)

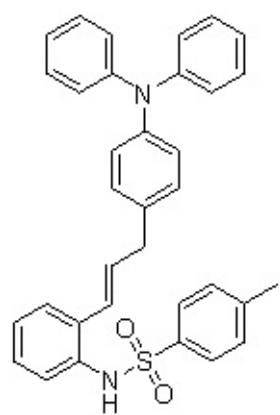


NMR spectra of compound 3g

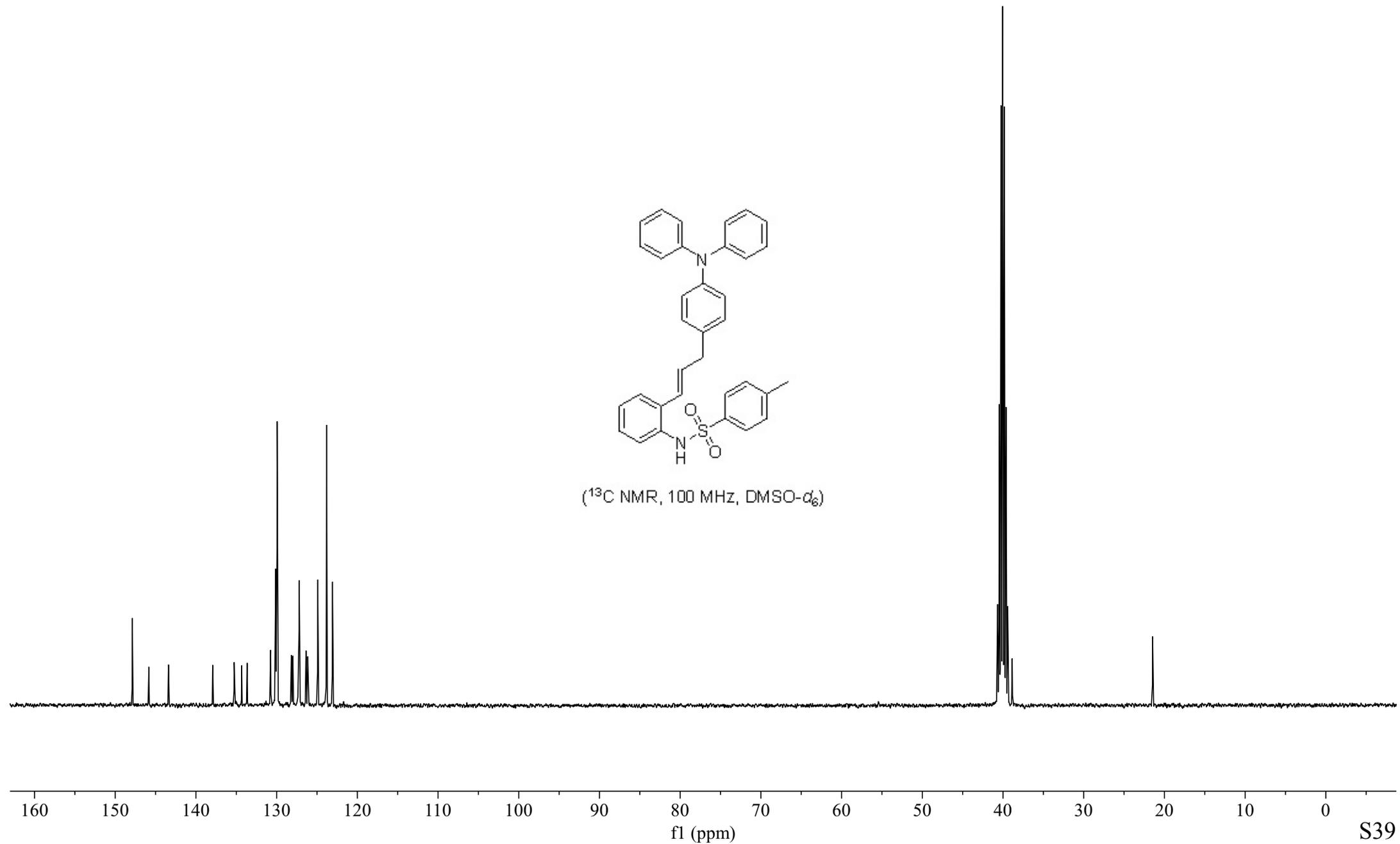
147.883
145.829
143.401
137.921
135.263
134.335
133.658
130.746
130.112
130.025
129.942
128.182
127.982
127.316
127.206
126.365
126.150
124.910
123.810
123.081

38.864

21.462



(¹³C NMR, 100 MHz, DMSO-*d*₆)

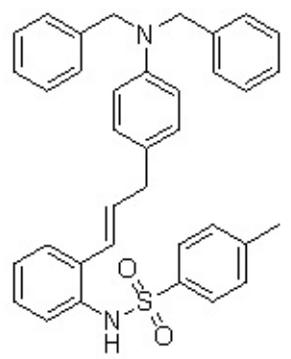


NMR spectra of compound 3h

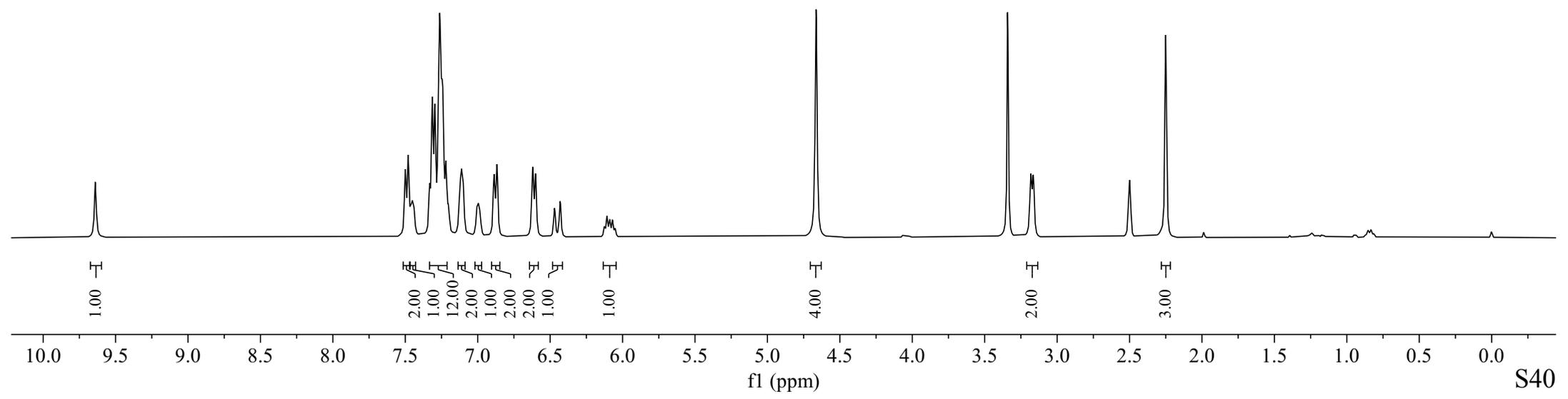
9.640
7.502
7.497
7.482
7.476
7.465
7.459
7.451
7.442
7.436
7.334
7.329
7.314
7.296
7.263
7.242
7.219
7.201
7.126
7.119
7.111
7.102
7.096
7.017
7.009
7.002
6.994
6.985
6.979
6.889
6.868
6.623
6.618
6.601
6.470
6.431
6.126
6.108
6.089
6.069
6.052
— 4.665

3.182
3.164

— 2.251



(¹H NMR, 400 MHz, DMSO-*d*₆)



NMR spectra of compound 3h

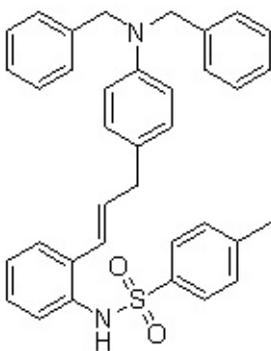
147.118
143.378
139.666
137.930
134.403
133.566
131.549
129.983
129.476
128.965
128.207
127.821
127.643
127.267
127.159
126.080
125.561

— 113.039

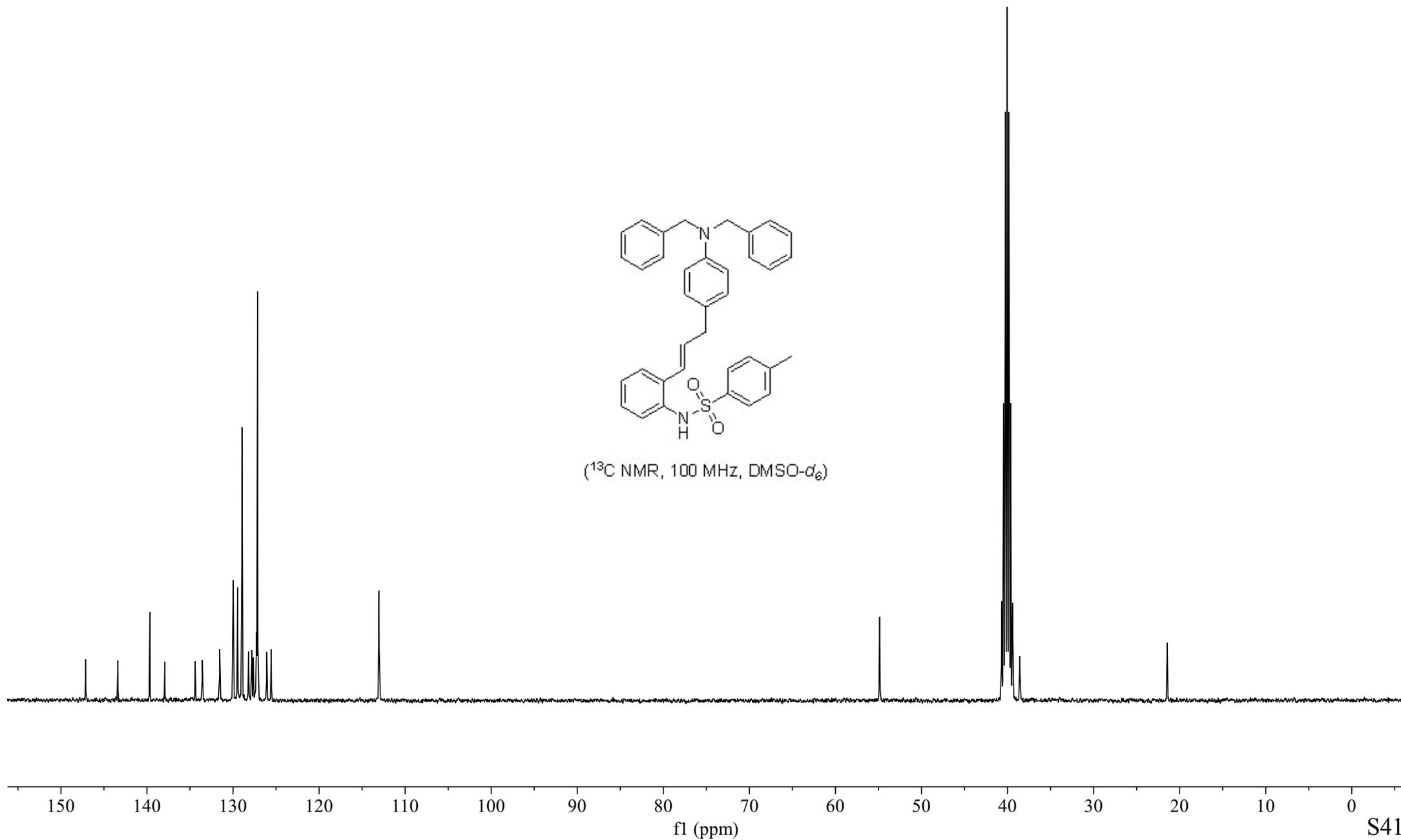
— 54.867

— 38.571

— 21.440



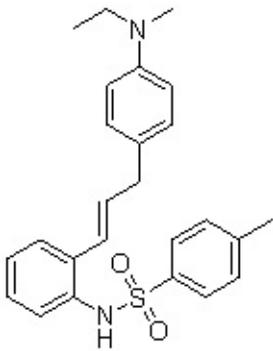
(¹³C NMR, 100 MHz, DMSO-*d*₆)



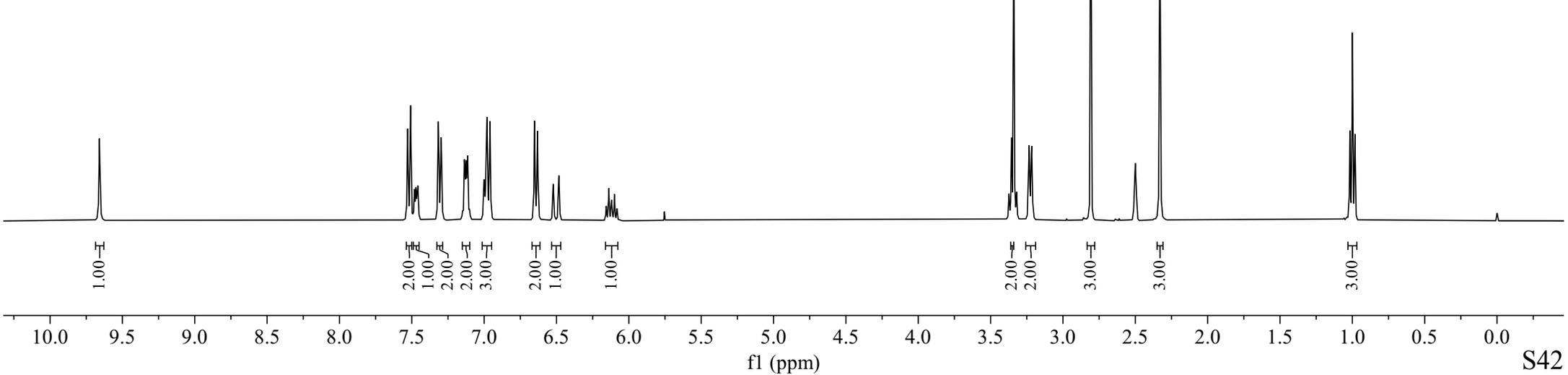
NMR spectra of compound 3i

9.658
7.529
7.509
7.491
7.482
7.475
7.471
7.464
7.458
7.317
7.297
7.150
7.137
7.132
7.125
7.119
7.113
7.101
7.009
7.001
6.995
6.989
6.980
6.960
6.652
6.636
6.631
6.523
6.484
6.156
6.139
6.121
6.117
6.100
6.082

3.373
3.355
3.340
3.320
3.234
3.216
2.808
2.330
1.017
1.000
0.982



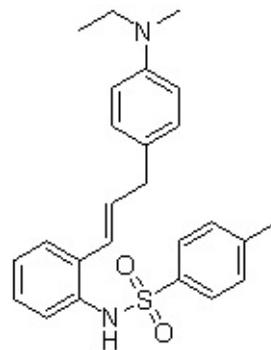
(¹H NMR, 400 MHz, DMSO-*d*₆)



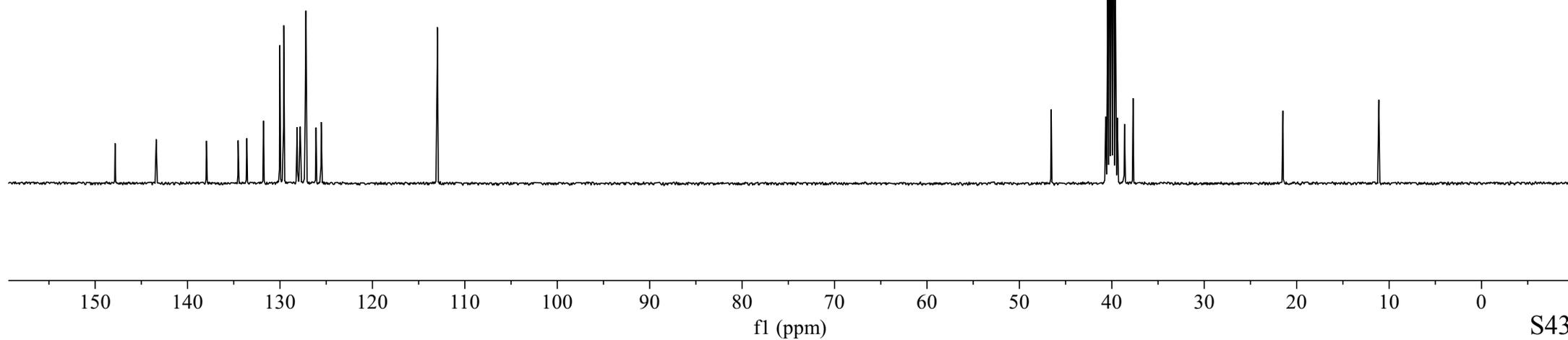
NMR spectra of compound 3i

— 147.842
 — 143.392
 — 137.954
 — 134.528
 — 133.592
 — 131.785
 — 130.016
 — 129.596
 — 128.141
 — 127.815
 — 127.284
 — 127.193
 — 126.102
 — 125.540
 — 112.974

— 46.559
 — 38.631
 — 37.701
 — 21.488
 — 11.109



(¹³C NMR, 100 MHz, DMSO-*d*₆)

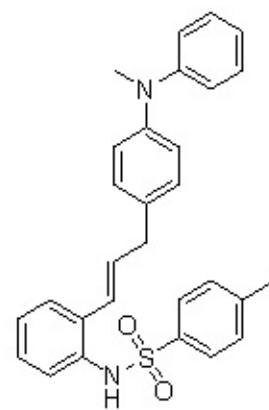


NMR spectra of compound 3j

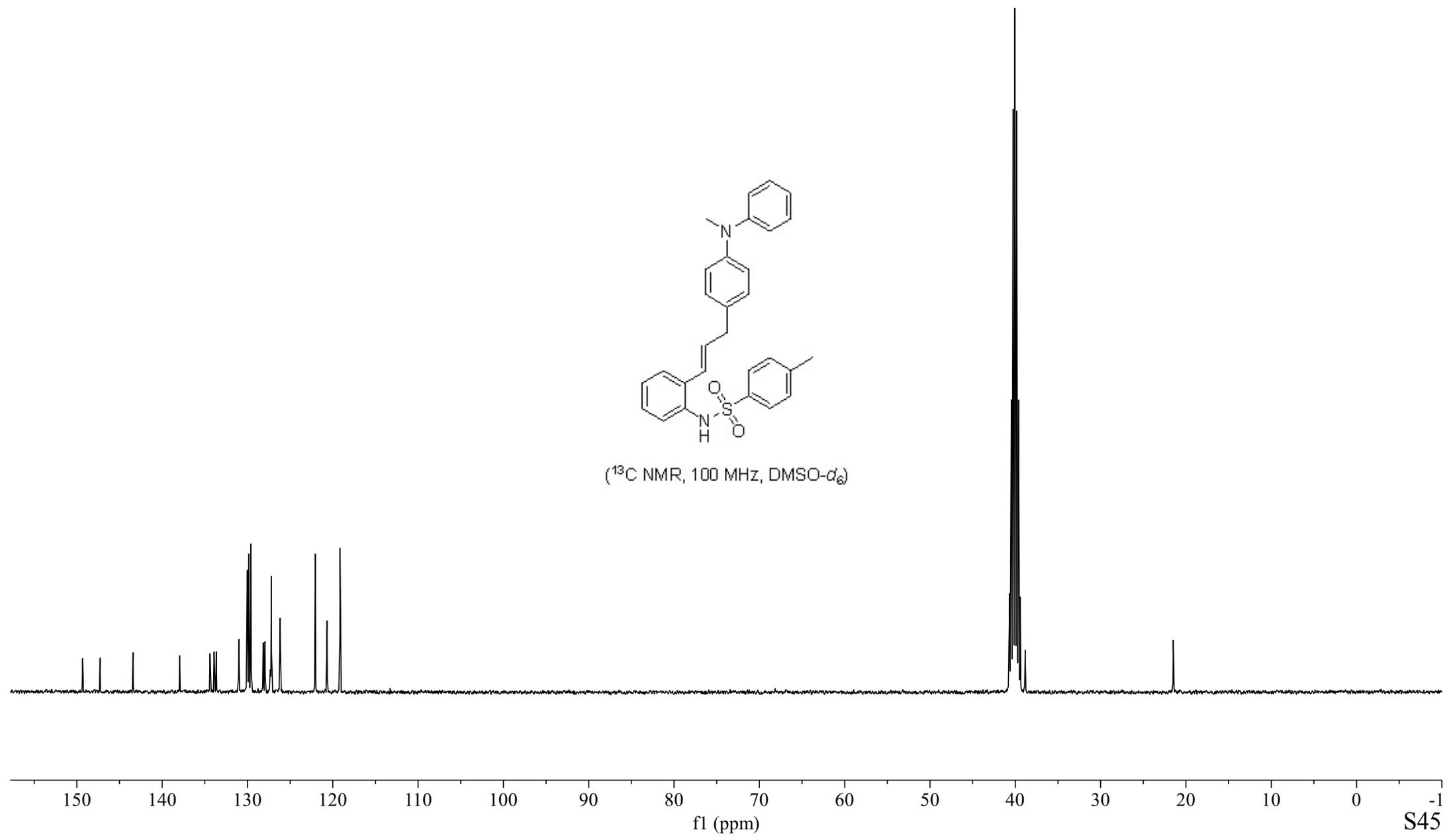
149.324
147.284
143.411
137.934
134.389
133.912
133.655
131.022
130.025
129.862
129.592
128.163
127.948
127.310
127.203
126.174
126.150
122.057
120.671
119.144

40.553
38.844

21.479



(¹³C NMR, 100 MHz, DMSO-*d*₆)



NMR spectra of compound 3k

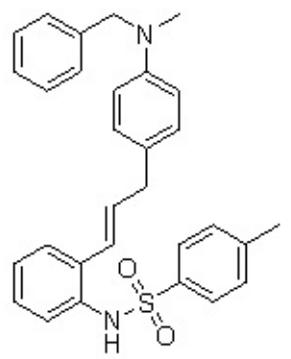
9.673
7.539
7.520
7.498
7.491
7.482
7.474
7.469
7.332
7.316
7.297
7.242
7.223
7.204
7.155
7.149
7.139
7.131
7.126
7.033
7.023
7.010
6.999
6.980
6.960
6.693
6.676
6.672
6.527
6.488
6.167
6.149
6.130
6.110
6.092

4.545

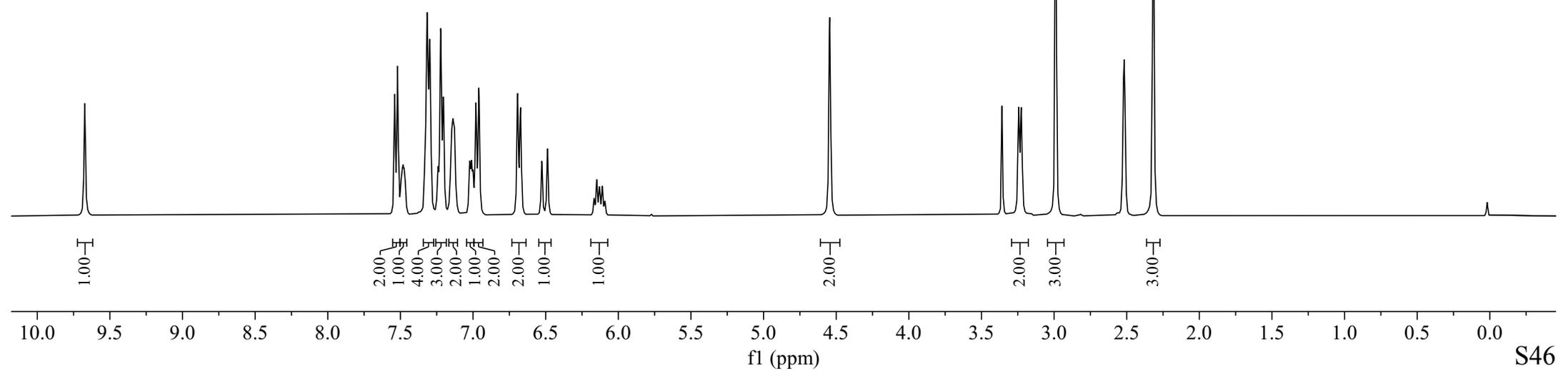
3.243
3.226

2.988

2.316



(¹H NMR, 400 MHz, DMSO-*d*₆)



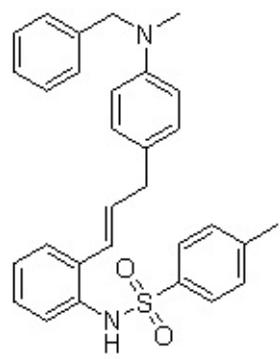
NMR spectra of compound 3k

148.106
143.393
139.695
137.947
134.489
133.590
131.694
130.008
129.543
128.899
128.168
127.824
127.483
127.299
127.181
127.141
126.103
125.573
112.792

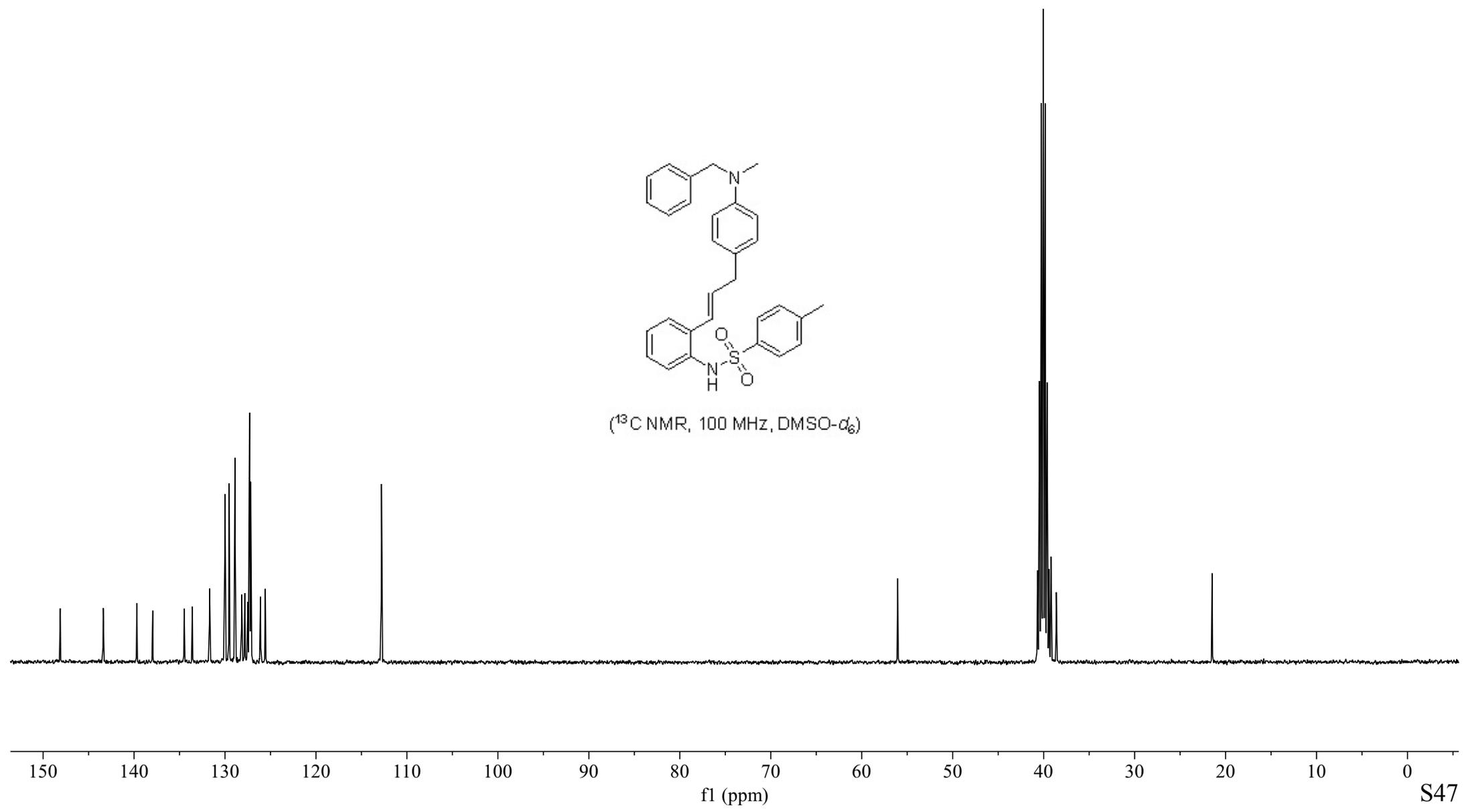
56.047

39.198
38.616

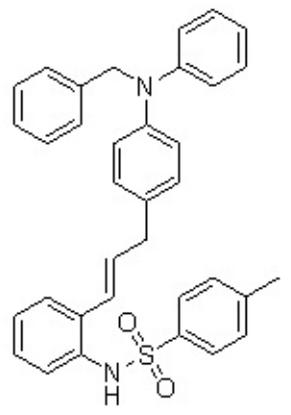
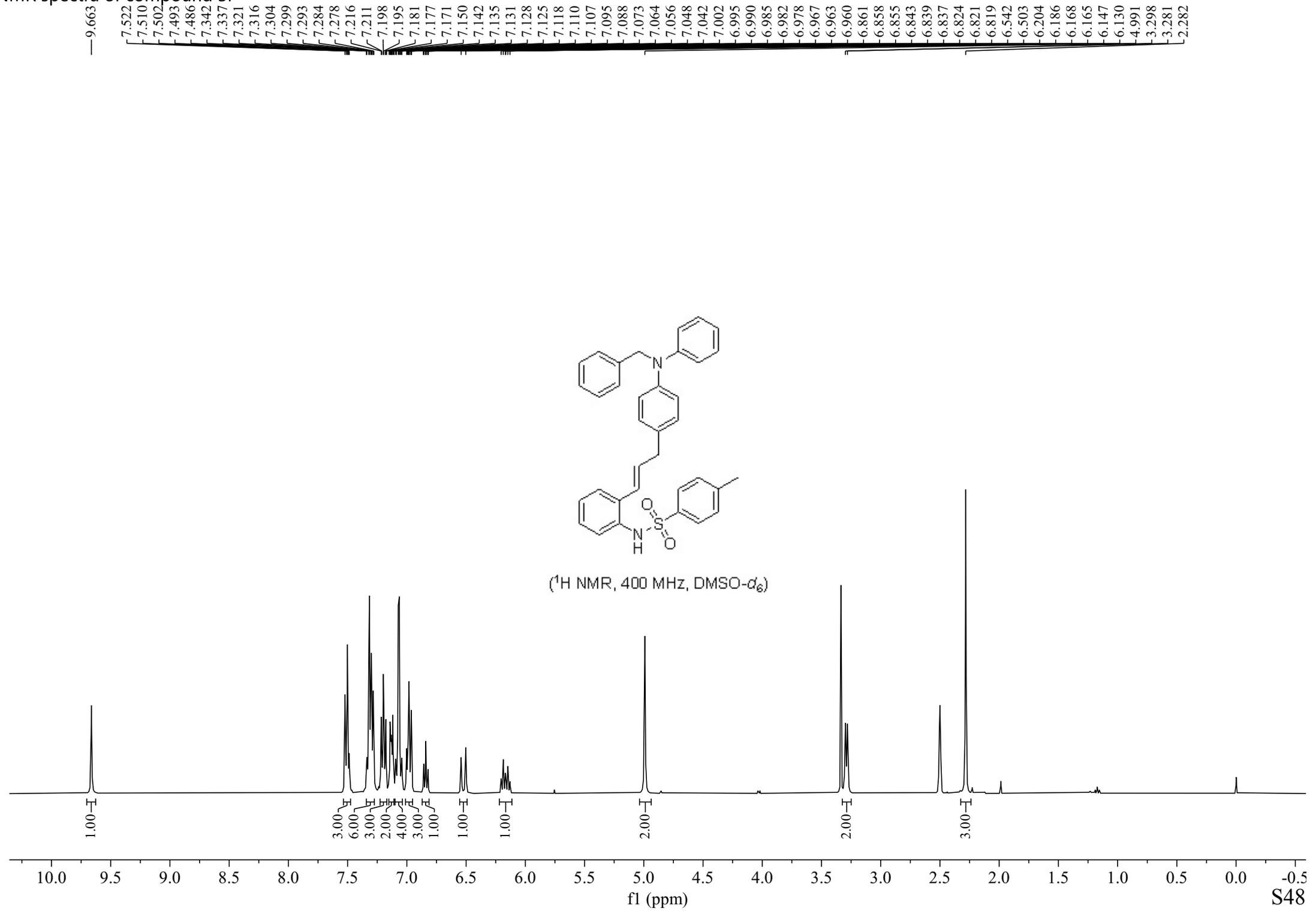
21.479



(¹³C NMR, 100 MHz, DMSO-*d*₆)



NMR spectra of compound 31



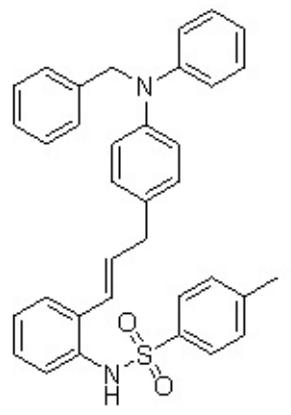
NMR spectra of compound 3I

148.309
146.092
143.403
139.719
137.927
134.336
133.817
133.644
130.919
130.012
129.903
129.674
128.955
128.187
127.944
127.298
127.188
127.008
126.187
126.142
122.075
120.793
119.443

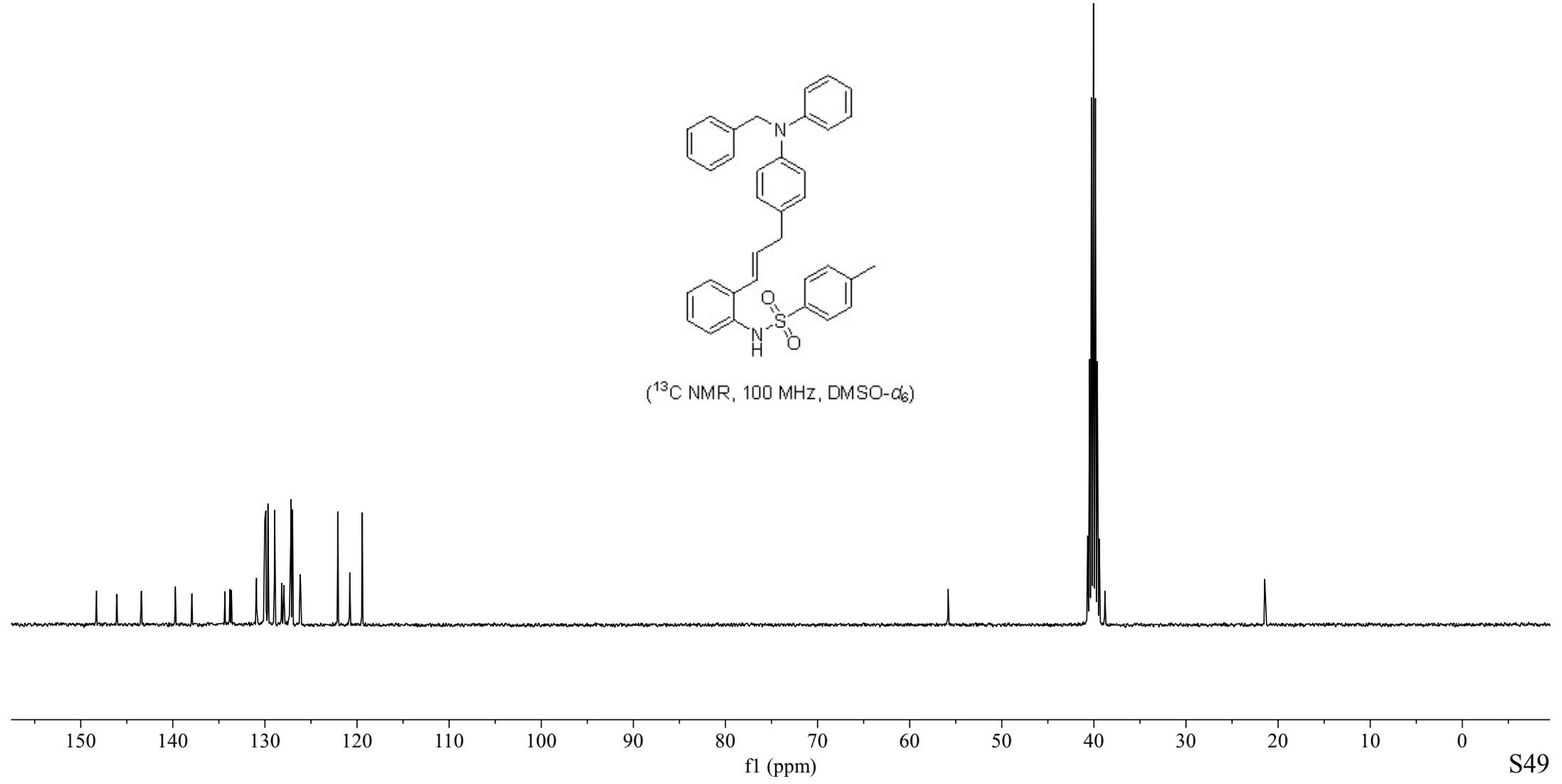
55.820

38.806

21.455



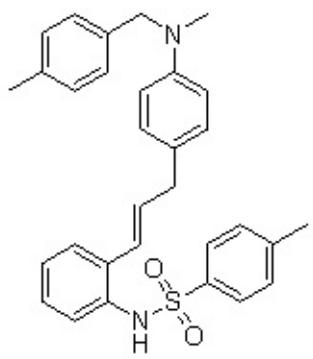
(¹³C NMR, 100 MHz, DMSO-*d*₆)



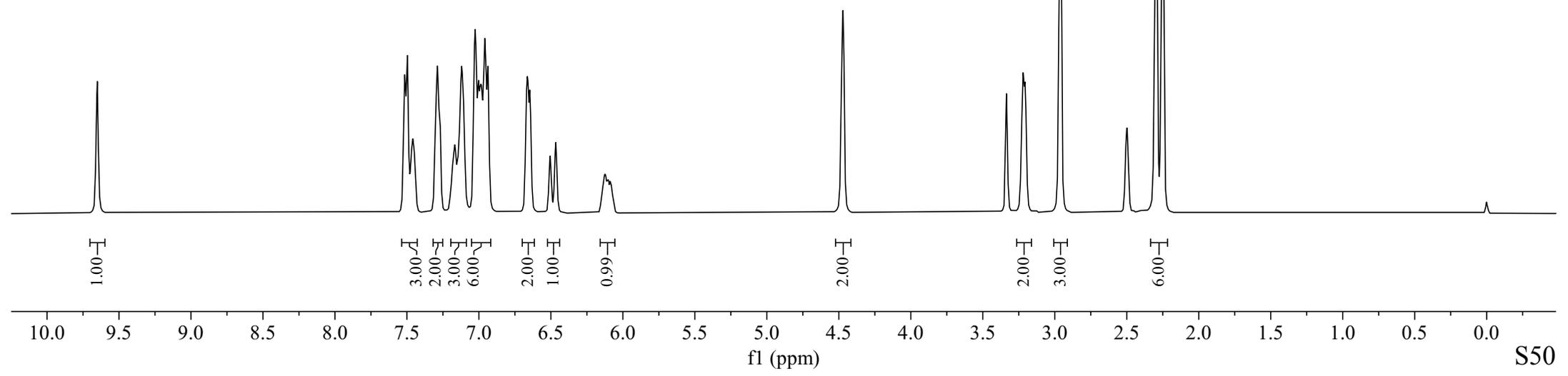
NMR spectra of compound 3m

9.661
9.650
7.528
7.515
7.497
7.476
7.469
7.462
7.453
7.443
7.308
7.303
7.289
7.271
7.195
7.183
7.167
7.146
7.135
7.129
7.120
7.112
7.104
7.097
7.026
7.002
6.993
6.985
6.979
6.968
6.958
6.937
6.678
6.669
6.664
6.659
6.647
6.640
6.505
6.466
6.138
6.128
6.120
6.108
6.099
6.090
6.082
4.482
4.470

3.222
3.205
2.975
2.967
2.958
2.303
2.293
2.256
2.247

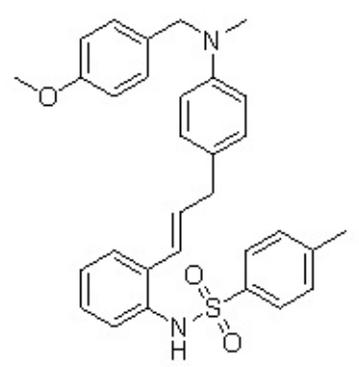


(¹H NMR, 400 MHz, DMSO-*d*₆)

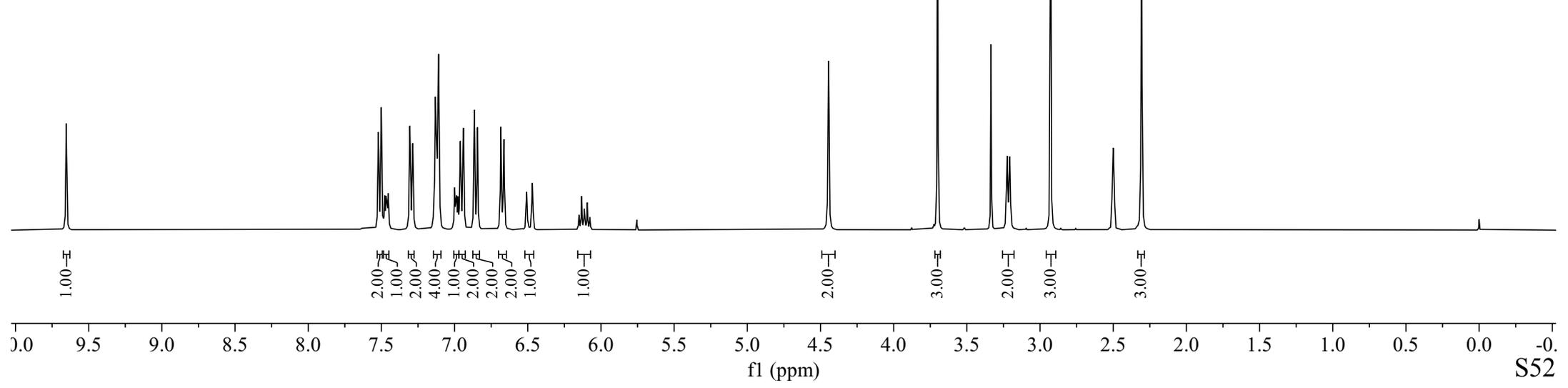


NMR spectra of compound 3n

9.653
7.521
7.517
7.505
7.501
7.486
7.478
7.470
7.466
7.461
7.454
7.445
7.306
7.286
7.145
7.133
7.131
7.125
7.117
7.109
7.009
7.000
6.993
6.988
6.984
6.976
6.961
6.944
6.939
6.873
6.865
6.860
6.848
6.843
6.836
6.826
6.692
6.684
6.679
6.667
6.662
6.508
6.469
6.150
6.132
6.114
6.111
6.093
6.076
4.445
3.700
3.225
3.207
2.928
2.307



(¹H NMR, 400 MHz, DMSO-*d*₆)



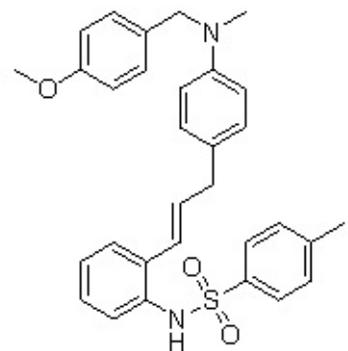
NMR spectra of compound 3n

158.604
148.169
143.400
137.937
134.500
133.577
131.710
131.319
130.013
129.513
128.612
128.167
127.824
127.468
127.292
127.181
126.101
125.557
114.305
112.979

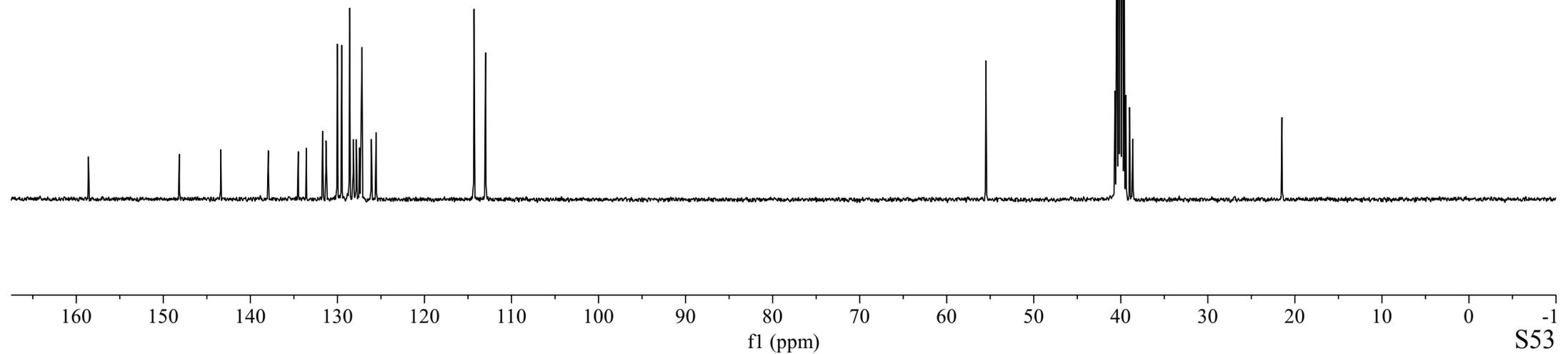
55.494

39.000
38.620

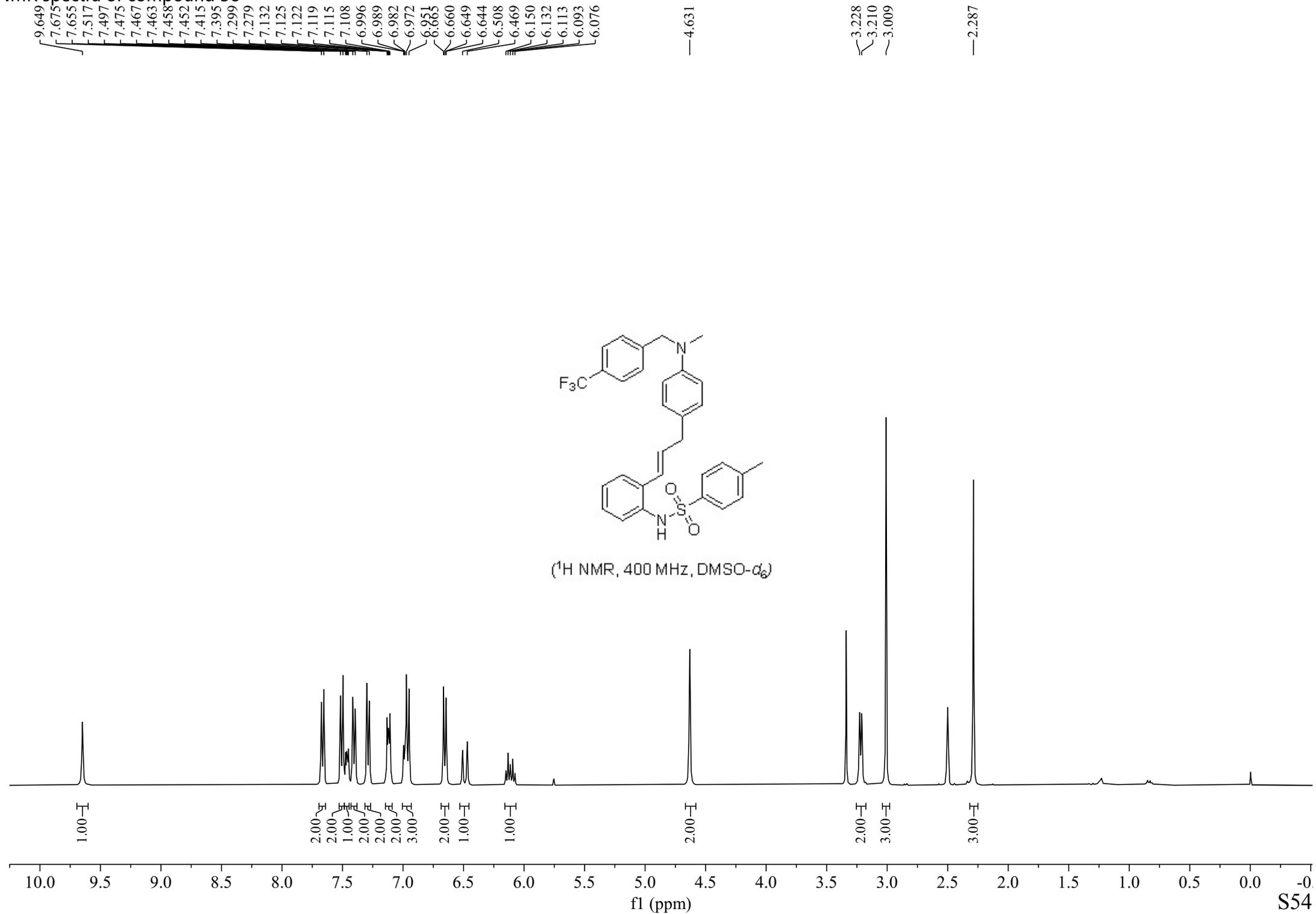
21.481



(¹³C NMR, 100 MHz, DMSO-*d*₆)



NMR spectra of compound 3o



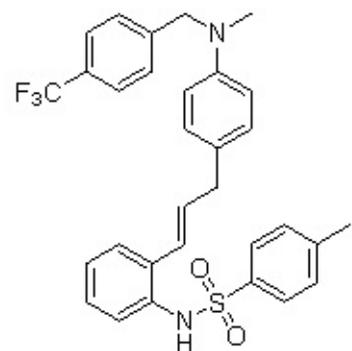
NMR spectra of compound 3o

147.792
 144.924
 143.374
 137.938
 134.480
 133.594
 131.621
 129.996
 129.625
 128.159
 127.972
 127.829
 127.779
 127.277
 127.178
 126.088
 125.818
 125.780
 125.619
 112.752

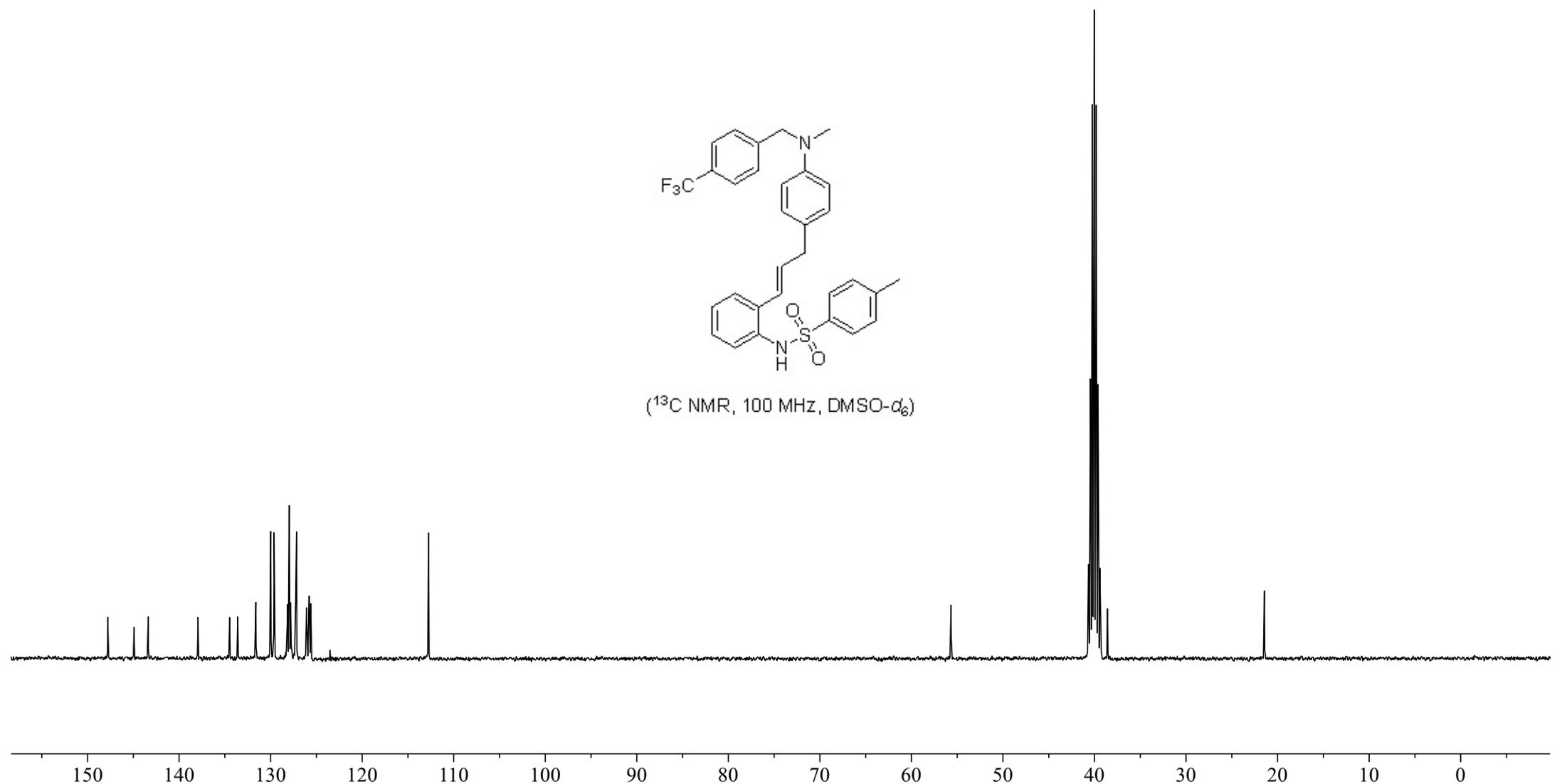
55.675

39.312
 38.587

21.440

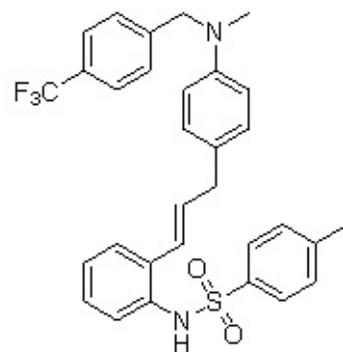


(¹³C NMR, 100 MHz, DMSO-*d*₆)

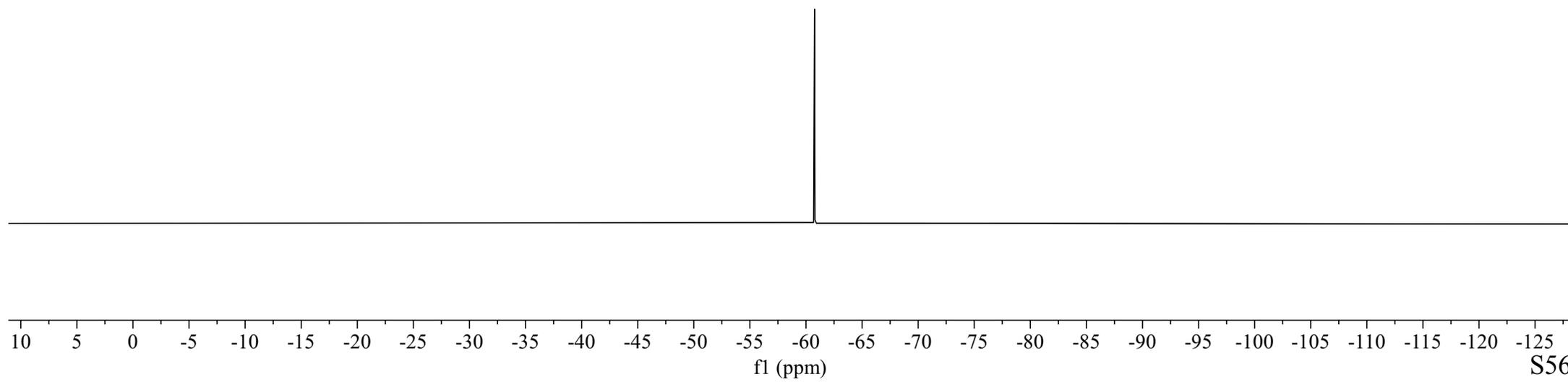


NMR spectra of compound 3o

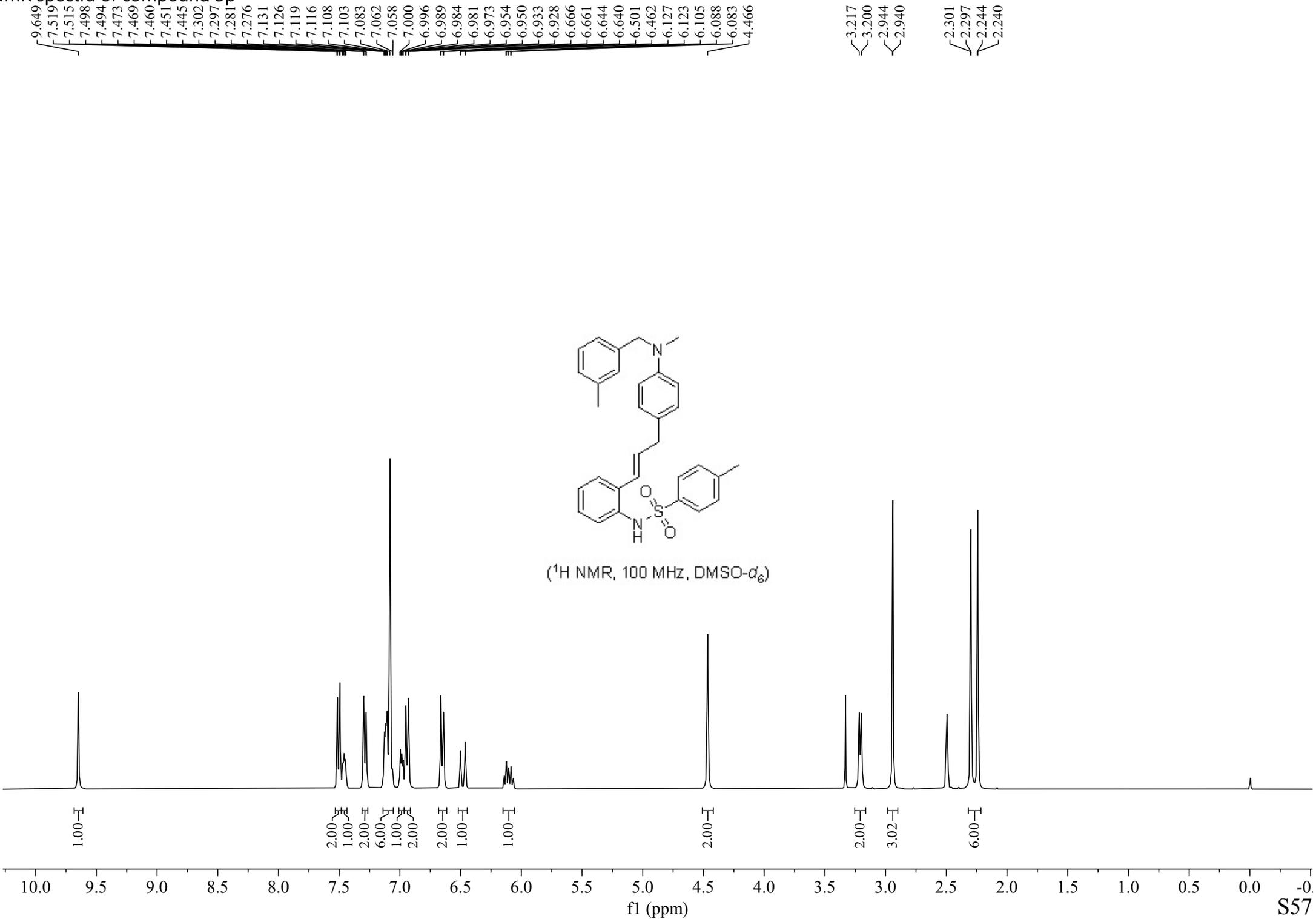
197.761



(¹⁹F NMR, 376 MHz, DMSO-*d*₆)



NMR spectra of compound 3p



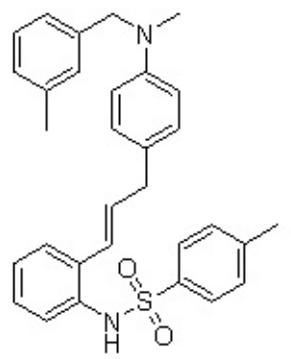
NMR spectra of compound 3p

— 148.143
 — 143.390
 / 137.946
 / 136.519
 / 136.154
 / 134.493
 / 133.586
 / 131.702
 / 130.005
 / 129.505
 / 129.453
 / 128.157
 / 127.817
 / 127.436
 / 127.330
 / 127.279
 / 127.178
 / 126.102
 / 125.565
 / 112.867

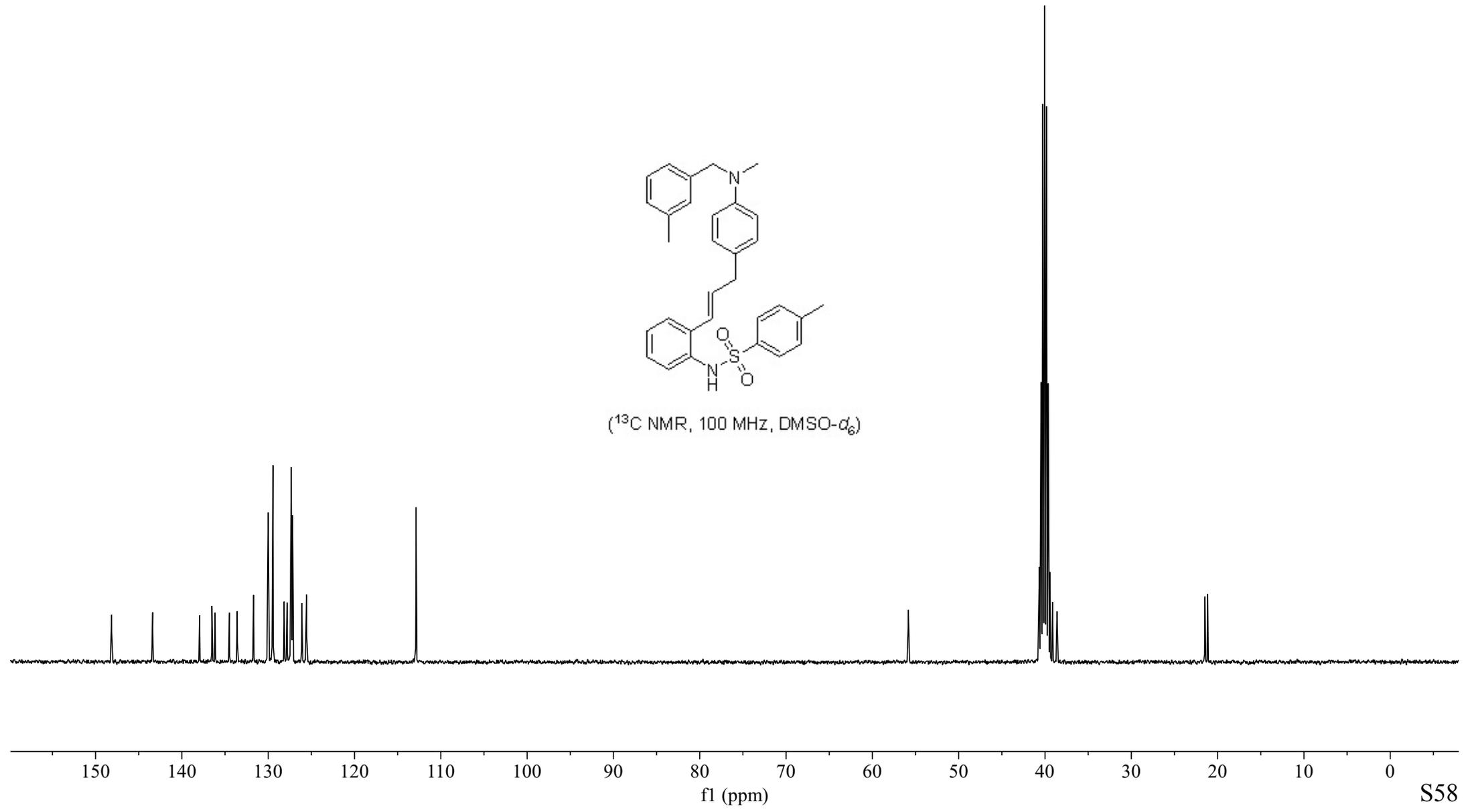
— 55.831

/ 39.127
 / 38.612

/ 21.471
 / 21.153



(¹³C NMR, 100 MHz, DMSO-*d*₆)

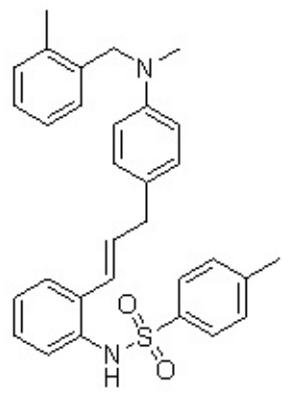


NMR spectra of compound 3g

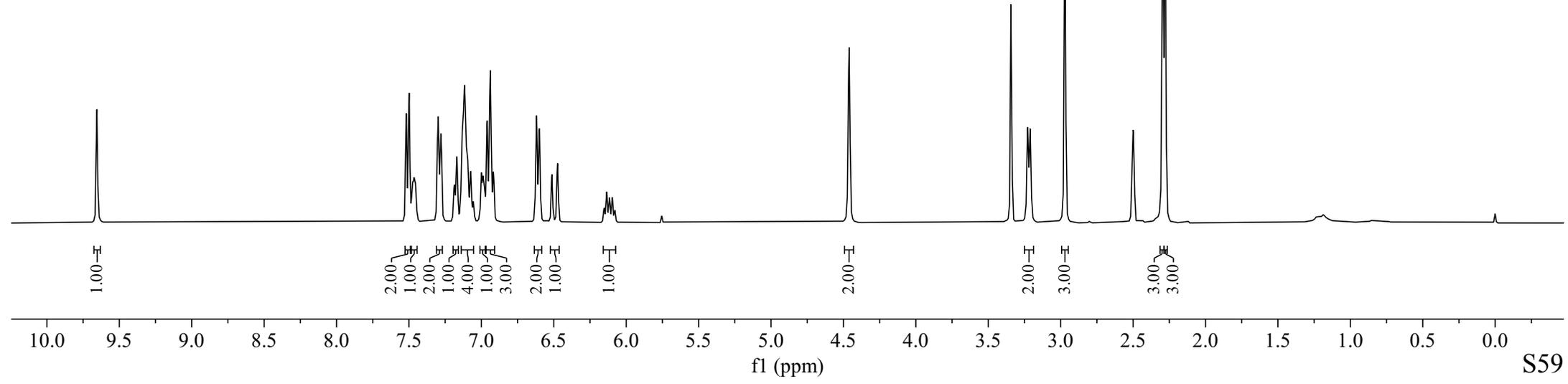
9.655
7.523
7.518
7.502
7.497
7.474
7.464
7.456
7.449
7.299
7.281
7.275
7.187
7.169
7.135
7.129
7.121
7.115
7.105
7.096
7.091
7.073
7.054
7.013
7.004
7.000
6.993
6.988
6.982
6.977
6.965
6.959
6.943
6.937
6.916
6.624
6.618
6.602
6.596
6.513
6.474
6.152
6.135
6.116
6.095
6.077
4.461

3.228
3.210
2.972

2.295
2.278



(¹H NMR, 400 MHz, DMSO-d₆)



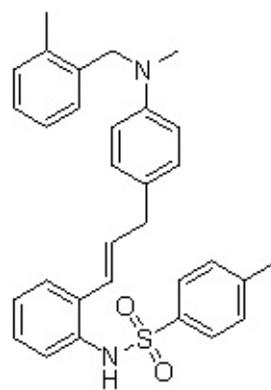
NMR spectra of compound 3q

148.213
 143.391
 137.937
 137.003
 136.027
 134.496
 133.575
 131.723
 130.667
 130.008
 129.557
 128.162
 127.824
 127.334
 127.290
 127.180
 126.896
 126.368
 126.183
 126.101
 125.555
 112.435

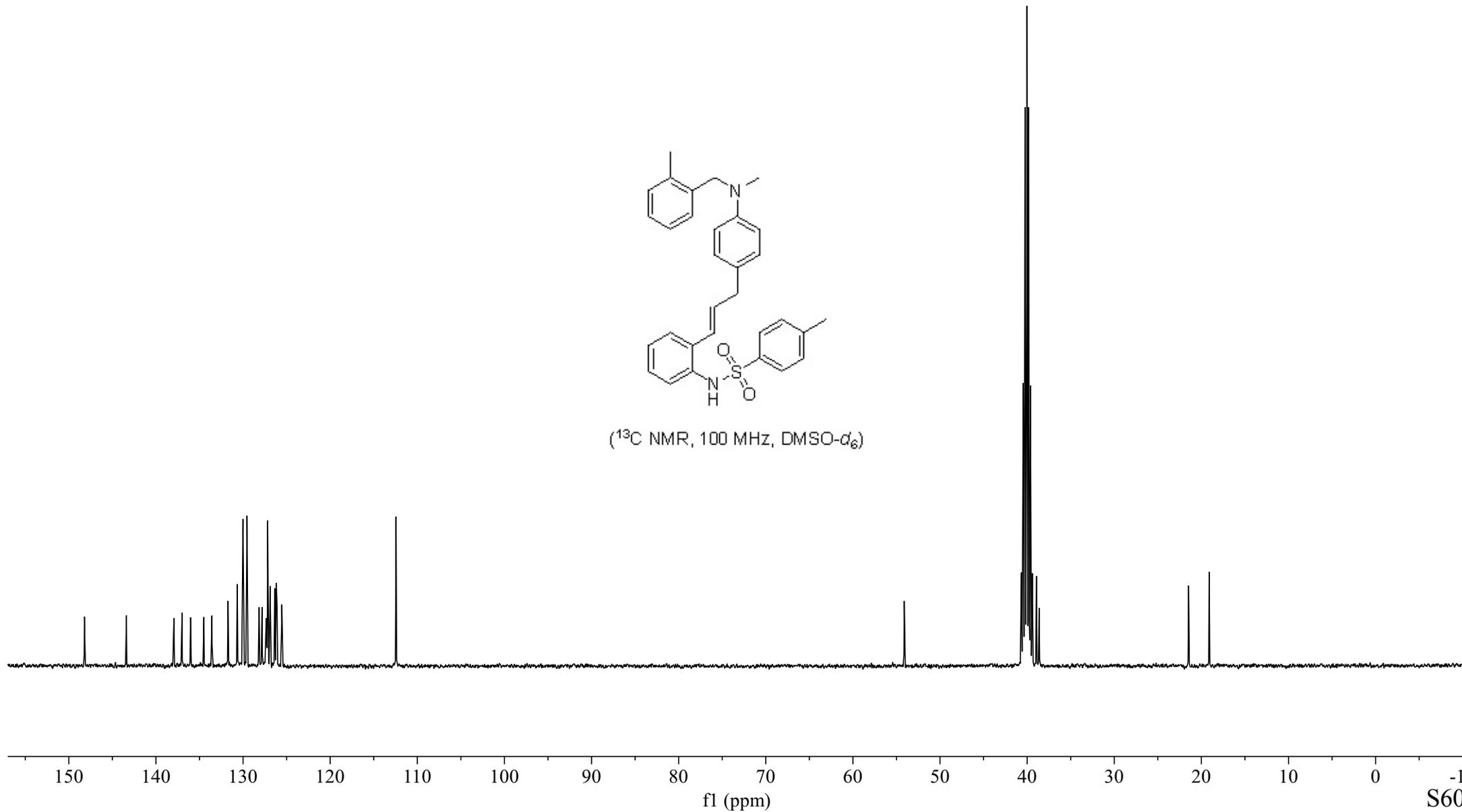
54.097

38.943
 38.623

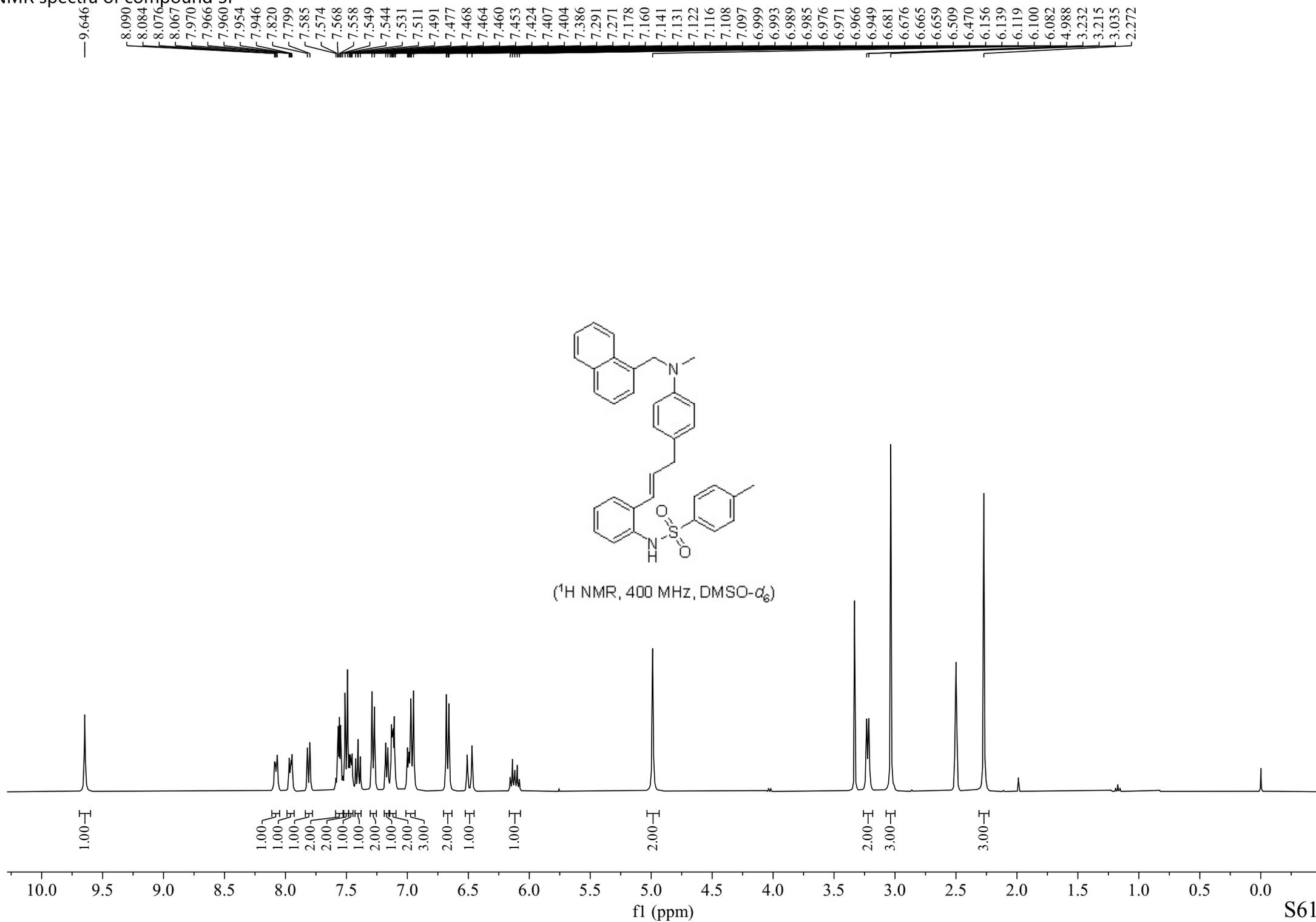
21.462
 19.104



(¹³C NMR, 100 MHz, DMSO-d₆)



NMR spectra of compound 3r



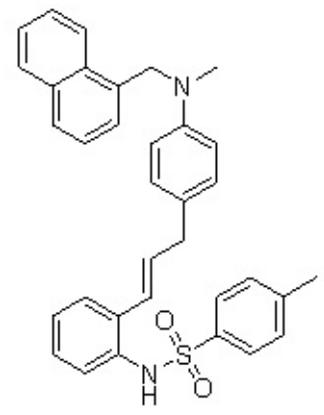
NMR spectra of compound 3r

148.238
143.366
137.959
134.467
134.148
133.994
133.610
131.702
131.369
129.996
129.621
129.103
128.141
127.821
127.572
127.502
127.257
127.168
126.566
126.291
126.097
125.959
125.566
124.062
123.621
112.533

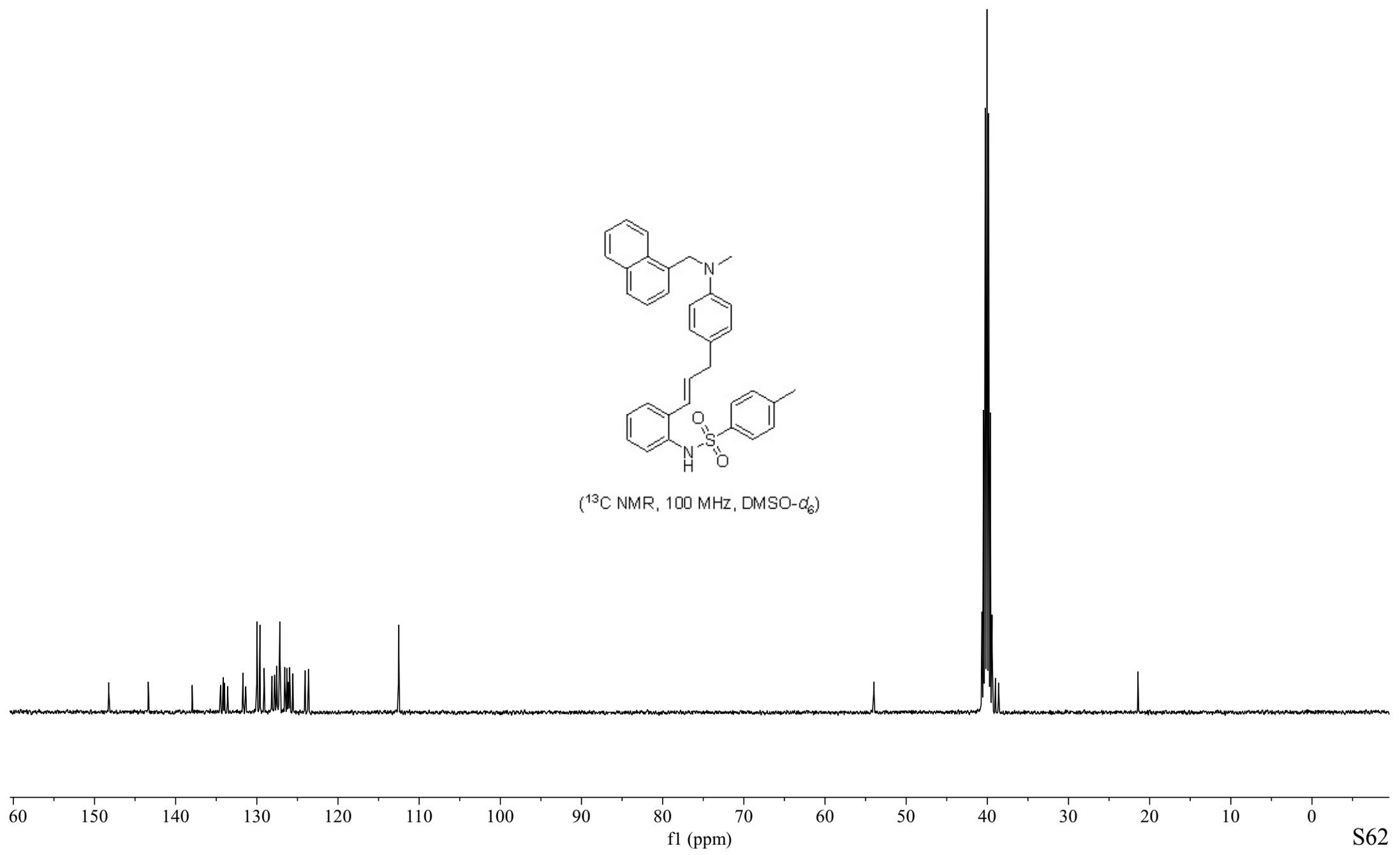
53.984

39.000
38.622

21.441



(¹³C NMR, 100 MHz, DMSO-*d*₆)



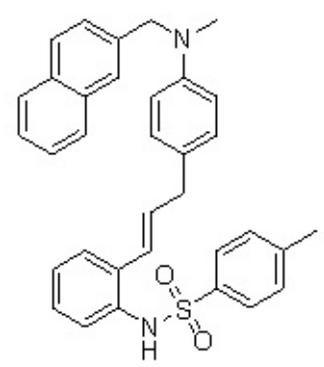
NMR spectra of compound 3s

148.216
143.369
137.963
137.528
134.484
133.610
133.510
132.663
131.669
129.993
129.563
128.553
128.157
128.042
127.993
127.819
127.622
127.263
127.172
126.638
126.106
126.043
125.988
125.601
125.450
112.913

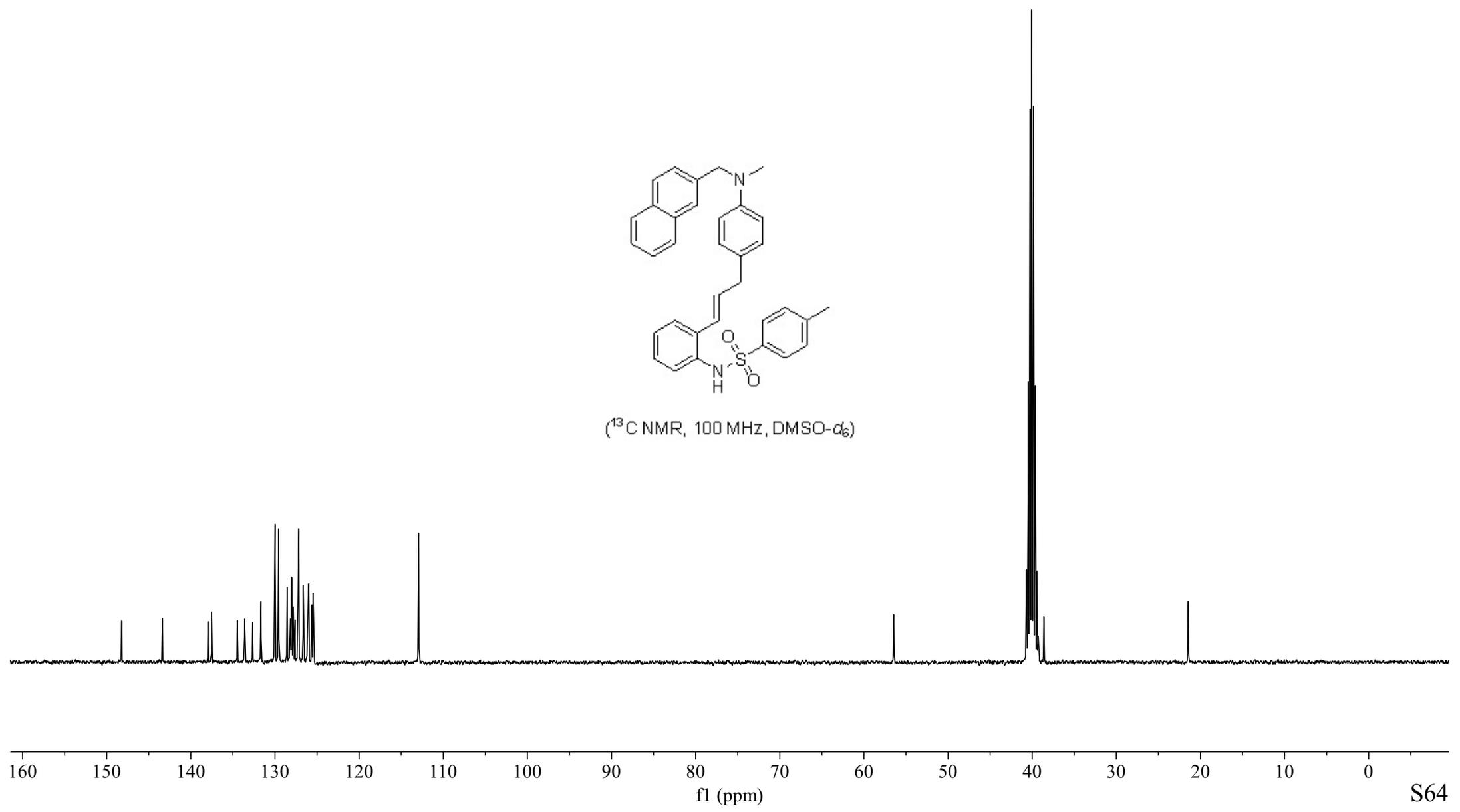
56.446

39.300
38.612

21.447



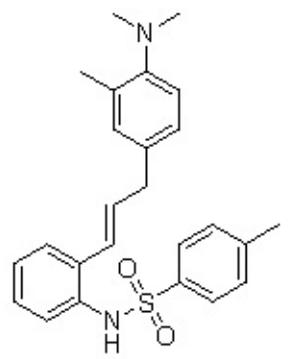
(¹³C NMR, 100 MHz, DMSO-d₆)



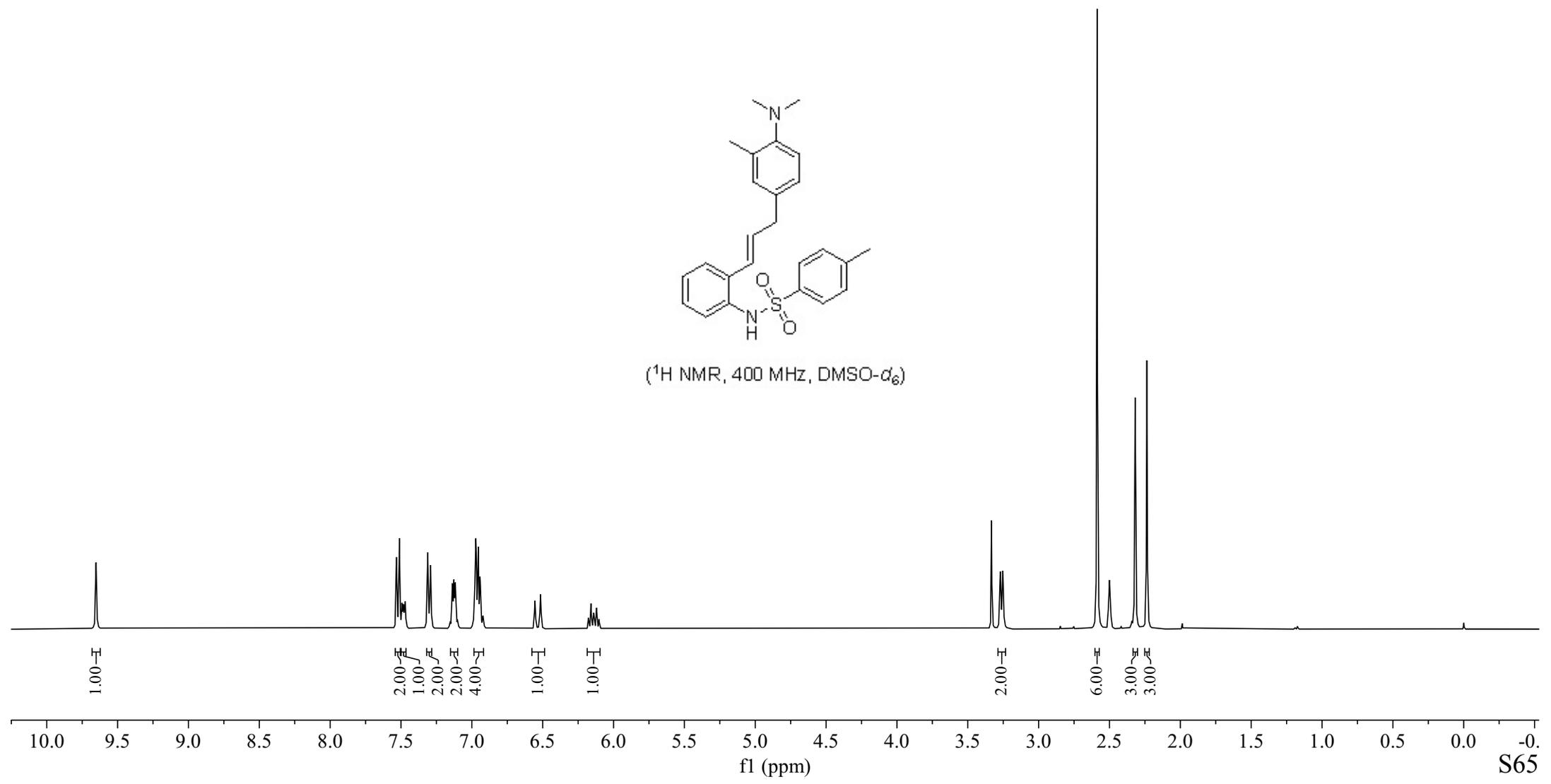
NMR spectra of compound 3t

9.652
7.532
7.528
7.512
7.493
7.486
7.482
7.475
7.470
7.311
7.291
7.138
7.134
7.127
7.120
7.117
7.114
6.983
6.976
6.972
6.960
6.954
6.943
6.938
6.922
6.917
6.554
6.519
6.515
6.159
6.141
6.138
6.120

3.332
3.270
3.252
2.588
2.509
2.505
2.500
2.495
2.491
2.319
2.236



(¹H NMR, 400 MHz, DMSO-*d*₆)

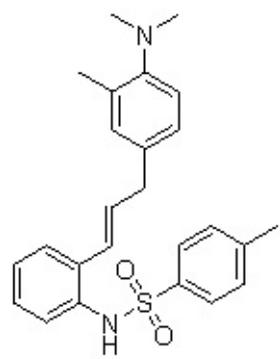


NMR spectra of compound 3t

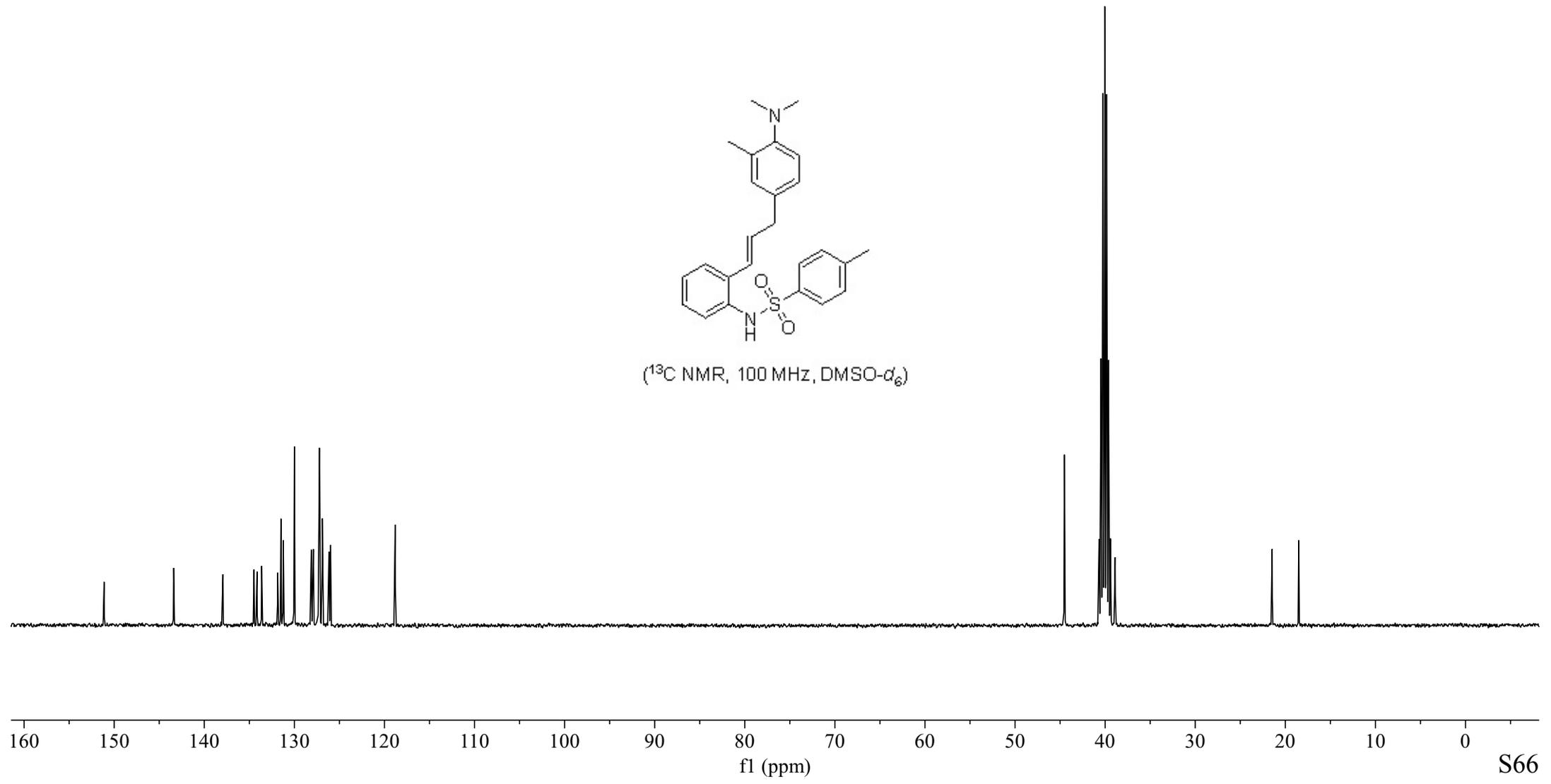
151.120
143.395
137.927
134.484
134.143
133.631
131.853
131.488
131.228
129.998
128.120
127.894
127.304
127.209
126.896
126.158
125.979
118.811

44.522
38.893

21.464
18.507



(¹³C NMR, 100 MHz, DMSO-d₆)

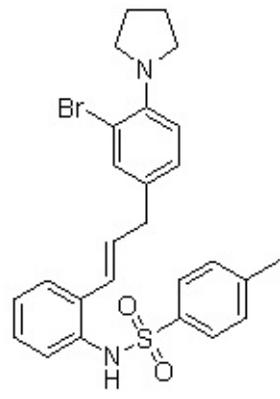


NMR spectra of compound 3u

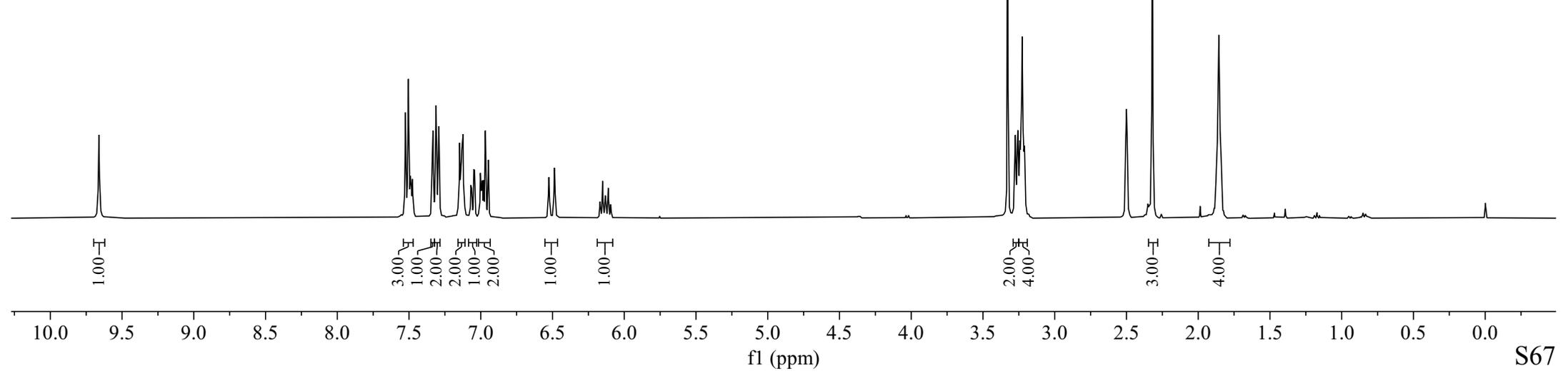
9.661
7.525
7.521
7.509
7.504
7.499
7.491
7.485
7.476
7.338
7.333
7.312
7.292
7.147
7.138
7.132
7.123
7.069
7.064
7.048
7.043
7.003
6.992
6.988
6.979
6.968
6.947
6.525
6.486
6.189
6.151
6.133
6.130
6.112
6.094

3.275
3.257
3.243
3.233
3.227
3.211

2.320
1.872
1.864
1.856
1.848
1.840



(¹H NMR, 400 MHz, DMSO-*d*₆)



NMR spectra of compound 3u

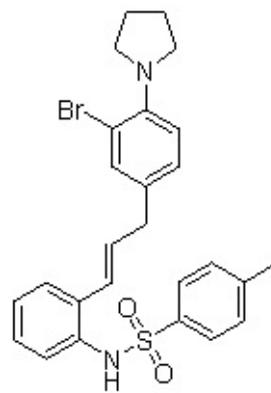
146.519
142.885
137.328
133.721
133.352
133.130
130.142
129.459
128.177
127.565
127.466
126.756
126.658
125.805
125.648
— 118.411
— 113.487

— 50.825

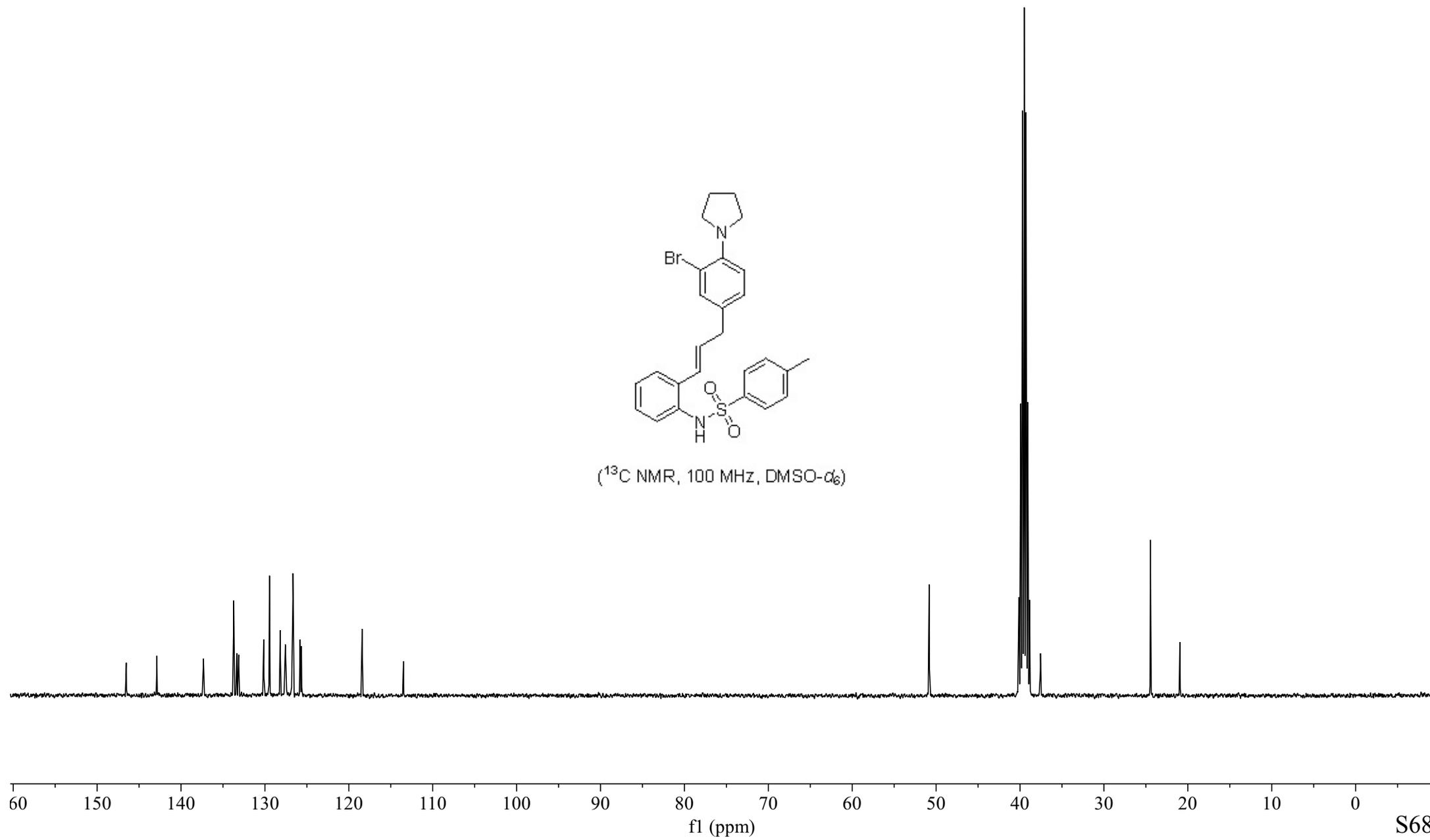
— 37.558

— 24.458

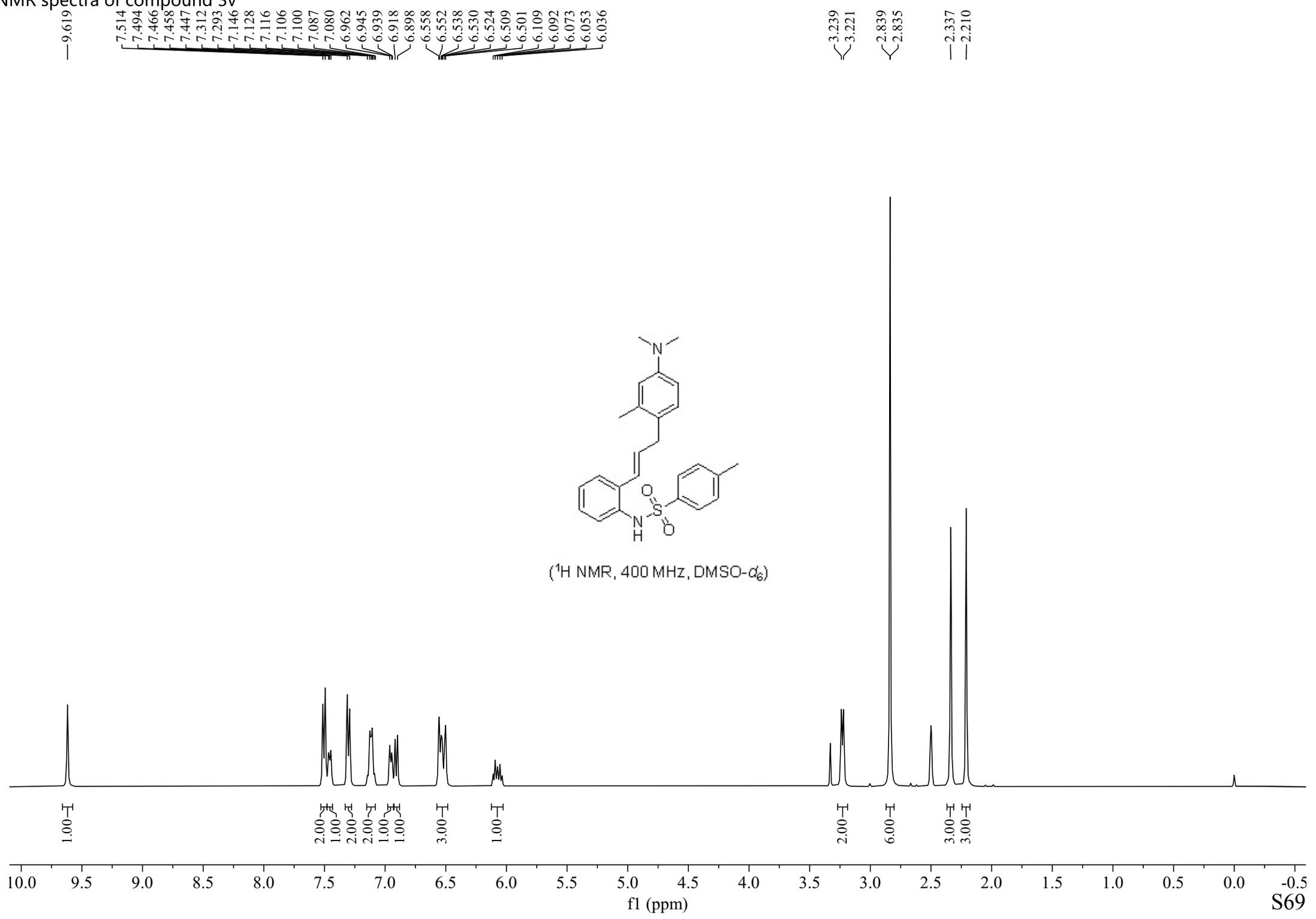
— 20.944



(¹³C NMR, 100 MHz, DMSO-*d*₆)



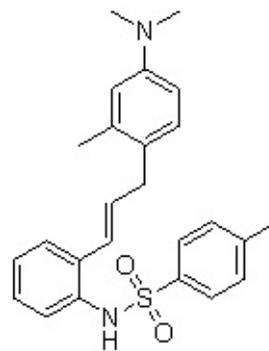
NMR spectra of compound 3v



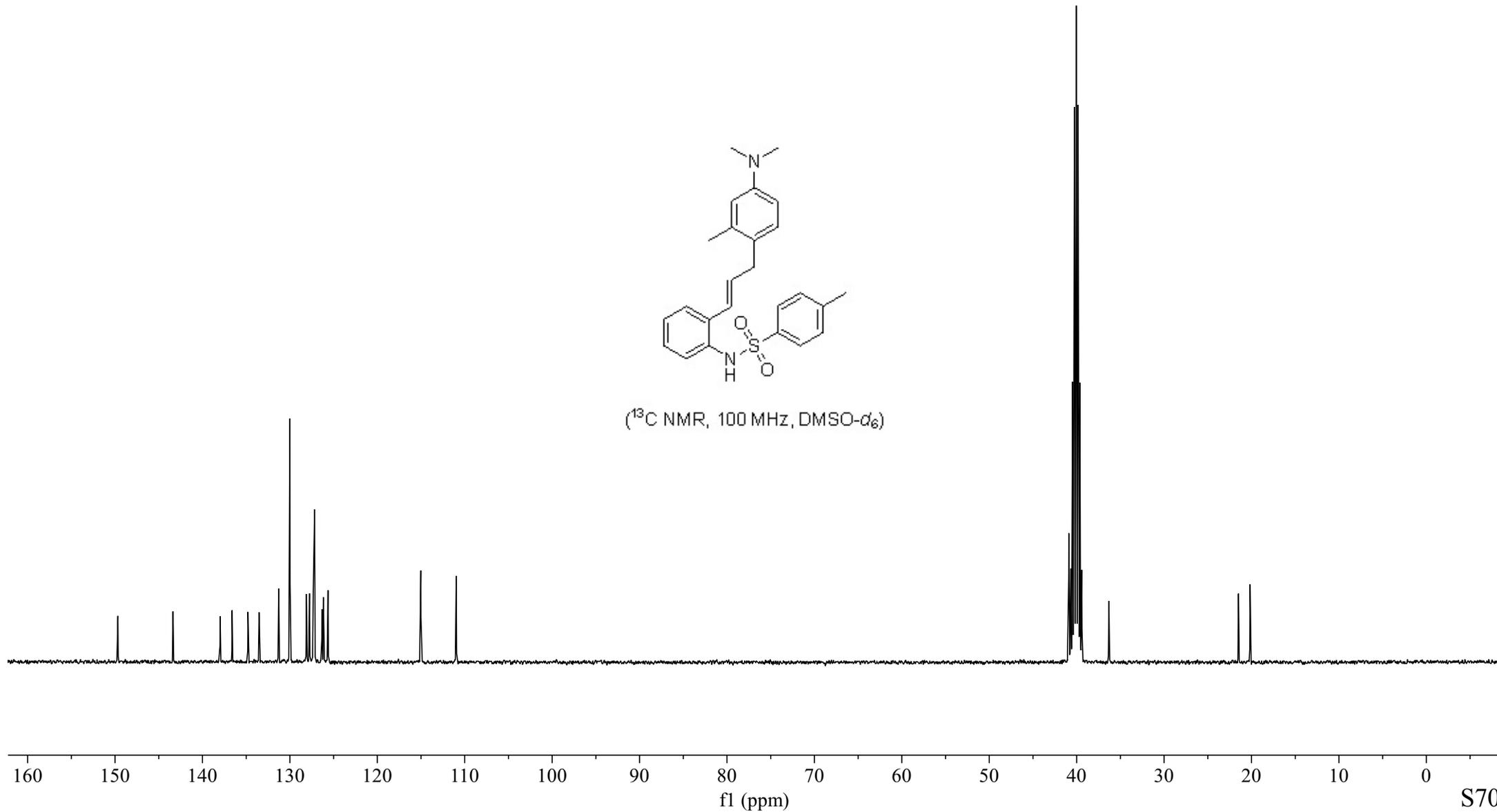
NMR spectra of compound 3v

— 149.675
 — 143.370
 / 137.976
 / 136.614
 / 134.798
 / 133.521
 / 131.277
 / 130.002
 / 128.104
 / 127.762
 / 127.325
 / 127.176
 / 126.337
 / 126.171
 / 125.641
 / 115.020
 / 110.970

— 40.897
 — 36.315
 / 21.491
 / 20.162



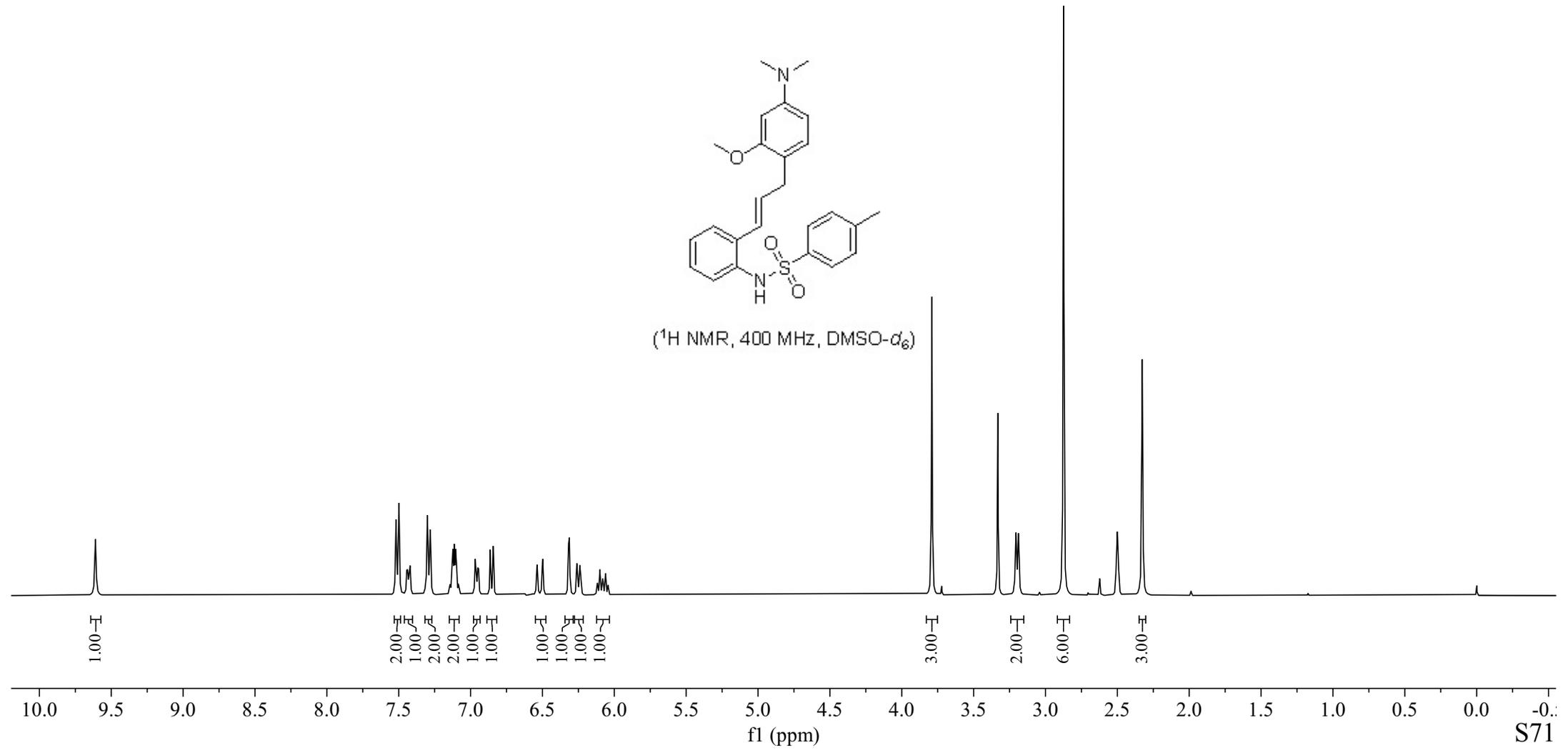
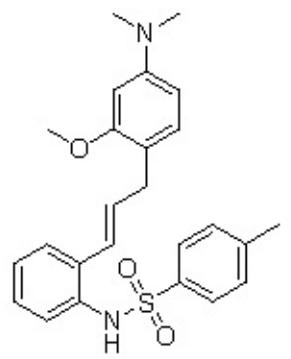
(¹³C NMR, 100 MHz, DMSO-*d*₆)



NMR spectra of compound 3w

9.610
7.519
7.499
7.444
7.437
7.429
7.425
7.420
7.301
7.281
7.147
7.142
7.129
7.123
7.114
7.104
7.098
7.085
7.080
6.967
6.963
6.959
6.950
6.944
6.863
6.842
6.538
6.499
6.318
6.312
6.261
6.255
6.240
6.234
6.118
6.100
6.083
6.079
6.061
6.043

3.790
3.206
3.188
2.875
2.327



NMR spectra of compound 3w

— 157.912
 — 151.148
 — 143.370
 / 137.979
 / 134.814
 / 133.500
 / 131.376
 / 130.213
 / 129.992
 / 128.023
 / 127.706
 / 127.296
 / 127.189
 / 126.132
 / 125.557
 / 116.073

— 105.107

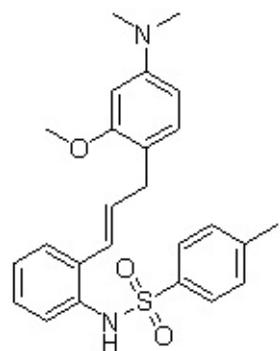
— 96.932

— 55.704

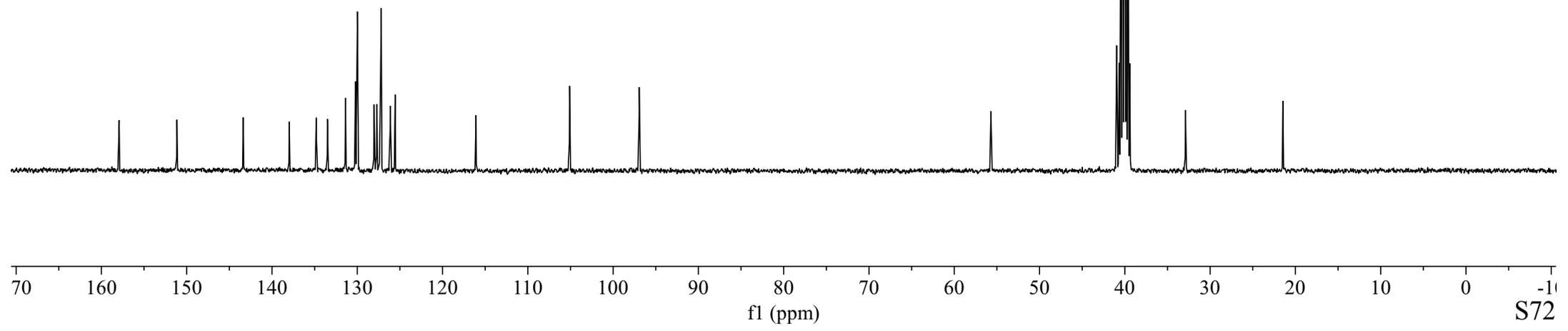
— 40.955

— 32.891

— 21.470



(¹³C NMR, 100 MHz, DMSO-*d*₆)



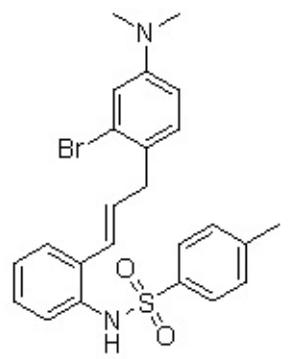
NMR spectra of compound 3x

9.635
7.515
7.499
7.494
7.461
7.453
7.448
7.438
7.307
7.287
7.149
7.141
7.134
7.126
7.060
7.038
7.005
6.998
6.995
6.990
6.982
6.879
6.872
6.722
6.715
6.700
6.693
6.571
6.532
6.516
6.092
6.075
6.070
6.053
6.036

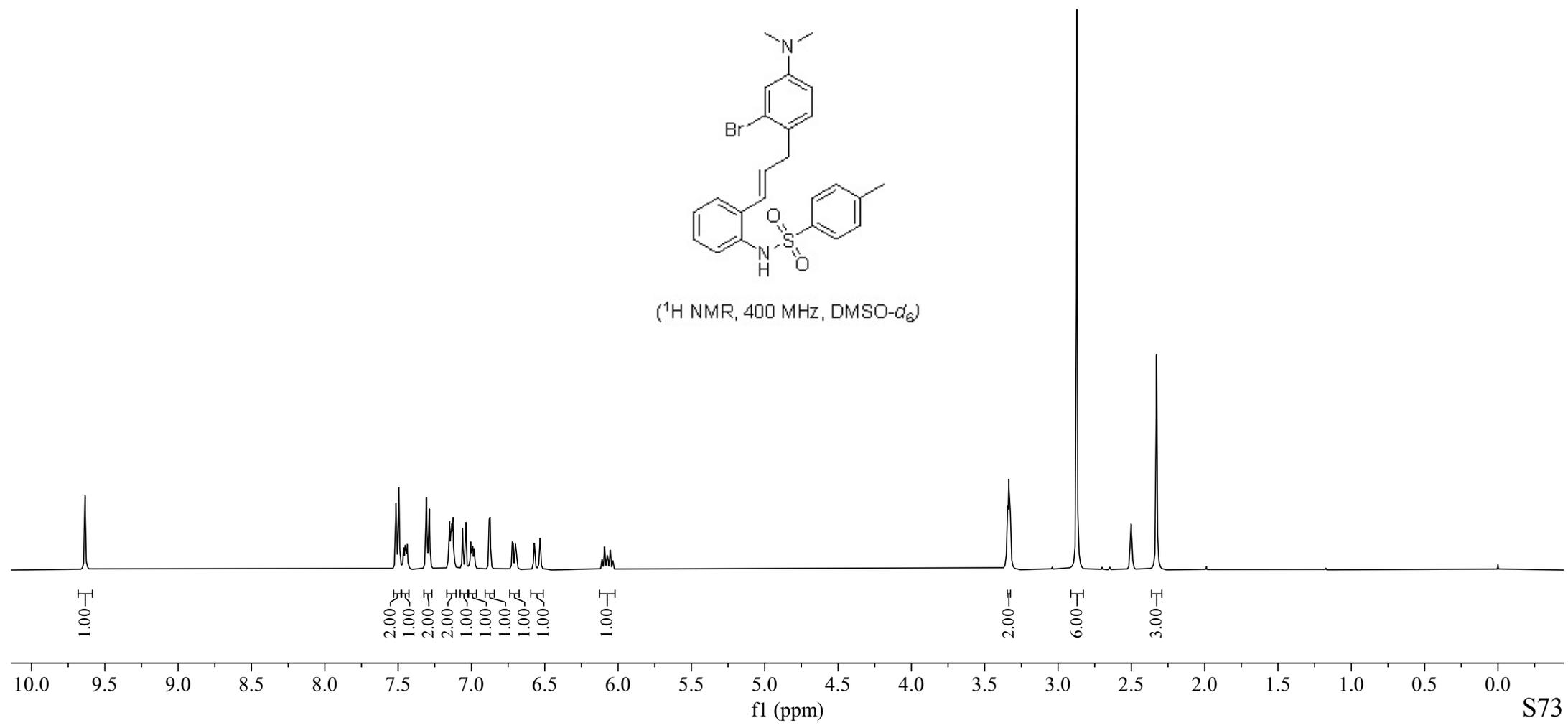
3.342
3.326

2.511
2.507
2.502
2.497
2.493

—0.000



(¹H NMR, 400 MHz, DMSO-*d*₆)

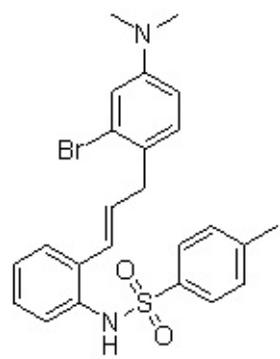


NMR spectra of compound 3x

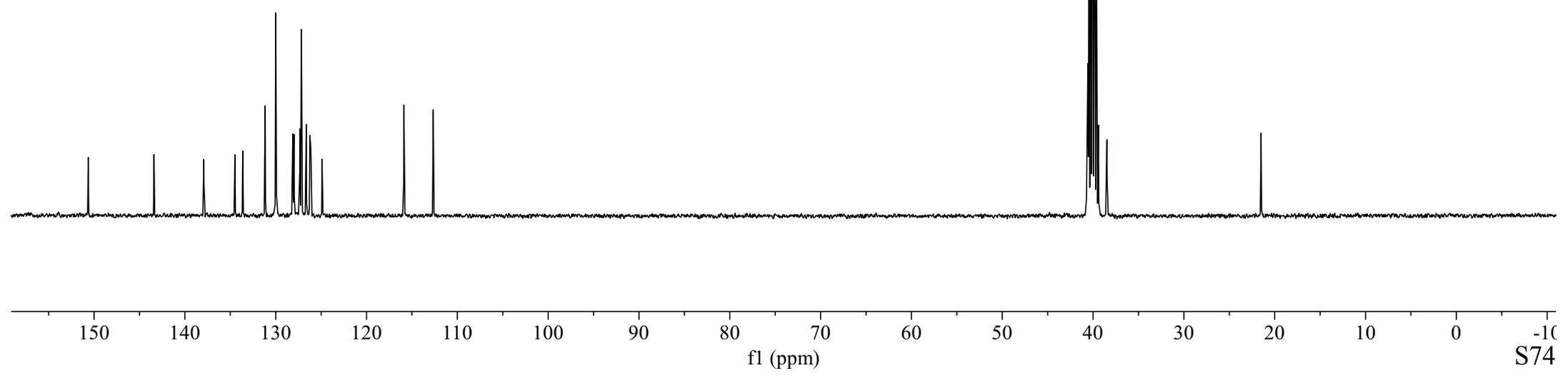
— 150.647
— 143.394
— 137.913
— 134.490
— 133.631
— 131.161
— 130.000
— 129.946
— 128.120
— 127.988
— 127.339
— 127.179
— 126.639
— 126.237
— 126.134
— 124.896
— 115.885
— 112.652

— 40.566
— 38.484

— 21.505



(¹³C NMR, 100 MHz, DMSO-*d*₆)



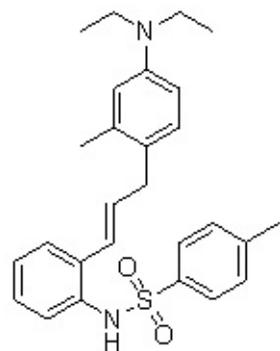
NMR spectra of compound 3y

9.618
7.518
7.513
7.497
7.492
7.469
7.461
7.454
7.450
7.445
7.307
7.287
7.144
7.139
7.126
7.120
7.111
7.102
7.096
7.084
7.078
6.976
6.969
6.964
6.960
6.952
6.946
6.886
6.881
6.865
6.860
6.540
6.501
6.479
6.472
6.456
6.449
6.435
6.427
6.107
6.094
6.088
6.070
6.055
6.049
6.032

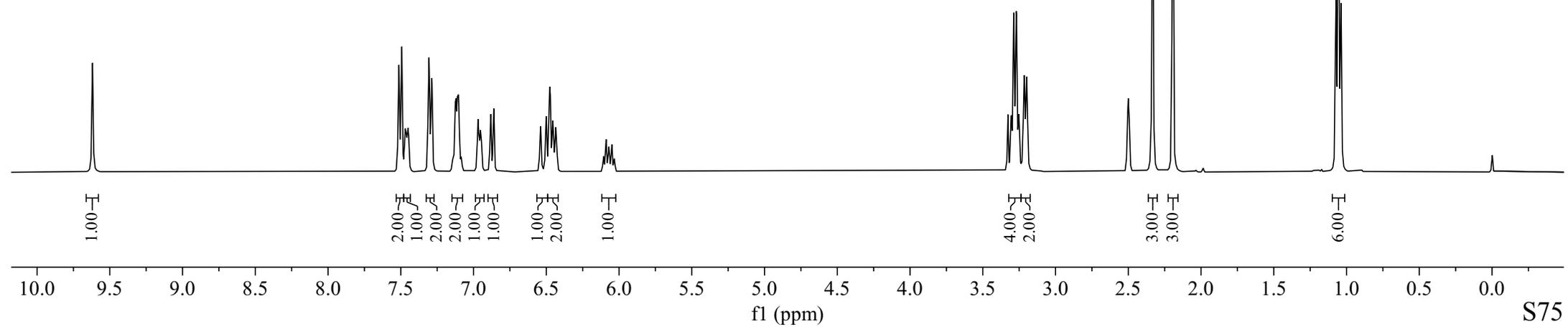
3.305
3.286
3.269
3.252
3.215
3.198

2.333
2.198
2.193

1.076
1.071
1.060
1.056
1.053
1.042
1.038
1.035



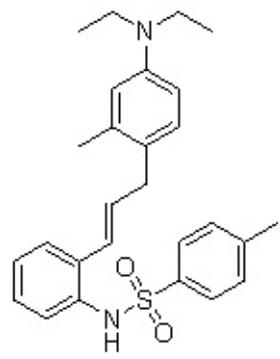
(¹H NMR, 400 MHz, DMSO-*d*₆)



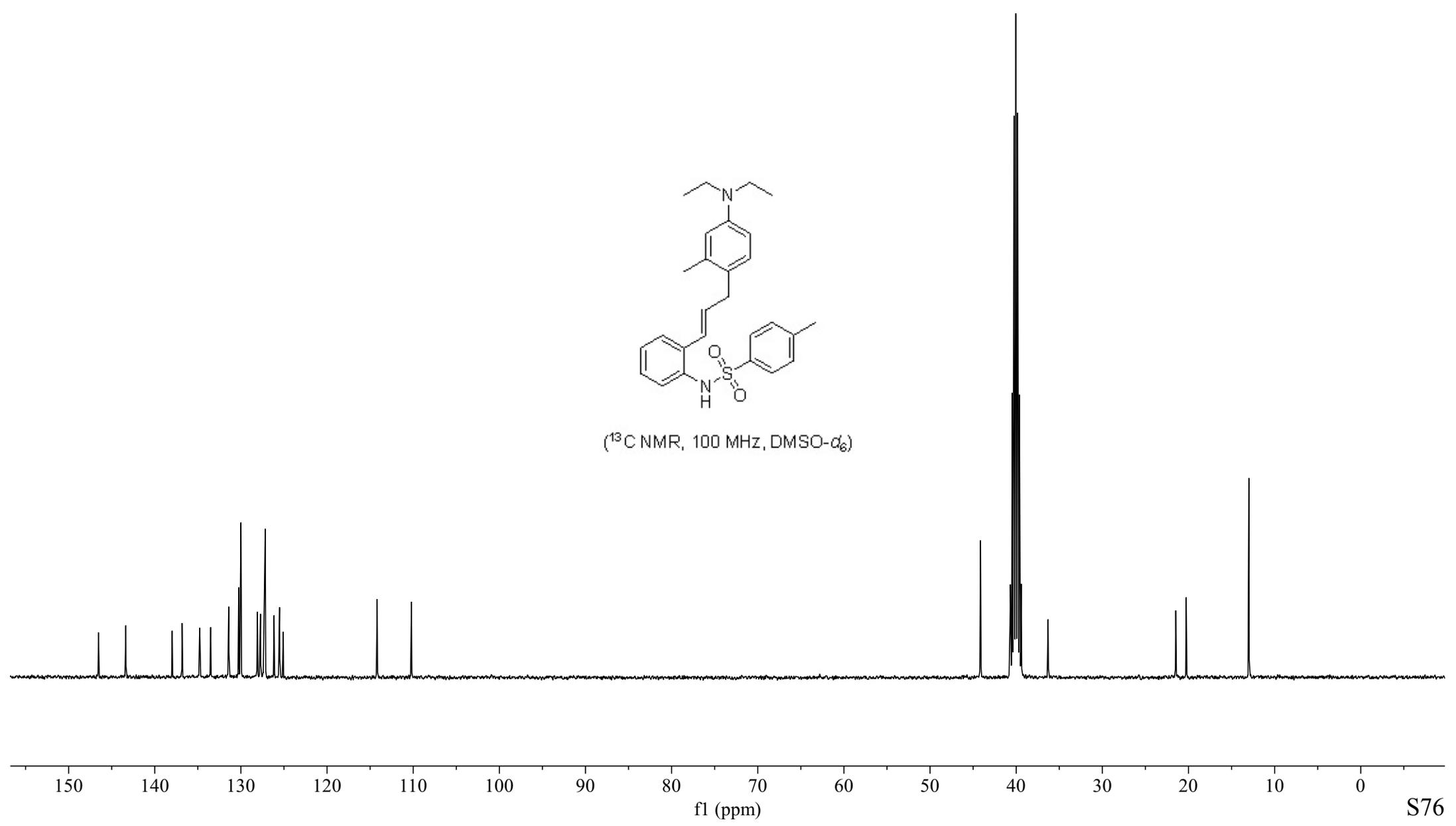
NMR spectra of compound 3y

— 146.531
 — 143.358
 — 137.975
 — 136.821
 — 134.784
 — 133.515
 — 131.410
 — 130.251
 — 129.996
 — 128.091
 — 127.734
 — 127.303
 — 127.180
 — 126.156
 — 125.517
 — 125.085
 — 114.184
 — 110.204

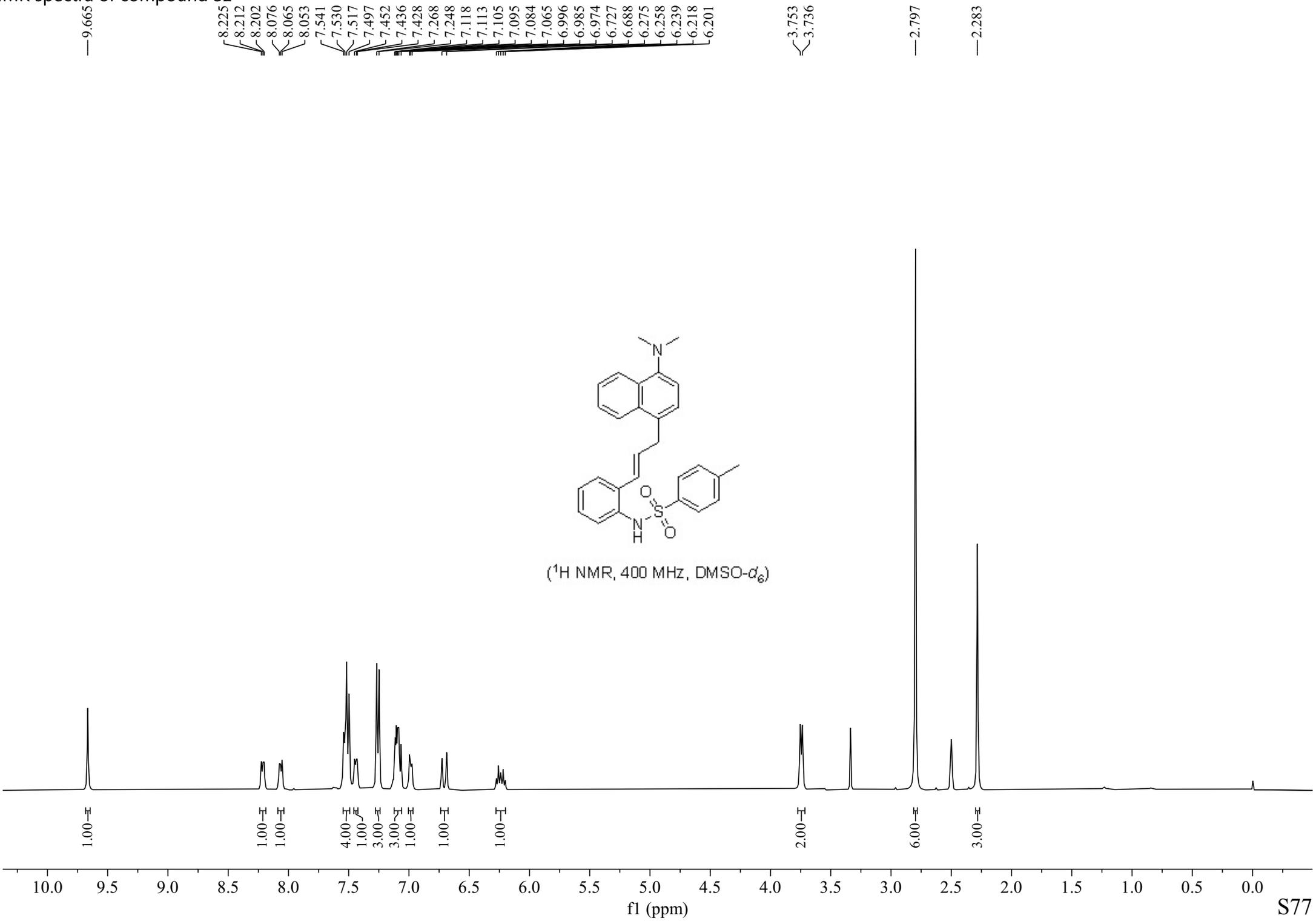
— 44.139
 — 36.302
 — 21.470
 — 20.264
 — 12.989



(¹³C NMR, 100 MHz, DMSO-d₆)



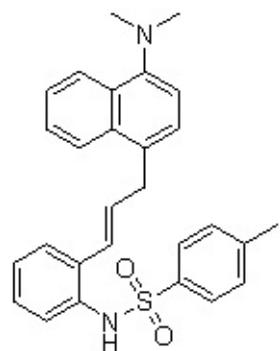
NMR spectra of compound 3z



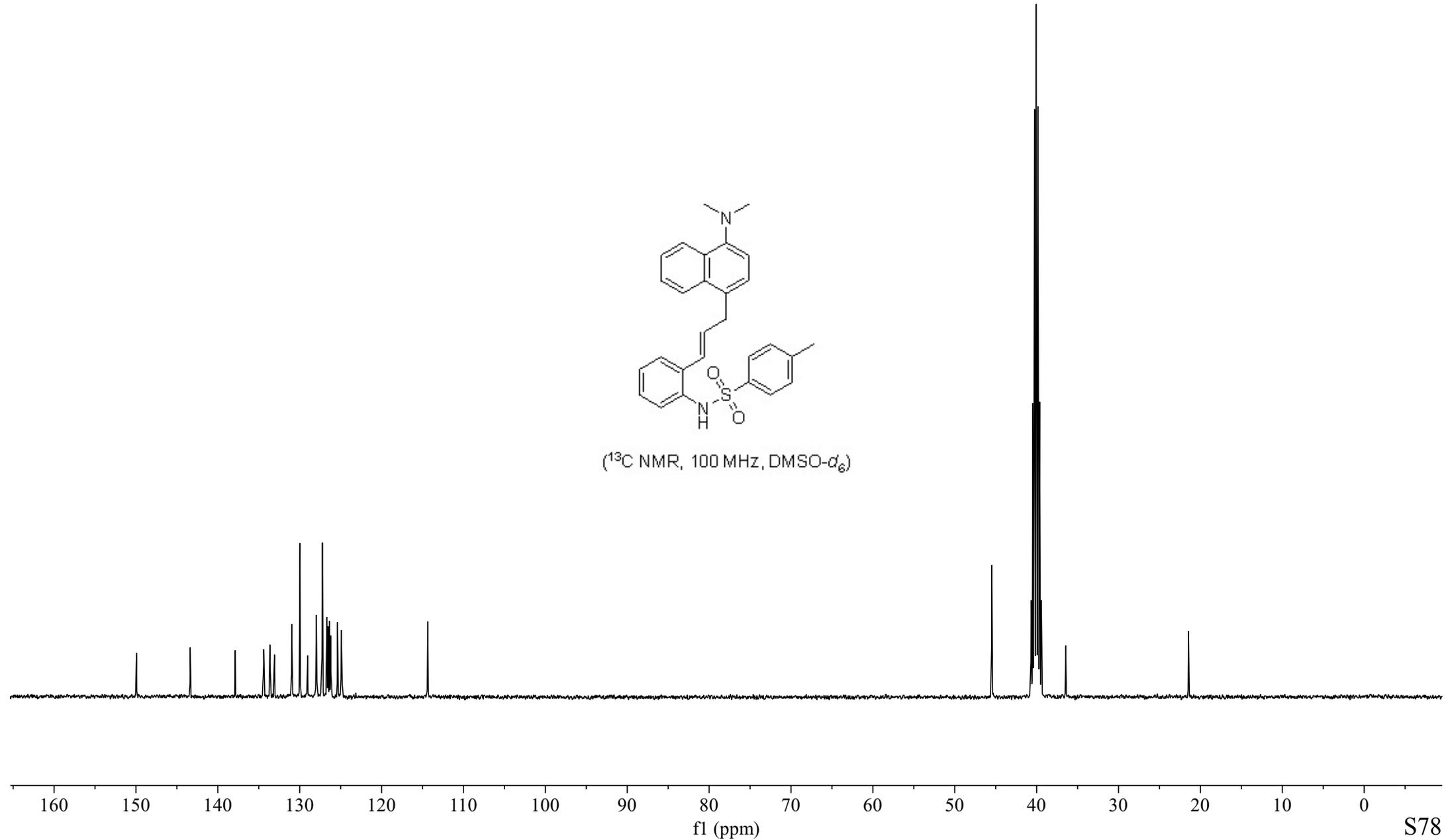
NMR spectra of compound 3z

— 149.928
 — 143.366
 — 137.872
 — 134.402
 — 133.639
 — 133.083
 — 130.977
 — 130.919
 — 129.963
 — 129.027
 — 127.968
 — 127.935
 — 127.263
 — 127.218
 — 126.682
 — 126.550
 — 126.365
 — 126.216
 — 125.388
 — 124.930
 — 124.840

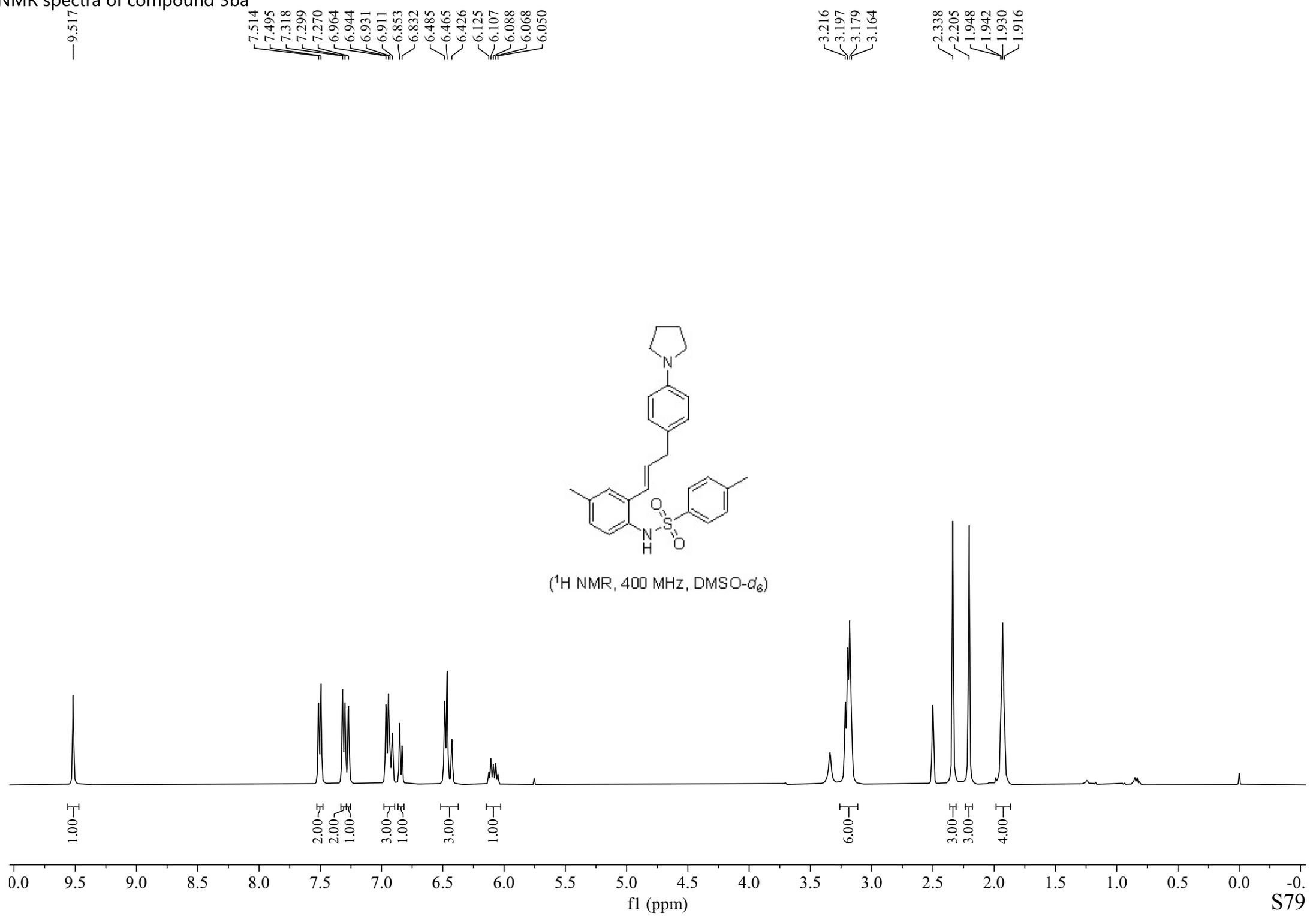
— 45.478
 — 36.448
 — 21.454



(¹³C NMR, 100 MHz, DMSO-d₆)



NMR spectra of compound 3ba



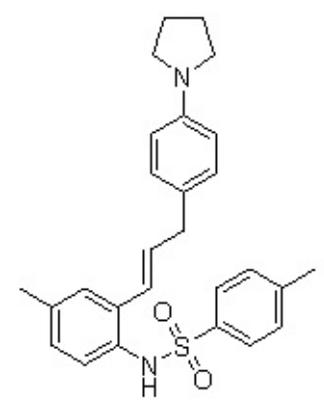
NMR spectra of compound 3ba

146.832
143.292
138.000
136.623
134.543
131.630
131.025
129.976
129.513
128.509
128.380
127.227
126.655
126.393
125.474
112.260

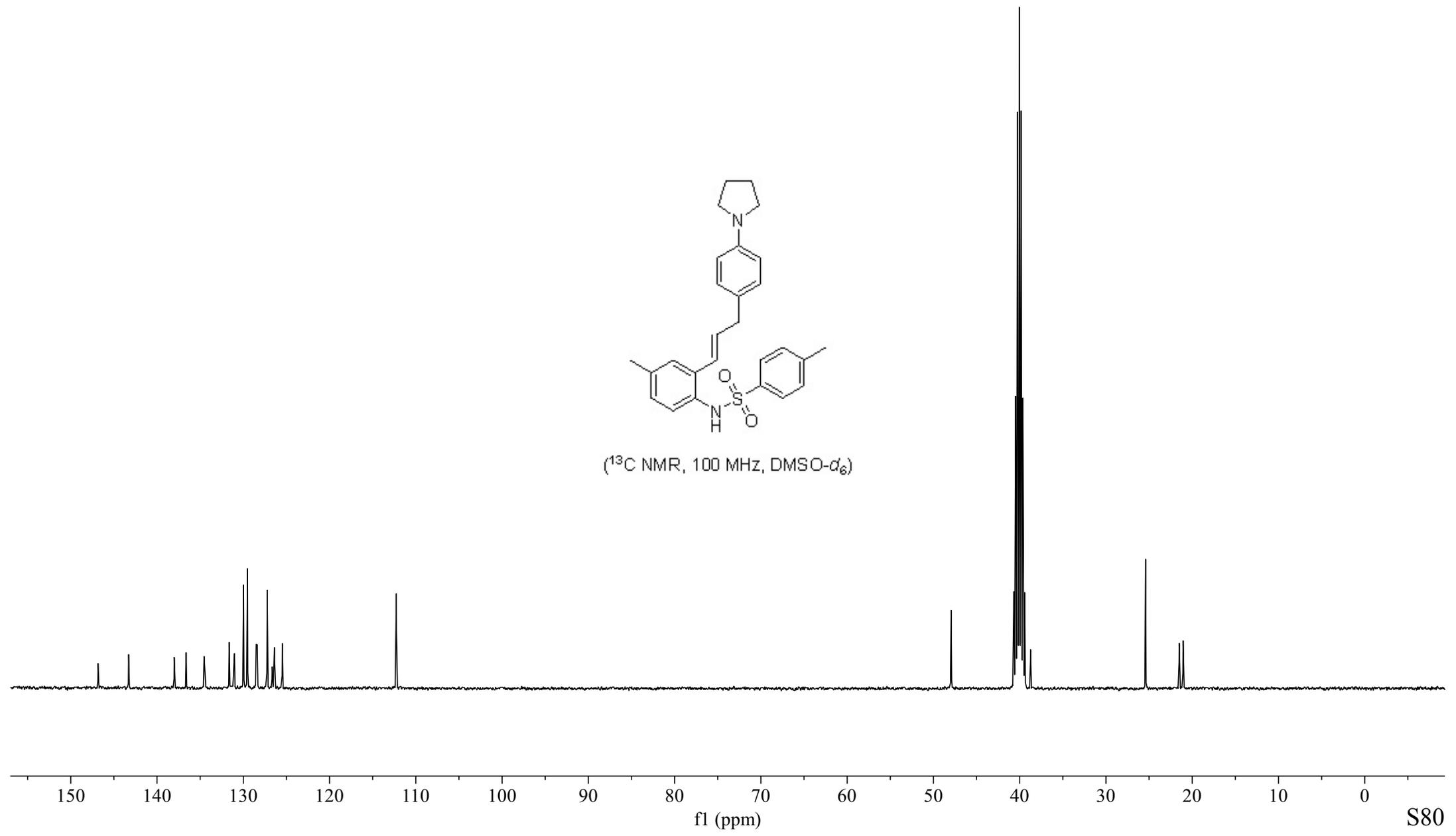
47.943

38.739

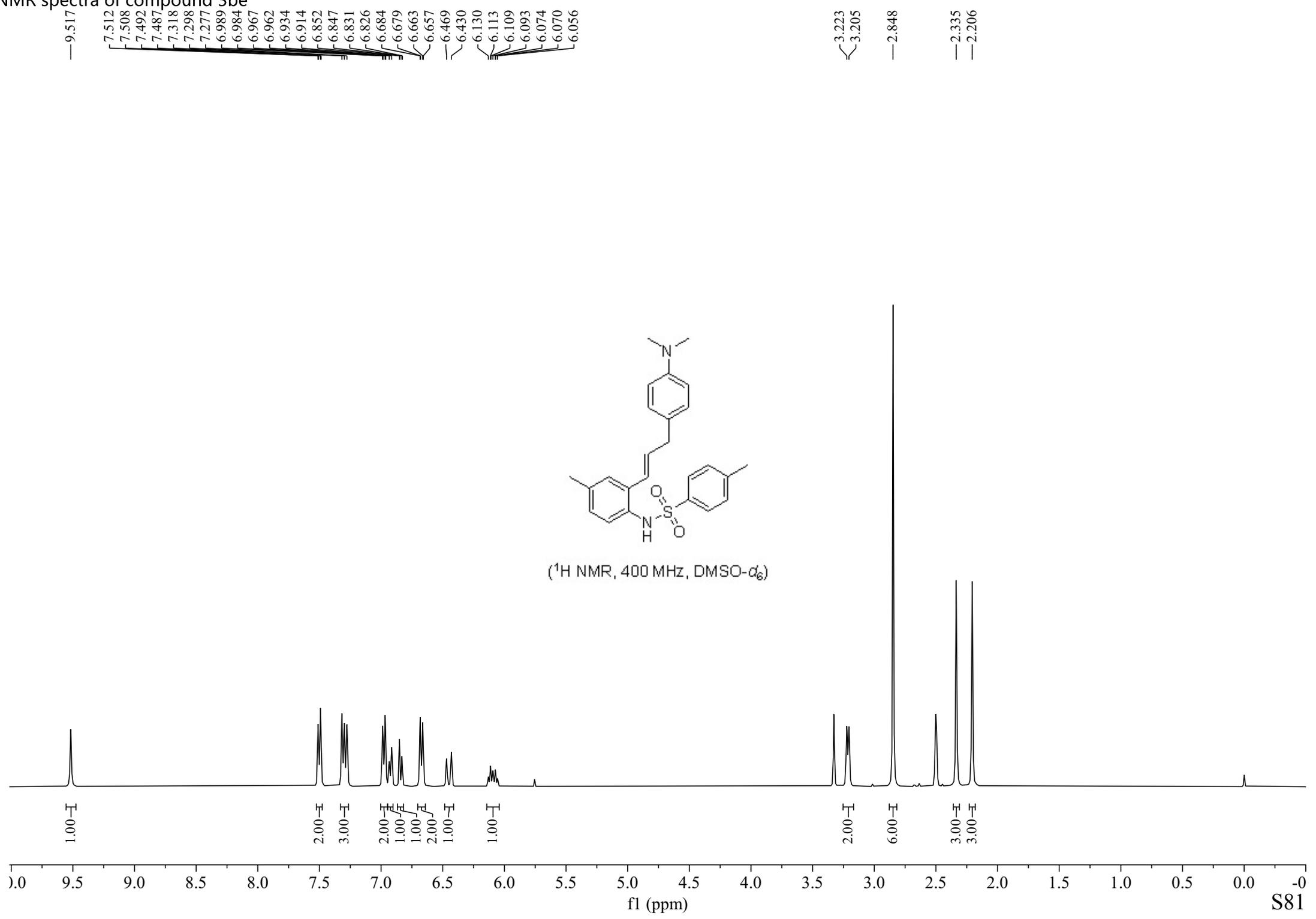
25.408
21.505
21.052



(¹³C NMR, 100 MHz, DMSO-d₆)



NMR spectra of compound 3be

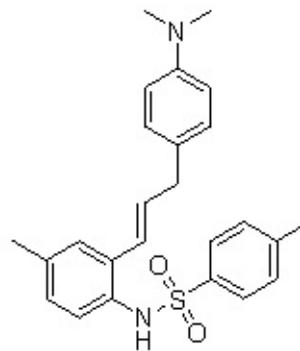


NMR spectra of compound 3be

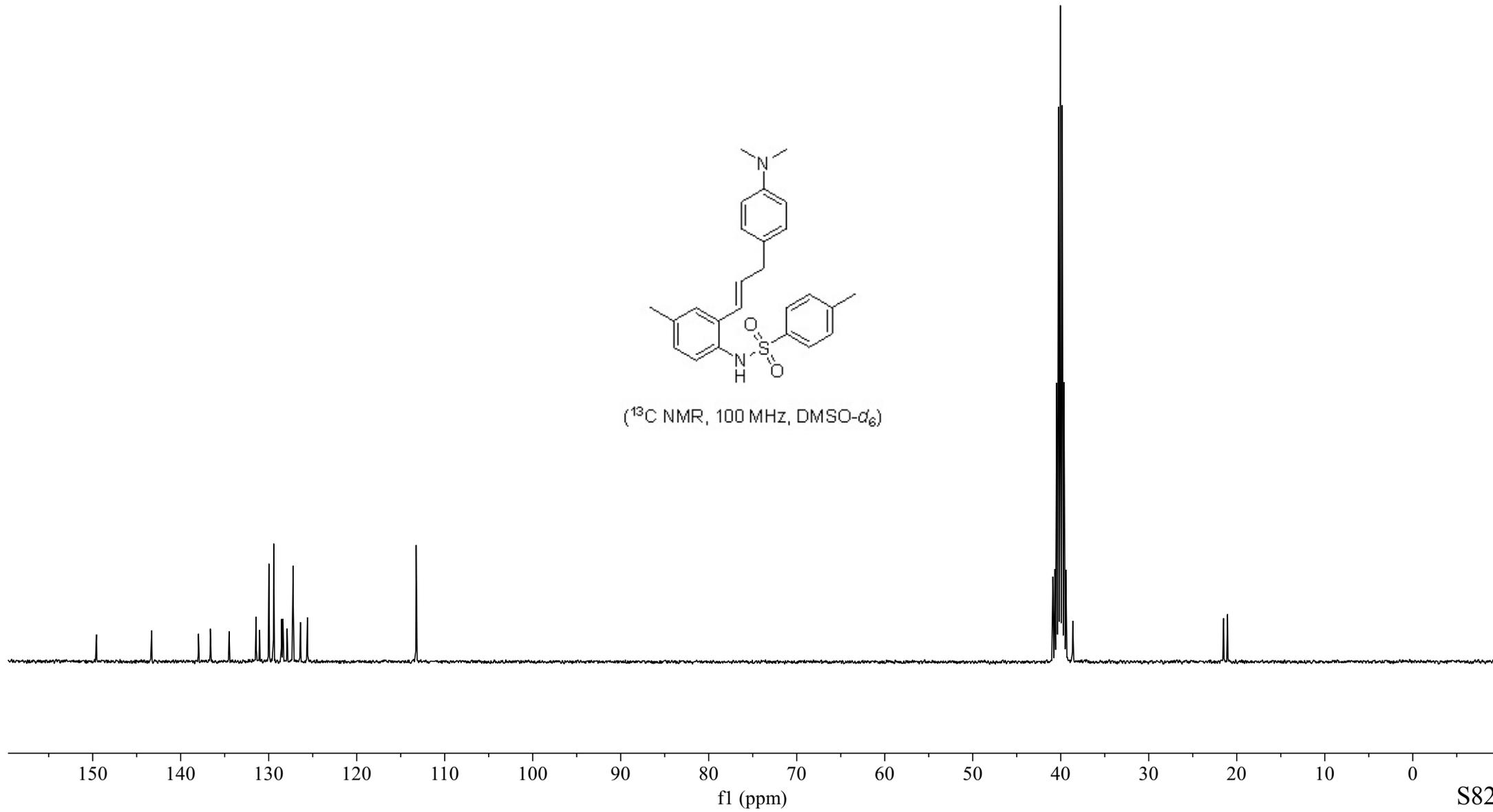
— 149.572
 — 143.295
 — 137.977
 — 136.628
 — 134.496
 — 131.432
 — 131.030
 — 129.975
 — 129.431
 — 128.537
 — 128.381
 — 127.906
 — 127.222
 — 126.399
 — 125.598
 — 113.237

— 40.909
 — 38.637

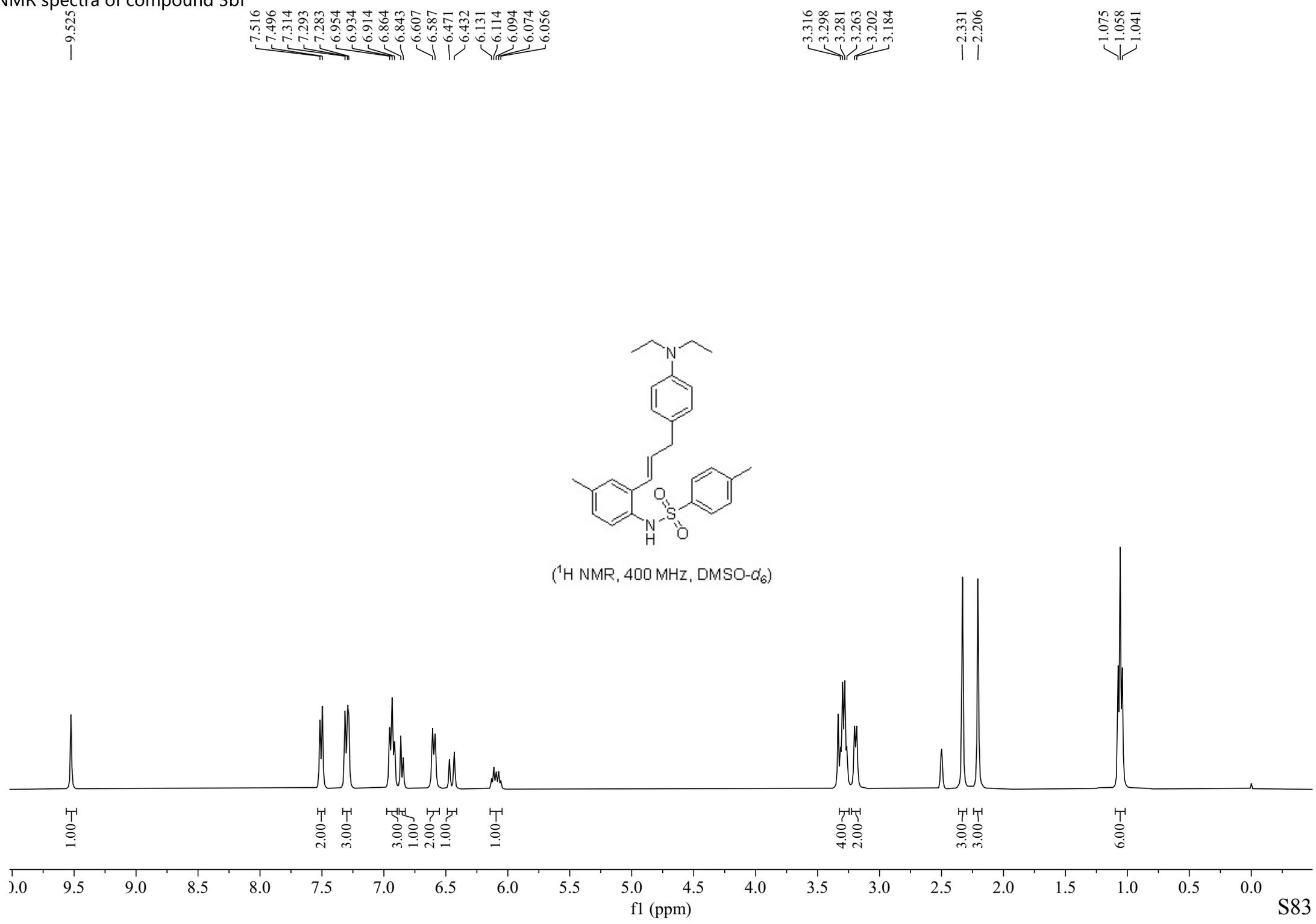
— 21.496
 — 21.046



(¹³C NMR, 100 MHz, DMSO-*d*₆)



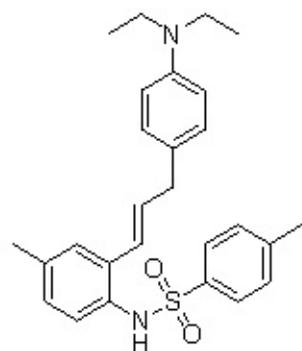
NMR spectra of compound 3bf



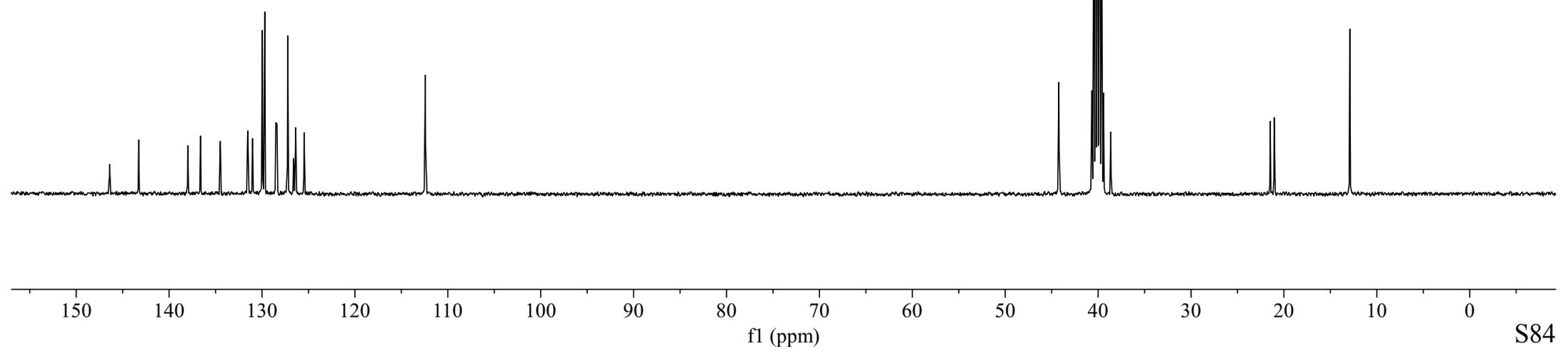
NMR spectra of compound 3bf

— 146.400
 — 143.282
 — 137.987
 — 136.615
 — 134.487
 — 131.537
 — 131.022
 — 129.968
 — 129.703
 — 128.512
 — 128.388
 — 127.232
 — 126.599
 — 126.377
 — 125.470
 — 112.421

— 44.233
 — 38.636
 — 21.475
 — 21.046
 — 12.910

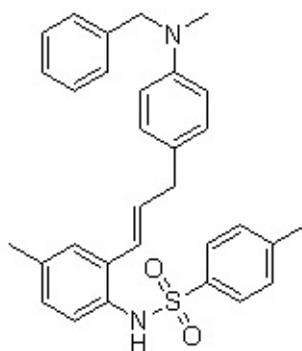


(¹³C NMR, 100 MHz, DMSO-*d*₆)

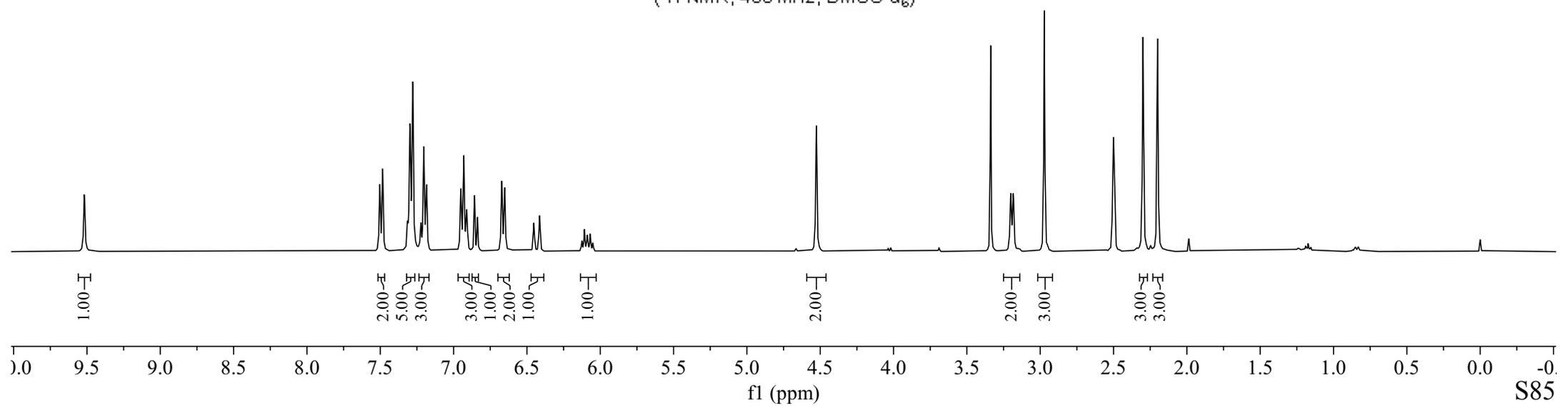


NMR spectra of compound 3bk

9.518
 7.505
 7.502
 7.484
 7.314
 7.302
 7.297
 7.278
 7.223
 7.207
 7.202
 7.184
 6.950
 6.930
 6.910
 6.858
 6.837
 6.673
 6.670
 6.651
 6.453
 6.414
 6.125
 6.108
 6.088
 6.069
 6.051
 4.527
 3.201
 3.184
 2.973
 2.970
 2.299
 2.200



(¹H NMR, 400 MHz, DMSO-*d*₆)



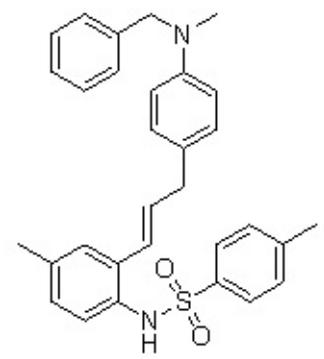
NMR spectra of compound 3bk

148.085
143.292
139.694
137.959
136.631
134.439
131.368
131.014
129.964
129.523
128.895
128.536
128.421
127.544
127.295
127.214
127.137
126.373
125.561
112.788

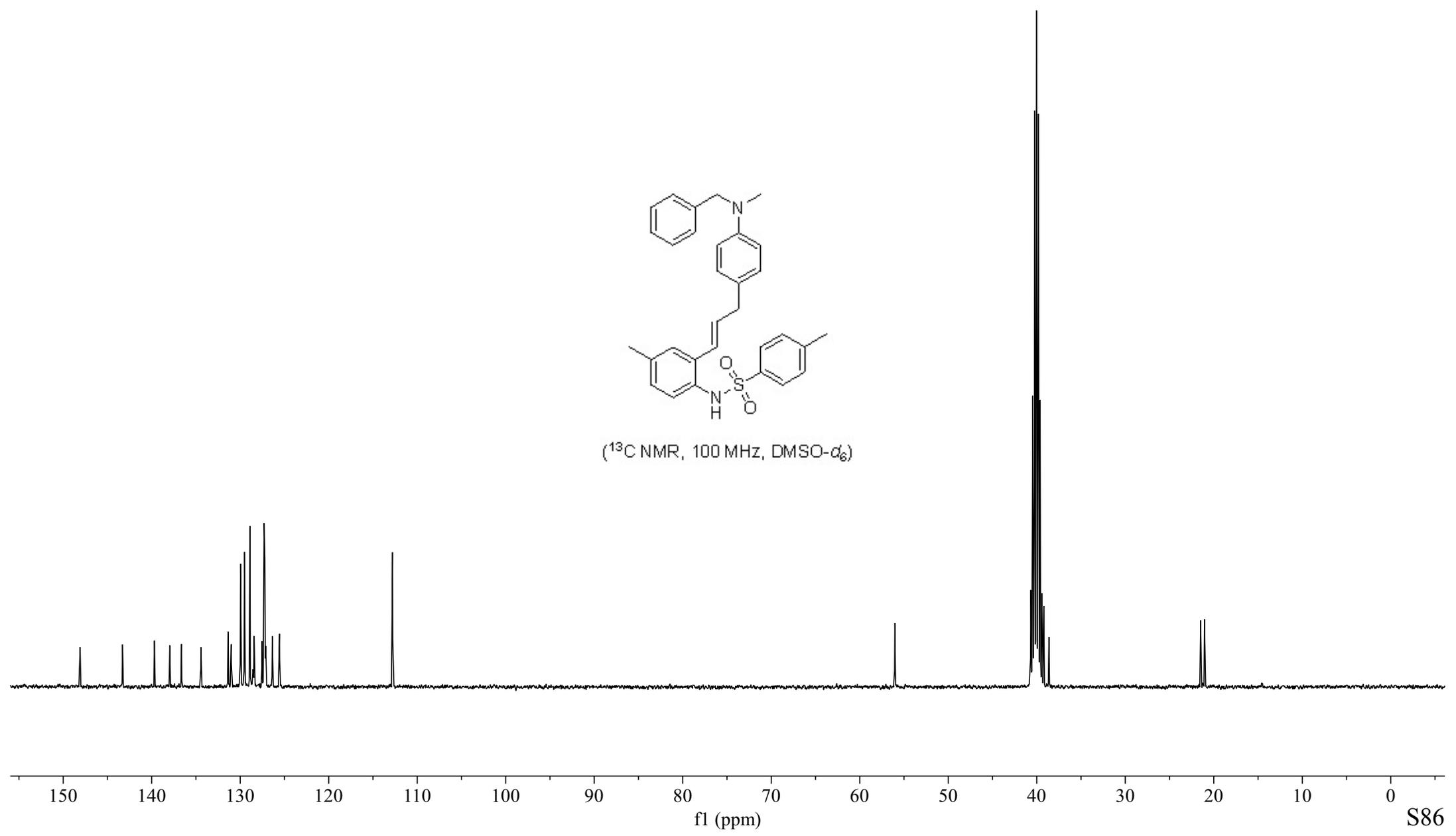
56.038

39.205
38.623

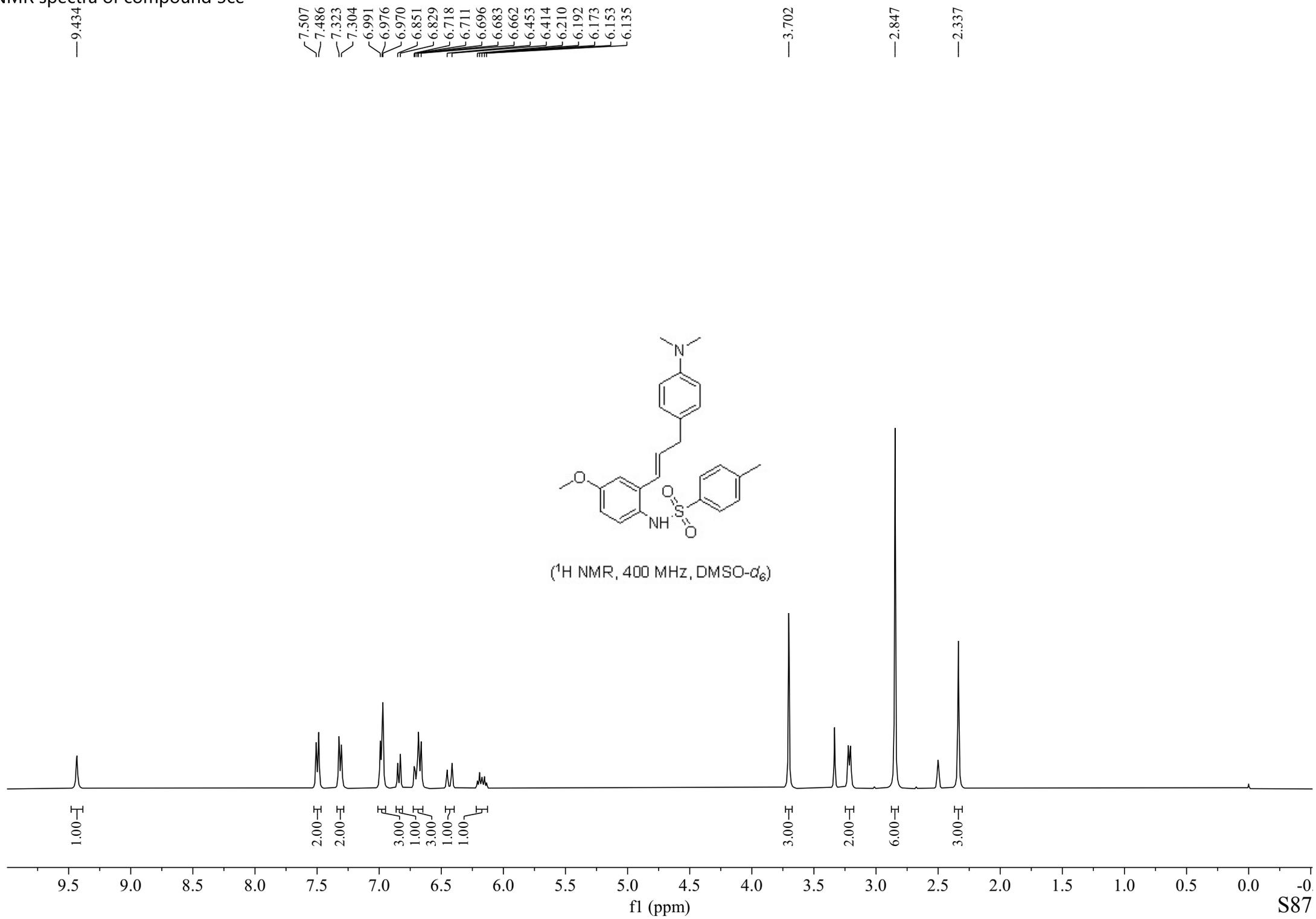
21.473
21.043



(¹³C NMR, 100 MHz, DMSO-*d*₆)



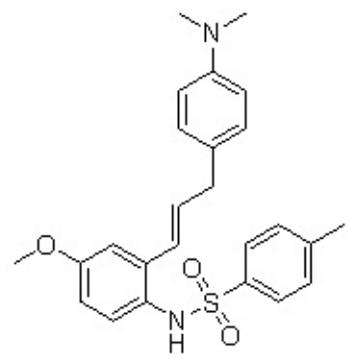
NMR spectra of compound 3ce



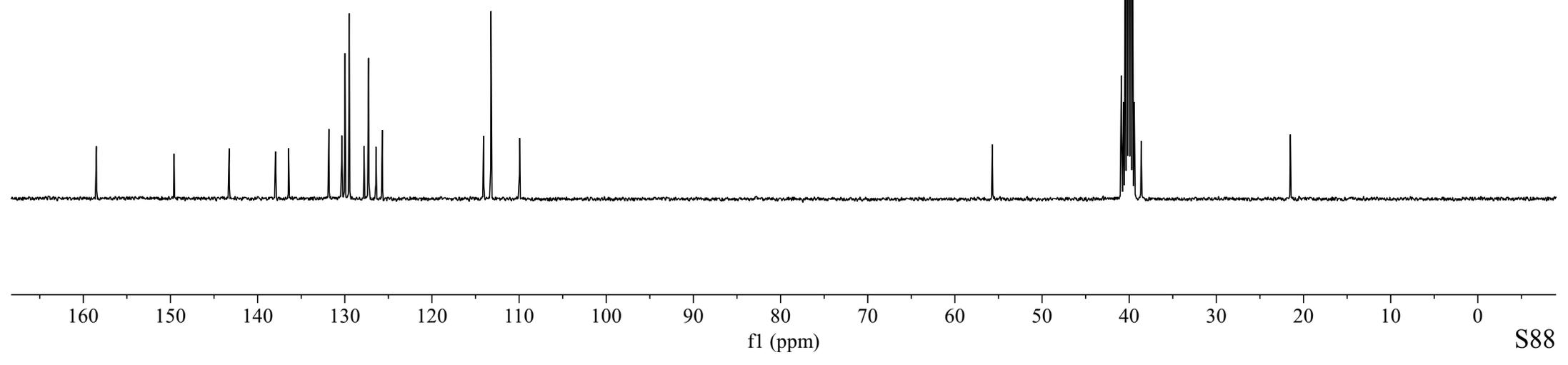
NMR spectra of compound 3ce

— 158.493
— 149.585
— 143.262
— 137.954
— 136.454
— 131.826
— 130.355
— 129.971
— 129.480
— 127.784
— 127.269
— 126.422
— 125.697
— 114.072
— 113.225
— 109.936

— 55.707
— 40.904
— 38.624
— 21.509



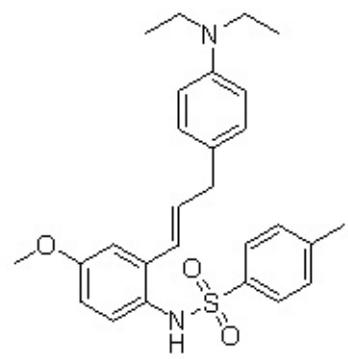
(¹³C NMR, 100 MHz, DMSO-*d*₆)



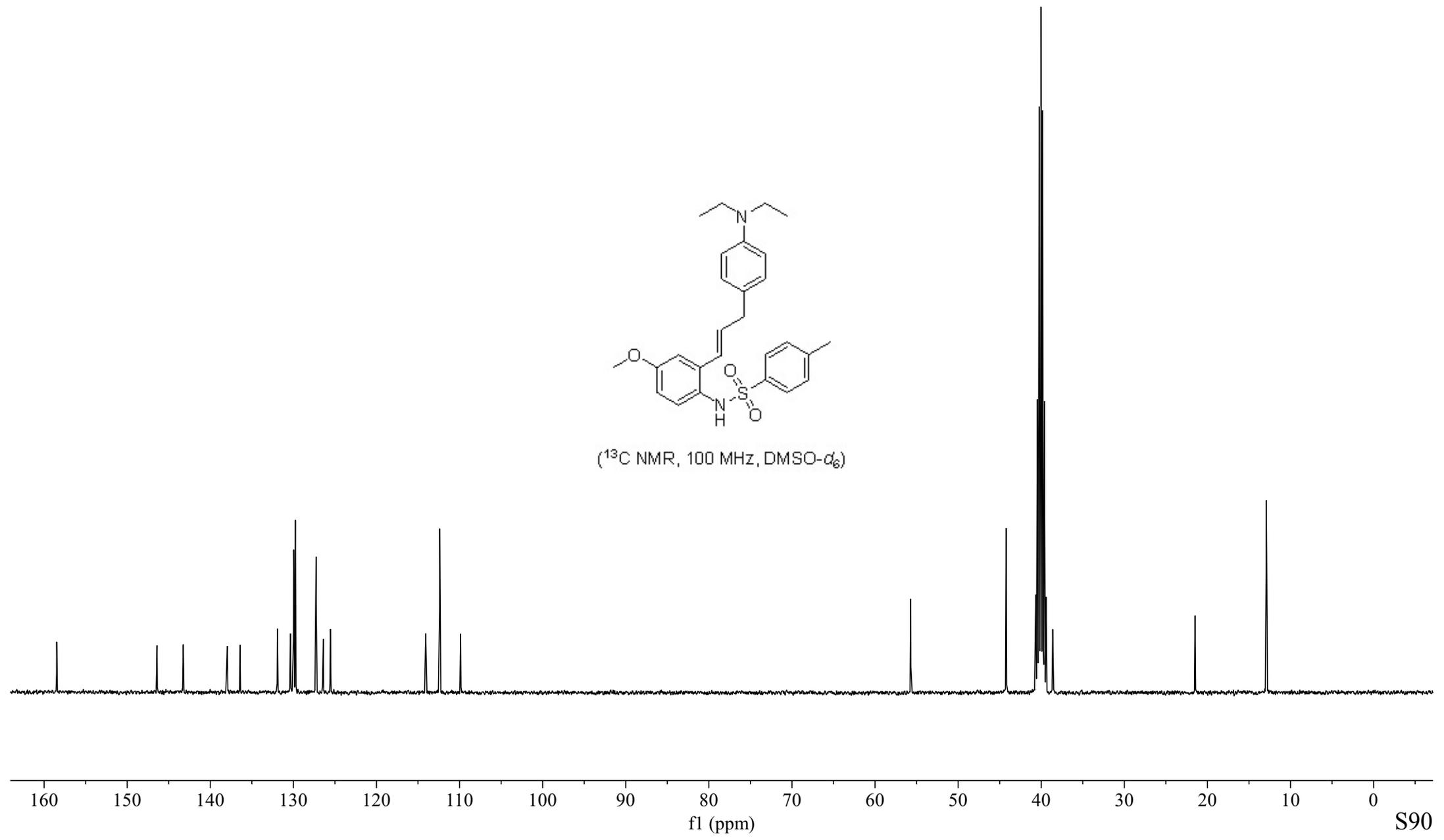
NMR spectra of compound 3cf

— 158.484
 — 146.404
 — 143.251
 — 137.947
 — 136.426
 — 131.921
 — 130.362
 — 129.971
 — 129.750
 — 127.269
 — 126.455
 — 126.403
 — 125.548
 — 114.071
 — 112.386
 — 109.875

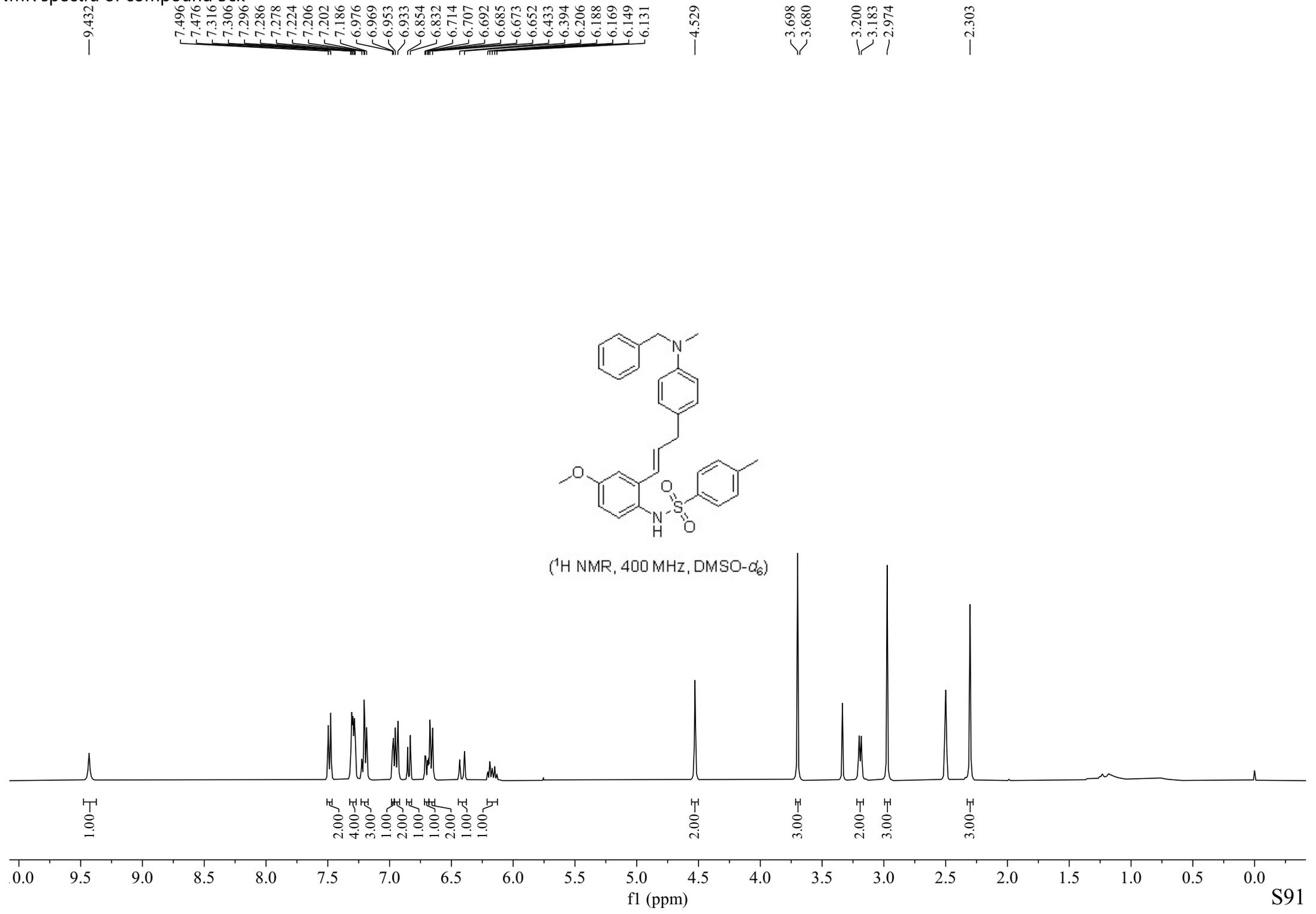
— 55.704
 — 44.221
 — 38.620
 — 21.488
 — 12.914



(¹³C NMR, 100 MHz, DMSO-*d*₆)



NMR spectra of compound 3ck



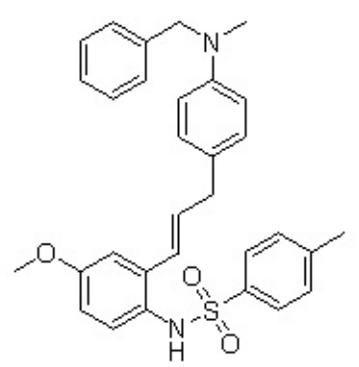
NMR spectra of compound 3ck

158.464
148.097
143.241
139.692
137.950
136.366
131.741
130.362
129.958
129.565
128.895
127.424
127.296
127.251
127.137
126.436
125.670
114.105
112.776
109.866

56.034
55.701

39.204
38.606

21.481



(¹³C NMR, 100 MHz, DMSO-*d*₆)

