

Supporting Information

Metal Triflimide-Mediated Acylation of Sulfonamides and Transacylation of N-Acylsulfonamides

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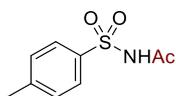
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General Information. Unless otherwise stated, all the reagents and solvents were purchased and used as received without further purification. Anhydrous dichloromethane was of Extra Dry grade with molecular sieves (water \leq 50 ppm). For reactions conducted at elevated temperatures, an oil bath was used as the heat source (silicone oil). Thin-layer chromatography analyses were performed on precoated GF254 silica gel plates and visualized under UV 254 nm light or by iodine staining. NMR spectra were recorded on a Bruker AVANCE-400 FT NMR spectrometer with TMS as internal standard. The melting points were uncorrected. PE = petroleum ether (60–90).

Acylation of sulfonamides (General Procedure A). To a 100 mL round-bottom flask was charged with a sulfonamide (5 mmol), $\text{Cu}(\text{NTf}_2)_2$ (0.0018 g, 0.005 mmol, 0.1 mol%), an acid anhydride or acyl chloride (7.5 mmol, 1.5 equiv) and anhydrous dichloromethane (5 mL). The mixture was allowed to stir overnight at room temperature. Silica gel (100 mesh) was then added to the reaction mixture, and the volatiles were removed using a rotary evaporator. The residue was purified by column chromatography (eluent: PE/EtOAc = 3:1–1:1, v/v) to afford the desired *N*-acylsulfonamide.

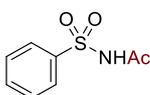
N-Tosylacetamide (**2**, prepared at room temperature).



From *p*-tosylamide (**1**, 0.171 g, 1 mmol), $\text{Cu}(\text{NTf}_2)_2$ (0.0006 g, 0.001 mmol, 0.1 mol%) and Ac_2O (0.123 g, 1.2 mmol, 1.2 equiv); white solid; yield: 0.200 g (93%); mp 137–139 °C (lit.¹ 136–138 °C); R_f = 0.64 (PE/EtOAc = 1:1).

¹H NMR (400 MHz, CDCl_3): δ 8.45 (s, 1H), 7.94 (d, J = 8.4 Hz, 2H), 7.36 (d, J = 7.7 Hz, 2H), 2.45 (s, 3H), 2.07 (s, 3H).

N-(Phenylsulfonyl)acetamide (**4a**).

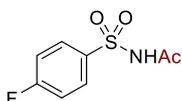


From benzenesulfonamide (**3a**, 0.157 g, 1 mmol); white solid; yield: 0.178 g (89%); mp 119–121 °C (lit.² 122.5–124.5 °C); R_f = 0.30 (PE/EtOAc = 2:1).

From **3a** (0.157 g, 1 mmol) using isopropenyl acetate (0.150 g, 1.5 mmol, 1.5 equiv) as the acylating agent; yield: 0.154 g (77%).

¹H NMR (400 MHz, CDCl_3): δ 8.88 (br s, 1H), 8.07 (d, J = 7.2 Hz, 2H), 7.67 (t, J = 7.5 Hz, 1H), 7.57 (t, J = 7.7 Hz, 2H), 2.08 (s, 3H).

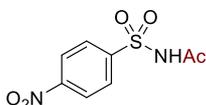
N-((4-Fluorophenyl)sulfonyl)acetamide (**4b**).



From 4-fluorobenzenesulfonamide (**3b**, 0.876 g, 5 mmol); white solid; yield: 0.806 g (74%); mp 128–129 °C (lit.¹ 125.5–127 °C); R_f = 0.18 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl_3): δ 8.99 (br s, 1H), 8.11 (dd, J_1 = 8.9 Hz, J_2 = 5.0 Hz, 2H), 7.24 (t, J = 8.6 Hz, 2H), 2.09 (s, 3H).

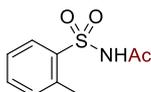
N-((4-Nitrophenyl)sulfonyl)acetamide (**4c**).



From 4-nitrobenzenesulfonamide (**3c**, 0.202 g, 1 mmol); off-white solid; yield: 0.133 g (54%); mp 192 – 194 °C (lit.¹ 193.5 – 194 °C); R_f = 0.16 (PE/EtOAc = 2:1).

^1H NMR (400 MHz, DMSO- d_6): δ 12.47 (br s, 1H), 8.44 (d, J = 8.9 Hz, 2H), 8.17 (d, J = 8.9 Hz, 2H), 1.96 (s, 3H).

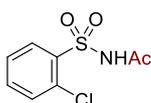
N-(*o*-Tolylsulfonyl)acetamide (**4d**).



From 2-methylbenzenesulfonamide (**3d**, 0.856 g, 5 mmol); white solid; yield: 0.906 g (84%); mp 130–132 °C (lit.¹ 131–132 °C); R_f = 0.41 (PE/EtOAc = 2:1).

^1H NMR (400 MHz, CDCl₃): δ 8.14 (dd, J_1 = 8.0 Hz, J_2 = 1.4 Hz, 1H), 7.53 (td, J_1 = 7.5 Hz, J_2 = 1.4 Hz, 1H), 7.38 (t, J = 7.7 Hz, 1H), 7.33 (d, J = 7.6 Hz, 1H), 5.81 (br s, 1H), 2.66 (s, 3H), 2.07 (s, 3H).

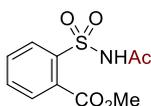
N-(2-Chlorophenylsulfonyl)acetamide (**4e**).



From 2-chlorobenzenesulfonamide (**3e**, 0.191 g, 1 mmol); white solid; yield: 0.154 g (66%); mp 139–141 °C (lit.² 142–144 °C); R_f = 0.47 (PE/EtOAc = 2:1).

^1H NMR (400 MHz, CDCl₃): δ 8.27 (dd, J_1 = 7.9 Hz, J_2 = 1.6 Hz, 1H), 7.63 – 7.57 (m, 1H), 7.57 – 7.53 (m, 1H), 7.52 – 7.47 (m, 1H), 2.11 (s, 3H).

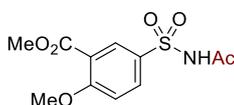
Methyl 2-(*N*-Acetylsulfamoyl)benzoate (**4f**).



From methyl 2-sulfamoylbenzoate (**3f**, 0.215 g, 1 mmol); white solid; yield: 0.158 g (61%); mp 150–152 °C (lit.¹ 153–154.5 °C); R_f = 0.43 (PE/EtOAc = 2:1).

^1H NMR (400 MHz, CDCl₃): δ 8.79 (br s, 1H), 8.35–8.27 (m, 1H), 7.83 (dt, J = 6.5, 3.6 Hz, 1H), 7.76 – 7.67 (m, 2H), 3.99 (s, 3H), 2.14 (s, 3H).

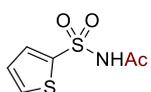
Methyl 5-(*N*-Acetylsulfamoyl)-2-methoxybenzoate (**4g**).



From methyl 2-methoxy-5-sulfamoylbenzoate (**3g**, 1.226 g, 5 mmol) and Cu(NTf₂)₂ (0.006 g, 0.005 mmol, 0.1 mol%); white solid; yield: 1.312 g (91%); mp 166–168 °C (lit.³ 169–171 °C); R_f = 0.18 (PE/EtOAc = 1:1).

^1H NMR (400 MHz, CDCl₃): δ 9.03 (br s, 1H), 8.46 (d, J = 2.5 Hz, 1H), 8.22 (dd, J_1 = 8.9 Hz, J_2 = 2.5 Hz, 1H), 7.13 (d, J = 8.9 Hz, 1H), 4.00 (s, 3H), 3.92 (s, 3H), 2.08 (s, 3H).

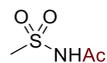
N-(Thiophen-2-ylsulfonyl)acetamide (**4h**).



From thiophene-2-sulfonamide (**3h**, 0.816 g, 5 mmol); white solid; yield: 0.950 g (92%); mp 93–94 °C (lit.² 96.5–97.5 °C); R_f = 0.24 (PE/EtOAc = 2:1).

^1H NMR (400 MHz, CDCl_3): δ 8.76 (br s, 1H), 7.90 (dd, $J_1 = 3.9$ Hz, $J_2 = 1.4$ Hz, 1H), 7.71 (dd, $J_1 = 5.0$ Hz, $J_2 = 1.4$ Hz, 1H), 7.14 (dd, $J_1 = 5.0$ Hz, $J_2 = 3.8$ Hz, 1H), 2.14 (s, 3H).

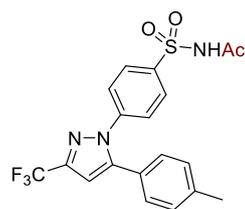
N-(Methylsulfonyl)acetamide (**4i**).



From methanesulfonamide (**3i**, 0.475 g, 5 mmol); the product was extracted from water, and was purified by recrystallization (EtOAc/hexane); white solid; yield: 0.391 g (57%); mp 94–96 °C (lit.² 87–89 °C).

^1H NMR (400 MHz, CDCl_3): δ 8.71 (br s, 1H), 3.32 (s, 3H), 2.16 (s, 3H).

N-((4-(5-(*p*-Tolyl)-3-(trifluoromethyl)-1*H*-pyrazol-1-yl)phenyl)sulfonyl)acetamide (**4j**).

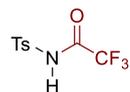


From celecoxib (**3j**, 0.381 g, 1 mmol); white solid; yield: 0.400 g (94%); mp 166–167 °C (recrystallized from cyclohexane and EtOAc; lit.¹ 90–92 °C); $R_f = 0.36$ (PE/EtOAc = 2:1).

^1H NMR (400 MHz, CDCl_3): δ 8.60 (br s, 1H), 8.04 (d, $J = 8.7$ Hz, 2H), 7.51 (d, $J = 8.8$ Hz, 2H), 7.19 (d, $J = 7.9$ Hz, 2H), 7.12 (d, $J = 8.0$ Hz, 2H), 6.75 (s, 1H), 2.39 (s, 3H), 2.06 (s, 3H).

^{13}C NMR (101 MHz, CDCl_3): δ 167.7, 145.4, 144.3 (q, $^2J_{\text{C-F}} = 38.9$ Hz), 143.6, 140.0, 137.6, 129.8, 129.5, 128.7, 125.6, 125.2, 121.0 (q, $^1J_{\text{C-F}} = 270.4$ Hz), 106.6, 23.5, 21.4.

2,2,2-Trifluoro-*N*-tosylacetamide (**4k**).

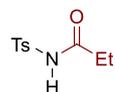


From **1** (0.171 g, 1 mmol); white solid; yield: 0.181 g (67%); mp 145–147 °C (lit.¹ 147–149 °C); $R_f = 0.26$ (PE/EtOAc = 2:1).

^1H NMR (400 MHz, CDCl_3): δ 7.81 (d, $J = 8.2$ Hz, 2H), 7.32 (d, $J = 8.0$ Hz, 2H), 4.21 (br s, 1H), 2.43 (s, 3H).

^{19}F NMR (376 MHz, CDCl_3): δ -75.76.

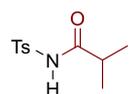
N-Tosylpropionamide (**4l**).



From **1** (0.171 g, 1 mmol); white solid; yield: 0.210 g (92%); mp 110–111 °C (lit.¹ 110–111.5 °C); $R_f = 0.64$ (PE/EtOAc = 2:1).

^1H NMR (400 MHz, CDCl_3): δ 8.58 (s, 1H), 7.95 (d, $J = 8.4$ Hz, 2H), 7.35 (d, $J = 7.8$ Hz, 2H), 2.45 (s, 3H), 2.30 (q, $J = 7.4$ Hz, 2H), 1.08 (t, $J = 7.4$ Hz, 3H).

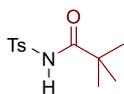
N-Tosylisobutyramide (**4m**).



From **1** (0.171 g, 1 mmol); white solid; yield: 0.218 g (90%); mp 114–116 °C (lit.¹ 114–116 °C); R_f = 0.66 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 8.75 (br s, 1H), 7.96 (d, J = 8.4 Hz, 2H), 7.35 (d, J = 8.1 Hz, 2H), 2.45 (s, 3H), 2.43 (septet, J = 6.8 Hz, 1H), 1.10 (d, J = 6.9 Hz, 6H).

N-Tosylpivalamide (**4n**).

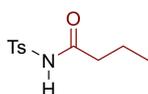


From **1** (0.171 g, 1 mmol), pivalic anhydride (0.223 g, 1.2 mmol, 1.2 equiv), and Cu(NTf₂)₂ (0.001 g, 0.001 mmol, 0.1 mol%); white solid; yield: 0.240 g (94%); mp 165–168 °C (lit.¹ 167.5–168 °C); R_f = 0.78 (PE/EtOAc = 2:1).

From **1** (0.171 g, 1 mmol), pivaloyl chloride (0.181 g, 1.5 mmol, 1.5 equiv), and Zn(NTf₂)₂ (0.0125 g, 0.02 mmol, 2 mol%); yield: 0.248 g (97%).

¹H NMR (400 MHz, CDCl₃): δ 8.43 (br s, 1H), 7.94 (d, J = 8.4 Hz, 2H), 7.34 (d, J = 7.9 Hz, 2H), 2.45 (s, 3H), 1.15 (s, 9H).

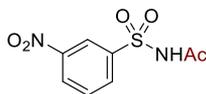
N-Tosylbutyramide (**4o**).



From **1** (0.171 g, 1 mmol) and Ce(NTf₂)₃ (0.001 g, 0.001 mmol, 0.1 mol%); white solid; yield: 0.221 g (91%); mp 75–78 °C (lit.¹ 80–81.5 °C); R_f = 0.58 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 7.95 (d, J = 8.4 Hz, 2H), 7.35 (d, J = 8.0 Hz, 2H), 2.45 (s, 3H), 2.23 (t, J = 7.4 Hz, 2H), 1.59 (sextet, J = 7.4 Hz, 2H), 0.87 (t, J = 7.4 Hz, 3H).

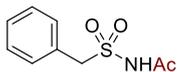
N-((3-Nitrophenyl)sulfonyl)acetamide (**4p**).



From 3-nitrobenzenesulfonamide (**3k**, 0.202 g, 1 mmol), AcCl (0.118 g, 1.5 mmol), and Cu(NTf₂)₂ (0.012 g, 0.02 mmol, 2 mol%); white solid; yield: 0.174 g (71%); mp 183–186 °C (lit.¹ 187–188 °C); R_f = 0.20 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, DMSO-*d*₆): δ 12.47 (br s, 1H), 8.60 (t, J = 2.0 Hz, 1H), 8.55 (ddd, J_1 = 8.3 Hz, J_2 = 2.4 Hz, J_3 = 1.0 Hz, 1H), 8.34 (dt, J_1 = 8.0 Hz, J_2 = 1.3 Hz, 1H), 7.94 (t, J = 8.1 Hz, 1H), 1.95 (s, 3H).

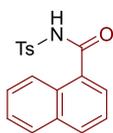
N-(Benzylsulfonyl)acetamide (**4q**).



From benzylsulfonamide (**3l**, 0.171 g, 1 mmol), AcCl (1.5 mmol), and Cu(NTf₂)₂ (0.012 g, 0.02 mmol, 2 mol%); off-white solid; yield: 0.182 g (85%); mp 131–132 °C (lit.¹ 131–132 °C); R_f = 0.20 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 8.01 (br s, 1H), 7.44 – 7.31 (m, 5H), 4.60 (s, 2H), 2.01 (s, 3H).

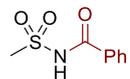
N-Tosyl-1-naphthamide (**4r**).



From **1** (0.343 g, 2 mmol), 1-naphthoyl chloride (0.572 g, 3 mmol, 1.5 equiv), and Zn(NTf₂)₂ (0.025 g, 0.04 mmol, 2 mol%); white solid; yield: 0.519 g (79%); mp 149–150 °C (lit.⁴ 146–147 °C); *R*_f = 0.69 (PE/EtOAc = 1:1).

¹H NMR (400 MHz, CDCl₃): δ 8.63 (br s, 1H), 8.24 – 8.17 (m, 1H), 8.08 (d, *J* = 8.4 Hz, 2H), 7.98 (d, *J* = 8.0 Hz, 1H), 7.90 – 7.83 (m, 1H), 7.68 (dd, *J*₁ = 7.2 Hz, *J*₂ = 1.3 Hz, 1H), 7.54 (d, *J* = 3.3 Hz, 1H), 7.52 (t, *J* = 3.4 Hz, 1H), 7.45 (dd, *J*₁ = 8.3 Hz, *J*₂ = 7.2 Hz, 1H), 7.38 (d, *J* = 8.1 Hz, 2H), 2.47 (s, 3H).

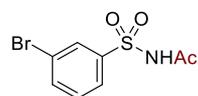
N-(Methylsulfonyl)benzamide (**4s**).



From methylsulfonamide (**4i**, 0.475 g, 5 mmol); off-white solid; yield: 0.989 g (99%); mp 152–154 °C (lit.⁵ 153–155 °C); *R*_f = 0.18 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 9.04 (br s, 1H), 7.88 (d, *J* = 7.1 Hz, 2H), 7.63 (t, *J* = 7.4 Hz, 1H), 7.50 (t, *J* = 7.8 Hz, 2H), 3.44 (s, 3H).

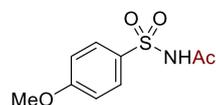
N-((3-Bromophenyl)sulfonyl)acetamide (**4t**).



From 3-bromobenzenesulfonamide (**3m**, 0.236 g, 1 mmol) and isopropenyl acetate (0.150 g, 1.5 mmol, 1.5 equiv); white solid; yield: 0.163 g (58%); mp 134–135 °C (lit.¹ 134–135 °C); *R*_f = 0.52 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 8.18 (t, *J* = 1.9 Hz, 1H), 8.03 (ddd, *J*₁ = 7.9 Hz, *J*₂ = 1.8 Hz, *J*₃ = 1.0 Hz, 1H), 7.79 (ddd, *J*₁ = 8.0 Hz, *J*₂ = 1.9 Hz, *J*₃ = 1.0 Hz, 1H), 7.45 (t, *J* = 8.0 Hz, 1H), 2.11 (s, 3H).

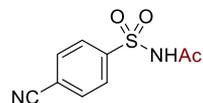
N-(4-Methoxyphenylsulfonyl)acetamide (**4u**).



From 4-methoxybenzenesulfonamide (**3n**, 0.187 g, 1 mmol) and isopropenyl acetate (0.150 g, 1.5 mmol, 1.5 equiv); white solid; yield: 0.215 g (93%); mp 143–143.5 °C (lit.⁶ 140–141 °C); *R*_f = 0.33 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 8.00 (d, *J* = 9.0 Hz, 2H), 7.01 (d, *J* = 9.0 Hz, 2H), 3.89 (s, 3H), 2.06 (s, 3H).

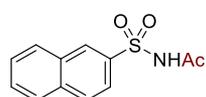
N-((4-Cyanophenyl)sulfonyl)acetamide (**4v**).



From 4-cyanobenzenesulfonamide (**3o**, 0.182 g, 1 mmol) and isopropenyl acetate (0.150 g, 1.5 mmol, 1.5 equiv); white solid; yield: 0.134 g (62%); mp 207–208 °C (lit.¹ 212.5–213 °C); *R*_f = 0.32 (PE/EtOAc = 1:1).

¹H NMR (400 MHz, DMSO-*d*₆): δ 12.41 (br s, 1H), 8.13 (d, *J* = 8.7 Hz, 2H), 8.07 (d, *J* = 8.8 Hz, 2H), 1.95 (s, 3H).

N-(Naphthalen-2-ylsulfonyl)acetamide (**4w**).

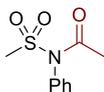


From naphthalene-2-sulfonamide (**3p**, 0.104 g, 0.5 mmol) and isopropenyl acetate (0.075 g, 0.75 mmol, 1.5 equiv); white solid; yield:

0.055 g (43%); mp 140–143 °C (lit.¹ 146.5–147.5 °C); $R_f = 0.25$ (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 8.68 (s, 1H), 8.02 (d, $J = 8.0$ Hz, 1H), 7.99 (d, $J = 1.3$ Hz, 2H), 7.93 (d, $J = 8.1$ Hz, 1H), 7.69 (td, $J_1 = 7.6$ Hz, $J_2 = 1.6$ Hz, 1H), 7.64 (td, $J_1 = 7.6$ Hz, $J_2 = 1.6$ Hz, 1H), 2.09 (s, 3H).

N-Phenyl-*N*-(methylsulfonyl)acetamide (**6a**).



From *N*-phenylmethanesulfonamide (**5a**, 0.342 g, 2 mmol) and Ac₂O (0.306 g, 3 mmol, 1.5 equiv); white solid; yield: 0.418 g (98%); mp 121–122 °C (lit.⁷ 123 °C); $R_f = 0.50$ (PE/EtOAc = 3:1).

¹H NMR (400 MHz, CDCl₃): δ 7.60 – 7.44 (m, 3H), 7.33 – 7.28 (m, 2H), 3.47 (s, 3H), 1.97 (s, 3H).

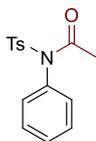
N-Methyl-*N*-tosylacetamide (**6b**).



From *N*-methyl-4-methylbenzenesulfonamide (**5b**, 0.556 g, 3 mmol) and Ac₂O (0.459 g, 4.5 mmol, 1.5 equiv); white solid; yield: 0.674 g (98%); mp 55 – 56 °C (lit.⁷ 54–55 °C); $R_f = 0.32$ (PE/EtOAc = 3:1).

¹H NMR (400 MHz, CDCl₃): δ 7.77 (d, $J = 8.4$ Hz, 2H), 7.36 (d, $J = 8.1$ Hz, 2H), 3.29 (s, 3H), 2.46 (s, 3H), 2.39 (s, 3H).

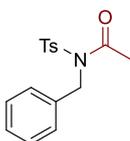
N-Phenyl-*N*-tosylacetamide (**6c**).



From *N*-tosylaniline (**5c**, 0.742 g, 3 mmol); white solid; yield: 0.509 g (58%); mp 152–153 °C (lit.¹ 150.5–152.5 °C); $R_f = 0.40$ (PE/EtOAc = 3:1).

¹H NMR (400 MHz, CDCl₃): δ 7.93 (d, $J = 8.4$ Hz, 2H), 7.53 – 7.46 (m, 3H), 7.35 (d, $J = 8.0$ Hz, 2H), 7.31 – 7.26 (m, 2H), 2.46 (s, 3H), 1.87 (s, 3H).

N-Benzyl-*N*-tosylacetamide (**6d**).



From *N*-benzyl-4-methylbenzenesulfonamide (**5d**, 0.261 g, 1 mmol) and Ac₂O (0.153 g, 1.5 mmol); white solid; yield: 0.300 g (99%); mp 98 – 98.5 °C (lit.¹ 95 – 96.5 °C); $R_f = 0.48$ (PE/EtOAc = 3:1).

From **5d** (0.261 g, 1 mmol) and AcCl (0.118 g, 1.5 mmol); yield: 0.251 g (82%).

From **5d** (0.261 g, 1 mmol) and IPA (0.150 g, 1.5 mmol); yield: 0.302 g (99%).

¹H NMR (400 MHz, CDCl₃): δ 7.61 (d, $J = 8.4$ Hz, 2H), 7.42 – 7.28 (m, 5H), 7.27 (d, $J = 8.0$ Hz, 2H), 5.09 (s, 2H), 2.42 (s, 3H), 2.29 (s, 3H).

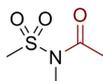
N-Benzyl-*N*-tosylisobutyramide (**6e**).



From **5d** (0.131 g, 0.5 mmol), Cu(NTf₂)₂ (0.006 g, 0.01 mmol, 2 mol%), and isobutyric anhydride (0.119 g, 0.75 mmol, 1.5 equiv); white solid; yield: 0.138 g (83%); mp 117–119 °C (lit.¹ 117–119 °C); *R*_f = 0.68 (PE/EtOAc = 3:1).

¹H NMR (400 MHz, CDCl₃): δ 7.61 (d, *J* = 8.4 Hz, 2H), 7.37 – 7.28 (m, 5H), 7.26 (d, *J* = 8.2 Hz, 2H), 5.11 (s, 2H), 3.12 (hept, *J* = 6.7 Hz, 1H), 2.42 (s, 3H), 0.96 (d, *J* = 6.7 Hz, 6H).

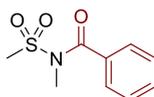
N-Methyl-*N*-(methylsulfonyl)acetamide (**6f**).



From *N*-methylmethanesulfonamide (**5e**, 0.546 g, 5 mmol); purified by recrystallization (EtOAc/hexane); white solid; yield: 0.691 g (91%); mp 71–73 °C (lit.⁷ 76 °C).

¹H NMR (400 MHz, CDCl₃): δ 3.29 (s, 3H), 3.24 (s, 3H), 2.39 (s, 3H).

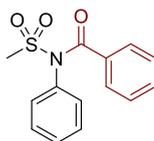
N-Methyl-*N*-(methylsulfonyl)benzamide (**6g**).



From **5e** (0.109 g, 1 mmol); white solid; yield: 0.085 g (39%); mp 110–112 °C (lit.⁸ 101–102 °C); *R*_f = 0.21 (PE/EtOAc = 3:1).

¹H NMR (400 MHz, CDCl₃): δ 7.64 – 7.59 (m, 2H), 7.59 – 7.53 (m, 1H), 7.51 – 7.45 (m, 2H), 3.39 (s, 3H), 3.29 (s, 3H).

N-(Methylsulfonyl)-*N*-phenylbenzamide (**6h**).



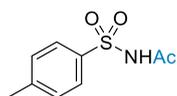
From **5a** (0.257 g, 1.5 mmol); white solid; yield: 0.041 g (9%); white solid; mp 136–138 °C (lit. 136–138 °C); *R*_f = 0.22 (PE/EtOAc = 3:1).

¹H NMR (400 MHz, CDCl₃): δ 7.55 (d, *J* = 7.2 Hz, 2H), 7.38 – 7.15 (m, 8H), 3.45 (s, 3H).

¹³C NMR (101 MHz, CDCl₃): δ 171.1, 136.9, 133.1, 132.2, 129.8, 129.7, 129.5, 129.2, 128.2, 40.4.

Transacylation of *N*-Acylsulfonamides at Room Temperature (General Procedure B). A mixture of an *N*-acylsulfonamide (1 mmol), Cu(NTf₂)₂ (0.128 g, 0.2 mmol, 20 mol%), and an acyl chloride (10 mmol, 10 equiv) was stirred overnight at room temperature in anhydrous DCM (5 ML). Silica gel (100 mesh) was then added, and removal of volatiles by a rotary evaporator, the residue was purified by column chromatography (eluent: PE/EtOAc = 3:1–1:1) to afford the desired *N*-acylsulfonamide. The following *N*-acylsulfonamides were prepared following this procedure. Characterization data of the following *N*-acylsulfonamides match those prepared *via N*-acylation.

N-Tosylacetamide (**2**).

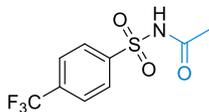


From *N*-tosylpivalamide (**4n**, 0.255 g, 1 mmol), Cu(NTf₂)₂ (0.128 g, 0.2 mmol, 20 mol%), and AcCl (0.785 g, 10 mmol, 10 equiv); yield: 0.157 g (73%).

From *N*-tosylcinnamamide (**7a**, 0.151 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and AcCl (0.393 g, 5 mmol, 10 equiv); yield: 0.077 g (72%).

From *N*-tosyl-naphthalene-1-carboxamide (**4r**, 0.163 g, 0.5 mmol); yield: 0.031 g (29%).

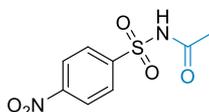
N-((4-(Trifluoromethyl)phenyl)sulfonyl)acetamide (**7d**).



From 4-methyl-*N*-((4-(trifluoromethyl)phenyl)sulfonyl)pentanamide (**7c**, 0.162 g, 0.5 mmol); yield: 0.125 g (93%); mp 213 – 215 °C (lit.¹ 213 – 214 °C); *R*_f = 0.22 (PE/EtOAc = 2:1).

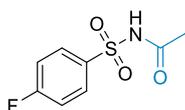
¹H NMR (400 MHz, CDCl₃): δ 8.21 (d, *J* = 8.2 Hz, 2H), 7.83 (d, *J* = 8.3 Hz, 2H), 2.09 (s, 3H). ¹⁹F NMR (376 MHz, CDCl₃): δ -63.27.

N-((4-Nitrophenyl)sulfonyl)acetamide (**4c**).



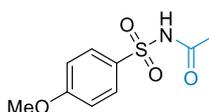
From *N*-((4-nitrophenyl)sulfonyl)butyramide (**7e**, 0.136 g, 0.5 mmol); yield: 0.119 g (97%).

N-((4-Fluorophenyl)sulfonyl)acetamide (**4b**).



From *N*-((4-fluorophenyl)sulfonyl)octanamide (**7f**, 0.150 g, 0.5 mmol); yield: 0.106 g (98%).

N-((4-Methoxyphenyl)sulfonyl)acetamide (**4u**).



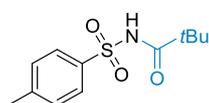
From *N*-((4-methoxyphenyl)sulfonyl)pivalamide (**7g**, 0.135 g, 0.5 mmol); yield: 0.105 g (92%).

Methyl 2-(*N*-acetylsulfamoyl)benzoate (**4f**).



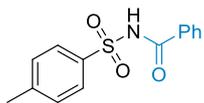
From methyl 2-(*N*-butyrylsulfamoyl)benzoate (**7h**, 0.143 g, 0.5 mmol); yield: 0.115 g (89%).

N-Tosylpivalamide (**4n**).



From **2** (0.107 g, 0.5 mmol); catalyzed by Cu(NTf₂)₂ at room temperature; yield: 0.060 g (46%).

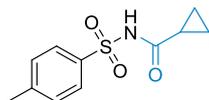
N-Tosylbenzamide (**7b**).



From **2** (0.213 g, 1 mmol) and benzoyl chloride (1.406 g, 10 mmol, 1.5 equiv); white solid; yield: 0.264 g (96%); mp 141–143 °C (lit.² 140.5–142.5 °C); R_f = 0.52 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 9.37 (br s, 1H), 8.04 (d, J = 8.1 Hz, 2H), 7.82 (d, J = 7.3 Hz, 2H), 7.54 (t, J = 7.4 Hz, 1H), 7.40 (t, J = 7.7 Hz, 2H), 7.34 (d, J = 8.0 Hz, 2H), 2.43 (s, 3H).

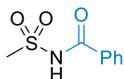
N-Tosylcyclopropanecarboxamide (**7i**).



From *N*-tosylpivalamide (**4n**, 0.128 g, 0.5 mmol), Ce(NTf₂)₃ (0.098 g, 0.1 mmol, 20 mol%), and cyclopropanecarbonyl chloride (0.523 g, 5 mmol, 10 equiv); white solid; yield: 0.095 g (78%); mp 152–155 °C (lit.² 154–156 °C); R_f = 0.57 (PE/EtOAc = 2:1).

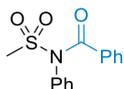
¹H NMR (400 MHz, CDCl₃): δ 7.95 (d, J = 8.4 Hz, 2H), 7.34 (d, J = 8.1 Hz, 2H), 2.45 (s, 3H), 1.52 (tt, J_1 = 7.9 Hz, J_2 = 4.5 Hz, 1H), 1.05 – 0.98 (m, 2H), 0.87 (dq, J_1 = 8.1 Hz, J_2 = 3.5 Hz, 2H).

N-(Methylsulfonyl)benzamide (**4s**).



From *N*-(methylsulfonyl)acetamide (**4i**, 0.137 g, 1 mmol); yield: 0.138 g (69%).

N-(Methylsulfonyl)-*N*-phenylbenzamide (**6h**).



From *N*-(methylsulfonyl)-*N*-phenylacetamide (**6a**, 0.107 g, 0.5 mmol); yield: 0.049 g (35%).

N-Methyl-2-phenyl-*N*-tosylacetamide (**7j**).⁹

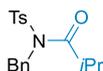


From *N*-methyl-*N*-tosylacetamide (**6b**, 0.113 g, 0.5 mmol); colorless liquid, solidified after standing overnight at rt; yield: 0.106 g (70%); mp 76–78 °C; R_f = 0.51 (PE/EtOAc = 3:1).

¹H NMR (400 MHz, CDCl₃) δ : 7.70 (d, J = 8.0 Hz, 2H), 7.39 – 7.26 (m, 5H), 7.19 – 7.06 (m, 2H), 4.05 (s, 2H), 3.28 (s, 3H), 2.45 (s, 3H).

¹³C NMR (101 MHz, CDCl₃) δ : 171.3, 145.0, 136.0, 133.4, 129.9, 129.4, 128.6, 127.5, 127.2, 43.1, 33.3, 21.6.

N-Benzyl-*N*-tosylisobutyramide (**6e**).



From *N*-benzyl-*N*-tosylacetamide (**6d**, 0.152 g, 0.5 mmol); white solid; yield: 0.077 g (46%).

N-Benzyl-*N*-tosylacetamide (**6d**).



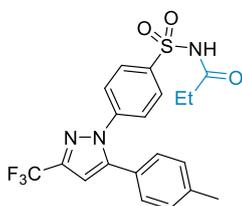
From **6e** (0.166 g, 0.5 mmol) using Cu(NTf₂)₂ as the transacylation catalyst; white solid; yield: 0.148 g (97%).

N-Phenyl-*N*-tosylacetamide (**6c**).



From *N*-phenyl-*N*-tosylpivalamide (**7k**, 0.066 g, 0.2 mmol); white solid; yield: 0.051 g (88%)

N-((4-(5-(*p*-Tolyl)-3-(trifluoromethyl)-1*H*-pyrazol-1-yl)phenyl)sulfonyl)propionamide (**10**).



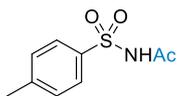
From **4j** (0.211 g, 0.5 mmol); white solid; yield: 0.076 g (34%); mp 73–84 °C (lit.¹⁰ 88.3–96.7 °C); *R*_f = 0.75 (PE/EtOAc = 1:1).

¹H NMR (400 MHz, CDCl₃): δ 8.04 (d, *J* = 8.8 Hz, 2H), 7.49 (d, *J* = 8.8 Hz, 2H), 7.18 (d, *J* = 8.0 Hz, 2H), 7.11 (d, *J* = 8.2 Hz, 2H), 6.74 (s, 1H), 2.38 (s, 3H), 2.27 (q, *J* = 7.4 Hz, 2H), 1.06 (t, *J* = 7.4 Hz, 3H).

¹³C NMR (101 MHz, CDCl₃): δ 171.8, 145.3, 144.2 (q, ²*J*_{C-F} = 38.8 Hz), 143.4, 139.9, 138.0, 129.8, 129.4, 128.7, 125.6, 125.2, 121.0 (q, ¹*J*_{C-F} = 270.3 Hz), 106.5, 29.7, 21.3, 8.3.

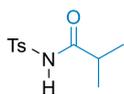
Transacylation of *N*-Acylsulfonamides with Acyl Chlorides at Elevated Temperatures following General Procedure B.

N-Tosylacetamide (**2**).



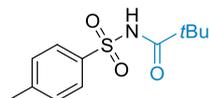
From *N*-tosylbutyramide (**7m**, 0.120 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and AcCl (0.392 g, 5 mmol, 10 equiv); stirred for 18 h at 65 °C; yield: 0.084 g (79%).

N-Tosylisobutyramide (**4m**).



From **2** (0.107 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and *i*PrCOCl (0.533 g, 5 mmol, 10 equiv); stirred for 18 h at 65 °C; yield: 0.109 g (90%).

N-Tosylpivalamide (**4n**).

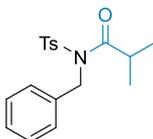


From **2** (0.107 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and PivCl (0.603 g, 5 mmol, 10 equiv); stirred for 18 h at 65 °C; yield: 0.116 g (90%).

From **2** (0.107 g, 0.5 mmol), Cu(NTf₂)₂ (0.032 g, 0.05 mmol, 10 mol%), and PivCl (0.603 g, 5 mmol, 10 equiv); stirred for 18 h at 65 °C; yield: 0.101 g (78%).

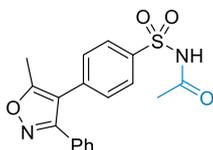
From **2** (0.107 g, 0.5 mmol), Cu(NTf₂)₂ (0.016 g, 0.025 mmol, 5 mol%), and PivCl (0.603 g, 5 mmol, 10 equiv); stirred for 18 h at 80 °C; yield: 0.102 g (79%).

N-Benzyl-*N*-tosylisobutyramide (**6e**).



From *N*-benzyl-*N*-tosylacetamide (**6d**, 0.152 g, 0.5 mmol), Cu(NTf₂)₂ (0.031 g, 0.05 mmol, 10 mol%), and isobutyric chloride (0.534 g, 5 mmol, 10 equiv); stirred for 18 h at 65 °C; yield: 0.135 g (81%).

N-((4-(5-methyl-3-phenylisoxazol-4-yl)phenyl)sulfonyl)acetamide (**9**).

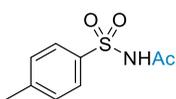


From parecoxib (**8**, 0.185 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and AcCl (0.392 g, 5 mmol, 10 equiv); stirred for 18 h at 65 °C; white solid; yield: 0.172 g (96%); mp 170–171 °C (lit.¹¹ 169.3–170.6 °C); *R*_f = 0.42 (PE/EtOAc = 1:1).

¹H NMR (400 MHz, CDCl₃): δ 8.84 (br s, 1H), 8.04 (d, *J* = 8.5 Hz, 2H), 7.45 – 7.31 (m, 7H), 2.51 (s, 3H), 2.10 (s, 3H).

Transacylation of *N*-Acylsulfonamides with Carboxylic Anhydrides at Elevated Temperatures following General Procedure B.

N-Tosylacetamide (**2**).



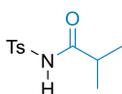
From *N*-tosylpivalamide (**4n**, 0.128 g, 0.5 mmol), Ac₂O (0.510 g, 5 mmol, 10 equiv), and Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%); stirred for 18 h at 80 °C; yield: 0.092 g (86%).

From *N*-tosylbenzamide (**7b**, 0.138 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and Ac₂O (0.510 g, 5 mmol, 10 equiv); stirred for 18 h at 65 °C; yield: 0.096 g (89%).

From 2,2,2-trifluoro-*N*-tosylacetamide (**4k**, 0.134 g, 0.5 mmol), Cu(NTf₂)₂ (0.003 g, 0.005 mmol, 1 mol%), and Ac₂O (0.510 g, 5 mmol, 10 equiv); stirred for 12 h at 120 °C; yield: 0.093 g (86%).

From *N*-tosylisobutyramide (**4m**, 0.121 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and Ac₂O (0.510 g, 5 mmol, 10 equiv); stirred for 18 h at 80 °C; yield: 0.100 g (93%).

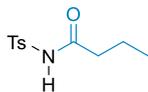
N-Tosylisobutyramide (**4m**).



From **2** (0.106 g, 0.5 mmol), isobutyric anhydride (0.791 g, 5 mmol, 10 equiv), and Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%); stirred for 18 h at 85 °C; yield: 0.111 g (92%).

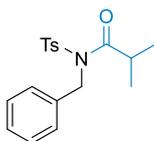
From **2** (0.106 g, 0.5 mmol), isobutyric anhydride (0.791 g, 5 mmol, 10 equiv), and Ga(OTf)₃ (0.052 g, 0.1 mmol, 20 mol%); stirred for 18 h at 65 °C; yield: 0.101 g (83%).

N-Tosylbutyramide (**4o**).



From **2** (0.107 g, 0.5 mmol), Zn(NTf₂)₂ (0.063 g, 0.1 mmol, 20 mol%), and butyric anhydride (0.791 g, 5 mmol, 10 equiv); stirred at 65 °C for 18 h; yield: 0.115 g (94%).

N-Benzyl-*N*-tosylisobutyramide (**6e**).



From *N*-benzyl-*N*-tosylpivalamide (**7m**, 0.173 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and isobutyric anhydride (0.791 g, 5 mmol, 10 equiv); stirred at 120 °C for 18 h; yield: 0.115 g (69%).

N-Methyl-*N*-tosylacetamide (**6b**).



From *N*-methyl-*N*-tosylpivalamide (**7l**, 0.055 g, 0.2 mmol), Cu(NTf₂)₂ (0.025 g, 0.04 mmol, 20 mol%), and Ac₂O (0.204 g, 2 mmol, 10 equiv); stirred for 18 h at 120 °C; yield: 0.046 g (99%).

N-Ethyl-*N*-tosylacetamide (**7o**).

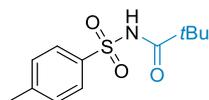


From *N*-ethyl-*N*-tosylpivalamide (**7n**, 0.142 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), and Ac₂O (0.510 g, 5 mmol, 10 equiv); stirred for 18 h at 120 °C; yield: 0.116 g (95%); mp 51–53 °C (lit.¹² 52.5 °C); *R*_f = 0.46 (PE/EtOAc = 2:1).

¹H NMR (400 MHz, CDCl₃): δ 7.78 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 8.1 Hz, 2H), 3.87 (q, *J* = 7.0 Hz, 2H), 2.45 (s, 3H), 2.33 (s, 3H), 1.31 (t, *J* = 7.0 Hz, 3H).

Mechanistic study.

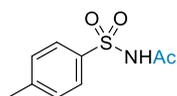
N-Tosylpivalamide (**4n**).



Prepared from **1** (0.171 g, 1 mmol), PivCl (0.181 g, 1.5 mmol, 1.5 equiv), and Cu(NTf₂)₂ (0.012 g, 0.02 mmol, 2 mol%) at room temperature; yield: 0.235 g (92%).

From **1** (0.171 g, 1 mmol), PivCl (0.181 g, 1.5 mmol, 1.5 equiv), and Tf₂NH (0.0056 g, 0.02 mmol, 2 mol%); yield: 0.230 g (90%).

N-Tosylacetamide (**2**).



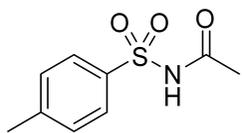
Prepared from **4n** (0.128 g, 0.5 mmol), Tf₂NH (0.028 g, 0.1 mmol, 20 mol%), and AcCl (0.392 g, 5 mmol, 10 equiv); yield: 0.067 g (62%).

From **1** (0.171 g, 1 mmol), Cu(NTf₂)₂ (0.012 g, 0.02 mmol, 2 mol%), Ac₂O (0.153 g, 1.5 mmol, 1.5 equiv), and 2,6-di-*tert*-butyl-4-methylpyridine (0.012 g, 0.06 mmol, 0.06 equiv); stirred for 18 h at 120 °C in CH₂Cl₂ (1.5 mL); yield: 0.175 g (82%).

From **4n** (0.128 g, 0.5 mmol), Cu(NTf₂)₂ (0.062 g, 0.1 mmol, 20 mol%), Ac₂O (0.510 g, 5 mmol, 10 equiv), and 2,6-di-*tert*-butyl-4-methylpyridine (0.063 g, 0.3 mmol, 0.6 equiv); stirred at 100 °C for 18 h; yield: 0.076 g (71%).

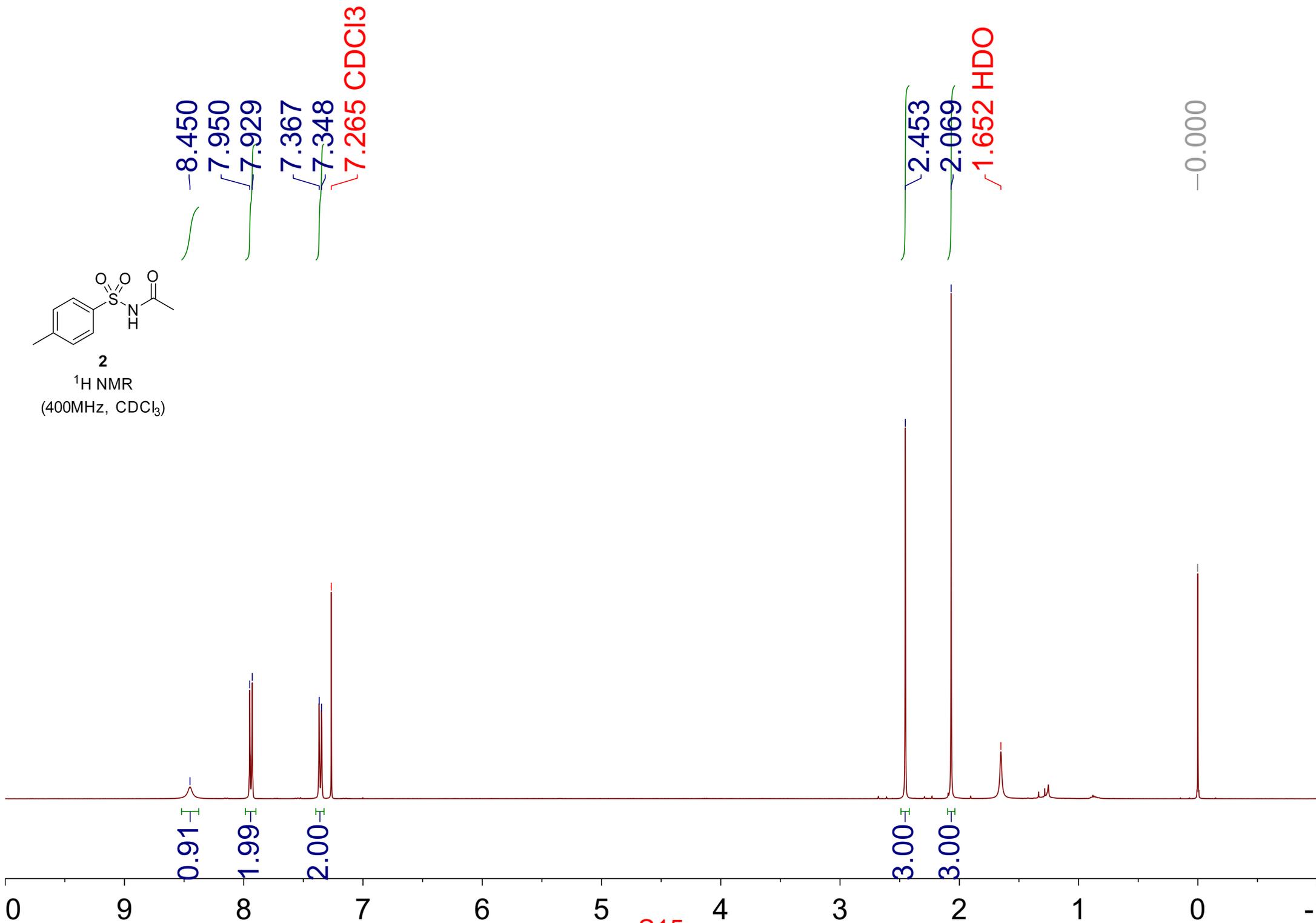
References

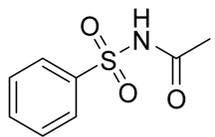
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2

¹H NMR
(400MHz, CDCl₃)





4a

¹H NMR
(400MHz, CDCl₃)

8.881
8.078
8.060
7.693
7.675
7.656
7.591
7.571
7.553
7.267 CDCl₃

2.084

-0.000

0.82

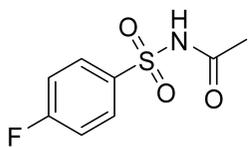
1.96

1.00

2.06

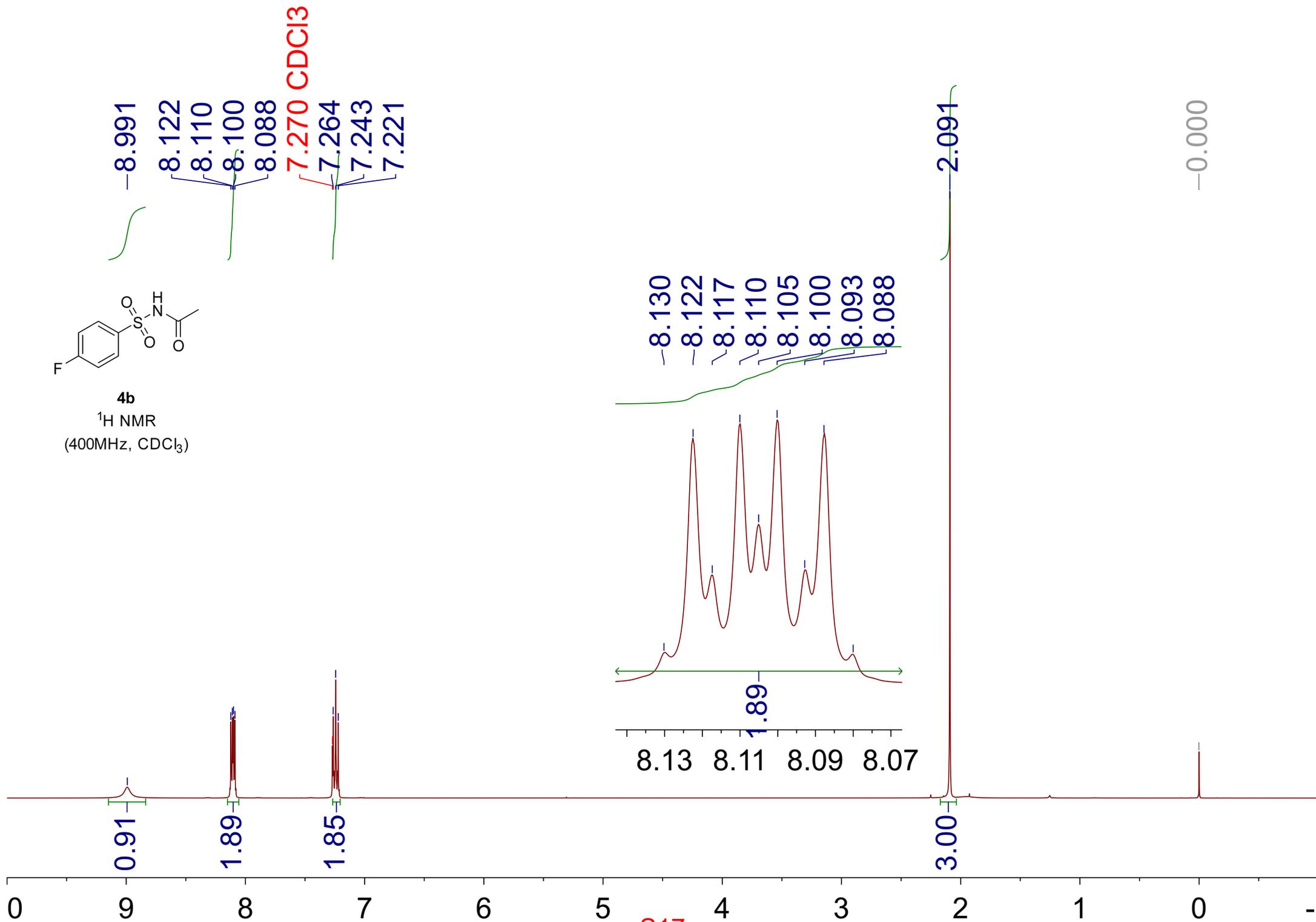
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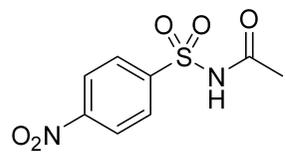
S16



4b

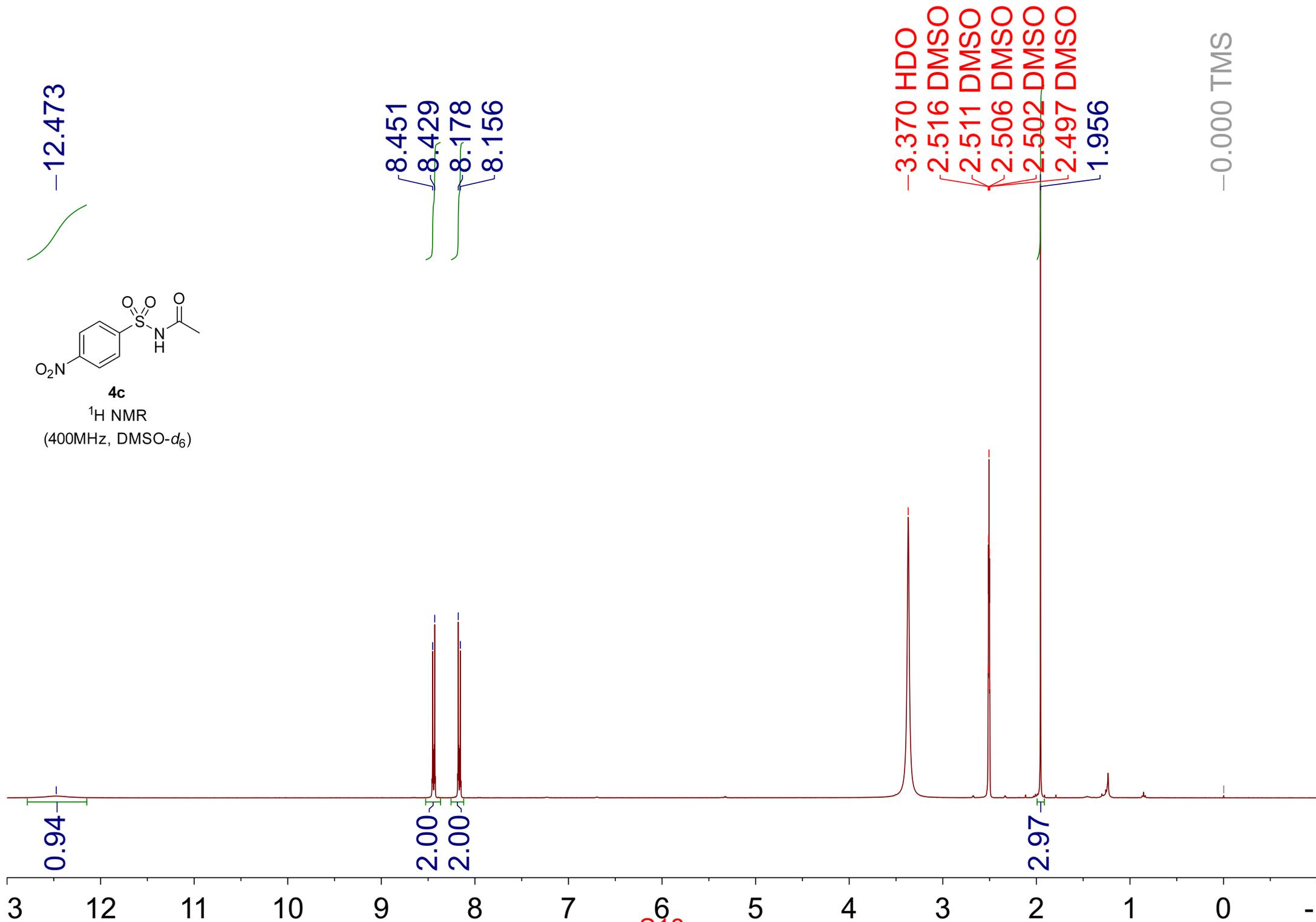
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(400MHz, CDCl₃)

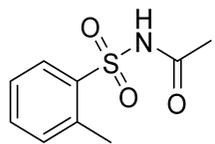




4c

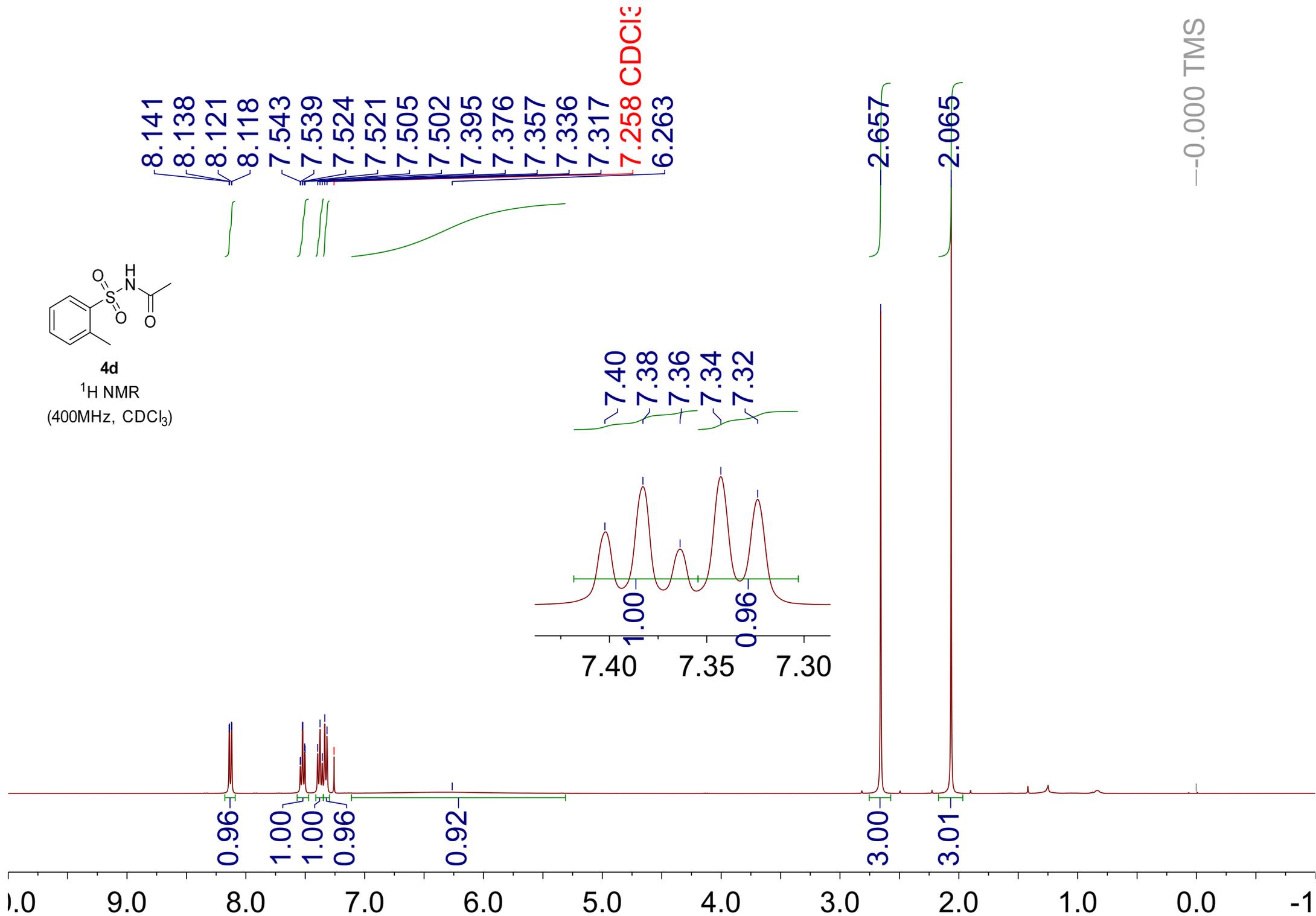
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(400MHz, DMSO-d₆)

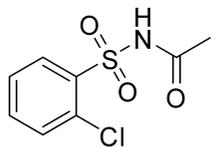




4d

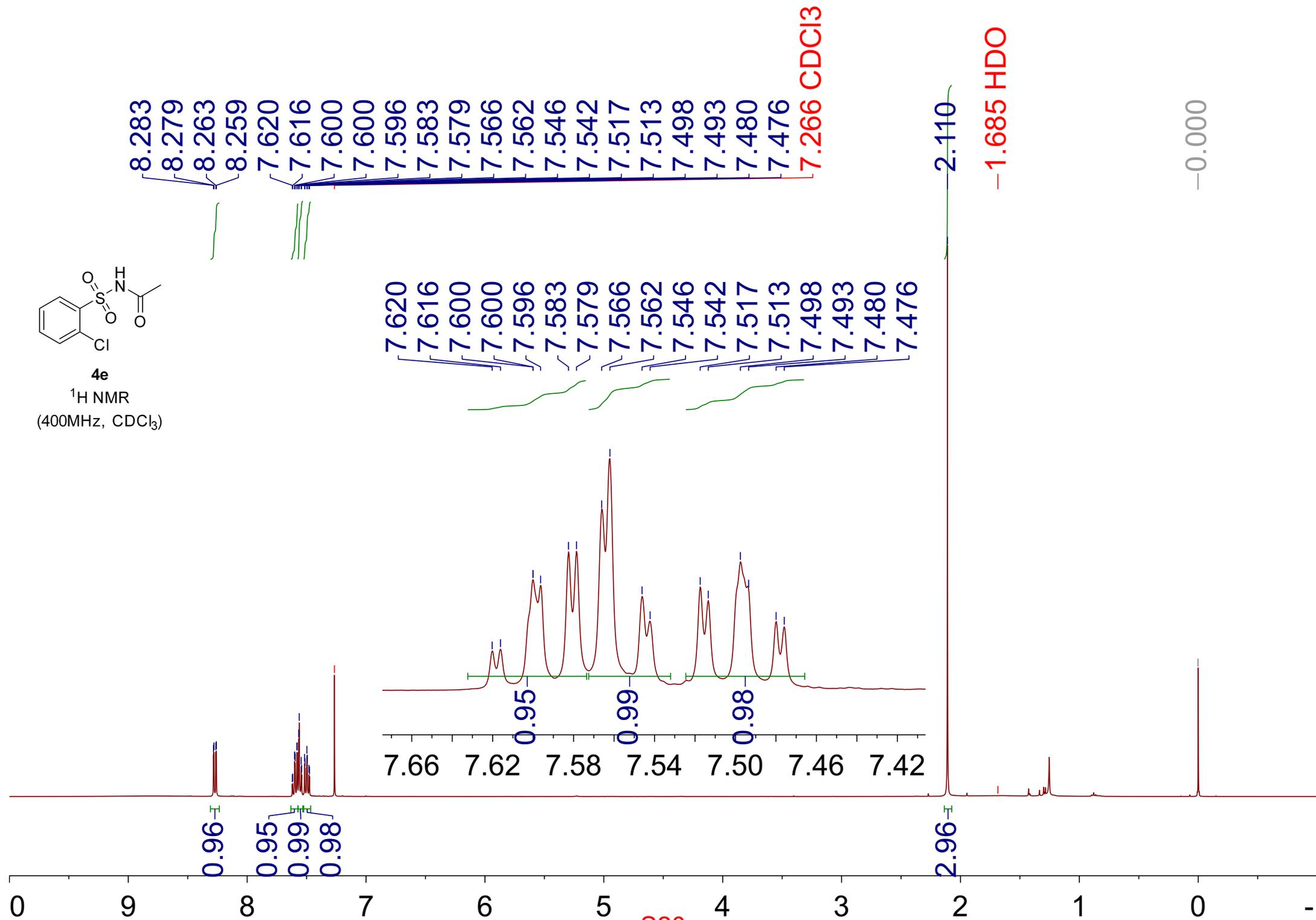
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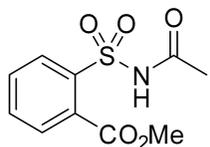




4e

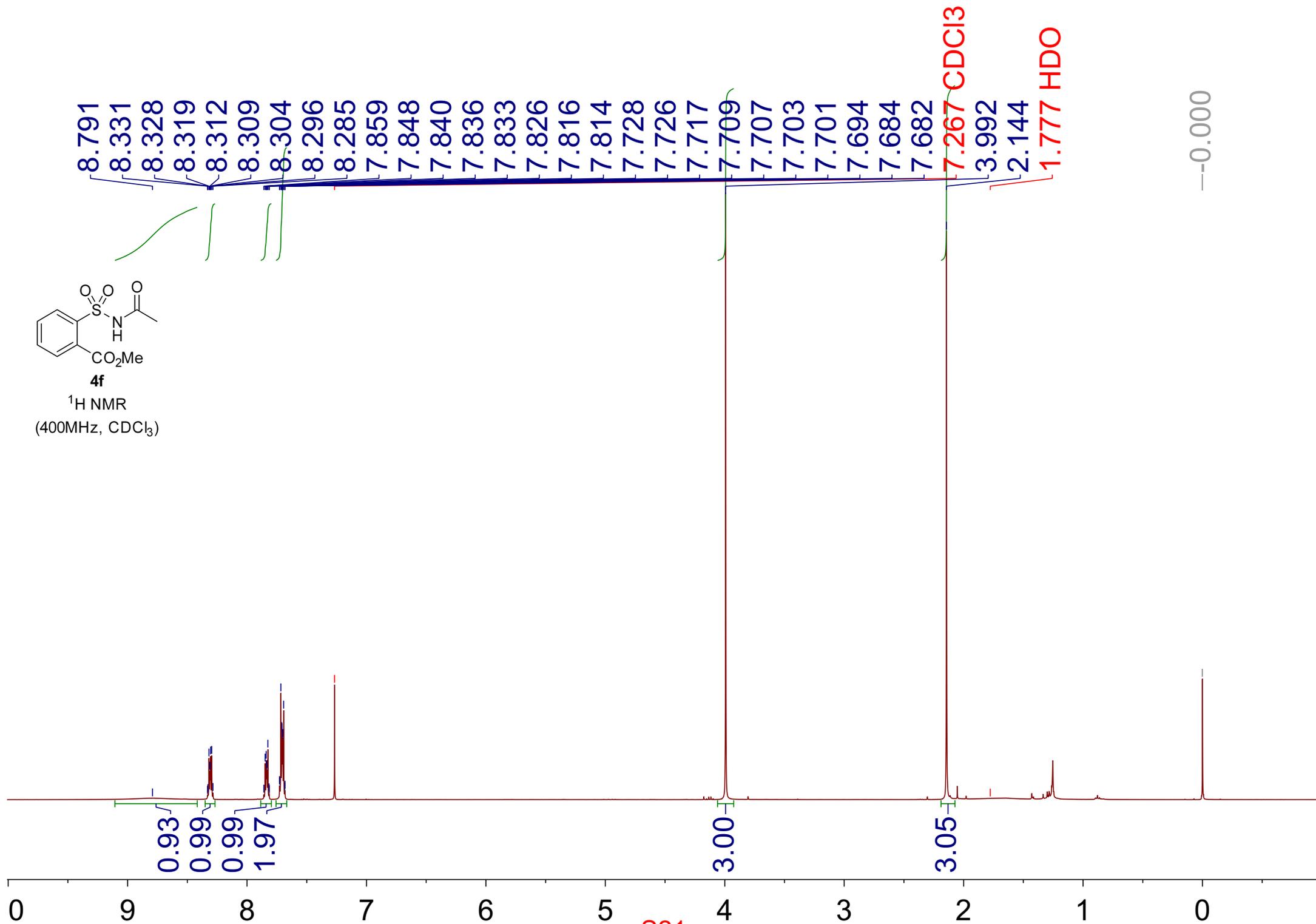
¹H NMR
(400MHz, CDCl₃)

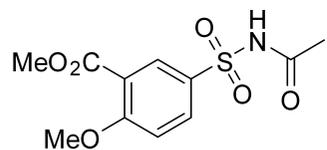




4f

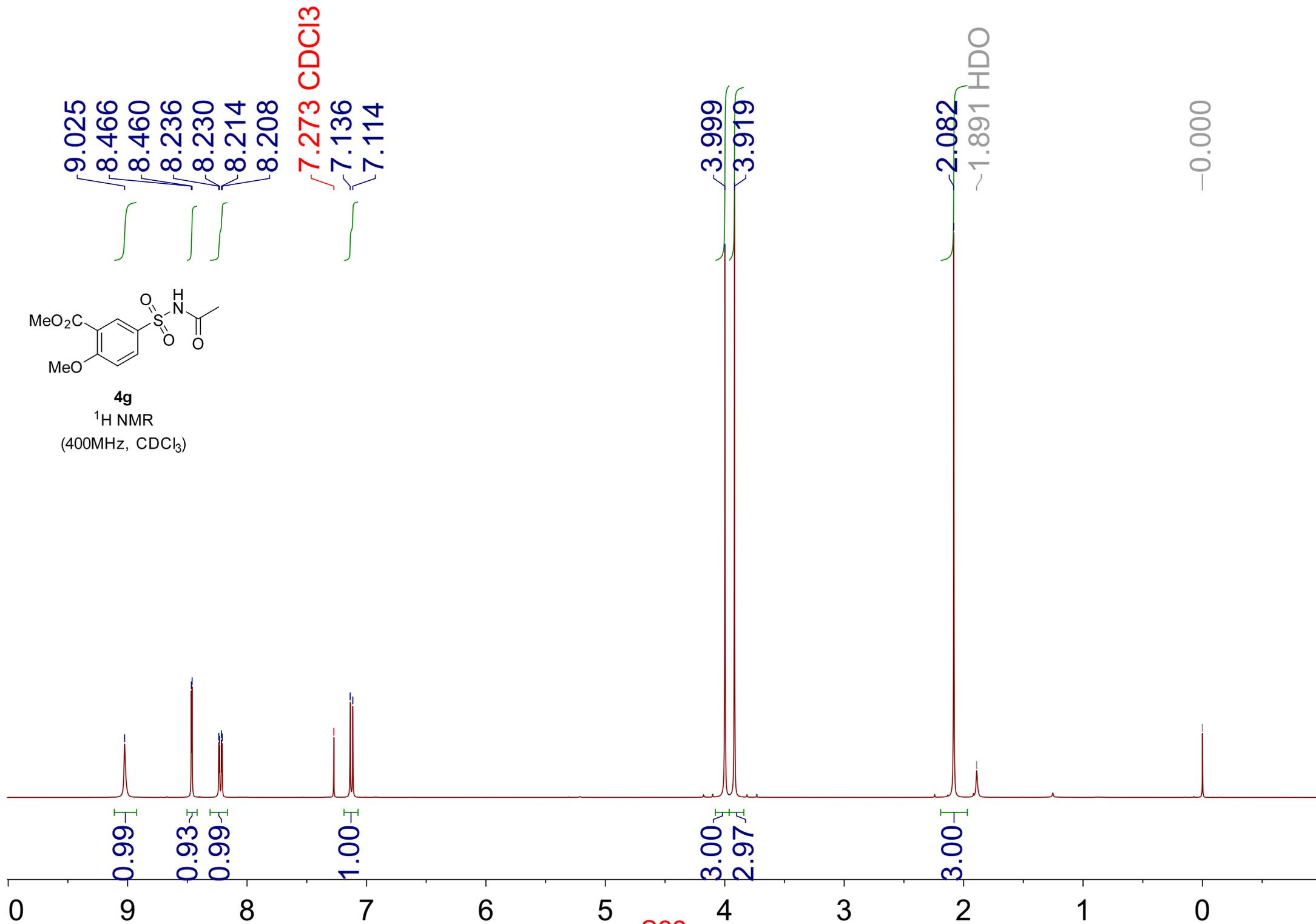
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(400MHz, CDCl₃)

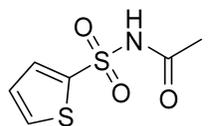




4g

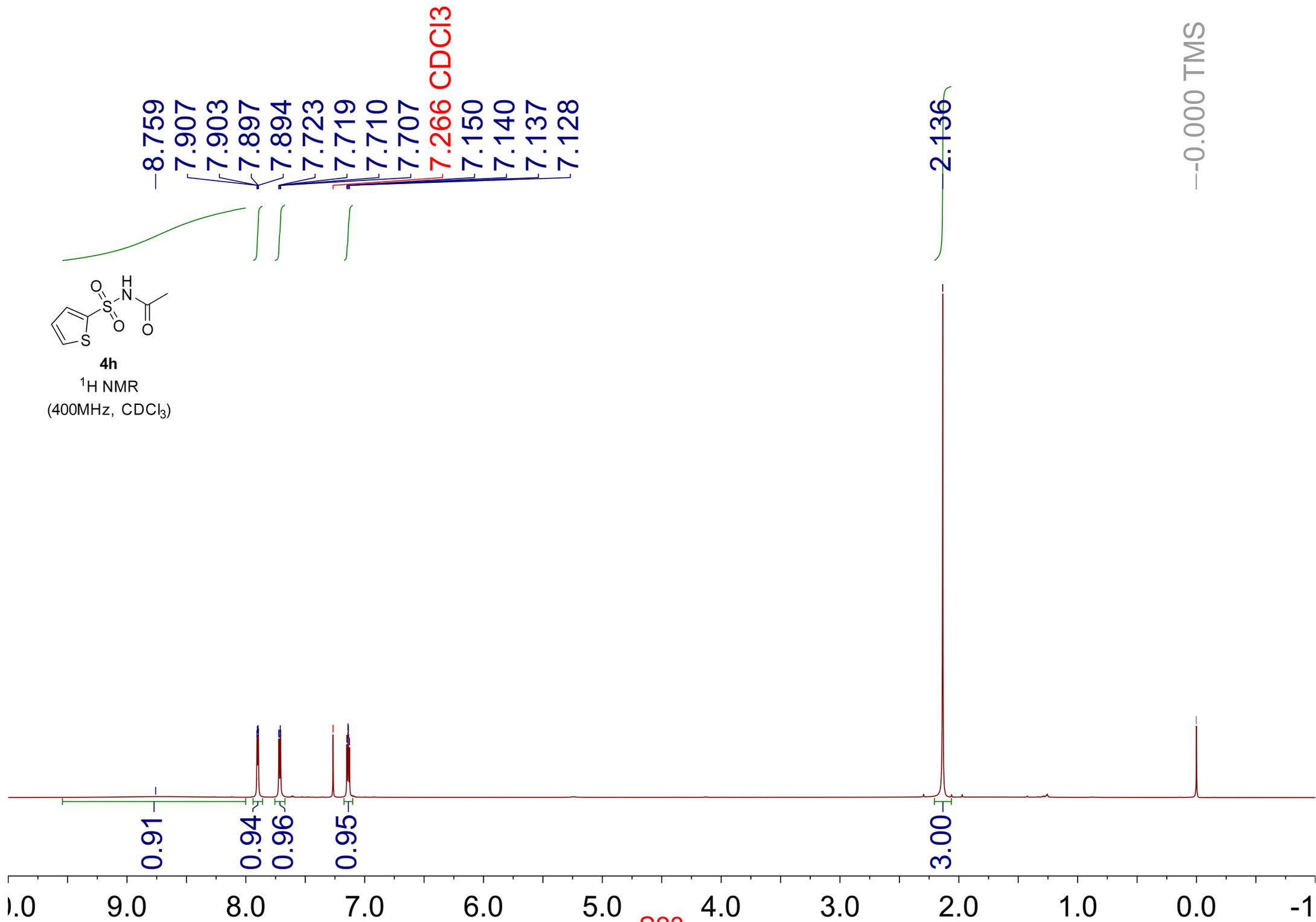
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(400MHz, CDCl₃)

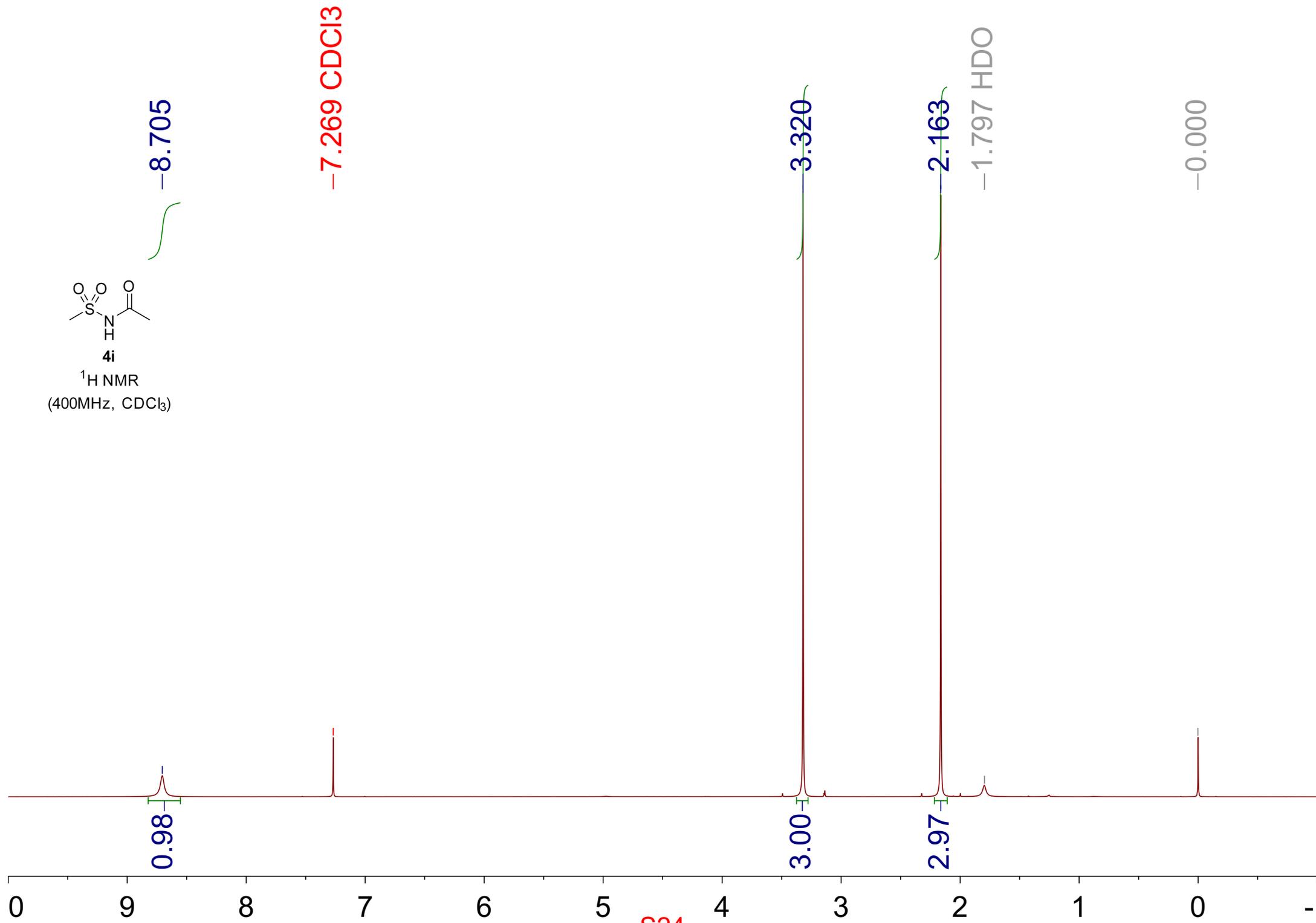
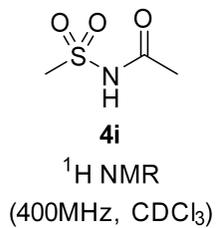


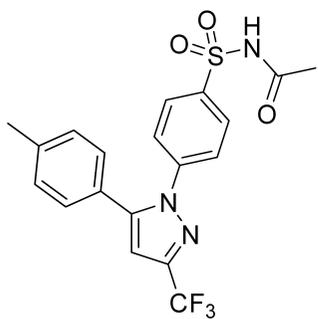


4h

¹H NMR
(400MHz, CDCl₃)

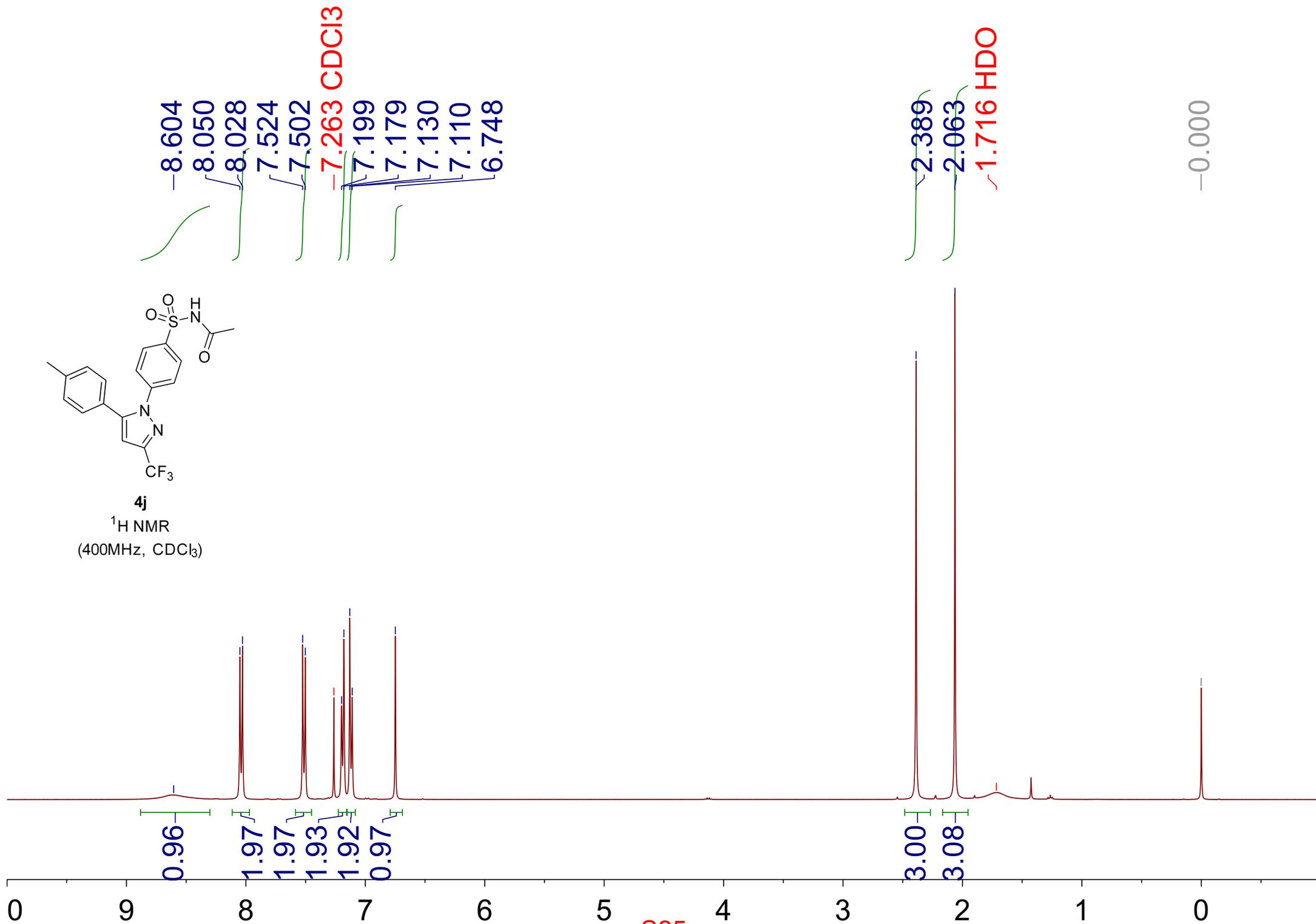


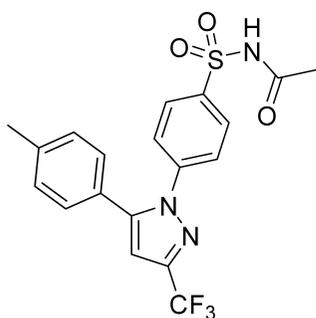




4j

¹H NMR
(400MHz, CDCl₃)





4j

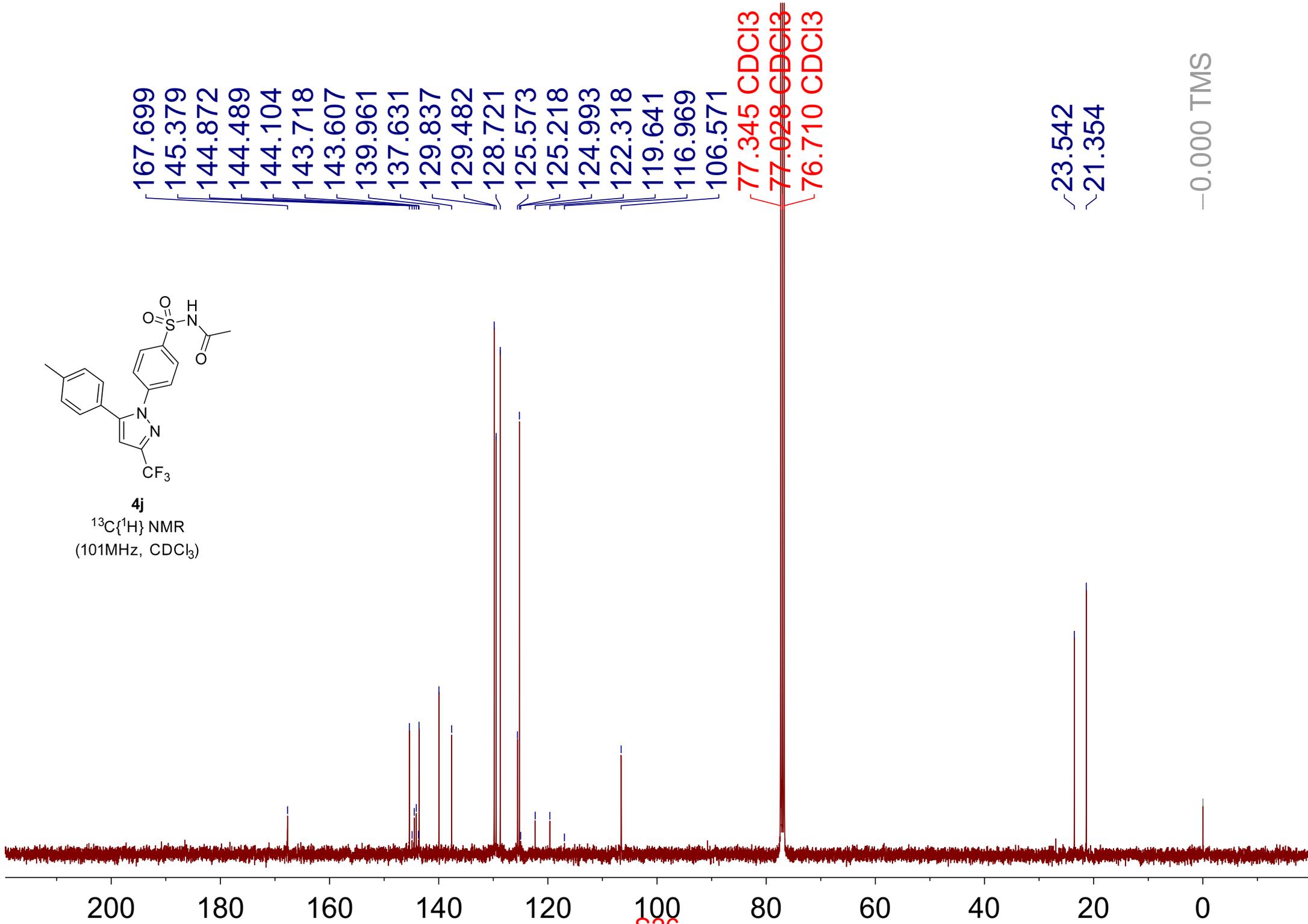
$^{13}\text{C}\{^1\text{H}\}$ NMR
(101MHz, CDCl_3)

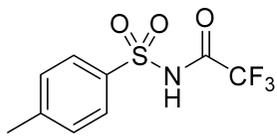
167.699
145.379
144.872
144.489
144.104
143.718
143.607
139.961
137.631
129.837
129.482
128.721
125.573
125.218
124.993
122.318
119.641
116.969
106.571

77.345 CDCl_3
77.028 CDCl_3
76.710 CDCl_3

23.542
21.354

-0.000 TMS





4k

¹H NMR
(400MHz, CDCl₃)

7.818
7.798
7.325
7.305
7.267 CDCl₃

-5.005 HDO

-4.207

2.435

-0.000

2.00

1.96

0.93

3.00

9

8

7

6

5

S27

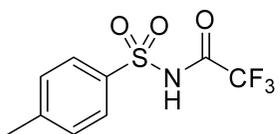
4

3

2

1

0



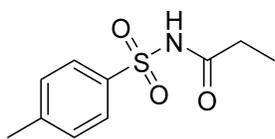
4k

¹⁹F NMR
(376MHz, CDCl₃)

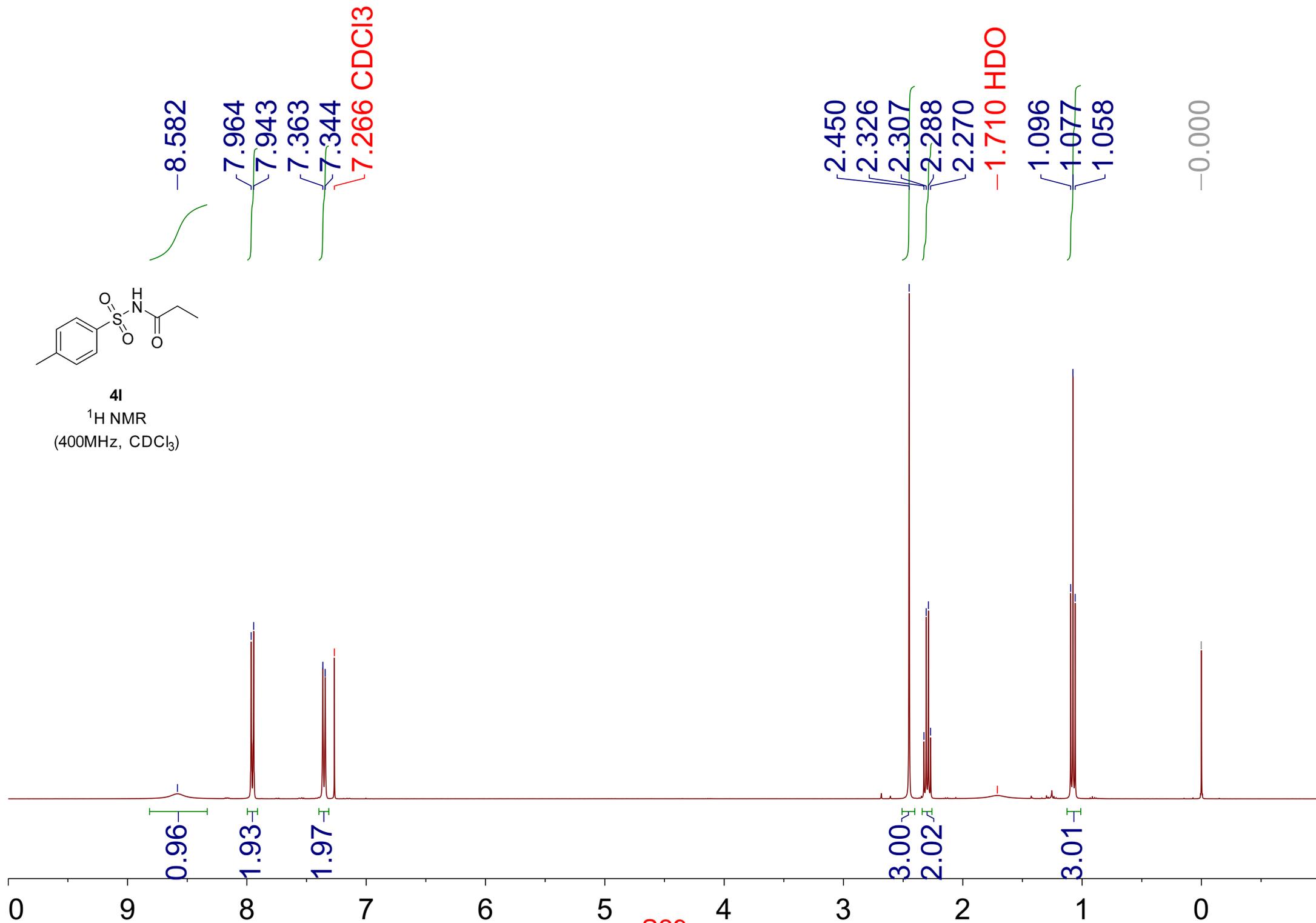
-75.763

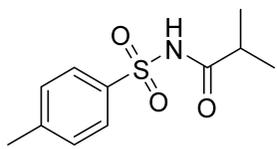


S28

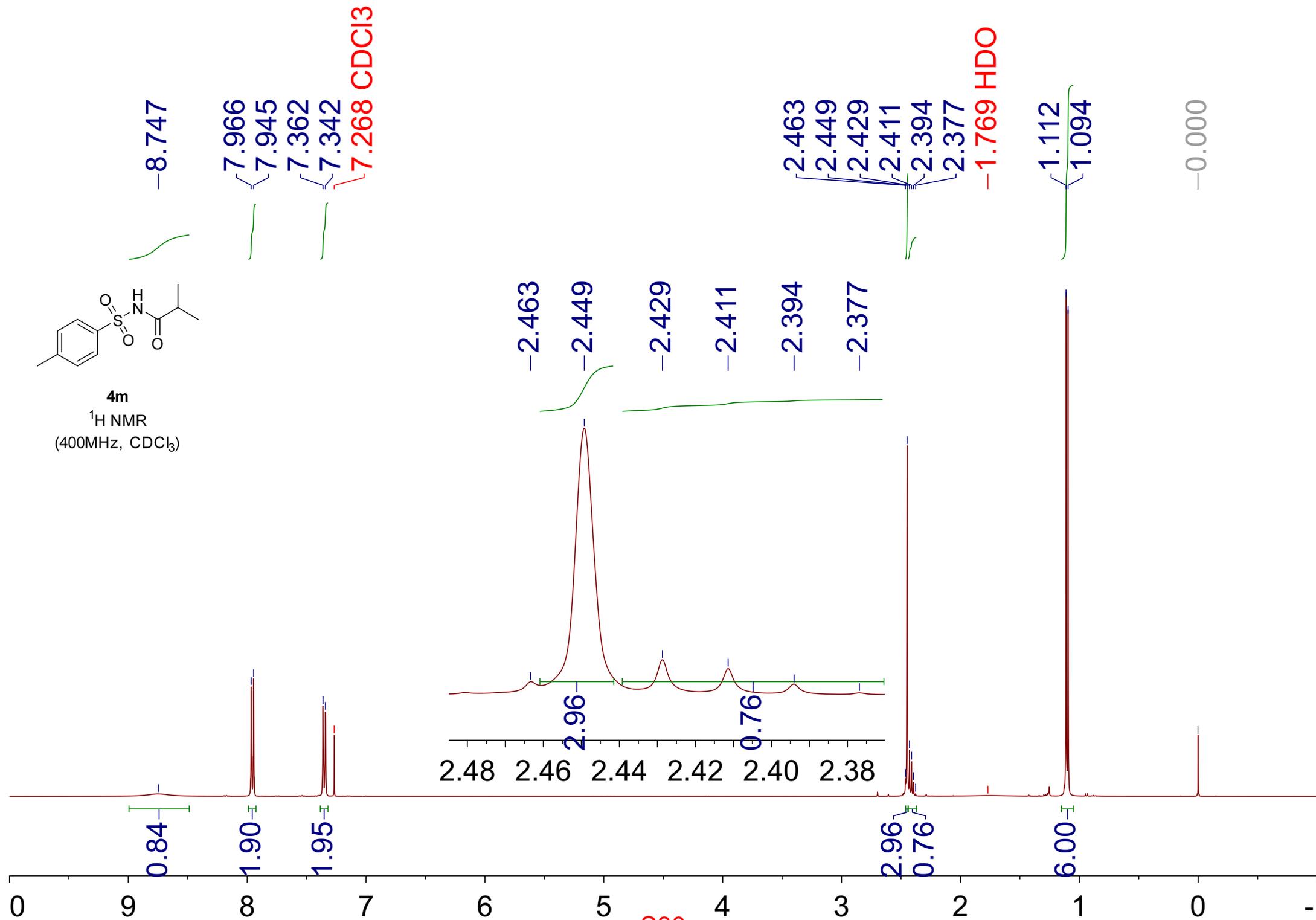


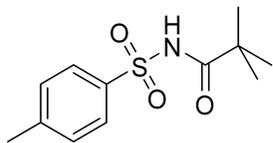
41
¹H NMR
(400MHz, CDCl₃)





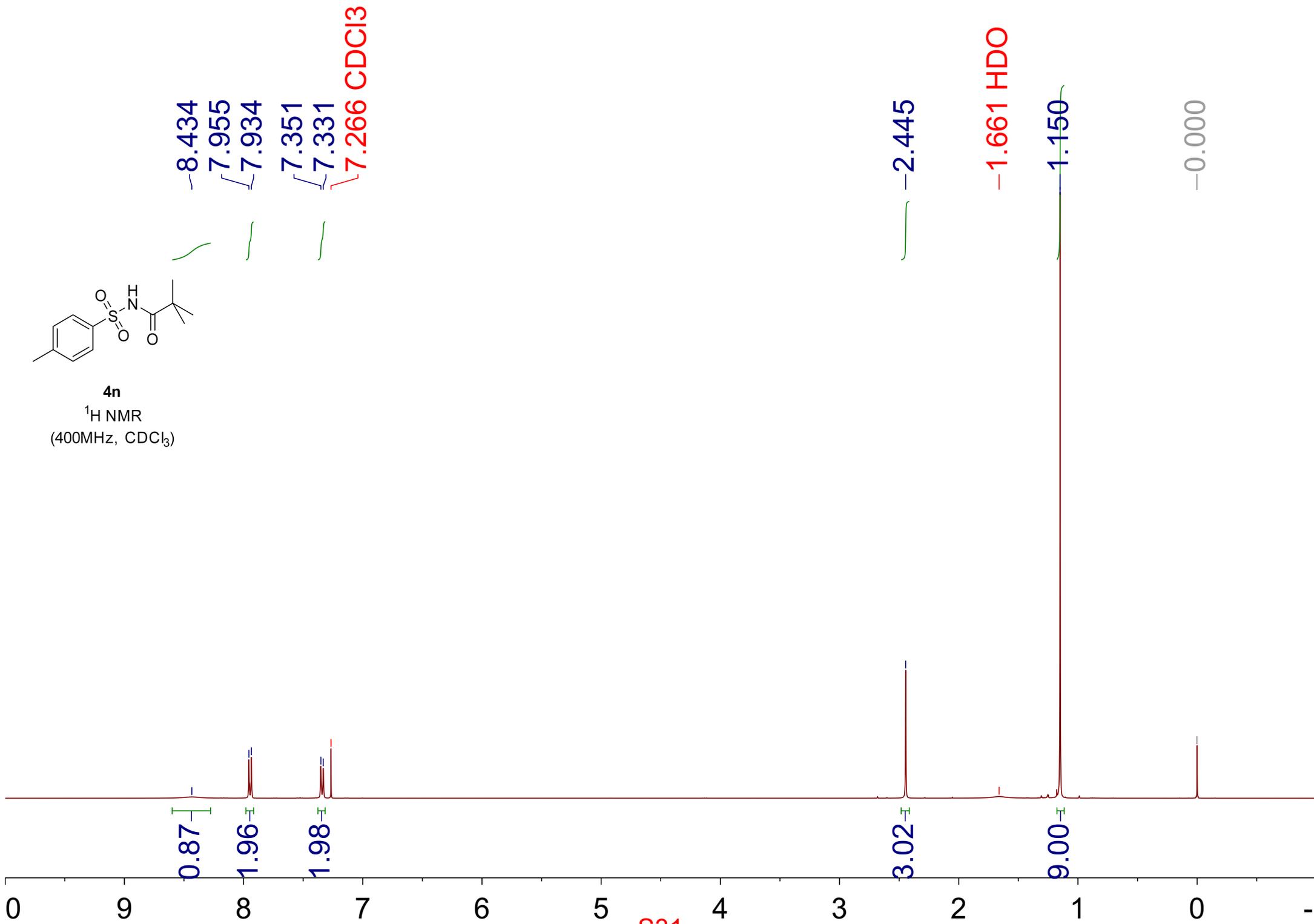
4m
¹H NMR
(400MHz, CDCl₃)

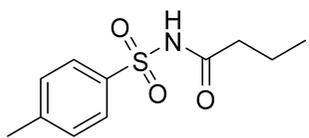




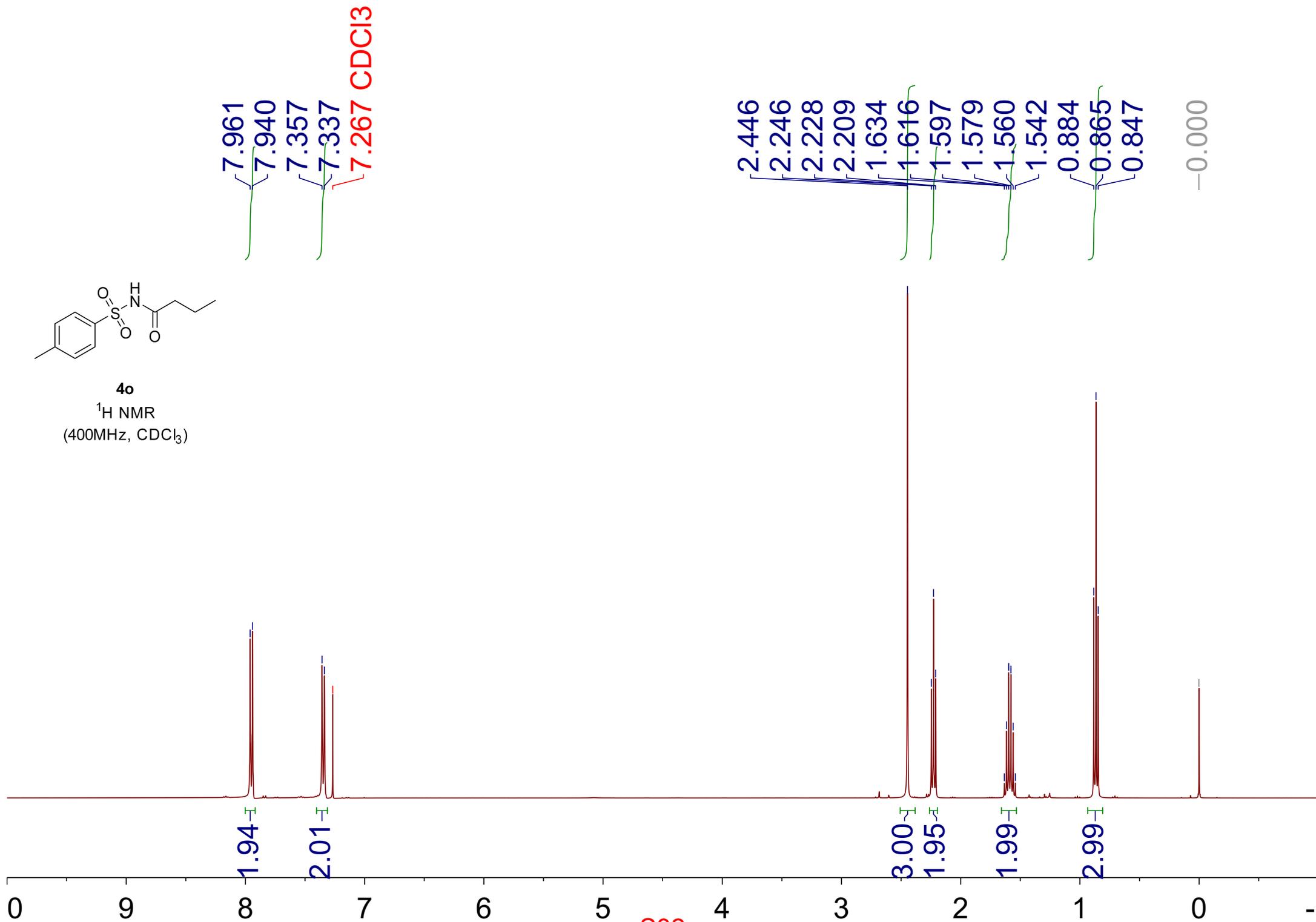
4n

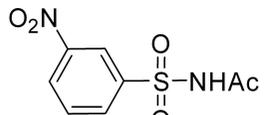
¹H NMR
(400MHz, CDCl₃)





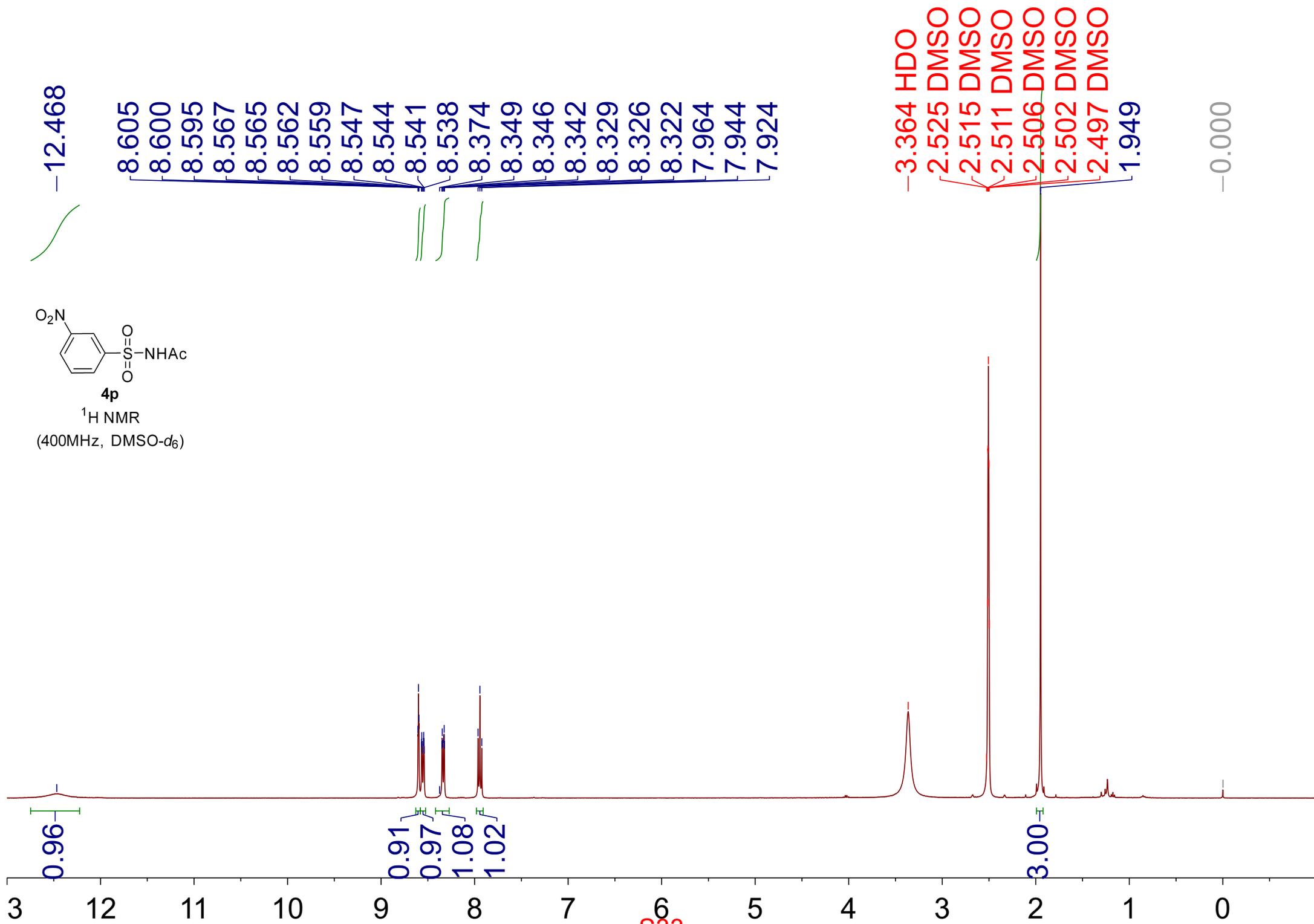
4o
¹H NMR
(400MHz, CDCl₃)

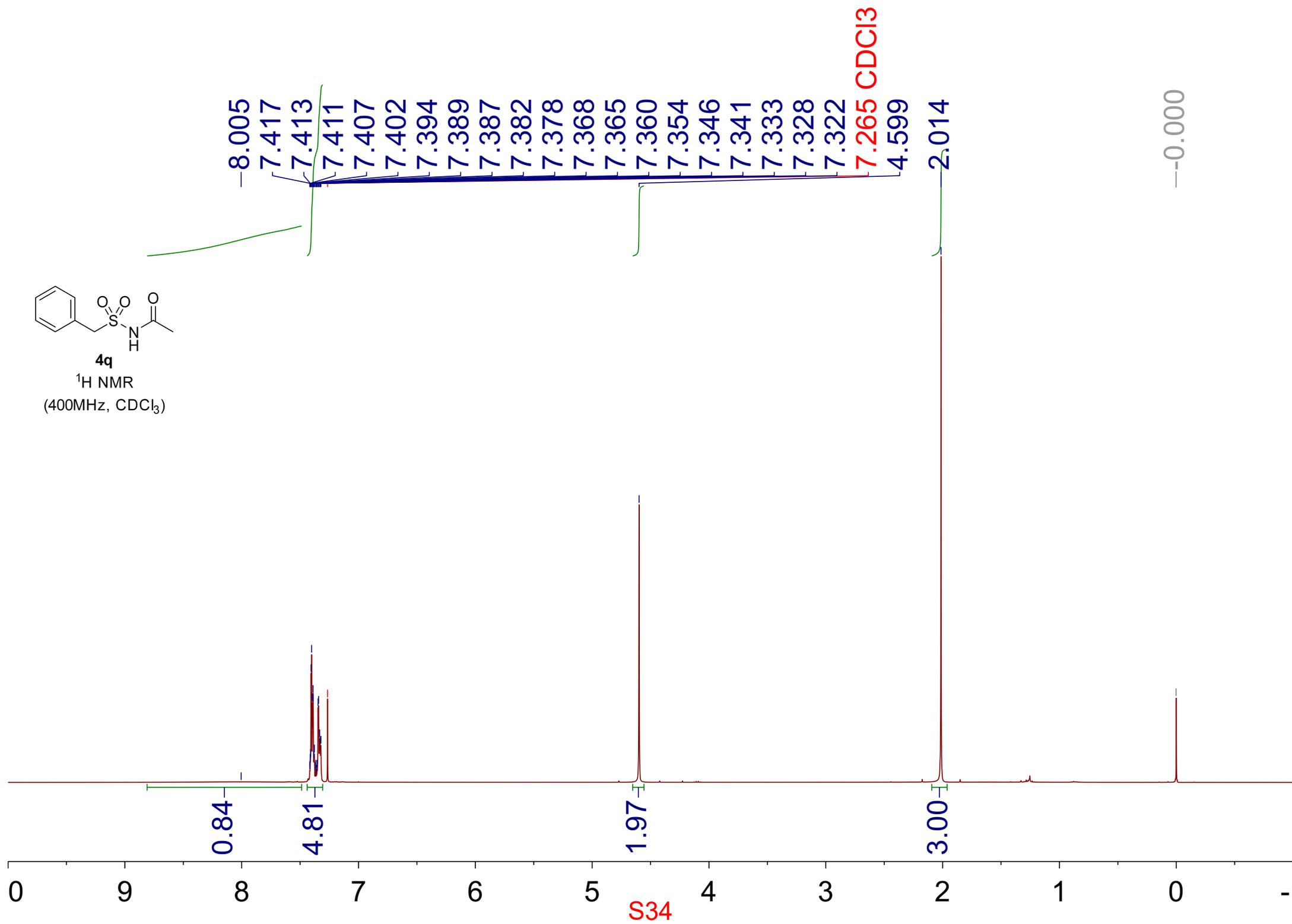
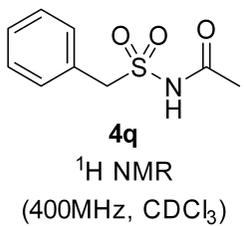


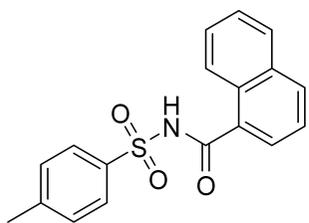


4p

¹H NMR
(400MHz, DMSO-d₆)

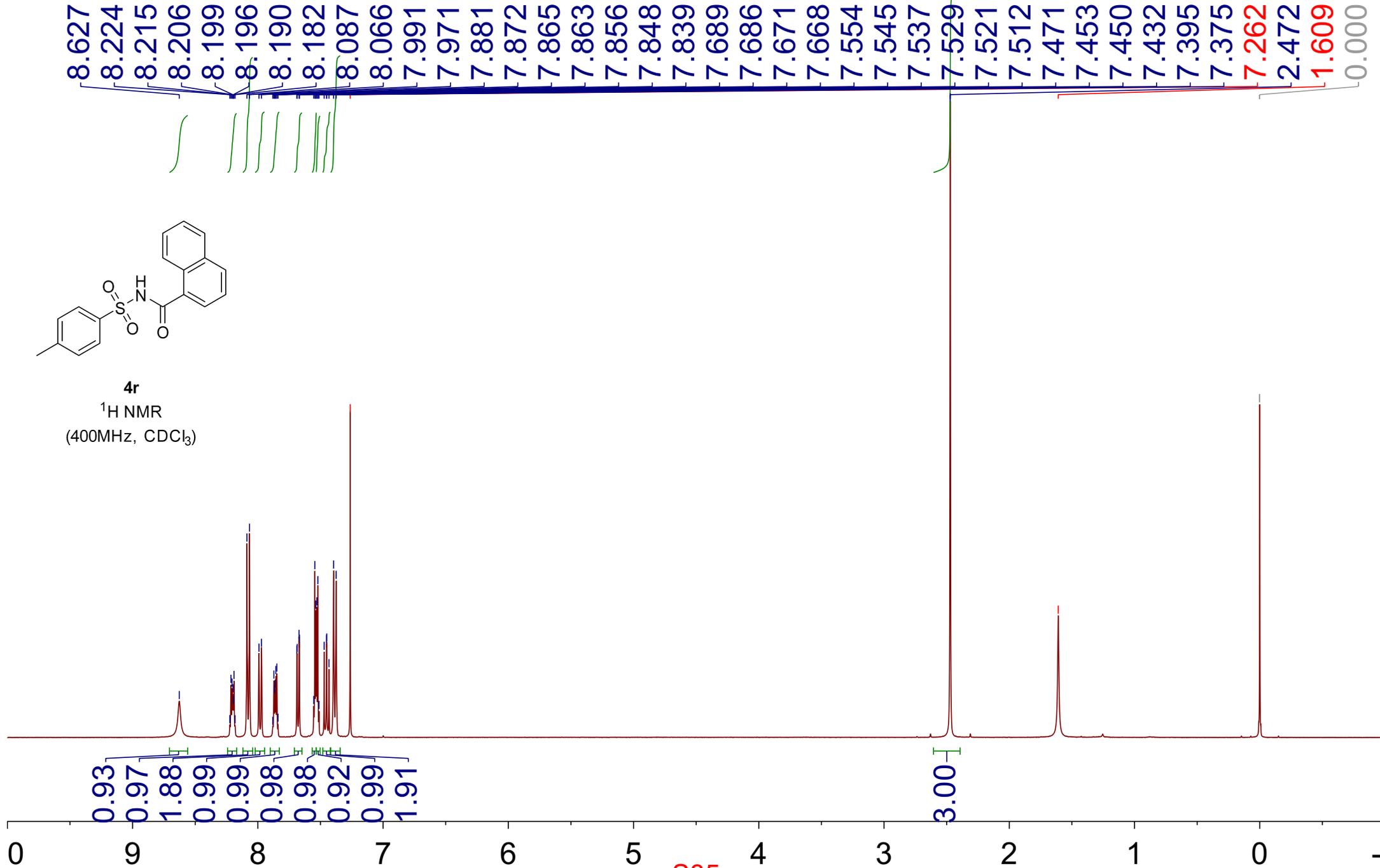


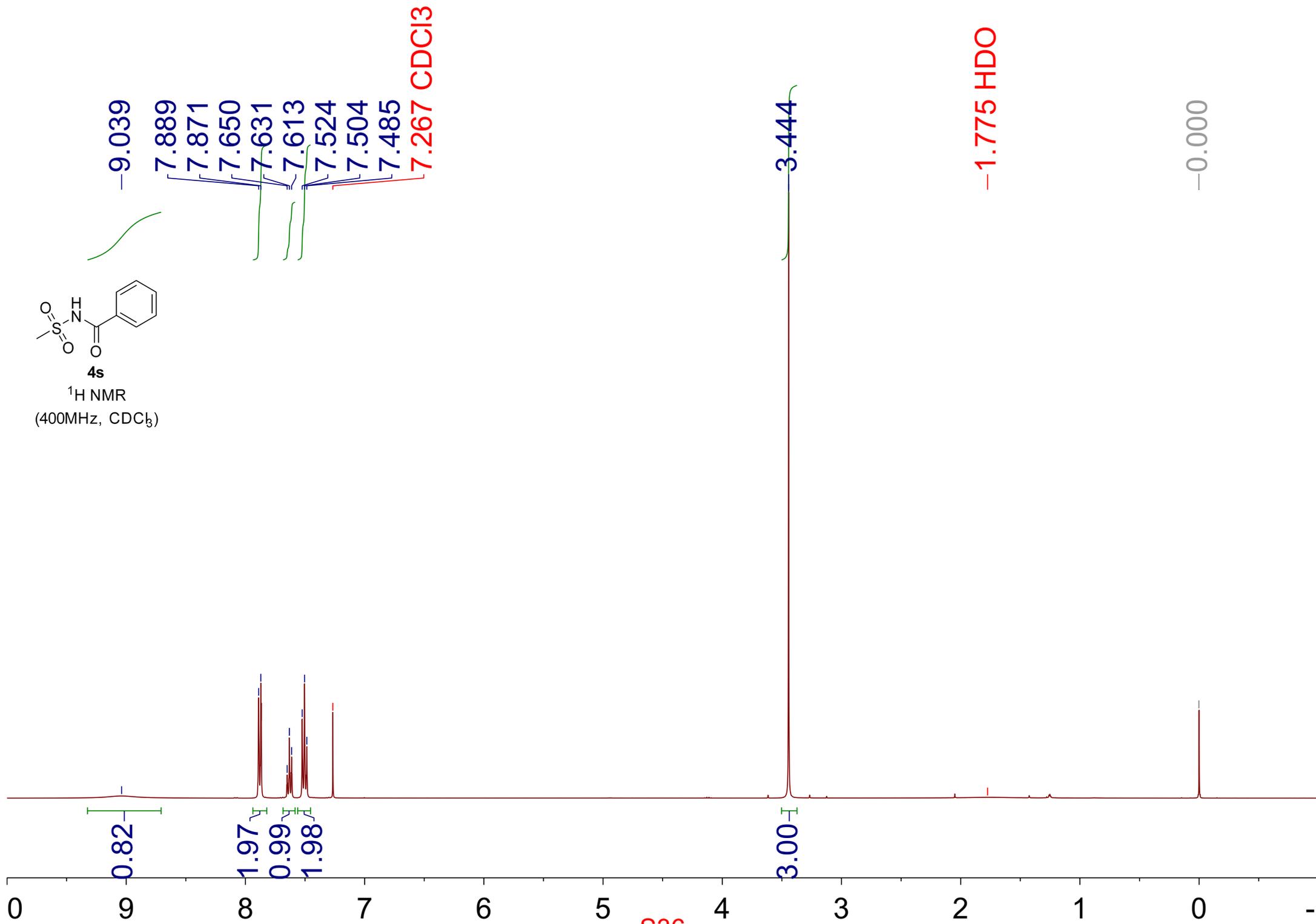
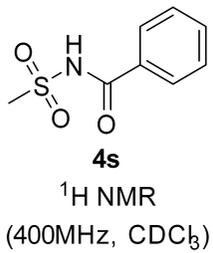


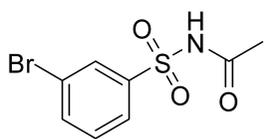


4r

¹H NMR
(400MHz, CDCl₃)

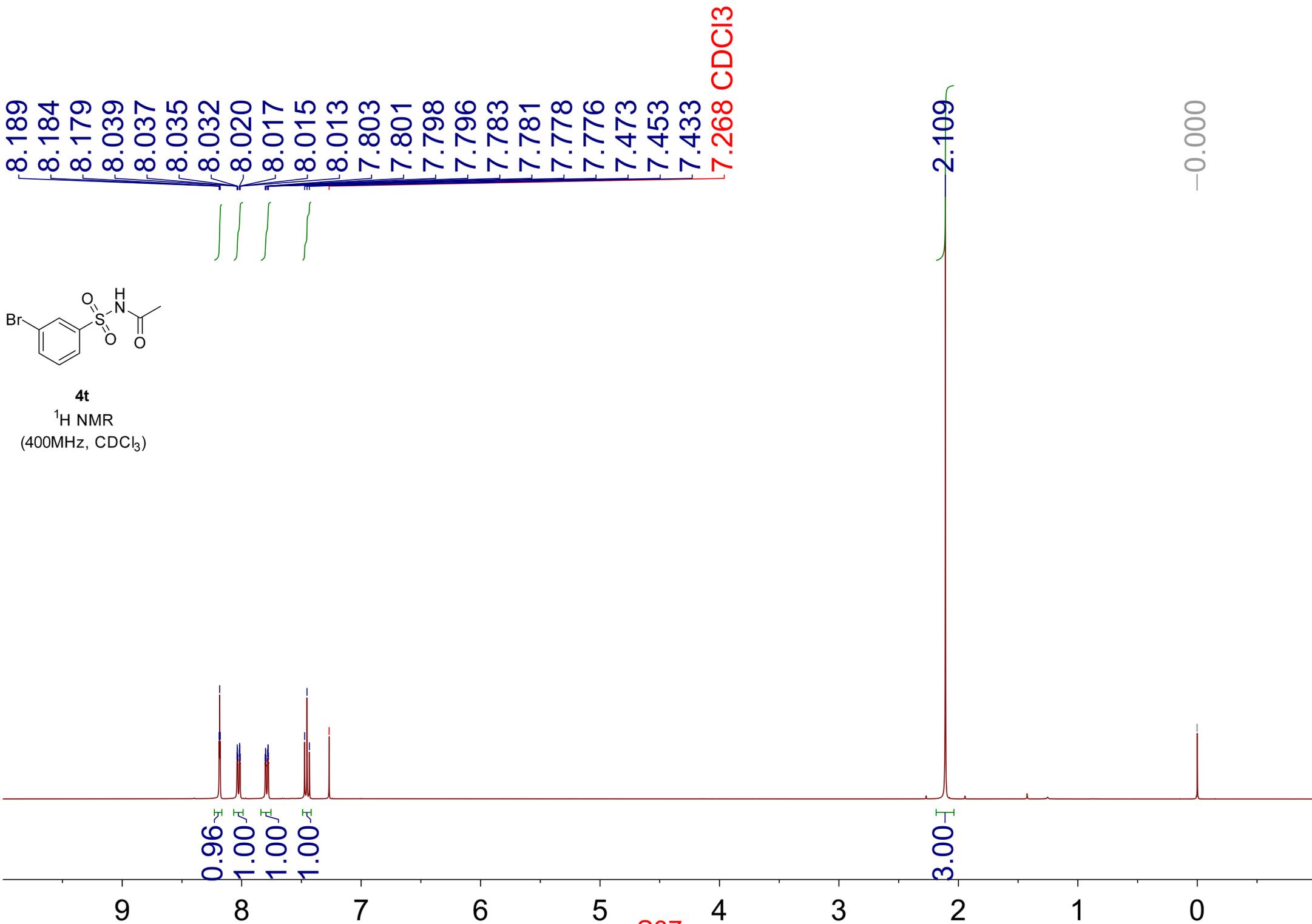


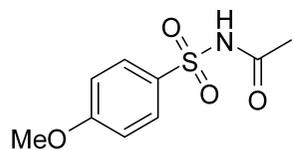




4t

¹H NMR
(400MHz, CDCl₃)





4u

¹H NMR
(400MHz, CDCl₃)

8.007
7.984

7.266 CDCl₃

7.020
6.998

3.887

2.063

-0.000

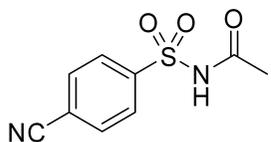
1.94

1.97

2.99

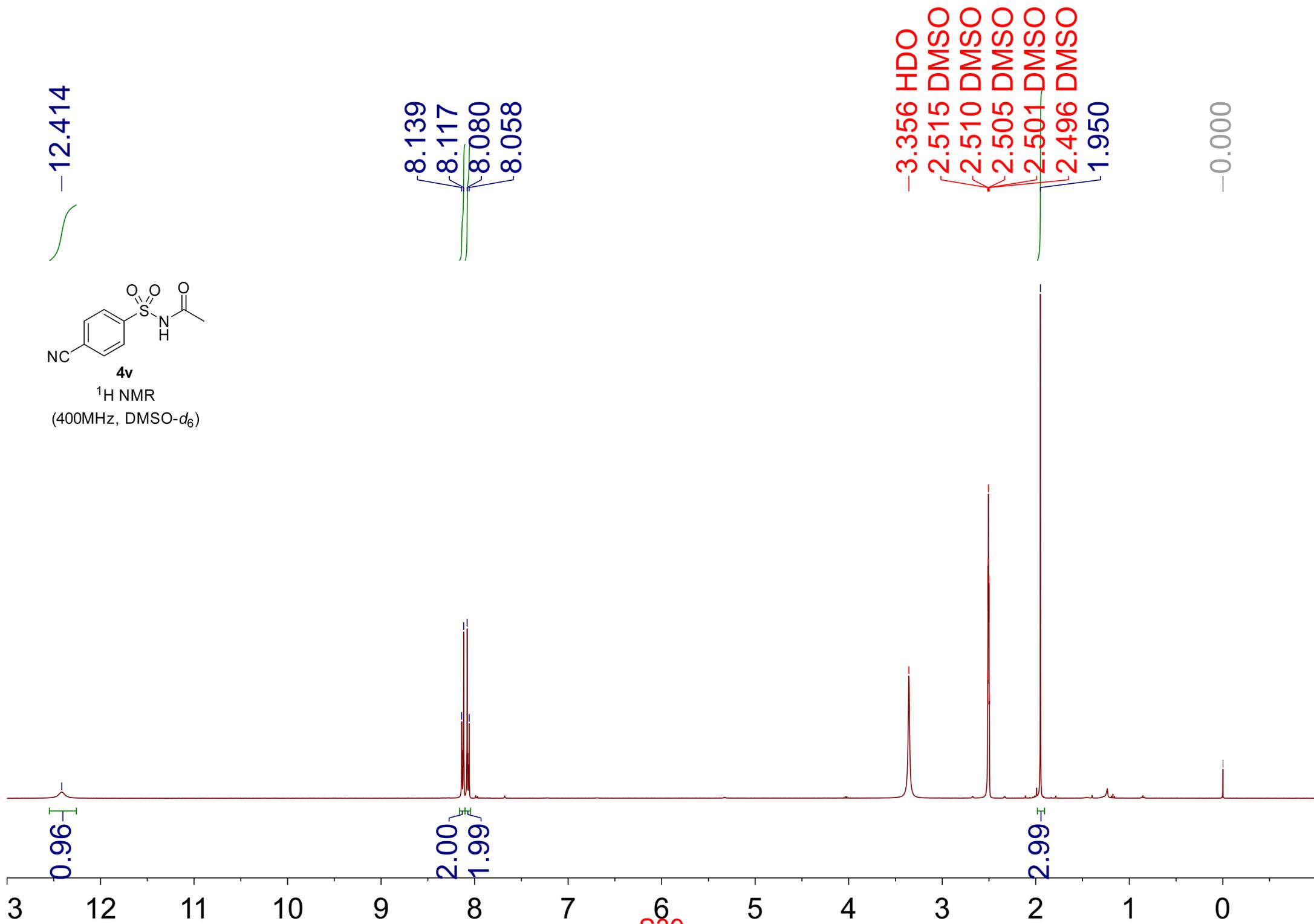
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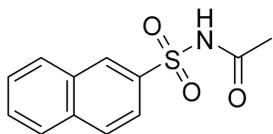
S38



4v

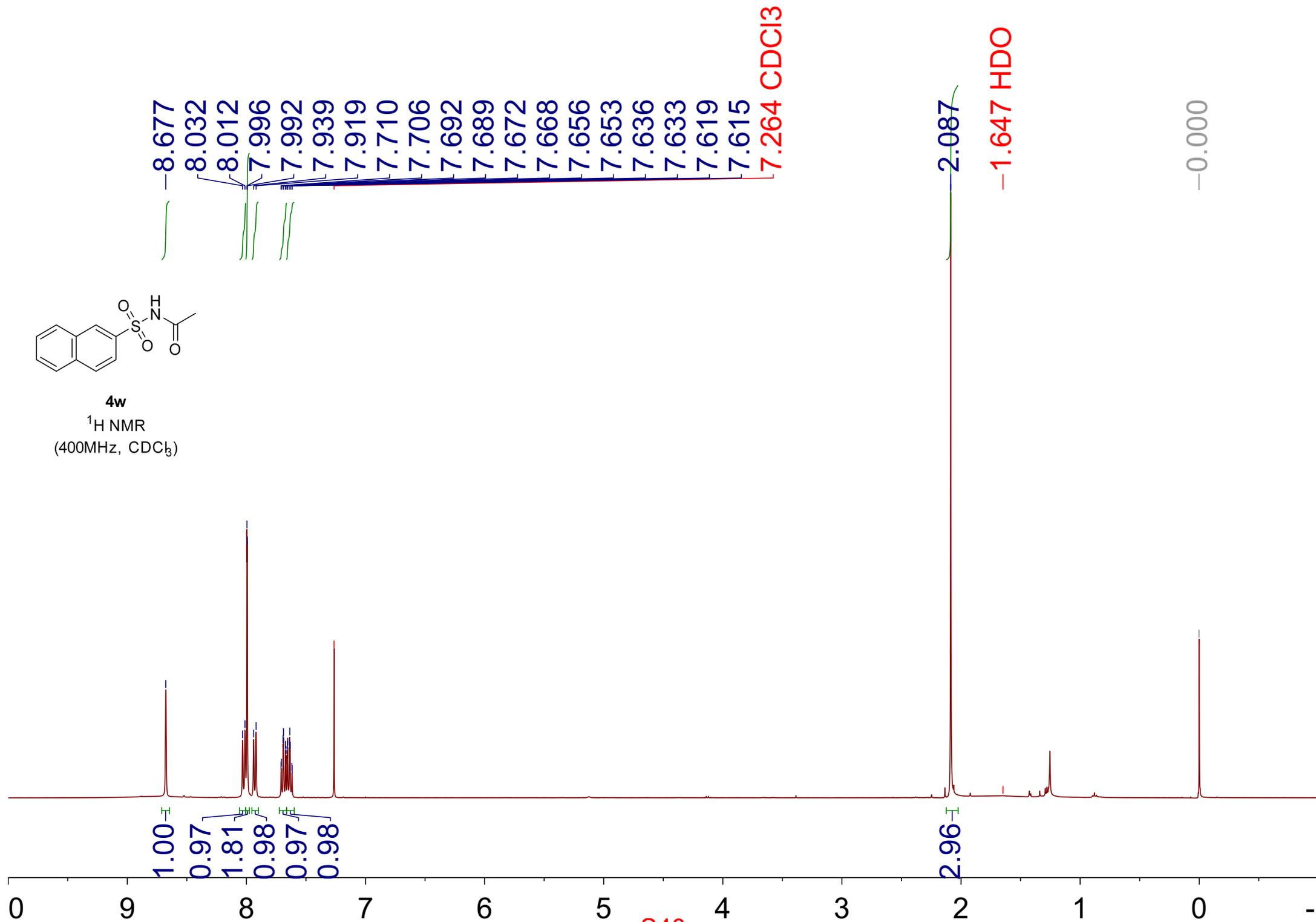
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(400MHz, DMSO-d₆)

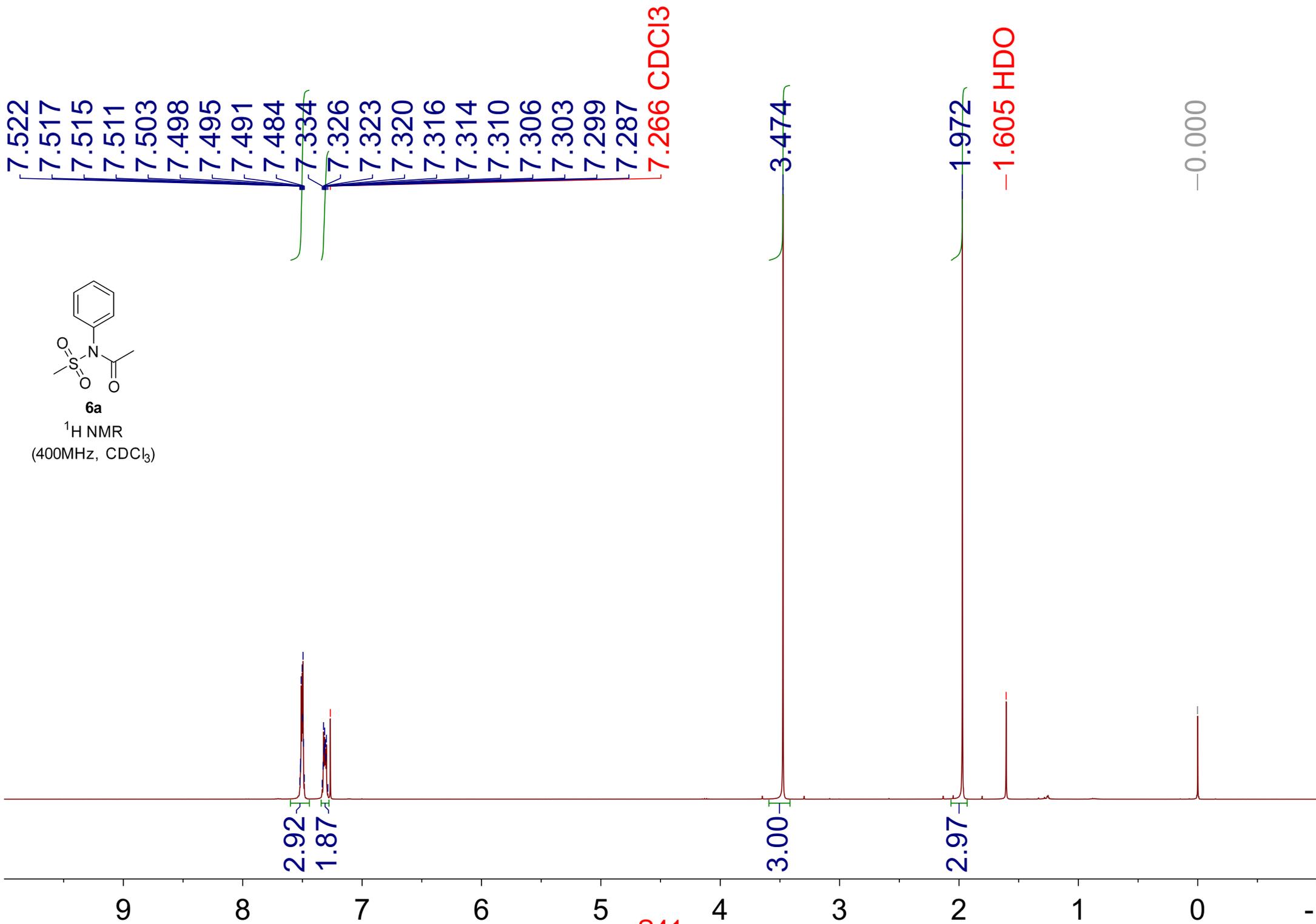
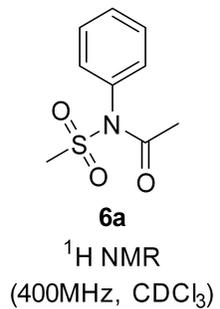


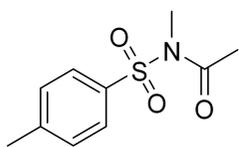


4w

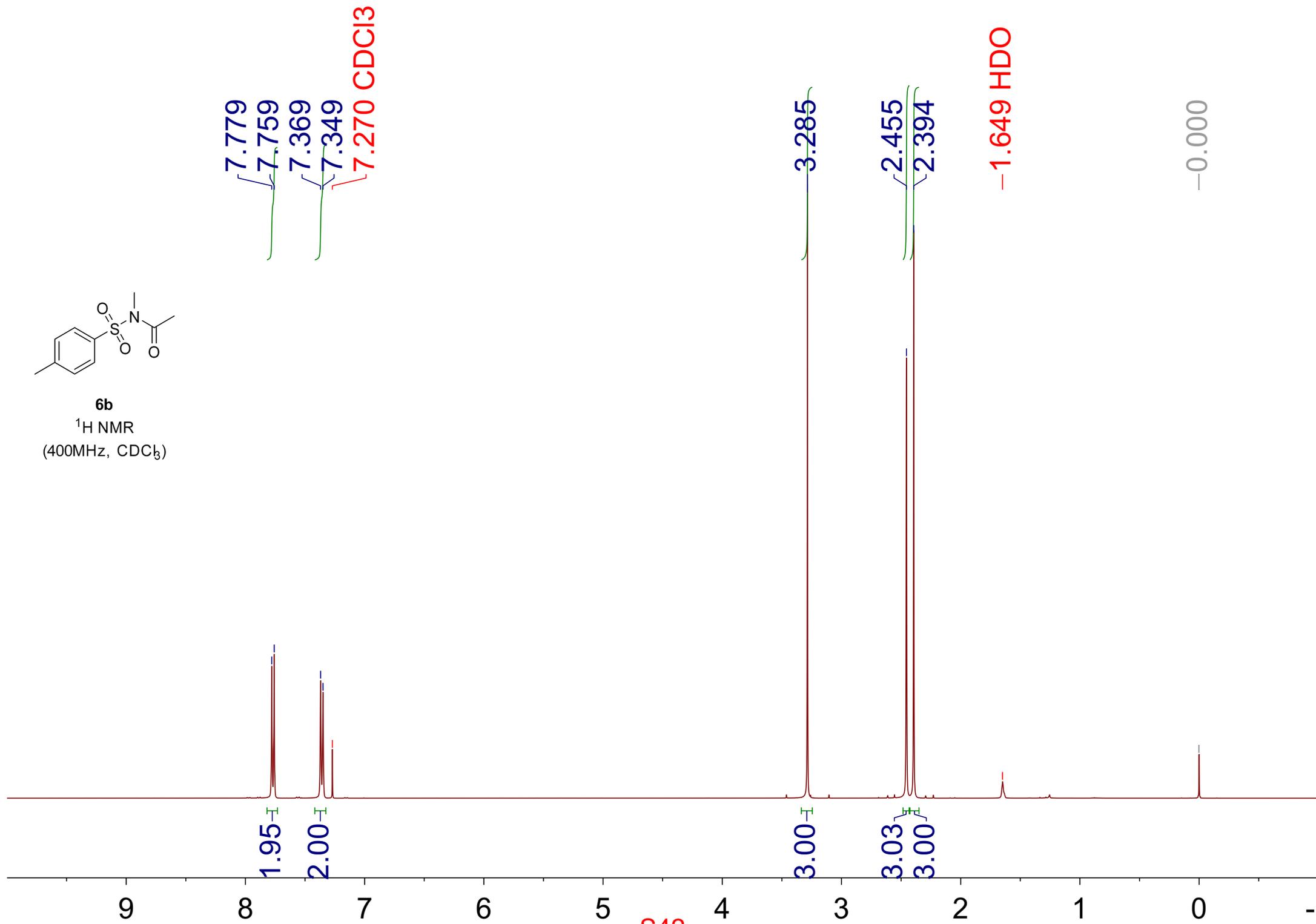
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(400MHz, CDCl₃)

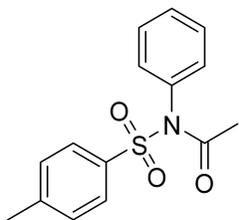






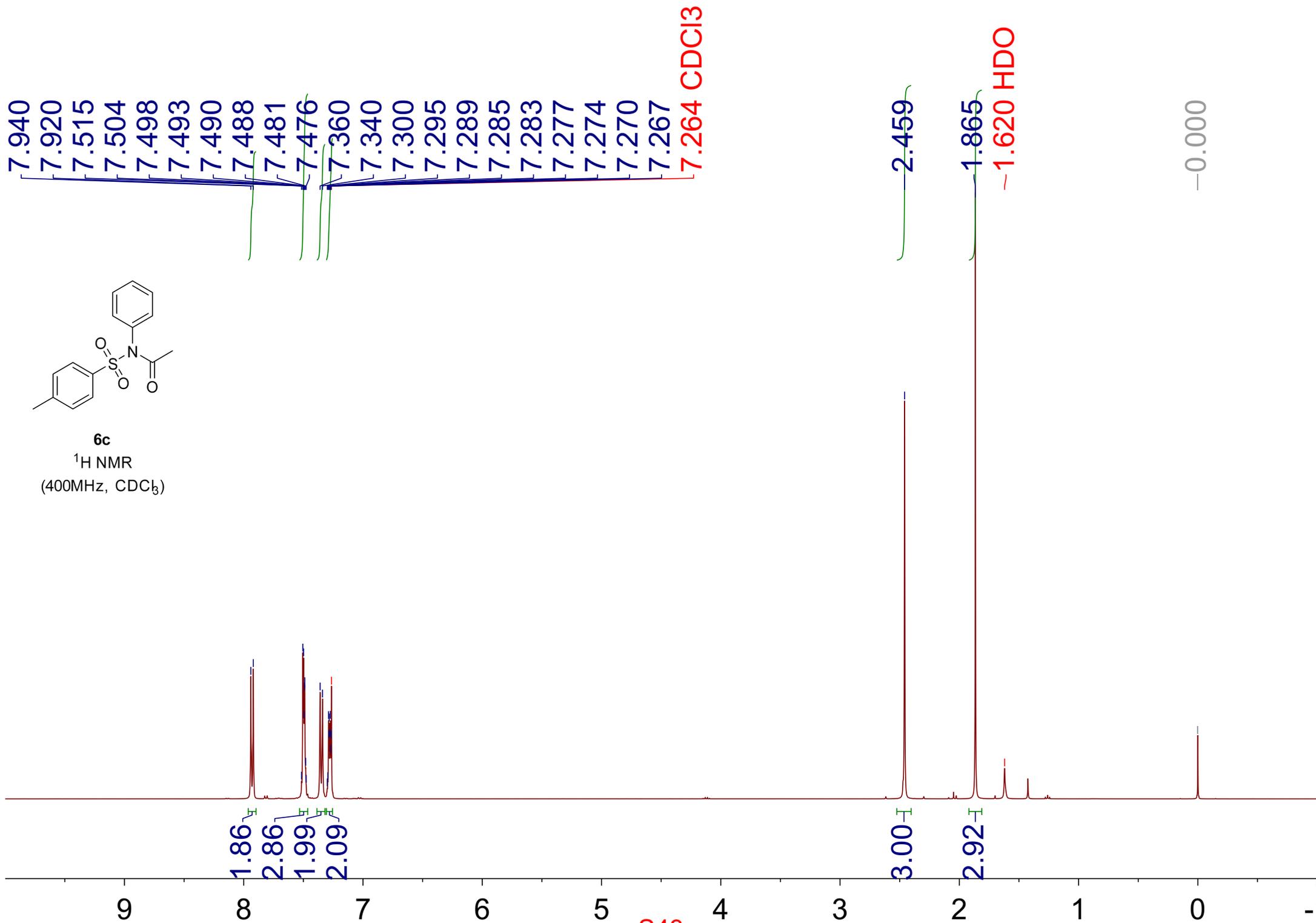
6b
¹H NMR
(400MHz, CDCl₃)

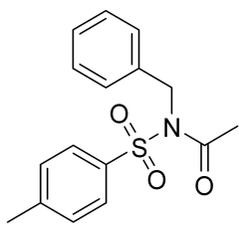




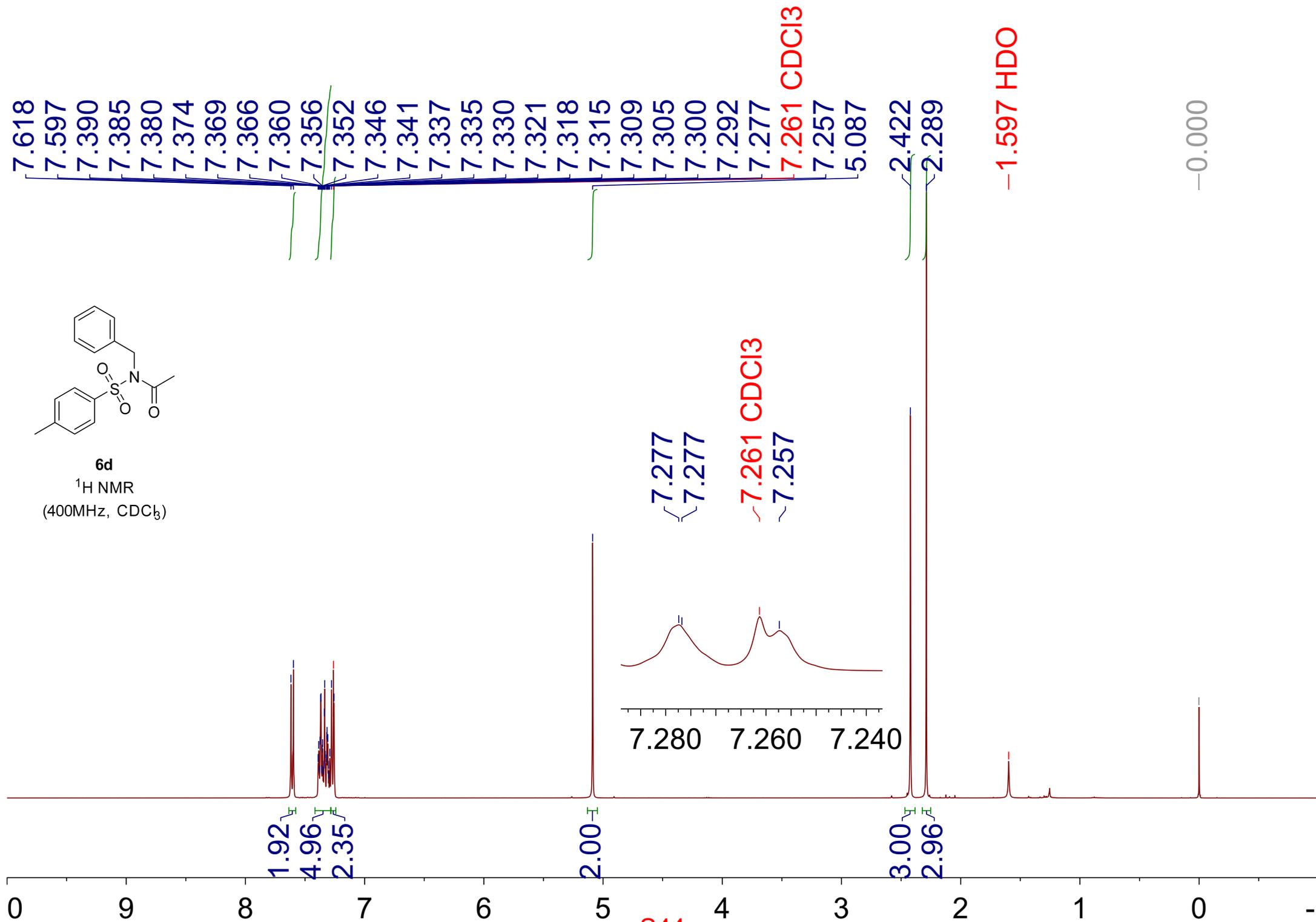
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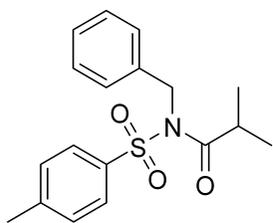
¹H NMR
(400MHz, CDCl₃)





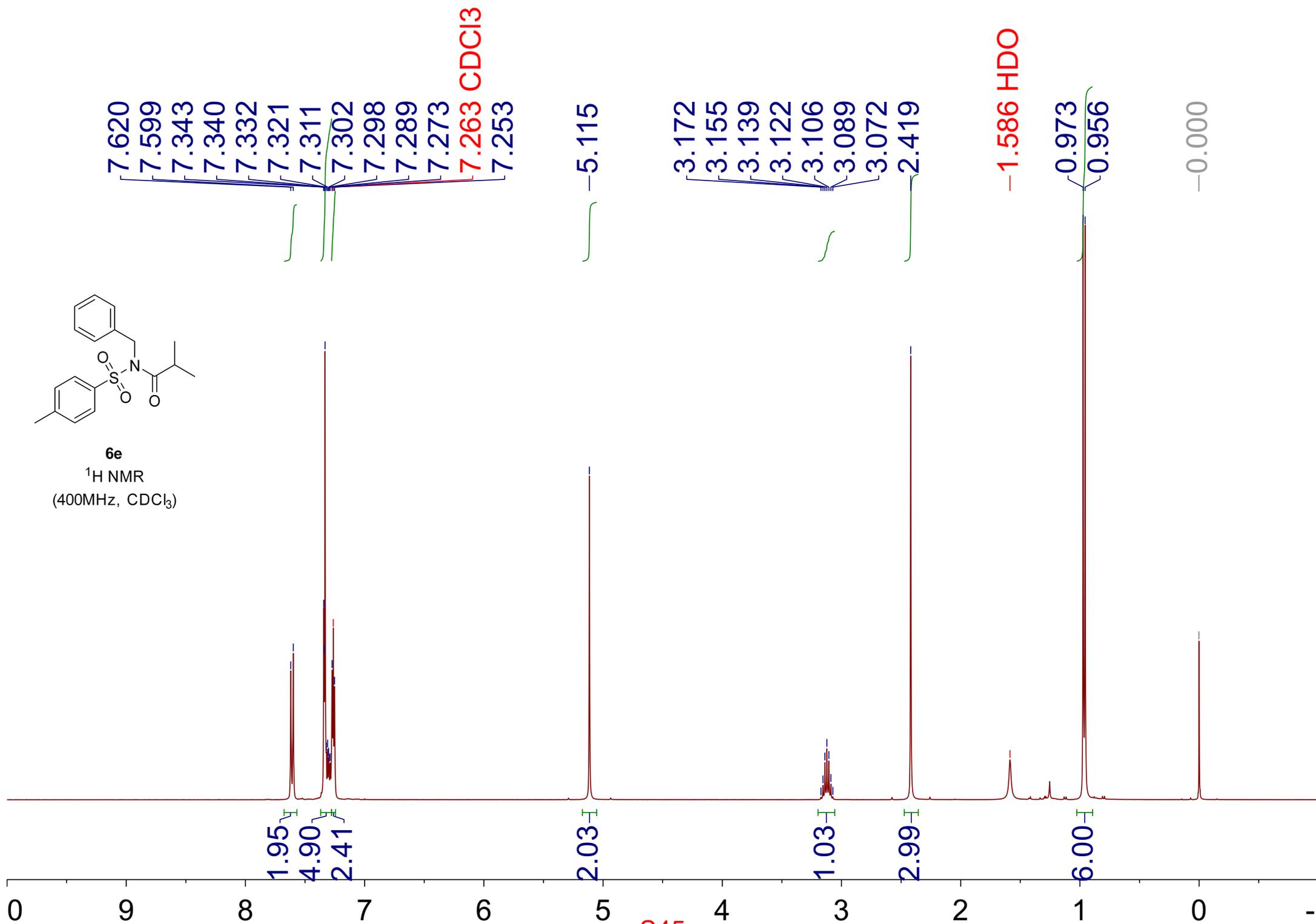
6d
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(400MHz, CDCl₃)

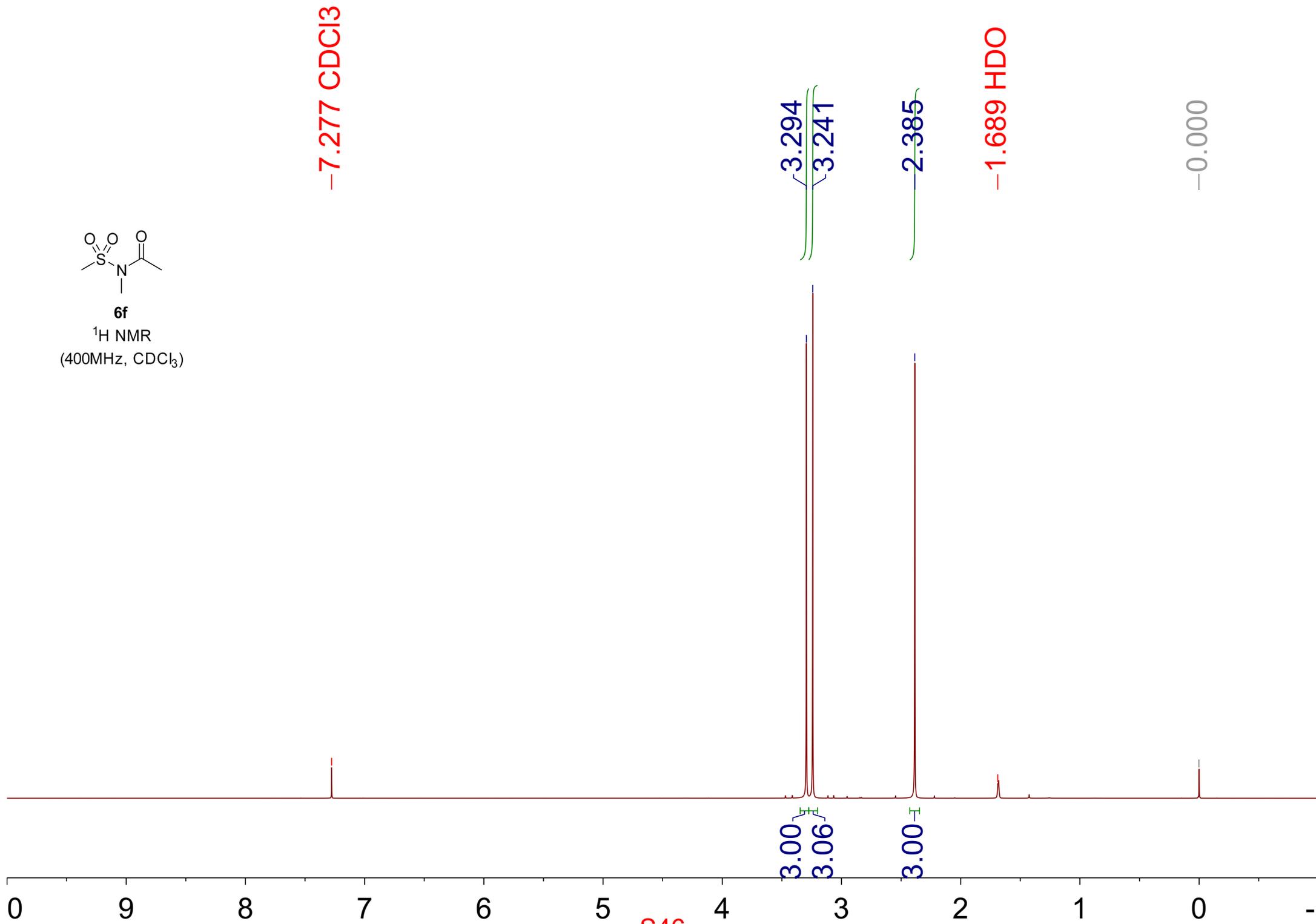
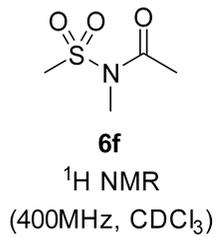


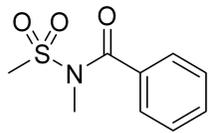


6e

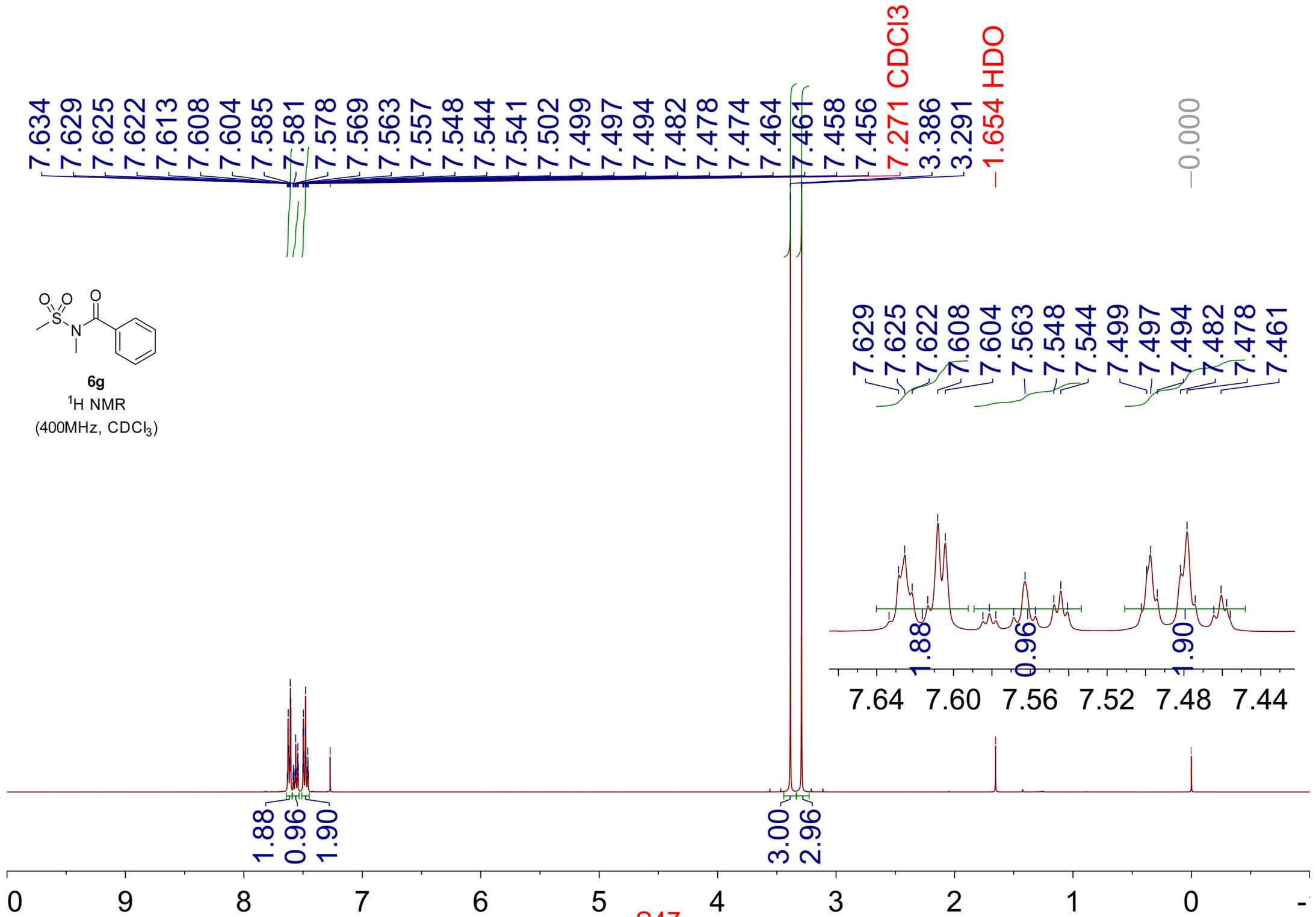
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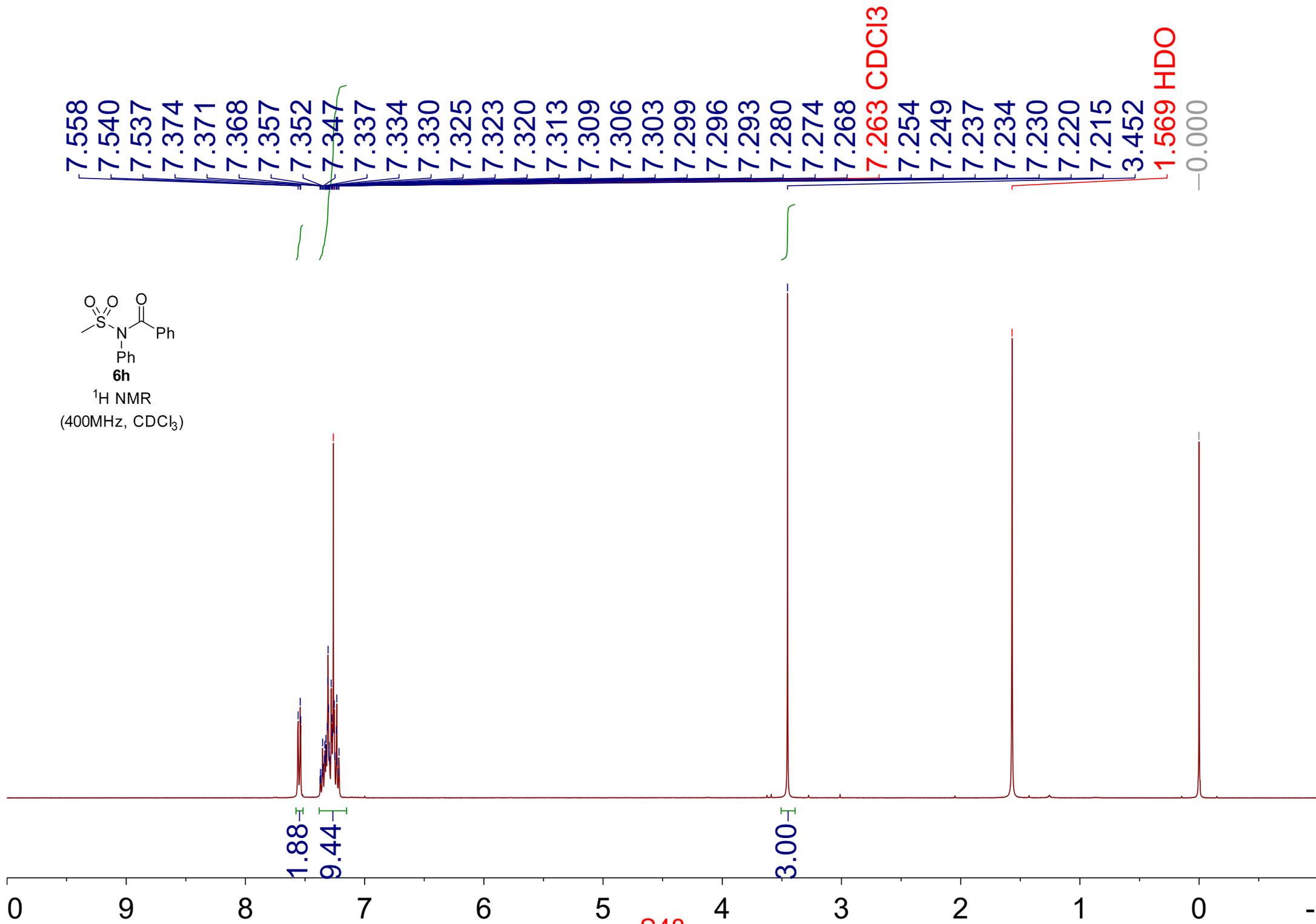
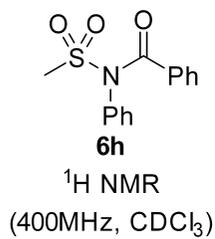


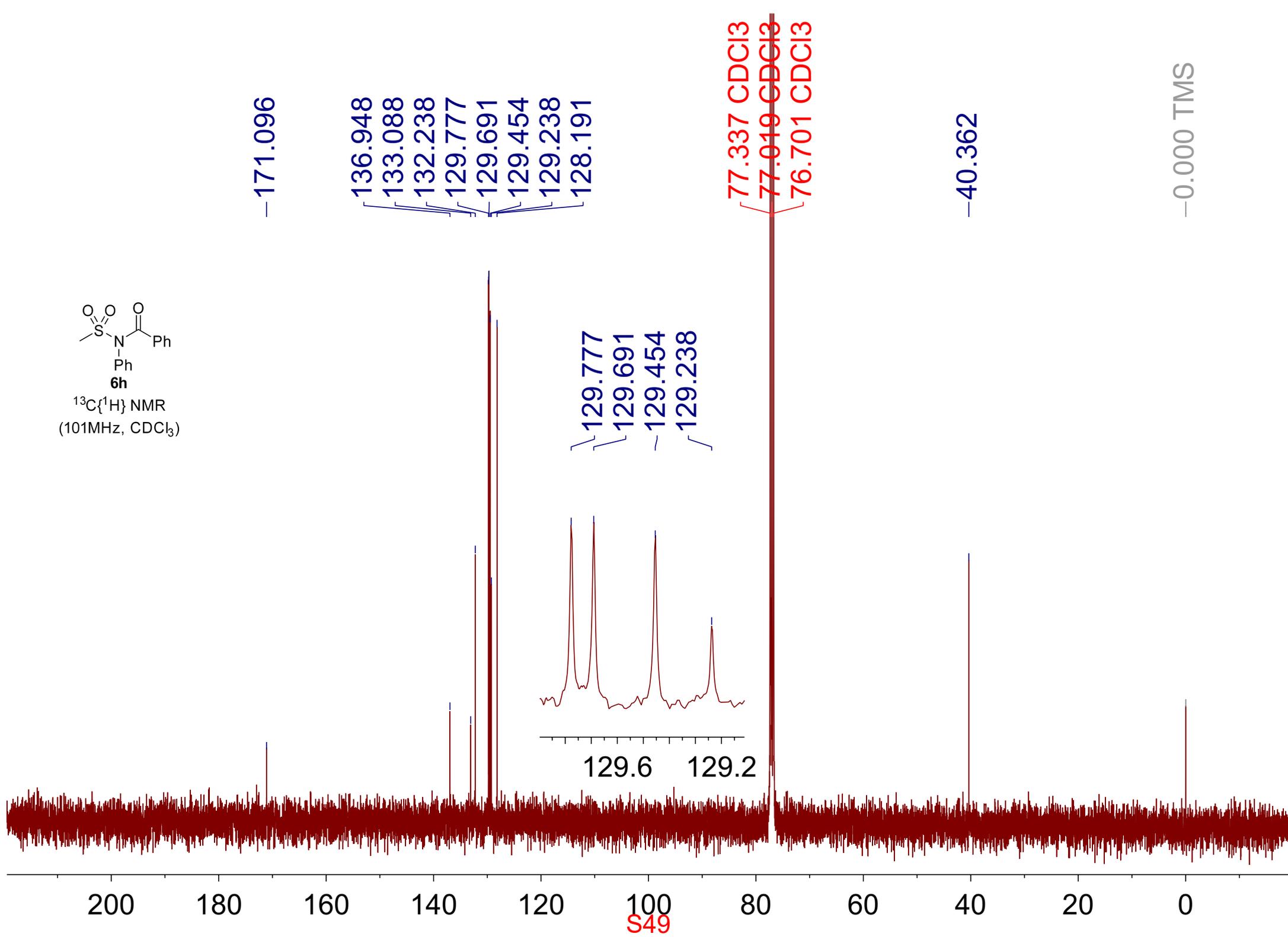
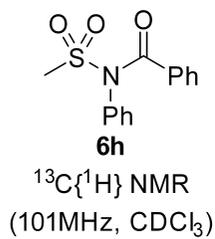


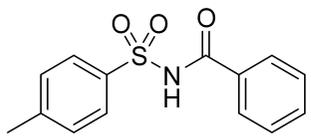


6g
¹H NMR
(400MHz, CDCl₃)



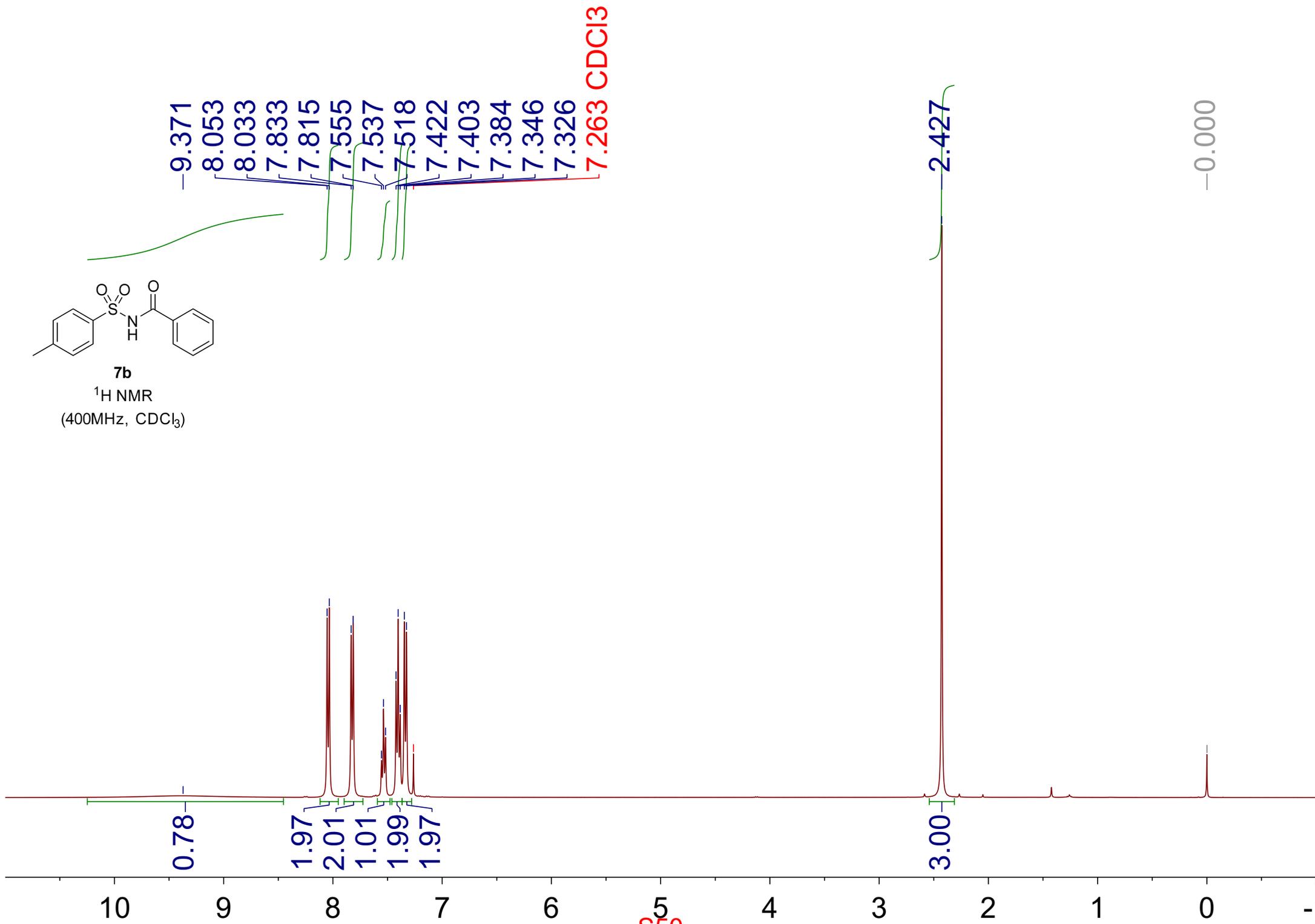


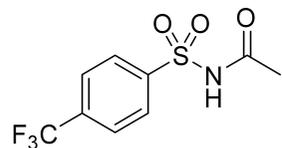




7b

¹H NMR
(400MHz, CDCl₃)





7d

¹H NMR
(400MHz, CDCl₃)

8.223
8.202
7.843
7.822

7.264 CDCl₃

2.089

-1.574 HDO

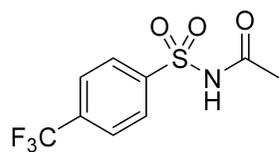
0.000

2.04

1.99

3.00

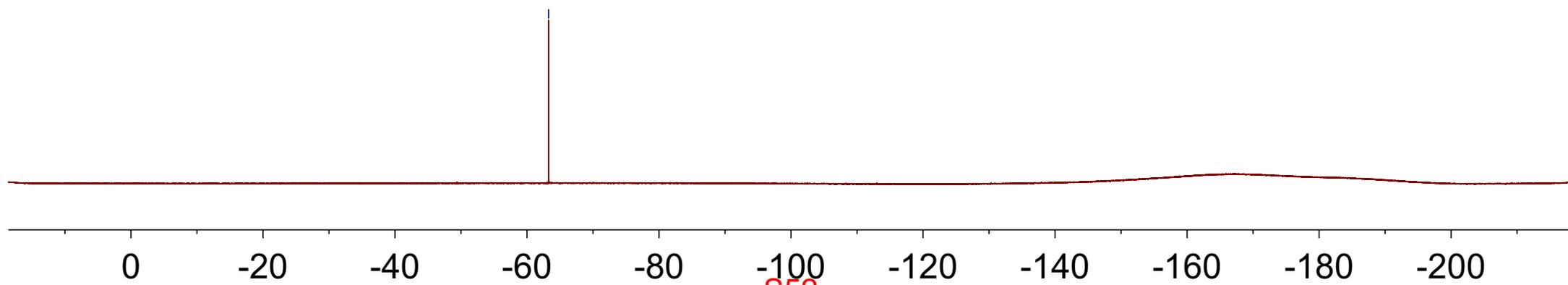




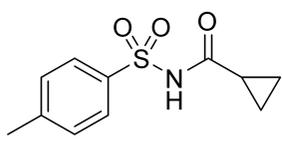
7d

¹⁹F NMR
(376MHz, CDCl₃)

--63.266



S52



7i

¹H NMR
(400MHz, CDCl₃)

7.959
7.938
7.353
7.333
7.266 CDCl₃
2.445
1.548
1.537
1.529
1.526
1.517
1.509
1.506
1.498
1.486
1.036
1.025
1.017
1.014
1.006
0.997
0.996
0.888
0.879
0.871
0.869
0.859
0.851
0.840
-0.000

1.96

1.98

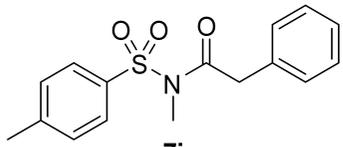
3.00

1.03

1.96

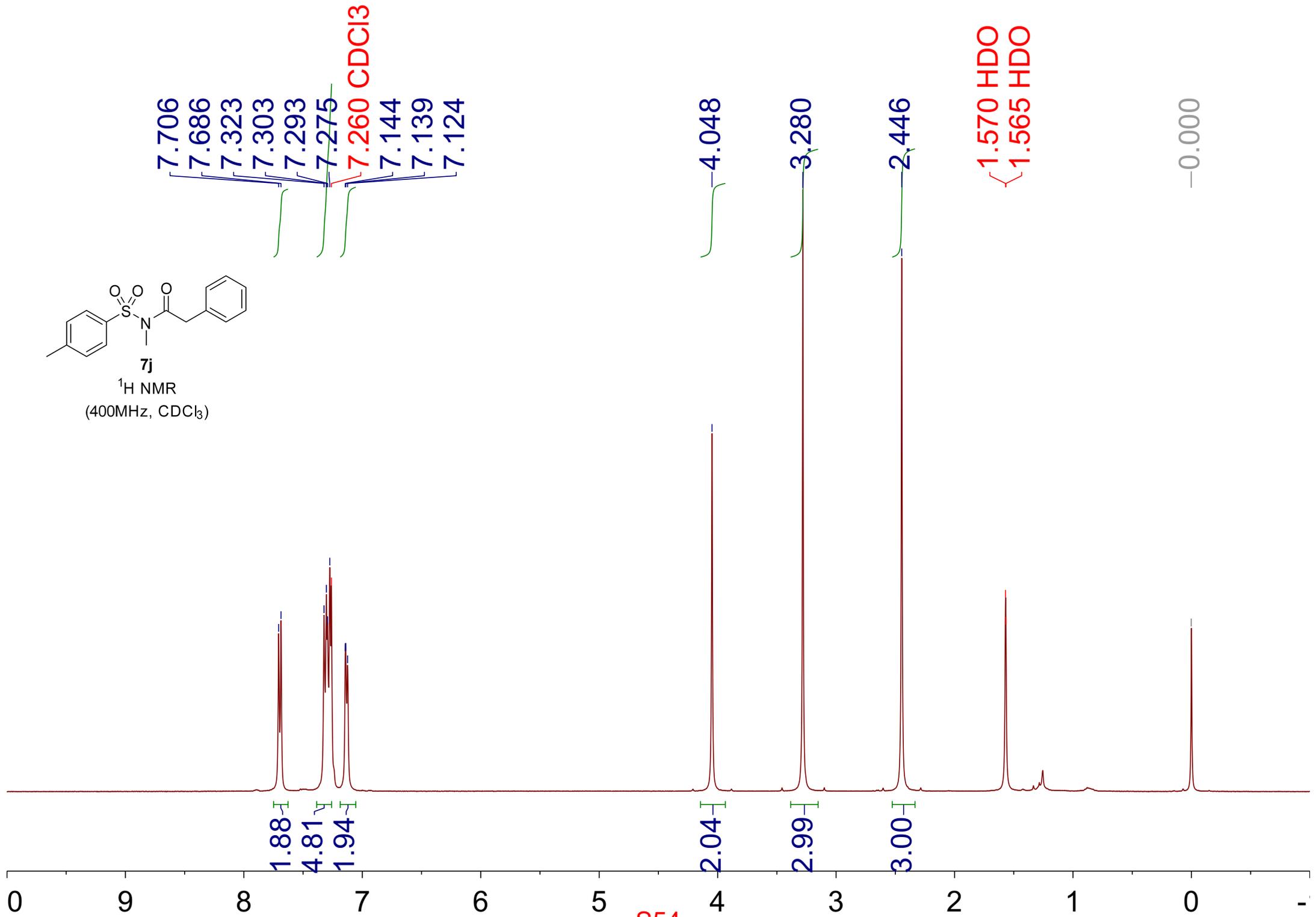
2.01

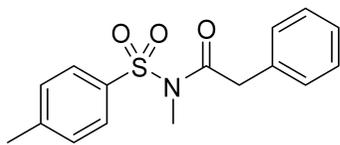




7j

¹H NMR
(400MHz, CDCl₃)





7j

$^{13}\text{C}\{^1\text{H}\}$ NMR
(101MHz, CDCl_3)

171.298

144.979

136.006

133.437

129.888

129.384

128.598

127.533

127.179

77.340 CDCl_3

77.022 CDCl_3

76.705 CDCl_3

43.085

33.293

21.649

0.000 TMS

200

180

160

140

120

100

80

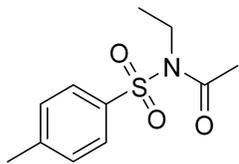
60

40

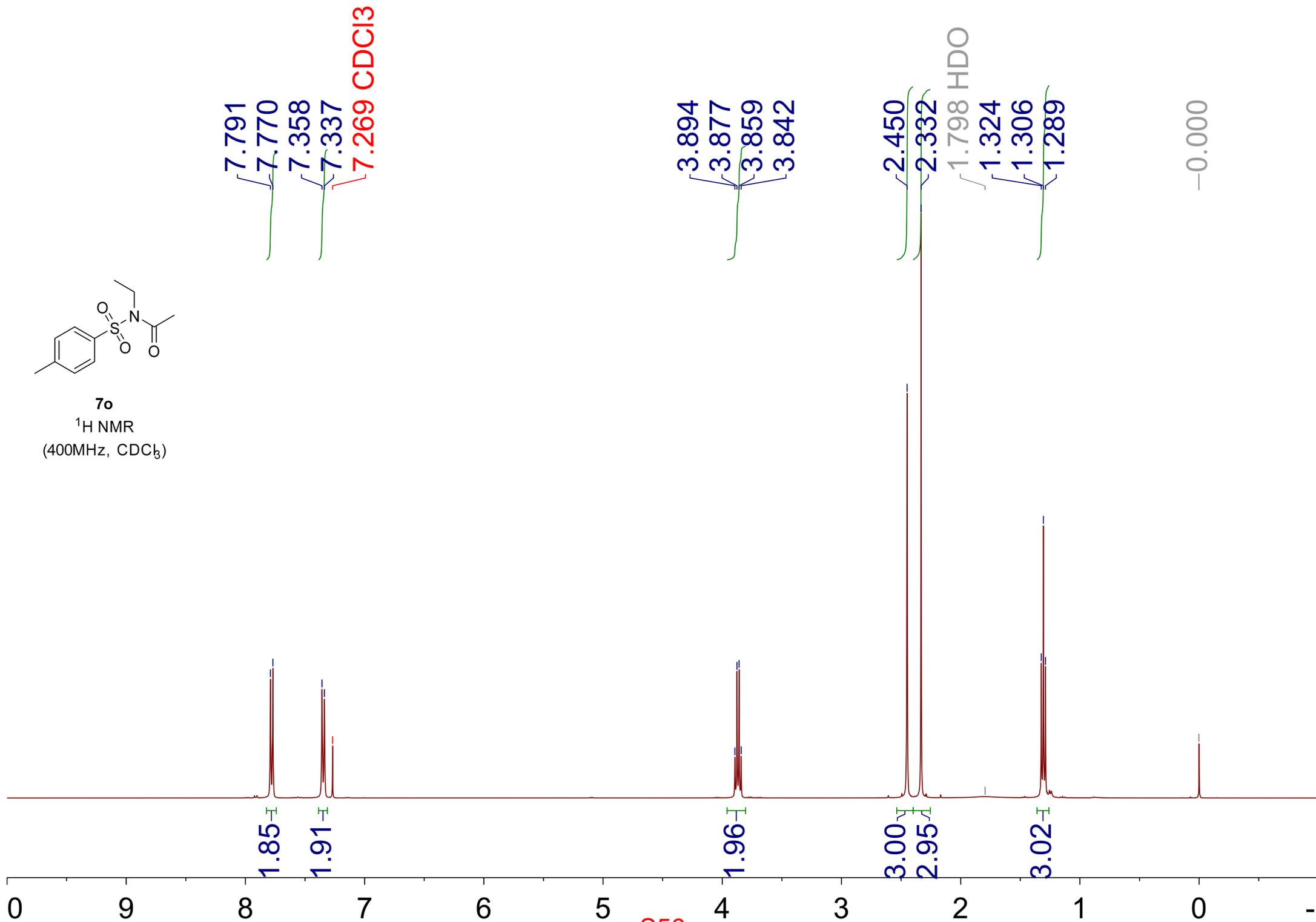
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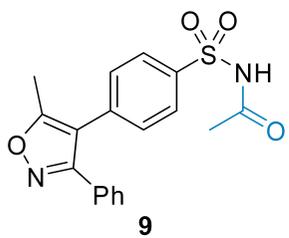
0

S55

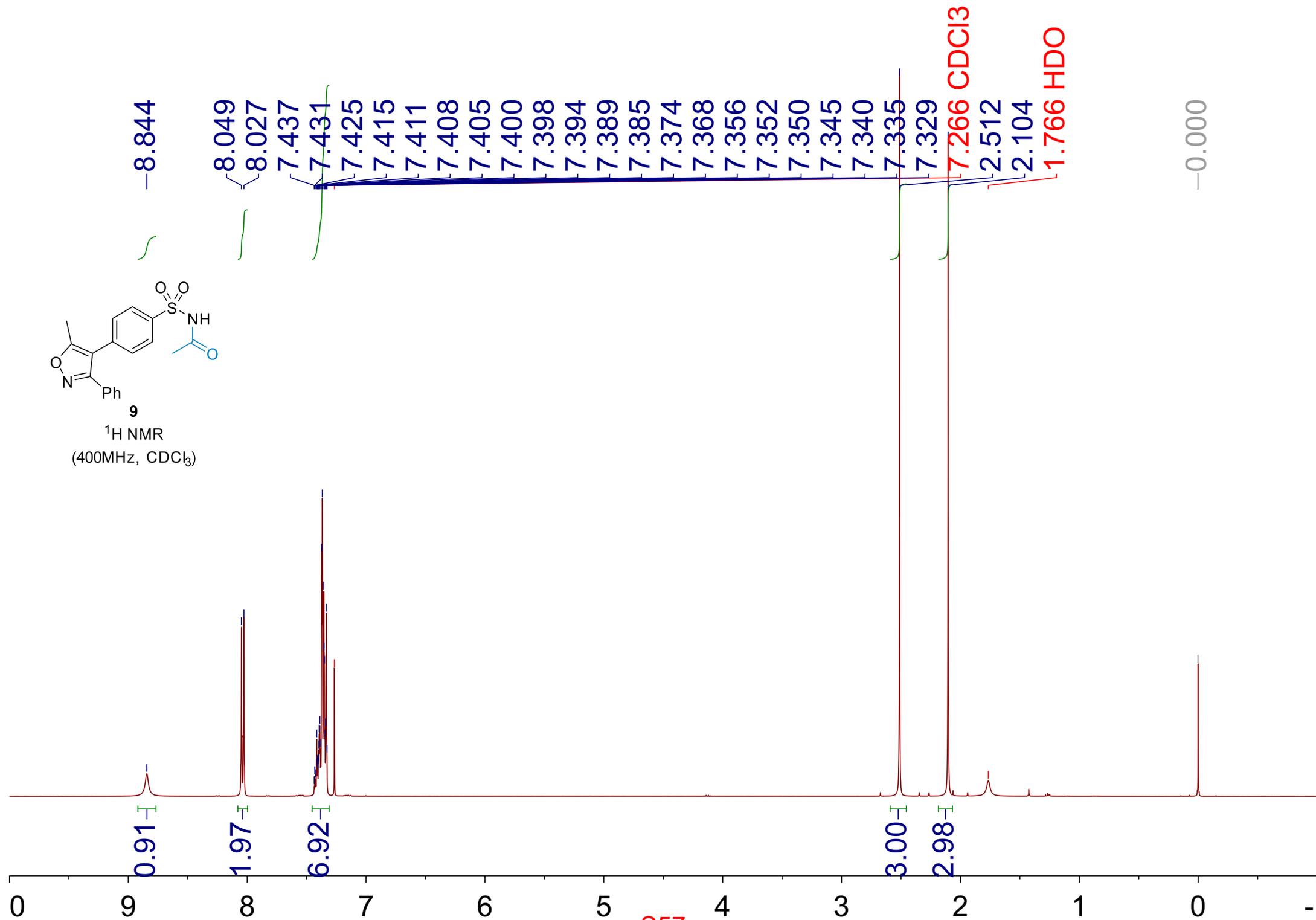


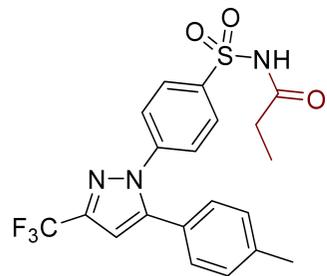
7o
¹H NMR
(400MHz, CDCl₃)



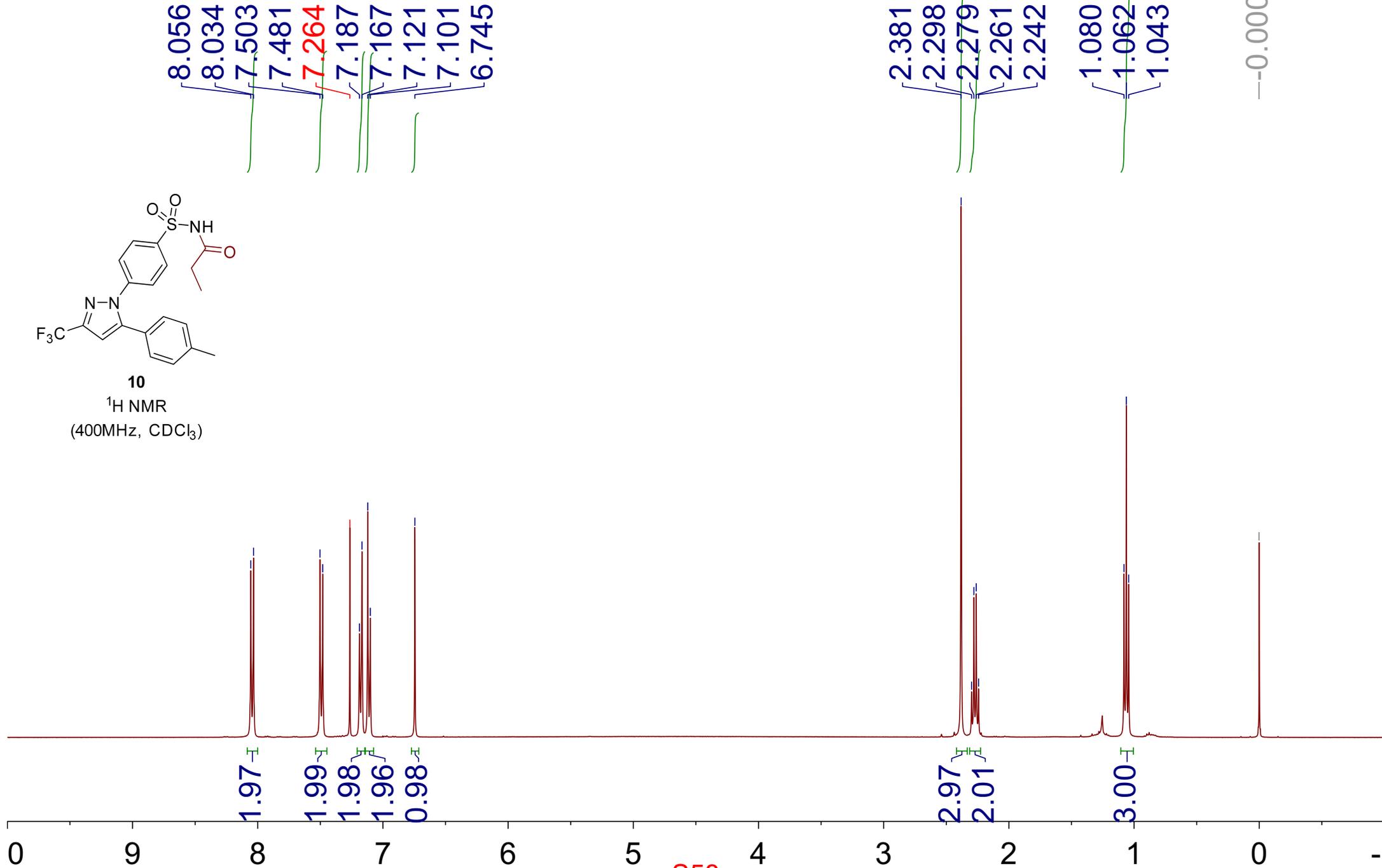


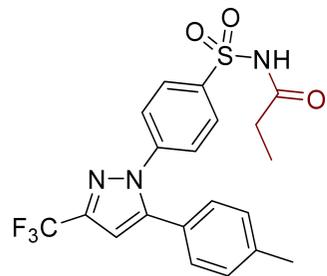
¹H NMR
(400MHz, CDCl₃)





10
¹H NMR
(400MHz, CDCl₃)





10

$^{13}\text{C}\{^1\text{H}\}$ NMR
(101MHz, CDCl_3)

171.838
145.337
144.793
144.411
144.025
143.643
143.431
139.907
137.966
129.802
129.409
128.702
125.570
125.203
124.997
122.320
119.646
116.971
106.482
77.342 CDCl_3
77.024 CDCl_3
76.706 CDCl_3
-29.710
-21.346
-8.270
-0.000 TMS

