Electronic Supplementary Material (ESI) for Green Chemistry.

Mechanosynthesis of sulfonamides via a telescopic, environmentally friendly, and cost-effective process

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1. General information

Commercially available reagents were purchased from Acros, Aldrich, Strem Chemicals, Alfa-Aesar, TCI Europe and used as received. All reactions were monitored by thin-layer chromatography (TLC) performed on glass-backed silica gel 60 F254, 0.2 mm plates (Merck), and compounds were visualized under UV light (254 nm) or using cerium ammonium molybdate solution with subsequent heating. The eluents were technical grade. Mechanochemical reactions were carried out using a FormTech FTS-1000 Shaker Mill® apparatus. The reagents were milled using a zirconia SmartSnap™ grinding jar (15 mL) equipped with balls (ϕ = 8 mm) of the same material. Precisely, the zirconium oxide of the vessels and balls used for all reactions accomplished in the mixer mill is yttrium oxide stabilized (ZrO_2-Y). These parameters were applied if not stated otherwise. ^{1}H and ^{13}C liquid NMR spectra were recorded on a Varian 500 MHz and Bruker Avance III HD 600 MHz NMR spectrometer at 298 K and were calibrated using trimethylsylane (TMS). Proton chemical shifts are expressed in parts per million (ppm, δ scale) and are referred to the residual hydrogen in the solvent ($CHCl_3$, 7.27 ppm or DMSO 2.54 ppm). Data are represented as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet and/or multiple resonances, bs = broad singlet, and combination of thereof), coupling constant (J) in Hertz (Hz) and integration. Carbon chemical shifts are expressed in parts per million (ppm, δ scale) and are referenced to the carbon resonances of the NMR solvent ($CDCl_3$, δ 77.0 ppm or δ DMSO-d6 δ 39.5 ppm). Deuterated NMR solvents were obtained from Aldrich. Samples were analyzed using an Agilent 5977B MS interfaced to the GC 7890B equipped with a DB-5ms column (J & W), injector temperature at 230 °C, detector temperature at 280 °C, helium carrier gas flow rate of 1 ml/min. The GC oven temperature program was 60°C initial temperature with 4 min hold time and ramping at 15°C/min to a final temperature of 270°C with 7 min hold time. 1 μL of each sample was injected in split (1:20) mode. After a solvent delay of 3 minutes mass spectra were acquired in full scan mode using 2.28 scans/s with a mass range of 50–500 Amu. Retention times of different compounds were determined by injecting pure compound under identical conditions. All the experiments were carried out in duplicate to ensure reproducibility of the experimental data. Yields refer to pure isolated materials.

2. List of Compounds

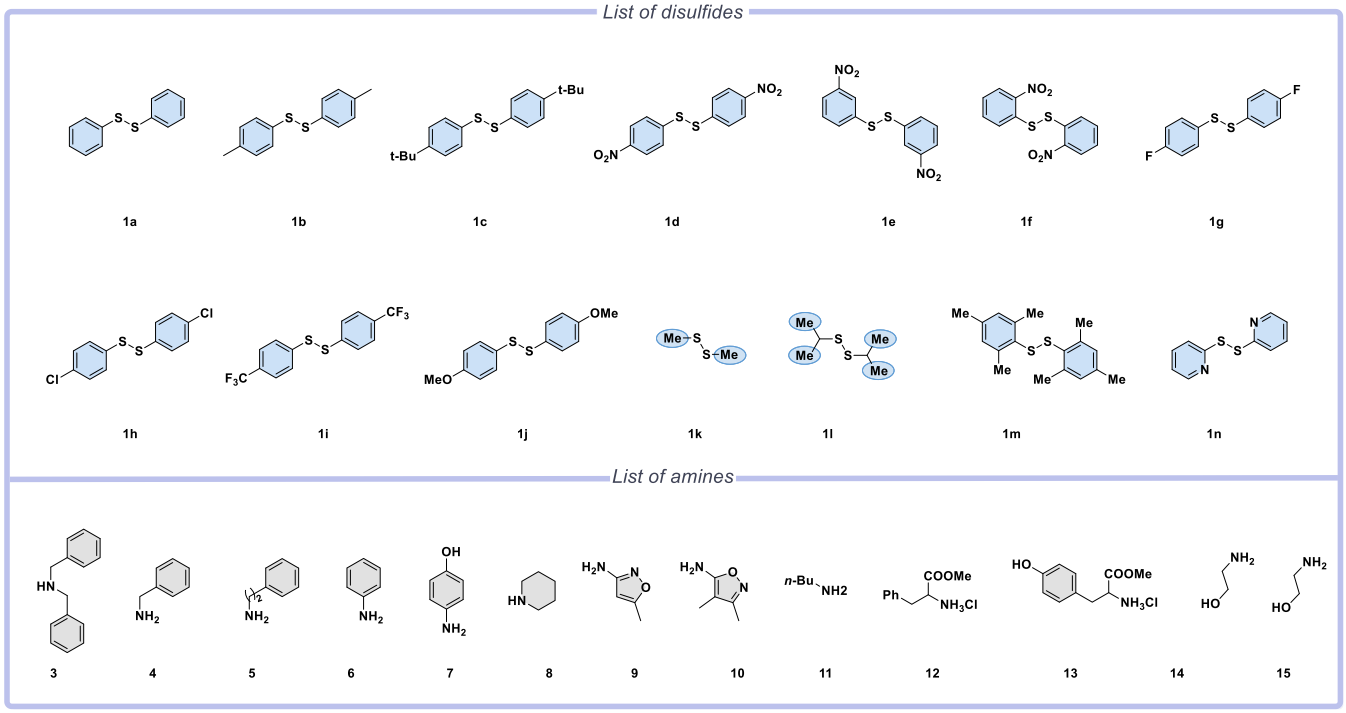


Figure F1. List of the used organic reagents.

3. Mechanochemical synthesis of 2a-n and 3-15a-n

General Procedure A for the preparation of sulfonyl chloride (2a-n): a 15 mL ZrO_2 jar equipped with two ZrO_2 balls (Φ = 8 mm, $mass_{tot}$ = 3.22 g) was charged with $NaHSO_4$ (10 mol%, 0.1 mmol), followed by disulfide (**1a-n**) (1.0 mmol) and NaOCl*5 H_2O (6 mmol). (*Attention!* It is crucial to add the reagents in the written order for the success of the reaction since a variable loss of gas could affect the yields). The jar was then closed and the mechanochemical reaction was conducted for 40 min at a frequency of 30 Hz. At the end of the reaction, the crude was recovered with 5 mL of AcOEt, filtered and concentrated under reduced pressure to afford the desired product **2a-n**. For the synthesis of **2h**, the amount of NaOCl*5H_2O had to be raised up to 7 mmol. For the synthesis of **2d-f** and **2i** the reaction time raised up to 180 min, and a short silica pad (Hexane/AcOEt: 3/7) was required for further purification.

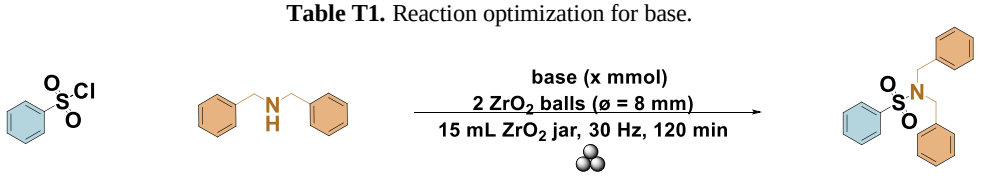
General Procedure B for the preparation of sulfonamides (3-15 a-n): a 15 mL ZrO_2 jar equipped with two ZrO_2 balls (Φ = 8 mm, $mass_{tot}$ = 3.22 g) was charged with sulphonyl chloride **2a-n** (1 mmol), amine **3-15** (1.1 mmol) and MgO (4 mmol) The jar was then closed, and the reaction was conducted for 120 min at a frequency of 30 Hz. At the end of the reaction, the crude was recovered with AcOEt (5 ml) from the jar and filtered. The filtrate was washed with an aqueous solution of citric acid 3x5 mL (10% w/w), to obtain the desired sulphonamide product **3-15a-n**. In some cases, a further extraction with AcOEt of the aqueous phase was required to improve the yields. A short silica pad (Hexane/AcOEt: 3/7) was required for compound **6k**. For the synthesis of sulfonamides **9d** and **10d**, *N*-methyl imidazole was added as LAG (η = 0.6 µL/mg) and the reaction was conducted for 180 min.

General One Pot Procedure C for the preparation of sulfonamides (3-15a-n): a 15 mL ZrO_2 jar equipped with two ZrO_2 balls (Φ = 8 mm, $mass_{tot}$ = 3.22 g) was charged with $NaHSO_4$ (10 mol%, 0.1 mmol), followed by disulfide (**1a-n**) (1.0 mmol) and NaOCl*5H_2O (6 mmol). (*Attention!* It is crucial to add the reagents in the written order for the success of the reaction since a variable loss of gas could affect the yields). The jar was then closed and the mechanochemical reaction was conducted for 40 min at a frequency of 30 Hz (for the synthesis of **2h**, the amount of NaOCl*5 H_2O had to be raised up to 7 mmol. For the synthesis of **2d-f** and **2i** the reaction time raised up to 180 min). At the end of the first step, the jar was opened and the amine **3-15** (2.2 mmol) and MgO (4 mmol) were added to the mixture. The jar was then closed, and the reaction was conducted for 90-120 min at a milling frequency of 30 Hz. Once the second step was ended, the crude was recovered from the jar with 10 mL of AcOEt and filtered. The filtrate was washed with an aqueous solution of citric acid 3x5 mL (10% w/w), to obtain the desired sulphonamide product **3-15a-n**. In some cases, a further extraction with AcOEt of the aqueous phase was required to improve the yields. A short silica pad (Hexane/AcOEt: 3/7) was required for compound **6k**. For the synthesis of sulfonamides **9d** and **10d**, *N*-methyl imidazole was added as LAG (η = 0.6 µL/mg) and the reaction was conducted for 3h.

Please note: for the preparation of the non-commercially available compounds **1c**, **1g**, **1i** and **1m** a solution-based methodology has been used. Please see this link to the following paper to know more about it: https://pubs.rsc.org/en/content/articlelanding/2017/CC/C7CC02652H.

4. Screening

Table T1. Reaction optimization for base.



2a (1mmol) **3** (1.1 mmol) **3a**, 99%

Entry	Base	Amount	Conversion (%) [a]
1	Na_2CO_3	1 mmol	9
2	Na_2CO_3	2 mmol	19
3	Na_2CO_3	4 mmol	65
5	K_2CO_3	1 mmol	7
6	K_2CO_3	2 mmol	20
7	K_2CO_3	4 mmol	62
9	Cs_2CO_3	1 mmol	14
10	Cs_2CO_3	2 mmol	30
11	Cs_2CO_3	4 mmol	66
12	MgO	1 mmol	5
13	MgO	2 mmol	32
14	**MgO**	**4 mmol**	**99**
15	none	-	< 1

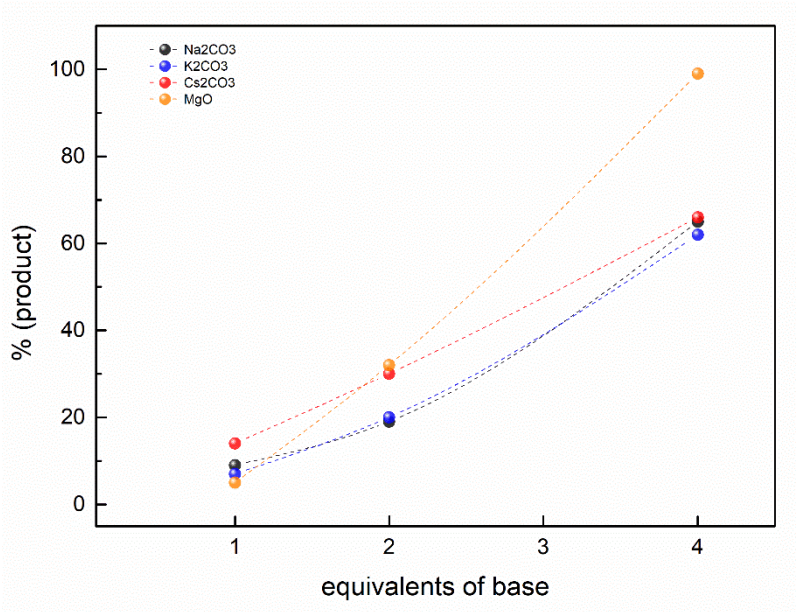
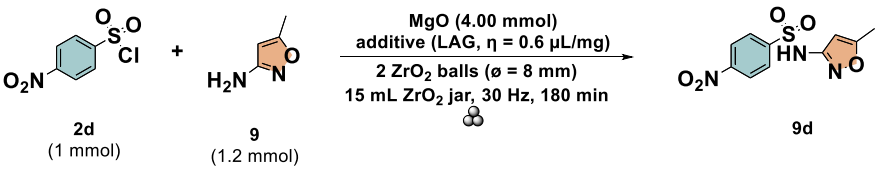


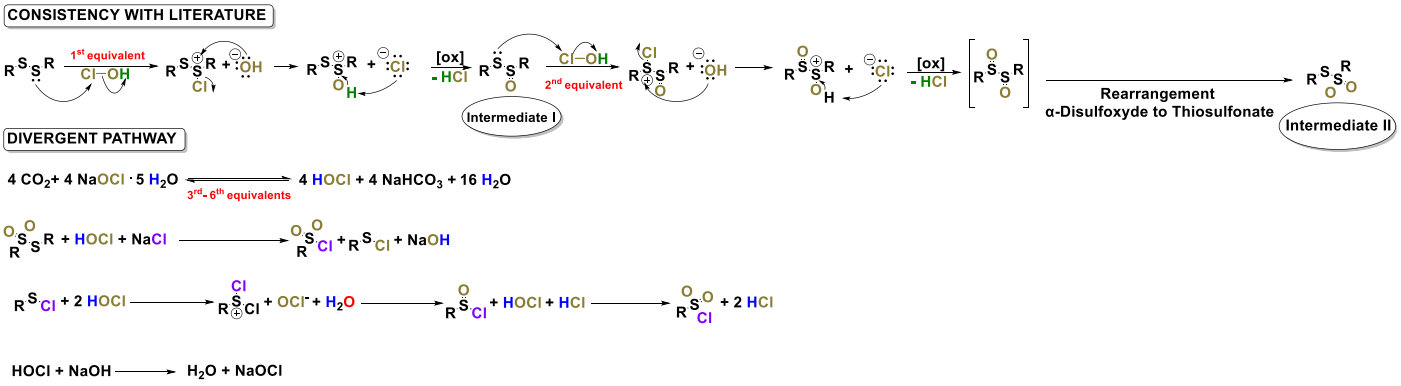
Figure F2. Plotted screening of bases used in relation to their equivalents.

Table T2. Reaction optimization for the pharmaceutical scope.



Entry	Additive (LAG)	Amount (μL/mg)	Conversion (%) [a]
1	***N*-methyl imidazole**	**0.6 μL/mg**	**75**
2	Acetone	0.6 μL/mg	n.d.
3	Acetonitrile	0.6 μL/mg	traces
5	Methanol	0.6 μL/mg	4
6	*tert*-Butanol	0.6 μL/mg	< 1
7	Ethyl Acetate	0.6 μL/mg	n.d.
9	Dioxane	0.6 μL/mg	n.d.
10	Toluene	0.6 μL/mg	n.d.
11	Hexane	0.6 μL/mg	n.d.

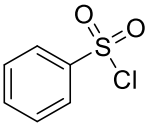
Mechanochemical conditions for this screening: Reaction conditions: sulfonyl chloride **2d** (1 mmol), amine **9** (1.1 equiv.), MgO (4.00 mmol) and a solvent (LAG, η = 0.6 μL/mg) were placed in a 15 mL zirconia jar equipped with two zirconia balls (Φ = 8 mm, 3.22 g) at a frequency of 30 Hz for 180 min.



Scheme S1. Mechanochemical oxidation reaction of disulfides mediated by $NaOCl_{*}5H_2O$ and divergent chlorination pathway promoted by atmospheric CO_2.

5. Compounds

Benzenesulphonyl chloride (**2a**)



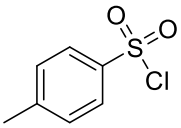
The title compound was synthesized according to the general procedure A stated above. **1a** (218.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2a** as a yellowish oil (349.69 mg, 0.99 mmol, 99%).

^{1}H NMR (600 MHz, $CDCl_3$): δ 8.06 – 8.04 (m, 2H), 7.77 – 7.74 (m, 1H), 7.65 – 7.62 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$): δ 144.6, 135.4, 129.8, 127.1.

The spectroscopic data closely match the ones previously reported in the literature.[1]

4-(Methyl)benzenesulphonyl chloride (**2b**)



The title compound was synthesized according to the general procedure A stated above. **1b** (246.39 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2b** as a white solid. (369.84 mg, 0.97 mmol, 97%).

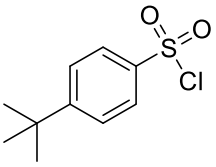
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.92-7.90 (d, *J* = 8.3 Hz, 2H), 7.41-7.40 (d, *J* = 8.3 Hz, 2H), 2.49 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.0, 141.8, 130.4, 127.1, 21.9.

M.P.: 69-71 °C.

The spectroscopic data closely match the ones previously reported in the literature.[1]

4-(*tert*-Butyl)benzenesulphonyl chloride (**2c**)



The title compound was synthesized according to the general procedure A stated above. **1c** (330.55 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2c** as a white solid. (442.17 mg, 0.95 mmol, 95%).

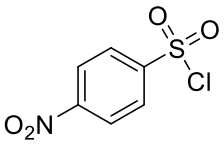
^{1}H NMR (600 MHz, $CDCl_3$): δ 7.97 – 7.95 (m, 2H), 7.63 – 7.61 (m, 2H), 1.37 (s, 9H).

^{13}C NMR (151 MHz, $CDCl_3$): δ 159.8, 141.7, 127.1, 126.8, 35.7, 31.1.

M.P.: 80-82 °C.

The spectroscopic data closely match the ones previously reported in the literature.[2]

4-(Nitro)benzenesulphonyl chloride (**2d**)



The title compound was synthesized according to the general procedure A stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2d** as a yellow solid. (345.71 mg, 0.78 mmol, 78%).

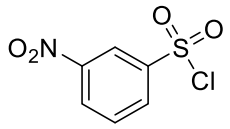
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.49 – 8.47 (m, 2H), 8.27 – 8.26 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 151.5, 148.8, 128.7, 125.2.

M.P.: 78 °C.

The spectroscopic data closely match the ones previously reported in the literature.[2]

3-(Nitro)benzenesulphonyl chloride (**2e**)



The title compound was synthesized according to the general procedure A stated above. **1e** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2e** as a yellow solid. (354.58 mg, 0.80 mmol, 80%).

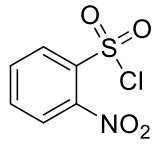
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.88-8.86 (t, *J* = 2.0 Hz, 1H), 8.62-8.60 (ddd, *J* = 8.3, 2.2, 1.0 Hz, 1H), 8.39-8.37 (ddd, *J* = 7.9, 1.9, 1.0 Hz, 1H), 7.93-7.90 (t, *J* = 8.1 Hz, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 148.5, 145.6, 132.4, 131.5, 129.7, 122.5.

M.P.: 60-62 °C.

The spectroscopic data closely match the ones previously reported in the literature.[2]

2-(Nitro)benzenesulphonyl chloride (**2f**)



The title compound was synthesized according to the general procedure A stated above. **1f** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), and $NaHSO_4$ (12.01 mg, 0.10 mmol) were used to afford **2f** as a yellow solid. (332.42 mg, 0.75 mmol, 75%).

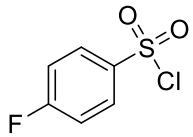
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.27 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.93 (ddd, *J* = 8.6, 7.3, 1.4 Hz, 1H), 7.90 – 7.87 (m, 1H), 7.86 – 7.84 (m, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 146.2, 136.6, 136.2, 133.0, 130.6, 125.4.

M.P.: 65-67 °C.

The spectroscopic data closely match the ones previously reported in the literature.[3]

4-(Fluoro)benzenesulphonyl chloride (**2g**)



The title compound was synthesized according to the general procedure A stated above. **1g** (254.31 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used to afford **2g** as a white solid. (350.28 mg, 0.90 mmol, 90%).

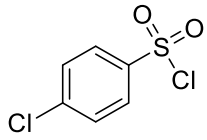
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.10 – 8.07 (m, 2H), 7.32 – 7.29 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.4 (d, $J_{C\text{-}F}$ = 260.6 Hz), 140.3 (d, $J_{C\text{-}F}$ = 3.0 Hz), 130.1 (d, $J_{C\text{-}F}$ = 10.1 Hz), 117.1 (d, $J_{C\text{-}F}$ = 23.2 Hz).

M.P.: 30-31 °C.

The spectroscopic data closely match the ones previously reported in the literature.[2]

4-(Chloro)benzenesulphonyl chloride (**2h**)



The title compound was synthesized according to the general procedure A stated above. **1h** (287.22 mg, 1.00 mmol), NaOCl*5H_2O (1151.64 mg, 7.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2h** as a white solid. (405.24 mg, 0.98 mmol, 98%).

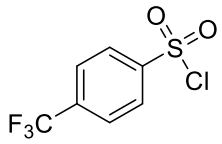
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.00 – 7.98 (m, 2H), 7.62 – 7.59 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 142.8, 142.4, 130.2, 128.6.

M.P.: 54-56 °C.

The spectroscopic data closely match the ones previously reported in the literature.[2]

4-(Trifluoromethyl)benzenesulphonyl chloride (**2i**)



The title compound was synthesized according to the general procedure A stated above. **1i** (354.33 mg, 1.00 mmol), NaOCl 5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2i** as a white solid. (484.33 mg, 0.99 mmol, 99%).

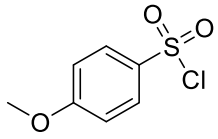
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.20 – 8.19 (m, 2H), 7.92 – 7.91 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.3, 137.0 (q, $J_{C\text{-}F}$ = 33.3 Hz), 136.7, 127.0 (q, $J_{C\text{-}F}$ = 3.7 Hz), 121.9 (q, $J_{C\text{-}F}$ = 273.7 Hz).

M.P.: 31-33 °C.

The spectroscopic data closely match the ones previously reported in the literature.[2]

4-(Methoxy)benzenesulphonyl chloride (**2j**)



The title compound was synthesized according to the general procedure A stated above. **1j** (354.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2j** as a white solid. (409.15 mg, 0.99 mmol, 99%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.99 – 7.97 (m, 2H), 7.06 – 7.04 (m, 2H), 3.92 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 165.0, 136.3, 129.7, 114.9, 56.1.

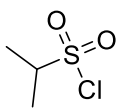
M.P.: 40-41 °C

The spectroscopic data closely match the ones previously reported in the literature.[1,2]

Dimethylsolfonyl chloride (**2k**)

The title compound was synthesized according to the general procedure A stated above. **1l** (94.19 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2l** as a colourless oil. (GC-MS conversion: 99%).

2-Isopropylsolfonyl chloride (**2l**)



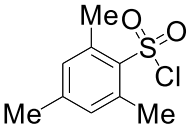
The title compound was synthesized according to the general procedure A stated above. **1l** (150.30 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2l** as a white solid. (282.35 mg, 0.99 mmol, 99%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 3.80 – 3.70 (hept, *J* = 6.7 Hz, 1H), 1.61 – 1.58 (dd, *J* = 6.7, 1.1 Hz, 6H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 67.5, 17.4.

The spectroscopic data closely match the ones previously reported in the literature.[4]

2,4,6-Trimethylbenzenesulfonyl chloride (**2m**)



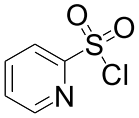
The title compound was synthesized according to the general procedure A stated above. **1m** (302,49 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2n** as a pale yellow solid. (411,12 mg, 0.94 mmol, 94%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.03 (s, 2H), 2.73 (s, 6H), 2.35 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 145.6, 140.1, 139.6, 132.4, 23.0, 21.3.

M.P.: 58 °C

Pyridine-2-sulfonyl chloride (**2n**)

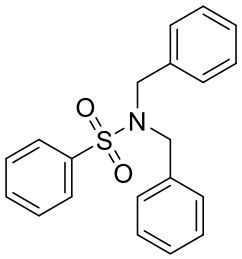


The title compound was synthesized according to the general procedure A stated above. **1n** (220,31 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol) were used, to afford **2n** as a viscous yellow oil. (310,13 mg, 0.87 mmol, 87%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.81 (d, *J* = 4.7 Hz, 1H), 8.12 – 8.03 (m, 2H), 7.72 – 7.66 (m, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 159.2, 150.8, 139.2, 129.3, 122.0.

N,*N*-dibenzyl-benzenesulphonamide (**3a**)



The title compound was synthesized according to the general procedure B stated above. **2a** (176.61 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3a** as a white solid (303.70 mg, 0.90 mmol, 90%).

The title compound was synthesized according to the general procedure C stated above. **1a** (218.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3a** as a white solid (607.40 mg, 1.8 mmol, 90%).

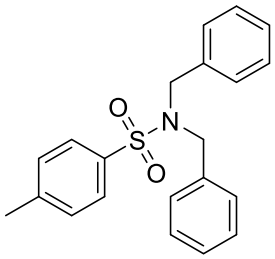
^{1}H NMR (600 MHz, $CDCl_3$): δ 7.87 – 7.85 (m, 2H), 7.59 – 7.58 (m, 1H), 7.53 – 7.50 (m, 2H), 7.22 – 7.21 (m, 6H), 7.05 – 7.04 (m, 4H), 4.34 (s, 4H).

^{13}C NMR (151 MHz, $CDCl_3$): δ 141.0, 135.7, 132.6, 129.3, 129.2, 128.7, 128.6, 127.8, 50.6.

M.P.: 74-76 °C

The spectroscopic data closely match the ones previously reported in the literature.[5]

N,*N*-Dibenzyl-4-(methyl)benzenesulphonamide (**3b**)



The title compound was synthesized according to the general procedure B stated above. **2b** (190.64 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3b** as a white solid (309.28 mg, 0.88 mmol, 88%).

The title compound was synthesized according to the general procedure C stated above. **1b** (246.39 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3b** as a white solid (618.57 mg, 1.76 mmol, 88%).

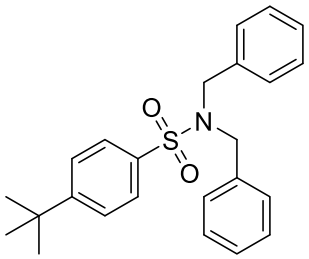
^{1}H NMR (600 MHz, $CDCl_3$): δ 7.76 – 7.75 (d, *J* = 7.9 Hz, 2H), 7.32 (d, *J* = 7.9 Hz, 2H), 7.23 – 7.22 (m, 6H), 7.08 – 7.06 (dd, *J* = 6.5, 3.1 Hz, 4H), 4.33 (s, 4H), 2.45 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$): δ 143.4, 137.8, 135.8, 128.7, 128.6, 128.4, 127.8, 127.7, 50.7, 21.6.

M.P.: 75-77 °C

The spectroscopic data closely match the ones previously reported in the literature.[6]

N,*N*-Dibenzyl-4-(tert-buthyl)benzenesulphonamide (**3c**)



The title compound was synthesized according to the general procedure B stated above. **2c** (232.72 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3c** as a white solid (334.52 mg, 0.85 mmol, 85%).

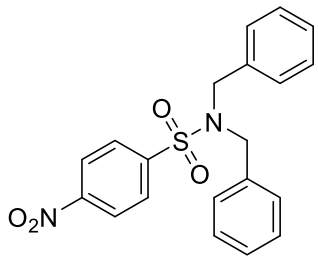
The title compound was synthesized according to the general procedure C stated above. **1c** (330.55 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3c** as a white solid (669.04 mg, 1.70 mmol, 85%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.78 – 7.76 (m, 2H), 7.52 – 7.50 (m, 2H), 7.22 – 7.18 (m, 6H), 7.04 – 7.01 (m, 4H), 4.33 (s, 4H), 1.37 (s, 9H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 156.5, 137.9, 135.9, 128.7, 128.5, 127.8, 127.2, 126.2, 50.6, 35.3, 31.3.

M.P.: 79-81 °C

N,*N*-Dibenzyl-4-(nitro)benzenesulphonamide (**3d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3d** as a brown solid (378.61 mg, 0.99 mmol, 99%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3d** as a brown solid (757.21 mg, 1.98 mmol, 99%).

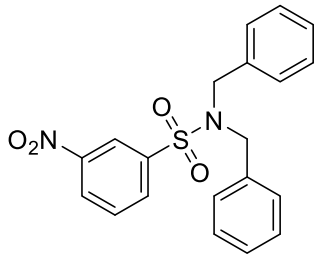
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.29 – 8.27 (m, 2H), 7.92 – 7.91 (m, 2H), 7.26 – 7.25 (m, 6H), 7.10 – 7.08 (m, 4H), 4.35 (s, 4H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 149.8, 146.8, 134.9, 128.7, 128.6, 128.3, 128.1, 124.2, 50.8.

M.P.: 126 – 127 °C

The spectroscopic data closely match the ones previously reported in the literature.[7]

N,*N*-Dibenzyl-3-(nitro)benzenesulphonamide (**3e**)



The title compound was synthesized according to the general procedure B stated above. **2e** (221.61 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3e** as a brown solid (370.96 mg, 0.97 mmol, 97%).

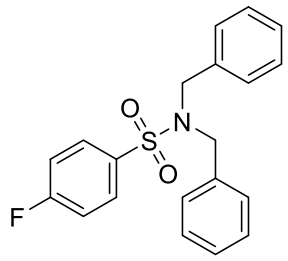
The title compound was synthesized according to the general procedure C stated above. **1e** (308.33 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3e** as a brown solid (741.91 mg, 1.94 mmol, 97%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.55 – 8.52 (t, *J* = 2.0 Hz, 1H), 8.38 – 8.37 (ddd, *J* = 8.0, 2.0, 1.0 Hz, 1H), 8.07 – 8.06 (ddd, *J* = 8.0, 2.0, 1.0 Hz, 1H), 7.67 – 7.64 (t, *J* = 8.0 Hz, 1H), 7.28 – 7.26 (m, 6H), 7.15 – 7.13 (m, 4H), 4.44 (s, 4H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 148.3, 143.3, 135.0, 132.6, 130.4, 128.8, 128.7, 128.3, 126.9, 122.4, 51.0.

M.P.: 105-106°C

N,*N*-Dibenzyl-4-(fluoro)benzenesulphonamide (**3g**)



The title compound was synthesized according to the general procedure B stated above. **2g** (194.60 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3g** as a white solid (351.88 mg, 0.99 mmol, 99%).

The title compound was synthesized according to the general procedure C stated above. **1g** (254.31 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3g** as a white solid (703.75 mg, 1.98 mmol, 99%).

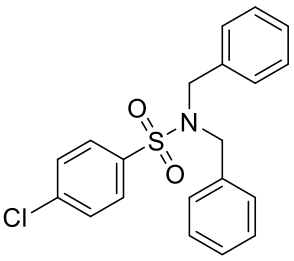
^{1}H NMR (600 MHz, $CDCl_3$): δ 7.84 – 7.81 (m, 2H), 7.26 – 7.22 (m, 6H), 7.18 – 7.14 (m, 2H), 7.07 – 7.06 (m, 4H), 4.34 (s, 4H).

^{13}C NMR (151 MHz, $CDCl_3$): δ 165.1 (d, $J_{C\text{-}F}$ = 255.2 Hz), 137.1, 137.0, 135.5, 130.0 (d, $J_{C\text{-}F}$ = 15.1 Hz), 128.7, 127.9, 116.4 (d, $J_{C\text{-}F}$ = 30.2 Hz), 50.6.

M.P.: 89-90 °C

The spectroscopic data closely match the ones previously reported in the literature.[8]

N,*N*-dibenzyl-4-(chloro)benzenesulphonamide (**3h**)



The title compound was synthesized according to the general procedure B stated above. **2h** (211.06 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3h** as a white solid (345.85 mg, 0.93 mmol, 93%).

The title compound was synthesized according to the general procedure C stated above. **1h** (287.22 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3h** as a white solid (691.70 mg, 1.86 mmol, 93%).

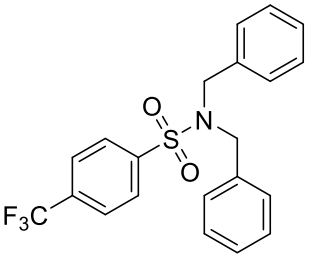
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.75 – 7.73 (m, 2H), 7.46 – 7.45 (m, 2H), 7.26 – 7.23 (m, 6H), 7.07 – 7.06 (m, 4H), 4.33 (s, 4H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 139.2, 138.8, 135.3, 129.3, 128.7, 128.6, 128.5, 127.9, 50.6.

M.P.: 92 °C

The spectroscopic data closely match the ones previously reported in the literature.[9]

N,*N*-Dibenzyl-4-(trifluoromethyl)benzenesulphonamide (**3i**)



The title compound was synthesized according to the general procedure B stated above. **2i** (244.61 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3i** as a white solid (381.11 mg, 0.94 mmol, 94%).

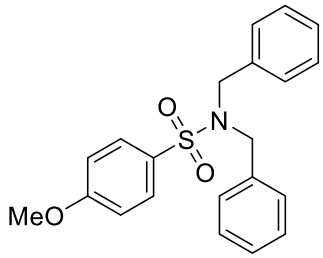
The title compound was synthesized according to the general procedure C stated above. **1i** (354.33 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3i** as a white solid (762.23 mg, 1.88 mmol, 94%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.90 – 7.89 (d, J = 8.1 Hz, 2H), 7.72 – 7.71 (d, J = 8.1 Hz, 2H), 7.24 – 7.20 (dd, J = 5.1, 2.0 Hz, 6H), 7.07 – 7.05 (m, 4H), 4.37 (s, 4H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 144.6, 135.2, 134.2 (q, J_{C-F} = 287 Hz), 128.3 (q, J_{C-F} = 136 Hz), 126.3, 126.1, 126.0, 124.3, 122.5, 50.8.

M.P.: 91 - 92 °C

N,*N*-Dibenzyl-4-(methoxy)benzenesulphonamide (**3j**)



The title compound was synthesized according to the general procedure B stated above. **2j** (206.64 mg, 1.00 mmol), **3** (217.01 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **3j** as a white solid (304.99 mg, 0.94 mmol, 94%).

The title compound was synthesized according to the general procedure C stated above. **1j** (278.38 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **3** (434.02 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **3j** as a white solid (609.98 mg, 1.66 mmol, 94%).

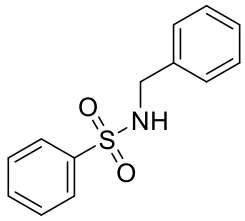
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.79 – 7.78 (m, 2H), 7.26 – 7.21 (m, 6H), 7.07 – 7.06 (m, 4H), 6.98 – 6.96 (m, 2H), 4.31 (s, 4H), 3.89 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 162.9, 135.9, 132.6, 129.5, 128.7, 128.5, 127.9, 114.4, 55.8, 50.6.

M.P.: 63-65 °C

The spectroscopic data closely match the ones previously reported in the literature.[10]

N-Benzyl-benzenesulphonamide (**4a**)



The title compound was synthesized according to the general procedure B stated above. **2a** (176.61 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4a** as a white solid (244.84 mg, 0.99 mmol, 99%).

The title compound was synthesized according to the general procedure C stated above. **1a** (218.33 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4a** as a white solid (489.68 mg, 1.98 mmol, 99%).

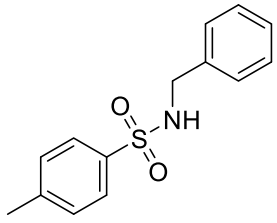
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.85 – 7.83 (m, 2H), 7.56 – 7.54 (m, 1H), 7.53 – 7.51 (m, 2H), 7.50 – 7.47 (m, 3H), 7.46 – 7.45 (m, 2H), 5.23 – 5.21 (t, *J* = 6.3 Hz, 1H), 4.11 – 4.10 (d, *J* = 6.3 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 140.0, 136.4, 132.7, 129.2, 128.7, 127.9, 127.8, 127.1, 47.3.

M.P.: 85-86 °C

The spectroscopic data closely match the ones previously reported in the literature.[11]

N-benzyl-4-(methyl)benzenesulphonamide (**4b**)



The title compound was synthesized according to the general procedure B stated above. **2b** (190.64 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4b** as a white solid (240.43 mg, 0.92 mmol, 92%).

The title compound was synthesized according to the general procedure C stated above. **1b** (246.39 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$

(12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4b** as a white solid (480.87 mg, 1.84 mmol, 92%).

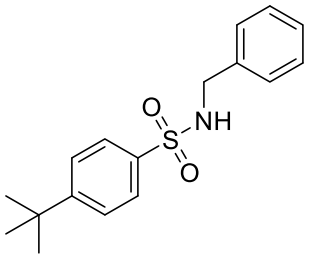
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.79 – 7.77 (m, 2H), 7.34 – 7.32 (m, 3H), 7.30 – 7.29 (m, 2H), 7.28 – 7.27 (m, 2H), 4.63 – 4.61 (s, 1H), 4.15 – 4.14 (d, *J* = 5.9 Hz, 2H), 2.46 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 143.7, 137.0, 136.4, 129.9, 128.8, 128.1, 128.0, 127.4, 47.5, 21.7.

M.P.: 112 – 113 °C

The spectroscopic data closely match the ones previously reported in the literature.[11]

N-Benzyl-4-(*tert*-buthyl)benzenesulphonamide (**4c**)



The title compound was synthesized according to the general procedure B stated above. **2c** (232.72 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4c** as a white solid (276.11 mg, 0.91 mmol, 91%).

The title compound was synthesized according to the general procedure C stated above. **1c** (330.55 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4c** as a white solid (552.22 mg, 1.82 mmol, 91%).

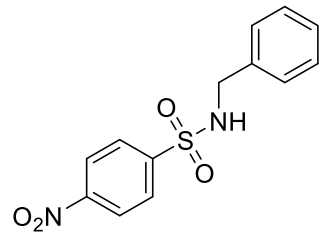
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.82 – 7.79 (m, 2H), 7.54 – 7.52 (m, 2H), 7.30 – 7.29 (m, 3H), 7.28 – 7.26 (m, 2H), 4.63 (s, 1H), 4.18 – 4.17 (d, *J* = 4.8 Hz, 2H), 1.37 (s, 9H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 156.7, 137.0, 136.4, 128.8, 128.0, 127.9, 127.1, 126.3, 47.5, 35.3, 31.2.

M.P.: 110 °C

The spectroscopic data closely match the ones previously reported in the literature.[12]

N-benzyl-4-(nitro)benzenesulphonamide (**4d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4d** as a brown solid (289.39 mg, 0.99 mmol, 99%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4d** as a brown solid (578.77 mg, 1.98 mmol, 99%).

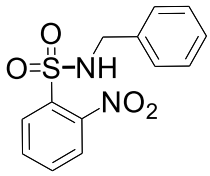
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.31 – 8.30 (m, 2H), 8.00 – 7.99 (m, 2H), 7.27 – 7.26 (m, 3H), 7.18 – 7.16 (m, 2H), 4.97 (t, *J* = 6.0 Hz, 1H), 4.24 – 4.23 (d, *J* = 6.0 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 150.1, 146.2, 135.6, 129.0, 128.5, 128.4, 128.0, 124.5, 47.6.

M.P.: 124-126 °C.

The spectroscopic data closely match the ones previously reported in the literature.[13]

N-Benzyl-2-nitrobenzenesulfonamide (**4f**)



The title compound was synthesized according to the general procedure B stated above. **2f** (221.61 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4d** as a brown solid (222.16 mg, 0.76 mmol, 76%).

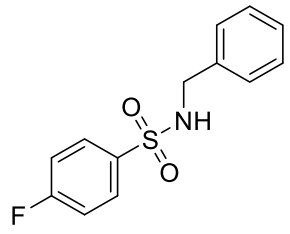
The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4d** as a brown solid (444.31 mg, 1.52 mmol, 76%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.05 – 8.03 (dd, *J* = 7.7, 1.6 Hz, 1 H), 7.86 – 7.84 (dd, J = 7.7, 1.6 Hz, 1 H), 7.68 – 7.65 (dd, J = 7.7, 1.6 Hz, 2 H), 7.25–7.18 (m, 5 H), 5.72 (t, J = 6.0 Hz, 1 H), 4.32 (d, J = 6.0 Hz, 2 H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.6, 135.9, 134.1, 133.6, 133.4, 129.8, 128.9, 127.7, 127.6, 125.2, 47.7.

M.P.: 43-44 °C.

N-Benzyl-4-(fluoro)benzenesulphonamide (**4g**)



The title compound was synthesized according to the general procedure B stated above. **2g** (194.60 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4g** as a white solid (257.34 mg, 0.97 mmol, 97%).

The title compound was synthesized according to the general procedure C stated above. **1g** (254.31 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4g** as a white solid (514.68 mg, 1.94 mmol, 97%).

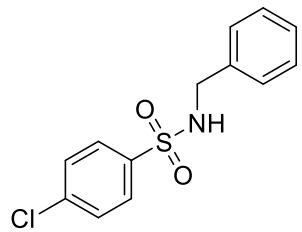
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.88 – 7.86 (m, 2H), 7.28 – 7.26 (m, 3H), 7.19 – 7.16 (m, 4H), 4.74 – 4.72 (t, *J* = 6.1 Hz, 1H), 4.17 – 4.16 (d, *J* = 6.1 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.3 (d, $J_{C\text{-}F}$ = 256.7 Hz), 136.1, 130.0, 129.9 (d, $J_{C\text{-}F}$ = 15.1 Hz), 128.1 (d, $J_{C\text{-}F}$ = 30.2 Hz), 127.9, 116.5, 116.4, 47.5.

M.P.: 99 °C

The spectroscopic data closely match the ones previously reported in the literature.[11,12]

N-Benzyl-4-(chloro)benzenesulphonamide (**4h**)



The title compound was synthesized according to the general procedure B stated above. **2h** (194.60 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4h** as a white solid (267.66 mg, 0.95 mmol, 95%).

The title compound was synthesized according to the general procedure C stated above. **1h** (254.31 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4h** as a white solid (535.33 mg, 1.90 mmol, 95%).

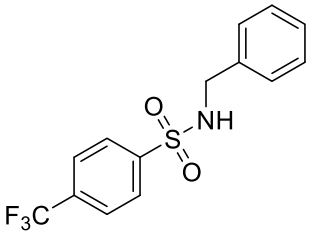
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.79 – 7.77 (m, 2H), 7.47 – 7.46 (m, 2H), 7.28 – 7.26 (m, 3H), 7.19 – 7.17 (m, 2H), 4.76 (m, 1H), 4.16 – 4.15 (d, *J* = 6.2 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 139.2, 138.6, 135.9, 129.4, 128.8, 128.6, 128.1, 127.9, 47.3.

M.P.: 108-109 °C

The spectroscopic data closely match the ones previously reported in the literature.[11]

N-Benzyl-4-(trifluoromethyl)benzenesulphonamide (**4i**)



The title compound was synthesized according to the general procedure B stated above. **2i** (244.61 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4i** as a white solid (302.70 mg, 0.96 mmol, 96%).

The title compound was synthesized according to the general procedure C stated above. **1i** (354.33 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4i** as a white solid (605.40 mg, 1.92 mmol, 96%).

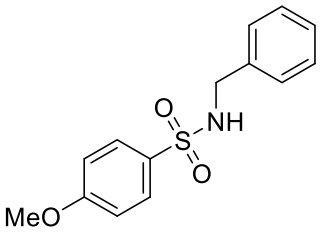
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.97 – 7.95 (m, 2H), 7.76 – 7.74 (m, 2H), 7.29 – 7.25 (m, 3H), 7.18 – 7.16 (m, 2H), 4.79 – 4.77 (t, J = 6.0 Hz, 1H), 4.21 – 4.20 (d, J = 6.0 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 143.9, 135.8, 134.6 (q, J_{C-F} = 35.0 Hz), 128.9, 128.4, 128.0, 127.7, 126.3 (q, J_{C-F} = 135.9 Hz), 124.3, 47.6.

M.P.: 121 - 122 °C

The spectroscopic data closely match the ones previously reported in the literature.[8,11,12]

N-Benzyl-4-(methoxy)benzenesulphonamide (**4j**)



The title compound was synthesized according to the general procedure B stated above. **2j** (206.64 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4j** as a white solid (246.83 mg, 0.89 mmol, 89%).

The title compound was synthesized according to the general procedure C stated above. **1j** (278.38 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4j** as a white solid (605.40 mg, 1.78 mmol, 89%).

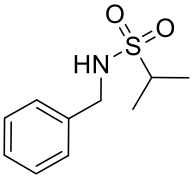
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.82 – 7.81 (m, 2H), 7.30 – 7.21 (m, 3H), 7.20 – 7.19 (m, 2H), 6.99 – 6.97 (m, 2H), 4.57 – 4.56 (t, J = 6.3 Hz, 1H), 4.13 – 4.12 (d, J = 6.3 Hz, 2H), 3.88 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 163.1, 136.4, 131.6, 129.5, 128.9, 128.1, 128.0, 114.5, 55.9, 47.4.

M.P.: 108-109 °C.

The spectroscopic data closely match the ones previously reported in the literature.[13]

N-Benzylpropane-2-sulfonamide (**4l**)



The title compound was synthesized according to the general procedure B stated above. **2l** (142.60 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4l** as a white solid (196.24 mg, 0.92 mmol, 92%).

The title compound was synthesized according to the general procedure C stated above. **1l** (150.30 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10

mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4l** as a white solid (392.47 mg, 1.84 mmol, 92%).

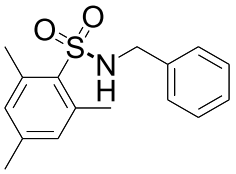
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.27 – 7.19 (m, 5H), 4.82 (s, 1H), 4.21 (s, 2H), 3.01 – 2.94 (p, *J* = 6.8 Hz, 1H), 1.25 – 1.24 (d, *J* = 6.8 Hz, 6H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 137.5, 128.8, 128.0, 127.9, 53.9, 47.5, 16.6.

M.P.: 98-100 °C.

The spectroscopic data closely match the ones previously reported in the literature.[13]

N-Benzyl-2,4,6-trimethylbenzenesulfonamide (**4m**)



The title compound was synthesized according to the general procedure B stated above. **2m** (218.70 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4m** as a white solid (252.01 mg, 0.87 mmol, 87%).

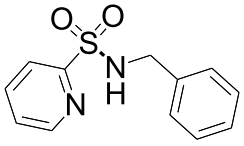
The title compound was synthesized according to the general procedure C stated above. **1m** (302.49 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4m** as a white solid (504.02 mg, 1.74 mmol, 87%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.28 – 7.24 (m, 3H), 7.19 – 7.18 (m, 2H), 6.97 (s, 2H), 4.84 (t, *J* = 6.4 Hz, 1H), 4.08 (d, *J* = 6.4 Hz, 2H), 2.65 (s, 6H), 2.33 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 142.4, 139.3, 136.52, 132.1, 128.7, 128.0, 127.9, 46.9, 23.0, 21.0.

M.P.: 98-100 °C.

N-Benzylpyridine-2-sulfonamide (**4n**)



The title compound was synthesized according to the general procedure B stated above. **2n** (177.60 mg, 1.00 mmol), **4** (117.87 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **4n** as a white solid (252.01 mg, 0.87 mmol, 61%).

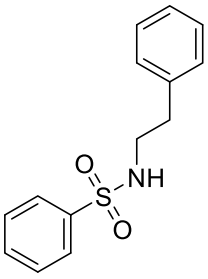
The title compound was synthesized according to the general procedure C stated above. **1m** (302.49 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **4** (235.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **4m** as a white solid (504.02 mg, 1.74 mmol, 61%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.67 – 8.66 (m, 1H), 7.99 – 7.98 (d, *J* = 7.8 Hz, 1H), 7.90 – 7.88 (t, *J* = 7.8 Hz, 1H), 7.49 – 7.47 (m, 1H), 7.27 (s, 2H), 7.26 – 7.24 (m, 3H), 5.21 (bs, 1H), 4.27 (s, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 157.7, 150.2, 138.1, 136.4, 128.8, 128.1, 127.5, 126.8, 122.4, 48.0.

M.P.: 99 °C.

N-Phenylethyl-benzenesulphonamide (**5a**)



The title compound was synthesized according to the general procedure B stated above. **2a** (176.61 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5a** as a white solid (237.82 mg, 0.91 mmol, 91%).

The title compound was synthesized according to the general procedure C stated above. **1a** (218.33 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5a** as a white solid (475.64 mg, 1.82 mmol, 91%).

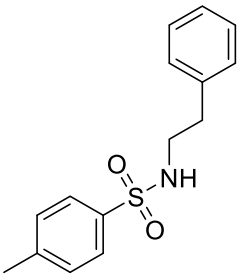
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.82 – 7.80 (m, 2H), 7.59 – 7.56 (m, 1H), 7.52 – 7.49 (m, 2H), 7.29 – 7.22 (m, 2H), 7.08 – 7.07 (m, 3H), 4.33 (s, 1H), 3.26 – 3.23 (q, *J* = 6.7 Hz, 2H), 2.78 – 2.76 (t, *J* = 6.7 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 140.1, 137.7, 132.8, 129.3, 128.9, 128.8, 127.2, 127.0, 44.3, 36.0.

M.P.: 63-66 °C.

The spectroscopic data closely match the ones previously reported in the literature.[14]

N-Phenylethyl-4-(methyl)benzenesulphonamide **(5b)**



The title compound was synthesized according to the general procedure B stated above. **2b** (190.64 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5b** as a white solid (247.83 mg, 0.90 mmol, 90%).

The title compound was synthesized according to the general procedure C stated above. **1b** (246.39 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5b** as a white solid (495.67 mg, 1.80 mmol, 90%).

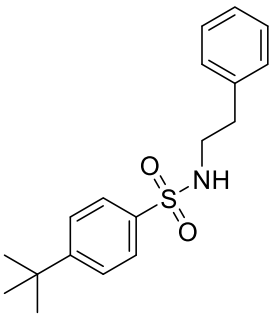
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.70 – 7.69 (d, *J* = 7.9 Hz, 2H), 7.27 – 7.25 (d, *J* = 7.9 Hz, 4H), 7.23 – 7.18 (t, *J* = 7.3 Hz, 1H), 7.07 – 7.06 (d, *J* = 7.3 Hz, 2H), 4.88 (d, *J* = 6.8 Hz, 1H), 3.19 – 3.18 (q, *J* = 6.8 Hz, 2H), 2.75 – 2.74 (t, *J* = 6.8 Hz, 2H), 2.40 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 143.4, 137.9, 137.0, 129.8, 128.8, 128.7, 127.1, 126.7, 44.3, 35.9, 21.5.

M.P.: 63-66 °C.

The spectroscopic data closely match the ones previously reported in the literature.[14]

N-Phenylethyl-4-(tert-buthyl)benzenesulphonamide **(5c)**



The title compound was synthesized according to the general procedure B stated above. **2c** (232.72 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5c** as a white solid (279.36 mg, 0.88 mmol, 88%).

The title compound was synthesized according to the general procedure C stated above. **1c** (330.55 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5c** as a white solid (558.71 mg, 1.76 mmol, 88%).

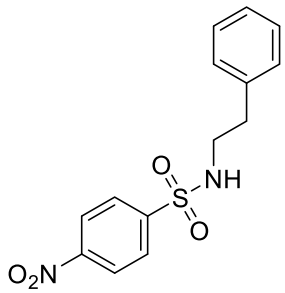
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.74 – 7.72 (d, *J* = 8.2 Hz, 2H), 7.49 – 7.48 (d, *J* = 8.2 Hz, 2H), 7.26 – 7.25 (d, *J* = 7.3 Hz, 2H), 7.24 – 7.20 (t, *J* = 7.3 Hz, 1H), 7.08 – 7.07 (m, 1H), 4.72 – 4.71 (t, *J* = 6.2 Hz, 2H), 3.23 – 3.20 (q, *J* = 6.8 Hz, 2H), 2.78 – 2.76 (t, *J* = 6.8 Hz, 2H), 1.34 (s, 9H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 156.5, 137.9, 136.9, 128.8, 128.7, 127.0, 126.8, 126.1, 44.3, 35.9, 35.2, 31.2.

M.P.: 112 °C.

The spectroscopic data closely match the ones previously reported in the literature.[15]

N-Phenylethyl-4-(nitro)benzenesulphonamide **(5d)**



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5d** as a brown solid (303.28 mg, 0.99 mmol, 99%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5d** as a brown solid (606.55 mg, 1.76 mmol, 99%).

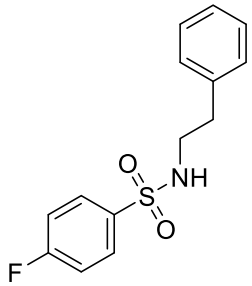
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.28 – 8.26 (m, 2H), 7.95 – 7.93 (m, 2H), 7.25 – 7.24 (m, 3H), 7.23 – 7.18 (m, 2H), 5.14 – 5.12 (t, *J* = 6.0 Hz, 1H), 3.30 – 3.27 (q, *J* = 6.7 Hz, 2H), 2.80 – 2.78 (t, *J* = 6.9 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 150.0, 145.8, 137.4, 128.8, 128.7, 128.3, 127.0, 124.4, 44.4, 35.9.

M.P.: 95°C.

The spectroscopic data closely match the ones previously reported in the literature.[16]

N-Phenylethyl-4-(fluoro)benzenesulphonamide **(5g)**



The title compound was synthesized according to the general procedure B stated above. **2g** (232.72 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5g** as a white solid (273.74 mg, 0.98 mmol, 98%).

The title compound was synthesized according to the general procedure C stated above. **1g** (330.55 mg, 1.00 mmol), $NaOCl\cdot 5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5c** as a white solid (547.49 mg, 1.96 mmol, 98%).

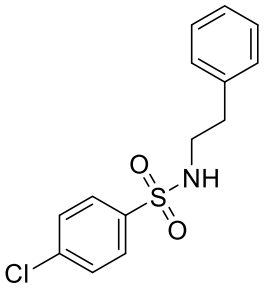
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.82 – 7.80 (m, 2H), 7.27 – 7.26 (m, 3H), 7.16 – 7.13 (t, *J* = 8.5 Hz, 2H), 7.09 – 7.07 (m, 2H), 4.80 (s, 1H), 3.23 – 3.21 (t, *J* = 7.0 Hz, 2H), 2.78 – 2.76 (t, *J* = 7.0 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 165.1 (d, $J_{C\text{-}F}$ = 135.9 Hz), 137.7, 136.1, 129.8 (d, $J_{C\text{-}F}$ = 271.8 Hz), 128.9, 128.8, 126.9, 116.5 (d, $J_{C\text{-}F}$ = 15.1 Hz), 44.3, 35.9.

M.P.: 81-83 °C.

The spectroscopic data closely match the ones previously reported in the literature.[14]

N-Phenylethyl-4-(chloro)benzenesulphonamide **(5h)**



The title compound was synthesized according to the general procedure B stated above. **2h** (211.06 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5h** as a white solid (275.10 mg, 0.93 mmol, 93%).

The title compound was synthesized according to the general procedure C stated above. **1h** (287.22 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5h** as a white solid (550.20 mg, 1.86 mmol, 93%).

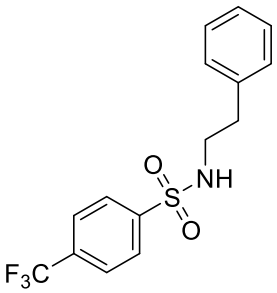
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.72 – 7.71 (m, 2H), 7.42 – 7.40 (m, 2H), 7.24 – 7.20 (m, 2H), 7.19 – 7.18 (m, 1H), 7.07 – 7.05 (m, 2H), 5.14 – 5.13 (t, *J* = 6.3 Hz, 1H), 3.21 – 3.17 (q, *J* = 6.7 Hz, 2H), 2.76 – 2.74 (t, *J* = 6.9 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 139.0, 138.4, 137.9, 129.4, 128.7, 128.5, 126.8, 44.4, 44.3 35.8.

M.P.: 101 °C

The spectroscopic data closely match the ones previously reported in the literature.[14]

N-Phenylethyl-4-(trifluoromethyl)benzenesulphonamide **(5i)**



The title compound was synthesized according to the general procedure B stated above. **2h** (244.61 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5h** as a white solid (312.87 mg, 0.95 mmol, 95%).

The title compound was synthesized according to the general procedure C stated above. **1h** (354.33 mg, 1.00 mmol), NaOCl· $5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5h** as a white solid (625.75 mg, 1.90 mmol, 95%).

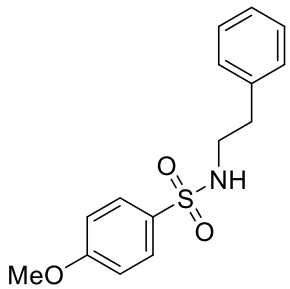
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.91 – 7.89 (m, 2H), 7.74 – 7.73 (d, *J* = 8.3 Hz, 2H), 7.27 – 7.21 (m, 2H), 7.08 – 7.06 (m, 3H), 4.70 – 4.69 (t, *J* = 5.9 Hz, 1H), 3.29 – 3.25 (q, *J* = 6.5 Hz, 2H), 2.79 – 2.78 (t, *J* = 6.9 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 143.6, 137.3, 134.3 (q, J_{C-F} = 30.2 Hz), 128.8 (d, J_{C-F} = 15.1 Hz), 127.5, 126.4, 126.3, 126.2, 123.3 (q, J_{C-F} = 135.9 Hz), 44.3, 35.8.

M.P.: 93-94 °C

The spectroscopic data closely match the ones previously reported in the literature.[17]

N-Phenylethyl-4-(methoxy)benzenesulphonamide **(5j)**



The title compound was synthesized according to the general procedure B stated above. **2j** (206.64 mg, 1.00 mmol), **5** (133.30 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **5j** as a white solid (262.23 mg, 0.90 mmol, 90%).

The title compound was synthesized according to the general procedure C stated above. **1j** (278.38 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **5** (266.60 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **5j** as a white solid (524.47 mg, 1.80 mmol, 90%).

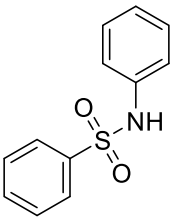
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.76 – 7.73 (m, 2H), 7.26 – 7.25 (m, 2H), 7.24 – 7.18 (m, 1H), 7.08 – 7.07 (m, 2H), 6.94 – 6.93 (m, 2H), 4.79 – 4.77 (t, *J* = 6.2 Hz, 1H), 3.84 (s, 3H), 3.19 – 3.16 (t, *J* = 7.1 Hz,, 2H), 2.76 – 2.74 (t, *J* = 7.1 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 162.9, 137.9, 131.3, 129.2, 128.8, 128.7, 126.7, 114.3, 55.7, 44.3, 35.8.

M.P.: 52-53 °C

The spectroscopic data closely match the ones previously reported in the literature.[18]

N-(Phenyl)benzenesulfonamide **(6a)**



The title compound was synthesized according to the general procedure B stated above. **2a** (176.61 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6a** as a white solid (198.30 mg, 0.86 mmol, 86%).

The title compound was synthesized according to the general procedure C stated above. **1a** (218.33 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6a** as a white solid (396.59 mg, 1.72 mmol, 86%).

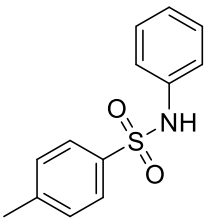
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.74 – 7.72 (m, 2H), 7.44 – 7.43 (m, 2H), 7.42 – 7.40 (m, 2H), 7.33 – 7.30 (m, 2H), 7.14 – 7.10 (m, 2H), 7.03 – 6.98 (m, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 139.0, 136.6, 133.1, 129.3, 129.1, 127.3, 125.4, 121.7.

M.P.: 110 °C

The spectroscopic data closely match the ones previously reported in the literature.[19]

N-Phenyl-4-(methyl)benzenesulfonamide **(6b)**



The title compound was synthesized according to the general procedure B stated above. **2b** (190.64 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6b** as a white solid (205.27 mg, 0.83 mmol, 83%).

The title compound was synthesized according to the general procedure C stated above. **1b** (246.39 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6b** as a white solid (410.54 mg, 1.66 mmol, 83%).

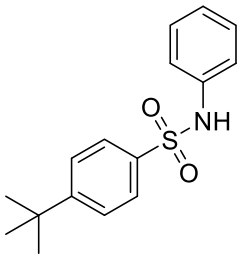
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.71 – 7.70 (d, *J* = 7.9 Hz, 2H), 7.55 (t, *J* = 8.1 Hz, 1H), 7.22 – 7.19 (d, *J* = 7.9 Hz, 4H), 7.12 – 7.06 (m, 3H), 2.35 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 143.9, 136.8, 136.1, 129.7, 129.3, 127.4, 125.2, 121.4, 21.6.

M.P.: 103 °C

The spectroscopic data closely match the ones previously reported in the literature.[20]

N-Phenyl-4-(*tert*-buthyl)benzenesulfonamide **(6c)**



The title compound was synthesized according to the general procedure B stated above. **2c** (190.64 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6c** as a white solid (231.51 mg, 0.80 mmol, 80%).

The title compound was synthesized according to the general procedure C stated above. **1c** (246.39 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6c** as a white solid (460.02 mg, 1.60 mmol, 80%).

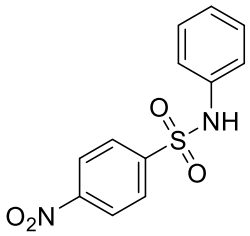
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.77 – 7.76 (m, 2H), 7.47 – 7.42 (m, 3H), 7.24 – 7.21 (m, 2H), 7.14 – 7.07 (m, 2H), 1.29 (s, 9H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 156.9, 136.9, 136.2, 129.4, 127.2, 126.2, 125.1, 121.3, 35.2, 31.1.

M.P.: 118-119 °C

The spectroscopic data closely match the ones previously reported in the literature.[21]

N-Phenyl-4-(nitro)benzenesulfonamide **(6d)**



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6d** as a brown solid (256.02 mg, 0.92 mmol, 92%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6d** as a brown solid (512.04 mg, 1.84 mmol, 92%).

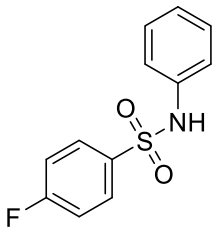
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.29 – 8.26 (m, 2H), 7.94 – 7.92 (m, 2H), 7.29 – 7.26 (m, 2H), 7.20 – 7.18 (m, 1H), 7.09 – 7.07 (m, 2H), 6.80 (s, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 150.4, 144.8, 135.4, 129.8, 128.7, 126.7, 124.4, 122.6.

M.P.: 135-136 °C

The spectroscopic data closely match the ones previously reported in the literature.[22]

N-Phenyl 4-(fluoro)benzenesulfonamide **(6g)**



The title compound was synthesized according to the general procedure B stated above. **2g** (194.60 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6g** as a white solid (226.15 mg, 0.90 mmol, 90%).

The title compound was synthesized according to the general procedure C stated above. **1c** (254.31 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6g** as a white solid (452.30 mg, 1.80 mmol, 90%).

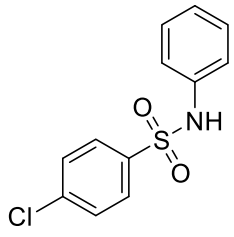
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.81 – 7.78 (m, 2H), 7.26 – 7.23 (m, 2H), 7.14 – 7.07 (m, 5H), 7.03 (s, 1H)

^{13}C NMR (151 MHz, $CDCl_3$) δ 165.1 (d, $J_{C\text{-}F}$ = 252.5 Hz), 136.3, 135.0 (d, $J_{C\text{-}F}$ = 328.9 Hz), 130.3, 129.9, 125.6, 121.8, 116.2 (d, $J_{C\text{-}F}$ = 22.9 Hz).

M.P.: 109-111 °C

The spectroscopic data closely match the ones previously reported in the literature.[23]

N-Phenyl-4-(chloro)benzenesulfonamide **(6h)**



The title compound was synthesized according to the general procedure B stated above. **2h** (211.06 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6h** as a white solid (232.93 mg, 0.87 mmol, 87%).

The title compound was synthesized according to the general procedure C stated above. **1h** (287.22 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6h** as a white solid (465.85 mg, 1.74 mmol, 87%).

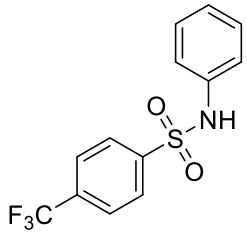
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.72 – 7.71 (m, 2H), 7.40 – 7.38 (m, 2H), 7.26 – 7.23 (m, 2H), 7.14 (m, 1H), 7.13 – 7.08 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 139.7, 137.5, 136.2, 129.6, 129.5, 128.8, 125.9, 122.0.

M.P.: 103-105 °C

The spectroscopic data closely match the ones previously reported in the literature.[23]

N-Phenyl-4-(trifluoromethyl)benzenesulfonamide **(6i)**



The title compound was synthesized according to the general procedure B stated above. **2i** (211.06 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6i** as a white solid (268.14 mg, 0.89 mmol, 89%).

The title compound was synthesized according to the general procedure C stated above. **1i** (287.22 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6i** as a white solid (536.28 mg, 1.78 mmol, 89%).

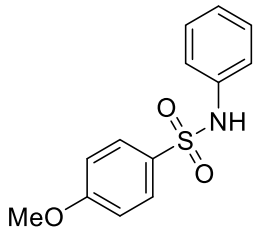
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.90 – 7.89 (d, J = 8.2 Hz, 2H), 7.71 – 7.70 (d, J = 8.2 Hz, 2H), 7.29 – 7.25 (m, 2H), 7.18 – 7.15 (m, 1H), 7.10 – 7.07 (m, 2H), 6.95 (s, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 142.7, 135.8, 133.5 (q, J_{C-F} = 32.9 Hz), 127.8, 126.3 (q, J_{C-F} = 3.8 Hz), 124.2, 122.4, 122.3 (d, J_{C-F} = 272.1 Hz), 121.5.

M.P.: 121-123 °C

The spectroscopic data closely match the ones previously reported in the literature.[23]

N-Phenyl-4-(methoxy)benzenesulfonamide **(6j)**



The title compound was synthesized according to the general procedure B stated above. **2j** (206.64 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6j** as a white solid (208.02 mg, 0.79 mmol, 79%).

The title compound was synthesized according to the general procedure C stated above. **1j** (278.38 mg, 1.00 mmol), $NaOCl*5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6j** as a white solid (416.03 mg, 1.58 mmol, 79%).

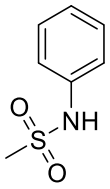
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.73 – 7.71 (m, 2H), 7.26 – 7.21 (m, 2H), 7.11 – 7.07 (m, 3H), 6.94 – 6.93 (m, 1H), 6.89 – 6.87 (m, 2H), 3.82 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 163.1, 136.8, 130.5, 129.5, 129.3, 125.1, 121.4, 114.2, 55.6.

M.P.: 108-109 °C

The spectroscopic data closely match the ones previously reported in the literature.[23]

N-phenyl-methanesulfonamide **(6k)**



The title compound was synthesized according to the general procedure B stated above. **2k** (114.54 mg, 1.00 mmol), **6** (102.44 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **6k** as a white solid (107.86 mg, 0.63 mmol, 63%).

The title compound was synthesized according to the general procedure C stated above. **1k** (94.19 mg, 1.00 mmol), NaOCl $5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **6** (204.89 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **6k** as a white solid (215.73 mg, 1.26 mmol, 63%).

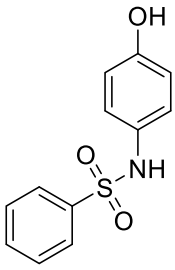
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.37 – 7.36 (m, 2H), 7.35 – 7.34 (m, 2H), 7.33 (s, 1H), 3.02 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 136.9, 129.9, 125.6, 120.9, 39.4.

M.P.: 98-100 °C

The spectroscopic data closely match the ones previously reported in the literature.[24]

N-(4-Hydroxyphenyl)-benzenesulfonamide (**7a**)



The title compound was synthesized according to the general procedure B stated above. **2a** (176.61 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **7a** as a brown solid (221.86 mg, 0.89 mmol, 89%).

The title compound was synthesized according to the general procedure C stated above. **1a** (218.33 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7a** as a brown solid (443.72 mg, 1.78 mmol, 89%).

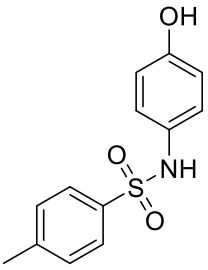
^{1}H NMR (600 MHz, DMSO) δ 9.71 (s, 1H), 9.30 (s, 1H), 7.66 – 7.64 (m, 2H), 7.60 – 7.57 (m, 1H), 7.53 – 7.50 (m, 2H), 6.83 – 6.81 (m, 2H), 6.60 – 6.58 (m, 2H).

^{13}C NMR (151 MHz, DMSO) δ 155.6, 139.9, 133.5, 129.8, 129.1, 127.5, 125.2, 116.4.

M.P.: 155-156 °C

The spectroscopic data closely match the ones previously reported in the literature.[25]

N-(4-Hydroxyphenyl)-4-(methyl)benzenesulfonamide (**7b**)



The title compound was synthesized according to the general procedure B stated above. **2b** (190.64 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **7b** as a brown solid (229.08 mg, 0.87 mmol, 87%).

The title compound was synthesized according to the general procedure C stated above. **1b** (218.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7b** as a brown solid (458.16 mg, 1.74 mmol, 87%).

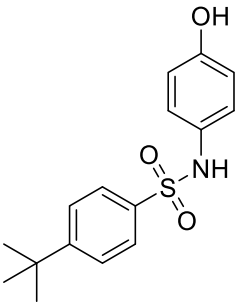
^{1}H NMR (600 MHz, DMSO) δ 9.65 (s, 1H), 7.56 – 7.54 (m, 2H), 7.30 – 7.28 (m, 2H), 6.87 – 6.85 (m, 2H), 6.63 – 6.60 (m, 2H), 2.30 (s, 3H).

^{13}C NMR (151 MHz, DMSO) δ 154.9, 142.9, 136.8, 129.5, 128.7, 126.8, 124.0, 115.6, 21.0.

M.P.: 148-150 °C

The spectroscopic data closely match the ones previously reported in the literature.[26]

N-(4-Hydroxyphenyl)-4-(*tert*-buthyl)benzenesulfonamide (**7c**)



The title compound was synthesized according to the general procedure B stated above. **2c** (232.72 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol), and MgO (161.20 mg, 4.00 mmol) were used to afford **7c** as a brown solid (253.47 mg, 0.83 mmol, 83%).

The title compound was synthesized according to the general procedure C stated above. **1c** (330.55 mg, 1.00 mmol), NaOCl· 5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7c** as a brown solid (506.95 mg, 1.66 mmol, 83%).

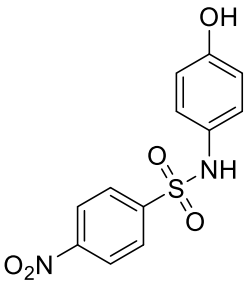
^{1}H NMR (600 MHz, DMSO) δ 9.72 (s, 1H), 7.62 – 7.60 (m, 2H), 7.54 – 7.52 (m, 2H), 6.88 – 6.87 (m, 2H), 6.62 – 6.60 (m, 2H), 1.25 (s, 9H).

^{13}C NMR (151 MHz, DMSO) δ 172.0, 155.5, 154.7, 137.0, 128.7, 126.6, 126.2, 115.6, 34.8, 30.8.

M.P.: 159-161 °C

The spectroscopic data closely match the ones previously reported in the literature.[26]

N-(4-Hydroxyphenyl)-4-(nitro)benzenesulfonamide (**7d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **7d** as a brown solid (276.62 mg, 0.94 mmol, 94%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl· 5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7d** as a brown solid (553.25 mg, 1.88 mmol, 94%).

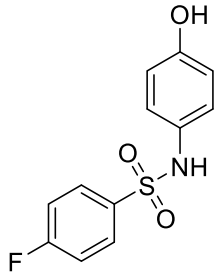
^{1}H NMR (600 MHz, DMSO) δ 10.04 (s, 1H), 9.38 (s, 1H), 8.36 – 8.34 (m, 2H), 7.89 – 7.87 (m, 2H), 6.84 – 6.82 (m, 2H), 6.63 – 6.60 (m, 2H).

^{13}C NMR (151 MHz, DMSO) δ 155.6, 150.0, 145.2, 128.6, 127.7, 125.1, 124.7, 116.0.

M.P.: 186 °C

The spectroscopic data closely match the ones previously reported in the literature.[27]

N-(4-Hydroxyphenyl)-4-(fluoro)benzenesulfonamide (**7g**)



The title compound was synthesized according to the general procedure B stated above. **2g** (194.60 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **7g** as a brown solid (245.89 mg, 0.92 mmol, 92%).

The title compound was synthesized according to the general procedure C stated above. **1g** (254.31 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7g** as a brown solid (491.78 mg, 1.84 mmol, 92%).

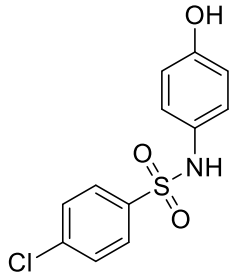
^{1}H NMR (600 MHz, DMSO) δ 9.72 (s, 1H), 9.33 (s, 1H), 7.70 – 7.68 (m, 2H), 7.38 – 7.35 (m, 2H), 6.83 – 6.81 (m, 2H), 6.62 – 6.59 (m, 2H).

^{13}C NMR (151 MHz, DMSO) δ 164.0 (d, J_{C-F} = 135.9 Hz), 155.1, 135.9, 130.2 (d, J_{C-F} = 30.2 Hz), 128.7, 124.4, 116.7 (d, J_{C-F} = 15.1 Hz), 116.0.

M.P.: 171-172 °C

The spectroscopic data closely match the ones previously reported in the literature.[28]

N-(4-Hydroxyphenyl)-4-(chloro)benzenesulfonamide (**7h**)



The title compound was synthesized according to the general procedure B stated above. **2h** (211.06 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **7h** as a brown solid (258.19 mg, 0.91 mmol, 91%).

The title compound was synthesized according to the general procedure C stated above. **1h** (287.22 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7h** as a brown solid (516.39 mg, 1.82 mmol, 91%).

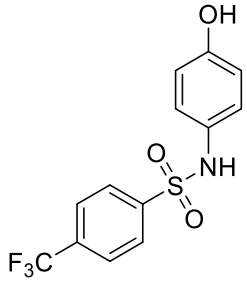
^{1}H NMR (600 MHz, DMSO) δ 10.50 (s, 1H), 7.79 – 7.71 (m, 2H), 7.70 – 7.63 (m, 2H), 7.05 – 7.04 (m, 2H), 6.95 – 6.93 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 135.1, 133.6, 129.9, 129.6, 129.5, 128.7, 123.4, 122.9.

M.P.: 178 °C

The spectroscopic data closely match the ones previously reported in the literature.[29]

N-(4-Hydroxyphenyl)-4-(trifluoromethyl)benzenesulfonamide (**7i**)



The title compound was synthesized according to the general procedure B stated above. **2i** (244.61 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **7i** as a brown solid (298.24 mg, 0.94 mmol, 94%).

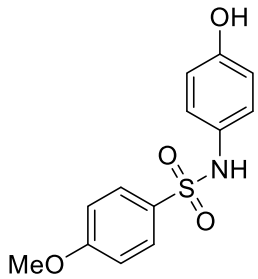
The title compound was synthesized according to the general procedure C stated above. **1i** (354.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7i** as a brown solid (596.49 mg, 1.88 mmol, 94%).

^{1}H NMR (600 MHz, DMSO) δ 9.96 (s, 1H), 9.38 (s, 1H), 7.93 – 7.92 (d, *J* = 8.3 Hz, 2H), 7.86 – 7.84 (d, *J* = 8.3 Hz, 2H), 6.85 – 6.83 (m, 2H), 6.63 – 6.61 (m, 2H).

^{13}C NMR (151 MHz, DMSO) δ 155.3, 143.4, (q, J_{C-F} = 30.2 Hz), 132.0, 127.8, 127.7, 126.4, 126.3, 124.4 (q, J_{C-F} = 135.9 Hz), 115.7.

M.P.: 181-182 °C

N-(4-Hydroxyphenyl)-4-(methoxy)benzenesulfonamide (**7j**)



The title compound was synthesized according to the general procedure B stated above. **2j** (206.64 mg, 1.00 mmol), **7** (120.04 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **7j** as a brown solid (223.45 mg, 0.80 mmol, 80%).

The title compound was synthesized according to the general procedure C stated above. **1j** (278.38 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **7** (240.09 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7j** as a brown solid (446.90 mg, 1.60 mmol, 80%).

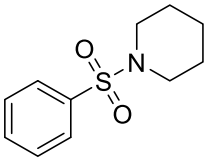
^{1}H NMR (600 MHz, DMSO): δ 9.56 (s, 1H), 7.58 – 7.57 (m, 2H), 7.03 – 7.02 (m, 2H), 6.84 – 6.82 (m, 2H), 6.60 – 6.59 (m, 2H), 3.79 (s, 3H).

^{13}C NMR (151 MHz, DMSO): δ 172.0, 162.2, 154.7, 131.2, 128.7, 123.9, 115.5, 114.1, 55.6.

M.P.: 185 °C

The spectroscopic data closely match the ones previously reported in the literature.[28]

N-phenylsulfonylpiperidine (**8a**)



The title compound was synthesized according to the general procedure B stated above. **2a** (176.61 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8a** as a white solid (220.80 mg, 0.98 mmol, 98%).

The title compound was synthesized according to the general procedure C stated above. **1a** (218.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **7a** as a white solid (441.61 mg, 1.96 mmol, 98%).

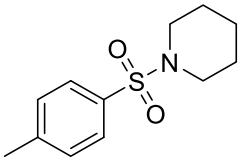
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.76 – 7.74 (m, 2H), 7.60 – 7.57 (t, *J* = 7.4 Hz, 1H), 7.53 – 7.51 (t, *J* = 7.5 Hz, 2H), 2.99 – 2.97 (t, *J* = 5.7 Hz, 4H), 1.65 – 1.61 (p, *J* = 5.7 Hz, 4H), 1.43 – 1.39 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 136.5, 132.7, 129.0, 127.8, 47.1, 25.3, 23.6.

M.P.: 95-97 °C

The spectroscopic data closely match the ones previously reported in the literature.[27]

N-(4-(Methyl)phenylsulfonyl) piperidine (**8b**)



The title compound was synthesized according to the general procedure B stated above. **2b** (190.64 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8b** as a white solid (229.76 mg, 0.96 mmol, 96%).

The title compound was synthesized according to the general procedure C stated above. **1b** (246.39 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **8b** as a white solid (469.51 mg, 1.96 mmol, 96%).

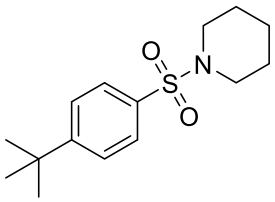
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.64 – 7.63 (m, 2H), 7.32 – 7.31 (m, 2H), 2.98 – 2.96 (m, 4H), 2.43 (s, 3H), 1.65 – 1.62 (m, 4H), 1.42 – 1.40 (qd, *J* = 7.1, 4.7 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 143.4, 133.5, 129.7, 127.9, 47.1, 25.3, 23.7, 21.7.

M.P.: 97-99 °C

The spectroscopic data closely match the ones previously reported in the literature.[6,20]

N-(4-(*tert*-Butyl)phenylsulfonyl) piperidine (**8c**)



The title compound was synthesized according to the general procedure B stated above. **2c** (232.72 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8c** as a white solid (261.71 mg, 0.93 mmol, 93%).

The title compound was synthesized according to the general procedure C stated above. **1c** (330.55 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **8c** as a white solid (523.43 mg, 1.86 mmol, 93%).

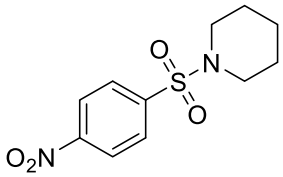
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.68 – 7.66 (m, 2H), 7.52 – 7.51 (m, 2H), 3.00 – 2.98 (m, 4H), 1.66 – 1.63 (m, 4H), 1.44 – 1.40 (m, 2H), 1.34 (s, 9H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 156.3, 133.5, 127.7, 126.0, 47.1, 35.3, 31.3, 25.4, 23.7.

M.P.: 129 – 130 °C

The spectroscopic data closely match the ones previously reported in the literature.[30]

N -(4-(Nitro)phenylsulfonyl) piperidine (**8d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (232.72 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8d** as a pale-yellow solid. (261.71 mg, 0.99 mmol, 99%).

The title compound was synthesized according to the general procedure C stated above. **1d** (330.55 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **8d** as a pale-yellow solid (523.43 mg, 1.98 mmol, 99%).

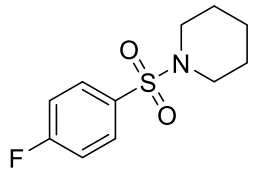
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.38 – 8.37 (m, 2H), 7.95 – 7.93 (m, 2H), 3.07 – 3.05 (m, 4H), 1.68 – 1.64 (m, 4H), 1.48 – 1.44 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 162.0, 142.9, 128.9, 124.4, 47.1, 25.3, 23.5.

M.P.: 168-170 °C

The spectroscopic data closely match the ones previously reported in the literature.[27,30]

N -(4-(Fluoro)phenylsulfonyl) piperidine (**8g**)



The title compound was synthesized according to the general procedure B stated above. **2g** (194.60 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8g** as a white solid. (218.97 mg, 0.90 mmol, 90%).

The title compound was synthesized according to the general procedure C stated above. **1g** (254.31 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **8g** as a white solid (437.94 mg, 1.80 mmol, 90%).

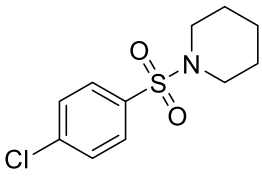
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.78 – 7.76 (m, 2H), 7.22 – 7.19 (m, 2H), 3.00 – 2.98 (m, 4H), 1.67 – 1.63 (p, *J* = 5.8 Hz, 4H), 1.45 – 1.41 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 165.3 (d, J_{C-F} = 135.9 Hz), 130.5, 130.4, 116.2 (d, J_{C-F} = 15.1 Hz), 47.1, 25.3, 23.6.

M.P.: 76–77 °C

The spectroscopic data closely match the ones previously reported in the literature.[31]

N -(4-(Chloro)phenylsulfonyl) piperidine (**8h**)



The title compound was synthesized according to the general procedure B stated above. **2h** (211.06 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8h** as a white solid. (225.37 mg, 0.87 mmol, 87%).

The title compound was synthesized according to the general procedure C stated above. **1h** (287.22 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **8h** as a white solid (450.73 mg, 1.74 mmol, 87%).

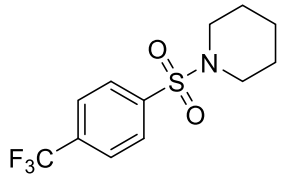
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.71 – 7.68 (m, 2H), 7.51 – 7.49 (m, 2H), 3.00 – 2.98 (t, *J* = 5.5 Hz, 4H), 1.67 – 1.63 (q, *J* = 5.5 Hz, 4H), 1.46 – 1.42 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 139.1, 135.0, 129.3, 129.1, 46.9, 25.2, 23.5.

M.P.: 92-93 °C

The spectroscopic data closely match the ones previously reported in the literature.[31]

N-(4-(Trifluoromethyl)phenylsulfonyl) piperidine (**8i**)



The title compound was synthesized according to the general procedure B stated above. **2i** (244.61 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8i** as a white solid. (269.84 mg, 0.92 mmol, 92%).

The title compound was synthesized according to the general procedure C stated above. **1i** (354.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **8i** as a white solid (539.67 mg, 1.84 mmol, 92%).

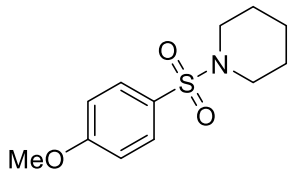
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.89 – 7.88 (d, *J* = 8.3 Hz, 2H), 7.81 – 7.79 (d, *J* = 8.3 Hz, 2H), 3.03 – 3.01 (t, *J* = 5.5 Hz, 4H), 1.68 – 1.64 (p, *J* = 5.8 Hz, 4H), 1.47 – 1.43 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 152.2, 140.3, 134.3 (q J_{C-F} = 32.9 Hz) , 126.2 (q J_{C-F} = 15.1 Hz), 122.4, 46.9, 25.2, 23.4.

M.P.: 95–96 °C

The spectroscopic data closely match the ones previously reported in the literature.[30]

N-(4-(Methoxy)phenylsulfonyl) piperidine (**8j**)



The title compound was synthesized according to the general procedure B stated above. **2j** (206.64 mg, 1.00 mmol), **8** (93.67 mg, 1.1 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **8j** as a white solid. (217.03 mg, 0.85 mmol, 85%).

The title compound was synthesized according to the general procedure C stated above. **1j** (278.38 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **8** (187.34 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **8j** as a white solid (434.06 mg, 1.7 mmol, 85%).

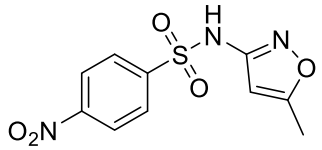
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.64 – 7.62 (m, 2H), 6.95 – 6.94 (m, 2H), 3.82 (s, 3H), 2.91 – 2.89 (m, 4H), 1.60 – 1.56 (m, 4H), 1.37 – 1.34 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 162.9, 129.7, 127.8, 114.1, 55.6, 46.9, 25.1, 23.5.

M.P.: 105-108 °C

The spectroscopic data closely match the ones previously reported in the literature.[10,31]

N-(5-Methylisoxazol-3-yl)-4-(nitro)benzenesulfonamide (**9d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **9** (107.86 mg, 1.10 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **9d** as an orange solid. (212.45 mg, 0.75 mmol, 75%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*$5H_2O$ (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **9** (215.72 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **9d** as an orange solid (424.89 mg, 1.50 mmol, 75%).

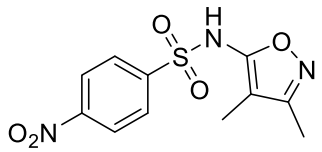
^{1}H NMR (600 MHz, DMSO) δ 8.44 – 8.43 (m, 2H), 8.13 – 8.11 (m, 2H), 2.31 (s, 3H).

^{13}C NMR (151 MHz, DMSO) δ 171.2, 157.5, 150.6, 145.1, 128.9, 125.3, 96.0, 12.5.

M.P.: 194-195 °C

The spectroscopic data closely match the ones previously reported in the literature.[32]

N-(3,4-dimethylisoxazol-5-yl)-4-(nitro)benzenesulfonamide (**10d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **10** (107.86 mg, 1.10 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **10d** as an orange solid. (196.21 mg, 0.66 mmol, 66%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **10** (215.72 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **10d** as an orange solid (392.42 mg, 1.32 mmol, 66%).

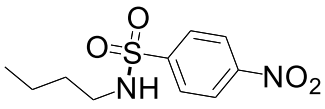
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.33 – 8.32 (d, *J* = 8.7 Hz, 2H), 8.02 – 8.01 (d, *J* = 8.7 Hz, 2H), 4.15 (s, 1H), 2.19 (s, 3H), 1.93 (s, 3H).

^{13}C NMR (151 MHz, DMSO) δ 164.6, 162.3, 154.7, 150.5, 145.8, 128.7, 124.6, 11.0, 6.8.

M.P.: 205-207 °C

The spectroscopic data closely match the ones previously reported in the literature.[33]

N-Butyl-4-nitrobenzenesulfonamide (**11d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **11** (80.45 mg, 1.10 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **11d** as a white solid. (100.62 mg, 0.39 mmol, 39%).

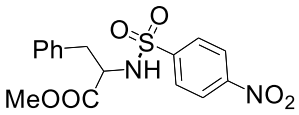
The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **11** (160.91 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **11d** as a white solid (201.24 mg, 0.78 mmol, 39%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.36 (d, *J* = 8.3 Hz, 2H), 8.05 (d, *J* = 8.3 Hz, 2H), 4.55 (bs, 1H), 3.03 (q, *J* = 6.9 Hz, 2H), 1.47 (t, *J* = 7.5 Hz, 2H), 1.31 (p, *J* = 7.5 Hz, 2H), 0.89 – 0.85 (m, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 150.2, 146.2, 128.4, 124.5, 43.3, 31.8, 19.8, 13.6.

M.P.: 75 °C

Methyl ((4-nitrophenyl)sulfonyl)phenylalaninate (**12d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **12** (237.25 mg, 1.10 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **11d** as a white solid. (236.84 mg, 0.65 mmol, 65%).

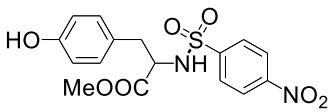
The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl 5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **12** (474.50 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **12d** as a white solid (473.68 mg, 1.30 mmol, 65%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.28 – 8.22 (m, 2H), 7.90 – 7.84 (m, 2H), 7.35 – 7.31 (m, 1H), 7.26 (m, 2H), 7.10 (m, 2H), 5.59 (d, *J* = 9.3 Hz, 1H), 4.30 (q, *J* = 7.0 Hz, 1H), 3.66 (s, 3H), 3.19 – 2.98 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 171.3, 150.1, 145.7, 128.9, 128.7, 128.3, 127.6, 125.2, 124.3, 57.3, 52.9, 39.3.

M.P.: 153-155°C

Methyl ((4-nitrophenyl)sulfonyl)tyrosinate (**13d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **13** (254.85 mg, 1.10 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **13d** as a white solid. (167.36 mg, 0.44 mmol, 44%).

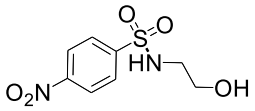
The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **13** (509.70 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **13d** as a white solid (334.73 mg, 0.88 mmol, 44%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.38 – 8.32 (m, 2H), 8.05 – 7.97 (m, 2H), 7.17 – 7.06 (m, 2H), 6.96 – 6.88 (m, 2H), 4.18 (bs, 1H), 3.74 (s, 3H), 3.15 – 2.99 (m, 2H), 2.96 – 2.79 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 174.9, 155.6, 134.9, 131.1, 130.8, 130.1, 129.9, 128.3, 128.2, 56.9, 55.4, 38.6.

M.P.: 169 °C

N-(2-Hydroxyethyl)-4-nitrobenzenesulfonamide (**14d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **14** (67.19 mg, 1.10 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **14d** as a white solid. (128.05 mg, 0.52 mmol, 52%).

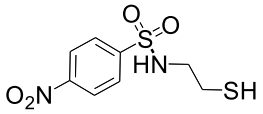
The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **14** (134.38 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **14d** as a white solid (256,09 mg, 1.04 mmol, 52%).

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.37 (d, *J* = 8.3 Hz, 2H), 8.07 (d, *J* = 8.3 Hz, 2H), 5.11 (bs, 1H), 3.74 (t, *J* = 5.2 Hz, 2H), 3.19 (q, *J* = 5.2 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 156.6, 146.0, 128.5, 124.6, 61.3, 45.3.

M.P.: 124 °C

N-(2-mercaptoethyl)-4-nitrobenzenesulfonamide (**15d**)



The title compound was synthesized according to the general procedure B stated above. **2d** (221.61 mg, 1.00 mmol), **15** (84,87 mg, 1.10 mmol) and MgO (161.20 mg, 4.00 mmol) were used, to afford **15d** as a white solid. (170.50 mg, 0.65 mmol, 65%).

The title compound was synthesized according to the general procedure C stated above. **1d** (308.33 mg, 1.00 mmol), NaOCl*5H_2O (987.12 mg, 6.00 mmol), $NaHSO_4$ (12.01 mg, 0.10 mmol), **15** (169.73 mg, 2.2 mmol), MgO (161.20 mg, 4.00 mmol) were used, to afford **15d** as a white solid (341.00 mg, 1.30 mmol, 65%).

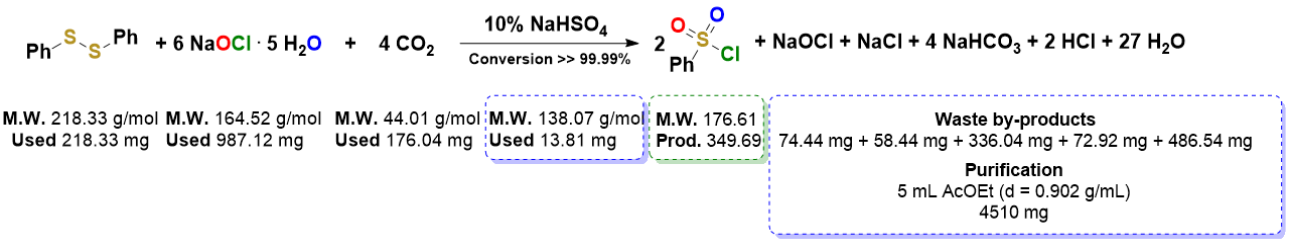
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.44 – 8.32 (m, 2H), 8.13 – 8.04 (m, 2H), 3.34 (m, 2H), 3.03 (m, 1H), 2.83 – 2.73 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 150.4, 145.8, 128.5, 124.7, 41.9, 38.3.

M.P.: 131-133 °C

6. Green Metrics Calculations

Calculation of Green Chemistry Metrics *(this mechanochemical method)*



$$\text{Atom Economy} = \frac{\text{Mass of desired useful product}}{\text{Total Mass of all reactants}} \times 100 = \frac{353.22}{372.20 + 18.02 + 88.02 + 218.33} \times 100 = 51.00\%$$

$$\text{Environmental Factor} = \frac{\text{Mass of total waste}}{\text{Mass of desired product}} = \frac{13.81 + 74.44 + 58.44 + 336.04 + 72.92 + 486.54 + 4510.00}{349.69} = 15.88$$

$$\text{Reaction Mass Efficiency} = \frac{\text{actual mass of desired product}}{\text{mass of reactants}} \times 100 = \frac{349.69}{218.33 + 987.12 + 176.04 + 13.81} \times 100 = 25.00\ \%$$

It is worth pointing out that we considered in our E-Factor calculations the amount of solvent used for the recovery of the product. If this value is neglected (due to the reusability of the solvent after distillation under reduced pressure), the E-Factor of our procedure should be:

$$\text{Environmental Factor} = \frac{\text{Mass of total waste}}{\text{Mass of desired product}} = \frac{13.81 + 74.44 + 58.44 + 336.04 + 72.92 + 486.54 + \cancel{4510.00}}{349.69} = 2.98$$

Ecoscale calculator

Reagents

	identifier*	name	MF*	MW	density	purity*	ml	g	mmoles	equiv.
1		Phenyl disulfide	C12H10S2	218.3314	1.353	100%	0.161368	0.218331	1	1
2		Hypochlorite salts	H10O6ClNa	164.51857		100%	0	0.987111	6	6
3		Sodium bisulfate	HNaO4S	120.05531	2.1	100%	0.005717	0.012006	0.1	0.1

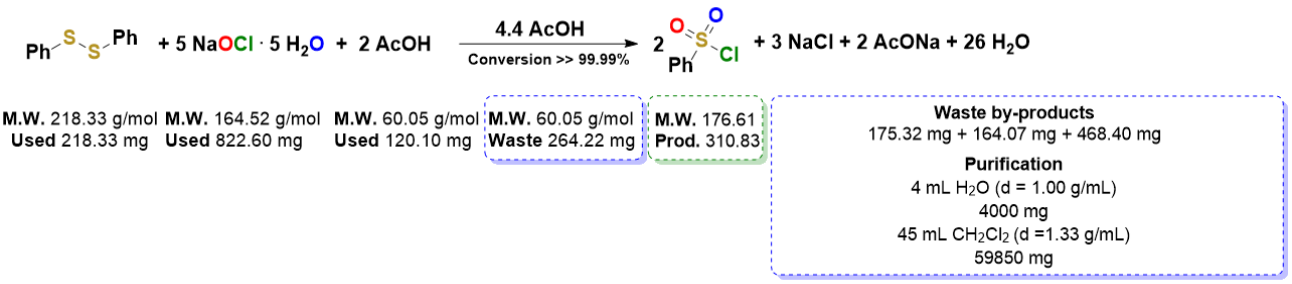
Products

identifier*:	name:	MF*:	MW:	g:	mmoles:	g theor:	yield:
	Benzenesulfonyl chloride	C6H5ClO2S	176.6175	0.353235	2	0.176618	199.9994

Conditions

Reagents	Name	mmoles	eq.	Bp	Hazard	Price	
	Phenyl disulfide	2.02	1	NaN			
	Hypochlorite salts	12.13	6	182			
	Sodium bisulfate	0.2	0.1	3600			
Yield	99						-0.5
Price / availability							-3
Safety							-5
Technical setup	Possible items: Common set-up; Instruments for controlled addition of chemicals; Unconventional activation technique					Selected items: Common set-up	0
Temperature / time	Possible items: Room temperature, < 1h; Room temperature, < 24h; Heating, < 1h					Selected items: Room temperature, < 1h	0
Workup and purification	Possible items: None; Cooling to room temperature; Adding solvent					Selected items: Adding solvent	0
EcoScale							91.5

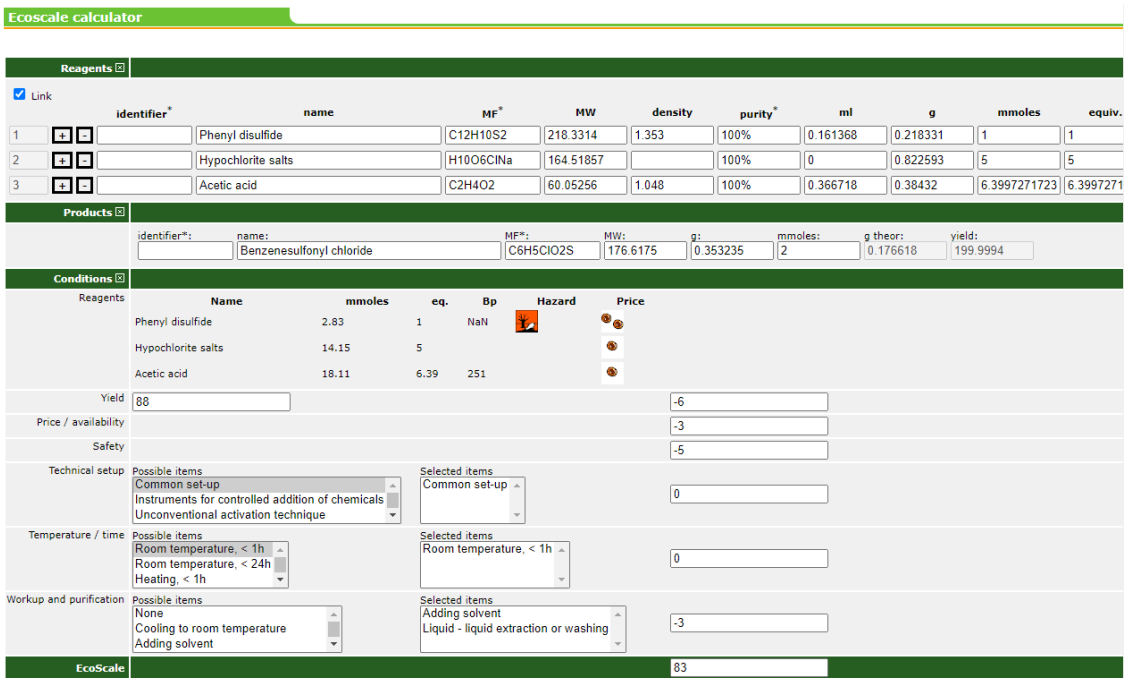
Calculation of Green Chemistry Metrics *(solution method)*[34]



$$\text{Atom Economy} = \frac{\text{Mass of desired useful product}}{\text{Total Mass of all reactants}} \times 100 = \frac{353.22}{218.33 + 329.04 + 60.05} \times 100 = 58\%$$

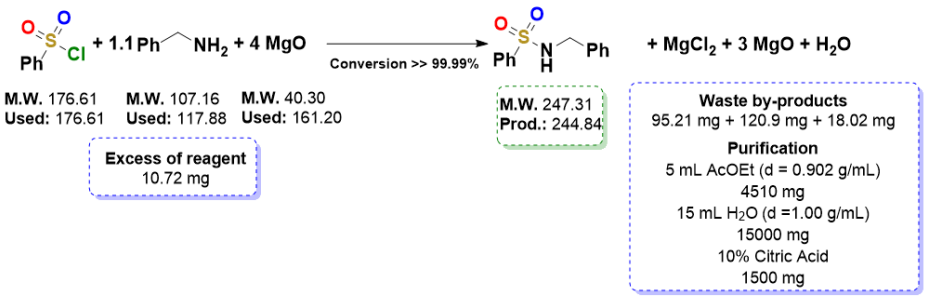
$$\text{Environmental Factor} = \frac{\text{Mass of total waste}}{\text{Mass of desired product}} = \frac{264.22 + 175.32 + 164.07 + 468.40 + 4000 + 59850}{310.83} = 208.87$$

$$\text{Reaction Mass Efficiency} = \frac{\text{actual mass of desired product}}{\text{mass of reactants}} \times 100 = \frac{310.83}{218.33 + 822.60 + 120.10 + 264.22} \times 100 = 21.80\ \%$$



http://ecoscale.cheminfo.org/calculator

Calculation of Green Chemistry Metrics *(this mechanochemical method)*



$$\text{Atom Economy} = \frac{\text{Mass of desired useful product}}{\text{Total Mass of all reactants}} \times 100 = \frac{247.31}{176.61 + 107.16 + 40.30} \times 100 = 76\%$$

$$\text{Environmental Factor} = \frac{\text{Mass of total waste}}{\text{Mass of desired product}} = \frac{95.21 + 120.9 + 18.02 + 4510 + 15000 + 1500 + 10.72}{244.84} = 86.81$$

$$\text{Reaction Mass Efficiency} = \frac{\text{actual mass of desired product}}{\text{mass of reactants}} \times 100 = \frac{244.84}{176.61 + 117.88 + 161.20} \times 100 = 53.7\ \%$$

It is worth pointing out that we considered in our E-Factor calculations the amount of solvent used for the recovery of the product, and both the solvent and the acid mass for the purification washes. If the value for all of this is neglected (due to the reusability of the solvent after distillation under reduced pressure), the E-Factor of our procedure should be:

$$\text{Environmental Factor} = \frac{\text{Mass of total waste}}{\text{Mass of desired product}} = \frac{95.21 + 120.9 + 18.02 \ \cancel{(+ 4510 + 15000 + 1500)} + 10.72}{244.84} = 1.00$$

Ecoscale calculator

Reagents

Link

	identifier*	name	MF*	MW	density	purity*	ml	g	mmoles	equiv.
1		Benzenesulfonyl chloride	C6H5ClO2S	176.6175	1.384	100%	0.127614	0.176618	1	1
2		Benzylamine	C7H9N	107.15516	0.98	100%	0.120277	0.117871	1.1	1.1
3		Magnesium oxide	MgO	40.3044	3.58	100%	0.045033	0.161218	4	4

Products

identifier*:	name:	MF*:	MW:	g:	mmoles:	g theor:	yield:
	N-(phenylmethyl)benzenesulfonamide	C13H13NO2S	247.31172	0.494623	2	0.247312	199.99960000

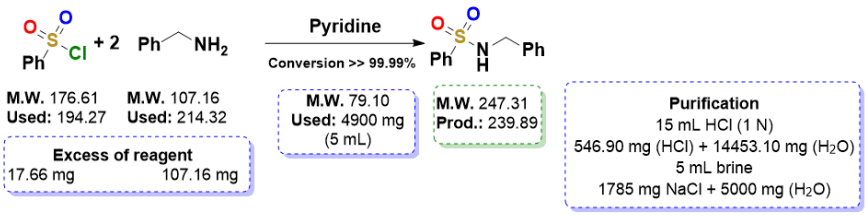
Conditions

Reagents

Name	mmoles	eq.	Bp	Hazard	Price
Benzenesulfonyl chloride	2.83	1	251		
Benzylamine	3.11	1.1	182		
Magnesium oxide	11.32	4	3600		

Yield	99	-0.5
Price / availability		0
Safety		0
Technical setup	Possible items: Common set-up; Instruments for controlled addition of chemicals; Unconventional activation technique — Selected items: Common set-up	0
Temperature / time	Possible items: Room temperature, < 1h; Room temperature, < 24h; Heating, < 1h — Selected items: Room temperature, < 24h	-1
Workup and purification	Possible items: None; Cooling to room temperature; Adding solvent — Selected items: Adding solvent; Liquid - liquid extraction or washing	-3
EcoScale		95.5

Calculation of Green Chemistry Metrics *(solution method)*[35]



$$\text{Atom Economy} = \frac{\text{Mass of desired useful product}}{\text{Total Mass of all reactants}} \times 100 = \frac{247.31}{176.61 + 107.16 + 79.10} \times 100 = 68.2\%$$

$$\text{Environmental Factor} = \frac{\text{Mass of total waste}}{\text{Mass of desired product}} = \frac{17.66 + 107.16 + 4900 + 546.90 + 14453.10 + 1785 + 5000}{239.89} = 111.76$$

$$\text{Reaction Mass Efficiency} = \frac{\text{actual mass of desired product}}{\text{mass of reactants}} \times 100 = \frac{239.89}{194.27 + 214.32 + 4900} \times 100 = 4.5\ \%$$

Ecoscale calculator

Reagents

Link

	identifier*	name	MF*	MW	density	purity*	ml	g	mmoles	equiv.
1		Benzenesulfonyl chloride	C6H5ClO2S	176.6175	1.384	100%	0.127614	0.176618	1	1
2		Benzylamine	C7H9N	107.15516	0.98	100%	0.218684	0.21431	2	2
3		Pyridine	C5H5N	79.1014	0.978	100%	5	4.89	61.819386256	61.8193862

Products

identifier*:	name:	MF*:	MW:	g:	mmoles:	g theor:	yield:
	N-(phenylmethyl)benzenesulfonamide	C13H13NO2S	247.31172	0.494623	2	0.247312	199.99960000

Conditions

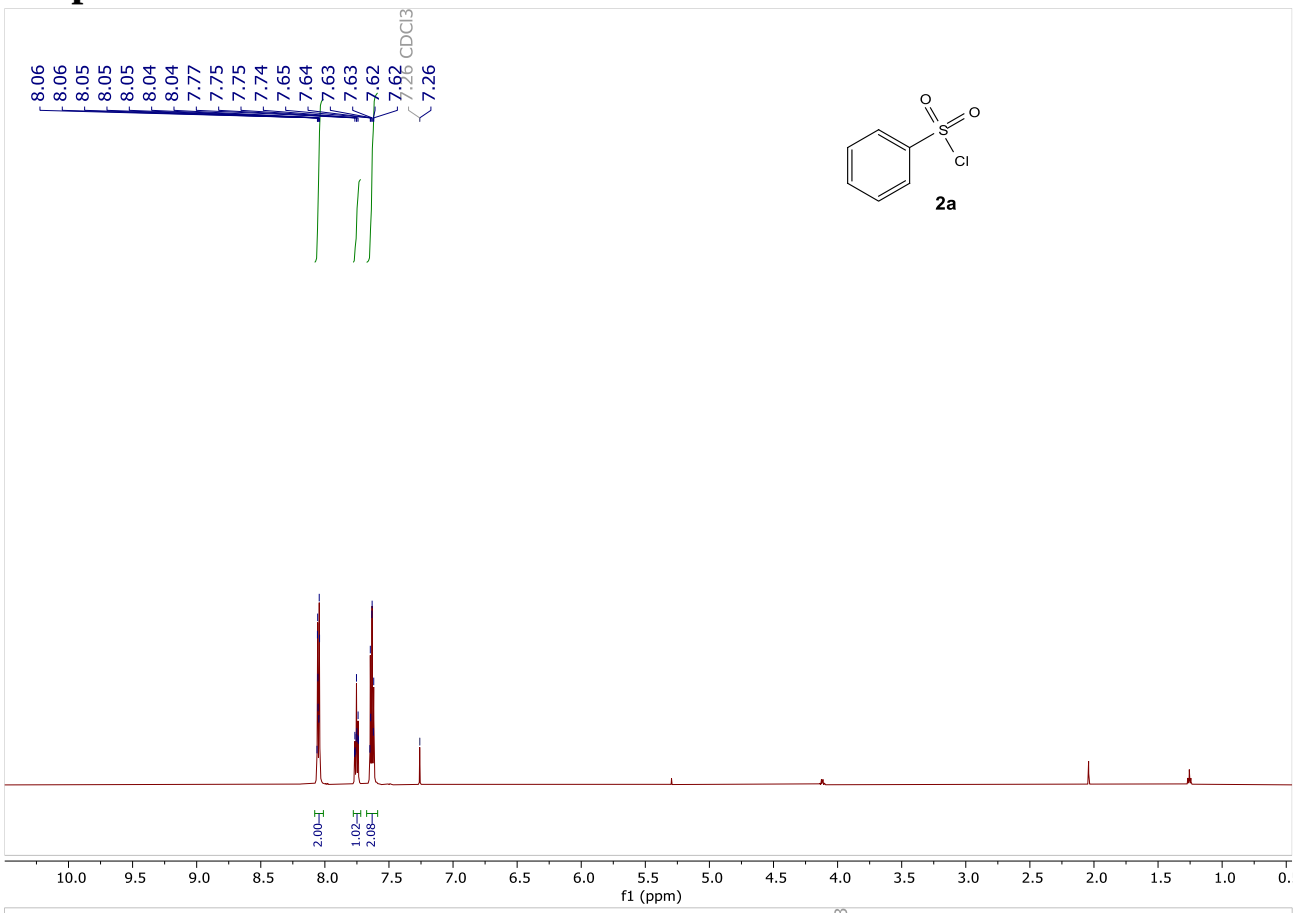
Reagents

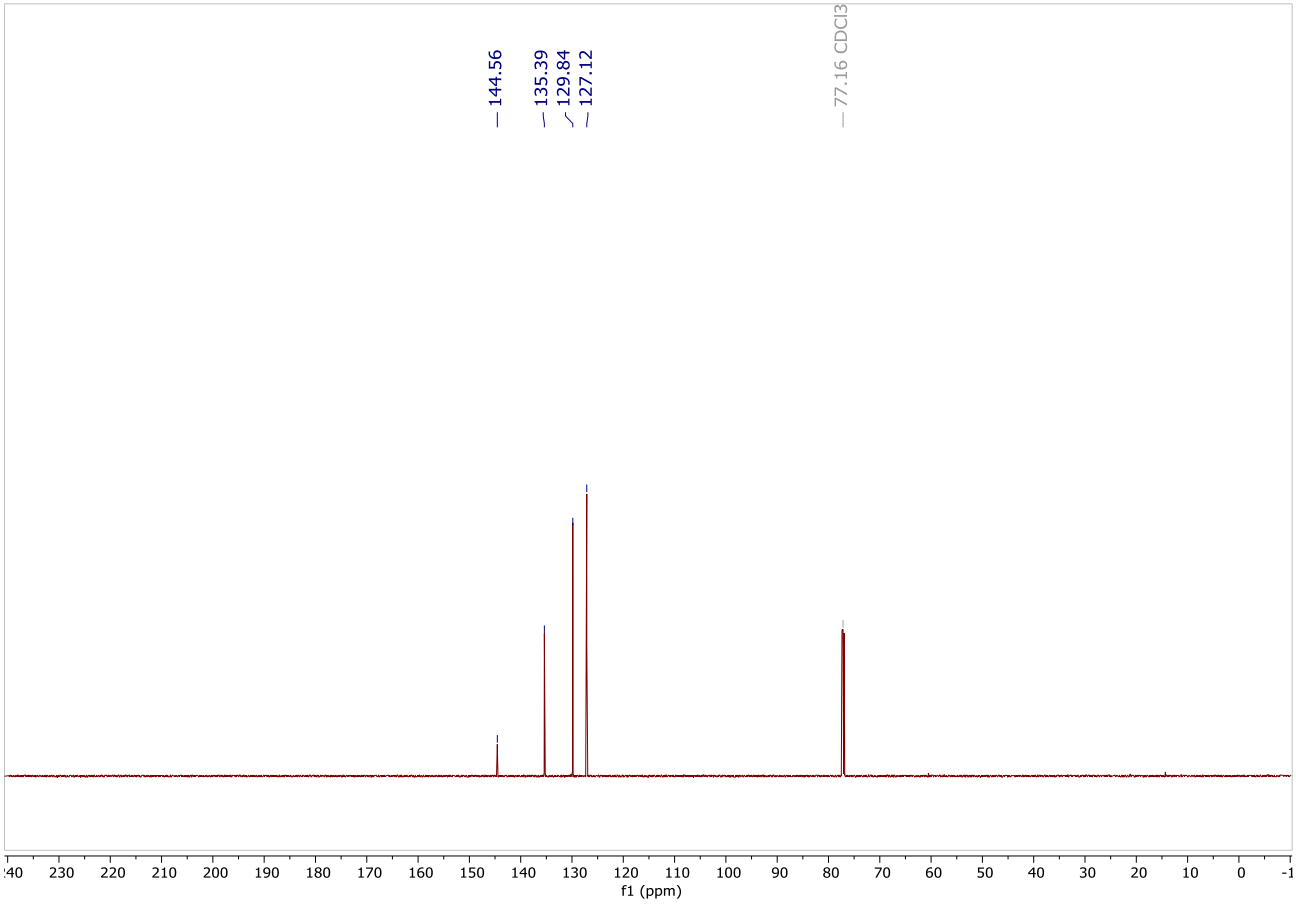
Name	mmoles	eq.	Bp	Hazard	Price
Benzenesulfonyl chloride	2.83	1	251		
Benzylamine	5.66	2	182		
Pyridine	175	61.81	115		

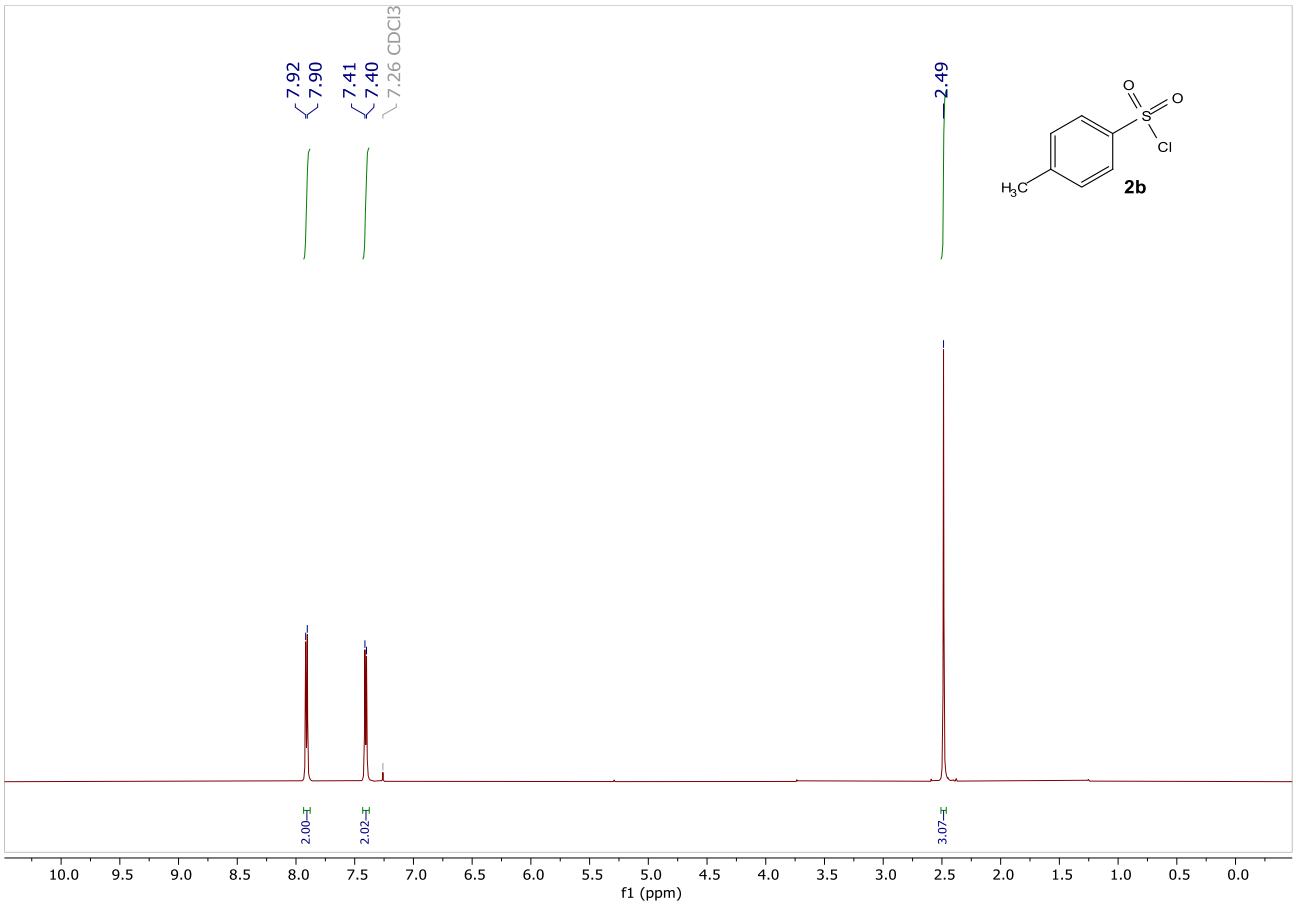
Yield	97	-1.5
Price / availability		0
Safety		-5
Technical setup	Possible items: Common set-up; Instruments for controlled addition of chemicals; Unconventional activation technique — Selected items: Common set-up	0
Temperature / time	Possible items: Heating, > 1h; Cooling to 0°C; Cooling, < 0°C — Selected items: Room temperature, < 24h; Cooling to 0°C	-5
Workup and purification	Possible items: Sublimation; Liquid - liquid extraction or washing; Classical chromatography — Selected items: Adding solvent; Classical chromatography; Liquid - liquid extraction or washing	-13
EcoScale		75.5

Please note: Since not enough information are provided on the amount of sodium sulfate, silica and solvents used for the separation, they have been neglected in calculations for the purification process. Since neither the amount of hydrochloric acid solution was given, we considered a minimum 5 mL of HCl 1 N (3x5 mL = 15 mL) and a minimum of 5 mL of brine (solubility of NaCl in water: 358 g/L).

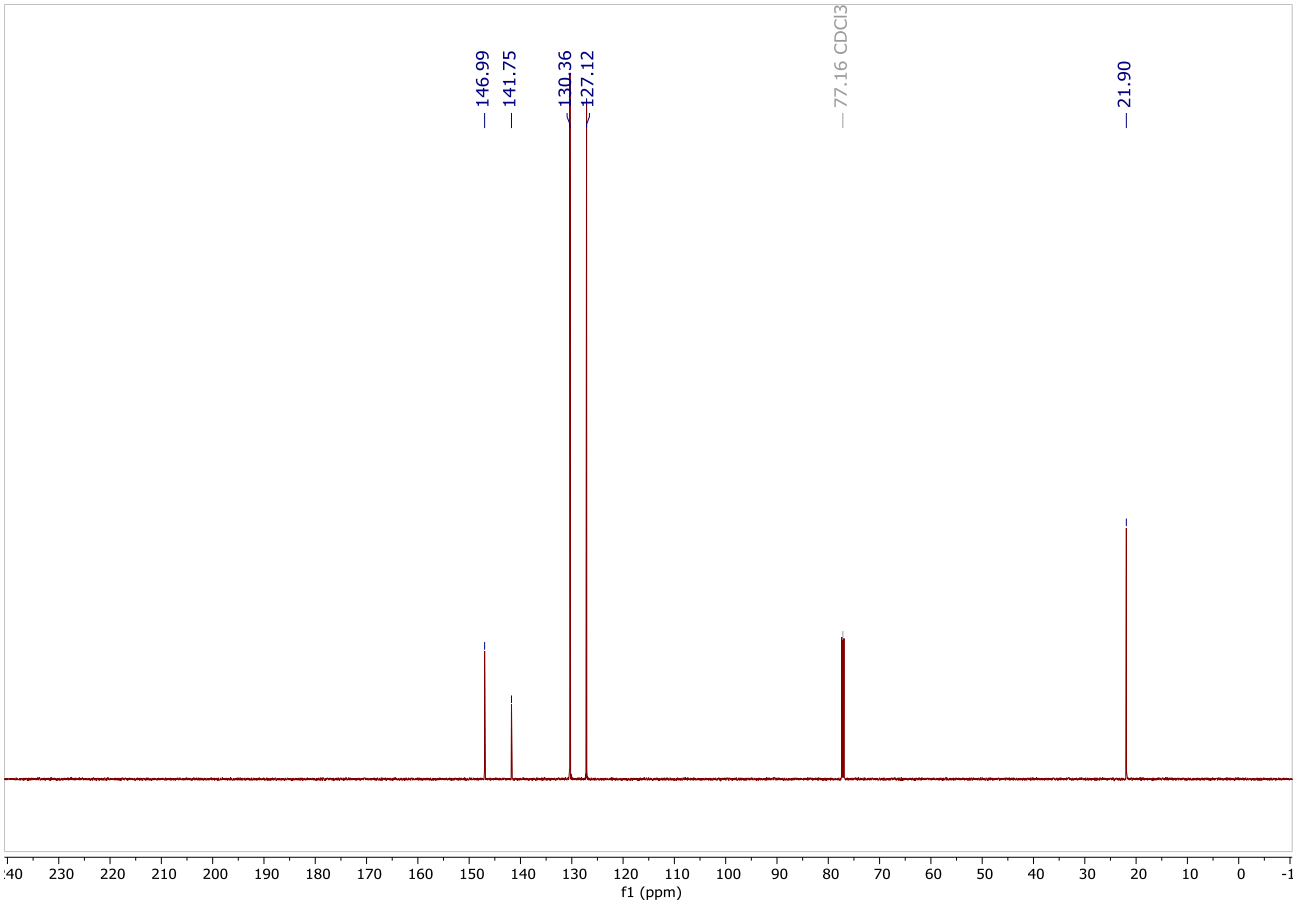
7. Spectra

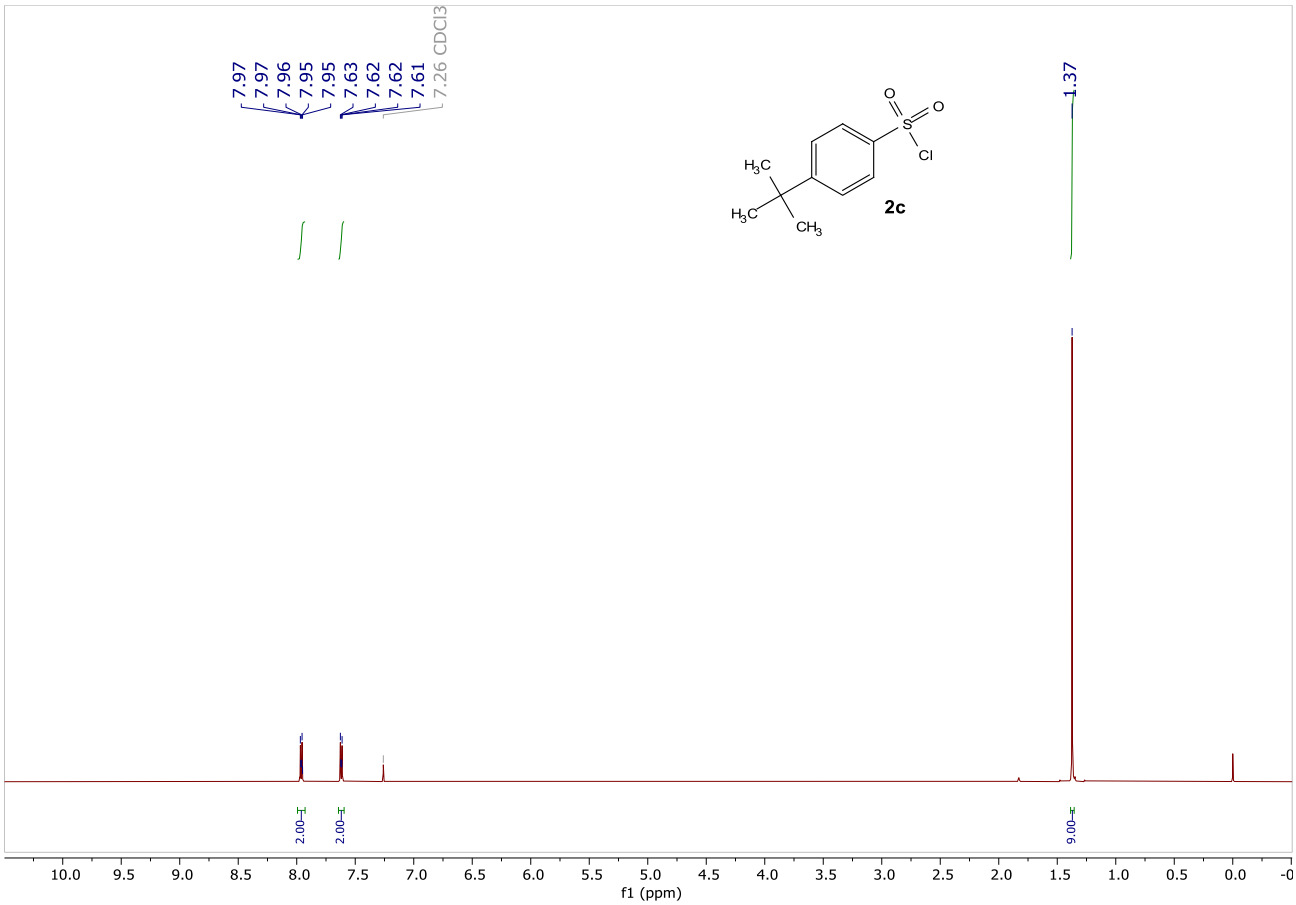

8.06
8.06
8.05
8.05
8.05
8.04
8.04
7.77
7.75
7.75
7.74
7.65
7.64
7.63
7.63
7.62
7.62
7.26 CDCl3
7.26
O
O
S
Cl
2a
2.00
1.02
2.08
f1 (ppm)

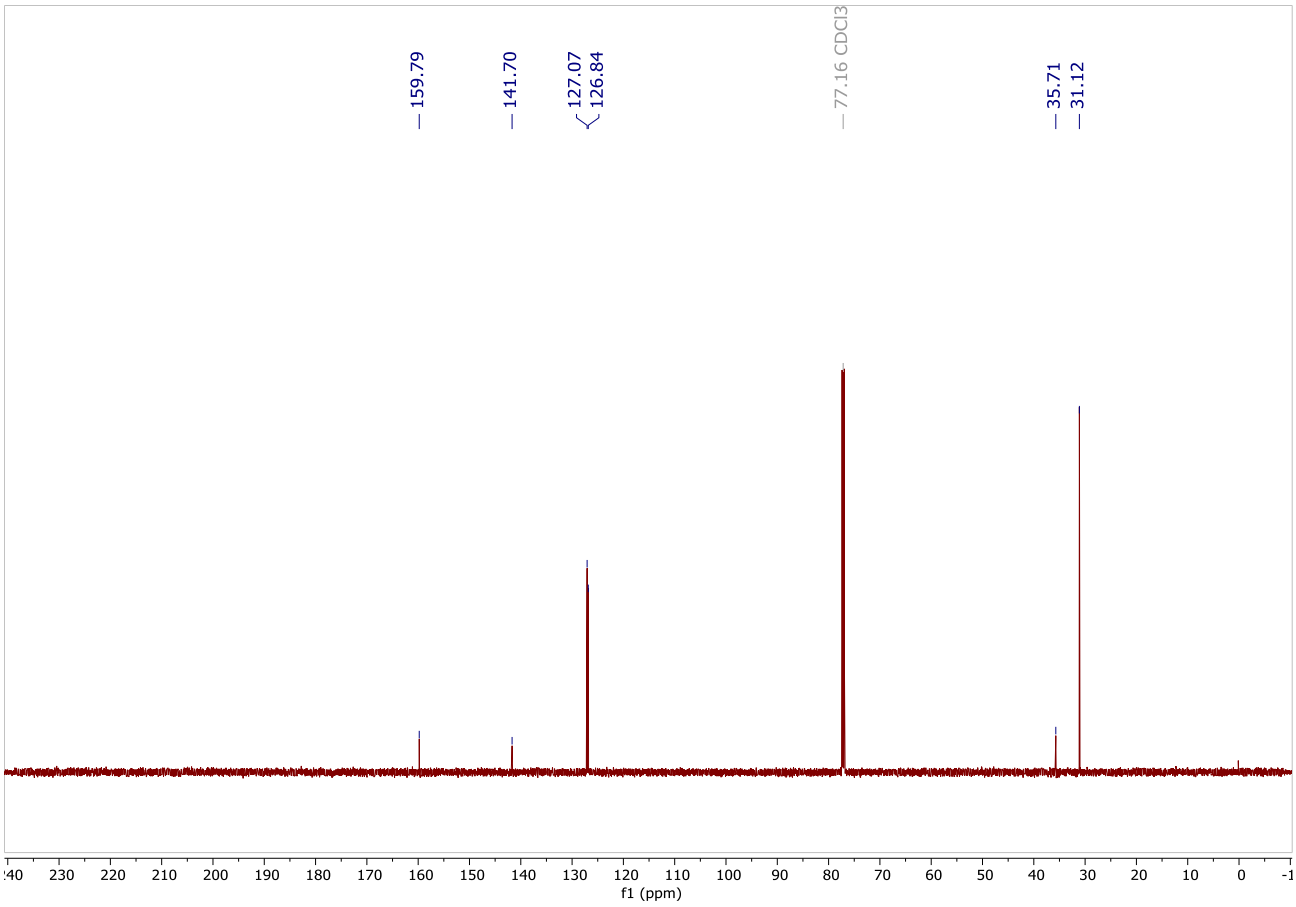

144.56
135.39
129.84
127.12
77.16 CDCl3
f1 (ppm)

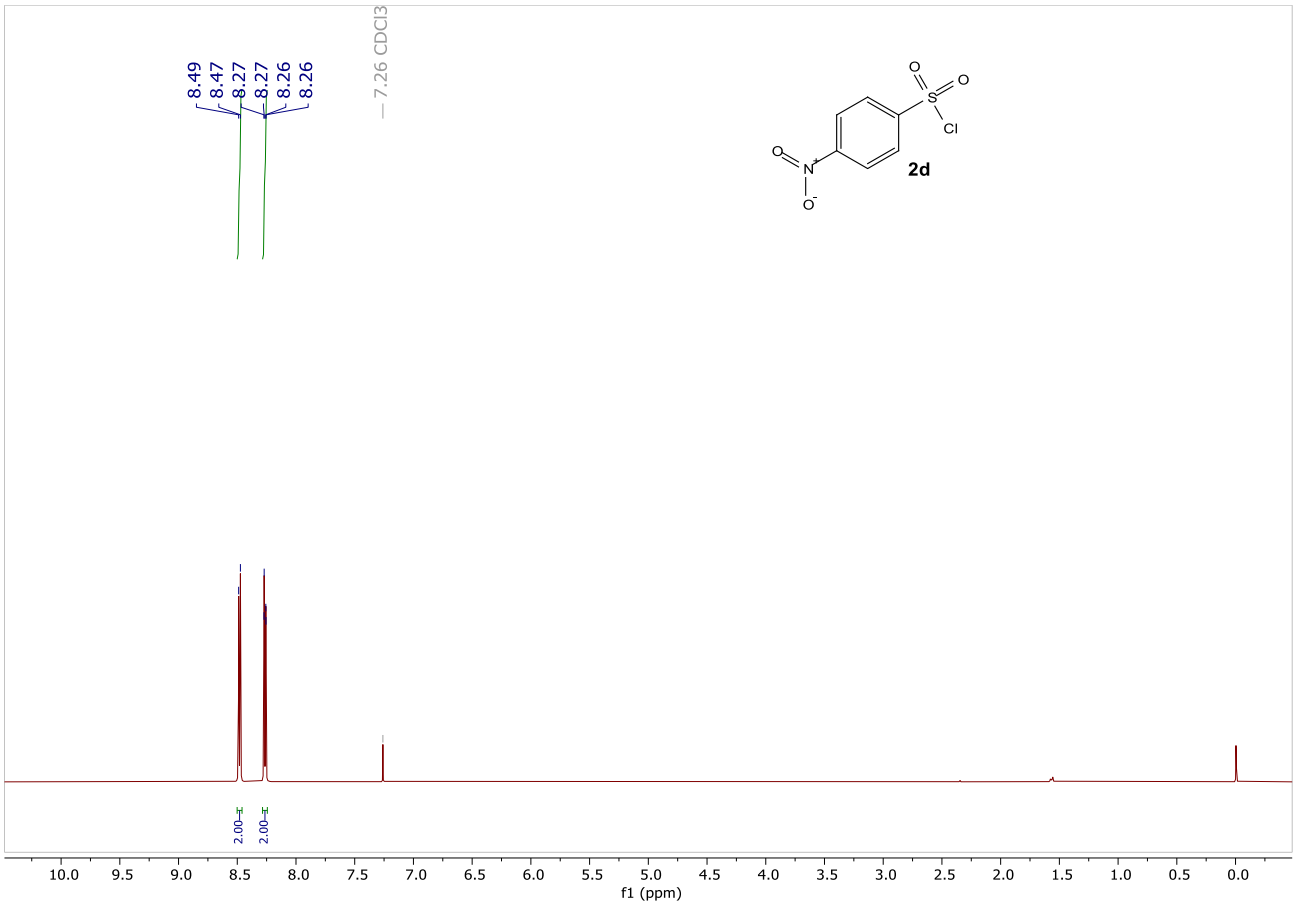

7.92
7.90
7.41
7.40
7.26 CDCl3
2.49
2.00
2.02
3.07
f1 (ppm)

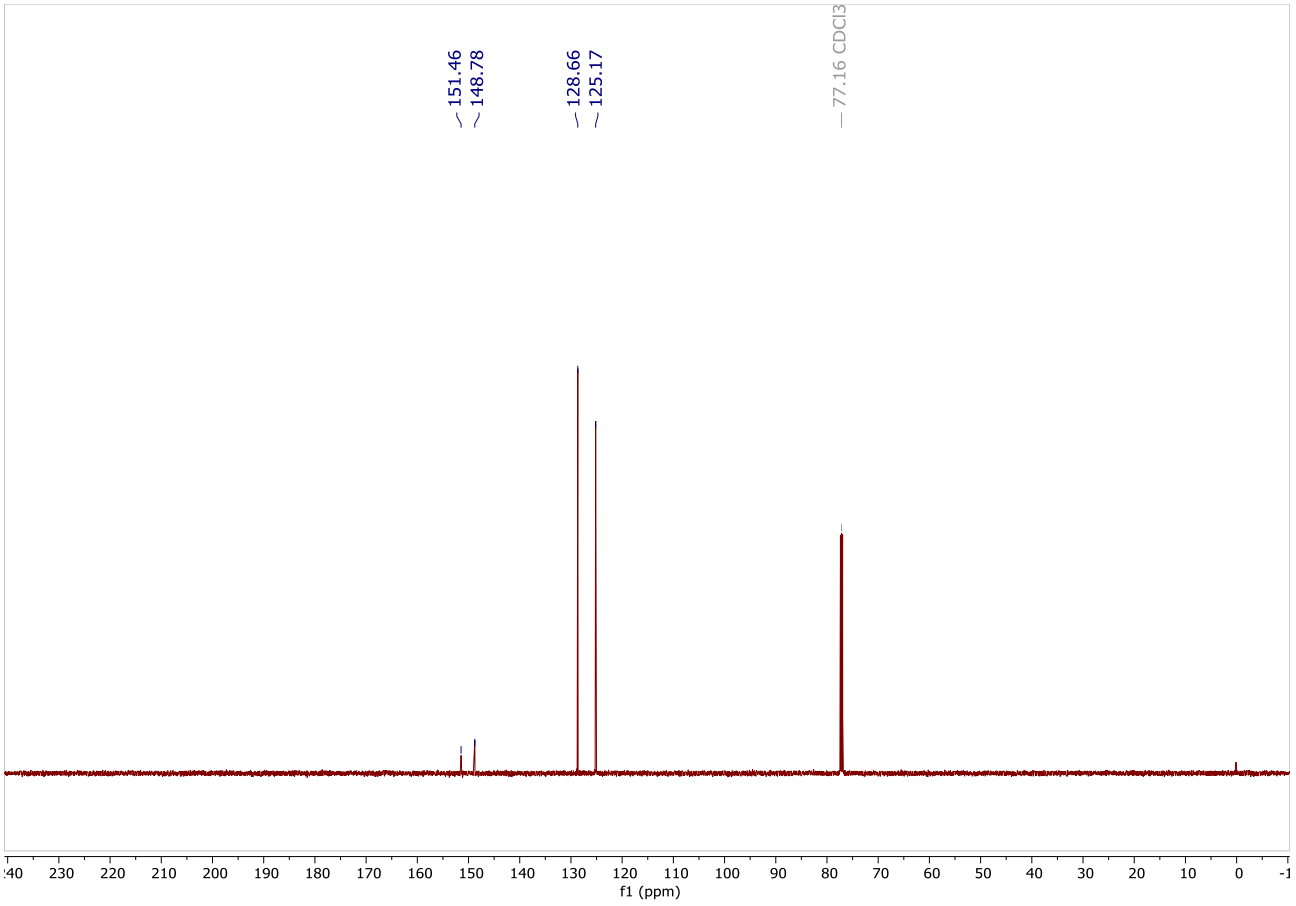
2b

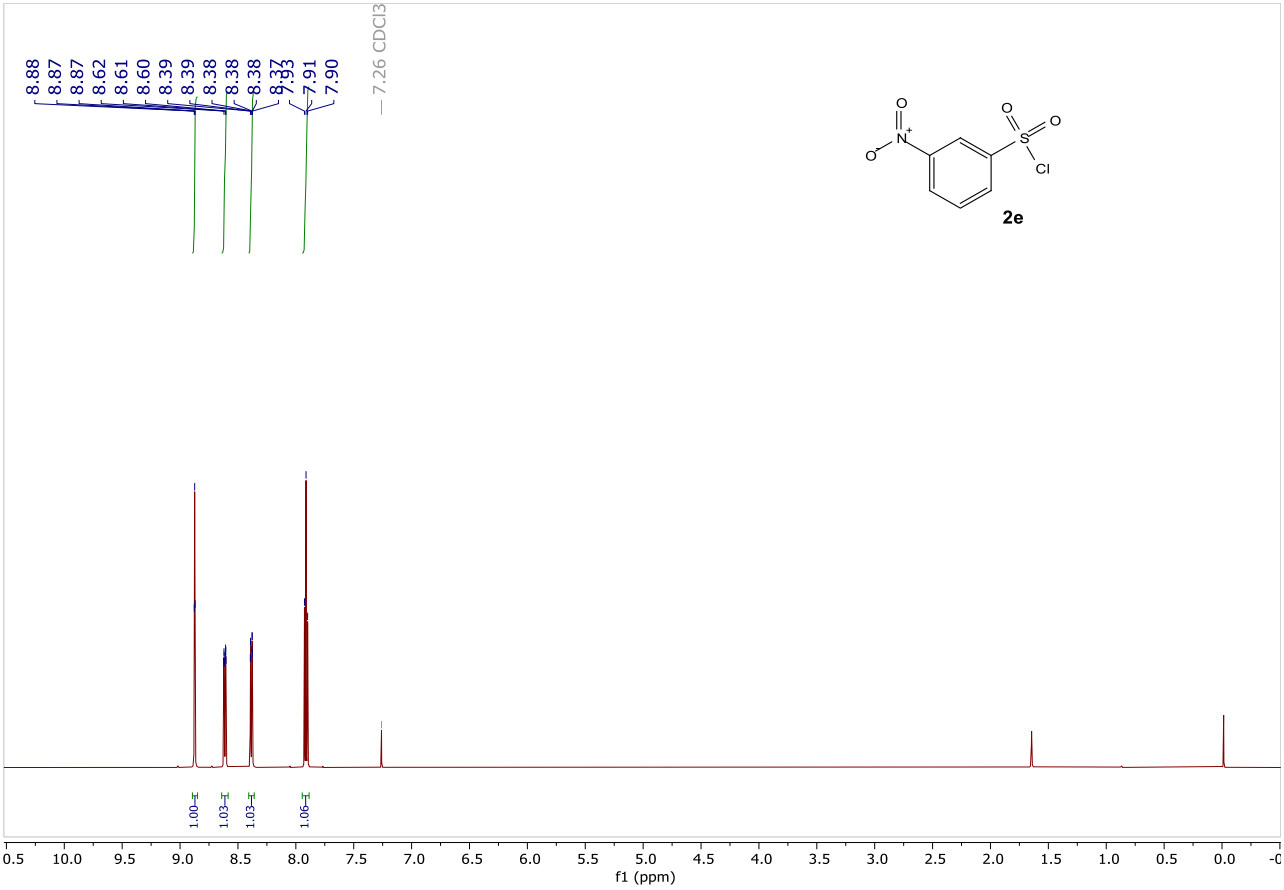

146.99
141.75
130.36
127.12
77.16 CDCl3
21.90
f1 (ppm)


7.97
7.97
7.96
7.95
7.95
7.63
7.62
7.62
7.61
7.26 CDCl3
1.37
2c
2.00
2.00
9.00
f1 (ppm)

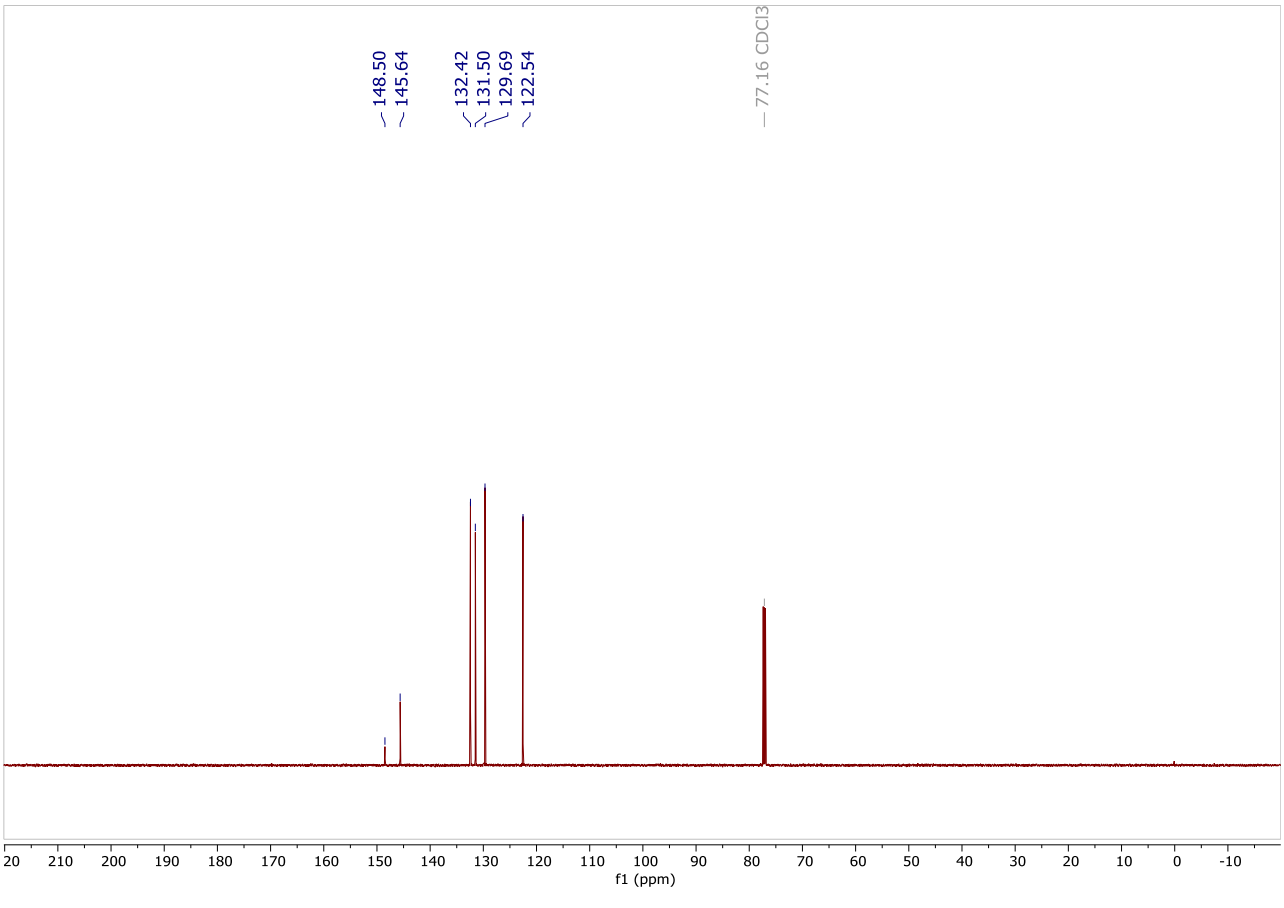

159.79
141.70
127.07
126.84
77.16 CDCl3
35.71
31.12
f1 (ppm)

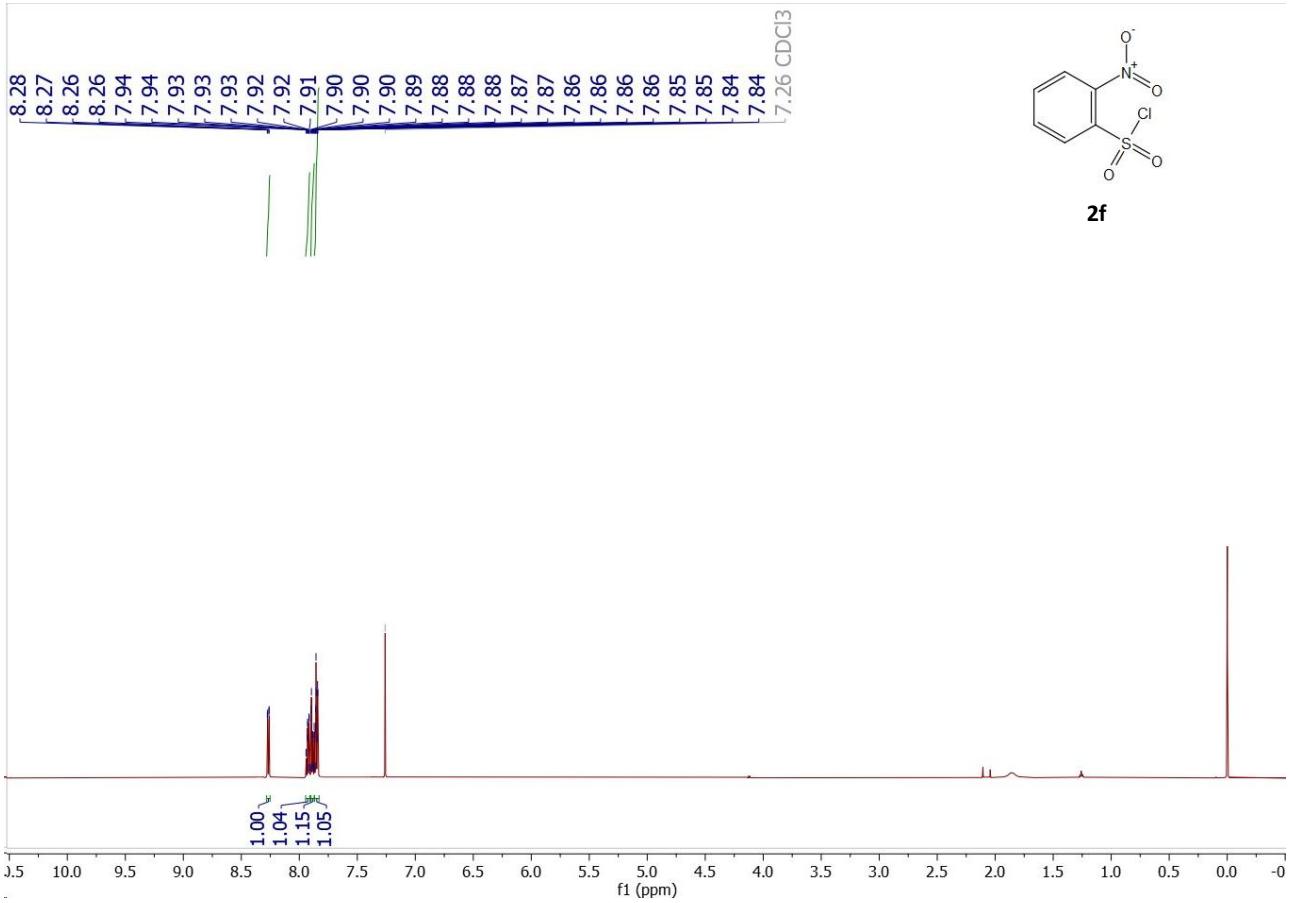

8.49
8.47
8.27
8.27
8.26
8.26
7.26 CDCl3
2d
2.00
2.00
f1 (ppm)


151.46
148.78
128.66
125.17
77.16 CDCl3
f1 (ppm)


8.88
8.87
8.87
8.62
8.61
8.60
8.39
8.39
8.38
8.38
8.38
8.37
7.93
7.91
7.90
7.26 CDCl3
1.00
1.03
1.03
1.06
0.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

2e


148.50
145.64
132.42
131.50
129.69
122.54
77.16 CDCl3
20 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


8.28
8.27
8.26
8.26
7.94
7.94
7.93
7.93
7.93
7.92
7.92
7.91
7.90
7.90
7.90
7.89
7.88
7.88
7.88
7.87
7.87
7.86
7.86
7.86
7.86
7.85
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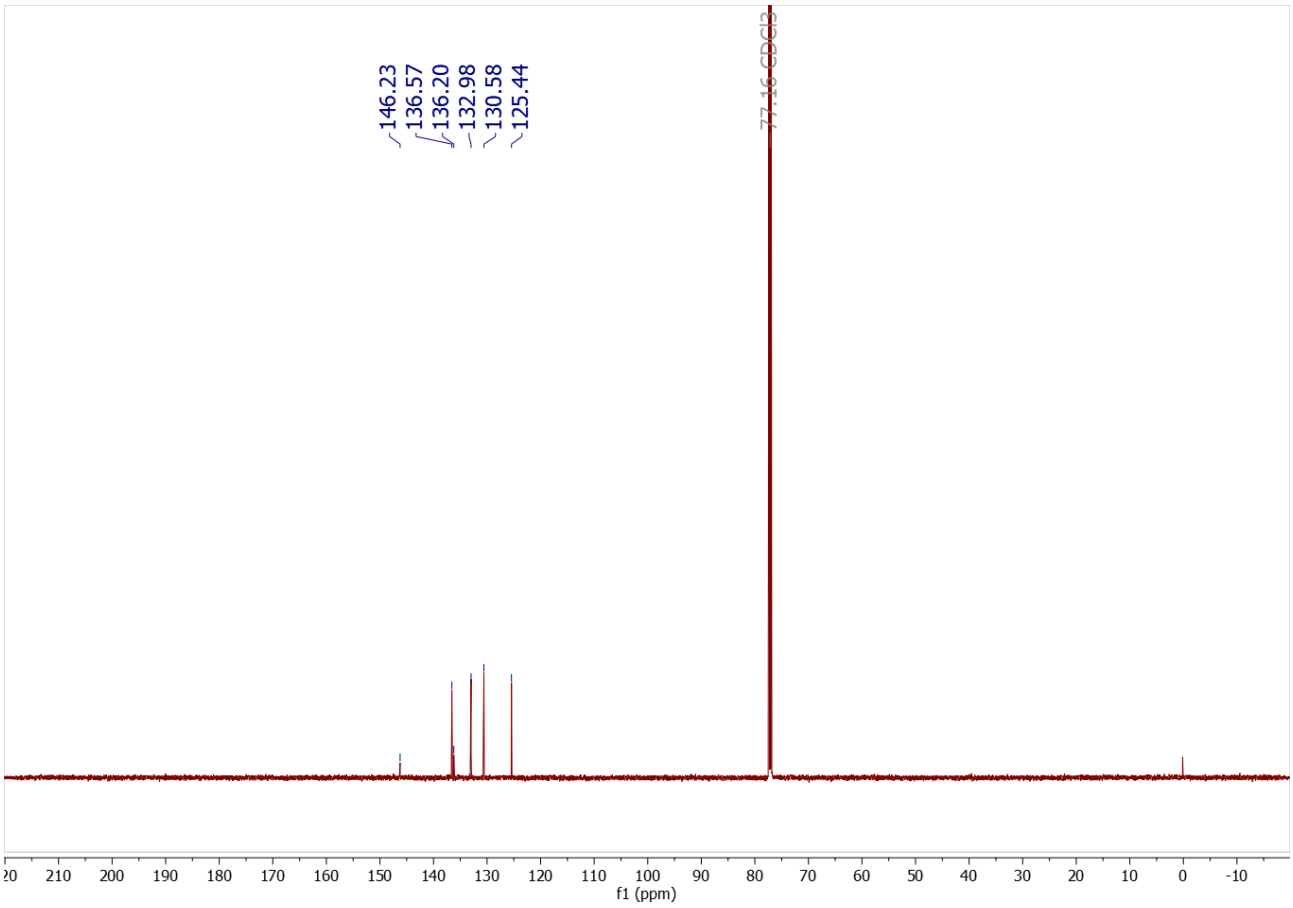
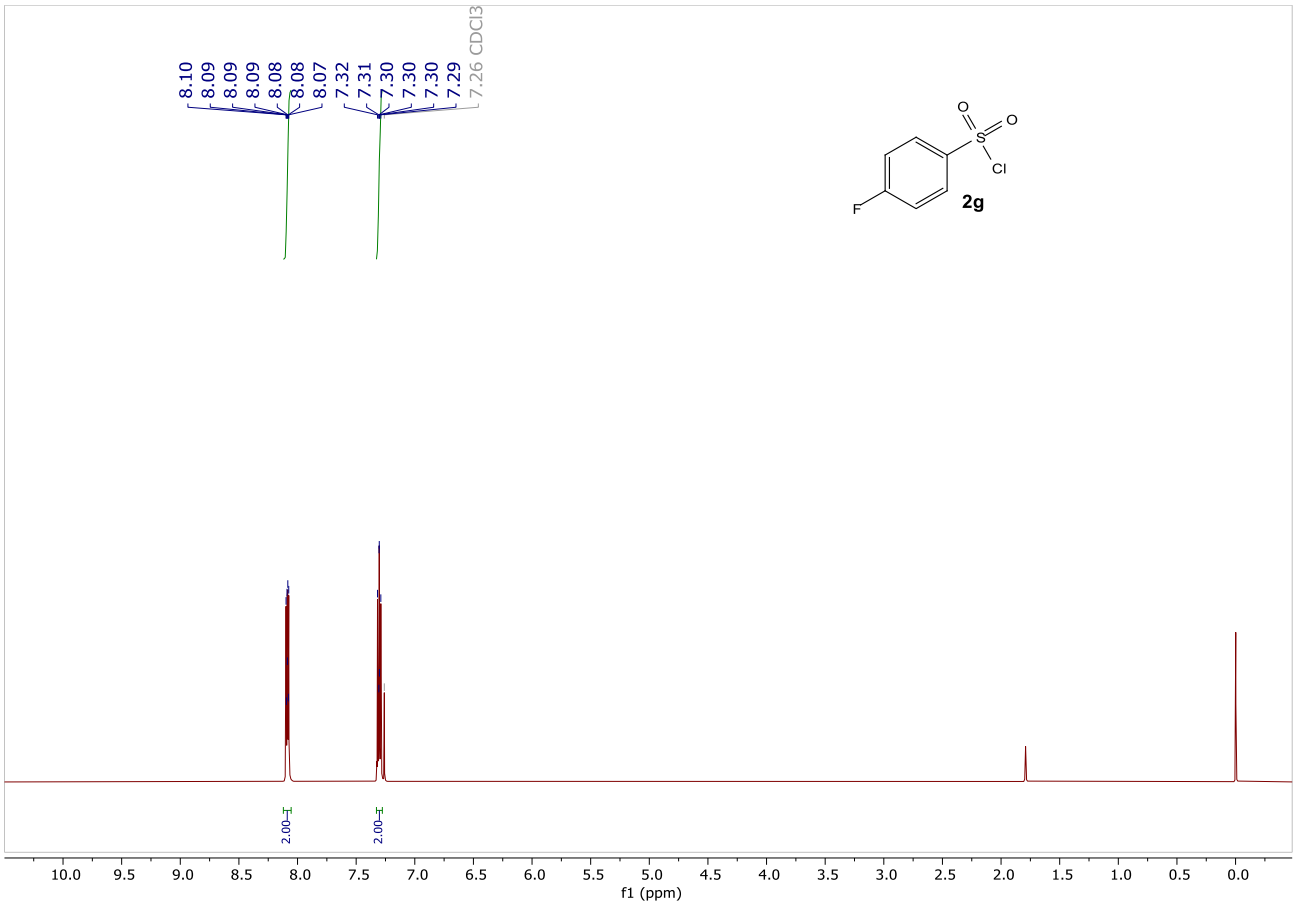
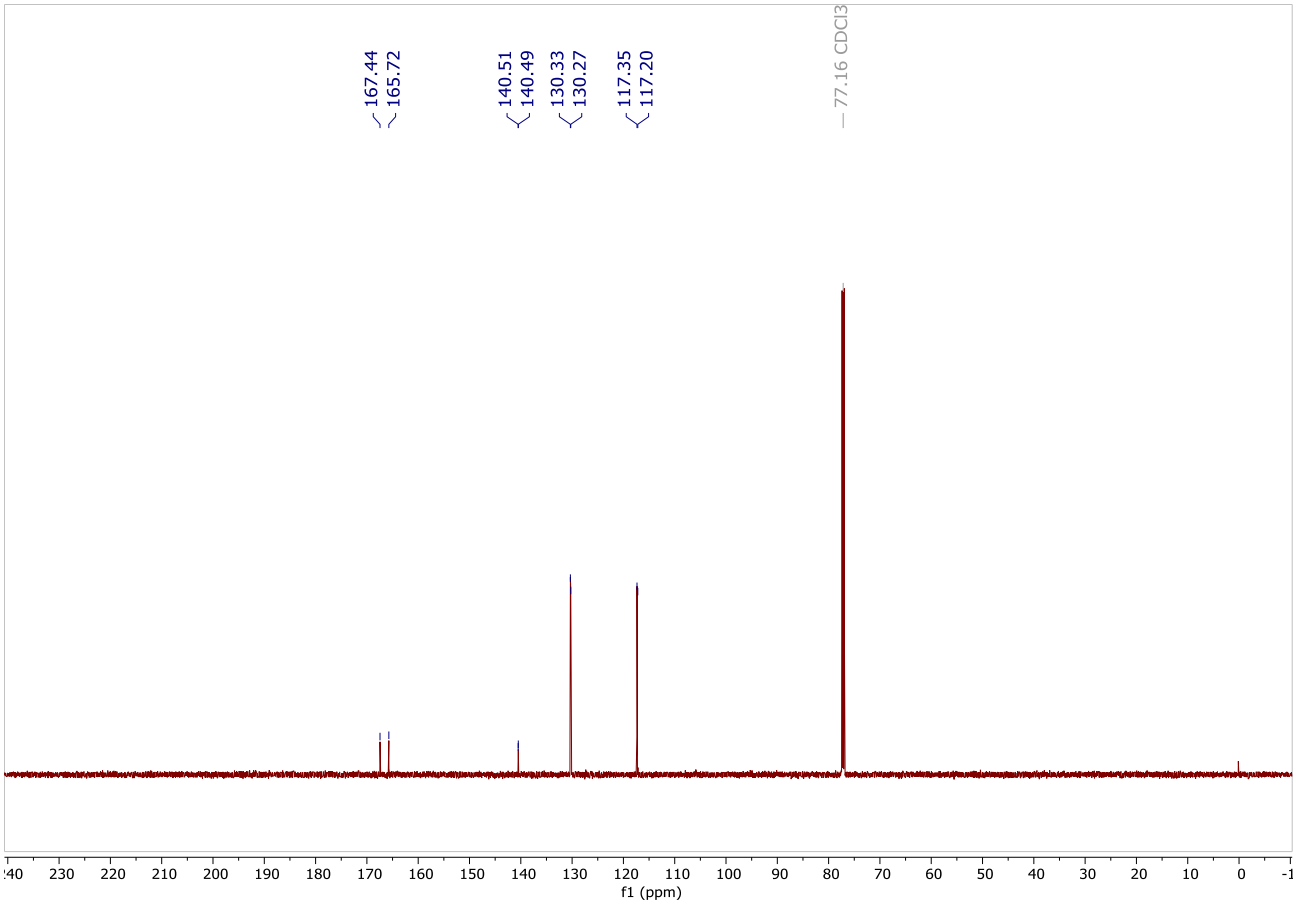
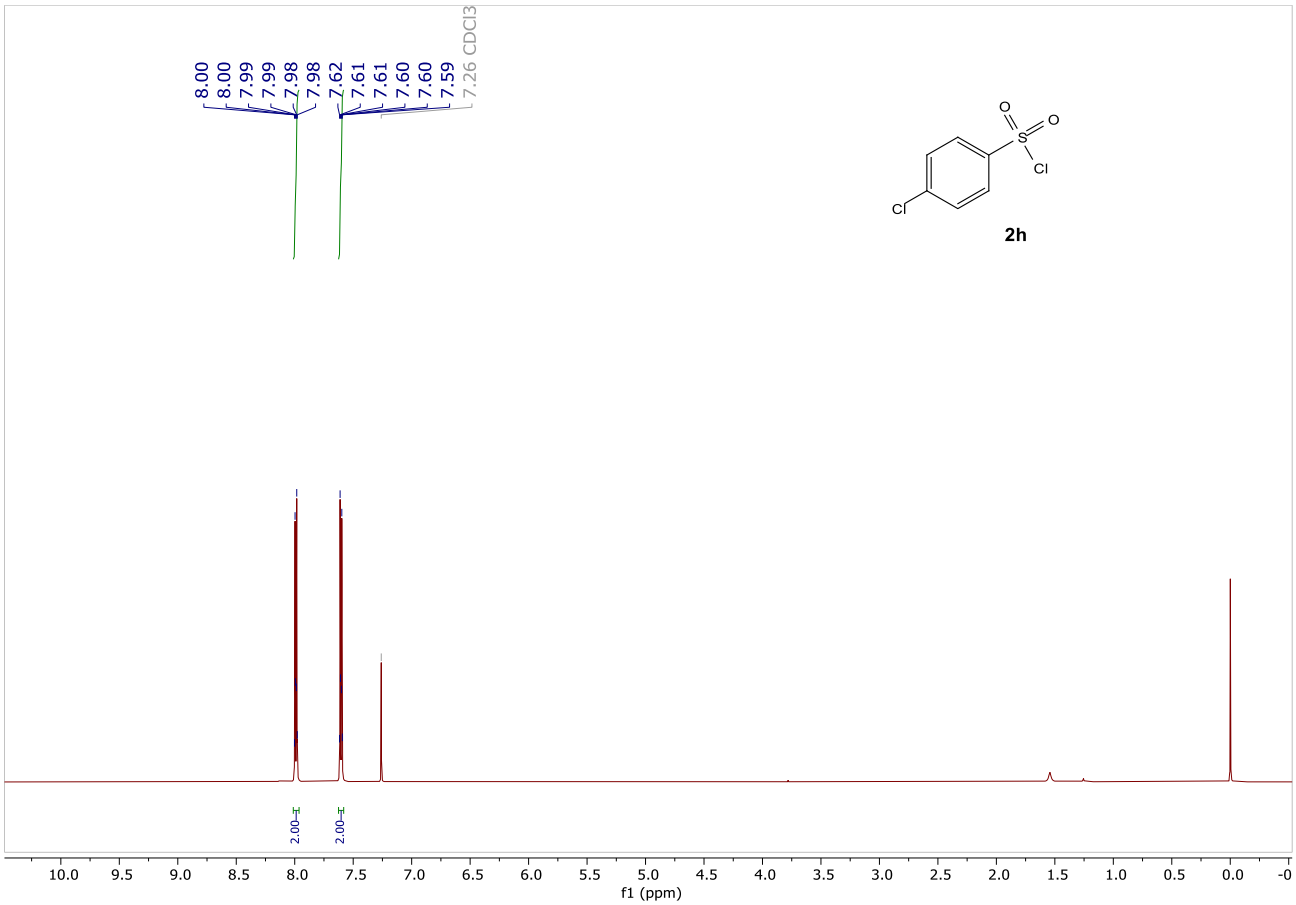
7.84
7.84
7.26 CDCl3
1.00
1.04
1.15
1.05
f1 (ppm)

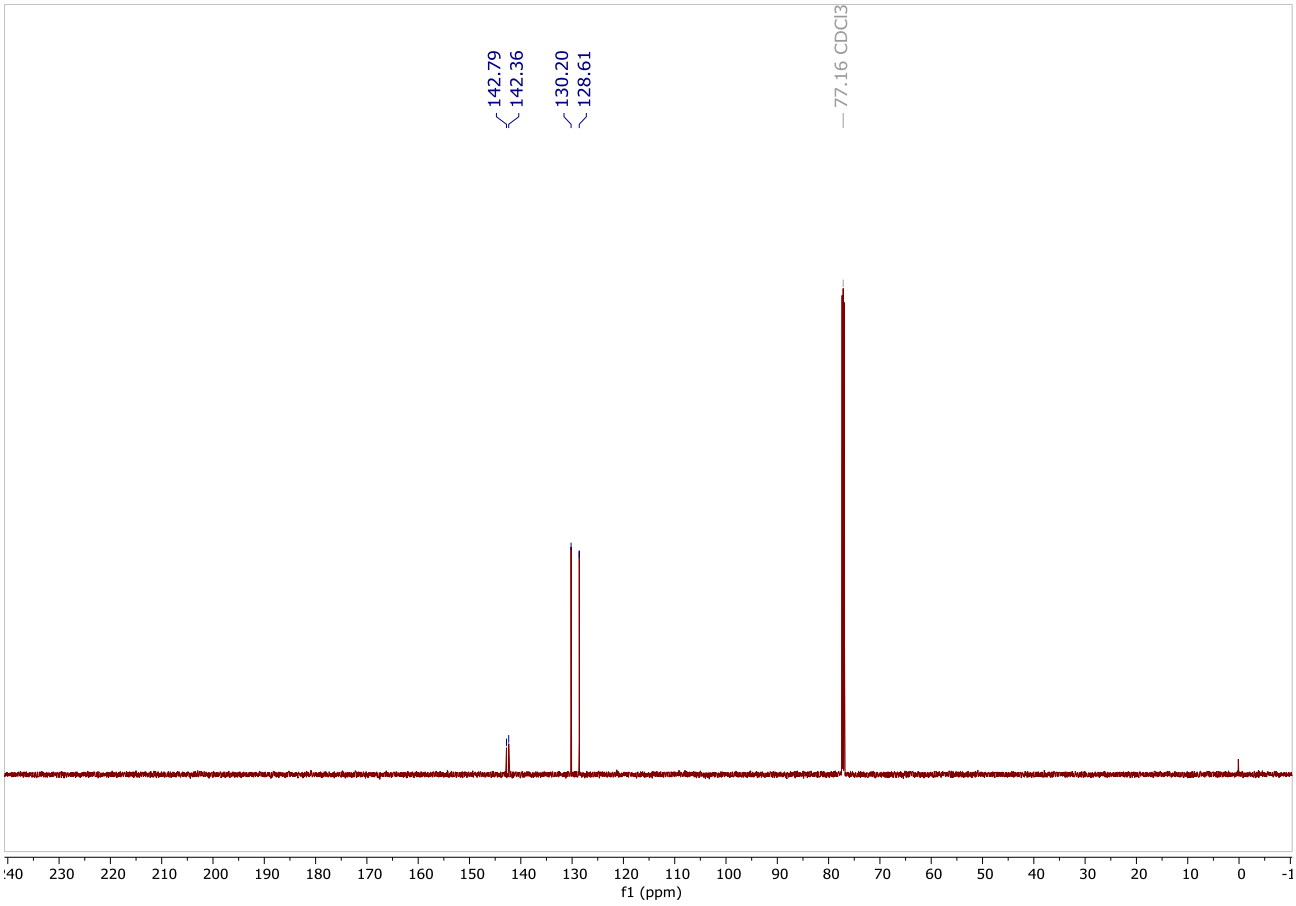
2f

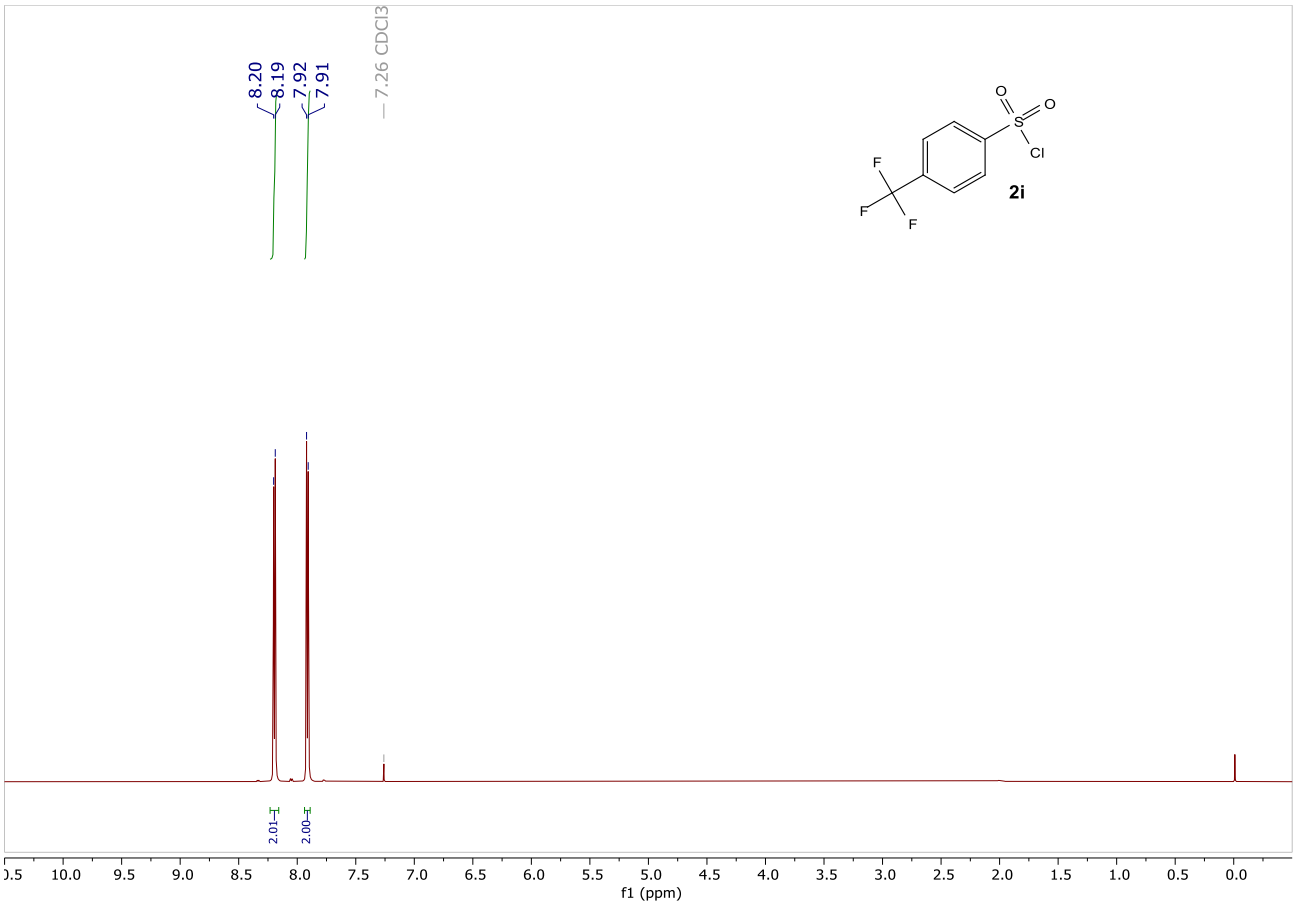

146.23
136.57
136.20
132.98
130.58
125.44
77.16 CDCl3
f1 (ppm)

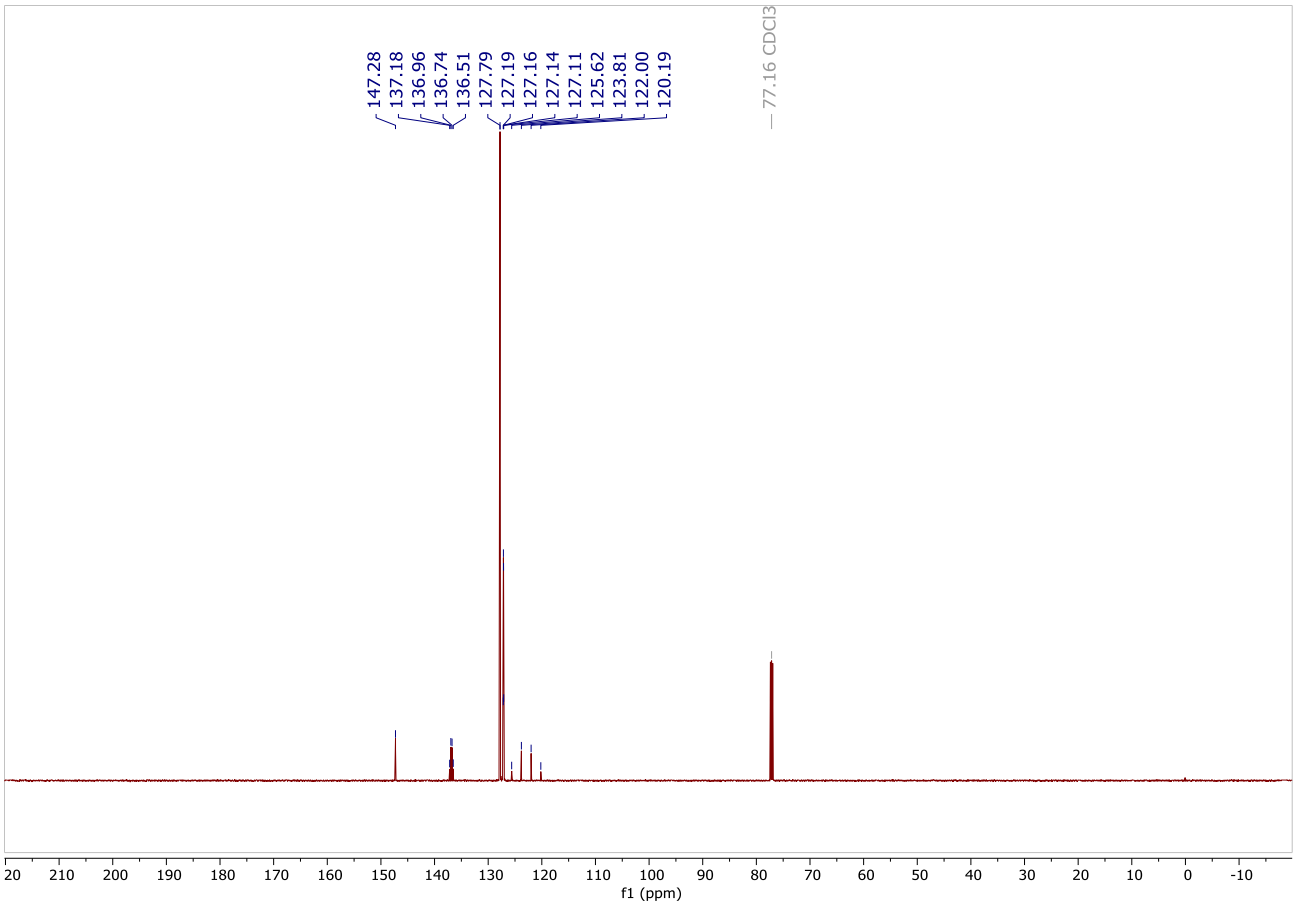

8.10
8.09
8.09
8.09
8.08
8.08
8.07
7.32
7.31
7.30
7.30
7.30
7.29
7.26 CDCl3
O
O
S
Cl
F
2g
2.00
2.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

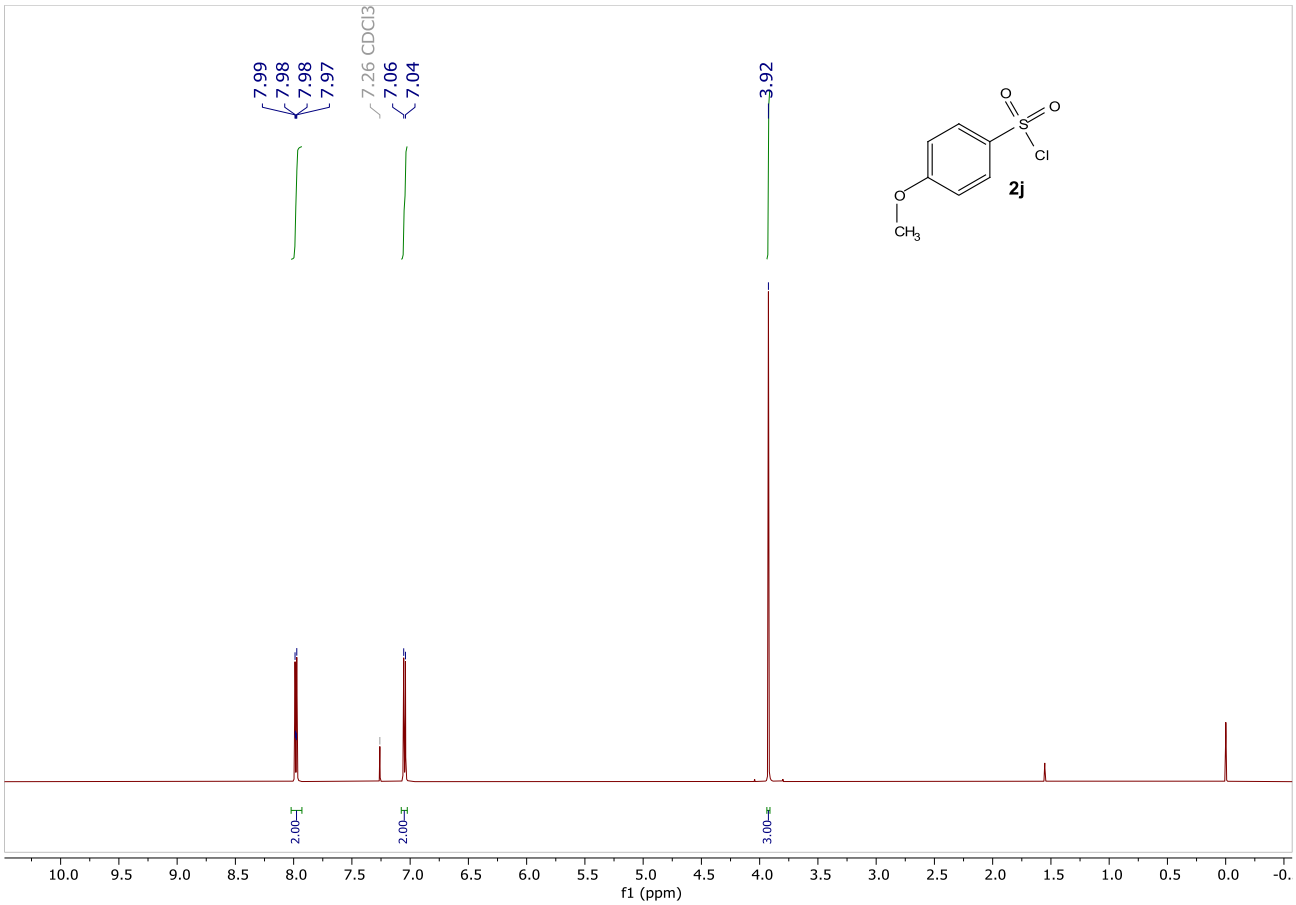

167.44
165.72
140.51
140.49
130.33
130.27
117.35
117.20
77.16 CDCl3
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

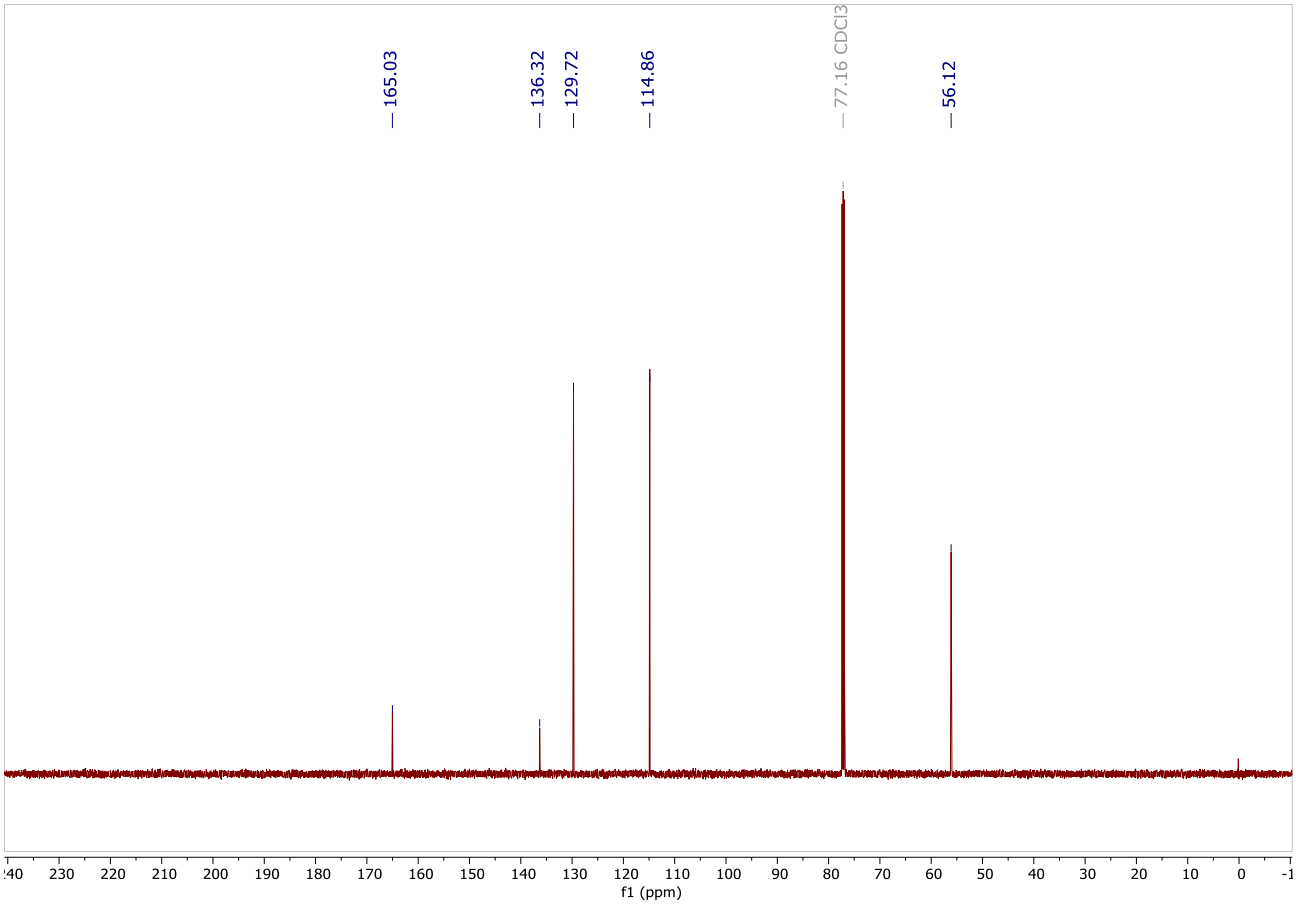

8.00
8.00
7.99
7.99
7.98
7.98
7.62
7.61
7.61
7.60
7.60
7.59
7.26 CDCl3
O
S
O
Cl
Cl
2h
2.00
2.00
f1 (ppm)

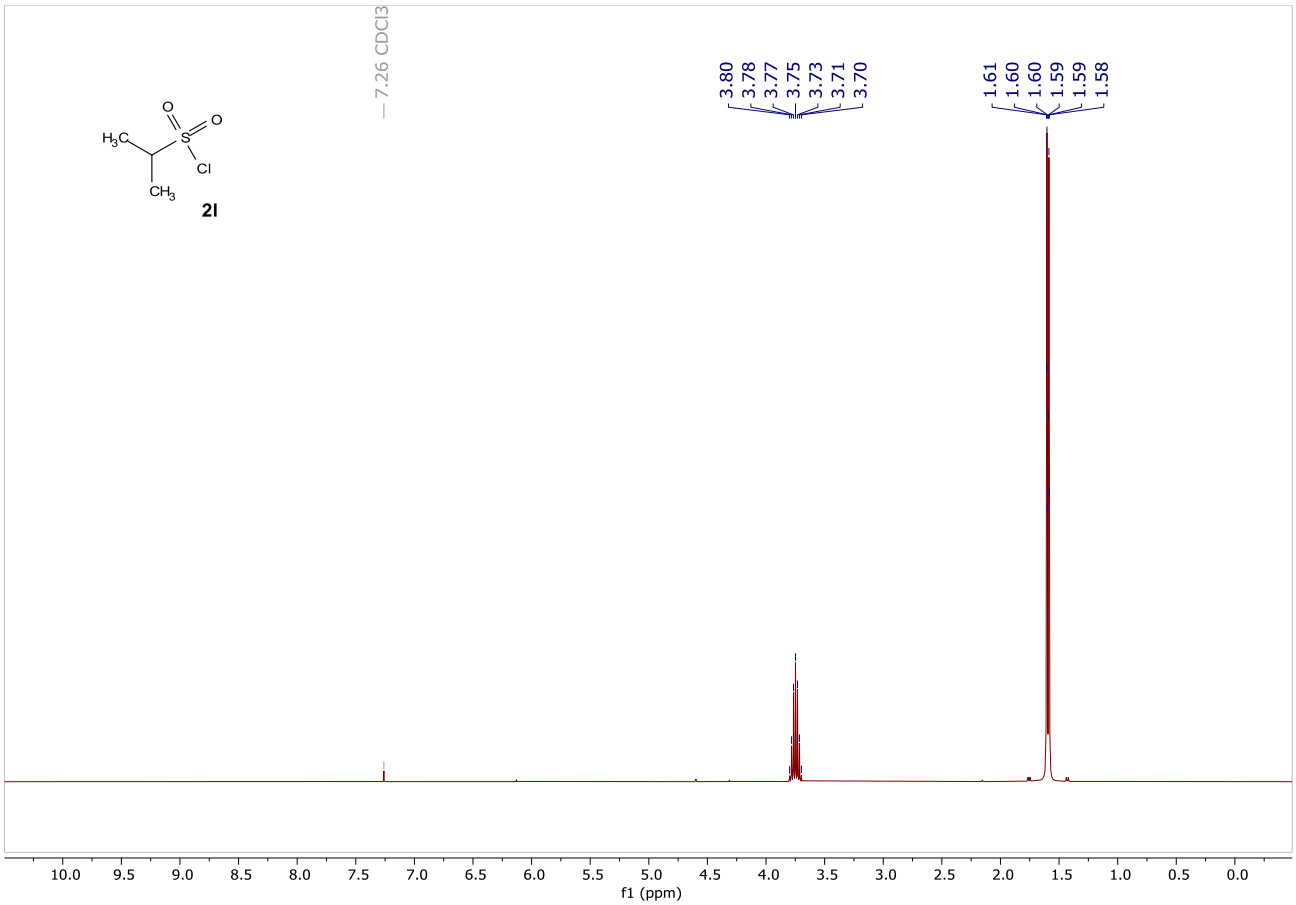

142.79
142.36
130.20
128.61
77.16 CDCl3
f1 (ppm)


8.20
8.19
7.92
7.91
7.26 CDCl3
2i
2.01
2.00
f1 (ppm)


147.28
137.18
136.96
136.74
136.51
127.79
127.19
127.16
127.14
127.11
125.62
123.81
122.00
120.19
77.16 CDCl3
f1 (ppm)


7.99
7.98
7.98
7.97
7.26 CDCl3
7.06
7.04
3.92
2j
2.00
2.00
3.00
f1 (ppm)


165.03
136.32
129.72
114.86
77.16 CDCl3
56.12
f1 (ppm)


7.26 CDCl3
3.80
3.78
3.77
3.75
3.73
3.71
3.70
1.61
1.60
1.60
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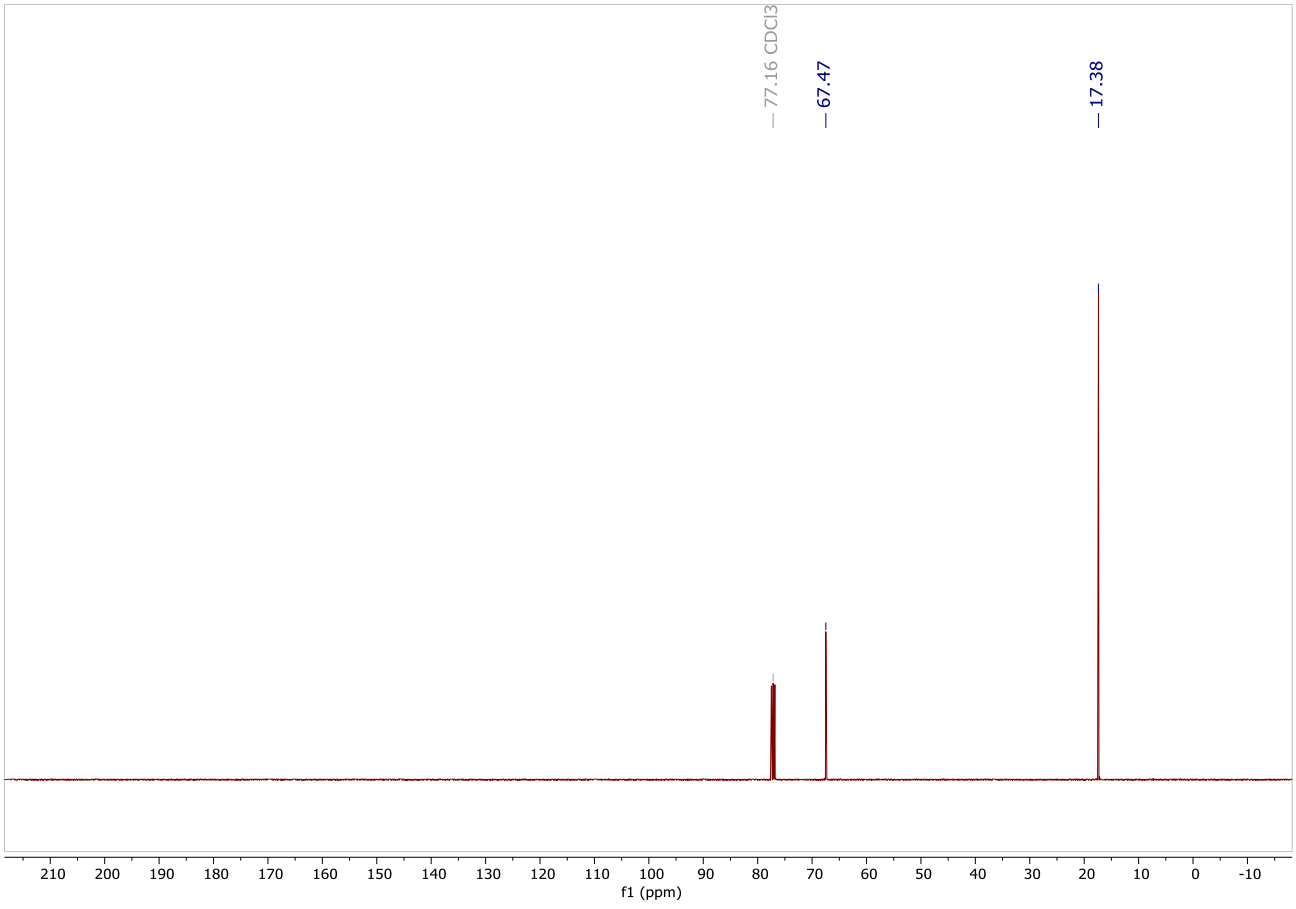
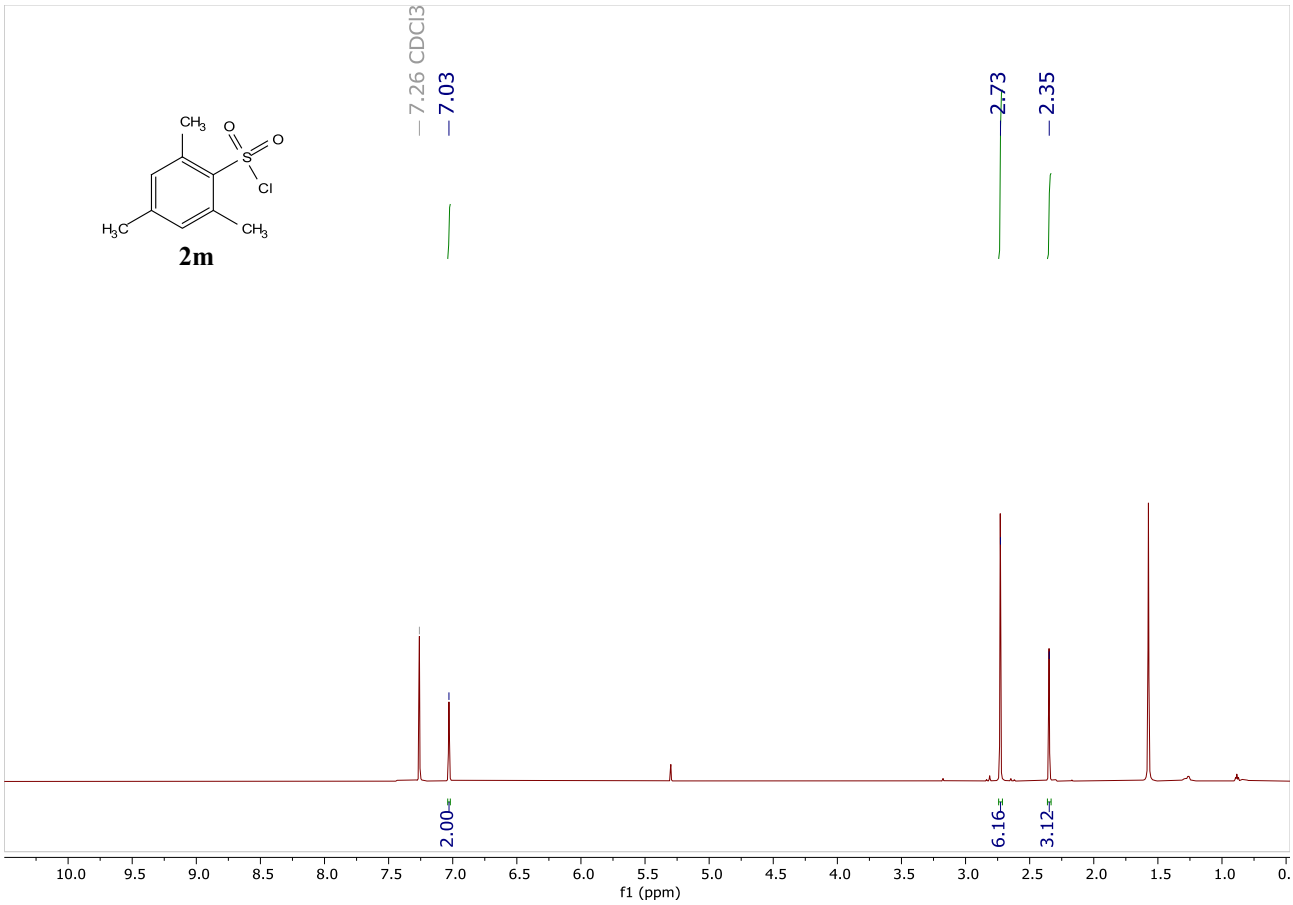
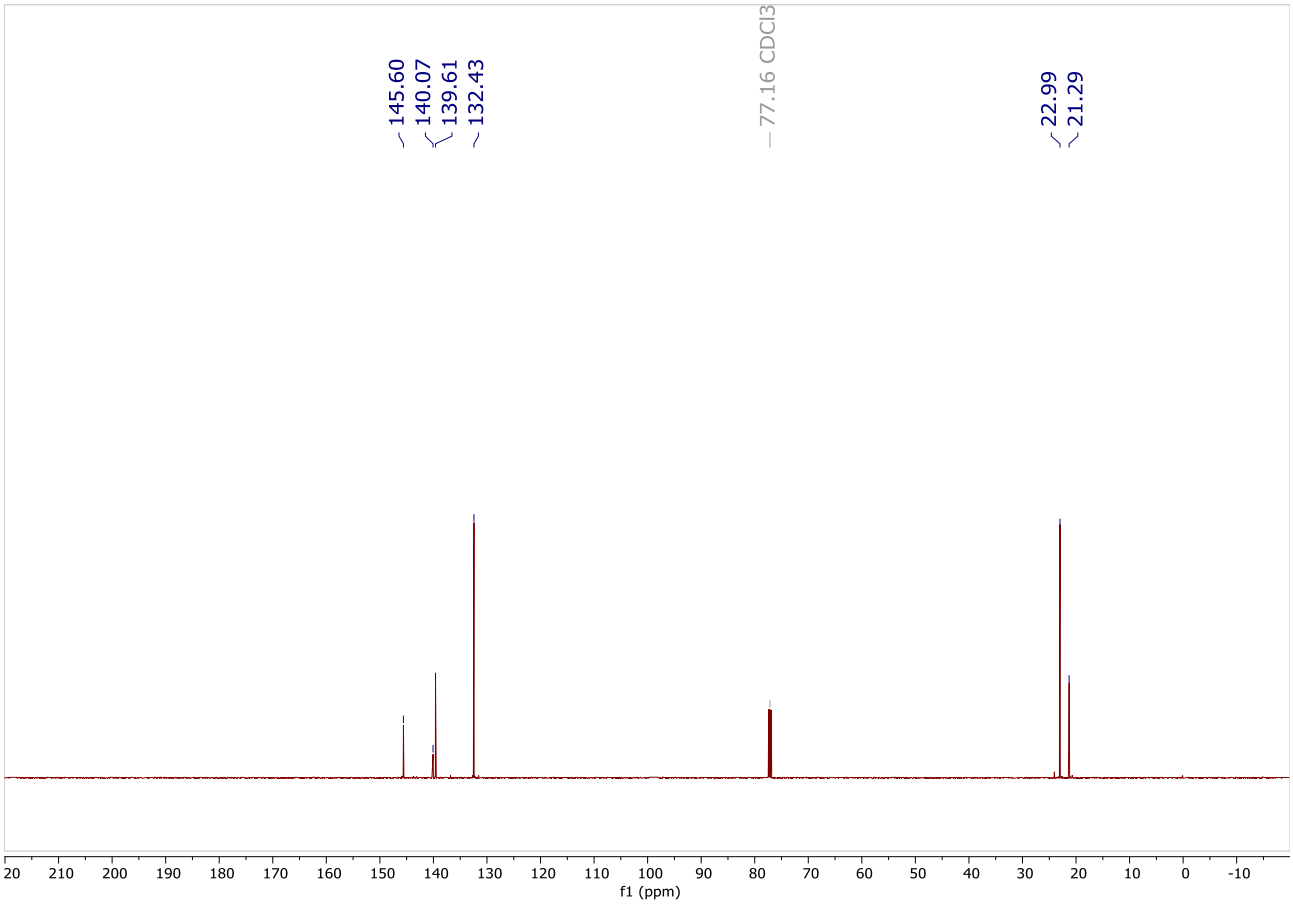
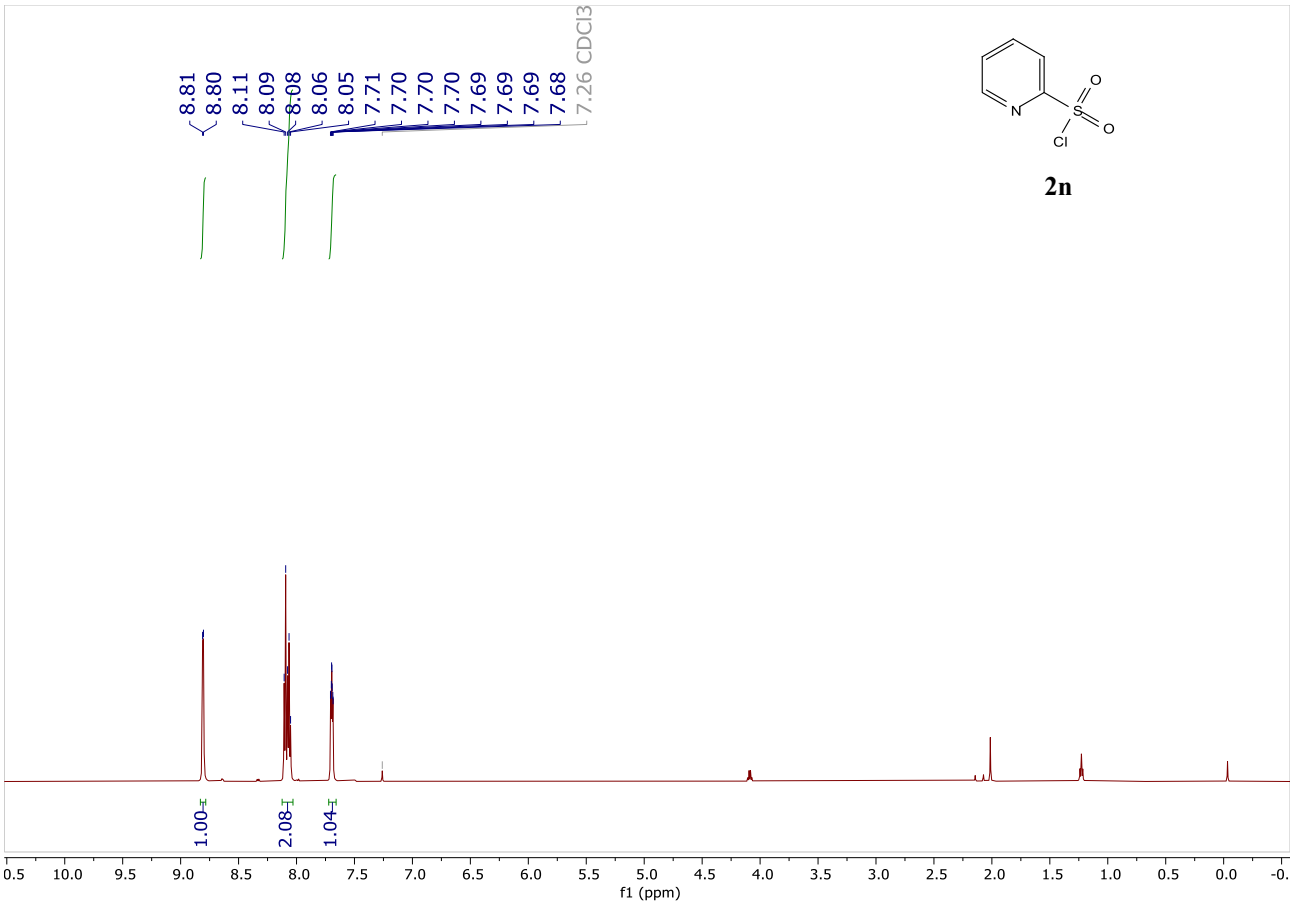
1.59
1.58
O
O
H3C
S
Cl
CH3
2l
f1 (ppm)


77.16 CDCl3
67.47
17.38
f1 (ppm)

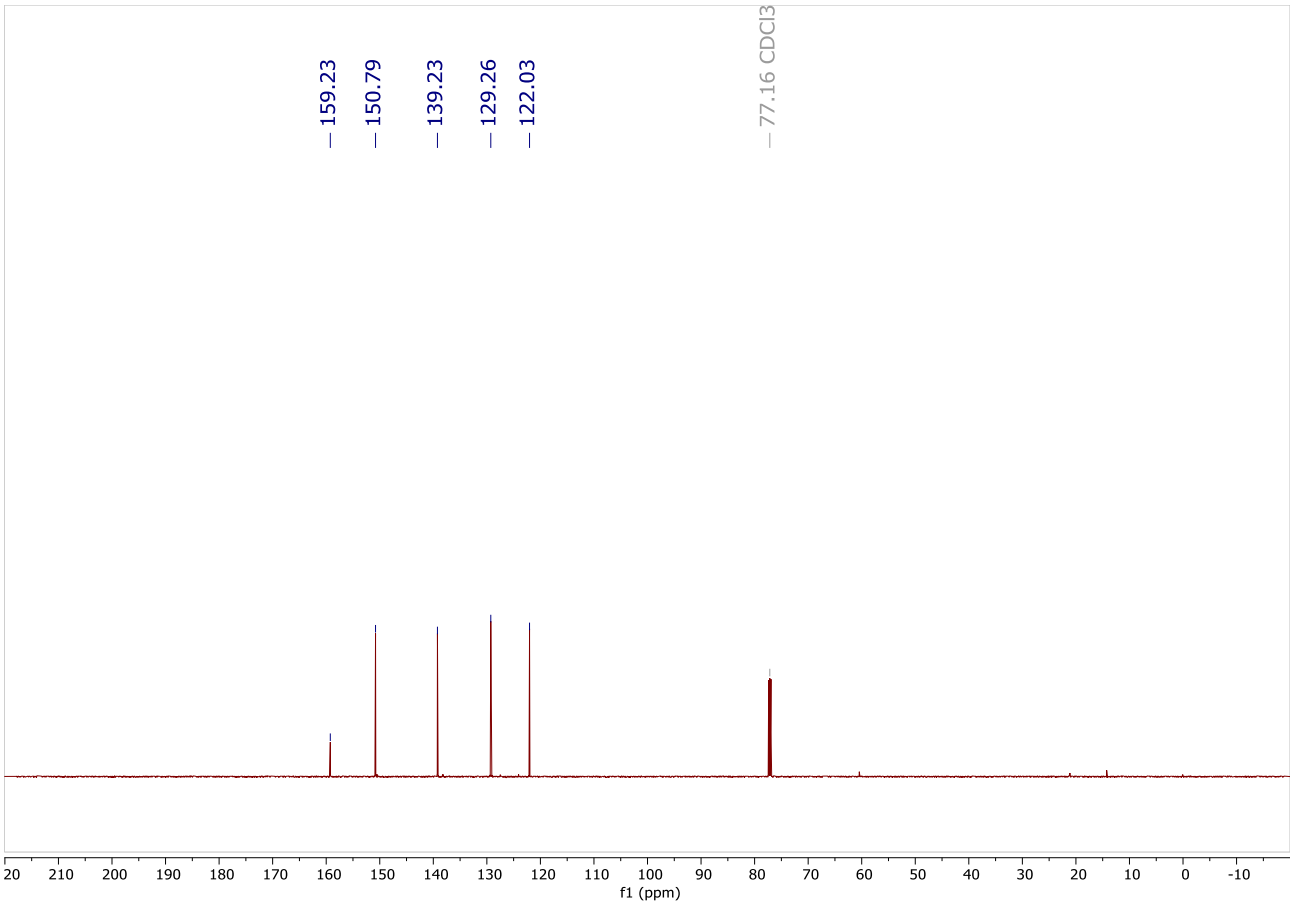

7.26 CDCl3
7.03
2.73
2.35
2.00
6.16
3.12
f1 (ppm)

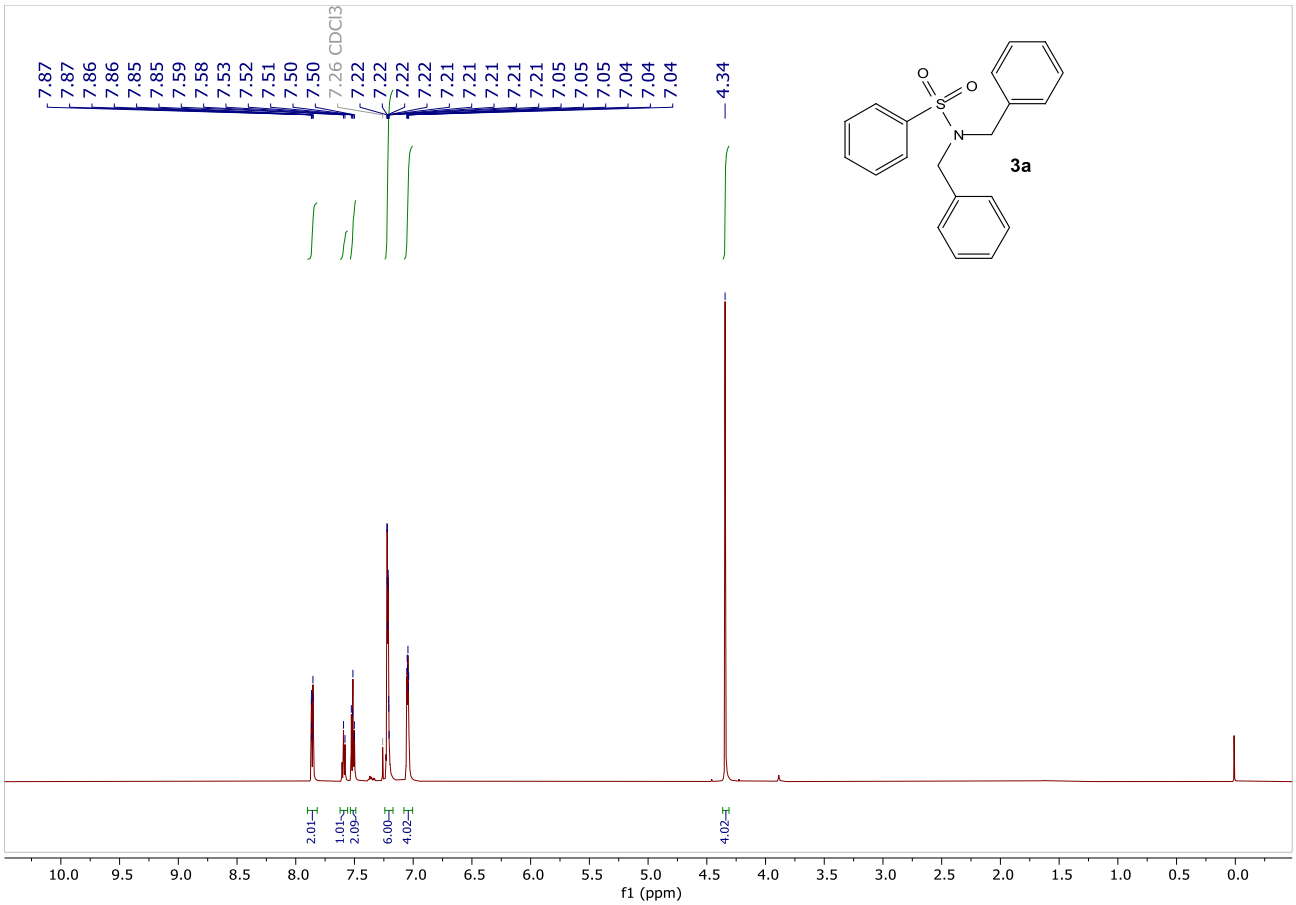
2m


145.60
140.07
139.61
132.43
77.16 CDCl3
22.99
21.29
f1 (ppm)


8.81
8.80
8.11
8.09
8.08
8.06
8.05
7.71
7.70
7.70
7.70
7.69
7.69
7.69
7.68
7.26 CDCl3
1.00
2.08
1.04
f1 (ppm)

2n


159.23
150.79
139.23
129.26
122.03
77.16 CDCl3
f1 (ppm)


7.87
7.87
7.86
7.86
7.85
7.85
7.59
7.58
7.53
7.52
7.51
7.50
7.50
7.26 CDCl3
7.22
7.22
7.22
7.21
7.21
7.21
7.21
7.05
7.05
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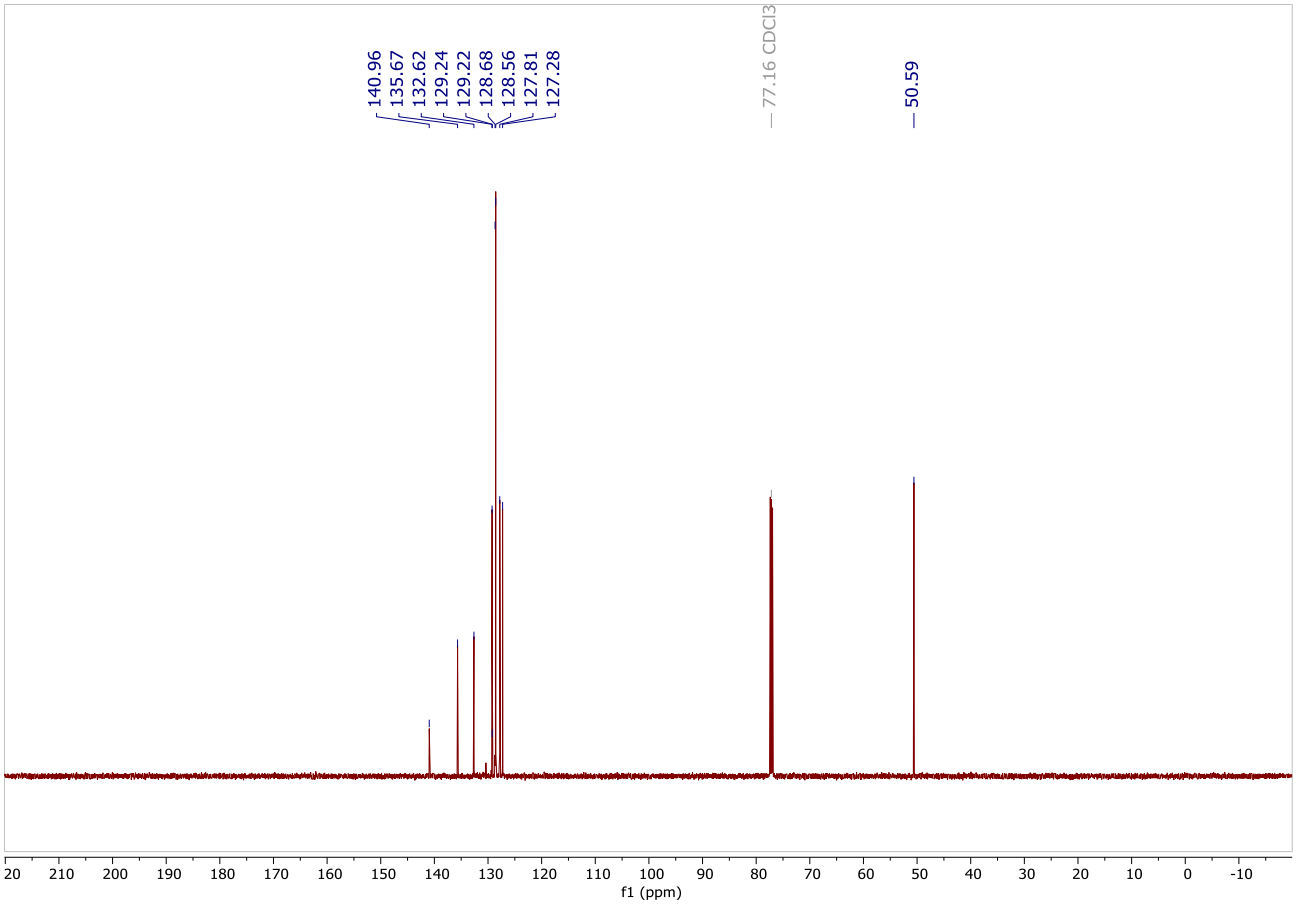
2.09
6.00
4.02
4.02
f1 (ppm)


140.96
135.67
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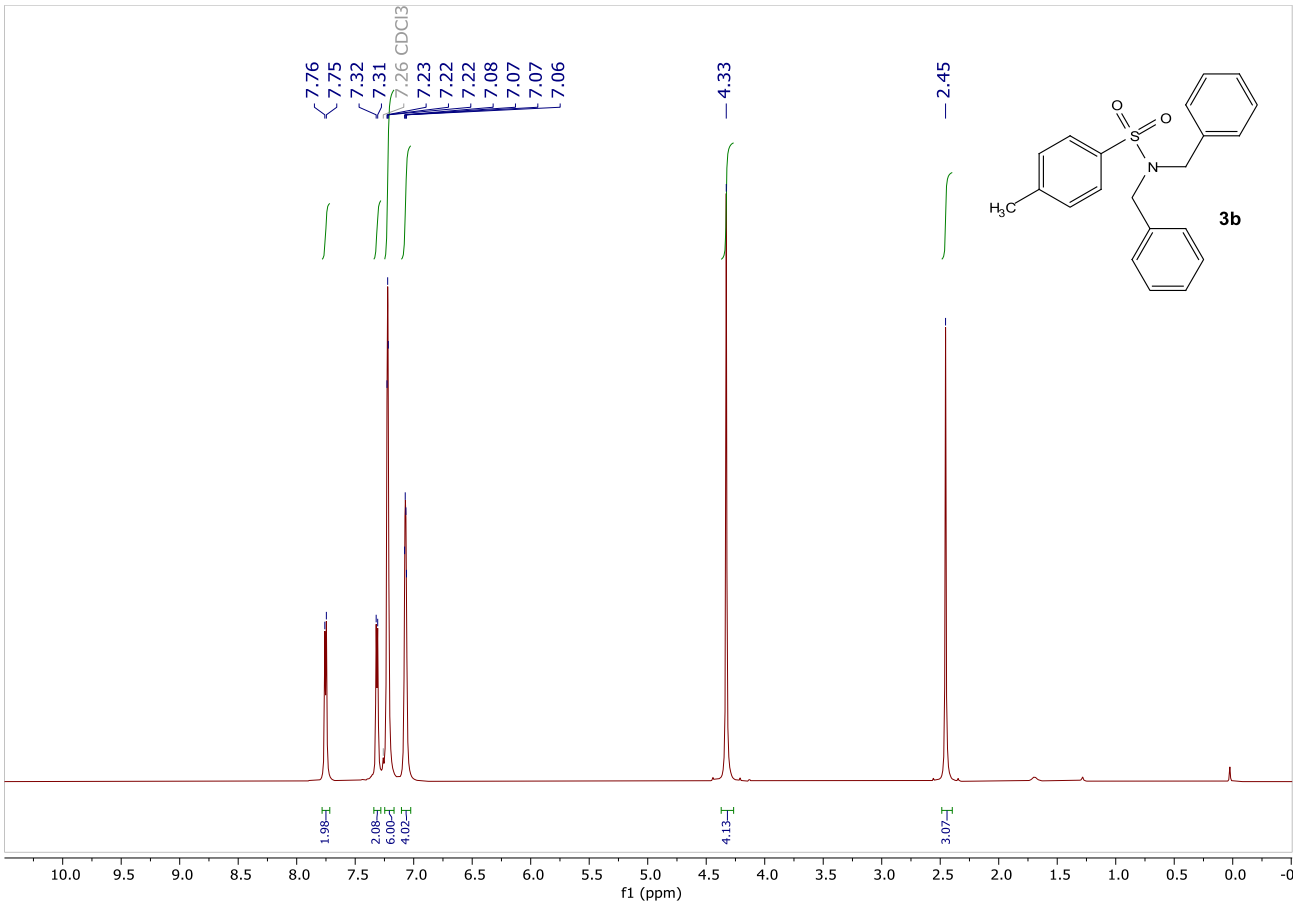
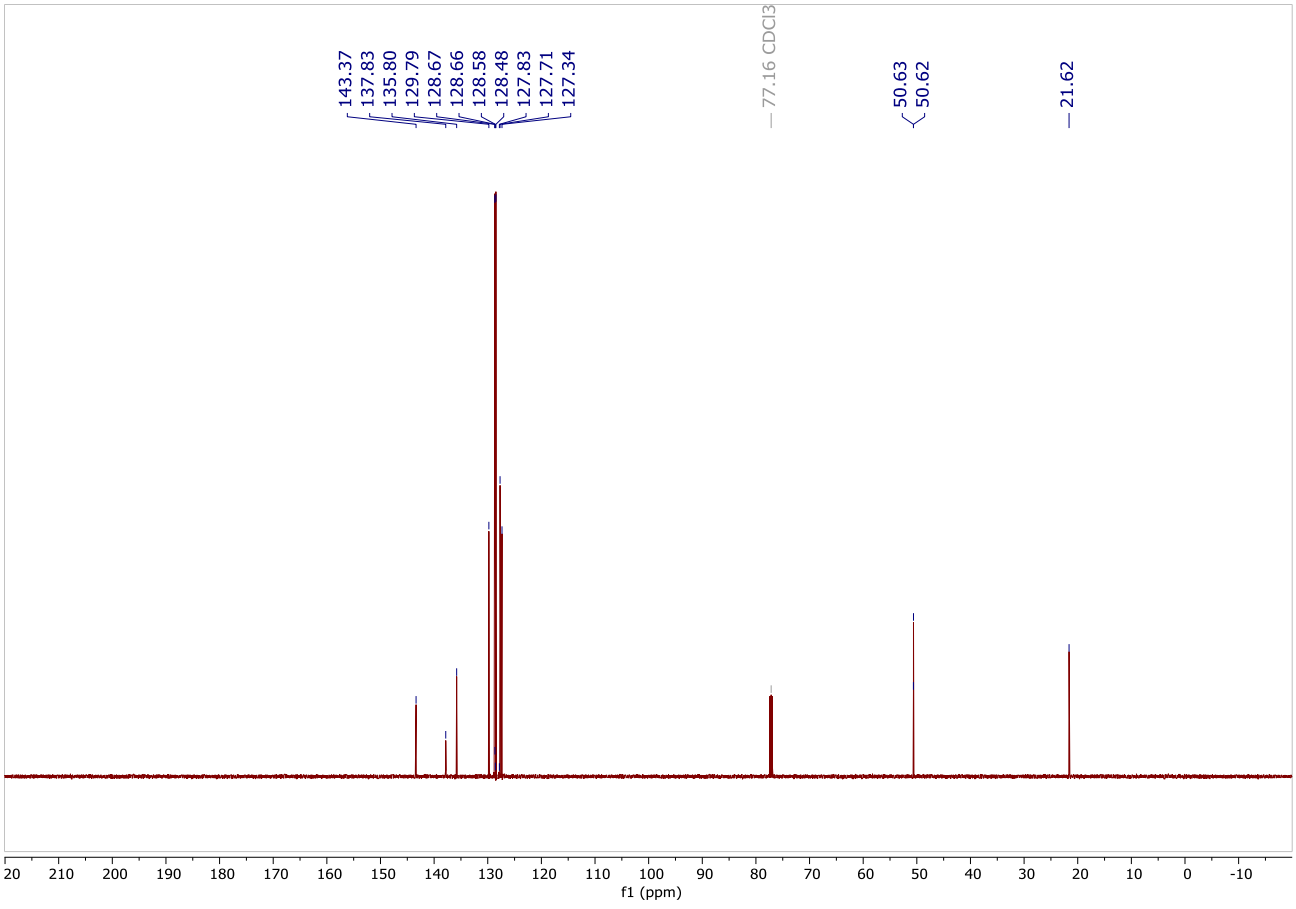
129.24
129.22
128.68
128.56
127.81
127.28
77.16 CDCl3
50.59
f1 (ppm)


7.76
7.75
7.32
7.31
7.26 CDCl3
7.23
7.22
7.22
7.08
7.07
7.07
7.06
4.33
2.45
1.98
2.08
6.00
4.02
4.13
3.07
3b
f1 (ppm)


143.37
137.83
135.80
129.79
128.67
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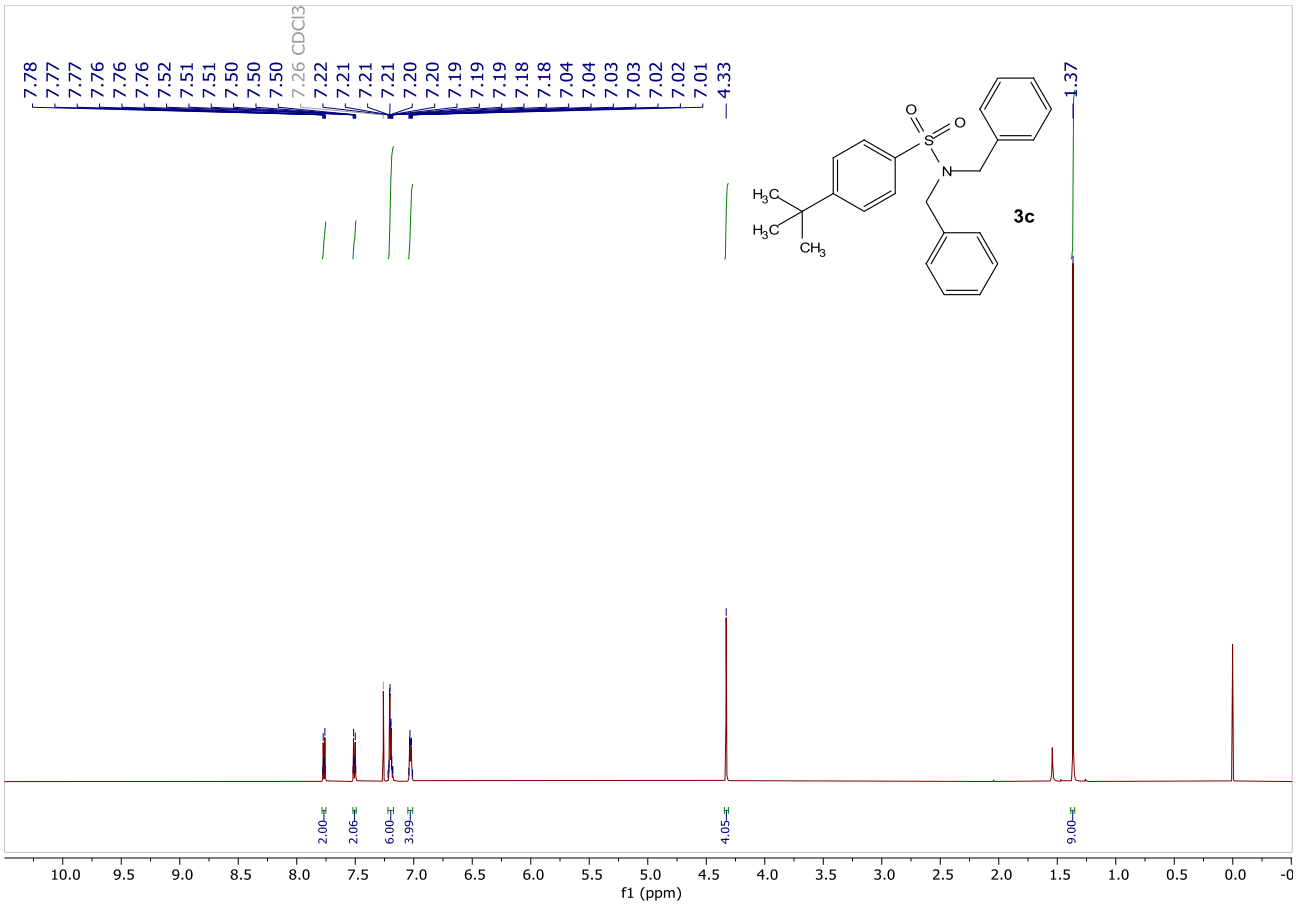
128.48
127.83
127.71
127.34
77.16 CDCl3
50.63
50.62
21.62
f1 (ppm)


7.78
7.77
7.77
7.76
7.76
7.76
7.52
7.51
7.51
7.50
7.50
7.50
7.26 CDCl3
7.22
7.21
7.21
7.21
7.20
7.20
7.19
7.19
7.19
7.18
7.18
7.04
7.04
7.03
7.03
7.02
7.02
7.01
4.33
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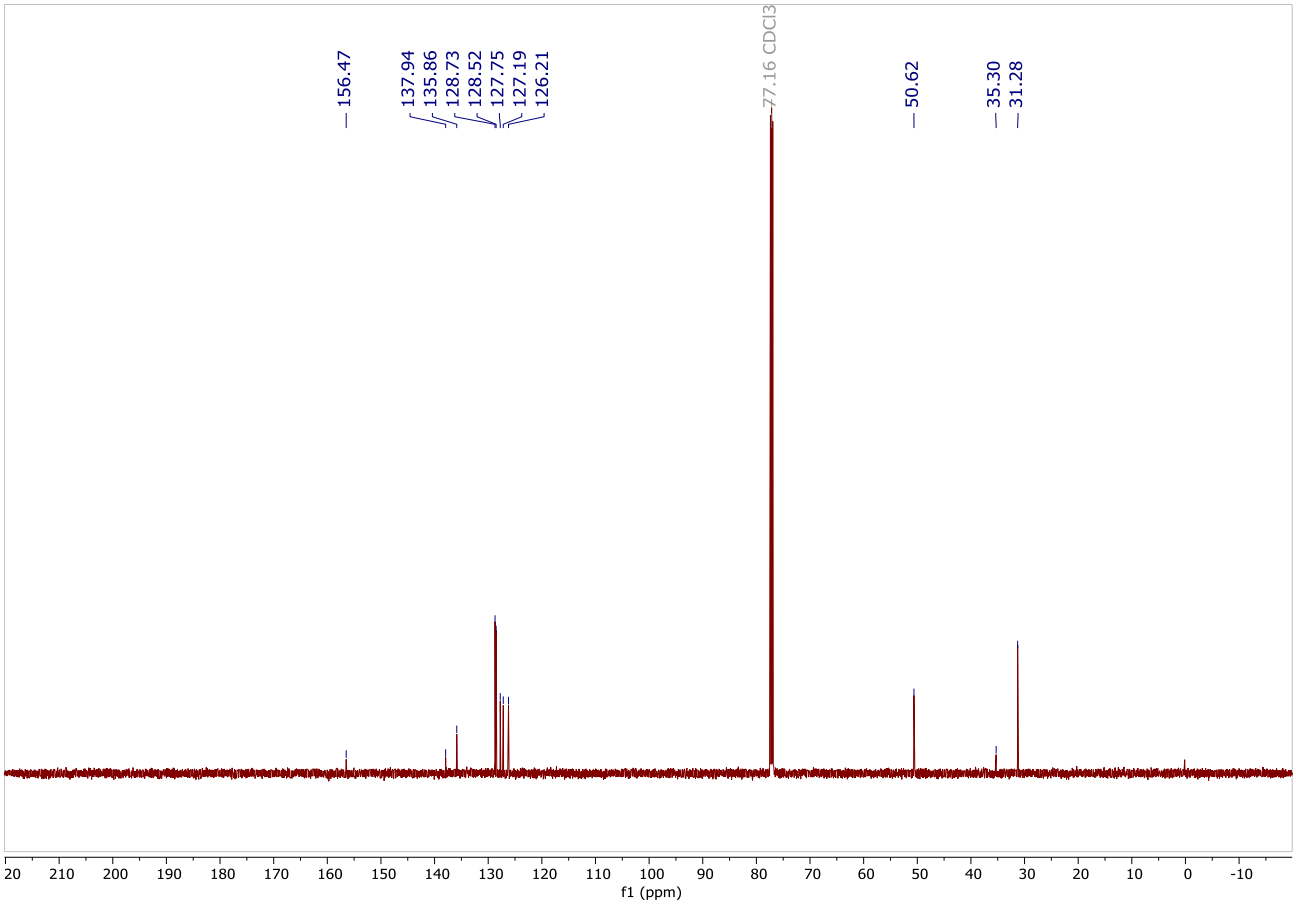
6.00
3.99
4.05
9.00
f1 (ppm)


156.47
137.94
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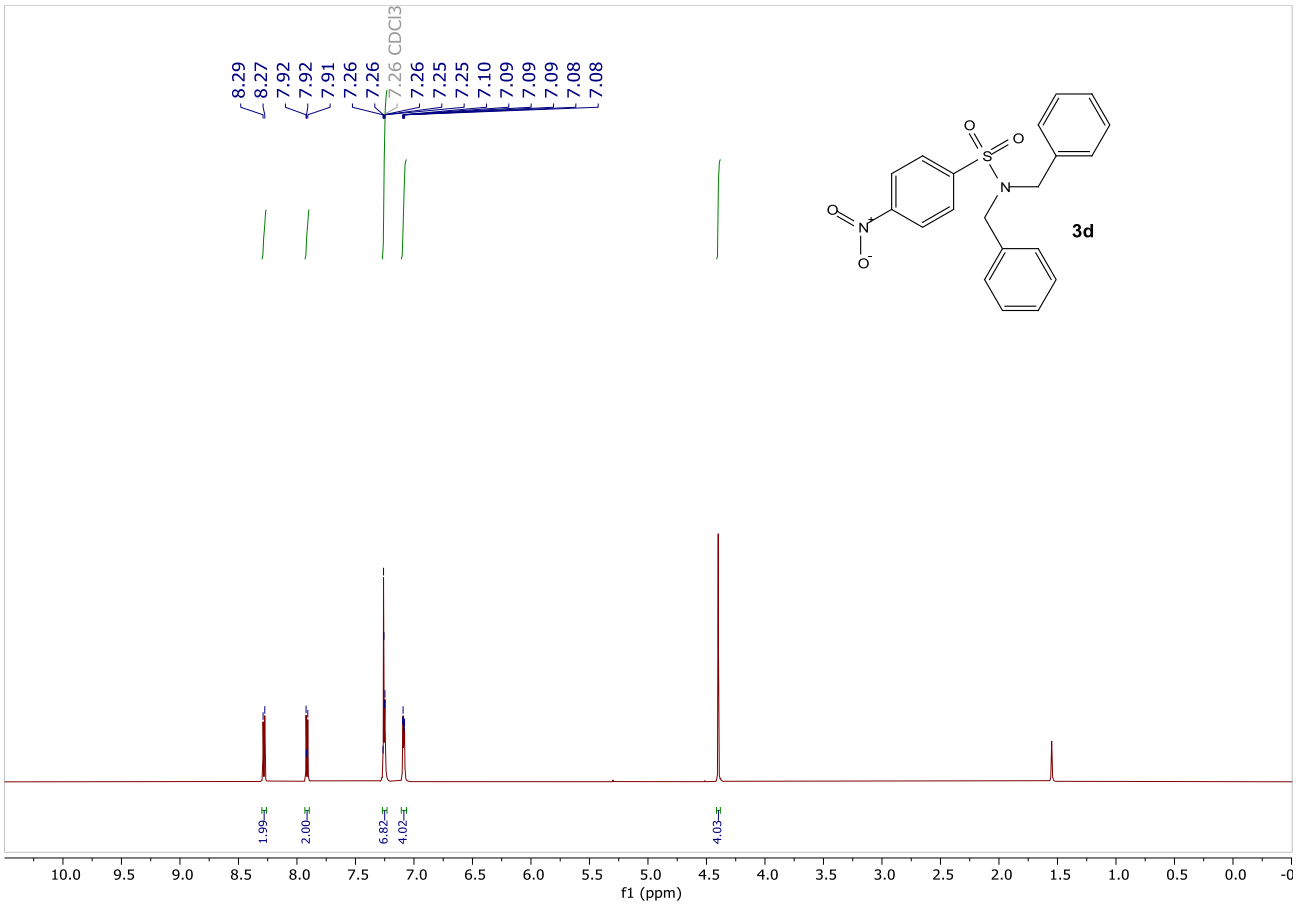
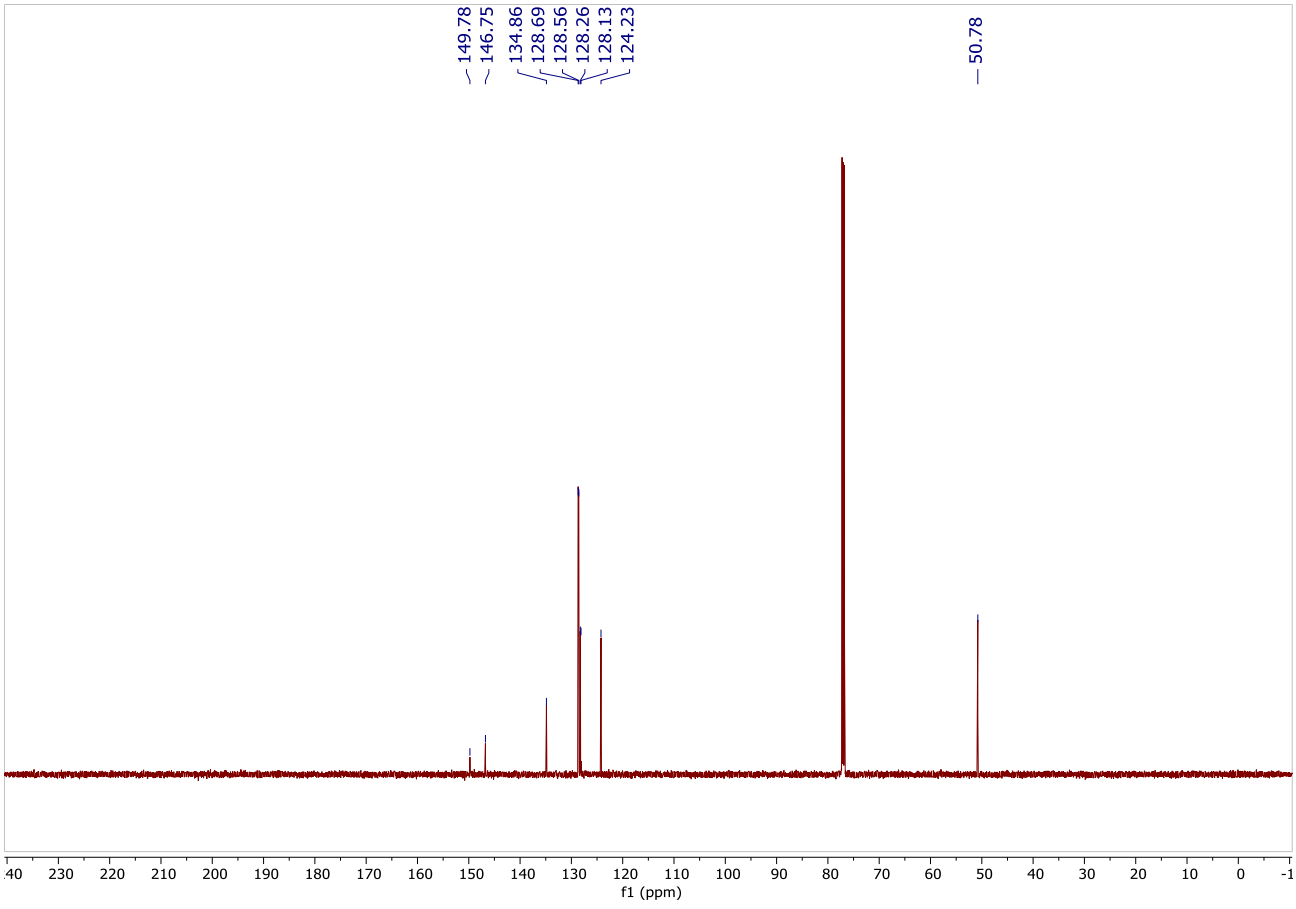
128.52
127.75
127.19
126.21
77.16 CDCl3
50.62
35.30
31.28
f1 (ppm)


8.29
8.27
7.92
7.92
7.91
7.26
7.26
7.26 CDCl3
7.26
7.25
7.25
7.10
7.09
7.09
7.09
7.08
7.08
3d
1.99
2.00
6.82
4.02
4.03
f1 (ppm)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128.69
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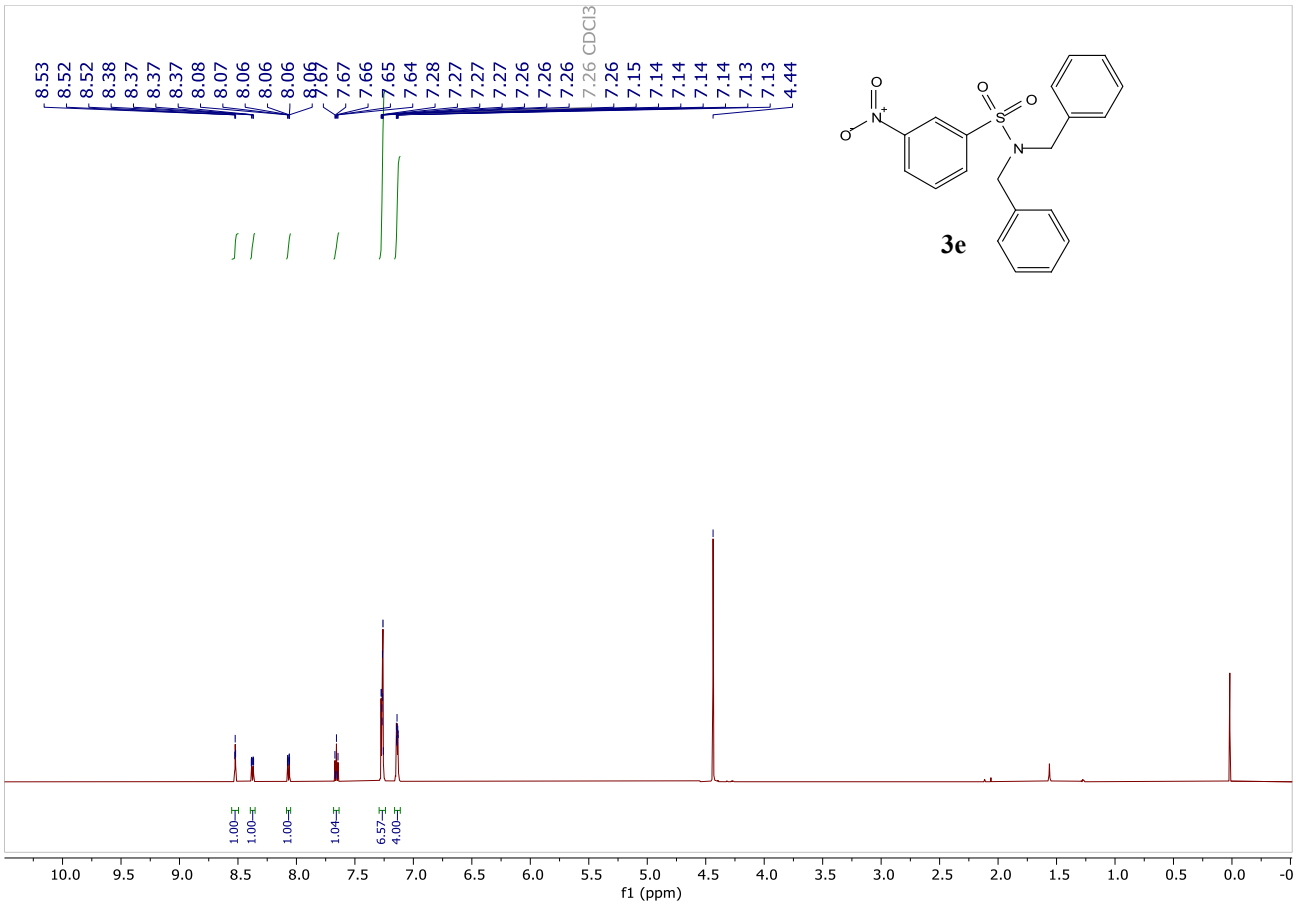
128.26
128.13
124.23
50.78
f1 (ppm)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8.37
8.37
8.08
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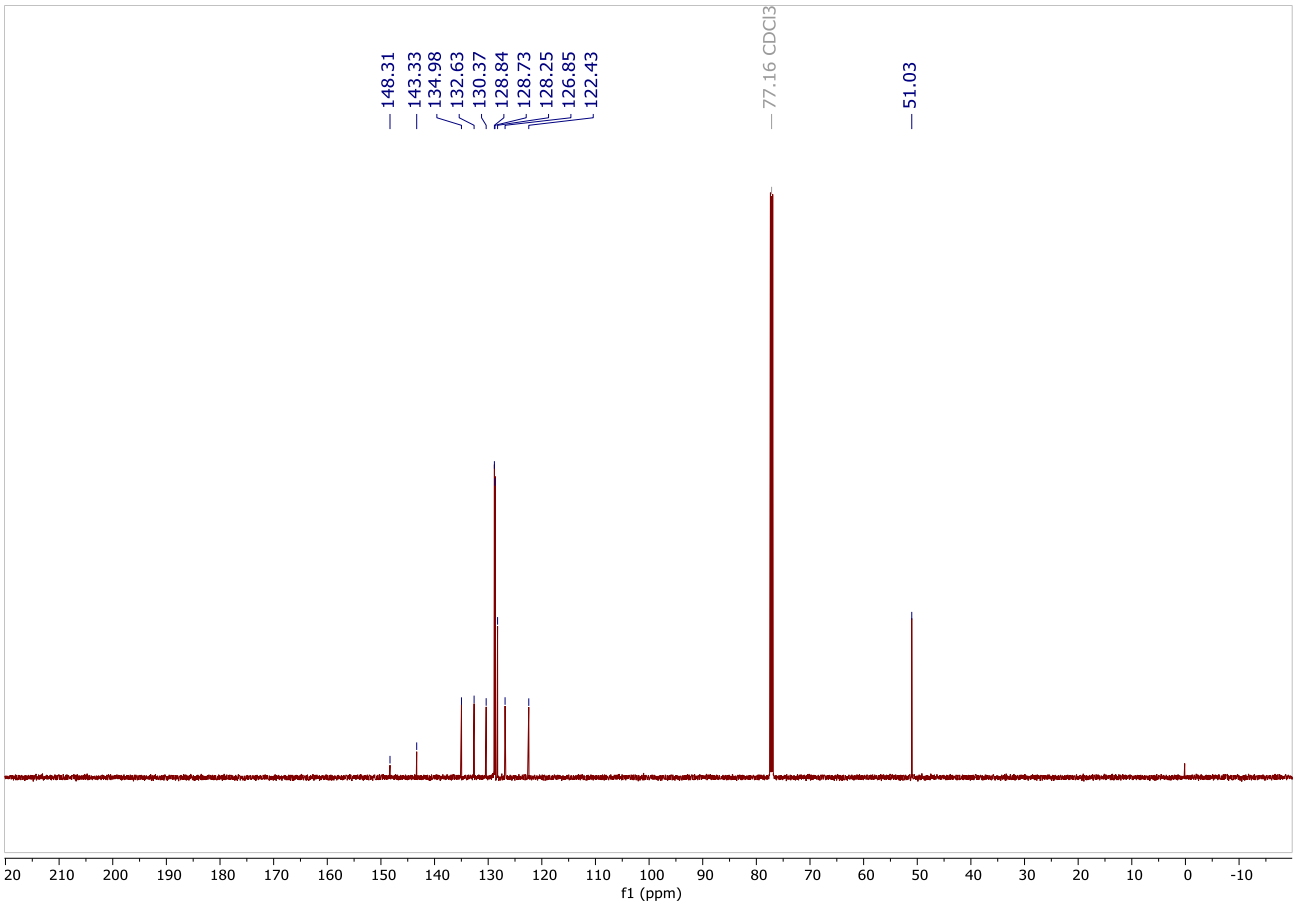
8.06
8.06
8.06
8.06
8.06
7.67
7.66
7.65
7.64
7.28
7.27
7.27
7.27
7.26
7.26
7.26
7.26
7.15
7.14
7.14
7.14
7.14
7.13
7.13
4.44
7.26 CDCl3
3e
1.00
1.00
1.00
1.04
6.57
4.00
f1 (ppm)


148.31
143.33
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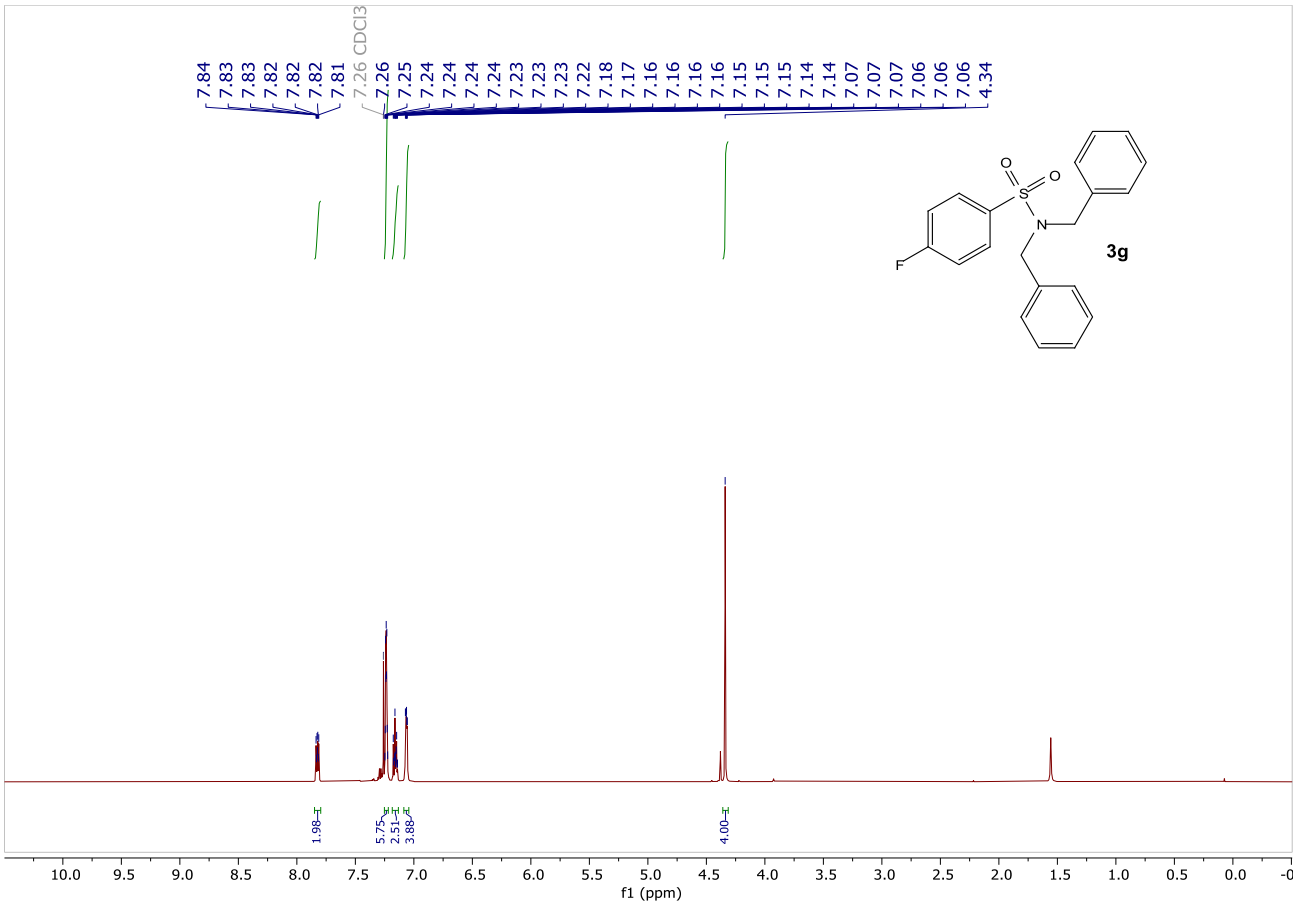
122.43
77.16 CDCl3
51.03
f1 (ppm)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7.82
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7.26 CDCl3
7.26
7.25
7.24
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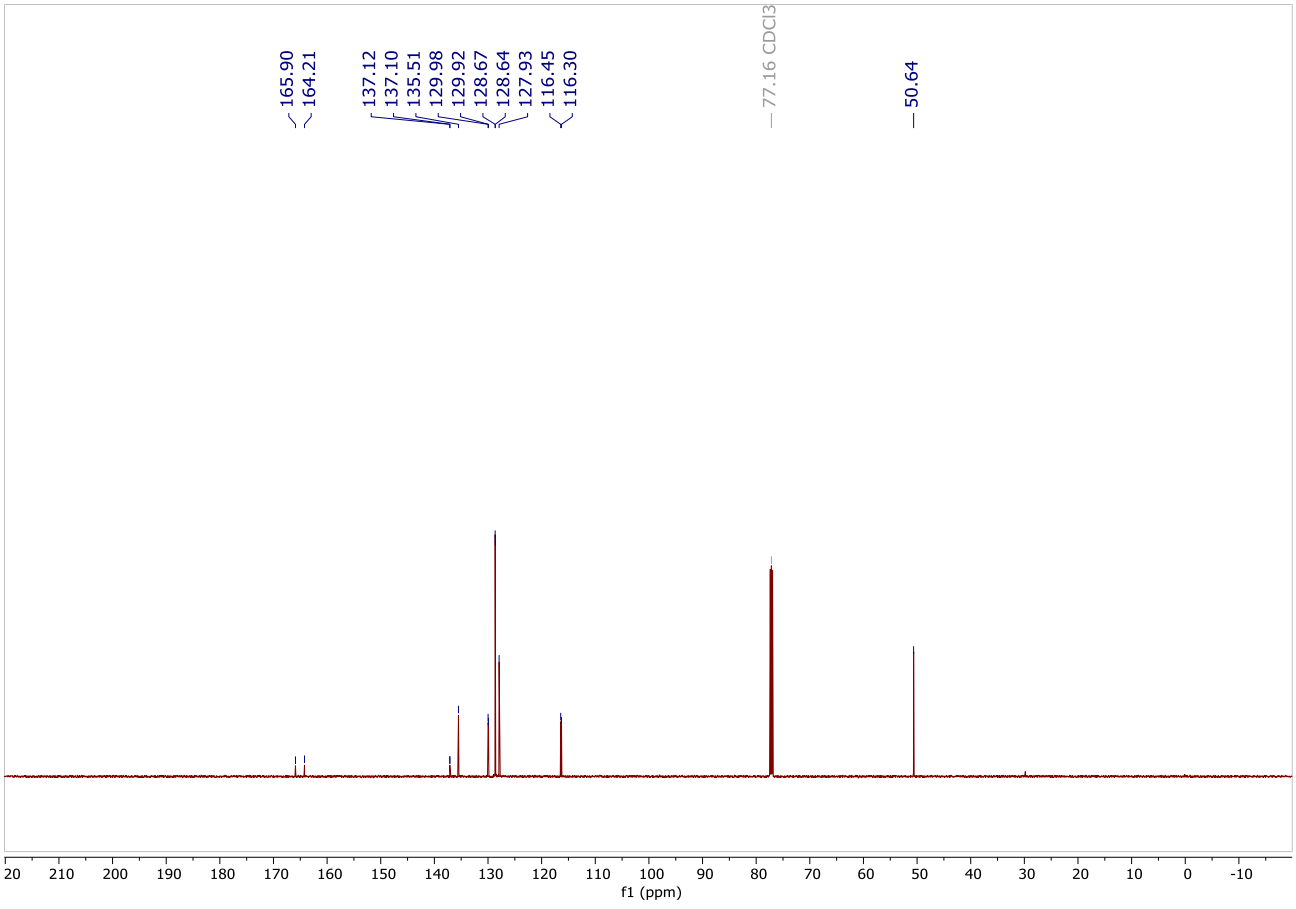
7.24
7.24
7.23
7.23
7.23
7.22
7.18
7.17
7.16
7.16
7.16
7.16
7.15
7.15
7.15
7.14
7.14
7.07
7.07
7.06
7.06
7.06
4.34
O
O
S
N
F
3g
1.98
5.75
2.51
3.88
4.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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164.21
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129.98
129.92
128.67
128.64
127.93
116.45
116.30
77.16 CDCl3
50.64
20
210
200
190
180
170
160
150
140
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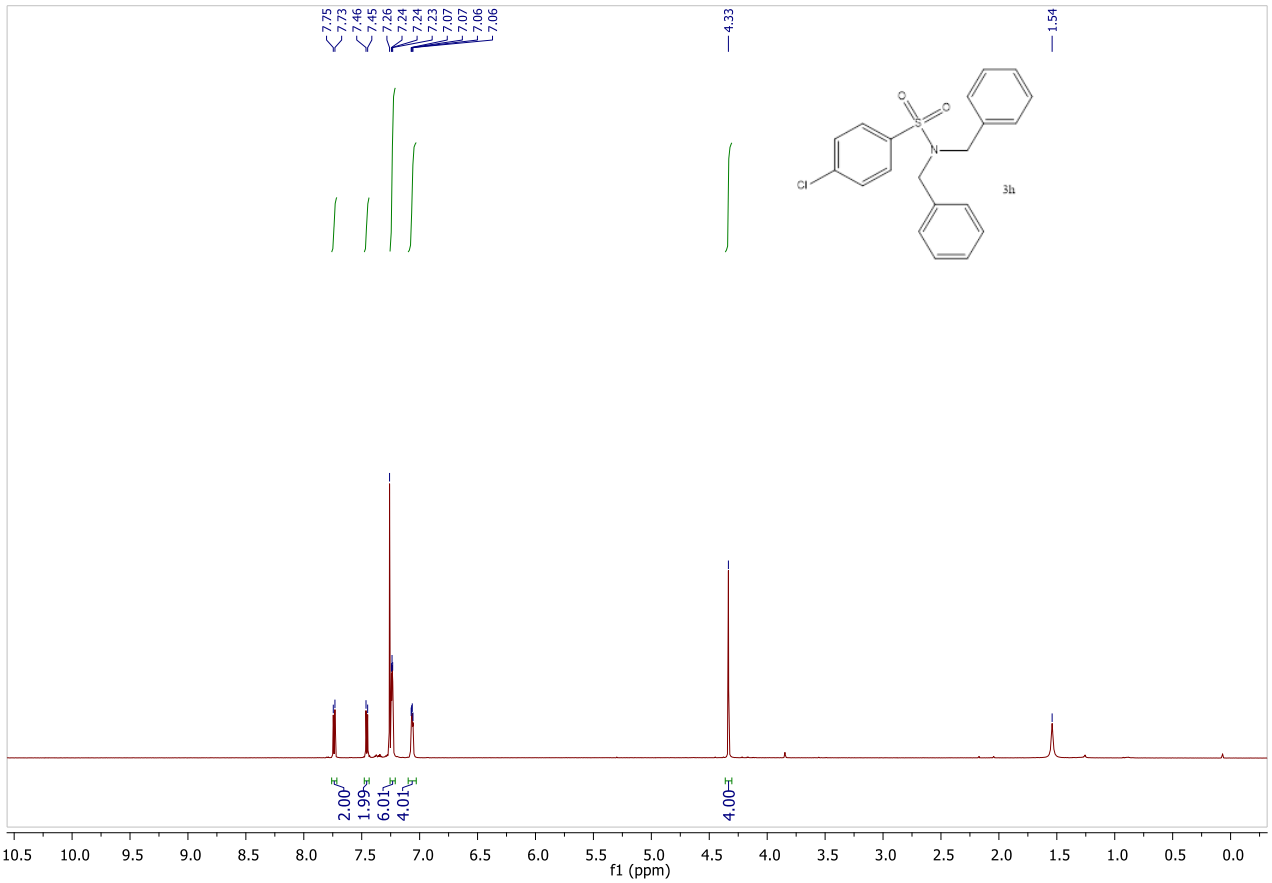
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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7.46
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7.24
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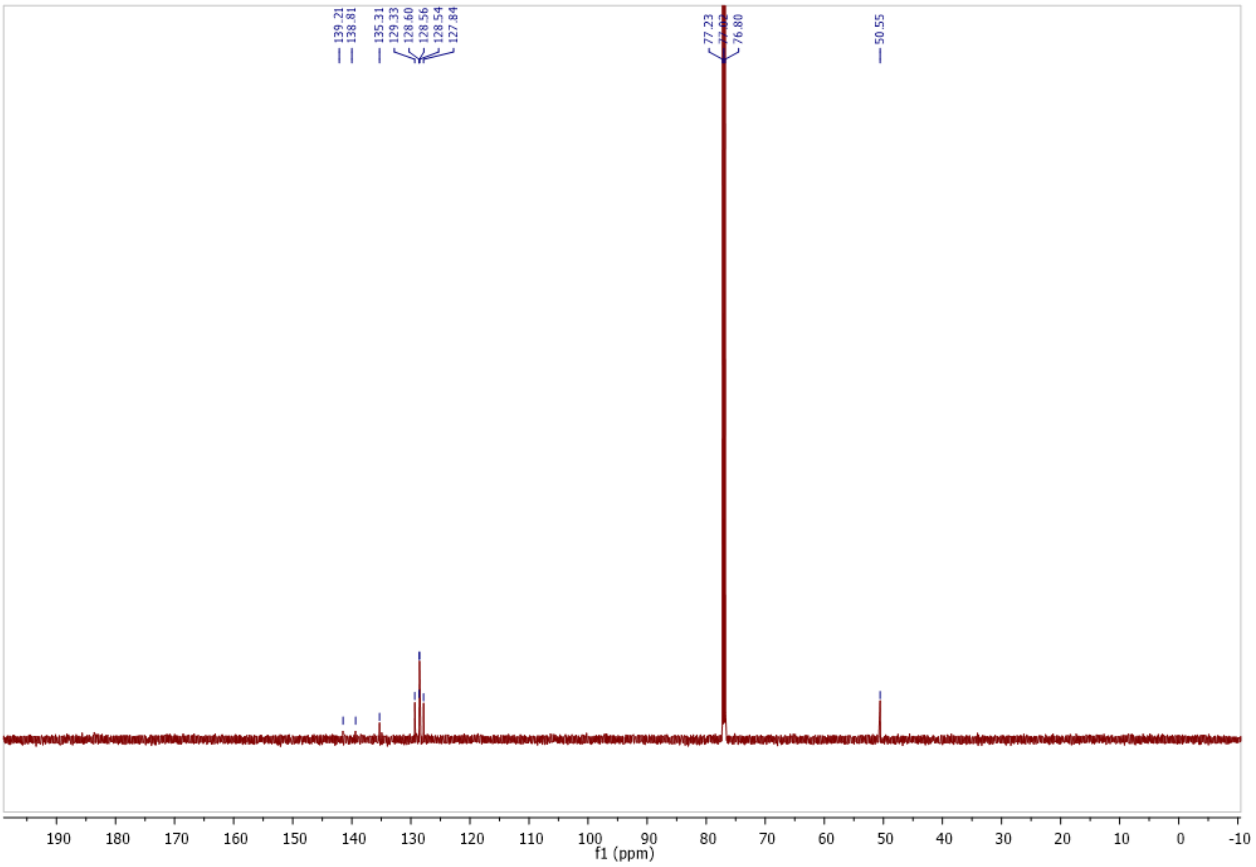
7.23
7.07
7.07
7.06
7.06
4.33
1.54
Cl
S
O
O
N
3h
2.00
1.99
6.01
4.01
4.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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135.31
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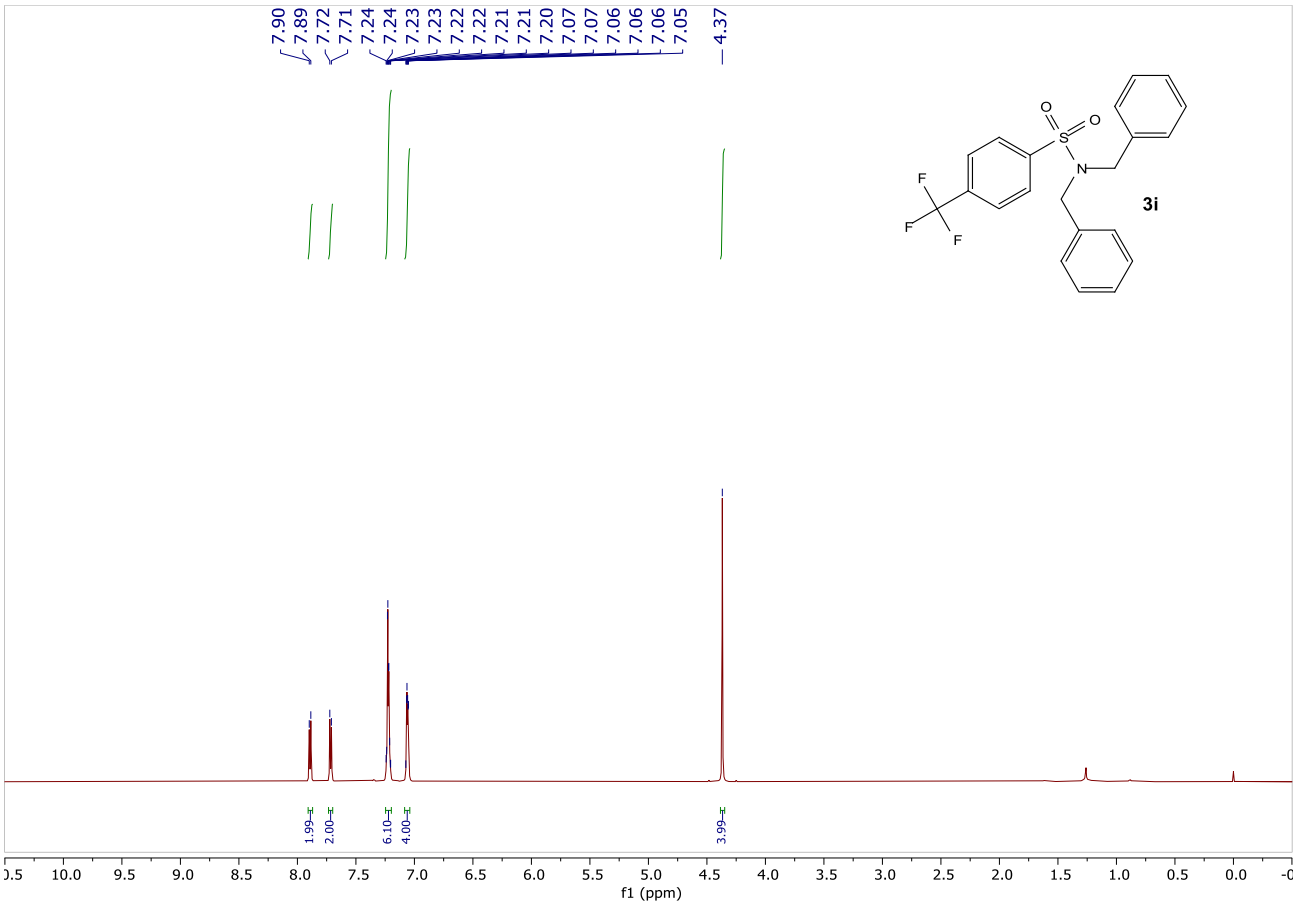
128.60
128.56
128.54
127.84
77.23
77.03
76.80
50.55
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.24
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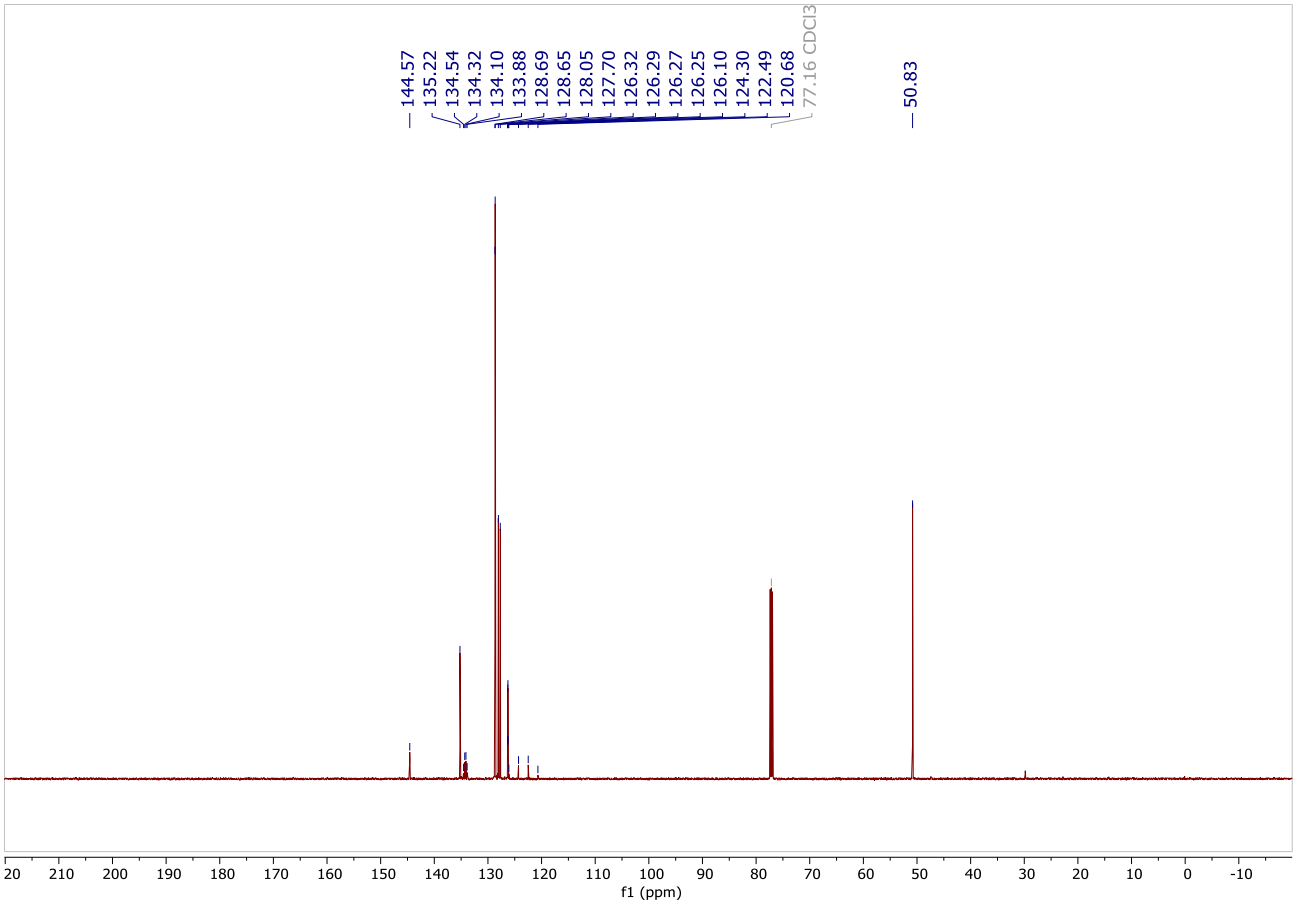
7.22
7.21
7.21
7.20
7.07
7.07
7.06
7.06
7.06
7.05
4.37
O
O
S
N
F
F
F
3i
1.99
2.00
6.10
4.00
3.99
f1 (ppm)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127.70
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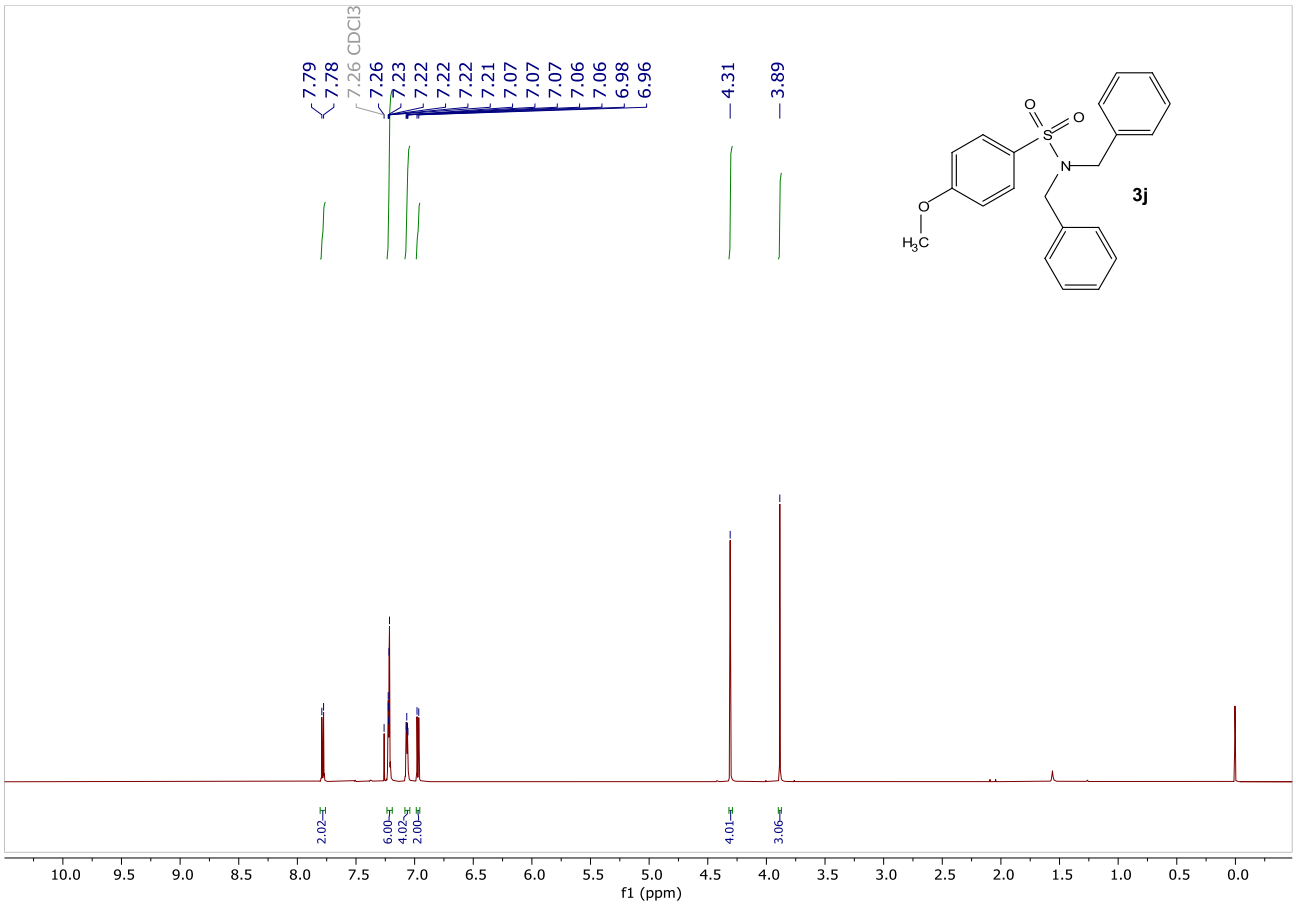
126.25
126.10
124.30
122.49
120.68
77.16 CDCl3
50.83
f1 (ppm)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7.78
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7.23
7.22
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7.21
7.07
7.07
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7.06
7.06
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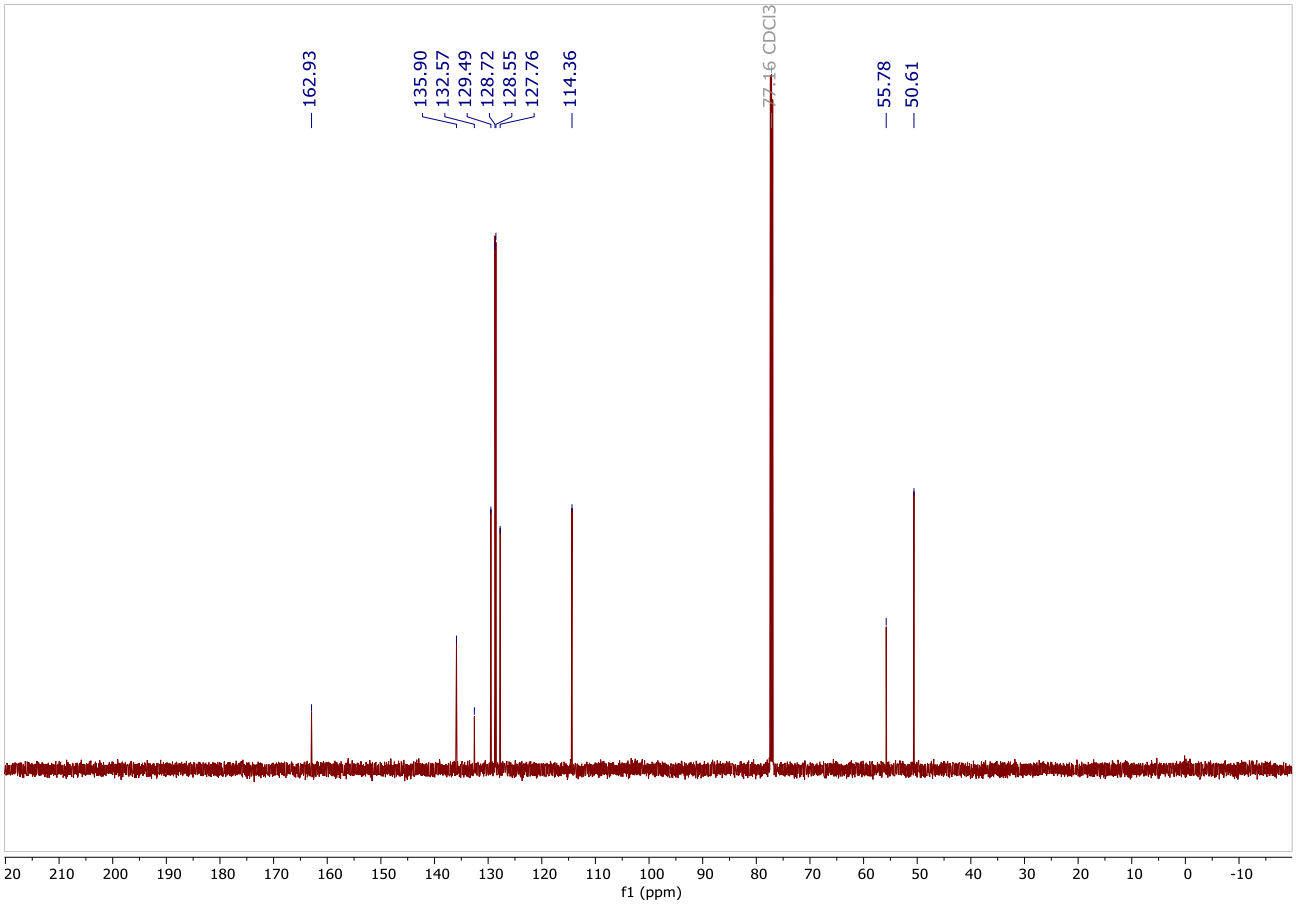
4.02
2.00
4.01
3.06
f1 (ppm)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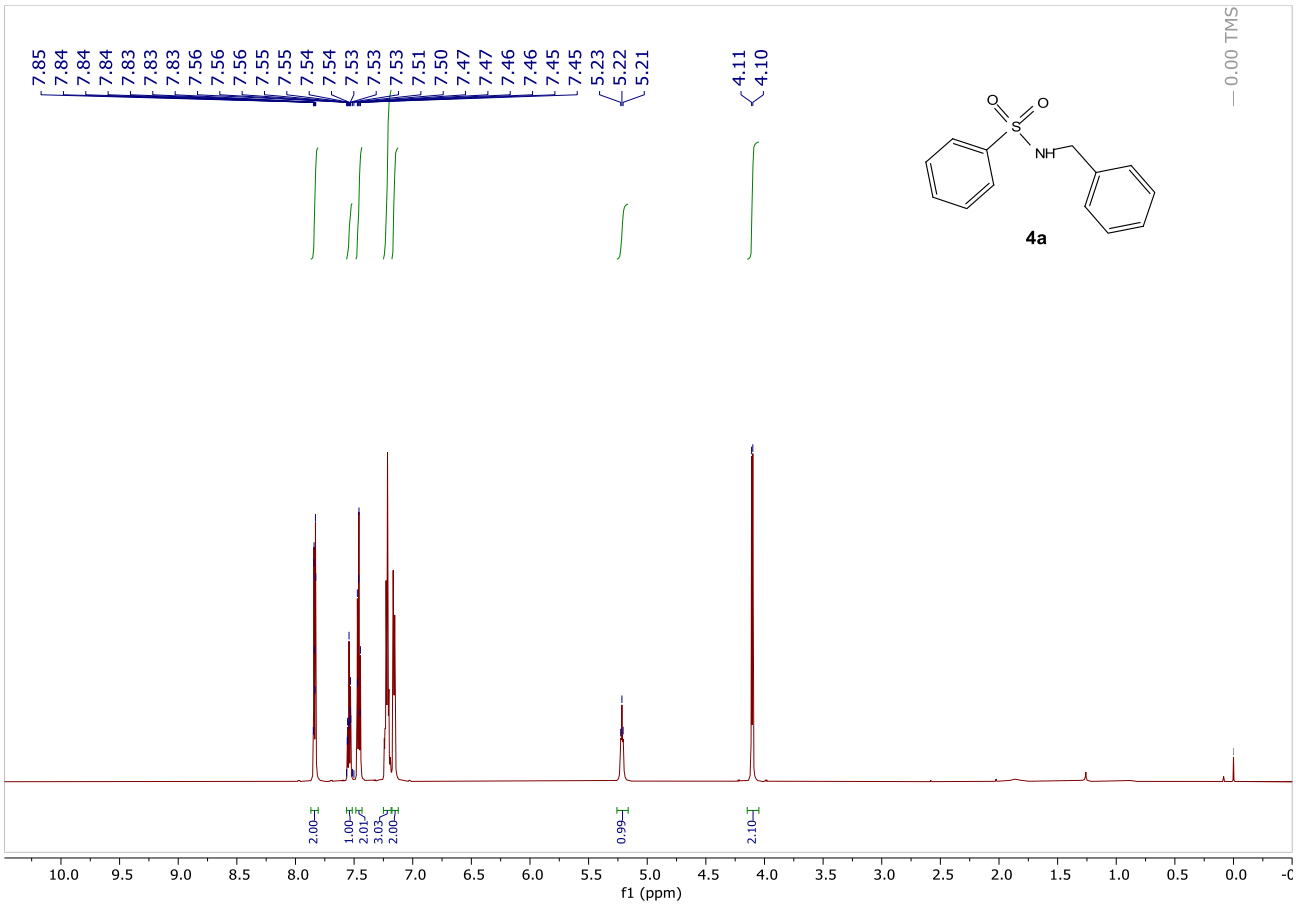
129.49
128.72
128.55
127.76
114.36
77.16 CDCl3
55.78
50.61
f1 (ppm)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7.45
7.45
5.23
5.22
5.21
4.11
4.10
0.00 TMS
O
O
S
NH
4a
2.00
1.00
2.01
3.03
2.00
0.99
2.10
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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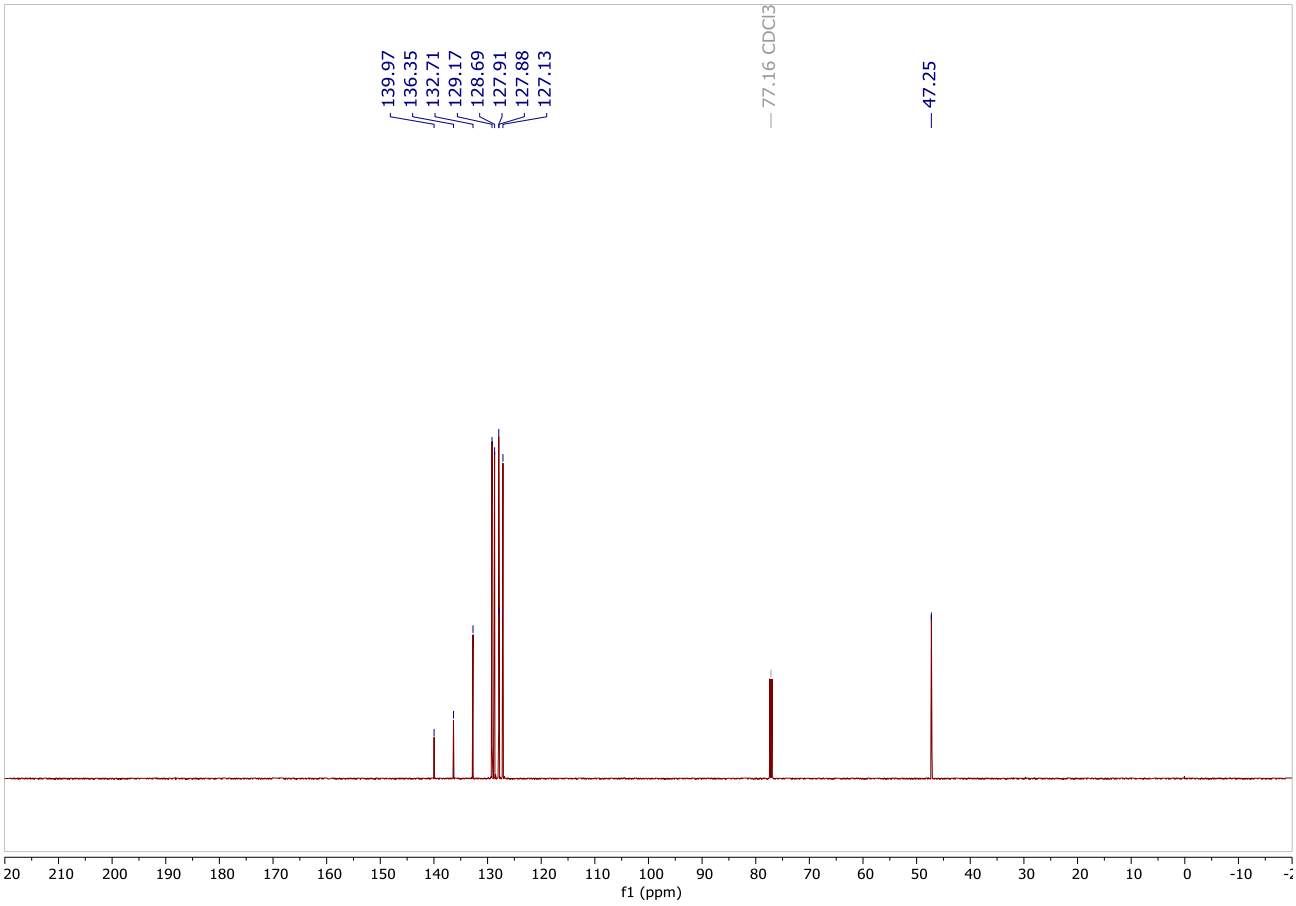
0.0
f1 (ppm)


139.97
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129.17
128.69
127.91
127.88
127.13
77.16 CDCl3
47.25
20
210
200
190
180
170
160
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100
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80
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30
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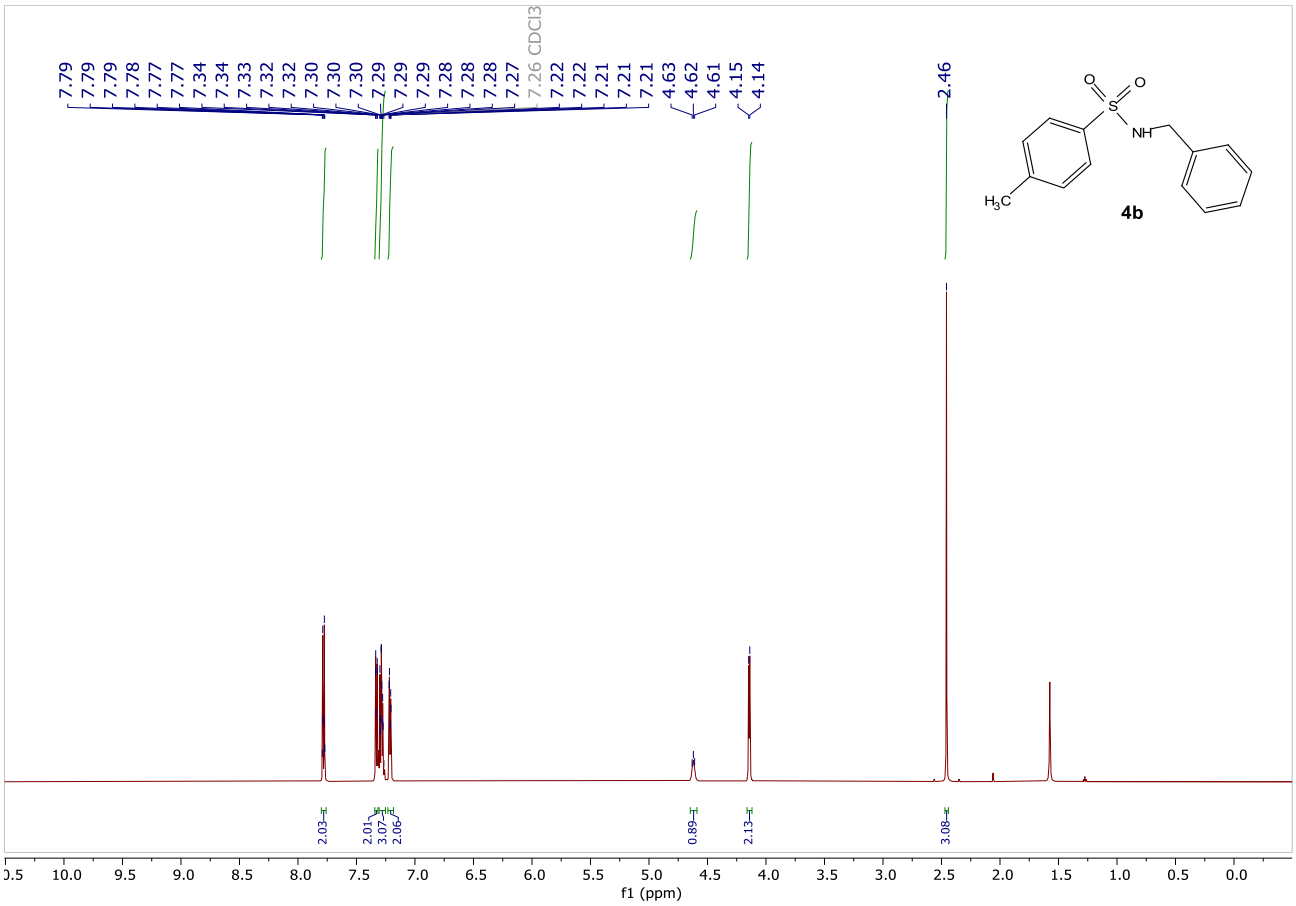
-10
f1 (ppm)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7.77
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7.34
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7.32
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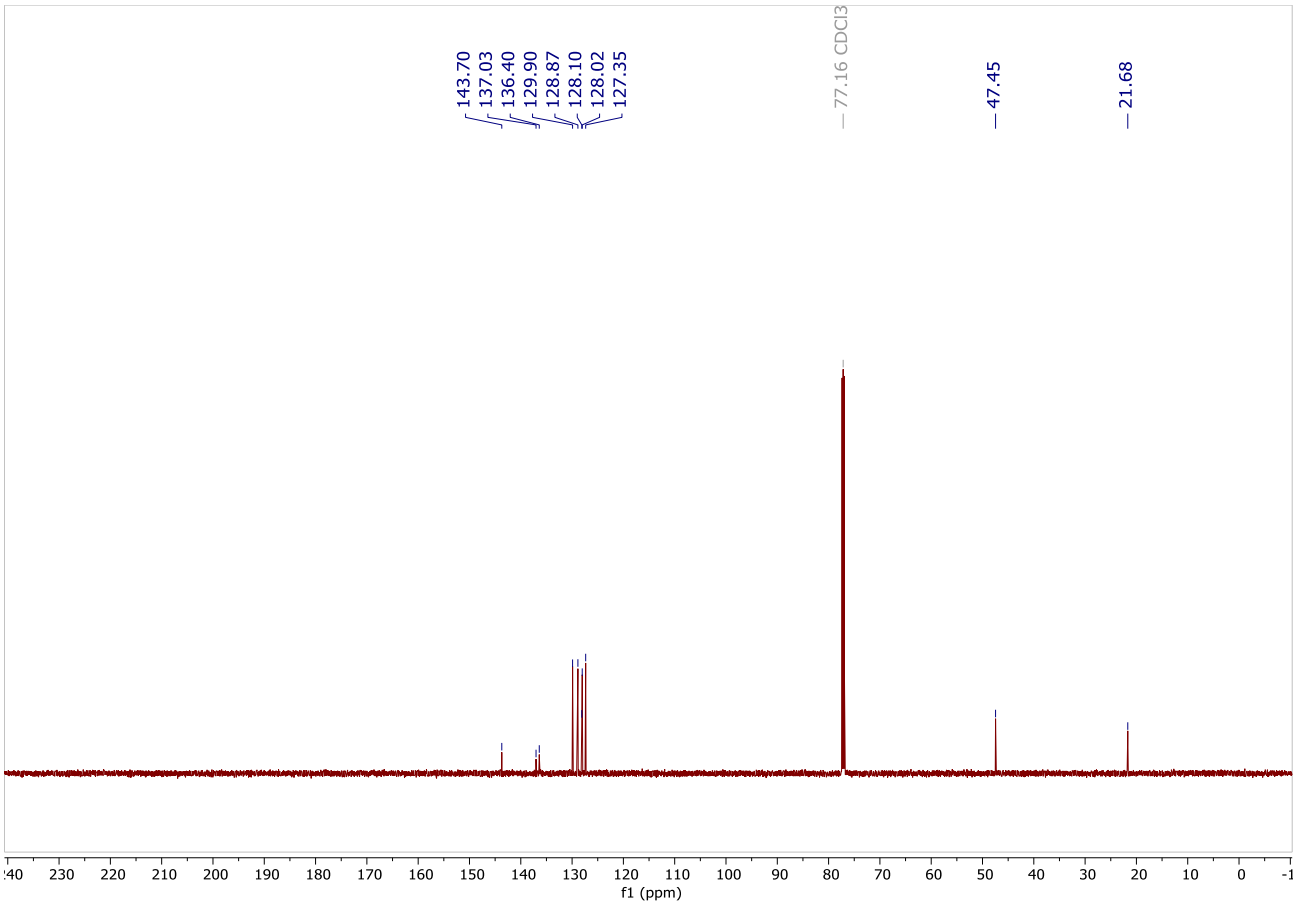
7.30
7.30
7.29
7.29
7.29
7.28
7.28
7.28
7.27
7.26 CDCl3
7.22
7.22
7.21
7.21
7.21
4.63
4.62
4.61
4.15
4.14
2.46
O
O
S
NH
H3C
4b
2.03
2.01
3.07
2.06
0.89
2.13
3.08
f1 (ppm)


143.70
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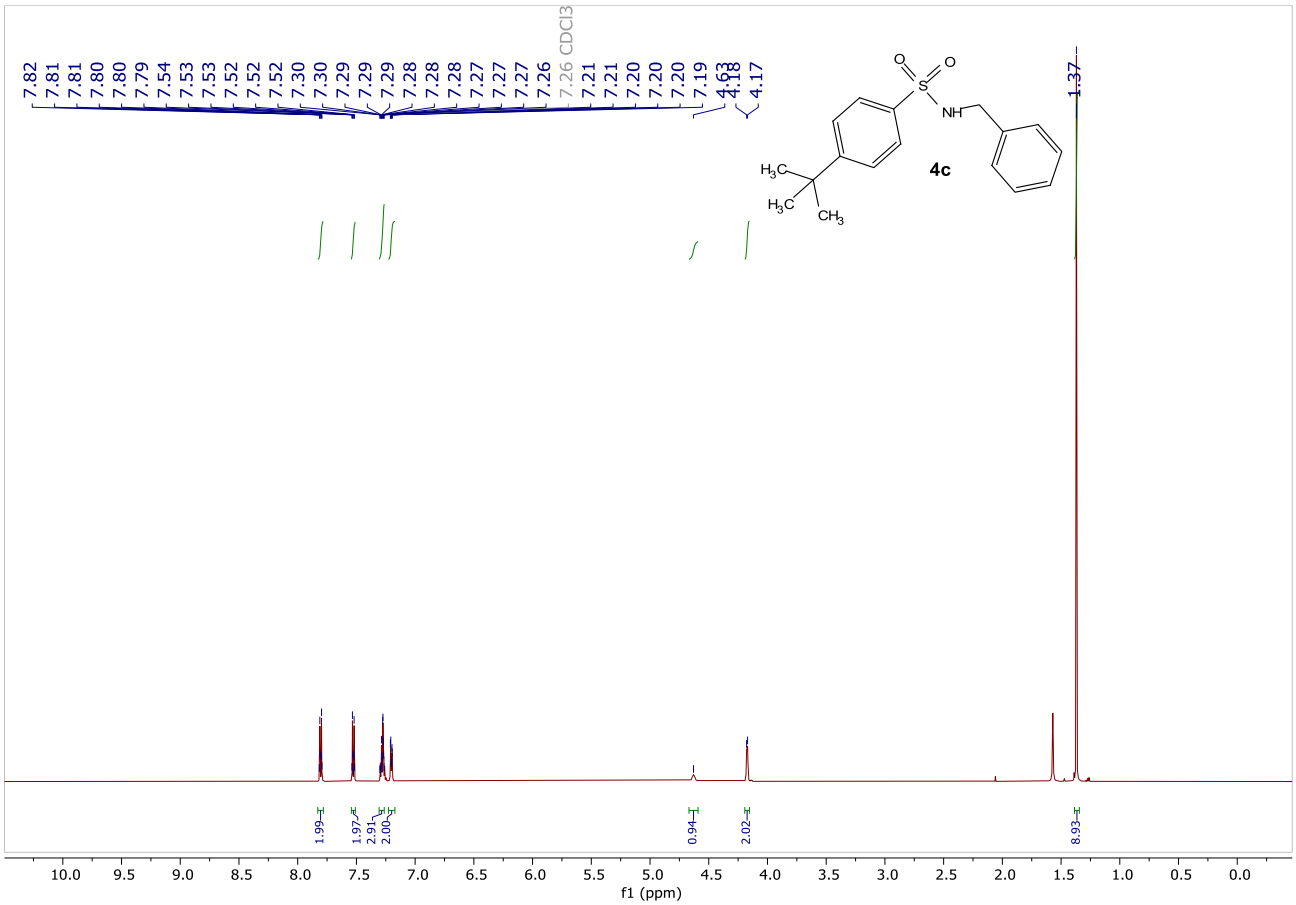
128.02
127.35
77.16 CDCl3
47.45
21.68
f1 (ppm)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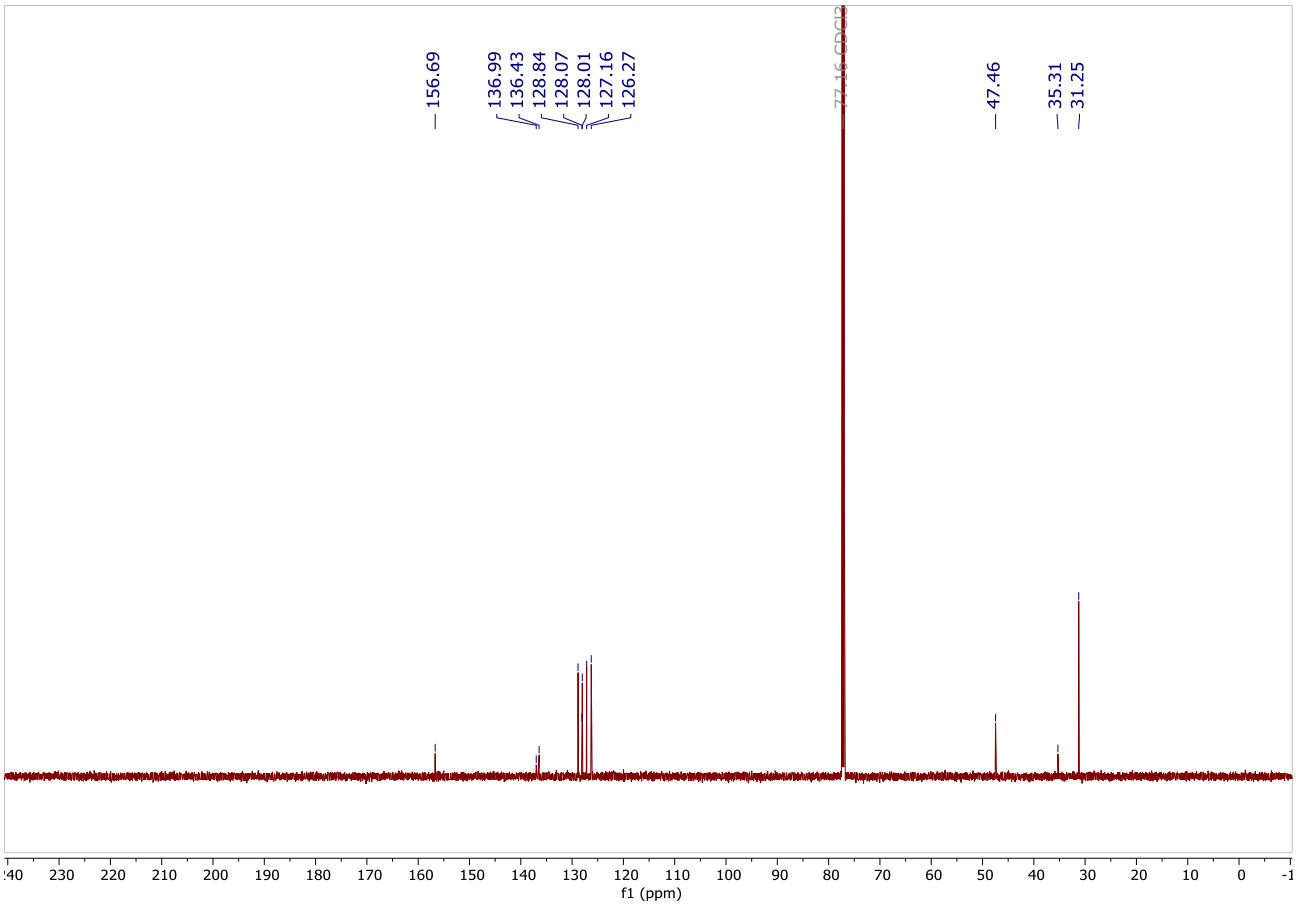
7.30
7.29
7.29
7.29
7.28
7.28
7.28
7.27
7.27
7.27
7.26
7.26 CDCl3
7.21
7.20
7.20
7.20
7.19
4.63
4.18
4.17
1.37
4c
1.99
1.97
2.91
2.00
0.94
2.02
8.93
f1 (ppm)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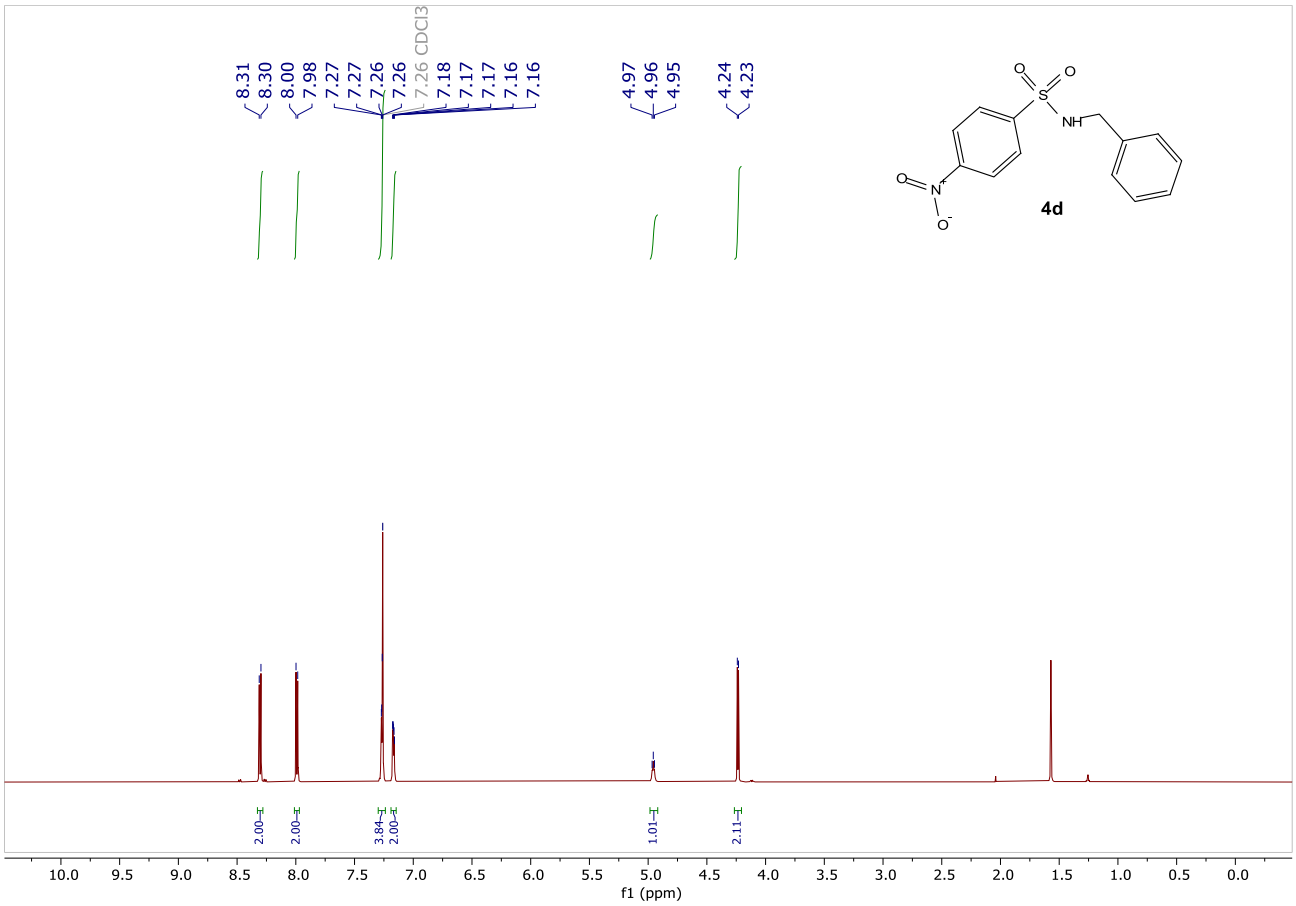
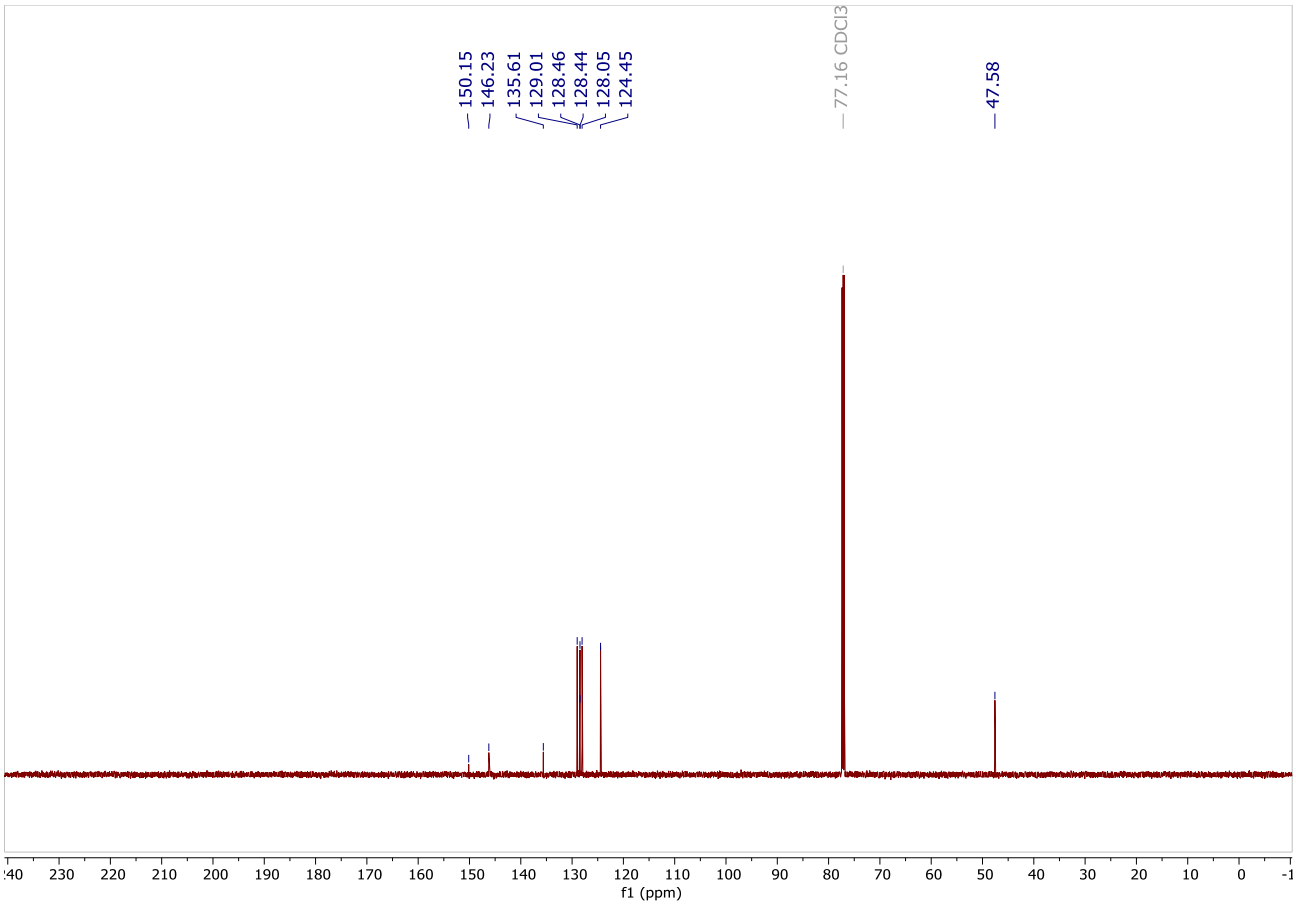
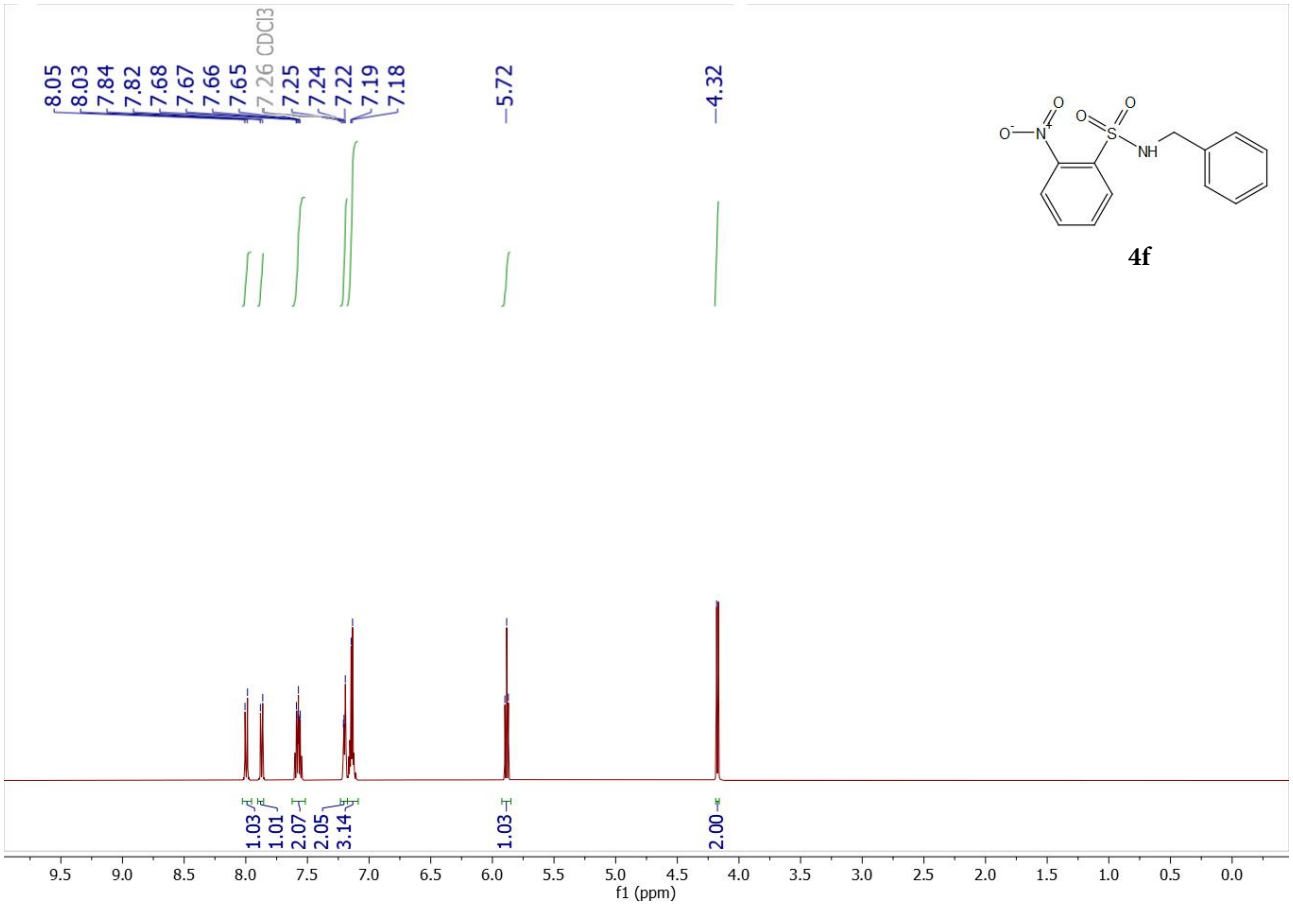
127.16
126.27
77.16 CDCl3
47.46
35.31
31.25
f1 (ppm)


8.31
8.30
8.00
7.98
7.27
7.27
7.26
7.26
7.26 CDCl3
7.18
7.17
7.17
7.16
7.16
4.97
4.96
4.95
4.24
4.23
2.00
2.00
3.84
2.00
1.01
2.11
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

4d


150.15
146.23
135.61
129.01
128.46
128.44
128.05
124.45
77.16 CDCl3
47.58
240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -1
f1 (ppm)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8.03
7.84
7.82
7.68
7.67
7.66
7.65
7.26 CDCl3
7.25
7.24
7.22
7.19
7.18
5.72
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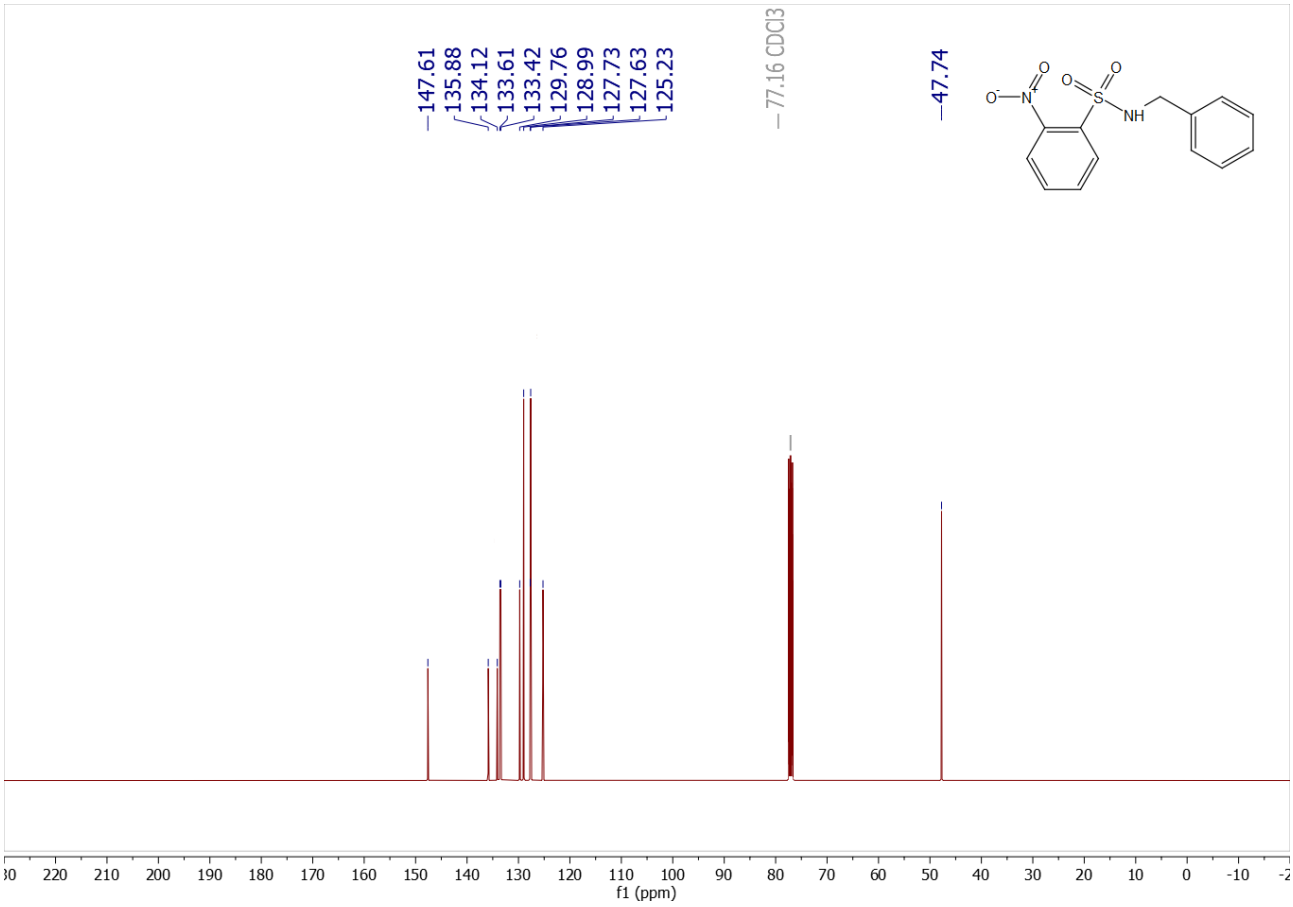
1.03
1.01
2.07
2.05
3.14
1.03
2.00
f1 (ppm)

4f


147.61
135.88
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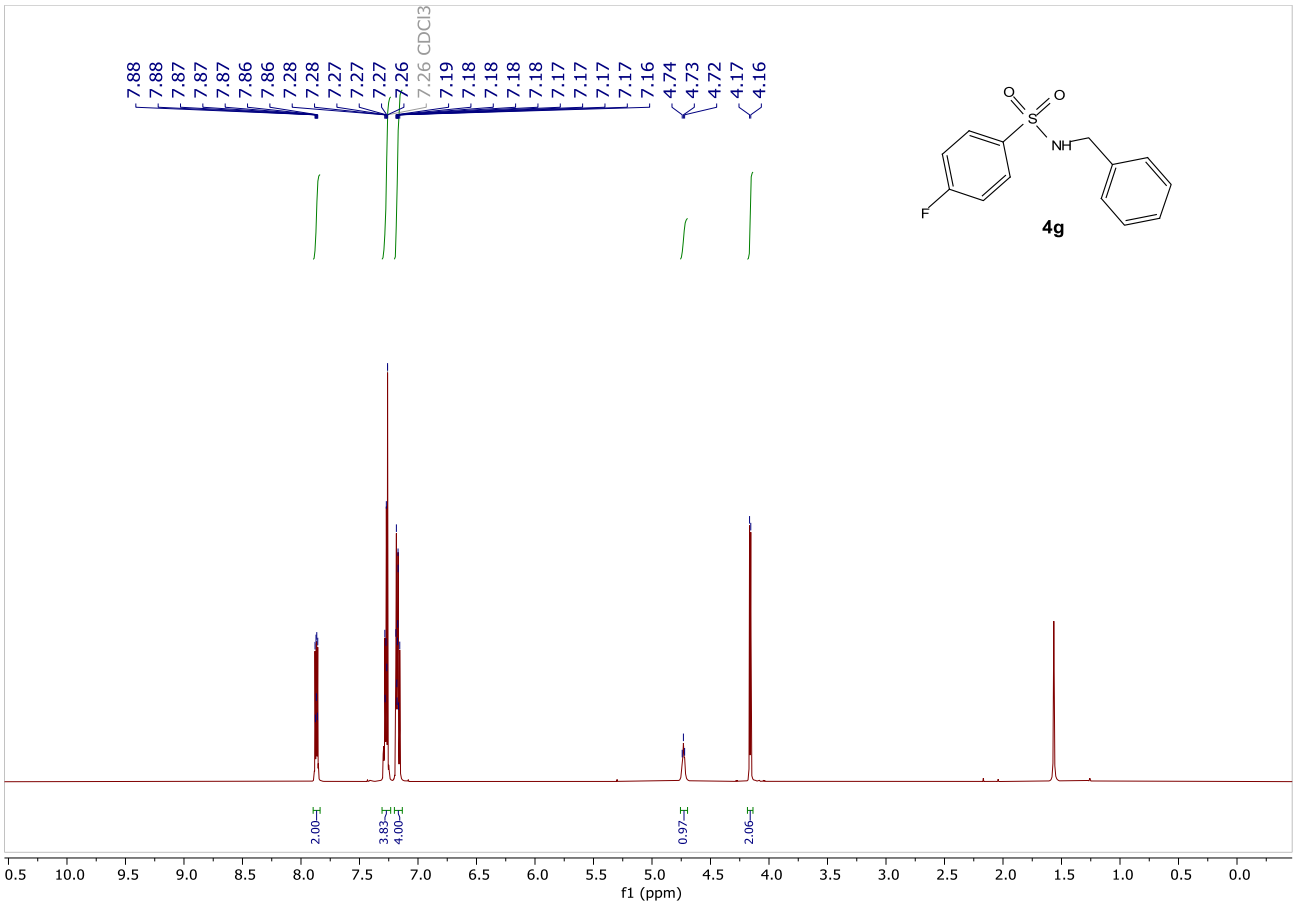
133.42
129.76
128.99
127.73
127.63
125.23
77.16 CDCl3
47.74
f1 (ppm)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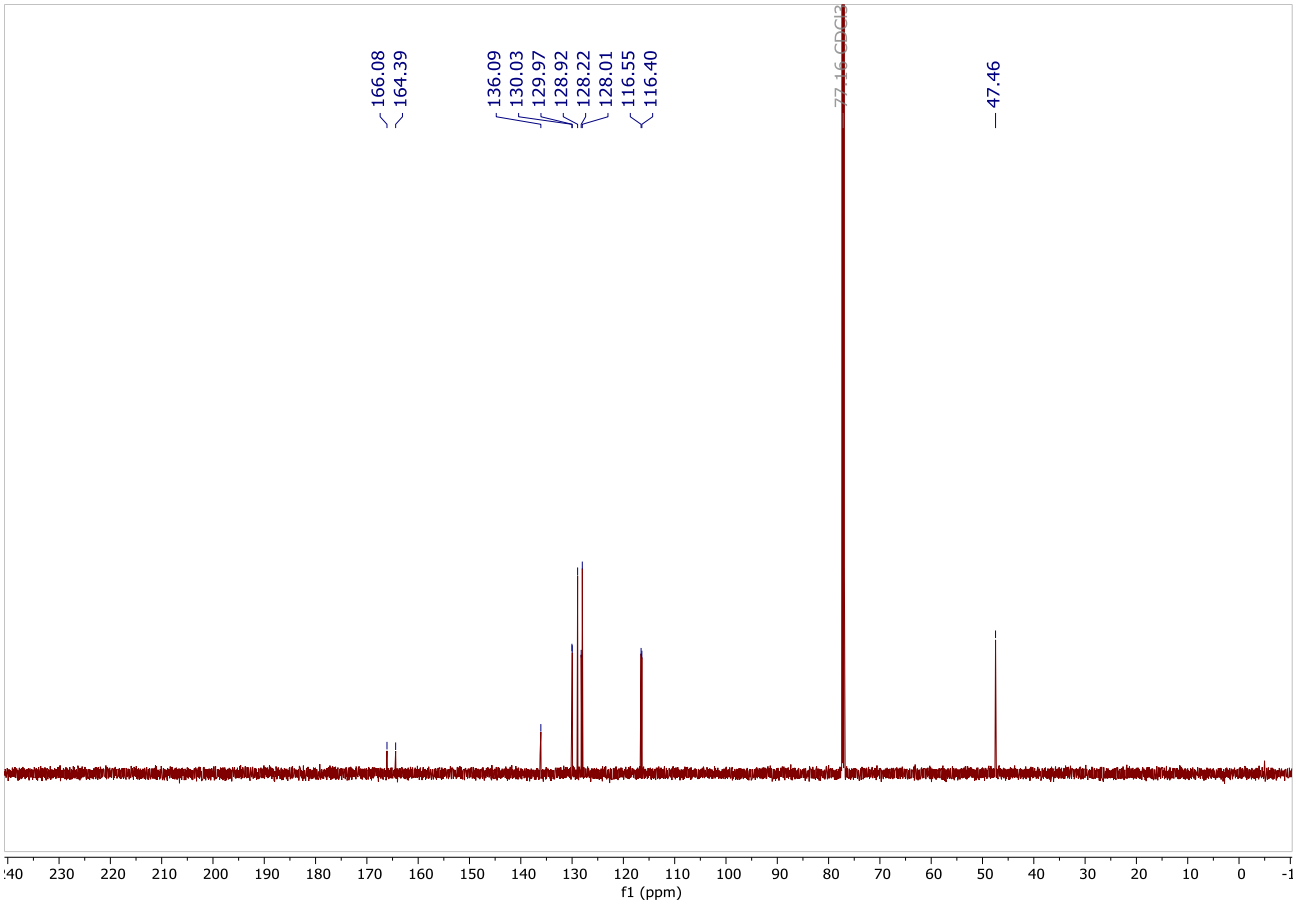
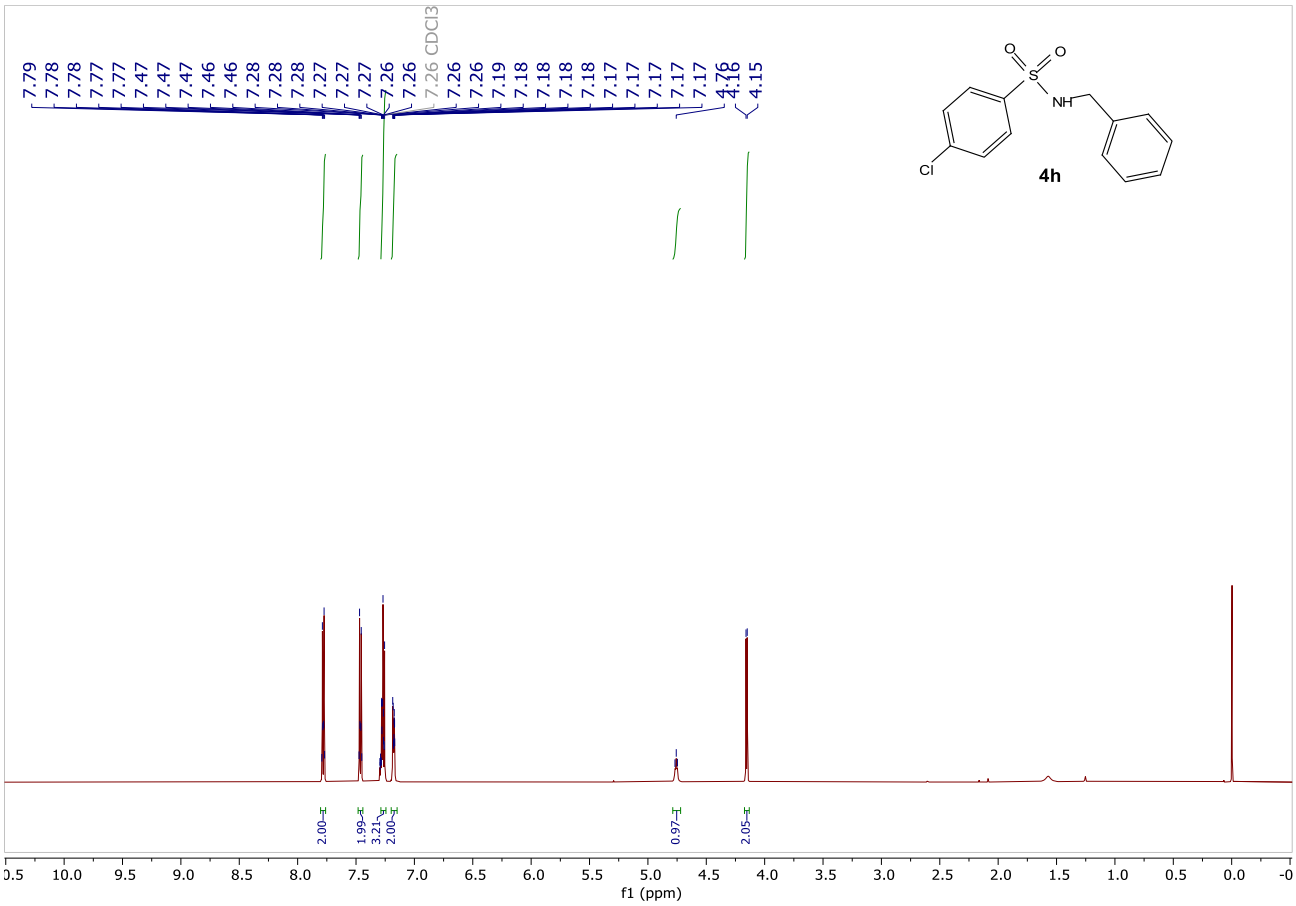
7.88
7.87
7.87
7.87
7.86
7.86
7.28
7.28
7.27
7.27
7.27
7.26
7.26 CDCl3
7.19
7.18
7.18
7.18
7.17
7.17
7.17
7.17
7.16
4.74
4.73
4.72
4.17
4.16
O
O
S
NH
F
4g
2.00
3.83
4.00
0.97
2.06
f1 (ppm)


166.08
164.39
136.09
130.03
129.97
128.92
128.22
128.01
116.55
116.40
77.16 CDCl3
47.46
f1 (ppm)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7.78
7.78
7.77
7.77
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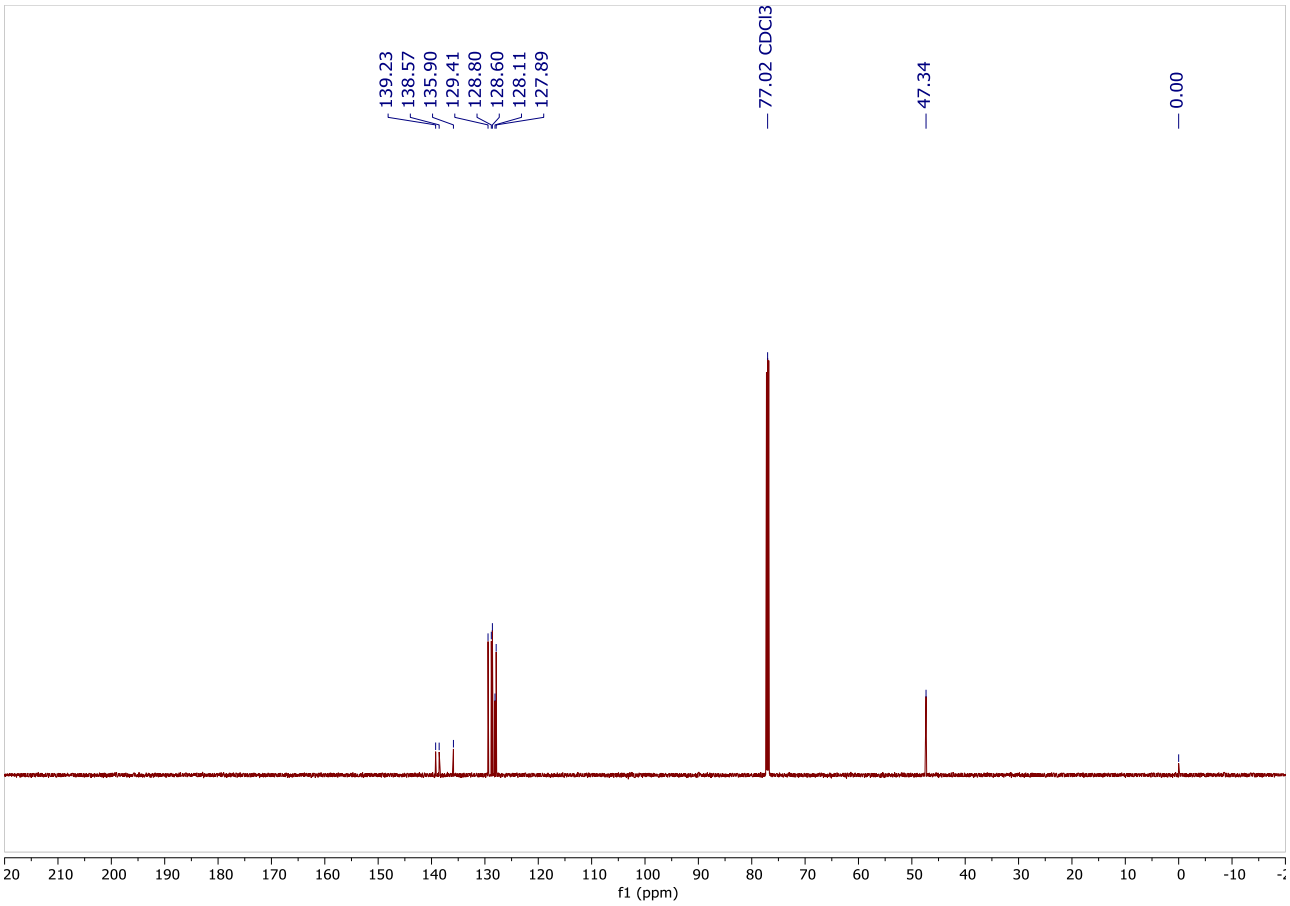
7.47
7.46
7.46
7.28
7.28
7.27
7.27
7.26
7.26
7.26 CDCl3
7.26
7.19
7.18
7.18
7.18
7.17
7.17
7.17
7.17
4.16
4.15
O
O
S
NH
Cl
4h
2.00
1.99
3.21
2.00
0.97
2.05
f1 (ppm)


139.23
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129.41
128.80
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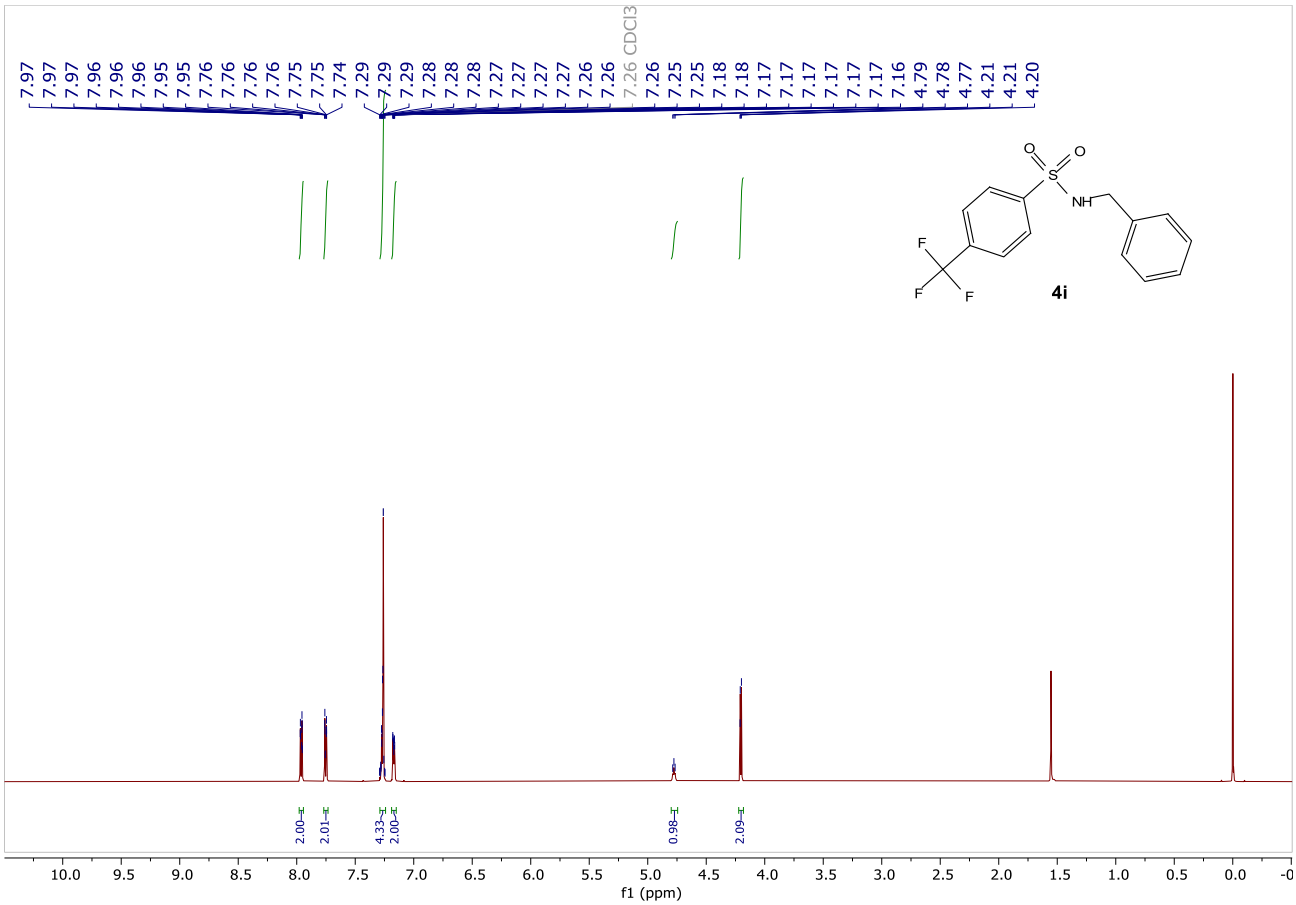
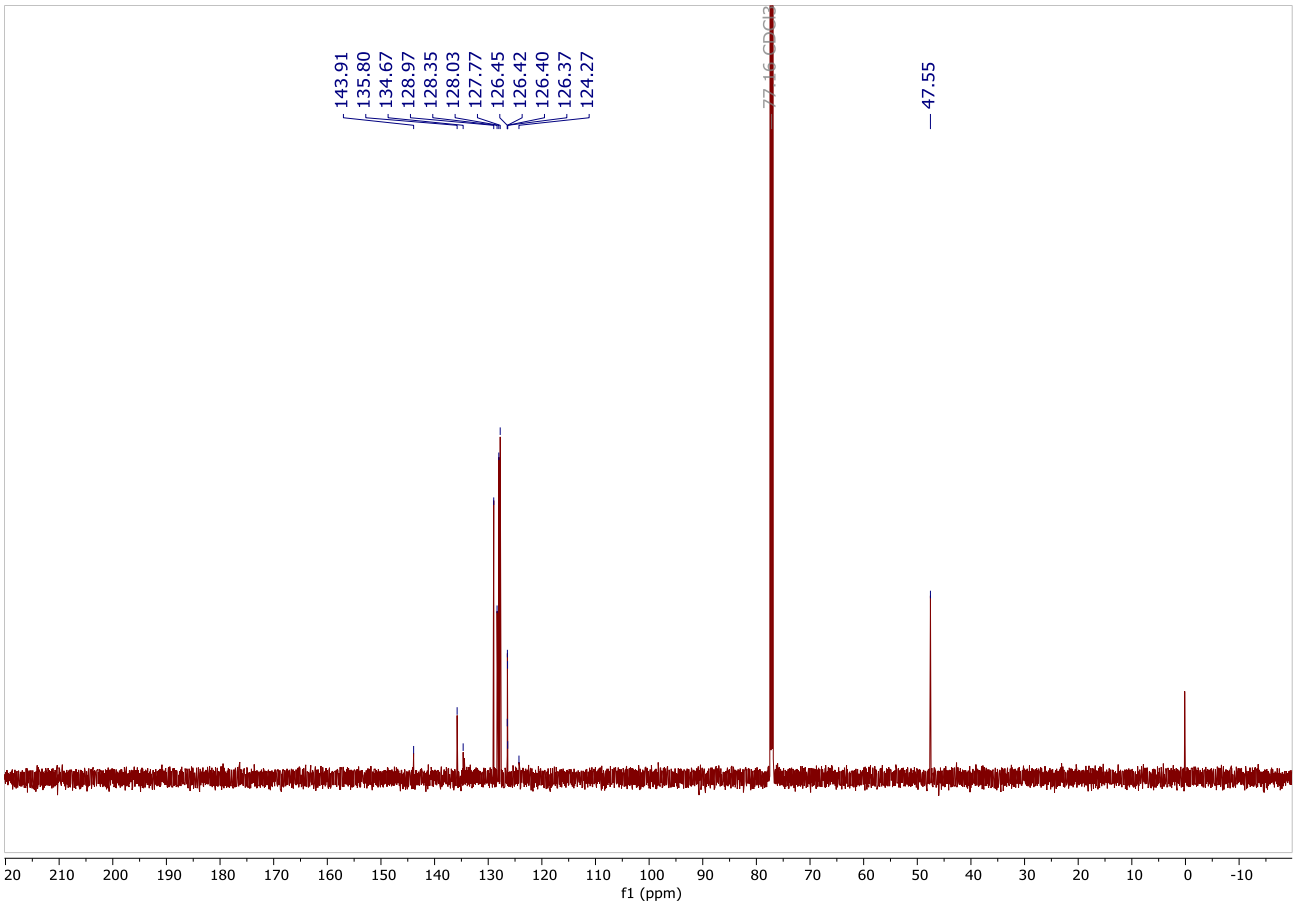
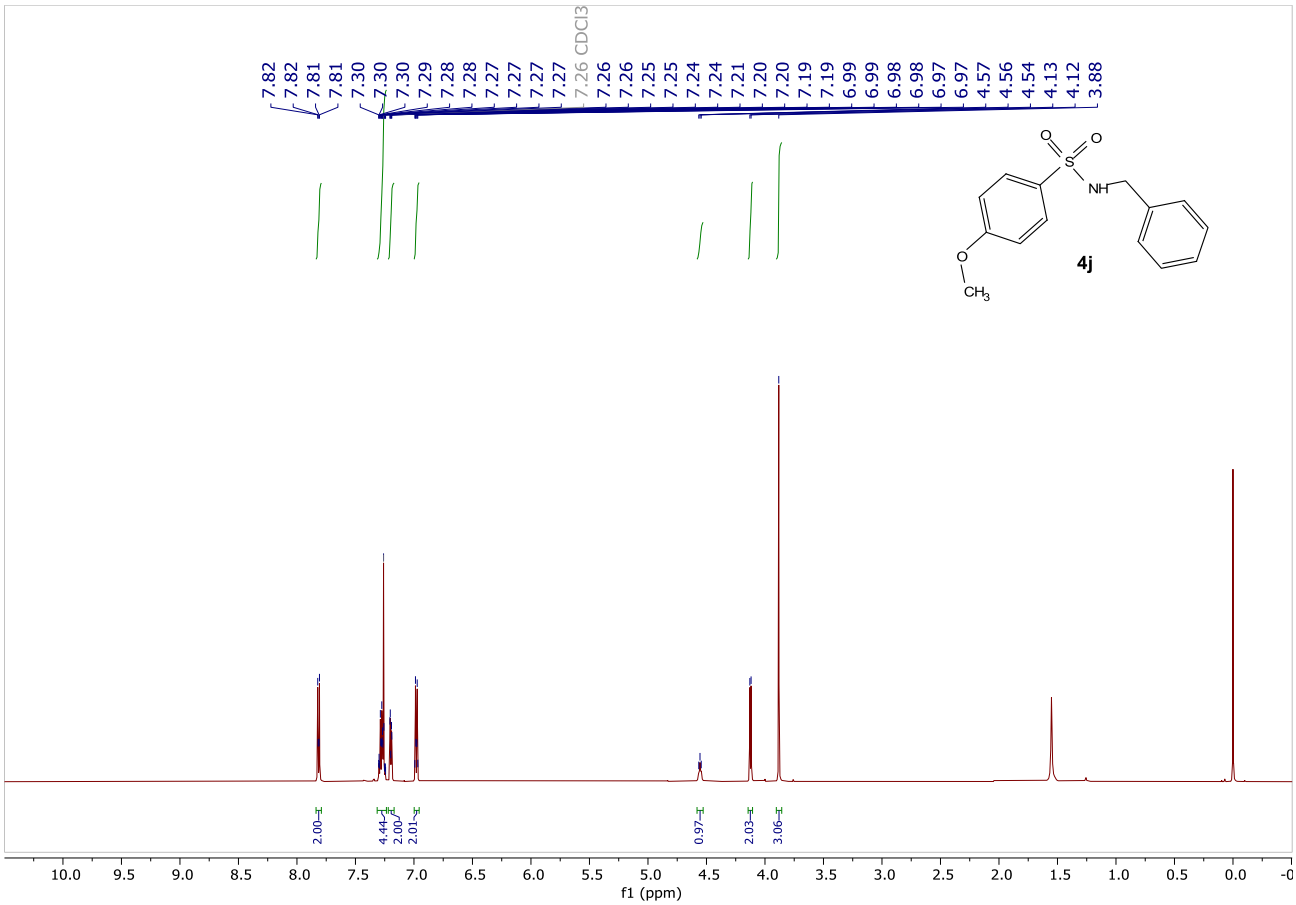
128.11
127.89
77.02 CDCl3
47.34
0.00
f1 (ppm)


7.97 7.97 7.97 7.96 7.96 7.96 7.95 7.95 7.76 7.76 7.76 7.76 7.75 7.75 7.74 7.29 7.29 7.29 7.28 7.28 7.28 7.27 7.27 7.27 7.27 7.26 7.26 7.26 CDCl3 7.25 7.25 7.18 7.18 7.17 7.17 7.17 7.17 7.17 7.17 7.16 4.79 4.78 4.77 4.21 4.21 4.20
O
O
S
NH
F
F
F
4i
2.00
2.01
4.33
2.00
0.98
2.09
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


143.91 135.80 134.67 128.97 128.35 128.03 127.77 126.45 126.42 126.40 126.37 124.27
77.16 CDCl3
47.55
20 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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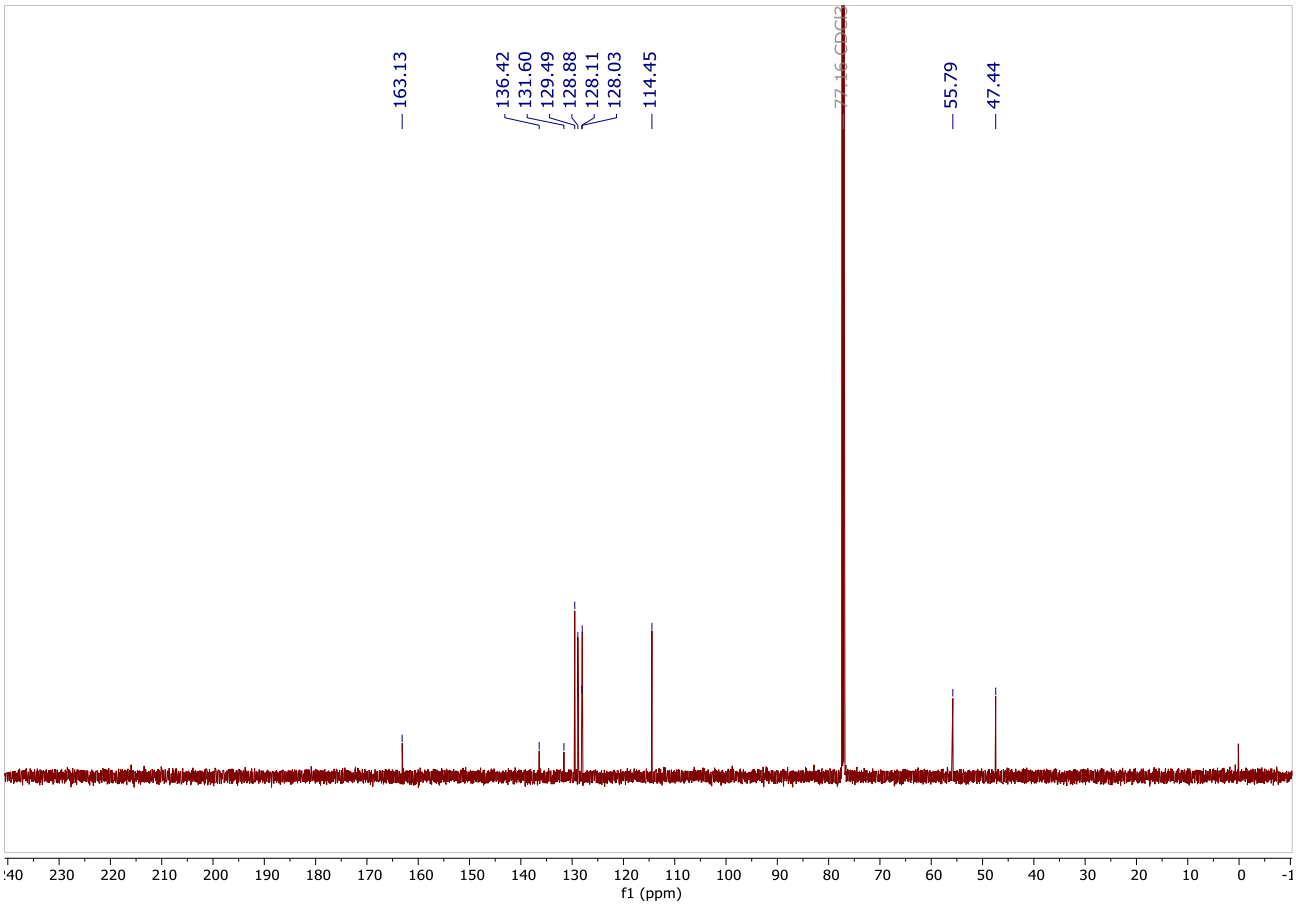
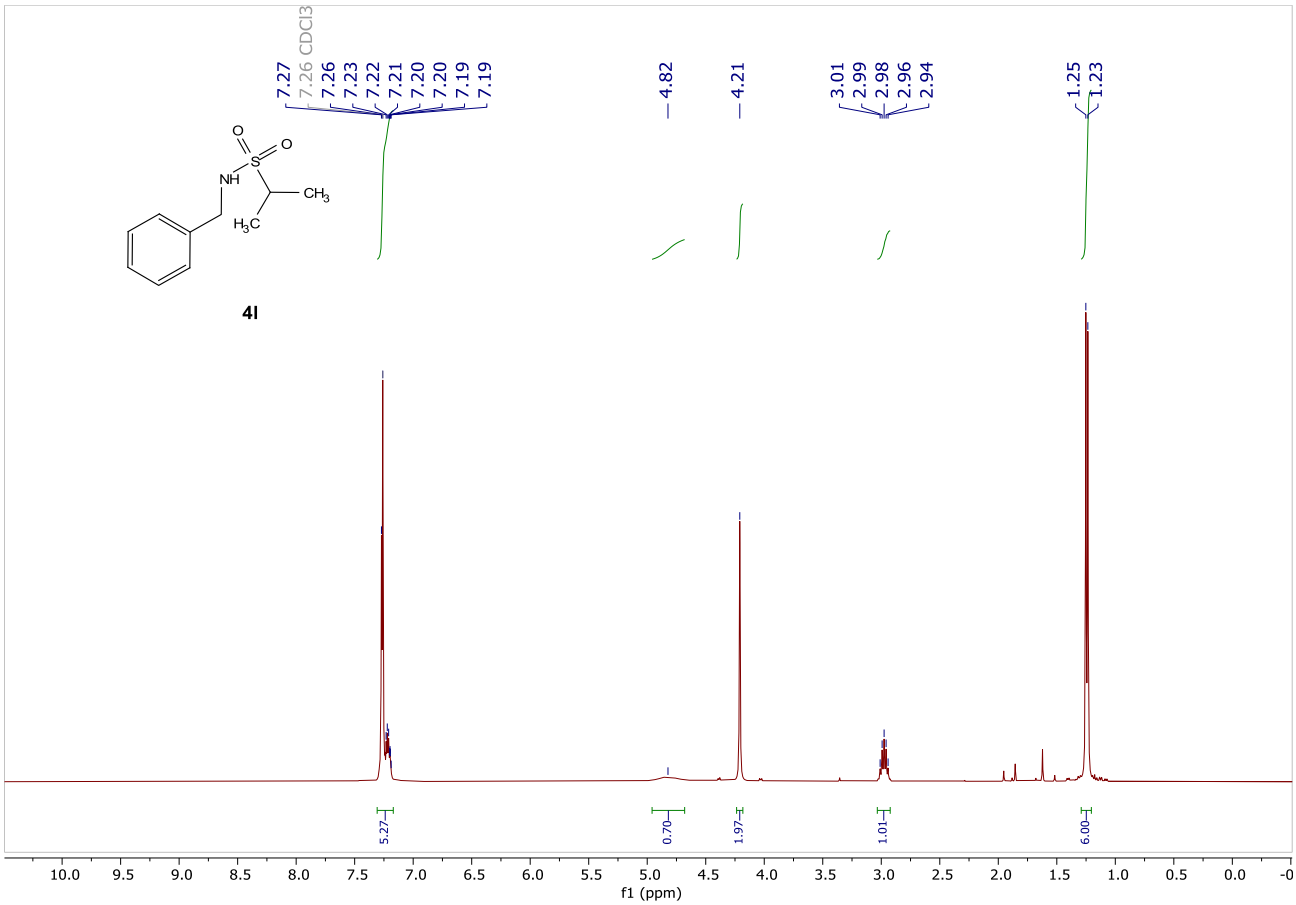
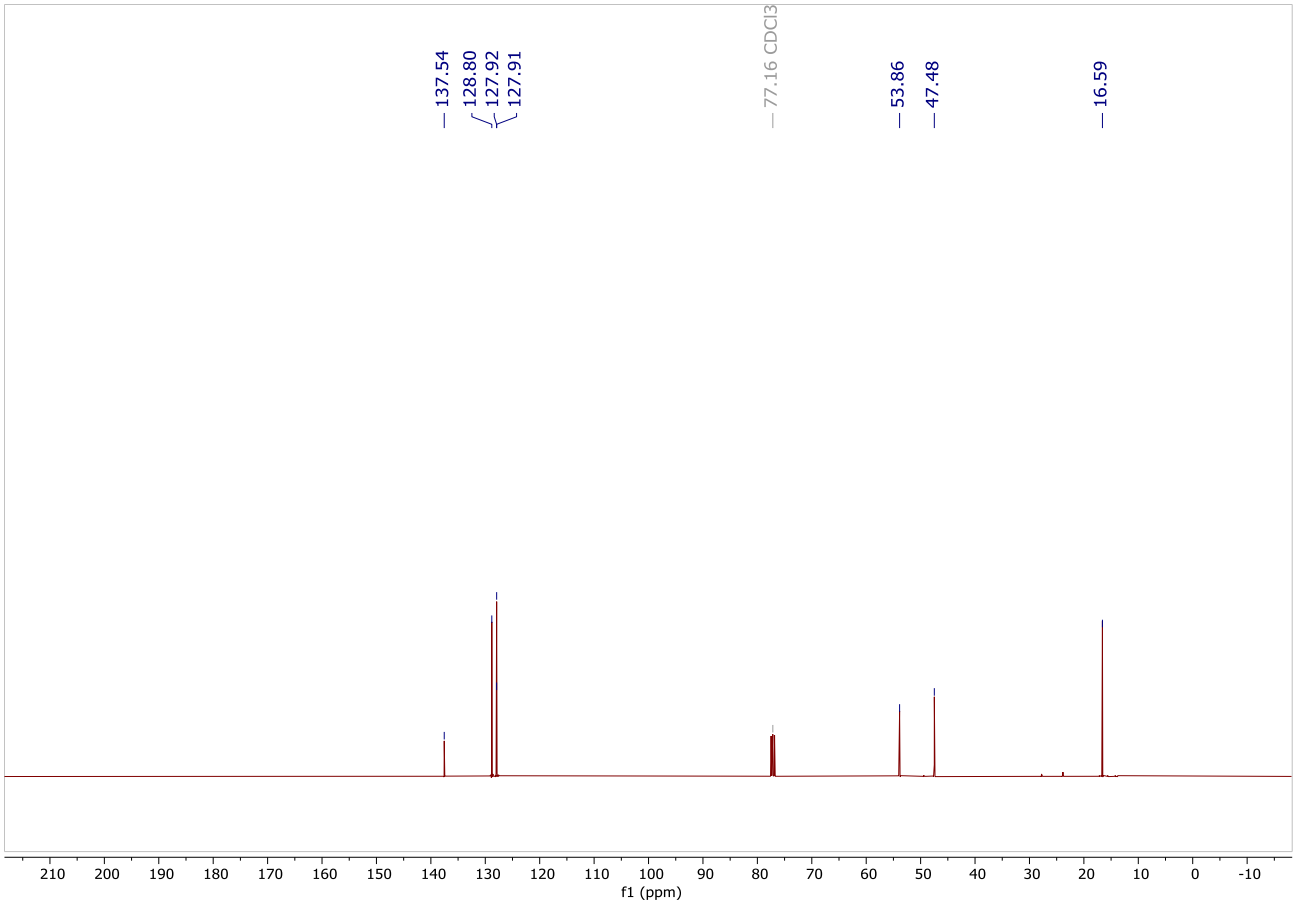
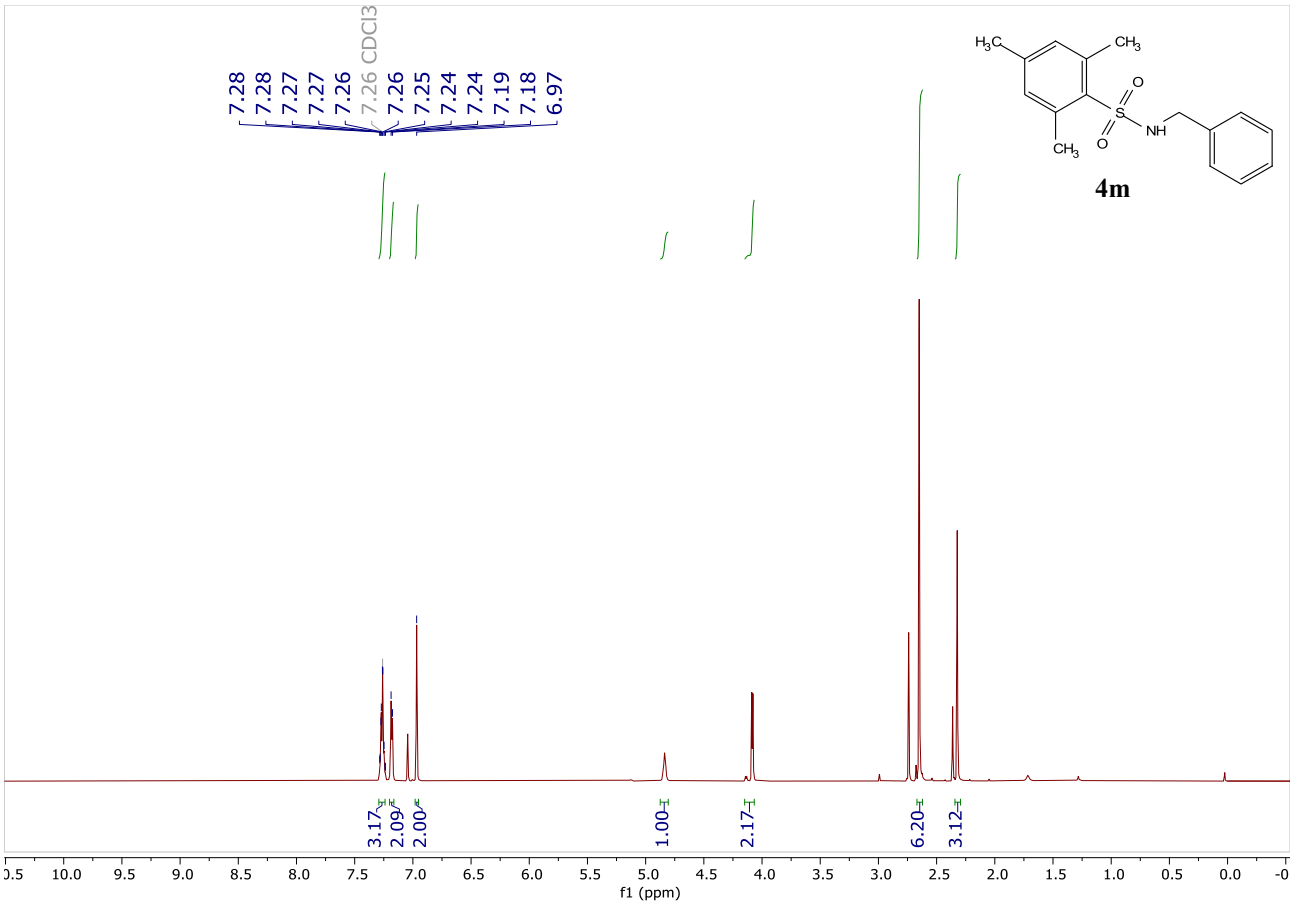
7.30
7.30
7.29
7.28
7.28
7.27
7.27
7.27
7.27
7.26 CDCl3
7.26
7.26
7.25
7.25
7.24
7.24
7.21
7.20
7.20
7.19
7.19
6.99
6.99
6.98
6.98
6.97
6.97
4.57
4.56
4.54
4.13
4.12
3.88
O
S
O
NH
O
CH3
4j
2.00
4.44
2.00
2.01
0.97
2.03
3.06
f1 (ppm)


163.13
136.42
131.60
129.49
128.88
128.11
128.03
114.45
77.16 CDCl3
55.79
47.44
f1 (ppm)


7.27
7.26 CDCl3
7.26
7.23
7.22
7.21
7.20
7.20
7.19
7.19
4.82
4.21
3.01
2.99
2.98
2.96
2.94
1.25
1.23
O
S
O
NH
CH3
H3C
4l
5.27
0.70
1.97
1.01
6.00
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0
f1 (ppm)


137.54
128.80
127.92
127.91
77.16 CDCl3
53.86
47.48
16.59
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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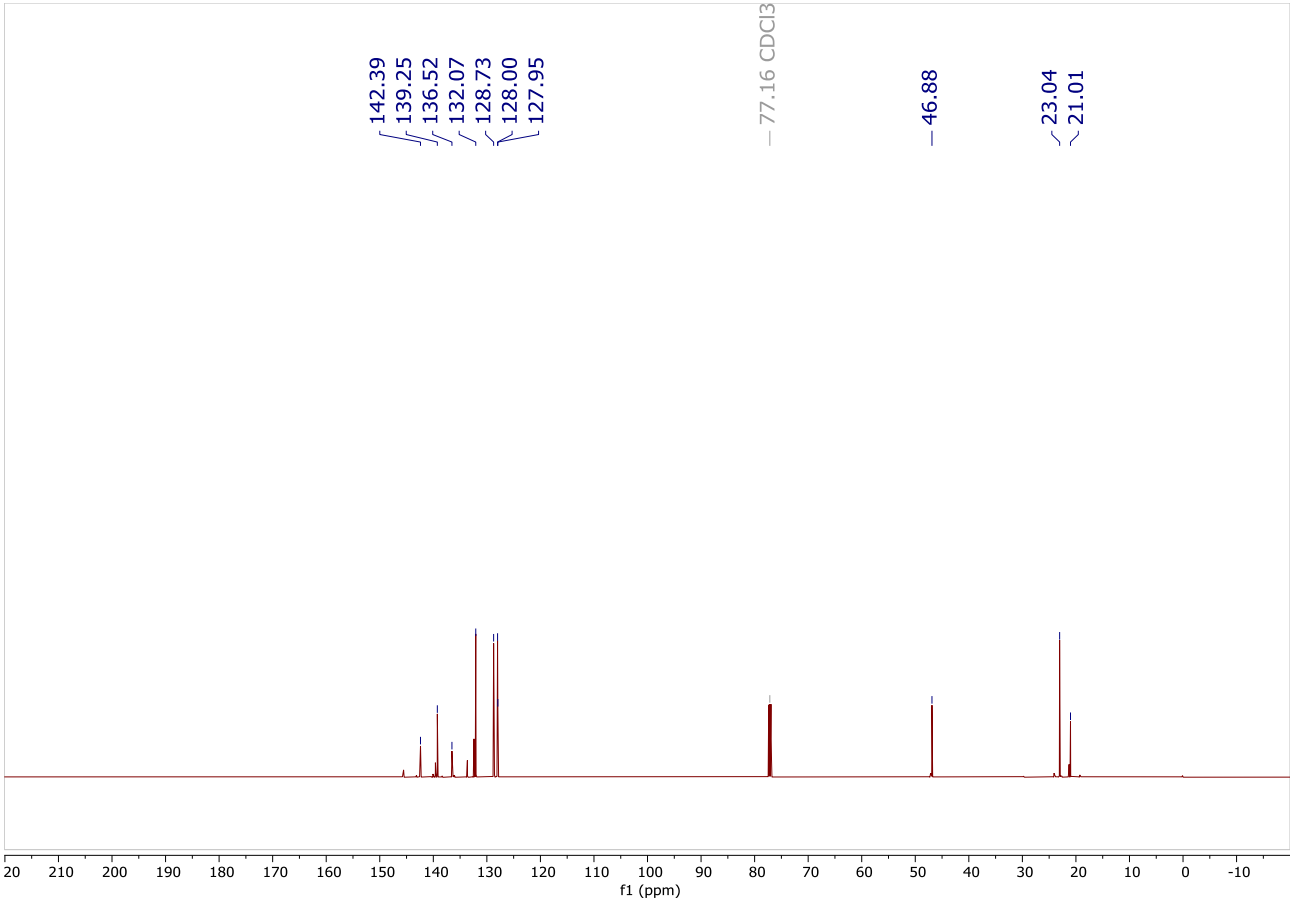
7.28
7.27
7.27
7.26
7.26 CDCl3
7.26
7.25
7.24
7.24
7.19
7.18
6.97
3.17
2.09
2.00
1.00
2.17
6.20
3.12
f1 (ppm)

H3C
CH3
O
S
NH
O
CH3

4m


142.39
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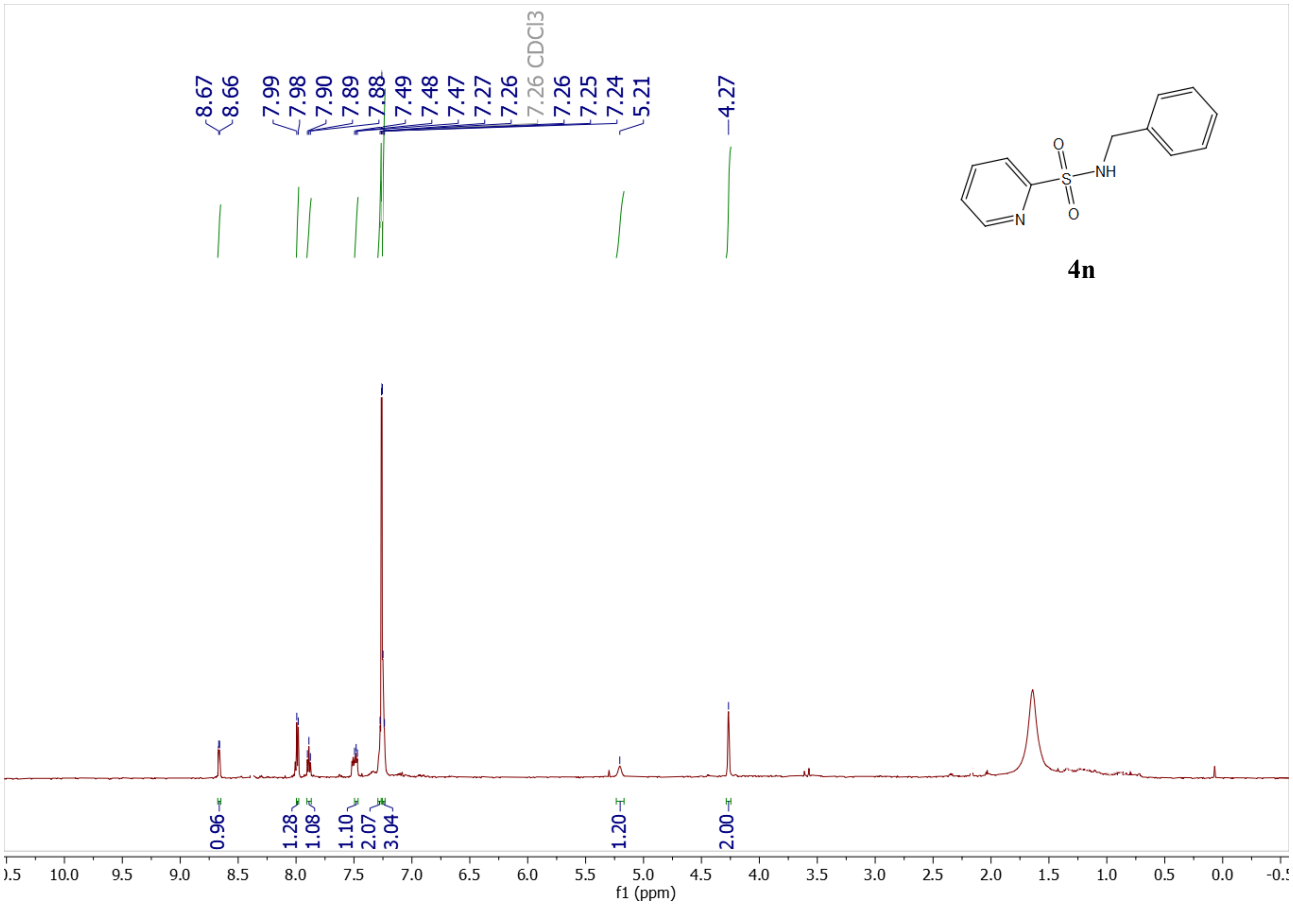
128.00
127.95
77.16 CDCl3
46.88
23.04
21.01
f1 (ppm)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7.88
7.49
7.48
7.47
7.27
7.26 CDCl3
7.26
7.25
7.24
5.21
4.27
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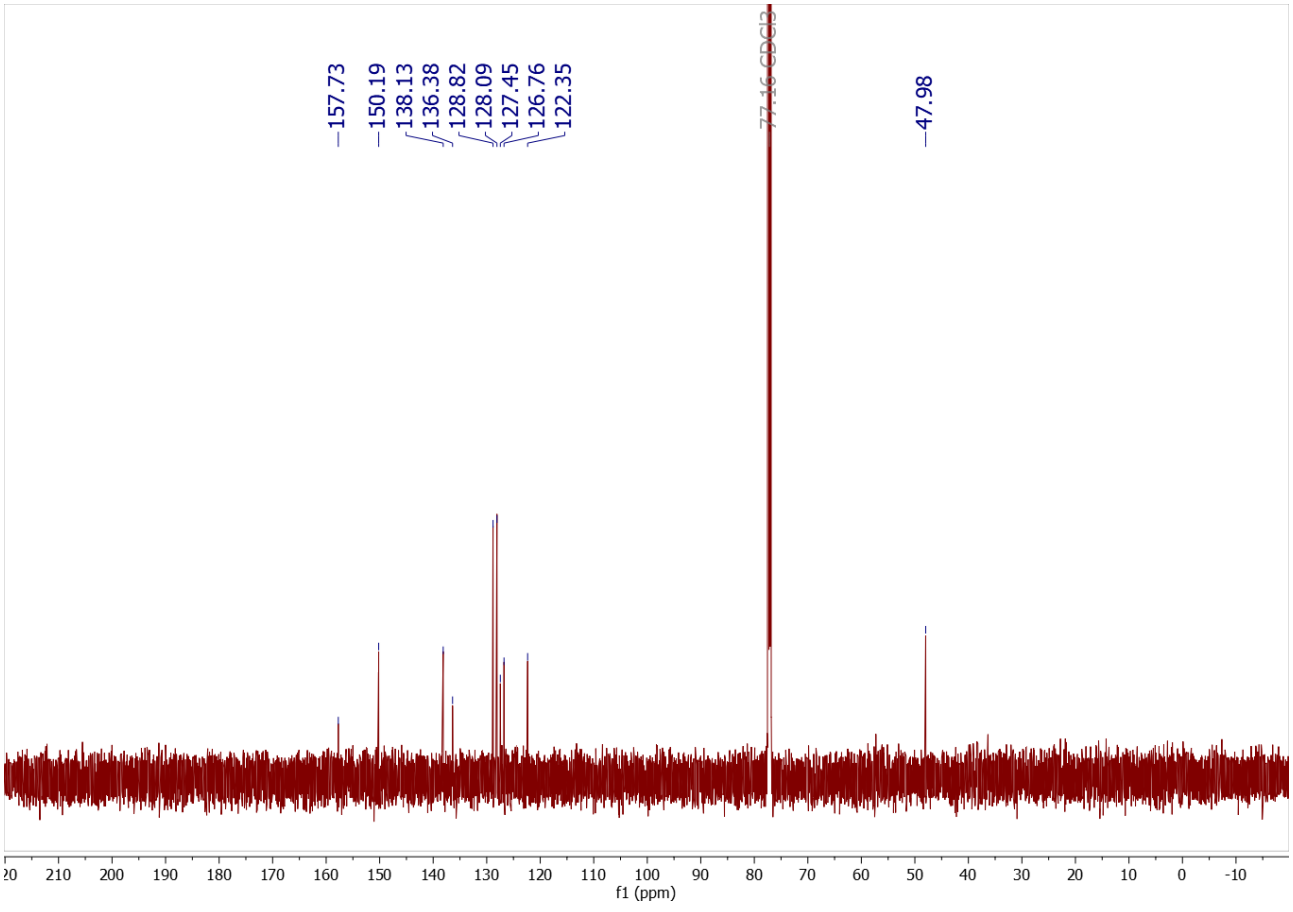
1.28
1.08
1.10
2.07
3.04
1.20
2.00
f1 (ppm)

4n


157.73
150.19
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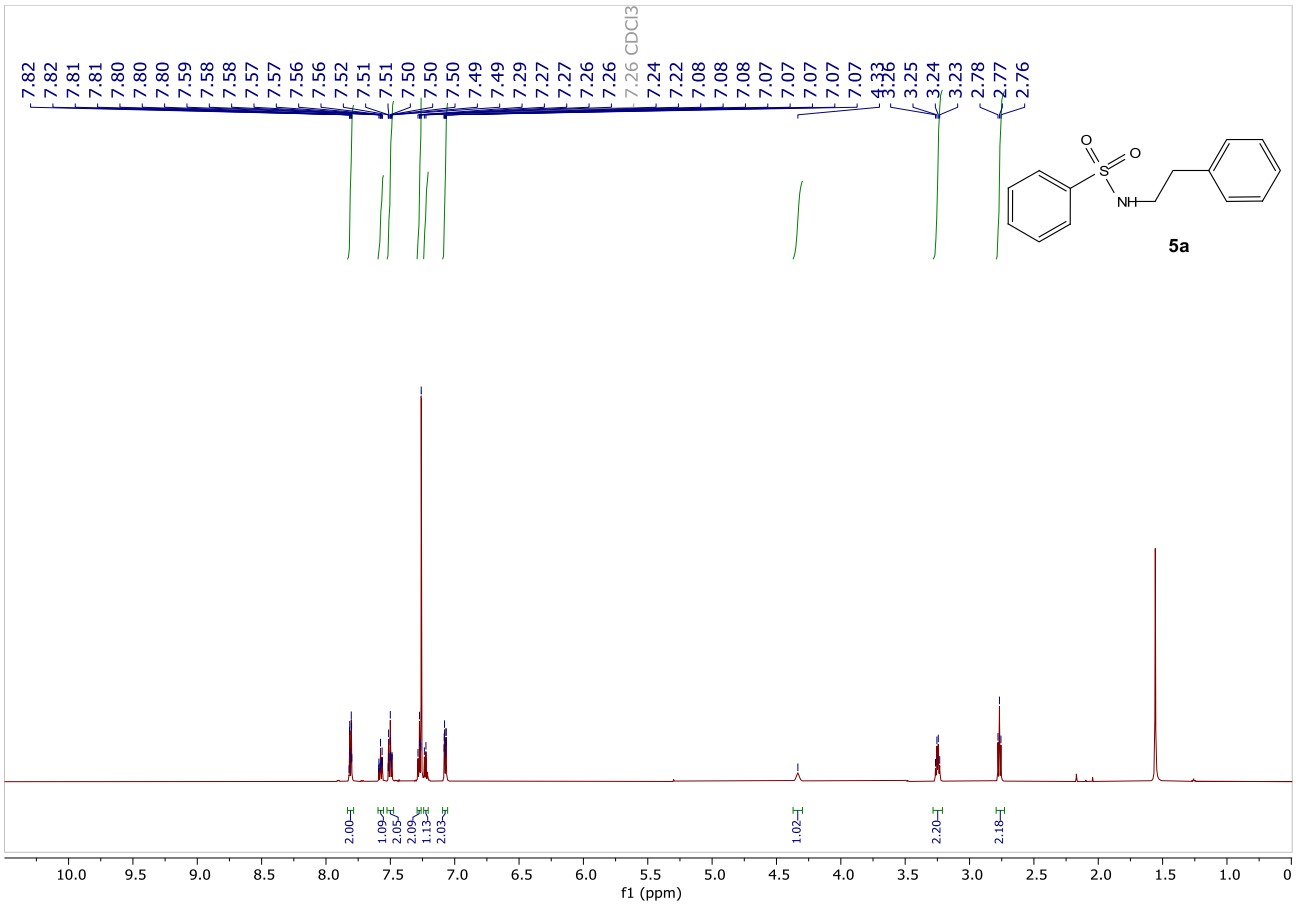
136.38
128.82
128.09
127.45
126.76
122.35
77.16 CDCl3
47.98
f1 (ppm)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7.59
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7.58
7.57
7.57
7.56
7.56
7.52
7.51
7.51
7.50
7.50
7.50
7.49
7.49
7.29
7.27
7.27
7.26
7.26
7.26 CDCl3
7.24
7.22
7.08
7.08
7.08
7.07
7.07
7.07
7.07
7.07
4.33
3.26
3.25
3.24
3.23
2.78
2.77
2.76
O
O
S
NH
5a
2.00
1.09
2.05
2.09
1.13
2.03
1.02
2.20
2.18
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
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4.0
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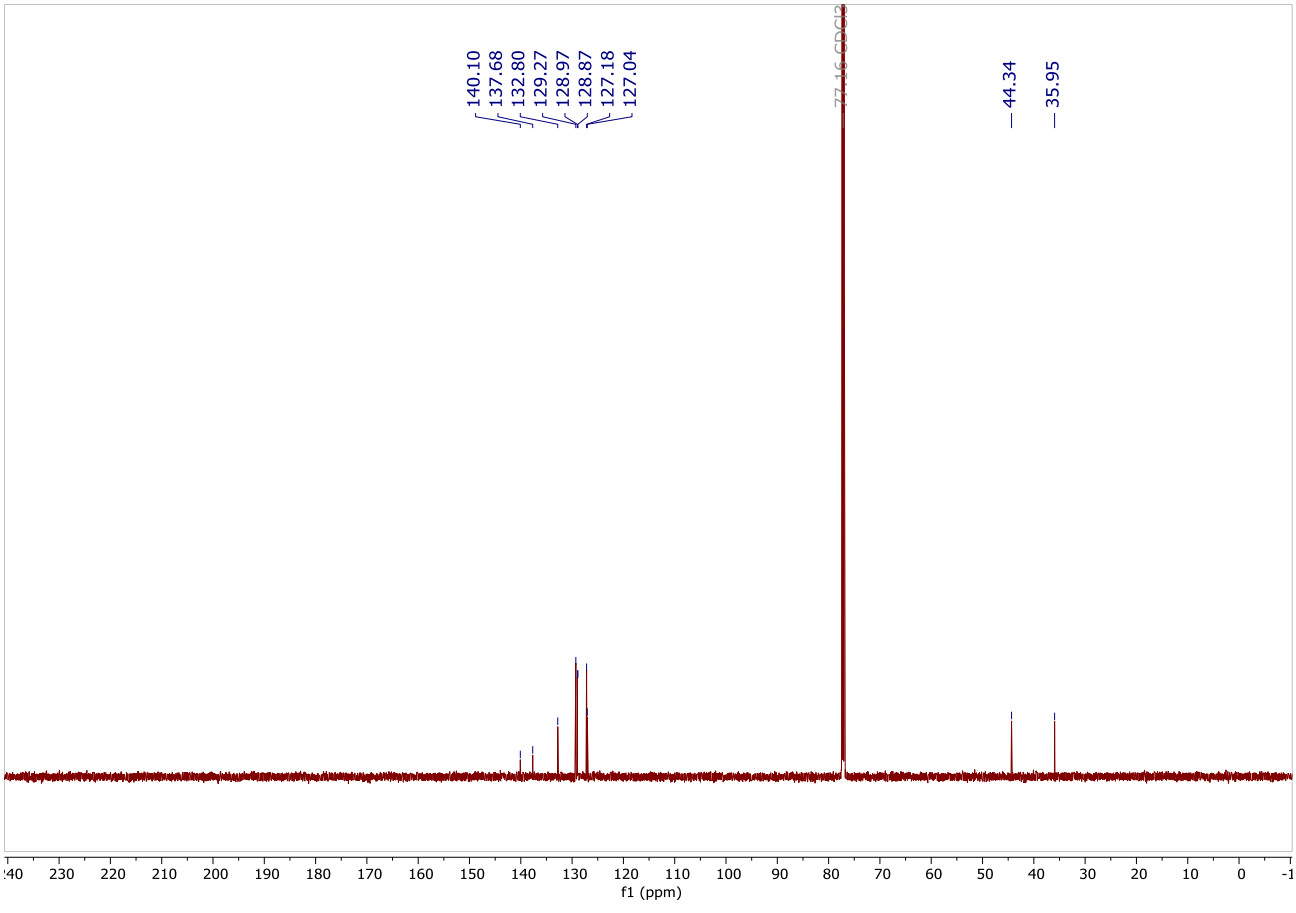
3.0
2.5
2.0
1.5
1.0
0
f1 (ppm)


140.10
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128.97
128.87
127.18
127.04
77.16 CDCl3
44.34
35.95
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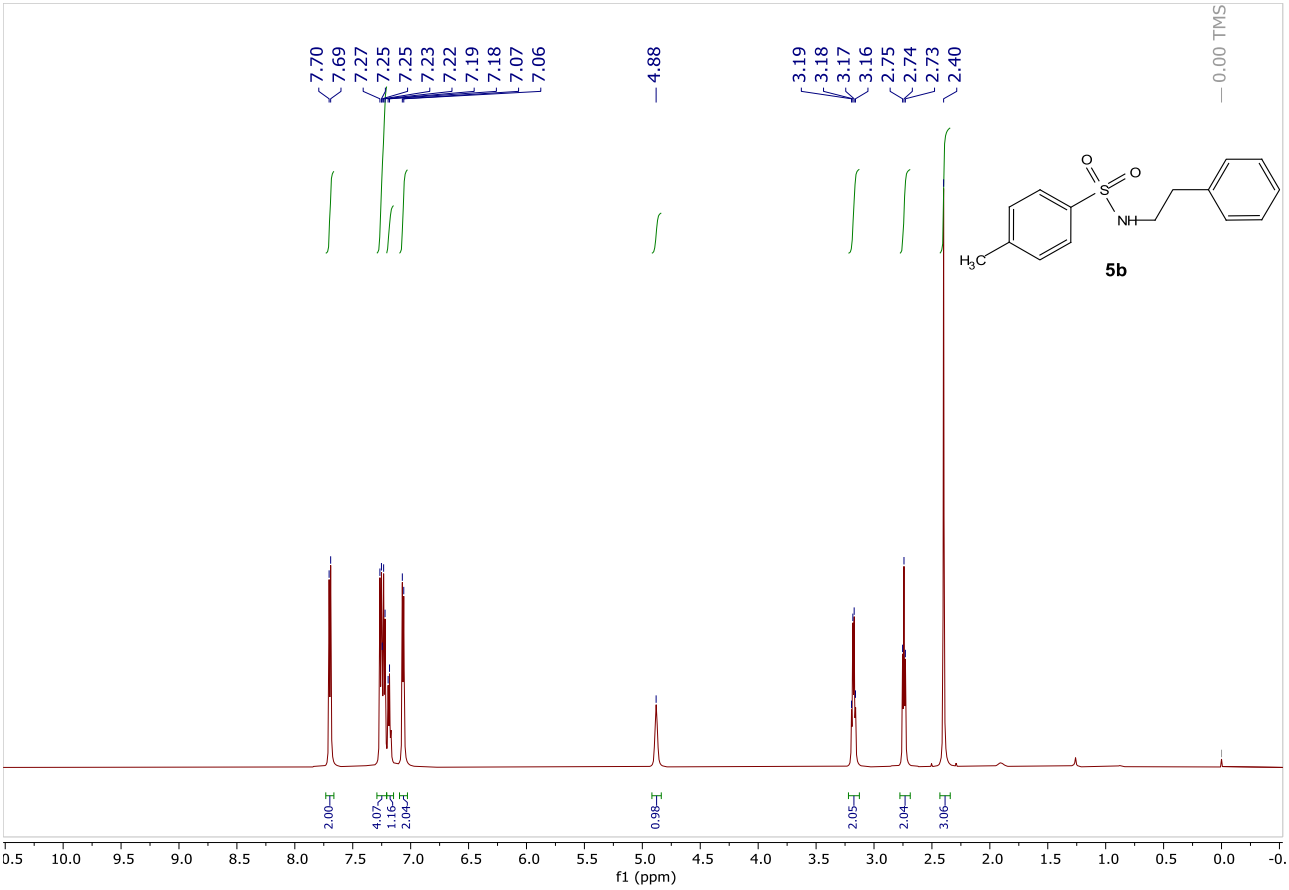
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


7.70
7.69
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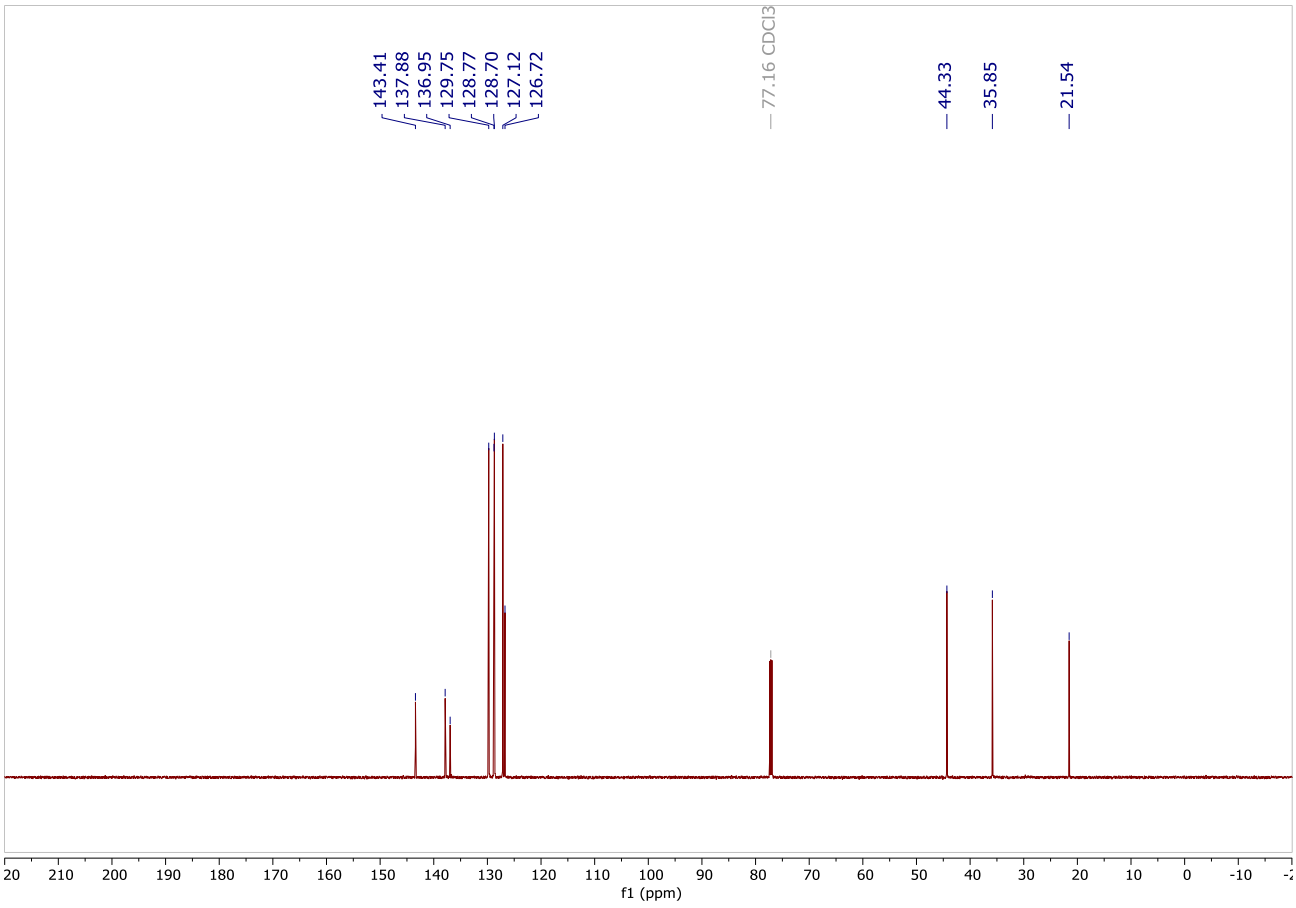
7.25
7.25
7.23
7.22
7.19
7.18
7.07
7.06
4.88
3.19
3.18
3.17
3.16
2.75
2.74
2.73
2.40
0.00 TMS
O
S
O
NH
H3C
5b
2.00
4.07
1.16
2.04
0.98
2.05
2.04
3.06
f1 (ppm)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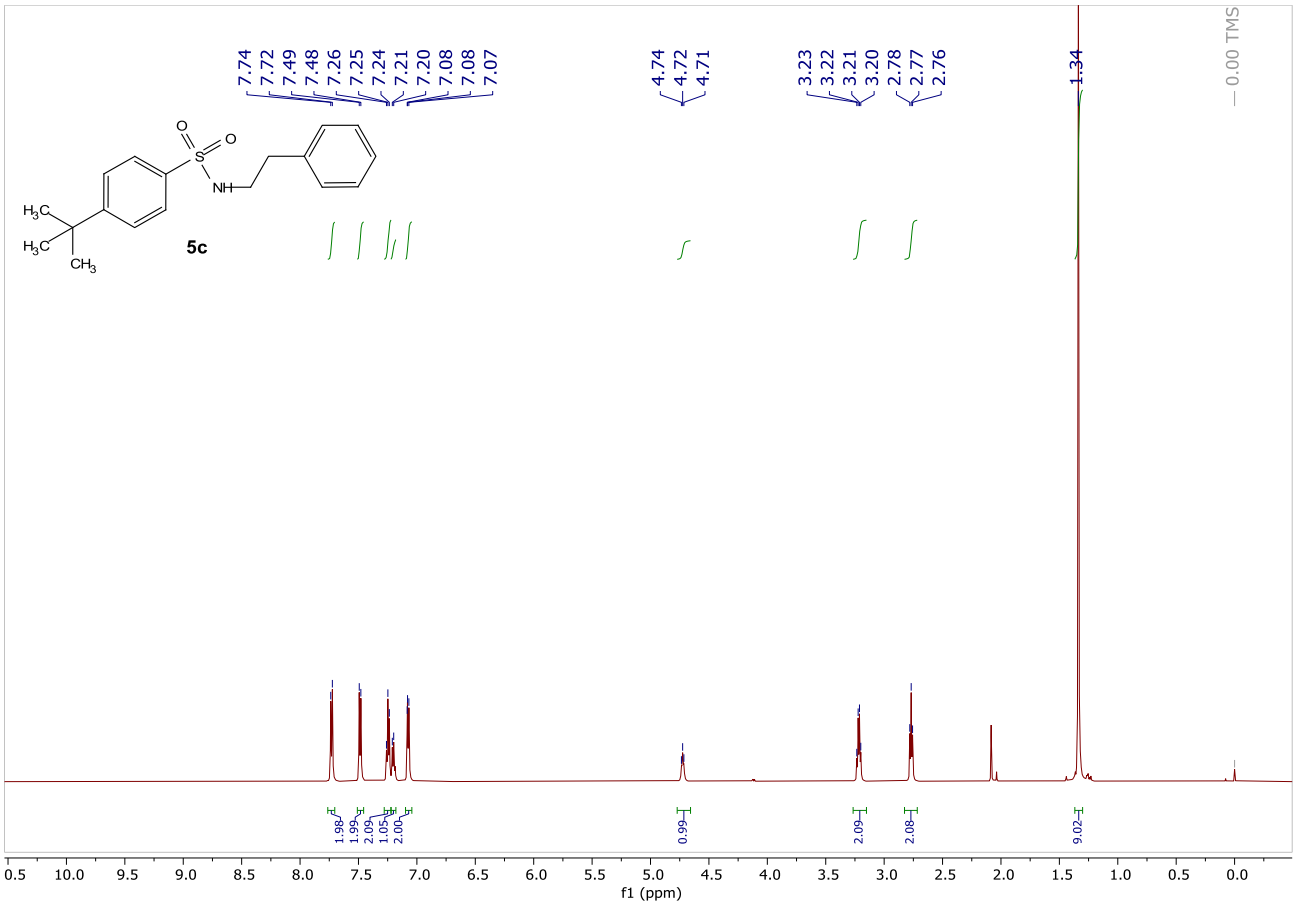
126.72
77.16 CDCl3
44.33
35.85
21.54
f1 (ppm)


7.74
7.72
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7.48
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7.25
7.24
7.21
7.20
7.08
7.08
7.07
4.74
4.72
4.71
3.23
3.22
3.21
3.20
2.78
2.77
2.76
1.34
0.00 TMS
5c
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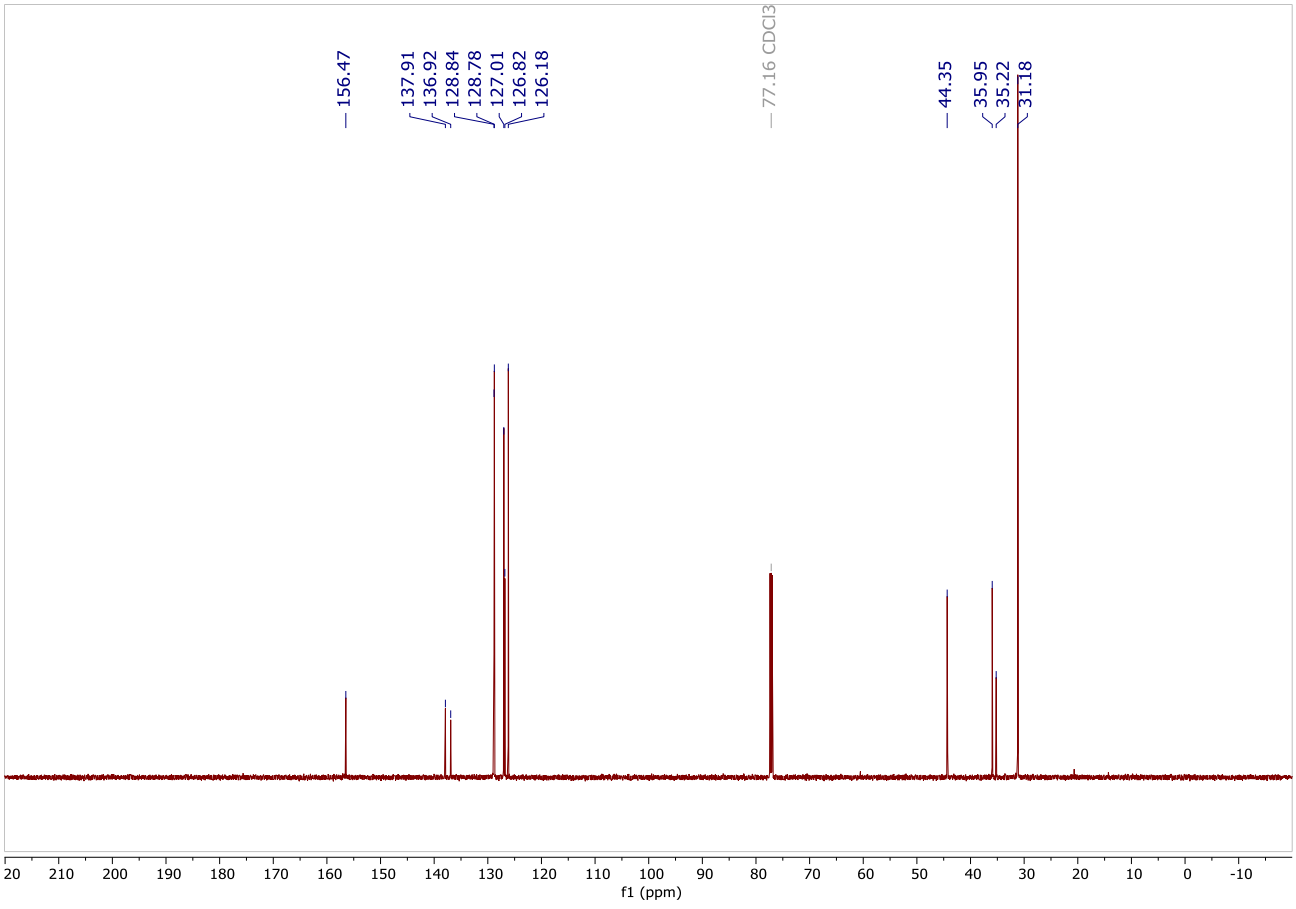
1.99
2.09
1.05
2.00
0.99
2.09
2.08
9.02
f1 (ppm)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136.92
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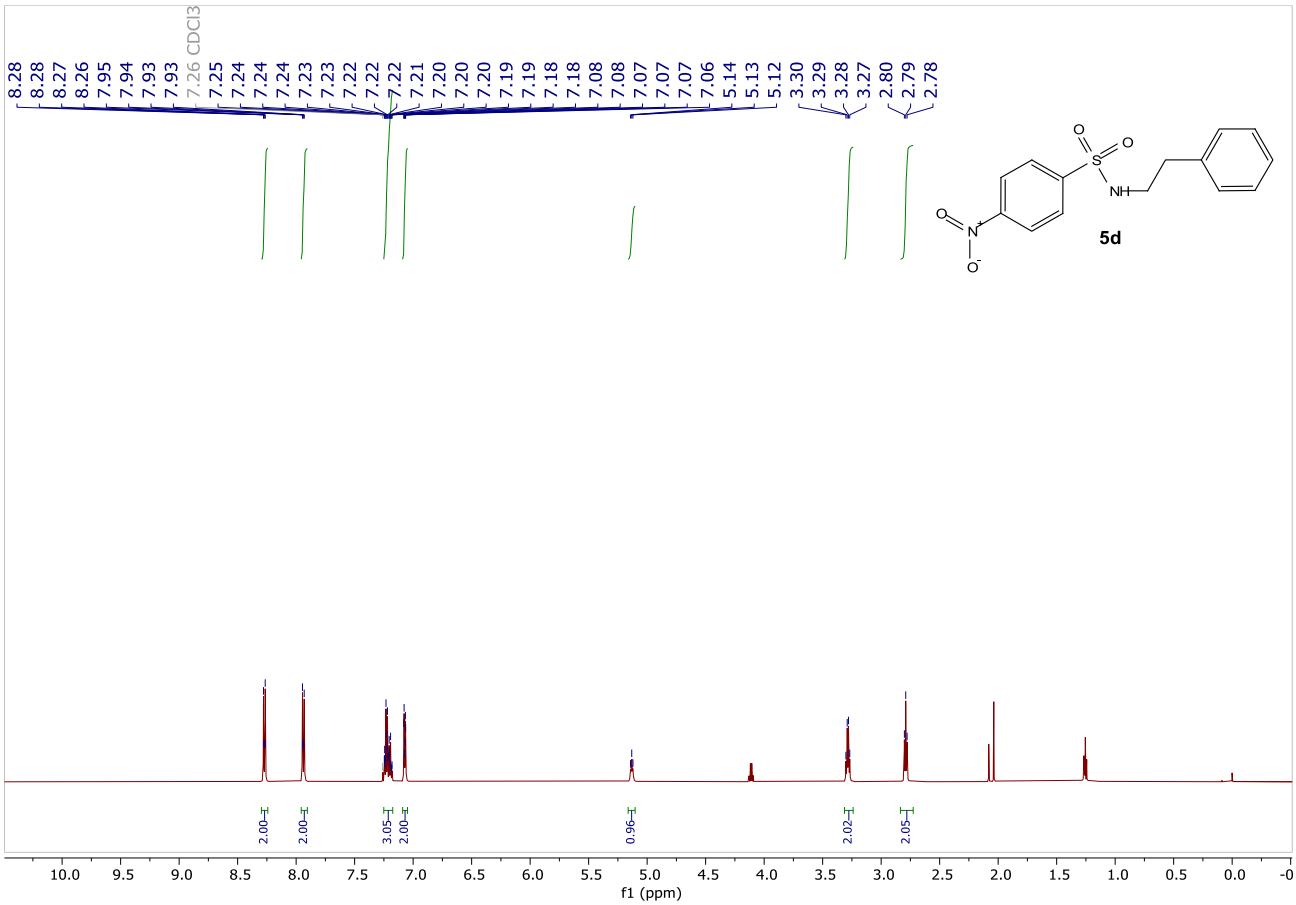
127.01
126.82
126.18
77.16 CDCl3
44.35
35.95
35.22
31.18
f1 (ppm)


8.28
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7.93
7.93
7.26 CDCl3
7.25
7.24
7.24
7.24
7.23
7.23
7.22
7.22
7.22
7.21
7.20
7.20
7.20
7.19
7.19
7.18
7.18
7.08
7.08
7.07
7.07
7.07
7.06
5.14
5.13
5.12
3.30
3.29
3.28
3.27
2.80
2.79
2.78
5d
2.00
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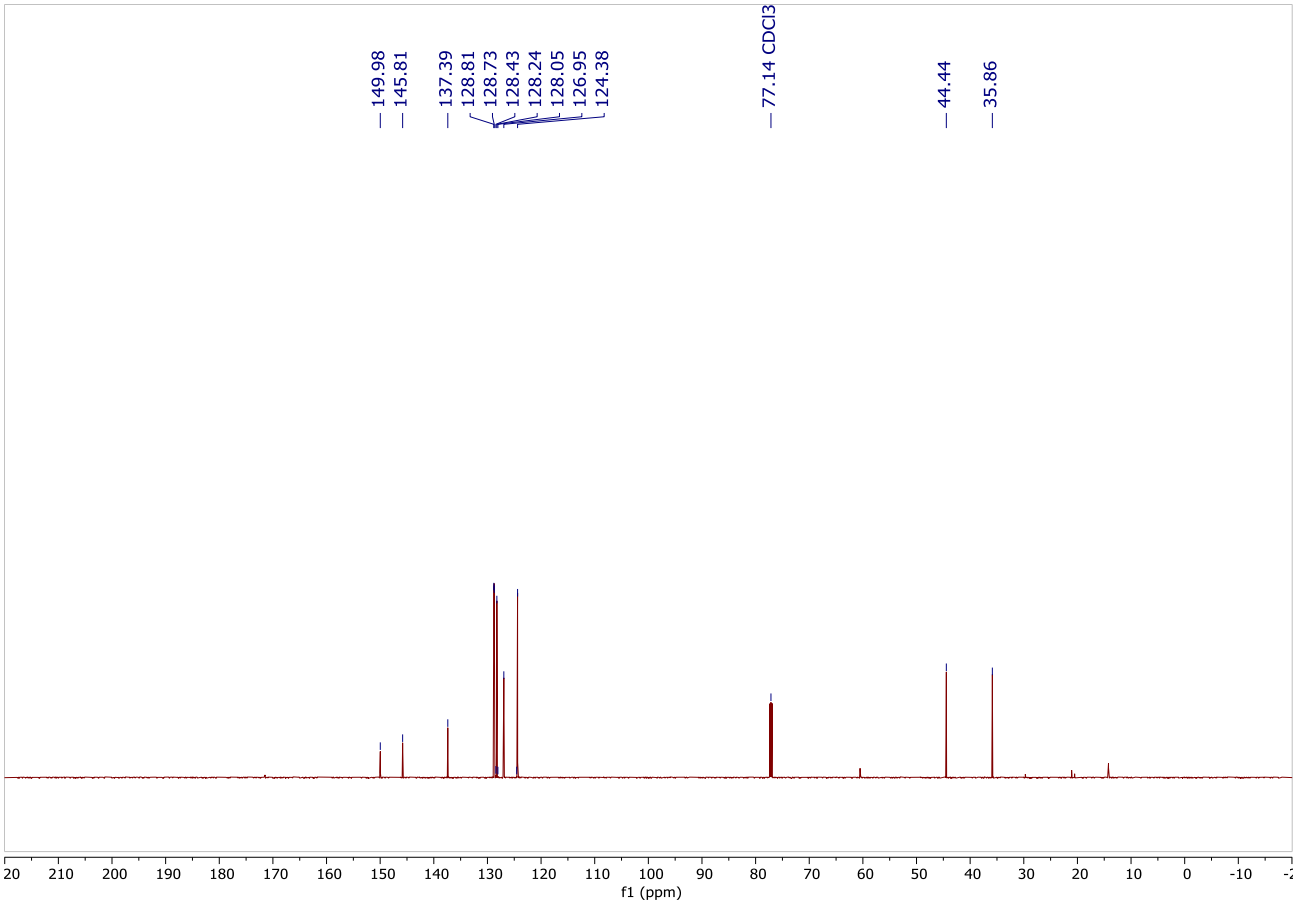
3.05
2.00
0.96
2.02
2.05
f1 (ppm)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145.81
137.39
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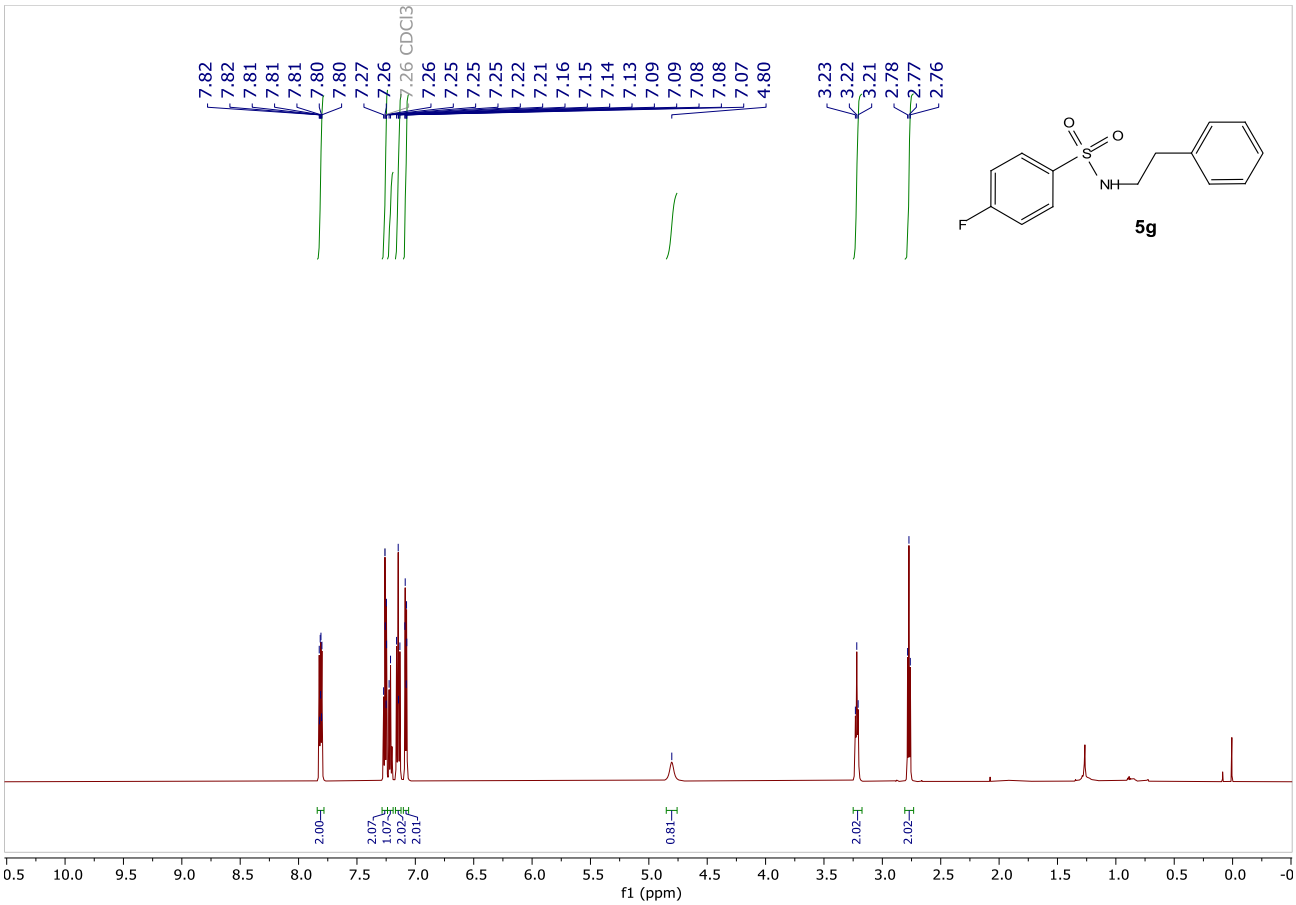
128.24
128.05
126.95
124.38
77.14 CDCl3
44.44
35.86
f1 (ppm)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7.80
7.27
7.26
7.26 CDCl3
7.26
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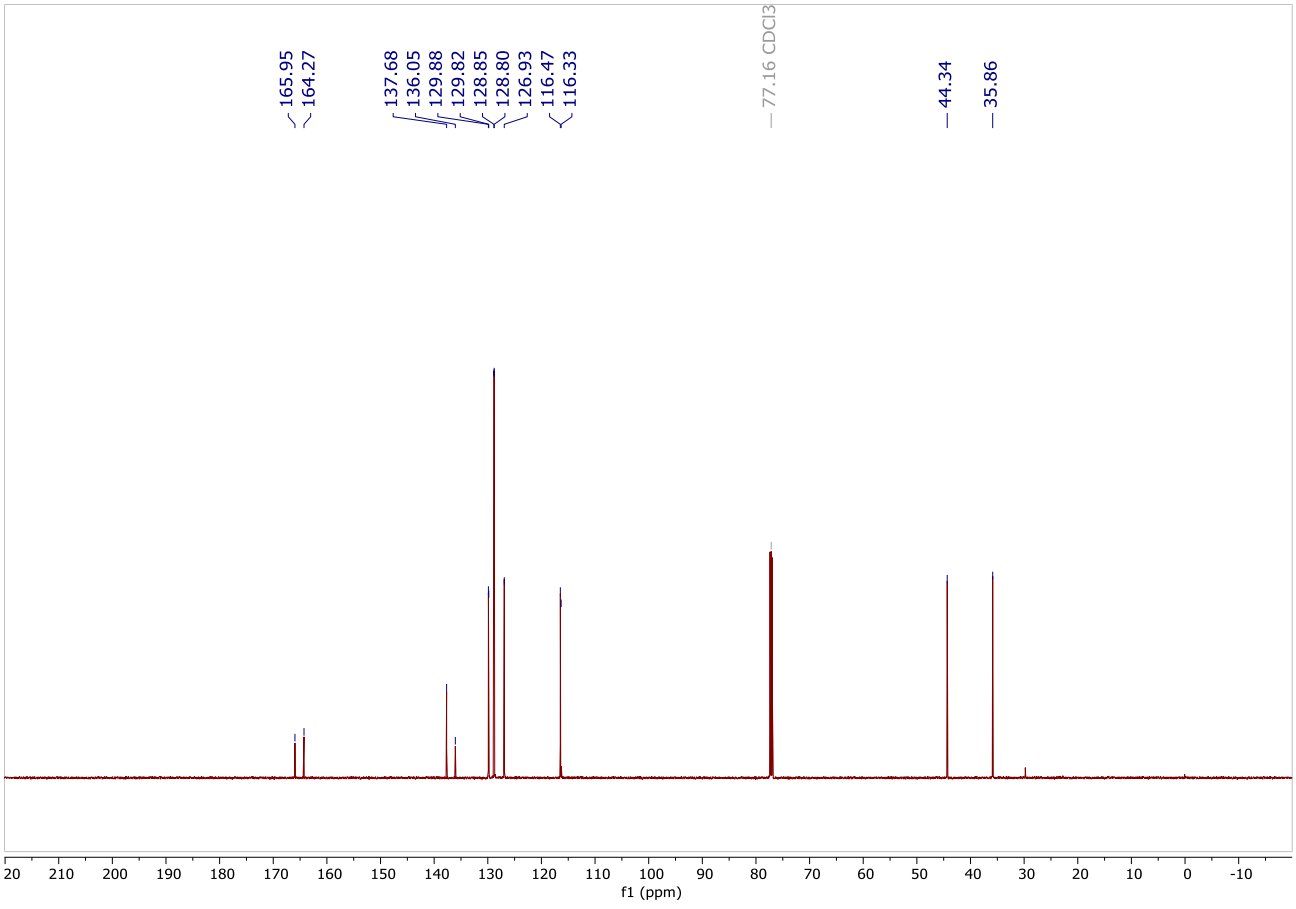
7.25
7.25
7.22
7.21
7.16
7.15
7.14
7.13
7.09
7.09
7.08
7.08
7.07
4.80
3.23
3.22
3.21
2.78
2.77
2.76
O
O
S
NH
F
5g
2.00
2.07
1.07
2.02
2.01
0.81
2.02
2.02
f1 (ppm)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128.80
126.93
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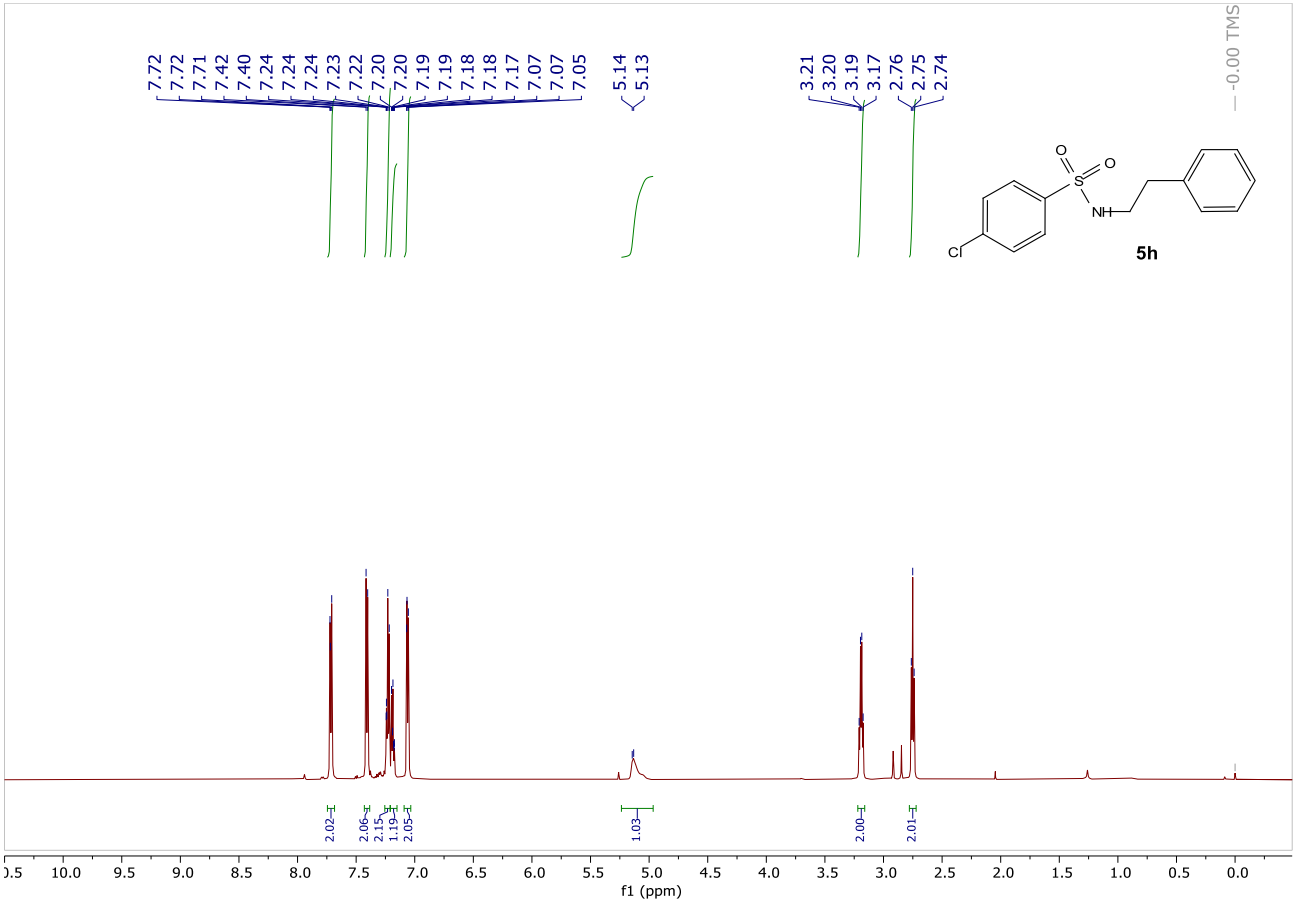
116.33
77.16 CDCl3
44.34
35.86
f1 (ppm)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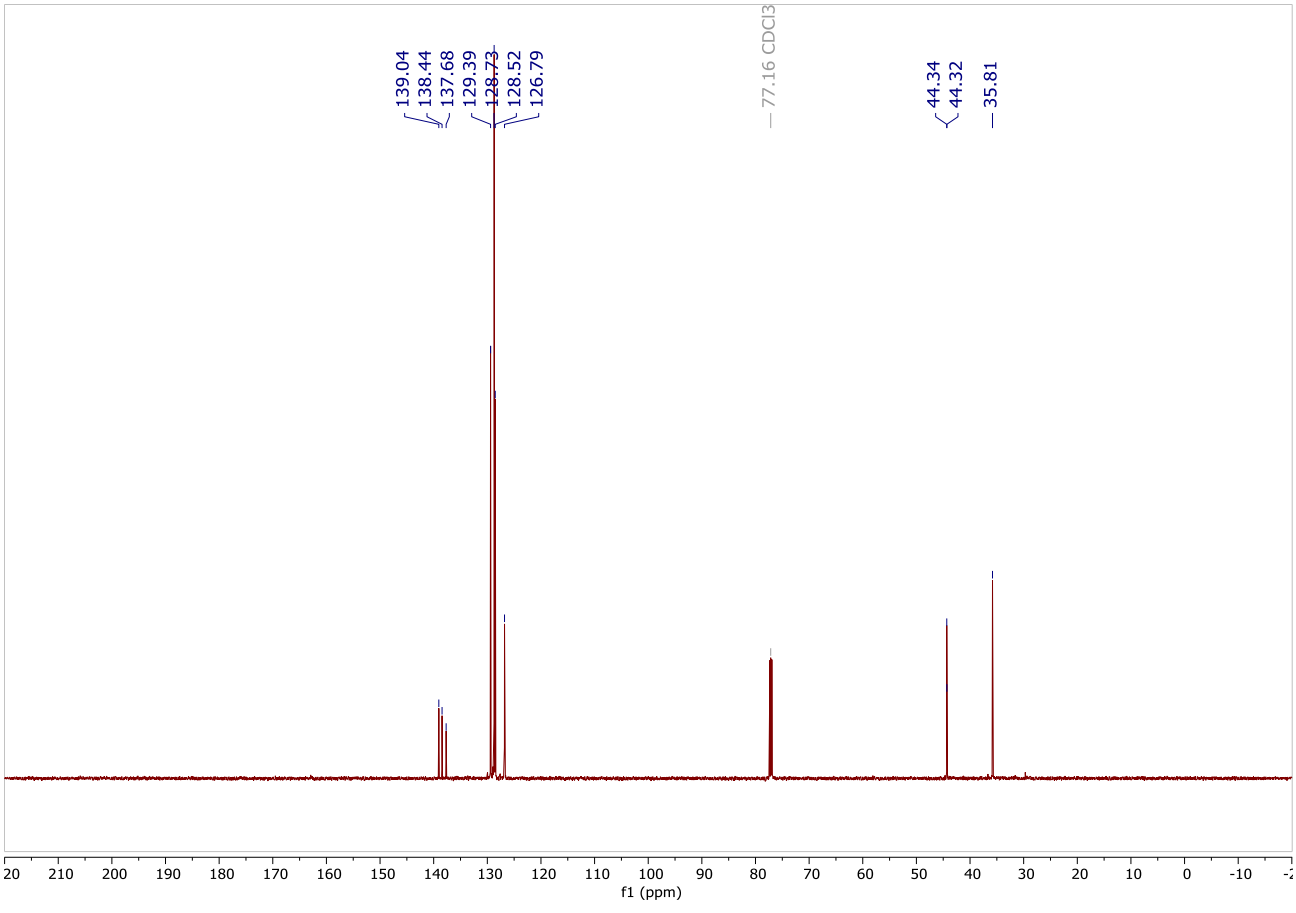
7.19
7.19
7.18
7.18
7.17
7.07
7.07
7.05
5.14
5.13
3.21
3.20
3.19
3.17
2.76
2.75
2.74
-0.00 TMS
O
O
S
NH
Cl
5h
2.02
2.06
2.15
1.19
2.05
1.03
2.00
2.01
f1 (ppm)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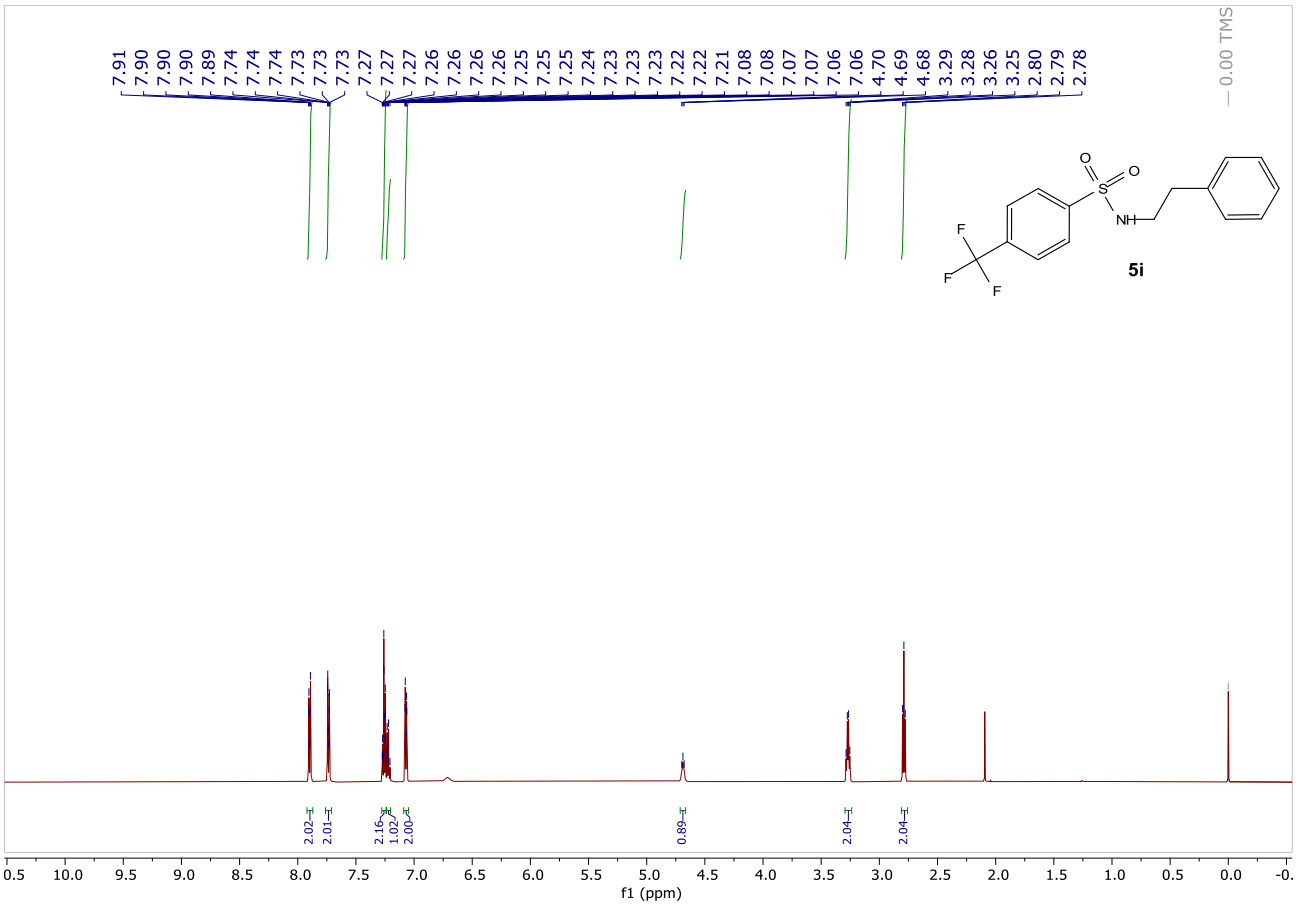
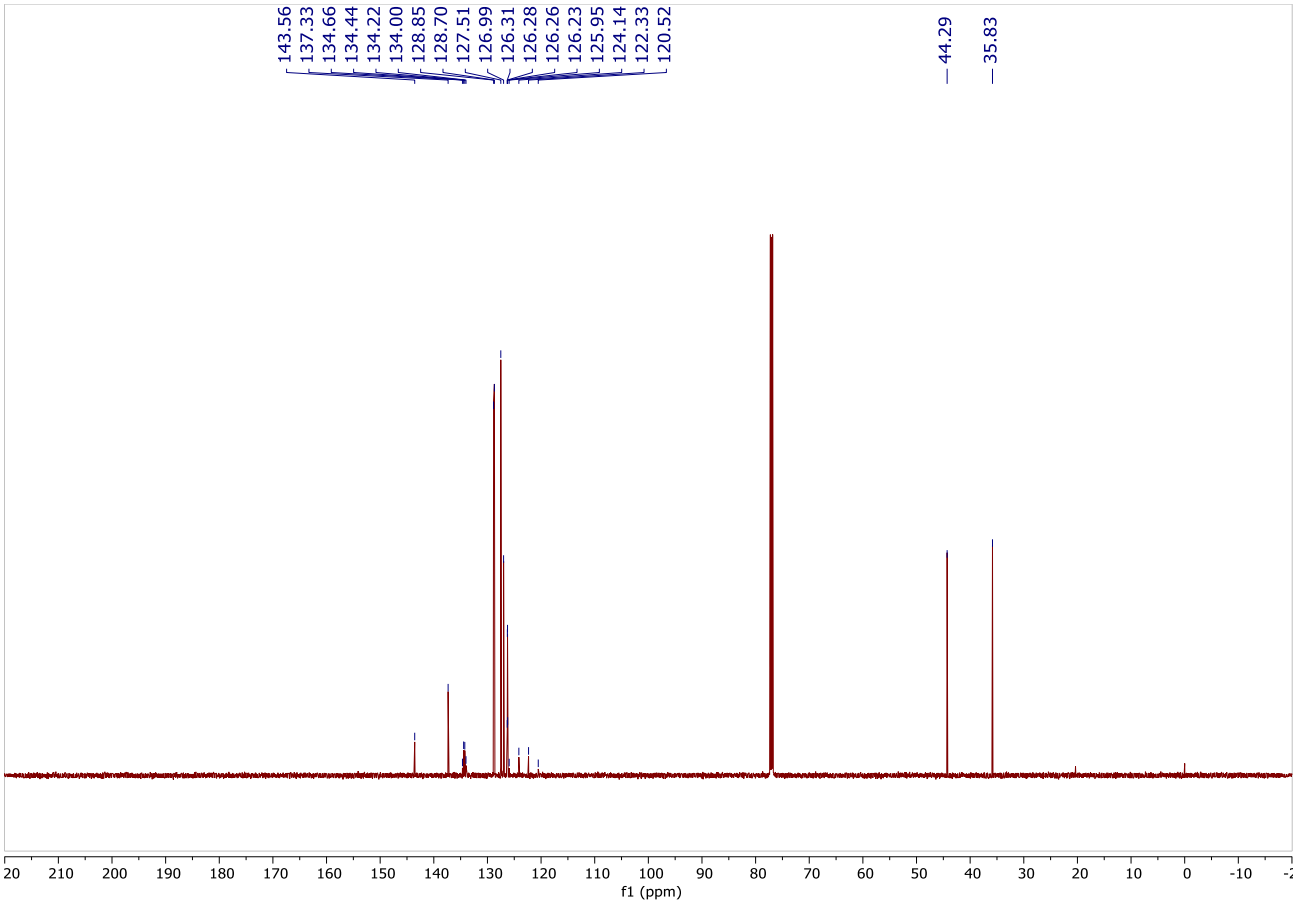
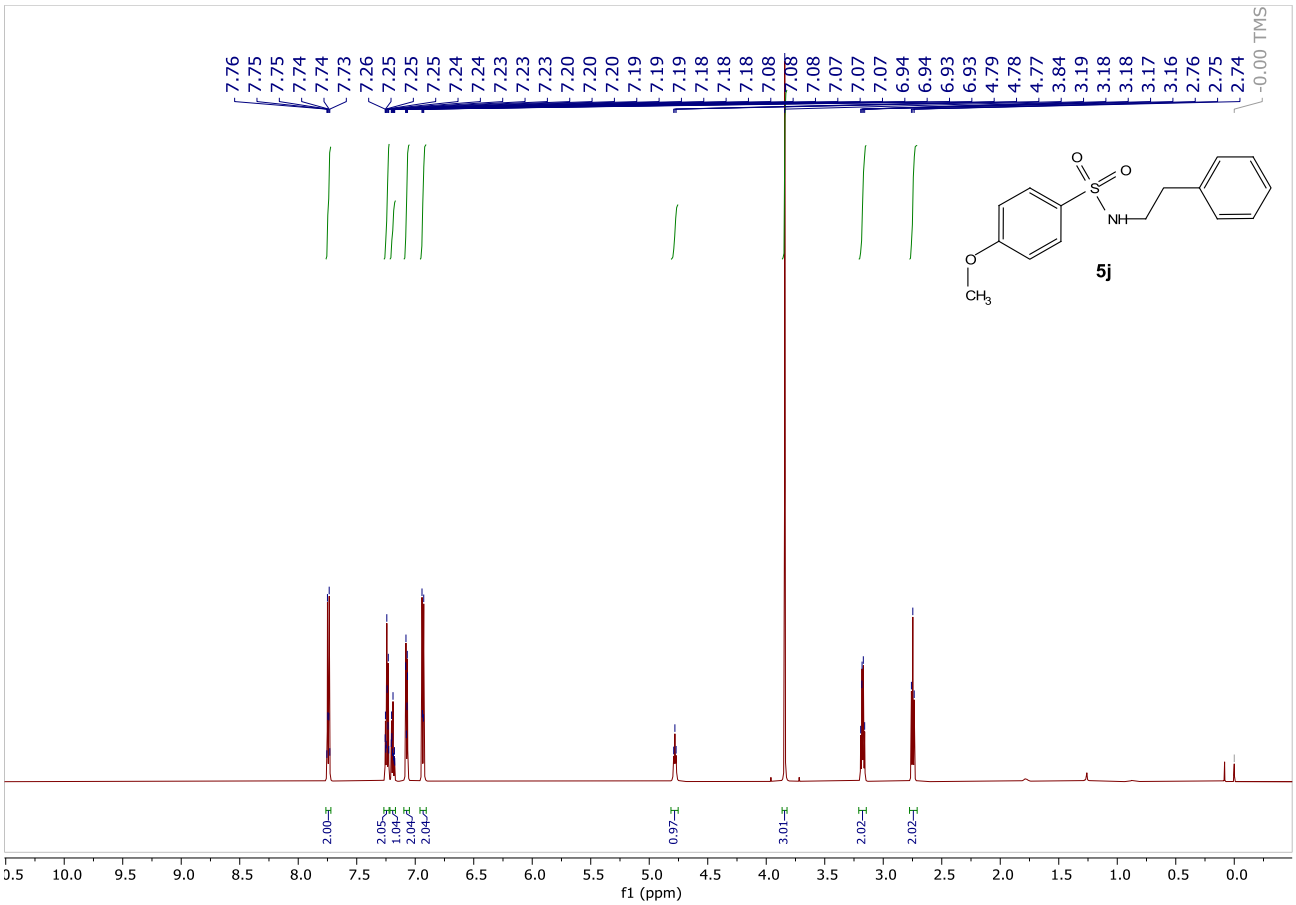
126.79
77.16 CDCl3
44.34
44.32
35.81
f1 (ppm)


7.91 7.90 7.90 7.90 7.89 7.74 7.74 7.74 7.73 7.73 7.73 7.27 7.27 7.27 7.26 7.26 7.26 7.26 7.25 7.25 7.25 7.24 7.23 7.23 7.23 7.22 7.22 7.21 7.08 7.08 7.07 7.07 7.06 7.06 4.70 4.69 4.68 3.29 3.28 3.26 3.25 2.80 2.79 2.78
0.00 TMS
O
O
S
NH
F
F
F
5i
2.02
2.01
2.16
1.02
2.00
0.89
2.04
2.04
f1 (ppm)


143.56 137.33 134.66 134.44 134.22 134.00 128.85 128.70 127.51 126.99 126.31 126.28 126.26 126.23 125.95 124.14 122.33 120.52
44.29
35.83
f1 (ppm)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7.75
7.75
7.74
7.74
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7.25
7.25
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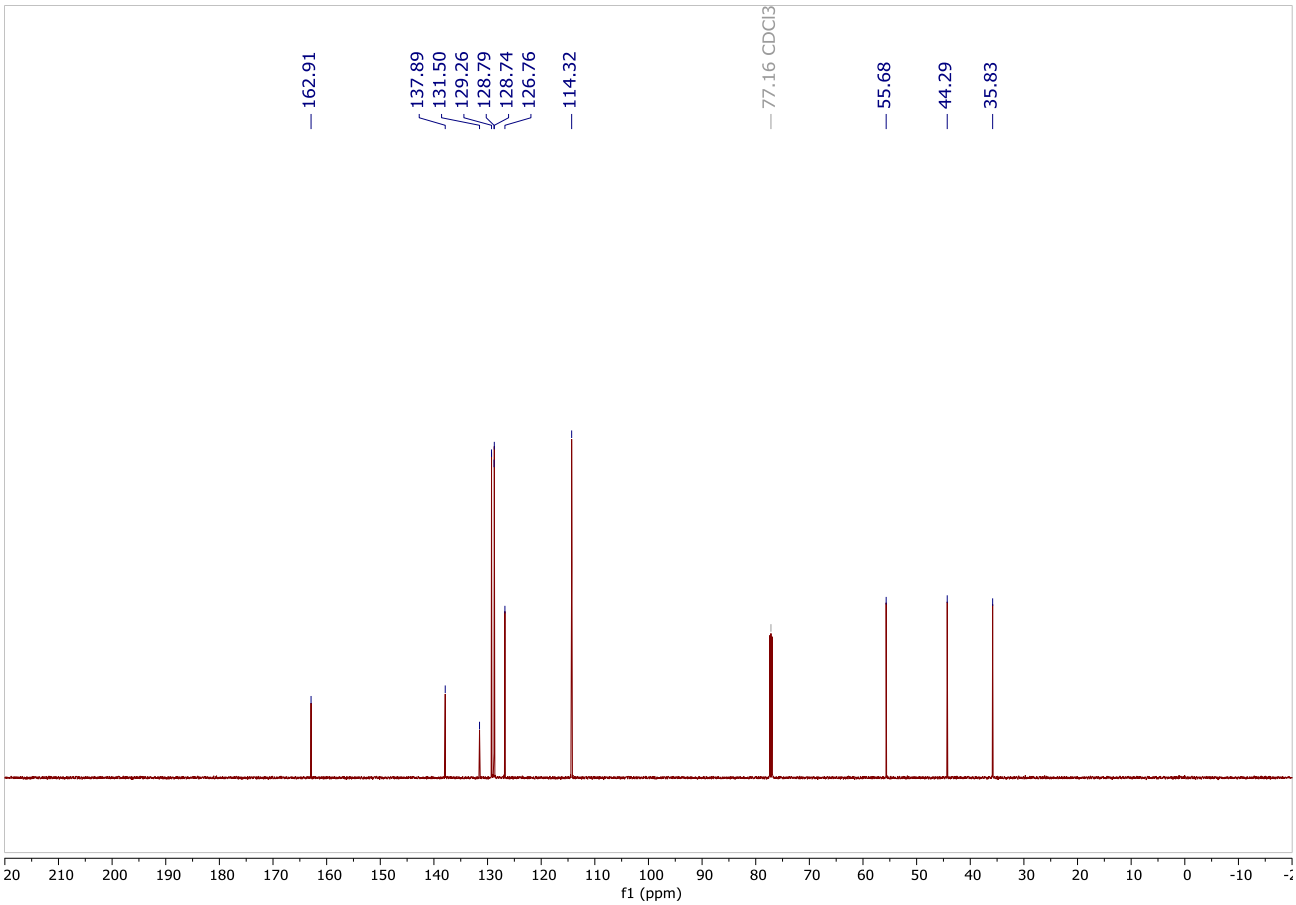
7.24
7.23
7.23
7.23
7.20
7.20
7.19
7.19
7.19
7.18
7.18
7.18
7.08
7.08
7.07
7.07
7.07
6.94
6.93
6.93
4.79
4.78
4.77
3.84
3.19
3.18
3.18
3.17
3.16
2.76
2.75
2.74
-0.00 TMS
O
O
S
NH
O
CH3
5j
2.00
2.05
1.04
2.04
2.04
0.97
3.01
2.02
2.02
f1 (ppm)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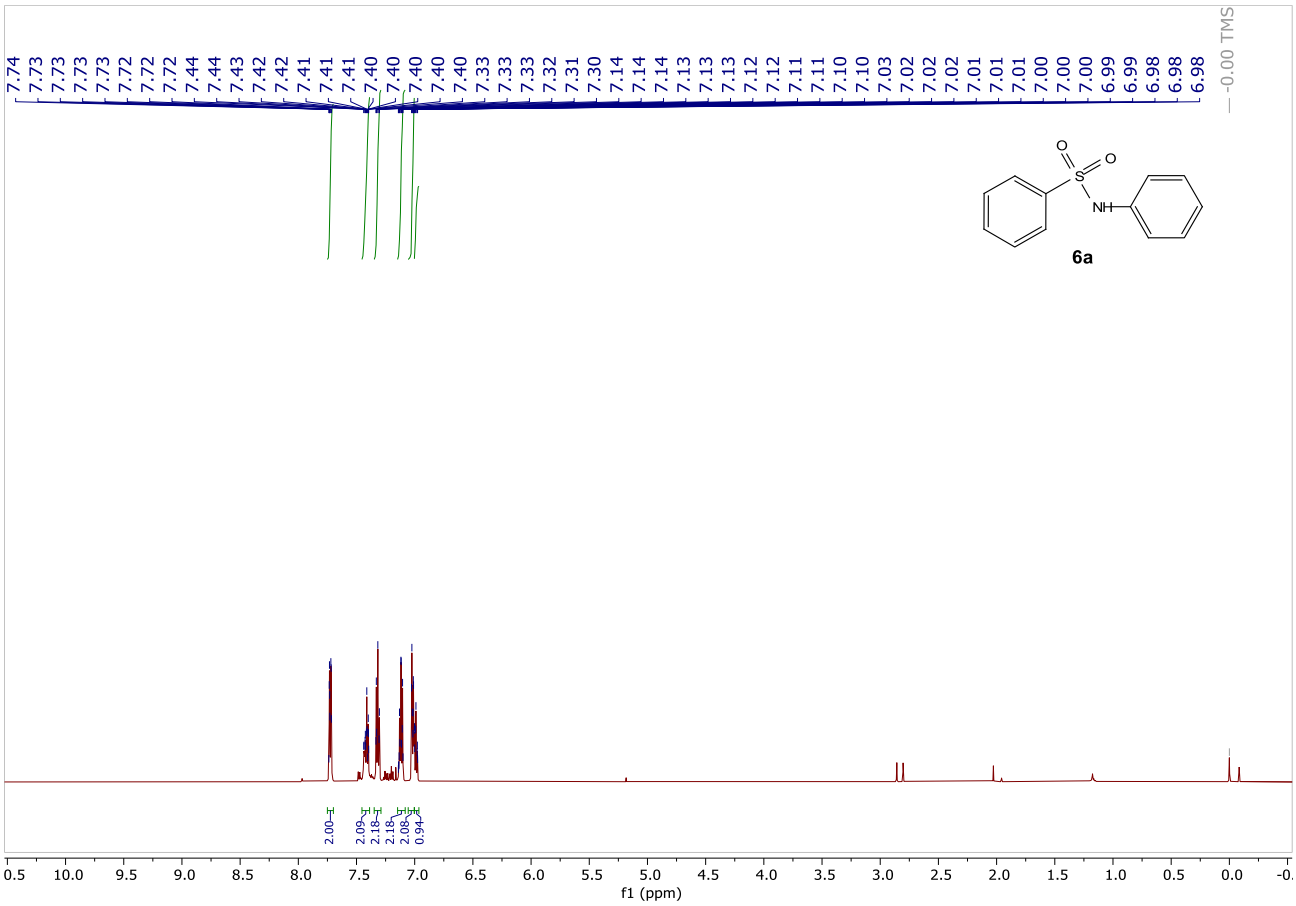
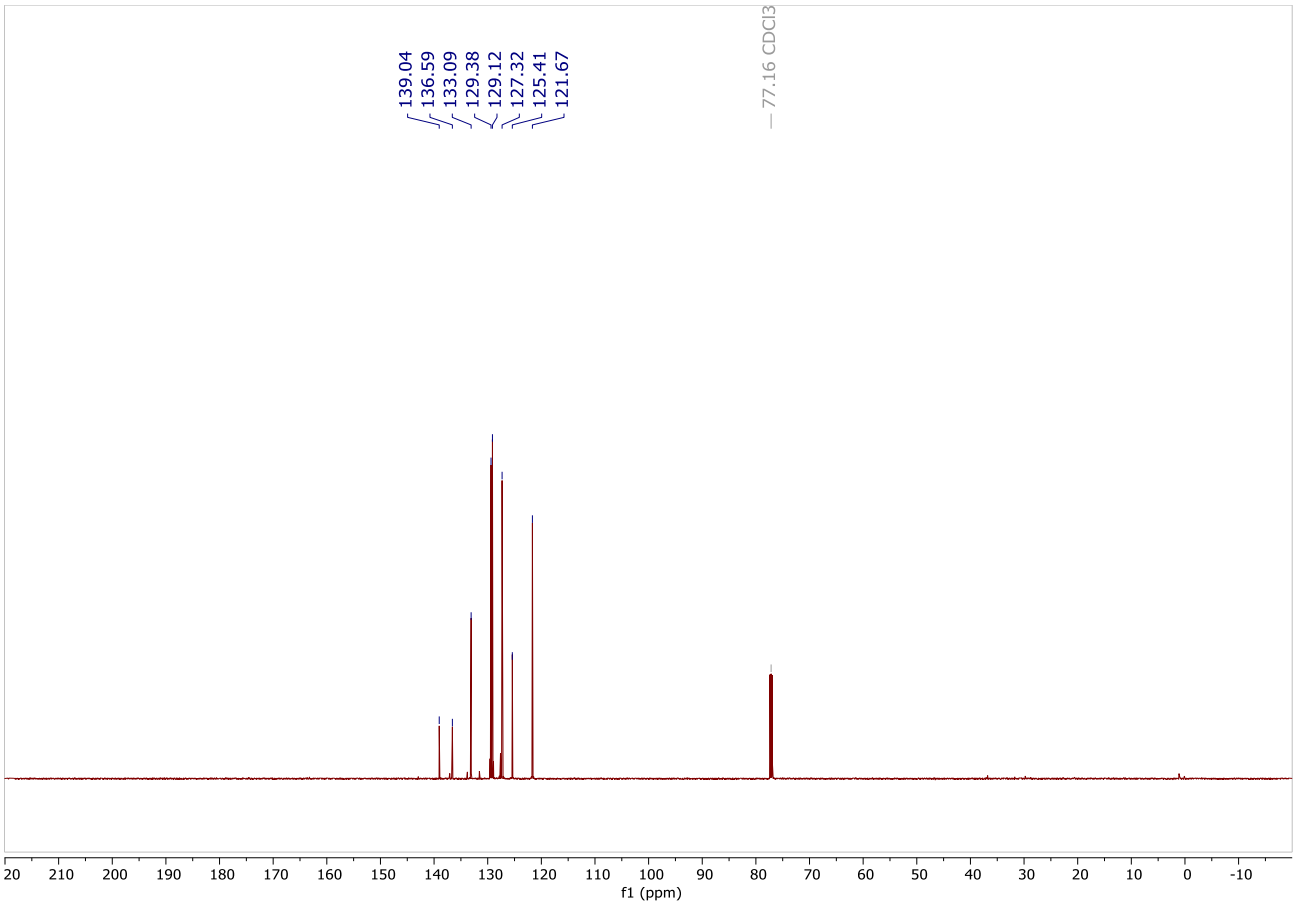
137.89
131.50
129.26
128.79
128.74
126.76
114.32
77.16 CDCl3
55.68
44.29
35.83
f1 (ppm)


7.74 7.73 7.73 7.73 7.72 7.72 7.72 7.44 7.44 7.43 7.42 7.42 7.41 7.41 7.41 7.40 7.40 7.40 7.40 7.40 7.33 7.33 7.32 7.31 7.30 7.14 7.14 7.14 7.13 7.13 7.13 7.12 7.12 7.11 7.11 7.10 7.10 7.03 7.02 7.02 7.02 7.01 7.01 7.01 7.00 7.00 7.00 6.99 6.99 6.98 6.98 6.98
-0.00 TMS
O
O
S
NH
6a
2.00
2.09
2.18
2.18
2.08
0.94
0.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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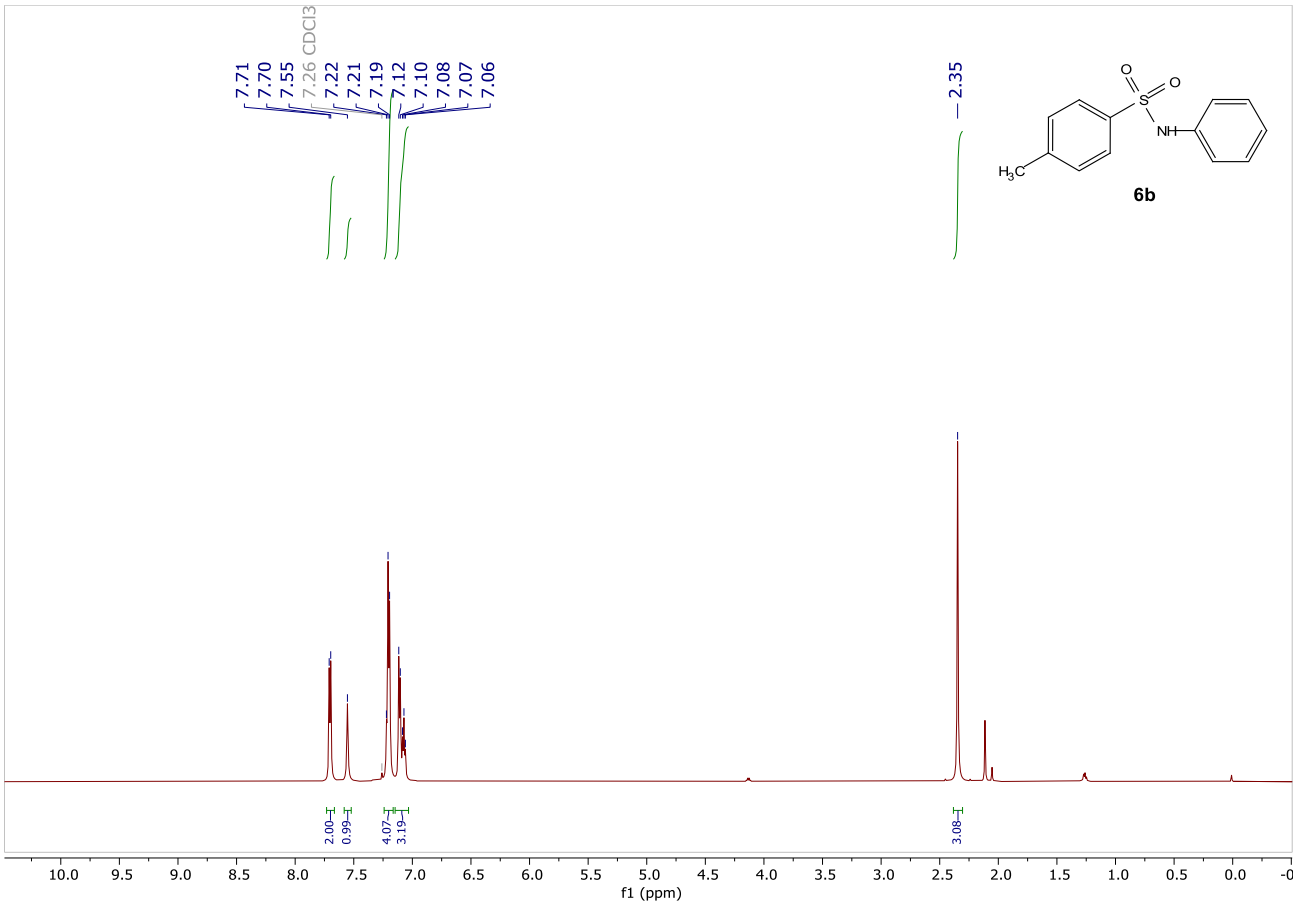
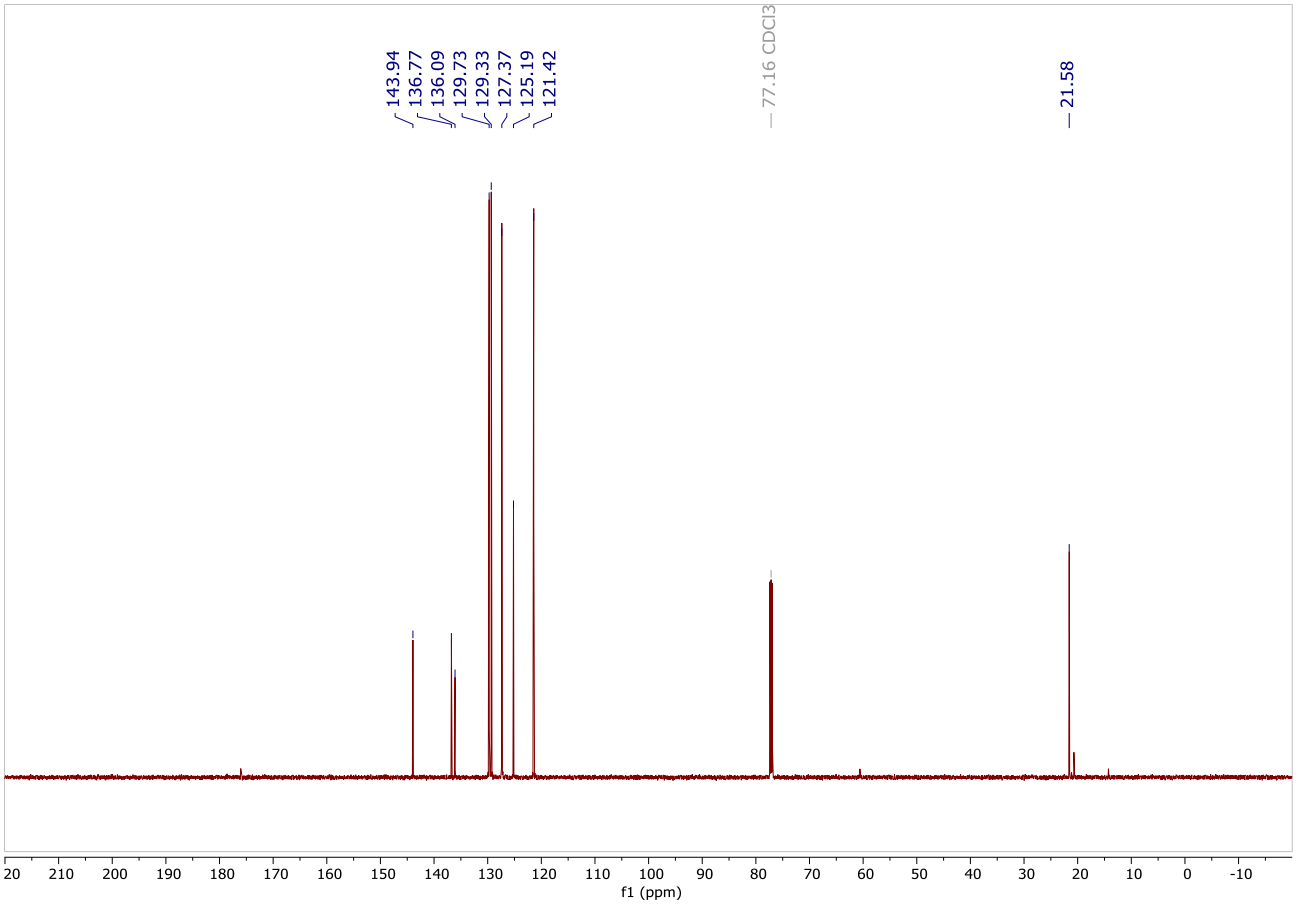
129.38
129.12
127.32
125.41
121.67
77.16 CDCl3
20 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


7.71
7.70
7.55
7.26 CDCl3
7.22
7.21
7.19
7.12
7.10
7.08
7.07
7.06
2.35
O
O
S
NH
H3C
6b
2.00
0.99
4.07
3.19
3.08
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0
f1 (ppm)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129.33
127.37
125.19
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77.16 CDCl3
21.58
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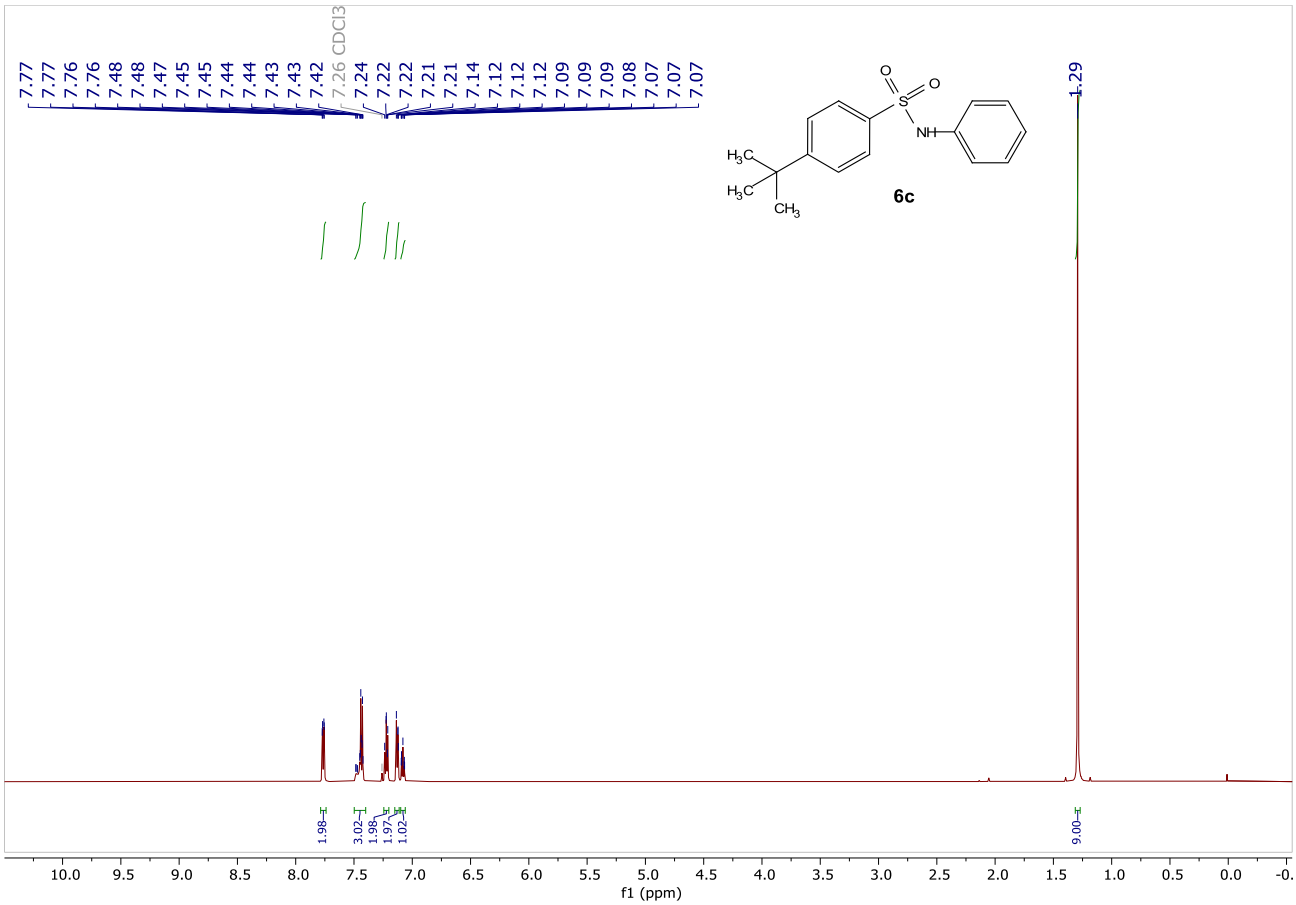
f1 (ppm)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7.76
7.76
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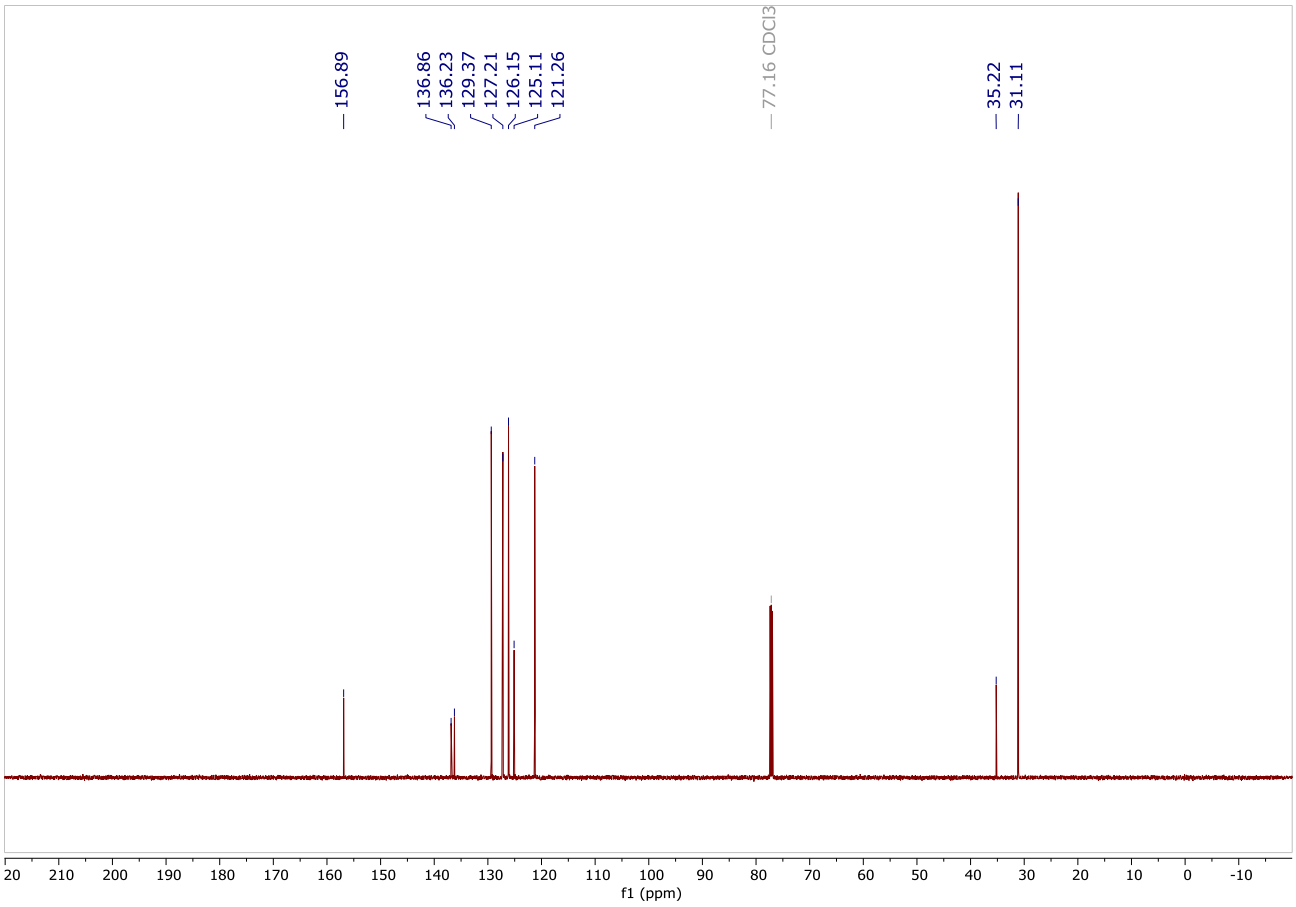
7.48
7.47
7.45
7.45
7.44
7.44
7.43
7.43
7.42
7.26 CDCl3
7.24
7.22
7.22
7.21
7.21
7.14
7.12
7.12
7.12
7.09
7.09
7.09
7.08
7.07
7.07
7.07
1.29
O
S
O
NH
H3C
H3C
CH3
6c
1.98
3.02
1.98
1.97
1.02
9.00
f1 (ppm)


156.89
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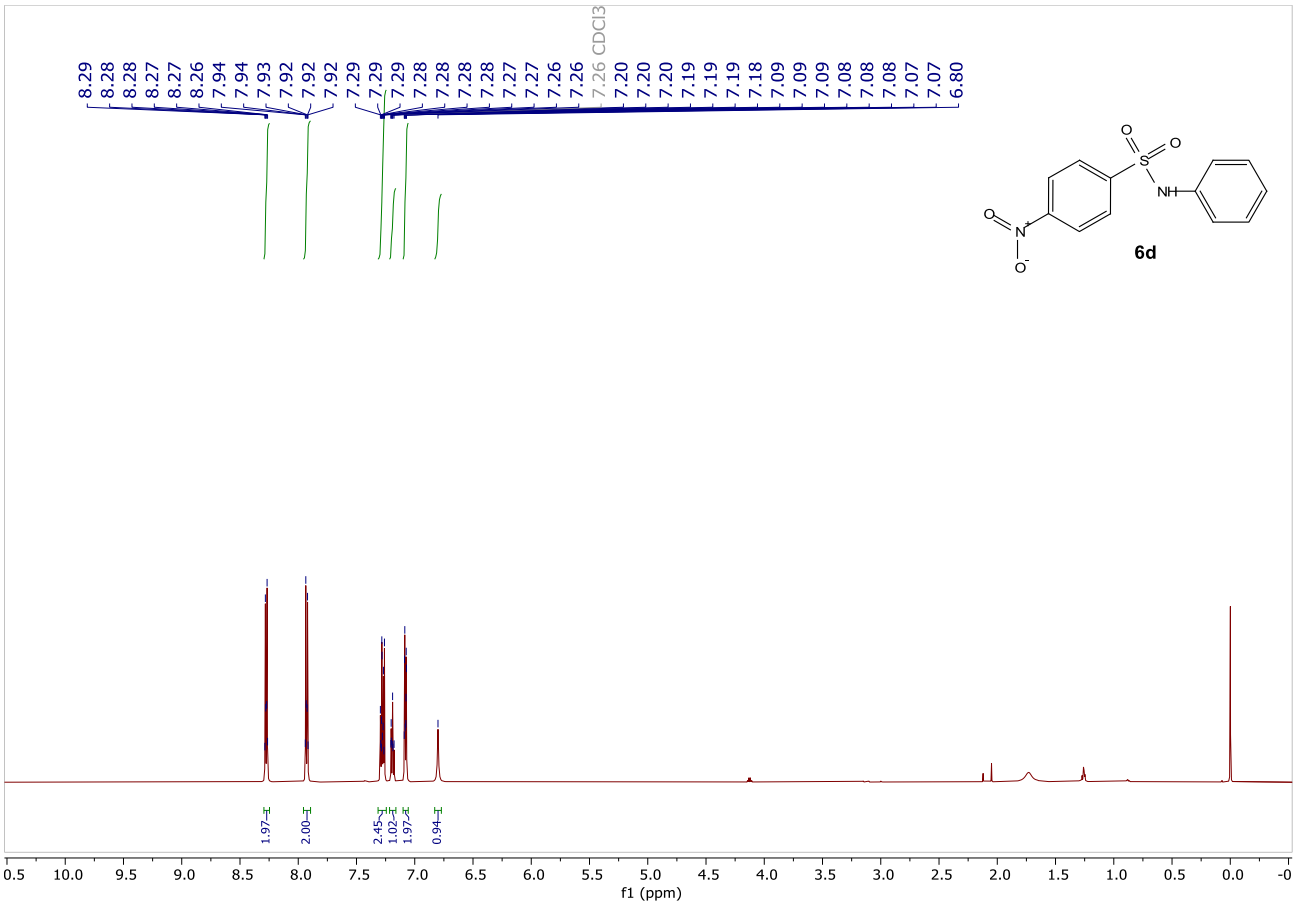
121.26
77.16 CDCl3
35.22
31.11
f1 (ppm)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7.93
7.92
7.92
7.29
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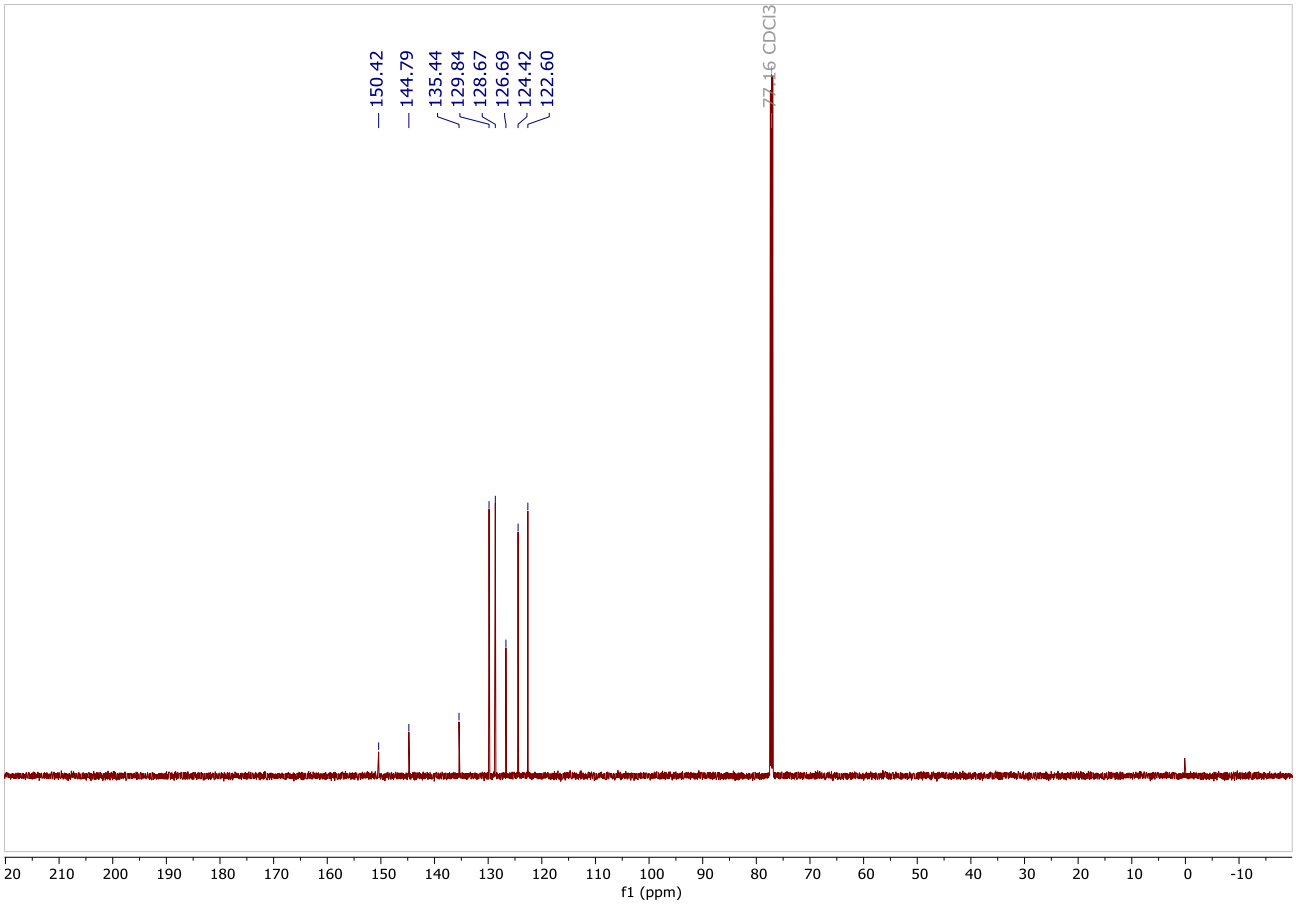
7.29
7.28
7.28
7.28
7.27
7.27
7.26
7.26
7.26 CDCl3
7.20
7.20
7.20
7.19
7.19
7.19
7.18
7.09
7.09
7.09
7.08
7.08
7.08
7.07
7.07
6.80
O
O
S
NH
N+
O
O-
6d
1.97
2.00
2.45
1.02
1.97
0.94
f1 (ppm)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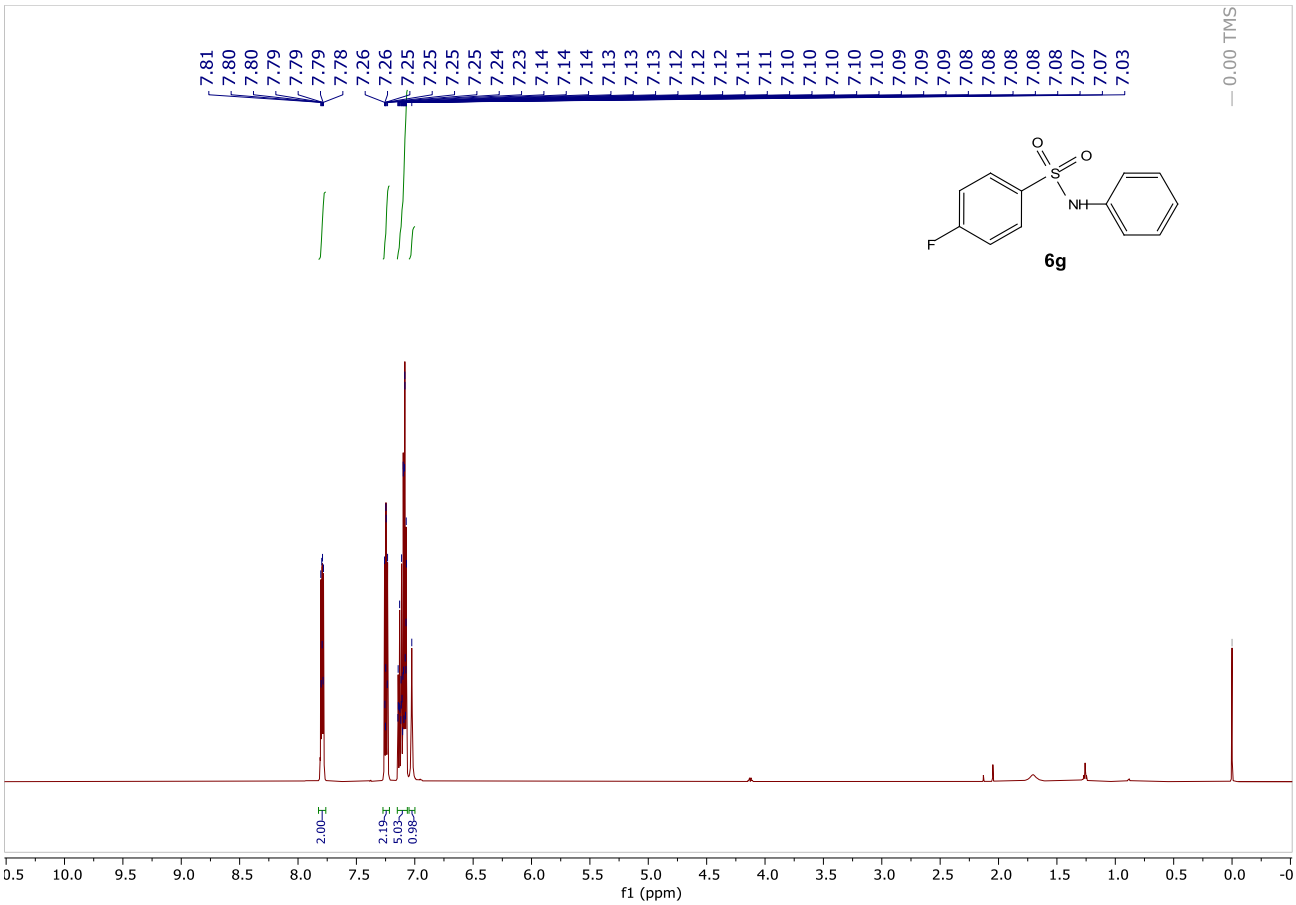
128.67
126.69
124.42
122.60
77.16 CDCl3
f1 (ppm)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7.25
7.25
7.24
7.23
7.14
7.14
7.14
7.13
7.13
7.13
7.12
7.12
7.12
7.11
7.11
7.10
7.10
7.10
7.10
7.10
7.09
7.09
7.09
7.08
7.08
7.08
7.08
7.08
7.07
7.07
7.03
— 0.00 TMS
O
O
S
NH
F
6g
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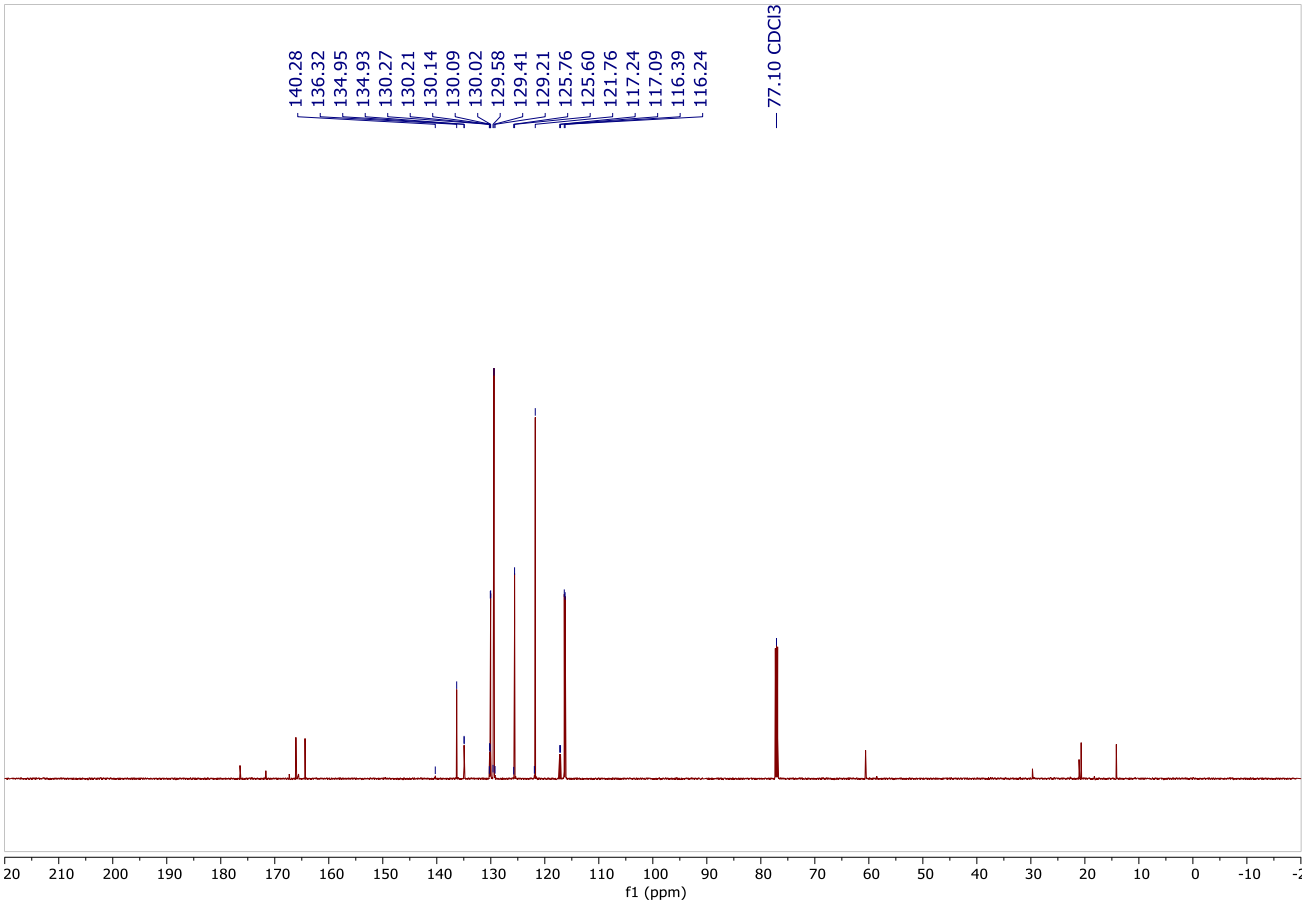
2.19
5.03
0.98
f1 (ppm)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130.09
130.02
129.58
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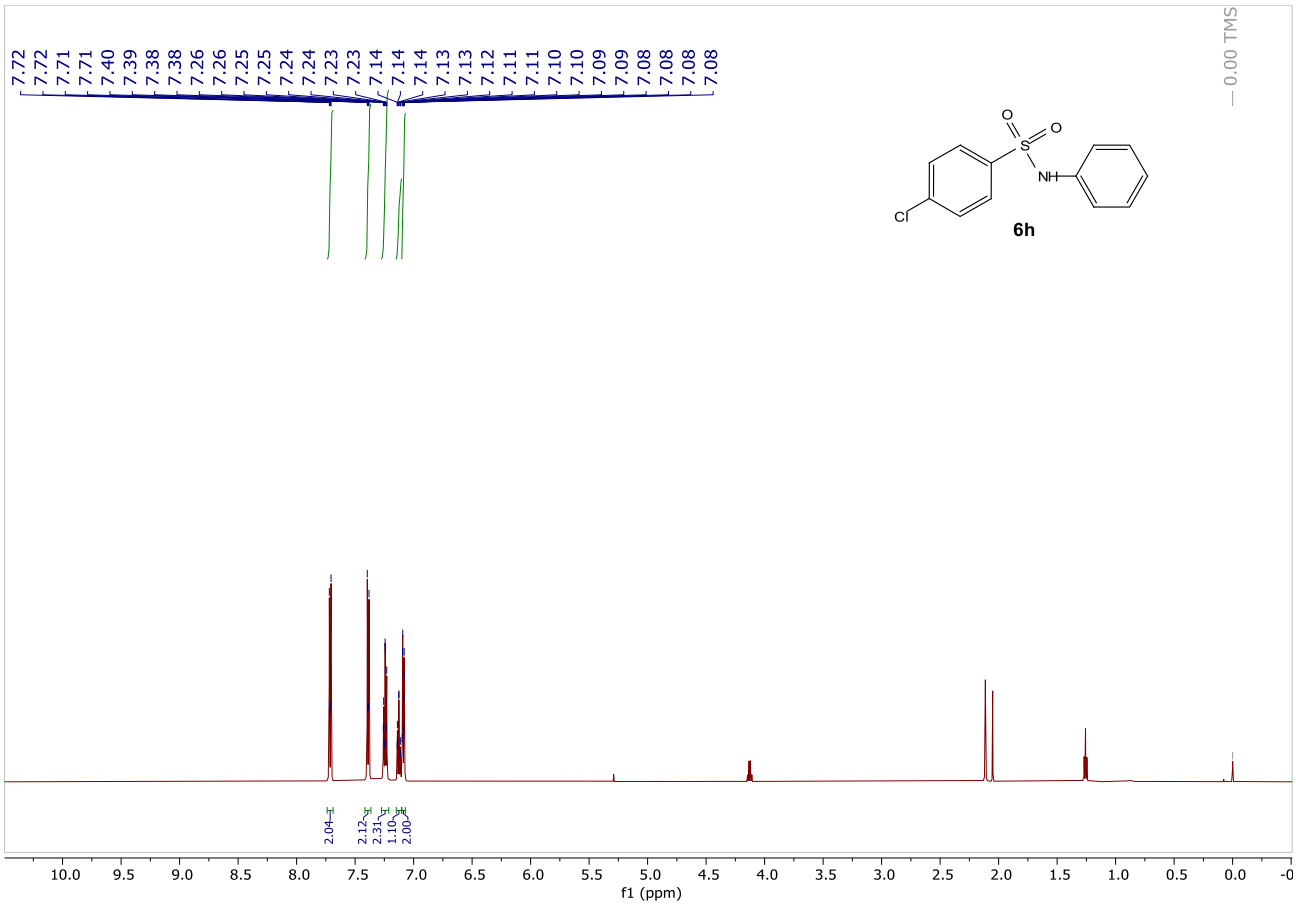
129.21
125.76
125.60
121.76
117.24
117.09
116.39
116.24
— 77.10 CDCl3
f1 (ppm)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7.25
7.25
7.24
7.24
7.23
7.23
7.14
7.14
7.14
7.13
7.13
7.12
7.11
7.11
7.10
7.10
7.09
7.09
7.08
7.08
7.08
7.08
0.00 TMS
O
O
S
NH
Cl
6h
2.04
2.12
2.31
1.10
2.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
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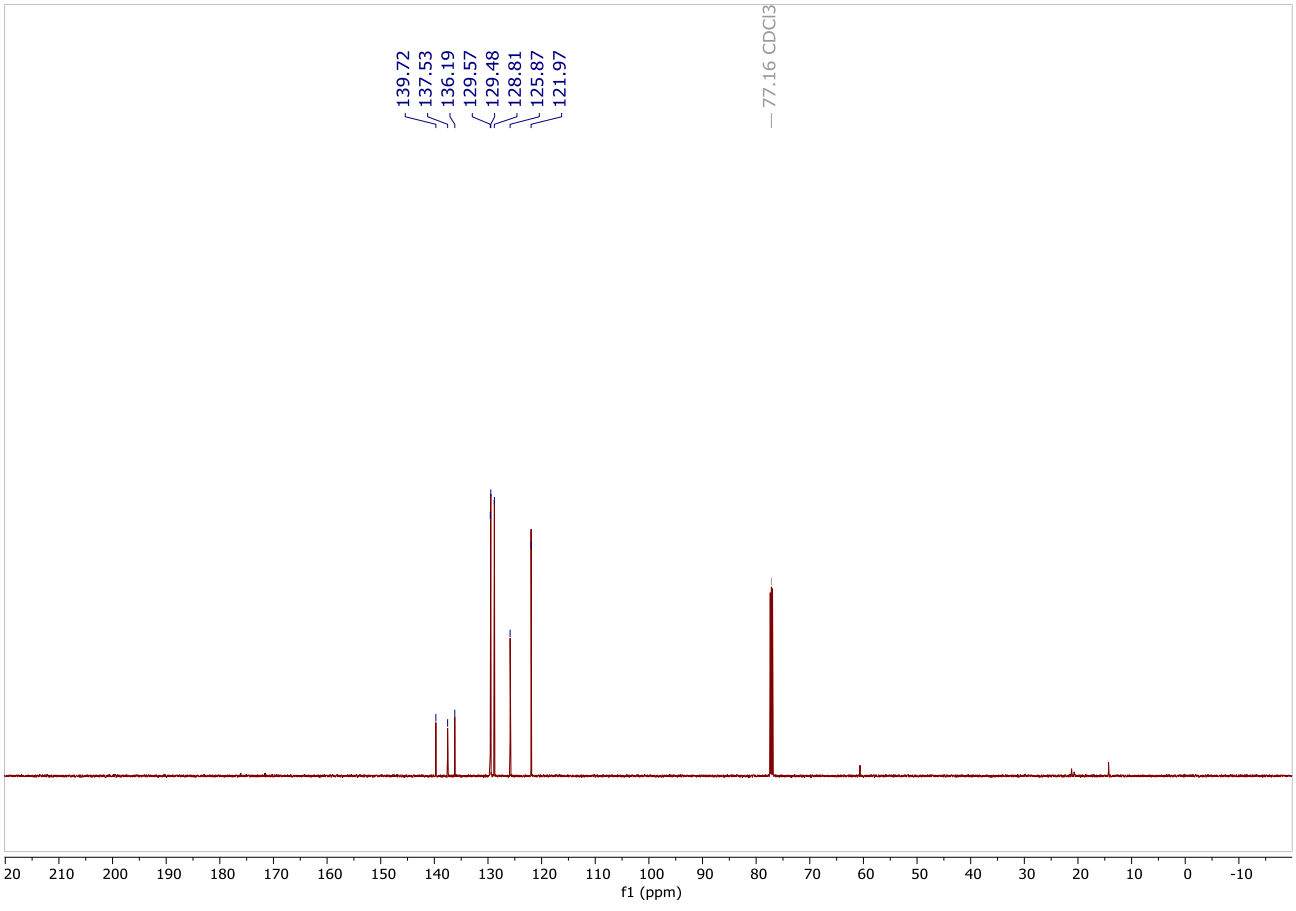
0.0
f1 (ppm)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128.81
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121.97
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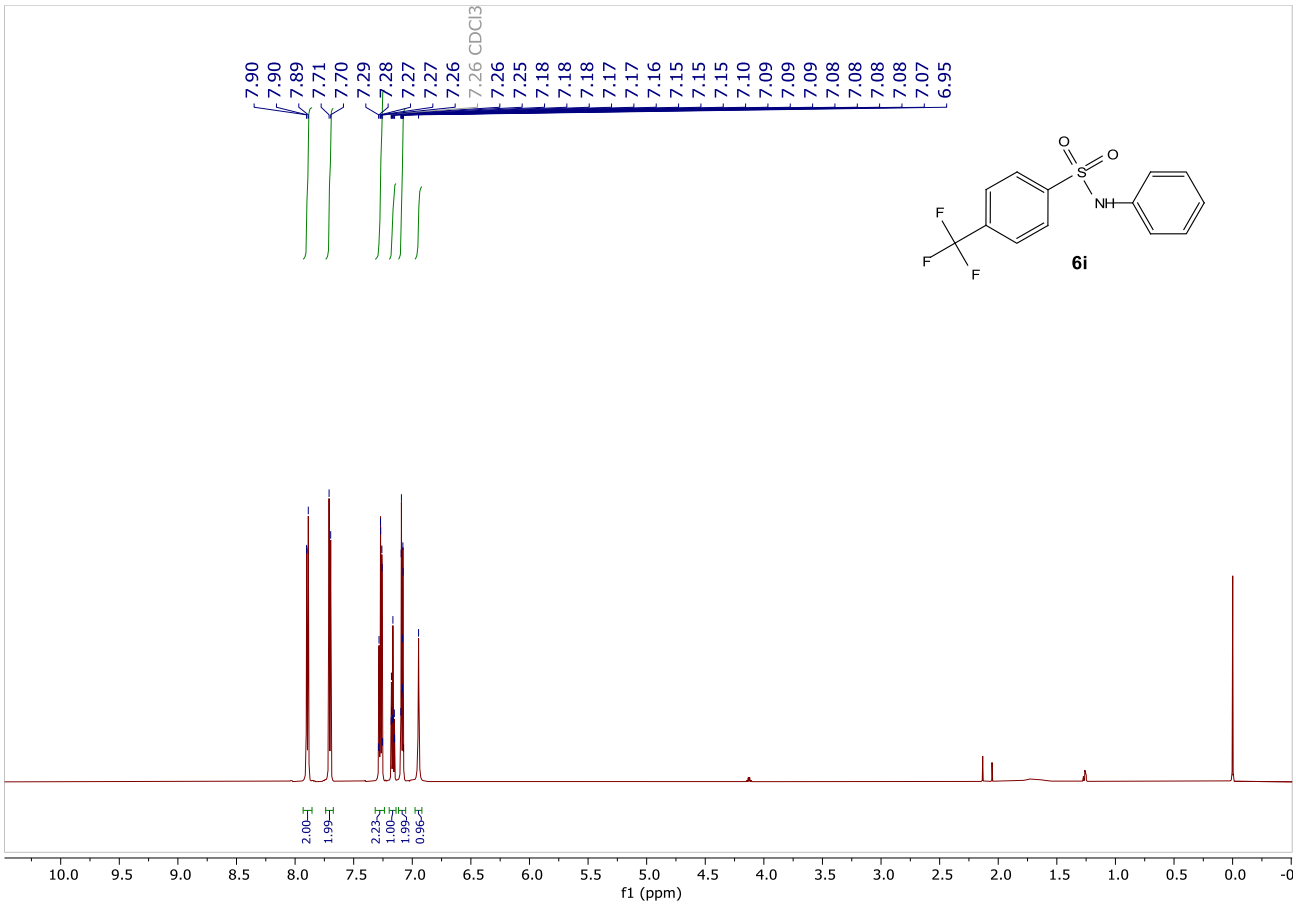
20
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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7.27
7.26
7.26 CDCl3
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7.18
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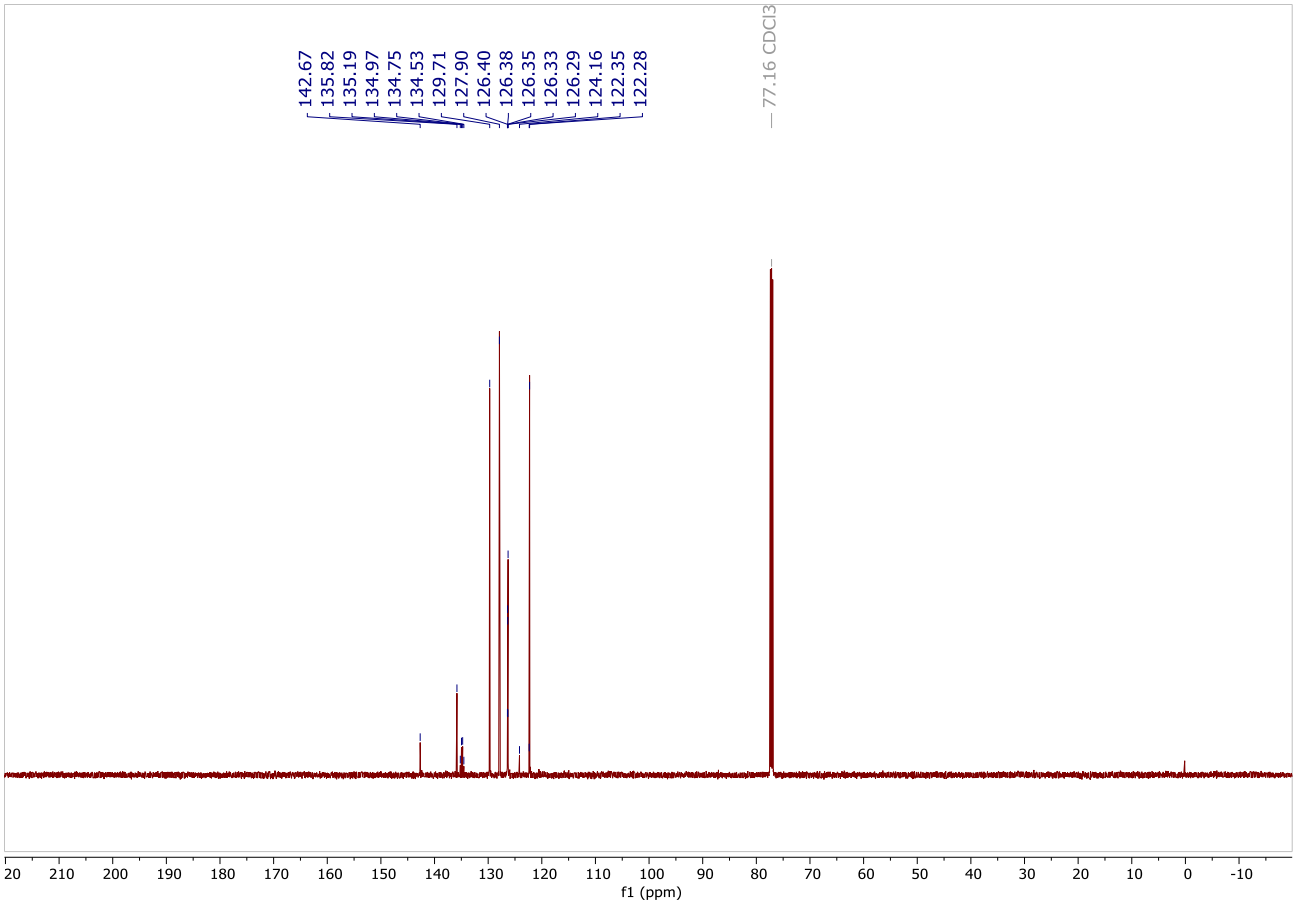
7.17
7.16
7.15
7.15
7.15
7.10
7.09
7.09
7.09
7.08
7.08
7.08
7.08
7.07
6.95
O
O
S
NH
F
F
F
6i
2.00
1.99
2.23
1.00
1.99
0.96
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0
f1 (ppm)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127.90
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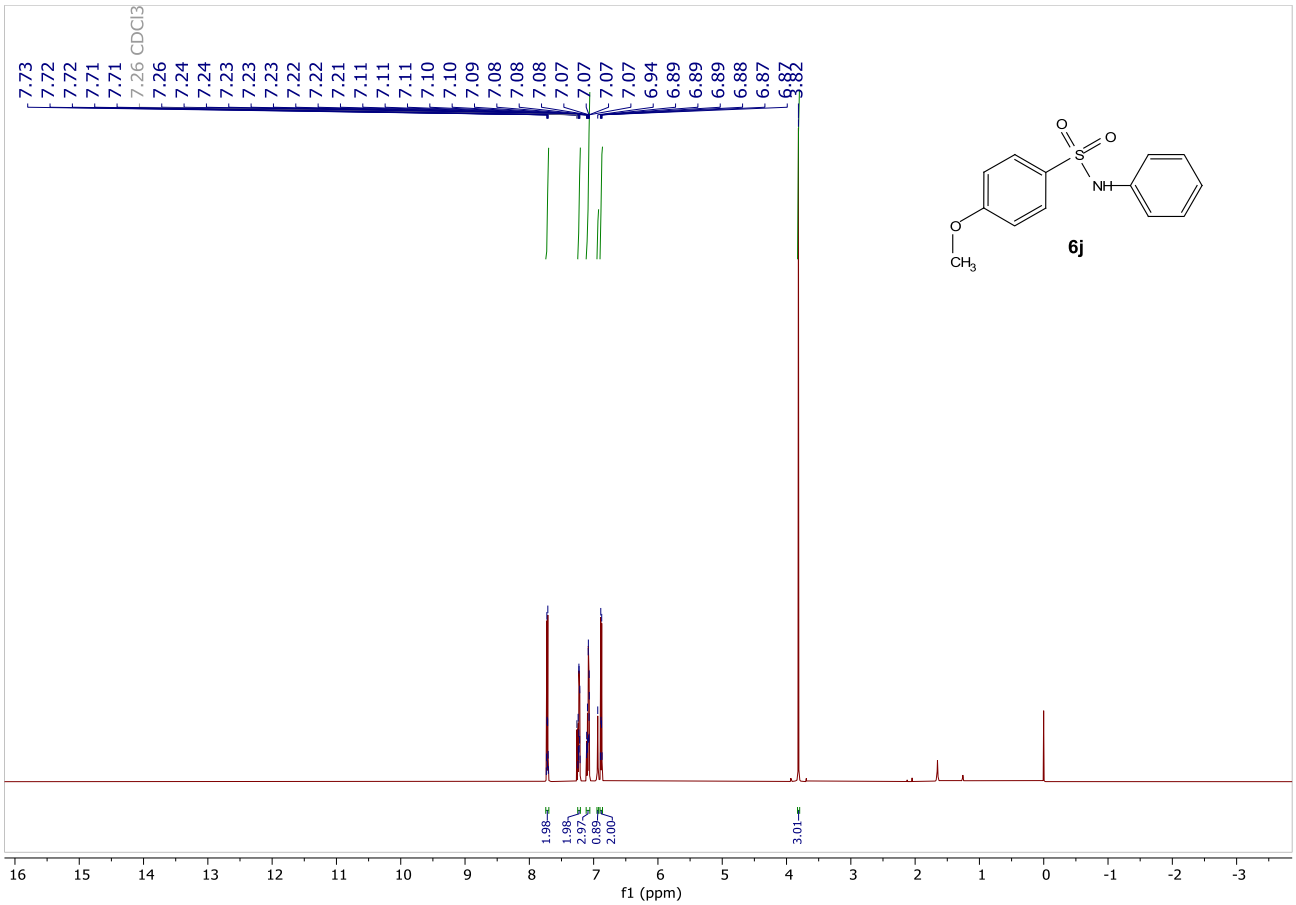
126.38
126.35
126.33
126.29
124.16
122.35
122.28
77.16 CDCl3
20 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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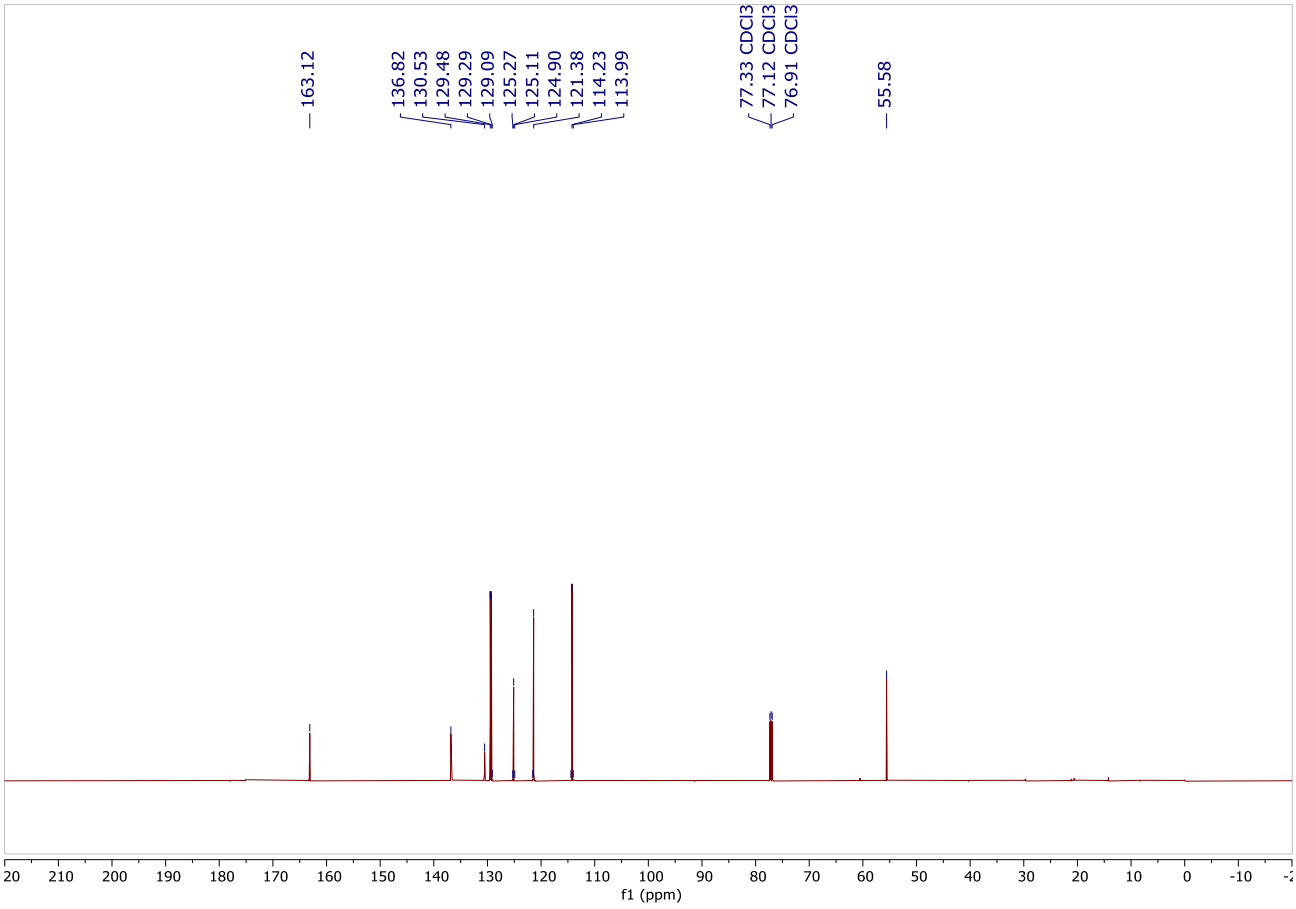
7.72
7.72
7.71
7.71
7.26 CDCl3
7.26
7.24
7.24
7.23
7.23
7.23
7.22
7.22
7.21
7.11
7.11
7.11
7.10
7.10
7.09
7.08
7.08
7.08
7.07
7.07
7.07
7.07
6.94
6.89
6.89
6.89
6.88
6.87
6.87
3.82
O
S
O
NH
O
CH3
6j
1.98
1.98
2.97
0.89
2.00
3.01
f1 (ppm)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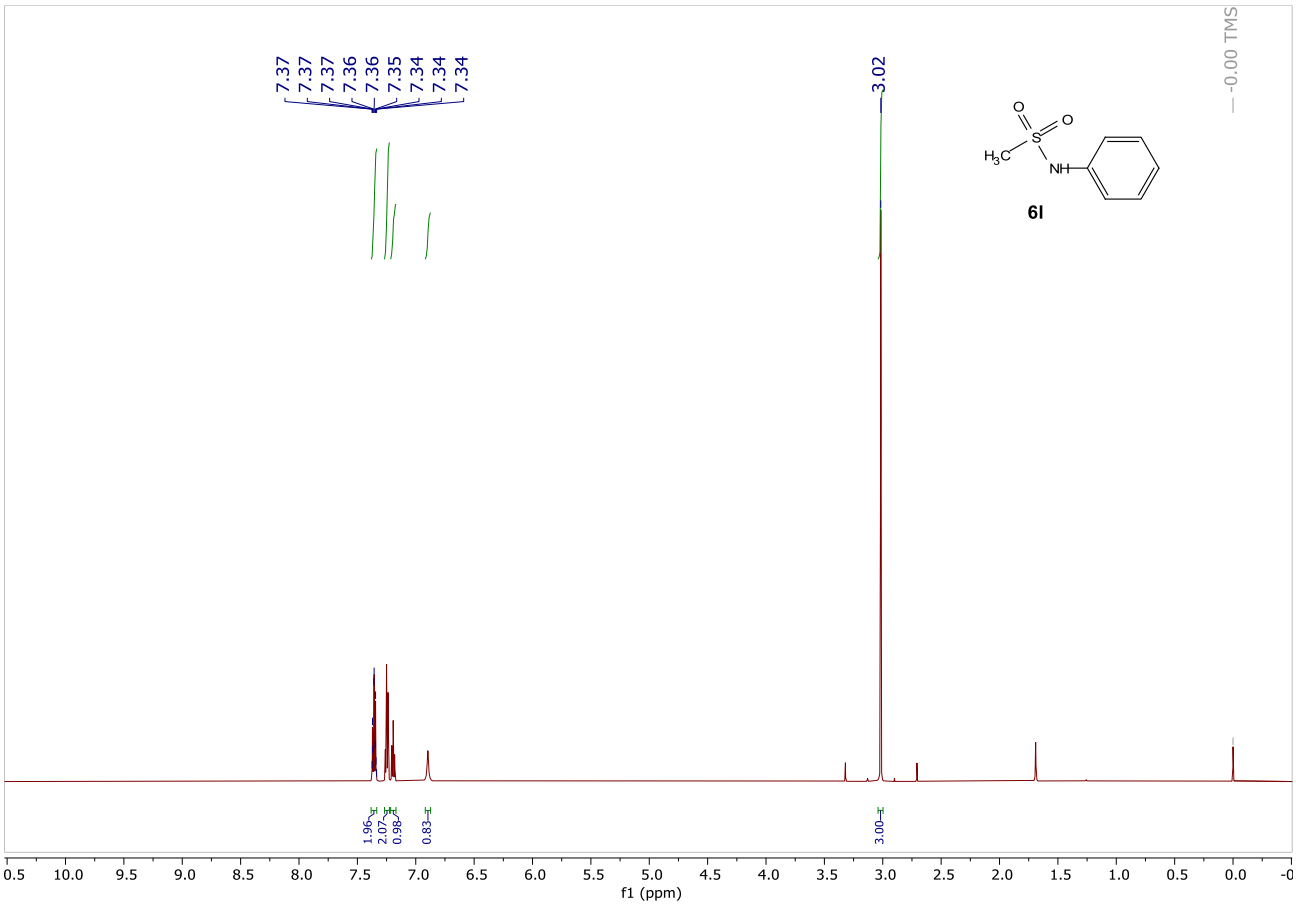
129.09
125.27
125.11
124.90
121.38
114.23
113.99
77.33 CDCl3
77.12 CDCl3
76.91 CDCl3
55.58
f1 (ppm)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7.35
7.34
7.34
7.34
3.02
-0.00 TMS
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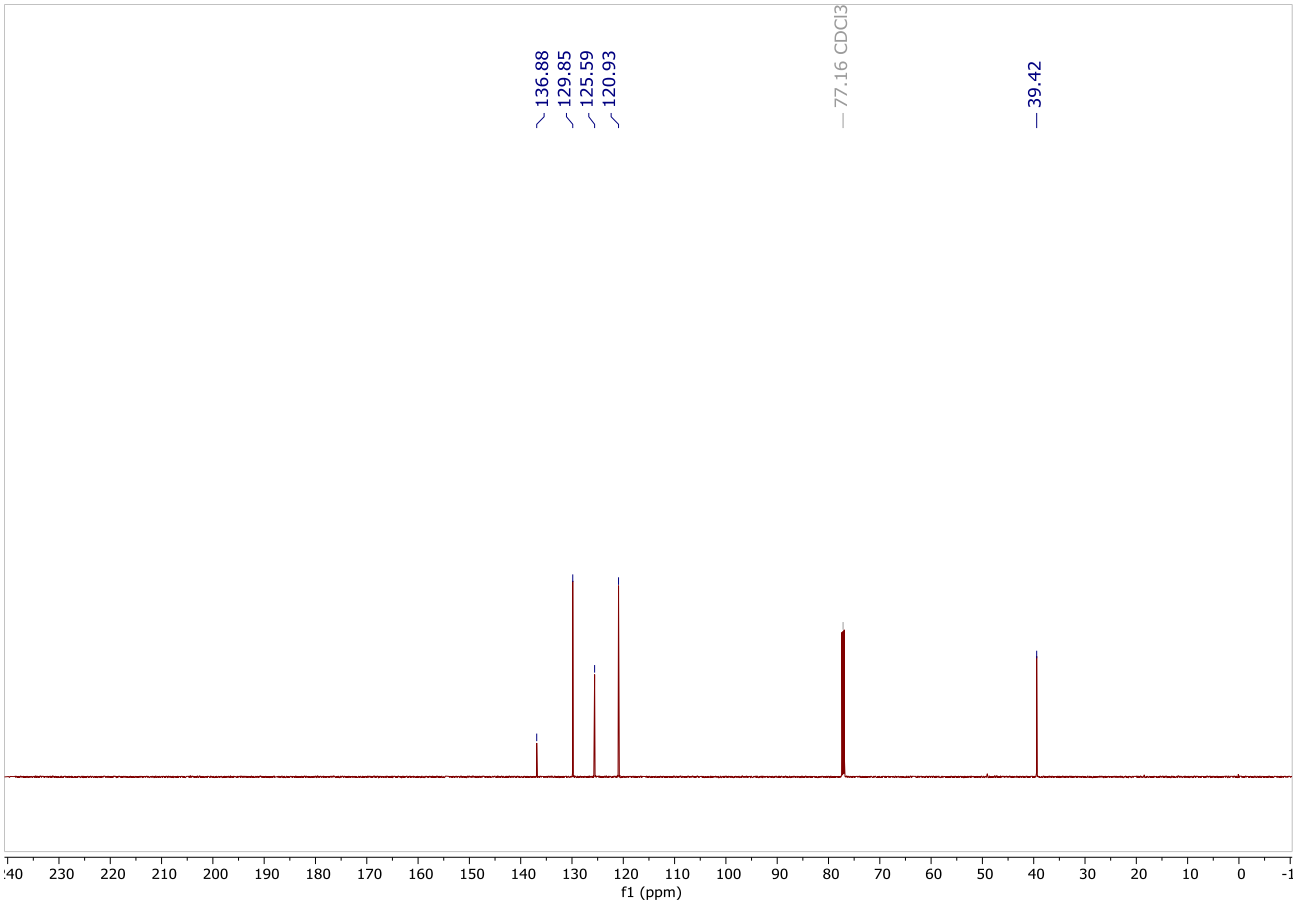
S
O
H3C
NH
6l
1.96
2.07
0.98
0.83
3.00
f1 (ppm)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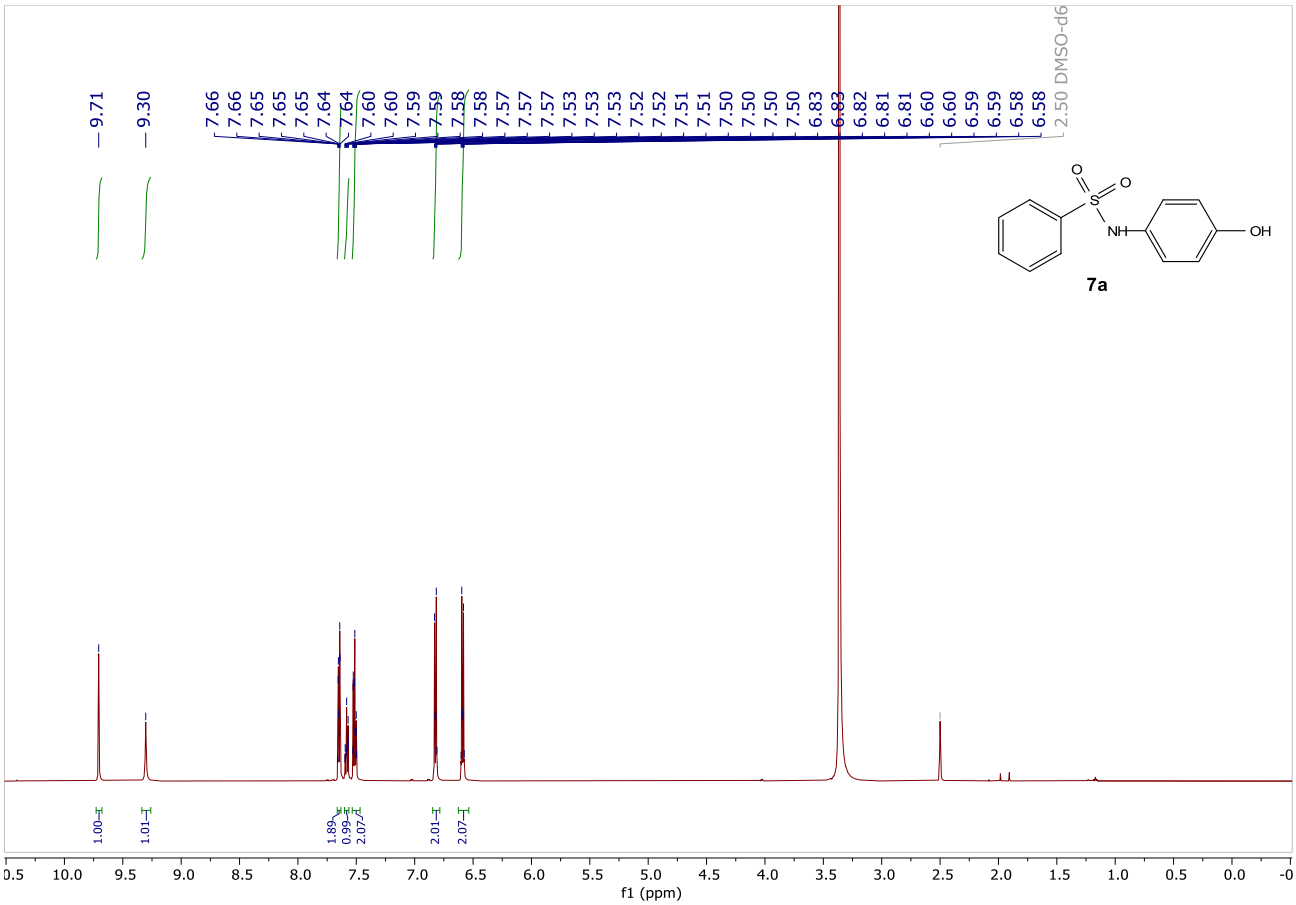
39.42
f1 (ppm)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7.50
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6.82
6.81
6.81
6.60
6.60
6.59
6.59
6.58
6.58
2.50 DMSO-d6
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O
S
NH
OH
7a
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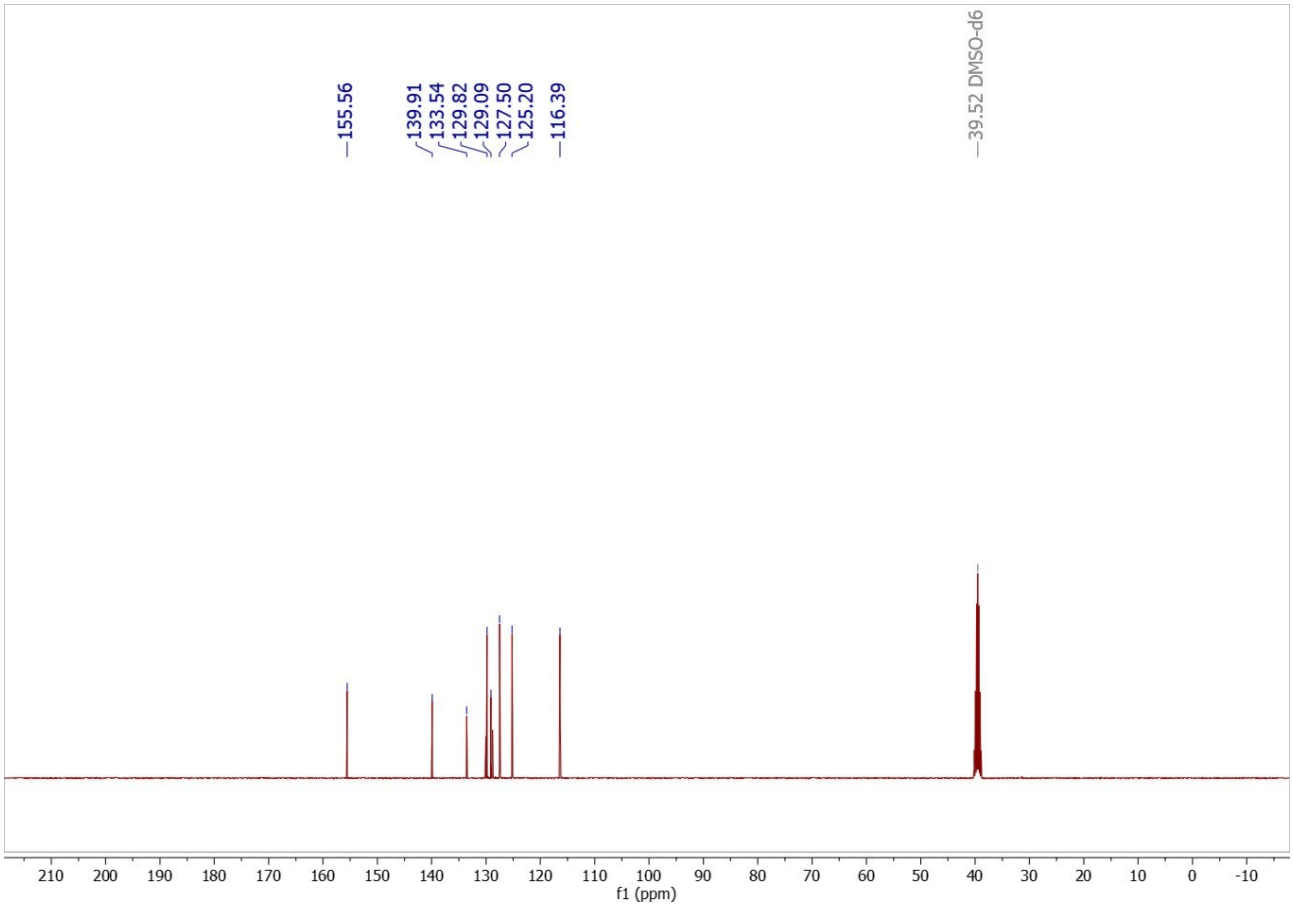
1.01
1.89
0.99
2.07
2.01
2.07
f1 (ppm)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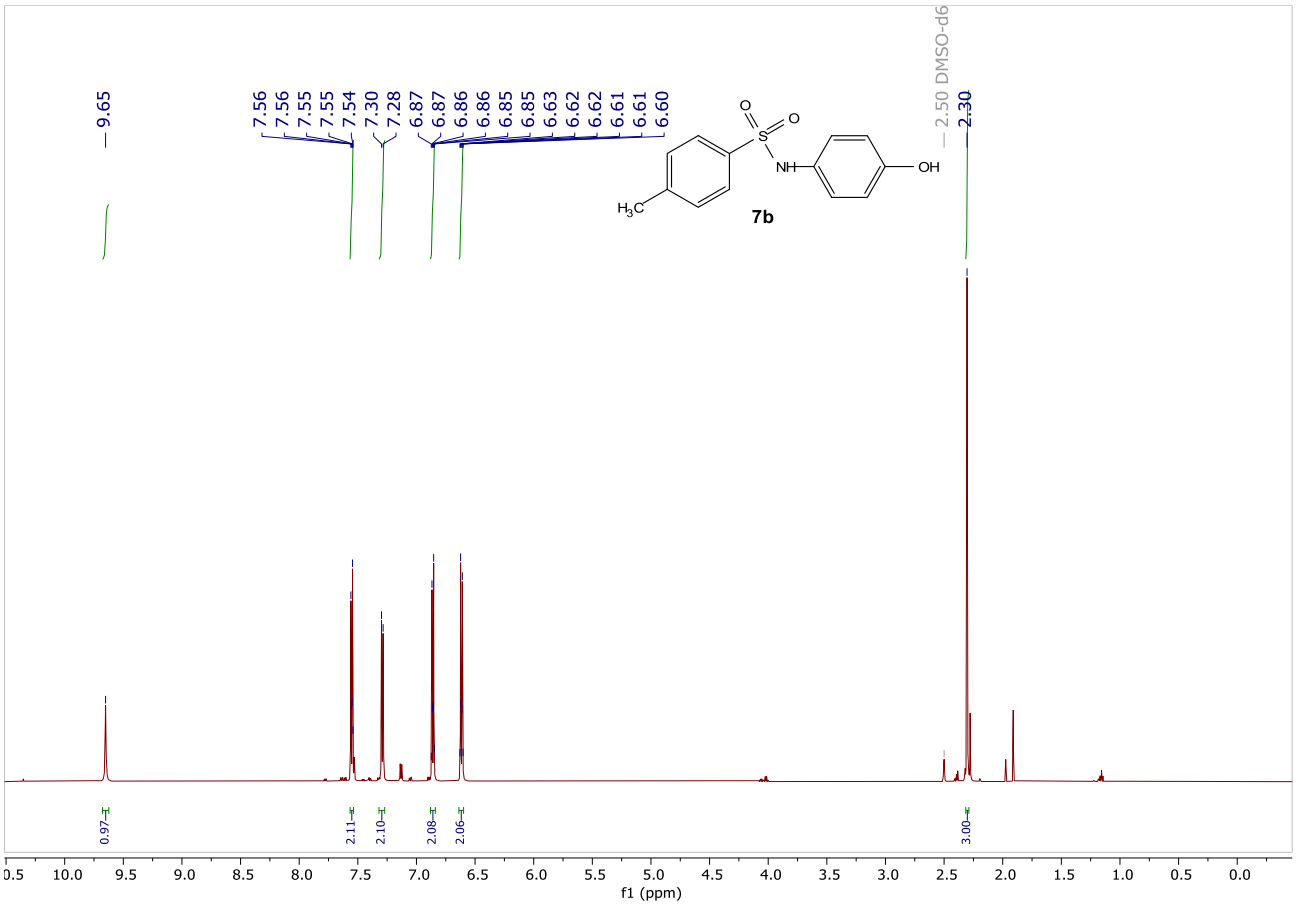
129.09
127.50
125.20
116.39
39.52 DMSO-d6
f1 (ppm)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7.28
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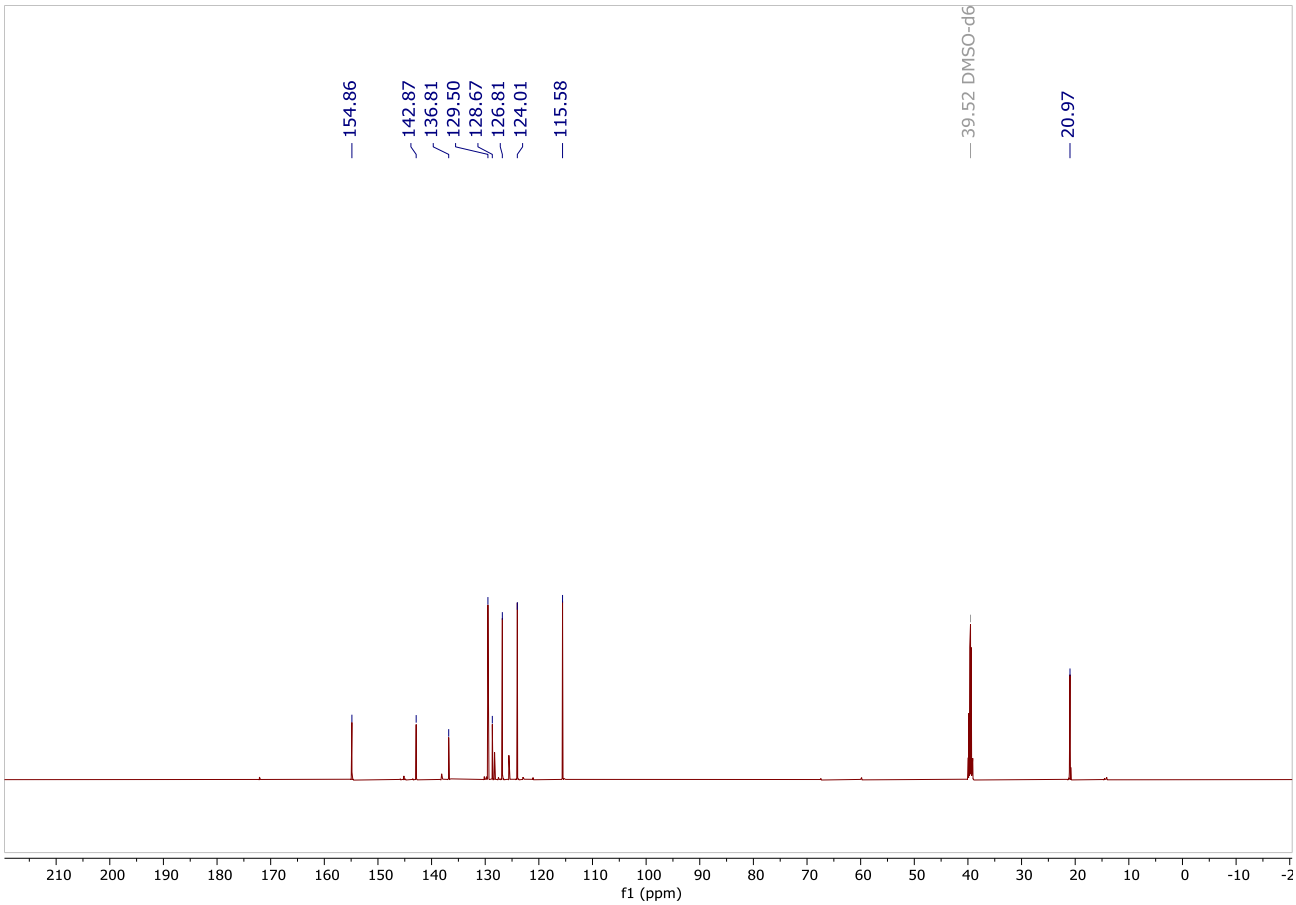
6.87
6.86
6.86
6.85
6.85
6.63
6.62
6.62
6.61
6.61
6.60
2.50 DMSO-d6
2.30
O
S
O
NH
OH
H3C
7b
0.97
2.11
2.10
2.08
2.06
3.00
f1 (ppm)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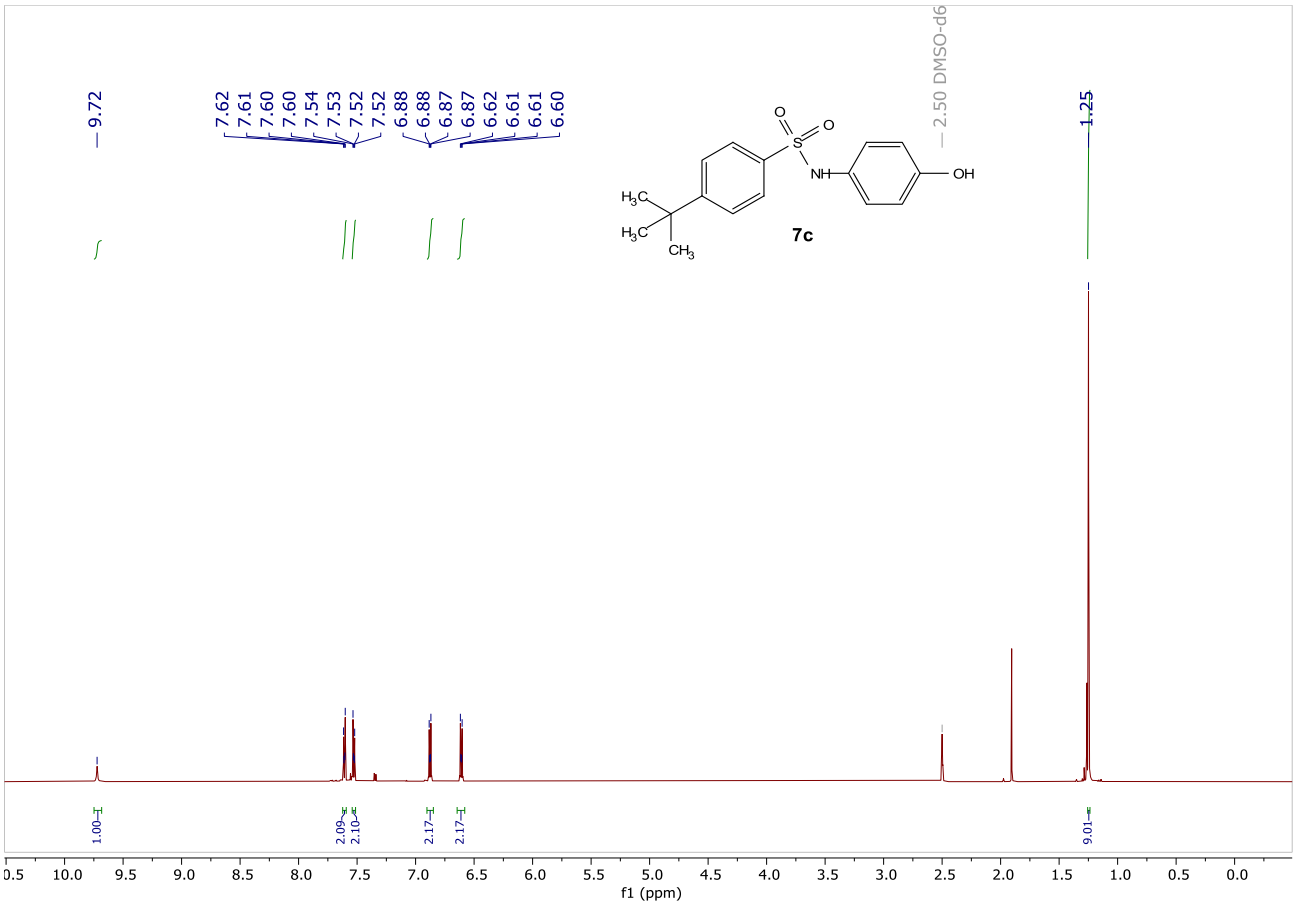
124.01
115.58
39.52 DMSO-d6
20.97
f1 (ppm)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7.61
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7.53
7.52
7.52
6.88
6.88
6.87
6.87
6.62
6.61
6.61
6.60
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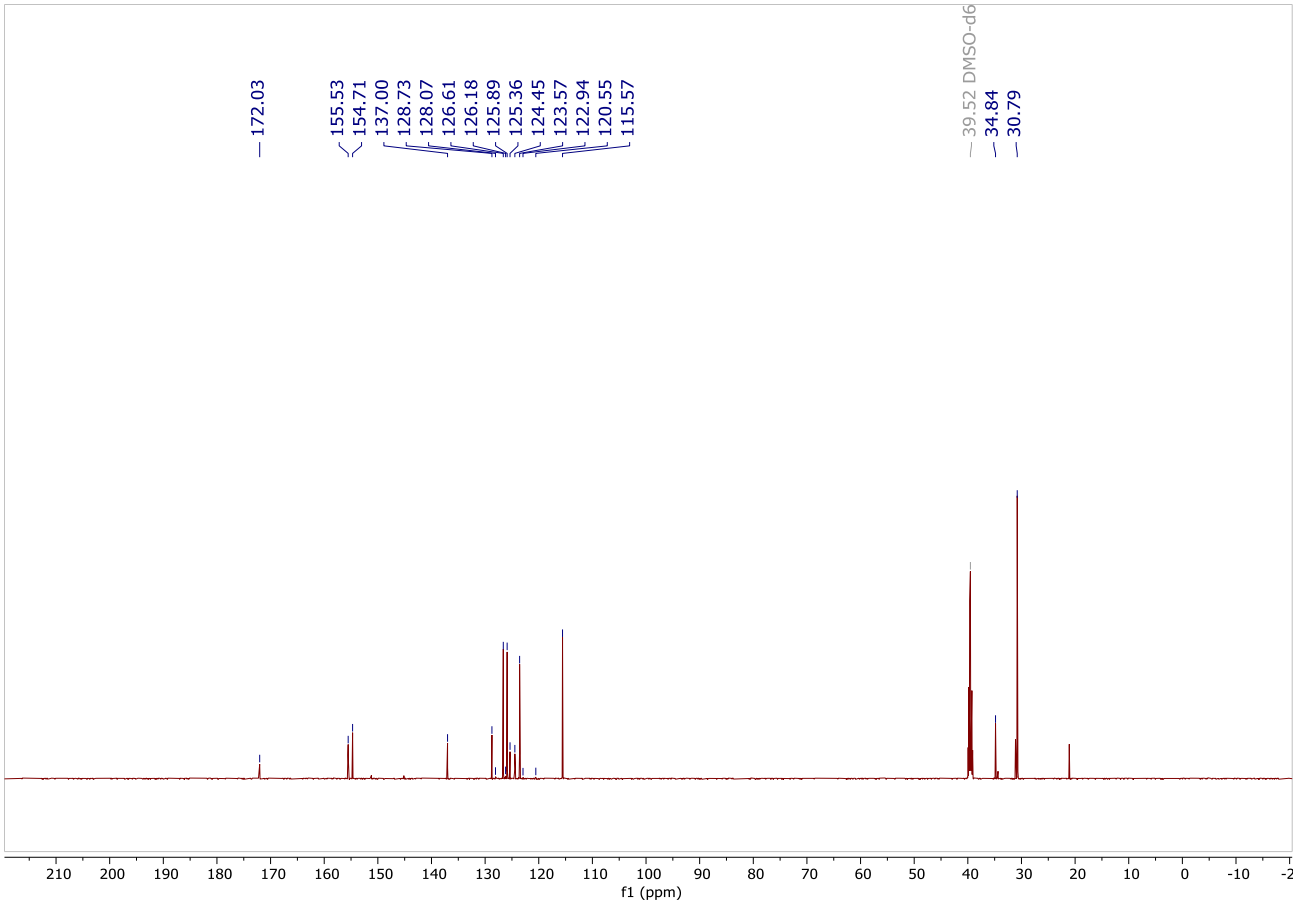
1.25
7c
1.00
2.09
2.10
2.17
2.17
9.01
f1 (ppm)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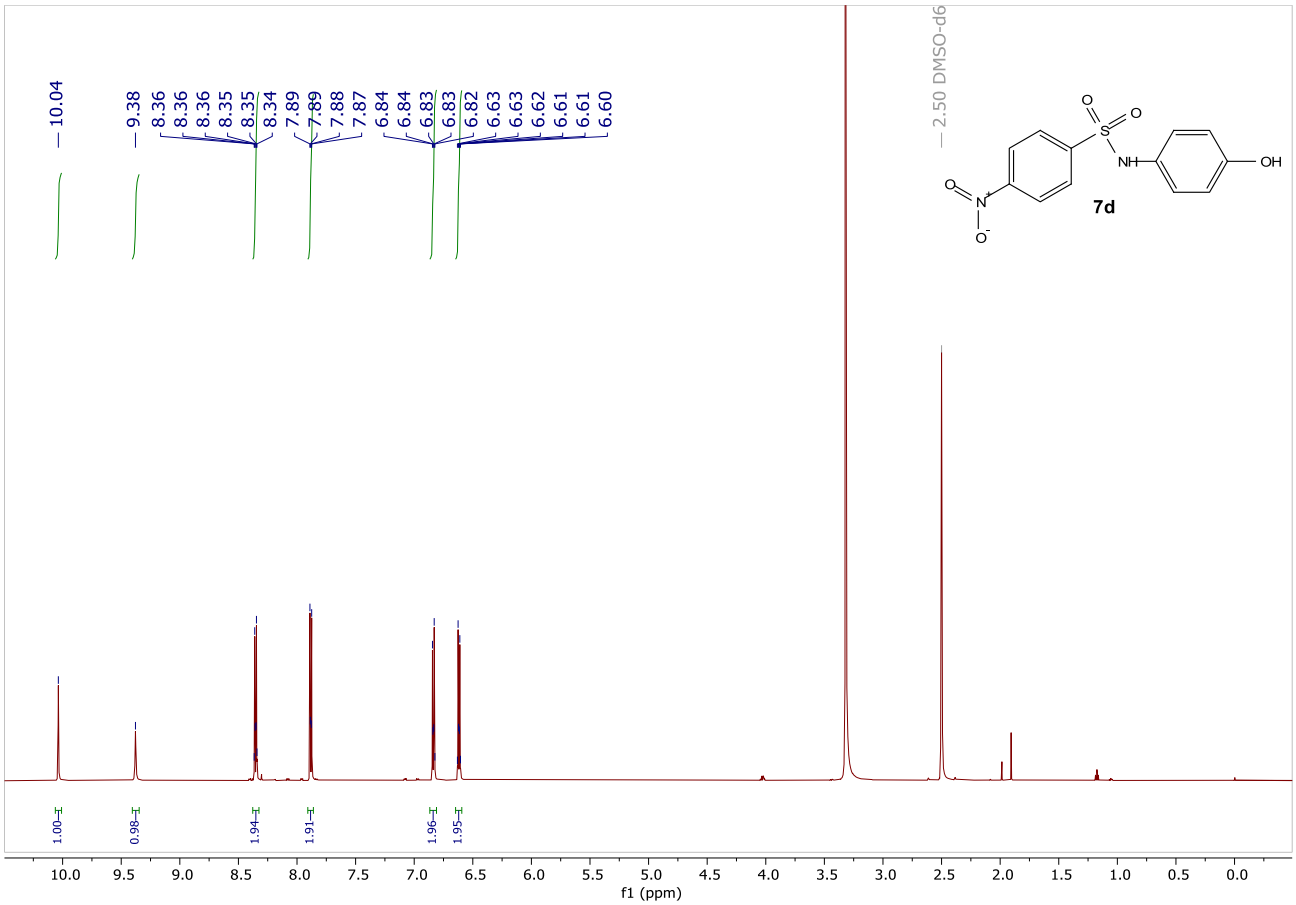
137.00
128.73
128.07
126.61
126.18
125.89
125.36
124.45
123.57
122.94
120.55
115.57
39.52 DMSO-d6
34.84
30.79
f1 (ppm)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9.38
8.36
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8.34
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7.89
7.88
7.87
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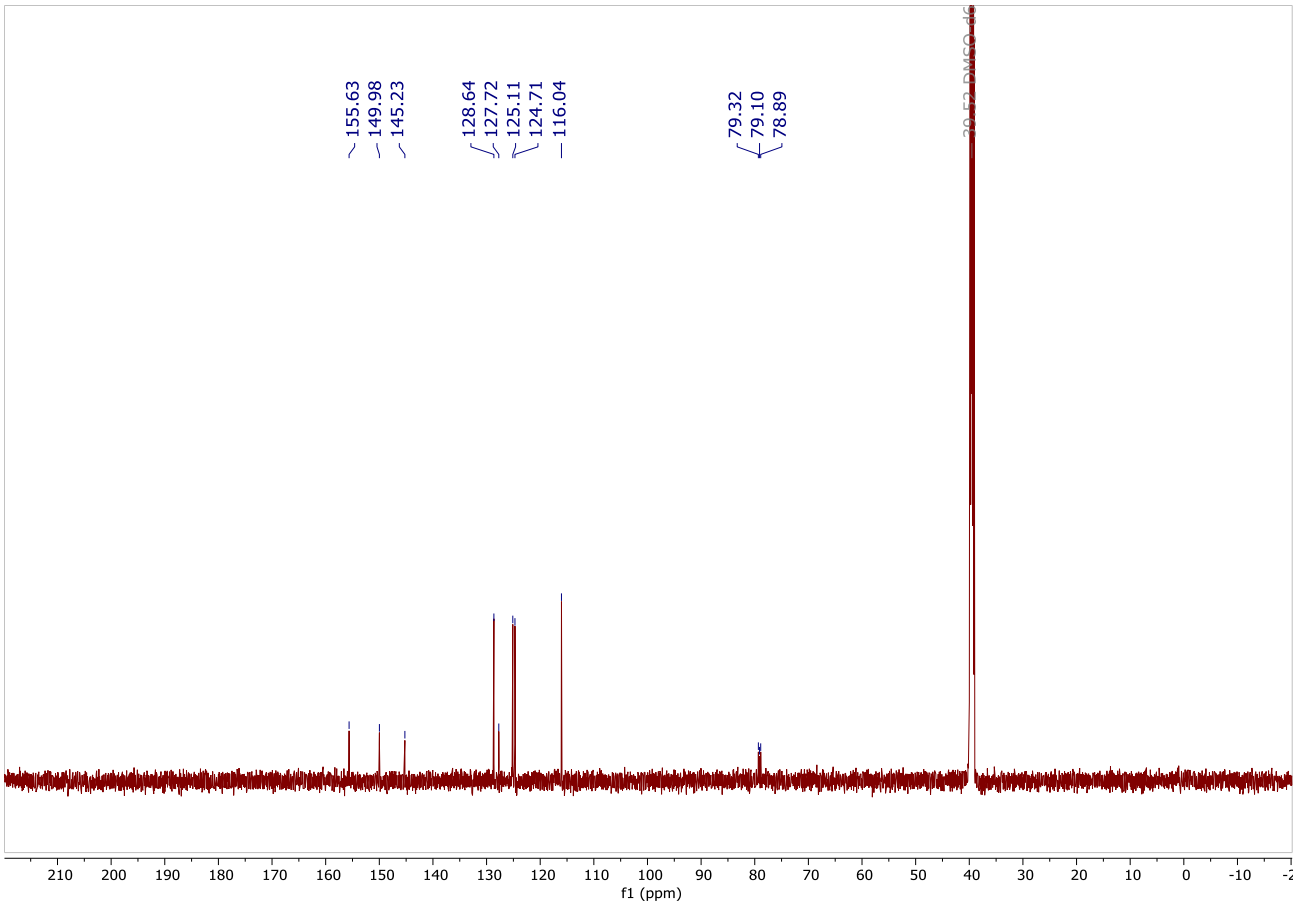
6.84
6.83
6.83
6.82
6.63
6.63
6.62
6.61
6.61
6.60
2.50 DMSO-d6
7d
1.00
0.98
1.94
1.91
1.96
1.95
f1 (ppm)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149.98
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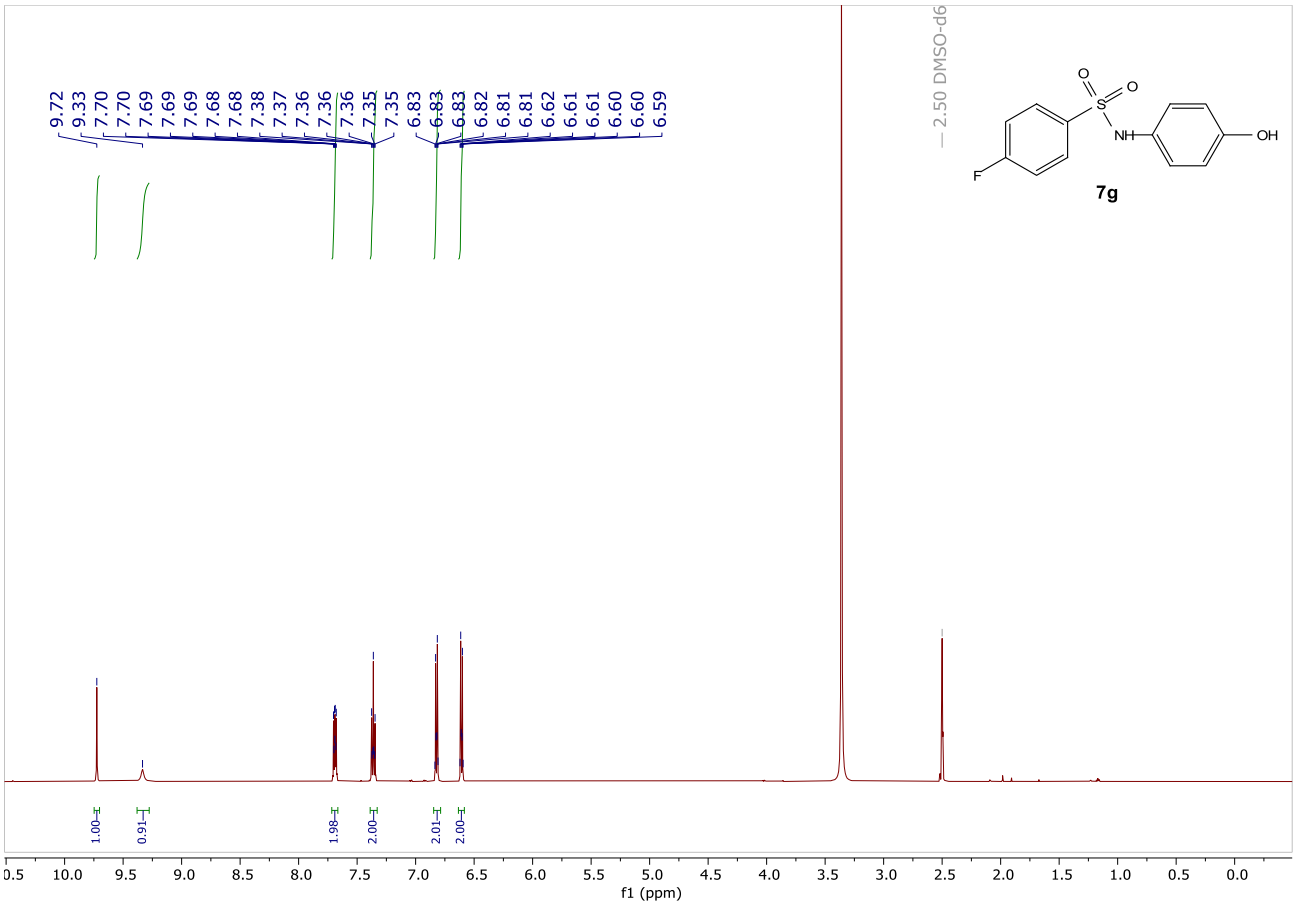
127.72
125.11
124.71
116.04
79.32
79.10
78.89
39.52 DMSO-d6
f1 (ppm)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7.69
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7.38
7.37
7.36
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7.36
7.35
7.35
6.83
6.83
6.83
6.82
6.81
6.81
6.62
6.61
6.61
6.60
6.60
6.59
2.50 DMSO-d6
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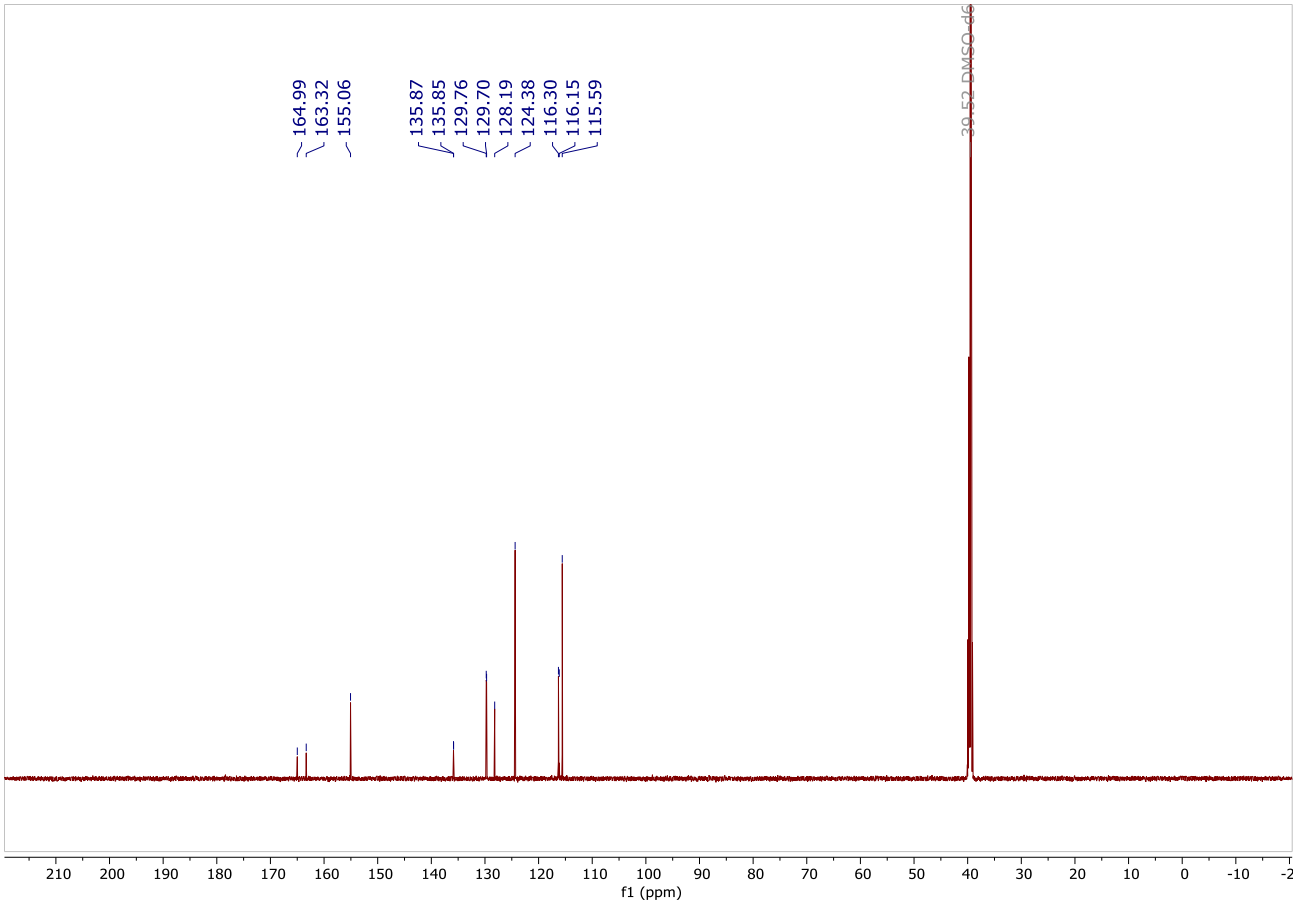
S
O
NH
OH
F
7g
1.00
0.91
1.98
2.00
2.01
2.00
f1 (ppm)


164.99
163.32
155.06
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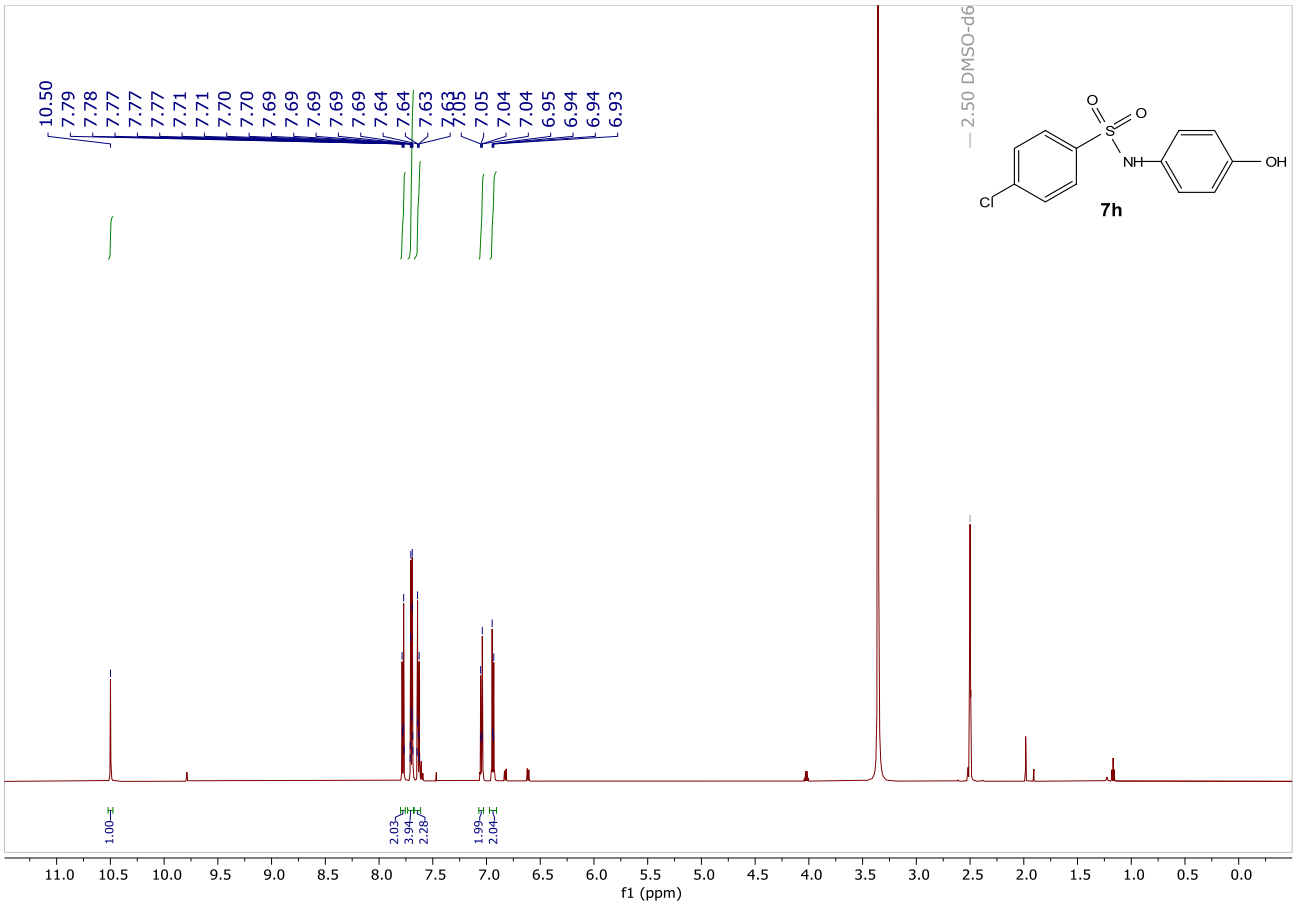
135.85
129.76
129.70
128.19
124.38
116.30
116.15
115.59
39.52 DMSO-d6
f1 (ppm)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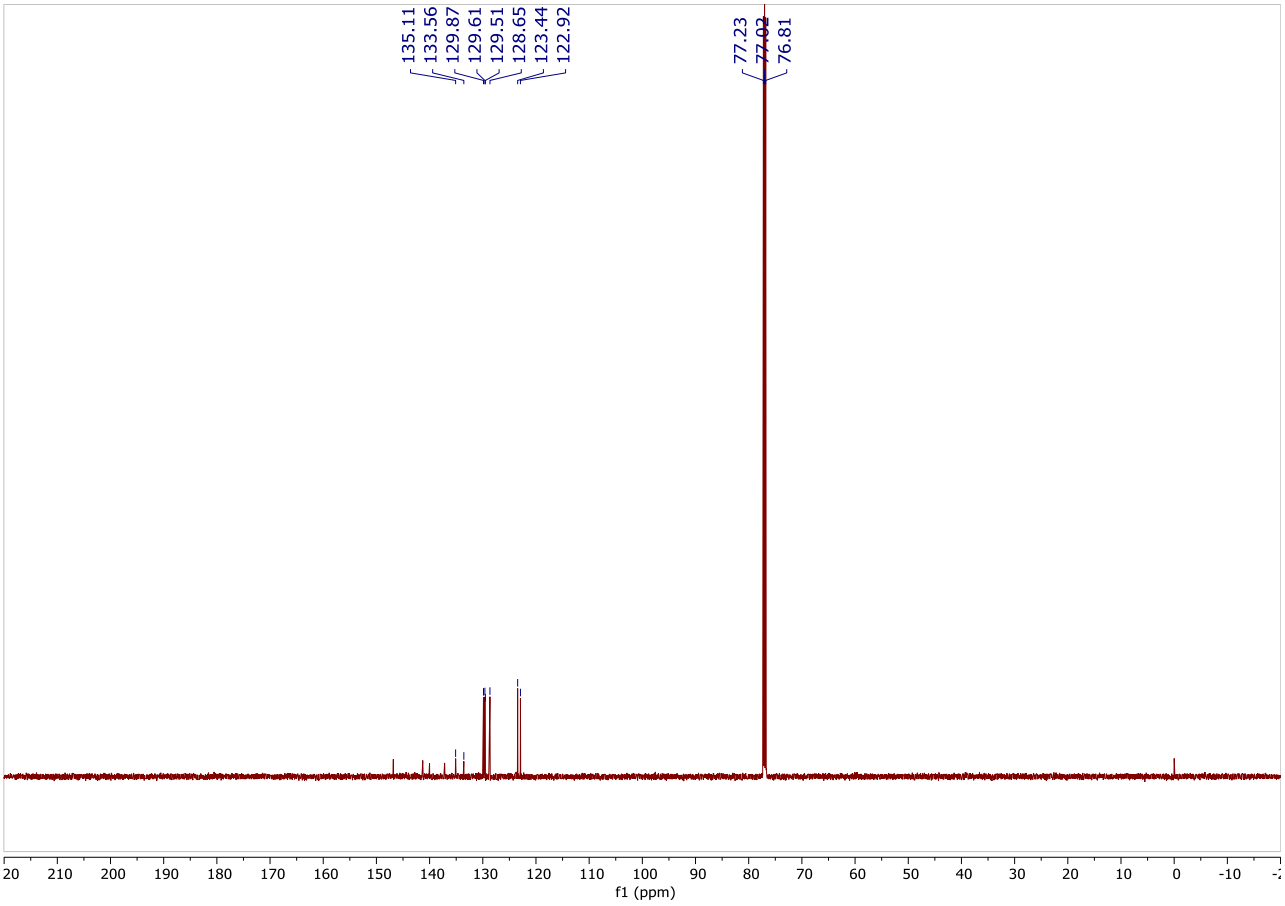
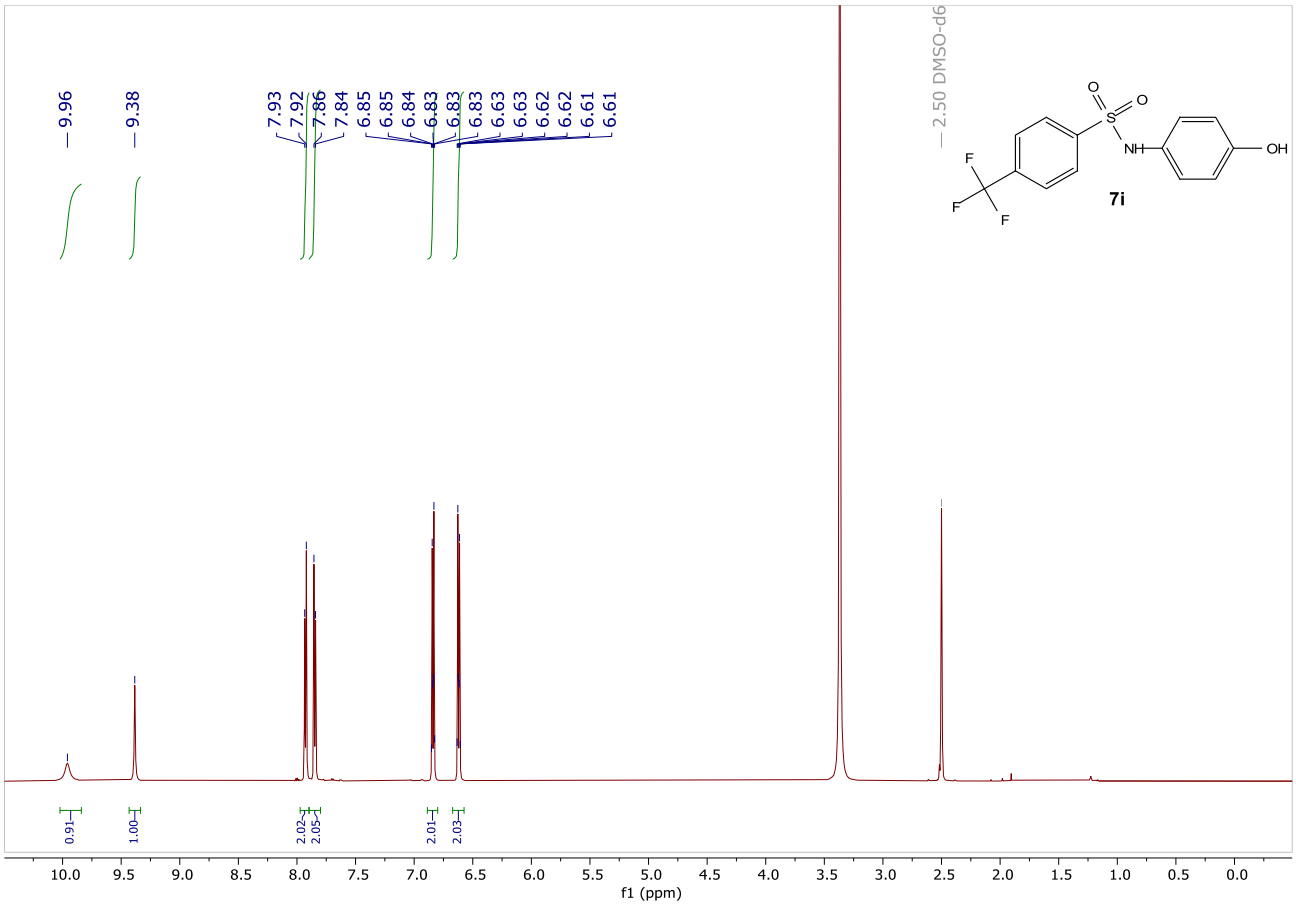
7.77
7.77
7.77
7.71
7.71
7.70
7.70
7.69
7.69
7.69
7.69
7.64
7.64
7.63
7.63
7.05
7.05
7.04
7.04
6.95
6.94
6.94
6.93
2.50 DMSO-d6
O
S
O
NH
OH
Cl
7h
1.00
2.03
3.94
2.28
1.99
2.04
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


135.11
133.56
129.87
129.61
129.51
128.65
123.44
122.92
77.23
77.02
76.81
20 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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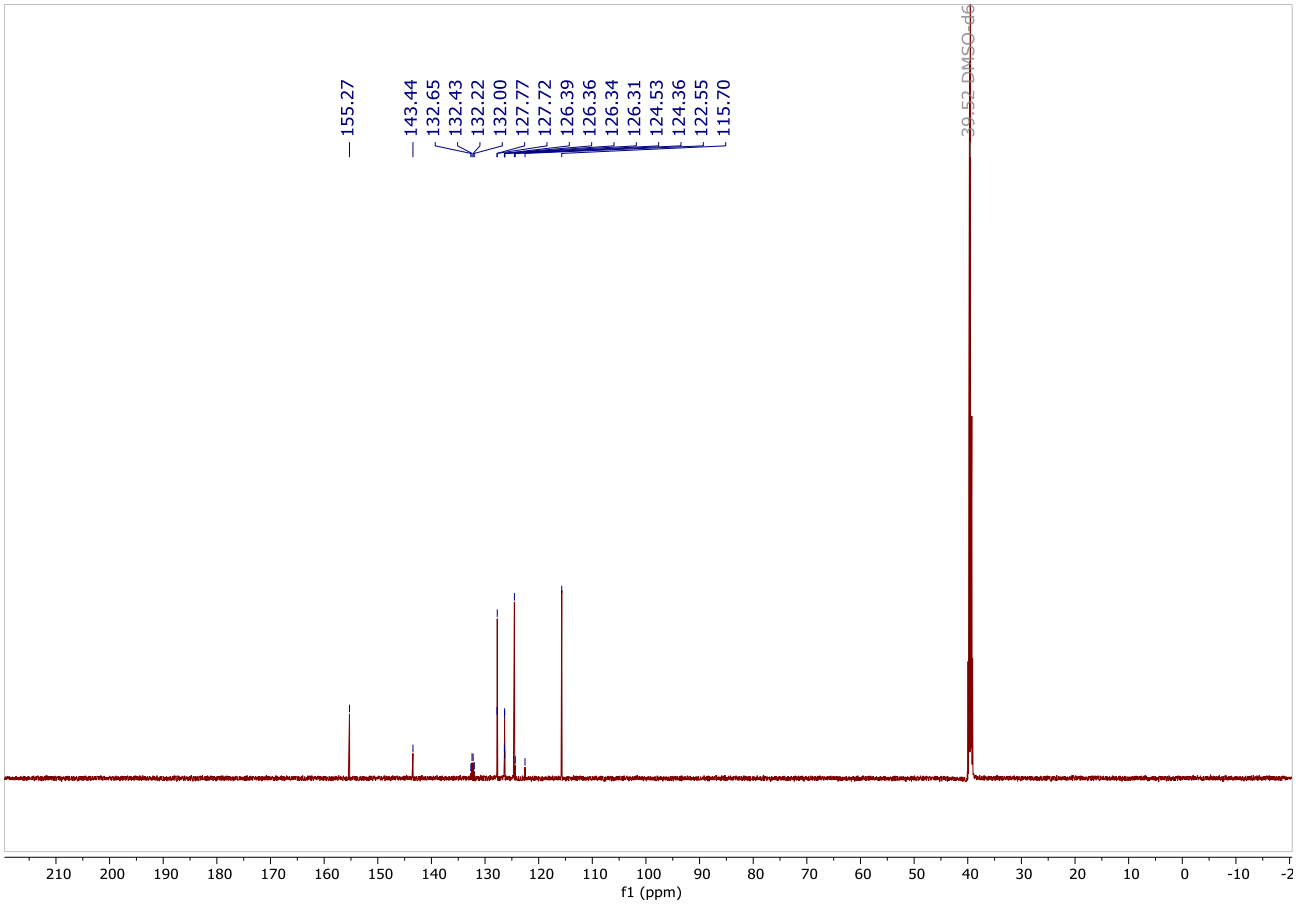
9.38
7.93
7.92
7.86
7.84
6.85
6.84
6.83
6.83
6.63
6.63
6.62
6.62
6.61
6.61
2.50 DMSO-d6
O
S
O
NH
OH
F
F
F
7i
0.91
1.00
2.02
2.05
2.01
2.03
f1 (ppm)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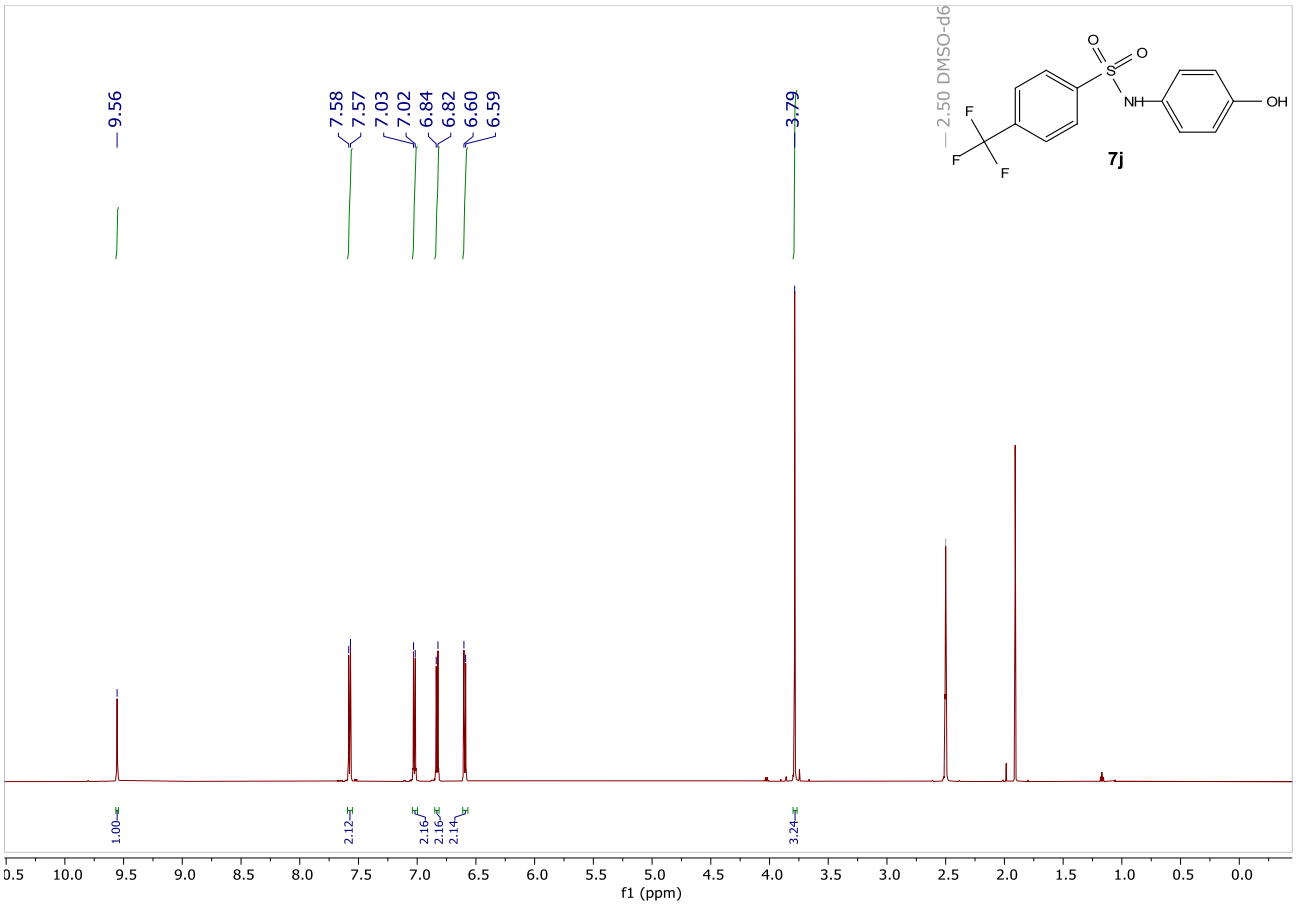
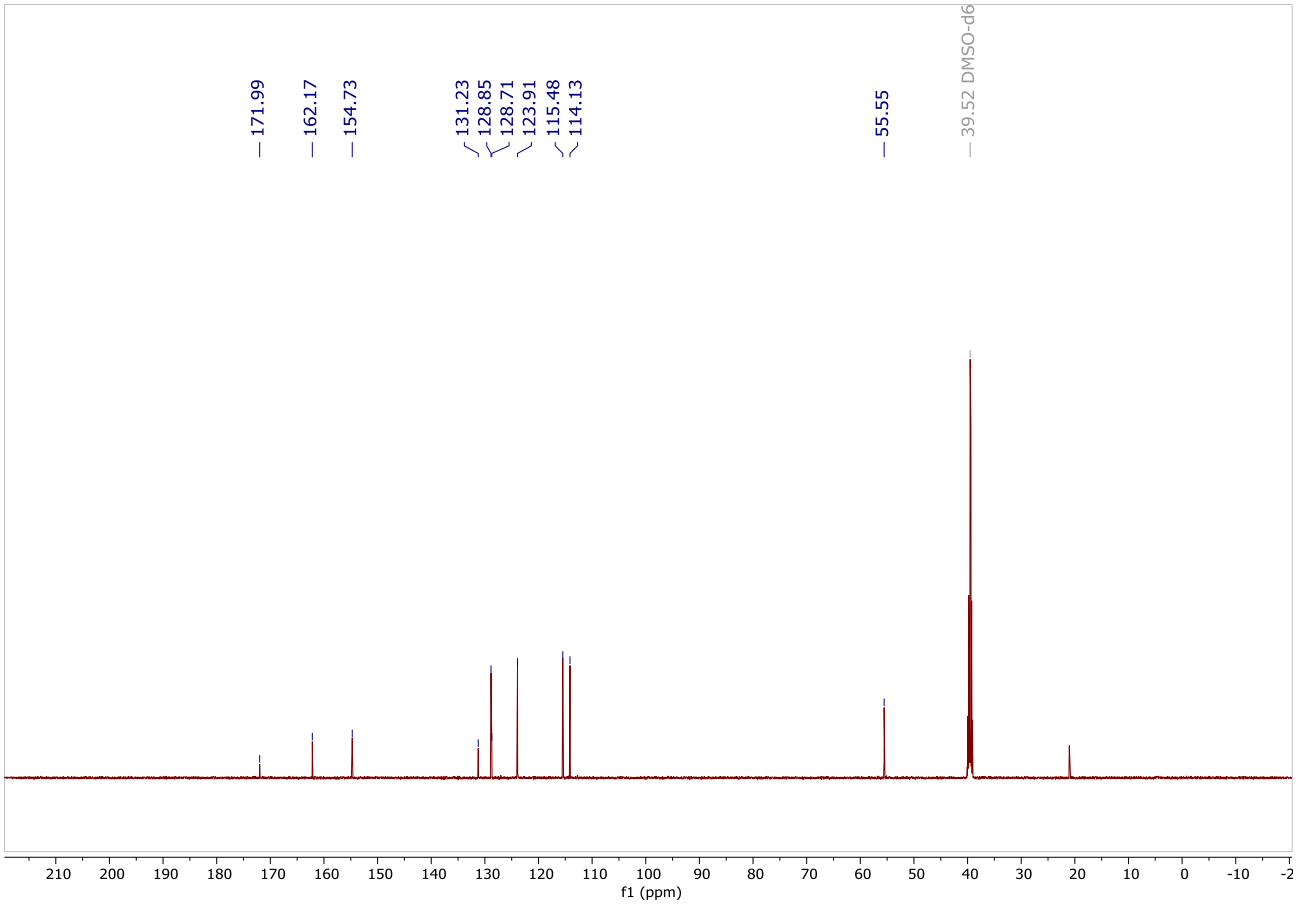
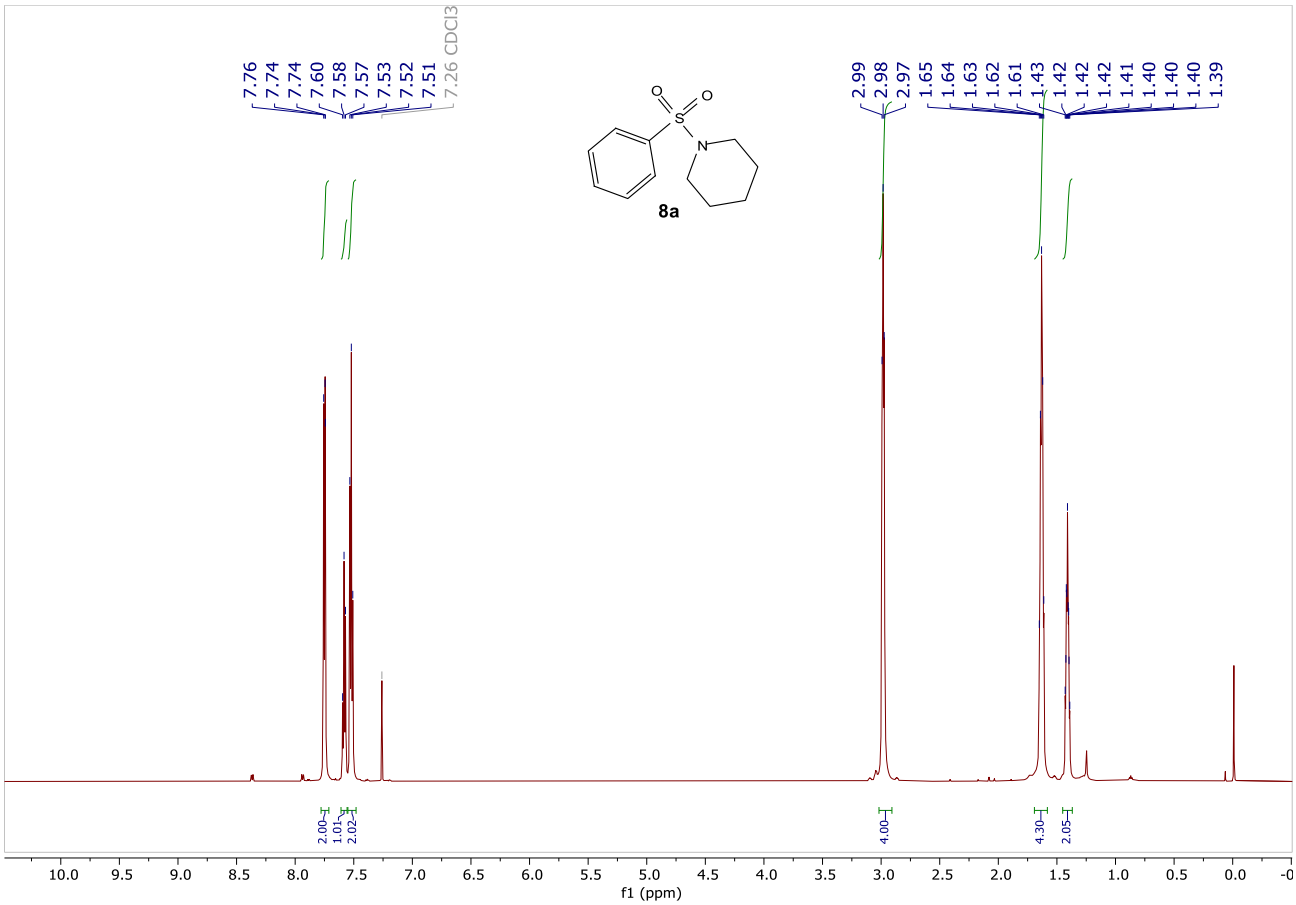
132.22
132.00
127.77
127.72
126.39
126.36
126.34
126.31
124.53
124.36
122.55
115.70
39.52 DMSO-d6
f1 (ppm)


9.56
7.58
7.57
7.03
7.02
6.84
6.82
6.60
6.59
3.79
2.50 DMSO-d6
7j
1.00
2.12
2.16
2.16
2.14
3.24
f1 (ppm)


171.99
162.17
154.73
131.23
128.85
128.71
123.91
115.48
114.13
55.55
39.52 DMSO-d6
f1 (ppm)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7.74
7.74
7.60
7.58
7.57
7.53
7.52
7.51
7.26 CDCl3
2.99
2.98
2.97
1.65
1.64
1.63
1.62
1.61
1.43
1.42
1.42
1.42
1.41
1.40
1.40
1.40
1.39
8a
2.00
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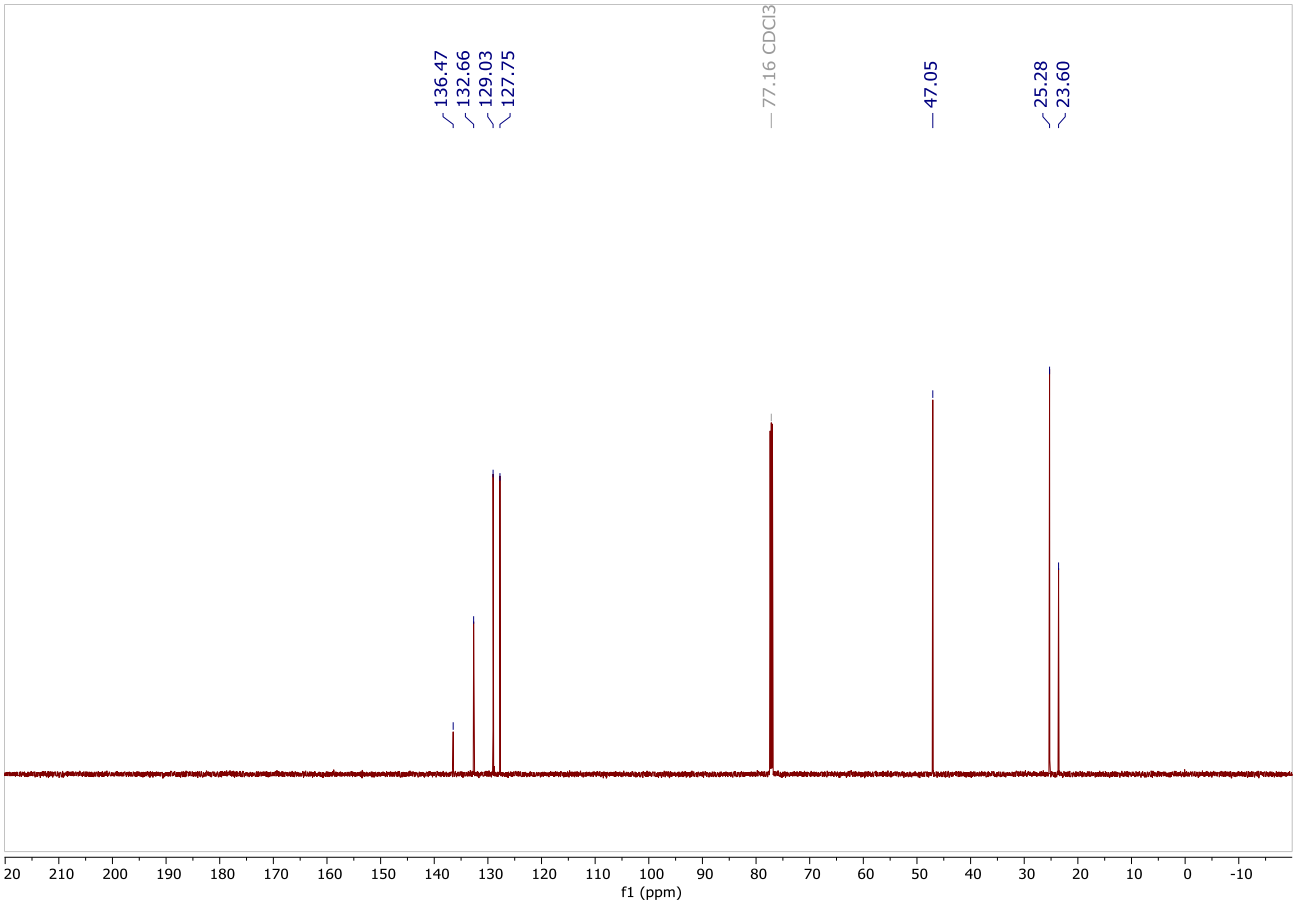
2.02
4.00
4.30
2.05
f1 (ppm)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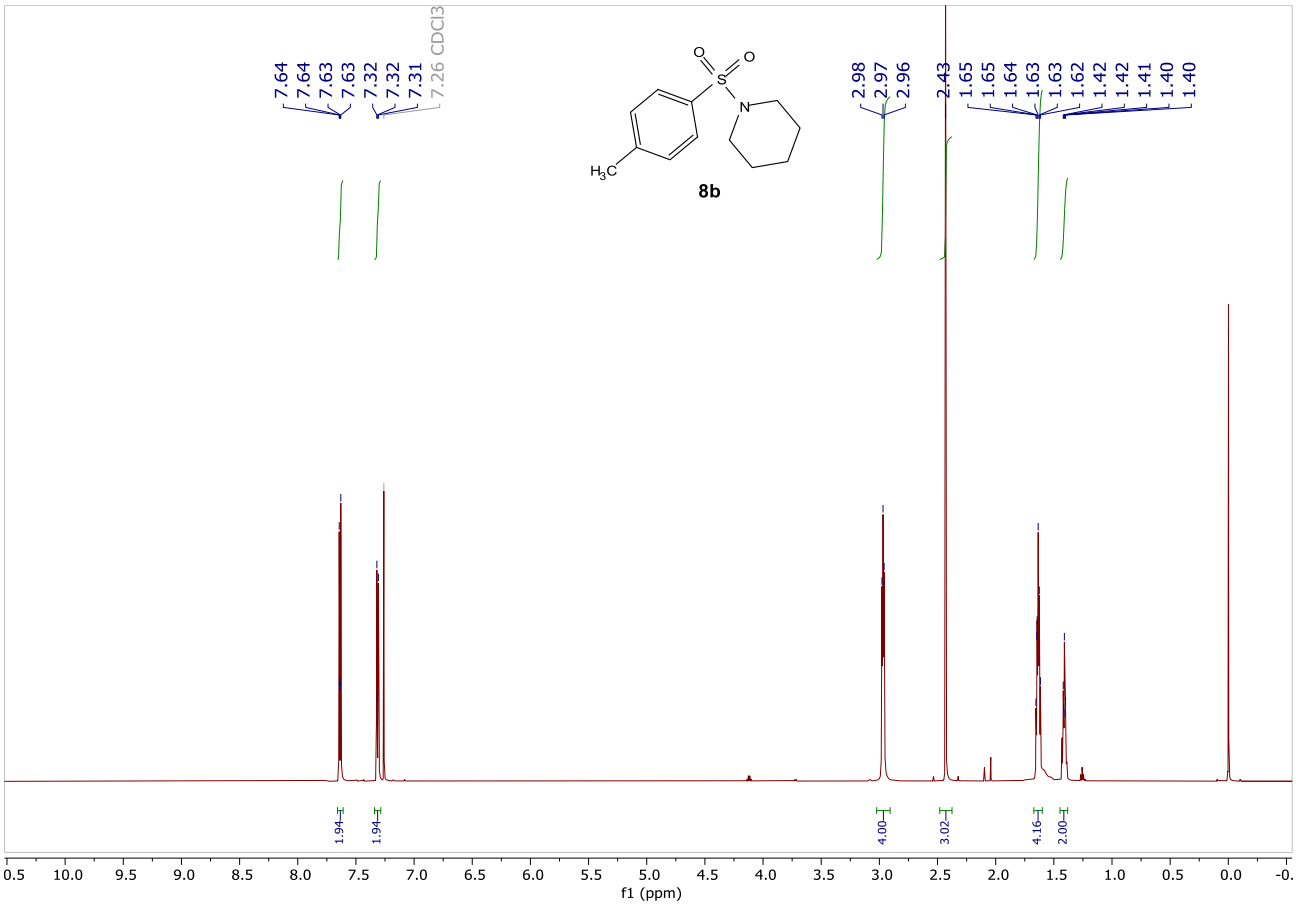
47.05
25.28
23.60
f1 (ppm)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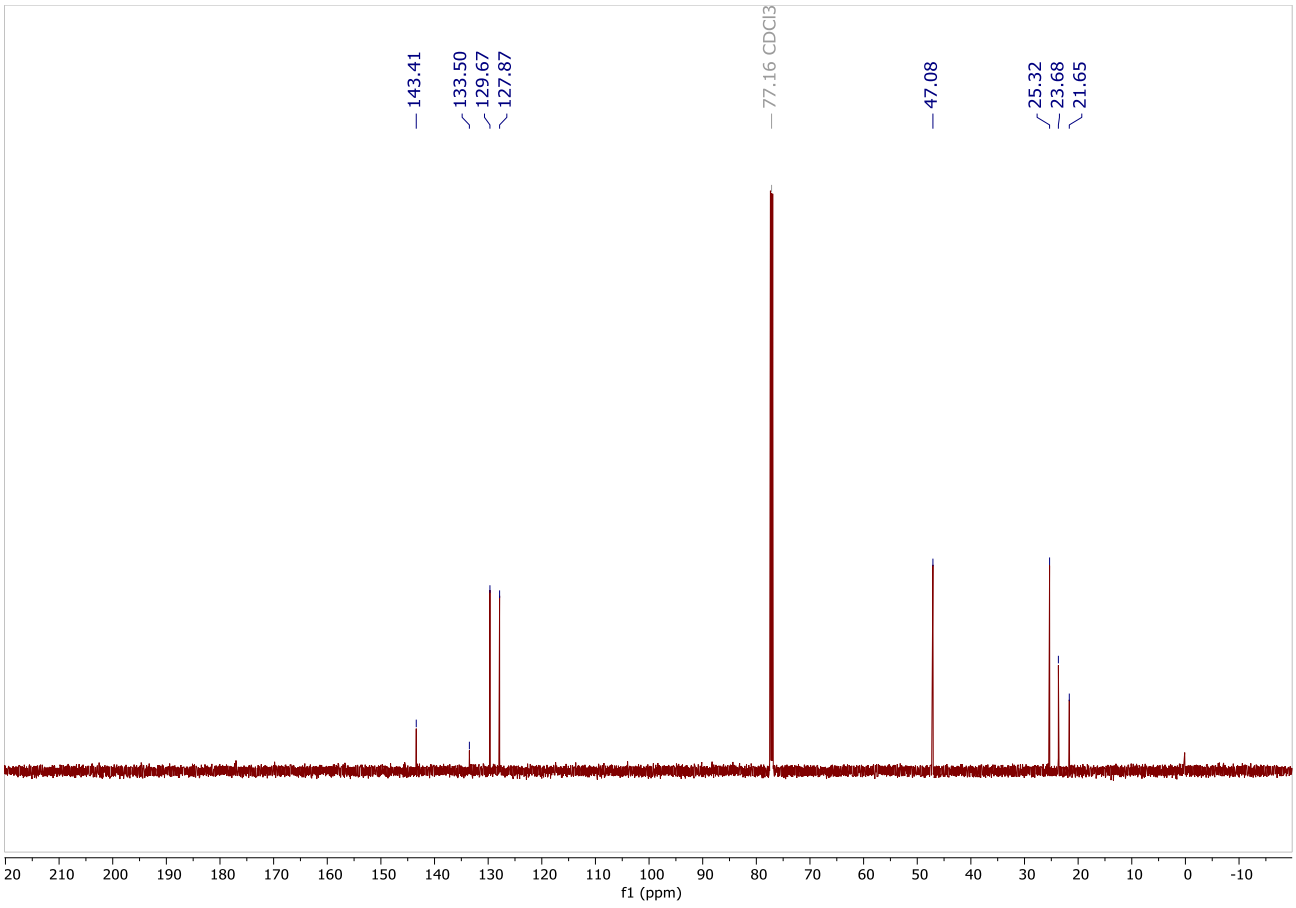
7.64
7.63
7.63
7.32
7.32
7.31
7.26 CDCl3
2.98
2.97
2.96
2.43
1.65
1.65
1.64
1.63
1.63
1.62
1.42
1.42
1.41
1.40
1.40
8b
1.94
1.94
4.00
3.02
4.16
2.00
f1 (ppm)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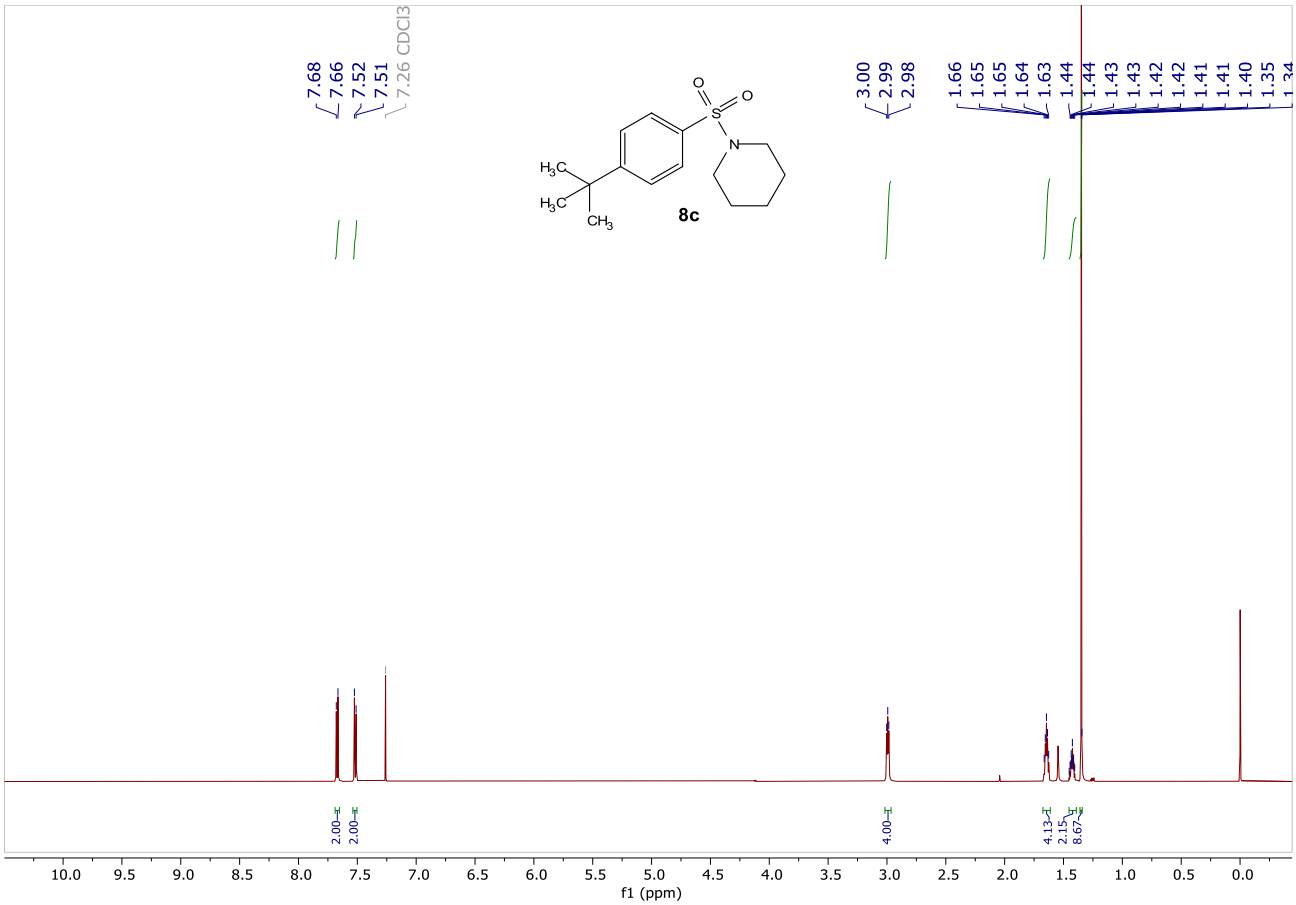
47.08
25.32
23.68
21.65
f1 (ppm)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2.98
1.66
1.65
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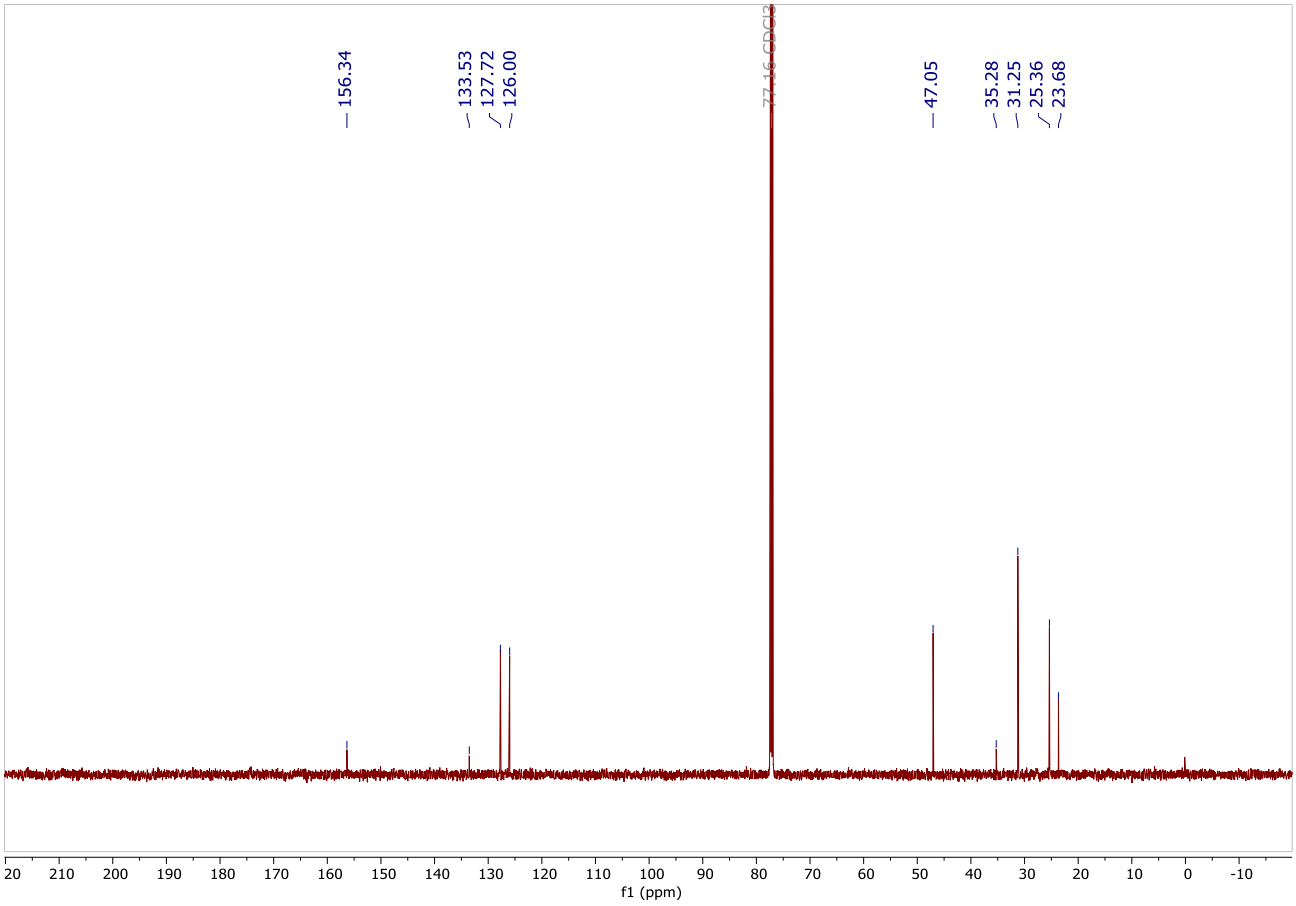
1.63
1.44
1.44
1.43
1.43
1.42
1.42
1.41
1.41
1.40
1.35
1.34
8c
2.00
2.00
4.00
4.13
2.15
8.67
f1 (ppm)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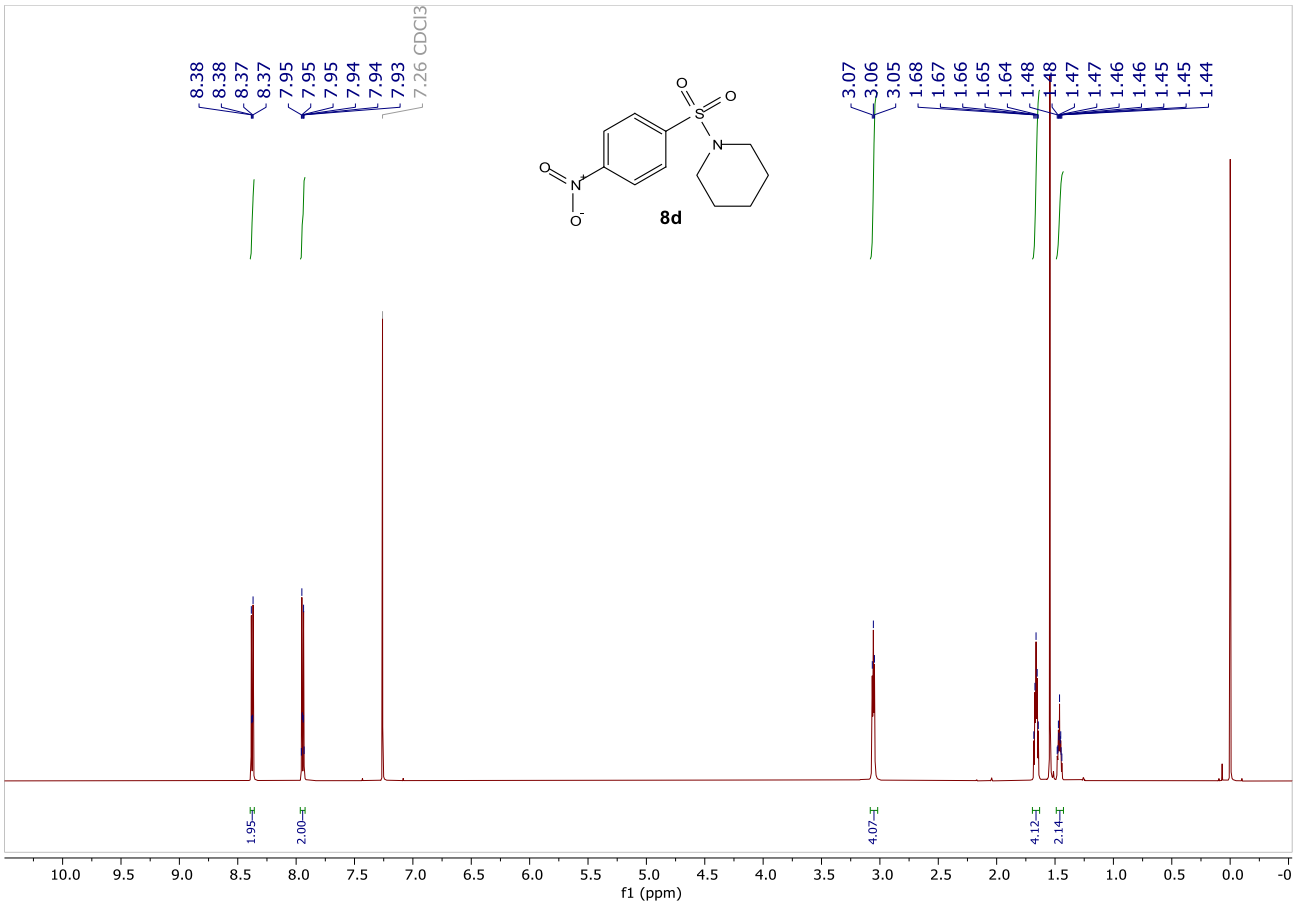
35.28
31.25
25.36
23.68
f1 (ppm)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8.37
7.95
7.95
7.95
7.94
7.94
7.93
7.26 CDCl3
3.07
3.06
3.05
1.68
1.67
1.66
1.65
1.64
1.48
1.48
1.47
1.47
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1.46
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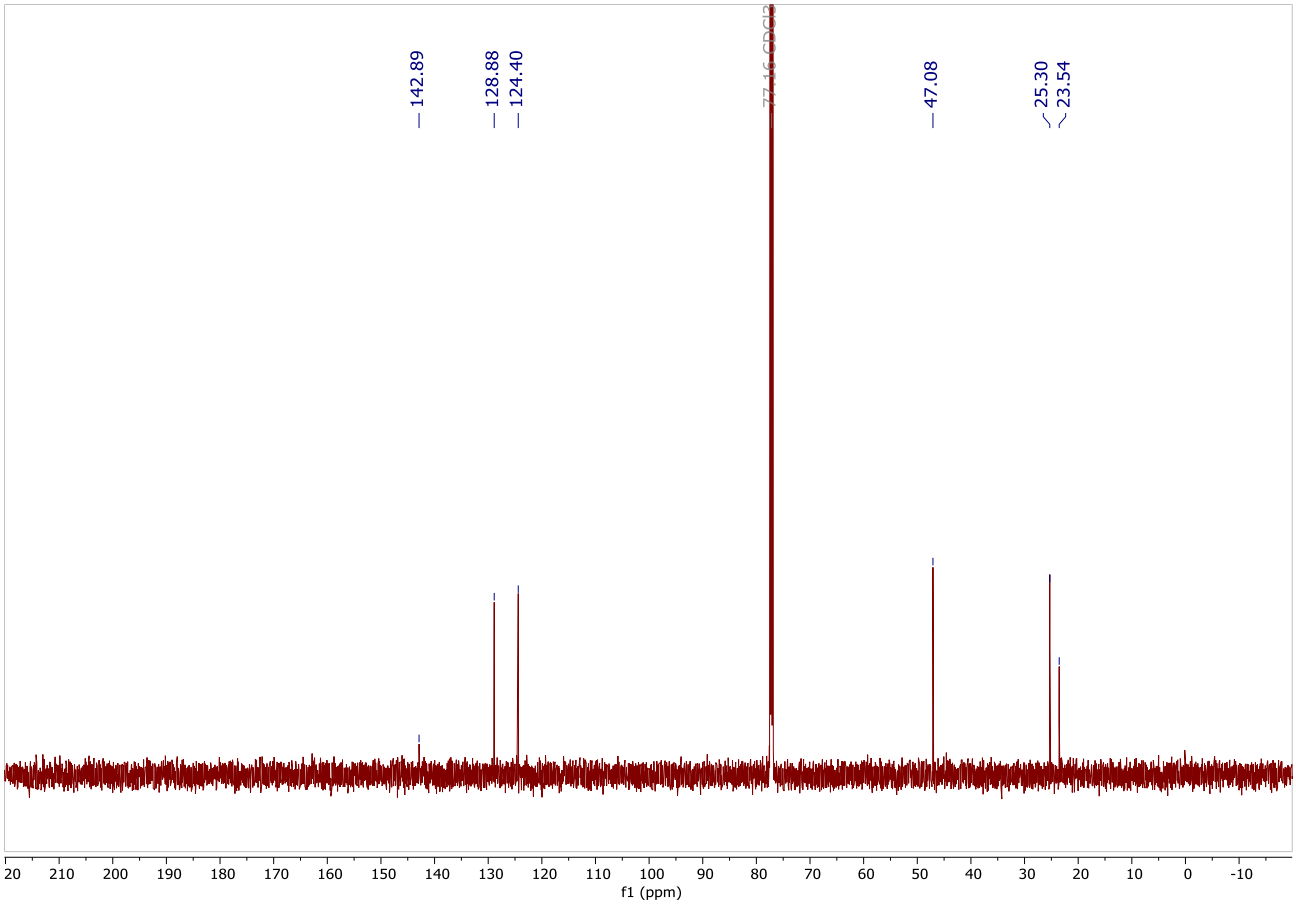
1.45
1.44
8d
1.95
2.00
4.07
4.12
2.14
f1 (ppm)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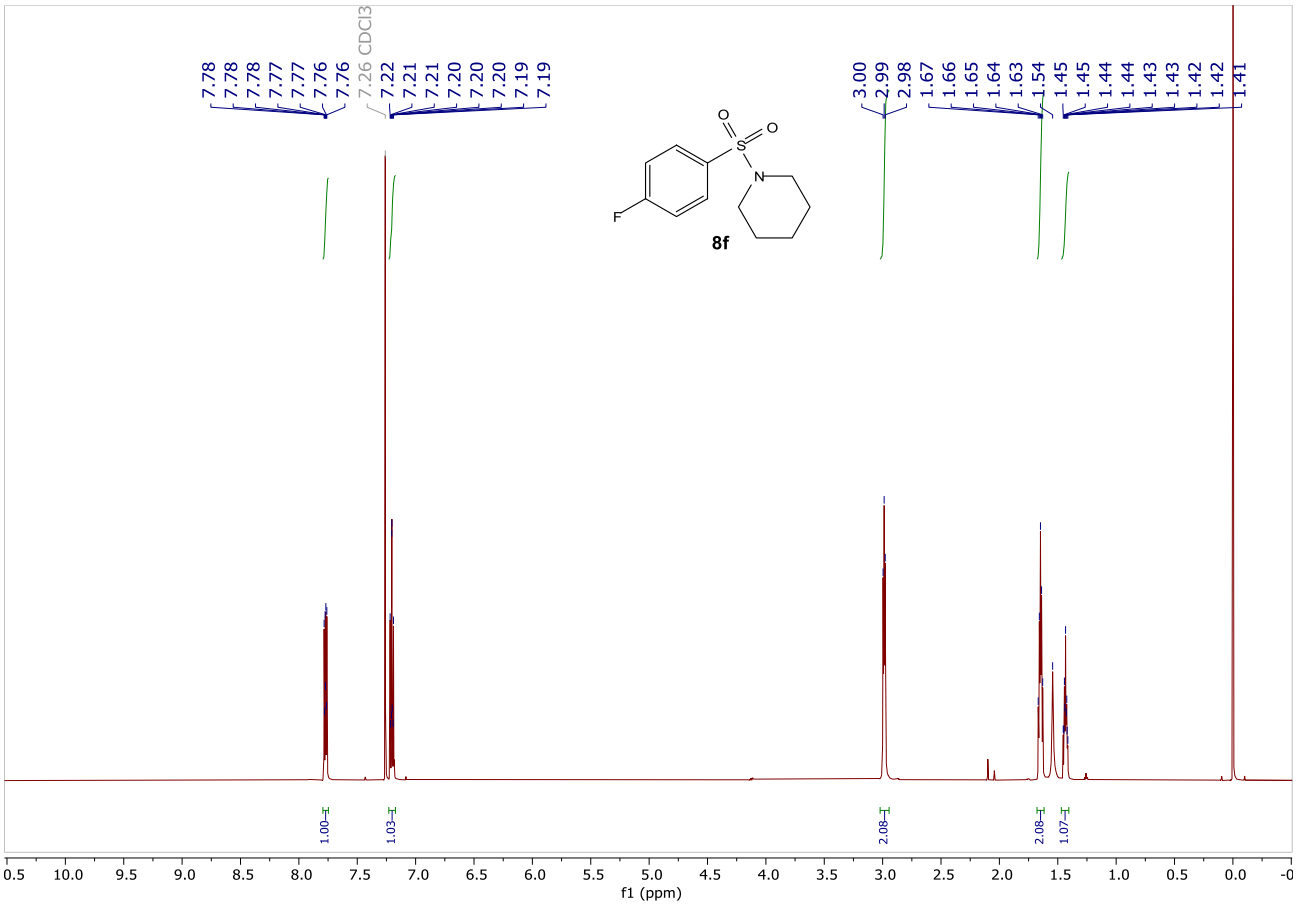
25.30
23.54
f1 (ppm)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7.78
7.77
7.77
7.76
7.76
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7.21
7.21
7.20
7.20
7.20
7.19
7.19
3.00
2.99
2.98
1.67
1.66
1.65
1.64
1.63
1.54
1.45
1.45
1.44
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1.43
1.42
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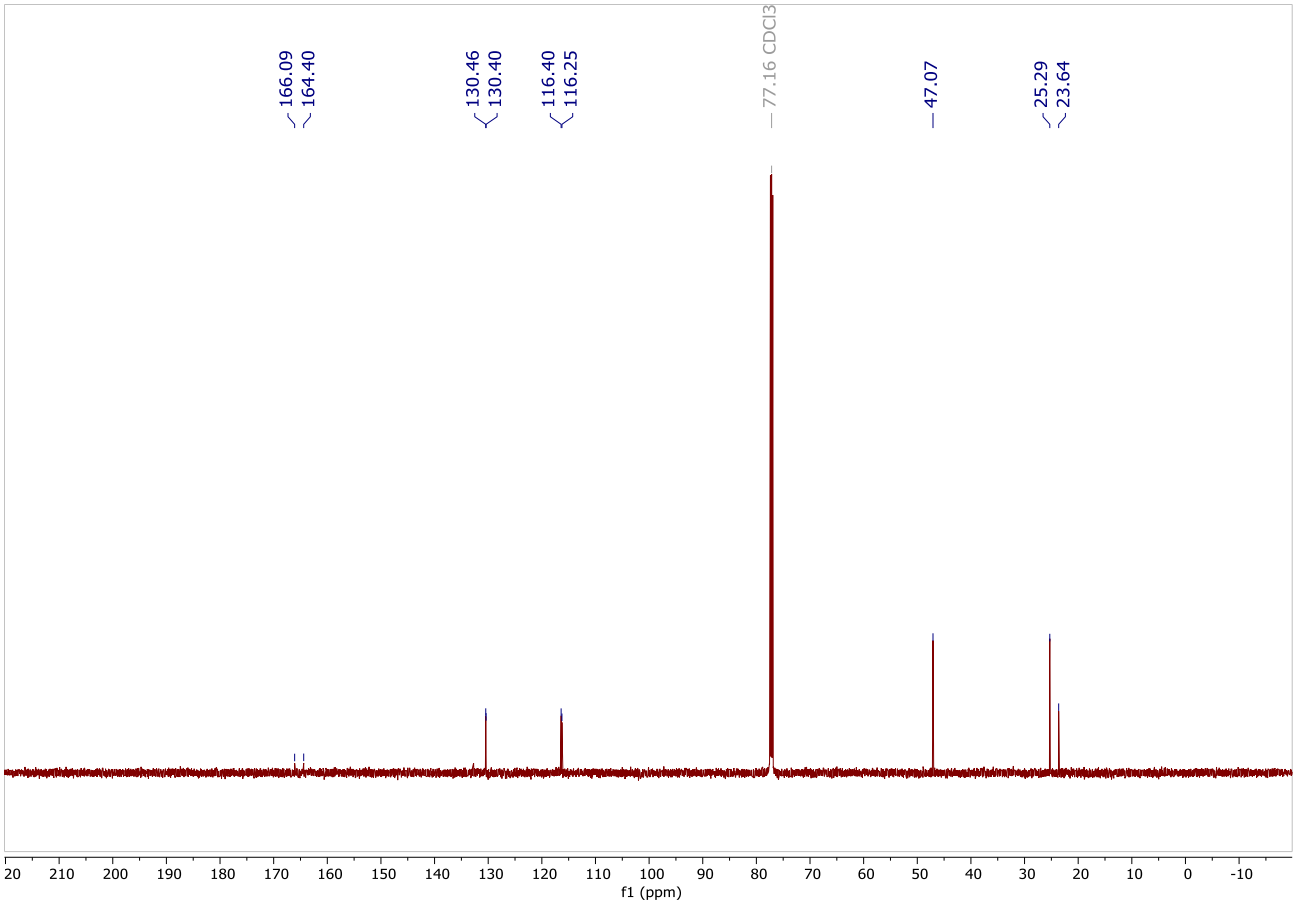
1.03
2.08
2.08
1.07
f1 (ppm)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116.25
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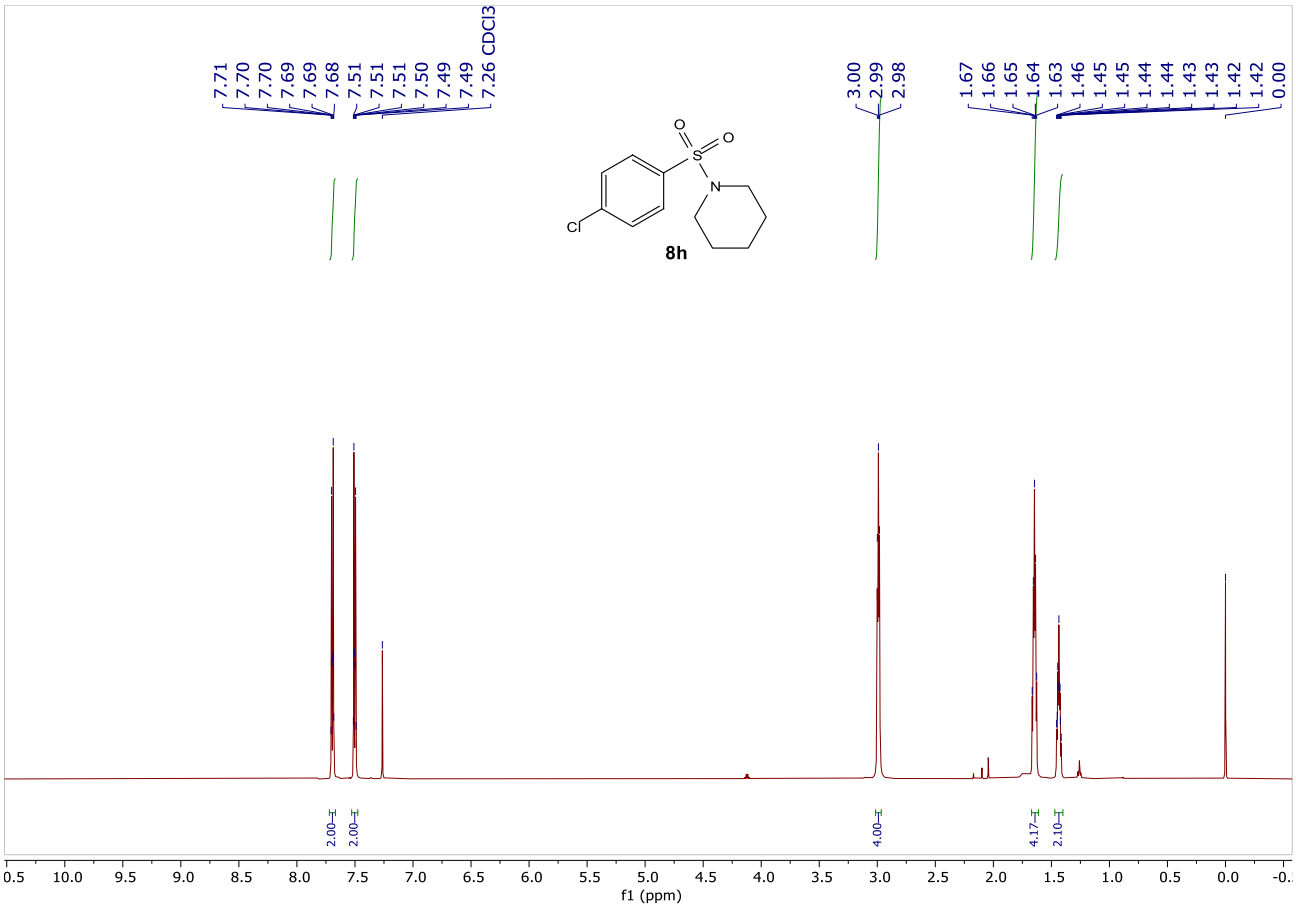
25.29
23.64
f1 (ppm)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7.51
7.51
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7.50
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7.49
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3.00
2.99
2.98
1.67
1.66
1.65
1.64
1.63
1.46
1.45
1.45
1.44
1.44
1.43
1.43
1.42
1.42
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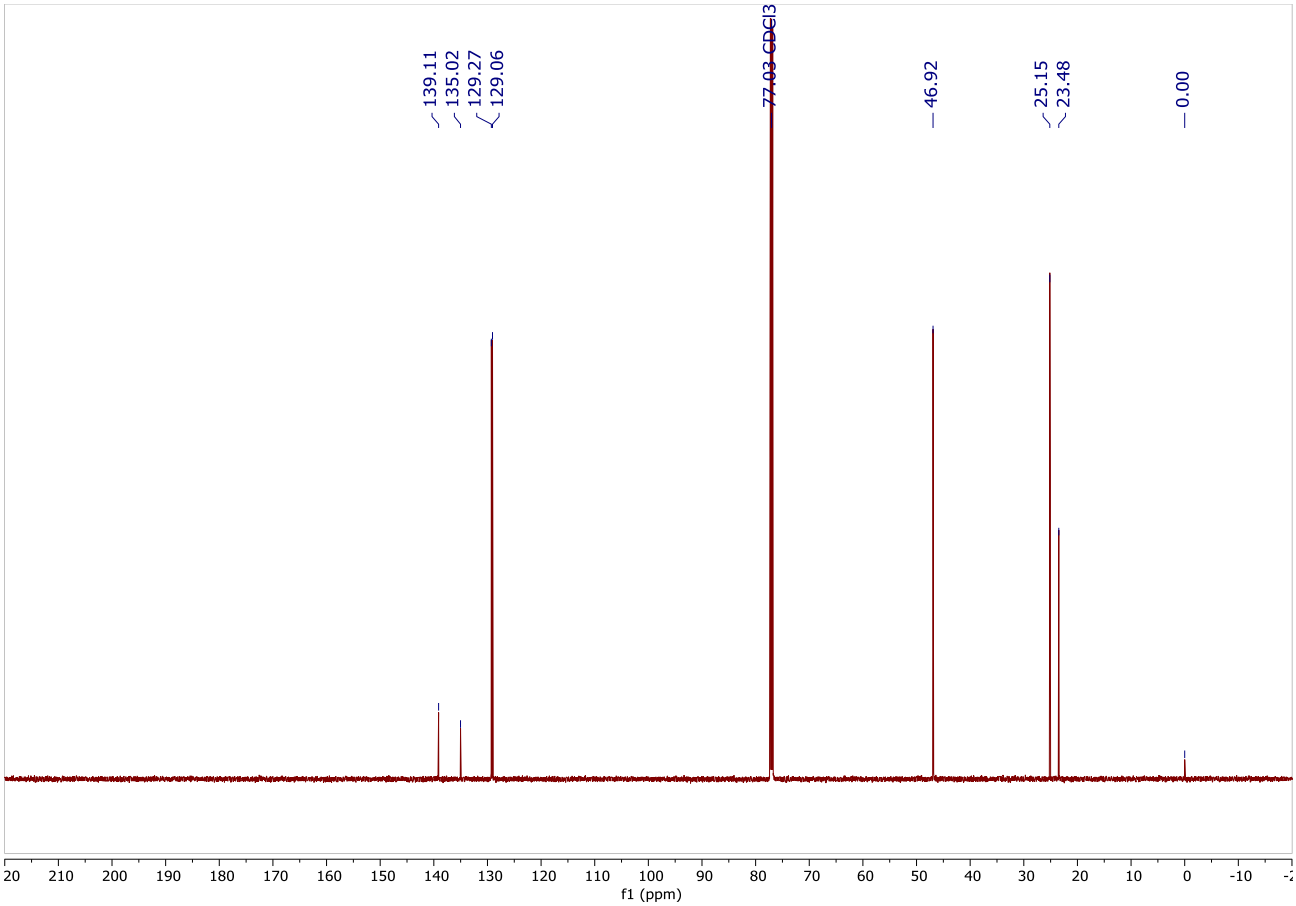
S
O
N
Cl
8h
2.00
2.00
4.00
4.17
2.10
f1 (ppm)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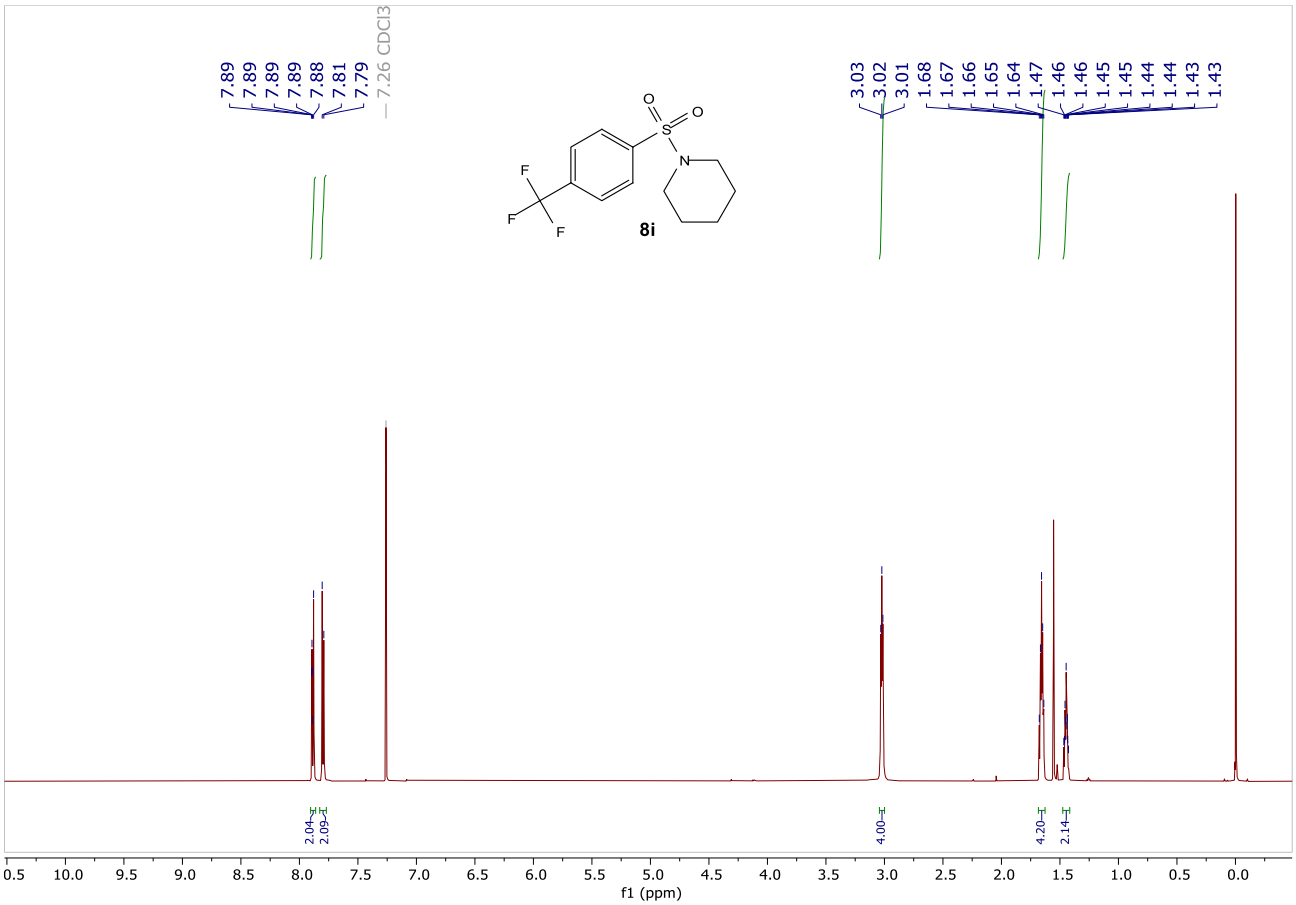
46.92
25.15
23.48
0.00
f1 (ppm)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7.89
7.89
7.89
7.88
7.81
7.79
7.26 CDCl3
3.03
3.02
3.01
1.68
1.67
1.66
1.65
1.64
1.47
1.46
1.46
1.45
1.45
1.44
1.44
1.43
1.43
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O
S
N
F
F
F
8i
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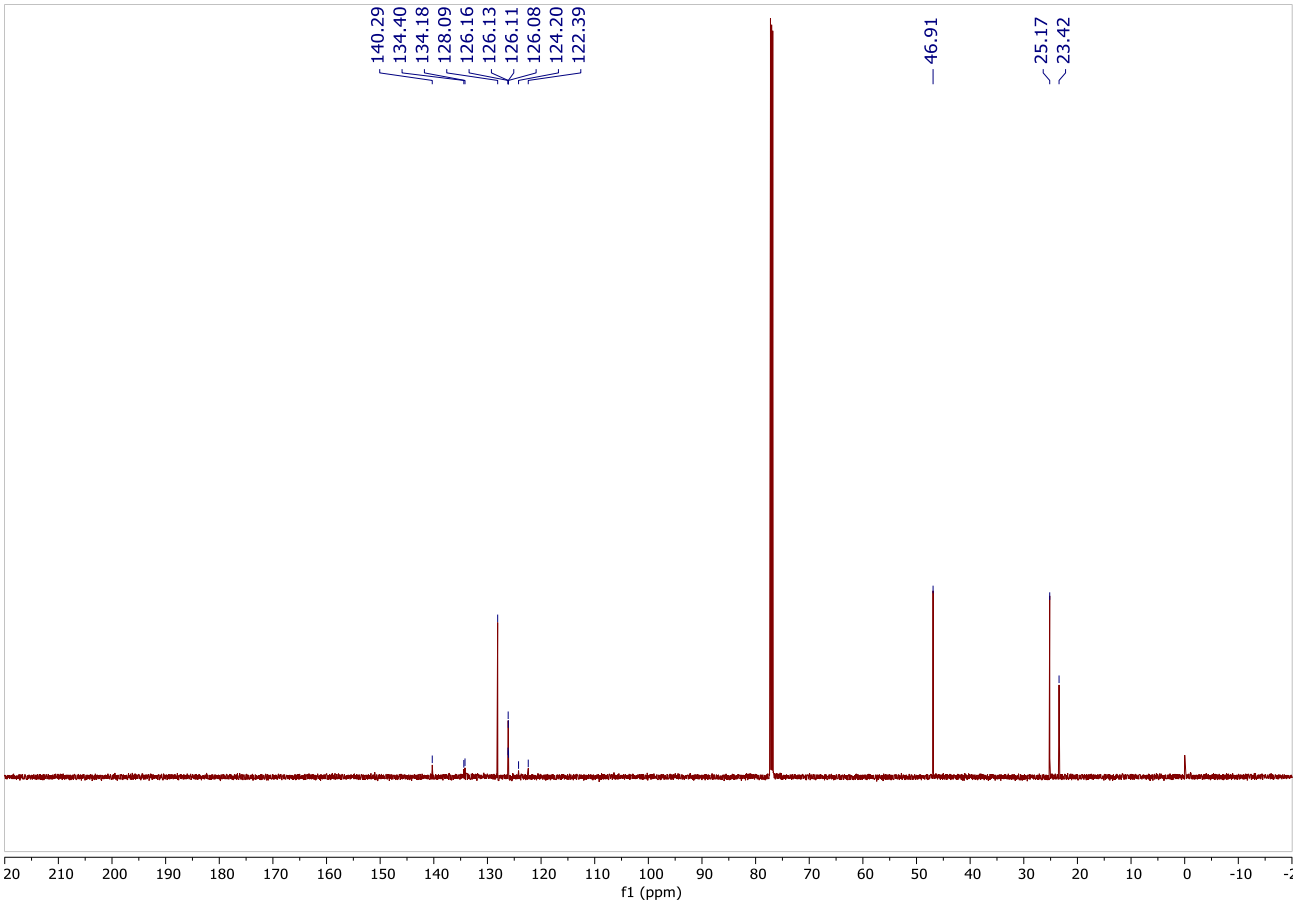
2.09
4.00
4.20
2.14
f1 (ppm)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134.40
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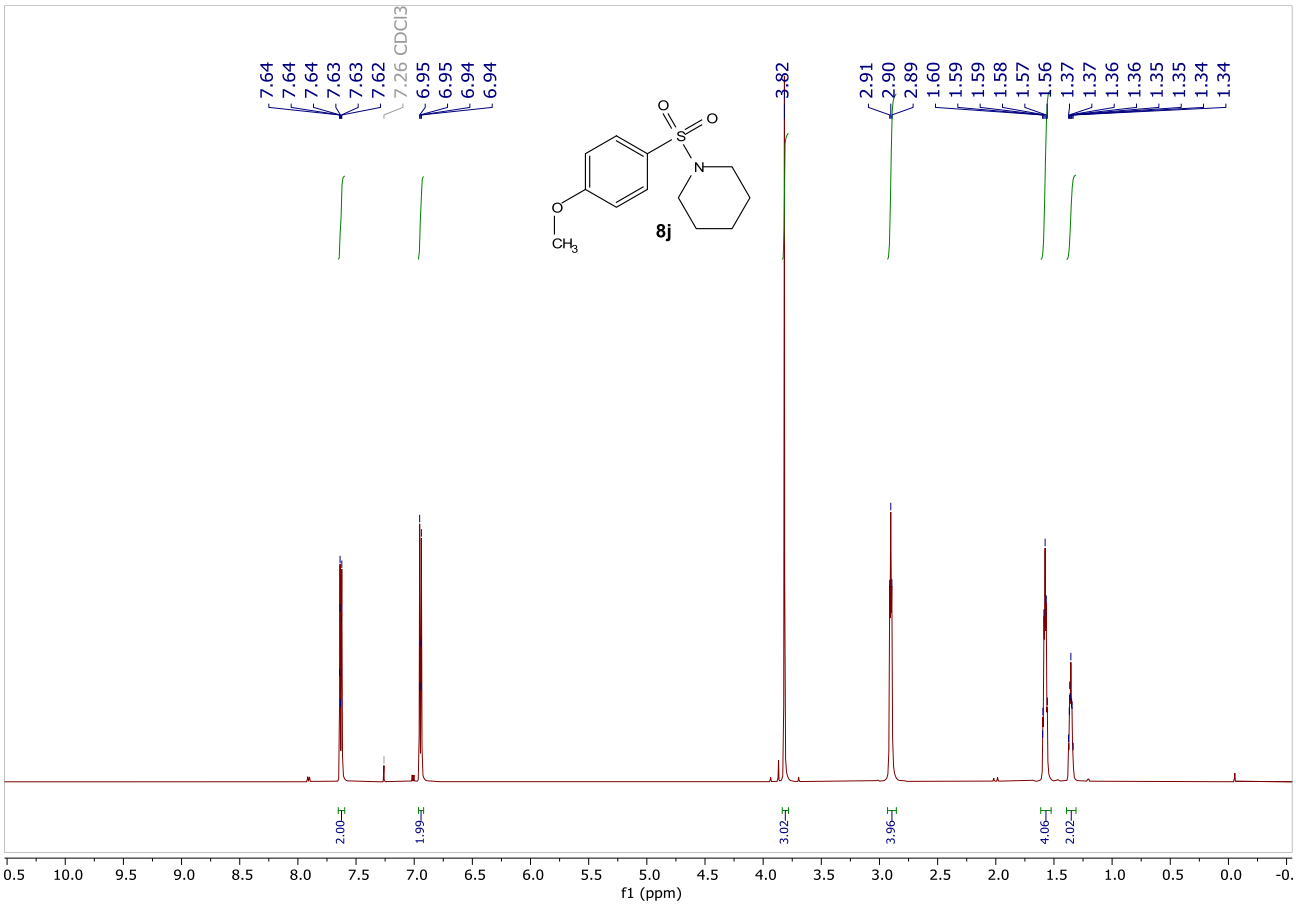
126.13
126.11
126.08
124.20
122.39
46.91
25.17
23.42
f1 (ppm)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7.64
7.64
7.63
7.63
7.62
7.26 CDCl3
6.95
6.95
6.94
6.94
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2.90
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1.58
1.57
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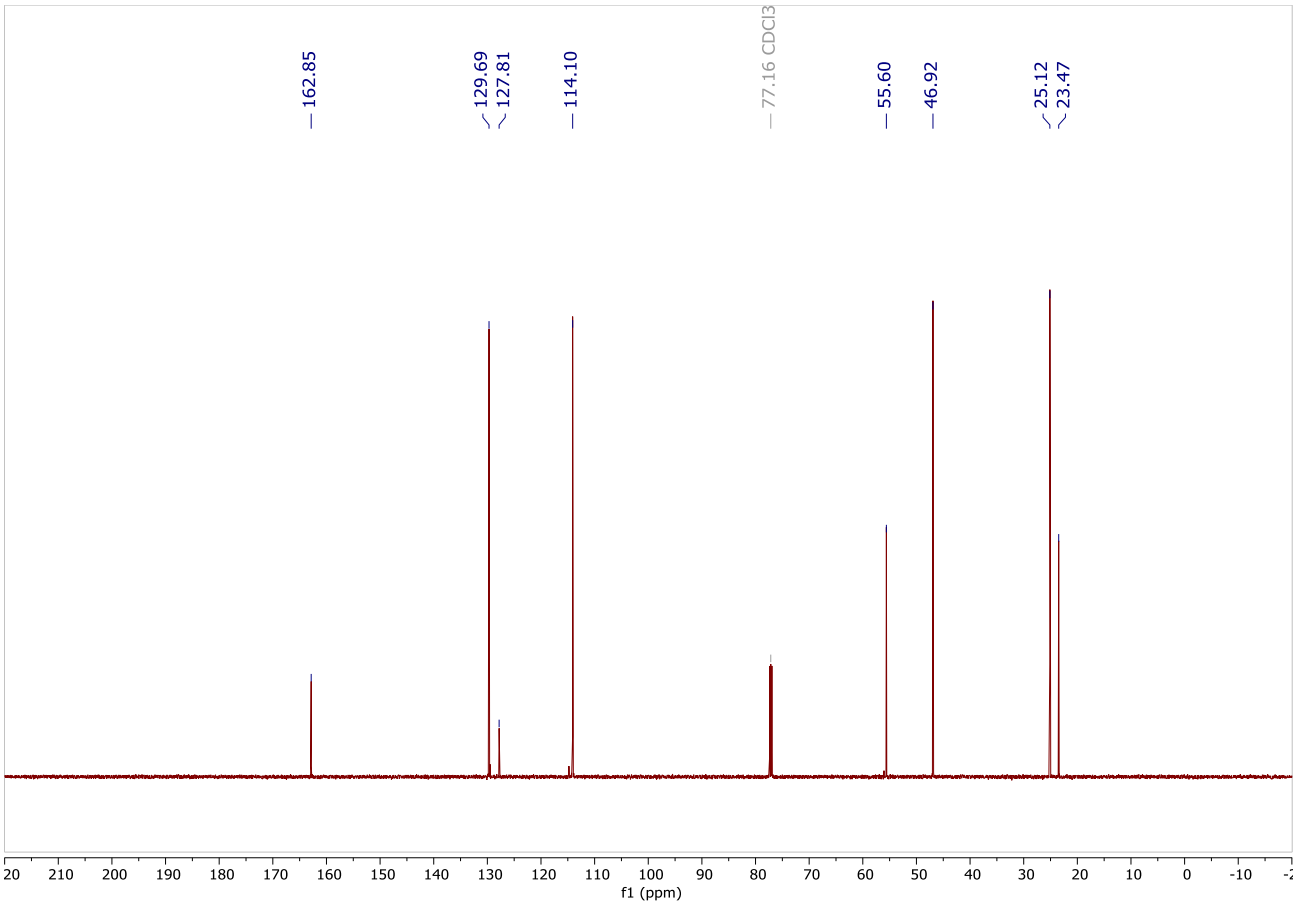
3.02
3.96
4.06
2.02
f1 (ppm)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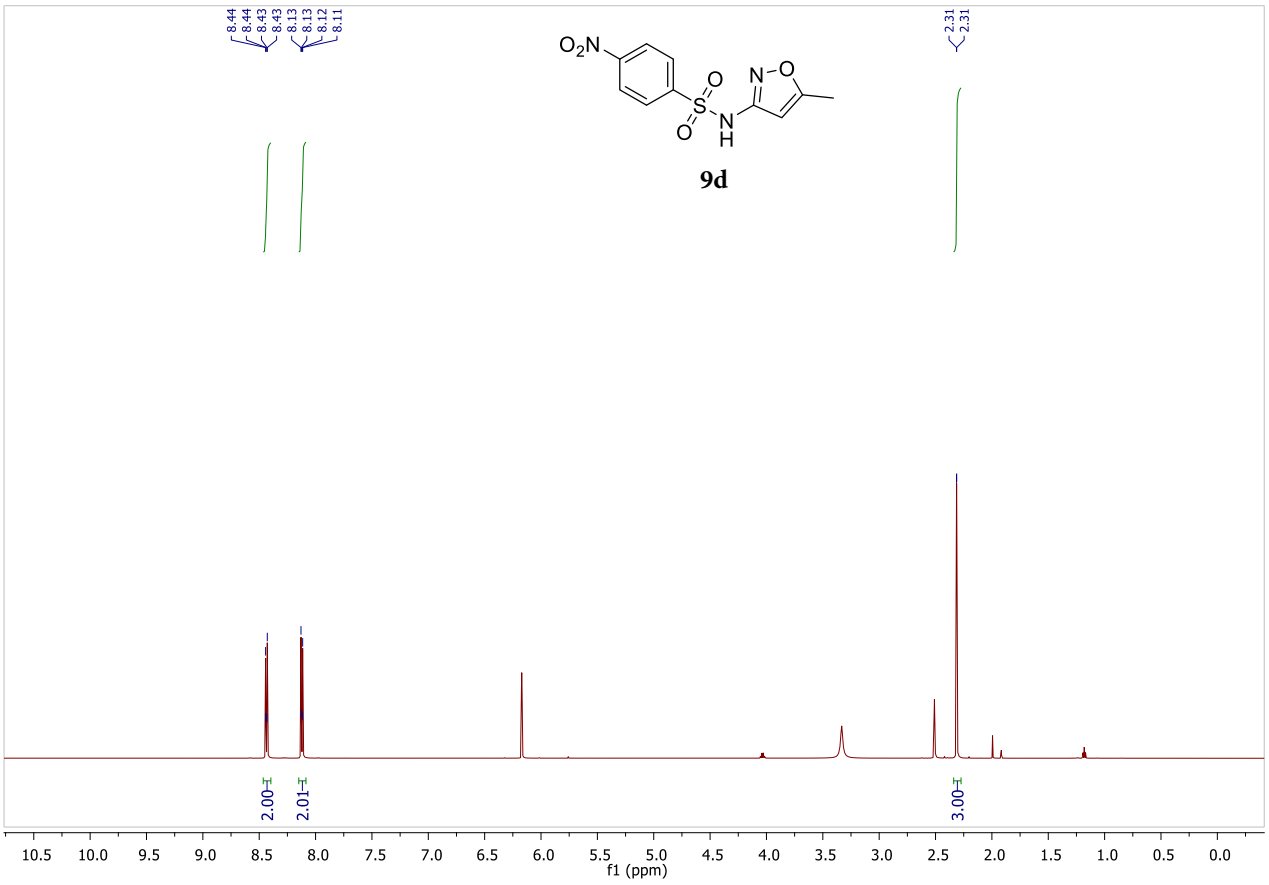
127.81
114.10
77.16 CDCl3
55.60
46.92
25.12
23.47
f1 (ppm)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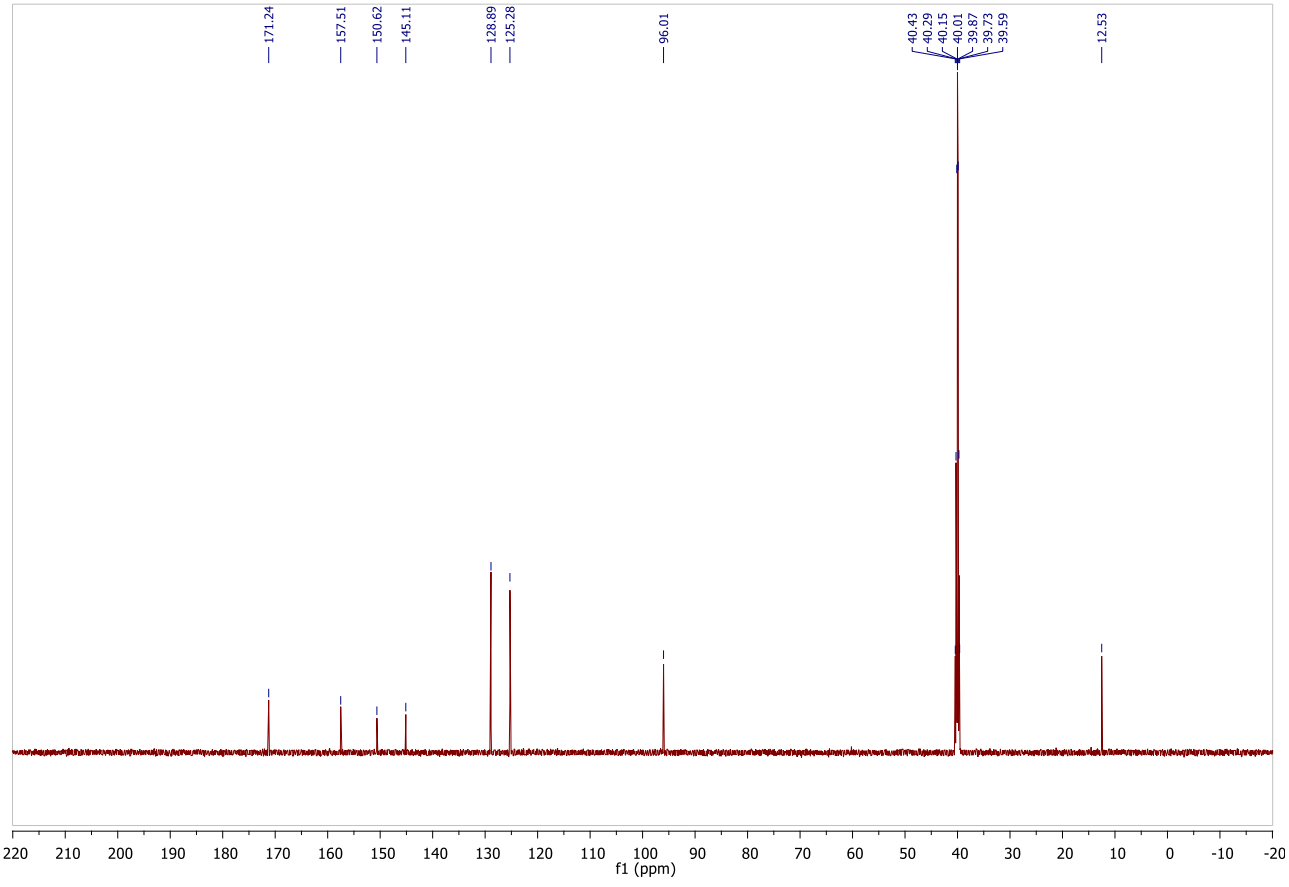
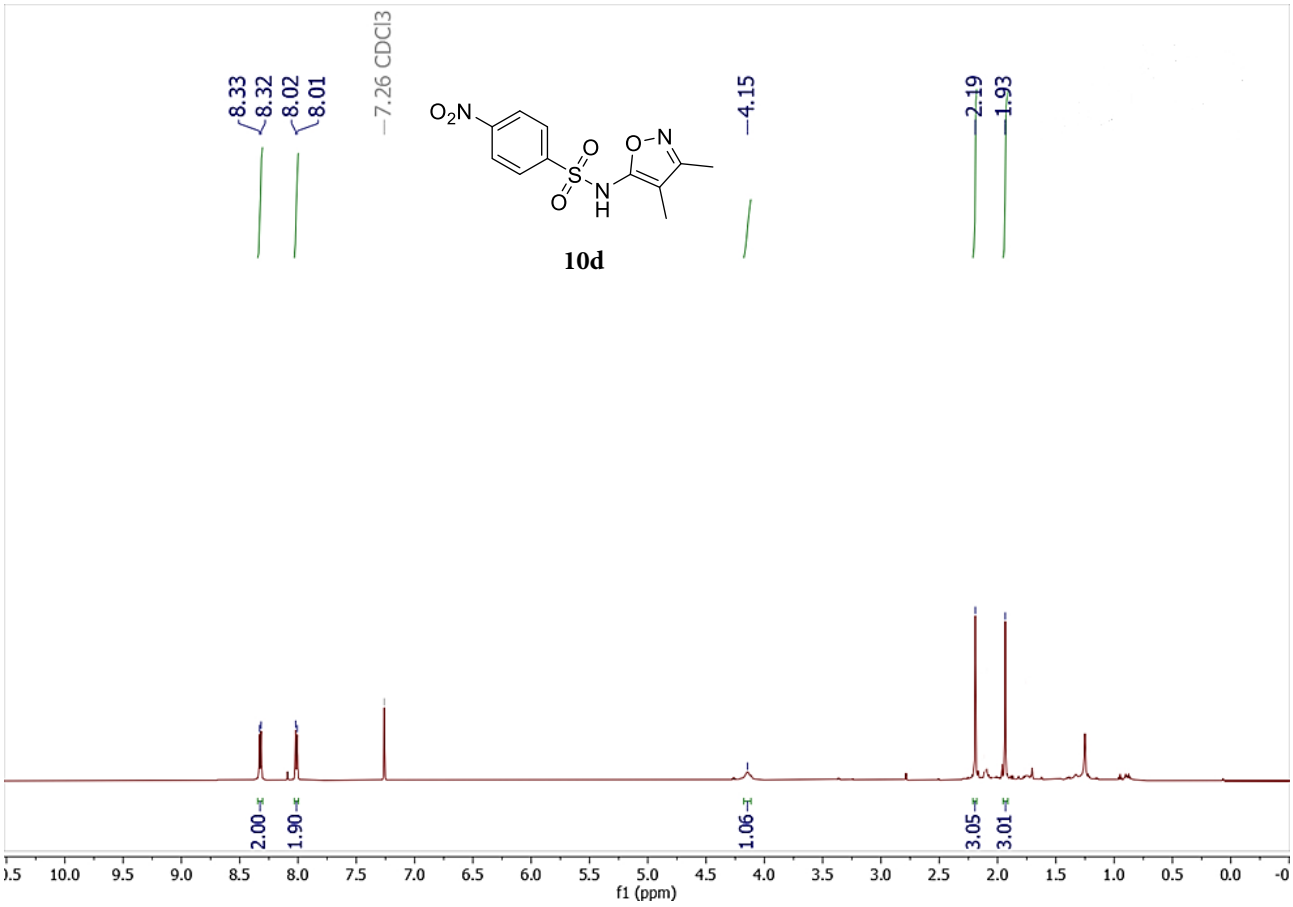
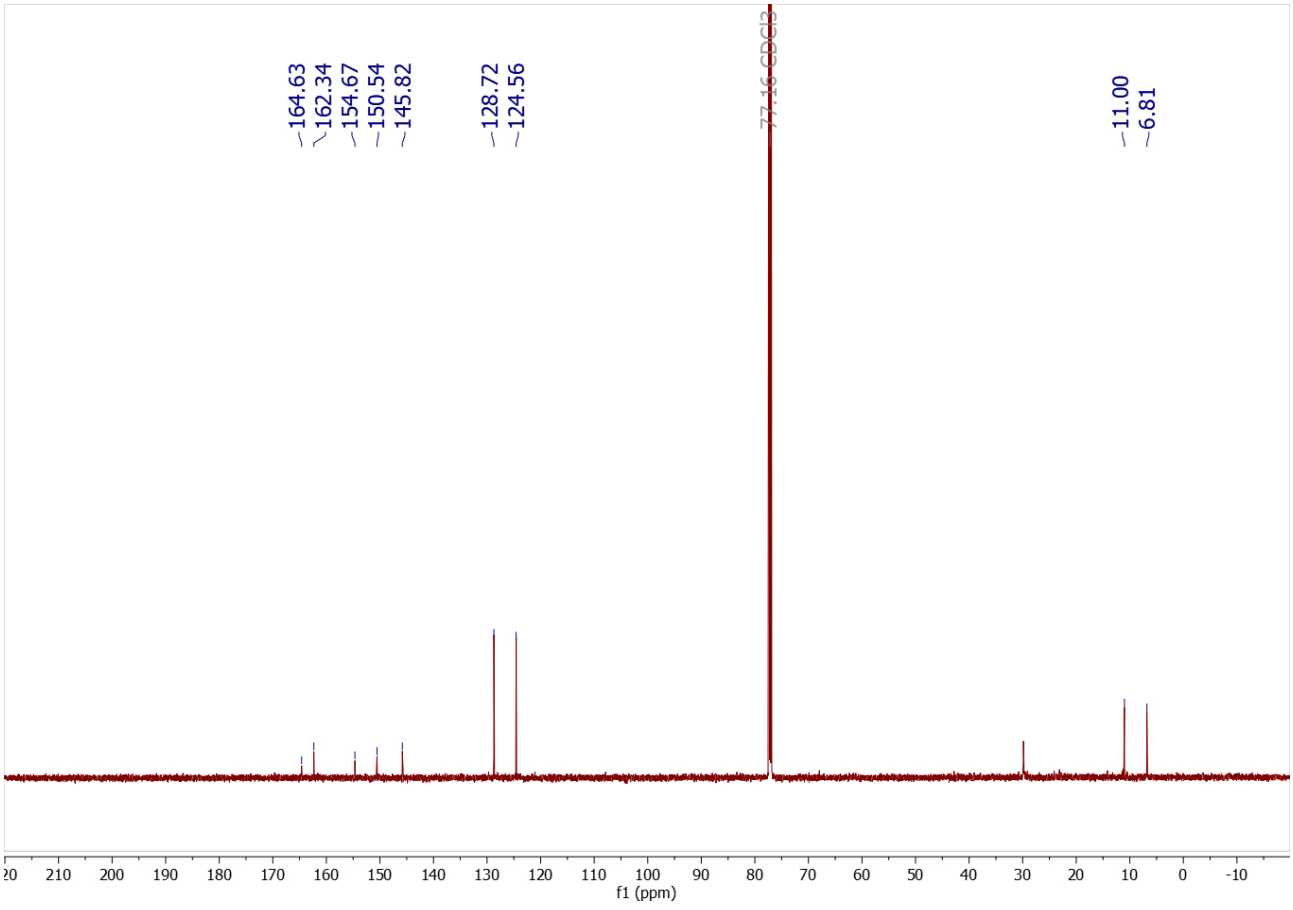
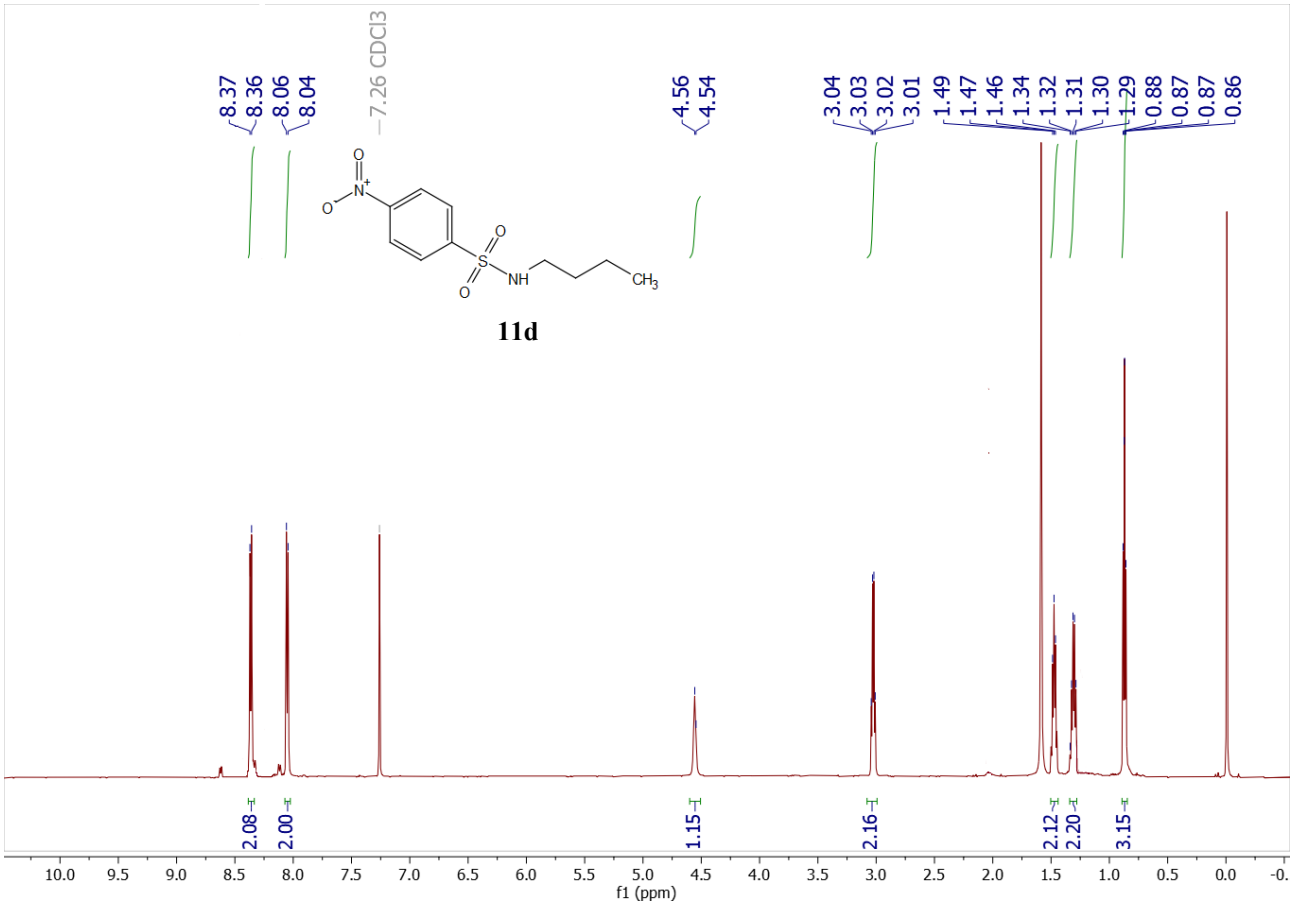
2.31
O2N
O
S
O
N
H
N
O
2.00
2.01
3.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

9d

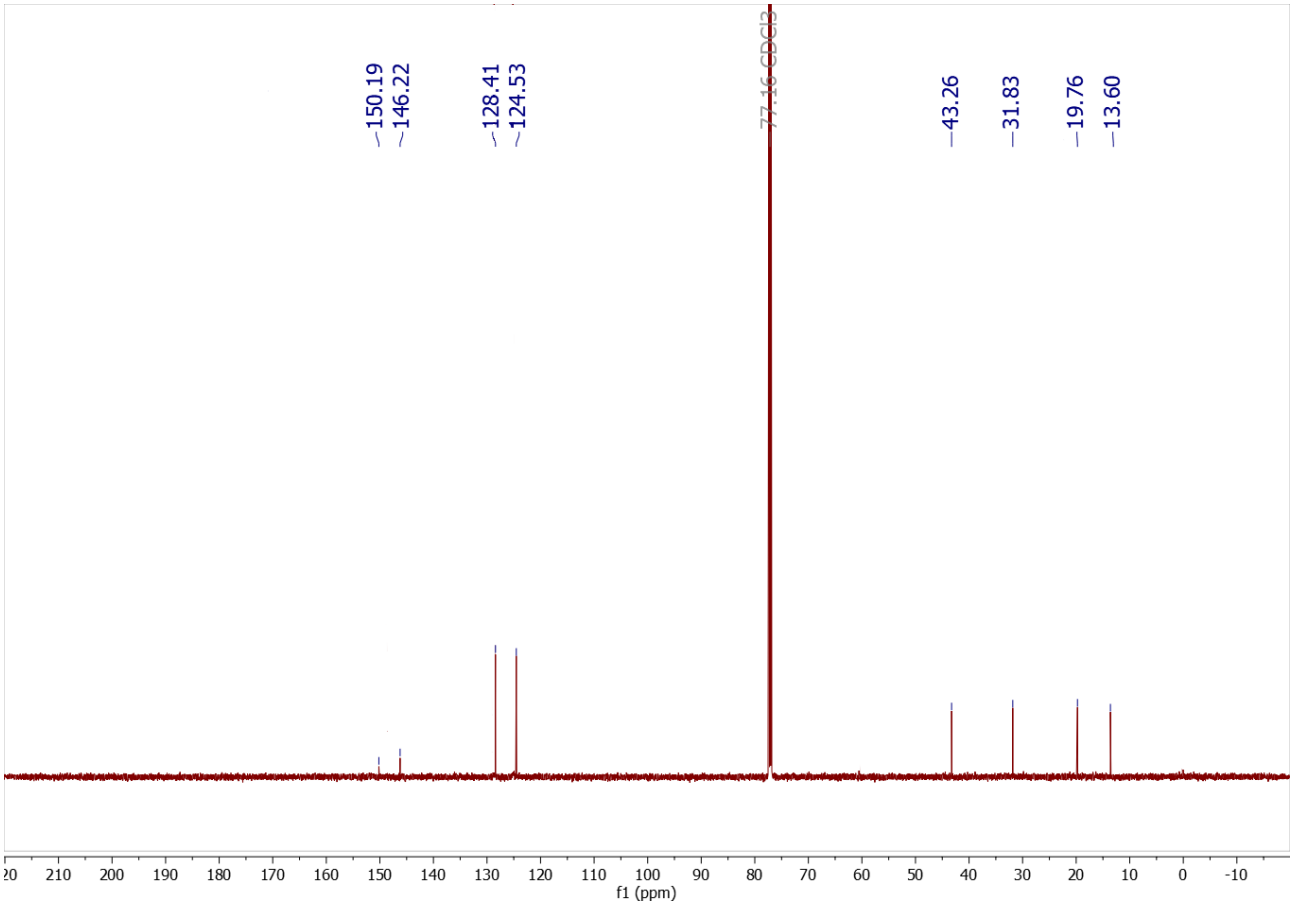

171.24
157.51
150.62
145.11
128.89
125.28
96.01
40.43
40.29
40.15
40.01
39.87
39.73
39.59
12.53
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20
f1 (ppm)

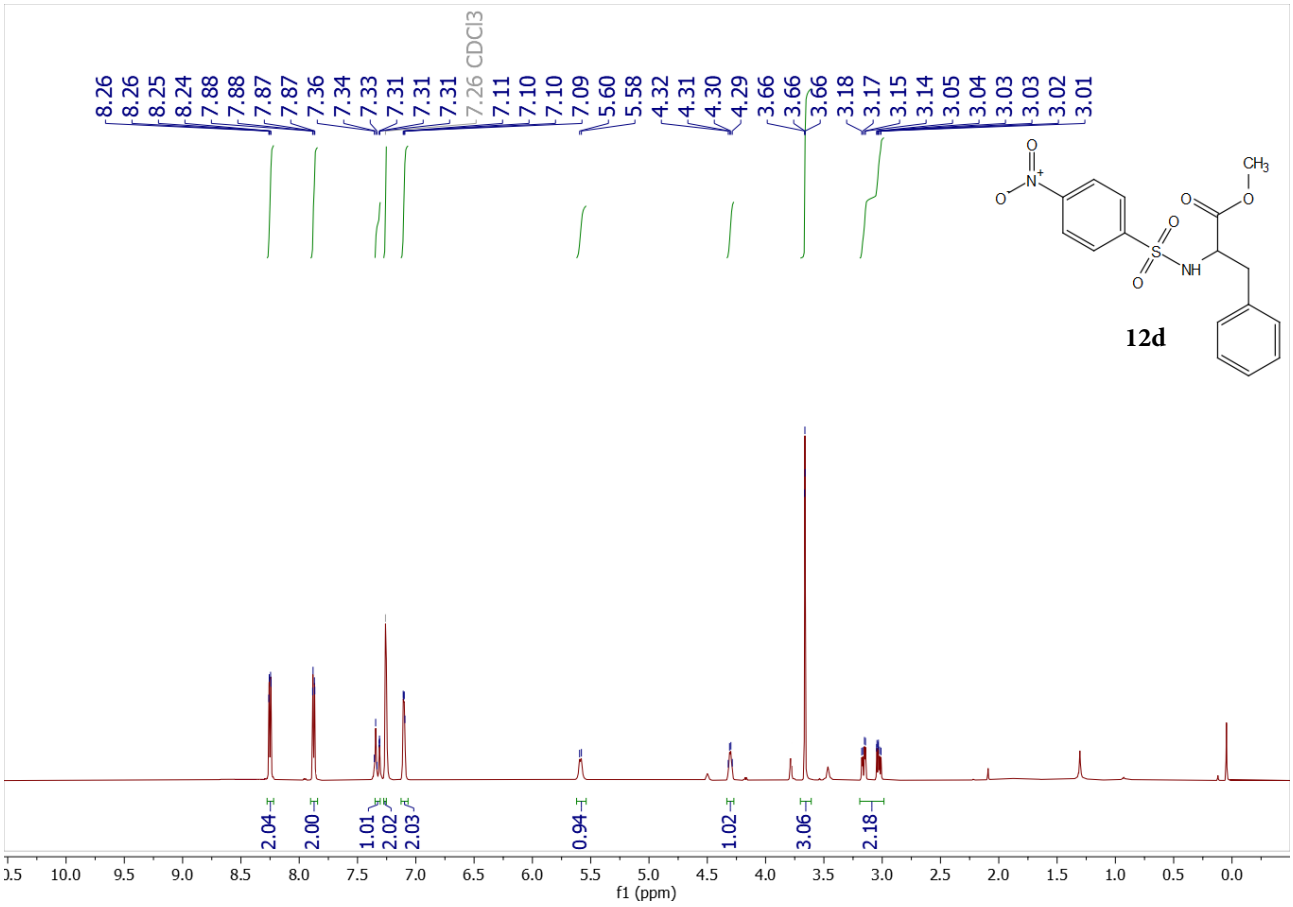

8.33
8.32
8.02
8.01
7.26 CDCl3
4.15
2.19
1.93
O2N
O
S
O
N
H
O
N
10d
2.00
1.90
1.06
3.05
3.01
f1 (ppm)

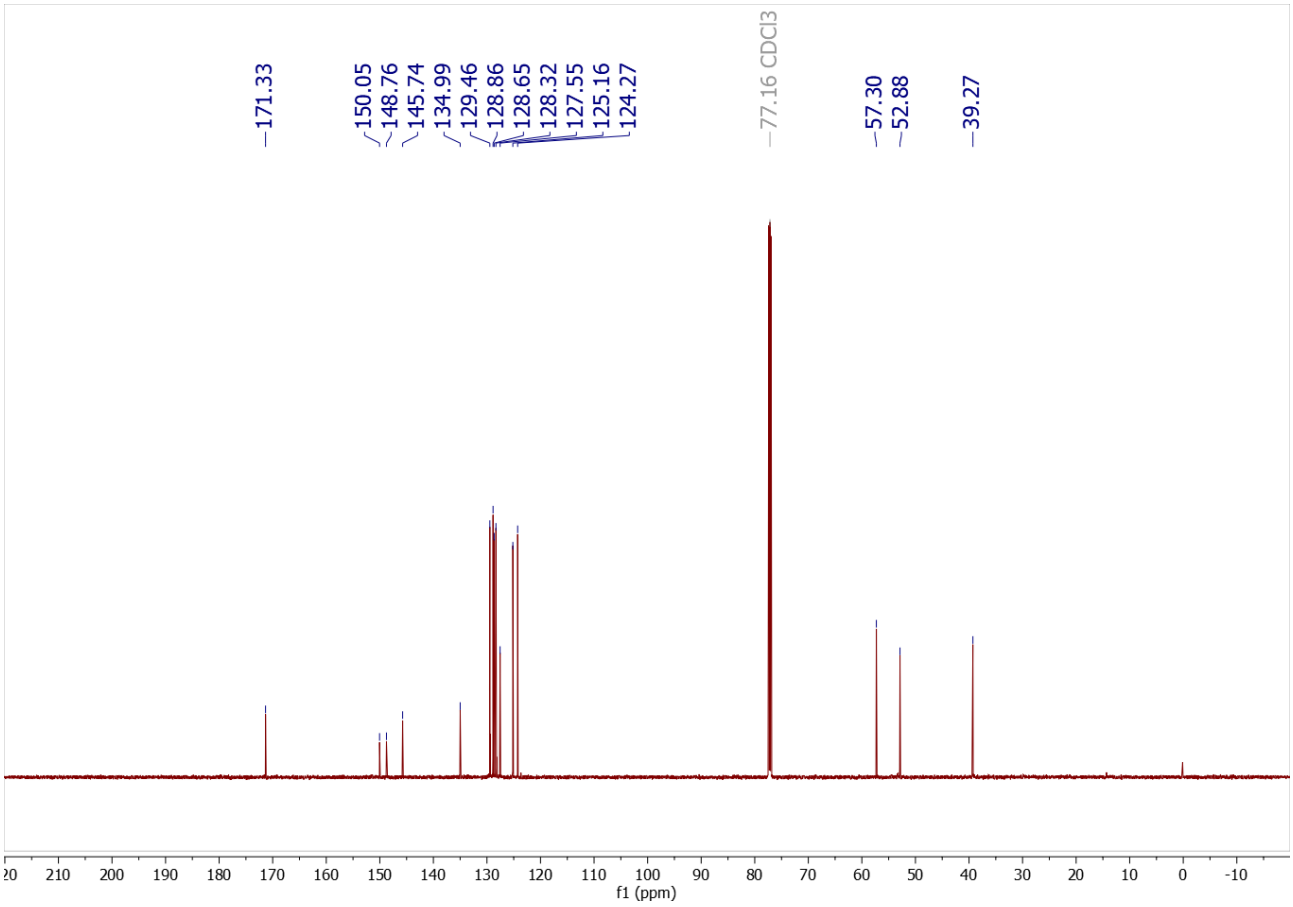

164.63
162.34
154.67
150.54
145.82
128.72
124.56
77.16 CDCl3
11.00
6.81
f1 (ppm)

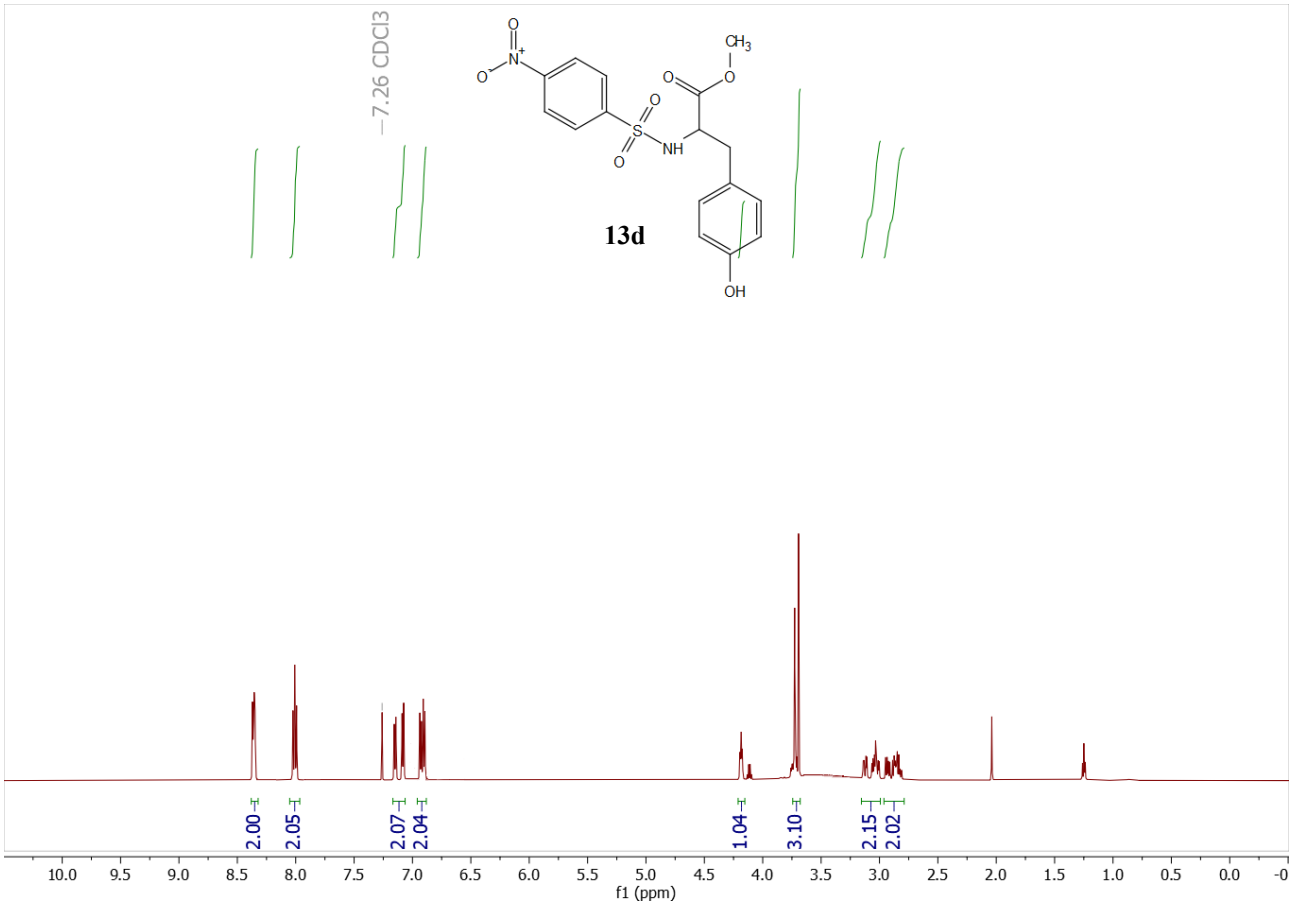

8.37
8.36
8.06
8.04
7.26 CDCl3
4.56
4.54
3.04
3.03
3.02
3.01
1.49
1.47
1.46
1.34
1.32
1.31
1.30
1.29
0.88
0.87
0.87
0.86
2.08
2.00
1.15
2.16
2.12
2.20
3.15
f1 (ppm)

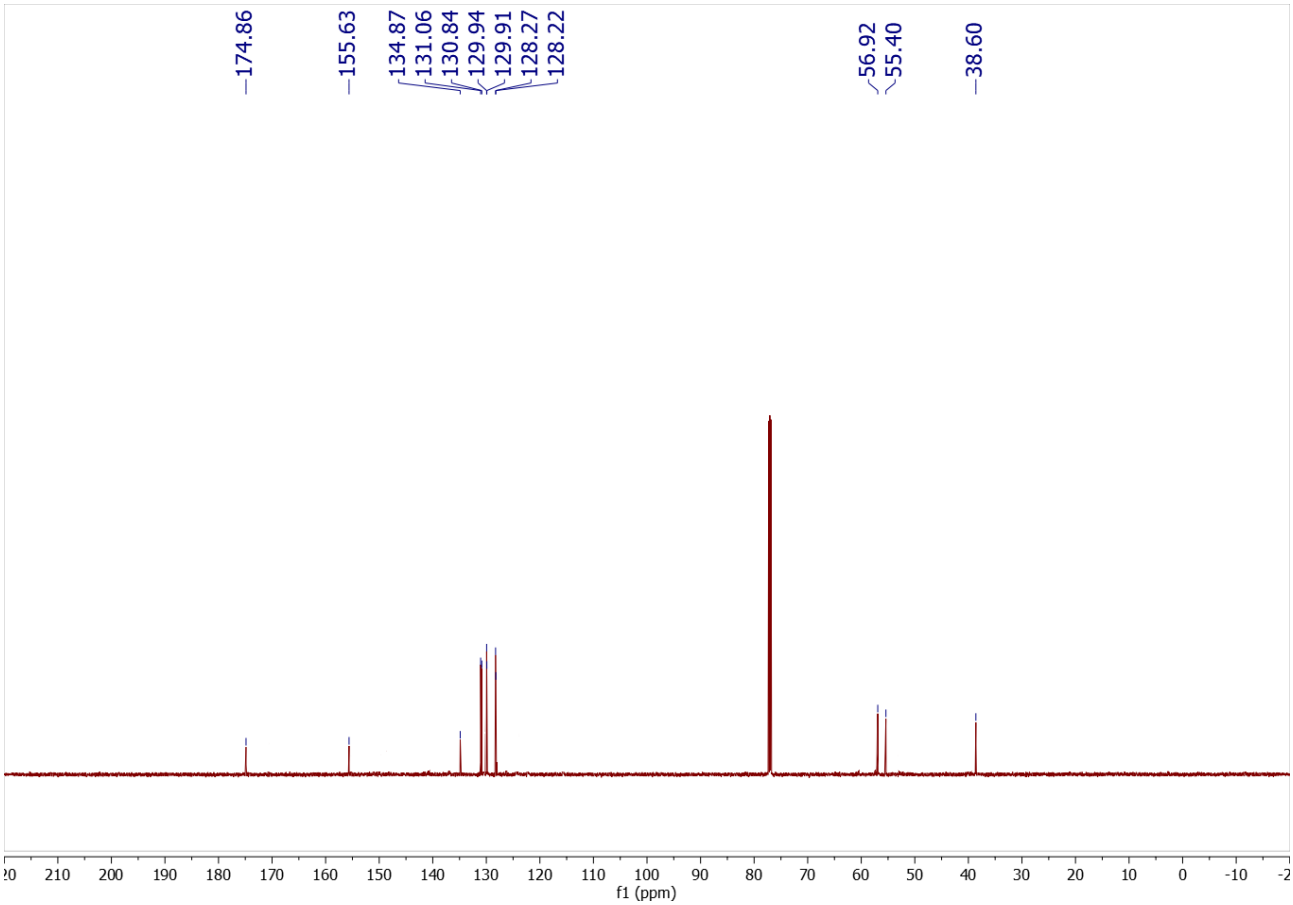
11d

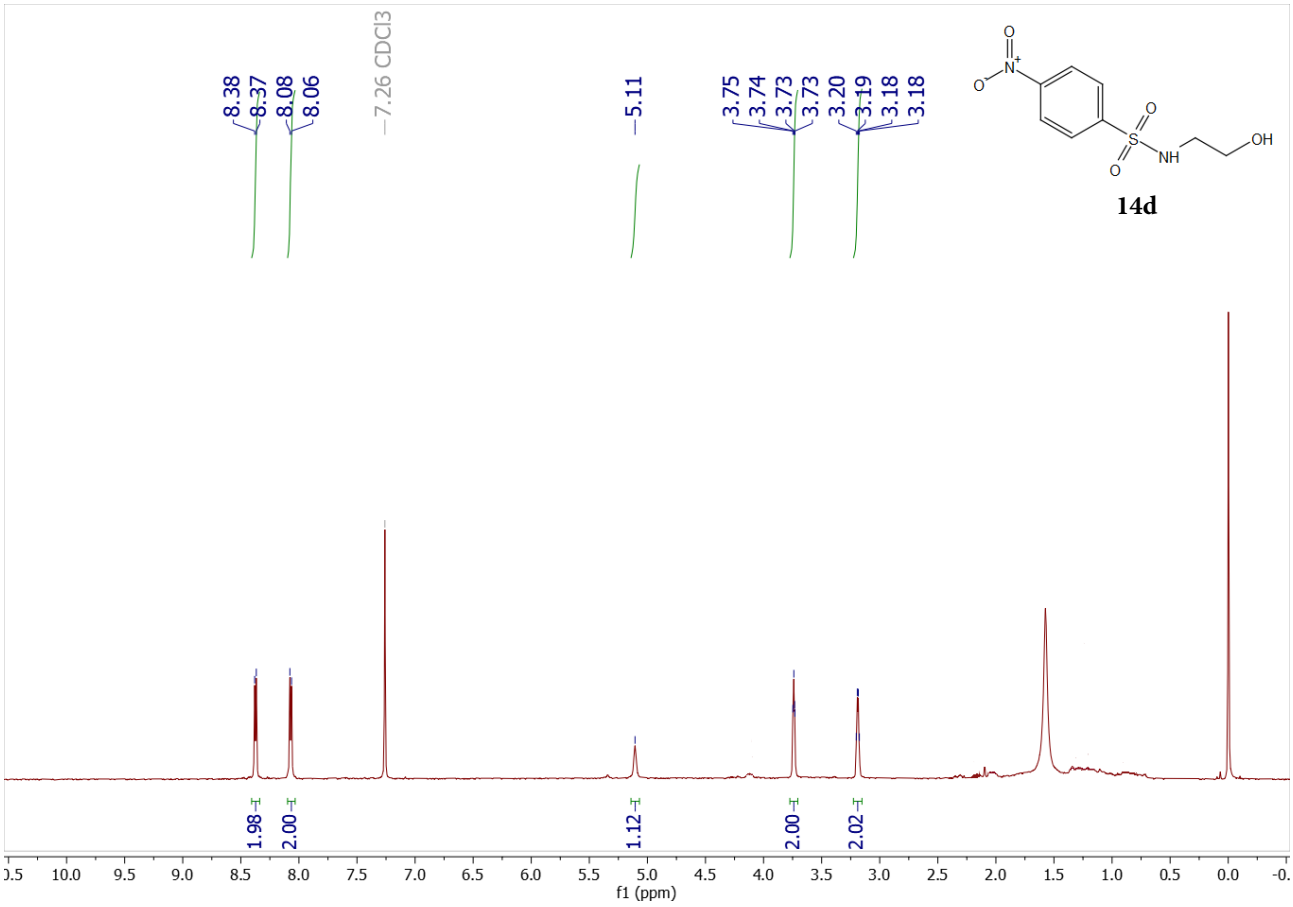

150.19
146.22
128.41
124.53
77.16 CDCl3
43.26
31.83
19.76
13.60
f1 (ppm)


8.26
8.26
8.25
8.24
7.88
7.88
7.87
7.87
7.36
7.34
7.33
7.31
7.31
7.31
7.26 CDCl3
7.11
7.10
7.10
7.09
5.60
5.58
4.32
4.31
4.30
4.29
3.66
3.66
3.66
3.18
3.17
3.15
3.14
3.05
3.04
3.03
3.03
3.02
3.01
12d
2.04
2.00
1.01
2.02
2.03
0.94
1.02
3.06
2.18
f1 (ppm)

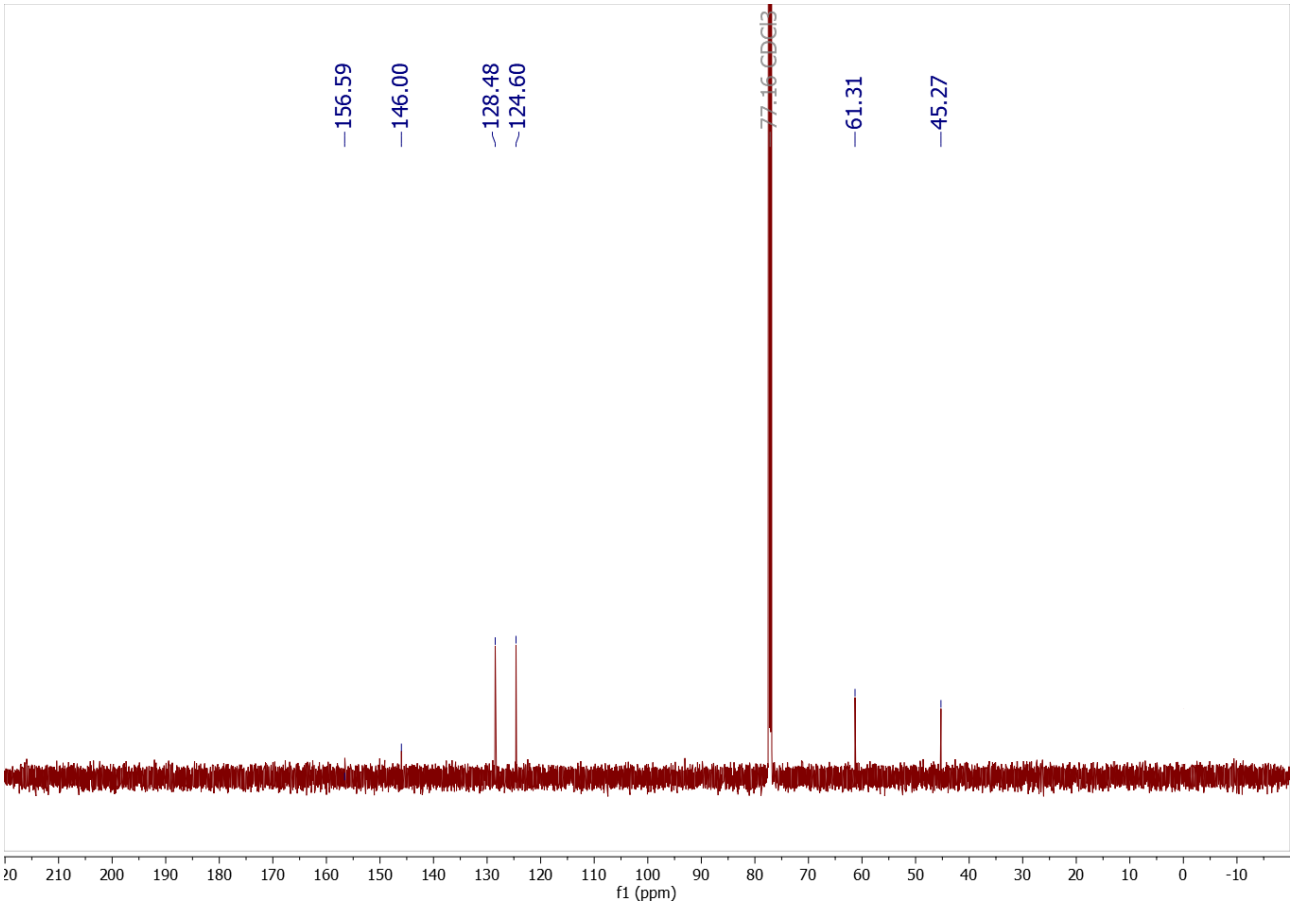

171.33
150.05
148.76
145.74
134.99
129.46
128.86
128.65
128.32
127.55
125.16
124.27
77.16 CDCl3
57.30
52.88
39.27
f1 (ppm)

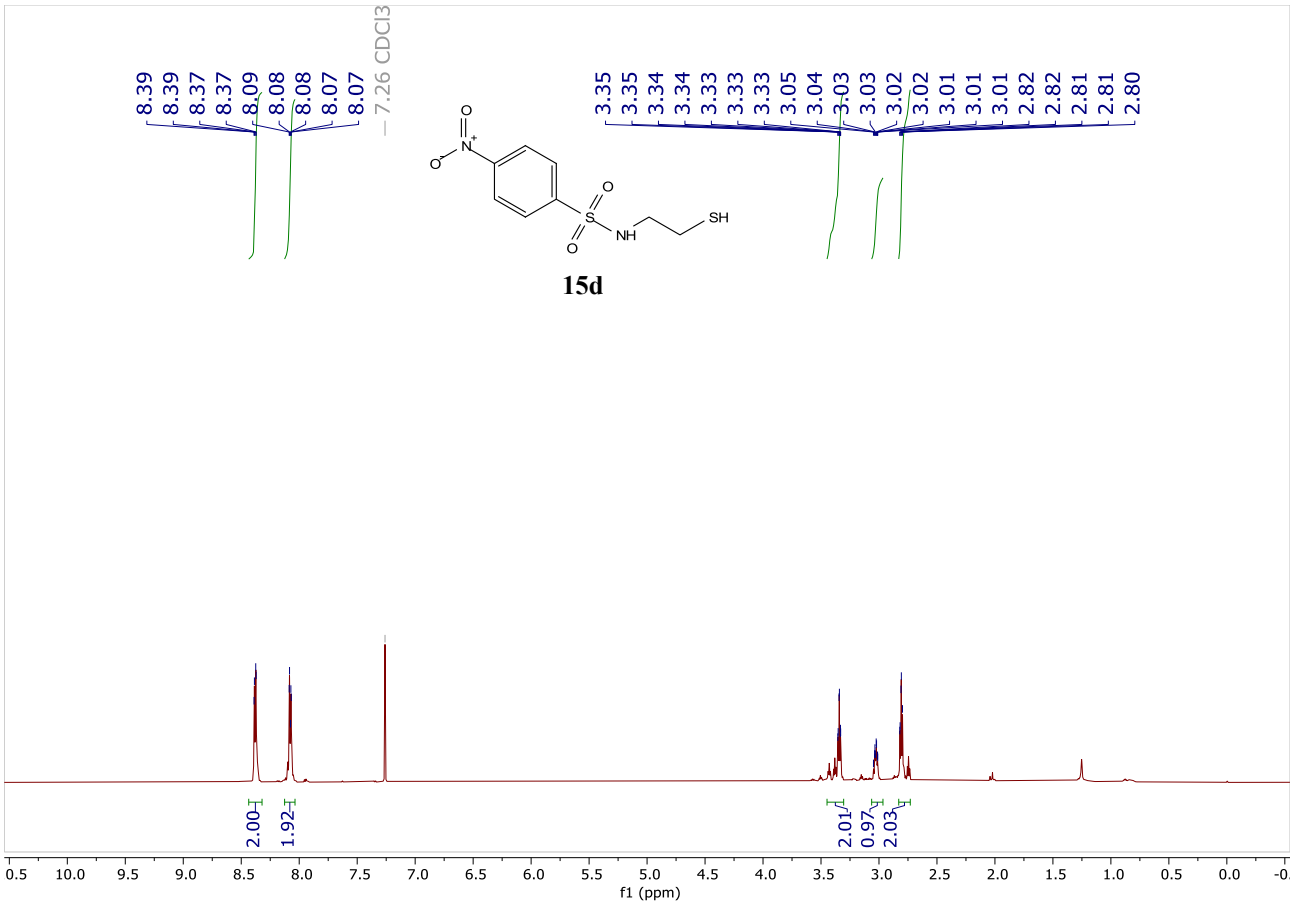

7.26 CDCl3
13d
2.00
2.05
2.07
2.04
1.04
3.10
2.15
2.02
f1 (ppm)


174.86
155.63
134.87
131.06
130.84
129.94
129.91
128.27
128.22
56.92
55.40
38.60
f1 (ppm)

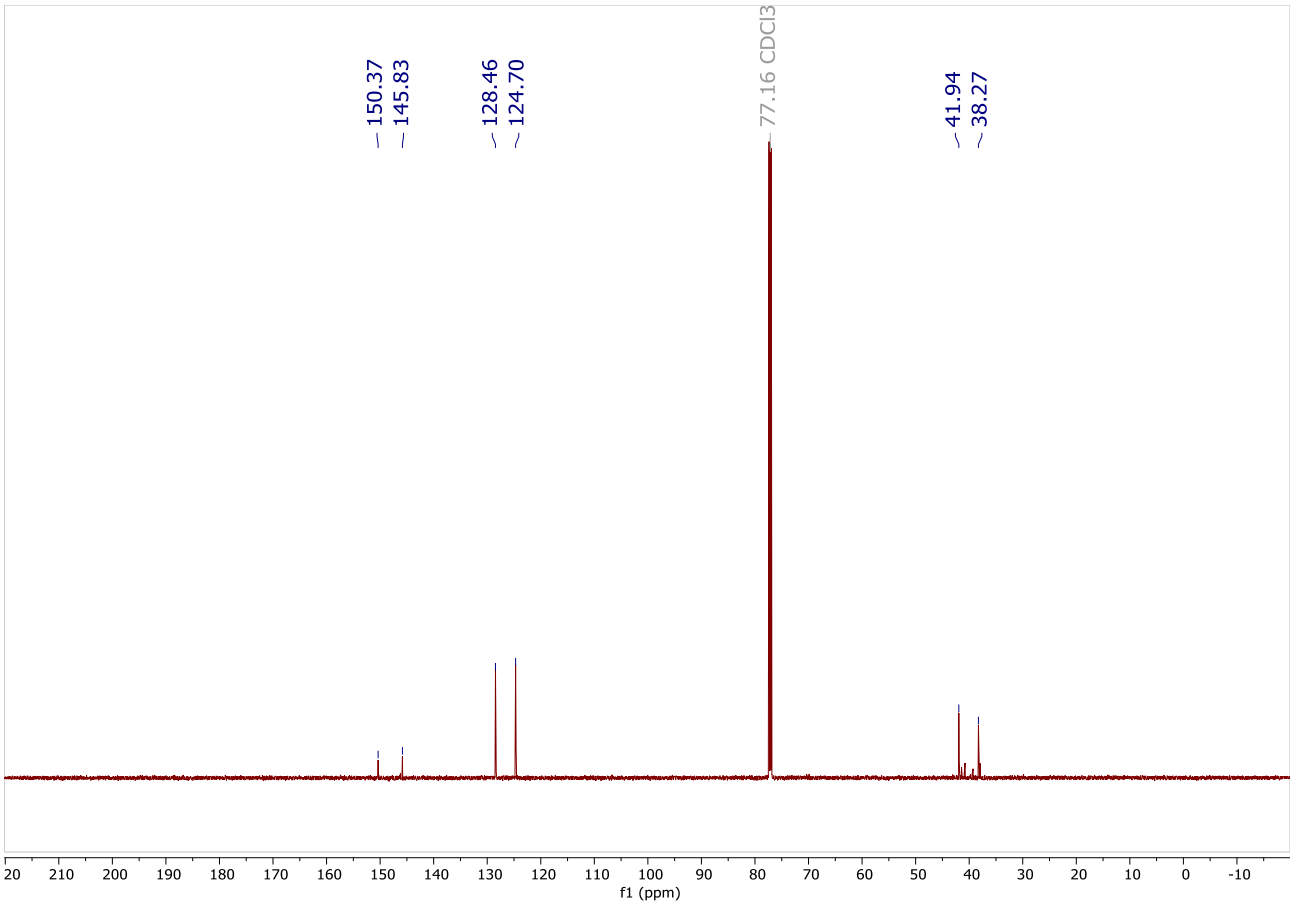

8.38
8.37
8.08
8.06
7.26 CDCl3
5.11
3.75
3.74
3.73
3.73
3.20
3.19
3.18
3.18
1.98
2.00
1.12
2.00
2.02
f1 (ppm)

14d


156.59
146.00
128.48
124.60
77.16 CDCl3
61.31
45.27
f1 (ppm)


8.39
8.39
8.37
8.37
8.09
8.08
8.08
8.07
8.07
7.26 CDCl3
3.35
3.35
3.34
3.34
3.33
3.33
3.33
3.05
3.04
3.03
3.03
3.02
3.02
3.01
3.01
3.01
2.82
2.82
2.81
2.81
2.80
O
N+
O-
O
S
O
NH
SH
2.00
1.92
2.01
0.97
2.03
f1 (ppm)

15d


150.37
145.83
128.46
124.70
77.16 CDCl3
41.94
38.27
f1 (ppm)

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