Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

C(sp^3)–H fluorosulfonylvinylation/aza-Michael addition approach to FSO_2-functionalized tetrahydropyridines

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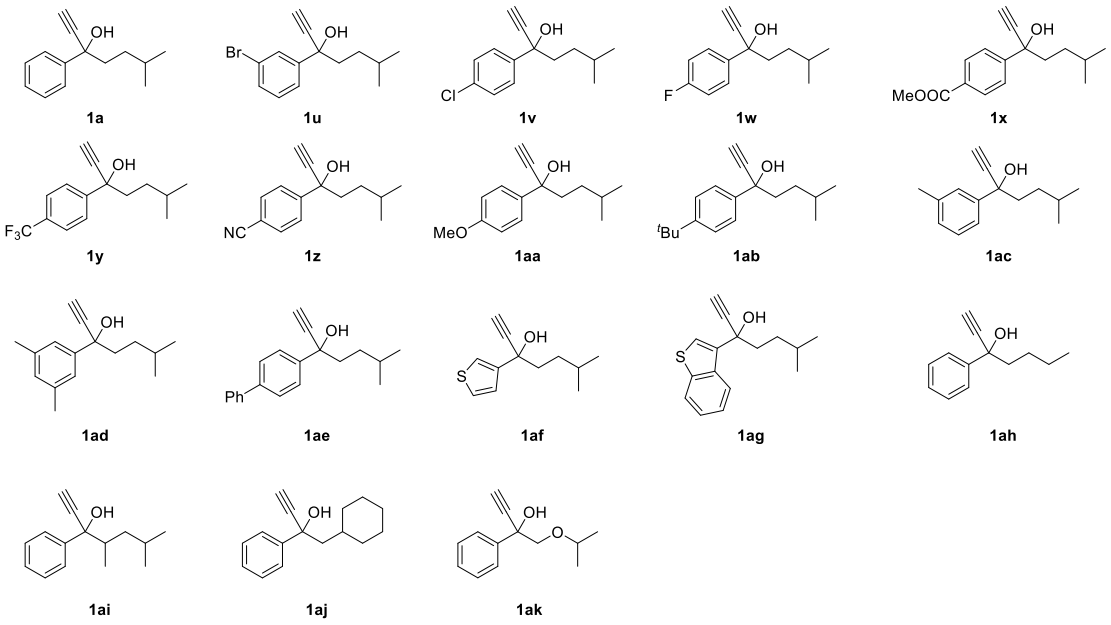
Supplementary Methods

I. General Information

Unless otherwise stated, all glassware was oven dried. All solvents were distilled from appropriate drying agents prior to use. All reagents were used as received from commercial suppliers unless otherwise indicated. Reactions were monitored using Thin Layer Chromatography (TLC) carried out on Merck silica gel plates (60F-254) using UV light as the visualizing agent and High Performance Liquid Chromatography (HPLC) with UV detection at 254 nm. For HPLC yields, UV response factors relative to an internal standard (diphenyl sulfide). Flash column chromatography was performed using silica gel 60 (200-300 mesh). HRMS experiments were carried out on a ThermoFisher LTQ Orbitrap XL. All ^{1}H NMR, ^{13}C NMR spectra were recorded on Bruker DRX-600 and AMX-400 instruments. Chemical shifts were given in parts per million (ppm, δ), referenced to the solvent peak of $CDCl_3$, defined at $\delta = 7.26$ (^{1}H NMR), defined at $\delta = 77.16$ (^{13}C NMR). Coupling constants were quoted in Hz (J). ^{1}H NMR Spectroscopy splitting patterns were designated as singlet (s), doublet (d), triplet (t), quartet (q). Splitting patterns that could not be interpreted or easily visualized were designated as multiplet (m) or broad (br). The diastereomeric ratios were determined by ^{1}H NMR analysis. FSO_2Cl was prepared according to the literature procedure.[1]

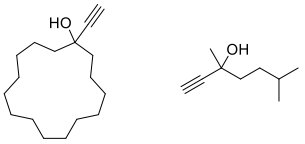
II. Preparation of Propargyl Alcohols

Table S1. Propargyl alcohols used in this study.



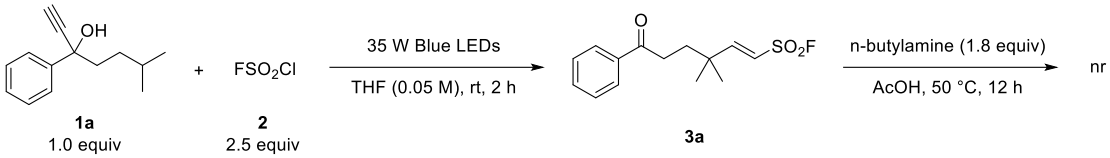
Propargyl alcohols **1a, 1u, 1v, 1w, 1x, 1y, 1z, 1aa, 1ab, 1ac, 1ad, 1ae, 1af, 1ag, 1ah, 1aj, 1ak** are known compounds and were synthesized according to the literature. [2,3,4,6,7] The preparation of new propargyl alcohols and their characterization datas provided as follows.

Table S2. Unsuccessful propargyl alcohols



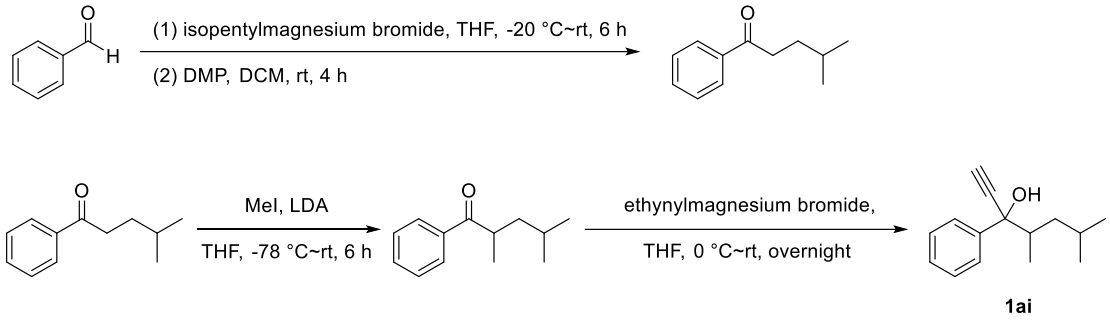
1al **1am**

Table S3. Unsuccessful reactions



1a 1.0 equiv + **2** 2.5 equiv → **3a**

Procedure A: Synthesis of propargyl alcohol **1ai**[2,3,5]



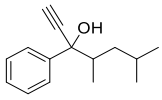
1ai

Step 1: Isopentylmagnesium bromide (10 mL, 2.0 equiv, 1 M in THF) was added dropwise to benzaldehyde (537.0 mg, 5 mmol, 1.0 equiv) in anhydrous THF (10 mL) at -20 °C. The reaction was warmed up to room temperature and stirred for 6 h. The reaction mixture was treated with saturated aqueous NH_4Cl and extracted with EtOAc for three times. The organic layers were dried over anhydrous Na_2SO_4 and concentrated in *vacuo*. The resultant crude alcohol was directly subjected to the oxidation by Dess-Martin periodinane (3.03 g, 7 mmol, 1.4 equiv) in DCM (25 mL) for 4 h. After the reaction completion, the crude reaction mixture was filtered and concentrated in *vacuo*. The residue was purified by flash column chromatography on silica gel to afford the corresponding ketone.

Step 2: To a solution of the ketone (463.5 mg, 2.5 mmol, 1.0 equiv) in THF (2.5 mL) was slowly added Lithium diisopropylamide (1.63 mL, 1.3 equiv, 2 M in THF) at -78 °C under N_2 atmosphere. After stirring for 1 h, MeI (236 µL, 3.75 mmol, 1.5 equiv) was added dropwise and continued stirring for 20 min. Then the solution was allowed to warm to room temperature and stirred for 6 h. The reaction is quenched with saturated aqueous NH_4Cl, extracted with EtOAc for three times. The combined extracts were washed with brine, dried over Na_2SO_4 and evaporated to dryness. The residue was purified by column chromatography to afford the 2,4-dimethyl-1-phenylpentan-1-one.

Step 3: Ethynylmagnesium bromide (2.4 mL, 1.2 equiv, 0.5 M in THF) was added to the2,4-dimethyl-1-phenylpentan-1-one (190.3 mg, 1 mmol, 1.0 equiv) in anhydrous THF (2 mL) at 0 °C. Then the reaction was warmed up to room temperature and stirred overnight. The reaction mixture was treated with saturated aqueous NH_4Cl and extracted with EtOAc for three times. The organic layers were dried over anhydrous Na_2SO_4 and concentrated in *vacuo*. The residue was purified by flash column chromatography on silica gel to afford the corresponding propargyl alcohol **1ai**.

4,6-Dimethyl-3-phenylhept-1-yn-3-ol (1ai)



Flash chromatography: 5% EtOAc in petroleum ether.

151.4 mg, 70% yield, *d.r.* = 1.65:1, colorless oil.

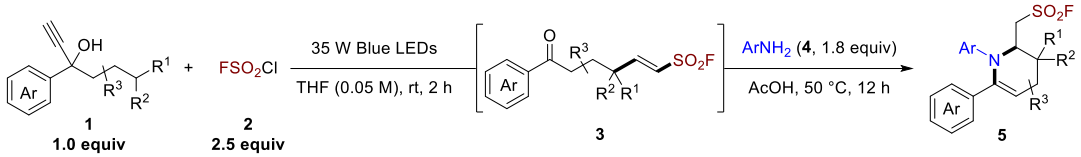
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.65 – 7.59 (m, 5.3H, two isomers), 7.38 – 7.34 (m, 5.3H, two isomers), 7.32 – 7.28 (m, 2.65H, two isomers), 2.68 (s, 2.65H, two isomers), 2.40 (s, 2.65H, two isomers), 2.04 – 1.98 (m, 1.65H, one isomer), 1.64 – 1.60 (m, 1H, one isomer), 1.58 – 1.49 (m, 3.3H, one isomer), 1.25 – 1.19 (m, 2H, one isomer), 1.13 – 1.07 (m, 2.65H, two isomers), 1.05 (d, J = 6.6 Hz, 3H, one isomer), 0.93 (d, J = 6.5 Hz, 4.95H, one isomer), 0.87 – 0.80 (m, 12.9H, two isomers), 0.70 (d, J = 6.5 Hz, 3H, one isomer).

^{13}C NMR (150 MHz, $CDCl_3$) δ 143.7 & 143.5 (two isomers), 128.08 &128.05 (two isomers), 127.84 & 127.82 (two isomers), 126.32 & 126.28 (two isomers), 85.60 & 85.56 (two isomers), 77.14 & 77.11 (two isomers), 75.04 & 75.01 (two isomers), 43.03 & 43.00 (two isomers), 40.9 & 40.4 (two isomers), 25.7 & 25.5 (two isomers), 24.4 & 24.3 (two isomers), 21.4 & 21.1 (two isomers), 15.0 & 14.4 (two isomers).

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{15}H_{21}O^+$ 427.1098, found 427.1093.

III. Synthesis of FSO_2-Functionalized Tetrahydropyridines

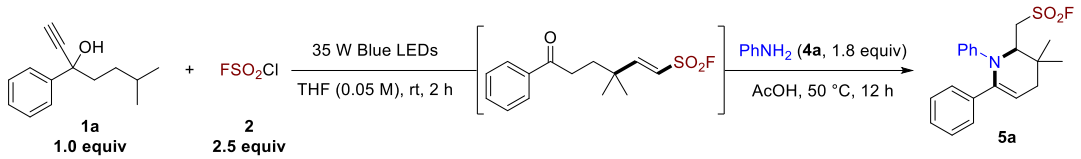
General Procedure B



The product **3** was prepared according to the method reported by Zhao et al.[4] After this reaction, the mixture was treated with cold saturated aqueous $NaHCO_3$, the mixture was extracted with EtOAc for three times to a 10 mL tube and concentrated in *vacuo*. Then aniline (0.36 mmol, 1.8 equiv) and AcOH (60 μL) were added, while this concentration had not been purified. The reaction mixture was stirred at 50 ℃ in oil bath for 12 h. After the reaction completion, the resulting mixture was diluted with 0.5 mL DCM and then directly purified by flash column chromatography on silica gel to afford the FSO_2-THP **5.**

Gram-Scale Reaction

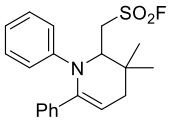
Typical procedure for gram-scale synthesis for **5a**:



Step 1 was progressed according to the method mentioned above on 10mmol scale.[4] The reaction mixture was stirred under 35 W Blue LEDs at room temperature for 2 h. After treated with saturated aqueous $NaHCO_3$, the mixture was extracted with EtOAc for three times to a 25 mL reaction flask and concentrated in *vacuo*. Then aniline (**4a**, 18 mmol, 1.65 mL, 1.8 equiv) and AcOH (3 mL) were added, while this concentration had not been purified. The reaction mixture was stirred at 50 ℃ in oil bath for 12 h. After the reaction completion, the resulting mixture was diluted with 25 mL DCM and then directly purified by flash column chromatography on silica gel to afford the FSO_2-THP **5a** (3.27 g, 91%).

Characterization Data

(3,3-Dimethyl-6-phenyl-1-(aryl)-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5a)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

61.8 mg, 86% yield, white solid.

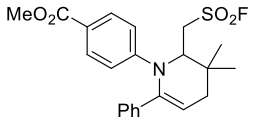
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.37 (d, J = 7.3 Hz, 2H), 7.23 – 7.14 (m, 3H), 7.07 (t, J = 7.8 Hz, 2H), 6.94 (d, J = 7.9 Hz, 2H), 6.79 (t, J = 7.3 Hz, 1H), 5.48 (t, J = 3.7 Hz, 1H), 4.29 (d, J = 9.8 Hz, 1H), 3.79 (dd, J = 14.7, 10.0 Hz, 1H), 3.54 (dd, J = 14.6, 5.0 Hz, 1H), 2.13 (dd, J = 19.2, 4.2 Hz, 1H), 2.06 (dd, J = 19.2, 3.0 Hz, 1H), 1.09 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.6, 138.9, 138.3, 128.7, 128.4, 127.7, 127.0, 121.6, 121.3, 110.7, 64.9, 50.5 (d, J = 13.0 Hz), 35.9 (d, J = 0.9 Hz), 35.1, 28.1, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.4.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{20}H_{23}FNO_2S^+$ 360.1428, found 360.1413.

Methyl 4-(2-((Fluorosulfonyl)methyl)-3,3-dimethyl-6-phenyl-3,4-dihydropyridin-1(2*H*)-yl)benzoate (5b)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-methoxycarbonyl aniline.

Flash chromatography: 10 to 20% EtOAc in petroleum ether.

74.3 mg, 89% yield, white solid.

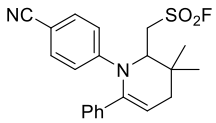
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.75 (d, J = 8.8 Hz, 2H), 7.34 (d, J = 6.7 Hz, 2H), 7.23 – 7.16 (m, 3H), 6.93 (d, J = 8.4 Hz, 2H), 5.58 (t, J = 3.7 Hz, 1H), 4.35 (d, J = 9.8 Hz, 1H), 3.81 (s, 3H), 3.78 (dd, J = 14.8, 10.1 Hz, 1H), 3.56 (dd, J = 14.6, 4.5 Hz, 1H), 2.15 (dd, J = 19.3, 4.2 Hz, 1H), 2.08 (dd, J = 19.4, 3.1 Hz, 1H), 1.11 (s, 3H), 0.87 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 167.0, 151.5, 138.2, 137.7, 130.7, 128.6, 128.0, 126.8, 122.6, 120.5, 112.5, 64.5, 51.9, 50.1 (d, J = 13.6 Hz), 36.2, 35.1, 27.8, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.2.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{22}H_{24}FNNaO_4S^+$ 440.1302, found 440.1280.

(1-(4-Cyanophenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5c)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-aminobenzonitrile.

Flash chromatography: 10 to 20% EtOAc in petroleum ether.

48.4 mg, 63% yield, white solid.

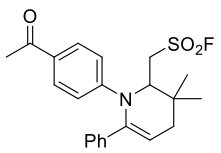
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.36 – 7.31 (m, 4H), 7.26 – 7.20 (m, 3H), 6.95 (d, J = 8.5 Hz, 2H), 5.63 (t, J = 3.7 Hz, 1H), 4.31 (d, J = 9.6 Hz, 1H), 3.77 (dd, J = 14.8, 10.1 Hz, 1H), 3.58 (dd, J = 14.8, 3.6 Hz, 1H), 2.20 – 2.06 (m, 2H), 1.12 (s, 3H), 0.86 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 151.1, 137.7, 137.2, 133.0, 128.8, 128.2, 126.6, 121.0, 119.4, 113.5, 103.7, 64.5, 49.89 (d, J = 13.9 Hz), 36.3, 35.0, 27.7, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.2.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{21}H_{21}FN_2NaO_2S^+$ 407.1200, found 407.1186.

(1-(4-Acetylphenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5d)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-aminoacetophenone.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

40.1 mg, 50% yield, colorless oil.

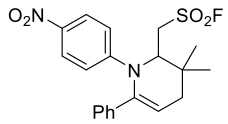
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.70 (d, J = 8.4 Hz, 2H), 7.35 (d, J = 6.8 Hz, 2H), 7.21 (d, J = 7.5 Hz, 3H), 6.95 (d, J = 8.1 Hz, 2H), 5.59 (m, 1H), 4.36 (d, J = 9.8 Hz, 1H), 3.78 (dd, J = 14.6, 10.1 Hz, 1H), 3.57 (dd, J = 14.6, 3.6 Hz, 1H), 2.45 (s, 3H), 2.19 – 2.07 (m, 2H), 1.11 (s, 3H), 0.88 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 196.8, 151.7, 138.1, 137.7, 130.1, 129.6, 128.7, 128.0, 126.7, 120.4, 112.8, 64.5, 50.1 (d, J = 13.7 Hz), 36.2, 35.1, 27.8, 27.6, 26.3.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.2.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{22}H_{25}FNO_3S^+$ 402.1534, found 402.1543.

(3,3-Dimethyl-1-(4-nitrophenyl)-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5e)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and *p*-nitroaniline.

Flash chromatography: 10 to 20% EtOAc in petroleum ether.

31.5 mg, 39% yield, colorless oil.

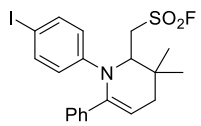
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.96 (d, J = 9.3 Hz, 2H), 7.35 – 7.32 (m, 2H), 7.25 – 7.20 (m, 3H), 6.96 (d, J = 8.8 Hz, 2H), 5.67 (t, J = 3.7 Hz, 1H), 4.37 (d, J = 9.7 Hz, 1H), 3.78 (dd, J = 14.9, 10.1 Hz, 1H), 3.59 (dd, J = 14.8, 3.5 Hz, 1H), 2.22 – 2.09 (m, 2H), 1.14 (s, 3H), 0.88 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 152.9, 141.2, 137.7, 137.1, 128.9, 128.4, 126.7, 125.1, 120.2, 114.1, 64.6, 49.9 (d, J = 14.3 Hz), 36.4, 35.1, 27.68, 27.65.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.1.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{20}H_{21}FN_2NaO_4S^+$ 427.1098, found 427.1093.

(1-(4-Iodophenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5f)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and *p*-iodoaniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

81.5 mg, 84% yield, white solid.

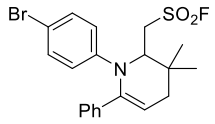
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.37 – 7.32 (m, 4H), 7.24 – 7.18 (m, 3H), 6.70 (d, J = 8.7 Hz, 2H), 5.51 (t, J = 3.7 Hz, 1H), 4.25 – 4.18 (m, 1H), 3.76 (dd, J = 14.8, 10.1 Hz, 1H), 3.54 (dd, J = 14.7, 4.1 Hz, 1H), 2.16 – 2.03 (m, 2H), 1.09 (s, 3H), 0.88 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.4, 138.3, 137.8, 137.6, 128.6, 127.9, 126.9, 123.5, 111.5, 84.3, 64.9, 50.30 (d, J = 13.1 Hz), 35.99 (d, J = 0.9 Hz), 35.0, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.4.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{20}H_{21}FINNaO_2S^+$ 508.0214, found 508.0197.

(1-(4-Bromophenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5g)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and *p*-bromoaniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

61.4 mg, 70% yield, white solid.

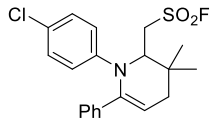
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.36 – 7.33 (m, 2H), 7.24 – 7.19 (m, 3H), 7.17 (d, *J* = 8.9 Hz, 2H), 6.81 (d, *J* = 8.7 Hz, 2H), 5.51 (t, *J* = 3.6 Hz, 1H), 4.21 (d, *J* = 9.7 Hz, 1H), 3.76 (dd, *J* = 14.7, 10.1 Hz, 1H), 3.54 (dd, *J* = 14.7, 4.0 Hz, 1H), 2.17 – 2.04 (m, 2H), 1.09 (s, 3H), 0.89 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 146.7, 138.4, 137.8, 131.7, 128.5, 127.9, 126.9, 123.1, 114.0, 111.3, 65.0, 50.3 (d, *J* = 13.2 Hz), 36.0 (d, *J* = 1.0 Hz), 35.0, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.4.

HRMS-ESI (m/z) $[M+K]^+$ calcd for $C_{20}H_{21}BrFNKO_2S^+$ 476.0092, found 476.0095.

(1-(4-Chlorophenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5h)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and *p*-chloroaniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

72.5 mg, 92% yield, white solid.

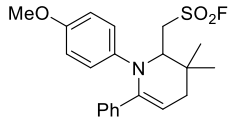
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.34 (d, *J* = 6.8 Hz, 2H), 7.24 – 7.17 (m, 3H), 7.02 (d, *J* = 8.8 Hz, 2H), 6.86 (d, *J* = 8.6 Hz, 2H), 5.50 (t, *J* = 3.5 Hz, 1H), 4.20 (d, *J* = 9.8 Hz, 1H), 3.76 (dd, *J* = 14.7, 10.1 Hz, 1H), 3.54 (dd, *J* = 14.6, 4.3 Hz, 1H), 2.15 – 2.04 (m, 2H), 1.09 (s, 3H), 0.89 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 146.3, 138.5, 137.8, 128.8, 128.5, 127.9, 126.93, 126.5, 122.7, 111.2, 65.1, 50.4 (d, *J* = 13.3 Hz), 36.0 (d, *J* = 0.9 Hz), 35.1, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.4.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{20}H_{22}ClFNO_2S^+$ 394.1038, found 394.1040.

(1-(4-Methoxyphenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5i)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and *p*-methoxyaniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

65.4 mg, 84% yield, white solid.

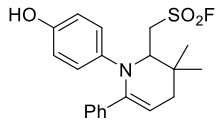
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.38 (d, J = 7.1 Hz, 2H), 7.23 – 7.14 (m, 3H), 6.91 (d, J = 8.7 Hz, 2H), 6.64 (d, J = 9.1 Hz, 2H), 5.45 – 5.40 (m, 1H), 4.19 (d, J = 9.5 Hz, 1H), 3.79 (dd, J = 14.7, 9.9 Hz, 1H), 3.68 (s, 3H), 3.54 (dd, J = 14.6, 3.8 Hz, 1H), 2.16 – 2.03 (m, 2H), 1.09 (s, 3H), 0.94 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 154.4, 141.3, 139.2, 138.4, 128.3, 127.6, 127.1, 123.0, 114.0, 109.4, 65.4, 55.39, 50.8 (d, J = 12.6 Hz), 35.6 (d, J = 0.7 Hz), 35.0, 28.1, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.7.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{21}H_{24}FNNaO_3S^+$ 412.1353, found 412.1351.

(1-(4-Hydroxyphenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5j)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-amino-phenol.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

30.0 mg, 40% yield, white solid.

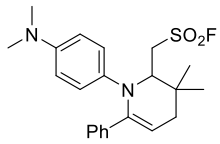
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.36 (d, J = 7.4 Hz, 2H), 7.21 – 7.13 (m, 3H), 6.84 (d, J = 8.3 Hz, 2H), 6.55 (d, J = 8.5 Hz, 2H), 5.42 – 5.39 (m, 1H), 4.40 (s, 1H), 4.15 (d, J = 9.8 Hz, 1H), 3.77 (dd, J = 14.6, 10.0 Hz, 1H), 3.53 (dd, J = 14.6, 4.3 Hz, 1H), 2.15 – 2.02 (m, 2H), 1.07 (s, 3H), 0.92 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 150.1, 141.5, 139.2, 138.4, 128.3, 127.6, 127.1, 123.2, 115.6, 109.5, 65.4, 50.8 (d, J = 12.6 Hz), 35.7, 35.1, 28.2, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.7.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{20}H_{23}FNO_3S^+$ 376.1377, found 376.1375.

(1-(4-(Dimethylamino)phenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5k)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-amino-*N*,*N*-dimethylaniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

49.9 mg, 62% yield, white solid.

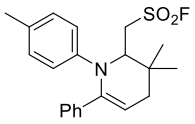
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.38 (d, J = 6.5 Hz, 2H), 7.23 – 7.09 (m, 3H), 6.87 (d, J = 6.8 Hz, 2H), 6.63 – 6.42 (m, 2H), 5.42 – 5.33 (m, 1H), 4.16 (d, J = 9.3 Hz, 1H), 3.83 – 3.73 (m, 1H), 3.52 (d, J = 12.2 Hz, 1H), 2.81 (s, 6H), 2.16 – 2.00 (m, 2H), 1.07 (s, 3H), 0.94 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 145.4, 139.2, 138.6, 128.1, 127.3, 127.0, 122.8, 113.5, 113.4, 108.6, 65.2, 50.78 (d, J = 12.0 Hz), 41.1, 35.3, 35.0, 28.1, 27.4.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.7.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{22}H_{28}FN_2O_2S^+$ 403.1850, found 403.1857.

(3,3-Dimethyl-6-phenyl-1-(*p*-tolyl)-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5l)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and *p*-toluidine.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

67.2 mg, 90% yield, white solid.

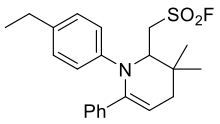
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.38 (d, J = 7.3 Hz, 2H), 7.23 – 7.14 (m, 3H), 6.88 (d, J = 8.3 Hz, 2H), 6.84 (d, J = 8.2 Hz, 2H), 5.45 (t, J = 3.6 Hz, 1H), 4.25 (d, J = 9.8 Hz, 1H), 3.78 (dd, J = 14.7, 10.0 Hz, 1H), 3.54 (dd, J = 14.6, 4.5 Hz, 1H), 2.17 (s, 3H), 2.12 (dd, J = 19.1, 4.2 Hz, 1H), 2.06 (dd, J = 19.1, 2.7 Hz, 1H), 1.08 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 145.2, 139.0, 138.5, 130.6, 129.3, 128.3, 127.6, 127.0, 121.5, 110.1, 65.0, 50.6 (d, J = 12.7 Hz), 35.8 (d, J = 1.0 Hz), 35.1, 28.1, 27.6, 20.7.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.5.

HRMS-ESI (m/z) $[M+K]^+$ calcd for $C_{21}H_{24}FKNO_2S^+$ 412.1143, found 412.1125.

(1-(4-Ethylphenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5m)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-aminoethylbenzene.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

56.6 mg, 73% yield, white solid.

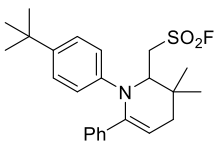
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.42 – 7.38 (m, 2H), 7.23 – 7.15 (m, 3H), 6.91 (d, J = 8.6 Hz, 2H), 6.87 (d, J = 8.3 Hz, 2H), 5.48 – 5.42 (m, 1H), 4.27 (d, J = 9.3 Hz, 1H), 3.79 (dd, J = 14.4, 10.2 Hz, 1H), 3.55 (dd, J = 14.6, 4.3 Hz, 1H), 2.49 (q, J = 7.6 Hz, 2H), 2.16 – 2.04 (m, 2H), 1.14 (t, J = 7.6 Hz, 3H), 1.09 (s, 3H), 0.93 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 145.3, 139.0, 138.5, 137.0, 128.3, 128.0, 127.6, 127.0, 121.5, 110.1, 65.0, 50.6 (d, J = 12.4 Hz), 35.7, 35.1 (d, J = 2.2 Hz), 28.04, 27.96, 27.6, 15.4.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.5.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{22}H_{26}FNNaO_2S^+$ 410.1560, found 410.1552.

(1-(4-(*tert*-Butyl)phenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5n)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-(*tert*-butyl) aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

79.8 mg, 96% yield, white solid.

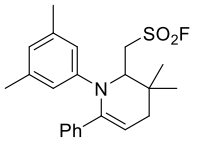
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.38 (d, J = 7.3 Hz, 2H), 7.21 - 7.16 (m, 3H), 7.07 (d, J = 8.6 Hz, 2H), 6.85 (d, J = 8.4 Hz, 2H), 5.44 (t, J = 3.6 Hz, 1H), 4.26 (d, J = 9.8 Hz, 1H), 3.78 (dd, J = 14.7, 10.0 Hz, 1H), 3.53 (dd, J = 14.6, 4.7 Hz, 1H), 2.12 (dd, J = 19.1, 4.1 Hz, 1H), 2.05 (dd, J = 19.1, 2.7 Hz, 1H), 1.20 (s, 9H), 1.08 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 145.0, 143.9, 139.0, 138.6, 128.3, 127.5, 127.0, 125.5, 121.1, 110.1, 64.9, 50.6 (d, J = 12.7 Hz), 35.7, 35.1, 34.1, 31.5, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.4.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{24}H_{30}FNNaO_2S^+$ 438.1873, found 438.1856.

(1-(3,5-Dimethylphenyl)-3,3-dimethyl-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5o)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 3,5-dimethylaminoaniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

61.2 mg, 79% yield, white solid.

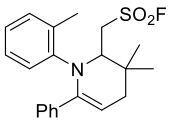
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.38 (d, J = 6.1 Hz, 2H), 7.20 (t, J = 6.9 Hz, 2H), 7.18 – 7.14 (m, 1H), 6.56 (s, 2H), 6.44 (s, 1H), 5.50 – 5.34 (m, 1H), 4.28 (d, J = 8.2 Hz, 1H), 3.84 – 3.74 (m, 1H), 3.54 (d, J = 10.9 Hz, 1H), 2.12 (s, 6H), 2.10 (s, 1H), 2.09 – 2.03 (m, 1H), 1.09 (s, 3H), 0.93 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.4, 139.1, 138.5, 137.9, 128.2, 127.4, 126.8, 123.1, 119.4, 110.2, 64.6, 50.5 (d, J = 16.7 Hz), 35.7 (d, J = 0.7 Hz), 35.0, 28.0, 27.5, 21.5.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.5.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{22}H_{27}FNO_2S^+$ 388.1741, found 388.1748.

(3,3-Dimethyl-6-phenyl-1-(*o*-tolyl)-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5p)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and *o*-toluidine.

Flash chromatography: 5 to 10% EtOAc in petroleum ether. **5p** was found to be too sensitive to obtain a clean NMR.

32.1 mg, 43% yield, *d.r.* = 2.2:1, pale yellow oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.22 (d, J = 7.2 Hz, 2.2H, one isomer), 7.16 – 7.09 (m, 15H, two isomers), 7.02 – 6.99 (m, 4.2H, two isomers), 6.96 – 6.91 (m, 4.2H, two isomers), 6.88 – 6.82 (m, 2.2H, one isomer), 6.74 (d, J = 7.3 Hz, 1H, one isomer), 5.38 – 5.34 (m, 1H, one isomer), 5.03 – 4.98 (m, 2.2H, one isomer), 4.01 (d, J = 15.4 Hz, 1H, one isomer), 3.97 – 3.86 (m, 6.4H, two isomers), 3.52 (d, J = 14.9 Hz, 2.2H, one isomer), 2.52 (s, 3H, one isomer), 2.33 (s, 6.6H, one isomer), 2.26 – 2.16 (m, 4.4H, one isomer), 2.12 – 2.03 (m, 2H, one isomer), 1.28 (s, 6.6H, one isomer), 1.15 (s, 6.6H, one isomer), 1.14 (s, 3H, one isomer), 1.02 (s, 3H, one isomer).

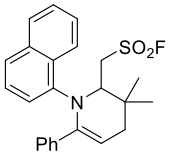
^{13}C NMR (150 MHz, $CDCl_3$) δ 146.0 & 143.8 (two isomers), 138.9 & 138.5 (two isomers), 132.9 & 132.1 (two isomers), 131.8 & 131.7 (two isomers), 128.2 & 128.0 (two isomers), 127.7 & 127.6 (two isomers), 127.3 & 127.0 (two isomers),

126.8 & 126.7 (two isomers), 125.8 & 124.81 (two isomers), 124.79 & 123.8 (two isomers), 63.5 & 62.9 (two isomers), 57.2 (d, *J* = 13.5 Hz) & 52.4 (d, *J* = 14.0 Hz) (two isomers), 35.49 & 34.48 (two isomers), 33.9 & 33.7 (two isomers), 28.2 & 28.1 (two isomers), 27.5 & 27.1 (two isomers), 20.4 & 18.9 (two isomers).

^{19}F NMR (565 MHz, $CDCl_3$) δ 64.8 & 58.4 (two isomers).

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{21}H_{24}FNNaO_2S^+$ 396.1404, found 396.1391.

(3,3-Dimethyl-1-(naphthalen-1-yl)-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5q)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 1-amino-naphthalene.

Flash chromatography: 5 to 10% EtOAc in petroleum ether. **5q** was found to be too sensitive to obtain a clean NMR.

59.0 mg, 72% yield, *d.r.* = 2.8:1, pale yellow oil.

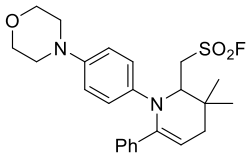
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.44 (d, *J* = 8.5 Hz, 2.8H, one isomer), 8.36 (d, *J* = 8.4 Hz, 1H, one isomer), 7.83 (d, *J* = 8.1 Hz, 1H, one isomer), 7.75 (d, *J* = 8.1 Hz, 2.8H, one isomer), 7.65 (t, *J* = 7.2 Hz, 1H, one isomer), 7.54 – 7.50 (m, 3.8H, two isomers), 7.48 – 7.44 (m, 3.8H, two isomers), 7.42 – 7.35 (m, 4.8H, two isomers), 7.30 – 7.25 (m, 2H, one isomer), 7.24 – 7.20 (m, 5.6H, one isomer), 7.17 – 7.07 (m, 7.6H, two isomers), 7.03 – 6.98 (m, 8.4H, one isomer), 6.95 (d, *J* = 7.5 Hz, 1H, one isomer), 5.52 (t, *J* = 3.7 Hz, 1H, one isomer), 5.18 – 5.10 (m, 2.8H, one isomer), 4.25 – 4.16 (m, 4.8H, two isomers), 4.01 – 3.88 (m, 3.8H, two isomers), 3.65 – 3.55 (m, 2.8H, one isomer), 2.36 – 2.14 (m, 7.6H, two isomers), 1.44 (s, 8.4H, one isomer), 1.18 (s, 8.4H, one isomer), 1.11 (s, 3H, one isomer), 1.00 (s, 3H, one isomer).

^{13}C NMR (150 MHz, $CDCl_3$) δ 143.4 & 142.6 (two isomers), 141.9 & 141.8 (two isomers), 139.0 & 138.6 (two isomers), 135.04 & 135.01 (two isomers), 129.6 & 128.9 (two isomers), 128.8 & 128.3 (two isomers), 127.9 & 127.8 (two isomers), 127.3 & 126.6 (two isomers), 126.2 & 126.1 (two isomers), 126.0 & 125.79 (two isomers), 125.77 & 125.51 (two isomers), 125.46 & 125.1 (two isomers), 124.4 & 124.3 (two isomers), 123.8 & 123.8 (two isomers), 123.62 & 123.60 (two isomers), 109.8 & 104.4 (two isomers), 64.3 & 64.2 (two isomers), 57.5 (d, *J* = 13.7 Hz) & 52.6 (d, *J* = 14.2 Hz) (two isomers), 35.9 & 34.8 (two isomers), 34.7 & 34.0 (two isomers), 28.4 & 28.3 (two isomers), 27.6 & 27.5 (two isomers).

^{19}F NMR (565 MHz, $CDCl_3$) δ 63.5 & 58.1 (two isomers).

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{24}H_{25}FNO_2S^+$ 410.1585, found 410.1589.

(3,3-Dimethyl-1-(4-morpholinophenyl)-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5r)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-morpholino-4-yl-phenylamine.

Flash chromatography: 20 to 40% EtOAc in petroleum ether.

72.0 mg, 81% yield, colorless oil.

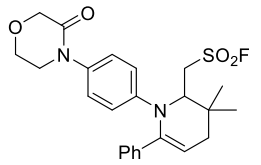
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.37 (d, J = 7.6 Hz, 2H), 7.24 – 7.15 (m, 3H), 6.88 (d, J = 8.6 Hz, 2H), 6.66 (d, J = 7.5 Hz, 2H), 5.41 (t, J = 3.5 Hz, 1H), 4.18 (d, J = 9.8 Hz, 1H), 3.85 – 3.77 (m, 5H), 3.53 (dd, J = 14.6, 4.4 Hz, 1H), 3.06 – 3.00 (m, 4H), 2.16 – 2.05 (m, 2H), 1.08 (s, 3H), 0.92 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 141.0, 139.1, 138.5, 128.3, 127.5, 127.1, 122.6, 116.36, 109.5, 67.0, 65.2, 50.7 (d, J = 12.4 Hz), 50.0, 35.6, 35.1, 28.1, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.7.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{24}H_{30}FN_2O_3S^+$ 445.1956, found 445.1962.

(3,3-Dimethyl-1-(4-(3-oxomorpholino)phenyl)-6-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5s)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and 4-(4-aminophenyl)-3-morpholinone.

Flash chromatography: 20 to 40% EtOAc in petroleum ether.

52.3 mg, 57% yield, colorless oil.

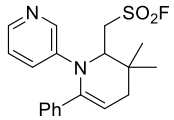
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.36 (d, J = 7.0 Hz, 2H), 7.22 – 7.15 (m, 3H), 7.05 (d, J = 8.9 Hz, 2H), 6.95 (d, J = 8.7 Hz, 2H), 5.49 (t, J = 3.6 Hz, 1H), 4.28 – 4.25 (m, 3H), 3.95 – 3.91 (m, 2H), 3.77 (dd, J = 14.7, 10.0 Hz, 1H), 3.67 – 3.57 (m, 2H), 3.54 (dd, J = 14.6, 4.0 Hz, 1H), 2.17 – 2.00 (m, 2H), 1.08 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 166.6, 146.1, 138.6, 138.1, 134.7, 128.5, 127.8, 126.9, 125.4, 121.8, 111.2, 68.6, 64.9, 64.2, 50.4 (d, J = 13.0 Hz), 49.6, 35.9, 35.1, 27.9, 27.7.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.4.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{24}H_{28}FN_2O_4S^+$ 459.1748, found 459.1753.

(3,3-Dimethyl-6-phenyl-3,4-dihydro-2*H*-[1,3'-bipyridin]-2-yl)methanesulfonyl fluoride (5t)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-phenylhept-1-yn-3-ol and pyridin-3-ylamine.

Flash chromatography: 10 to 20% EtOAc in petroleum ether.

20.2 mg, 28% yield, pale yellow solid.

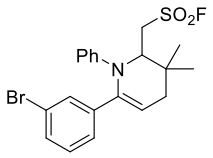
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.19 – 8.14 (m, 1H), 8.04 (d, J = 4.6 Hz, 1H), 7.38 (d, J = 8.3 Hz, 1H), 7.34 (d, J = 7.4 Hz, 2H), 7.23 – 7.16 (m, 3H), 7.07 (dd, J = 8.4, 4.7 Hz, 1H), 5.55 (t, J = 3.6 Hz, 1H), 4.21 (d, J = 10.0 Hz, 1H), 3.79 (dd, J = 14.8, 10.1 Hz, 1H), 3.57 (dd, J = 14.7, 4.3 Hz, 1H), 2.19 – 2.05 (m, 2H), 1.10 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 143.9, 143.2, 141.9, 137.9, 137.1, 128.7, 128.24, 128.23, 127.0, 123.6, 111.8, 65.0, 50.2 (d, J = 13.7 Hz), 36.0 (d, J = 0.8 Hz**)**, 35.0, 27.8, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.4.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{19}H_{21}FN_2NaO_2S^+$ 383.1200, found 383.1195.

(6-(3-Bromophenyl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5u)



Following **General Procedure B** on 0.2 mmol scale with 3-(3-bromophenyl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

66.6 mg, 76% yield, white solid.

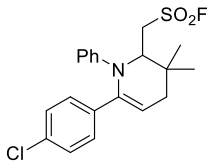
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.64 – 7.60 (m, 1H), 7.31 – 7.27 (m, 1H), 7.22 (d, *J* = 7.9 Hz, 1H), 7.10 (dd, *J* = 8.3, 7.6 Hz, 2H), 7.01 (t, *J* = 7.9 Hz, 1H), 6.93 (d, *J* = 7.9 Hz, 2H), 6.82 (t, *J* = 7.3 Hz, 1H), 5.50 (t, *J* = 3.7 Hz, 1H), 4.27 (d, *J* = 9.4 Hz, 1H), 3.74 (dd, *J* = 14.7, 10.2 Hz, 1H), 3.58 – 3.52 (m, 1H), 2.17 – 2.01 (m, 2H), 1.08 (s, 3H), 0.89 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.2, 140.6, 137.8, 130.6, 129.9, 129.8, 128.9, 125.7, 122.5, 121.7, 121.6, 111.7, 64.9, 50.4 (d, *J* = 12.9 Hz), 35.9, 35.1, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.7.

HRMS-ESI (m/z) $[M+K]^+$ calcd for $C_{20}H_{21}BrFNKO_2S^+$ 476.0092, found 476.0082.

(6-(4-Chlorophenyl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5v)



Following **General Procedure B** on 0.2 mmol scale with 3-(4-chlorophenyl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

64.6 mg, 82% yield, white solid.

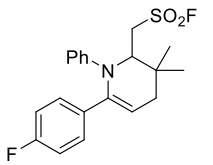
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.31 (d, *J* = 8.5 Hz, 2H), 7.16 (d, *J* = 8.6 Hz, 2H), 7.09 (t, *J* = 7.9 Hz, 2H), 6.92 (d, *J* = 7.8 Hz, 2H), 6.82 (t, *J* = 7.3 Hz, 1H), 5.47 (t, *J* = 3.2 Hz, 1H), 4.28 (d, *J* = 9.8 Hz, 1H), 3.76 (dd, *J* = 14.6, 10.2 Hz, 1H), 3.55 (dd, *J* = 14.6, 3.2 Hz, 1H), 2.16 – 2.03 (m, 2H), 1.09 (s, 3H), 0.90 (s, 3H)

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.3, 137.9, 136.8, 133.3, 128.9, 128.6, 128.2, 121.7, 121.6, 111.0, 64.9, 50.4 (d, *J* = 12.9 Hz), 35.9 (d, *J* = 0.9 Hz), 35.1, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.8.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{20}H_{22}ClFNO_2S^+$ 394.1038, found 394.1043.

(6-(4-Fluorophenyl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5w)



Following **General Procedure B** on 0.2 mmol scale with 3-(4-fluorophenyl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

52.1 mg, 69% yield, white solid.

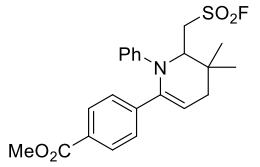
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.35 (dd, *J* = 8.6, 5.5 Hz, 2H), 7.09 (t, *J* = 7.9 Hz, 2H), 6.93 (d, *J* = 7.9 Hz, 2H), 6.89 (t, *J* = 8.7 Hz, 2H), 6.82 (t, *J* = 7.3 Hz, 1H), 5.43 (t, *J* = 3.6 Hz, 1H), 4.28 (d, *J* = 9.9 Hz, 1H), 3.79 (dd, *J* = 14.6, 10.2 Hz, 1H), 3.56 (dd, *J* = 14.6, 3.4 Hz, 1H), 2.23 – 1.98 (m, 2H), 1.09 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ162.3 (d, *J* = 246.7 Hz), 147.4, 138.0, 134.3 (d, *J* = 3.1 Hz), 128.8, 128.6 (d, *J* = 8.0 Hz), 121.7, 121.5, 115.3 (d, *J* = 21.5 Hz), 110.3, 64.9, 50.4 (d, *J* = 12.8 Hz), 35.8 (d, *J* = 1.0 Hz), 35.1, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.7, -114.5.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{20}H_{22}F_2NO_2S^+$ 378.1334, found 378.1324.

Methyl 4-(6-((fluorosulfonyl)methyl)-5,5-dimethyl-1-phenyl-1,4,5,6-tetrahydropyridin-2-yl)benzoate (5x)



Following **General Procedure B** on 0.2 mmol scale with methyl 4-(3-hydroxy-6-methylhept-1-yn-3-yl) benzoate and aniline.

Flash chromatography: 10 to 20% EtOAc in petroleum ether.

46.8 mg, 56% yield, white solid.

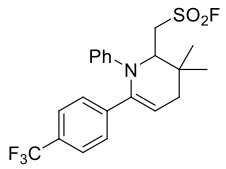
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.5 Hz, 2H), 7.44 (d, *J* = 8.3 Hz, 2H), 7.07 (t, *J* = 7.9 Hz, 2H), 6.91 (d, *J* = 7.8 Hz, 2H), 6.80 (t, *J* = 7.3 Hz, 1H), 5.59 (t, *J* = 3.7 Hz, 1H), 4.29 (d, *J* = 9.8 Hz, 1H), 3.85 (s, 3H), 3.75 (dd, *J* = 14.7, 10.2 Hz, 1H), 3.56 (dd, *J* = 14.6, 3.4 Hz, 1H), 2.20 – 2.06 (m, 2H), 1.09 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 167.0, 147.3, 142.9, 138.3, 129.7, 129.2, 128.9, 126.9, 121.7, 121.5, 112.5, 64.9, 52.1, 50.5 (d, *J* = 13.0 Hz), 35.8 (d, *J* = 0.6 Hz), 35.1, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.7.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{22}H_{25}FNO_4S^+$ 418.1483, found 418.1473.

(3,3-Dimethyl-1-phenyl-6-(4-(trifluoromethyl)phenyl)-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5y)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-(4-(trifluoromethyl)phenyl)hept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

55.6 mg, 65% yield, white solid.

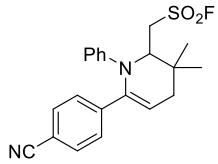
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.50 (d, *J* = 8.2 Hz, 2H), 7.45 (d, *J* = 8.4 Hz, 2H), 7.12 – 7.07 (m, 2H), 6.93 (d, *J* = 7.8 Hz, 2H), 6.83 (t, *J* = 7.3 Hz, 1H), 5.58 (t, *J* = 3.7 Hz, 1H), 4.30 (d, *J* = 9.4 Hz, 1H), 3.74 (dd, *J* = 14.6, 10.3 Hz, 1H), 3.60 – 3.55 (m, 1H), 2.19 – 2.07 (m, 2H), 1.10 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.2, 141.9, 137.9, 129.5 (q, *J* = 32.6 Hz), 129.0, 127.1, 125.4 (q, *J* = 3.7 Hz), 124.2 (q, *J* = 273.2 Hz), 121.8, 121.6, 121.5, 112.6, 64.9, 50.4 (d, *J* = 13.0 Hz), 35.8 (d, *J* = 1.0 Hz), 35.1, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.9, -62.5.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{21}H_{22}F_4NO_2S^+$ 428.1302, found 428.1310.

(6-(4-Cyanophenyl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5z)



Following **General Procedure B** on 0.2 mmol scale with 4-(3-hydroxy-6-methylhept-1-yn-3-yl)benzonitrile and aniline.

Flash chromatography: 10 to 20% EtOAc in petroleum ether.

47.7 mg, 62% yield, white solid.

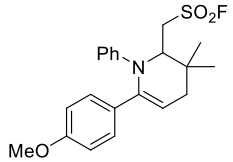
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.50 – 7.45 (m, 4H), 7.09 (t, J = 7.9 Hz, 2H), 6.90 (d, J = 7.7 Hz, 2H), 6.83 (t, J = 7.3 Hz, 1H), 5.62 (t, J = 3.8 Hz, 1H), 4.29 (d, J = 9.3 Hz, 1H), 3.71 (dd, J = 14.6, 10.4 Hz, 1H), 3.57 (dd, J = 14.6, 1.9 Hz, 1H), 2.20 – 2.07 (m, 2H), 1.10 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.0, 143.0, 137.7, 132.2, 129.0, 127.5, 122.0, 121.5, 119.0, 113.4, 111.0, 64.9, 50.3 (d, J = 13.0 Hz), 35.8 (d, J = 0.8 Hz), 35.1, 28.0, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 61.1.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{21}H_{21}FN_2NaO_2S^+$ 407.1200, found 407.1208.

(6-(4-Methoxyphenyl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5aa)



Following **General Procedure B** on 0.2 mmol scale with 3-(4-methoxyphenyl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

46.7 mg, 60% yield, white solid.

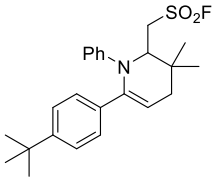
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.30 (d, J = 8.6 Hz, 2H), 7.09 (t, J = 7.8 Hz, 2H), 6.95 (d, J = 7.9 Hz, 2H), 6.80 (t, J = 7.3 Hz, 2H), 6.74 (d, J = 8.6 Hz, 1H), 5.44 – 5.33 (m, 1H), 4.28 (d, J = 9.8 Hz, 1H), 3.81 (dd, J = 14.5, 10.1 Hz, 1H), 3.73 (s, 3H), 3.55 (dd, J = 14.6, 4.4 Hz, 1H), 2.15 – 2.01 (m, 2H), 1.08 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 159.2, 147.8, 138.4, 130.8, 128.7, 128.1, 121.7, 121.2, 113.8, 109.1, 65.0, 55.3, 50.5 (d, J = 12.8 Hz), 35.9, 35.1, 28.1, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.5.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{21}H_{25}FNO_3S^+$ 390.1534, found 390.1528.

(6-(4-(*tert*-Butyl)phenyl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5ab)



Following **General Procedure B** on 0.2 mmol scale with 3-(4-(*tert*-butyl)phenyl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

54.0 mg, 65% yield, white solid.

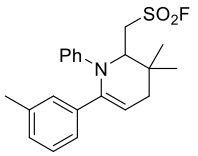
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.30 (d, J = 8.3 Hz, 2H), 7.22 (d, J = 8.3 Hz, 2H), 7.09 (t, J = 7.8 Hz, 2H), 6.96 (d, J = 7.8 Hz, 2H), 6.85 – 6.80 (m, 1H), 5.46 (s, 1H), 4.29 (d, J = 9.6 Hz, 1H), 3.79 (dd, J = 14.3, 10.1 Hz, 1H), 3.53 (dd, J = 14.5, 4.7 Hz, 1H), 2.19 – 2.06 (m, 2H), 1.26 (s, 9H), 1.09 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 150.7, 147.8, 135.3, 128.7, 126.5, 125.3, 121.6, 121.2, 110.3, 100.1, 65.0, 50.6 (d, J = 13.2 Hz), 35.9, 35.2, 34.6, 31.4, 28.1, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.3.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{24}H_{31}FNO_2S^+$ 416.2054, found 416.2046.

(3,3-Dimethyl-1-phenyl-6-(*m*-tolyl)-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5ac)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-(*m*-tolyl) hept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

61.3 mg, 82% yield, white solid.

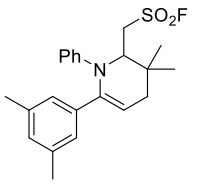
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.26 – 7.23 (m, 1H), 7.14 (d, J = 7.8 Hz, 1H), 7.10 – 7.05 (m, 3H), 6.99 (d, J = 7.5 Hz, 1H), 6.96 (d, J = 7.9 Hz, 2H), 6.80 (t, J = 7.3 Hz, 1H), 5.47 (t, J = 3.6 Hz, 1H), 4.29 (d, J = 9.3 Hz, 1H), 3.79 (dd, J = 14.7, 9.9 Hz, 1H), 3.54 (dd, J = 14.7, 4.3 Hz, 1H), 2.27 (s, 3H), 2.15 – 2.02 (m, 2H), 1.09 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.7, 138.9, 138.3, 137.9, 128.7, 128.5, 128.2, 127.6, 124.2, 121.5, 121.2, 110.5, 64.9, 50.6 (d, J = 12.9 Hz), 35.9, 35.1, 28.0, 27.6, 21.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.3.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{21}H_{25}FNO_2S^+$ 374.1585, found 374.1597.

(6-(3,5-Dimethylphenyl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5ad)



Following **General Procedure B** on 0.2 mmol scale with 3-(3,5-dimethylphenyl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

62.0 mg, 80% yield, white solid.

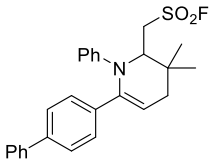
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.08 (t, J = 7.8 Hz, 2H), 6.99 (s, 2H), 6.95 (d, J = 7.9 Hz, 2H), 6.82 – 6.76 (m, 2H), 5.48 – 5.39 (m, 1H), 4.27 (d, J = 9.6 Hz, 1H), 3.78 (dd, J = 14.6, 9.9 Hz, 1H), 3.53 (dd, J = 14.6, 5.1 Hz, 1H), 2.20 (s, 6H), 2.12 – 2.01 (m, 2H), 1.08 (s, 3H), 0.89 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.8, 139.0, 138.4, 137.7, 129.4, 128.7, 124.8, 121.4, 121.2, 110.5, 64.9, 50.6 (d, J = 12.9 Hz), 35.9, 35.1, 28.0, 27.6, 21.5.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.2.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{22}H_{27}FNO_2S^+$ 388.1741, found 388.1748.

(6-([1,1'-Biphenyl]-4-yl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5ae)



Following **General Procedure B** on 0.2 mmol scale with 3-([1,1'-biphenyl]-4-yl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

38.3 mg, 44% yield, white solid.

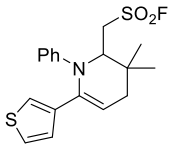
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.54 (d, J = 7.6 Hz, 2H), 7.47 – 7.43 (m, 4H), 7.40 (t, J = 7.6 Hz, 2H), 7.31 (t, J = 7.3 Hz, 1H), 7.11 (t, J = 7.8 Hz, 2H), 6.99 (d, J = 7.9 Hz, 2H), 6.82 (t, J = 7.3 Hz, 1H), 5.58 – 5.52 (m, 1H), 4.32 (d, J = 9.8 Hz, 1H), 3.82 (dd, J = 14.7, 10.1 Hz, 1H), 3.57 (dd, J = 14.7, 4.4 Hz, 1H), 2.22 – 2.03 (m, 2H), 1.10 (s, 3H), 0.93 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.6, 140.7, 140.3, 138.5, 137.3, 128.83, 128.82, 127.4, 127.3, 127.03, 127.00, 121.6, 121.4, 110.7, 65.0, 50.5 (d, J = 12.7 Hz), 35.9, 35.2, 28.1, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.5.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{26}H_{26}FNNaO_2S^+$ 458.1560, found 458.1551.

(3,3-Dimethyl-1-phenyl-6-(thiophen-3-yl)-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5af)



Following **General Procedure B** on 0.2 mmol scale with 6-methyl-3-(thiophen-3-yl) hept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

36.5 mg, 50% yield, pale yellow solid.

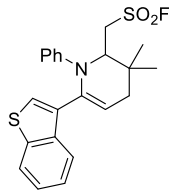
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.15 – 7.07 (m, 4H), 7.04 (d, J = 4.8 Hz, 1H), 6.97 (d, J = 7.8 Hz, 2H), 6.83 (t, J = 7.2 Hz, 1H), 5.57 – 5.46 (m, 1H), 4.25 (d, J = 10.2 Hz, 1H), 3.80 (dd, J = 14.5, 10.5 Hz, 1H), 3.54 (dd, J = 14.4, 4.4 Hz, 1H), 2.18 – 1.96 (m, 2H), 1.07 (s, 3H), 0.89 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.7, 139.8, 134.3, 128.7, 126.6, 125.2, 122.3, 121.4, 121.3, 109.3, 64.8, 50.3 (d, J = 12.6 Hz), 35.8 (d, J = 1.2 Hz), 34.9, 28.1, 27.7.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.8.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{18}H_{21}FNO_2S_2^+$ 366.0992, found 366.0997.

(6-(Benzo[*b*]thiophen-3-yl)-3,3-dimethyl-1-phenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5ag)



Following **General Procedure B** on 0.2 mmol scale with 3-(benzo[*b*]thiophen-3-yl)-6-methylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

49.9 mg, 60% yield, pale yellow solid.

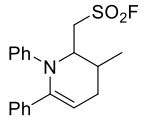
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.20 (d, J = 8.1 Hz, 1H), 7.82 (d, J = 8.0 Hz, 1H), 7.43 (t, J = 7.5 Hz, 1H), 7.36 (t, J = 7.5 Hz, 1H), 7.28 (s, 1H), 7.02 (t, J = 7.8 Hz, 2H), 6.93 (d, J = 8.0 Hz, 2H), 6.76 (t, J = 7.3 Hz, 1H), 5.68 – 5.53 (m, 1H), 4.32 (d, J = 9.9 Hz, 1H), 3.89 (dd, J = 14.6, 10.1 Hz, 1H), 3.60 (dd, J = 14.6, 1.7 Hz, 1H), 2.25 (dd, J = 19.1, 4.0 Hz, 1H), 2.10 – 2.04 (m, 1H), 1.12 (s, 3H), 0.98 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.5, 141.0, 137.7, 133.4, 133.0, 128.8, 125.8, 124.41, 124.35, 123.2, 123.0, 121.5, 120.7, 110.8, 64.7, 50.7 (d, J = 12.6 Hz), 35.8, 34.7, 28.1, 27.6.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.8.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{22}H_{23}FNO_2S_2^+$ 416.1149, found 416.1143.

(3-Methyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5ah)



Following **General Procedure B** on 0.2 mmol scale with 3-phenylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

29.7 mg, 43% yield, *d.r*. = 6:1, white solid.

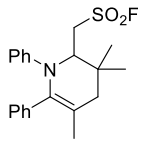
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.43 (d, J = 7.4 Hz, 12H, one isomer), 7.34 (d, J = 7.3 Hz, 2H, one isomer), 7.22 – 7.12 (m, 33H, two isomers), 7.07 (d, J = 7.9 Hz, 14H, two isomers), 6.96 – 6.87 (m, 8H, two isomers), 6.80 (t, J = 7.0 Hz, 1H, one isomer), 5.69 – 5.59 (m, 6H, one isomer), 5.46 – 5.40 (m, 1H, one isomer), 4.55 (d, J = 8.9 Hz, 1H, one isomer), 4.31 (d, J = 10.4 Hz, 6H, one isomer), 4.22 – 4.16 (m, 1H, one isomer), 4.02 – 3.96 (m, 1H, one isomer), 3.86 – 3.76 (m, 6H, one isomer), 3.49 – 3.37 (m, 7H, two isomers), 2.51 – 2.40 (m, 7H, two isomers), 2.25 – 2.16 (m, 6H, one isomer), 2.16 – 2.11 (m, 1H, one isomer), 1.87 – 1.77 (m, 6H, one isomer), 1.01 (d, J = 6.8 Hz, 18H, one isomer), 0.96 (d, J = 6.9 Hz, 3H, one isomer).

^{13}C NMR (150 MHz, $CDCl_3$) δ 147.9, 140.3, 138.3, 129.0, 128.4, 127.9, 127.0, 124.1, 123.1, 111.4, 62.4, 48.4 (d, J = 13.4 Hz), 29.0, 28.0, 18.2.

^{19}F NMR (565 MHz, $CDCl_3$) δ 61.4 & 60.1 (two isomers).

HRMS-ESI (m/z) $[M+NH_4]^+$ calcd for $C_{20}H_{26}FN_2O_2S^+$ 363.1537, found 363.1553.

(3,3,5-Trimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (5ai)



Following **General Procedure B** on 0.2 mmol scale with 4,6-dimethyl-3-phenylhept-1-yn-3-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

57.5 mg, 77% yield, white solid.

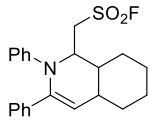
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.35 (d, J = 7.4 Hz, 2H), 7.20 (t, J = 7.6 Hz, 2H), 7.11 (t, J = 7.4 Hz, 1H), 7.01 (t, J = 7.9 Hz, 2H), 6.94 (d, J = 7.9 Hz, 2H), 6.71 (t, J = 7.2 Hz, 1H), 4.32 – 4.19 (m, 1H), 3.77 (dd, J = 14.7, 9.4 Hz, 1H), 3.56 (dd, J = 14.7, 3.6 Hz, 1H), 2.08 (t, J = 18.0 Hz, 1H), 1.89 – 1.83 (m, 4H), 1.08 (s, 3H), 0.92 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 148.2, 137.5, 133.0, 130.3, 128.5, 127.9, 127.1, 121.8, 121.0, 115.5, 64.8, 51.2 (d, J = 12.9 Hz), 41.5, 36.6 (d, J = 0.9 Hz), 28.1, 28.0, 20.3.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.2.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{21}H_{24}FNNaO_2S^+$ 396.1404, found 396.1390.

(2,3-Diphenyl-1,2,4a,5,6,7,8,8a-octahydroisoquinolin-1-yl)methanesulfonyl fluoride (5aj)



Following **General Procedure B** on 0.2 mmol scale with 1-cyclohexyl-2-phenylbut-3-yn-2-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

39.3 mg, 51% yield, *d.r.* = 2.1:1, white solid.

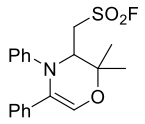
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.44 (d, J = 7.2 Hz, 4.2H, one isomer), 7.34 (d, J = 7.1 Hz, 2H, one isomer), 7.21 – 7.12 (m, 13.5H, two isomers), 7.11 – 7.05 (m, 6.2H, two isomers), 6.94 – 6.90 (m, 4.1H, two isomers), 6.80 (t, J = 7.3 Hz, 1H, one isomer), 5.53 – 5.46 (m, 2.1H, one isomer), 5.22 – 5.17 (m, 1H, one isomer), 4.53 – 4.49 (m, 1H, one isomer), 4.27 (d, J = 10.8 Hz, 2.1H, one isomer), 4.05 – 3.98 (m, 1H, one isomer), 3.89 – 3.81 (m, 2.1H, one isomer), 3.52 (d, J = 14.5 Hz, 1H, one isomer), 3.44 – 3.38 (m, 2.1H, one isomer), 2.74 (s, 1H, one isomer), 2.06 (d, J = 12.8 Hz, 2H, one isomer), 1.99 – 1.93 (m, 2H, one isomer), 1.90 – 1.86 (m, 2.1H, one isomer), 1.85 – 1.79 (m, 4.2H, one isomer), 1.73 – 1.69 (m, 1H, one isomer), 1.65 – 1.61 (m, 4.2H, one isomer), 1.59 – 1.53 (m, 2.1H, one isomer), 1.48 – 1.31 (m, 7.2H, two isomers), 1.25 – 1.21 (m, 2.1H, one isomer), 1.19 – 1.15 (m, 1H, one isomer), 1.05 – 0.98 (m, 2.1H, one isomer).

^{13}C NMR (150 MHz, $CDCl_3$) δ 148.1 & 147.8 (two isomers), 140.2 & 138.8 (two isomers), 138.5 & 135.7 (two isomers), 129.0 & 128.8 (two isomers), 128.34 & 128.31 (two isomers), 127.8 & 127.6 (two isomers), 127.2 & 127.0 (two isomers), 124.4 & 123.2 (two isomers), 122.1 & 121.7 (two isomers), 116.3 & 100.1 (two isomers), 62.2 & 61.3 (two isomers), 53.4 (d, J = 12.1 Hz) & 49.86 (d, J = 12.7 Hz) (two isomers), 39.2 & 39.1 (two isomers), 37.4 & 33.00 (two isomers), 32.97 & 30.5 (two isomers), 29.7 & 26.9 (two isomers), 26.7 & 26.2 (two isomers), 25.6 & 22.2 (two isomers).

^{19}F NMR (565 MHz, $CDCl_3$) δ 61.6 & 60.4 (two isomers).

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{22}H_{25}FNO_2S^+$ 386.1585, found 386.1578.

(2,2-Dimethyl-4,5-diphenyl-3,4-dihydro-2H-1,4-oxazin-3-yl)methanesulfonyl fluoride (5ak)



Following **General Procedure B** on 0.2 mmol scale with 1-isopropoxy-2-phenylbut-3-yn-2-ol and aniline.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

21.7 mg, 30% yield, white solid.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.31 (d, J = 7.4 Hz, 2H), 7.23 (t, J = 7.5 Hz, 2H), 7.17 (t, J = 7.3 Hz, 1H), 7.12 (t, J = 7.9 Hz, 2H), 6.98 (d, J = 8.0 Hz, 2H), 6.84 (t, J = 7.3 Hz, 1H), 6.57 (s, 1H), 4.49 – 4.44 (m, 1H), 3.77 – 3.69 (m, 1H), 3.66 – 3.57 (m, 1H), 1.41 (s, 3H), 1.15 (s, 3H).

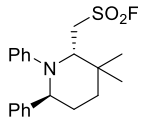
^{13}C NMR (150 MHz, $CDCl_3$) δ 146.6, 135.1, 131.3, 129.1, 128.7, 127.1, 125.7, 121.6, 120.3, 119.1, 77.3, 60.7, 50.0 (d, J = 14.3 Hz), 26.3, 24.4.

^{19}F NMR (565 MHz, $CDCl_3$) δ 60.9.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{19}H_{21}FNO_3S^+$ 362.1221, found 362.1231.

IV. Further Transformations

((2*S*,6*S*)-3,3-Dimethyl-1,6-diphenylpiperidin-2-yl)methanesulfonyl fluoride (6)



Flash chromatography: 5 to 10% EtOAc in petroleum ether.

To a stirred solution of (3,3-dimethyl-1,6-diphenyl-1,2,3, 4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.2 mg, 0.2 mmol) in CH_2Cl_2 (4 mL) were added $NaBH_3CN$ (66.0 mg, 1 mmol) at -40 °C followed by TFA (0.16 mL, 2.0 mmol). The resulting suspension was stirred for 5 h at this temperature. The reaction was quenched with saturated aqueous $NaHCO_3$, diluted with CH_2Cl_2 (10 mL) and the organic layer was separated. The aqueous layer was extracted with CH_2Cl_2. The combined organic layers were dried over Na_2SO_4, concentrated in *vacuo* and the residue was purified by column chromatography to afford **6** as a white solid.

71.6 mg, 99% yield, white solid.

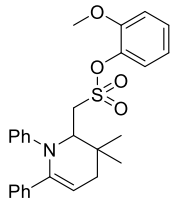
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.23 (d, J = 7.4 Hz, 2H), 7.16 (t, J = 7.6 Hz, 2H), 7.13 – 7.05 (m, 3H), 6.90 – 6.84 (m, 3H), 4.04 – 3.98 (m, 2H), 3.78 (d, J = 15.6 Hz, 1H), 3.70 – 3.63 (m, 1H), 1.94 – 1.86 (m, 1H), 1.84 – 1.79 (m, 1H), 1.59 (s, 3H), 1.55 – 1.51 (m, 2H), 1.13 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 149.0, 143.9, 128.8, 128.5, 127.2, 126.7, 125.1, 123.1, 67.9, 58.2, 47.3 (d, J = 15.0 Hz), 34.4, 33.3, 32.8, 28.0, 26.4.

^{19}F NMR (565 MHz, $CDCl_3$) δ 57.6.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{20}H_{25}FNO_2S^+$ 362.1585, found 362.1584.

2-Methoxyphenyl(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)me-thanesulfonate (7)



(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.3 mg, 0.2 mmol) and *o*-methoxy-phenol (25.3 mg, 0.24 mmol) were dissolved in MeCN (2 mL), and K_2CO_3 (33.2 mg, 0.24 mmol) was added. The reaction was stirred at room temperature for 8 h, the resulting mixture was concentrated in *vacuo* and the residue was purified by column chromatography to afford **7** as a white solid.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

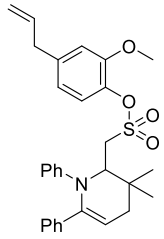
89.9 mg, 97% yield, colorless oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.44 – 7.41 (m, 2H), 7.38 (dd, J = 7.9, 1.5 Hz, 1H), 7.27 – 7.24 (m, 1H), 7.16 – 7.10 (m, 3H), 7.06 – 7.01 (m, 4H), 7.00 – 6.95 (m, 2H), 6.77 – 6.72 (m, 1H), 5.46 – 5.41 (m, 1H), 4.40 (dd, J = 9.6, 1.2 Hz, 1H), 3.86 – 3.79 (m, 1H), 3.75 (s, 3H), 3.64 – 3.60 (m, 1H), 2.10 (s, 2H), 1.07 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 151.6, 148.0, 139.2, 138.8, 138.3, 128.4, 128.2, 128.1, 127.3, 127.2, 124.5, 121.7, 121.2, 120.7, 113.0, 110.4, 64.6, 55.8, 51.2, 35.9, 35.3, 28.0, 27.7.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{27}H_{30}NO_4S^+$ 450.1734, found 450.1734.

4-Allyl-2-methoxyphenyl(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonate (8)



(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.2 mg, 0.2 mmol) and eugenol (39.8 mg, 0.24 mmol) were dissolved in MeCN (2 mL), and K_2CO_3 (33.2 mg, 0.24 mmol) was added. The reaction was stirred at room temperature for 8 h, the resulting mixture was concentrated in *vacuo* and the residue was purified by column chromatography to afford **8** as a colorless oil.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

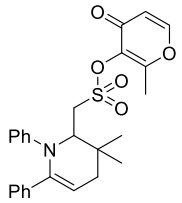
98.7 mg, 98% yield, colorless oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.42 (d, J = 6.8 Hz, 2H), 7.29 (d, J = 8.1 Hz, 1H), 7.17 – 7.10 (m, 3H), 7.06 – 6.99 (m, 4H), 6.82 – 6.77 (m, 2H), 6.76 – 6.73 (m, 1H), 6.01 – 5.90 (m, 1H), 5.46 – 5.40 (m, 1H), 5.14 – 5.08 (m, 2H), 4.39 (d, J = 9.4 Hz, 1H), 3.83 – 3.77 (m, 1H), 3.74 (s, 3H), 3.61 (d, J = 14.4 Hz, 1H), 3.38 (d, J = 6.7 Hz, 2H), 2.09 (s, 2H), 1.07 (s, 3H), 0.91 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 151.4, 148.0, 140.5, 139.2, 138.9, 136.8, 136.6, 128.45, 128.2, 127.3, 127.2, 124.3, 121.8, 121.2, 120.7, 116.6, 113.2, 110.3, 64.7, 55.9, 51.2, 40.2, 36.0, 35.3, 28.0, 27.7.

HRMS-ESI (m/z) $[M+NH_4]^+$ calcd for$C_{30}H_{37}N_2O_4S^+$ 507.2312, found 507.2305.

2-Methyl-4-oxo-4*H*-pyran-3-yl(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonat-e (9)



(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.2 mg, 0.2 mmol) and 3-hydroxy-2-methyl-4-pyrone (30.9 mg, 0.24 mmol) were dissolved in MeCN (2 mL), and K_2CO_3 (33.2 mg, 0.24 mmol) was added. The reaction was stirred at 50 °C for 4 h, the resulting mixture was concentrated in *vacuo* and the residue was purified by column chromatography to afford **9** as a colorless oil.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

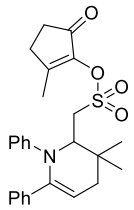
82.9 mg, 89% yield, colorless oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.68 (d, J = 5.6 Hz, 1H), 7.43 (d, J = 7.3 Hz, 2H), 7.19 – 7.11 (m, 3H), 7.06 – 6.97 (m, 4H), 6.74 (d, J = 6.8 Hz, 1H), 6.41 (d, J = 5.6 Hz, 1H), 5.49 – 5.43 (m, 1H), 4.39 – 4.31 (m, 2H), 4.01 – 3.94 (m, 1H), 2.52 (s, 3H), 2.20 – 2.04 (m, 2H), 1.14 (s, 3H), 0.89 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 172.8, 163.3, 154.4, 148.2, 138.94, 138.90, 128.5, 128.2, 127.3, 127.2, 121.7, 120.7, 117.6, 110.9, 65.0, 53.3, 36.1, 35.3, 28.0, 27.8, 16.1.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{26}H_{28}NO_5S^+$ 466.1683, found 466.1690.

2-Methyl-5-oxocyclopent-1-en-1-yl(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesul-fonate (10)



(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.2 mg, 0.2 mmol) and methylcyclopentenolone (27.6 mg, 0.24 mmol) were dissolved in MeCN (2 mL), and K_2CO_3 (33.2 mg, 0.24 mmol) was added. The reaction was stirred at 50°C for 6 h, the resulting mixture was concentrated in *vacuo* and the residue was purified by column chromatography to afford **10** as a colorless oil.

Flash chromatography: 10 to 20% EtOAc in petroleum ether.

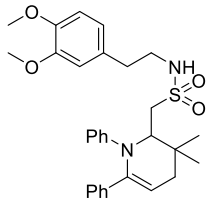
75.9 mg, 84% yield, colorless oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.44 (d, J = 7.4 Hz, 2H), 7.20 – 7.11 (m, 3H), 7.08 – 6.98 (m, 4H), 6.75 (t, J = 6.9 Hz, 1H), 5.50 – 5.44 (m, 1H), 4.35 (d, J = 9.8 Hz, 1H), 4.05 (d, J = 14.2 Hz, 1H), 3.94 – 3.87 (m, 1H), 2.65 – 2.57 (m, 2H), 2.49 – 2.39 (m, 2H), 2.24 – 2.18 (m, 3H), 2.18 – 2.05 (m, 2H), 1.13 (s, 3H), 0.90 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 200.1, 166.0, 148.1, 145.5, 138.90, 138.85, 128.4, 128.1, 127.23, 127.16, 121.6, 120.7, 110.8, 64.9, 53.1, 36.0, 35.2, 32.4, 28.1, 27.9, 27.7, 15.8.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{26}H_{29}NNaO_4S^+$ 460.1553, found 460.1539.

***N*-(3,4-Dimethoxyphenethyl)-1-(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfon-amide (11)**



(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.2 mg, 0.2 mmol) and 2-(3,4-dimethoxyphenyl)-ethylamine (74.8 mg, 0.4 mmol) were added in MeCN (2 mL), and DBU (62 μL, 0.4 mmol) was slowly added. The reaction was stirred at room temperature for 8 h, the resulting mixture was concentrated in *vacuo* and the residue was purified by column chromatography to afford **11** as a colorless oil.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

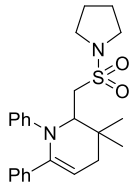
102.1 mg, 98% yield, colorless oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.41 (d, J = 7.2 Hz, 2H), 7.21 – 7.12 (m, 3H), 7.06 – 6.98 (m, 4H), 6.79 – 6.69 (m, 3H), 6.66 (s, 1H), 5.42 – 5.38 (m, 1H), 4.56 – 4.44 (m, 1H), 4.19 (d, J = 8.8 Hz, 1H), 3.83 (s, 3H), 3.79 (s, 3H), 3.42 – 3.32 (m, 2H), 3.24 – 3.17 (m, 1H), 2.96 (d, J = 14.2 Hz, 1H), 2.79 (t, J = 6.3 Hz, 2H), 2.04 – 1.91 (m, 2H), 0.98 (s, 3H), 0.84 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 149.2, 148.1, 148.0, 138.9, 138.8, 130.5, 128.5, 128.3, 127.3, 126.9, 121.6, 121.0, 120.6, 112.0, 111.5, 110.8, 64.8, 56.0, 55.9, 52.1, 44.9, 36.4, 35.8, 35.2, 27.9, 27.7.

HRMS-ESI (m/z) $[M+Na]^+$ calcd for $C_{30}H_{36}N_2NaO_4S^+$ 529.2131, found 529.2134.

3,3-Dimethyl-1,6-diphenyl-2-((pyrrolidin-1-ylsulfonyl)methyl)-1,2,3,4-tetrahydropyridine (12)



(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.2 mg, 0.2 mmol) were added in MeCN (2 mL), and tetrahydro pyrrole (84 μL, 1 mmol) was slowly added followed by DBU (62 μL, 0.4 mmol). The reaction was stirred at room temperature for 8 h, the resulting mixture was concentrated in *vacuo* and the residue was purified by column chromatography to afford **12** as a colorless oil.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

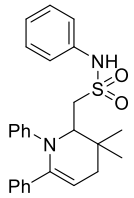
75.5 mg, 92% yield, colorless oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.44 (d, J = 7.3 Hz, 2H), 7.23 – 7.12 (m, 3H), 7.08 – 7.01 (m, 4H), 6.73 (s, 1H), 5.42 – 5.36 (m, 1H), 4.27 (d, J = 8.1 Hz, 1H), 3.44 – 3.37 (m, 4H), 3.33 – 3.26 (m, 1H), 3.06 (d, J = 13.9 Hz, 1H), 2.11 – 2.02 (m, 2H), 1.98 – 1.92 (m, 4H), 1.07 (s, 3H), 0.88 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 148.2, 139.2, 128.4, 128.3, 127.3, 127.0, 122.3, 121.7, 120.5, 110.7, 64.4, 48.5, 47.9, 36.0, 35.3, 28.0, 27.8, 26.0.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{24}H_{31}N_2O_2S^+$ 397.1944, found 397.1944.

1-(3,3-Dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)-*N*-phenylmethanesulfonamide (13)



(3,3-dimethyl-1,6-diphenyl-1,2,3,4-tetrahydropyridin-2-yl)methanesulfonyl fluoride (73.2 mg, 0.2 mmol) and aniline (40 μL, 0.4 mmol) were added in MeCN (2 mL), and DBU (62 μL, 0.4 mmol) was slowly added. The reaction was stirred at room temperature for 8 h, the resulting mixture was concentrated in *vacuo* and the residue was purified by column chromatography to afford **13** as a colorless oil.

Flash chromatography: 5 to 10% EtOAc in petroleum ether.

51.9 mg, 60% yield, colorless oil.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.37 (d, J = 6.9 Hz, 2H), 7.30 (t, J = 7.8 Hz, 2H), 7.21 (d, J = 7.9 Hz, 2H), 7.17 – 7.11 (m, 2H), 7.10 – 7.00 (m, 7H), 6.75 (t, J = 7.0 Hz, 1H), 5.29 (t, J = 3.5 Hz, 1H), 4.27 (d, J = 8.8 Hz, 1H), 3.38 – 3.30 (m, 1H), 3.22 (d, J = 13.9 Hz, 1H), 1.90 (dd, J = 19.0, 4.1 Hz, 1H), 1.74 (dd, J = 19.0, 2.4 Hz, 1H), 0.88 (s, 3H), 0.82 (s, 3H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 148.1, 139.0, 138.8, 137.1, 129.9, 128.5, 128.2, 127.3, 127.0, 124.9, 121.6, 120.7, 119.7, 111.0, 64.7, 51.5, 35.9, 35.0, 27.8, 27.7.

HRMS-ESI (m/z) $[M+H]^+$ calcd for $C_{26}H_{29}N_2O_2S^+$ 419.1788, found 419.1794.

Supplemental Reference

1. V. P. Reddy, D. R. Bellew, G. K. S. Prakash, A convenient preparation of sulfuryl chloride fluoride, *J. Fluorine Chem.* **1992**, *56*, 195.
2. S. Wu, X. Wu, D. Wang, C. Zhu, Regioselective Vinylation of Remote Unactivated C(sp^3)−H Bonds: Access to Complex Fluoroalkylated Alkenes, *Angew. Chem. Int. Ed.* **2019**, *58*, 1499.
3. S. Yang, X. Wu, S. Wu, C. Zhu, Regioselective Sulfonylvinylation of the Unactivated C(sp^3)–H Bond via a C-Centered Radical-Mediated Hydrogen Atom Transfer (HAT) Process, *Org. Lett.* **2019**, *21*, 4837.
4. X. Zhao, D. Chen, S. Zhu, J. Luo, S. Liao, B. Zheng and S. Huang, Fluorosulfonylvinylation of Unactivated C(sp^3)-H via Electron Donor-Acceptor Photoactivation, *Org. Lett.* **2023**, DOI: 10.1021/acs.orglett.3c00950.
5. T. He, D. Chen, S. Qian, Y. Zheng, S. Huang, Selective C–C Bond Cleavage of Cycloalkanones by $NaNO_2$/HCl, *Org. Lett*. **2021**, *23*, 6525.
6. Z. Xia, J. Hu, Y.-Q. Gao, Q. Yao, W. Xie, Facile access to 2,2-disubstituted indolin-3-ones via a cascade Fischer indolization/Claisen rearrangement reaction, *Chem. Commun.* **2017**, *53*, 7485.
7. J. R. Sosa, A. A. Tudjarian, T. G. Minehan, Synthesis of Alkynyl Ethers and Low-Temperature Sigmatropic Rearrangement of Allyl and Benzyl Alkynyl Ethers, *Org. Lett.* **2008**, *10*, 5091.

Supplemental Data

I. X-ray Crystal Data

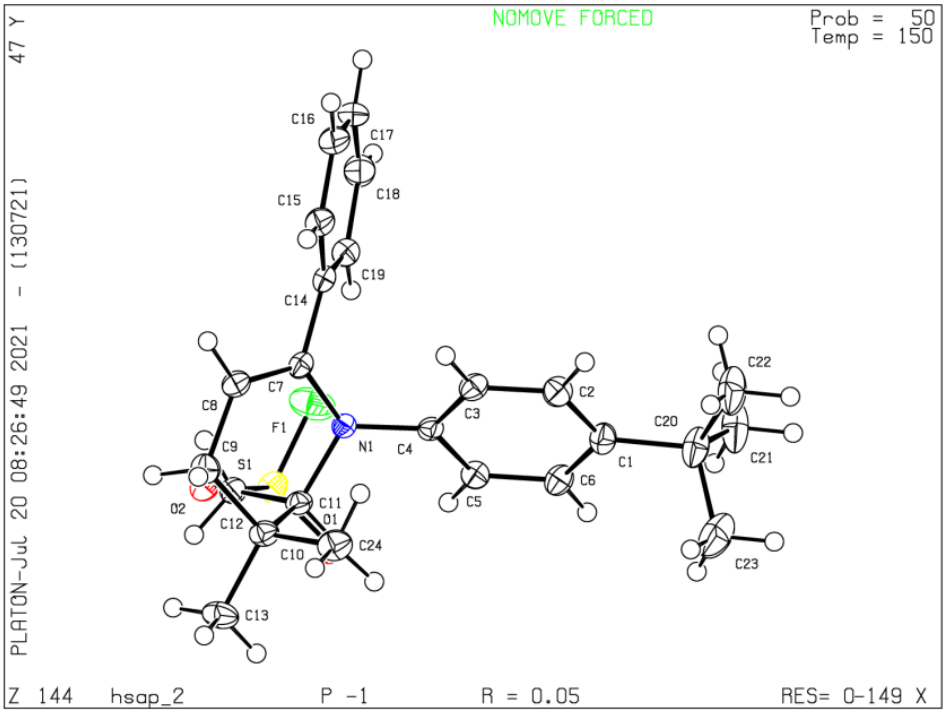
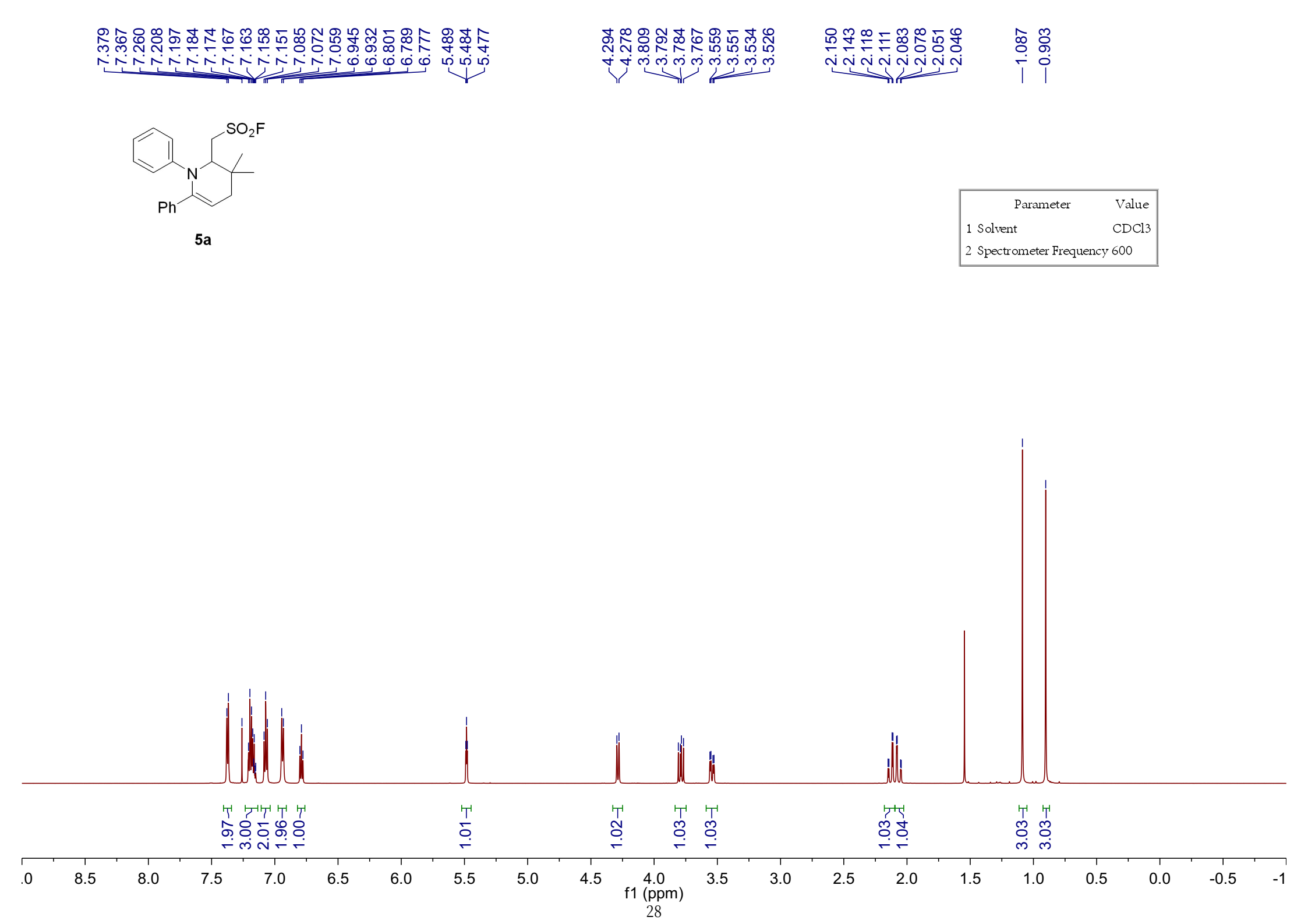


Figure S1 X-ray structure of **5n (**2183275**).**

Table S4 Crystal data and structure refinement for **5n**.	
Identification code	**5n**
Empirical formula	$C_{24}H_{30}FNO_2S$
Formula weight	415.55
Temperature/K	150.1(4)
Crystal system	triclinic
Space group	P-1
a/Å	8.0575(6)
b/Å	10.2338(8)
c/Å	13.7884(9)
α/°	85.464(6)
β/°	88.881(5)
γ/°	84.269(6)
Volume/Å^3	1127.67(14)
Z	2

ρ_{calc}g/cm^3	1.224
μ/mm^{-1}	0.171
F(000)	444.0
Crystal size/mm^3	0.12 × 0.11 × 0.1
Radiation	Mo Kα (λ = 0.71073)
2Θ range for data collection/°	4.012 to 49.998
Index ranges	$-9 \leq h \leq 9$, $-11 \leq k \leq 12$, $-16 \leq l \leq 15$
Reflections collected	8377
Independent reflections	3978 [R_{int} = 0.0252, R_{sigma} = 0.0430]
Data/restraints/parameters	3978/7/261
Goodness-of-fit on F^2	1.053
Final R indexes [I>=2σ (I)]	R_1 = 0.0544, wR_2 = 0.1243
Final R indexes [all data]	R_1 = 0.0654, wR_2 = 0.1326
Largest diff. peak/hole / e Å^{-3}	1.11/-1.03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7.260
7.208
7.197
7.184
7.174
7.167
7.163
7.158
7.151
7.085
7.072
7.059
6.945
6.932
6.801
6.789
6.777
5.489
5.484
5.477
4.294
4.278
3.809
3.792
3.784
3.767
3.559
3.551
3.534
3.526
2.150
2.143
2.118
2.111
2.083
2.078
2.051
2.046
1.087
0.903
SO2F
N
Ph
5a
Parameter Value
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2 Spectrometer Frequency 600
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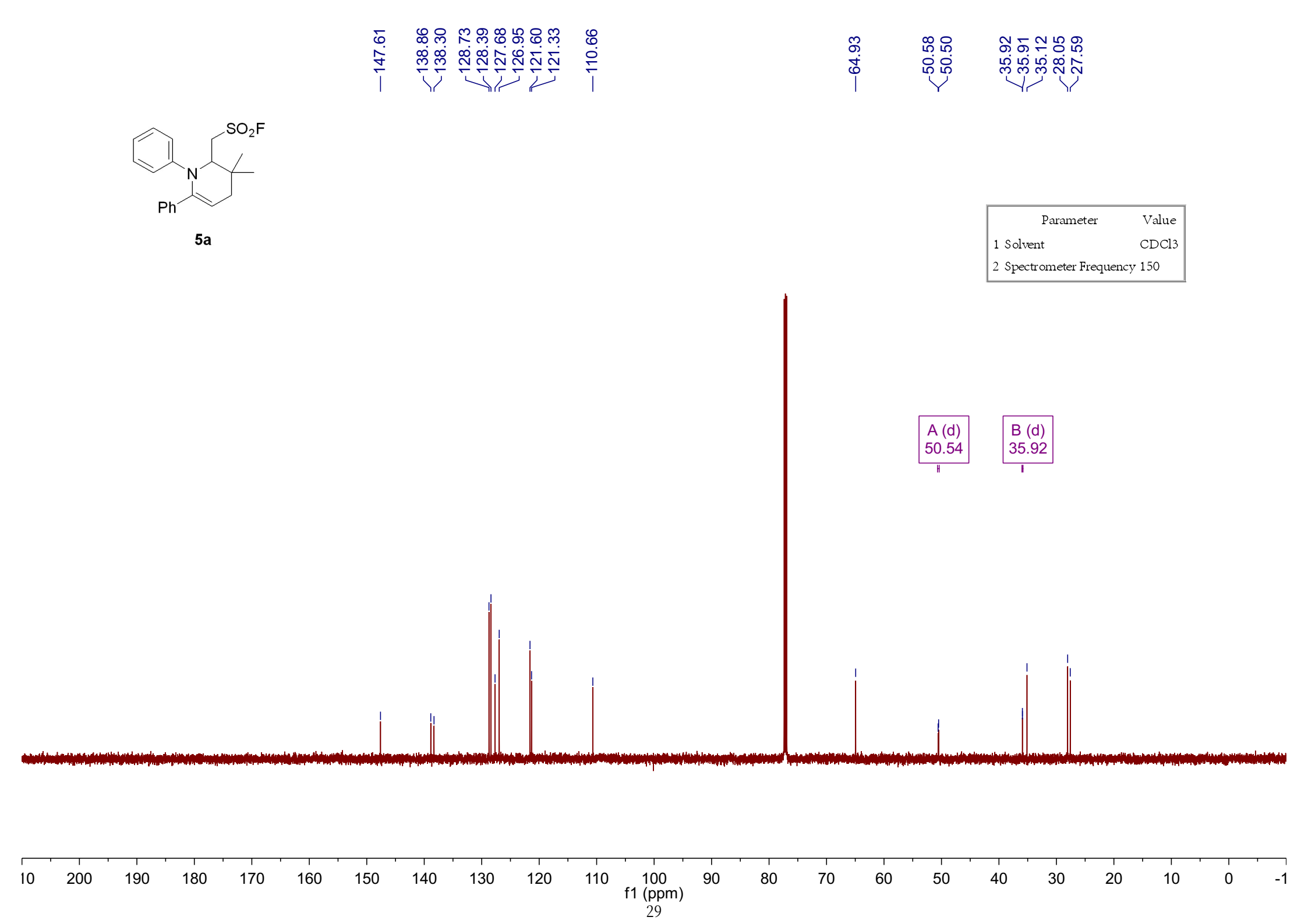
3.00
2.01
1.96
1.00
1.01
1.02
1.03
1.03
1.03
1.04
3.03
3.03
f1 (ppm)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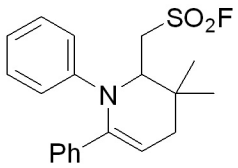
138.86
138.30
128.73
128.39
127.68
126.95
121.60
121.33
110.66
64.93
50.58
50.50
35.92
35.91
35.12
28.05
27.59
SO2F
N
Ph
5a
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.54
B (d)
35.92
f1 (ppm)



5a

60.39

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

1.00

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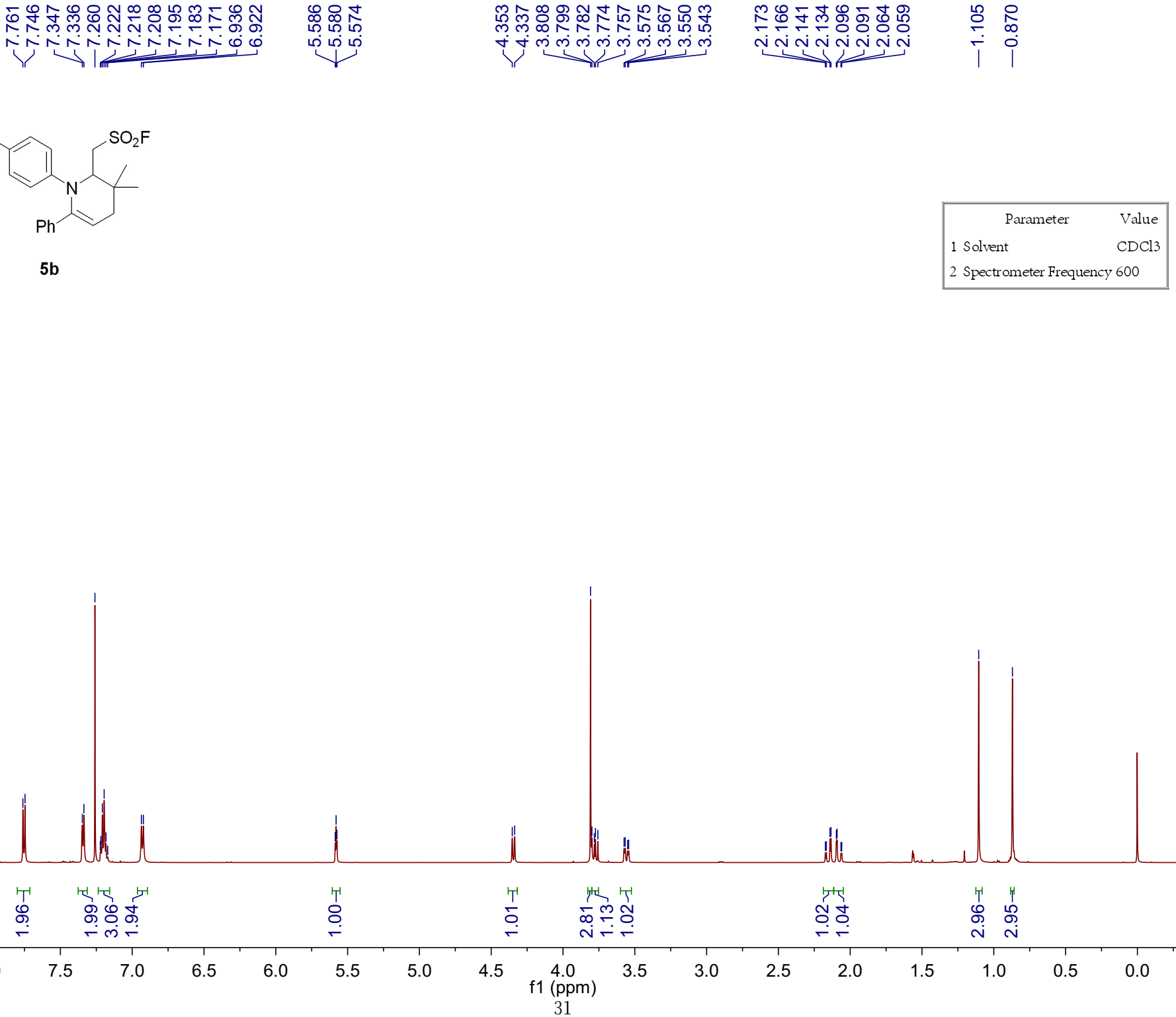
f1 (ppm)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7.222
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7.171
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5.586
5.580
5.574
4.353
4.337
3.808
3.799
3.782
3.774
3.757
3.575
3.567
3.550
3.543
2.173
2.166
2.141
2.134
2.096
2.091
2.064
2.059
1.105
0.870
MeO2C
SO2F
N
Ph
5b
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
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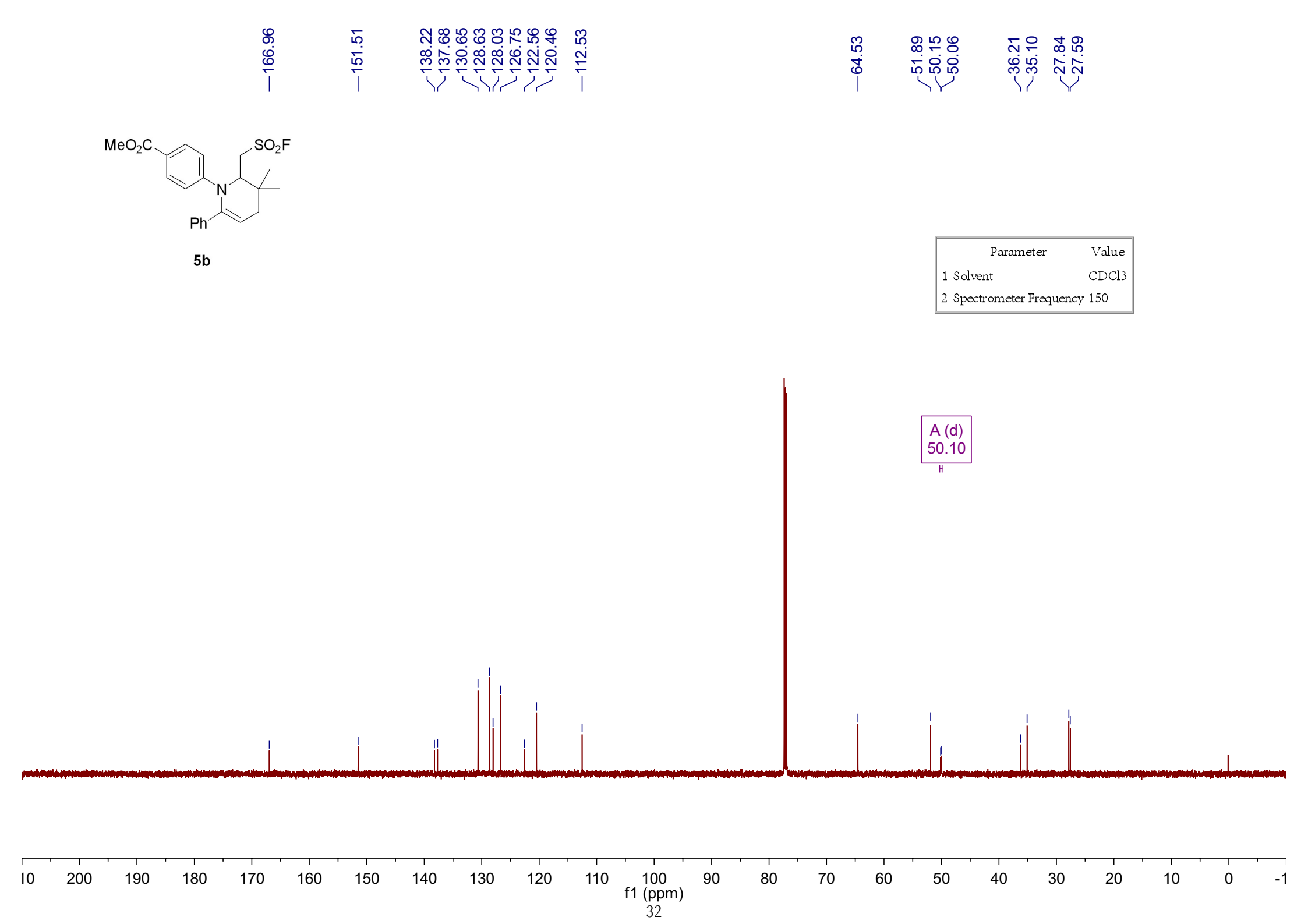
1.99
3.06
1.94
1.00
1.01
2.81
1.13
1.02
1.02
1.04
2.96
2.95
f1 (ppm)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137.68
130.65
128.63
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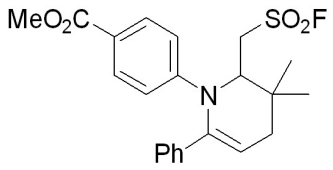
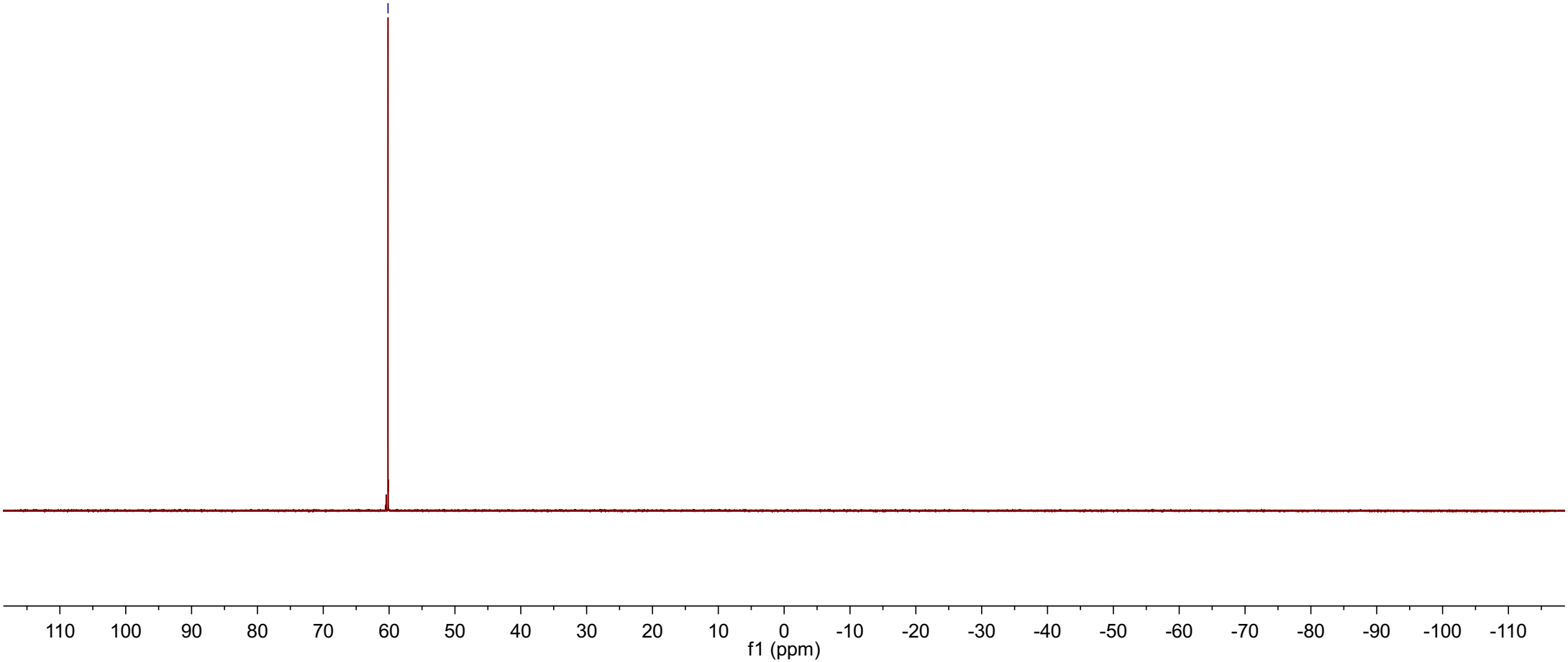
122.56
120.46
112.53
64.53
51.89
50.15
50.06
36.21
35.10
27.84
27.59
MeO2C
SO2F
N
Ph
5b
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.10
f1 (ppm)

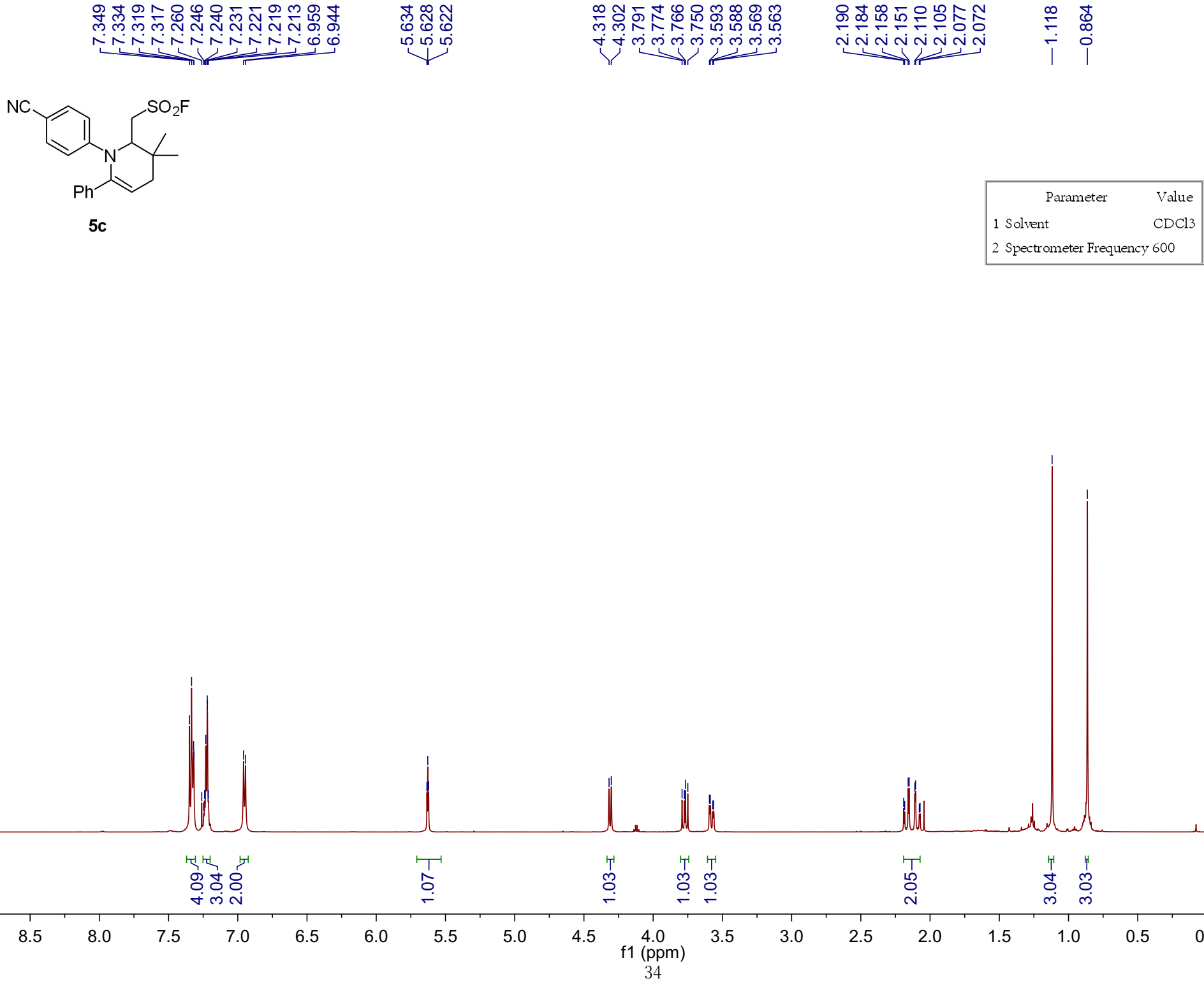


5b

60.16

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

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7.219
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6.944
5.634
5.628
5.622
4.318
4.302
3.791
3.774
3.766
3.750
3.593
3.588
3.569
3.563
2.190
2.184
2.158
2.151
2.110
2.105
2.077
2.072
1.118
0.864
NC
SO2F
N
Ph
5c
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
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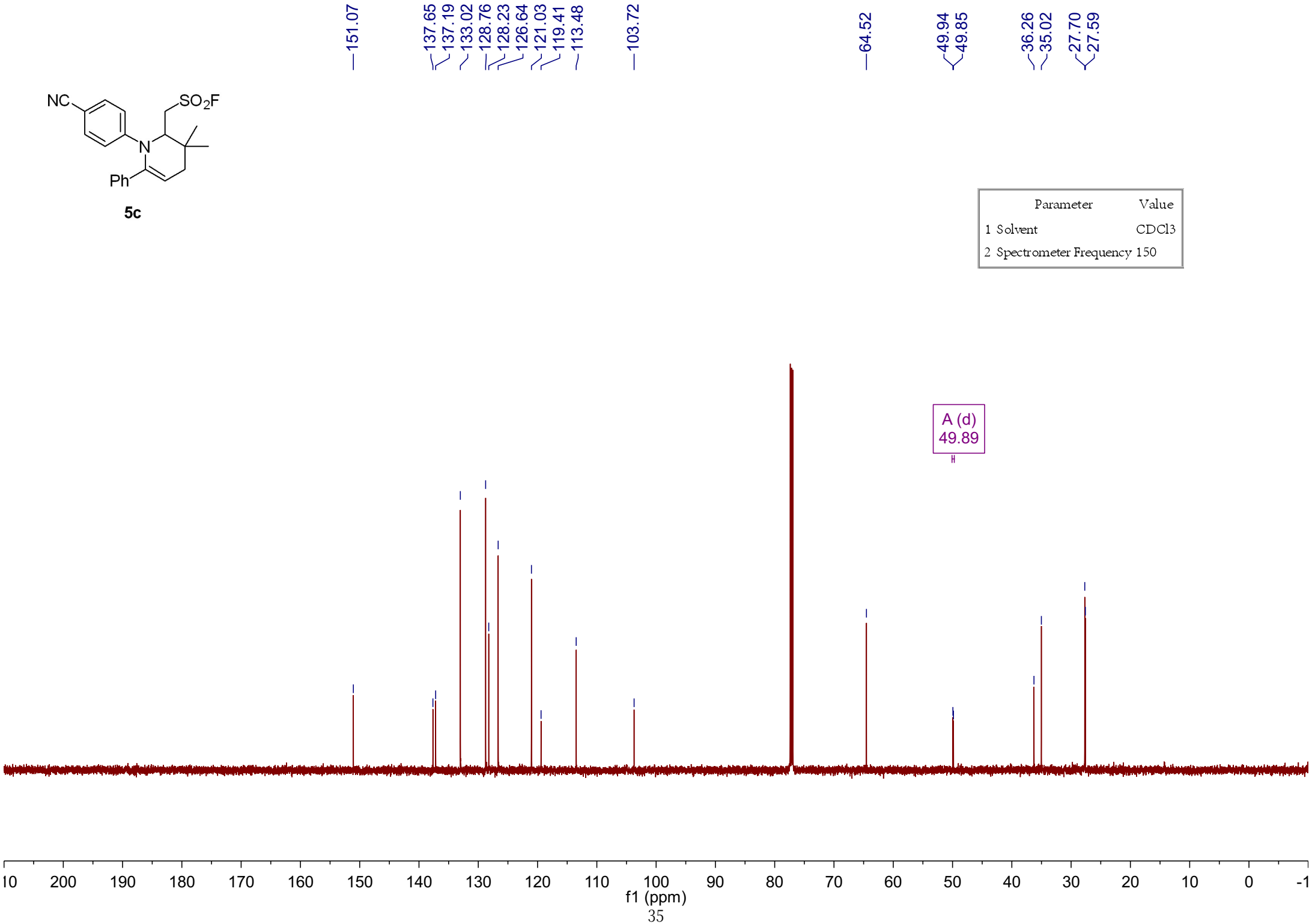
1.03
1.03
1.03
2.05
3.04
3.03
f1 (ppm)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128.76
128.23
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121.03
119.41
113.48
103.72
64.52
49.94
49.85
36.26
35.02
27.70
27.59
NC
SO2F
N
Ph
5c
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
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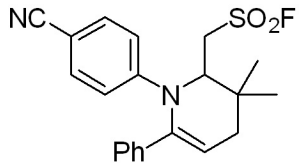
f1 (ppm)



5c

60.22

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

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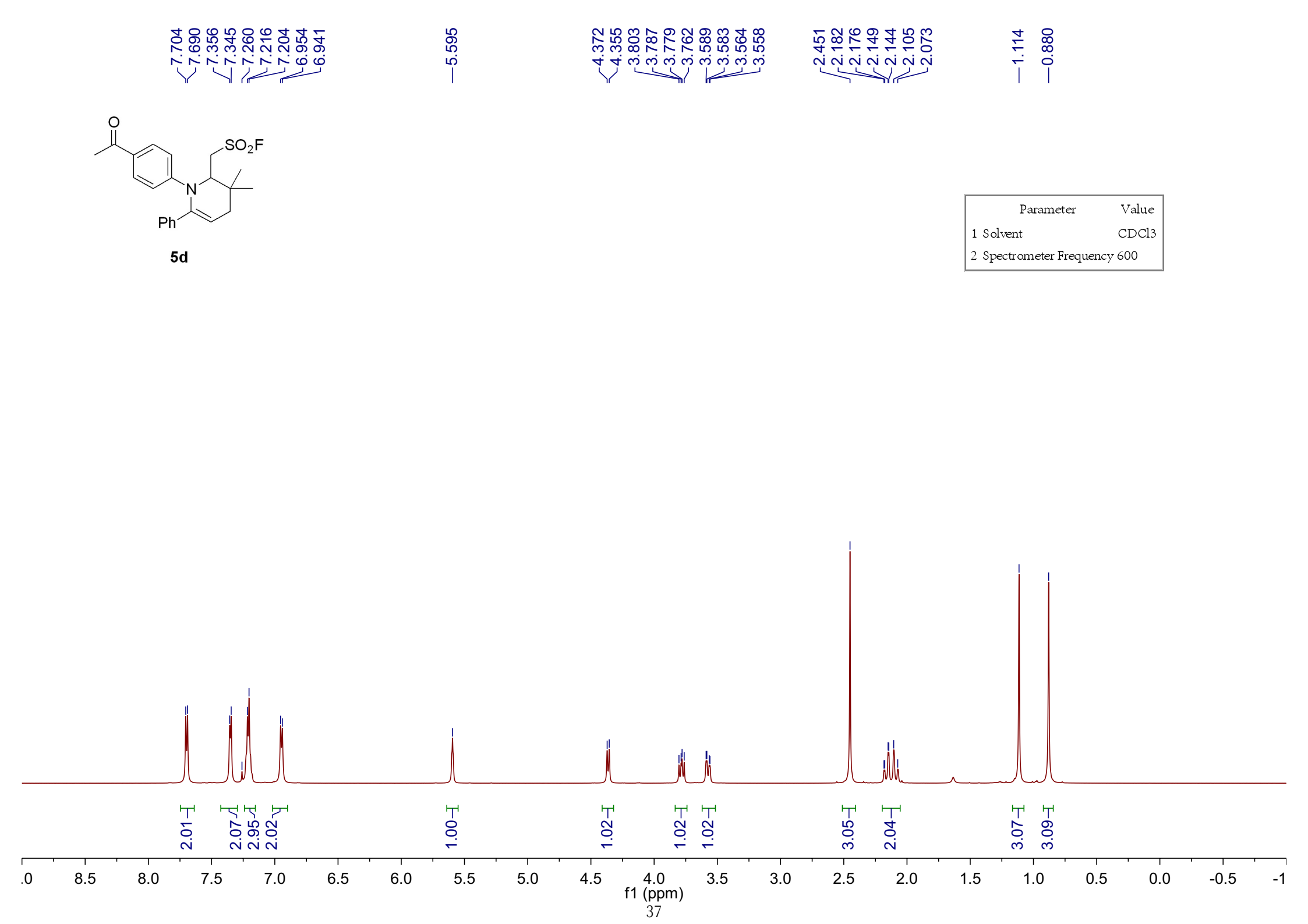
f1 (ppm)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3.787
3.779
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3.589
3.583
3.564
3.558
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2.182
2.176
2.149
2.144
2.105
2.073
1.114
0.880
O
SO2F
N
Ph
5d
Parameter Value
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2 Spectrometer Frequency 600
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1.00
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1.02
1.02
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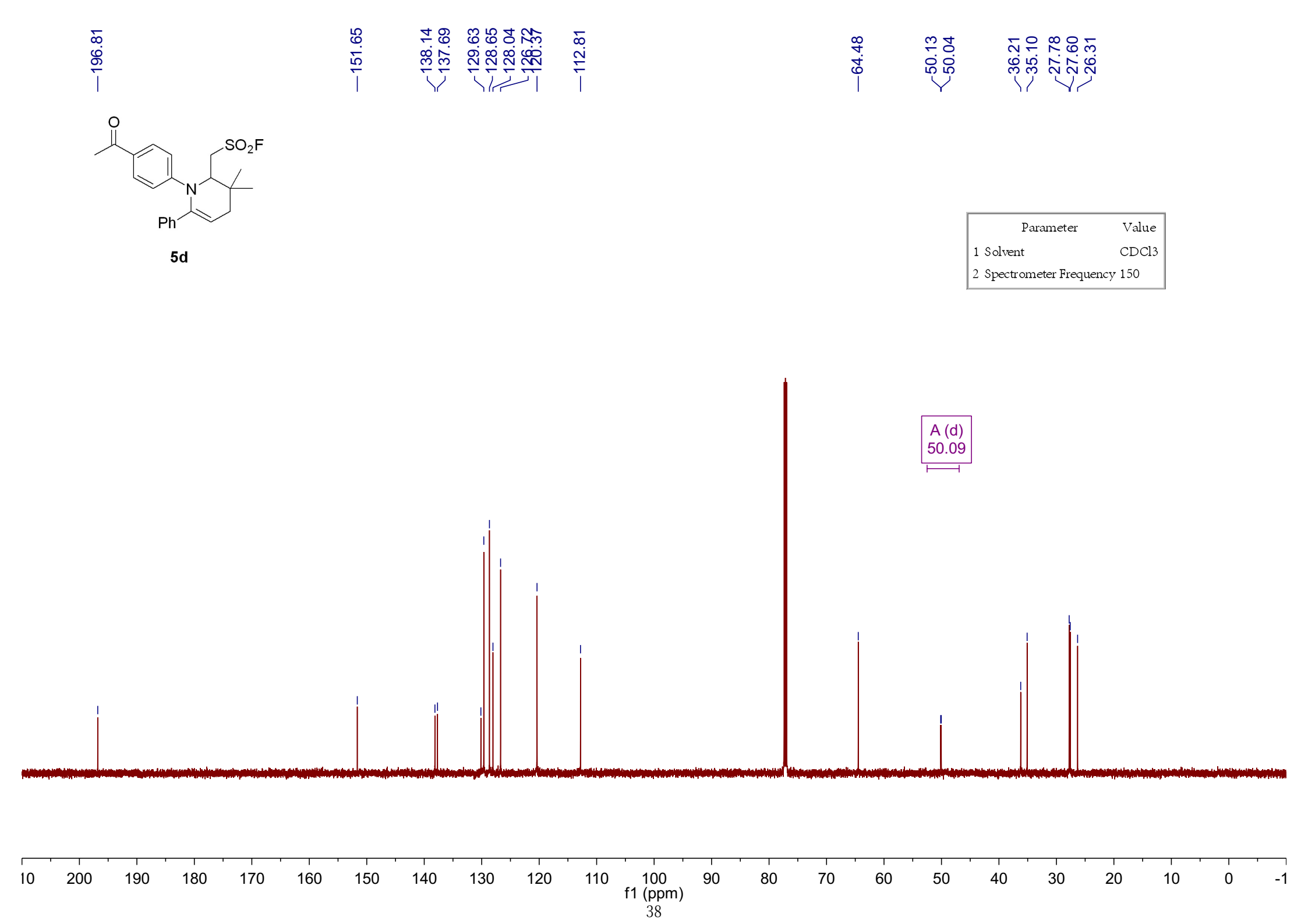
3.07
3.09
f1 (ppm)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128.65
128.04
126.72
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64.48
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50.04
36.21
35.10
27.78
27.60
26.31
O
SO2F
N
Ph
5d
Parameter Value
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2 Spectrometer Frequency 150
A (d)
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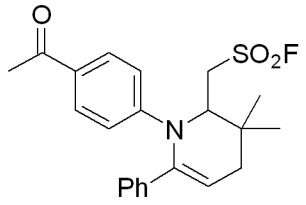
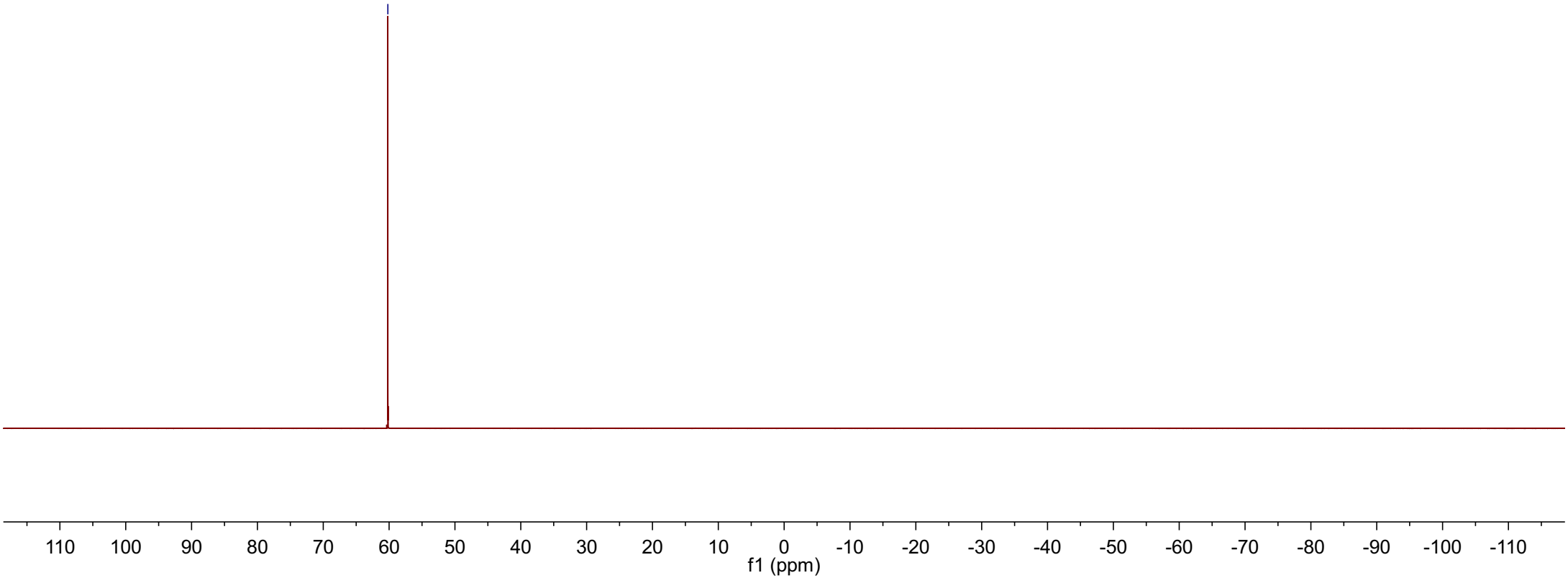
f1 (ppm)

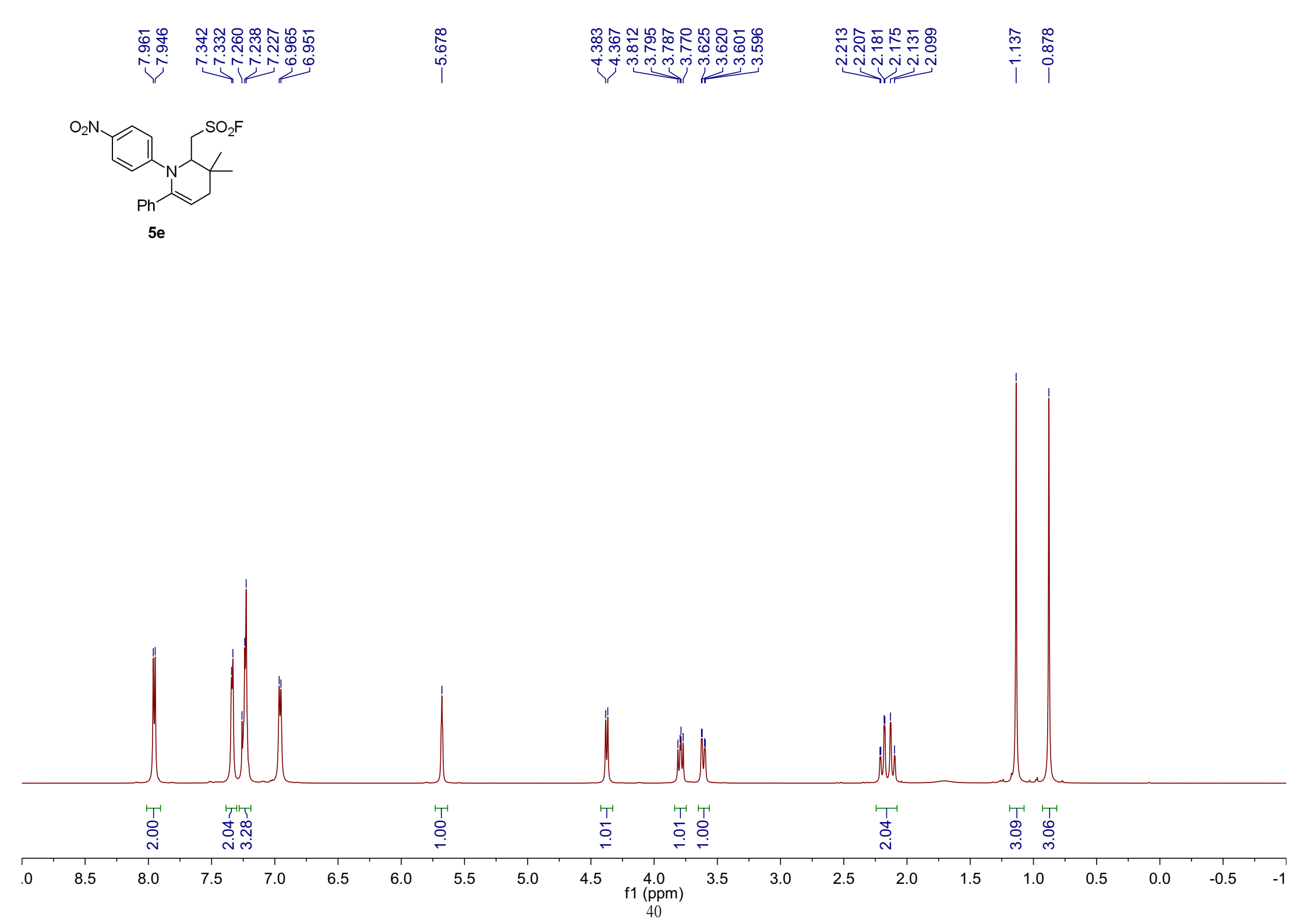


5d

60.19

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

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3.795
3.787
3.770
3.625
3.620
3.601
3.596
2.213
2.207
2.181
2.175
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O2N
SO2F
N
Ph
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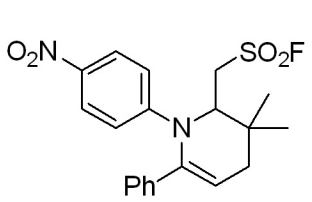
f1 (ppm)



5e

152.92
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137.08
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128.39
126.62
125.07
120.22
114.13
64.58
49.83
49.74
36.40
35.05
27.66
27.63

Parameter	Value
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2 Spectrometer Frequency	150

A (d)
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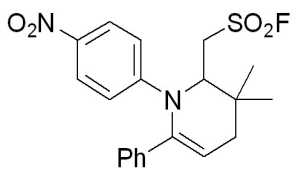
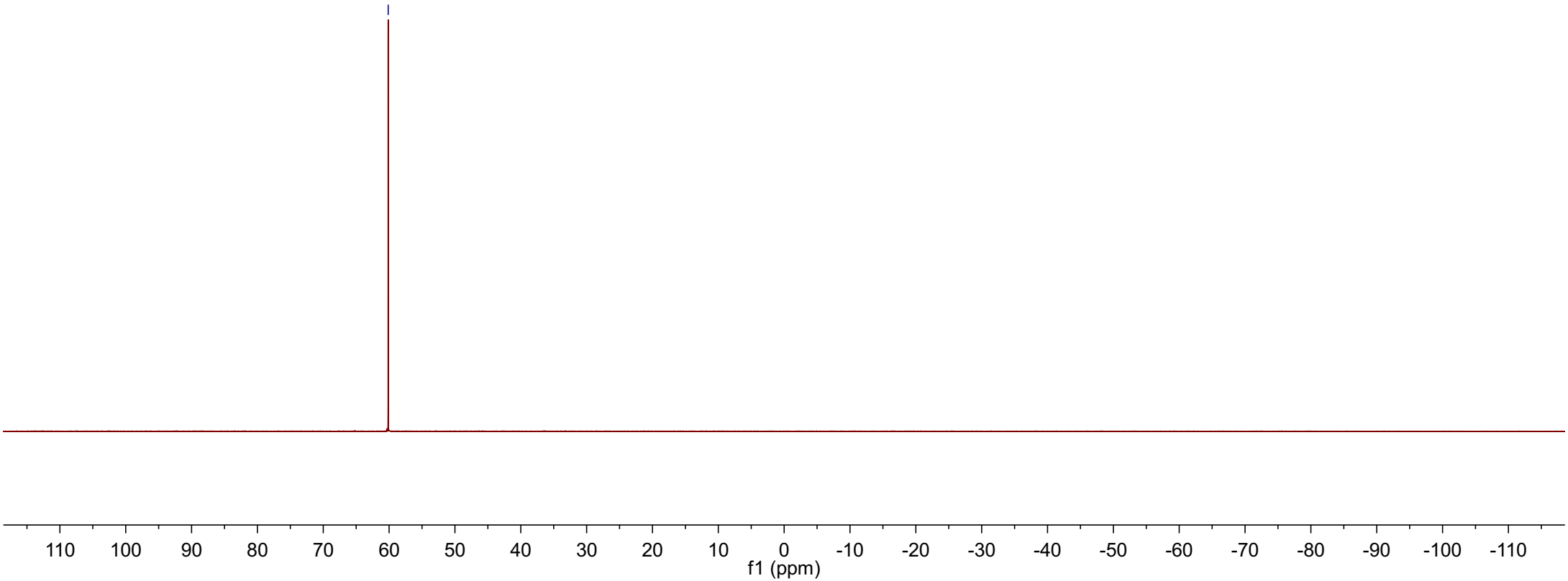
f1 (ppm)

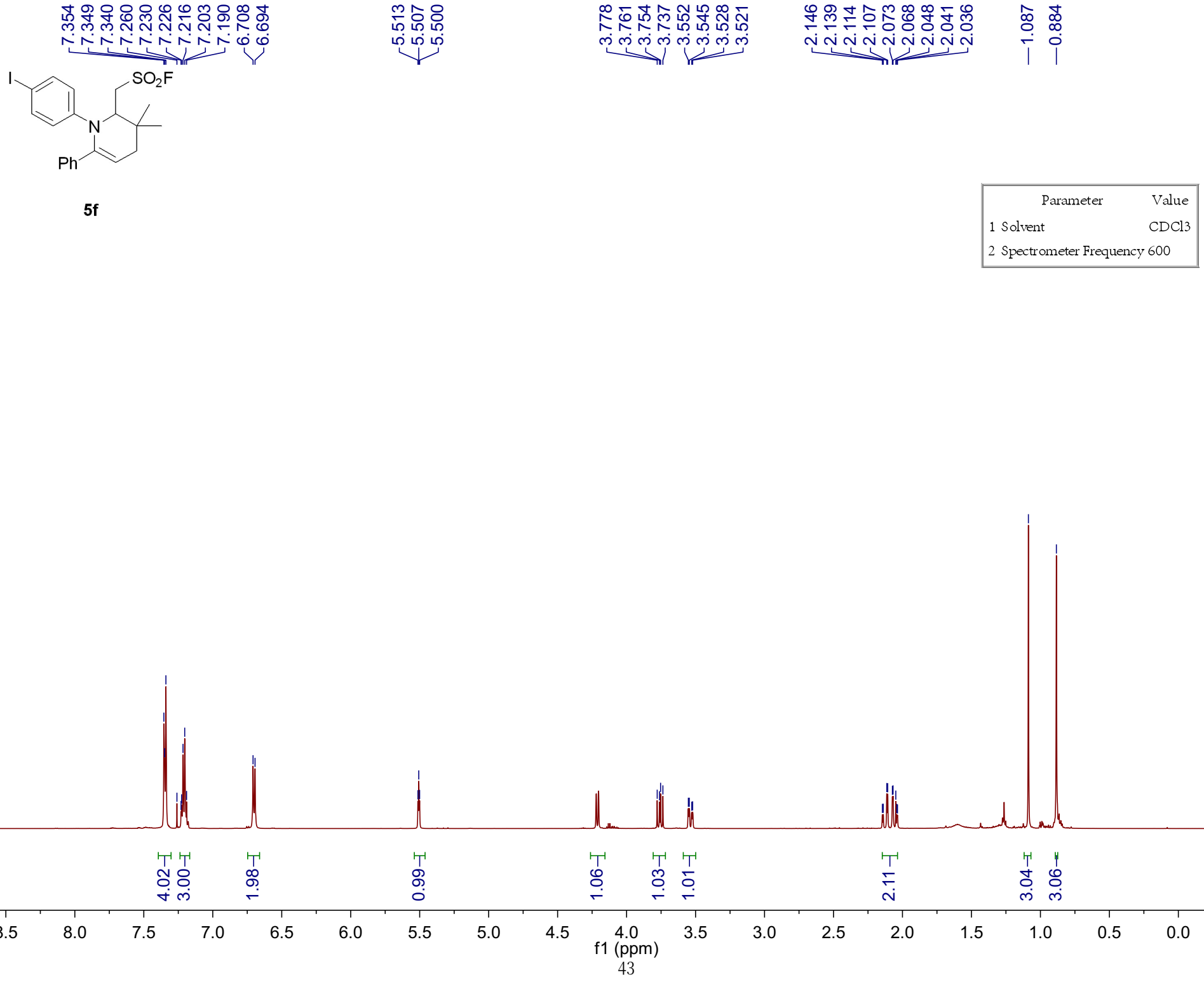


5e

60.14

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

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7.203
7.190
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6.694
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5.500
3.778
3.761
3.754
3.737
3.552
3.545
3.528
3.521
2.146
2.139
2.114
2.107
2.073
2.068
2.048
2.041
2.036
1.087
0.884
I
SO2F
N
Ph
5f
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
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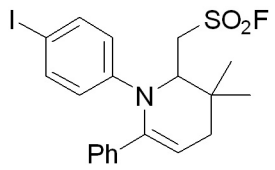
2.11
3.04
3.06
f1 (ppm)



5f

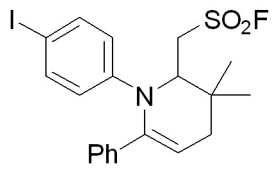
147.40
138.30
137.76
137.64
128.55
127.91
126.88
123.53
111.50
84.31
64.92
50.35
50.26
36.00
35.99
35.03
27.95
27.61

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

A (d) 50.30 H

B (d) 35.99

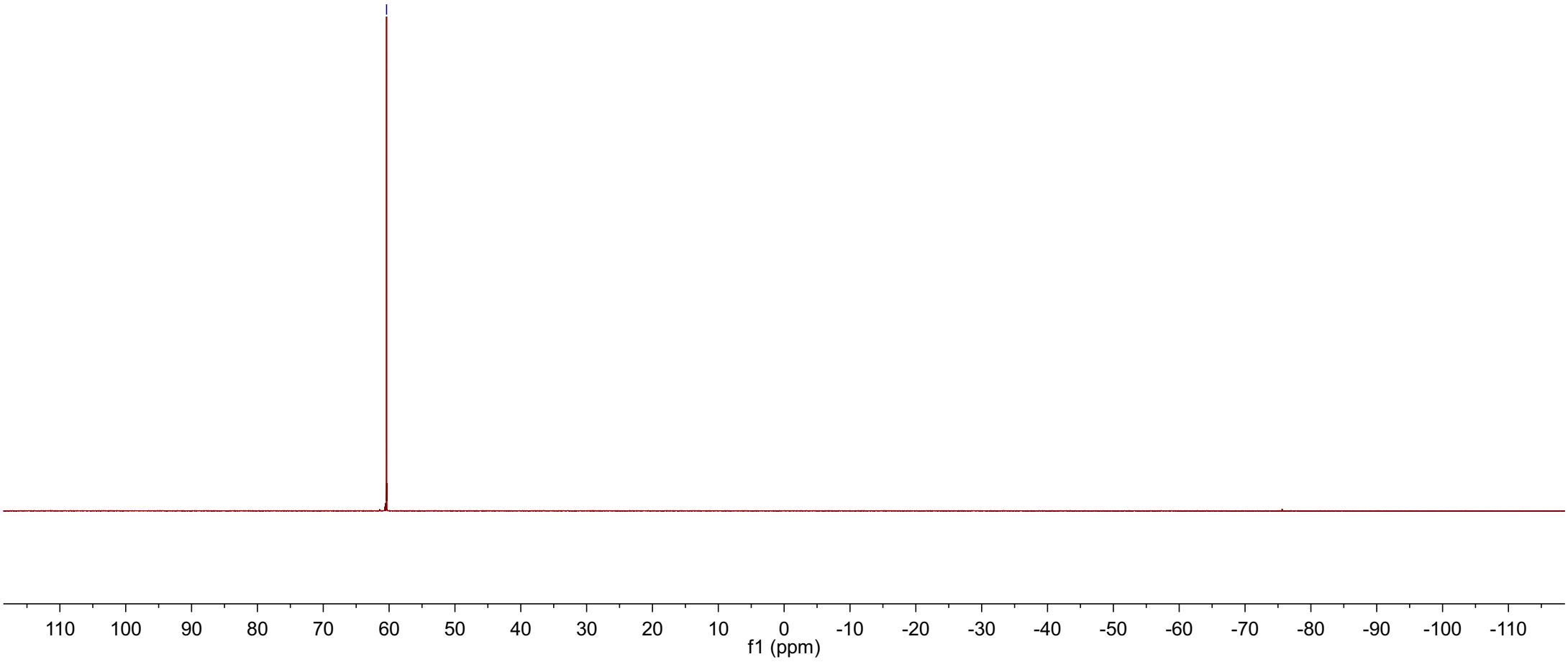
f1 (ppm)

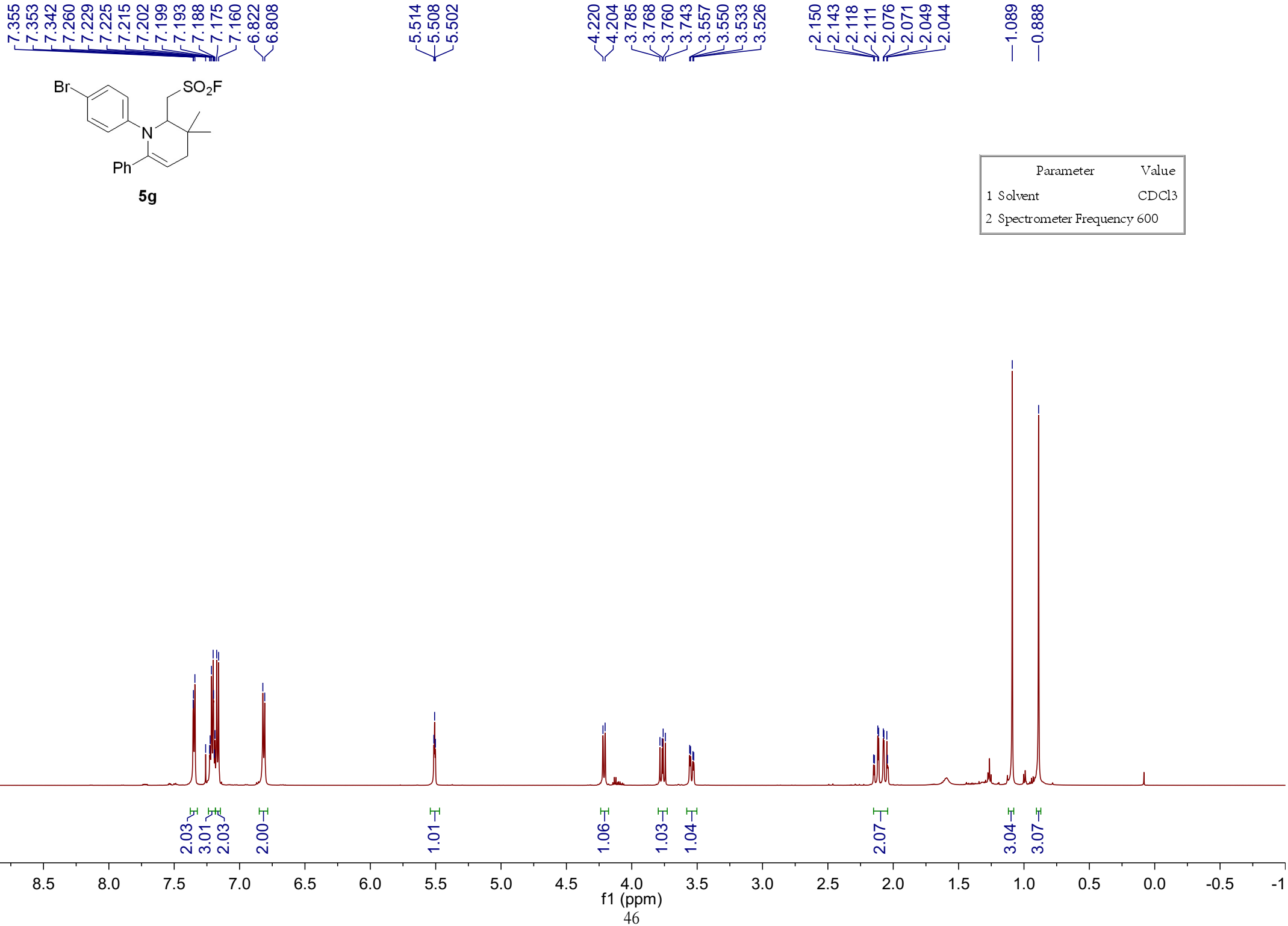


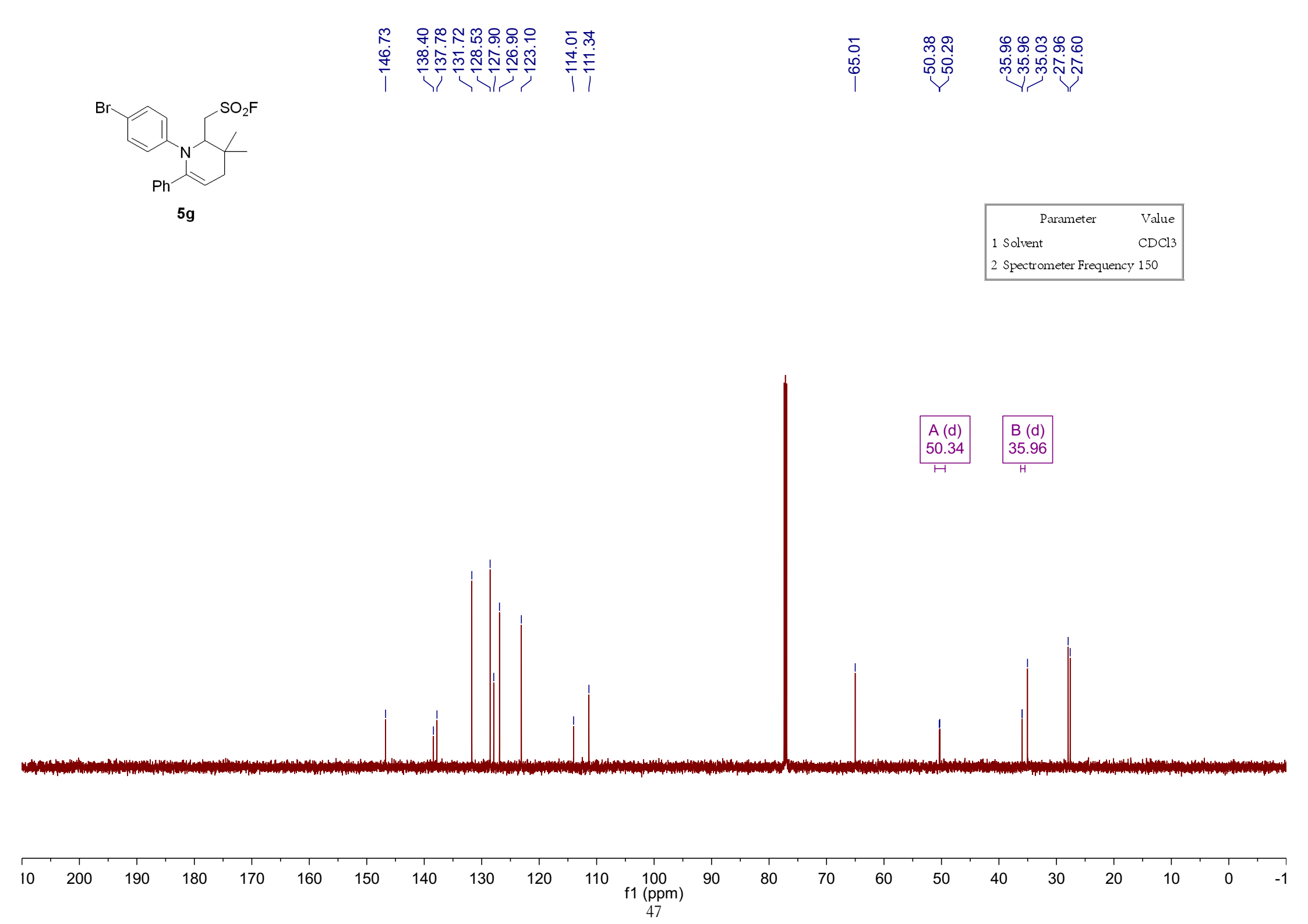
5f

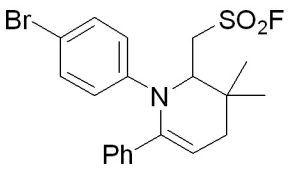
60.38

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.355
7.353
7.342
7.260
7.229
7.225
7.215
7.202
7.199
7.193
7.188
7.175
7.160
6.822
6.808
5.514
5.508
5.502
4.220
4.204
3.785
3.768
3.760
3.743
3.557
3.550
3.533
3.526
2.150
2.143
2.118
2.111
2.076
2.071
2.049
2.044
1.089
0.888
Br
SO2F
N
Ph
5g
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.03
3.01
2.03
2.00
1.01
1.06
1.03
1.04
2.07
3.04
3.07
f1 (ppm)

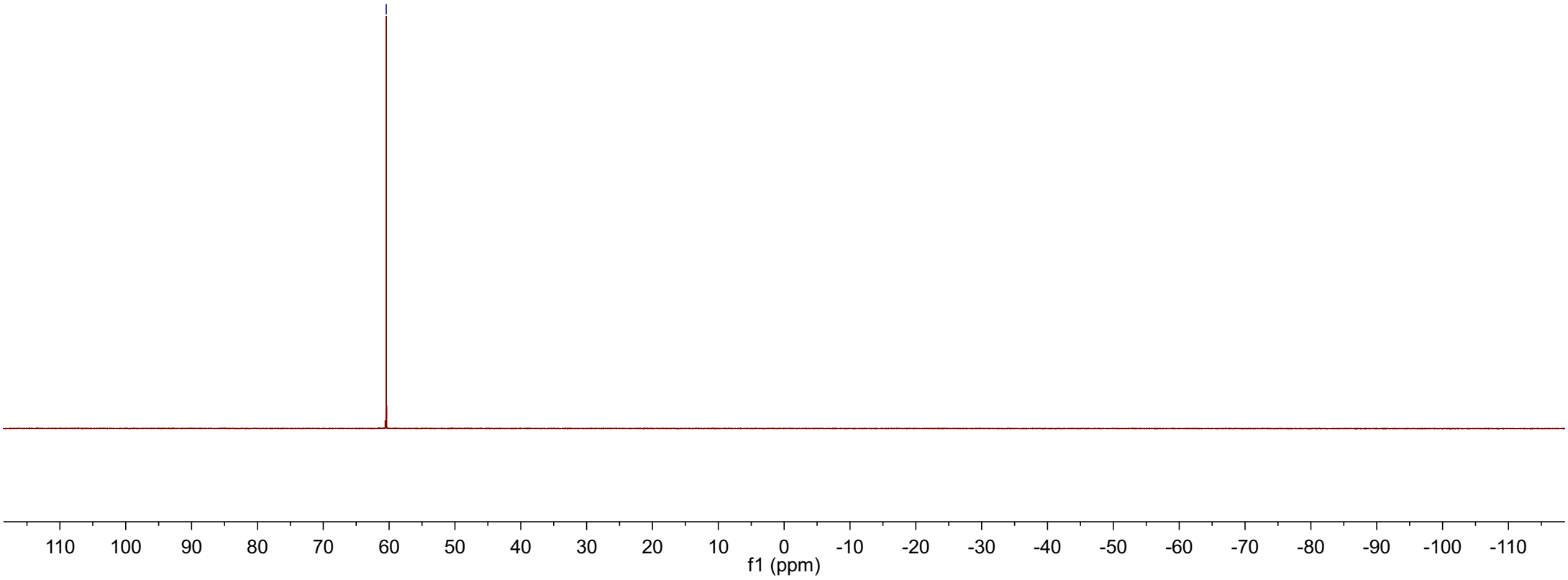

146.73
138.40
137.78
131.72
128.53
127.90
126.90
123.10
114.01
111.34
65.01
50.38
50.29
35.96
35.96
35.03
27.96
27.60
Br
SO2F
N
Ph
5g
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d) 50.34
B (d) 35.96
f1 (ppm)

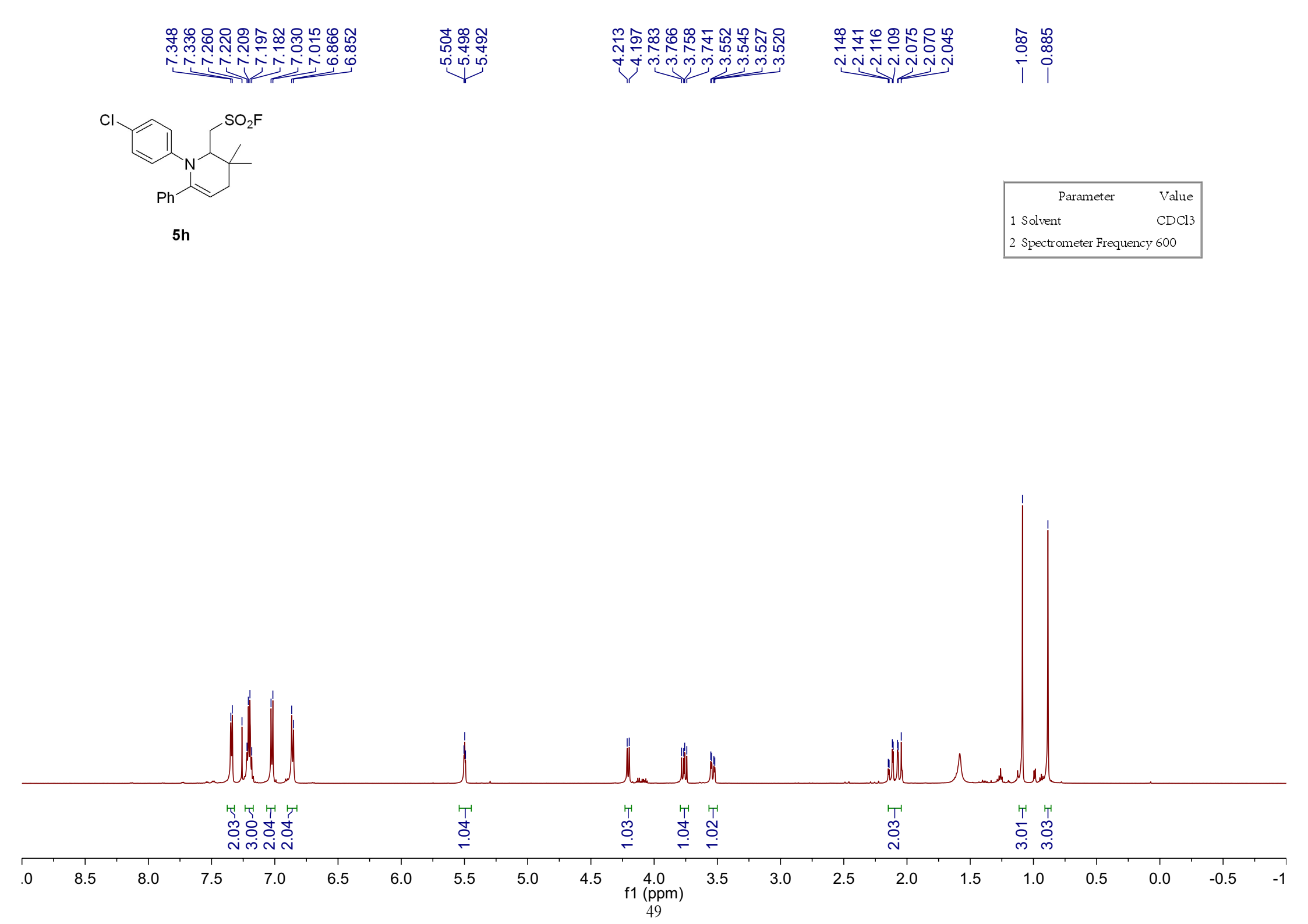


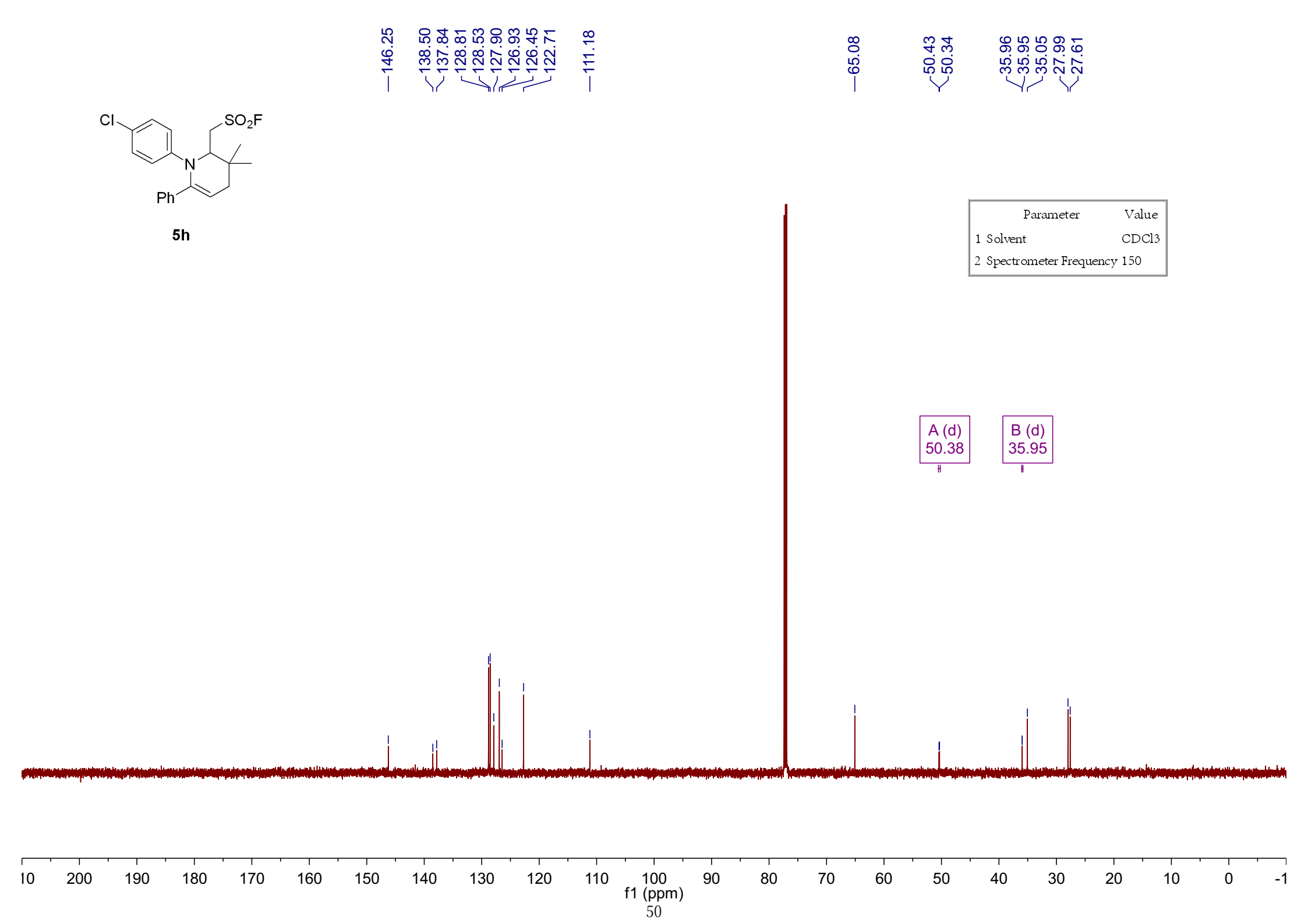
5g

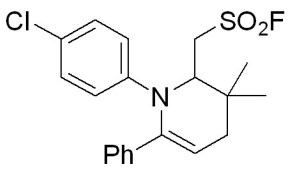
60.43

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.348
7.336
7.260
7.220
7.209
7.197
7.182
7.030
7.015
6.866
6.852
5.504
5.498
5.492
4.213
4.197
3.783
3.766
3.758
3.741
3.552
3.545
3.527
3.520
2.148
2.141
2.116
2.109
2.075
2.070
2.045
1.087
0.885
Cl
SO2F
N
Ph
5h
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.03
3.00
2.04
2.04
1.04
1.03
1.04
1.02
2.03
3.01
3.03
f1 (ppm)


146.25
138.50
137.84
128.81
128.53
127.90
126.93
126.45
122.71
111.18
65.08
50.43
50.34
35.96
35.95
35.05
27.99
27.61
Cl
SO2F
N
Ph
5h
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d) 50.38
B (d) 35.95
f1 (ppm)



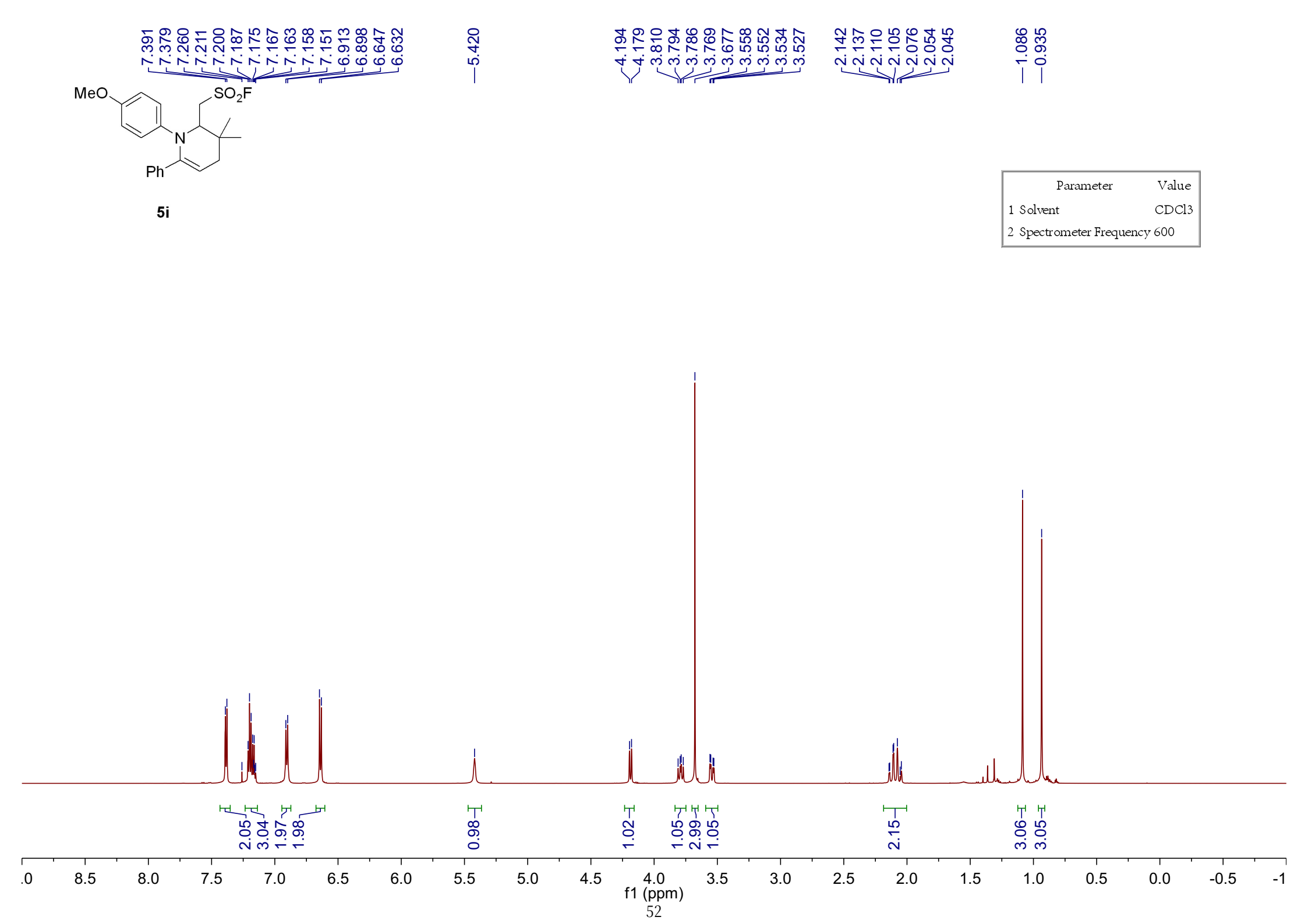
5h

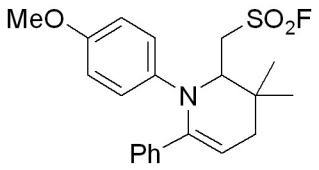
60.42

	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.391
7.379
7.260
7.211
7.200
7.187
7.175
7.167
7.163
7.158
7.151
6.913
6.898
6.647
6.632
5.420
4.194
4.179
3.810
3.794
3.786
3.769
3.677
3.558
3.552
3.534
3.527
2.142
2.137
2.110
2.105
2.076
2.054
2.045
1.086
0.935
MeO
SO2F
N
Ph
5i
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.05
3.04
1.97
1.98
0.98
1.02
1.05
2.99
1.05
2.15
3.06
3.05
f1 (ppm)



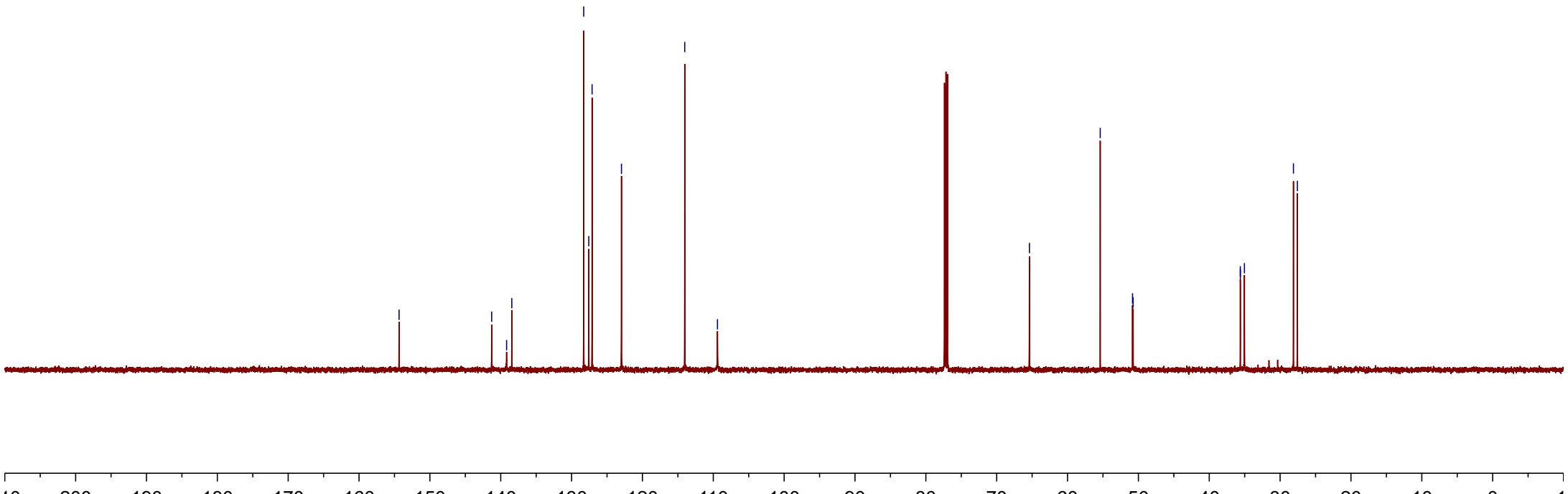
5i

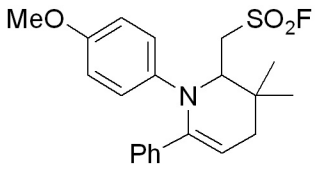
154.35
141.28
139.17
138.44
128.29
127.57
127.11
122.96
114.03
109.41
65.38
55.39
50.83
50.75
35.62
35.61
35.04
28.12
27.56

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

A (d) 50.79

B (d) 35.62





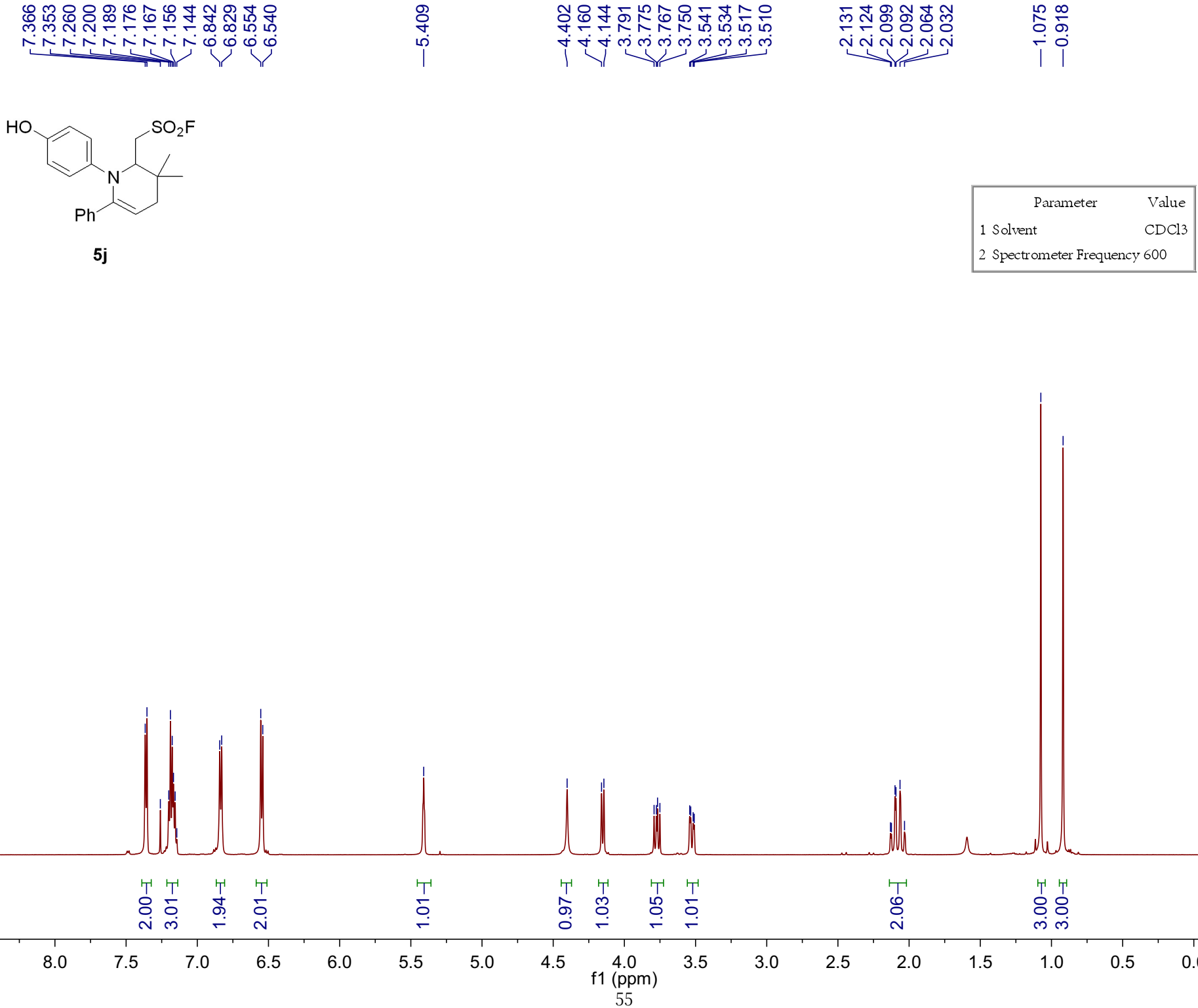
5i

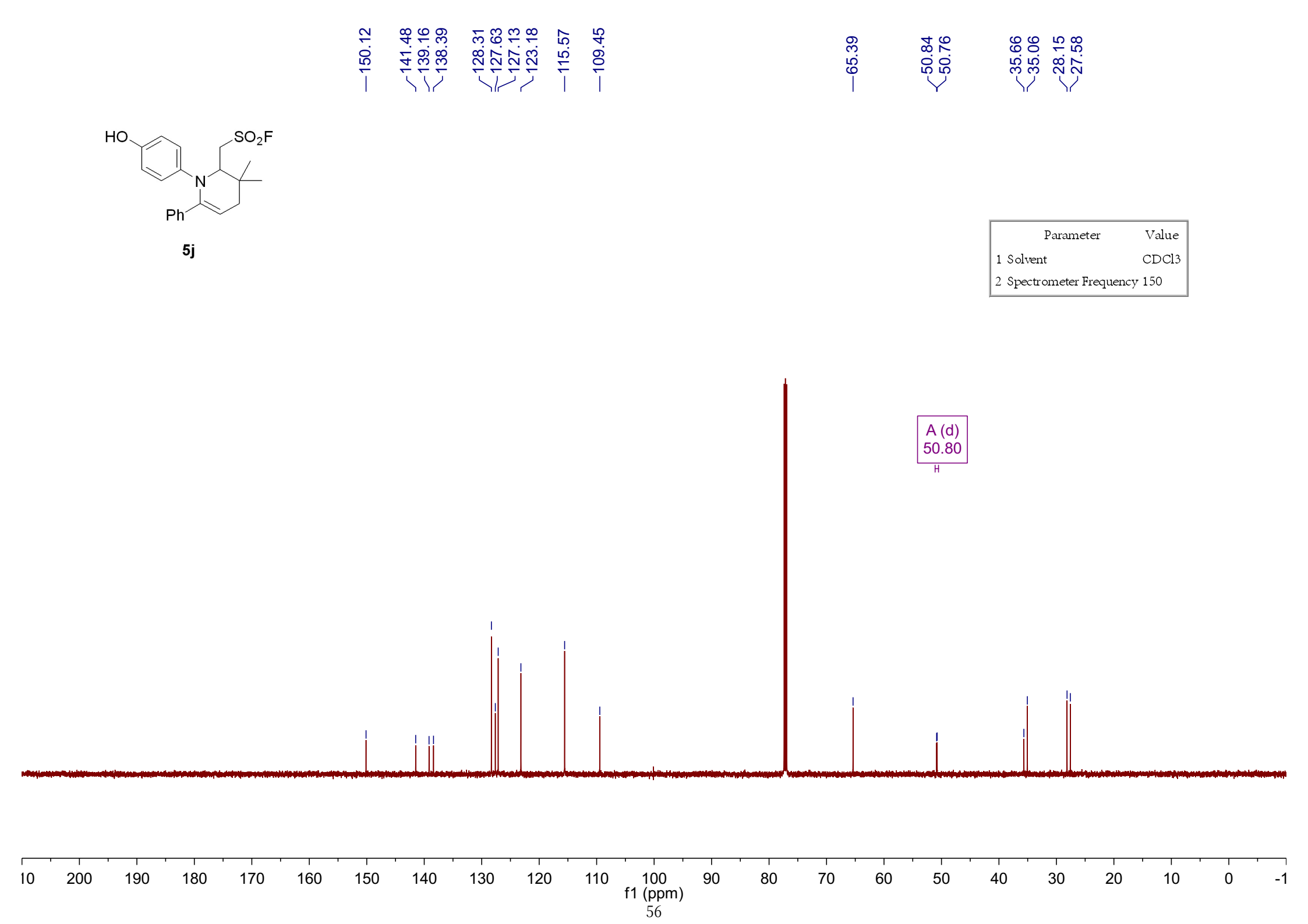
60.68

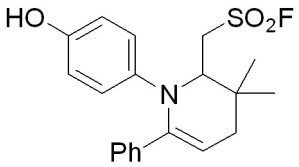
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.366
7.353
7.260
7.200
7.189
7.176
7.167
7.156
7.144
6.842
6.829
6.554
6.540
5.409
4.402
4.160
4.144
3.791
3.775
3.767
3.750
3.541
3.534
3.517
3.510
2.131
2.124
2.099
2.092
2.064
2.032
1.075
0.918
HO
SO2F
N
Ph
5j
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.00
3.01
1.94
2.01
1.01
0.97
1.03
1.05
1.01
2.06
3.00
3.00
f1 (ppm)


150.12
141.48
139.16
138.39
128.31
127.63
127.13
123.18
115.57
109.45
65.39
50.84
50.76
35.66
35.06
28.15
27.58
HO
SO2F
N
Ph
5j
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.80
H
f1 (ppm)



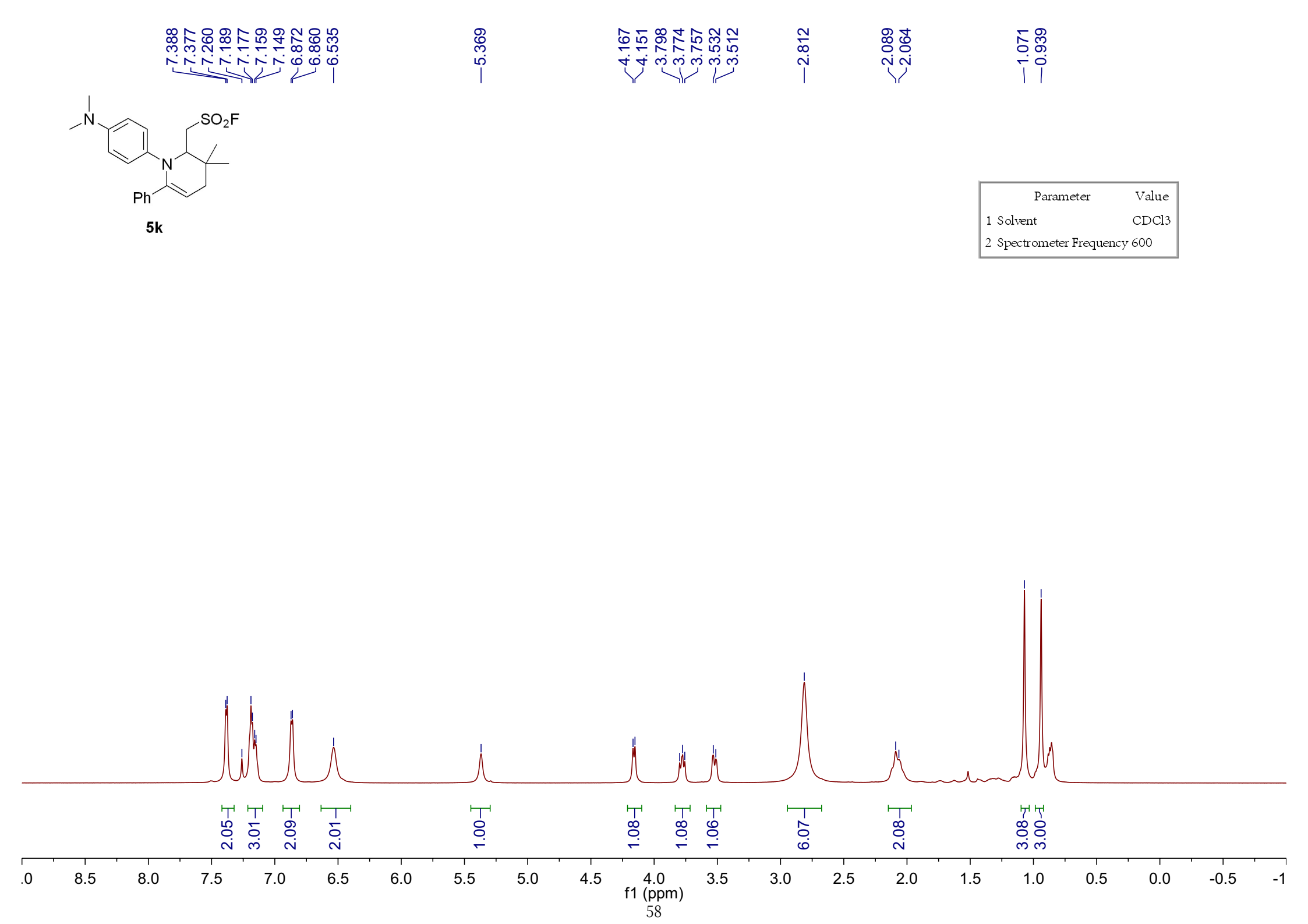
5j

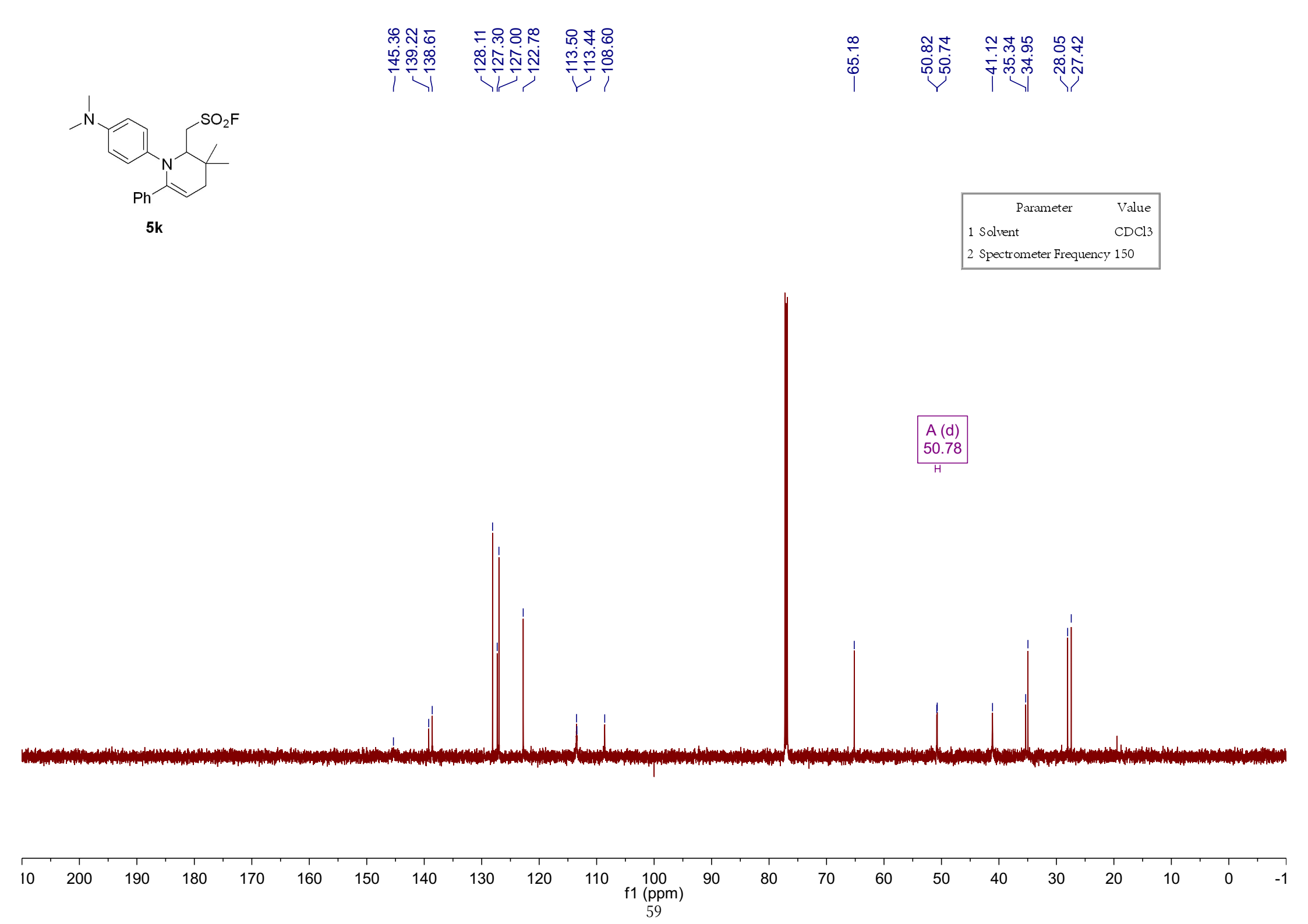
60.65

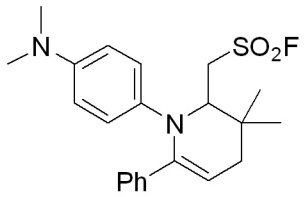
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.388
7.377
7.260
7.189
7.177
7.159
7.149
6.872
6.860
6.535
5.369
4.167
4.151
3.798
3.774
3.757
3.532
3.512
2.812
2.089
2.064
1.071
0.939
N
SO2F
N
Ph
5k
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.05
3.01
2.09
2.01
1.00
1.08
1.08
1.06
6.07
2.08
3.08
3.00
f1 (ppm)


145.36
139.22
138.61
128.11
127.30
127.00
122.78
113.50
113.44
108.60
65.18
50.82
50.74
41.12
35.34
34.95
28.05
27.42
SO2F
N
N
Ph
5k
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.78
H
f1 (ppm)



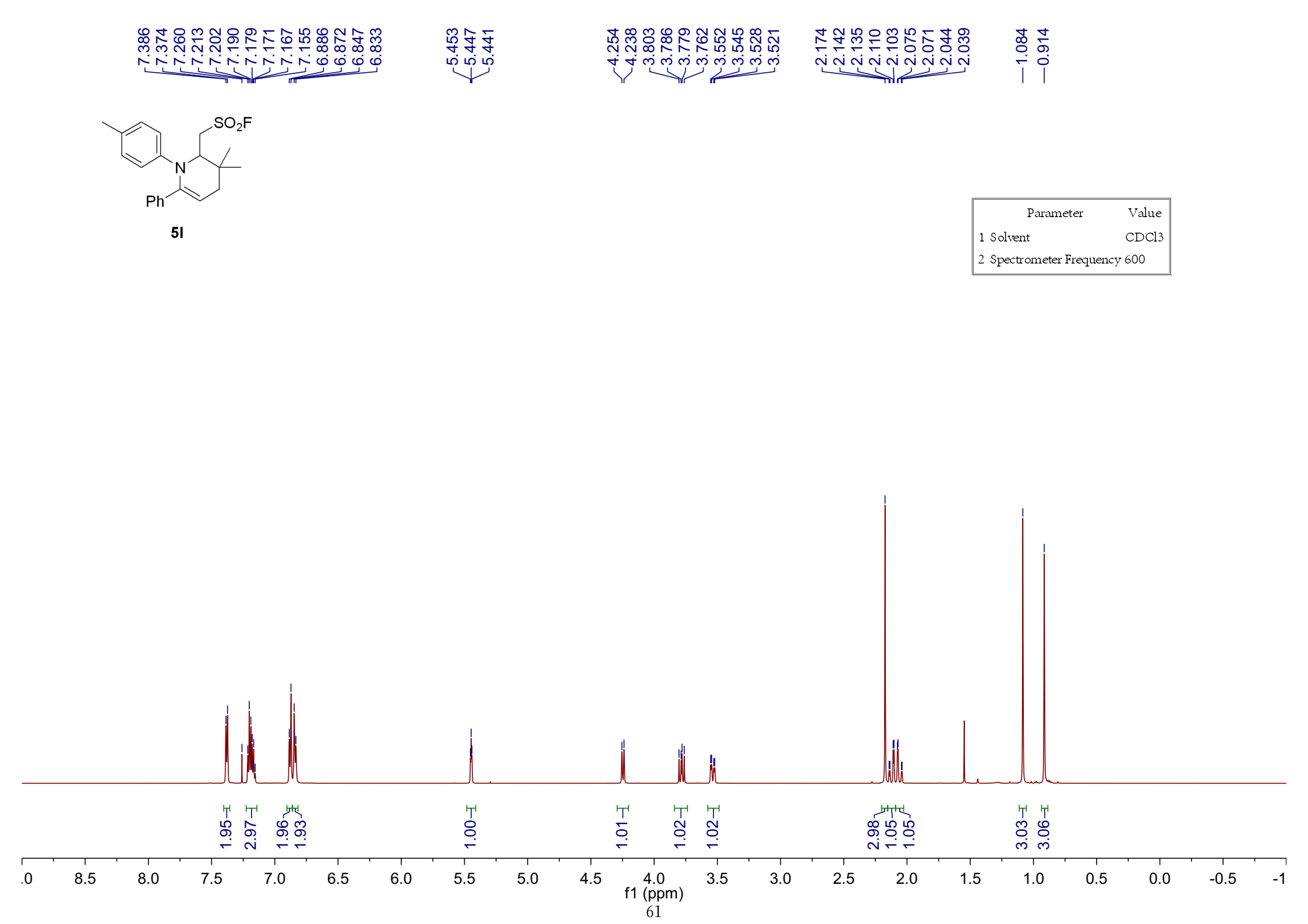
5k

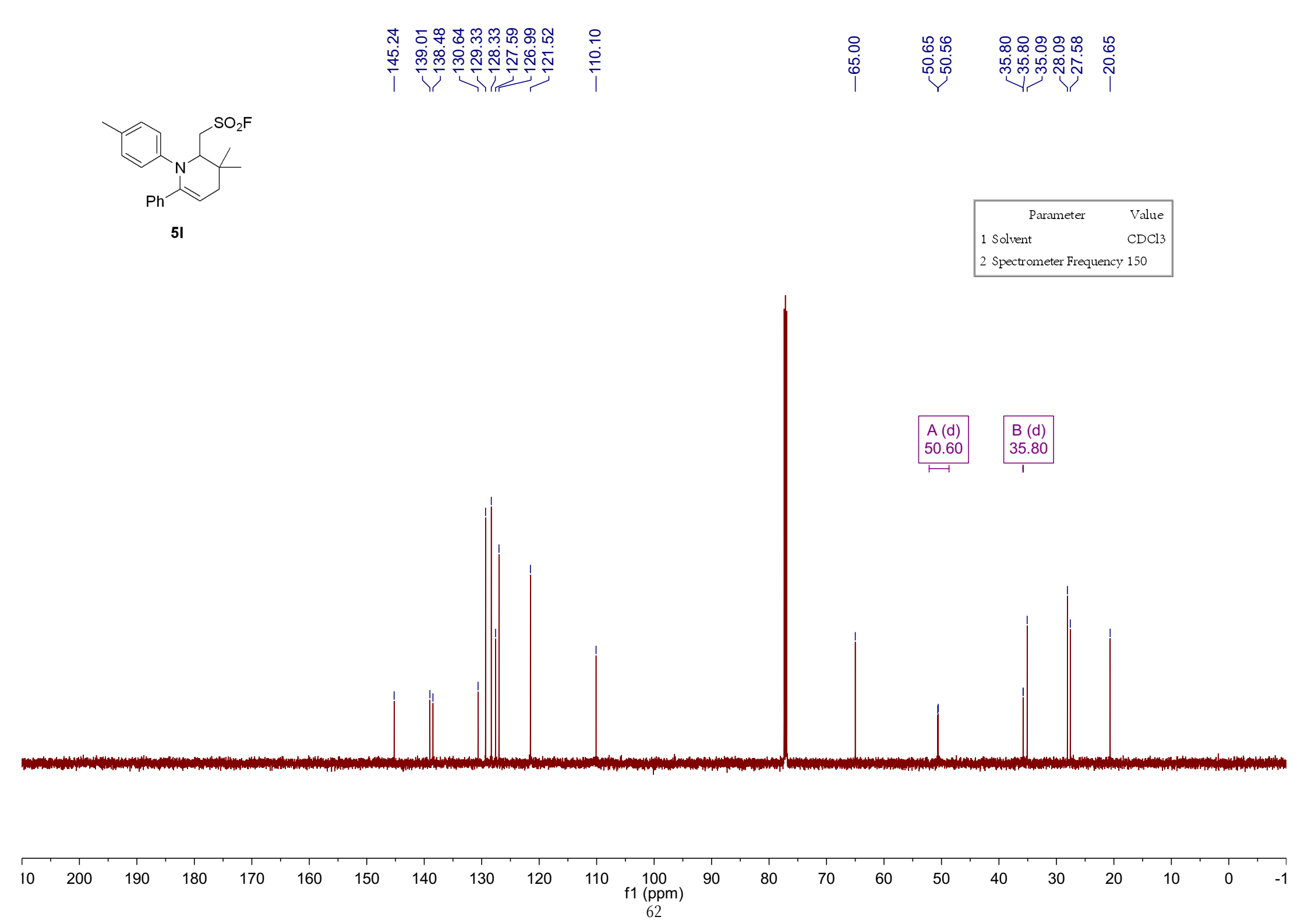
60.67

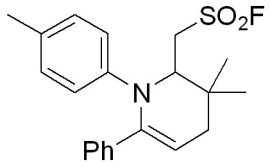
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.386
7.374
7.260
7.213
7.202
7.190
7.179
7.171
7.167
7.155
6.886
6.872
6.847
6.833
5.453
5.447
5.441
4.254
4.238
3.803
3.786
3.779
3.762
3.552
3.545
3.528
3.521
2.174
2.142
2.135
2.110
2.103
2.075
2.071
2.044
2.039
1.084
0.914
SO2F
N
Ph
5l
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
1.95
2.97
1.96
1.93
1.00
1.01
1.02
1.02
2.98
1.05
1.05
3.03
3.06
f1 (ppm)


145.24
139.01
138.48
130.64
129.33
128.33
127.59
126.99
121.52
110.10
65.00
50.65
50.56
35.80
35.80
35.09
28.09
27.58
20.65
SO2F
N
Ph
5l
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d) 50.60
B (d) 35.80
f1 (ppm)



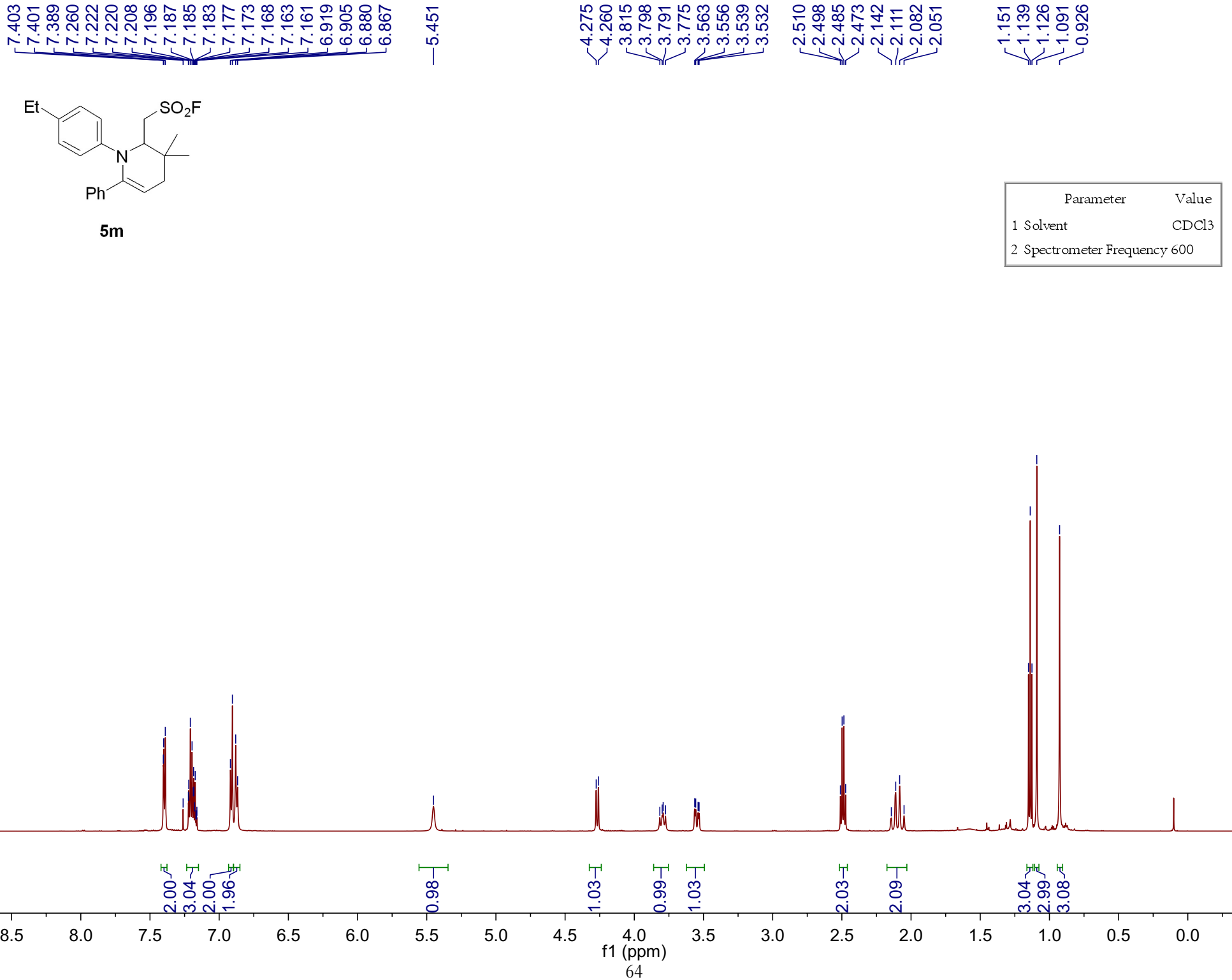
5l

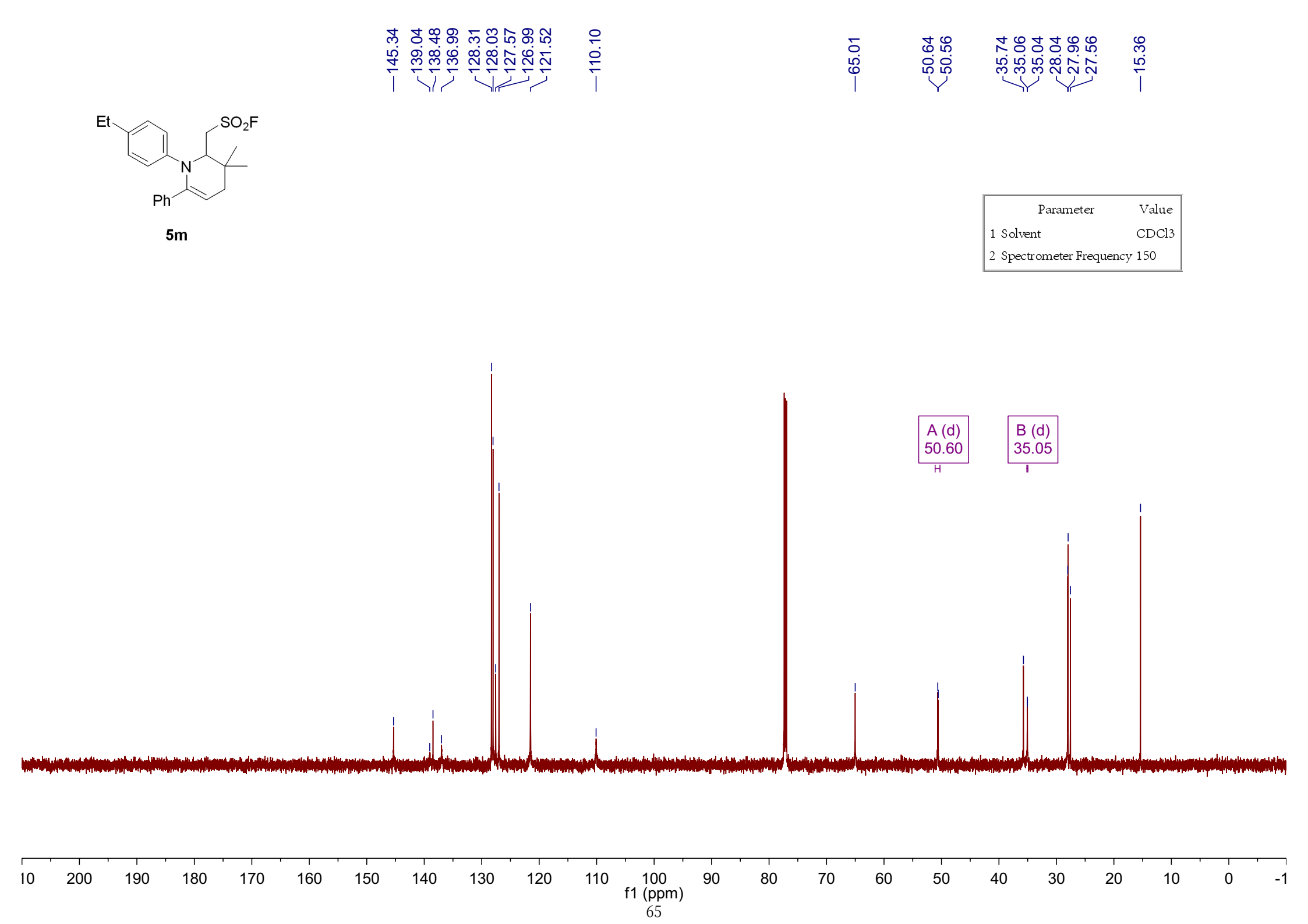
60.46

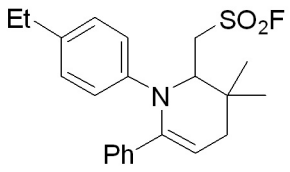
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.403
7.401
7.389
7.260
7.222
7.220
7.208
7.196
7.187
7.185
7.183
7.177
7.173
7.168
7.163
7.161
6.919
6.905
6.880
6.867
5.451
4.275
4.260
3.815
3.798
3.791
3.775
3.563
3.556
3.539
3.532
2.510
2.498
2.485
2.473
2.142
2.111
2.082
2.051
1.151
1.139
1.126
1.091
0.926
Et
SO2F
N
Ph
5m
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.00
3.04
2.00
1.96
0.98
1.03
0.99
1.03
2.03
2.09
3.04
2.99
3.08
f1 (ppm)


145.34
139.04
138.48
136.99
128.31
128.03
127.57
126.99
121.52
110.10
65.01
50.64
50.56
35.74
35.06
35.04
28.04
27.96
27.56
15.36
Et
SO2F
N
Ph
5m
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.60
H
B (d)
35.05
f1 (ppm)



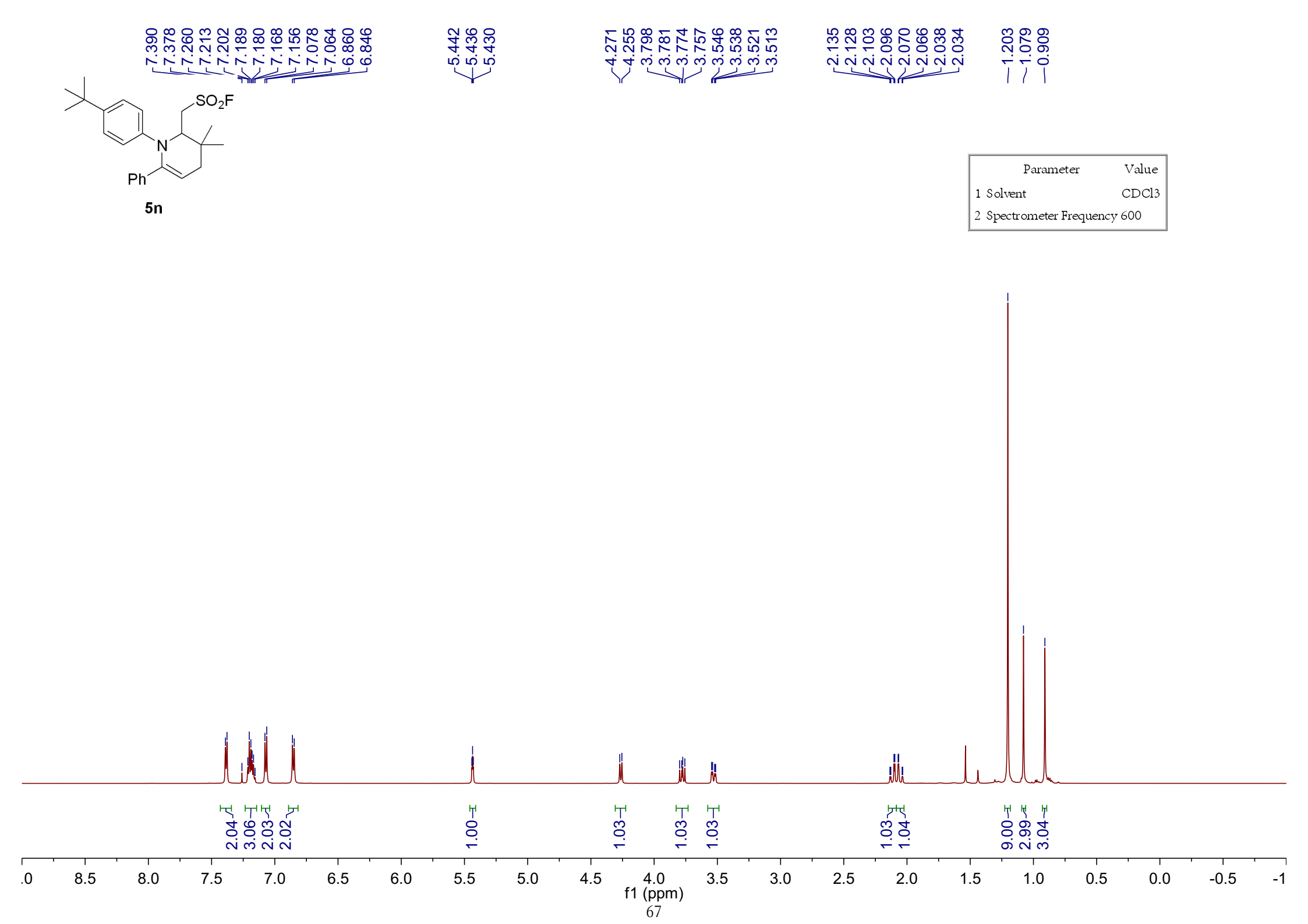
5m

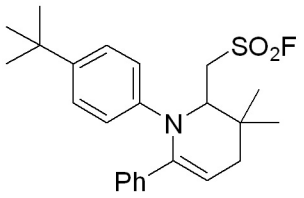
60.49

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.390
7.378
7.260
7.213
7.202
7.189
7.180
7.168
7.156
7.078
7.064
6.860
6.846
5.442
5.436
5.430
4.271
4.255
3.798
3.781
3.774
3.757
3.546
3.538
3.521
3.513
2.135
2.128
2.103
2.096
2.070
2.066
2.038
2.034
1.203
1.079
0.909
SO2F
N
Ph
5n
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.04
3.06
2.03
2.02
1.00
1.03
1.03
1.03
1.03
1.04
9.00
2.99
3.04
f1 (ppm)



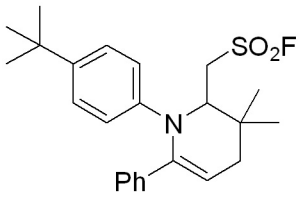
5n

145.00
143.90
139.03
138.56
128.31
127.54
127.00
125.51
121.05
110.10
64.94
50.66
50.57
35.72
35.13
34.09
31.48
28.04
27.58

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

A (d)
50.61

f1 (ppm)



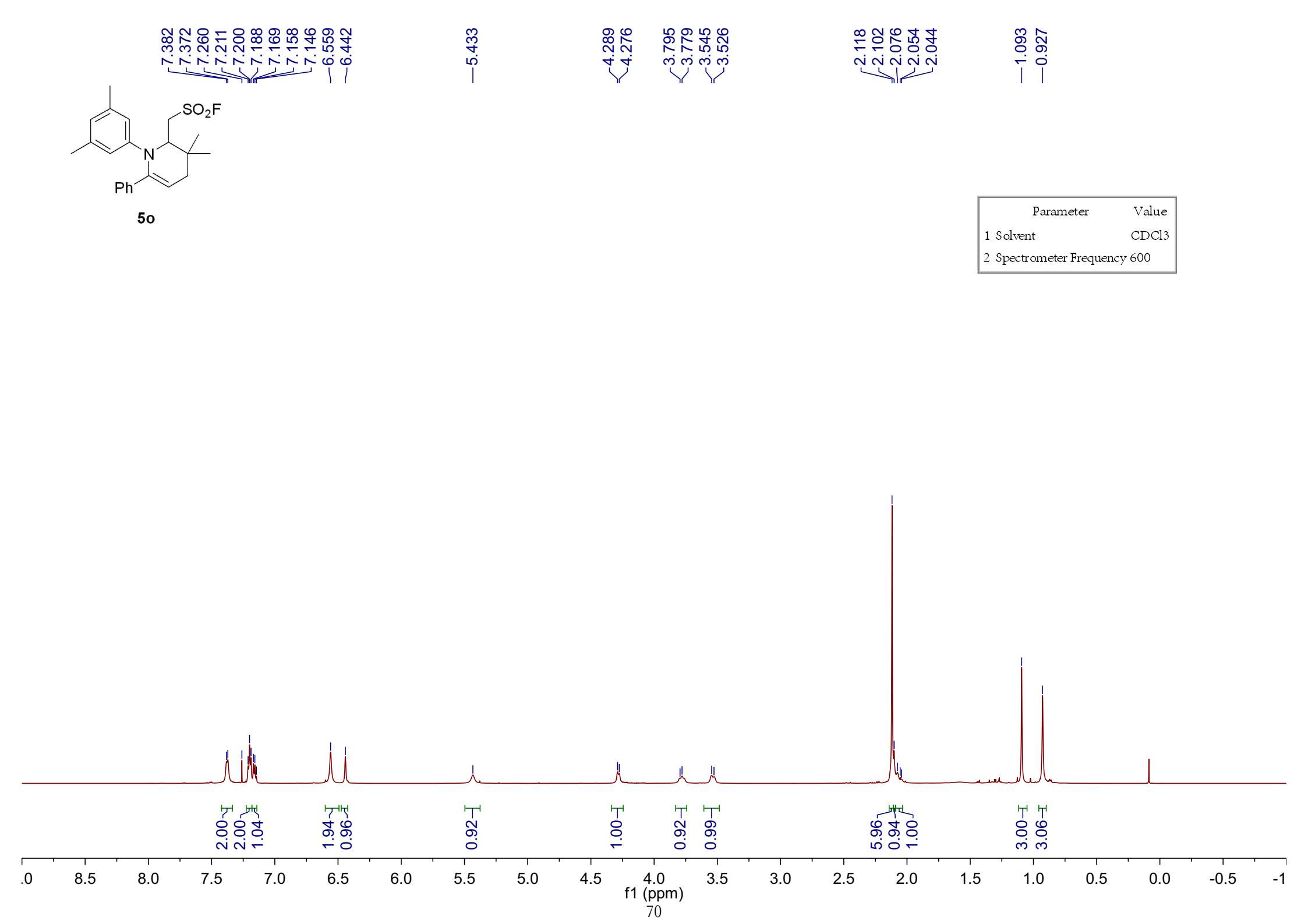
5n

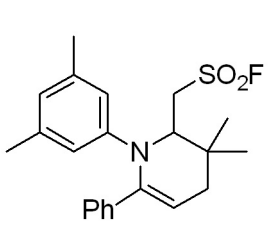
60.44

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.382
7.372
7.260
7.211
7.200
7.188
7.169
7.158
7.146
6.559
6.442
5.433
4.289
4.276
3.795
3.779
3.545
3.526
2.118
2.102
2.076
2.054
2.044
1.093
0.927
SO2F
N
Ph
5o
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.00
2.00
1.04
1.94
0.96
0.92
1.00
0.92
0.99
5.96
0.94
1.00
3.00
3.06
f1 (ppm)



5o

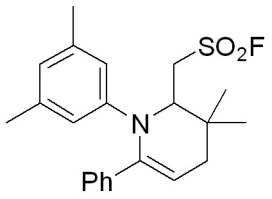
147.53
139.12
138.65
137.96
128.30
127.48
126.86
123.15
119.51
110.26
64.66
50.67
50.59
35.85
35.12
28.07
27.62
21.55

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

B (d)
50.63

A (d)
35.48

f1 (ppm)



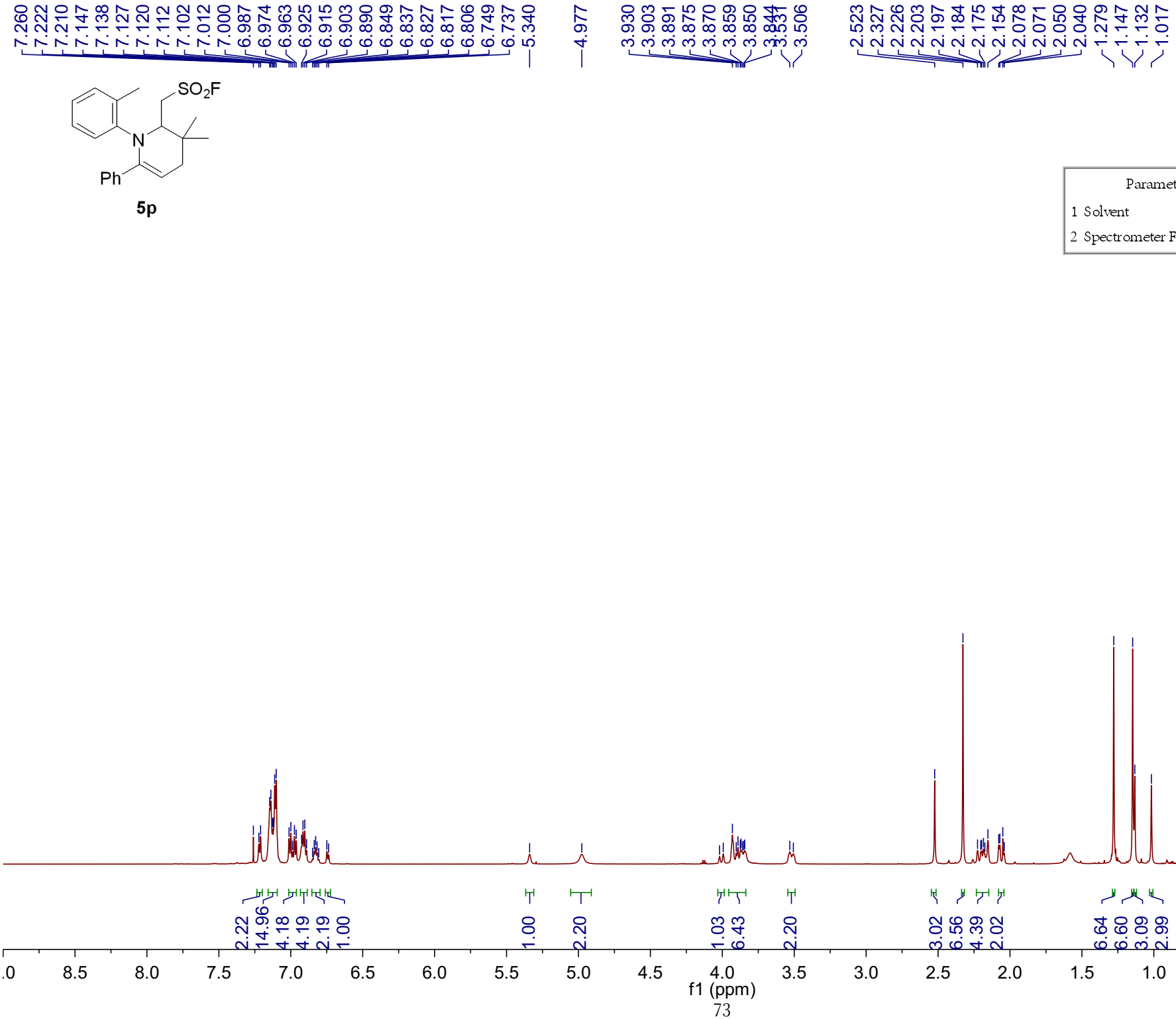
5o

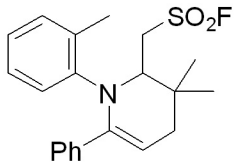
60.48

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.260
7.222
7.210
7.147
7.138
7.127
7.120
7.112
7.102
7.012
7.000
6.987
6.974
6.963
6.925
6.915
6.903
6.890
6.849
6.837
6.827
6.817
6.806
6.749
6.737
5.340
4.977
3.930
3.903
3.891
3.875
3.870
3.859
3.850
3.844
3.531
3.506
2.523
2.327
2.226
2.203
2.197
2.184
2.175
2.154
2.078
2.071
2.050
2.040
1.279
1.147
1.132
1.017
SO2F
N
Ph
5p
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.22
14.96
4.18
4.19
2.19
1.00
1.00
2.20
1.03
6.43
2.20
3.02
6.56
4.39
2.02
6.64
6.60
3.09
2.99
f1 (ppm)



5p

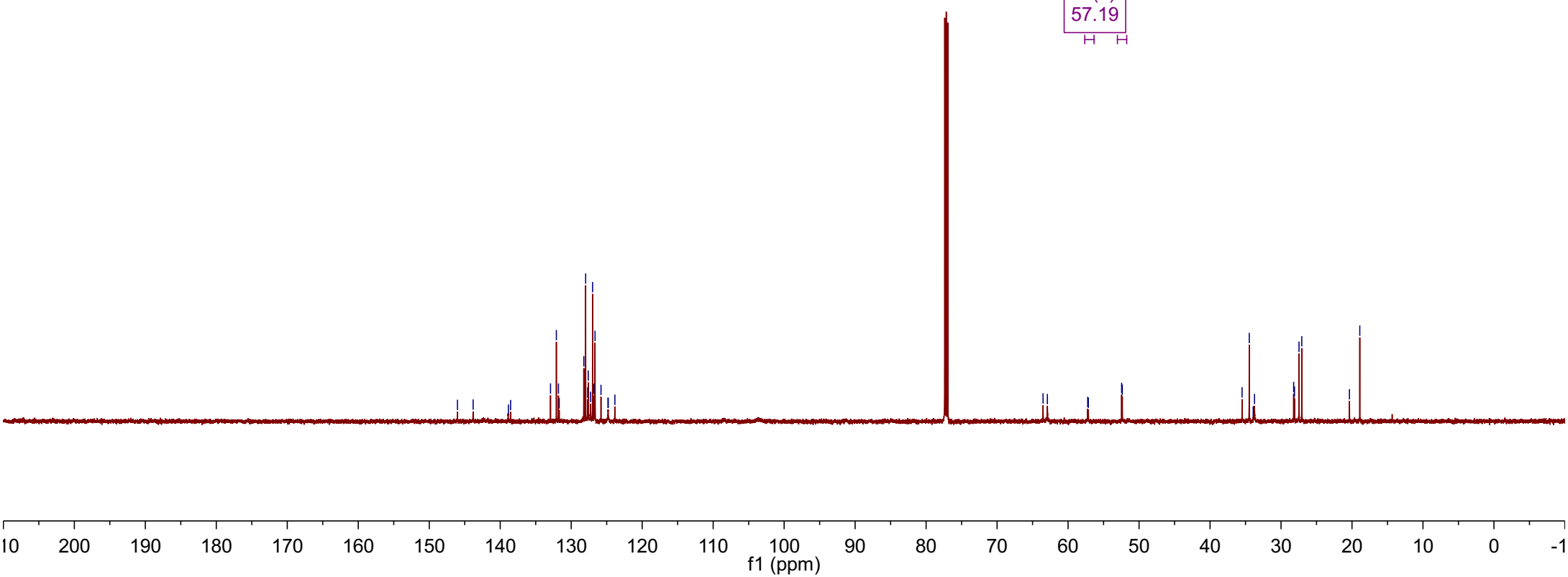
146.03
143.82
138.85
138.54
132.91
132.09
131.80
131.69
128.22
127.96
127.68
127.60
127.28
126.99
126.79
126.65
125.80
124.81
124.79
123.84

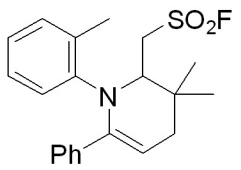
63.53
62.91
57.23
57.14
52.45
52.36
35.49
34.48
33.92
33.74
28.22
28.11
27.47
27.07
20.36
18.90

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

B (d)
52.41

A (d)
57.19



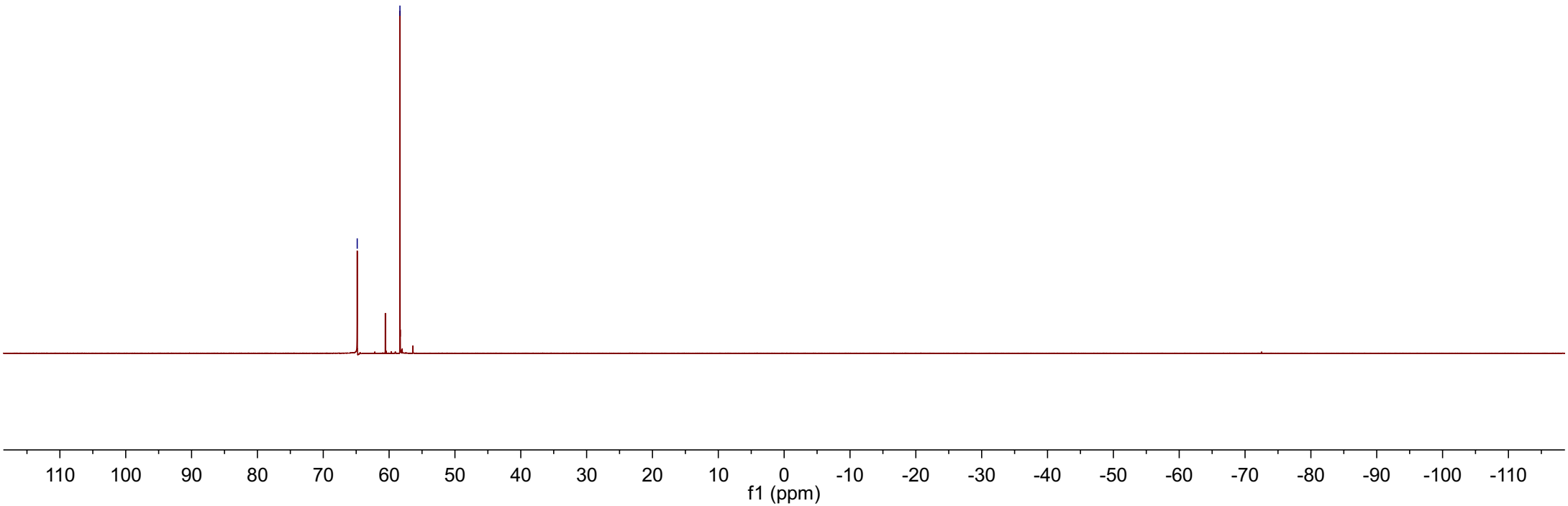


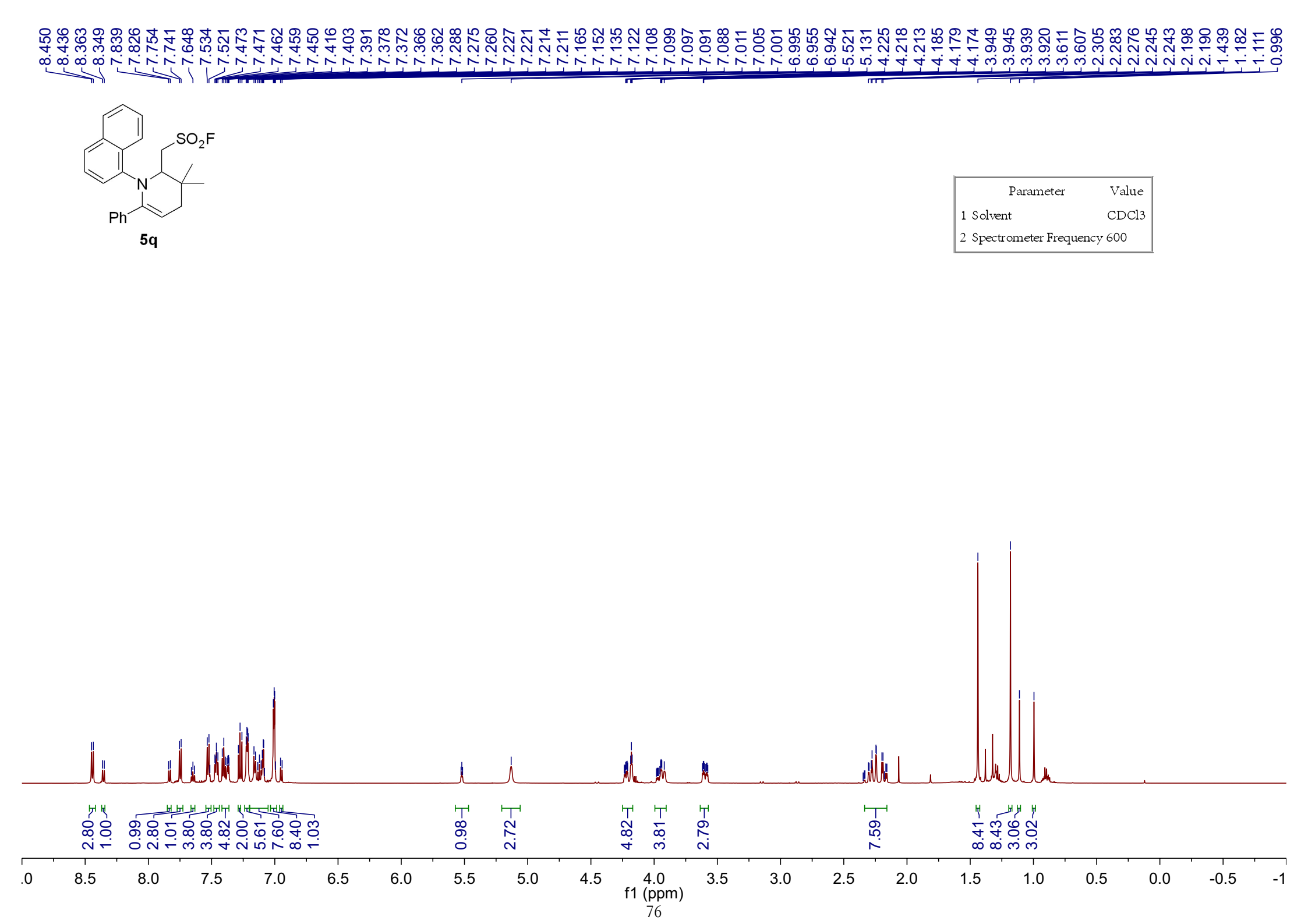
5p

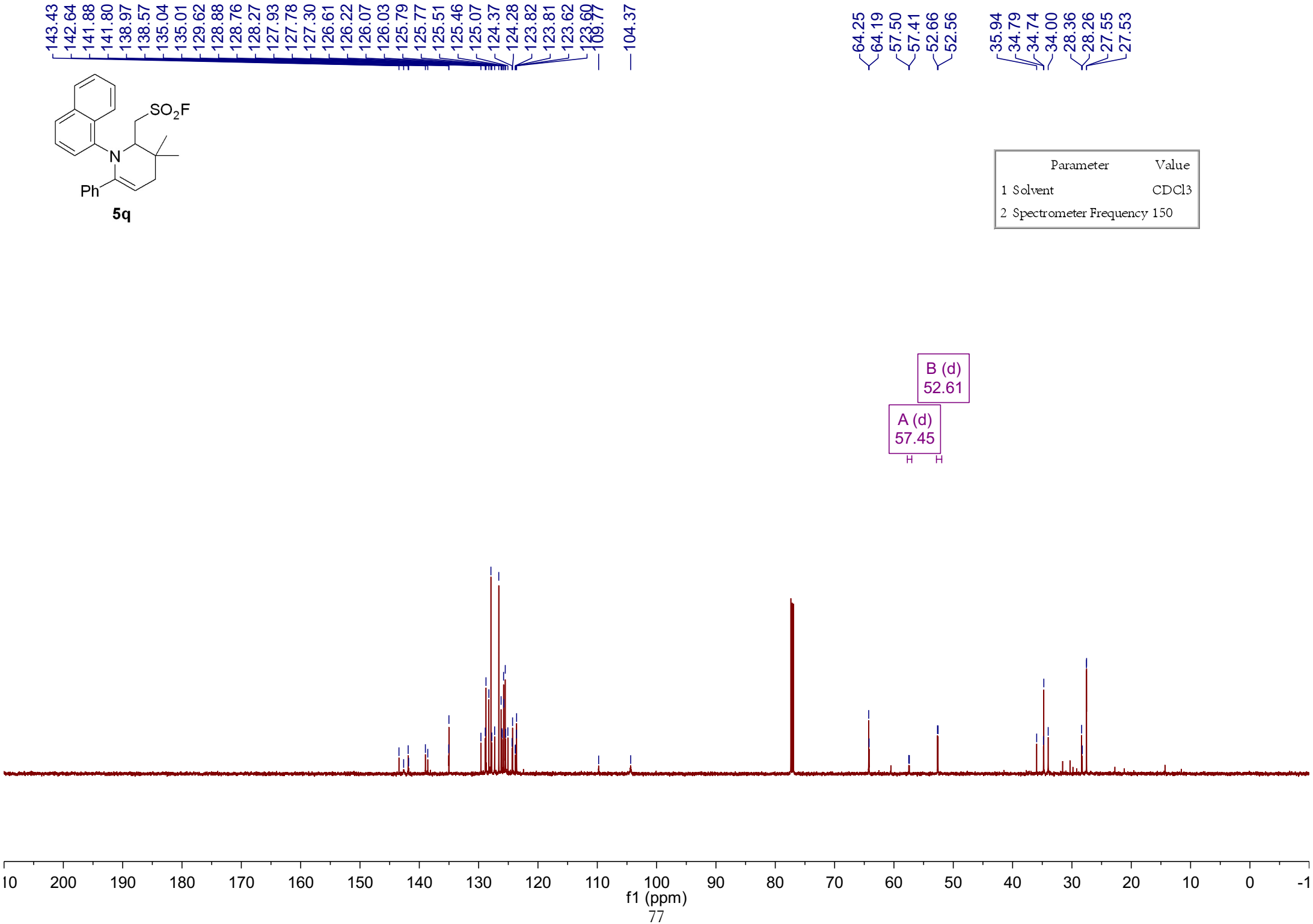
64.84

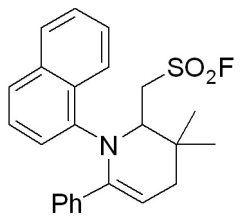
58.35

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




8.450 8.436 8.363 8.349 7.839 7.826 7.754 7.741 7.648 7.534 7.521 7.473 7.471 7.462 7.459 7.450 7.416 7.403 7.391 7.378 7.372 7.366 7.362 7.288 7.275 7.260 7.227 7.221 7.214 7.211 7.165 7.152 7.135 7.122 7.108 7.099 7.097 7.091 7.088 7.011 7.005 7.001 6.995 6.955 6.942 5.521 5.131 4.225 4.218 4.213 4.185 4.179 4.174 3.949 3.945 3.939 3.920 3.611 3.607 2.305 2.283 2.276 2.245 2.243 2.198 2.190 1.439 1.182 1.111 0.996
SO2F
N
Ph
5q
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.80 1.00 0.99 2.80 1.01 3.80 3.80 4.82 2.00 5.61 7.60 8.40 1.03 0.98 2.72 4.82 3.81 2.79 7.59 8.41 8.43 3.06 3.02
f1 (ppm)

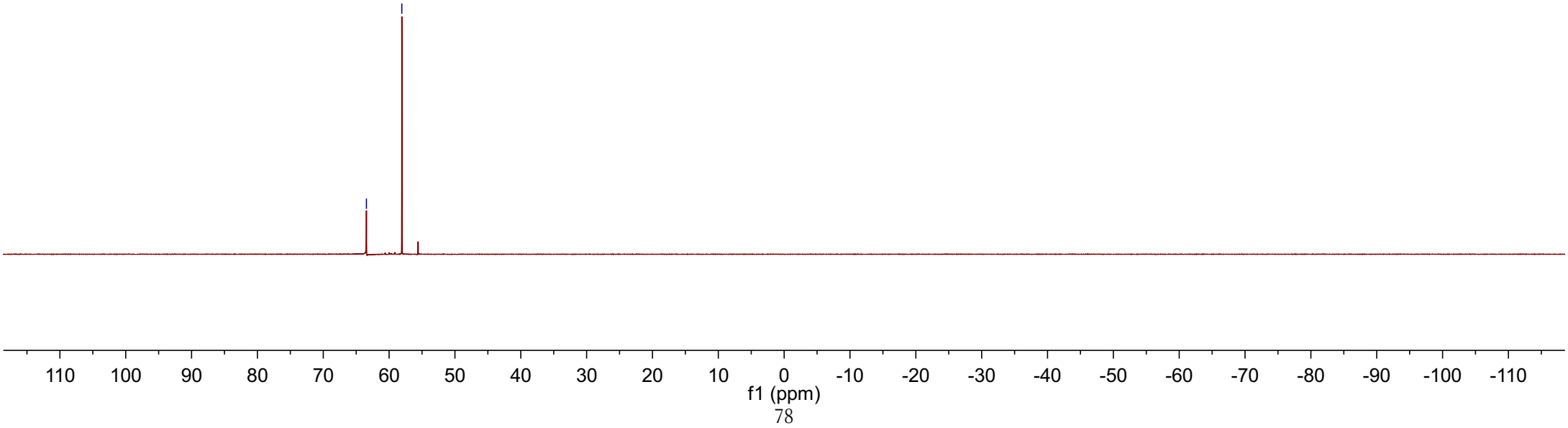

143.43
142.64
141.88
141.80
138.97
138.57
135.04
135.01
129.62
128.88
128.76
128.27
127.93
127.78
127.30
126.61
126.22
126.07
126.03
125.79
125.77
125.51
125.46
125.07
124.37
124.28
123.82
123.81
123.62
123.60
109.77
104.37
64.25
64.19
57.50
57.41
52.66
52.56
35.94
34.79
34.74
34.00
28.36
28.26
27.55
27.53
SO2F
N
Ph
5q
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
B (d)
52.61
A (d)
57.45
H H
f1 (ppm)

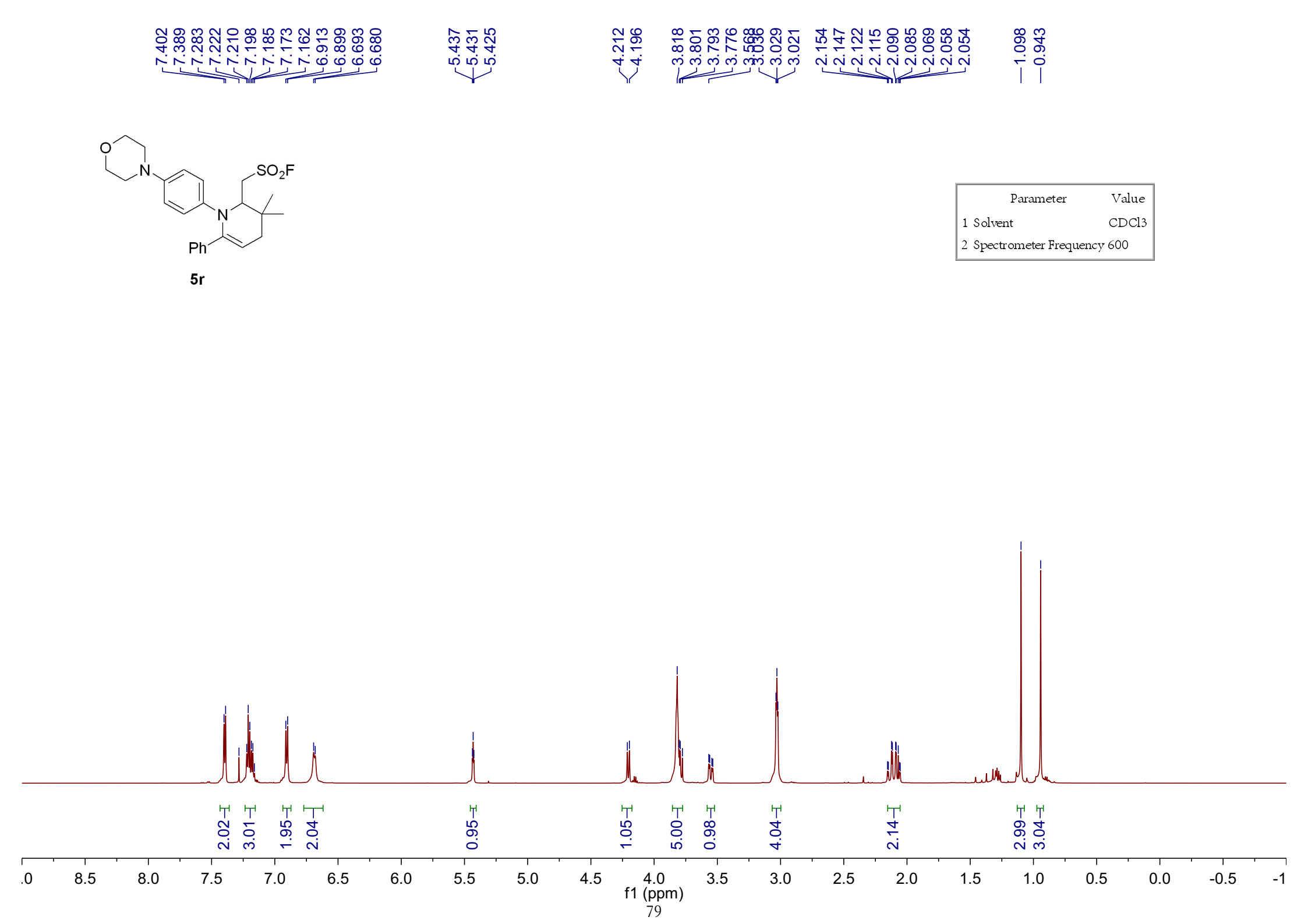


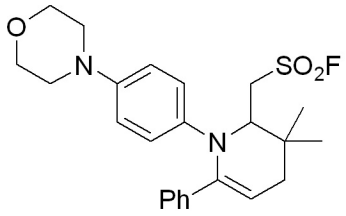
5q

63.45
58.07

	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565




7.402
7.389
7.283
7.222
7.210
7.198
7.185
7.173
7.162
6.913
6.899
6.693
6.680
5.437
5.431
5.425
4.212
4.196
3.818
3.801
3.793
3.776
3.568
3.038
3.029
3.021
2.154
2.147
2.122
2.115
2.090
2.085
2.069
2.058
2.054
1.098
0.943
O
N
SO2F
N
Ph
5r
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.02
3.01
1.95
2.04
0.95
1.05
5.00
0.98
4.04
2.14
2.99
3.04
f1 (ppm)

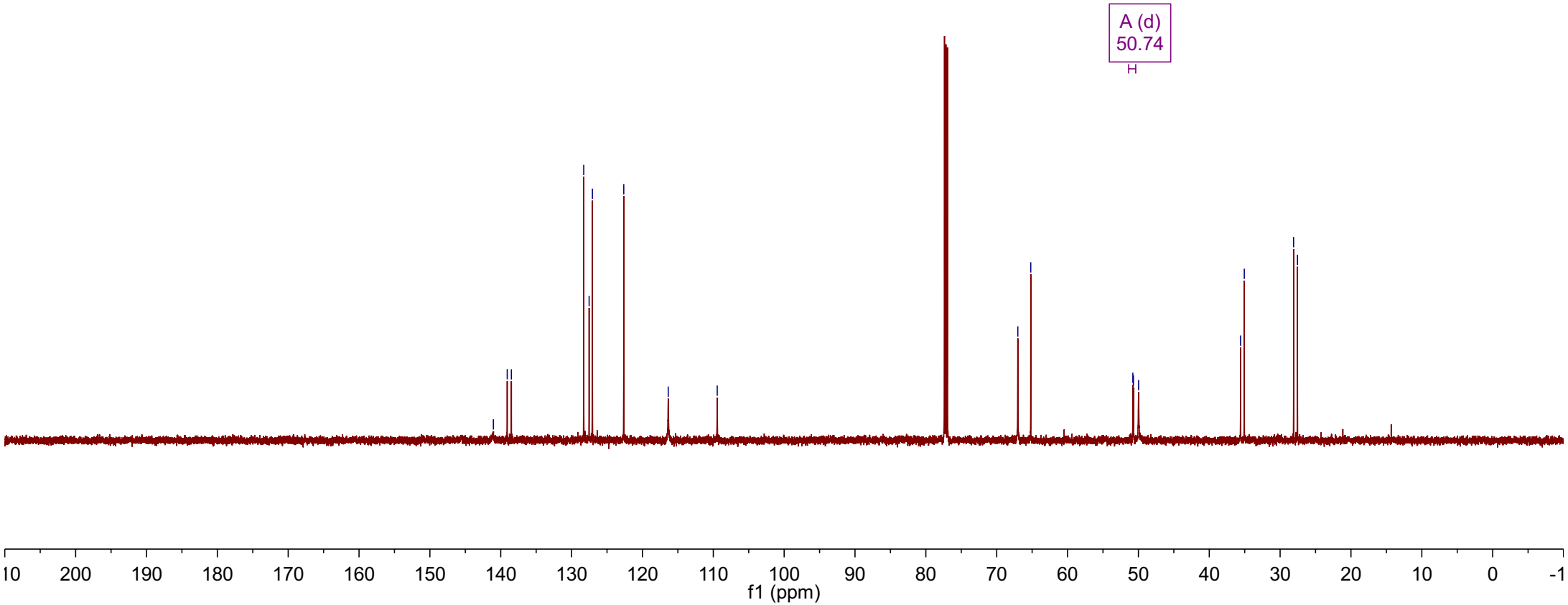


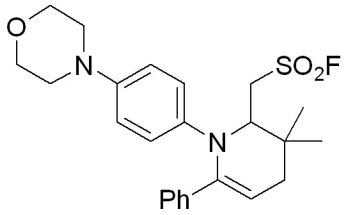
5r

141.04
139.09
138.50
128.29
127.53
127.06
122.63
116.36
109.45
67.02
65.19
50.78
50.70
49.97
35.58
35.06
28.09
27.55

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

A (d)
50.74
H

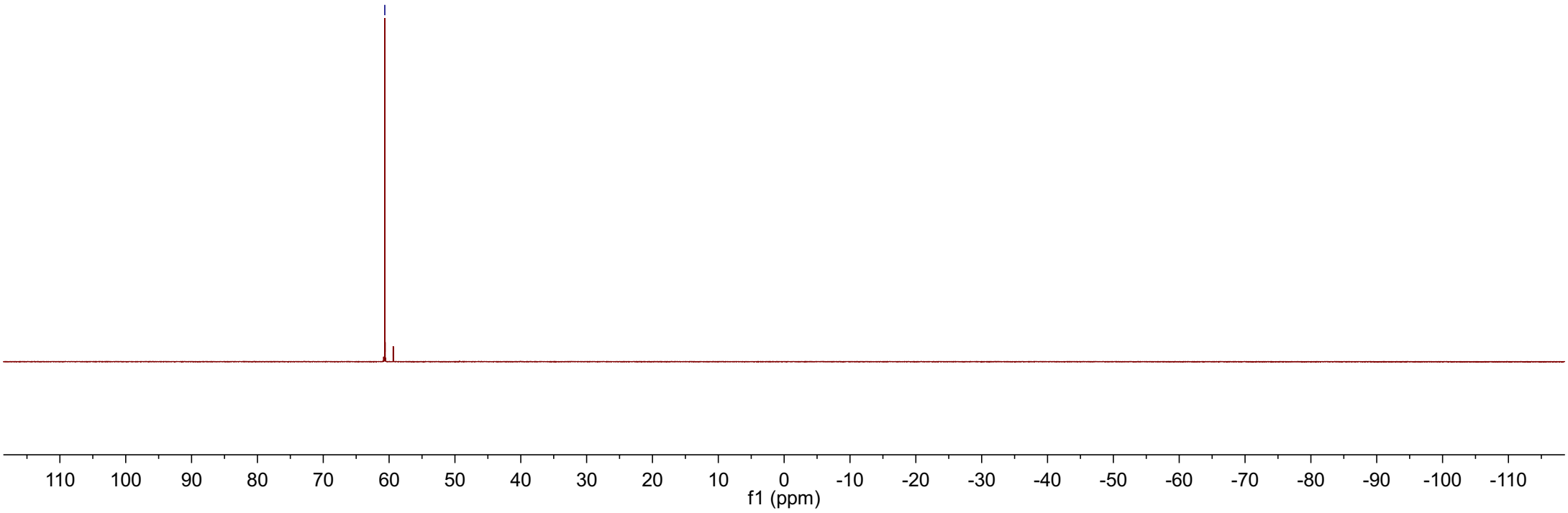


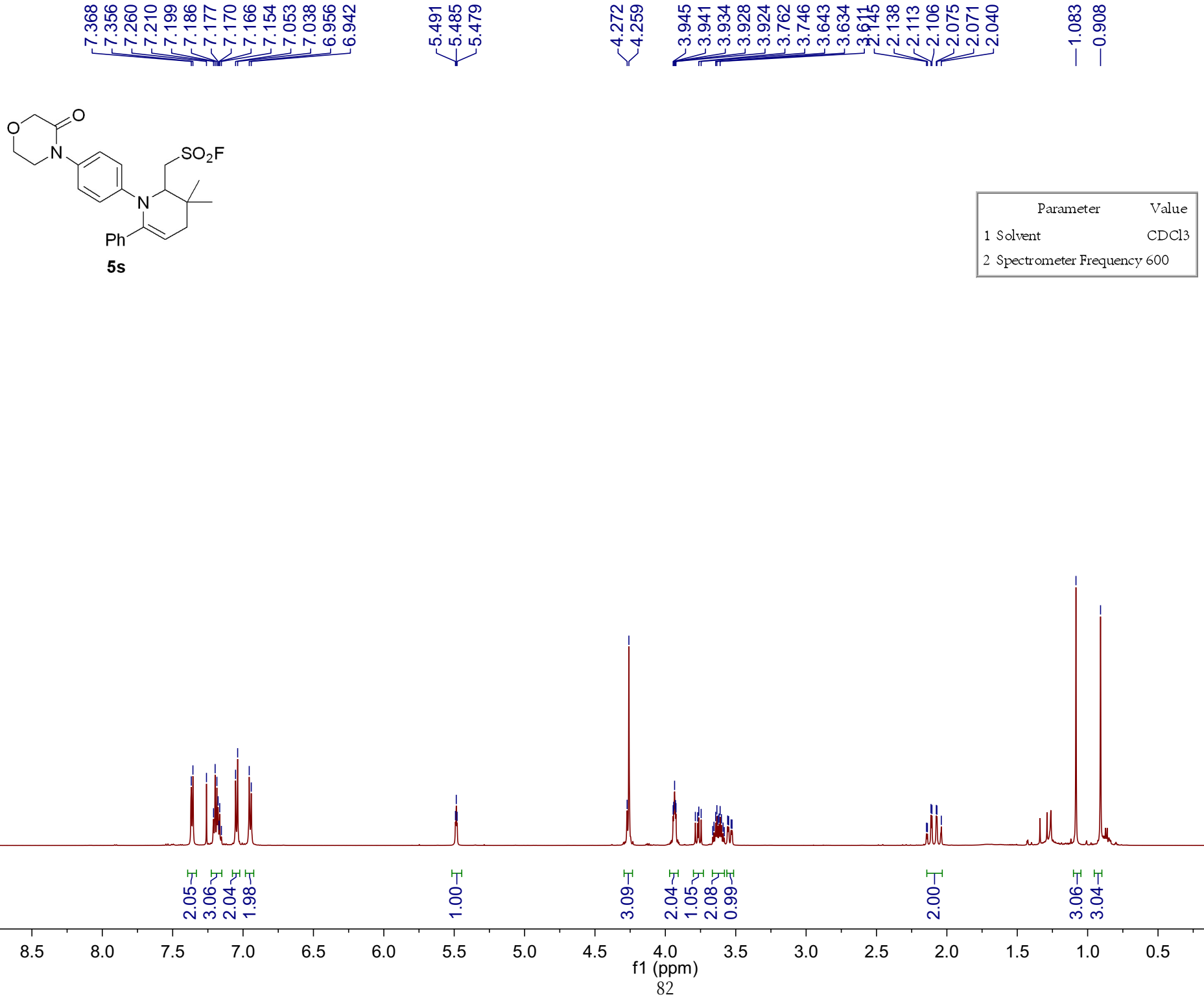


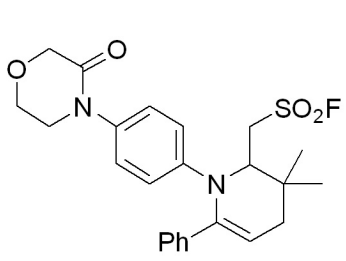
5r

60.65

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.368
7.356
7.260
7.210
7.199
7.186
7.177
7.170
7.166
7.154
7.053
7.038
6.956
6.942
5.491
5.485
5.479
4.272
4.259
3.945
3.941
3.934
3.928
3.924
3.762
3.746
3.643
3.634
3.611
2.145
2.138
2.113
2.106
2.075
2.071
2.040
1.083
0.908
O
O
N
SO2F
N
Ph
5s
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.05
3.06
2.04
1.98
1.00
3.09
2.04
1.05
2.08
0.99
2.00
3.06
3.04
f1 (ppm)

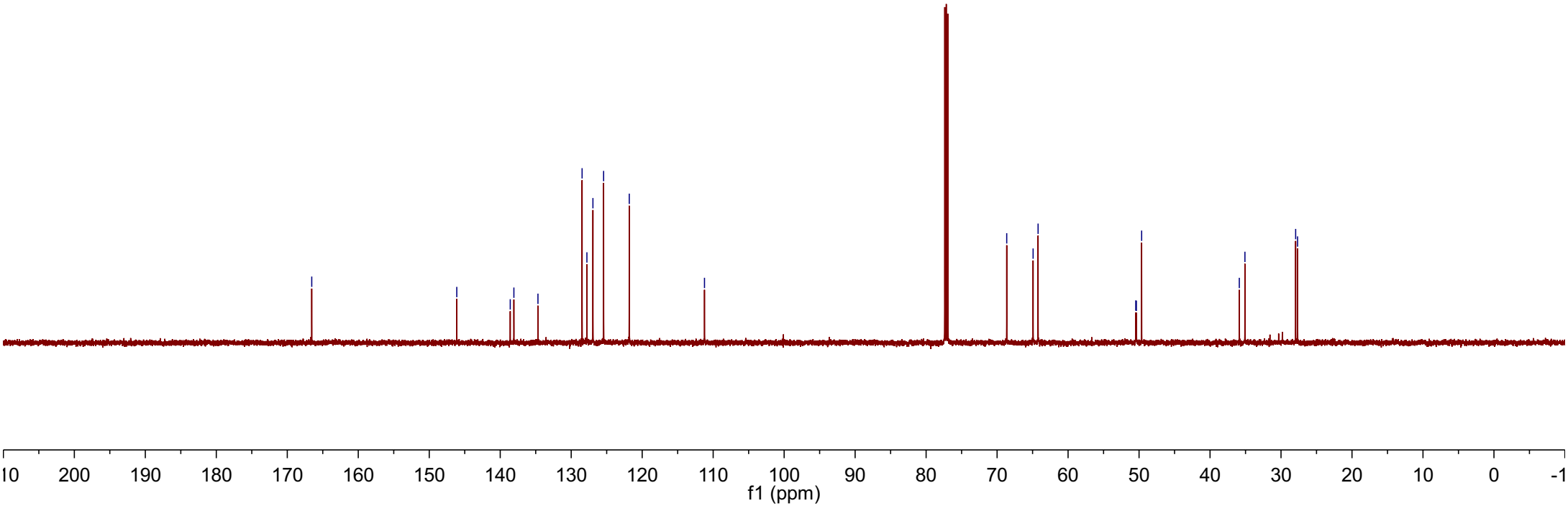


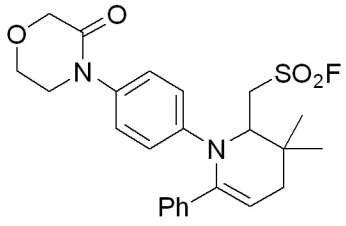
5s

166.55
146.12
138.59
138.07
134.68
128.46
127.79
126.94
125.43
121.82
111.22
68.64
64.93
64.22
50.46
50.38
49.63
35.88
35.08
27.94
27.67

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

A (d)
50.42
H

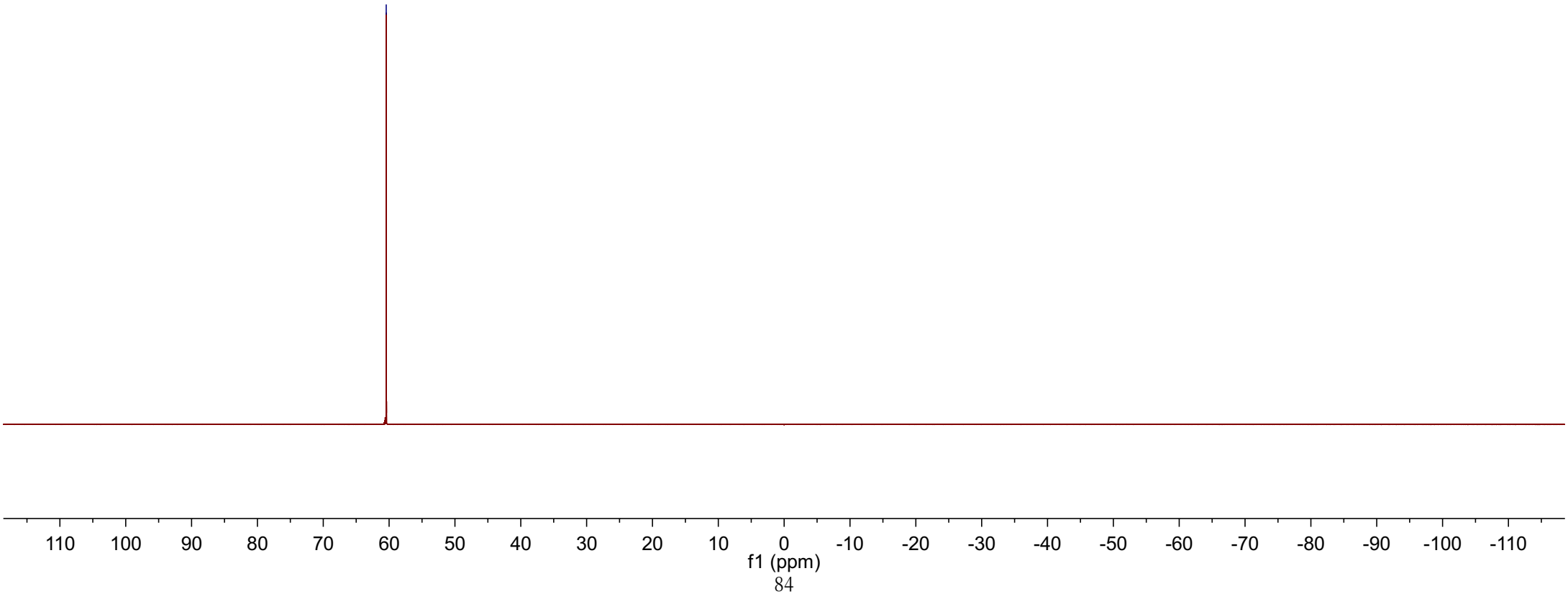


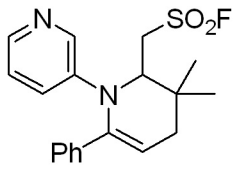


5s

60.44

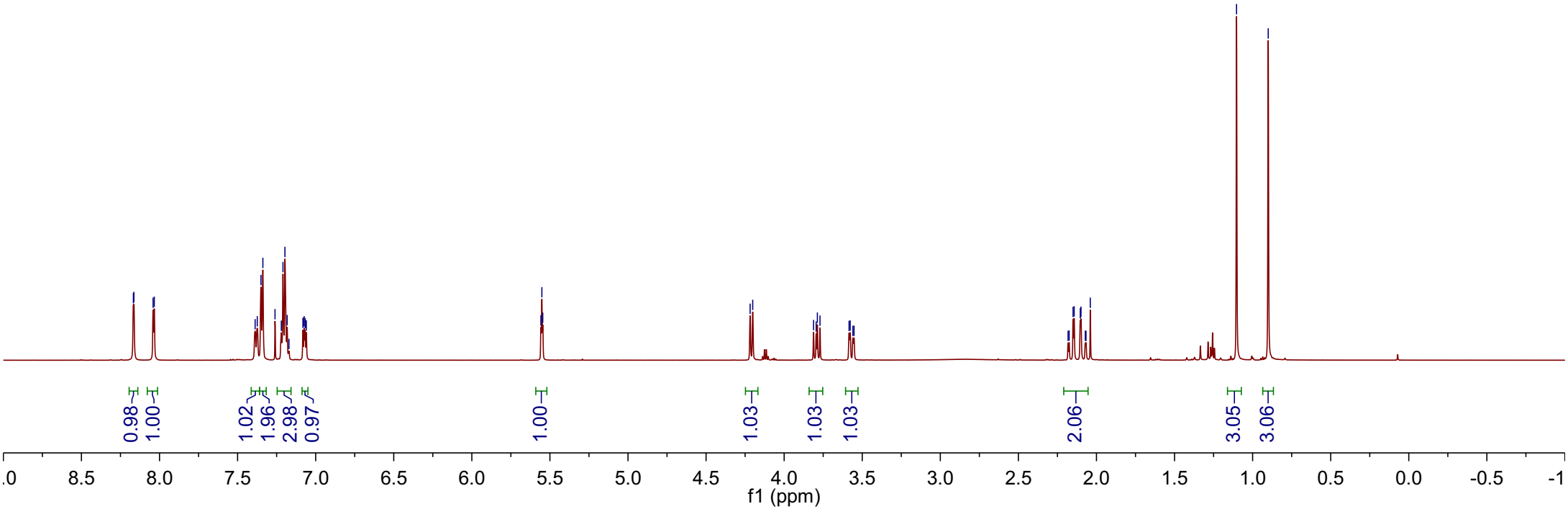
	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565

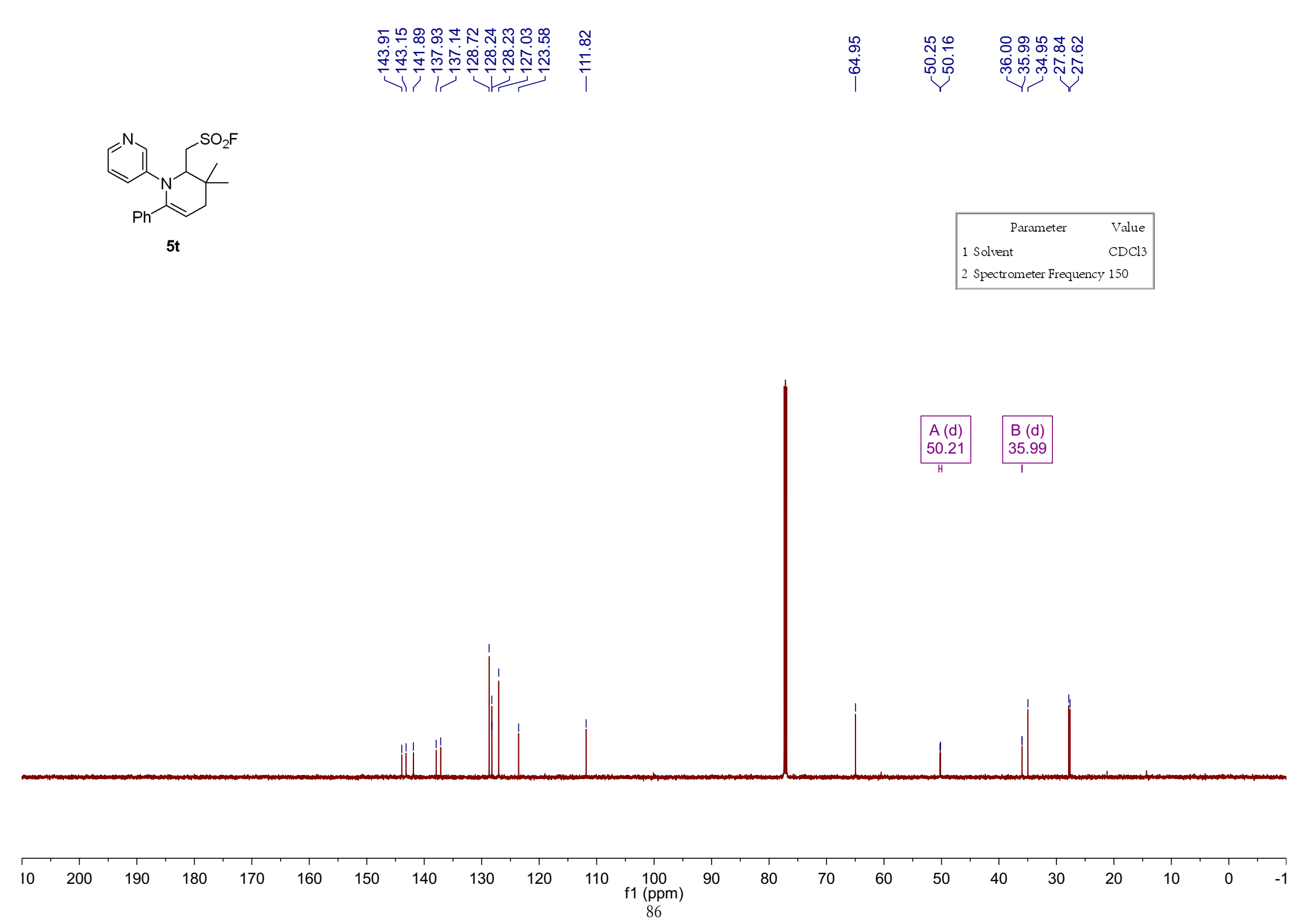


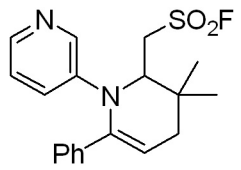


5t

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	600



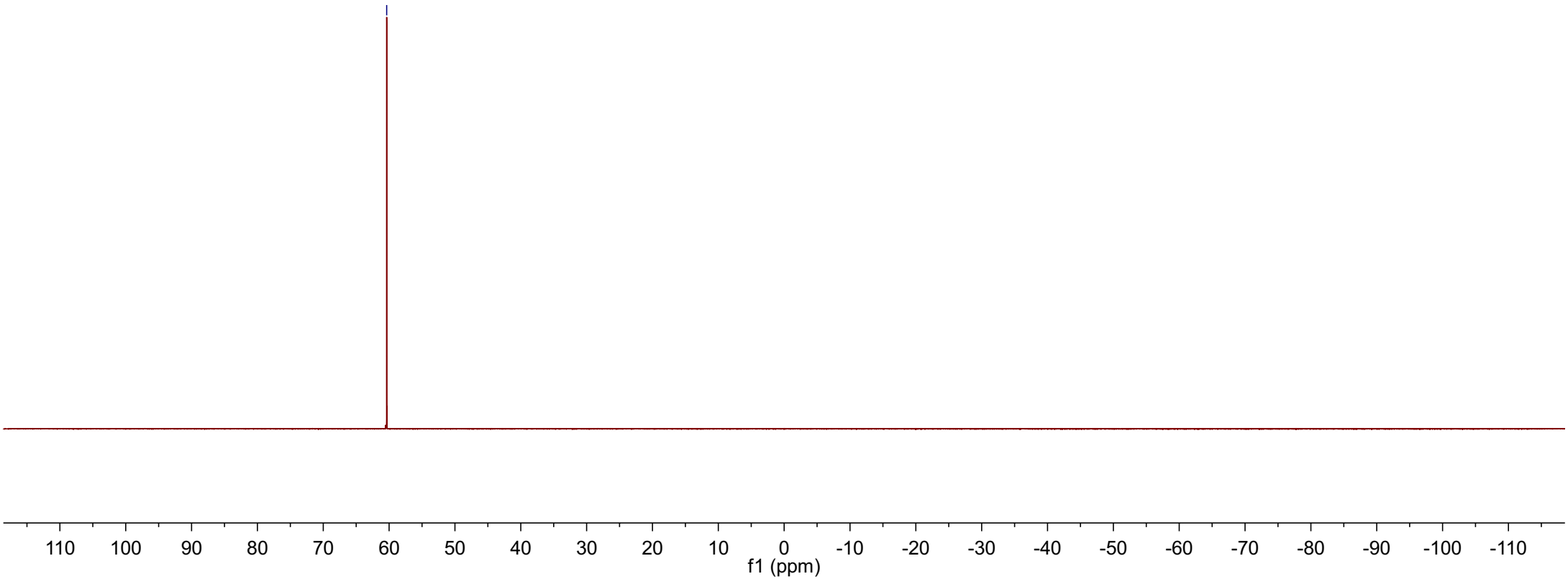

143.91
143.15
141.89
137.93
137.14
128.72
128.24
128.23
127.03
123.58
111.82
64.95
50.25
50.16
36.00
35.99
34.95
27.84
27.62
N
SO2F
N
Ph
5t
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.21
B (d)
35.99
f1 (ppm)

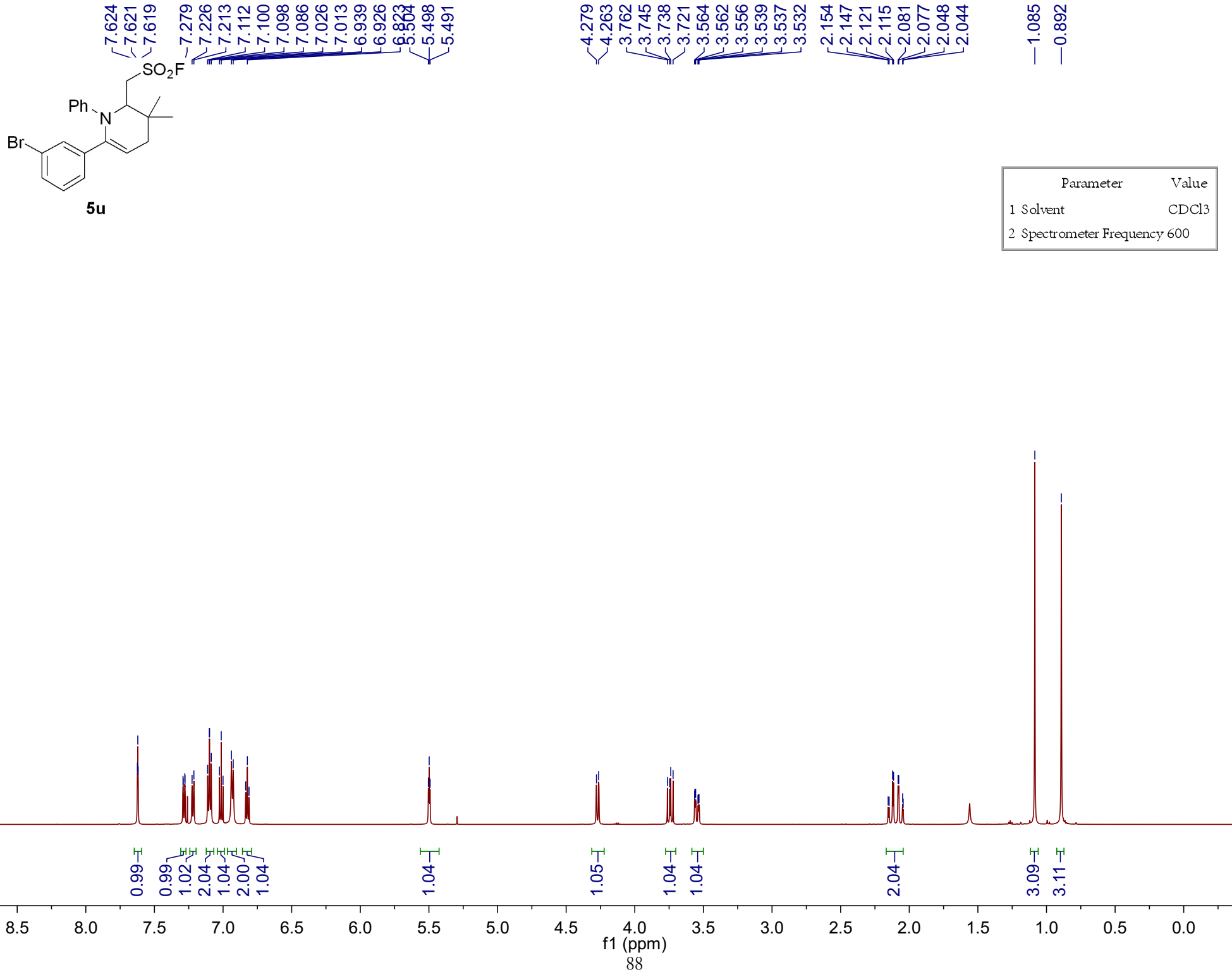


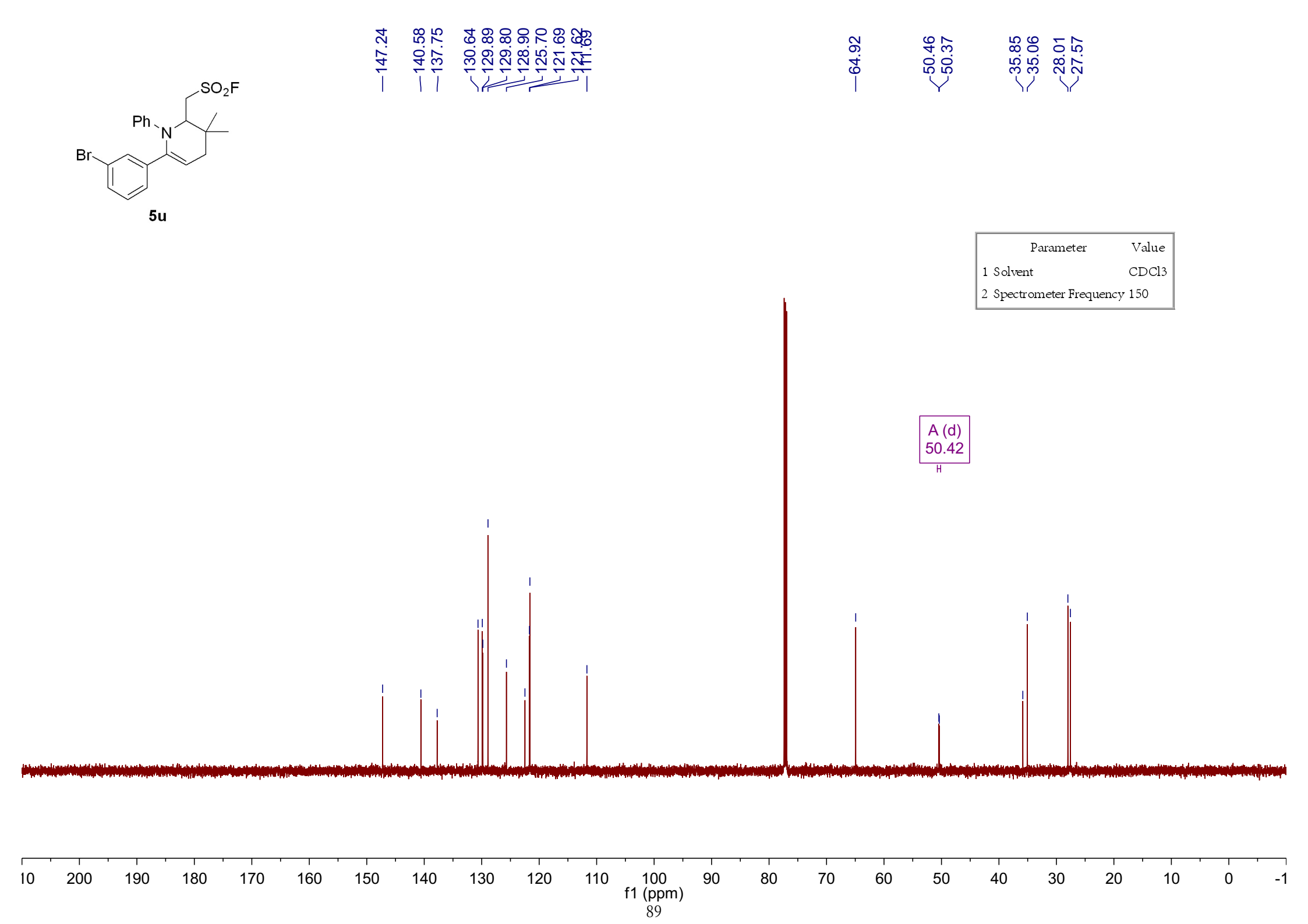
5t

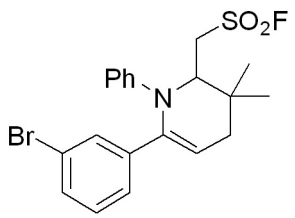
60.37

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.624
7.621
7.619
7.279
7.226
7.213
7.112
7.100
7.098
7.086
7.026
7.013
6.939
6.926
6.823
6.804
5.498
5.491
4.279
4.263
3.762
3.745
3.738
3.721
3.564
3.562
3.556
3.539
3.537
3.532
2.154
2.147
2.121
2.115
2.081
2.077
2.048
2.044
1.085
0.892
SO2F
Ph
N
Br
5u
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
0.99
0.99
1.02
2.04
1.04
2.00
1.04
1.04
1.05
1.04
1.04
2.04
3.09
3.11
f1 (ppm)

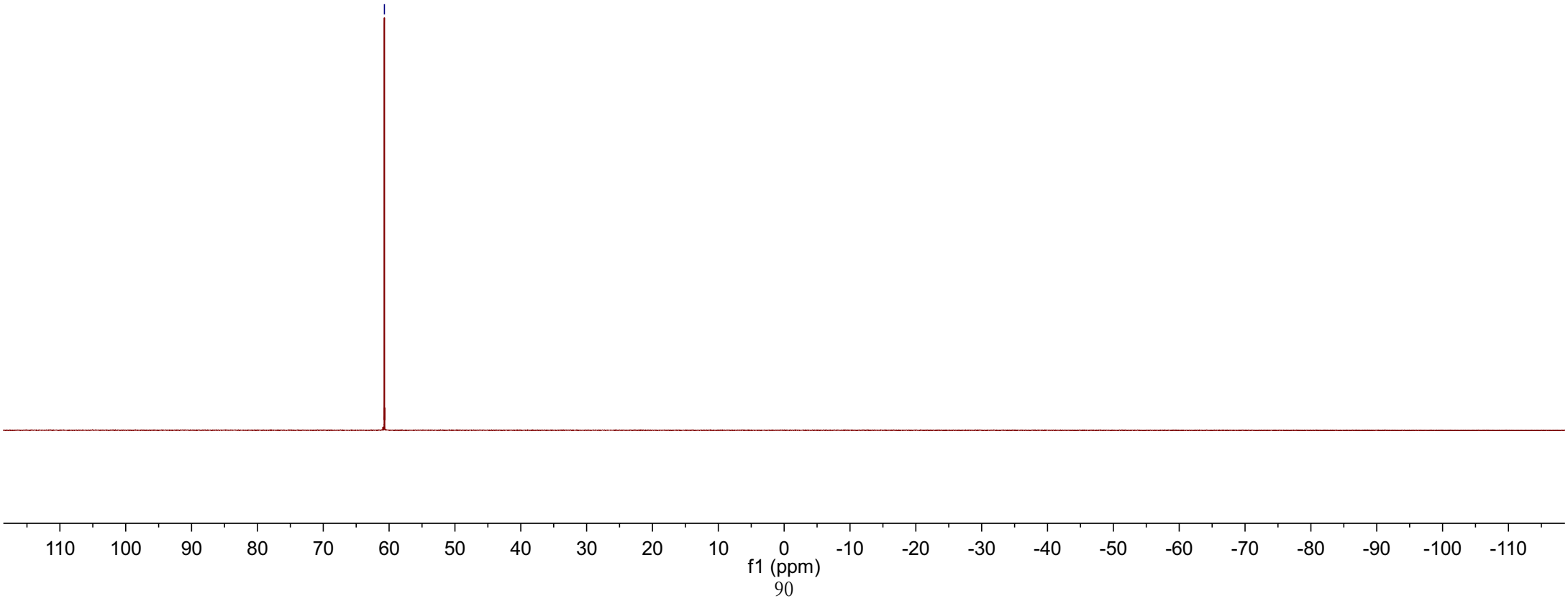

147.24
140.58
137.75
130.64
129.89
129.80
128.90
125.70
121.69
121.62
111.69
64.92
50.46
50.37
35.85
35.06
28.01
27.57
SO2F
Ph
N
Br
5u
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.42
H
f1 (ppm)

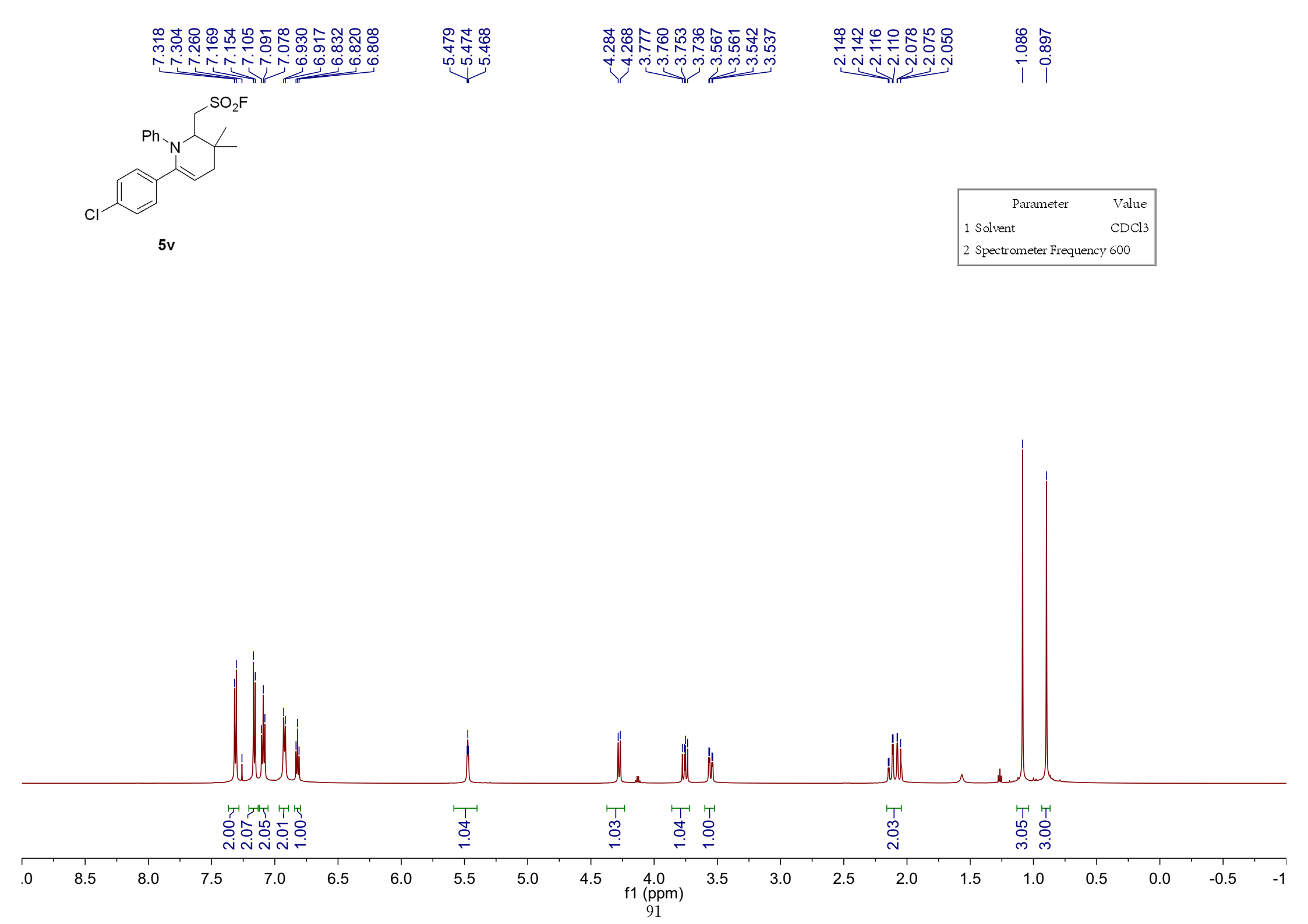


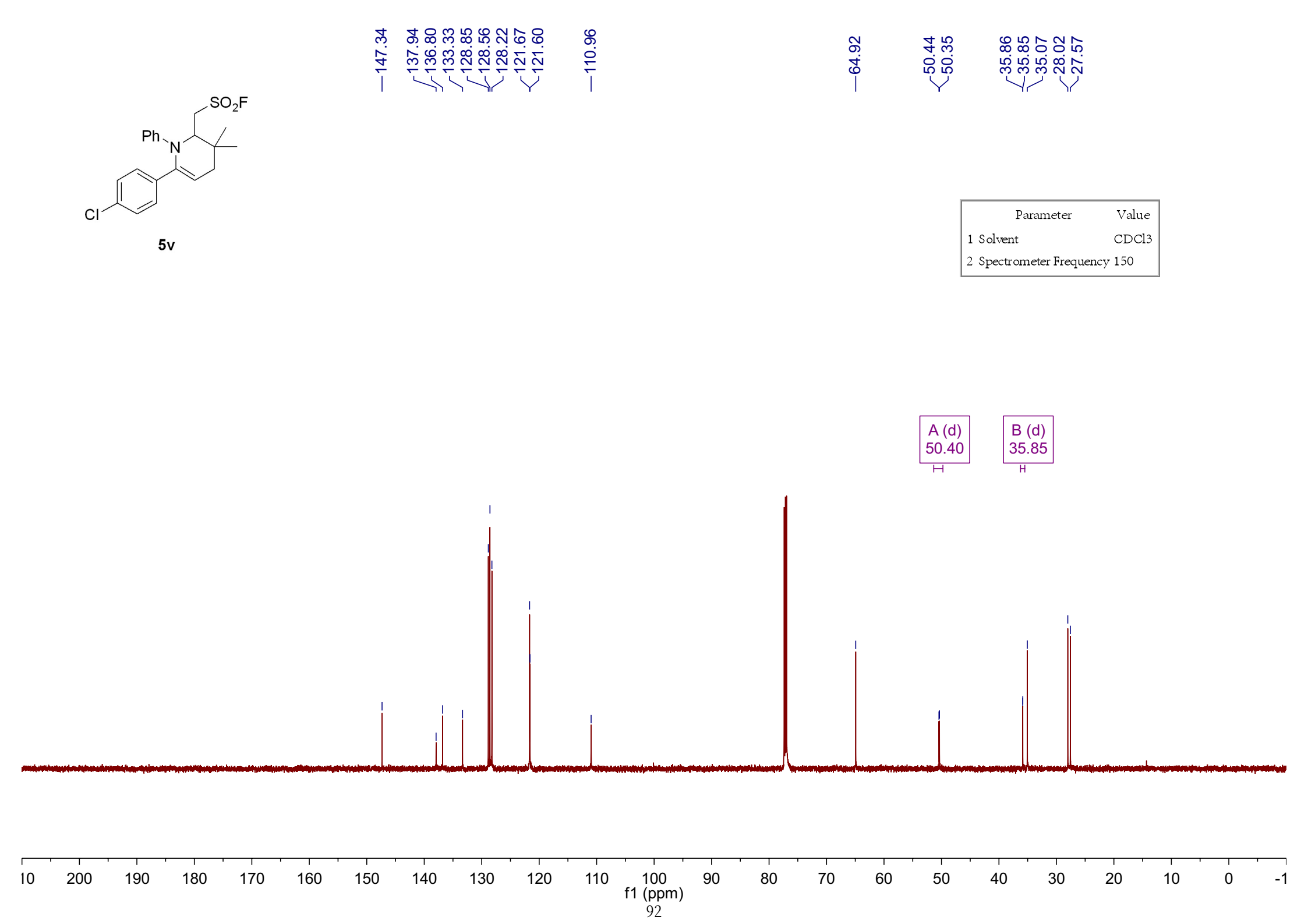
5u

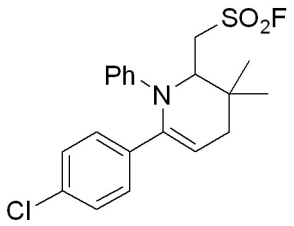
60.71

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.318
7.304
7.260
7.169
7.154
7.105
7.091
7.078
6.930
6.917
6.832
6.820
6.808
5.479
5.474
5.468
4.284
4.268
3.777
3.760
3.753
3.736
3.567
3.561
3.542
3.537
2.148
2.142
2.116
2.110
2.078
2.075
2.050
1.086
0.897
SO2F
Ph
N
Cl
5v
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.00
2.07
2.05
2.01
1.00
1.04
1.03
1.04
1.00
2.03
3.05
3.00
f1 (ppm)

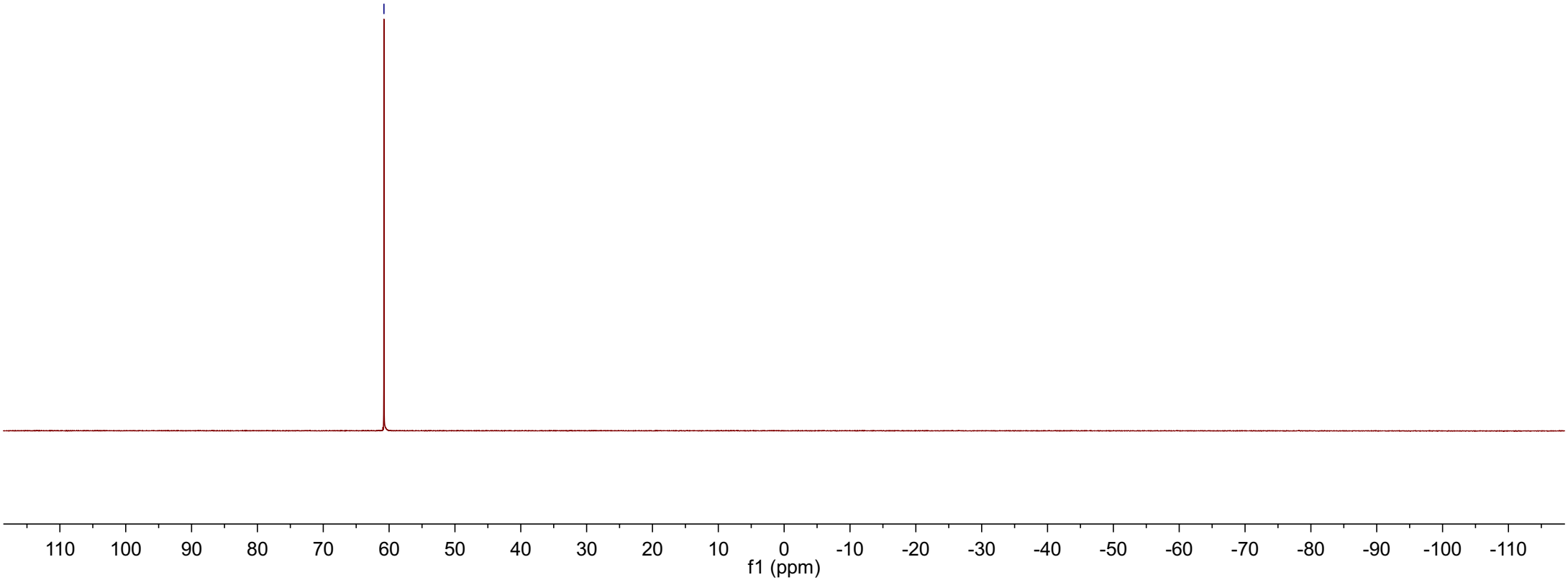

147.34
137.94
136.80
133.33
128.85
128.56
128.22
121.67
121.60
110.96
64.92
50.44
50.35
35.86
35.85
35.07
28.02
27.57
SO2F
Ph
N
Cl
5v
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.40
B (d)
35.85
f1 (ppm)

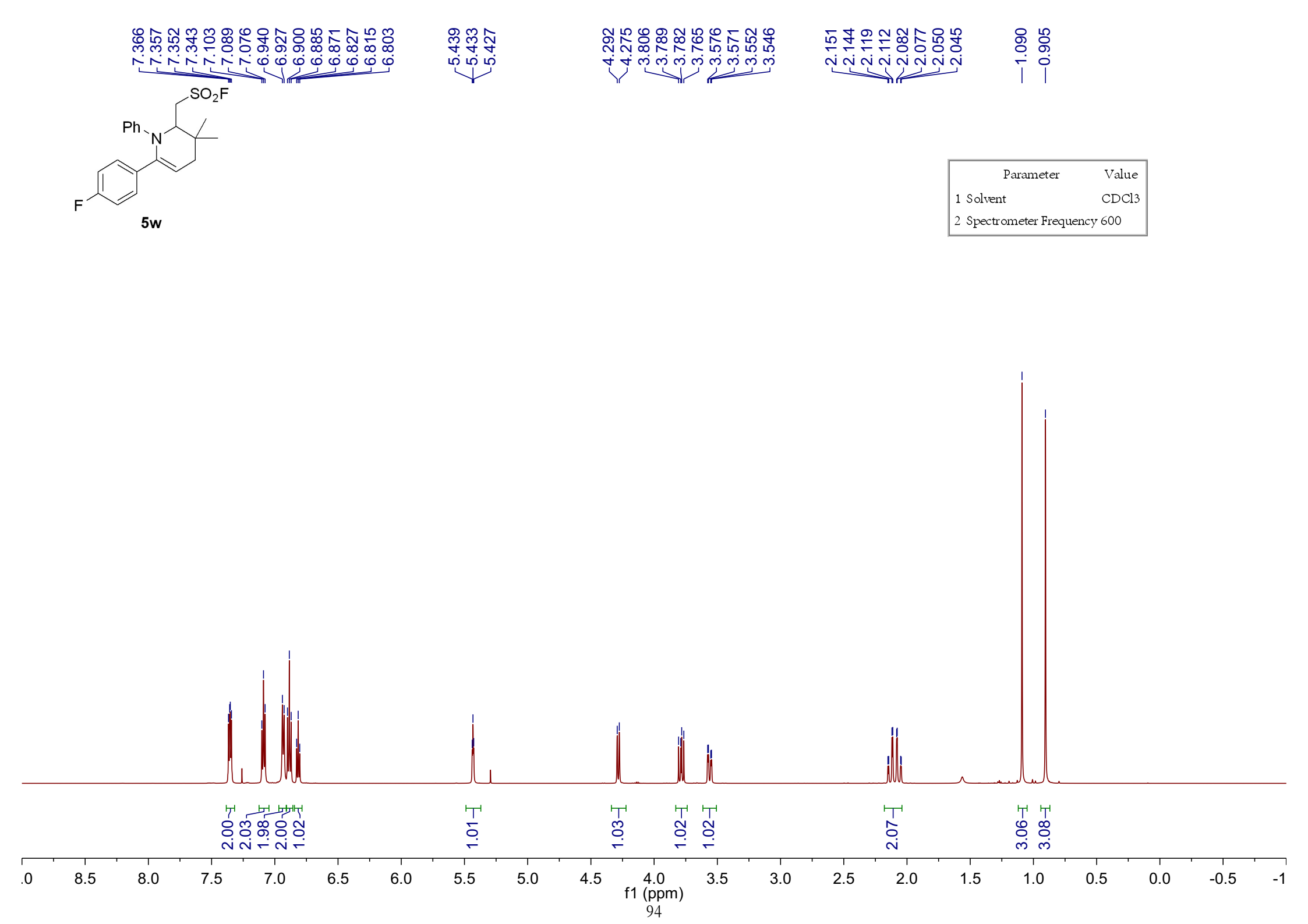


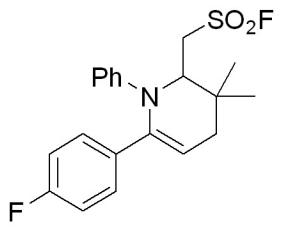
5v

60.78

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.366
7.357
7.352
7.343
7.103
7.089
7.076
6.940
6.927
6.900
6.885
6.871
6.827
6.815
6.803
5.439
5.433
5.427
4.292
4.275
3.806
3.789
3.782
3.765
3.576
3.571
3.552
3.546
2.151
2.144
2.119
2.112
2.082
2.077
2.050
2.045
1.090
0.905
SO2F
Ph
N
F
5w
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.00
2.03
1.98
2.00
1.02
1.01
1.03
1.02
1.02
2.07
3.06
3.08
f1 (ppm)



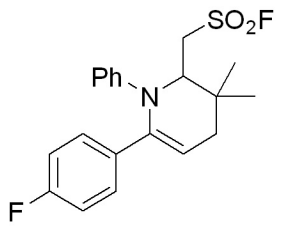
5w

163.14
161.50
147.42
137.95
134.33
134.31
128.77
128.61
128.56
121.74
121.51
115.33
115.19
110.34
64.94
50.45
50.36
35.87
35.87
35.05
28.02
27.56

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

C (d) 162.32
E (d) 134.32
F (d) 128.58
D (d) 115.26
A (d) 50.41
B (d) 35.87

f1 (ppm)

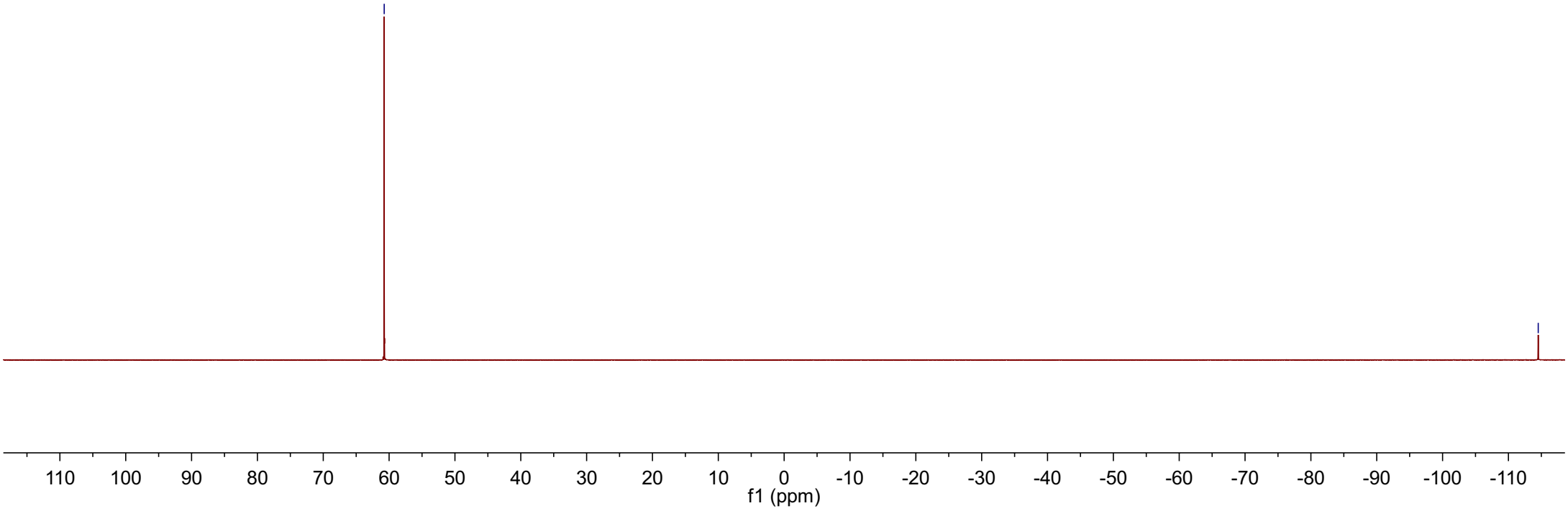


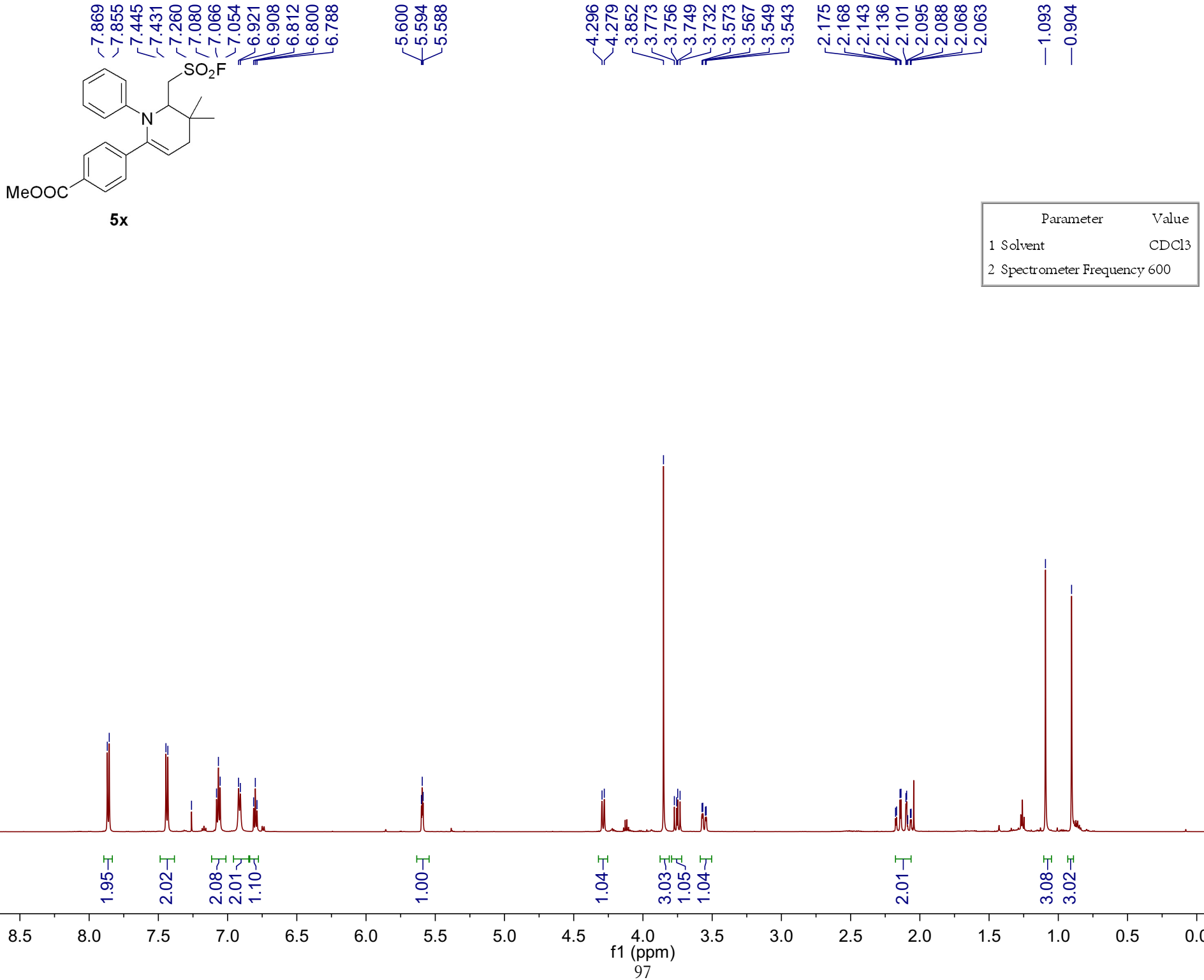
5w

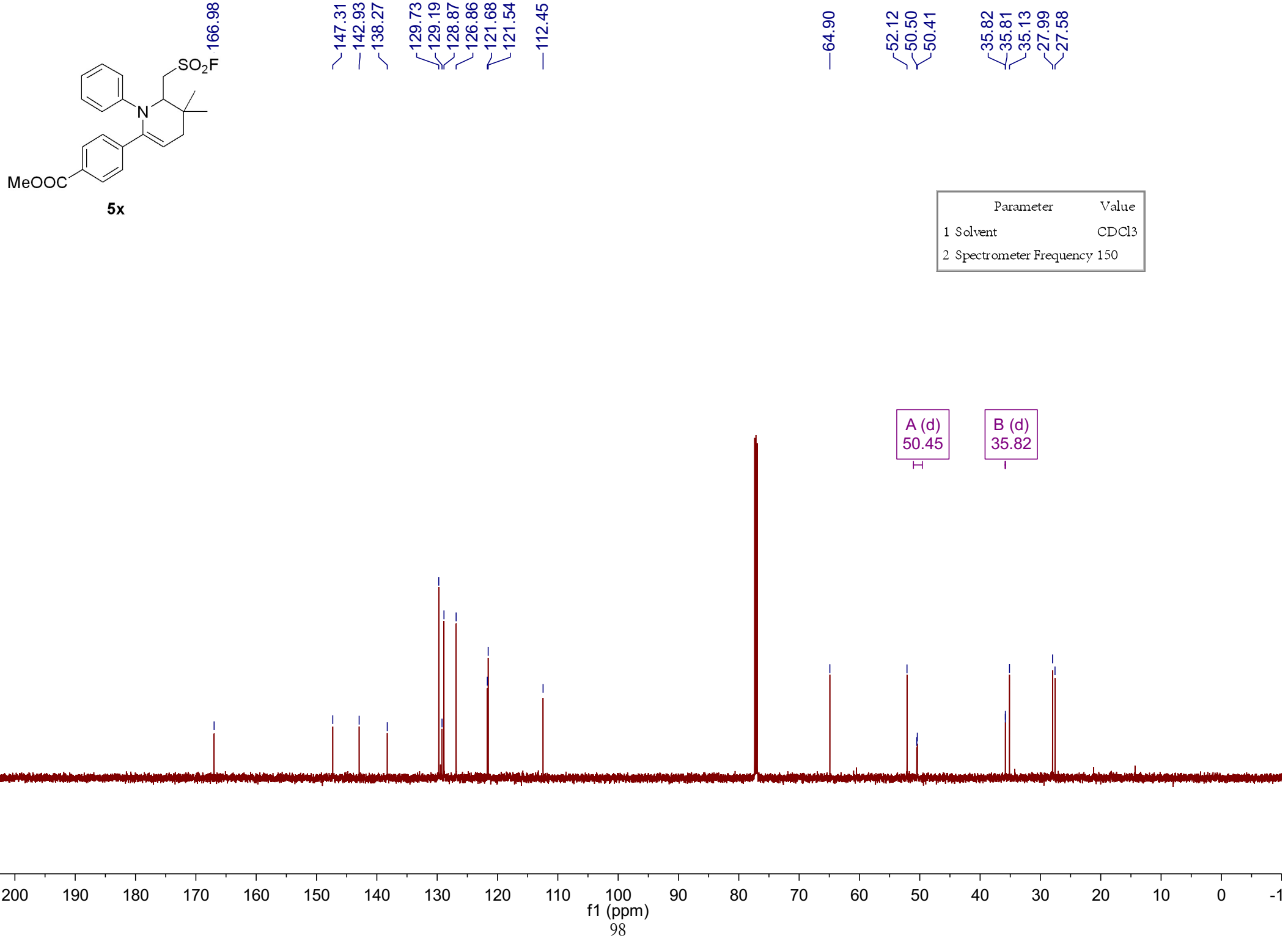
60.74

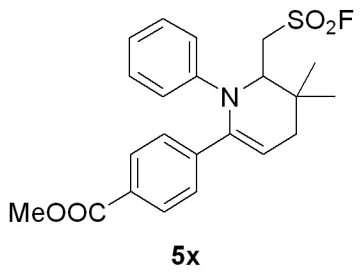
-114.53

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.869
7.855
7.445
7.431
7.260
7.080
7.066
7.054
6.921
6.908
6.812
6.800
6.788
5.600
5.594
5.588
4.296
4.279
3.852
3.773
3.756
3.749
3.732
3.573
3.567
3.549
3.543
2.175
2.168
2.143
2.136
2.101
2.095
2.088
2.068
2.063
1.093
0.904
SO2F
N
MeOOC
5x
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
1.95
2.02
2.08
2.01
1.10
1.00
1.04
3.03
1.05
1.04
2.01
3.08
3.02
f1 (ppm)

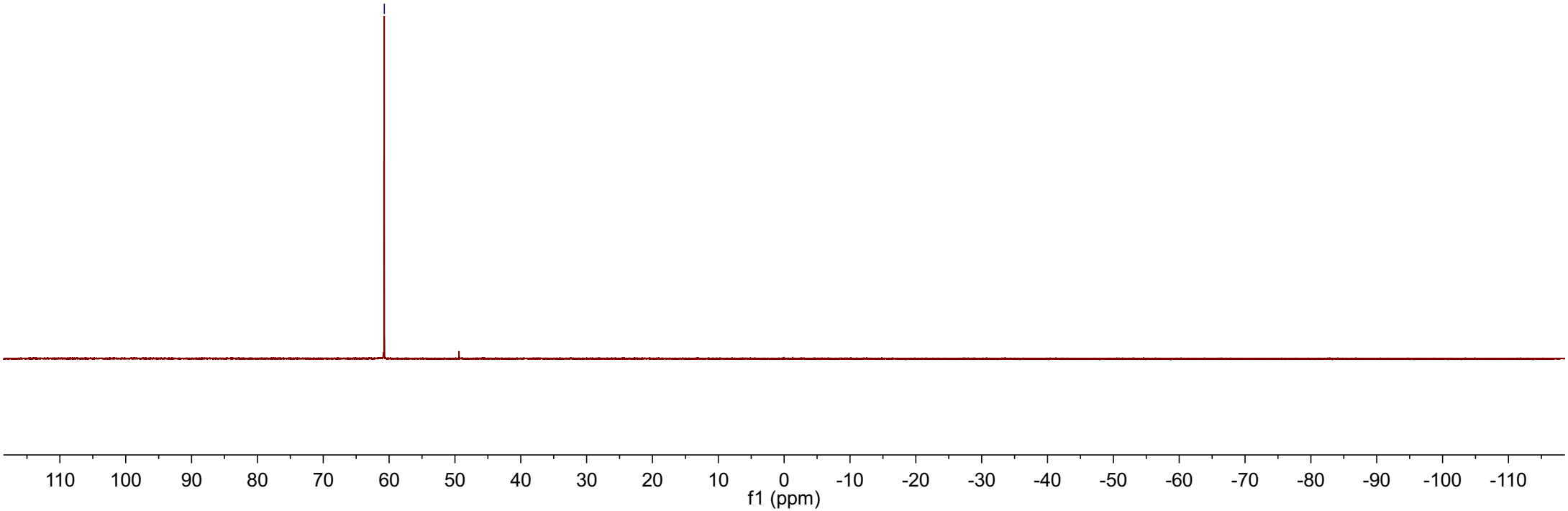

166.98
147.31
142.93
138.27
129.73
129.19
128.87
126.86
121.68
121.54
112.45
64.90
52.12
50.50
50.41
35.82
35.81
35.13
27.99
27.58
SO2F
N
MeOOC
5x
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d) 50.45
B (d) 35.82
f1 (ppm)

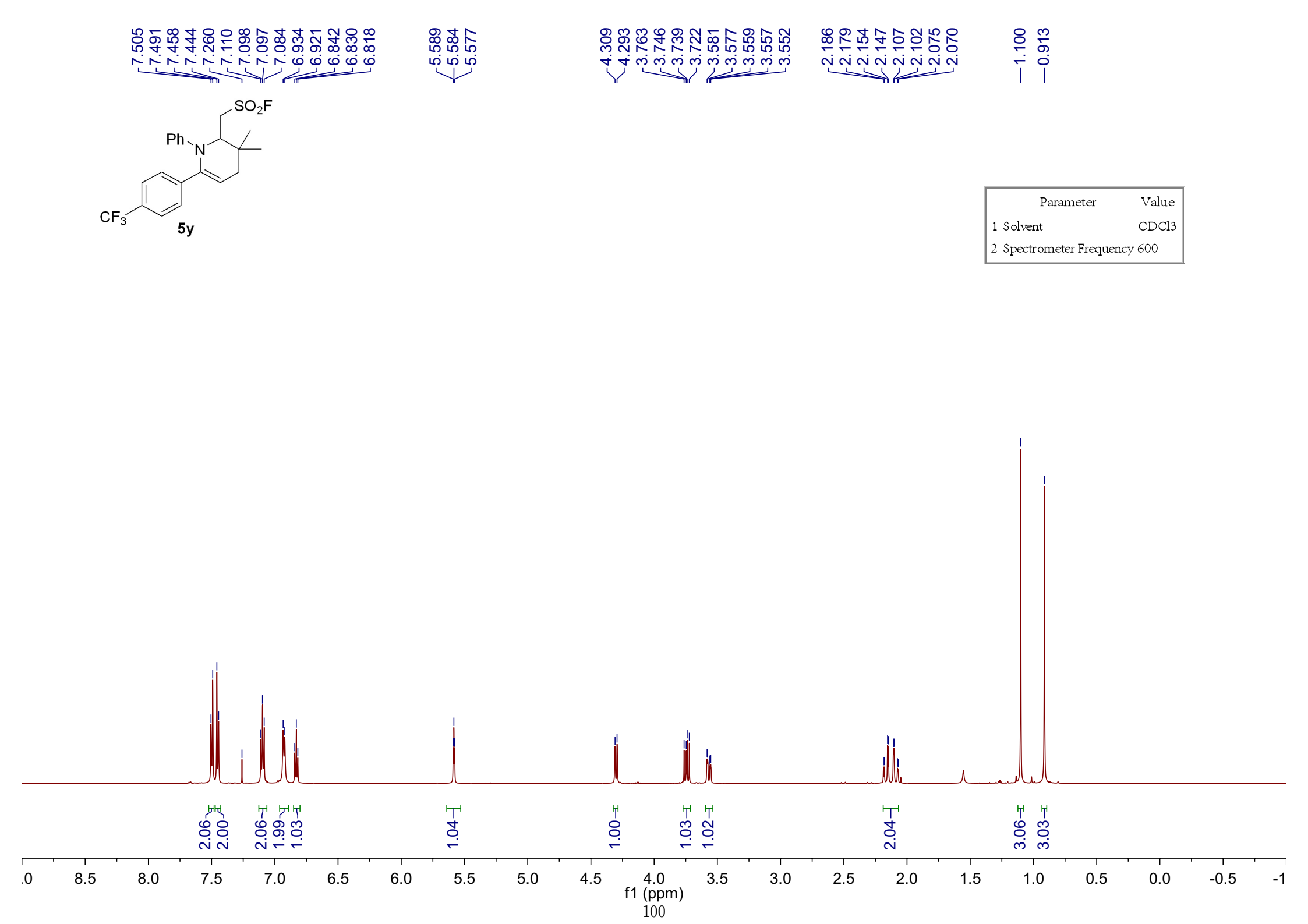


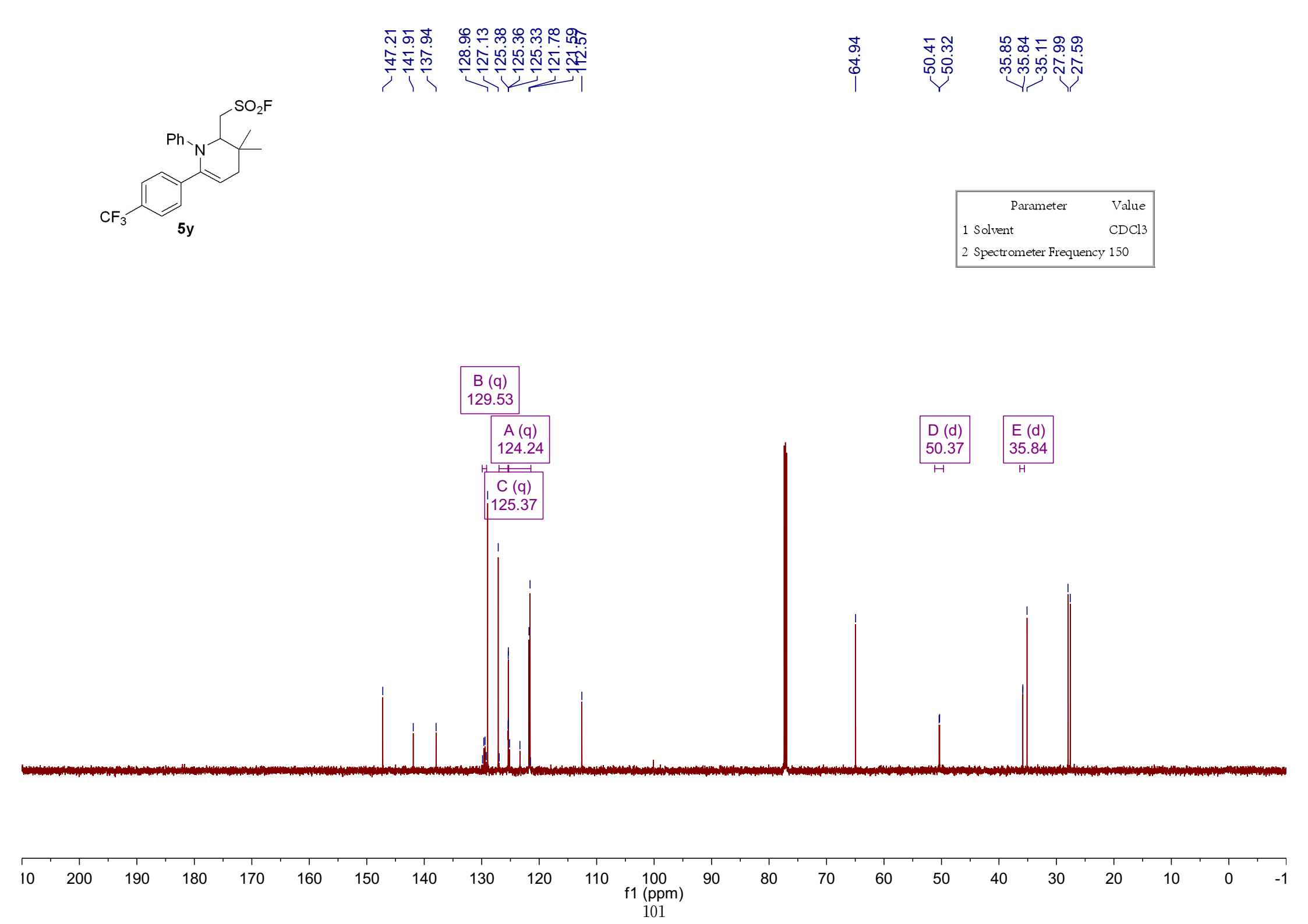
5x

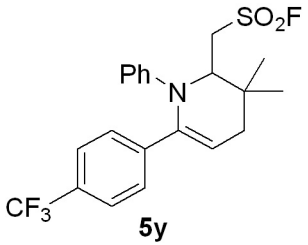
60.73

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.505
7.491
7.458
7.444
7.260
7.110
7.098
7.097
7.084
6.934
6.921
6.842
6.830
6.818
5.589
5.584
5.577
4.309
4.293
3.763
3.746
3.739
3.722
3.581
3.577
3.559
3.557
3.552
2.186
2.179
2.154
2.147
2.107
2.102
2.075
2.070
1.100
0.913
SO2F
Ph
N
CF3
5y
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.06
2.00
2.06
1.99
1.03
1.04
1.00
1.03
1.02
2.04
3.06
3.03
f1 (ppm)


147.21
141.91
137.94
128.96
127.13
125.38
125.36
125.33
121.78
64.94
50.41
50.32
35.85
35.84
35.11
27.99
27.59
SO2F
Ph
N
CF3
5y
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
B (q)
129.53
A (q)
124.24
C (q)
125.37
D (d)
50.37
E (d)
35.84
f1 (ppm)

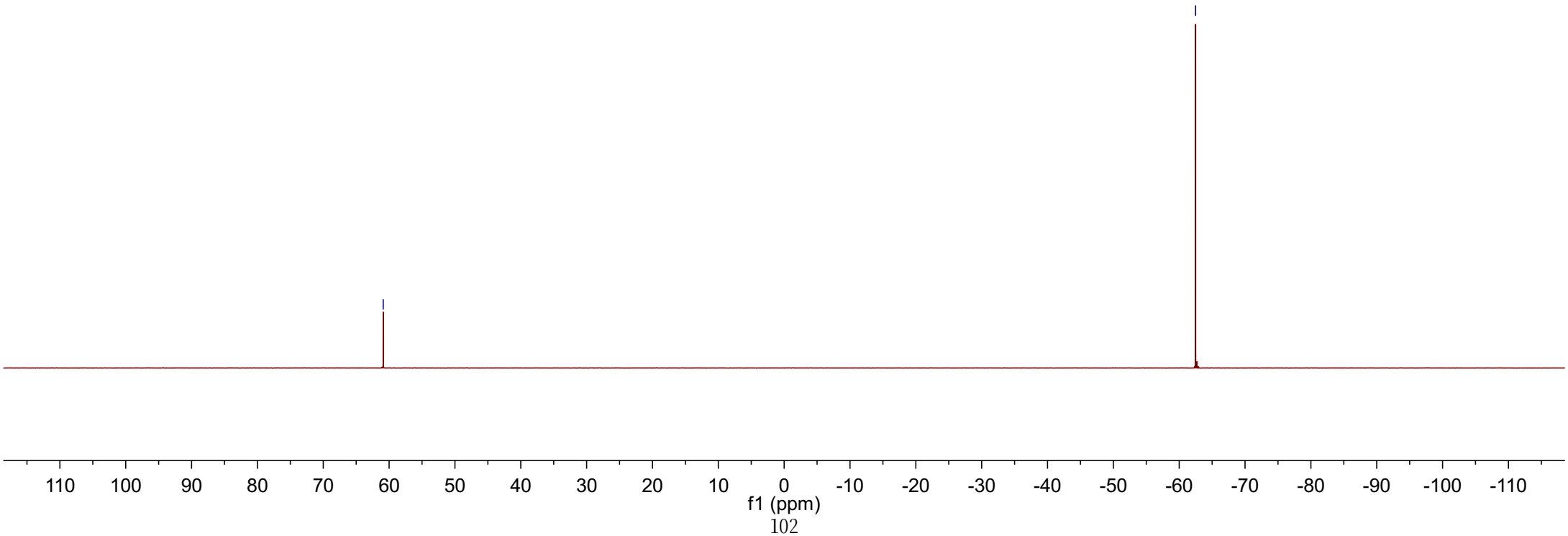


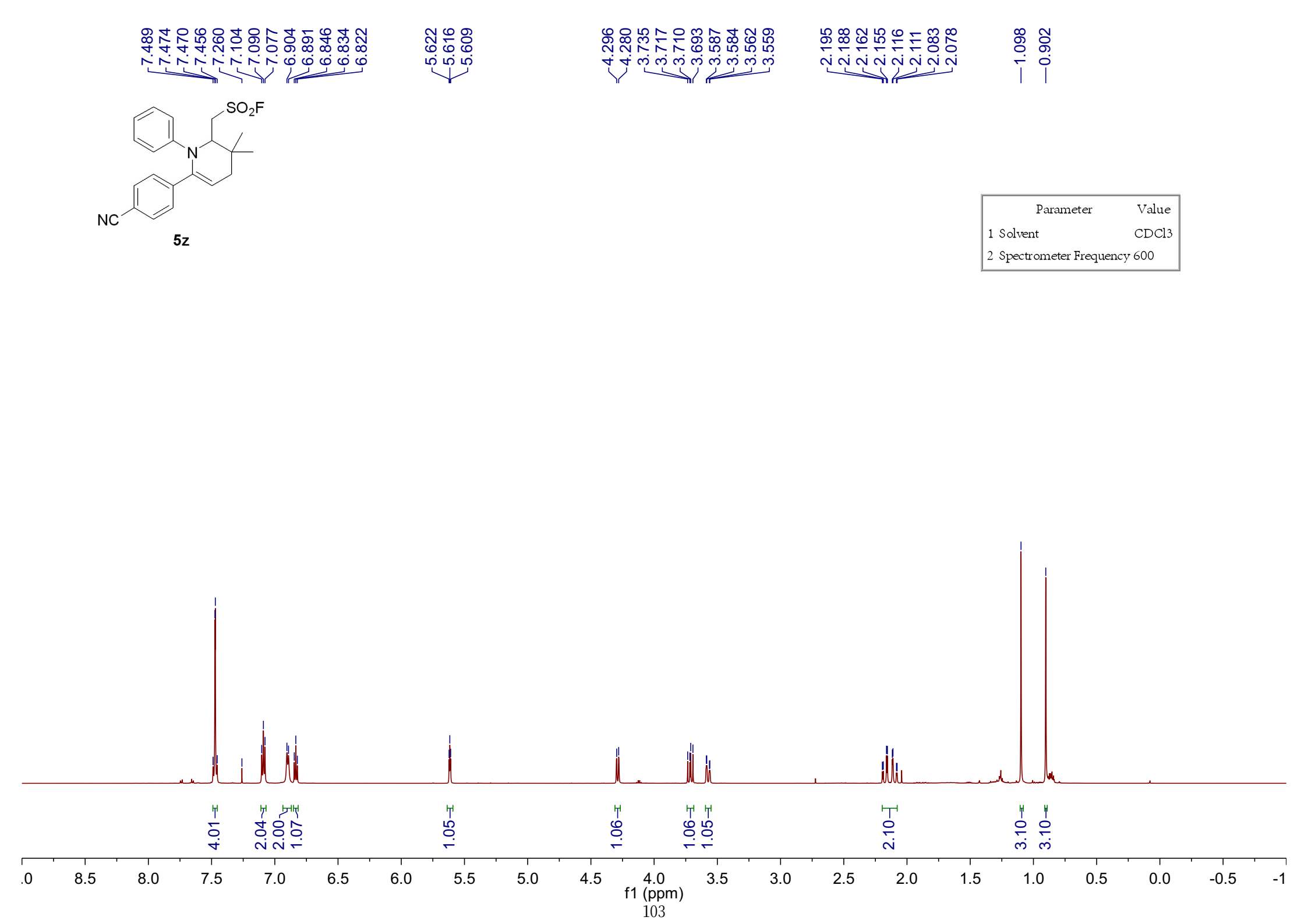
5y

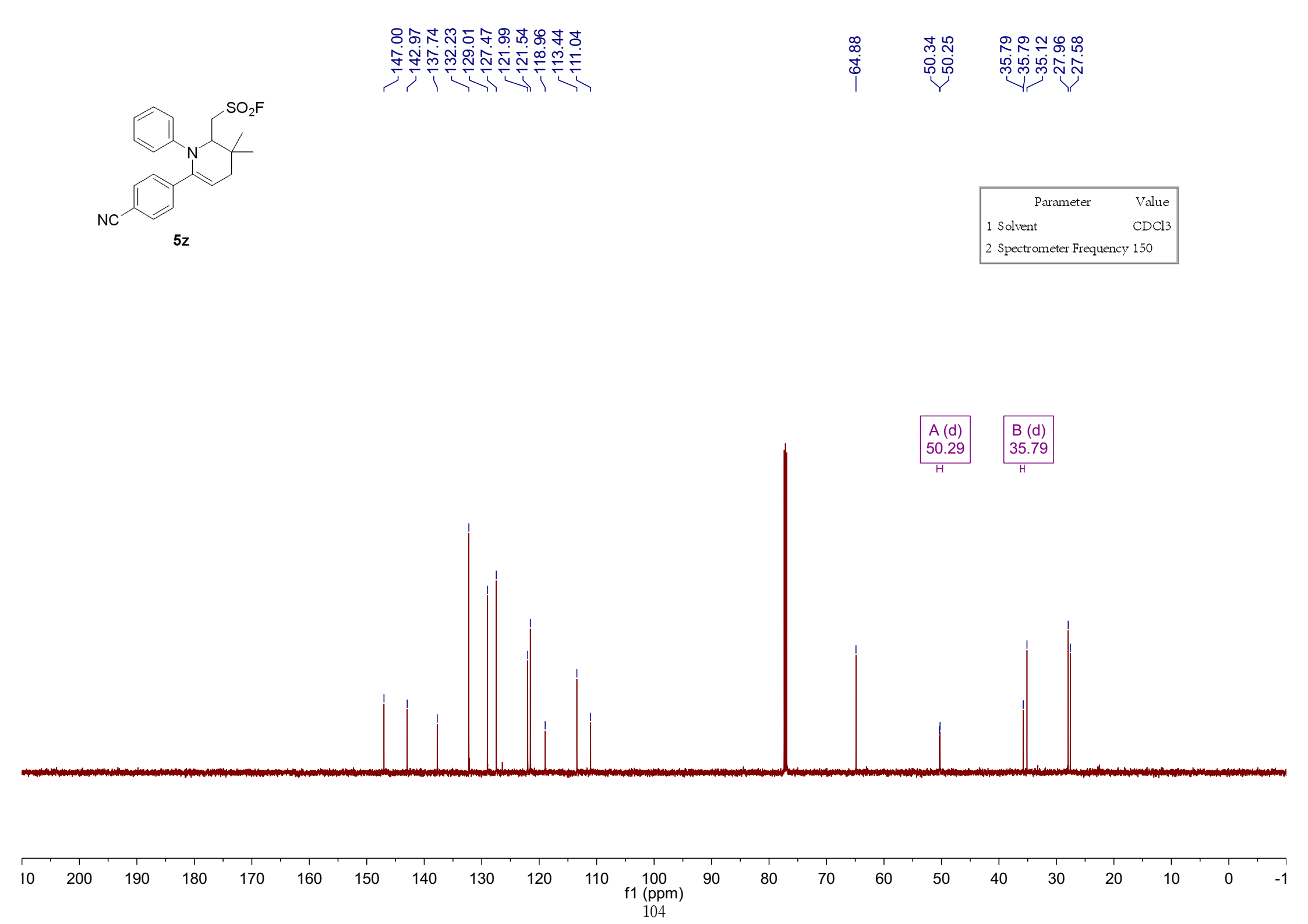
-60.90

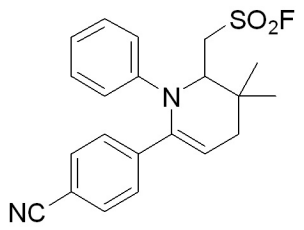
-62.49

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565



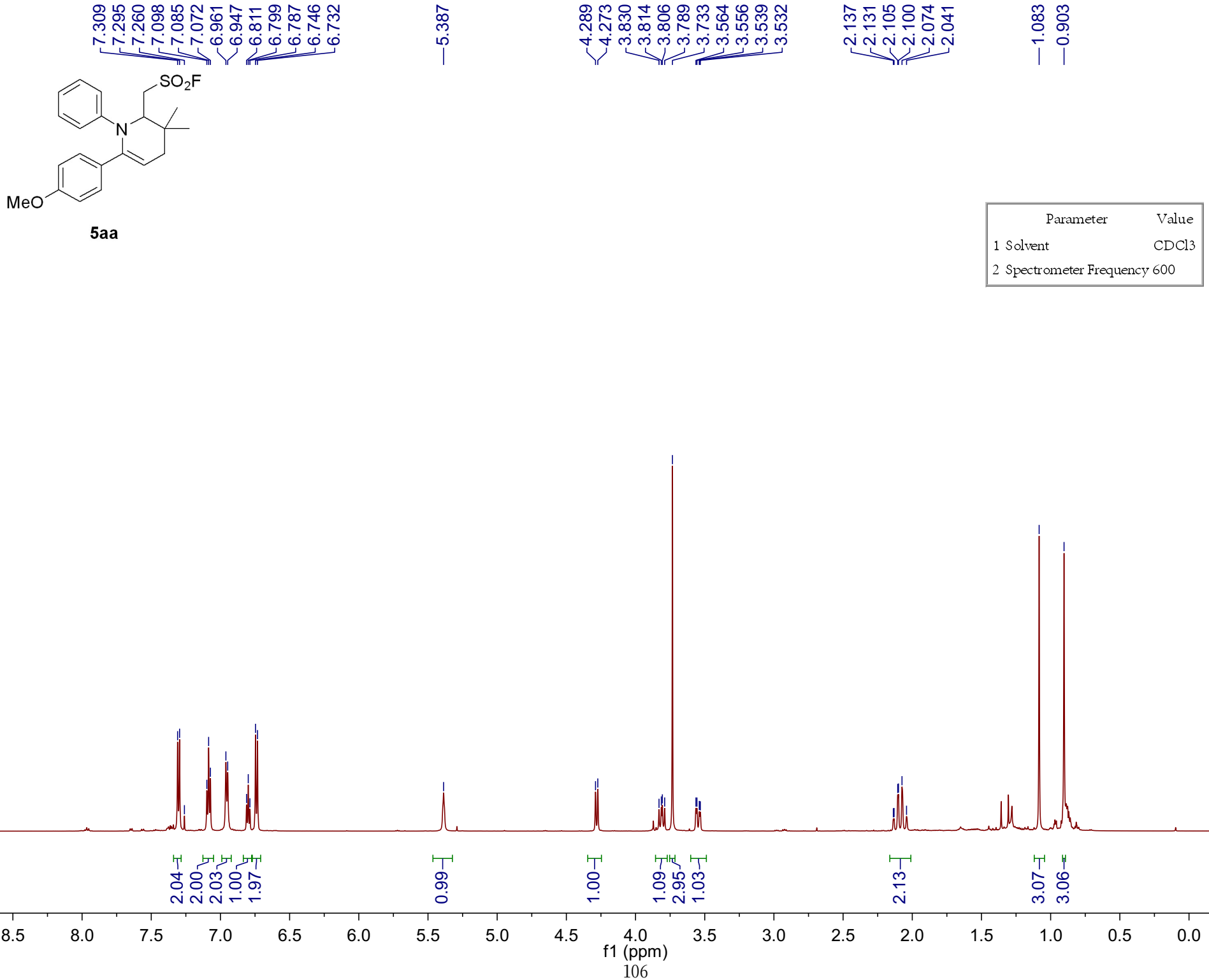

7.489
7.474
7.470
7.456
7.260
7.104
7.090
7.077
6.904
6.891
6.846
6.834
6.822
5.622
5.616
5.609
4.296
4.280
3.735
3.717
3.710
3.693
3.587
3.584
3.562
3.559
2.195
2.188
2.162
2.155
2.116
2.111
2.083
2.078
1.098
0.902
SO2F
N
NC
5z
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
4.01
2.04
2.00
1.07
1.05
1.06
1.06
1.05
2.10
3.10
3.10
f1 (ppm)

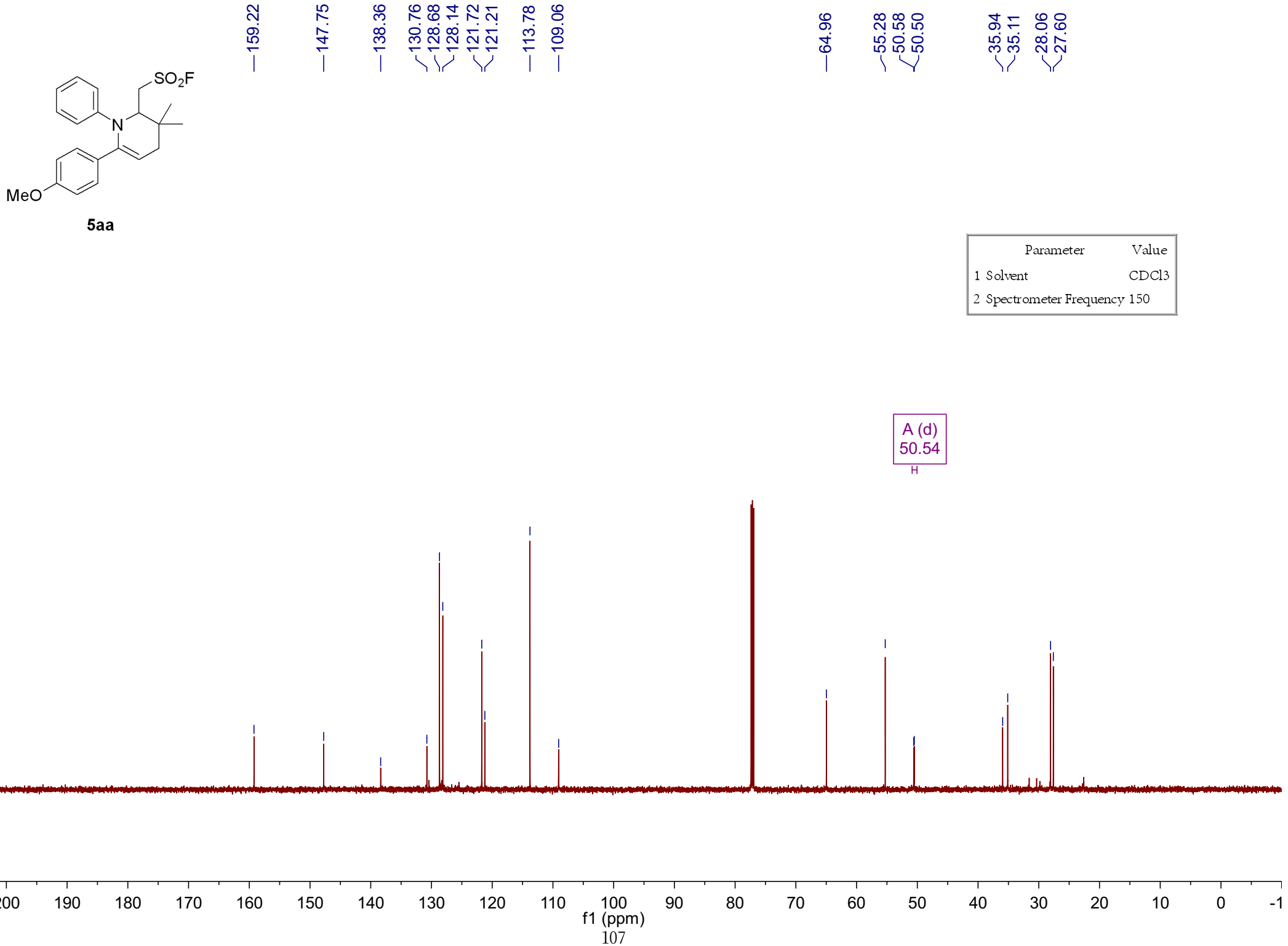

147.00
142.97
137.74
132.23
129.01
127.47
121.99
121.54
118.96
113.44
111.04
64.88
50.34
50.25
35.79
35.79
35.12
27.96
27.58
SO2F
N
NC
5z
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.29
H
B (d)
35.79
H
f1 (ppm)

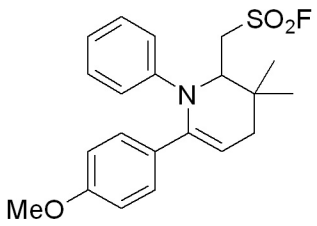

SO2F
N
NC

5z

61.12
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 565
110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110
f1 (ppm)


7.309
7.295
7.260
7.098
7.085
7.072
6.961
6.947
6.811
6.799
6.787
6.746
6.732
5.387
4.289
4.273
3.830
3.814
3.806
3.789
3.733
3.564
3.556
3.539
3.532
2.137
2.131
2.105
2.100
2.074
2.041
1.083
0.903
SO2F
N
MeO
5aa
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.04
2.00
2.03
1.00
1.97
0.99
1.00
1.09
2.95
1.03
2.13
3.07
3.06
f1 (ppm)

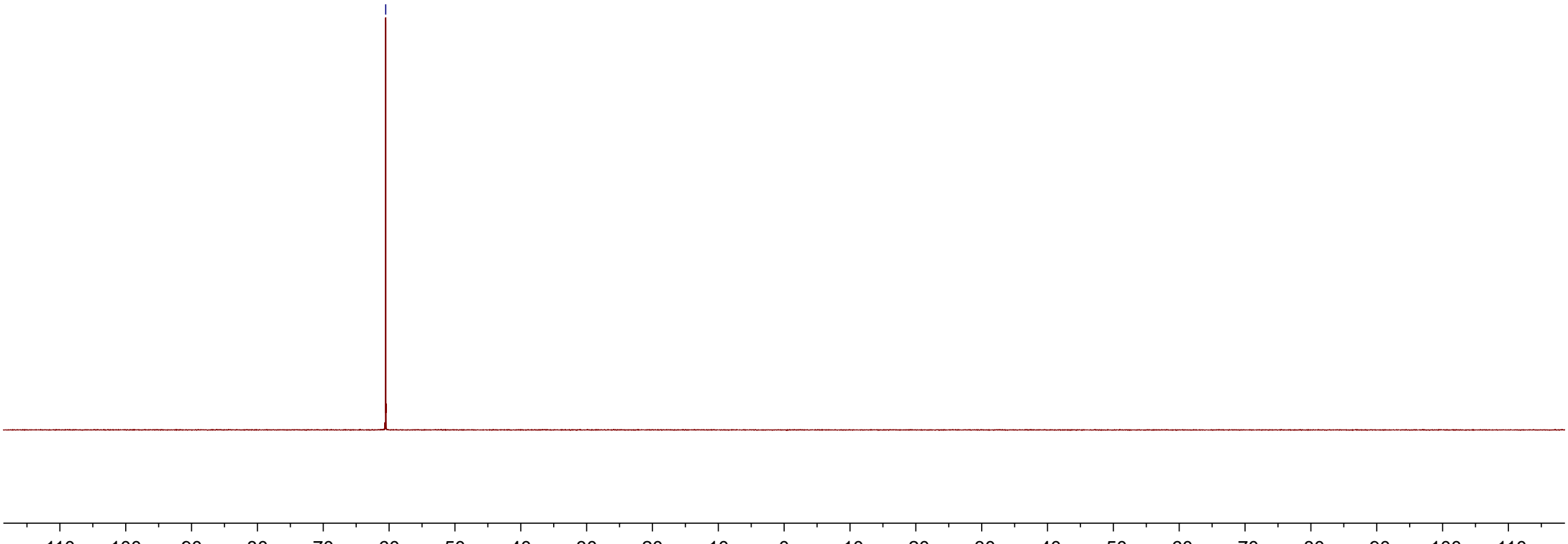

159.22
147.75
138.36
130.76
128.68
128.14
121.72
121.21
113.78
109.06
64.96
55.28
50.58
50.50
35.94
35.11
28.06
27.60
SO2F
N
MeO
5aa
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.54
H
f1 (ppm)

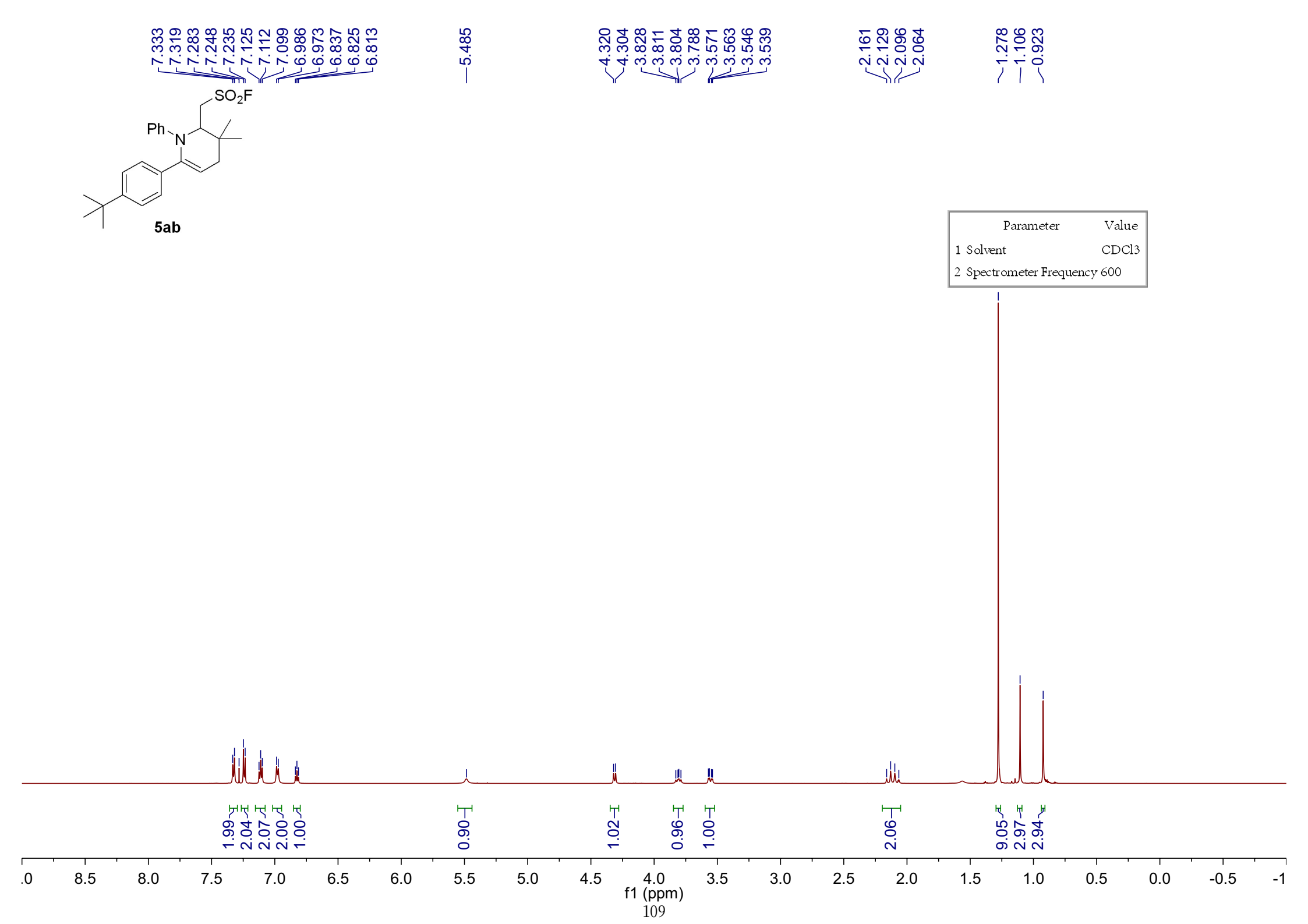


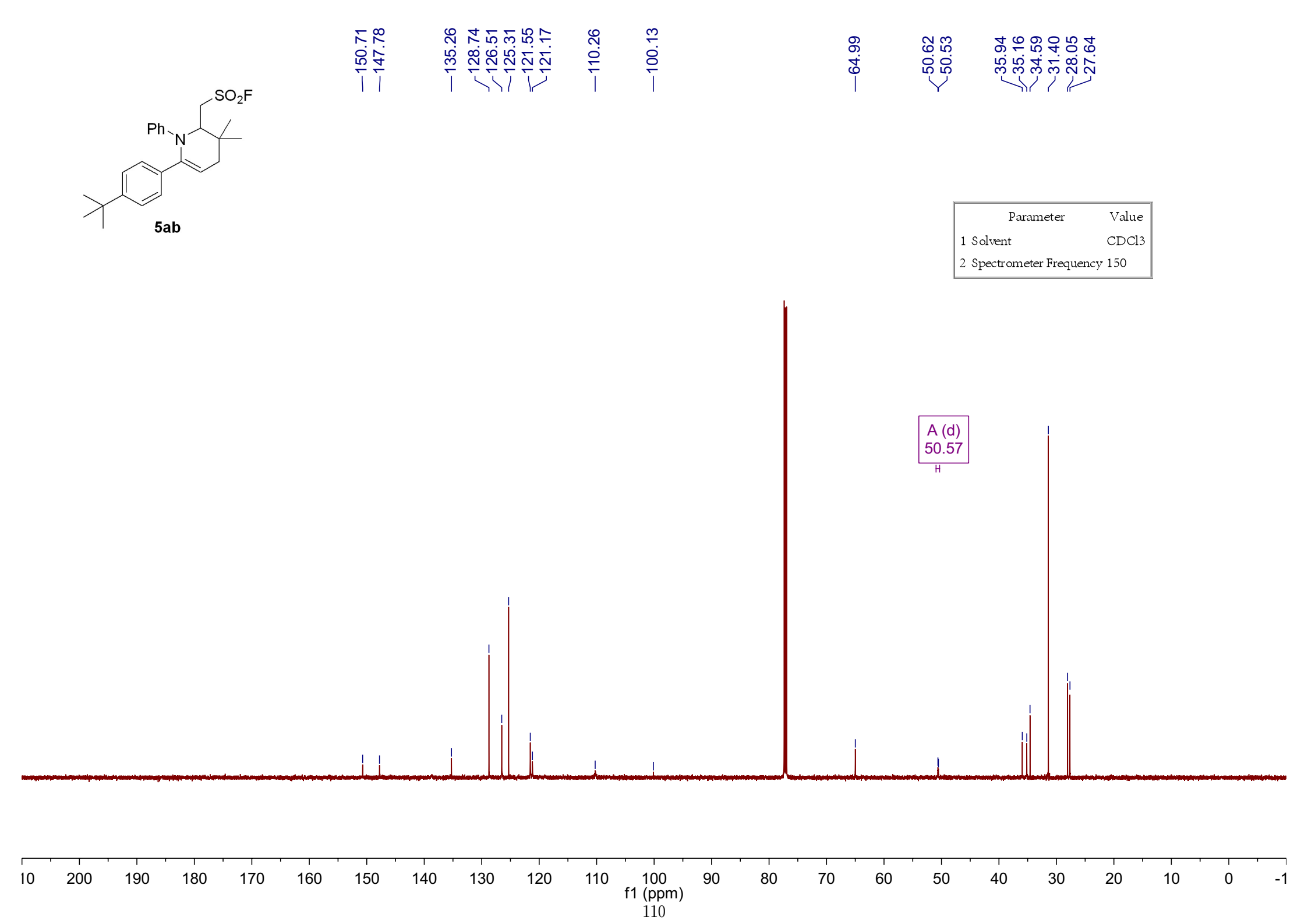
5aa

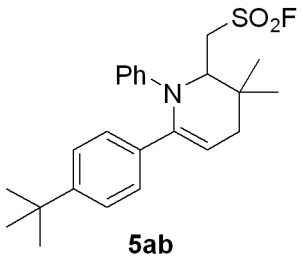
60.51

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.333
7.319
7.283
7.248
7.235
7.125
7.112
7.099
6.986
6.973
6.837
6.825
6.813
5.485
4.320
4.304
3.828
3.811
3.804
3.788
3.571
3.563
3.546
3.539
2.161
2.129
2.096
2.064
1.278
1.106
0.923
SO2F
Ph
N
5ab
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
1.99
2.04
2.07
2.00
1.00
0.90
1.02
0.96
1.00
2.06
9.05
2.97
2.94
f1 (ppm)


150.71
147.78
135.26
128.74
126.51
125.31
121.55
121.17
110.26
100.13
64.99
50.62
50.53
35.94
35.16
34.59
31.40
28.05
27.64
SO2F
Ph
N
5ab
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.57
H
f1 (ppm)



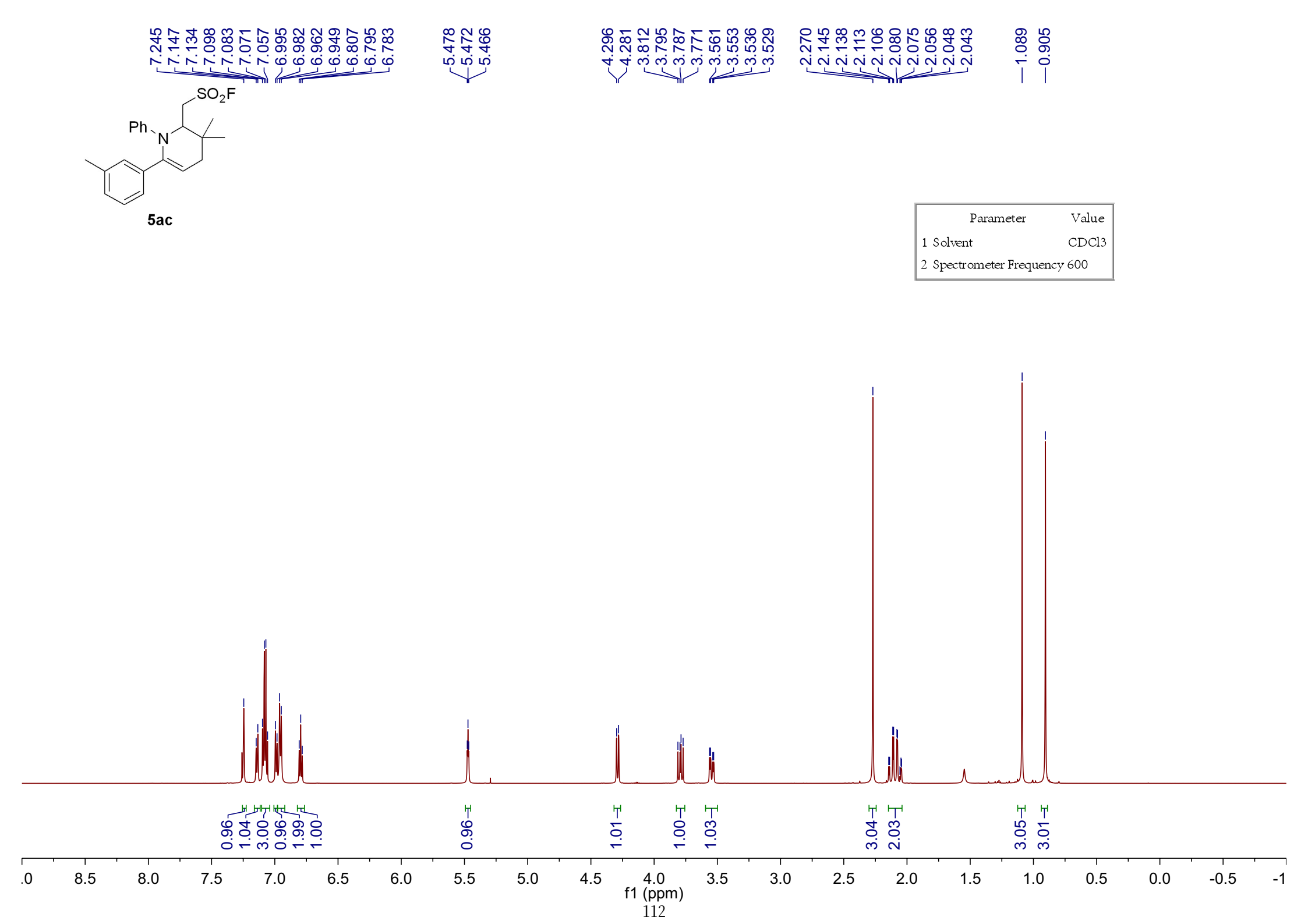
5ab

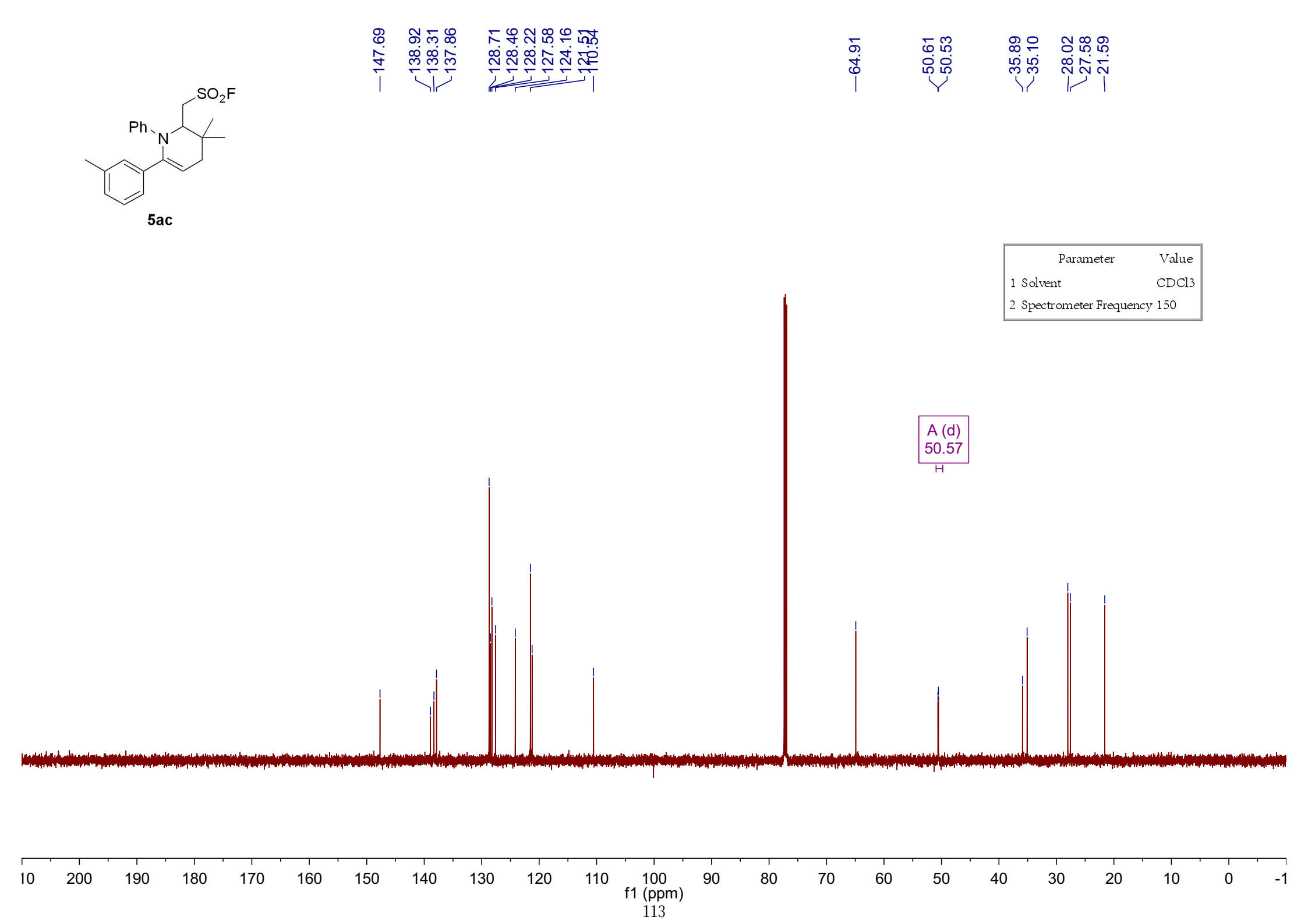
60.32

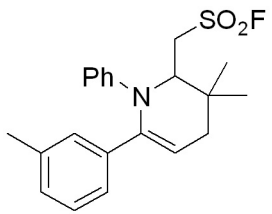
	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.245
7.147
7.134
7.098
7.083
7.071
7.057
6.995
6.982
6.962
6.949
6.807
6.795
6.783
5.478
5.472
5.466
4.296
4.281
3.812
3.795
3.787
3.771
3.561
3.553
3.536
3.529
2.270
2.145
2.138
2.113
2.106
2.080
2.075
2.056
2.048
2.043
1.089
0.905
SO2F
Ph
N
5ac
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
0.96
1.04
3.00
0.96
1.99
1.00
0.96
1.01
1.00
1.03
3.04
2.03
3.05
3.01
f1 (ppm)

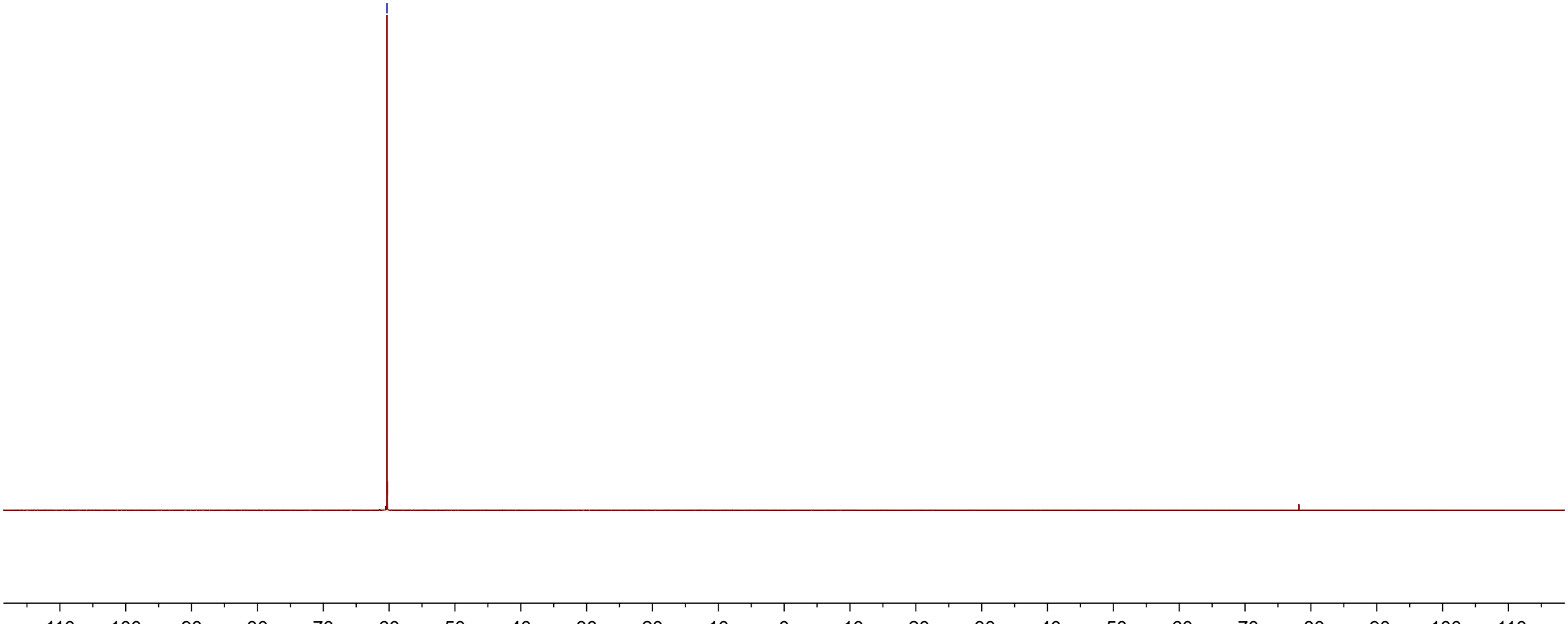

147.69
138.92
138.31
137.86
128.71
128.46
128.22
127.58
124.16
121.51
110.54
64.91
50.61
50.53
35.89
35.10
28.02
27.58
21.59
SO2F
Ph
N
5ac
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.57
H
f1 (ppm)

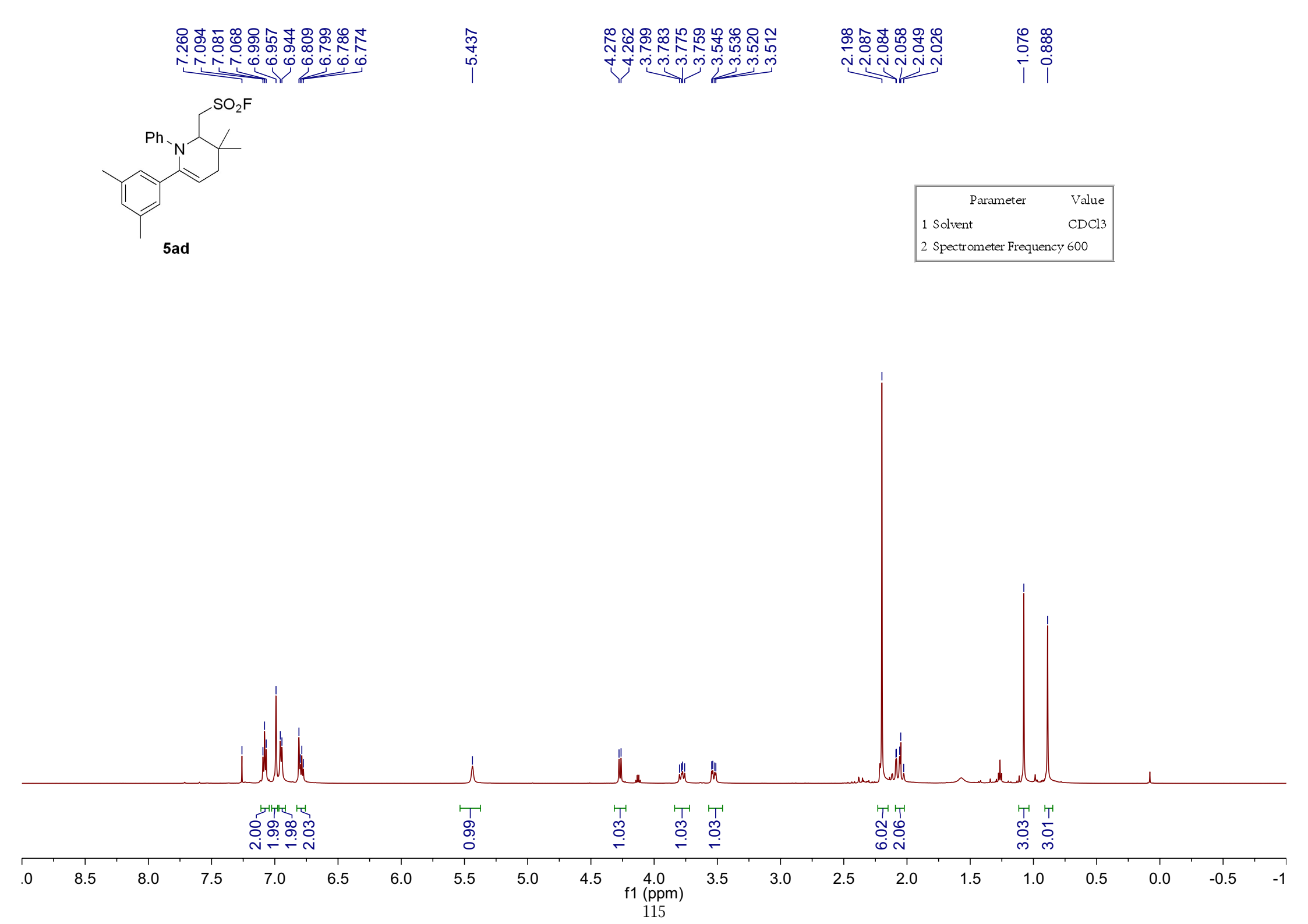


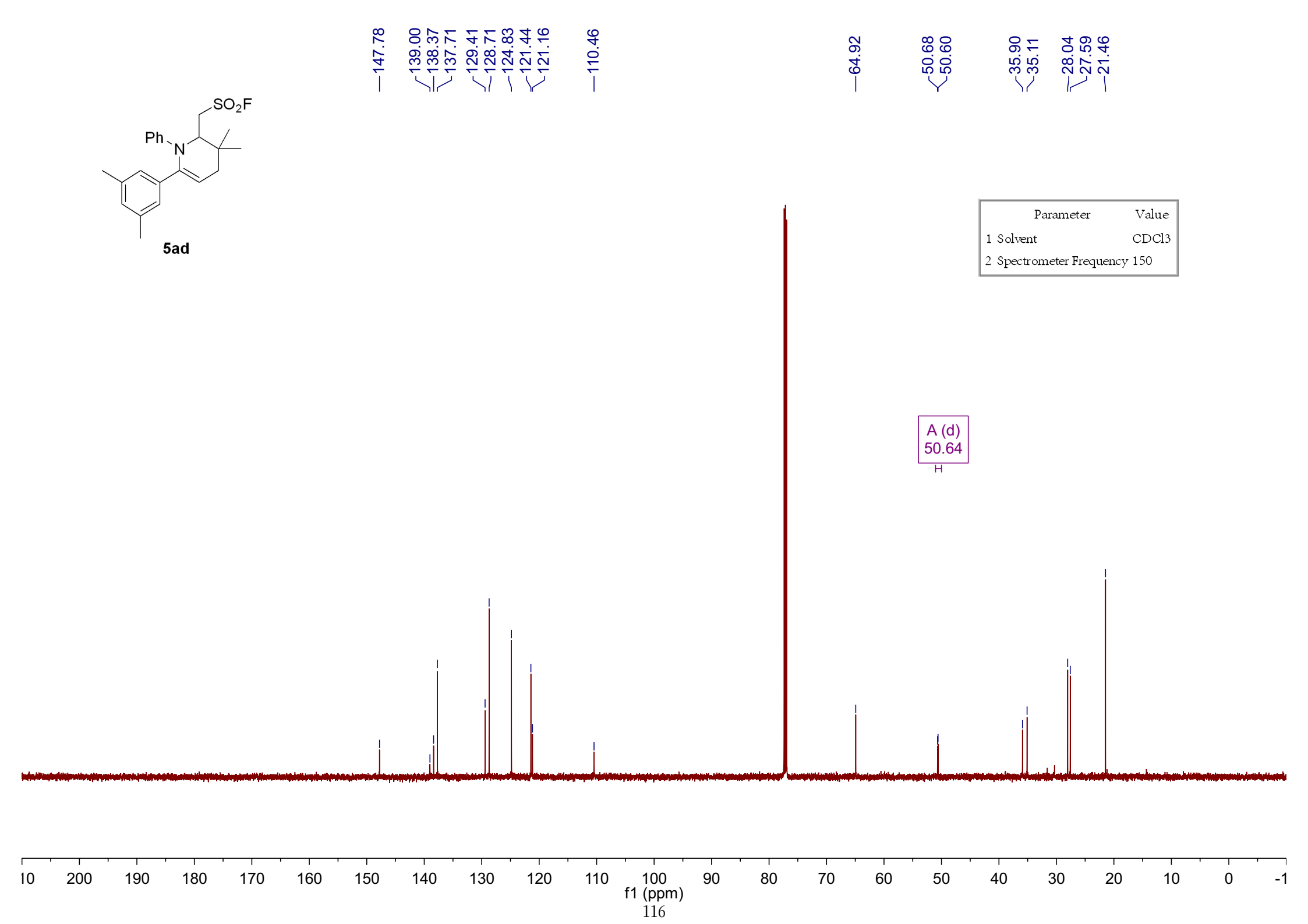
5ac

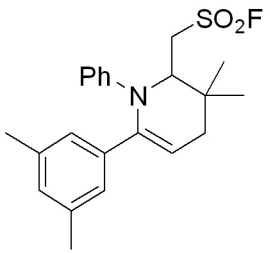
60.32

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




7.260
7.094
7.081
7.068
6.990
6.957
6.944
6.809
6.799
6.786
6.774
5.437
4.278
4.262
3.799
3.783
3.775
3.759
3.545
3.536
3.520
3.512
2.198
2.087
2.084
2.058
2.049
2.026
1.076
0.888
SO2F
Ph
N
5ad
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.00
1.99
1.98
2.03
0.99
1.03
1.03
1.03
6.02
2.06
3.03
3.01
f1 (ppm)

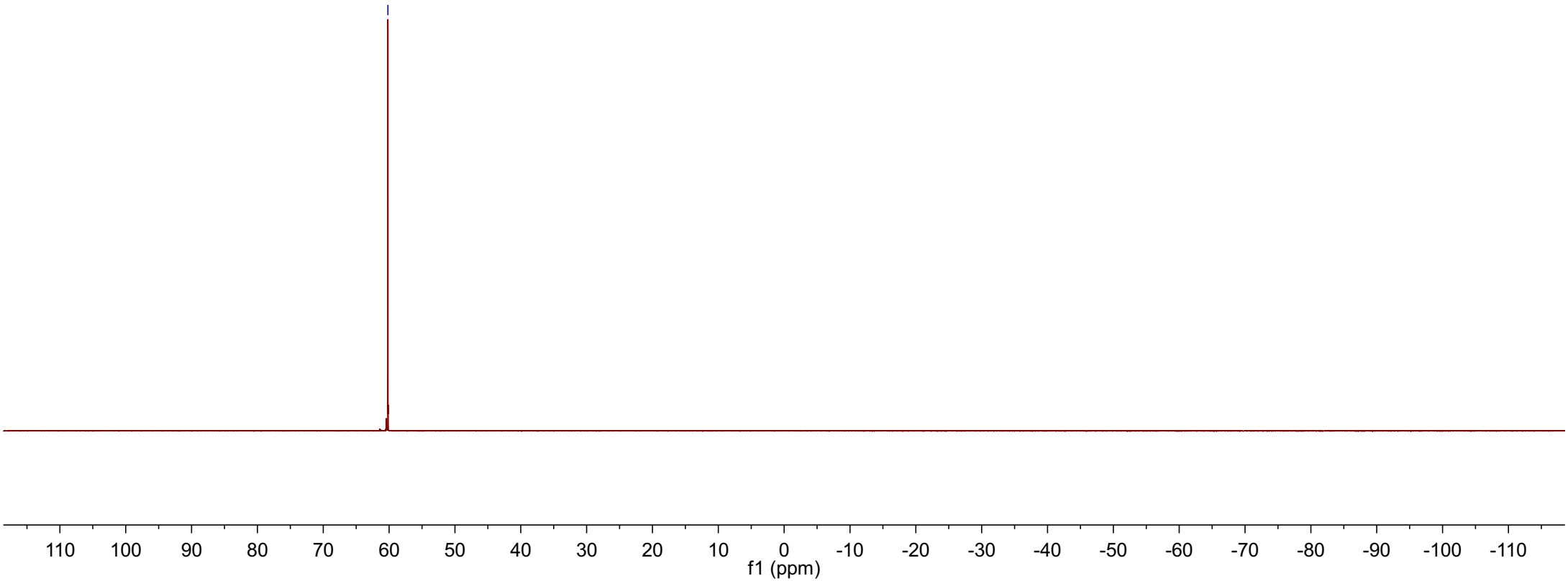

147.78
139.00
138.37
137.71
129.41
128.71
124.83
121.44
121.16
110.46
64.92
50.68
50.60
35.90
35.11
28.04
27.59
21.46
SO2F
Ph
N
5ad
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.64
H
f1 (ppm)

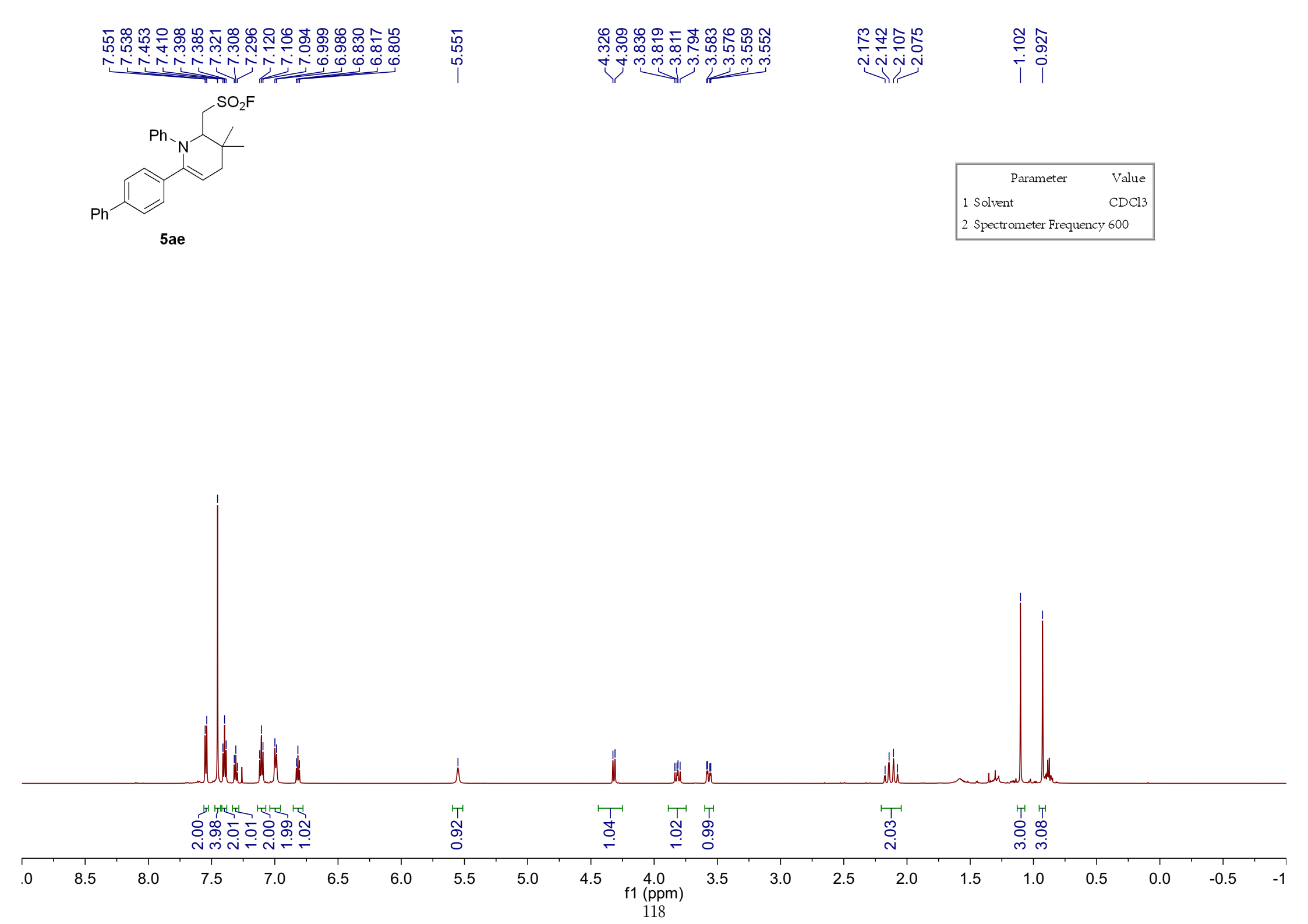


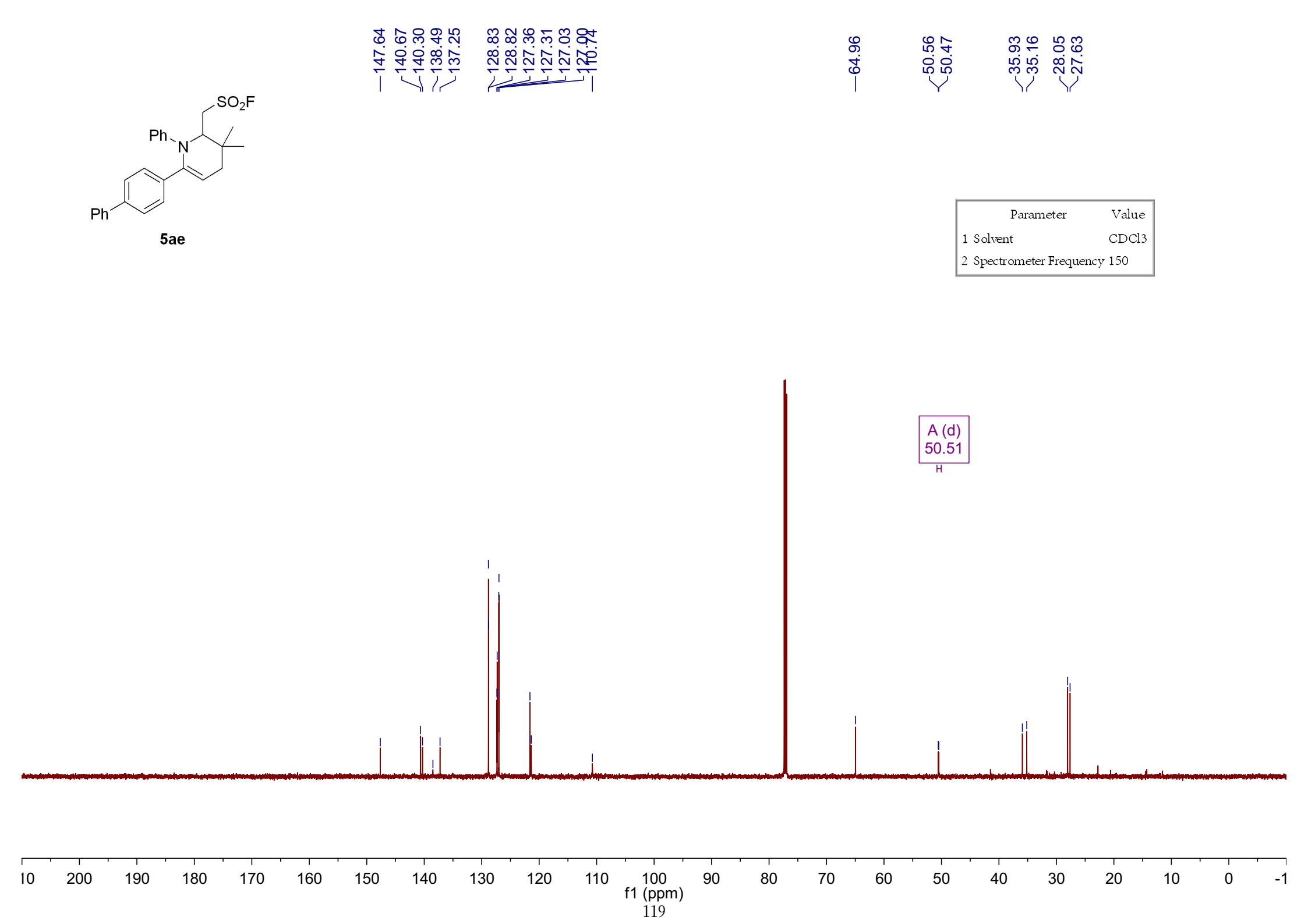
5ad

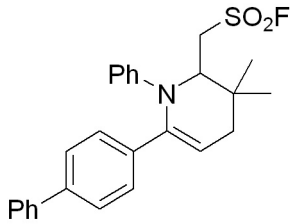
60.18

	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565




7.551
7.538
7.453
7.410
7.398
7.385
7.321
7.308
7.296
7.120
7.106
7.094
6.999
6.986
6.830
6.817
6.805
5.551
4.326
4.309
3.836
3.819
3.811
3.794
3.583
3.576
3.559
3.552
2.173
2.142
2.107
2.075
1.102
0.927
SO2F
Ph
N
Ph
5ae
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.00
3.98
2.01
1.01
2.00
1.99
1.02
0.92
1.04
1.02
0.99
2.03
3.00
3.08
f1 (ppm)


147.64
140.67
140.30
138.49
137.25
128.83
128.82
127.36
127.31
127.03
64.96
50.56
50.47
35.93
35.16
28.05
27.63
SO2F
Ph
N
Ph
5ae
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.51
H
f1 (ppm)

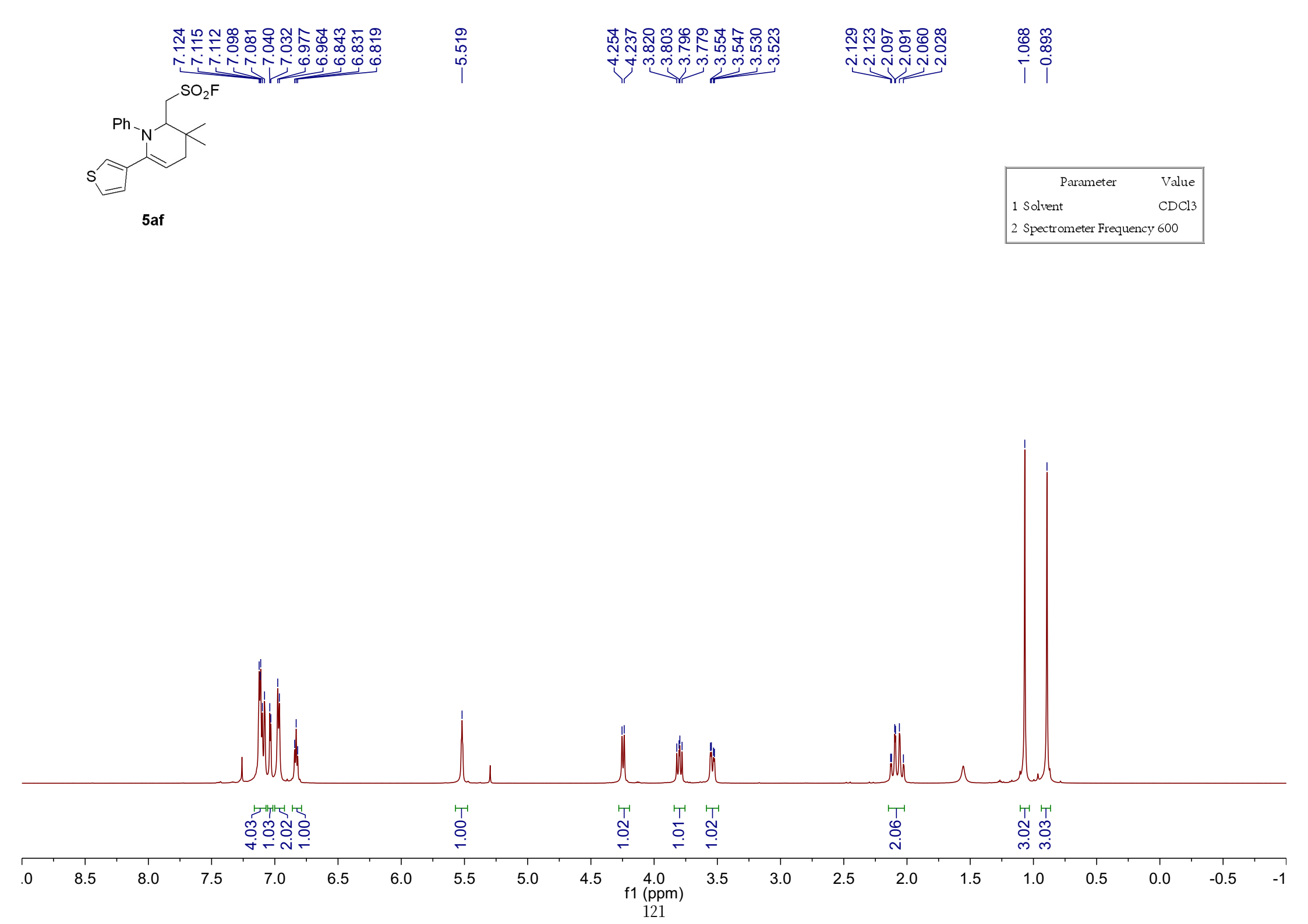


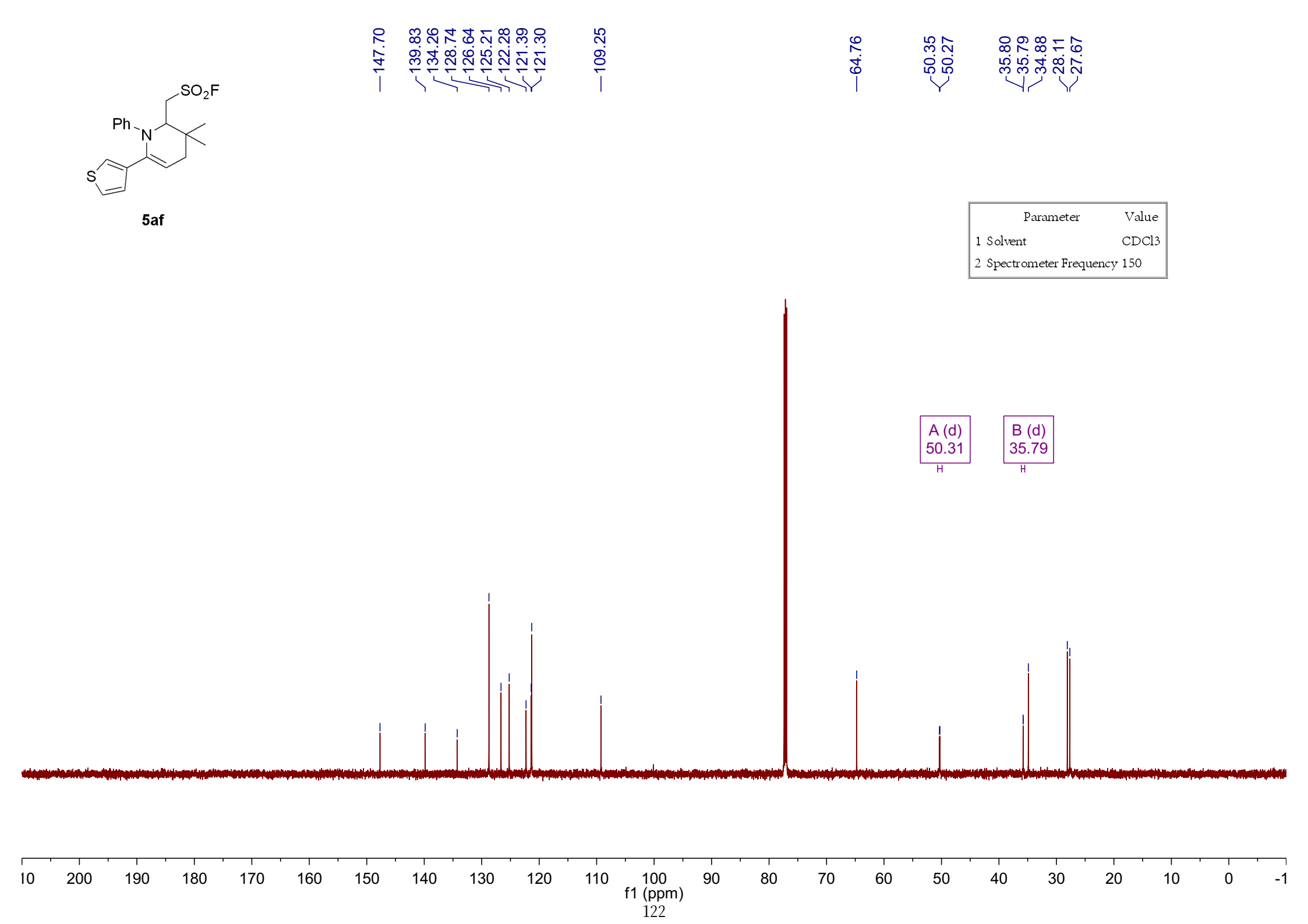
5ae

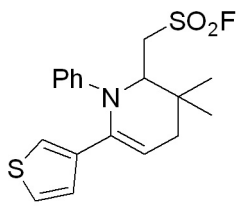
60.54

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.124
7.115
7.112
7.098
7.081
7.040
7.032
6.977
6.964
6.843
6.831
6.819
5.519
4.254
4.237
3.820
3.803
3.796
3.779
3.554
3.547
3.530
3.523
2.129
2.123
2.097
2.091
2.060
2.028
1.068
0.893
SO2F
Ph
N
S
5af
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
4.03
1.03
2.02
1.00
1.00
1.02
1.01
1.02
2.06
3.02
3.03
f1 (ppm)

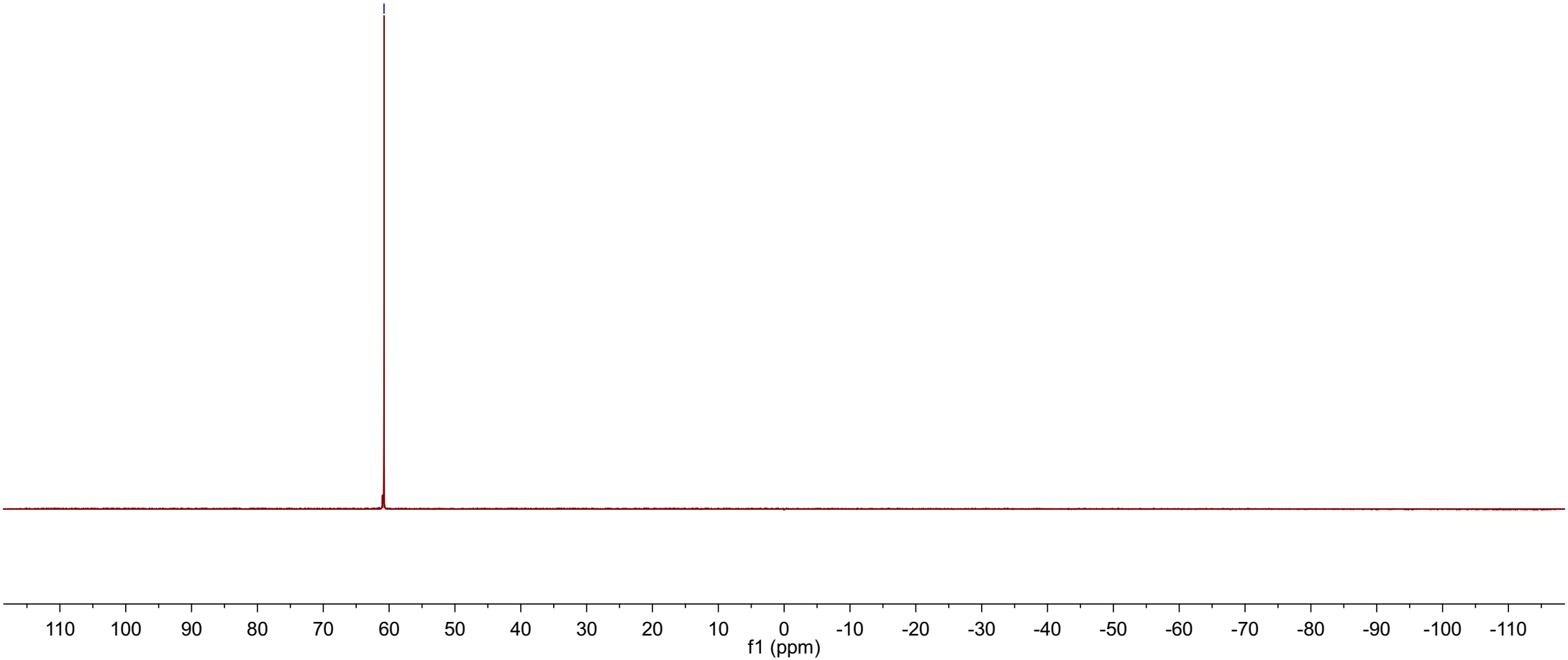

147.70
139.83
134.26
128.74
126.64
125.21
122.28
121.39
121.30
109.25
64.76
50.35
50.27
35.80
35.79
34.88
28.11
27.67
SO2F
Ph
N
S
5af
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.31
H
B (d)
35.79
H
f1 (ppm)

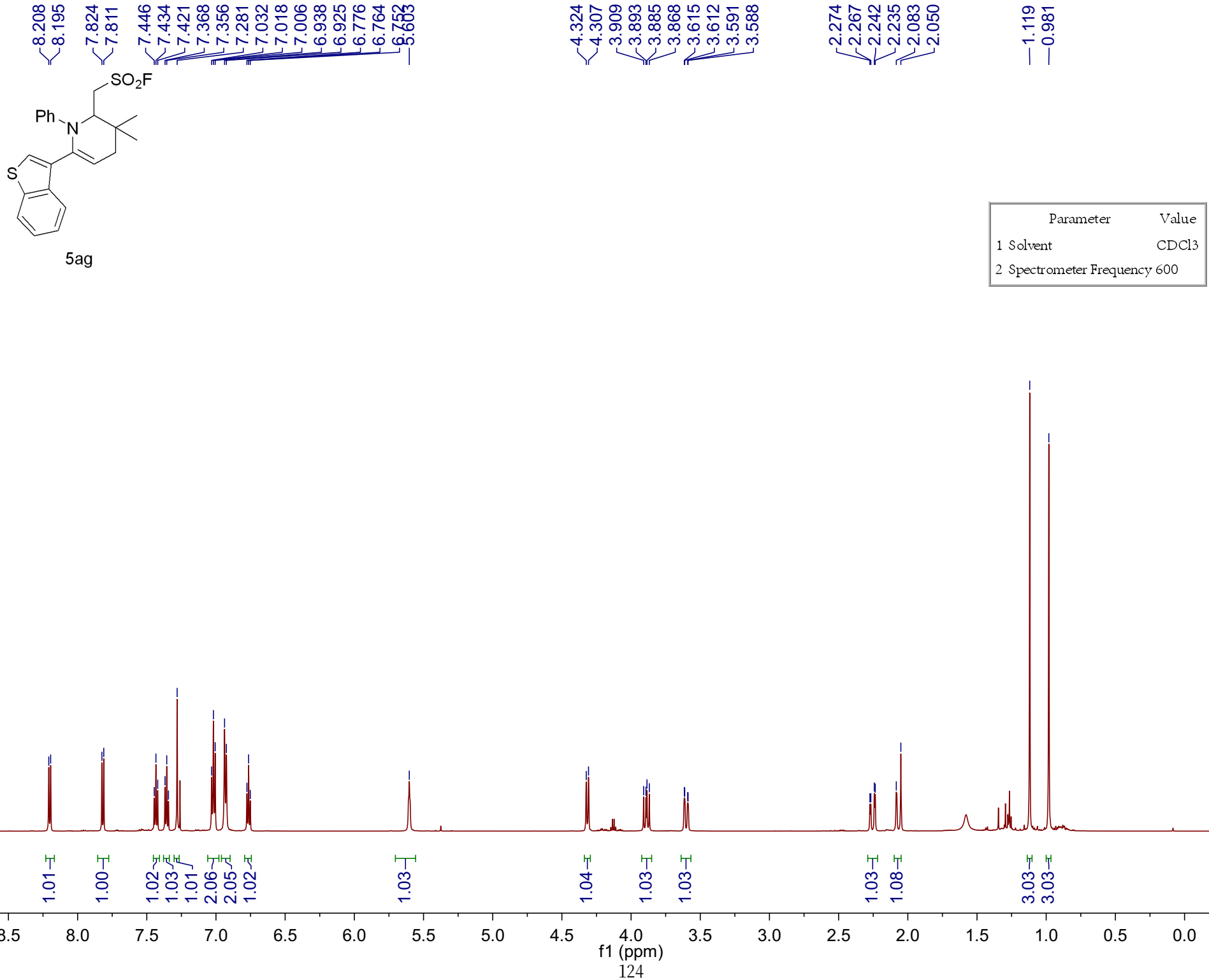


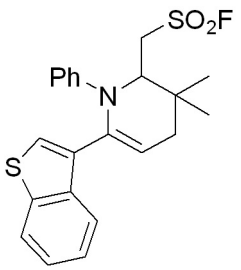
5af

60.77

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565




8.208
8.195
7.824
7.811
7.446
7.434
7.421
7.368
7.356
7.281
7.032
7.018
7.006
6.938
6.925
6.776
6.764
6.752
6.603
4.324
4.307
3.909
3.893
3.885
3.868
3.615
3.612
3.591
3.588
2.274
2.267
2.242
2.235
2.083
2.050
1.119
0.981
SO2F
Ph
N
S
5ag
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
1.01
1.00
1.02
1.03
1.01
2.06
2.05
1.02
1.03
1.04
1.03
1.03
1.03
1.08
3.03
3.03
f1 (ppm)



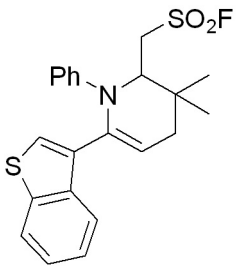
5ag

147.52
141.01
137.71
128.84
125.75
124.41
124.35
123.17
122.99
121.53
120.74
110.78
64.70
50.74
50.65
35.81
34.76
28.08
27.57

Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150

A (d)
50.70
H

f1 (ppm)



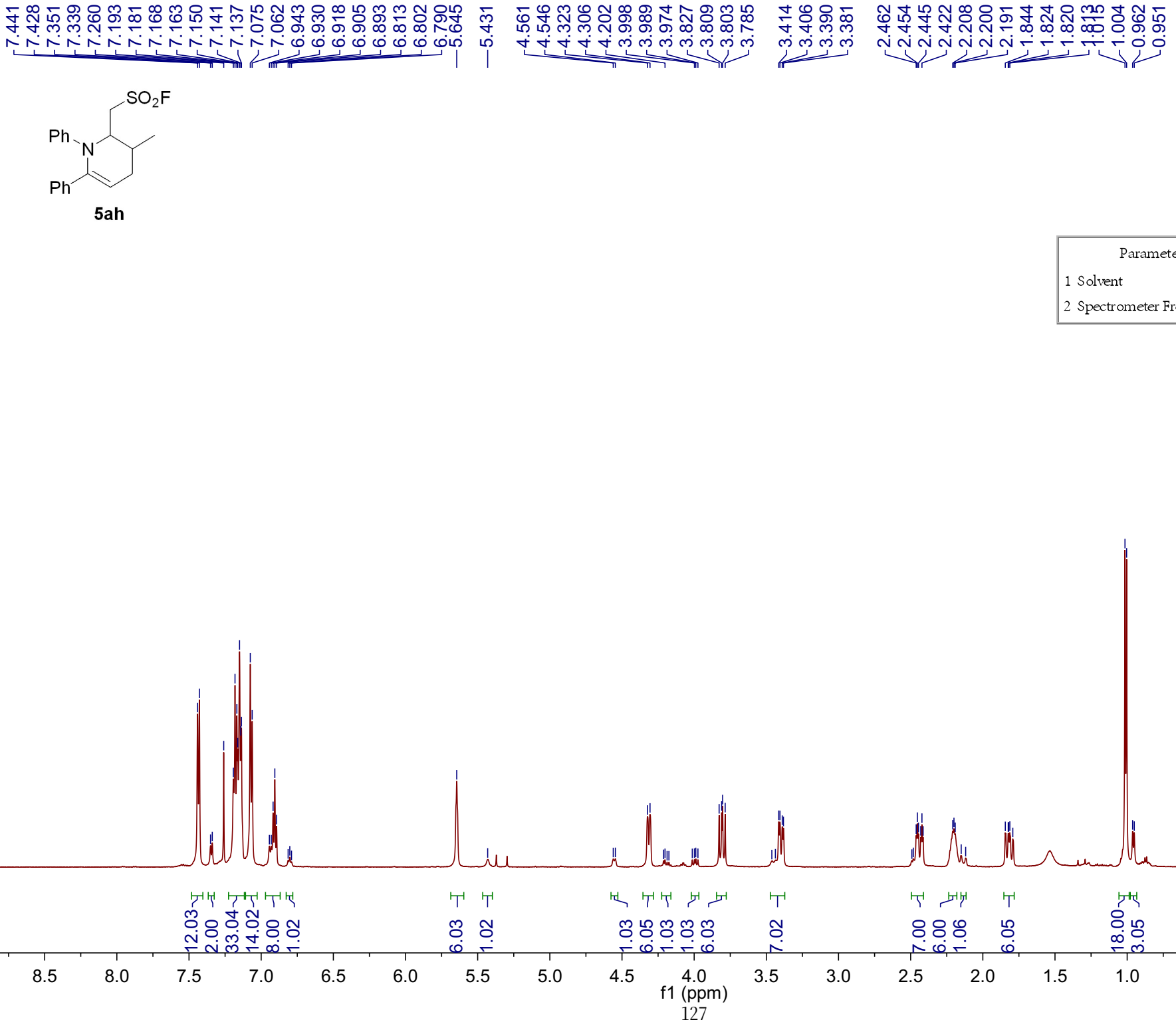
5ag

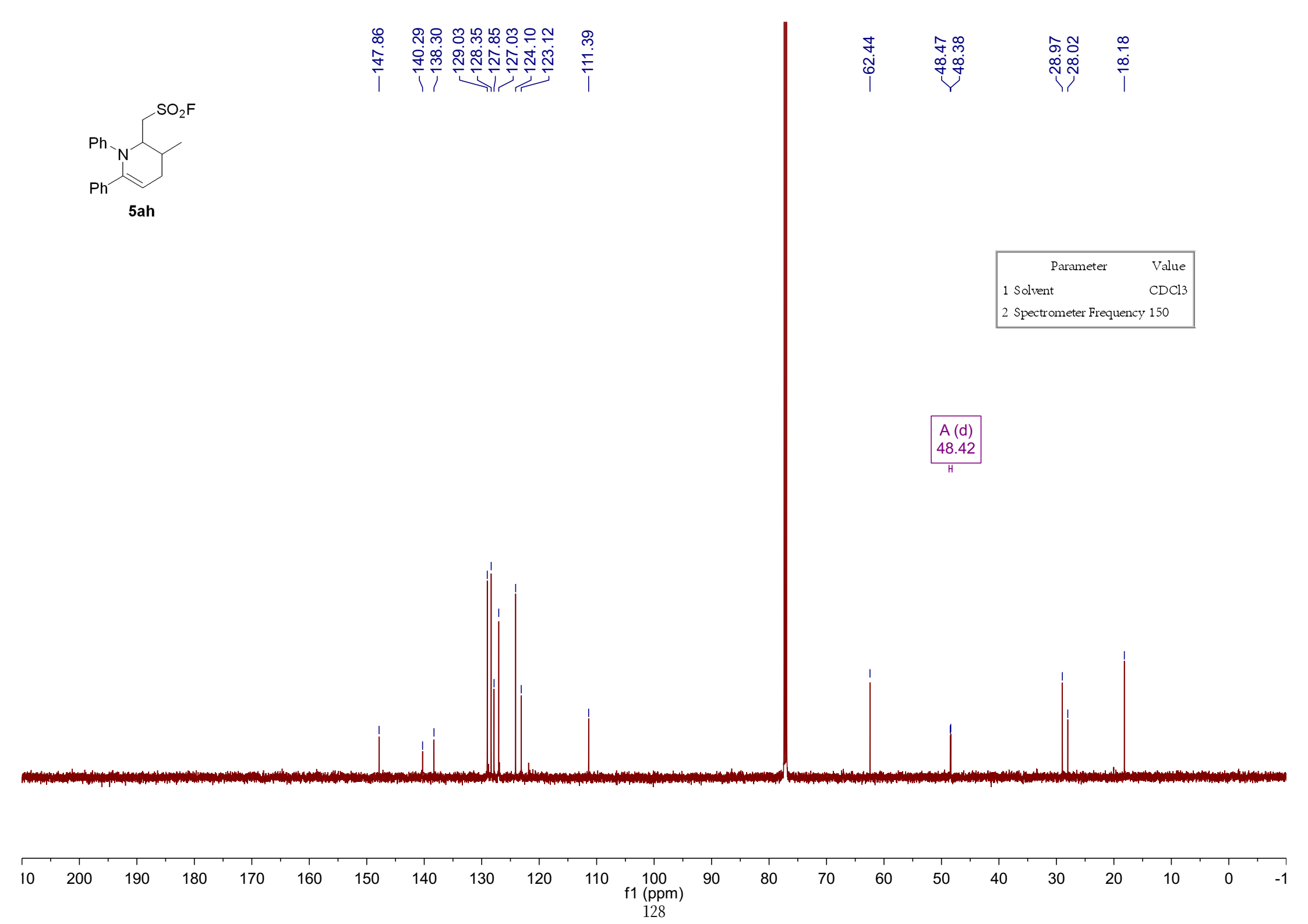
60.80

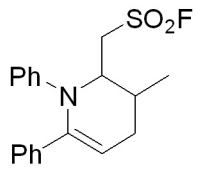
	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.441
7.428
7.351
7.339
7.260
7.193
7.181
7.168
7.163
7.150
7.141
7.137
7.075
7.062
6.943
6.930
6.918
6.905
6.893
6.813
6.802
6.790
5.645
5.431
4.561
4.546
4.323
4.306
4.202
3.998
3.989
3.974
3.827
3.809
3.803
3.785
3.414
3.406
3.390
3.381
2.462
2.454
2.445
2.422
2.208
2.200
2.191
1.844
1.824
1.820
1.813
1.004
0.962
0.951
SO2F
Ph
N
Ph
5ah
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
12.03
2.00
33.04
14.02
8.00
1.02
6.03
1.02
1.03
6.05
1.03
1.03
6.03
7.02
7.00
6.00
1.06
6.05
18.00
3.05
f1 (ppm)


147.86
140.29
138.30
129.03
128.35
127.85
127.03
124.10
123.12
111.39
62.44
48.47
48.38
28.97
28.02
18.18
SO2F
Ph
N
Ph
5ah
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
48.42
H
f1 (ppm)



5ah

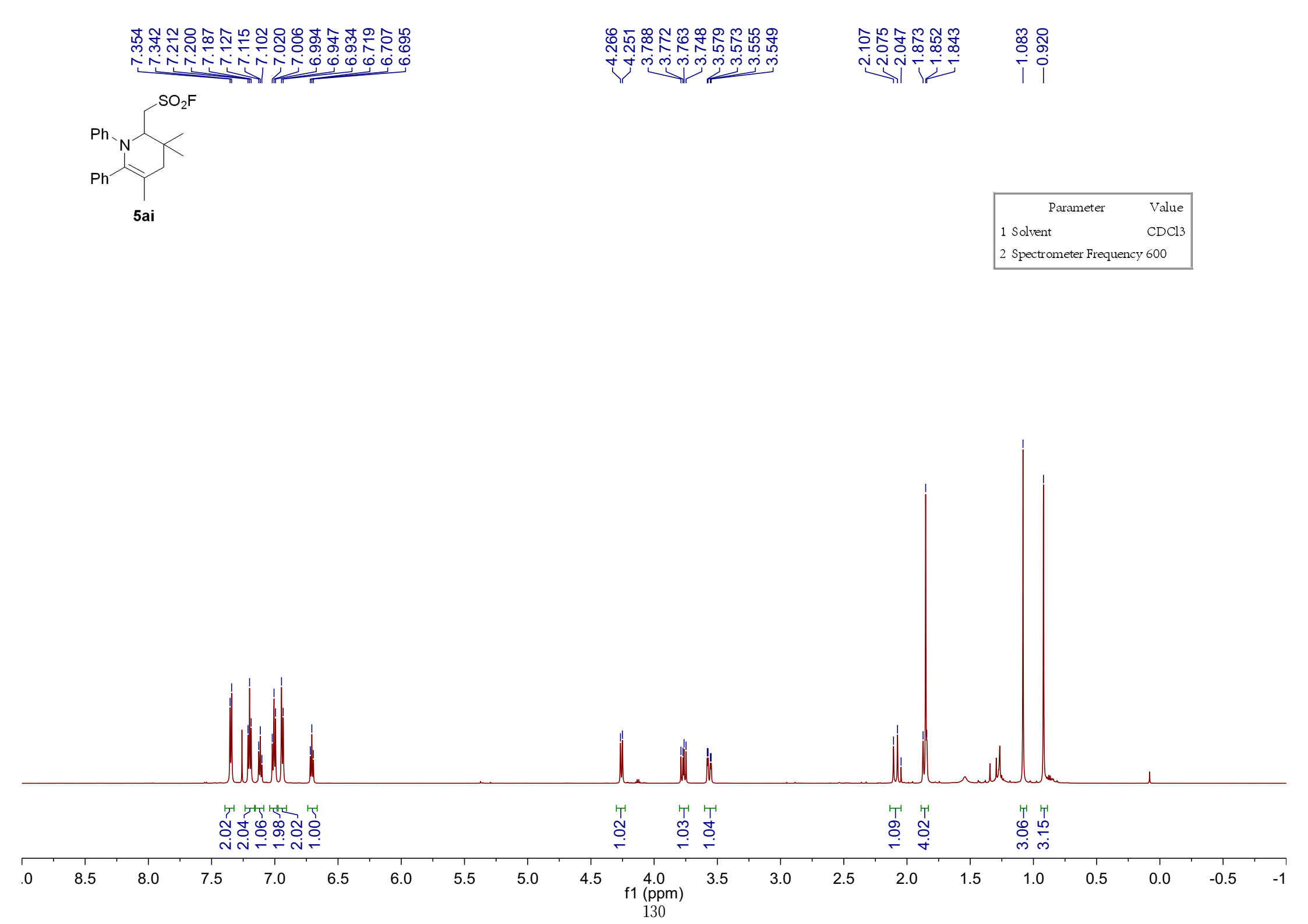
61.40
60.08

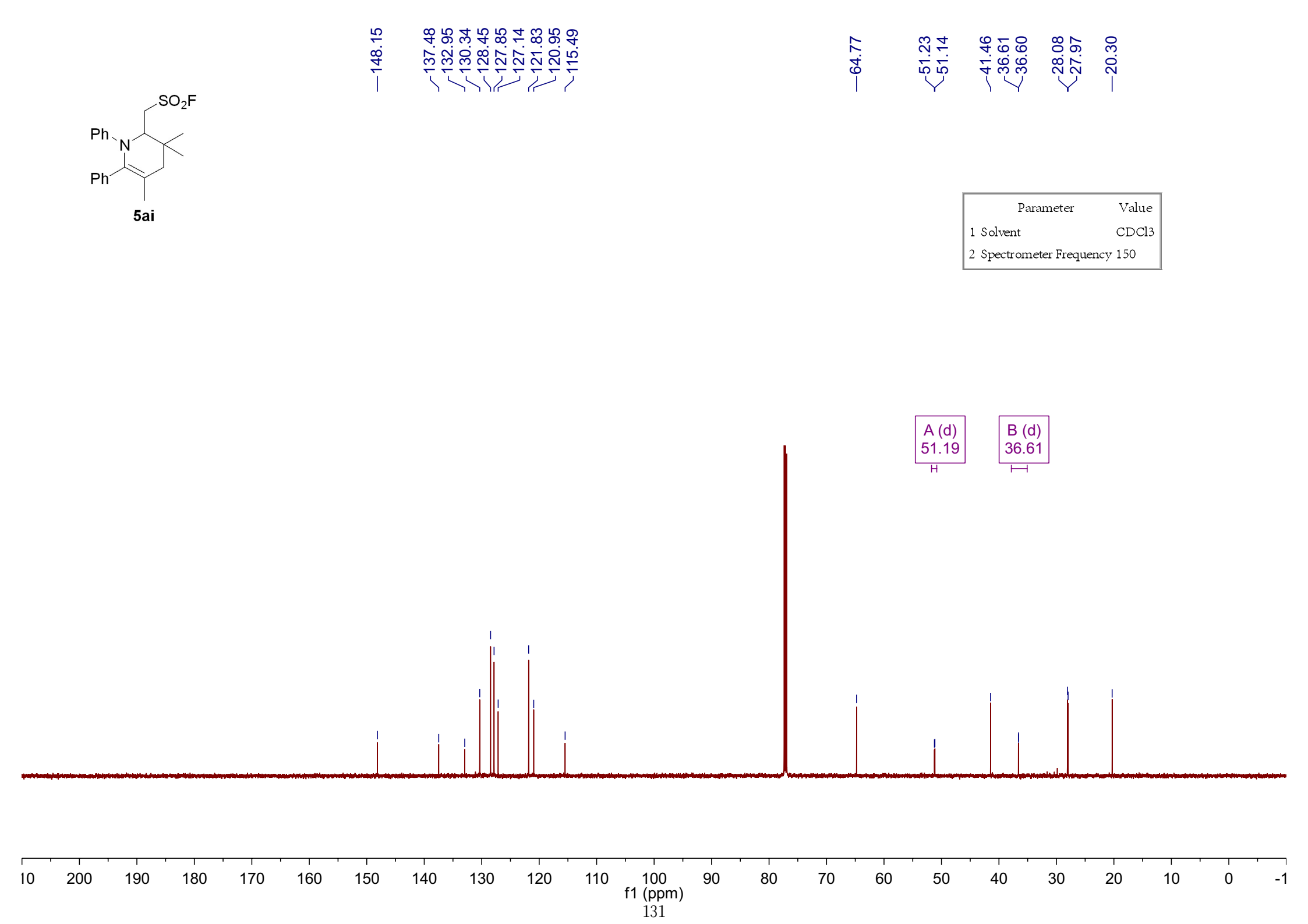
	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565

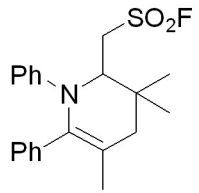
13.01
14.05
1.85
2.08

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.354
7.342
7.212
7.200
7.187
7.127
7.115
7.102
7.020
7.006
6.994
6.947
6.934
6.719
6.707
6.695
4.266
4.251
3.788
3.772
3.763
3.748
3.579
3.573
3.555
3.549
2.107
2.075
2.047
1.873
1.852
1.843
1.083
0.920
SO2F
Ph
N
Ph
5ai
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.02
2.04
1.06
1.98
2.02
1.00
1.02
1.03
1.04
1.09
4.02
3.06
3.15
f1 (ppm)

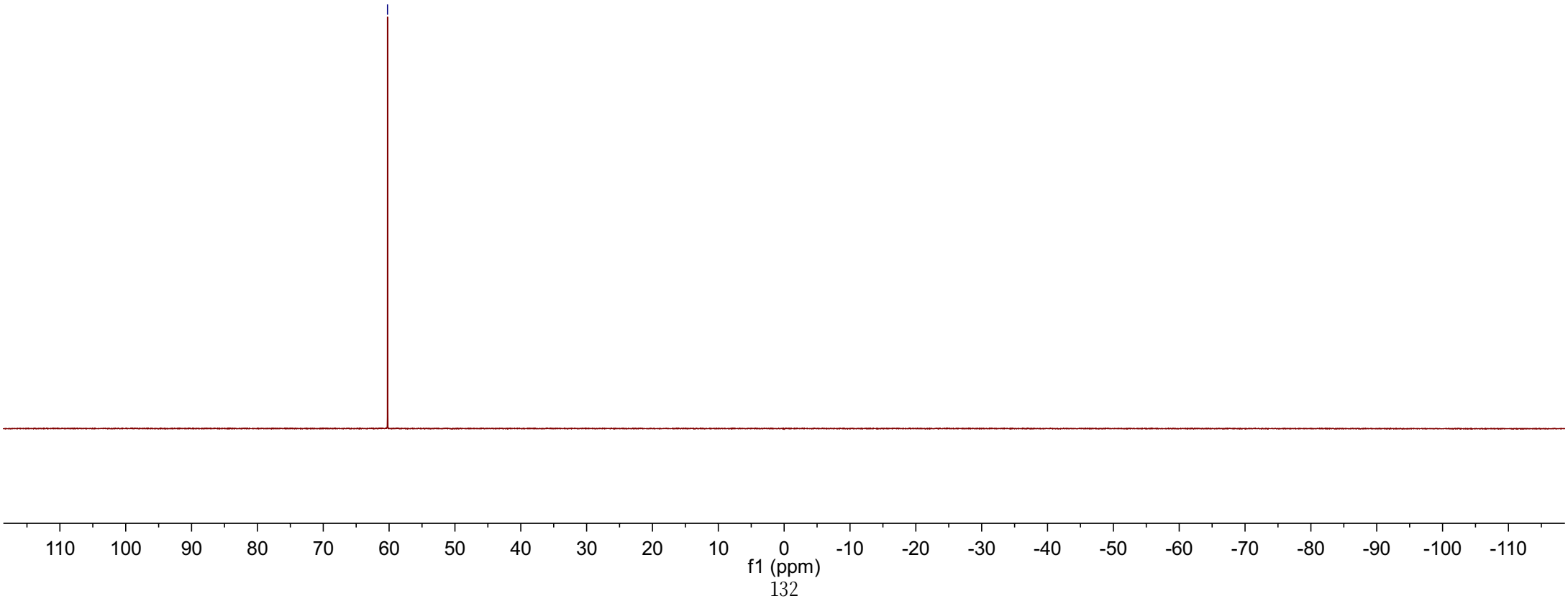

148.15
137.48
132.95
130.34
128.45
127.85
127.14
121.83
120.95
115.49
64.77
51.23
51.14
41.46
36.61
36.60
28.08
27.97
20.30
SO2F
Ph
N
Ph
5ai
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
51.19
B (d)
36.61
f1 (ppm)

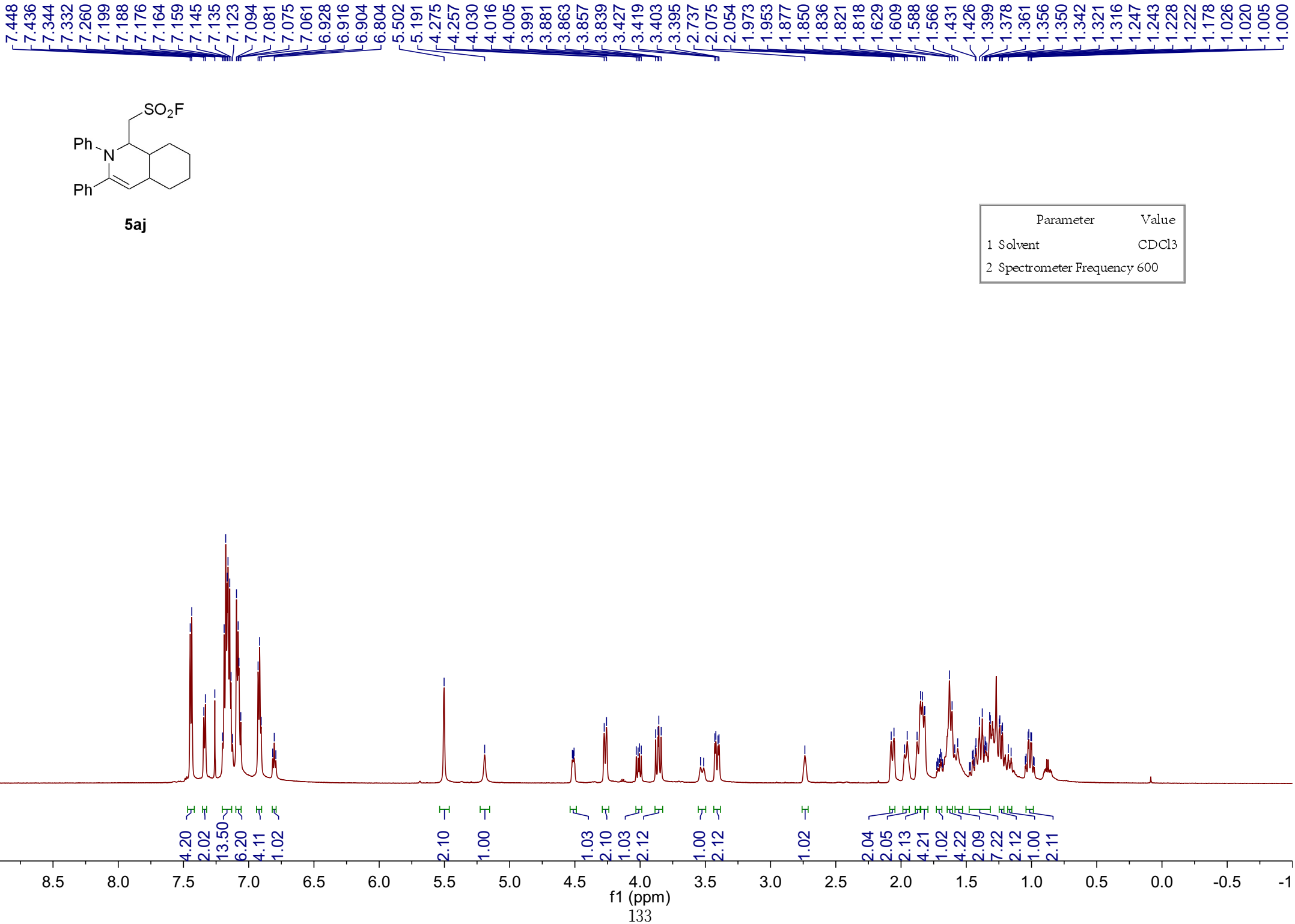


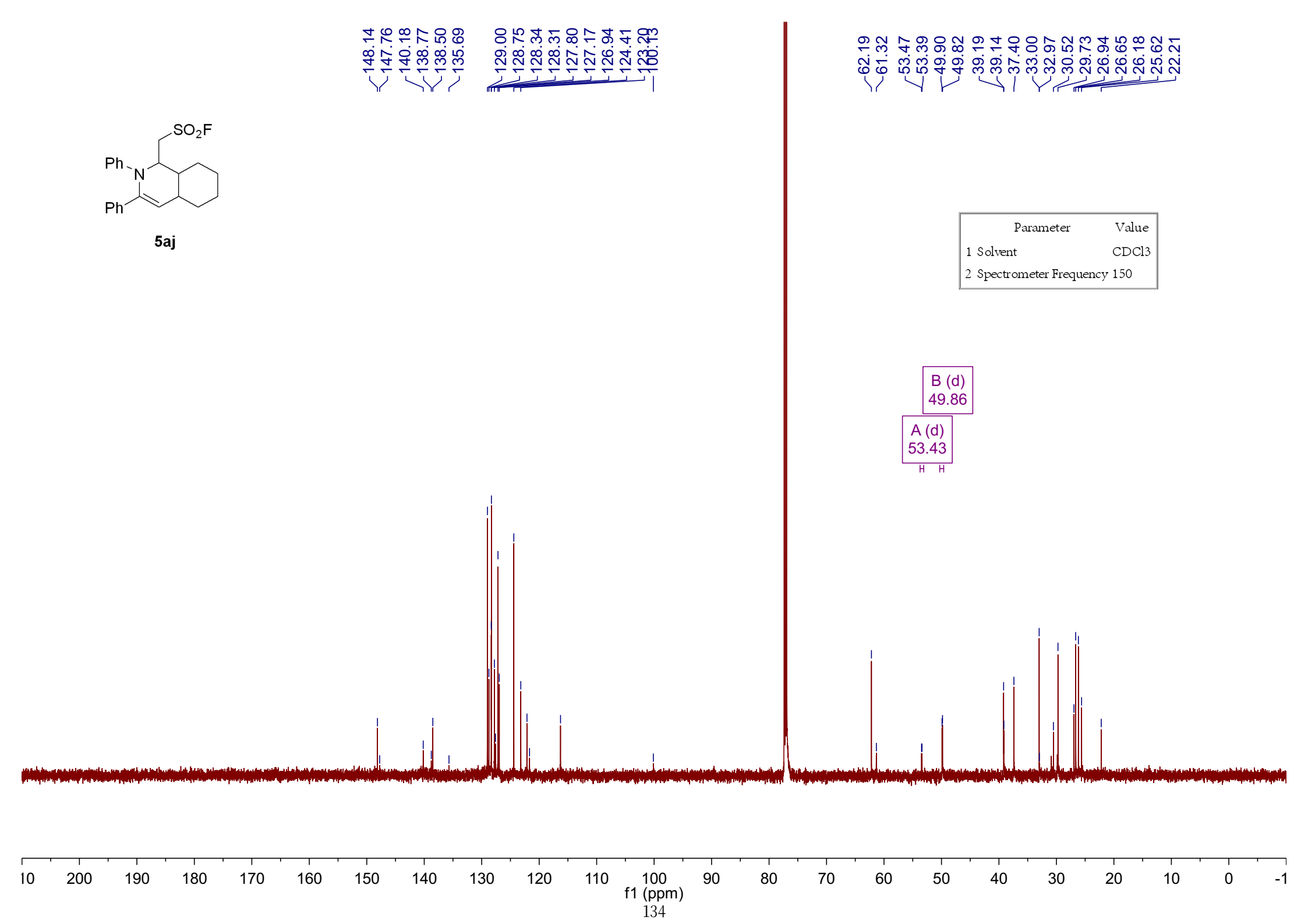
5ai

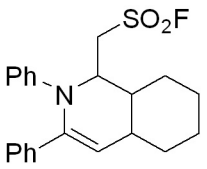
60.24

	Parameter	Value
1	Solvent	CDCl3
2	Spectrometer Frequency	565




7.448 7.436 7.344 7.332 7.260 7.199 7.188 7.176 7.164 7.159 7.145 7.135 7.123 7.094 7.081 7.075 7.061 6.928 6.916 6.904 6.804 5.502 5.191 4.275 4.257 4.030 4.016 4.005 3.991 3.881 3.863 3.857 3.839 3.427 3.419 3.403 3.395 2.737 2.075 2.054 1.973 1.953 1.877 1.850 1.836 1.821 1.818 1.629 1.609 1.588 1.566 1.431 1.426 1.399 1.378 1.361 1.356 1.350 1.342 1.321 1.316 1.247 1.243 1.228 1.222 1.178 1.026 1.020 1.005 1.000
SO2F
Ph
N
Ph
5aj
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
4.20 2.02 13.50 6.20 4.11 1.02 2.10 1.00 1.03 2.10 1.03 2.12 1.00 2.12 1.02 2.04 2.05 2.13 4.21 1.02 4.22 2.09 7.22 2.12 1.00 2.11
f1 (ppm)


148.14
147.76
140.18
138.77
138.50
135.69
129.00
128.75
128.34
128.31
127.80
127.17
126.94
124.41
123.20
100.13
62.19
61.32
53.47
53.39
49.90
49.82
39.19
39.14
37.40
33.00
32.97
30.52
29.73
26.94
26.65
26.18
25.62
22.21
SO2F
Ph
N
Ph
5aj
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
B (d)
49.86
A (d)
53.43
H H
f1 (ppm)



5aj

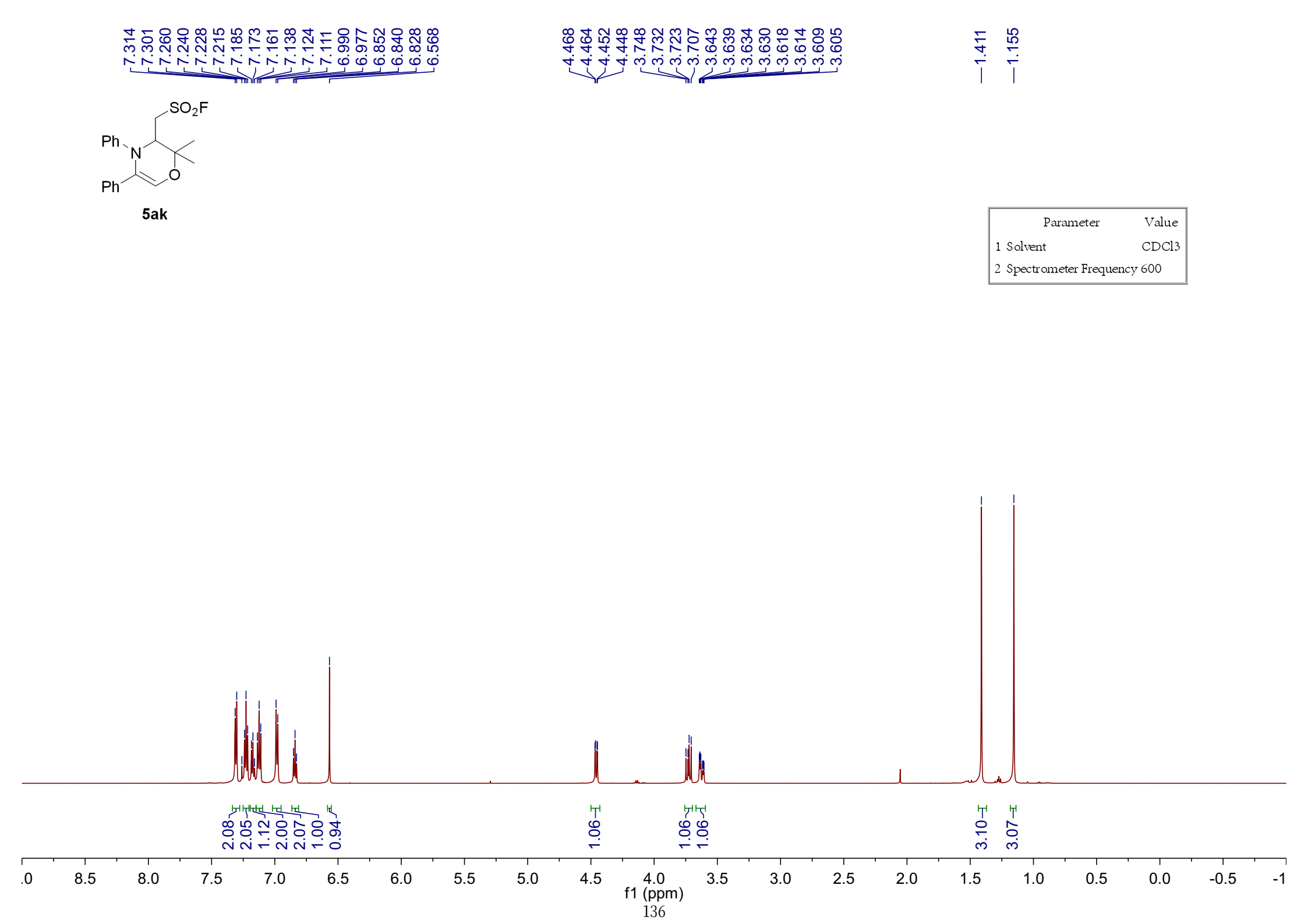
61.56
60.40

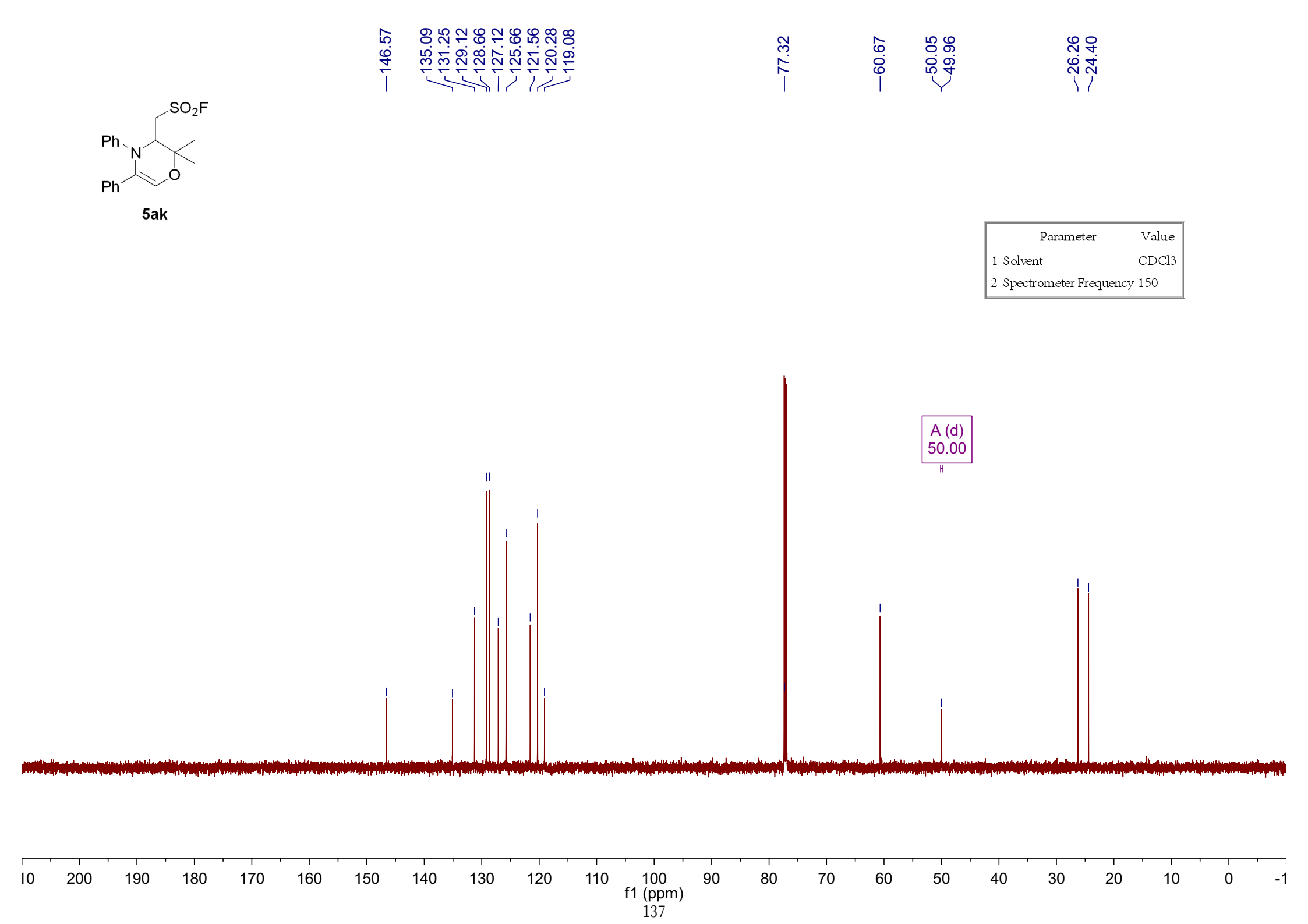
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

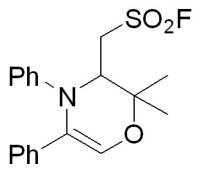
2.10
1.00

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)


7.314
7.301
7.260
7.240
7.228
7.215
7.185
7.173
7.161
7.138
7.124
7.111
6.990
6.977
6.852
6.840
6.828
6.568
4.468
4.464
4.452
4.448
3.748
3.732
3.723
3.707
3.643
3.639
3.634
3.630
3.618
3.614
3.609
3.605
1.411
1.155
SO2F
Ph
N
O
Ph
5ak
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.08
2.05
1.12
2.00
2.07
1.00
0.94
1.06
1.06
1.06
3.10
3.07
f1 (ppm)


146.57
135.09
131.25
129.12
128.66
127.12
125.66
121.56
120.28
119.08
77.32
60.67
50.05
49.96
26.26
24.40
SO2F
Ph
N
O
Ph
5ak
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
50.00
f1 (ppm)



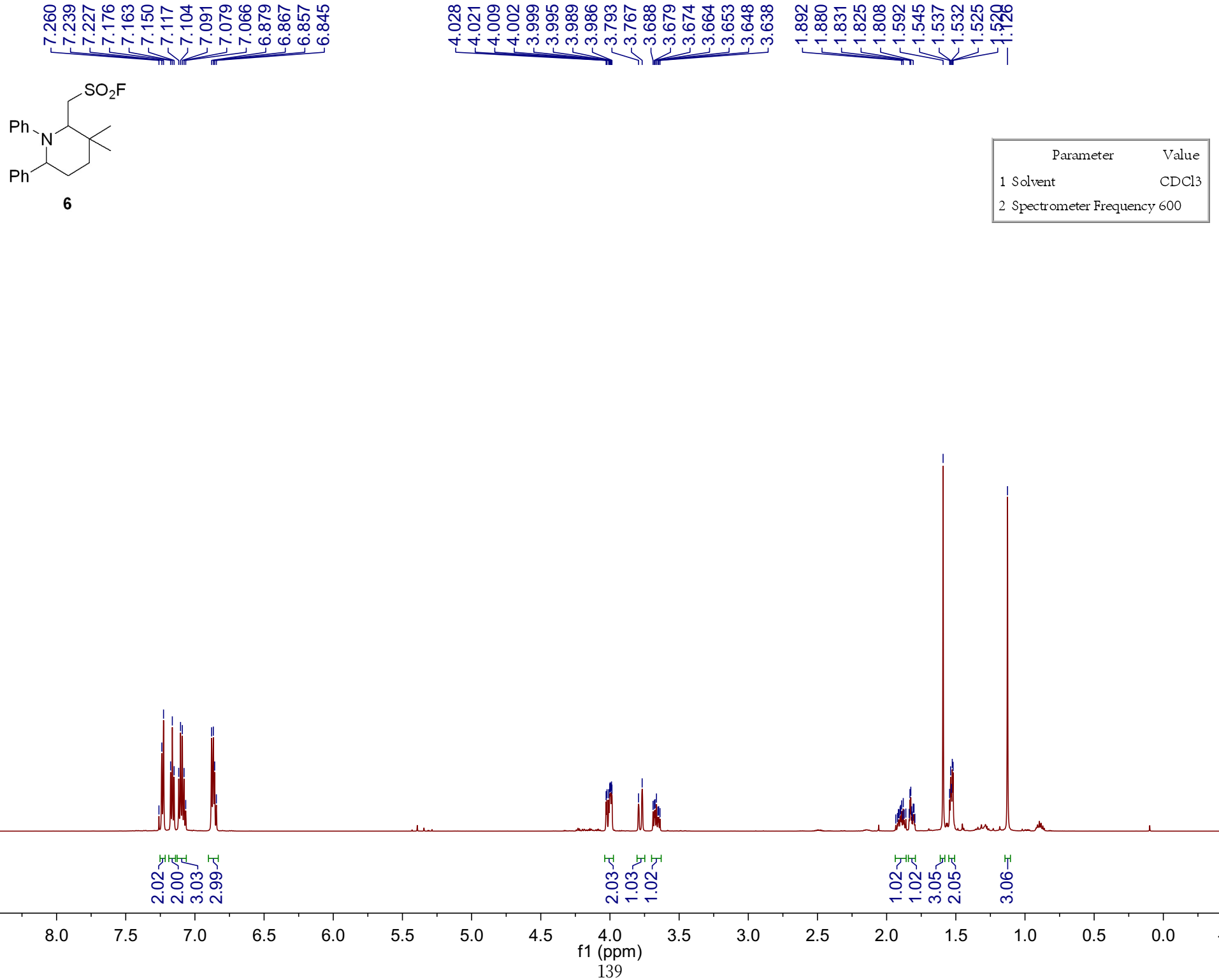
5ak

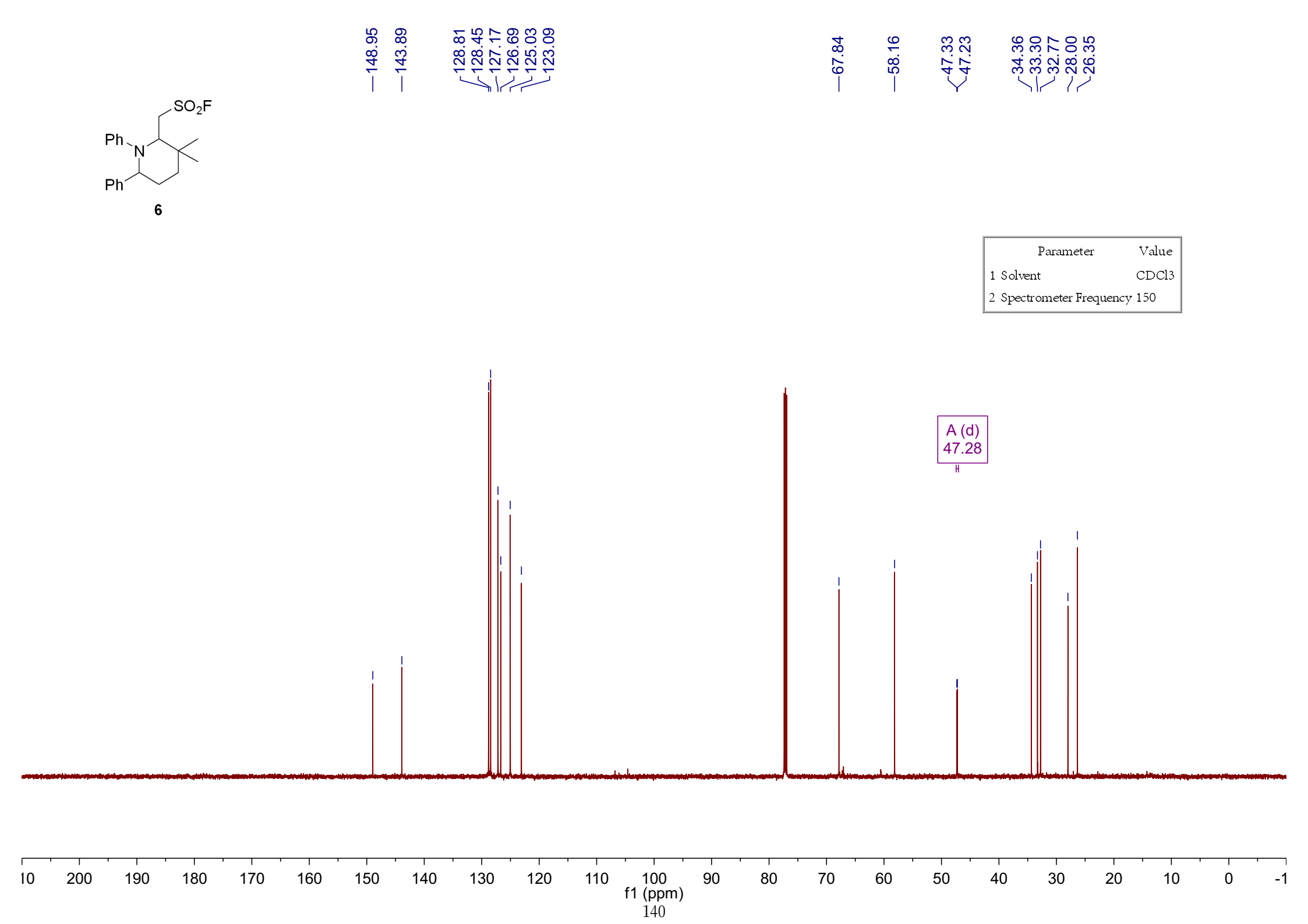
60.87

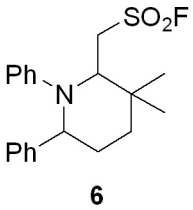
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	565

110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

f1 (ppm)

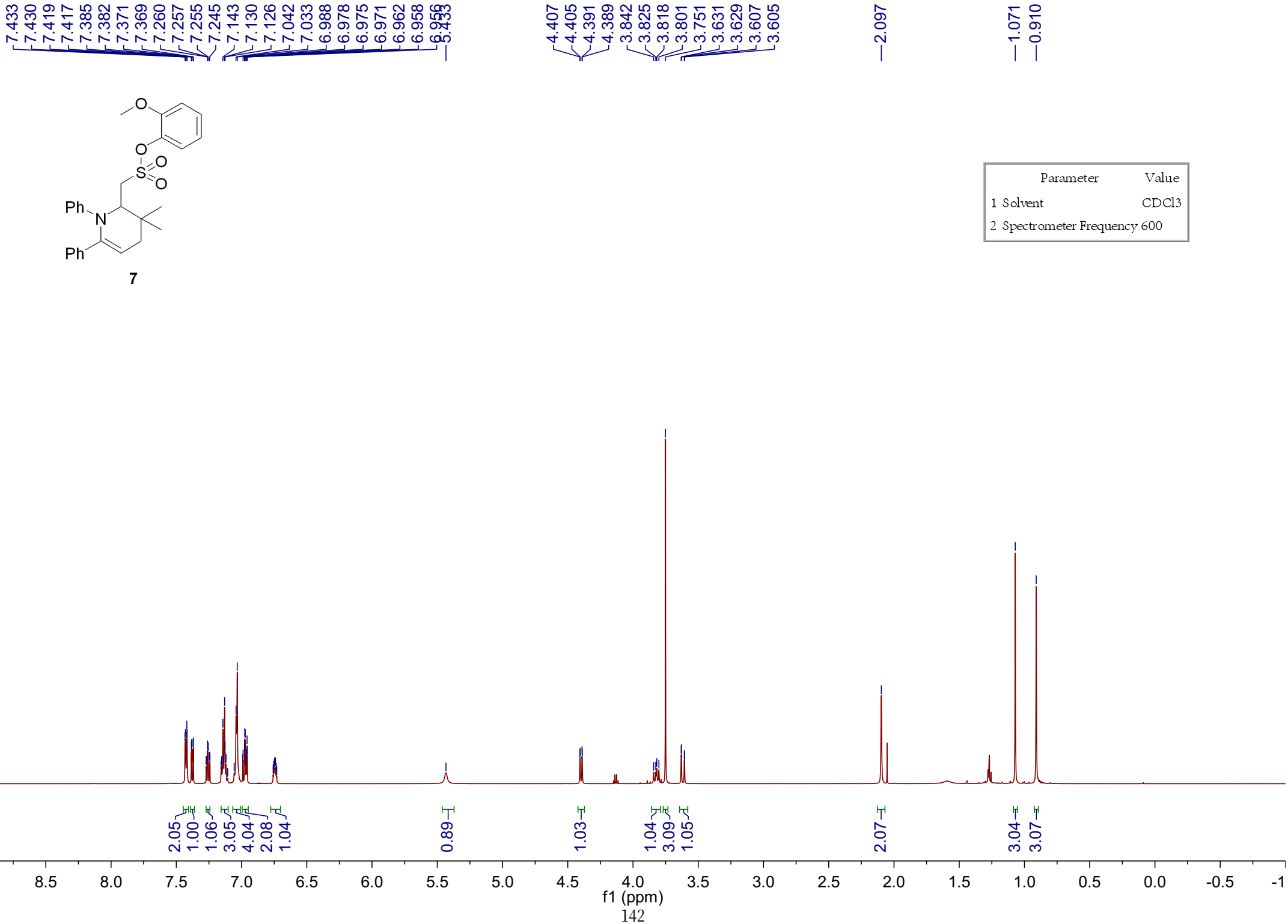

7.260
7.239
7.227
7.176
7.163
7.150
7.117
7.104
7.091
7.079
7.066
6.879
6.867
6.857
6.845
4.028
4.021
4.009
4.002
3.999
3.995
3.989
3.986
3.793
3.767
3.688
3.679
3.674
3.664
3.653
3.648
3.638
1.892
1.880
1.831
1.825
1.808
1.592
1.545
1.537
1.532
1.525
1.520
1.126
SO2F
Ph
N
Ph
6
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.02
2.00
3.03
2.99
2.03
1.03
1.02
1.02
1.02
3.05
2.05
3.06
f1 (ppm)

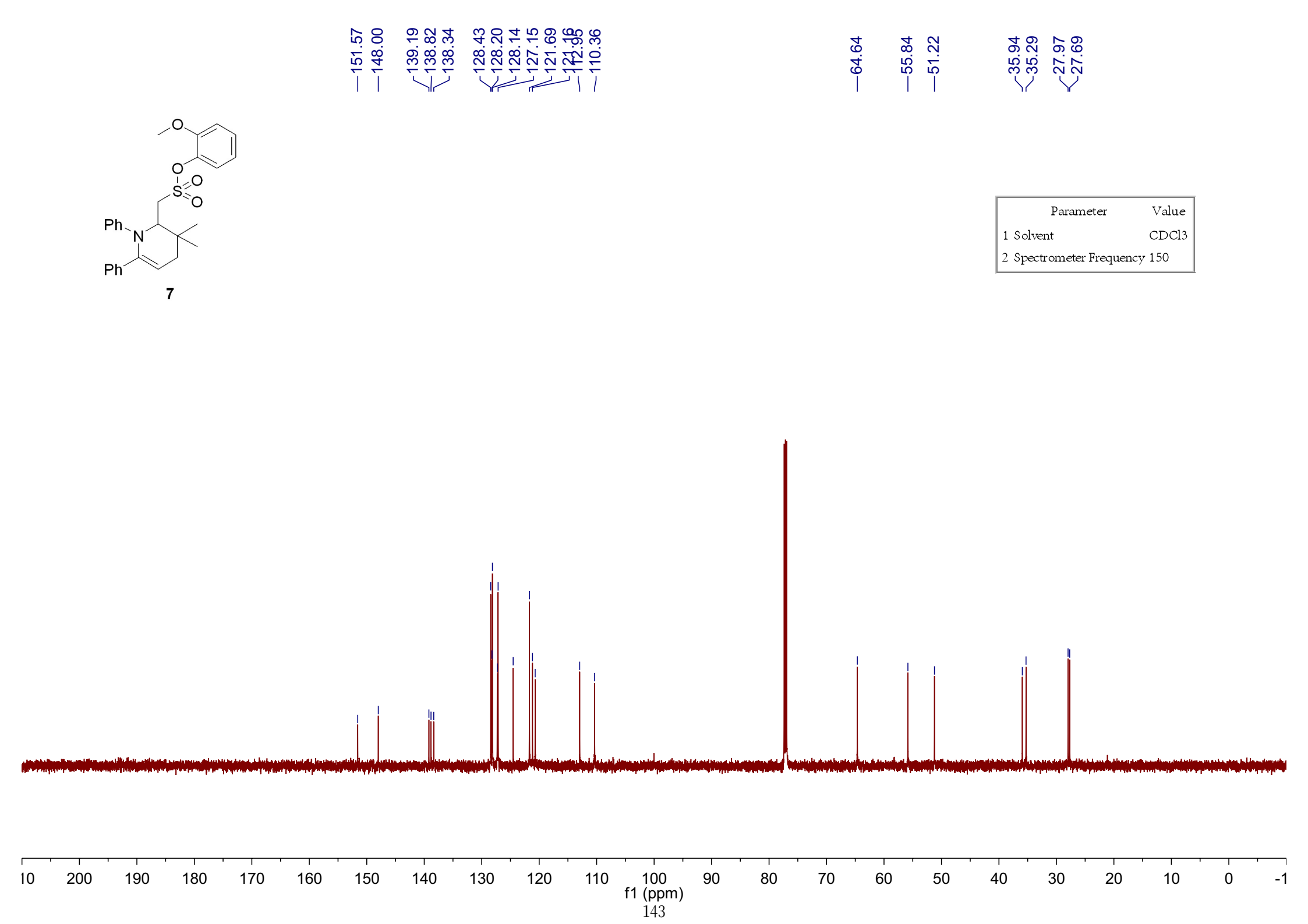

148.95
143.89
128.81
128.45
127.17
126.69
125.03
123.09
67.84
58.16
47.33
47.23
34.36
33.30
32.77
28.00
26.35
SO2F
Ph
N
Ph
6
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
A (d)
47.28
f1 (ppm)

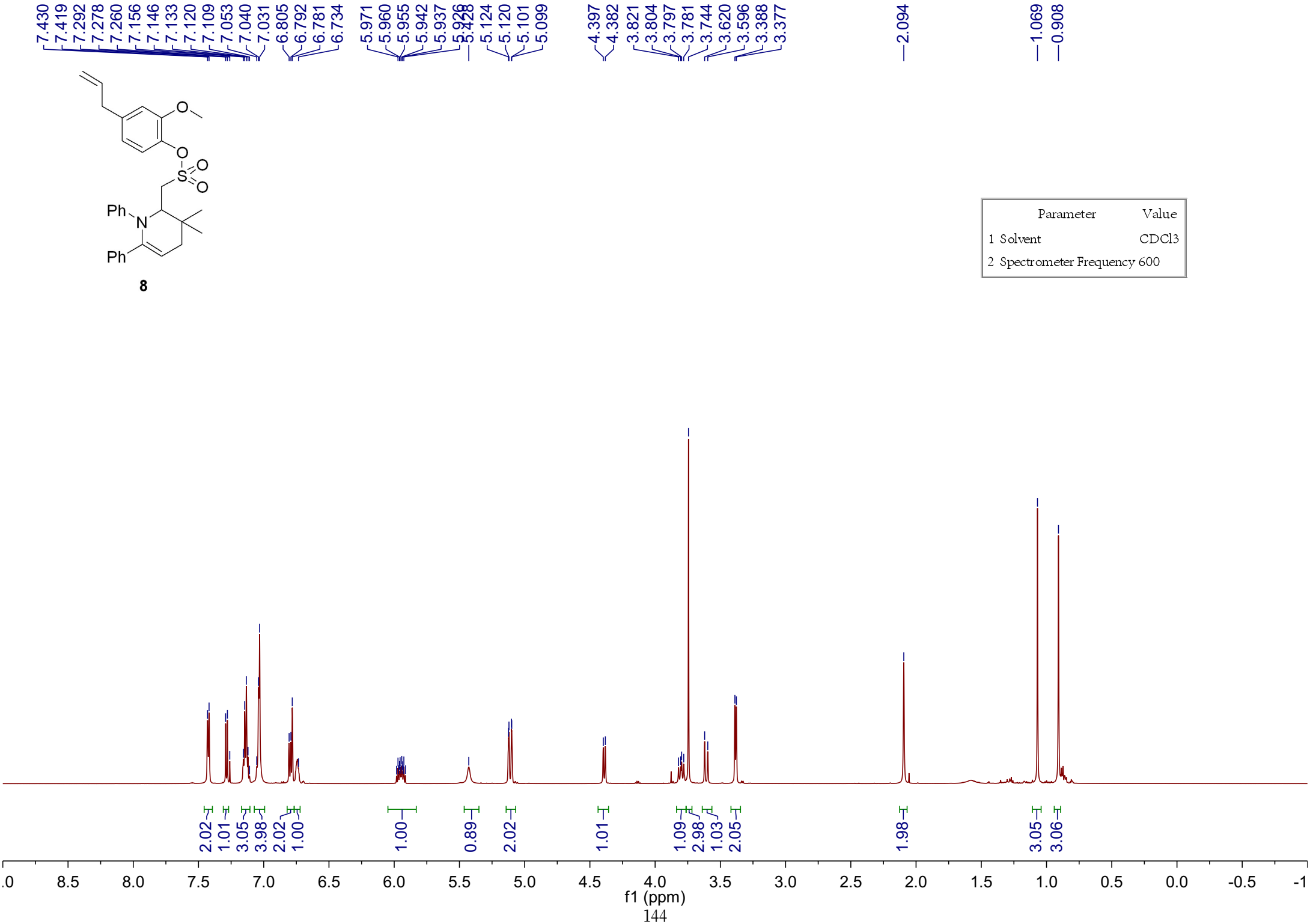

SO2F
Ph
N
Ph

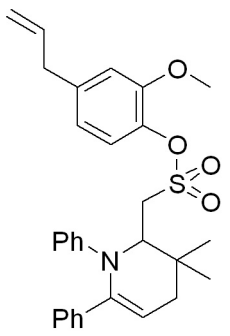
6

57.57
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 565
110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110
f1 (ppm)


7.433
7.430
7.419
7.417
7.385
7.382
7.371
7.369
7.260
7.257
7.255
7.245
7.143
7.130
7.126
7.042
7.033
6.988
6.978
6.975
6.971
6.962
6.958
6.956
3.433
4.407
4.405
4.391
4.389
3.842
3.825
3.818
3.801
3.751
3.631
3.629
3.607
3.605
2.097
1.071
0.910
O
O
S
O
O
Ph
N
Ph
7
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.05
1.00
1.06
3.05
4.04
2.08
1.04
0.89
1.03
1.04
3.09
1.05
2.07
3.04
3.07
f1 (ppm)


151.57
148.00
139.19
138.82
138.34
128.43
128.20
128.14
127.15
121.69
121.16
112.95
110.36
64.64
55.84
51.22
35.94
35.29
27.97
27.69
Ph
N
Ph
O
O
S
O
O
7
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
f1 (ppm)

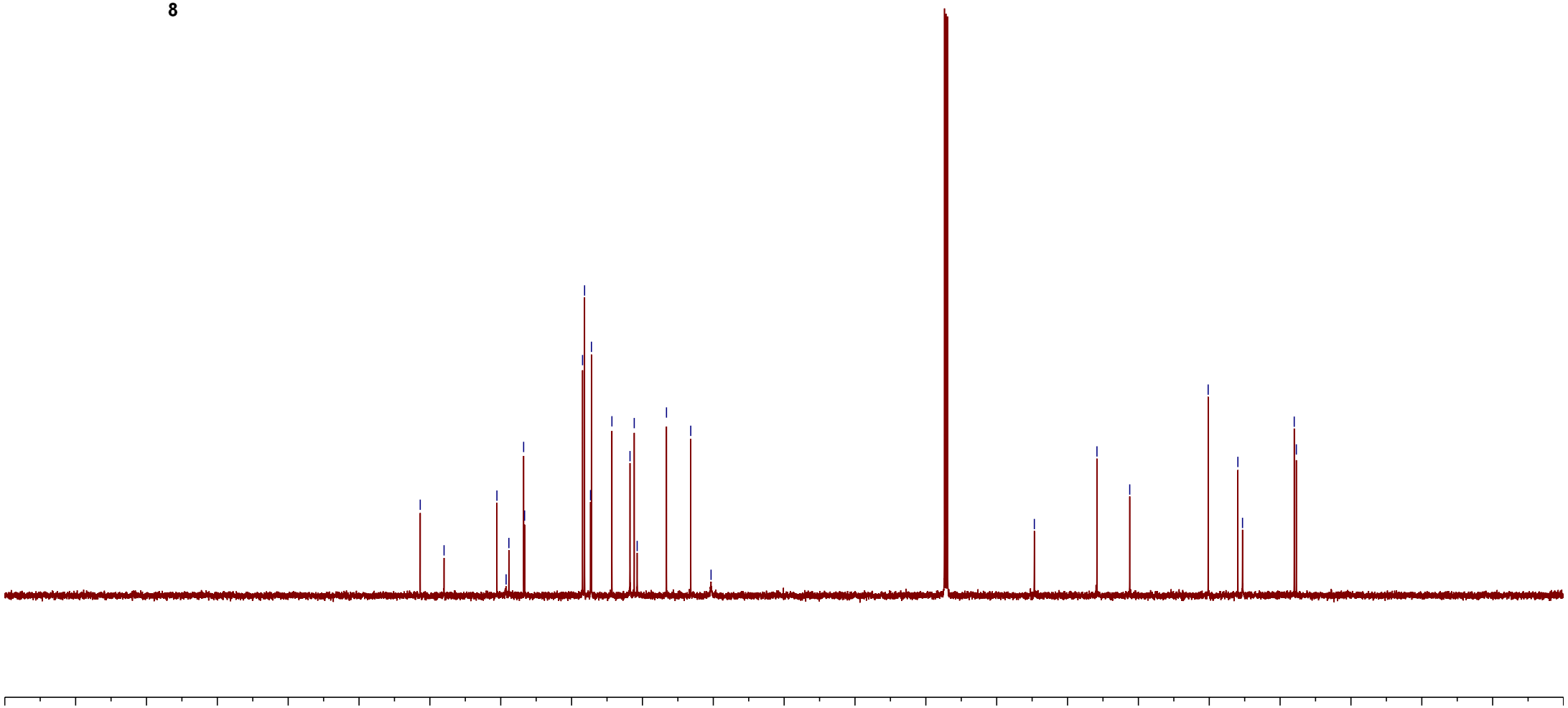

7.430
7.419
7.292
7.278
7.260
7.156
7.146
7.133
7.120
7.109
7.053
7.040
7.031
6.805
6.792
6.781
6.734
5.971
5.960
5.955
5.942
5.937
5.124
5.120
5.101
5.099
4.397
4.382
3.821
3.804
3.797
3.781
3.744
3.620
3.596
3.388
3.377
2.094
1.069
0.908
Ph
N
Ph
O
O
S
O
O
8
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.02
1.01
3.05
3.98
2.02
1.00
1.00
0.89
2.02
1.01
1.09
2.98
1.03
2.05
1.98
3.05
3.06
f1 (ppm)

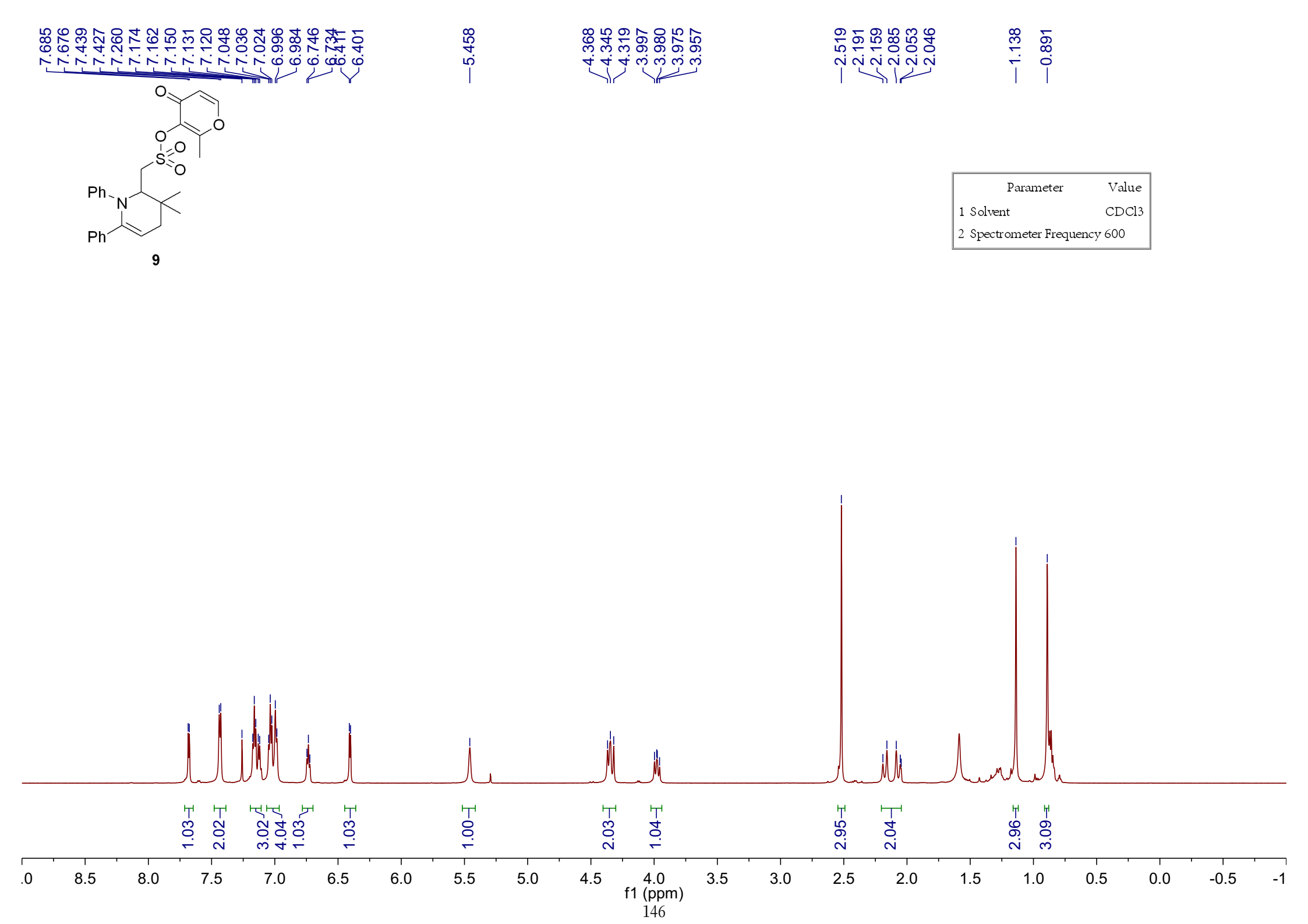


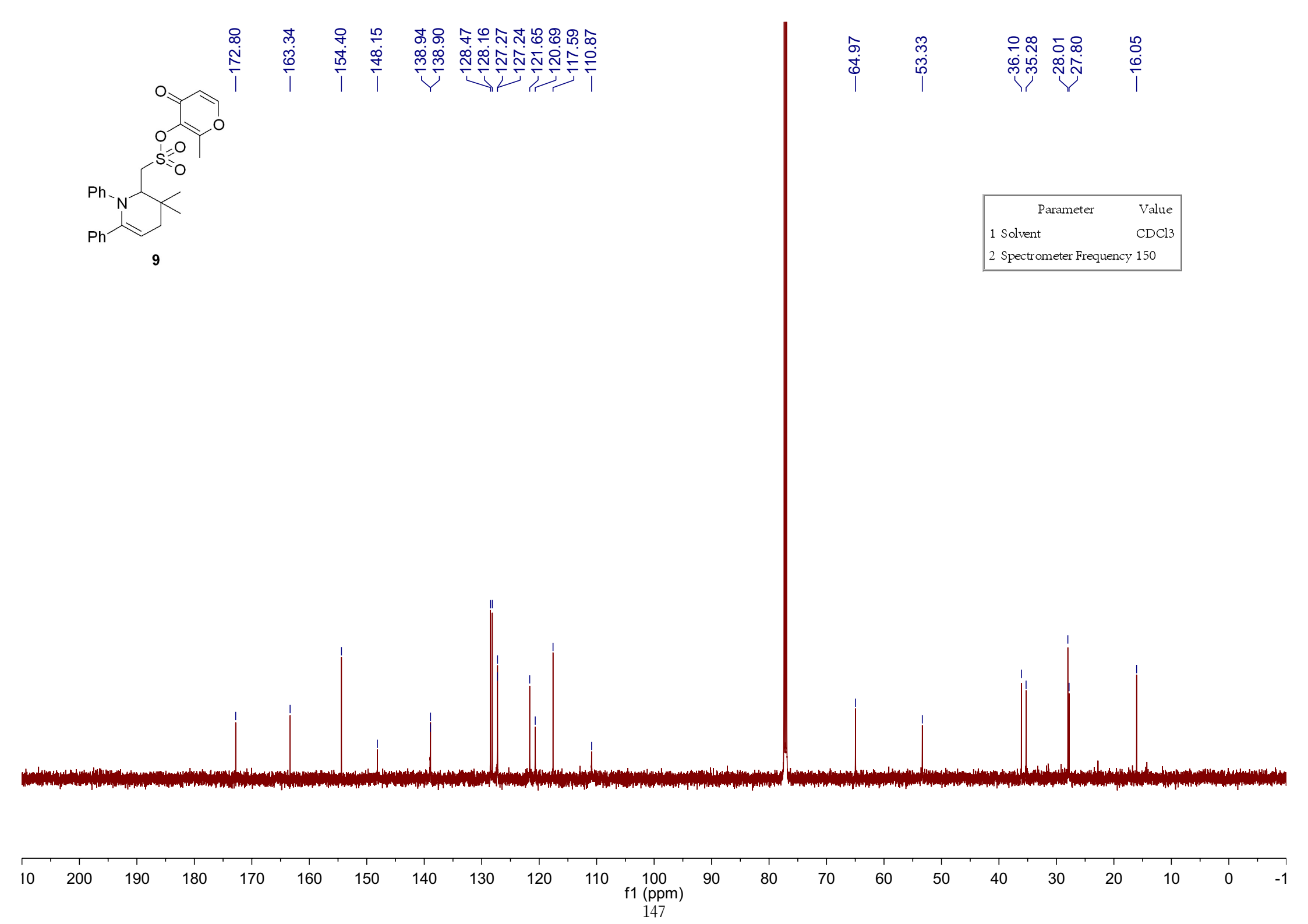
8

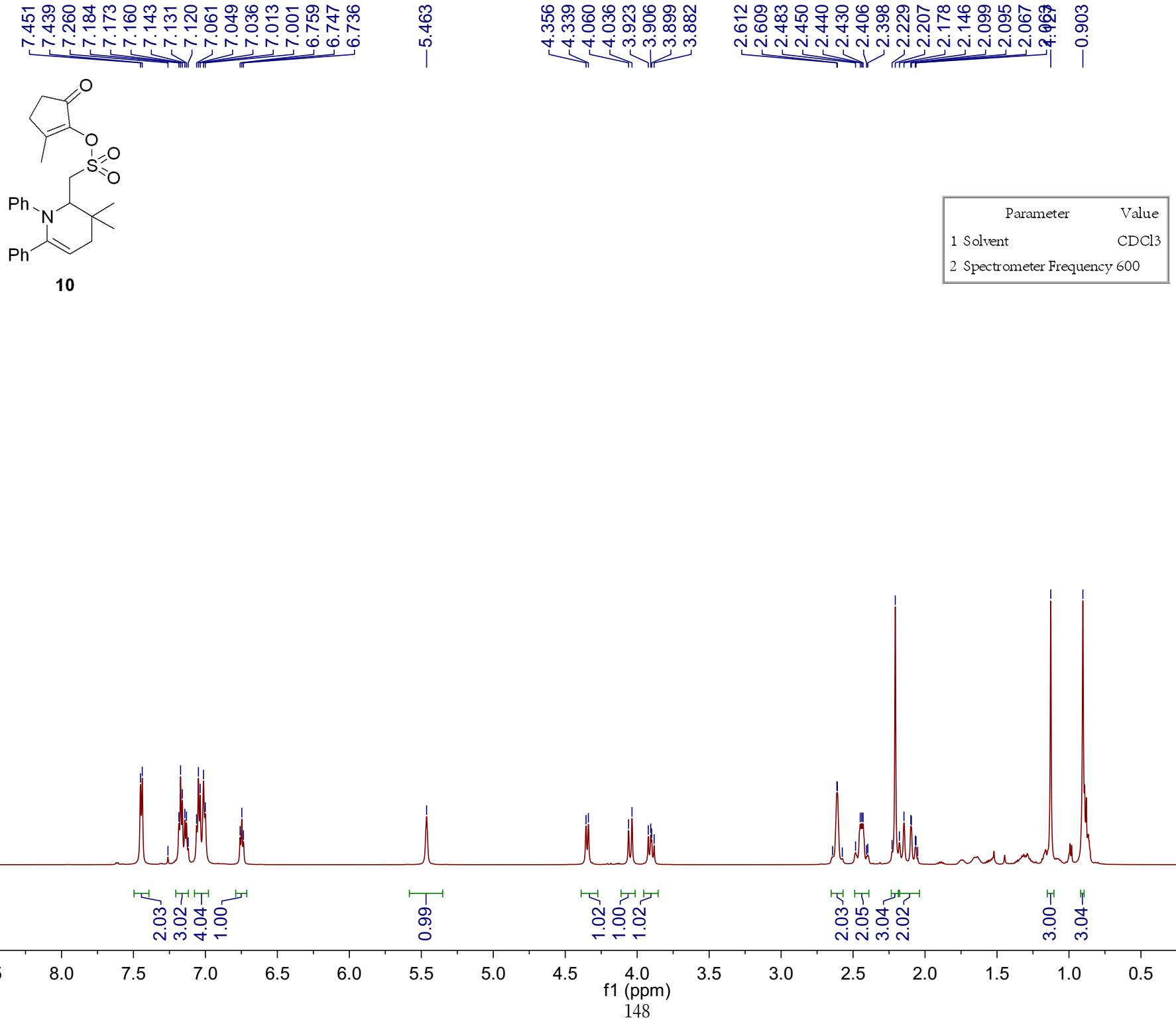
151.36
148.00
140.54
138.85
136.77
136.63
128.45
128.17
127.33
127.20
124.31
121.76
121.16
120.74
116.61
113.18
110.32
64.69
55.85
51.22
40.15
35.96
35.30
28.01
27.71

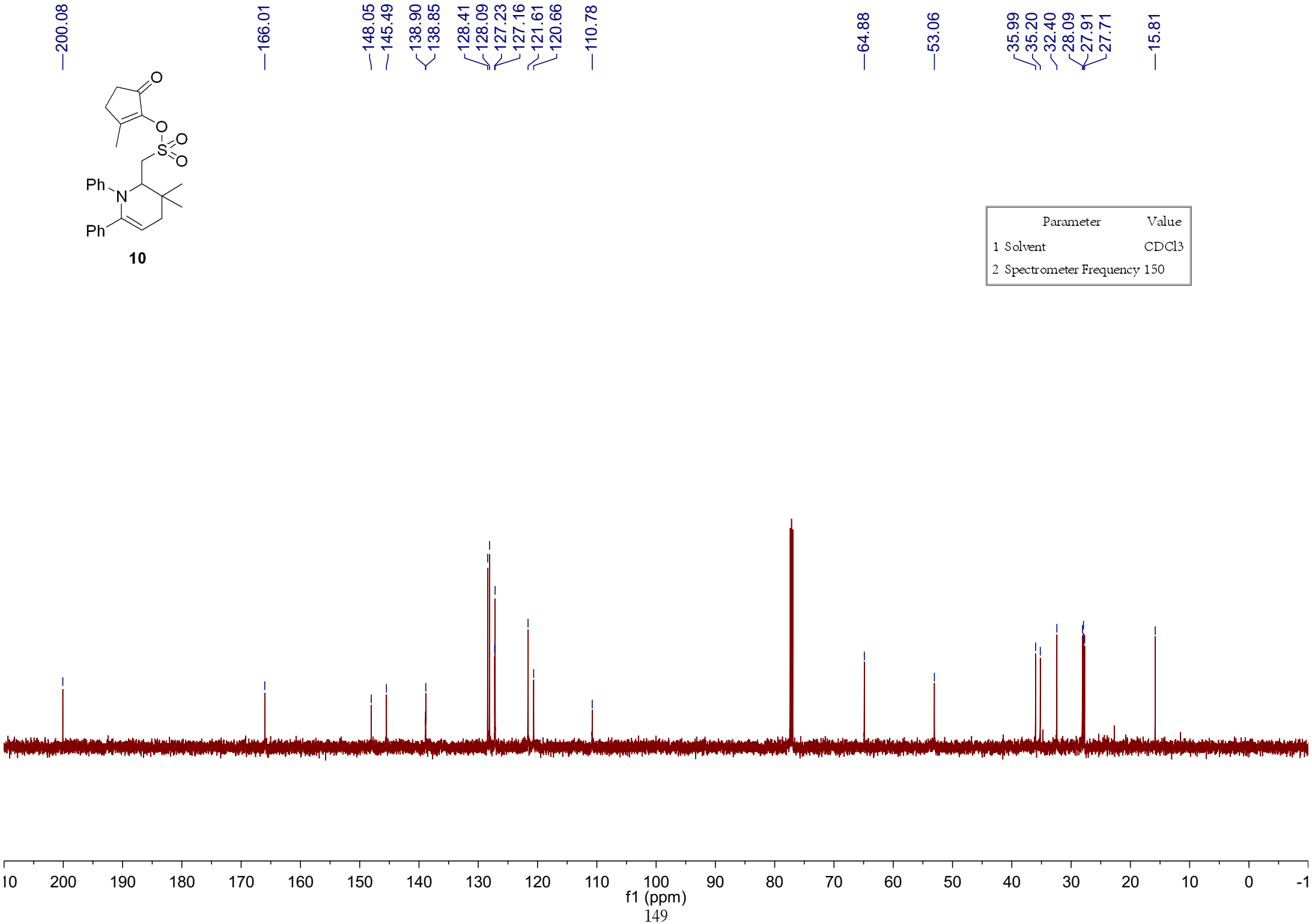
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	151

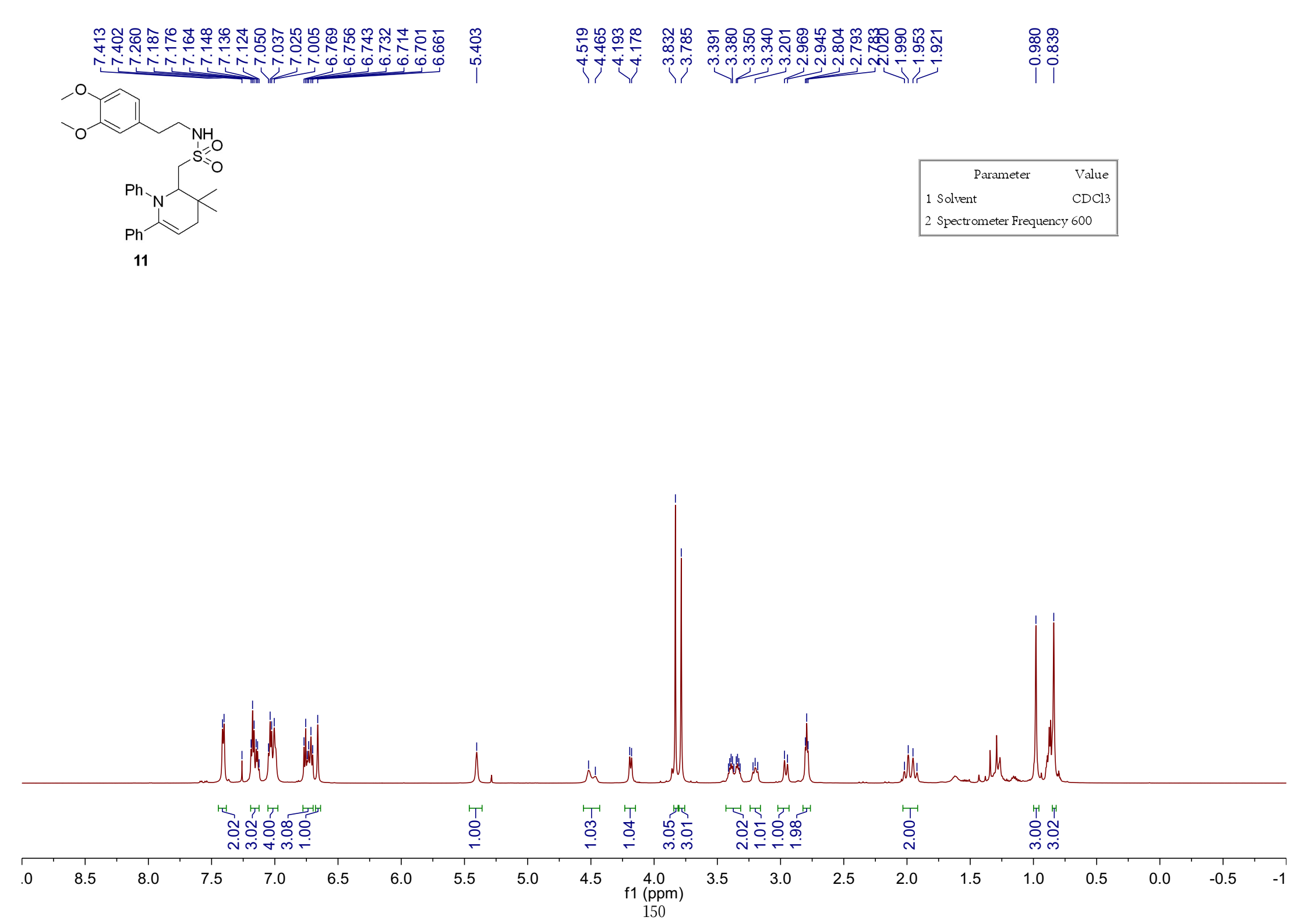


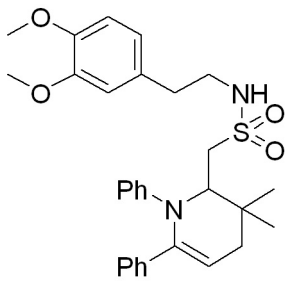

7.685
7.676
7.439
7.427
7.260
7.174
7.162
7.150
7.131
7.120
7.048
7.036
7.024
6.996
6.984
6.746
6.734
6.411
6.401
5.458
4.368
4.345
4.319
3.997
3.980
3.975
3.957
2.519
2.191
2.159
2.085
2.053
2.046
1.138
0.891
Ph
N
Ph
9
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
1.03
2.02
3.02
4.04
1.03
1.03
1.00
2.03
1.04
2.95
2.04
2.96
3.09
f1 (ppm)


172.80
163.34
154.40
148.15
138.94
138.90
128.47
128.16
127.27
127.24
121.65
120.69
117.59
110.87
64.97
53.33
36.10
35.28
28.01
27.80
16.05
Ph
N
Ph
9
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
f1 (ppm)


7.451
7.439
7.260
7.184
7.173
7.160
7.143
7.131
7.120
7.061
7.049
7.036
7.013
7.001
6.759
6.747
6.736
5.463
4.356
4.339
4.060
4.036
3.923
3.906
3.899
3.882
2.612
2.609
2.483
2.450
2.440
2.430
2.406
2.398
2.229
2.207
2.178
2.146
2.099
2.095
2.067
0.903
Ph
N
Ph
O
O
S
O
O
10
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.03
3.02
4.04
1.00
0.99
1.02
1.00
1.02
2.03
2.05
3.04
2.02
3.00
3.04
f1 (ppm)


200.08
166.01
148.05
145.49
138.90
138.85
128.41
128.09
127.23
127.16
121.61
120.66
110.78
64.88
53.06
35.99
35.20
32.40
28.09
27.91
27.71
15.81
O
O
O
S
O
Ph
N
Ph
10
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
f1 (ppm)

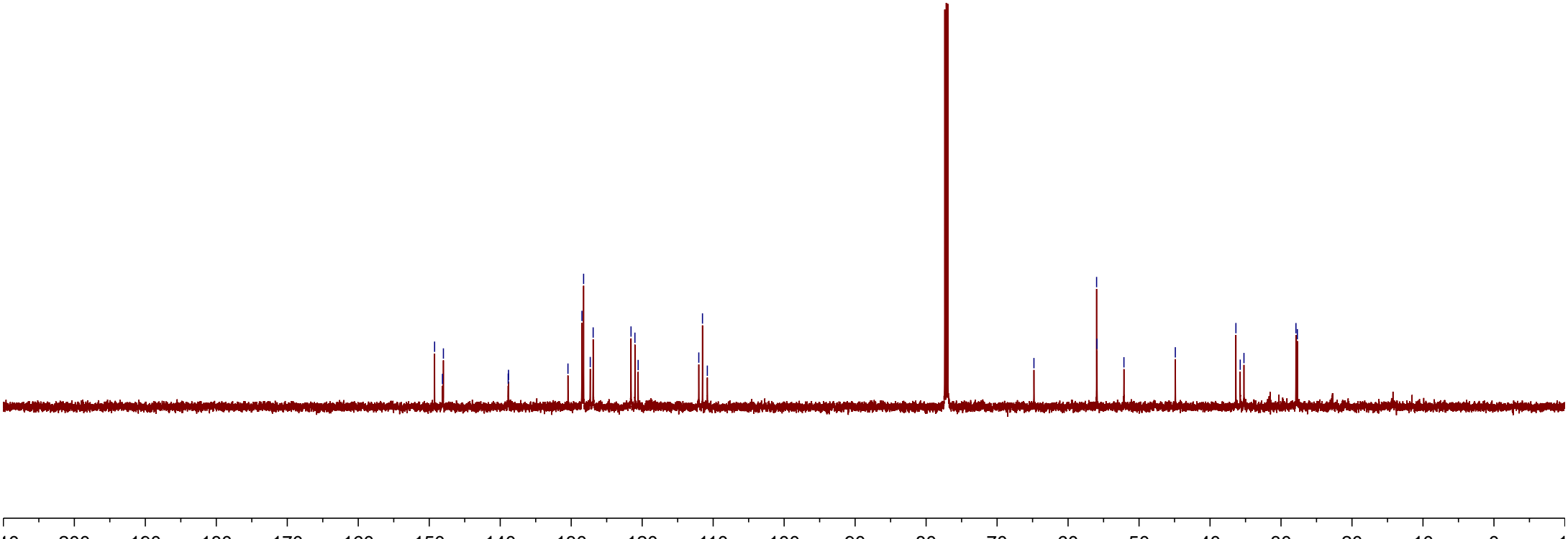

7.413
7.402
7.260
7.187
7.176
7.164
7.148
7.136
7.124
7.050
7.037
7.025
7.005
6.769
6.756
6.743
6.732
6.714
6.701
6.661
5.403
4.519
4.465
4.193
4.178
3.832
3.785
3.391
3.380
3.350
3.340
3.201
2.969
2.945
2.804
2.793
2.783
2.020
1.990
1.953
1.921
0.980
0.839
O
O
NH
O
S
O
Ph
N
Ph
11
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.02
3.02
4.00
3.08
1.00
1.00
1.03
1.04
3.05
3.01
2.02
1.01
1.00
1.98
2.00
3.00
3.02
f1 (ppm)

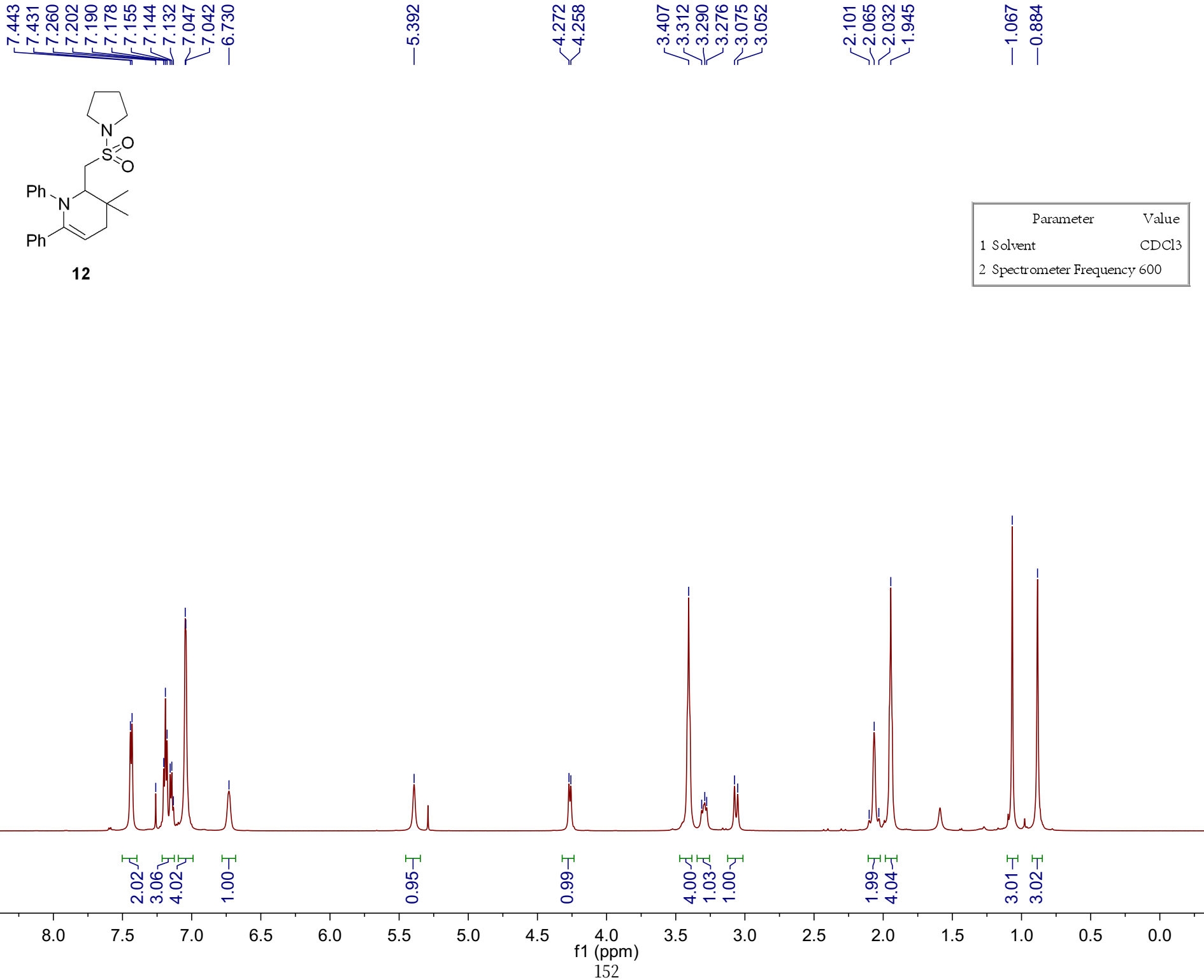


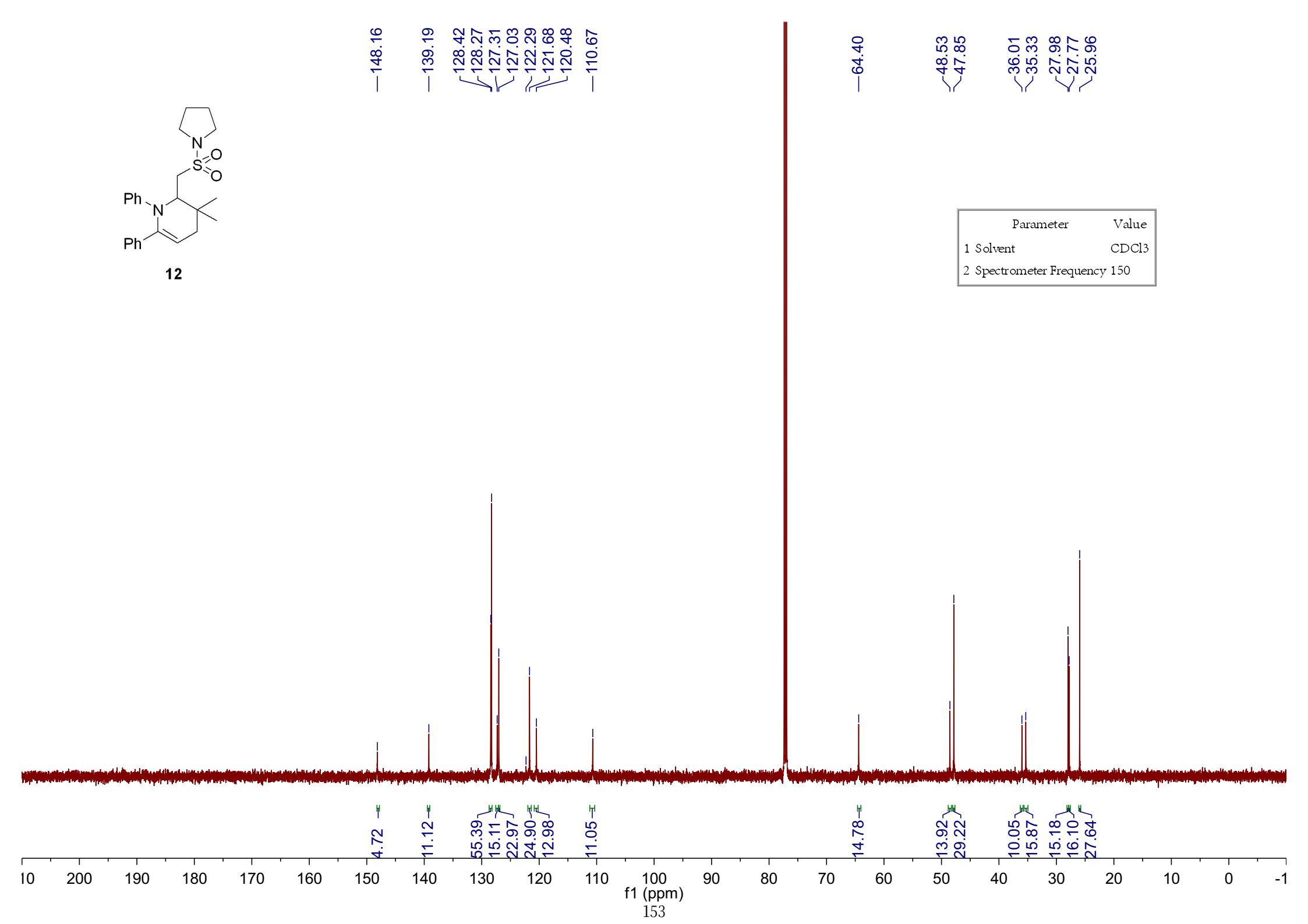
11

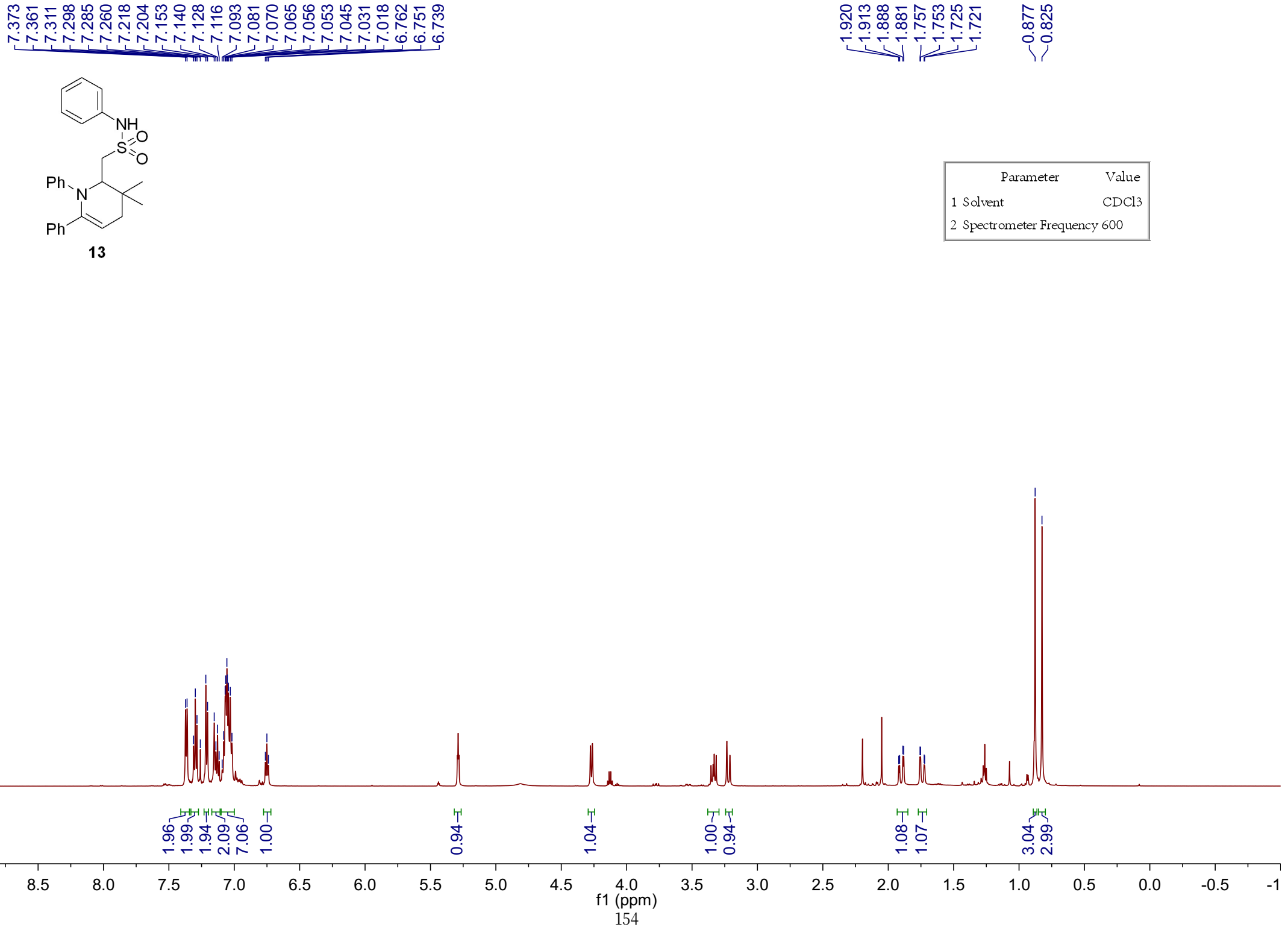
149.24
148.14
148.00
138.88
138.83
128.49
128.25
127.32
126.91
121.57
121.02
112.03
111.50
110.82
64.81
55.98
55.93
52.13
44.89
36.36
35.75
35.22
27.90
27.70

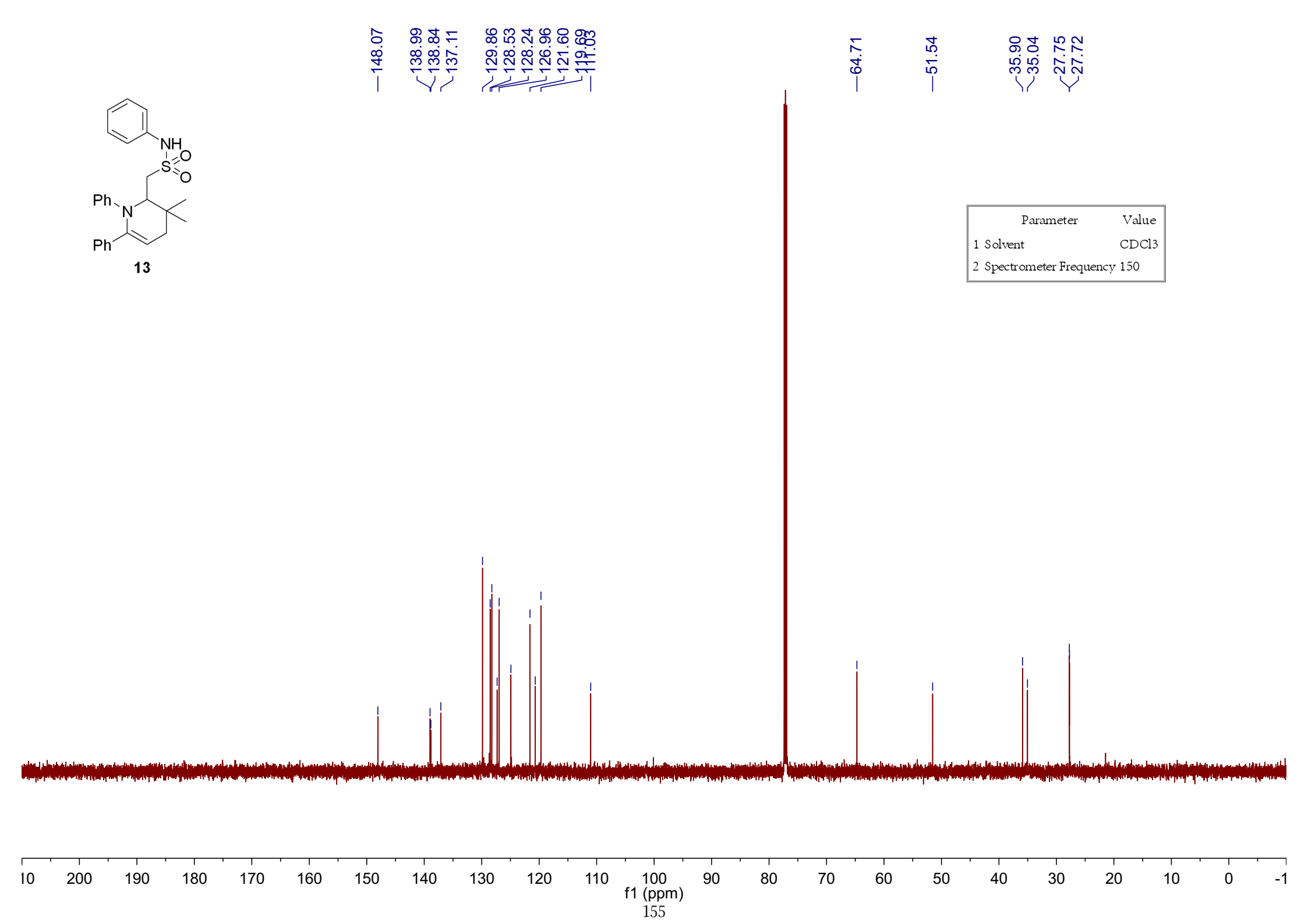
Parameter	Value
1 Solvent	CDCl3
2 Spectrometer Frequency	150




7.443
7.431
7.260
7.202
7.190
7.178
7.155
7.144
7.132
7.047
7.042
6.730
5.392
4.272
4.258
3.407
3.312
3.290
3.276
3.075
3.052
2.101
2.065
2.032
1.945
1.067
0.884
Ph
N
Ph
12
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
2.02
3.06
4.02
1.00
0.95
0.99
4.00
1.03
1.00
1.99
4.04
3.01
3.02
f1 (ppm)


148.16
139.19
128.42
128.27
127.31
127.03
122.29
121.68
120.48
110.67
64.40
48.53
47.85
36.01
35.33
27.98
27.77
25.96
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
Ph
N
Ph
N
S
O
O
12
4.72
11.12
55.39
15.11
22.97
24.90
12.98
11.05
14.78
13.92
29.22
10.05
15.87
15.18
16.10
27.64
f1 (ppm)


7.373
7.361
7.311
7.298
7.285
7.260
7.218
7.204
7.153
7.140
7.128
7.116
7.093
7.081
7.070
7.065
7.056
7.053
7.045
7.031
7.018
6.762
6.751
6.739
1.920
1.913
1.888
1.881
1.757
1.753
1.725
1.721
0.877
0.825
NH
O
S
O
Ph
N
Ph
13
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 600
1.96
1.99
1.94
2.09
7.06
1.00
0.94
1.04
1.00
0.94
1.08
1.07
3.04
2.99
f1 (ppm)


148.07
138.99
138.84
137.11
129.86
128.53
128.24
126.96
121.60
119.69
111.03
64.71
51.54
35.90
35.04
27.75
27.72
NH
O
S
O
Ph
N
Ph
13
Parameter Value
1 Solvent CDCl3
2 Spectrometer Frequency 150
f1 (ppm)