Supporting information

Direct Electrochemical Synthesis of Arenesulfonyl Fluorides from Nitroarenes: A Dramatic Ionic Liquid Effect

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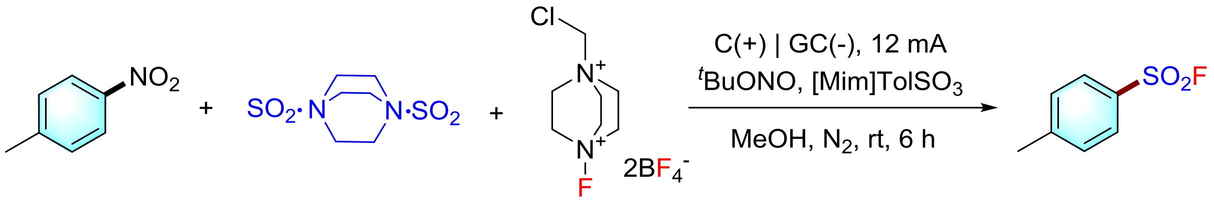
1. General

Commercial reagents such as nitroarenes and solvents were obtained from the commercial providers and used without further purification. The products were purified using a commercial flash chromatography system or a regular glass column. TLC was developed on silica gel 60 F254 glass plates. 1-(Chloromethyl)-4-fluoro-1,4-diazabicyclo[2.2.2]octane-1,4-diium tetrafluoroborate (Selectfluor) was bought from Leyan.com. The chemical shifts are reported in δ (ppm) values (^{1}H and ^{13}C NMR relative to $CHCl_3$, δ 7.26 ppm for ^{1}H NMR and δ 77.0 ppm for ^{13}C NMR). Or alternatively, ^{1}H NMR chemical shifts were referenced to tetramethylsilane signal (0 ppm). Multiplicities are recorded by s (singlet), d (doublet), t (triplet), q (quartet), p (pentet), h (hextet), m (multiplet) and br (broad). Coupling constants (*J*), are reported in Hertz (Hz). Commercial reagents were used without any further purification.

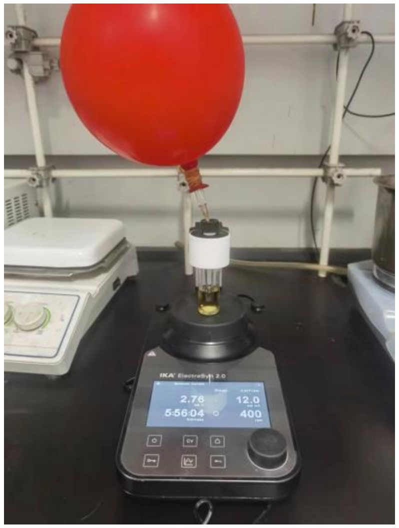
2. General procedure for electrochemical synthesis of Arenesulfonyl Fluorides.



1a **2** (DABSO) Selectfluor **3a**

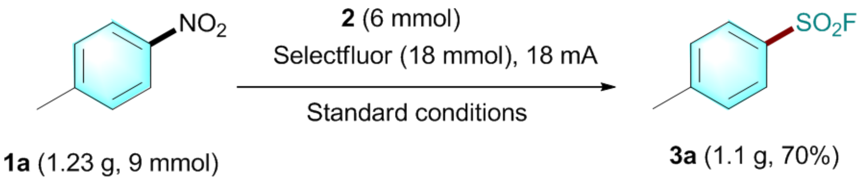
General procedure for electrochemical synthesis of arenesulfonyl fluorides: An undivided cell was equipped with carbon plate anode (8 mm × 2 mm) and glassy carbon cathode (8 mm × 2 mm). To the cell was added **1a** (0.3 mmol), DABSO **2** (0.2 mmol, 48 mg), Selectfluor (0.6 mmol, 212 mg), MeOH (4 mL) and [Mim]TolSO$_3$ (0.5 mL) under Glove box, and then stirred at room temperature for 5 min. ^{t}BuONO (0.90 mmol, 92.7mg) were added. The mixture was electrolyzed using constant current conditions (I = 12 mA) at 25 °C under magnetic stirring. When TLC analysis indicated that the electrolysis was complete (witnessed by the disappearance of the **1a**), the solvent was removed under reduced pressure. The residue was poured into a saturated aqueous solution of NaCl and the product was then extracted with CH_2Cl_2 (3×20 mL), dried over Na_2SO_4, and concentrated in vacuo. The residue was purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAcas eluent to afford the desired pure product **3a**.

Glassy carbon (Left) and Carbon plate (Right).

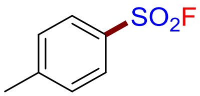


Current controlled electrolysis (ElectraSyn 2.0 apparatus, IKA)

3. Gram Scale Reaction.

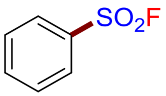


An undivided cell was equipped with carbon plate anode (8 mm × 2 mm) and glassy carbon cathode (8 mm × 2 mm). To the cell was added 4-nitrotoluene **1a** (9 mmol, 1.23g), DABSO 2 (6 mmol, 1.44 g), Selectfluor (18 mmol, 6.36 g), MeOH (120 mL) and [Mim]TolSO$_3$ (15 mL) under Glove box, and then stirred at room temperature for 10 min. ^{t}BuONO (27 mmol, 2.78 g) were added. The mixture was electrolyzed using constant current conditions (12 mA) at 25 °C under magnetic stirring. When TLC analysis indicated that the electrolysis was complete (witnessed by the disappearance of the **1a**), the solvent was removed under reduced pressure. The residue was poured into a saturated aqueous solution of NaCl and the product was then extracted with CH_2Cl_2 (3 × 60 mL), dried over Na_2SO_4, and concentrated in vacuo. The residue was purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired pure product **3a** (1.1 g, 70%).



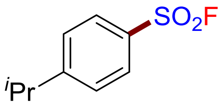
3a

4-Methylbenzenesulfonyl fluoride (**3a**),[1] 37.6 mg, Obtained as a colorless oil in 72% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.87 (d, J = 8.1 Hz, 2H), 7.42 (d, J = 8.1 Hz, 2H), 2.49 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 147.27, 130.31, 130.02 (d, J = 23.8 Hz), 128.38, 21.75. ^{19}F NMR (376 MHz, $CDCl_3$) δ 66.28.



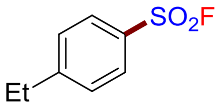
3b

benzenesulfonyl fluoride (**3b**),[1] 26.4 mg, Obtained as a colorless oil in 55% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.05 – 7.98 (m, 2H), 7.79 (t, *J* = 7.6 Hz, 1H), 7.64 (td, *J* = 7.9, 7.5, 1.1 Hz, 2H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 135.67, 133.03 (d, *J* = 23.9 Hz), 129.72, 128.36. ^{19}F NMR (376 MHz, CDCl$_3$) δ 65.92.



3c

4-*iso*-Propylbenzenesulfonyl fluoride (**3c**), [1] 45.5 mg, Obtained as a colorless oil in 75% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 7.93 (dt, *J* = 8.5, 1.7 Hz, 2H), 7.48 (d, *J* = 8.2 Hz, 2H), 3.07-3.01 (m, 1H), 1.31-1.28 (m, 6H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 157.75, 130.22 (d, *J* = 23.8 Hz), 128.63, 127.84, 34.45, 23.45. ^{19}F NMR (376 MHz, CDCl$_3$) δ 66.25.



3d

4-Ethylbenzenesulfonyl fluoride (**3d**),[1] 40.6 mg, Obtained as a colorless oil in 72% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 – 7.80 (m, 2H), 7.45 (d, *J* = 8.2 Hz, 2H), 2.77 (q, *J* = 7.6 Hz, 2H), 1.28 (t, *J* = 7.6 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 153.30, 130.96 (d, *J* = 26.3 Hz), 129.19, 128.50, 28.99, 14.84. ^{19}F NMR (471 MHz, $CDCl_3$) δ 66.26.

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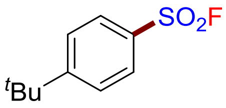
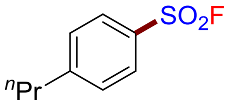


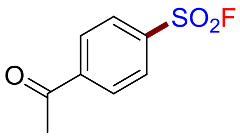
3e

4-(*tert*-Butyl)benzenesulfonyl fluoride (**3e**),[1] 48.6 mg, Obtained as a yellow solid (m. p. 54–55 °C) in 75% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.94 (d, *J* = 8.6 Hz, 2H), 7.65 (d, *J* = 8.4 Hz, 2H), 1.37 (s, 9H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 160.02, 130.01 (d, *J* = 23.8 Hz), 128.34, 126.75, 35.53, 30.90. ^{19}F NMR (376 MHz, $CDCl_3$) δ 66.24.



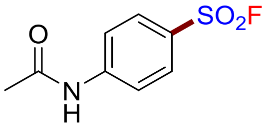
3f

4-Propylbenzenesulfonyl fluoride (**3f**),[1] 44.8 mg, Obtained as a colorless oil in 74% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.90 (d, *J* = 8.0 Hz, 2H), 7.43 (d, *J* = 8.1 Hz, 2H), 2.70 (t, *J* = 7.8 Hz, 2H), 1.67 (d, *J* = 7.7 Hz, 2H), 0.95 (t, *J* = 7.5 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 151.85, 130.26 (d, *J* = 23.8 Hz), 129.74, 128.38, 37.92, 24.01, 13.51.



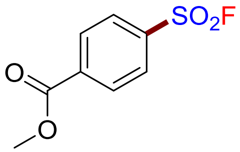
3g

4-Acetylbenzenesulfonyl fluoride (**3g**),[1] 42.4 mg, Obtained as a white solid (m. p. 78−79 °C) in 70% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.23 (d, *J* = 8.2 Hz, 2H), 8.13 (d, *J* = 8.3 Hz, 2H), 2.74 (s, 3H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 196.28, 142.27, 136.18 (d, *J* = 23.8 Hz), 129.27, 128.73, 26.79. ^{19}F NMR (376 MHz, CDCl$_3$) δ 65.60.



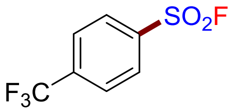
3h

4-Acetamidobenzenesulfonyl fluoride (**3h**),[1] 41.0 mg, Obtained as a white solid (m. p. 174−175 ℃) in 65% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.01 – 7.91 (m, 2H), 7.79 (d, *J* = 8.7 Hz, 2H), 7.55 (s, 1H), 2.26 (s, 3H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 168.68, 144.41, 130.06, 119.35, 24.87. ^{19}F NMR (376 MHz, CDCl$_3$) δ 66.80.



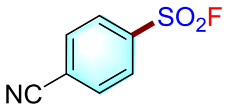
3i, 69%

Methyl 4-(fluorosulfonyl)benzoate (**3i**),[2] 45.1 mg, Obtained as a white solid (m. p. 84−86 ℃) in 69% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.29 (d, *J* = 8.3 Hz, 2H), 8.10 (d, *J* = 8.3 Hz, 2H), 4.00 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 164.93, 136.73 (d, *J* = 25.0 Hz), 136.50, 130.71, 128.52, 52.98. ^{19}F NMR (376 MHz, $CDCl_3$) δ 65.78.



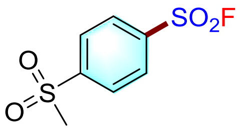
3j

4-(Trifluoromethyl)benzenesulfonyl fluoride (**3j**),[1] 49.2 mg, Obtained as a white solid (m. p. 67−69 ℃) in 72% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.18 (d, *J* = 8.3 Hz, 2H), 7.93 (d, *J* = 8.2 Hz, 2H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 137.6 – 136.1 (m), 129.11, 127.0 (d, *J* = 3.5 Hz), 122.72(q, *J* = 273 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ 65.80, -63.58.



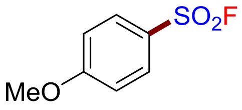
3k

4-Cyanobenzenesulfonyl fluoride (**3k**),[1] 36.7 mg, Obtained as a white solid (m. p. 89−91 ℃) in 66% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.17 (d, *J* = 8.5 Hz, 2H), 7.97 (d, *J* = 8.2 Hz, 2H). ^{13}C NMR (126 MHz, $CDCl_3$) δ136.91 (d, *J* = 23.9 Hz), 133.46, 129.16, 119.44, 116.53. ^{19}F NMR (376 MHz, $CDCl_3$) δ 65.99.



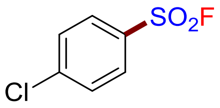
3l

4-(methylsulfonyl)benzenesulfonyl fluoride (**3l**),[1] 48.3 mg, Obtained as a white solid (m. p. 155−157 ℃) in 68% yield. ^{1}H NMR (500 MHz, Chloroform-d) δ 8.24 (s, 4H), 3.14 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 147.13, 137.88 (d, *J* = 26.5 Hz), 129.62, 128.93, 44.22. ^{19}F NMR (376 MHz, $CDCl_3$) δ 66.08.



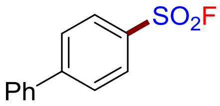
3m

4-Methoxybenzenesulfonyl fluoride (**3m**),[1] 35.9 mg, Obtained as a brown liquid in 63% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.98 – 7.83 (m, 2H), 7.06 (d, *J* = 9.0 Hz, 2H), 3.91 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.34, 130.76, 123.75 (d, *J* = 25.0 Hz), 114.93, 55.87. ^{19}F NMR (376 MHz, $CDCl_3$) δ 67.29.



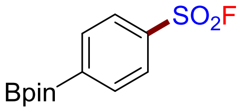
3n

4-Methoxybenzenesulfonyl fluoride (**3n**),[1] 49.7 mg, Obtained as a colorless oil in 65% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 7.96 (d, *J* = 8.7 Hz, 2H), 7.74 – 7.52 (m, 2H). ^{13}C NMR (101 MHz, CDCl$_3$) δ 142.68, 131.39 (d, *J* = 25.0 Hz), 130.15, 130.13, 129.89, 129.87. ^{13}F NMR (376 MHz, CDCl$_3$) δ 66.48.



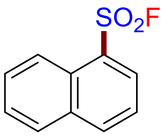
3o

[1,1'-Biphenyl]-4-sulfonyl fluoride (**3o**),[1] 48.9 mg, Obtained as a white solid (m. p. 77–78 ℃) in 69% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.06 (d, *J* = 8.4 Hz, 2H), 7.81 (d, *J* = 8.2 Hz, 2H), 7.67 – 7.59 (m, 2H), 7.56 – 7.43 (m, 3H). ^{13}C NMR (101 MHz, CDCl$_3$) δ 148.67, 138.53, 131.36 (d, *J* = 30.0 Hz), 129.29, 129.23, 129.01, 129.01, 128.22, 127.48. ^{19}F NMR (376 MHz, CDCl$_3$) δ 66.56.



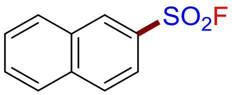
3p

4-(4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)benzenesulfonyl fluoride (**3p**),[1] 64.5 mg, Obtained as a white solid (m. p. 129–130 ℃) in 63% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.04 (d, *J* = 7.9 Hz, 2H), 7.99 (d, *J* = 8.2 Hz, 2H), 1.37 (s, 12H). ^{13}C NMR (101 MHz, CDCl$_3$) δ 135.71, 135.01 (d, *J* = 24.0 Hz), 127.25, 84.79, 24.87. ^{19}F NMR (376 MHz, CDCl$_3$) δ 65.72.



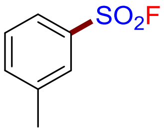
3q

Naphthalene-1-sulfonyl fluoride (**3q**),[1] 37.2 mg, Obtained as a white solid (m. p. 52–54 ℃) in 59% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.50 (dd, *J* = 8.8, 2.9 Hz, 1H), 8.30 (d, *J* = 7.5 Hz, 1H), 8.14 (d, *J* = 8.2 Hz, 1H), 7.92 (d, *J* = 8.2 Hz, 1H), 7.71 (ddd, *J* = 8.5, 6.8, 1.4 Hz, 1H), 7.62 (t, *J* = 7.5 Hz, 1H), 7.57 – 7.47 (m, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 136.9, 134.0, 131.1, 129.5, 129.2 (d, J = 23.4 Hz), 129.1, 128.2, 127.8, 124.2, 124.1. ^{19}F NMR (376 MHz, $CDCl_3$) δ 62.64.



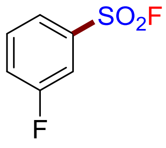
3r

Naphthalene-2-sulfonyl fluoride (**3r**),[1] 42.8 mg, Obtained as a white solid (m. p. 85–87 ℃) in 68% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.56 (s, 1H), 8.01 (d, *J* = 8.7 Hz, 1H), 7.97 (d, *J* = 8.3 Hz, 1H), 7.93 (d, *J* = 8.3 Hz, 1H), 7.89 (dt, *J* = 8.7, 1.4 Hz, 1H), 7.72 (t, *J* = 7.5 Hz, 1H), 7.66 (t, *J* = 7.5 Hz, 1H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 135.99, 131.78, 130.92, 130.39, 130.10, 129.86 (d, *J* = 23.4 Hz), 129.58, 128.33, 128.14, 122.10. ^{19}F NMR (376 MHz, $CDCl_3$) δ 66.38.



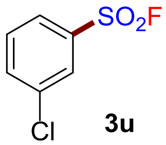
3s

3-Methylbenzenesulfonyl fluoride (**3s**),[1] 37.6 mg, Obtained as a colorless oil in 72% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.82 (d, *J* = 6.0 Hz, 2H), 7.59 (s, 1H), 7.51 (t, *J* = 8.0 Hz, 1H), 2.48 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.20, 136.35, 132.94 (d, *J* = 24.0 Hz), 129.49, 128.66, 125.57, 21.29. ^{19}F NMR (376 MHz, $CDCl_3$) δ 65.80.



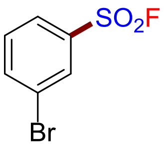
3t

3-Fluorobenzenesulfonyl fluoride (**3t**),[1] 34.0 mg, Obtained as a colorless oil in 64% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.84 (dd, *J* = 7.9, 1.7 Hz, 1H), 7.74 – 7.69 (m, 1H), 7.67 (dt, *J* = 8.1, 4.1 Hz, 1H), 7.52 (td, *J* = 8.3, 2.6 Hz, 1H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 162.34 (d, *J* = 254.52 Hz), 134.59 (d, *J* = 7.56 Hz), 131.76 (d, *J* = 7.56 Hz), 124.33 (d, *J* = 3.78 Hz), 123.08 (d, *J* = 21.42 Hz), 115.75 (d, *J* = 21.46 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ 65.79, -107.77.



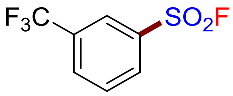
3u

3-Chlorobenzenesulfonyl fluoride (**3u**),[1] 40.0 mg, Obtained as a colorless oil in 69% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.00 (t, *J* = 2.0 Hz, 1H), 7.92 (dt, *J* = 7.9, 1.2 Hz, 1H), 7.76 (dd, *J* = 8.2, 2.0 Hz, 1H), 7.61 (t, *J* = 8.0 Hz, 1H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 135.99, 135.83, 134.49 (d, *J* = 26.3 Hz), 131.05, 128.38, 126.54. ^{19}F NMR (471 MHz, $CDCl_3$) δ 66.10.



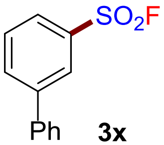
3v

3-Bromobenzenesulfonyl fluoride (**3v**),[1] 44.8 mg, Obtained as a colorless oil in 63% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.15 (t, *J* = 1.9 Hz, 1H), 7.96 (dt, *J* = 8.0, 1.3 Hz, 1H), 7.92 (dt, *J* = 8.1, 1.3 Hz, 1H), 7.54 (td, *J* = 8.1, 1.0 Hz, 1H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 138.75, 134.61 (d, *J* = 26.3 Hz), 131.20, 126.98, 123.53. ^{19}F NMR (471 MHz, CDCl$_3$) δ 66.26.



3w

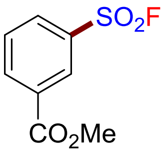
3-(Trifluoromethyl)benzenesulfonyl fluoride (**3w**),[2] 37.5 mg, Obtained as a yellow oil in 55% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.28 (d, *J* = 5.9 Hz, 1H), 8.24 (d, *J* = 8.0 Hz, 1H), 8.07 (d, *J* = 7.9 Hz, 1H), 7.89 – 7.81 (m, 1H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 134.2 (d, *J* = 26.7 Hz), 132.51 (q, *J* = 27.0 Hz), 132.29 (q, *J* = 3.0 Hz), 131.65, 130.75, 125.6 (q, *J* = 3.6 Hz), 119.0 (q, *J* = 272.9 Hz). ^{19}F NMR (376 MHz, CDCl$_3$) δ 66.08, -63.19.



3x

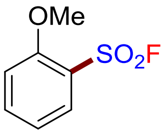
[1,1'-Biphenyl]-3-sulfonyl fluoride (**3x**),[2] 51.7 mg, Obtained as a white solid (m. p. 75–77 ℃) in 73% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.19 (d, *J* = 2.1 Hz, 1H), 7.96 (dt, *J* = 8.0, 2.4 Hz, 2H), 7.67 (t, *J* = 7.9 Hz, 1H), 7.58 (d, *J* = 7.2 Hz, 2H), 7.49 (d, *J* = 7.3 Hz, 2H), 7.42 (t, *J* = 7.3 Hz, 1H).

^{13}C NMR (126 MHz, CDCl$_3$) δ 143.23, 138.30, 134.12, 133.69 (d, *J* = 23.9 Hz), 130.19, 129.29, 128.81, 127.22, 126.86, 126.81. ^{19}F NMR (471 MHz, CDCl$_3$) δ 66.08.



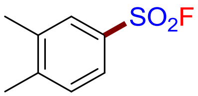
3y

Methyl 3-(fluorosulfonyl)benzoate (**3y**),[2] 45.8 mg, Obtained as a white solid (m. p. 65–67 ℃) in 70% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 8.67 (d, *J* = 1.9 Hz, 1H), 8.51 – 8.40 (m, 1H), 8.21 (dd, *J* = 8.0, 1.8 Hz, 1H), 7.78 (t, *J* = 7.9 Hz, 1H), 4.01 (s, 3H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 164.58, 136.31, 133.65 (d, *J* = 26.0 Hz), 132.14, 132.06, 130.09, 129.51, 52.88. ^{19}F NMR (471 MHz, CDCl$_3$) δ 66.52.



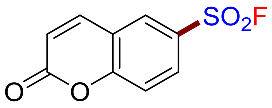
3z

2-Methoxybenzenesulfonyl fluoride (**3z**),[1] 33.6 mg, Obtained as a yellow oil in 59% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 7.90 (dd, *J* = 8.0, 1.8 Hz, 1H), 7.75 – 7.66 (m, 1H), 7.20 – 7.05 (m, 2H), 3.99 (s, 3H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 158.04, 137.63, 130.98, 121.09 (d, *J* = 26.0 Hz), 120.51, 112.96, 56.51. ^{19}F NMR (471 MHz, CDCl$_3$) δ 58.62.



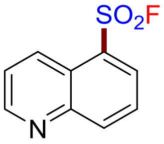
3aa

3,5-Dimethylbenzenesulfonyl fluoride (**3aa**), [1] 37.2 mg, Obtained as a yellow oil in 66% yield. ^{1}H NMR (500 MHz, CDCl$_3$) δ 7.86 (d, *J* = 8.1 Hz, 1H), 7.22 (s, 1H), 7.17 (d, *J* = 8.3 Hz, 1H), 2.61 (s, 3H), 2.41 (s, 3H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 146.81, 138.76, 133.58, 130.08, 130.06, 129.19 (d, *J* = 21.4 Hz), 127.24, 21.40, 20.02. ^{13}C NMR (126 MHz, CDCl$_3$) δ 146.81, 138.76, 133.58, 130.08, 130.06, 129.29, 129.12, 127.24, 21.40, 20.02. ^{19}F NMR (471 MHz, CDCl$_3$) δ 60.87.



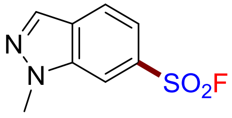
3ab

2-Oxo-2*H*-chromene-6-sulfonyl fluoride (**3ab**), [1] 48.6 mg, Obtained as a white solid (m. p. 101–103 ℃) in 71% yield. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.22 (d, *J* = 2.3 Hz, 1H), 8.14 (dd, *J* = 8.8, 2.3 Hz, 1H), 7.80 (d, *J* = 9.7 Hz, 1H), 7.56 (d, *J* = 8.8 Hz, 1H), 6.62 (d, *J* = 9.7 Hz, 1H). ^{13}C NMR (126 MHz, CDCl$_3$) δ 158.44, 158.21, 141.74, 131.11, 129.22, 128.84 (d, *J* = 26.0 Hz), 119.43, 119.25, 118.77. ^{19}F NMR (376 MHz, CDCl$_3$) δ 67.12.



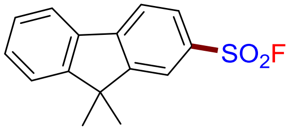
3ac

Quinoline-5-sulfonyl fluoride (**3ac**), [1] 43.7 mg, Obtained as a white solid (m. p. 93–95 ℃) in 69% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.10 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.89 (ddt, *J* = 8.8, 2.5, 1.1 Hz, 1H), 8.52 (d, *J* = 8.5 Hz, 1H), 8.44 (dd, *J* = 7.5, 1.2 Hz, 1H), 7.88 (ddd, *J* = 8.8, 7.4, 1.5 Hz, 1H), 7.69 (dd, *J* = 8.8, 4.2 Hz, 1H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 152.01, 148.23, 138.52, 132.41, 131.41, 129.21 (d, *J* = 26.0 Hz), 127.64, 124.32, 123.77. ^{19}F NMR (376 MHz, $CDCl_3$) δ 64.70.



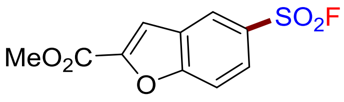
3ad

1-Methyl-1H-indazole-6-sulfonyl fluoride (**3ad**), 41.7 mg, Obtained as a white solid (m. p. 89–91 ℃) in 65% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.17 (dd, *J* = 11.6, 1.3 Hz, 2H), 7.97 (dd, *J* = 8.6, 0.9 Hz, 1H), 7.71 (dd, *J* = 8.5, 1.5 Hz, 1H), 4.20 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 138.27, 133.34, 130.30 (d, J = 26.0 Hz), 127.55, 122.91, 118.52, 111.40, 36.18. ^{19}F NMR (376 MHz, $CDCl_3$) δ 67.23. HRMS (EI) m/z: $[M+Na]^+$ Calcd for $C_8H_7FNaO_2S$ 237.0110; Found 237.0111.



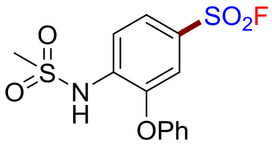
3ae

9,9-Dimethyl-9*H*-fluorene-2-sulfonyl fluoride (**3ae**),[2] 57.1 mg, Obtained as a white solid (m. p. 65–68 ℃) in 69% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (d, *J* = 1.8 Hz, 1H), 7.93 (dd, *J* = 8.0, 1.8 Hz, 1H), 7.83 (d, *J* = 8.1 Hz, 1H), 7.76 – 7.72 (m, 1H), 7.44 – 7.31 (m, 3H), 1.45 (s, 6H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 154.78, 146.81, 136.54, 130.70, 130.47, 129.90, 128.09, 127.70, 123.07, 122.93, 121.59, 120.75, 47.53, 26.73. ^{19}F NMR (376 MHz, $CDCl_3$) δ 67.16.



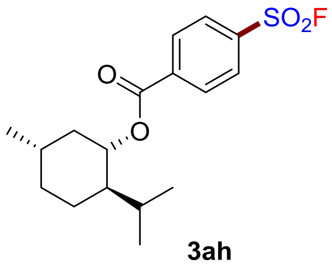
3af

Methyl 5-(fluorosulfonyl)benzofuran-2-carboxylate (**3af**), 49.3 mg, Obtained as a white solid (m. p. 133–135 ℃) in 64% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (d, *J* = 1.9 Hz, 1H), 8.09 (dd, *J* = 8.9, 2.0 Hz, 1H), 7.83 (d, *J* = 8.9 Hz, 1H), 7.65 (d, *J* = 1.0 Hz, 1H), 4.49 (q, *J* = 7.1 Hz, 2H), 1.46 (t, *J* = 7.1 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 158.52, 158.35, 148.77, 128.81 (d, *J* = 26.0 Hz), 127.71, 126.92, 125.09, 113.99, 113.29, 62.27, 14.25. 19F NMR (376 MHz, $CDCl_3$) δ 67.63. HRMS (EI) m/z: $[M+H]^+$ Calcd for $C_{10}H_8FO_5S$ 259.0076; Found 259.0074.



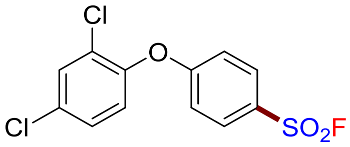
3ag

4-(Methylsulfonamido)-3-phenoxybenzenesulfonyl fluoride (**3ag**), 55.9 mg, Obtained as a white solid (m. p. 95–96 ℃) in 54% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.7 Hz, 1H), 7.75 (dd, *J* = 8.7, 2.1 Hz, 1H), 7.50 – 7.41 (m, 2H), 7.36 (d, *J* = 2.1 Hz, 1H), 7.31 (t, *J* = 7.5 Hz, 1H), 7.12 – 7.02 (m, 2H), 3.19 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 153.92, 146.62, 134.80, 130.78, 127.69, 127.49, 126.15, 124.39, 119.69, 117.83, 115.96, 40.71. ^{19}F NMR (471 MHz, $CDCl_3$) δ 66.77. HRMS (EI) m/z: $[M+Na]^+$ Calcd for $C_{13}H_{12}FNNaO_5S_2$ 368.0039; Found 368.0041.



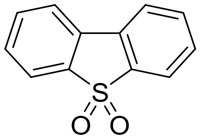
3ah

(1*S*,2*R*,5*S*)-2-*iso*-Propyl-5-methylcyclohexyl 4-(fluorosulfonyl)benzoate (**3ah**), [1] 66.7 mg, Obtained as a yellow oil in 65% yield. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.21 (d, *J* = 8.3 Hz, 2H), 8.02 (d, *J* = 8.6 Hz, 2H), 4.92 (td, *J* = 10.9, 4.4 Hz, 1H), 2.12 – 2.00 (m, 1H), 1.84 (pd, *J* = 7.0, 2.7 Hz, 1H), 1.68 (dt, *J* = 15.1, 3.9 Hz, 2H), 1.51 (ddt, *J* = 13.9, 10.6, 3.7 Hz, 3H), 1.06 (qd, *J* = 12.1, 10.9, 4.6 Hz, 2H), 0.86 (t, *J* = 7.1 Hz, 6H), 0.72 (d, *J* = 6.9 Hz, 3H). ^{13}C NMR (101 MHz, CDCl$_3$) δ 163.96, 137.22, 136.55, 136.30, 130.70, 128.51, 47.16, 40.80, 34.16, 31.47, 26.58, 23.54, 22.03, 20.75, 16.47. ^{19}F NMR (376 MHz, CDCl$_3$) δ 65.92.



3ai

4-(2,4-Dichlorophenoxy)benzene-1-sulfonyl fluoride (**3ai**), 65.1 mg, Obtained as a white solid (m. p. 101–103 ℃) in 68% yield. Clear liquid ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.93 – 7.85 (m, 2H), 7.47 (d, *J* = 2.5 Hz, 1H), 7.27 (dd, *J* = 8.7, 2.5 Hz, 1H), 7.05 (d, *J* = 8.7 Hz, 1H), 7.00 – 6.95 (m, 2H). ^{13}C NMR (100 MHz, CDCl$_3$) δ 162.85, 148.50, 132.07, 131.12, 131.10, 128.84, 128.09, 126.80, 126.55, 123.82, 116.91. ^{19}F NMR (376 MHz, CDCl$_3$) δ 66.99. HRMS (EI) m/z: $[M+H]^+$ Calcd for $C_{12}H_8Cl_2FO_3S$ 320.9555; Found 320.9558.

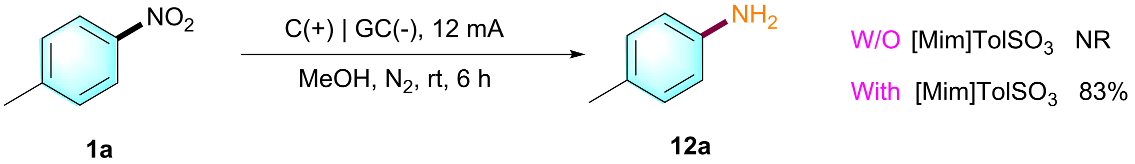


5

Dibenzo[*b*,*d*]thiophene 5,5-dioxide (**5**), 104.3 mg, Obtained as a white solid (m. p. 231–232 ℃) in 69% yield. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.80 (d, *J* = 7.7 Hz, 2H), 7.77 (d, *J* = 7.7 Hz, 2H), 7.65 – 7.59 (m, 2H), 7.51 (t, *J* = 7.6 Hz, 2H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 137.69, 133.92, 131.59, 130.38, 122.12, 121.64.

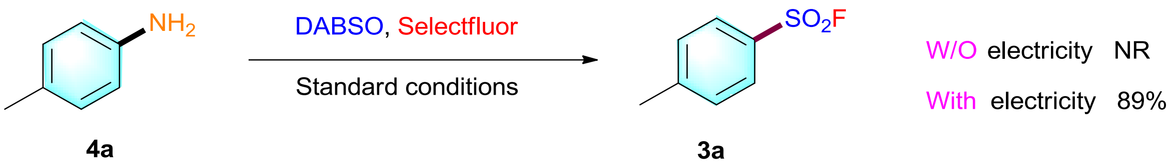
4. Mechanistic studies

a) Reduction of nitrobenzene



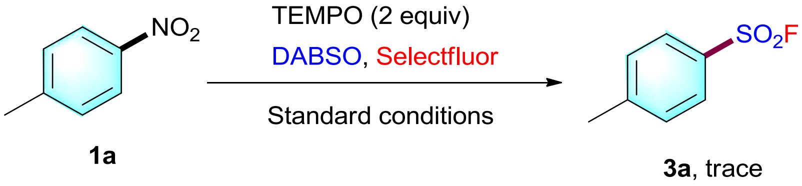
An undivided cell was equipped with carbon plate anode (8 mm × 2 mm) and glassy carbon cathode (8 mm × 2 mm). To the cell was added **1a** (0.3 mmol), MeOH (4 mL) and $[Mim]TolSO_3$ (0.5 mL) under Glove box, and then stirred at room temperature for 5 min. The mixture was electrolyzed using constant current conditions (12 mA) at 25 ºC under magnetic stirring. When TLC analysis indicated that the electrolysis was complete (witnessed by the disappearance of the **1a**, 6 h), the solvent was removed under reduced pressure. The residue was poured into a saturated aqueous solution of $NaHCO_3$ and the product was then extracted with CH_2Cl_2 (3 × 20 mL), dried over Na_2SO_4, and concentrated in vacuo. The residue was purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired pure product **12a** (32.1 mg, 83%). As a comparison, no **12a** was detected in the absence of $[Mim]TolSO_3$. In addition, while the use of $[Mim]HSO_4$ could deliver **12a** with 21% yield, the presence of other acids such as [Mim]Cl, [Mim]OAc, H_2SO_4, HCl or TsOH only led to trace **12a**.

b) Sandmeyer-type arenesulfonyl fluorides of aniline



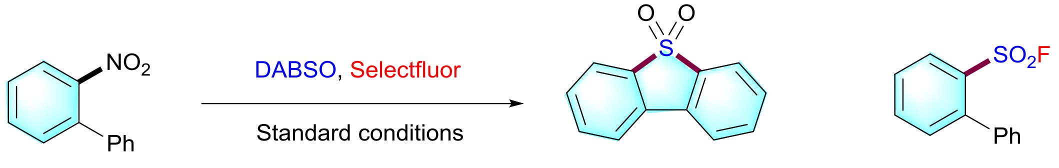
An undivided cell was equipped with carbon plate anode (8 mm × 2 mm) and glassy carbon cathode (8 mm × 2 mm). To the cell was added **4a** (0.3 mmol, 32 mg), DABSO (0.2 mmol, 48 mg), Selectfluor (0.6 mmol, 212 mg), MeOH (4 mL) and [Mim]TolSO$_3$ (0.5 mL) under Glove box, and then stir at room temperature for 5 min. ^{t}BuONO (0.90 mmol, 92.7 mg) were added. The mixture was electrolyzed using constant current conditions (12 mA) at 25 ^{o}C under magnetic stirring. When TLC analysis indicated that the electrolysis was complete (witnessed by the disappearance of the **4a**, 6 h), the solvent was removed under reduced pressure. The residue was poured into a saturated aqueous solution of NaCl and the product was then extracted with CH_2Cl_2 (3×20 mL), dried over Na_2SO_4, and concentrated in vacuo. The residue was purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired pure product **3a** (46.5 mg, 89%). As a comparison, no **3a** was detected in the absence of electricity.

c) Radical trapping experiments



An undivided cell was equipped with carbon plate anode (8 mm × 2 mm) and glassy carbon cathode (8 mm × 2 mm). To the cell was added **1a** (0.3 mmol, 41 mg), DABSO (0.2 mmol, 48 mg), Selectfluor (0.6 mmol, 212 mg), TEMPO (0.6 mmol, 95.3 mg), MeOH (4 mL) and [Mim]TolSO$_3$ (0.5 mL) under Glove box, and then stir at room temperature for 5 min. ^{t}BuONO (0.90 mmol, 92.7mg) were added. The mixture was electrolyzed using constant current conditions (12 mA) at 25 ºC under magnetic stirring. When TLC analysis indicated that the electrolysis was complete (witnessed by the disappearance of the **1a**), GC-MS analysis of the crude reaction mixture indicates the formation of trace amounts of **3a**.

d) Radical clock experiment



4

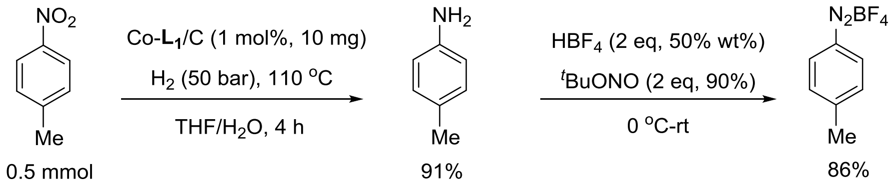
5, 81%

6 (not detected)

An undivided cell was equipped with carbon plate anode (8 mm × 2 mm) and glassy carbon cathode (8 mm × 2 mm). To the cell was added **4** (0.3 mmol, 60 mg), MeOH (4 mL) and [Mim]TolSO$_3$ (0.5 mL) under Glove box, and then stir at room temperature for 5 min. The mixture was electrolyzed using constant current conditions (12 mA) at 25 ºC under magnetic stirring. When TLC analysis indicated that the electrolysis was complete (witnessed by the disappearance of the **4**, 6 h), the solvent was removed under reduced pressure. The residue was poured into a saturated aqueous solution of NaHCO$_3$ and the product was then extracted with CH$_2$Cl$_2$ (3 × 20 mL), dried over Na$_2$SO$_4$, and concentrated in vacuo. The residue was purified by column chromatography on silica gel using a mixture of petroleum ether/EtOAc as eluent to afford the desired pure product **5** in 81% yield (52 mg), and no **6** was detected.

5. Green metrics

To give a clear calculation, compound **3a** has been chosen as a representative example, and steps for the synthesis of corresponding 4-methylphenyl diazo reagent from the reduction of 1-methyl-4-nitrobenzene and diazotization have been added in one chemical equation. The data for the first reduction and the second diazotization step was calculated based on the work of Beller (*Nat. Chem.* **2013**, *5*, 537) and Ian J. S. Fairlamb (*ACS Catal.* **2017**, *7*, 5174), respectively. Furthermore, based on the procedure of Beller, for every reduction procedure with 0.5 mmol scale, about 1200 mg H_2 has been used.

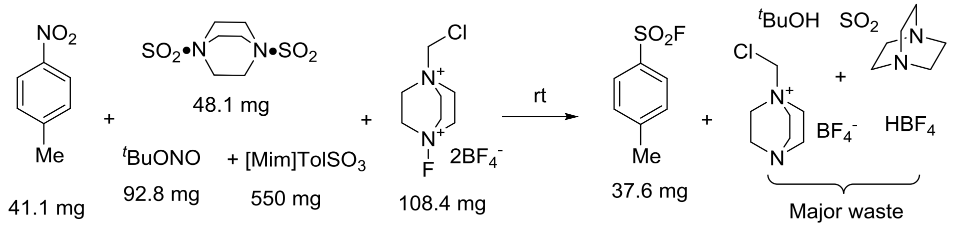


Based on these, the following four green metrics with different methods have been calculated and the data have been summarized in Table S1.

Table S1. A comparison of four green chemistry metrics with different methods

Entry	Work of different group	***E*-Factor**	**AE**	**RME**	**PMI**
1	**This work**	21.3	20.8%	4.5%	22.4
2	**Chen and Liu** (Example A)	43.3	32.7%	2.3%	44.3
3	**Zheng, Hu and Liu** (Example B)	48.2	15.9%	2.0%	49.2
4	**Weng** (Example C)	45.1	16.3%	2.2%	46.1

This work:



Total amounts of reactants = 840.4 mg

Amount of final product = 37.6 mg

Amount of waste: 840.4 mg – 37.6 mg = 802.8 mg

E-Factor = Amount of waste/Amount of final product = 21.3

Molecular weight of product = 174.2

Sum of molecular weight of reagent = 834.7

AE = Molecular weight of product/Sum of molecular weight of reagent = 20.8%

Mass of product = 37.6 mg

Total mass of reagent = 840.4 mg

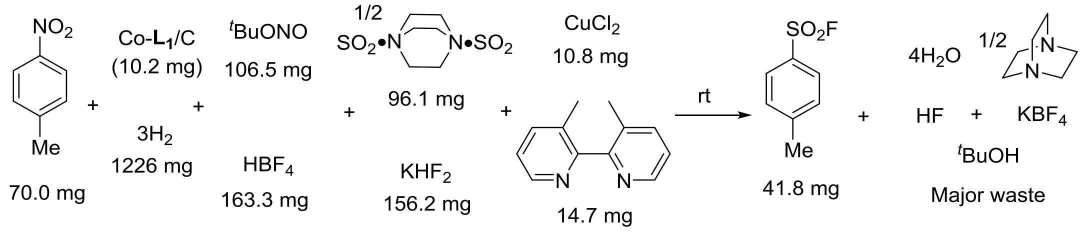
RME = Mass of product/Total mass of reagent = 4.5%

Total mass in process = 840.4 mg

Mass of product = 37.6 mg

PMI = Total mass in process/Mass of product = 22.4

Example A: (Liu, Y., Yu, D., Guo, Y., Xiao, J.-C., Chen, Q.-Y., Liu, C. *Org. Lett.* **2020**, *22*, 2281−2286)



Total amounts of reactants = 1853.8 mg

Amount of final product = 41.8 mg

Amount of waste: 1853.8 mg – 41.8 mg = 1812.0 mg

E-Factor = Amount of waste/Amount of final product = 43.3

Molecular weight of product = 174.2

Sum of molecular weight of reagent = 532.3

AE = Molecular weight of product/Sum of molecular weight of reagent = 32.7%

Mass of product = 41.8 mg

Total mass of reagent = 1828.3 mg

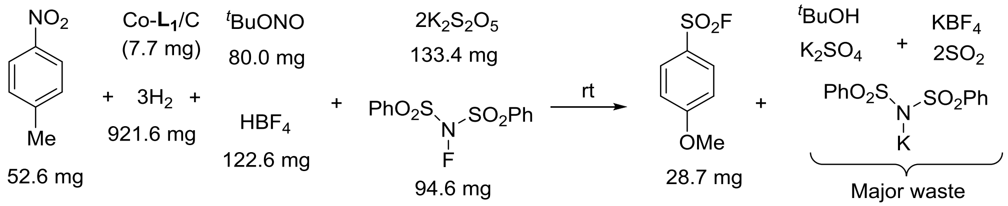
RME = Mass of product/Total mass of reagent = 2.3%

Total mass in process = 1853.8 mg

Mass of product = 41.8 mg

PMI = Total mass in process/Mass of product = 44.3

Example B: (Lin, Q., Ma, Z., Zheng, C., Hu, X.-J., Guo, Y., Chen, Q.-Y., Liu, C. *Chin. J. Chem.* **2020**, *38*, 1107−1110)



Total amounts of reactants = 1412.5 mg

Amount of final product = 28.7 mg

Amount of waste: 1412.5 mg – 28.7 mg = 1383.8 mg

E-Factor = Amount of waste/Amount of final product = 48.2

Molecular weight of product = 174.2

Sum of molecular weight of reagent = 1093.9

AE = Molecular weight of product/Sum of molecular weight of reagent = 15.9%

Mass of product = 28.7 mg

Total mass of reagent = 1404.8 mg

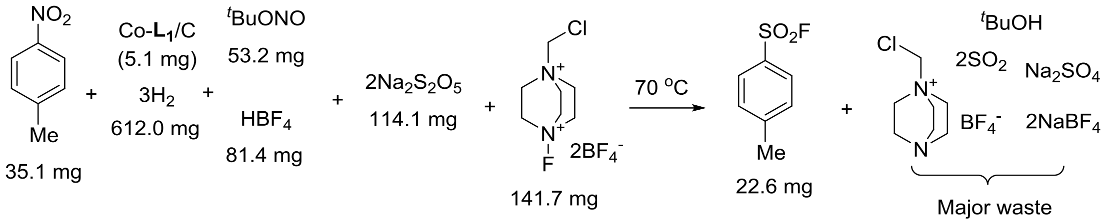
RME = Mass of product/Total mass of reagent = 2.0%

Total mass in process = 1412.5 mg

Mass of product = 28.7 mg

PMI = Total mass in process/Mass of product = 49.2

Example C: (Zhong, T., Pang, M-K., Chen, Z.-D., Zhang, B., Weng, J., Lu, G. *Org. Lett.* **2020**, *22*, 3072−3078)



Total amounts of reactants = 1042.6 mg

Amount of final product = 22.6 mg

Amount of waste: 1042.6 mg – 22.6 mg = 1020.0 mg

E-Factor = Amount of waste/Amount of final product = 45.1

Molecular weight of product = 174.2

Sum of molecular weight of reagent = 1068.4

AE = Molecular weight of product/Sum of molecular weight of reagent = 16.3%

Mass of product = 22.6 mg

Total mass of reagent = 1037.5 mg

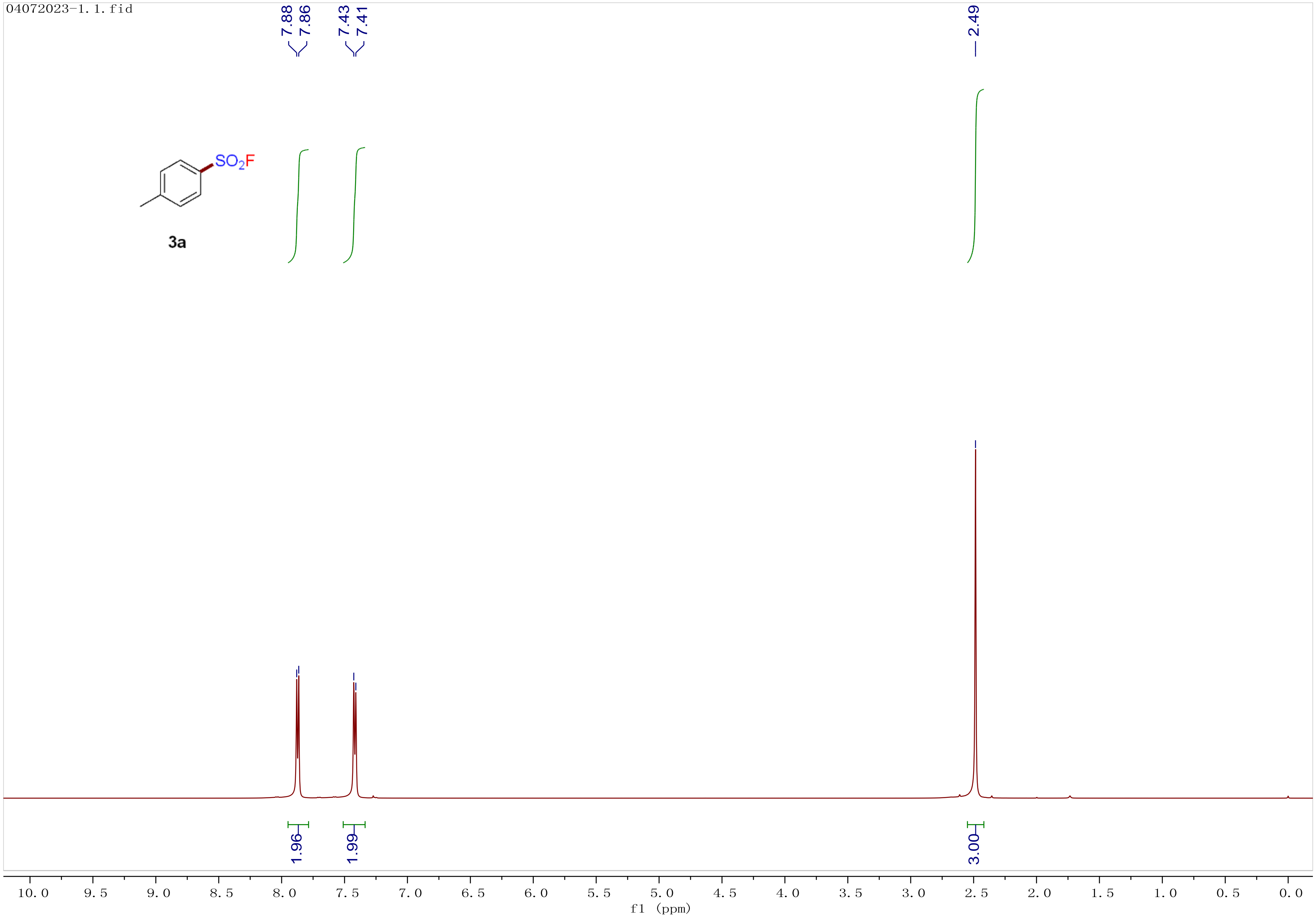
RME = Mass of product/Total mass of reagent = 2.2%

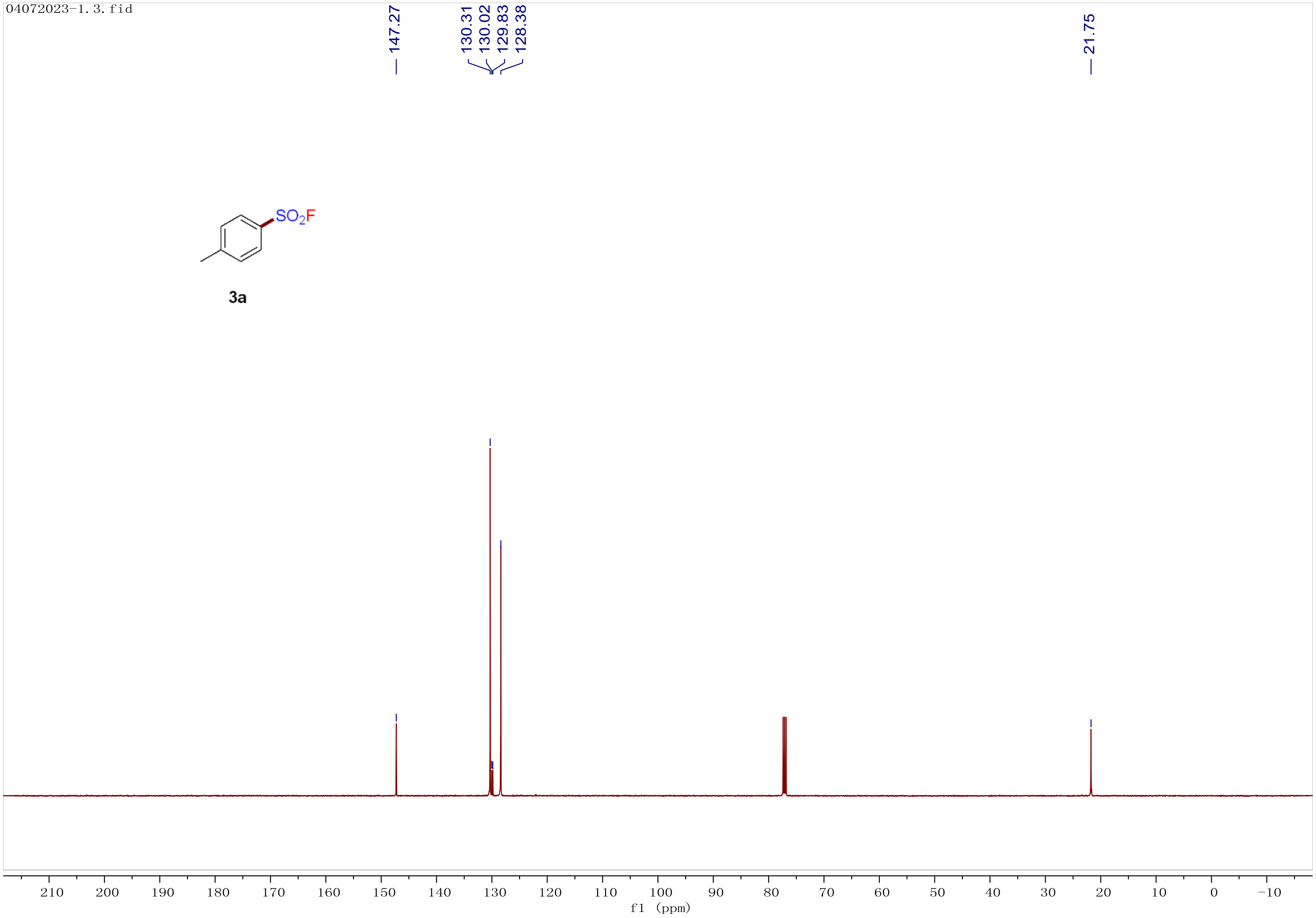
Total mass in process = 1042.6 mg

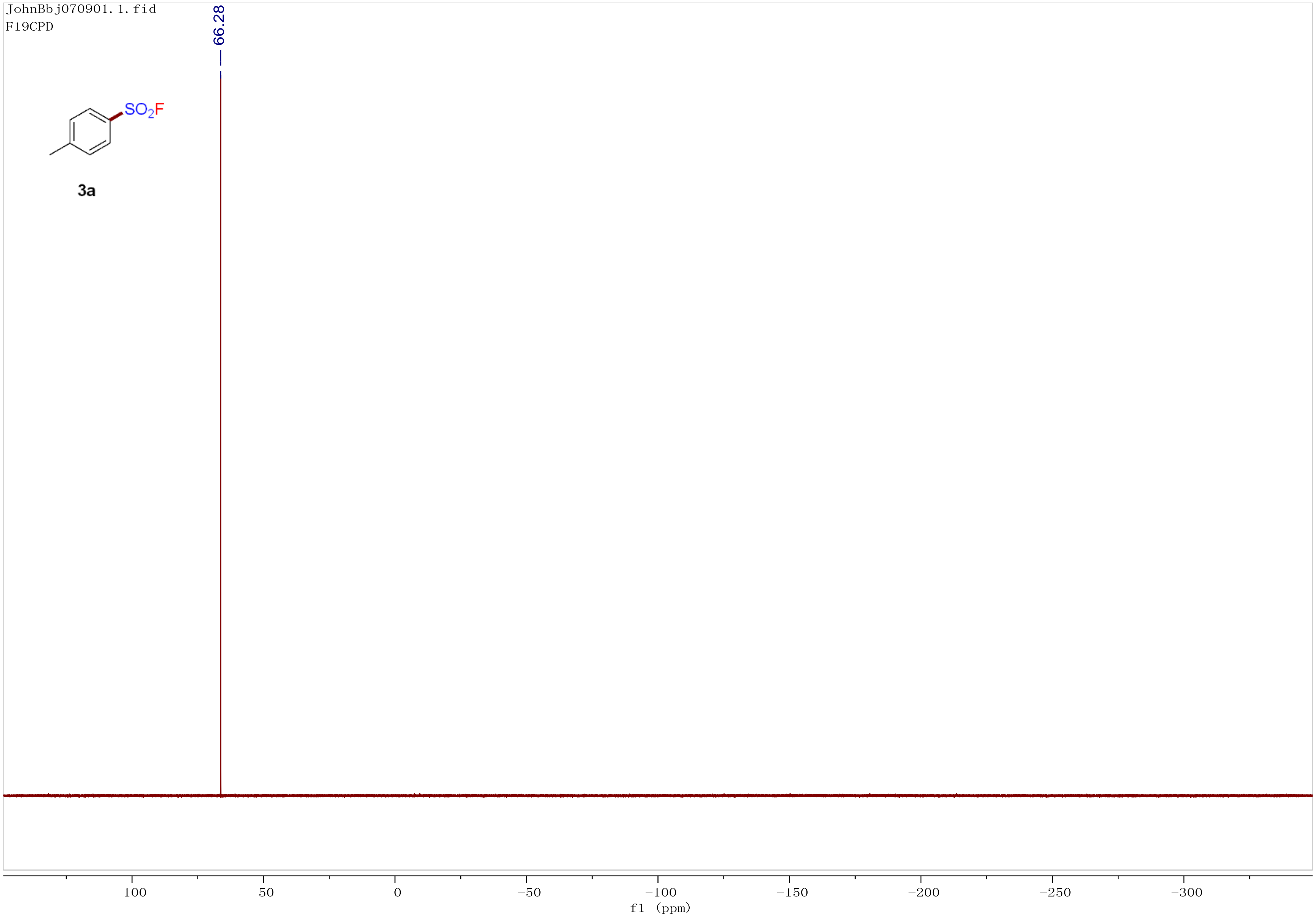
Mass of product = 22.6 mg

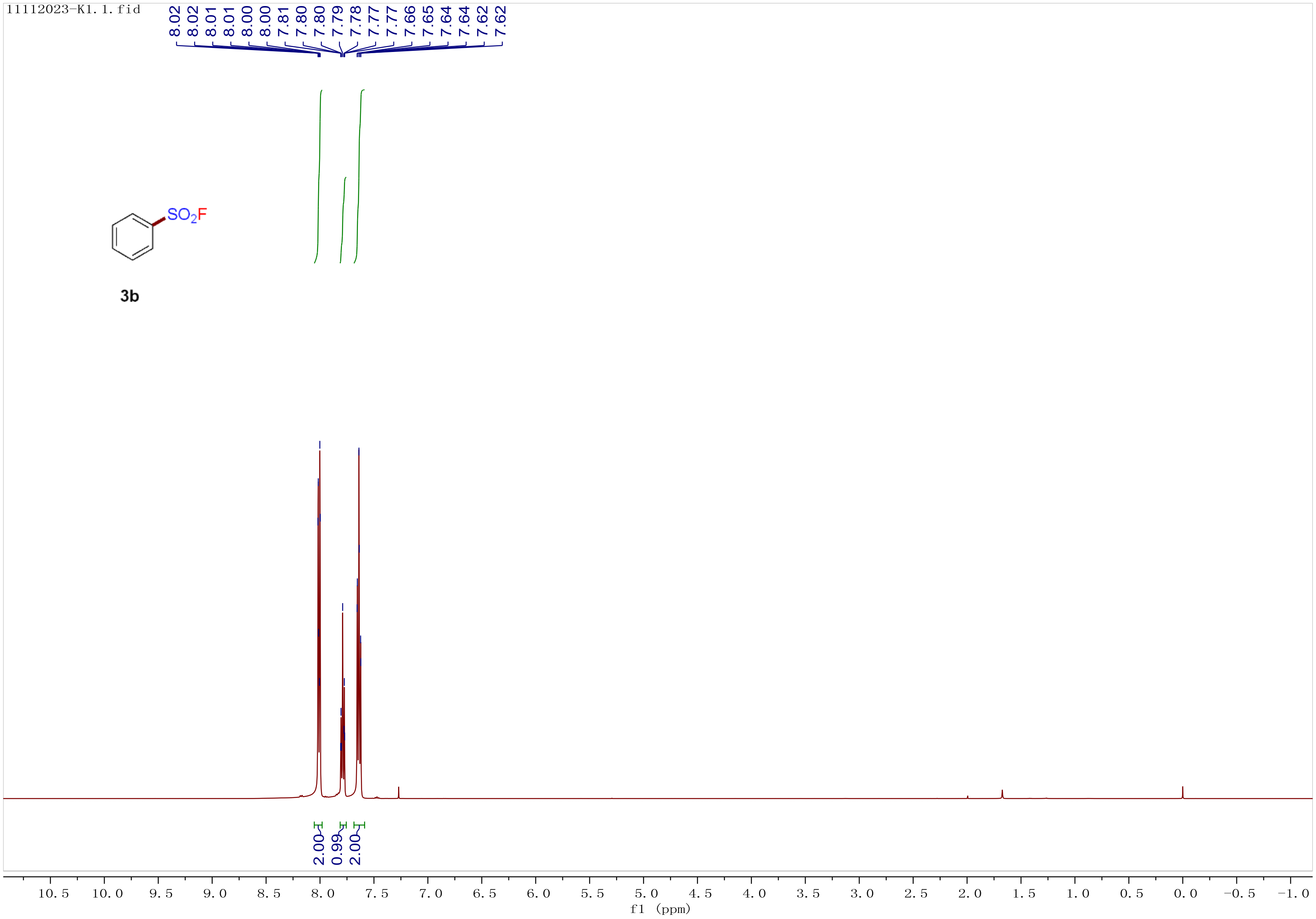
PMI = Total mass in process/Mass of product = 46.1

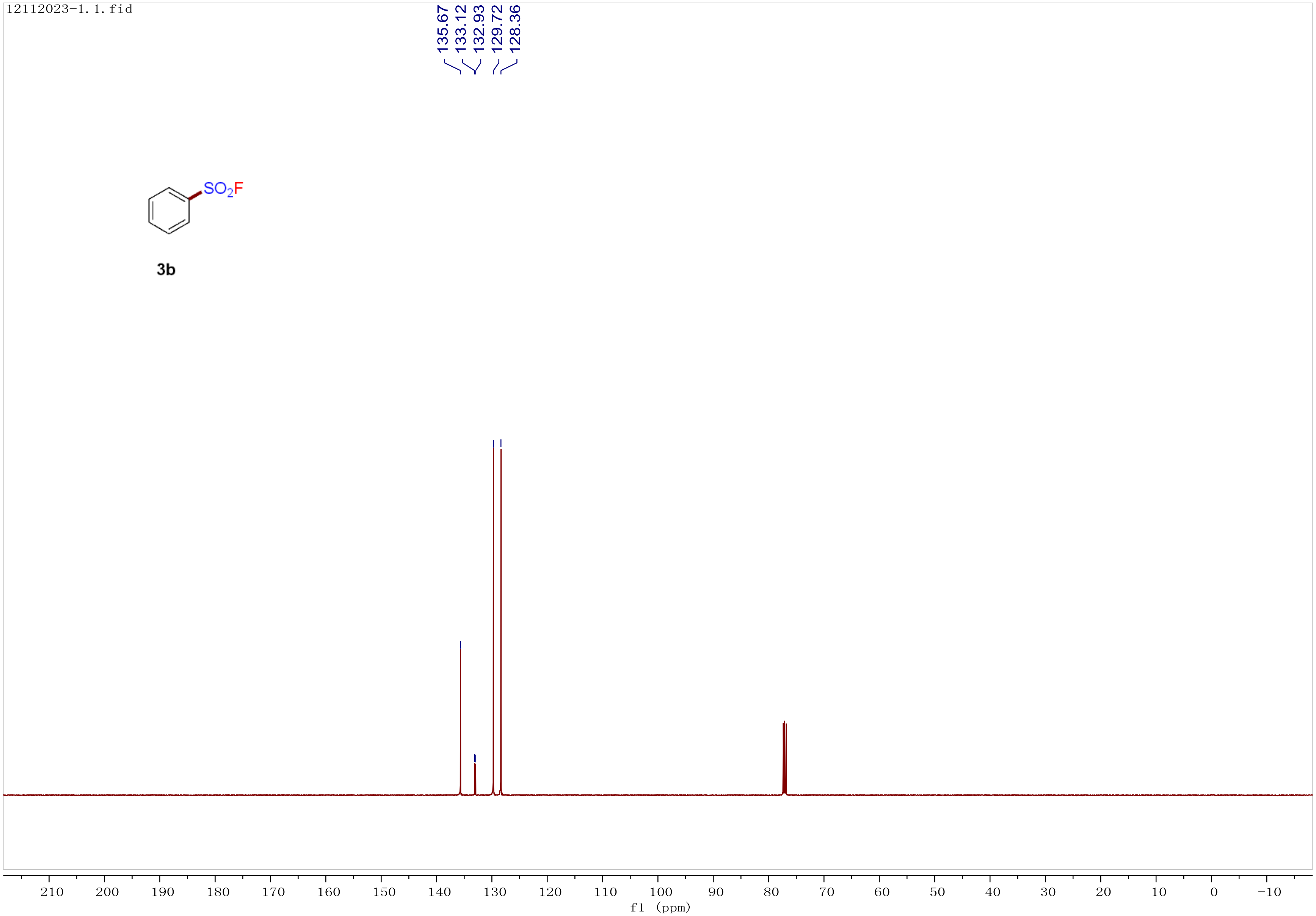
6. Copies of NMR spectra




04072023-1.3.fid
147.27
130.31
130.02
129.83
128.38
21.75
SO2F
3a
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

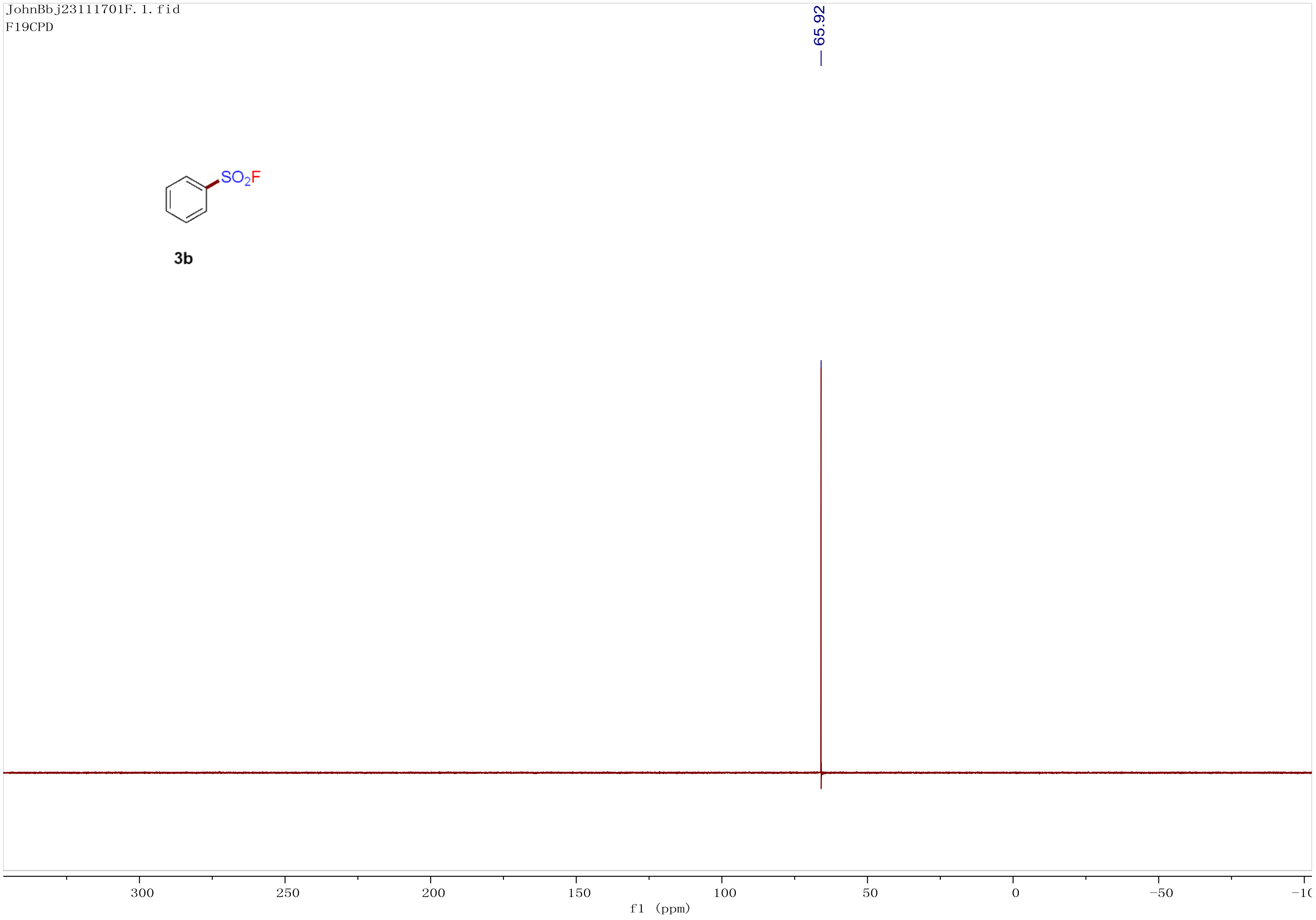

JohnBbj070901.1.fid
F19CPD
66.28
SO2F
3a
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

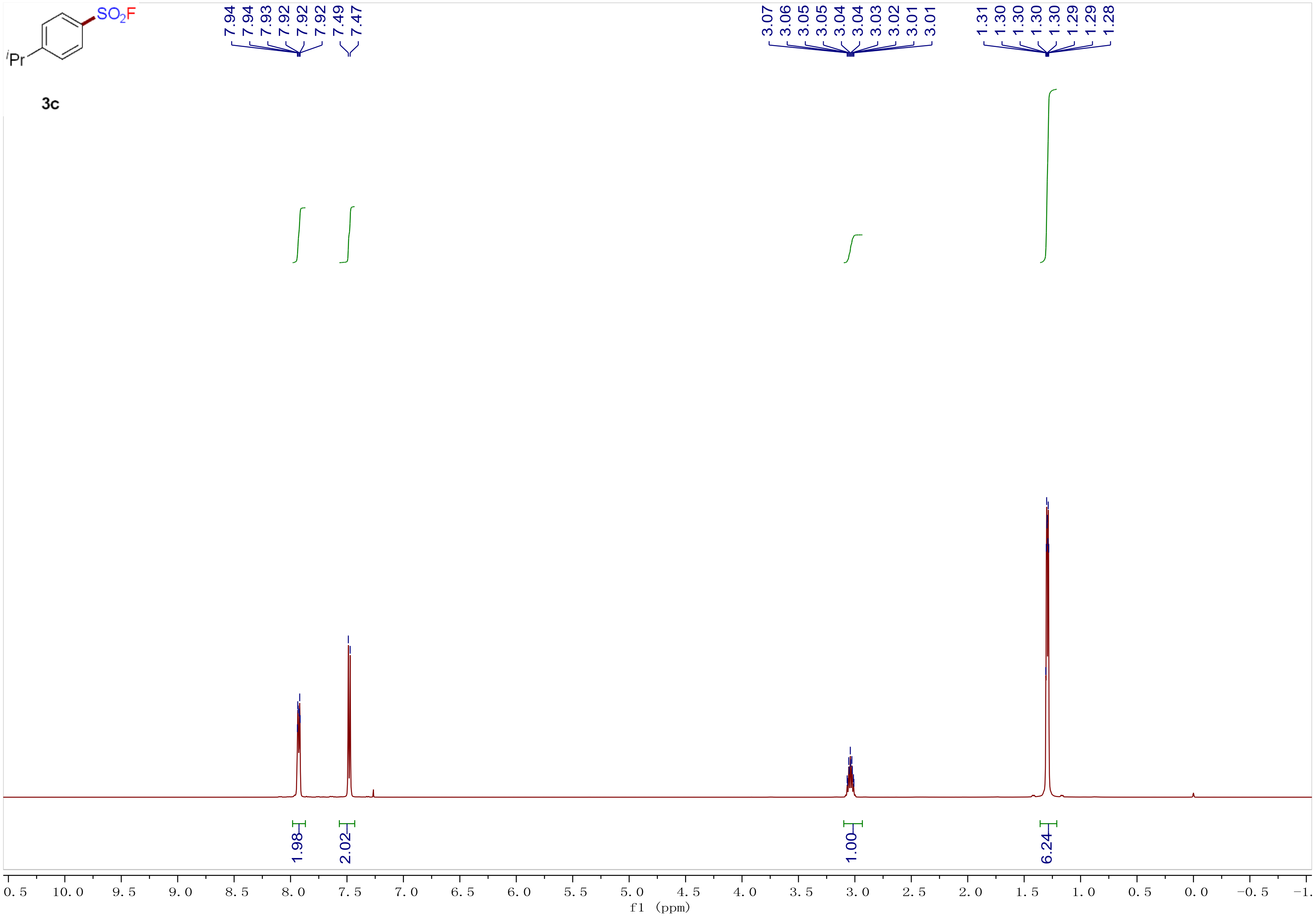

11112023-K1.1.fid
8.02
8.02
8.01
8.01
8.00
8.00
7.81
7.80
7.80
7.79
7.78
7.77
7.77
7.66
7.65
7.64
7.64
7.62
7.62
SO2F
3b
2.00
0.99
2.00
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
f1 (ppm)



3b

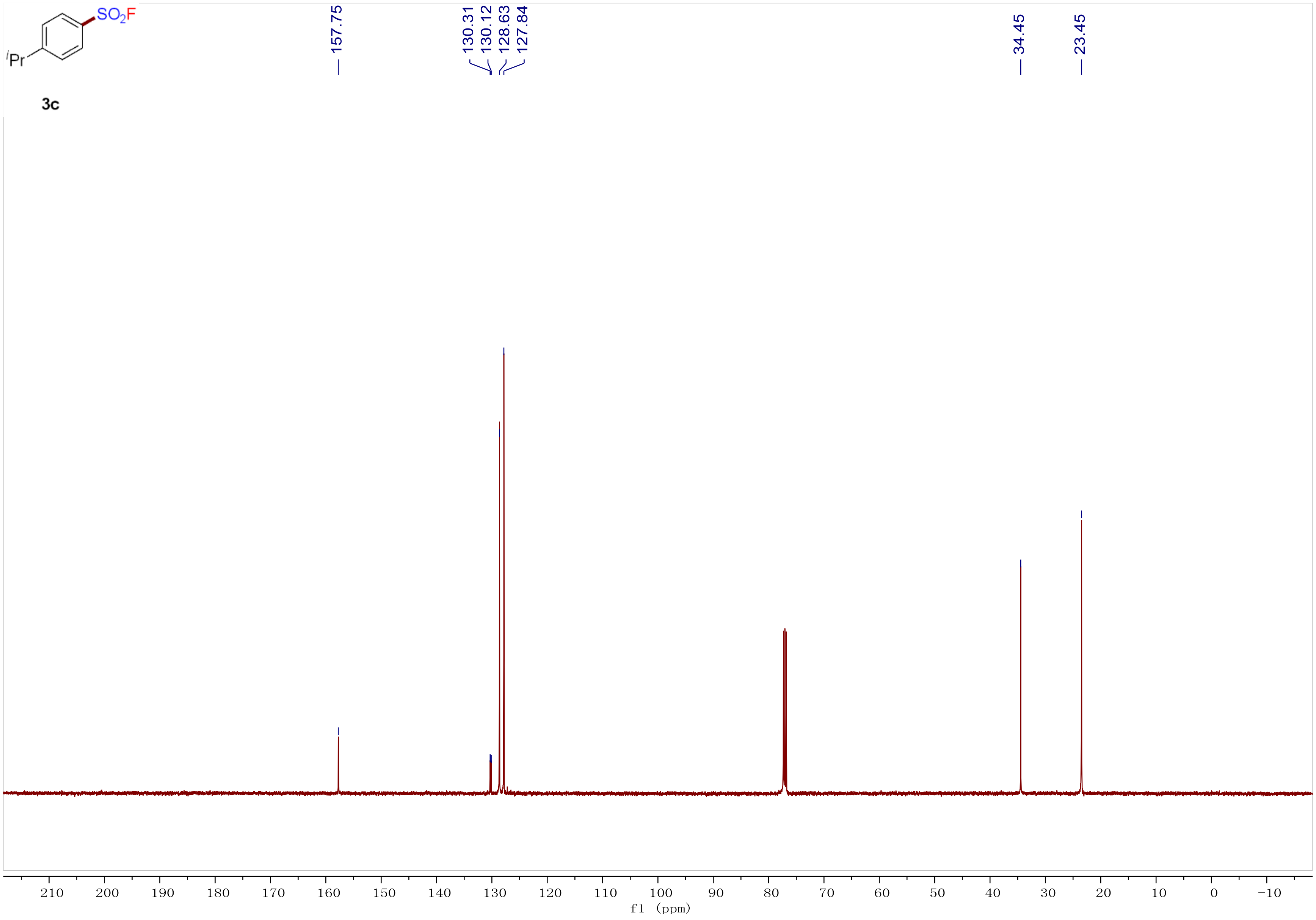
12112023-1.1.fid
135.67
133.12
132.93
129.72
128.36
SO2F
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


JohnBbj23111701F.1.fid
F19CPD
65.92
SO2F
3b
300
250
200
150
100
50
0
-50
f1 (ppm)



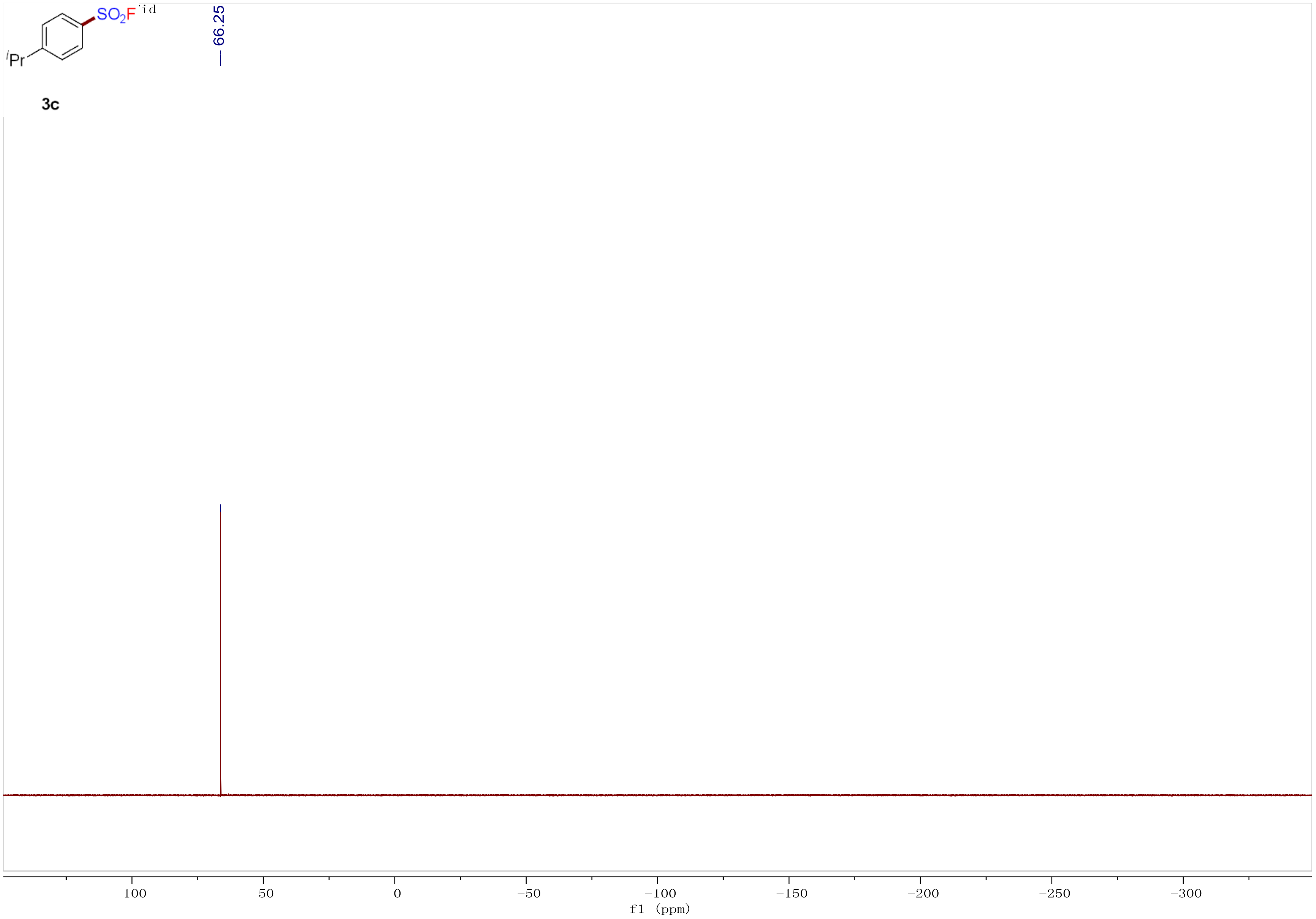
3c

SO$_2$F
^{i}Pr
7.94
7.94
7.93
7.92
7.92
7.92
7.49
7.47
3.07
3.06
3.05
3.05
3.04
3.04
3.03
3.02
3.01
3.01
1.31
1.30
1.30
1.30
1.30
1.29
1.29
1.28
1.98
2.02
1.00
6.24
0.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.
f1 (ppm)

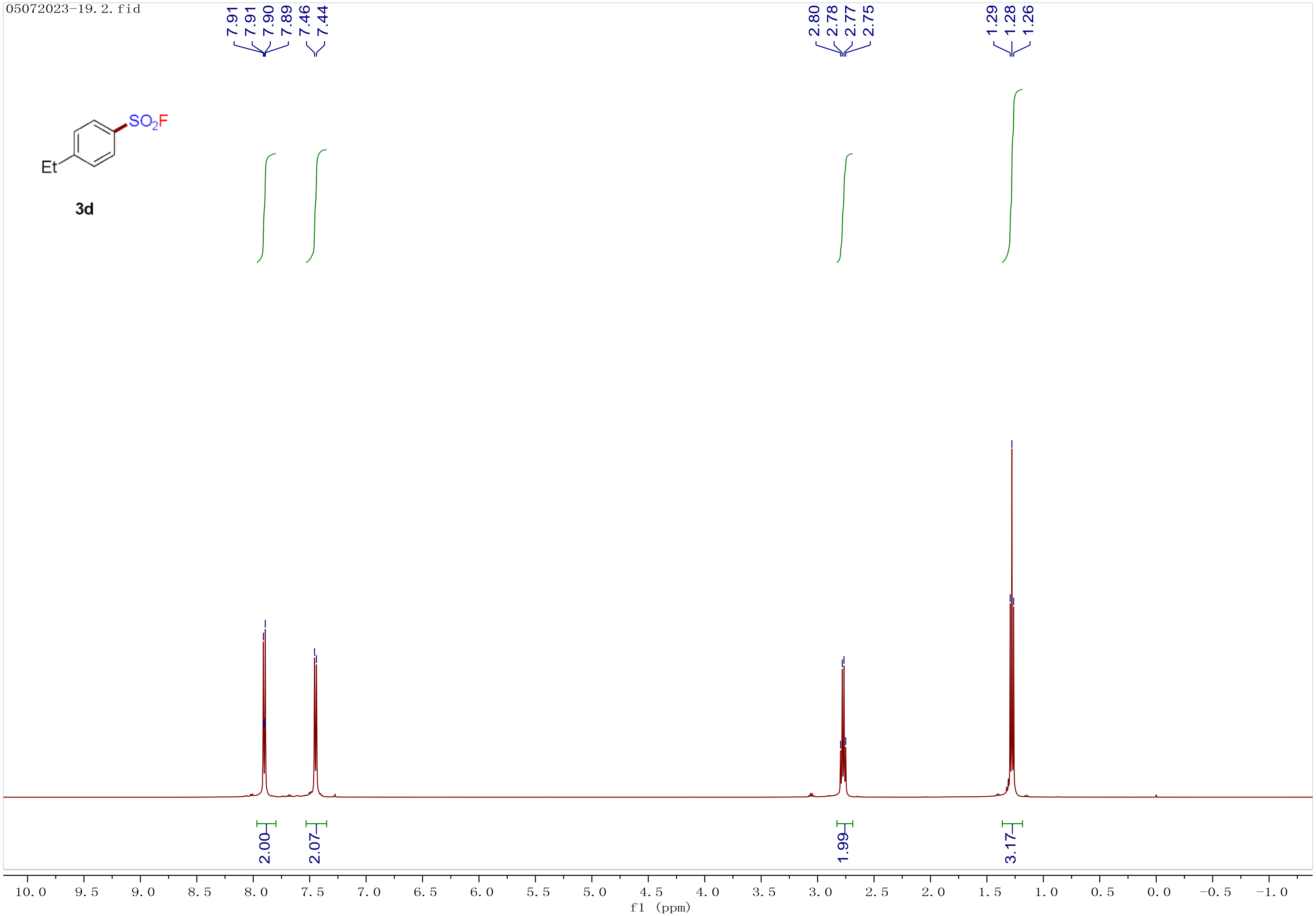


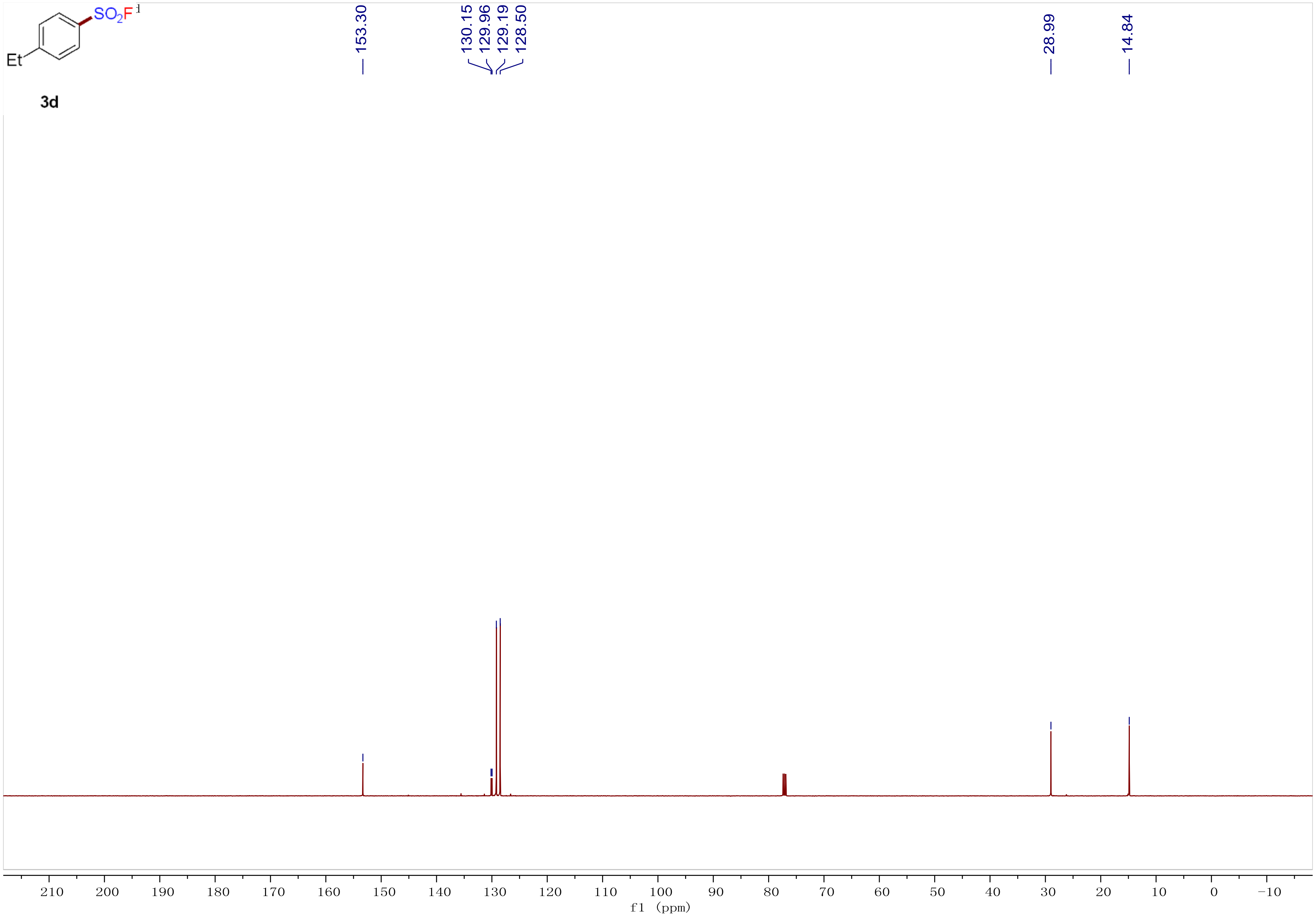
3c

157.75
130.31
130.12
128.63
127.84
34.45
23.45
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)



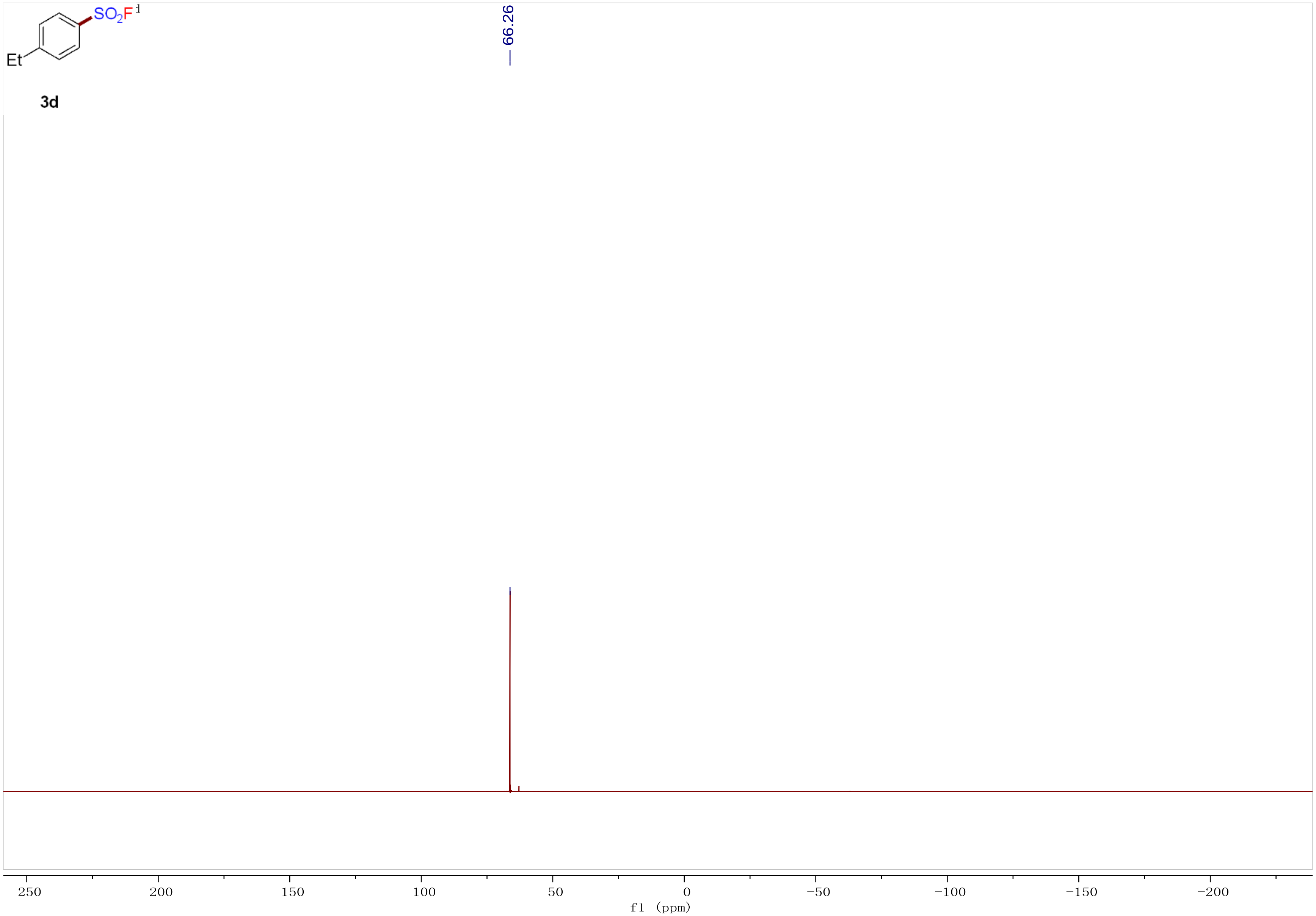
3c

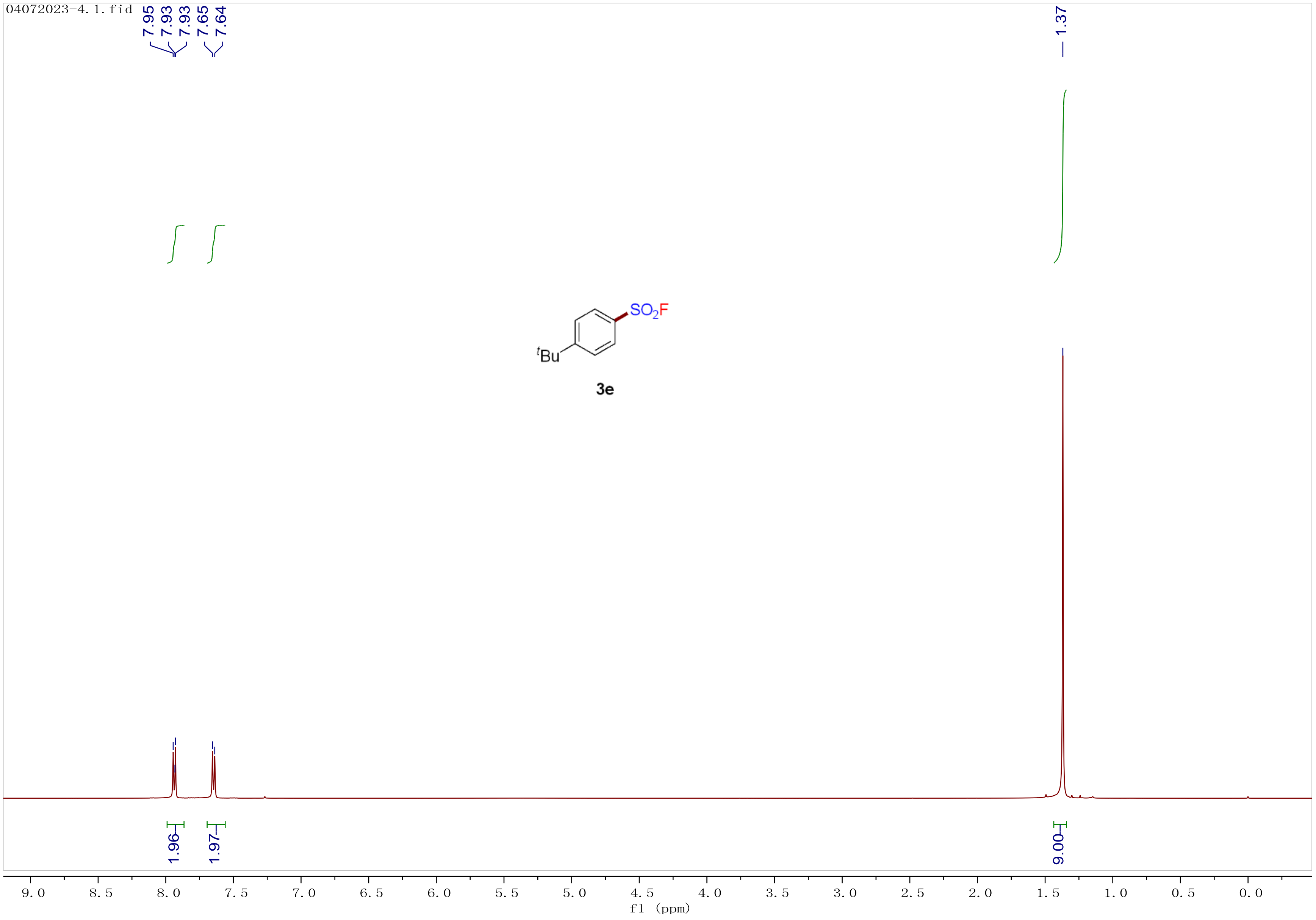

05072023-19.2.fid
7.91
7.91
7.90
7.89
7.46
7.44
2.80
2.78
2.77
2.75
1.29
1.28
1.26
SO2F
Et
3d
2.00
2.07
1.99
3.17
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

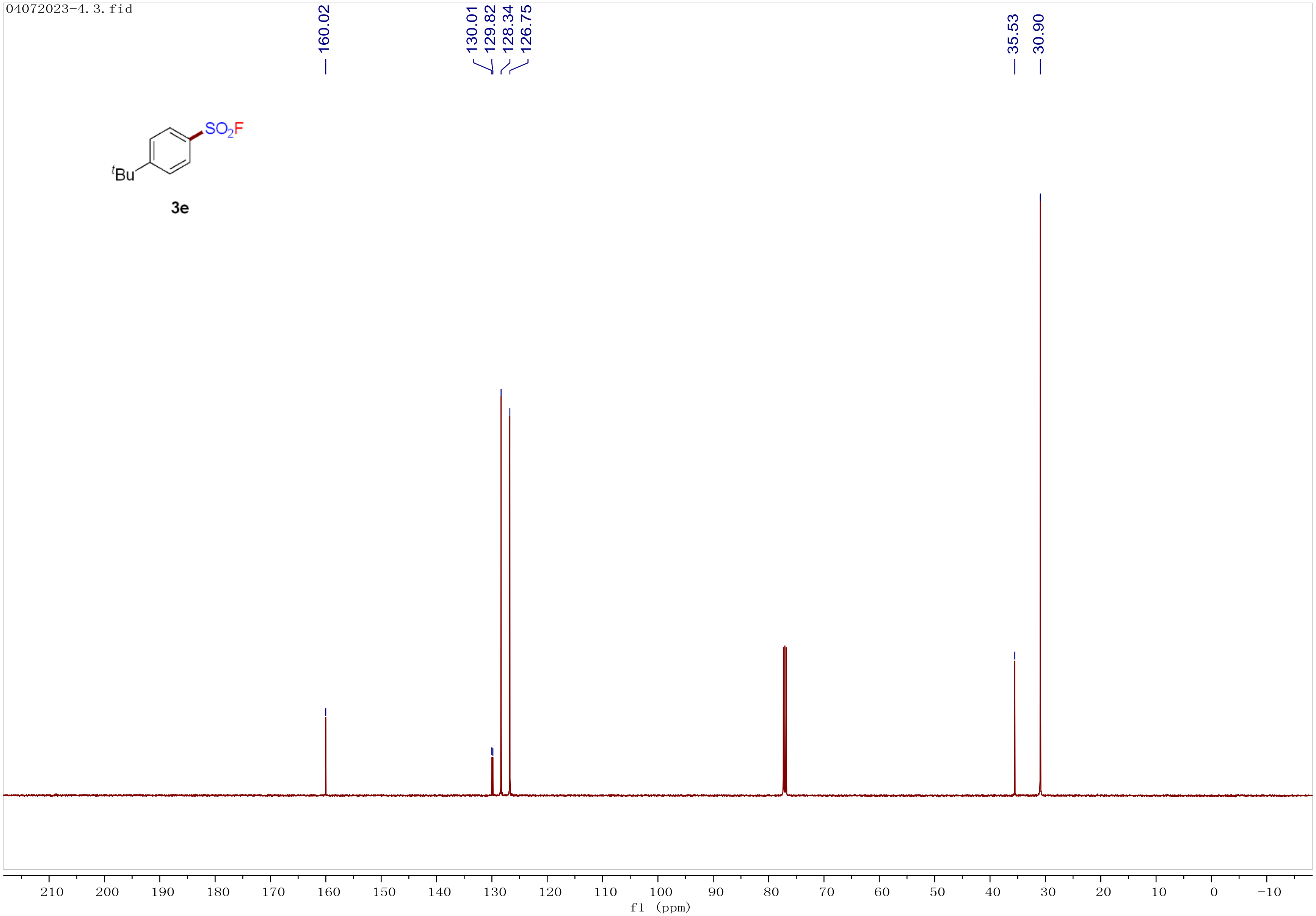


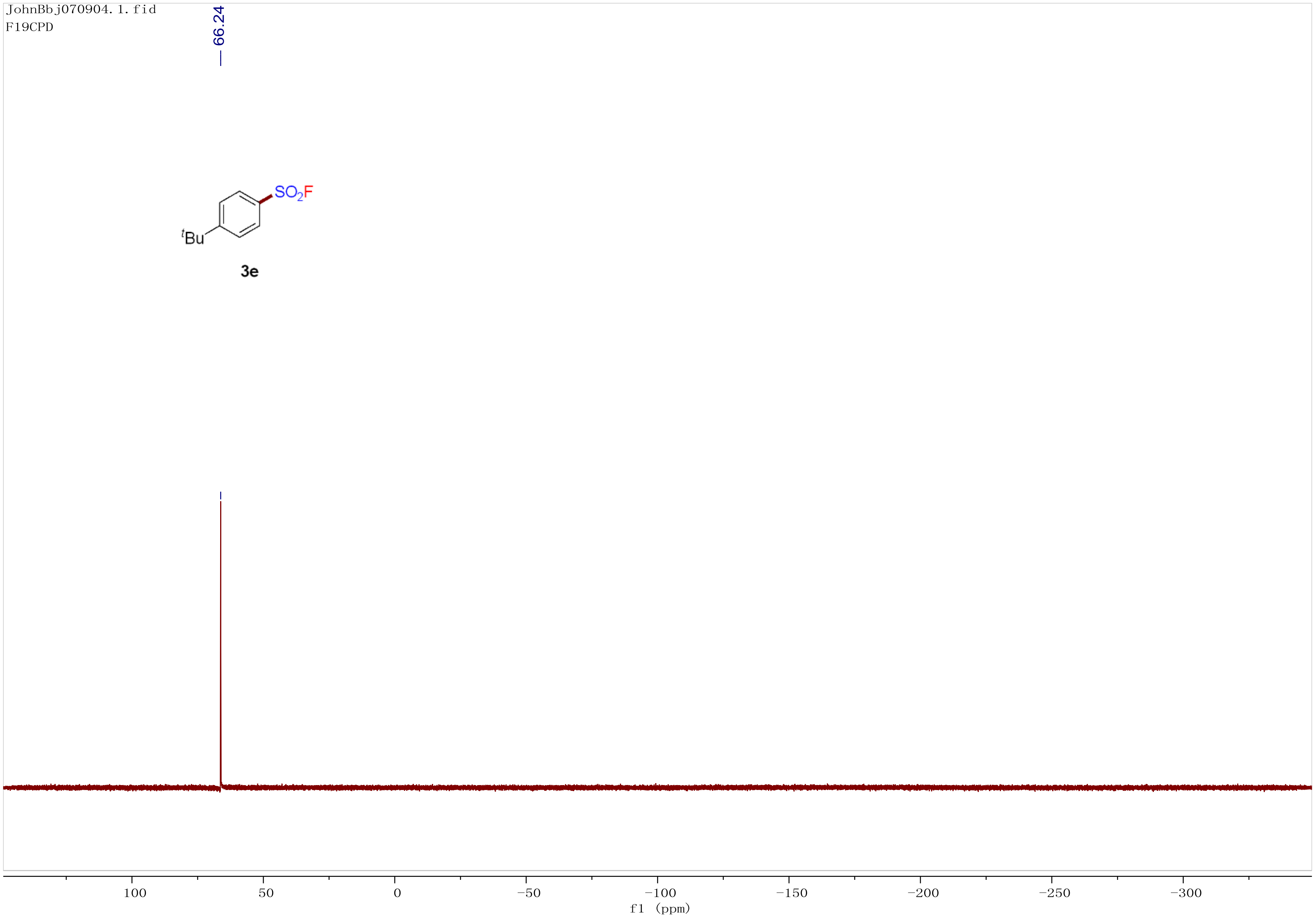
Et
SO$_2$F
153.30
130.15
129.96
129.19
128.50
28.99
14.84
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

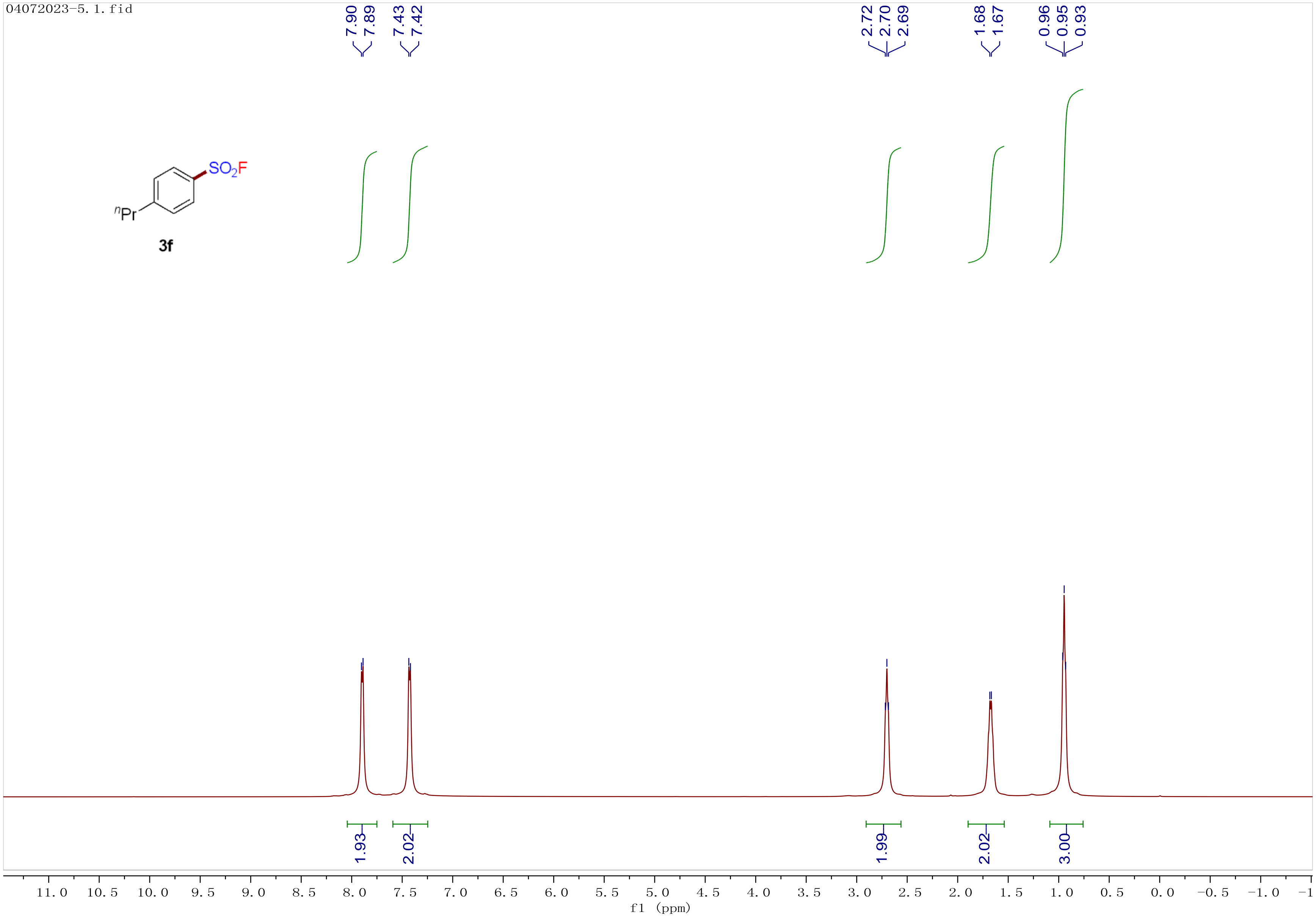
3d

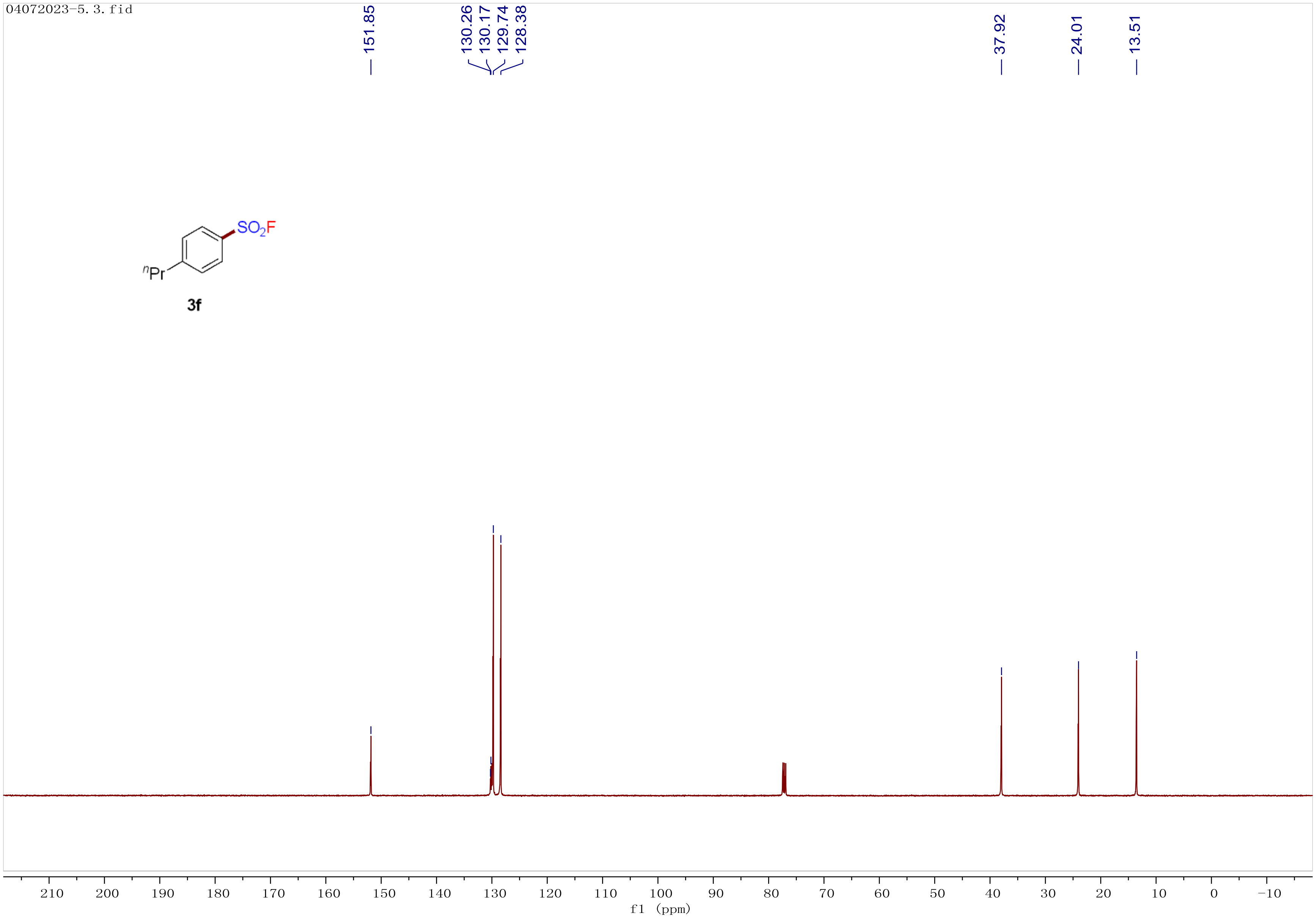

SO2F
Et
3d
66.26
250
200
150
100
50
0
−50
−100
−150
−200
f1 (ppm)

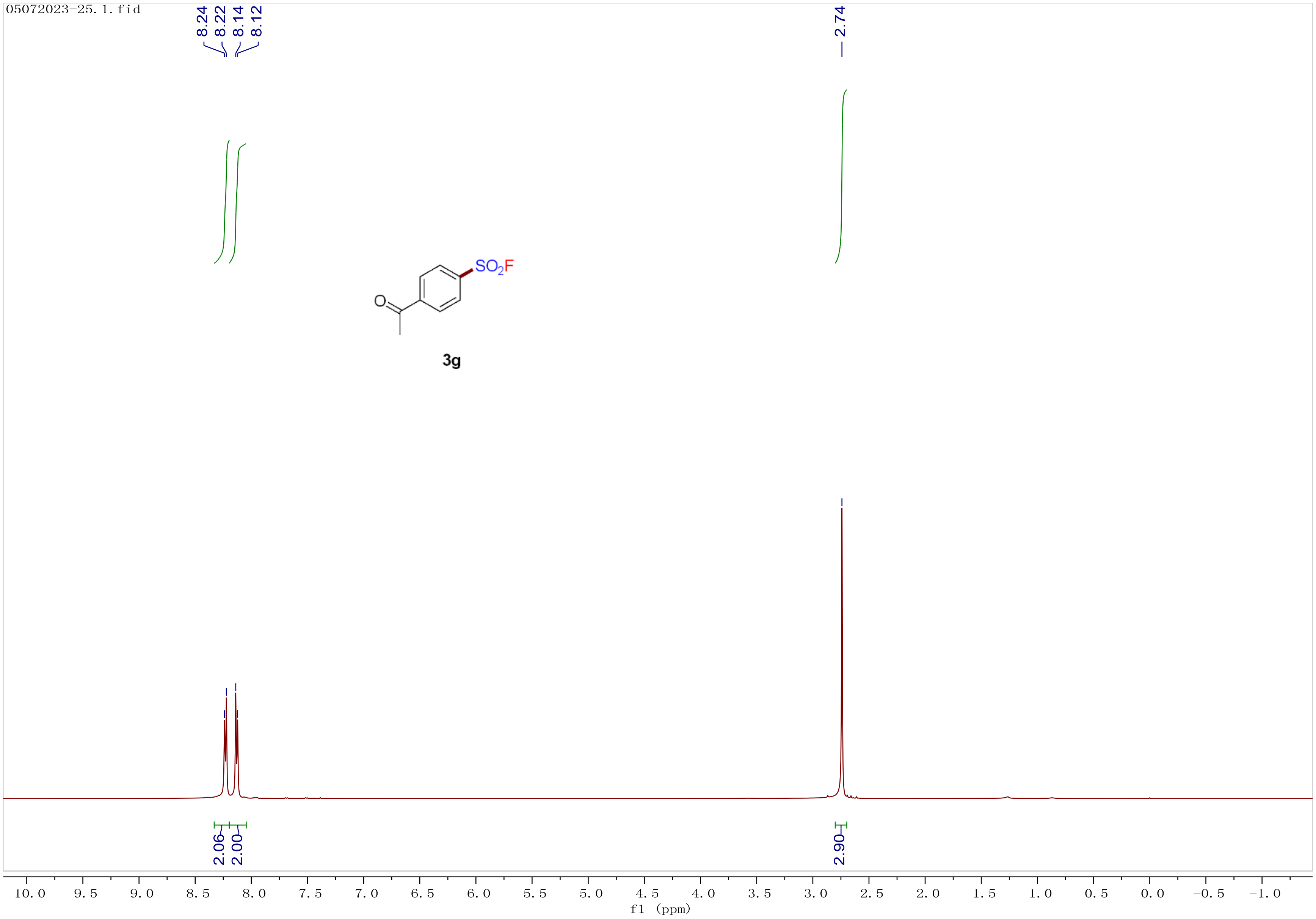

04072023-4.1.fid
7.95
7.93
7.93
7.65
7.64
1.37
SO2F
tBu
3e
1.96
1.97
9.00
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

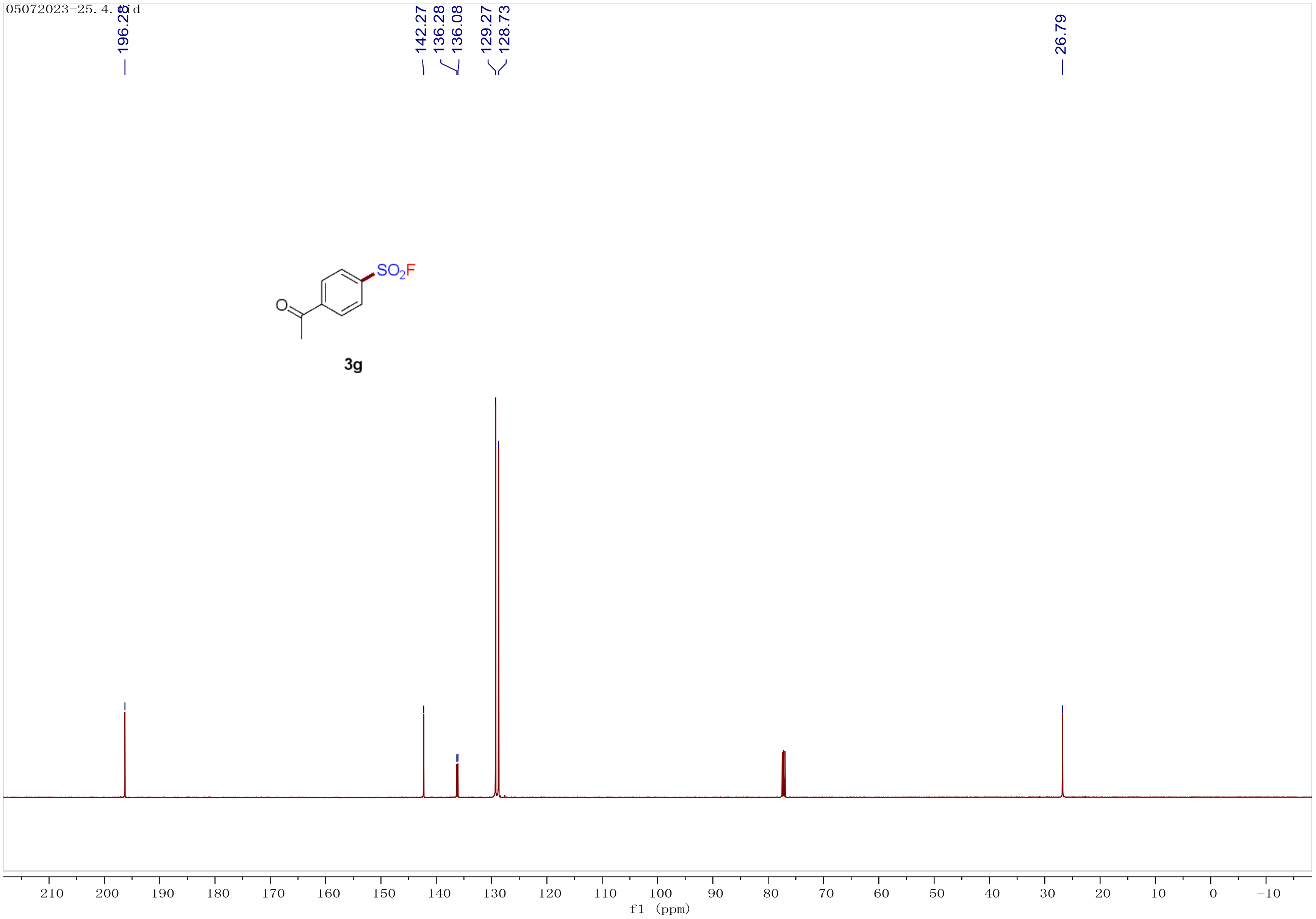

04072023-4.3.fid
160.02
130.01
129.82
128.34
126.75
35.53
30.90
SO2F
tBu
3e
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

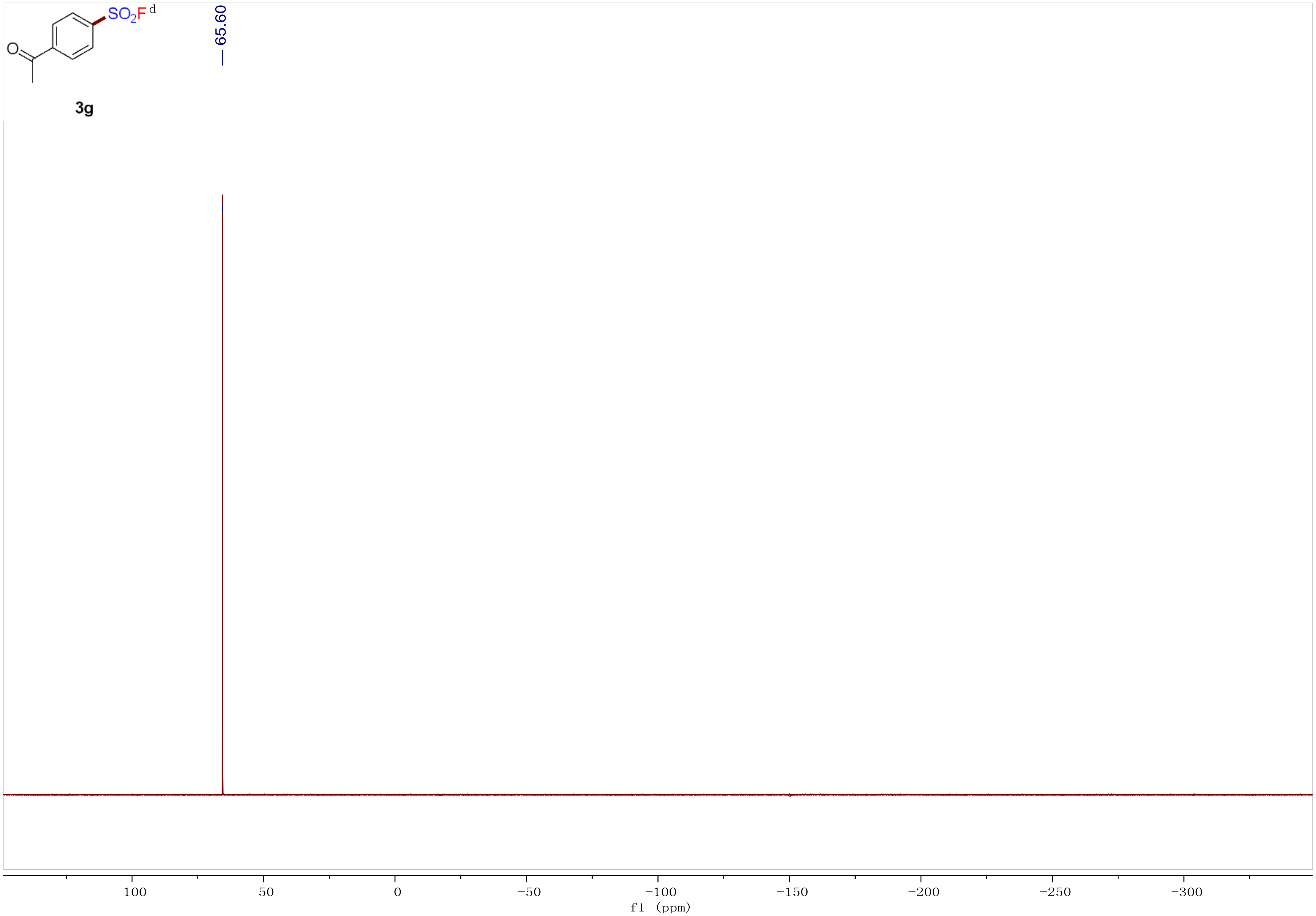

JohnBbj070904.1.fid
F19CPD
66.24
SO2F
tBu
3e
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

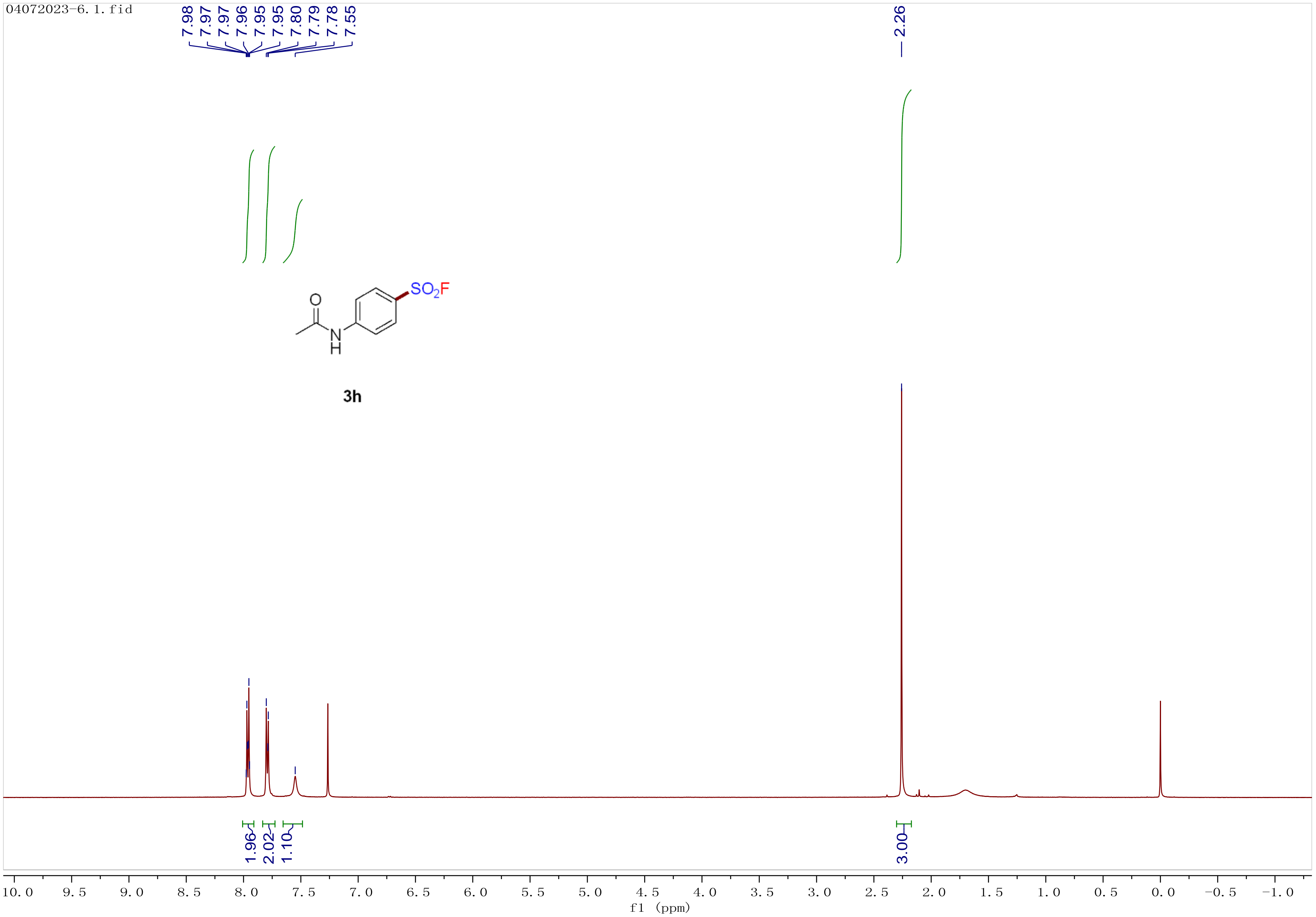

04072023-5.1.fid
7.90
7.89
7.43
7.42
2.72
2.70
2.69
1.68
1.67
0.96
0.95
0.93
SO2F
nPr
3f
1.93
2.02
1.99
2.02
3.00
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1
f1 (ppm)

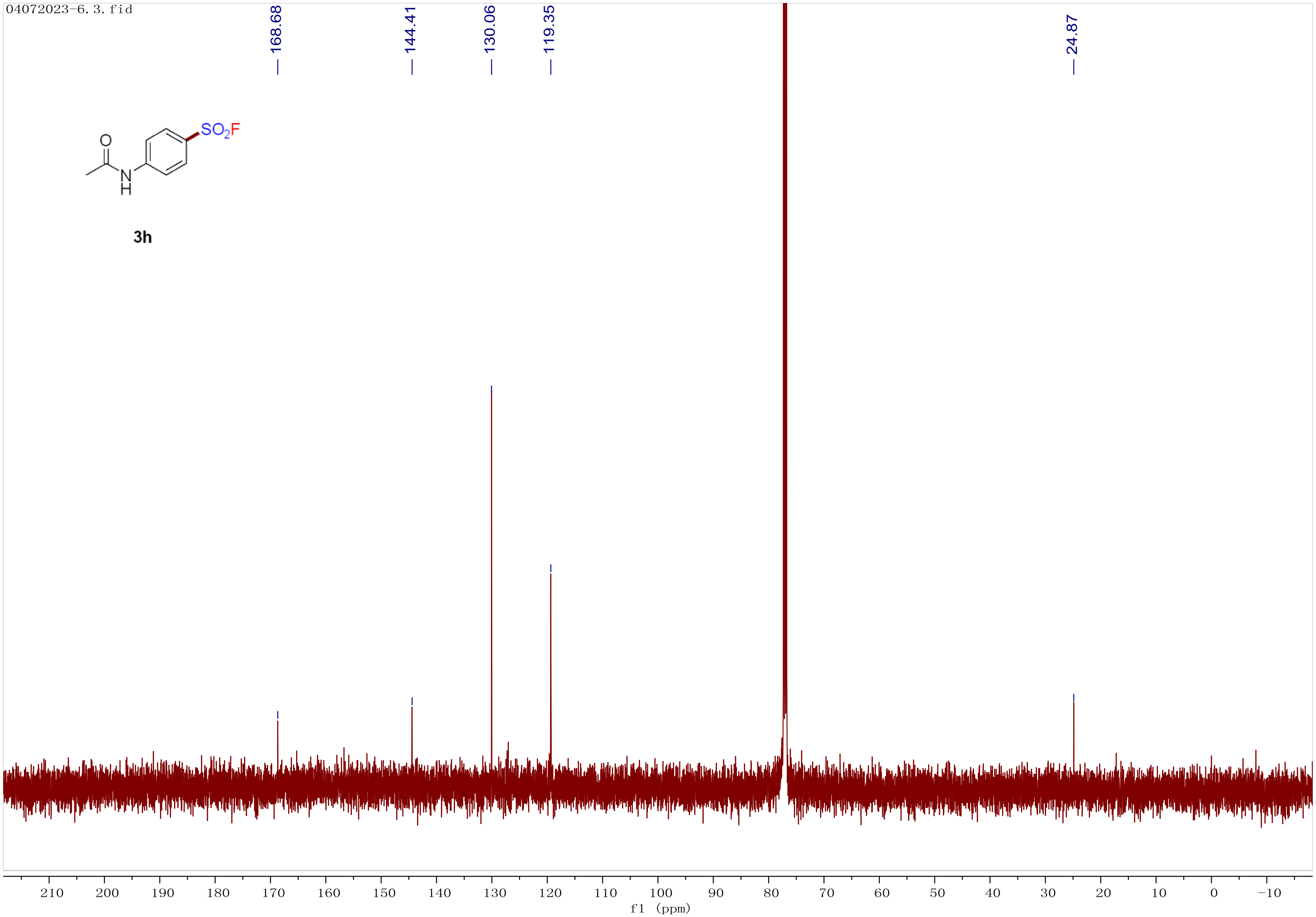

04072023-5.3.fid
151.85
130.26
130.17
129.74
128.38
37.92
24.01
13.51
SO2F
nPr
3f
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

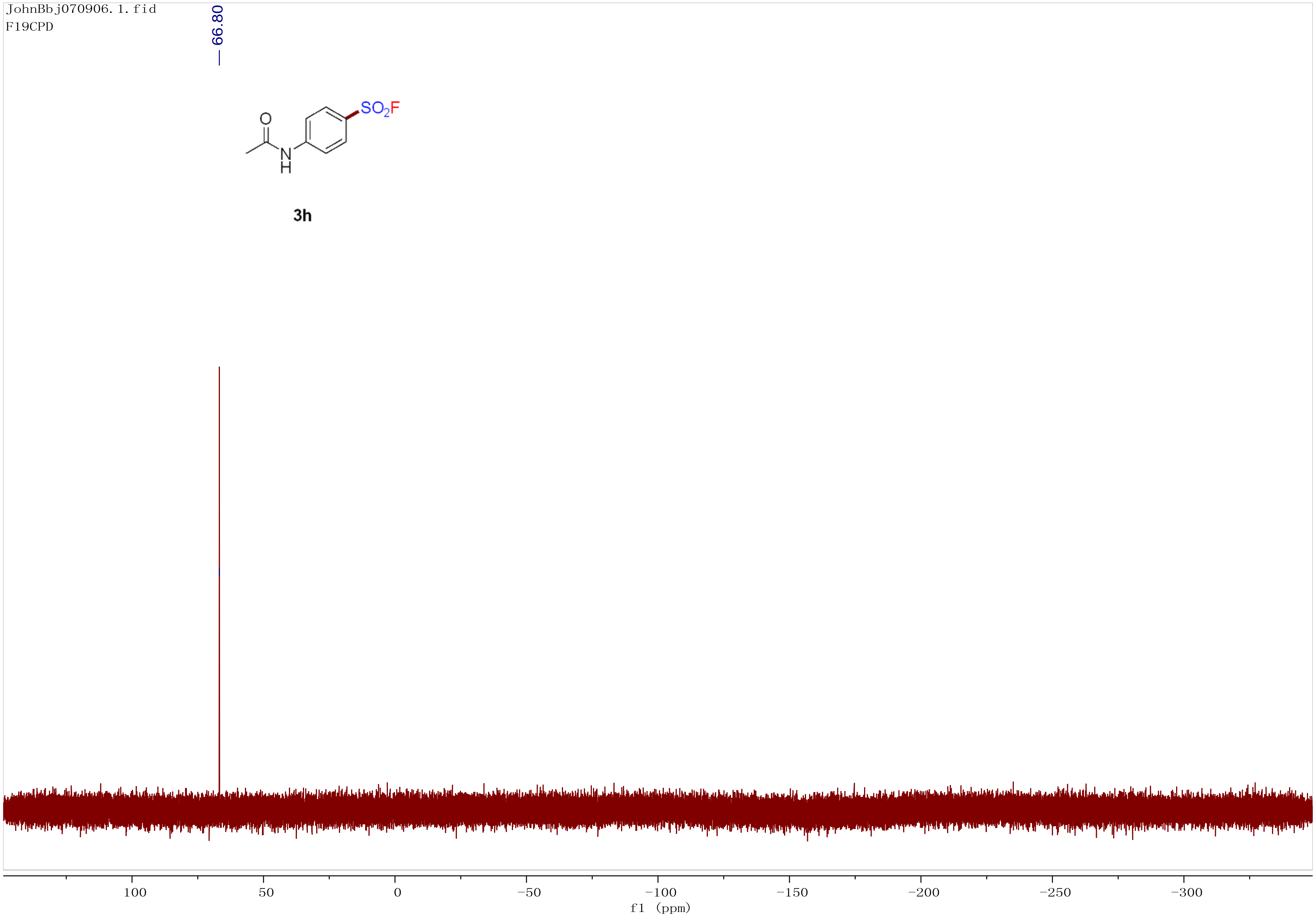

05072023-25.1.fid
8.24
8.22
8.14
8.12
2.74
SO2F
O
3g
2.06
2.00
2.90
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

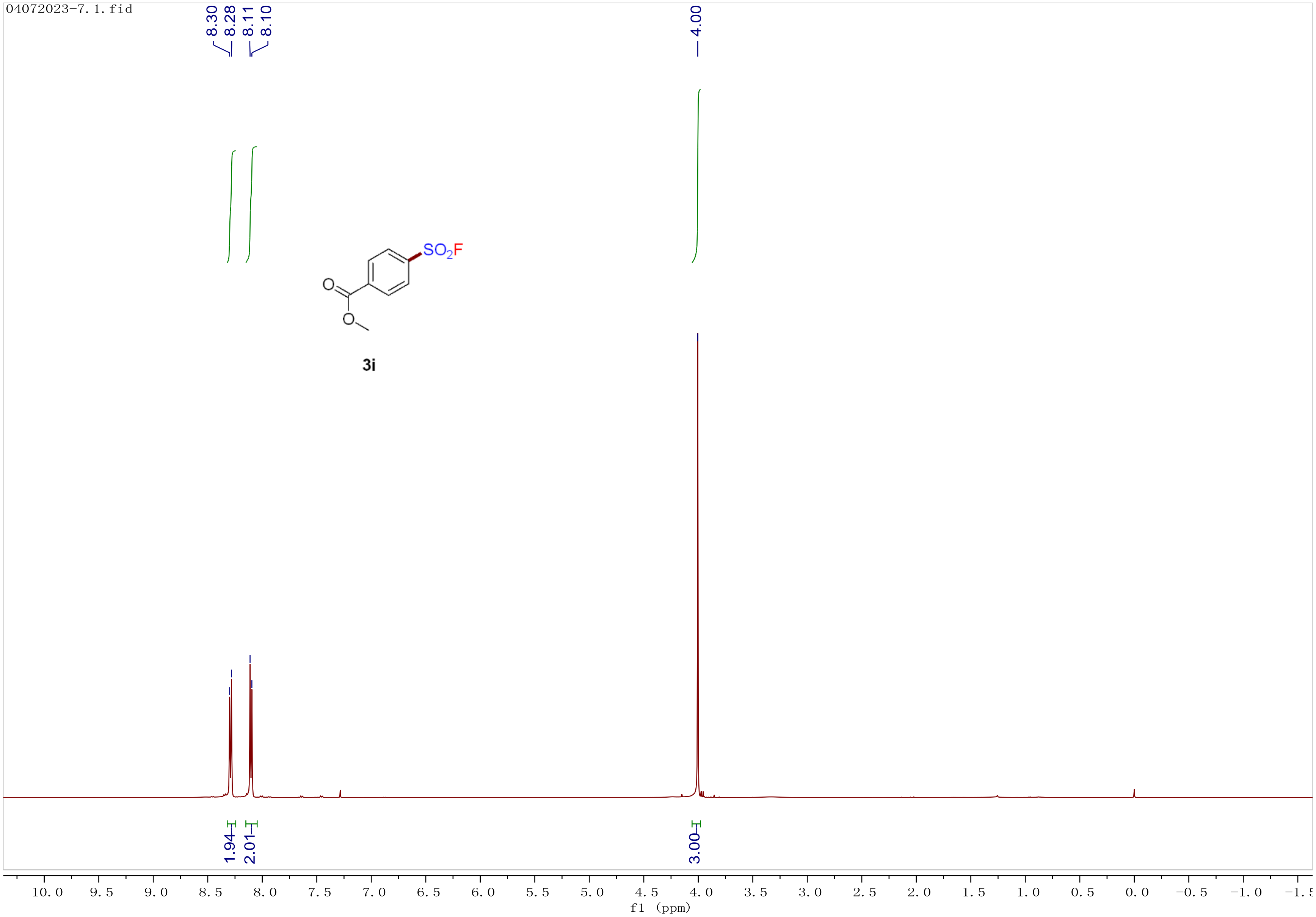

05072023-25.4.fid
196.28
142.27
136.28
136.08
129.27
128.73
26.79
SO2F
O
3g
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

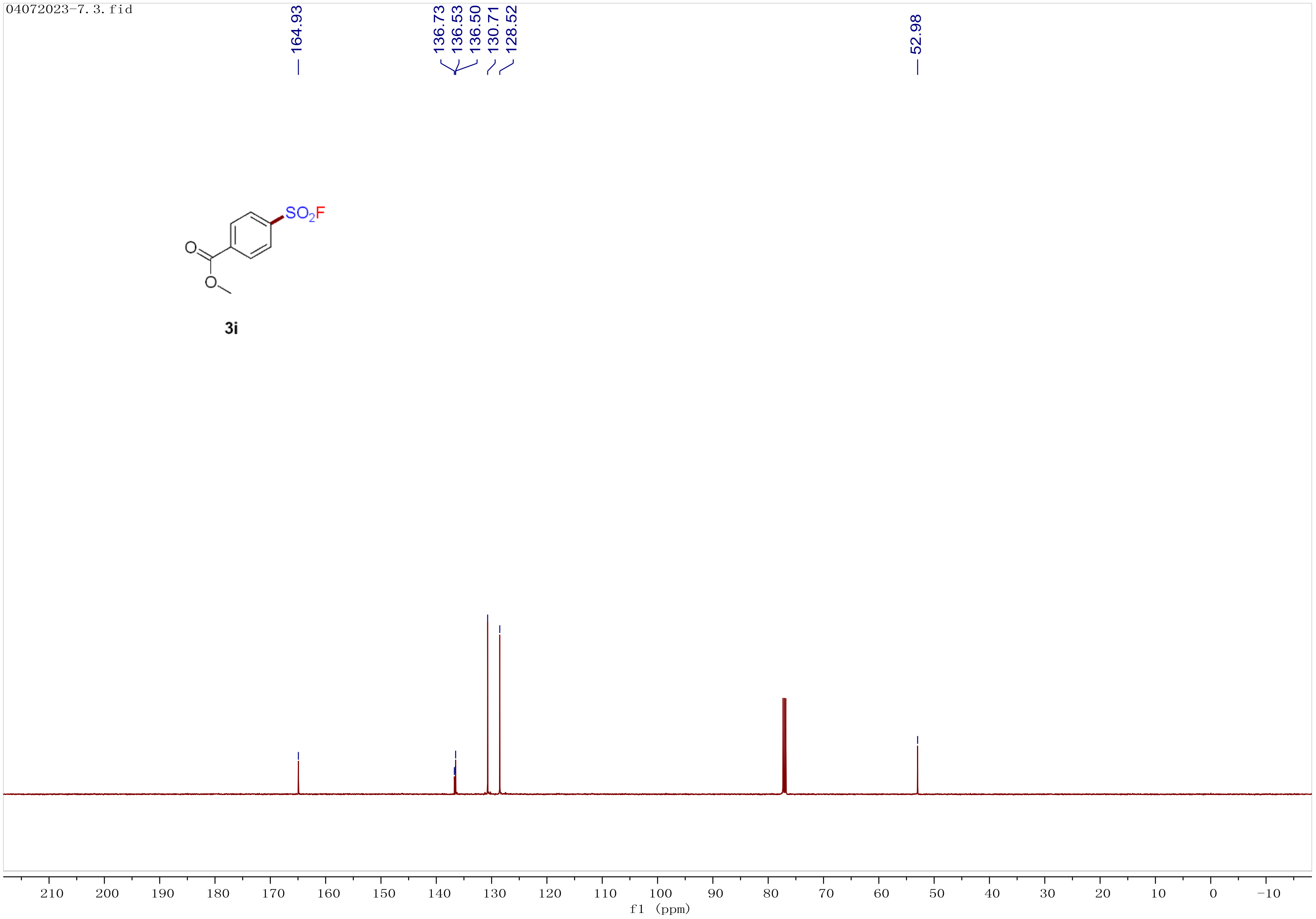

SO2F d
3g
65.60
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

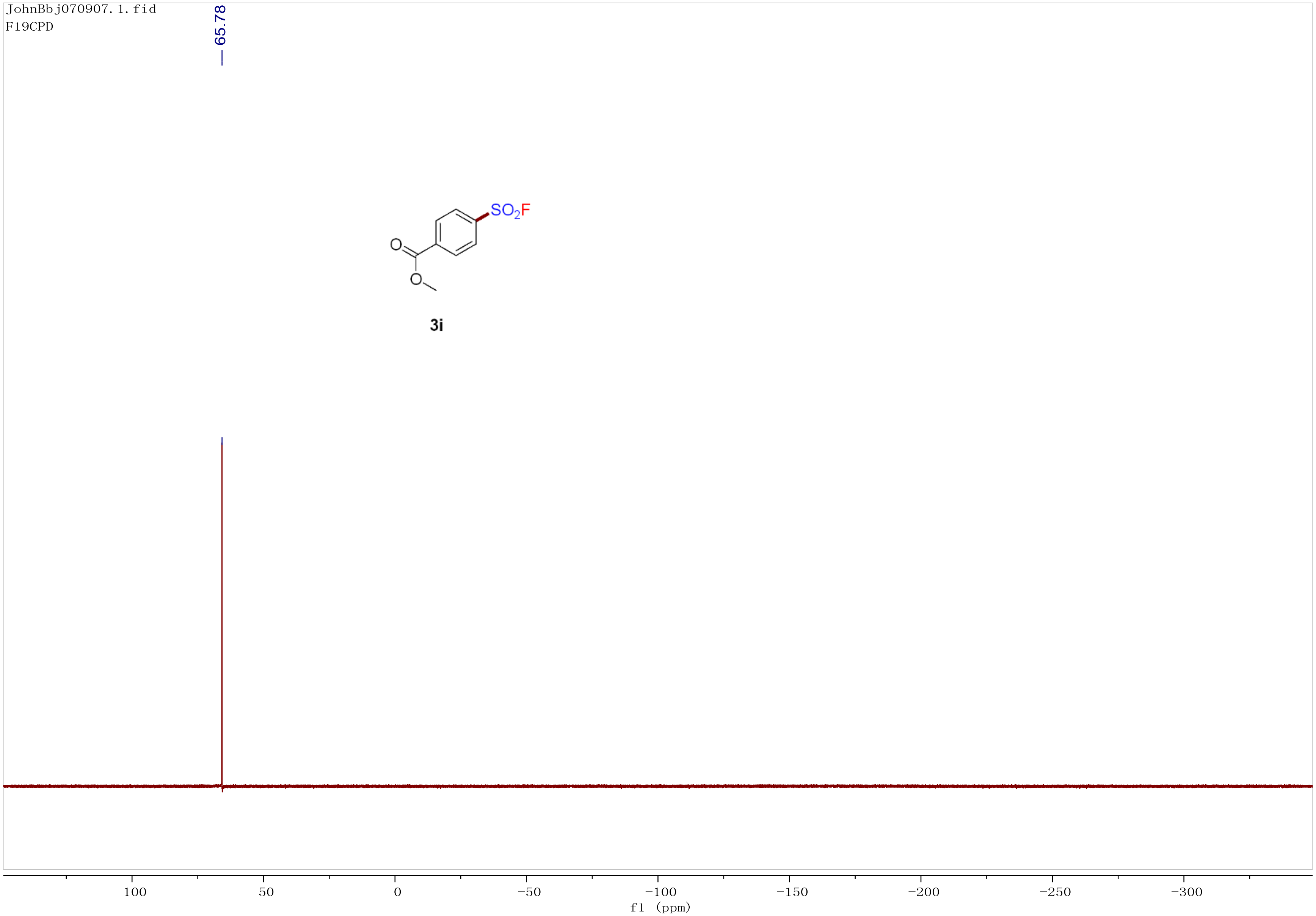

04072023-6.1.fid
7.98
7.97
7.97
7.96
7.95
7.95
7.80
7.79
7.78
7.55
2.26
SO2F
O
N
H
3h
1.96
2.02
1.10
3.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)


04072023-6.3.fid
168.68
144.41
130.06
119.35
24.87
O
N
H
SO2F
3h
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

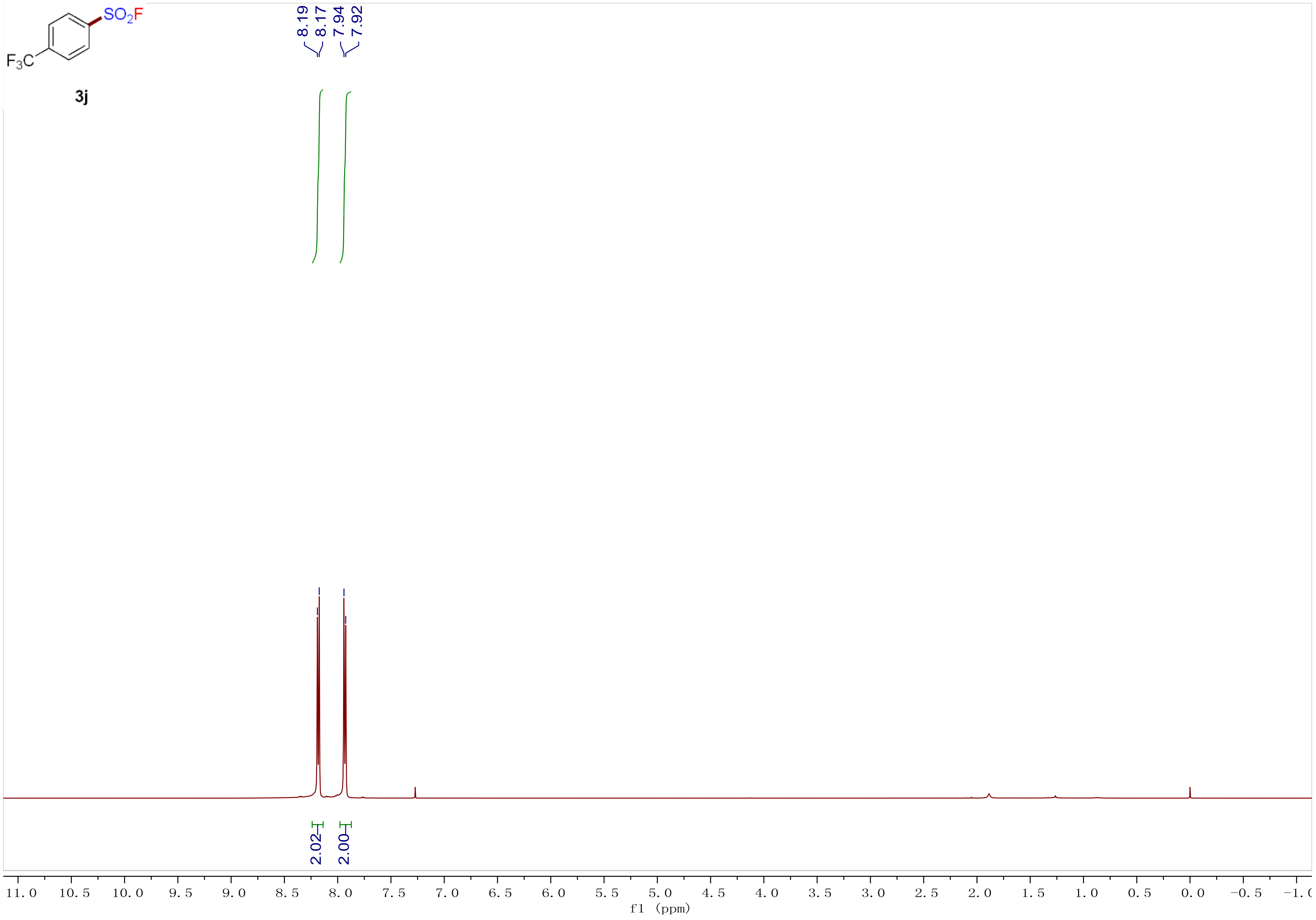

JohnBbj070906.1.fid
F19CPD
66.80
O
N
H
SO2F
3h
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)


04072023-7.1.fid
8.30
8.28
8.11
8.10
4.00
SO$_2$F
O
O
3i
1.94
2.01
3.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
f1 (ppm)


04072023-7.3.fid
164.93
136.73
136.53
136.50
130.71
128.52
52.98
SO2F
O
O
3i
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

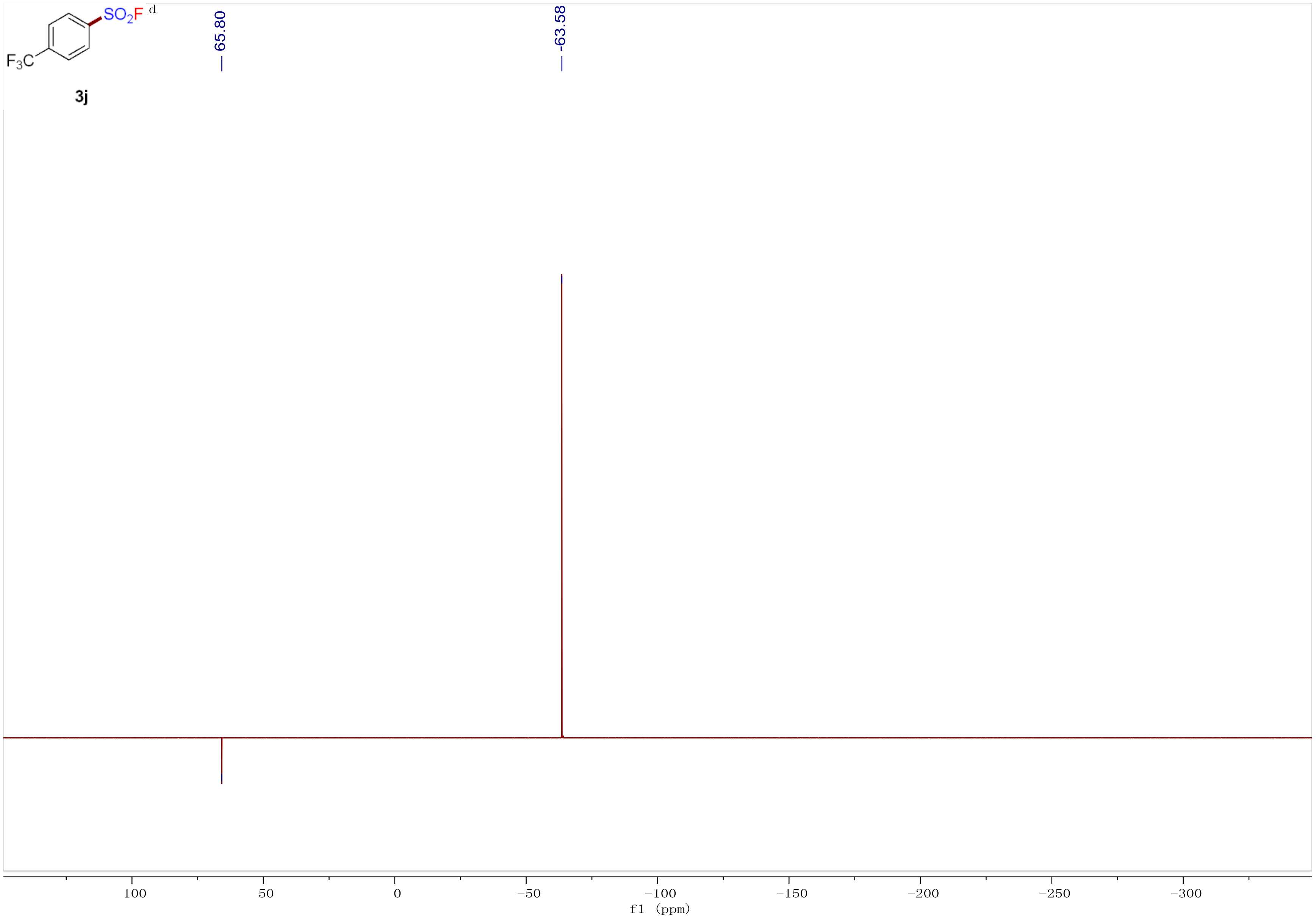

JohnBbj070907.1.fid
F19CPD
65.78
SO2F
O
O
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

3i

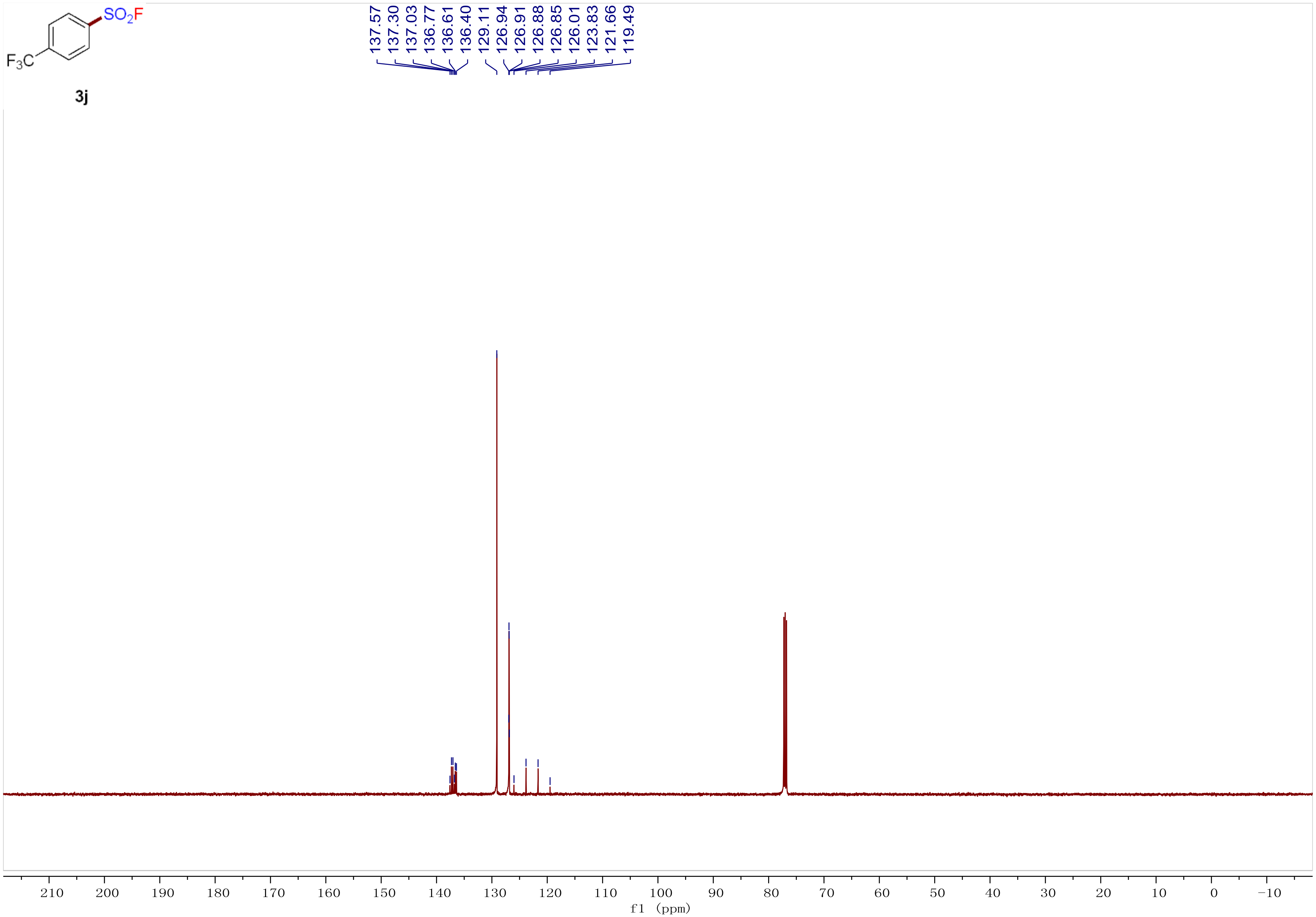


SO2F
F3C
8.19
8.17
7.94
7.92
2.02
2.00
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
f1 (ppm)

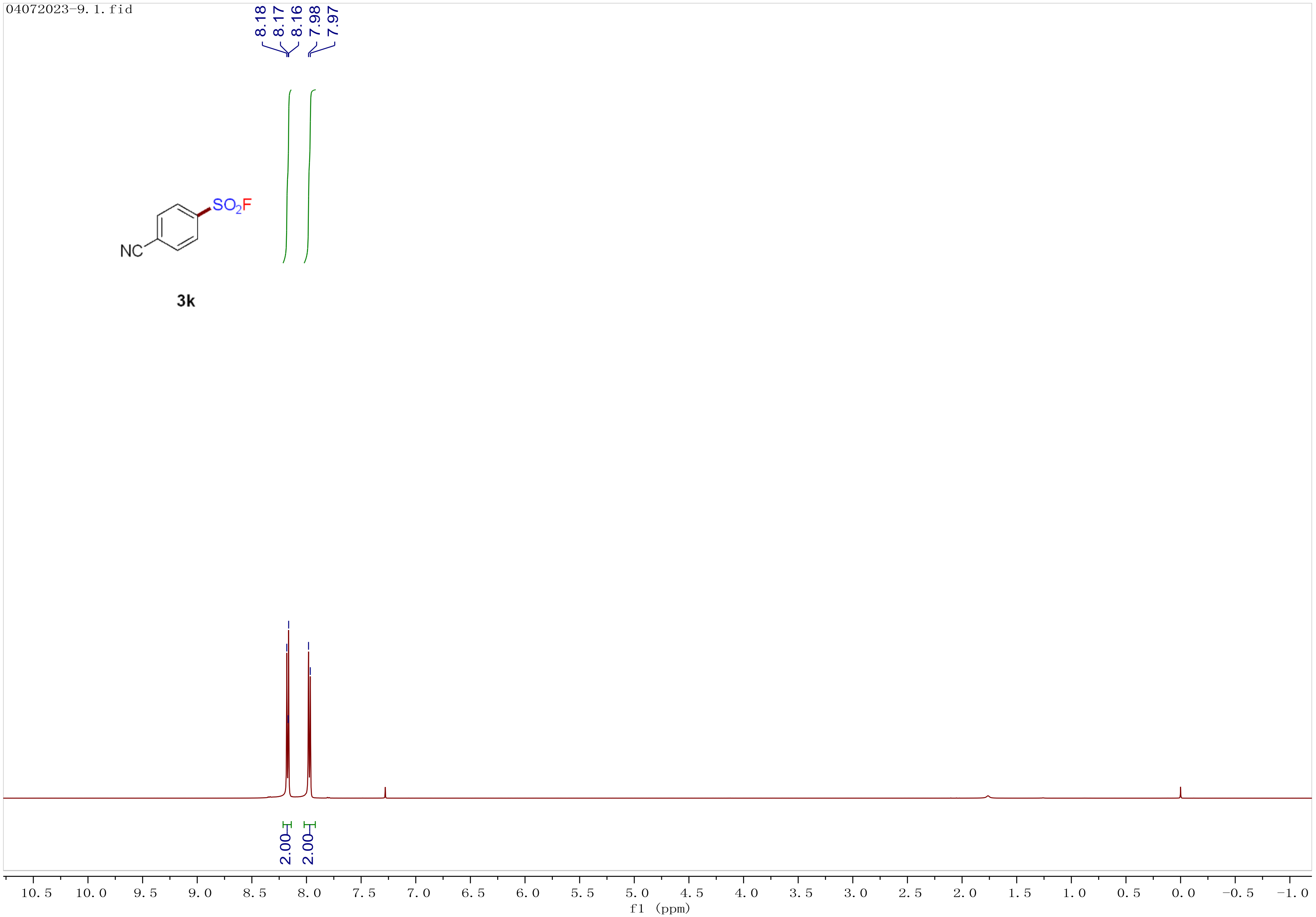
3j

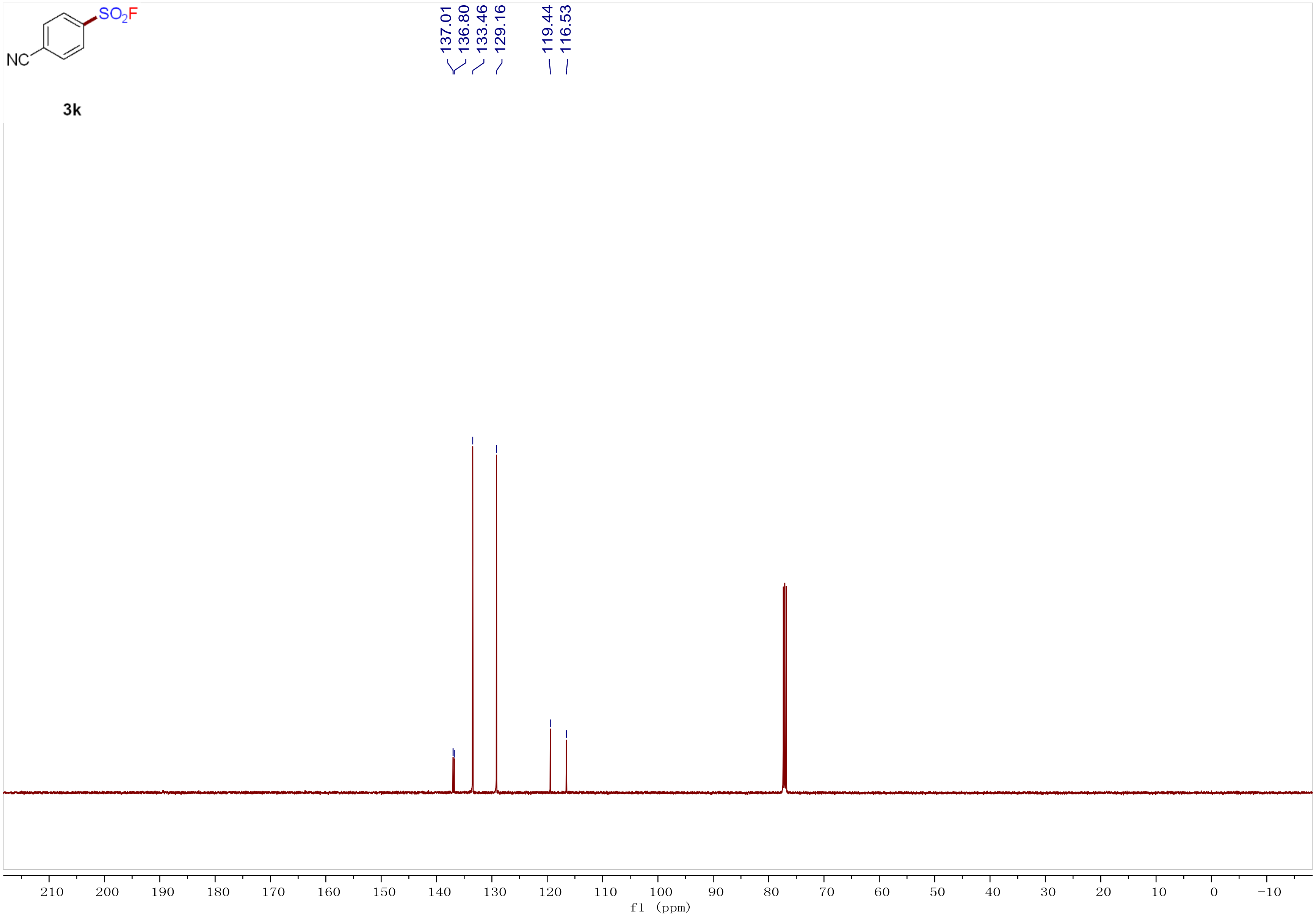


3j



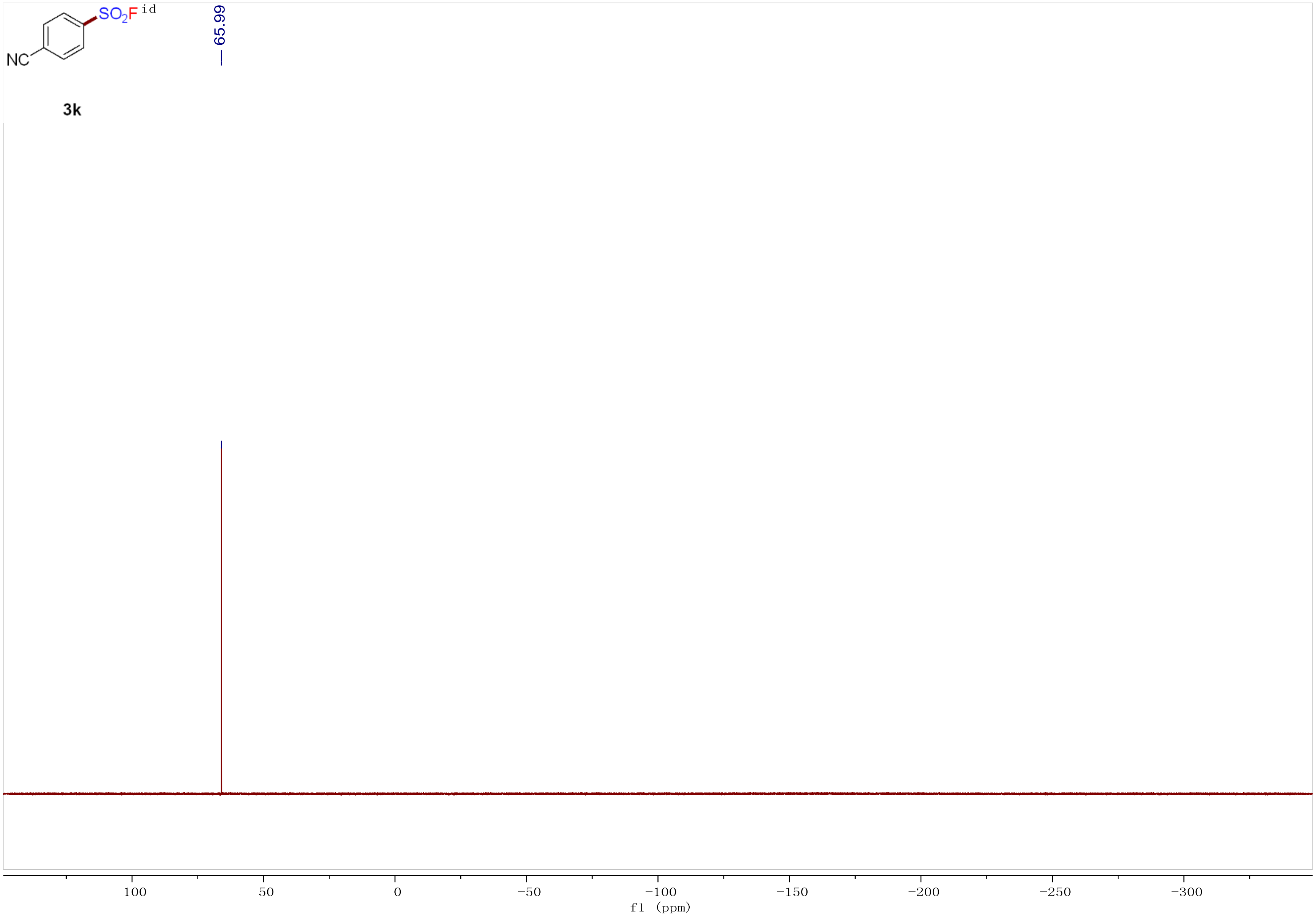
SO2F
F3C
3j
137.57
137.30
137.03
136.77
136.61
136.40
129.11
126.94
126.91
126.88
126.85
126.01
123.83
121.66
119.49
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


04072023-9.1.fid
8.18
8.17
8.16
7.98
7.97
SO2F
NC
3k
2.00
2.00
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
f1 (ppm)

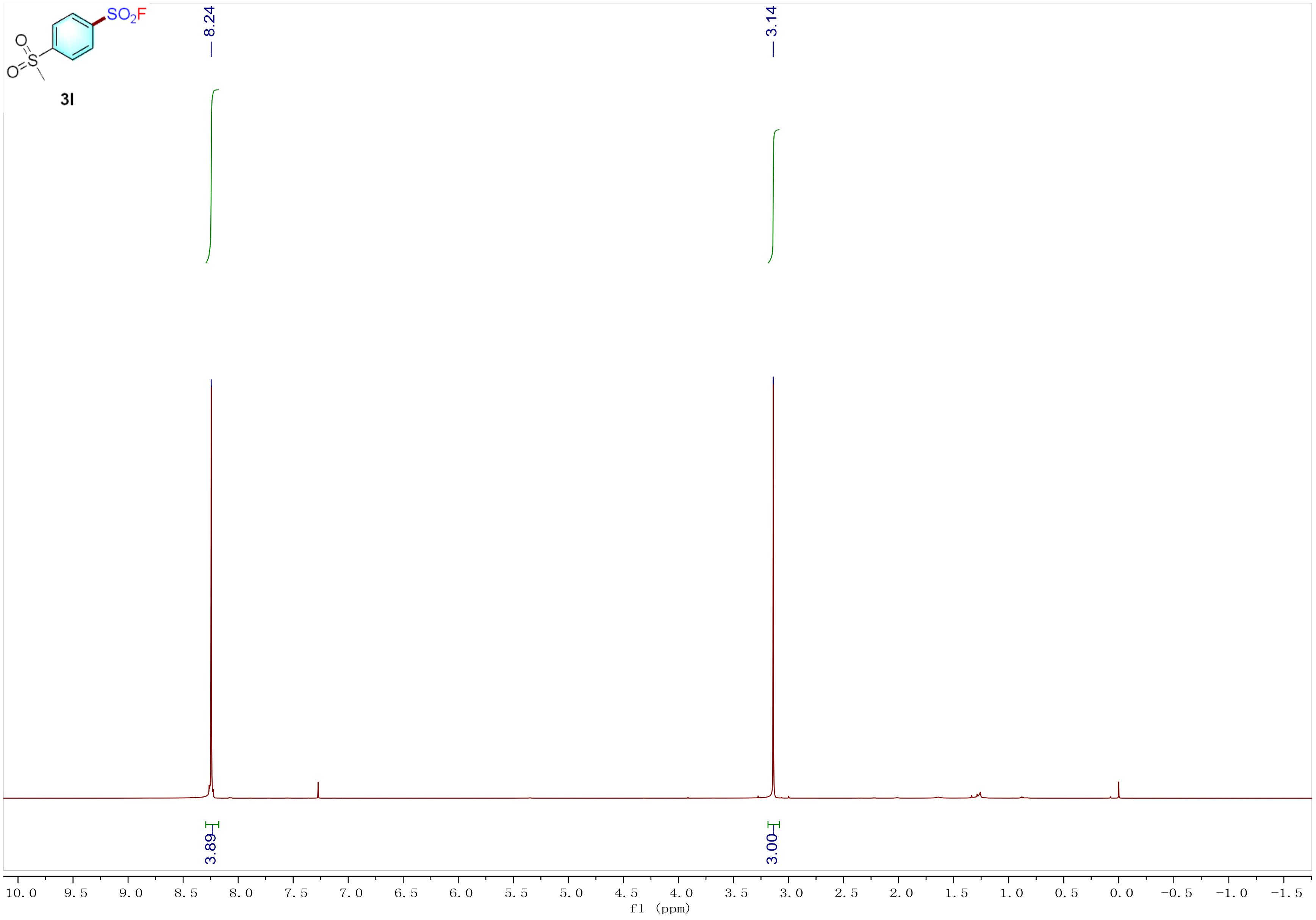


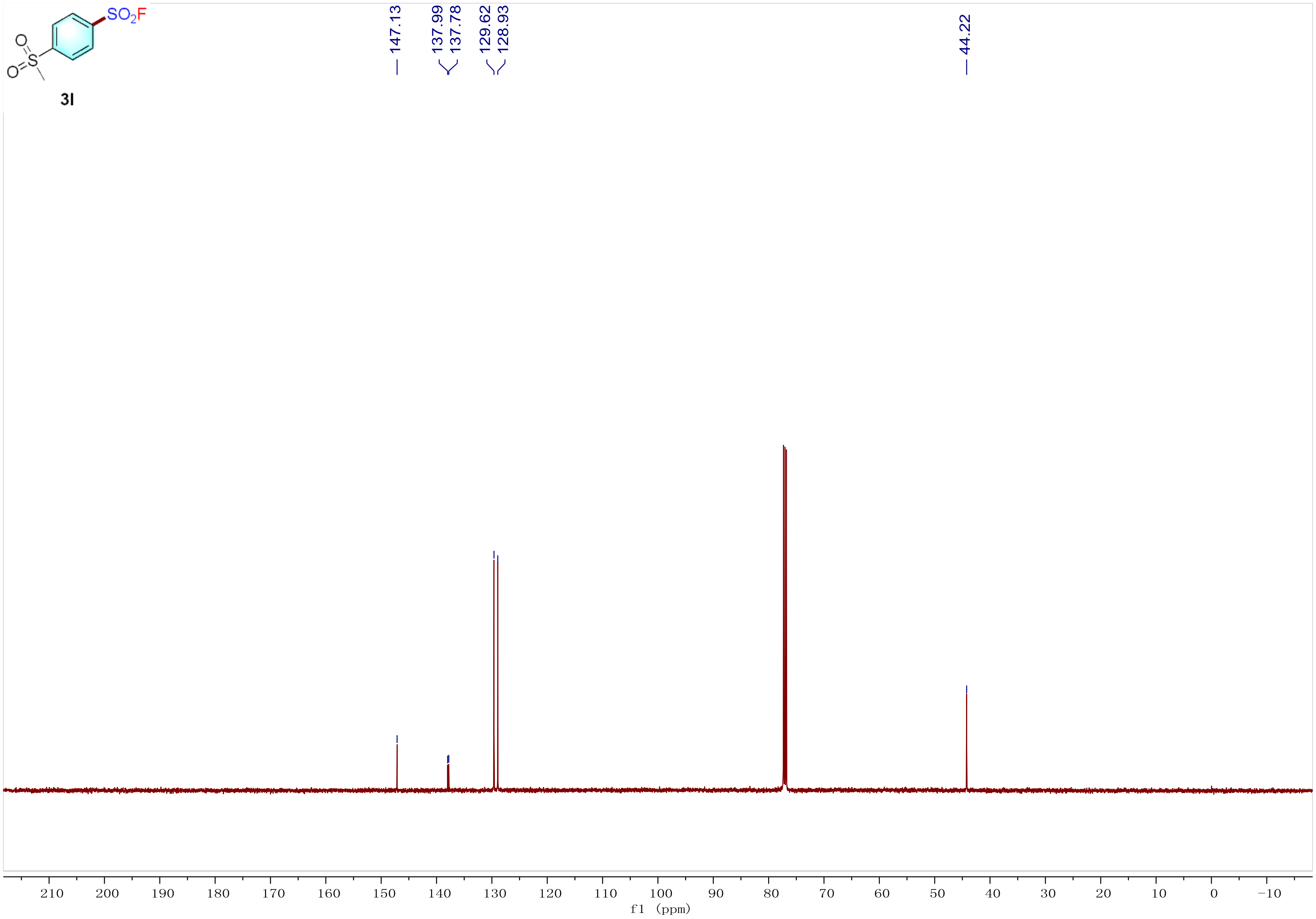
3k

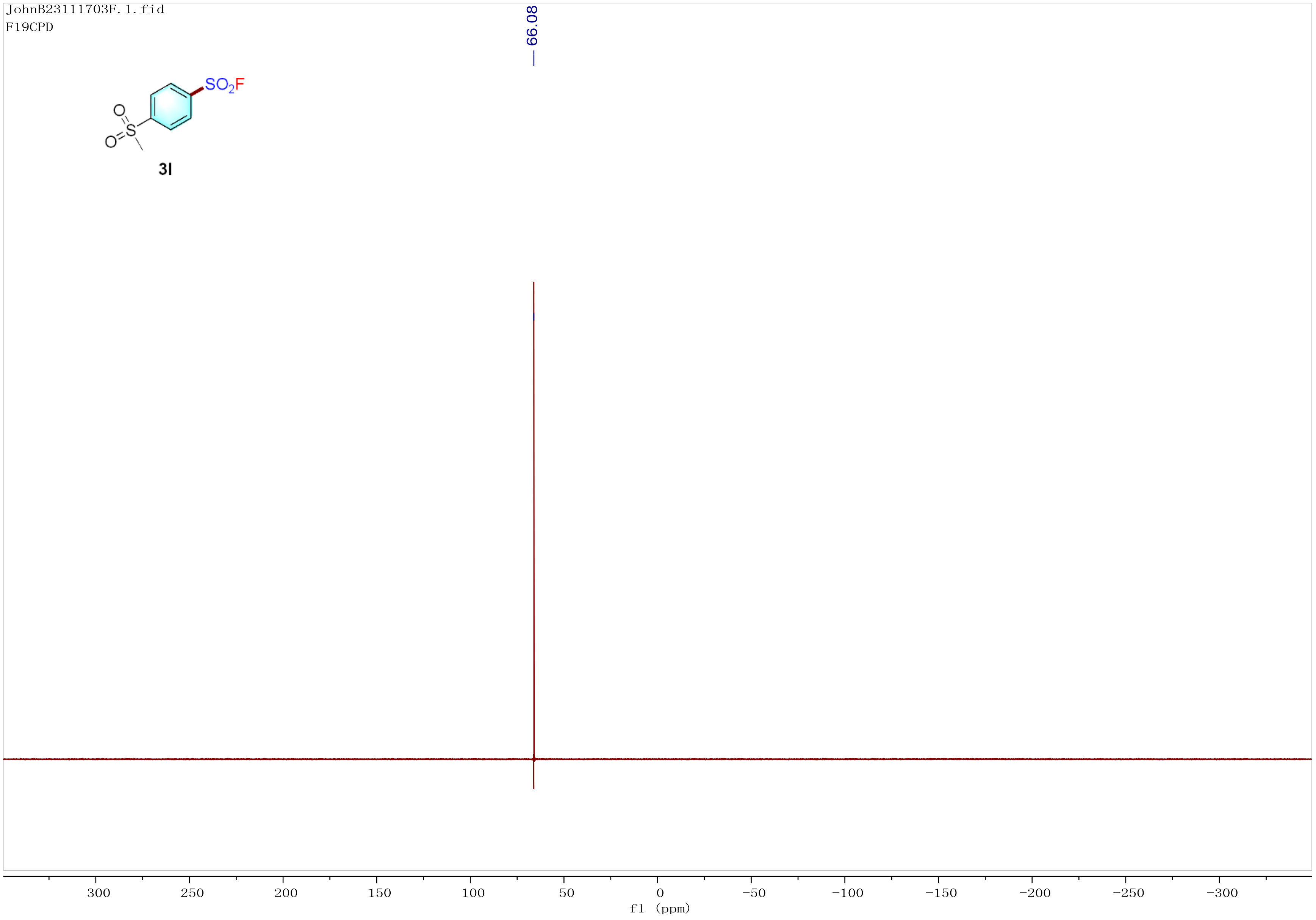
NC
SO2F
137.01
136.80
133.46
129.16
119.44
116.53
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

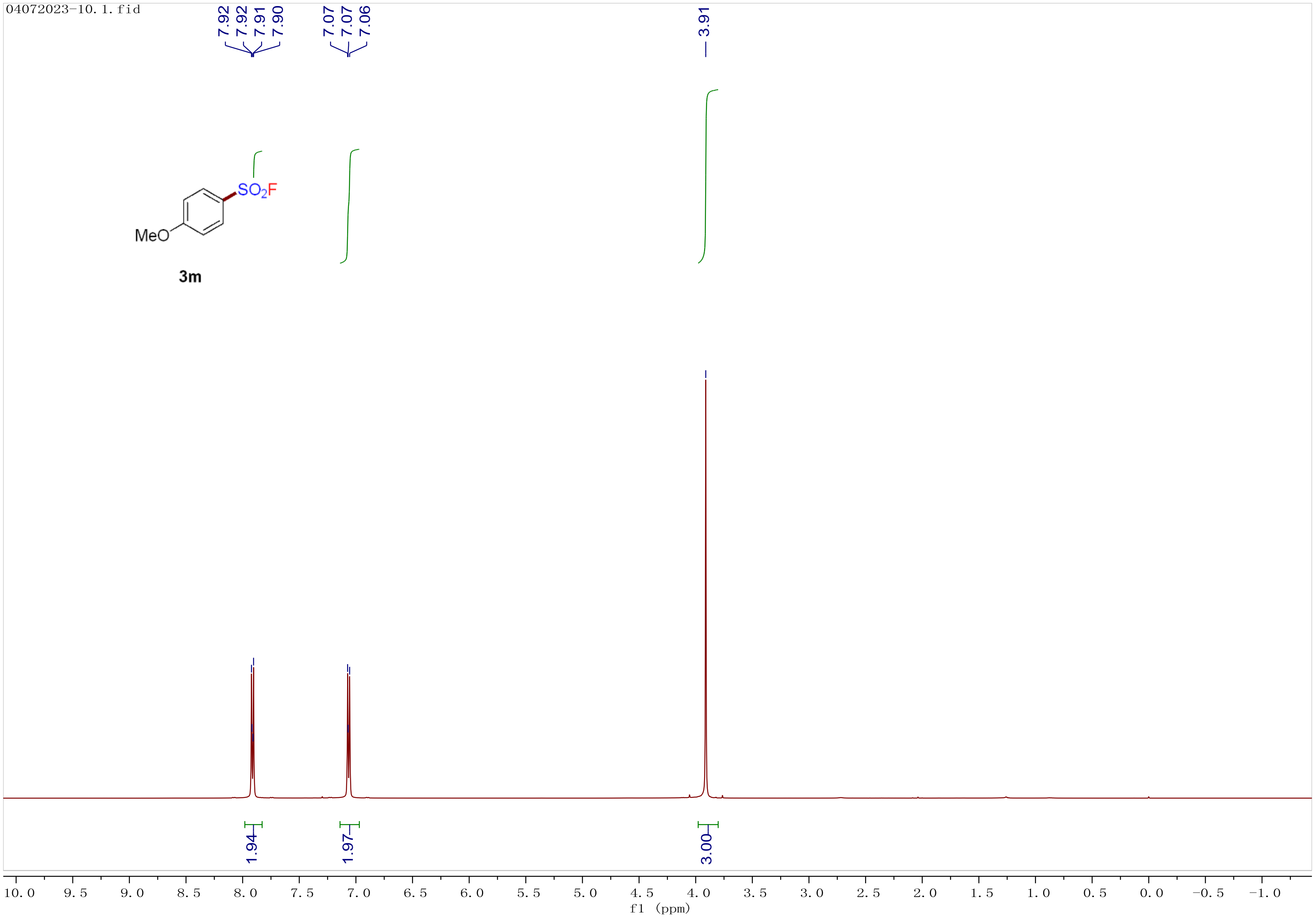


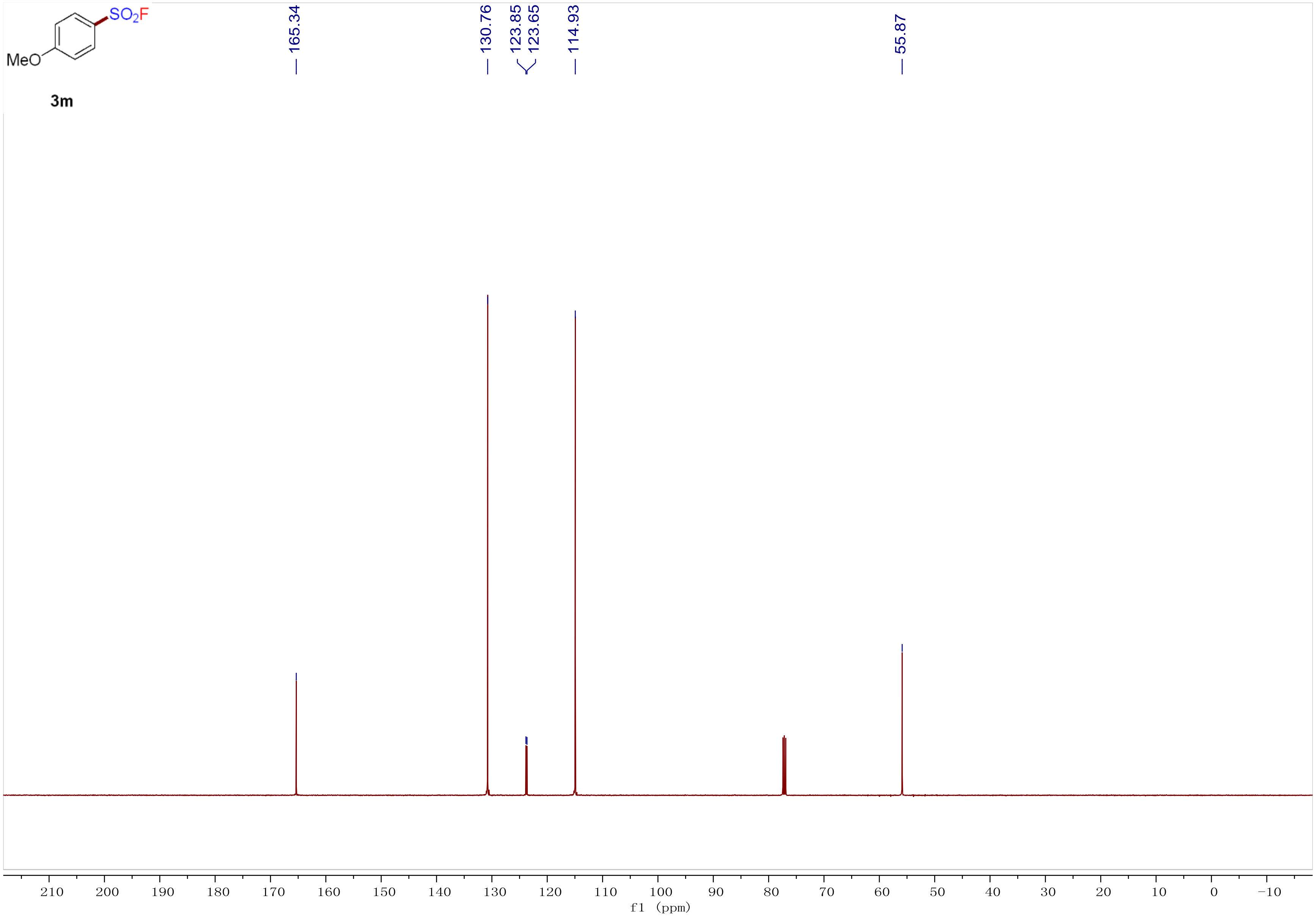
3k

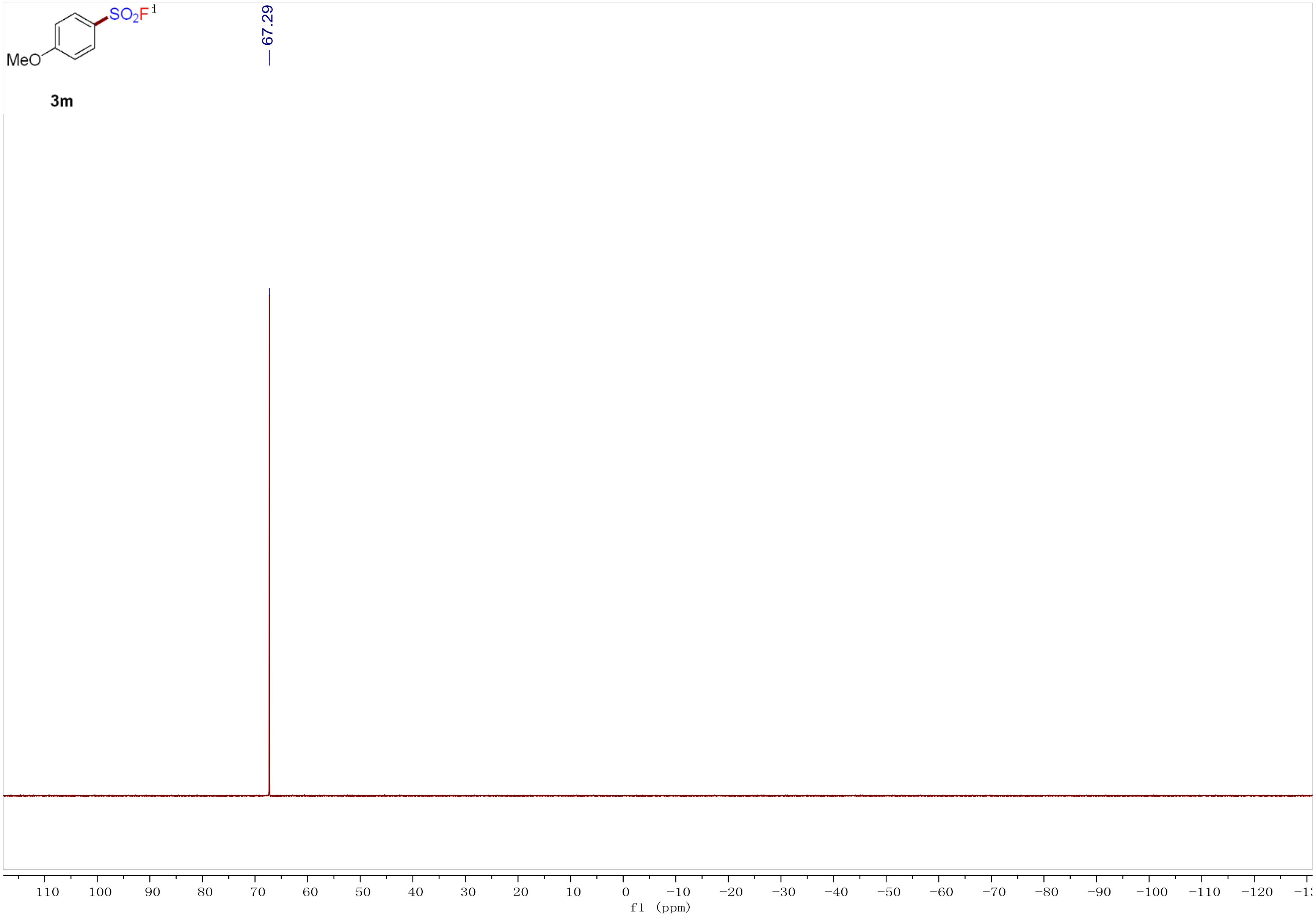

SO2F
O
O=S
3l
8.24
3.14
3.89
3.00
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0 −1.5
f1 (ppm)

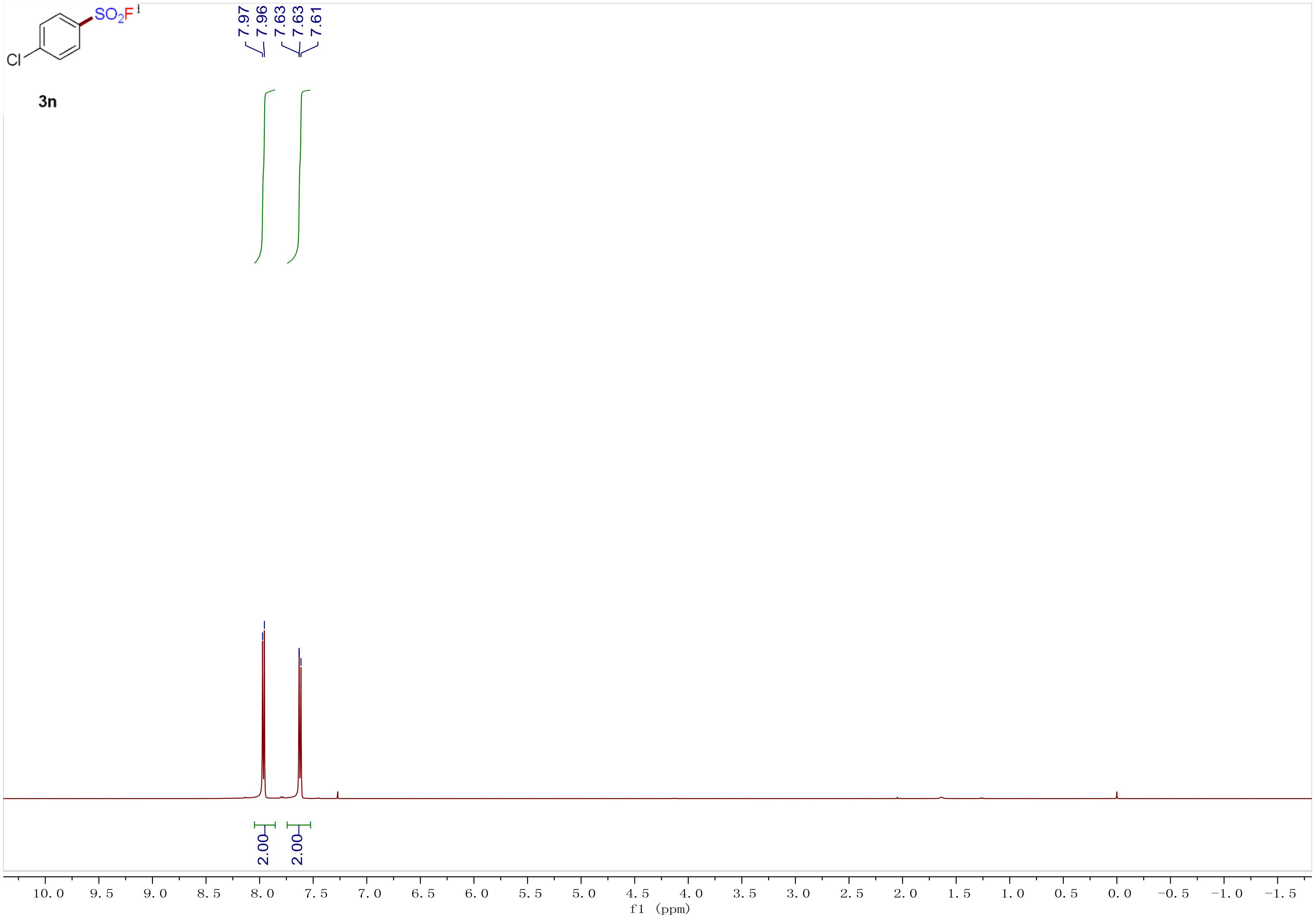

SO2F
O
O=S
3l
147.13
137.99
137.78
129.62
128.93
44.22
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


JohnB23111703F.1.fid
F19CPD
66.08
SO2F
O
O
S
3l
300
250
200
150
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)


04072023-10.1.fid
7.92
7.92
7.91
7.90
7.07
7.07
7.06
3.91
SO2F
MeO
3m
1.94
1.97
3.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

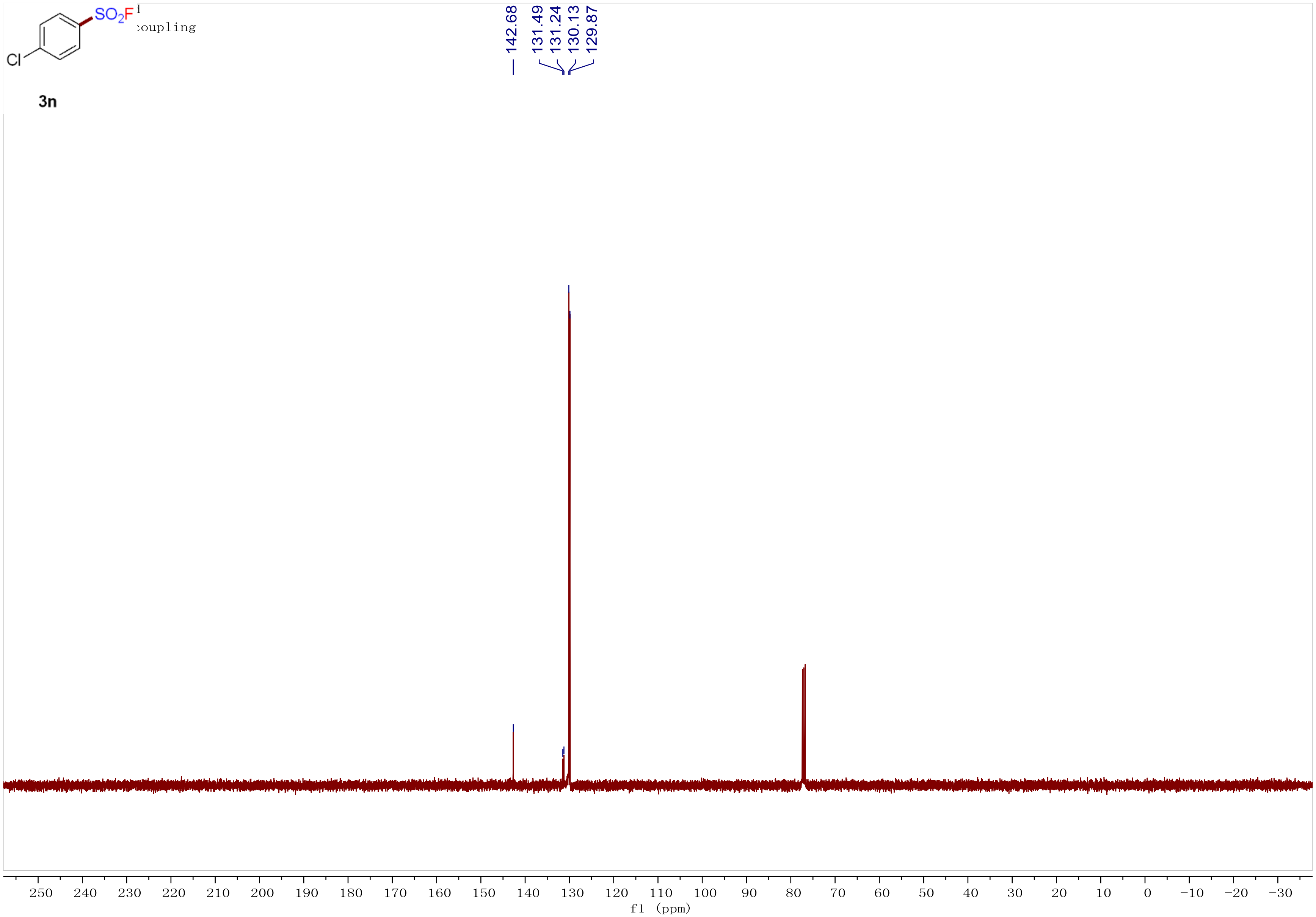

SO2F
MeO
3m
165.34
130.76
123.85
123.65
114.93
55.87
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


SO2F
MeO
3m
67.29
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
−120
f1 (ppm)

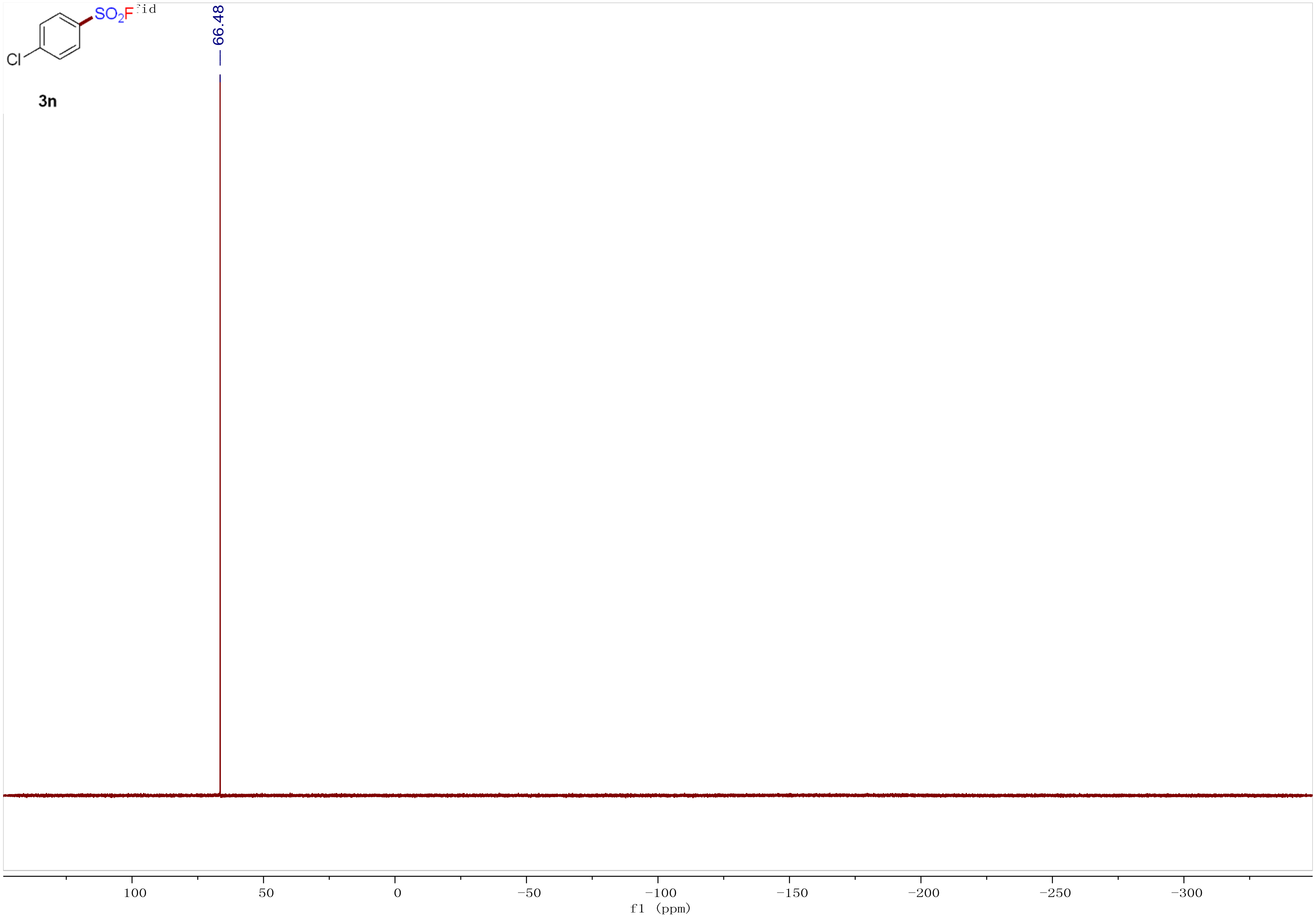


SO2F
Cl
1
7.97
7.96
7.63
7.63
7.61
2.00
2.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
f1 (ppm)

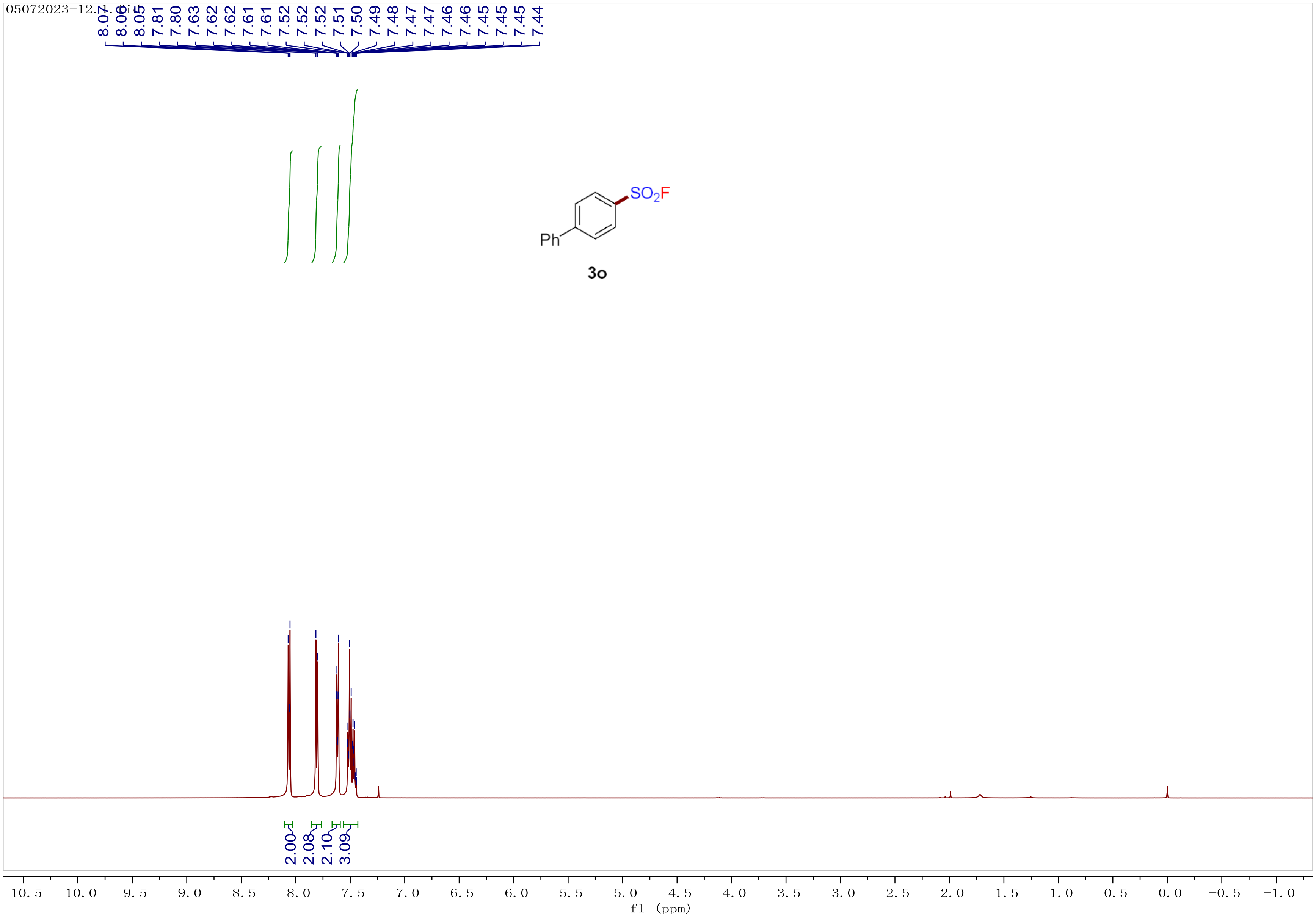
3n

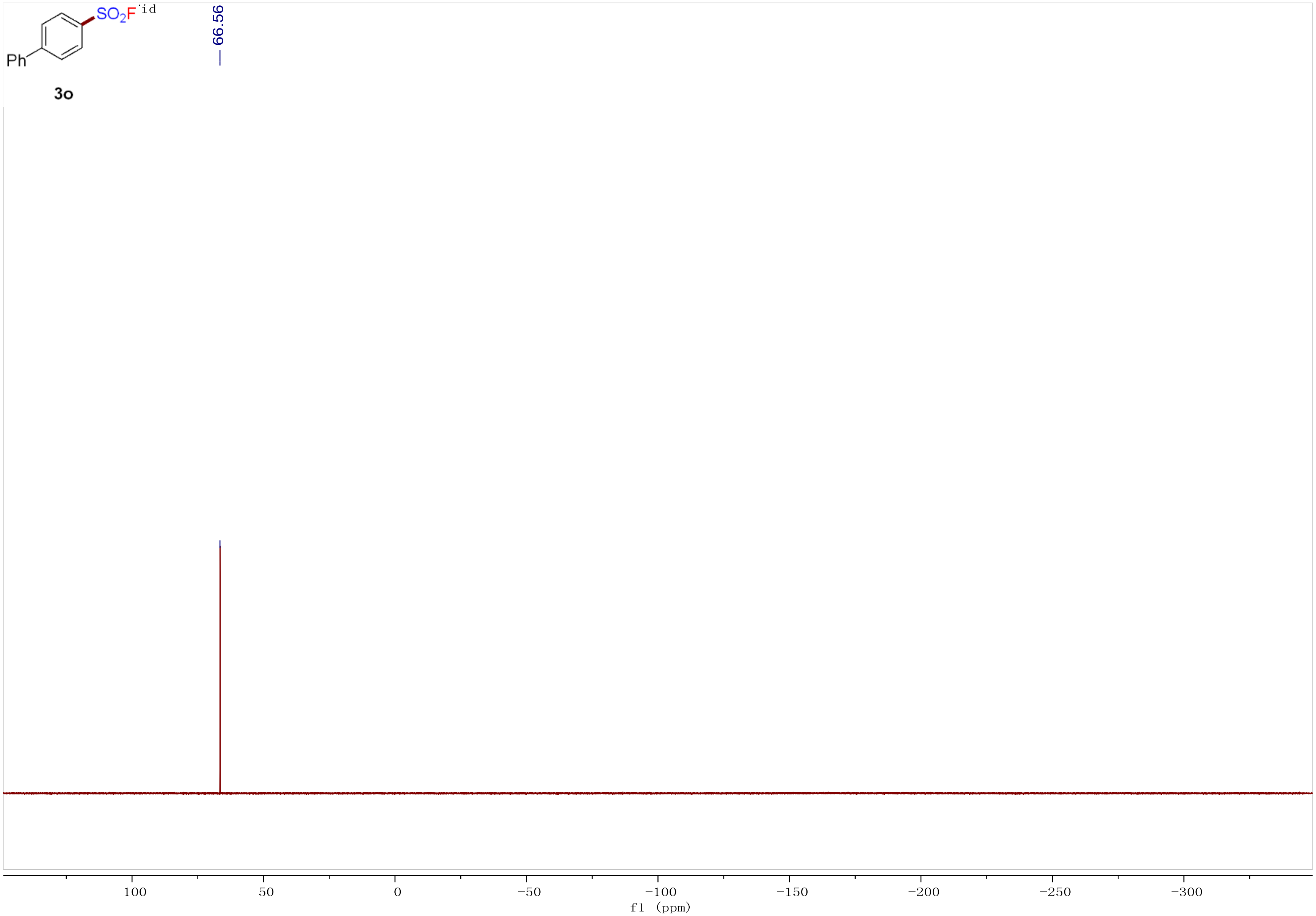

SO2F
Cl
1
coupling
142.68
131.49
131.24
130.13
129.87
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
f1 (ppm)

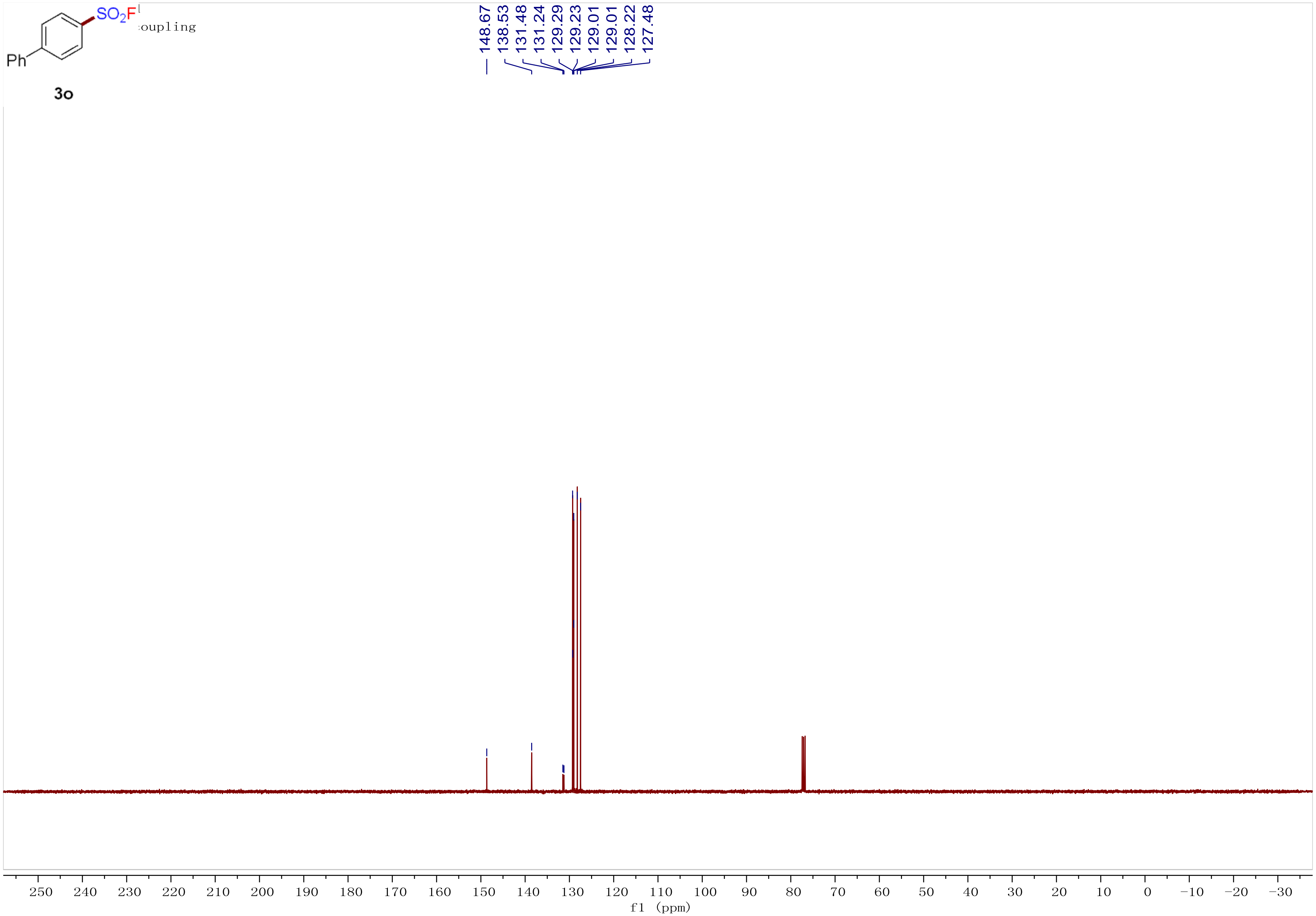
3n

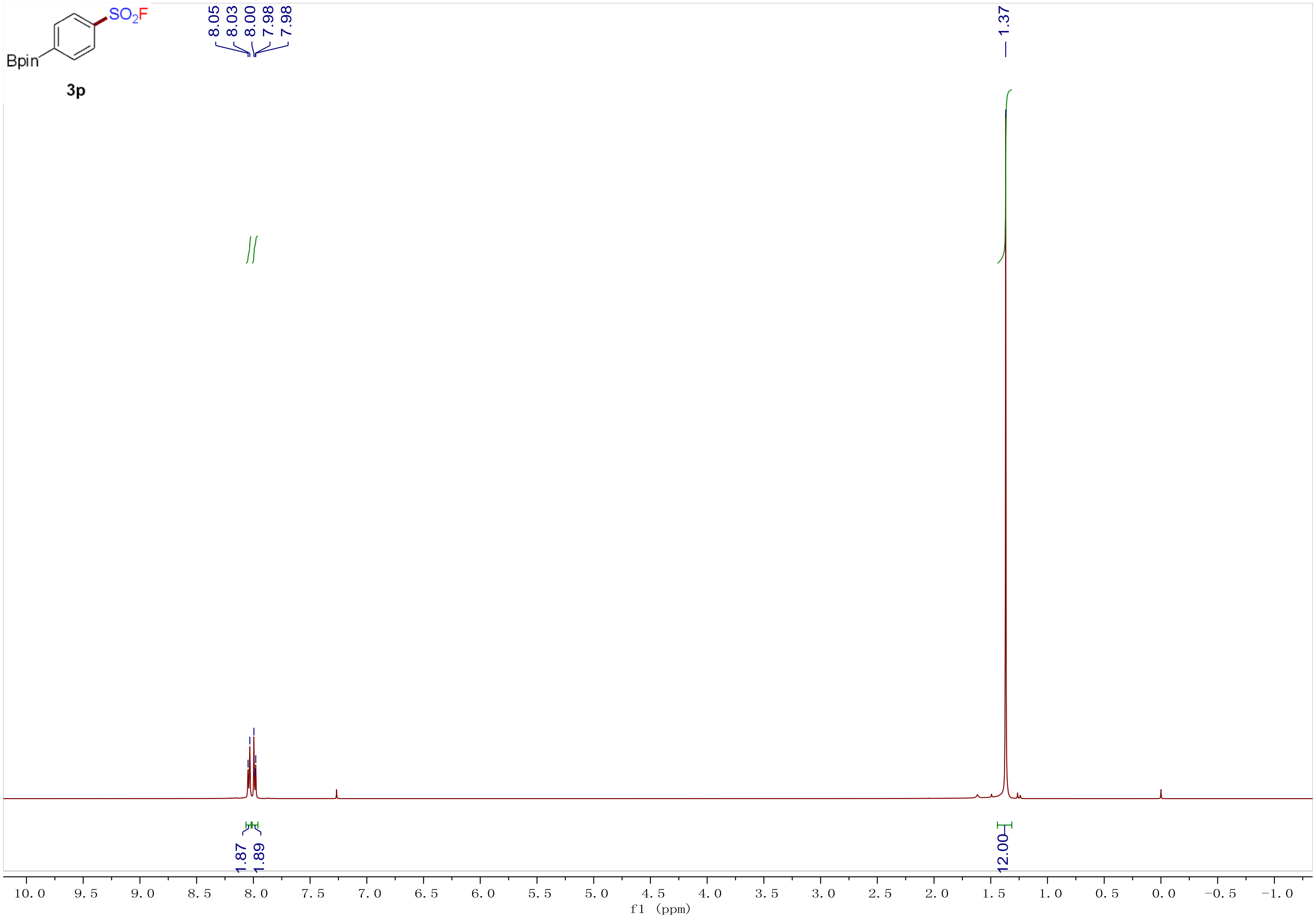


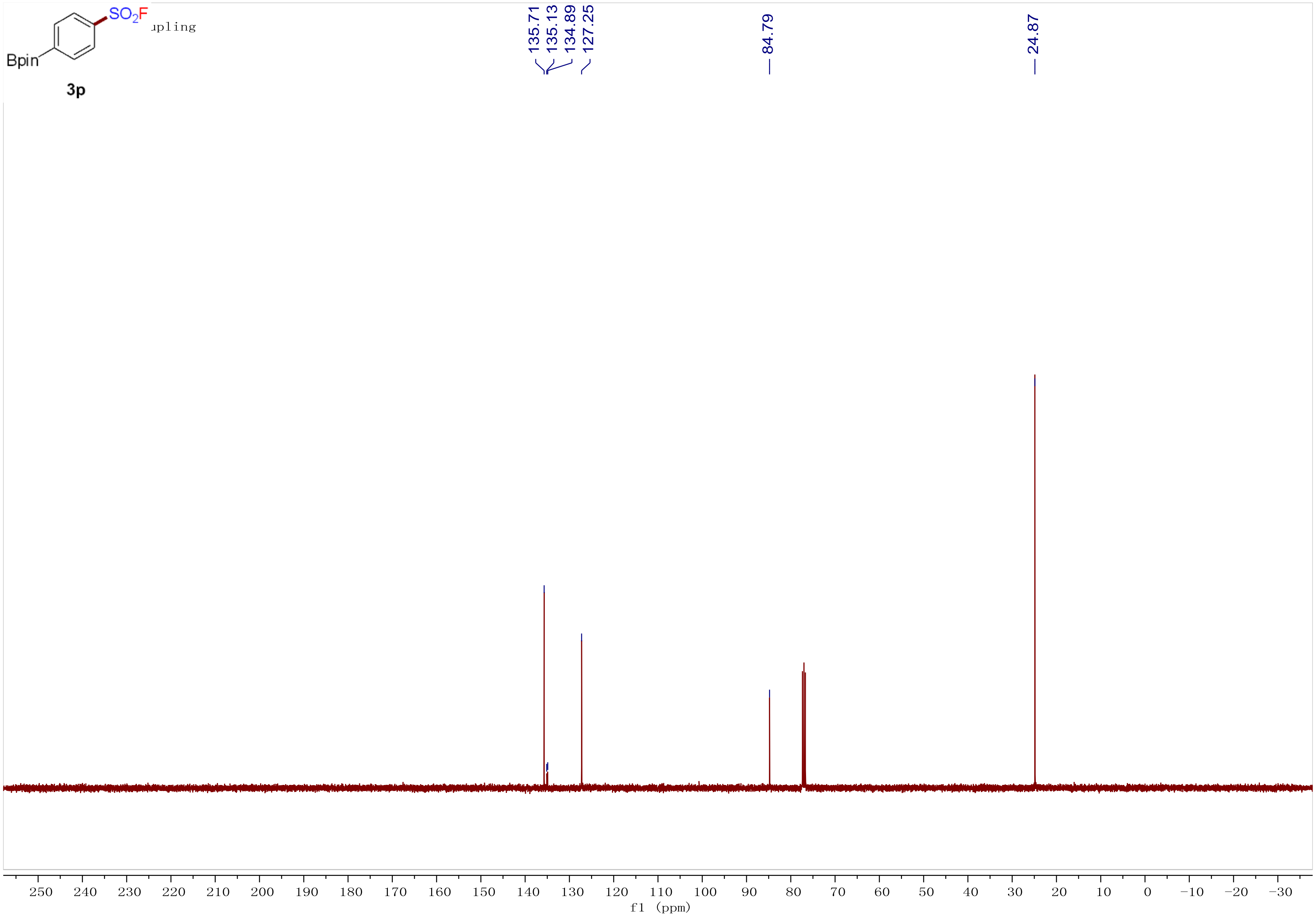
3n

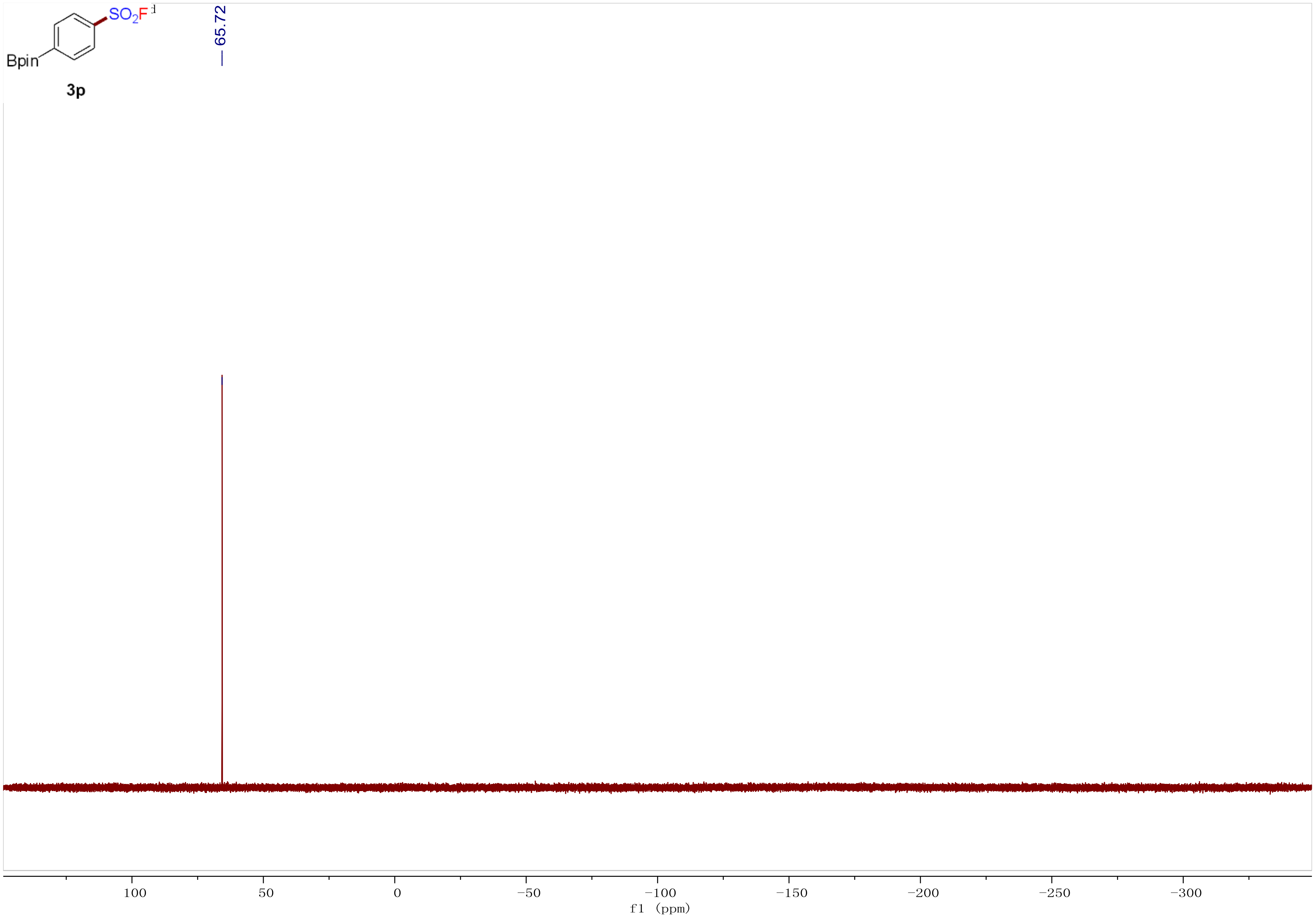

05072023-12.1.fid
8.07
8.06
8.05
7.81
7.80
7.63
7.62
7.62
7.61
7.61
7.52
7.52
7.52
7.51
7.50
7.49
7.48
7.47
7.47
7.46
7.46
7.45
7.45
7.45
7.44
SO2F
Ph
3o
2.00
2.08
2.10
3.09
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)


SO2F
Ph
3o
66.56
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

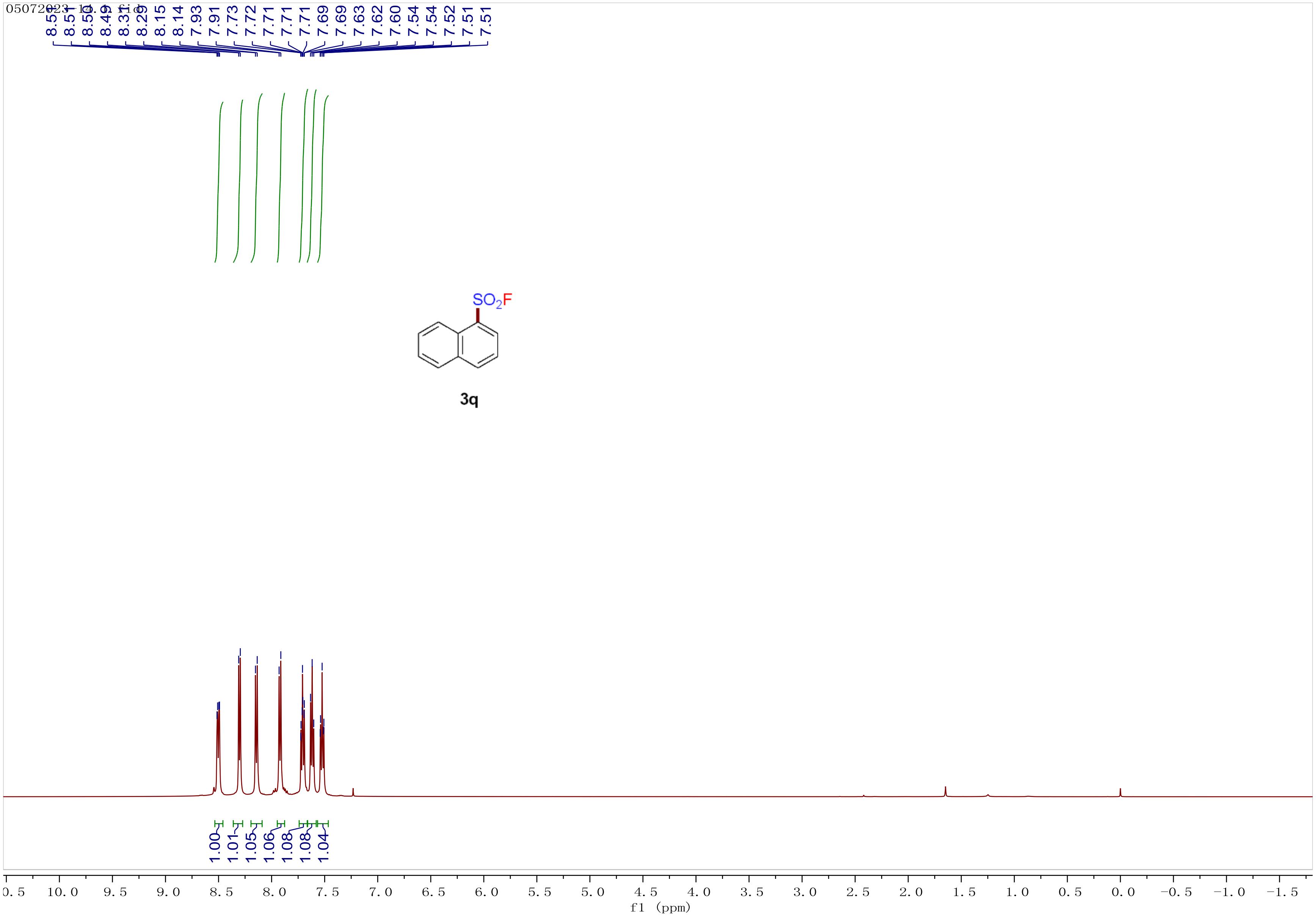

SO2F
Ph
3o
coupling
148.67
138.53
131.48
131.24
129.29
129.23
129.01
128.22
127.48
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
f1 (ppm)


SO2F
Bpin
3p
8.05
8.03
8.00
7.98
7.98
1.37
1.87
1.89
12.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

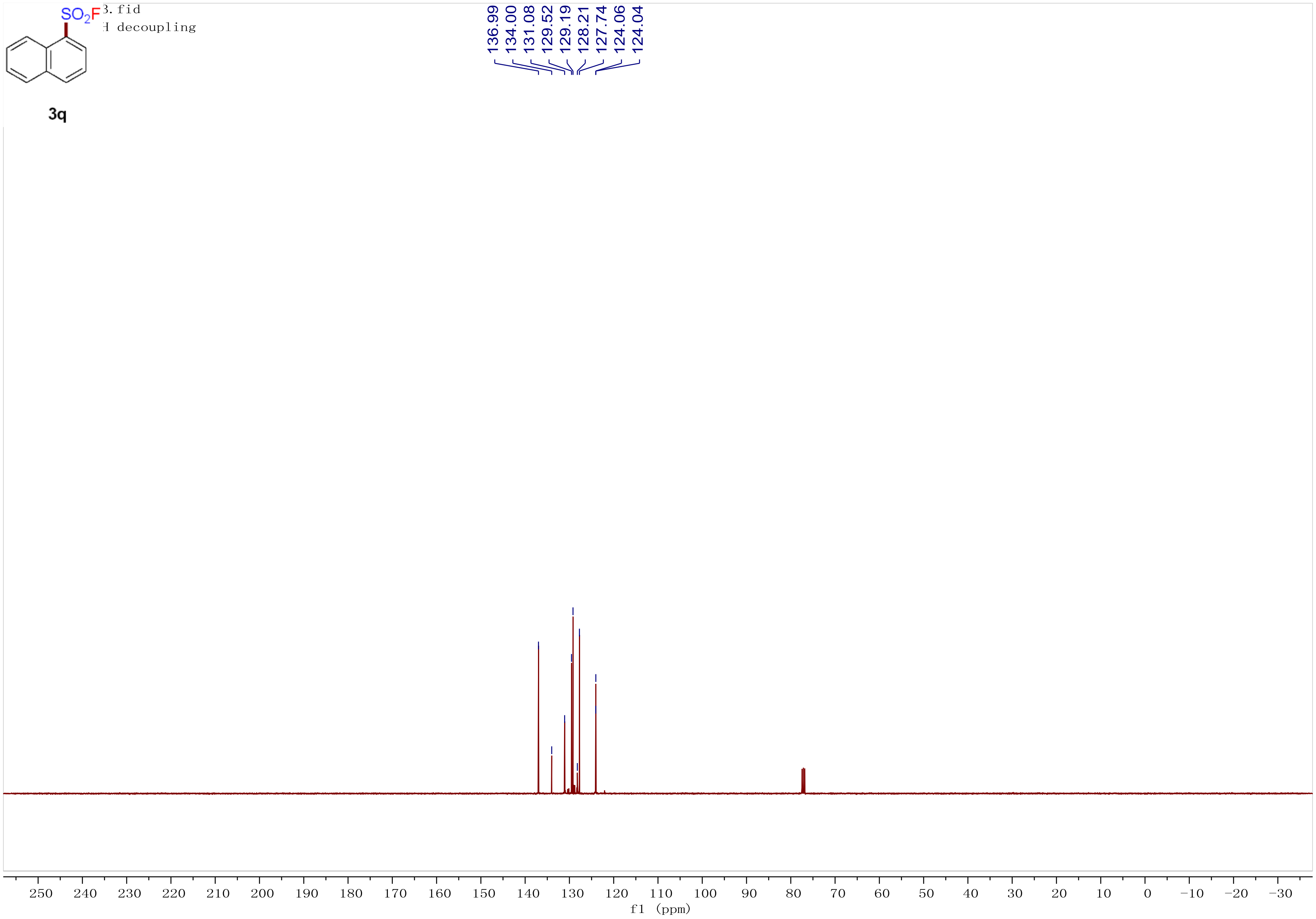

SO2F
Bpin
3p
ıpling
135.71
135.13
134.89
127.25
84.79
24.87
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
f1 (ppm)



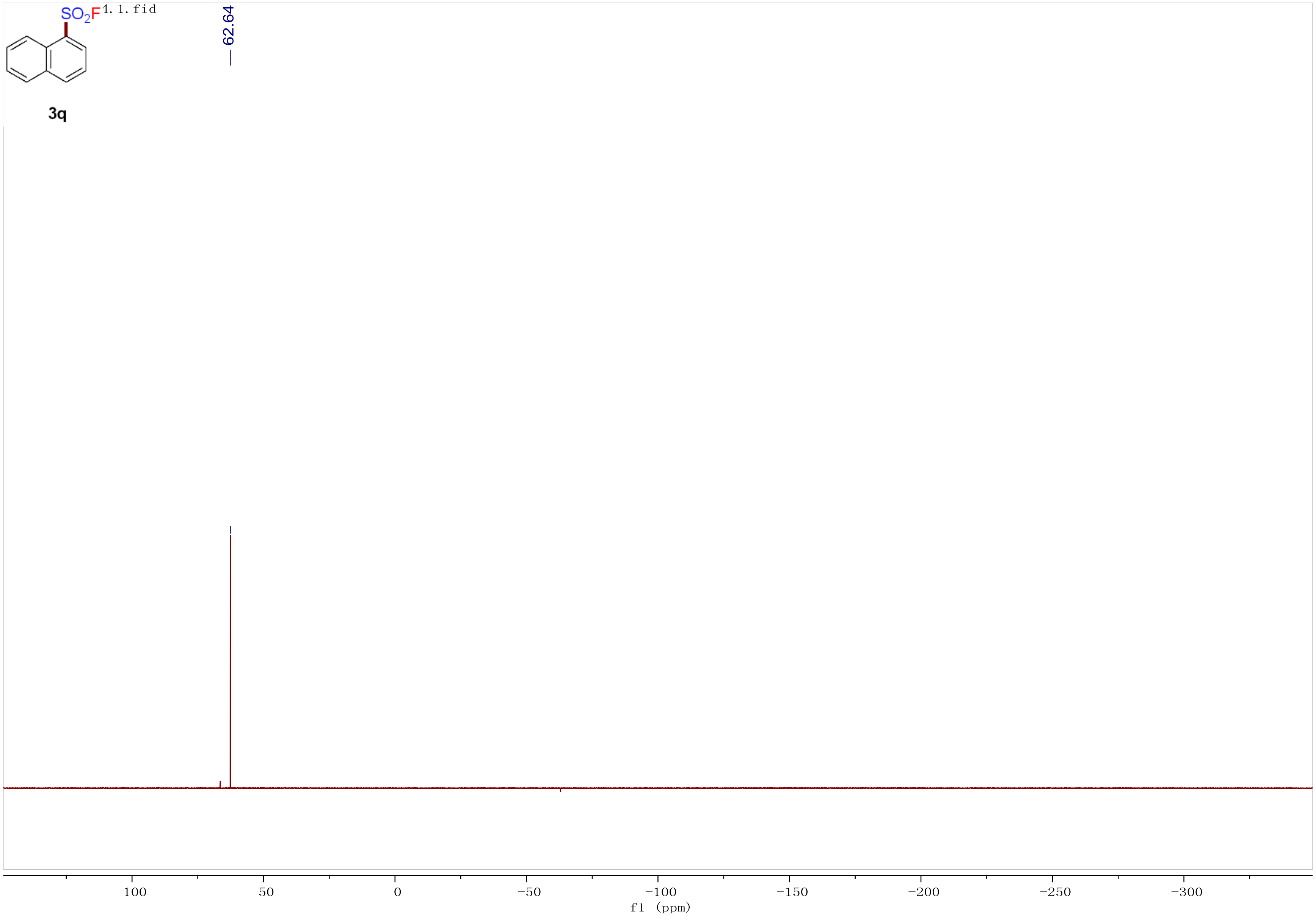
Bpin
SO2F
3p
65.72
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

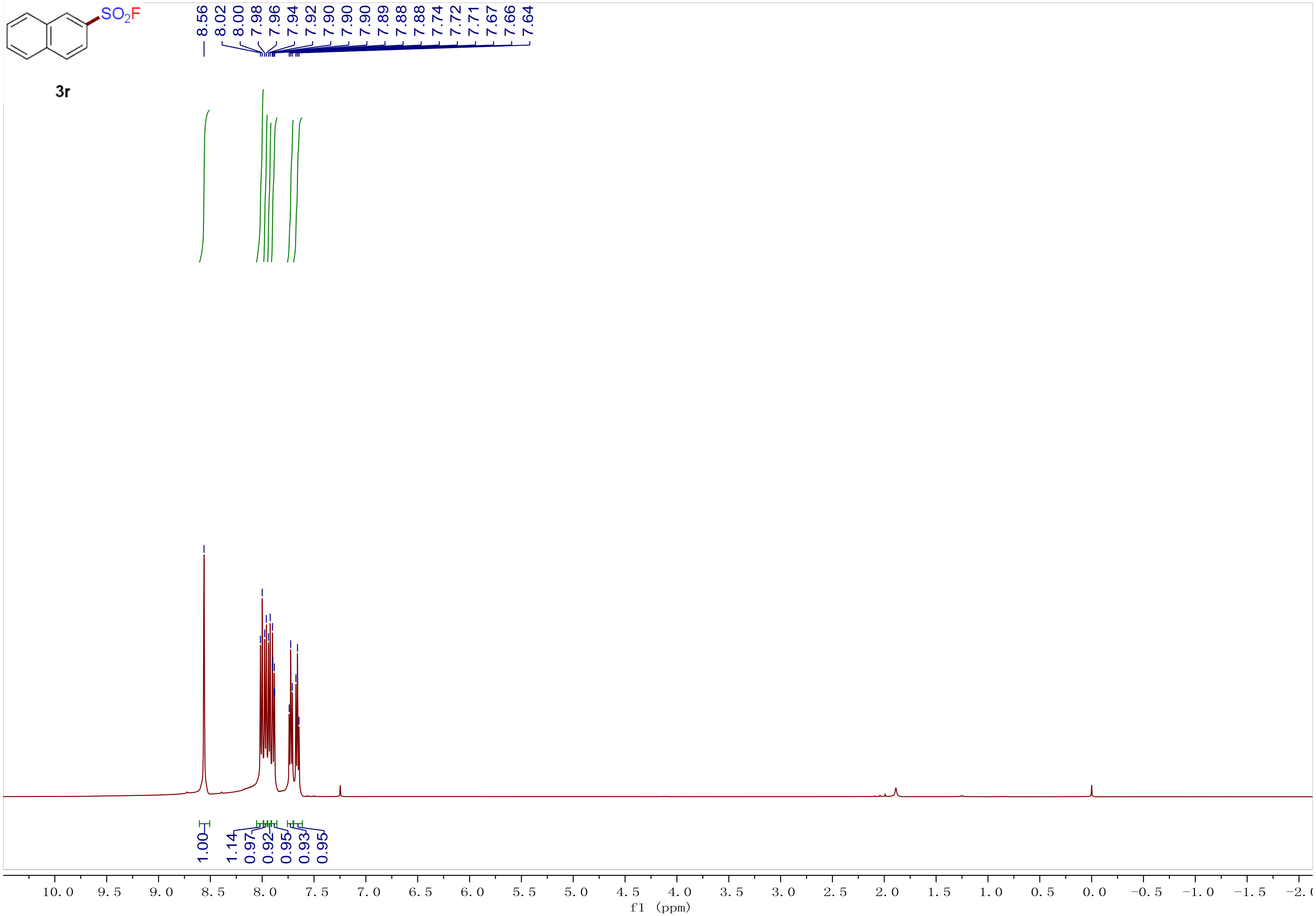

05072023-14.1.fid
8.53
8.51
8.50
8.49
8.31
8.29
8.15
8.14
7.93
7.91
7.73
7.72
7.71
7.71
7.71
7.69
7.69
7.63
7.62
7.60
7.54
7.54
7.52
7.51
7.51
SO2F
1.00
1.01
1.05
1.06
1.08
1.08
1.04
0.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
f1 (ppm)

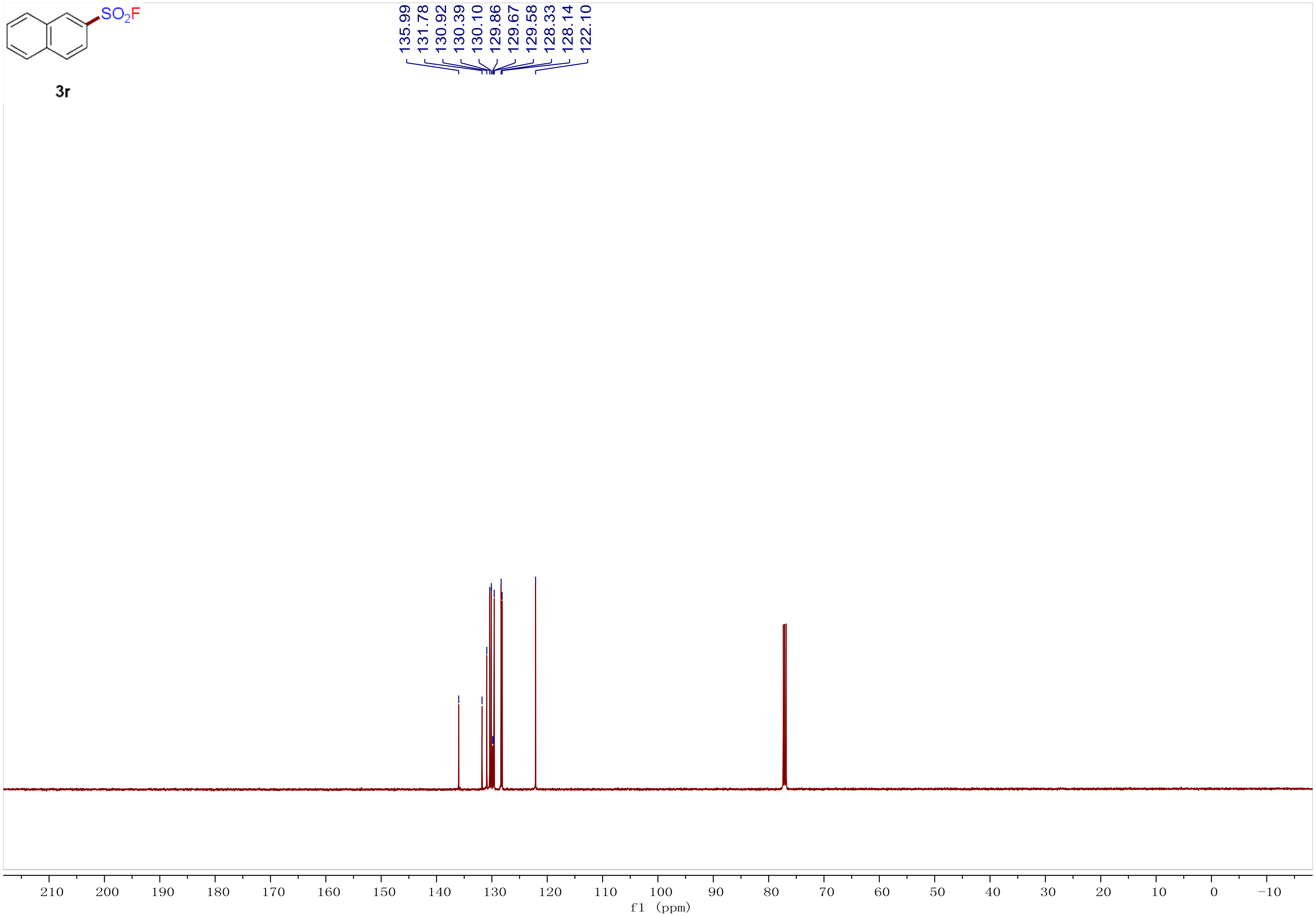
3q


SO2F
3. fid
I decoupling
136.99
134.00
131.08
129.52
129.19
128.21
127.74
124.06
124.04
250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10 −20 −30
f1 (ppm)

3q

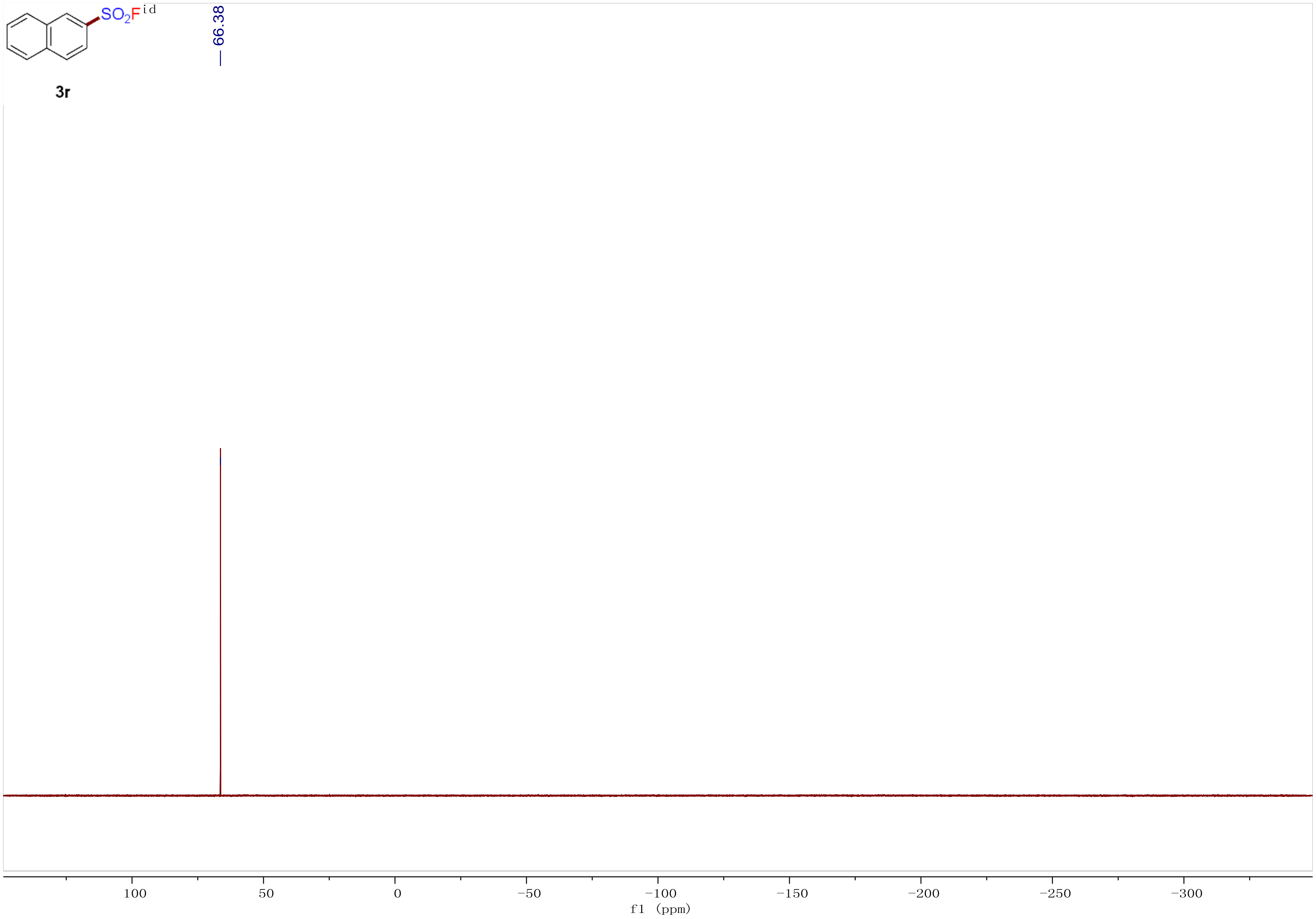

3q

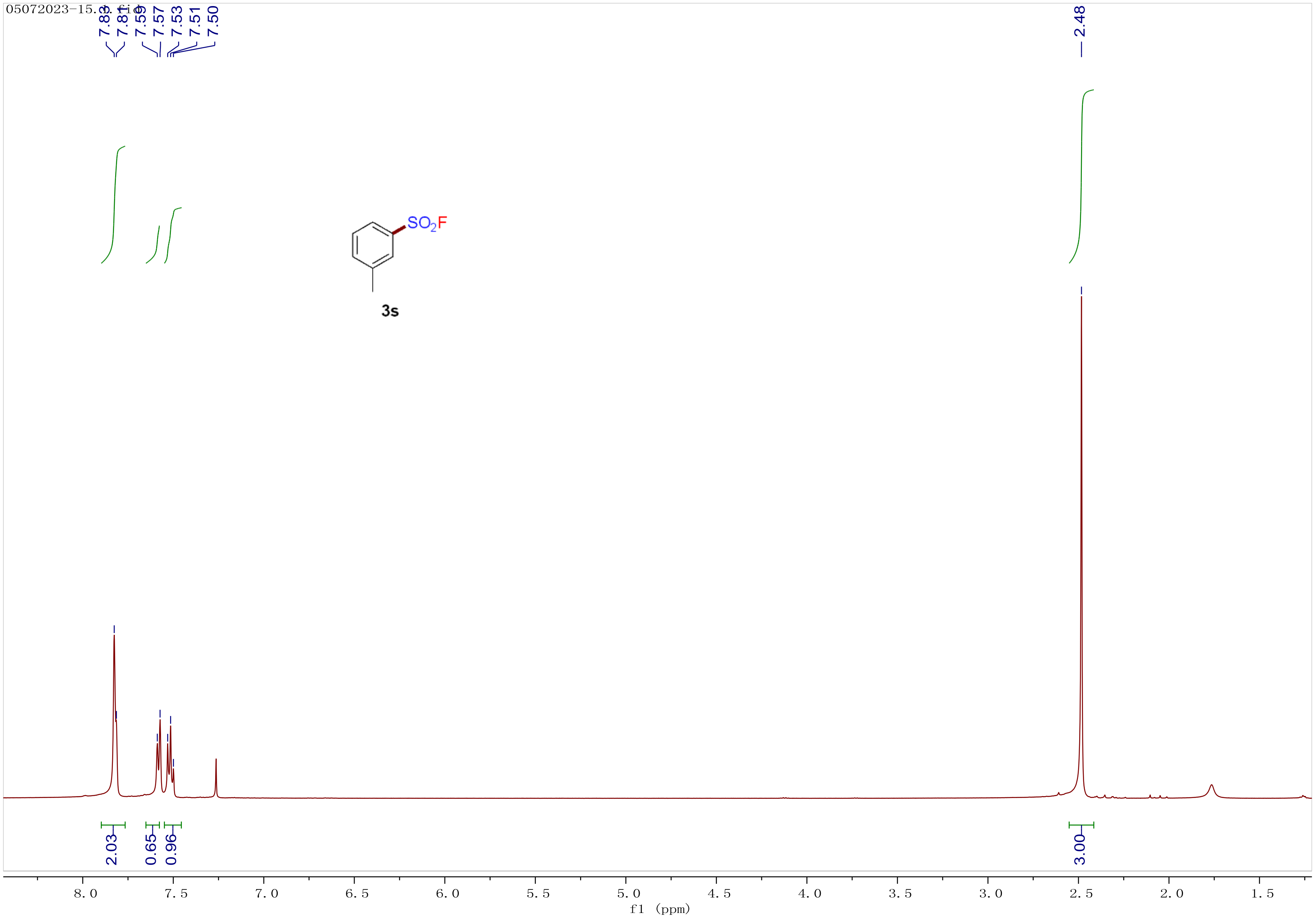

SO2F
3r
8.56
8.02
8.00
7.98
7.96
7.94
7.92
7.90
7.90
7.89
7.88
7.88
7.74
7.72
7.71
7.67
7.66
7.64
1.00
1.14
0.97
0.92
0.95
0.93
0.95
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.
f1 (ppm)

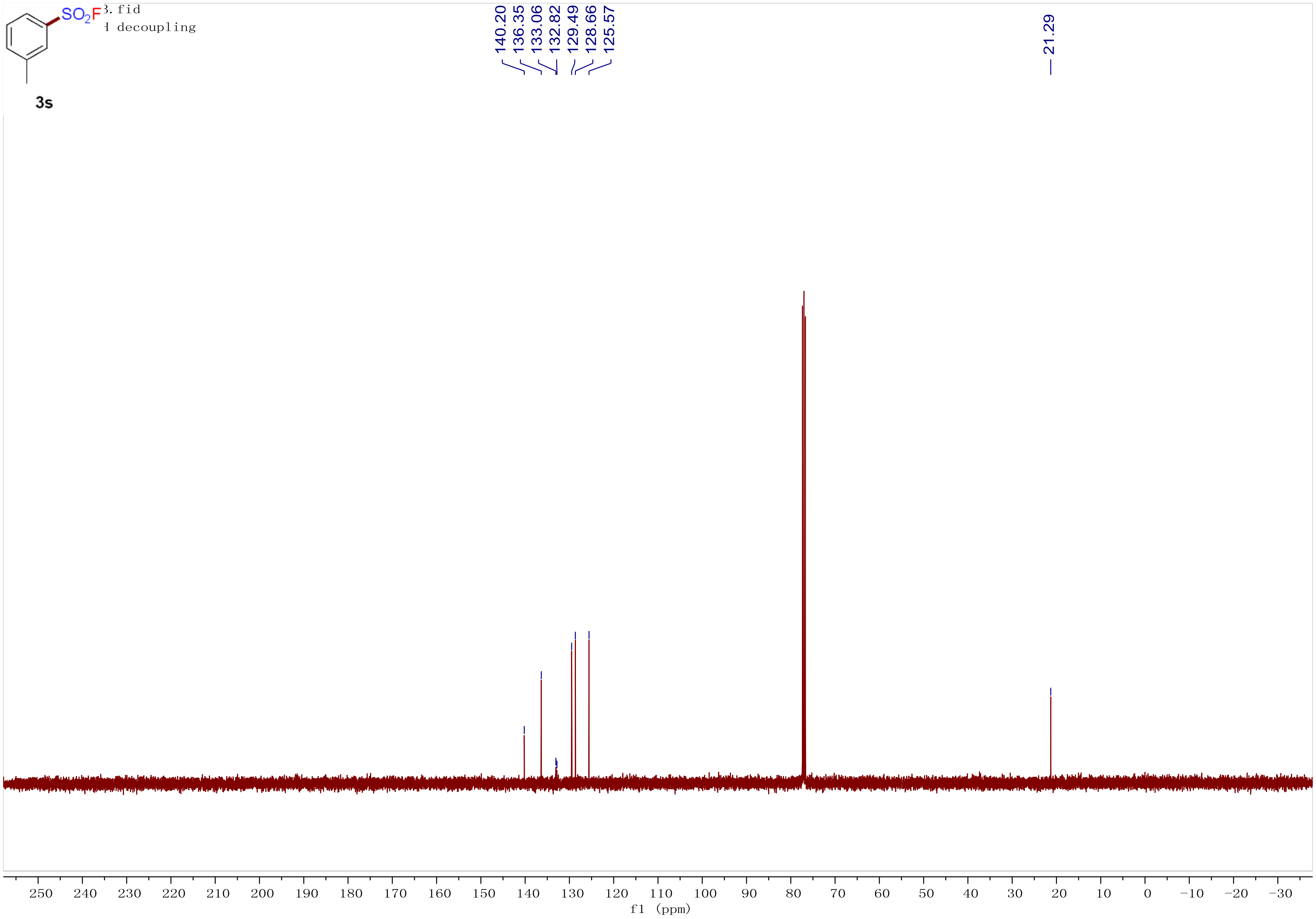


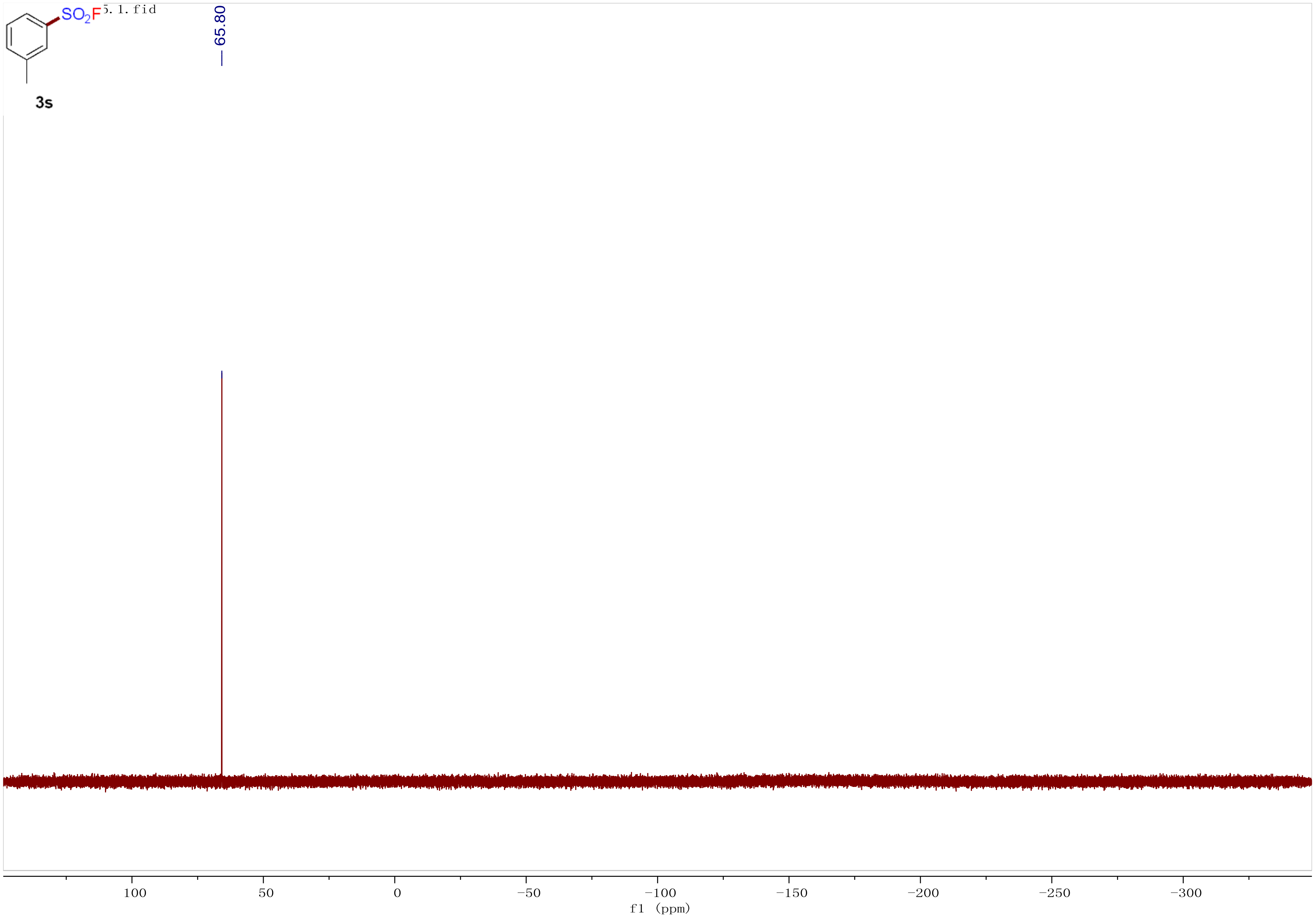
3r

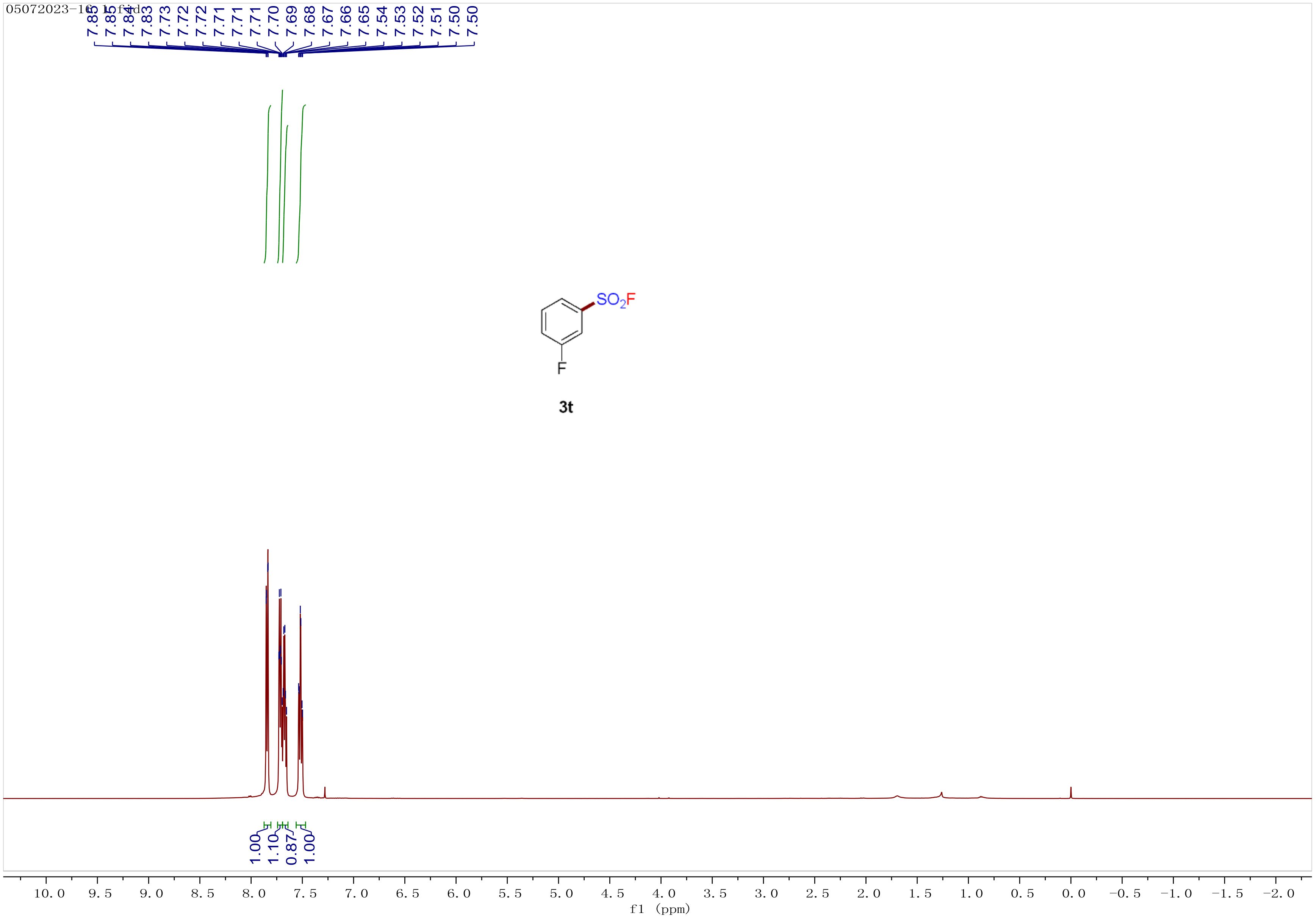
SO2F
135.99
131.78
130.92
130.39
130.10
129.86
129.67
129.58
128.33
128.14
122.10
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

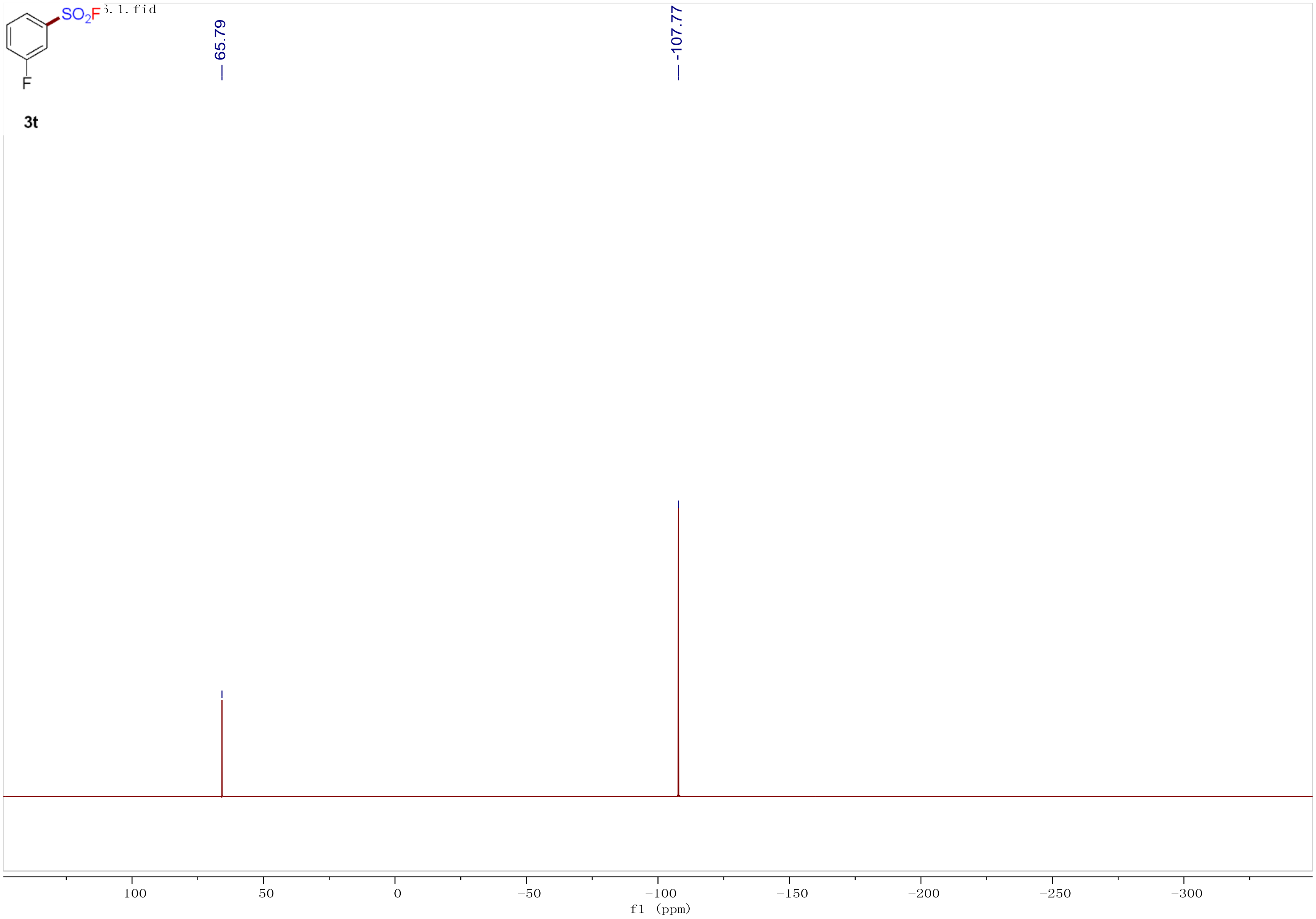

3r

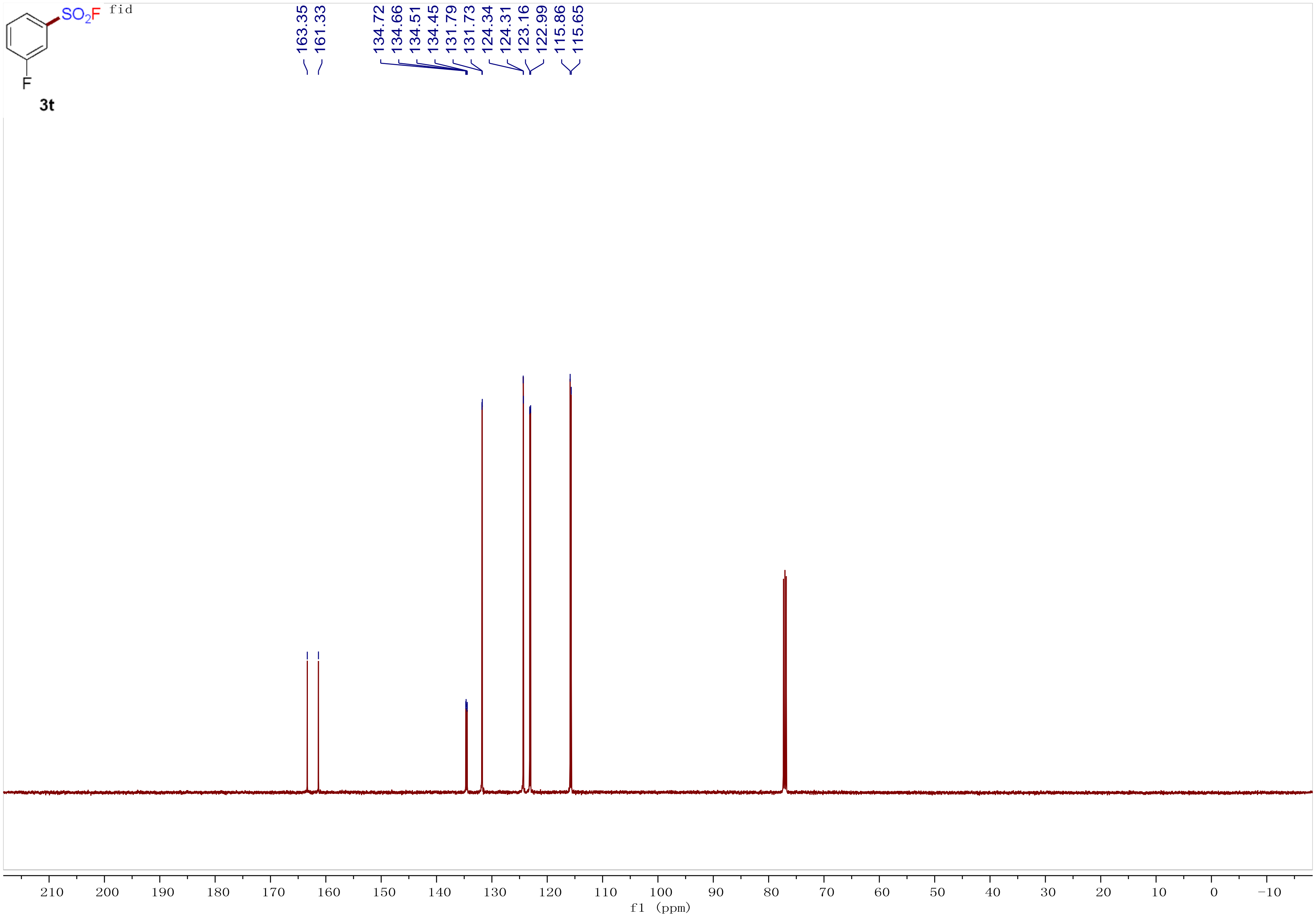

05072023-15.1.fid
7.83
7.81
7.59
7.57
7.53
7.51
7.50
2.48
SO2F
3s
2.03
0.65
0.96
3.00
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
f1 (ppm)


SO2F
3s
3.fid
decoupling
140.20
136.35
133.06
132.82
129.49
128.66
125.57
21.29
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
f1 (ppm)

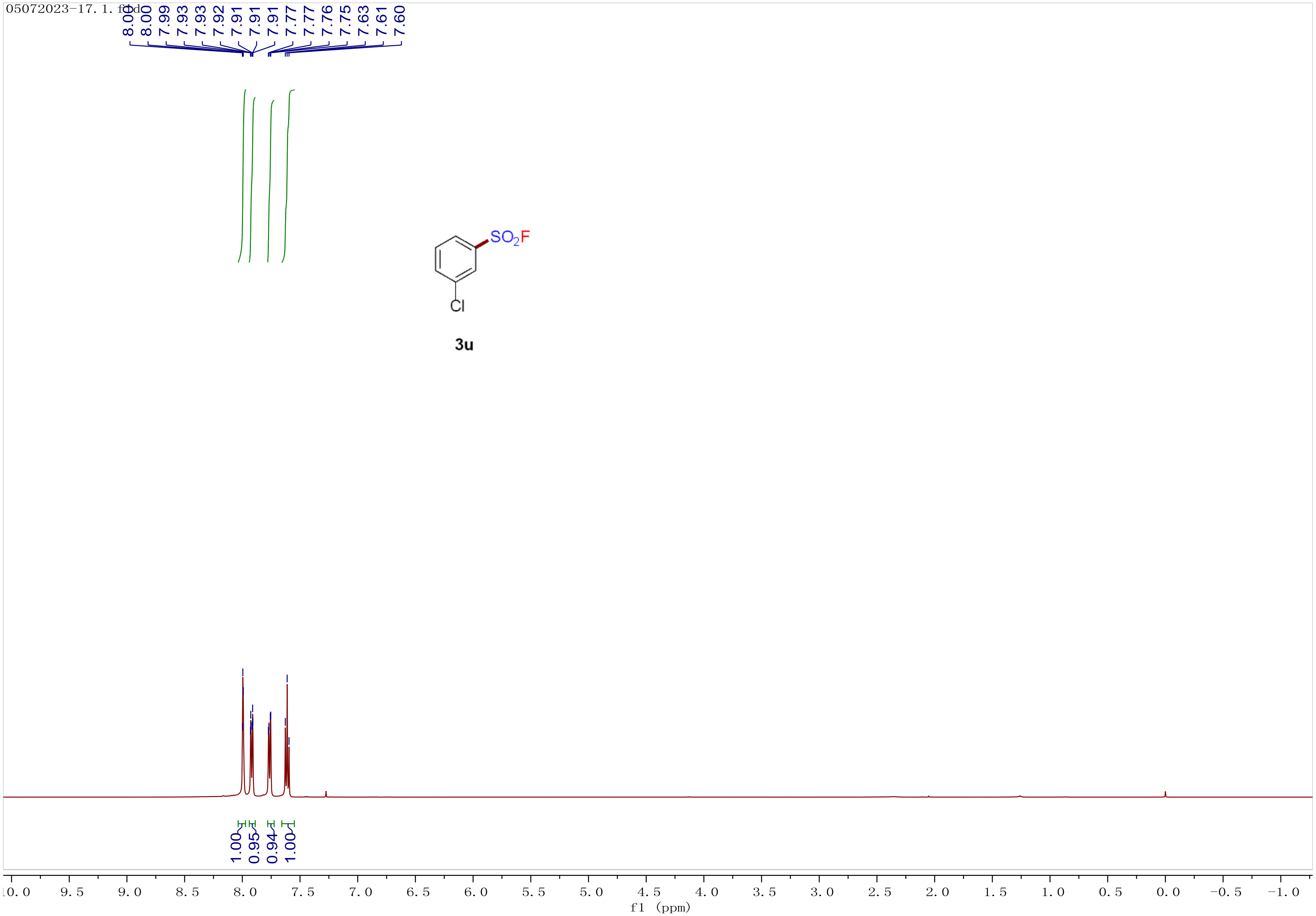

SO2F
3s
5.1.fid
65.80
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)


05072023-16.1.fid
7.85
7.85
7.84
7.83
7.73
7.72
7.72
7.71
7.71
7.71
7.70
7.69
7.68
7.67
7.66
7.65
7.54
7.53
7.52
7.51
7.50
7.50
SO2F
F
3t
1.00
1.10
0.87
1.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
f1 (ppm)

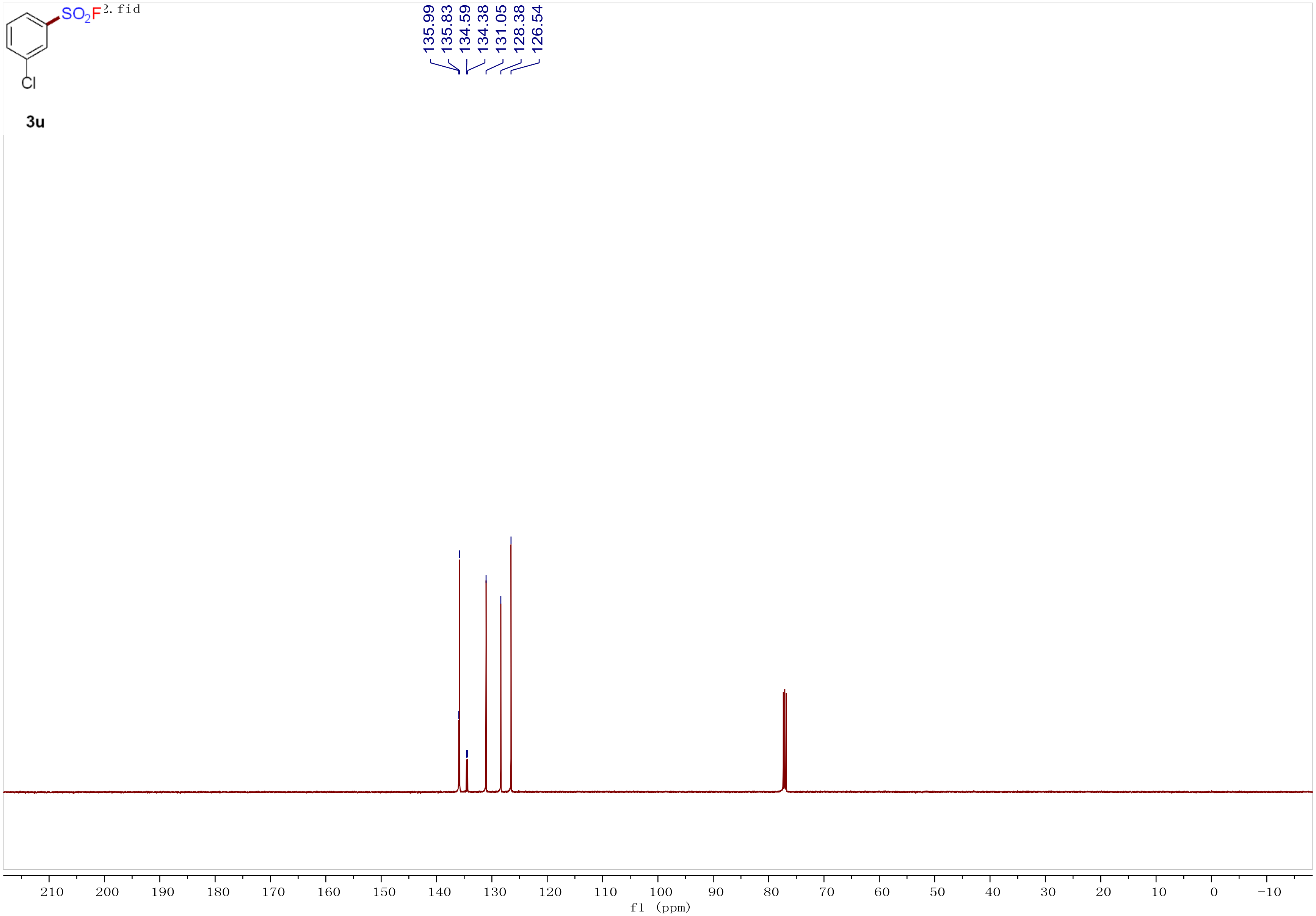

SO2F
F
3t
6.1.fid
65.79
-107.77
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

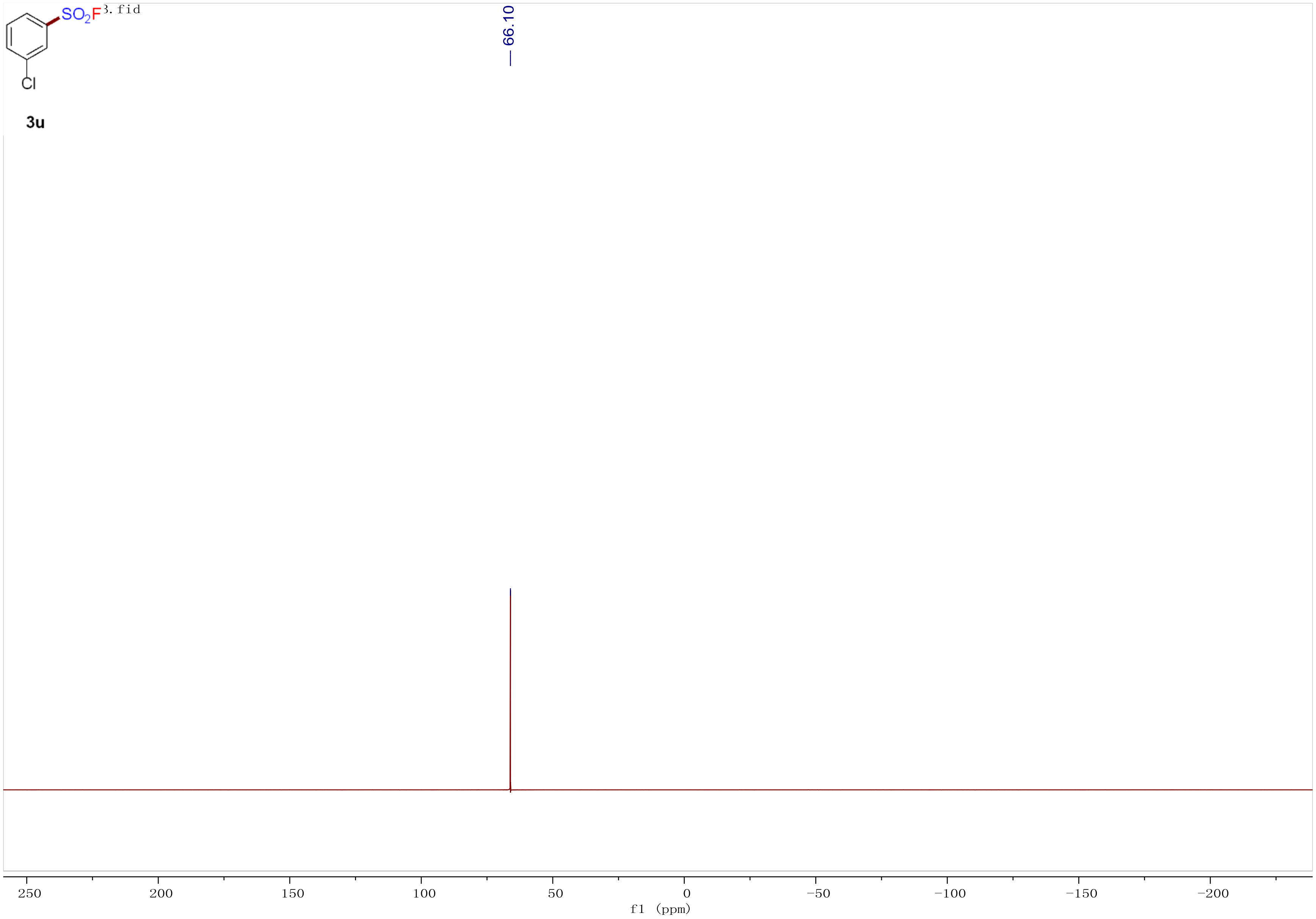

3t

SO2F
F
fid
163.35
161.33
134.72
134.66
134.51
134.45
131.79
131.73
124.34
124.31
123.16
122.99
115.86
115.65
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

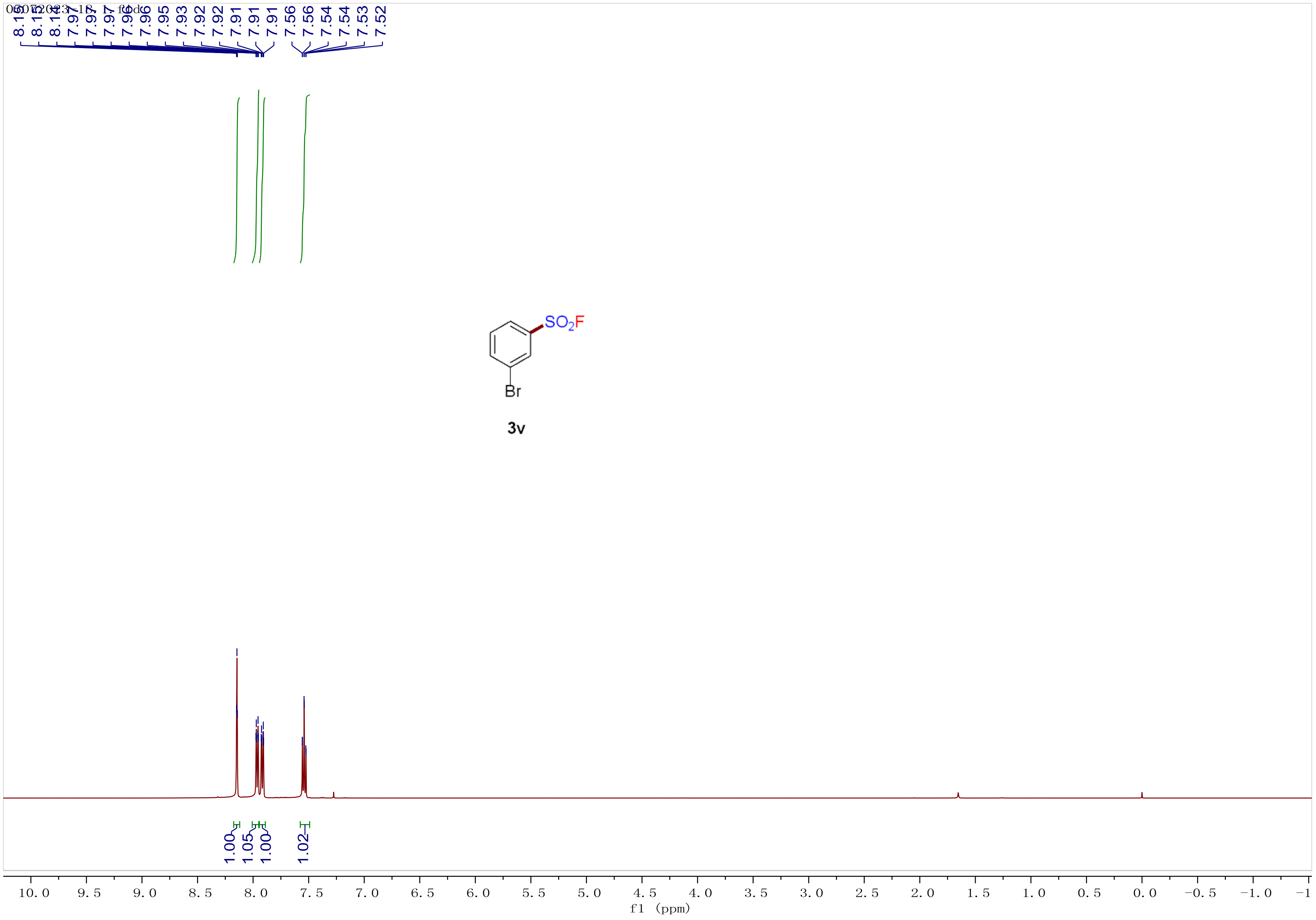

05072023-17.1.fid
8.00
8.00
7.99
7.93
7.93
7.92
7.91
7.91
7.91
7.77
7.77
7.76
7.75
7.63
7.61
7.60
SO$_2$F
Cl
1.00
0.95
0.94
1.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

3u

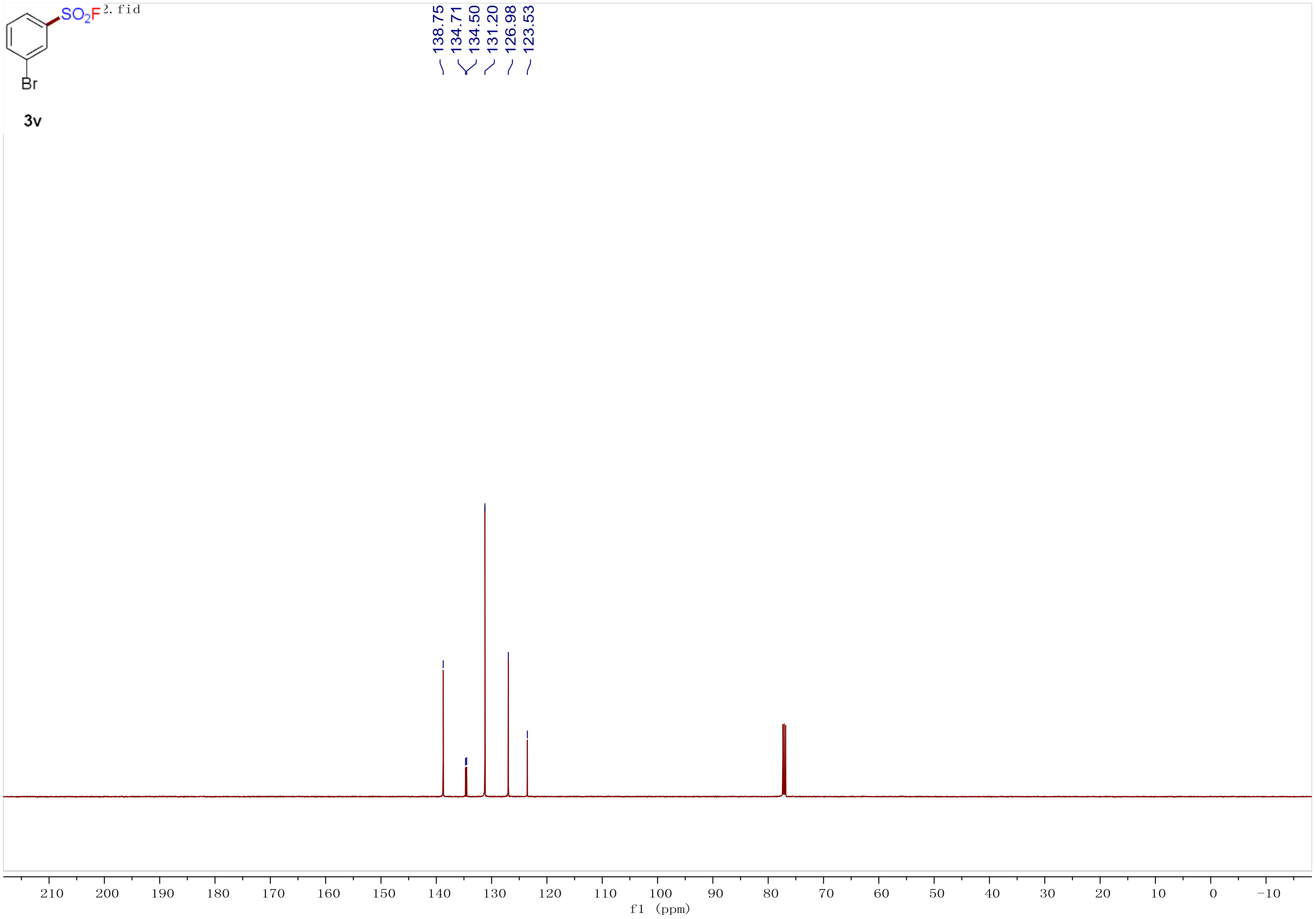

SO2F
Cl
3u
2.fid
135.99
135.83
134.59
134.38
131.05
128.38
126.54
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

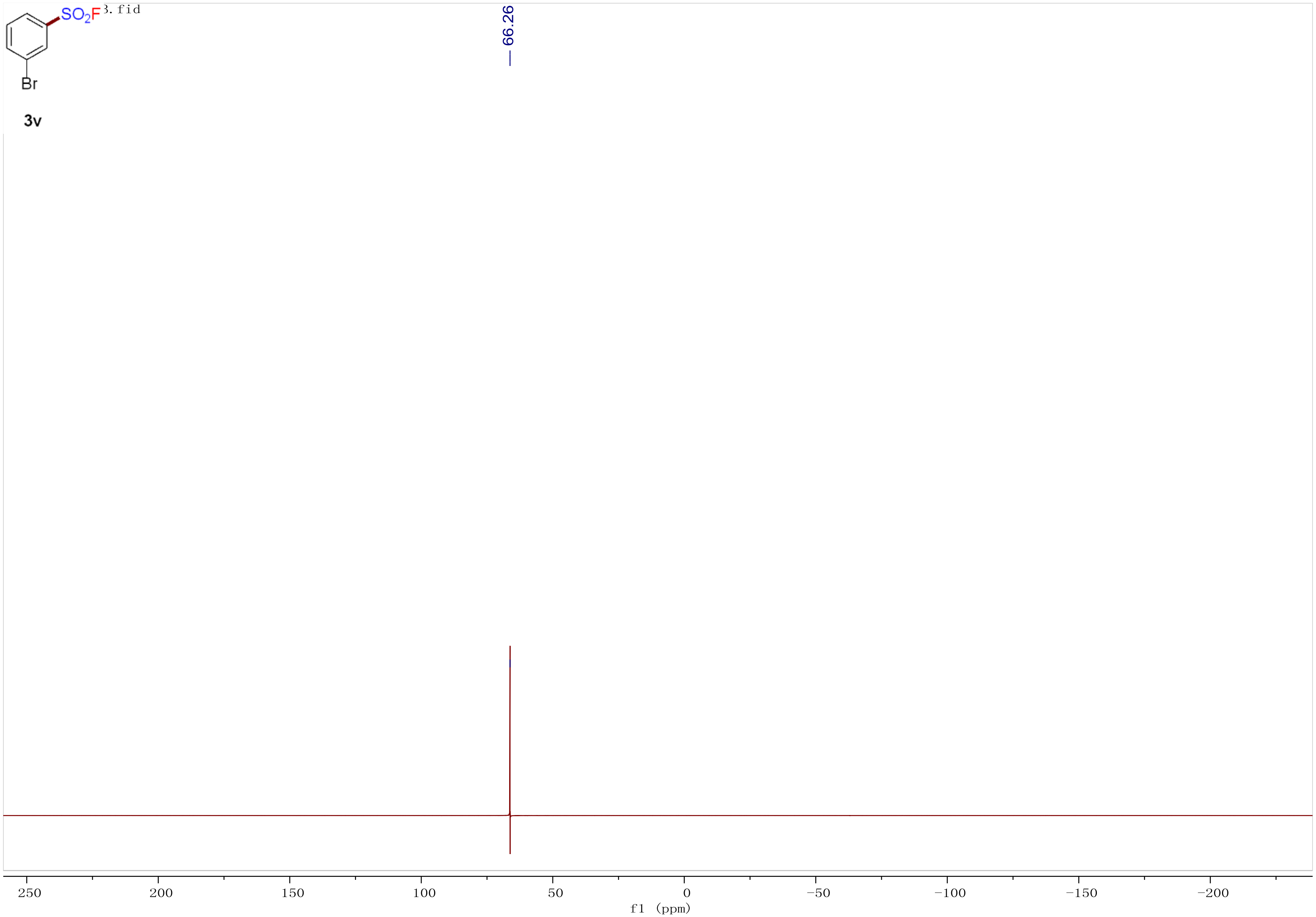


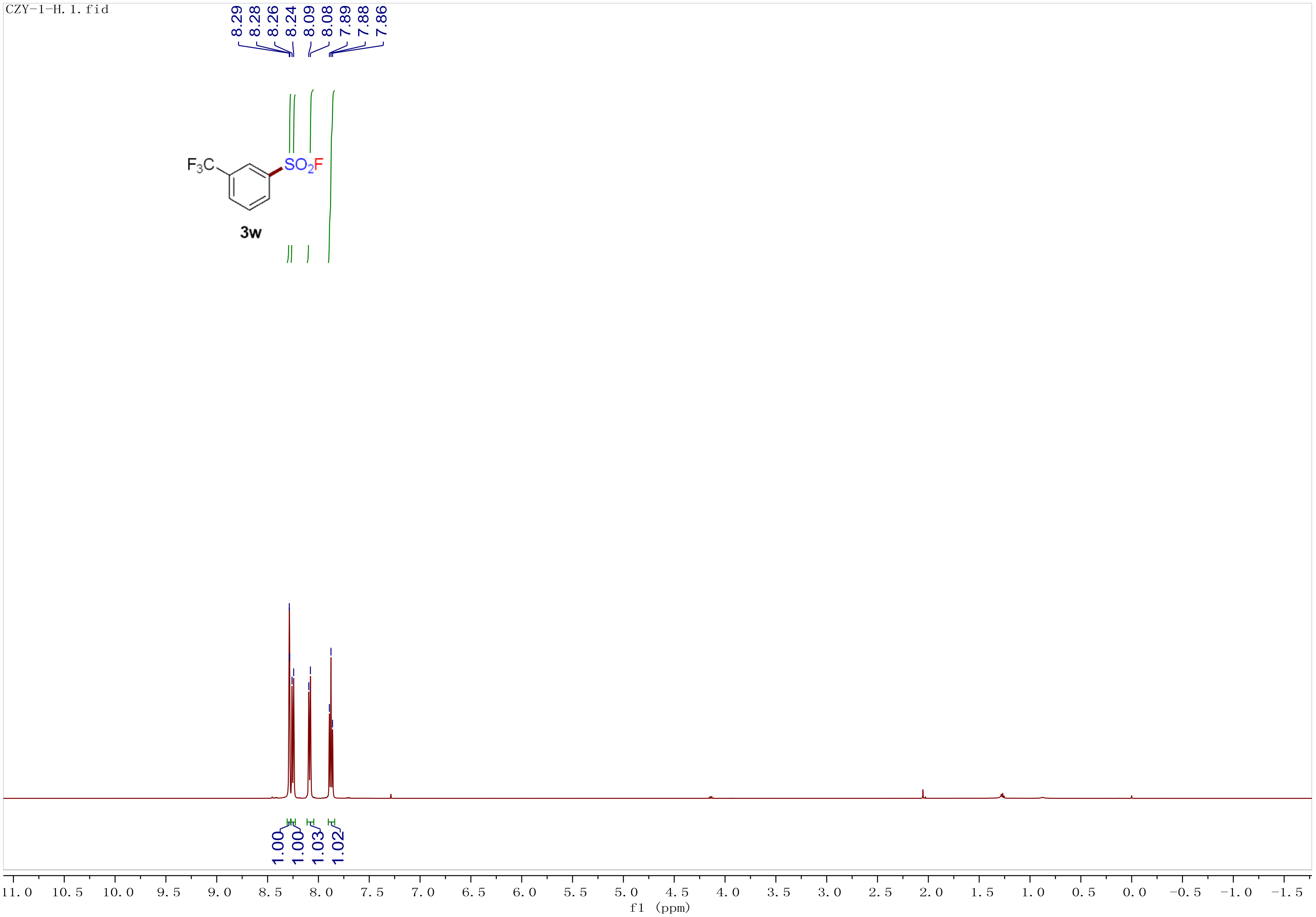
3u

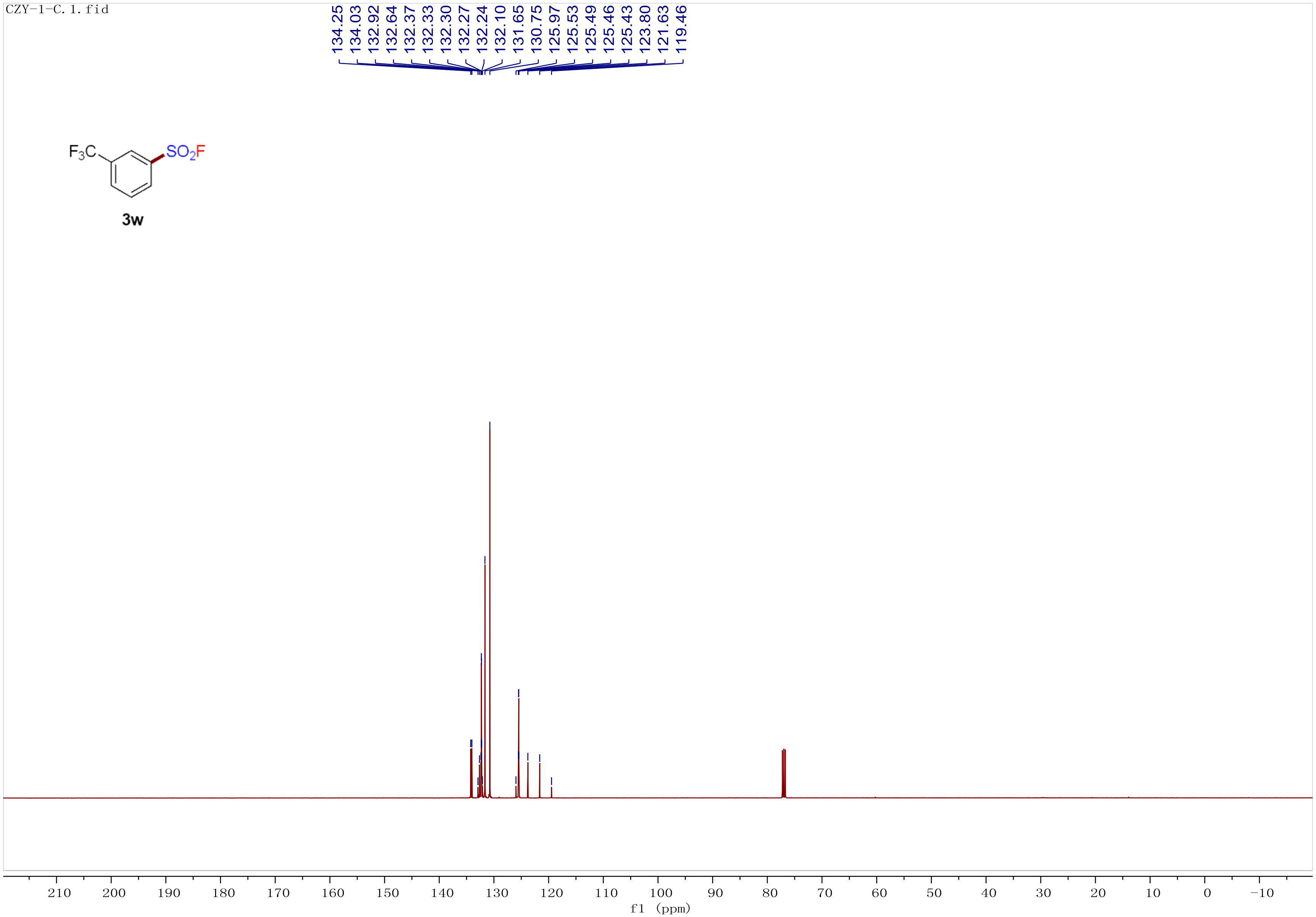

05072023-18.1.fid
8.15
8.15
8.14
7.97
7.97
7.97
7.96
7.96
7.95
7.93
7.92
7.92
7.91
7.91
7.91
7.56
7.56
7.54
7.54
7.53
7.52
SO2F
Br
1.00
1.05
1.00
1.02
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1
f1 (ppm)

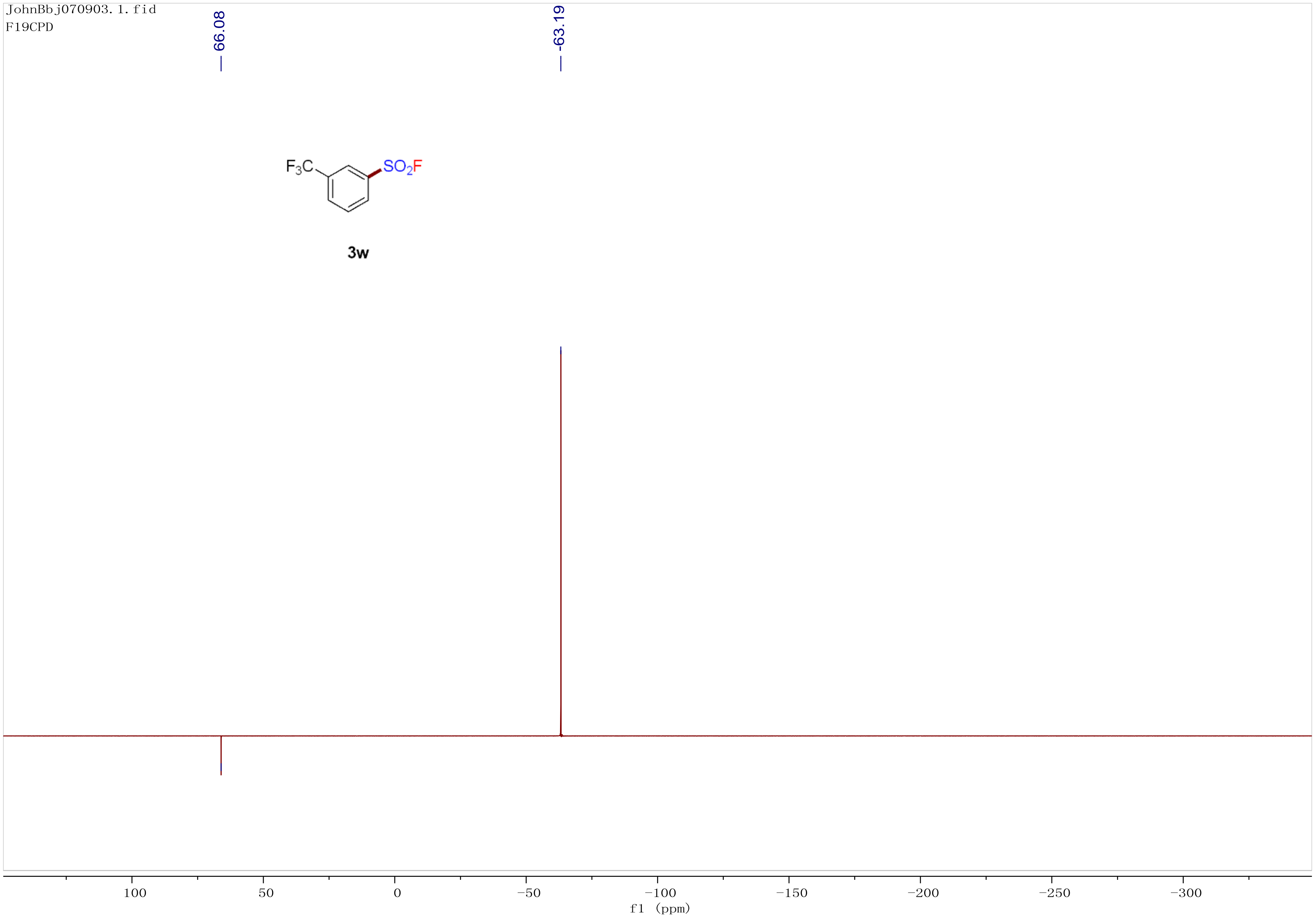
3v


SO2F
Br
3v
2.fid
138.75
134.71
134.50
131.20
126.98
123.53
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

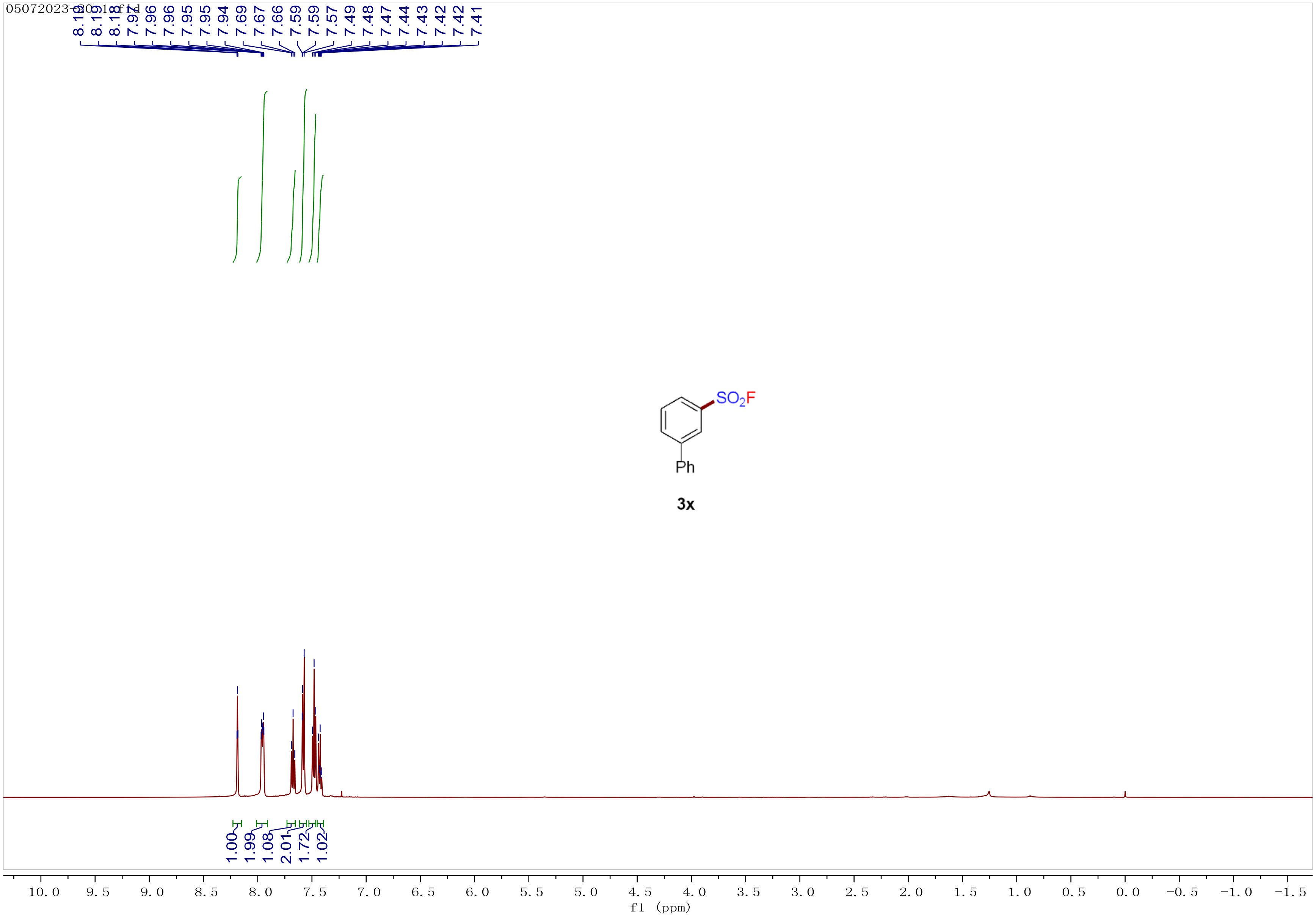

SO2F
Br
3v
3.fid
66.26
250
200
150
100
50
0
−50
−100
−150
−200
f1 (ppm)

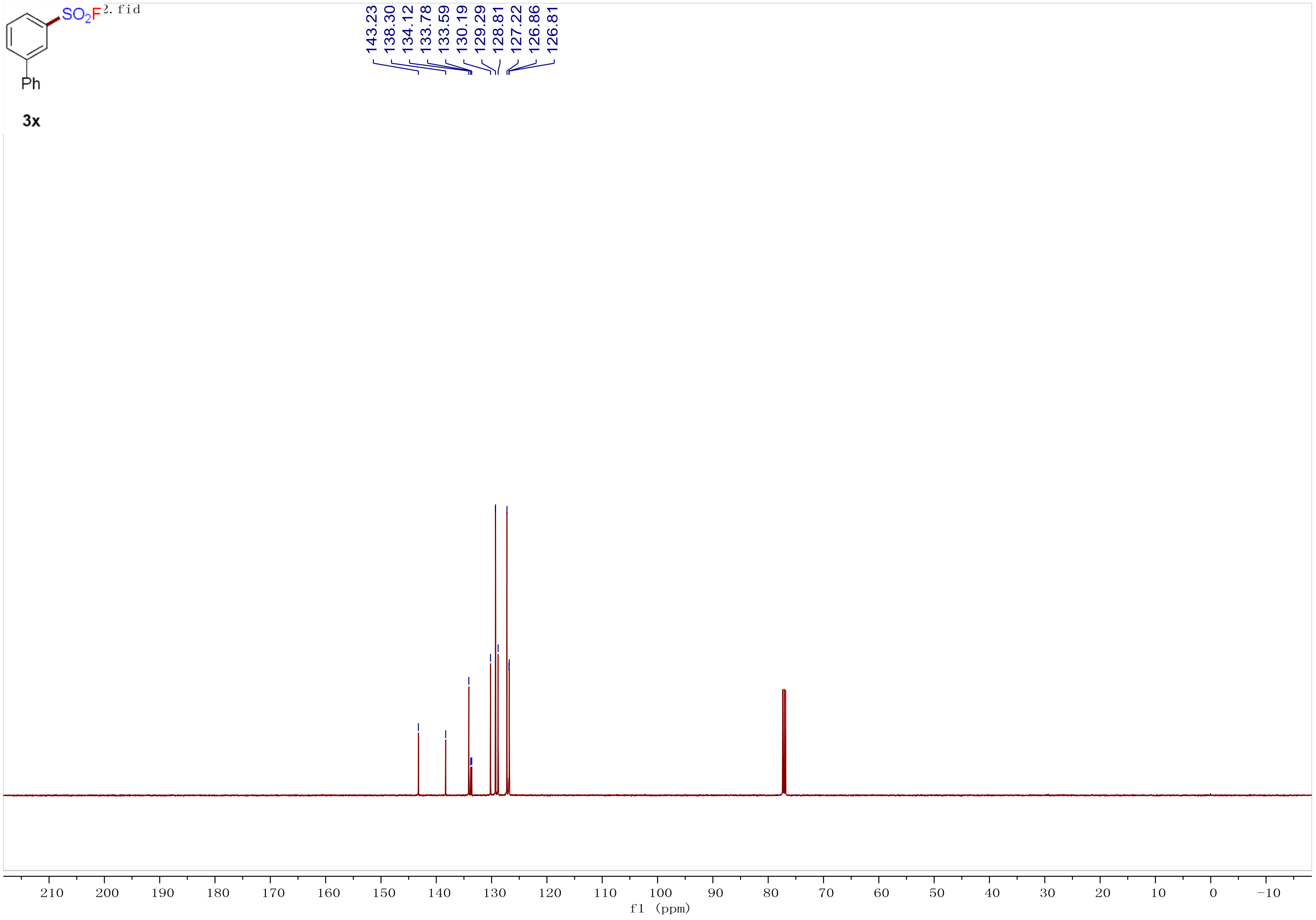

CZY-1-H.1.fid
8.29
8.28
8.26
8.24
8.09
8.08
7.89
7.88
7.86
F_3C
SO_2F
3w
1.00
1.00
1.03
1.02
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0 −1.5
f1 (ppm)


CZY-1-C.1.fid
134.25
134.03
132.92
132.64
132.37
132.33
132.30
132.27
132.24
132.10
131.65
130.75
125.97
125.53
125.49
125.46
125.43
123.80
121.63
119.46
F3C
SO2F
3w
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


JohnBbj070903.1.fid
F19CPD
66.08
-63.19
F3C
SO2F
100
50
0
−50
−100
−150
−200
−250
−300
f1 (ppm)

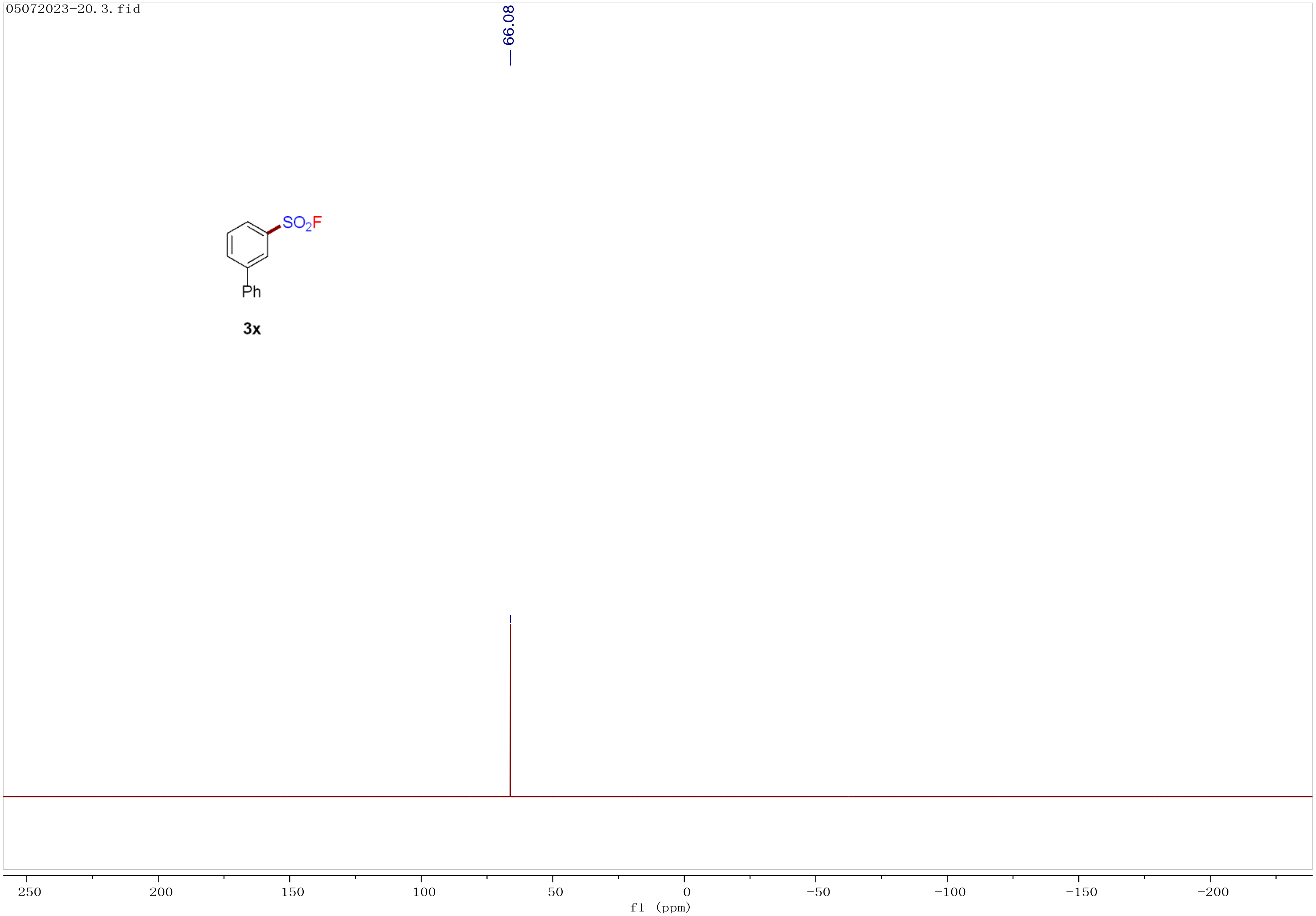
3w

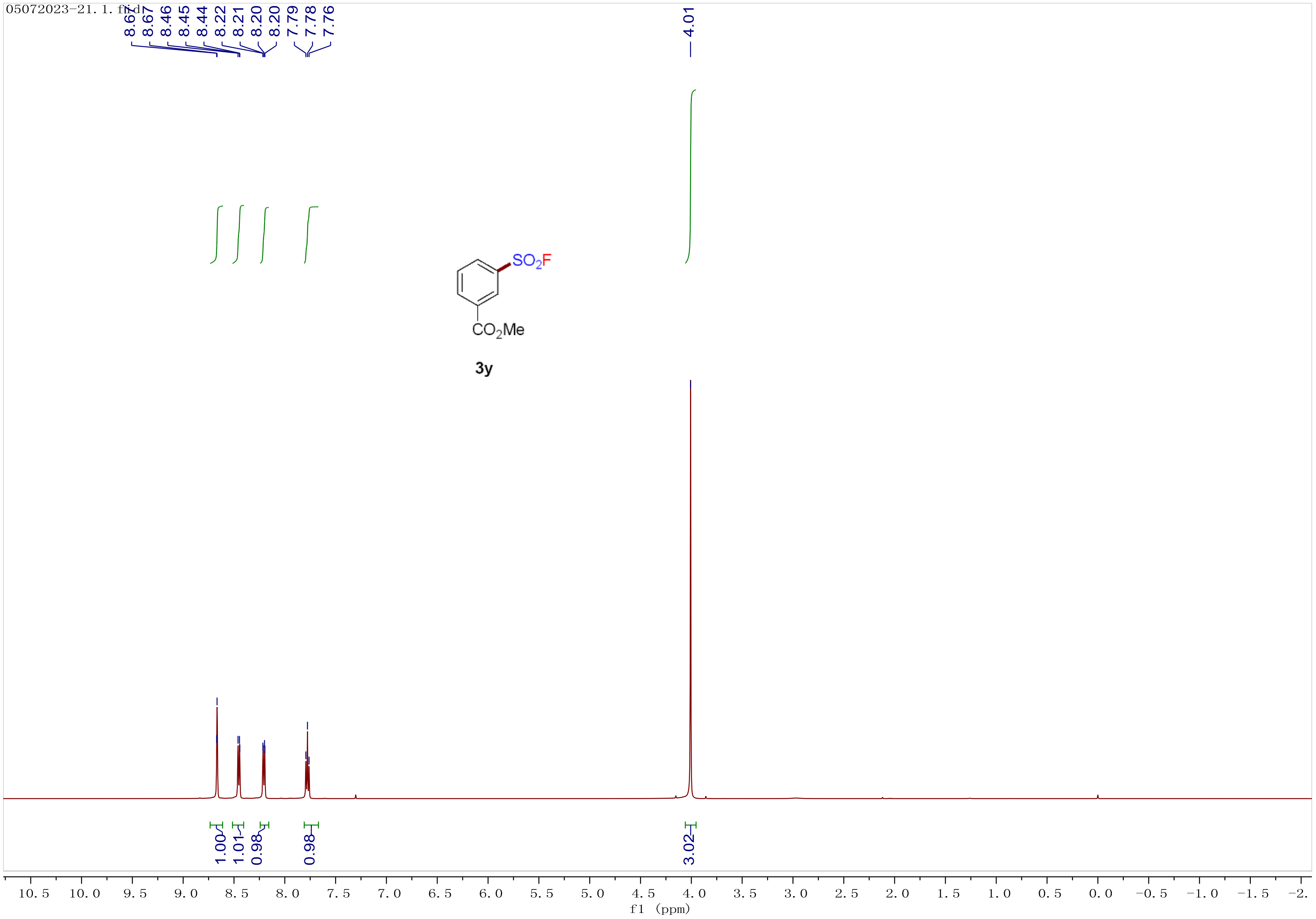

05072023-20.1.fid
8.19
8.19
8.18
7.97
7.96
7.96
7.95
7.95
7.94
7.69
7.67
7.66
7.59
7.59
7.57
7.49
7.48
7.47
7.44
7.43
7.42
7.42
7.41
SO2F
Ph
3x
1.00
1.99
1.08
2.01
1.72
1.02
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
f1 (ppm)

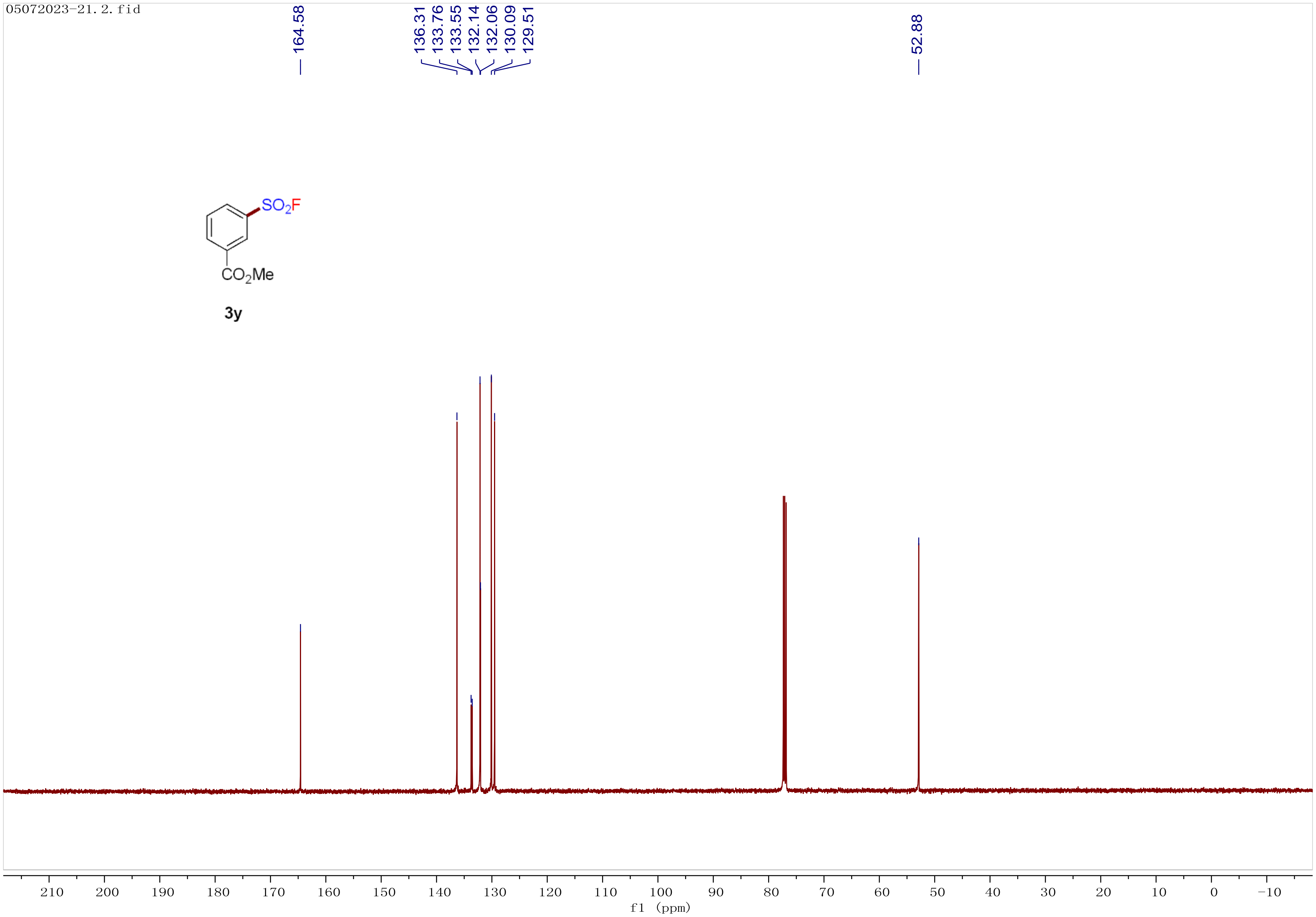


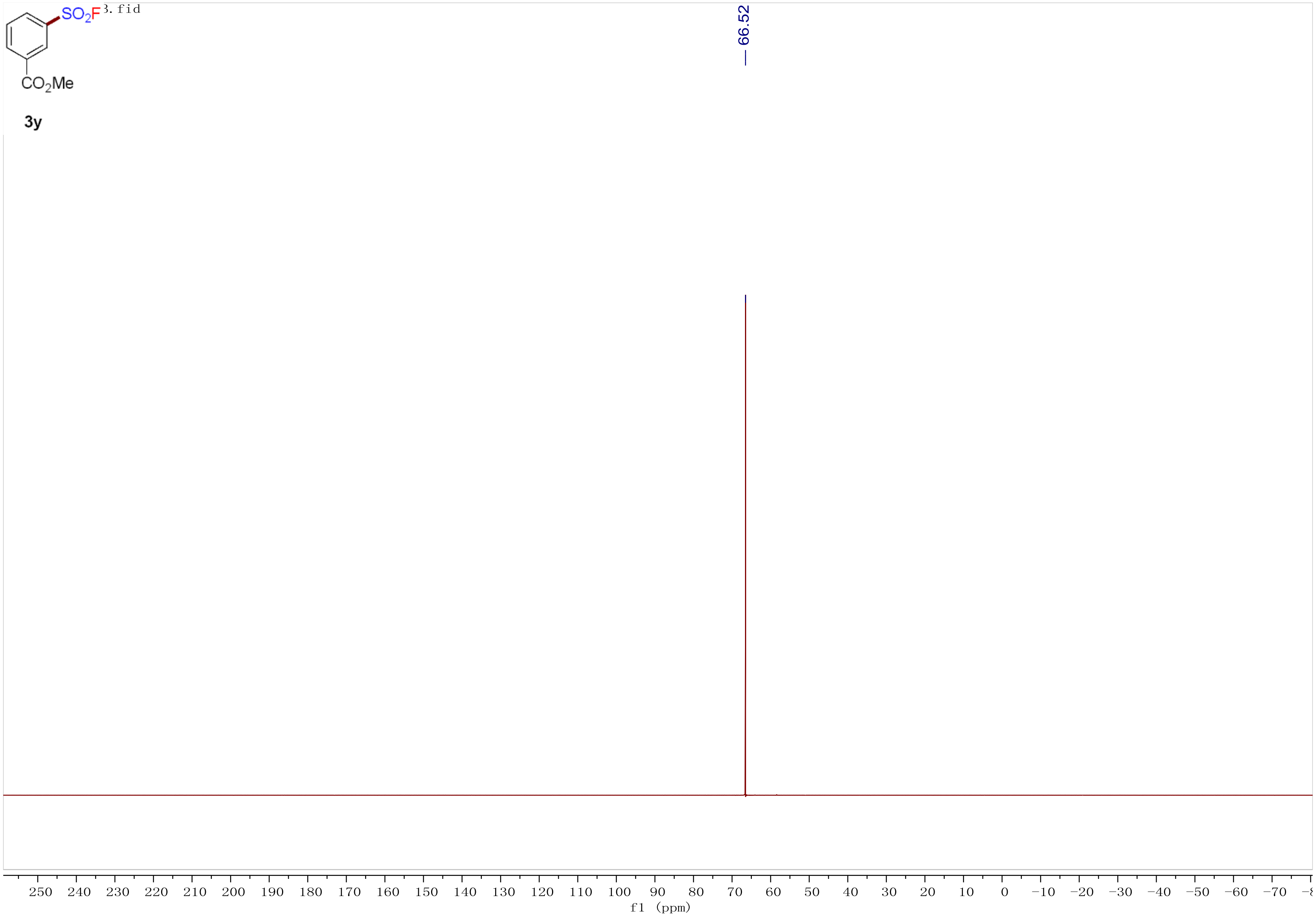
3x

SO$_2$F
Ph
2.fid
143.23
138.30
134.12
133.78
133.59
130.19
129.29
128.81
127.22
126.86
126.81
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

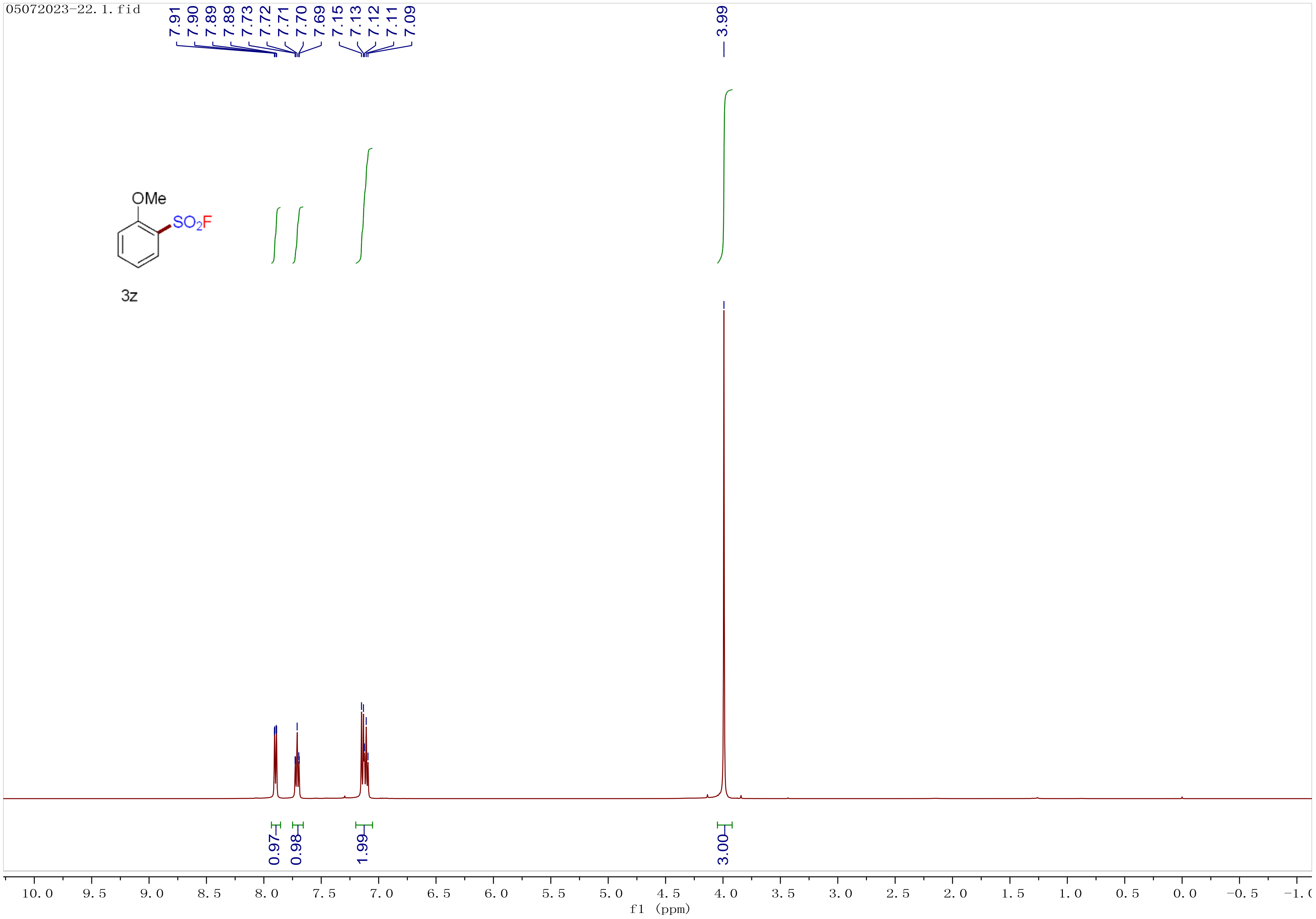

05072023-20.3.fid
66.08
SO2F
Ph
3x
250
200
150
100
50
0
−50
−100
−150
−200
f1 (ppm)

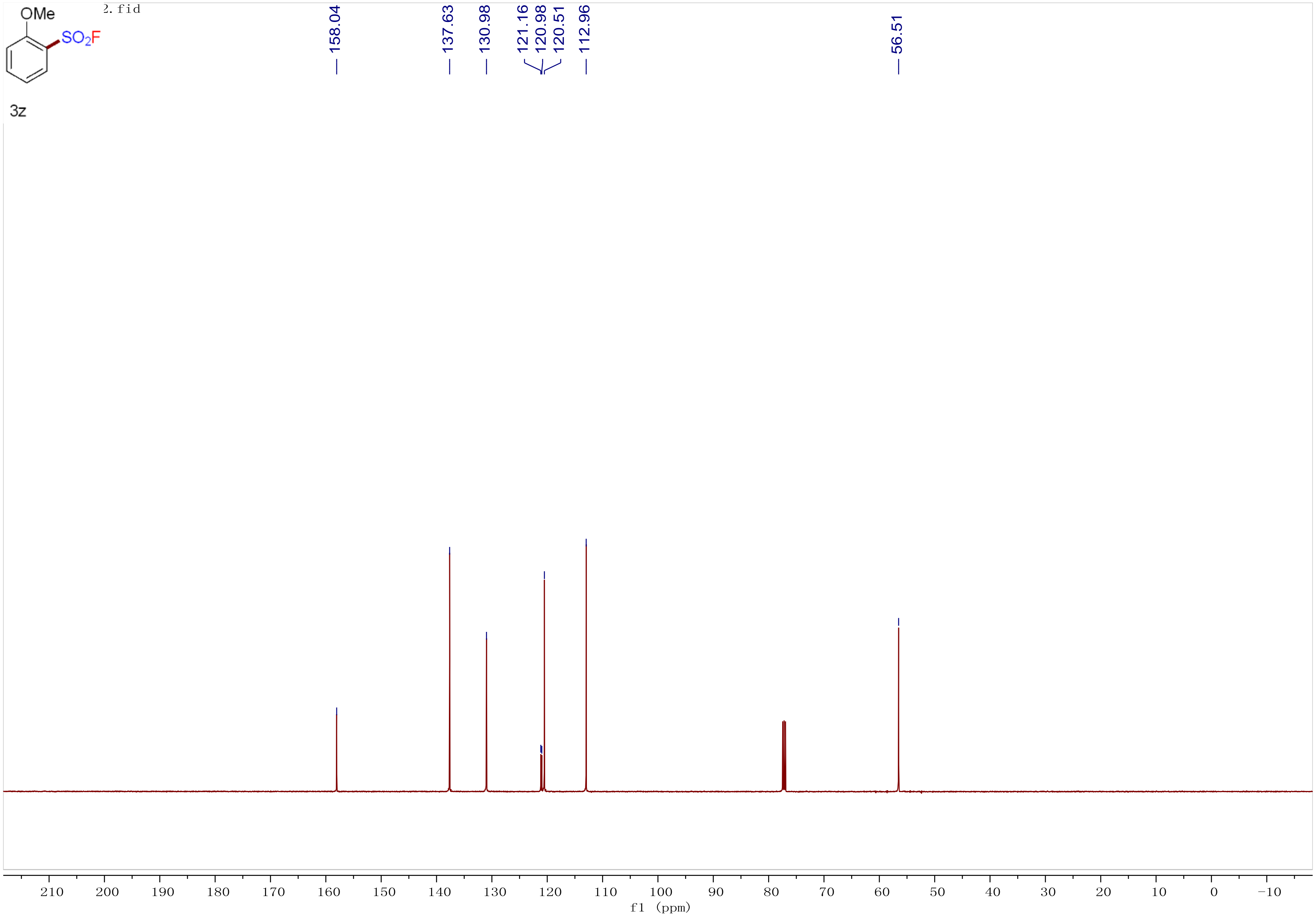

05072023-21.1.fid
8.67
8.67
8.46
8.45
8.44
8.22
8.21
8.20
8.20
7.79
7.78
7.76
4.01
SO2F
CO2Me
3y
1.00
1.01
0.98
0.98
3.02
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.
f1 (ppm)

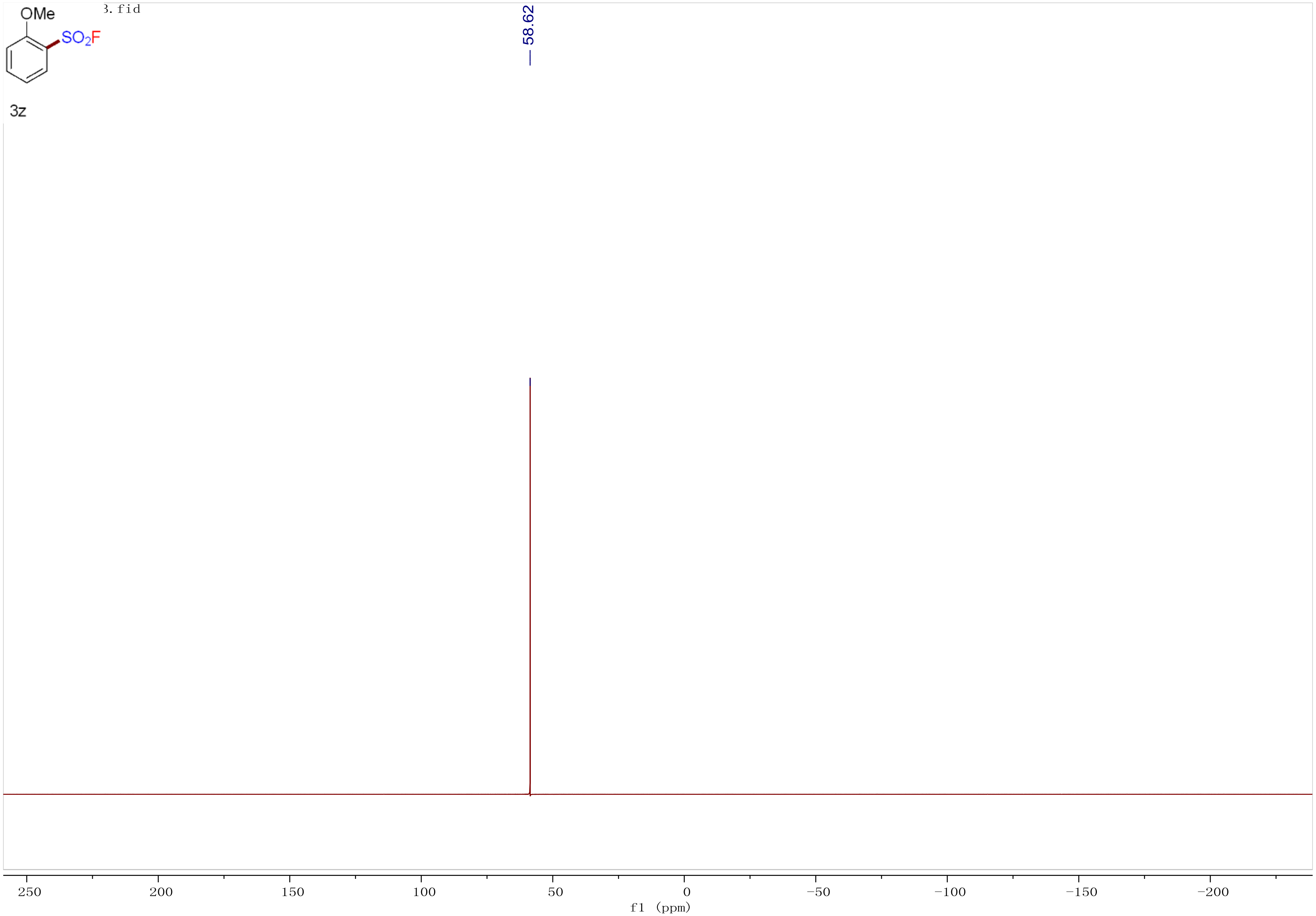

05072023-21.2.fid
164.58
136.31
133.76
133.55
132.14
132.06
130.09
129.51
52.88
SO2F
CO2Me
3y
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

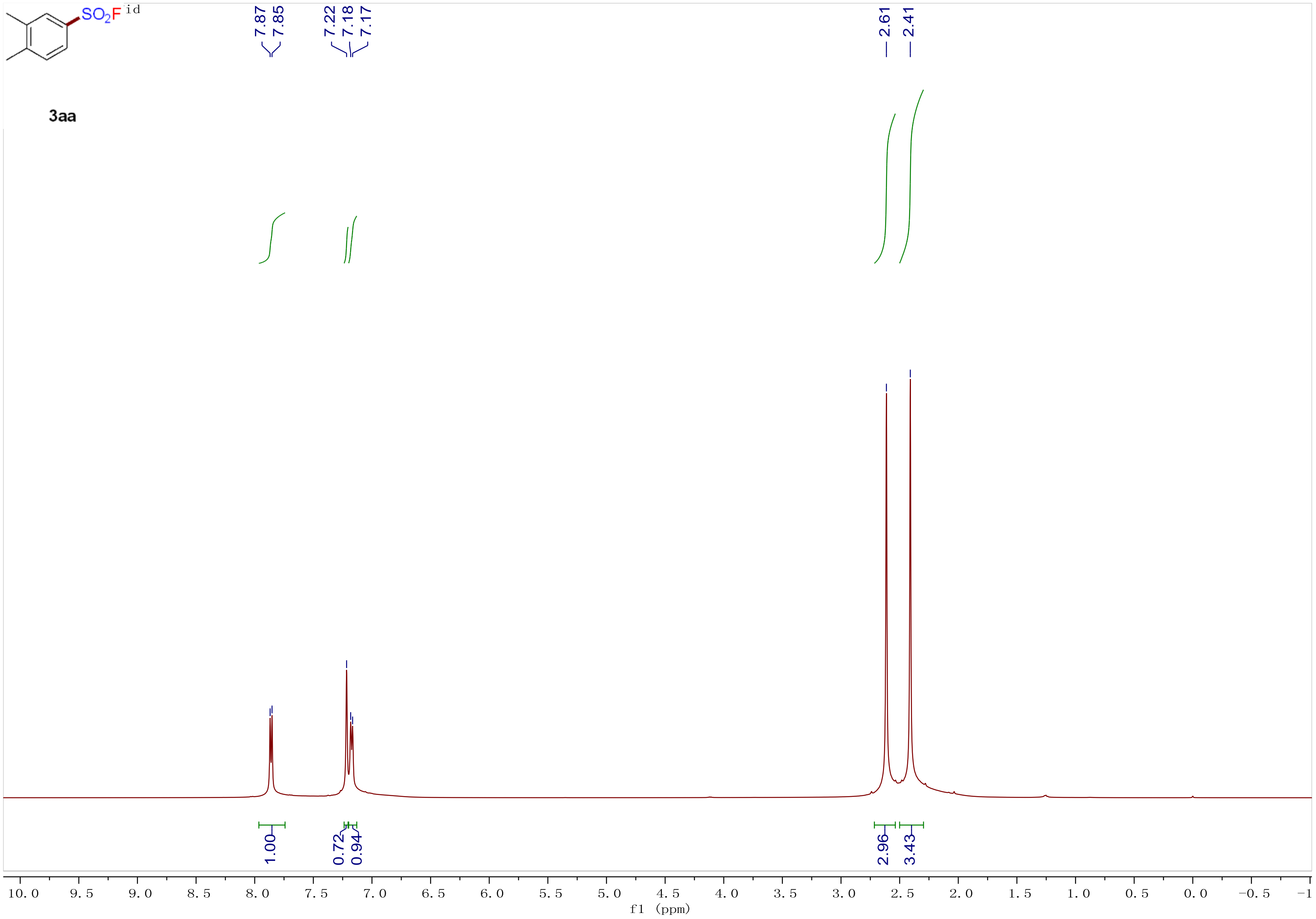
SO2F
CO2Me
3.fid
66.52
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−8
f1 (ppm)

3y

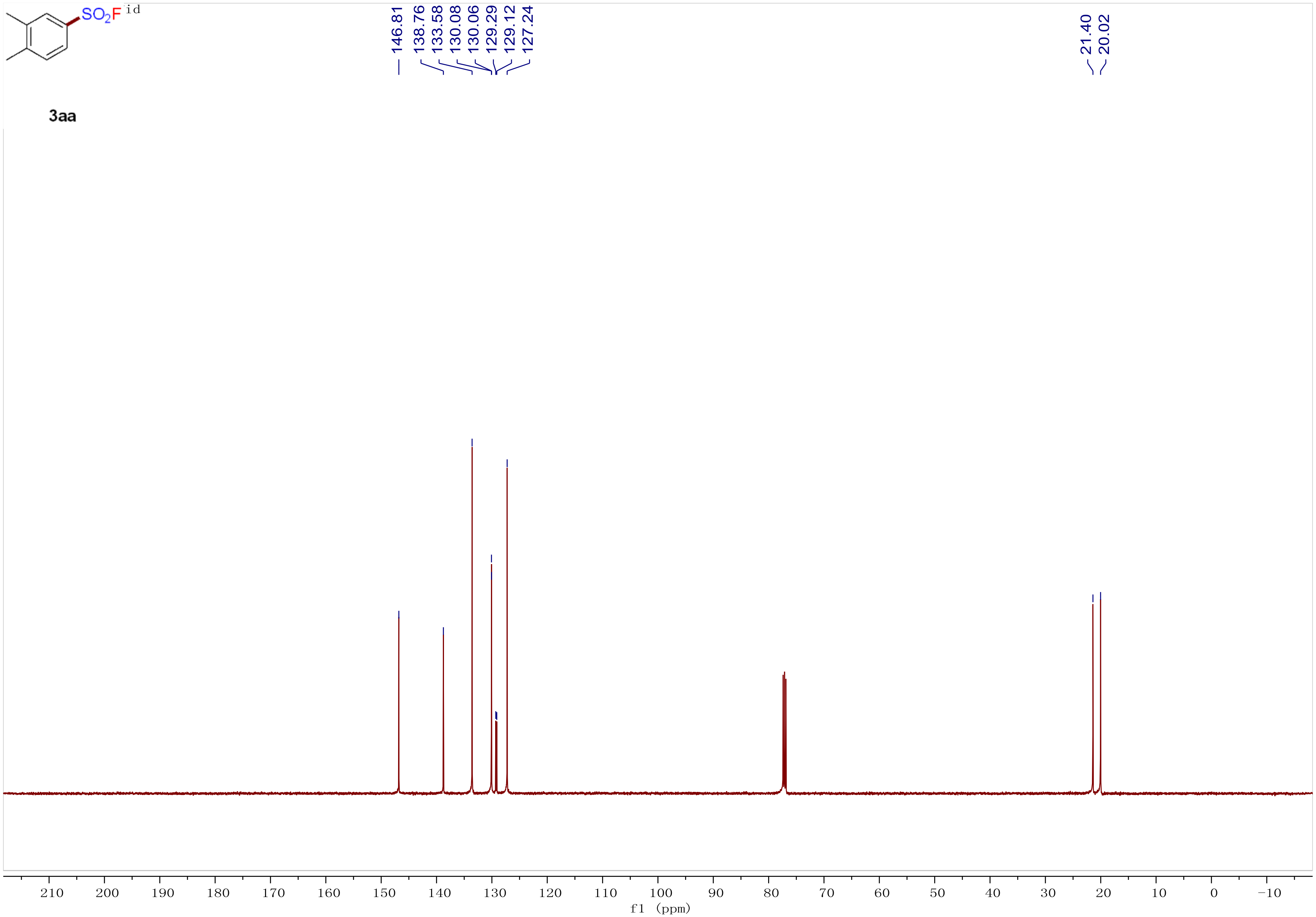

05072023-22.1.fid
7.91
7.90
7.89
7.89
7.73
7.72
7.71
7.70
7.69
7.15
7.13
7.12
7.11
7.09
3.99
OMe
SO2F
3z
0.97
0.98
1.99
3.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
f1 (ppm)

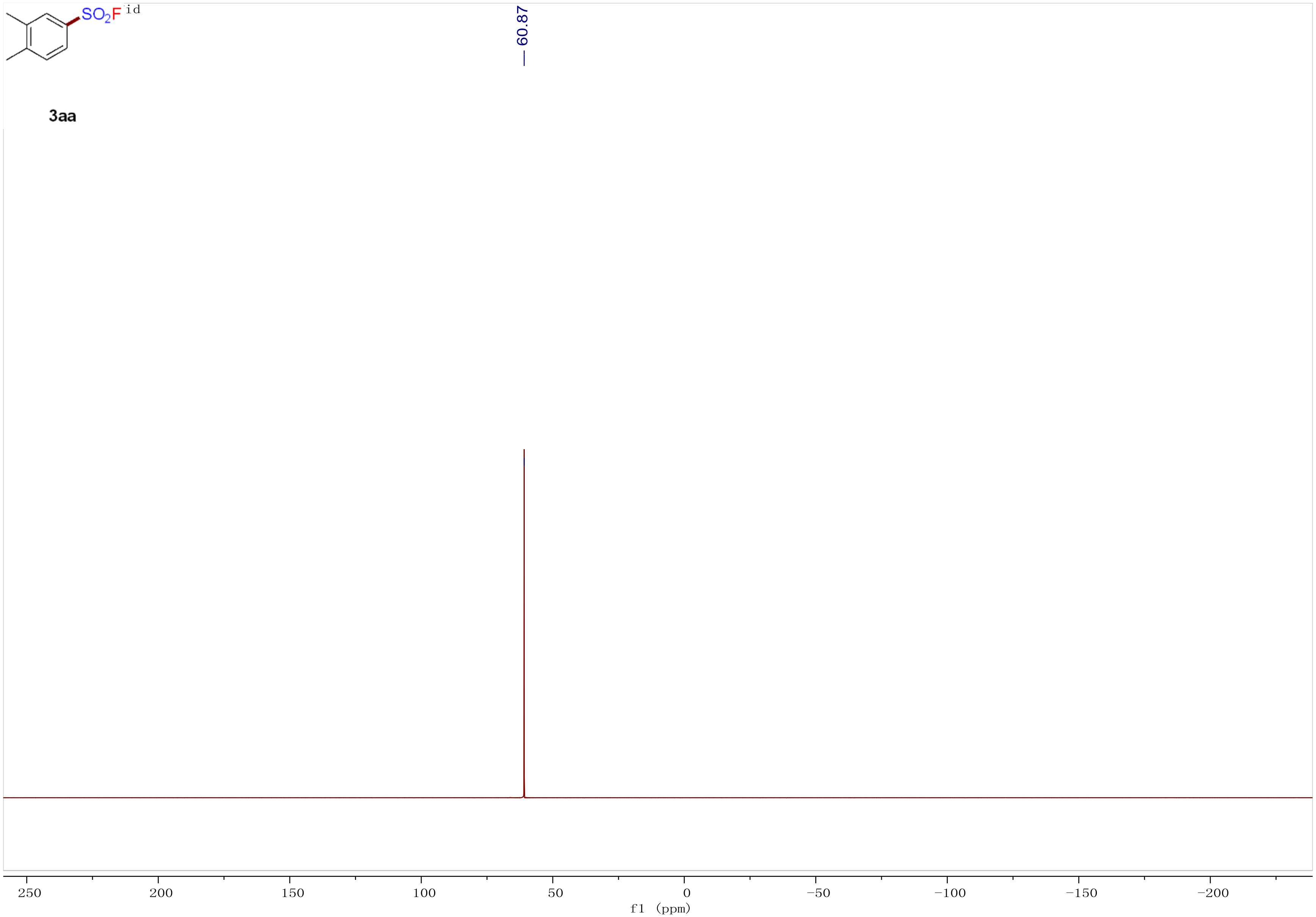

OMe
SO2F
3z
2.fid
158.04
137.63
130.98
121.16
120.98
120.51
112.96
56.51
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


3.fid
OMe
SO2F
3z
58.62
250
200
150
100
50
0
−50
−100
−150
−200
f1 (ppm)

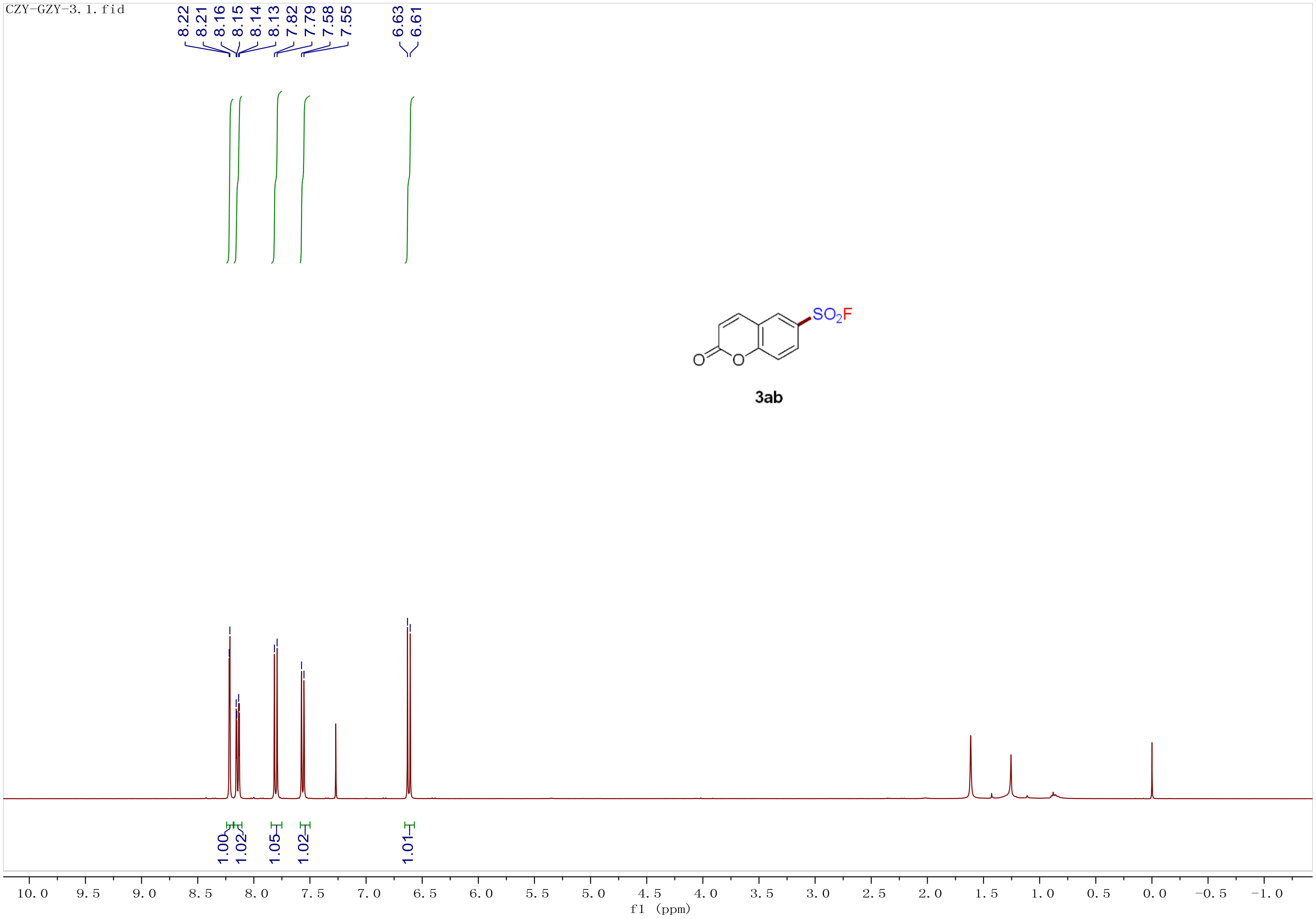

3aa
SO2F
id
7.87
7.85
7.22
7.18
7.17
2.61
2.41
1.00
0.72
0.94
2.96
3.43
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1
f1 (ppm)

3aa

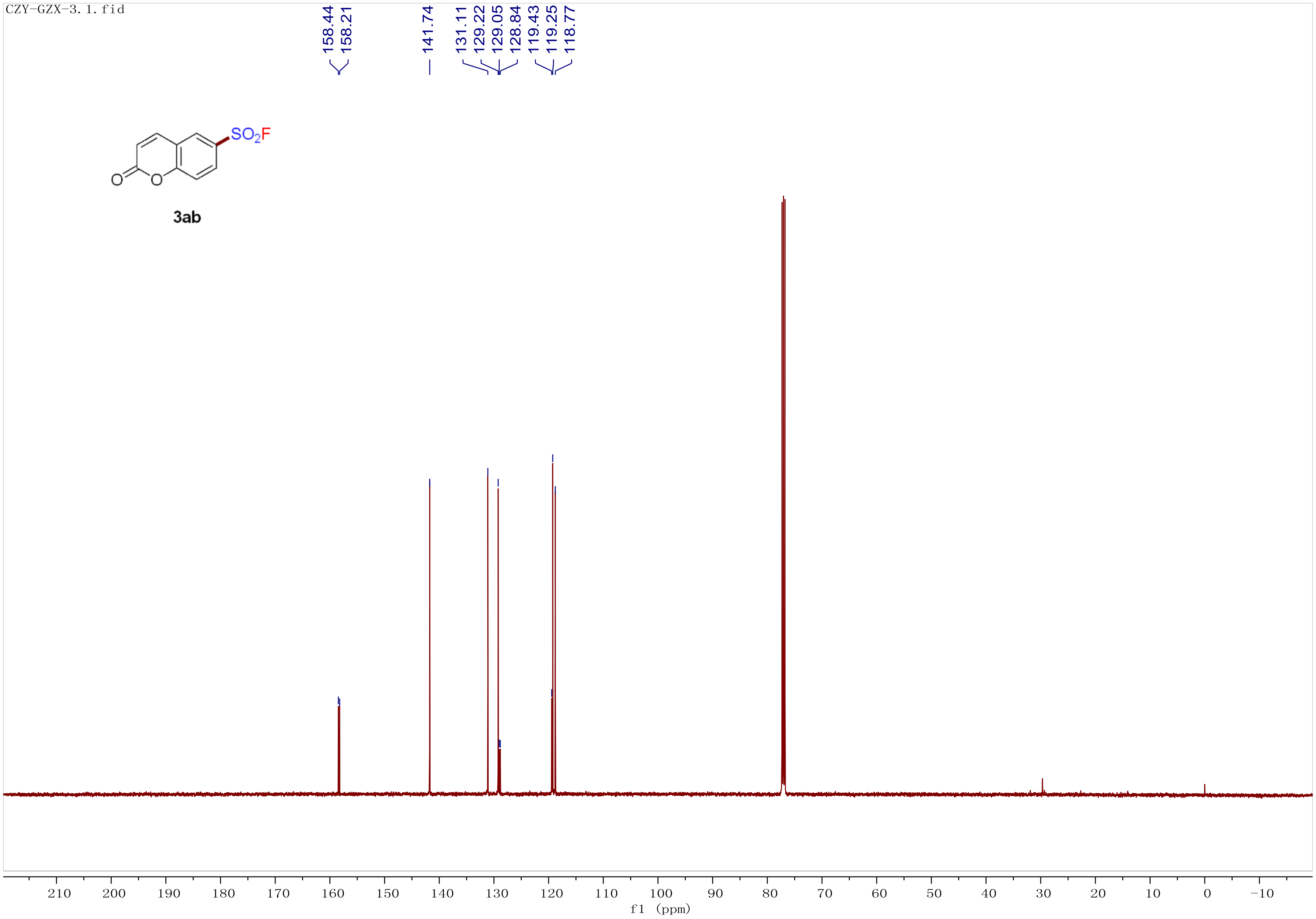

id
146.81
138.76
133.58
130.08
130.06
129.29
129.12
127.24
21.40
20.02
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)



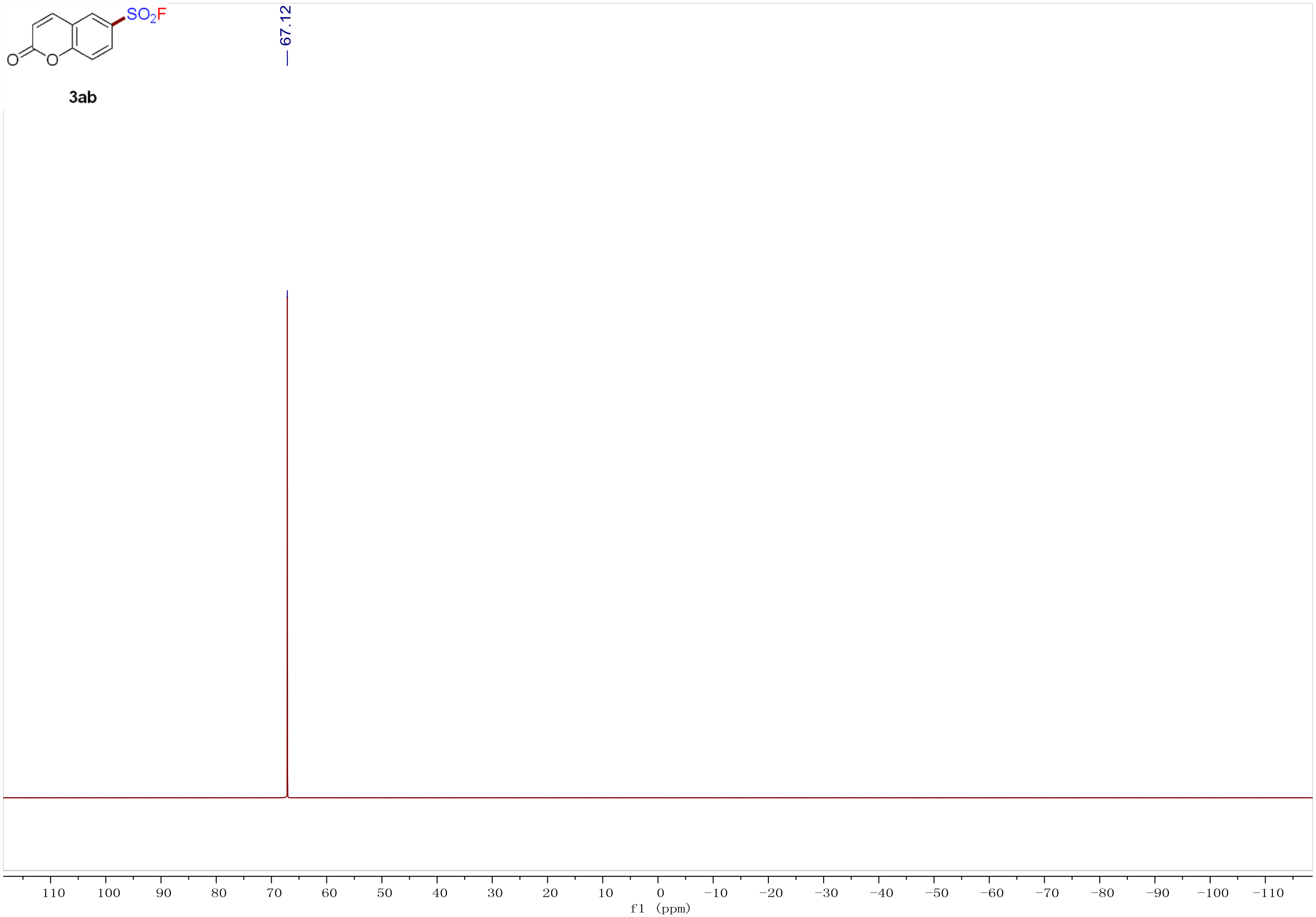
3aa


CZY-GZY-3.1.fid
8.22
8.21
8.16
8.15
8.14
8.13
7.82
7.79
7.58
7.55
6.63
6.61
SO2F
O
O
1.00
1.02
1.05
1.02
1.01
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

3ab

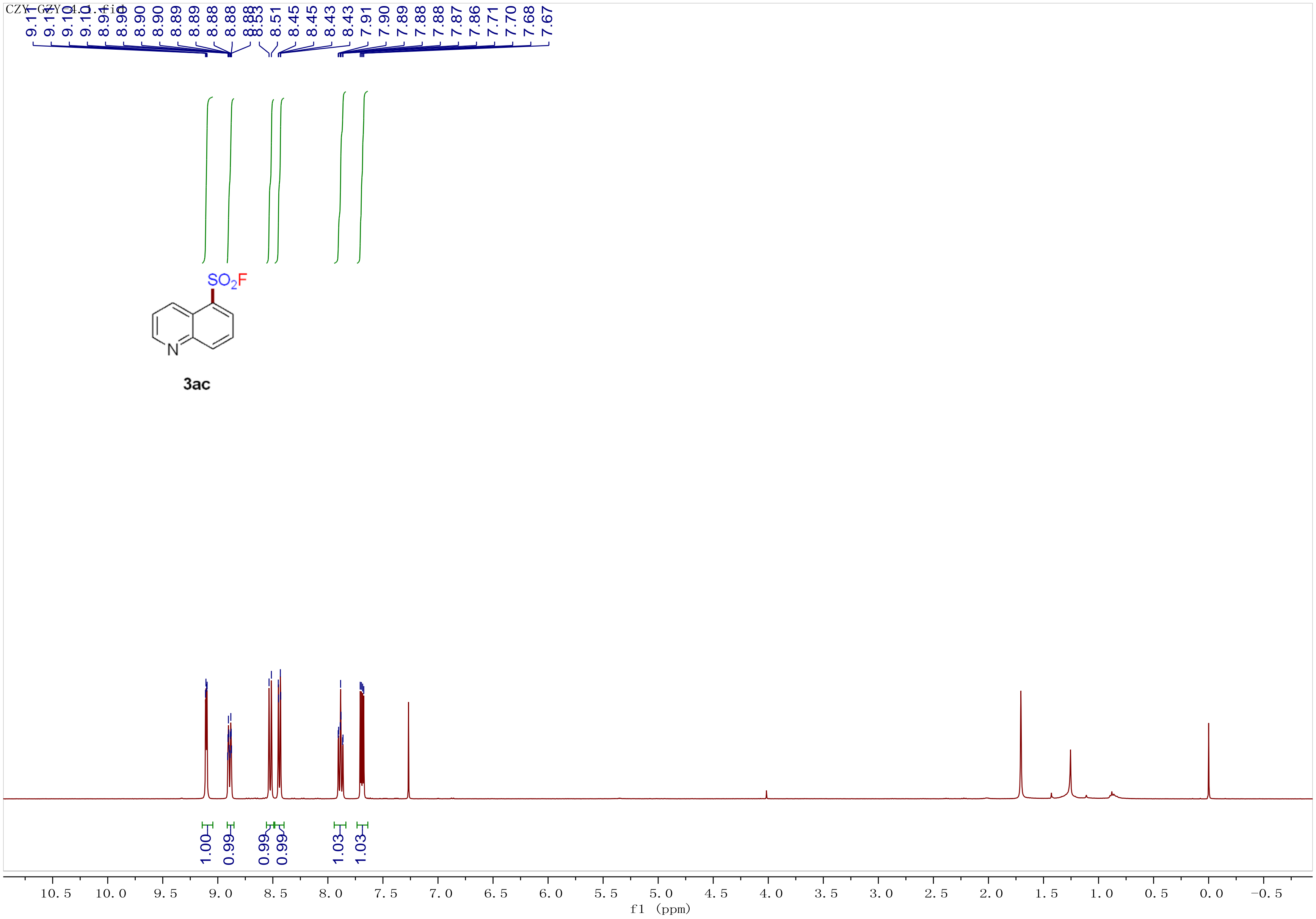

CZY-GZX-3.1.fid
158.44
158.21
141.74
131.11
129.22
129.05
128.84
119.43
119.25
118.77
SO2F
O
O
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

3ab

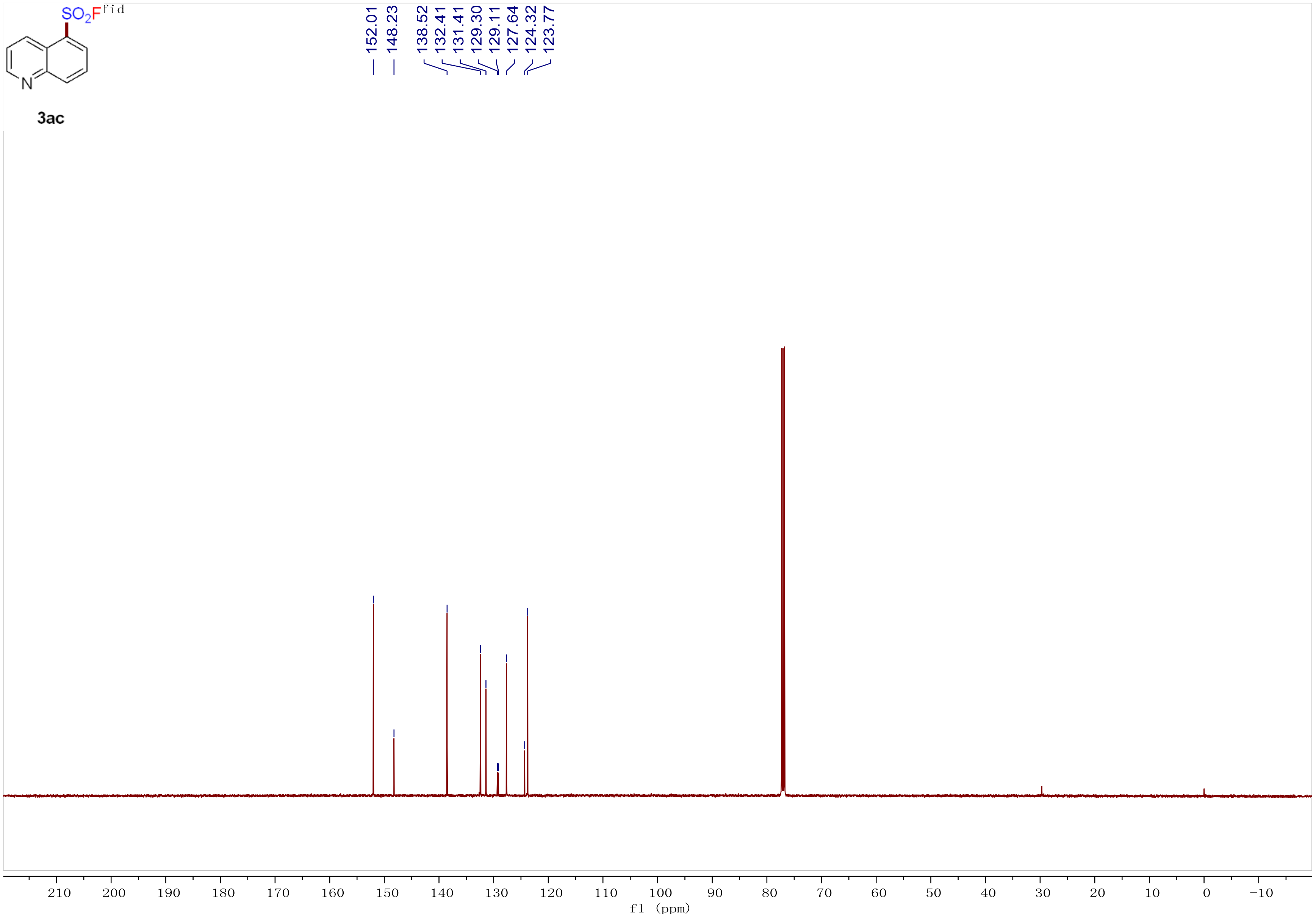


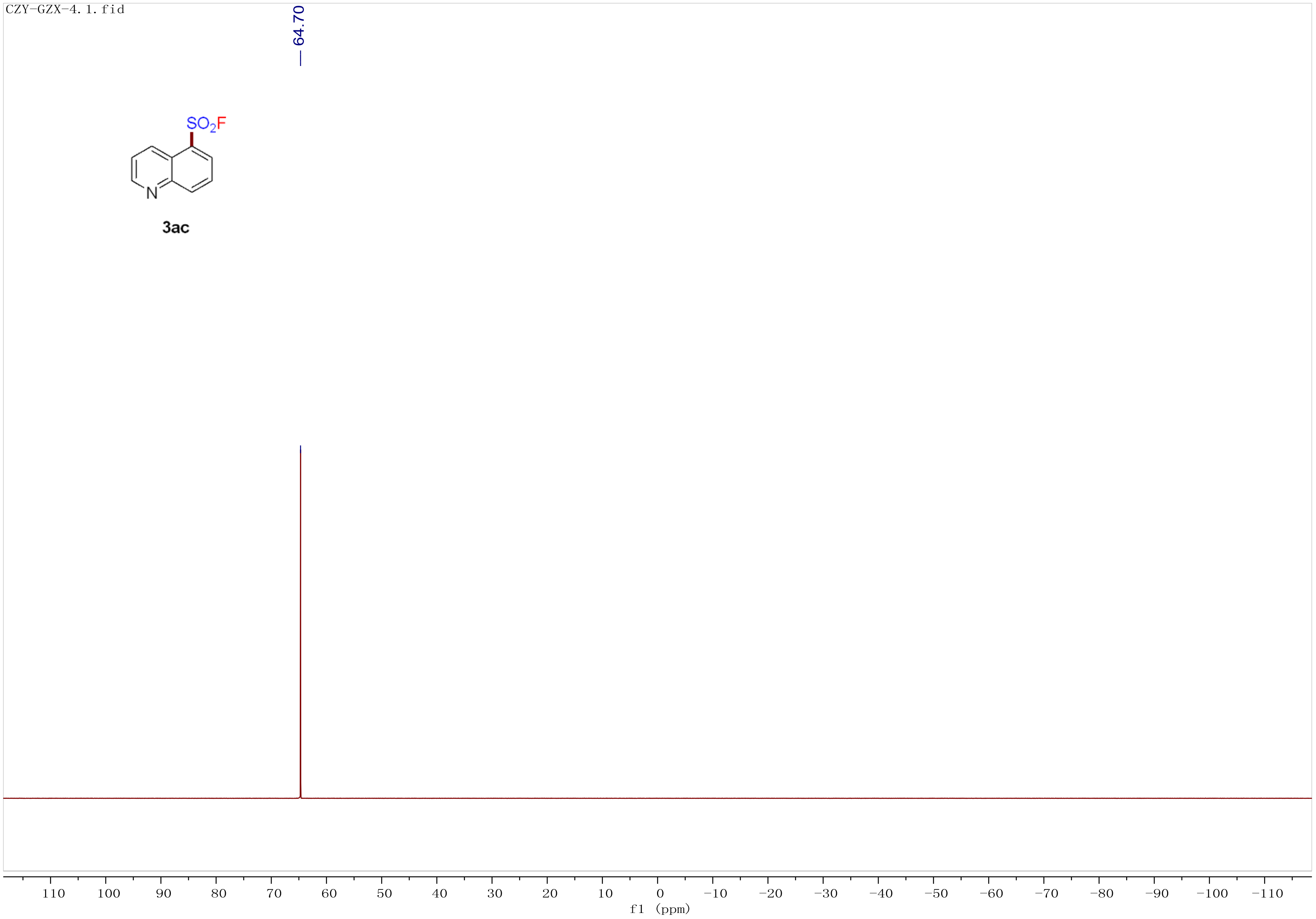
3ab

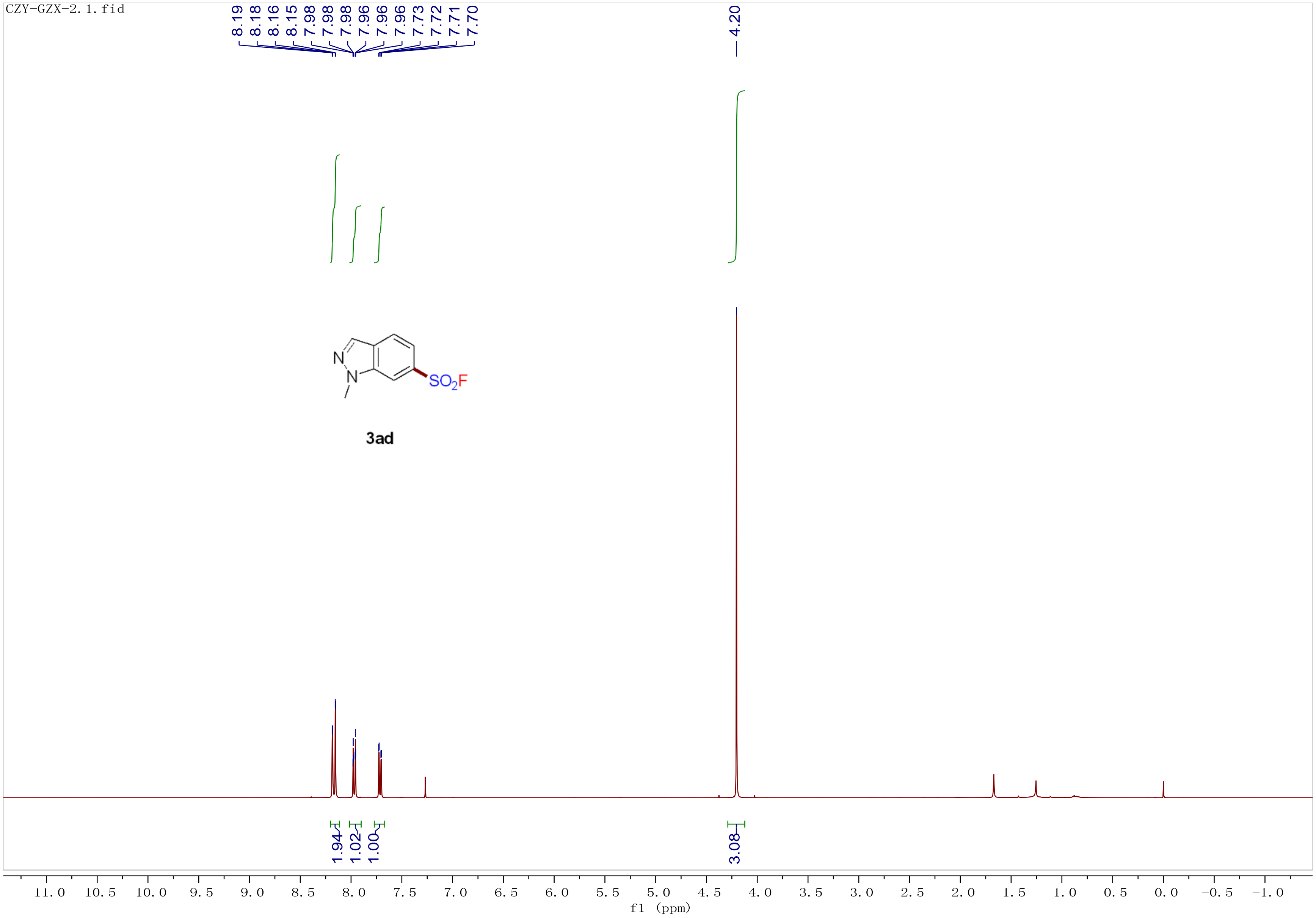
SO2F
O
O
67.12
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
f1 (ppm)

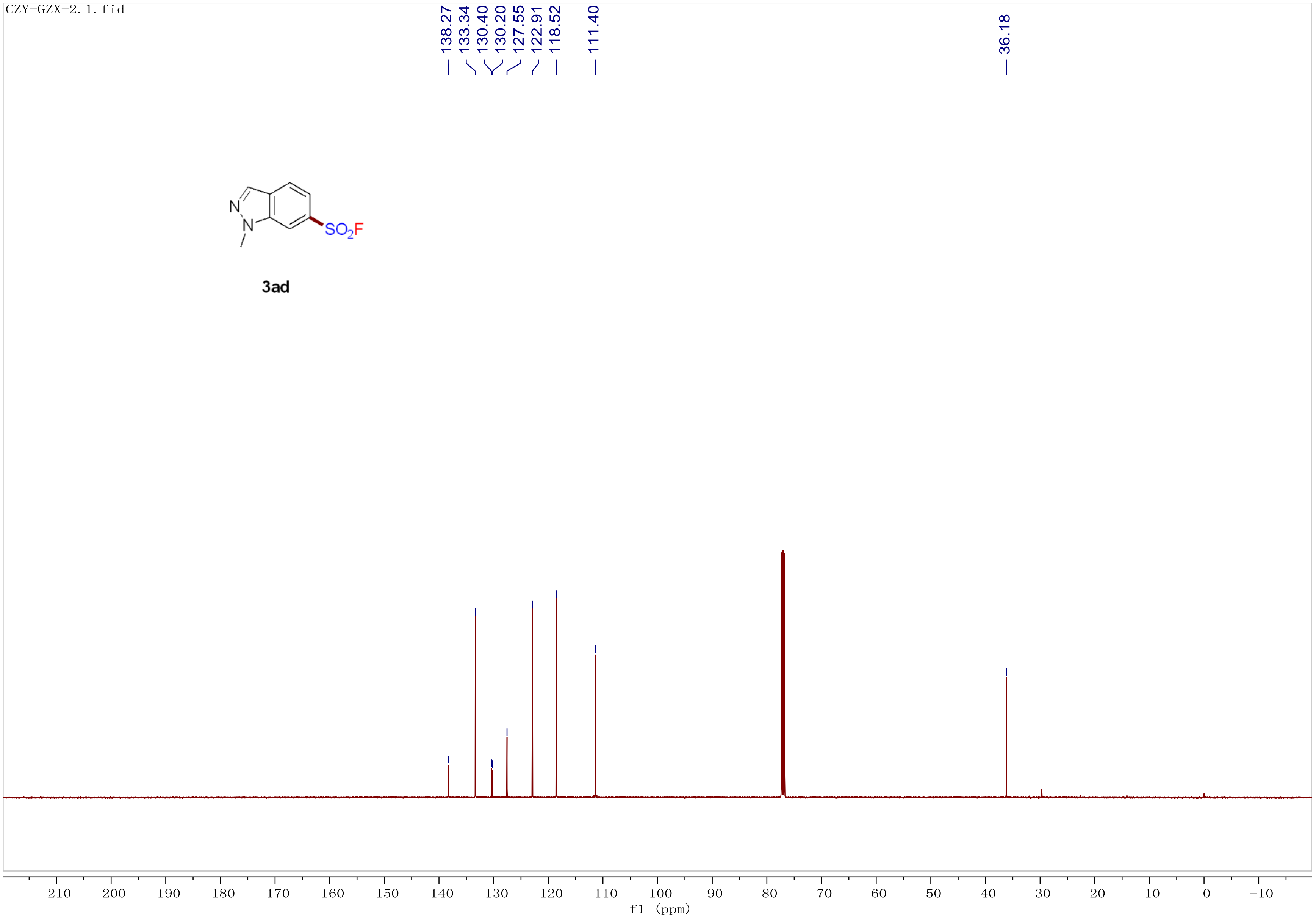

CZY-GZY-4.1.fid
9.11
9.11
9.10
9.10
8.91
8.90
8.90
8.90
8.89
8.89
8.88
8.88
8.88
8.53
8.51
8.45
8.45
8.43
8.43
7.91
7.90
7.89
7.88
7.88
7.87
7.86
7.71
7.70
7.68
7.67
SO2F
N
1.00
0.99
0.99
0.99
1.03
1.03
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

3ac

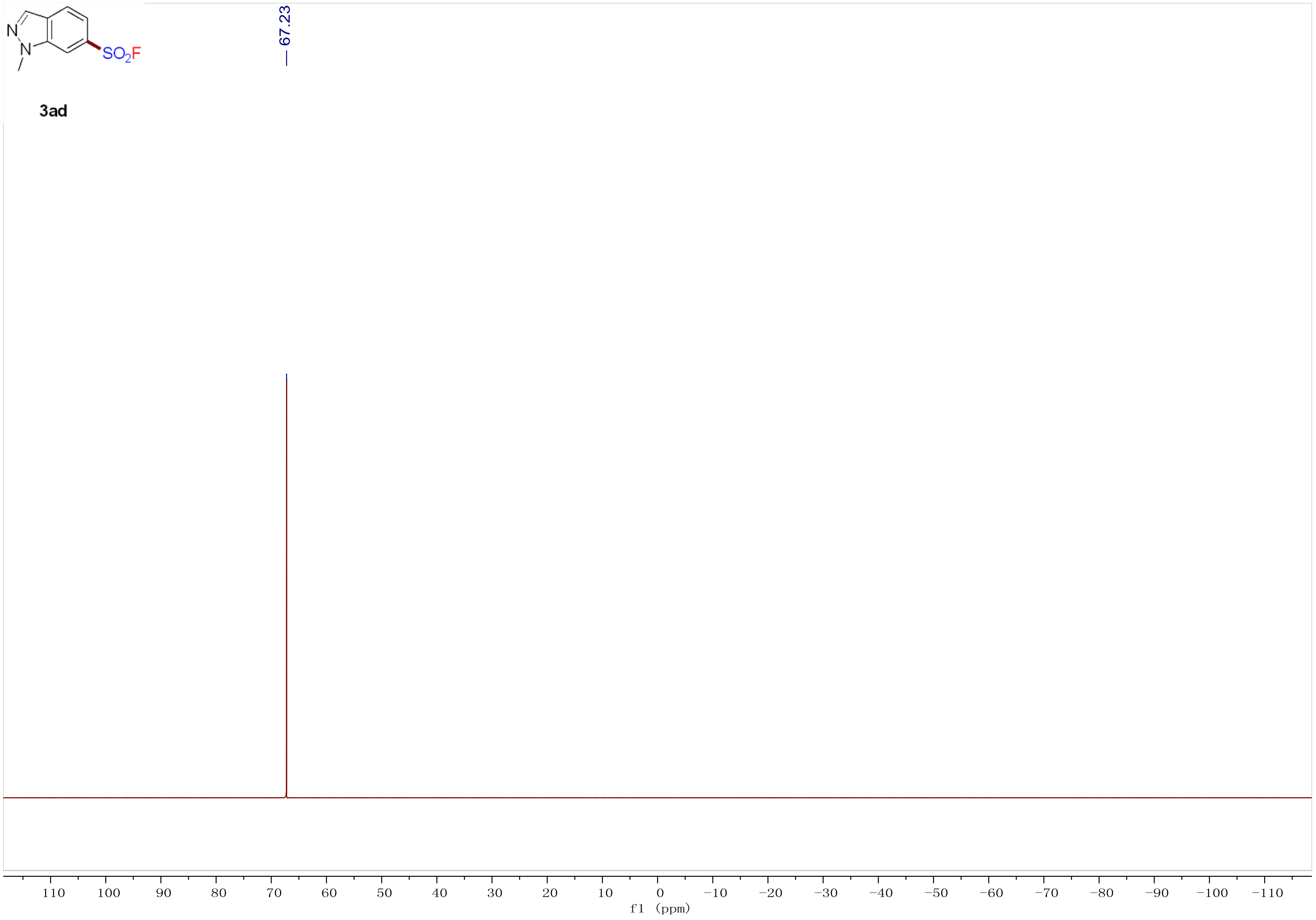

3ac
SO$_2$F
N
fid
152.01
148.23
138.52
132.41
131.41
129.30
129.11
127.64
124.32
123.77
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

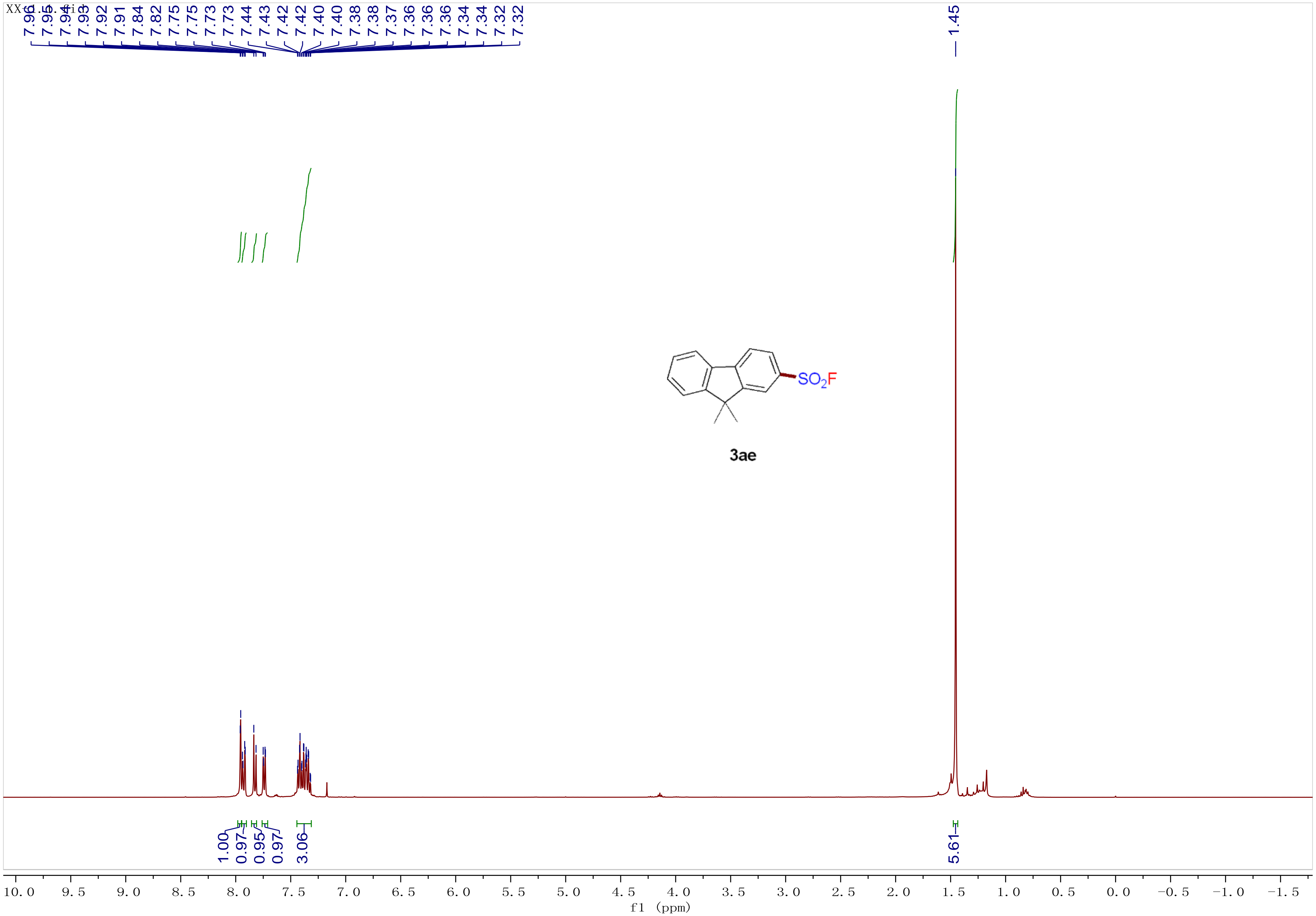

CZY-GZX-4.1.fid
64.70
SO2F
N
3ac
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
f1 (ppm)

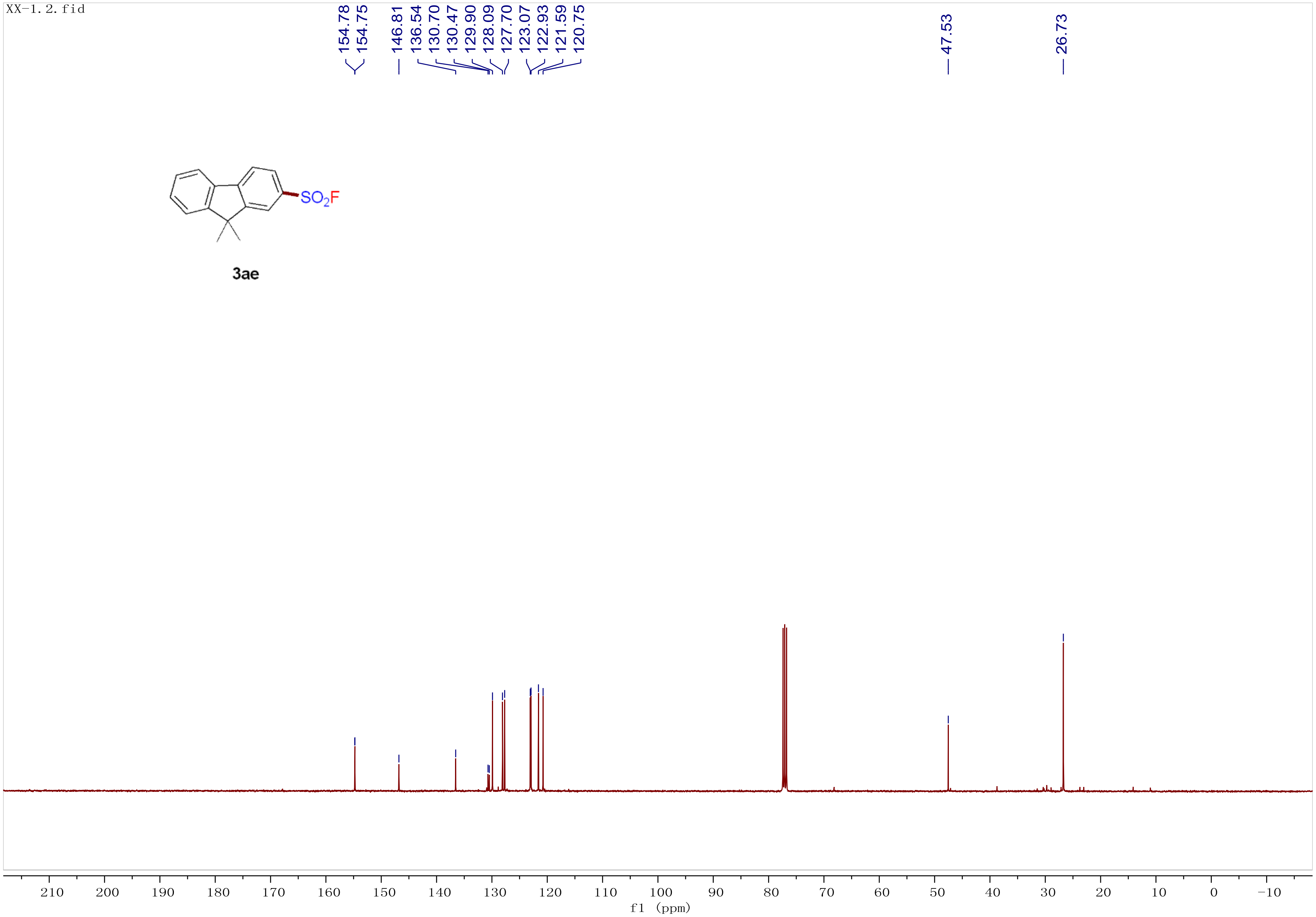

CZY-GZX-2.1.fid
8.19
8.18
8.16
8.15
7.98
7.98
7.98
7.96
7.96
7.96
7.73
7.72
7.71
7.70
4.20
N
N
SO2F
3ad
1.94
1.02
1.00
3.08
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)


CZY-GZX-2.1.fid
138.27
133.34
130.40
130.20
127.55
122.91
118.52
111.40
36.18
N
N
SO2F
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

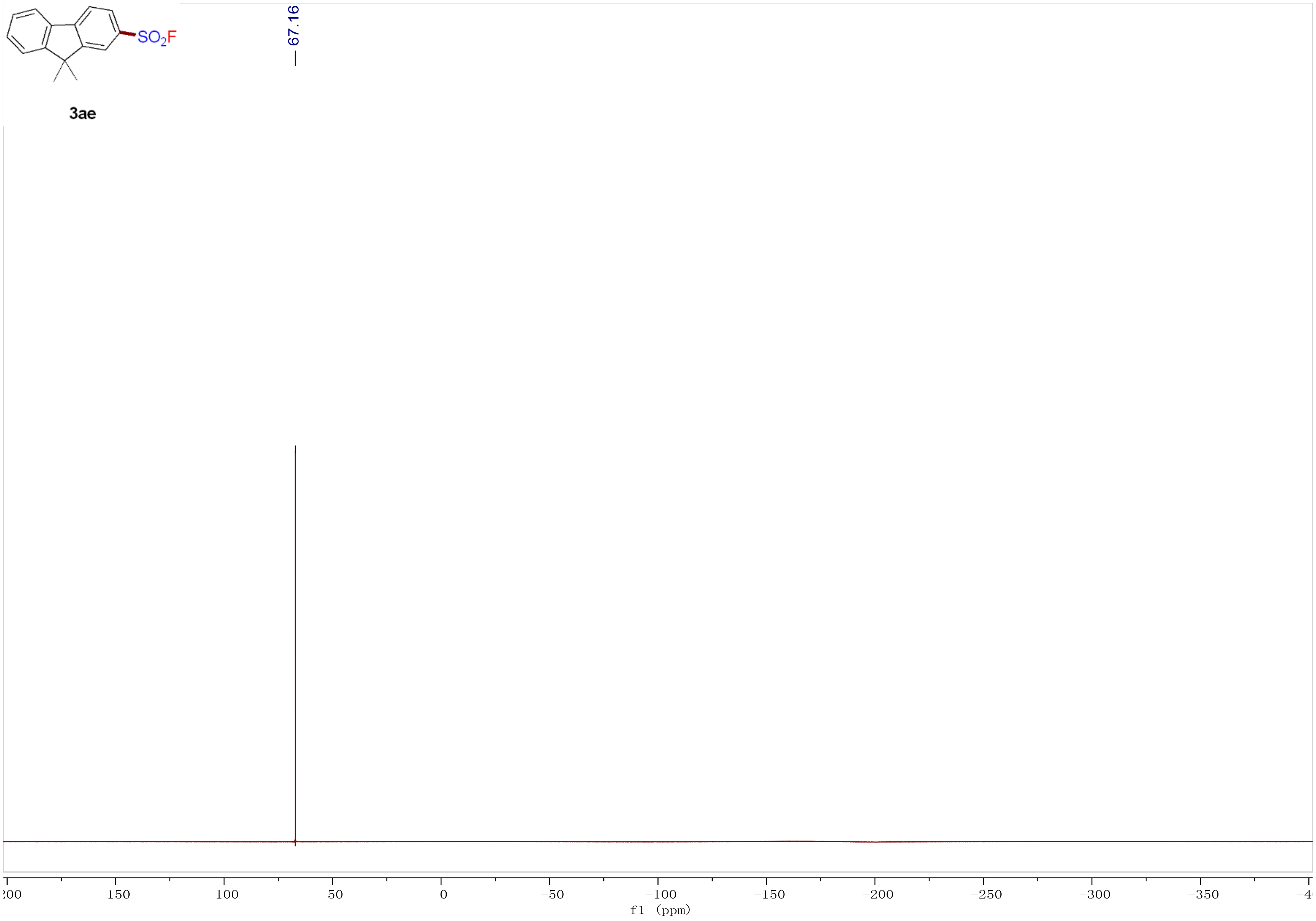
3ad


N
N
SO2F
3ad
67.23
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)

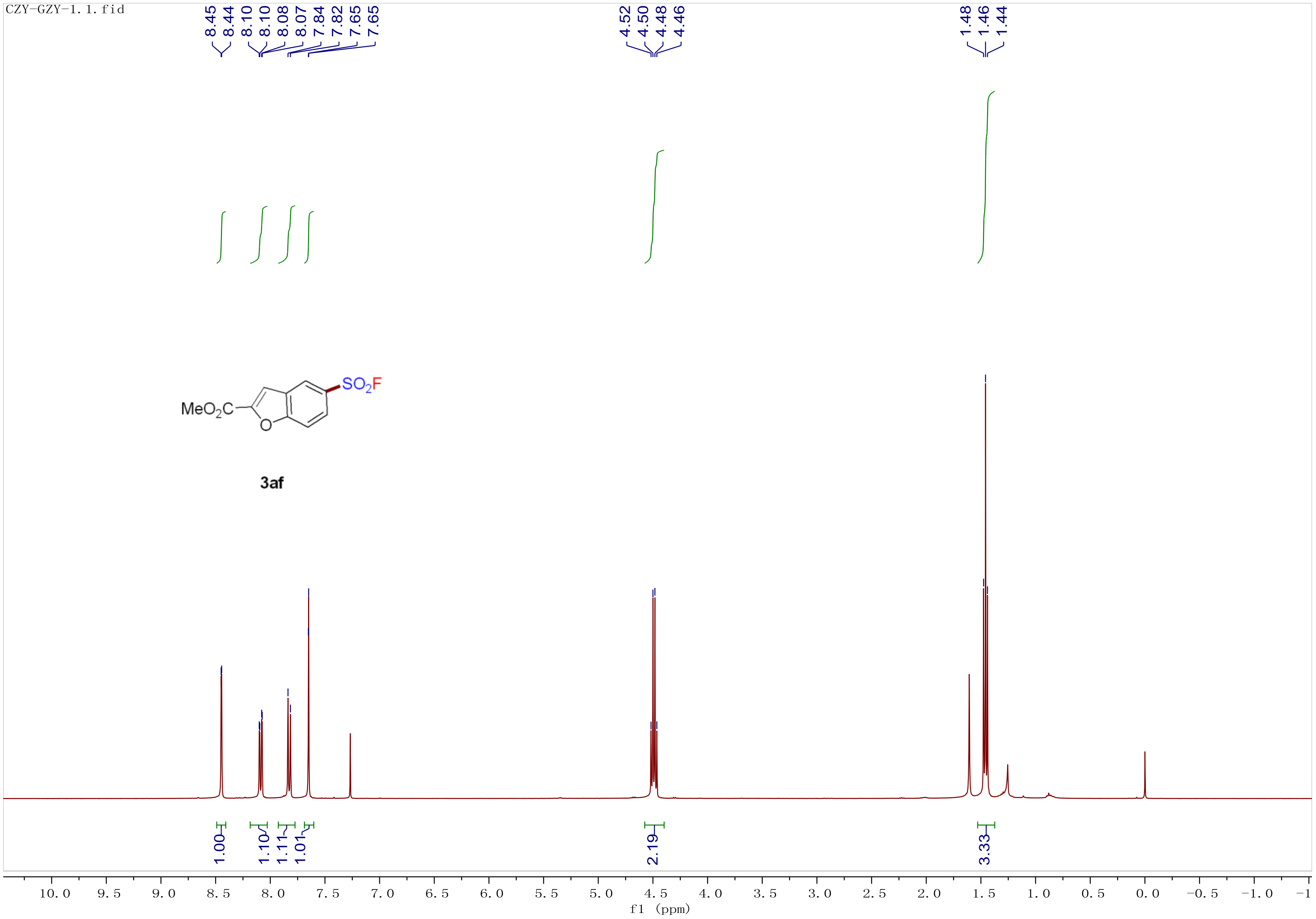

7.96
7.95
7.94
7.93
7.92
7.91
7.84
7.82
7.75
7.75
7.73
7.73
7.44
7.43
7.42
7.42
7.40
7.40
7.38
7.38
7.37
7.36
7.36
7.34
7.34
7.32
7.32
1.45
SO2F
3ae
1.00
0.97
0.95
0.97
3.06
5.61
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
f1 (ppm)

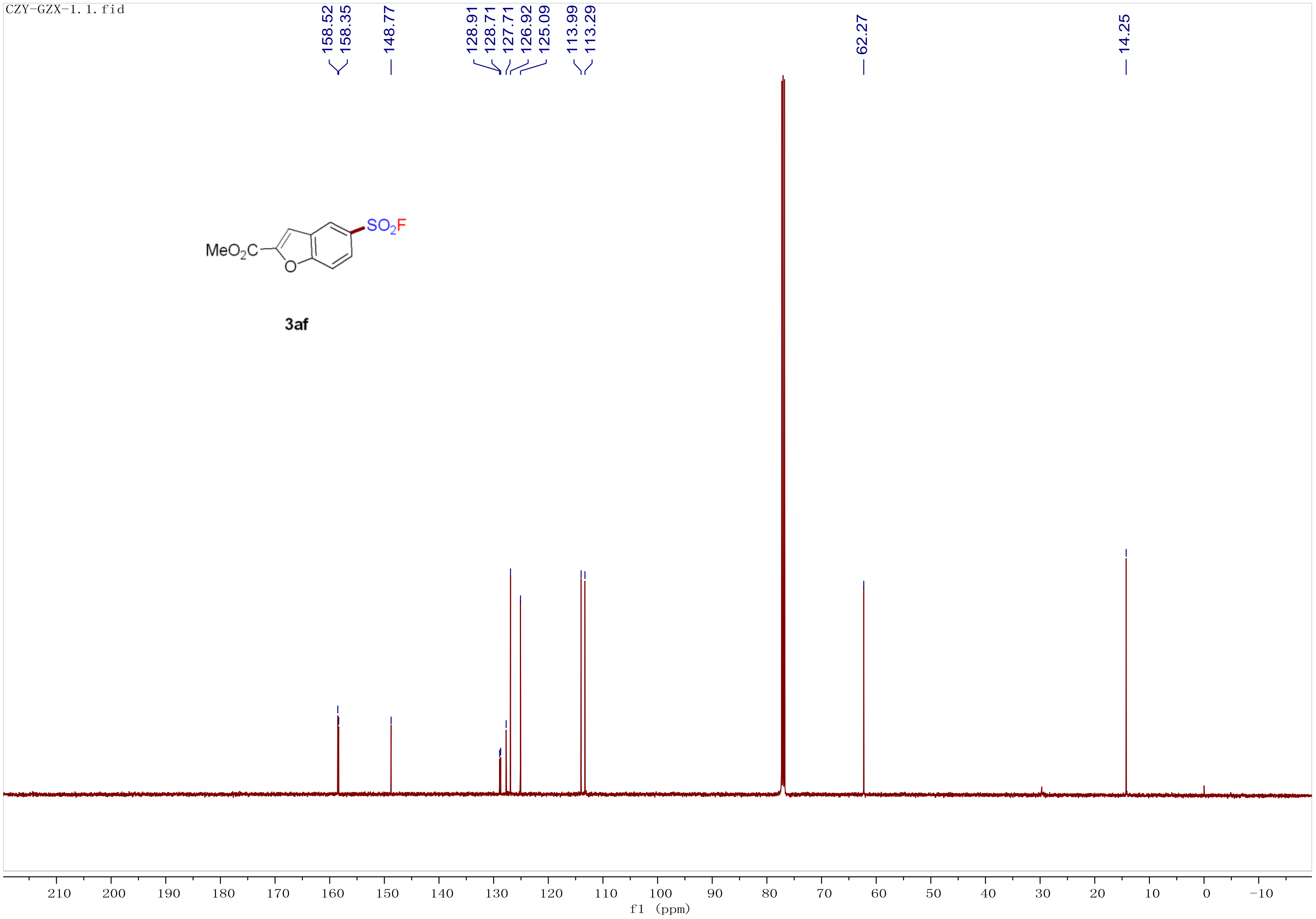

XX-1.2.fid
154.78
154.75
146.81
136.54
130.70
130.47
129.90
128.09
127.70
123.07
122.93
121.59
120.75
47.53
26.73
SO_2F
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

3ae

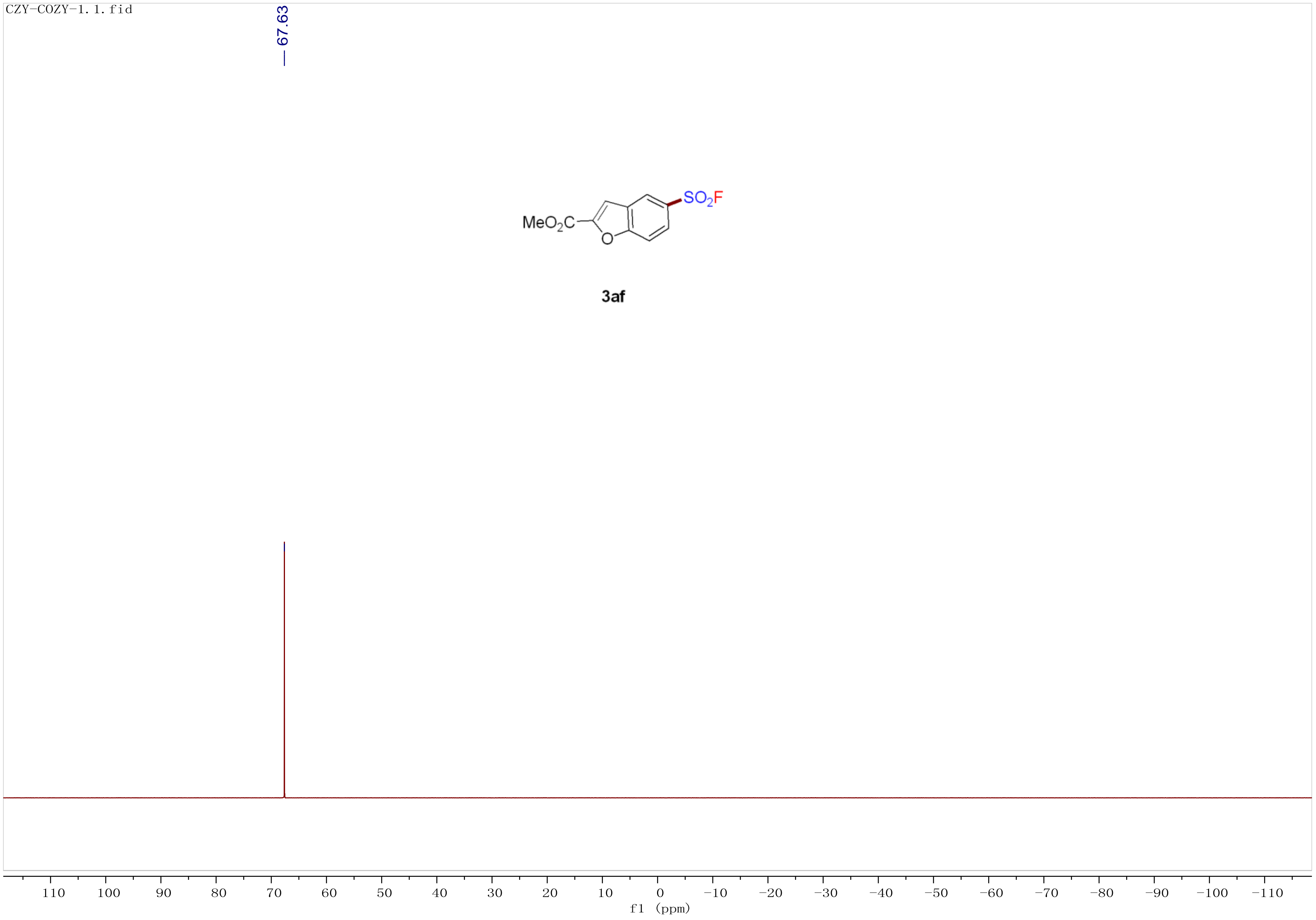


3ae

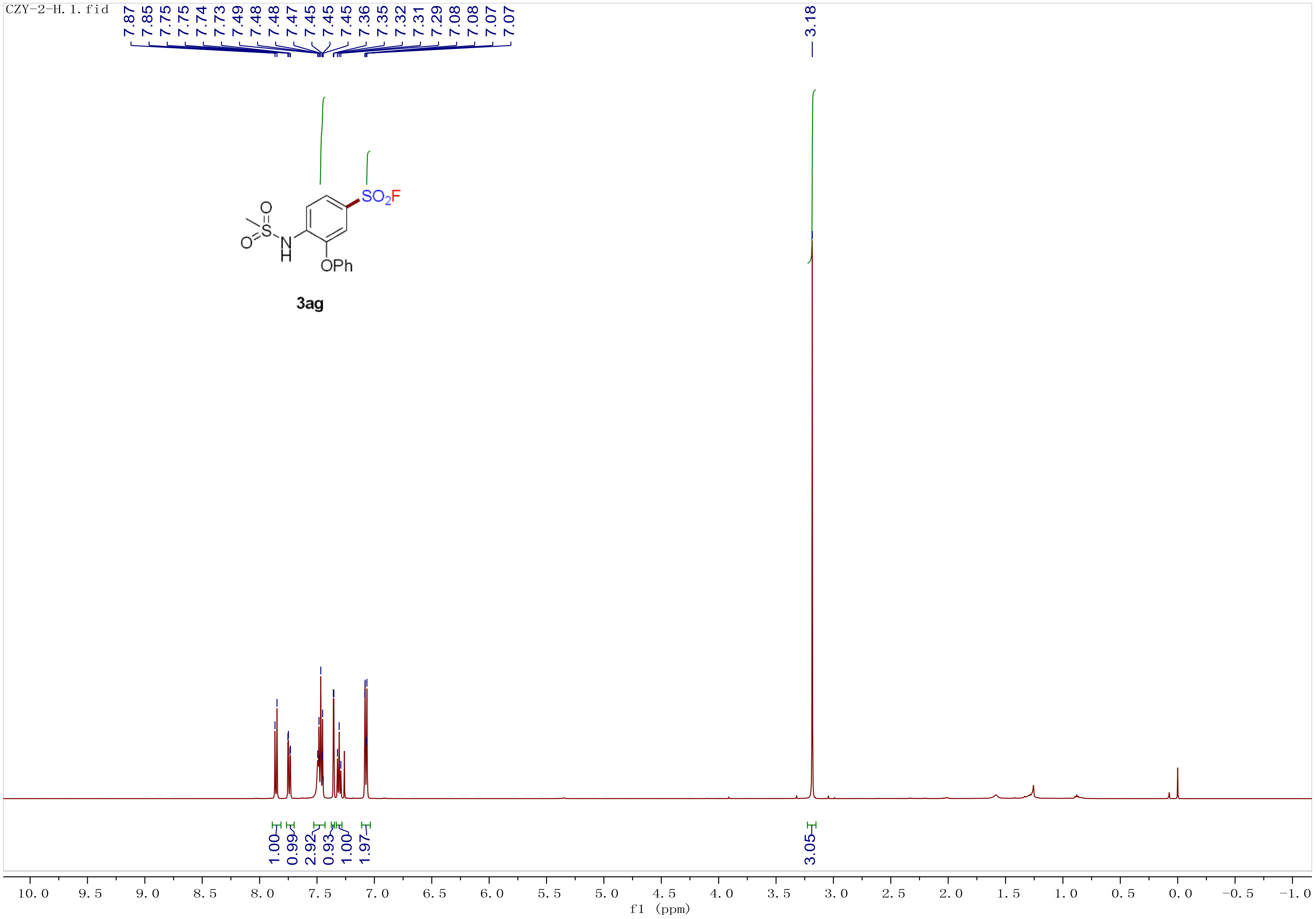

CZY-GZY-1.1.fid
8.45
8.44
8.10
8.08
8.07
7.84
7.82
7.65
7.65
4.52
4.50
4.48
4.46
1.48
1.46
1.44
MeO2C
O
SO2F
3af
1.00
1.10
1.11
1.01
2.19
3.33
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1
f1 (ppm)

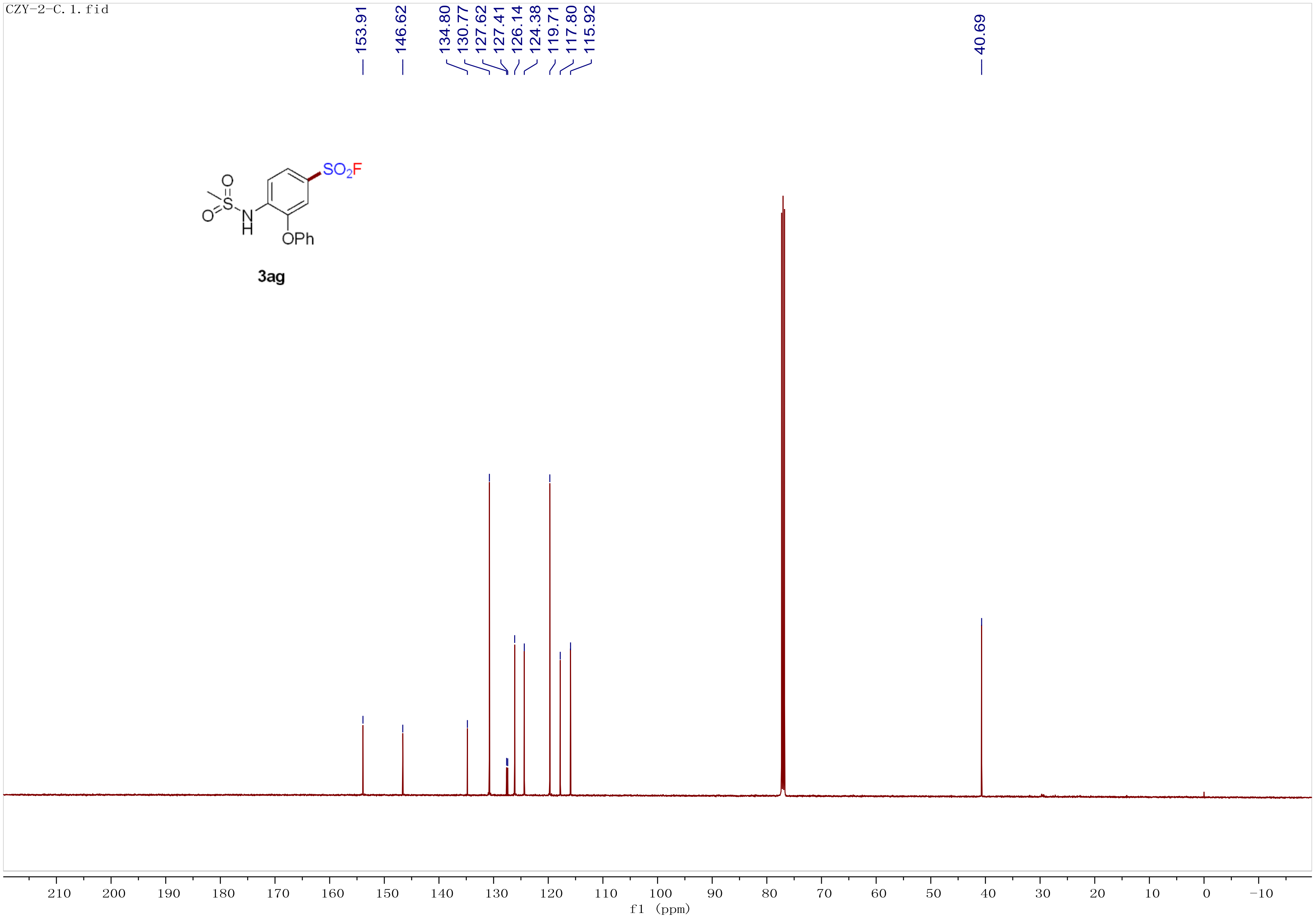

CZY-GZX-1.1.fid
158.52
158.35
148.77
128.91
128.71
127.71
126.92
125.09
113.99
113.29
62.27
14.25
MeO2C
SO2F
O
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

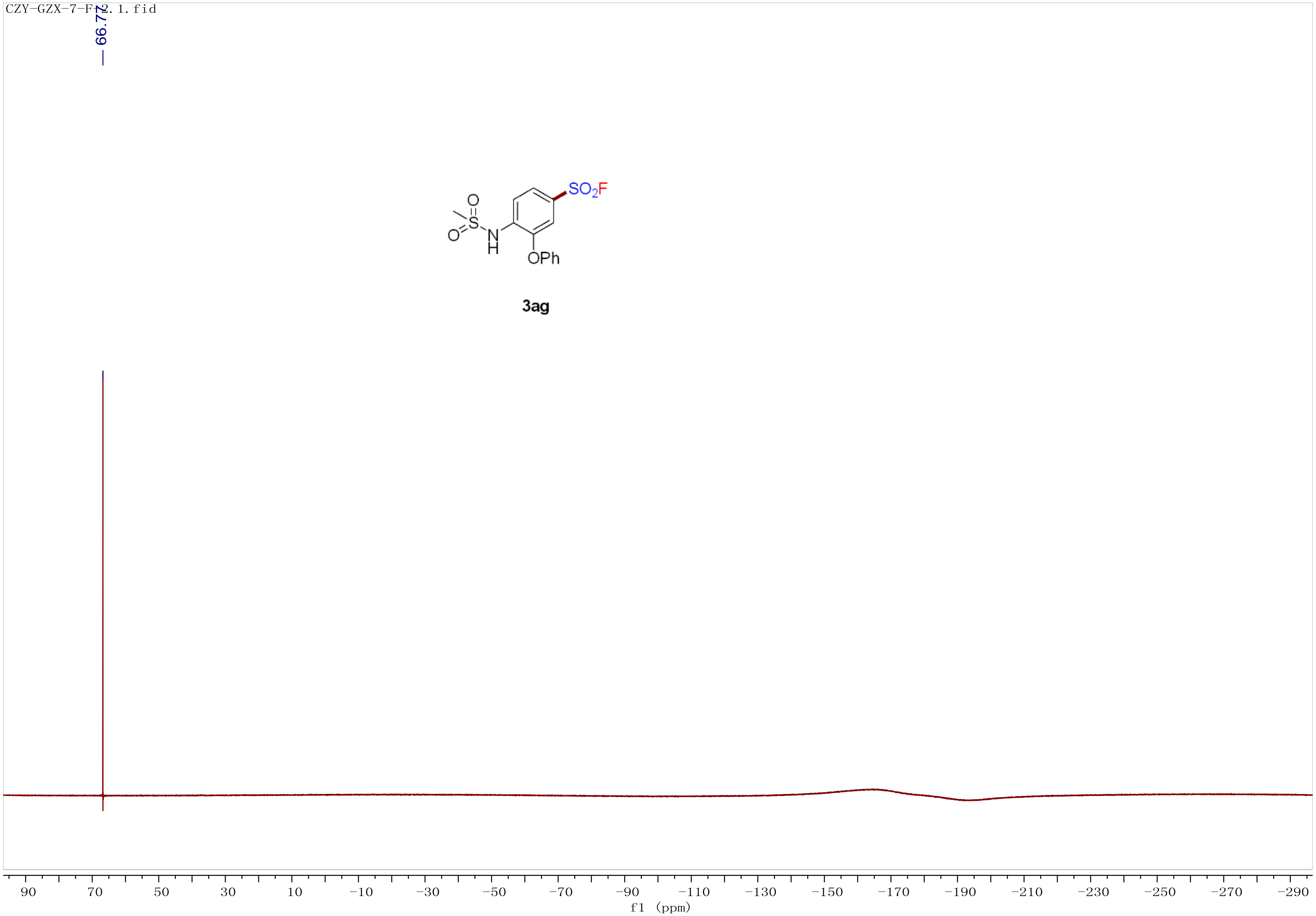
3af

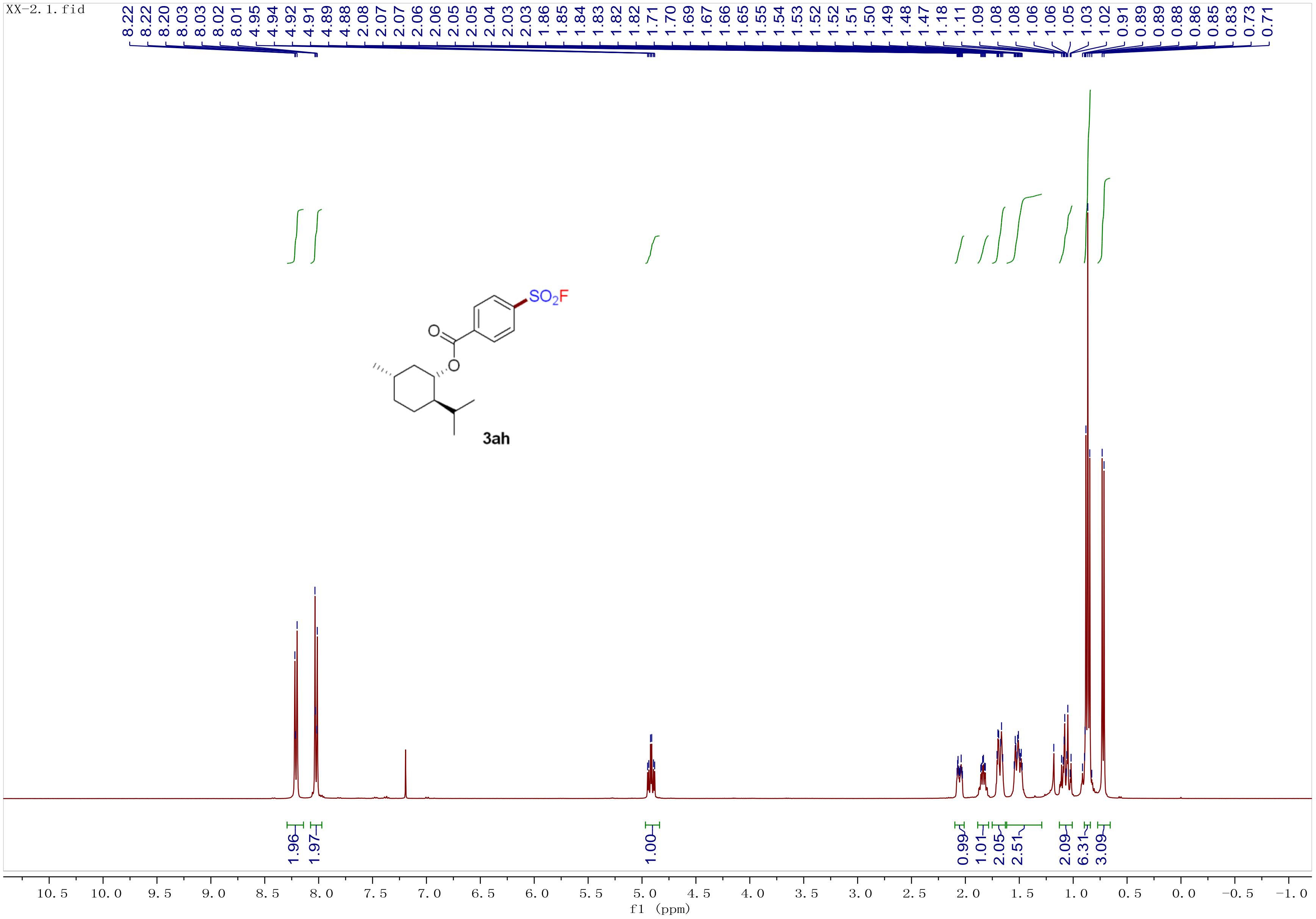

CZY-COZY-1.1.fid
67.63
MeO2C
O
SO2F
110
100
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
f1 (ppm)

3af

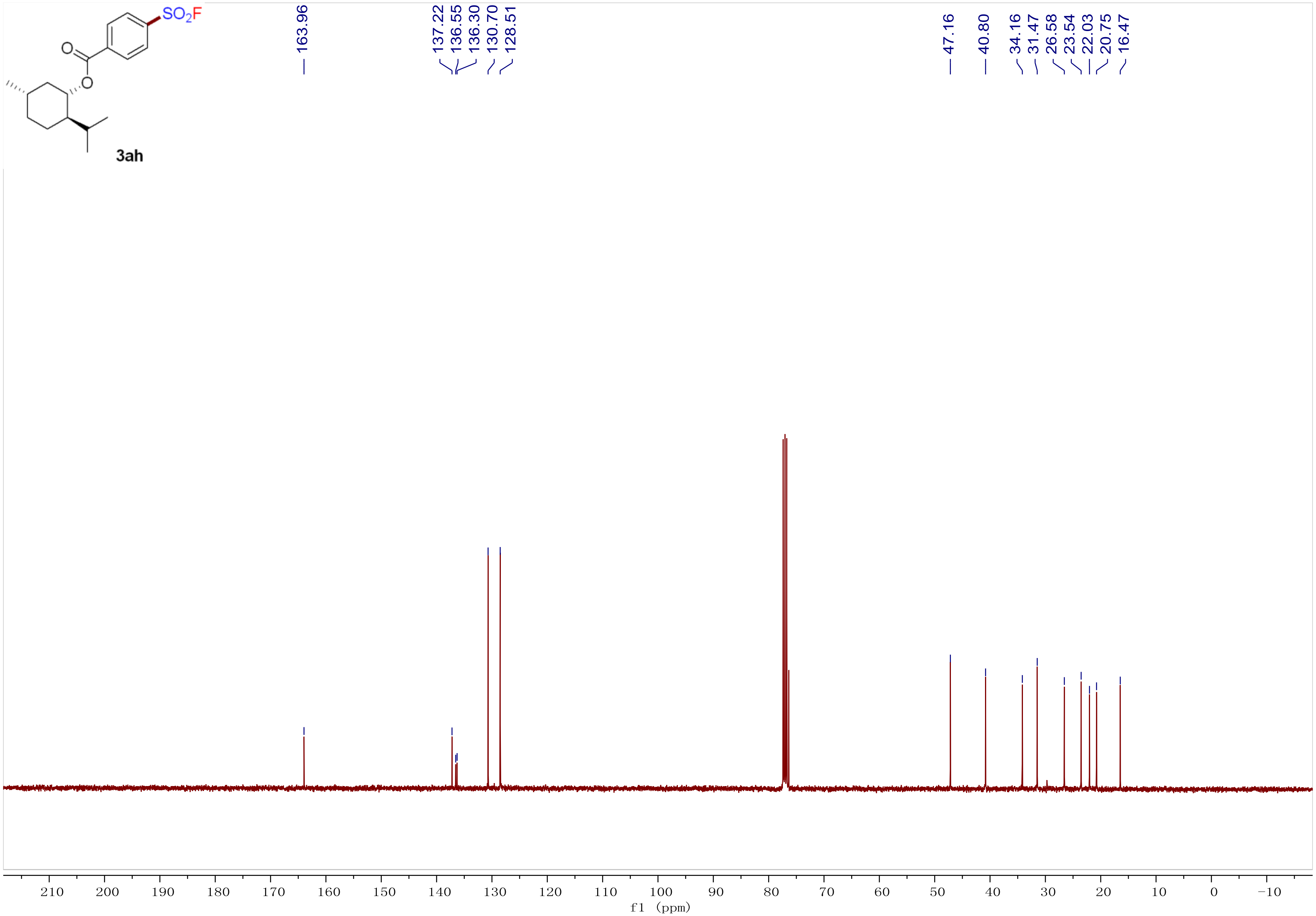

CZY-2-H.1.fid
7.87
7.85
7.75
7.75
7.74
7.73
7.49
7.48
7.48
7.47
7.45
7.45
7.45
7.36
7.35
7.32
7.31
7.29
7.08
7.08
7.07
7.07
3.18
SO2F
O
S
O
N
H
OPh
3ag
1.00
0.99
2.92
0.93
1.00
1.97
3.05
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

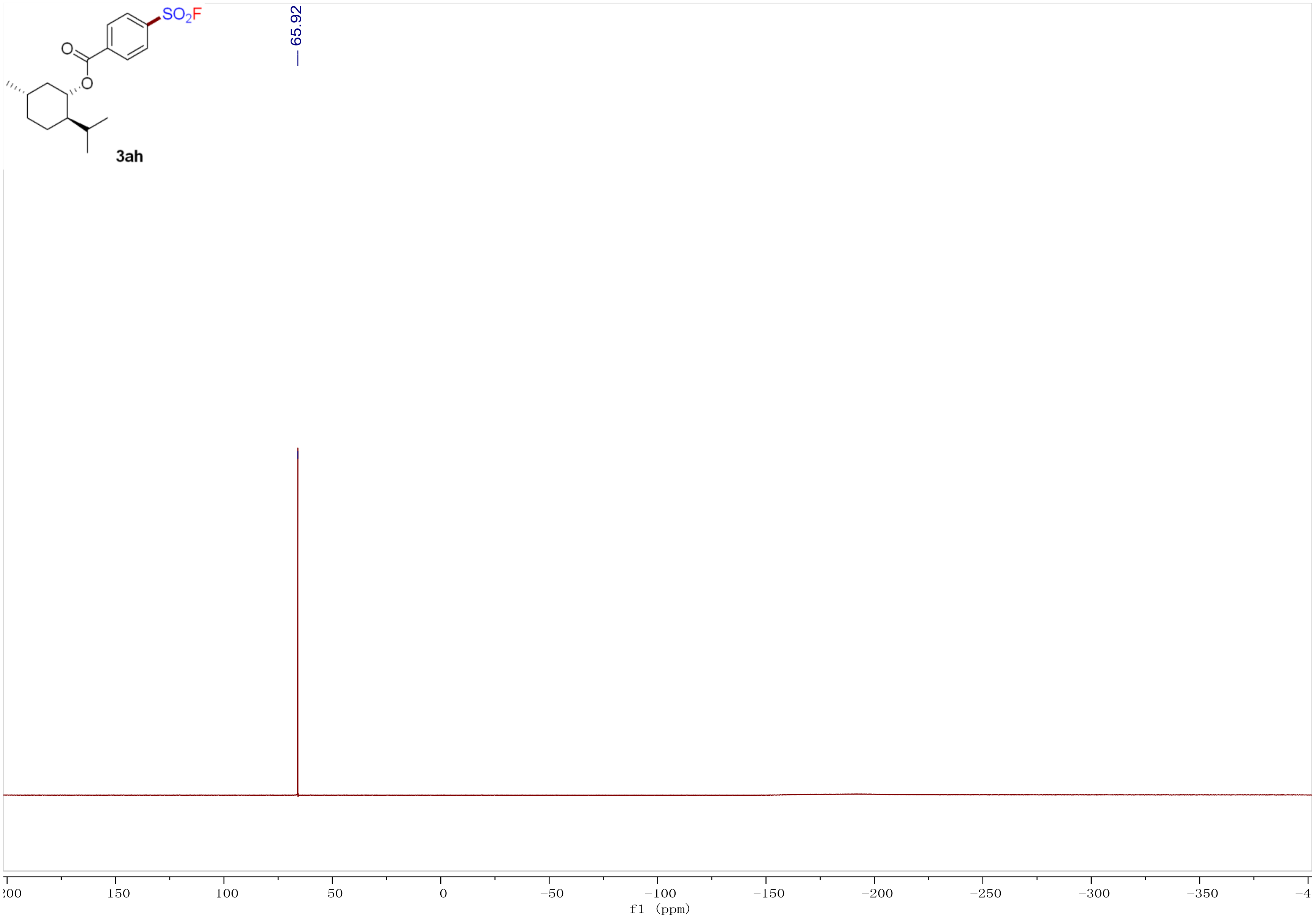

CZY-2-C.1.fid
153.91
146.62
134.80
130.77
127.62
127.41
126.14
124.38
119.71
117.80
115.92
40.69
SO2F
O
S
O
N
H
OPh
3ag
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

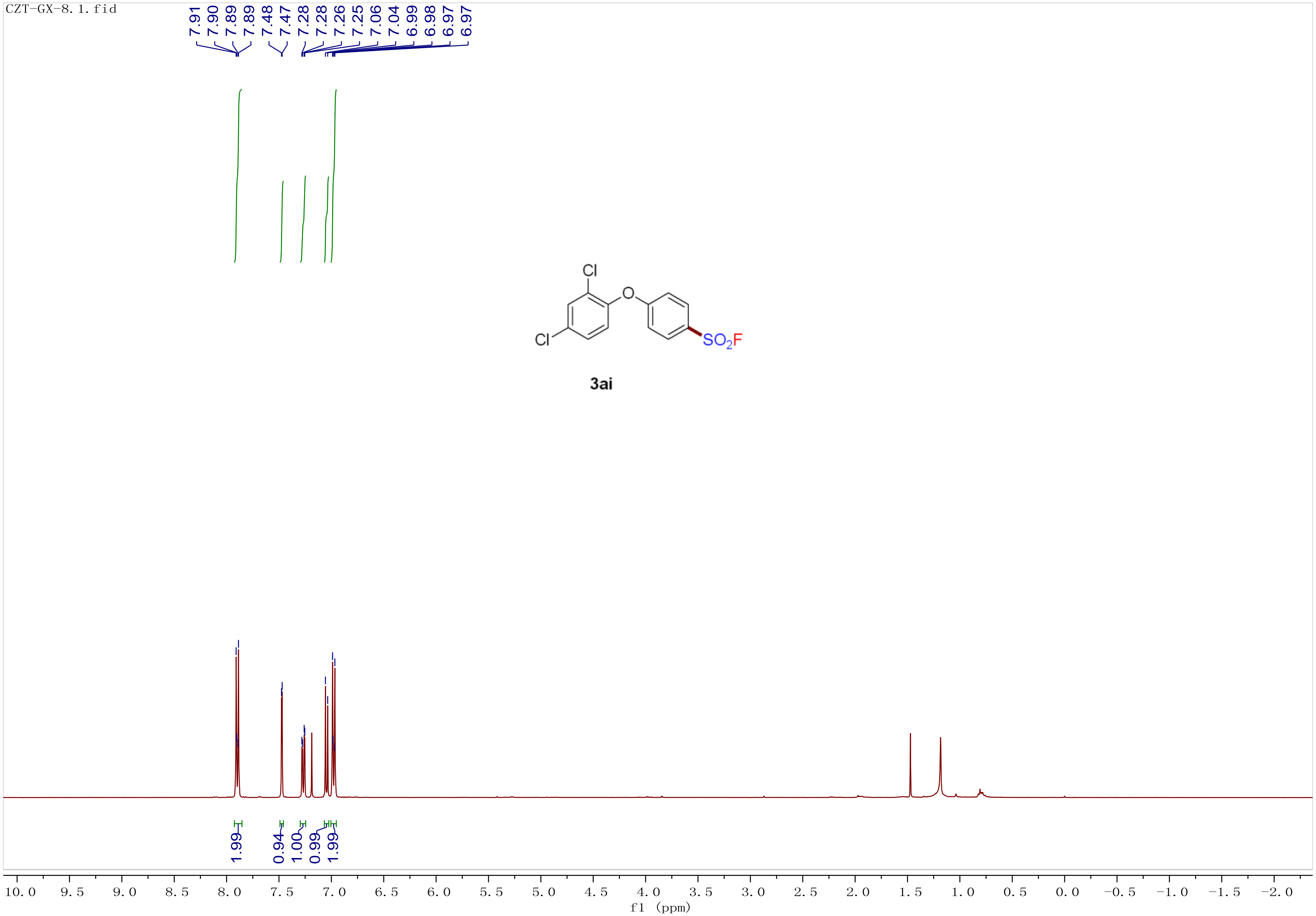

CZY-GZX-7-F-2.1.fid
66.77
SO2F
O
S
O
N
H
OPh
3ag
90
70
50
30
10
−10
−30
−50
−70
−90
−110
−130
−150
−170
−190
−210
−230
−250
−270
−290
f1 (ppm)

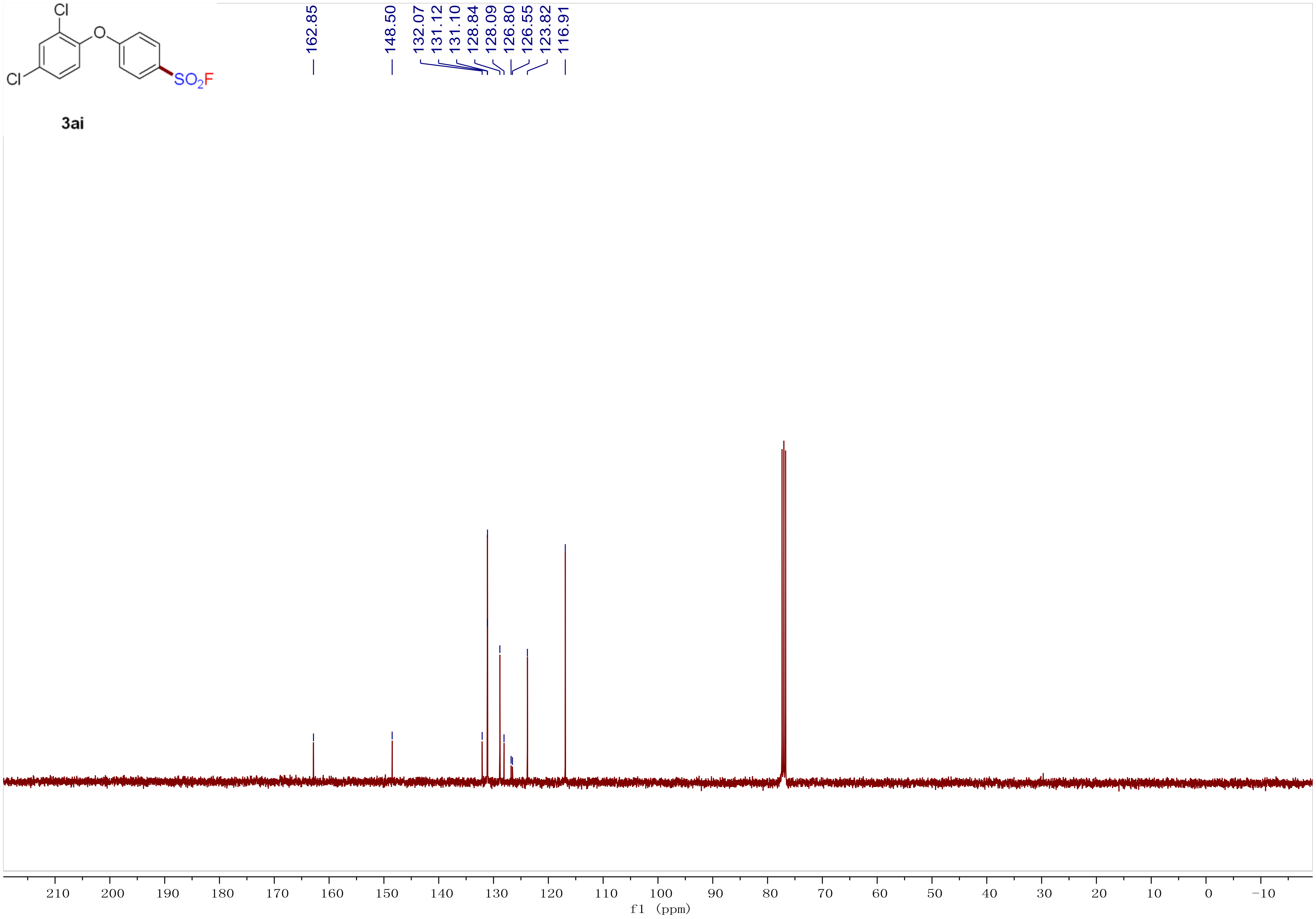

XX-2.1.fid
8.22
8.22
8.20
8.03
8.03
8.02
8.01
4.95
4.94
4.92
4.91
4.89
4.88
2.08
2.07
2.07
2.06
2.06
2.05
2.05
2.04
2.03
2.03
1.86
1.85
1.84
1.83
1.82
1.82
1.71
1.70
1.69
1.67
1.66
1.65
1.55
1.54
1.53
1.52
1.52
1.51
1.50
1.49
1.48
1.47
1.18
1.11
1.09
1.08
1.08
1.06
1.06
1.05
1.03
1.02
0.91
0.89
0.89
0.88
0.86
0.85
0.83
0.73
0.71
SO2F
O
O
1.96
1.97
1.00
0.99
1.01
2.05
2.51
2.09
6.31
3.09
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

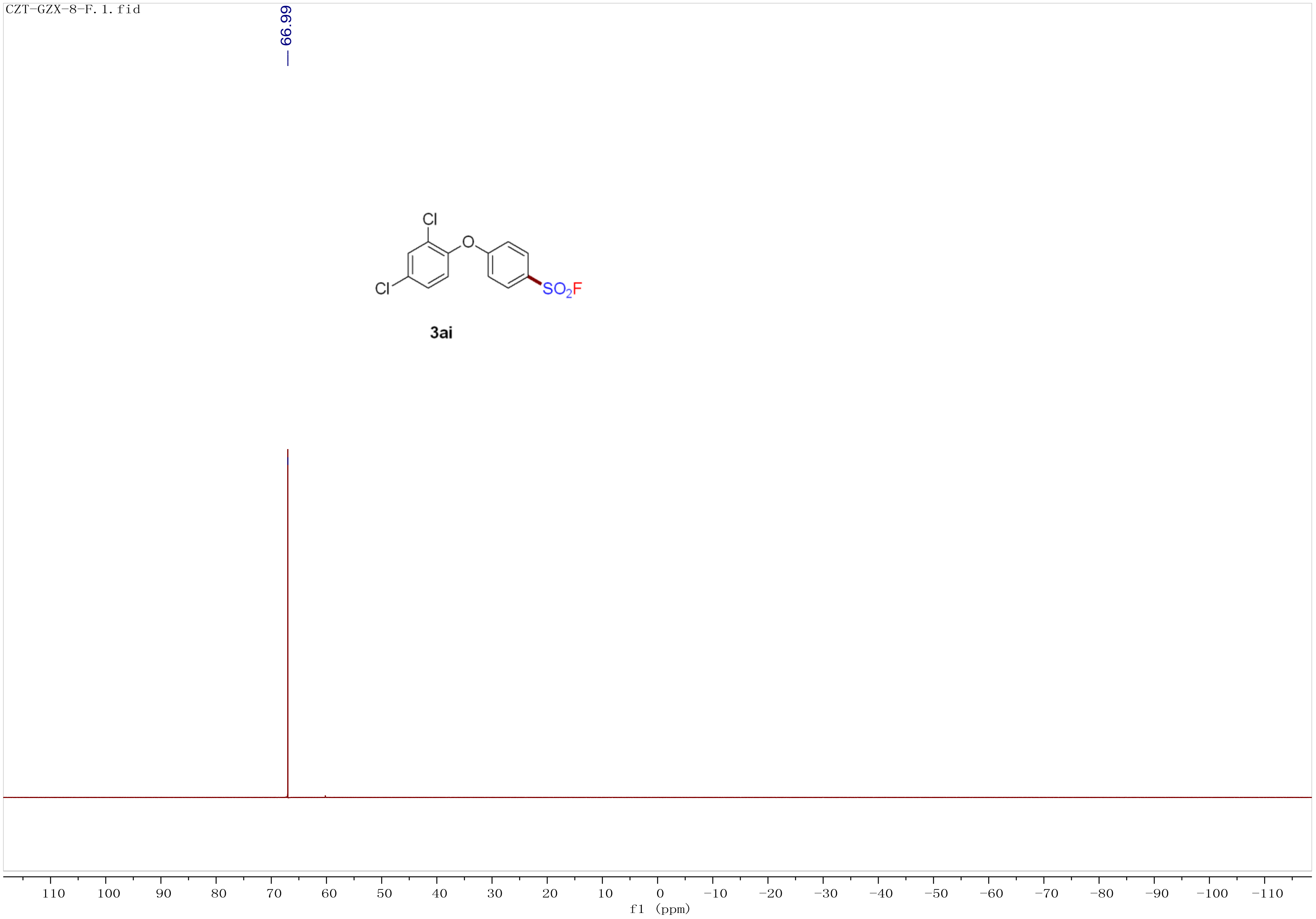
3ah

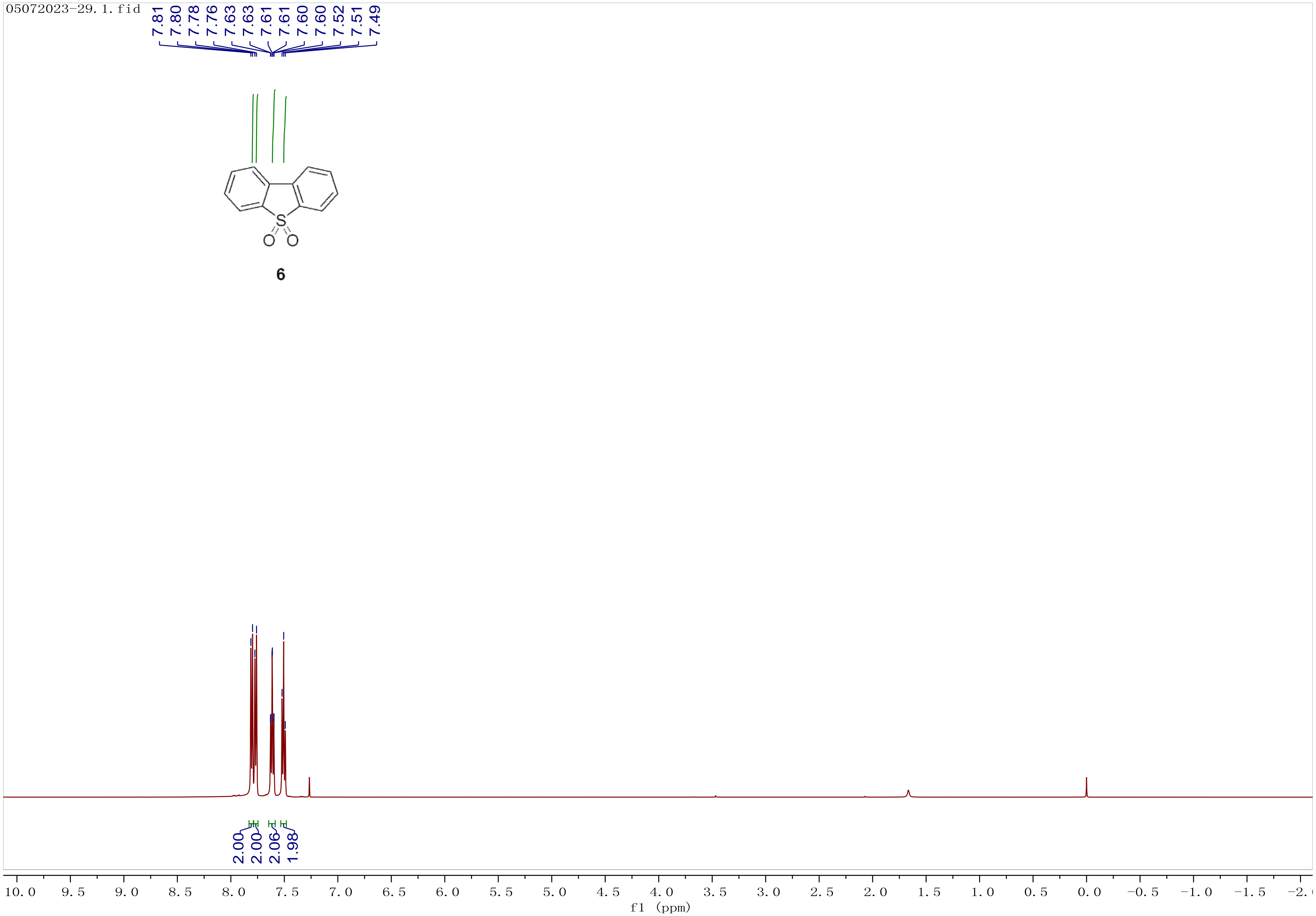

SO2F
O
O
3ah
163.96
137.22
136.55
136.30
130.70
128.51
47.16
40.80
34.16
31.47
26.58
23.54
22.03
20.75
16.47
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

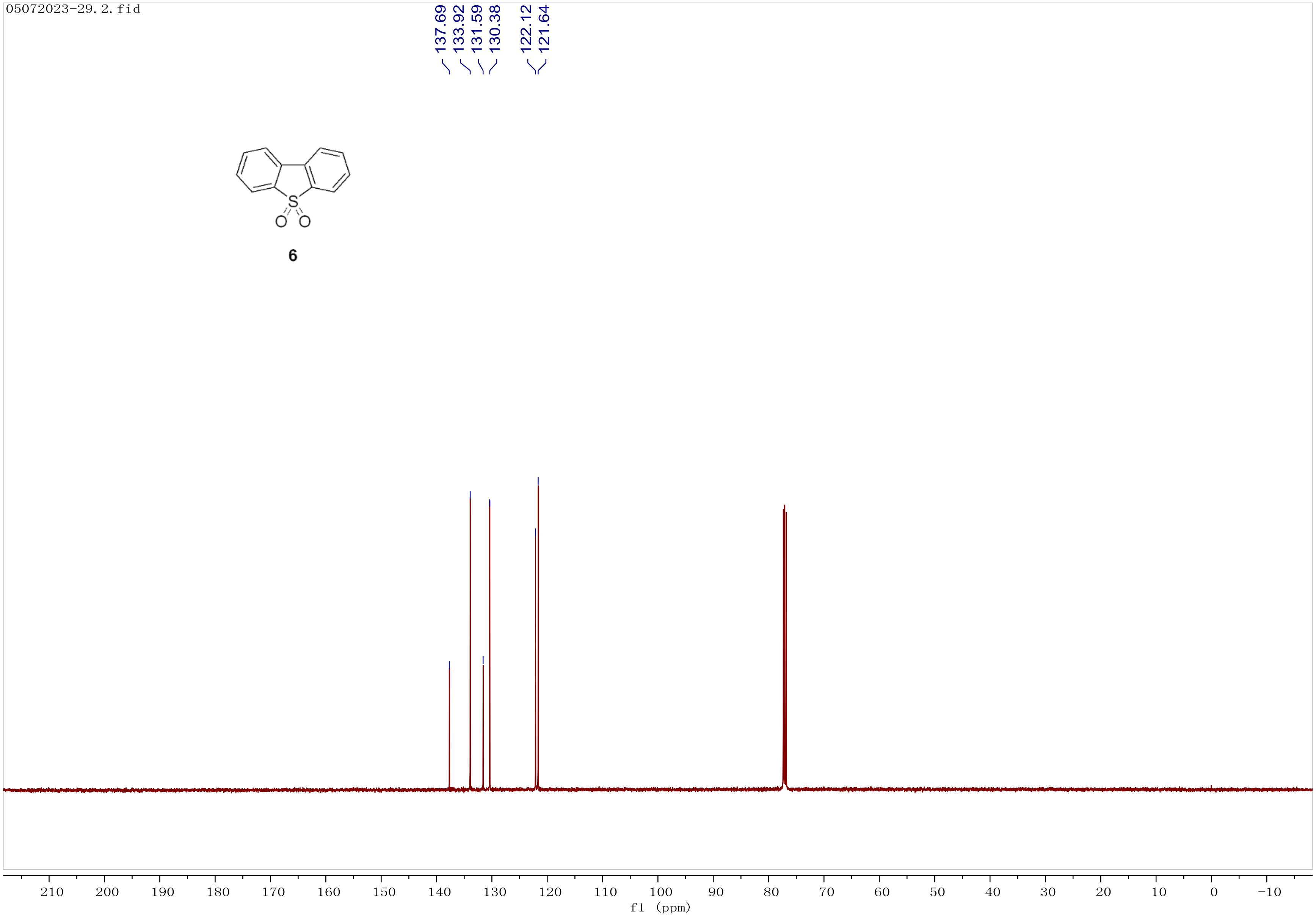

SO2F
O
O
3ah
65.92
200
150
100
50
0
−50
−100
−150
−200
−250
−300
−350
−4
f1 (ppm)


CZT-GX-8.1.fid
7.91
7.90
7.89
7.89
7.48
7.47
7.28
7.28
7.26
7.25
7.06
7.04
6.99
6.98
6.97
6.97
Cl
O
Cl
SO2F
3ai
1.99
0.94
1.00
0.99
1.99
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
f1 (ppm)


Cl
O
Cl
SO2F
3ai
162.85
148.50
132.07
131.12
131.10
128.84
128.09
126.80
126.55
123.82
116.91
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


CZT-GZX-8-F.1.fid
66.99
Cl
O
Cl
SO2F
3ai
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)


05072023-29.1.fid
7.81
7.80
7.78
7.76
7.63
7.63
7.61
7.61
7.60
7.60
7.52
7.51
7.49
6
2.00
2.00
2.06
1.98
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.
f1 (ppm)


05072023-29.2.fid
137.69
133.92
131.59
130.38
122.12
121.64
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

6

7. References

1. Liu, Y., Yu, D., Guo, Y., Xiao, J.-C., Chen, Q.-Y., & Liu, C. Arenesulfonyl fluoride synthesis via copper-catalyzed fluorosulfonylation of arenediazonium salts. *Org. Lett.* **2020**, *22*, 2281–2286.
2. Zhong, T., Pang, M-K., Chen, Z.-D., Zhang, B., Weng, J., & Lu, G. Copper-free Sandmeyer-type reaction for the synthesis of sulfonyl fluorides. *Org. Lett.* **2020**, 22, 3072–3078.