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Supporting Information

A mild protocol for efficient preparation of functional molecules containing triazole

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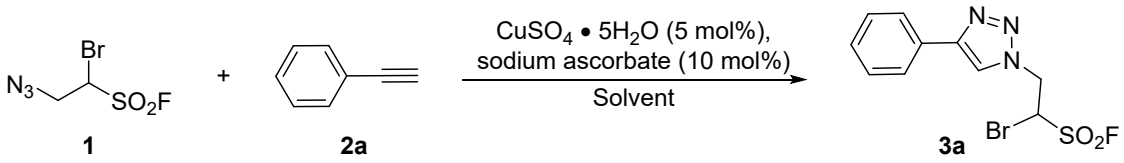
1. General considerations

All reactions were carried out under an air atmosphere. Unless otherwise specified, NMR spectra were recorded in $CDCl_3$ or DMSO-d_6 on a 500 MHz (for ^1H), 471 MHz (for ^{19}F), or 126 MHz (for ^{13}C) spectrometer. The chemical shifts converted to the TMS scale ($CDCl_3$: δ H = 7.26 ppm, δ C = 77.16 ppm; DMSO-d_6: δ H = 2.50 ppm, δ C = 39.52 ppm). Data for ^{19}F NMR was reported in terms of chemical shift (ppm) relative to added internal standard ($CFCl_3$ at 0 ppm). All coupling constants (*J* values) were reported in Hertz (Hz). The HPLC experiments were carried out on a Waters e2695 instrument (column: J&K, RP-C18, 5 μm, 4.6 × 150 mm), and the yields of the products were determined by using the corresponding pure compounds as the external standards. The following abbreviations are used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad. Melting points are reported uncorrected. MS experiments were performed on a TOF-Q ESI or CI/EI instrument. Reagents used in the reactions were all purchased from commercial sources and used without further purification.

2. Optimization of the reaction conditions

Table 1 Screening of solvents for the synthesis of BTESF [a]



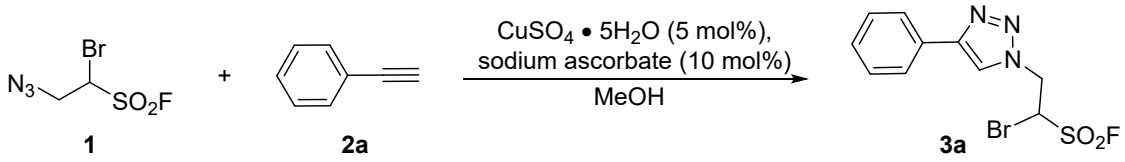
1 **2a** **3a**

Entry	Solvent	Yield **3a** [b] (%)
1	CH_3CN	n.d.
2	Toluene	55
3	THF	n.d.
4	1,4-Dioxane	21
5	DMSO	n.d.
6	DMF	n.d.
7	NMP	n.d.

8	MeOH	63
9	H_2O/*t*-BuOH = 2/1	39

[a] Reaction condition: $CuSO_4 \cdot 5H_2O$ (5 mol%, 12.5 mg), sodium ascorbate (10 mol% 19.8 mg) were dissolved in corresponding solvent (5 mL), **2a** (1 mmol, 102 mg) and **1** (1 mmol, 232 mg) were added to the solvent and the mixture was stirred at room temperature for 12 hours. [b] Isolated yield.

Table 2 Screening of ratio of 1 and 2 for the synthesis of BTESF [a]



Entry	Ratio (**1** : **2a**)	Yield **3a** [b] (%)
1	1 : 1	63
2	1 : 1.2	74
3	1 : 1.5	85
4	1 : 2	99
5	1.2 : 1	83
6	1.5 : 1	95

[a] Reaction condition: $CuSO_4 \cdot 5H_2O$ (5 mol%, 12.5 mg), sodium ascorbate (10 mol% 19.8 mg) were dissolved MeOH (5 mL), **1** and **2a** were added to MeOH and the mixture was stirred at room temperature for 12 hours. [b] Isolated yield.

3. General procedure for synthesis 2 and 3

3.1 General procedure for the synthesis of **2**

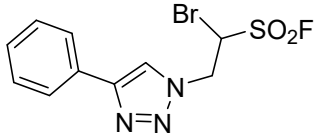
2r-2w, 2z were prepared according to the literature.[1] All homemade starting materials are identical to those reported regarding the ^1H and ^{13}C NMR and melting points (if applicable).

3.2 General procedure for synthesis of **3**

An oven-dried round-bottle flask (20 mL) was charged with $CuSO_4 \cdot 5H_2O$ (5 mol%, 12.5 mg), sodium ascorbate (10 mol%, 19.8 mg), alkyne **2** (2 mmol), 2-azido-1-

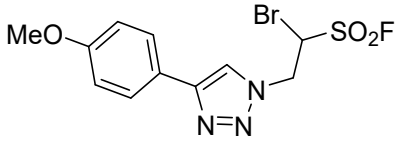
bromoethane-1-sulfonyl fluoride **1** (1 mmol, 232 mg) and 5 mL MeOH. The mixture was stirred at room temperature for 12-24 h with monitoring by TLC. After the reaction was completed, the solution was concentrated to dryness and the residue was purified through silica gel chromatography using 50% EA / PE to afford desired product **3**.

4. NMR spectra of 3 and 4



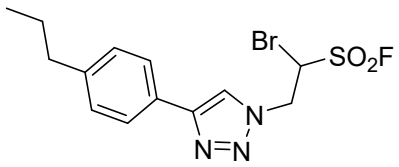
3a

1-Bromo-2-(4-phenyl-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3a**). White solid, 331 mg, 99%. M.p. 162-163 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.66 (s, 1H), 7.85 (d, *J* = 7.4 Hz, 2H), 7.47 (t, *J* = 7.7 Hz, 2H), 7.37 (t, *J* = 7.4 Hz, 1H), 7.00-6.97 (m, 1H), 5.47 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.30 (dd, *J* = 15.1, 7.6 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 146.5 (s), 130.2 (s), 129.1 (s), 128.2 (s), 125.3 (s), 122.6 (s), 55.4 (d, *J* = 18.9 Hz), 50.3 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{10}H_{10}BrFN_3O_2S$ $[M+H]^+$ 333.9656, found 333.9655.



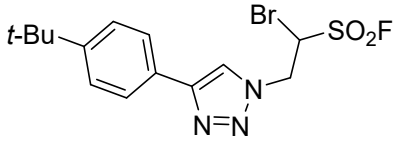
3b

1-Bromo-2-(4-(4-methoxyphenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3b**). 315 mg, 87%. M.p. 131-132 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.83 (s, 1H), 7.76 (d, *J* = 8.9 Hz, 2H), 6.97 (d, *J* = 8.9 Hz, 2H), 5.70-5.67 (m, 1H), 5.34 (dd, *J* = 14.8, 5.1 Hz, 1H), 4.96 (dd, *J* = 14.7, 8.4 Hz, 1H), 3.84 (s, 3H). ^{13}C NMR (126 MHz, DMSO) δ 159.2 (s), 146.4 (s), 126.6 (s), 122.8 (s), 121.6 (s), 114.4 (s), 55.4 (d, *J* = 18.7 Hz), 55.2 (s), 50.2 (s). ^{19}F NMR (471 MHz, $CDCl_3$) δ 46.8 (s, 1F). ESI-MS HRMS calculated for $C_{11}H_{12}BrFN_3O_2S$ $[M+H]^+$ 363.9761, found 363.9758.



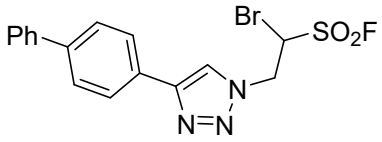
3c

1-Bromo-2-(4-(4-propylphenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3c**). White solid, 338 mg, 90%. M.p. 128-130 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.60 (s, 1H), 7.76 (d, *J* = 8.1 Hz, 2H), 7.28 (d, *J* = 8.1 Hz, 2H), 6.99-6.97 (m, 1H), 5.46 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.29 (dd, *J* = 15.1, 7.6 Hz, 1H), 2.58 (t, *J* = 7.5 Hz, 2H), 1.65-1.57 (m, 2H), 0.90 (t, *J* = 7.3 Hz, 3H). ^{13}C NMR (126 MHz, DMSO) δ 146.5 (s), 142.3 (s), 129.0 (s), 127.7 (s), 125.2 (s), 122.2 (s), 55.4 (d, *J* = 18.8 Hz), 50.3 (s), 37.0 (s), 23.9 (s), 13.6 (s). ^{19}F NMR (471 MHz, $CDCl_3$) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{13}H_{16}BrFN_3O_2S$ $[M+H]^+$ 376.0125, found 376.0123.



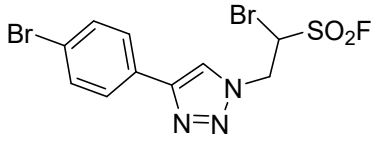
3d

1-Bromo-2-(4-(4-(tert-butyl)phenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3d**). White solid, 318 mg, 82%. M.p. 168-170 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.62 (s, 1H), 7.78 (d, *J* = 7.1 Hz, 2H), 7.49 (d, *J* = 8.3 Hz, 2H), 6.99-6.97 (m, 1H), 5.47 (dd, *J* = 15.1, 5.1 Hz, 1H), 5.30 (dd, *J* = 15.1, 7.6 Hz, 1H), 1.31 (s, 9H). ^{13}C NMR (126 MHz, DMSO) δ 150.7 (s), 146.5 (s), 127.4 (s), 125.7 (s), 125.1 (s), 122.2 (s), 55.4 (d, *J* = 18.8 Hz), 50.3 (s), 34.4 (s), 31.0 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{14}H_{18}BrFN_3O_2S$ $[M+H]^+$ 390.0282, found 390.0280.



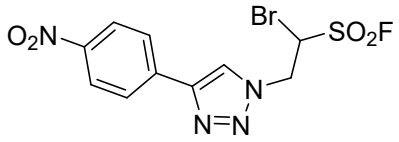
3e

2-(4-([1,1'-Biphenyl]-4-yl)-1H-1,2,3-triazol-1-yl)-1-bromoethane-1-sulfonyl fluoride (**3e**). White solid, 224 mg, 55%. M.p. 195-197 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.72 (s, 1H), 7.95 (d, *J* = 8.4 Hz, 2H), 7.79 (d, *J* = 8.4 Hz, 2H), 7.72 (d, *J* = 7.3 Hz, 2H), 7.48 (t, *J* = 7.7 Hz, 2H), 7.38 (t, *J* = 7.4 Hz, 1H), 7.01-6.99 (m, 1H), 5.49 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.32 (dd, *J* = 15.1, 7.5 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 146.1 (s), 139.8 (s), 139.5 (s), 129.3 (s), 129.0 (s), 127.6 (s), 127.3 (s), 126.6 (s), 125.8 (s), 122.7 (s), 55.4 (d, *J* = 18.9 Hz), 50.3 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{16}H_{14}BrFN_3O_2S$ $[M+H]^+$ 409.9969, found 409.9968.



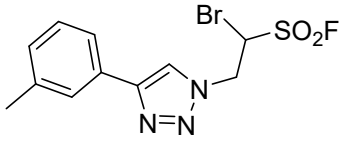
3f

1-Bromo-2-(4-(4-bromophenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3f**). White solid, 380 mg, 93%. M.p. 132-134 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.71 (s, 1H), 7.82 (d, *J* = 8.6 Hz, 2H), 7.67 (d, *J* = 8.5 Hz, 2H), 6.98-6.96 (m, 1H), 5.46 (dd, *J* = 15.2, 5.2 Hz, 1H), 5.31 (dd, *J* = 15.2, 7.5 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 145.4 (s), 132.0 (s), 129.4 (s), 127.3 (s), 123.0 (s), 121.2 (s), 55.3 (d, *J* = 18.9 Hz), 50.4 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{10}H_9Br_2FN_3O_2S$ $[M+H]^+$ 411.8761, found 411.8760.



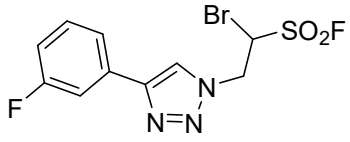
3g

1-Bromo-2-(4-(4-nitrophenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3g**). White solid, 306 mg, 81%. M.p. 156-157 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.93 (s, 1H), 8.34 (d, *J* = 8.9 Hz, 2H), 8.14 (t, *J* = 5.7 Hz, 2H), 7.01-6.98 (m, 1H), 5.51 (dd, *J* = 15.2, 5.2 Hz, 1H), 5.37 (dd, *J* = 15.2, 7.4 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 146.9 (s), 144.5 (s), 136.5 (s), 126.1 (s), 124.8 (s), 124.5 (s), 55.2 (d, *J* = 19.1 Hz), 50.4 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.2 (s, 1F). ESI-MS HRMS calculated for $C_{10}H_9BrFN_4O_4S$ $[M+H]^+$ 378.9506, found 378.9504.



3h

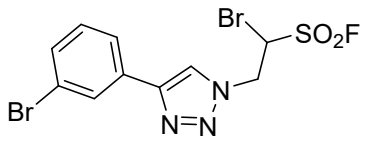
1-Bromo-2-(4-(m-tolyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3h**). White solid, 318 mg, 91%. M.p. 127-129 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.63 (s, 1H), 7.68 (s, 1H), 7.63 (d, *J* = 7.7 Hz, 1H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 7.5 Hz, 1H), 6.99-6.96 (m, 1H), 5.46 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.30 (dd, *J* = 15.1, 7.5 Hz, 1H), 2.37 (s, 3H). ^{13}C NMR (126 MHz, DMSO) δ 146.5 (s), 138.2 (s), 130.1 (s), 128.9 (s), 128.8 (s), 125.8 (s), 122.6 (s), 122.4 (s), 55.4 (d, *J* = 18.9 Hz), 50.3 (s), 21.0 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{11}H_{12}BrFN_3O_2S$ $[M+H]^+$ 347.9812, found 347.9811.



3i

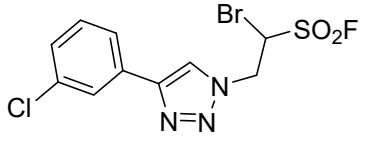
1-Bromo-2-(4-(3-fluorophenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3i**).

White solid, 323 mg, 92%. M.p. 116-117 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.74 (s, 1H), 7.71-7.65 (m, 2H), 7.54-7.50 (m, 1H), 7.20 (td, *J* = 8.6, 2.4 Hz, 1H), 6.98-6.95 (m, 1H), 5.46 (dd, *J* = 15.2, 5.2 Hz, 1H), 5.31 (dd, *J* = 15.2, 7.4 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 162.7 (d, *J* = 242.2 Hz) 145.4 (d, *J* = 2.7 Hz), 132.6 (d, *J* = 8.6 Hz), 131.3(d, *J* = 8.6 Hz), 123.5 (s), 121.4 (d, *J* = 2.7 Hz), 115.0 (d, *J* = 21.1 Hz), 111.9 (d, *J* = 22.9 Hz), 55.4 (d, *J* = 18.8 Hz), 50.4 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.2 (s, 1F), −112.0- −112.1 (m, 1F). ESI-MS HRMS calculated for $C_{10}H_9BrF_2N_3O_2S$ $[M+H]^+$ 351.9561, found 351.9560.



3j

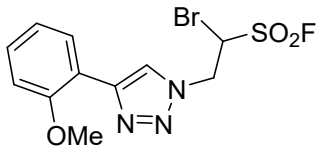
1-Bromo-2-(4-(3-bromophenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3j**). White solid, 384 mg, 94%. M.p. 101-102 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.77 (s, 1H), 8.06 (t, *J* = 1.6 Hz, 1H), 7.87 (d, *J* = 7.8 Hz, 1H), 7.58-7.55 (m, 1H), 7.44 (t, *J* = 7.9 Hz, 1H), 6.99-6.96 (m, 1H), 5.47 (dd, *J* = 15.2, 5.2 Hz, 1H), 5.31 (dd, *J* = 15.2, 7.4 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 145.0 (s), 132.5 (s), 131.3 (s), 130.9 (s), 127.7 (s), 124.2 (s), 123.5 (s), 122.3 (s), 55.3 (d, *J* = 18.9 Hz), 50.4 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.2 (s, 1F). ESI-MS HRMS calculated for $C_{10}H_9Br_2FN_3O_2S$ $[M+H]^+$ 411.8761, found 411.8760.



3k

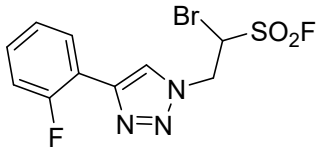
1-Bromo-2-(4-(3-chlorophenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3k**). White solid, 314 mg, 85%. M.p. 117-119 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.77 (s, 1H), 7.91 (t, *J* = 1.7 Hz, 1H), 7.83 (d, *J* = 7.7 Hz, 1H), 7.51 (t, *J* = 7.9 Hz, 1H), 7.44-

7.42 (m, 1H), 6.98-6.95 (m, 1H), 5.47 (dd, *J* = 15.2, 5.2 Hz, 1H), 5.32 (dd, *J* = 15.2, 7.4 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 145.1 (s), 133.8 (s), 132.3 (s), 131.0 (s), 128.0 (s), 124.8 (s), 123.8 (s), 123.5 (s), 55.3 (d, *J* = 19.0 Hz), 50.4 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.2 (s, 1F). ESI-MS HRMS calculated for $C_{10}H_9BrClFN_3O_2S$ $[M+H]^+$ 367.9266, found 367.9265.



3l

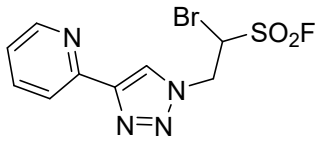
1-Bromo-2-(4-(2-methoxyphenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3l**). White solid, 322 mg, 88%. M.p. 152-154 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.57 (s, 1H), 8.16 (dd, *J* = 7.7, 1.7 Hz, 1H), 7.36 (td, *J* = 7.8, 1.8 Hz, 1H), 7.15 (d, *J* = 7.8 Hz, 1H), 7.07 (td, *J* = 7.6, 1.0 Hz, 1H), 6.98-6.95 (m, 1H), 5.47 (dd, *J* = 15.0, 5.3 Hz, 1H), 5.31 (dd, *J* = 15.0, 7.8 Hz, 1H), 3.92 (s, 3H). ^{13}C NMR (126 MHz, DMSO) δ 155.5 (s), 142.2 (s), 129.4 (s), 126.7 (s), 125.2 (s), 120.9 (s), 118.7 (s), 111.8 (s), 55.7 (s), 55.6 (d, *J* = 18.9 Hz), 50.1 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{11}H_{12}BrFN_3O_3S$ $[M+H]^+$ 363.9761, found 363.9769.



3m

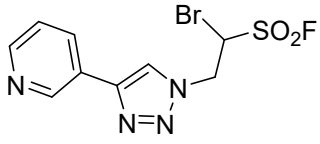
1-Bromo-2-(4-(2-fluorophenyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3m**). White solid, 350 mg, 99%. M.p. 132-133 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.61 (d, *J* = 3.7 Hz, 1H), 8.17 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46-7.41 (m, 1H), 7.38-7.33 (m, 2H), 7.03-7.00 (m, 1H), 5.53 (dd, *J* = 15.0, 5.3 Hz, 1H), 5.37 (dd, *J* = 15.0, 7.7 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 158.5 (d, *J* = 247.2 Hz), 139.8 (d, *J* = 2.4 Hz), 130.0 (d, *J* = 8.4 Hz), 127.3 (d, *J* = 3.4 Hz), 125.1 (s), 125.0 (d, *J* = 9.6 Hz),

117.9 (d, *J* = 13.0 Hz), 116.1 (d, *J* = 21.3 Hz), 55.3 (d, *J* = 18.9 Hz), 50.1 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F), –114.2- –114.3 (m, 1F). ESI-MS HRMS calculated for $C_{10}H_9BrF_2N_3O_2S$ $[M+H]^+$ 351.9561, found 351.9560.



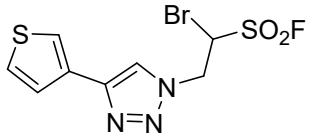
3n

1-Bromo-2-(4-(pyridin-2-yl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3n**). White solid, 194 mg, 58%. M.p. 123-124 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.72 (s, 1H), 8.62 (d, *J* = 4.8 Hz, 1H), 8.06 (d, *J* = 7.9 Hz, 1H), 7.91 (td, *J* = 7.8, 1.7 Hz, 1H), 7.38-7.35 (m, 1H), 7.02-6.99 (m, 1H), 5.52 (dd, *J* = 15.0, 5.3 Hz, 1H), 5.37 (dd, *J* = 15.0, 7.6 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 149.3 (s), 149.0 (s), 146.9 (s), 137.9 (s), 124.7 (s), 123.4 (s), 119.8 (s), 55.3 (d, *J* = 19.0 Hz), 50.2 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_9H_9BrFN_4O_2S$ $[M+H]^+$ 334.9608, found 334.9605.



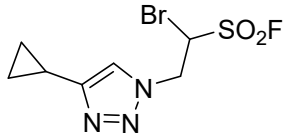
3o

1-Bromo-2-(4-(pyridin-3-yl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3o**). White solid, 250 mg, 75%. M.p. 133-134 °C. ^{1}H NMR (500 MHz, DMSO) δ 9.08 (d, *J* = 1.6 Hz, 1H), 8.82 (s, 1H), 8.58 (dd, *J* = 4.8, 1.5 Hz, 1H), 8.26 (dt, *J* = 4.8, 1.5 Hz, 1H), 7.53 (dd, *J* = 8.3, 5.1 Hz, 1H), 7.01-6.98 (m, 1H), 5.50 (dd, *J* = 15.2, 5.2 Hz, 1H), 5.36 (dd, *J* = 15.2, 7.4 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 145.8 (s), 143.1 (s), 142.5 (s), 136.4 (d, *J* = 3.4 Hz), 127.7 (s), 125.7 (s), 124.3 (s), 55.3 (d, *J* = 18.9 Hz), 50.5 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.2 (s, 1F). ESI-MS HRMS calculated for $C_9H_9BrFN_4O_2S$ $[M+H]^+$ 334.9608, found 334.9605.



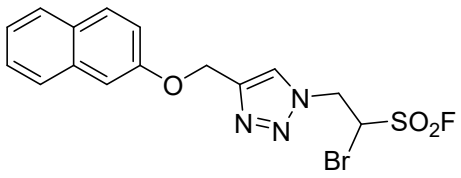
3p

1-Bromo-2-(4-(thiophen-3-yl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3p**). White solid, 312 mg, 92%. M.p. 133-134 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.51 (s, 1H), 7.89 (dd, *J* = 2.9, 1.2 Hz, 1H), 7.66 (dd, *J* = 5.0, 2.9 Hz, 1H), 7.52 (dd, *J* = 5.0, 1.2 Hz, 1H), 6.96-6.93 (m, 1H), 5.44 (dd, *J* = 15.2, 5.2 Hz, 1H), 5.29 (dd, *J* = 15.2, 7.4 Hz, 1H). ^{13}C NMR (126 MHz, DMSO) δ 143.1 (s), 131.5 (s), 127.5 (s), 125.8 (s), 122.4 (s), 121.5 (s), 55.5 (d, *J* = 18.8 Hz), 50.3 (s). ^{19}F NMR (471 MHz, DMSO) δ 46.7 (s, 1F). ESI-MS HRMS calculated for $C_8H_8BrFN_3O_2S_2$ $[M+H]^+$ 339.9220, found 339.9219.



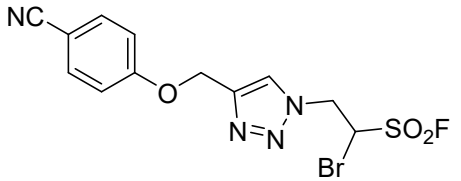
3q

1-Bromo-2-(4-cyclopropyl-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3q**). White solid, 213 mg, 72%. M.p. 100-101 °C. ^{1}H NMR (500 MHz, DMSO) δ 7.92 (s, 1H), 6.88-6.84 (t, *J* = 6.4 Hz, 1H), 5.31 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.14 (dd, *J* = 15.1, 7.7 Hz, 1H), 2.00-1.94 (m, 1H), 0.94-0.90 (m, 2H), 0.73-0.69 (m, 2H). ^{13}C NMR (126 MHz, DMSO) δ 149.2 (s), 122.1 (s), 55.5 (d, *J* = 18.6 Hz), 50.0 (s), 7.7 (s), 6.4 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.0 (s, 1F). ESI-MS HRMS calculated for $C_7H_{10}BrFN_3O_2S$ $[M+H]^+$ 297.9656, found 297.7654.



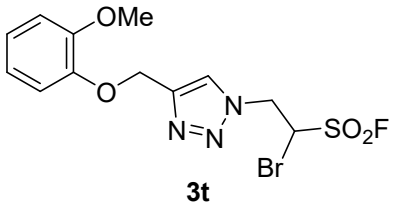
3r

1-Bromo-2-(4-((naphthalen-2-yloxy)methyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3r**). White solid, 394 mg, 95%. M.p. 110-111 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.39 (s, 1H), 7.85-7.81 (m, 3H), 7.50 (d, *J* = 2.5 Hz, 1H), 7.47 (t, *J* = 7.0 Hz, 1H), 7.36 (t, *J* = 7.0 Hz, 1H), 7.20 (dd, *J* = 8.9, 2.5 Hz, 1H), 6.97-6.94 (m, 1H), 5.45 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.32-5.27 (m, 3H). ^{13}C NMR (126 MHz, DMSO) δ 155.9 (s), 142.9 (s), 134.2 (s), 129.4 (s), 128.7 (s), 127.5 (s), 126.8 (s), 126.5 (s), 125.9 (s), 123.8 (s), 118.7 (s), 107.4 (s), 61.1 (s), 55.4 (d, *J* = 18.9 Hz), 50.1(s). ^{19}F NMR (471 MHz, DMSO) δ 47.0 (s, 1F). ESI-MS HRMS calculated for $C_{14}H_{14}BrFN_3O_3S$ $[M+H]^+$ 413.9918, found 413.9915.



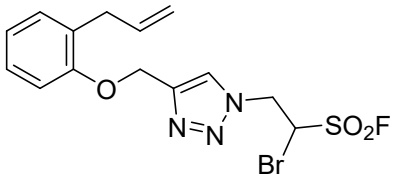
3s

1-Bromo-2-(4-((4-cyanophenoxy)methyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3s**). White solid, 186 mg, 48%. M.p. 102-104 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.36 (s, 1H), 7.78 (d, *J* = 8.9 Hz, 2H), 7.22 (d, *J* = 8.9 Hz, 2H), 6.95-6.92 (m, 1H), 5.44 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.31-5.27 (m, 3H). ^{13}C NMR (126 MHz, DMSO) δ 161.5 (s), 142.3 (s), 134.3 (s), 126.3 (s), 119.2 (s), 116.0 (s), 103.4 (s), 61.4 (s), 55.4 (d, *J* = 18.9 Hz), 50.2 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{12}H_{11}BrFN_4O_3S$ $[M+H]^+$ 388.9714, found 388.9714.



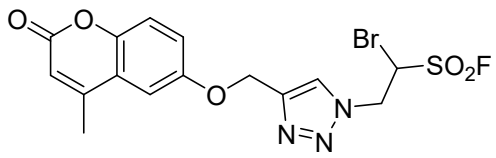
3t

1-Bromo-2-(4-((2-methoxyphenoxy)methyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3t**). White solid, 385 mg, 98%. M.p. 109-110 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.30 (s, 1H), 7.11 (dd, *J* = 7.9, 1.6 Hz, 1H), 6.98-6.86 (m, 4H), 5.43 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.28 (dd, *J* = 15.1, 7.7 Hz, 1H), 5.15 (s, 2H), 3.74 (s, 3H). ^{13}C NMR (126 MHz, DMSO) δ 149.3 (s), 147.5 (s), 143.2 (s), 125.9 (s), 121.7 (s), 120.7 (s), 114.3 (s), 112.4 (s), 61.8 (s), 55.5 (s), 55.4 (*d*, J = 16.3 Hz), 50.1 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.0 (s, 1F). ESI-MS HRMS calculated for $C_{12}H_{14}BrFN_3O_4S$ $[M+H]^+$ 393.9876, found 393.9876.



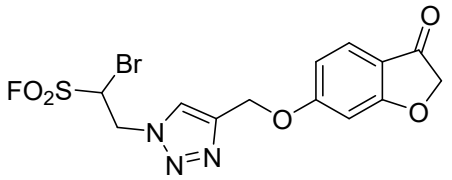
3u

2-(4-((2-Allylphenoxy)methyl)-1H-1,2,3-triazol-1-yl)-1-bromoethane-1-sulfonyl fluoride (**3u**). White solid, 400 mg, 99%. M.p. 60-61 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.78 (s, 1H), 7.19-7.14 (m, 2H), 6.95-6.91 (m, 2H), 6.00-5.92 (m, 1H), 5.70 (dd, *J* = 8.1, 5.2 Hz, 1H), 5.30 (dd, *J* = 14.8, 5.1 Hz, 1H), 5.24 (s, 2H), 5.03-5.02 (m, 1H), 5.00 (s, 1H), 4.95 (dd, *J* = 14.8, 8.2 Hz, 1H), 3.38 (d, *J* = 6.6 Hz, 2H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 155.8 (s), 145.3 (s), 136.9 (s), 130.2 (s), 129.0 (s), 127.5 (s), 124.3 (s), 121.5 (s), 115.6 (s), 112.0 (s), 62.2 (s), 55.1 (d, *J* = 22.4 Hz), 51.4 (s), 34.4 (s). ^{19}F NMR (471 MHz, $CDCl_3$) δ 46.8 (s, 1F). ESI-MS HRMS calculated for $C_{14}H_{16}BrFN_3O_3S$ $[M+H]^+$ 404.0074, found 404.0073.



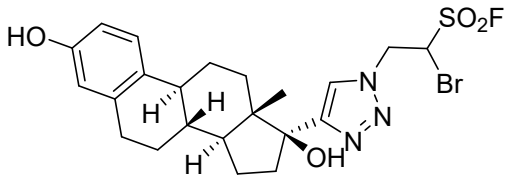
3v

1-Bromo-2-(4-(((4-methyl-2-oxo-2H-chromen-6-yl)oxy)methyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3v**). White solid, 443 mg, 99%. M.p. 178-180 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.35 (s, 1H), 7.36-7.29 (m, 3H), 6.95-6.93 (m, 1H), 6.39 (s, 1H), 5.44 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.32-5.27 (m, 3H), 2.43 (s, 3H). ^{13}C NMR (126 MHz, DMSO) δ 156.0 (s), 154.3 (s), 153.1 (s), 147.5 (s), 142.7 (s), 126.0 (s), 120.2 (s), 119.9 (s), 117.6 (s), 114.8 (s), 109.6 (s), 61.6 (s), 55.4 (d, *J* = 18.8 Hz), 50.1 (s), 18.2 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{15}H_{14}BrFN_3O_5S$ $[M+H]^+$ 445.9816, found 445.9816.



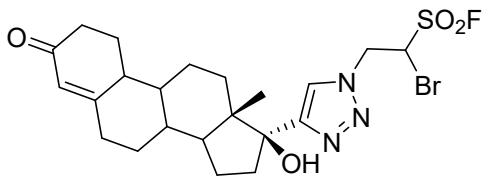
3w

1-Bromo-2-(4-(((3-oxo-2,3-dihydrobenzofuran-6-yl)oxy)methyl)-1H-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3w**). White solid, 416 mg, 99%. M.p. 117-118 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.39 (s, 1H), 7.54 (d, *J* = 8.6 Hz, 1H), 6.99 (d, *J* = 2.1 Hz, 1H), 6.95-6.92 (m, 1H), 6.76 (dd, *J* = 8.6, 2.1 Hz, 1H), 5.45 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.33-5.28 (m, 3H), 4.77 (s, 2H). ^{13}C NMR (126 MHz, DMSO) δ 197.3 (s), 175.7 (s), 166.3 (s), 142.1 (s), 126.3 (s), 124.8 (s), 114.4 (s), 112.0 (s), 97.8 (s), 75.6 (s), 61.7 (s), 55.4 (d, *J* = 18.9 Hz), 50.2 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{13}H_{12}BrFN_3O_5S$ $[M+H]^+$ 419.9660, found 419.9660.



3x

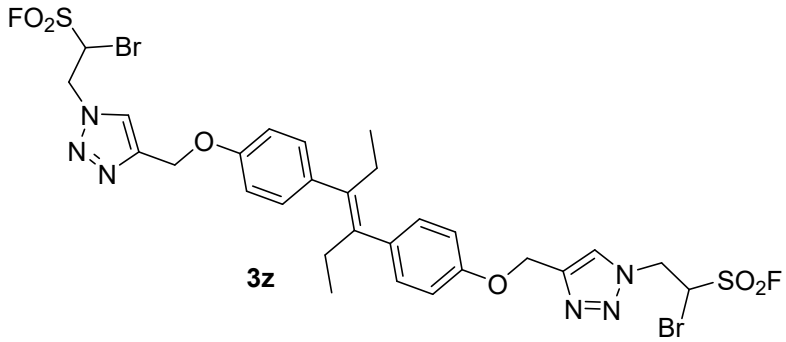
1-Bromo-2-(4-((8*R*,9*S*,13*S*,14*S*,17*S*)-3,17-dihydroxy-13-methyl-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthren-17-yl)-1*H*-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3x**). White solid, 478 mg, 91%. M.p. 205-206 ^{o}C. ^{1}H NMR (500 MHz, DMSO) δ 9.01 (brs, 1H), 7.97 (s, 1H), 6.95 (d, *J* = 8.4 Hz, 1H), 6.92-6.89 (m, 1H), 6.46 (dd, *J* = 8.3, 2.1 Hz, 1H), 6.42 (s, 1H), 5.38 (dt, *J* = 14.9, 4.7 Hz, 1H), 5.23 (dd, *J* = 15.0, 7.5 Hz, 1H), 2.72-2.65 (m, 2H), 2.35-2.30 (m, 1H), 2.08-2.06 (m, 1H), 1.99-1.94 (m, 1H), 1.83-1.82 (m, 2H), 1.77-1.72 (m, 1H), 1.65-1.58 (m, 1H), 1.49-1.15 (m, 6H), 0.92 (s, 3H), 0.63-0.59 (m, 1H). ^{13}C NMR (126 MHz, DMSO) δ 154.9 (s), 154.5 (d, *J* = 4.4 Hz), 137.3 (s), 130.5 (s), 126.1 (s), 124.0 (d, *J* = 7.8 Hz), 115.0 (s), 112.8 (s), 81.2 (s), 55.7 (d, *J* = 18.4 Hz), 55.6 (d, *J* = 18.4 Hz), 50.0 (d, *J* = 3.4 Hz), 47.7 (s), 46.9 (s), 43.3 (s), 37.3 (s), 32.5 (s), 29.3 (s), 27.3 (s), 26.2 (s), 23.6 (s), 14.4 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.2 (d, *J* = 22.8 Hz, 1F). ESI-MS HRMS calculated for $C_{22}H_{28}BrFN_3O_4S$ $[M+H]^+$ 528.0962, found 528.0962.



3y

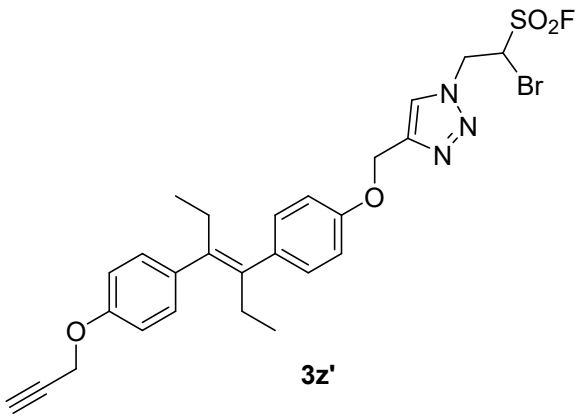
1-Bromo-2-(4-((13*S*,17*R*)-13-methyl-3-oxo-2,3,6,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1*H*-cyclopenta[a]phenanthren-17-yl)-1*H*-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3y**). White solid, 414 mg, 82%. M.p. 97-98 ^{o}C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (d, *J* = 6.3 Hz, 1H), 5.79-5.78 (m, 1H), 5.70-5.67 (m, 1H), 5.30-5.23 (m, 1H), 5.00-4.93 (m, 1H), 2.47-2.02 (m, 9H), 1.88-1.86 (m, 2H), 1.71-1.69 (m, 1H),

1.52-1.41 (m, 5H), 1.25-1.16 (m, 2H), 1.06 (s, 3H), 0.64-0.60 (m, 1H), 0.48-0.42 (m, 1H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 200.0 (s), 166.8 (s), 154.4 (s), 124.7 (s), 123.2 (s), 82.3 (d, *J* = 11.5 Hz), 55.2 (dd, *J* = 22.3, 15.8 Hz), 51.5 (s), 49.1 (d, *J* = 13.2 Hz), 48.3 (s), 47.3 (d, *J* = 3.5 Hz), 42.6 (s), 41.2 (s), 38.1 (s), 36.6 (s), 35.6 (s), 32.7 (s), 30.9 (s), 26.6 (s), 26.2 (s), 23.7 (d, *J* = 6.4 Hz), 14.3 (s). ^{19}F NMR (471 MHz, DMSO) δ 46.8 (d, *J* = 7.5 Hz, 1F). ESI-MS HRMS calculated for $C_{22}H_{30}BrFN_3O_3S$ $[M+H]^+$ 514.1170, found 514.1170.



3z

(*E*)-2,2'-((((hex-3-ene-3,4-diylbis(4,1-phenylene))bis(oxy))bis(methylene))bis(1*H*-1,2,3-triazole-4,1-diyl))bis(1-bromoethane-1-sulfonyl fluoride) (**3z**). White solid, 706 mg, 88% (when corresponding alkyne 1 mmol and **1** 2 mmol were used, **3z** was obtained in 88% yield, no **3z'** was obtained). M.p. 206-208 °C. ^{1}H NMR (500 MHz, DMSO) δ 8.34 (s, 2H), 7.13 (d, *J* = 8.5 Hz, 4H), 7.05 (d, *J* = 8.6 Hz, 4H), 6.96-6.94 (t, *J* = 5.3 Hz, 2H), 5.45 (dd, *J* = 15.1, 5.2 Hz, 2H), 5.30 (dd, *J* = 15.0, 7.6 Hz, 2H), 5.20 (s, 4H), 2.09 (q, *J* = 7.4 Hz, 4H), 0.72 (t, *J* = 7.4 Hz, 6H). ^{13}C NMR (126 MHz, DMSO) δ 156.6 (s), 143.2 (s), 138.1 (s), 134.6 (s), 129.6 (s), 125.9 (s), 114.5 (s), 61.0 (s), 55.5 (d, *J* = 18.7 Hz), 50.1 (s), 28.1 (s), 13.3 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 2F). ESI-MS HRMS calculated for $C_{28}H_{31}Br_2F_2N_6O_6S_2$ $[M+H]^+$ 809.0055, found 809.0055.

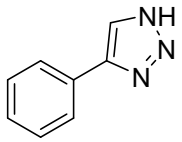


3z'

(*E*)-1-bromo-2-(4-((4-(4-(4-(prop-2-yn-1-yloxy)phenyl)hex-3-en-3-yl)phenoxy)methyl)-1*H*-1,2,3-triazol-1-yl)ethane-1-sulfonyl fluoride (**3z'**). White solid, 140 mg, 24% (when corresponding alkyne 1 mmol and **1** 1 mmol were used, corresponding **3z** was obtained in 75% yield (300 mg), and **3z'** was obtained in 24% yield). M.p. 101-102 ^{o}C. ^{1}H NMR (500 MHz, DMSO) δ 8.35 (s, 1H), 7.15-7.13 (m, 4H), 7.05 (d, *J* = 8.5 Hz, 2H), 7.00 (d, *J* = 8.5 Hz, 2H), 6.96-6.94 (t, *J* = 5.4 Hz, 1H), 5.45 (dd, *J* = 15.1, 5.2 Hz, 1H), 5.30 (dd, *J* = 15.1, 7.6 Hz, 1H), 5.20 (s, 2H), 4.80 (d, *J* = 2.1 Hz, 2H), 3.55 (s, 1H), 2.08 (q, *J* = 6.9 Hz, 4H), 0.71 (t, *J* = 7.4 Hz, 6H). ^{13}C NMR (126 MHz, DMSO) δ 156.6 (s), 155.8 (s), 143.1 (s), 138.1 (s), 138.0 (s), 134.9 (s), 134.5 (s), 129.52 (s), 129.47 (s), 125.9 (s), 114.5 (s), 114.4 (s), 79.5 (s), 78.2 (s), 61.0 (s), 55.4 (d, *J* = 16.6 Hz), 55.4 (s), 50.1 (s), 28.1 (s), 13.29(s), 13.27 (s). ^{19}F NMR (471 MHz, DMSO) δ 47.1 (s, 1F). ESI-MS HRMS calculated for $C_{26}H_{28}BrFN_3O_4S$ $[M+H]^+$ 576.0962, found 576.0962.

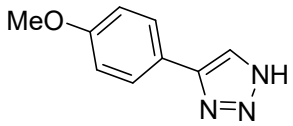
Note: In the ^{13}C NMR spectrum of **3z'**, theoretically, there should be twenty-six peaks.

Due to the compact overlaying, it is difficult to specify the overlaying peaks.



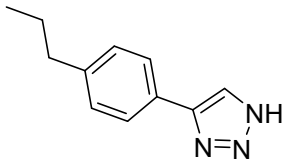
4a

4-Phenyl-1H-1,2,3-triazole (**4a**). [2] White solid, 43 mg, 99%. ^{1}H NMR (500 MHz, DMSO) δ 14.98 (s, 1H), 8.24 (s, 1H), 7.86 (d, *J* = 7.3 Hz, 2H), 7.45 (t, *J* = 7.6 Hz, 2H), 7.35 (t, *J* = 7.0 Hz, 1H).



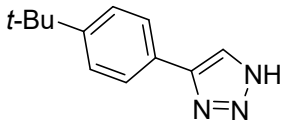
4b

4-(4-Methoxyphenyl)-1*H*-1,2,3-triazole (**4b**). [2] White solid, 52 mg, 99%. ^{1}H NMR (500 MHz, DMSO) δ 14.83 (s, 1H), 8.14 (s, 1H), 7.79 (d, *J* = 7.9 Hz, 2H), 7.01 (d, *J* = 8.2 Hz, 2H), 3.79 (s, 3H).



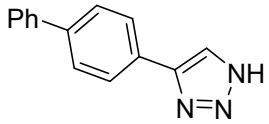
4c

4-(4-Propylphenyl)-1*H*-1,2,3-triazole (**4c**). [3] White solid, 52 mg, 92%. ^{1}H NMR (500 MHz, DMSO) δ 14.90 (s, 1H), 8.20 (s, 1H), 7.76 (d, *J* = 7.1 Hz, 2H), 7.26 (d, *J* = 7.3 Hz, 2H), 2.57 (t, *J* = 7.5 Hz, 2H), 1.64-1.56 (m, 2H), 0.89 (t, *J* = 7.3 Hz, 3H).



4d

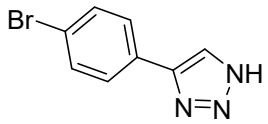
4-(4-(*Tert*-butyl)phenyl)-1*H*-1,2,3-triazole (**4d**). [4] White solid, 59 mg, 98%. ^{1}H NMR (500 MHz, DMSO) δ 14.90 (s, 1H), 8.19 (s, 1H), 7.78 (d, *J* = 7.4 Hz, 2H), 7.47 (d, *J* = 8.0 Hz, 2H), 1.30 (s, 9H).



4e

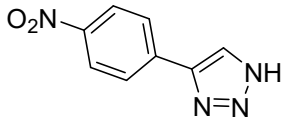
4-([1,1'-Biphenyl]-4-yl)-1*H*-1,2,3-triazole (**4e**). [5] White solid, 62 mg, 94%. ^{1}H NMR (500 MHz, DMSO) δ 15.00 (s, 1H), 8.30 (s, 1H), 7.96 (d, *J* = 7.7 Hz, 2H), 7.76 (d, *J* = 7.8 Hz, 2H), 7.72 (d, *J* = 7.5 Hz, 2H), 7.48 (t, *J* = 7.6 Hz, 2H), 7.38 (t, *J* = 7.1 Hz,

1H).



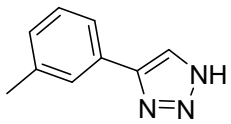
4f

4-(4-Bromophenyl)-1*H*-1,2,3-triazole (**4f**). [6] White solid, 64 mg, 95%. ^{1}H NMR (500 MHz, DMSO) δ 15.07 (s, 1H), 8.30 (s, 1H), 7.83 (d, *J* = 7.9 Hz, 2H), 7.65 (d, *J* = 8.1 Hz, 2H).



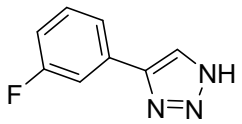
4g

4-(4-Nitrophenyl)-1*H*-1,2,3-triazole (**4g**). [2] Yellow solid, 52 mg, 92%. ^{1}H NMR (500 MHz, DMSO) δ 15.30 (s, 1H), 8.45 (s, 1H), 8.30 (d, *J* = 8.6 Hz, 2H), 8.13 (d, *J* = 8.2 Hz, 2H).



4h

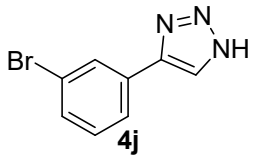
4-(*m*-Tolyl)-1*H*-1,2,3-triazole (**4h**). [6] White solid, 47 mg, 99%. ^{1}H NMR (500 MHz, DMSO) δ 14.92 (s, 1H), 8.22 (s, 1H), 7.69 (s, 1H), 7.65 (d, *J* = 7.4 Hz, 1H), 7.33 (d, *J* = 7.5 Hz, 1H), 7.17 (d, *J* = 7.3 Hz, 1H), 2.36 (s, 3H).



4i

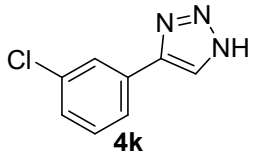
4-(3-Fluorophenyl)-1*H*-1,2,3-triazole (**4i**). [7] White solid, 47 mg, 96%. ^{1}H NMR (500 MHz, DMSO) δ 15.08 (s, 1H), 8.34 (s, 1H), 7.93 (s, 1H), 7.85 (d, *J* = 7.2 Hz, 1H),

7.49 (t, *J* = 7.8 Hz, 1H), 7.42-7.41 (m, 1H).



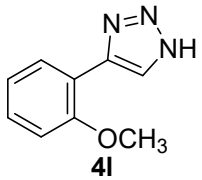
4j

4-(3-Bromophenyl)-1*H*-1,2,3-triazole (**4j**). [2] White solid, 63 mg, 94%. ^{1}H NMR (500 MHz, DMSO) δ 15.12 (s, 1H), 8.34 (s, 1H), 8.07 (s, 1H), 7.89 (d, *J* = 7.3 Hz, 1H), 7.54-7.53 (m, 1H), 7.42 (t, *J* = 7.8 Hz, 1H).



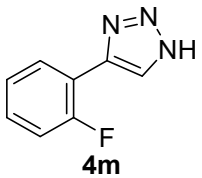
4k

4-(3-Chlorophenyl)-1*H*-1,2,3-triazole (**4k**). [4] White solid, 49 mg, 91%. ^{1}H NMR (500 MHz, DMSO) δ 15.11 (s, 1H), 8.34 (s, 1H), 7.93 (s, 1H), 7.85 (d, *J* = 7.0 Hz, 1H), 7.48 (t, *J* = 7.8 Hz, 1H), 7.41-7.40 (m, 1H).



4l

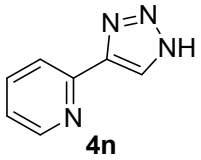
4-(2-Methoxyphenyl)-1*H*-1,2,3-triazole (**4l**). [6] White solid, 52 mg, 99%. ^{1}H NMR (500 MHz, DMSO) δ 15.14 (s, 1H), 8.18-8.00 (m, 2H), 7.34 (t, *J* = 7.2 Hz, 1H), 7.13 (d, *J* = 8.3 Hz, 1H), 7.05 (t, *J* = 7.5 Hz, 1H), 3.90 (s, 3H).



4m

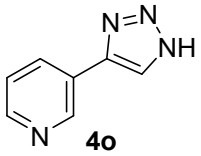
4-(2-Fluorophenyl)-1*H*-1,2,3-triazole (**4m**). [8] White solid, 44 mg, 91%. ^{1}H NMR

(500 MHz, DMSO) δ 15.34 (s, 1H), 8.20 (s, 1H), 8.05-8.03 (m, 1H), 7.41-7.39 (m, 1H), 7.35-7.29 (m, 2H).



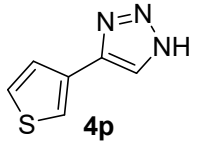
4n

2-(1*H*-1,2,3-triazol-4-yl)pyridine (**4n**). [9] White solid, 40 mg, 91%. ^{1}H NMR (500 MHz, DMSO) δ 15.13 (s, 1H), 8.62-8.62 (m, 1H), 8.25 (s, 1H), 8.05-7.88 (m, 2H), 7.38-7.36 (m, 1H).



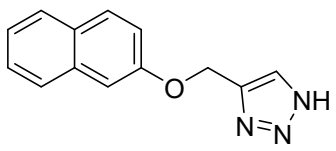
4o

3-(1*H*-1,2,3-triazol-4-yl)pyridine (**4o**). [2] White solid, 40 mg, 92%. ^{1}H NMR (500 MHz, DMSO) δ 15.16 (s, 1H), 9.09 (s, 1H), 8.69-8.37 (m, 2H), 8.23 (d, J = 7.6 Hz, 1H), 7.50-7.47 (m, 1H).



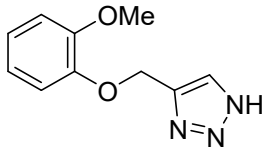
4p

4-(Thiophen-3-yl)-1*H*-1,2,3-triazole (**4p**). [4] White solid, 43 mg, 94%. ^{1}H NMR (500 MHz, DMSO) δ 14.88 (s, 1H), 8.12 (s, 1H), 7.89 (s, 1H), 7.64 (s, 1H), 7.54 (d, J = 5.0 Hz, 1H).



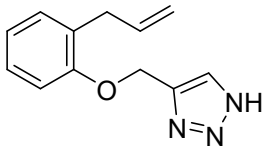
4r

4-((Naphthalen-2-yloxy)methyl)-1*H*-1,2,3-triazole (**4r**). White solid, 64 mg, 95%. M.p. 122-123 °C. ^{1}H NMR (500 MHz, DMSO) δ 14.98 (s, 1H), 7.93 (s, 1H), 7.84-7.81 (m, 3H), 7.50-7.45 (m, 2H), 7.36 (t, *J* = 7.4 Hz, 1H), 7.20 (d, *J* = 7.5 Hz, 1H), 5.30 (s, 2H). ^{13}C NMR (126 MHz, DMSO) δ 155.9 (s), 143.0 (s), 134.2 (s), 133.5 (s), 129.4 (s), 128.6 (s), 127.5 (s), 126.7 (s), 126.4 (s), 123.7 (s), 118.7 (s), 107.2 (s), 61.0 (s). ESI-MS HRMS calculated for $C_{13}H_{12}N_3O$ $[M+H]^+$ 226.0975, found 226.0974.



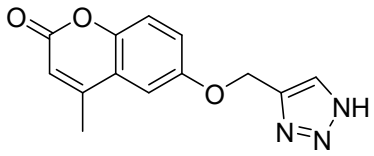
4t

4-((2-Methoxyphenoxy)methyl)-1*H*-1,2,3-triazole (**4t**). White solid, 55 mg, 90%. M.p. 121-123 °C. ^{1}H NMR (500 MHz, DMSO) δ 14.94 (s, 1H), 7.84 (s, 1H), 7.11-7.09 (m, 1H), 6.96 (d, *J* = 7.6 Hz, 1H), 6.92 (t, *J* = 7.3 Hz, 1H), 6.89-6.86 (m, 1H), 5.14 (s, 2H), 3.73 (s, 3H). 13C NMR (126 MHz, DMSO) δ 149.3 (s), 147.5 (s), 143.2 (s), 133.6 (s), 121.5 (s), 120.6 (s), 114.1 (s), 112.3 (s), 61.6 (s), 55.4 (s). ESI-MS HRMS calculated for $C_{10}H_{12}N_3O_2$ $[M+H]^+$ 206.0924, found 206.0922.



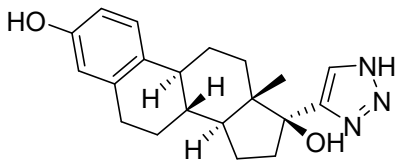
4u

4-((2-Allylphenoxy)methyl)-1*H*-1,2,3-triazole (**4u**). White solid, 62 mg, 97%. M.p. 80-82 °C. ^{1}H NMR (500 MHz, DMSO) δ 14.93 (s, 1H), 7.84 (s, 1H), 7.21-7.18 (m, 1H), 7.12-7.11 (m, 2H), 6.90 (t, *J* = 7.3 Hz, 1H), 5.96-5.88 (m, 1H), 5.19 (s, 2H), 5.01-4.97 (m, 2H), 3.29 (d, *J* = 6.4 Hz, 2H). ^{13}C NMR (126 MHz, DMSO) δ 155.7 (s), 143.4 (s), 136.8 (s), 133.1 (s), 129.6 (s), 128.2 (s), 127.4 (s), 120.8 (s), 115.5 (s), 112.2 (s), 61.4 (s), 33.9 (s). ESI-MS HRMS calculated for $C_{12}H_{14}N_3O$ $[M+H]^+$ 216.1131, found 216.1131.



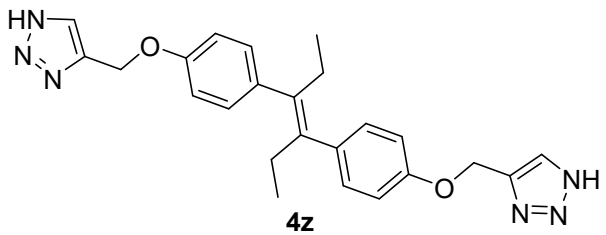
4v

6-((1*H*-1,2,3-triazol-4-yl)methoxy)-4-methyl-2*H*-chromen-2-one (**4v**). White solid, 63 mg, 82%. M.p. 172-173 °C. ^{1}H NMR (500 MHz, DMSO) δ 14.98 (s, 1H), 7.89 (s, 1H), 7.36-7.29 (m, 3H), 6.39 (s, 1H), 5.28 (s, 2H), 2.43 (s, 3H). ^{13}C NMR (126 MHz, DMSO) δ 159.9 (s), 154.3 (s), 153.0 (s), 147.4 (s), 142.8 (s), 133.5 (s), 120.2 (s), 119.8 (s), 117.5 (s), 114.7 (s), 109.5 (s), 61.7 (s), 18.2 (s). ESI-MS HRMS calculated for $C_{13}H_{12}N_3O_3$ $[M+H]^+$ 258.0873, found 258.0872.



4x

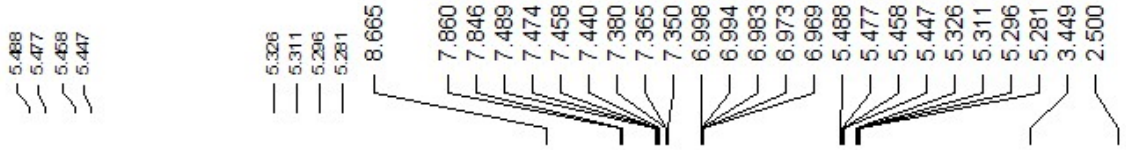
(8*R*,9*S*,13*S*,14*S*,17*S*)-13-methyl-17-(1*H*-1,2,3-triazol-4-yl)-7,8,9,11,12,13,14,15,16,17-decahydro-6*H*-cyclopenta[a]phenanthrene-3,17-diol (**4x**). White solid, 91 mg, 90%. M.p. 233-235 °C. ^{1}H NMR (500 MHz, DMSO) δ 14.45 (s, 1H), 8.94 (s, 1H), 7.60 (s, 1H), 6.94 (d, *J* = 8.4 Hz, 1H), 6.46 (d, *J* = 8.3 Hz, 1H), 6.41 (s, 1H), 5.15 (s, 1H), 2.72-2.64 (m, 2H), 2.09-1.75 (m, 6H), 1.51-1.17 (m, 6H), 0.93 (s, 3H), 0.53-0.41 (m, 1H). ^{13}C NMR (126 MHz, DMSO) δ 154.9 (s), 137.1 (s), 132.5 (s), 130.4 (s), 126.0 (s), 114.9 (s), 112.7(s), 81.1 (s), 50.5 (s), 47.6 (s), 46.7 (s), 43.2 (s), 37.4 (s), 32.7 (s), 29.2 (s), 27.2 (s), 26.0 (s), 23.4 (s), 14.3 (s). ESI-MS HRMS calculated for $C_{20}H_{26}N_3O_2$ $[M+H]^+$ 340.2020, found 340.2020.

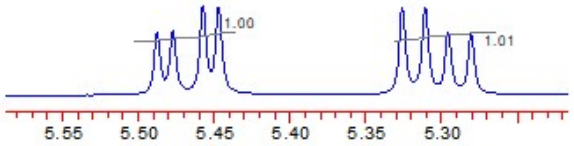


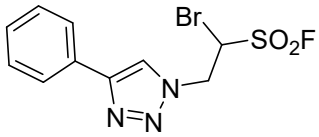
4z

(*E*)-4,4'-(((hex-3-ene-3,4-diylbis(4,1-phenylene))bis(oxy))bis(methylene))bis(1*H*-

1,2,3-triazole) (**4z**). White solid, 121 mg, 94%. M.p. 154-156 ^{o}C. ^{1}H NMR (500 MHz, DMSO) δ 14.96 (s, 2H), 7.88 (s, 2H), 7.13 (d, *J* = 8.6 Hz, 4H), 7.05 (d, *J* = 8.6 Hz, 4H), 5.19 (s, 4H), 2.09 (q, *J* = 7.3 Hz, 4H), 0.72 (t, *J* = 7.4 Hz, 6H). ^{13}C NMR (126 MHz, DMSO) δ 156.6 (s), 143.2 (s), 138.0 (s), 134.5 (s), 133.4 (s), 129.4 (s), 114.3 (s), 61.0 (s), 28.0 (s), 13.2 (s). ESI-MS HRMS calculated for $C_{24}H_{27}N_6O_2$ $[M+H]^+$ 431.2190, found 431.2189.

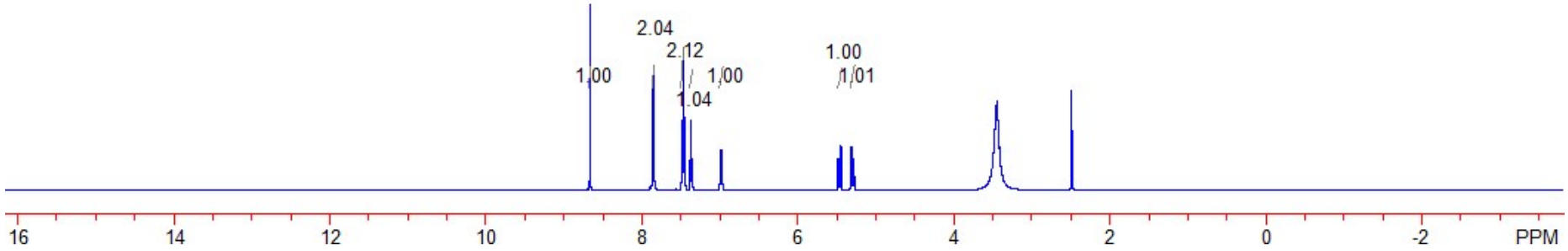


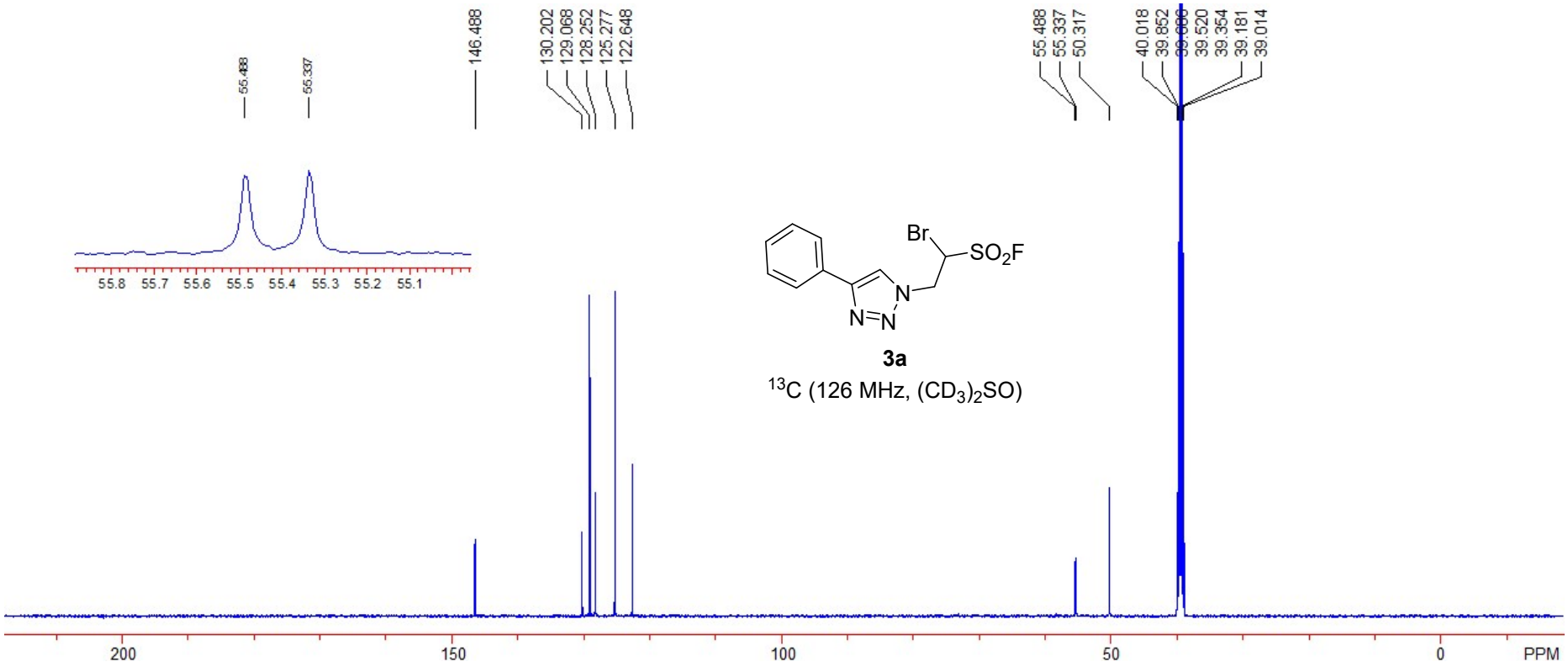




3a

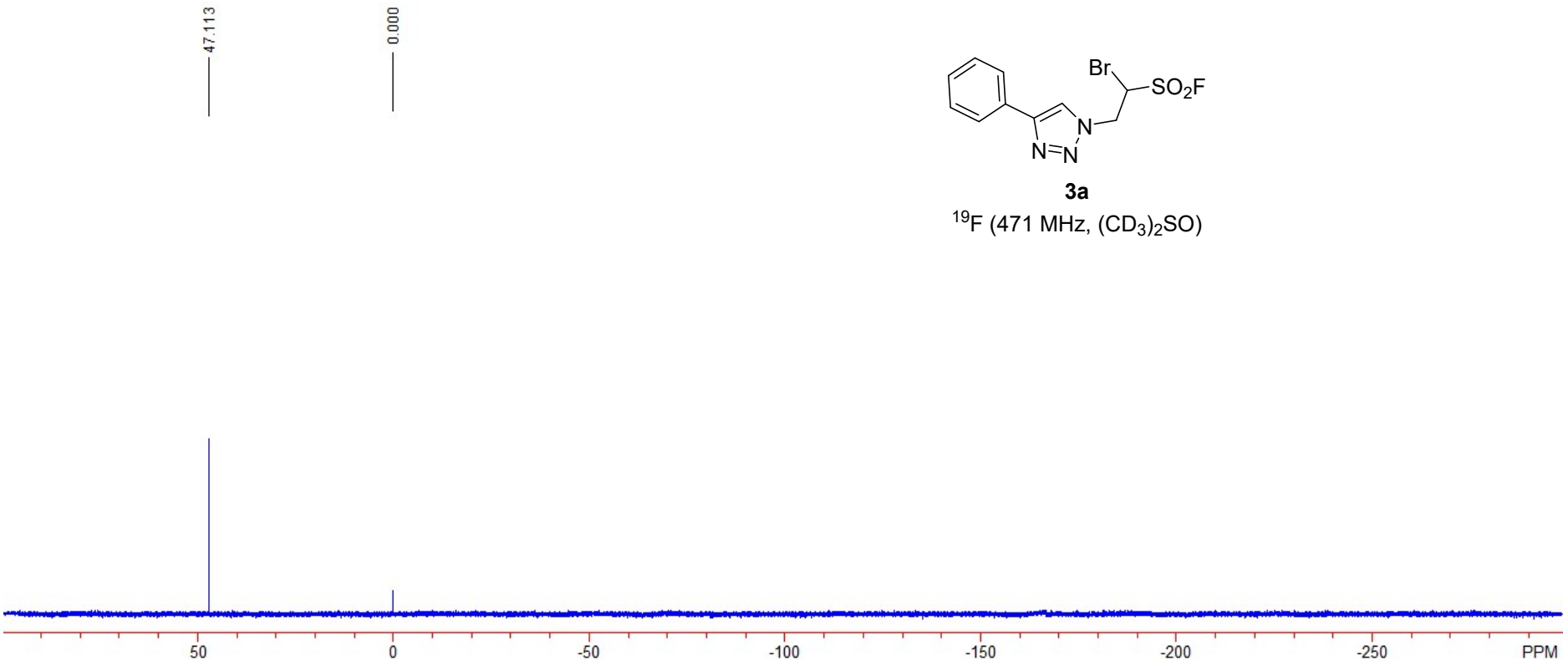
^{1}H (500 MHz, $(CD_3)_2SO$)





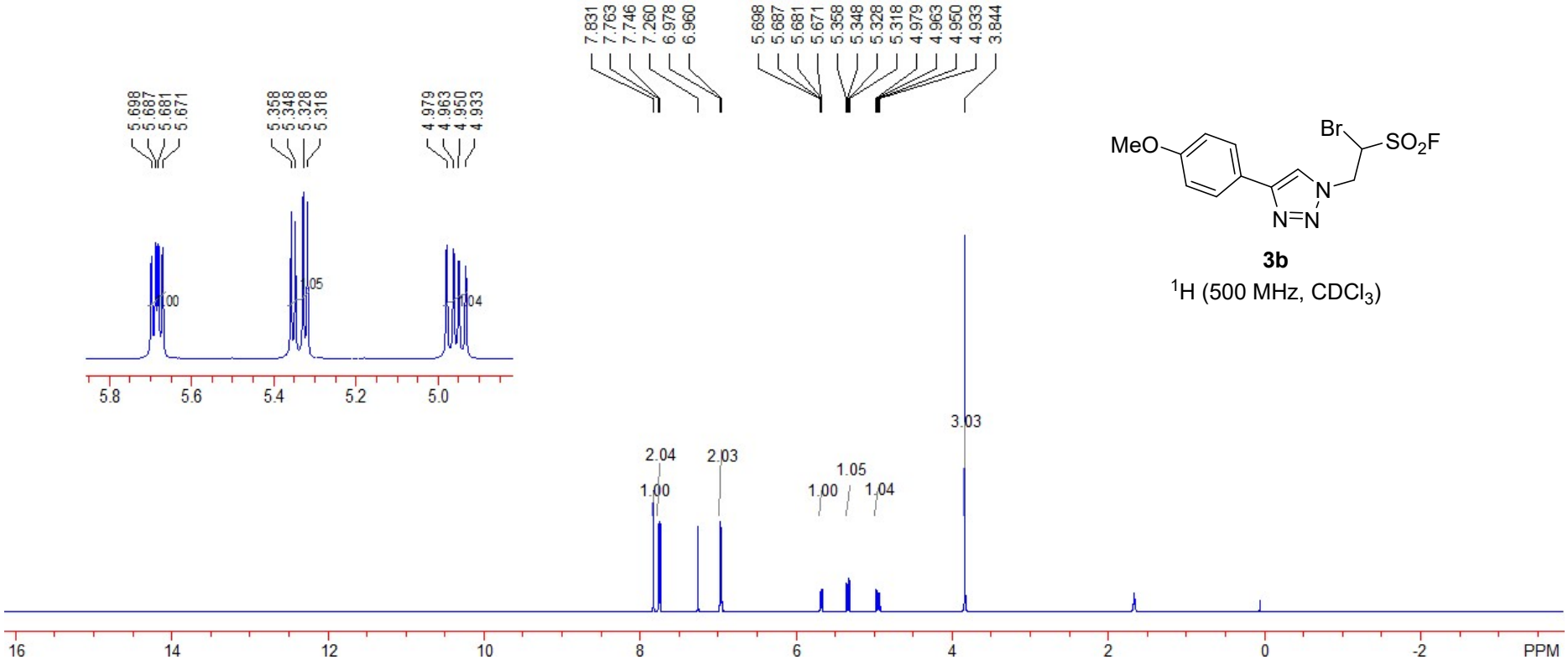
3a

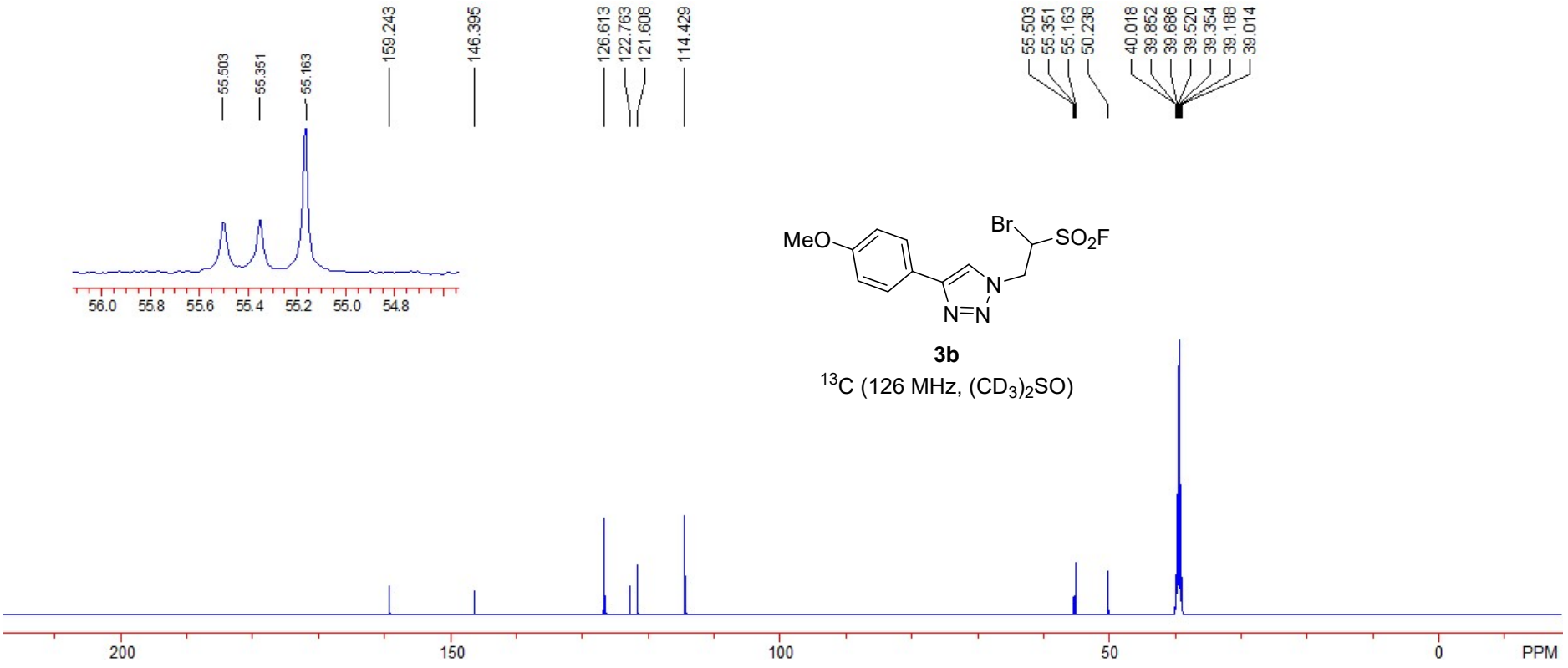
^{13}C (126 MHz, $(CD_3)_2SO$)



3a

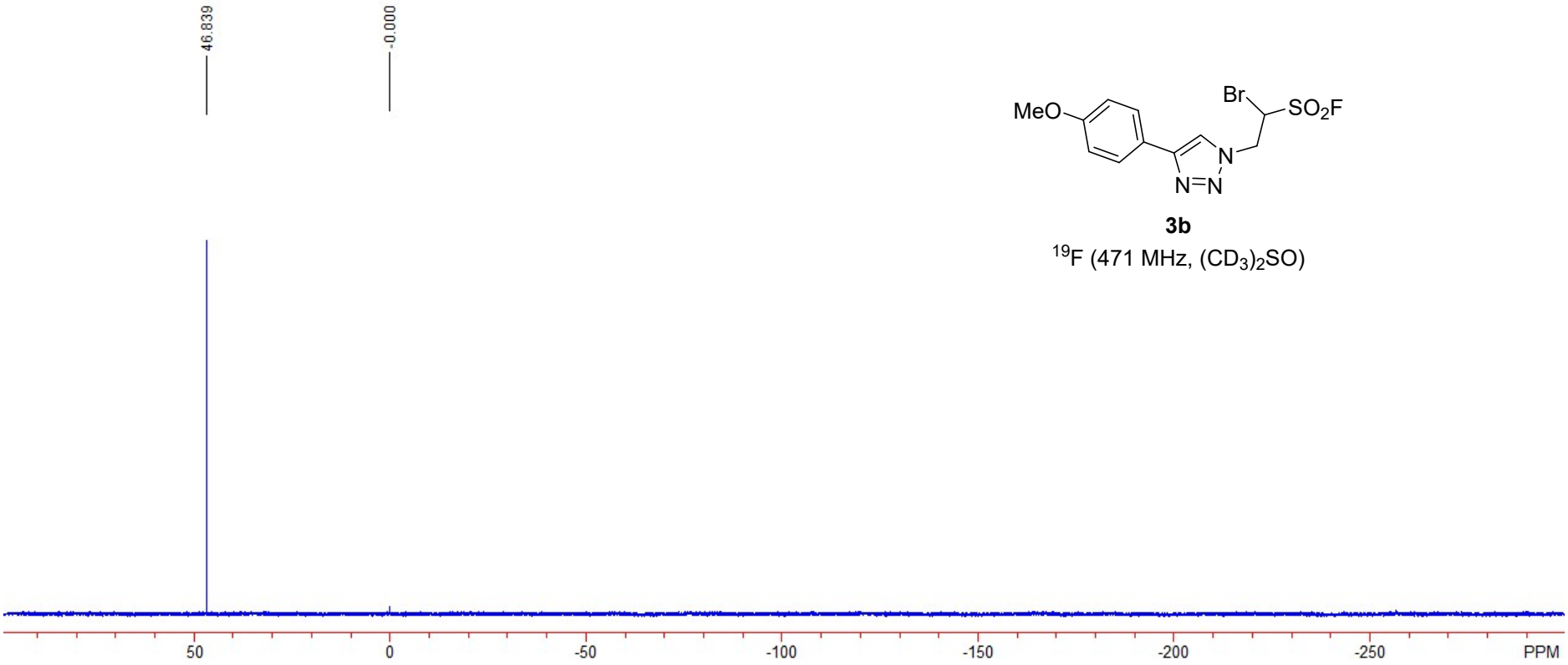
^{19}F (471 MHz, $(CD_3)_2SO$)


7.831
7.763
7.746
7.260
6.978
6.960
5.698
5.687
5.681
5.671
5.358
5.348
5.328
5.318
4.979
4.963
4.950
4.933
3.844
MeO
Br
SO2F
N
N=N
3b
1H (500 MHz, CDCl3)
3.03
2.04
2.03
1.05
1.00
1.00
1.04
PPM



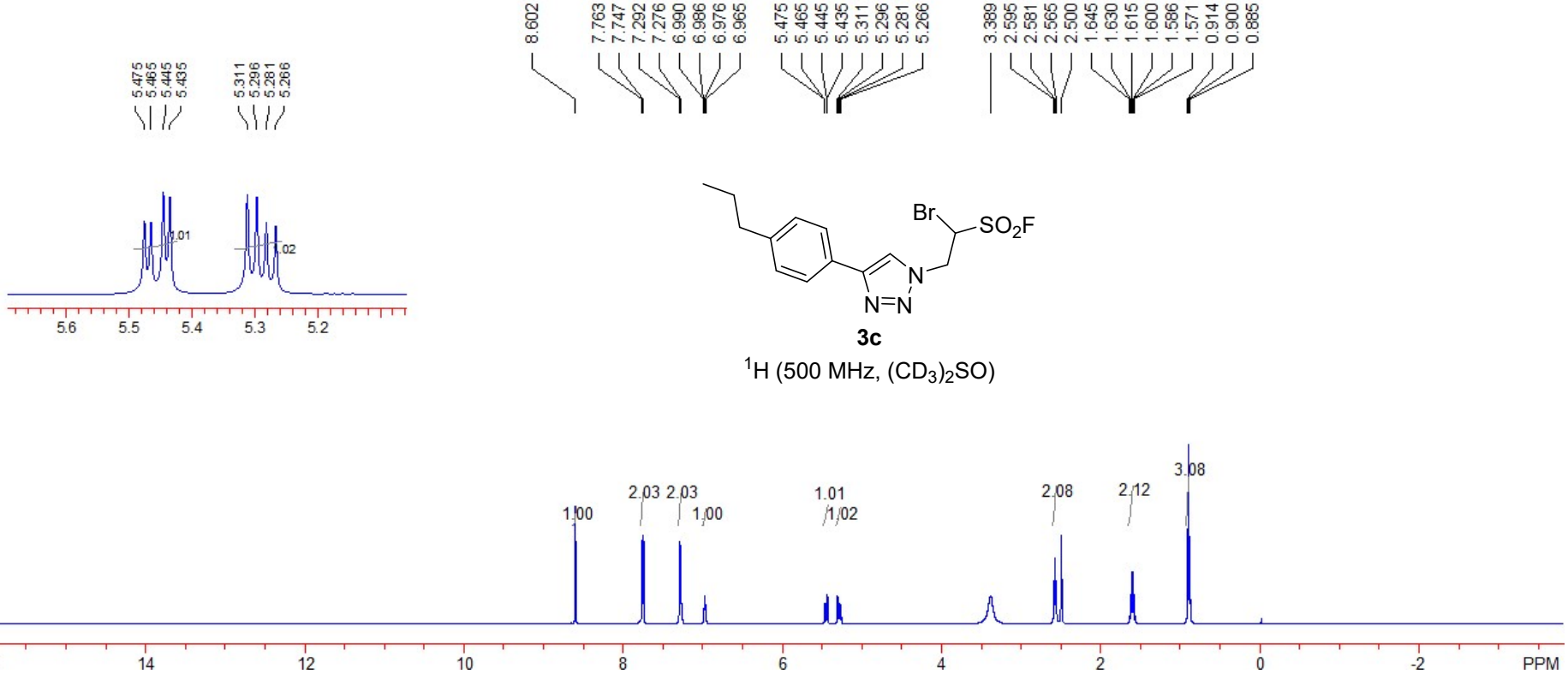
3b

^{13}C (126 MHz, $(CD_3)_2SO$)



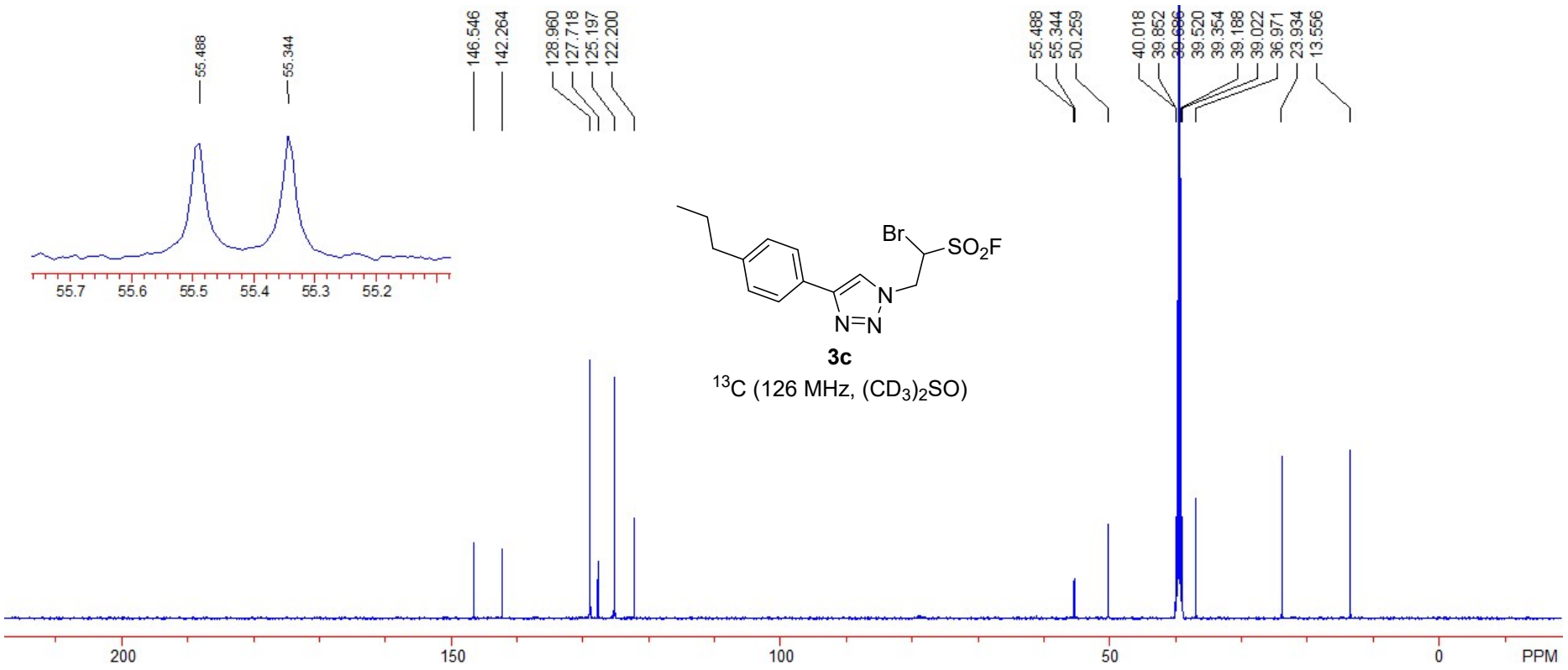
3b

^{19}F (471 MHz, $(CD_3)_2SO$)



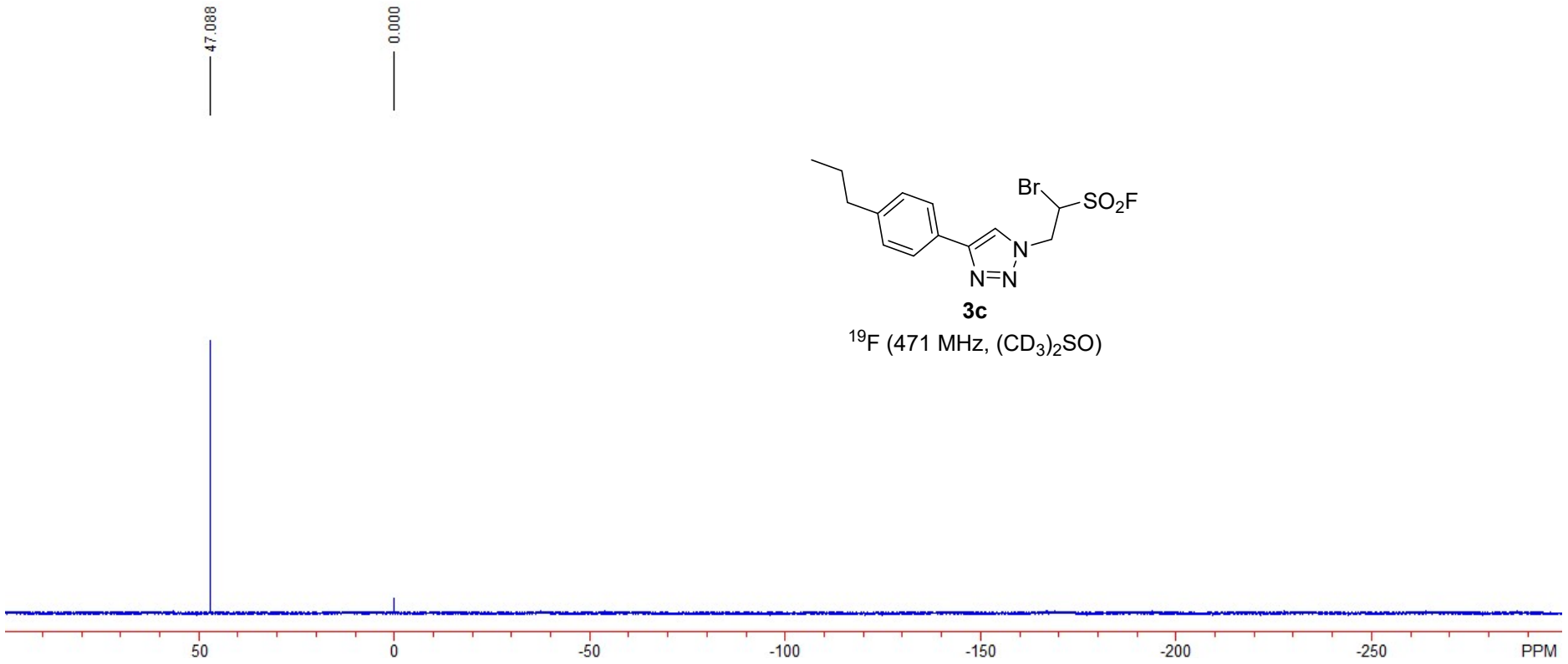
3c

^{1}H (500 MHz, $(CD_3)_2SO$)



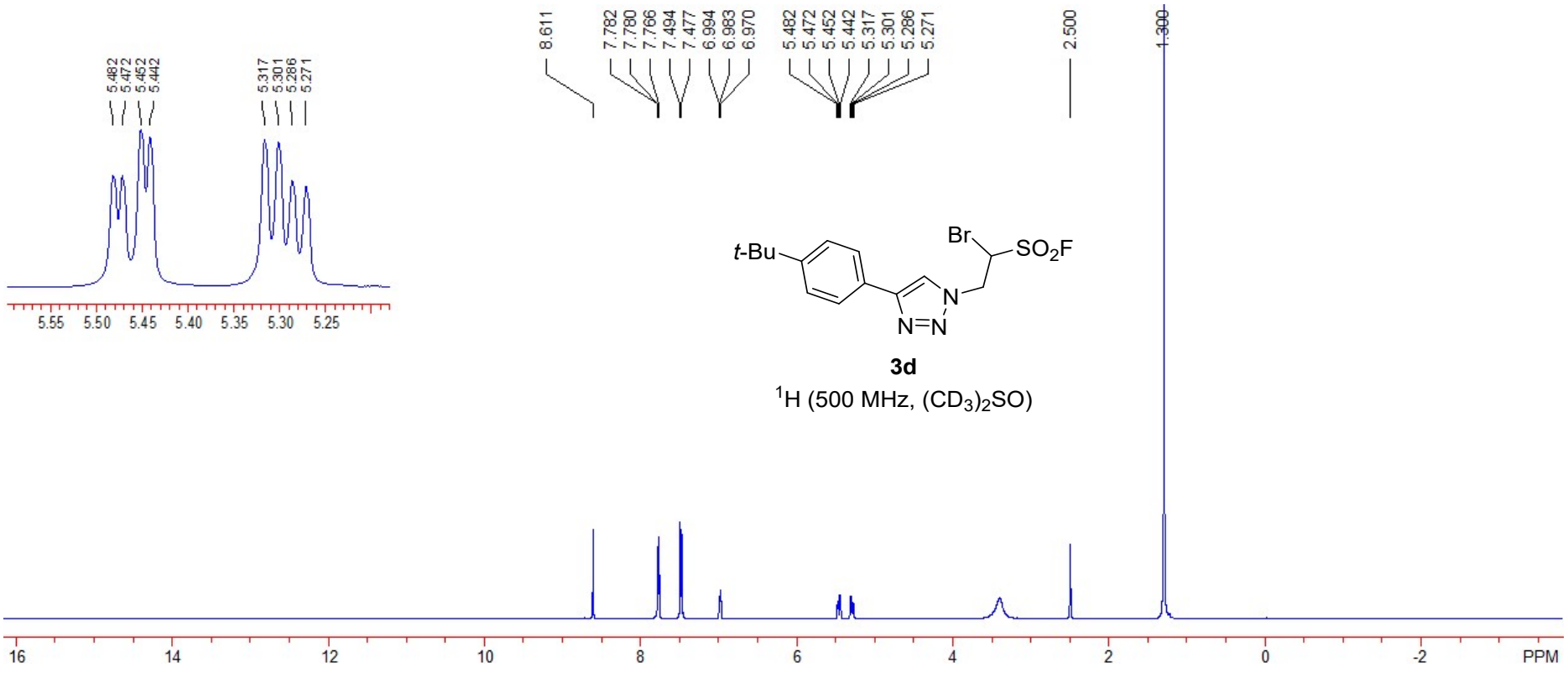
3c

^{13}C (126 MHz, $(CD_3)_2SO$)



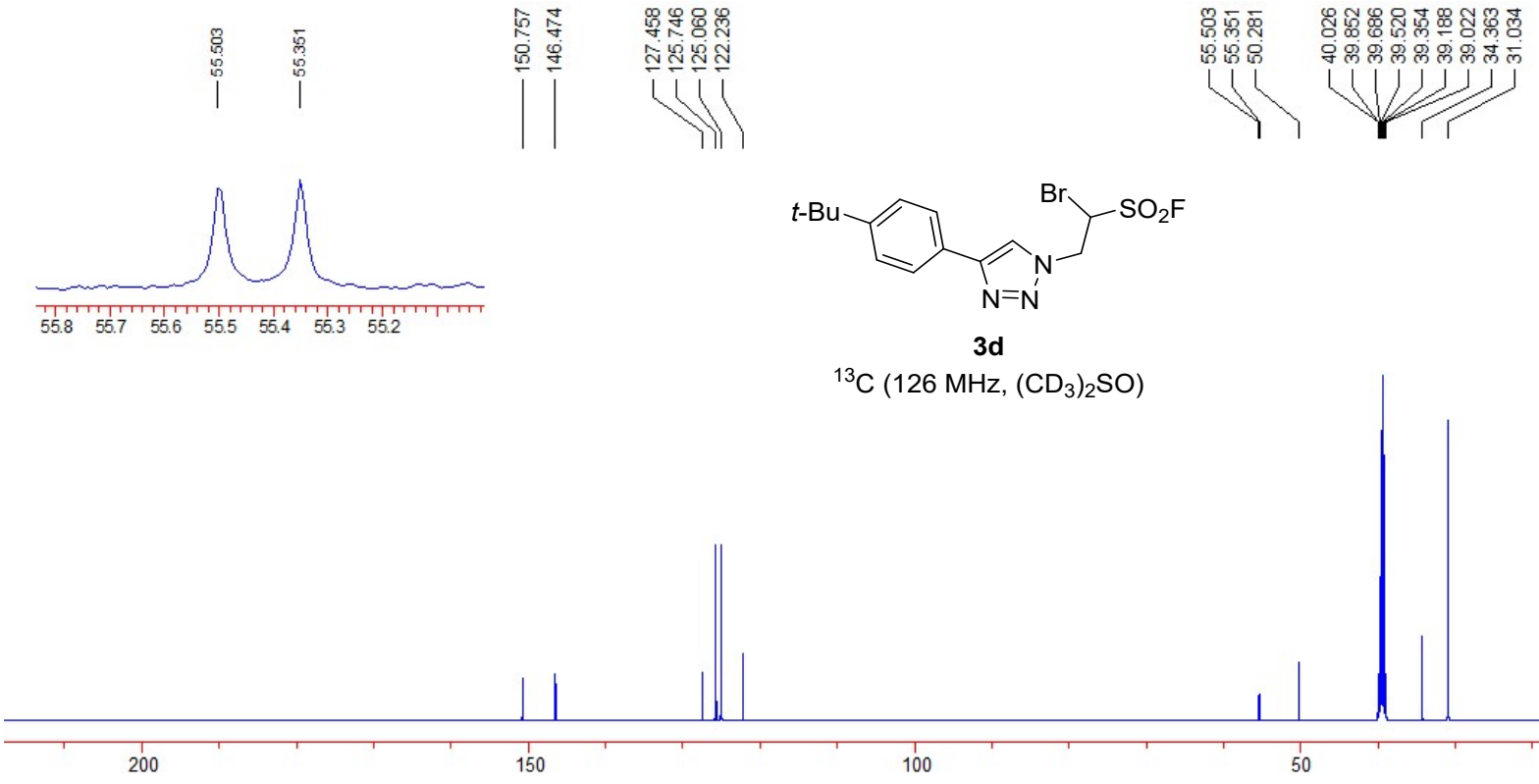
3c

^{19}F (471 MHz, $(CD_3)_2SO$)



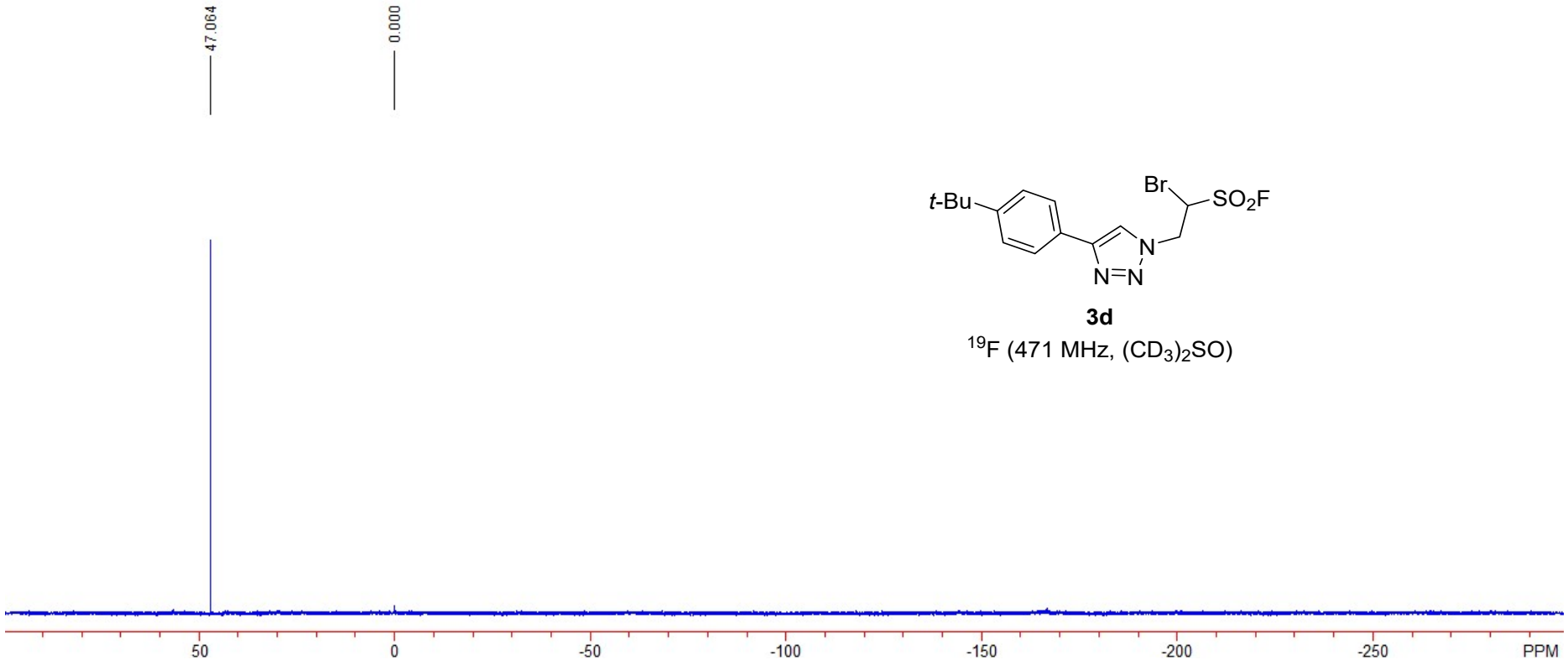
3d

^{1}H (500 MHz, $(CD_3)_2SO$)



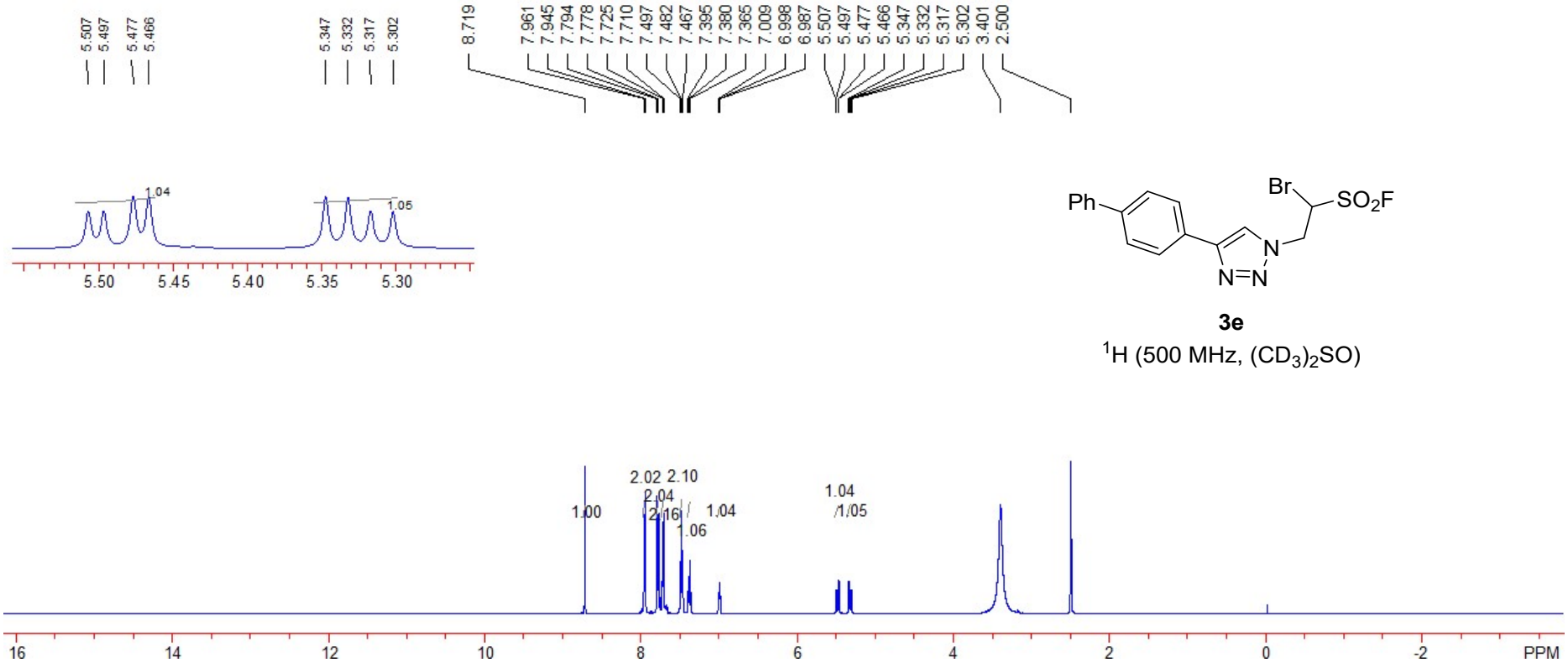
3d

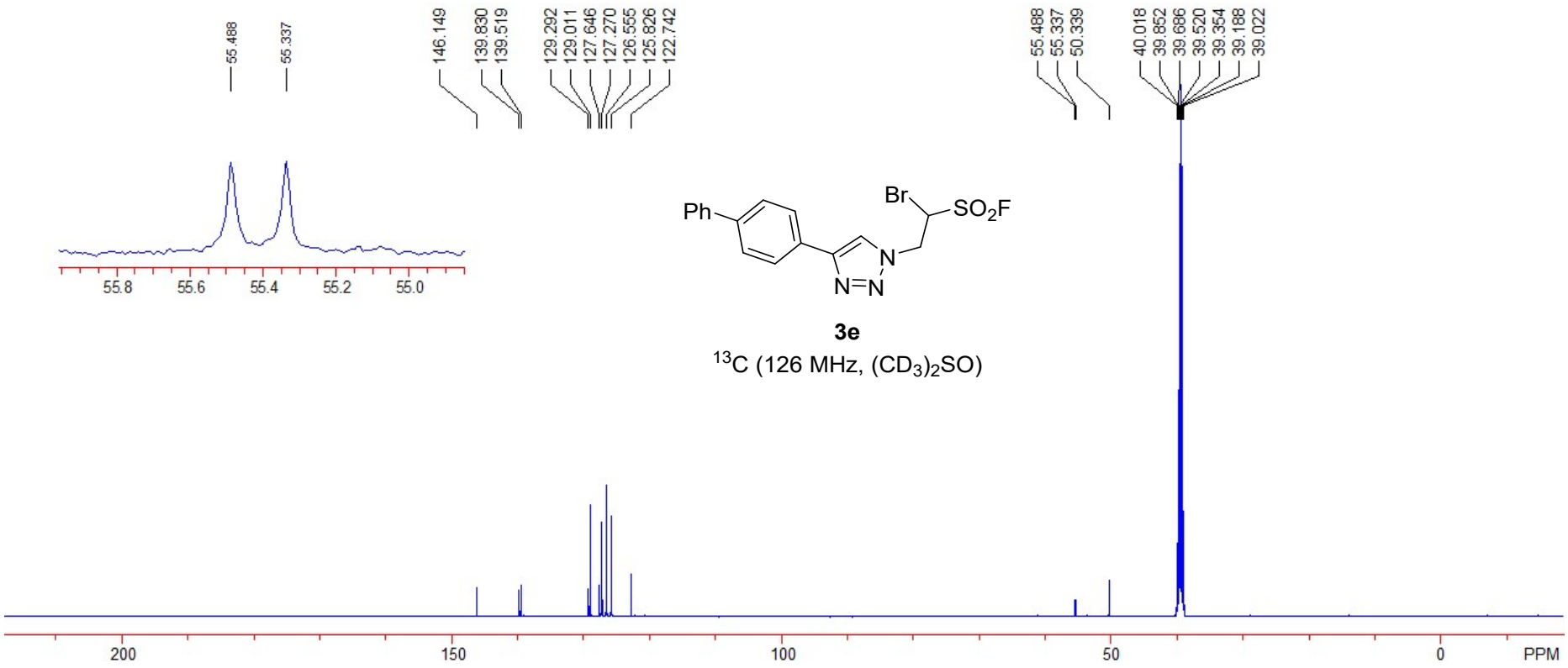
^{13}C (126 MHz, $(CD_3)_2SO$)



3d

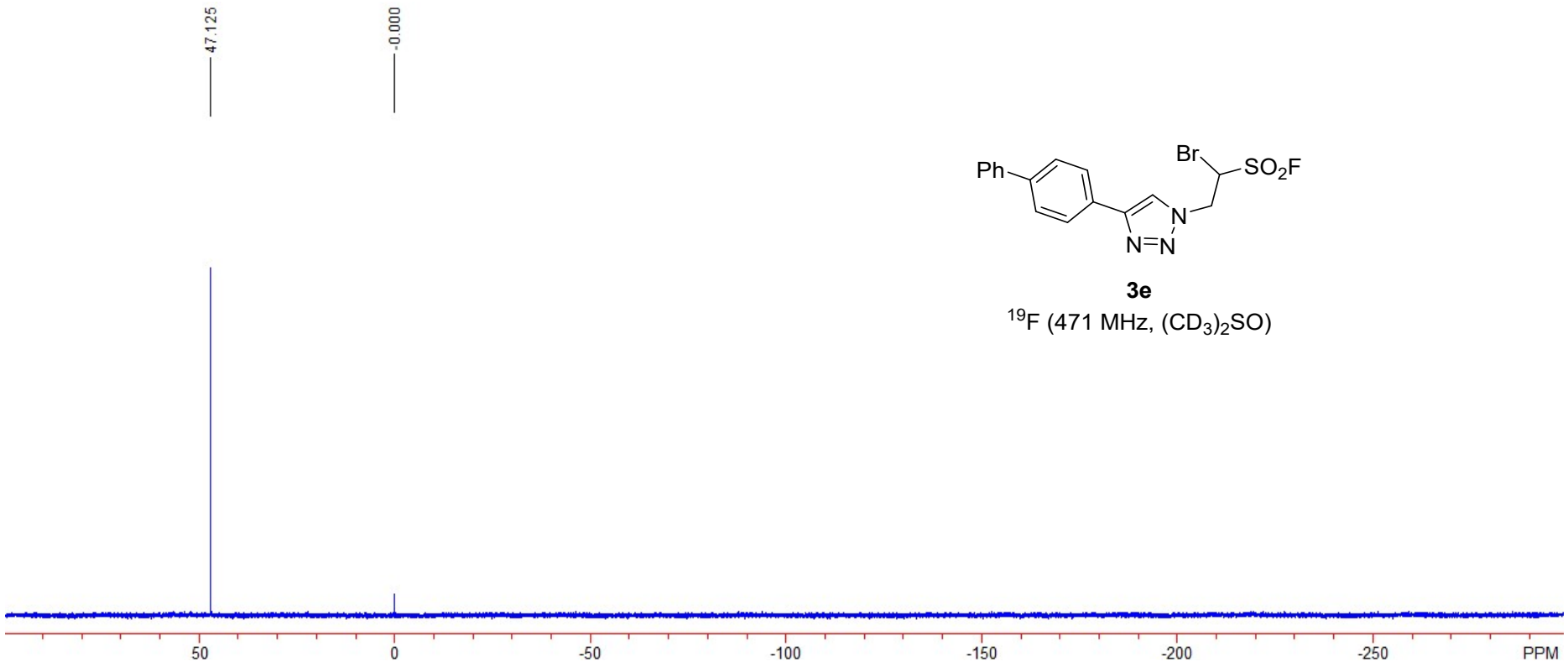
^{19}F (471 MHz, $(CD_3)_2SO$)


5.507
5.497
5.477
5.466
5.347
5.332
5.317
5.302
8.719
7.961
7.945
7.794
7.778
7.725
7.710
7.497
7.482
7.467
7.395
7.380
7.365
7.009
6.998
6.987
5.507
5.497
5.477
5.466
5.347
5.332
5.317
5.302
3.401
2.500
1.04
1.05
5.50
5.45
5.40
5.35
5.30
Ph
Br
SO2F
N
N=N
3e
1H (500 MHz, (CD3)2SO)
1.00
2.02
2.04
2.16
2.10
1.06
1.04
1.04
1.05
16
14
12
10
8
6
4
2
0
-2
PPM



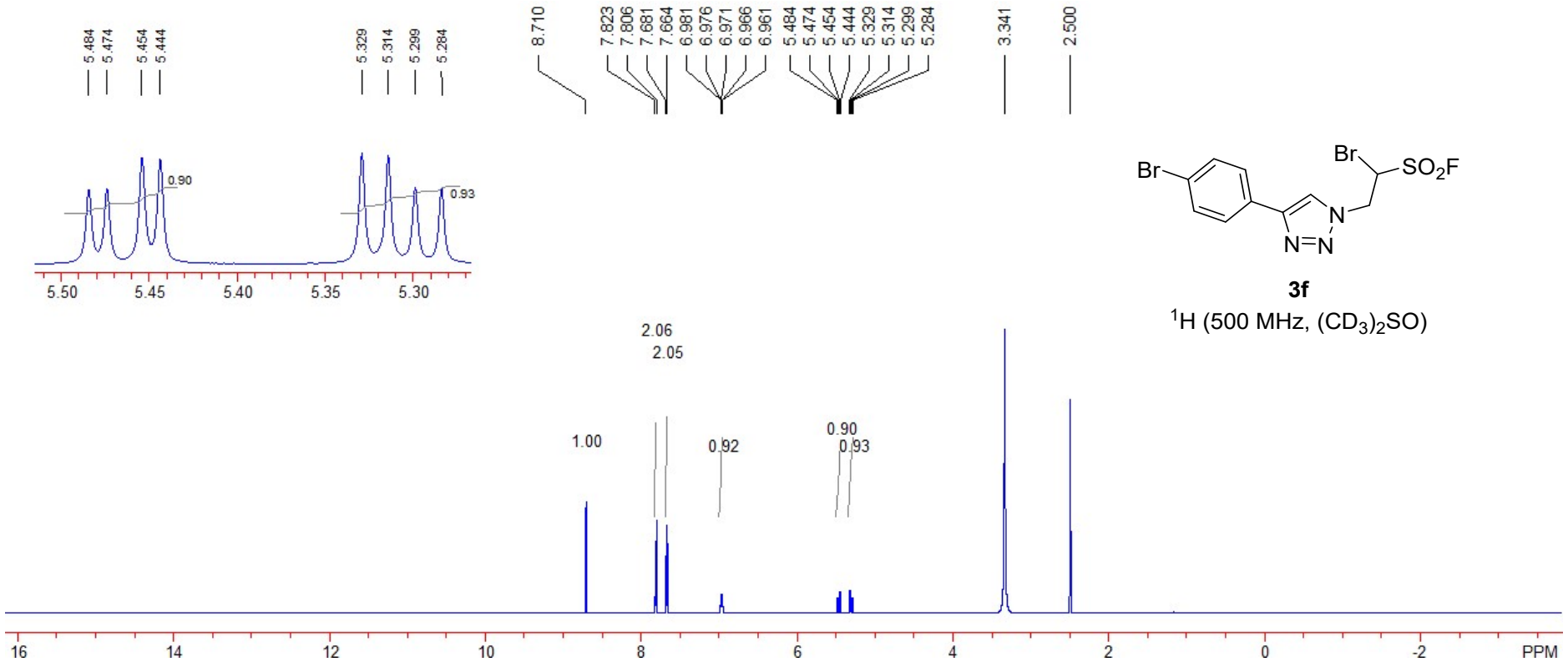
3e

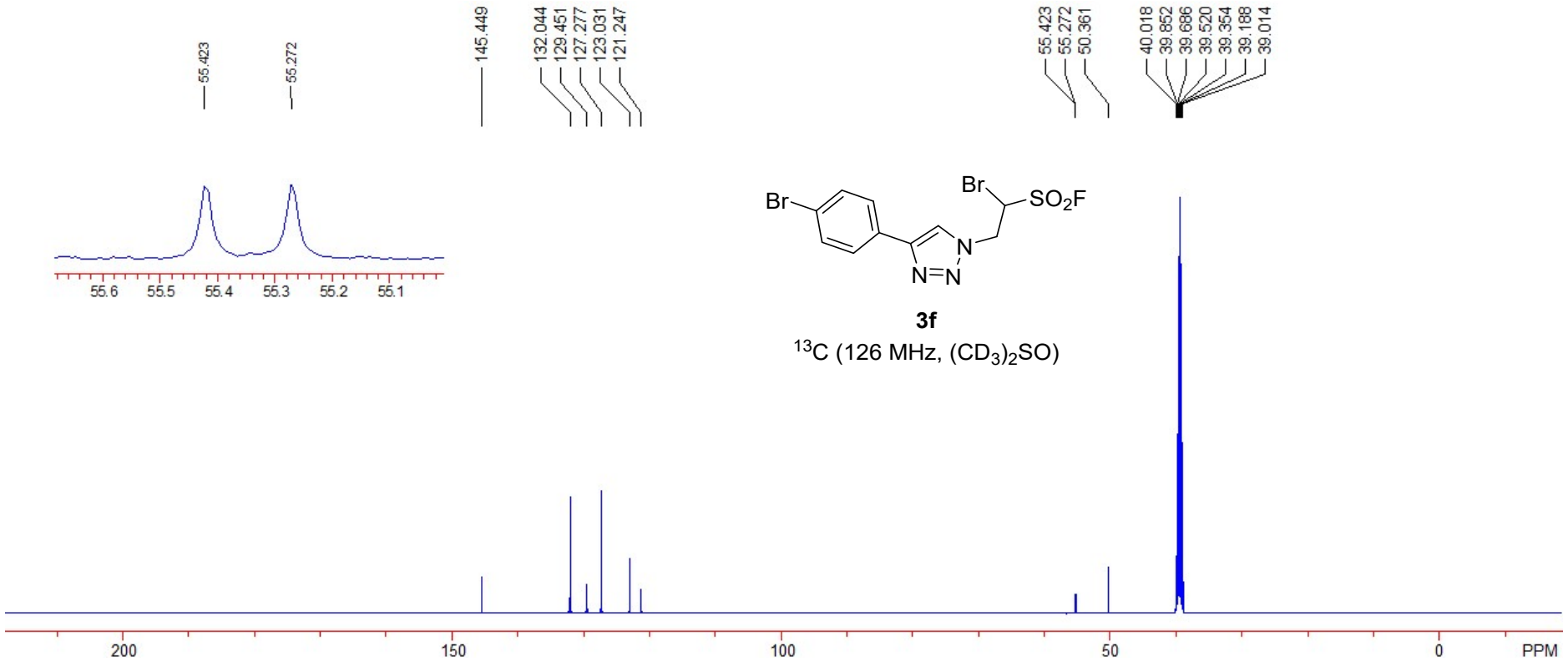
^{13}C (126 MHz, $(CD_3)_2SO$)



3e

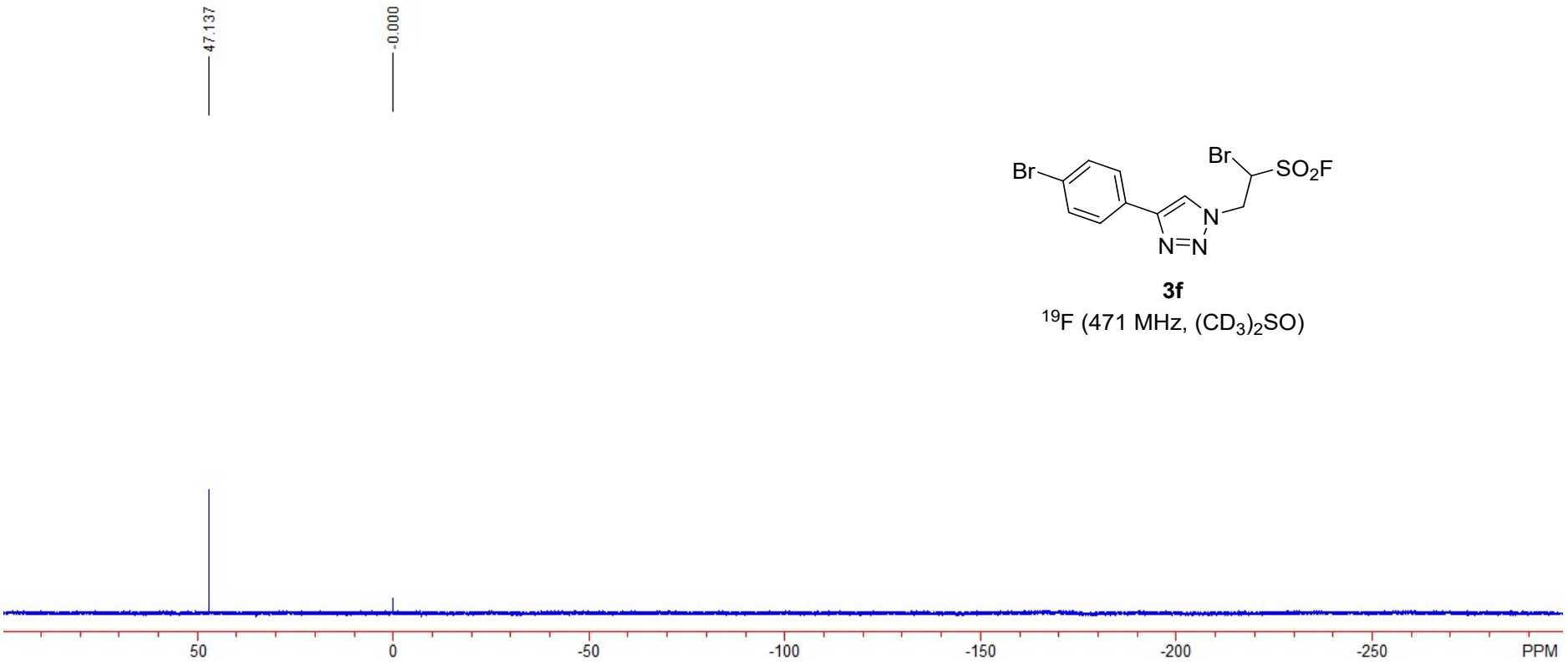
^{19}F (471 MHz, $(CD_3)_2SO$)


5.484
5.474
5.454
5.444
5.329
5.314
5.299
5.284
8.710
7.823
7.806
7.681
7.664
6.981
6.976
6.971
6.966
6.961
5.484
5.474
5.454
5.444
5.329
5.314
5.299
5.284
3.341
2.500
0.90
0.93
5.50
5.45
5.40
5.35
5.30
Br
Br
SO2F
N
N=N
3f
1H (500 MHz, (CD3)2SO)
2.06
2.05
1.00
0.92
0.90
0.93
16
14
12
10
8
6
4
2
0
-2
PPM



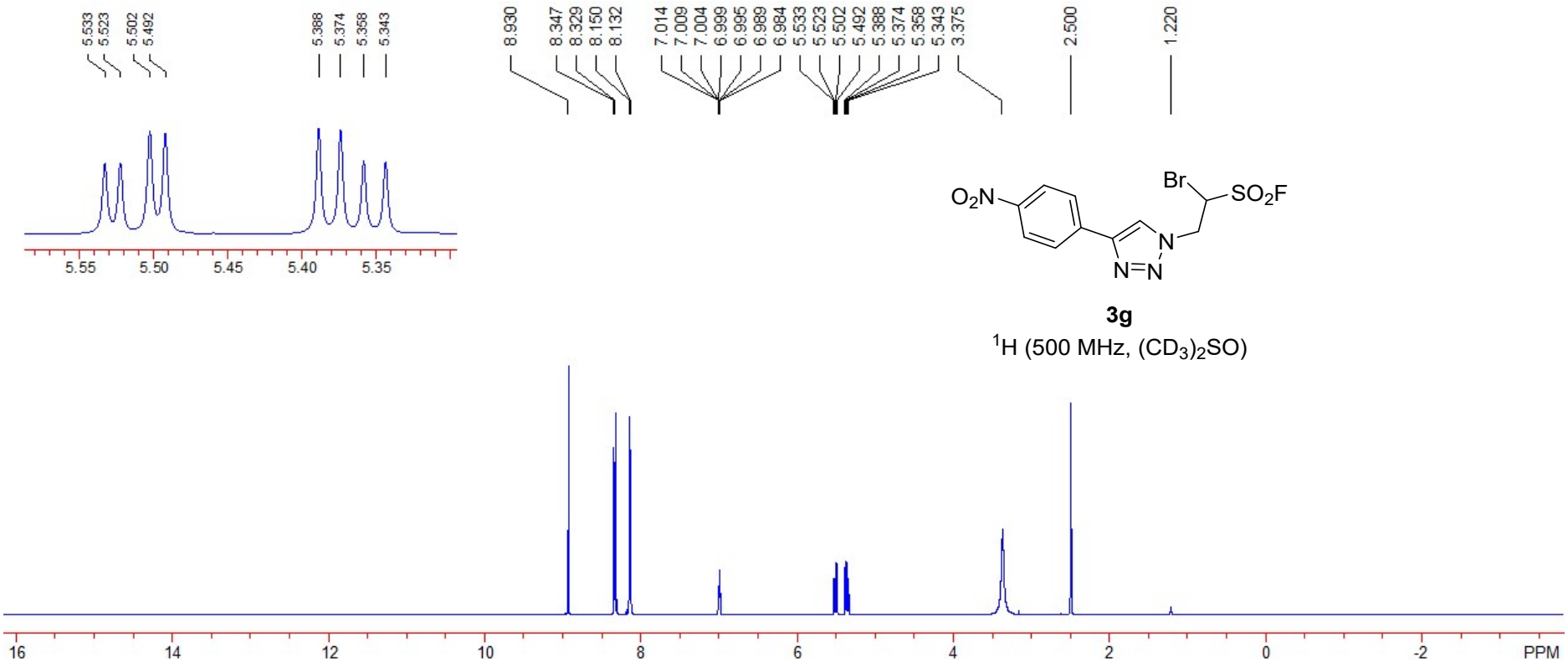
3f

^{13}C (126 MHz, $(CD_3)_2SO$)



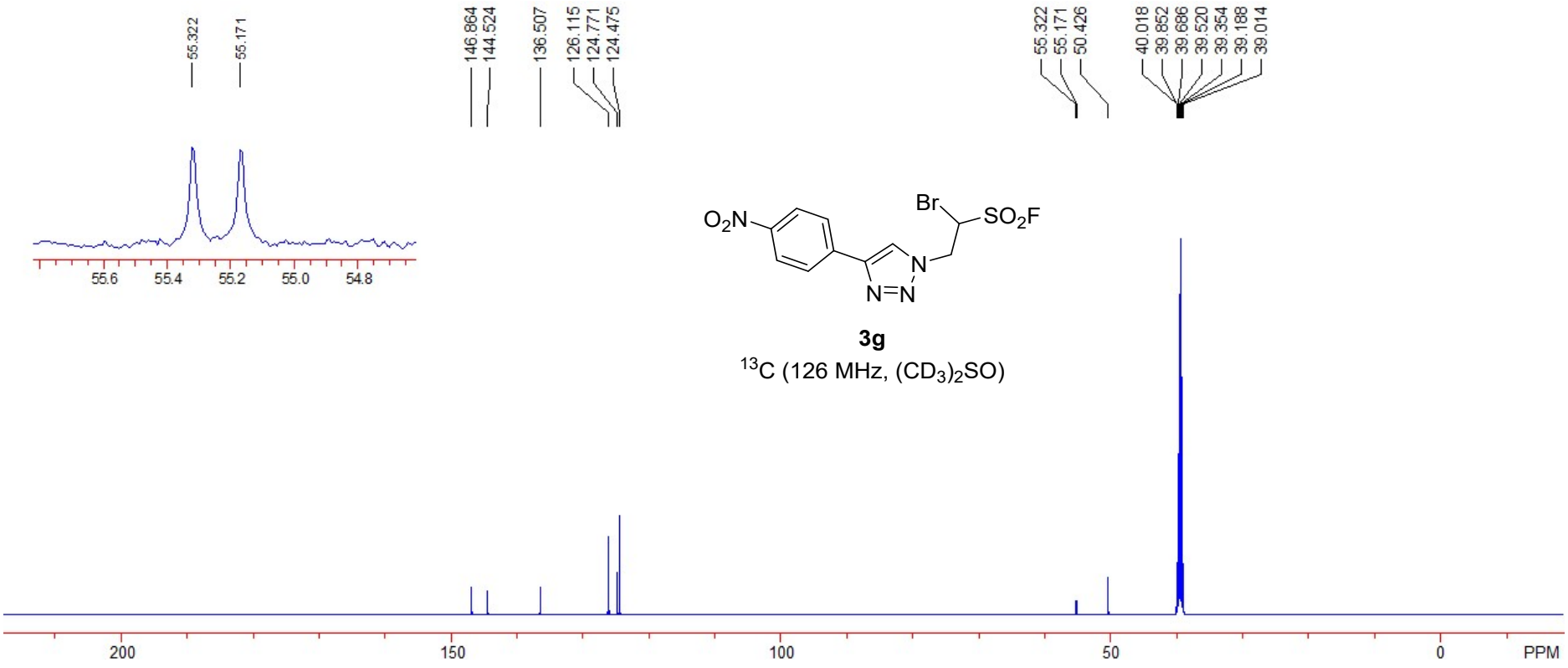
3f

^{19}F (471 MHz, $(CD_3)_2SO$)



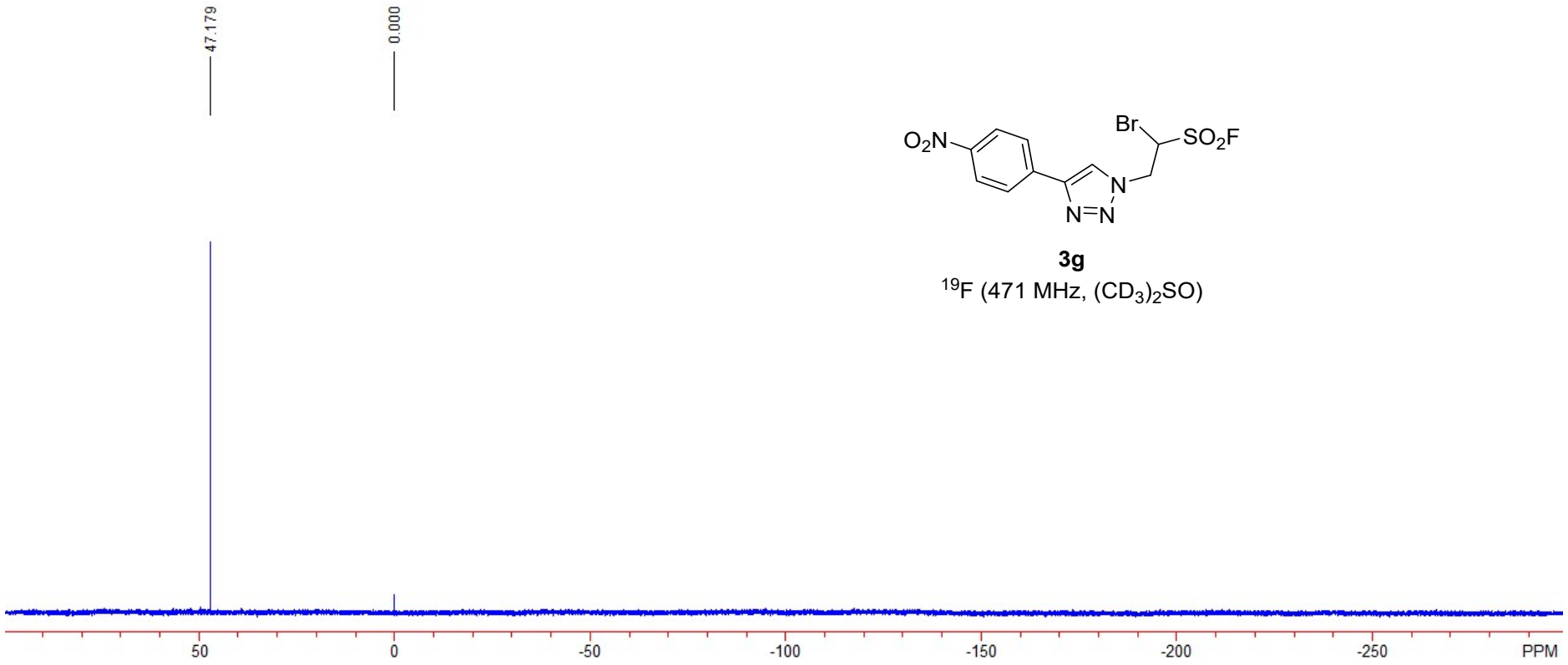
3g

^{1}H (500 MHz, $(CD_3)_2SO$)



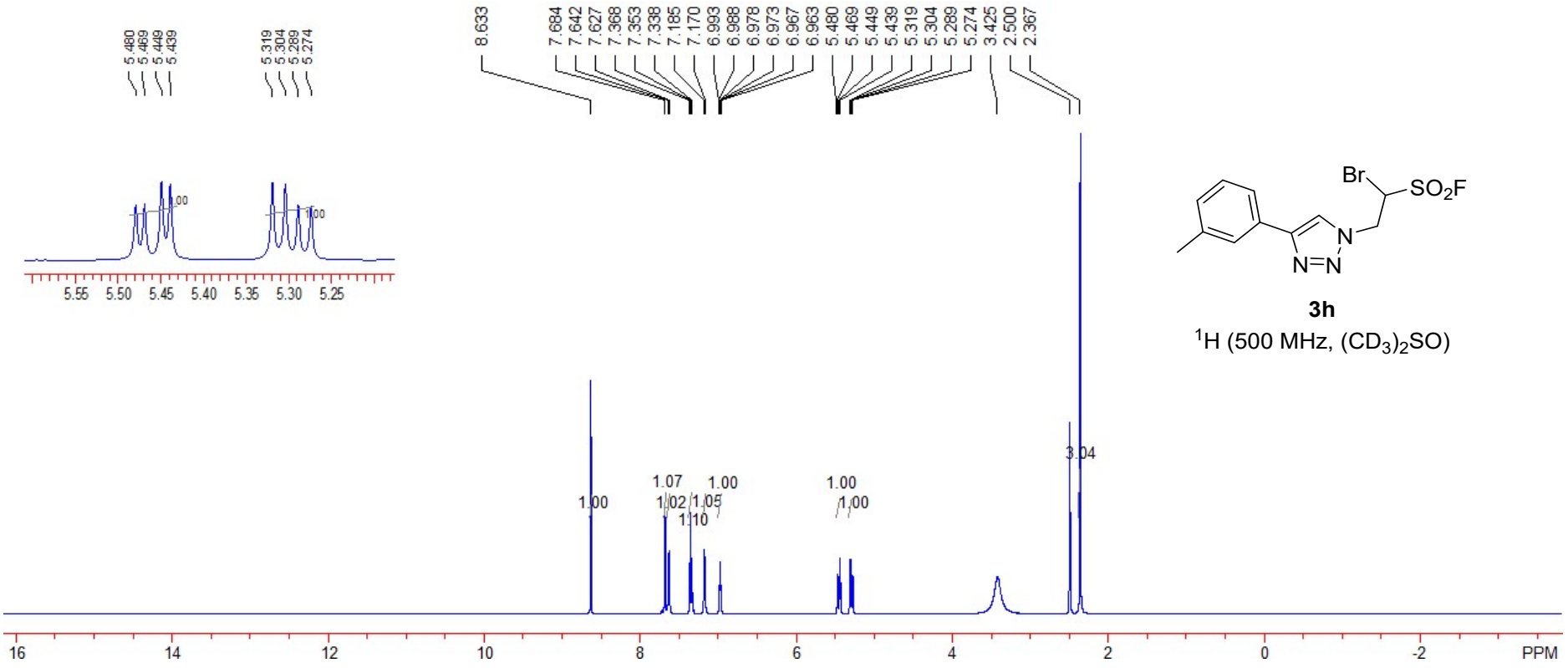
3g

^{13}C (126 MHz, $(CD_3)_2SO$)



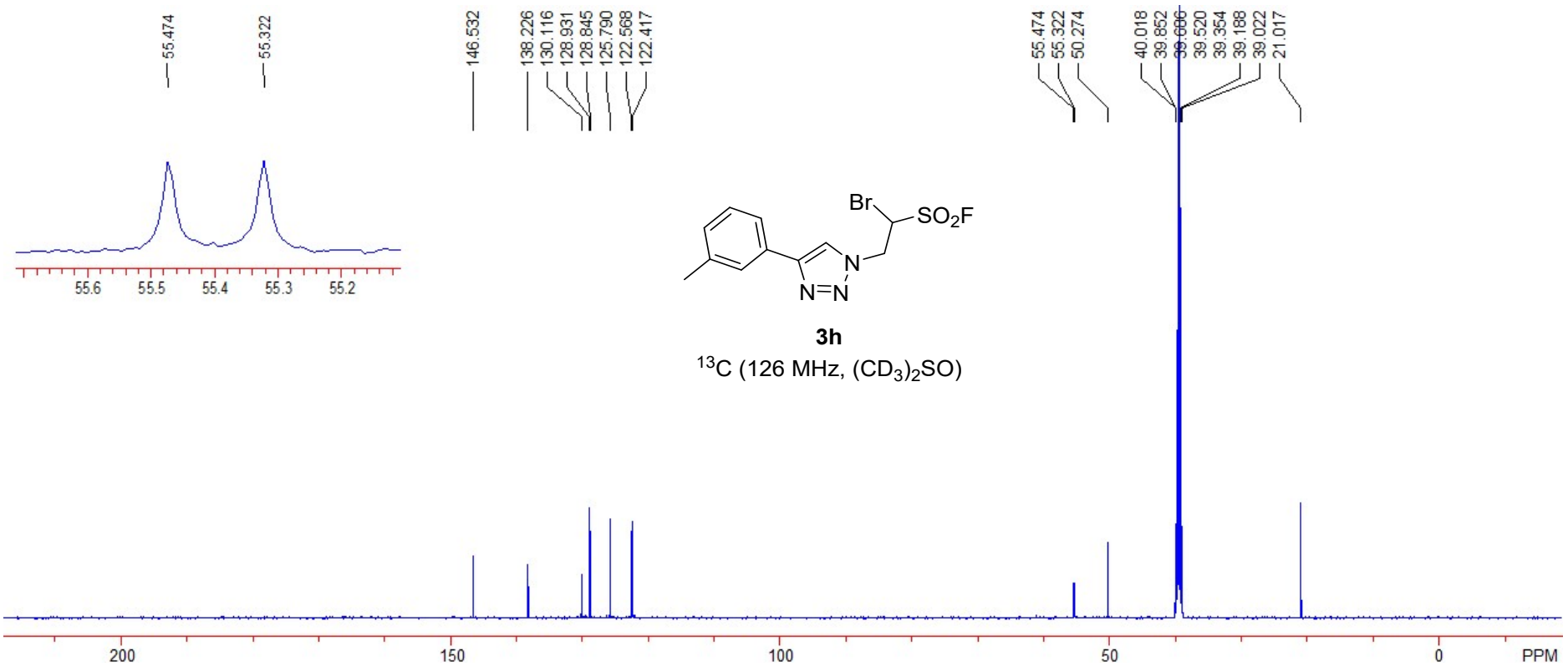
3g

^{19}F (471 MHz, $(CD_3)_2SO$)



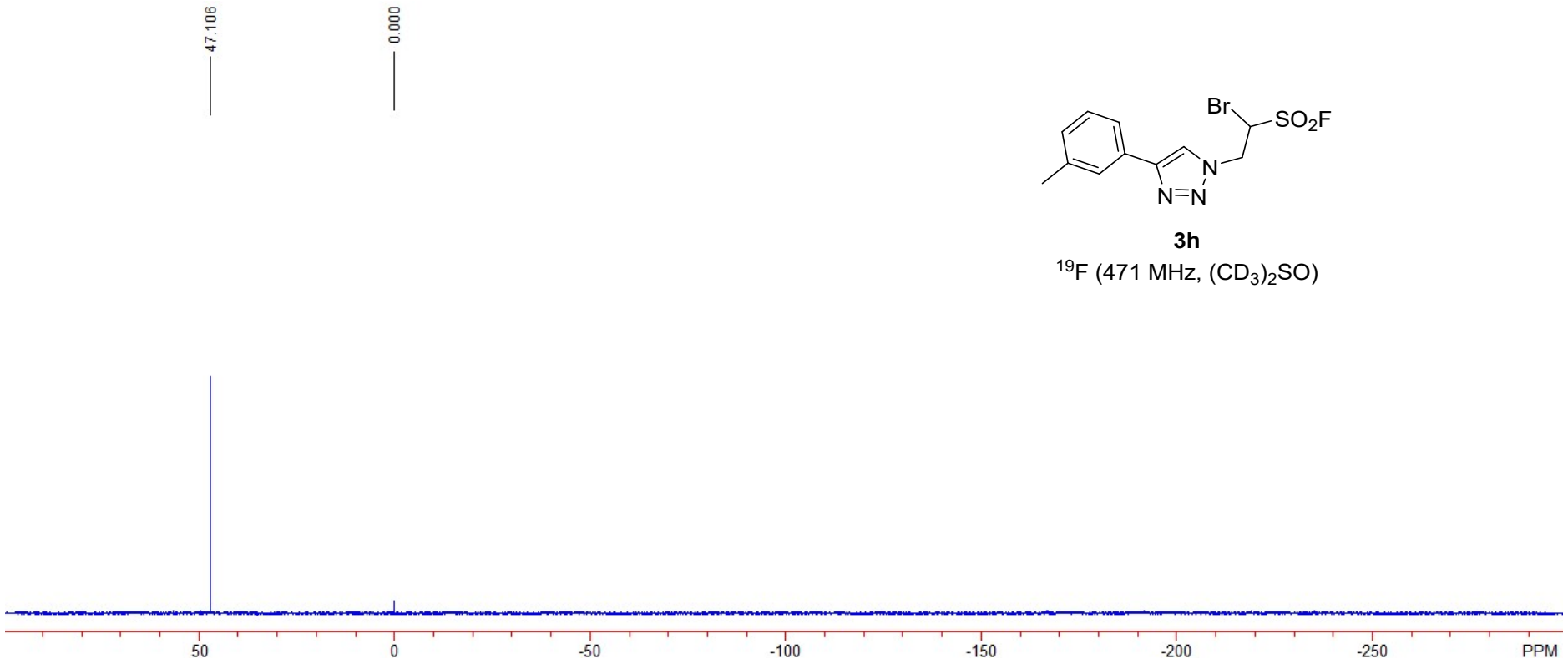
3h

^{1}H (500 MHz, $(CD_3)_2SO$)



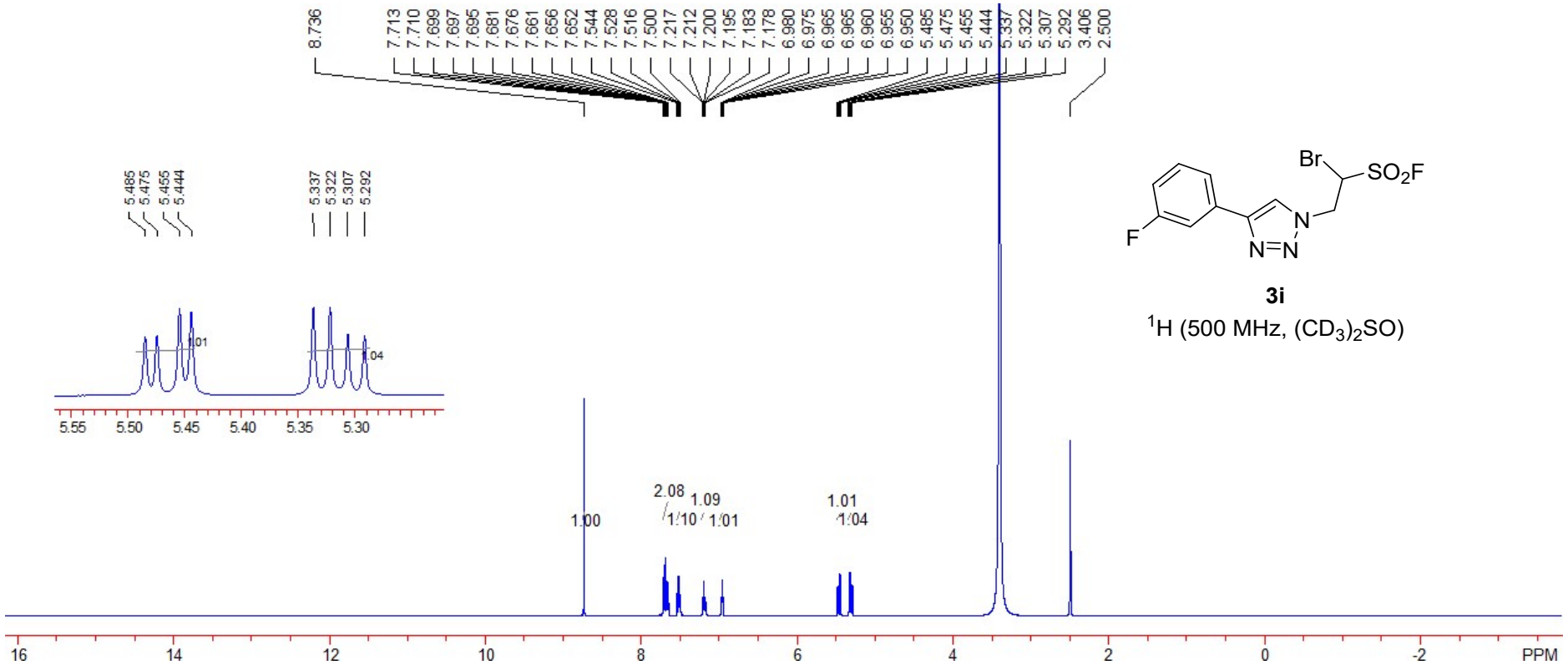
3h

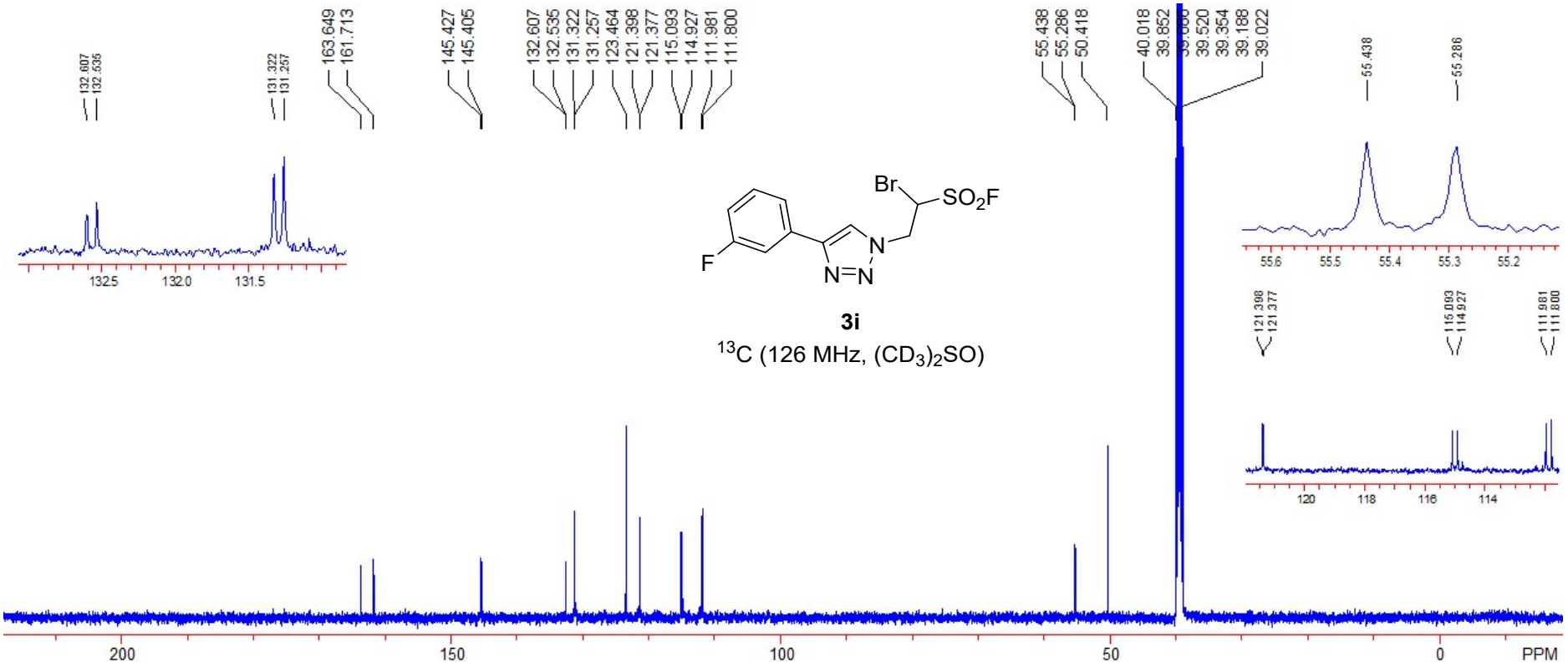
^{13}C (126 MHz, $(CD_3)_2SO$)

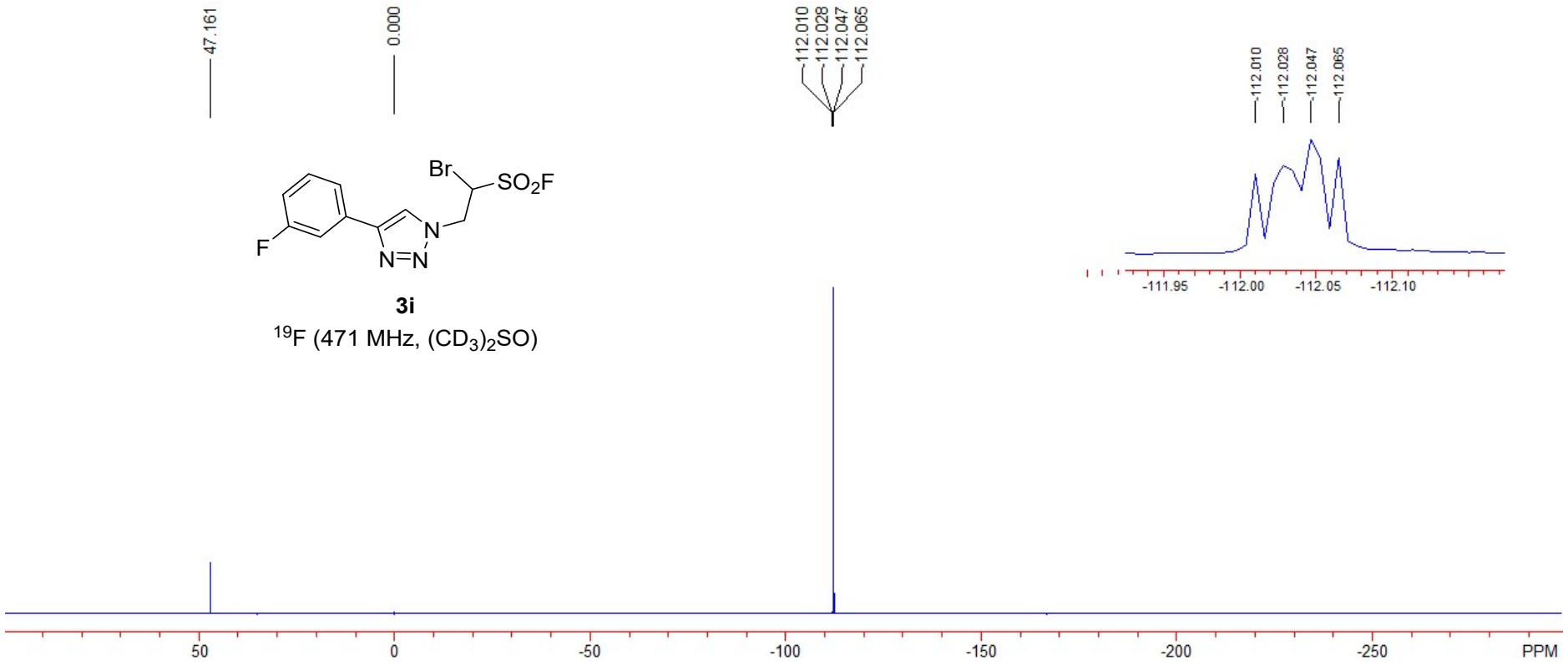


3h

^{19}F (471 MHz, $(CD_3)_2SO$)

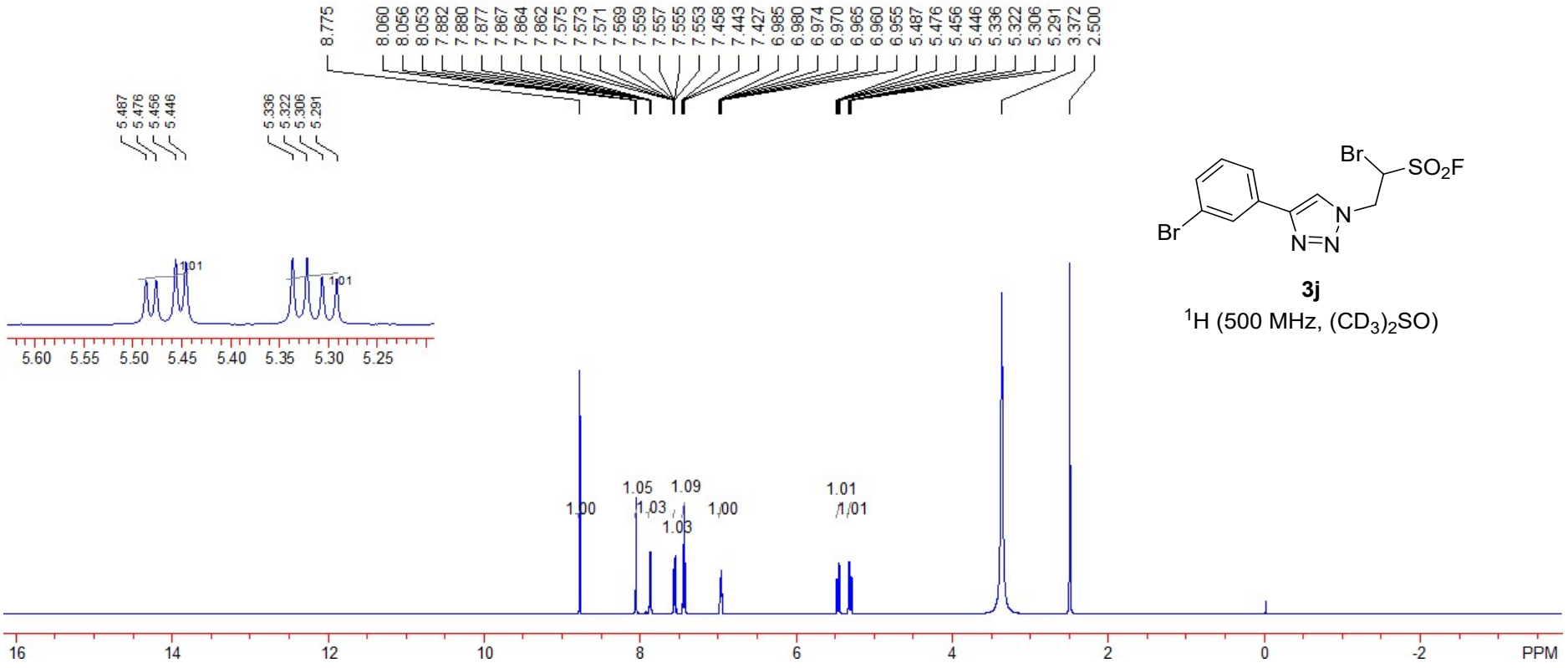

8.736
7.713
7.710
7.699
7.697
7.695
7.681
7.676
7.661
7.656
7.652
7.544
7.528
7.516
7.500
7.217
7.212
7.200
7.195
7.183
7.178
6.980
6.975
6.965
6.965
6.960
6.955
6.950
5.485
5.475
5.455
5.444
5.337
5.322
5.307
5.292
3.406
2.500
1.00
2.08
1.09
1.10
1.01
1.01
1.04
5.55
5.50
5.45
5.40
5.35
5.30
16
14
12
10
8
6
4
2
0
-2
PPM
Br
SO2F
F
N
N=N
3i
1H (500 MHz, (CD3)2SO)


132.607
132.535
131.322
131.257
163.649
161.713
145.427
145.405
132.607
132.535
131.322
131.257
123.464
121.398
121.377
115.093
114.927
111.981
111.800
55.438
55.286
50.418
40.018
39.852
39.520
39.354
39.188
39.022
55.438
55.286
121.398
121.377
115.093
114.927
111.981
111.800
Br
SO2F
F
N
N=N
3i
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM



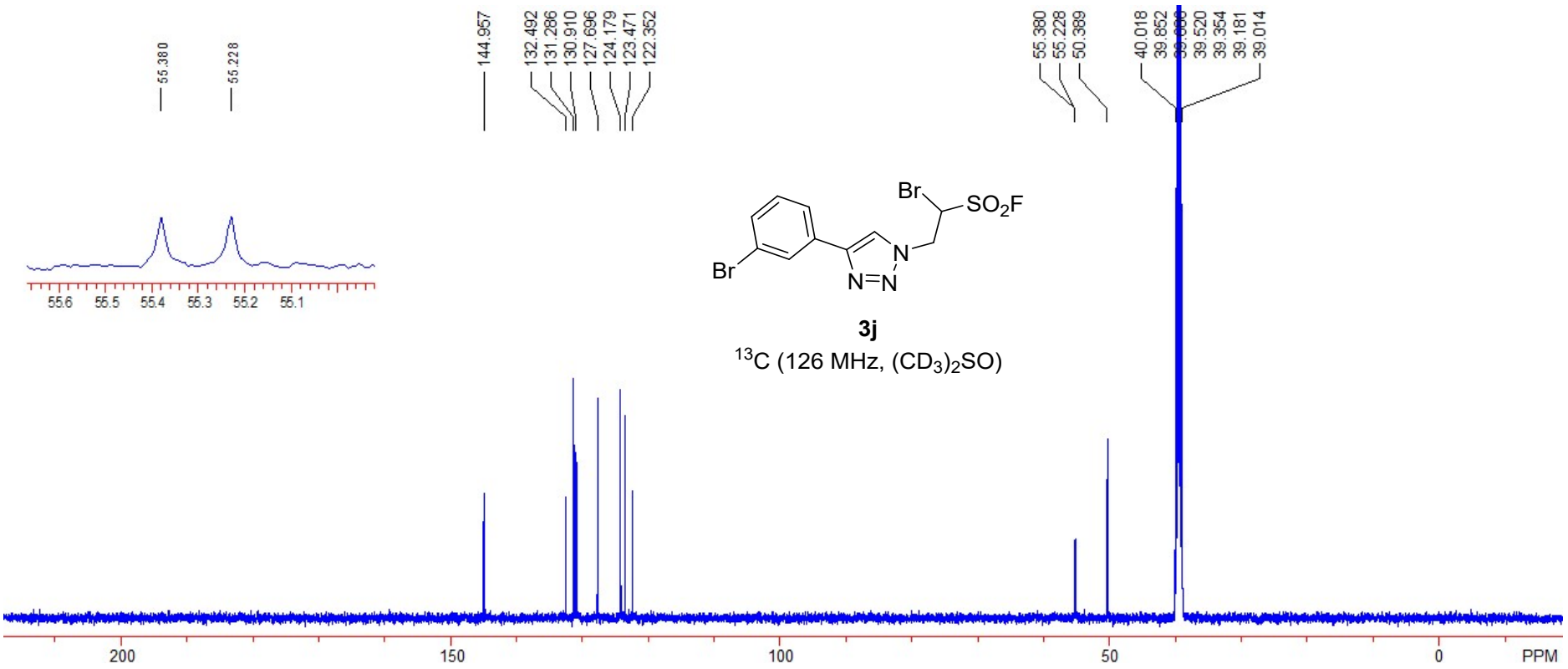
3i

^{19}F (471 MHz, $(CD_3)_2SO$)



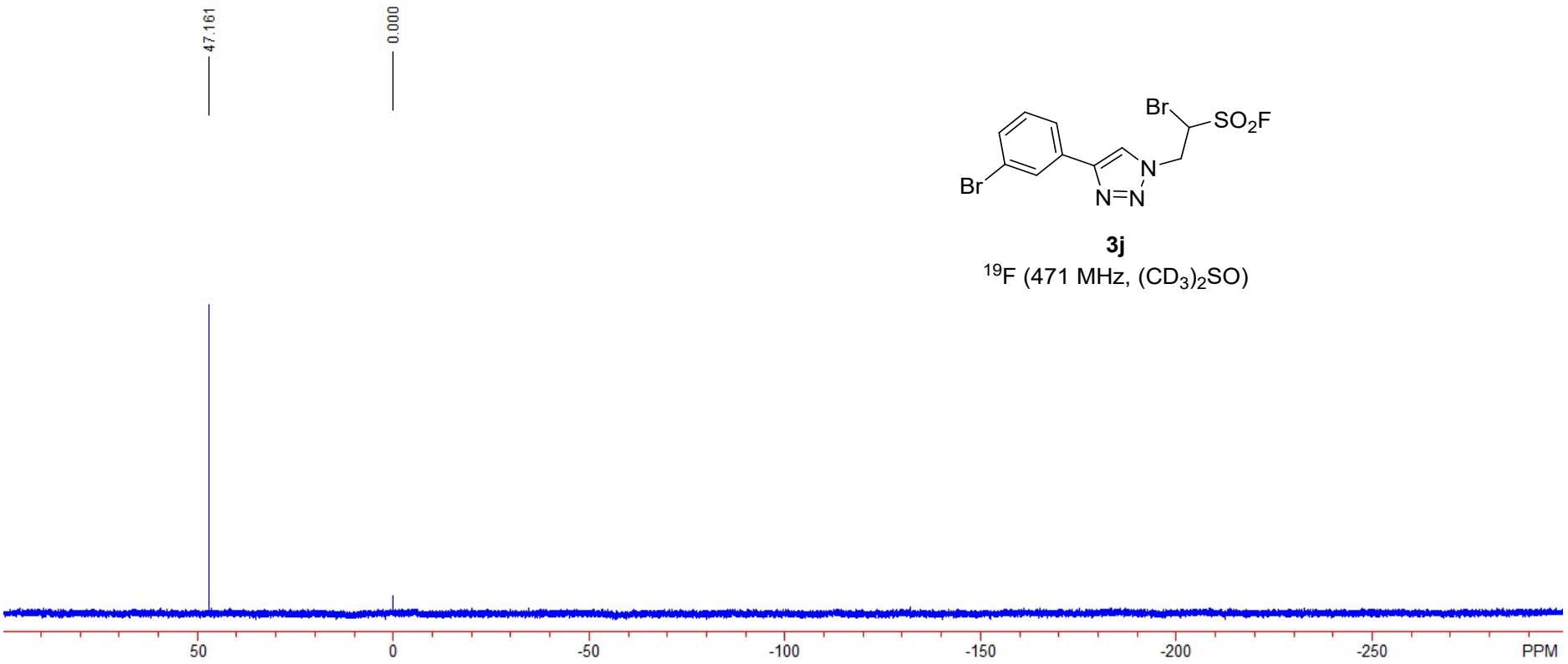
3j

^{1}H (500 MHz, $(CD_3)_2SO$)



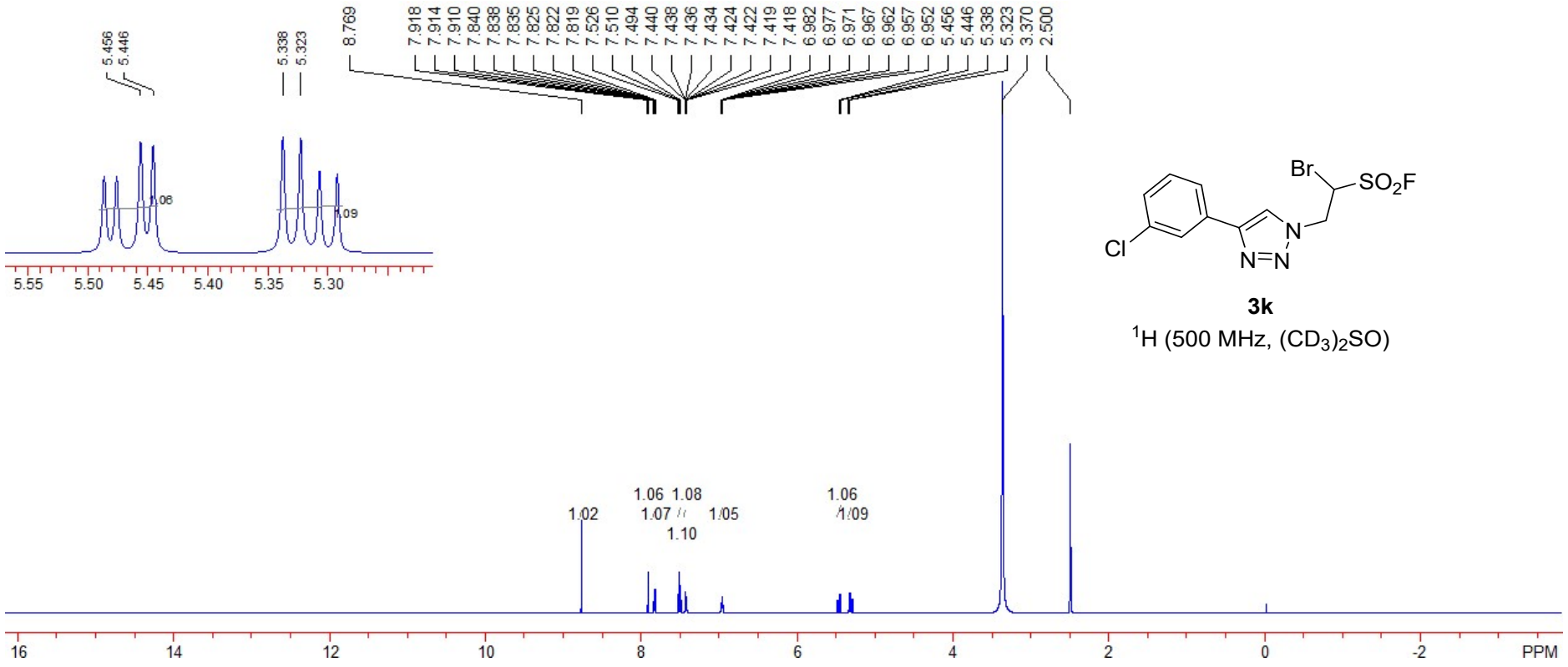
3j

^{13}C (126 MHz, $(CD_3)_2SO$)



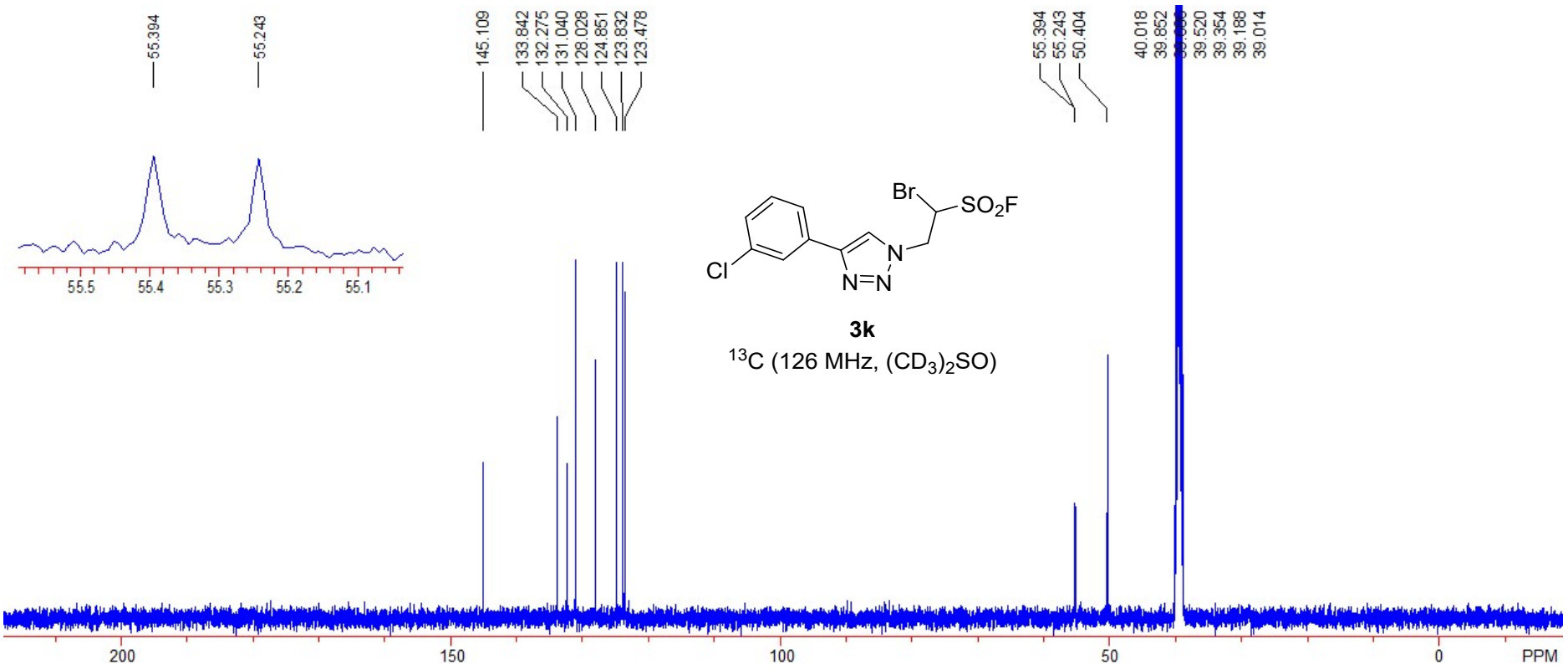
3j

^{19}F (471 MHz, $(CD_3)_2SO$)



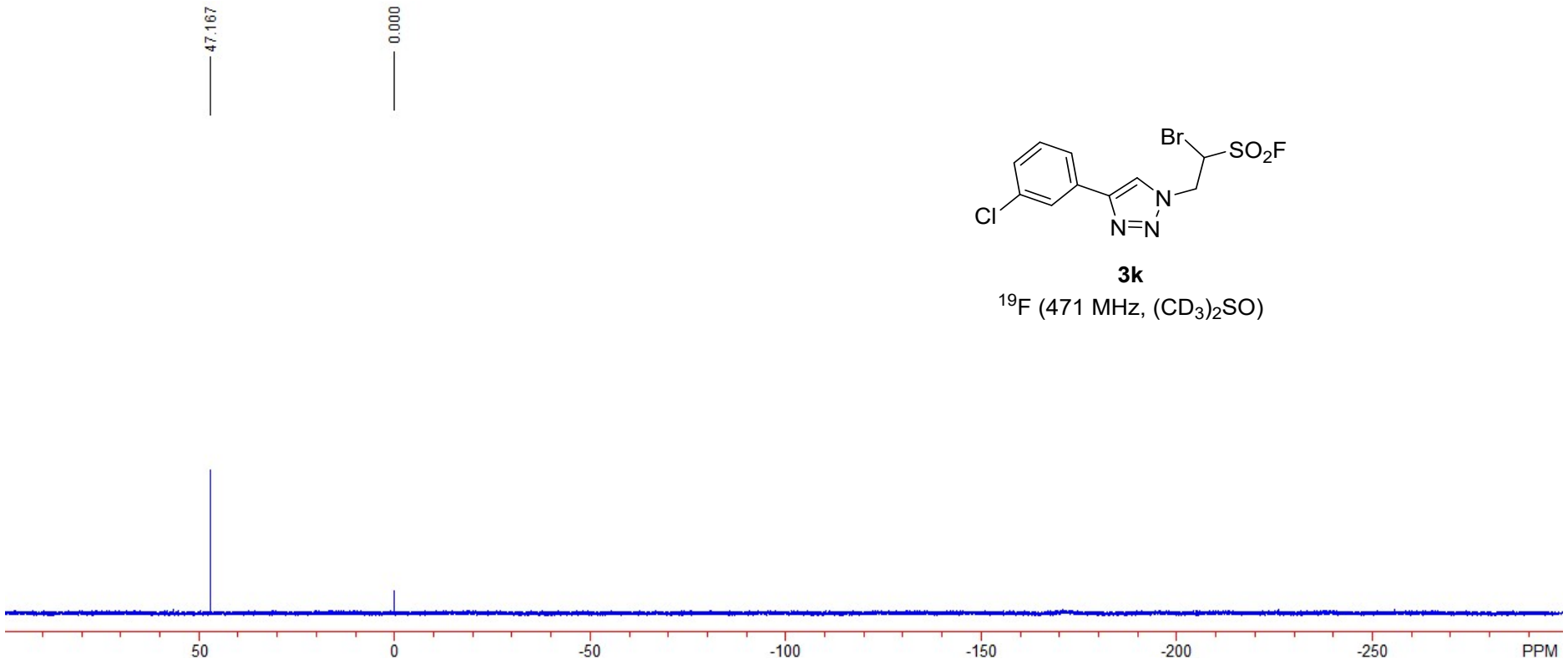
3k

^{1}H (500 MHz, $(CD_3)_2SO$)



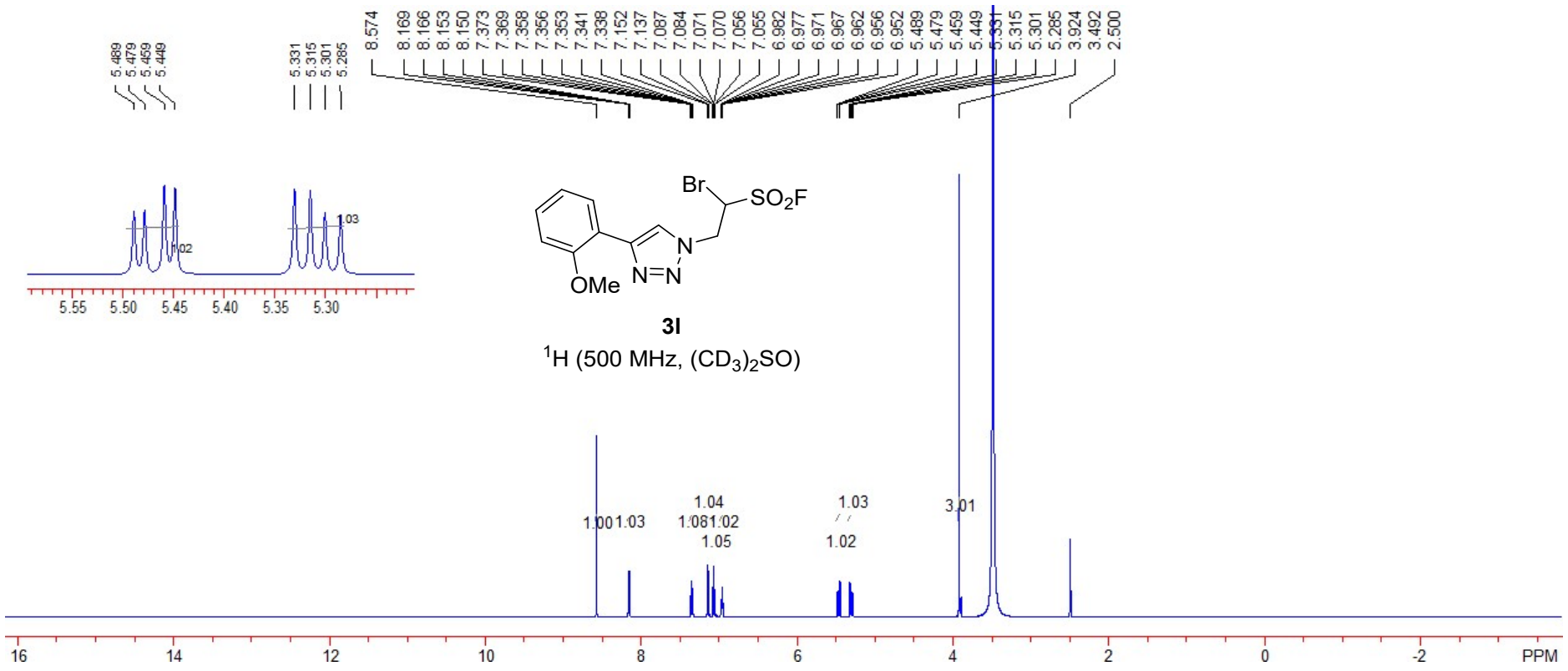
3k

^{13}C (126 MHz, $(CD_3)_2SO$)



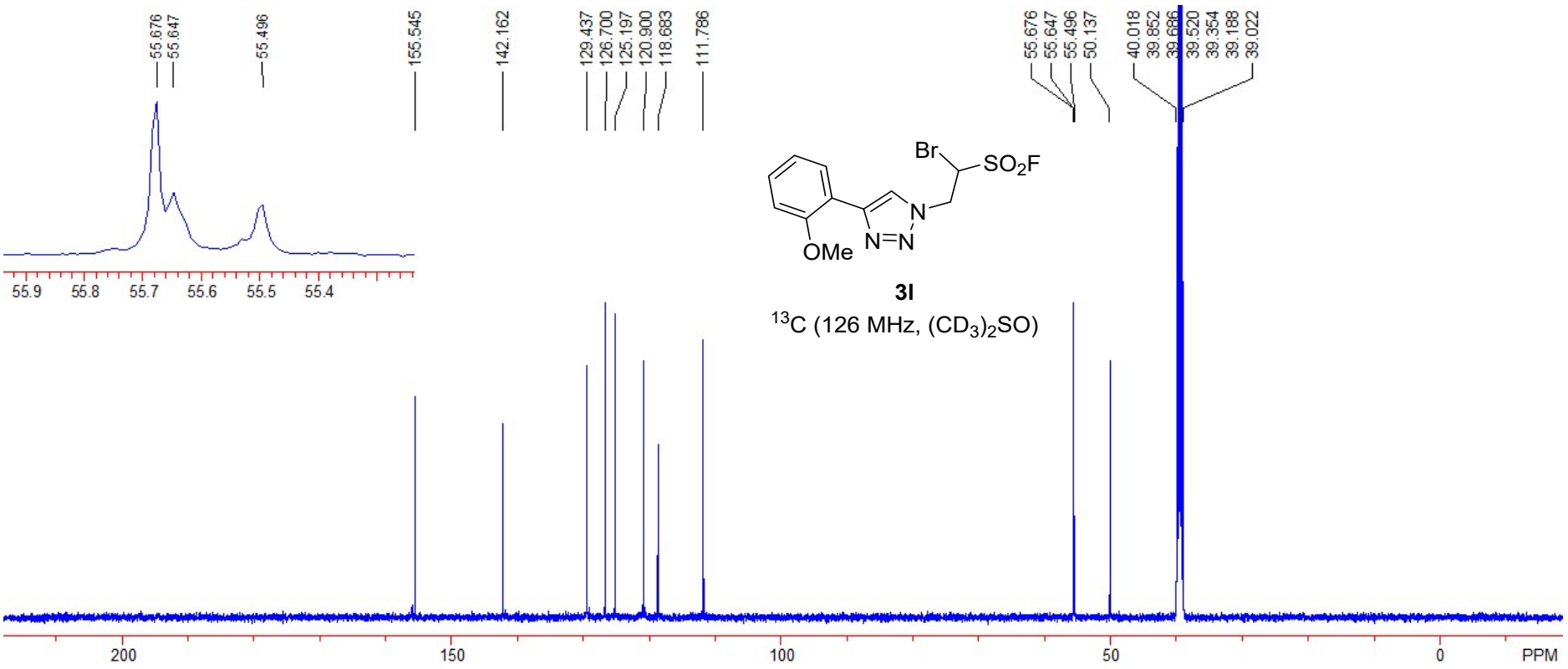
3k

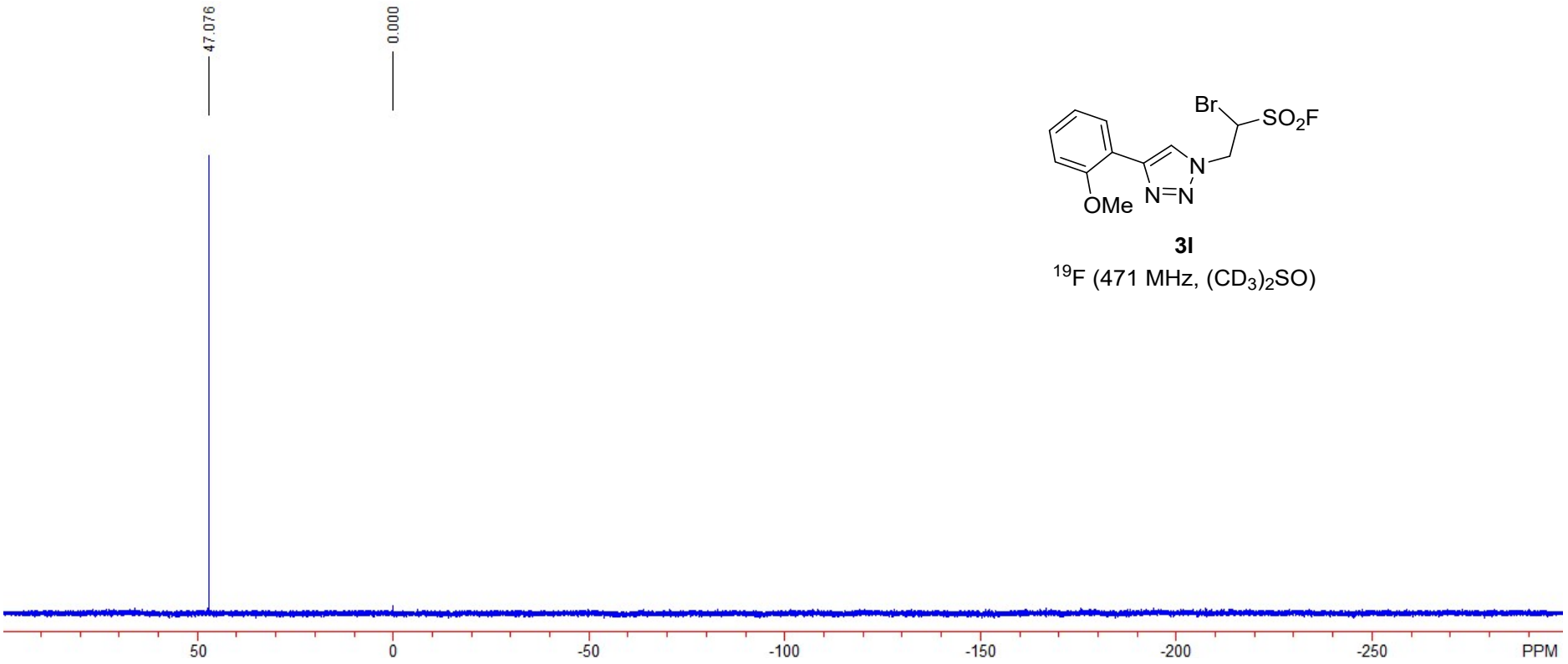
^{19}F (471 MHz, $(CD_3)_2SO$)



3l

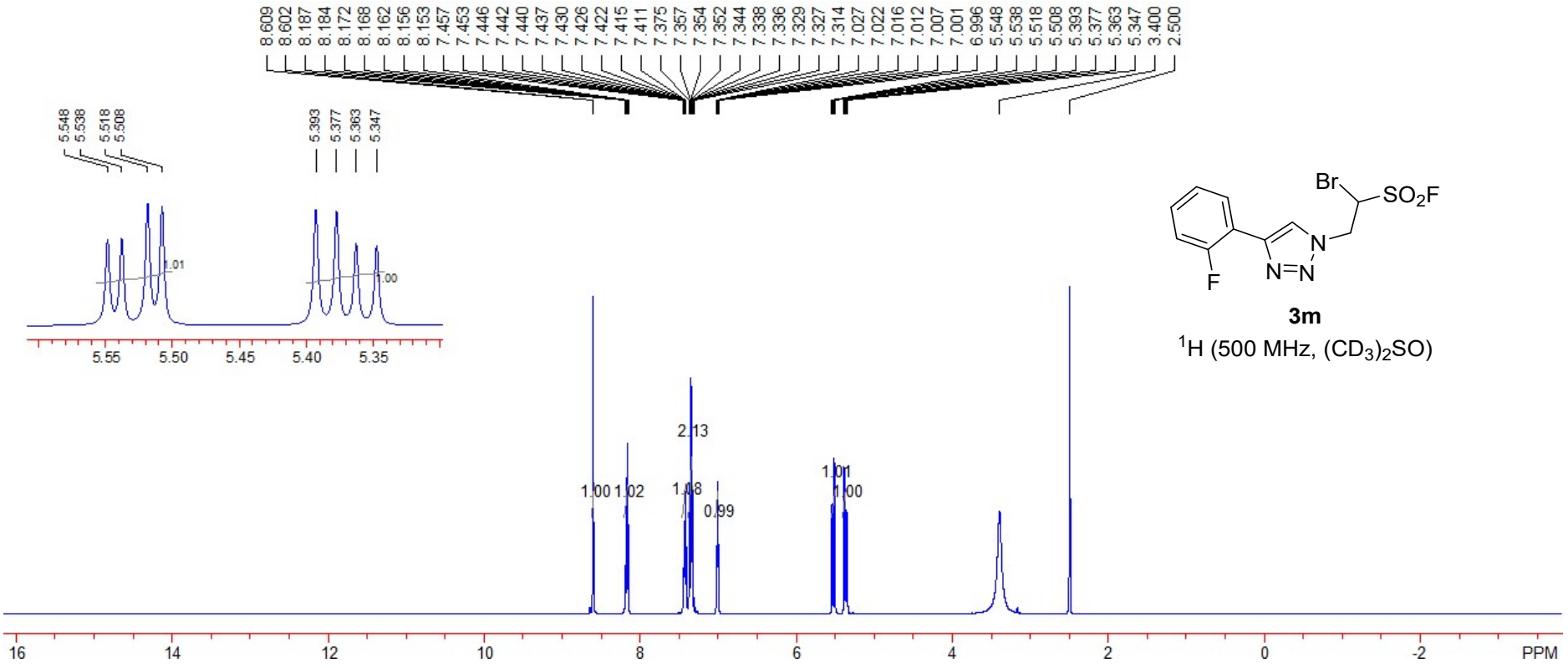
^{1}H (500 MHz, $(CD_3)_2SO$)

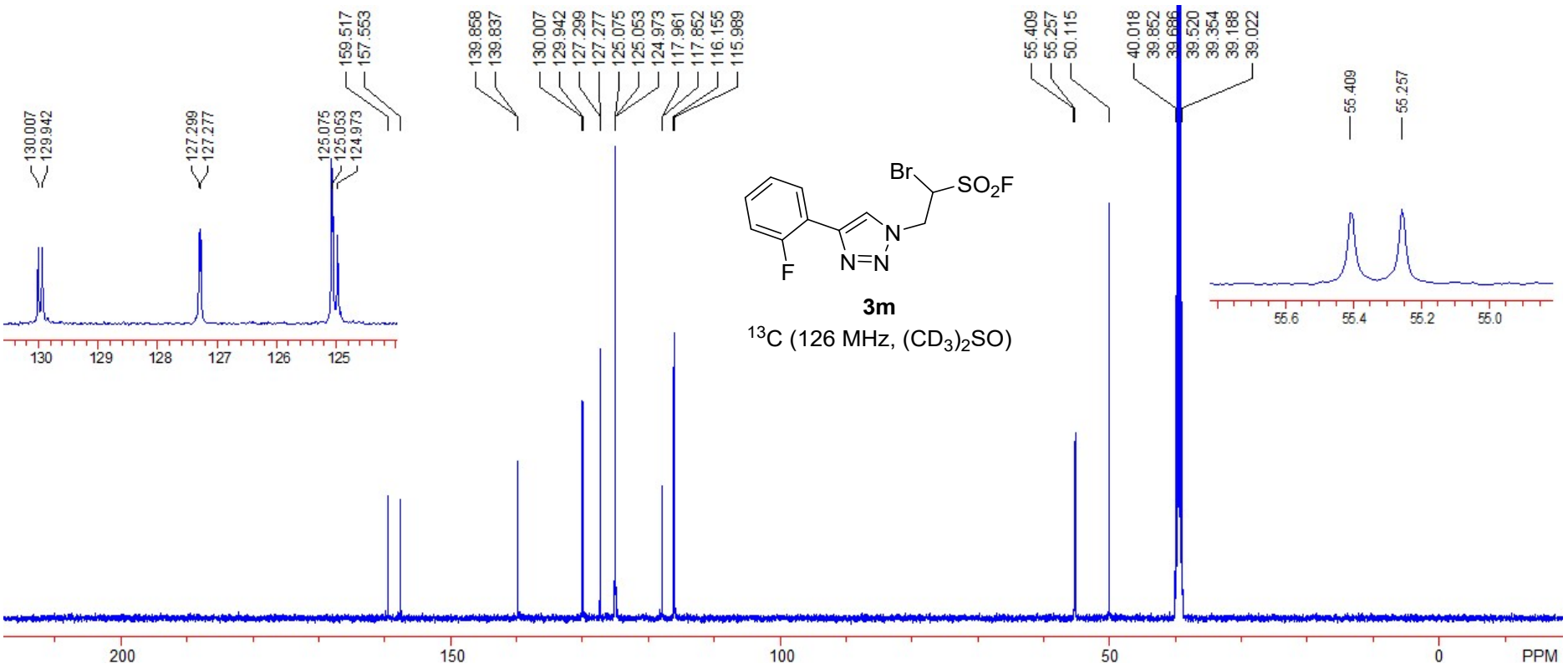

55.676
55.647
55.496
155.545
142.162
129.437
126.700
125.197
120.900
118.683
111.786
55.676
55.647
55.496
50.137
40.018
39.852
39.686
39.520
39.354
39.188
39.022
55.9
55.8
55.7
55.6
55.5
55.4
Br
SO2F
N
N=N
OMe
3l
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM

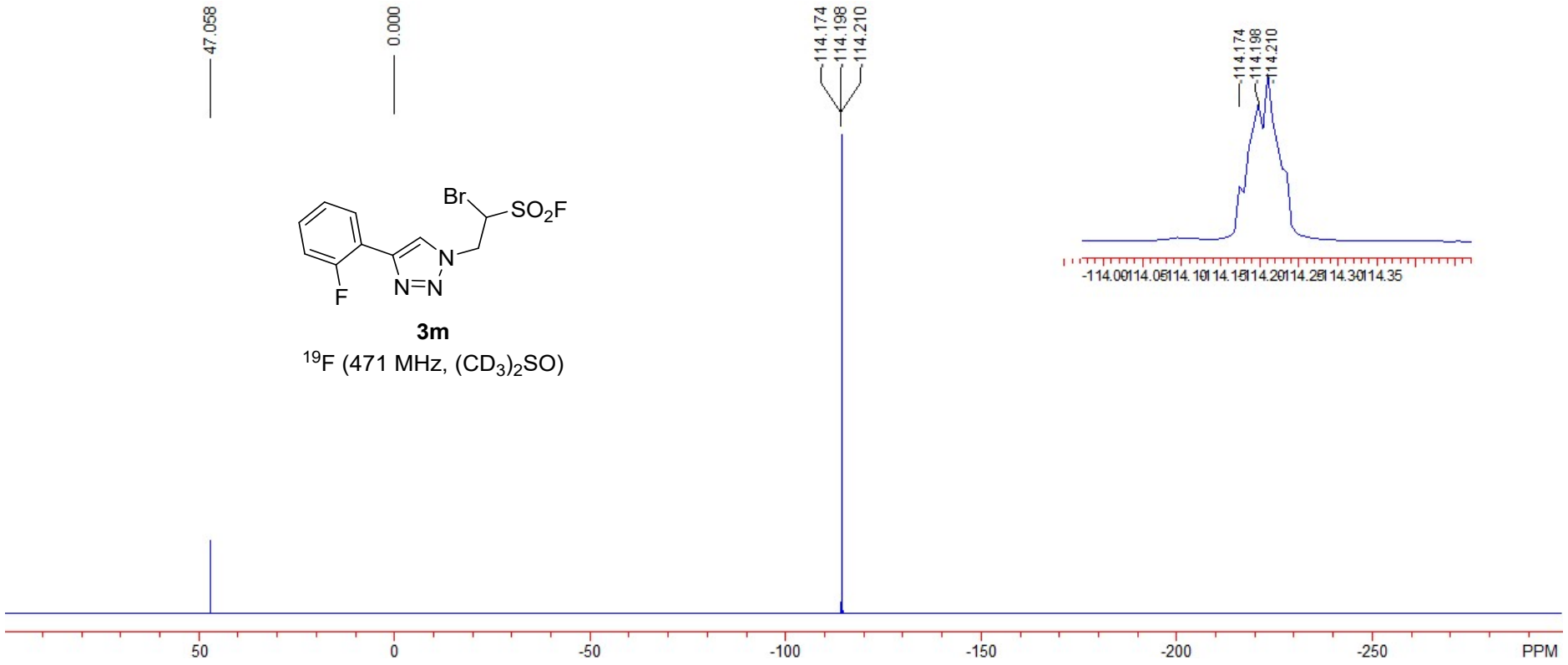


3l

^{19}F (471 MHz, $(CD_3)_2SO$)

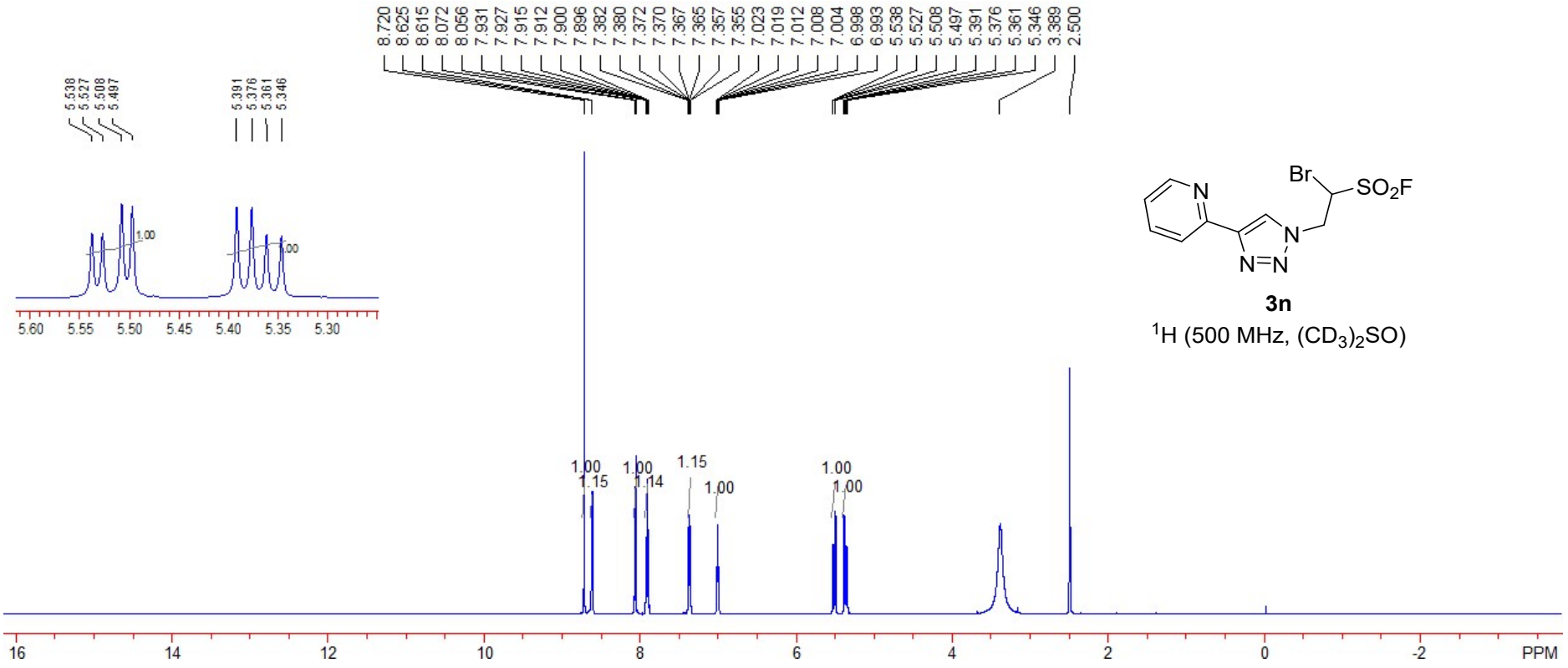

8.609
8.602
8.187
8.184
8.172
8.168
8.162
8.156
8.153
7.457
7.453
7.446
7.442
7.440
7.437
7.430
7.426
7.422
7.415
7.411
7.375
7.357
7.354
7.352
7.344
7.338
7.336
7.329
7.327
7.314
7.027
7.022
7.016
7.012
7.007
7.001
6.996
5.548
5.538
5.518
5.508
5.393
5.377
5.363
5.347
3.400
2.500
1.00 1.02
2.13
1.01
1.00
0.99
16
14
12
10
8
6
4
2
0
-2
PPM
Br
SO2F
N
N=N
F
3m
1H (500 MHz, (CD3)2SO)


159.517
157.553
139.858
139.837
130.007
129.942
127.299
127.277
125.075
125.053
124.973
117.961
117.852
116.155
115.989
55.409
55.257
50.115
40.018
39.852
39.686
39.520
39.354
39.188
39.022
Br
SO2F
N
N=N
F
3m
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM



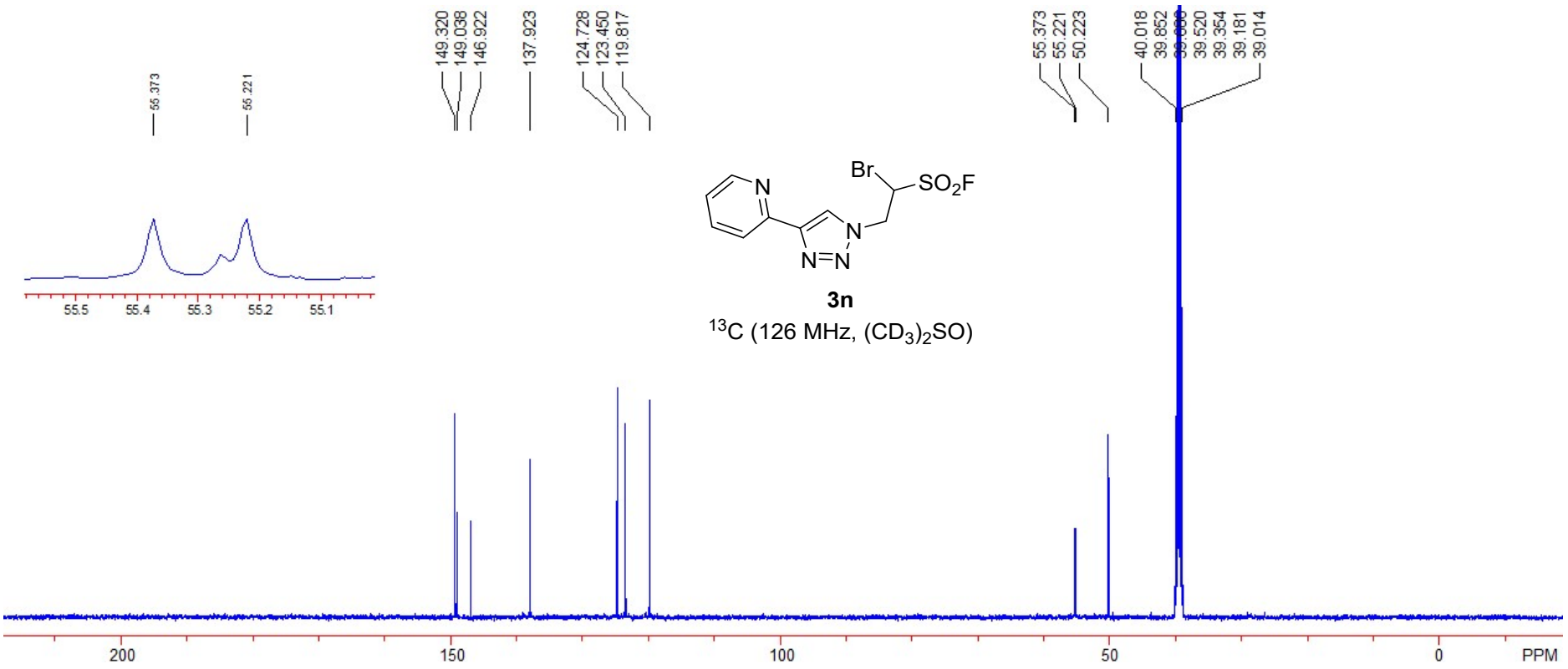
3m

^{19}F (471 MHz, $(CD_3)_2SO$)



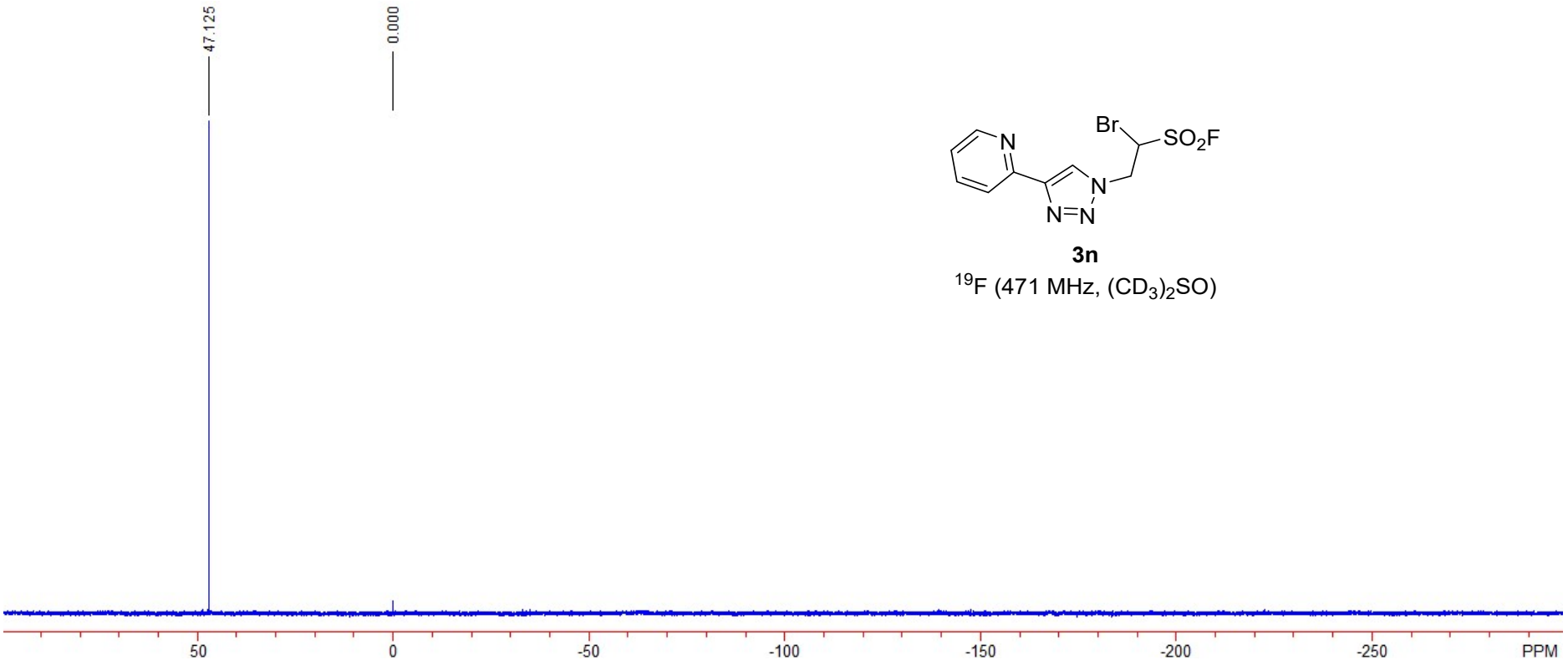
3n

^{1}H (500 MHz, $(CD_3)_2SO$)



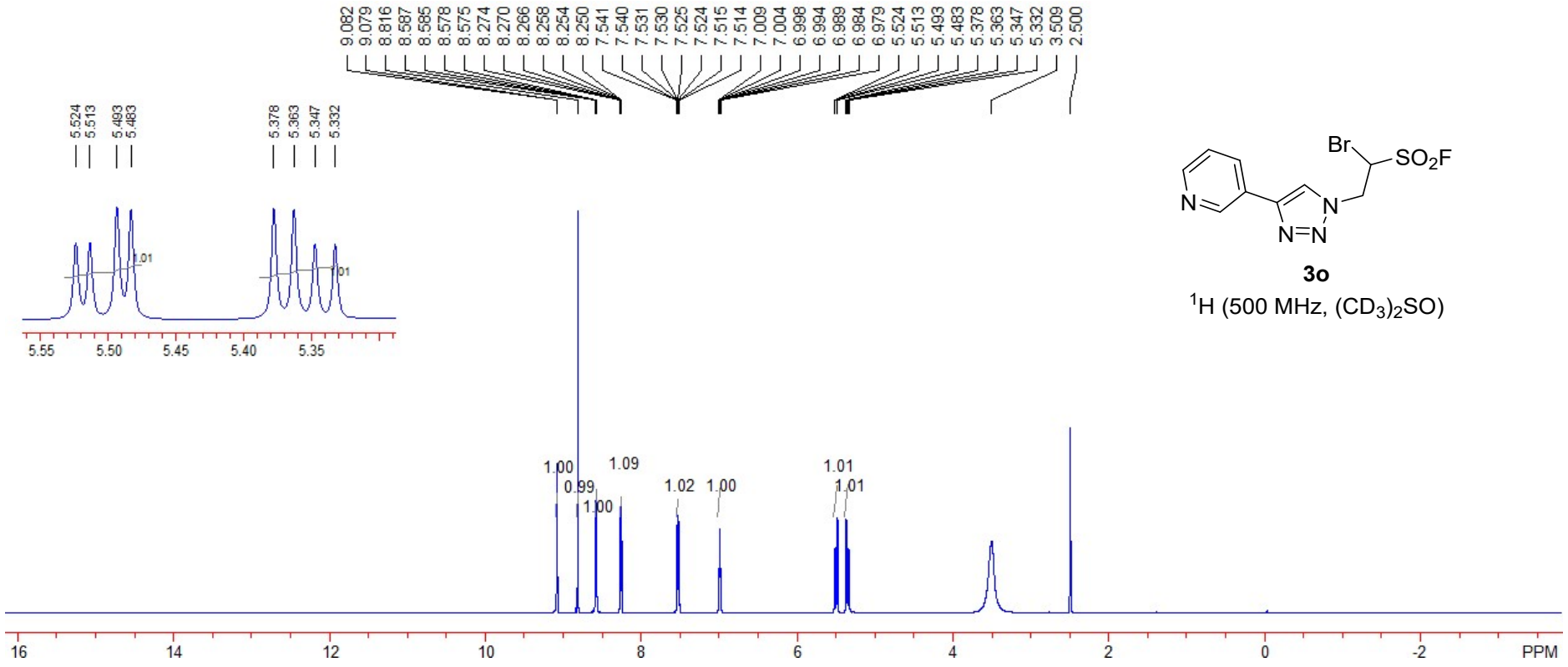
3n

^{13}C (126 MHz, $(CD_3)_2SO$)



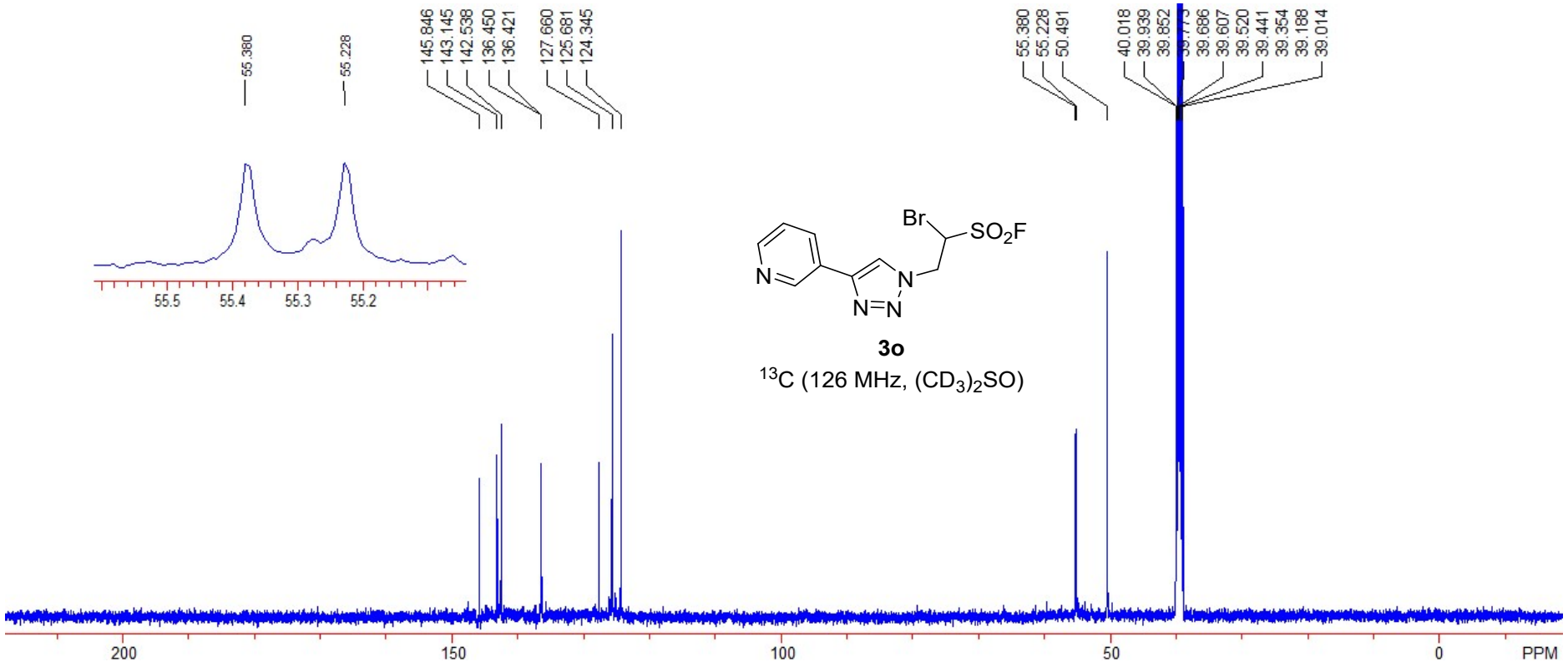
3n

^{19}F (471 MHz, $(CD_3)_2SO$)



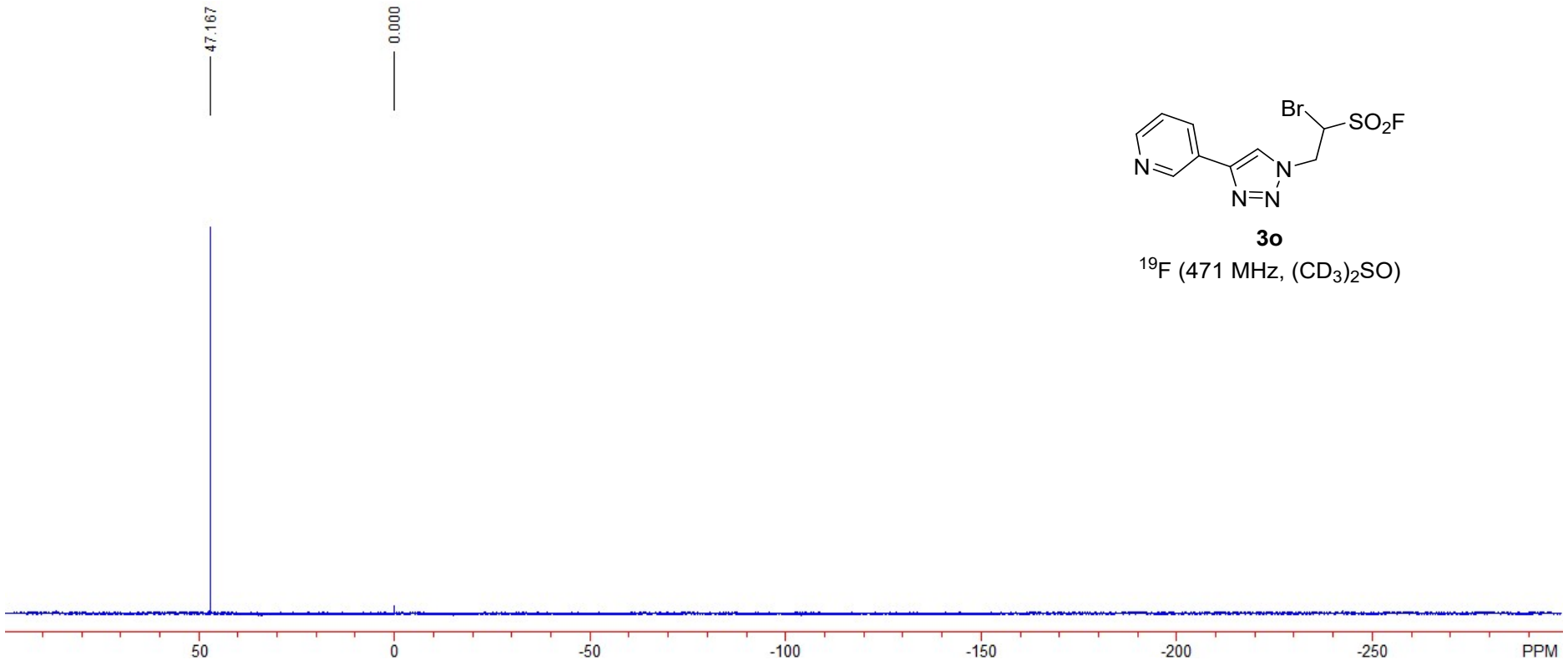
3o

^{1}H (500 MHz, $(CD_3)_2SO$)



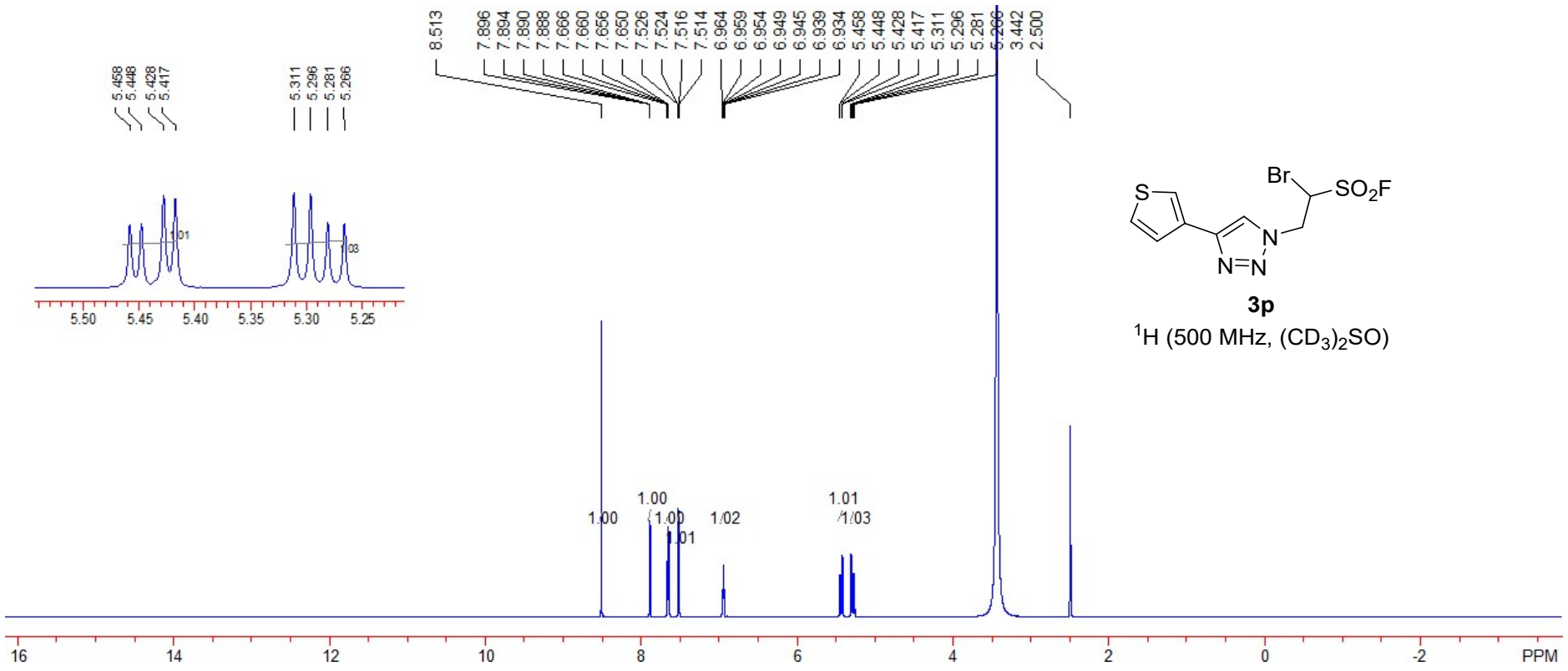
3o

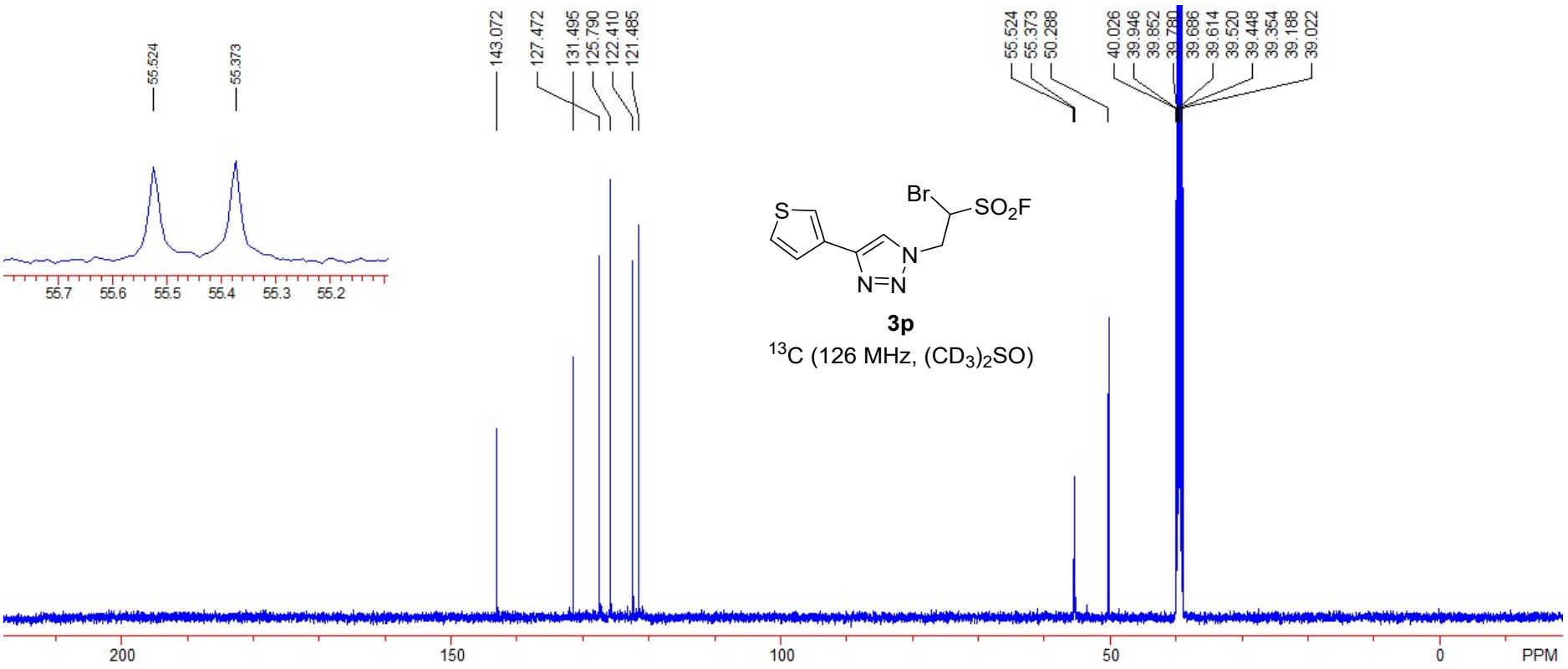
^{13}C (126 MHz, $(CD_3)_2SO$)

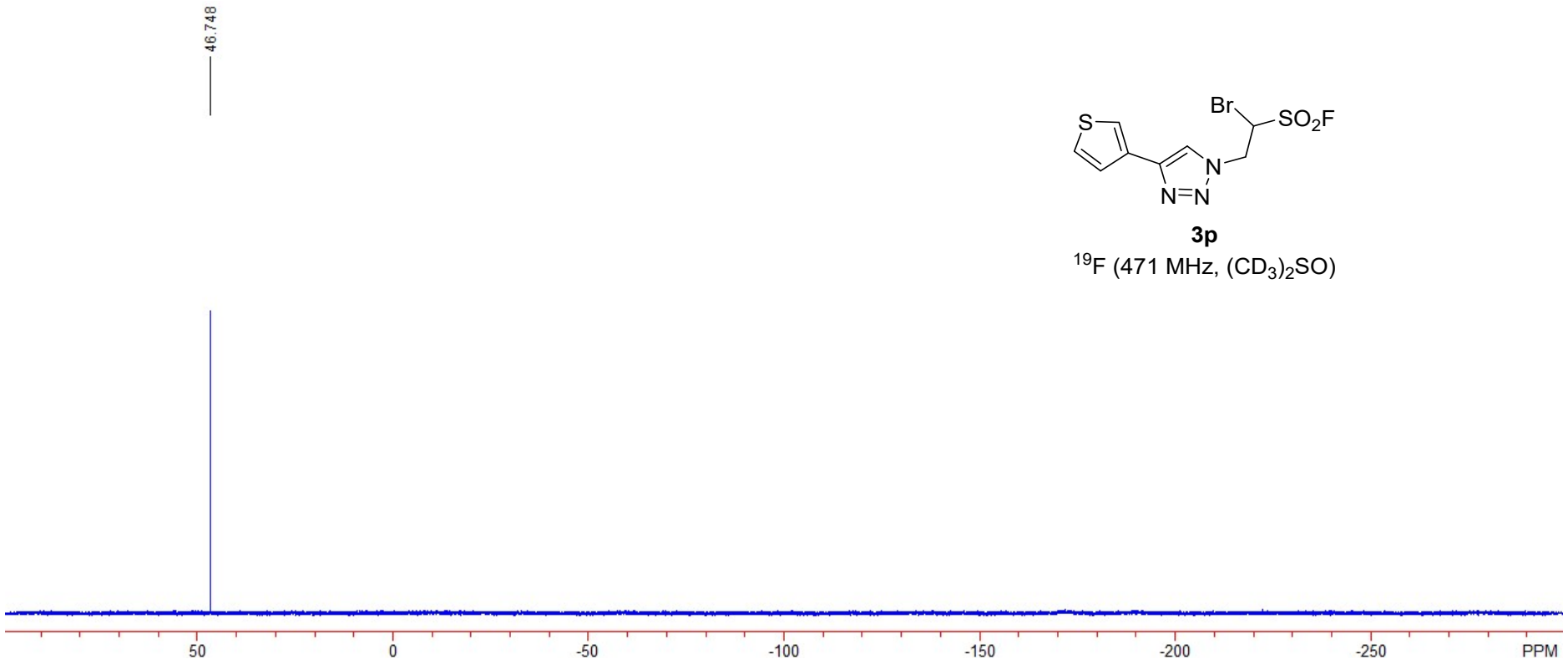


3o

^{19}F (471 MHz, $(CD_3)_2SO$)

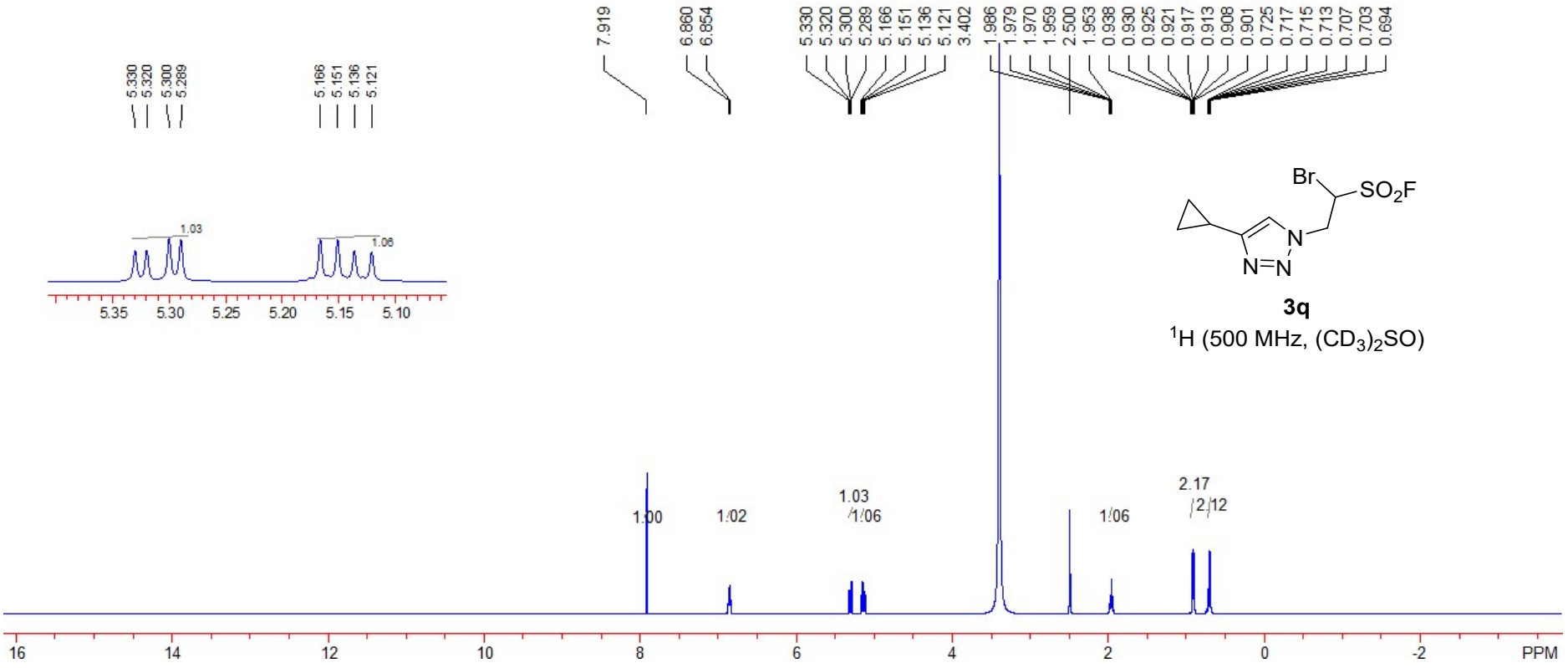

8.513
7.896
7.894
7.890
7.888
7.666
7.660
7.656
7.650
7.526
7.524
7.516
7.514
6.964
6.959
6.954
6.949
6.945
6.939
6.934
5.458
5.448
5.428
5.417
5.311
5.296
5.281
5.266
3.442
2.500
1.00
1.00
1.00
1.01
1.02
1.01
1.03
16
14
12
10
8
6
4
2
0
-2
PPM
5.50
5.45
5.40
5.35
5.30
5.25
Br
SO2F
S
N
N=N
3p
1H (500 MHz, (CD3)2SO)


55.524
55.373
143.072
127.472
131.495
125.790
122.410
121.485
55.524
55.373
50.288
40.026
39.946
39.852
39.780
39.686
39.614
39.520
39.448
39.354
39.188
39.022
55.7
55.6
55.5
55.4
55.3
55.2
S
Br
SO2F
N
N=N
3p
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM



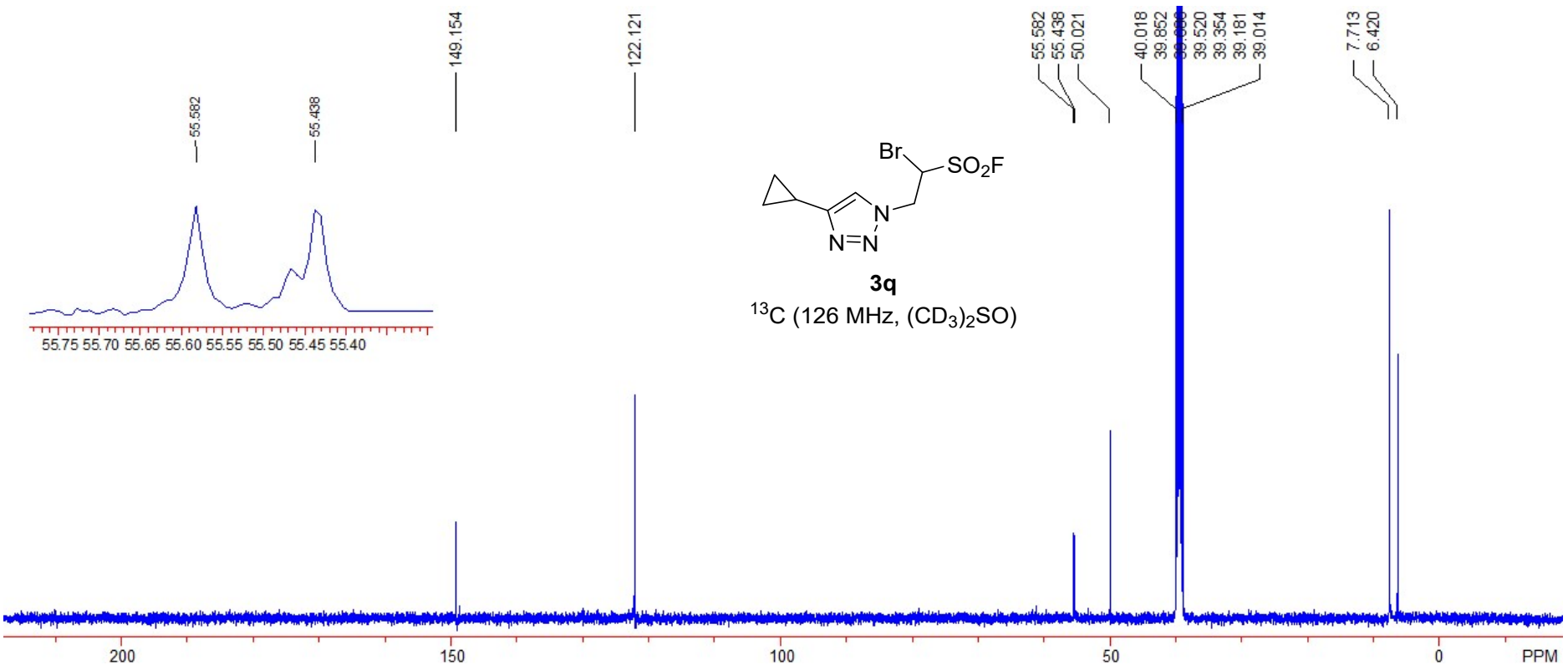
3p

^{19}F (471 MHz, $(CD_3)_2SO$)



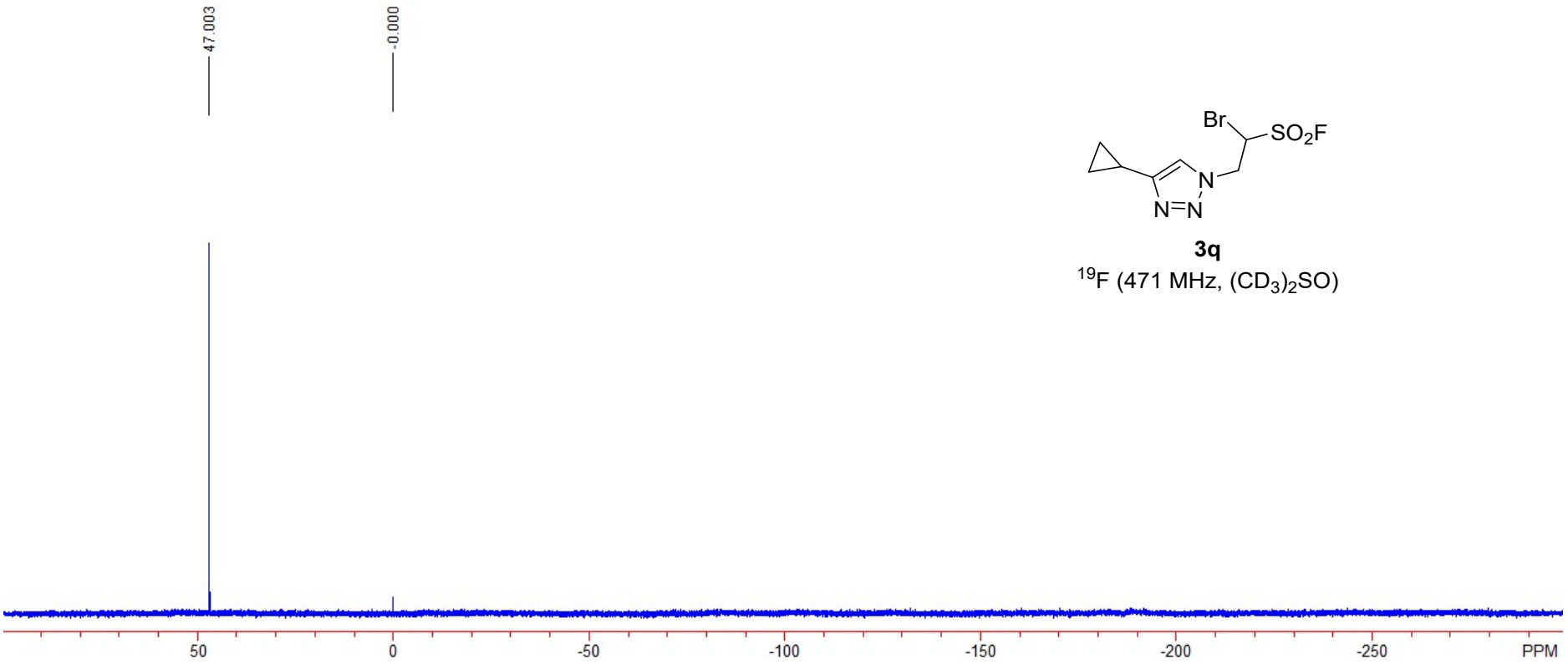
3q

^{1}H (500 MHz, $(CD_3)_2SO$)



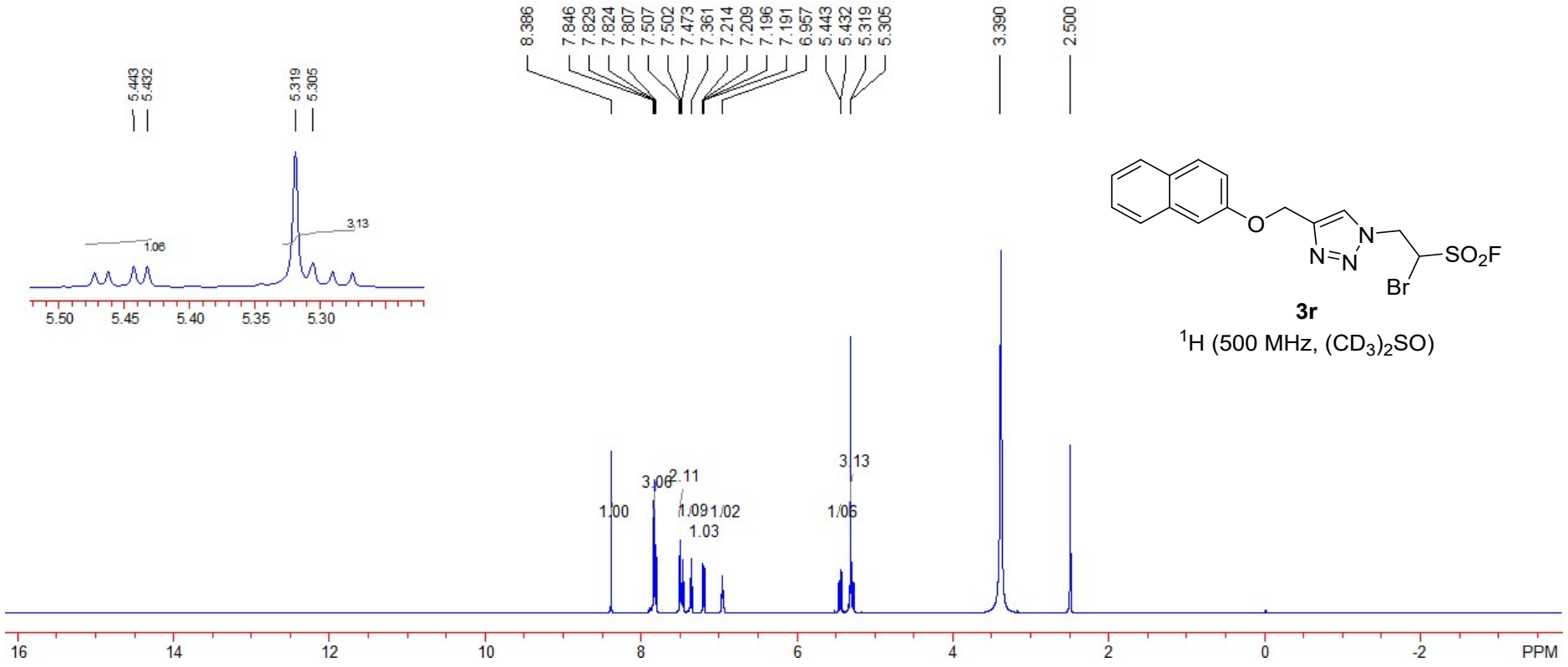
3q

^{13}C (126 MHz, $(CD_3)_2SO$)



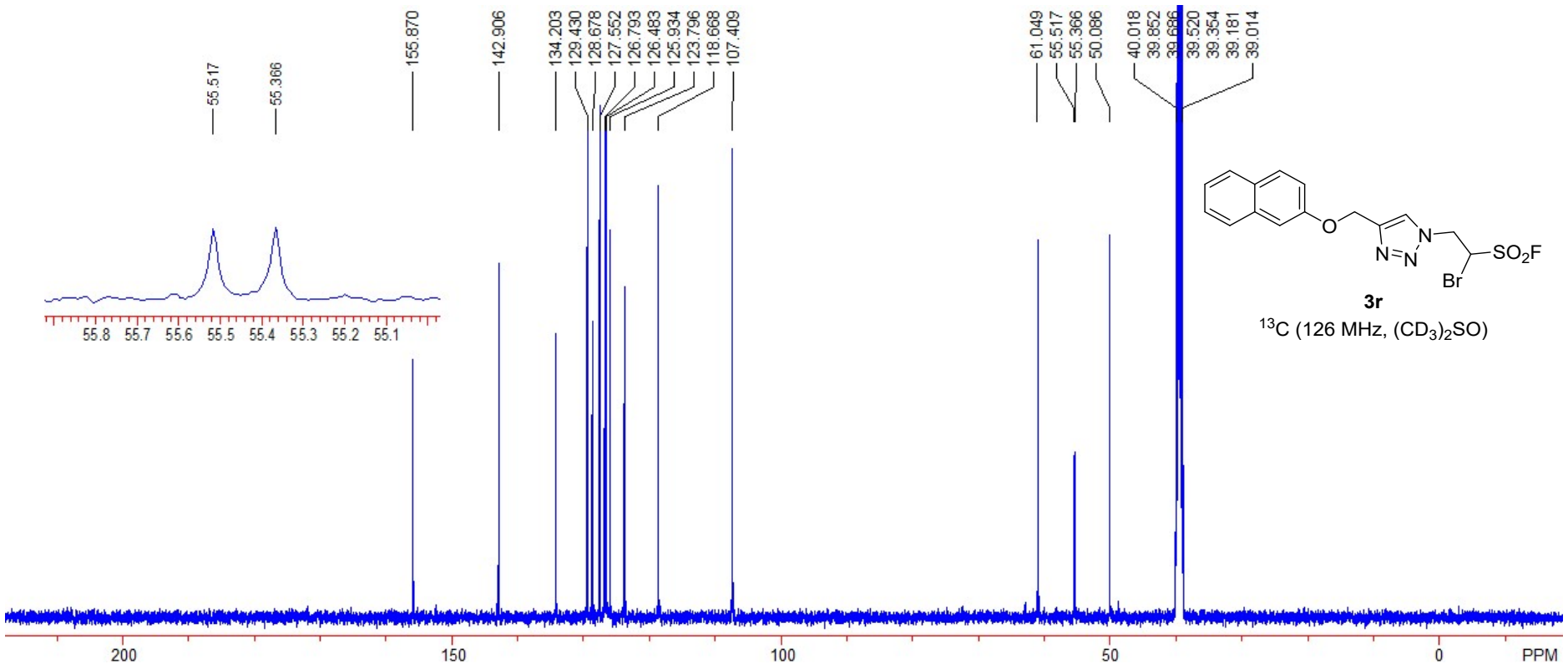
3q

^{19}F (471 MHz, $(CD_3)_2SO$)



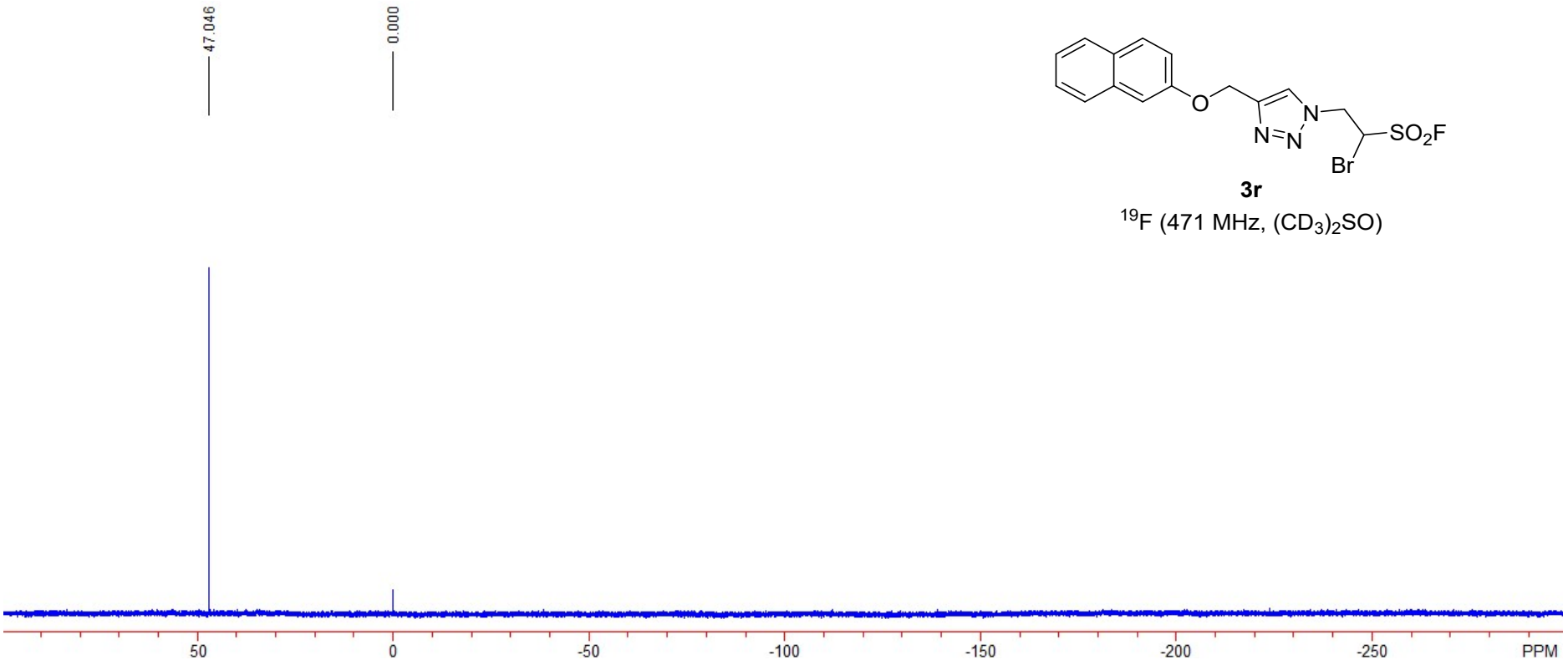
3r

^{1}H (500 MHz, $(CD_3)_2SO$)



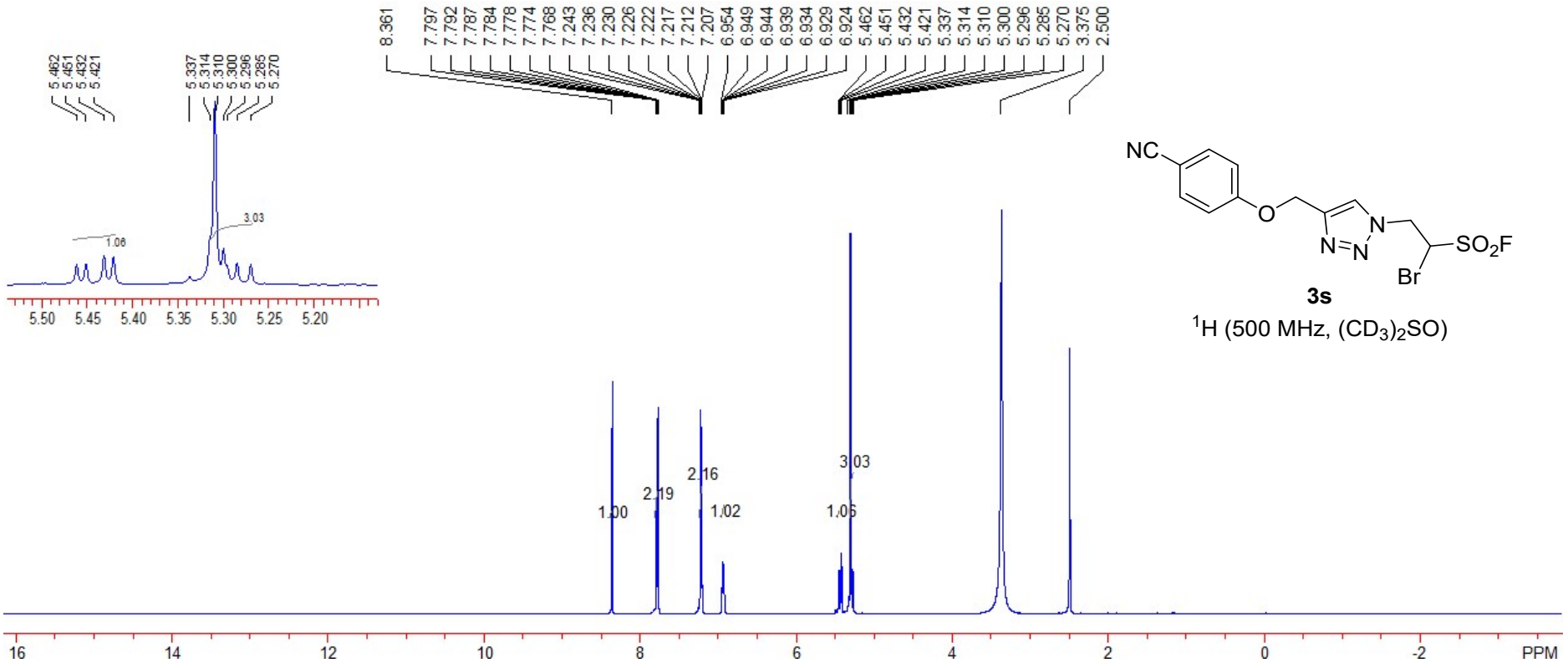
3r

^{13}C (126 MHz, $(CD_3)_2SO$)



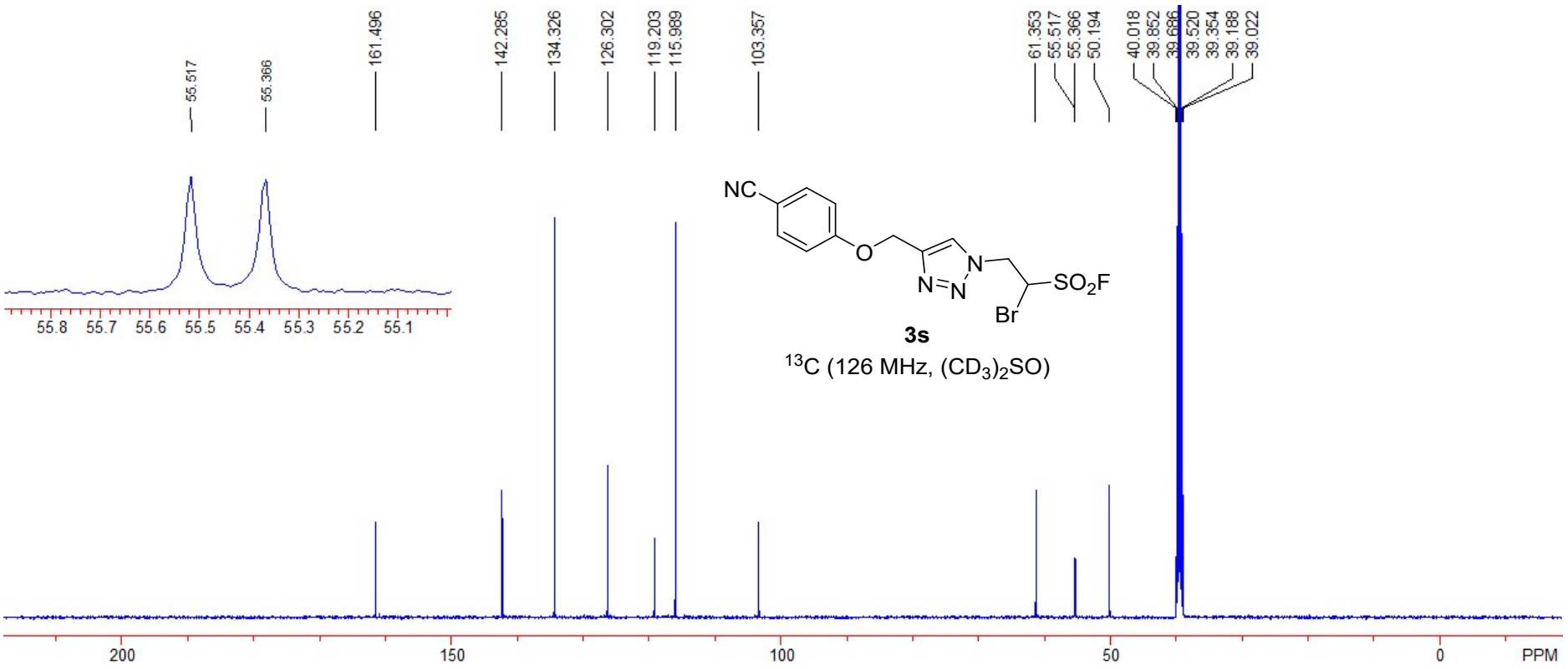
3r

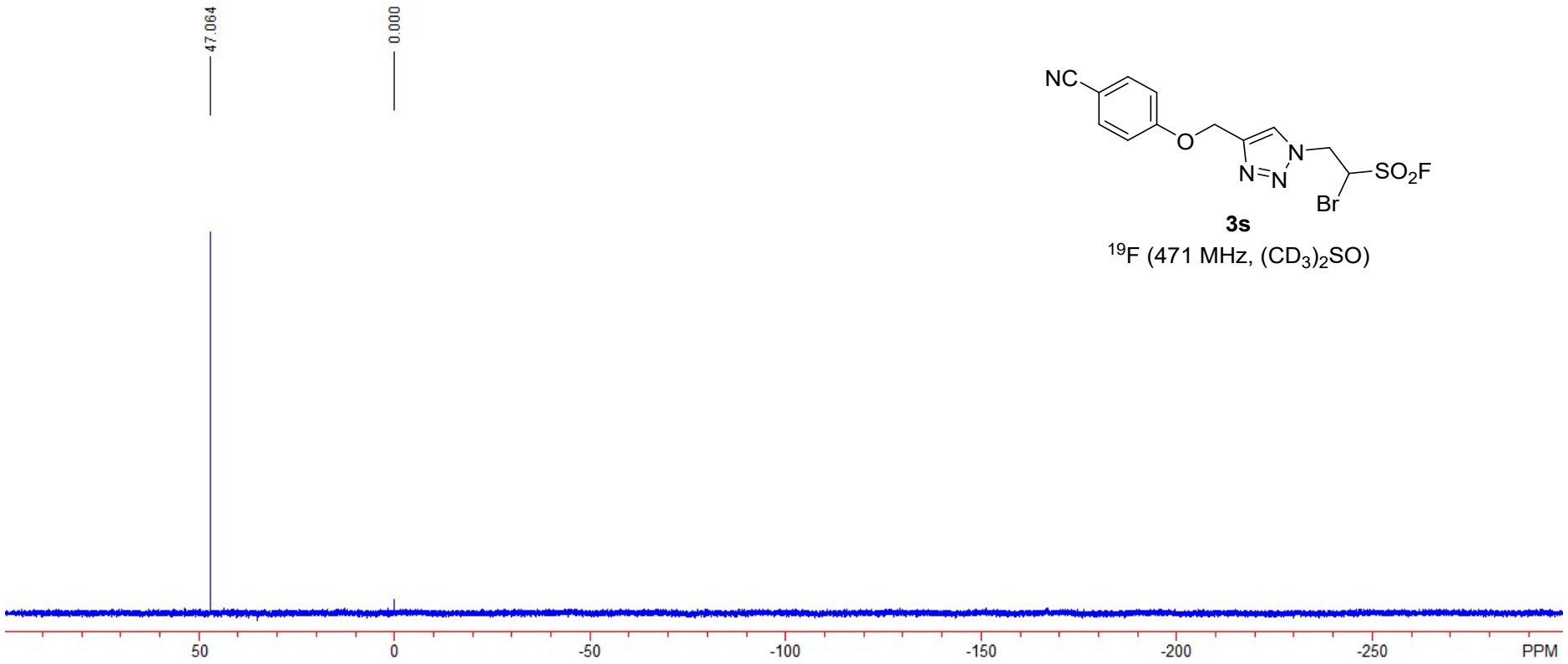
^{19}F (471 MHz, $(CD_3)_2SO$)



3s

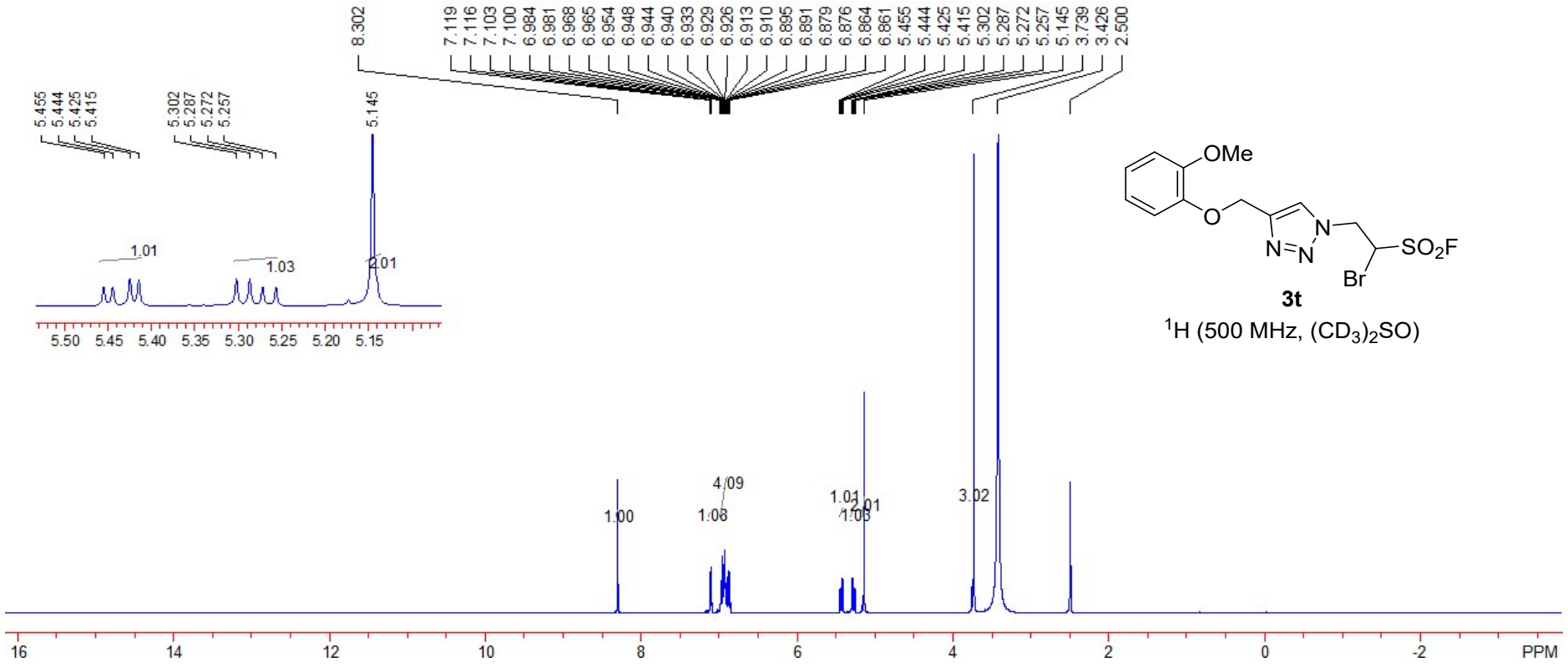
^{1}H (500 MHz, $(CD_3)_2SO$)

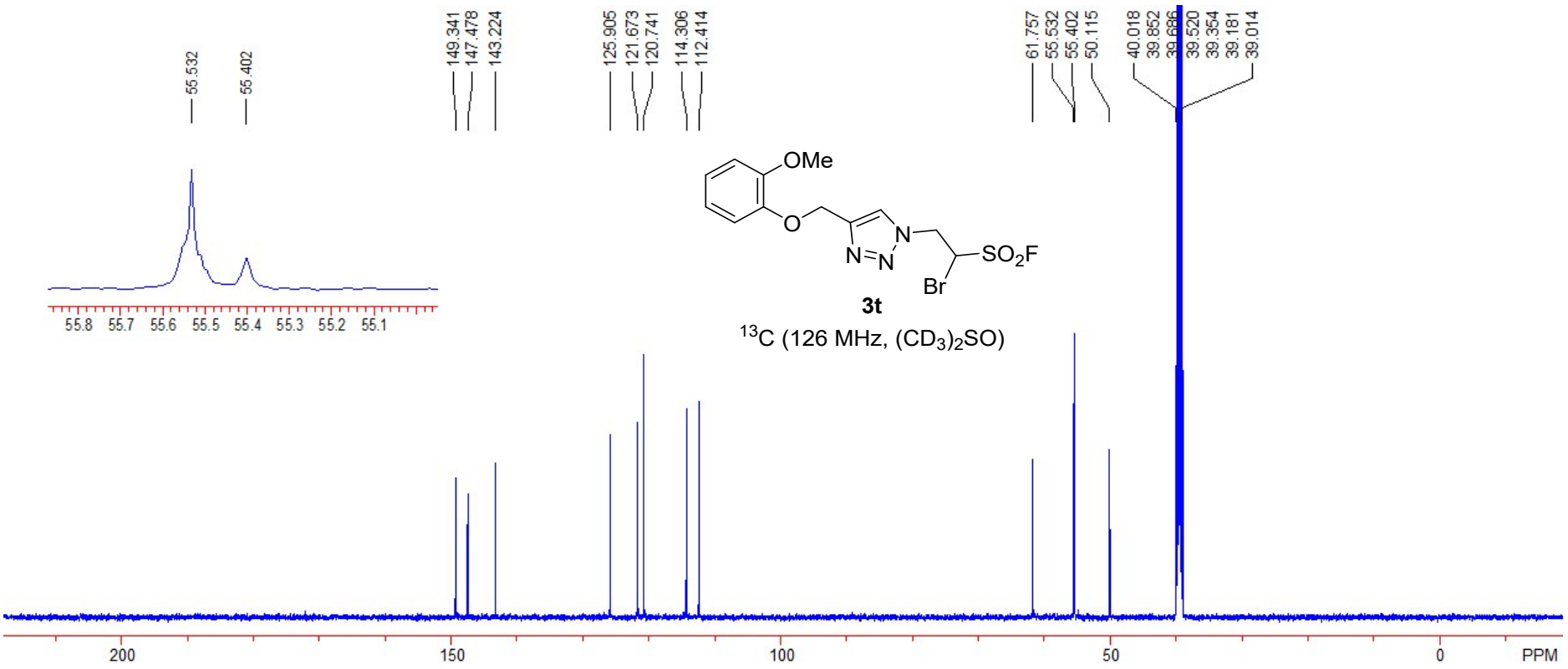

55.517
55.366
161.496
142.285
134.326
126.302
119.203
115.989
103.357
61.353
55.517
55.366
50.194
40.018
39.852
39.686
39.520
39.354
39.188
39.022
55.8 55.7 55.6 55.5 55.4 55.3 55.2 55.1
NC
O
N
N=N
SO2F
Br
3s
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM

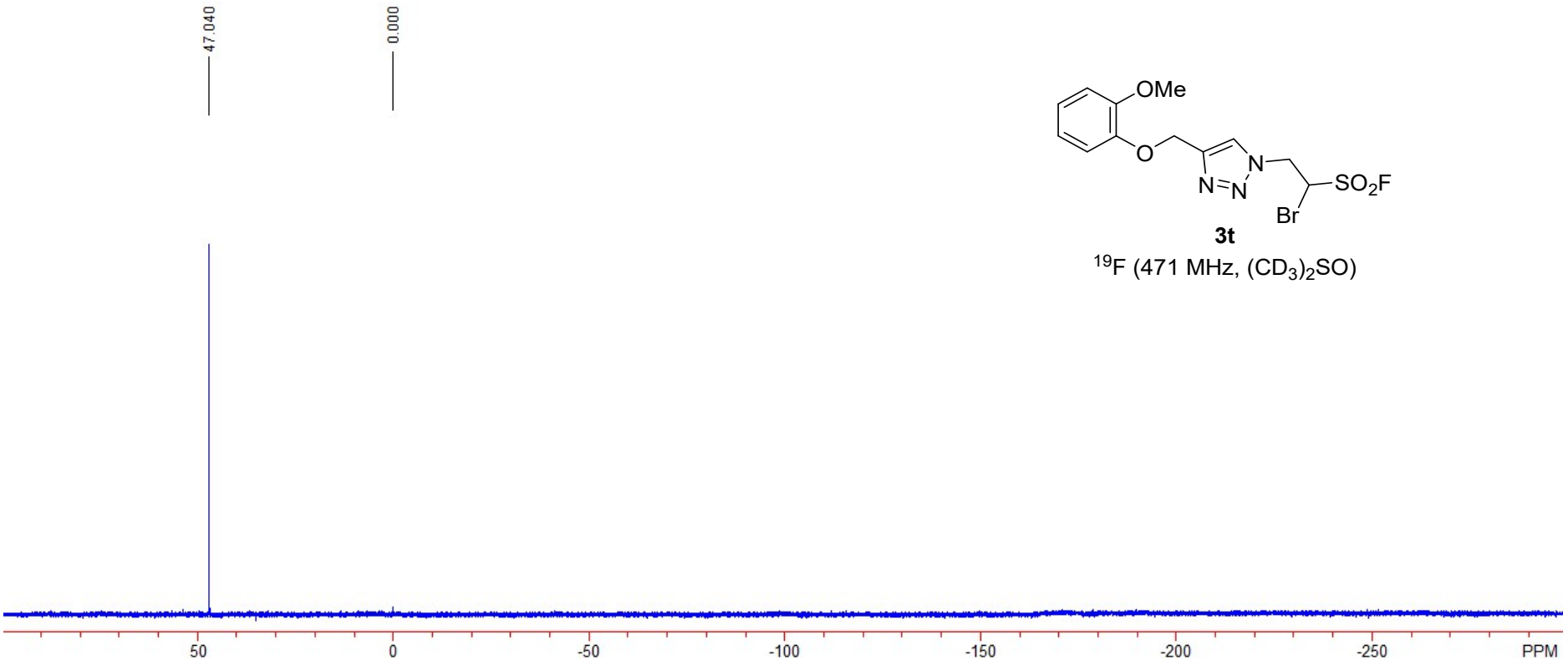


3s

^{19}F (471 MHz, $(CD_3)_2SO$)

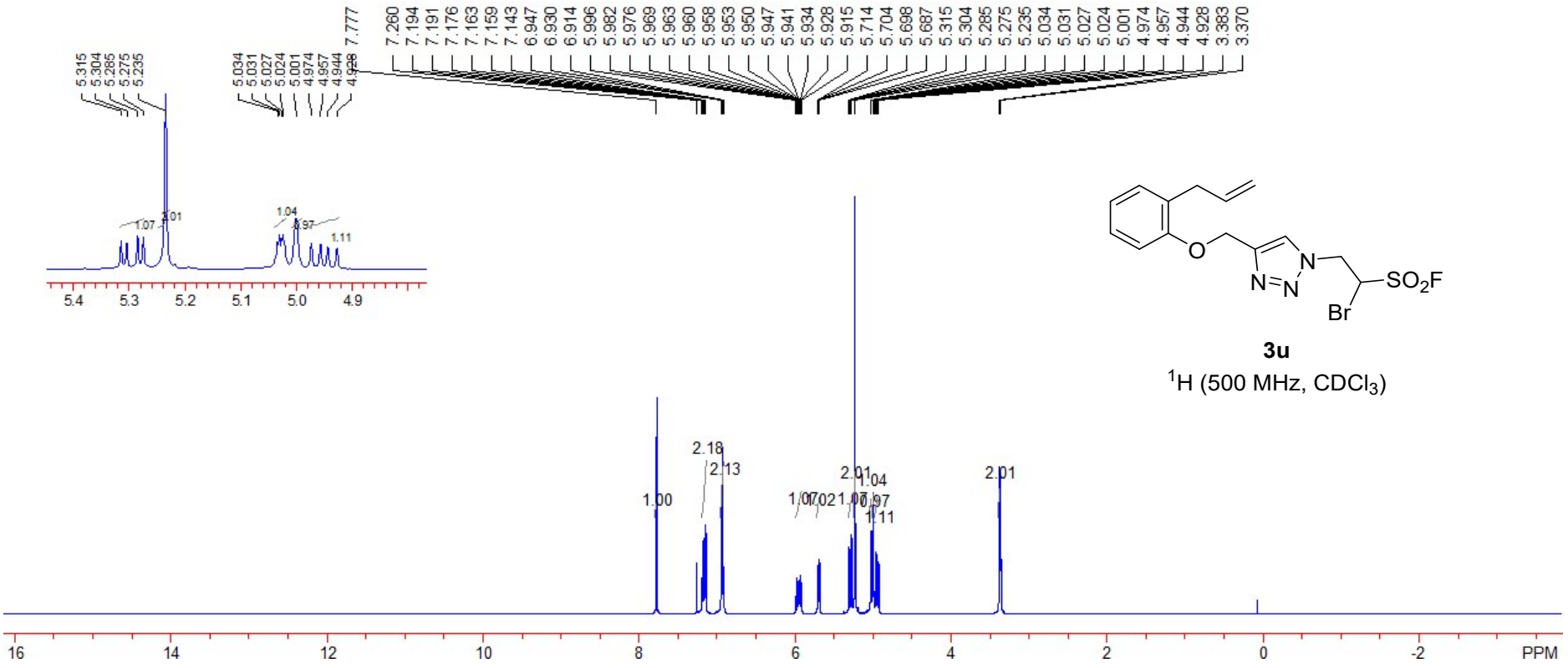

8.302
7.119
7.116
7.103
7.100
6.984
6.981
6.968
6.965
6.954
6.948
6.944
6.940
6.933
6.929
6.926
6.913
6.910
6.895
6.891
6.879
6.876
6.864
6.861
5.455
5.444
5.425
5.415
5.302
5.287
5.272
5.257
5.145
3.739
3.426
2.500
1.01
1.03
2.01
5.50 5.45 5.40 5.35 5.30 5.25 5.20 5.15
1.00
4.09
1.08
1.01
1.03
2.01
3.02
16 14 12 10 8 6 4 2 0 -2 PPM
OMe
O
N
N=N
SO2F
Br
3t
1H (500 MHz, (CD3)2SO)

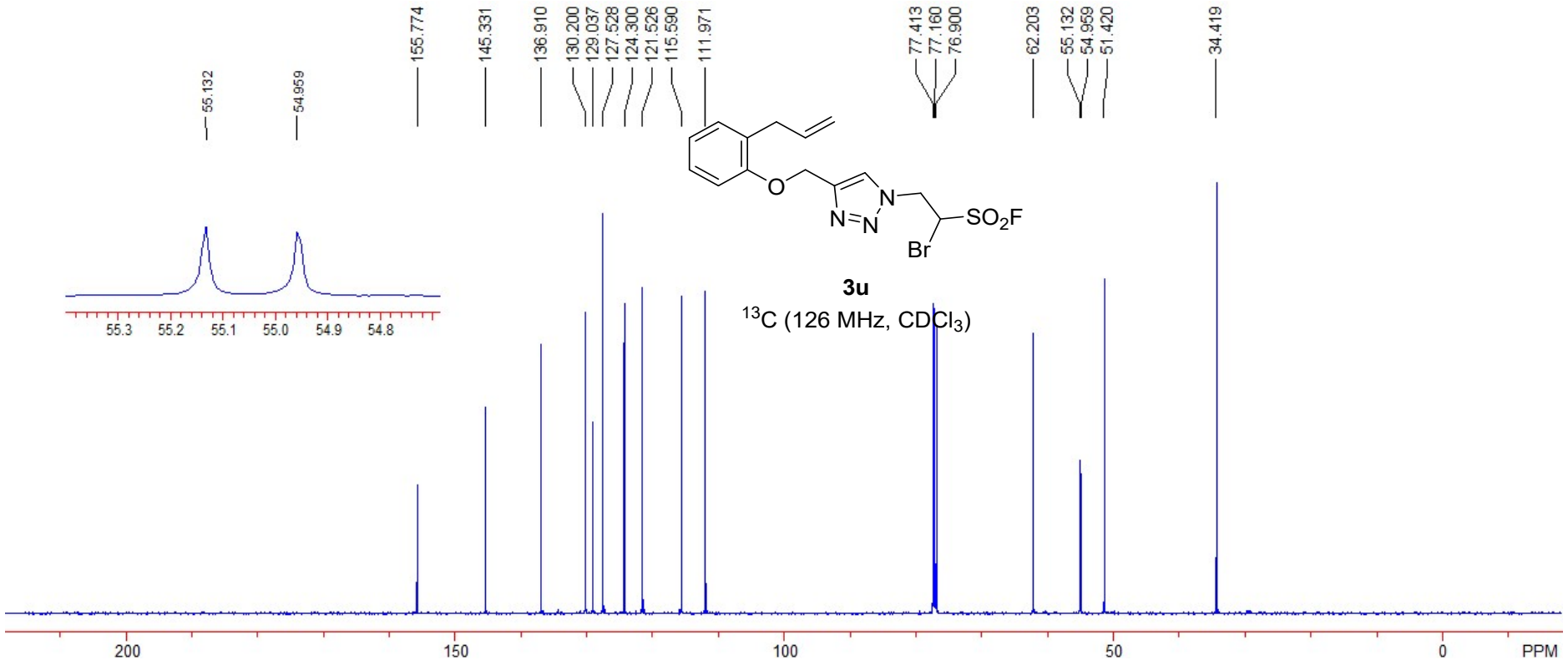

55.532
55.402
149.341
147.478
143.224
125.905
121.673
120.741
114.306
112.414
61.757
55.532
55.402
50.115
40.018
39.852
39.686
39.520
39.354
39.181
39.014
OMe
O
N
N=N
SO2F
Br
3t
13C (126 MHz, (CD3)2SO)
55.8 55.7 55.6 55.5 55.4 55.3 55.2 55.1
200
150
100
50
0
PPM



3t

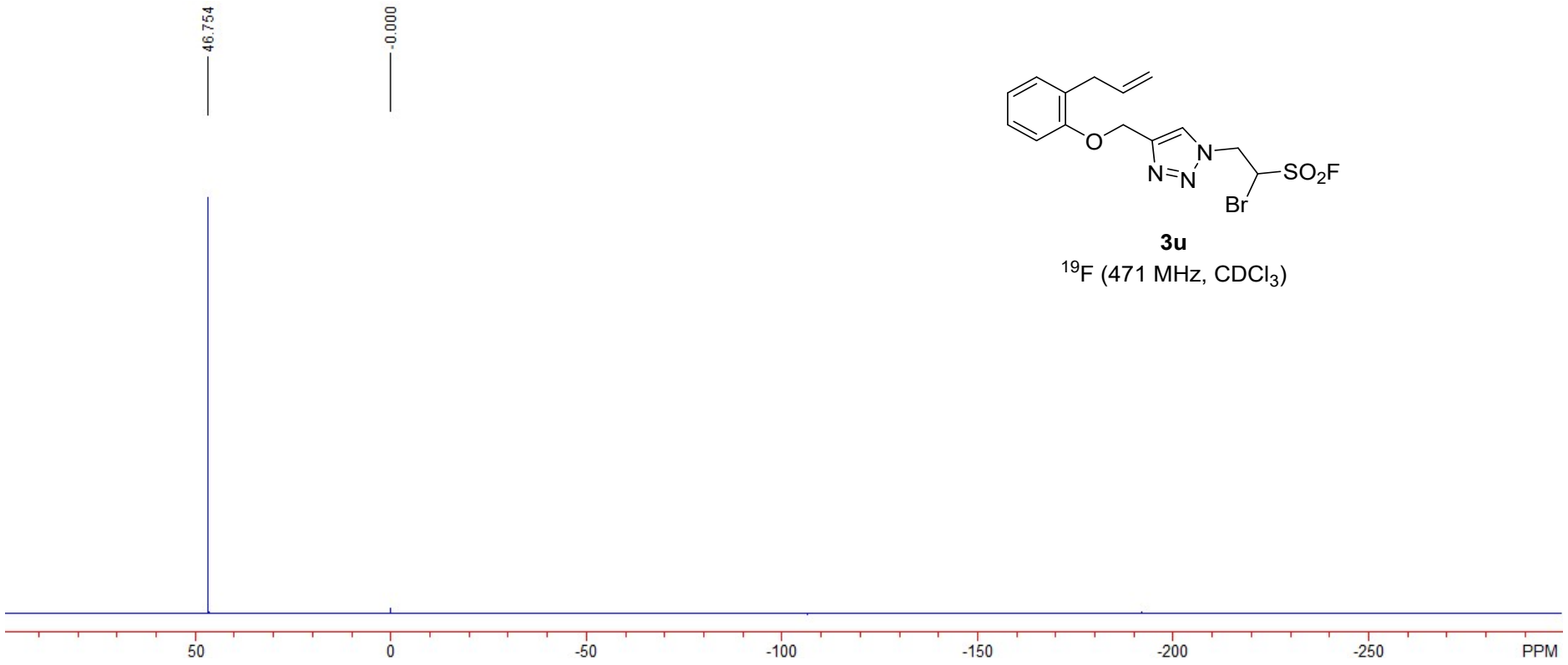
^{19}F (471 MHz, $(CD_3)_2SO$)


7.777
7.260
7.194
7.191
7.176
7.163
7.159
7.143
6.947
6.930
6.914
5.996
5.982
5.976
5.969
5.963
5.960
5.958
5.953
5.950
5.947
5.941
5.934
5.928
5.915
5.714
5.704
5.698
5.687
5.315
5.304
5.285
5.275
5.235
5.034
5.031
5.027
5.024
5.001
4.974
4.957
4.944
4.928
3.383
3.370
1.07
2.01
1.04
0.97
1.11
5.4
5.3
5.2
5.1
5.0
4.9
O
N
N=N
SO2F
Br
3u
1H (500 MHz, CDCl3)
1.00
2.18
2.13
1.07
1.02
2.01
1.04
1.07
0.97
1.11
2.01
16
14
12
10
8
6
4
2
0
-2
PPM



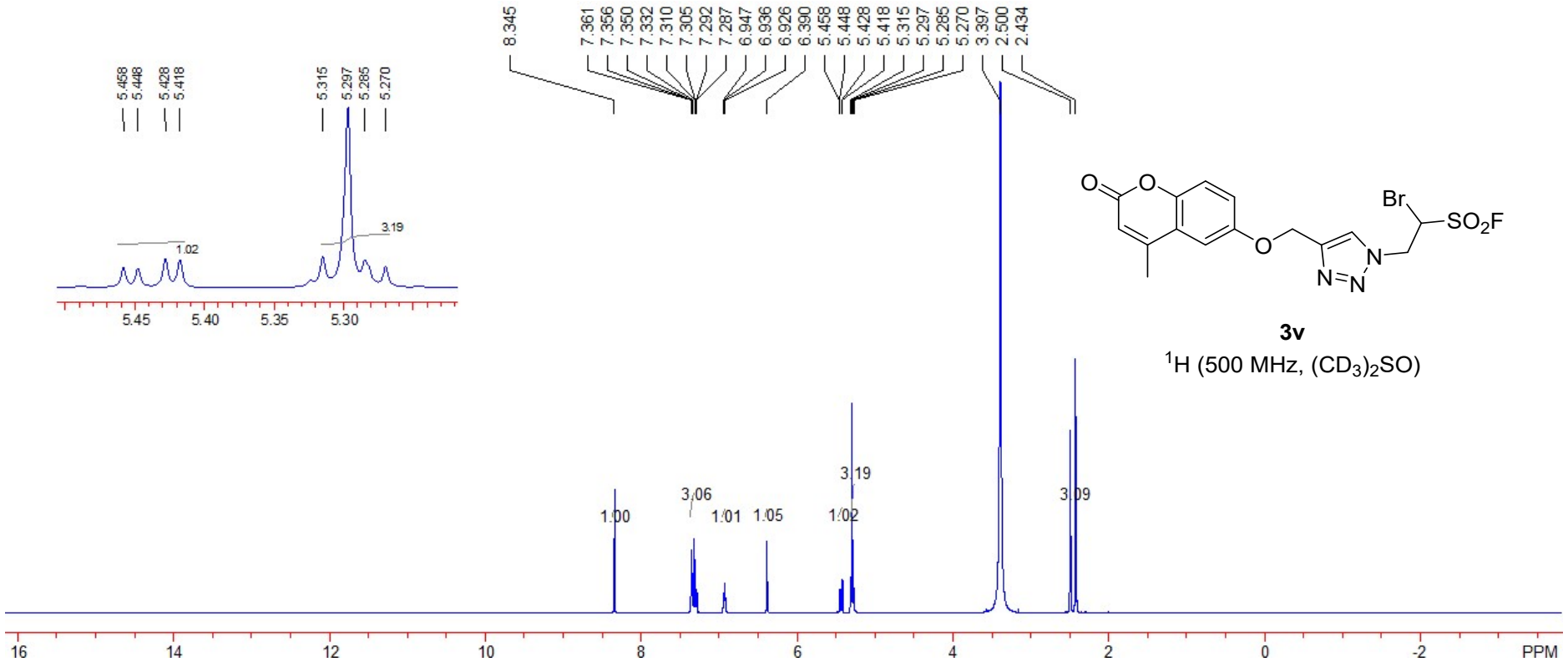
3u

^{13}C (126 MHz, $CDCl_3$)



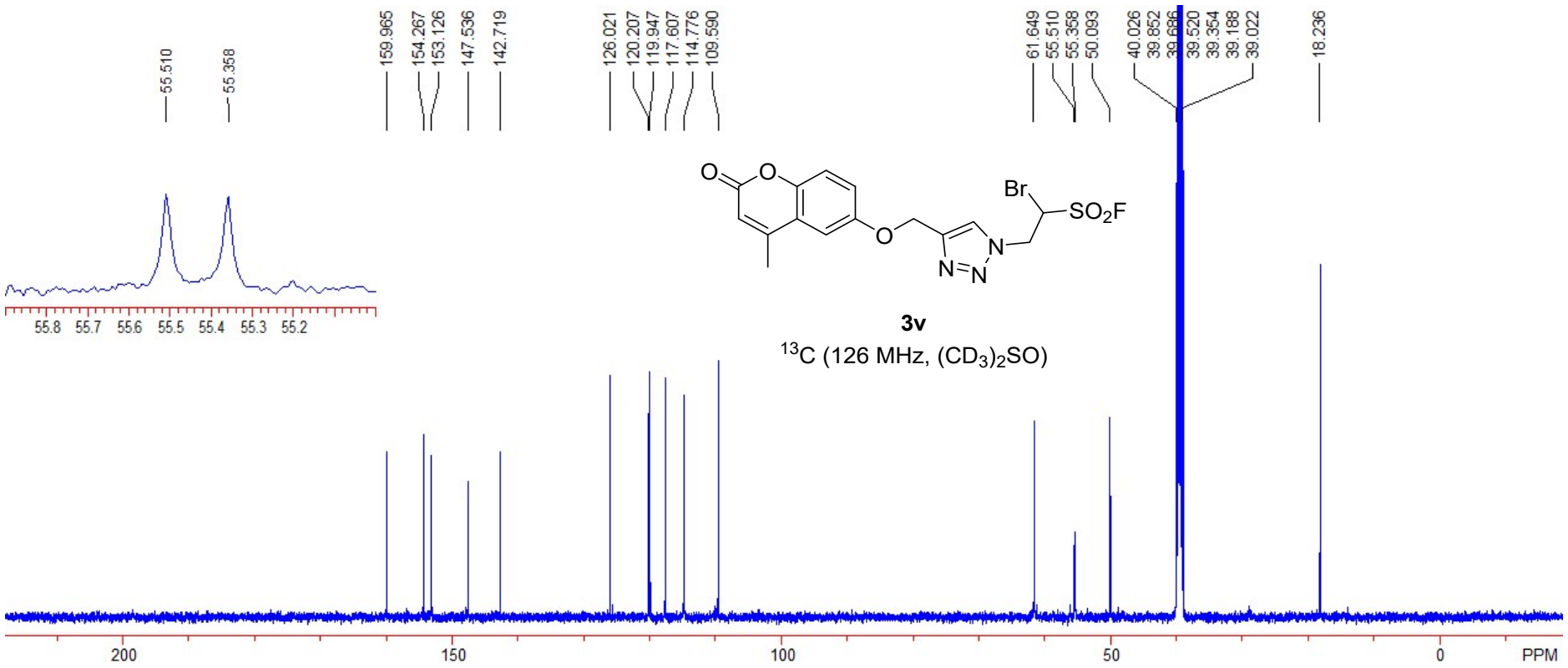
3u

^{19}F (471 MHz, $CDCl_3$)



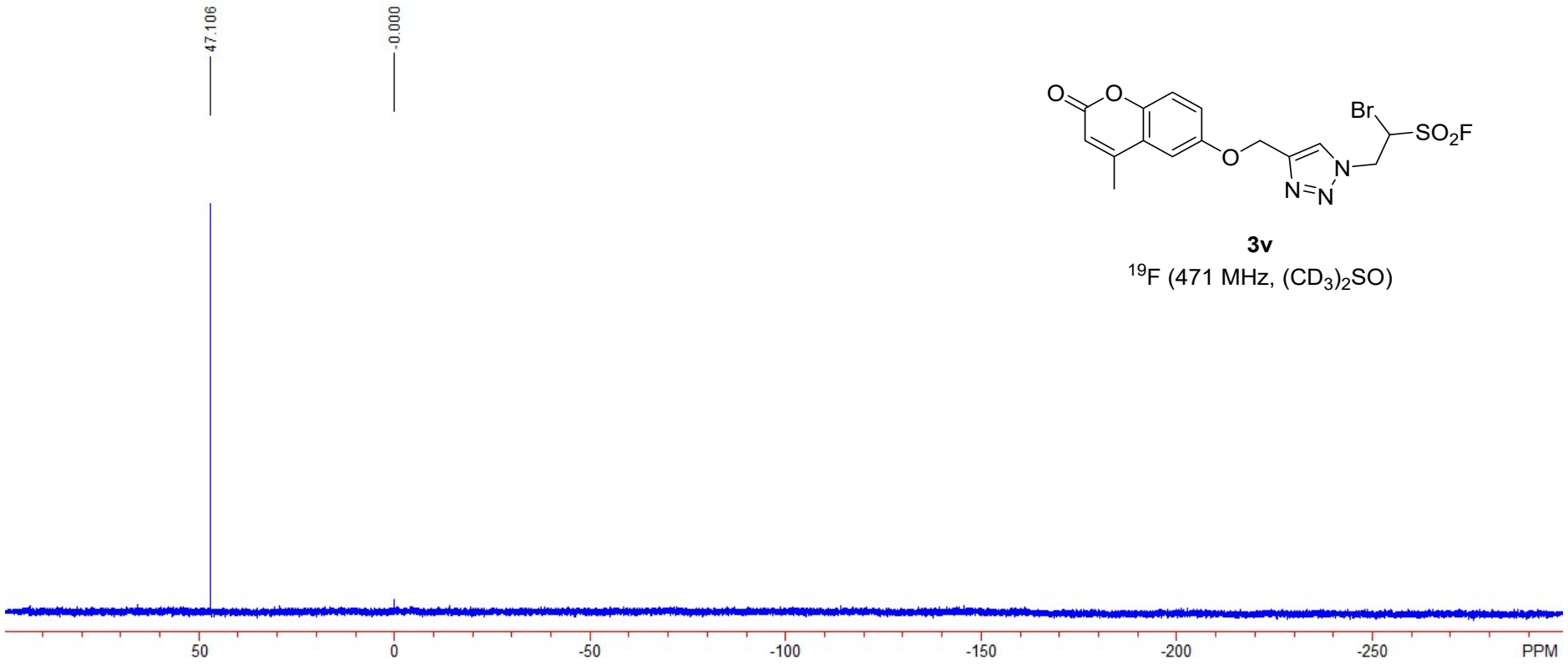
3v

^{1}H (500 MHz, $(CD_3)_2SO$)



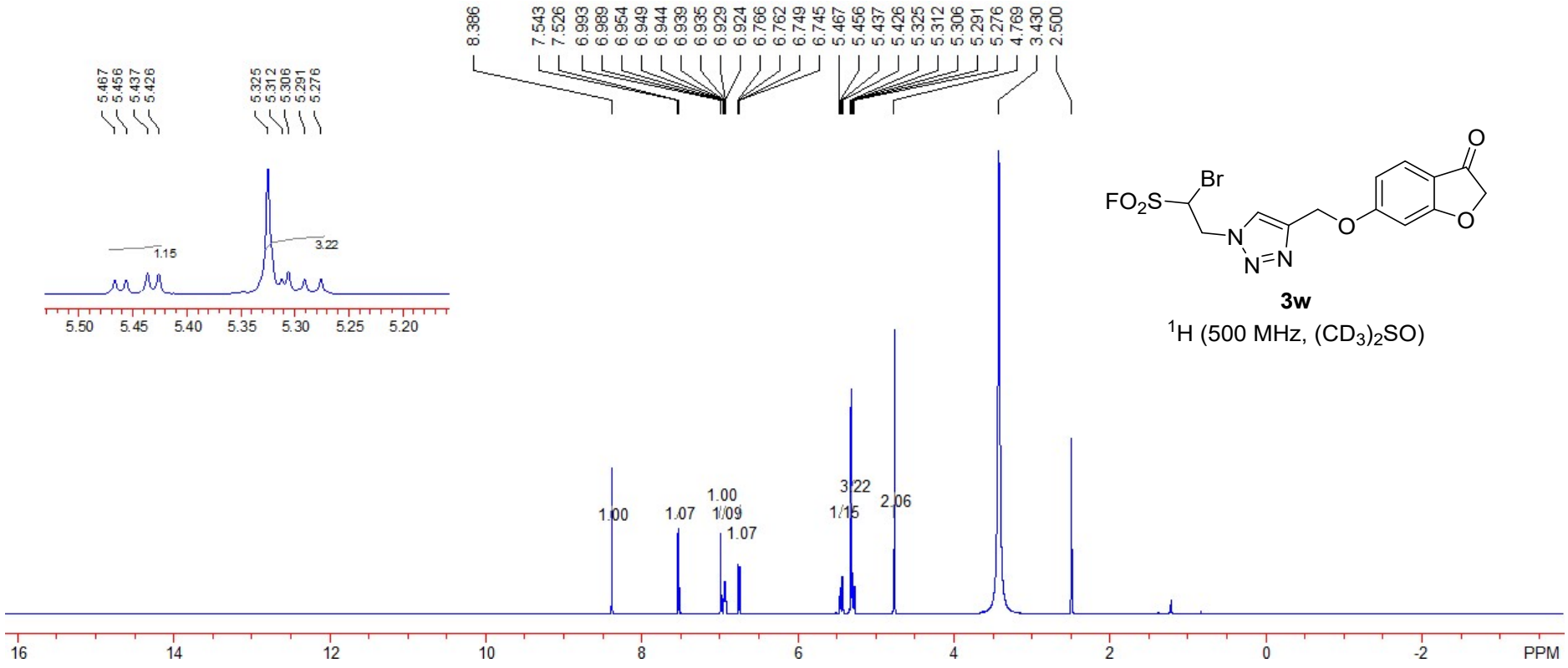
3v

^{13}C (126 MHz, $(CD_3)_2SO$)



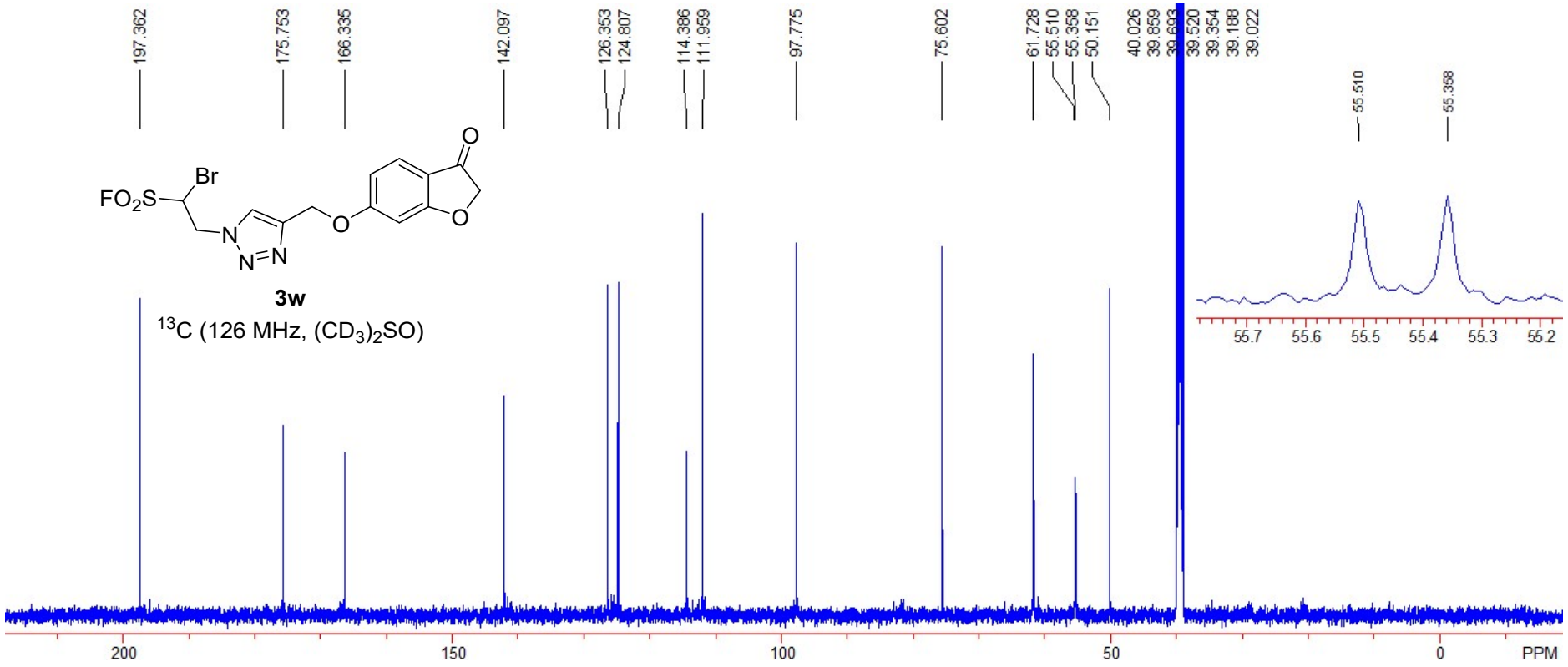
3v

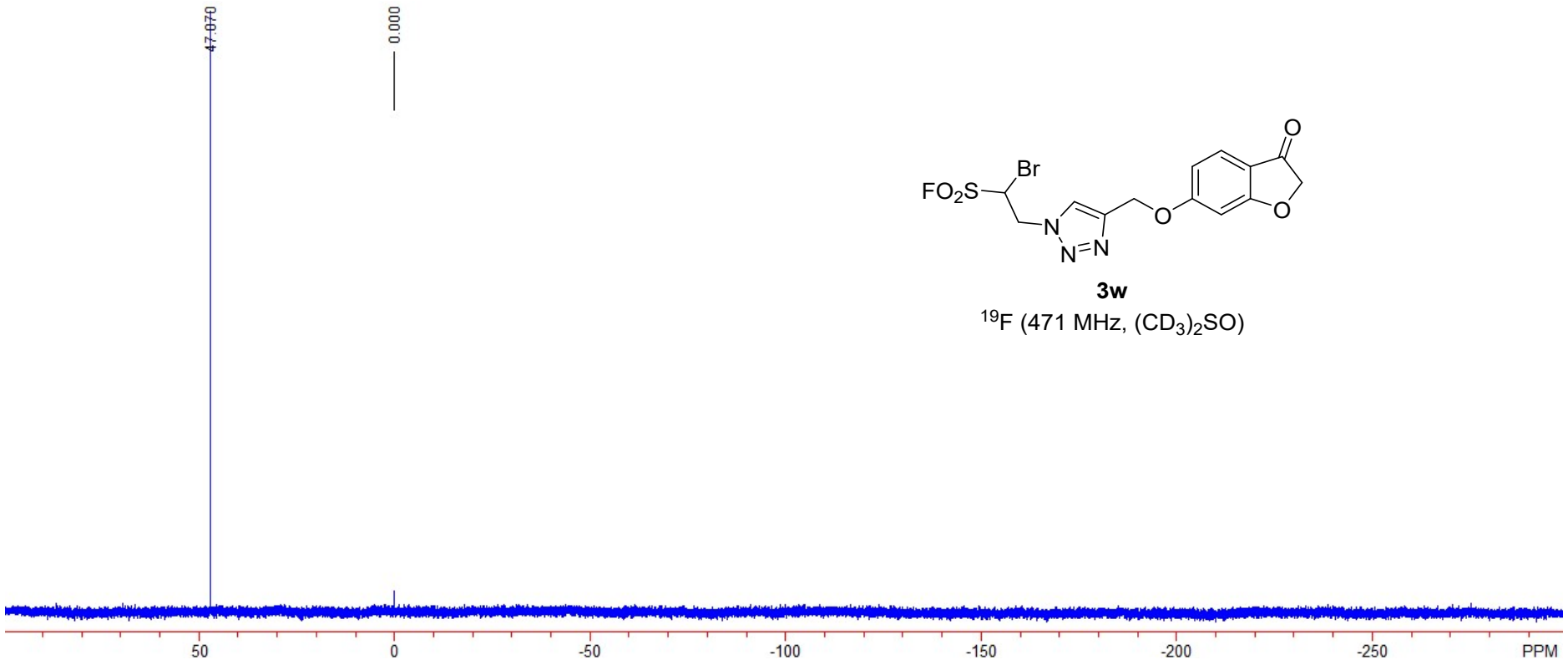
^{19}F (471 MHz, $(CD_3)_2SO$)



3w

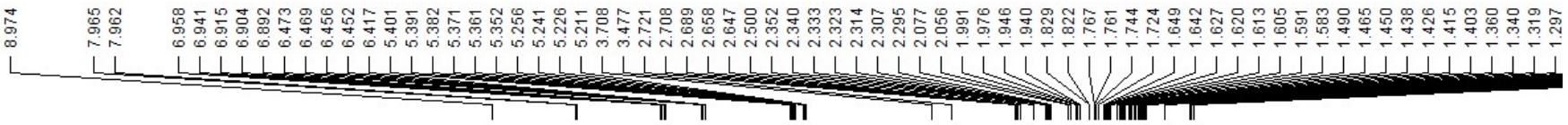
^1H (500 MHz, $(CD_3)_2SO$)

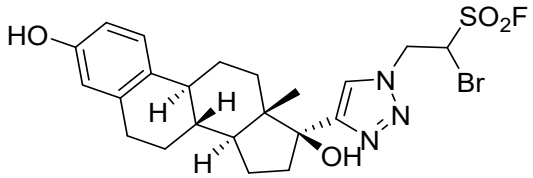

197.362
175.753
166.335
142.097
126.353
124.807
114.386
111.959
97.775
75.602
61.728
55.510
55.358
50.151
40.026
39.859
39.693
39.520
39.354
39.188
39.022
FO2S
Br
N
N=N
O
O
O
3w
13C (126 MHz, (CD3)2SO)
55.510
55.358
55.7
55.6
55.5
55.4
55.3
55.2
200
150
100
50
0
PPM



3w

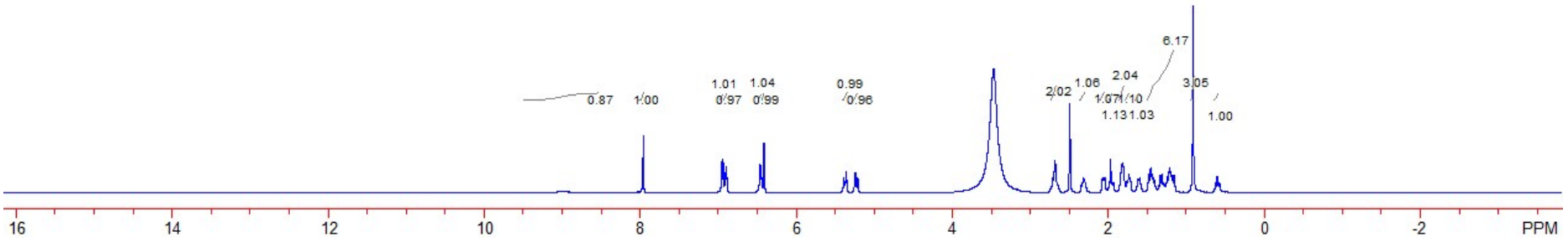
^{19}F (471 MHz, $(CD_3)_2SO$)

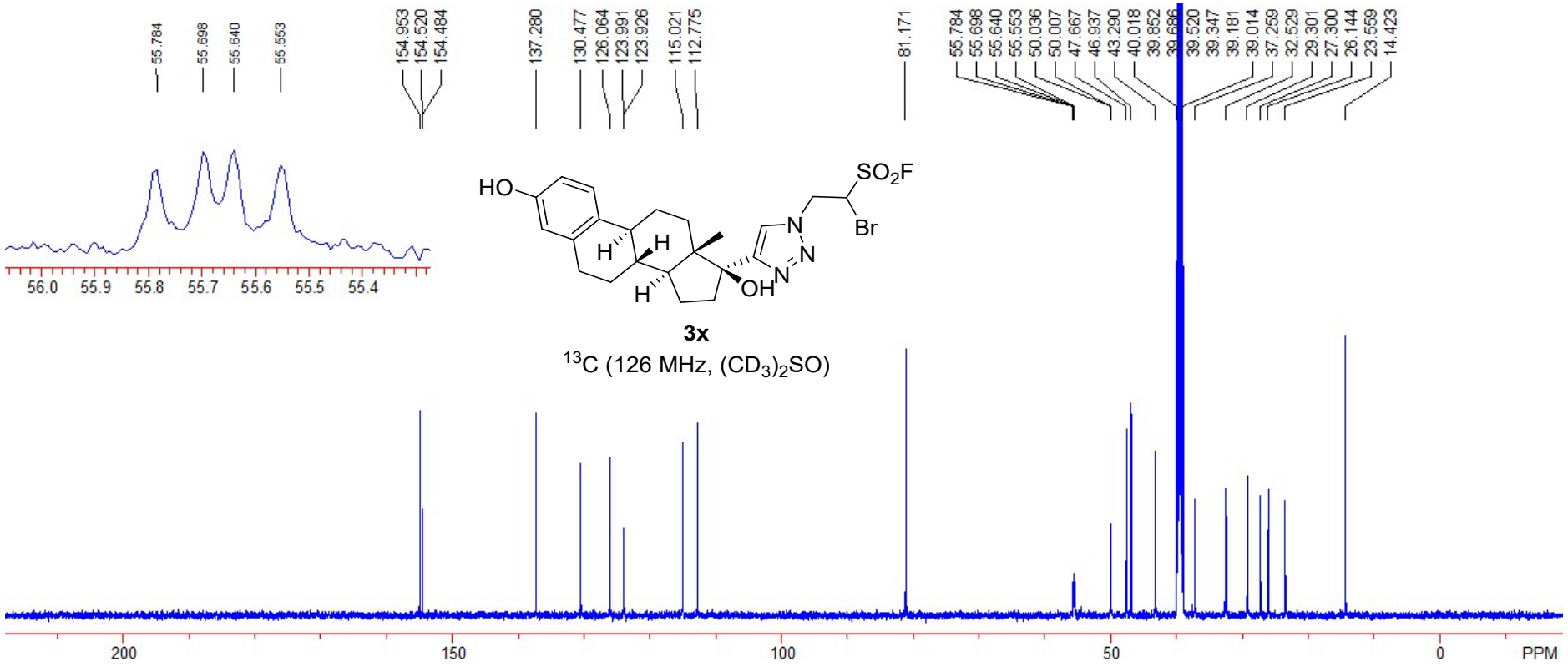




3x

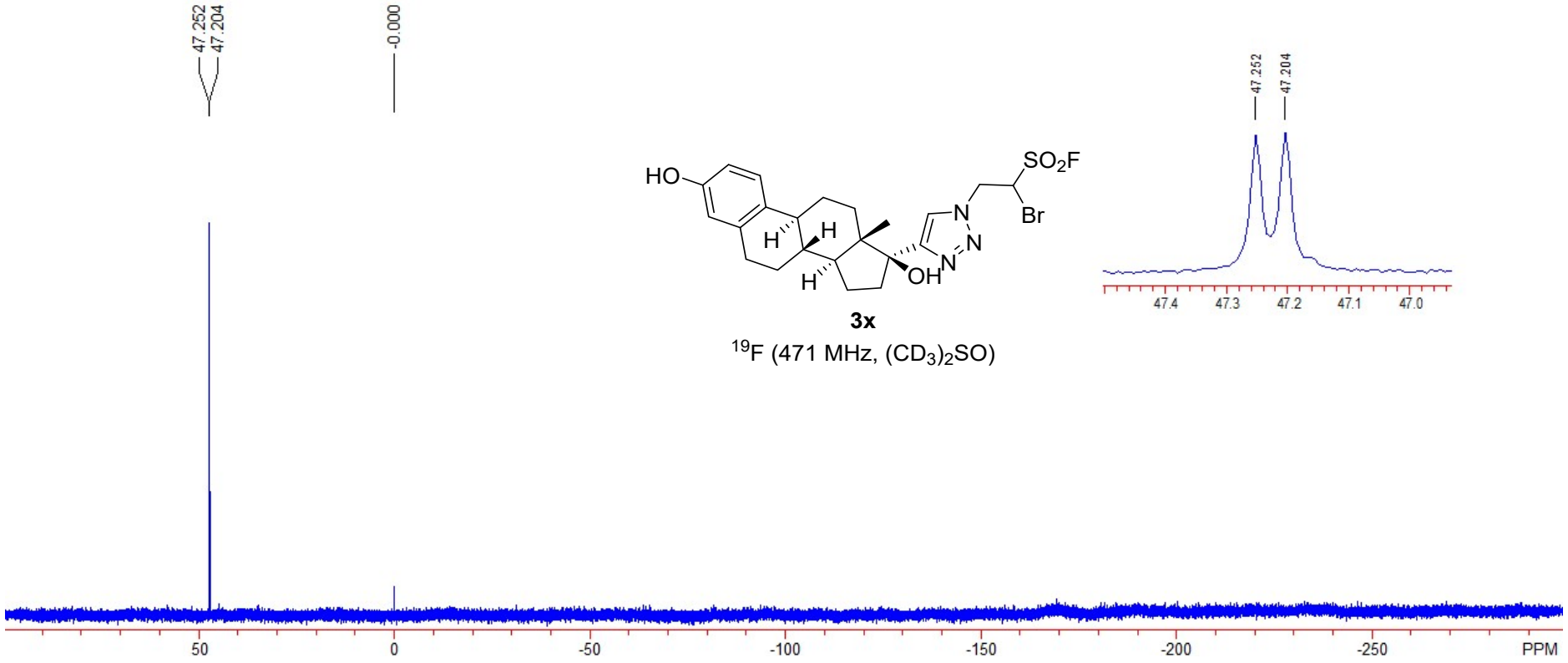
^{1}H (500 MHz, $(CD_3)_2SO$)





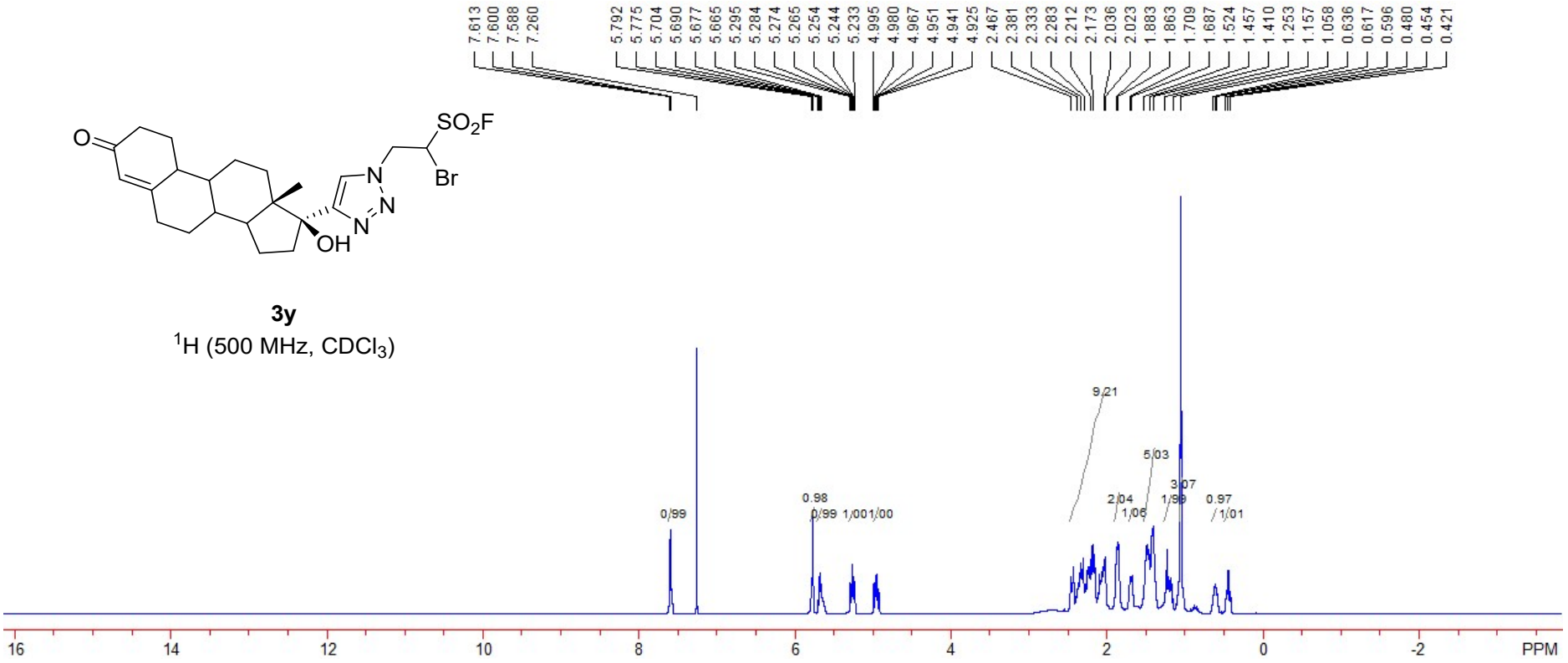
3x

^{13}C (126 MHz, $(CD_3)_2SO$)



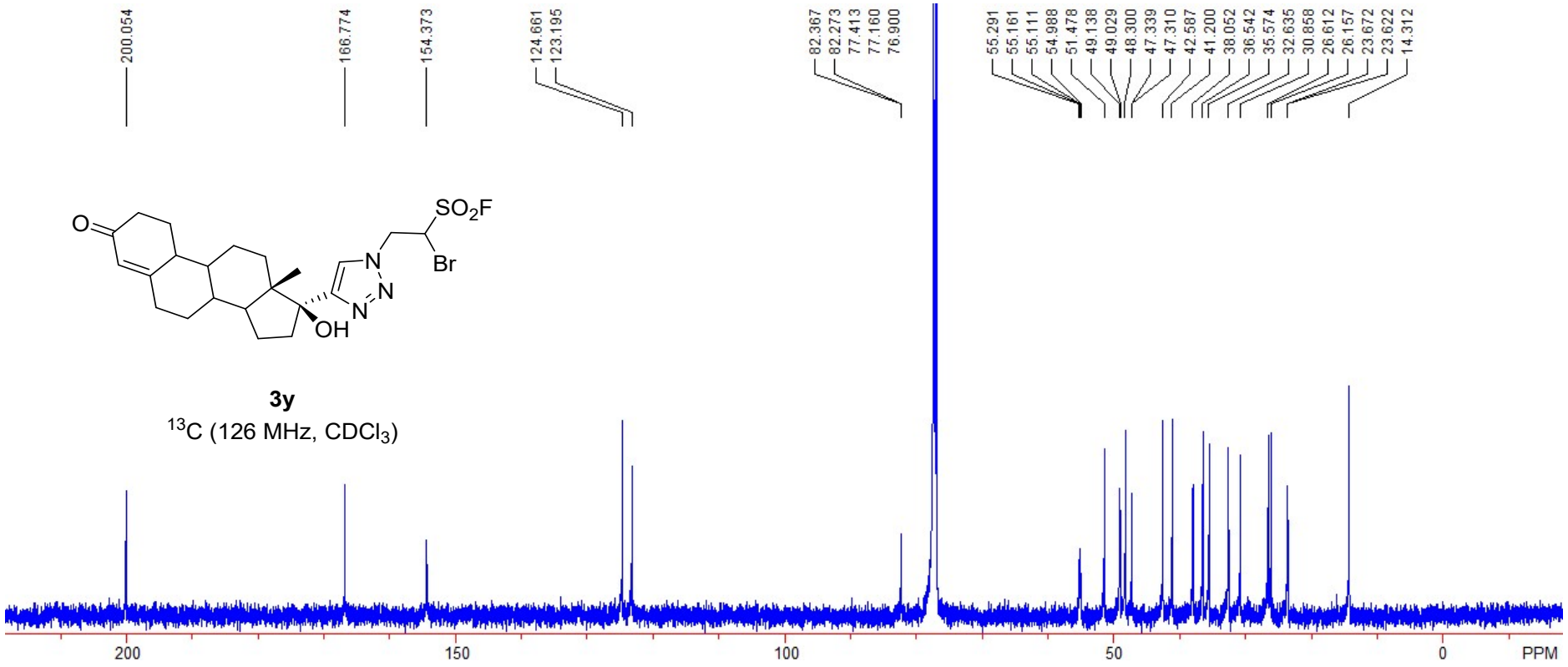
3x

^{19}F (471 MHz, $(CD_3)_2SO$)



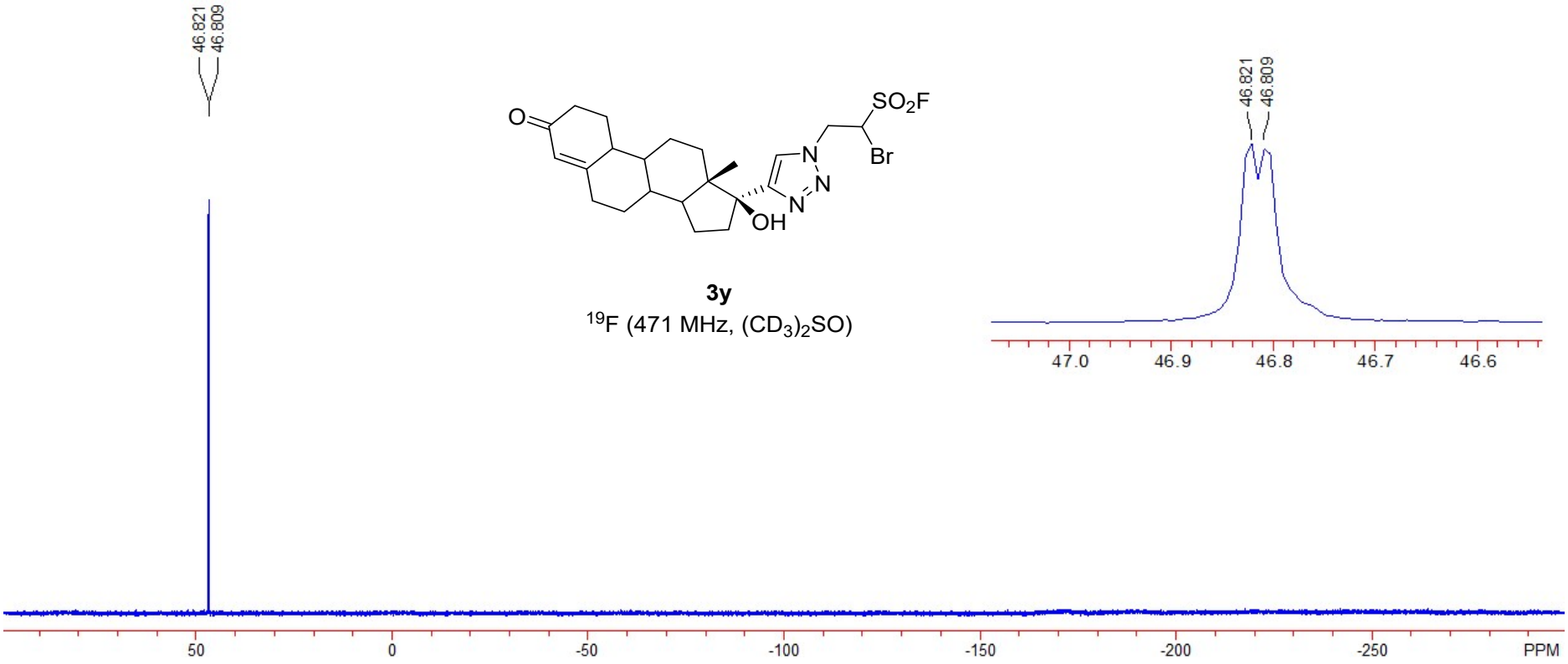
3y

^{1}H (500 MHz, $CDCl_3$)



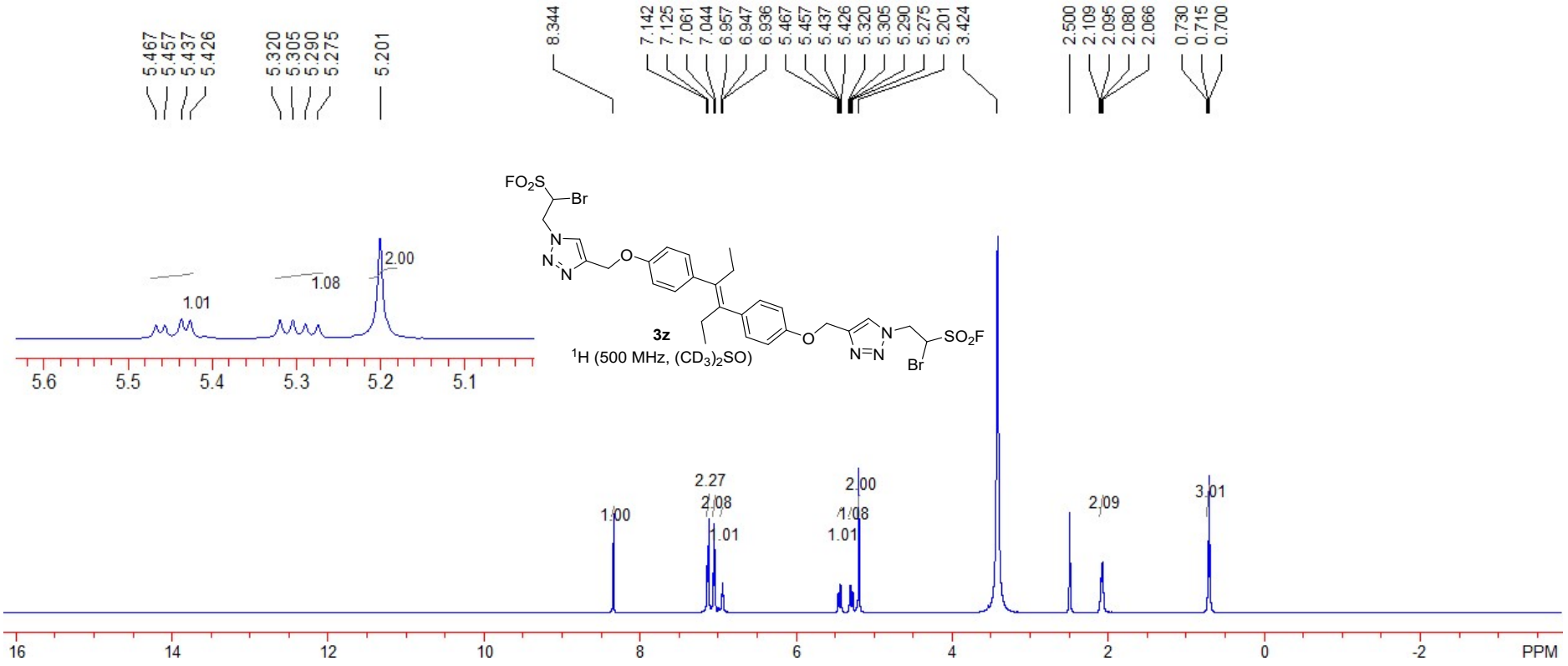
3y

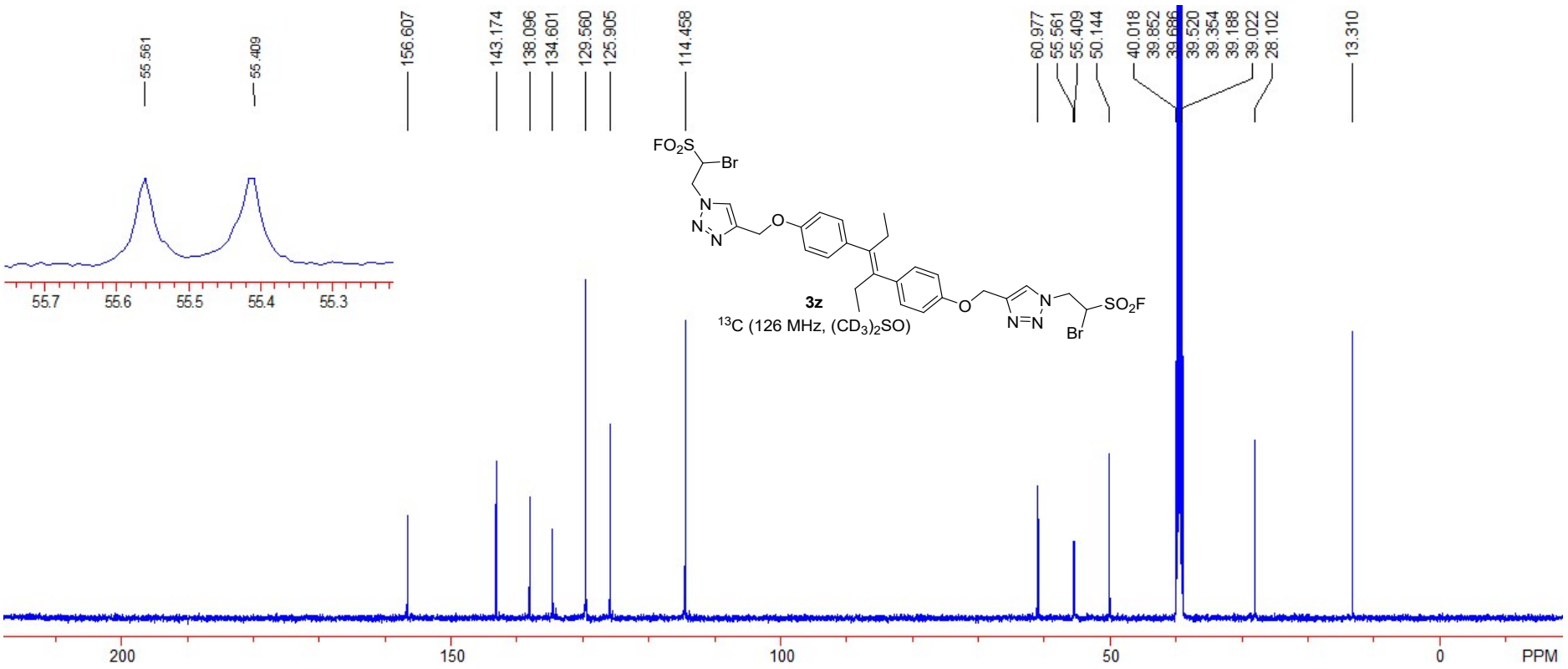
^{13}C (126 MHz, $CDCl_3$)

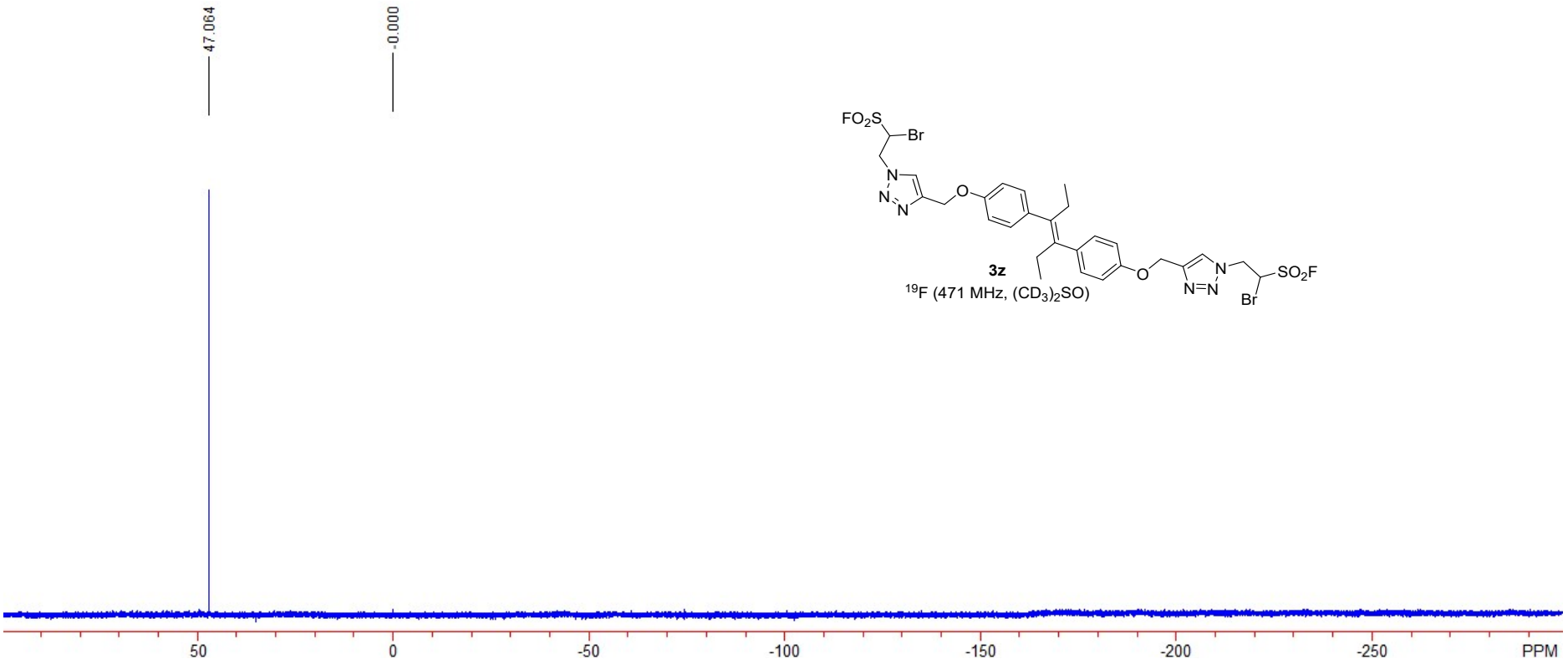


3y

^{19}F (471 MHz, $(CD_3)_2SO$)

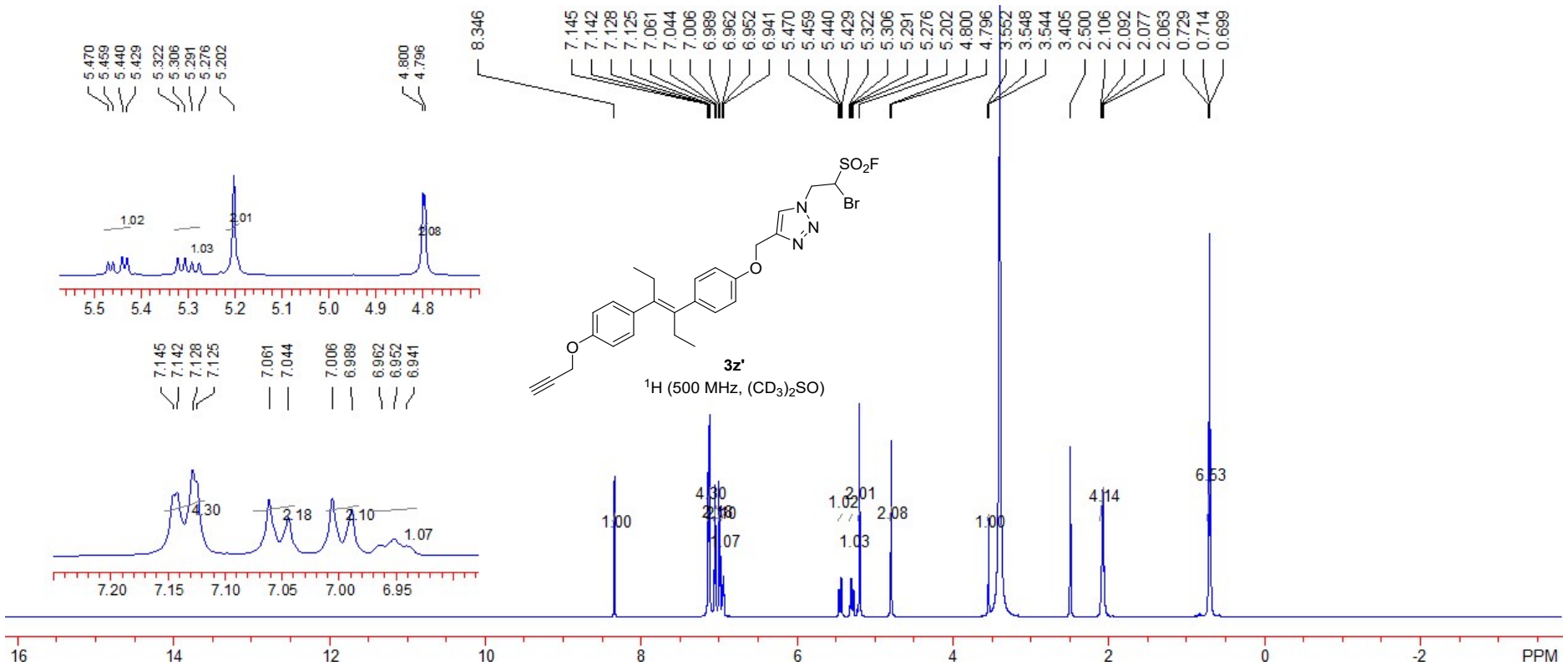

5.467
5.457
5.437
5.426
5.320
5.305
5.290
5.275
5.201
8.344
7.142
7.125
7.061
7.044
6.957
6.947
6.936
5.467
5.457
5.437
5.426
5.320
5.305
5.290
5.275
5.201
3.424
2.500
2.109
2.095
2.080
2.066
0.730
0.715
0.700
FO2S
Br
N
N
N
O
O
N
N=N
N
SO2F
Br
3z
1H (500 MHz, (CD3)2SO)
1.01
1.08
2.00
5.6
5.5
5.4
5.3
5.2
5.1
1.00
2.27
2.08
1.01
2.00
1.08
1.01
2.09
3.01
16
14
12
10
8
6
4
2
0
-2
PPM

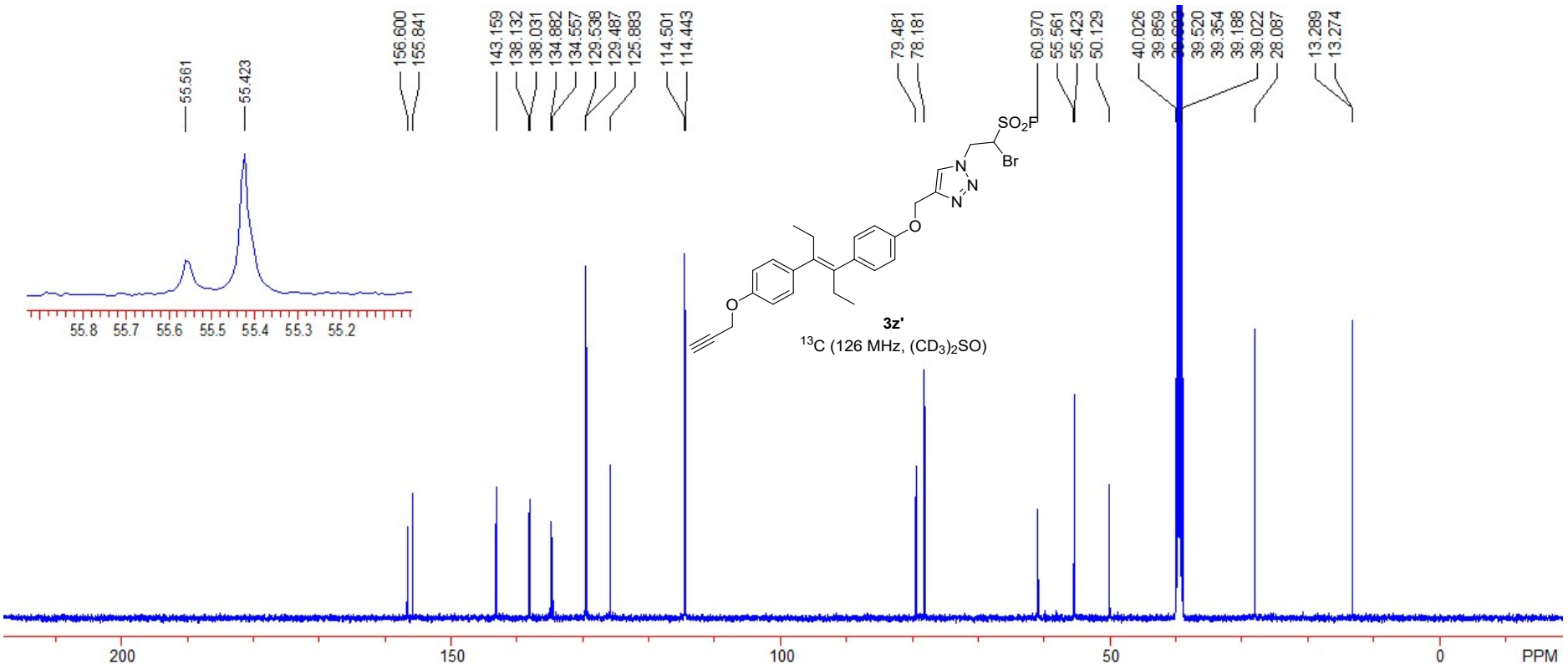

55.561
55.409
156.607
143.174
138.096
134.601
129.560
125.905
114.458
60.977
55.561
55.409
50.144
40.018
39.852
39.686
39.520
39.354
39.188
39.022
28.102
13.310
55.7
55.6
55.5
55.4
55.3
FO2S
Br
O
N
N
N
O
N
N=N
SO2F
Br
3z
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM

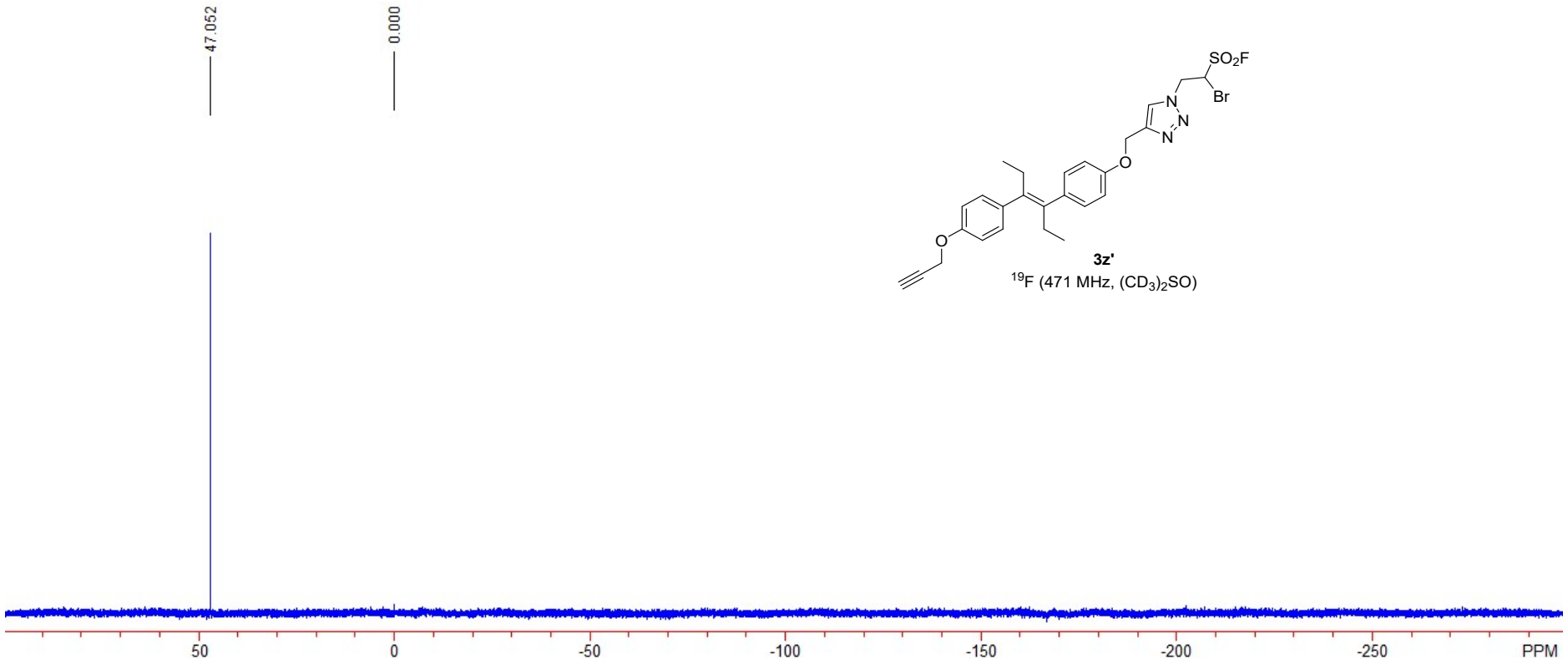


3z

^{19}F (471 MHz, $(CD_3)_2SO$)

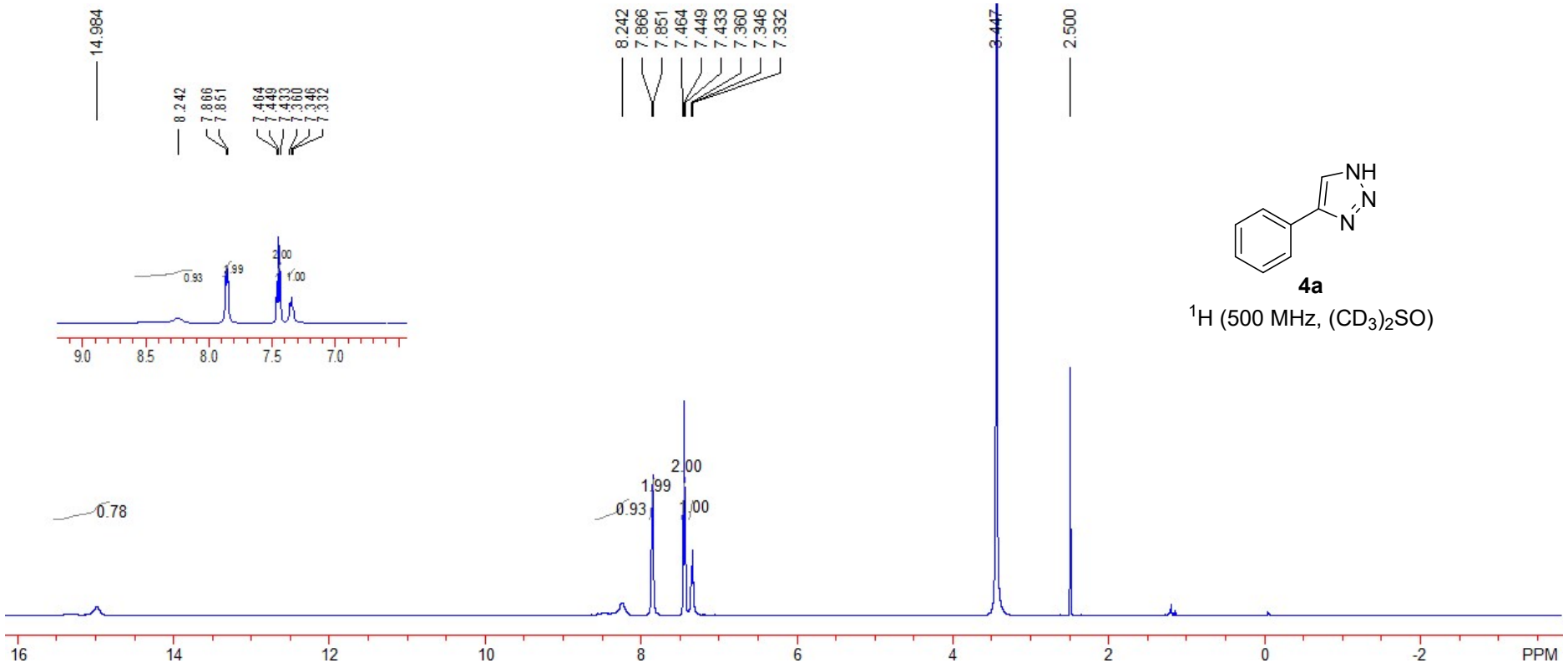

3z'
1H (500 MHz, (CD3)2SO)
SO2F
Br
N
N
N
O
O
8.346
7.145
7.142
7.128
7.125
7.061
7.044
7.006
6.989
6.962
6.952
6.941
5.470
5.459
5.440
5.429
5.322
5.306
5.291
5.276
5.202
4.800
4.796
3.552
3.548
3.544
3.405
2.500
2.106
2.092
2.077
2.063
0.729
0.714
0.699
1.00
4.30
2.18
2.10
1.07
1.02
2.01
1.03
2.08
1.00
4.14
6.53
16
14
12
10
8
6
4
2
0
-2
PPM

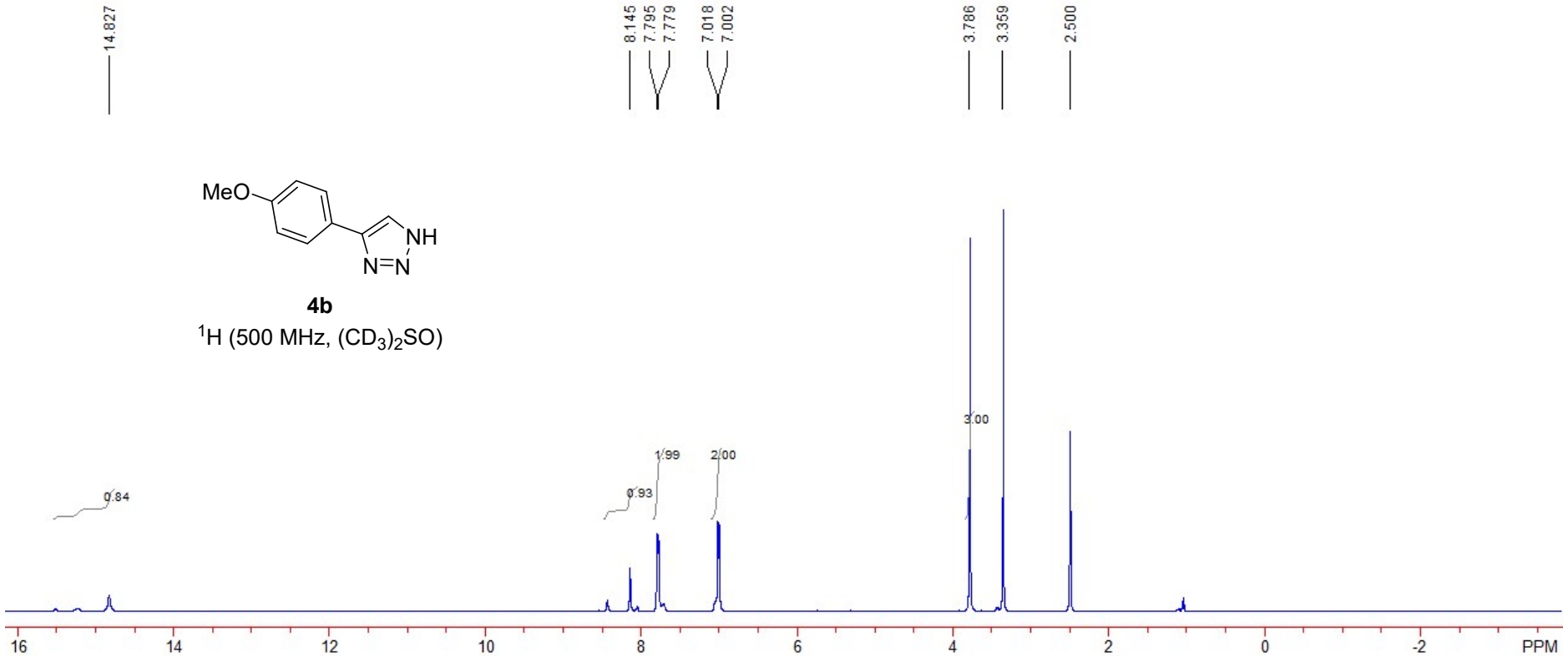

55.561
55.423
156.600
155.841
143.159
138.132
138.031
134.882
134.557
129.538
129.487
125.883
114.501
114.443
79.481
78.181
60.970
55.561
55.423
50.129
40.026
39.859
39.520
39.354
39.188
39.022
28.087
13.289
13.274
55.8 55.7 55.6 55.5 55.4 55.3 55.2
SO2F
Br
N
N
N
O
O
3z'
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM

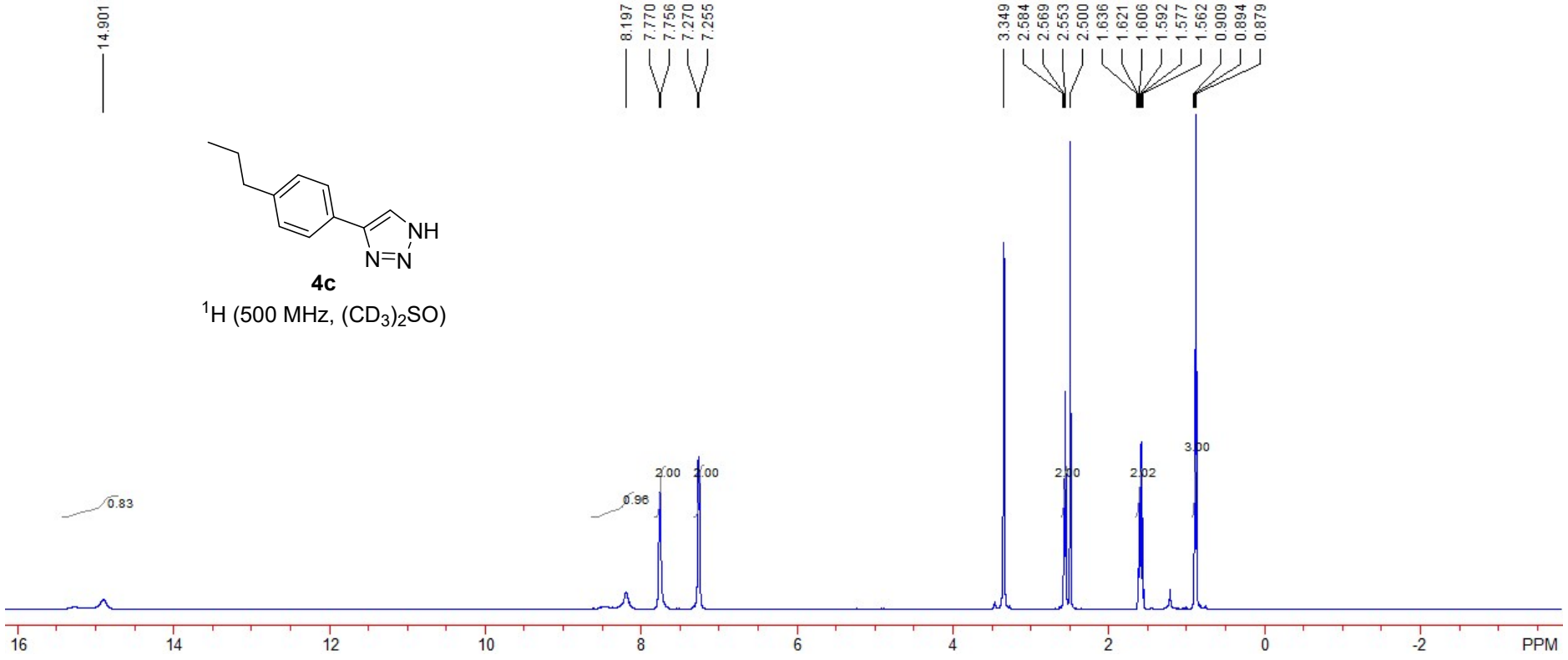


3z'

^{19}F (471 MHz, $(CD_3)_2SO$)

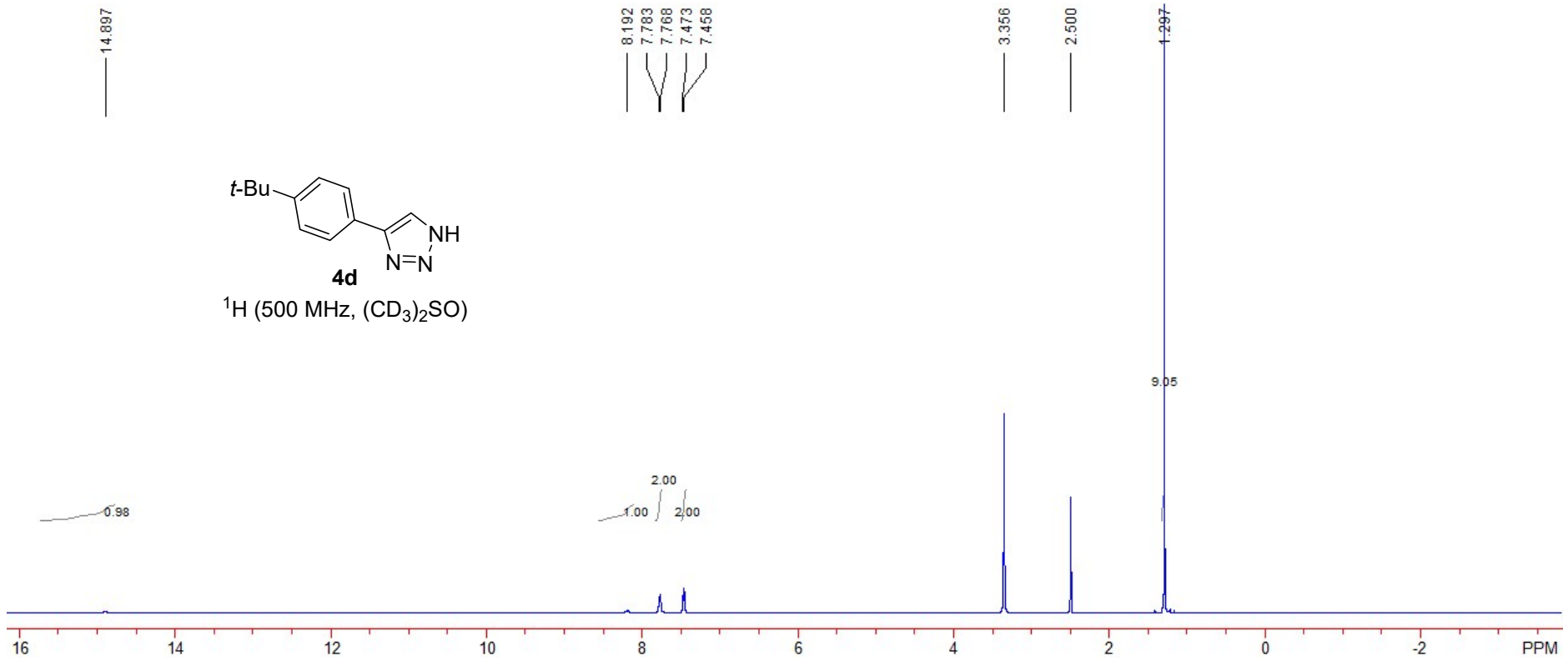

14.984
8.242
7.866
7.851
7.464
7.449
7.433
7.360
7.346
7.332
3.447
2.500
0.78
0.93
1.99
2.00
1.00
NH
N
N
4a
^{1}H (500 MHz, $(CD_3)_2SO$)
16
14
12
10
8
6
4
2
0
-2
PPM

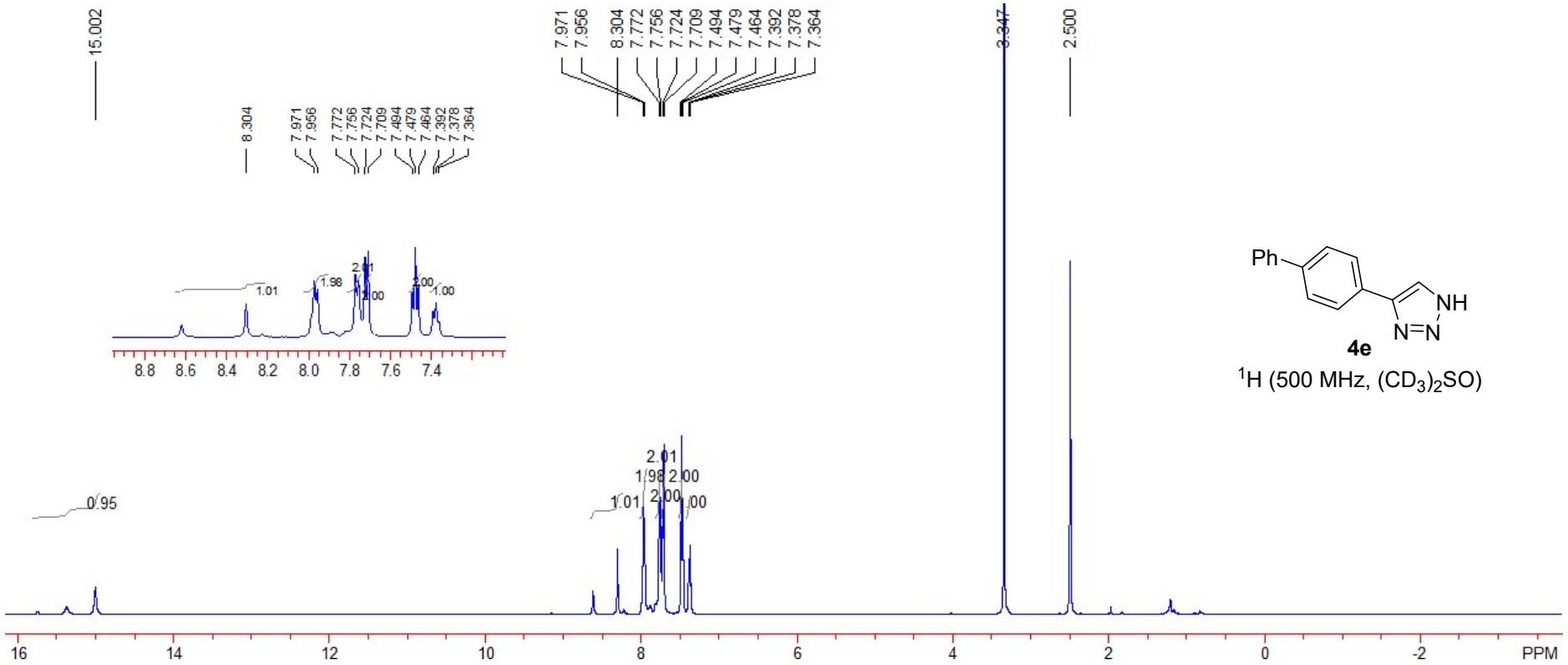

14.827
8.145
7.795
7.779
7.018
7.002
3.786
3.359
2.500
MeO
NH
N=N
4b
^{1}H (500 MHz, $(CD_3)_2SO$)
0.84
0.93
1.99
2.00
3.00
16
14
12
10
8
6
4
2
0
-2
PPM

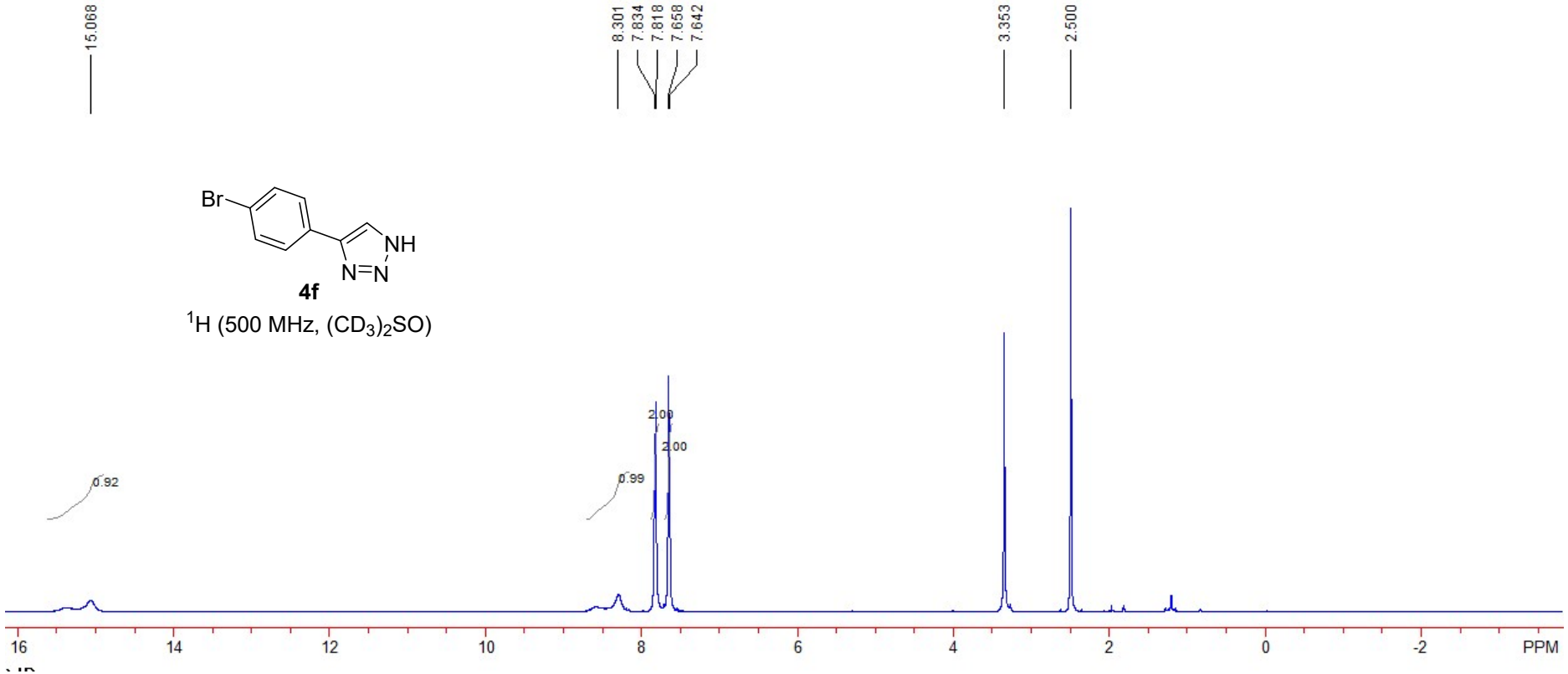


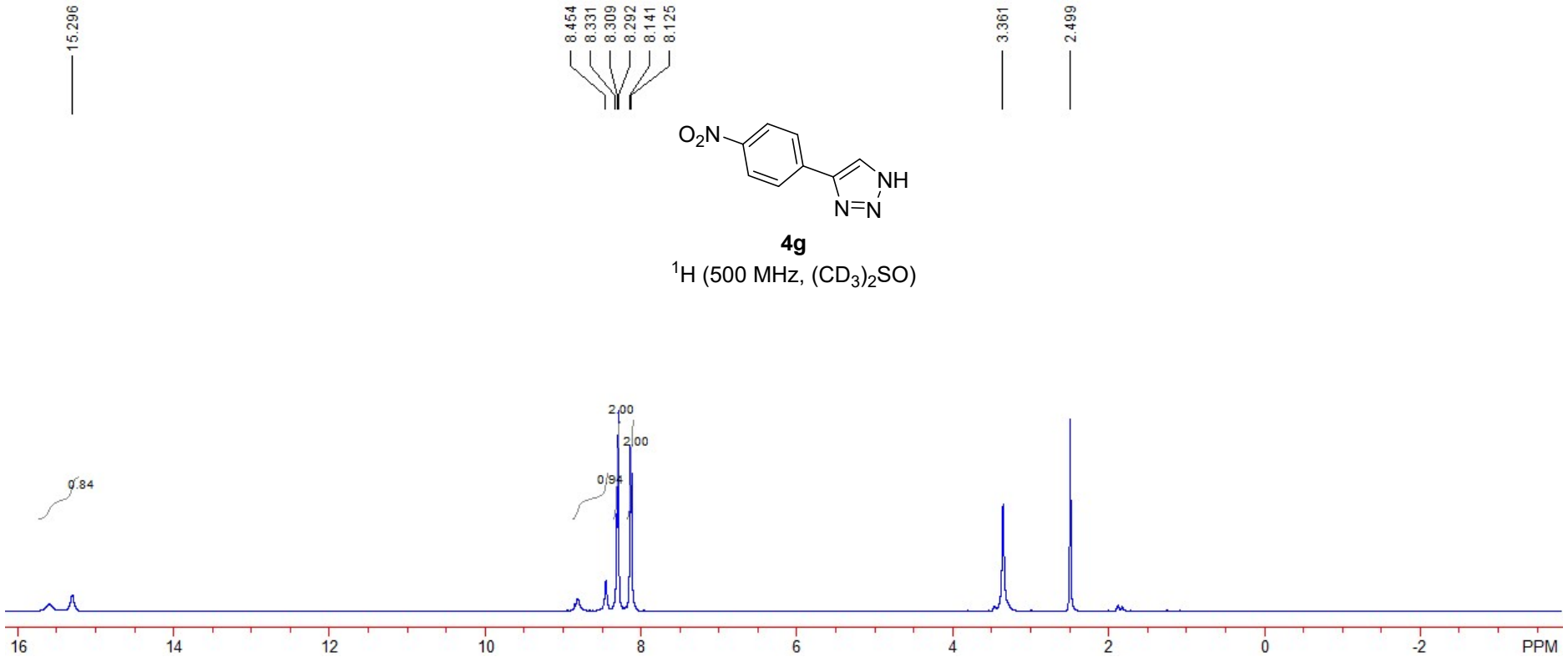
4c

^{1}H (500 MHz, $(CD_3)_2SO$)


14.897
8.192
7.783
7.768
7.473
7.458
3.356
2.500
1.297
t-Bu
NH
N=N
4d
1H (500 MHz, (CD3)2SO)
9.05
2.00
0.98
1.00
2.00
16
14
12
10
8
6
4
2
0
-2
PPM

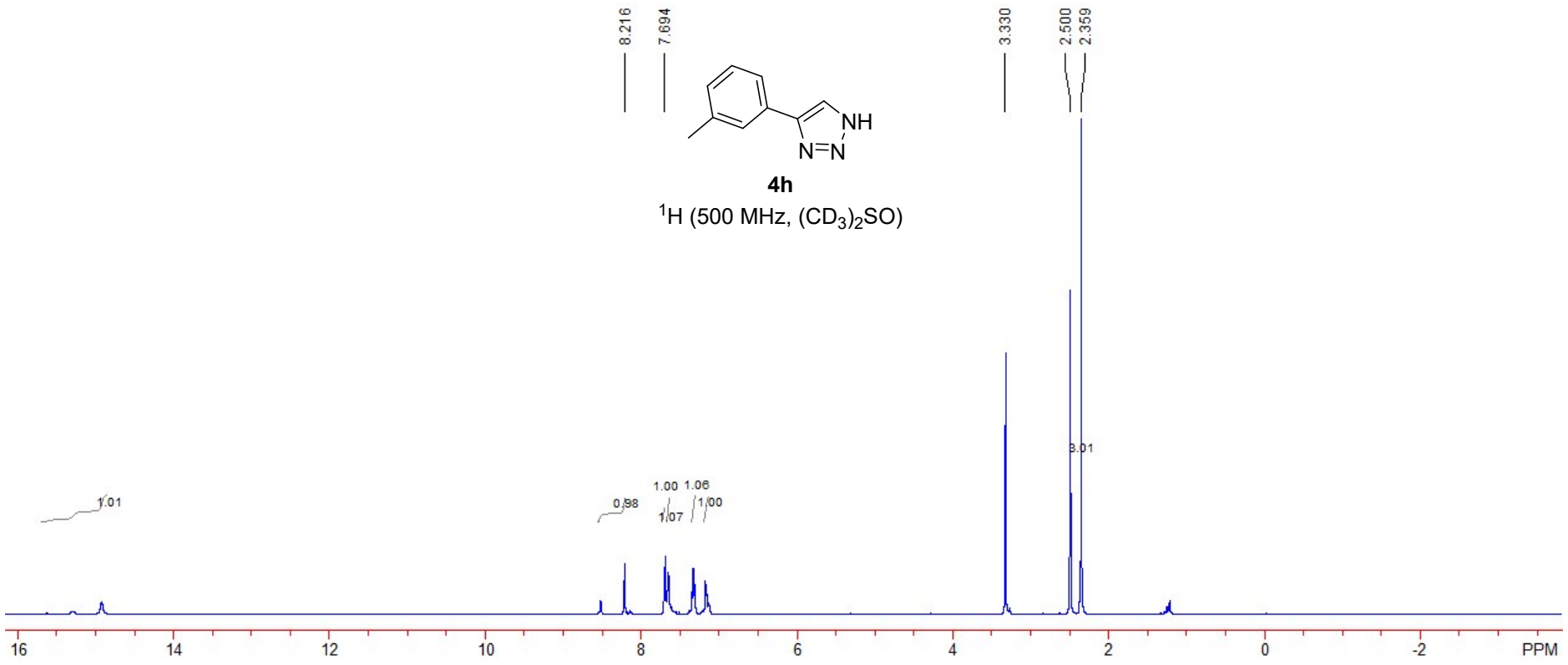

15.002
8.304
7.971
7.956
7.772
7.756
7.724
7.709
7.494
7.479
7.464
7.392
7.378
7.364
3.347
2.500
0.95
1.01
1.98
2.01
2.00
1.00
Ph
NH
N=N
4e
^{1}H (500 MHz, $(CD_3)_2SO$)
16
14
12
10
8
6
4
2
0
-2
PPM


15.068
8.301
7.834
7.818
7.658
7.642
3.353
2.500
Br
NH
N=N
4f
^{1}H (500 MHz, $(CD_3)_2SO$)
0.92
0.99
2.00
2.00
16
14
12
10
8
6
4
2
0
-2
PPM



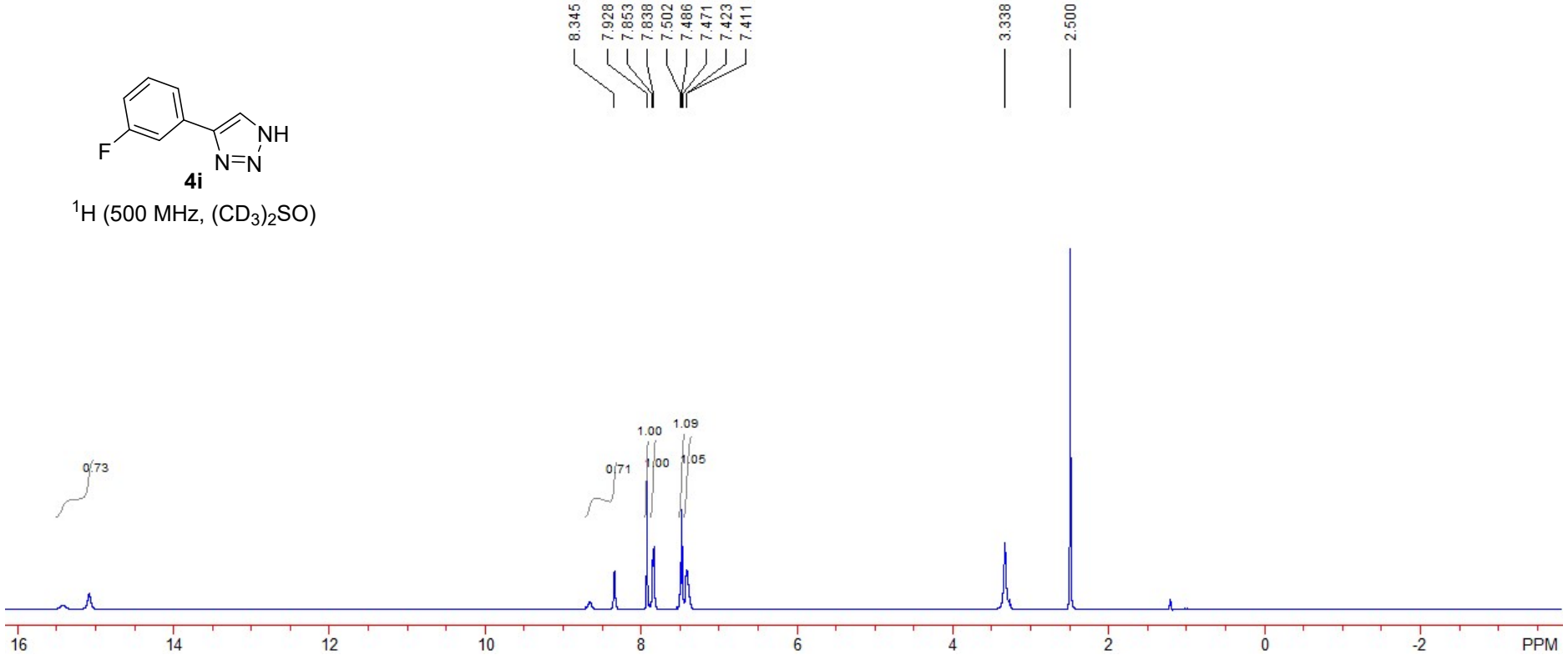
4g

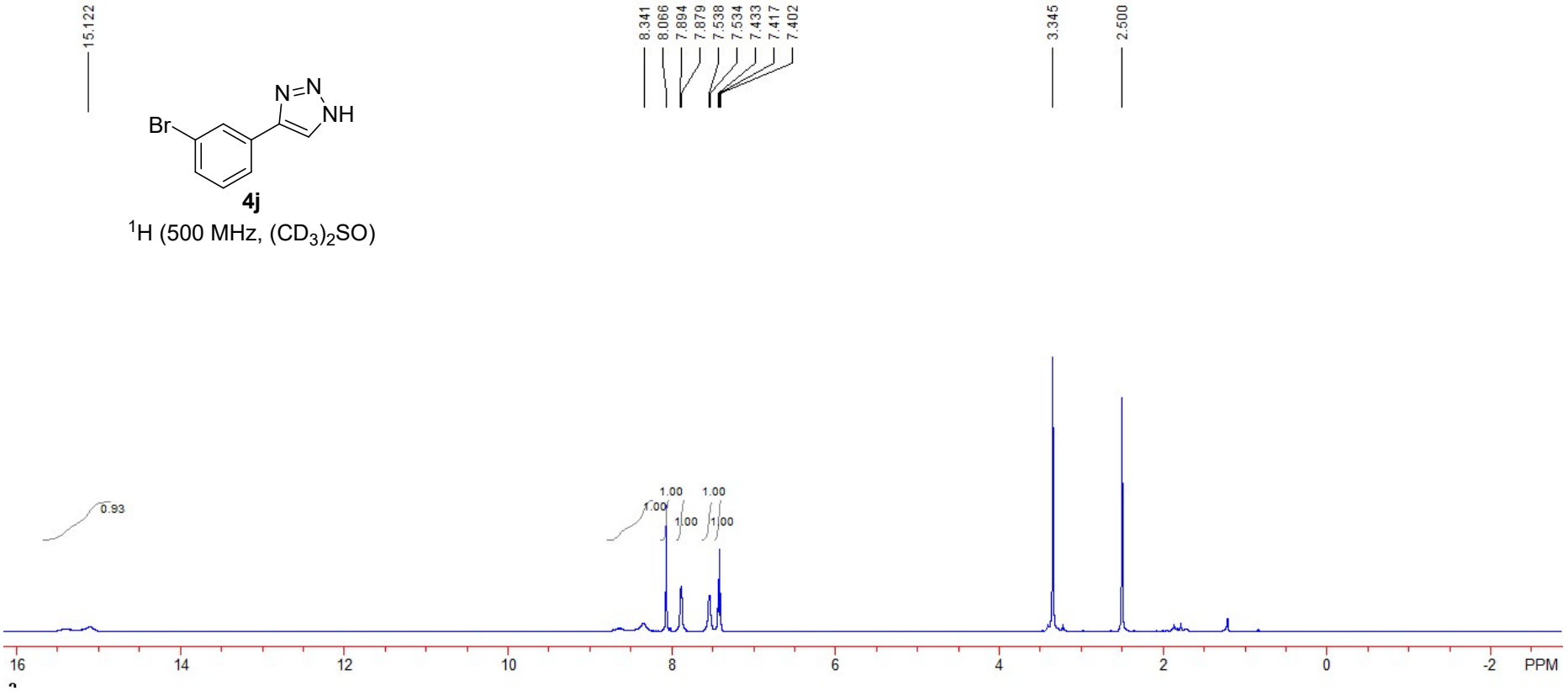
^{1}H (500 MHz, $(CD_3)_2SO$)

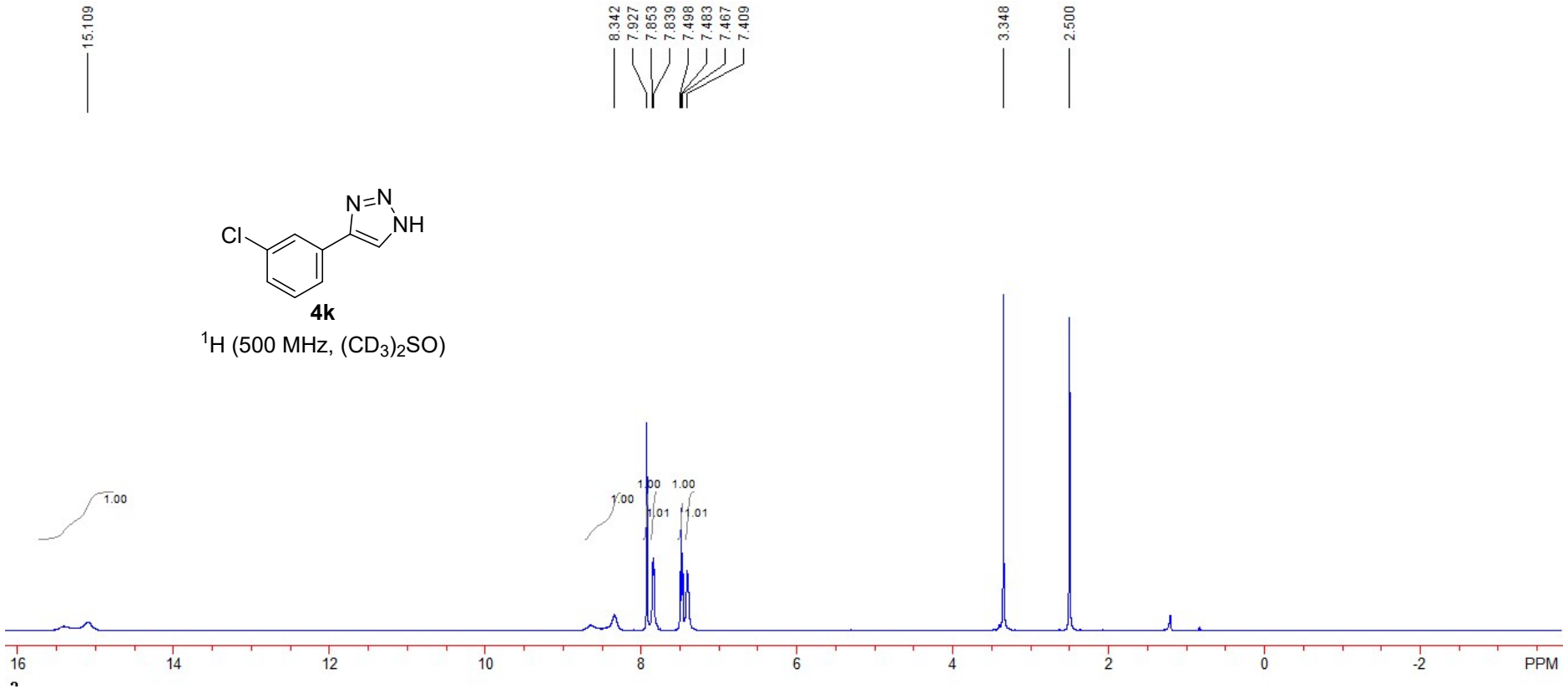


4h

^{1}H (500 MHz, $(CD_3)_2SO$)

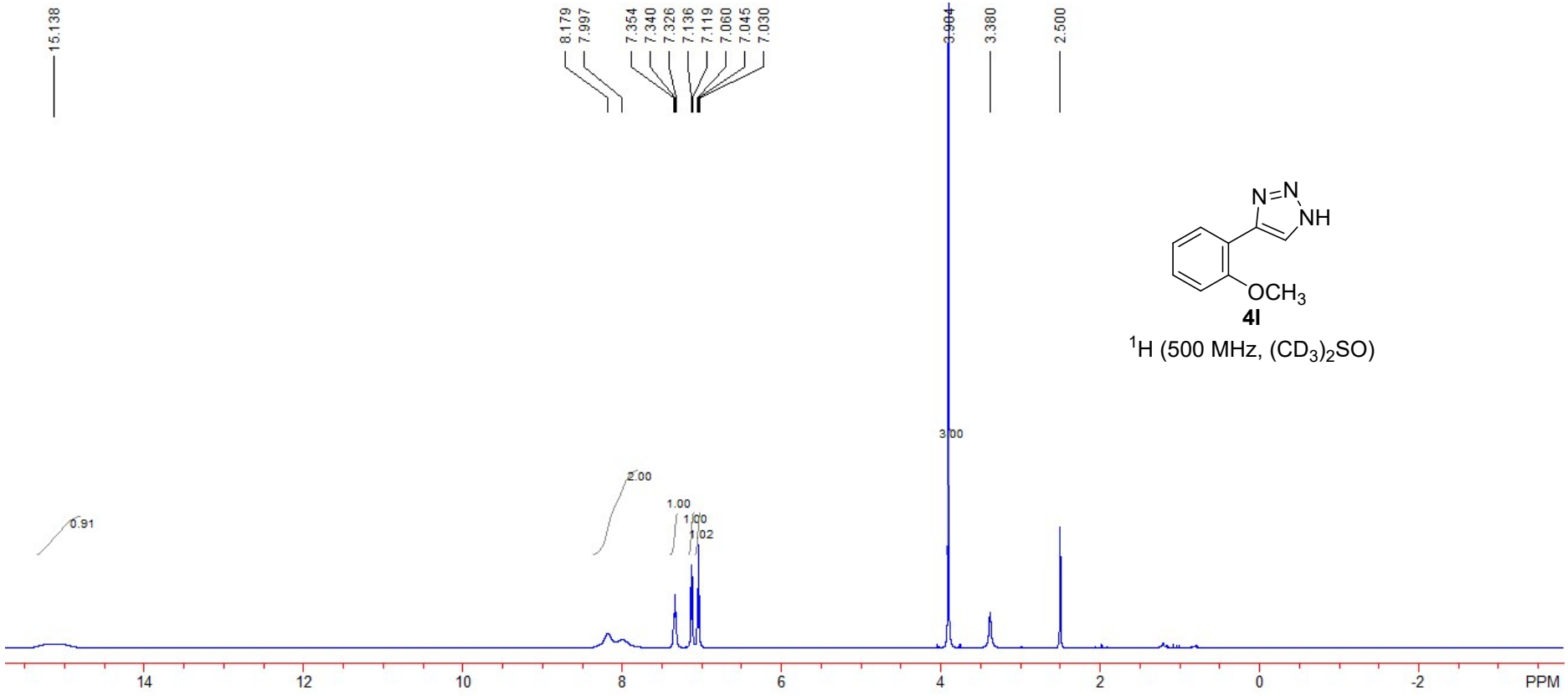

F
NH
N=N
4i
1H (500 MHz, (CD3)2SO)
8.345
7.928
7.853
7.838
7.502
7.486
7.471
7.423
7.411
3.338
2.500
0.73
0.71
1.00
1.00
1.09
1.05
16
14
12
10
8
6
4
2
0
-2
PPM


15.122
8.341
8.066
7.894
7.879
7.538
7.534
7.433
7.417
7.402
3.345
2.500
Br
N=N
NH
4j
^{1}H (500 MHz, $(CD_3)_2SO$)
0.93
1.00
1.00
1.00
1.00
1.00
16
14
12
10
8
6
4
2
0
-2
PPM



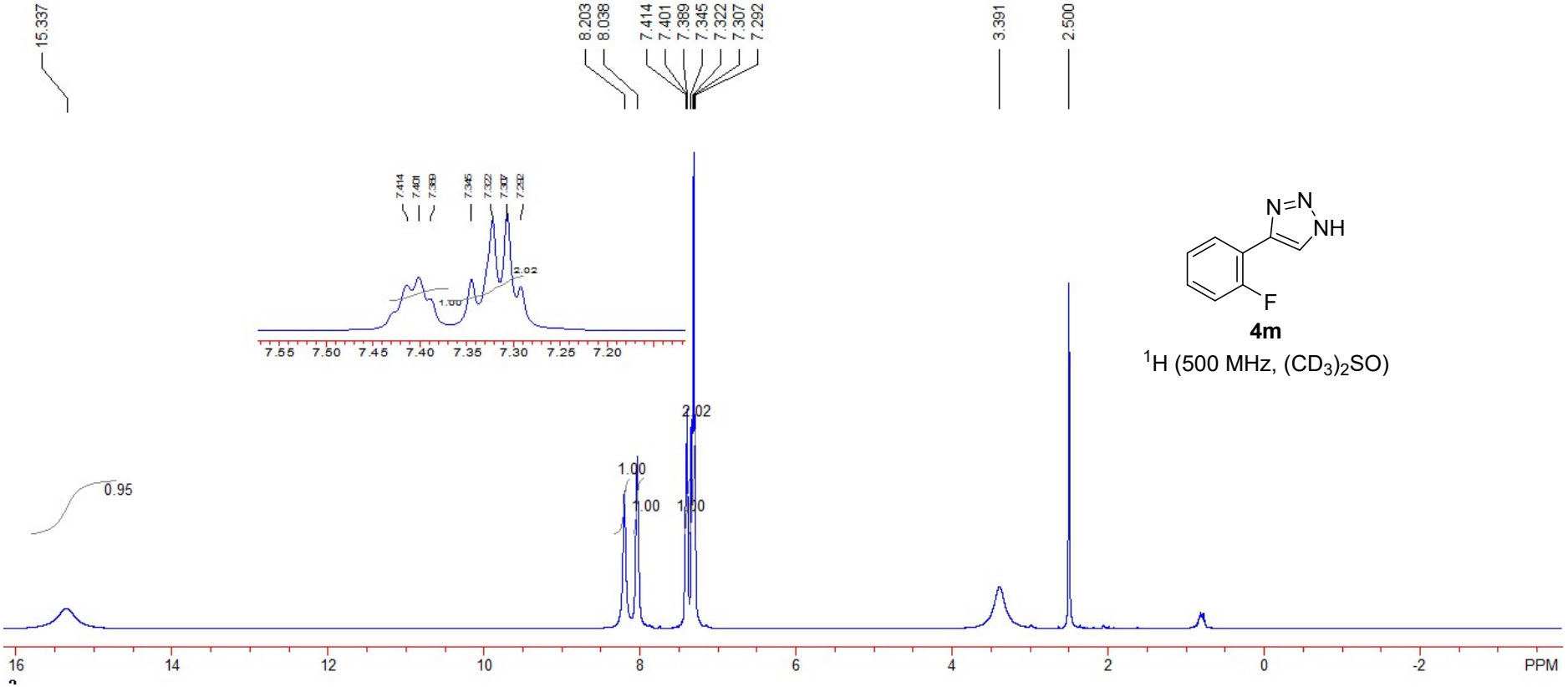
4k

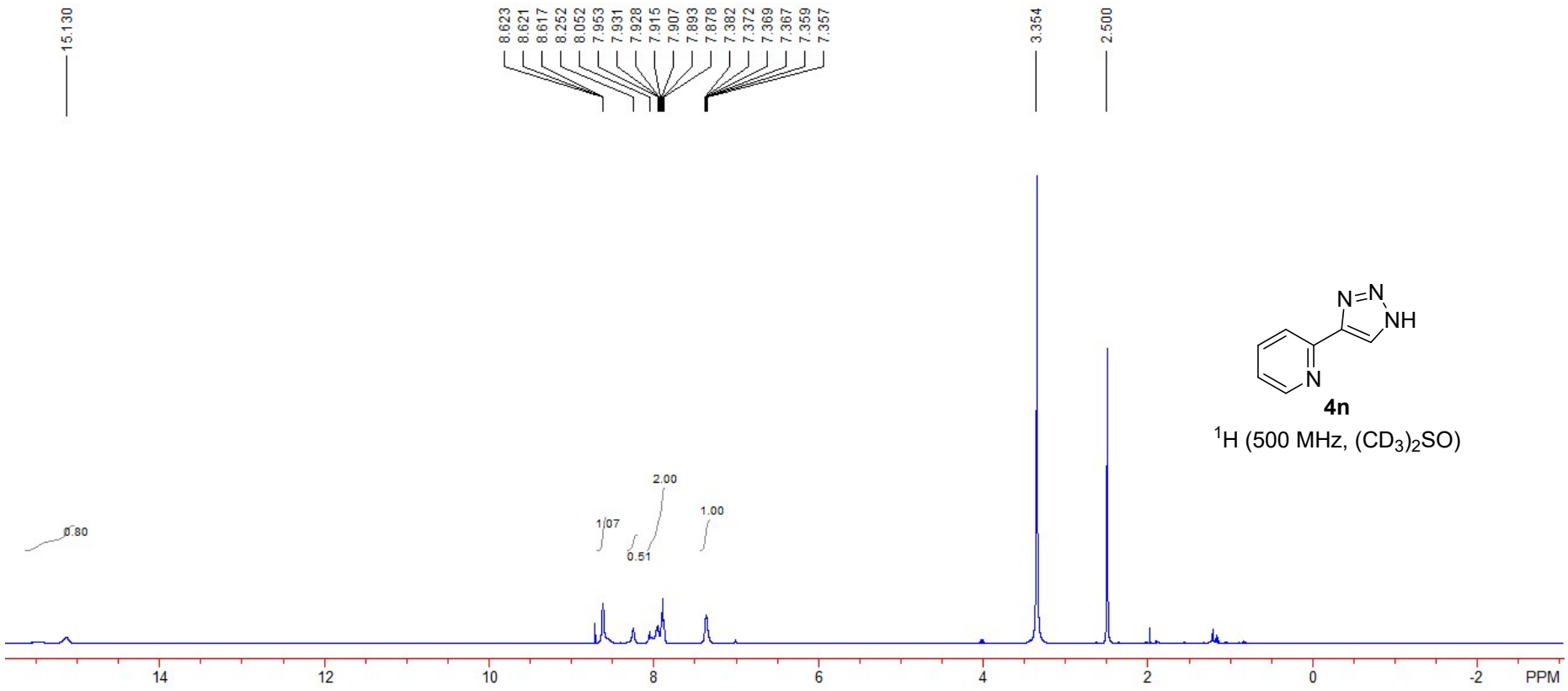
^{1}H (500 MHz, $(CD_3)_2SO$)



4l

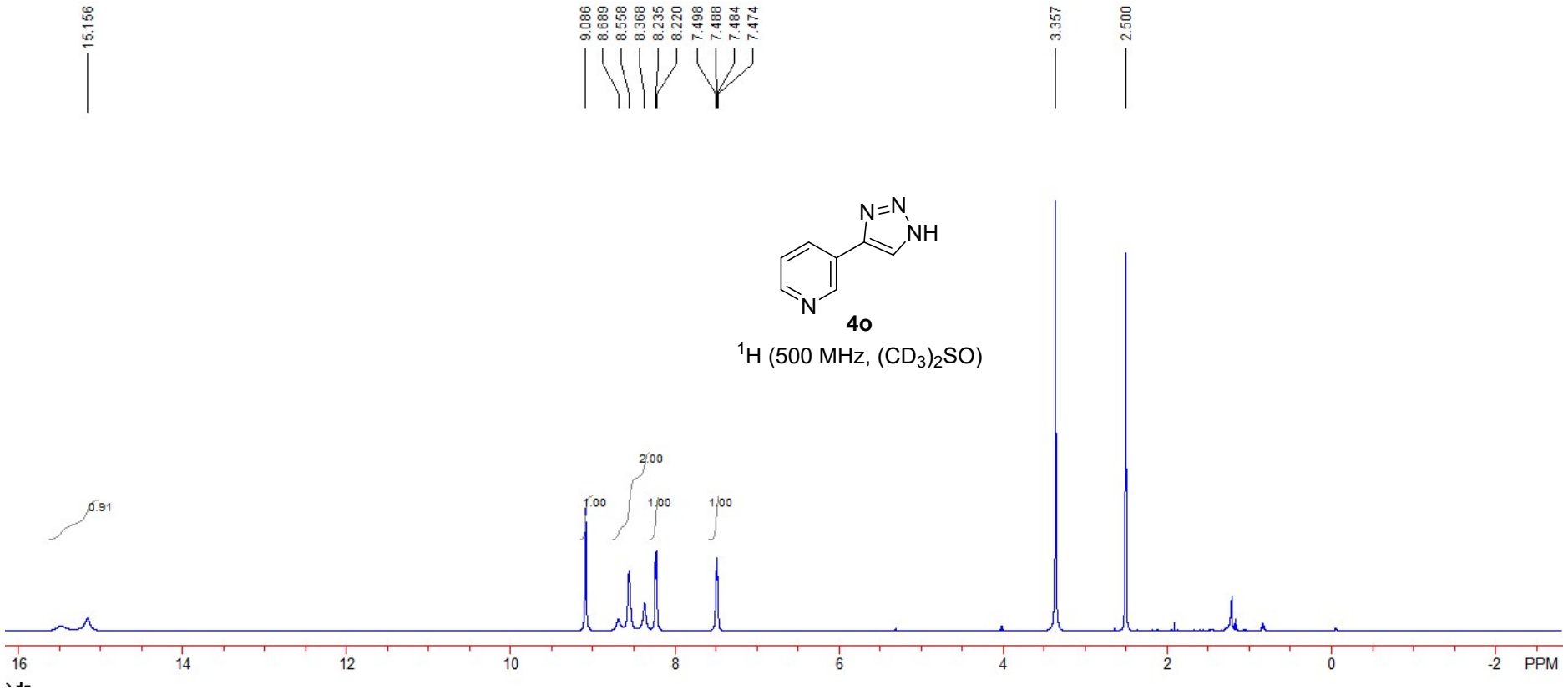
^{1}H (500 MHz, $(CD_3)_2SO$)


15.337
8.203
8.038
7.414
7.401
7.389
7.345
7.322
7.307
7.292
3.391
2.500
0.95
1.00
1.00
2.02
1.00
2.02
16
14
12
10
8
6
4
2
0
-2
PPM
7.55 7.50 7.45 7.40 7.35 7.30 7.25 7.20
N=N
NH
F
4m
1H (500 MHz, (CD3)2SO)



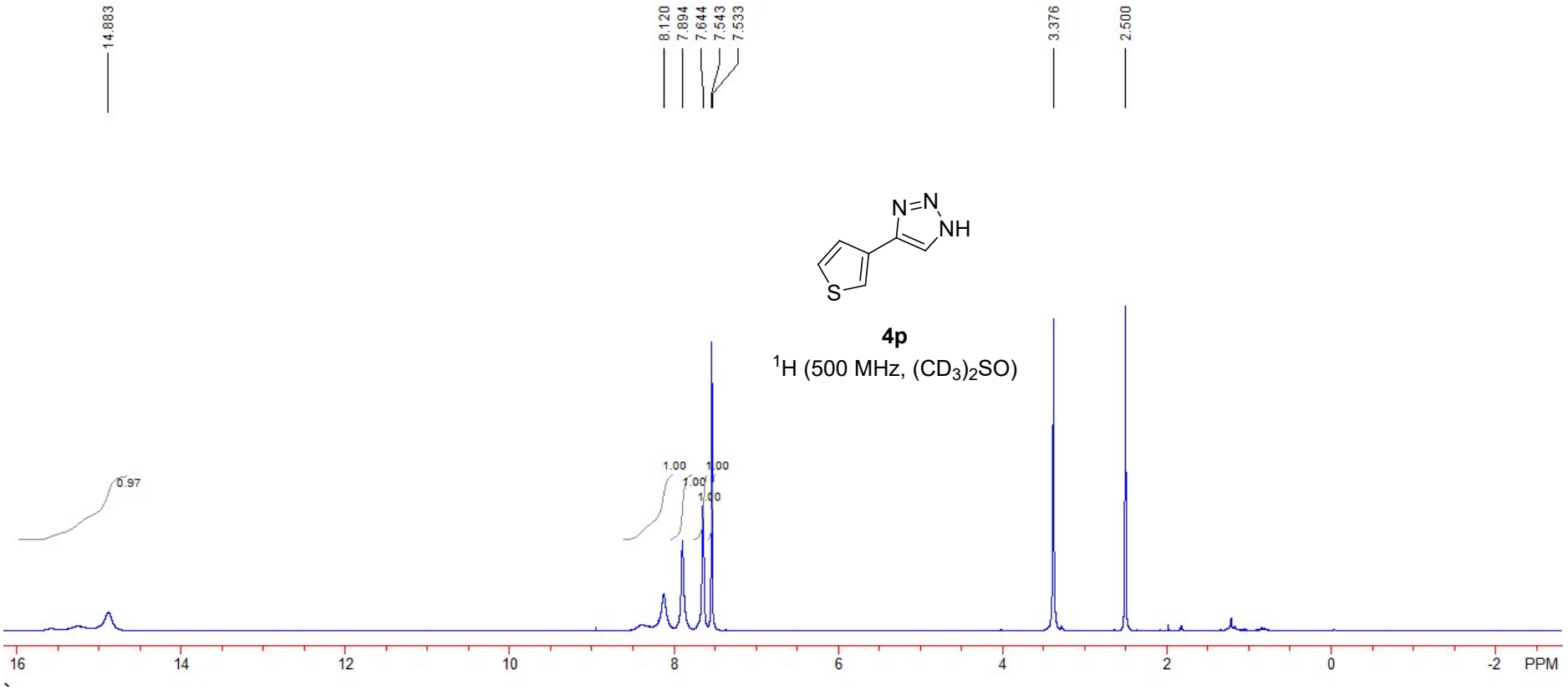
4n

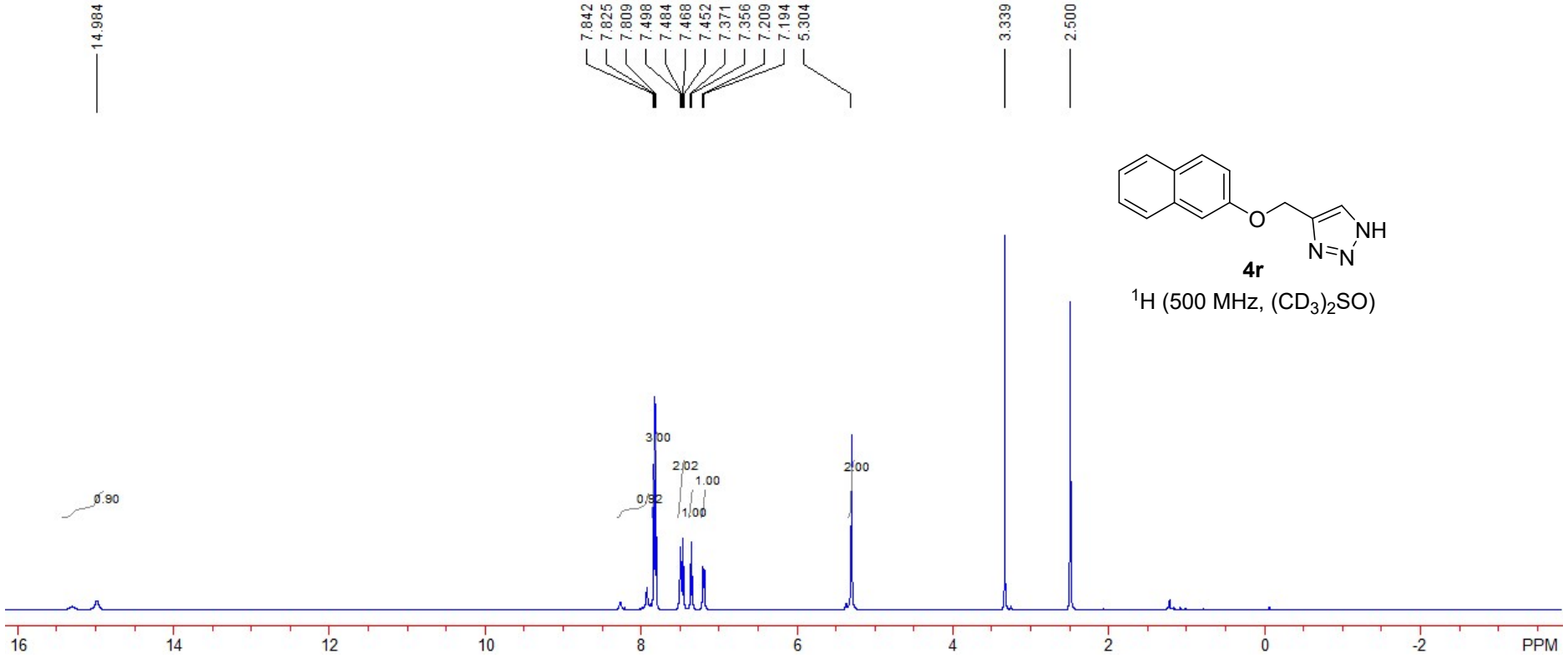
^{1}H (500 MHz, $(CD_3)_2SO$)

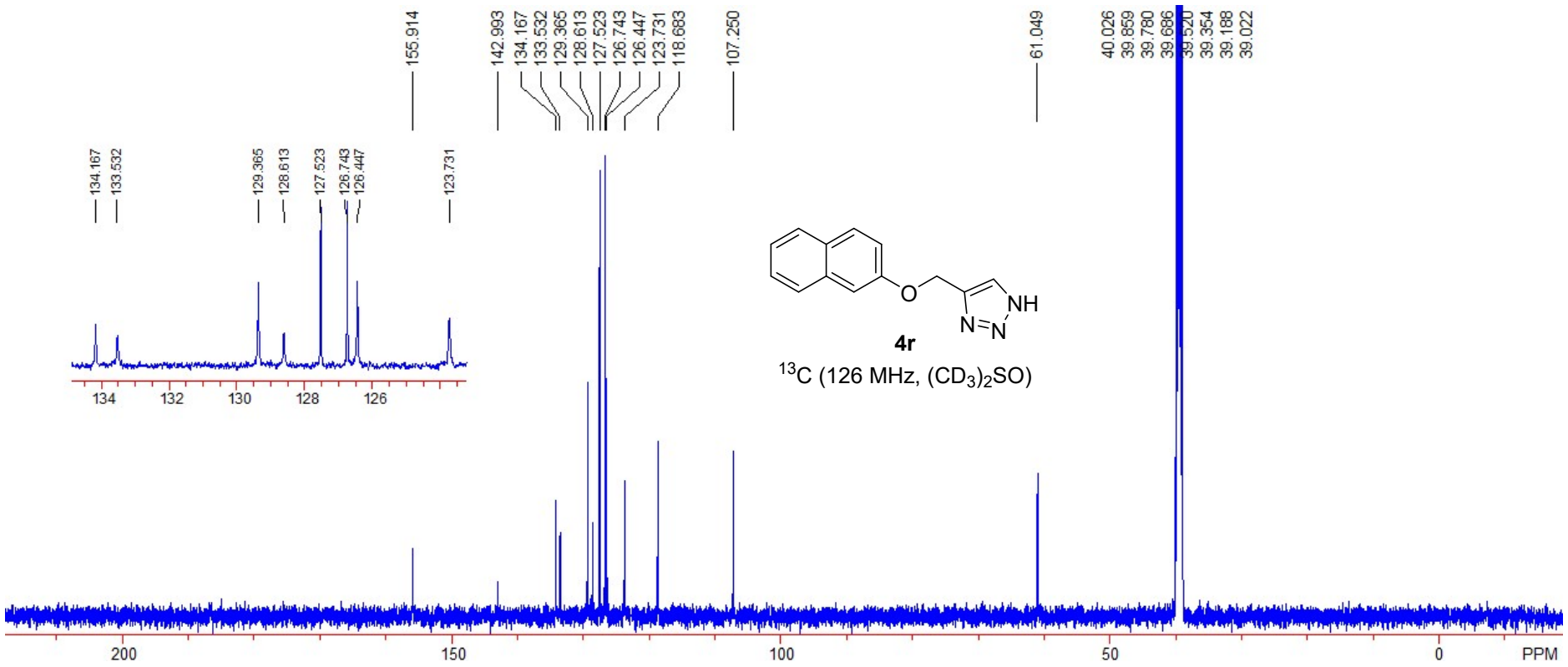


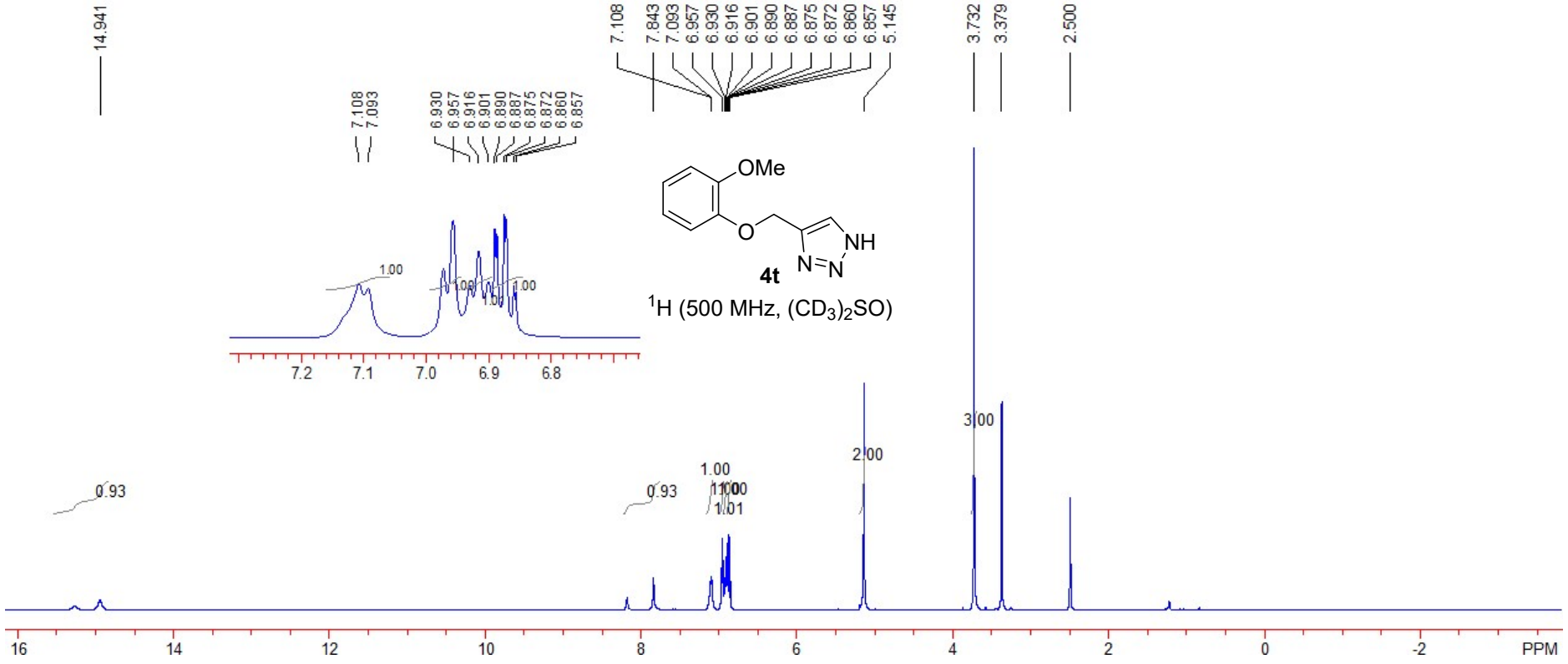
4o

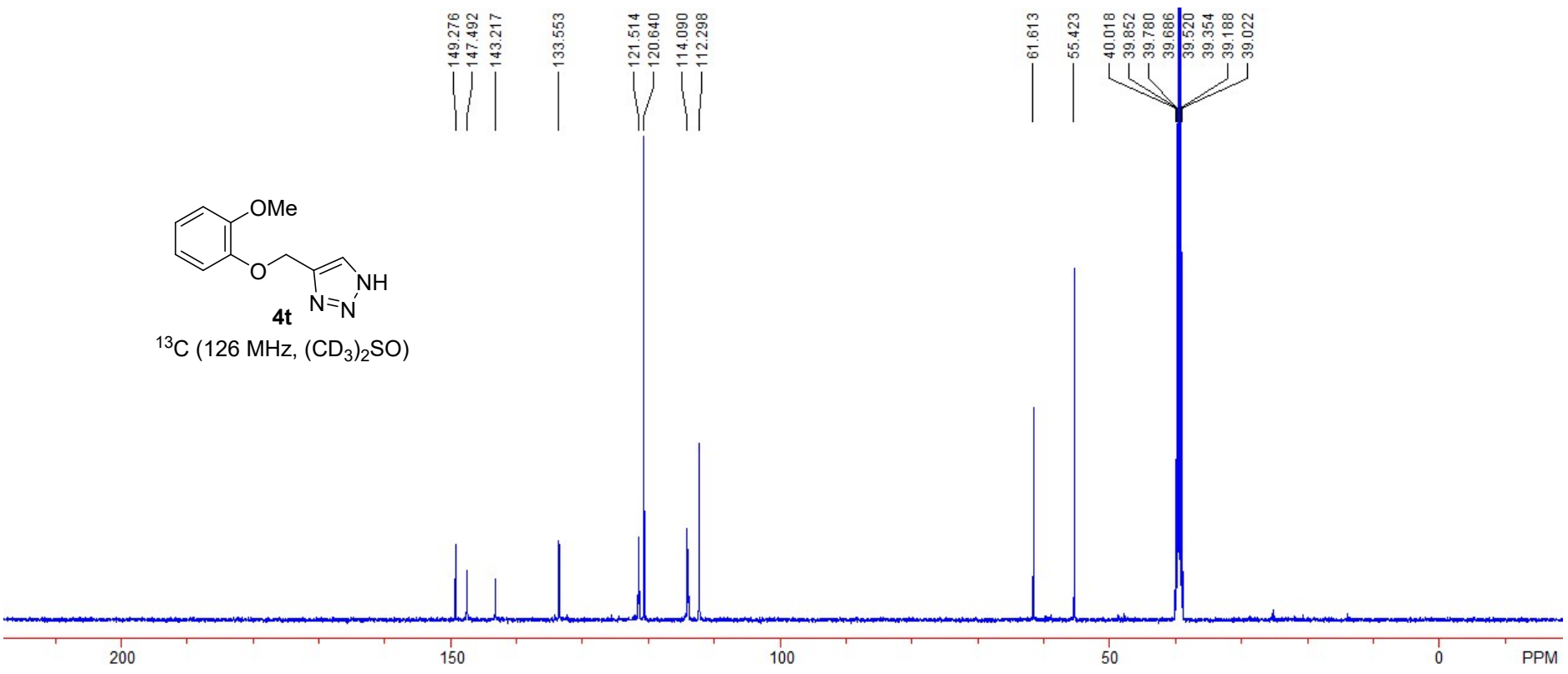
^{1}H (500 MHz, $(CD_3)_2SO$)


14.883
8.120
7.894
7.644
7.543
7.533
3.376
2.500
N=N
NH
S
4p
1H (500 MHz, (CD3)2SO)
0.97
1.00
1.00
1.00
1.00
16
14
12
10
8
6
4
2
0
-2
PPM


14.984
7.842
7.825
7.809
7.498
7.484
7.468
7.452
7.371
7.356
7.209
7.194
5.304
3.339
2.500
O
NH
N=N
4r
1H (500 MHz, (CD3)2SO)
0.90
3.00
2.02
1.00
0.92
1.00
2.00
16
14
12
10
8
6
4
2
0
-2
PPM

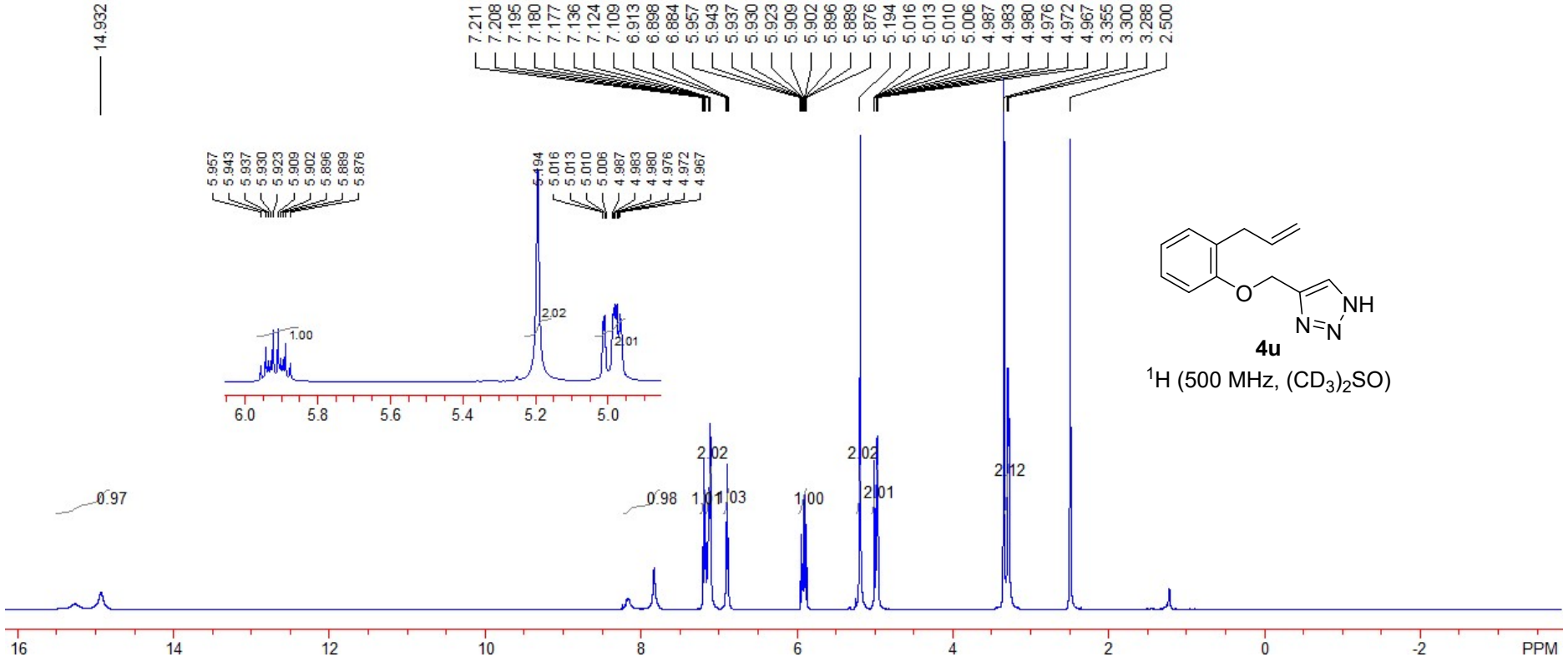

155.914
142.993
134.167
133.532
129.365
128.613
127.523
126.743
126.447
123.731
118.683
107.250
61.049
40.026
39.859
39.780
39.686
39.520
39.354
39.188
39.022
134.167
133.532
129.365
128.613
127.523
126.743
126.447
123.731
134
132
130
128
126
O
NH
N=N
4r
13C (126 MHz, (CD3)2SO)
200
150
100
50
0
PPM

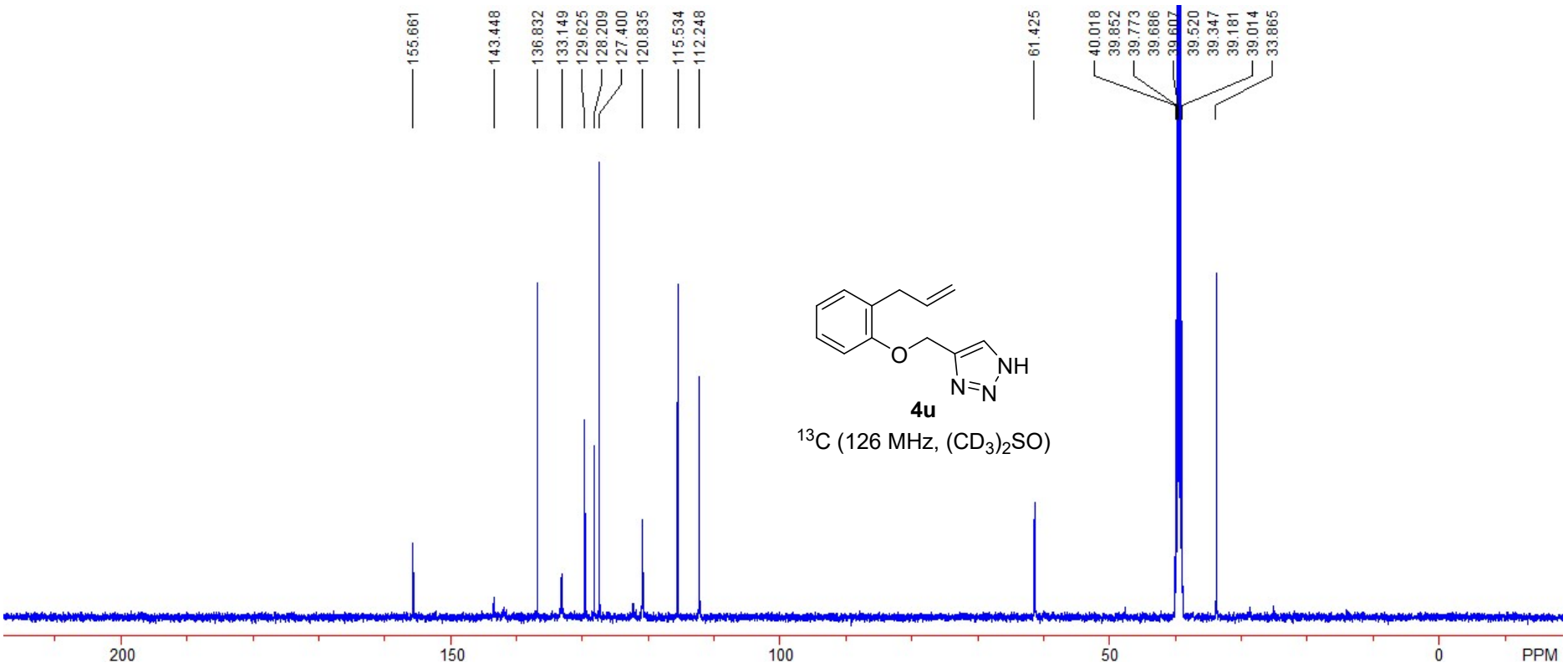

14.941
7.108
7.093
6.930
6.957
6.916
6.901
6.890
6.887
6.875
6.872
6.860
6.857
7.108
7.843
7.093
6.957
6.930
6.916
6.901
6.890
6.887
6.875
6.872
6.860
6.857
5.145
3.732
3.379
2.500
OMe
O
NH
N=N
4t
1H (500 MHz, (CD3)2SO)
1.00
1.00
1.00
7.2
7.1
7.0
6.9
6.8
0.93
0.93
1.00
1.00
1.01
2.00
3.00
16
14
12
10
8
6
4
2
0
-2
PPM



4t

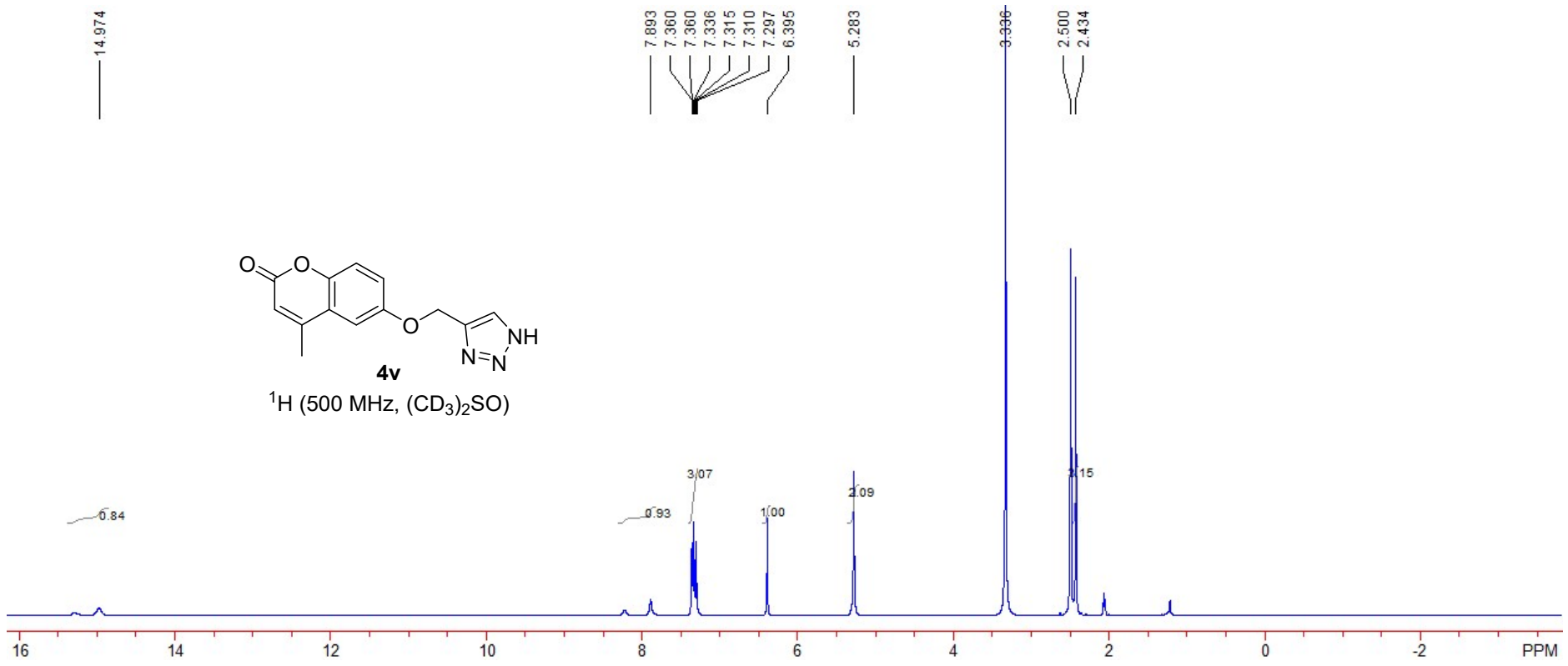
^{13}C (126 MHz, $(CD_3)_2SO$)

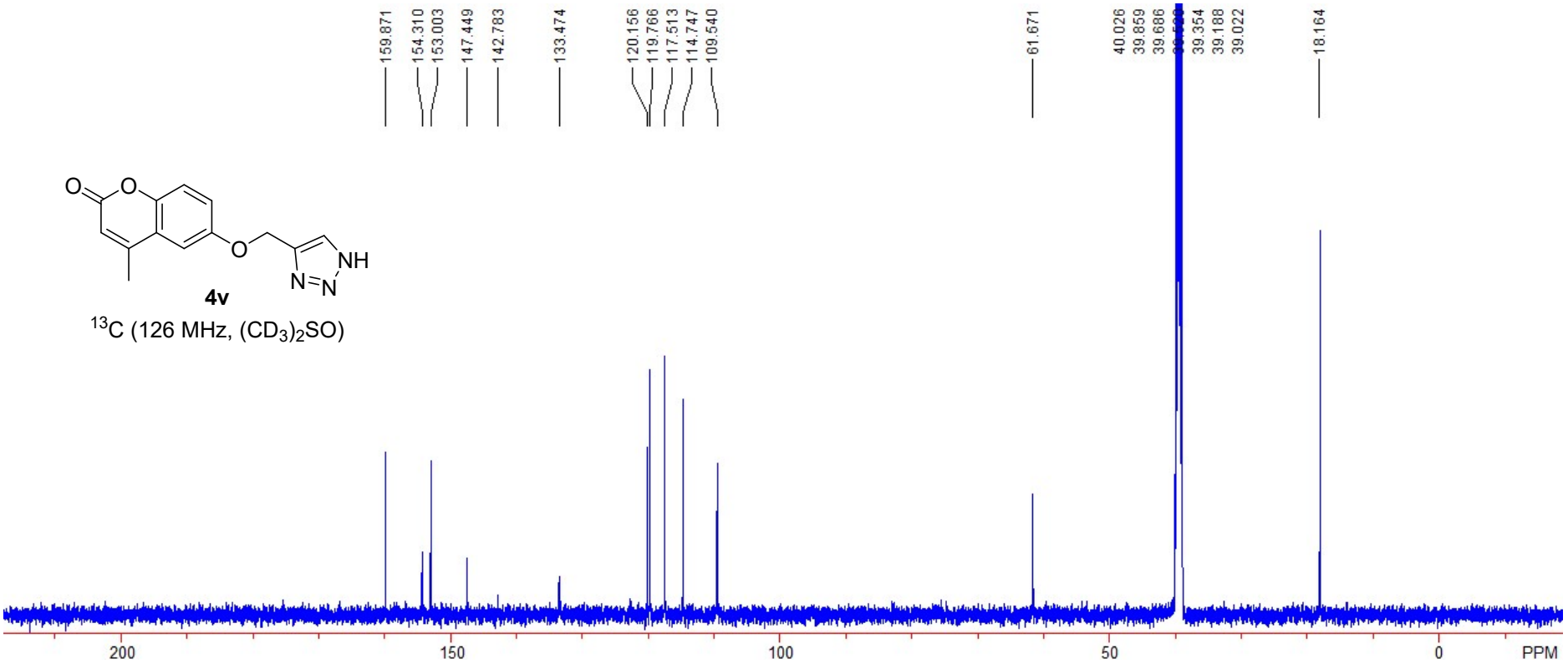

14.932
7.211
7.208
7.195
7.180
7.177
7.136
7.124
7.109
6.913
6.898
6.884
5.957
5.943
5.937
5.930
5.923
5.909
5.902
5.896
5.889
5.876
5.194
5.016
5.013
5.010
5.006
4.987
4.983
4.980
4.976
4.972
4.967
3.355
3.300
3.288
2.500
1.00
2.02
2.01
6.0
5.8
5.6
5.4
5.2
5.0
0.97
0.98
1.01
1.03
2.02
1.00
2.02
2.01
2.12
16
14
12
10
8
6
4
2
0
-2
PPM
O
NH
N=N
4u
1H (500 MHz, (CD3)2SO)



4u

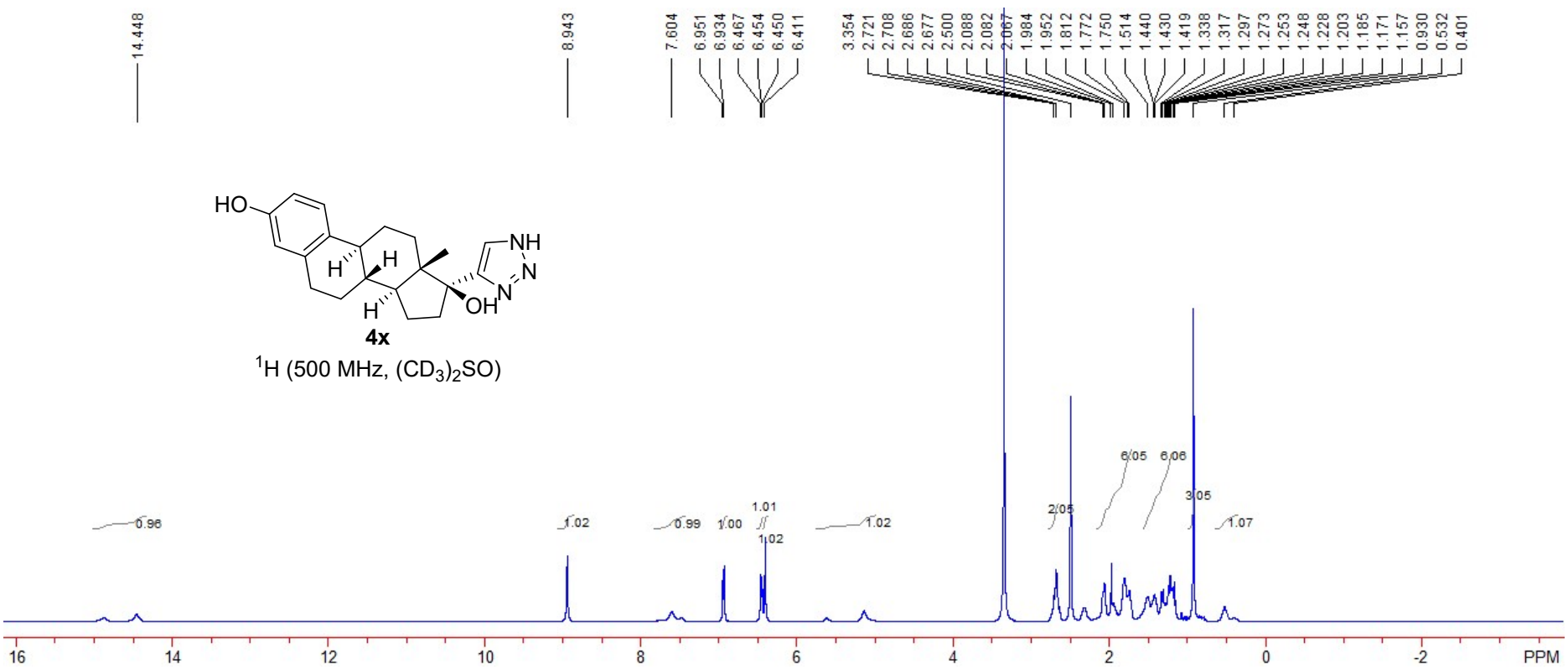
^{13}C (126 MHz, $(CD_3)_2SO$)


14.974
7.893
7.360
7.360
7.336
7.315
7.310
7.297
6.395
5.283
3.336
2.500
2.434
O
O
O
NH
N=N
4v
^{1}H (500 MHz, $(CD_3)_2SO$)
0.84
0.93
3.07
1.00
2.09
3.15
16
14
12
10
8
6
4
2
0
-2
PPM



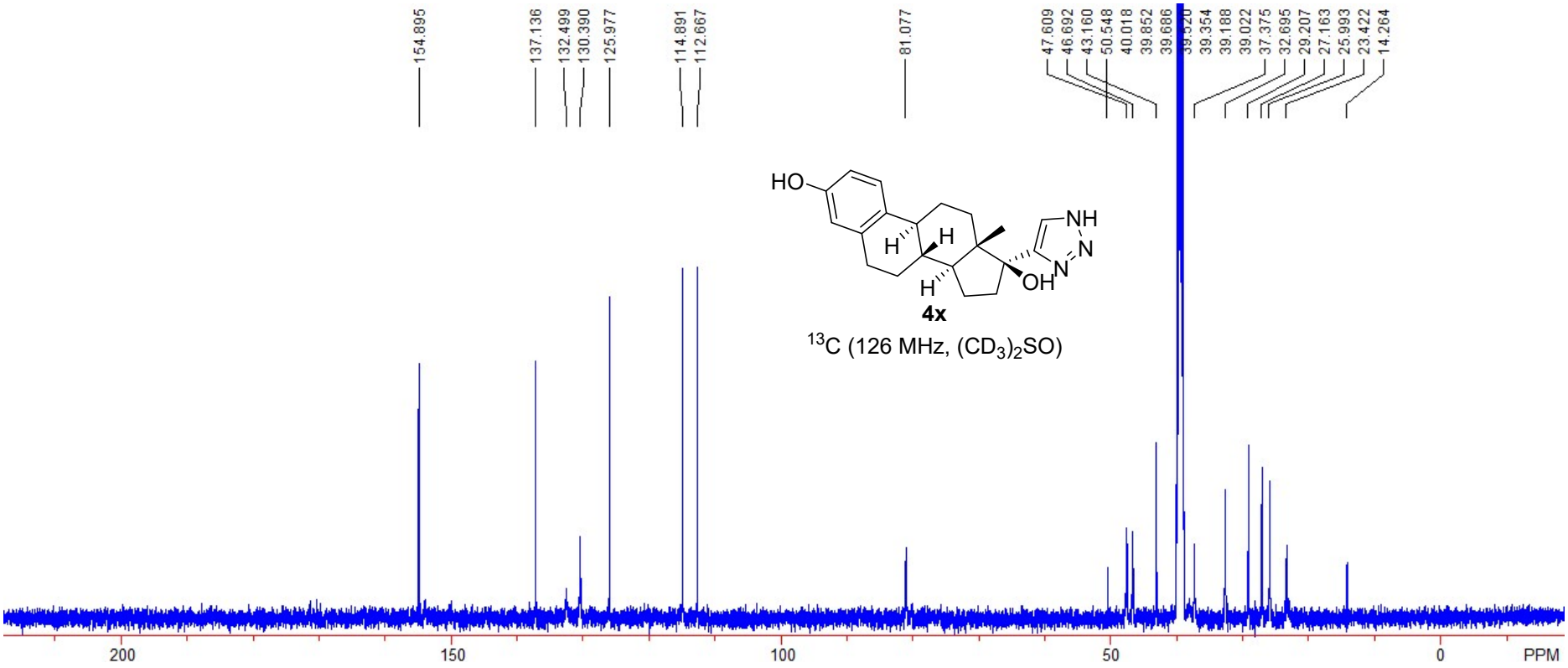
4v

^{13}C (126 MHz, $(CD_3)_2SO$)



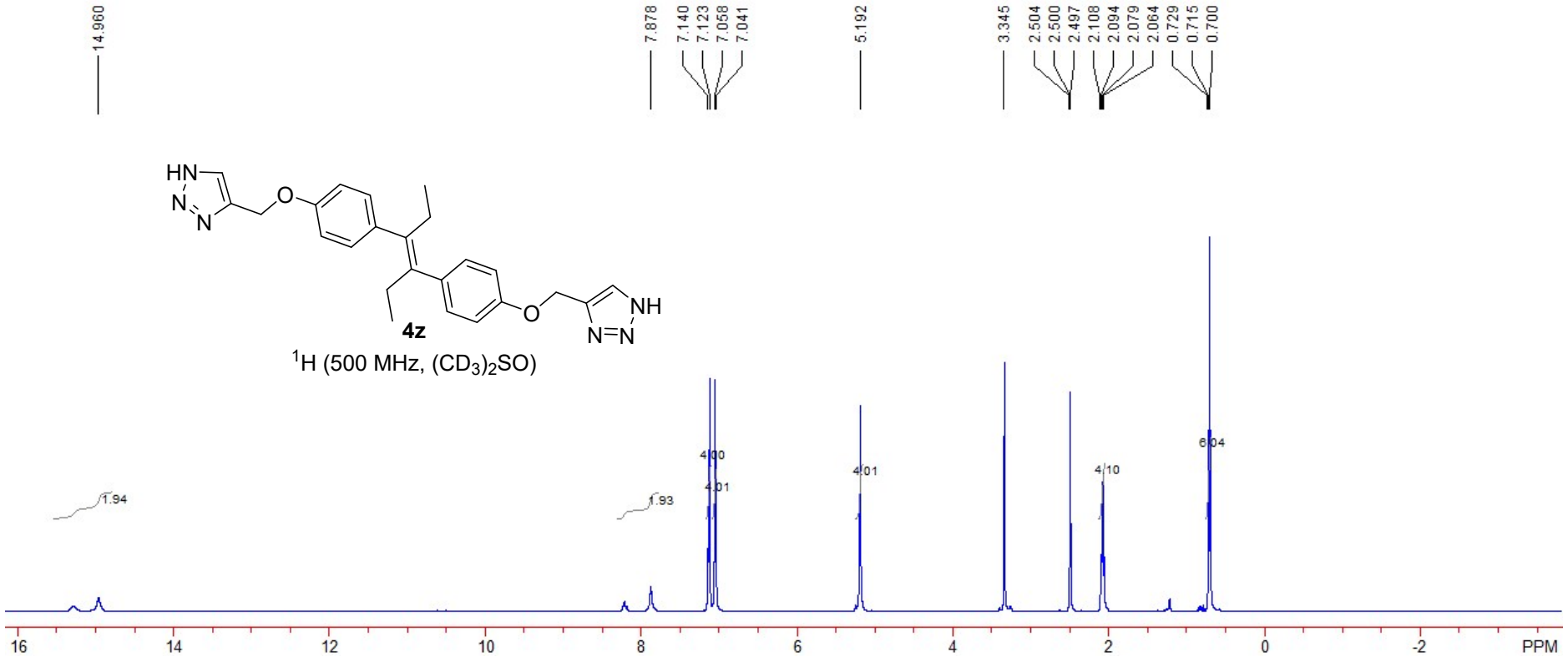
4x

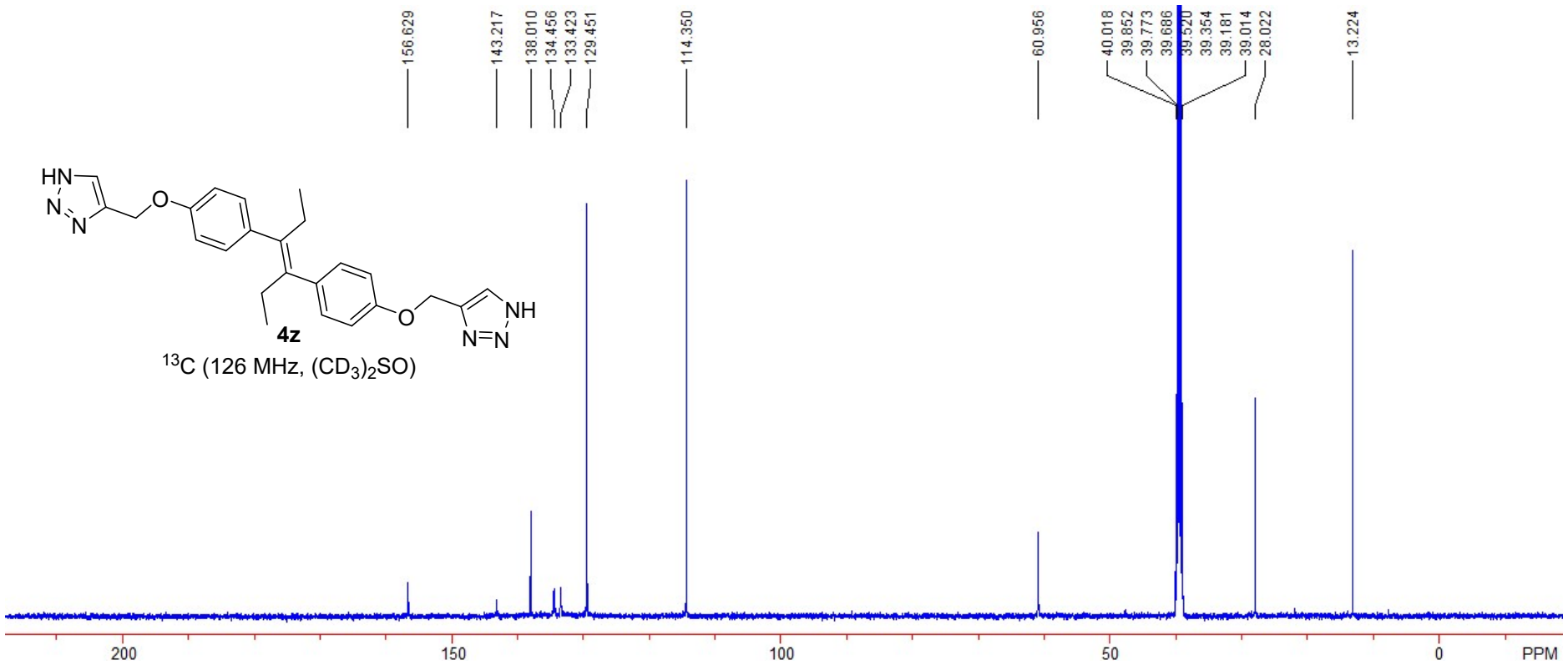
^{1}H (500 MHz, $(CD_3)_2SO$)



4x

^{13}C (126 MHz, $(CD_3)_2SO$)


14.960
7.878
7.140
7.123
7.058
7.041
5.192
3.345
2.504
2.500
2.497
2.108
2.094
2.079
2.064
0.729
0.715
0.700
HN
N
N
O
O
NH
N=N
4z
1H (500 MHz, (CD3)2SO)
1.94
1.93
4.00
4.01
4.01
4.10
6.04
16
14
12
10
8
6
4
2
0
-2
PPM



4z

^{13}C (126 MHz, $(CD_3)_2SO$)

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