Supporting Information

Electrochemical C-H Trifluoromethylation of 4-Phenylthiazol-2-amines

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Experimental

General

The one and two dimensional ^{1}H- and ^{13}C NMR spectra were recorded on a Varian-400 or a Bruker-400 spectrometer in $CDCl_3$ using tetramethylsilane as the internal reference. All spectra were recorded at 25 ^{o}C and coupling constants (*J* values) are given in Hz. Chemical shifts are given in parts per million (ppm). Mass spectra of unknown compounds were recorded on an Agilent Technologies 6530 Accurate-Mass Q-TOF-LC/MS. Electroorganic syntheses were carried out using a glassy carbon electrode (GCE) as a working electrode and a Pt electrode as a counter electrode in the ElectraSyn 2.0 pro Package instrument.

Figure 1. ElectraSyn 2.0 device used for electroorganic synthesis.

General procedure

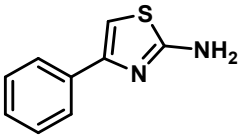
General Procedure A: General Procedure for the Synthesis of 2-Aminothiazoles

The synthesis of 2-aminothiazoles was carried out according to the method known in the literature (Tsai et al., 2016). Acetophenone (1 mmol), iodine (1.1 equiv.), and thiourea (3.0 equiv.) were placed in a 100 mL reaction flask. 50 ml of ethanol was added to the mixture and refluxed for 16 hours. After the reaction mixture was brought to room temperature, it was neutralized with 2 M NaOH (aq.) and the ethanol was removed in the evaporator. The crude product was extracted with ethyl acetate (2x25 mL) and the organic phases were combined. It was washed with brine and dried over $MgSO_4$. After removing the solvent in the evaporator, the crude product was purified by eluting through a silica gel column with 40% EtOAc/n-hexane.

General Procedure B for trifluoromethylation:

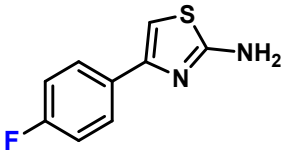
2-Aminothiazole **1a-1o** (0.5 mmol) was transferred to an ElectraSyn 2.0 vial and dissolved in 7 mL of DMSO. 2 equivalents of CF_3SO_2Na and 2 equivalents of TBHP were added to the solution. The vial was placed in the ElectraSyn 2.0 device. The current was set to 10 mA, the reactant molar ratio was 0.5, and the stirring speed was set to 400 rpm. After 2 hours, the electrosynthesis was completed. The reaction mixture was transferred to a separatory funnel, and 20 mL of ethyl acetate was added. After the mixture was washed 5 times with water, the organic phase was dried over Na_2SO_4, and the solvent of the mixture was removed in the evaporator.

4-Phenylthiazole-2-amine (1a) (Sadgar et al., 2021):



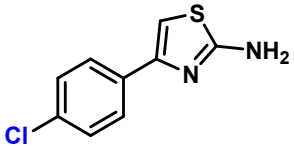
The reaction was performed according to general procedure A. (White solid, 158.4 mg, 90%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.79 (d, J = 7.2 Hz, 2H), 7.35 (t, J = 7.6 Hz, 2H), 7.24 (t, J = 7.3 Hz, 1H), 7.08 (s, 2H), 7.00 (s, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.2, 149.9, 135.0, 128.5, 127.2, 125.6, 101.5.

4-(4-Fluorophenyl)thiazol-2-amine (1b) (Deng et al., 2023):



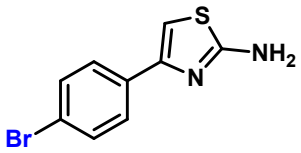
The reaction was performed according to general procedure A. (Yellow solid, 188,2 mg, 97%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.91 – 7.70 (m, 2H), 7.18 (m, 2H), 7.08 (bs, 2H), 6.96 (s, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.3, 161.4 (d, *J* = 244.0 Hz), 148.8, 131.6 (d, *J* = 2.9 Hz), 127.5 (d, *J* = 8.0 Hz), 115.2 (d, *J* = 21.5 Hz), 101.2.

4-(4-Chlorophenyl)thiazol-2-amine (1c) (Sadgar et al., 2021):



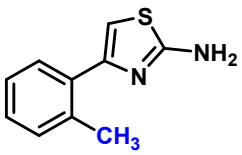
The reaction was performed according to general procedure A (White solid, 202,7 mg, 96%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.80 (d, *J* = 8.5 Hz, 2H), 7.41 (d, *J* = 8.5 Hz, 2H), 7.12 (bs, 2H), 7.06 (s, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.4, 148.6, 133.8, 131.6, 128.5, 127.3, 102.3.

4-(4-Bromophenyl)thiazol-2-amine (1d) (Sadgar et al., 2021):



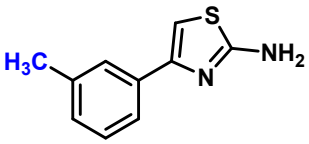
The reaction was performed according to general procedure A (White solid, 244,8 mg, 96%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.74 (d, *J* = 8.6 Hz, 2H), 7.54 (d, *J* = 8.5 Hz, 2H), 7.09 (bs, 2H), 7.08 (s, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.3, 148.6, 134.1, 131.4, 127.5, 120.1, 102.4.

4-(*o*-Tolyl)thiazol-2-amine (1e) (Deng et al., 2023):



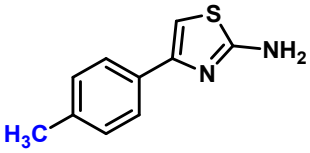
The reaction was performed according to general procedure A (White solid, 161,5 mg, 85%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.63 – 7.48 (m, 1H), 7.29 – 7.09 (m, 3H), 7.01 (bs, 2H), 6.60 (s, 1H), 2.40 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 167.3, 150.0, 135.2, 135.1, 130.7, 129.2, 127.3, 125.7, 104.3, 21.3.

4-(*m*-Tolyl)thiazol-2-amine (1f) (Wang et al., 2022):



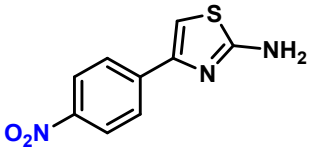
The reaction was performed according to general procedure A (Yellow solid, 167,2mg, 88%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (s, 1H), 7.56 (d, *J* = 7.7 Hz, 1H), 7.27 (t, *J* = 7.6 Hz, 1H), 7.12 (d, *J* = 7.5 Hz, 1H), 6.67 (s, 1H), 5.57 (bs, 2H), 2.39 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 151.2, 138.3, 134.6, 128.6, 126.8, 123.1, 102.5, 21.6.

4-(*p*-Tolyl)thiazol-2-amine (1g) (Sadgar et al., 2021):



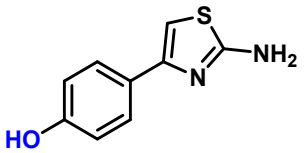
The reaction was performed according to general procedure A (White solid, 155,8 mg, 82%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.68 (d, *J* = 8.0 Hz, 2H), 7.16 (d, *J* = 8.1 Hz, 2H), 7.04 (s, 2H), 6.91 (s, 1H), 2.27 (d, *J* = 19.8 Hz, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.1, 149.9, 136.4, 132.3, 129.1, 125.5, 100.6, 84.

4-(4-Nitrophenyl)thiazol-2-amine (1h) (Sadgar et al., 2021):



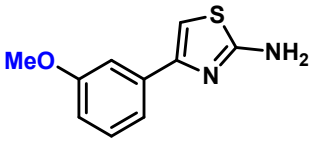
The reaction was performed according to general procedure A (Yellow solid, 223,9 mg, 84%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.22 (d, *J* = 9.0 Hz, 2H), 8.03 (d, *J* = 9.0 Hz, 2H), 7.39 (s, 1H), 7.24 (s, 2H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.8, 147.9, 146.1, 141.0, 126.5, 124.2, 106.8.

4-(2-Aminothiazol-4-yl)phenol (1i) (Sadgar et al., 2021):



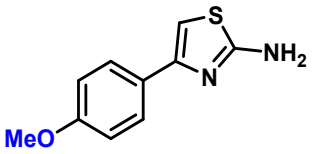
The reaction was performed according to general procedure A (Yellow solid, 172,8 mg, 90%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.46 (s, 1H), 7.59 (d, *J* = 8.7 Hz, 2H), 6.97 (bs, 2H), 6.77 – 6.70 (m, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.0, 156.8, 150.1, 126.9, 126.4, 115.2, 98.4.

4-(3-Methoxyphenyl)thiazol-2-amine (1j) (Deng et al., 2023):



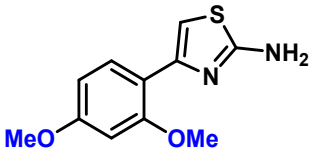
The reaction was performed according to general procedure A (Yellow solid, 179,2 mg, 87%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 – 7.32 (m, 2H), 7.31 – 7.24 (m, 1H), 6.87 – 6.82 (m, 1H), 6.70 (s, 1H), 5.41 (bs, 2H), 3.85 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.6, 159.9, 151.2, 136.2, 129.7, 118.6, 113.6, 111.5, 103.2, 55.4.

4-(4-Methoxyphenyl)thiazol-2-amine (1k) (Sadgar et al., 2021):



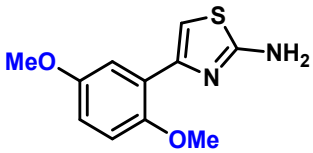
The reaction was performed according to general procedure A (White solid, 189,5 mg, 92%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.71 (d, *J* = 8.6 Hz, 2H), 7.00 (bs, 2H), 6.91 (d, *J* = 8.6 Hz, 2H), 6.81 (s, 1H), 3.76 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.3, 158.7, 149.8, 127.9, 127.0, 114.0, 99.5, 55.2.

4-(2,4-dimethoxyphenyl)thiazol-2-amine (1l) (Zhu et al., 2012):



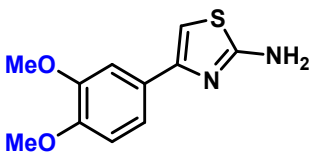
The reaction was performed according to general procedure A (White solid, 193,5 mg, 82%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (d, *J* = 8.4 Hz, 1H), 7.03 (s, 1H), 6.56 – 6.51 (m, 2H), 5.31 (bs, 2H), 3.88 (s, 3H), 3.82 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.0, 160.2, 158.1, 146.9, 130.8, 117.0, 105.6, 104.7, 99.0, 55.63, 55.62.

4-(2,5-Dimethoxyphenyl)thiazol-2-amine (1m) (Kakati et al., 2021):



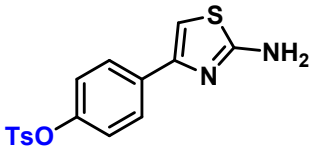
The reaction was performed according to general procedure A (White solid, 1982 mg, 84%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 3.1 Hz, 1H), 7.24 (s, 1H), 6.88 (d, *J* = 8.9 Hz, 1H), 6.80 (dd, *J* = 8.9, 3.1 Hz, 1H), 5.07 (s, 2H), 3.88 (s, 3H), 3.82 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.5, 153.7, 151.4, 146.9, 124.1, 114.7, 114.2, 112.5, 108.2, 56.1, 56.0.

4-(3,4-Dimethoxyphenyl)thiazol-2-amine (1n) (Wang et al., 2022):



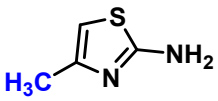
The reaction was performed according to general procedure A (Yellow solid, 198,2 mg, 84%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.39 – 7.30 (m, 2H), 7.03 (s, 2H), 6.93 (d, *J* = 8.3 Hz, 1H), 6.87 (s, 1H), 3.78 (s, 3H), 3.76 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.0, 149.8, 148.6, 148.2, 128.1, 118.0, 111.7, 109.3, 99.7, 55.5, 55.4.

4-(4-Tosylphenyl)thiazol-2-amine (1o):



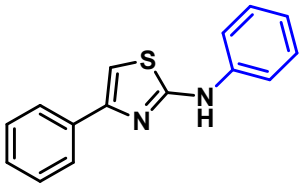
The reaction was performed according to general procedure A (Yellow solid, 284 mg, 82% M.p: 198-200 °C). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.78 – 7.71 (m, 4H), 7.46 (d, *J* = 7.7 Hz, 2H), 7.10 (bs, 2H), 7.02 (s, 1H), 6.99 (d, *J* = 8.4 Hz, 2H), 2.40 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.4, 148.5, 147.9, 145.9, 134.1, 131.4, 130.3, 128.3, 127.0, 122.2, 102.6, 21.3.

4-Methylthiazol-2-amine (1p) (Keshari et al., 2015):



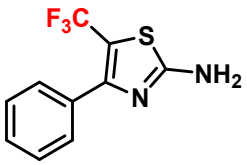
The reaction was performed according to general procedure A (Light yellow solid, 86.7 mg, 76%). M.p: 44-46 °C). ^{1}H NMR (400 MHz, $CDCl_3$) δ 5.98 (s, 1H), 5.71 (s, 2H), 2.14 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.1, 148.2, 102.0, 17.1.

N,4-diphenylthiazol-2-amine (1r) (Banothu et al., 2014):



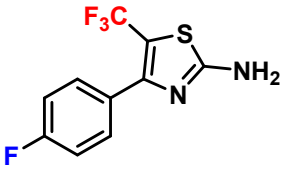
The reaction was performed according to general procedure A (White solid, 116.7 mg, 92%). M.p: 137-139°C). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 – 7.81 (m, 2H), 7.68 (bs, 1H), 7.45 – 7.28 (m, 7H), 7.08 (tt, *J* = 7.0, 1.8 Hz, 1H), 6.83 (s, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 164.7, 151.1, 140.3, 134.4, 129.6, 128.8, 128.1, 126.2, 123.2, 118.4, 101.8.

4-Phenyl-5-(trifluoromethyl)thiazol-2-amine (2a):



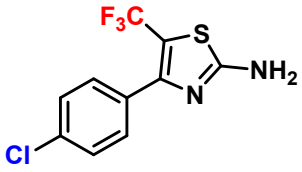
The reaction was performed according to general procedure B. (Brown oil, 89.0 mg, 73%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58–7.54 (m, 2H), 7.47–7.32 (m, 3H), 6.28 (bs, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.8, 152.1 (bd, J = 2.9 Hz), 132,8, 129.5, 128.8 (bd, J = 1.5 Hz), 128.5, 122.3 (q, J = 268.7 Hz), 108.4 (q, *J* = 37.5 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -49.5. HRMS (Q-TOF, ESI): m/z for $[M + H]^+$ $C_{10}H_8F_3N_2S$ calculated: 245.0360; found: 245.0355.

4-(4-Fluorophenyl)-5-(trifluoromethyl)thiazol-2-amine (2b):



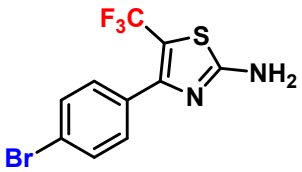
The reaction was performed according to general procedure B. (Yellow oil, 113.9 mg, 87%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.82 (bs, 2H), 7.60 – 7.55 (m, 2H), 7.32 – 7.20 (m, 2H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 169.0, 163.0 (d, J = 246.4 Hz), 153.0 (q, J = 2.9 Hz), 131.3 (bdd, J = 8.5, 1.7 Hz), 130.8 (d, J = 3.1 Hz), 123.6 (q, J = 267.5 Hz), 115.9 (d, J = 21.7 Hz), 104.6 (q, J = 36.5 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -47.7, -112.3. HRMS (Q-TOF, ESI): m/z $[M + H]^+$ $C_{10}H_7F_4N_2S$ calculated: 263.0266; found: 263.0257.

4-(4-Chlorophenyl)-5-(trifluoromethyl)thiazol-2-amine (2c):



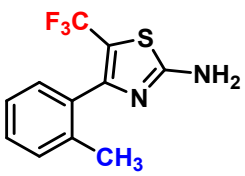
The reaction was performed according to general procedure B. Brown oil, 125.6 mg, 90%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51 (d, J = 8.4 Hz, 2H), 7.37 (d, J = 8.4 Hz, 2H), 5.94 (bs, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.8, 151.8, 135.4, 131.9, 130.2 (d, J = 1.7 Hz), 128.7, 122.3 (q, J = 268.6 Hz), 109.09 (q, *J* = 37.8 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -49.6. HRMS (Q-TOF, ESI): m/z calculated for $[M + H]^+$ $C_{10}H_7ClF_3N_2S$: 278.9971; found: 278.9965.

4-(4-Bromophenyl)-5-(trifluoromethyl)thiazol-2-amine (2d):



The reaction was performed according to general procedure B. (Brown oil, 132.4 mg, 82%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (d, J = 8.3 Hz, 2H), 7.44 (d, J = 8.3 Hz, 2H), 5.86 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.3, 151.6 (q, *J* = 3.1 Hz), 132.0, 131.6, 130.4 (bd, *J* = 1.5 Hz), 123.7, 122.2 (q, *J* = 268.6 Hz), 108.8 (q, *J* = 37.6 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -49.7. HRMS (Q-TOF, ESI): m/z for $[M + H]^+$ $C_{10}H_7BrF_3N_2S$ calculated: 322.9465; found: 322.9455.

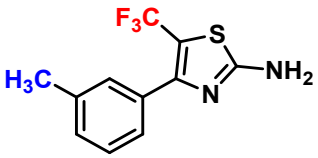
4-(o-Tolyl)-5-(trifluoromethyl)thiazol-2-amine (2e):



The reaction was performed according to general procedure B. (Brown oil, 95.4 mg, 74%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33 – 7.27 (m, 1H), 7.24 – 7.15 (m, 3H), 6.27 (bs, 2H), 2.22 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.3, 152.7, 136.9, 132.9, 130.1, 129.4 (d, J = 1.1 Hz), 129.2, 125.5, 122.2 (q, J = 268.6 Hz),

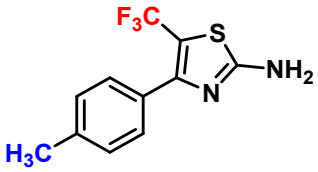
109.6 (q, *J* = 37.2 Hz), 19.6. ^{19}F NMR (376 MHz, $CDCl_3$) δ -51.7. HRMS (Q-TOF, ESI): m/z for $[M + H]^+$ $C_{11}H_{10}F_3N_2S$ calculated: 259.0517; found: 259.0510.

4-(m-Tolyl)-5-(trifluoromethyl)thiazol-2-amine (2f):



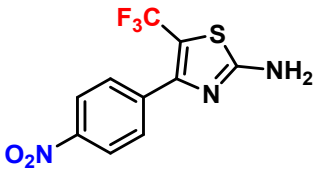
The reaction was performed according to general procedure B. (Yellow oil, 103.6 mg, 80%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 – 7.33 (m, 2H), 7.29 (t, J = 7.6 Hz, 1H), 7.21 (d, J = 7.5 Hz, 1H), 5.94 (bs, 2H), 2.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.8, 152.9 (bd, *J* = 2.7 Hz), 138.1, 133.0, 130.1, 129.4 (bd, *J* = 1.5 Hz), 128.3, 125.9 (bd, *J* = 1.9 Hz), 122.4 (q, *J* = 268.4 Hz), 108.31 (q, *J* = 37.6 Hz), 21.5. ^{19}F NMR (376 MHz, $CDCl_3$) δ -49.5. HRMS (Q-TOF, ESI): calculated for m/z $[M + H]^+$ $C_{11}H_{10}F_3N_2S$: 259.0517; found: 259.0512.

4-(p-Tolyl)-5-(trifluoromethyl)thiazol-2-amine (2g):



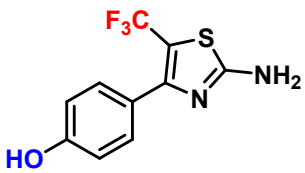
The reaction was performed according to general procedure B. (Brown oil, 114.7 mg, 89%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, J = 8.0 Hz, 2H), 7.21 (d, J = 8.0 Hz, 2H), 5.92 (s, 1H), 2.38 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.6, 153.1 (bd, *J* = 3.1 Hz), 139.4, 130.5, 129.1, 128.7 (bd, *J* = 1.5 Hz), 122.5 (q, *J* = 268.4 Hz), 108.1 (q, *J* = 38.0 Hz), 21.5.^{19}F NMR (376 MHz, $CDCl_3$) δ -49.5. HRMS (Q-TOF, ESI): m/z calculated for $[M + H]^+$ $C_{11}H_{10}F_3N_2S$: 259.0517; found: 259.0512.

4-(4-Nitrophenyl)-5-(trifluoromethyl)thiazol-2-amine (2h):



The reaction was performed according to general procedure B. (Brown oil, 138.6 mg, 96%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.30 (d, J = 8.9 Hz, 2H), 7.93 (bs, 2H), 7.81 (d, J = 8.9 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.7, 150.9 (q, J = 3.0 Hz), 147.5, 139.8, 129.8 (bd, J = 1.5 Hz), 123.5, 122.7 (q, J = 267.8 Hz), 106.1 (q, *J* = 36.6 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -47.9. HRMS (Q-TOF, ESI): m/z for $[M + H]^+$ $C_{10}H_7F_3N_3O_2S$ calculated: 290.0211; found: 290.0200.

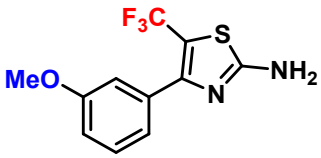
4-(2-Amino-5-(trifluoromethyl)thiazol-5-yl)phenol (2i):



The reaction was performed according to general procedure B. (Green oil, 103.9 mg, 80%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.79 (bs, 1H), 7.70 (bs, 2H), 7.40 (d, J = 8.5 Hz, 2H), 6.81 (d, J = 8.5 Hz, 2H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 167.9, 158.3, 153.8 (q, J = 2.9 Hz), 130.0 (bd, J = 1.5 Hz), 124.5, 123.3 (q, J

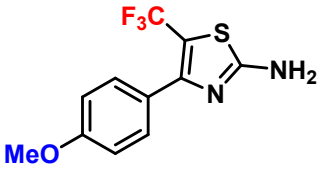
= 267.1 Hz), 115.0, 102.3 (q, *J* = 36.1 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -47.4. HRMS (Q-TOF, ESI): m/z [M + H]$^+$ $C_{10}H_8F_3N_2OS$ calculated: 261.0309; found: 261.0304.

4-(3-Methoxyphenyl)-5-(trifluoromethyl)thiazol-2-amine (2j):



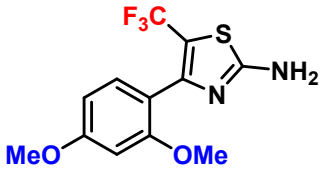
The reaction was performed according to general procedure B. (Brown oil, 106.8 mg, 78%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.31 (t, J = 7.9 Hz, 1H), 7.16 (d, J = 7.6 Hz, 1H), 7.12 (bs, 1H), 6.95 (dd, J = 8.3, 2.6 Hz, 1H), 5.96 (bs, 2H), 3.83 (p, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.6, 159.4, 153.0 (q, J = 3.1 Hz), 134.7, 129.4, 122.44 (q, J = 268.5 Hz), 121.2 (d, J = 1.8 Hz), 115.3, 114.1 (d, J = 1.7 Hz), 108.8 (q, *J* = 37.6 Hz), 107.4 (q, *J* = 37.3 Hz), 55.4.^{19}F NMR (376 MHz, $CDCl_3$) δ -49.4. HRMS (Q-TOF, ESI): calculated for m/z [M + H]$^+$ $C_{11}H_{10}F_3N_2OS$: 275.0466; found: 275.0460

4-(4-Methoxyphenyl)-5-(trifluoromethyl)thiazol-2-amine (2k):



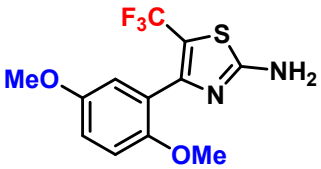
The reaction was performed according to general procedure B. (Brown oil, 132.8 mg, 97%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (d, J = 8.7 Hz, 2H), 6.92 (d, J = 8.7 Hz, 2H), 6.03 (s, 2H), 3.83 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.6, 160.3, 153.0 (q, J = 3.0 Hz), 130.2 (bd, J = 1.5 Hz), 126.0, 122.6 (q, J = 268.2 Hz), 113.8, 107.4 (q, *J* = 37.3 Hz), 55.4. ^{19}F NMR (376 MHz, $CDCl_3$) δ -49.5. HRMS (Q-TOF, ESI): m/z calculated for [M + H]$^+$ $C_{11}H_{10}F_3N_2OS$: 275.0466; found: 275.0458.

4-(2,4-Dimethoxyphenyl)-5-(trifluoromethyl)thiazol-2-amine (2l):



The reaction was performed according to general procedure B. (Brown oil, 133.7 mg, 88%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.22 (d, J = 8.9 Hz, 1H), 6.53 – 6.42 (m, 2H), 5.98 (bs, 2H), 3.82 (s, 3H), 3.76 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.8, 161.7, 158.4, 149.6, 131.5, 122.4 (q, J = 268.2 Hz), 115.5, 109.80 (q, *J* = 36.1 Hz), 104.3, 98.7, 55.52, 55.45.^{19}F NMR (376 MHz, $CDCl_3$) δ -52.4. HRMS (Q-TOF, ESI): m/z [M + H]$^+$ $C_{12}H_{12}O_2F_3N_2S$ calculated: 305.0572; found: 305.0564.

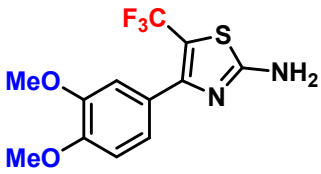
4-(2,5-Dimethoxyphenyl)-5-(trifluoromethyl)thiazol-2-amine (2m):



The reaction was performed according to general procedure B. (Yellow oil, 118.5 mg, 78%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.71 (bs, 2H), 6.98 (d, J = 8.9 Hz, 1H), 6.94 (dd, J = 8.9, 2.6 Hz, 1H), 6.80 (d, J = 2.6 Hz, 1H), 3.70 (s, 3H), 3.66 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 169.0, 153.1, 151.5, 150.5, 124.4,

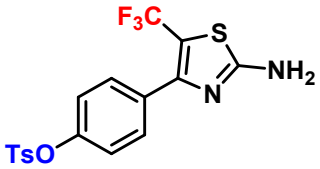
123.4 (q, J = 267.2 Hz), 116.5, 115.6, 112.9, 106.5 (q, *J* = 36.0 Hz), 56.3, 56.0. ^{19}F NMR (376 MHz, DMSO-d_6) δ -50.9. HRMS (Q-TOF, ESI): m/z $[M + H]^+$ $C_{12}H_{12}O_2F_3N_2S$ calculated: 305.0572; found: 305.0566.

4-(3,4-Dimethoxyphenyl)-5-(trifluoromethyl)thiazol-2-amine (2n):



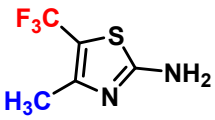
The reaction was performed according to general procedure B. (Yellow oil, 129.1 mg, 85%). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.78 (bs, 1H), 7.12 (m, 2H), 7.01 (d, J = 8.1 Hz, 2H), 3.79 (s, 3H), 3.75 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.6, 154.1 (q, J = 3.0 Hz), 150.1, 148.8, 126.7, 123.8 (q, J = 267.2 Hz), 121.7 (d, J = 2.2 Hz), 112.5, 111.8, 103.4 (q, J = 35.6 Hz), 56.1, 56.0. ^{19}F NMR (376 MHz, DMSO-d_6) δ -47.3. HRMS (Q-TOF, ESI): m/z $[M + H]^+$ $C_{12}H_{12}F_3N_2O_2S$ calculated: 305.0572; found: 305.0566.

4-(2-Amino-5-(trifluoromethyl)thiazol-4-yl)phenyl 4-methylbenzenesulfonate (2o):



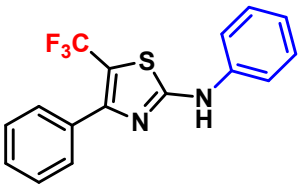
The reaction was performed according to general procedure B. (Yellow solid, 172.8 mg, 83% Mp: 175-177 °C). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.82 (bs, 2H), 7.74 (d, *J* = 8.5 Hz, 2H), 7.52 (d, *J* = 8.6 Hz, 2H), 7.47 (d, *J* = 8.6 Hz, 2H), 7.10 (d, *J* = 8.5 Hz, 2H), 2.41 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.4, 151.9 (q, *J* = 3.1 Hz), 149.3, 146.0, 132.7, 131.3, 130.3, 130.2 (bd, *J* = 1.4 Hz), 128.3, 122.8 (q, *J* = 267.5 Hz), 121.9, 104.5 (q, *J* = 36.5 Hz), 21.2. ^{19}F NMR (376 MHz, DMSO-d_6) δ -47.8. HRMS (Q-TOF, ESI): m/z $[M + H]^+$ $C_{17}H_{14}F_3N_2O_3S_2$ calculated: 415,03979; found: 415,03964.

4-Methyl-5-(trifluoromethyl)thiazol-2-amine (2p):



The reaction was performed according to general procedure B. (Brown oil, 72 mg, 79%). ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.07 (s, 2H), 2.29 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.2, 150.5 (bd, *J* = 3.1 Hz), 122.7 (q, *J* = 267.8 Hz), 108.0 (q, *J* = 37.6 Hz), 15.6. ^{19}F NMR (376 MHz, $CDCl_3$) δ -52.19. HRMS (Q-TOF, ESI): m/z $[M + H]^+$ $C_5H_6F_3N_2S$ calculated: 183,02038; found: 183,01948.

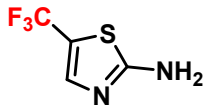
N,4-diphenyl-5-(trifluoromethyl)thiazol-2-amine (2r):



The reaction was performed according to general procedure B. (Green solid, 128 mg, 80% Mp: 128-130 °C). ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.49 (s, 1H), 7.64 – 7.58 (m, 2H), 7.40 – 7.29 (m, 3H), 7.23 (t, *J* = 7.8 Hz, 2H), 7.10 (t, *J* = 7.4 Hz, 1H), 6.99 (d, *J* = 8.2 Hz, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.9, 153.2 (q,

J = 2.6 Hz), 139.5, 133.5, 129.7, 129.3, 129.99, 128.98, 128.4, 124.9, 122.6 (q, 268.7 Hz), 120.4, 107.3 (q, *J* = 37.3 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -49.42. HRMS (Q-TOF, ESI): m/z $[M + H]^+$ $C_{16}H_{12}F_3N_2S$ calculated: 321,06733; found: 321,06655.

5-(Trifluoromethyl)thiazol-2-amine (2s):



The reaction was performed according to general procedure B. (Light yellow oil, 63 mg, 75%).^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 (s, 1H), 5.74 (bs, 2H). ^{19}F NMR (376 MHz, $CDCl_3$) δ -54.86. HRMS (Q-TOF, ESI): m/z $[M + H]^+$ $C_{16}H_{12}F_3N_2S$ calculated: 169,00473; found: 321,00387.

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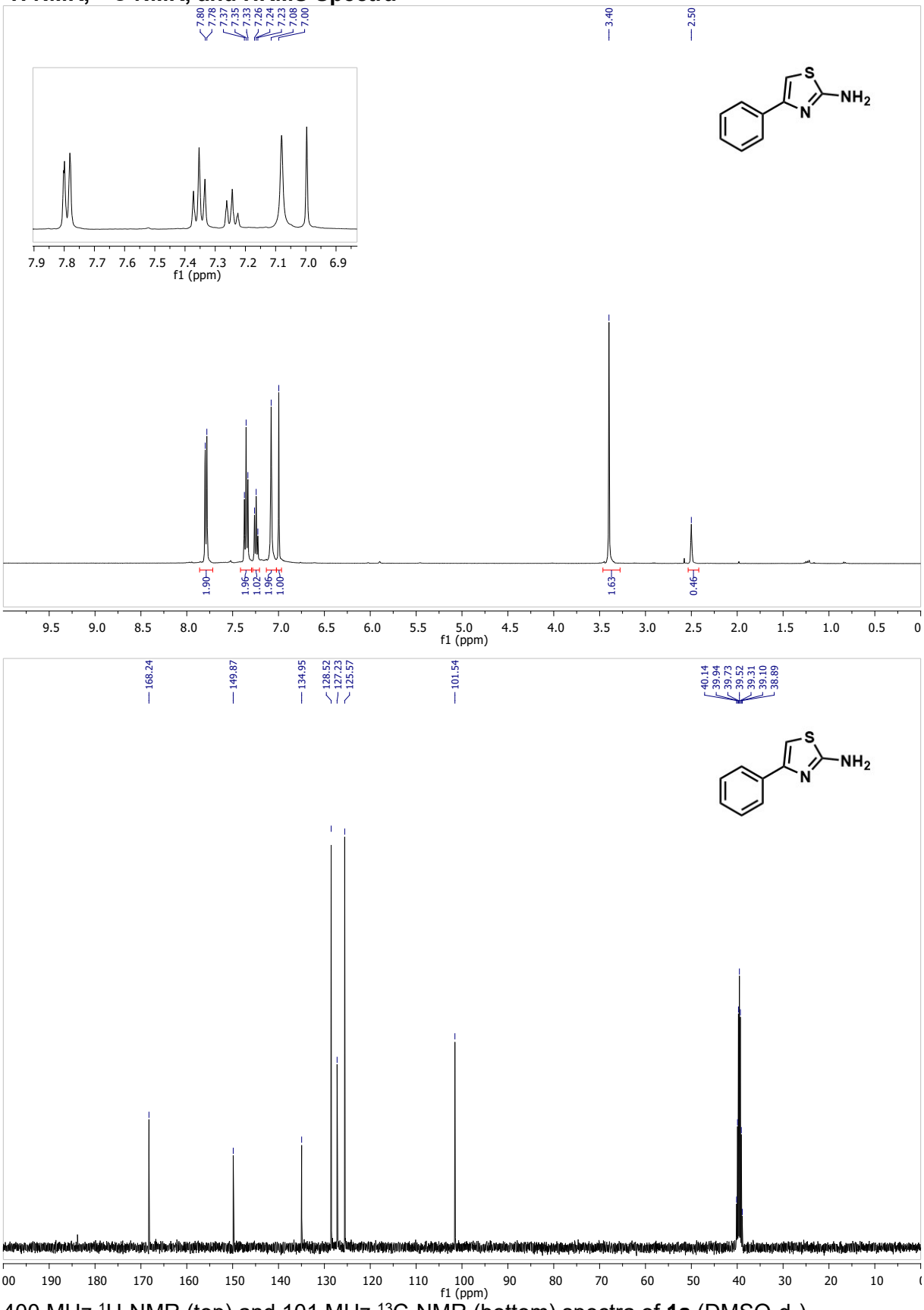
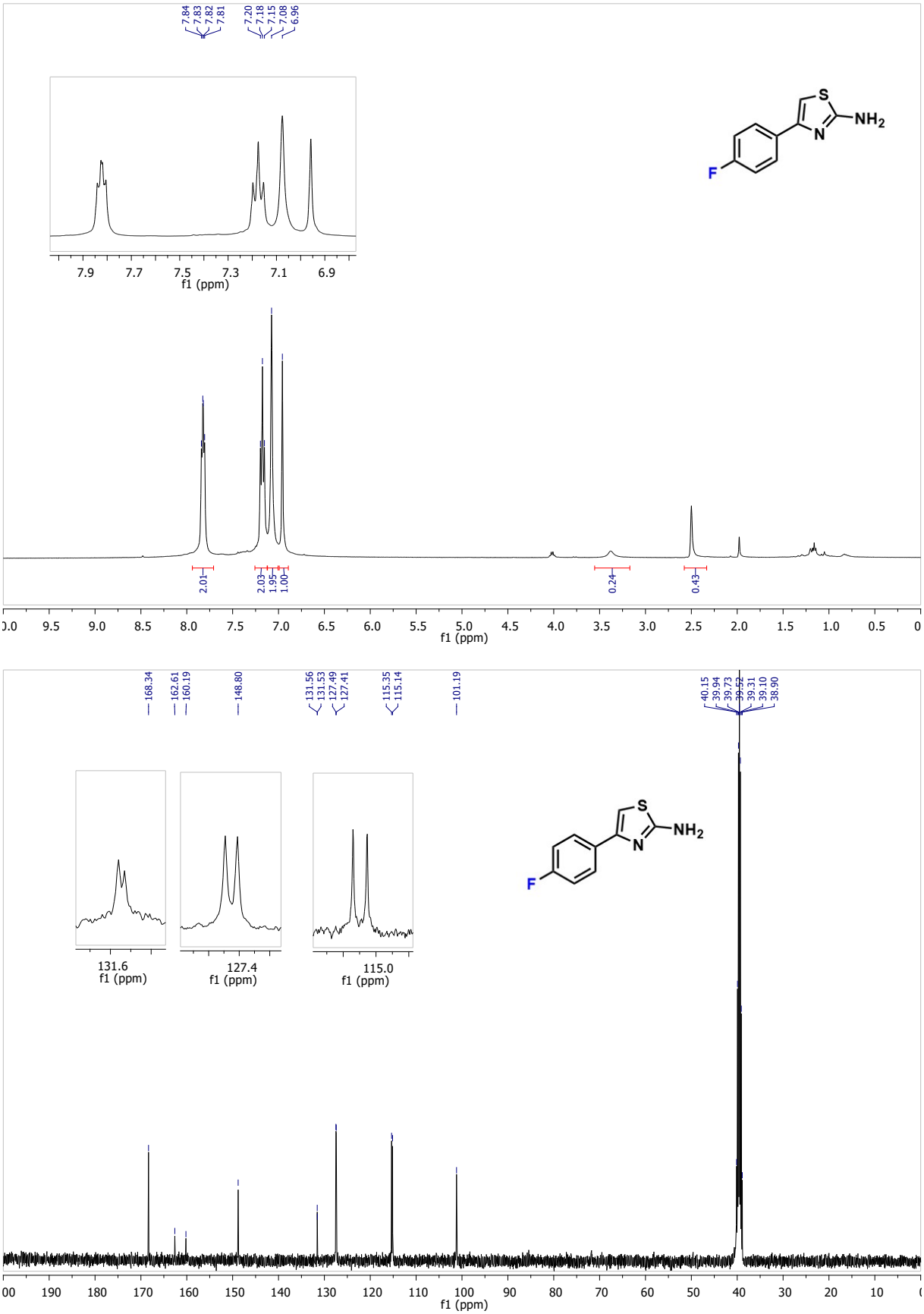
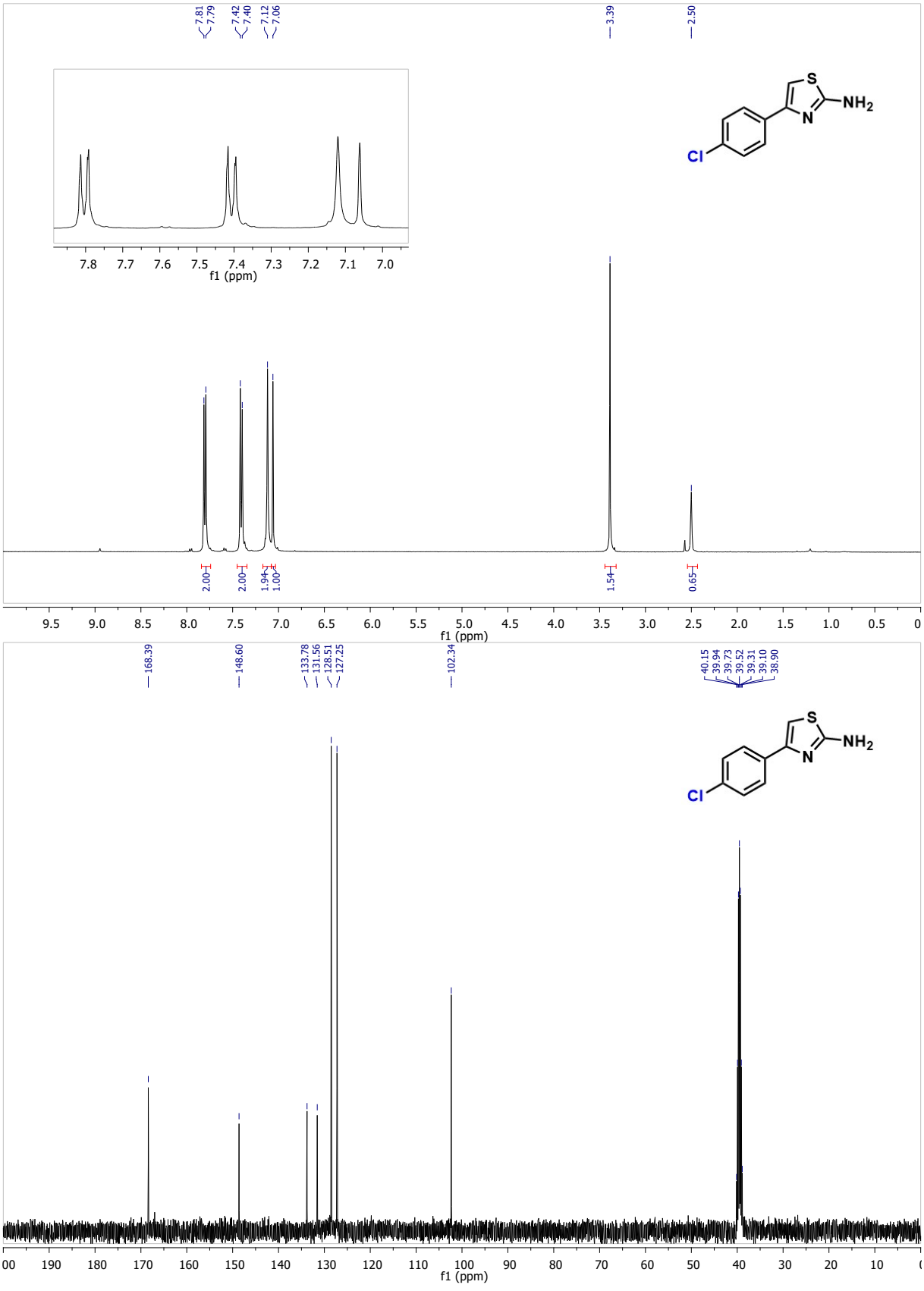
^{1}H NMR, ^{13}C NMR, and HRMS Spectra



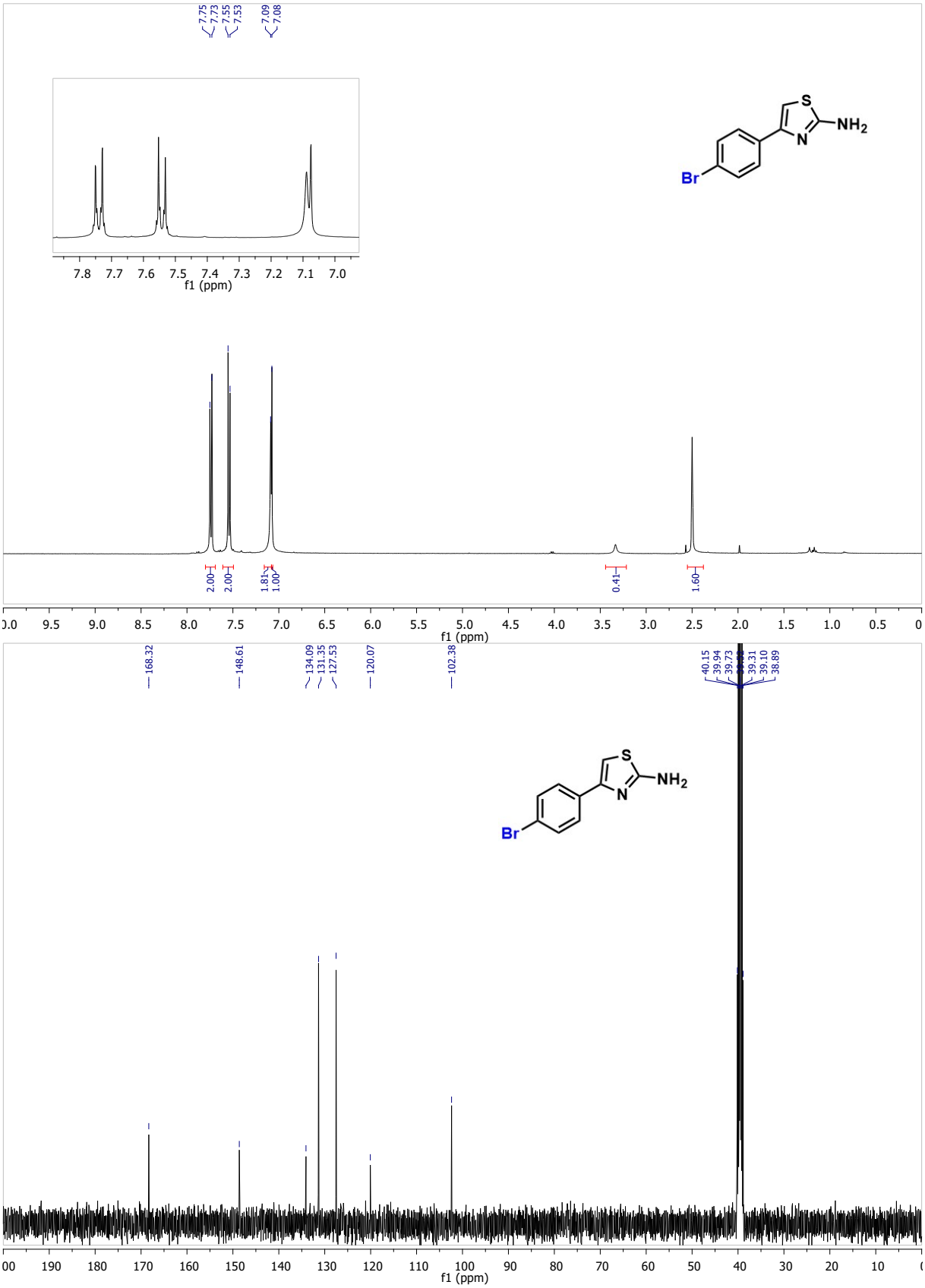
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1a** (DMSO-d_6)



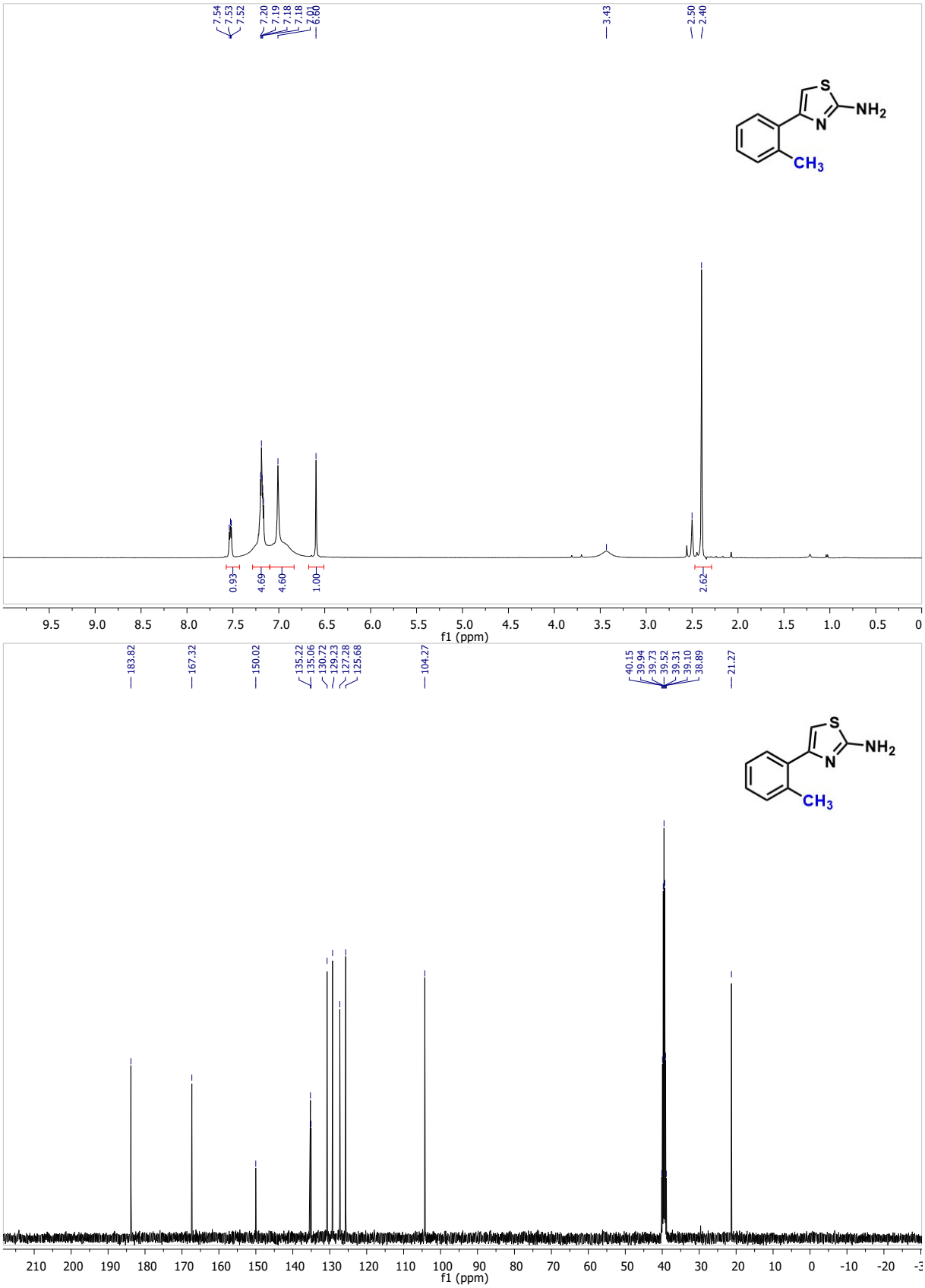
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1b** (DMSO-d_6)



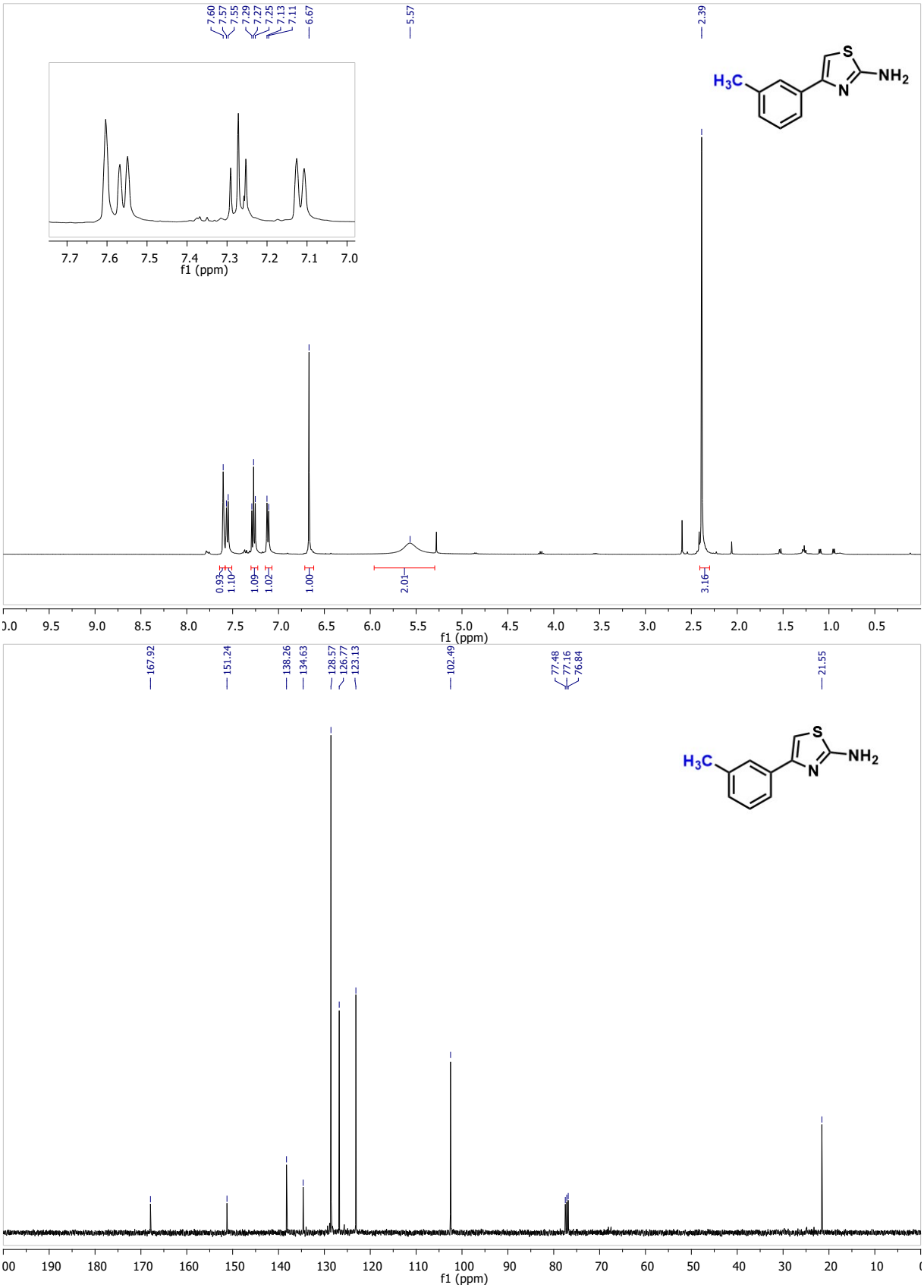
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1c** (DMSO-d_6)



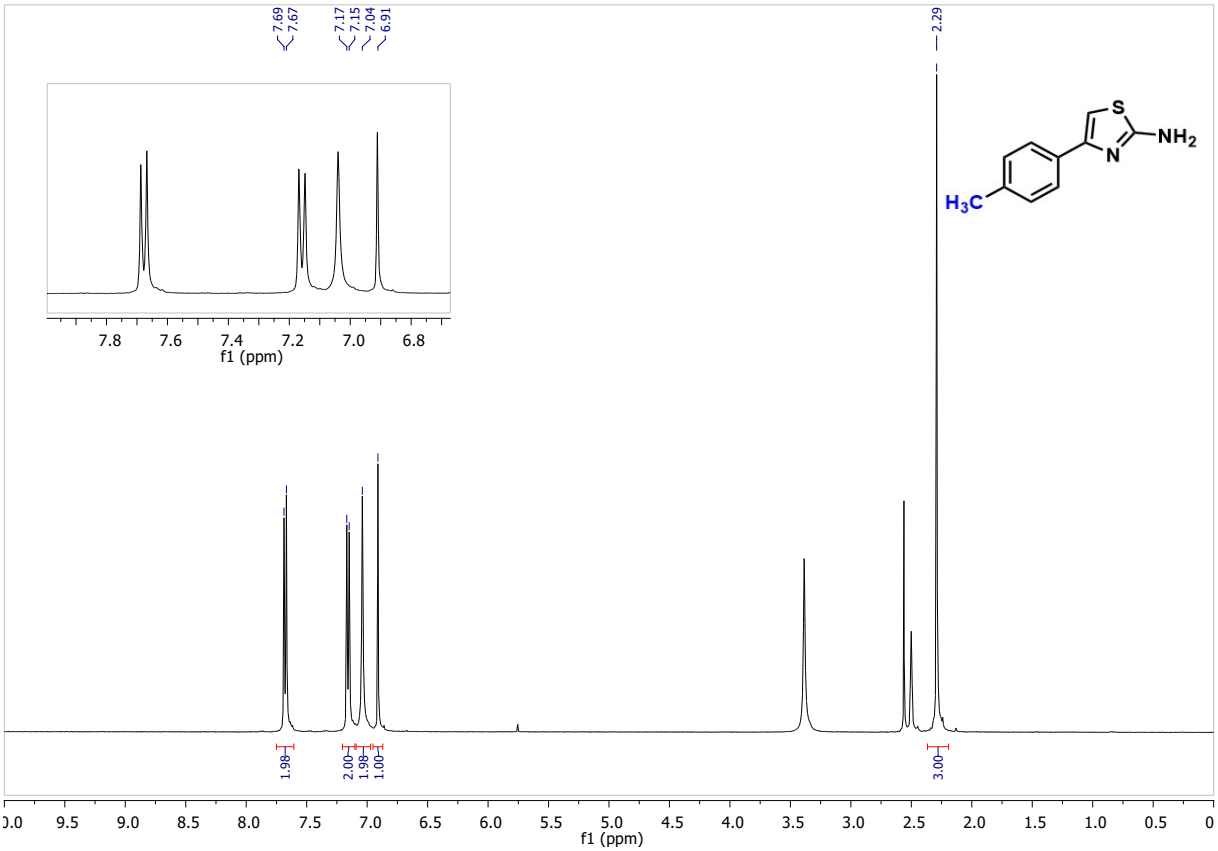
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1d** (DMSO-d_6)

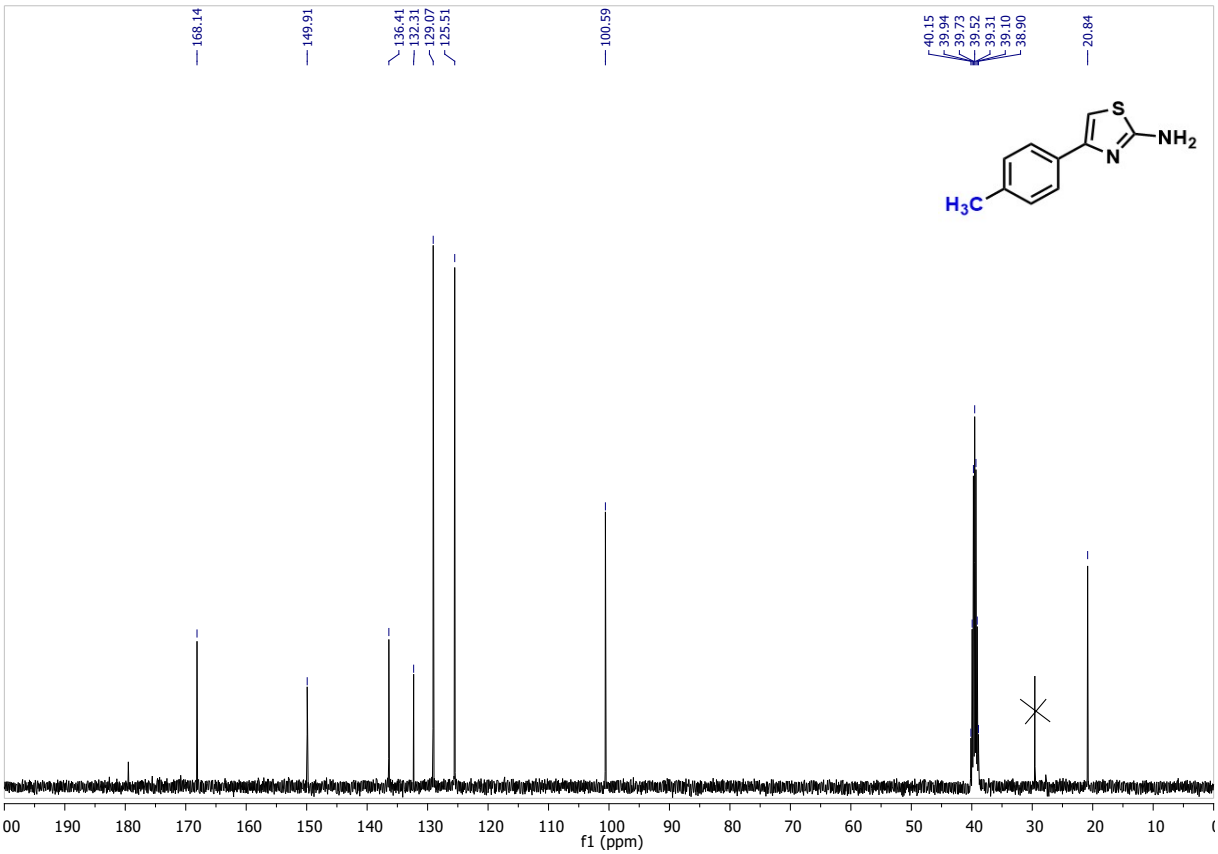


400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1e** (DMSO-d_6)

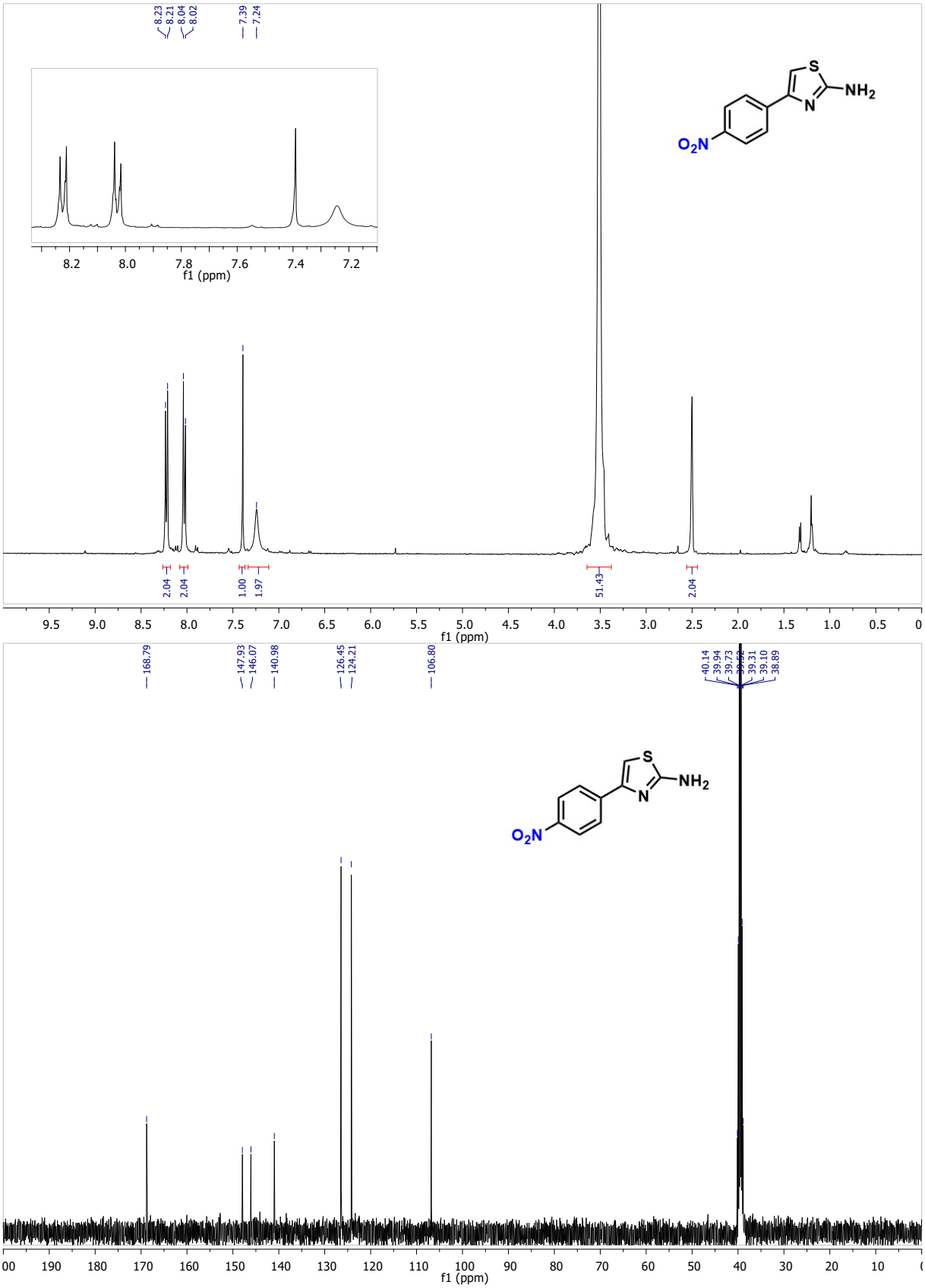


400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1f** ($CDCl_3$)

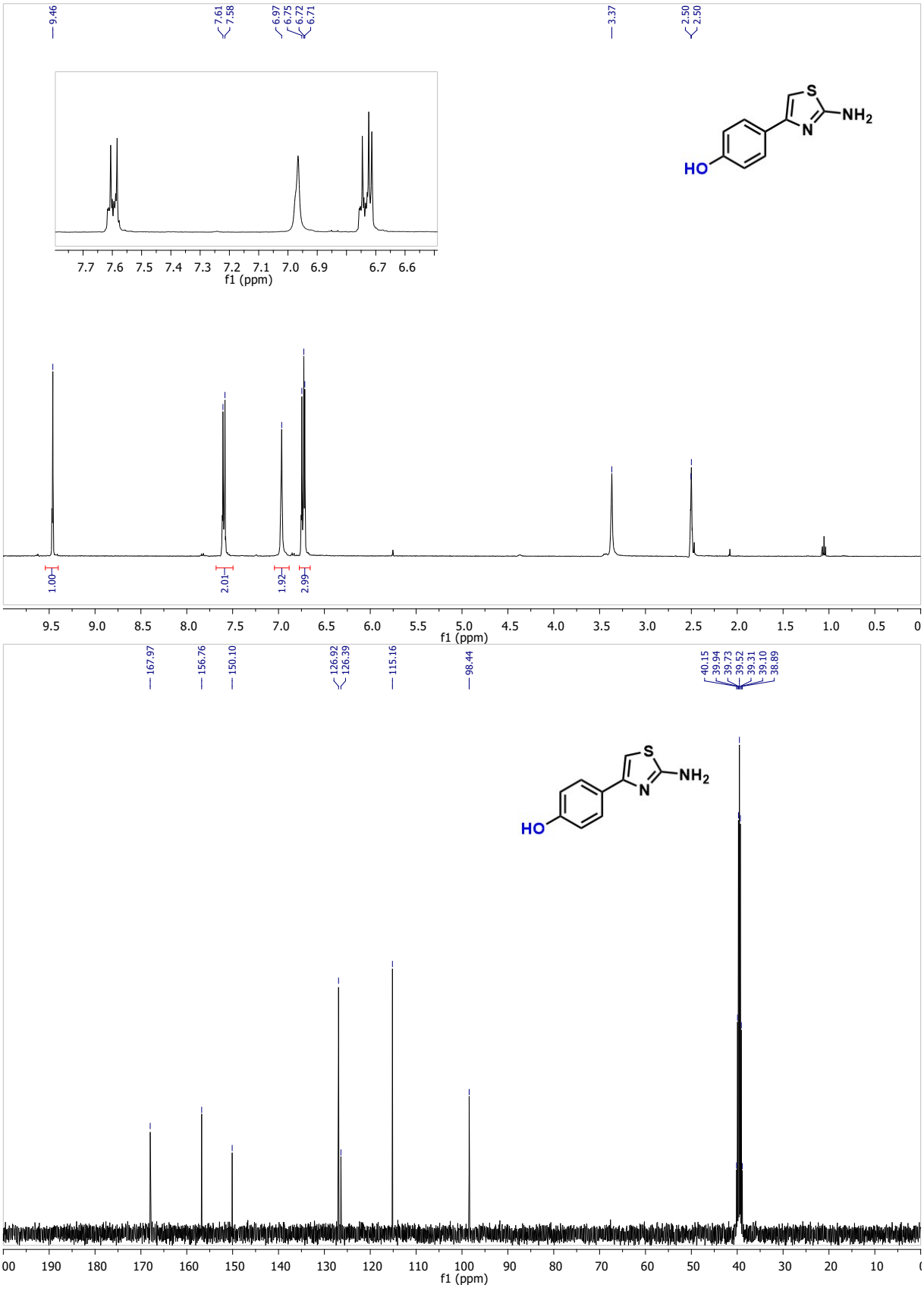




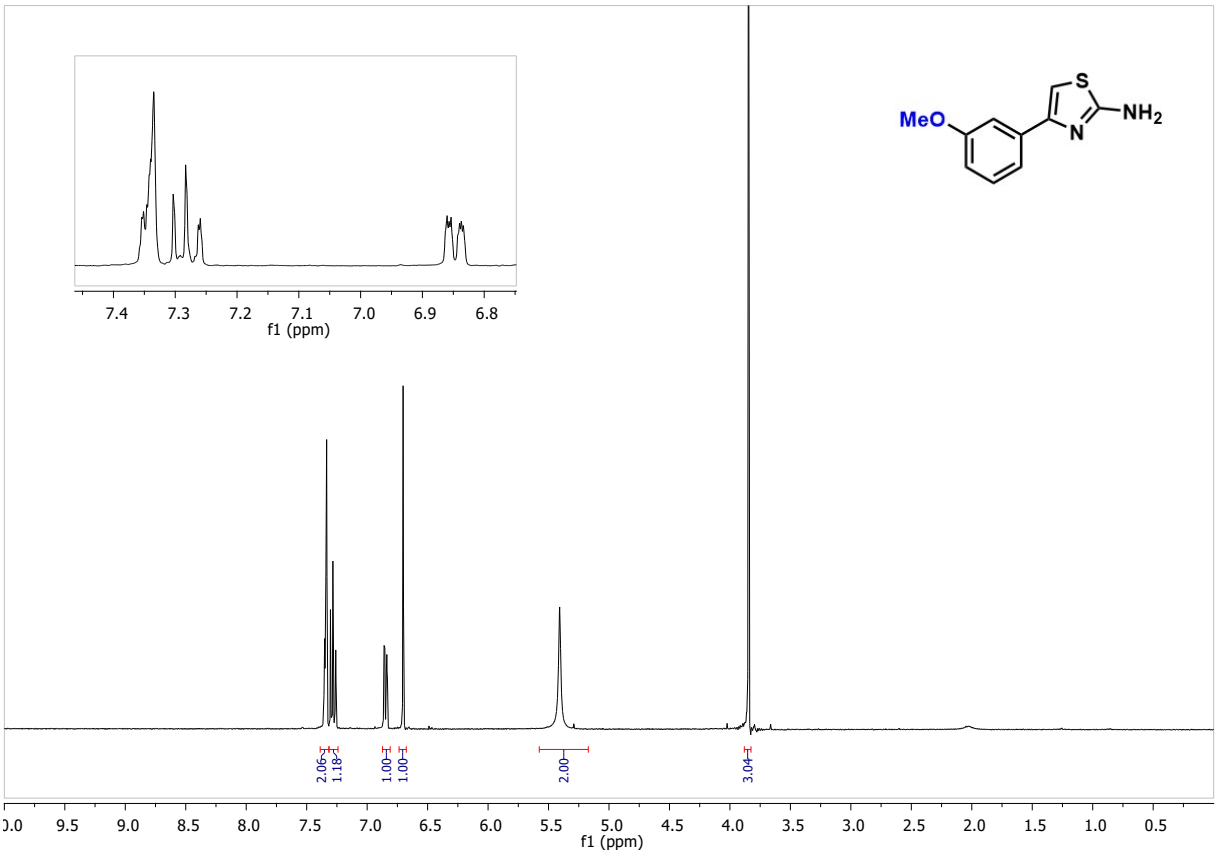
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1g** (DMSO-d_6)

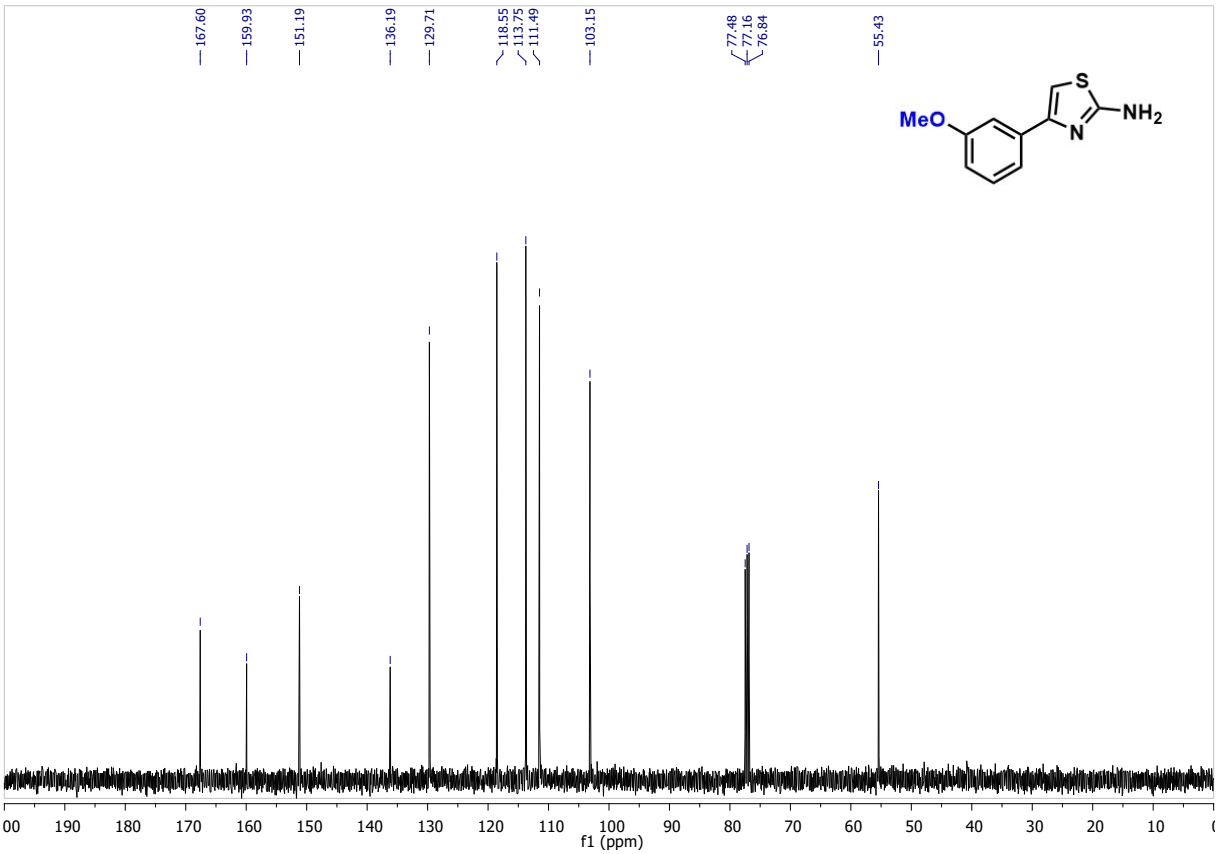


400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1h** (DMSO-d_6)

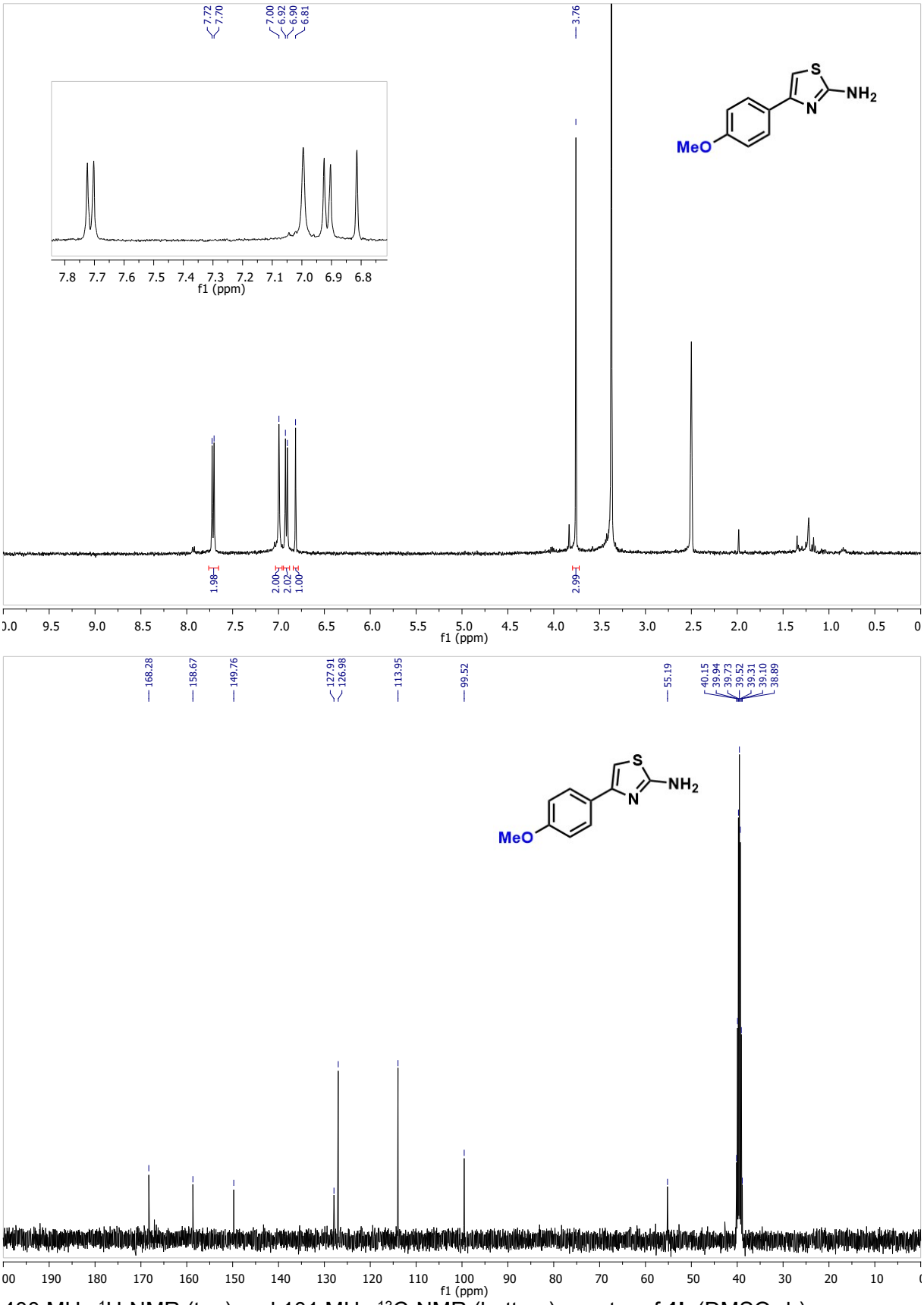


400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1i** (DMSO-d_6)

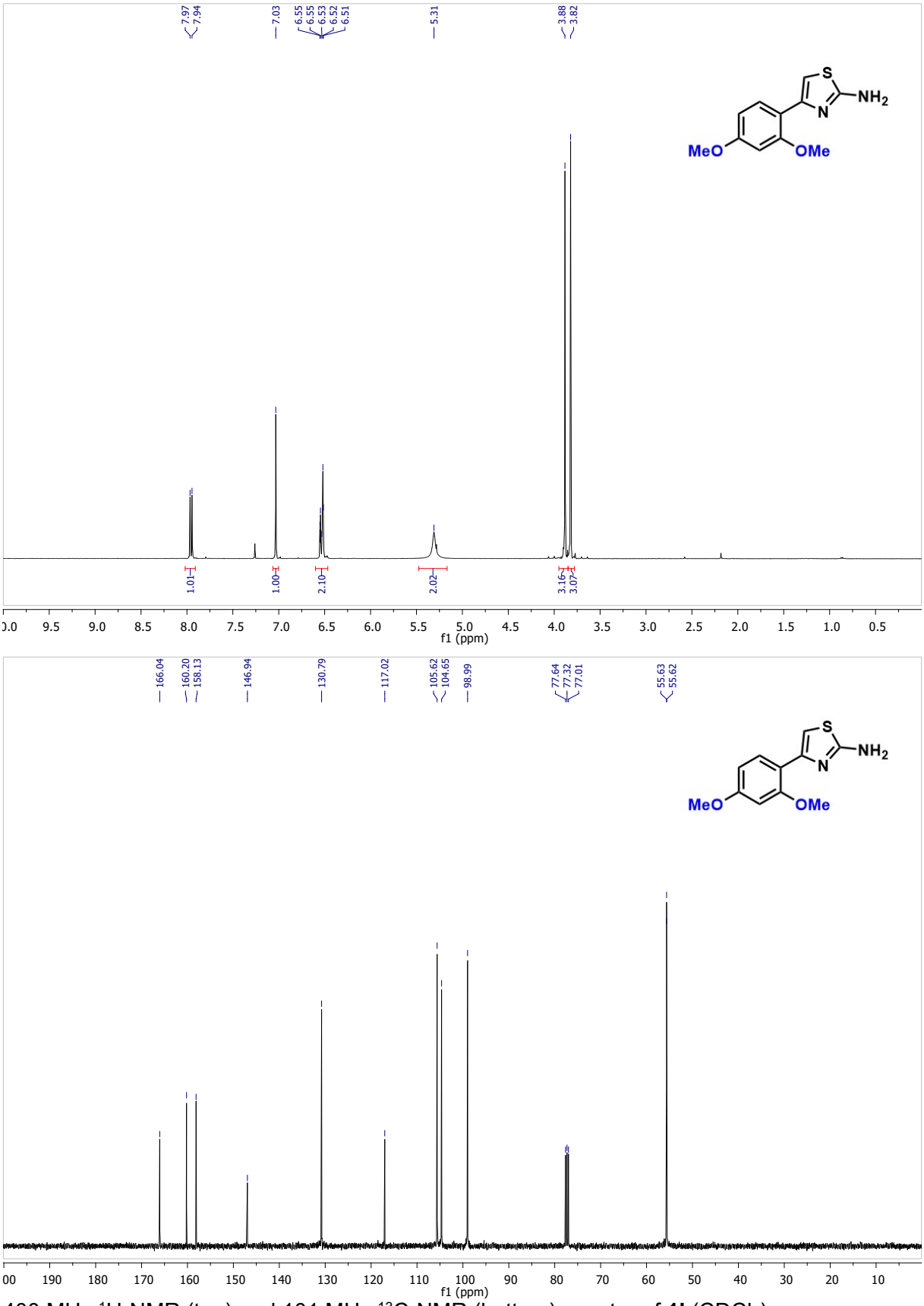




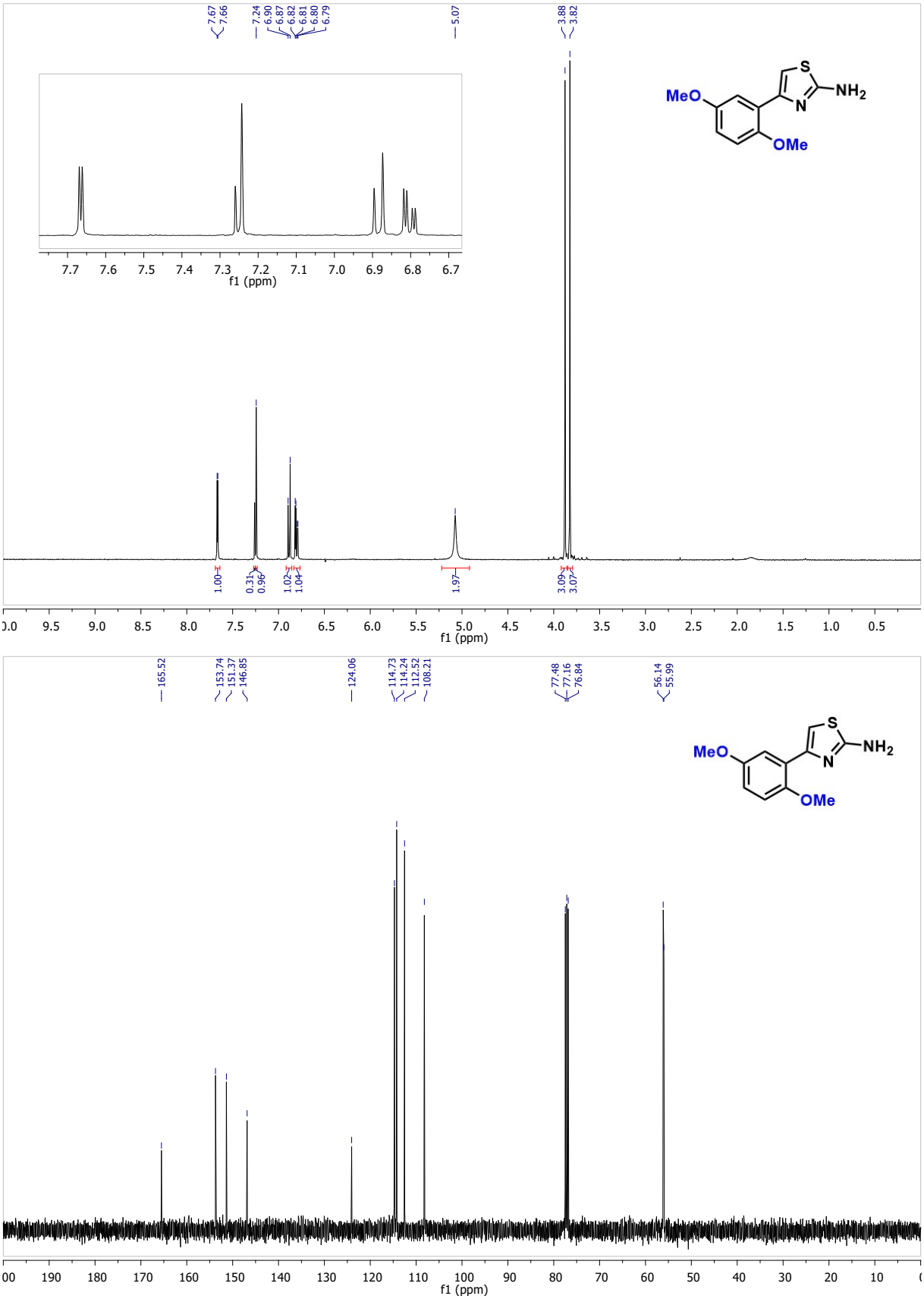
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1j** ($CDCl_3$)



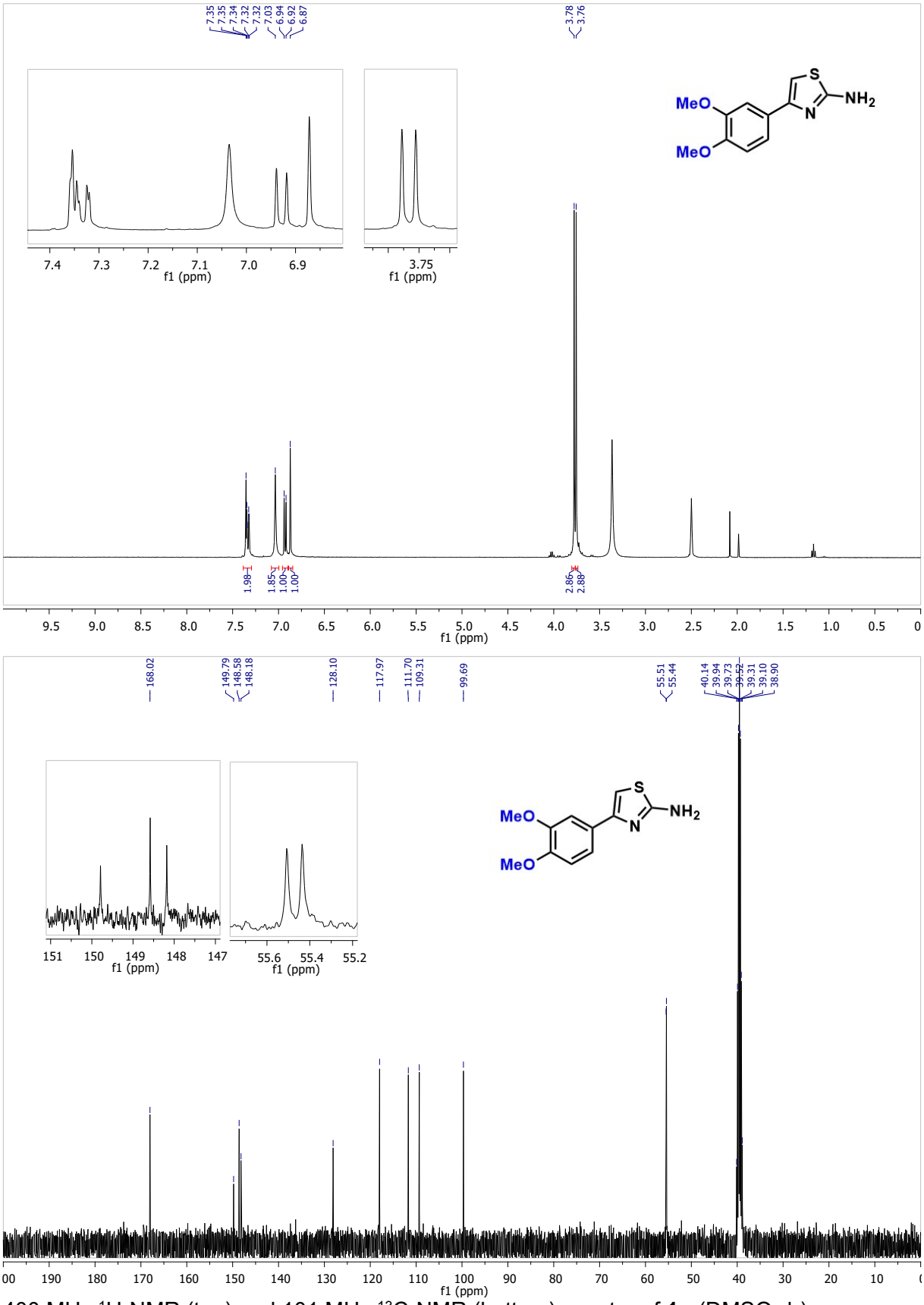
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1k** (DMSO-d_6)



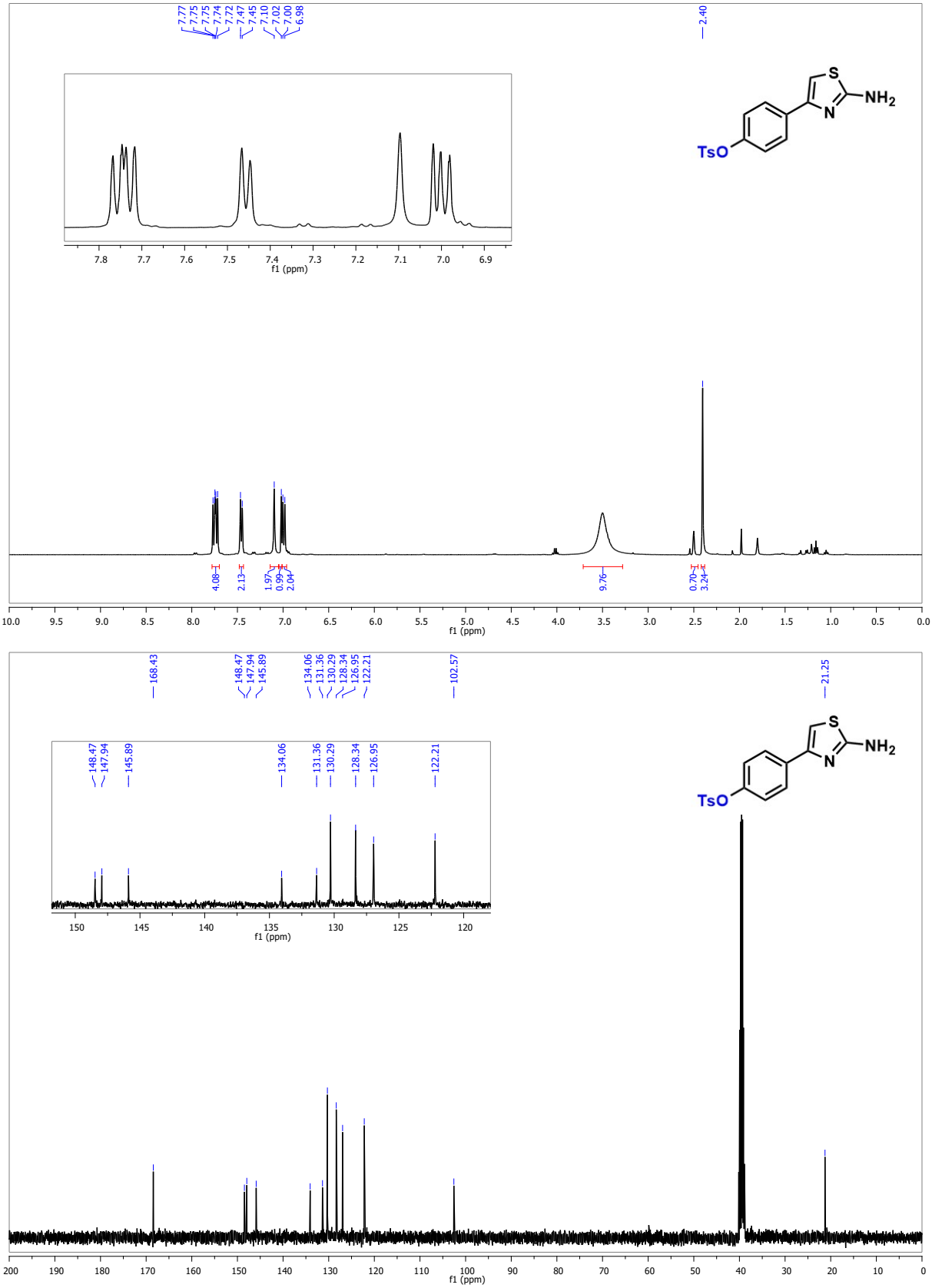
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1l** ($CDCl_3$)



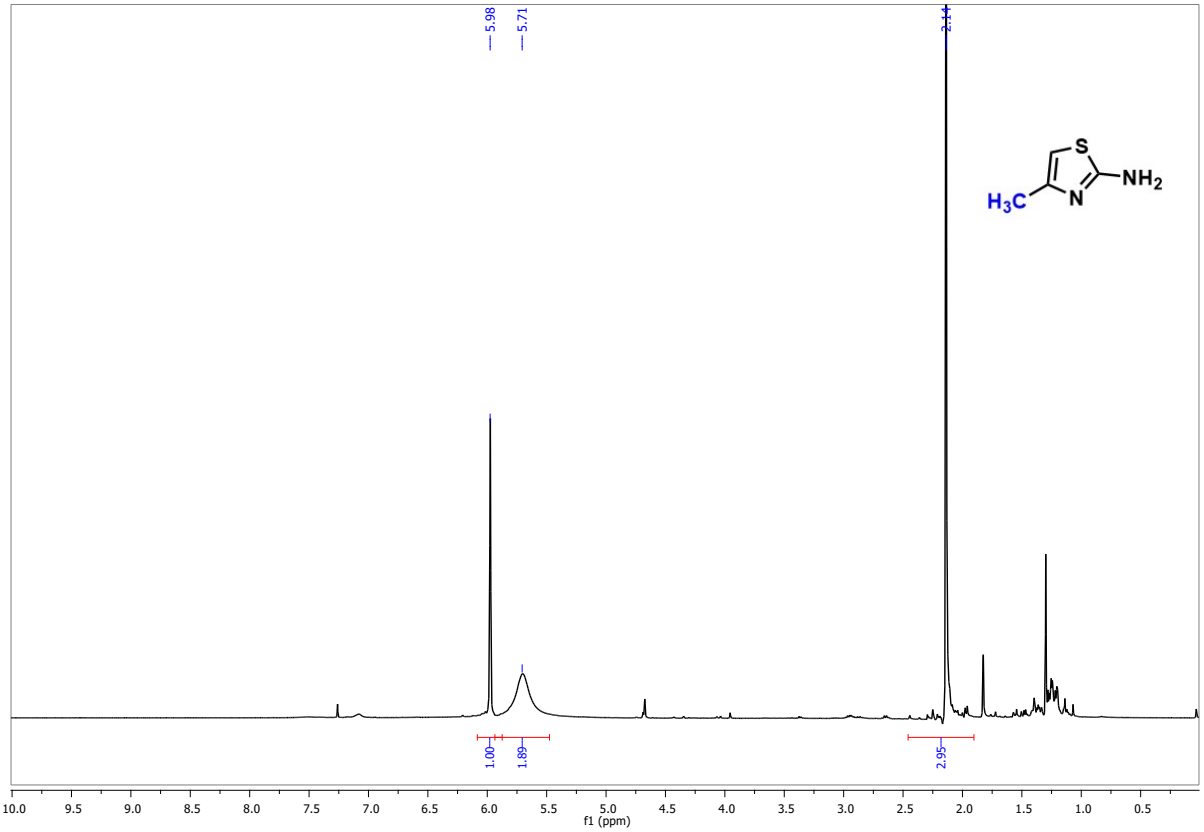
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1m** ($CDCl_3$)

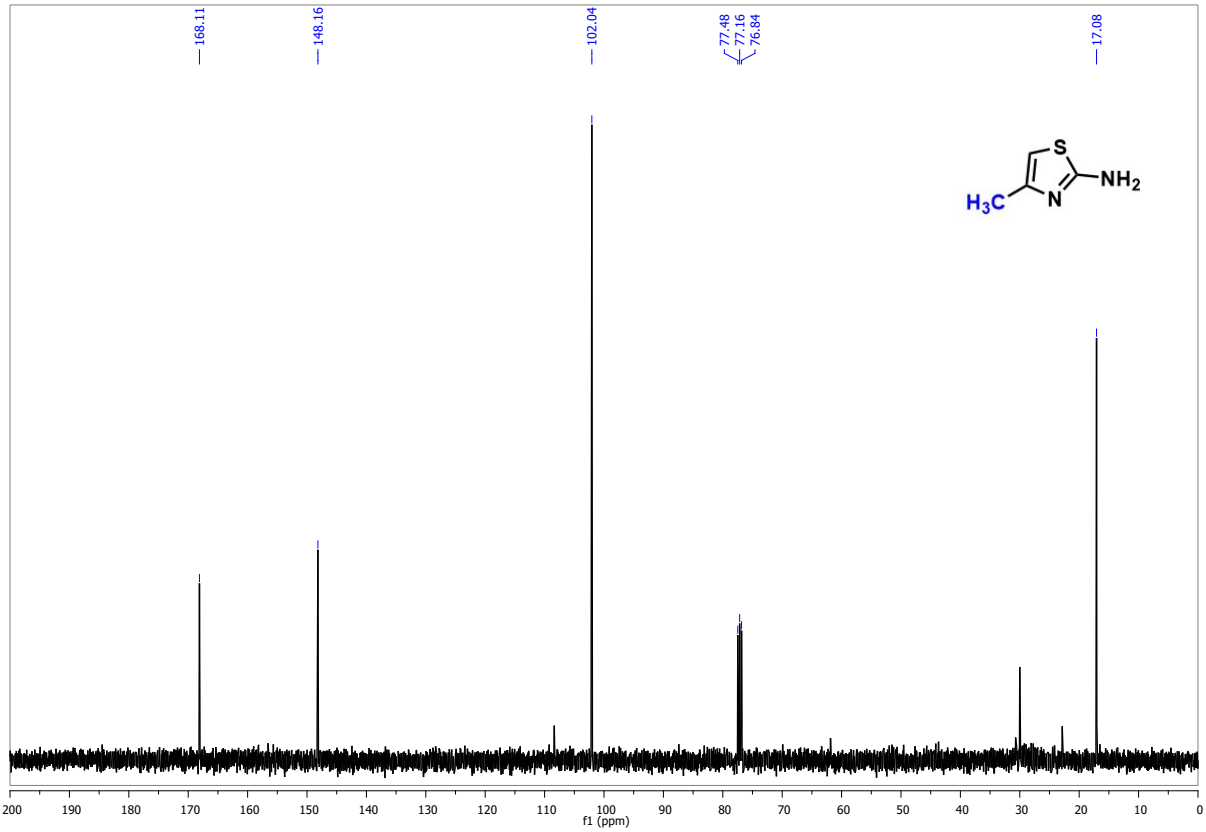


400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1n** (DMSO-d_6)

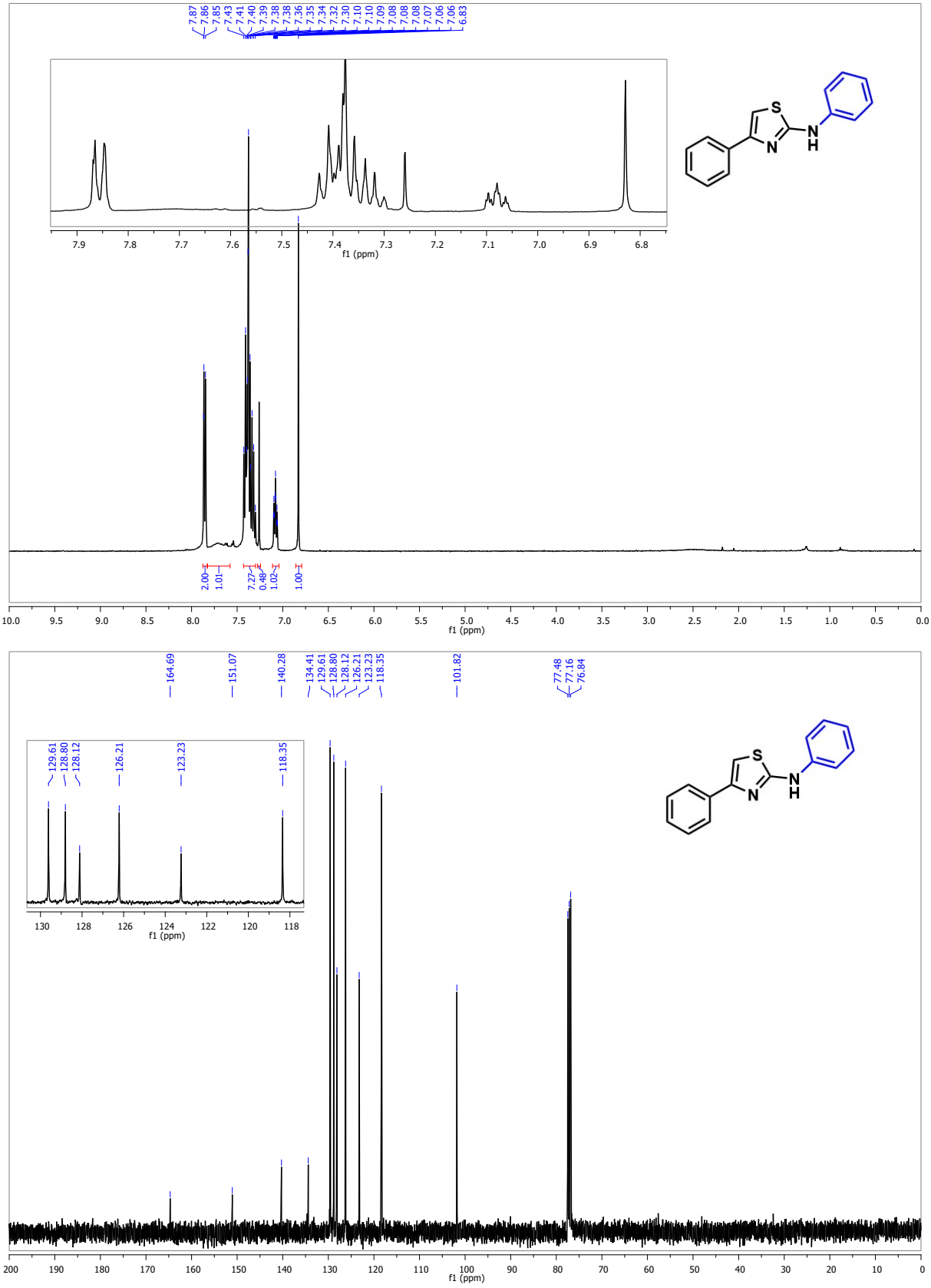


400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1o** (DMSO-d_6)

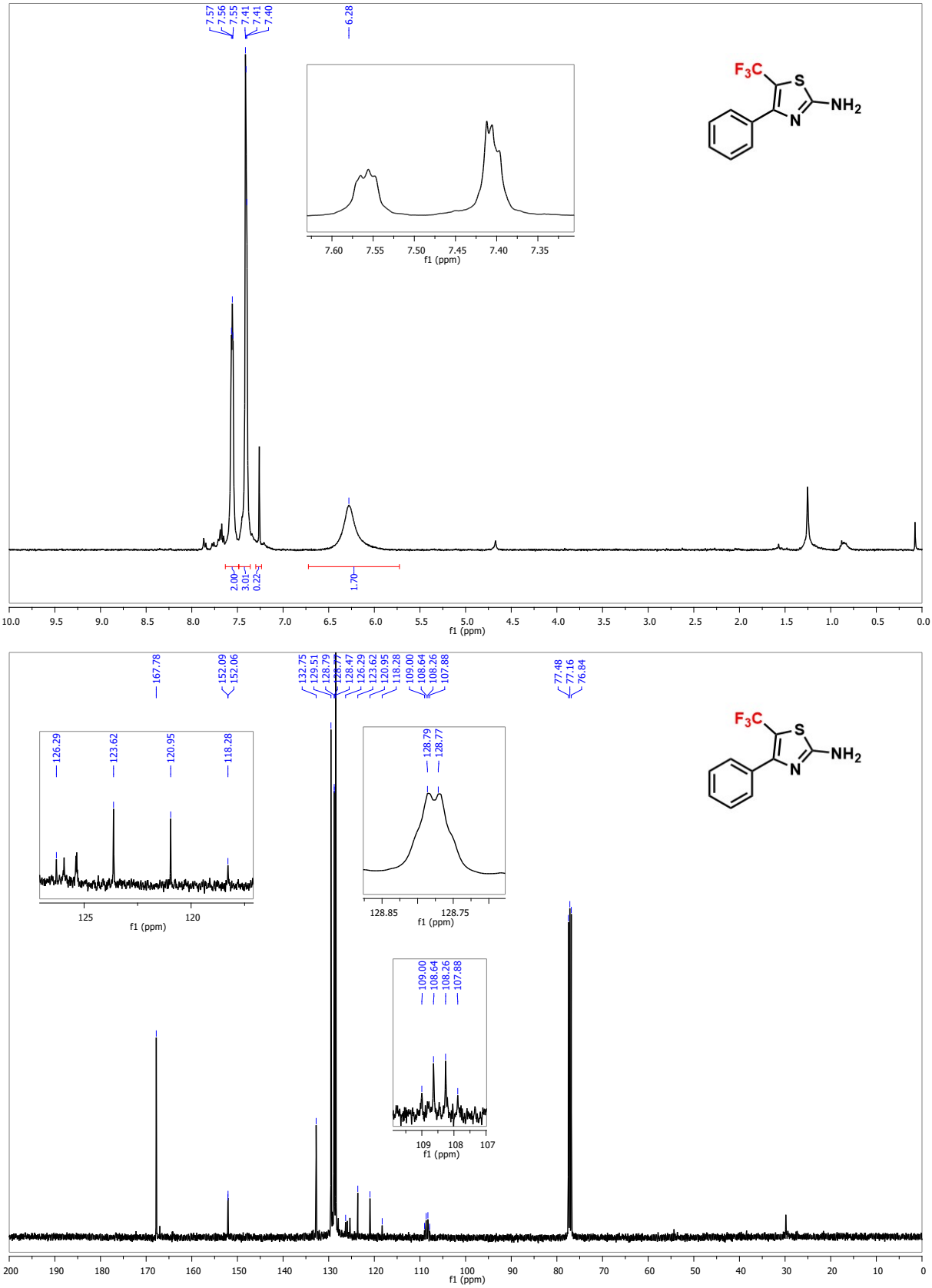




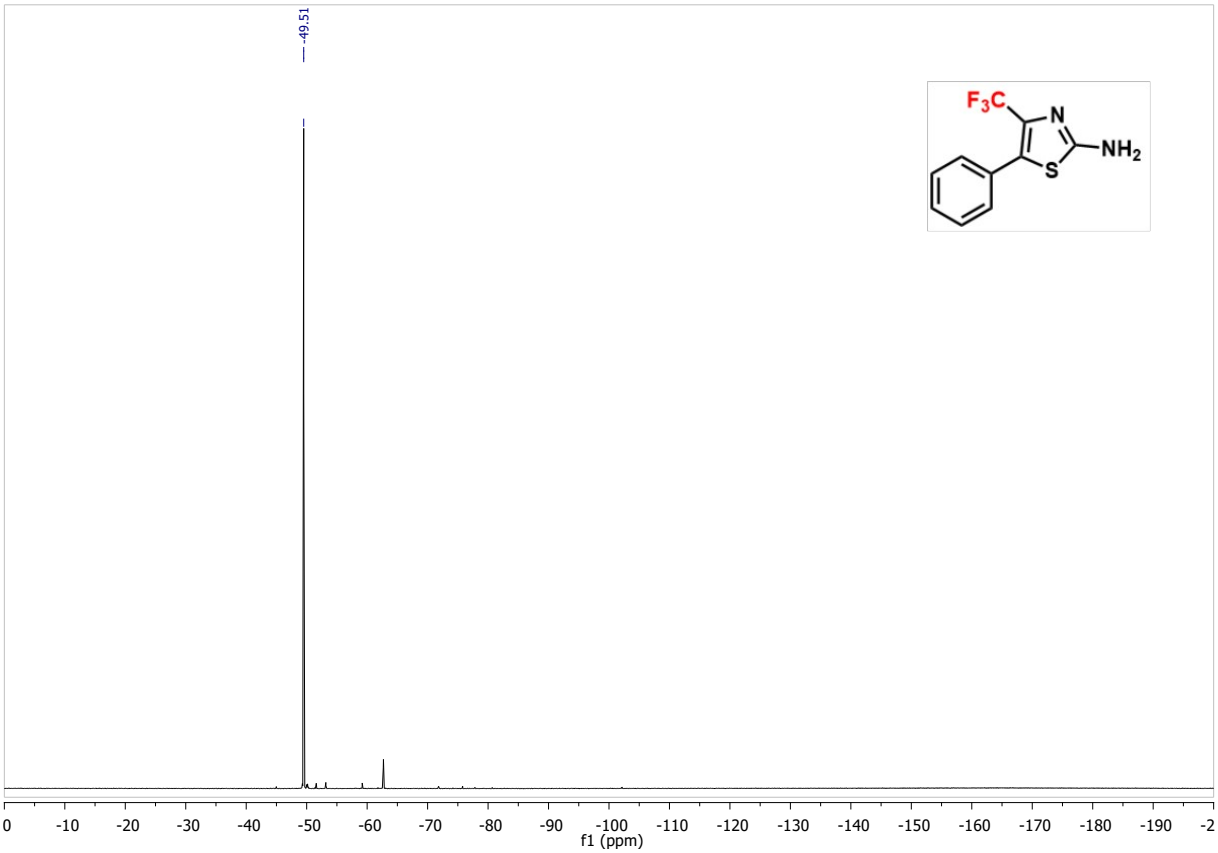
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1p** ($CDCl_3$)



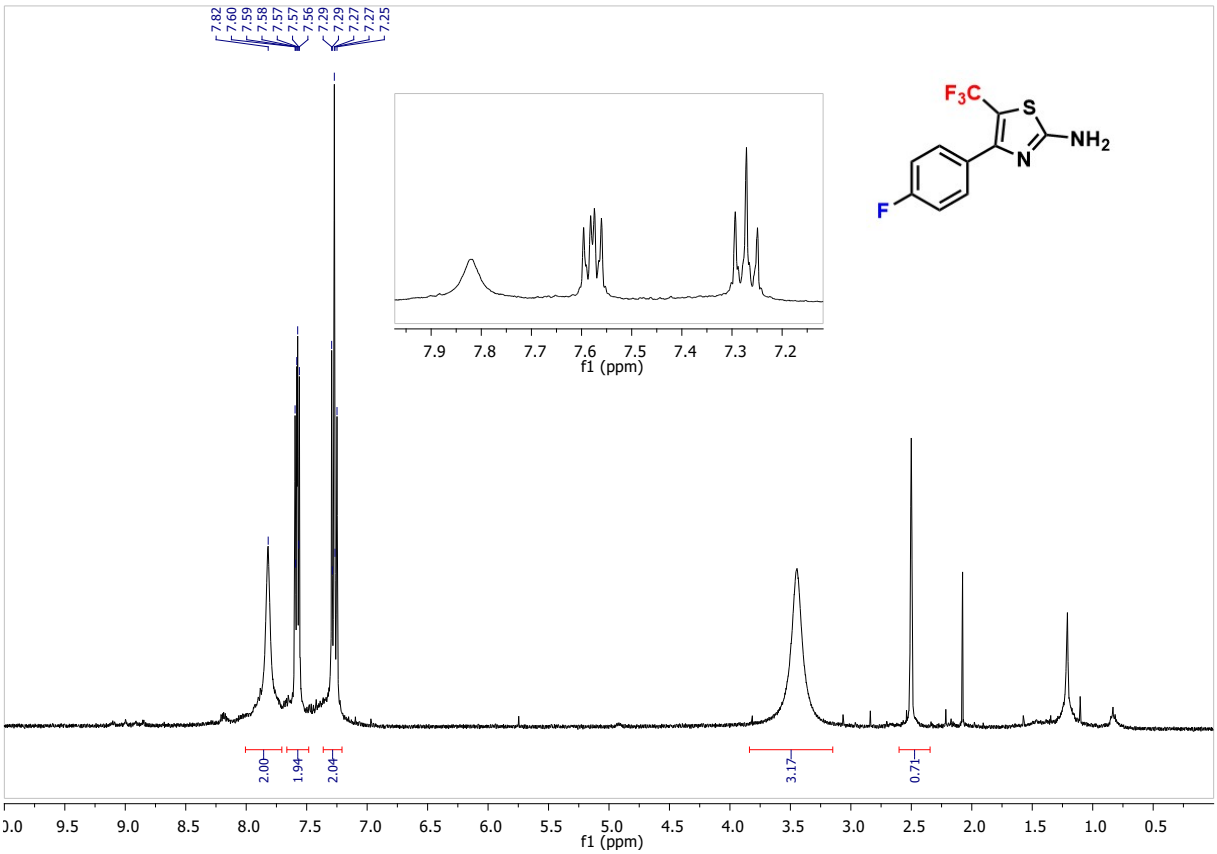
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **1r** ($CDCl_3$)



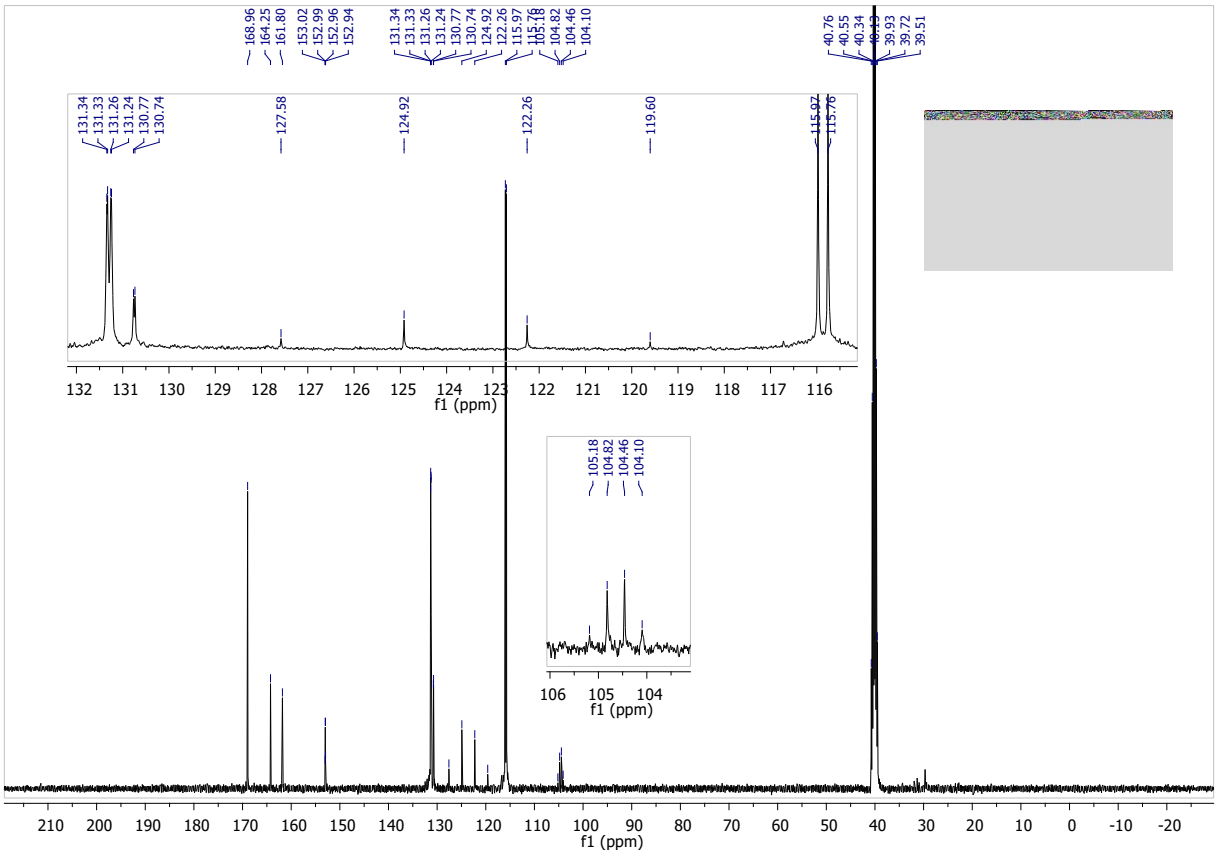
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **2a** ($CDCl_3$)



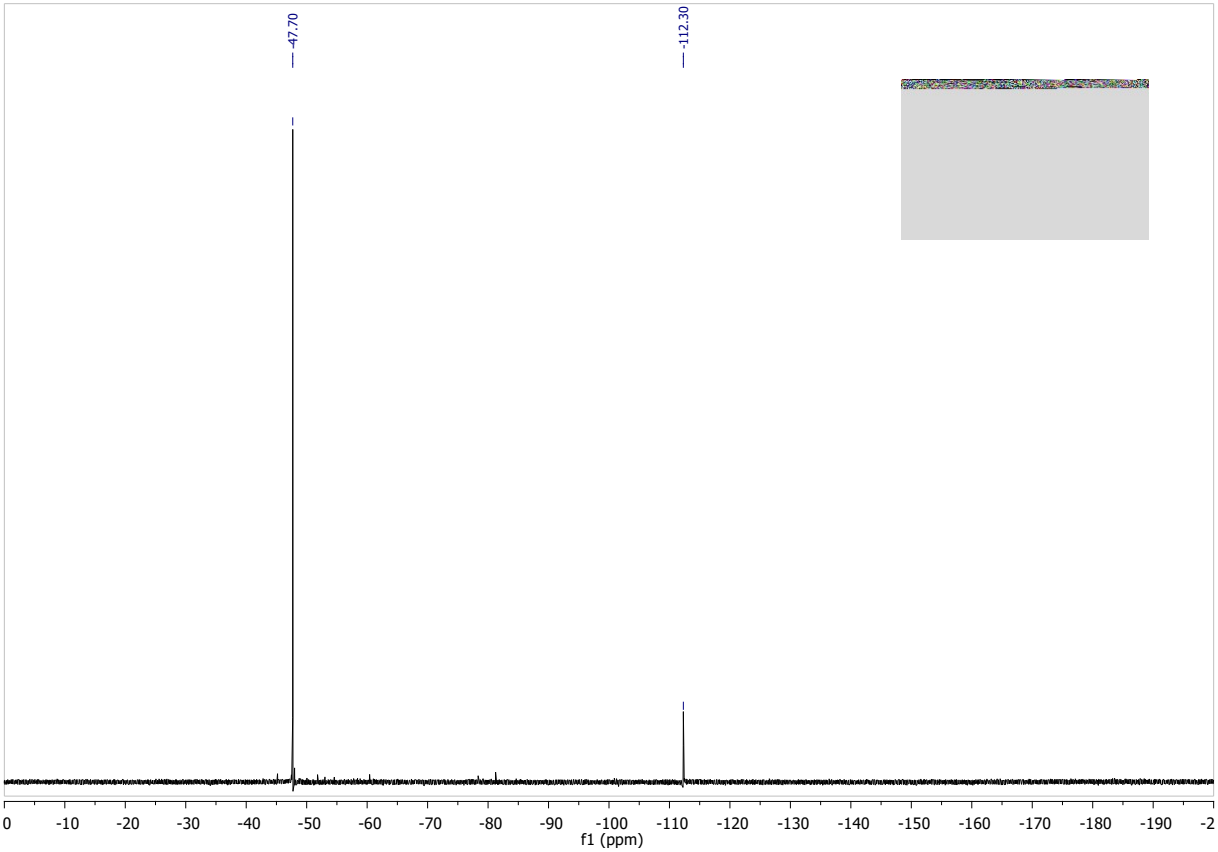
376 MHz ^{19}F-NMR spectra of **2a** ($CDCl_3$)



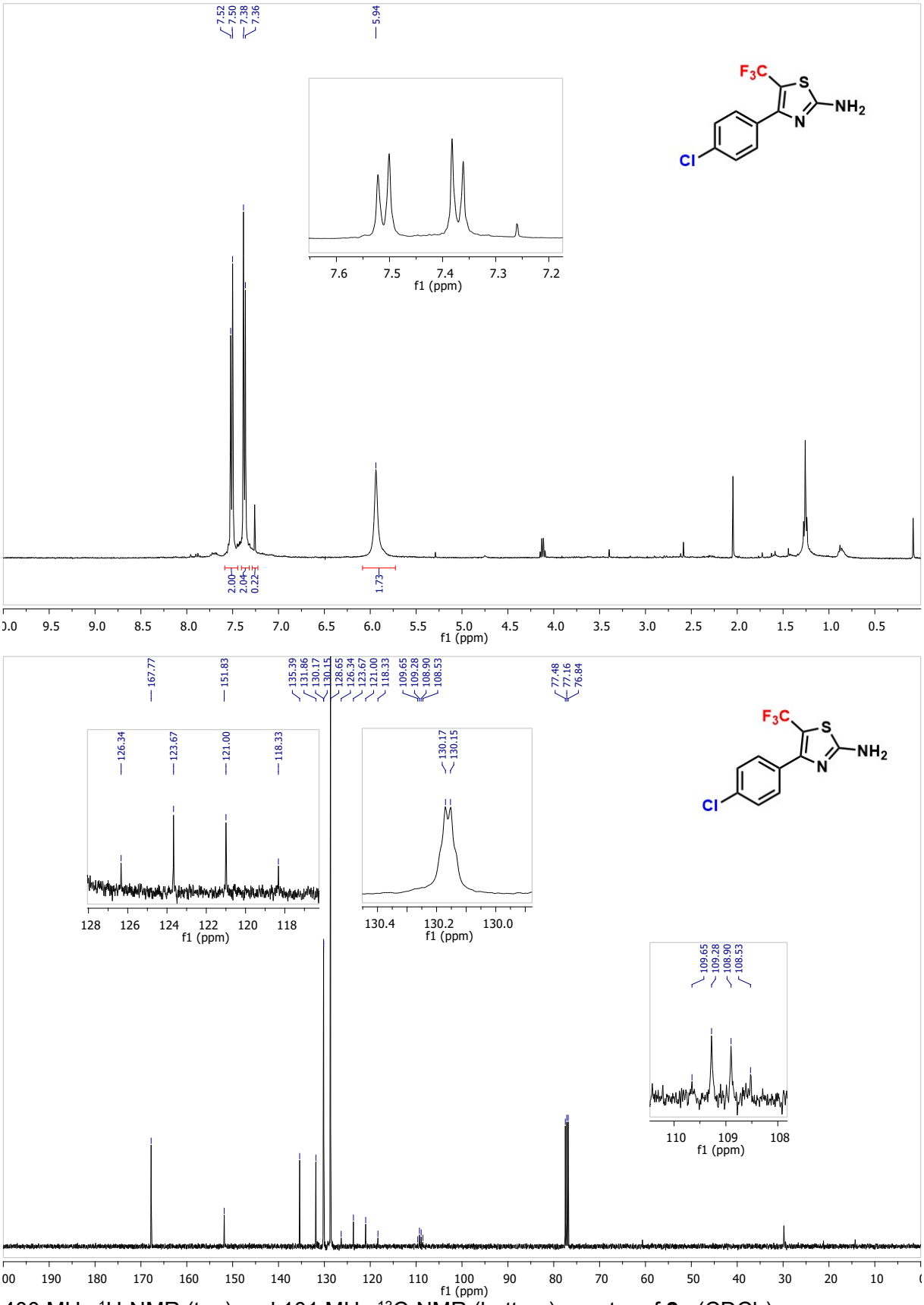
400 MHz ^{1}H-NMR spectra of **2b** (DMSO-d_6)



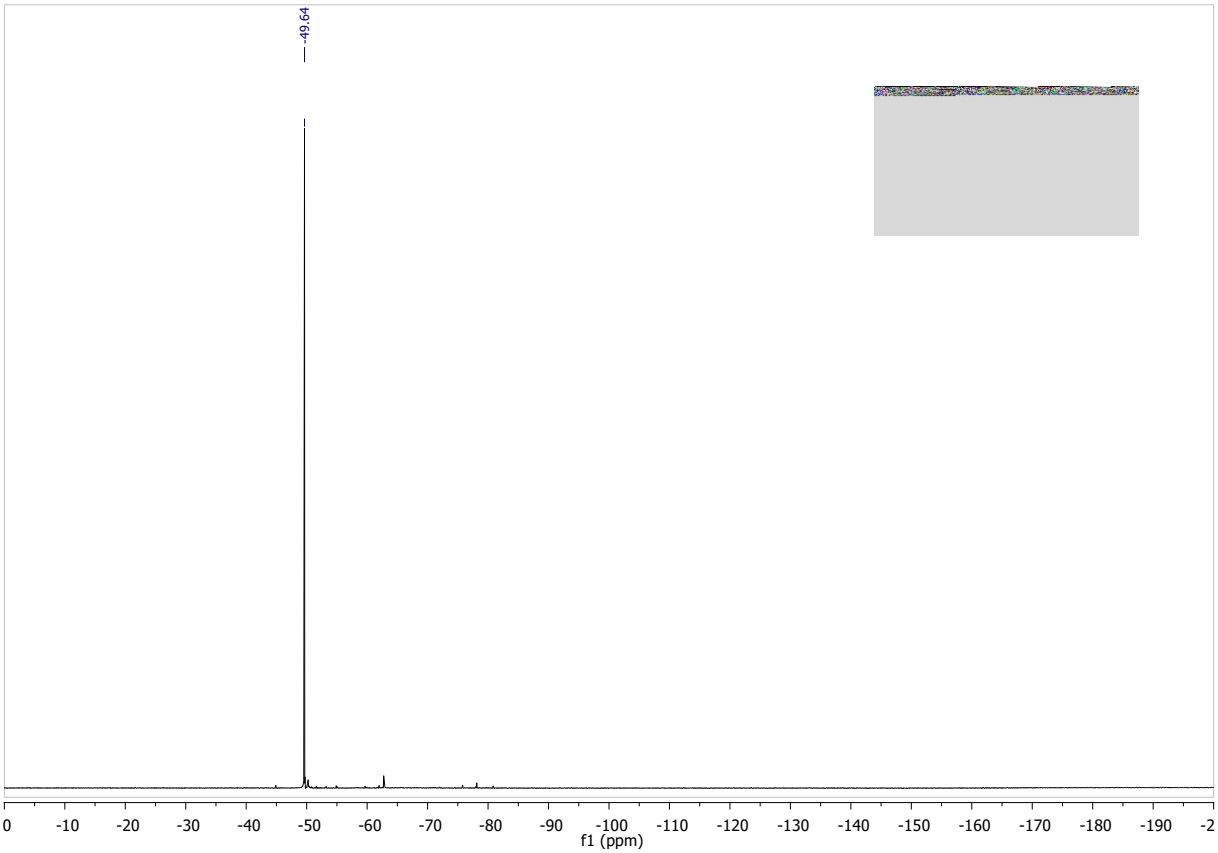
101 MHz ^{13}C-NMR spectra of **2b** (DMSO-d_6)



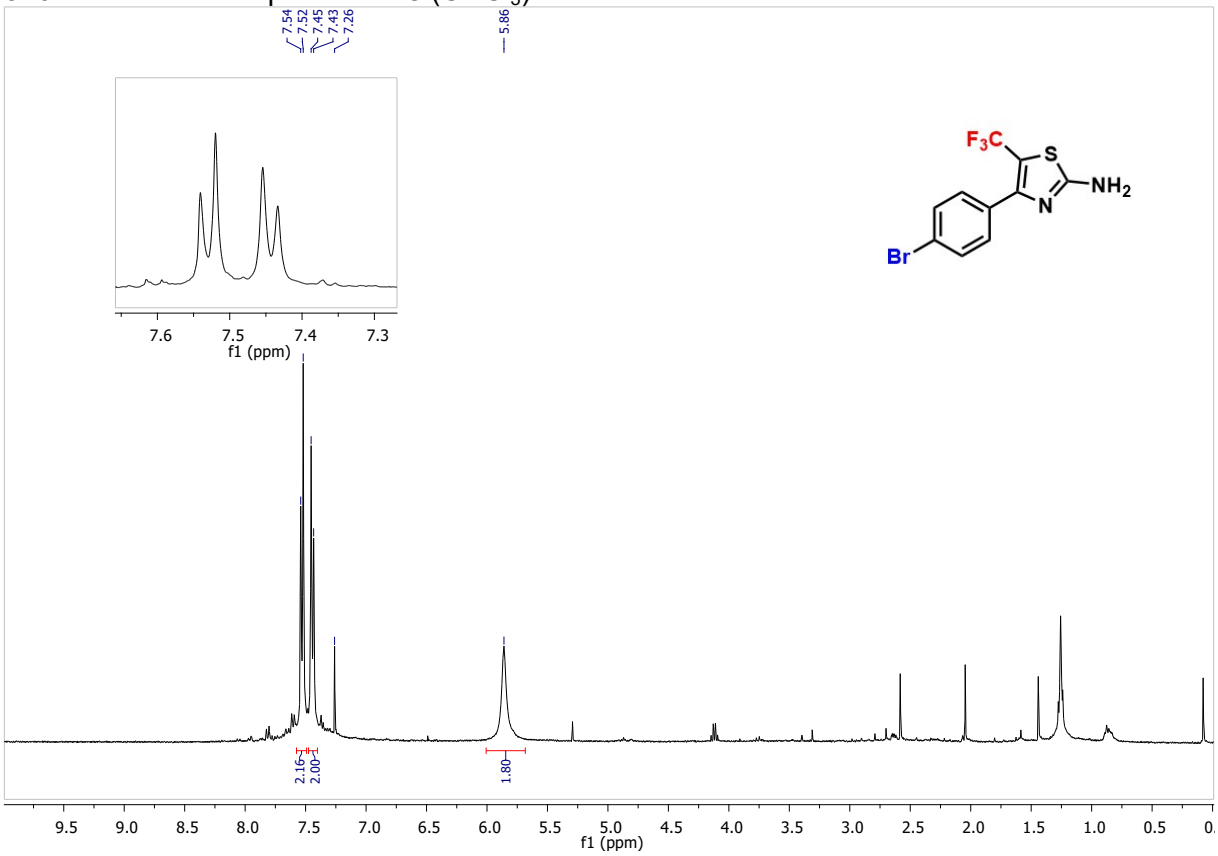
376 MHz ^{19}F-NMR spectra of **2b** (DMSO-d_6)



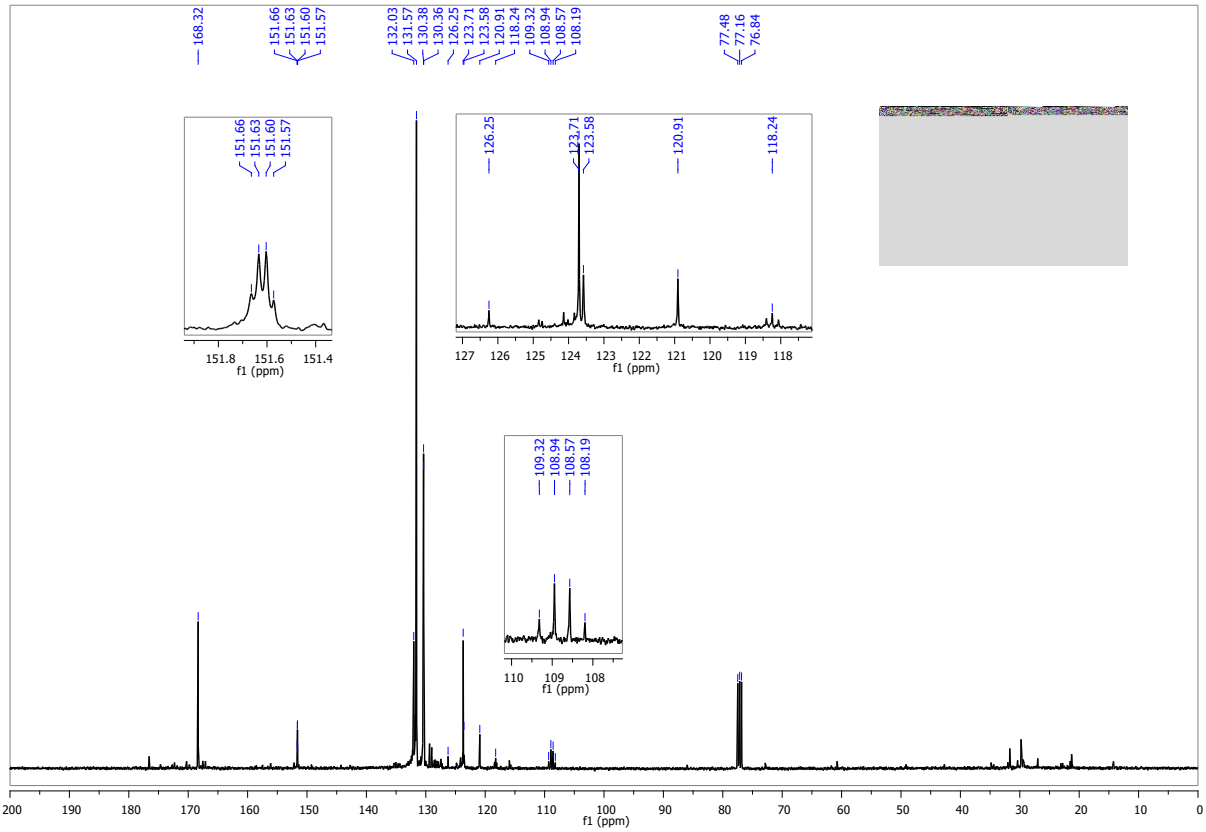
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **2c** ($CDCl_3$)



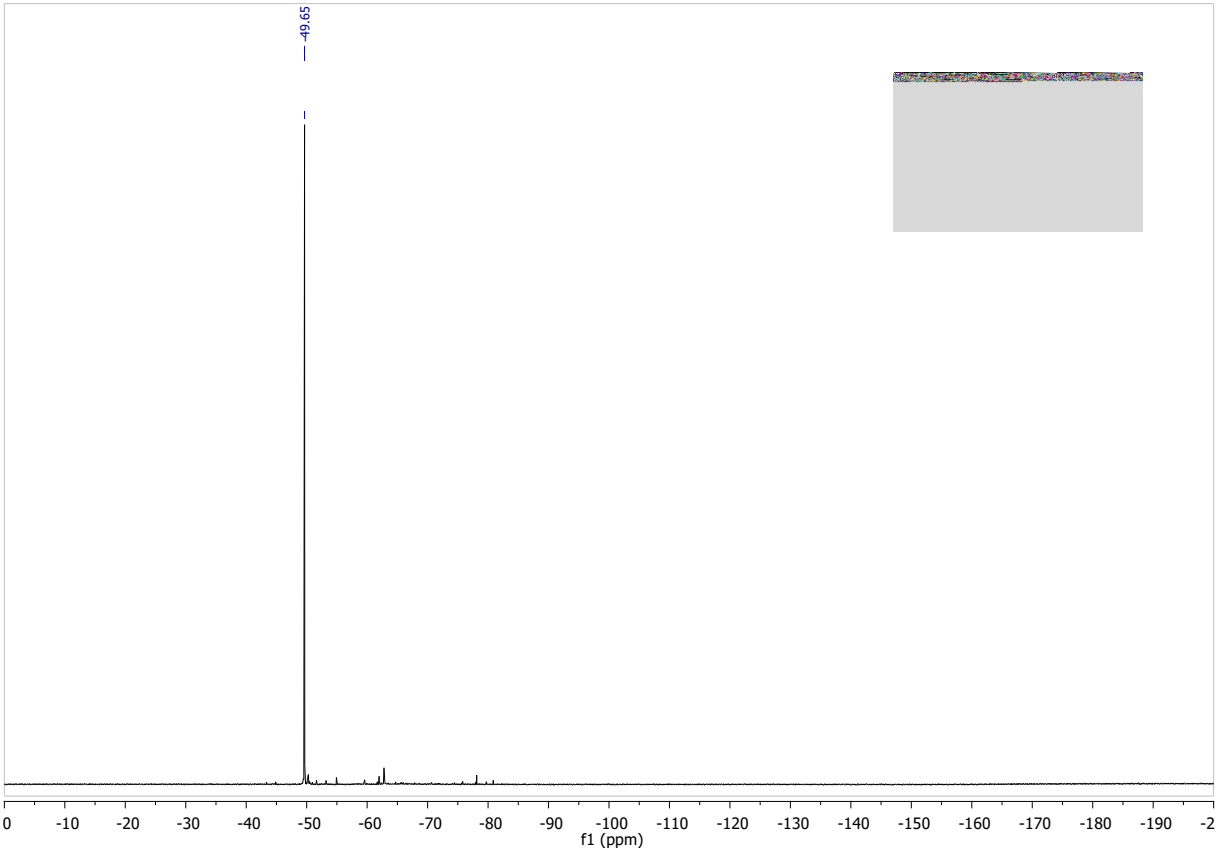
376 MHz ^{19}F-NMR spectra of **2c** ($CDCl_3$)



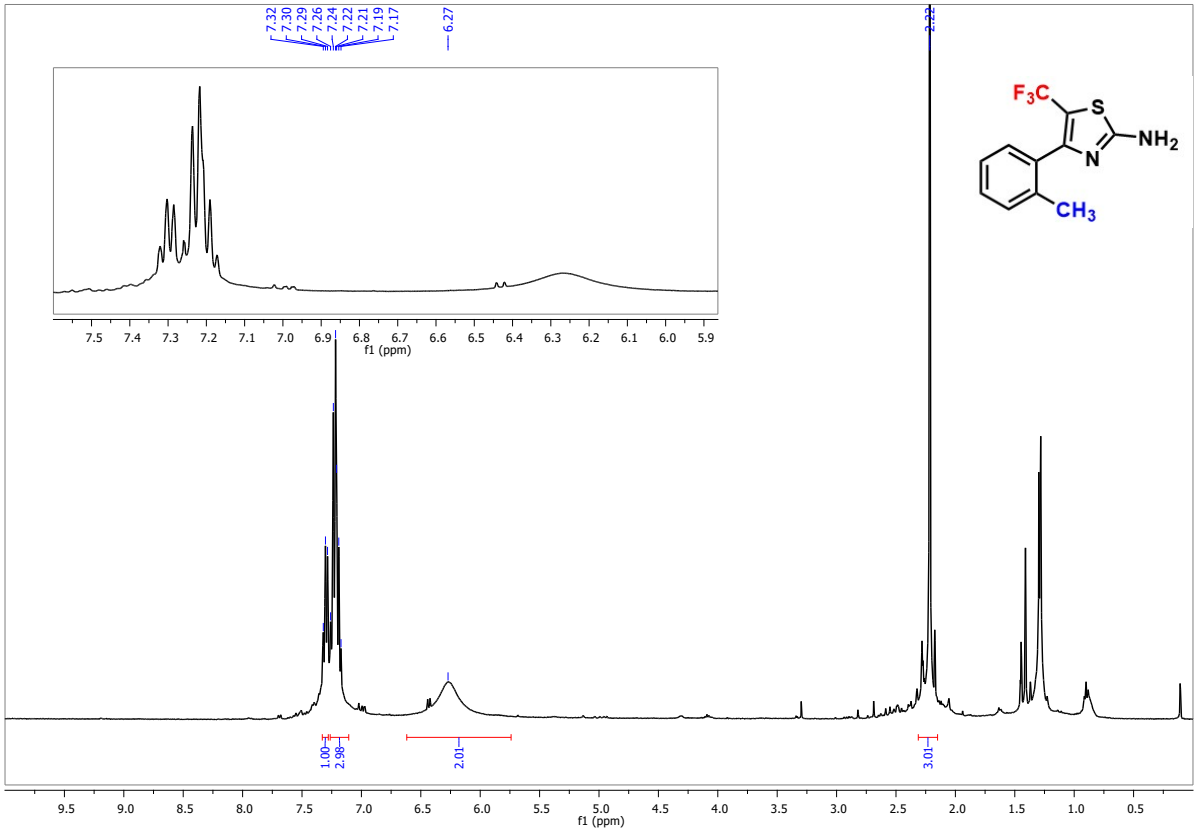
400 MHz ^{1}H-NMR spectra of **2d** ($CDCl_3$)



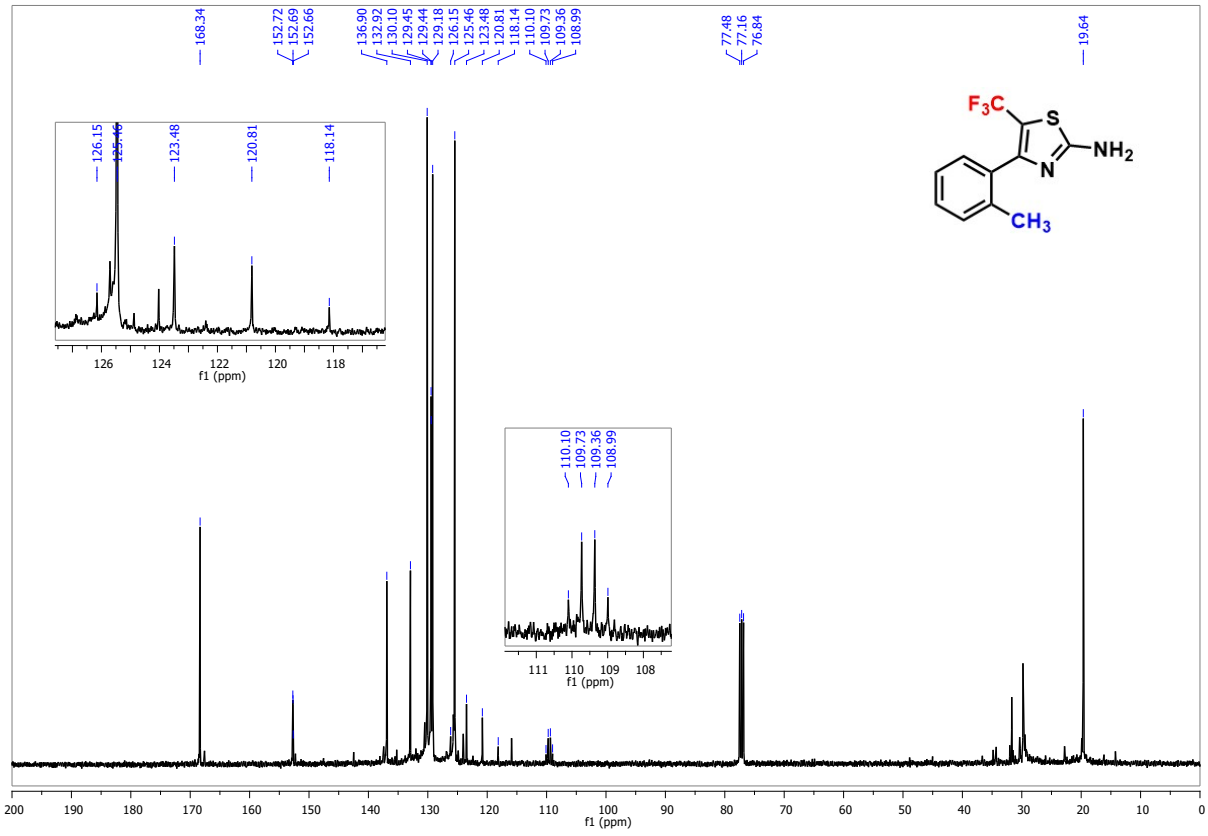
101 MHz ^{13}C-NMR spectra of **2d** ($CDCl_3$)



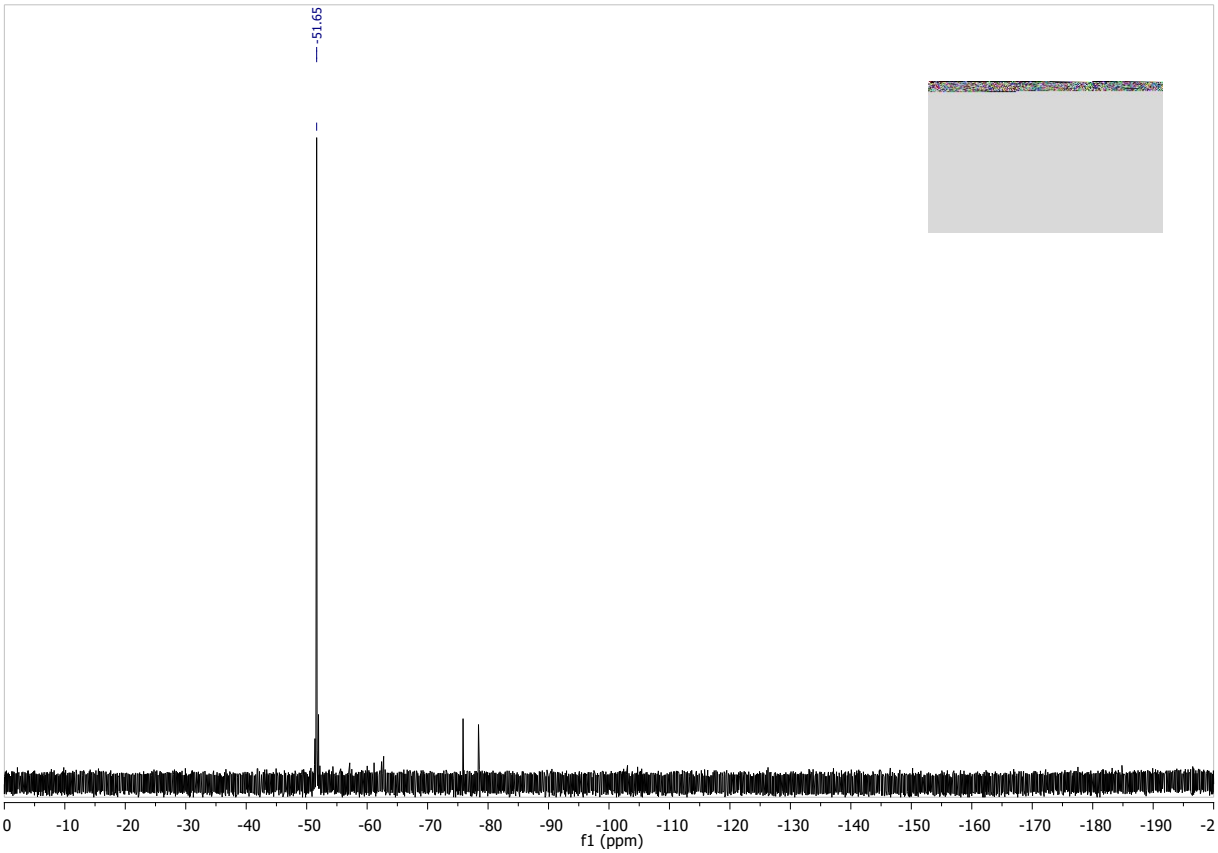
376 MHz ^{19}F-NMR spectra of **2d** ($CDCl_3$)



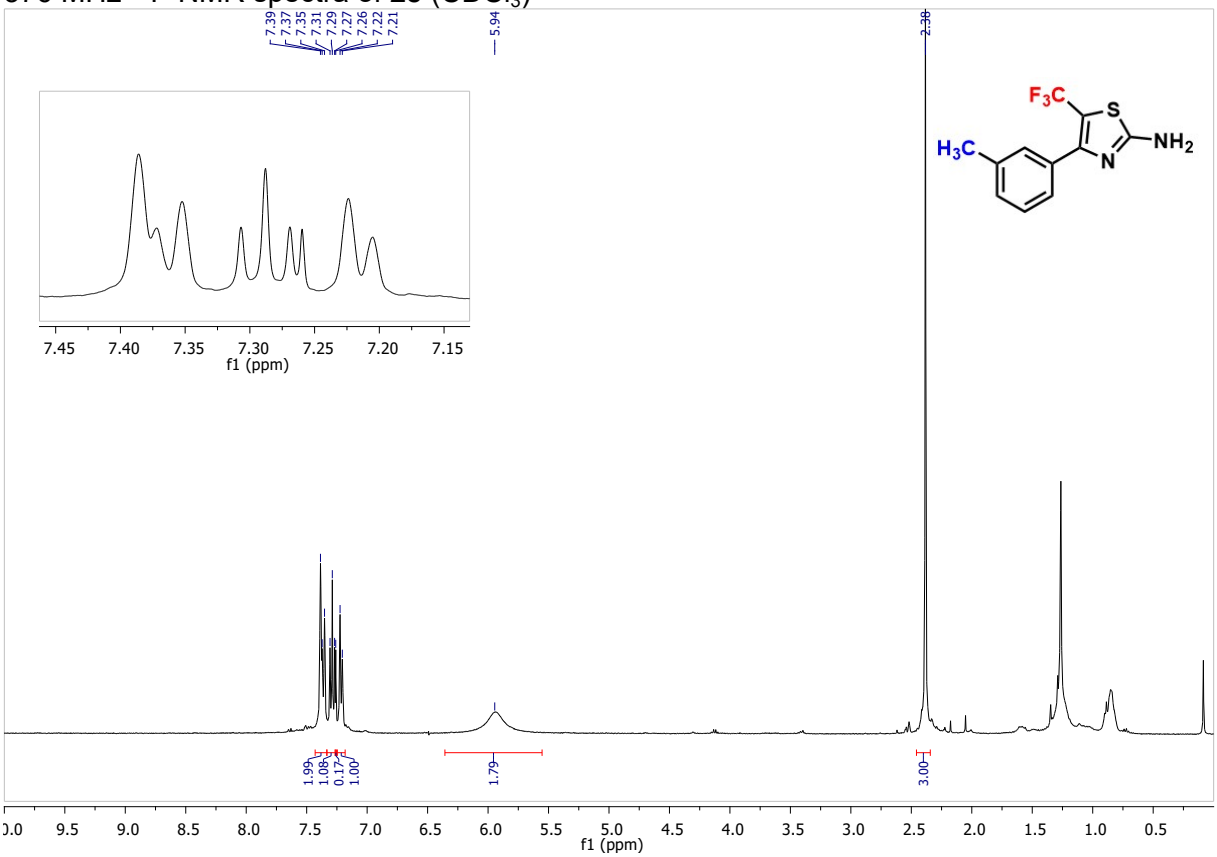
400 MHz ^{1}H-NMR spectra of **2e** ($CDCl_3$)



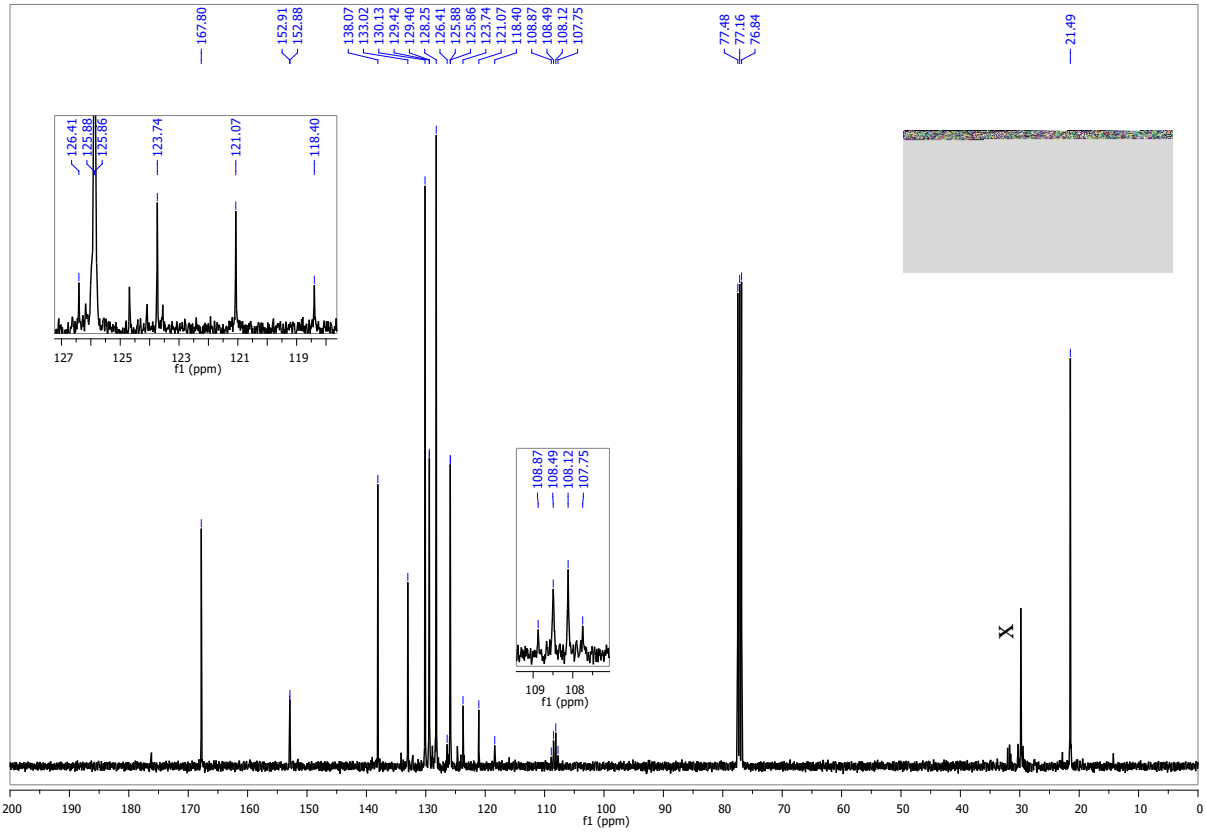
101 MHz ^{13}C-NMR spectra of **2e** ($CDCl_3$)



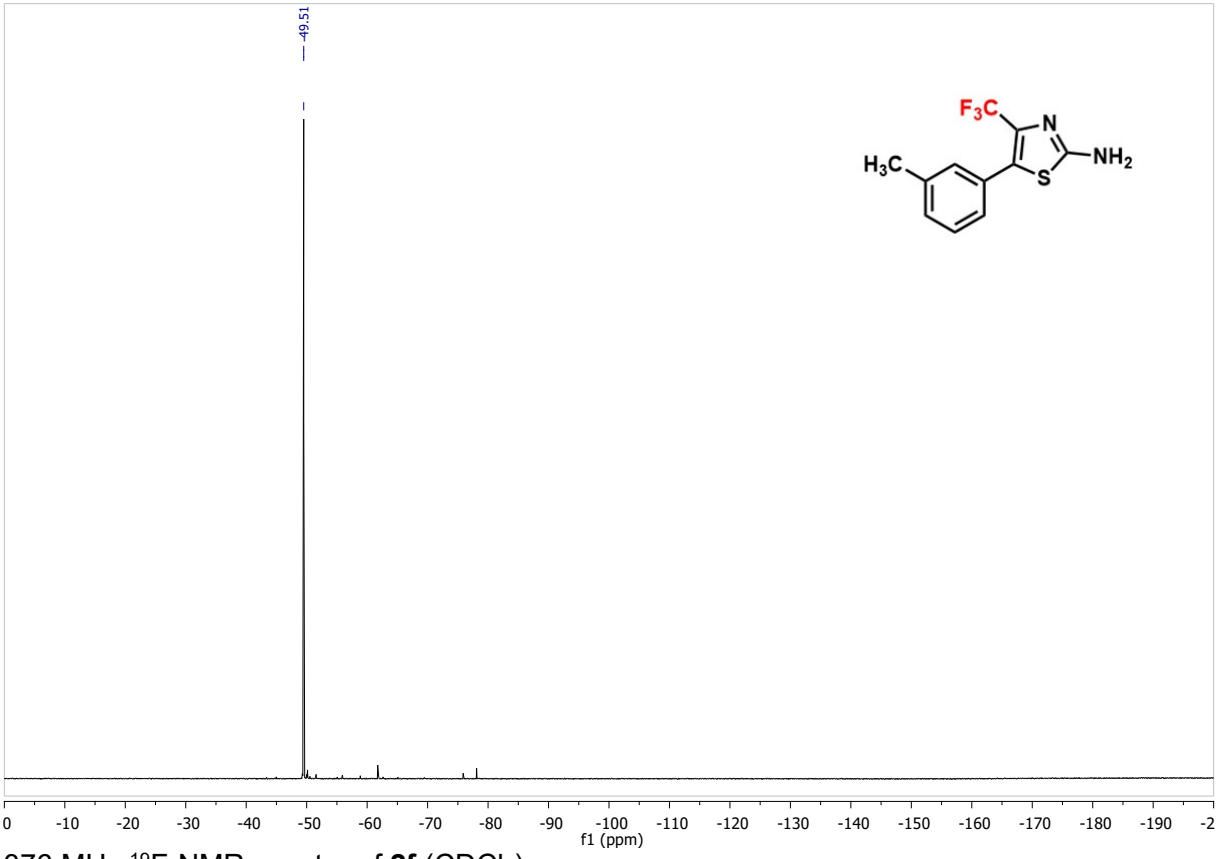
376 MHz ^{19}F-NMR spectra of **2e** ($CDCl_3$)



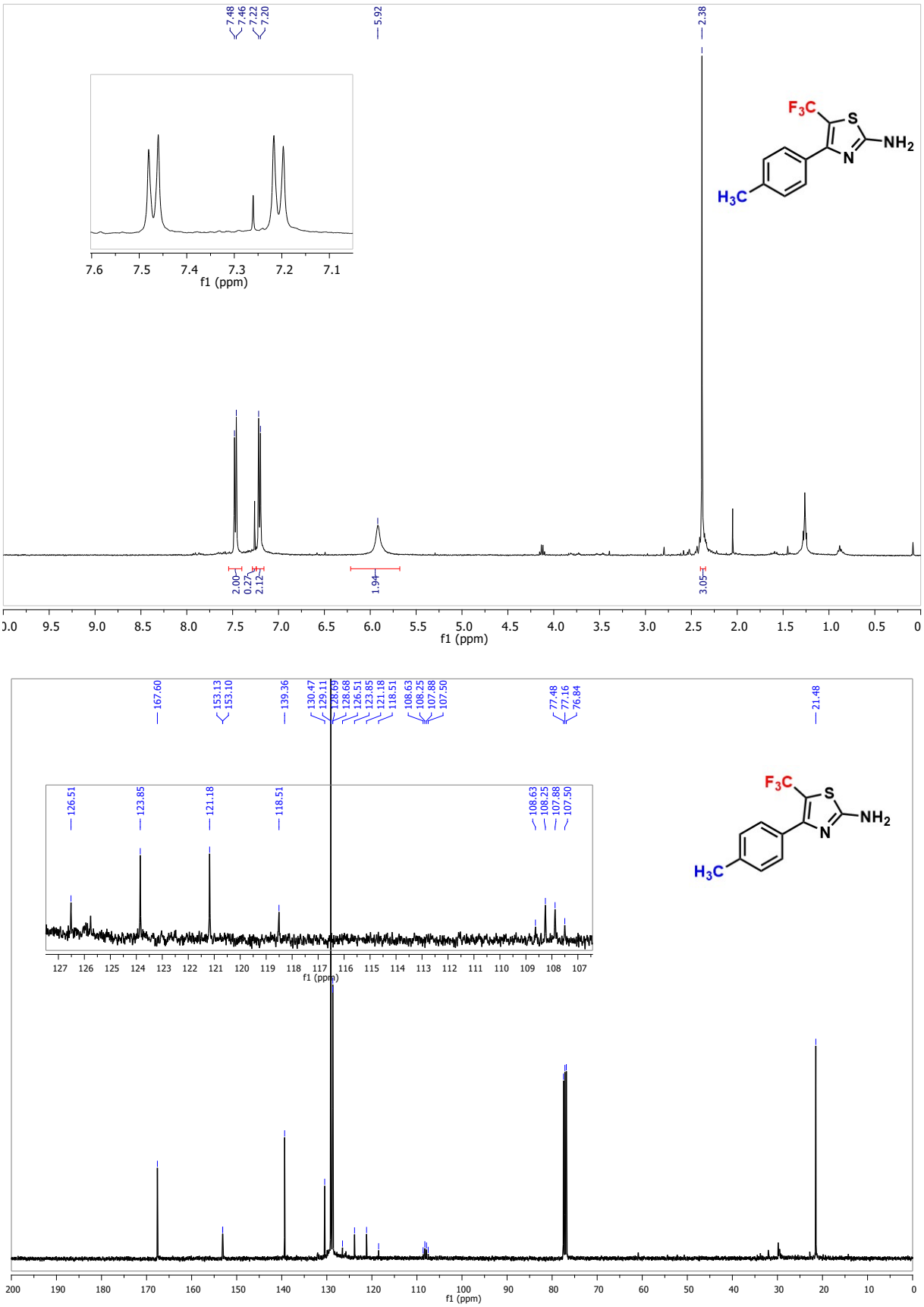
400 MHz ^{1}H-NMR spectra of **2f** ($CDCl_3$)



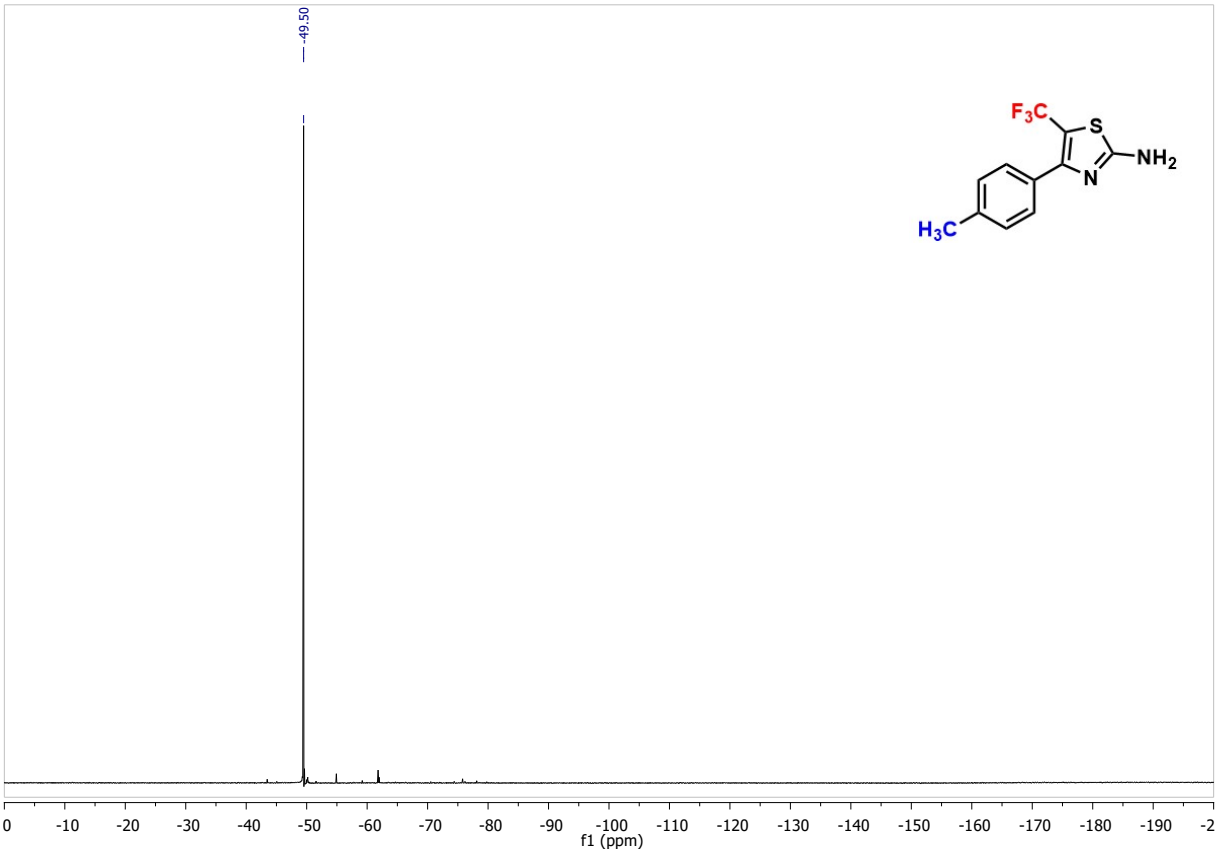
101 MHz ^{13}C-NMR spectra of **2f** ($CDCl_3$)



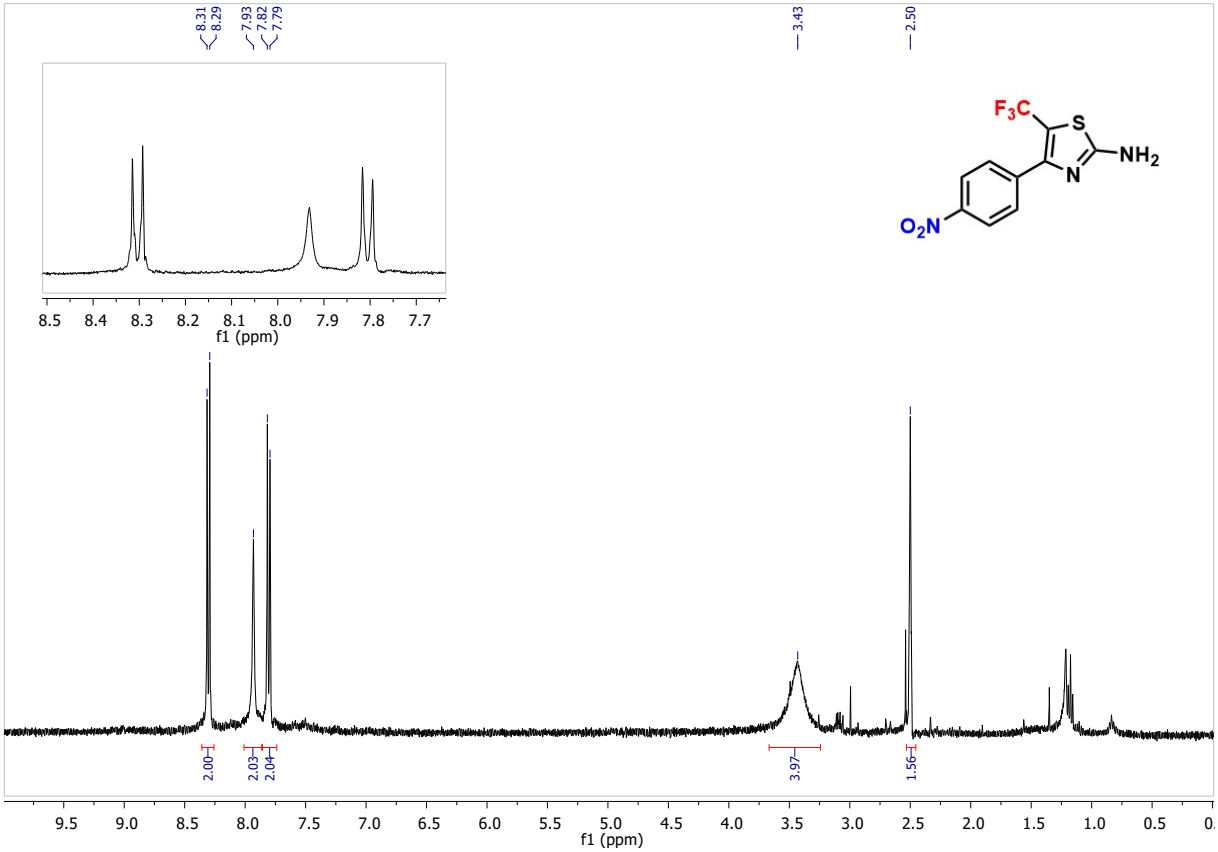
376 MHz ^{19}F-NMR spectra of **2f** ($CDCl_3$)



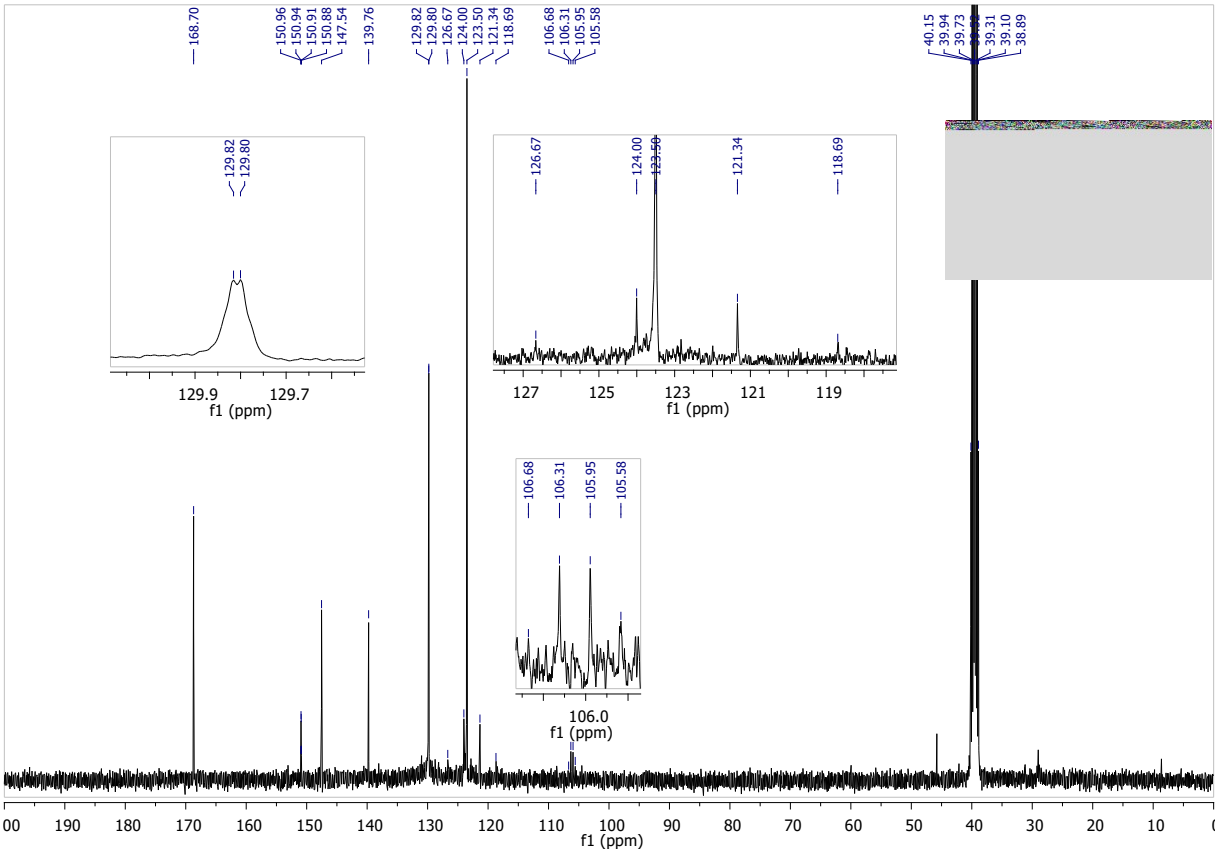
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **2g** ($CDCl_3$)



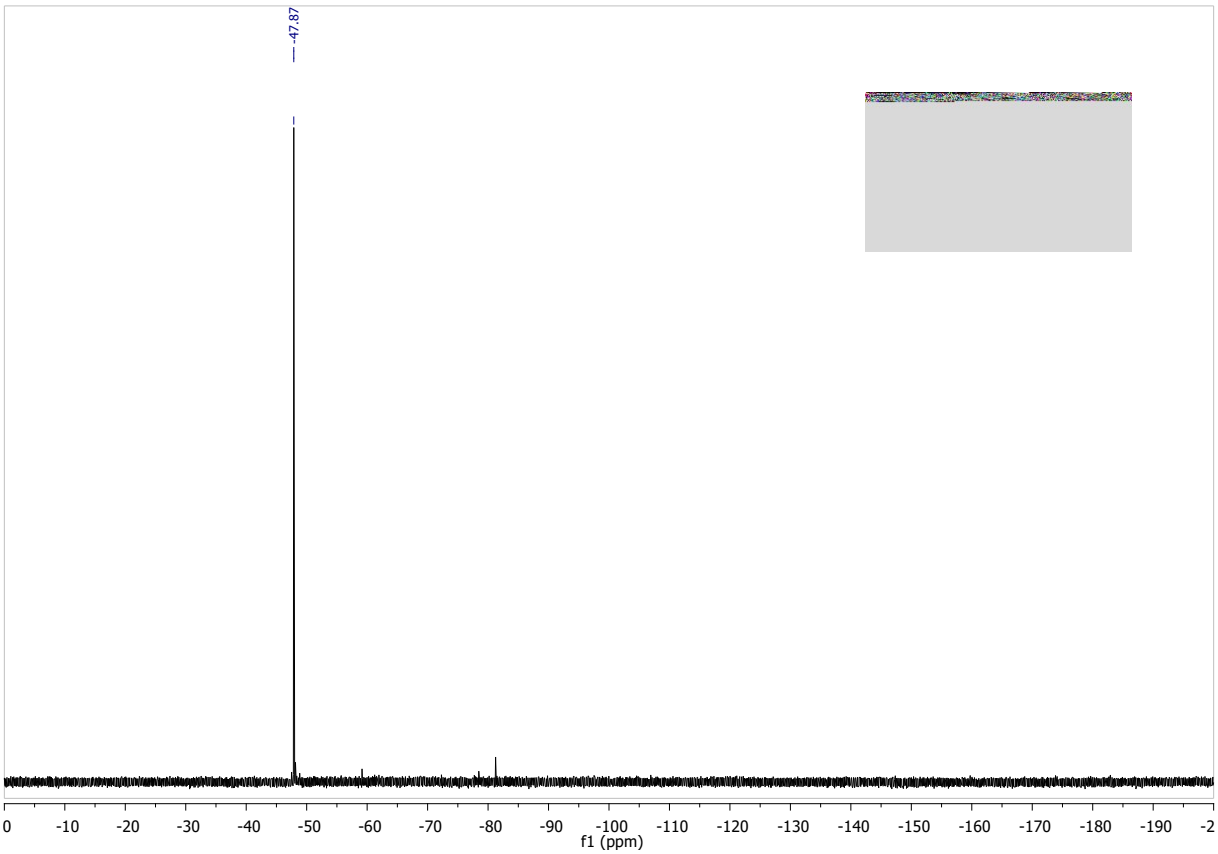
376 MHz ^{19}F-NMR spectra of **2g** ($CDCl_3$)



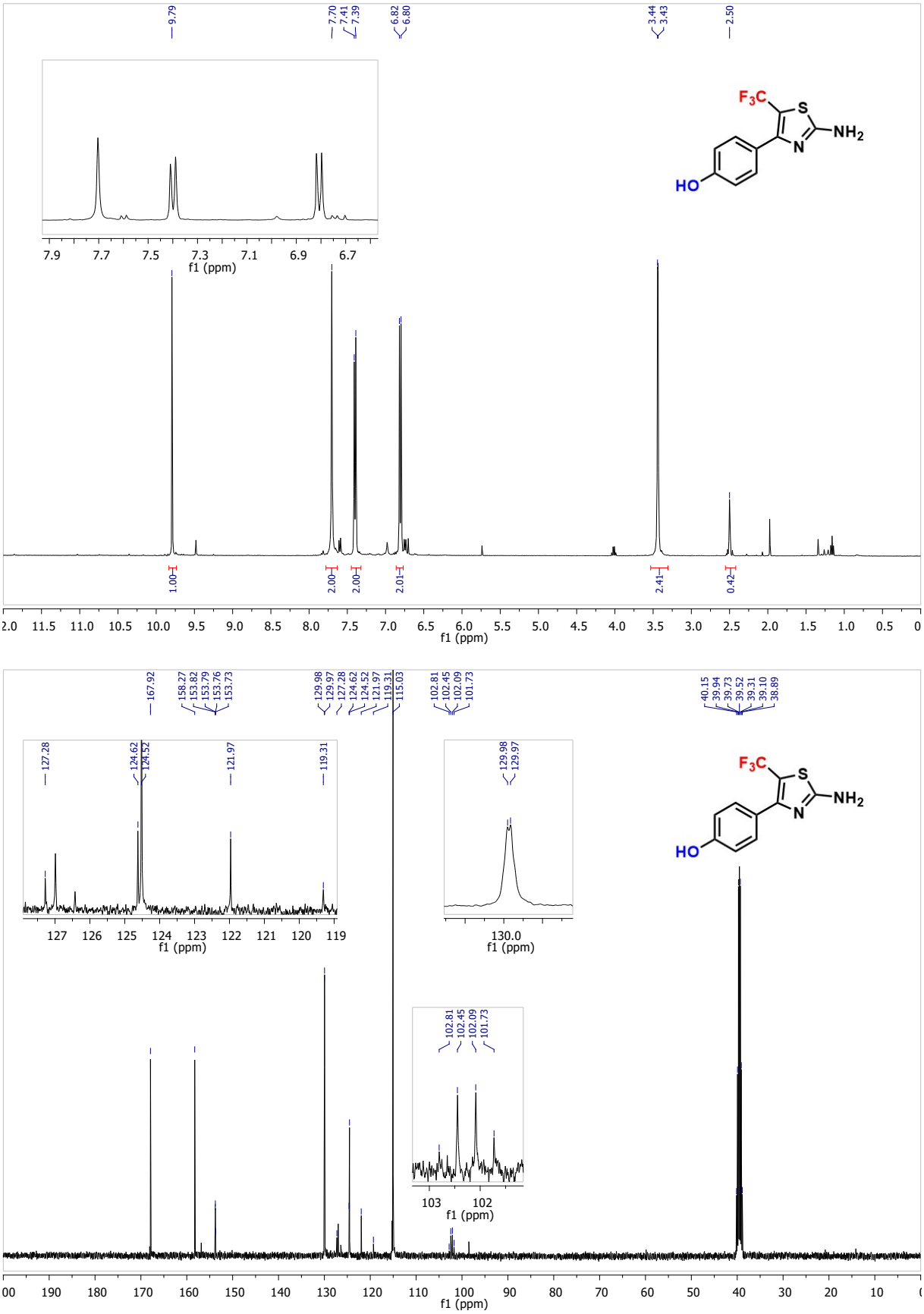
400 MHz ^{1}H-NMR spectra of **2h** ($DMSO\text{-}d_6$)



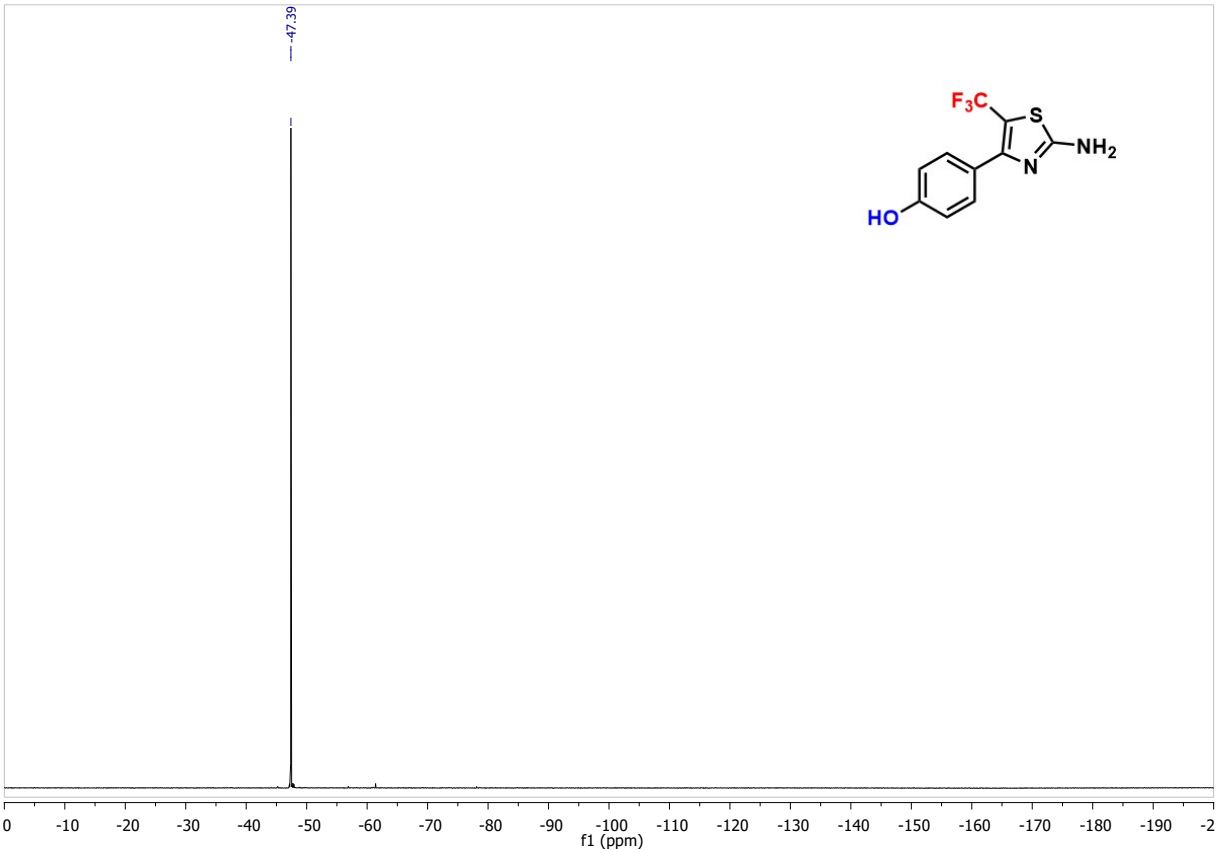
101 MHz ^{13}C-NMR spectra of **2h** (DMSO-d_6)



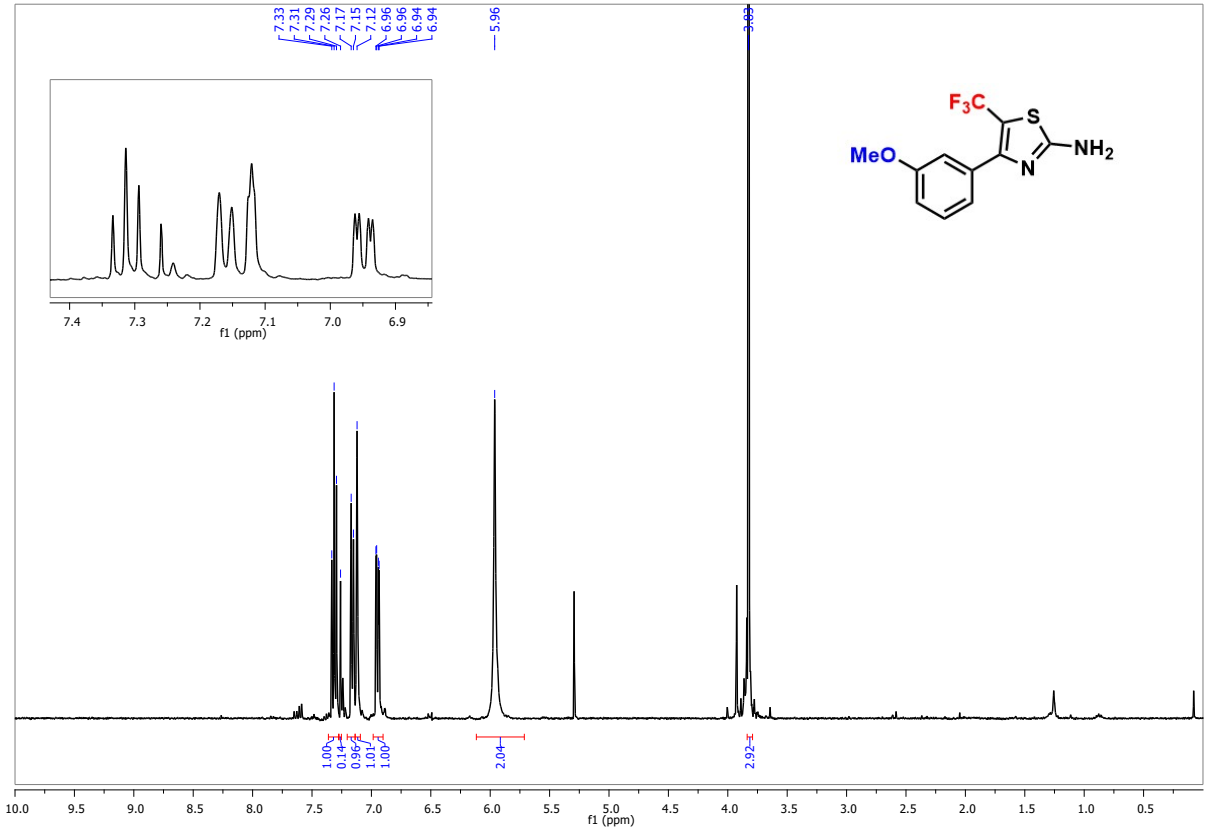
376 MHz ^{19}F-NMR spectra of **2h** (DMSO-d_6)



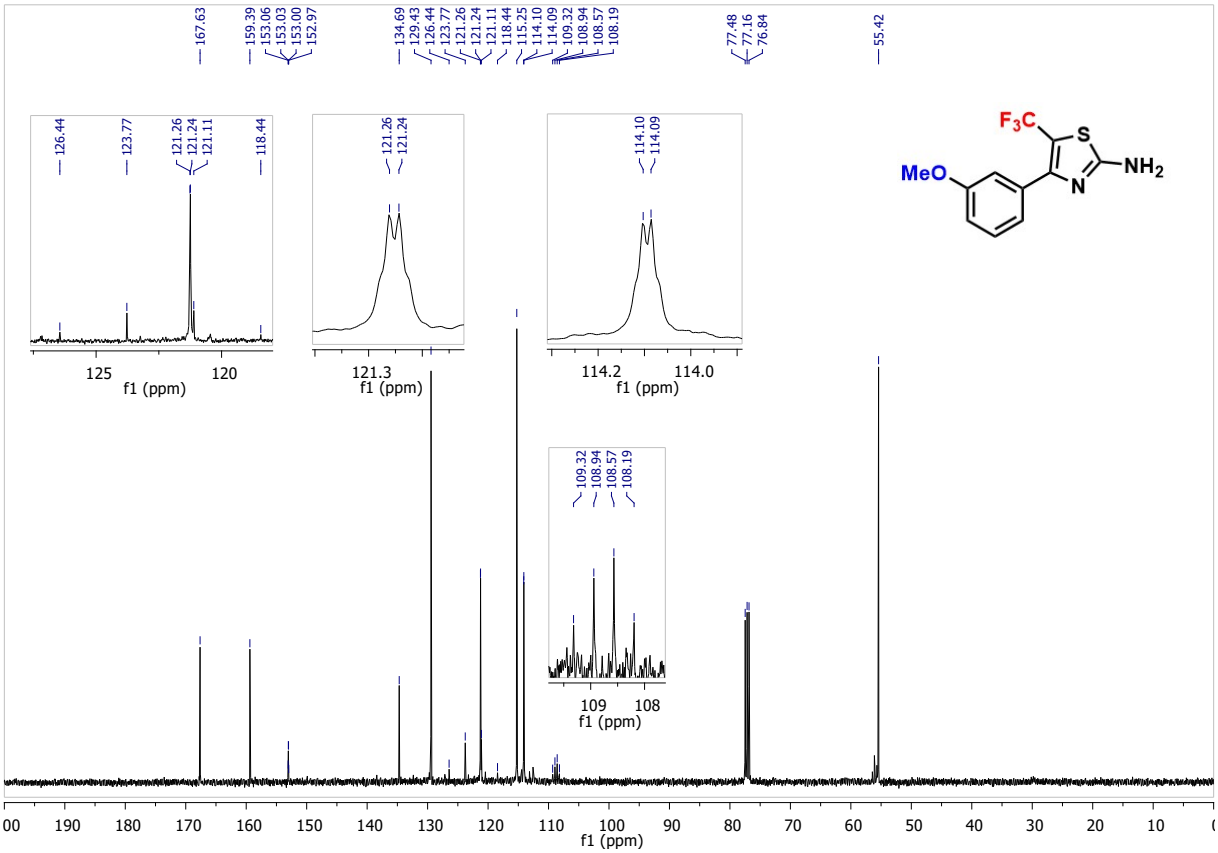
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **2i** (DMSO-d_6)



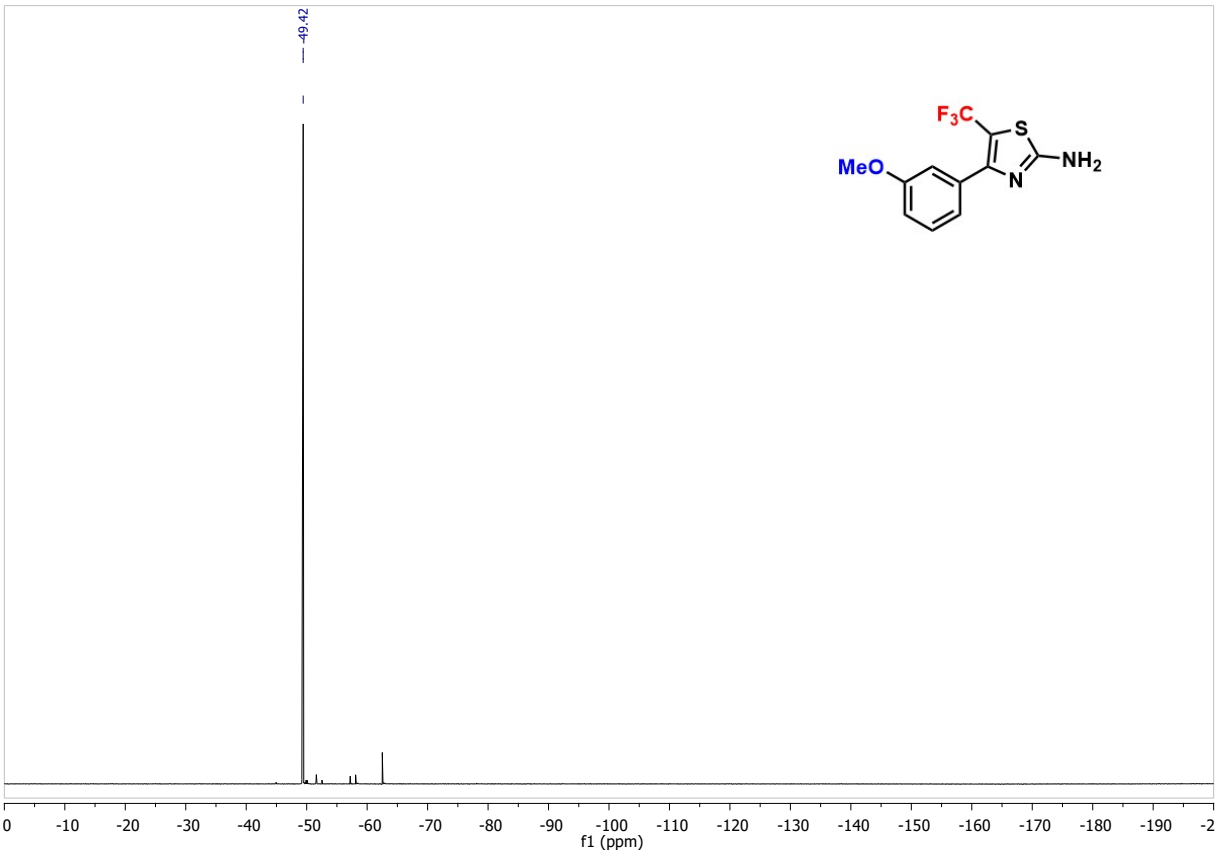
376 MHz ^{19}F-NMR spectra of **2i** (DMSO-d_6)



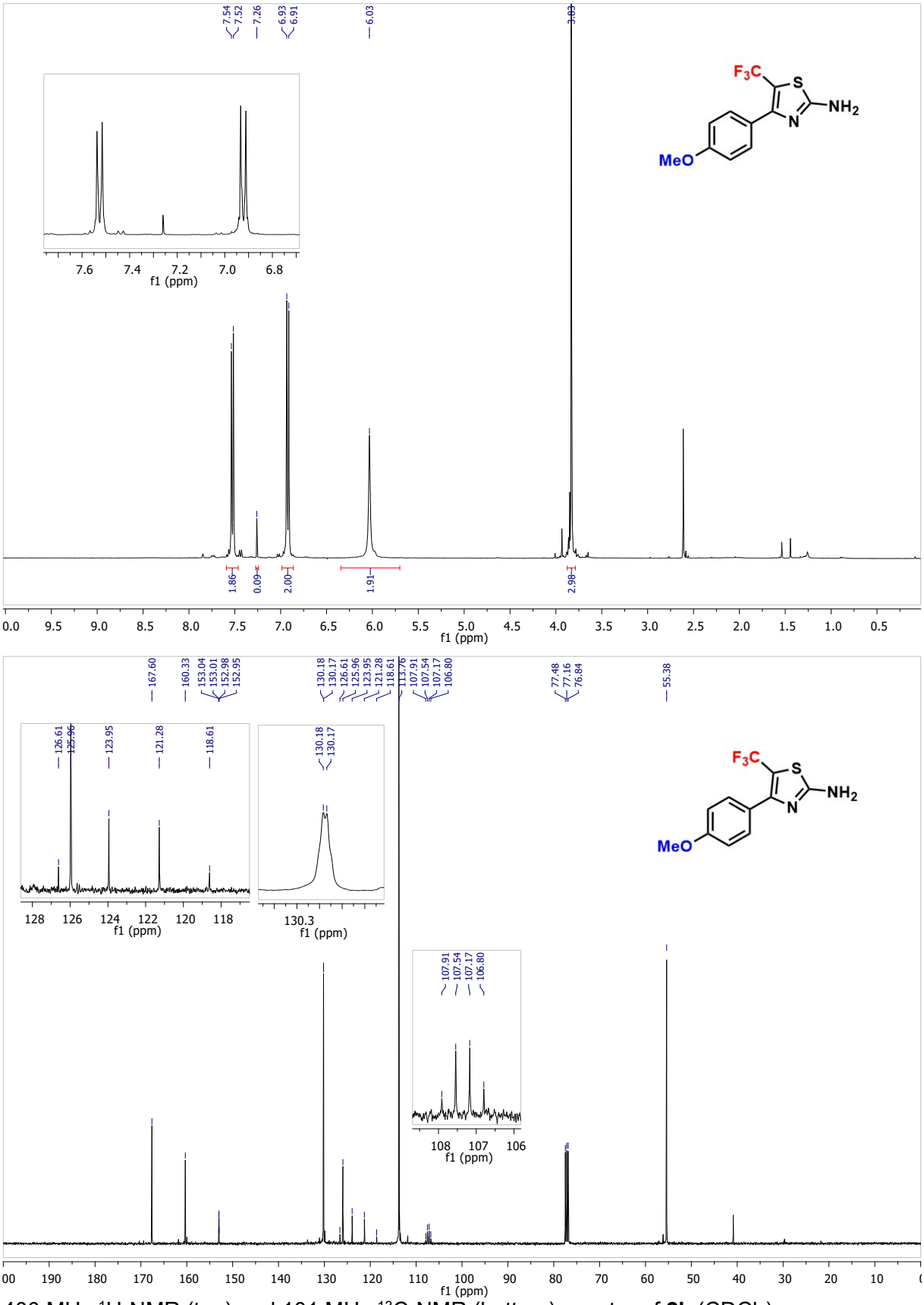
400 MHz ^{1}H-NMR spectra of **2j** ($CDCl_3$)



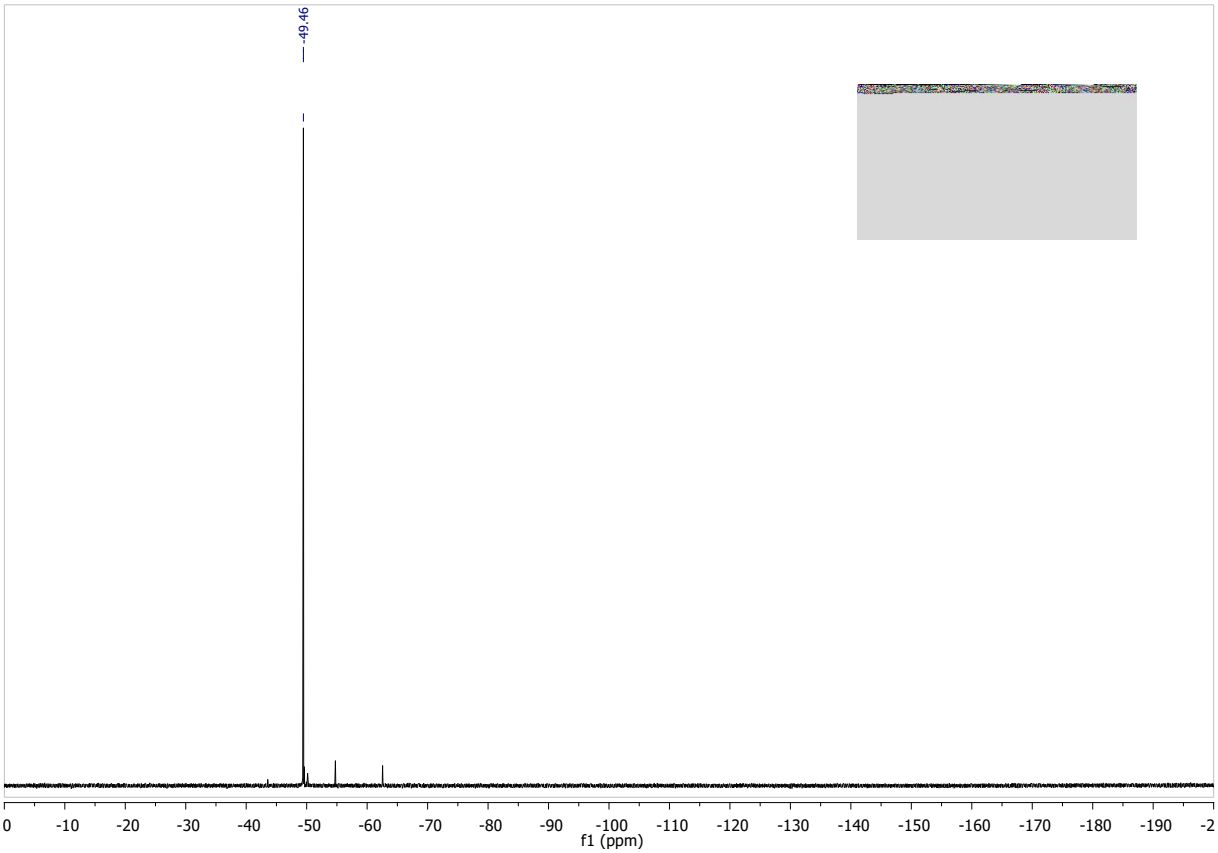
101 MHz ^{13}C-NMR spectra of **2j** ($CDCl_3$)



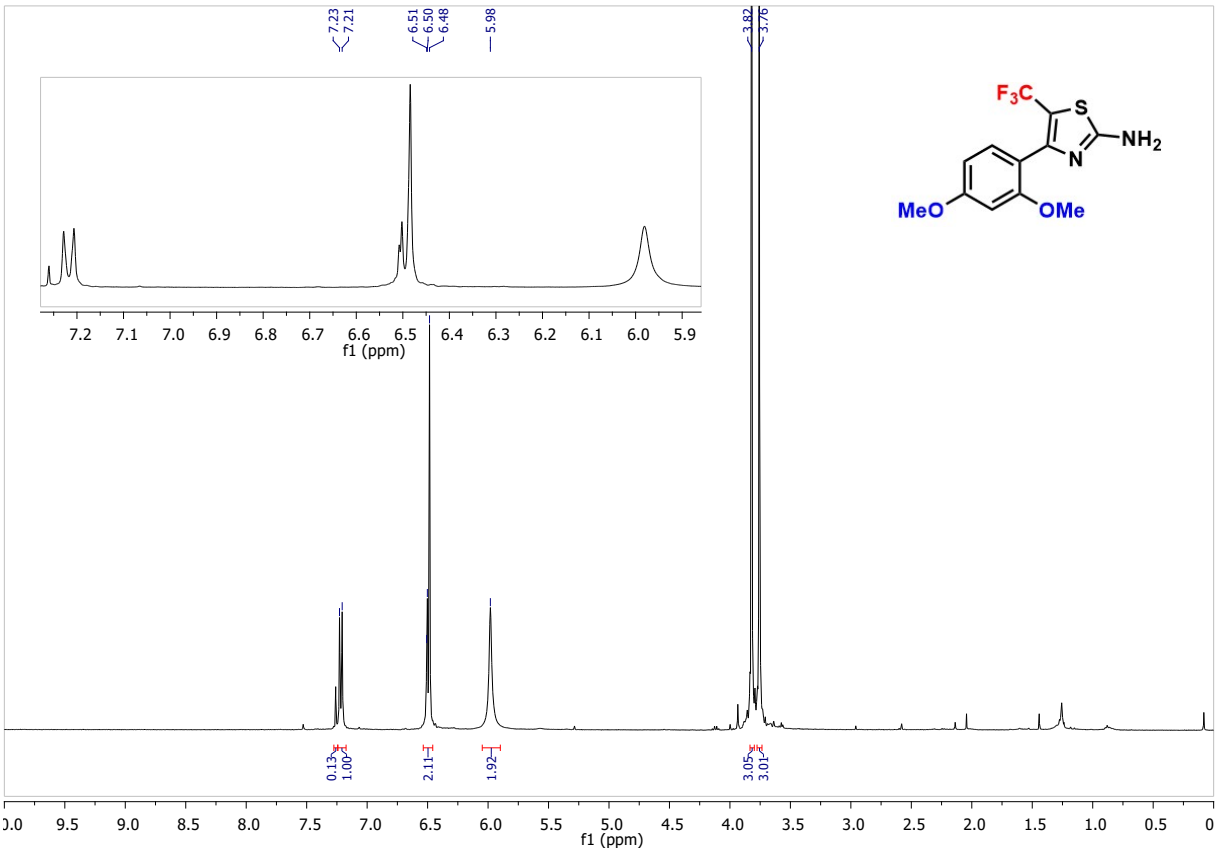
376 MHz ^{19}F-NMR spectra of **2j** ($CDCl_3$)



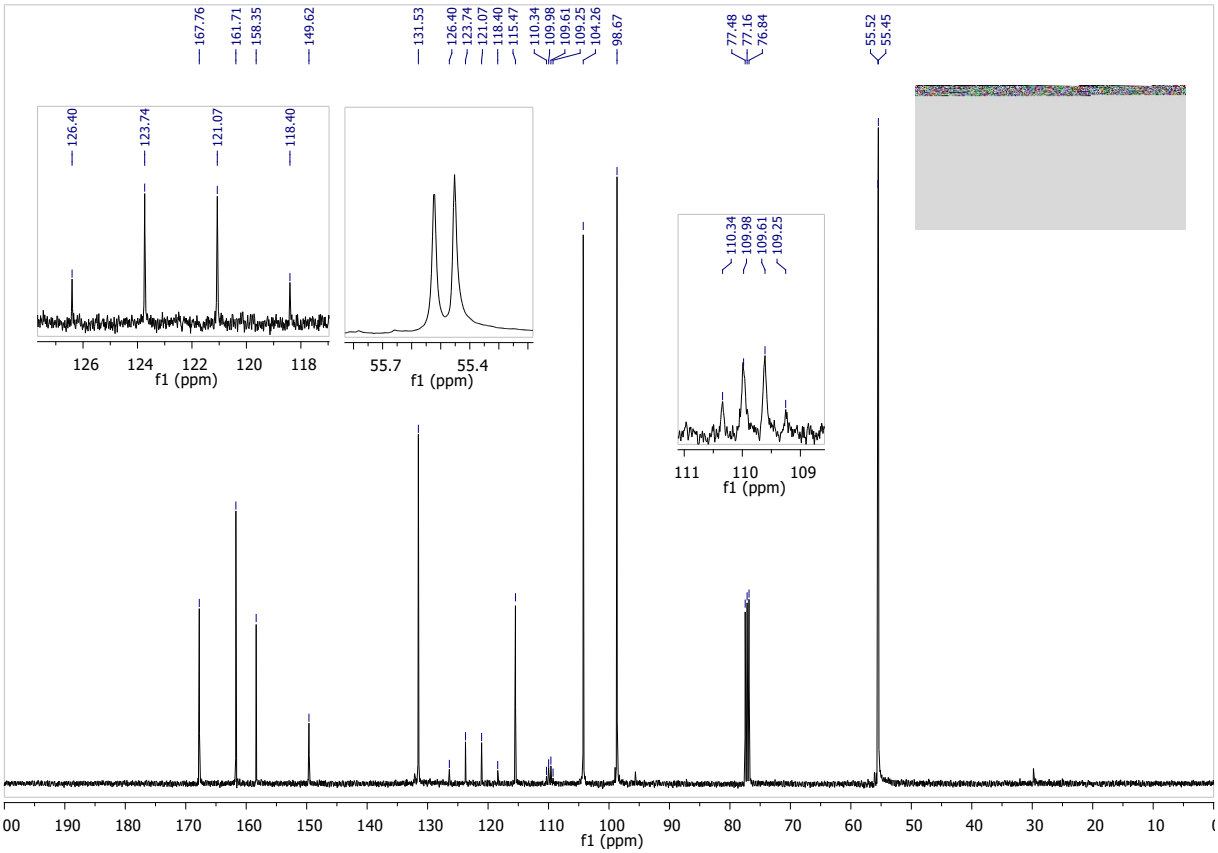
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **2k** ($CDCl_3$)



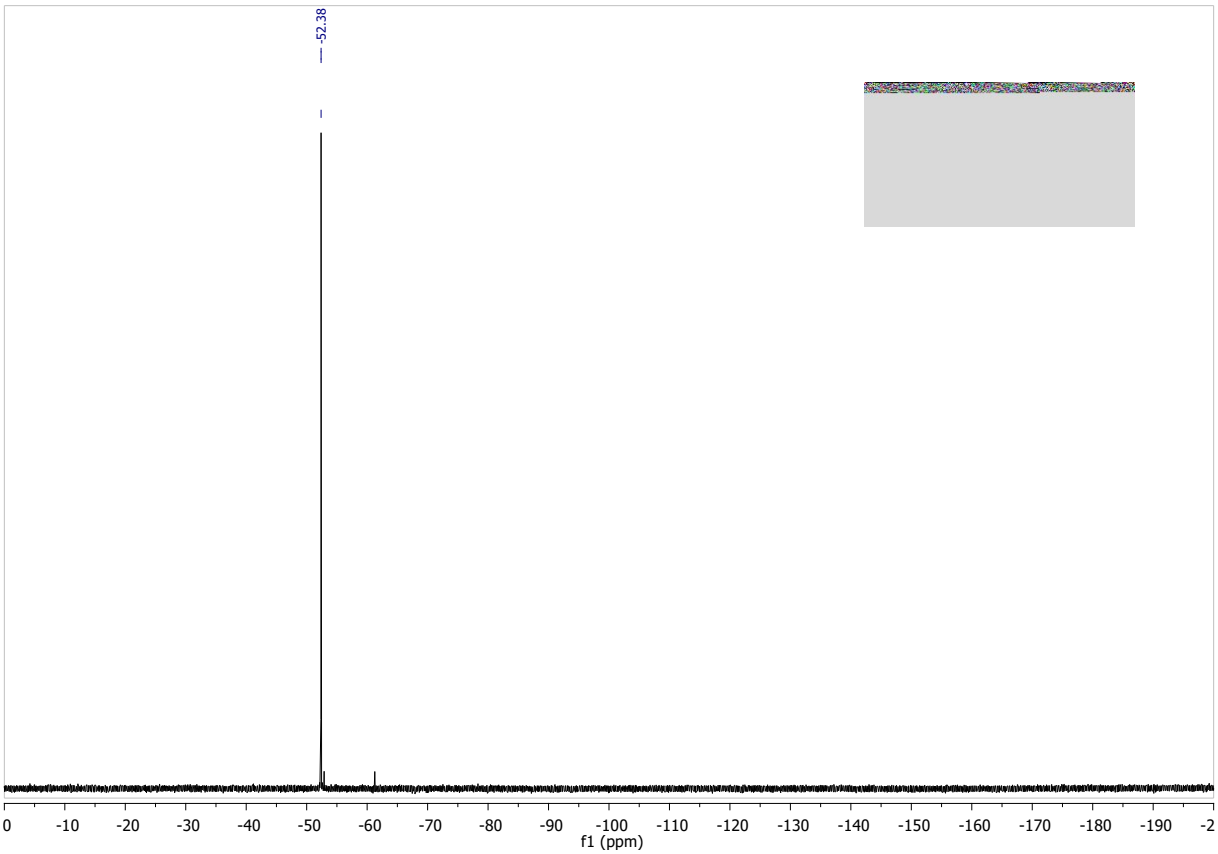
376 MHz ^{19}F-NMR spectra of **2k** ($CDCl_3$)



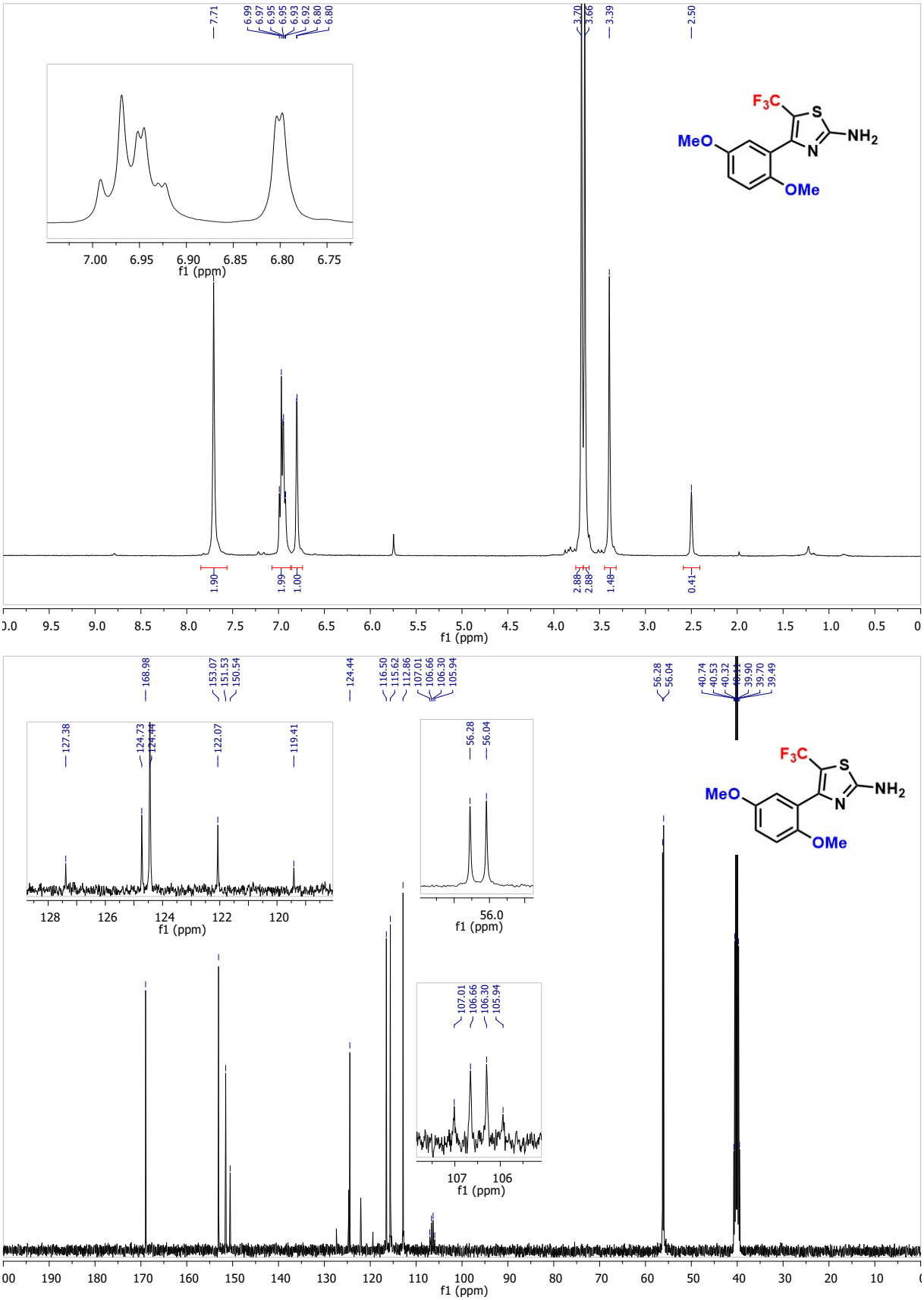
400 MHz ^{1}H-NMR spectra of **2l** ($CDCl_3$)



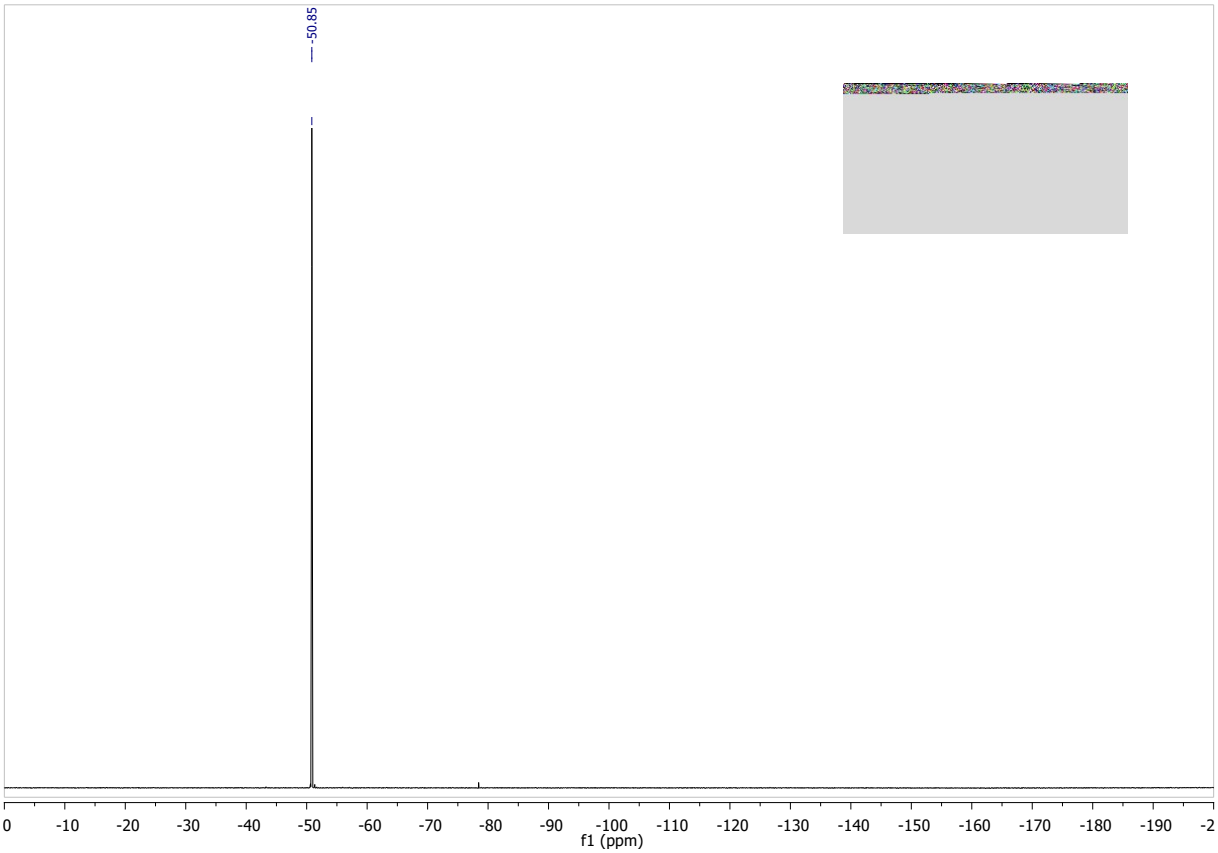
101 MHz ^{13}C-NMR spectra of **2l** ($CDCl_3$)



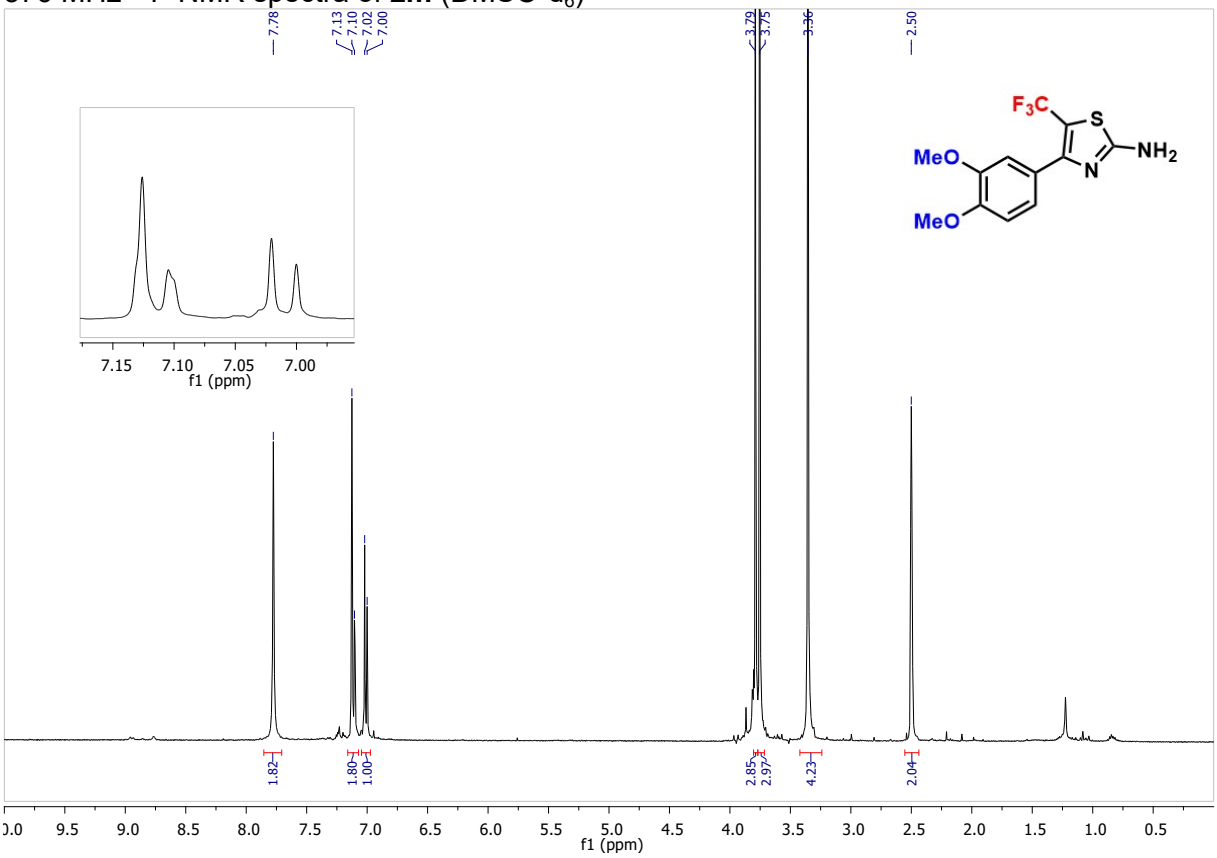
376 MHz ^{19}F-NMR spectra of **2l** ($CDCl_3$)



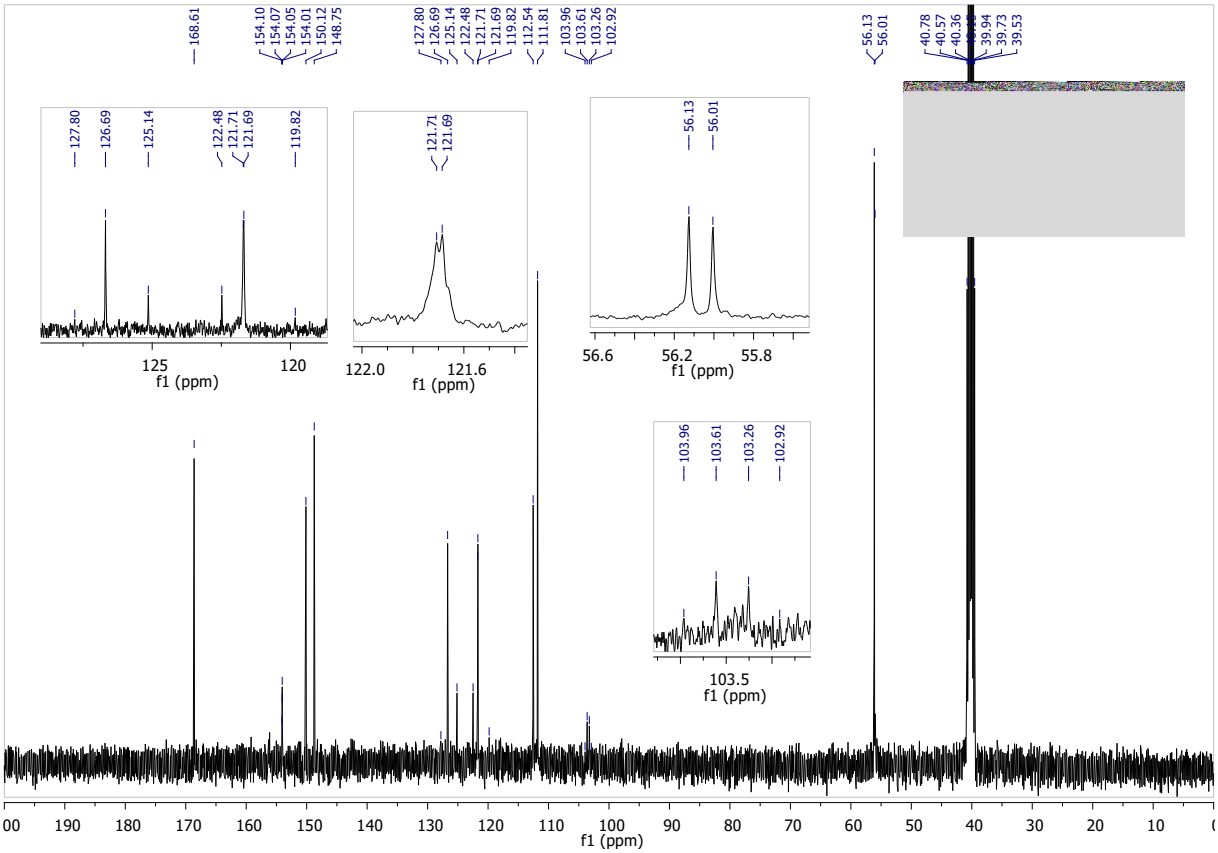
400 MHz ^{1}H-NMR (top) and 101 MHz ^{13}C-NMR (bottom) spectra of **2m** (DMSO-d_6)



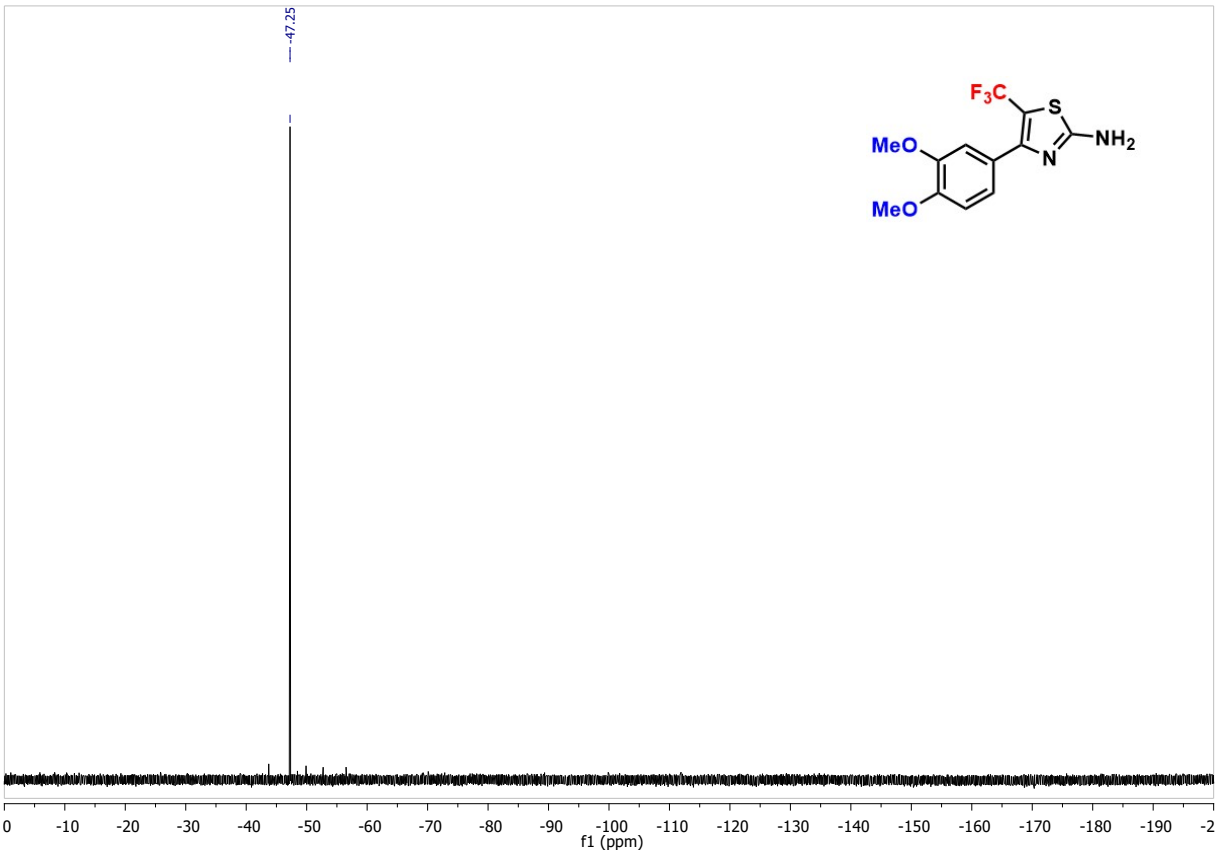
376 MHz ^{19}F-NMR spectra of **2m** (DMSO-d_6)



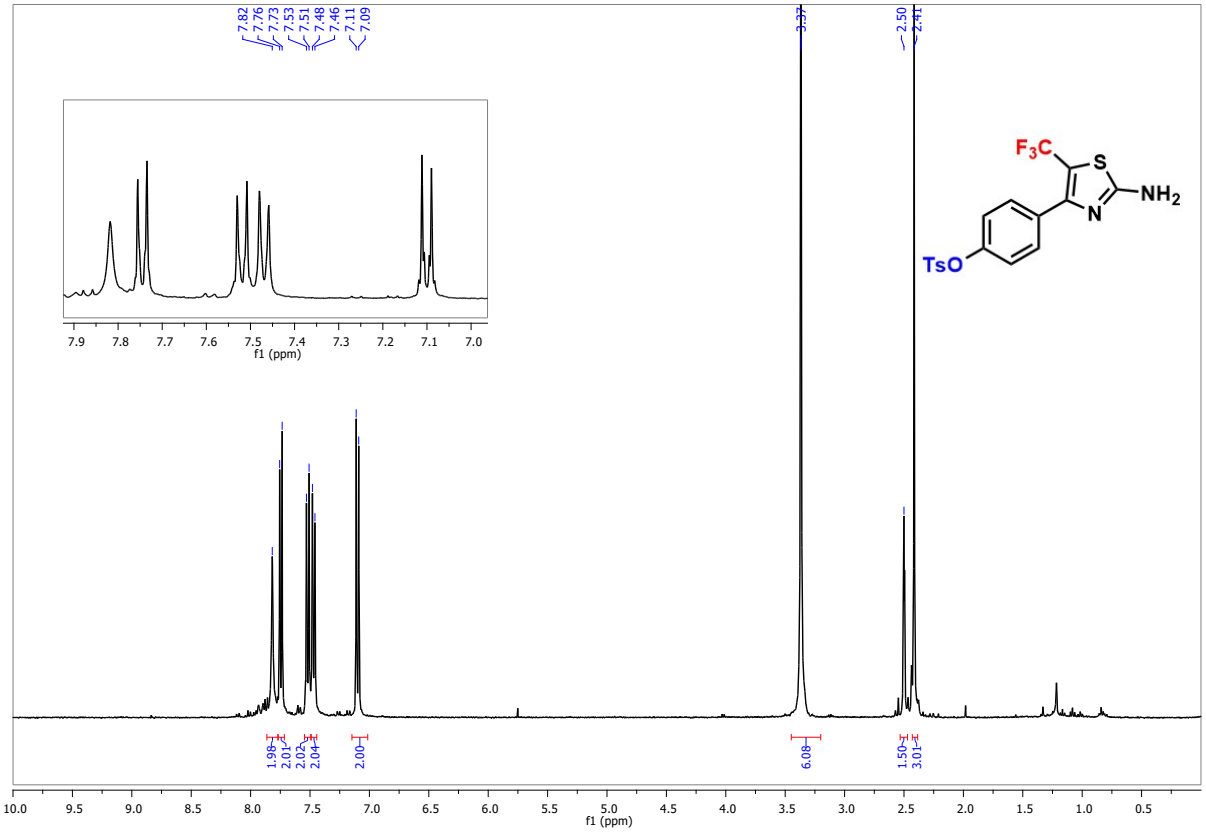
400 MHz ^{1}H-NMR spectra of **2n** (DMSO-d_6)



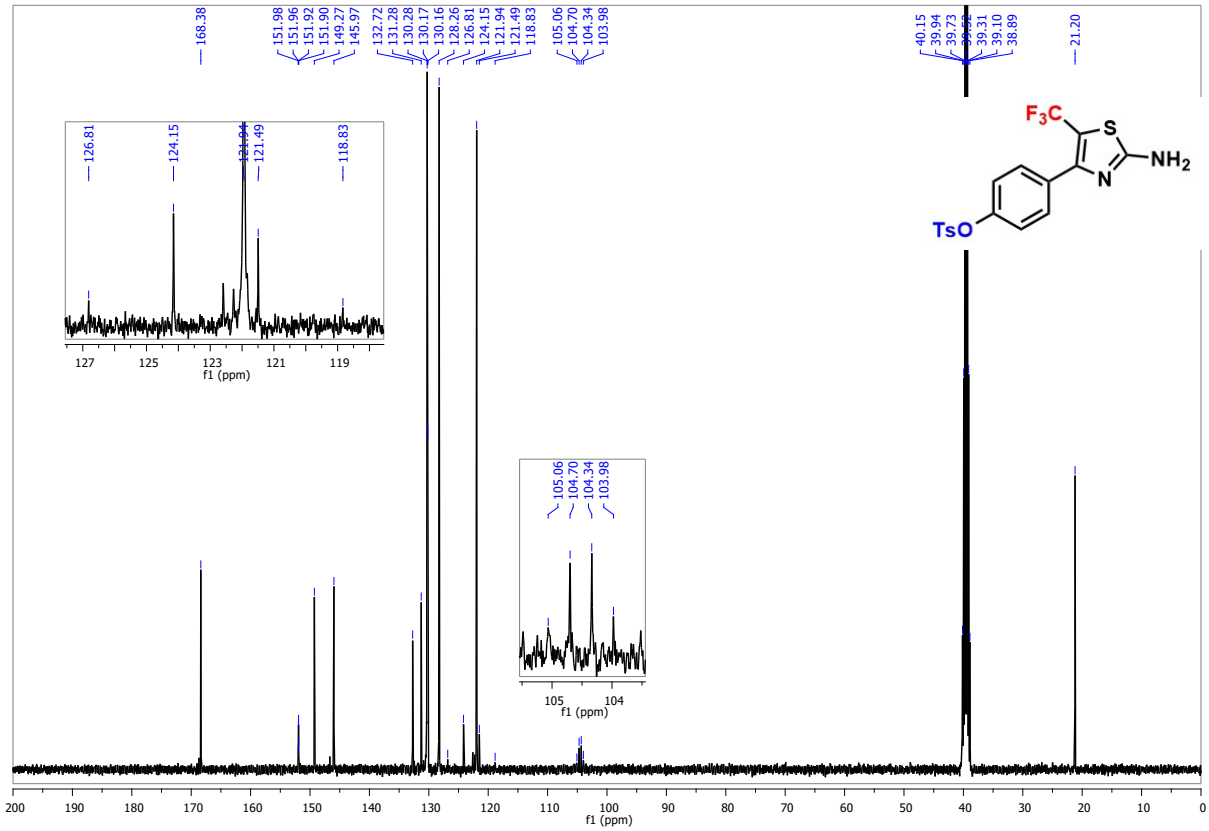
101 MHz ^{13}C-NMR spectra of **2n** (DMSO-d_6)



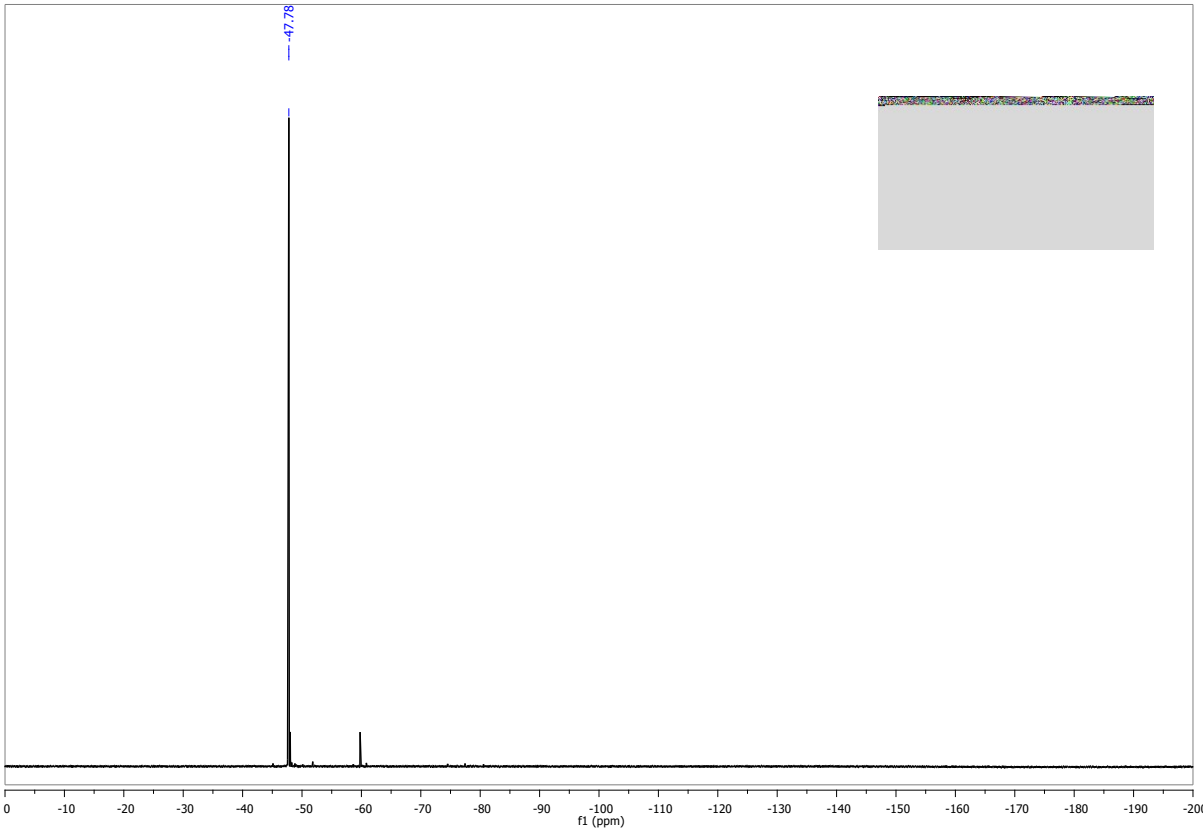
376 MHz ^{19}F-NMR spectra of **2n** (DMSO-d_6)



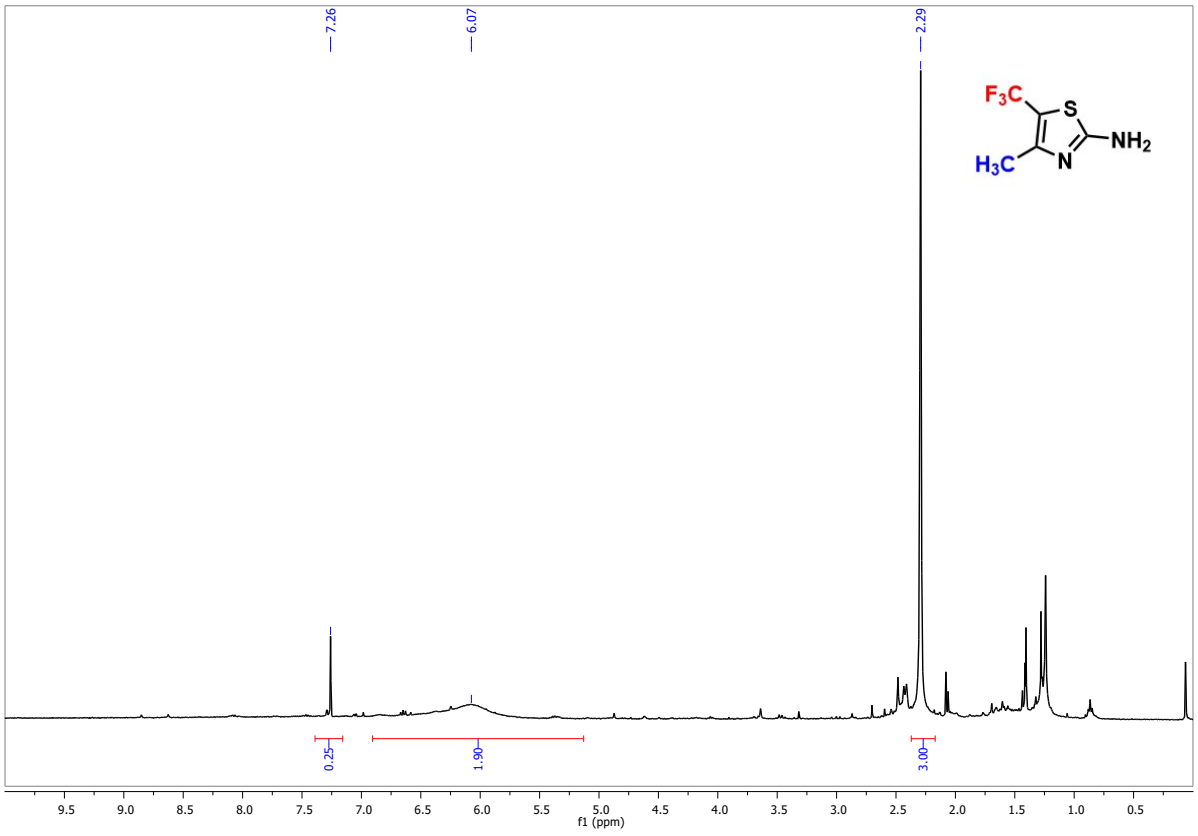
400 MHz ^{1}H-NMR spectra of **2o** (DMSO-d_6)



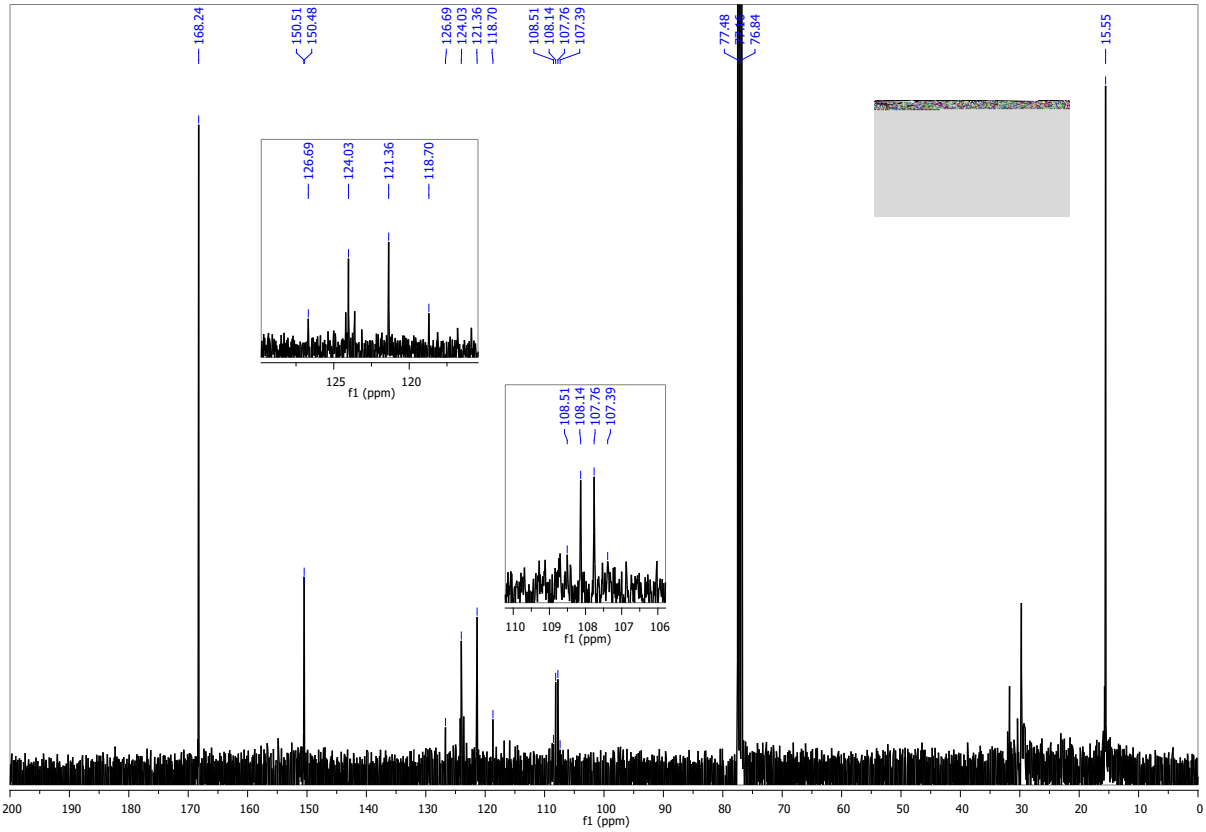
101 MHz ^{13}C-NMR spectra of **2o** (DMSO-d_6)



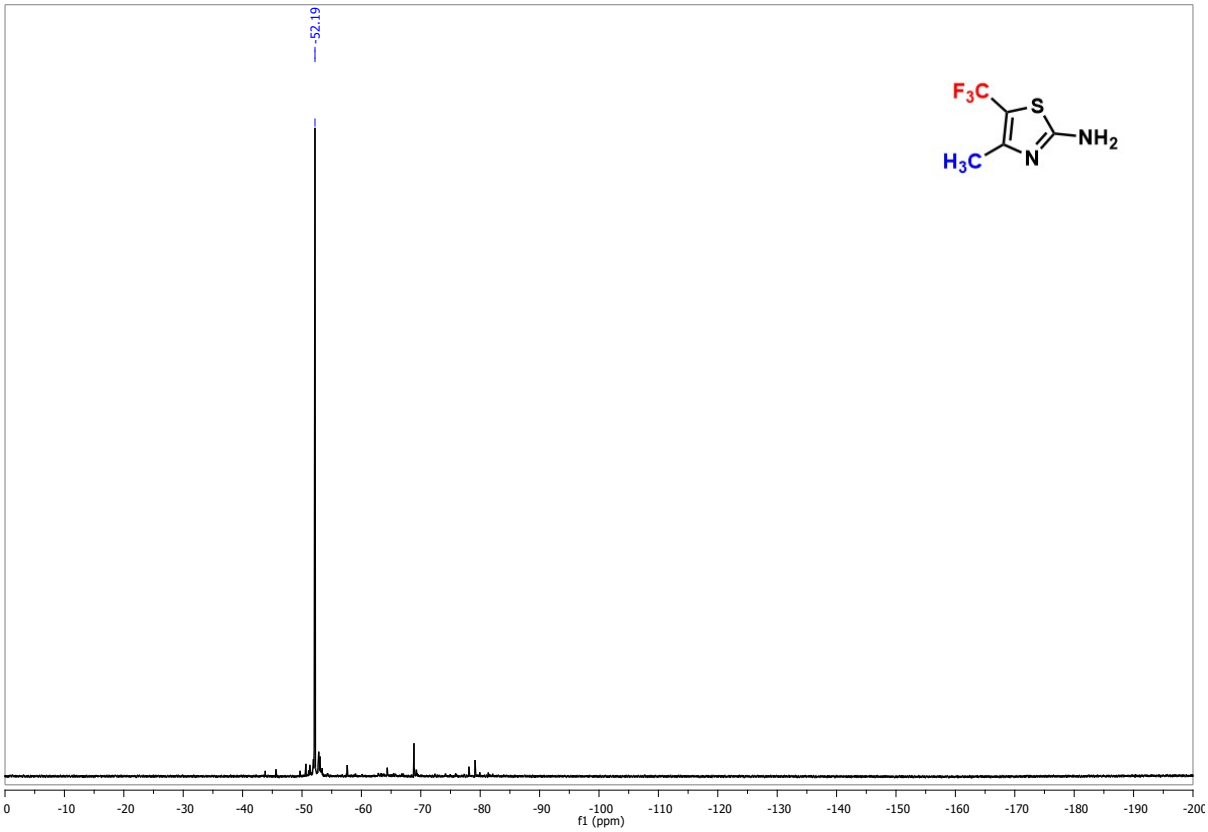
376 MHz ^{19}F-NMR spectra of **2o** (DMSO-d_6)



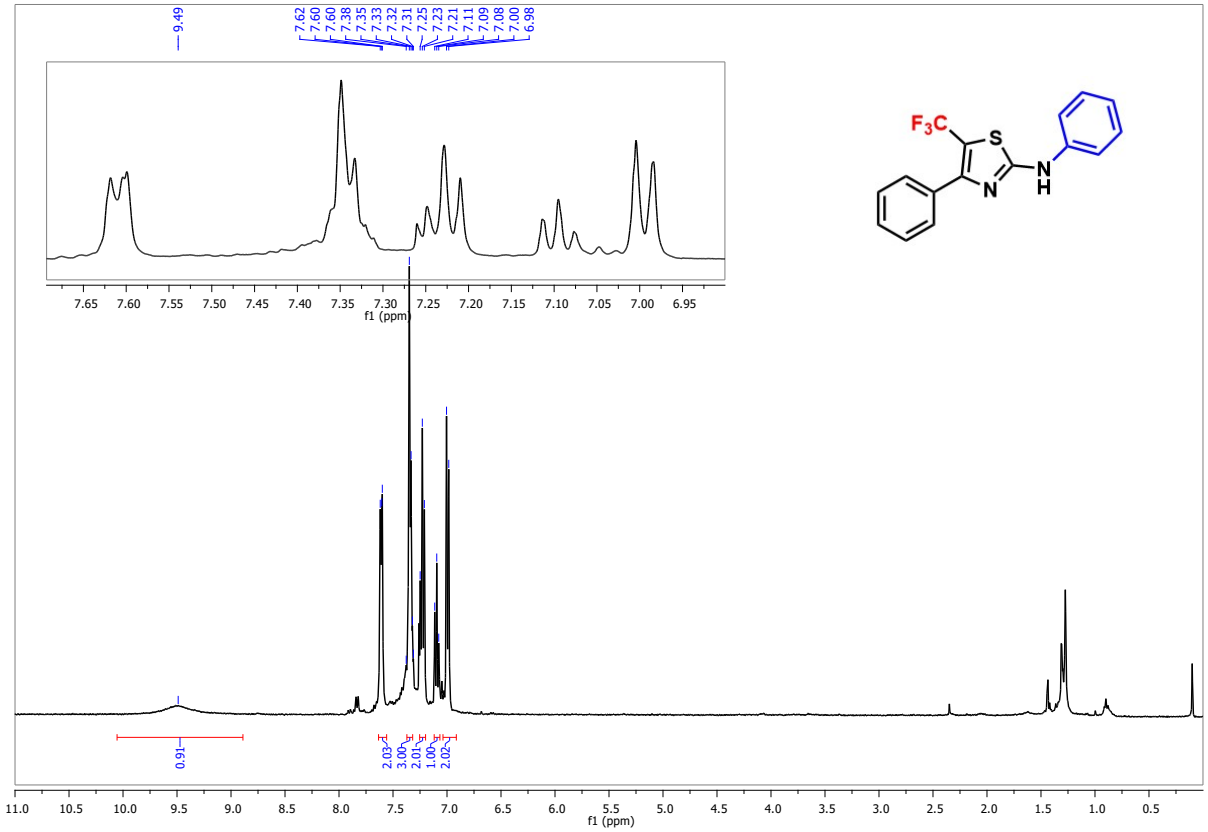
400 MHz ^{1}H-NMR spectra of **2p** ($CDCl_3$)



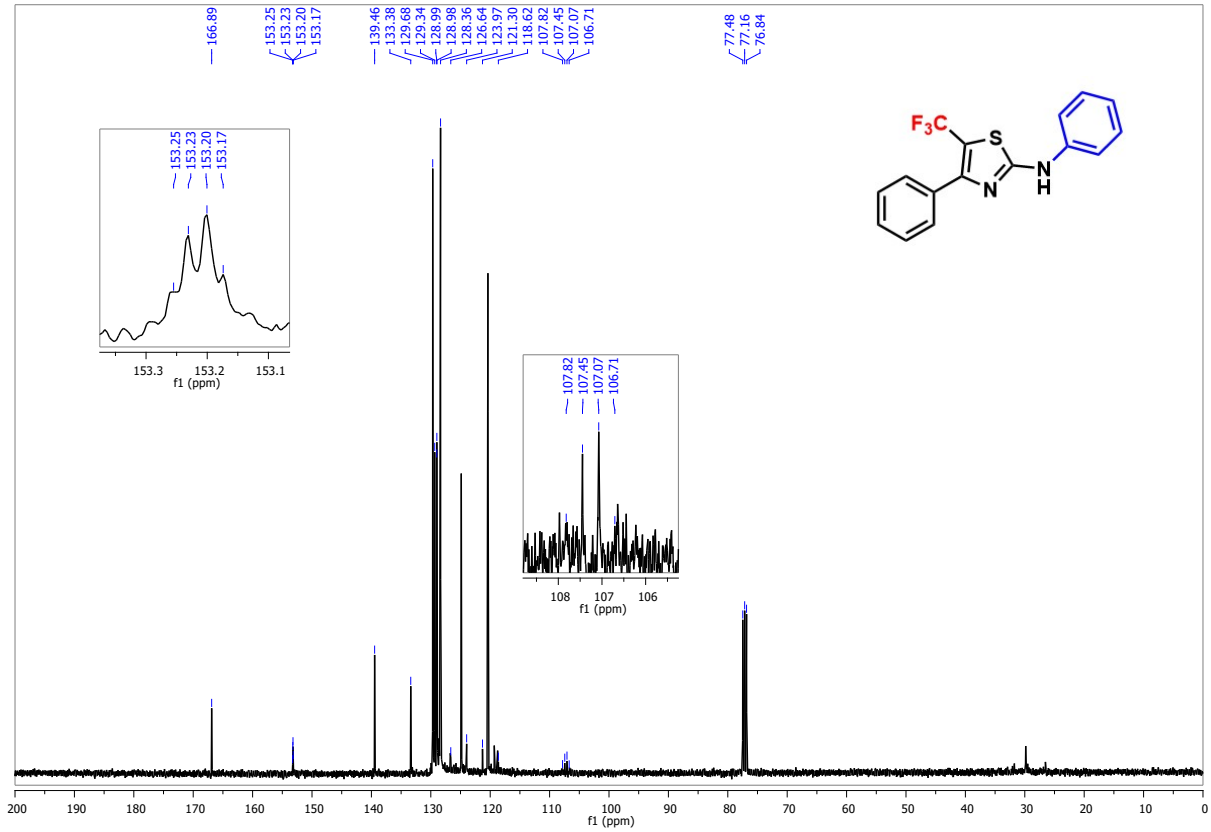
101 MHz ^{13}C-NMR spectra of **2p** ($CDCl_3$)



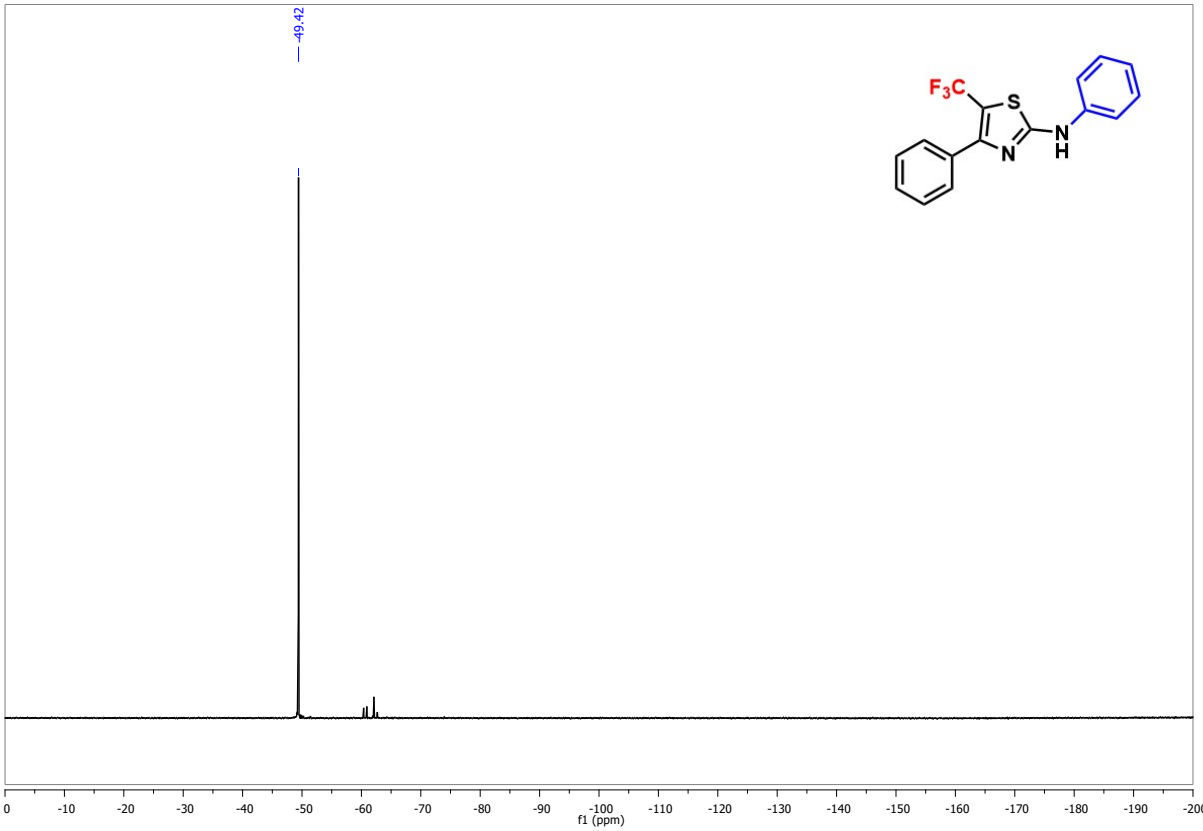
376 MHz ^{19}F-NMR spectra of **2p** ($CDCl_3$)



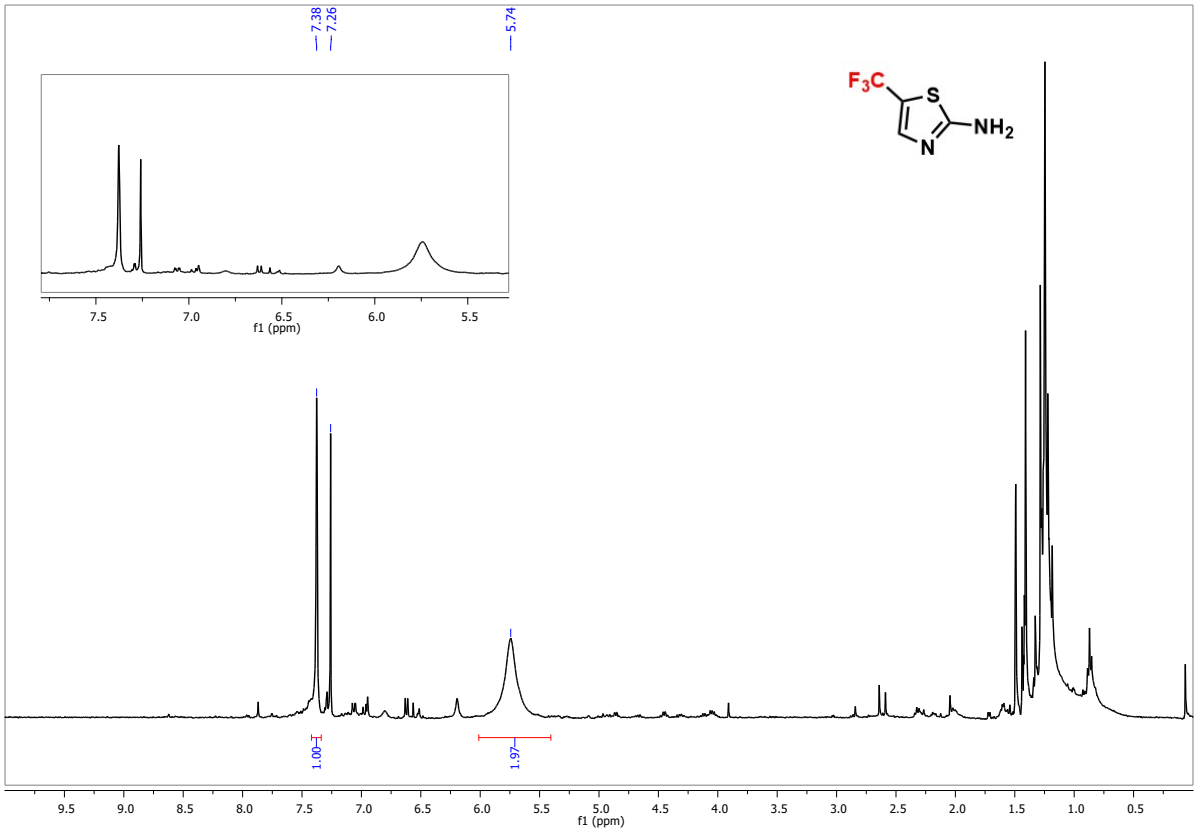
400 MHz ^{1}H-NMR spectra of **2r** ($CDCl_3$)



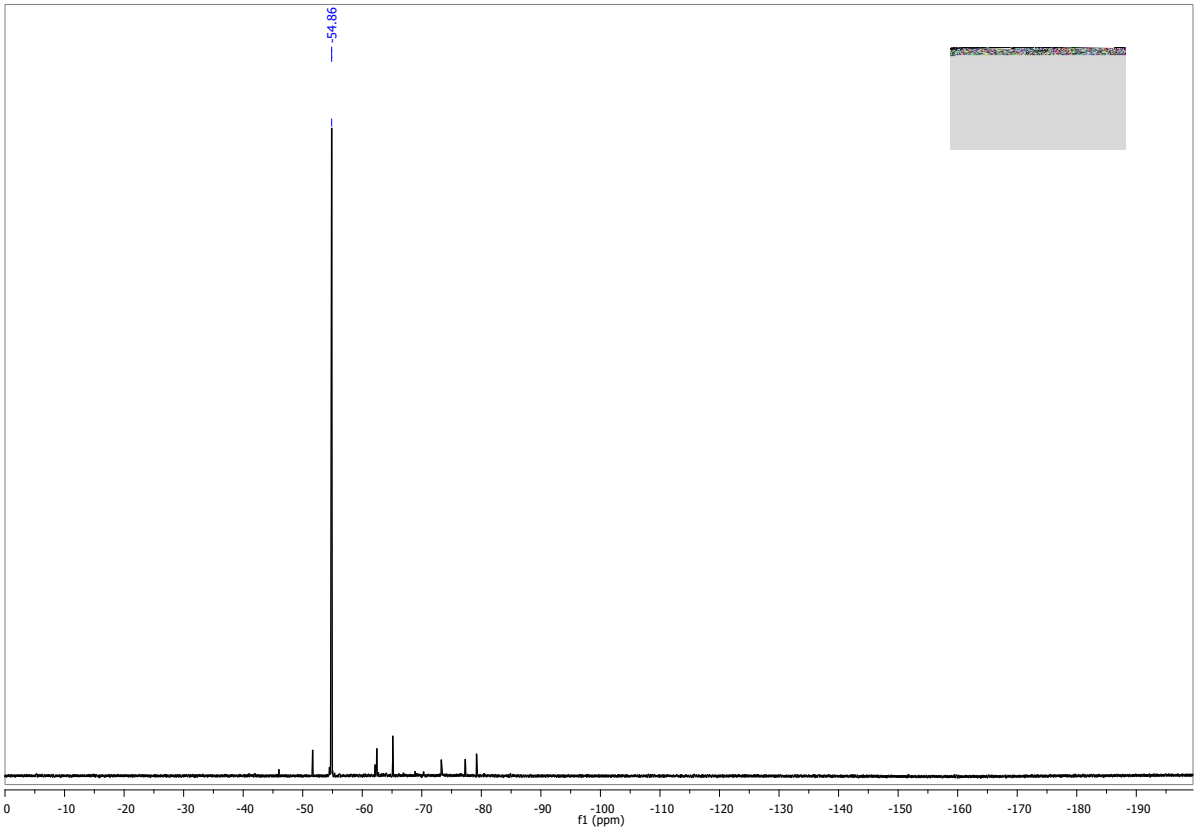
101 MHz ^{13}C-NMR spectra of **2r** ($CDCl_3$)



376 MHz ^{19}F-NMR spectra of **2r** ($CDCl_3$)

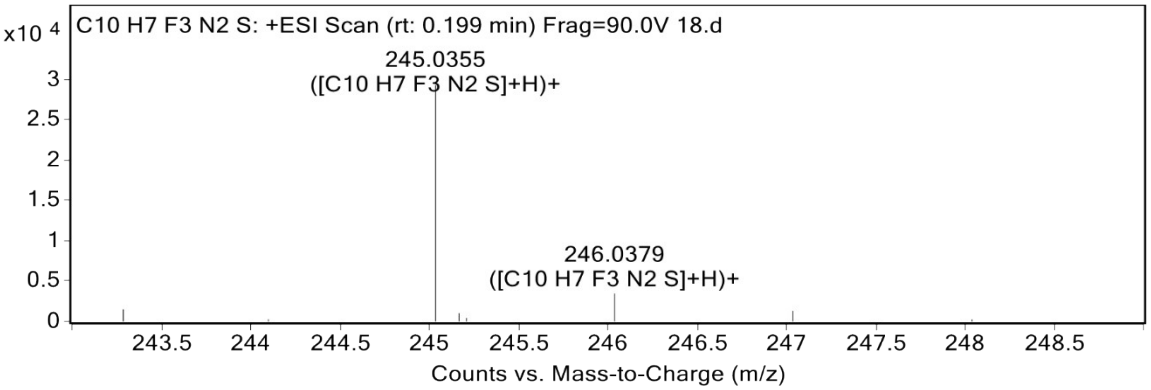


400 MHz ^{1}H-NMR spectra of **2s** ($CDCl_3$)

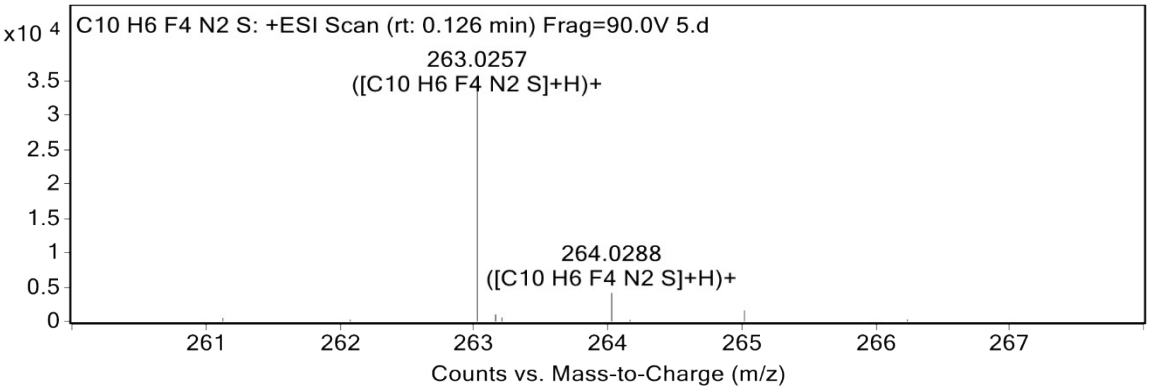


376 MHz ^{19}F-NMR spectra of **2s** ($CDCl_3$)

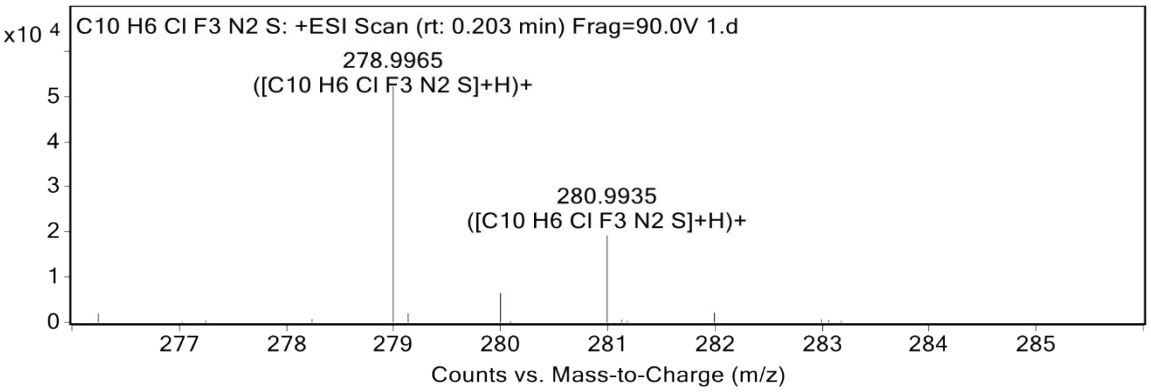
HRMS spectrums



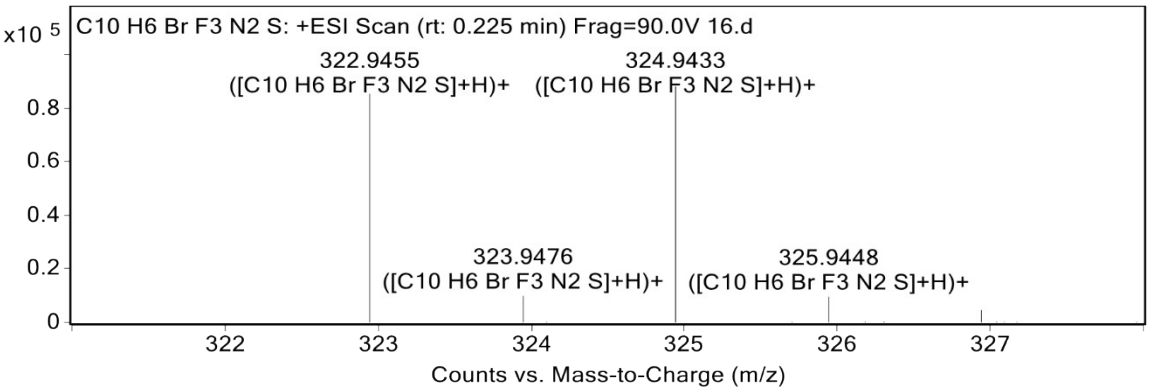
HRMS spectrum of **2a**



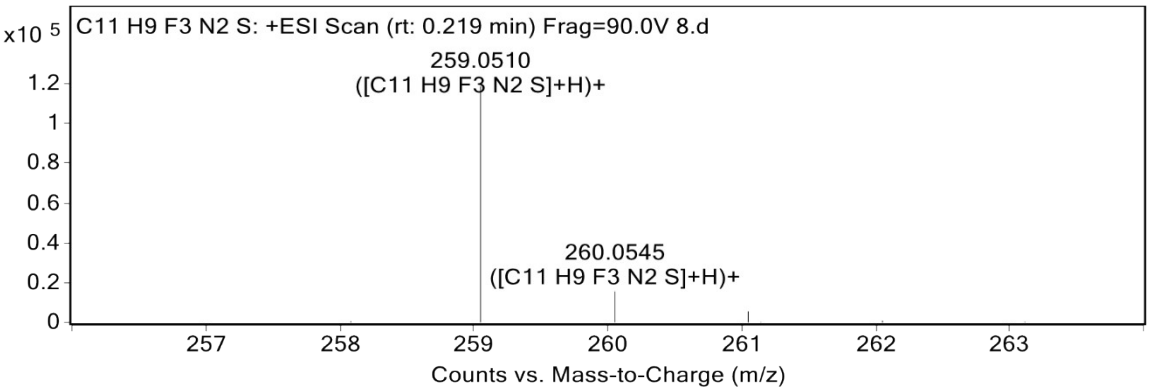
HRMS spectrum of **2b**



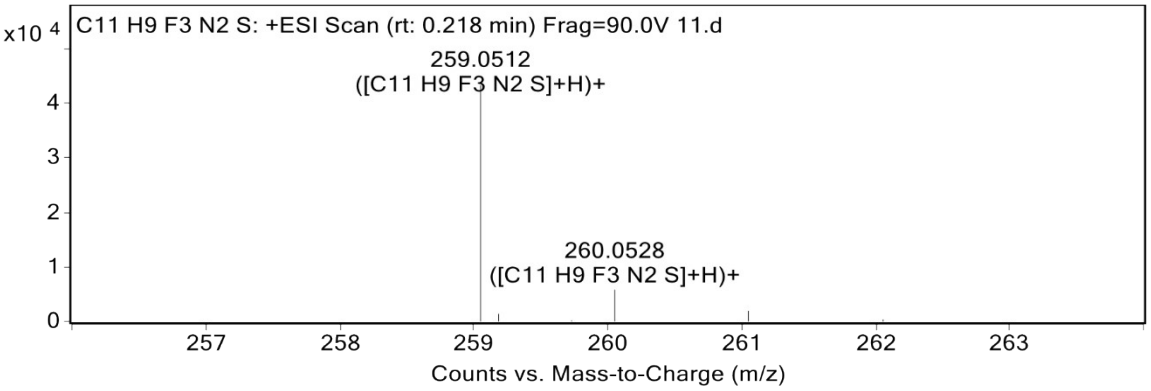
HRMS spectrum of **2c**



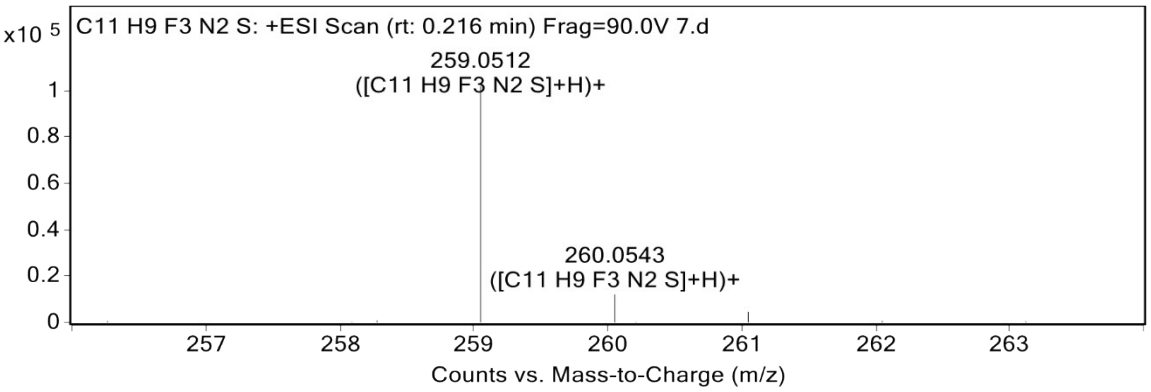
HRMS spectrum of **2d**



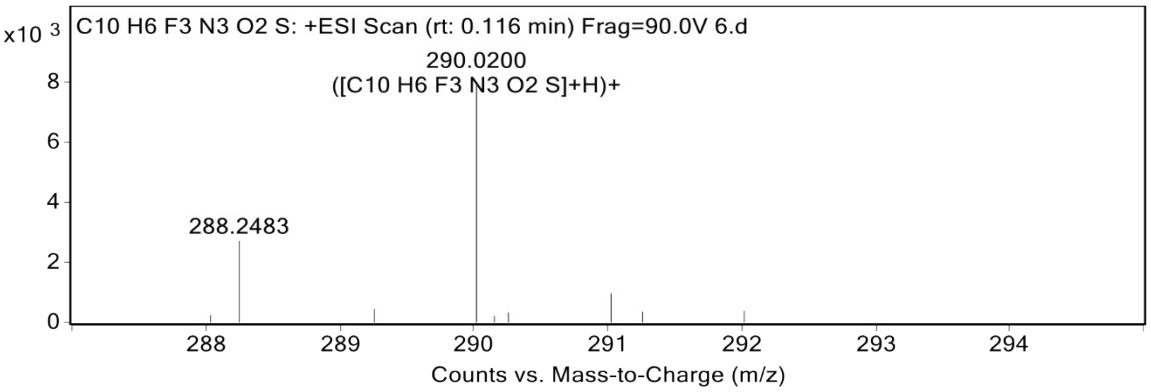
HRMS spectrum of **2e**



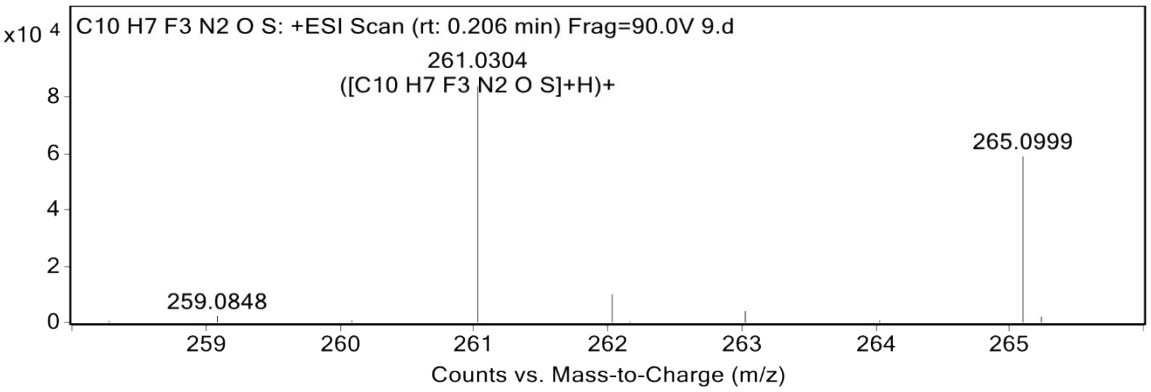
HRMS spectrum of **2f**



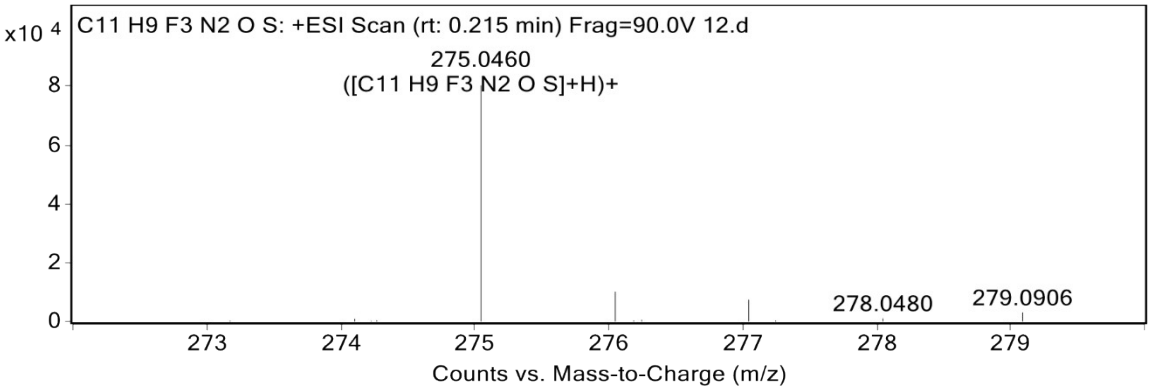
HRMS spectrum of **2g**



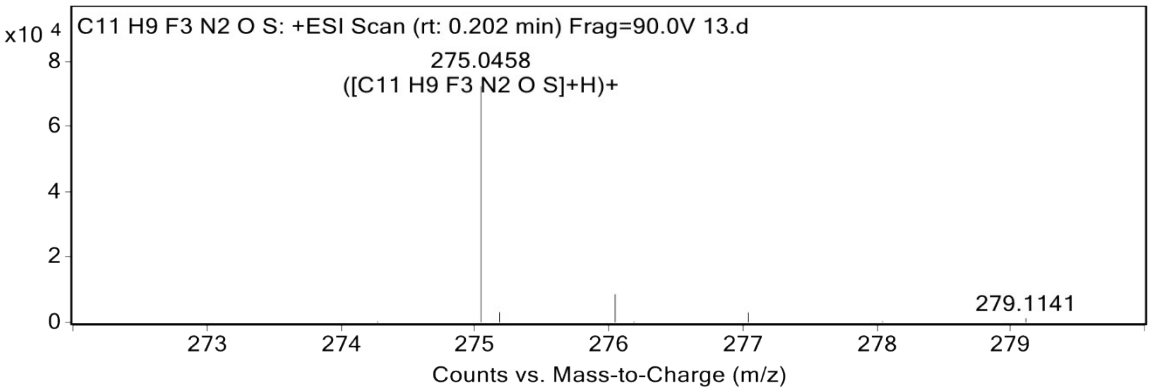
HRMS spectrum of **2h**



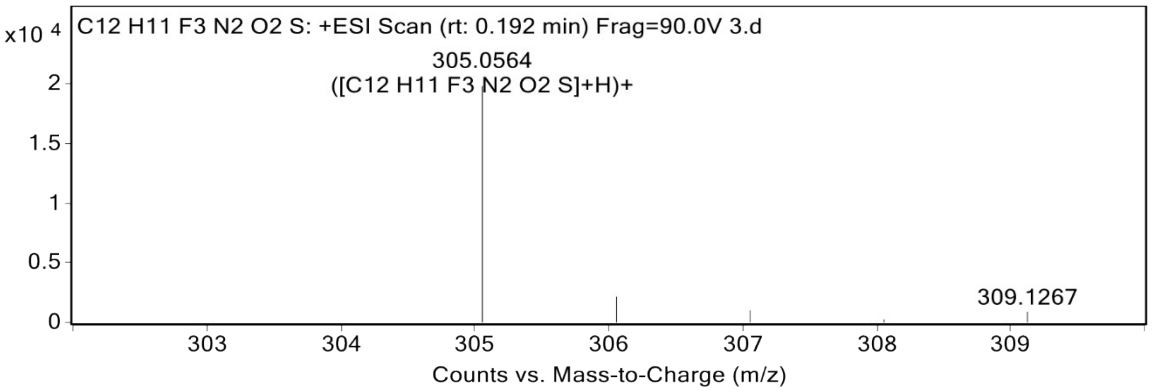
HRMS spectrum of **2i**



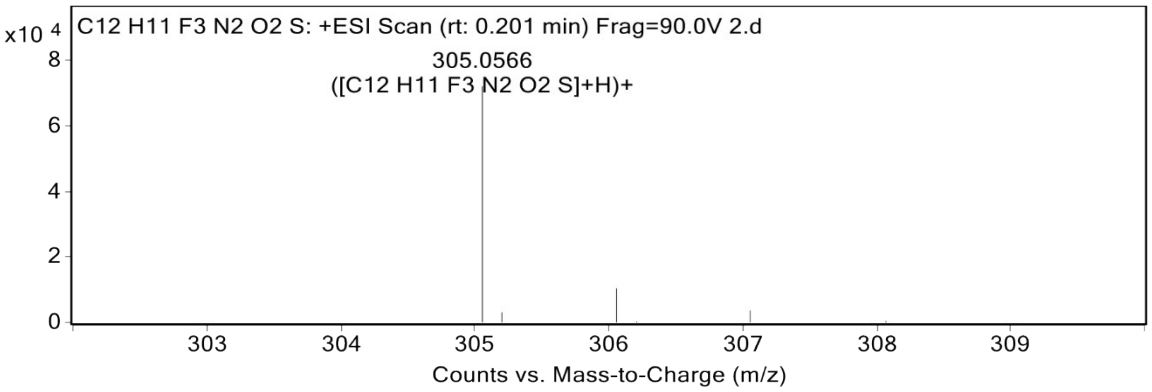
HRMS spectrum of **2j**



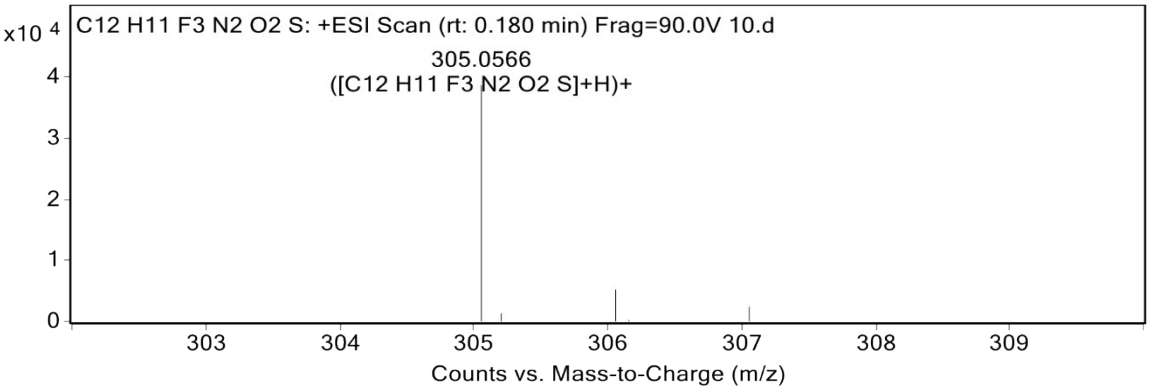
HRMS spectrum of **2k**



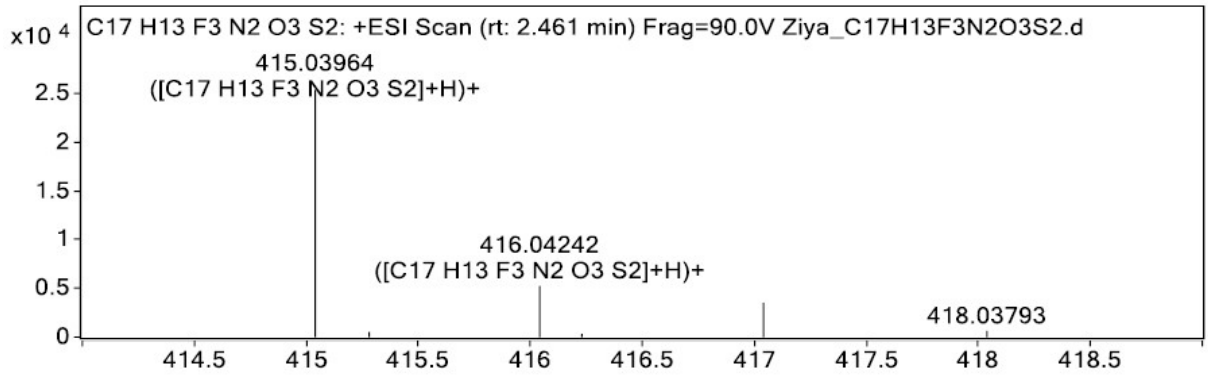
HRMS spectrum of **2l**



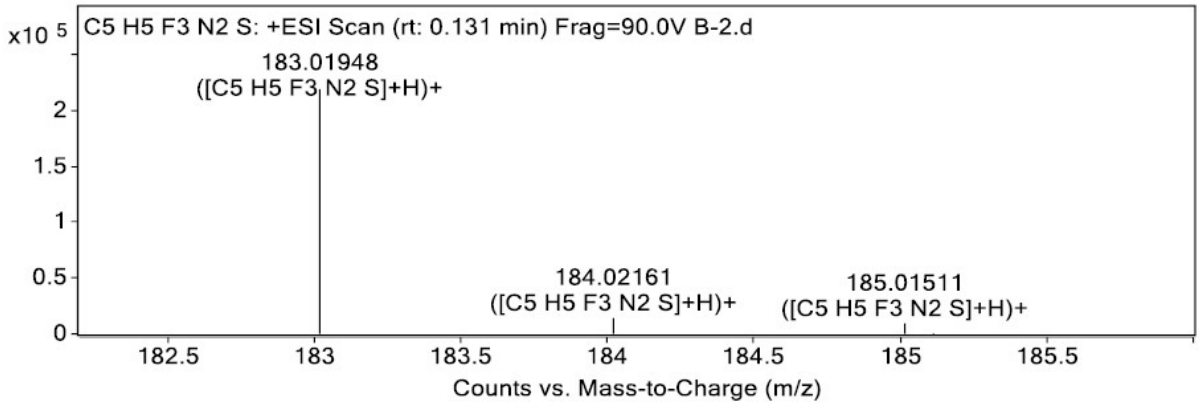
HRMS spectrum of **2m**



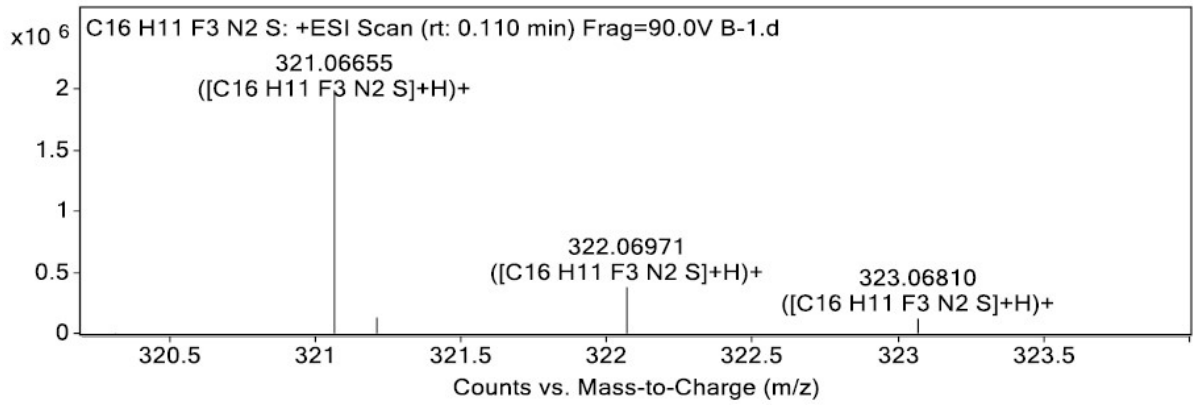
HRMS spectrum of **2n**



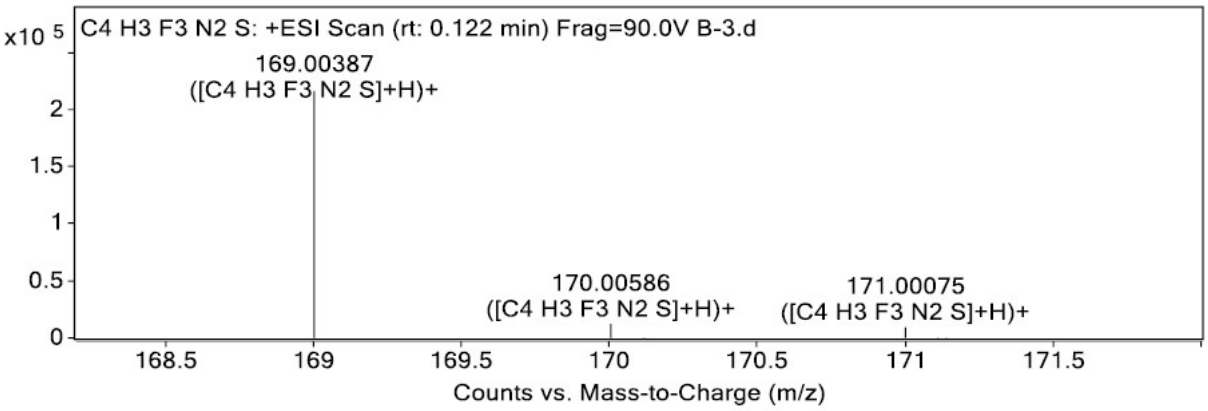
HRMS spectrum of **2o**



HRMS spectrum of **2p**



HRMS spectrum of **2r**



HRMS spectrum of **2s**