

Trapping of Thermally Generated *ortho*- and *para*-Quinone Methides by Imidazoles and Pyrazoles: a Simple Route to Green Synthesis of Benzopyrone-Azole Hybrids and their Evaluation as α -Glucosidase Inhibitors

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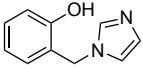
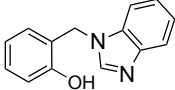
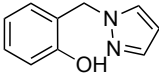
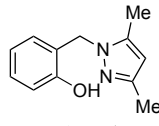
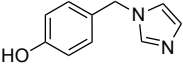
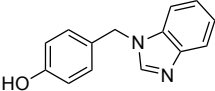
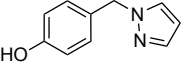
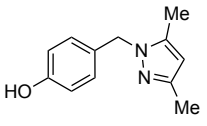
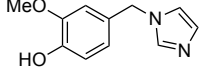
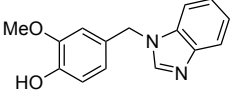
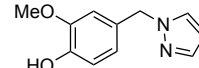
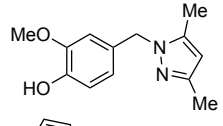
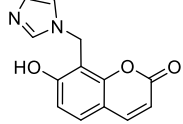
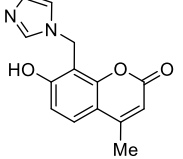
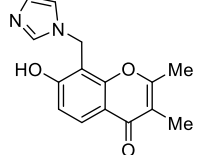
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Table S1. Inhibition of α -glucosidase by synthesized compound 4-5 and 9-14	S2
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Table S1. Inhibition of α -glucosidase by synthesized compounds **4-5** and **9-14** ^[a]

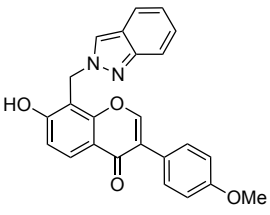
Compound	Structure	Inhibition at 25 μ M (%) ^[b]	IC ₅₀ , μ M
4a		N.I.	
4b		24.2	
4c		N.I.	
4d		N.I.	
5a		9.9	
5b		19.4	
5c		N.I.	
5d		N.I.	
5e		N.I.	
5f		10.9	
5g		N.I.	
5h		4.9	
9a		N.I.	
9b		53.6	23.6 \pm 1.8
9c		26.7	

Compound	Structure	Inhibition at 25 μ M (%) ^[b]	IC ₅₀ , μ M
9d		42.0	27.0 \pm 0.2
9e		11.8	
9f		1.08	
9g		N.I.	
9h		12.8	
9i		73.7	20.0 \pm 2.0
9j		29.9	
10a		13.3	
10b		69.3	21.1 \pm 0.7

Compound	Structure	Inhibition at 25 μ M (%) ^[b]	IC ₅₀ , μ M
10c		8.0	
10d		64.6	20.6±2.1
10e		18.8	
10f		48.6	25.5±7.9
10g		79.6	15.9±4.7
10h		99.1	9.5±1.6
11a		N.I.	
11b		35.5	
11c		N.I.	

Compound	Structure	Inhibition at 25 μM (%) ^[b]	IC ₅₀ , μM
11d		62.5	16.2 \pm 3.4
11e		39.2	
11f		27.7	
11g		14.4	
11h		15.2	
11i		21.5	
11j		84.1	14.3 \pm 2.0
12a		20.2	
12b		14.2	
12c		42.8	27.4 \pm 1.9

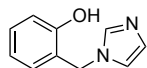
Compound	Structure	Inhibition at 25 μM (%) ^[b]	IC ₅₀ , μM
12d		67.23	20.9±2.5
12e		N.I.	
12f		14.5	
12g		21.8	
12h		66.9	21.16±0.66
12i		94.0	5.8±0.2
13a		N.I.	
13b		73.0	17.1±2.8
14a		N.I.	

Compound	Structure	Inhibition at 25 μ M (%) ^[b]	IC ₅₀ , μ M
14b		50.3	23.9 \pm 2.3
acarbose			760.6 \pm 120.3

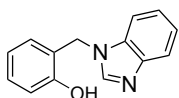
^[a] IC₅₀ values are shown as average value \pm standard deviation; ^[b] N. I. – no inhibition

Characterization of compounds

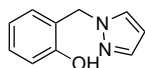
2-(1H-imidazol-1-ylmethyl)phenol (4a). Off-white solid, yield 122 mg (70%); mp 161–163 °C (lit¹ 161–164 °C); ¹H NMR (400 MHz, DMSO-*d*₆): δ 10.03 (s, 1H), 7.70 (s, 1H), 7.18–7.09 (m, 2H), 7.05–6.99 (m, 1H), 6.91–6.83 (m, 2H), 6.79–6.73 (m, 1H), 5.09 ppm (s, 2H). ¹³C{¹H} NMR (125 MHz, DMSO-*d*₆): δ 155.0, 137.5, 129.3, 129.2, 128.2, 123.8, 119.7, 119.1, 115.2, 45.0 ppm. MS (APCI) *m/z*: 175.2 [M+H]⁺. Anal. calcd (%) for C₁₀H₁₀N₂O: C, 68.95; H, 5.79; N, 16.08. Found (%): C, 69.21; H, 5.88; N, 15.81.



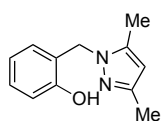
2-(1H-Benzimidazol-1-ylmethyl)phenol (4b). Off-white solid, yield 96 mg (43%); mp 235–237 °C (lit² 238–239 °C); ¹H NMR (400 MHz, DMSO-*d*₆): δ 9.93 (s, 1H), 8.29 (s, 1H), 7.64 (d, *J* = 7.5 Hz, 1H), 7.57 (d, *J* = 7.5 Hz, 1H), 7.24–7.15 (m, 2H), 7.14–7.08 (m, 2H), 6.86 (d, *J* = 8.0 Hz, 1H), 6.74 (t, *J* = 7.5 Hz, 1H), 5.38 ppm (s, 2H); ¹³C NMR (101 MHz, DMSO-*d*₆): δ 155.2, 144.6, 143.4, 133.8, 129.4, 129.2, 122.7, 122.2, 121.4, 119.4, 119.1, 115.3, 110.7, 43.2 ppm. MS (APCI): *m/z* 225.0 [M+H]⁺. Anal. calcd (%) for C₁₄H₁₂N₂O: C, 74.98; H, 5.39; N, 12.49. Found (%): C, 75.13; H, 5.17; N 12.68.



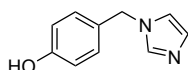
2-(1H-Pyrazol-1-ylmethyl)phenol (4c). Off-white solid, yield 85 mg (49%); mp 124–126 °C (lit³ 123–125 °C); ¹H NMR (400 MHz, CDCl₃) δ 10.30 (s, 1H), 7.53 (s, 1H), 7.47 (s, 1H), 7.22 (d, *J* = 7.7 Hz, 1H), 7.15 (d, *J* = 7.5 Hz, 1H), 6.99 (d, *J* = 8.1 Hz, 1H), 6.85 (t, *J* = 7.4 Hz, 1H), 6.27–6.19 (m, 1H), 5.21 ppm (s, 2H); ¹³C NMR (101 MHz, CDCl₃) δ 156.6, 139.3, 130.6, 130.2, 129.7, 123.4, 120.3, 118.9, 105.7, 53.4 ppm. MS (APCI): *m/z* 175.0 [M+H]⁺. Anal. calcd (%) for C₁₀H₁₀N₂O: C, 68.95; H, 5.79; N, 16.08. Found (%): C, 68.71; H, 6.03; N, 16.17.



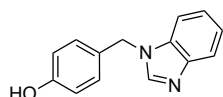
2-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]phenol (4d). Off-white solid, yield 107 mg (53%); mp 154–156 °C (lit⁴ 167–169 °C); ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.77 (s, 1H), 7.11–7.03 (m, 1H), 6.81 (dd, *J* = 8.1, 1.2 Hz, 1H), 6.70 (t, *J* = 7.4 Hz, 1H), 6.63–6.56 (m, 1H), 5.83 (s, 1H), 5.06 (s, 2H), 2.16 (s, 3H), 2.08 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 154.4, 145.9, 139.0, 128.3, 128.0, 124.1, 119.1, 115.2, 104.7, 46.8, 13.4, 10.5 ppm. MS (APCI): *m/z* 203.0 [M+H]⁺. Anal. calcd (%) for C₁₂H₁₄N₂O: C, 71.26; H, 6.98; N, 13.85. Found (%): C, 71.03; H, 7.17; N, 13.62.



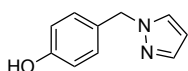
4-(1H-Imidazol-1-ylmethyl)phenol (5a). Off-white solid, yield 96 mg (55%); mp 206–208 °C (lit⁵ 210–211 °C); ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.37 (s, 1H), 7.66 (s, 1H), 7.13–7.07 (m, 3H), 6.87 (s, 1H), 6.73 (d, *J* = 8.0 Hz, 2H), 5.03 ppm (s, 2H); ¹³C NMR (125 MHz, DMSO-*d*₆) δ 157.0, 137.1, 129.1, 128.5, 127.9, 119.3, 115.4, 49.2 ppm. MS (APCI): *m/z* 175.2 [M+H]⁺. Anal. calcd (%) for C₁₀H₁₀N₂O: C, 68.95; H, 5.79; N, 16.08. Found (%): C, 68.76; H, 5.63; N, 16.35.



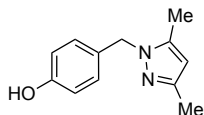
4-(1H-Benzimidazol-1-ylmethyl)phenol (5b). Off-white solid, yield 96 mg (43%); mp 228–230 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 9.44 (s, 1H), 8.34 (s, 1H), 7.63 (d, *J* = 7.6 Hz, 1H), 7.51 (d, *J* = 7.6 Hz, 1H), 7.22–7.13 (m, 4H), 6.70 (d, *J* = 8.0 Hz, 2H), 5.33 ppm (s, 2H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 157.0, 144.0, 143.6, 133.6, 129.0, 127.1, 122.3, 121.5, 119.4, 115.4, 110.8, 47.3 ppm. MS (APCI): *m/z* 225.0 [M+H]⁺. Anal. calcd (%) for C₁₄H₁₂N₂O: C, 74.98; H, 5.39; N 12.49. Found (%): C, 74.71; H, 5.54; N, 12.65.



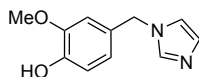
4-(1H-Pyrazol-1-ylmethyl)phenol (5c). Off-white solid, yield 91 mg (52%); mp 112–114 °C (lit³ 114–115 °C); ¹H NMR (500 MHz, DMSO-*d*₆) δ 9.41 (s, 1H), 7.71 (d, *J* = 2.3 Hz, 1H), 7.42 (d, *J* = 1.9 Hz, 1H), 7.07 (d, *J* = 8.4 Hz, 2H), 6.71 (d, *J* = 8.4 Hz, 2H), 6.24–6.20 (m, 1H), 5.17 ppm (s, 2H); ¹³C NMR (125 MHz, DMSO-*d*₆) δ 156.9, 138.7, 129.6, 129.1, 127.8, 115.2, 105.3, 54.4 ppm. MS (APCI): *m/z* 175.0 [M+H]⁺. Anal. calcd (%) for C₁₀H₁₀N₂O: C, 68.95; H, 5.79; N, 16.08. Found (%): C, 69.18; H, 5.52; N, 16.14.



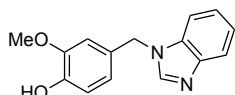
4-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]phenol (5d). Off-white solid, yield 113 mg (56%); mp 171–173 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 9.34 (s, 1H), 6.93 (d, *J* = 8.6 Hz, 2H), 6.69 (d, *J* = 8.6 Hz, 2H), 5.79 (s, 1H), 5.02 (s, 2H), 2.13 (s, 3H), 2.07 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 156.6, 145.7, 138.3, 128.3, 128.0, 115.2, 104.9, 51.2, 13.4, 10.7 ppm. MS (APCI): *m/z* 203.2 [M+H]⁺. Anal. calcd (%) for C₁₂H₁₄N₂O: C, 71.26; H, 6.98; N, 13.85. Found (%): C, 71.12; H, 7.15; N, 13.96.



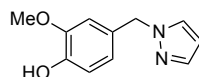
4-(1H-Imidazol-1-ylmethyl)-2-methoxyphenol (5e). Off-white solid, yield 161 mg (79%); mp 155–157 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.08 (s, 1H), 7.71 (d, *J* = 1.4 Hz, 1H), 7.16 (t, *J* = 1.3 Hz, 1H), 6.92 (d, *J* = 1.8 Hz, 1H), 6.88 (t, *J* = 1.2 Hz, 1H), 6.75 – 6.66 (m, 2H), 5.03 (s, 2H), 3.74 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 147.7, 146.3, 137.2, 128.5, 128.4, 120.5, 119.4, 115.5, 112.2, 55.6, 49.5 ppm. MS (APCI): *m/z* 205.0 [M+H]⁺. Anal. calcd (%) for C₁₁H₁₂N₂O₂: C, 64.69; H, 5.92; N, 13.72. Found (%): C, 64.42; H, 6.16; N, 13.56.



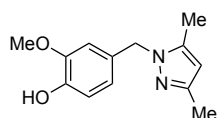
4-(1H-Benzimidazol-1-ylmethyl)-2-methoxyphenol (5f). Off-white solid, yield 135 mg (53%); mp 178–180 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.03 (s, 1H), 8.37 (s, 1H), 7.64 (dd, *J* = 7.1, 1.9 Hz, 1H), 7.59 – 7.54 (m, 1H), 7.25 – 7.14 (m, 2H), 7.02 (d, *J* = 1.6 Hz, 1H), 6.78 – 6.66 (m, 2H), 5.34 (s, 2H), 3.73 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 147.7, 146.3, 144.1, 143.6, 133.7, 127.6, 122.3, 121.5, 120.4, 119.4, 115.5, 112.2, 110.9, 55.7, 47.7 ppm. MS (APCI): *m/z* 255.0 [M+H]⁺. Anal. calcd (%) for C₁₅H₁₄N₂O₂: C, 70.85; H, 5.55; N, 11.02. Found (%): C, 70.59; H, 5.82; N, 11.31.



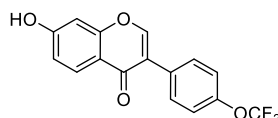
2-Methoxy-4-(1H-pyrazol-1-ylmethyl)phenol (5g). Off-white solid, yield 155 mg (76%); mp 173–175 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 8.91 (s, 1H), 7.72 (s, 1H), 7.43 (s, 1H), 6.87 (s, 1H), 6.72 (d, *J* = 7.9 Hz, 1H), 6.65 (d, *J* = 7.9 Hz, 1H), 6.23 (s, 1H), 5.18 (s, 2H), 3.72 ppm (s, 3H); ¹³C NMR (125 MHz, DMSO-*d*₆) δ 147.5, 146.1, 138.7, 129.7, 128.4, 120.5, 115.3, 112.2, 105.3, 55.6, 54.7 ppm. MS (APCI): *m/z* 205.2 [M+H]⁺. Anal. calcd (%) for C₁₁H₁₂N₂O₂: C, 64.69; H, 5.92; N, 13.72. Found (%): C, 64.92; H, 5.71; N, 13.98.



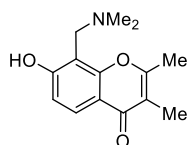
4-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-2-methoxyphenol (5h). Off-white solid, yield 125 mg (54%); mp 151–153 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 8.94 (s, 1H), 6.75 (s, 1H), 6.71 (d, *J* = 8.0 Hz, 1H), 6.48 (d, *J* = 8.0 Hz, 1H), 5.81 (s, 1H), 5.04 (s, 2H), 3.71 (s, 3H), 2.15 (s, 3H), 2.09 ppm (s, 3H); ¹³C NMR (125 MHz, DMSO-*d*₆) δ 147.5, 145.8, 145.7, 138.4, 128.7, 119.5, 115.4, 111.4, 104.9, 55.6, 51.5, 13.4, 10.7 ppm. MS (APCI): *m/z* 233.2 [M+H]⁺. Anal. calcd (%) for C₁₃H₁₆N₂O₂: C, 67.22; H, 6.94; N, 12.06. Found (%): C, 67.48; H, 6.88; N, 12.27.



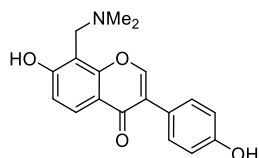
7-Hydroxy-3-[4-(trifluoromethoxy)phenyl]-4H-chromen-4-one (6j). Off-white solid, yield 2417 mg (75%); mp 225–227 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 10.86 (s, 1H), 8.45 (s, 1H), 7.99 (d, *J* = 8.7 Hz, 1H), 7.71 (d, *J* = 8.7 Hz, 2H), 7.42 (d, *J* = 8.7 Hz, 2H), 6.96 (dd, *J* = 8.7, 2.3 Hz, 1H), 6.90 ppm (d, *J* = 2.3 Hz, 1H); ¹³C NMR (125 MHz, DMSO-*d*₆) δ 174.2, 162.8, 157.5, 154.2, 147.9, 131.5, 130.8, 127.3, 122.3, 120.7, 120.2 (q, *J* = 256.6 Hz), 116.5, 115.4, 102.2 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -57.3 ppm. MS (APCI): *m/z* 323.0 [M+H]⁺. Anal. calcd (%) for C₁₆H₉F₃O₄: C, 59.64; H, 2.82. Found (%): C, 59.78; H, 2.65.



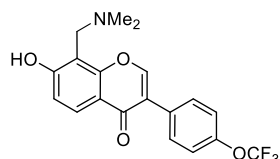
8-[(Dimethylamino)methyl]-7-hydroxy-2,3-dimethyl-4H-chromen-4-one (8c). Off-white solid, yield 450 mg (91%); mp 170–172 °C; ¹H NMR (400 MHz, CDCl₃) δ 10.82 (s, 1H), 7.94 (d, *J* = 8.8 Hz, 1H), 6.77 (d, *J* = 8.8 Hz, 1H), 3.89 (s, 2H), 2.37 (s, 6H), 2.32 (s, 3H), 1.96 ppm (s, 3H); ¹³C NMR (126 MHz, CDCl₃) δ 177.5, 163.4, 160.4, 154.7, 126.2, 116.1, 115.2, 114.9, 106.9, 55.1, 44.6, 18.4, 9.9 ppm; MS (APCI): *m/z* 248.3 [M+H]⁺. Anal. calcd (%) for C₁₄H₁₇NO₃: C, 68.00; H, 6.93; N, 5.66. Found (%): C, 67.73; H, 7.18; N, 5.39.



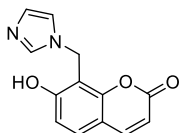
8-[(Dimethylamino)methyl]-7-hydroxy-3-(4-hydroxyphenyl)-4H-chromen-4-one (8d). Off-white solid, yield 221 mg (71%); mp 285–287 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 8.30 (s, 1H), 7.90 (d, *J* = 8.8 Hz, 1H), 7.38 (d, *J* = 8.6 Hz, 2H), 6.86 (d, *J* = 8.8 Hz, 1H), 6.80 (d, *J* = 8.6 Hz, 2H), 3.93 (s, 2H), 2.34 ppm (s, 6H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 174.8, 163.9, 157.2, 155.0, 152.4, 130.1, 125.7, 123.3, 122.5, 115.8, 115.2, 114.9, 108.3, 53.3, 44.0 ppm. MS (APCI): *m/z* 312.2 [M+H]⁺. Anal. calcd (%) for C₁₈H₁₇NO₄: C, 69.44; H, 5.50; N, 4.50. Found (%): C, 69.29; H, 5.34; N, 4.69.



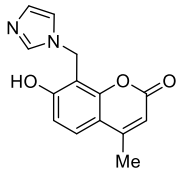
8-[(Dimethylamino)methyl]-7-hydroxy-3-[4-(trifluoromethoxy)phenyl]-4H-chromen-4-one (8j). Off-white solid, yield 1669 mg (88%); mp 168–170 °C; ¹H NMR (500 MHz, CDCl₃) δ 11.94 (s, 1H), 8.06 (d, *J* = 8.8 Hz, 1H), 7.87 (s, 1H), 7.54 (d, *J* = 8.2 Hz, 2H), 7.21 (d, *J* = 8.2 Hz, 2H), 6.85 (d, *J* = 8.8 Hz, 1H), 3.93 (s, 2H), 2.38 ppm (s, 6H); ¹³C NMR (126 MHz, CDCl₃) δ 175.4, 164.5, 155.0, 152.0, 149.0, 130.9, 130.4, 126.6, 123.6, 120.8, 120.5 (q, *J* = 256.6 Hz), 116.8, 115.8, 107.6, 55.1, 44.5 ppm; ¹⁹F NMR (376 MHz, CDCl₃) δ -58.8 ppm. MS (APCI): *m/z* 380.0 [M+H]⁺. Anal. calcd (%) for C₁₉H₁₆F₃NO₄: C, 60.16; H, 4.25; N, 3.69. Found (%): C, 60.32; H, 4.47; N, 3.82.



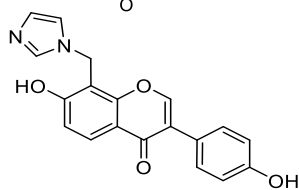
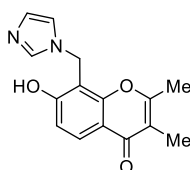
7-Hydroxy-8-(1H-imidazol-1-ylmethyl)-2H-chromen-2-one (9a). Off-white solid, yield 177 mg (73%); mp 292–294°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.90 (d, *J* = 9.4 Hz, 1H), 7.63 (s, 1H), 7.50 (d, *J* = 8.4 Hz, 1H), 7.09 (s, 1H), 6.91 (d, *J* = 8.4 Hz, 1H), 6.85 (s, 1H), 6.21 (d, *J* = 9.4 Hz, 1H), 5. ppm 26 (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 160.9, 160.4, 154.2, 145.6, 135.8, 131.2, 122.5, 120.7, 113.4, 112.2, 112.1, 107.8, 41.5 ppm. MS (APCI): *m/z* 243.0 [M+H]⁺. Anal. calcd (%) for C₁₃H₁₀N₂O₃: C, 64.46; H, 4.16; N, 11.56. Found (%): C, 64.59; H, 4.03; N, 11.42.



7-Hydroxy-8-(1H-imidazol-1-ylmethyl)-4-methyl-2H-chromen-2-one (9b). Off-white solid, yield 241 mg (94%); mp 250–252°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.09 (s, 1H), 7.62 (s, 1H), 7.58 (d, *J* = 8.8 Hz, 1H), 7.05 (s, 1H), 6.89 (d, *J* = 8.8 Hz, 1H), 6.81 (s, 1H), 6.15 (s, 1H), 5.21 (s, 2H), 2.32 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 159.7, 159.2, 153.8, 152.9, 137.2, 128.1, 126.4, 119.3, 112.3, 112.1, 110.2, 110.1, 37.9, 18.2 ppm; MS (APCI): *m/z* 257.0 [M+H]⁺. Anal. calcd (%) for C₁₄H₁₂N₂O₃: C, 65.62; H, 4.72; N, 10.93. Found (%): C, 65.48; H, 4.93; N, 10.78.

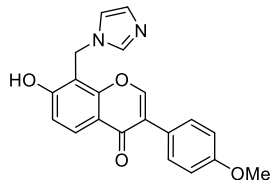


7-Hydroxy-8-(1H-imidazol-1-ylmethyl)-2,3-dimethyl-4H-chromen-4-one (9c). Off-white solid, yield 246 mg (91%); mp 255–257 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.84 (d, *J* = 8.6 Hz, 1H), 7.73 (s, 1H), 7.12 (s, 1H), 6.99 (d, *J* = 8.6 Hz, 1H), 6.85 (s, 1H), 5.29 (s, 2H), 2.43 (s, 3H), 1.90 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 175.8, 161.3, 160.3, 155.0, 137.4, 128.2, 126.5, 119.4, 115.3, 114.7, 114.0, 110.1, 37.9, 18.1, 9.6 ppm; MS (APCI): *m/z* 271.0 [M+H]⁺. Anal. calcd (%) for C₁₅H₁₄N₂O₃: C, 66.66; H, 5.22; N, 10.36. Found (%): C, 66.87; H, 5.03; N, 10.13.

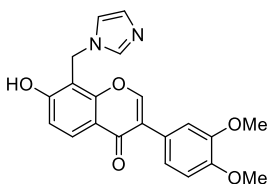


7-Hydroxy-3-(4-hydroxyphenyl)-8-(1H-imidazol-1-ylmethyl)-4H-chromen-4-one (9d). Off-white solid, yield 244 mg (73%); mp 211–213 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 9.59 (s, 1H), 8.39 (s, 1H), 7.97 (d, *J* = 8.8 Hz, 1H), 7.72 (s, 1H), 7.38 (d, *J* = 8.3 Hz, 2H), 7.15 (s, 1H), 7.05 (d, *J* = 8.8 Hz, 1H), 6.85 (s, 1H), 6.81 (d, *J* = 8.3 Hz, 2H), 5.30 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.8, 160.8, 157.3, 155.5, 152.8, 137.4, 130.1, 128.2, 127.1, 123.5, 122.4, 119.6, 116.6, 115.1, 114.6, 110.4, 38.0 ppm; MS (APCI): *m/z* 335.0 [M+H]⁺. Anal. calcd (%) for C₁₉H₁₄N₂O: C, 68.26; H, 4.22; N, 8.38. Found (%): C, 68.53; H, 4.07; N, 8.75.

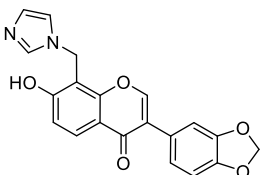
7-Hydroxy-8-(1H-imidazol-1-ylmethyl)-3-(4-methoxyphenyl)-4H-chromen-4-one (9e). Off-white solid, yield 292 mg (85%); mp 223–224°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 8.44 (s, 1H), 7.98 (d, *J* = 8.8 Hz, 1H), 7.73 (s, 1H), 7.51 (d, *J* = 8.7 Hz, 2H), 7.16 (s, 1H), 7.06 (d, *J* = 8.8 Hz, 1H), 6.99 (d, *J* = 8.7 Hz, 2H), 6.86 (s, 1H), 5.31 (s, 2H), 3.79 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 174.6, 160.8, 159.0, 155.4, 153.0, 137.3, 130.0, 128.2, 127.0, 124.0, 123.1, 119.4, 116.5, 114.6, 113.6, 110.4, 55.1, 37.9 ppm; MS (APCI): *m/z* 349.2 [M+H]⁺. Anal. calcd (%) for C₂₀H₁₆N₂O₄: C, 68.96; H, 4.63; N, 8.04. Found (%): C, 69.15; H, 4.77; N, 8.16.



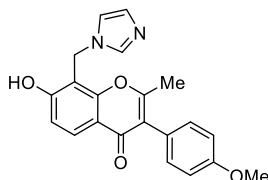
3-(3,4-Dimethoxyphenyl)-7-hydroxy-8-(1H-imidazol-1-ylmethyl)-4H-chromen-4-one (9f). Off-white solid, yield 348 mg (92%); mp 238–239°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 8.47 (s, 1H), 7.99 (d, *J* = 8.8 Hz, 1H), 7.72 (s, 1H), 7.22 – 7.13 (m, 3H), 7.07 (d, *J* = 8.9 Hz, 1H), 7.01 (d, *J* = 8.4 Hz, 1H), 6.87 – 6.84 (m, 1H), 5.32 (s, 2H), 3.78 ppm (s, 6H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.6, 160.9, 155.4, 153.2, 148.7, 148.3, 137.4, 128.2, 127.1, 124.4, 123.2, 121.2, 119.5, 116.5, 114.6, 112.7, 111.6, 110.3, 55.5, 38.0 ppm; MS (APCI): *m/z* 379.2 [M+H]⁺. Anal. calcd (%) for C₂₁H₁₈N₂O₅: C, 66.66; H, 4.80; N, 7.40. Found (%): C, 66.54; H, 4.96; N, 7.23.



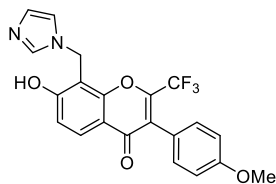
3-(1,3-Benzodioxol-5-yl)-7-hydroxy-8-(1H-imidazol-1-ylmethyl)-4H-chromen-4-one (9g). Off-white solid, yield 312 mg (86%); mp 255–257 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.43 (s, 1H), 8.44 (s, 1H), 7.98 (d, *J* = 8.8 Hz, 1H), 7.72 (s, 1H), 7.19 – 7.13 (m, 2H), 7.10 – 7.03 (m, 2H), 6.97 (d, *J* = 8.0 Hz, 1H), 6.86 (s, 1H), 6.05 (s, 2H), 5.31 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.5, 161.0, 155.4, 153.4, 147.0, 147.0, 137.4, 128.3, 127.1, 125.6, 123.1, 122.4, 119.4, 116.4, 114.7, 110.4, 109.4, 108.1, 101.1, 37.9 ppm; MS (APCI): *m/z* 363.2 [M+H]⁺. Anal. calcd (%) for C₂₀H₁₄N₂O₅: C, 66.30; H, 3.89; N, 7.73. Found (%): C, 66.04; H, 3.62; N, 7.56.



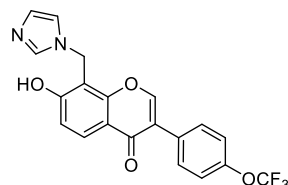
7-Hydroxy-8-(1H-imidazol-1-ylmethyl)-3-(4-methoxyphenyl)-2-methyl-4H-chromen-4-one (9h). Off-white solid, yield 300 mg (83%); mp 217–218°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.26 (s, 1H), 7.88 (d, *J* = 8.8 Hz, 1H), 7.75 (s, 1H), 7.20 (d, *J* = 8.6 Hz, 2H), 7.17 (s, 1H), 7.03 (d, *J* = 8.8 Hz, 1H), 6.98 (d, *J* = 8.6 Hz, 2H), 6.87 (s, 1H), 5.34 (s, 2H), 3.80 (s, 3H), 2.33 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 175.0, 162.5, 160.4, 158.6, 155.0, 137.4, 131.6, 128.3, 126.9, 125.1, 121.7, 119.5, 115.5, 114.1, 113.5, 110.3, 55.1, 37.9, 19.1 ppm; MS (APCI): *m/z* 363.0 [M+H]⁺. Anal. calcd (%) for C₂₁H₁₈N₂O₄: C, 69.60; H, 5.01; N, 7.73. Found (%): C, 69.37; H, 4.87; N, 7.96.



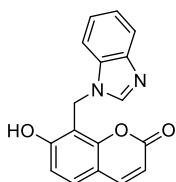
7-Hydroxy-8-(1H-imidazol-1-ylmethyl)-3-(4-methoxyphenyl)-2-(trifluoromethyl)-4H-chromen-4-one (9i). Off-white solid, yield 358 mg (86%); mp 230–232 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 7.92 (d, *J* = 8.8 Hz, 1H), 7.69 (s, 1H), 7.18 (d, *J* = 8.3 Hz, 2H), 7.14 – 7.09 (m, 2H), 6.98 (d, *J* = 8.3 Hz, 2H), 6.89 (s, 1H), 5.31 (s, 2H), 3.78 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 175.4, 162.0, 159.4, 154.4, 146.3 (q, *J* = 35.1 Hz), 137.2, 131.1, 128.2, 127.3, 124.7, 121.1, δ 119.5 (q, *J* = 276.1 Hz); 119.3, 115.6, 115.3, 113.4, 110.5, 55.1, 37.9 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -63.0 ppm; MS (APCI): *m/z* 417.0 [M+H]⁺. Anal. calcd (%) for C₂₁H₁₅F₃N₂O₄: C, 60.58; H, 3.63; N, 6.73. Found (%): C, 60.73; H, 3.49; N, 6.56.



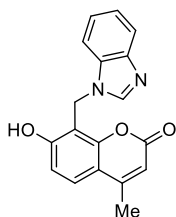
7-Hydroxy-8-(1H-imidazol-1-ylmethyl)-3-[4-(trifluoromethoxy)phenyl]-4H-chromen-4-one (9j). Off-white solid, yield 342 mg (85%); mp 248–250 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 8.50 (s, 1H), 7.97 (d, *J* = 8.8 Hz, 1H), 7.75 (s, 1H), 7.70 (d, *J* = 8.2 Hz, 2H), 7.39 (d, *J* = 8.2 Hz, 2H), 7.16 (s, 1H), 7.07 (d, *J* = 8.8 Hz, 1H), 6.87 (s, 1H), 5.31 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.3, 161.4, 155.5, 154.1, 148.0, 137.4, 131.4, 130.8, 128.2, 127.1, 122.3, 120.7, 120.2 (q, *J* = 256.2 Hz), 119.5, 116.3, 114.9, 110.4, 38.0 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -57.3 ppm. MS (APCI): *m/z* 403.0 [M+H]⁺. Anal. calcd (%) for C₂₀H₁₃F₃N₂O₄: C, 59.71; H, 3.26; N, 6.96. Found (%): C, 59.47; H, 3.03; N, 7.11.



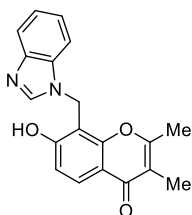
8-(1H-Benzimidazol-1-ylmethyl)-7-hydroxy-2H-chromen-2-one (10a). Off-white solid, yield 219 mg (75%); mp 312–314 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.28 (s, 1H), 8.28 (s, 1H), 7.93 (d, *J* = 9.5 Hz, 1H), 7.72 (d, *J* = 7.9 Hz, 1H), 7.61 (d, *J* = 7.8 Hz, 1H), 7.52 (d, *J* = 8.5 Hz, 1H), 7.19 (dt, *J* = 22.0, 7.3 Hz, 2H), 6.92 (d, *J* = 8.5 Hz, 1H), 6.25 (d, *J* = 9.5 Hz, 1H), 5.52 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆+CF₃SO₃H) δ 159.9, 154.0, 144.9, 142.5, 131.0, 130.7, 130.7, 126.7, 126.5, 115.1, 113.1, 112.8, 111.9, 111.7, 106.9, 39.4 ppm; MS (APCI): *m/z* 293.0 [M+H]⁺. Anal. calcd (%) for C₁₇H₁₂N₂O₃: C, 69.86; H, 4.14; N, 9.58. Found (%): C, 69.98; H, 4.37; N, 9.43.



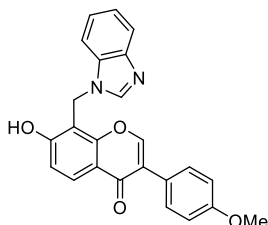
8-(1H-Benzimidazol-1-ylmethyl)-7-hydroxy-4-methyl-2H-chromen-2-one (10b). Off-white solid, yield 211 mg (69%); mp 265–267 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.21 (s, 1H), 8.26 (s, 1H), 7.72 (d, *J* = 7.8 Hz, 1H), 7.63 – 7.54 (m, 2H), 7.24 – 7.12 (m, 2H), 6.94 (d, *J* = 8.7 Hz, 1H), 6.17 (s, 1H), 5.53 (s, 2H), 2.34 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 159.6, 159.3, 153.9, 153.0, 144.7, 143.1, 133.6, 126.4, 122.3, 121.5, 119.3, 112.3, 112.1, 110.4, 110.2, 109.4, 36.6, 18.2 ppm; MS (APCI): *m/z* 307.2 [M+H]⁺. Anal. calcd (%) for C₁₈H₁₄N₂O₃: C, 70.58; H, 4.61; N, 9.15. Found (%): C, 70.32; H, 4.78; N, 9.02.



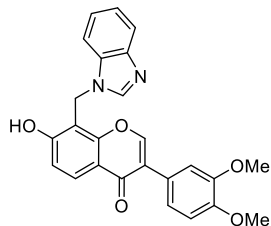
8-(1H-Benzimidazol-1-ylmethyl)-7-hydroxy-2,3-dimethyl-4H-chromen-4-one (10c). Off-white solid, yield 224 mg (70%); mp 275–277 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 11.37 (s, 1H), 8.34 (s, 1H), 7.82 (d, *J* = 8.8 Hz, 1H), 7.64 (d, *J* = 8.0 Hz, 1H), 7.59 (d, *J* = 7.9 Hz, 1H), 7.23 – 7.17 (m, 1H), 7.16 – 7.10 (m, 1H), 7.00 (d, *J* = 8.8 Hz, 1H), 5.57 (s, 2H), 2.40 (s, 3H), 1.85 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 175.7, 161.2, 160.0, 155.3, 144.8, 143.2, 133.6, 126.5, 122.3, 121.4, 119.4, 115.5, 114.9, 114.0, 110.3, 109.1, 36.6, 18.0, 9.5 ppm; MS (APCI): *m/z* 321.0 [M+H]⁺. Anal. calcd (%) for C₁₉H₁₆N₂O₃: C, 71.24; H, 5.03; N, 8.74. Found (%): C, 71.41; H, 4.82; N, 8.96.



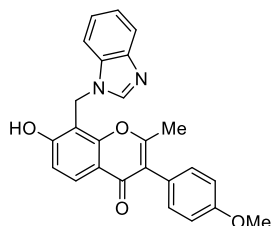
8-(1H-Benzimidazol-1-ylmethyl)-7-hydroxy-3-(4-methoxyphenyl)-4H-chromen-4-one (10d). Off-white solid, yield 283 mg (71%); mp 262–263 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.52 (s, 1H), 8.53 (s, 1H), 8.36 (s, 1H), 7.98 (d, *J* = 8.8 Hz, 1H), 7.76 – 7.70 (m, 1H), 7.65 – 7.59 (m, 1H), 7.51 (d, *J* = 8.7 Hz, 2H), 7.28 – 7.21 (m, 1H), 7.20 – 7.14 (m, 1H), 7.08 (d, *J* = 8.8 Hz, 1H), 6.99 (d, *J* = 8.7 Hz, 2H), 5.59 (s, 2H), 3.79 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 174.7, 160.7, 159.1, 155.7, 153.0, 144.8, 143.2, 133.7, 130.1, 127.2, 124.0, 123.3, 122.5, 121.6, 119.4, 116.7, 114.6, 113.7, 110.4, 109.6, 55.2, 36.6 ppm; MS (APCI): *m/z* 399.2 [M+H]⁺. Anal. calcd (%) for C₂₄H₁₈N₂O₄: C, 72.35; H, 4.55; N, 7.03. Found (%): C, 72.09; H, 4.71; N, 7.28.



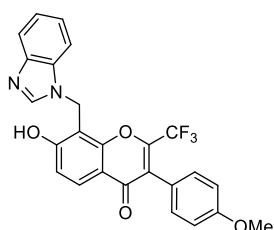
8-(1*H*-Benzimidazol-1-ylmethyl)-3-(3,4-dimethoxyphenyl)-7-hydroxy-4*H*-chromen-4-one (10e). Off-white solid, yield 380 mg (89%); mp 269–270 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.56 (s, 1H), 8.56 (s, 1H), 8.36 (s, 1H), 7.98 (d, *J* = 8.9 Hz, 1H), 7.72 (d, *J* = 8.0 Hz, 1H), 7.62 (d, *J* = 7.8 Hz, 1H), 7.28–7.21 (m, 1H), 7.20–7.11 (m, 3H), 7.08 (d, *J* = 8.9 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 1H), 5.59 (s, 2H), 3.78 (s, 3H), 3.78 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 174.6, 160.7, 155.7, 153.3, 148.7, 148.3, 144.9, 143.2, 133.7, 127.2, 124.3, 123.4, 122.5, 121.6, 121.3, 119.5, 116.8, 114.7, 112.6, 111.5, 110.4, 109.6, 55.6, 55.5, 36.7 ppm; MS (APCI): *m/z* 429.2 [M+H]⁺. Anal. calcd (%) for C₂₅H₂₀N₂O₅: C, 70.09; H, 4.71; N, 6.54. Found (%): C, 69.83; H, 4.90; N, 6.37.



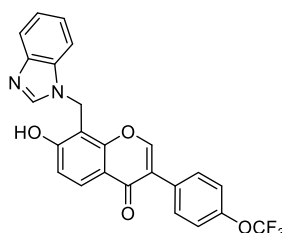
8-(1*H*-Benzimidazol-1-ylmethyl)-7-hydroxy-3-(4-methoxyphenyl)-2-methyl-4*H*-chromen-4-one (10f). Off-white solid, yield 297 mg (72%); mp 339–341 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.46 (s, 1H), 8.39 (s, 1H), 7.87 (d, *J* = 8.8 Hz, 1H), 7.71 (d, *J* = 8.0 Hz, 1H), 7.63 (d, *J* = 7.9 Hz, 1H), 7.27–7.13 (m, 4H), 7.06 (d, *J* = 8.8 Hz, 1H), 6.96 (d, *J* = 8.7 Hz, 2H), 5.63 (s, 2H), 3.78 (s, 3H), 2.31 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 174.9, 162.3, 160.3, 158.6, 155.3, 144.8, 143.1, 133.7, 131.6, 126.9, 124.9, 122.3, 121.8, 121.5, 119.4, 115.7, 114.2, 113.5, 110.3, 109.3, 55.1, 36.6, 19.0 ppm; MS (APCI): *m/z* 413.2 [M+H]⁺. Anal. calcd (%) for C₂₅H₂₀N₂O₄: C, 72.80; H, 4.89; N, 6.79. Found (%): C, 72.96; H, 5.10; N, 6.54.



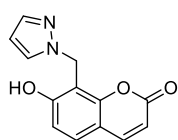
8-(1*H*-Benzimidazol-1-ylmethyl)-7-hydroxy-3-(4-methoxyphenyl)-2-(trifluoromethyl)-4*H*-chromen-4-one (10g). Off-white solid, yield 377 mg (81%); mp 288–290 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 11.89 (s, 1H), 8.24 (s, 1H), 7.93 (d, *J* = 8.7 Hz, 1H), 7.66 (d, *J* = 8.0 Hz, 1H), 7.61 (d, *J* = 7.9 Hz, 1H), 7.24–7.12 (m, 5H), 6.97 (d, *J* = 8.3 Hz, 2H), 5.59 (s, 2H), 3.77 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 175.3, 161.9, 159.4, 154.7, 146.3 (d, *J* = 35.5 Hz), 144.5, 143.2, 133.6, 131.1, 127.3, 124.9, 122.4, 121.6, 121.0, 119.5, 119.5 (q, *J* = 276.7 Hz), 115.6, 115.6, 113.4, 110.2, 109.6, 55.1, 36.5 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -62.7 ppm. MS (APCI): *m/z* 467.0 [M+H]⁺. Anal. calcd (%) for C₂₅H₁₇F₃N₂O₄: C, 64.38; H, 3.67; N, 6.01. Found (%): C, 64.54; H, 3.91; N, 6.22.



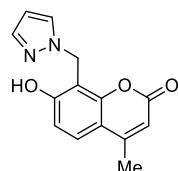
8-(1*H*-Benzimidazol-1-ylmethyl)-7-hydroxy-3-[4-(trifluoromethoxy)phenyl]-4*H*-chromen-4-one (10h). Off-white solid, yield 357 mg (79%); mp 293–295 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 11.57 (s, 1H), 8.60 (s, 1H), 8.33 (s, 1H), 7.98 (d, *J* = 8.8 Hz, 1H), 7.76–7.66 (m, 3H), 7.64–7.58 (m, 1H), 7.40 (d, *J* = 8.1 Hz, 2H), 7.22 (t, *J* = 7.6 Hz, 1H), 7.16 (t, *J* = 7.5 Hz, 1H), 7.09 (d, *J* = 8.8 Hz, 1H), 5.58 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.2, 160.9, 155.7, 154.0, 148.0, 144.7, 143.1, 133.7, 131.2, 130.8, 127.1, 122.4, 122.4, 121.5, 120.7, 120.1 (q, *J* = 256.2 Hz), 119.4, 116.6, 114.8, 110.4, 109.7, 36.6 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -57.2 ppm. MS (APCI): *m/z* 453.0 [M+H]⁺. Anal. calcd (%) for C₂₄H₁₅F₃N₂O₄: C, 63.72; H, 3.34; N, 6.19. Found (%): C, 63.97; H, 3.09; N, 6.03.



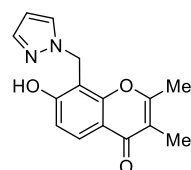
7-Hydroxy-8-(1*H*-pyrazol-1-ylmethyl)-2*H*-chromen-2-one (11a). Off-white solid, yield 176 mg (73%); mp 238–240 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 10.98 (s, 1H), 7.92 (d, *J* = 9.5 Hz, 1H), 7.64 (s, 1H), 7.51 (d, *J* = 8.4 Hz, 1H), 7.37 (s, 1H), 6.89 (d, *J* = 8.4 Hz, 1H), 6.22 (d, *J* = 9.5 Hz, 1H), 6.18 (s, 1H), 5.39 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 160.1, 159.8, 153.8, 144.8, 138.4, 129.8, 129.4, 112.6, 111.3, 111.3, 109.8, 104.9, 43.0 ppm; MS (APCI): *m/z* 243.2 [M+H]⁺. Anal. calcd (%) for C₁₃H₁₀N₂O₃: C, 64.46; H, 4.16; N, 11.56. Found (%): C, 64.21; H, 4.37; N, 11.71.



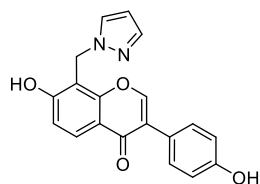
7-Hydroxy-4-methyl-8-(1*H*-pyrazol-1-ylmethyl)-2*H*-chromen-2-one (11b). Off-white solid, yield 173 mg (68%); mp 206–208 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 10.92 (s, 1H), 7.65–7.57 (m, 2H), 7.35 (d, *J* = 1.2 Hz, 1H), 6.91 (d, *J* = 8.8 Hz, 1H), 6.25–6.03 (m, 2H), 5.39 (s, 2H), 2.36 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 159.9, 159.6, 153.8, 153.2, 138.3, 129.7, 126.3, 112.3, 112.1, 110.2, 109.7, 104.8, 43.1, 18.2 ppm; MS (APCI): *m/z* 257.0 [M+H]⁺. Anal. calcd (%) for C₁₄H₁₂N₂O₃: C, 65.62; H, 4.72; N, 10.93. Found (%): C, 65.41; H, 4.54; N, 11.07.



7-Hydroxy-2,3-dimethyl-8-(1*H*-pyrazol-1-ylmethyl)-4*H*-chromen-4-one (11c). Off-white solid, yield 176 mg (65%); mp 223–225 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.00 (s, 1H), 7.84 (d, *J* = 8.7 Hz, 1H), 7.71–7.63 (m, 1H), 7.39–7.33 (m, 1H), 6.97 (d, *J* = 8.7 Hz, 1H), 6.18 (t, *J* = 2.1 Hz, 1H), 5.43 (s, 2H), 2.33 (s, 3H), 1.87 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 175.9, 161.2, 160.3, 155.3, 138.4, 129.9, 126.3, 115.3, 114.8, 113.9, 109.6, 104.9, 43.2, 18.1, 9.5 ppm; MS (APCI): *m/z* 271.0 [M+H]⁺. Anal. calcd (%) for C₁₅H₁₄N₂O₃: C, 66.66; H, 5.22; N, 10.36. Found (%): C, 66.39; H, 5.47; N, 10.59.

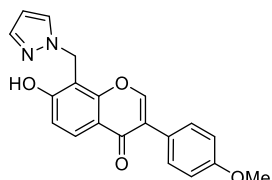


7-Hydroxy-3-(4-hydroxyphenyl)-8-(1H-pyrazol-1-ylmethyl)-4H-chromen-4-one (11d). Off-white solid, yield 271 mg (81%); mp 152–154 °C;



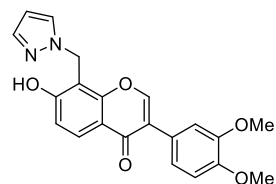
¹H NMR (400 MHz, DMSO-*d*₆) δ 11.16 (s, 1H), 9.48 (s, 1H), 8.35 (s, 1H), 7.99 (d, *J* = 8.8 Hz, 1H), 7.66 (d, *J* = 2.3 Hz, 1H), 7.43 – 7.34 (m, 3H), 7.08 (d, *J* = 8.9 Hz, 1H), 6.81 (d, *J* = 8.5 Hz, 2H), 6.19 (t, *J* = 2.1 Hz, 1H), 5.48 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.8, 161.0, 157.2, 155.7, 152.7, 138.4, 130.1, 129.8, 127.0, 123.5, 122.4, 116.6, 115.0, 114.5, 109.9, 105.0, 43.1 ppm; MS (APCI): *m/z* 335.2 [M+H]⁺. Anal. calcd (%) for C₁₉H₁₄N₂O₄: C, 68.26; H, 4.22; N, 8.38. Found (%): C, 68.49; H, 4.03; N, 8.56.

7-Hydroxy-3-(4-methoxyphenyl)-8-(1H-pyrazol-1-ylmethyl)-4H-chromen-4-one (11e). Off-white solid, yield 279 mg (80%); mp 206–208 °C;



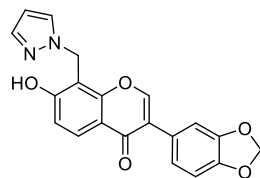
¹H NMR (400 MHz, DMSO-*d*₆) δ 11.22 (s, 1H), 8.42 (s, 1H), 8.00 (d, *J* = 8.8 Hz, 1H), 7.68 (d, *J* = 2.3 Hz, 1H), 7.51 (d, *J* = 8.4 Hz, 2H), 7.42 – 7.35 (m, 1H), 7.06 (d, *J* = 8.8 Hz, 1H), 6.98 (d, *J* = 8.4 Hz, 2H), 6.26 – 6.13 (m, 1H), 5.47 (s, 2H), 3.78 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.7, 161.0, 159.0, 155.7, 153.1, 138.4, 130.1, 129.8, 127.0, 124.0, 123.1, 116.6, 114.5, 113.6, 109.9, 105.0, 55.1, 43.1 ppm; MS (APCI): *m/z* 349.2 [M+H]⁺. Anal. calcd (%) for C₂₀H₁₆N₂O₄: C, 68.96; H, 4.63; N, 8.04. Found (%): C, 69.13; H, 4.87; N, 8.23.

3-(3,4-Dimethoxyphenyl)-7-hydroxy-8-(1H-pyrazol-1-ylmethyl)-4H-chromen-4-one (11f). Off-white solid, yield 352 mg (93%); mp 140–142 °C;



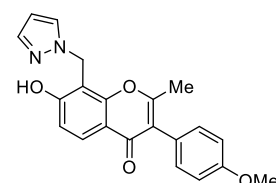
¹H NMR (400 MHz, DMSO-*d*₆) δ 11.21 (s, 1H), 8.45 (d, *J* = 4.1 Hz, 1H), 8.00 (d, *J* = 8.7 Hz, 1H), 7.68 (d, *J* = 2.3 Hz, 1H), 7.43 – 7.35 (m, 1H), 7.19 (d, *J* = 2.1 Hz, 1H), 7.14 (dd, *J* = 8.2, 2.0 Hz, 1H), 7.07 (d, *J* = 8.8 Hz, 1H), 6.99 (d, *J* = 8.2 Hz, 1H), 6.33 – 6.10 (m, 1H), 5.48 (s, 2H), 3.78 ppm (s, 6H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.7, 161.0, 155.7, 153.3, 148.6, 148.3, 138.4, 129.8, 127.0, 124.3, 123.2, 121.2, 116.6, 114.6, 112.7, 111.5, 109.9, 105.0, 55.5, 55.5, 43.1 ppm; MS (APCI): *m/z* 379.2 [M+H]⁺. Anal. calcd (%) for C₂₁H₁₈N₂O₅: C, 66.66; H, 4.80; N, 7.40. Found (%): C, 66.81; H, 4.97; N, 7.63.

3-(1,3-Benzodioxol-5-yl)-7-hydroxy-8-(1H-pyrazol-1-ylmethyl)-4H-chromen-4-one (11g). Off-white solid, yield 301 mg (83%); mp 246–248 °C;



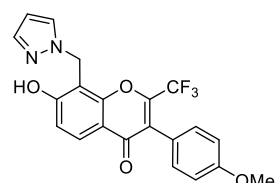
¹H NMR (400 MHz, DMSO-*d*₆) δ 11.23 (s, 1H), 8.43 (s, 1H), 7.99 (d, *J* = 8.8 Hz, 1H), 7.68 (d, *J* = 2.3 Hz, 1H), 7.38 (d, *J* = 1.8 Hz, 1H), 7.14 (d, *J* = 1.7 Hz, 1H), 7.09 – 7.02 (m, 2H), 6.96 (d, *J* = 8.0 Hz, 1H), 6.20 (t, *J* = 2.0 Hz, 1H), 6.04 (s, 2H), 5.47 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.6, 161.0, 155.7, 153.3, 147.0, 146.9, 138.4, 129.8, 127.0, 125.5, 123.2, 122.4, 116.6, 114.6, 109.9, 109.4, 108.1, 105.0, 101.1, 43.1 ppm; MS (APCI): *m/z* 363.2 [M+H]⁺. Anal. calcd (%) for C₂₀H₁₄N₂O₅: C, 66.30; H, 3.89; N, 7.73. Found (%): C, 66.52; H, 3.65; N, 7.98.

7-Hydroxy-3-(4-methoxyphenyl)-2-methyl-8-(1H-pyrazol-1-ylmethyl)-4H-chromen-4-one (11h). Off-white solid, yield 261 mg (72%); mp



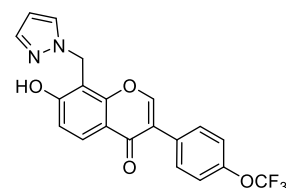
230–232 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.10 (s, 1H), 7.88 (d, *J* = 8.8 Hz, 1H), 7.74 (d, *J* = 2.0 Hz, 1H), 7.39 (d, *J* = 2.0 Hz, 1H), 7.19 (d, *J* = 8.7 Hz, 2H), 7.01 (d, *J* = 8.8 Hz, 1H), 6.97 (d, *J* = 8.7 Hz, 2H), 6.21 (t, *J* = 2.0 Hz, 1H), 5.50 (s, 2H), 3.79 (s, 3H), 2.25 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 175.5, 162.8, 161.1, 159.0, 155.7, 138.9, 132.1, 130.4, 127.1, 125.5, 122.1, 116.0, 114.6, 113.9, 110.3, 105.3, 55.5, 43.6, 19.6 ppm; MS (APCI): *m/z* 363.2 [M+H]⁺. Anal. calcd (%) for C₂₁H₁₈N₂O₄: C, 69.60; H, 5.01; N, 7.73. Found (%): C, 69.84; H, 4.87; N, 7.95.

7-Hydroxy-3-(4-methoxyphenyl)-8-(1H-pyrazol-1-ylmethyl)-2-(trifluoromethyl)-4H-chromen-4-one (11i). Off-white solid, yield 278 mg (67%); mp 219–221 °C;



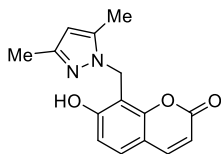
¹H NMR (500 MHz, DMSO-*d*₆) δ 11.50 (s, 1H), 7.94 (d, *J* = 8.8 Hz, 1H), 7.70 (d, *J* = 2.3 Hz, 1H), 7.42 – 7.36 (m, 1H), 7.20 (d, *J* = 8.2 Hz, 2H), 7.13 (d, *J* = 8.8 Hz, 1H), 6.99 (d, *J* = 8.2 Hz, 2H), 6.26 – 6.19 (m, 1H), 5.48 (s, 2H), 3.80 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 175.4, 162.1, 159.4, 154.7, 146.4 (q, *J* = 34.9 Hz), 138.6, 131.2, 129.9, 127.1, 124.7, 121.1, 119.4 (q, *J* = 276.5 Hz), 115.6, 115.4, 113.4, 110.3, 105.0, 55.1, 43.0 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -63.0 ppm. MS (APCI): *m/z* 417.0 [M+H]⁺. Anal. calcd (%) for C₂₁H₁₅F₃N₂O₄: C, 60.58; H, 3.63; N, 6.73. Found (%): C, 60.43; H, 3.78; N, 6.58.

7-Hydroxy-8-(1H-pyrazol-1-ylmethyl)-3-[4-(trifluoromethoxy)phenyl]-4H-chromen-4-one (11j). Off-white solid, yield 361 mg (90%); mp

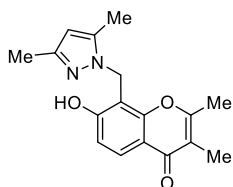


190–192 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 11.28 (s, 1H), 8.55 (s, 1H), 8.01 (d, *J* = 8.8 Hz, 1H), 7.71 (d, *J* = 8.8 Hz, 2H), 7.69 (d, *J* = 2.8 Hz, 1H), 7.42 (d, *J* = 8.2 Hz, 2H), 7.39 (d, *J* = 1.8 Hz, 1H), 7.08 (d, *J* = 8.8 Hz, 1H), 6.23 – 6.18 (m, 1H), 5.48 ppm (s, 2H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.3, 161.2, 155.8, 154.2, 147.9, 138.4, 131.3, 130.9, 129.8, 127.0, 122.3, 120.7, 120.1 (q, *J* = 256.4 Hz), 116.5, 114.8, 110.1, 105.0, 43.1 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -57.2 ppm. MS (APCI): *m/z* 403.0 [M+H]⁺. Anal. calcd (%) for C₂₀H₁₃F₃N₂O₄: C, 59.71; H, 3.26; N, 6.96. Found (%): C, 59.45; H, 3.07; N, 7.03.

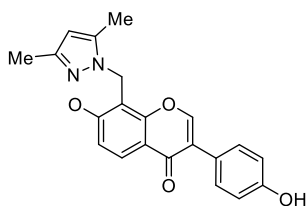
8-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-2H-chromen-2-one (12a). Off-white solid, yield 213 mg (79%); mp 189–191°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 10.94 (s, 1H), 7.91 (d, *J* = 9.4 Hz, 1H), 7.47 (d, *J* = 8.4 Hz, 1H), 6.83 (d, *J* = 8.4 Hz, 1H), 6.19 (d, *J* = 9.4 Hz, 1H), 5.71 (s, 1H), 5.14 (s, 2H), 2.38 (s, 3H), 1.95 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 160.1, 159.9, 153.6, 145.9, 144.9, 139.5, 129.0, 113.1, 111.3, 111.3, 110.9, 104.1, 38.9, 13.3, 10.8 ppm; MS (APCI): *m/z* 271.2 [M+H]⁺. Anal. calcd (%) for C₁₅H₁₄N₂O₃: C, 66.66; H, 5.22; N, 10.36. Found (%): C, 66.81; H, 5.43; N, 10.09.



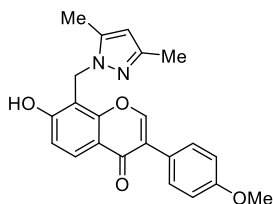
8-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-2,3-dimethyl-4H-chromen-4-one (12b). Off-white solid, yield 206 mg (69%); mp 233–235 °C; ¹H NMR (500 MHz, DMSO-*d*₆+ CF₃SO₃H) δ 7.84 (d, *J* = 8.8 Hz, 1H), 6.92 (d, *J* = 8.8 Hz, 1H), 6.35 (s, 1H), 5.52 (s, 2H), 2.30 (s, 3H), 2.26 (s, 3H), 2.24 (s, 3H), 1.82 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆+CF₃SO₃H) δ 176.5, 162.0, 161.2, 155.9, 146.6, 145.2, 128.1, 116.2, 115.5, 114.5, 108.0, 106.3, 42.1, 18.4, 11.3, 11.2, 10.1 ppm; MS (APCI): *m/z* 299.2 [M+H]⁺. Anal. calcd (%) for C₁₇H₁₈N₂O₃: C, 68.44; H, 6.08; N, 9.39. Found (%): C, 68.67; H, 6.26; N, 9.51.



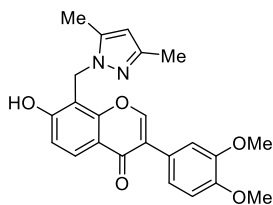
8-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-3-(4-hydroxyphenyl)-4H-chromen-4-one (12c). Off-white solid, yield 260 mg (72%); mp 264–266 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.07 (s, 1H), 9.57 (s, 1H), 8.37 (s, 1H), 7.95 (d, *J* = 8.7 Hz, 1H), 7.39 (d, *J* = 8.6 Hz, 2H), 7.00 (d, *J* = 8.7 Hz, 1H), 6.80 (d, *J* = 8.6 Hz, 2H), 5.75 (s, 1H), 5.24 (s, 2H), 2.37 (s, 3H), 1.99 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.8, 161.0, 157.2, 155.6, 152.7, 145.9, 139.4, 130.1, 126.5, 123.4, 122.4, 116.6, 115.0, 114.8, 110.8, 104.2, 39.8, 13.4, 10.8 ppm; MS (APCI): *m/z* 363.0 [M+H]⁺. Anal. calcd (%) for C₂₁H₁₈N₂O₄: C, 69.60; H, 5.01; N, 7.73. Found (%): C, 69.34; H, 5.25; N, 7.86.



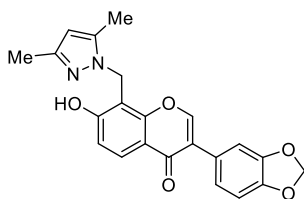
8-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-3-(4-methoxyphenyl)-4H-chromen-4-one (12d). Off-white solid, yield 286 mg (76%); mp 228–229°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.18 (s, 1H), 8.45 (s, 1H), 7.97 (d, *J* = 8.8 Hz, 1H), 7.52 (d, *J* = 8.8 Hz, 2H), 7.02 (d, *J* = 8.8 Hz, 1H), 6.99 (d, *J* = 8.8 Hz, 2H), 5.76 (s, 1H), 5.25 (s, 2H), 3.78 (s, 3H), 2.39 (s, 3H), 1.99 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 174.7, 160.9, 159.0, 155.6, 153.0, 145.9, 139.3, 130.1, 126.5, 124.1, 123.0, 116.6, 114.8, 113.6, 110.9, 104.2, 55.1, 39.7, 13.3, 10.8 ppm; MS (APCI): *m/z* 377.2 [M+H]⁺. Anal. calcd (%) for C₂₂H₂₀N₂O₄: C, 70.20; H, 5.36; N, 7.44. Found (%): C, 70.02; H, 5.11; N, 7.18.



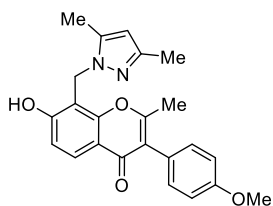
3-(1,3-Benzodioxol-5-yl)-8-[(3,5-dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-4H-chromen-4-one (12e). Off-white solid, yield 292 mg (72%); mp 172–173°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.19 (s, 1H), 8.48 (s, 1H), 7.97 (d, *J* = 8.8 Hz, 1H), 7.19 (d, *J* = 1.9 Hz, 1H), 7.15 (dd, *J* = 8.3, 1.9 Hz, 1H), 7.05–6.94 (m, 2H), 5.77 (s, 1H), 5.25 (s, 2H), 3.78 (s, 6H), 2.39 (s, 3H), 1.99 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 174.8, 161.0, 155.6, 153.4, 148.6, 148.3, 145.9, 139.4, 126.6, 124.4, 123.2, 121.3, 116.7, 114.9, 112.6, 111.5, 110.9, 104.3, 55.6, 55.5, 39.8, 13.4, 10.9 ppm; MS (APCI): *m/z* 407.2 [M+H]⁺. Anal. calcd (%) for C₂₃H₂₂N₂O₅: C, 67.97; H, 5.46; N, 6.89. Found (%): C, 67.81; H, 5.59; N, 7.12.



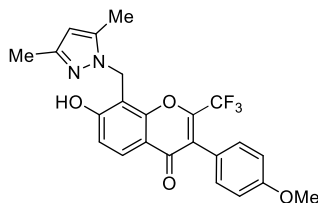
3-(1,3-Benzodioxol-5-yl)-8-[(3,5-dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-4H-chromen-4-one (12f). Off-white solid, yield 292 mg (75%); mp 223–225 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 11.16 (s, 1H), 8.43 (s, 1H), 7.96 (d, *J* = 8.9 Hz, 1H), 7.14 (s, 1H), 7.06 (d, *J* = 8.1 Hz, 1H), 7.01 (d, *J* = 8.9 Hz, 1H), 6.96 (d, *J* = 8.1 Hz, 1H), 6.04 (s, 2H), 5.76 (s, 1H), 5.24 (s, 2H), 2.37 (s, 3H), 1.99 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.6, 161.0, 155.6, 153.3, 147.0, 146.9, 145.9, 139.4, 126.5, 125.6, 123.0, 122.4, 116.6, 114.9, 110.9, 109.4, 108.1, 104.2, 101.0, 39.6, 13.3, 10.8 ppm; MS (APCI): *m/z* 391.2 [M+H]⁺. Anal. calcd (%) for C₂₂H₁₈N₂O₅: C, 67.69; H, 4.65; N, 7.18. Found (%): C, 67.83; H, 4.87; N, 7.02.



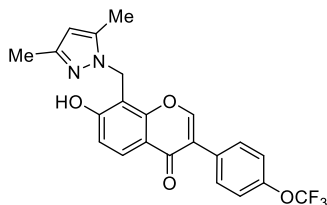
8-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-3-(4-methoxyphenyl)-2-methyl-4H-chromen-4-one (12g). Off-white solid, yield 300 mg (77%); mp 210–212°C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.13 (s, 1H), 7.86 (d, *J* = 8.7 Hz, 1H), 7.18 (d, *J* = 8.6 Hz, 2H), 7.01–6.95 (m, 3H), 5.79 (s, 1H), 5.31 (s, 2H), 3.79 (s, 3H), 2.36 (s, 3H), 2.23 (s, 3H), 2.03 ppm (s, 3H); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 175.0, 162.2, 160.7, 158.5, 155.1, 145.8, 139.3, 131.6, 126.3, 125.1, 121.6, 115.6, 114.6, 113.5, 110.5, 104.3, 55.1, 19.0, 13.2, 10.8 ppm; MS (APCI): *m/z* 391.2 [M+H]⁺. Anal. calcd (%) for C₂₃H₂₂N₂O₄: C, 70.75; H, 5.68; N, 7.17. Found (%): C, 70.98; H, 5.42; N, 7.03.



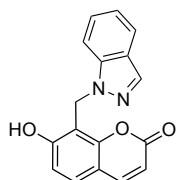
8-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-3-(4-methoxyphenyl)-2-(trifluoromethyl)-4H-chromen-4-one (12h). Off-white solid, yield 356 mg (80%); mp 201–203 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.61 (s, 1H), 7.94 (d, *J* = 8.8 Hz, 1H), 7.20 (d, *J* = 8.4 Hz, 2H), 7.10 (d, *J* = 8.8 Hz, 1H), 7.00 (d, *J* = 8.4 Hz, 2H), 5.80 (s, 1H), 5.28 (s, 2H), 3.80 (s, 3H), 2.35 (s, 3H), 2.02 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 175.3, 162.2, 159.4, 154.4, 146.4 (q, *J* = 35.0 Hz), 145.9, 139.2, 131.1, 126.7, 124.5, 121.1, 119.4 (q, *J* = 276.4 Hz), 116.1, 115.5, 113.4, 110.9, 104.3, 55.1, 39.9, 13.2, 10.4 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -63.0 ppm. MS (APCI): *m/z* 445.0 [M+H]⁺. Anal. calcd (%) for C₂₃H₁₉F₃N₂O₄: C, 62.16; H, 4.31; N, 6.30. Found (%): C, 62.31; H, 4.52; N, 6.45.



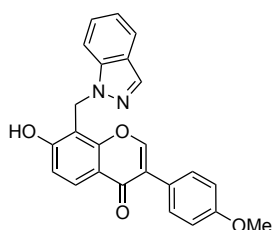
8-[(3,5-Dimethyl-1H-pyrazol-1-yl)methyl]-7-hydroxy-3-[4-(trifluoromethoxy)phenyl]-4H-chromen-4-one (12i). Off-white solid, yield 349 mg (81%); mp 231–233 °C; ¹H NMR (500 MHz, DMSO-*d*₆) δ 11.22 (s, 1H), 8.53 (s, 1H), 7.96 (d, *J* = 8.8 Hz, 1H), 7.70 (d, *J* = 8.7 Hz, 2H), 7.40 (d, *J* = 8.7 Hz, 2H), 7.02 (d, *J* = 8.8 Hz, 1H), 5.74 (s, 1H), 5.23 (s, 2H), 2.36 (s, 3H), 1.98 ppm (s, 3H); ¹³C NMR (126 MHz, DMSO-*d*₆) δ 174.3, 161.2, 155.7, 154.1, 147.9, 145.9, 139.4, 131.3, 130.8, 126.5, 122.2, 120.7, 120.1 (q, *J* = 256.1 Hz), 116.5, 115.0, 111.0, 104.2, 39.7, 13.3, 10.8 ppm; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -57.3 ppm. MS (APCI): *m/z* 431.0 [M+H]⁺. Anal. calcd (%) for C₂₂H₁₇F₃N₂O₄: C, 61.40; H, 3.98; N, 6.51. Found (%): C, 61.13; H, 4.17; N, 6.72.



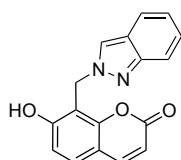
7-Hydroxy-8-(1H-indazol-1-ylmethyl)-2H-chromen-2-one (13a). Off-white solid, yield 30 mg (10%); mp 227–229 °C; ¹H NMR (600 MHz, DMSO-*d*₆) δ 10.87 (s, 1H), 7.97 (s, 1H), 7.94 (d, *J* = 9.4 Hz, 1H), 7.83 (d, *J* = 8.5 Hz, 1H), 7.71 (d, *J* = 8.0 Hz, 1H), 7.52 (d, *J* = 8.5 Hz, 1H), 7.42–7.35 (m, 1H), 7.11 (t, *J* = 7.4 Hz, 1H), 6.86 (d, *J* = 8.5 Hz, 1H), 6.22 (d, *J* = 9.5 Hz, 1H), 5.66 ppm (s, 2H); ¹³C NMR (151 MHz, DMSO-*d*₆) δ 160.0, 159.9, 154.0, 144.8, 139.4, 132.6, 129.2, 125.7, 123.3, 120.5, 120.2, 112.5, 111.3, 110.2, 110.2, 40.2 ppm. MS (APCI): *m/z* 293.0 [M+H]⁺. Anal. calcd (%) for C₁₇H₁₂N₂O₃: C, 69.86; H, 4.14; N, 9.58. Found (%): C, 70.07; H, 3.97; N, 9.51.



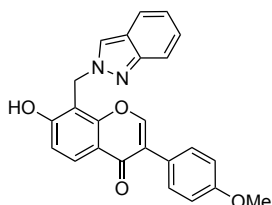
7-Hydroxy-8-(1H-indazol-1-ylmethyl)-3-(4-methoxyphenyl)-4H-chromen-4-one (13b). Off-white solid, yield 80 mg (20%); mp 196–198 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.14 (s, 1H), 8.36 (s, 1H), 7.96 (d, *J* = 0.9 Hz, 1H), 7.95 (d, *J* = 8.8 Hz, 1H), 7.83–7.78 (m, 1H), 7.72–7.66 (m, 1H), 7.47 (d, *J* = 8.9 Hz, 2H), 7.41–7.33 (m, 1H), 7.12–7.06 (m, 1H), 7.00 (d, *J* = 8.8 Hz, 1H), 6.95 (d, *J* = 8.9 Hz, 2H), 5.71 (s, 2H), 3.75 ppm (s, 3H); ¹³C NMR (100 MHz, DMSO-*d*₆) δ 174.7, 160.9, 159.0, 156.0, 153.0, 139.5, 132.7, 130.1, 126.8, 125.9, 124.0, 123.3, 123.2, 120.6, 120.3, 116.6, 114.5, 113.6, 110.3, 110.1, 55.1, 40.4 ppm. MS (APCI): *m/z* 399.0 [M+H]⁺. Anal. calcd (%) for C₂₄H₁₈N₂O₄: C, 72.35; H, 4.55; N, 7.03. Found (%): C, 72.23; H, 4.77; N, 6.72.



7-Hydroxy-8-(2H-indazol-2-ylmethyl)-2H-chromen-2-one (14a). Off-white solid, yield 195 mg (67%); mp 223–225 °C; ¹H NMR (600 MHz, DMSO-*d*₆) δ 11.05 (s, 1H), 8.28 (s, 1H), 7.97 (d, *J* = 9.2 Hz, 1H), 7.66 (d, *J* = 8.4 Hz, 1H), 7.58 (d, *J* = 8.5 Hz, 1H), 7.55 (d, *J* = 8.8 Hz, 1H), 7.19 (dd, *J* = 8.8, 6.5 Hz, 1H), 7.02–6.96 (m, 1H), 6.93 (d, *J* = 8.5 Hz, 1H), 6.25 (d, *J* = 9.6 Hz, 1H), 5.73 ppm (s, 2H); ¹³C NMR (151 MHz, DMSO-*d*₆) δ 160.0, 159.9, 153.9, 147.8, 144.8, 129.8, 125.3, 123.7, 121.1, 120.8, 120.5, 116.9, 112.7, 111.4, 111.4, 109.1, 44.7 ppm. MS (APCI): *m/z* 293.2 [M+H]⁺. Anal. calcd (%) for C₁₇H₁₂N₂O₃: C, 69.86; H, 4.14; N, 9.58. Found (%): C, 69.66; H, 4.07; N, 9.73.

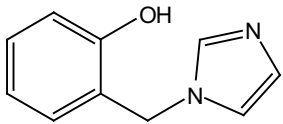


7-Hydroxy-8-(2H-indazol-2-ylmethyl)-3-(4-methoxyphenyl)-4H-chromen-4-one (14b). Off-white solid, yield 178 mg (45%); mp 191–193 °C; ¹H NMR (400 MHz, DMSO-*d*₆) δ 11.32 (s, 1H), 8.44 (s, 1H), 8.32 (s, 1H), 8.04 (d, *J* = 8.8 Hz, 1H), 7.68–7.63 (m, 1H), 7.56 (d, *J* = 8.8 Hz, 1H), 7.51 (d, *J* = 8.7 Hz, 2H), 7.24–7.16 (m, 1H), 7.09 (d, *J* = 8.8 Hz, 1H), 7.03–6.94 (m, 3H), 5.80 (s, 2H), 3.78 ppm (s, 3H); ¹³C NMR (100 MHz, DMSO-*d*₆) δ 174.7, 161.2, 159.0, 155.9, 153.1, 147.9, 130.1, 127.4, 125.4, 124.0, 123.8, 123.2, 121.3, 120.9, 120.6, 116.9, 116.7, 114.6, 113.6, 109.3, 55.1, 44.8 ppm. MS (APCI): *m/z* 399.2 [M+H]⁺. Anal. calcd (%) for C₂₄H₁₈N₂O₄: C, 72.35; H, 4.55; N, 7.03. Found (%): C, 72.64; H, 4.82; N, 7.18.



1. M. Ogata, H. Matsumoto, K. Takahashi, S. Shimizu, S. Kida, M. Ueda, S. Kimoto and M. Haruna, *J. Med. Chem.*, 1984, **27**, 1142–1149.
2. M. Ogata and H. Matsumoto, *Synth. Commun.*, 1980, **10**, 559–567.
3. S. González-Pelayo and L. A. López, *Eur. J. Org. Chem.*, 2017, **2017**, 6003–6007.
4. G. Wu, Z. Yang, X. Xu, L. Hao, L. Chen, Y. Wang and Y. Ji, *Org. Lett.*, 2022, **24**, 3570–3575.
5. S. Ahmed, I. Shahid, S. Dhanani and C. P. Owen, *Bioorg. Med. Chem. Lett.*, 2009, **19**, 4698–4701.

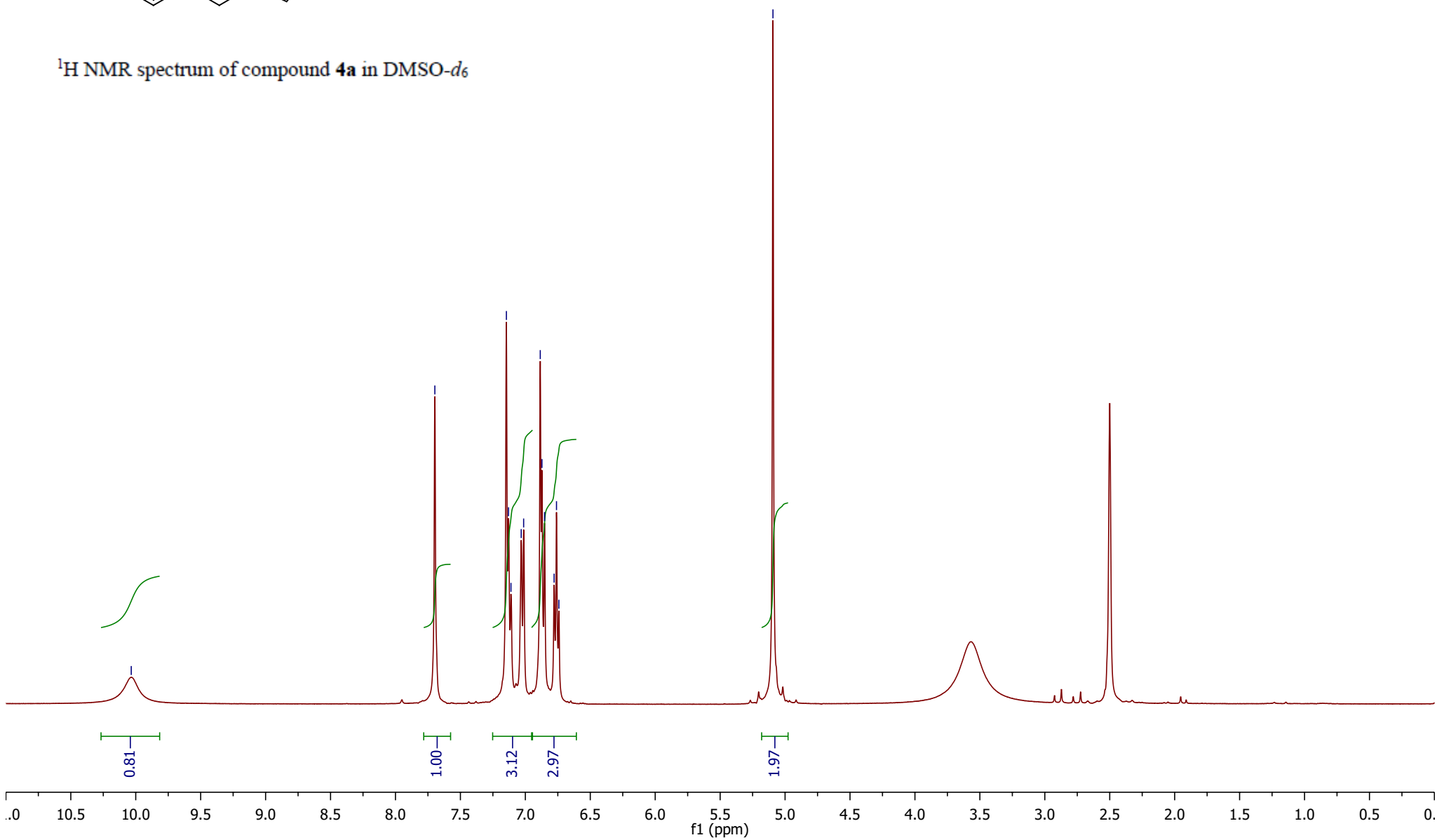
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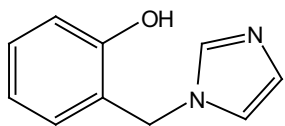


7.70
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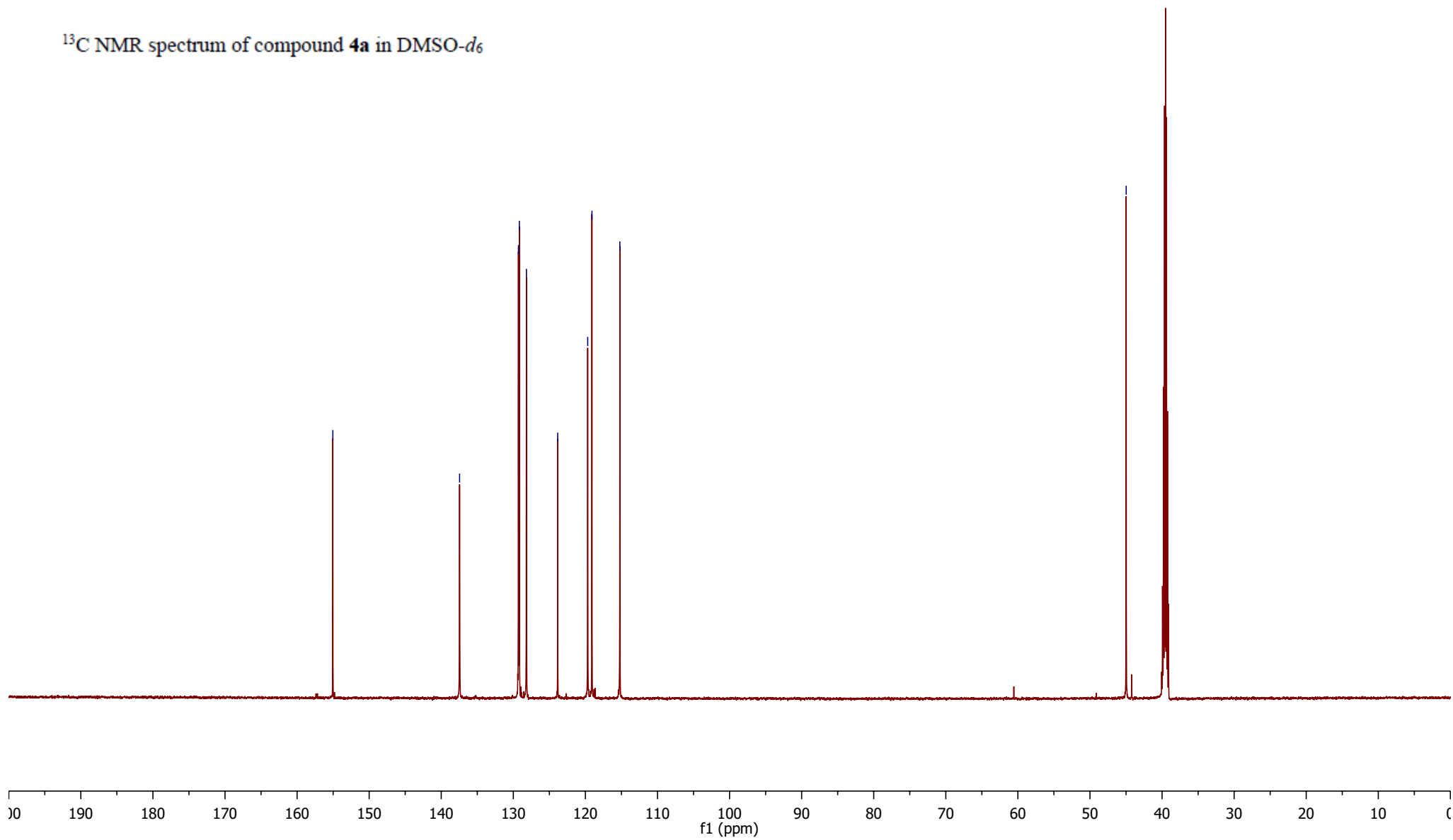
5.09

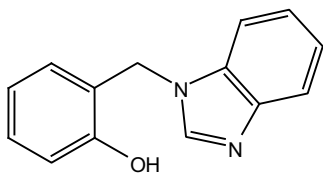
¹H NMR spectrum of compound **4a** in DMSO-*d*₆



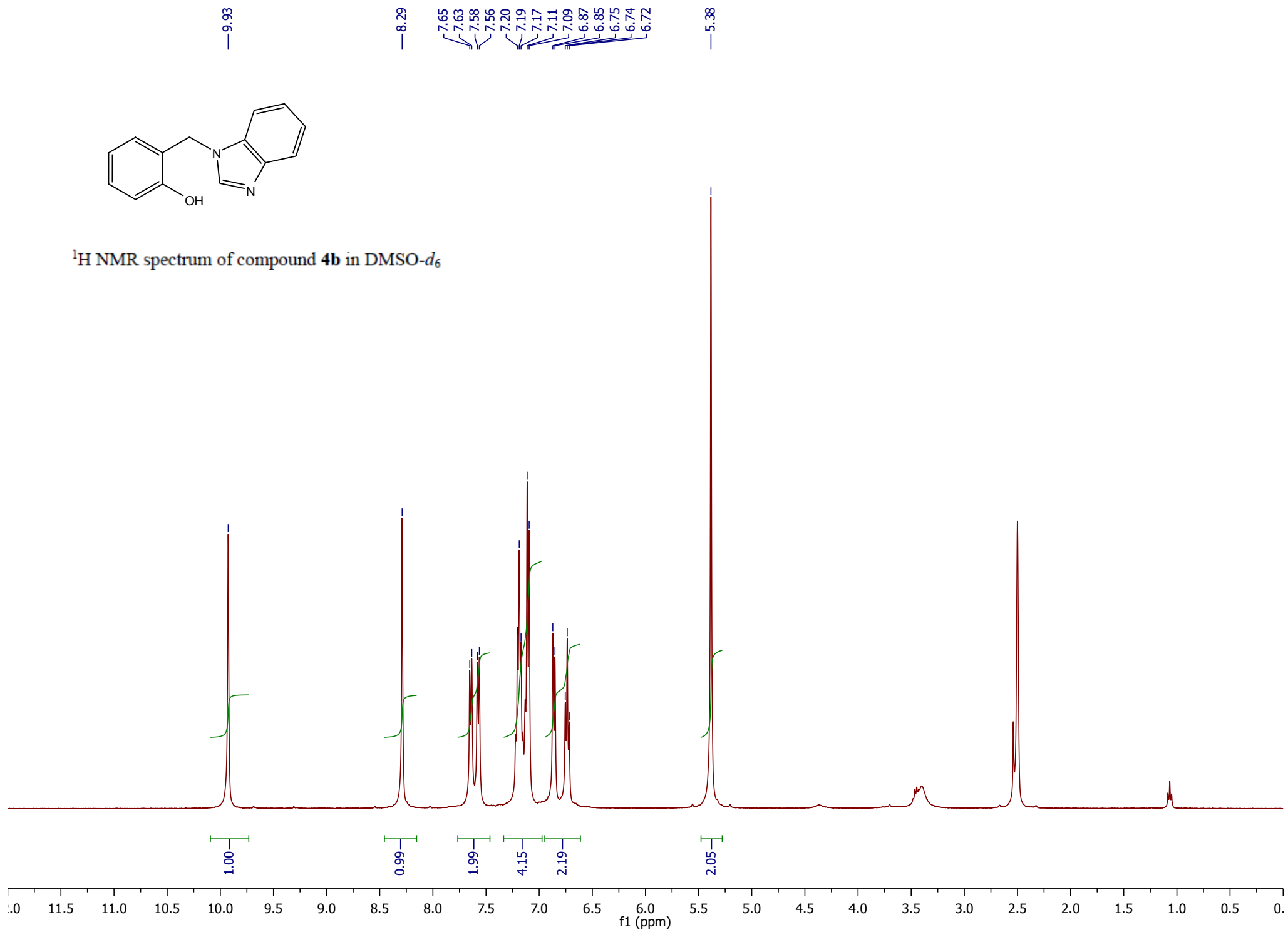


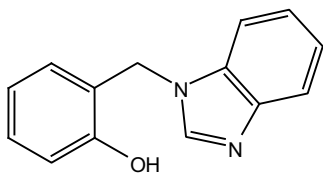
¹³C NMR spectrum of compound 4a in DMSO-*d*₆



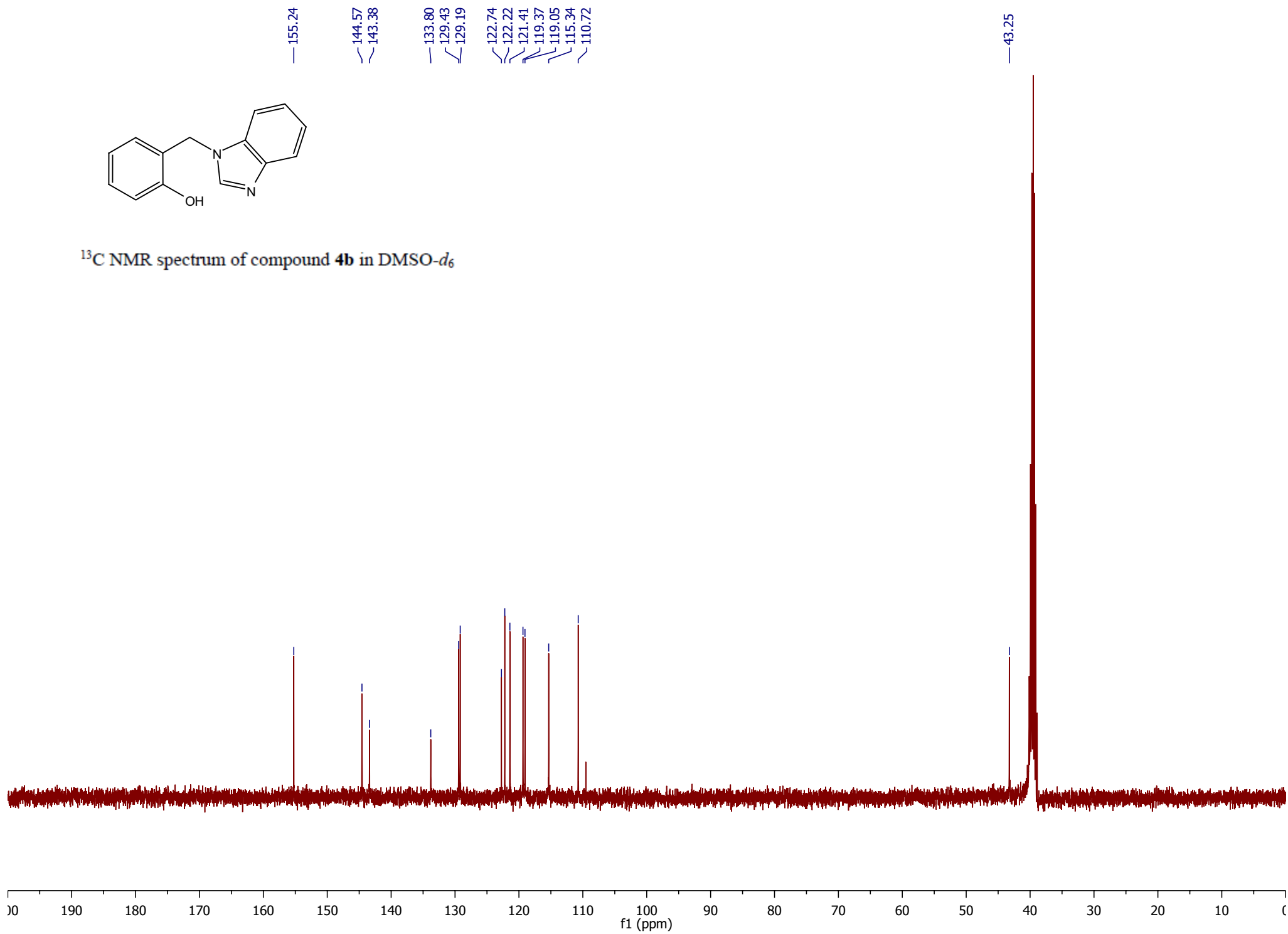


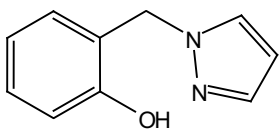
^1H NMR spectrum of compound **4b** in $\text{DMSO-}d_6$



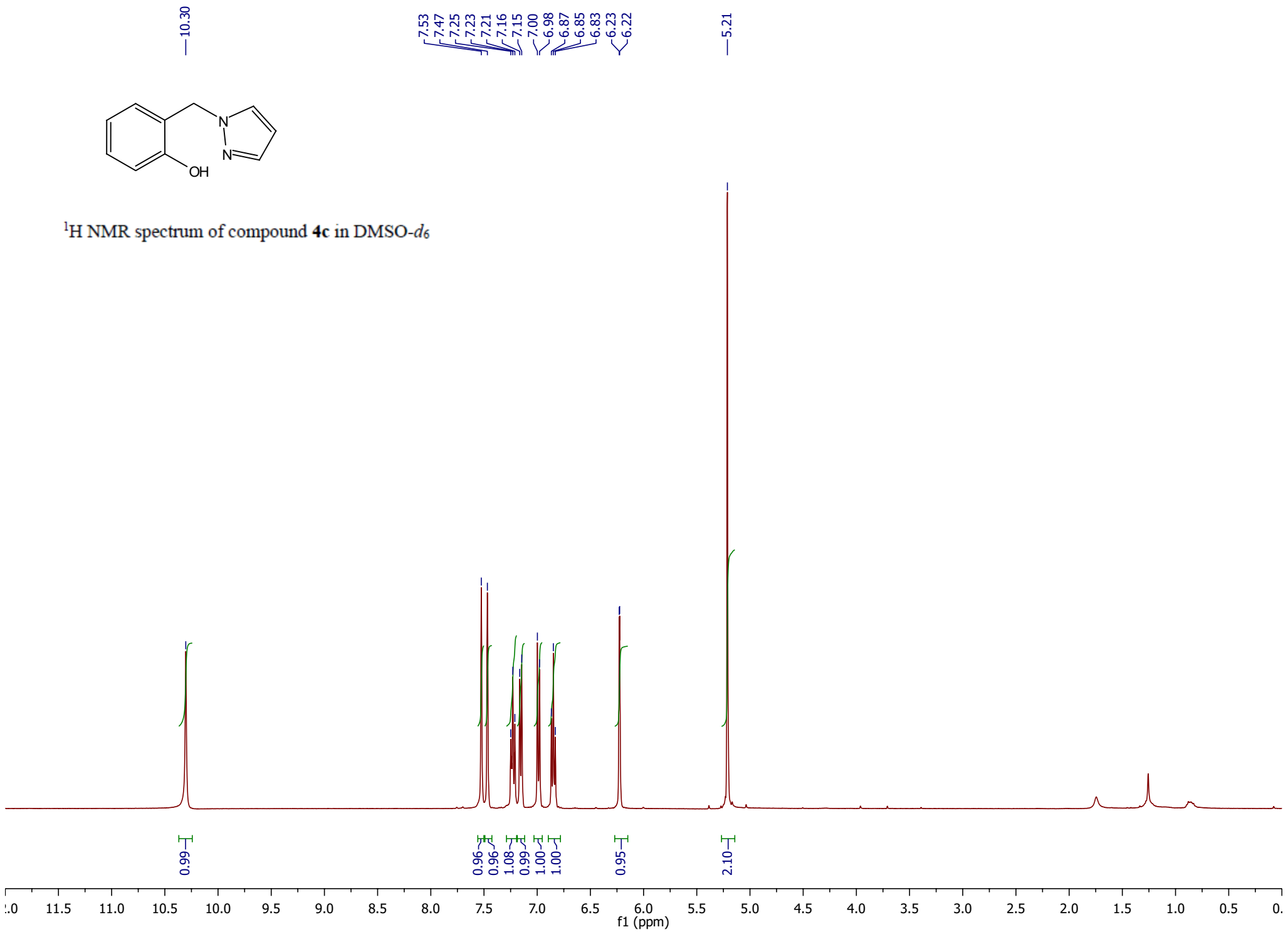


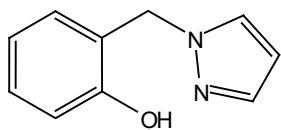
^{13}C NMR spectrum of compound **4b** in $\text{DMSO-}d_6$





^1H NMR spectrum of compound 4c in DMSO- d_6





— 156.62

— 139.25

130.62

130.17

129.65

123.39

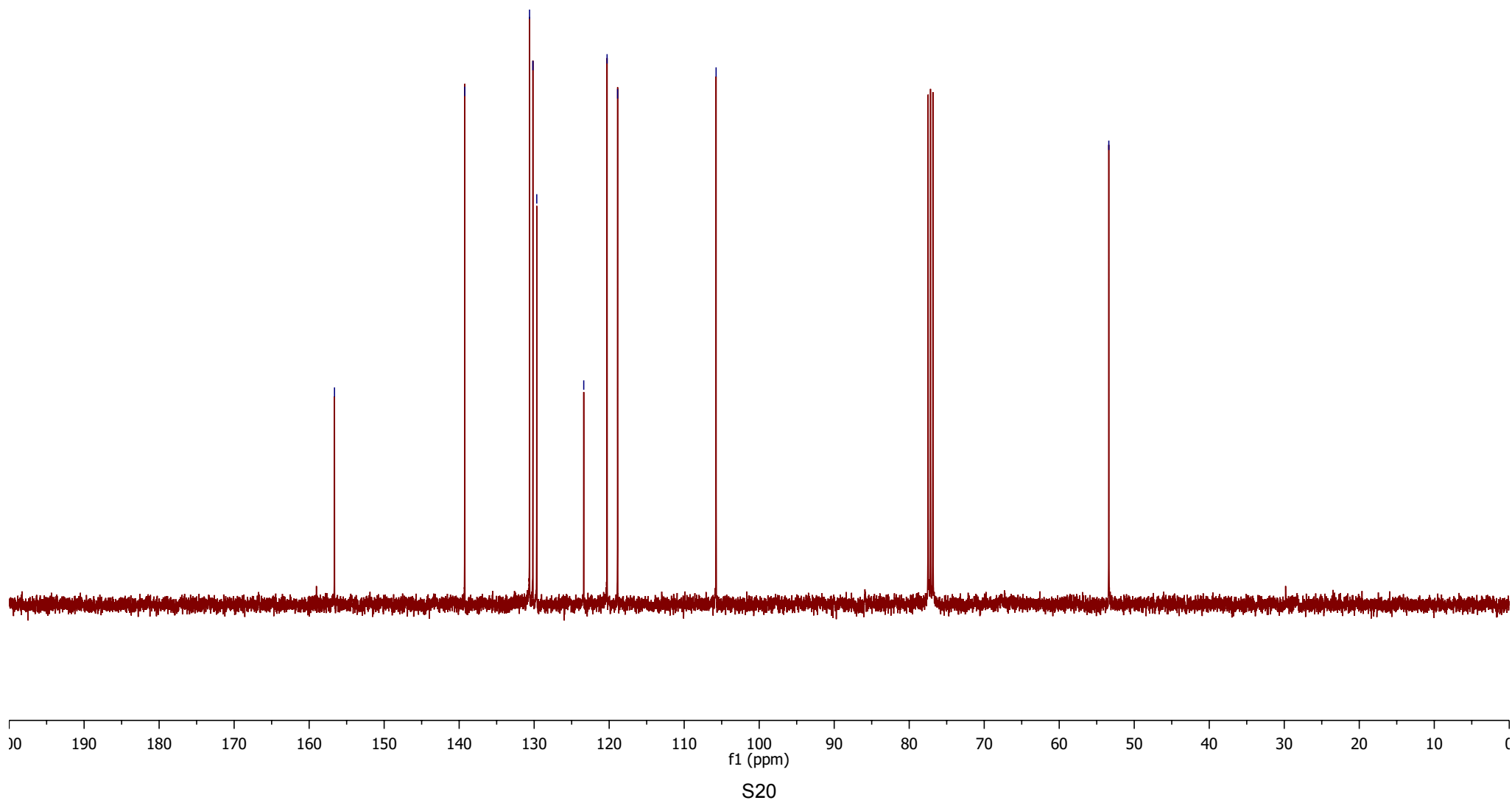
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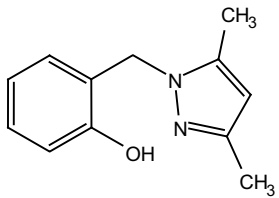
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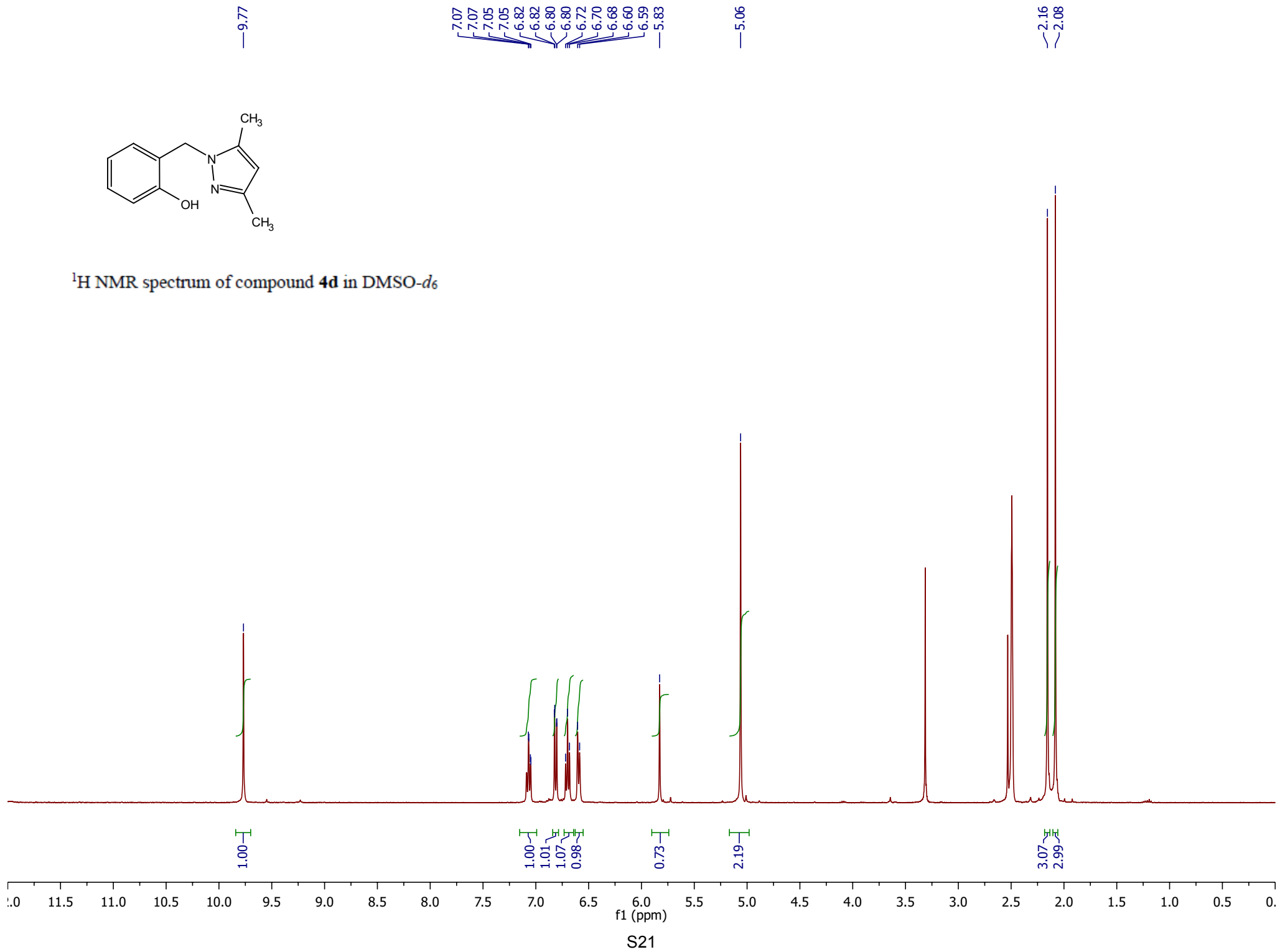
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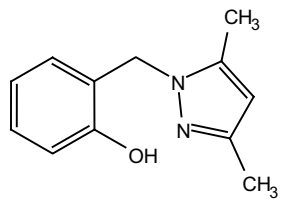
^{13}C NMR spectrum of compound **4c** in $\text{DMSO-}d_6$



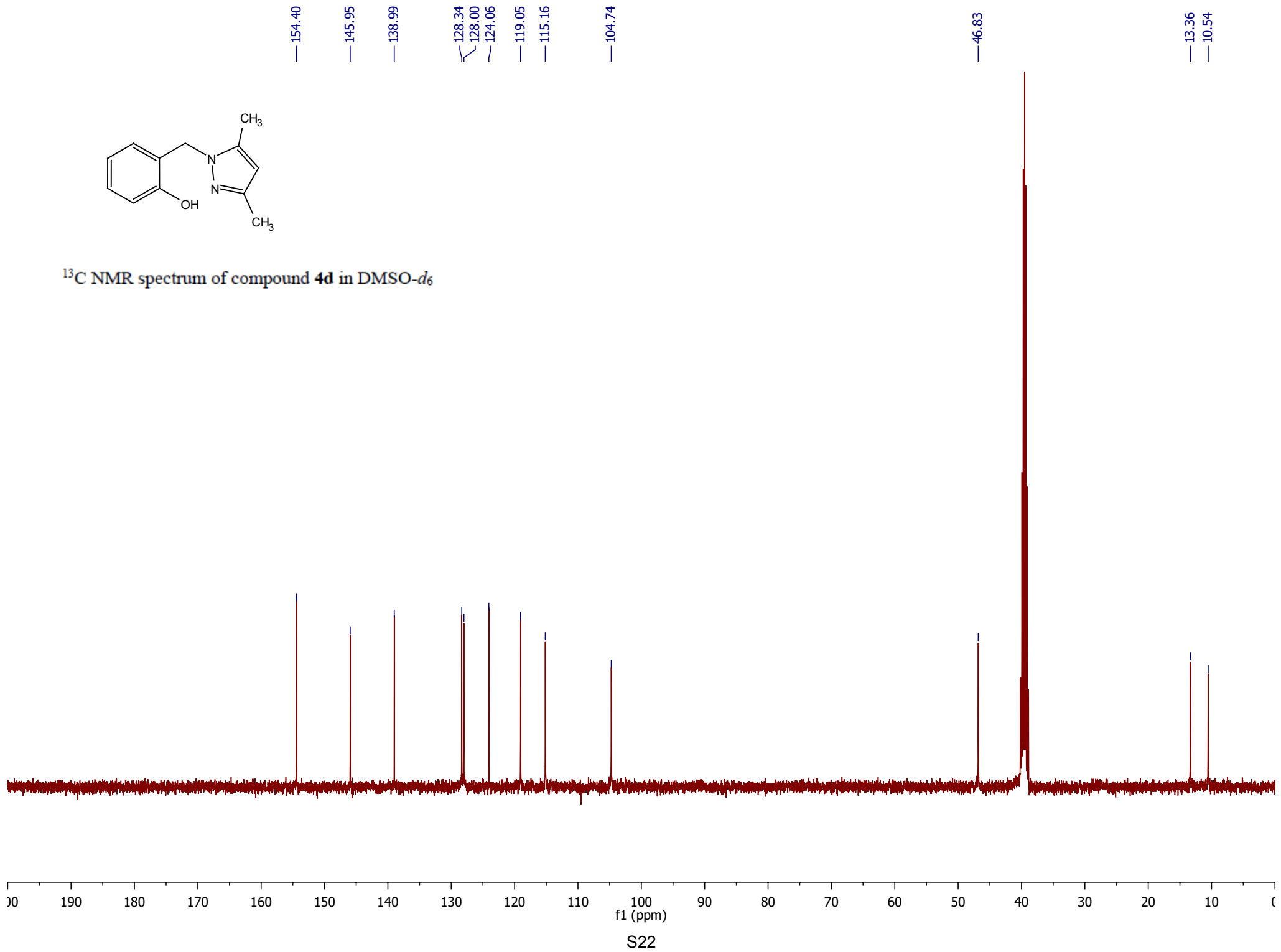


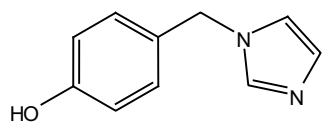
^1H NMR spectrum of compound 4d in DMSO- d_6



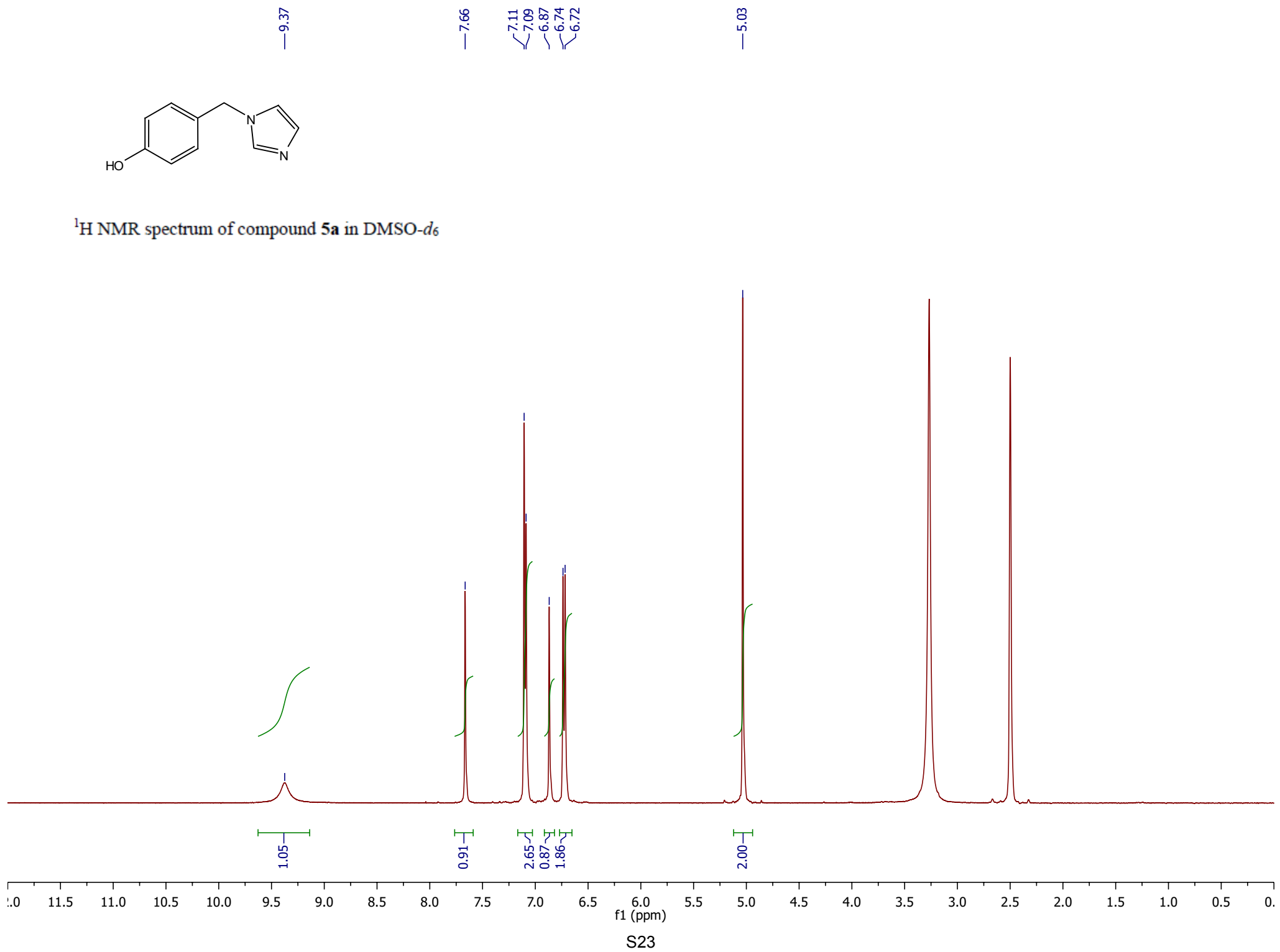


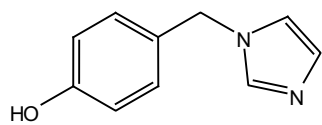
¹³C NMR spectrum of compound **4d** in DMSO-*d*₆



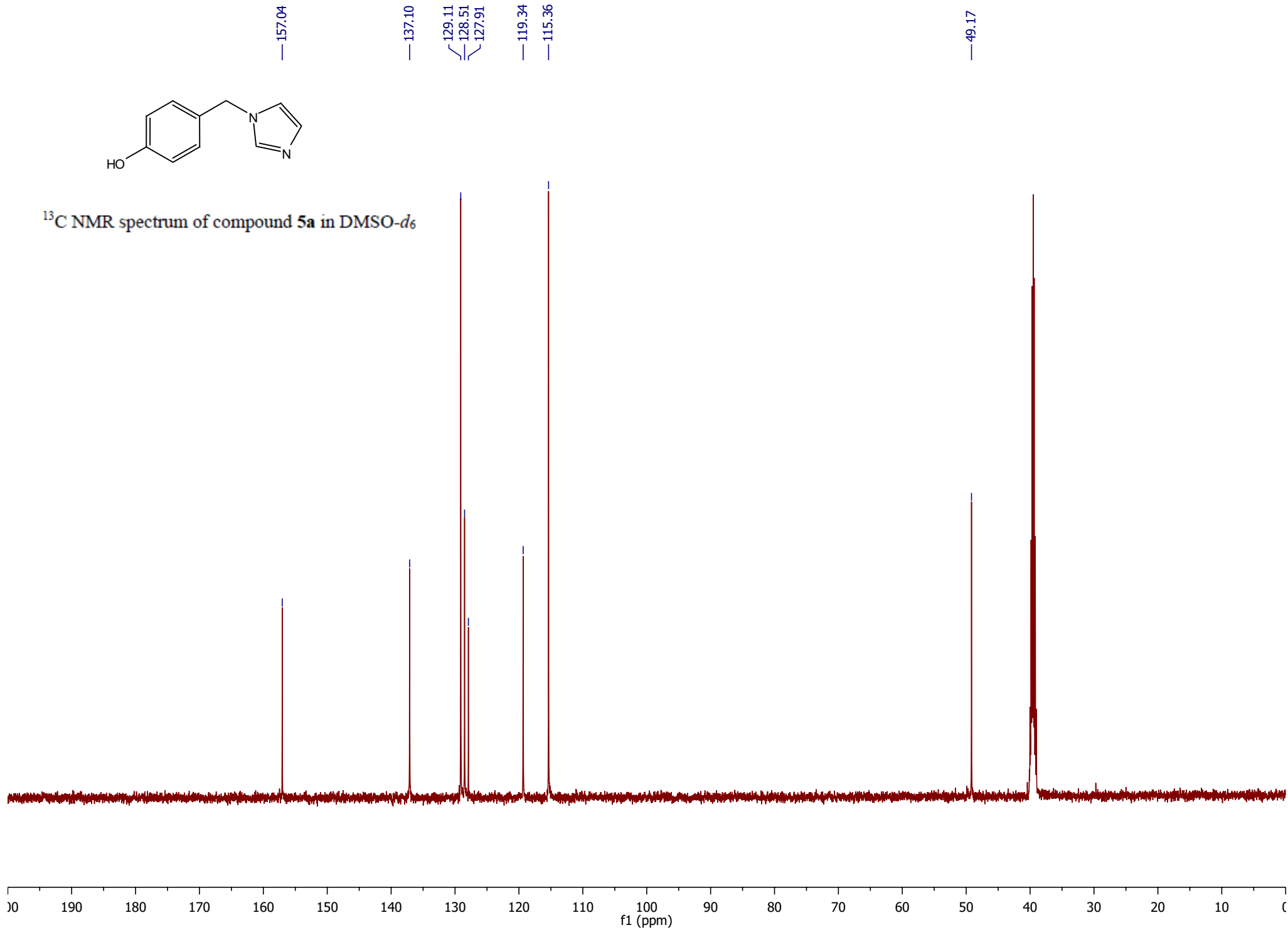


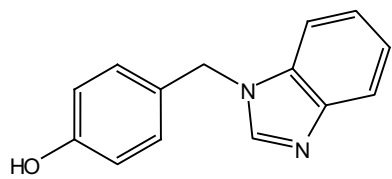
^1H NMR spectrum of compound 5a in DMSO- d_6



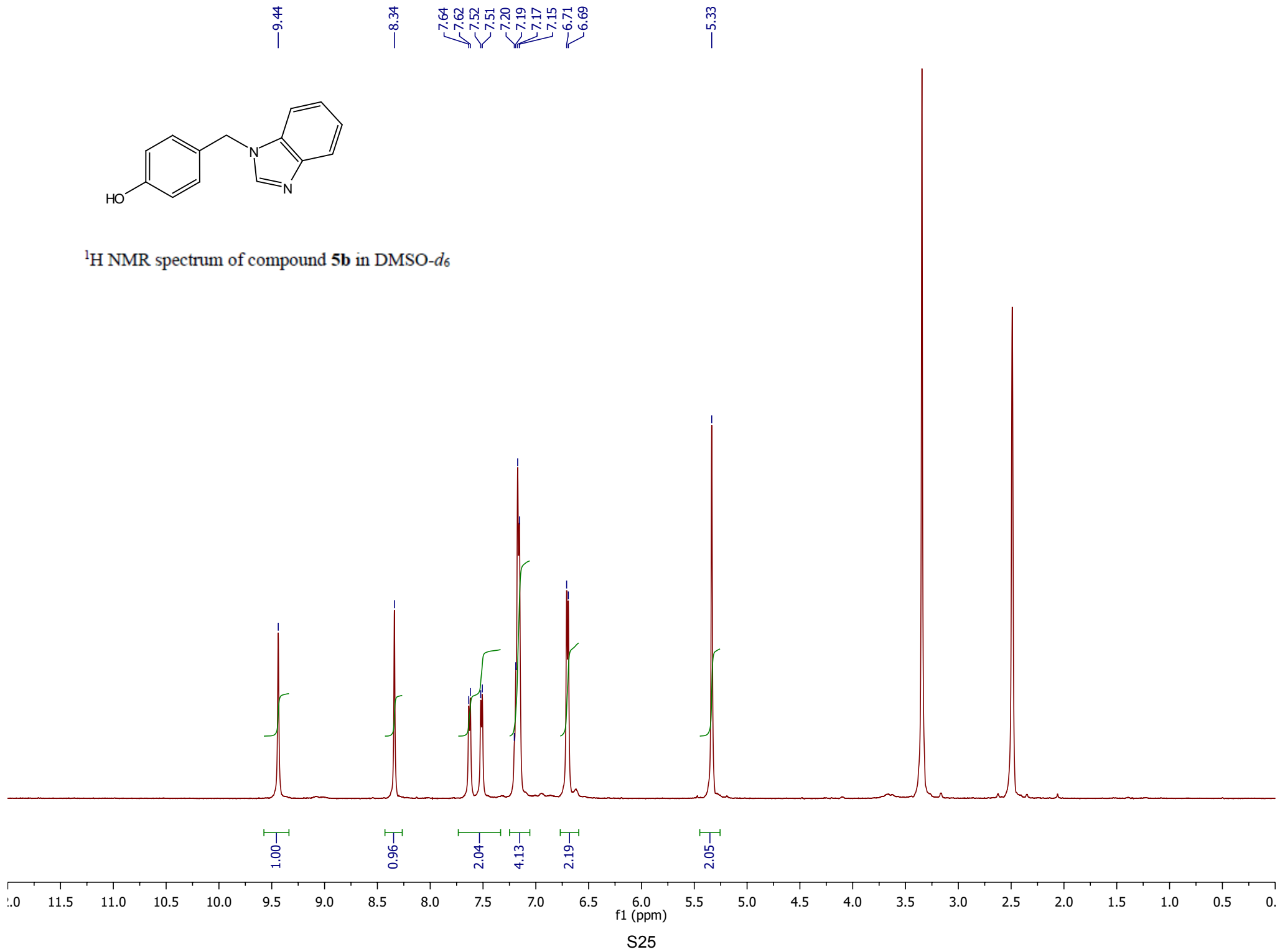


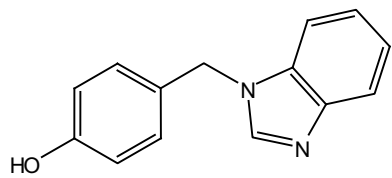
^{13}C NMR spectrum of compound 5a in $\text{DMSO-}d_6$



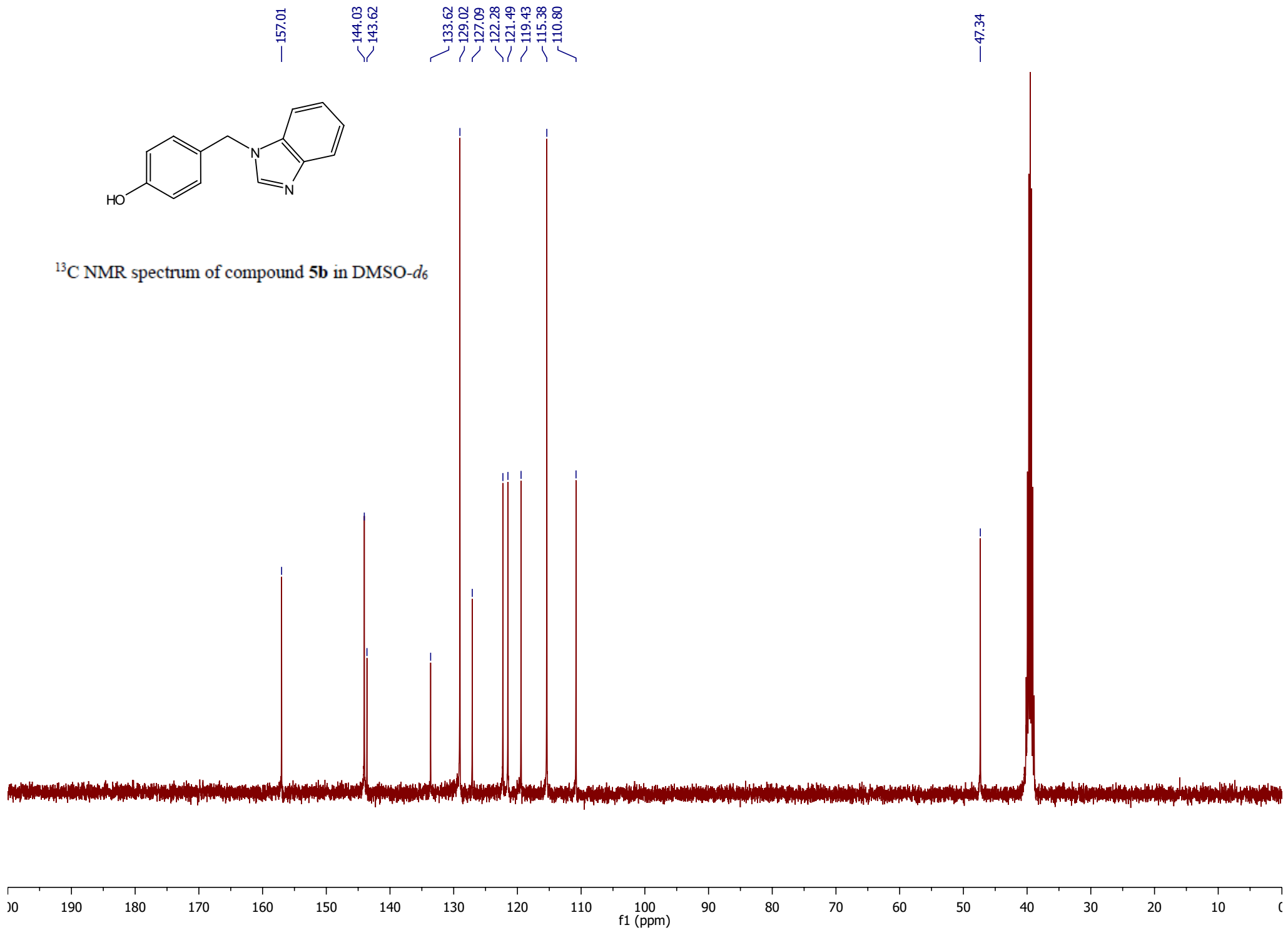


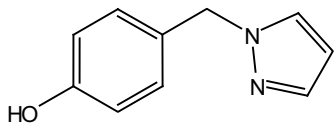
^1H NMR spectrum of compound **5b** in $\text{DMSO-}d_6$



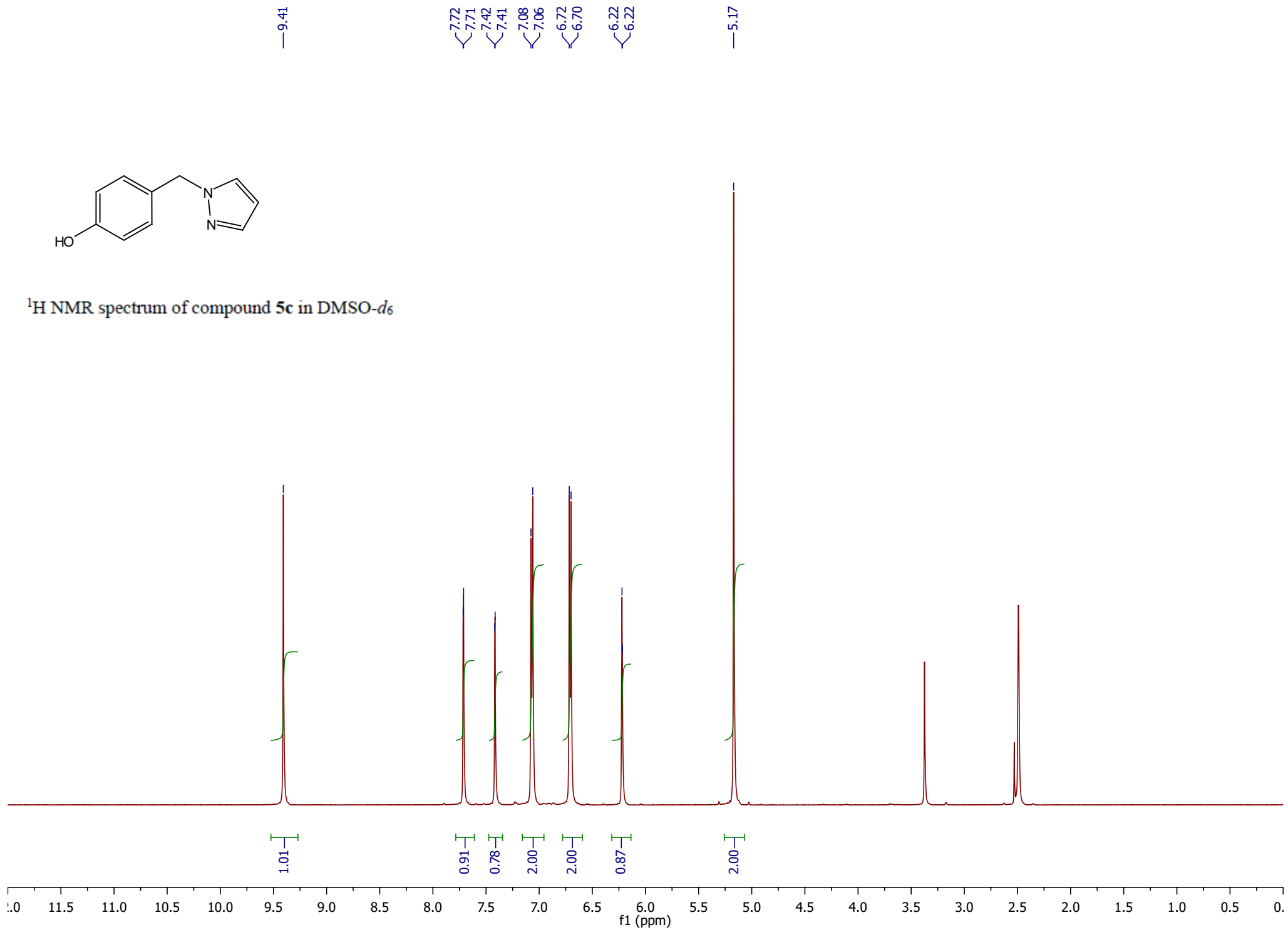


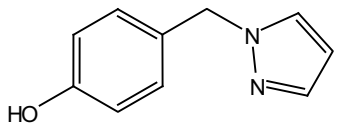
^{13}C NMR spectrum of compound **5b** in $\text{DMSO-}d_6$



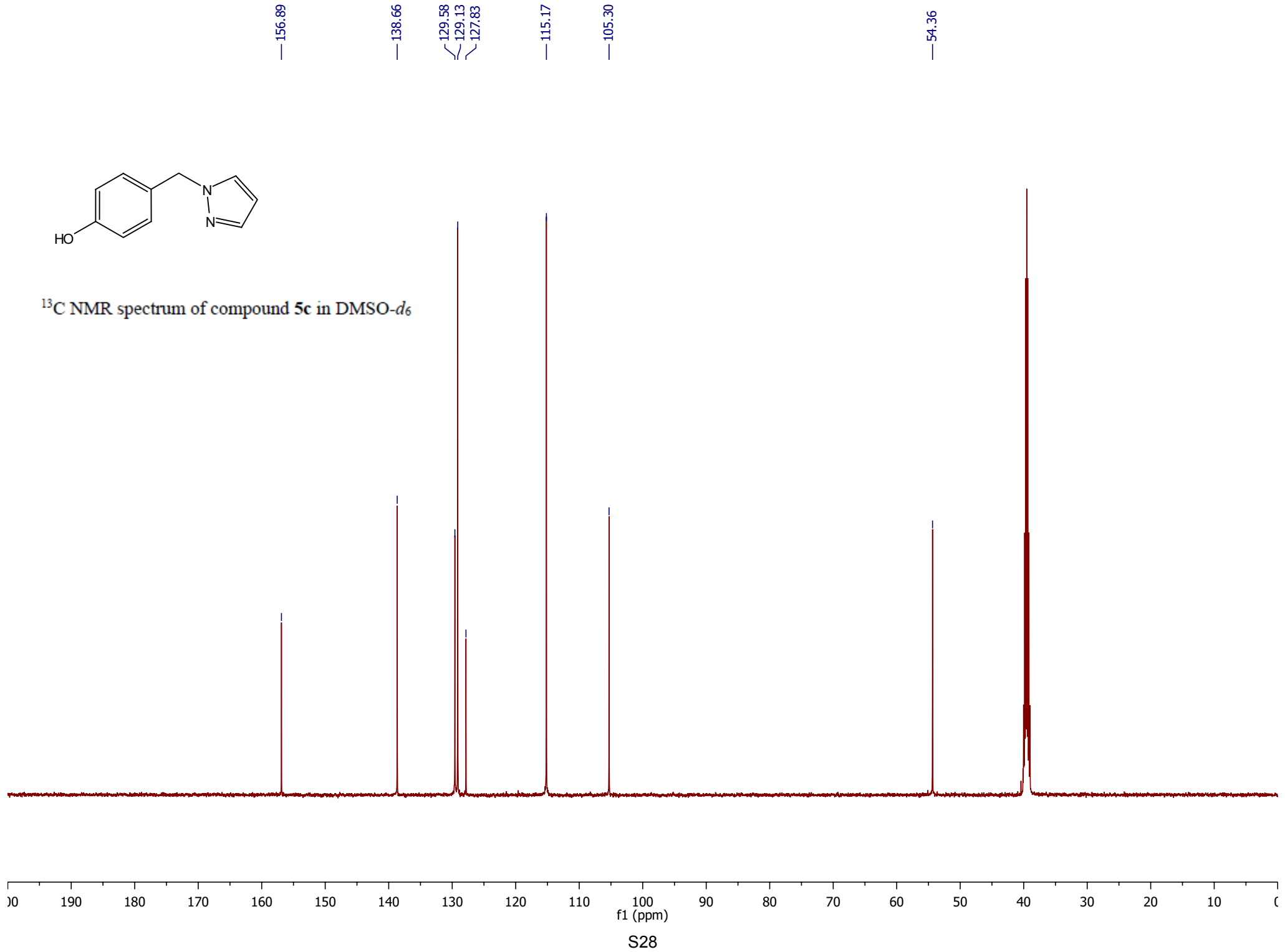


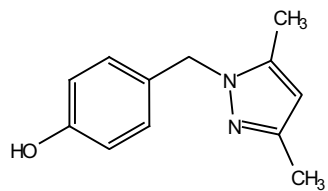
^1H NMR spectrum of compound **5c** in $\text{DMSO-}d_6$



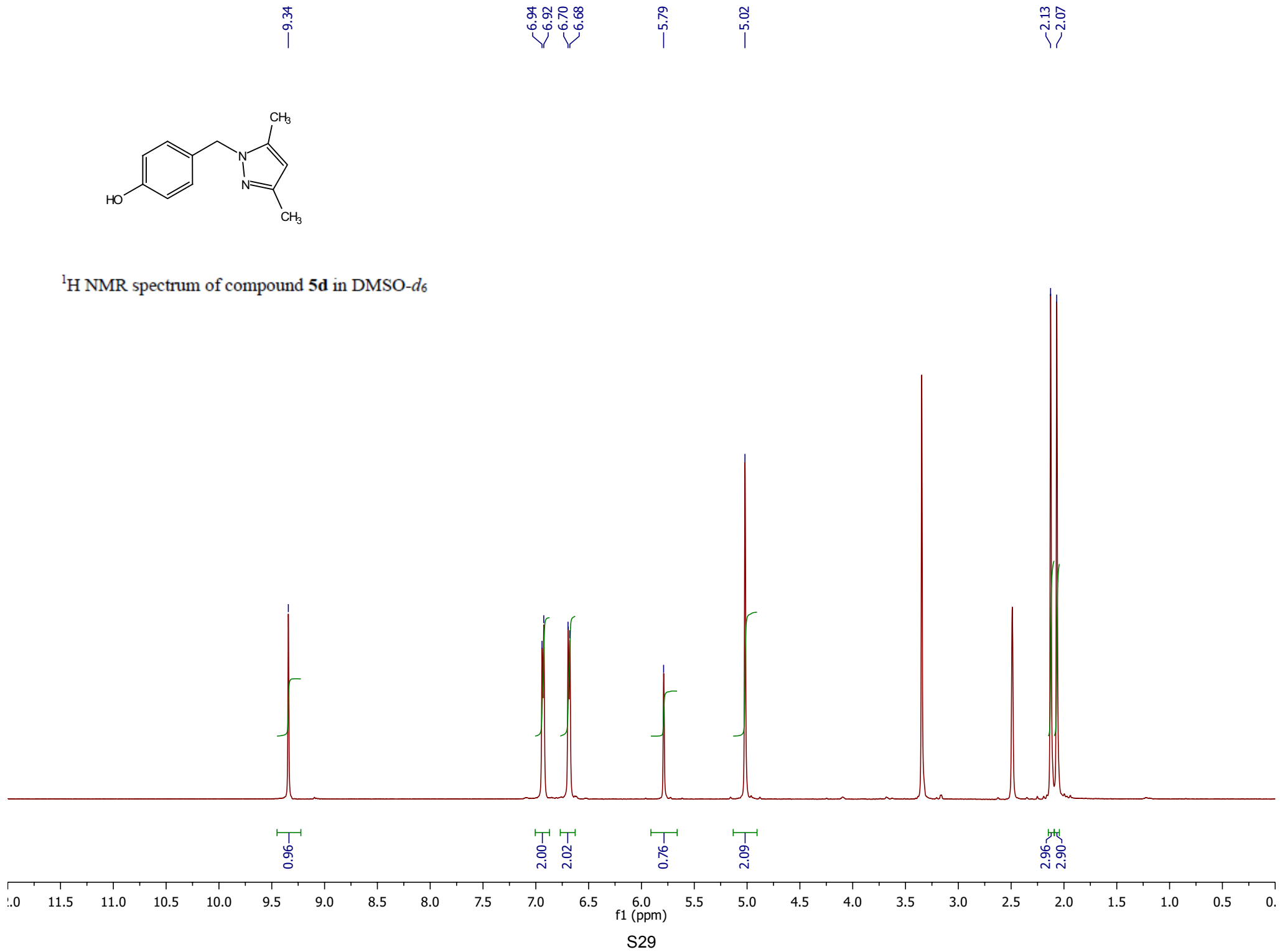


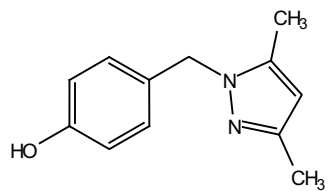
^{13}C NMR spectrum of compound 5c in $\text{DMSO-}d_6$





¹H NMR spectrum of compound 5d in DMSO-*d*₆





— 156.59

— 145.67

— 138.33

< 128.33
> 128.05

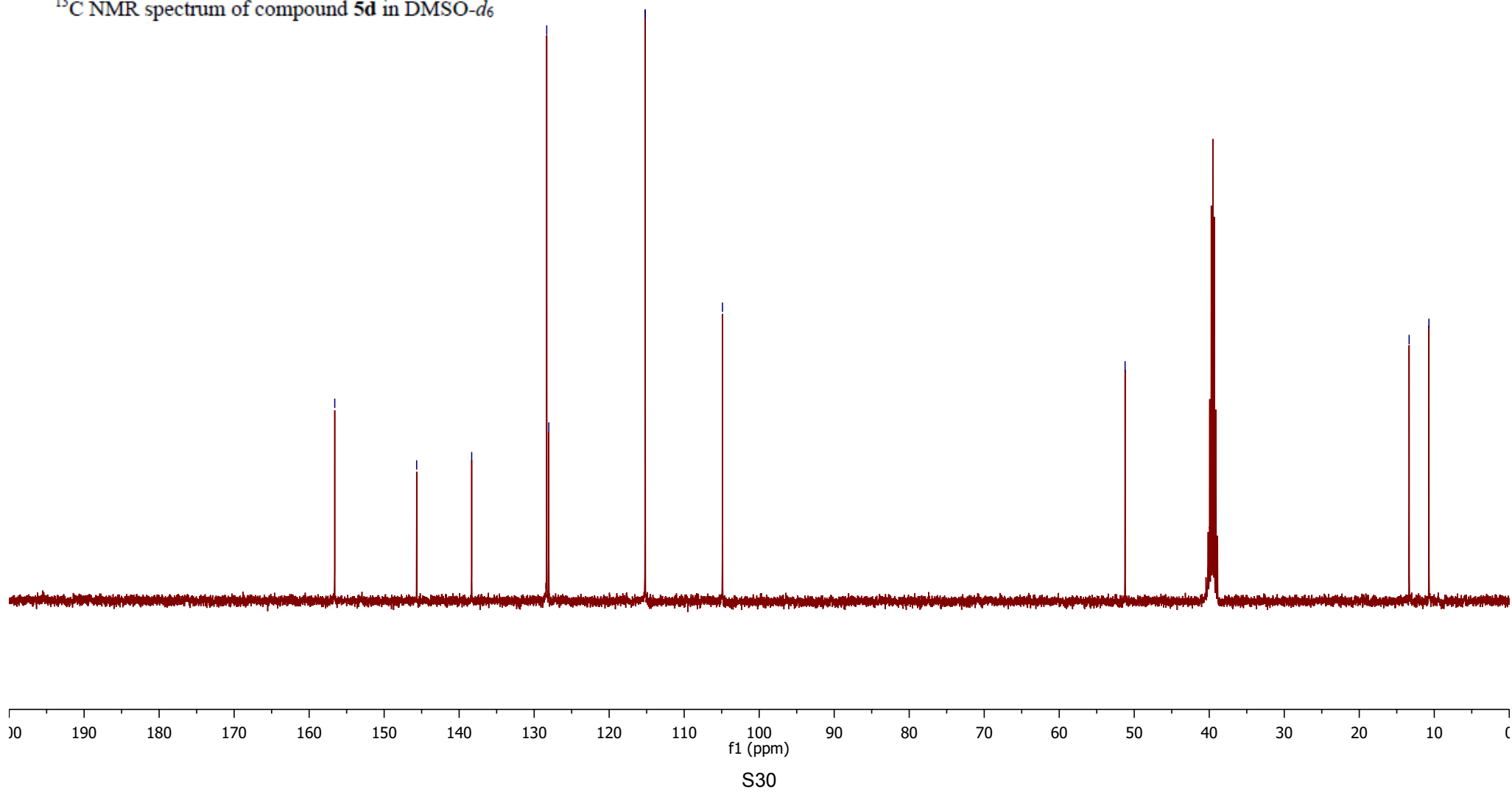
— 115.20

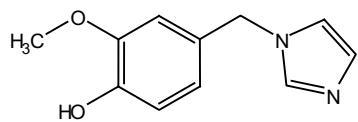
— 104.89

— 51.22

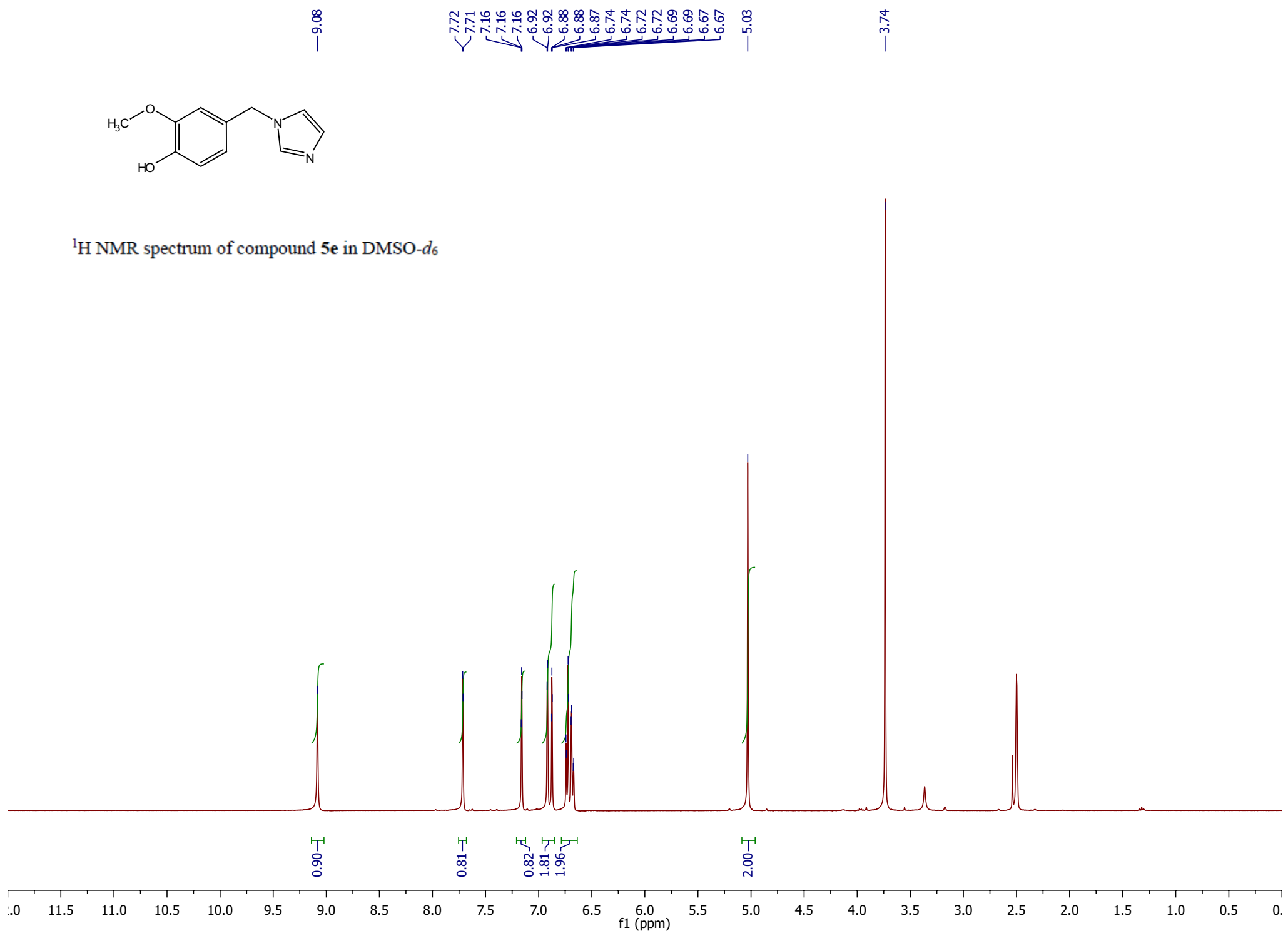
— 13.35
— 10.71

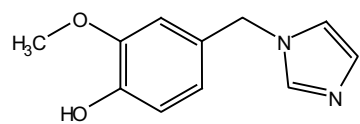
^{13}C NMR spectrum of compound 5d in DMSO- d_6





^1H NMR spectrum of compound 5e in $\text{DMSO-}d_6$





147.67
146.31

137.18

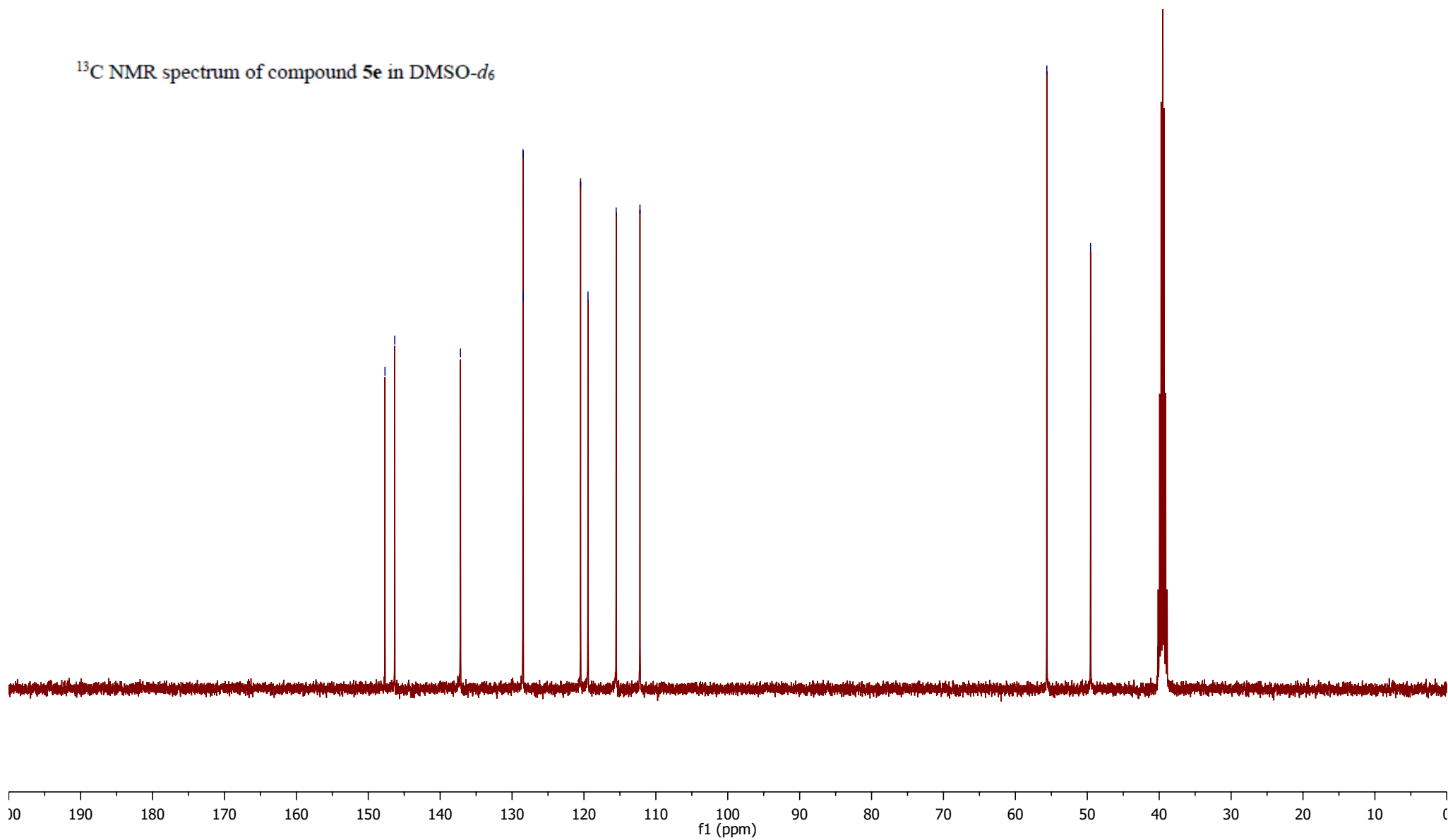
128.48
128.45

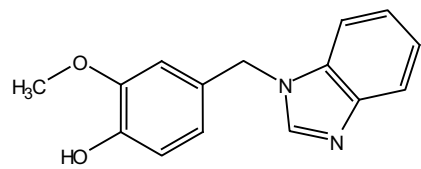
120.47
119.44
115.52
112.21

55.63

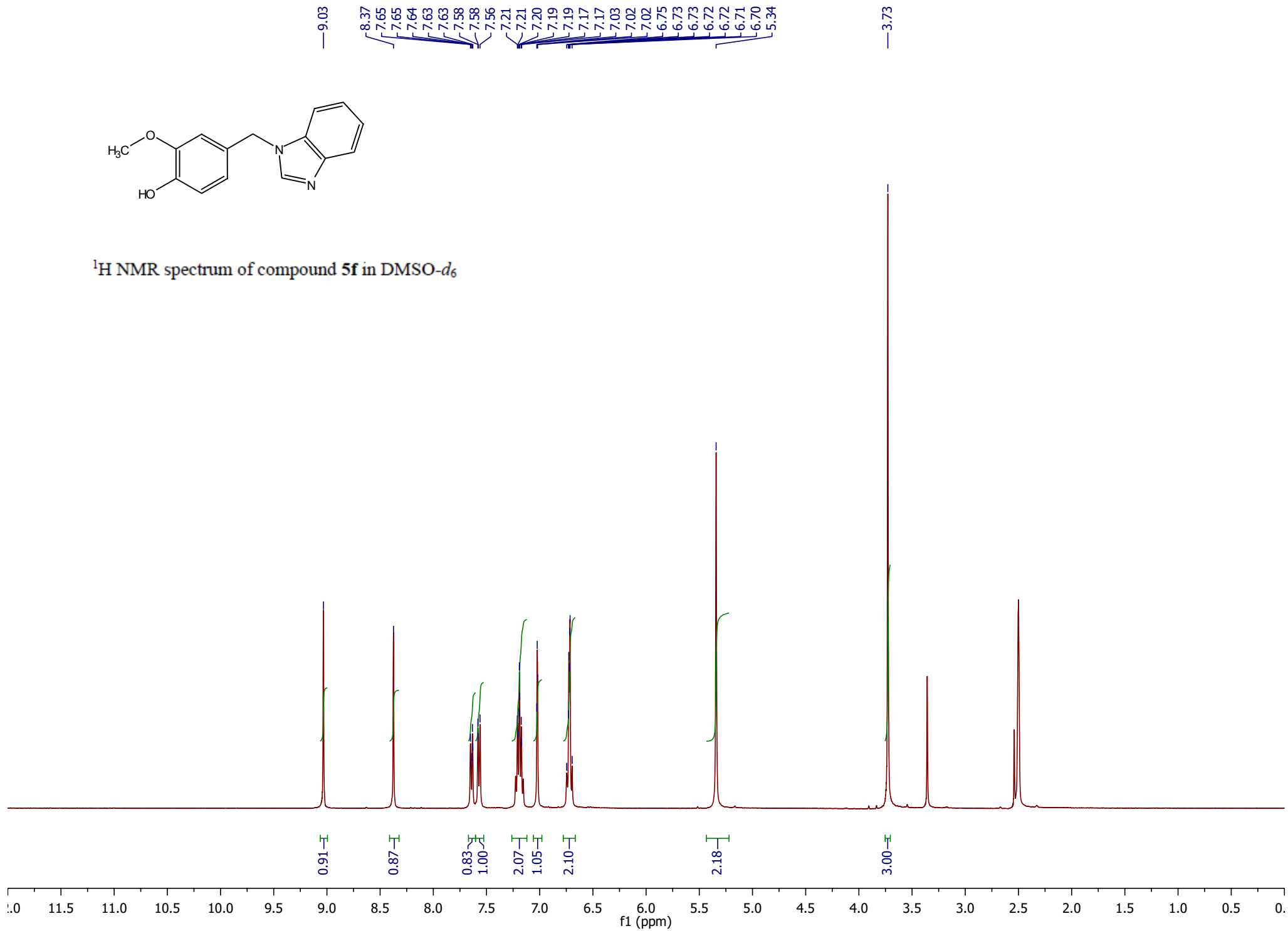
49.54

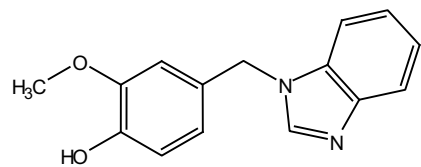
¹³C NMR spectrum of compound 5e in DMSO-d₆



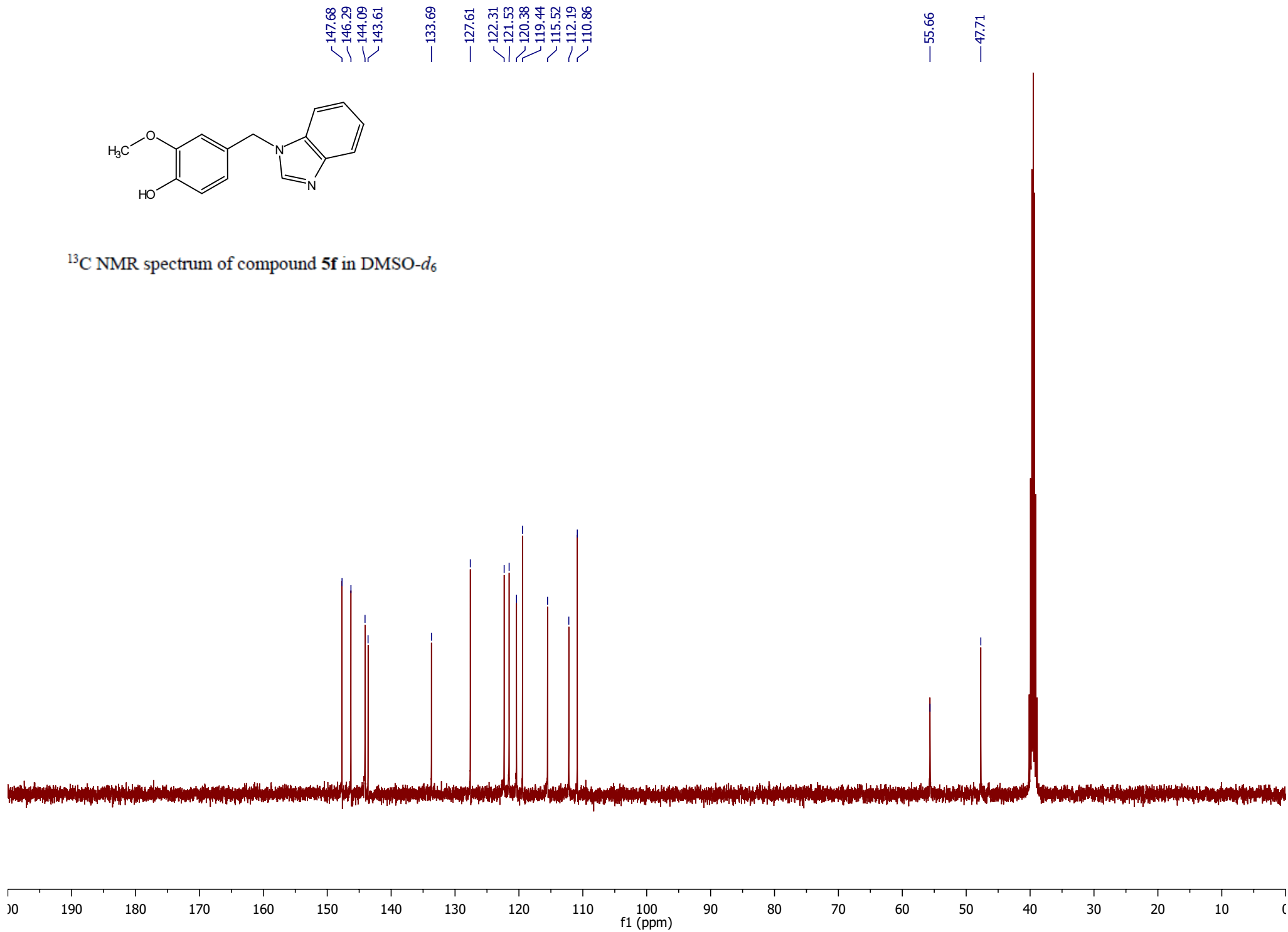


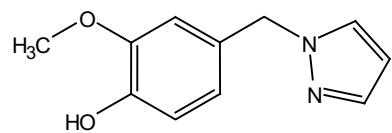
¹H NMR spectrum of compound 5f in DMSO-d₆





^{13}C NMR spectrum of compound 5f in $\text{DMSO-}d_6$





8.91

7.72

7.43

6.87

6.73

6.71

6.66

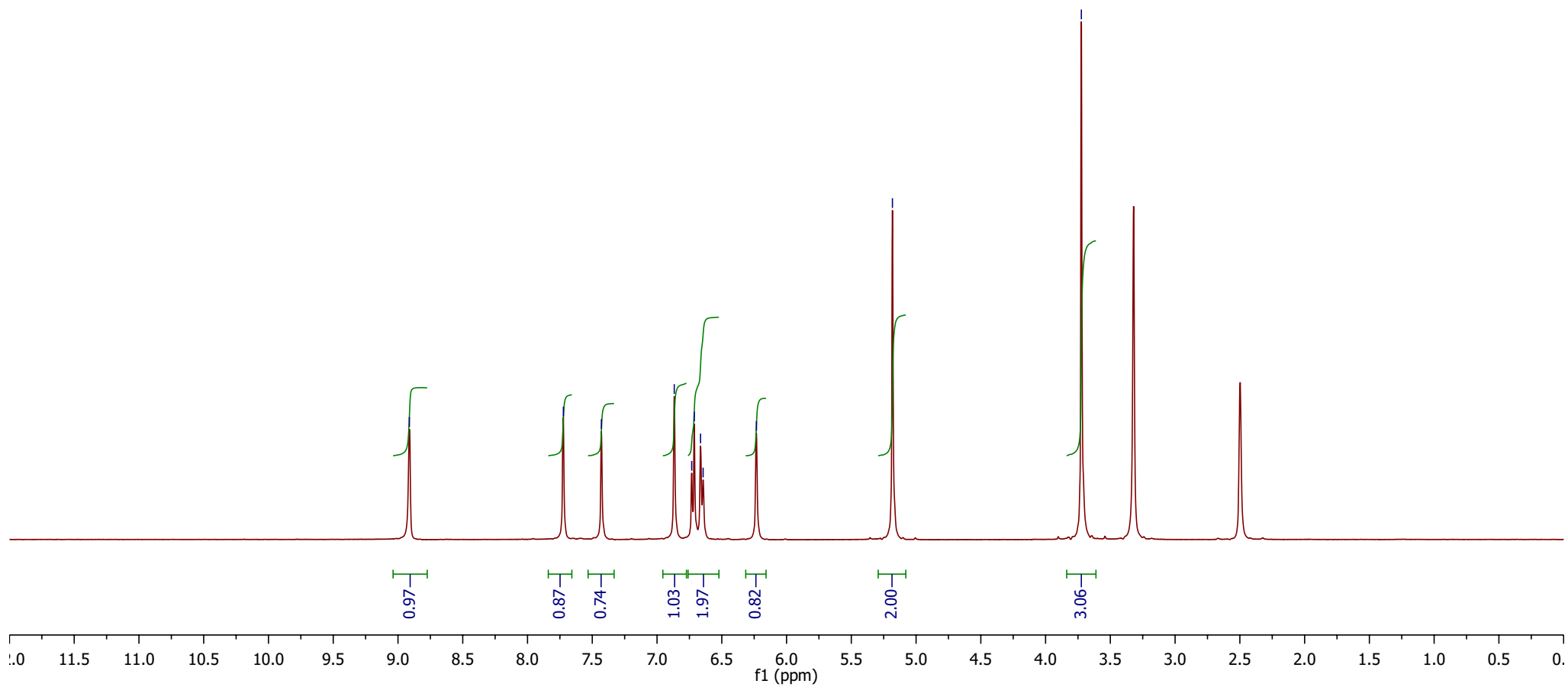
6.64

6.23

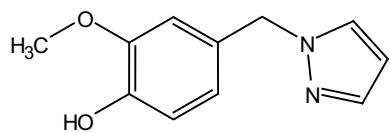
5.18

3.72

¹H NMR spectrum of compound 5g in DMSO-*d*₆



S35



147.47
146.12

138.66

129.65
128.36

120.46

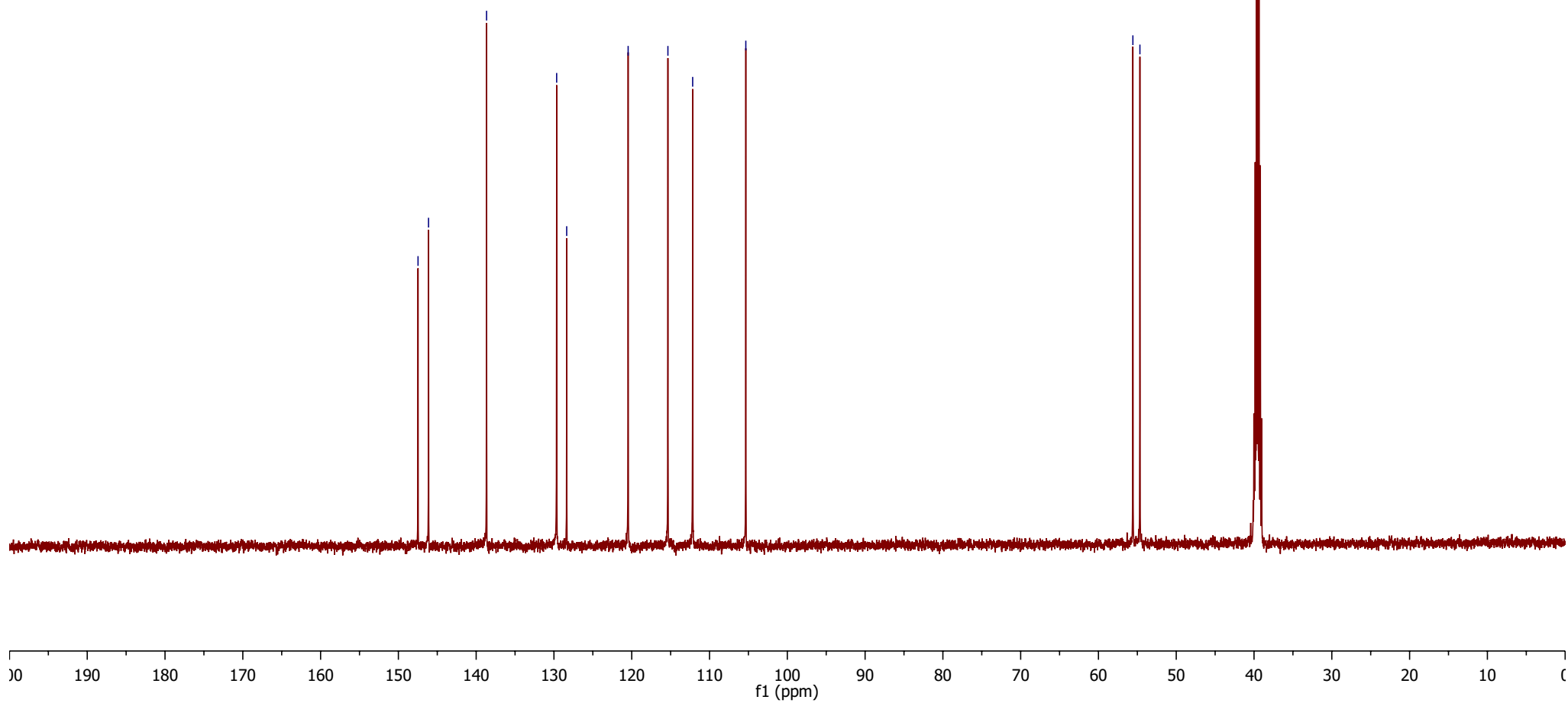
115.35

112.17

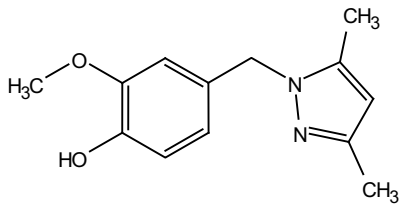
105.33

55.57
54.67

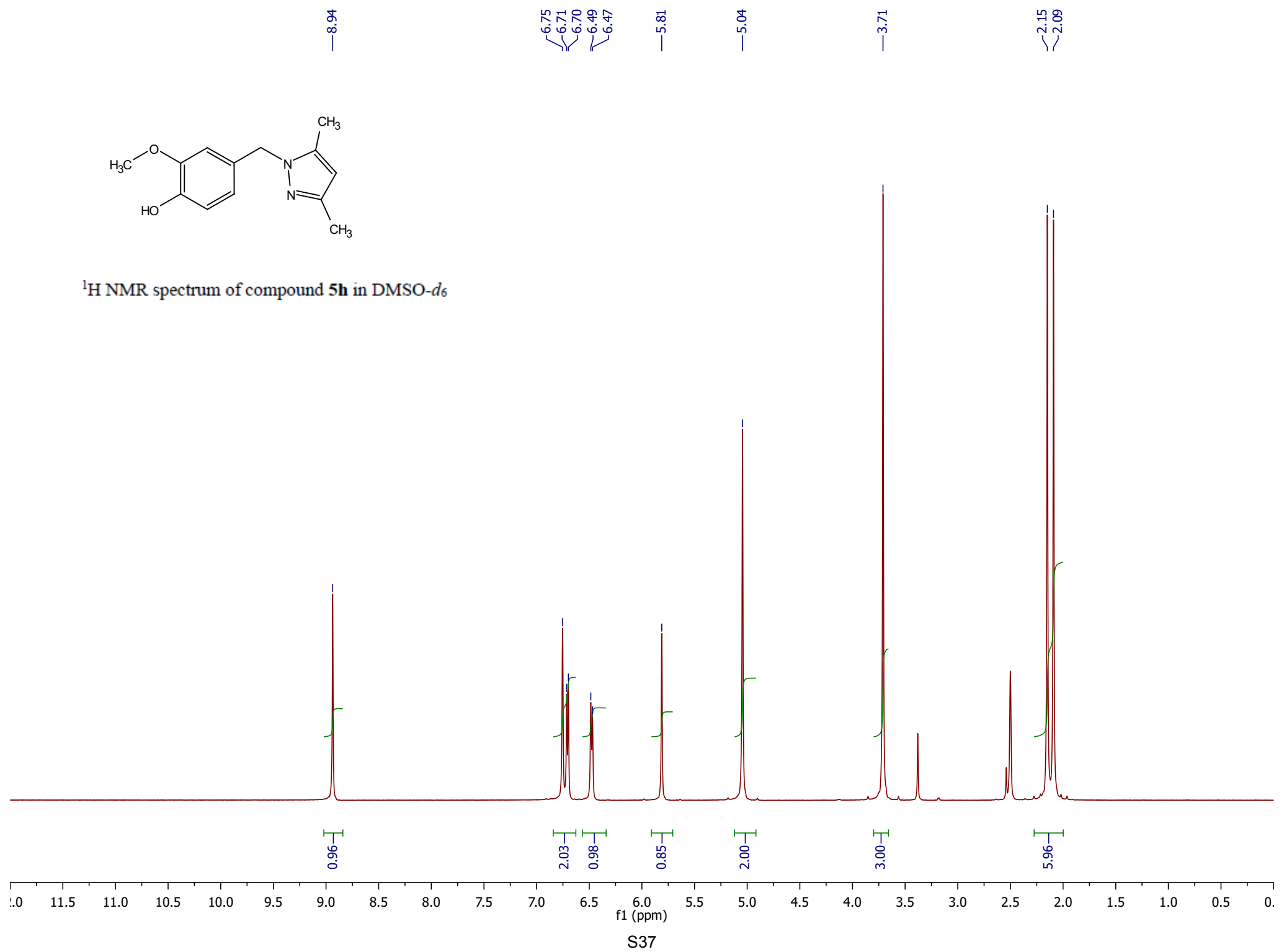
¹³C NMR spectrum of compound 5g in DMSO-d₆

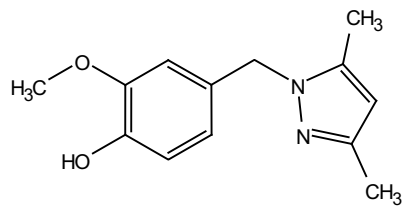


S36



¹H NMR spectrum of compound 5h in DMSO-d₆



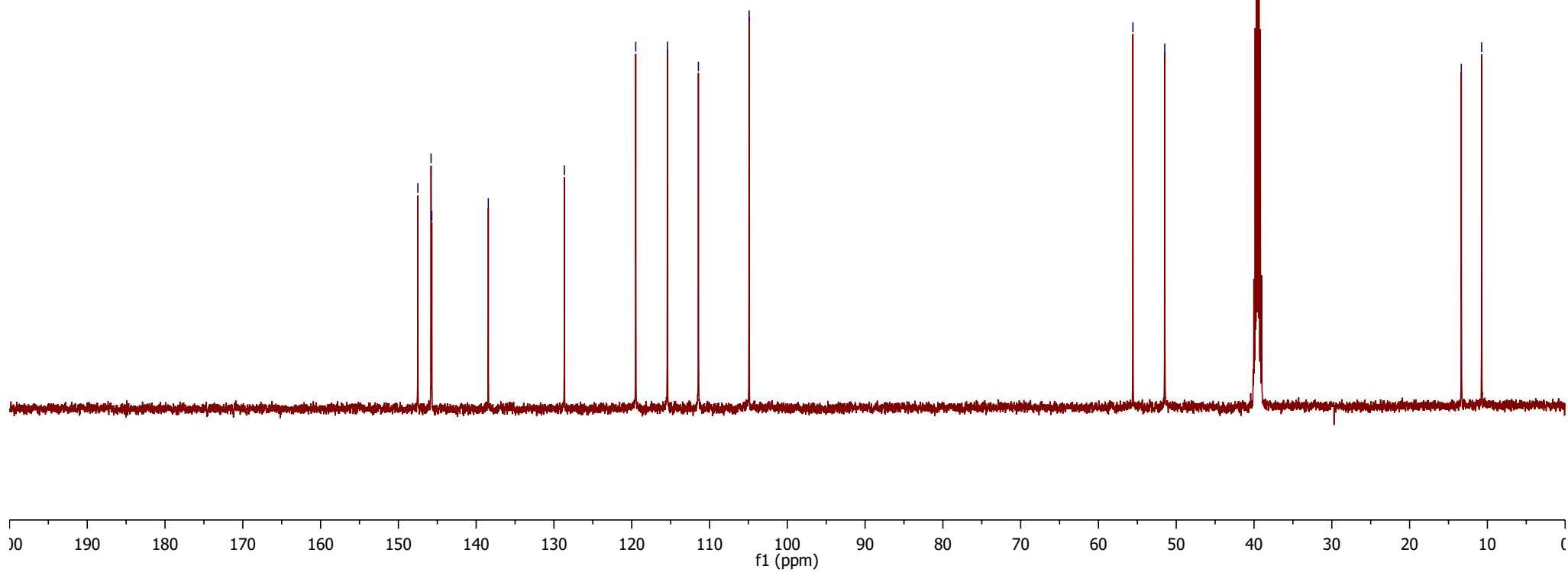


147.50
145.79
145.70
138.44
128.66
119.48
115.41
111.43
104.91

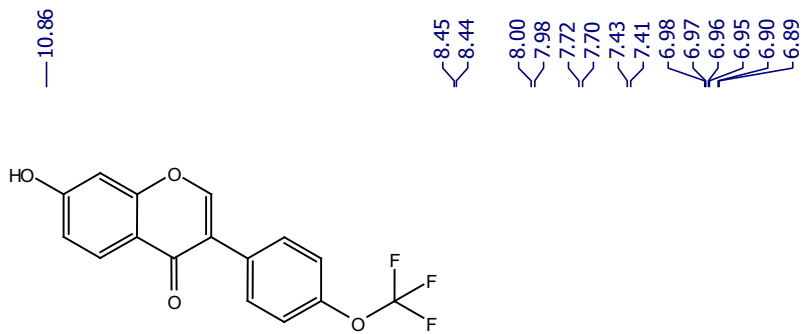
55.57
51.48

13.35
10.74

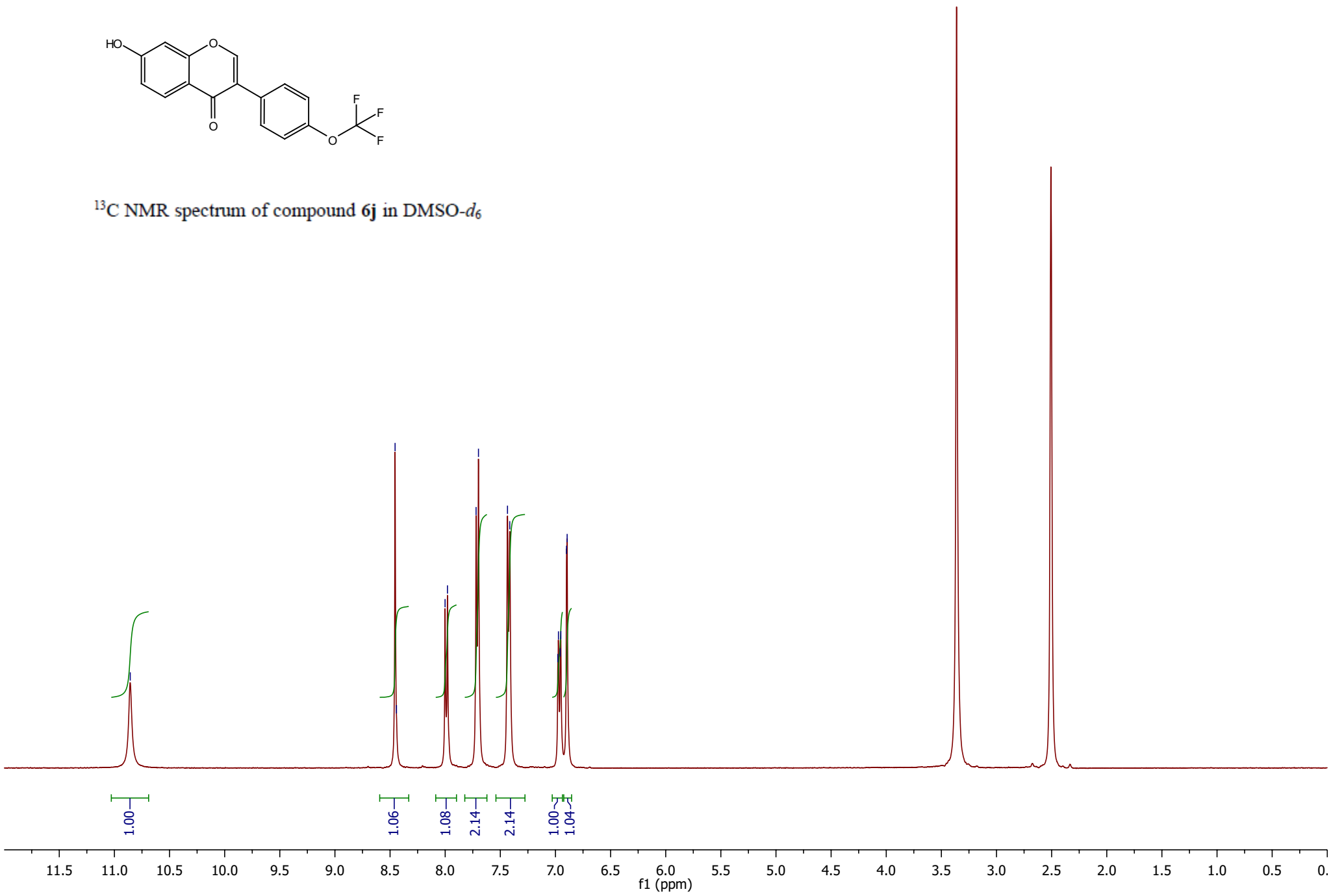
^{13}C NMR spectrum of compound 5h in DMSO- d_6

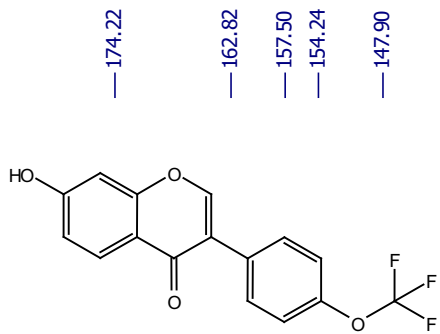


S38



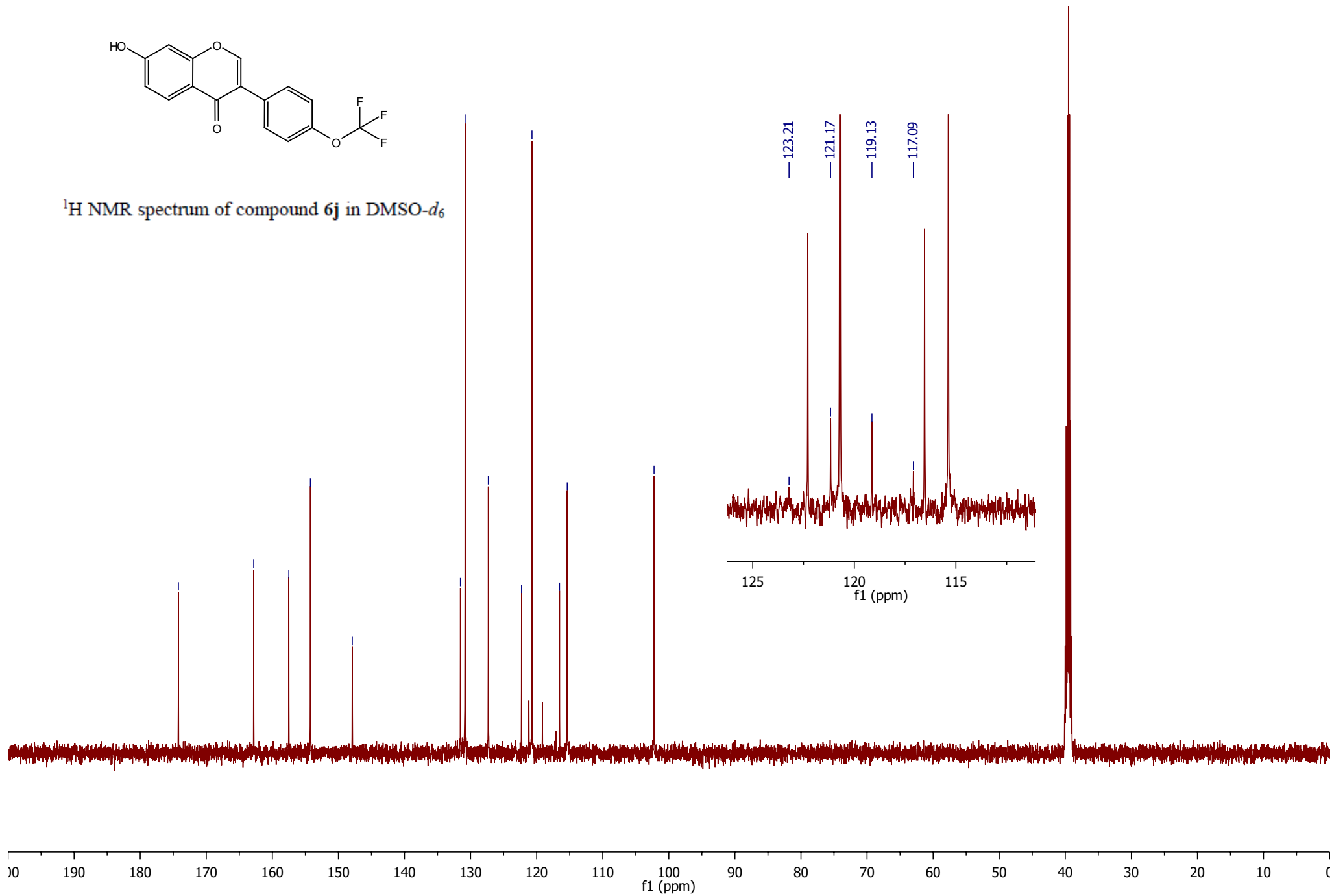
^{13}C NMR spectrum of compound 6j in $\text{DMSO-}d_6$

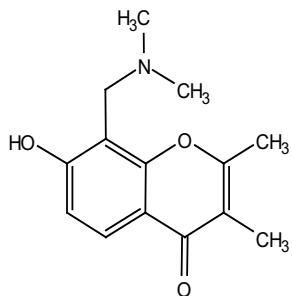




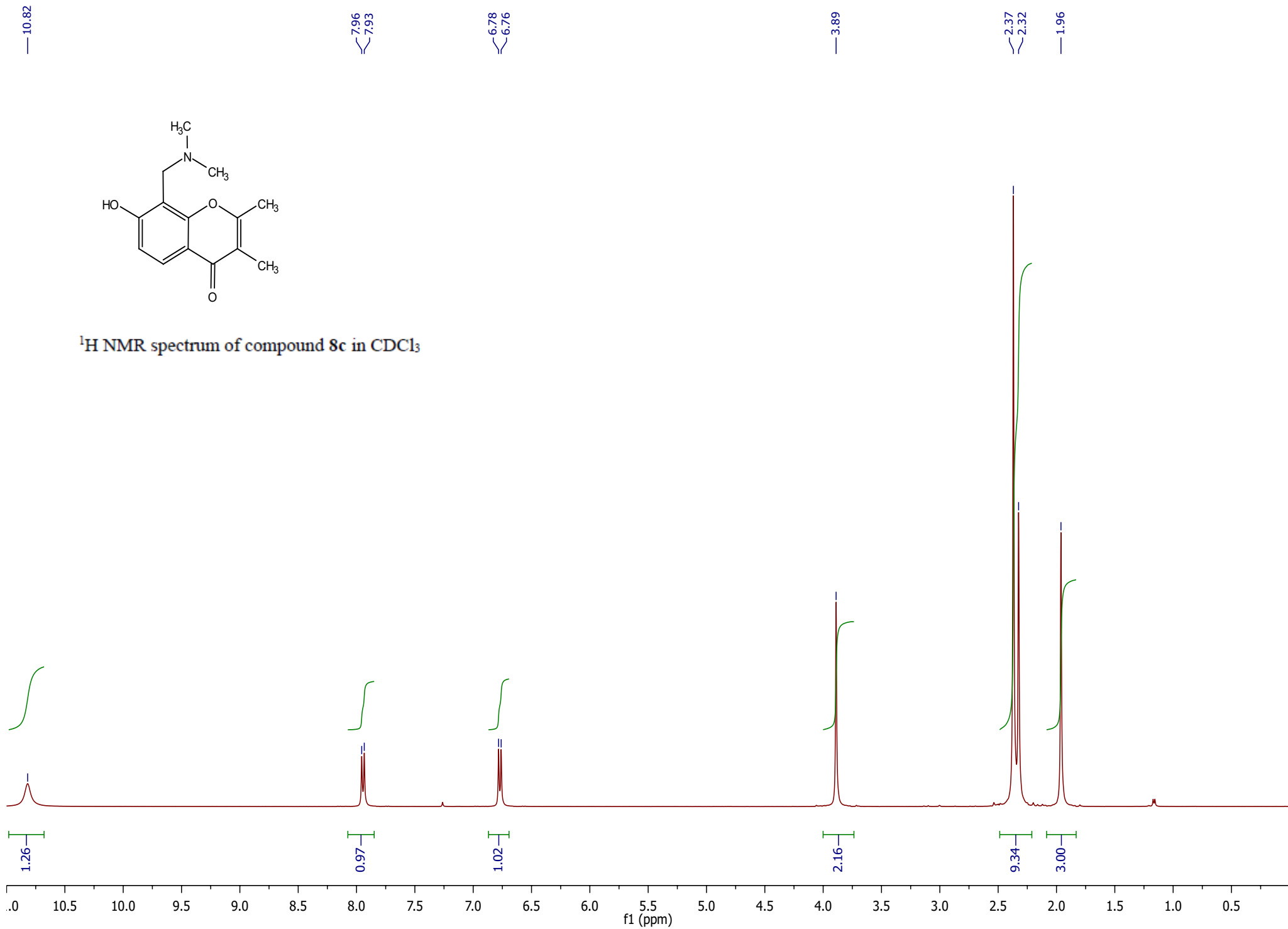
174.22
162.82
157.50
154.24
147.90
131.53
130.83
127.31
122.29
120.71
116.54
115.37
102.24

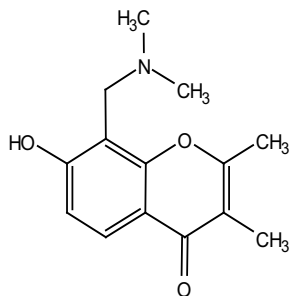
¹H NMR spectrum of compound 6j in DMSO-*d*₆



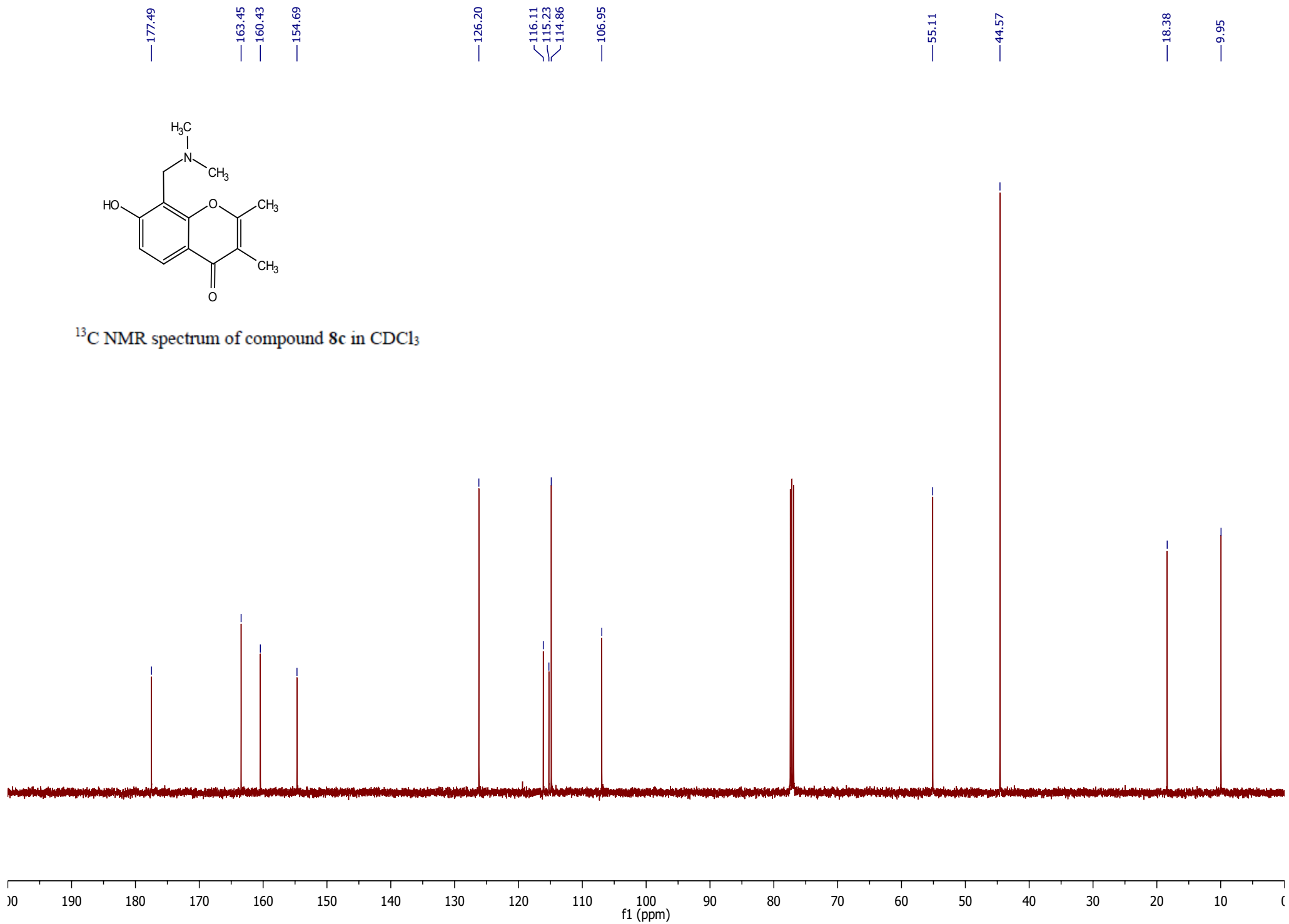


¹H NMR spectrum of compound 8c in CDCl₃

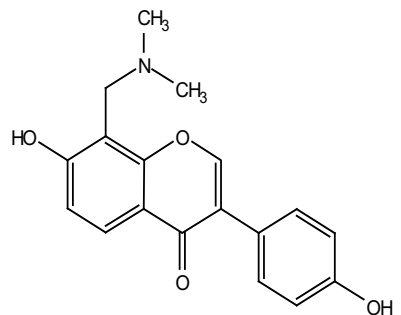




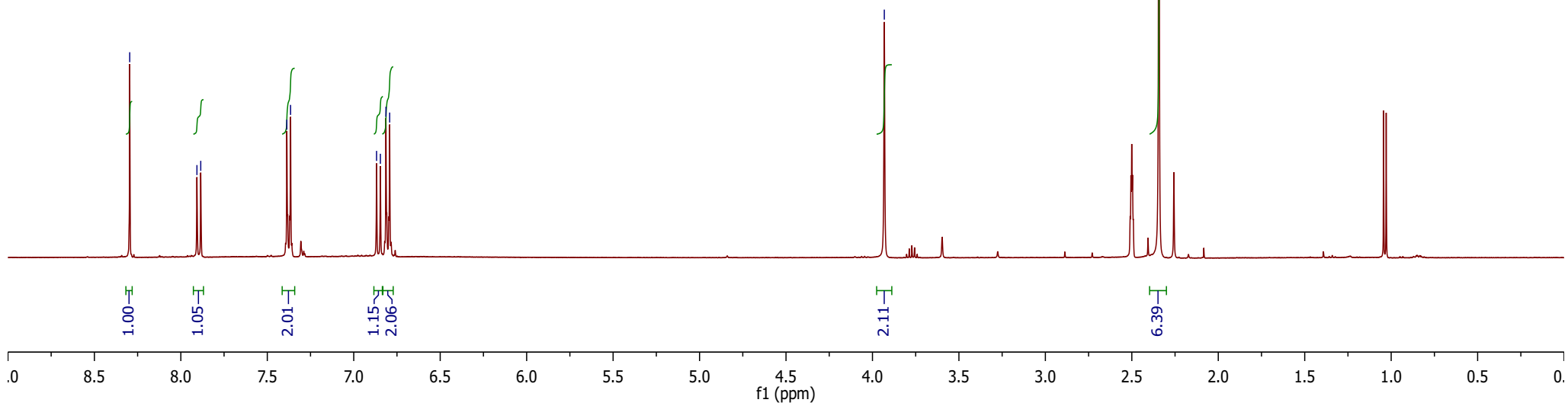
^{13}C NMR spectrum of compound 8c in CDCl_3

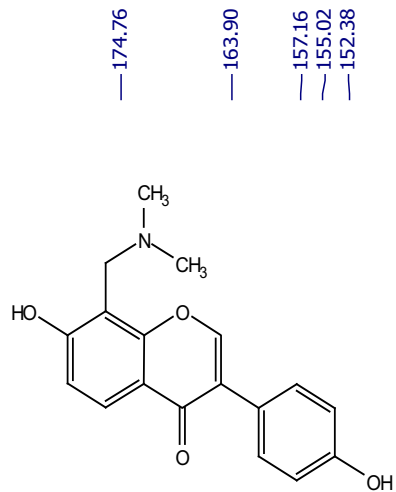


8.30
7.91
7.88
7.39
7.37
6.87
6.85
6.81
6.79
3.93
2.34

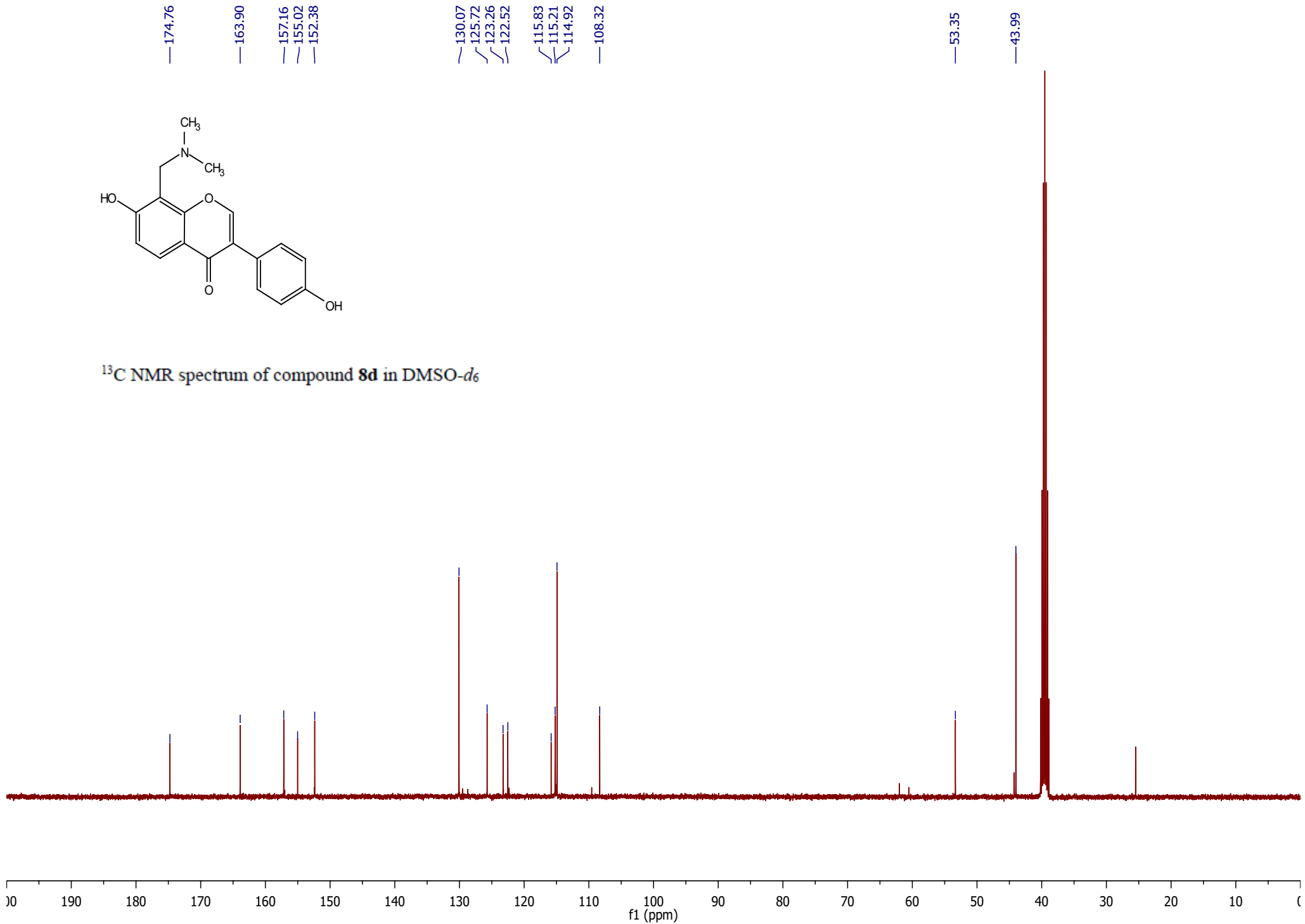


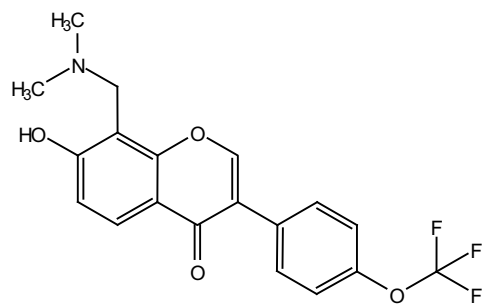
¹H NMR spectrum of compound **8d** in DMSO-*d*₆



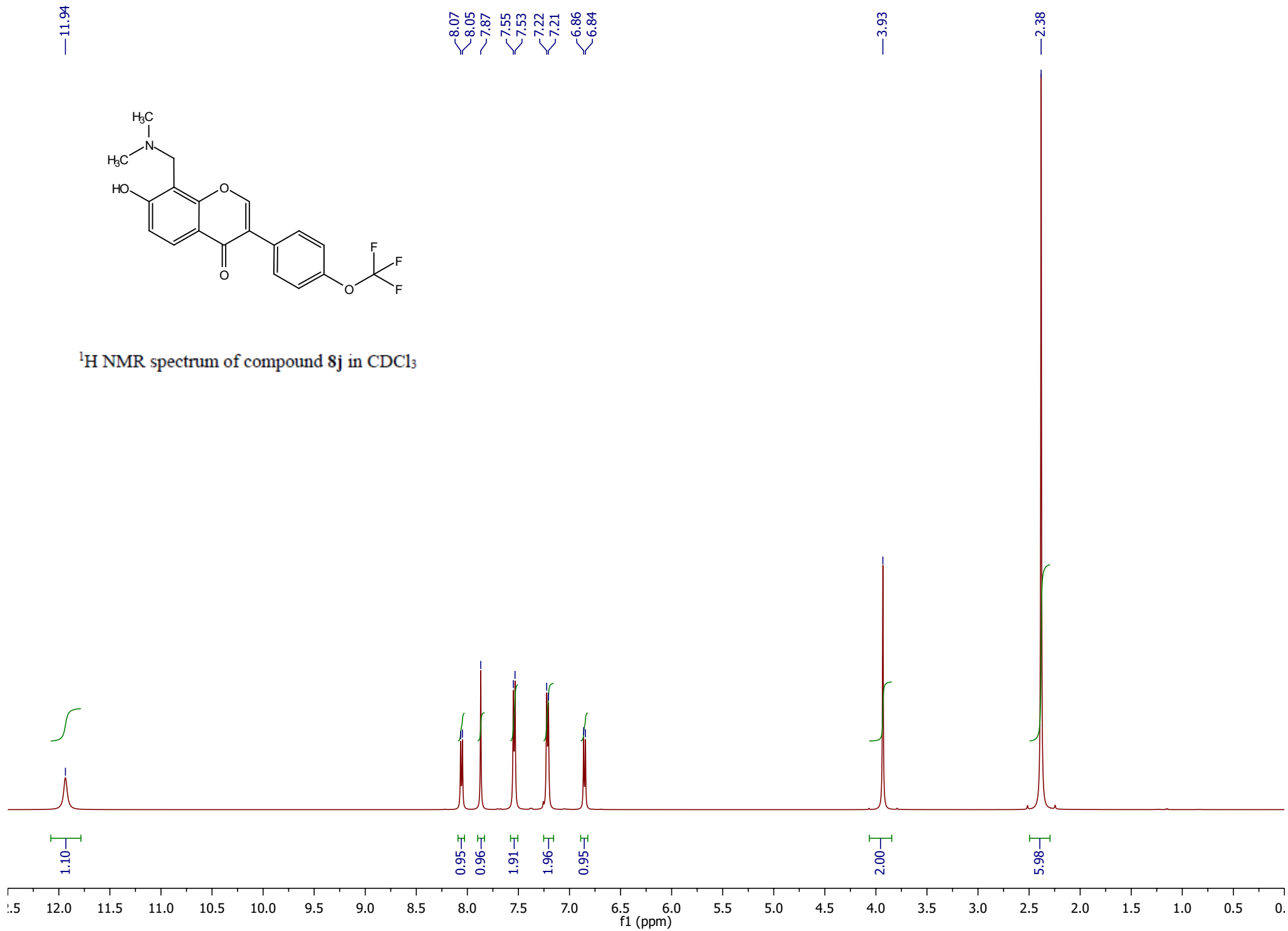


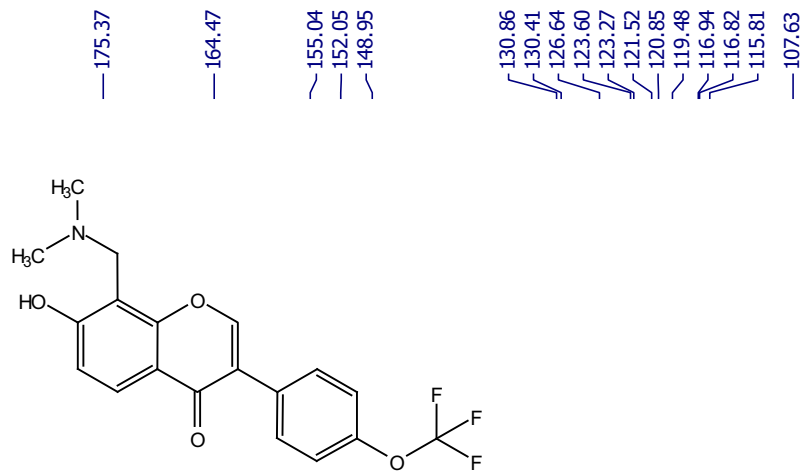
^{13}C NMR spectrum of compound 8d in $\text{DMSO-}d_6$



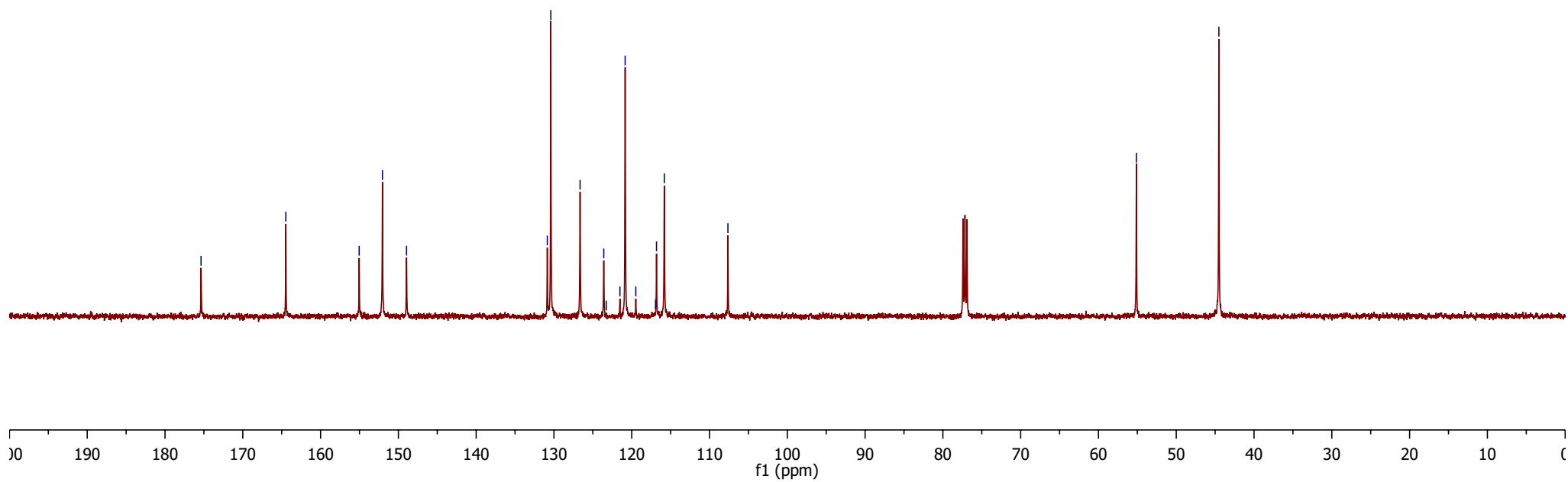


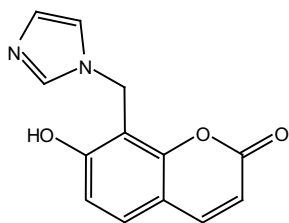
^1H NMR spectrum of compound **8j** in CDCl_3



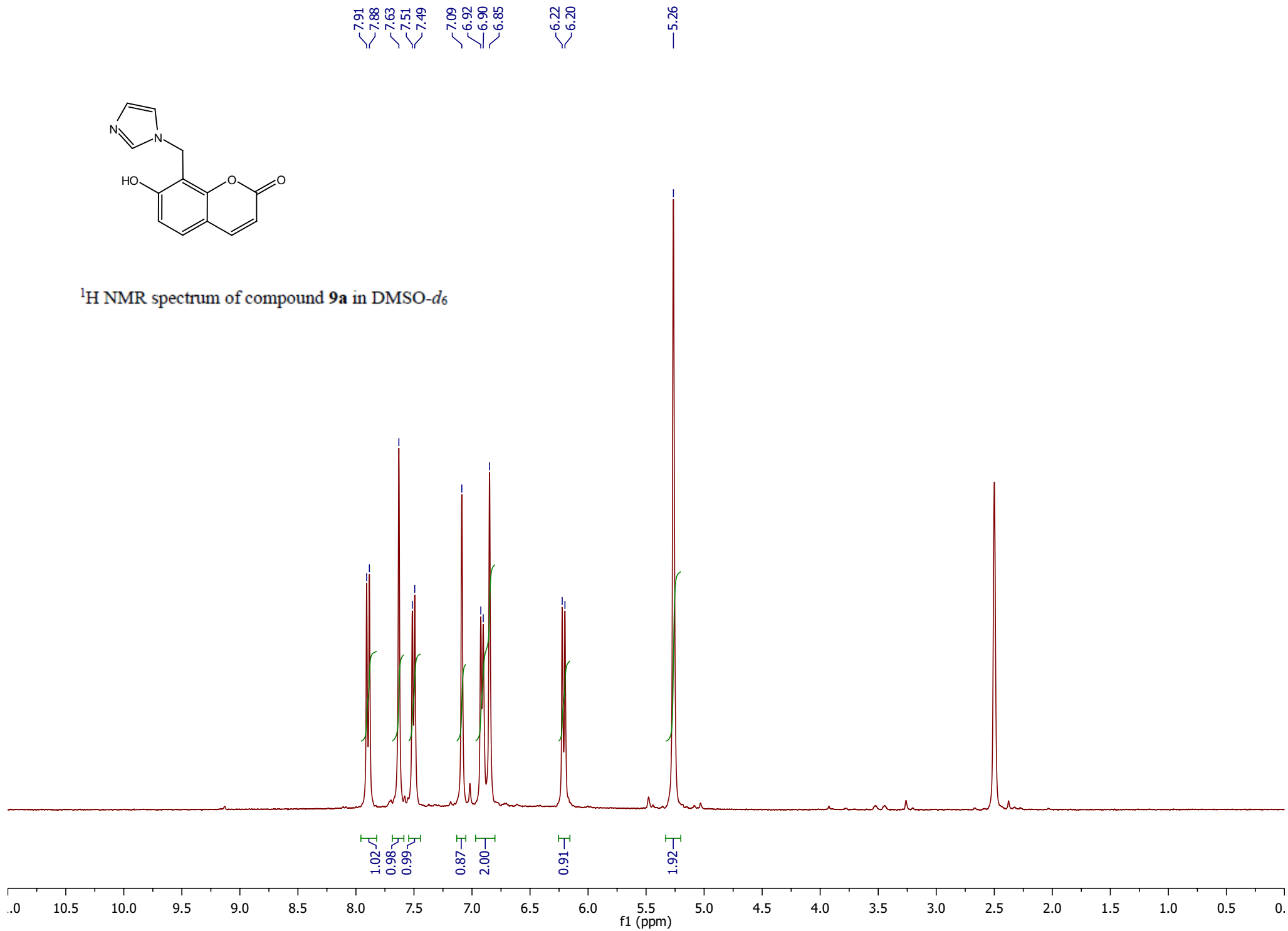


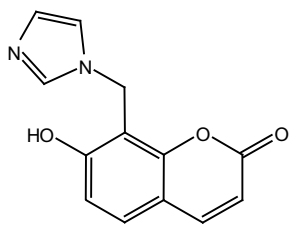
^{13}C NMR spectrum of compound **8c** in CDCl_3



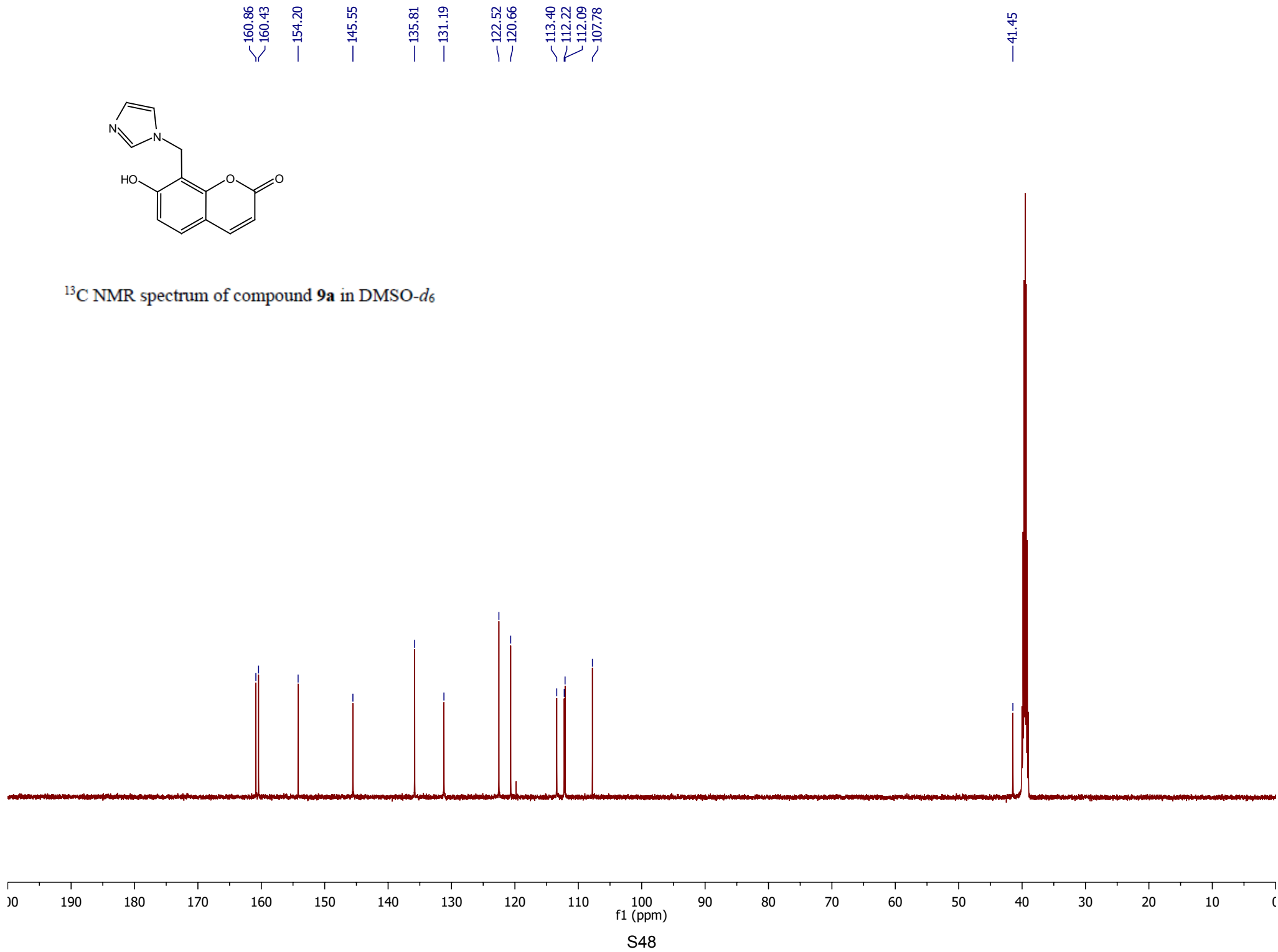


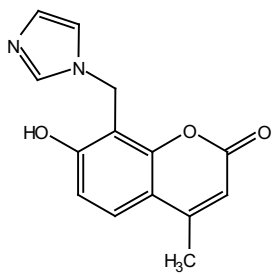
^1H NMR spectrum of compound **9a** in $\text{DMSO-}d_6$



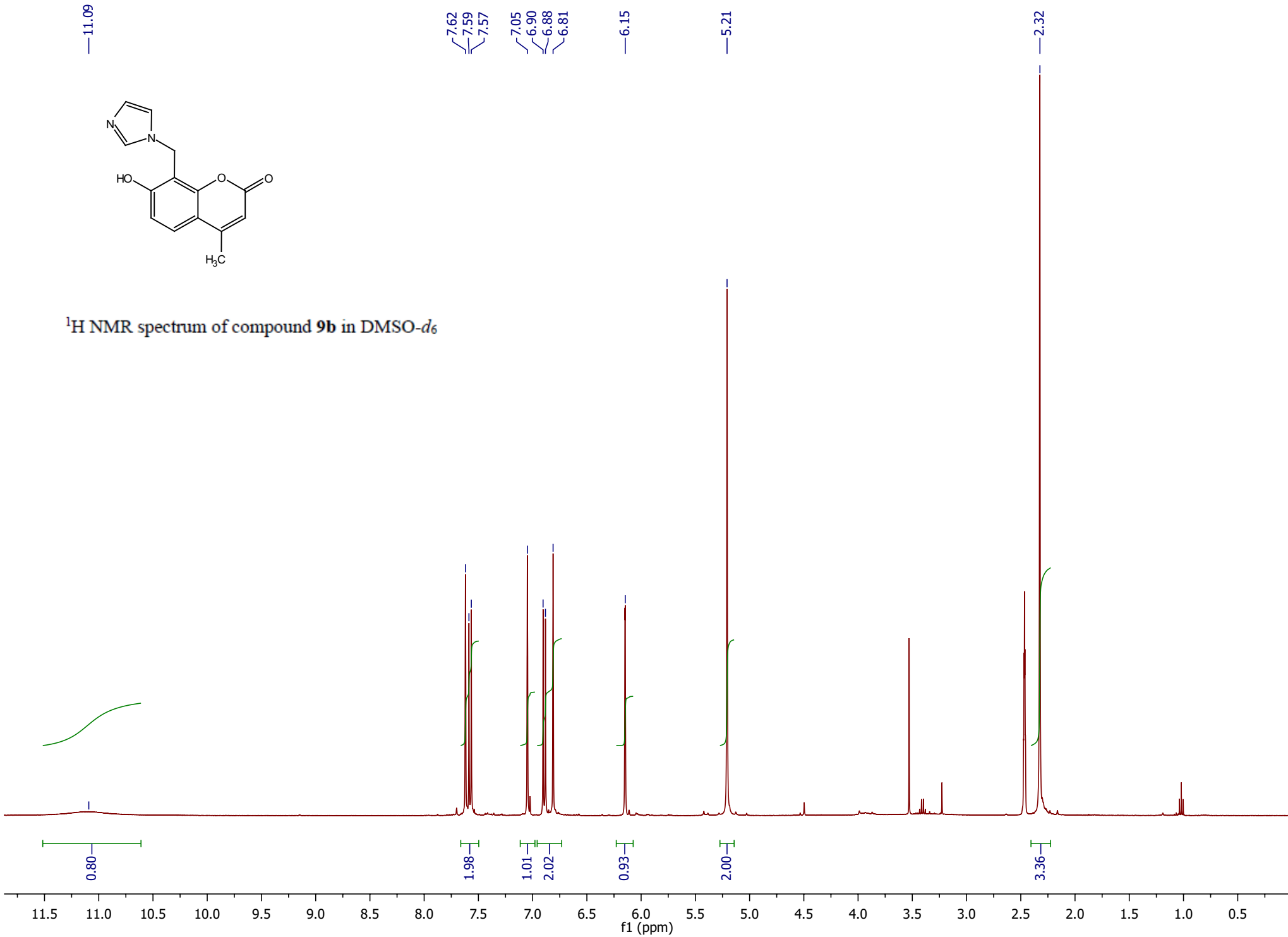


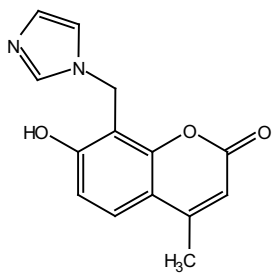
^{13}C NMR spectrum of compound 9a in $\text{DMSO-}d_6$



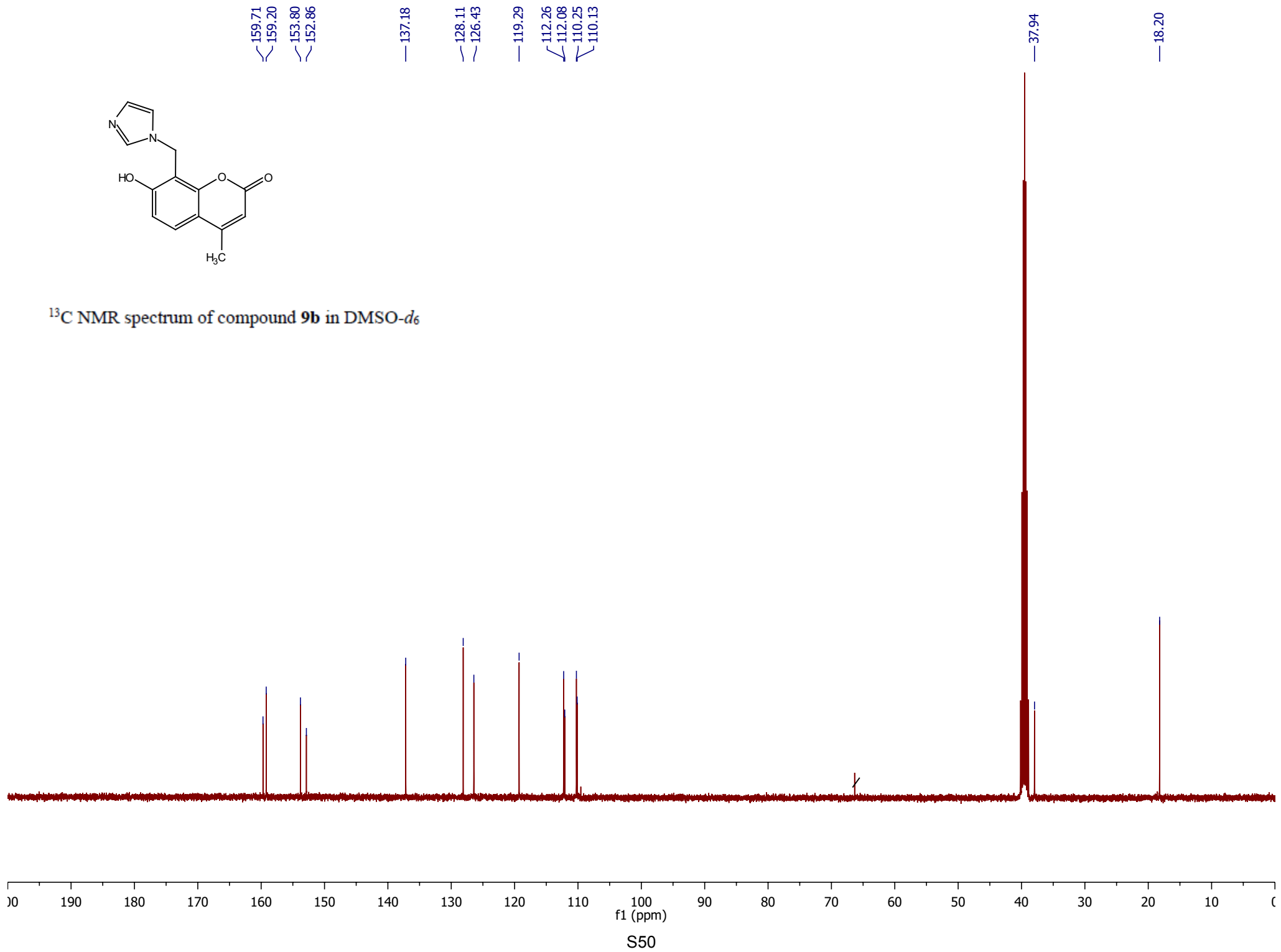


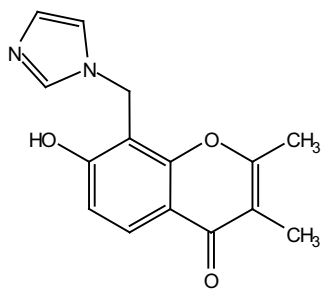
¹H NMR spectrum of compound 9b in DMSO-d₆



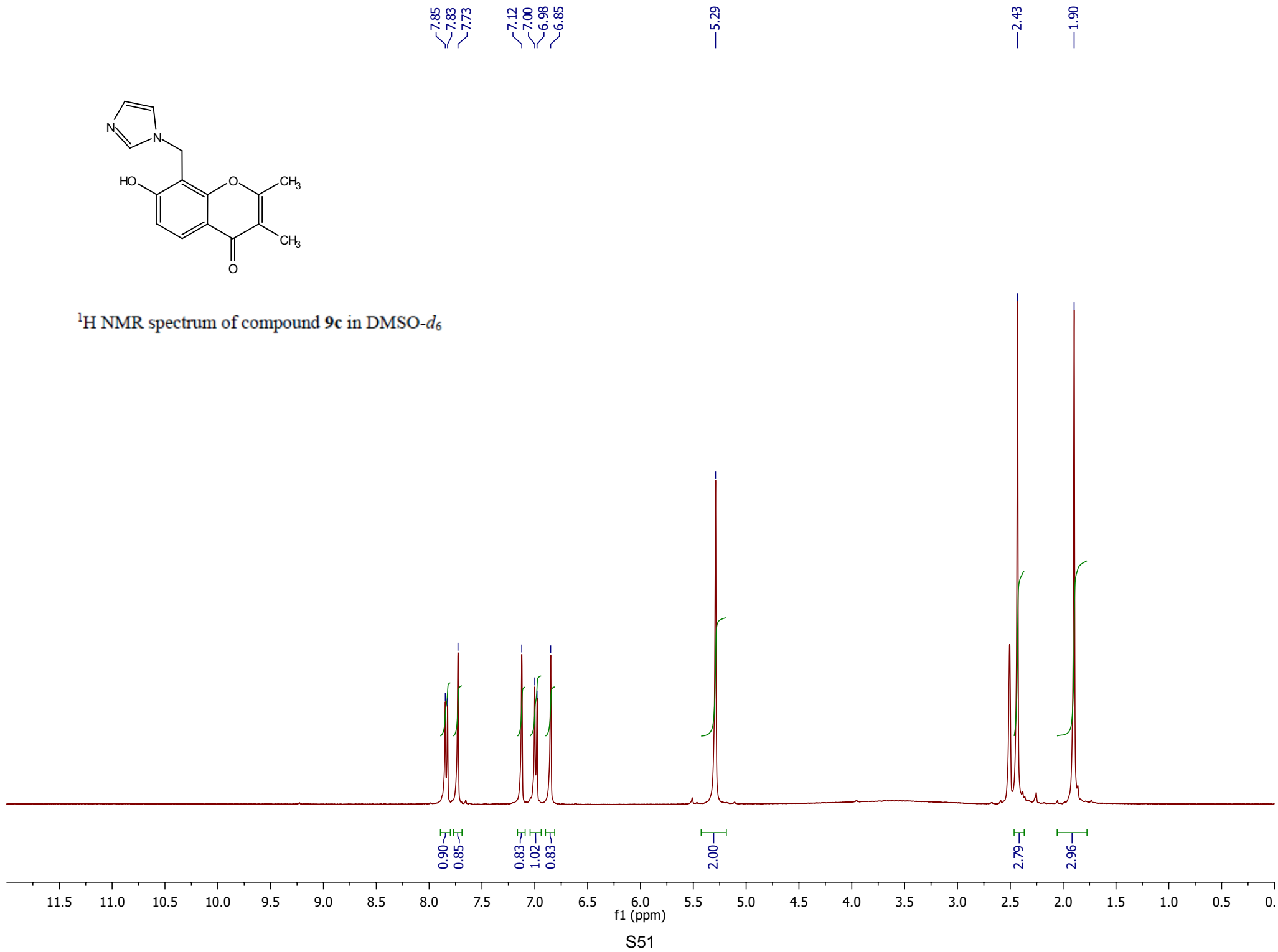


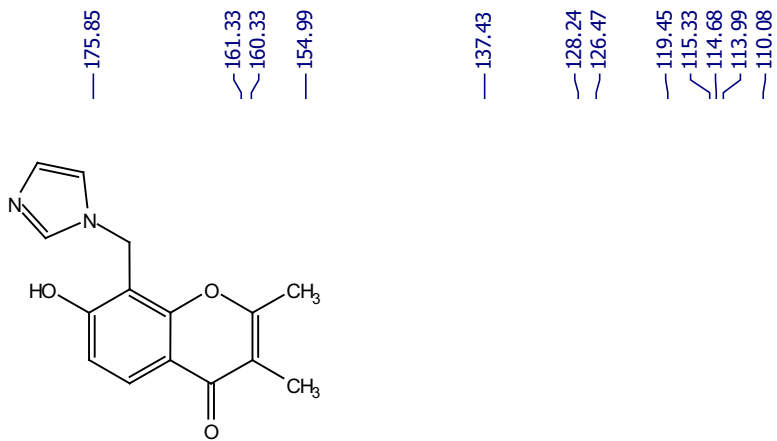
^{13}C NMR spectrum of compound **9b** in $\text{DMSO-}d_6$



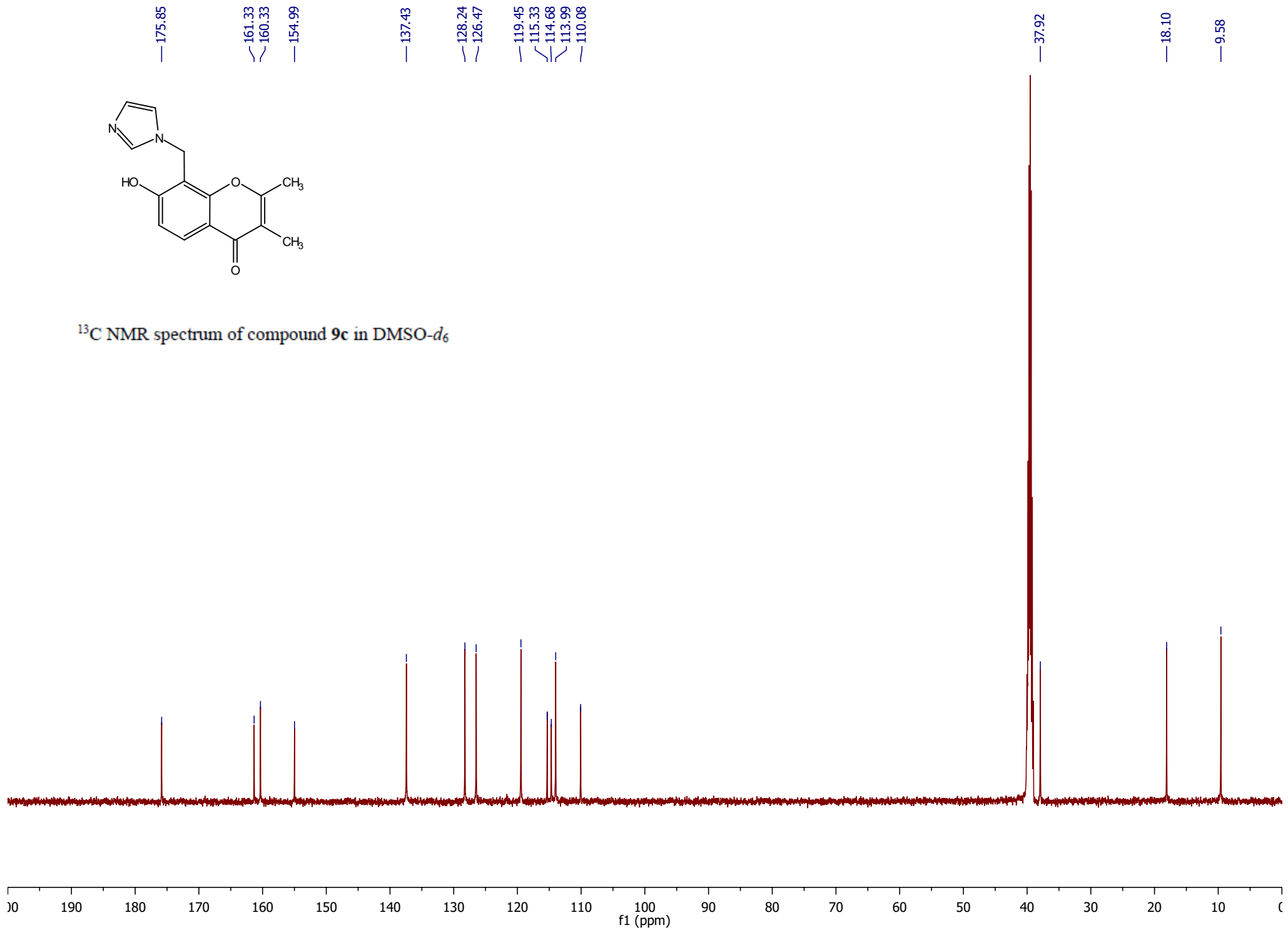


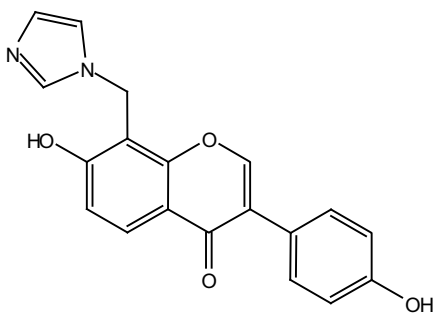
¹H NMR spectrum of compound 9c in DMSO-d₆



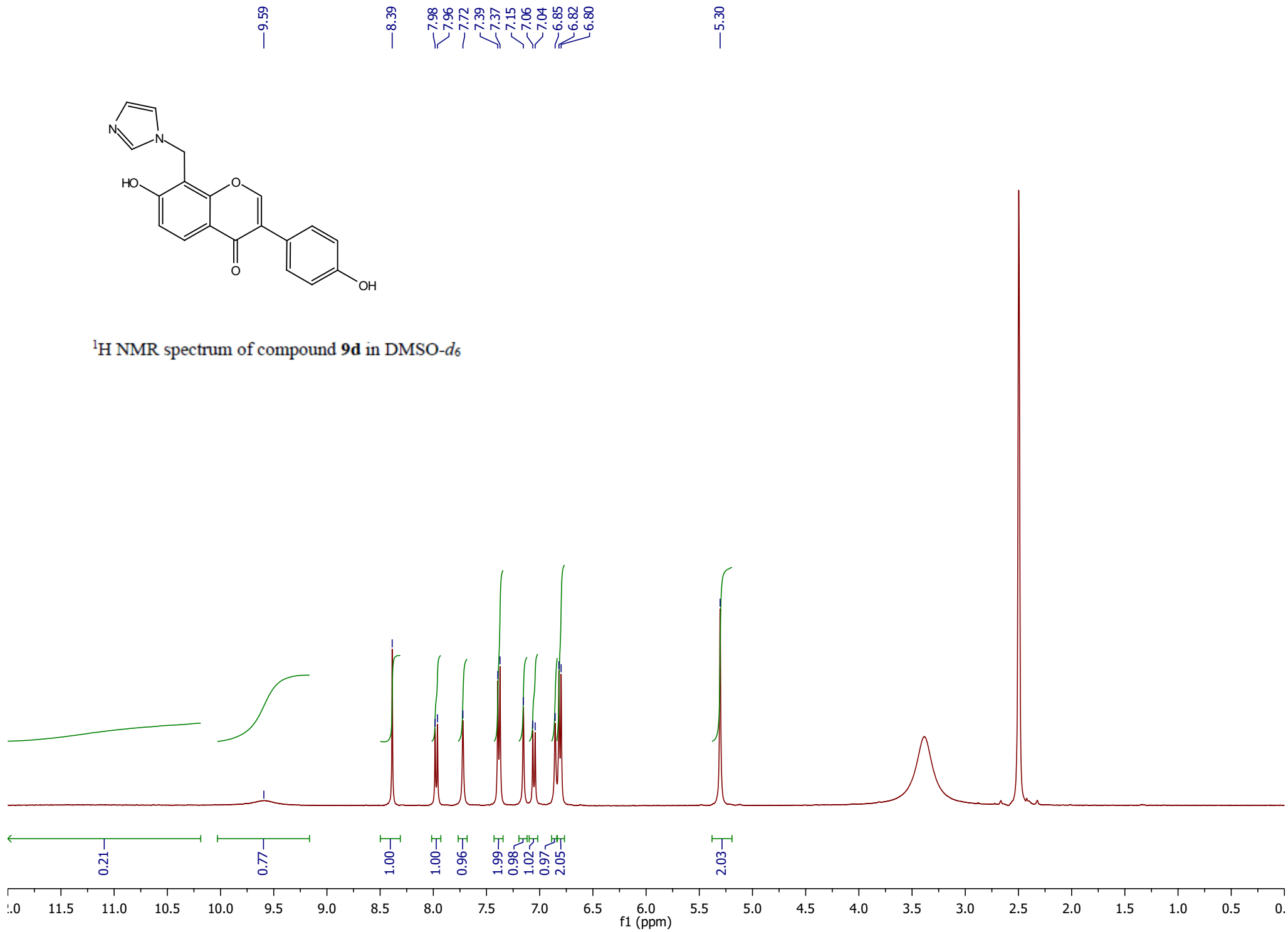


¹³C NMR spectrum of compound **9c** in DMSO-*d*₆

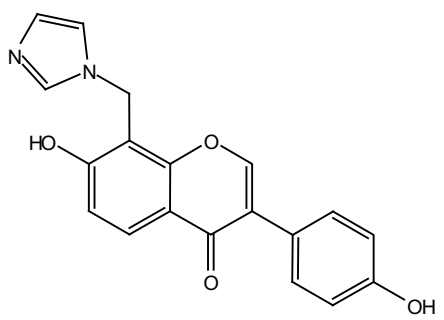




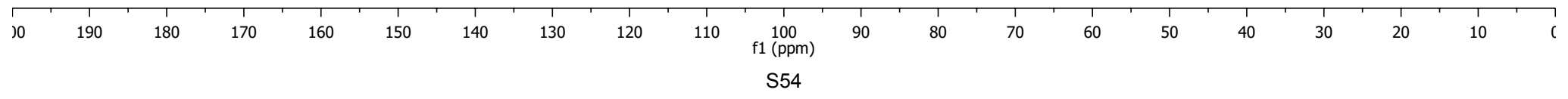
^1H NMR spectrum of compound **9d** in $\text{DMSO-}d_6$

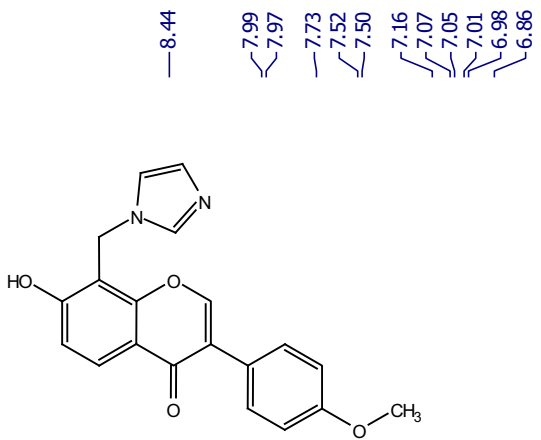


174.83
160.85
157.31
155.46
152.79
137.44
130.13
128.22
127.14
123.52
122.40
119.59
116.58
115.08
114.58
110.38
38.02

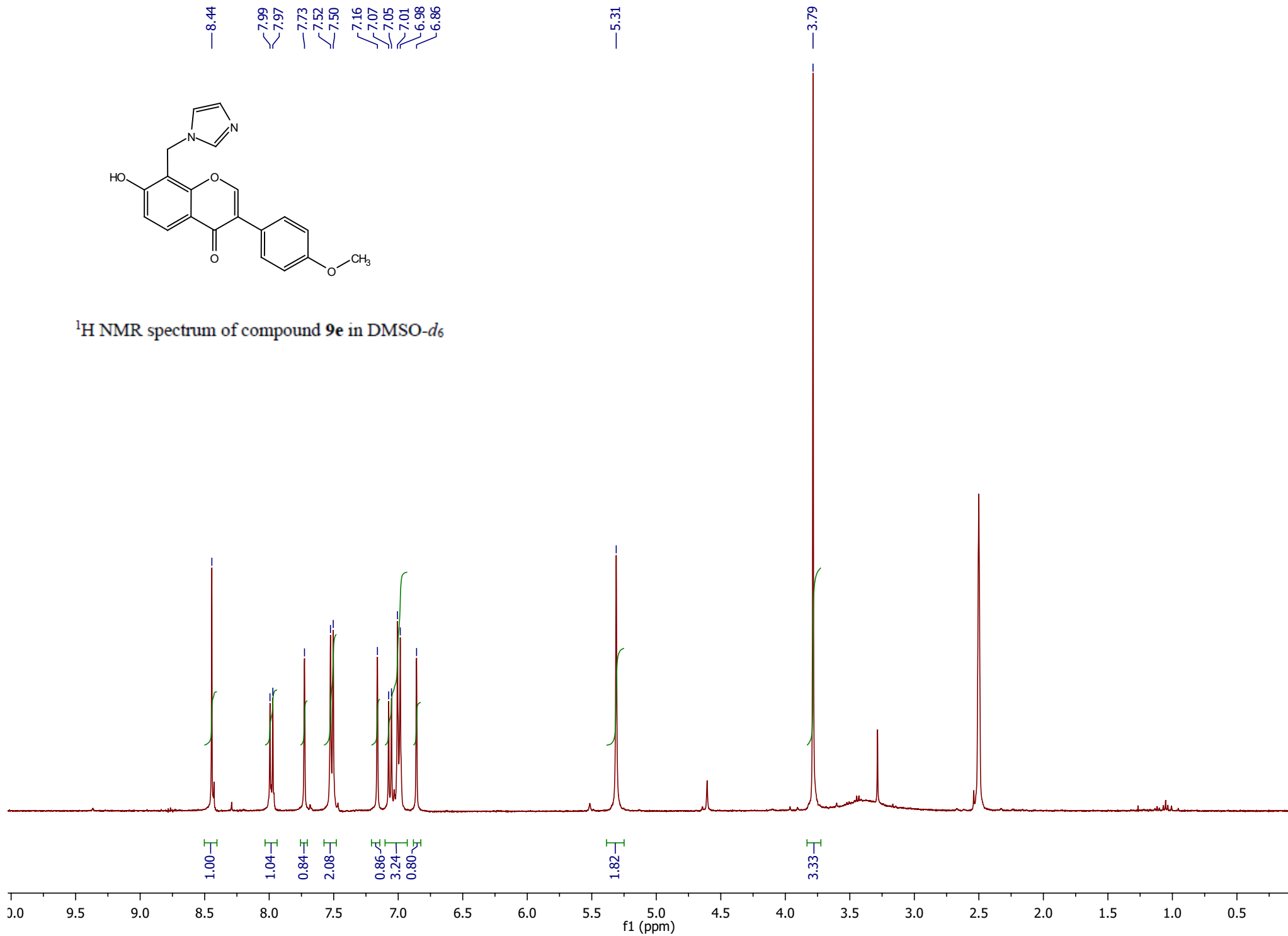


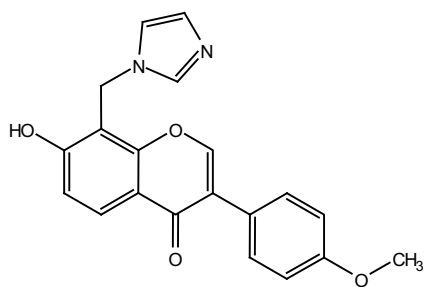
^{13}C NMR spectrum of compound **9d** in $\text{DMSO-}d_6$



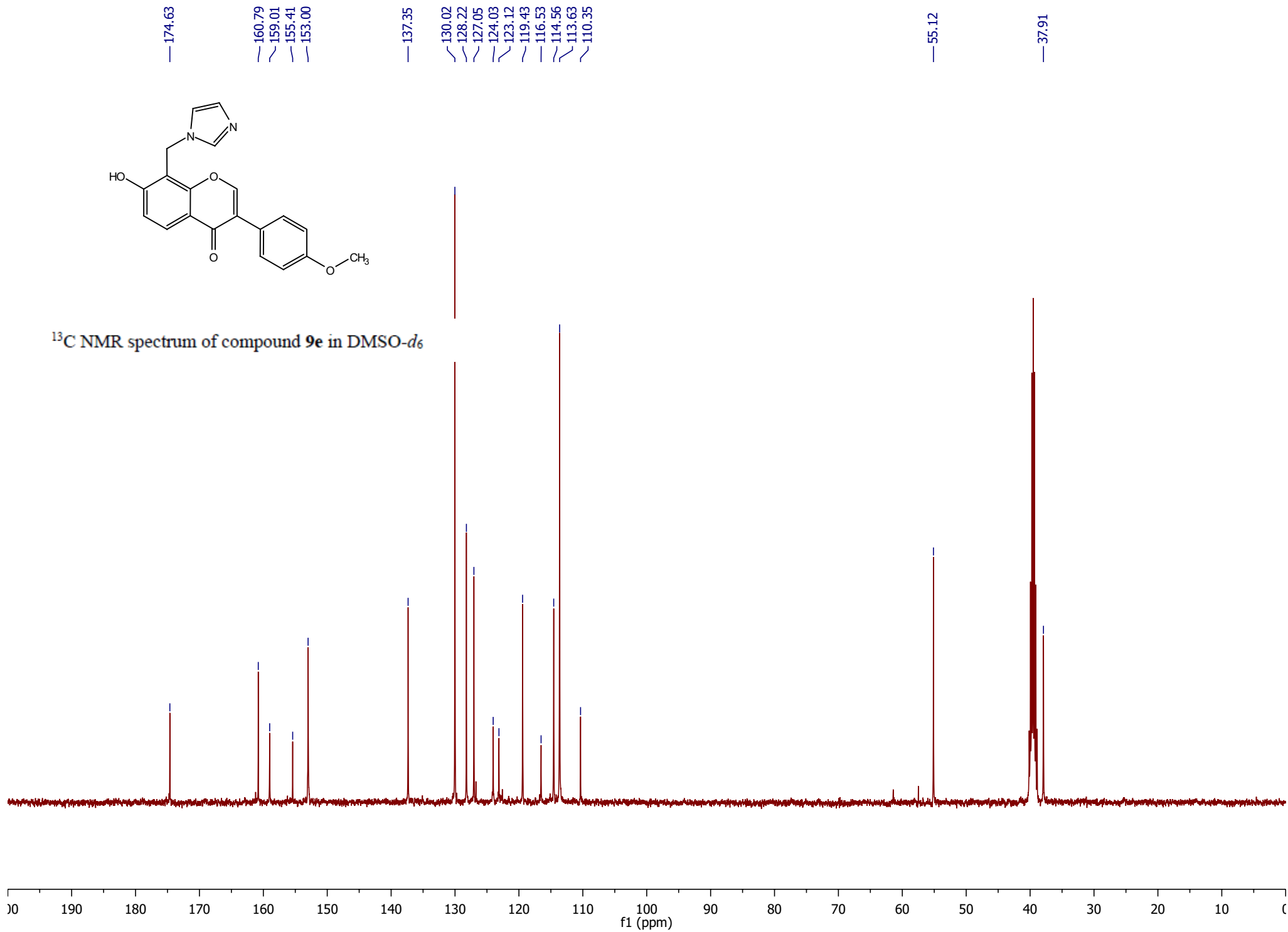


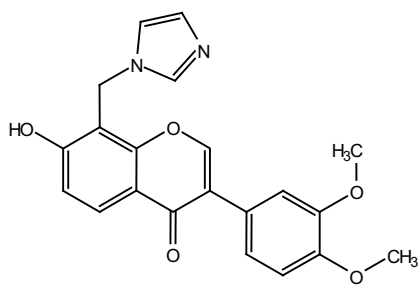
^1H NMR spectrum of compound 9e in $\text{DMSO-}d_6$



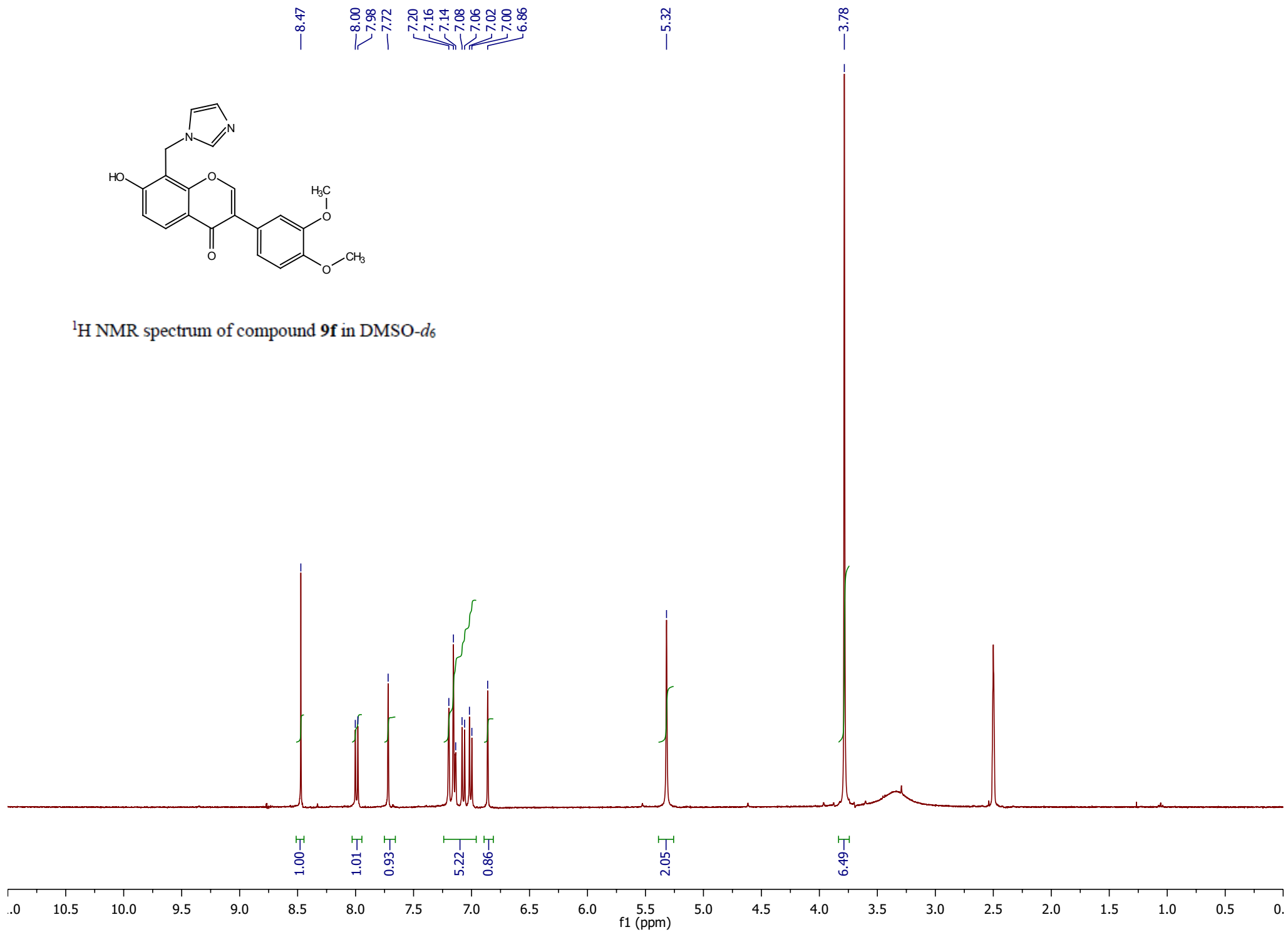


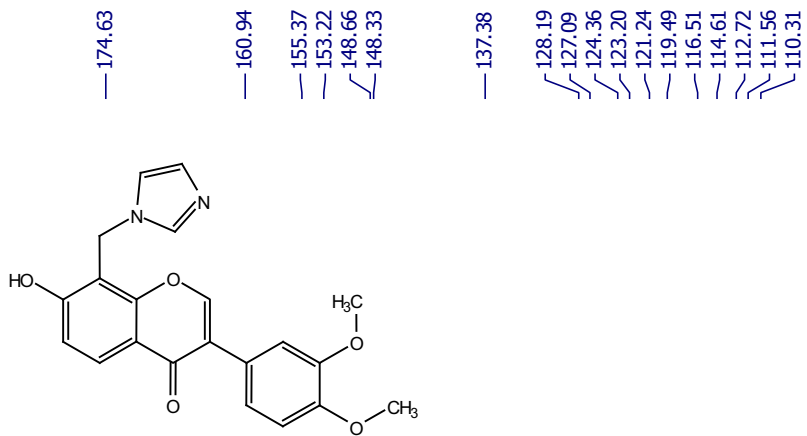
^{13}C NMR spectrum of compound 9e in $\text{DMSO-}d_6$



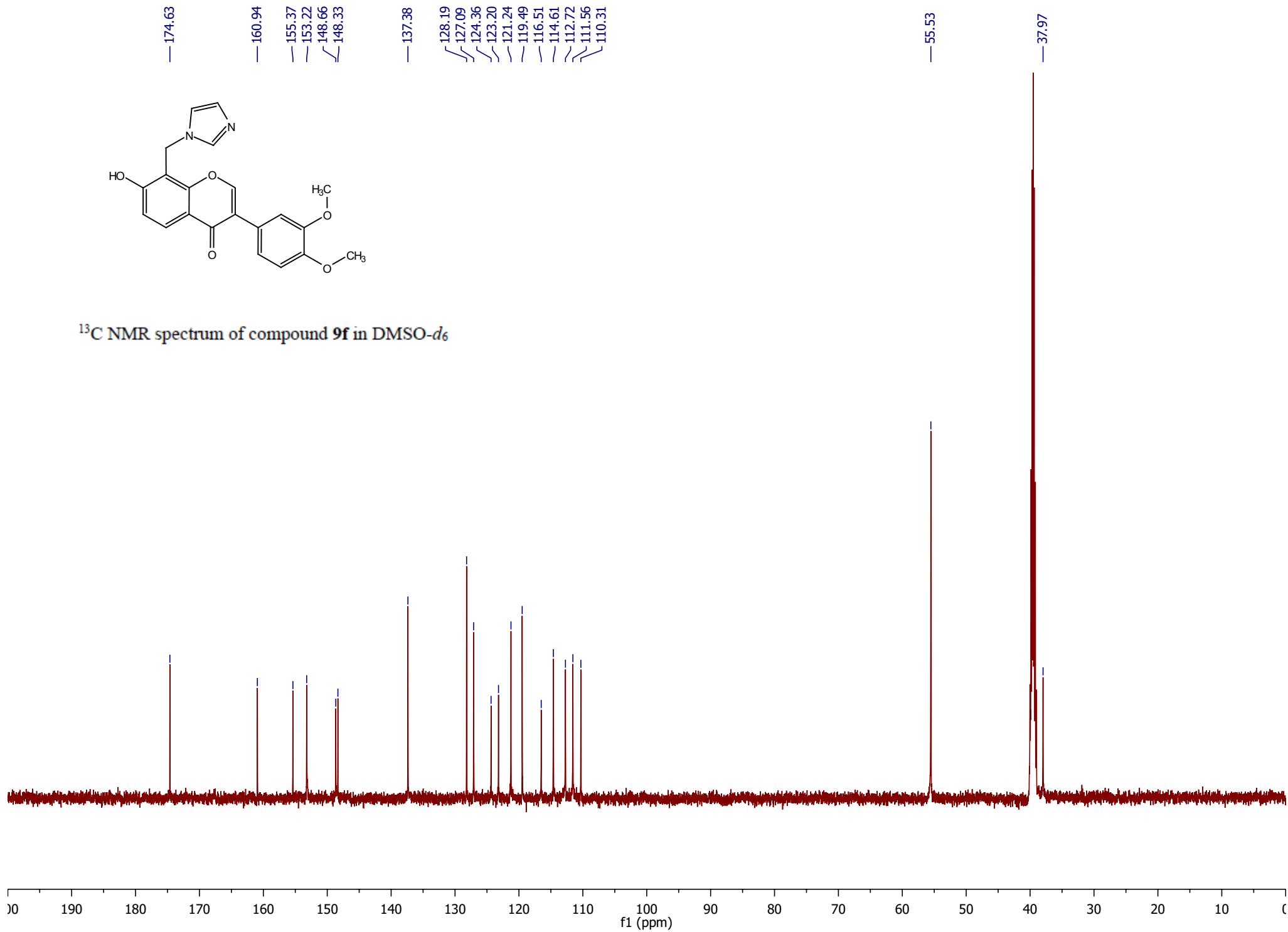


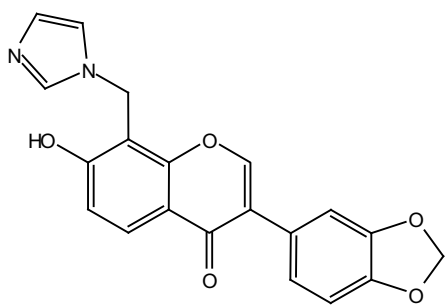
^1H NMR spectrum of compound **9f** in $\text{DMSO-}d_6$



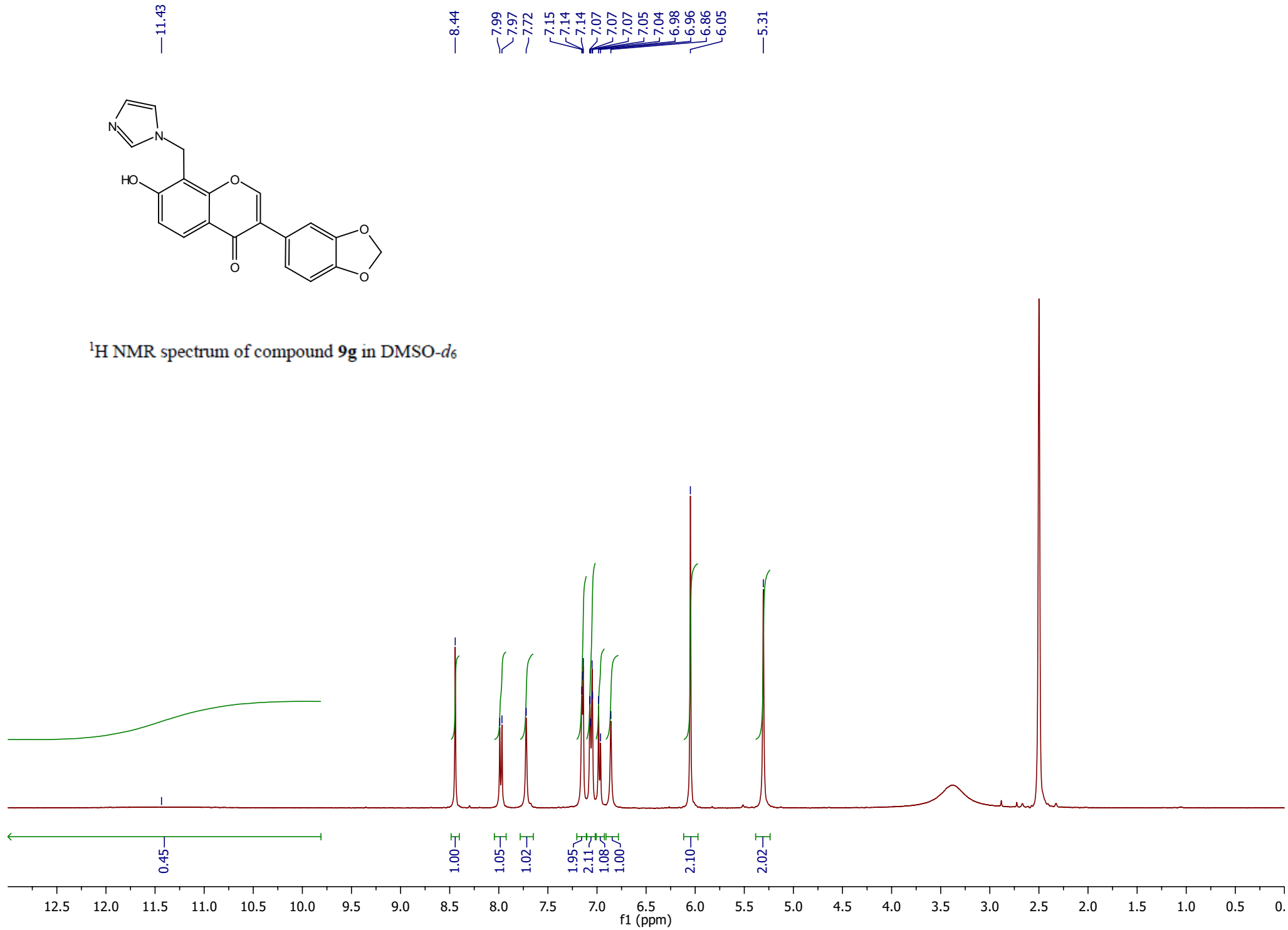


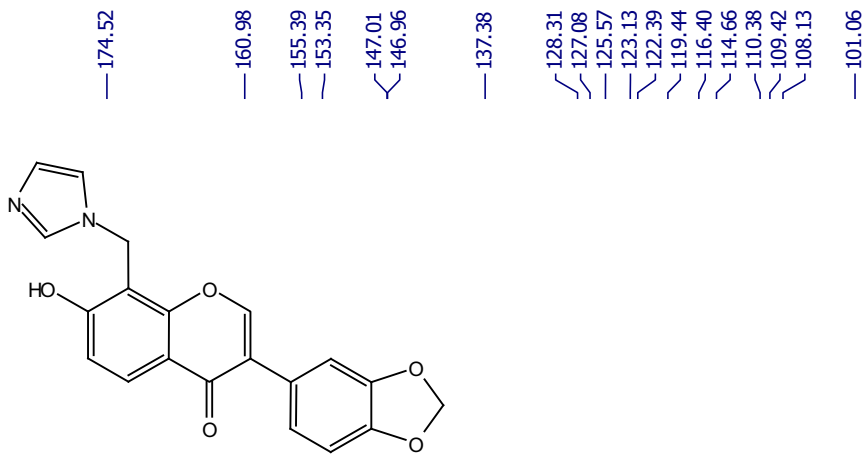
¹³C NMR spectrum of compound **9f** in DMSO-*d*₆



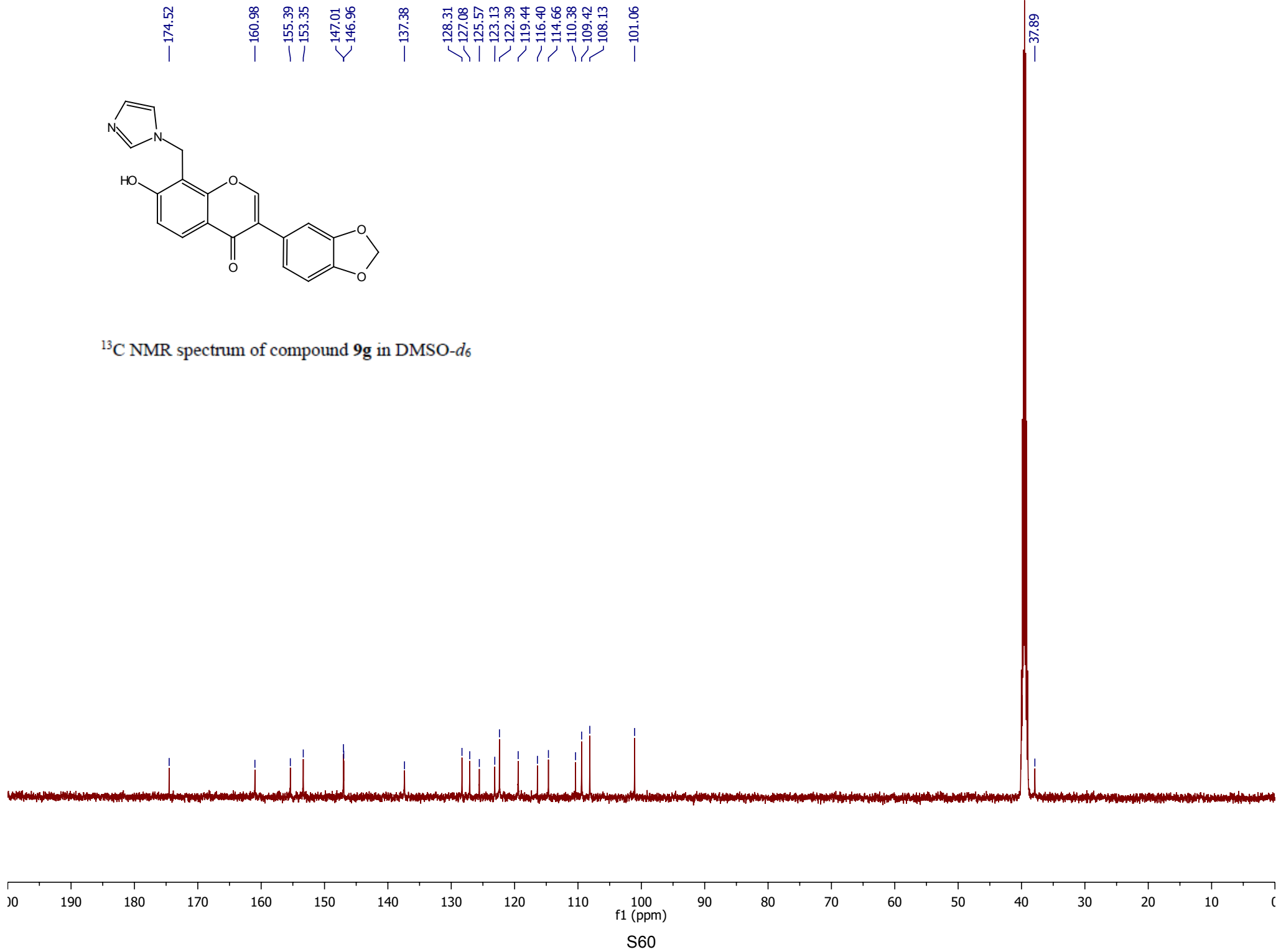


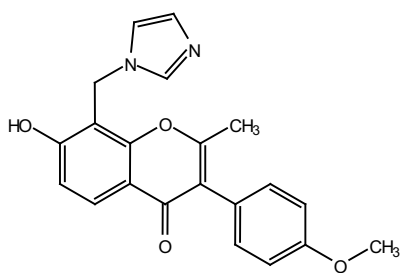
¹H NMR spectrum of compound **9g** in DMSO-*d*₆



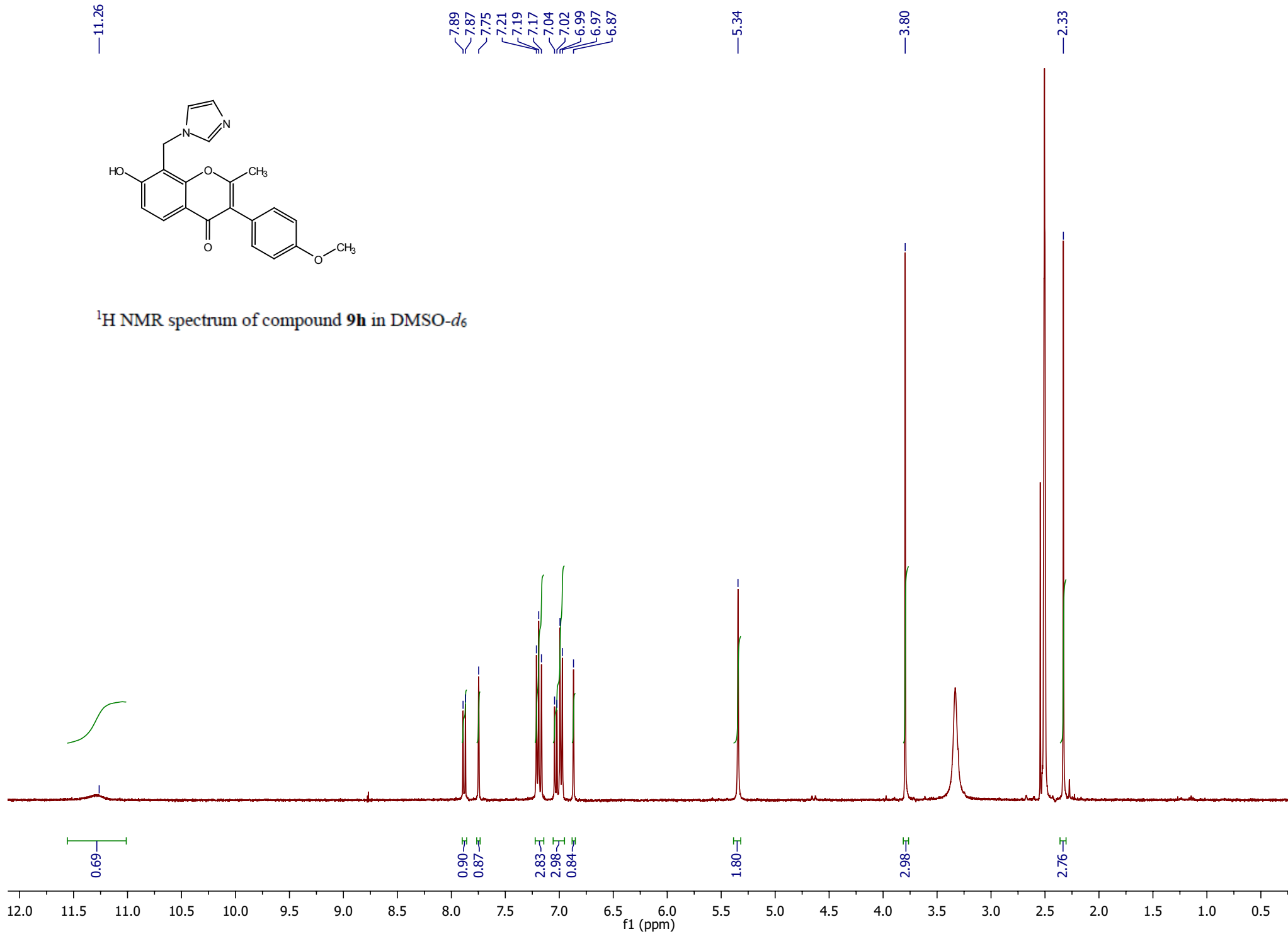


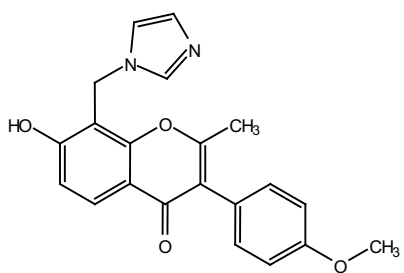
^{13}C NMR spectrum of compound **9g** in $\text{DMSO-}d_6$



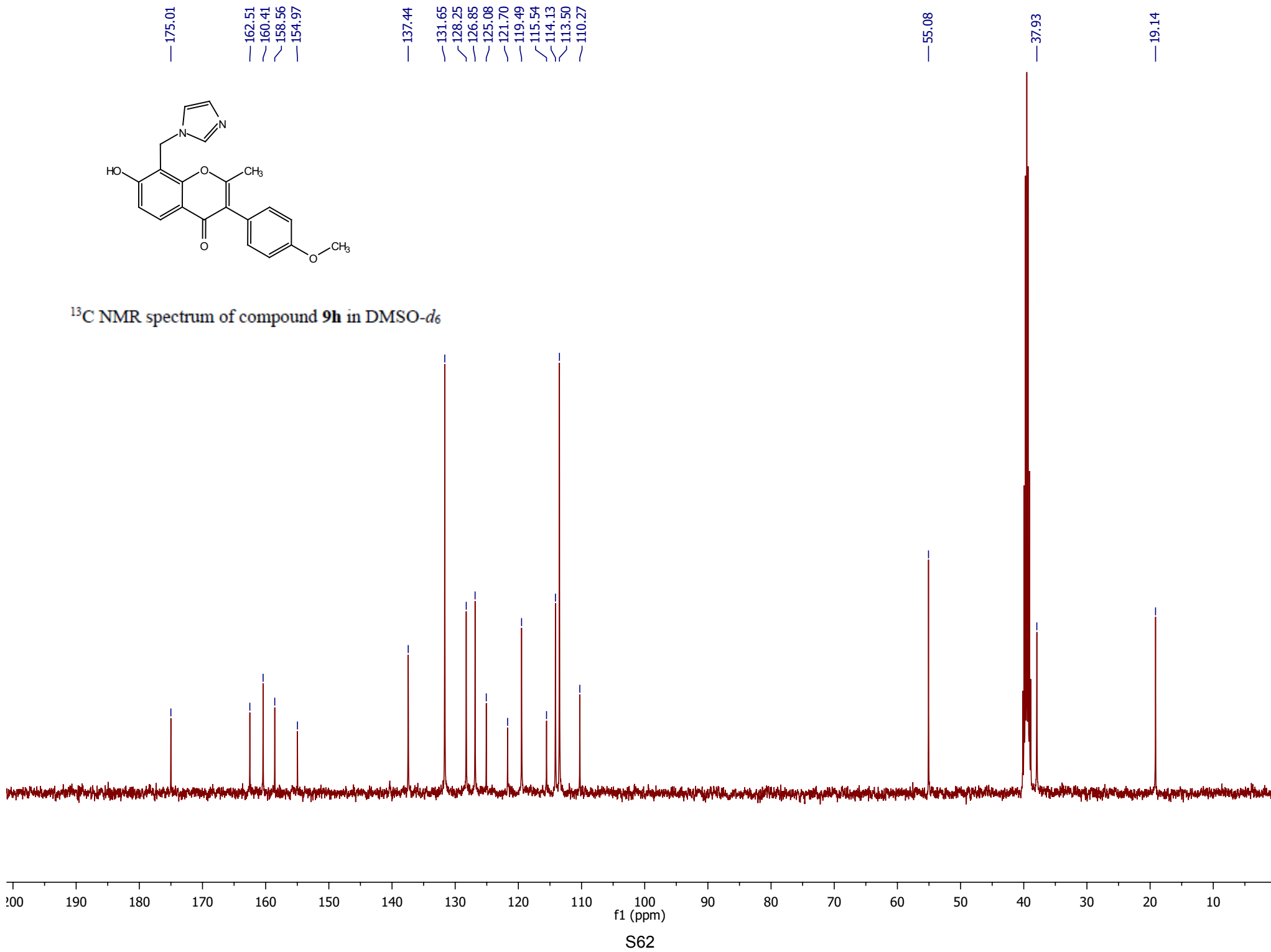


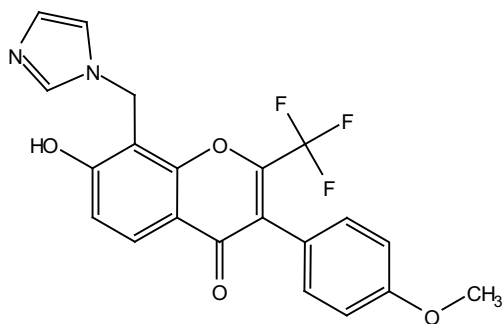
^1H NMR spectrum of compound **9h** in $\text{DMSO-}d_6$



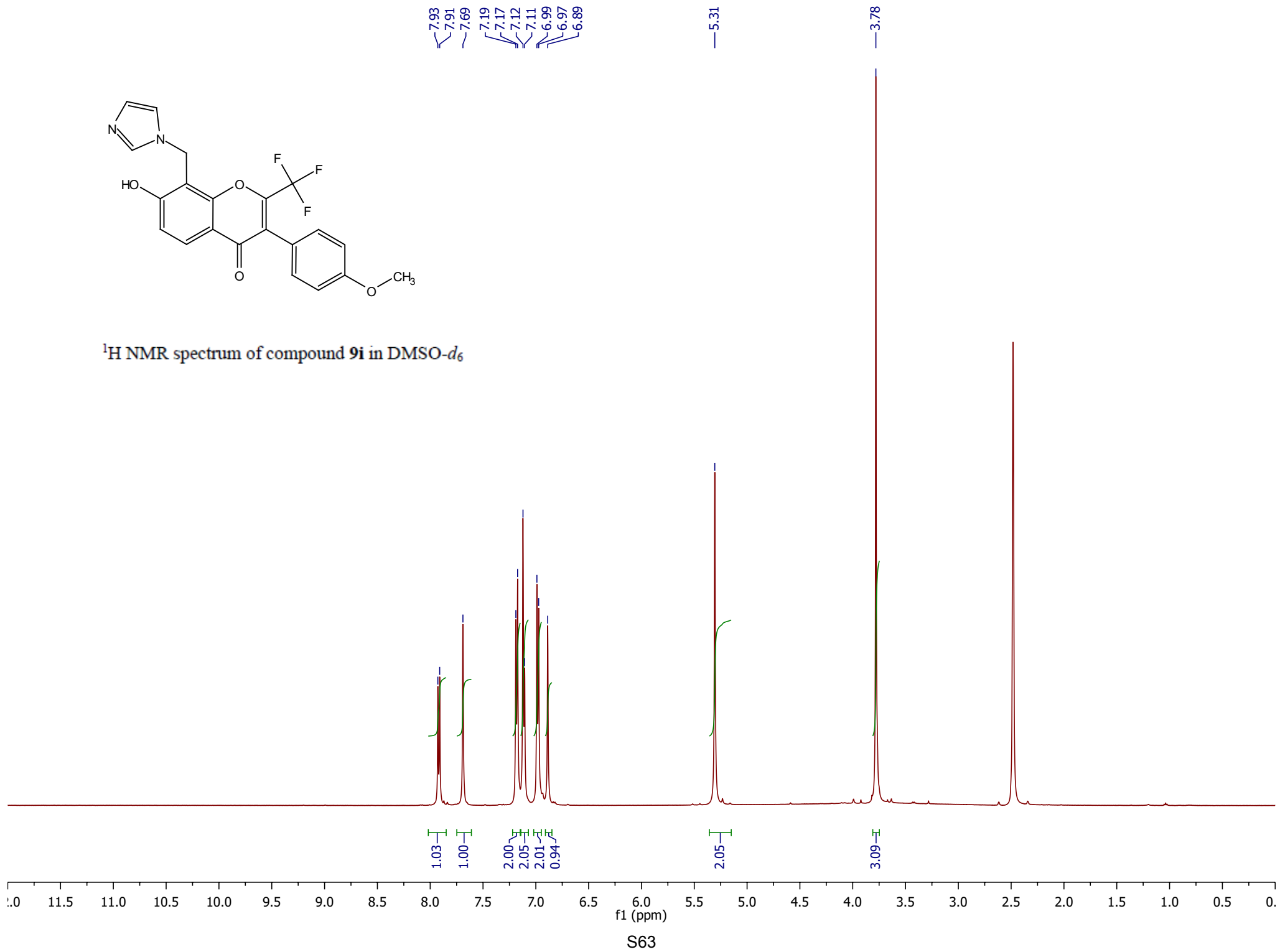


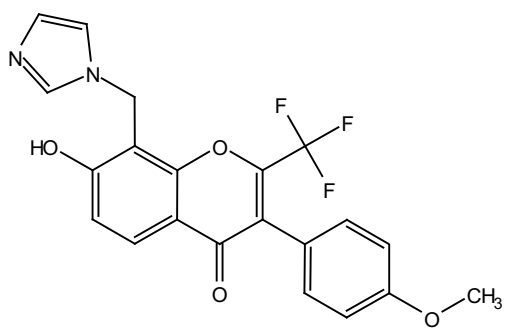
¹³C NMR spectrum of compound 9h in DMSO-*d*₆





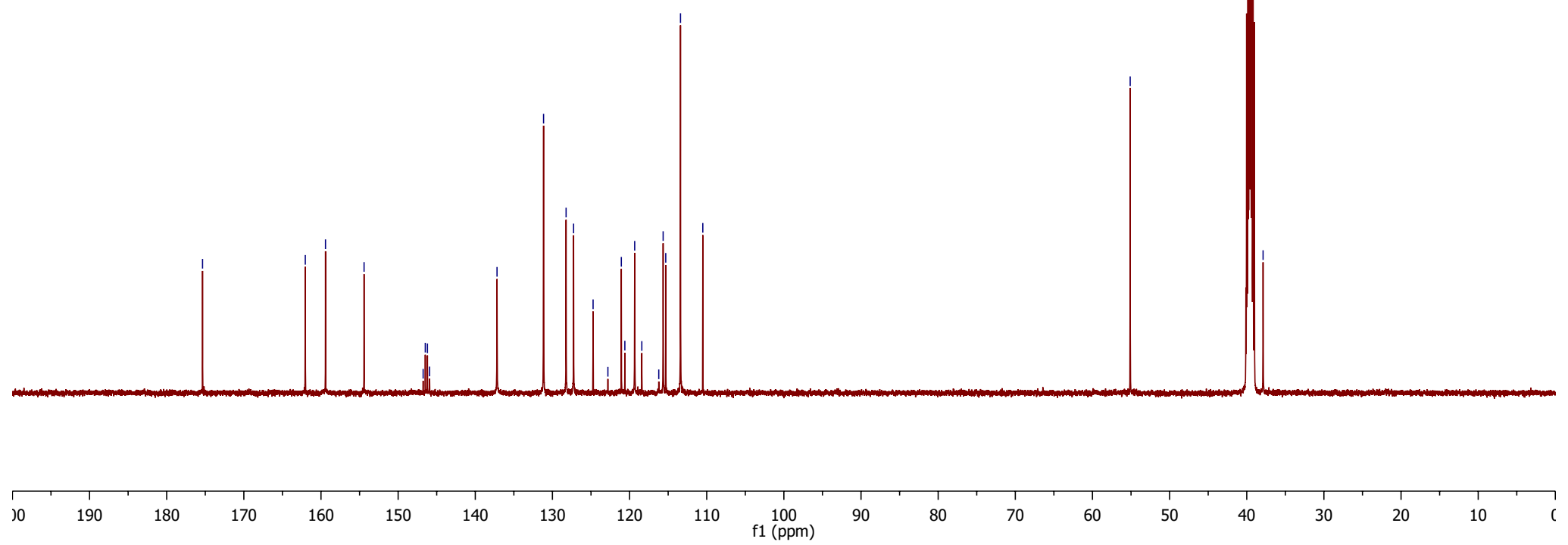
^1H NMR spectrum of compound **9i** in $\text{DMSO-}d_6$

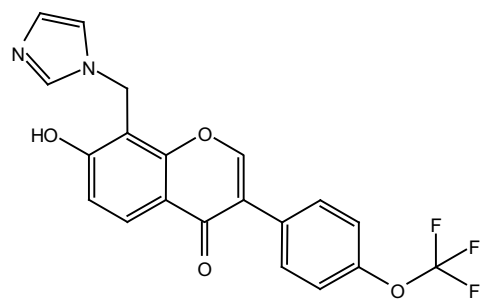




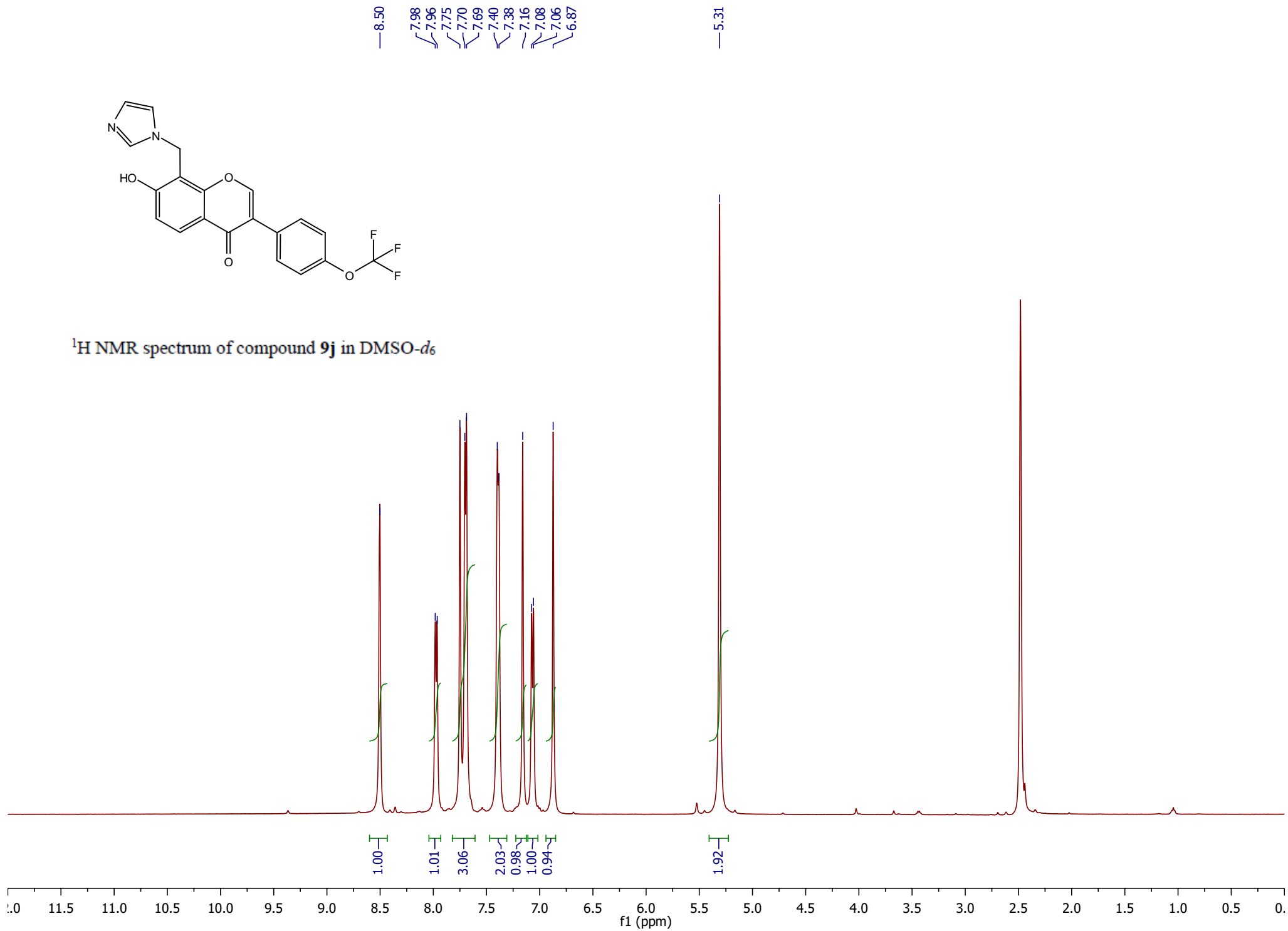
¹³C NMR spectrum of compound **9i** in DMSO-*d*₆

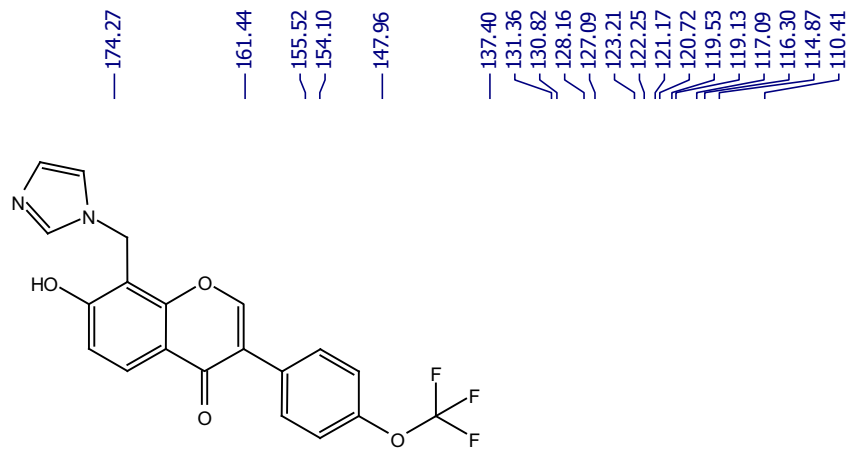
- 175.35
- 162.04
- 159.42
- 154.42
- 146.76
- 146.48
- 146.20
- 145.92
- 137.18
- 131.15
- 128.23
- 127.26
- 124.73
- 122.81
- 121.07
- 120.61
- 119.34
- 118.41
- 116.22
- 115.65
- 115.31
- 113.40
- 110.51
- 55.11
- 37.88



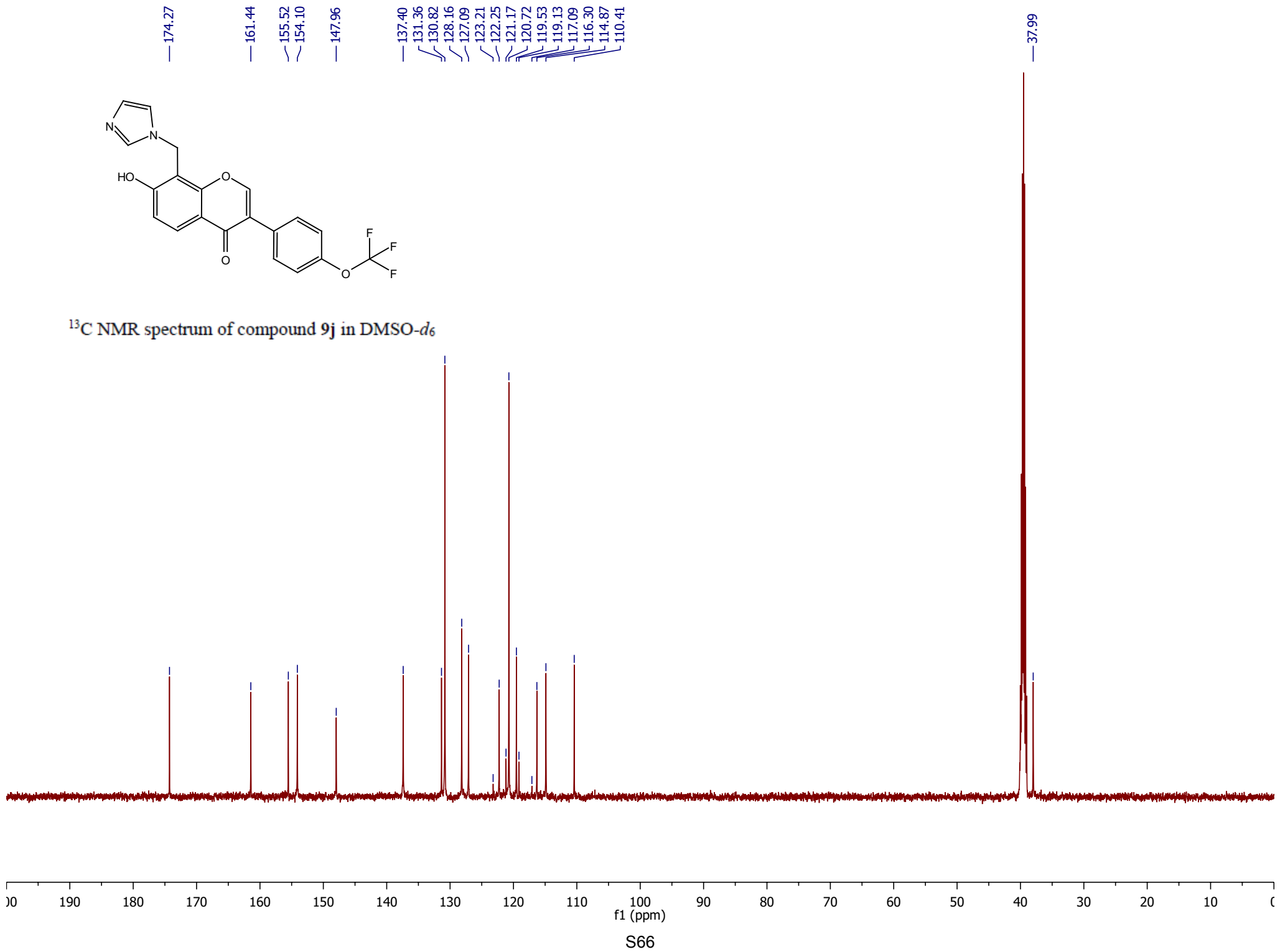


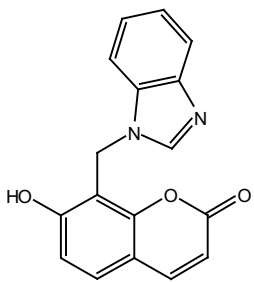
¹H NMR spectrum of compound 9j in DMSO-d₆



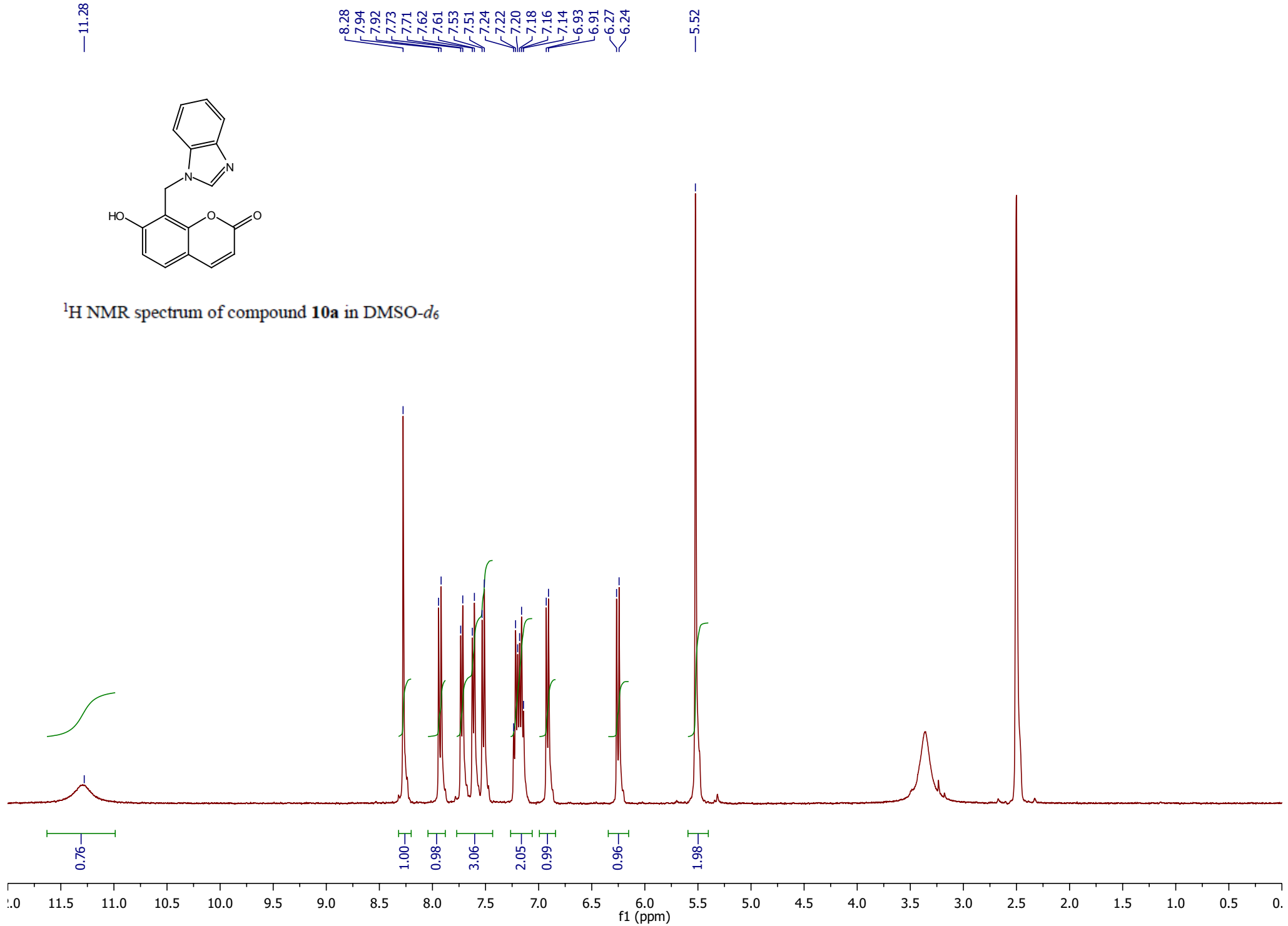


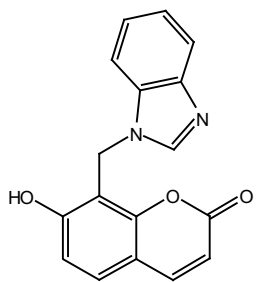
^{13}C NMR spectrum of compound 9j in $\text{DMSO-}d_6$



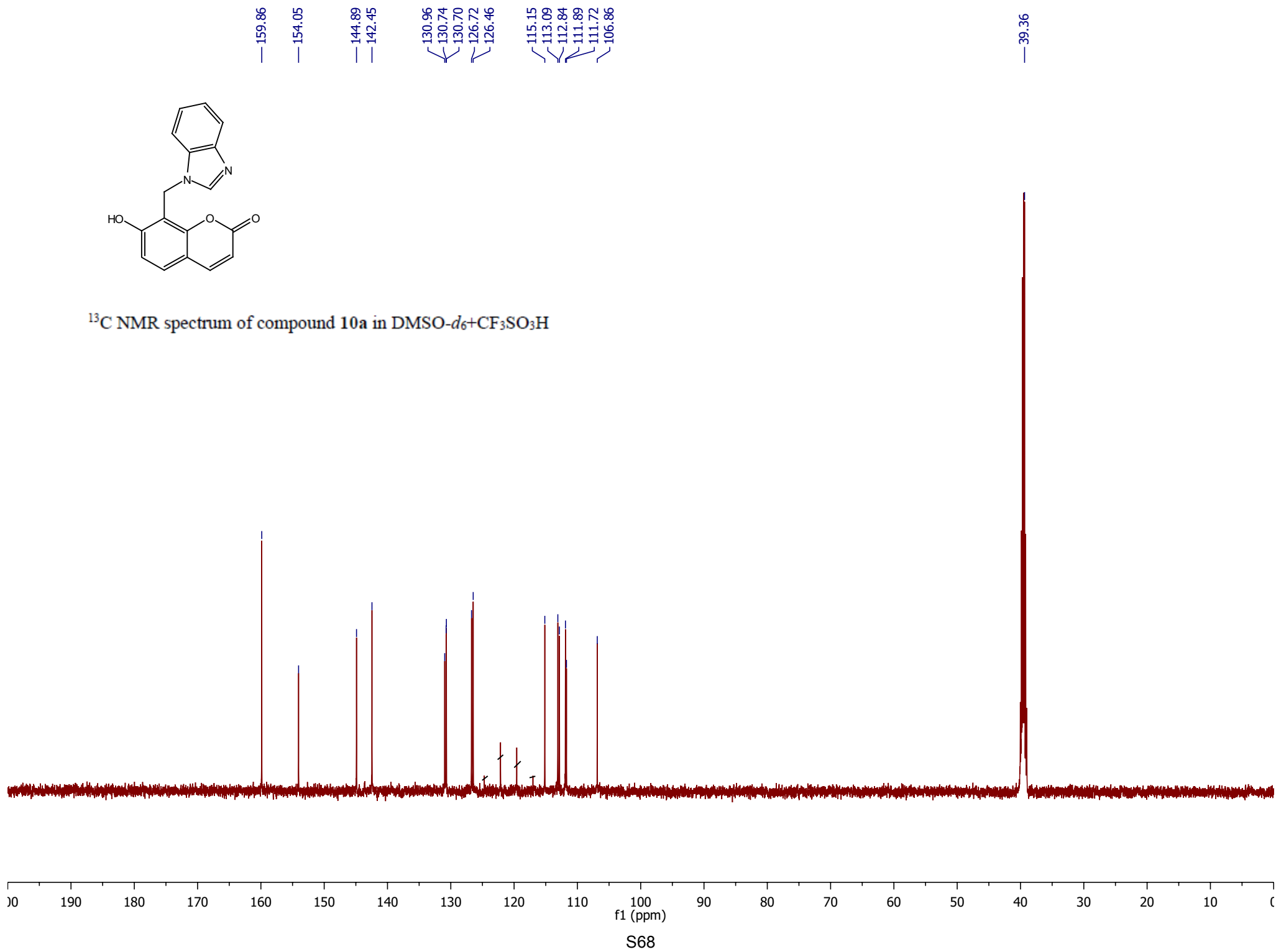


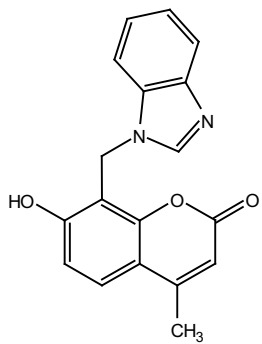
^1H NMR spectrum of compound **10a** in $\text{DMSO-}d_6$



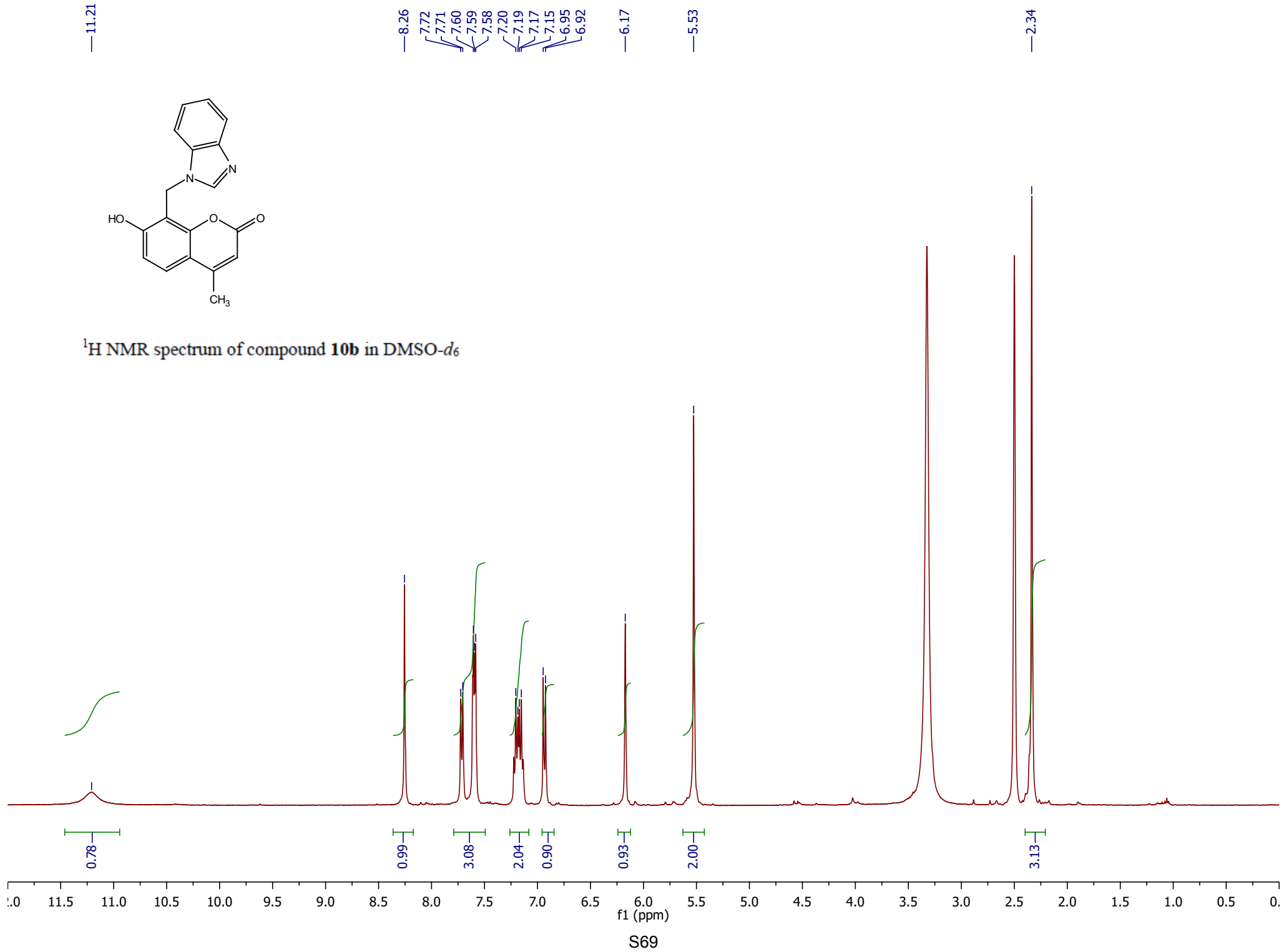


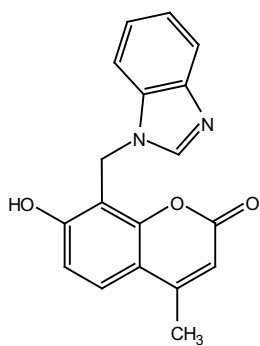
^{13}C NMR spectrum of compound 10a in $\text{DMSO-}d_6 + \text{CF}_3\text{SO}_3\text{H}$





¹H NMR spectrum of compound 10b in DMSO-d₆



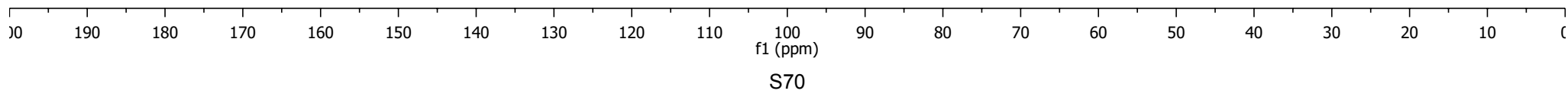


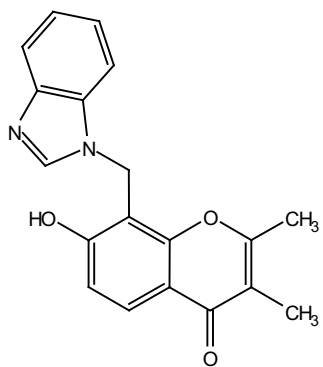
^{13}C NMR spectrum of compound **10b** in $\text{DMSO-}d_6$

159.65
159.28
153.88
153.04
144.71
143.07
133.62
126.43
122.33
121.49
119.35
112.35
112.13
110.36
110.19
109.39

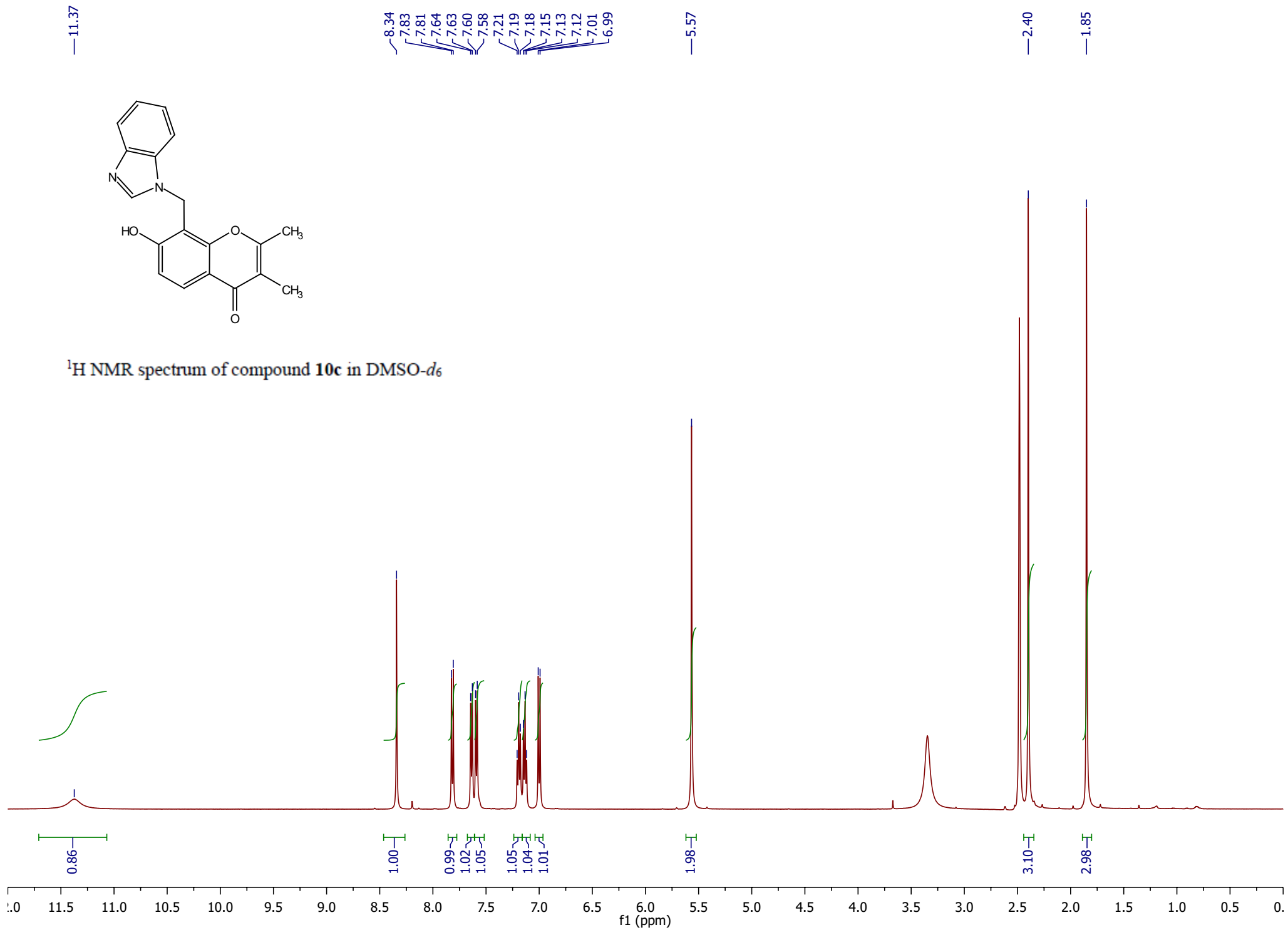
36.63

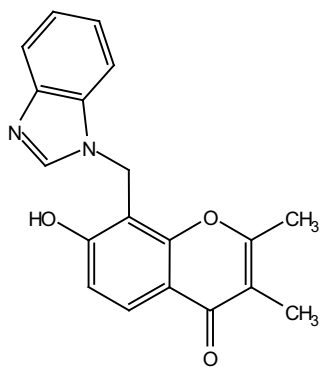
18.18



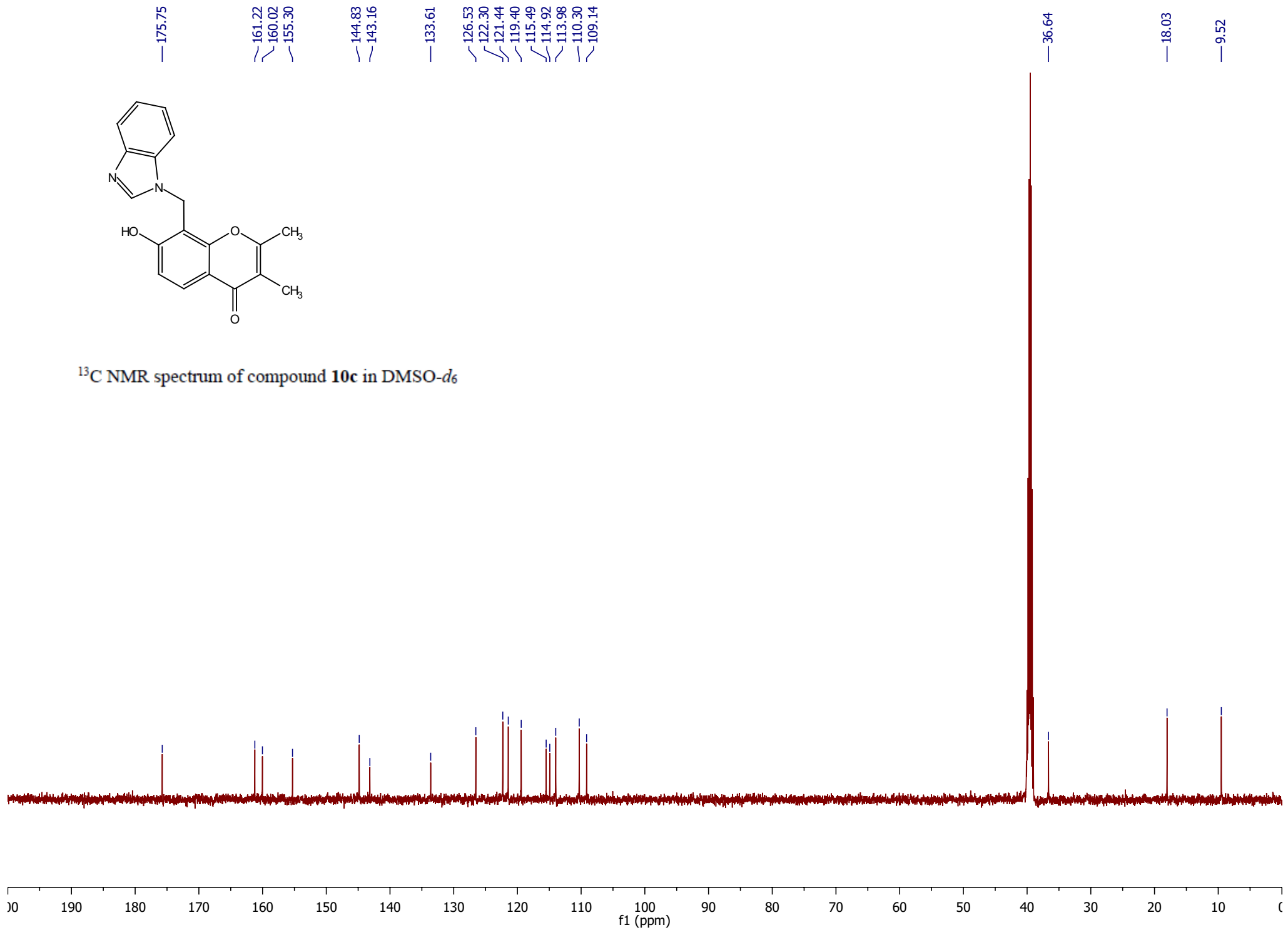


^1H NMR spectrum of compound **10c** in $\text{DMSO-}d_6$



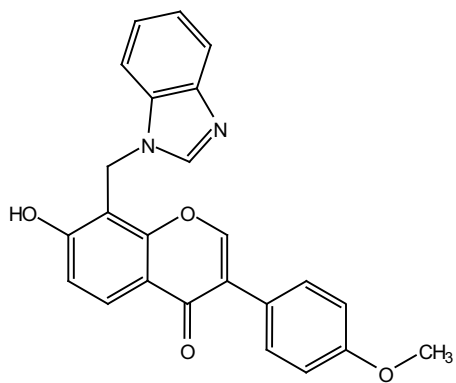


¹³C NMR spectrum of compound 10c in DMSO-*d*₆

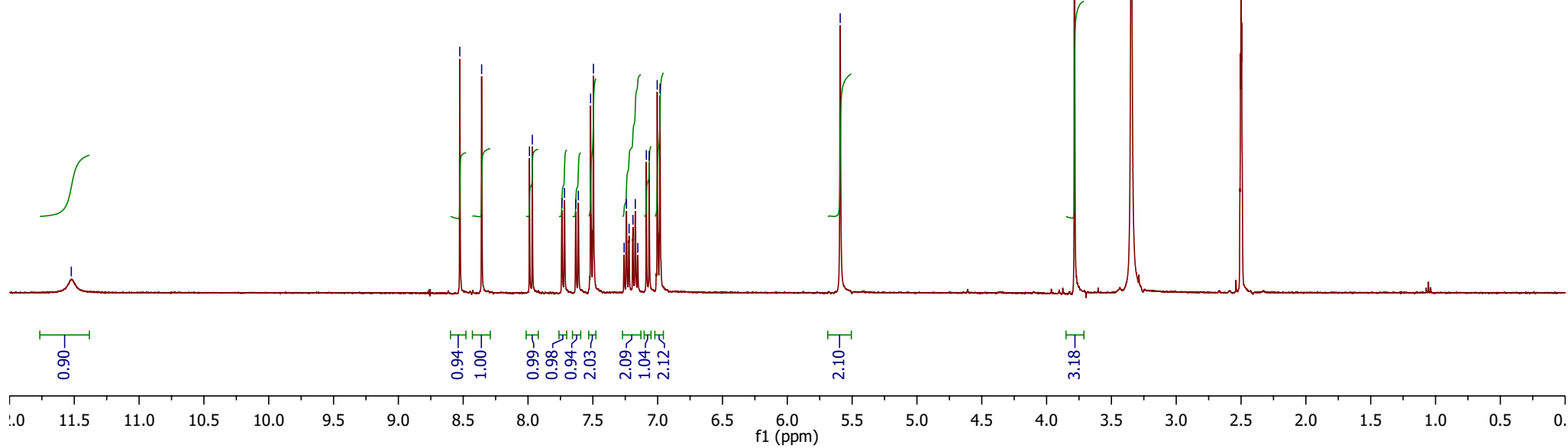


—11.52

—8.53
—8.36
7.99
7.97
7.74
7.72
7.63
7.61
7.52
7.50
7.26
7.24
7.22
7.19
7.17
7.15
7.09
7.07
7.00
6.98
5.59

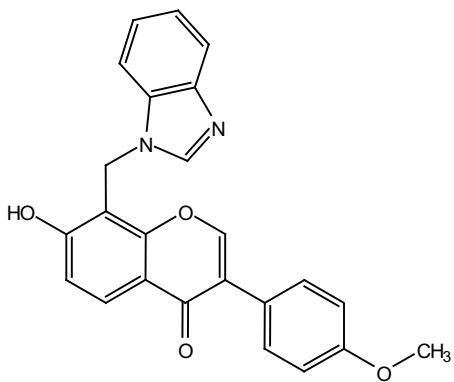


¹H NMR spectrum of compound **10d** in DMSO-*d*₆

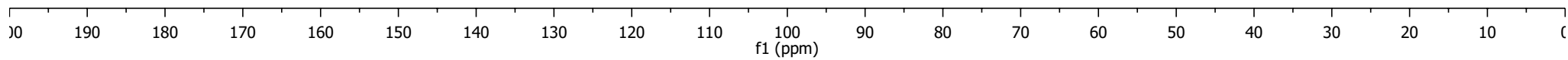


S73

174.66
160.68
159.06
155.71
153.01
144.83
143.17
133.71
130.10
127.18
123.98
123.30
122.49
121.57
119.42
116.73
114.62
113.67
110.45
109.63
55.17
36.63



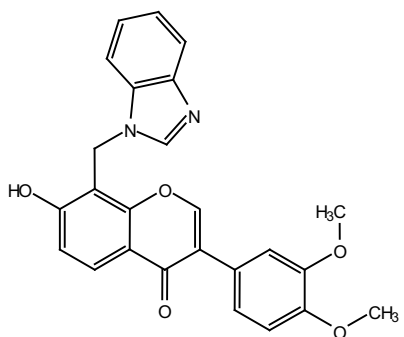
^{13}C NMR spectrum of compound **10d** in $\text{DMSO-}d_6$



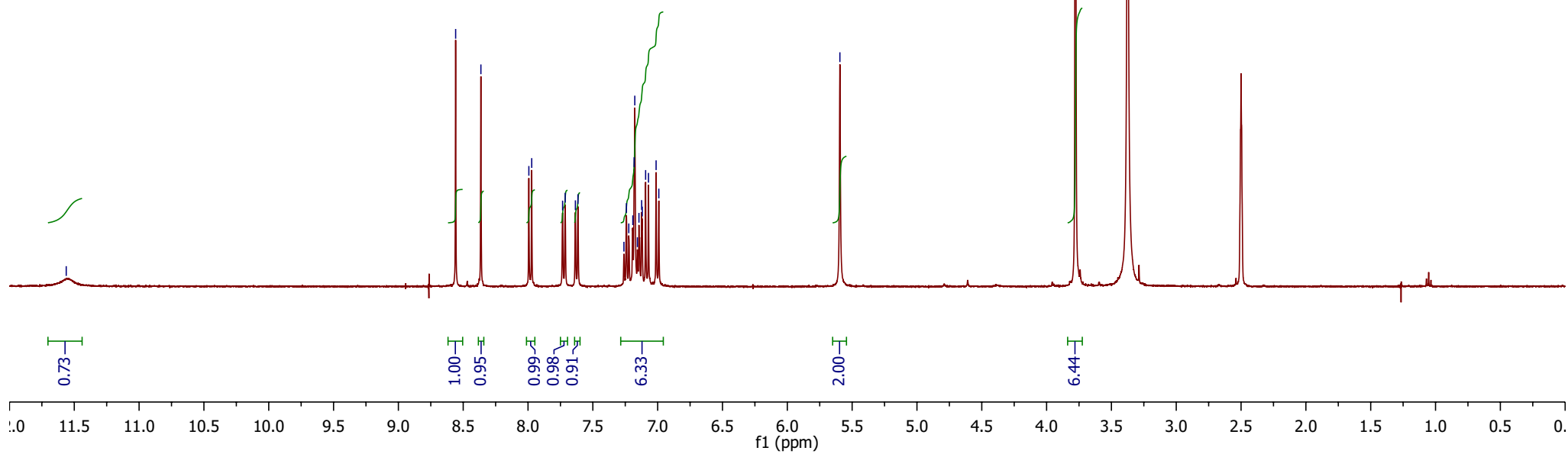
11.56

8.56
8.36
7.99
7.97
7.73
7.71
7.63
7.62
7.26
7.24
7.22
7.19
7.18
7.18
7.16
7.14
7.12
7.12
7.09
7.07
7.01
6.99
5.59

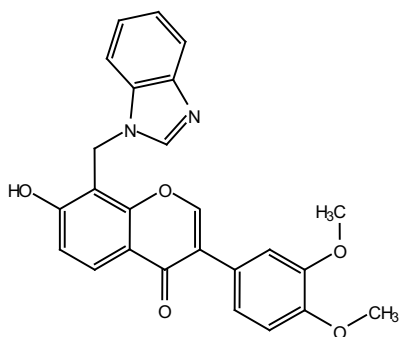
3.78
3.78



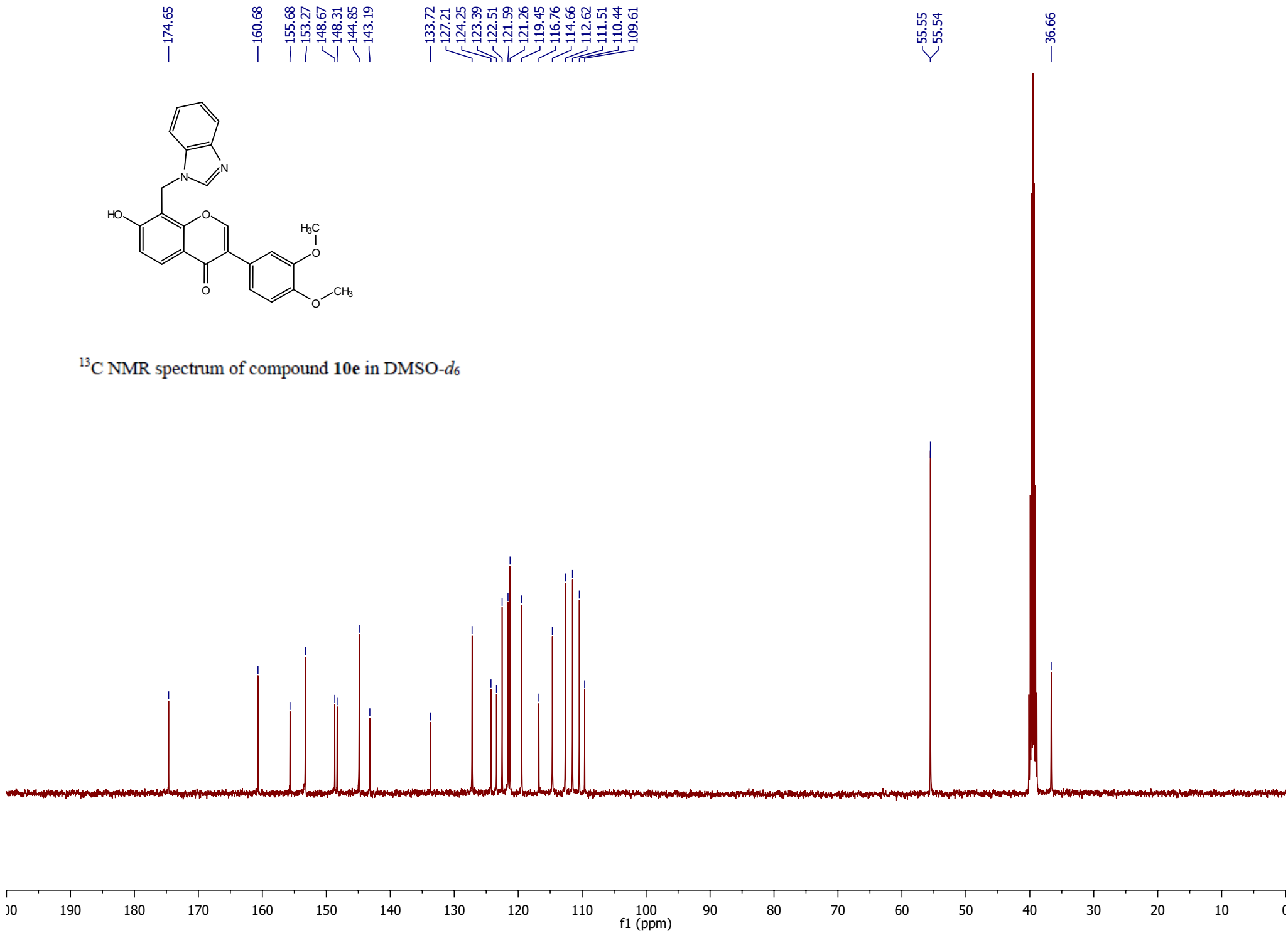
¹H NMR spectrum of compound 10e in DMSO-d₆



S75



^{13}C NMR spectrum of compound **10e** in $\text{DMSO-}d_6$



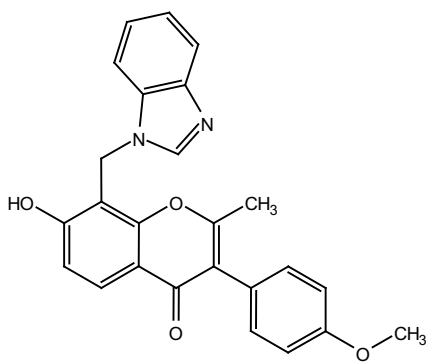
—11.46

—8.39
7.88
7.86
7.72
7.70
7.64
7.62
7.26
7.24
7.22
7.19
7.18
7.16
7.07
7.05
6.97

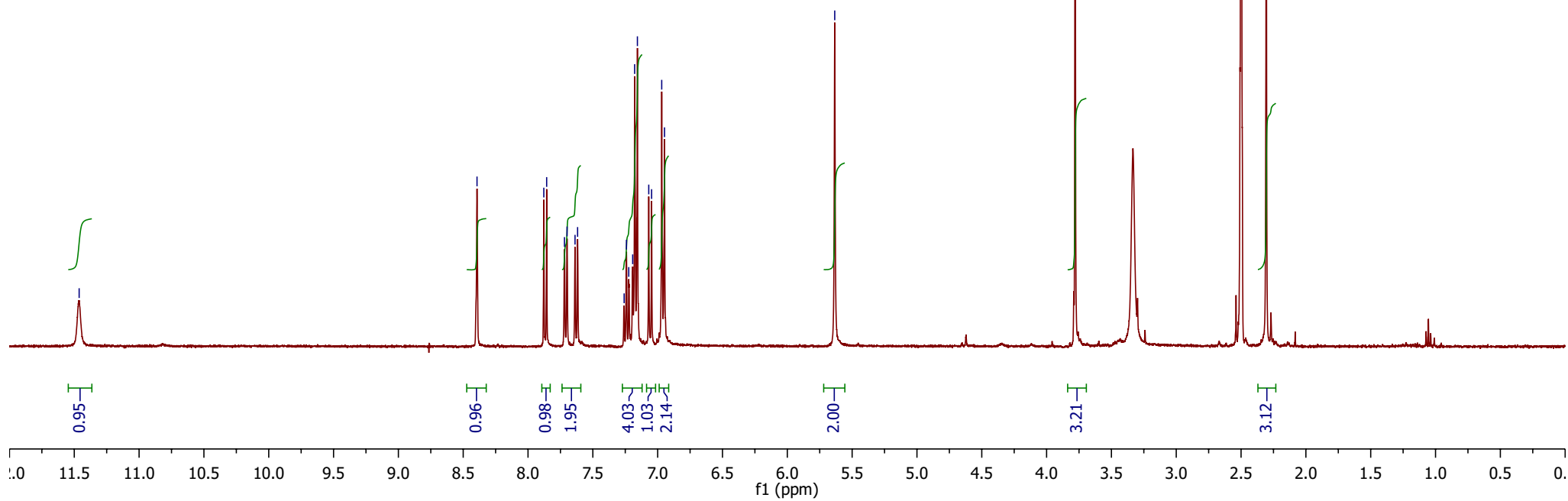
—5.63

—3.78

—2.31



¹H NMR spectrum of compound **10f** in DMSO-*d*₆

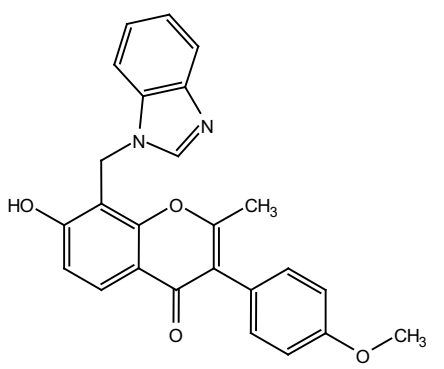


174.90
162.28
160.28
158.56
155.35
144.78
143.15
133.65
131.61
126.86
124.95
122.35
121.83
121.48
119.41
115.71
114.18
113.47
110.34
109.34

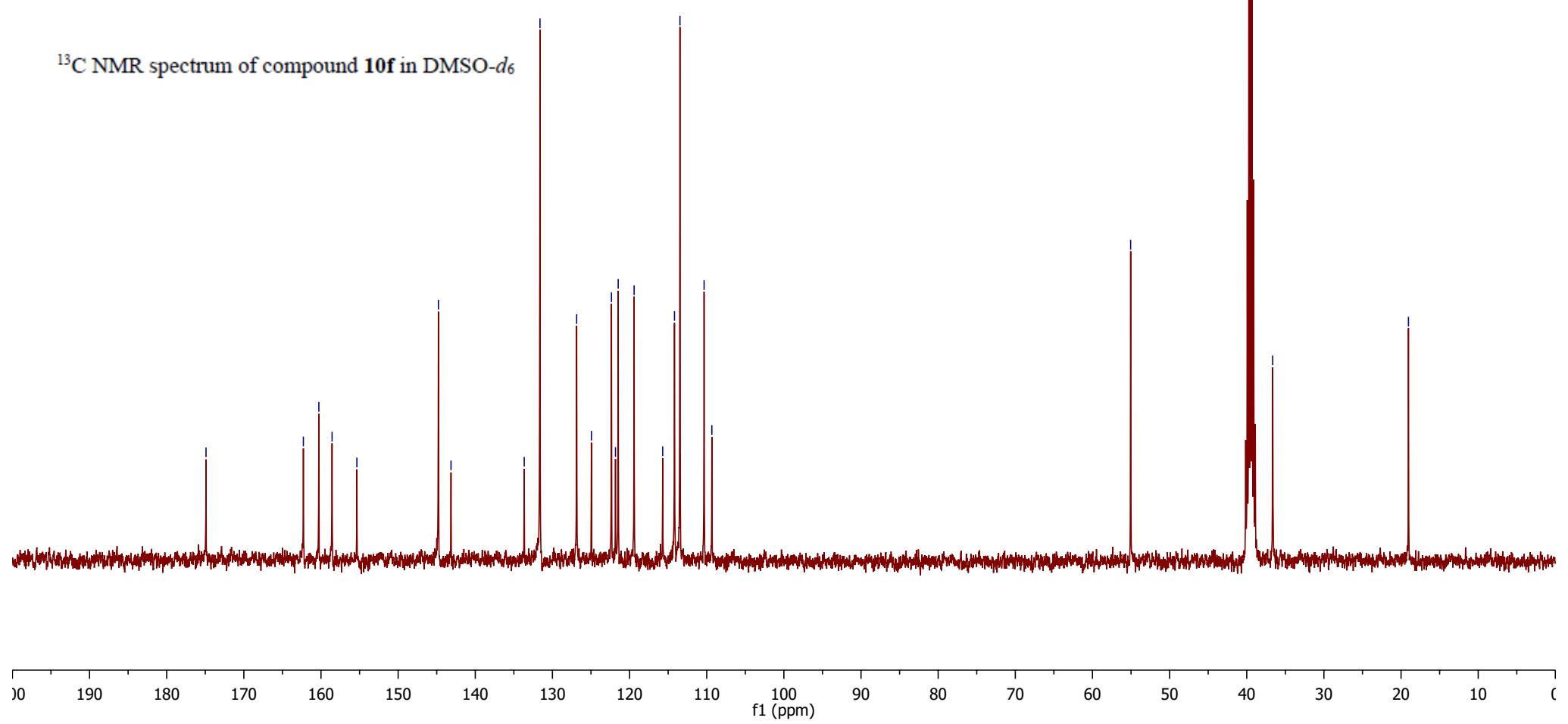
55.05

36.64

19.04



¹³C NMR spectrum of compound 10f in DMSO-d₆

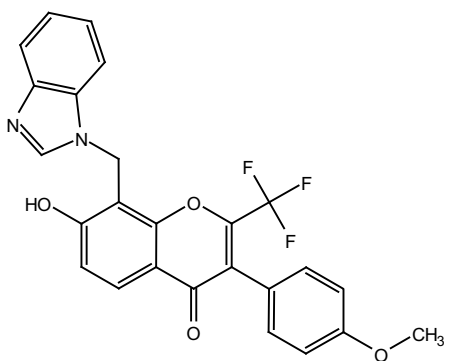


11.89

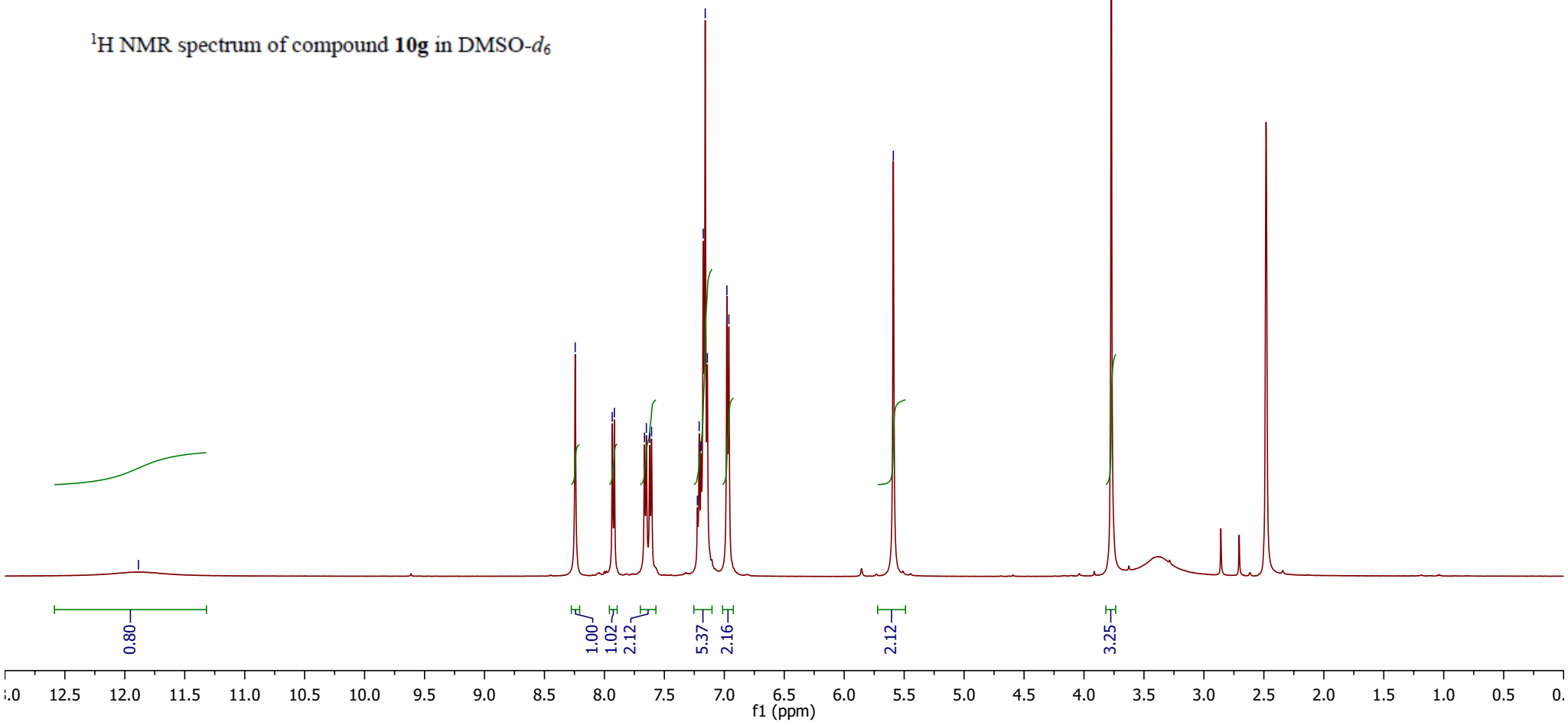
8.24
7.93
7.92
7.67
7.65
7.62
7.61
7.22
7.21
7.19
7.18
7.16
7.14
6.98
6.96

5.59

3.77



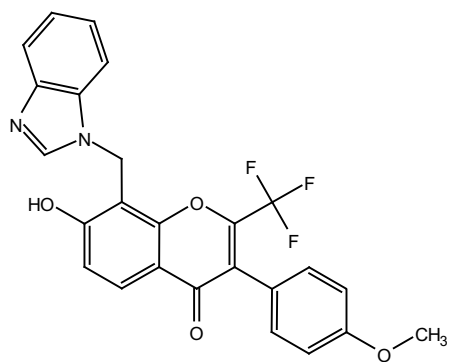
¹H NMR spectrum of compound 10g in DMSO-d₆



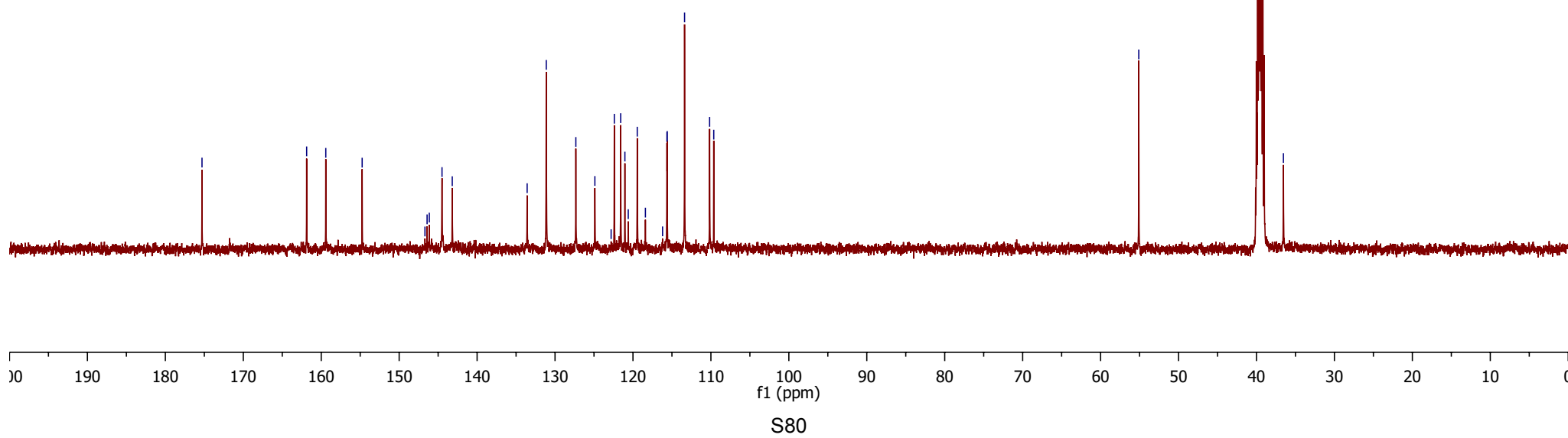
175.30
161.87
159.41
154.75
146.69
146.42
146.13
144.50
143.19
133.58
131.13
127.33
124.89
122.80
122.39
121.57
121.04
120.60
119.45
118.41
116.20
115.64
115.61
113.38
110.17
109.64

55.10

36.54

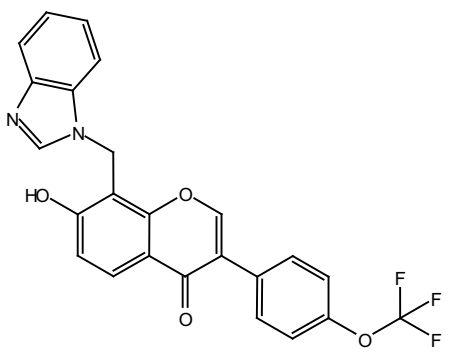


^{13}C NMR spectrum of compound **10g** in $\text{DMSO-}d_6$

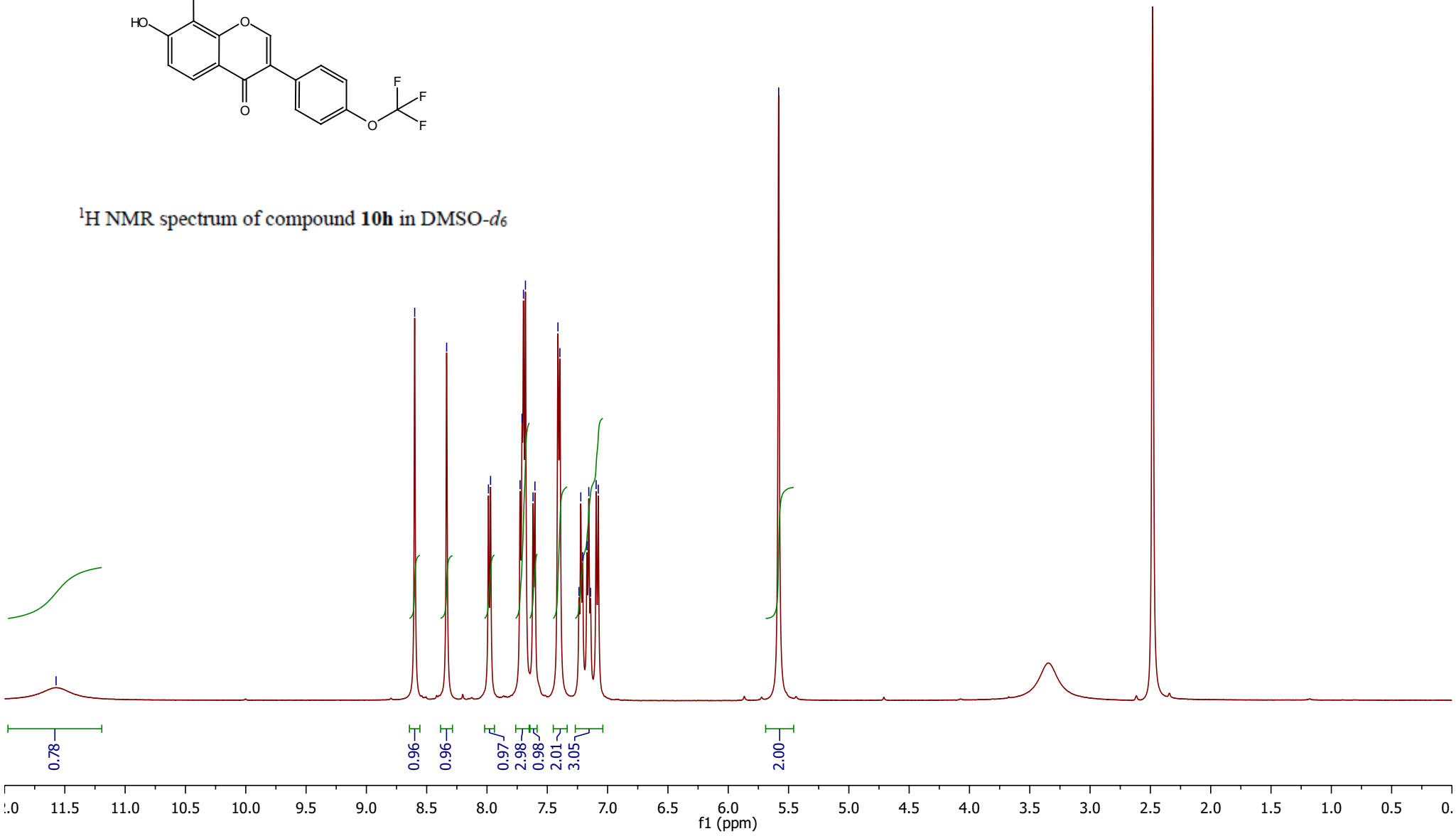


—11.57

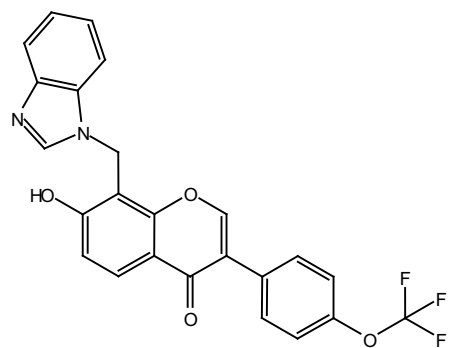
—8.60
—8.33
—7.99
—7.97
—7.73
—7.71
—7.70
—7.68
—7.62
—7.60
—7.41
—7.40
—7.24
—7.22
—7.21
—7.17
—7.16
—7.14
—7.10
—7.08
—5.58



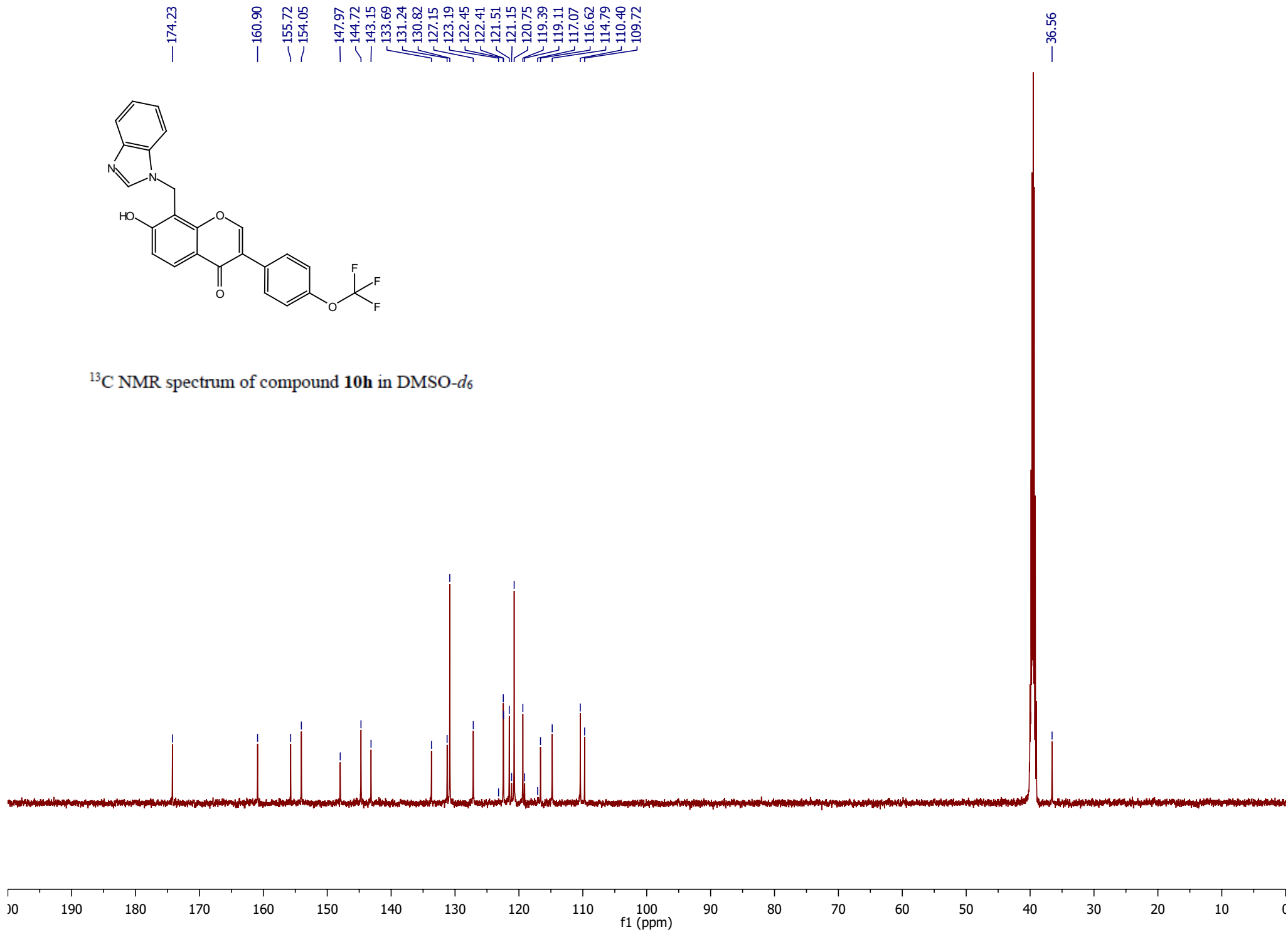
¹H NMR spectrum of compound **10h** in DMSO-*d*₆



S81



^{13}C NMR spectrum of compound 10h in $\text{DMSO-}d_6$



10.98

7.93

7.91

7.64

7.52

7.50

7.37

6.90

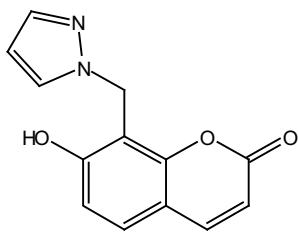
6.88

6.23

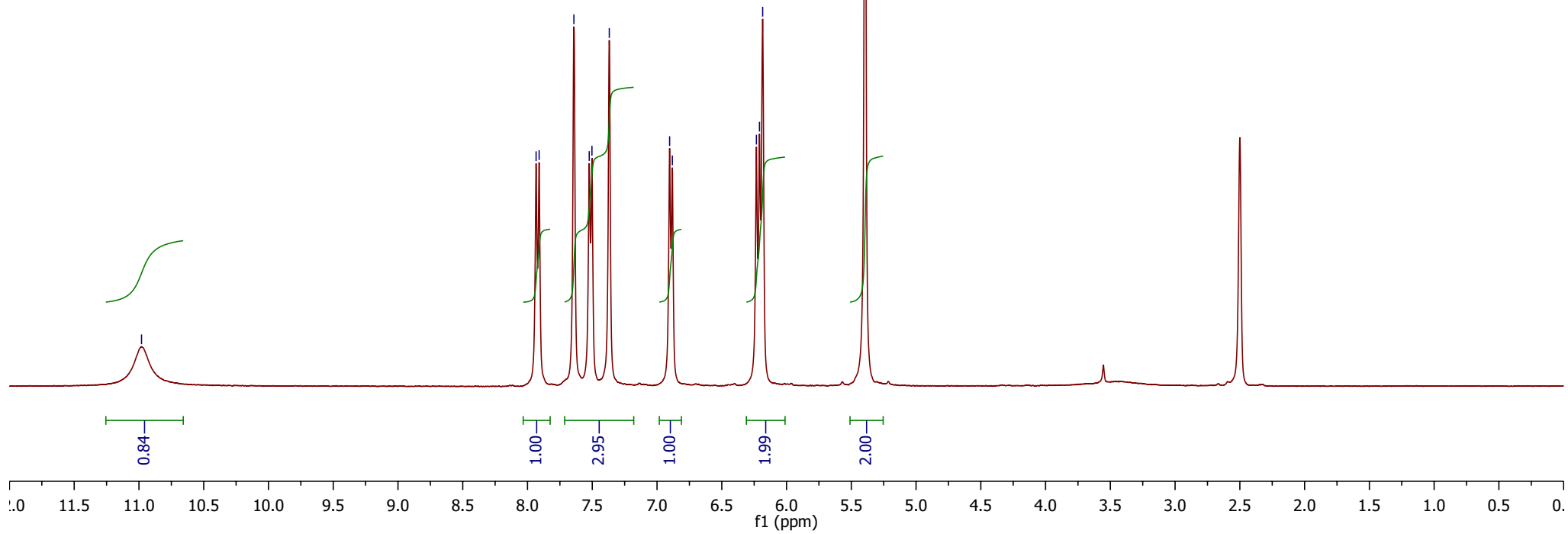
6.21

6.18

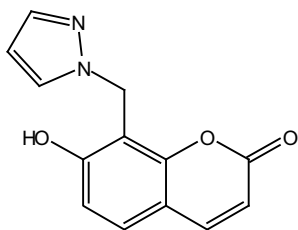
5.39



^1H NMR spectrum of compound **11a** in $\text{DMSO-}d_6$

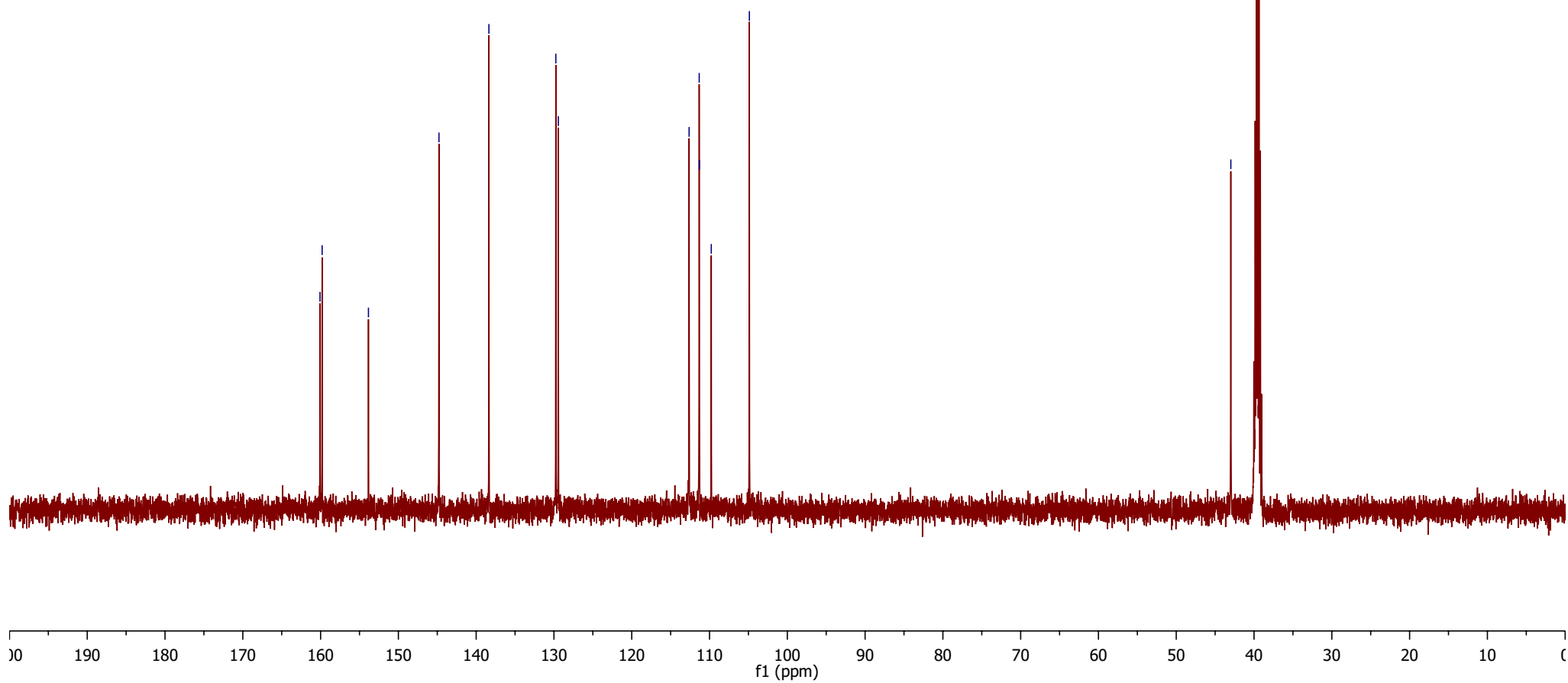


S83



160.08
159.80
153.85
144.78
138.36
129.76
129.44
112.62
111.33
111.31
109.78
104.88
42.98

^{13}C NMR spectrum of compound **11a** in $\text{DMSO-}d_6$



— 10.92

7.62

7.60

7.36

7.35

6.92

6.90

6.18

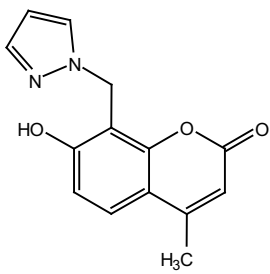
6.18

6.17

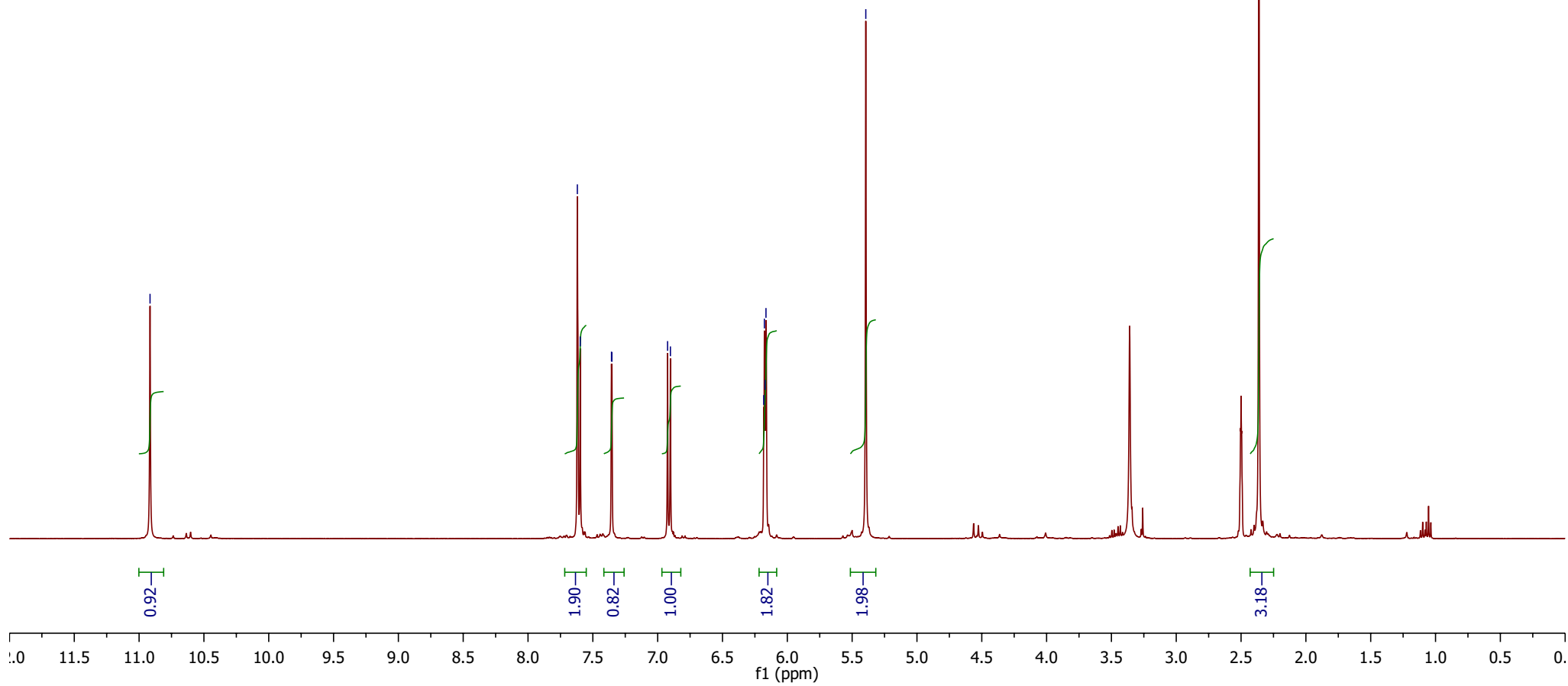
6.16

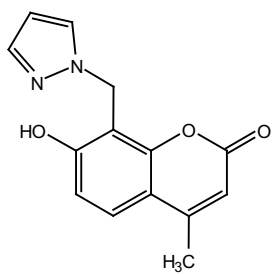
— 5.39

— 2.36



¹H NMR spectrum of compound 11b in DMSO-d₆





159.88
159.61

153.81
153.21

138.33

129.69

126.32

112.29

112.05

110.21

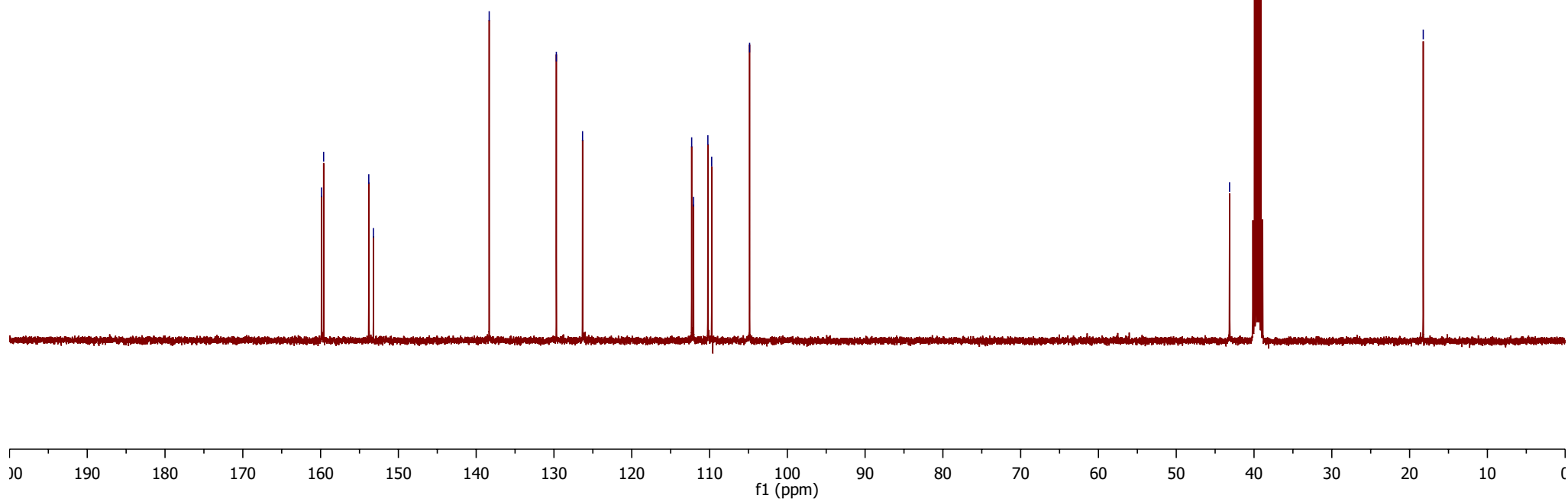
109.72

104.85

43.15

18.25

¹³C NMR spectrum of compound **11b** in DMSO-*d*₆



—11.00

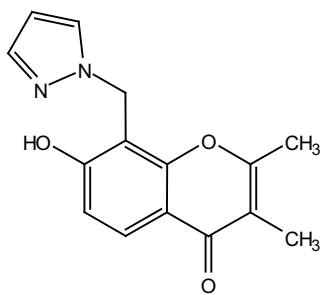
7.85
7.83
7.67
7.67
7.36
7.35
6.99
6.96

6.18
6.18
6.17

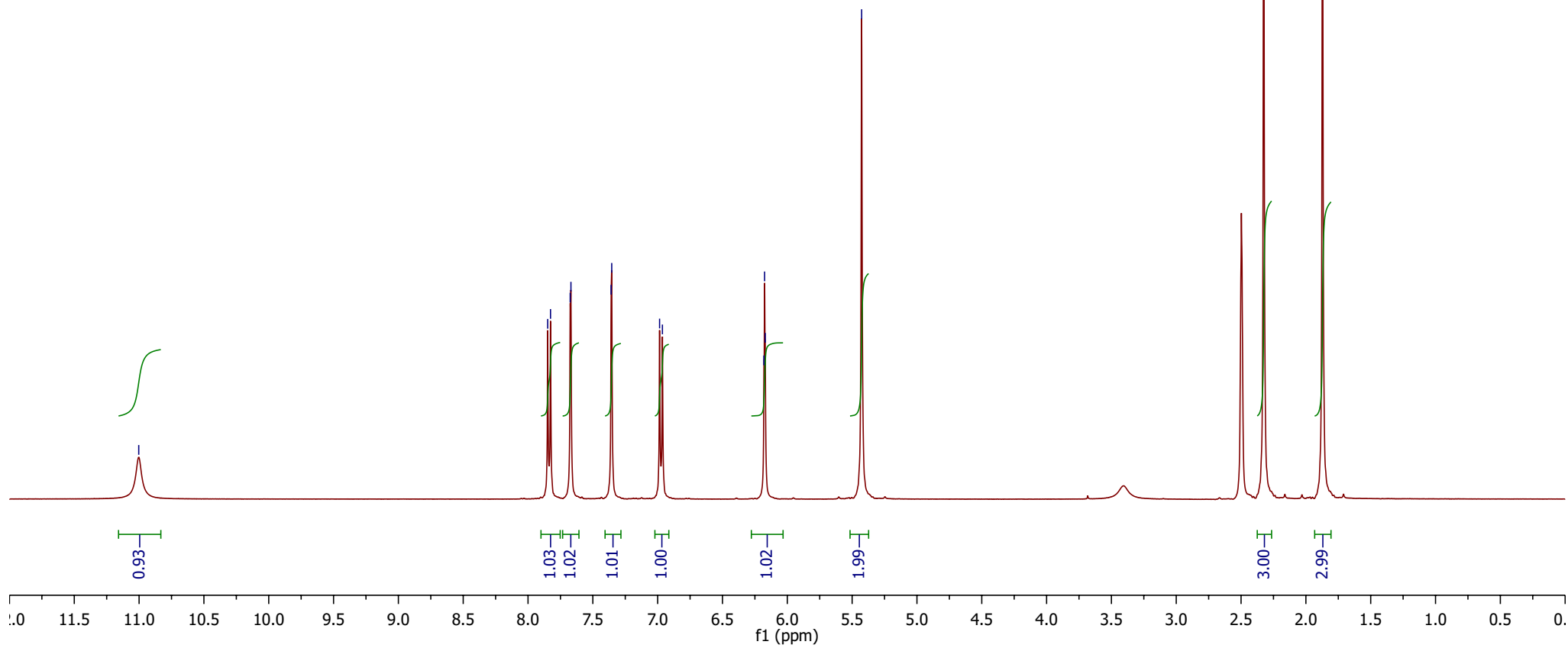
—5.43

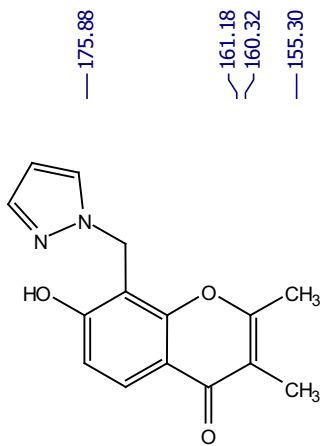
—2.33

—1.87



^1H NMR spectrum of compound 11c in $\text{DMSO}-d_6$





— 175.88

— 161.18

— 160.32

— 155.30

— 138.38

— 129.87

— 126.32

— 115.26

— 114.81

— 113.94

— 109.64

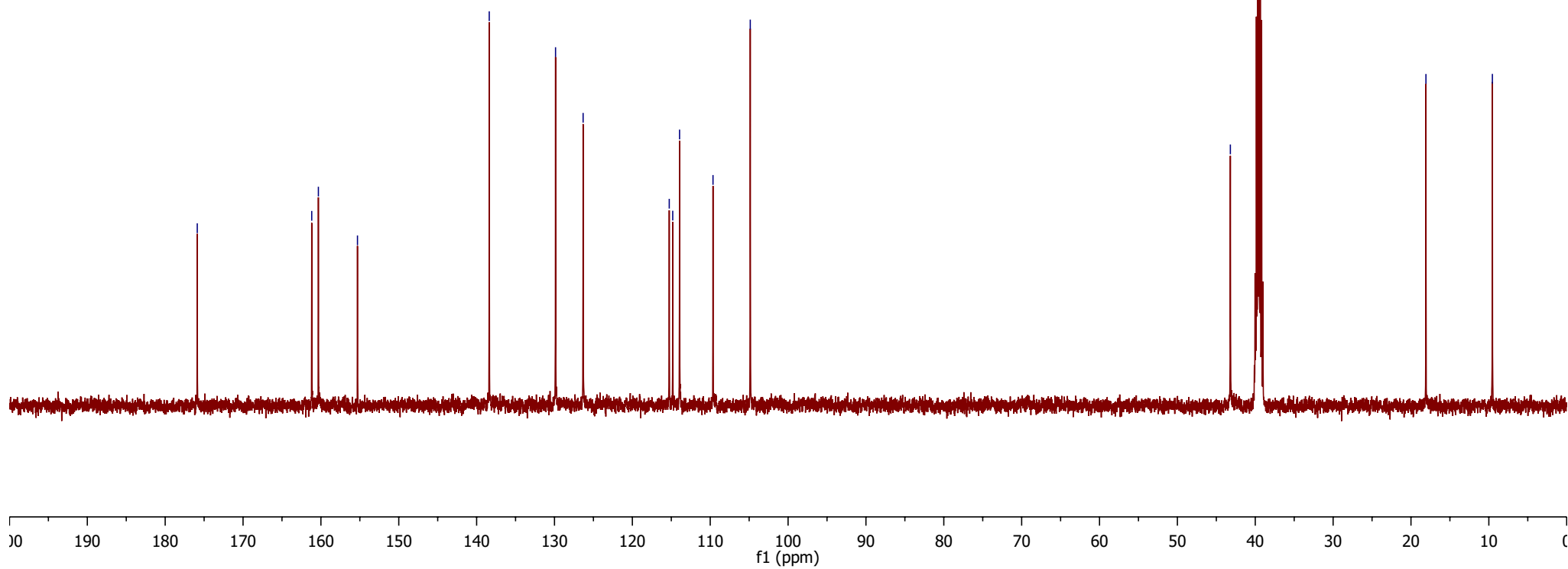
— 104.86

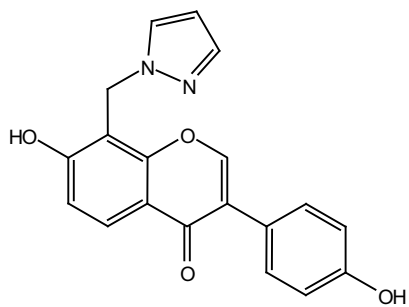
— 43.20

— 18.08

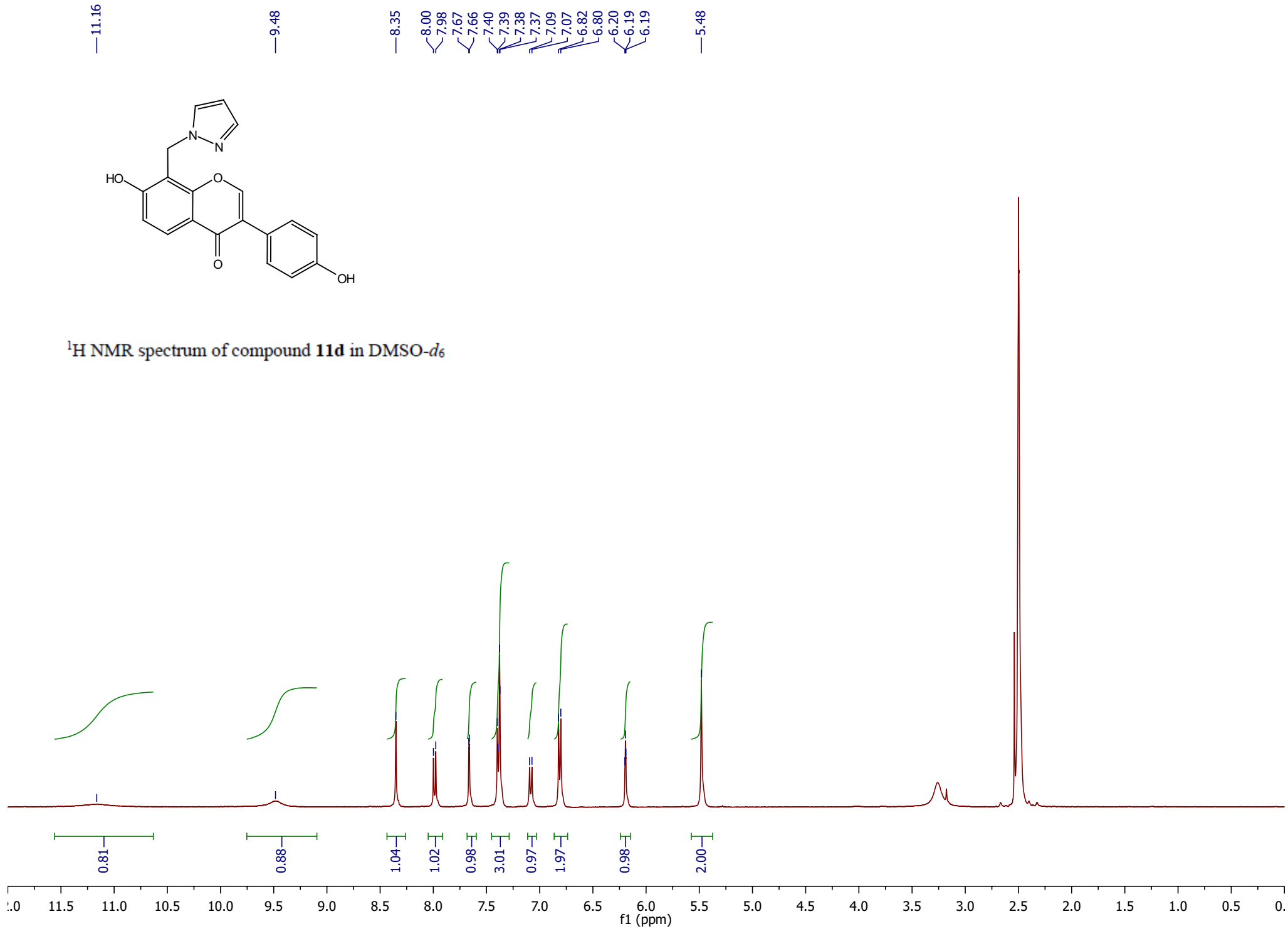
— 9.55

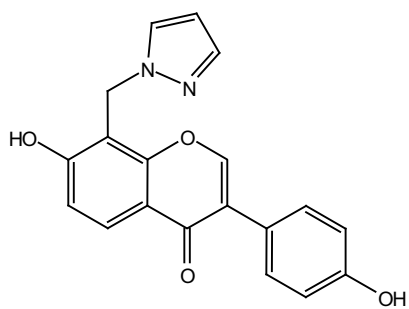
¹³C NMR spectrum of compound 11c in DMSO-*d*₆



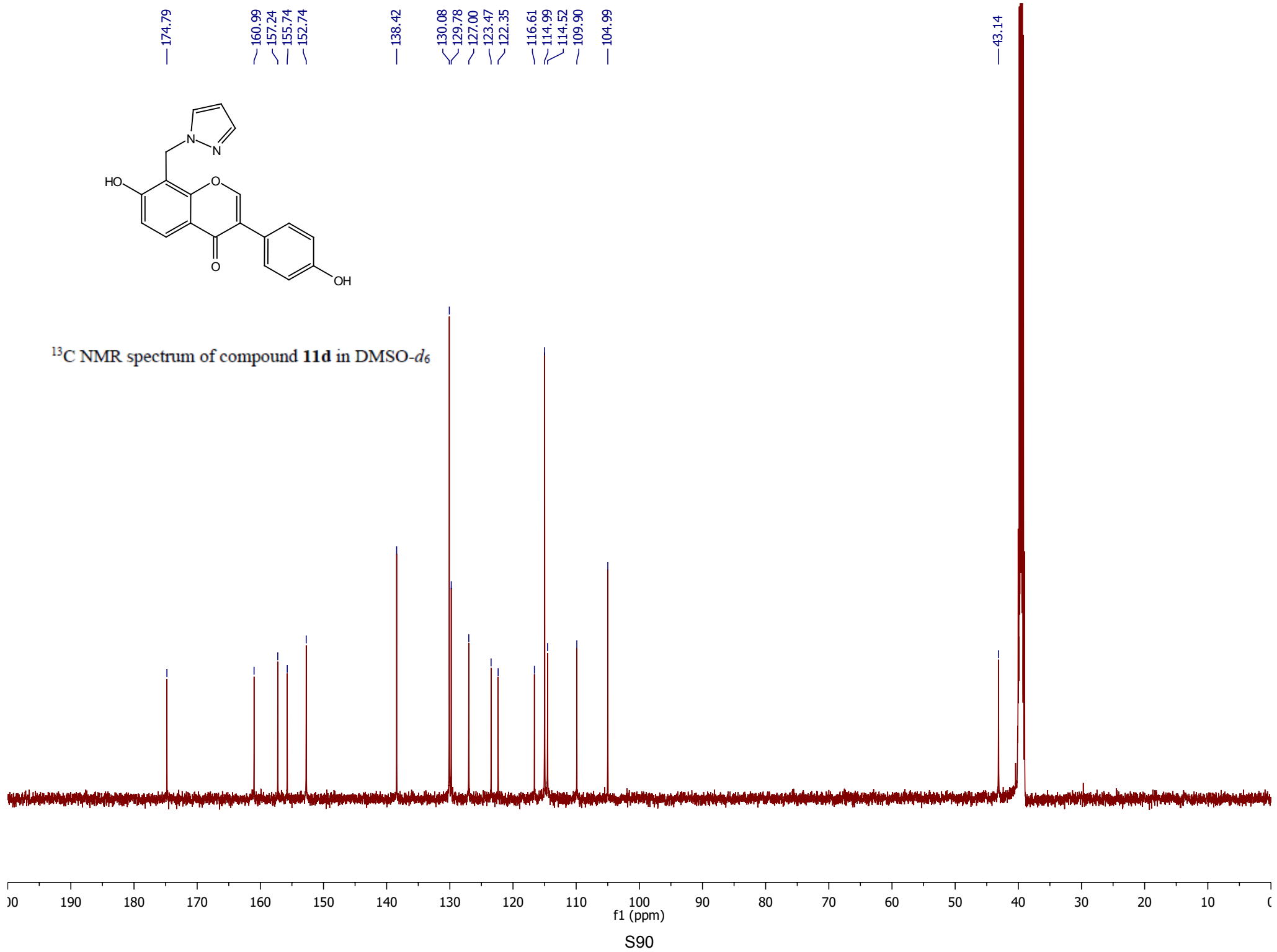


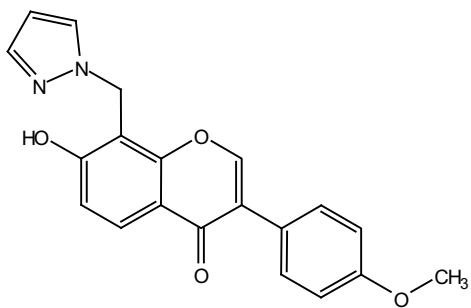
^1H NMR spectrum of compound 11d in $\text{DMSO-}d_6$



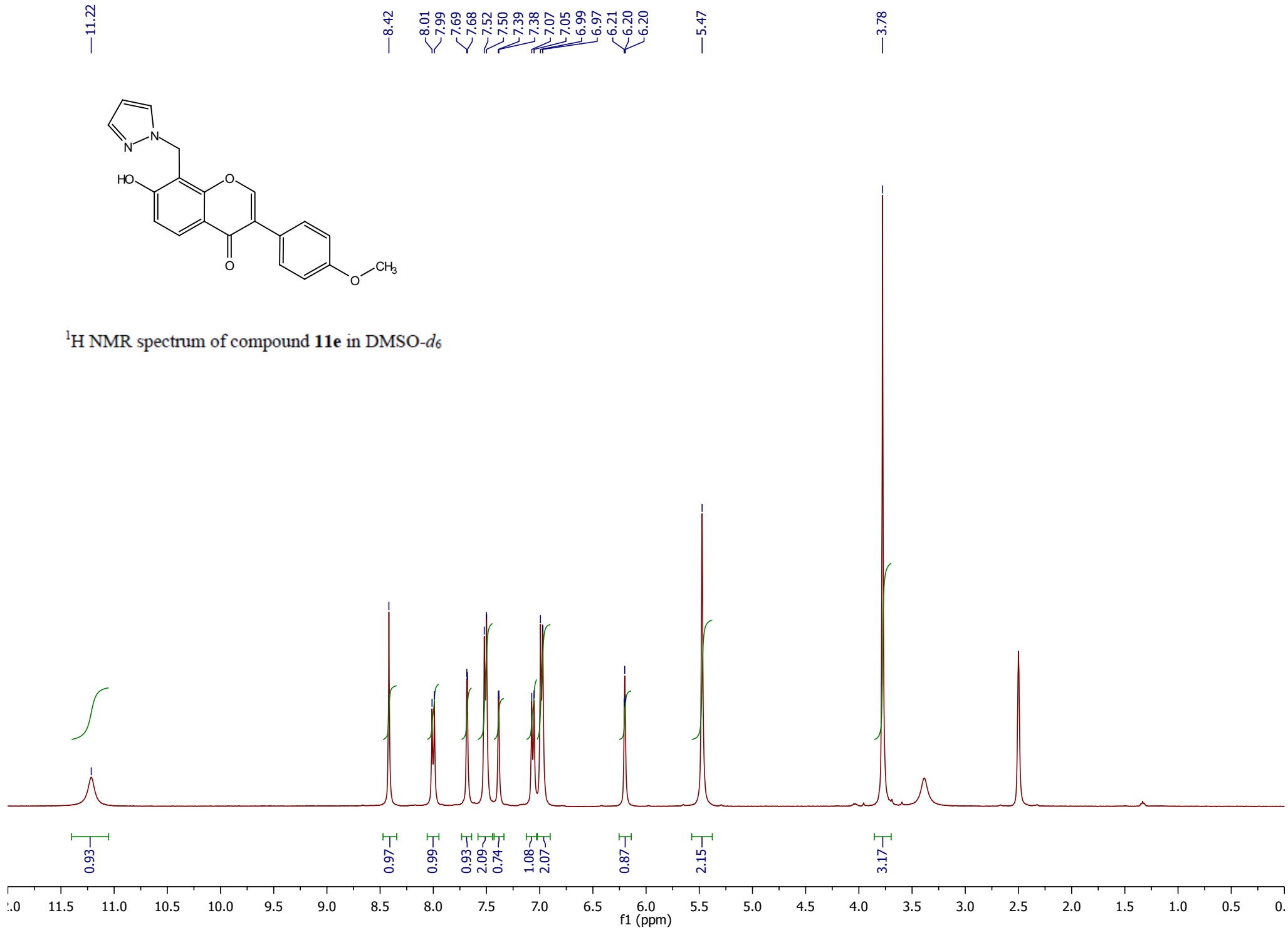


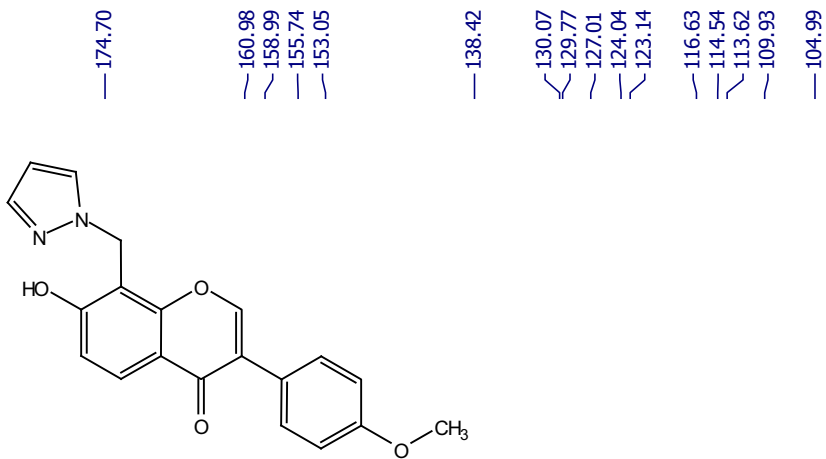
^{13}C NMR spectrum of compound 11d in $\text{DMSO-}d_6$



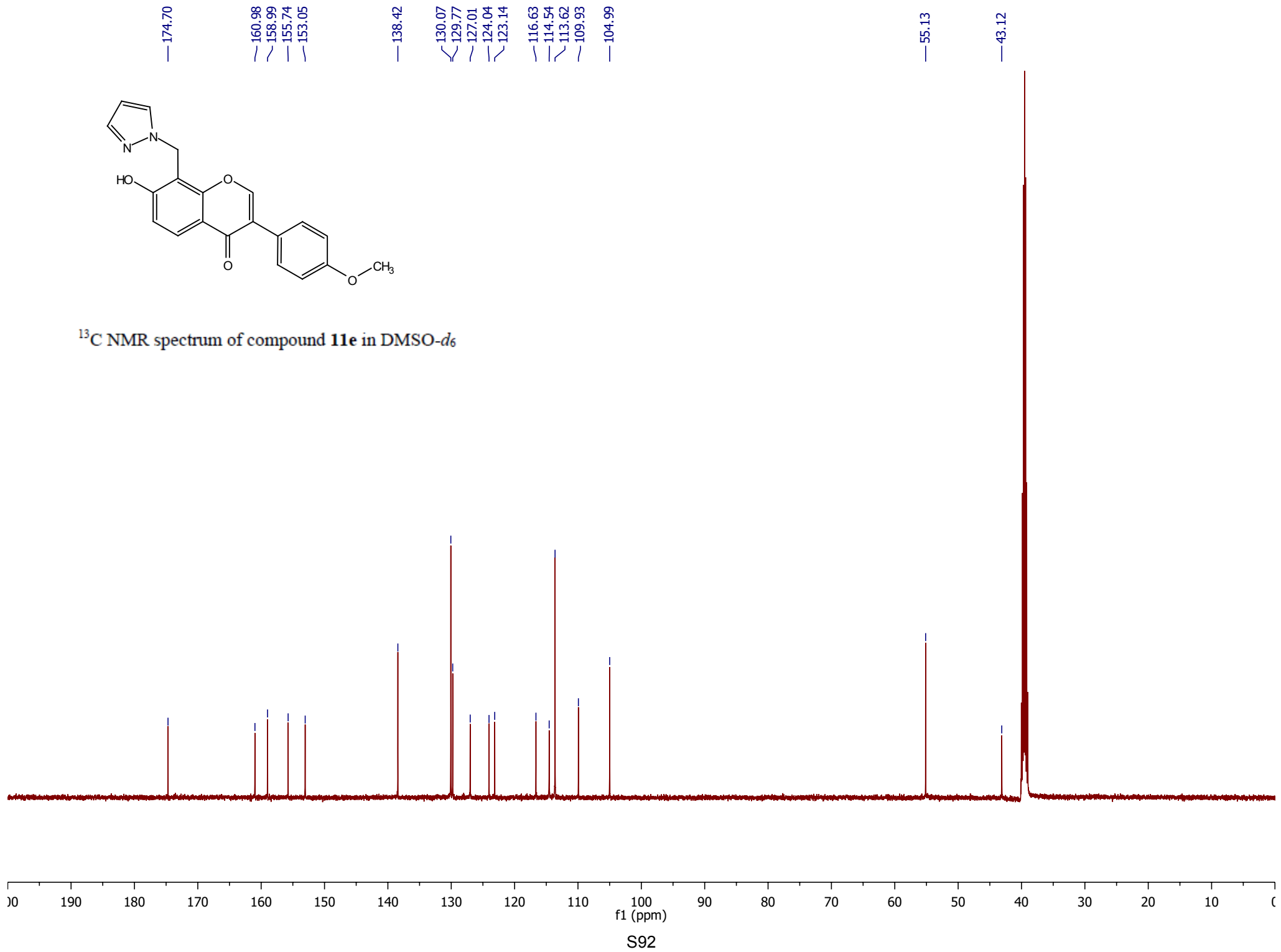


^1H NMR spectrum of compound **11e** in $\text{DMSO-}d_6$



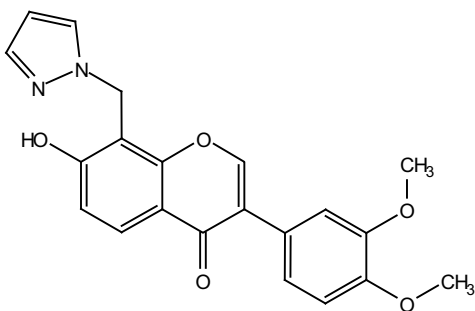


^{13}C NMR spectrum of compound 11e in $\text{DMSO-}d_6$

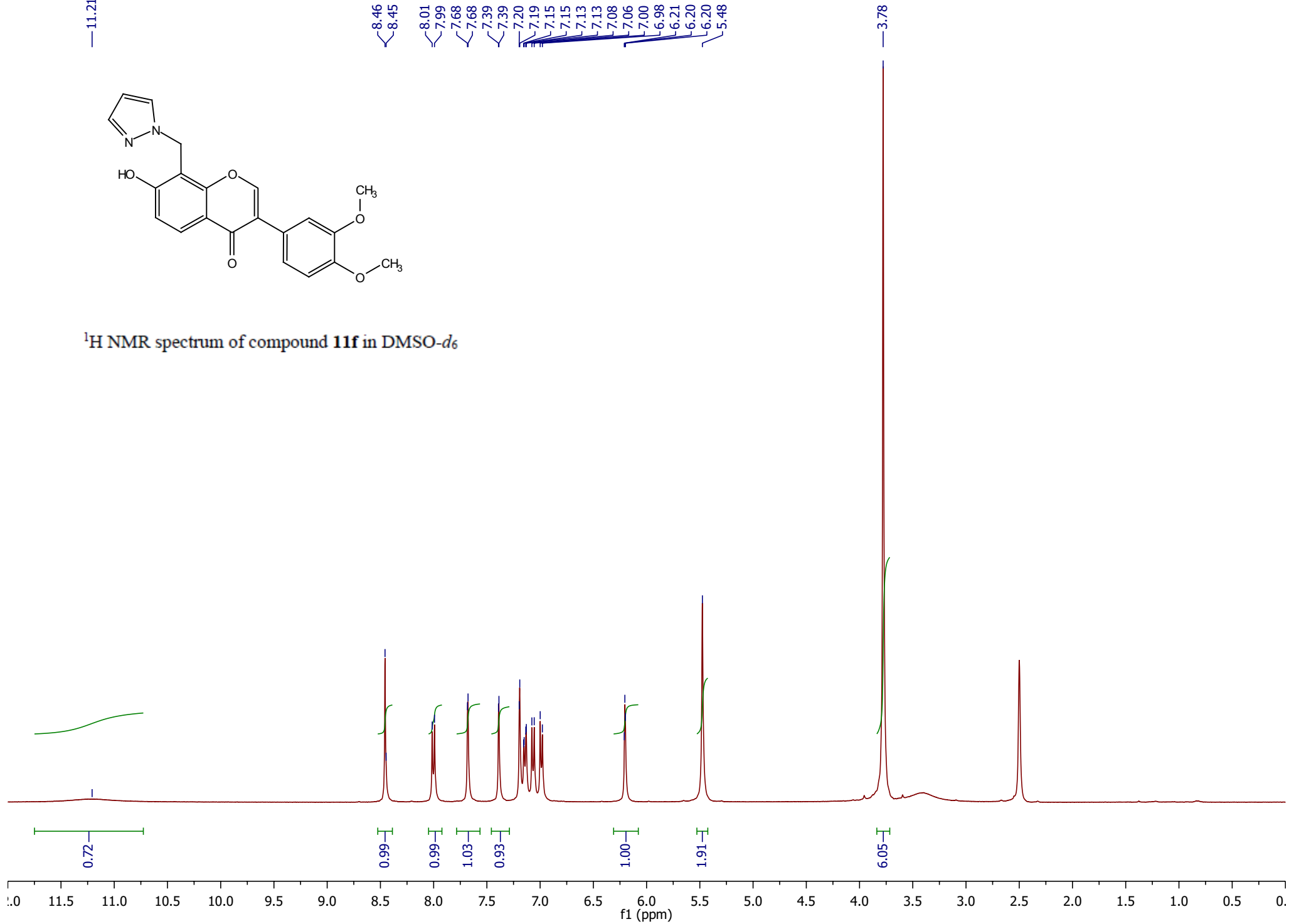


— 11.21

8.46
8.45
8.01
7.99
7.68
7.68
7.39
7.39
7.20
7.19
7.15
7.15
7.13
7.13
7.08
7.06
7.00
6.98
6.21
6.20
6.20
5.48



^1H NMR spectrum of compound **11f** in $\text{DMSO-}d_6$

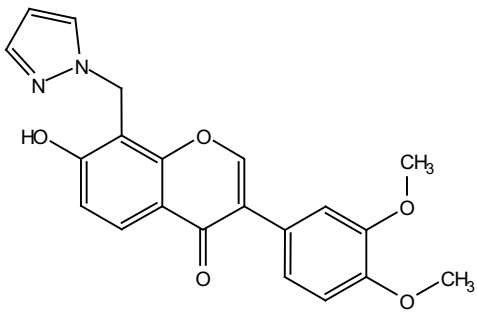


S93

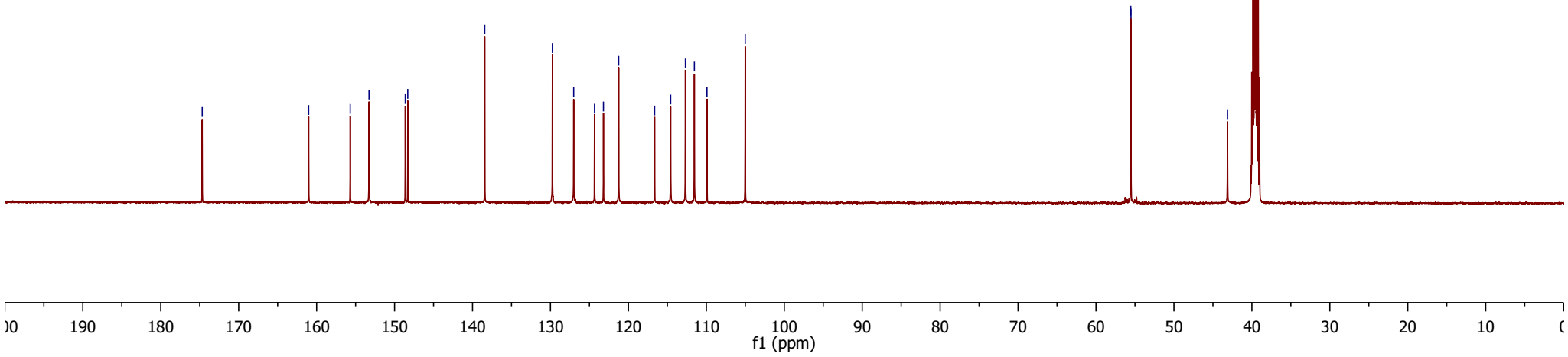
— 174.68 — 161.02 — 155.69 — 153.28 — 148.63 — 148.31 — 138.43 — 129.75 — 127.02 — 124.35 — 123.20 — 121.25 — 116.63 — 114.58 — 112.69 — 111.54 — 109.92 — 105.02

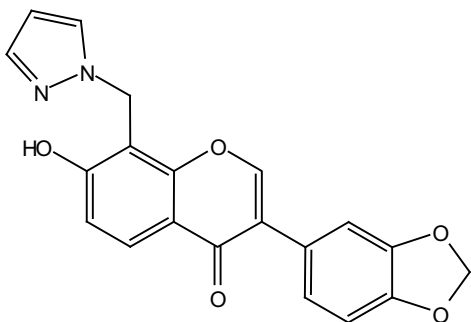
55.54
55.51

— 43.13

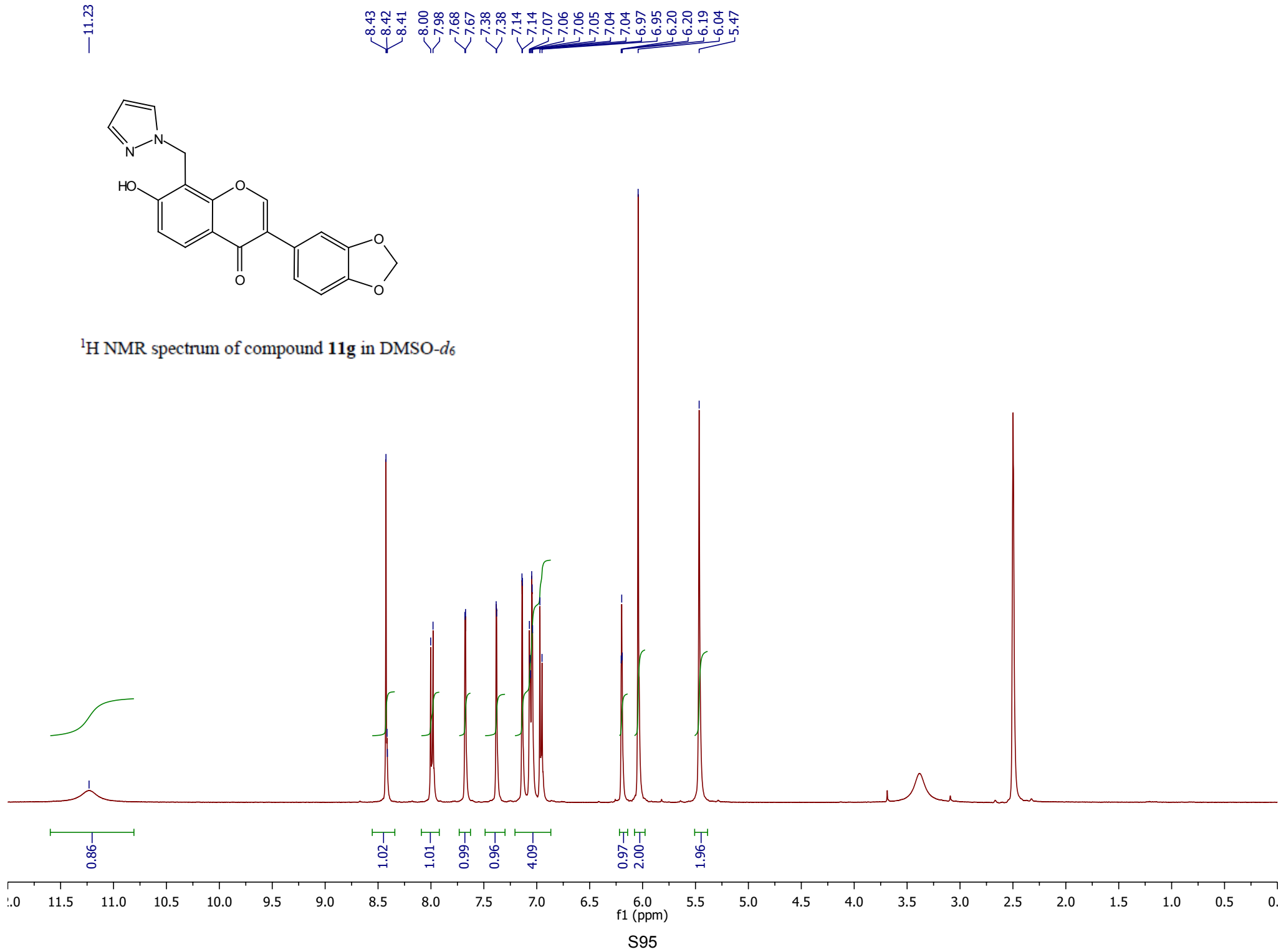


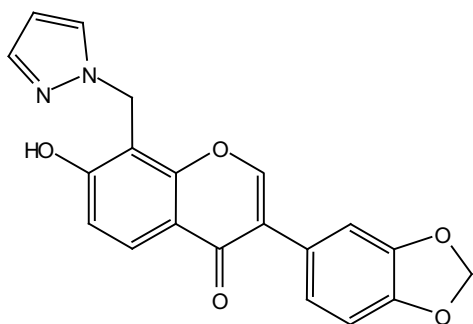
^{13}C NMR spectrum of compound **11f** in $\text{DMSO-}d_6$



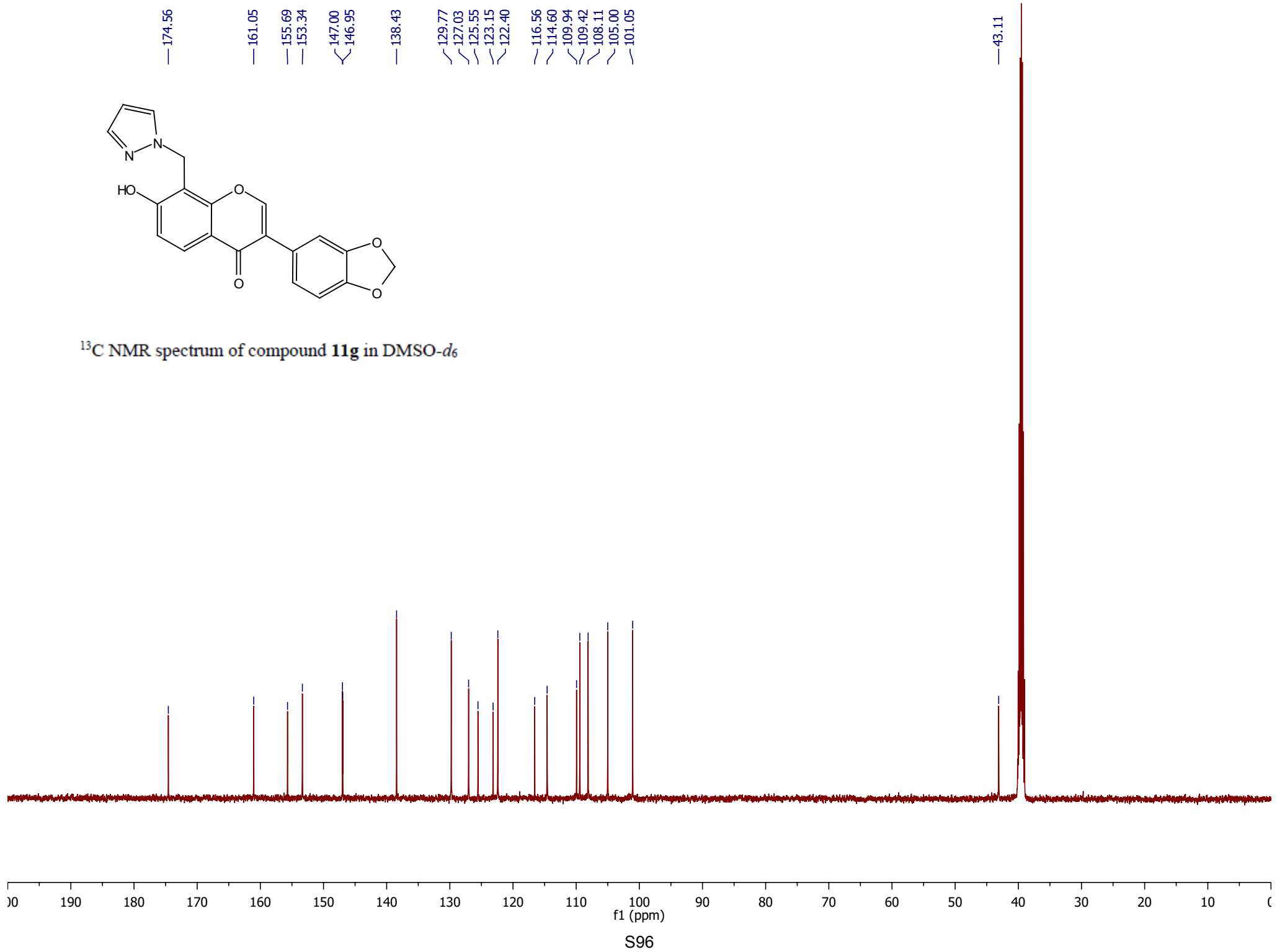


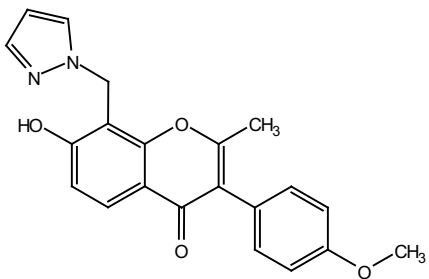
^1H NMR spectrum of compound 11g in DMSO- d_6



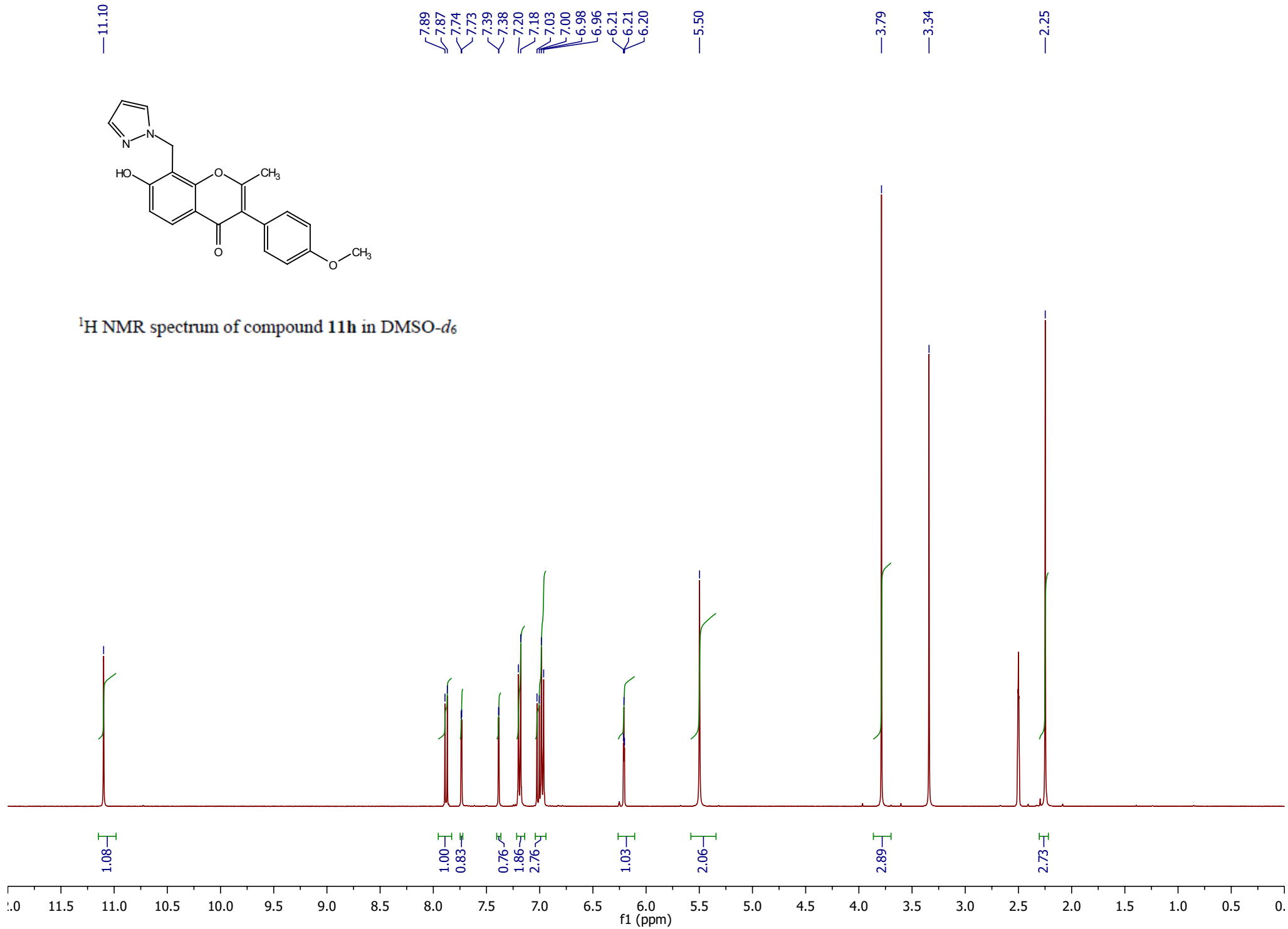


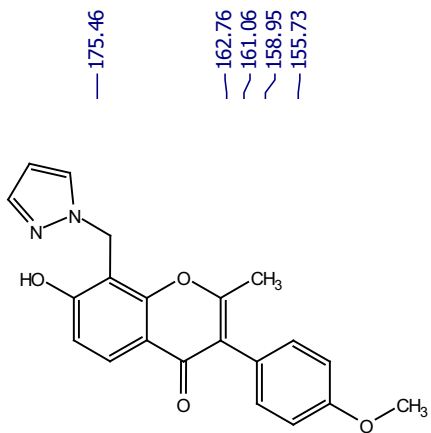
^{13}C NMR spectrum of compound **11g** in $\text{DMSO-}d_6$



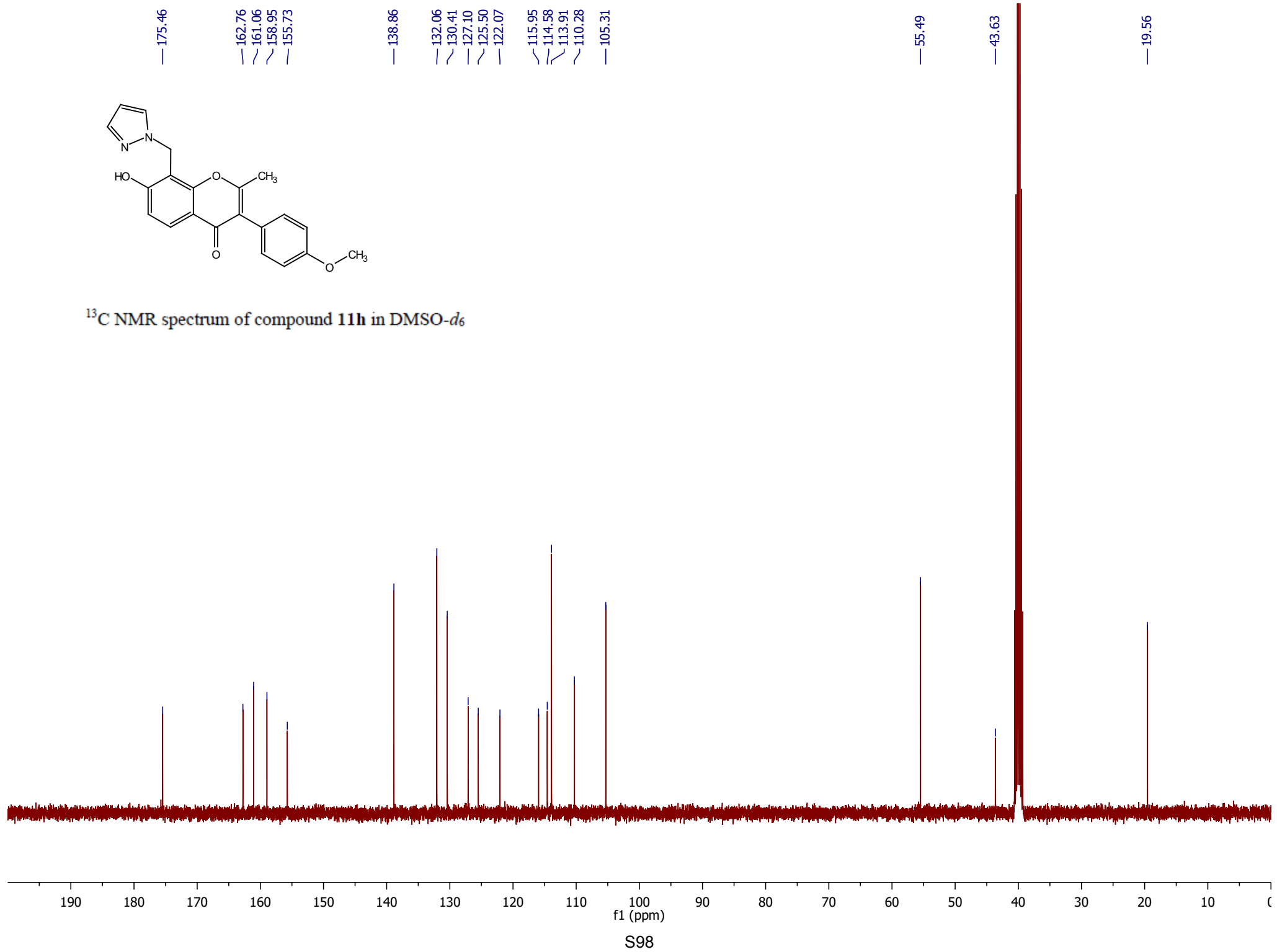


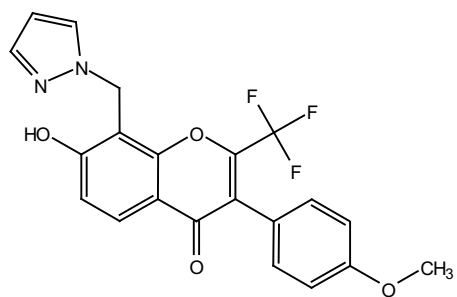
^1H NMR spectrum of compound 11h in $\text{DMSO-}d_6$



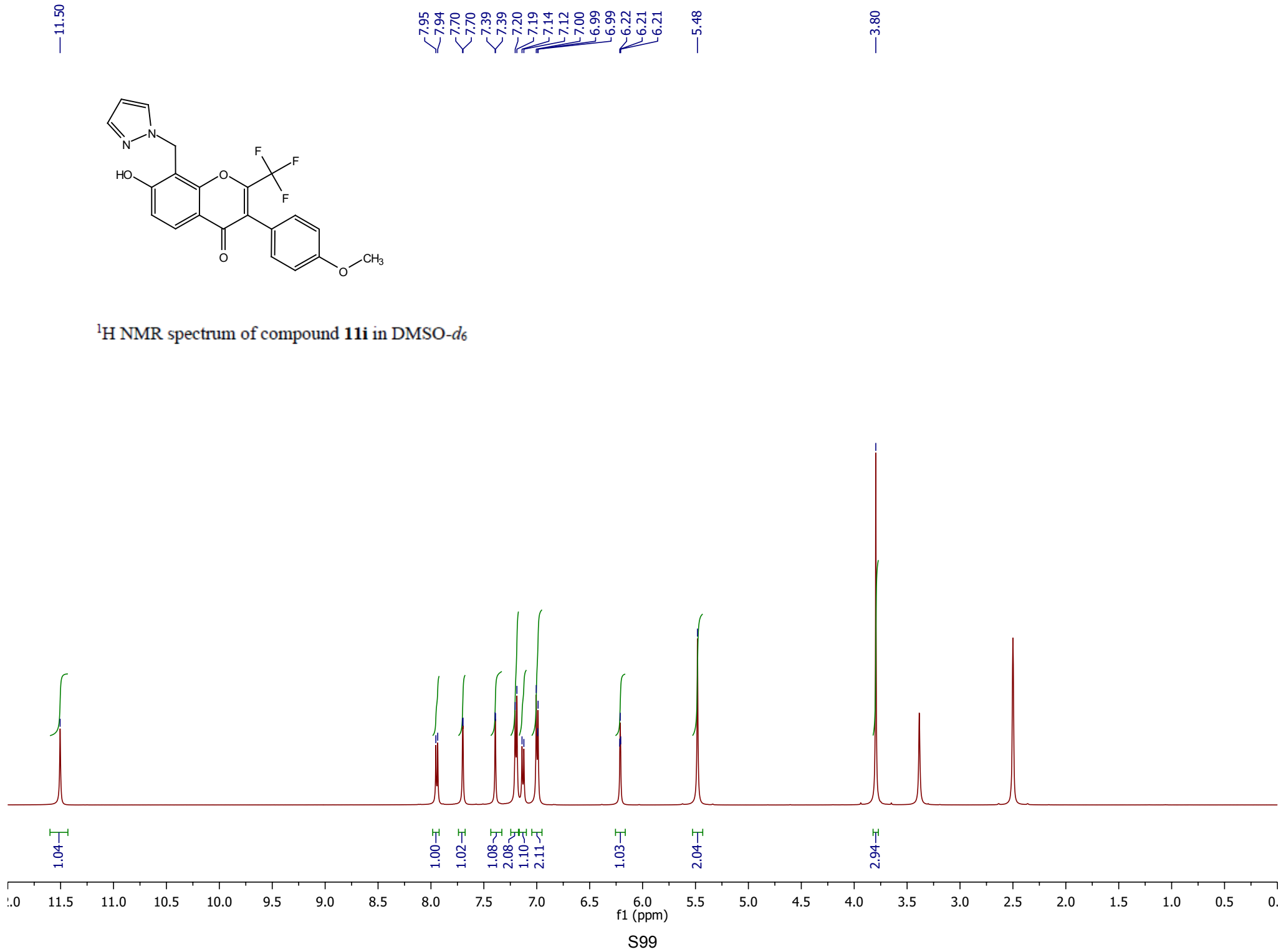


^{13}C NMR spectrum of compound 11h in $\text{DMSO-}d_6$





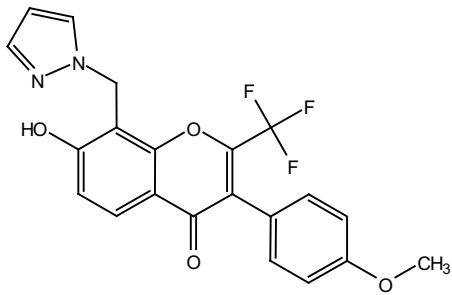
^1H NMR spectrum of compound 11i in $\text{DMSO-}d_6$



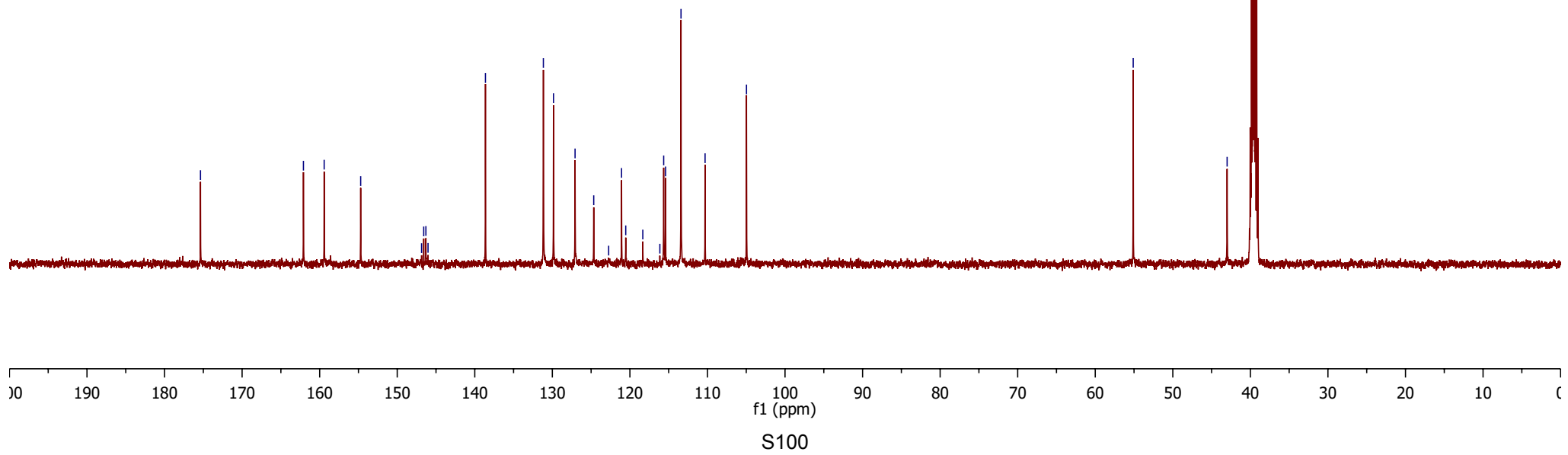
175.37
162.09
159.42
154.71
146.86
146.58
146.30
146.03
138.62
131.16
129.85
127.07
124.66
122.74
121.08
120.54
118.34
116.14
115.64
115.40
113.41
110.31
104.97

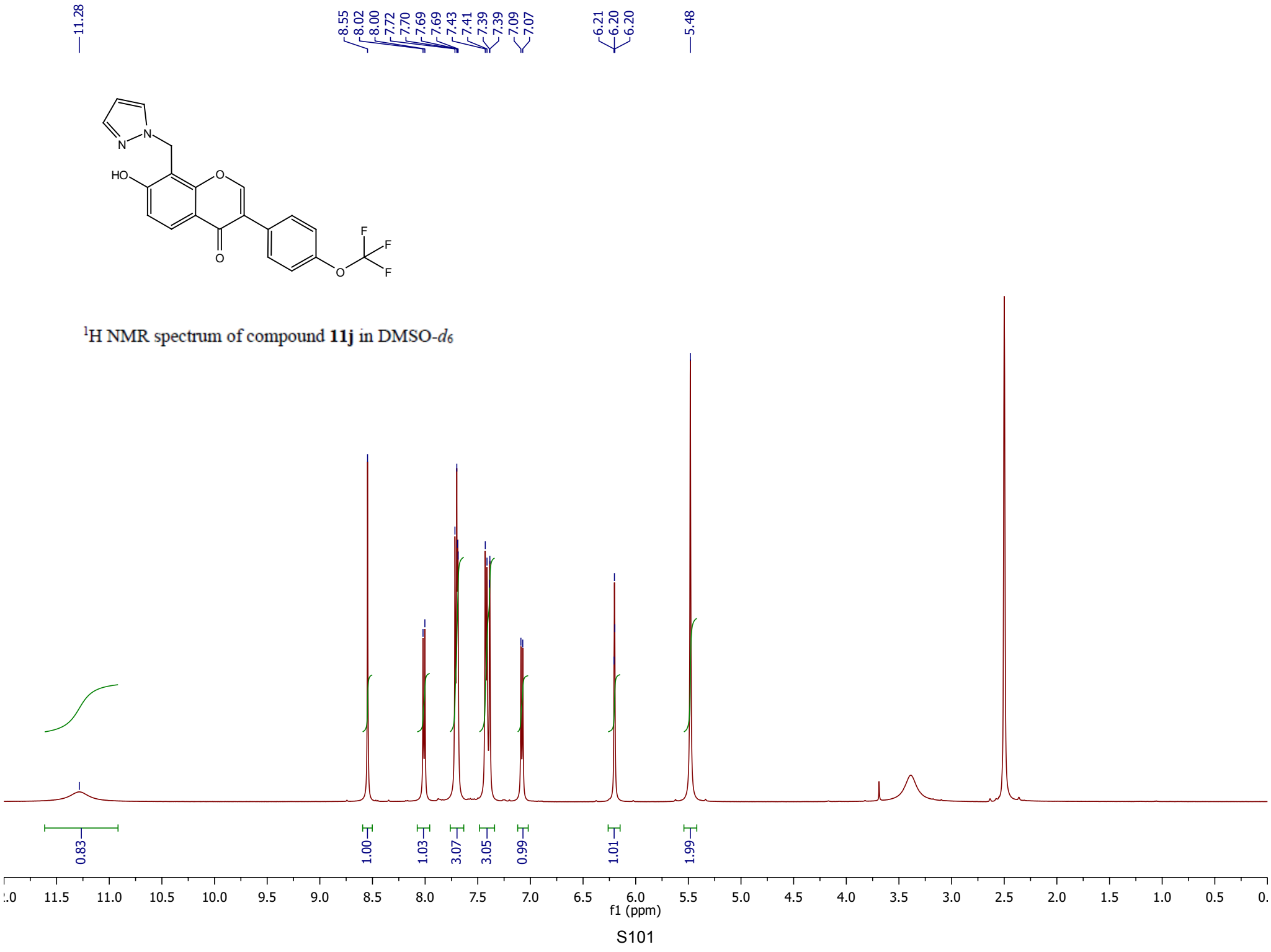
55.11

43.00



^{13}C NMR spectrum of compound 11i in $\text{DMSO-}d_6$

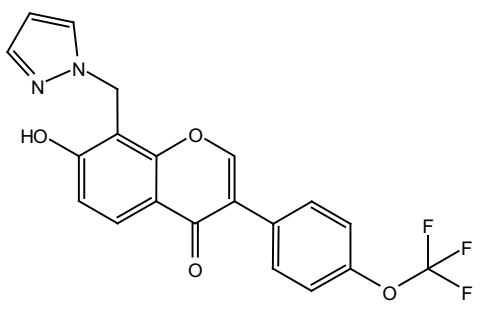




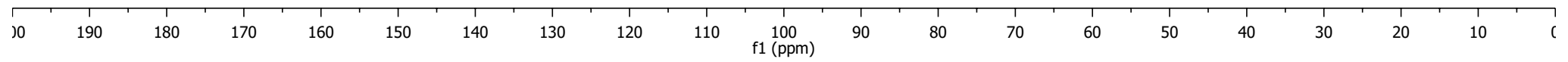
S101

174.32
161.24
155.80
154.17
147.93
138.45
131.32
130.85
129.80
127.02
123.19
122.28
121.15
120.74
119.11
117.07
116.53
114.76
110.07
105.01

43.10



¹³C NMR spectrum of compound **11j** in DMSO-*d*₆



— 10.94

7.92
7.89

7.48
7.46

6.84
6.82

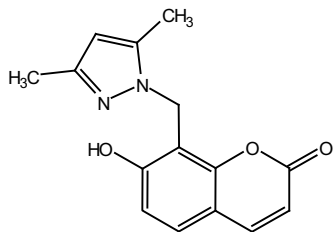
6.20
6.18

— 5.71

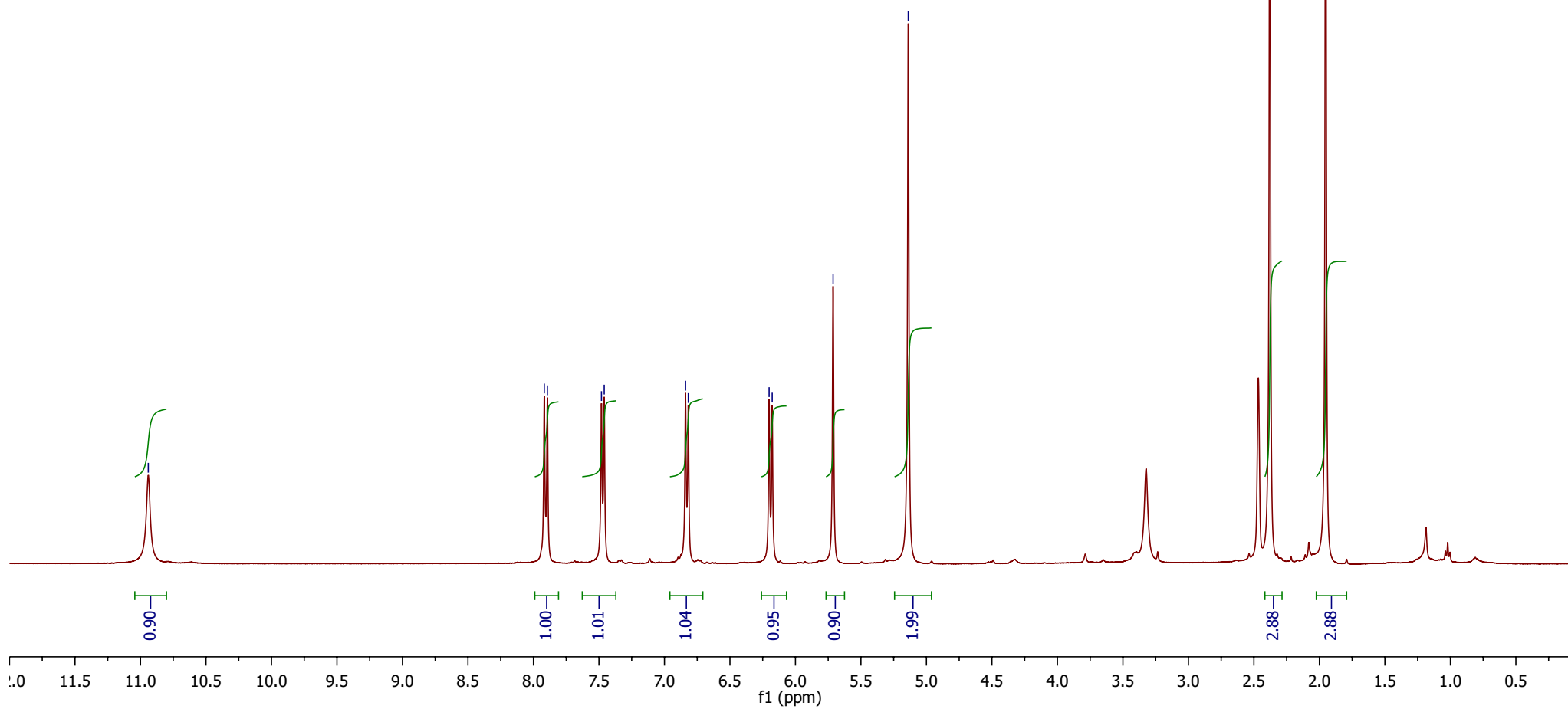
— 5.14

— 2.38

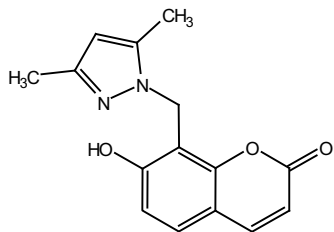
— 1.95



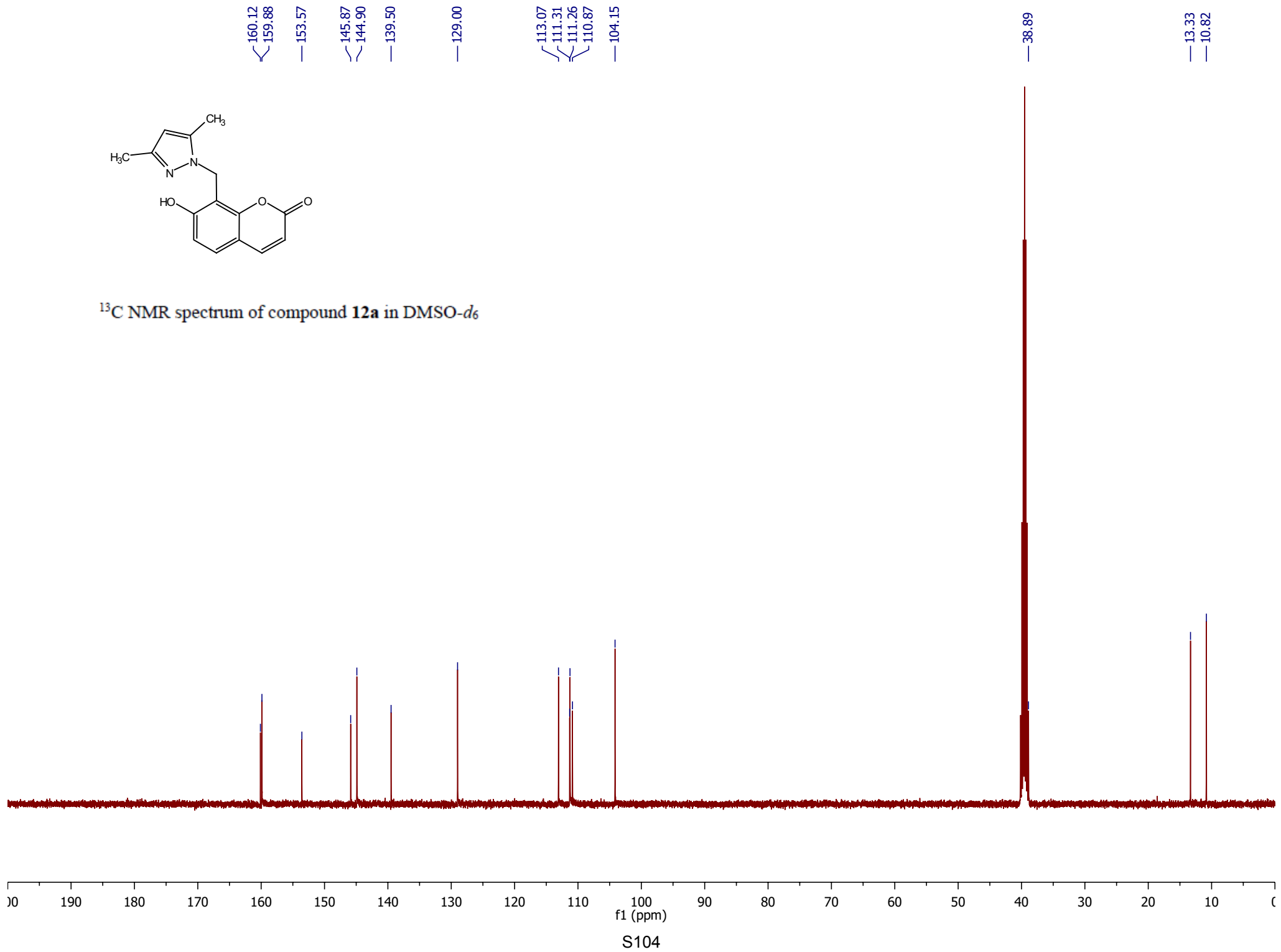
¹H NMR spectrum of compound 12a in DMSO-*d*₆

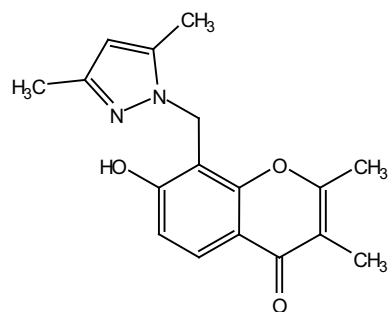


S103

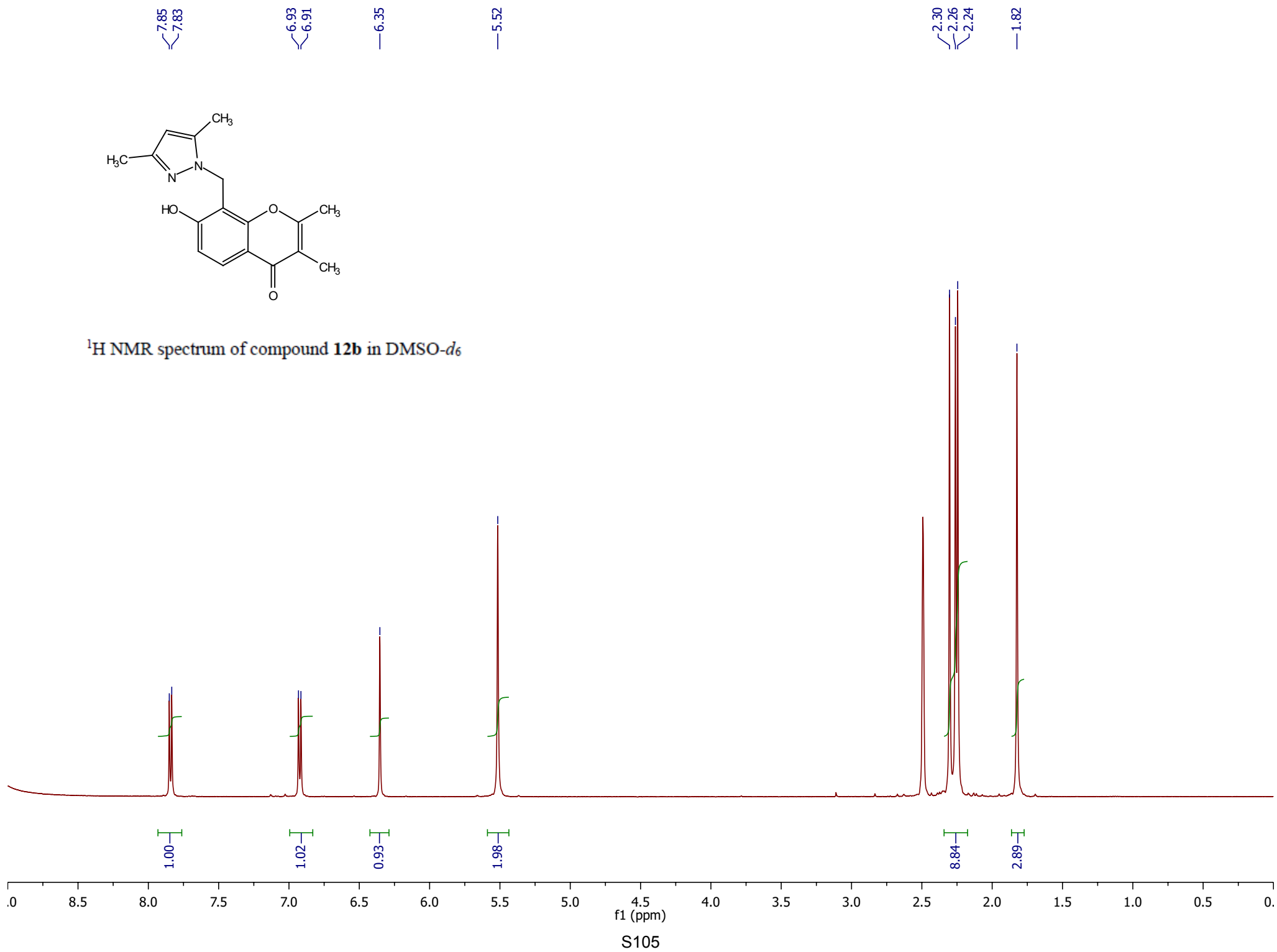


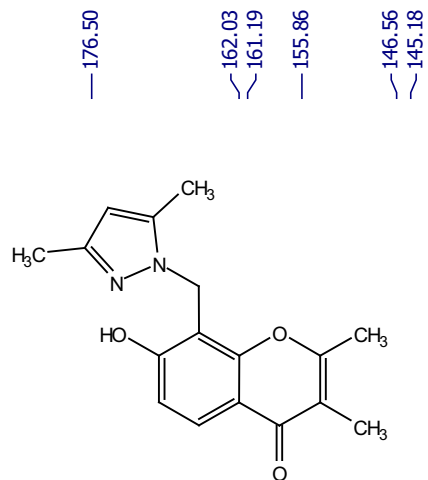
^{13}C NMR spectrum of compound **12a** in $\text{DMSO-}d_6$



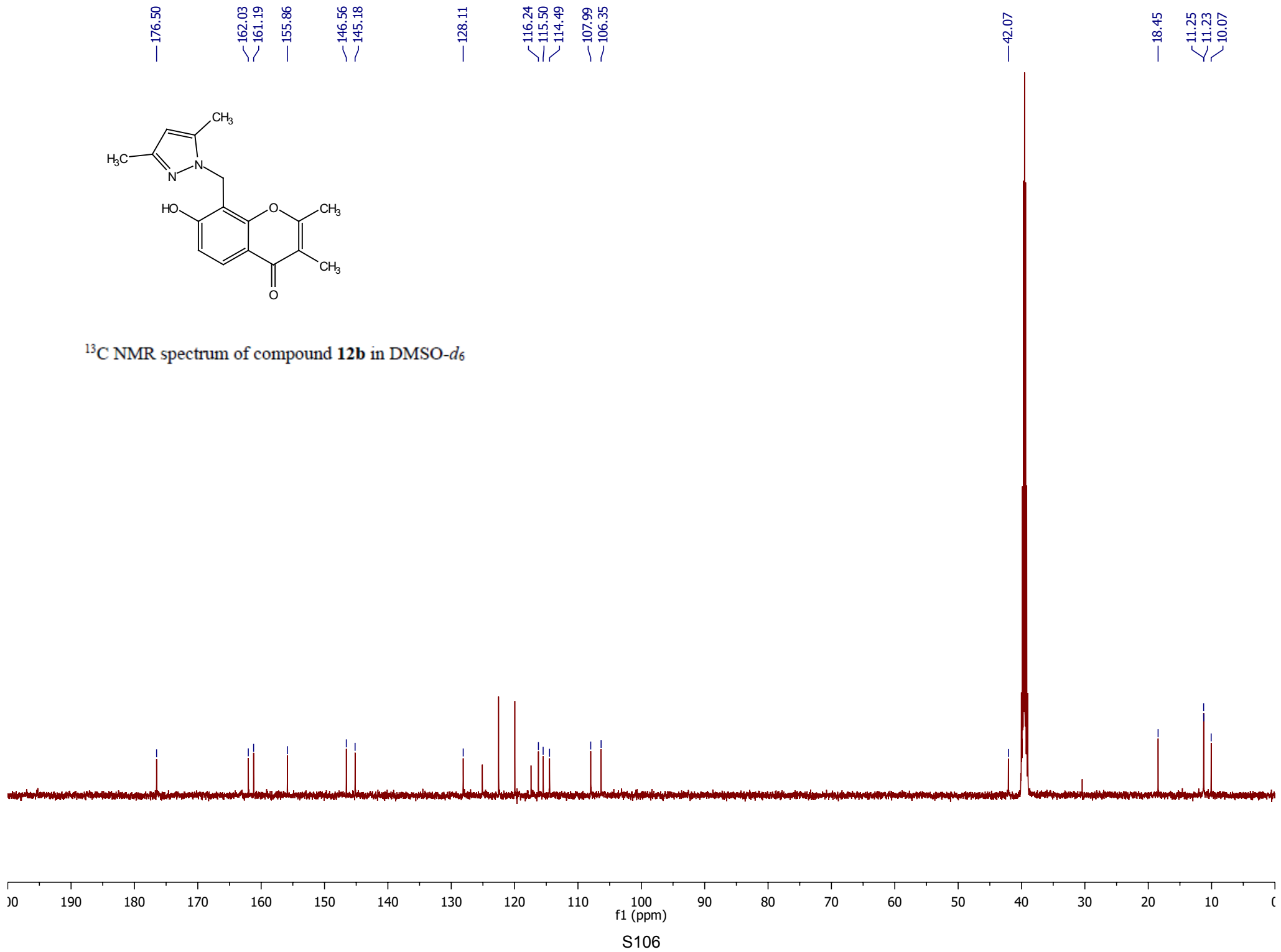


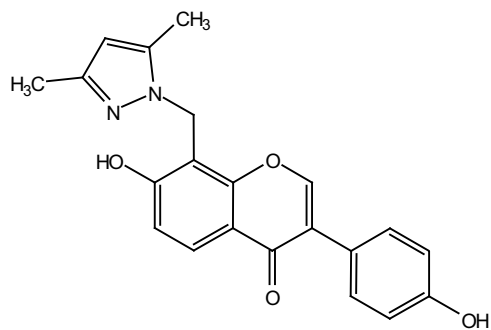
^1H NMR spectrum of compound 12b in $\text{DMSO-}d_6$



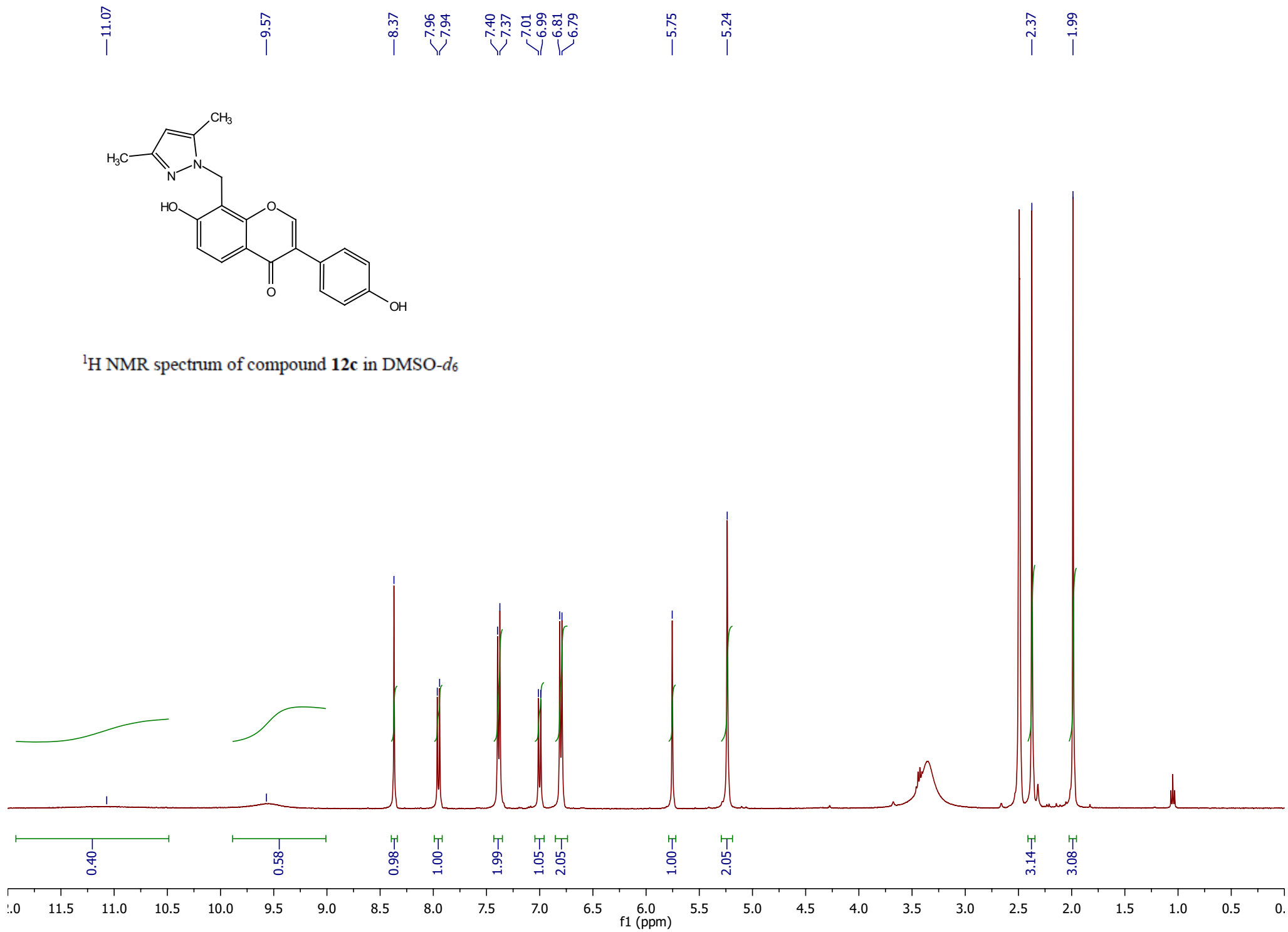


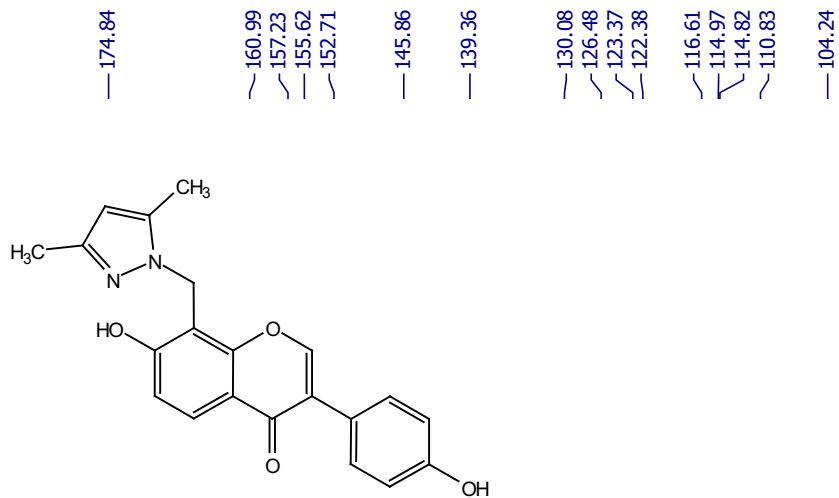
^{13}C NMR spectrum of compound **12b** in $\text{DMSO-}d_6$



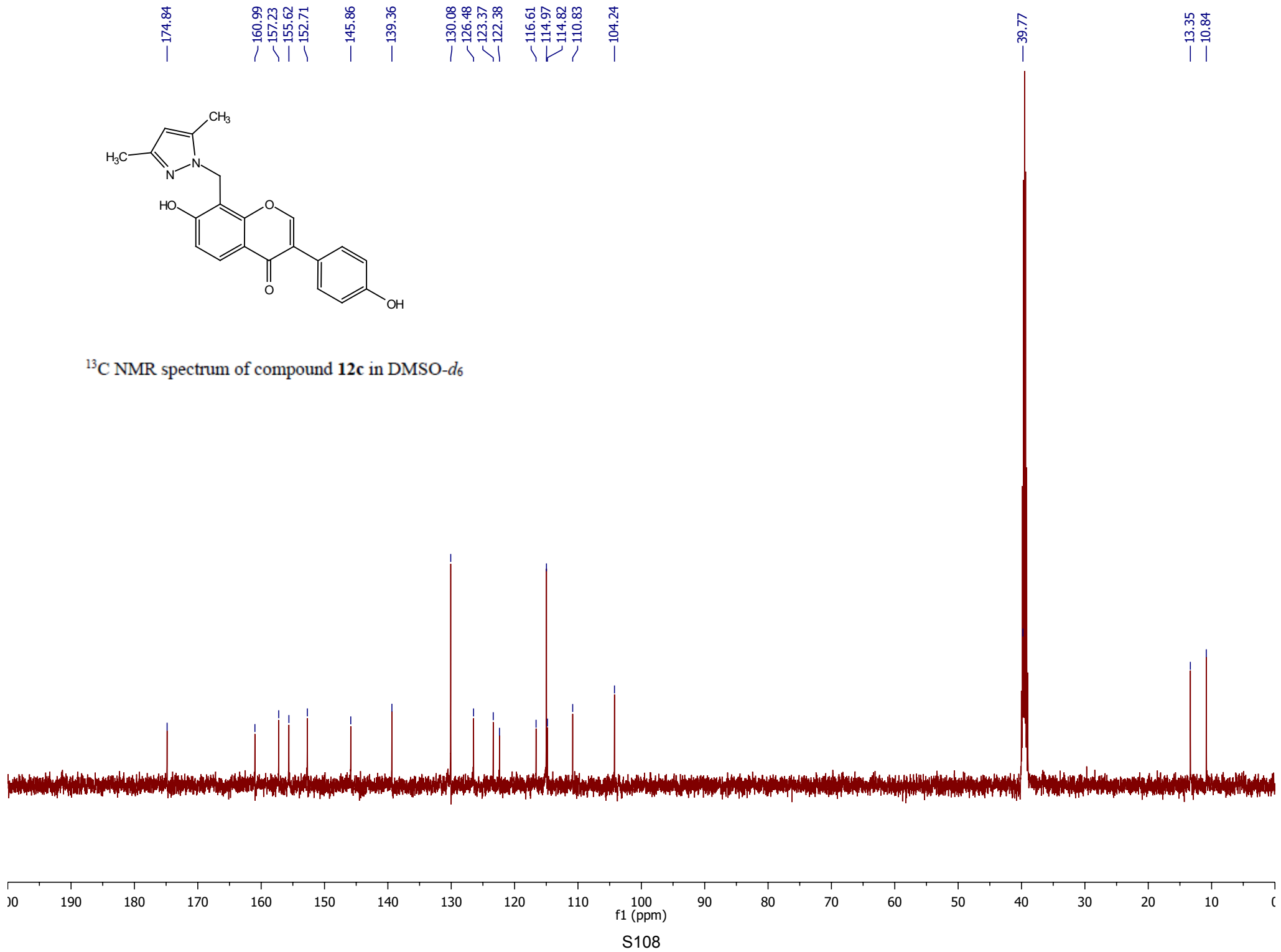


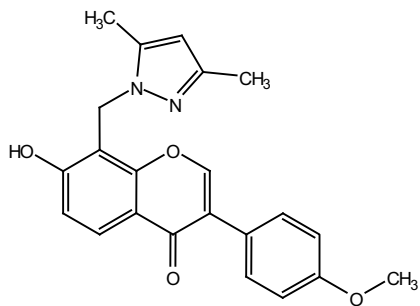
^1H NMR spectrum of compound 12c in $\text{DMSO-}d_6$



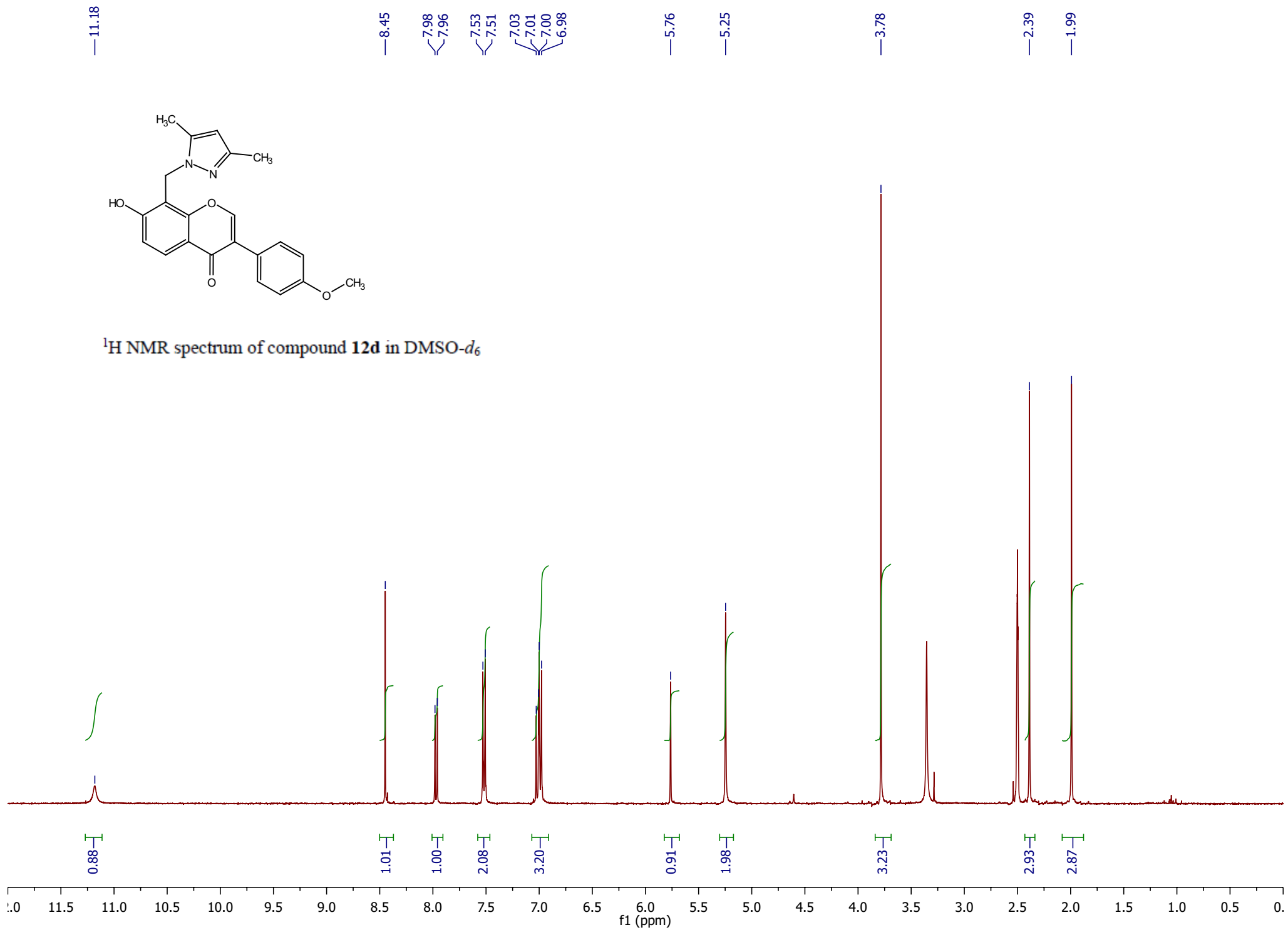


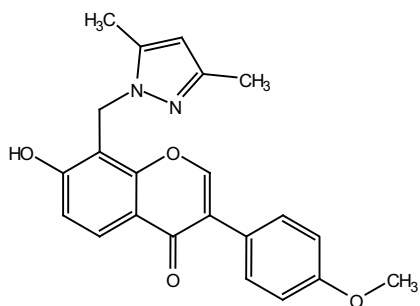
^{13}C NMR spectrum of compound **12c** in $\text{DMSO-}d_6$





^1H NMR spectrum of compound 12d in $\text{DMSO-}d_6$





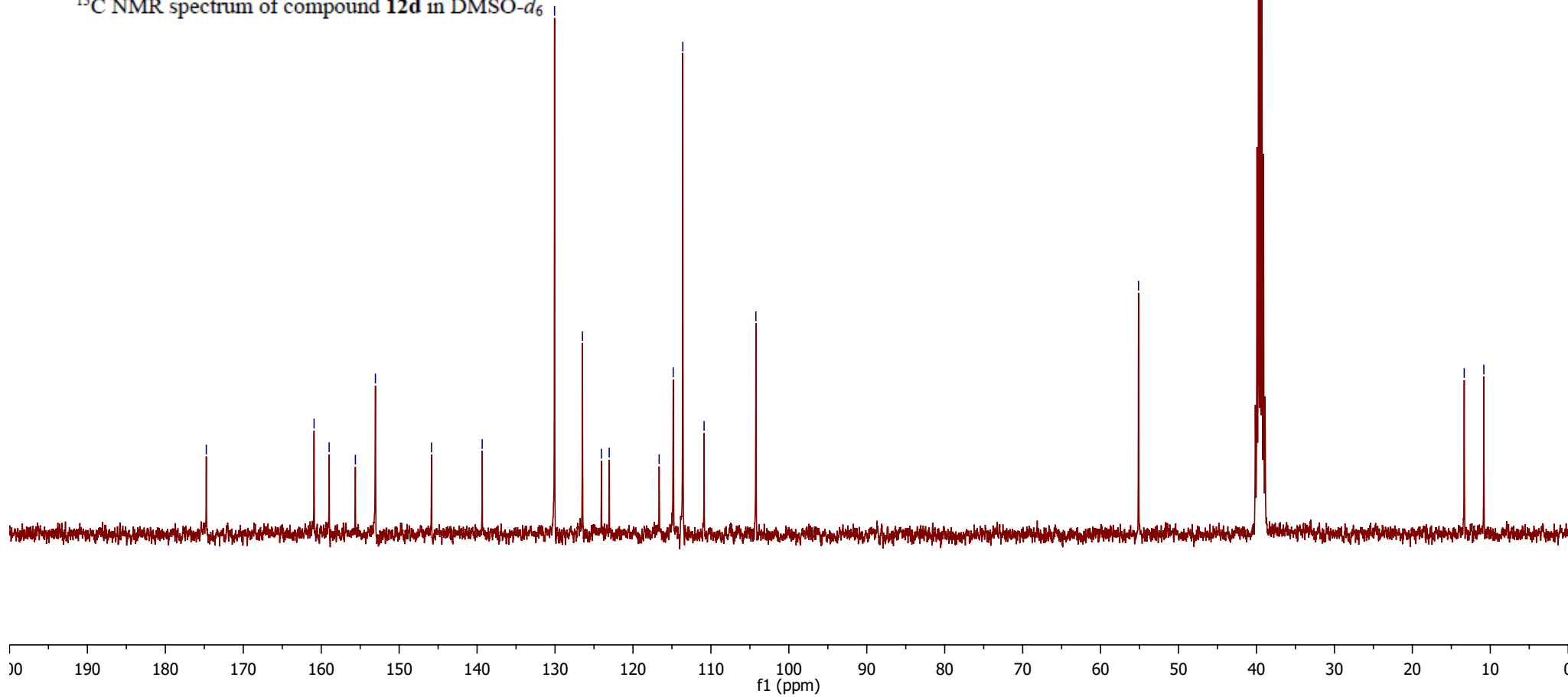
174.75
160.92
158.98
155.62
153.05
145.85
139.35
130.06
126.48
124.05
123.05
116.64
114.83
113.61
110.88
104.23

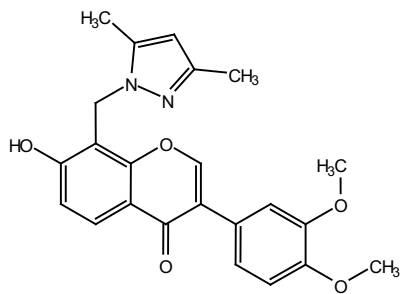
55.14

39.73

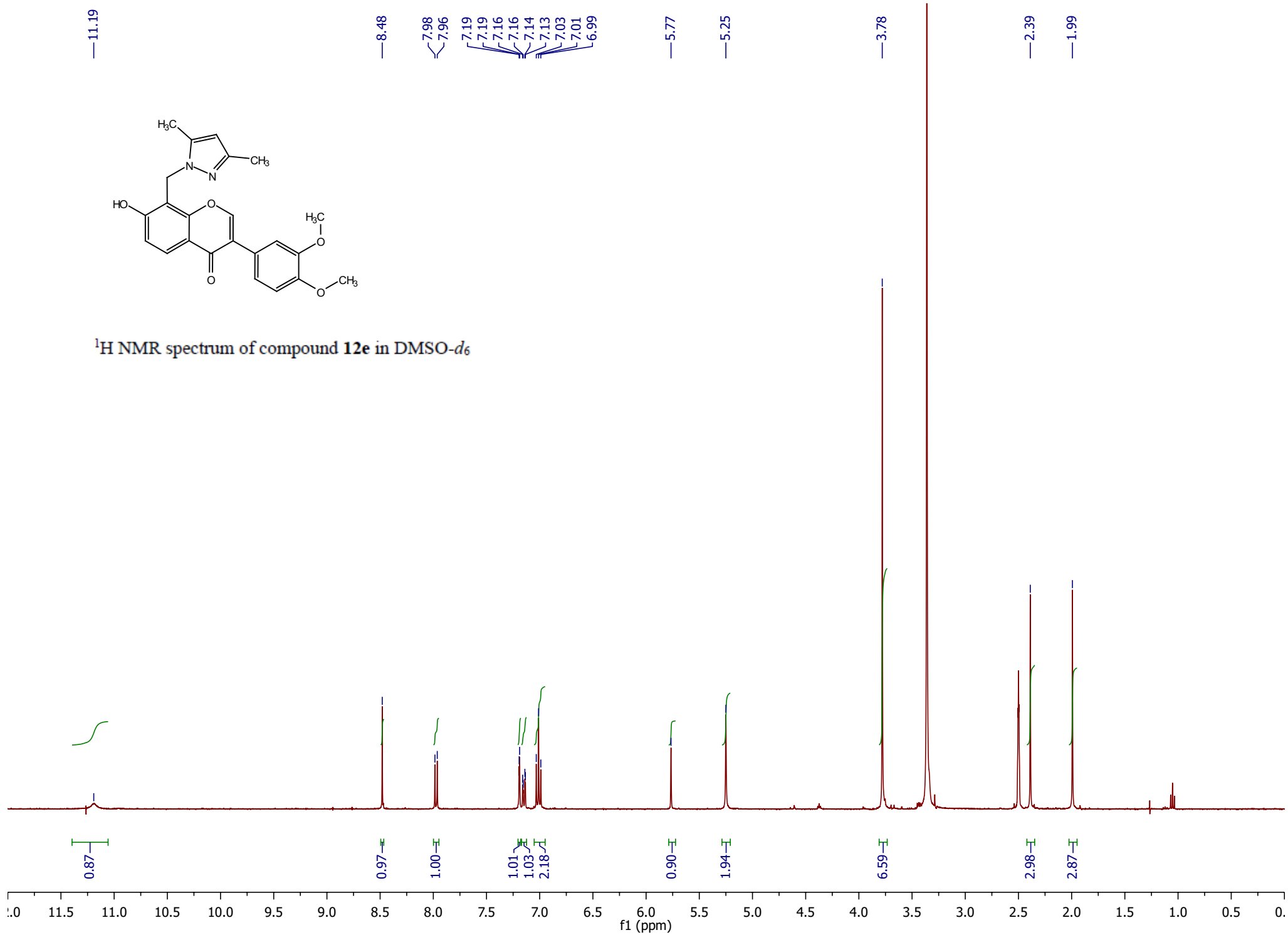
13.34
10.83

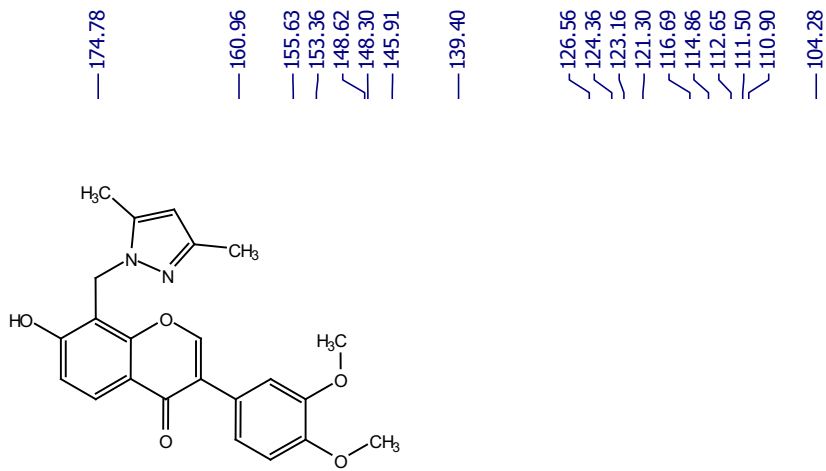
^{13}C NMR spectrum of compound 12d in DMSO- d_6



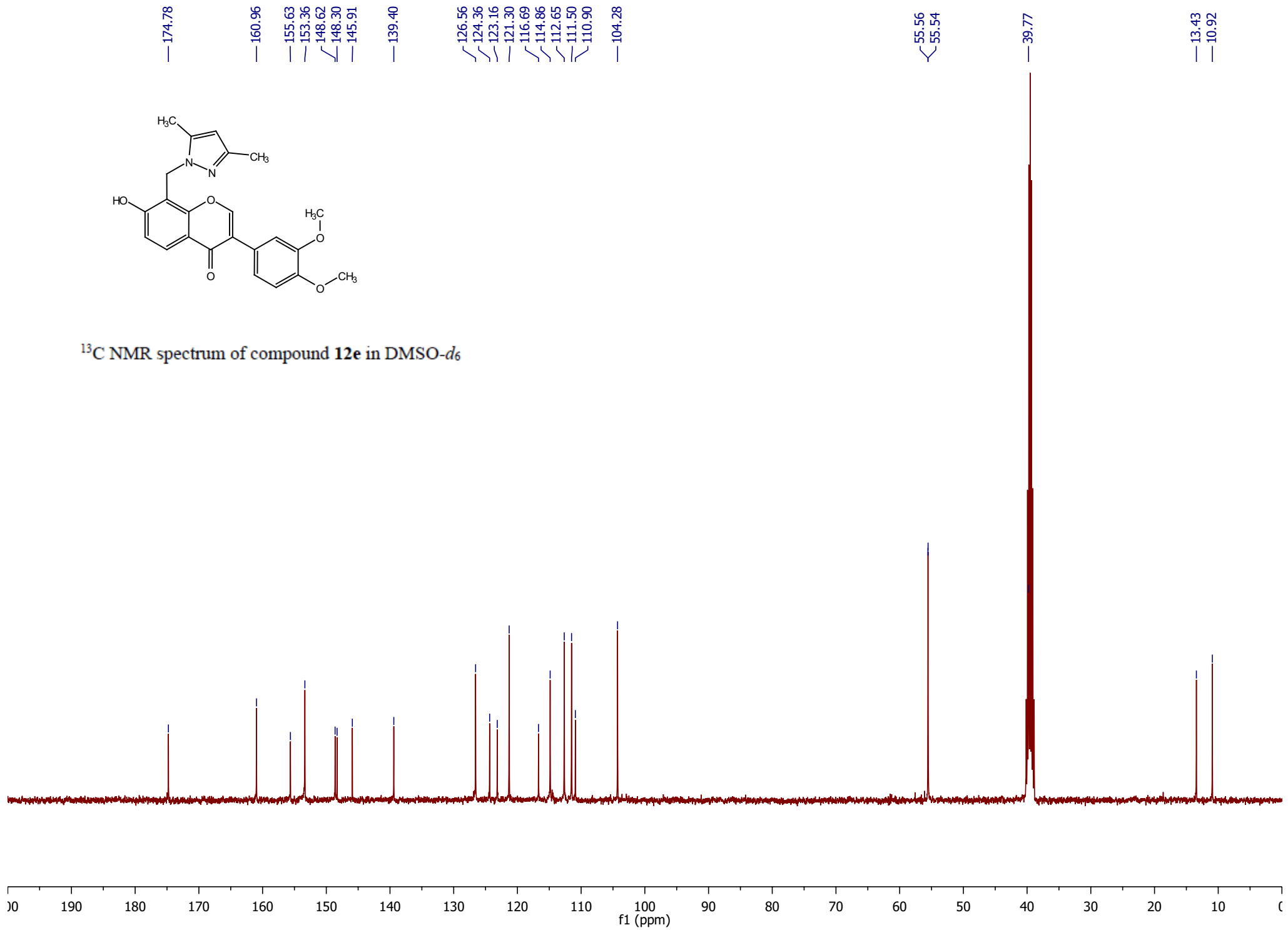


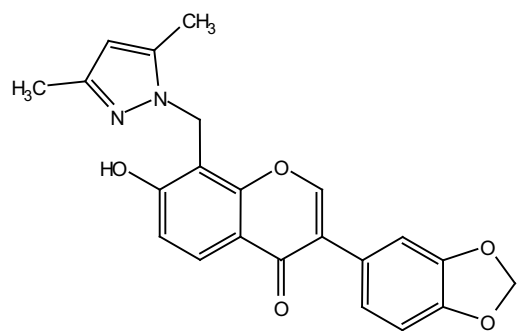
¹H NMR spectrum of compound 12e in DMSO-*d*₆



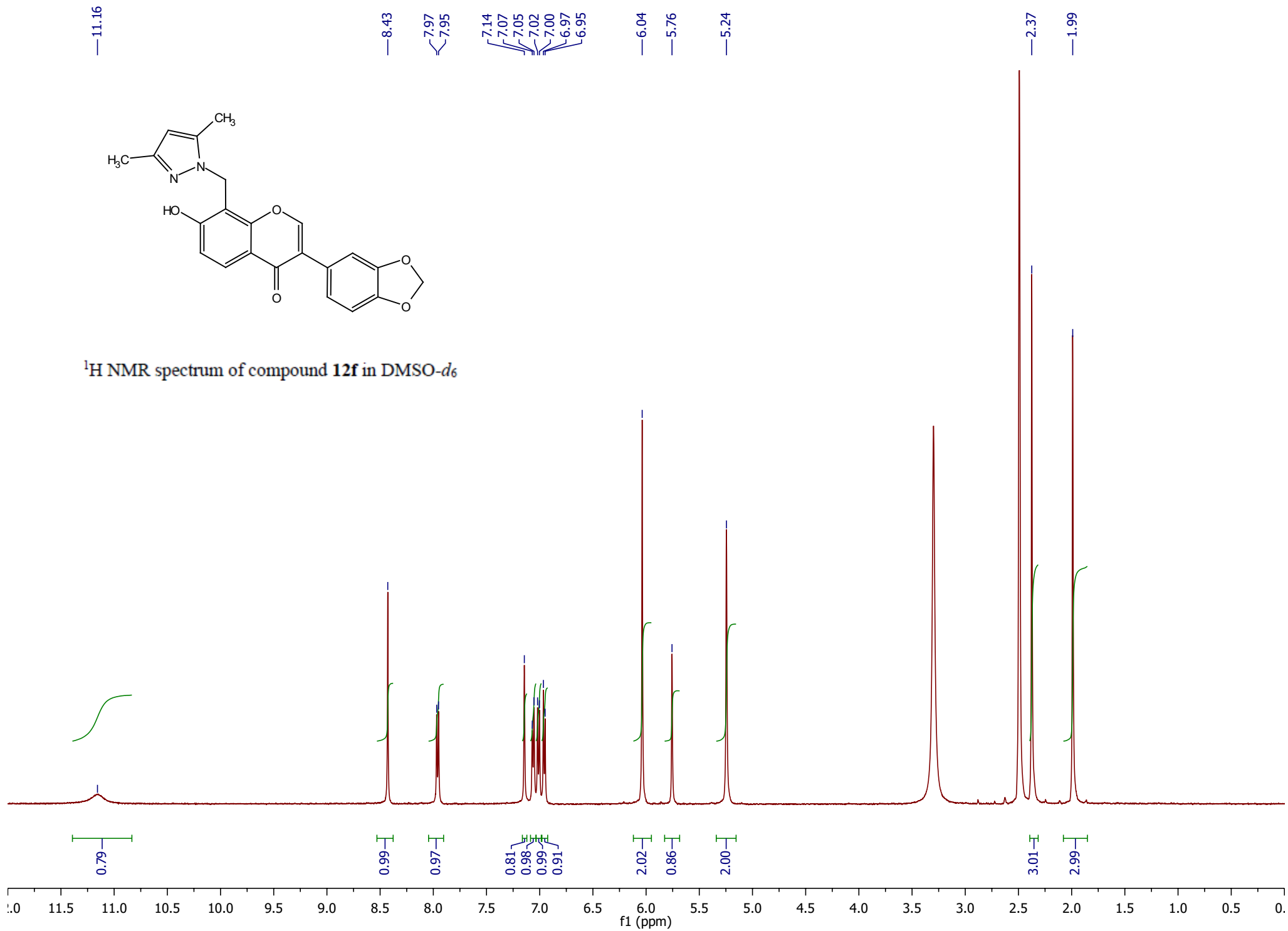


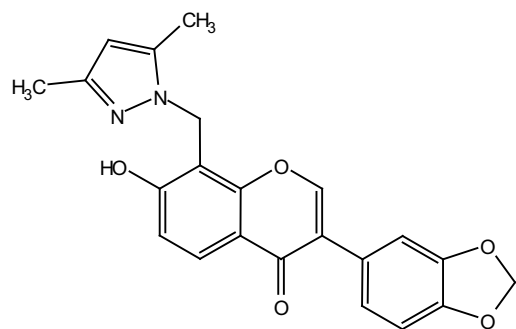
^{13}C NMR spectrum of compound **12e** in $\text{DMSO-}d_6$



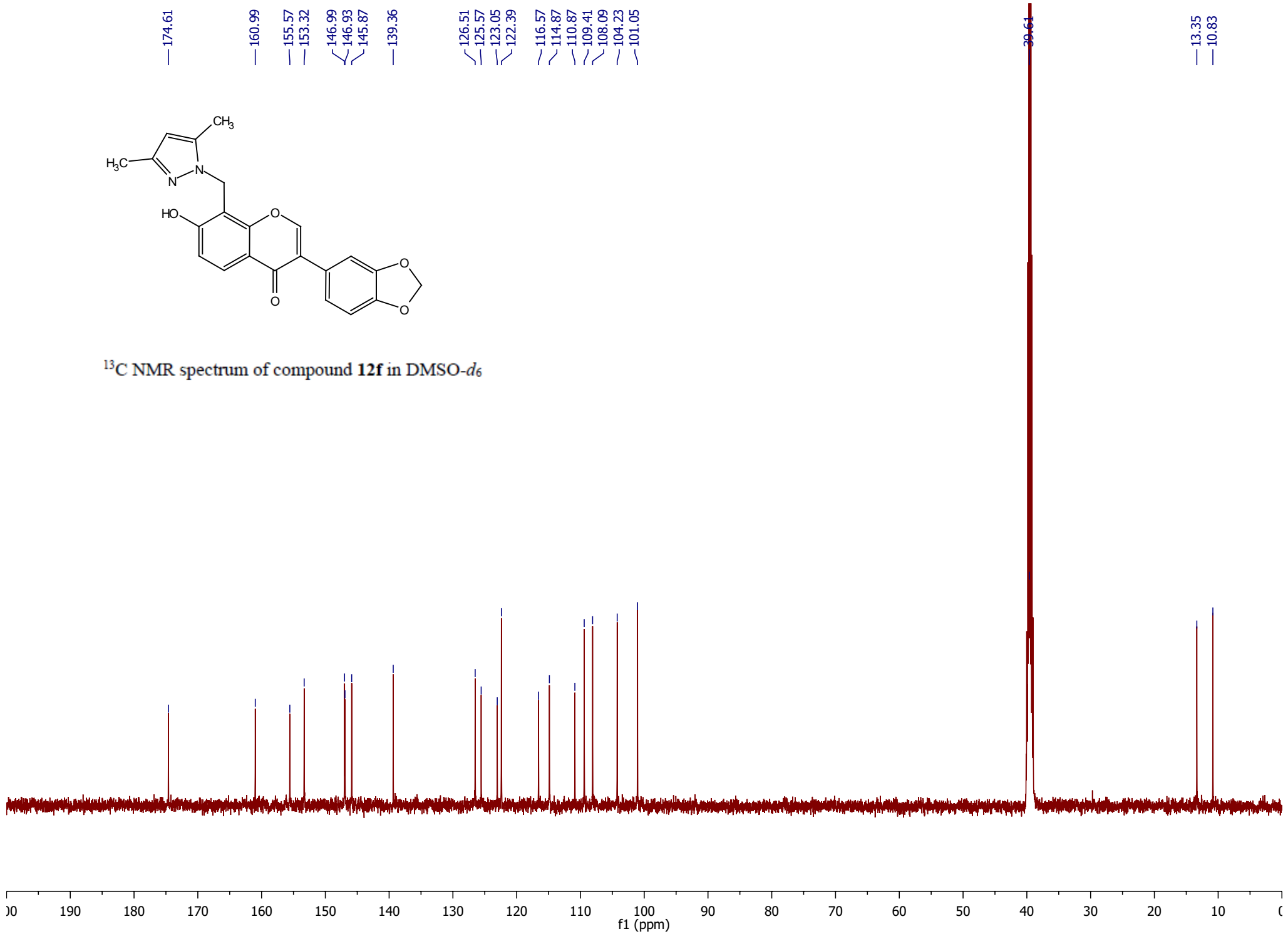


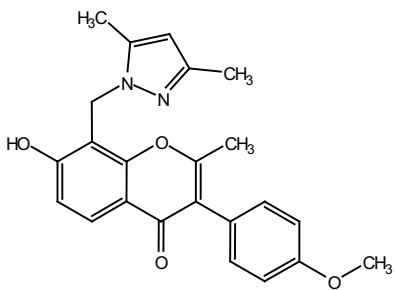
^1H NMR spectrum of compound **12f** in $\text{DMSO-}d_6$



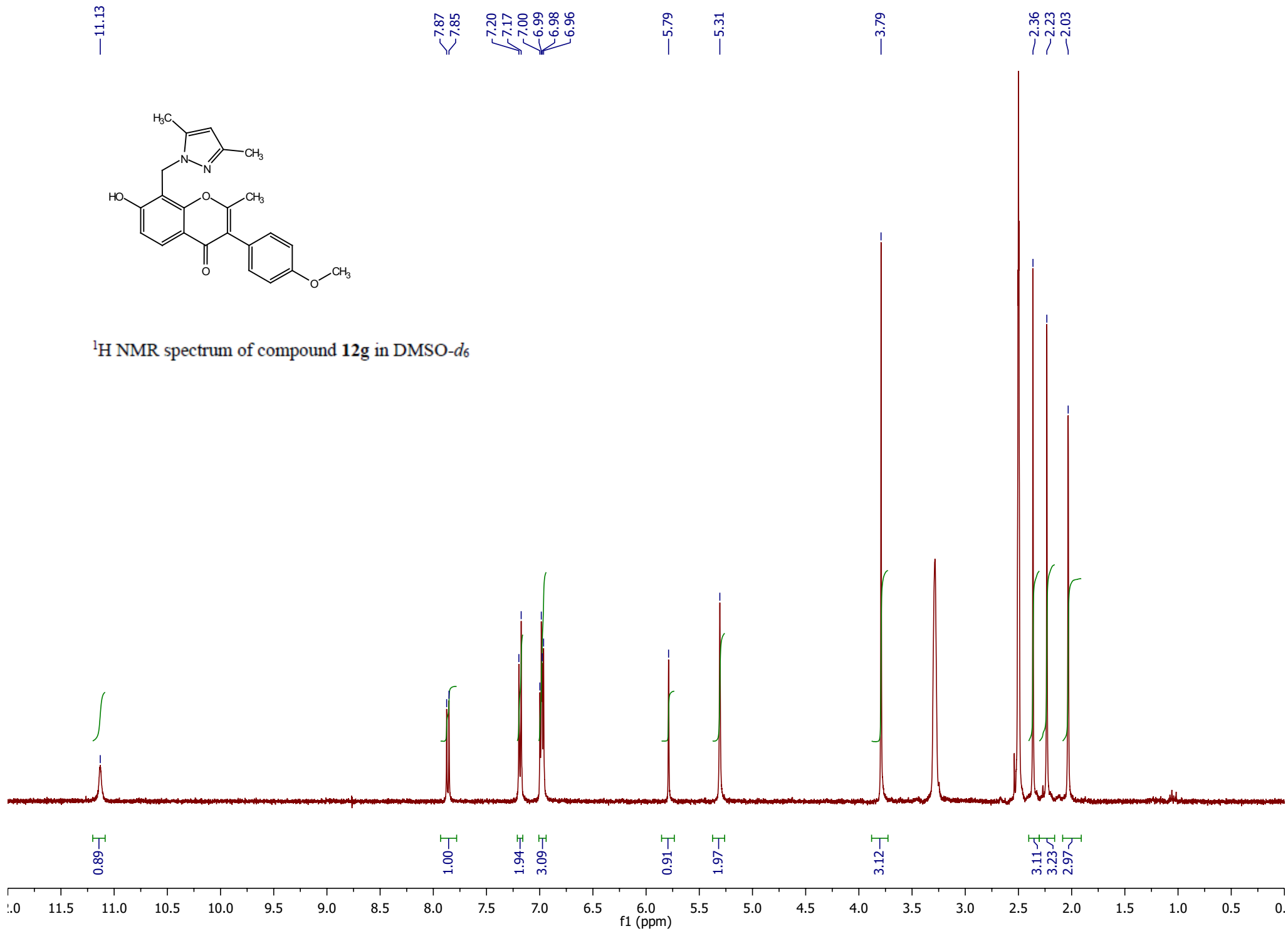


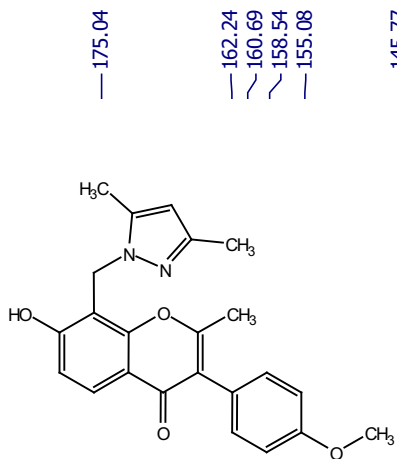
^{13}C NMR spectrum of compound 12f in $\text{DMSO-}d_6$



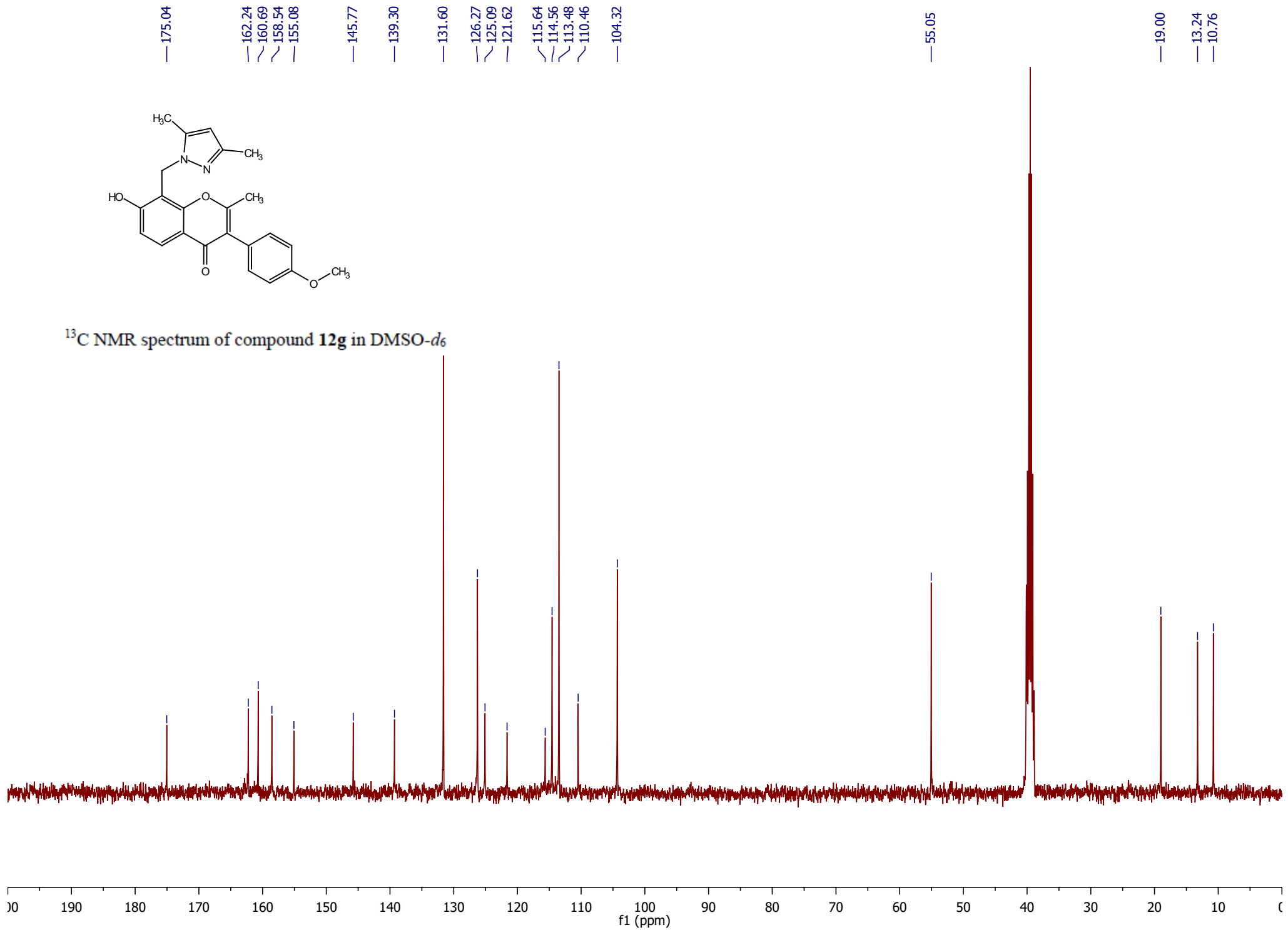


^1H NMR spectrum of compound **12g** in $\text{DMSO-}d_6$





^{13}C NMR spectrum of compound **12g** in $\text{DMSO-}d_6$



—11.61

7.95
7.93

7.21
7.19
7.11
7.09
7.01
6.99

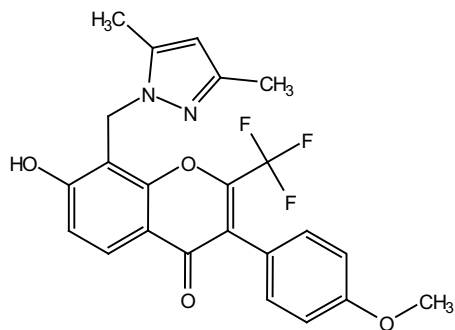
—5.80

—5.28

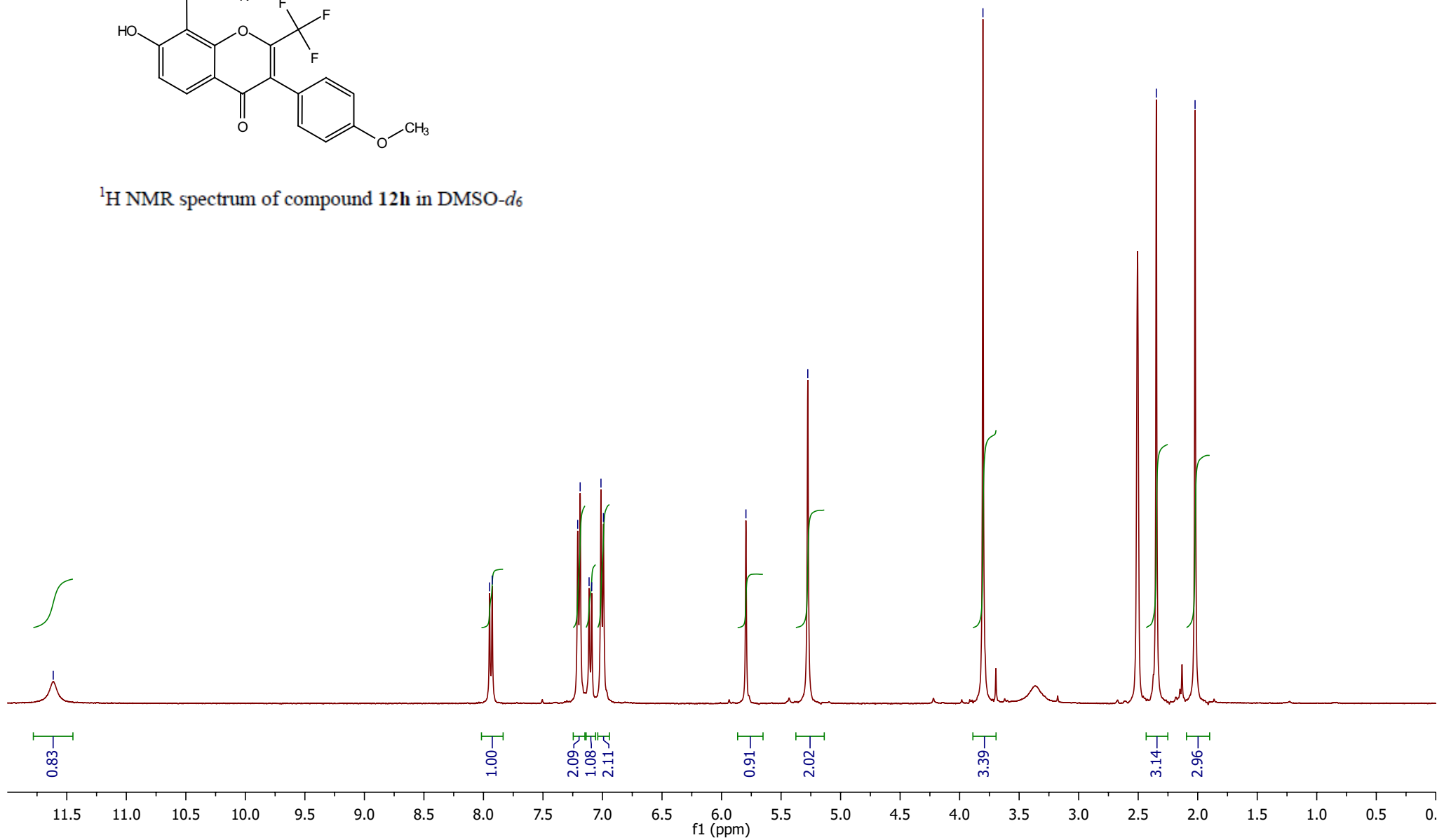
—3.80

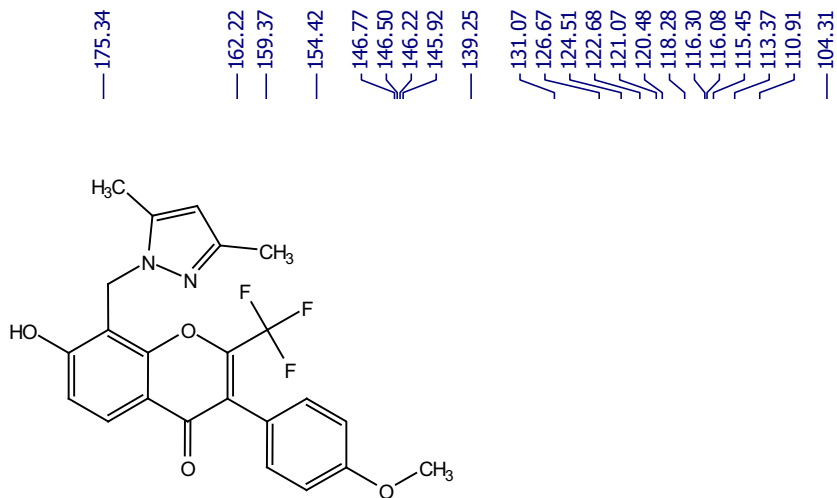
—2.35

—2.02

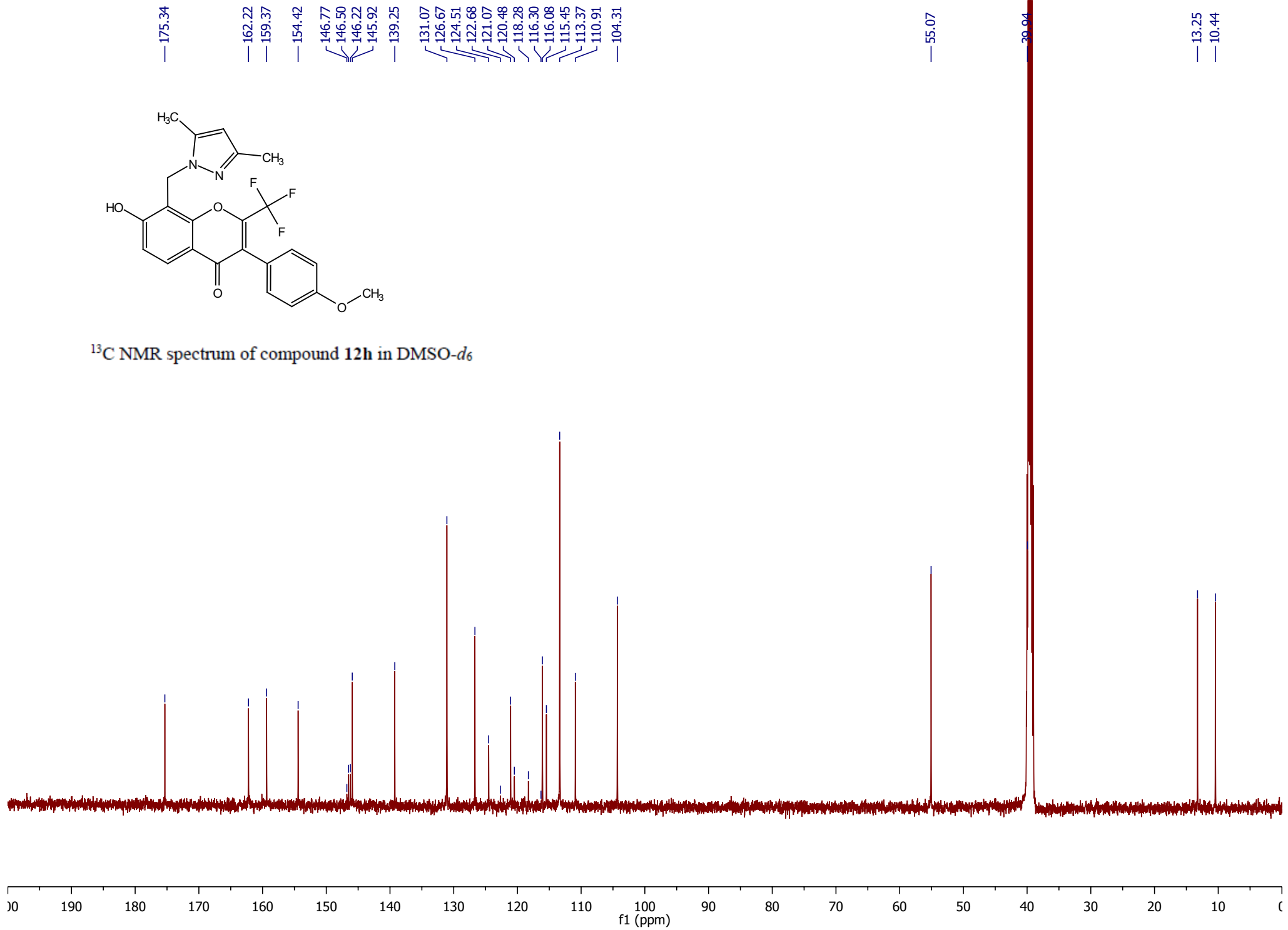


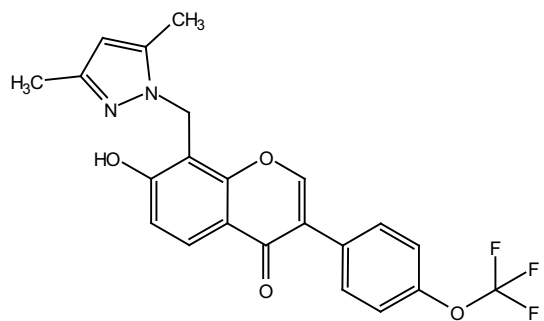
¹H NMR spectrum of compound 12h in DMSO-*d*₆



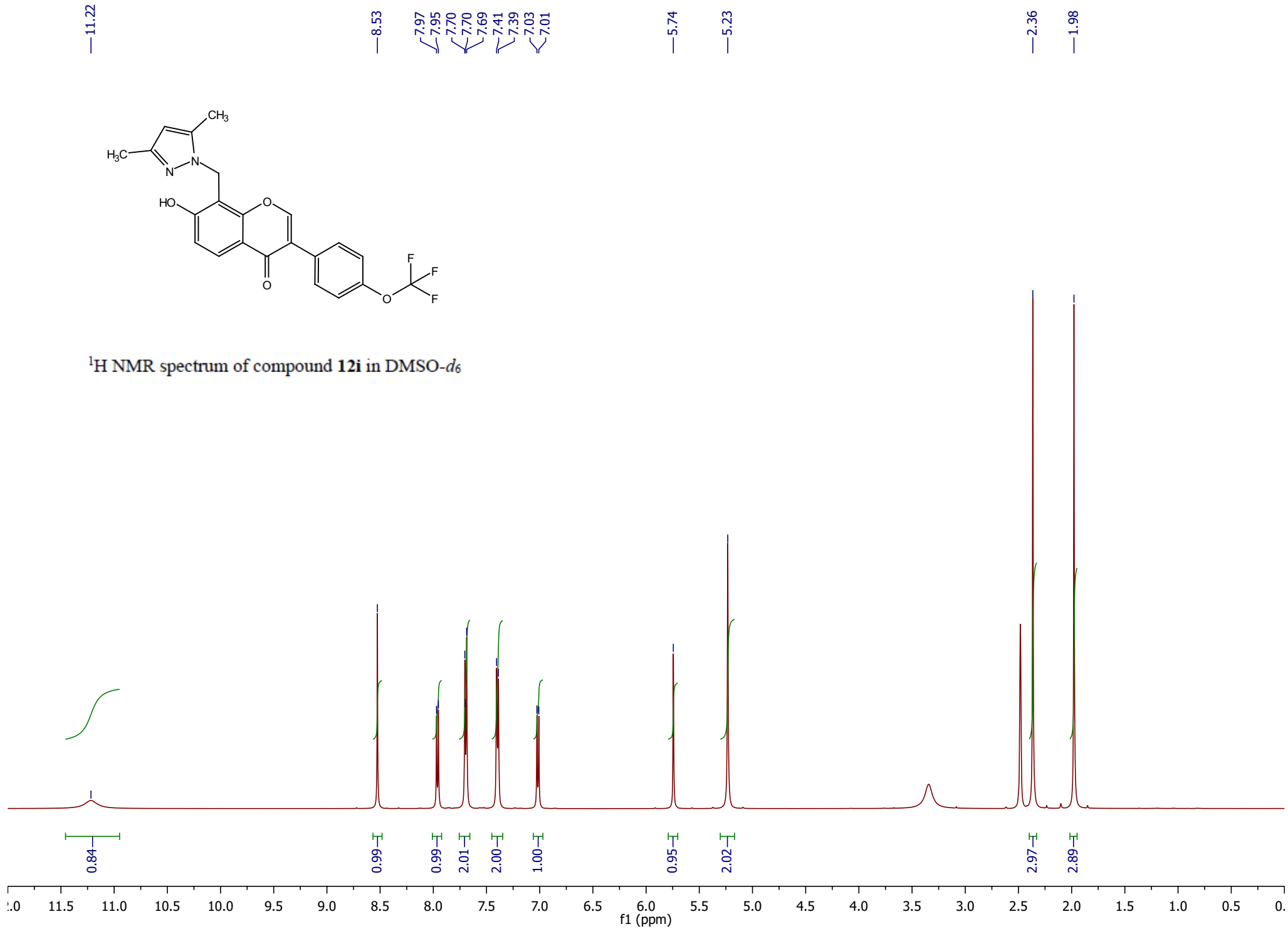


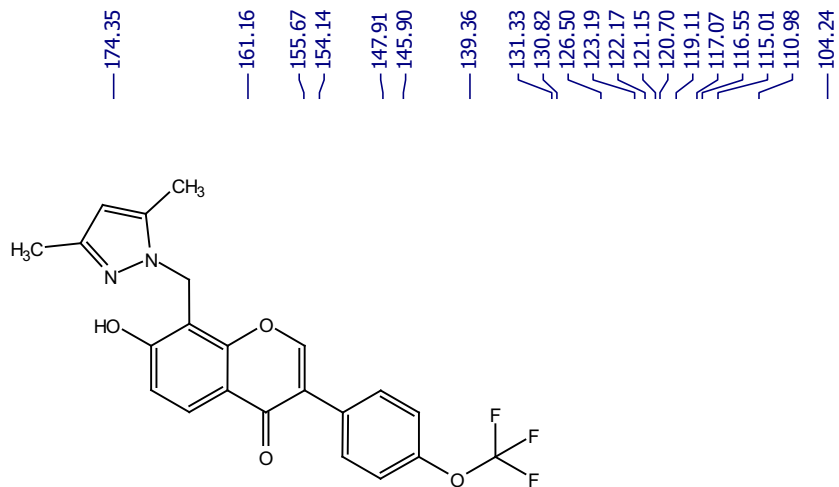
^{13}C NMR spectrum of compound 12h in $\text{DMSO-}d_6$



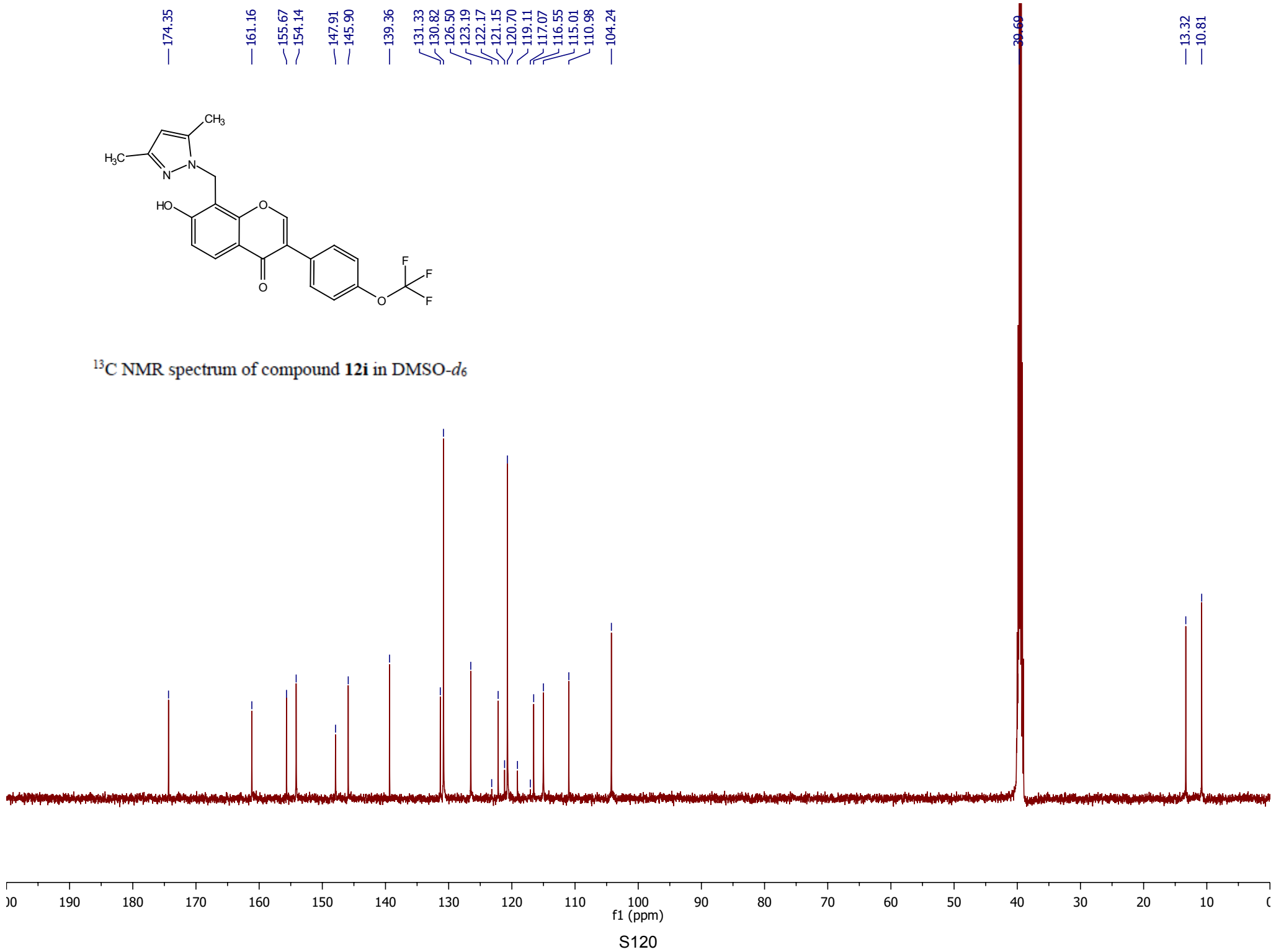


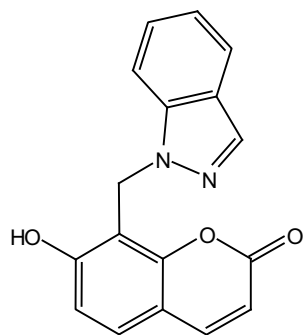
¹H NMR spectrum of compound **12i** in DMSO-*d*₆



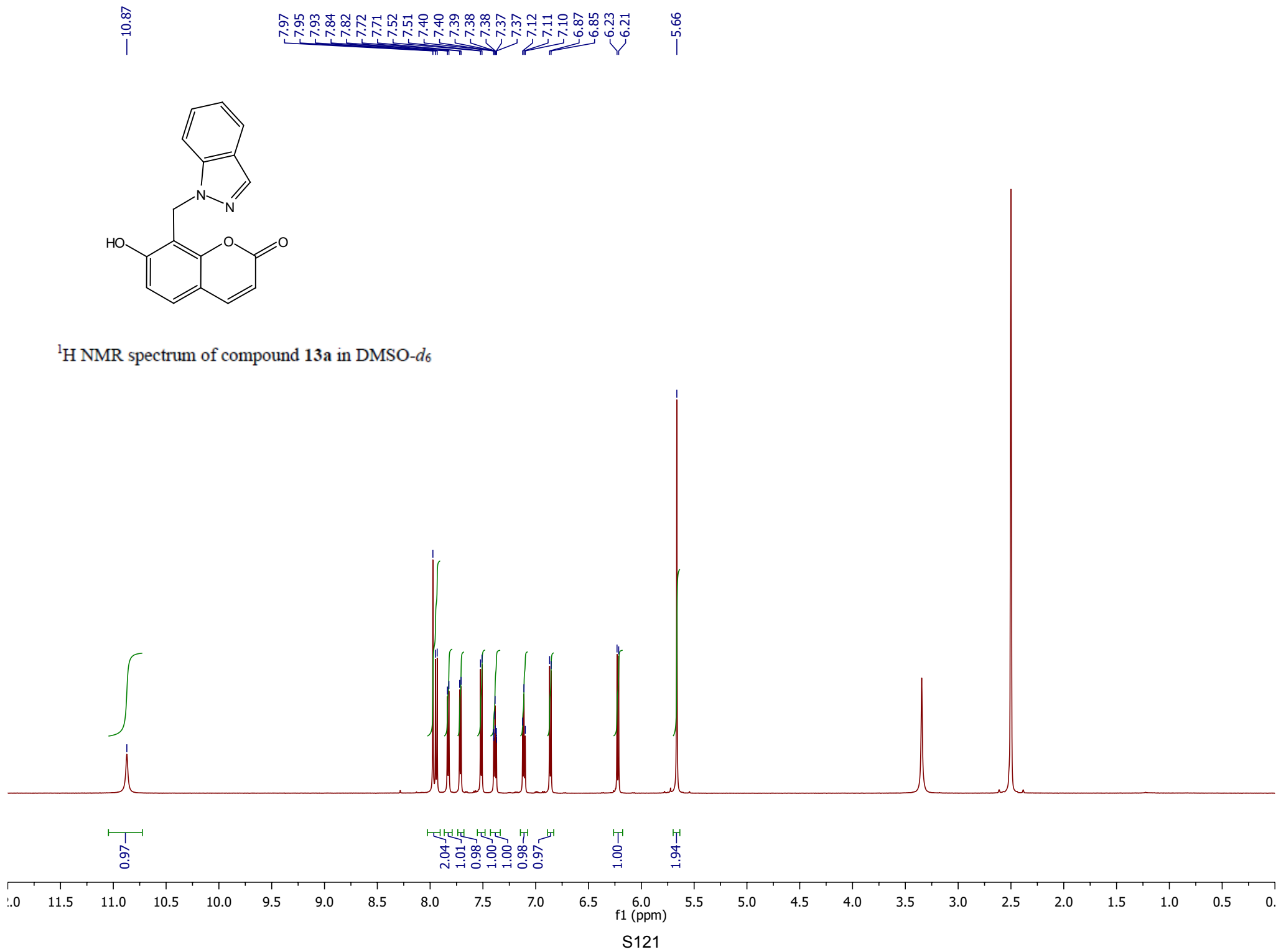


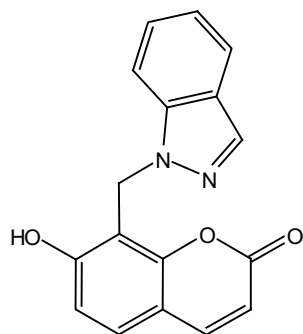
^{13}C NMR spectrum of compound **12i** in $\text{DMSO-}d_6$





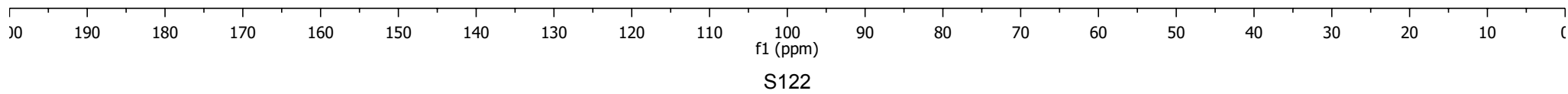
^1H NMR spectrum of compound 13a in $\text{DMSO-}d_6$

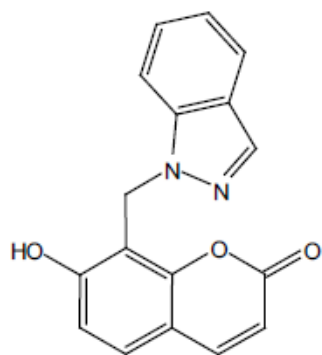




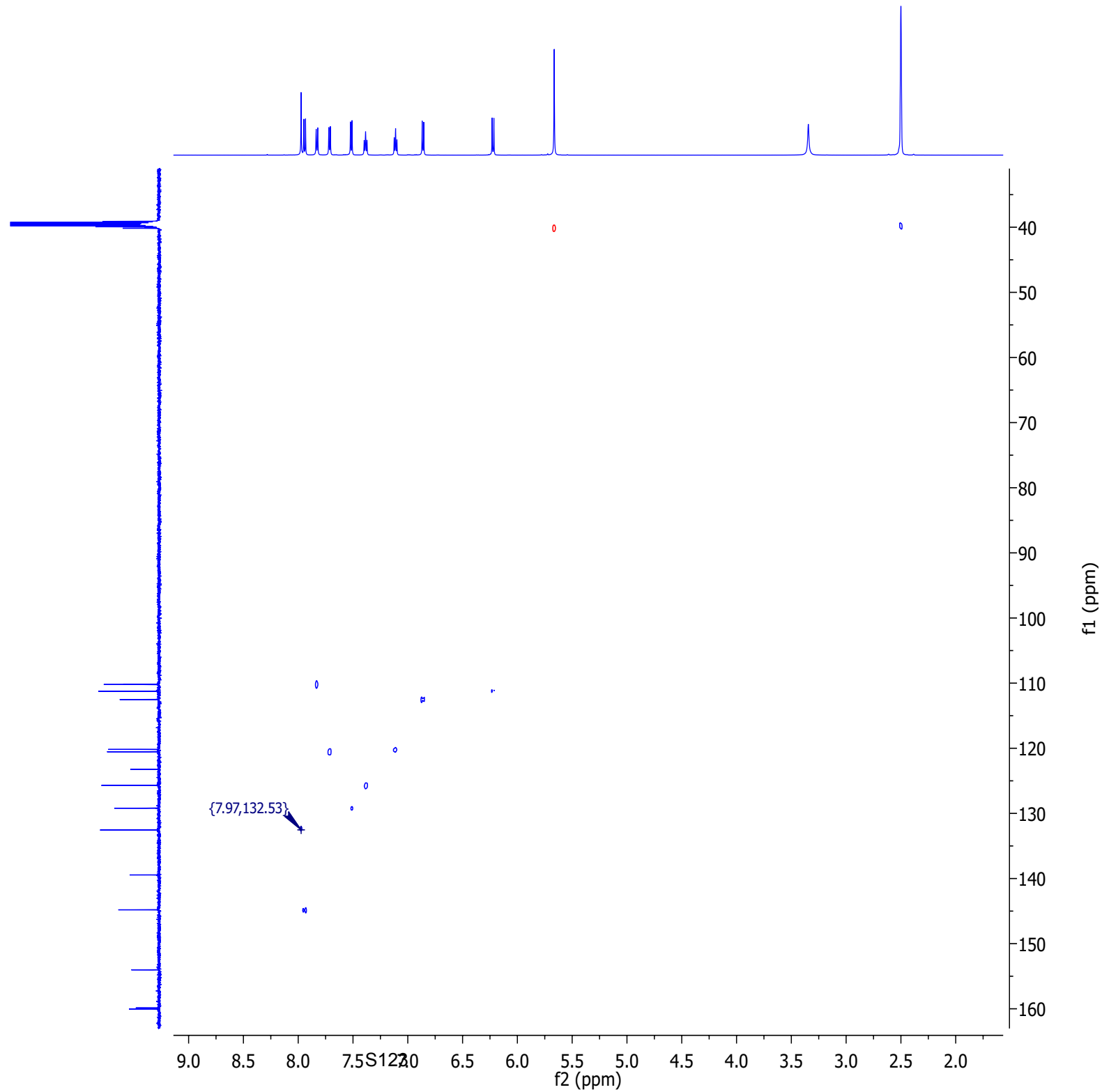
^{13}C NMR spectrum of compound 13a in $\text{DMSO-}d_6$

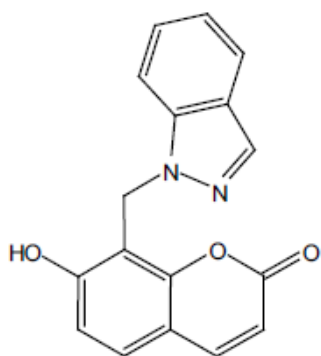
160.03
159.86
154.02
144.80
139.45
132.55
129.20
125.71
123.25
120.54
120.18
112.52
111.25
110.21
110.18
40.16



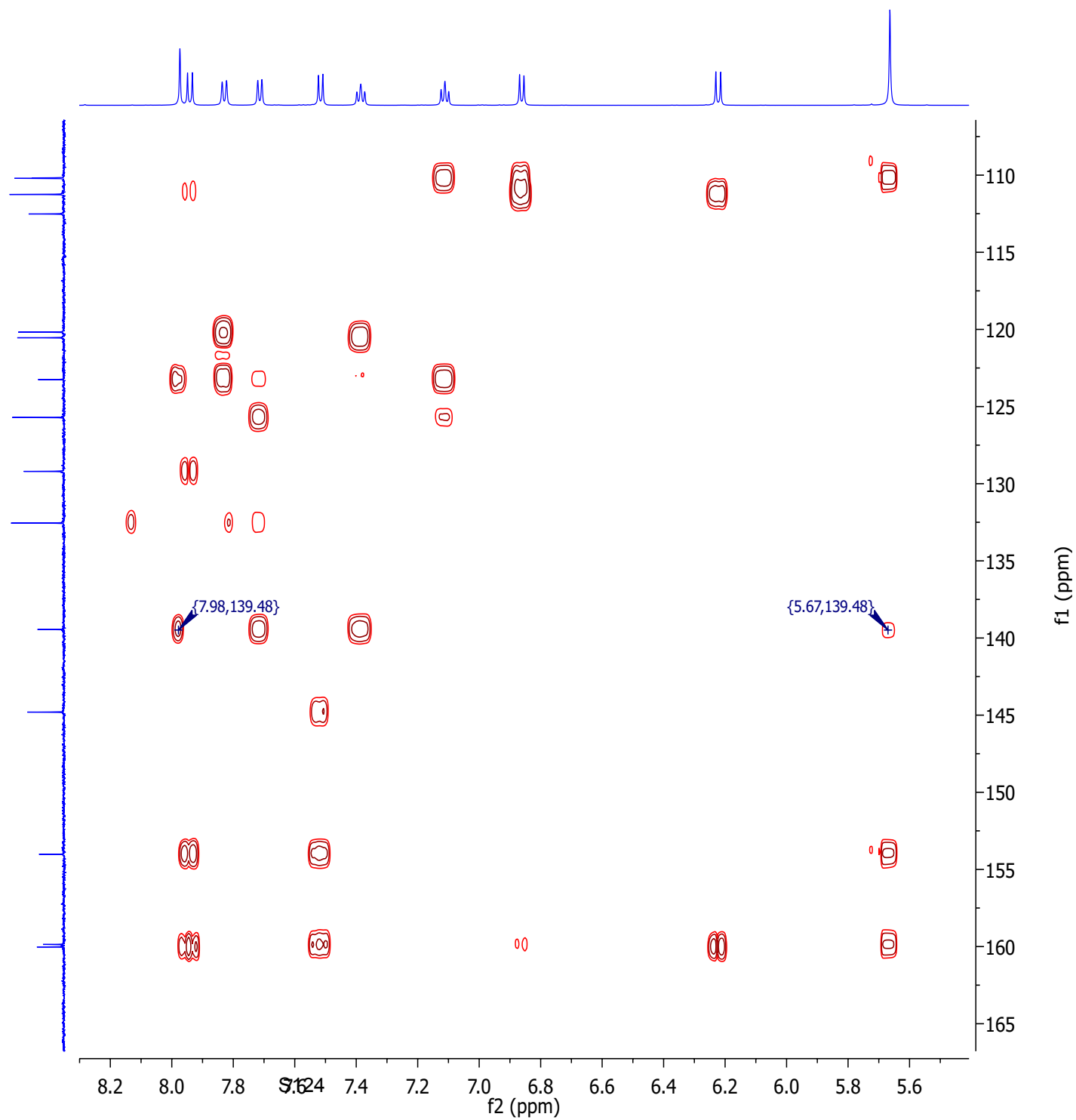


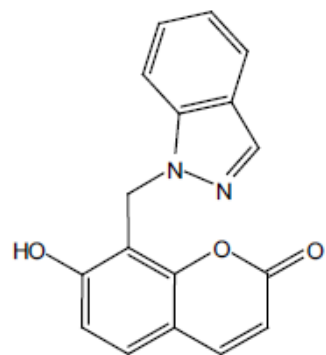
^1H - ^{13}C HSQC spectrum of
compound 13a in $\text{DMSO-}d_6$



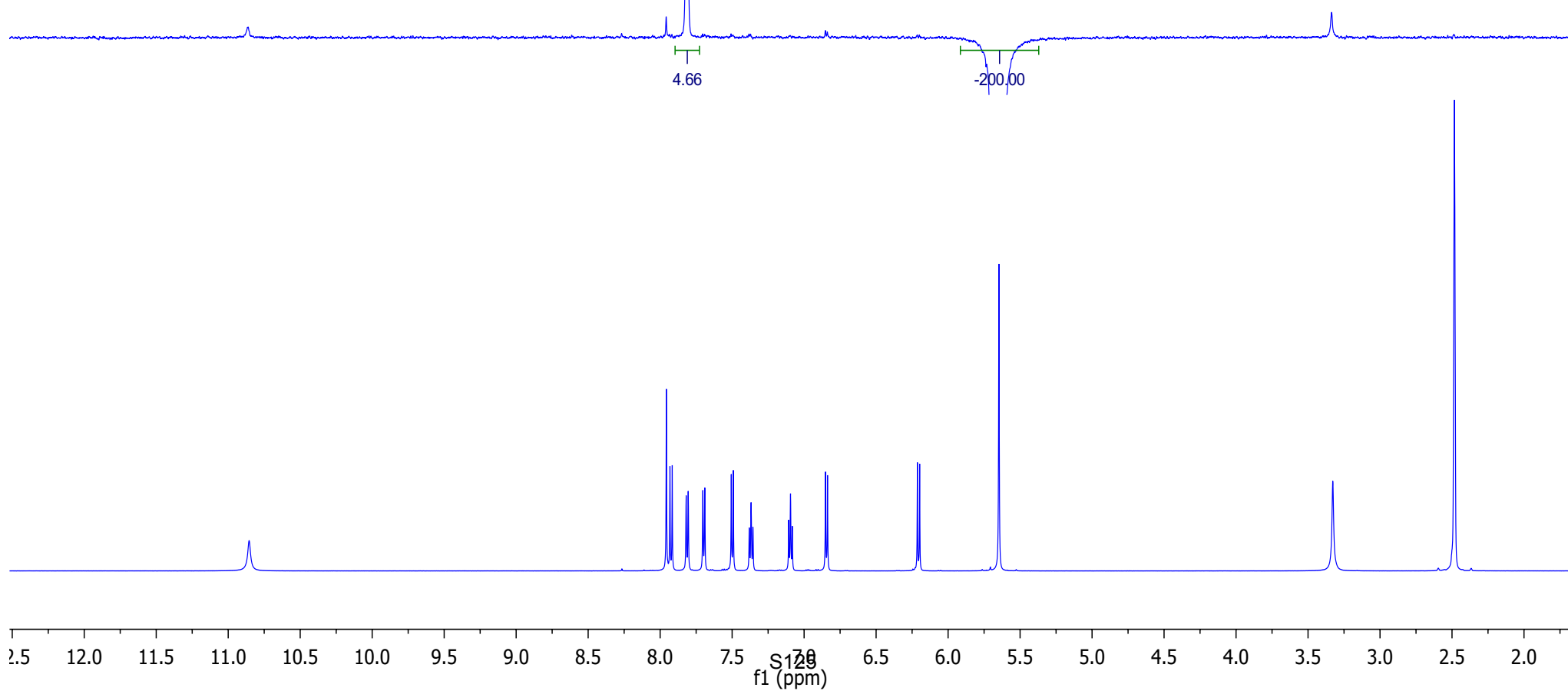


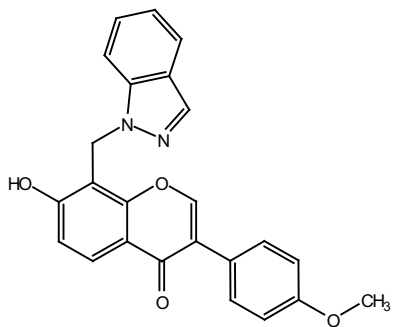
^1H - ^{13}C HMBC spectrum of
compound 13a in $\text{DMSO-}d_6$



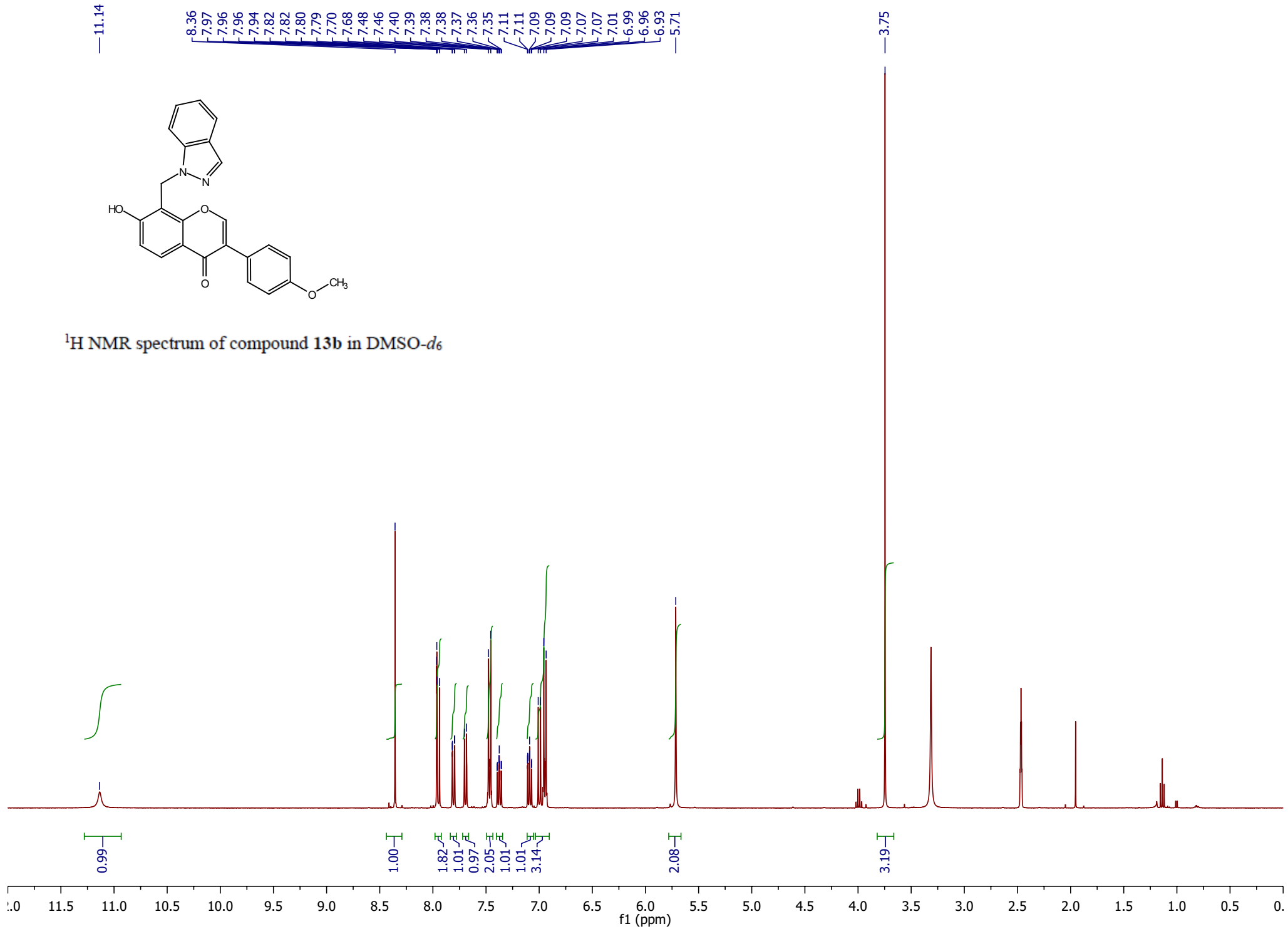


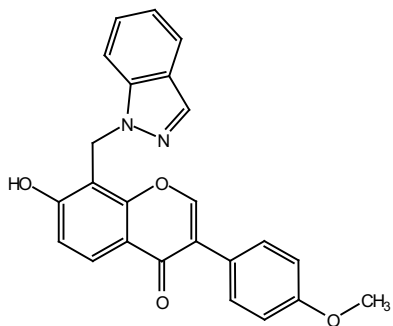
1D NOESY spectrum of compound 13a in DMSO-*d*₆



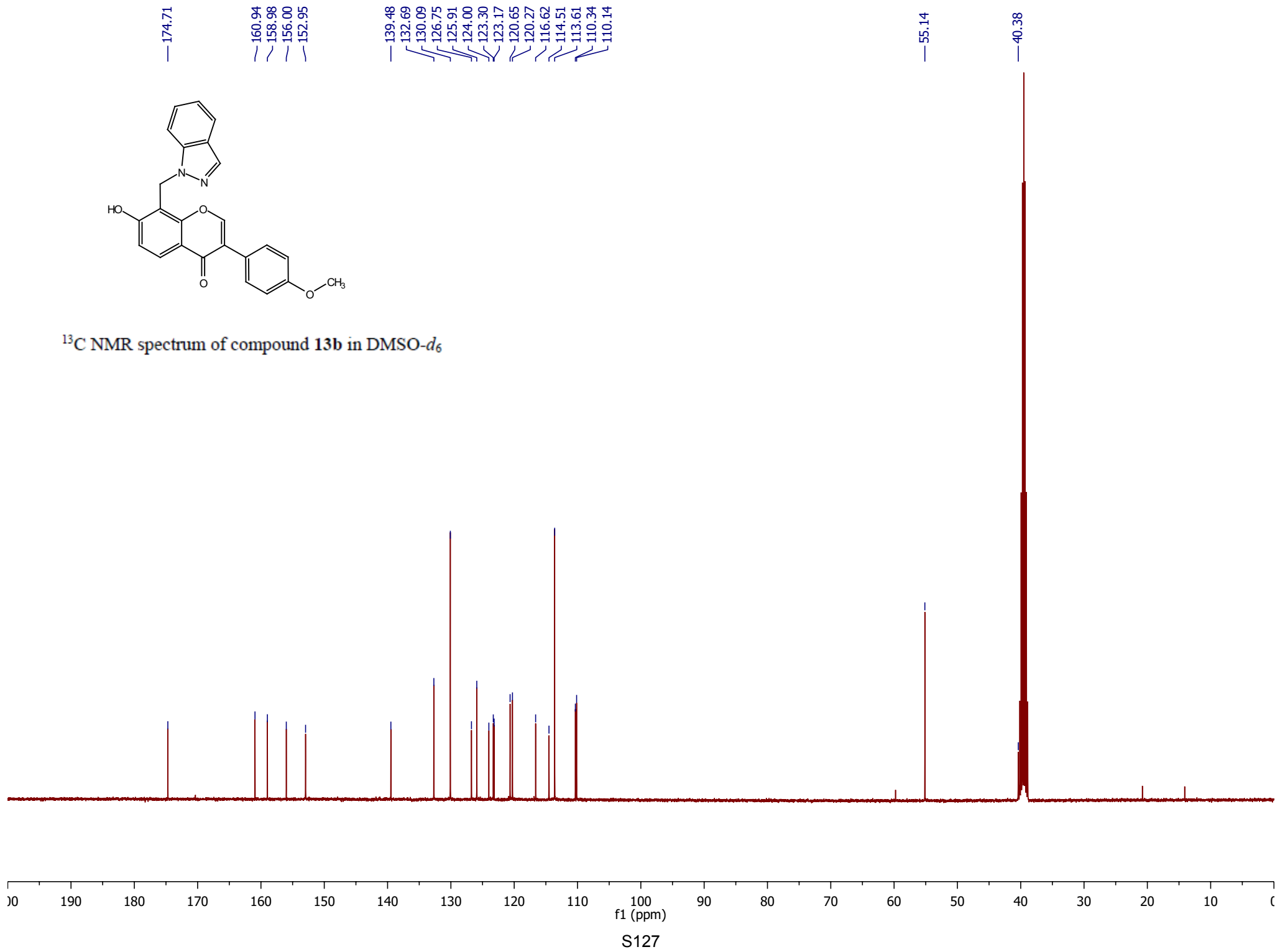


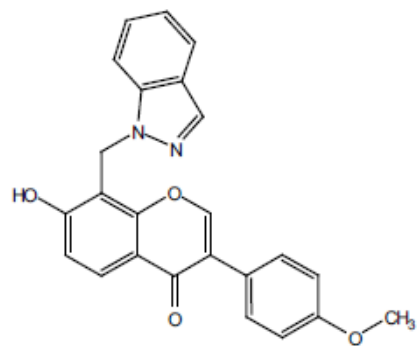
¹H NMR spectrum of compound 13b in DMSO-*d*₆



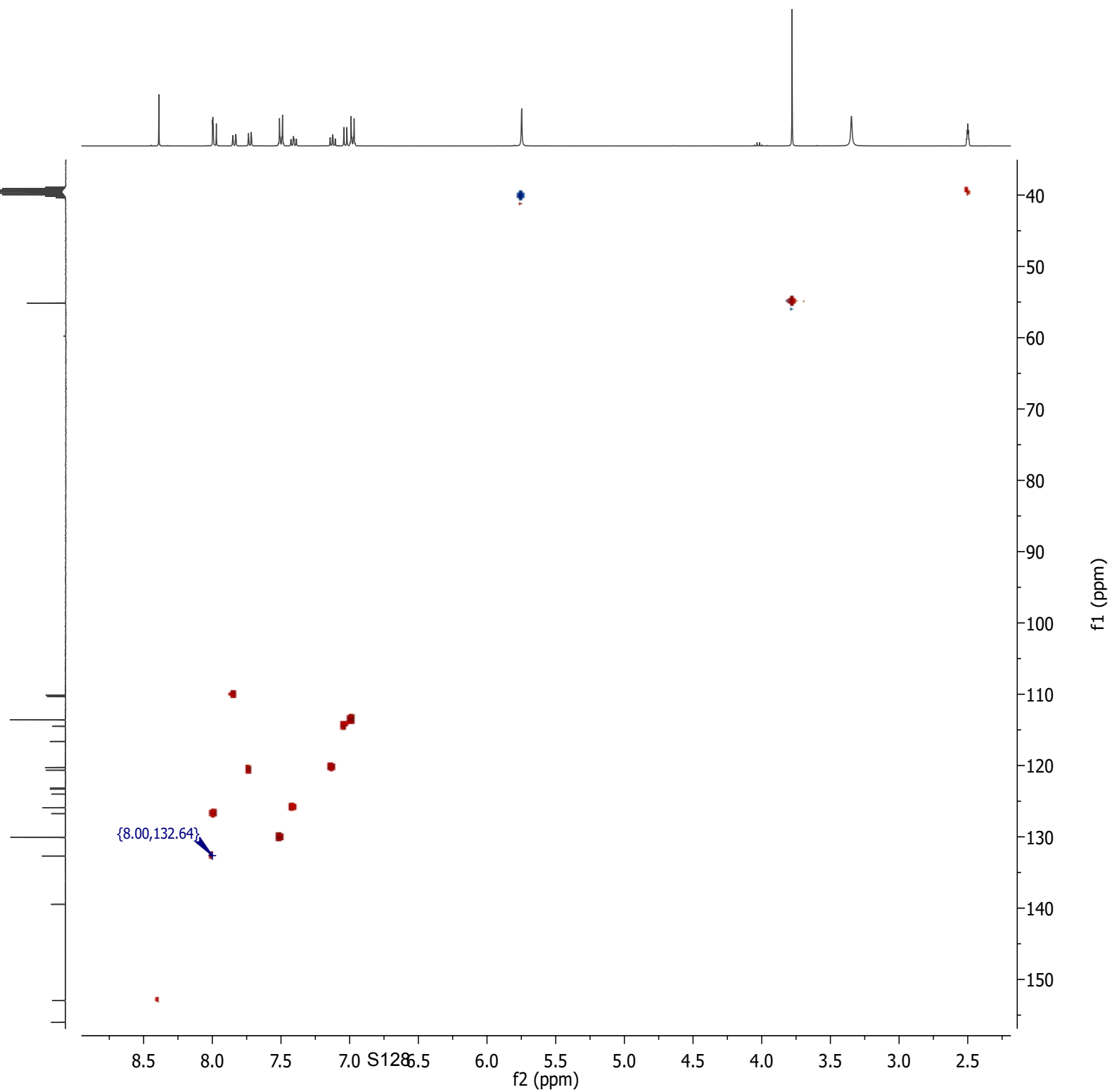


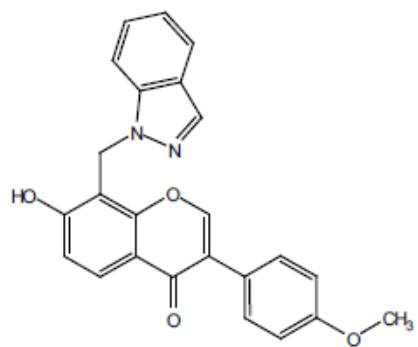
¹³C NMR spectrum of compound 13b in DMSO-*d*₆



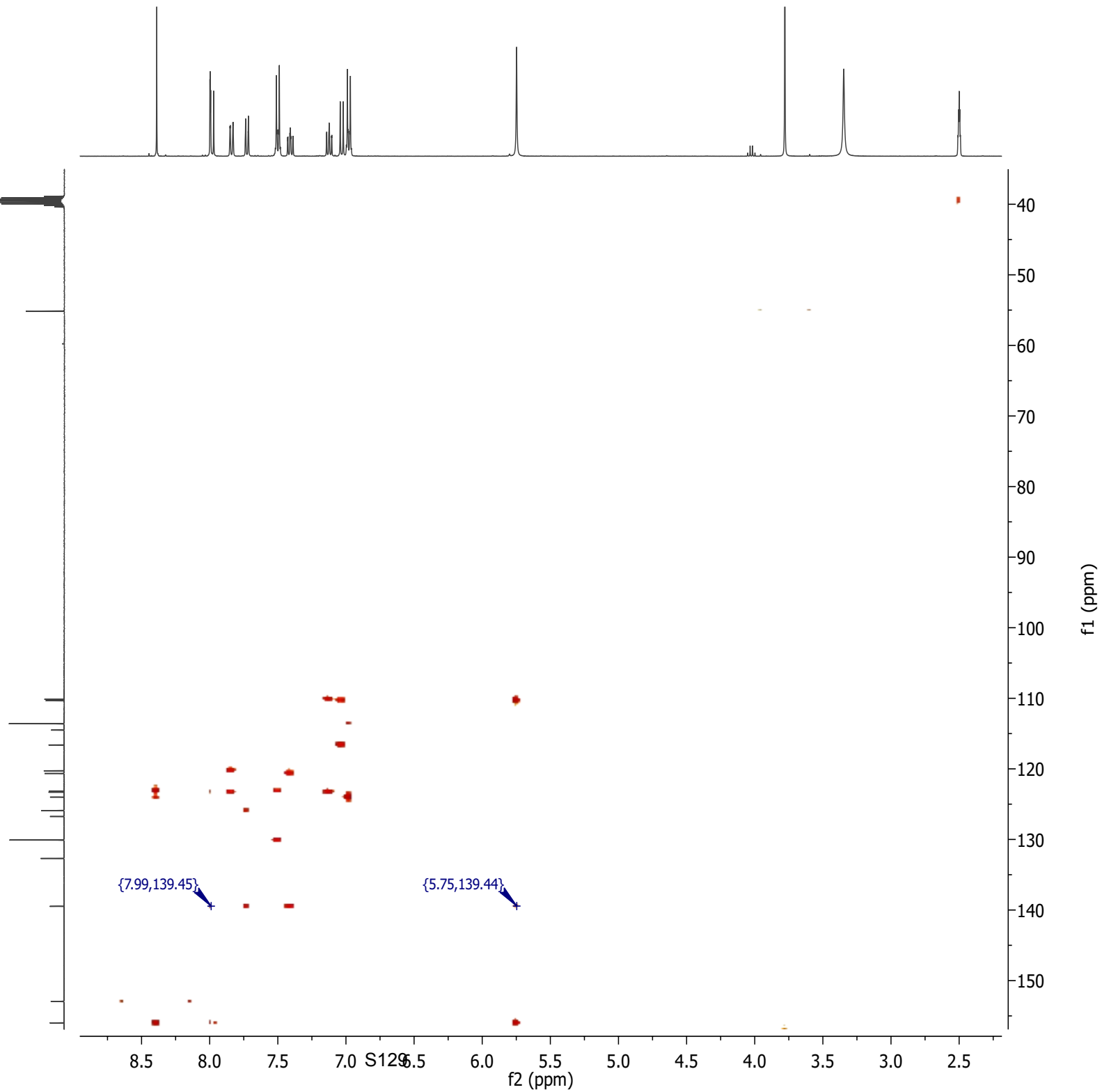


^1H - ^{13}C HSQC spectrum of
compound 13b in $\text{DMSO-}d_6$



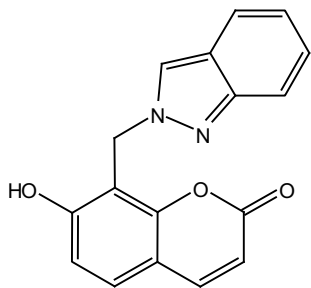


^1H - ^{13}C HMBC spectrum of
compound 13b in $\text{DMSO-}d_6$

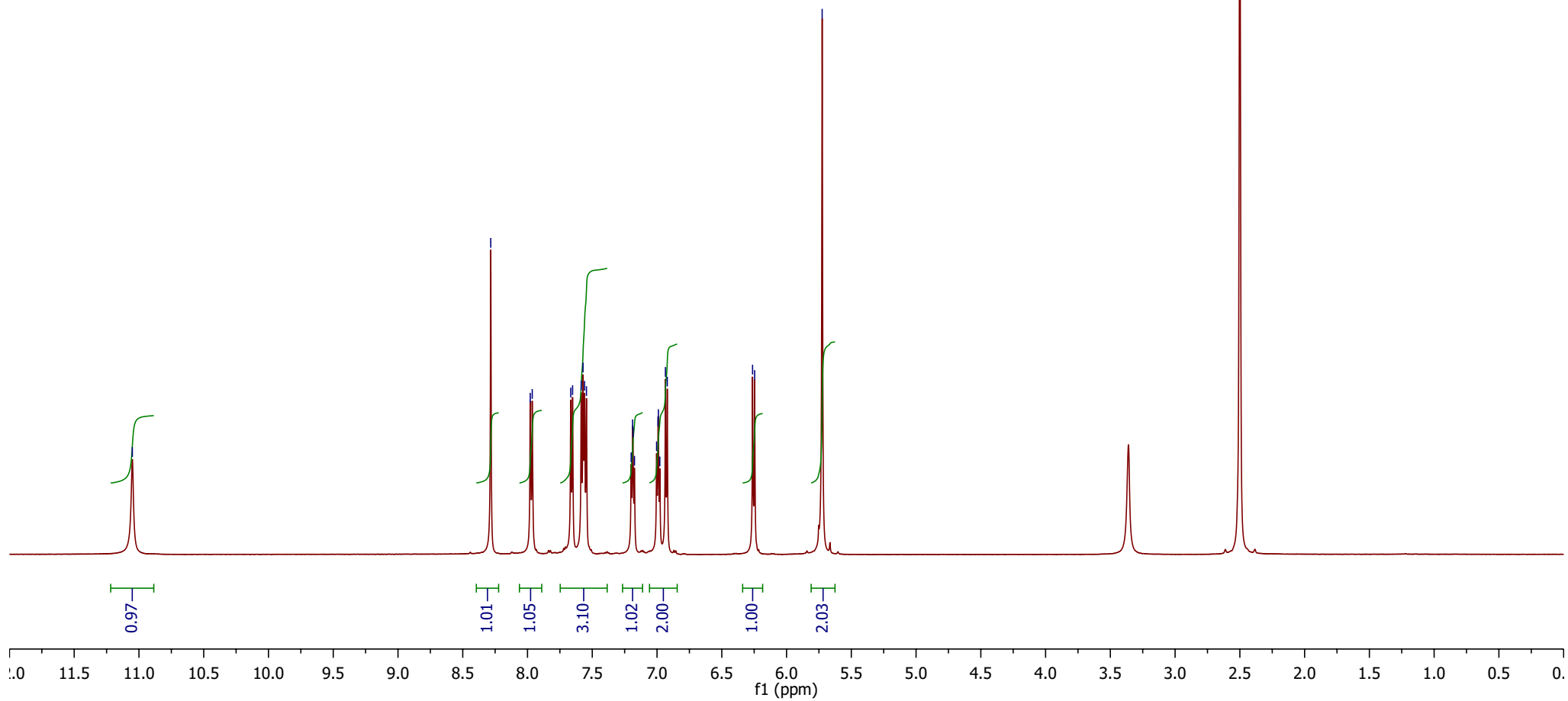


—11.05

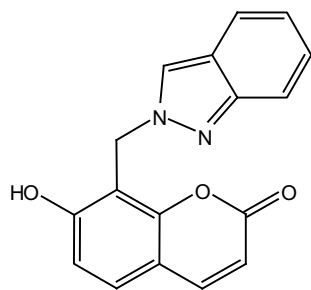
—8.28
7.98
7.96
7.67
7.65
7.59
7.57
7.56
7.54
7.20
7.19
7.18
7.17
7.00
6.99
6.99
6.98
6.94
6.92
6.26
6.25
5.73



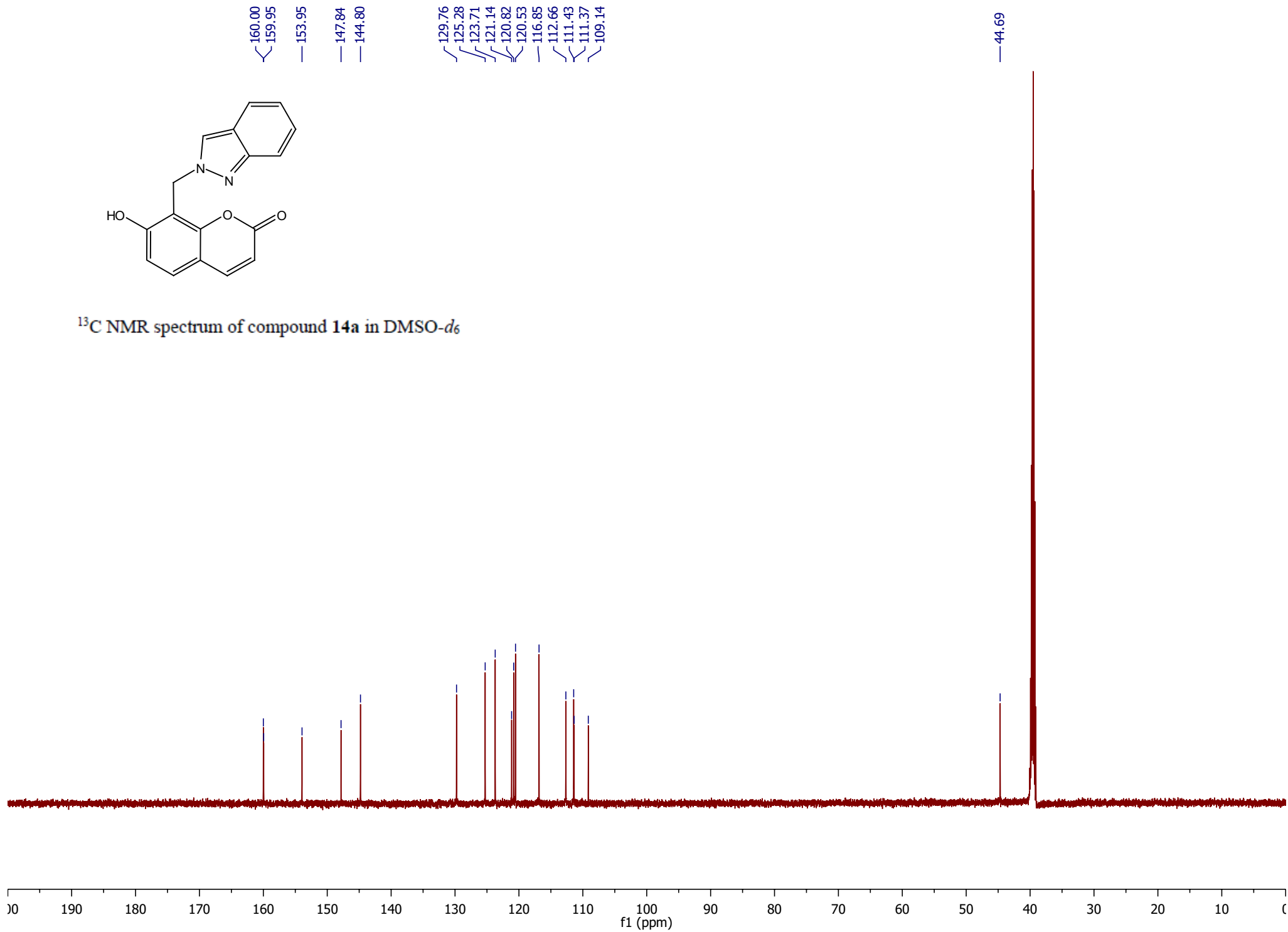
^1H NMR spectrum of compound **14a** in $\text{DMSO-}d_6$

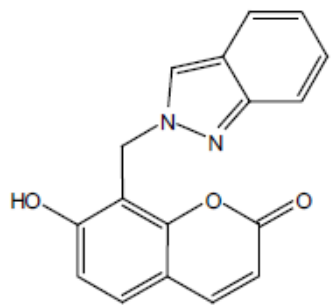


S130

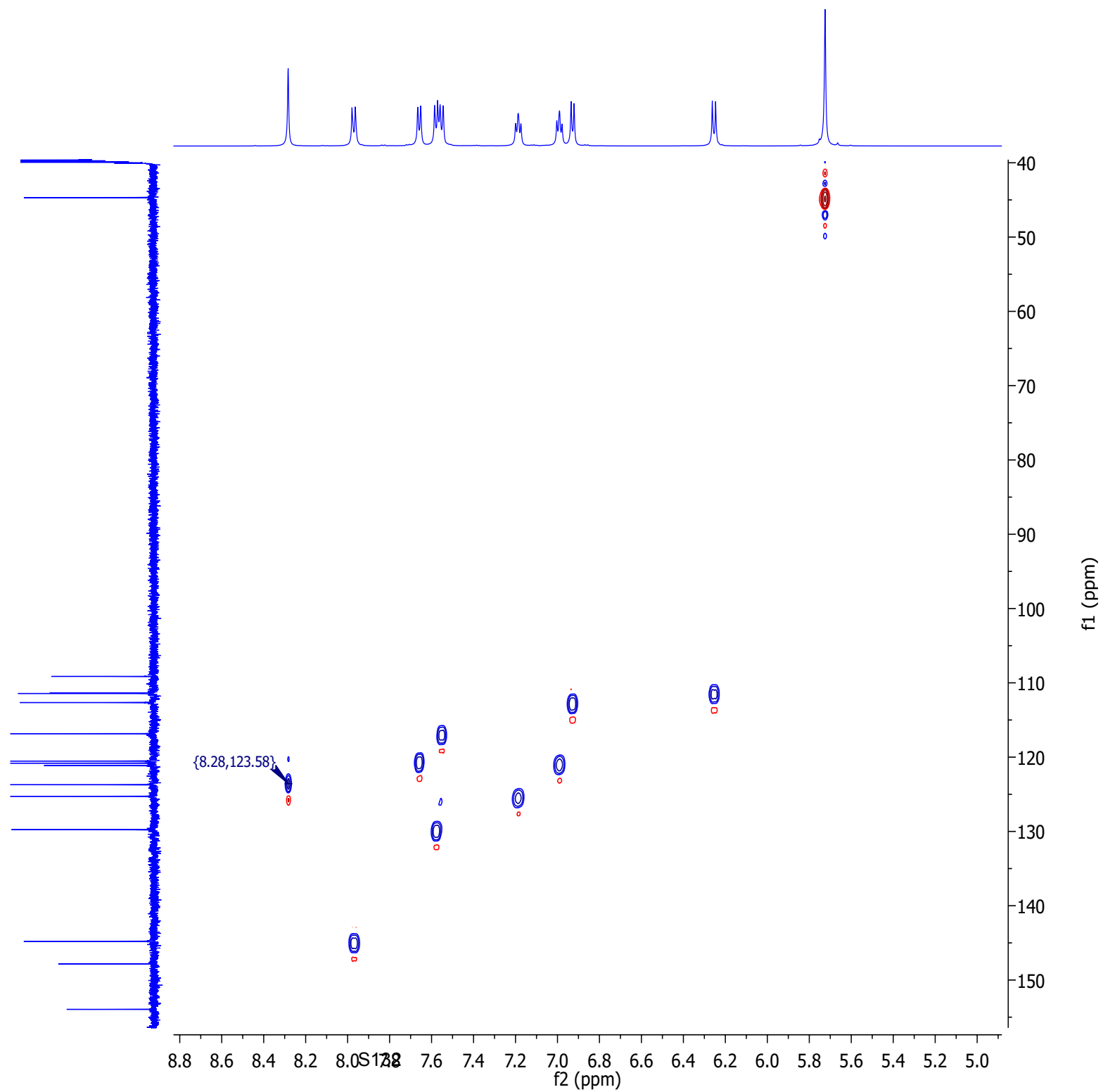


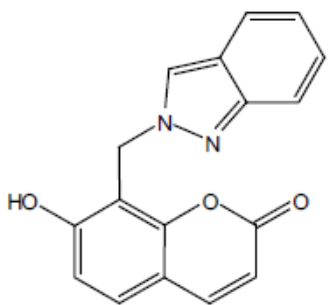
¹³C NMR spectrum of compound 14a in DMSO-d₆



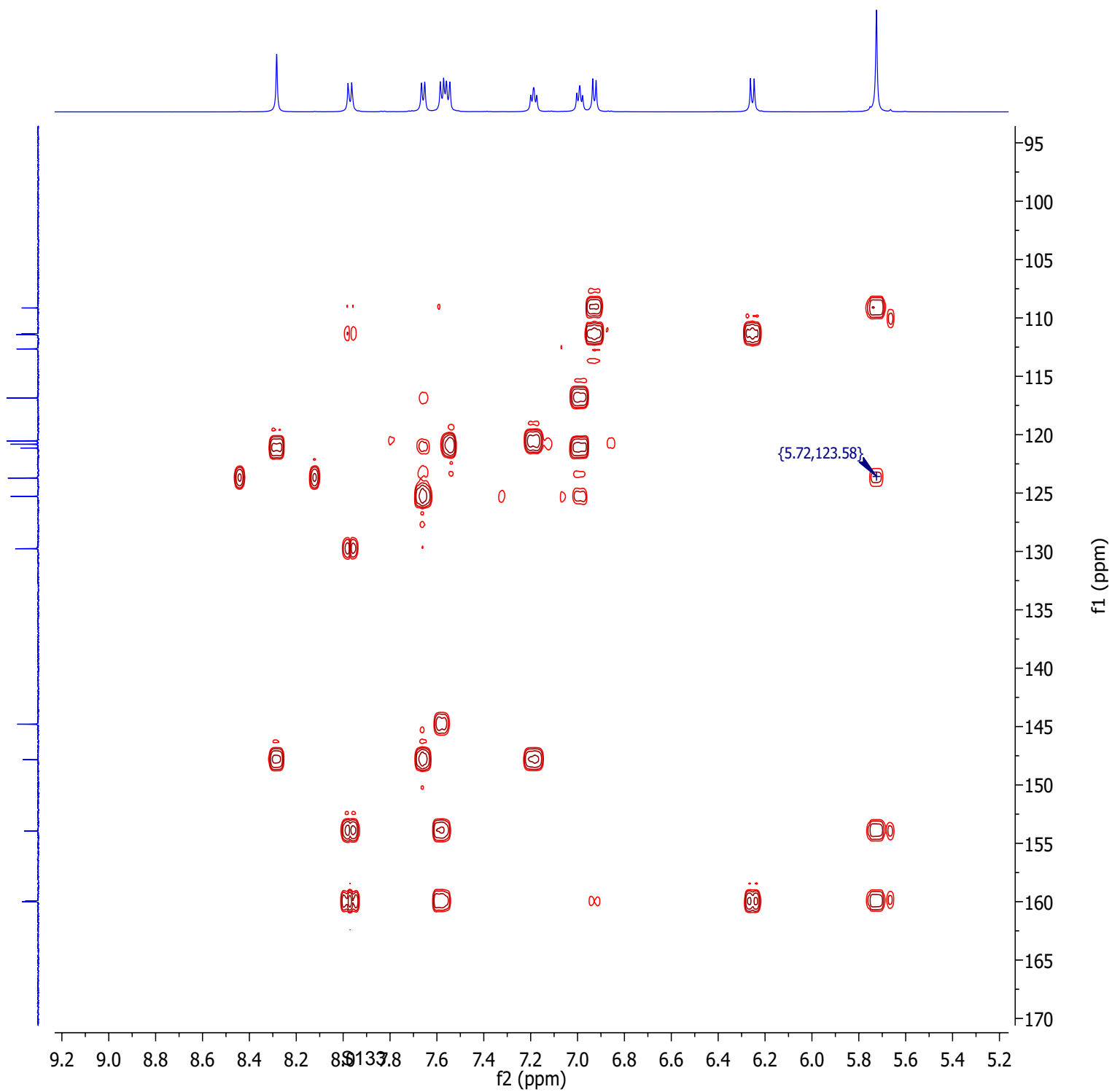


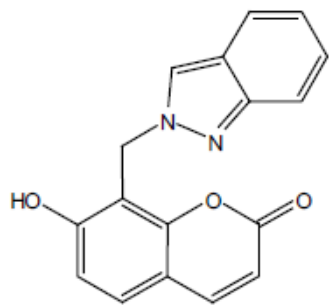
^1H - ^{13}C HSQC spectrum of
compound **14a** in $\text{DMSO-}d_6$



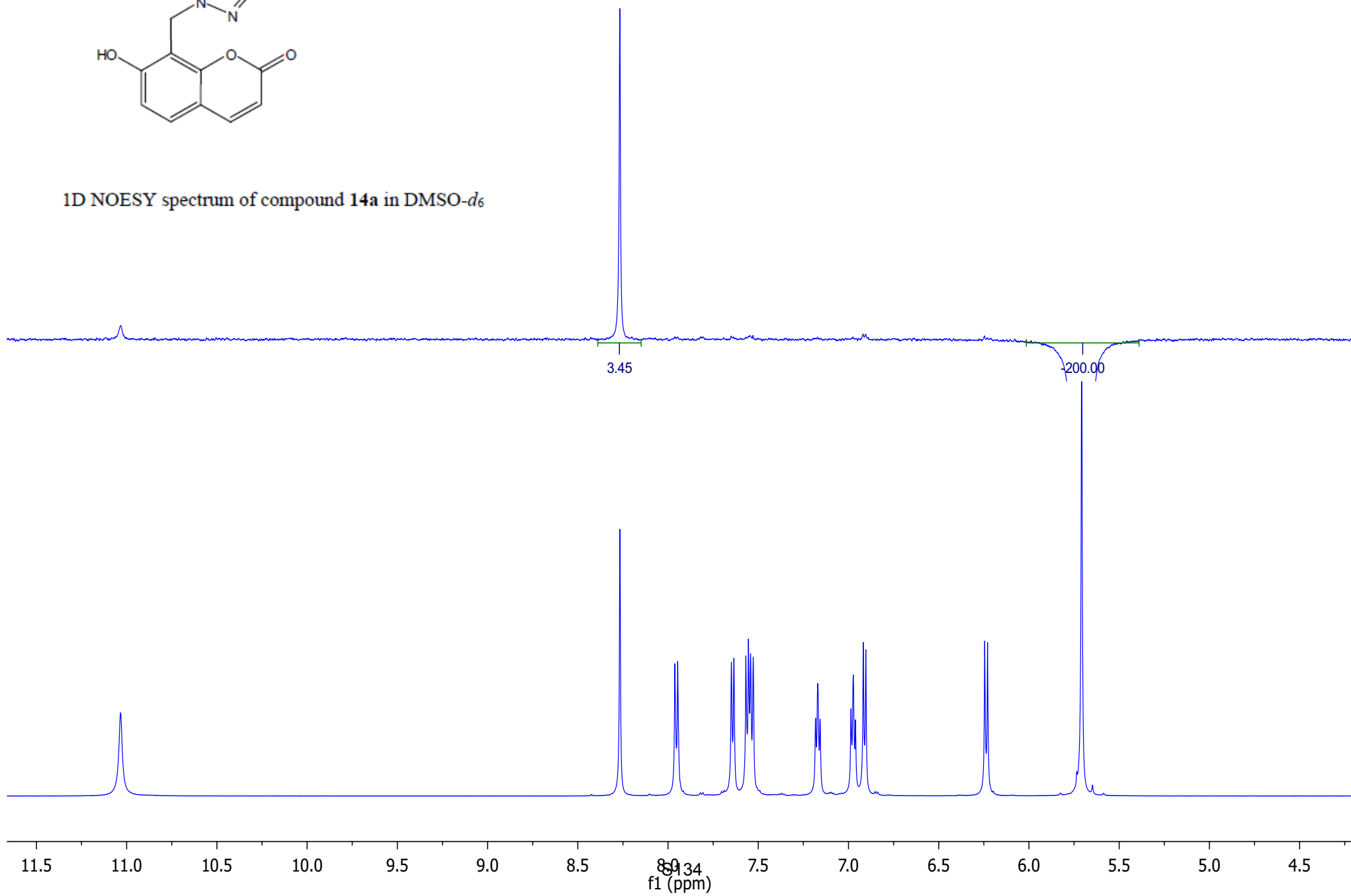


^1H - ^{13}C HMBC spectrum of
compound **14a** in $\text{DMSO-}d_6$



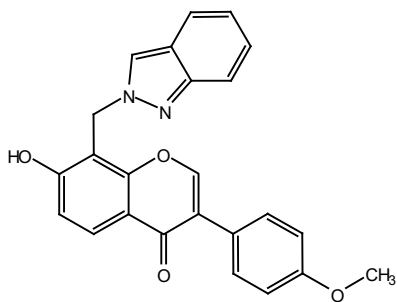


1D NOESY spectrum of compound 14a in DMSO-*d*₆

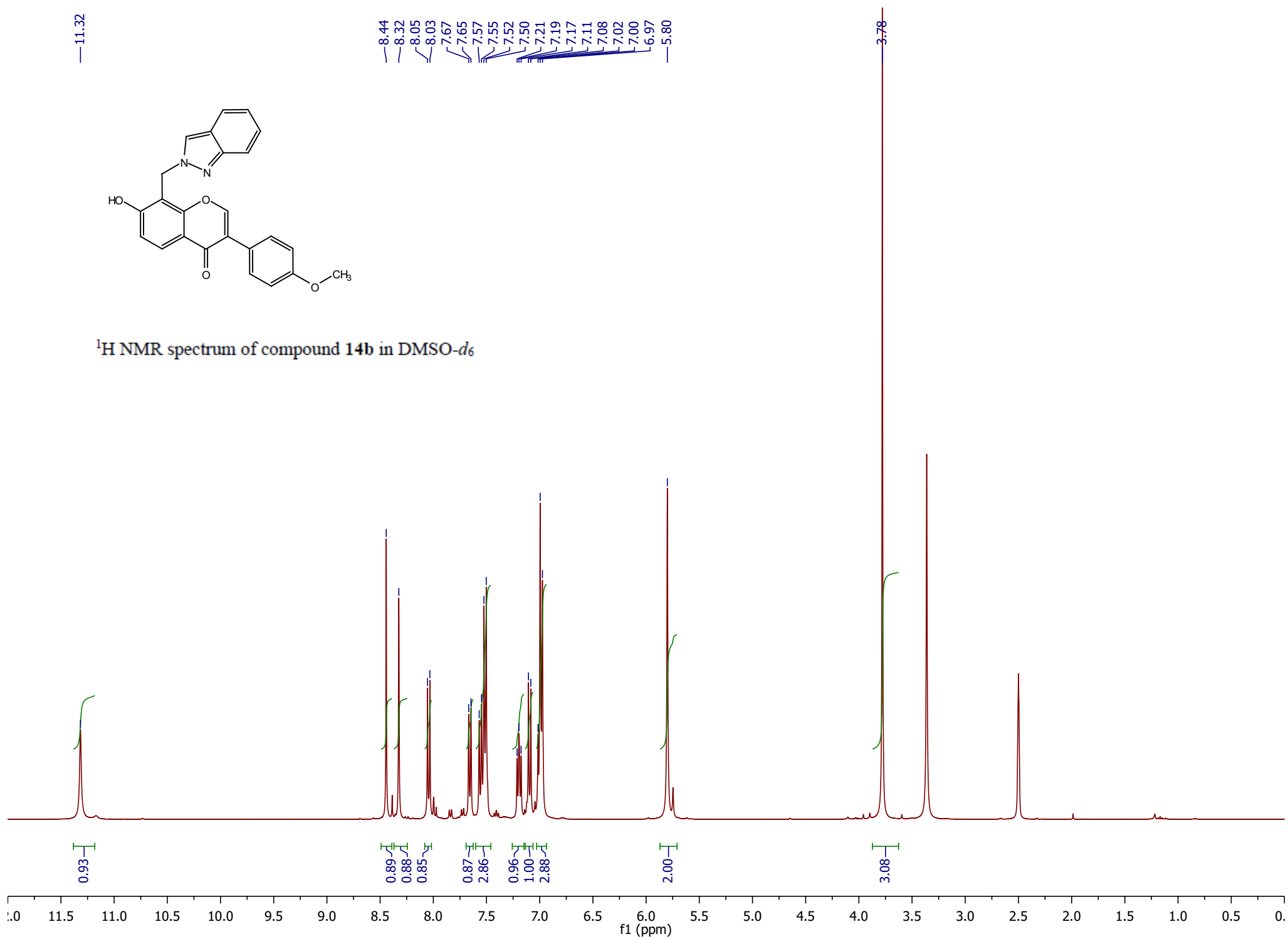


11.32

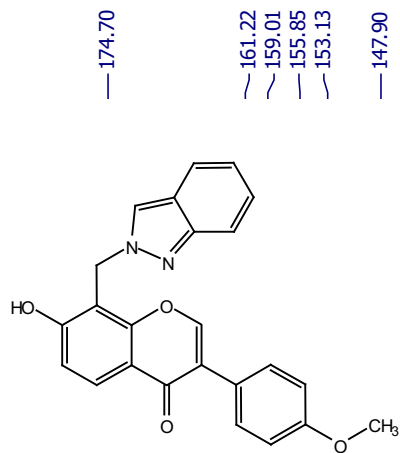
8.44
8.32
8.05
8.03
7.67
7.65
7.57
7.55
7.52
7.50
7.21
7.19
7.17
7.11
7.08
7.02
7.00
6.97
5.80



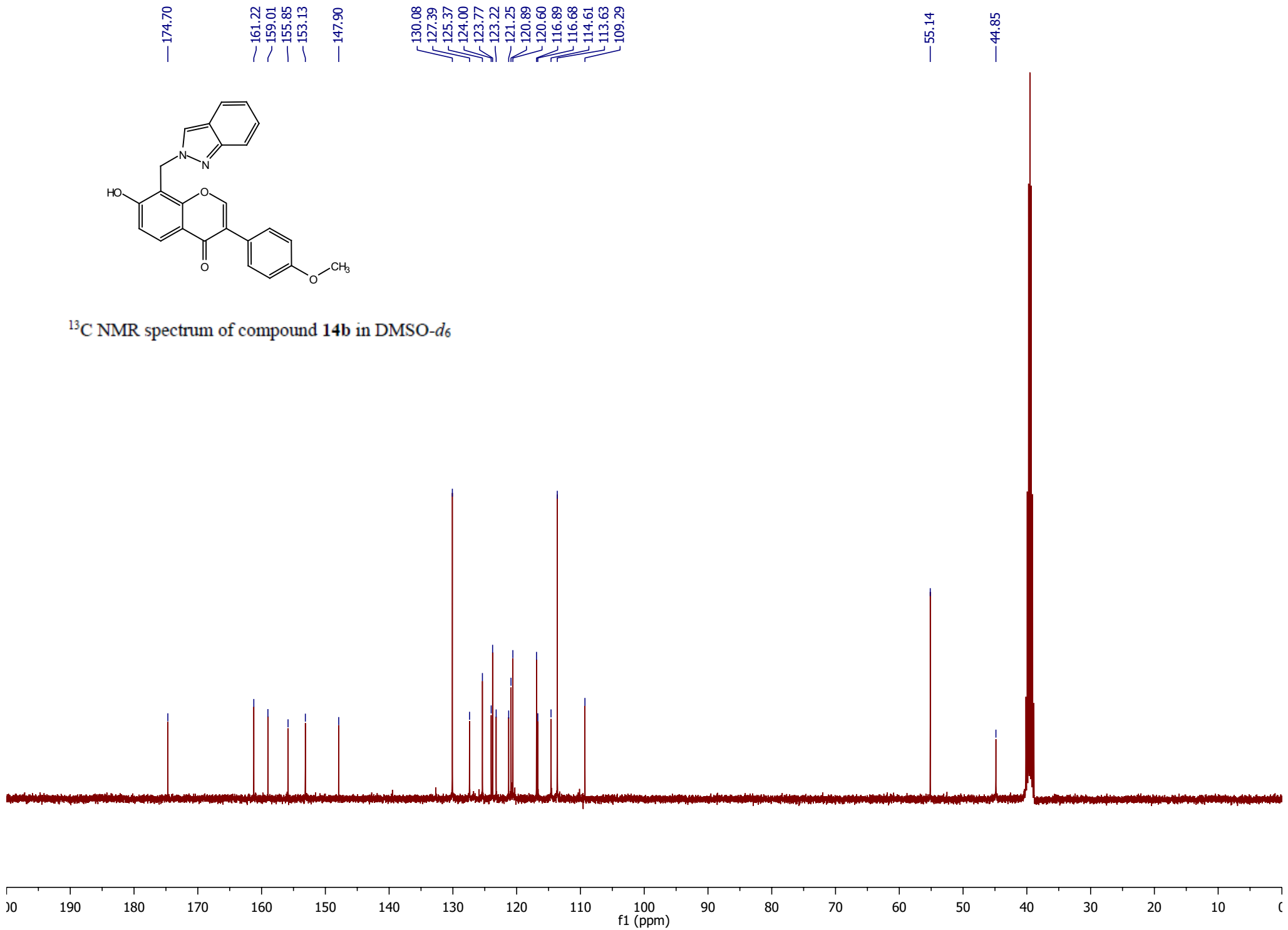
^1H NMR spectrum of compound **14b** in $\text{DMSO-}d_6$

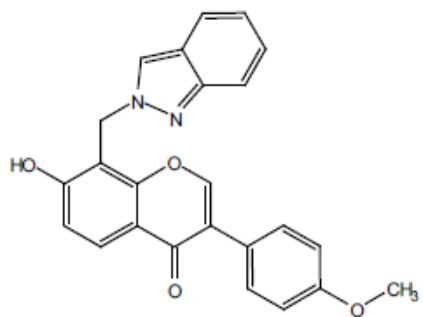


S135

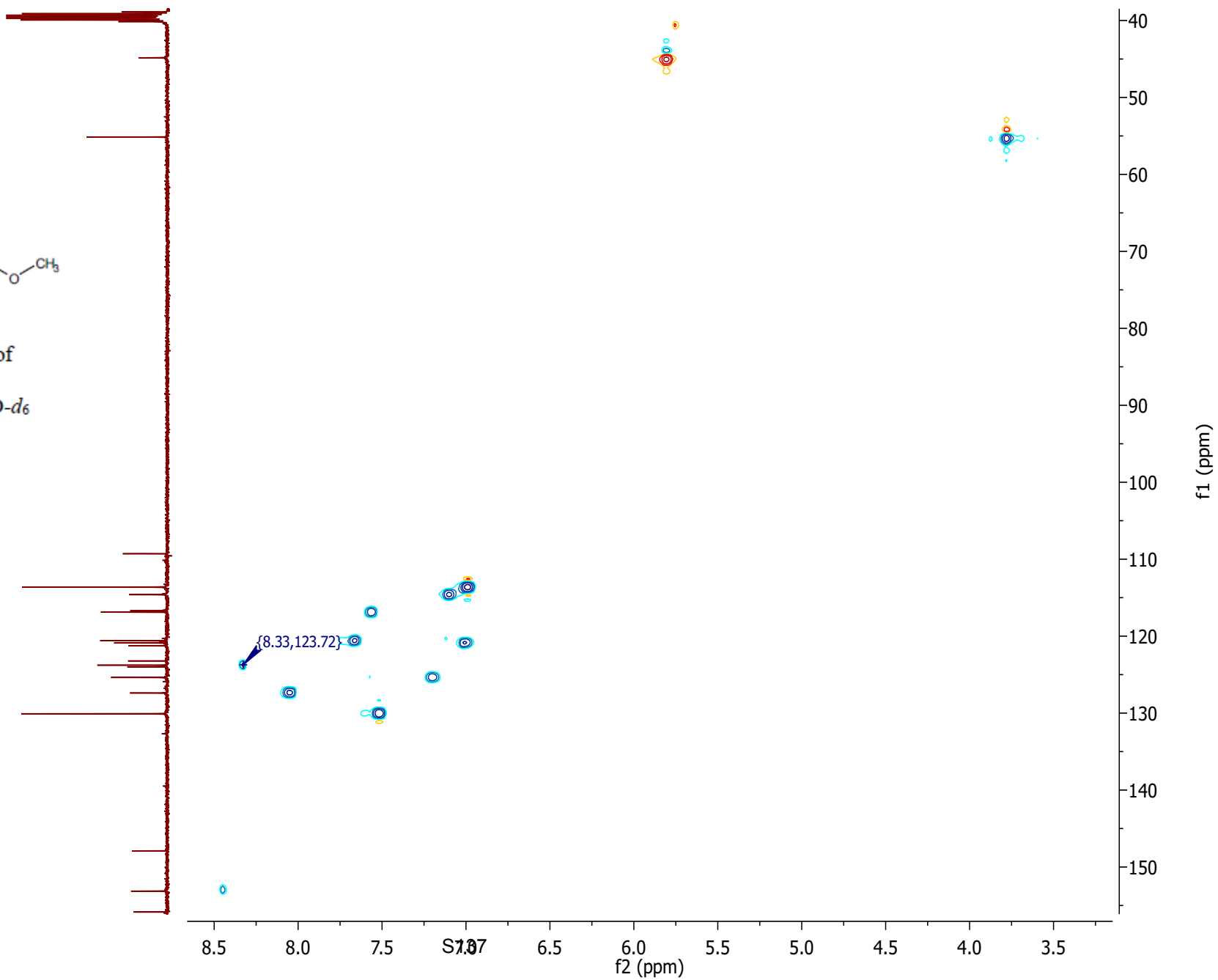


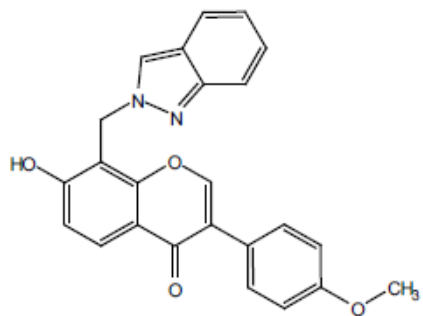
^{13}C NMR spectrum of compound **14b** in $\text{DMSO-}d_6$



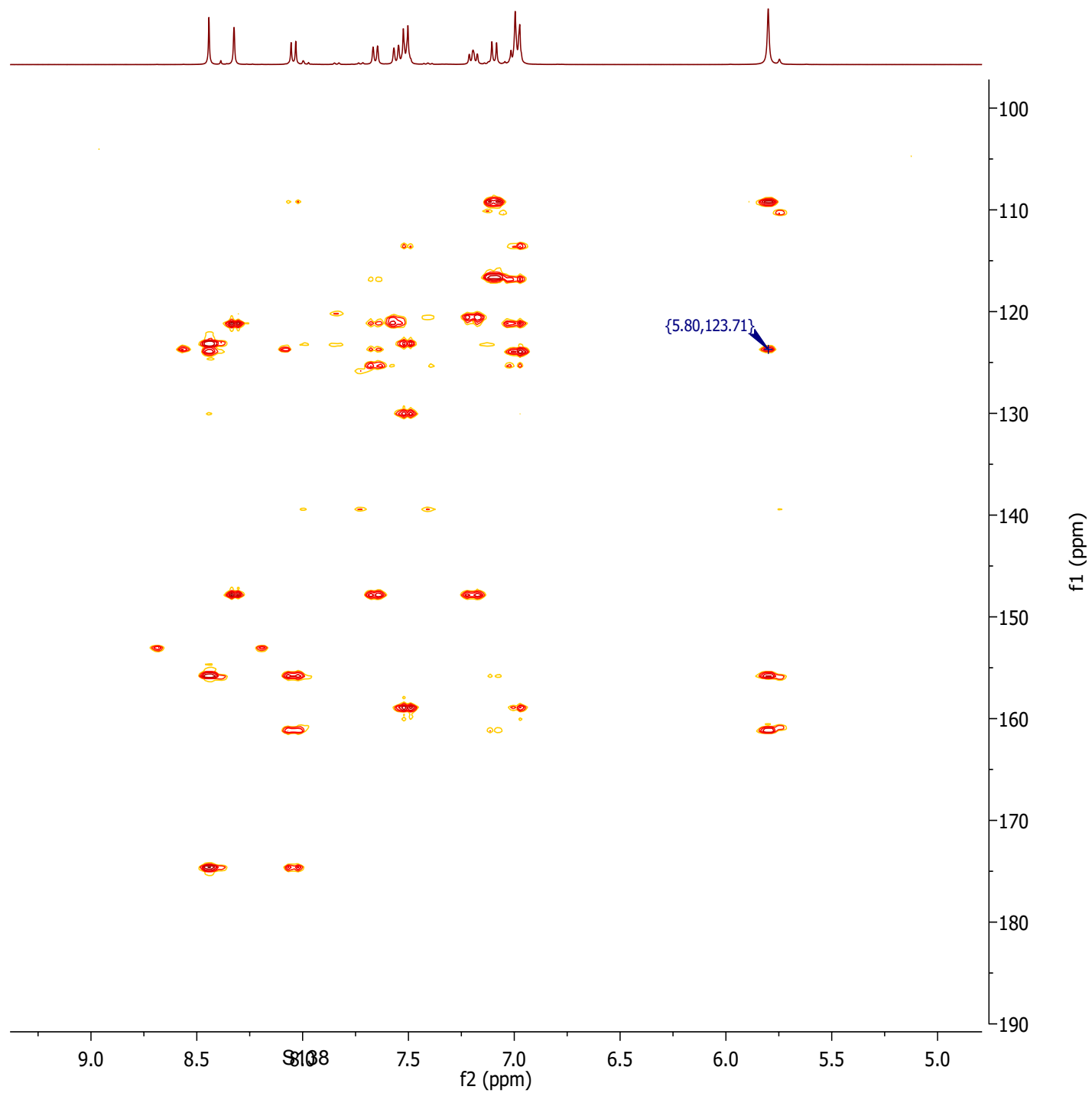


^1H - ^{13}C HSQC spectrum of
compound **14b** in $\text{DMSO-}d_6$



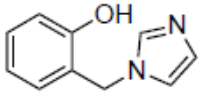
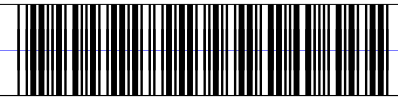


^1H - ^{13}C HMBC spectrum of
compound **14b** in $\text{DMSO-}d_6$



MaxPeak: 100.00%
Ret_Time: 0.656 min

IBOX17064



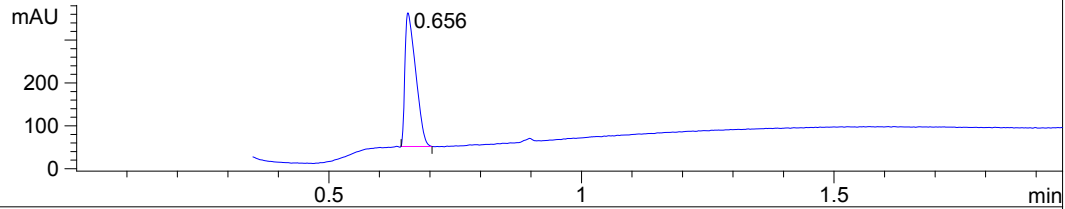
4a

Mol Wt 0

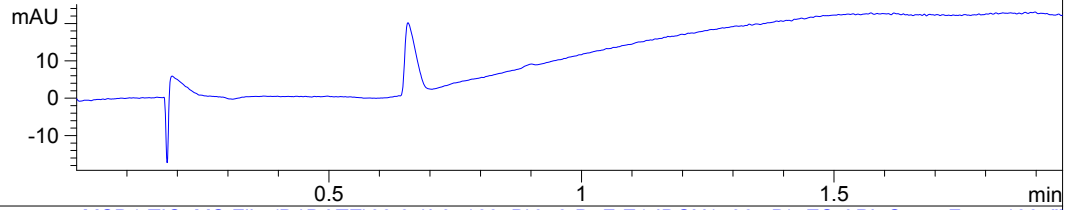
Exact Mass

#	Time	Area%
1	0.656	100.00

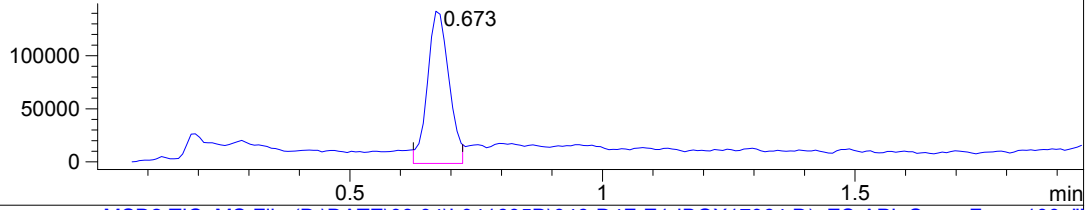
DAD1 A, Sig=215,16 Ref=off (D:\DATE\08.04\L041605D\046-D4F-E1-IBOX17064.D)



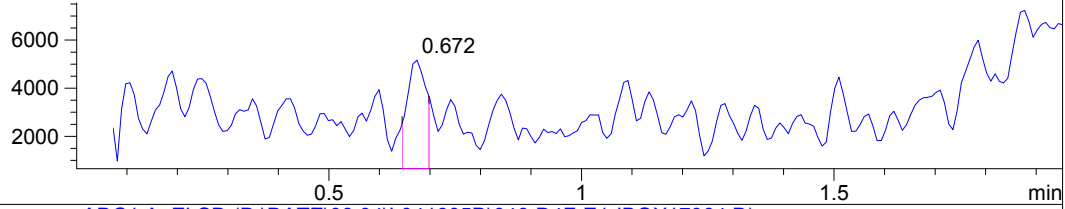
DAD1 B, Sig=254,16 Ref=off (D:\DATE\08.04\L041605D\046-D4F-E1-IBOX17064.D)



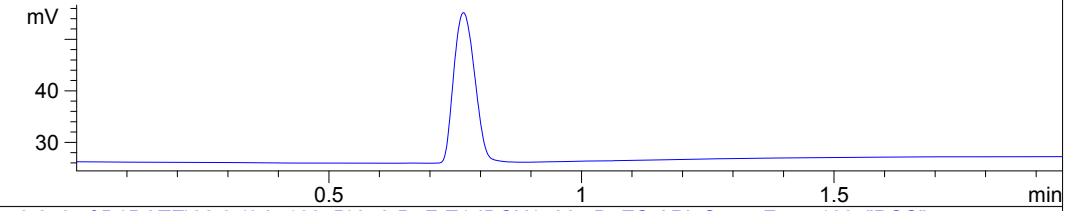
MSD1 TIC, MS File (D:\DATE\08.04\L041605D\046-D4F-E1-IBOX17064.D) ES-API, Scan, Frag: 100, "POS"



MSD2 TIC, MS File (D:\DATE\08.04\L041605D\046-D4F-E1-IBOX17064.D) ES-API, Scan, Frag: 100, "NEG"

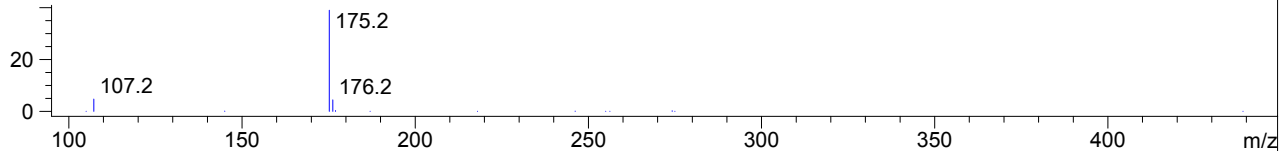


ADC1 A, ELSD (D:\DATE\08.04\L041605D\046-D4F-E1-IBOX17064.D)



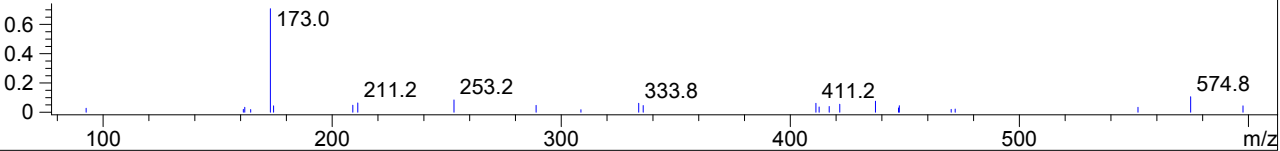
*MSD1 SPC, time=0.670 of D:\DATE\08.04\L041605D\046-D4F-E1-IBOX17064.D ES-API, Scan, Frag: 100, "POS"

RT 0.673



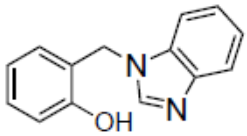
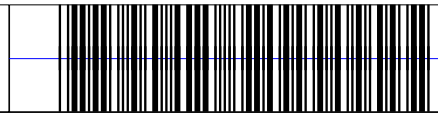
*MSD2 SPC, time=0.674 of D:\DATE\08.04\L041605D\046-D4F-E1-IBOX17064.D ES-API, Scan, Frag: 100, "NEG"

RT 0.672



MaxPeak: 98.97%
Ret_Time: 0.550 min

CLQ379824

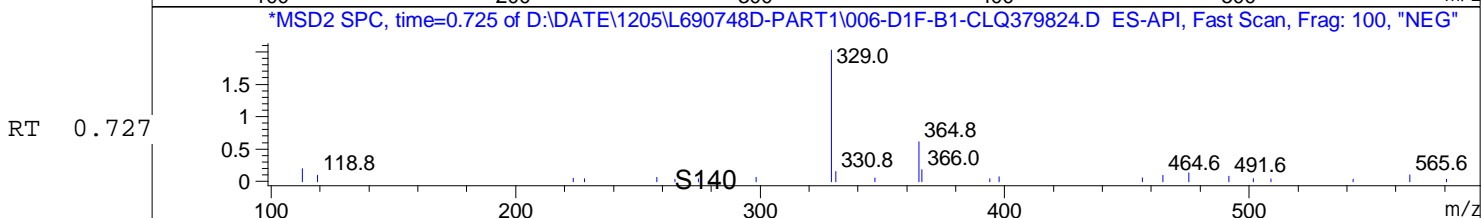
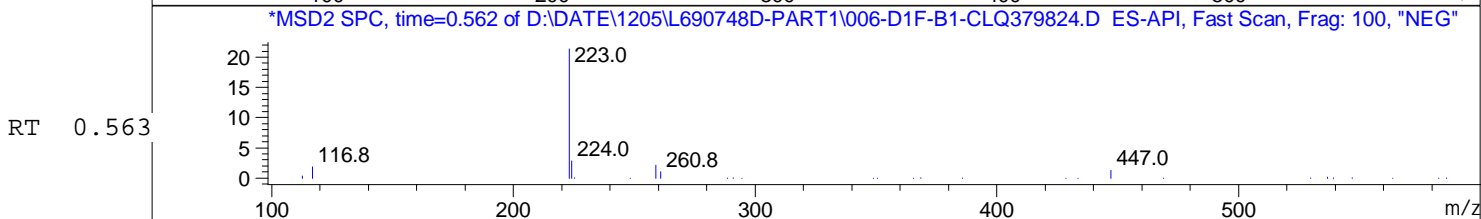
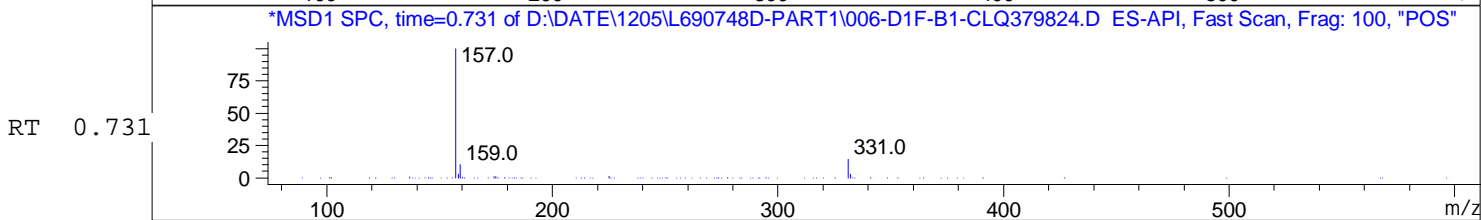
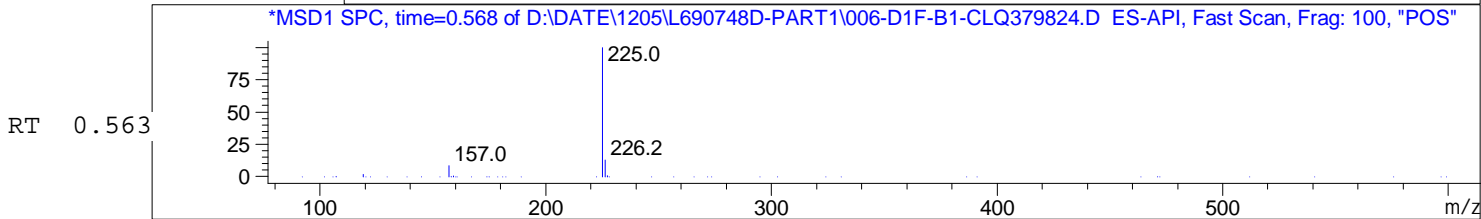
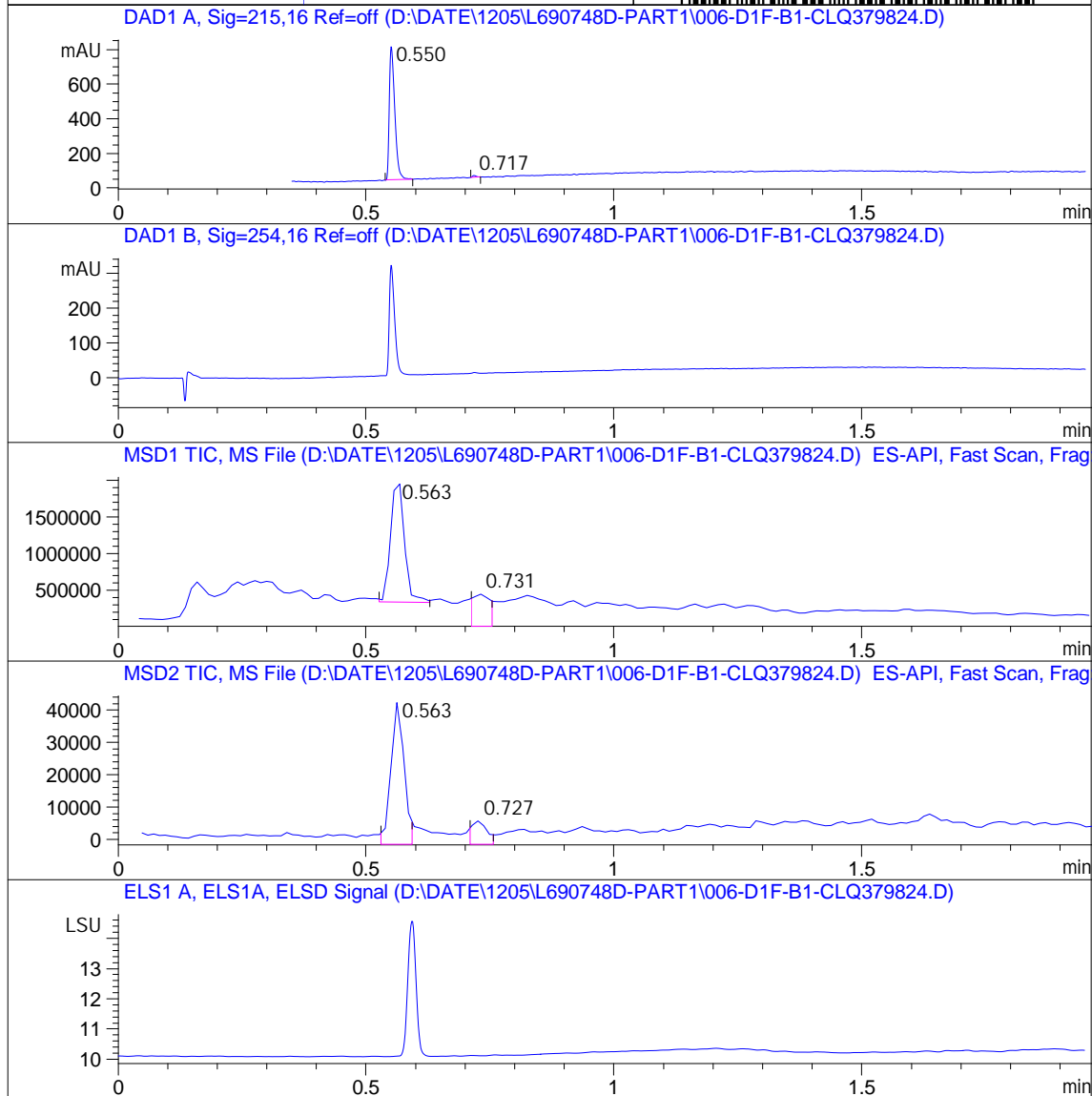


4b

Mol Wt
Exact Mass

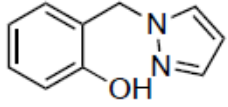
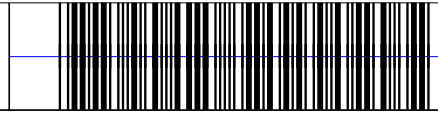
0

#	Time	Area%
1	0.550	98.97
2	0.717	1.03



MaxPeak: 100.00%
Ret_Time: 0.777 min

CLQ379825

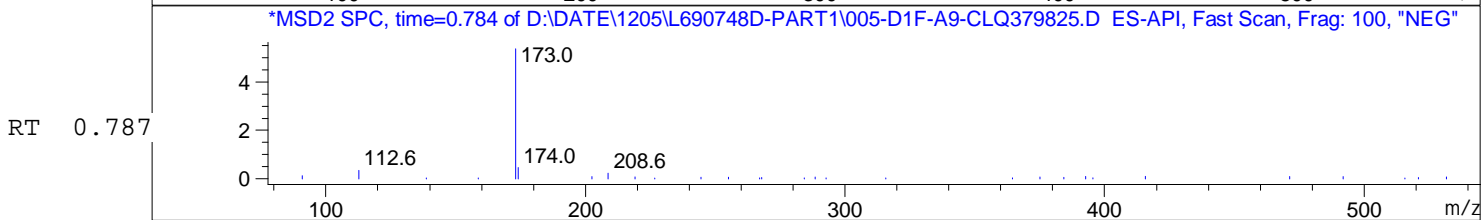
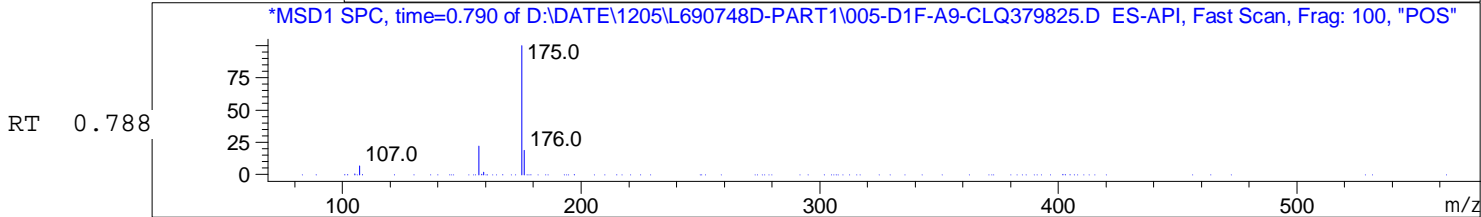
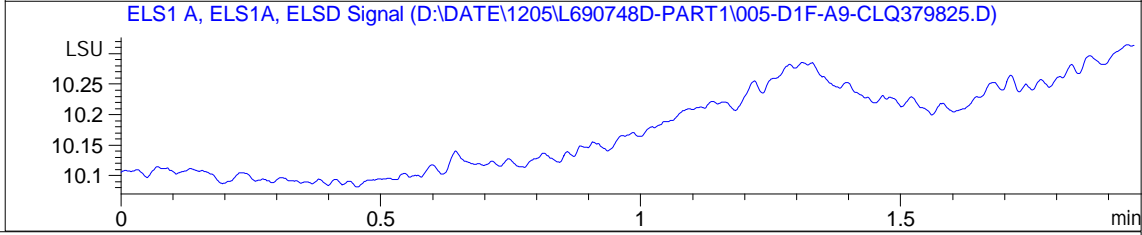
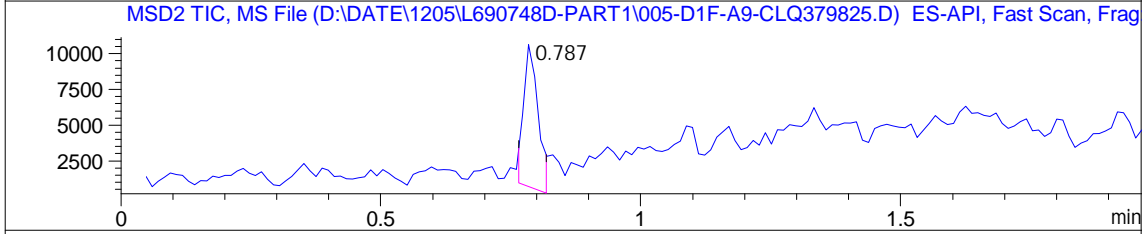
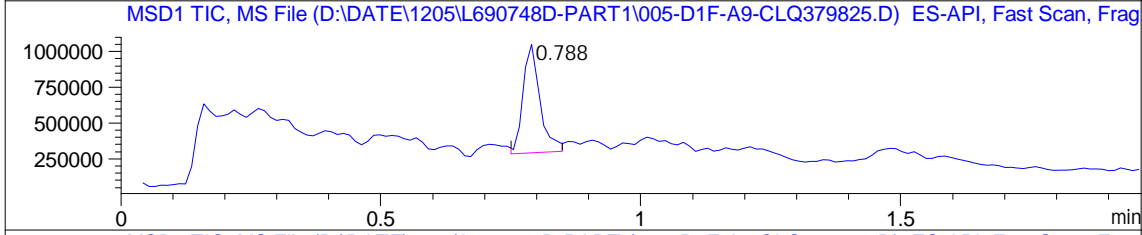
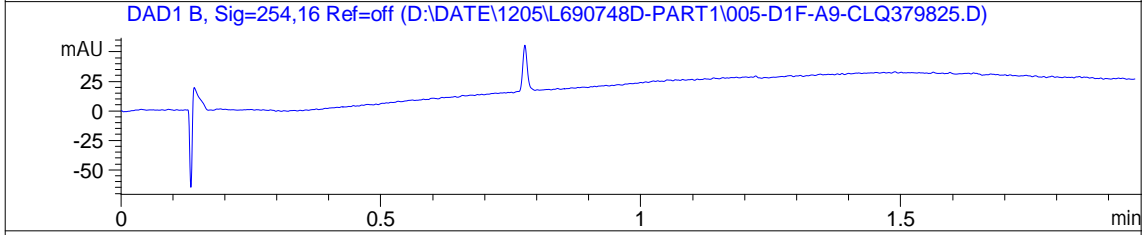
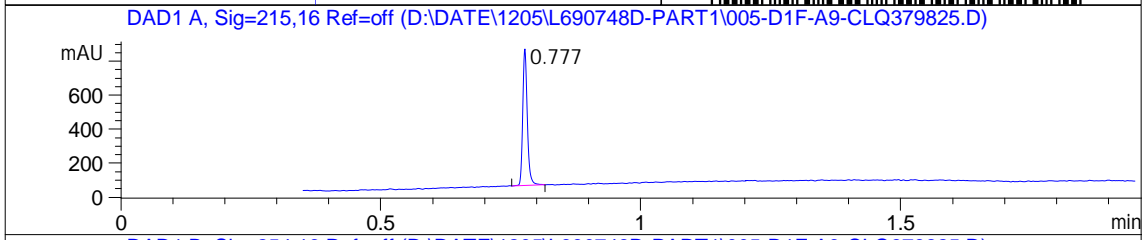


4c

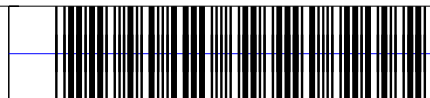
Mol Wt
Exact Mass

0

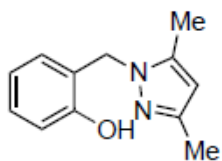
#	Time	Area%
1	0.777	100.00



CLQ377579

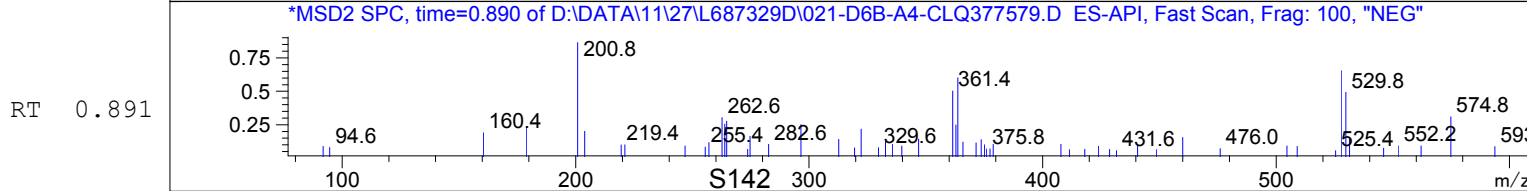
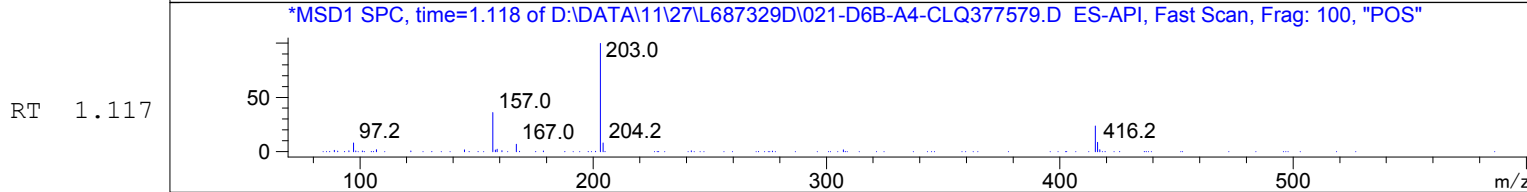
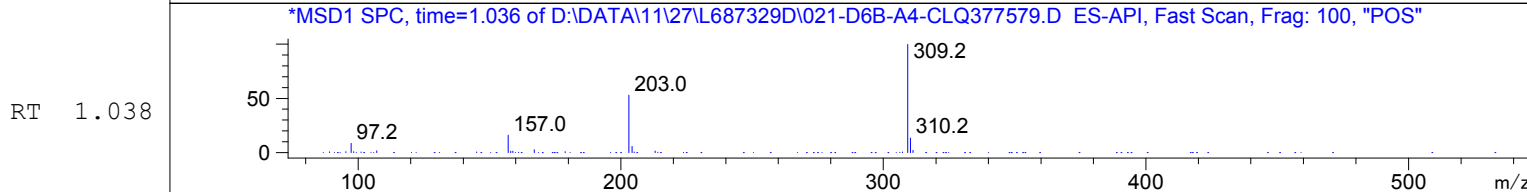
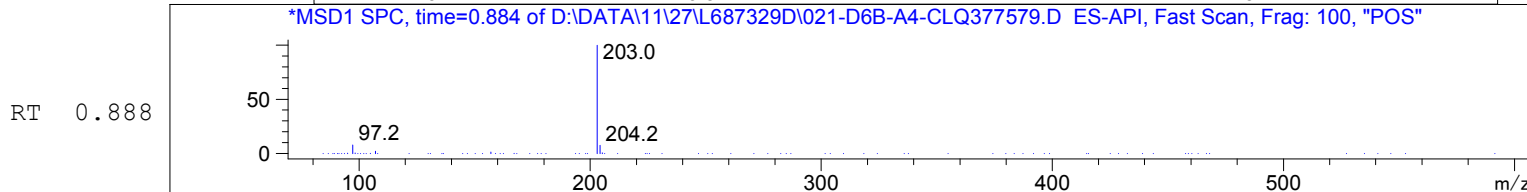
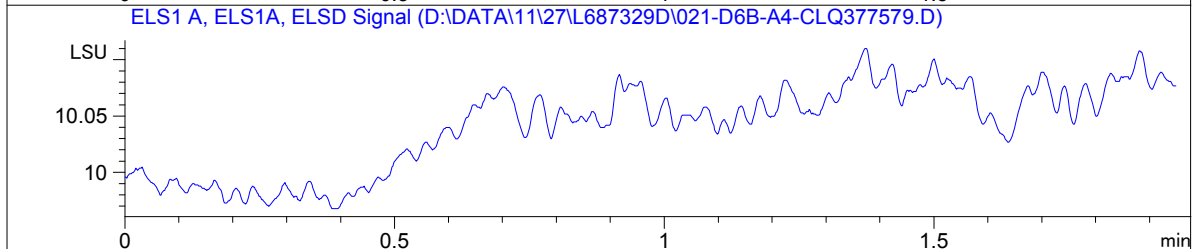
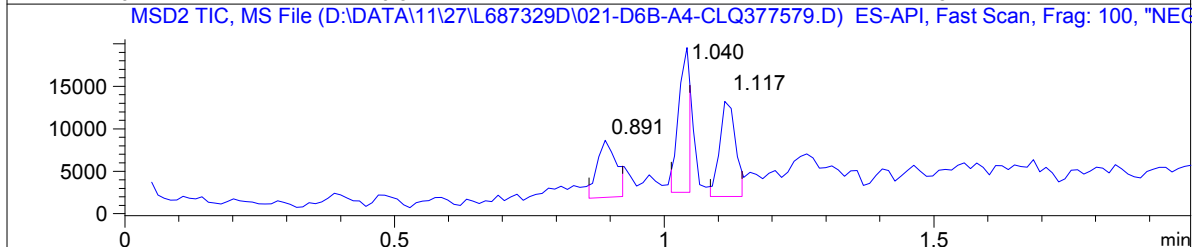
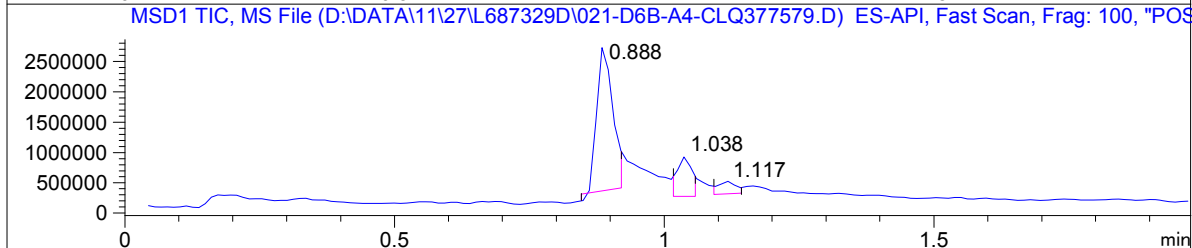
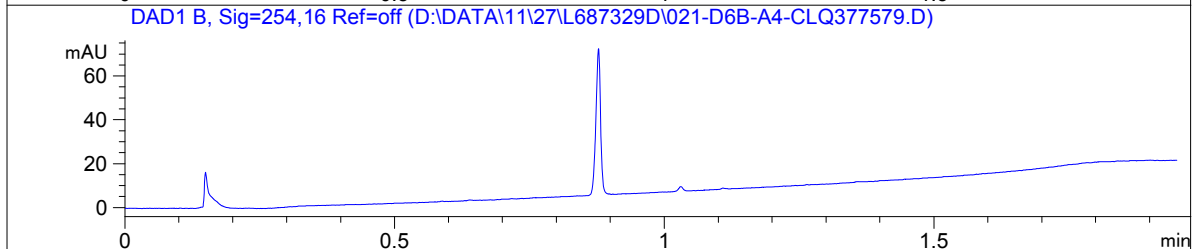
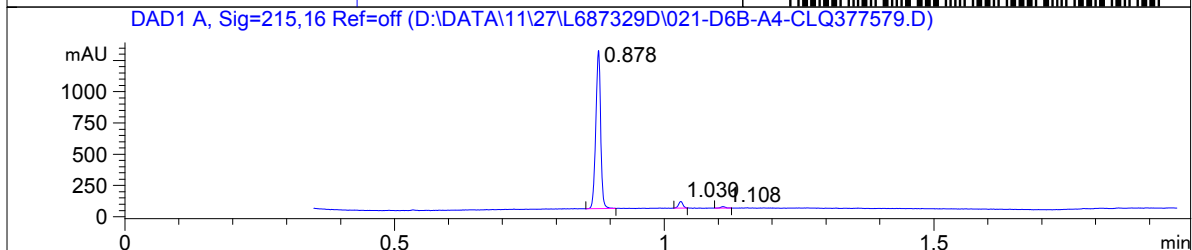


MaxPeak: 95.28%
Ret_Time: 0.878 min



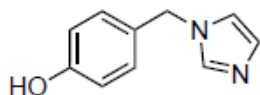
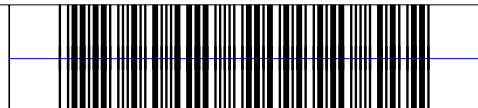
Mol Wt
Exact Mass

#	Time	Area%
1	0.878	95.28
2	1.030	3.66
3	1.108	1.06



Error: Peaks not found!

CLQ379834

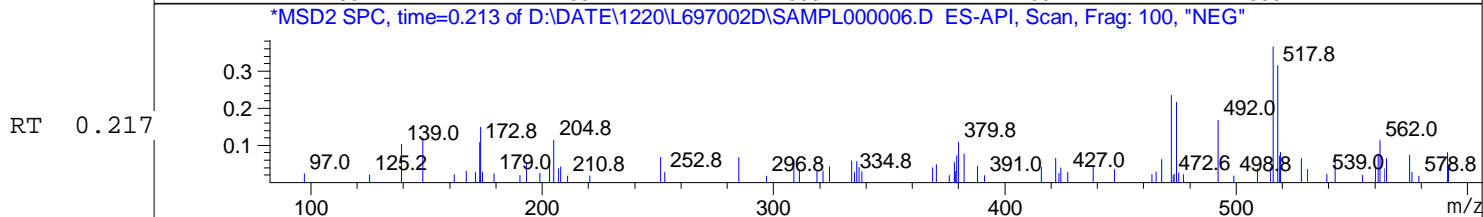
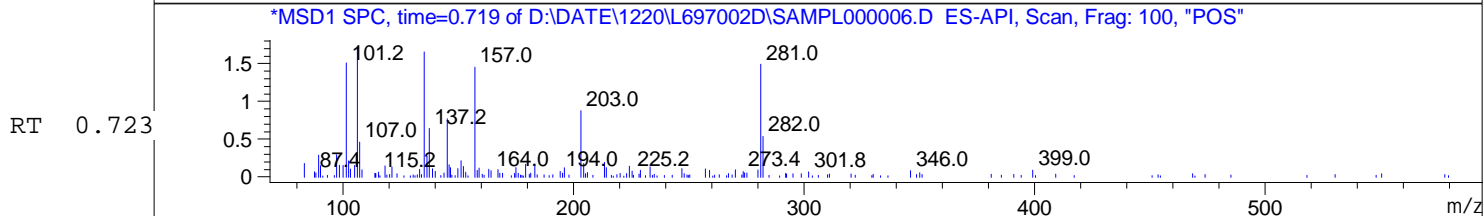
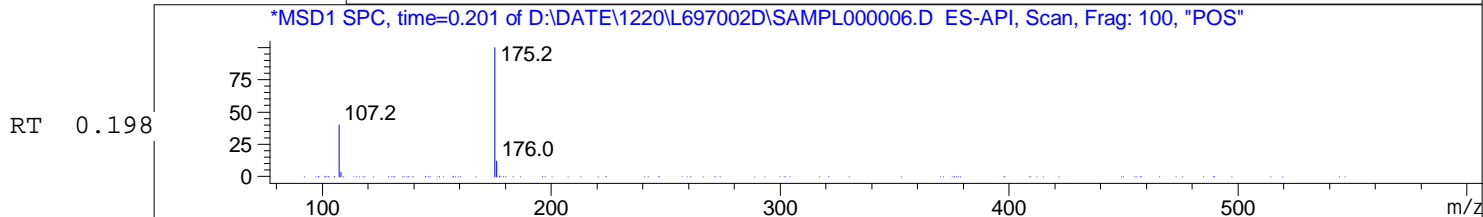
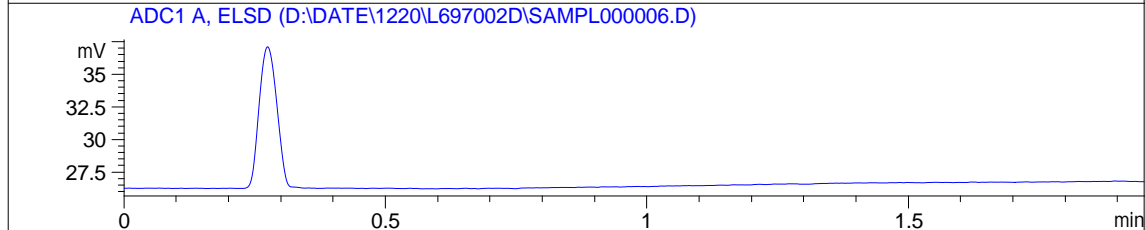
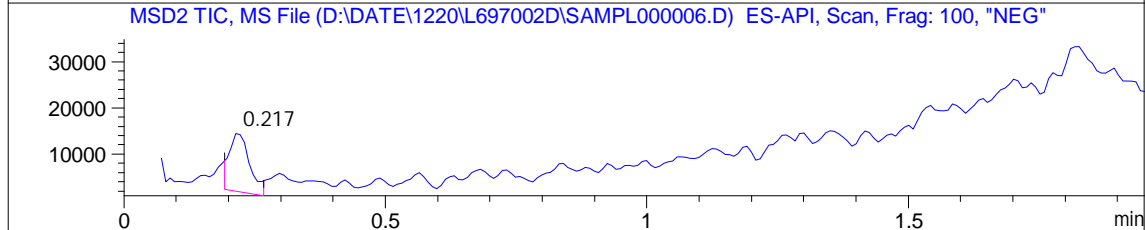
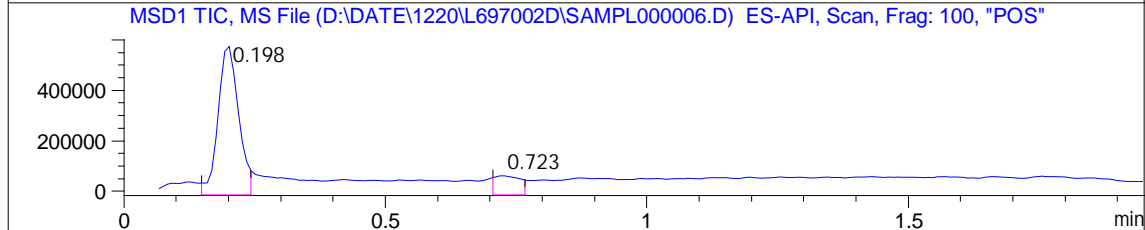
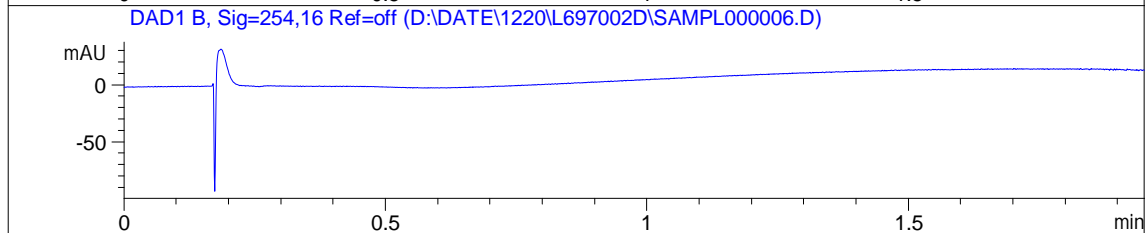
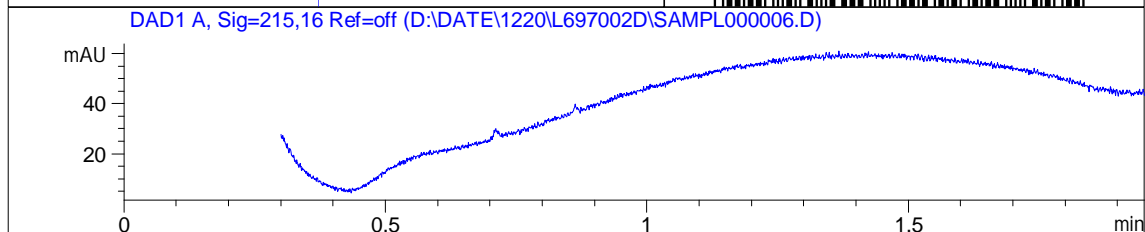


5a

Mol Wt
Exact Mass

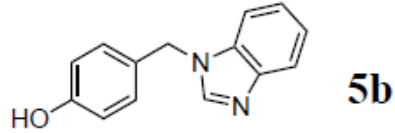
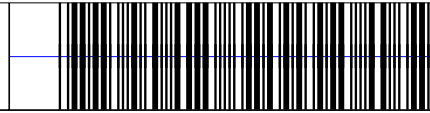
0

Error: Peaks not found!



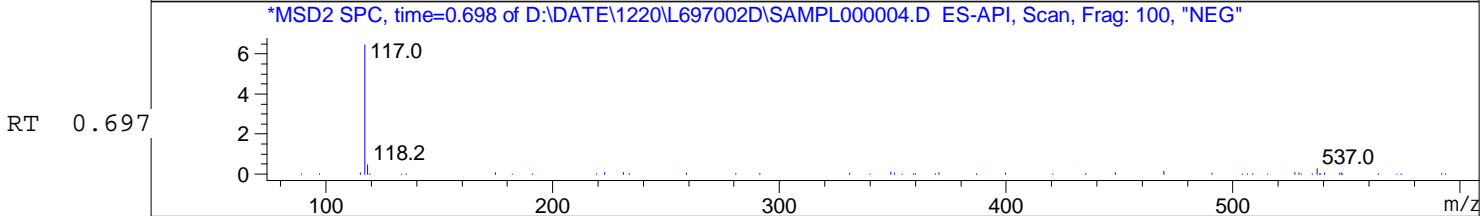
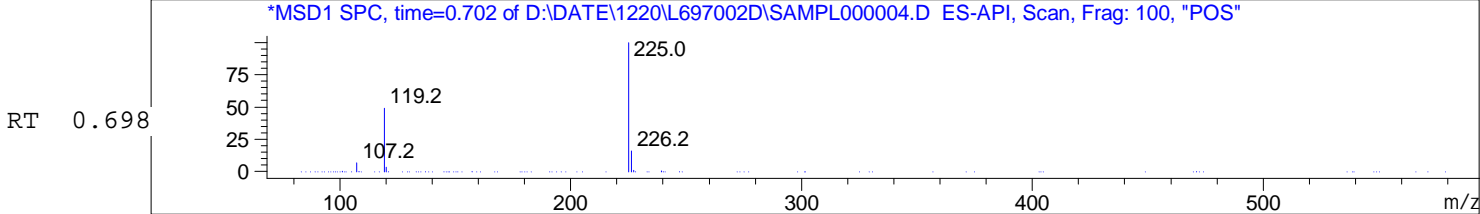
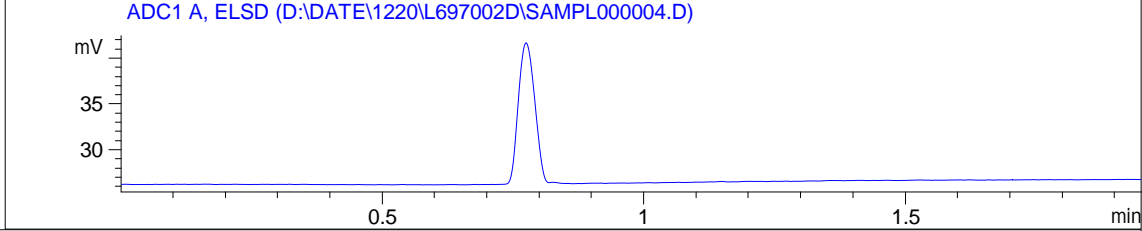
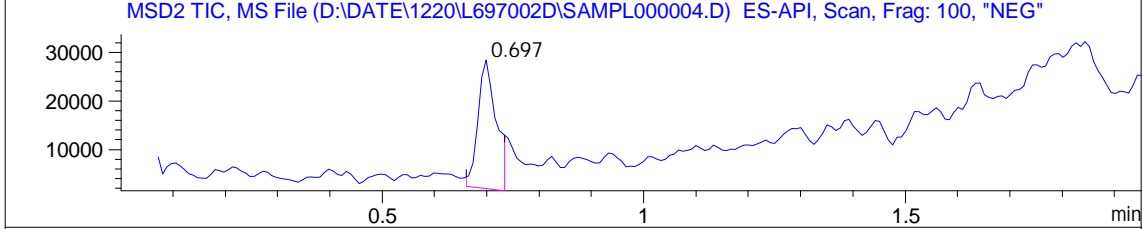
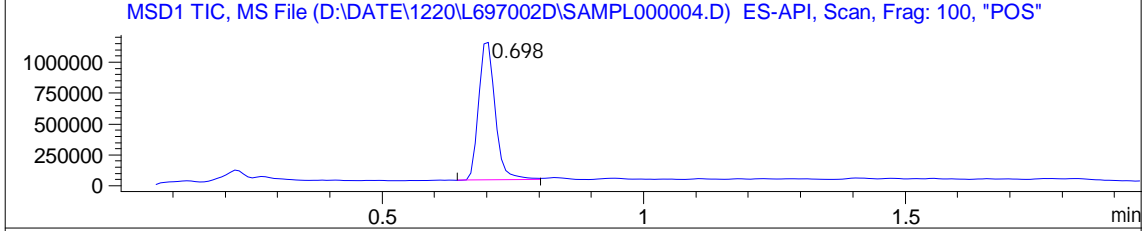
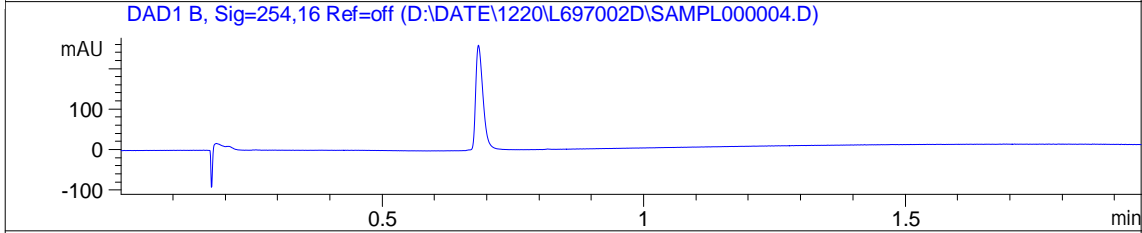
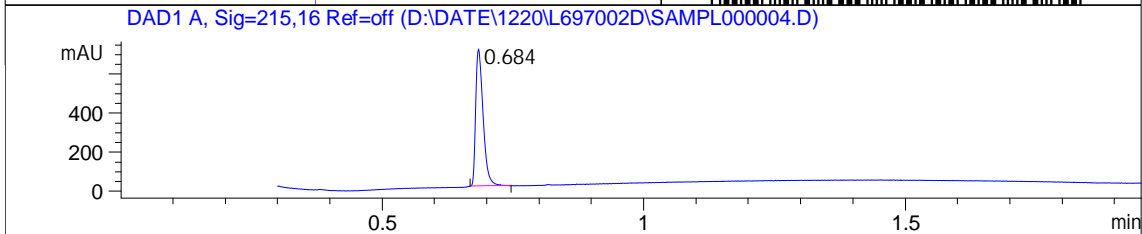
MaxPeak: 100.00%
Ret_Time: 0.684 min

CLQ379836



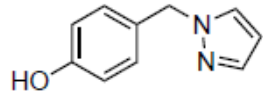
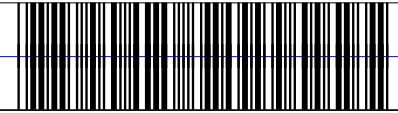
Mol Wt
Exact Mass

#	Time	Area%
1	0.684	100.00

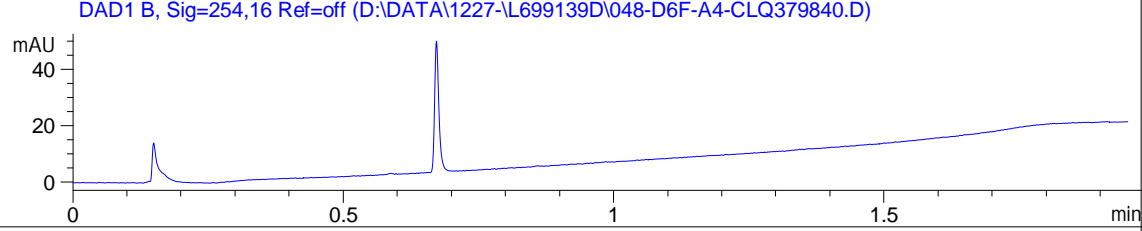
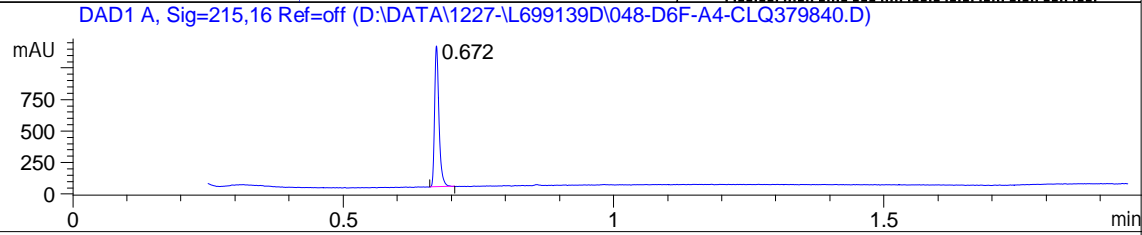


MaxPeak: 100.00%
Ret_Time: 0.672 min

CLQ379840



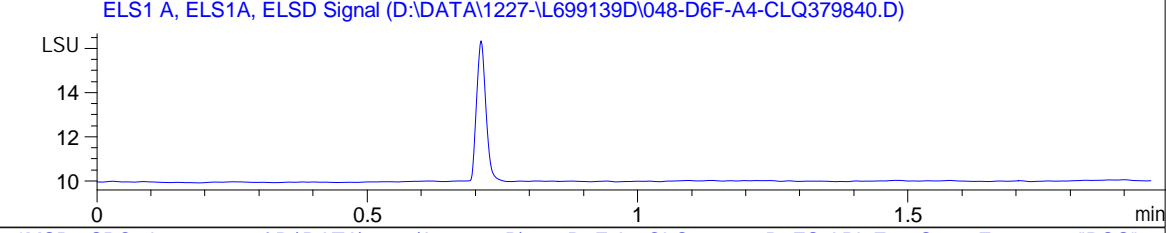
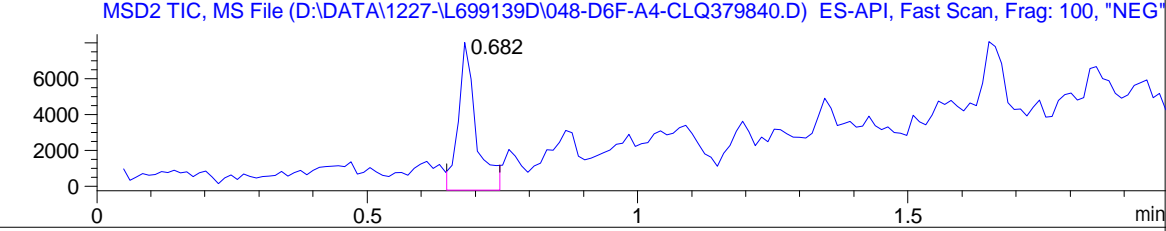
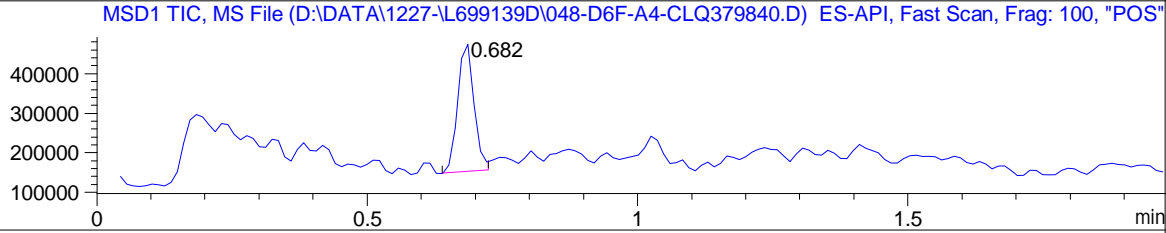
5c



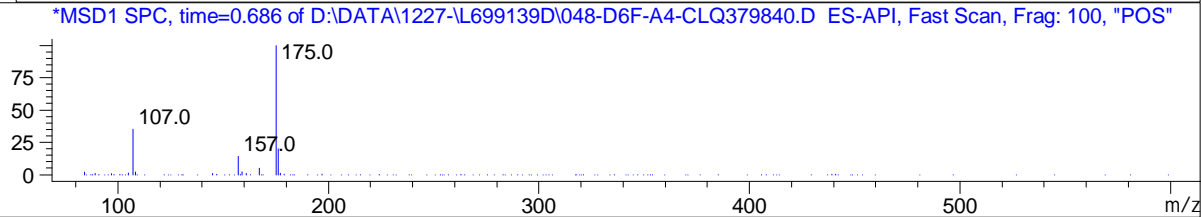
Mol Wt
Exact Mass

#	Time	Area%
1	0.672	100.00

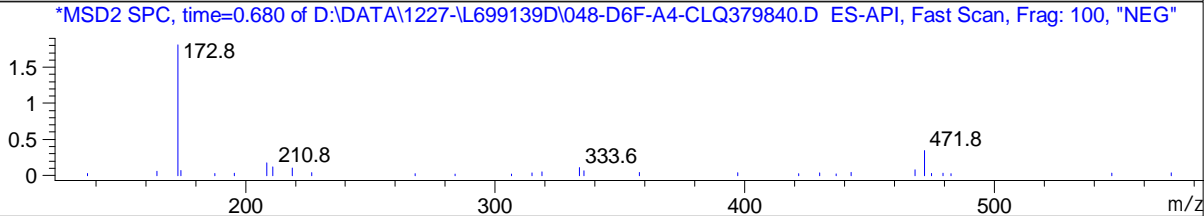
0



RT 0.682

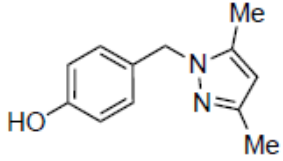
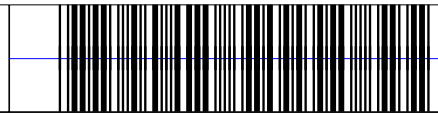


RT 0.682



MaxPeak: 97.13%
Ret_Time: 0.937 min

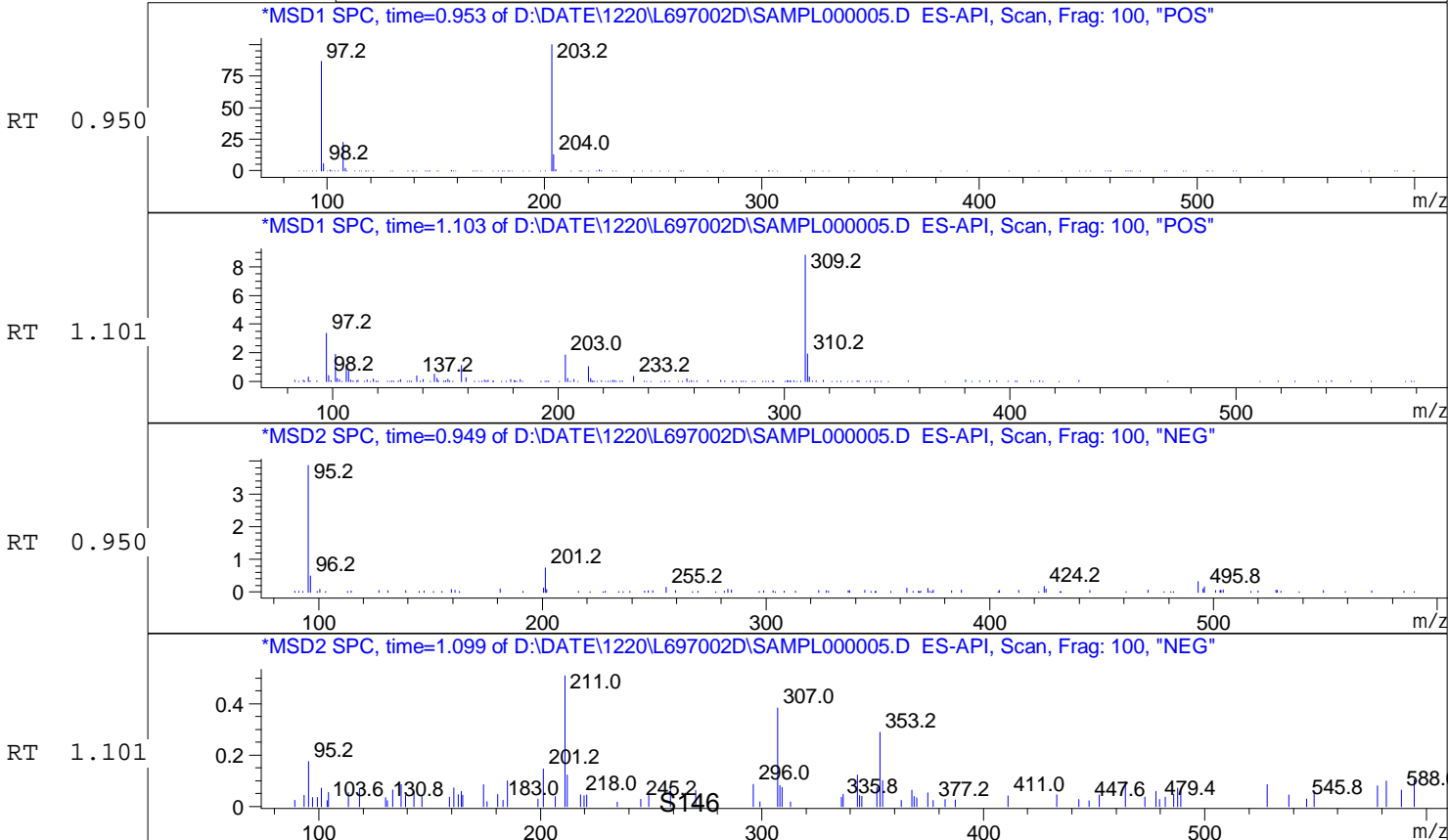
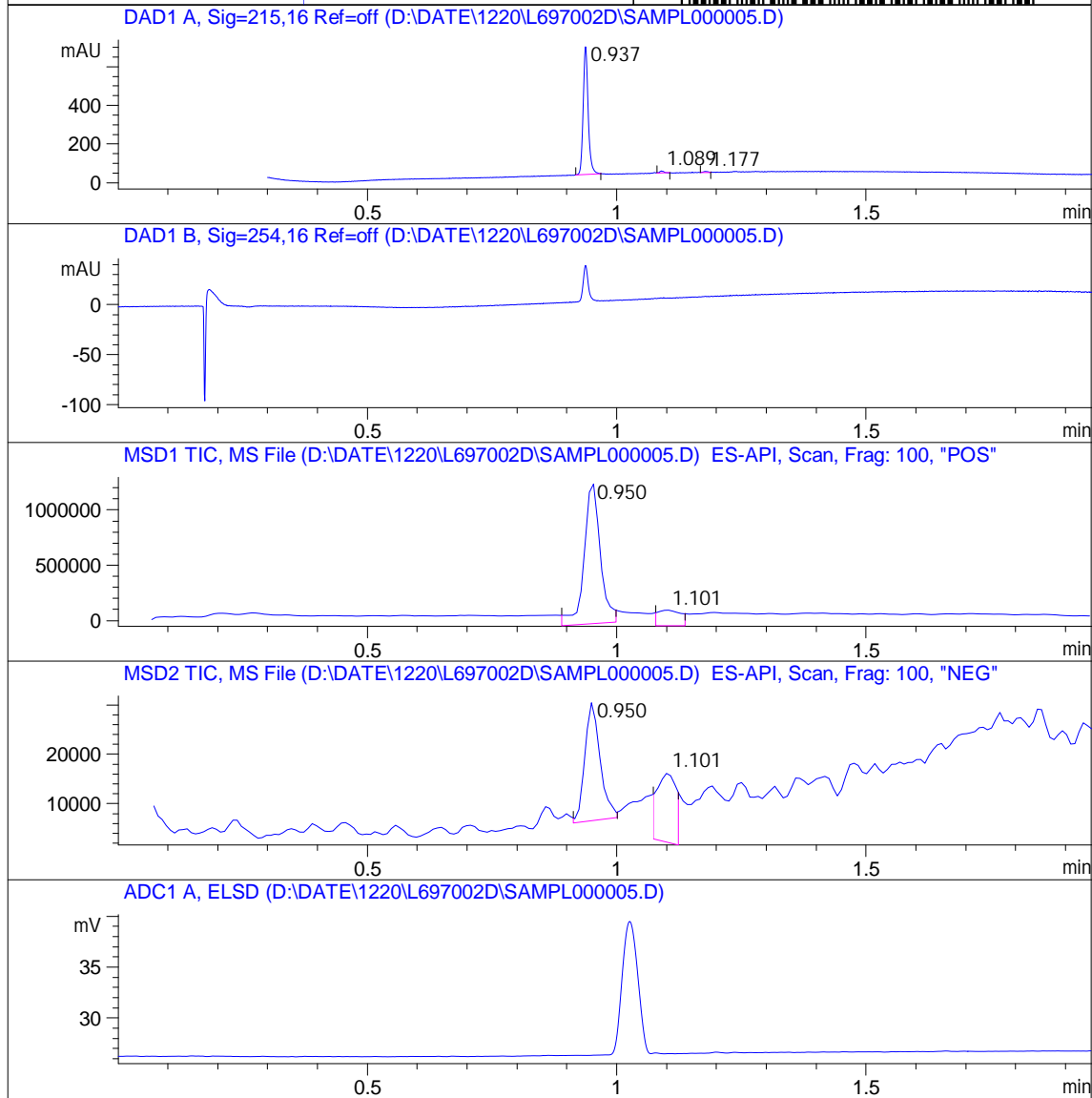
CLQ379837



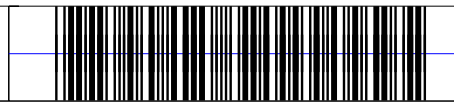
0

Mol Wt
Exact Mass

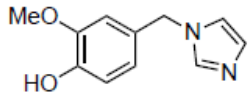
#	Time	Area%
1	0.937	97.13
2	1.089	1.62
3	1.177	1.25



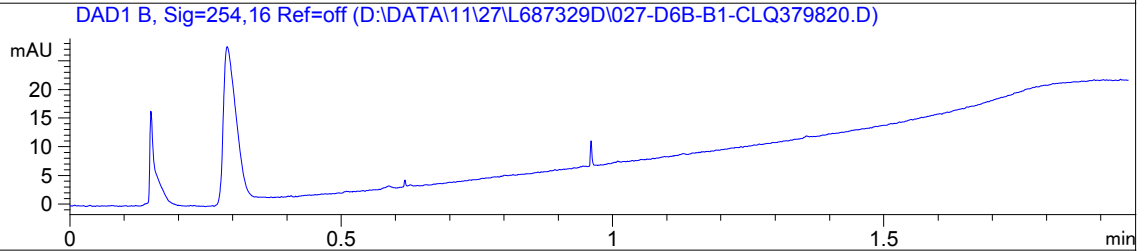
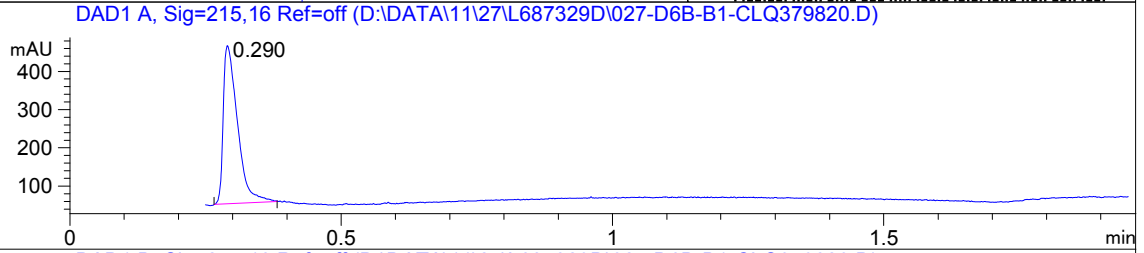
CLQ379820



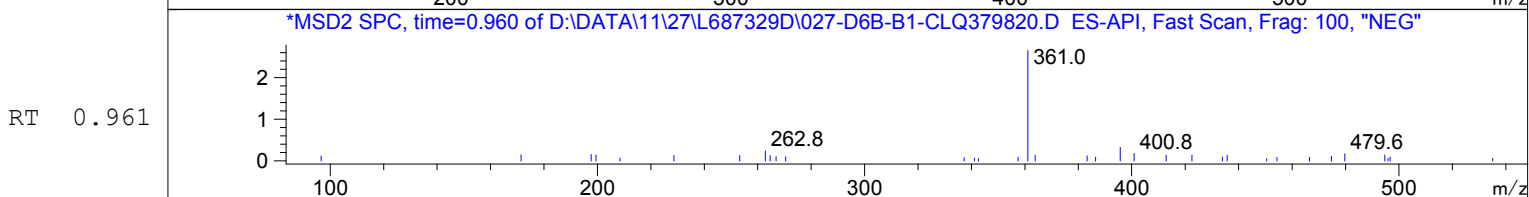
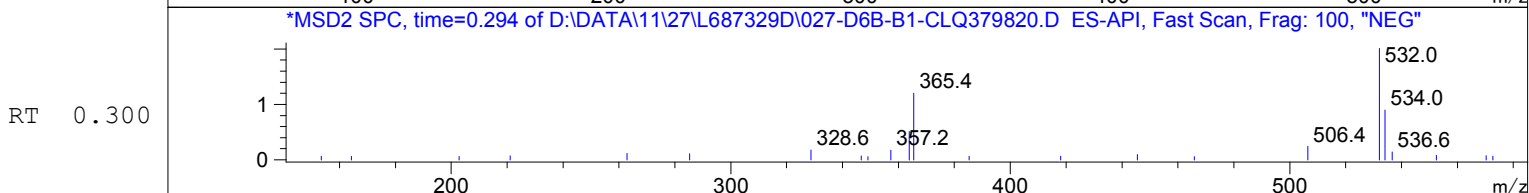
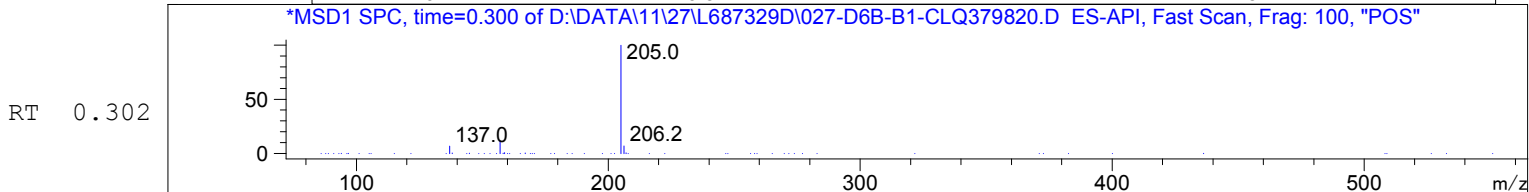
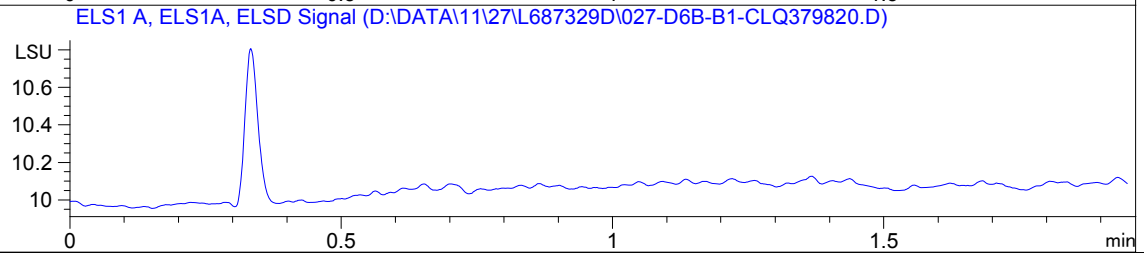
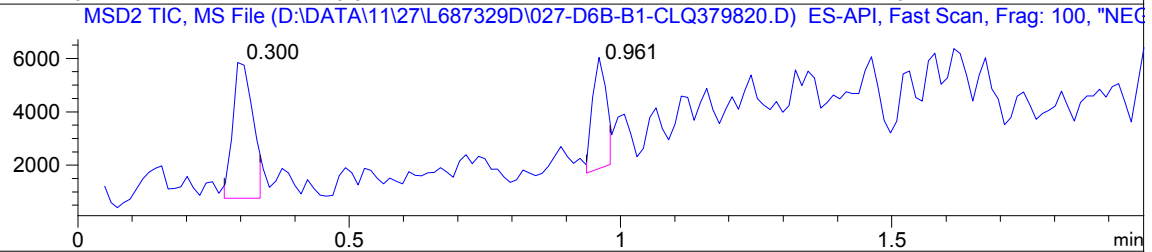
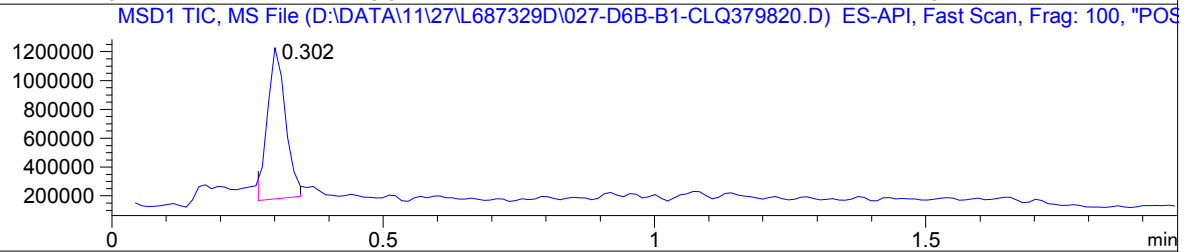
MaxPeak: 100.00%
Ret_Time: 0.290 min



5e

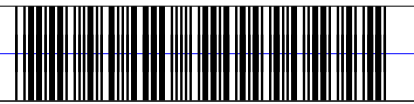


#	Time	Area%
1	0.290	100.00

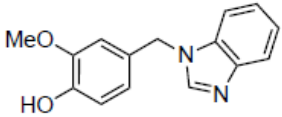


S147

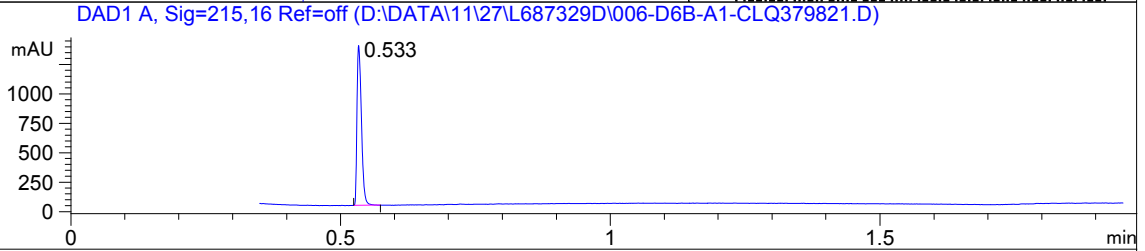
CLQ379821



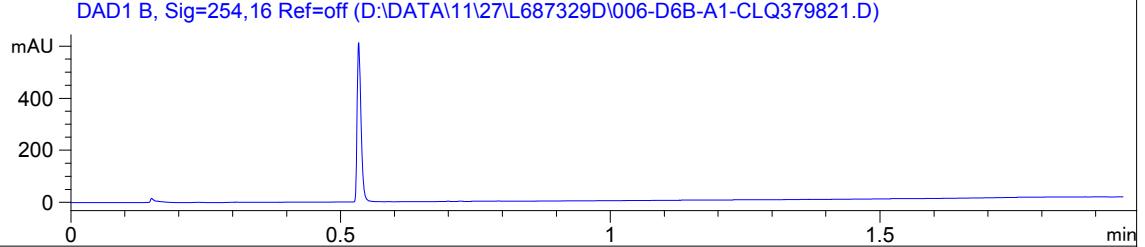
MaxPeak: 100.00%
Ret_Time: 0.533 min



5f

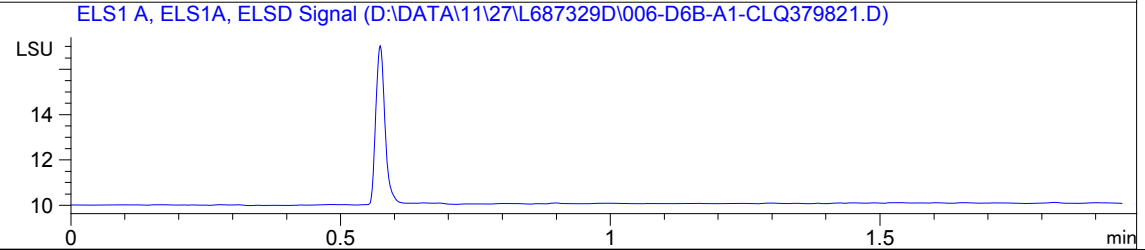
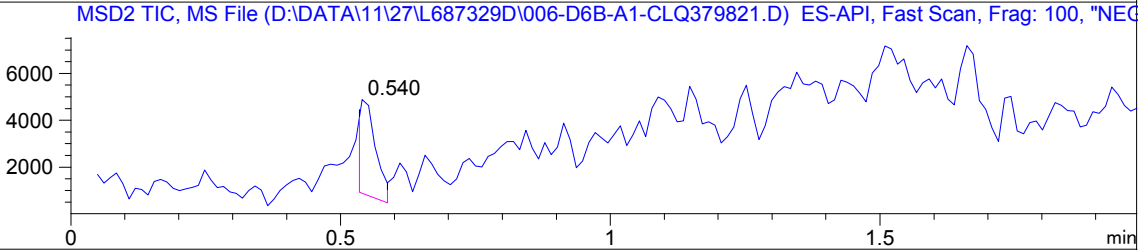
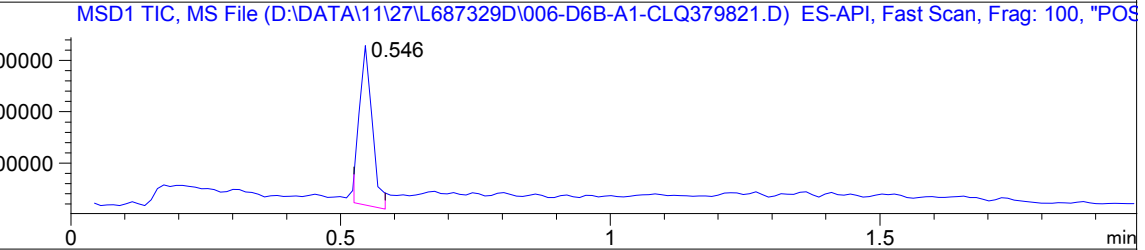


0

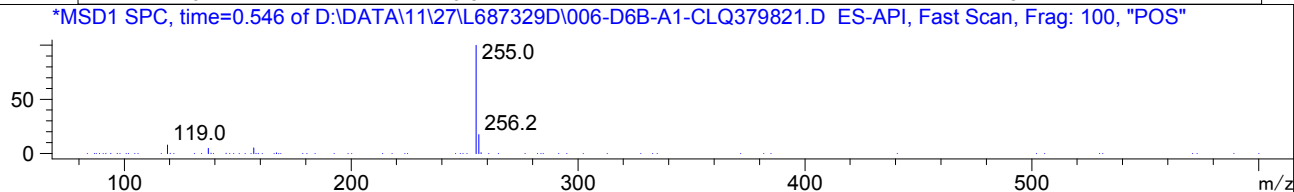


Mol Wt
Exact Mass

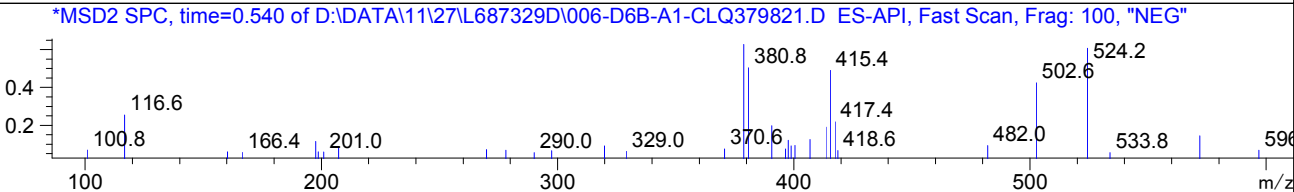
#	Time	Area%
1	0.533	100.00



RT 0.546

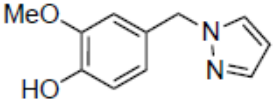
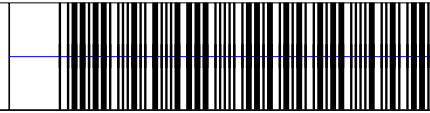


RT 0.540



MaxPeak: 100.00%
Ret_Time: 0.916 min

CLQ379832

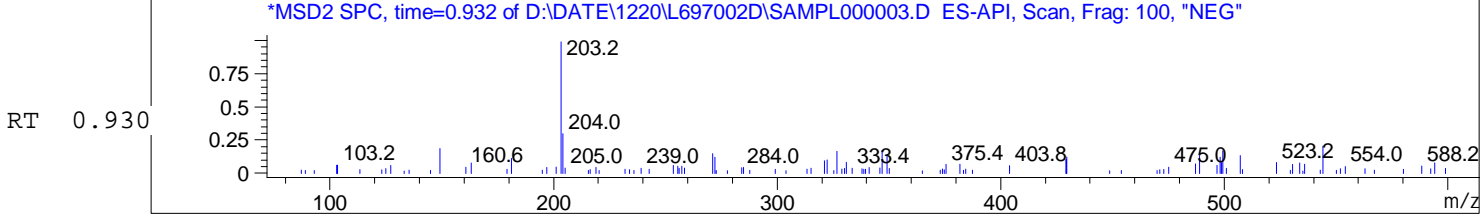
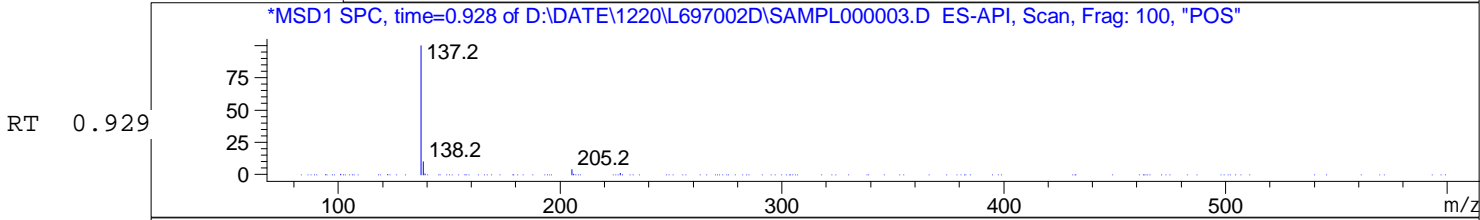
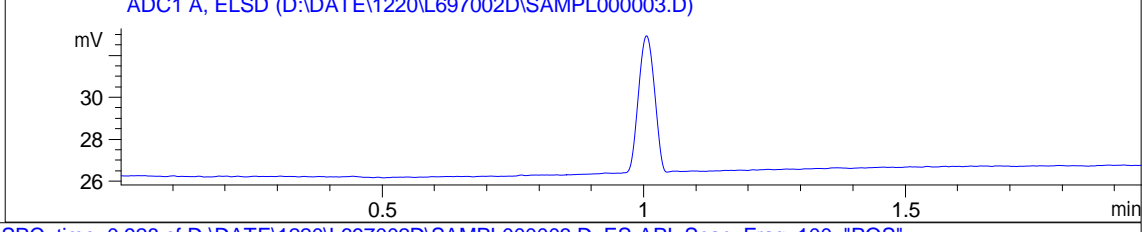
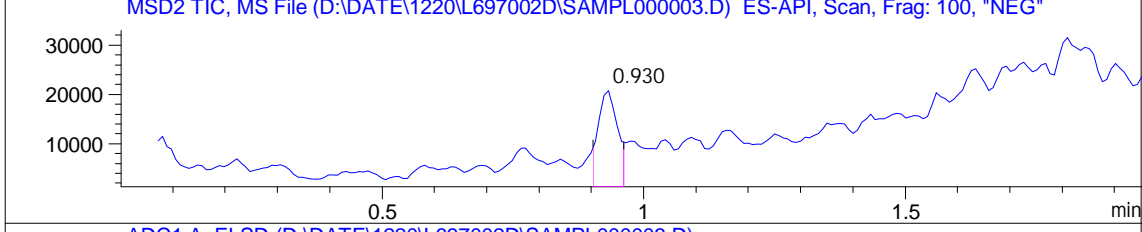
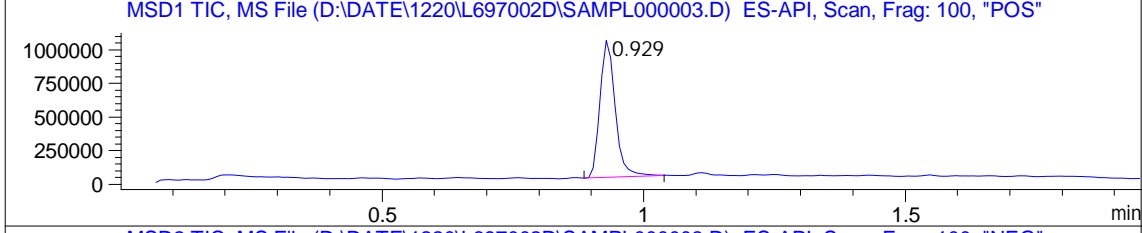
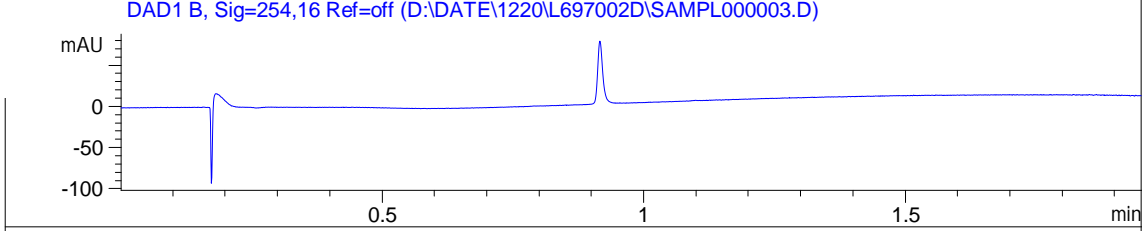
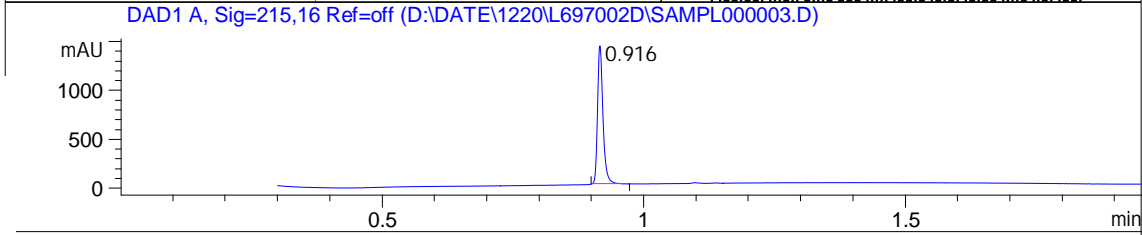


5g

Mol Wt
Exact Mass

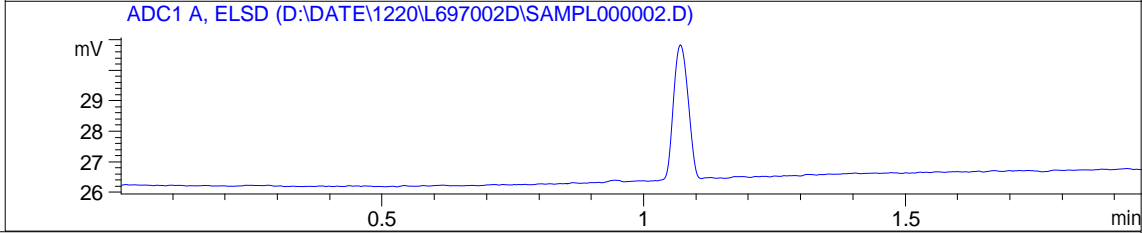
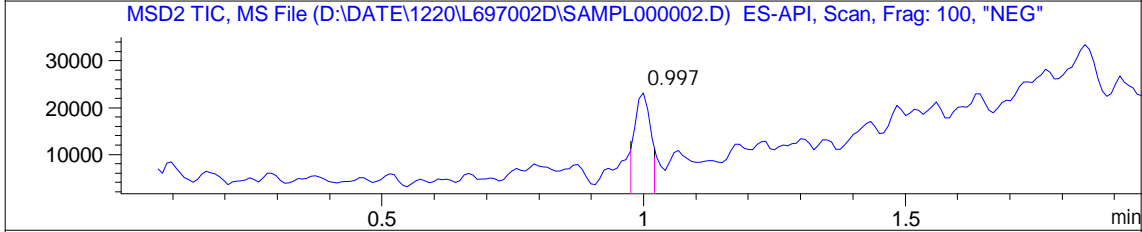
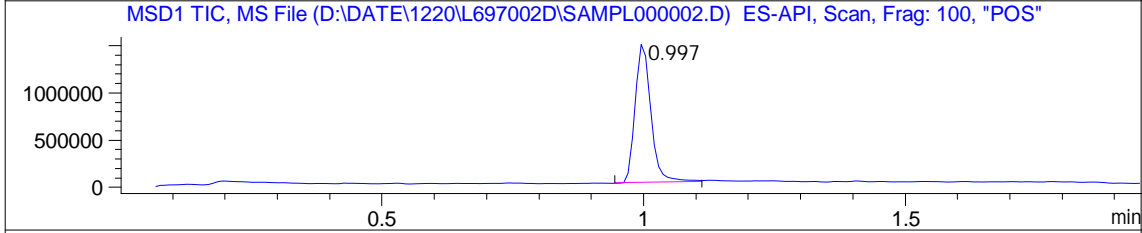
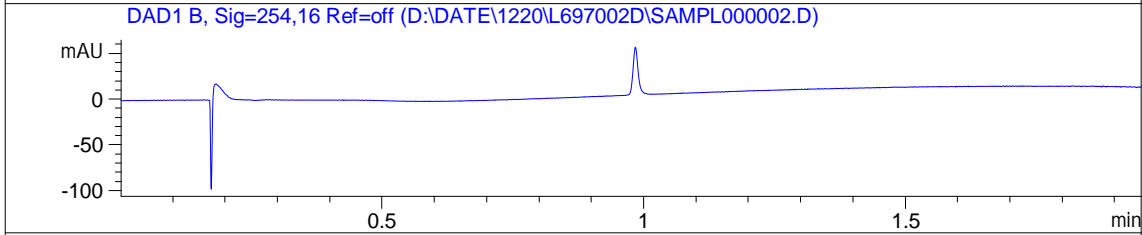
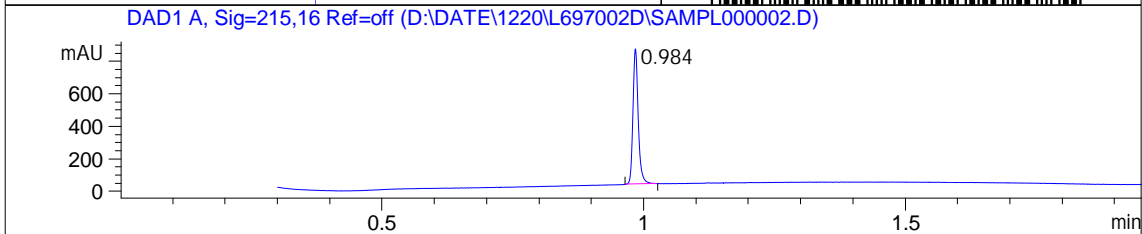
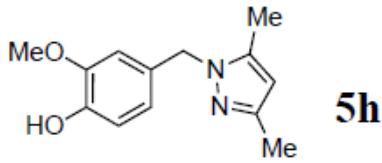
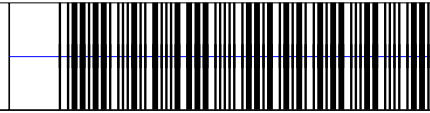
0

#	Time	Area%
1	0.916	100.00



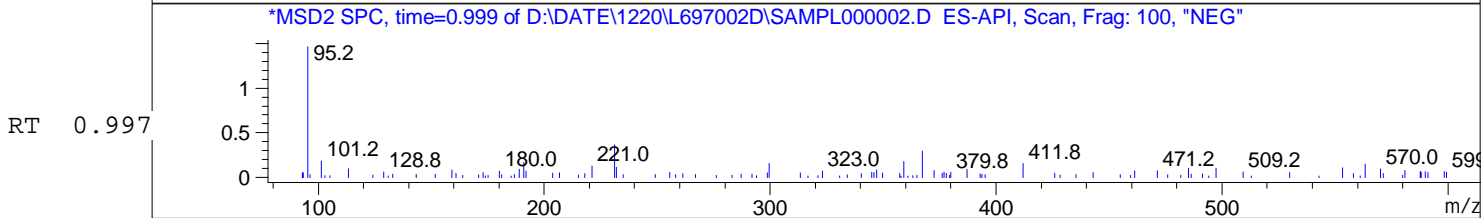
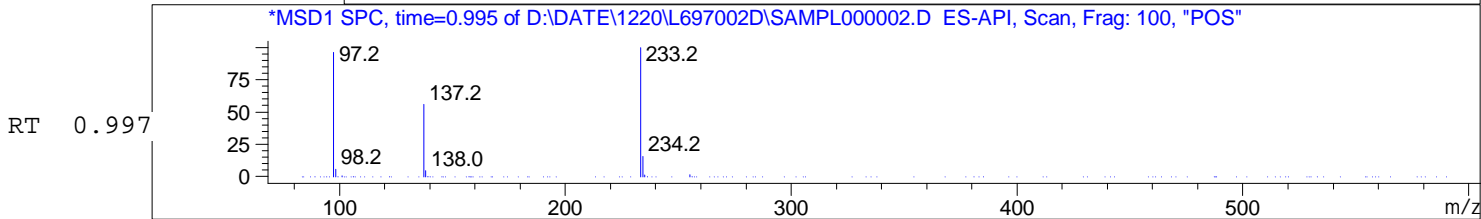
MaxPeak: 100.00%
Ret_Time: 0.984 min

CLQ379833



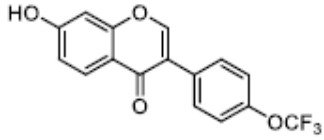
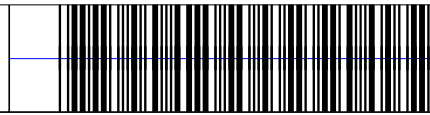
Mol Wt
Exact Mass

#	Time	Area%
1	0.984	100.00



MaxPeak: 100.00%
Ret_Time: 1.213 min

CLQ331159

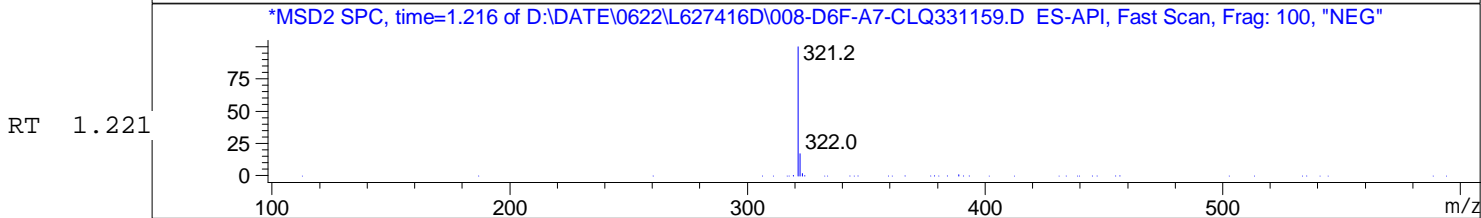
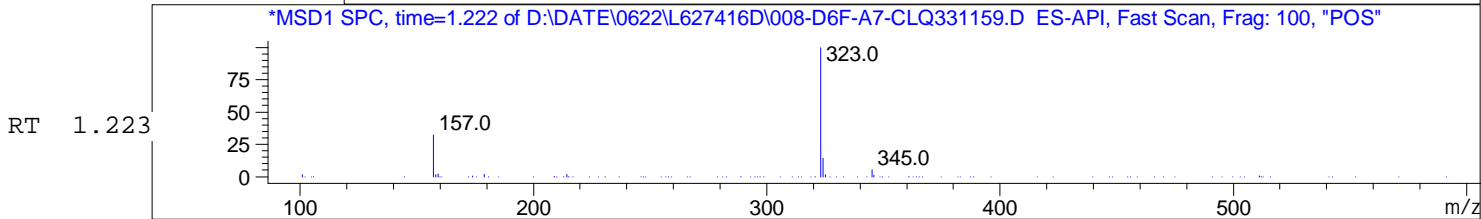
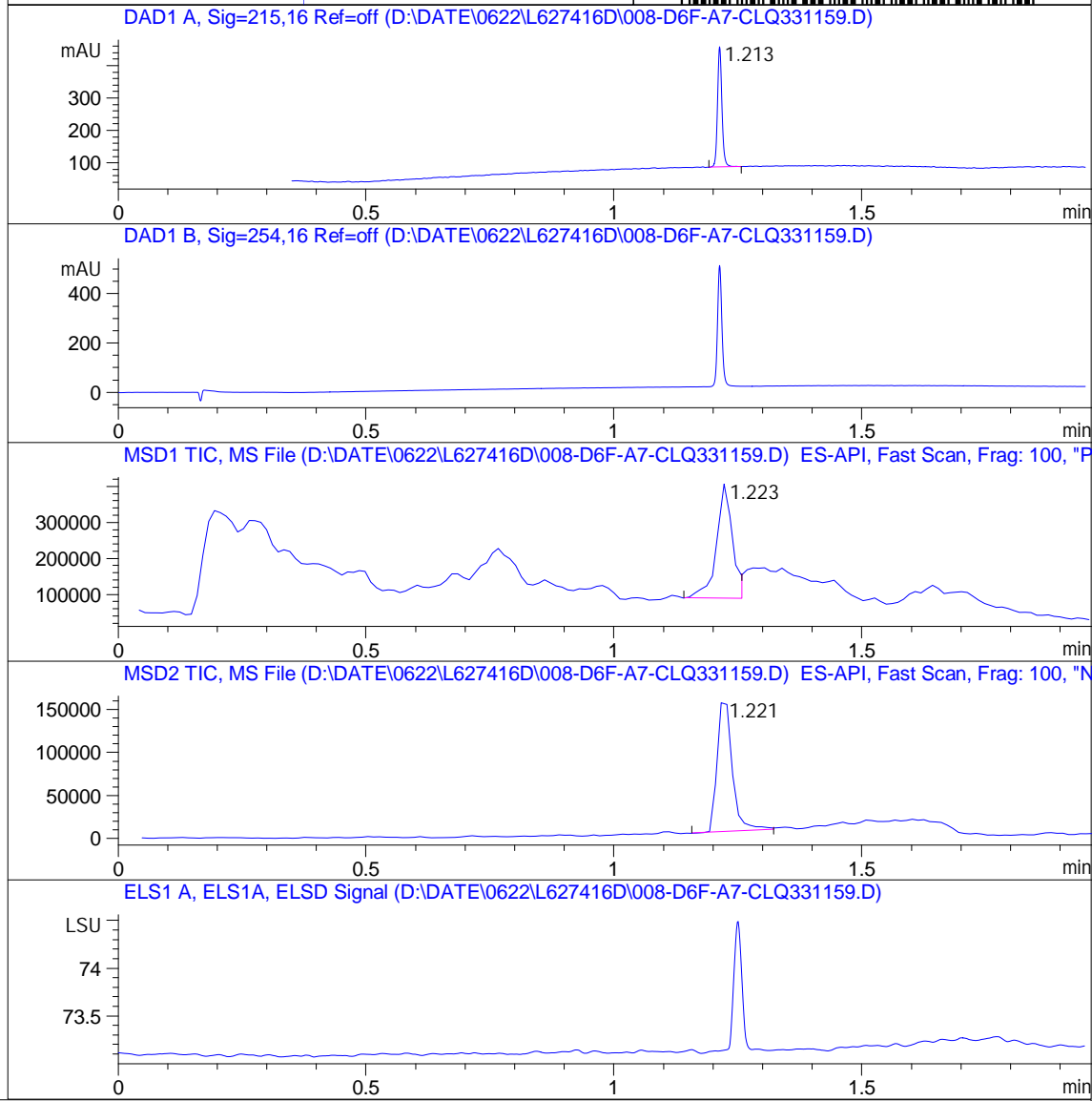


6j

Mol Wt
Exact Mass

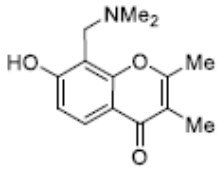
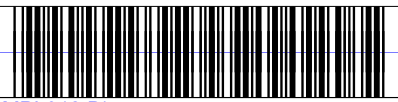
0

#	Time	Area%
1	1.213	100.00



MaxPeak: 100.00%
Ret_Time: 0.675 min

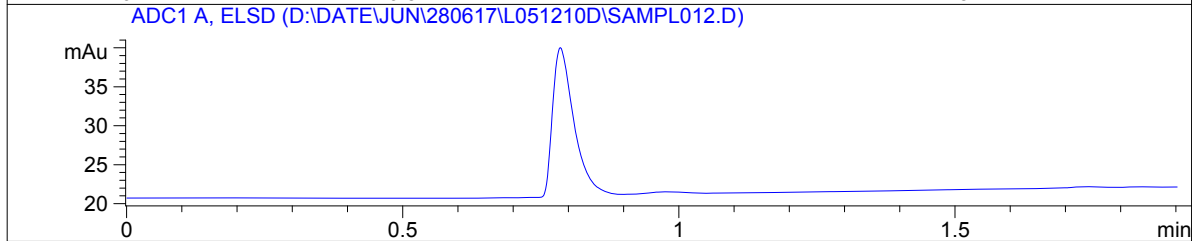
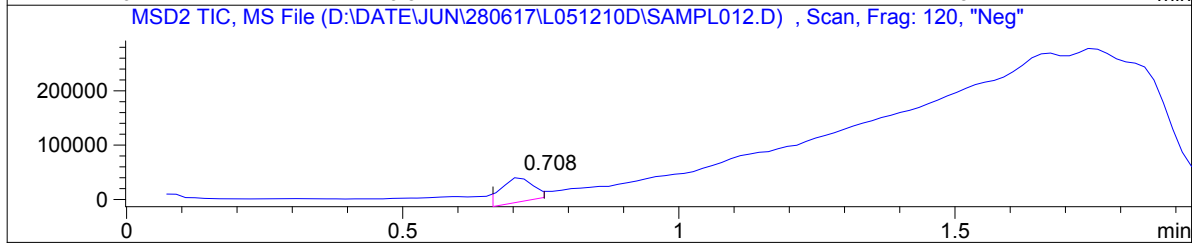
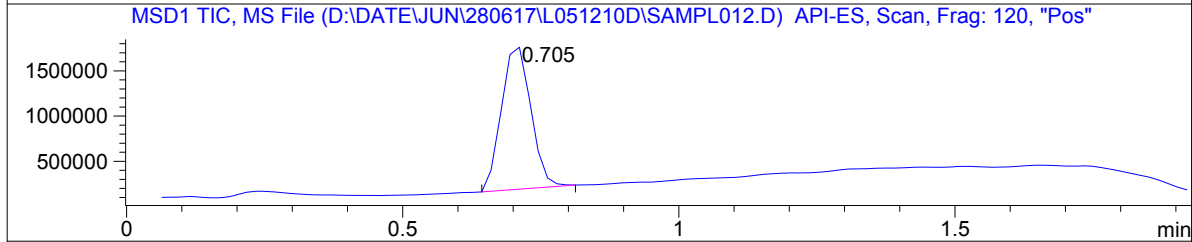
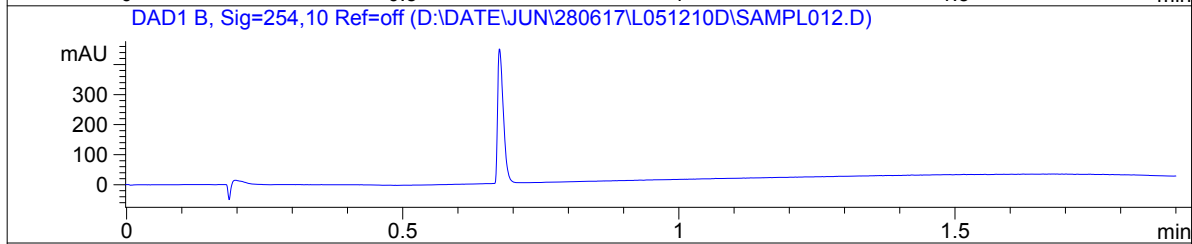
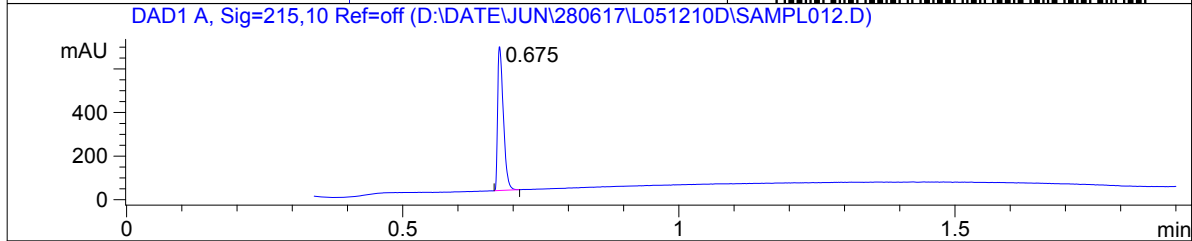
IBOX17995



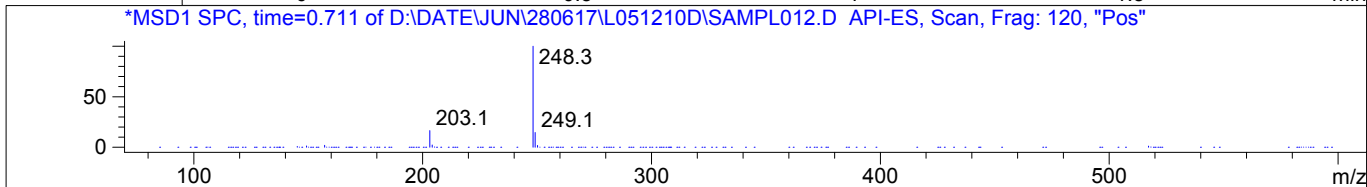
8c

Mol Wt 0
Exact Mass

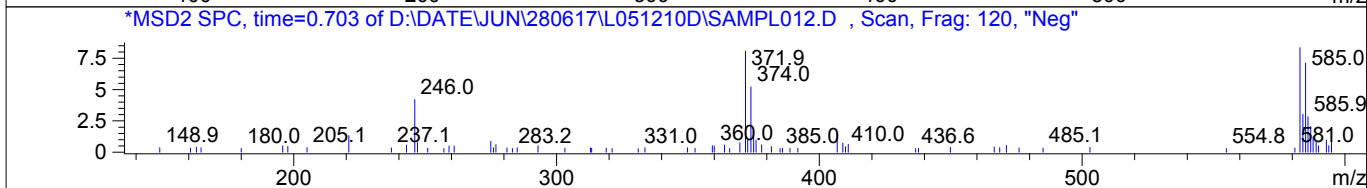
#	Time	Area%
1	0.675	100.00



RT 0.705

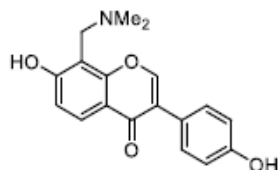
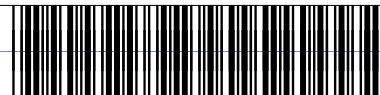


RT 0.708



MaxPeak: 90.60%
Ret_Time: 0.755 min

IBOX14058



8d

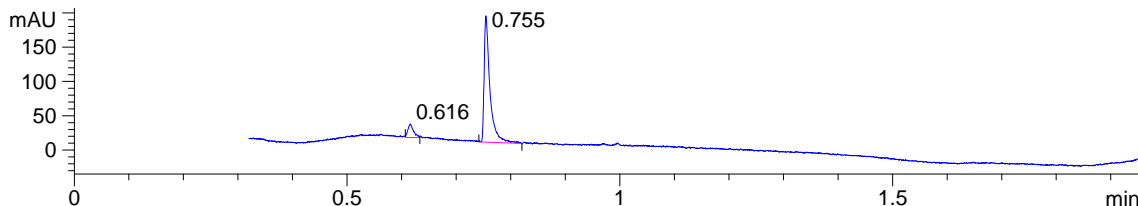
Mol Wt
Exact Mass

0

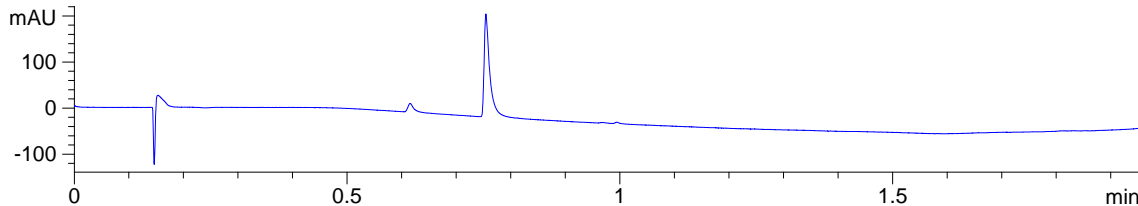
Time Area%

#	Time	Area%
1	0.616	9.40
2	0.755	90.60

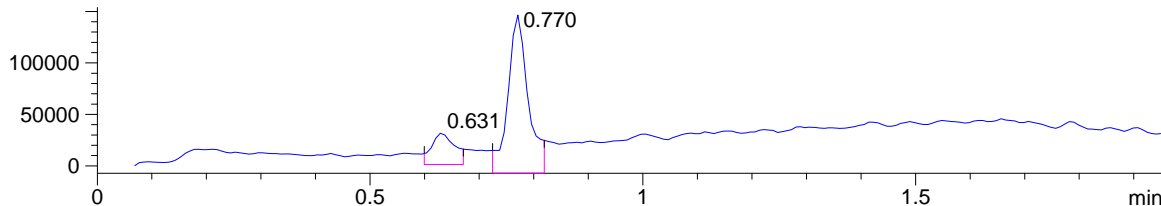
DAD1 A, Sig=215,16 Ref=off (D:\DATE\JUN\0106\L009676D\SAMPL000009.D)



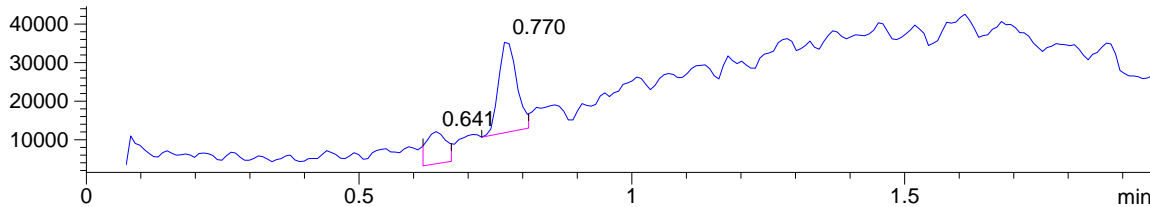
DAD1 B, Sig=254,16 Ref=off (D:\DATE\JUN\0106\L009676D\SAMPL000009.D)



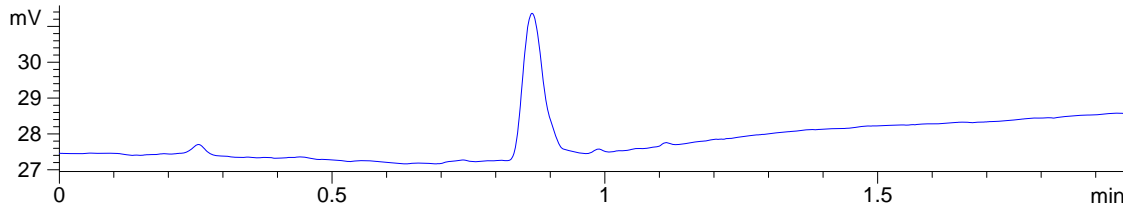
MSD1 TIC, MS File (D:\DATE\JUN\0106\L009676D\SAMPL000009.D) ES-API, Scan, Frag: 100, "POS"



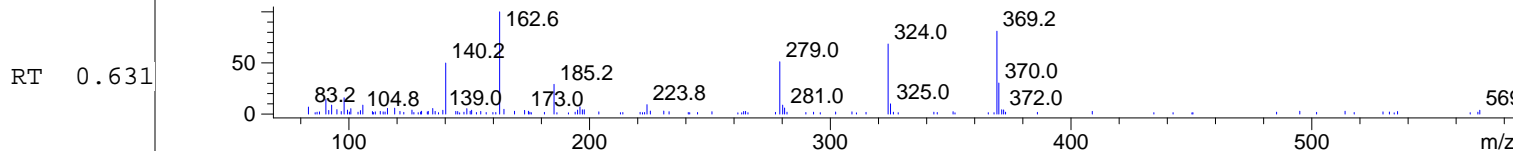
MSD2 TIC, MS File (D:\DATE\JUN\0106\L009676D\SAMPL000009.D) ES-API, Scan, Frag: 100, "NEG"



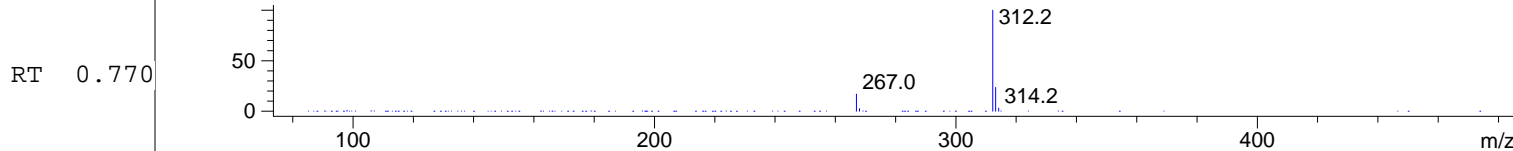
ADC1 A, ELSD (D:\DATE\JUN\0106\L009676D\SAMPL000009.D)



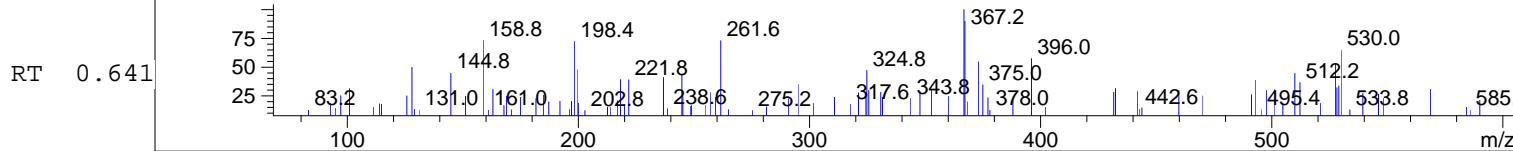
*MSD1 SPC, time=0.629 of D:\DATE\JUN\0106\L009676D\SAMPL000009.D ES-API, Scan, Frag: 100, "POS"



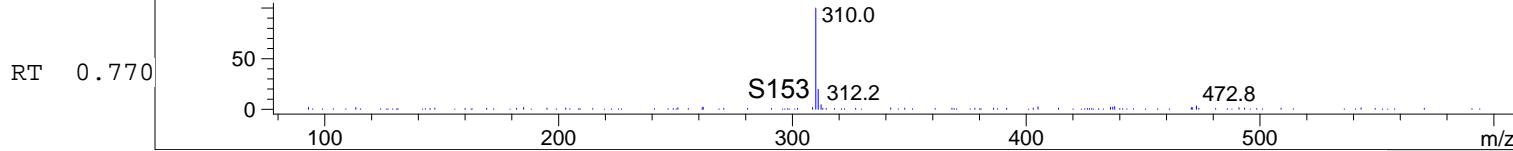
*MSD1 SPC, time=0.771 of D:\DATE\JUN\0106\L009676D\SAMPL000009.D ES-API, Scan, Frag: 100, "POS"



*MSD2 SPC, time=0.641 of D:\DATE\JUN\0106\L009676D\SAMPL000009.D ES-API, Scan, Frag: 100, "NEG"



*MSD2 SPC, time=0.767 of D:\DATE\JUN\0106\L009676D\SAMPL000009.D ES-API, Scan, Frag: 100, "NEG"



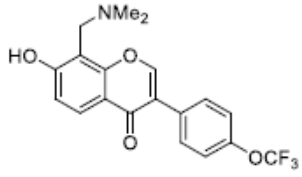
Inj.Date 6/1/2016

A P2-A-09 -5- Acq. Method C:\CHEM32\ -> ->

CLQ331161



MaxPeak: 100.00%
Ret_Time: 1.116 min

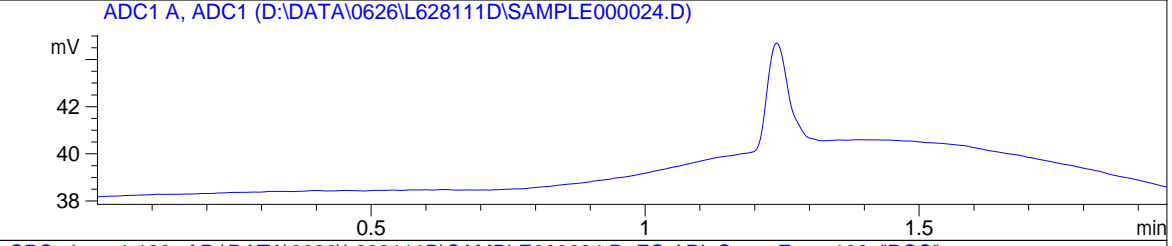
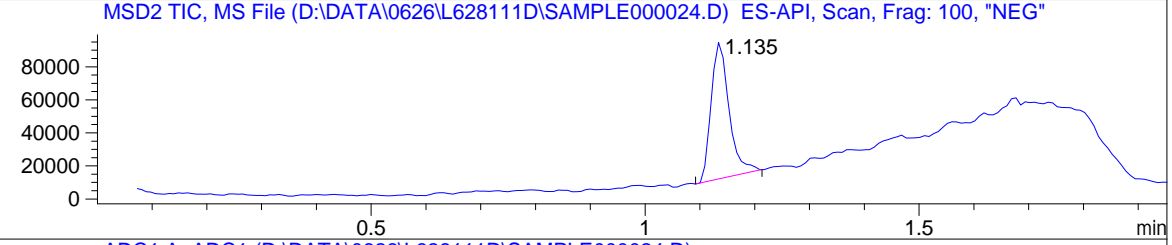
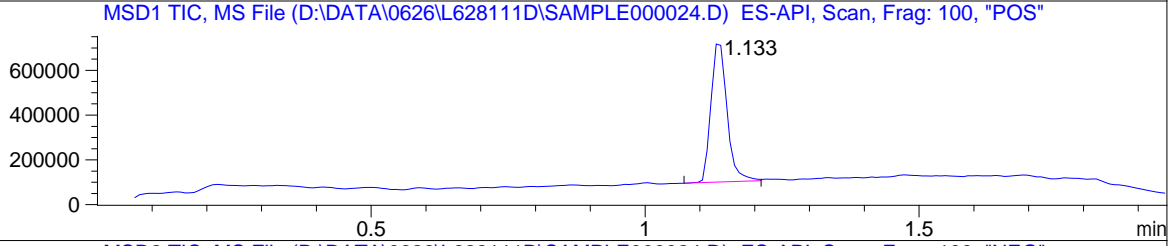
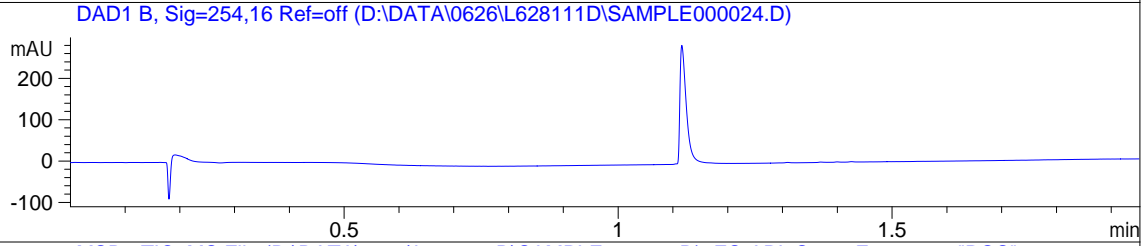
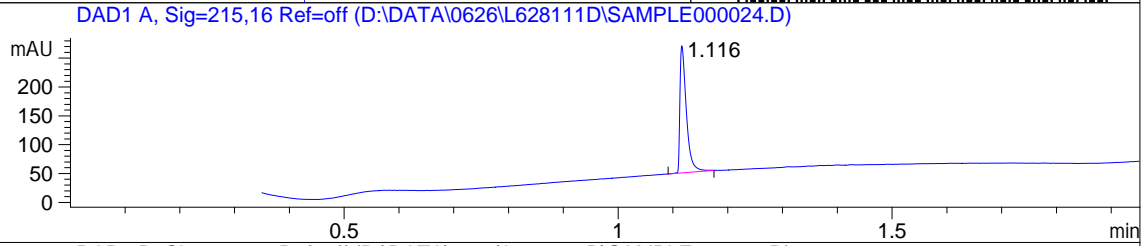


8j

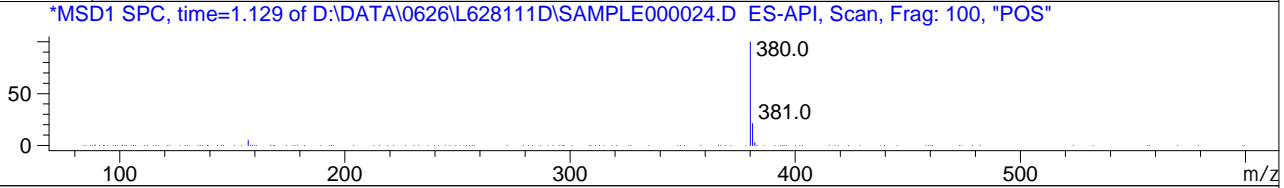
Mol Wt
Exact Mass

0

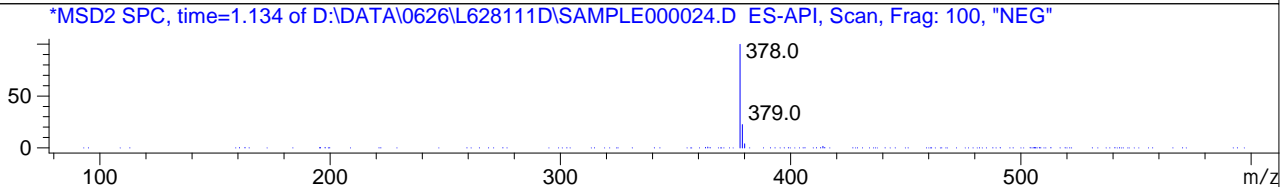
#	Time	Area%
1	1.116	100.00



RT 1.133

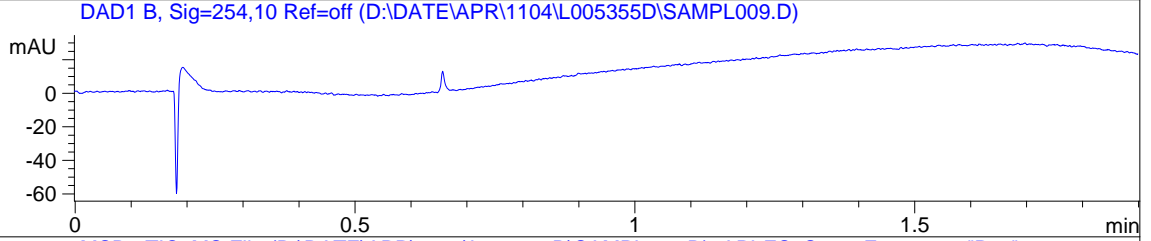
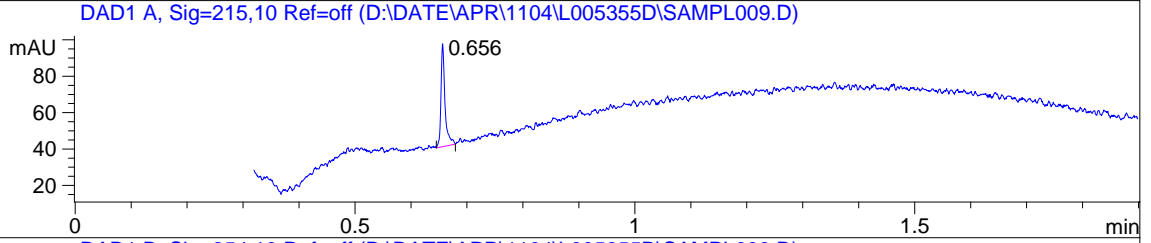
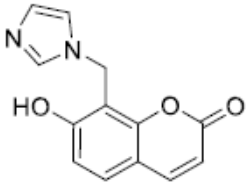
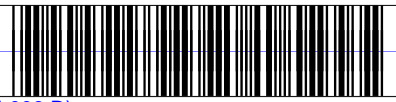


RT 1.135



MaxPeak: 100.00%
Ret_Time: 0.656 min

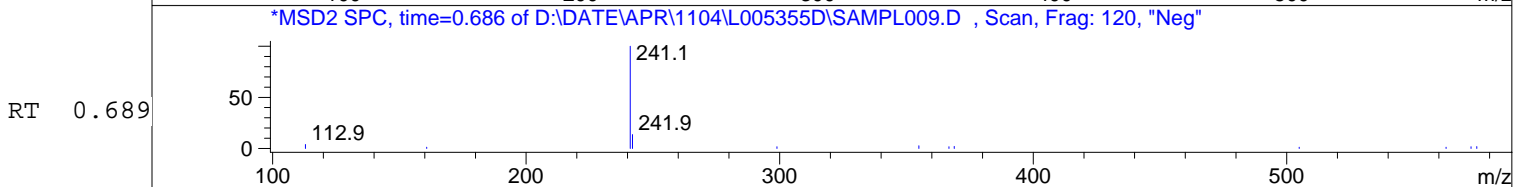
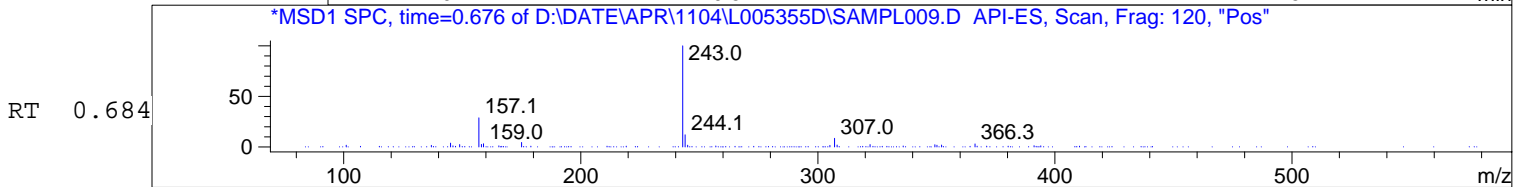
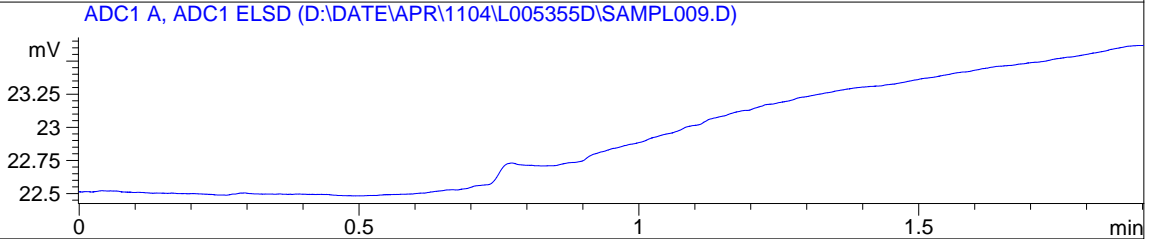
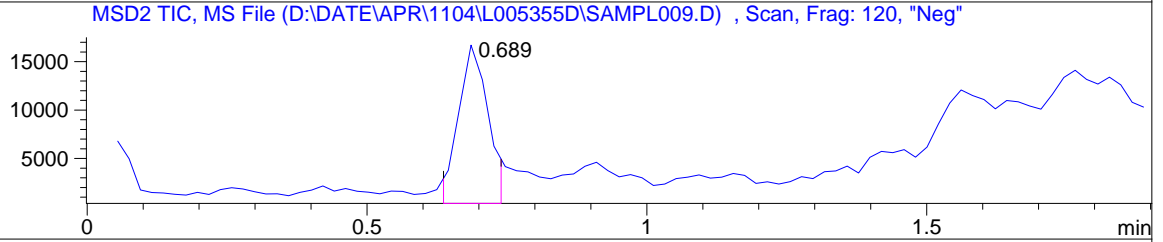
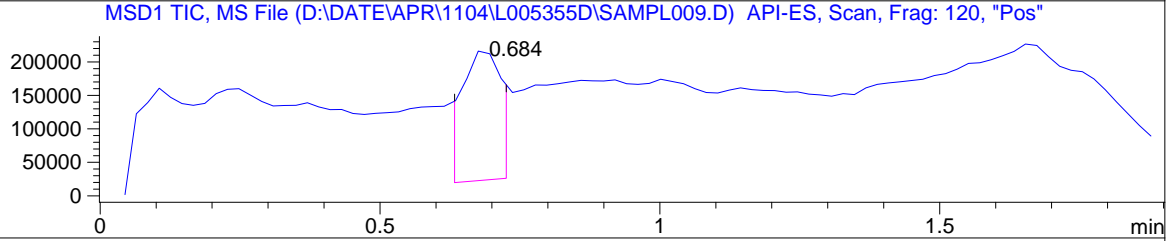
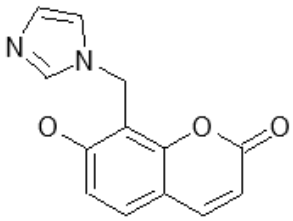
IBOX13648



Mol Wt
Exact Mass

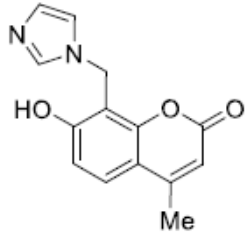
#	Time	Area%
1	0.656	100.00

0



MaxPeak: 100.00%
Ret_Time: 0.792 min

IBOX13627

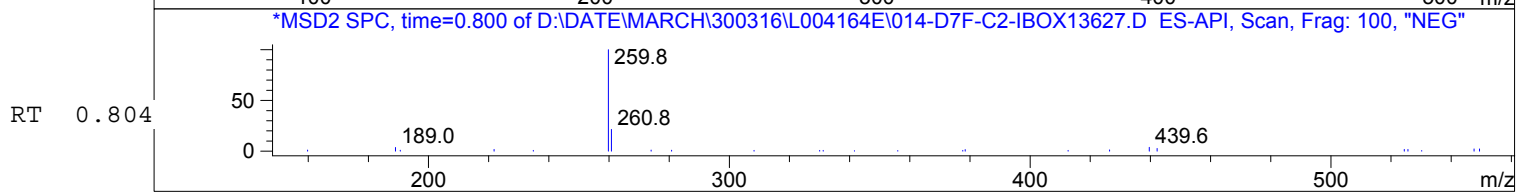
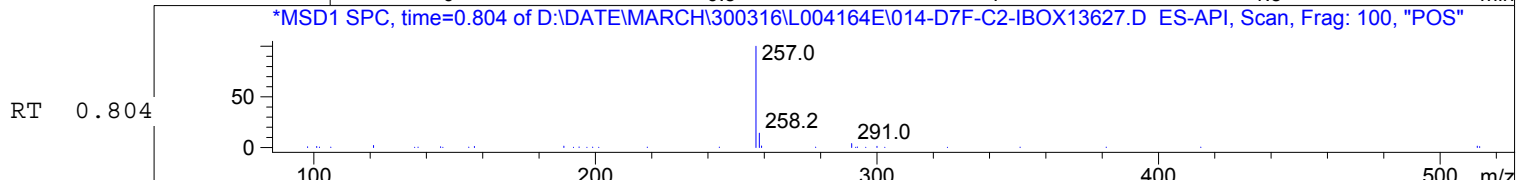
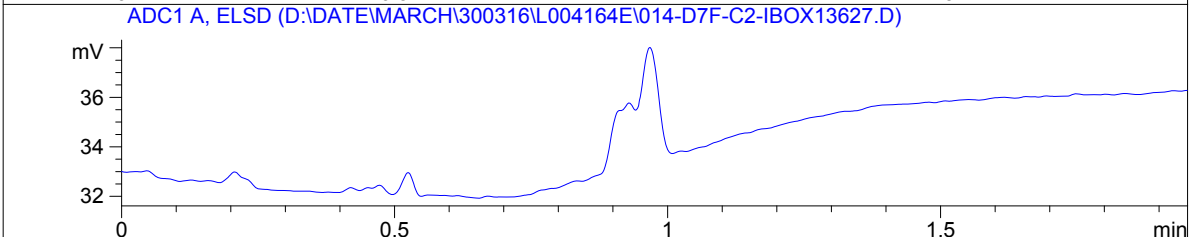
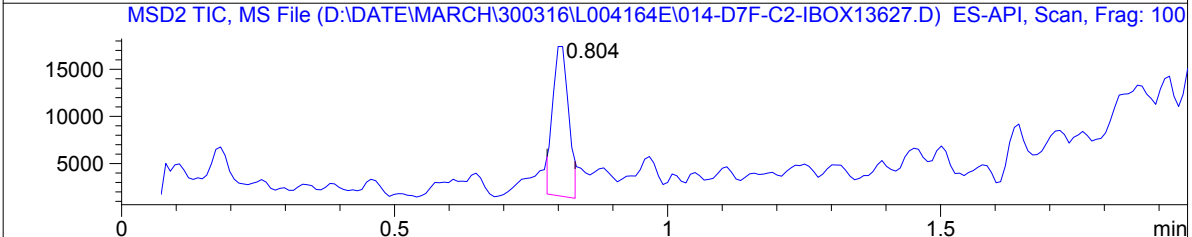
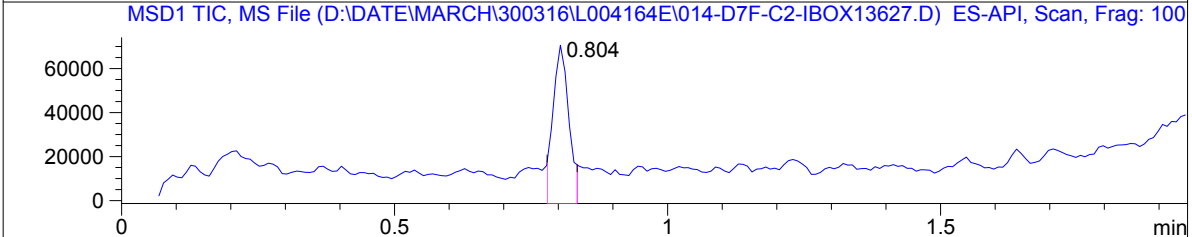
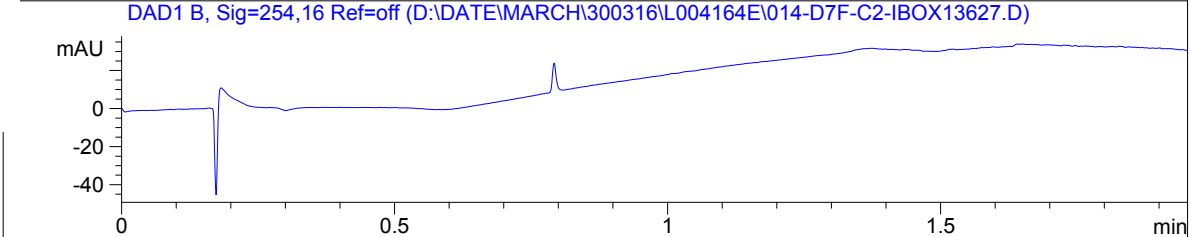
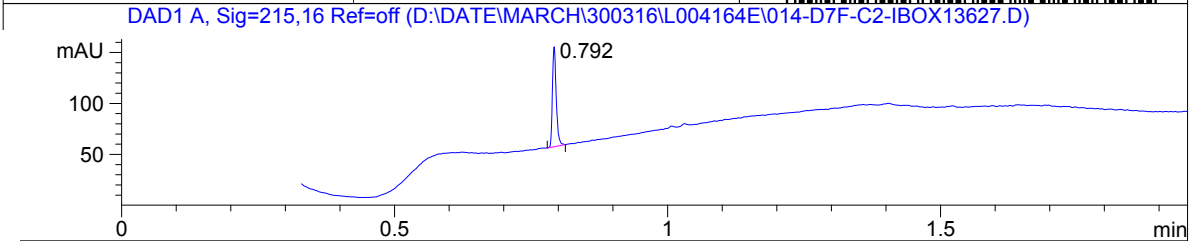


9b

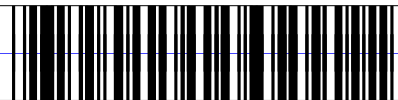
0

Mol Wt
Exact Mass

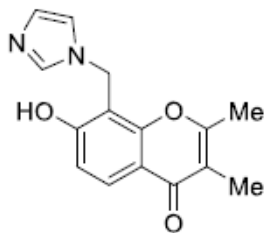
#	Time	Area%
1	0.792	100.00



CLQ362994



MaxPeak: 100.00%
Ret_Time: 0.634 min

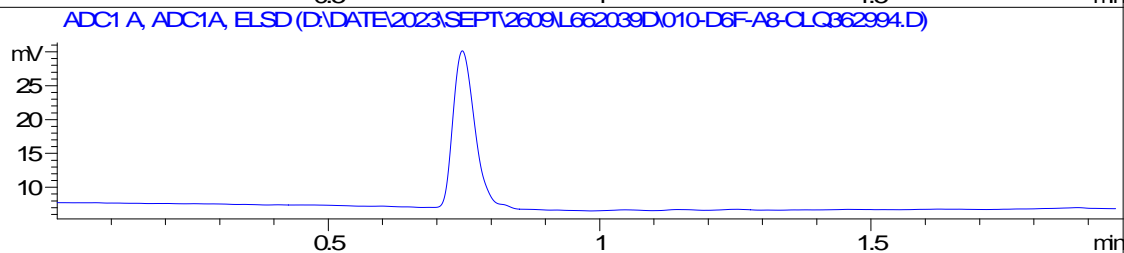
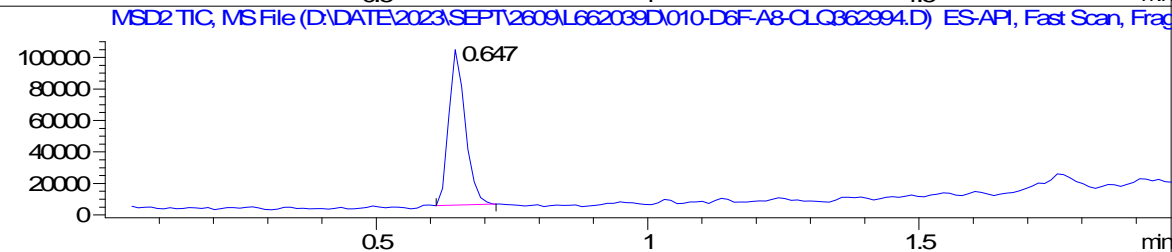
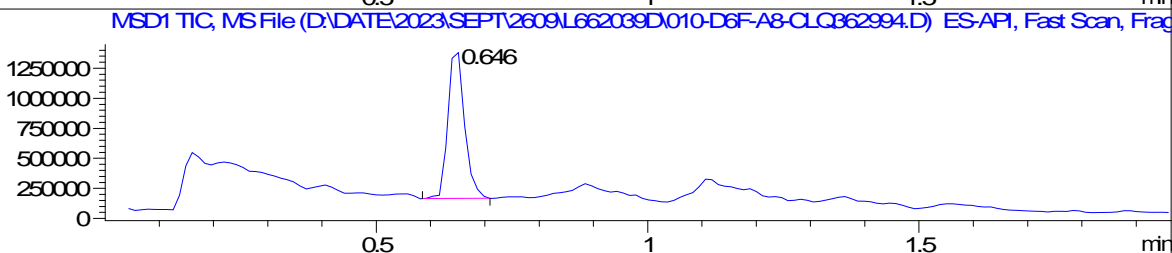
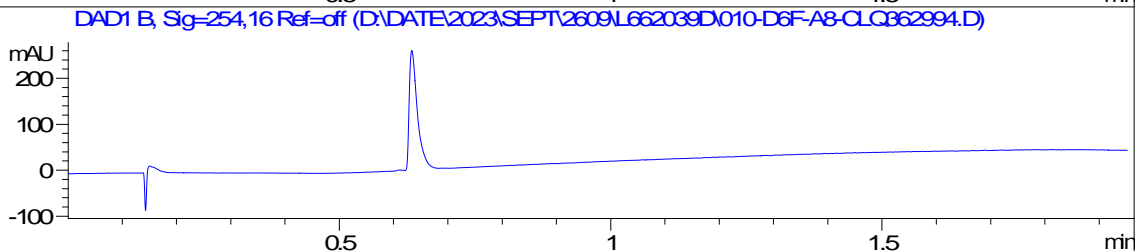
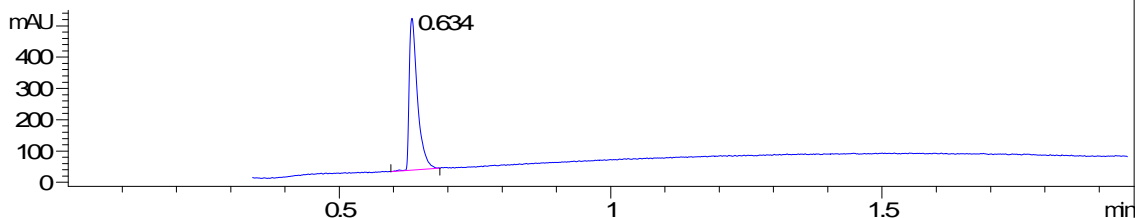


9c

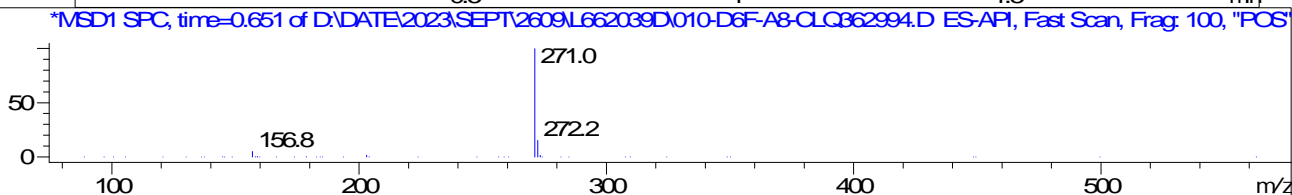
Mol Wt

Exact Mass

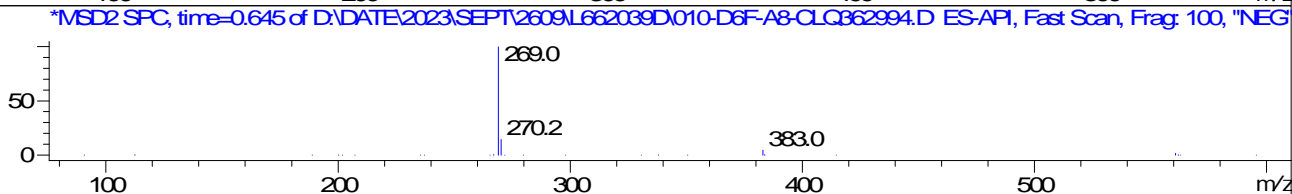
#	Time	Area%
1	0.634	100.00



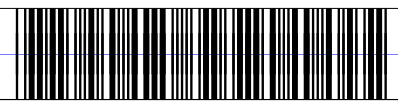
RT 0.646



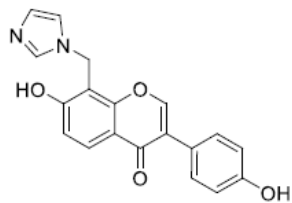
RT 0.647



CLQ377562



MaxPeak: 97.21%
Ret_Time: 0.835 min

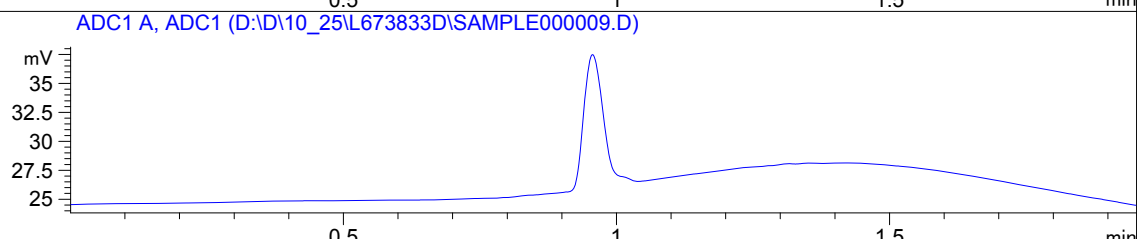
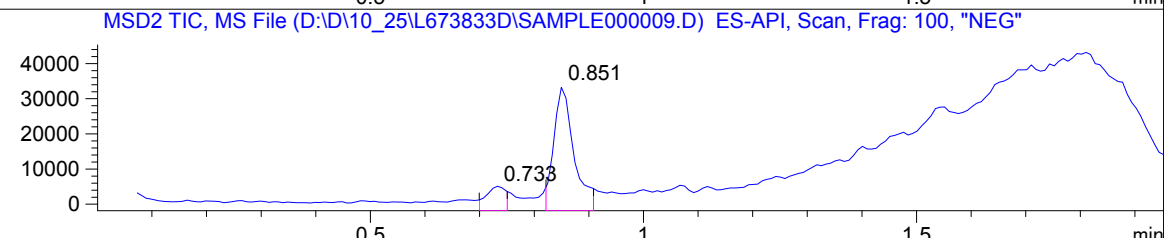
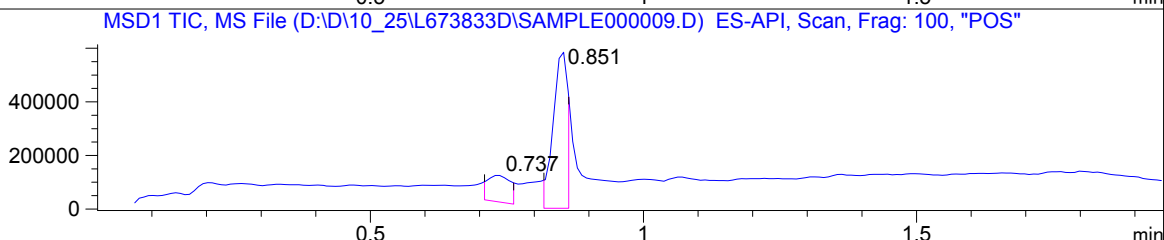
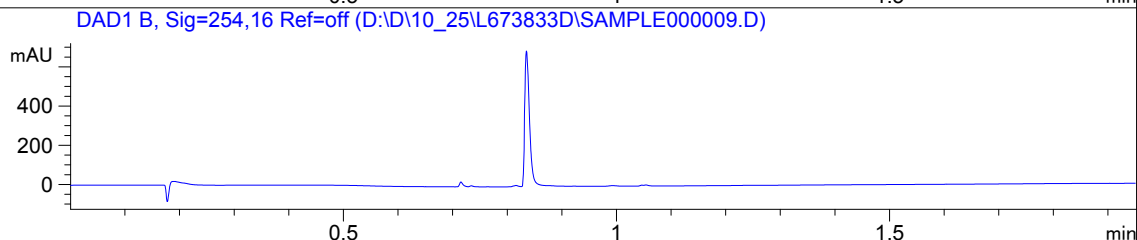
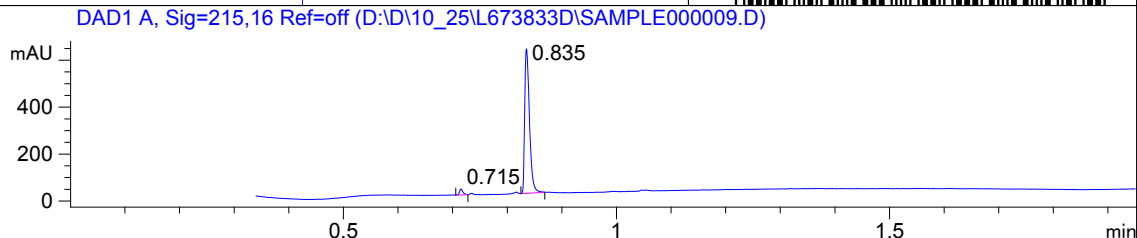


9d

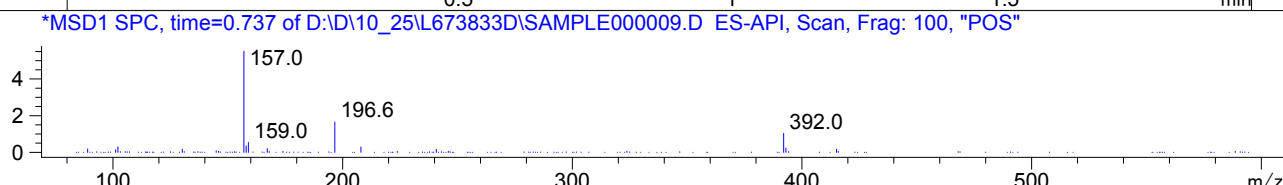
Mol Wt
Exact Mass

0

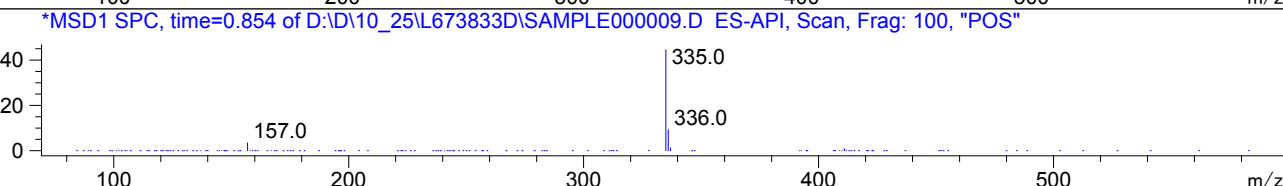
#	Time	Area%
1	0.715	2.79
2	0.835	97.21



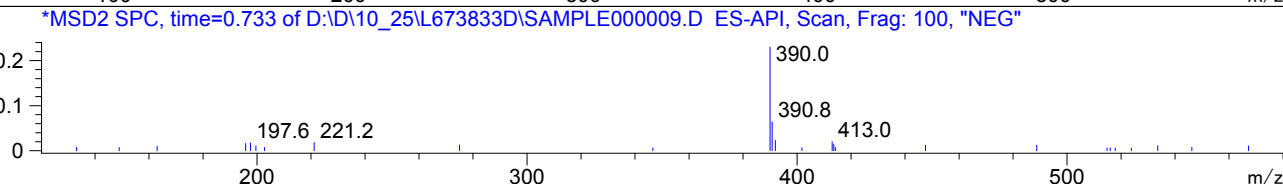
RT 0.737



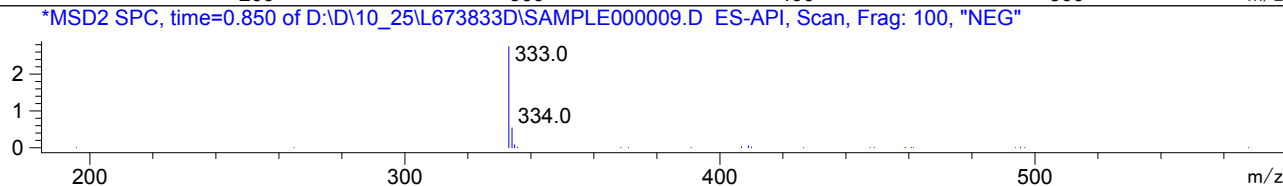
RT 0.851



RT 0.733



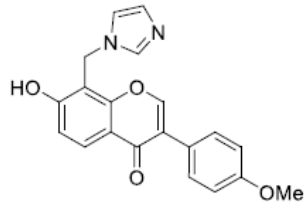
RT 0.851



S158

MaxPeak: 91.95%
Ret_Time: 0.892 min

IBOX13689



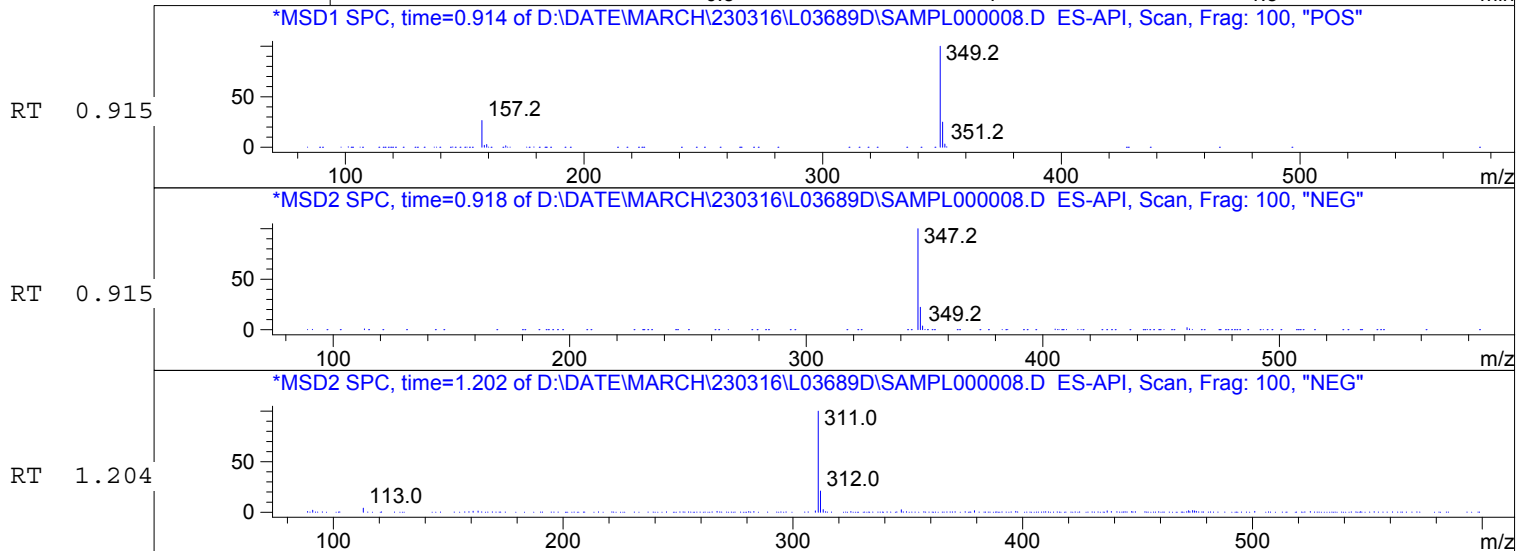
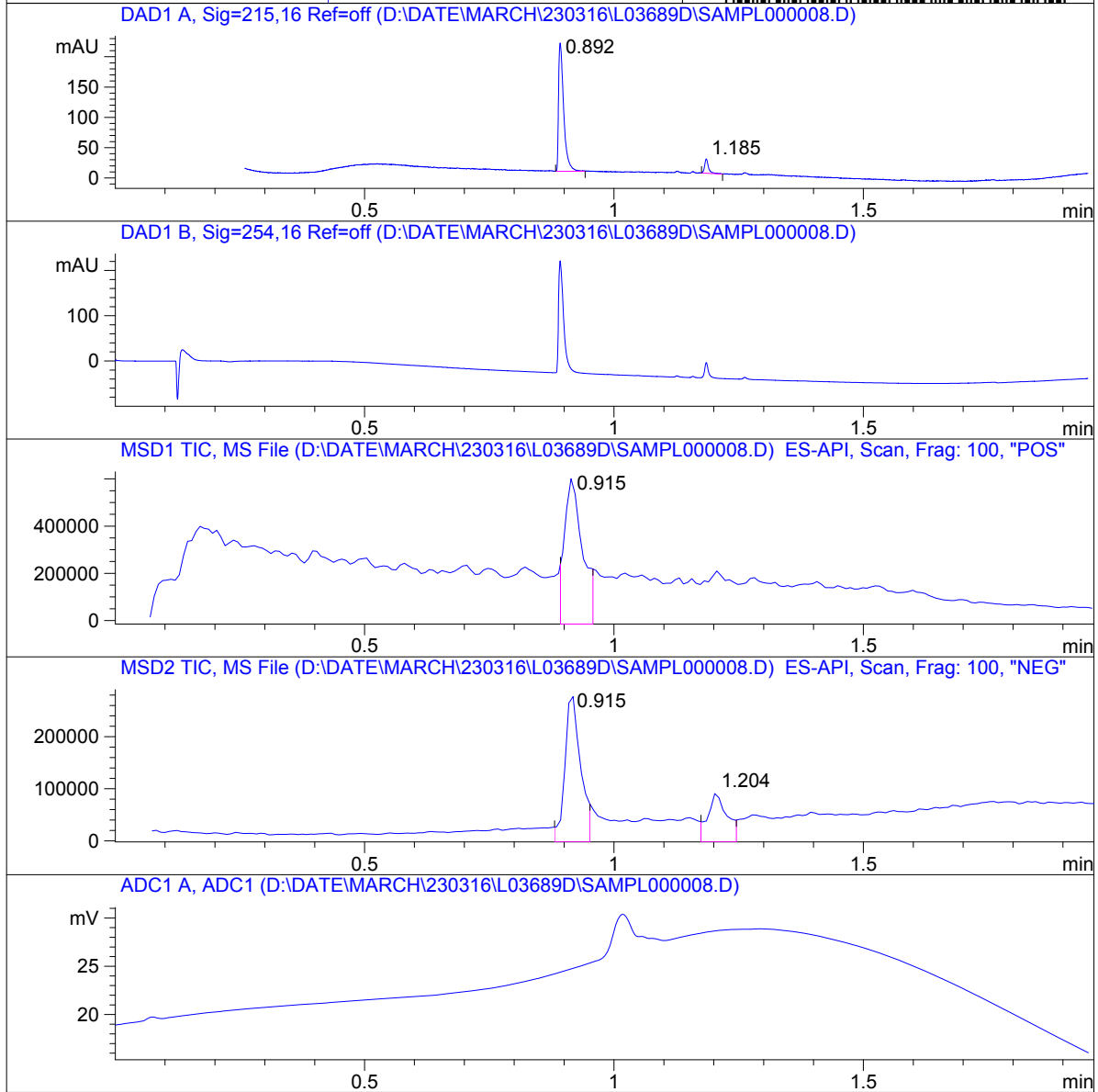
9e

Mol Wt
Exact Mass

0

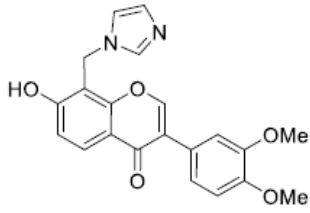
Time Area%

#	Time	Area%
1	0.892	91.95
2	1.185	8.05



MaxPeak: 100.00%
Ret_Time: 0.857 min

IBOX13688



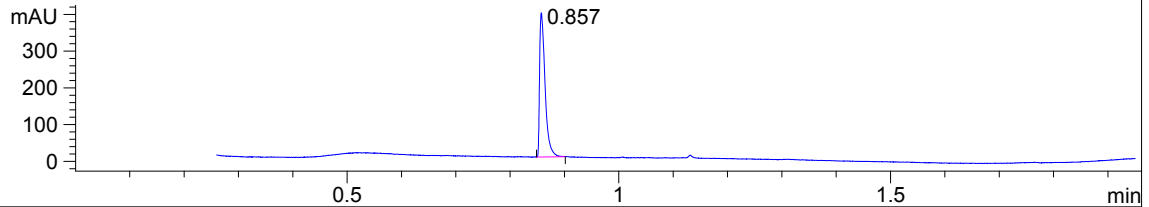
9f

Mol Wt
Exact Mass

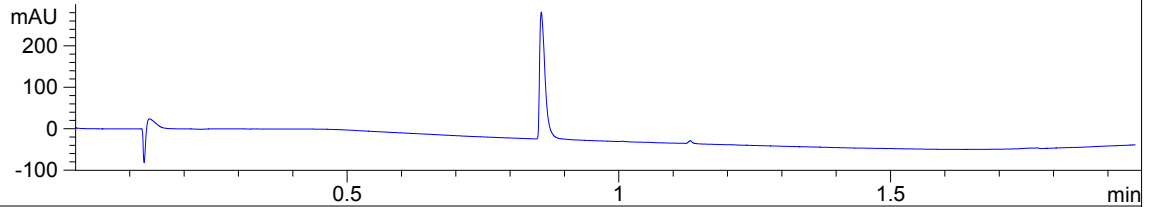
0

#	Time	Area%
1	0.857	100.00

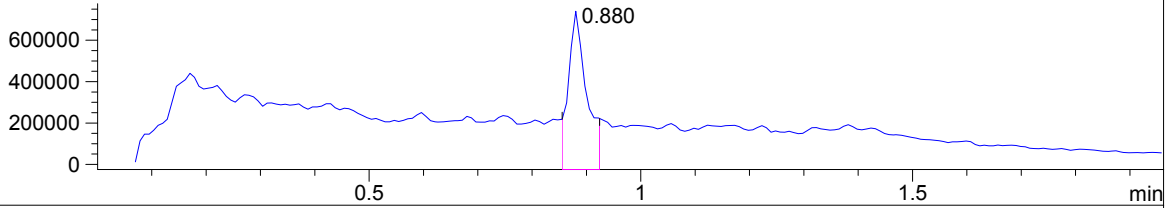
DAD1 A, Sig=215,16 Ref=off (D:\DATE\MARCH\230316\L03689D\SAMPL000009.D)



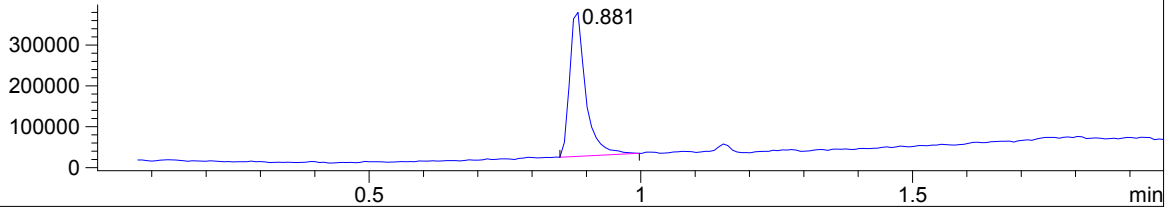
DAD1 B, Sig=254,16 Ref=off (D:\DATE\MARCH\230316\L03689D\SAMPL000009.D)



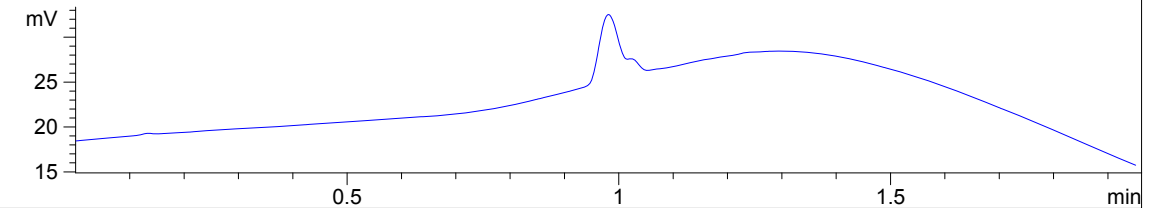
MSD1 TIC, MS File (D:\DATE\MARCH\230316\L03689D\SAMPL000009.D) ES-API, Scan, Frag: 100, "POS"



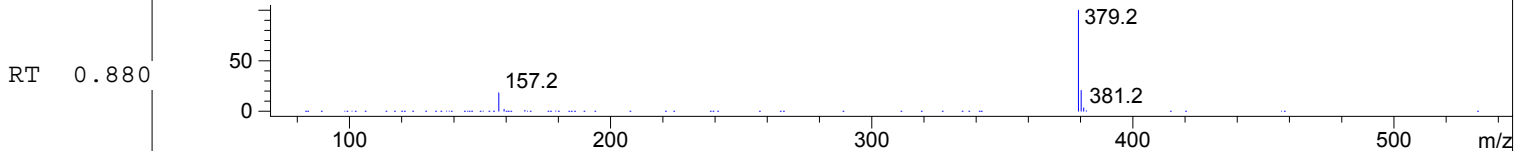
MSD2 TIC, MS File (D:\DATE\MARCH\230316\L03689D\SAMPL000009.D) ES-API, Scan, Frag: 100, "NEG"



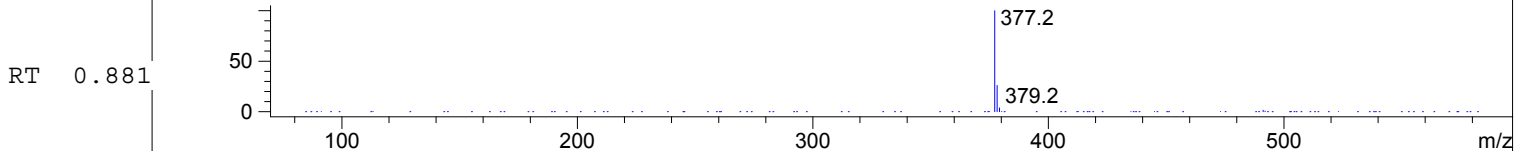
ADC1 A, ADC1 (D:\DATE\MARCH\230316\L03689D\SAMPL000009.D)



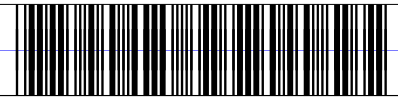
*MSD1 SPC, time=0.880 of D:\DATE\MARCH\230316\L03689D\SAMPL000009.D ES-API, Scan, Frag: 100, "POS"



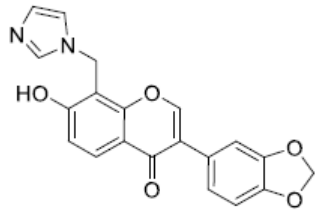
*MSD2 SPC, time=0.885 of D:\DATE\MARCH\230316\L03689D\SAMPL000009.D ES-API, Scan, Frag: 100, "NEG"



CLQ377550



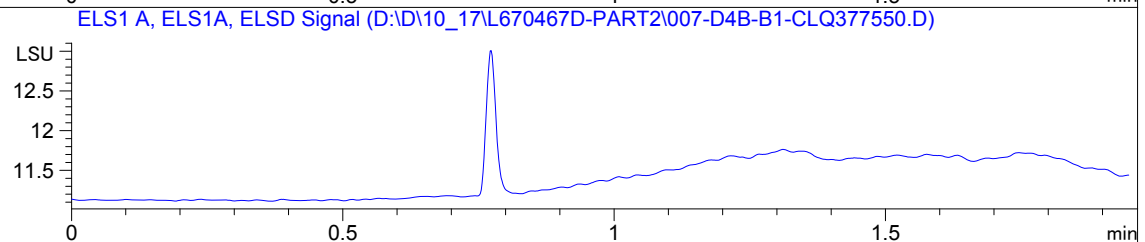
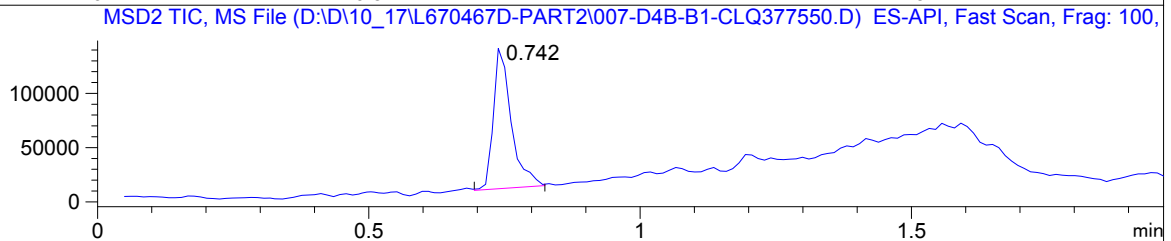
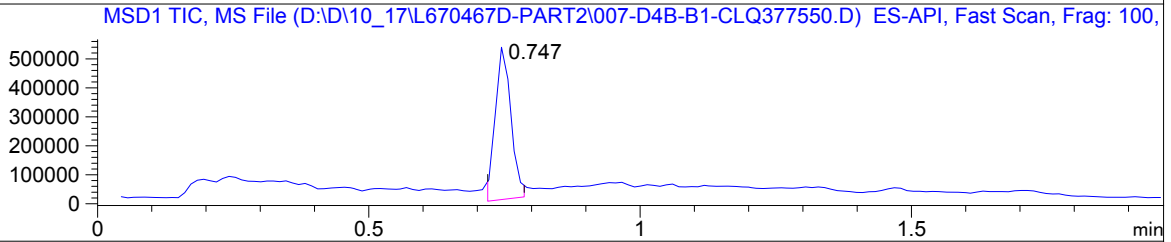
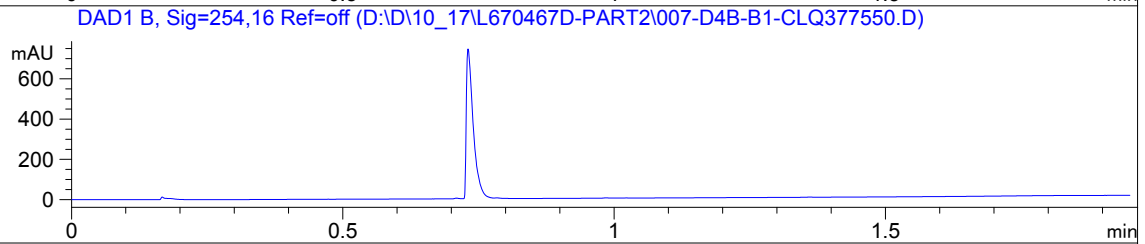
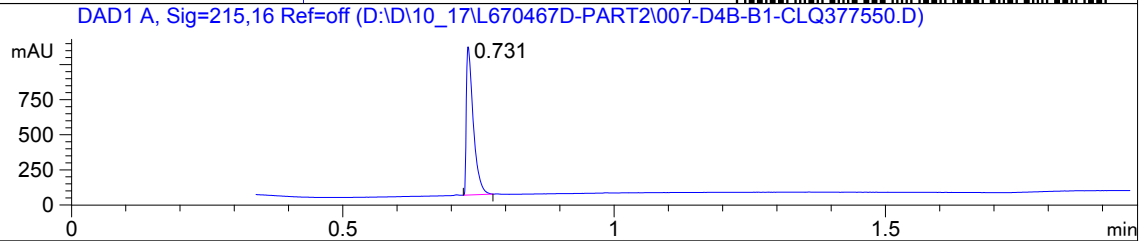
MaxPeak: 100.00%
Ret_Time: 0.731 min



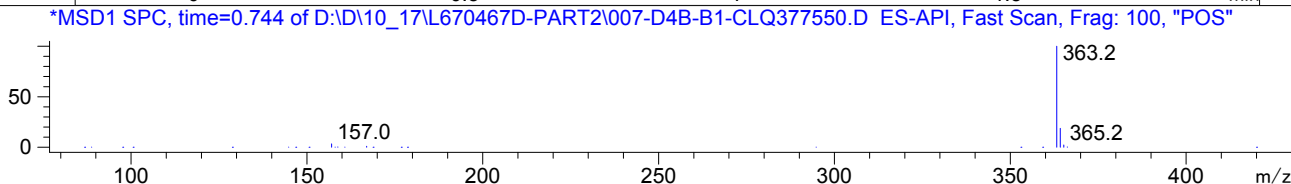
9g

Mol Wt 0
Exact Mass

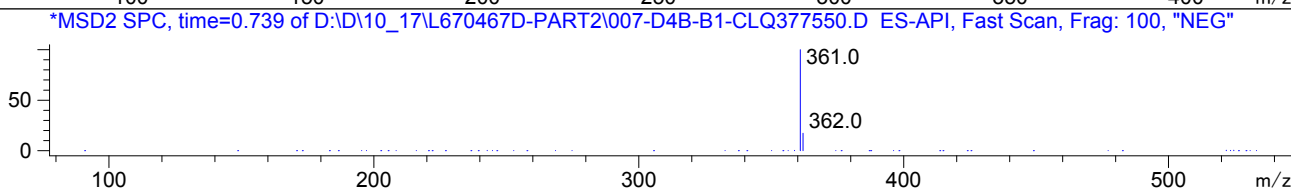
#	Time	Area%
1	0.731	100.00



RT 0.747

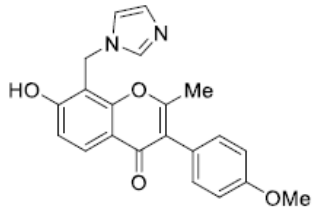


RT 0.742



MaxPeak: 100.00%
Ret_Time: 0.969 min

IBOX13644

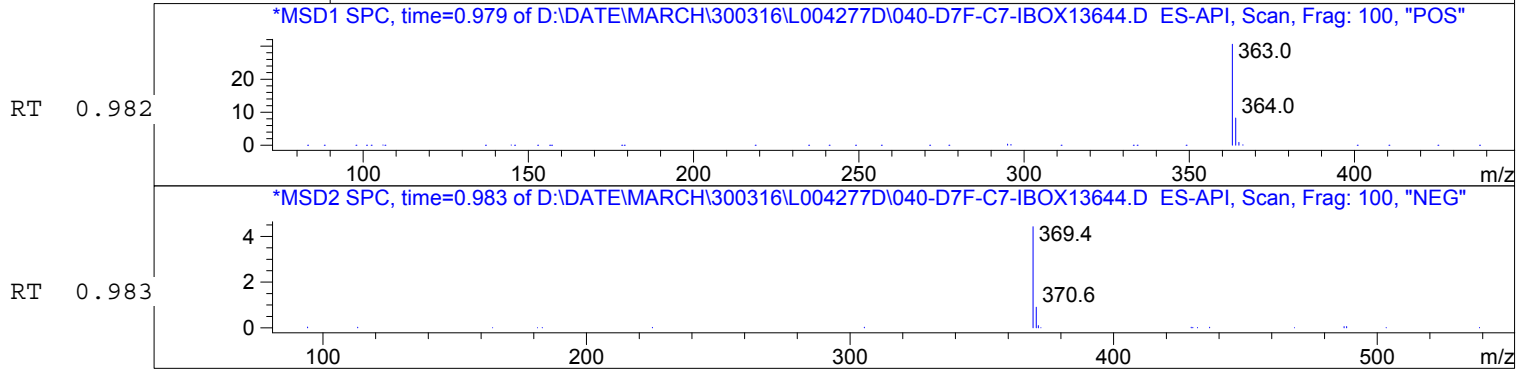
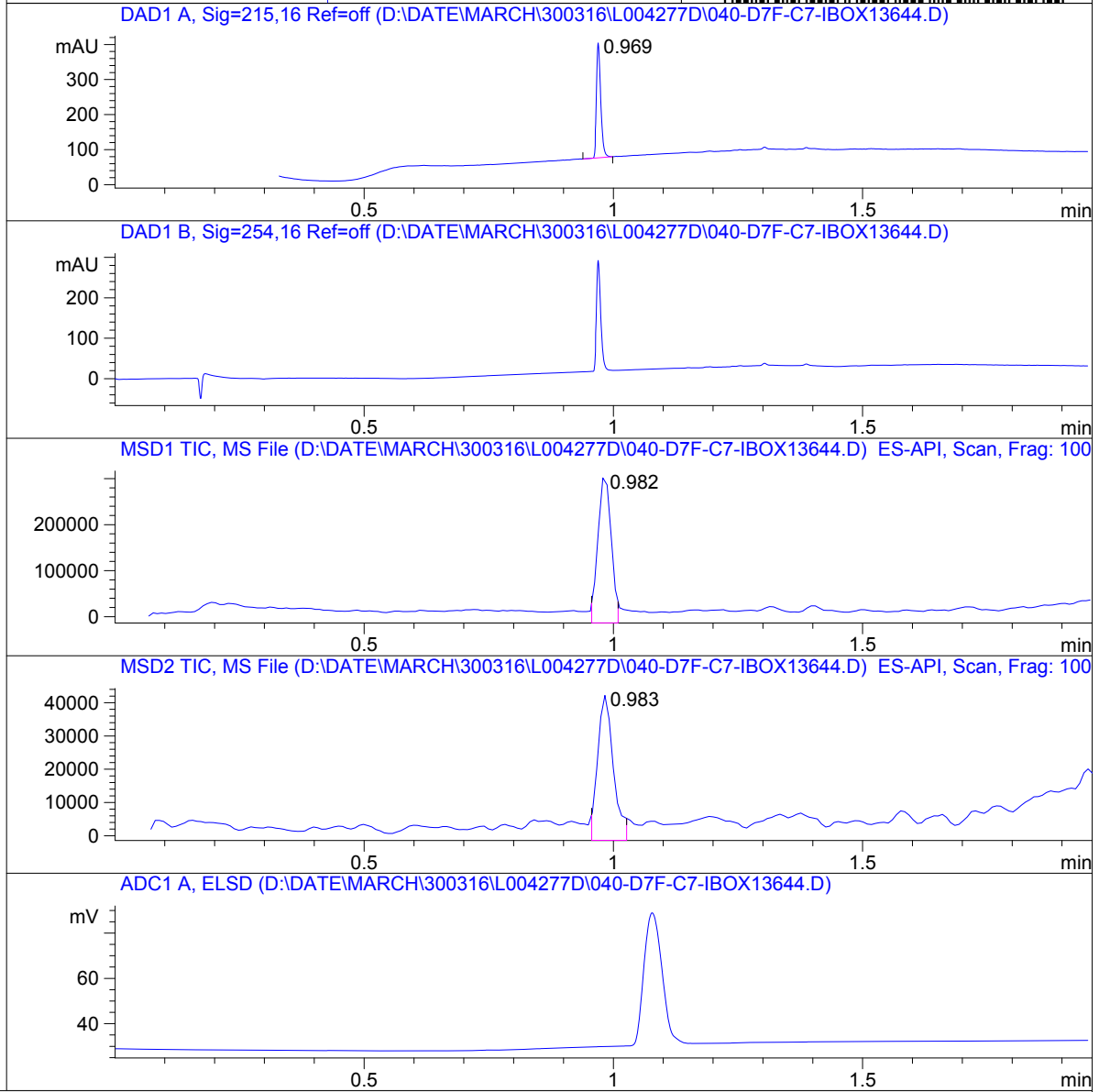


9h

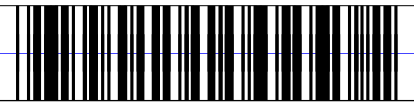
Mol Wt
Exact Mass

0

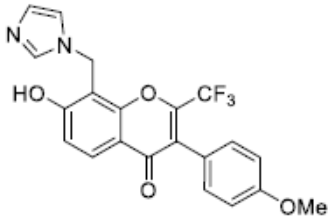
#	Time	Area%
1	0.969	100.00



CLQ362993



MaxPeak: 100.00%
Ret_Time: 0.898 min

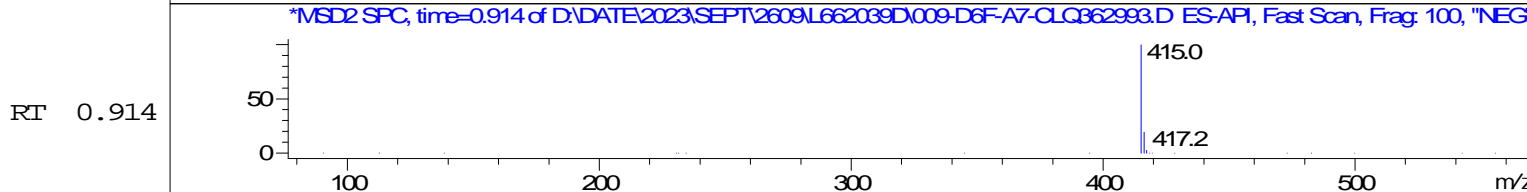
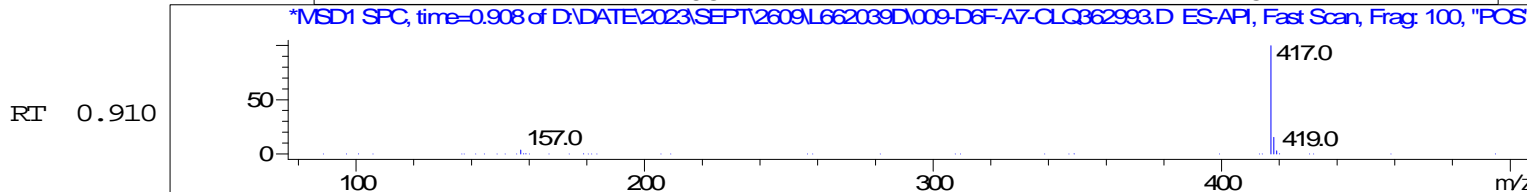
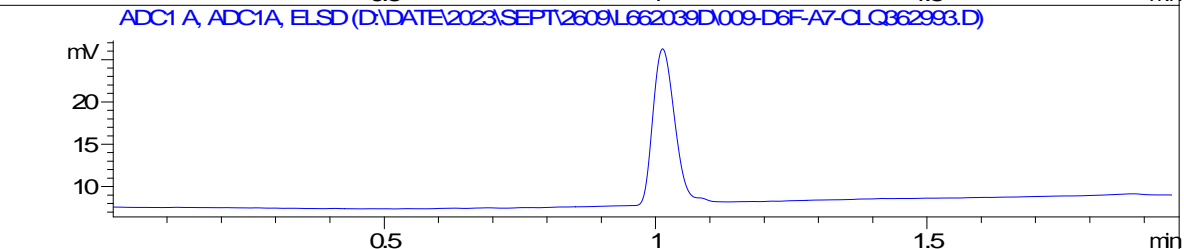
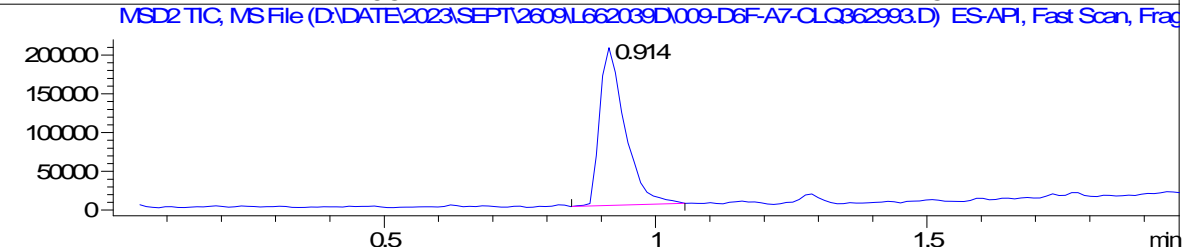
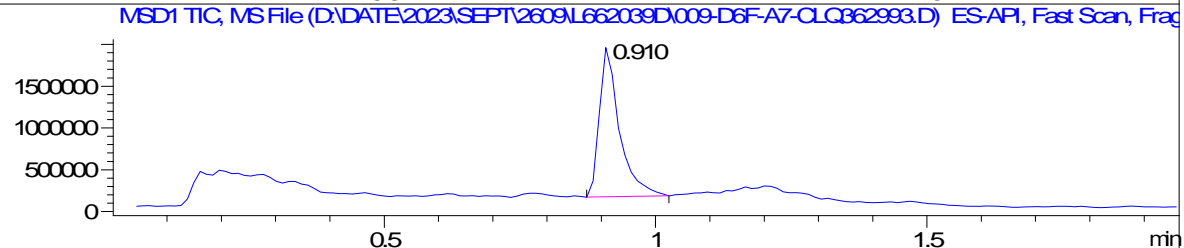
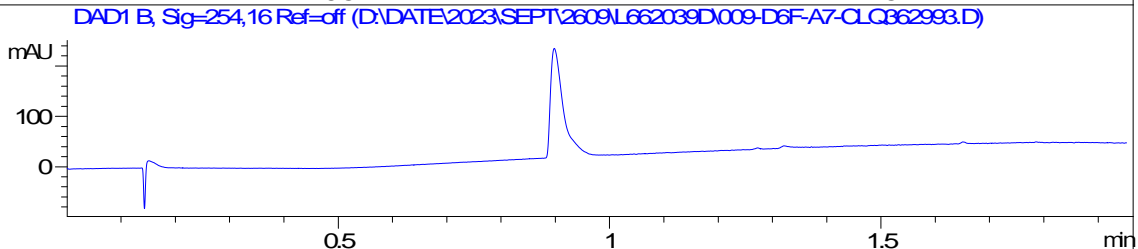
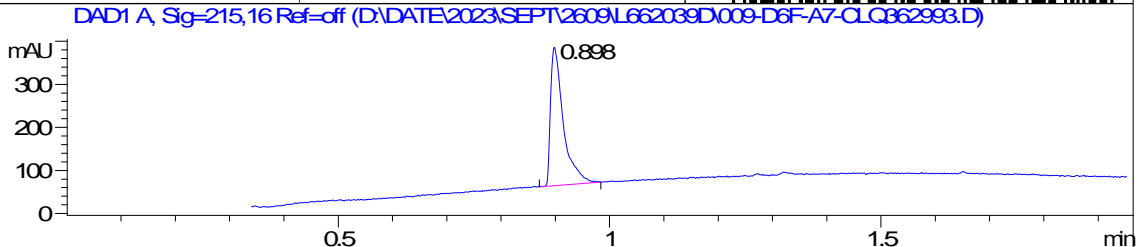


9i

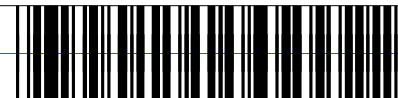
Mol Wt

Exact Mass

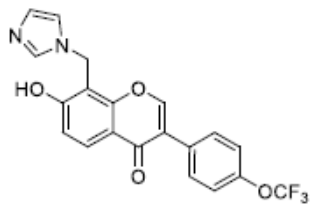
#	Time	Area%
1	0.898	100.00



CLQ362997



MaxPeak: 100.00%
Ret_Time: 0.934 min



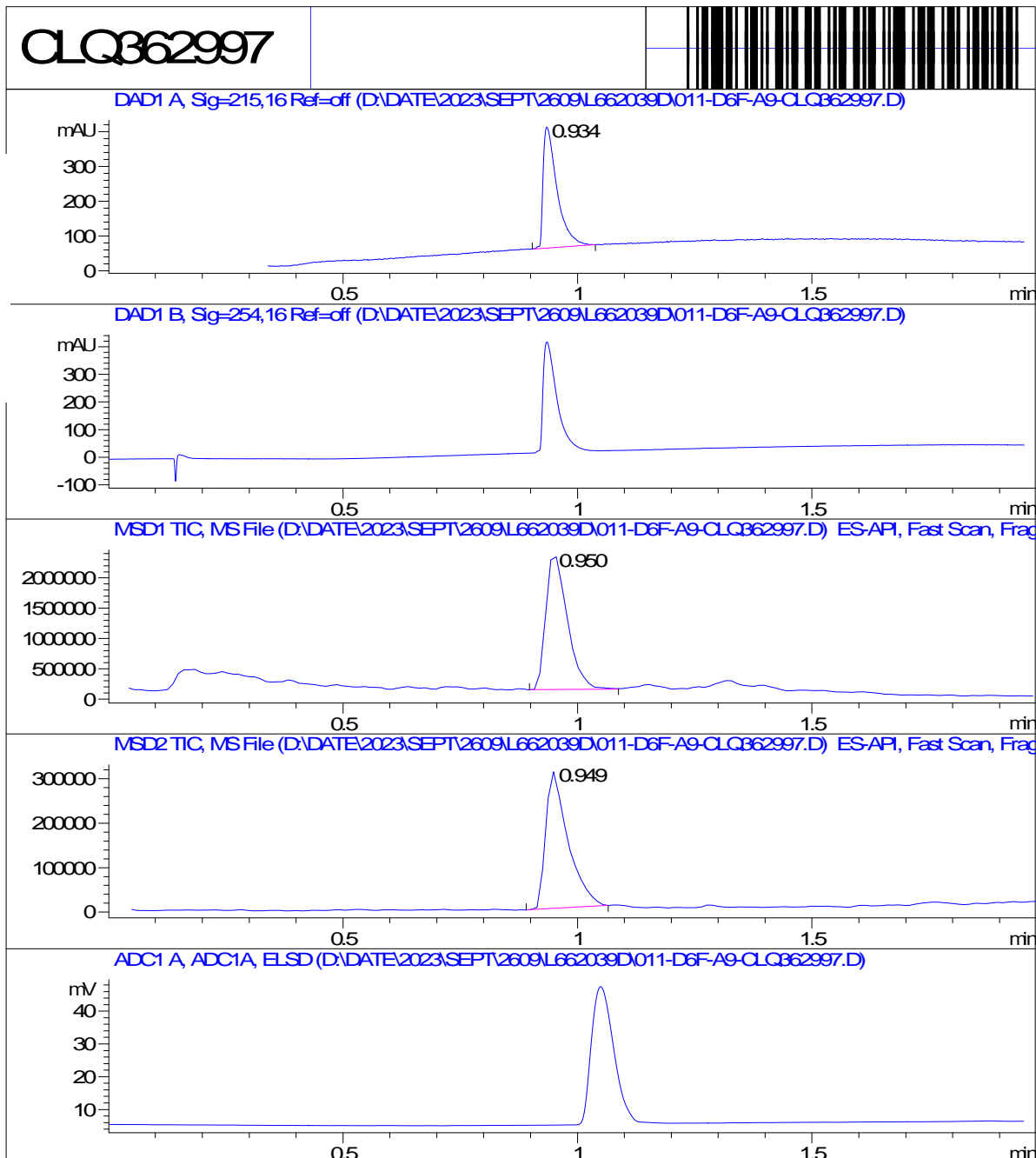
9j

Mol Wt

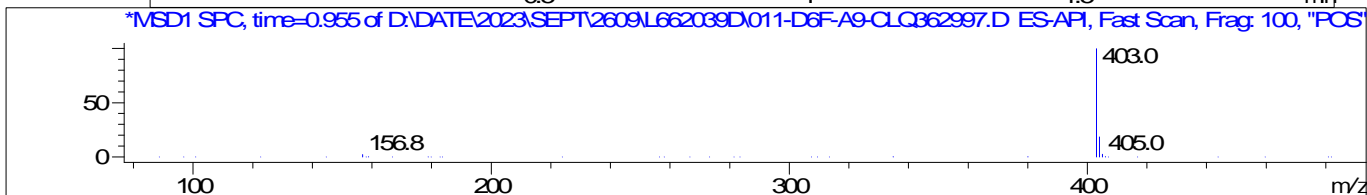
Exact Mass

#	Time	Area%
1	0.934	100.00

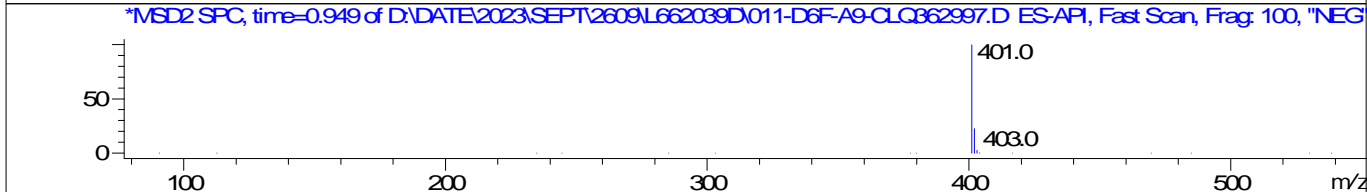
0



RT 0.950

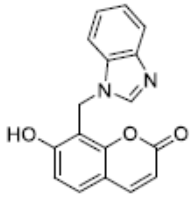
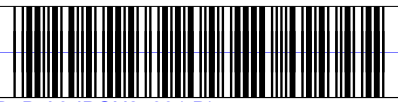


RT 0.949



MaxPeak: 100.00%
Ret_Time: 0.847 min

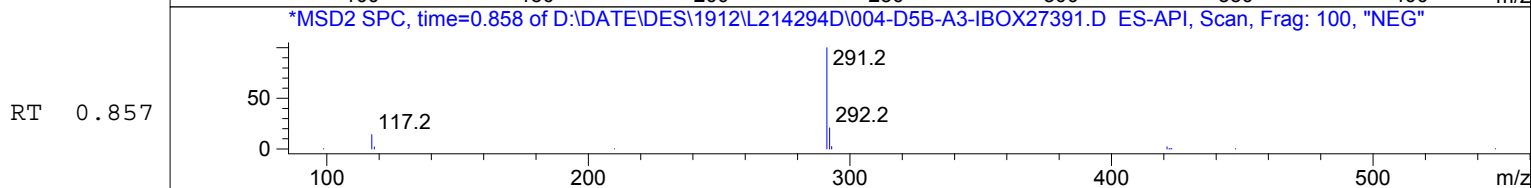
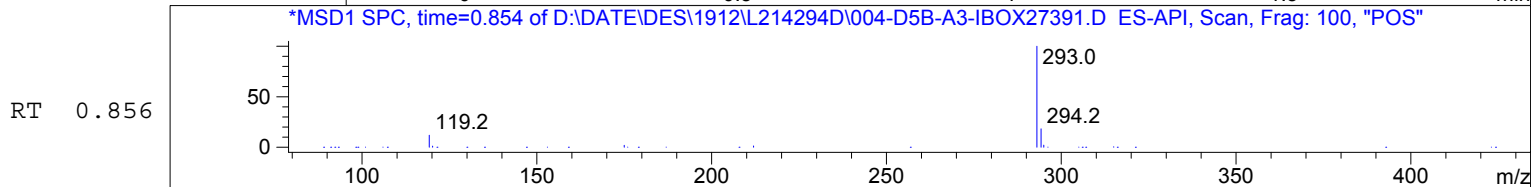
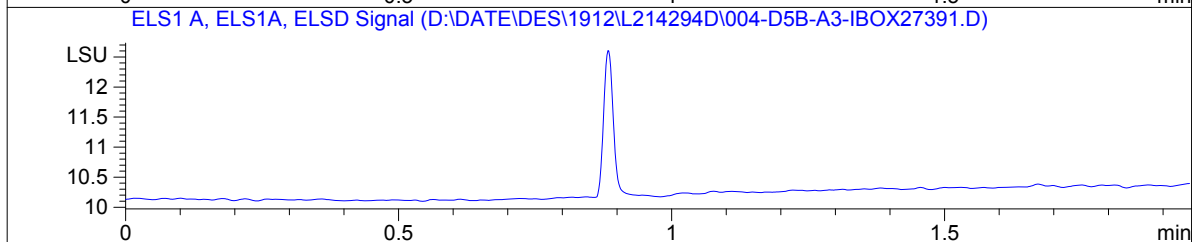
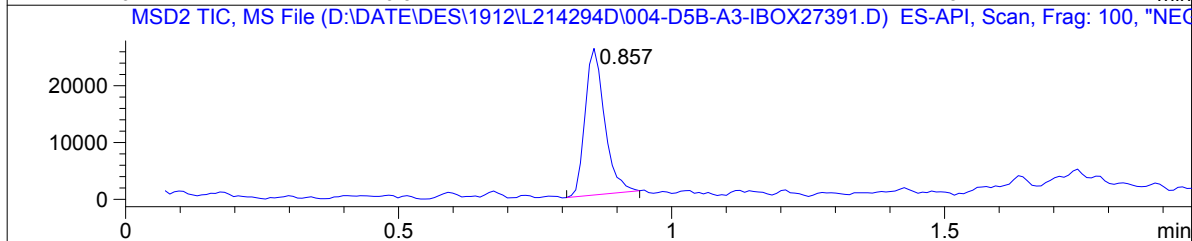
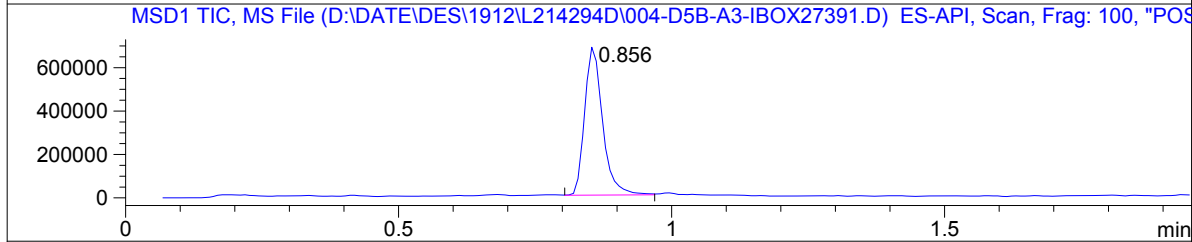
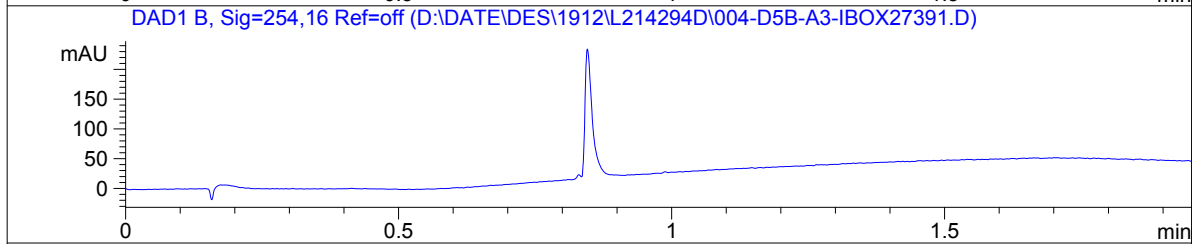
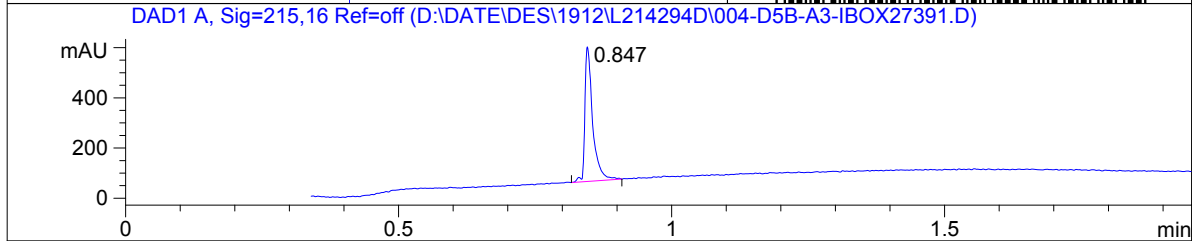
IBOX27391



10a

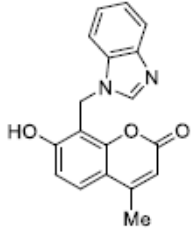
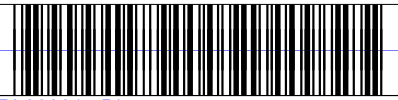
Mol Wt
Exact Mass

#	Time	Area%
1	0.847	100.00



MaxPeak: 100.00%
Ret_Time: 1.002 min

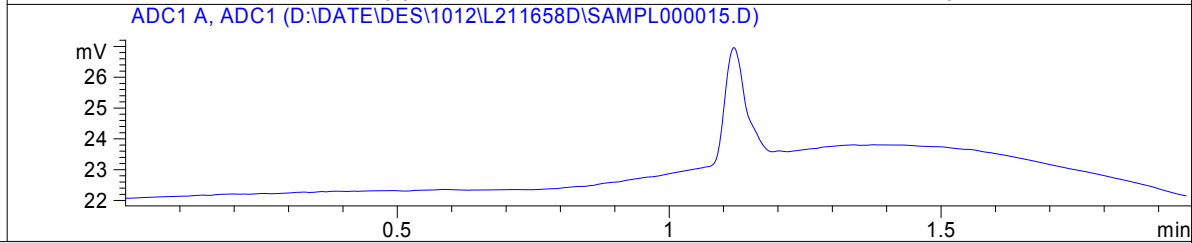
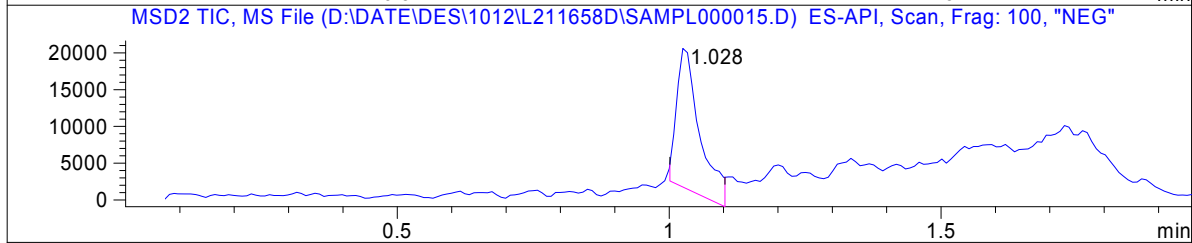
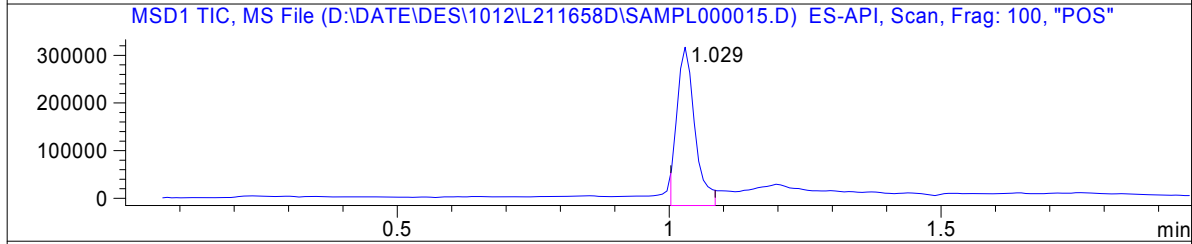
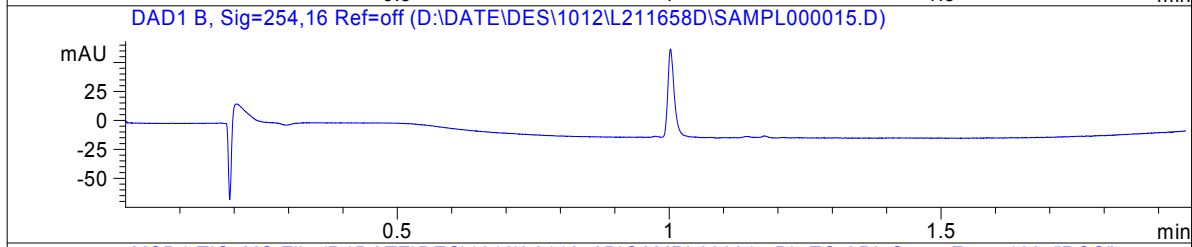
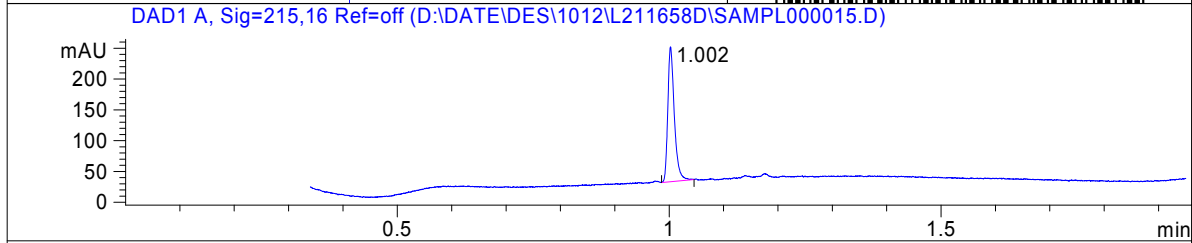
IBOX27197



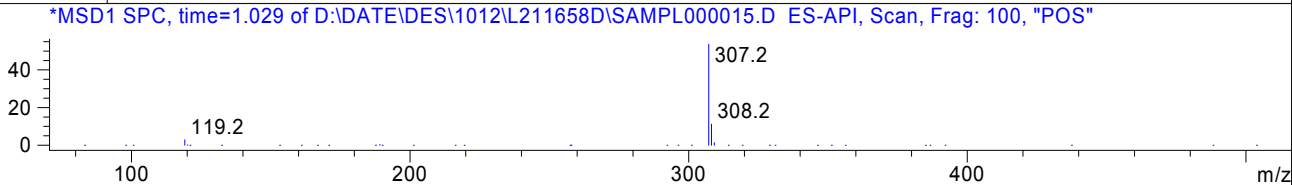
10b

Mol Wt
Exact Mass

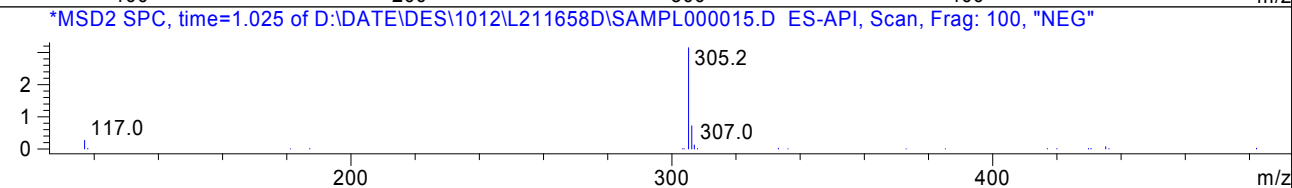
#	Time	Area%
1	1.002	100.00



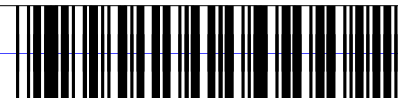
RT 1.029



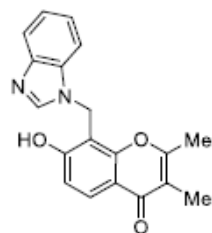
RT 1.028



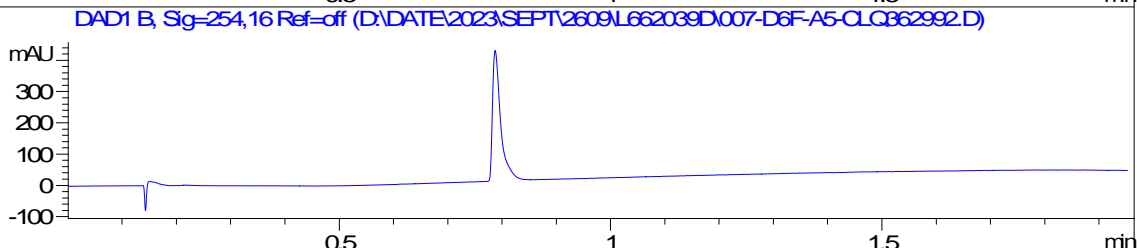
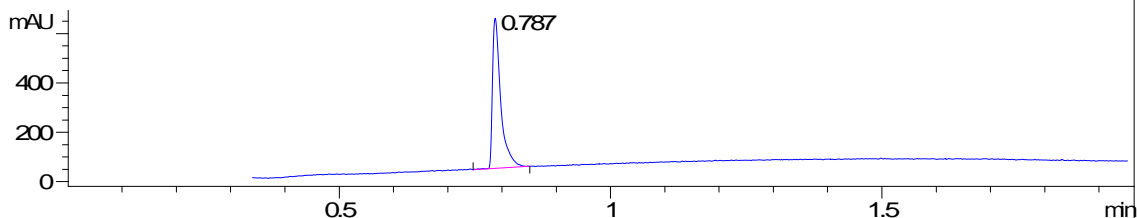
CLQ362992



MaxPeak: 100.00%
Ret_Time: 0.787 min



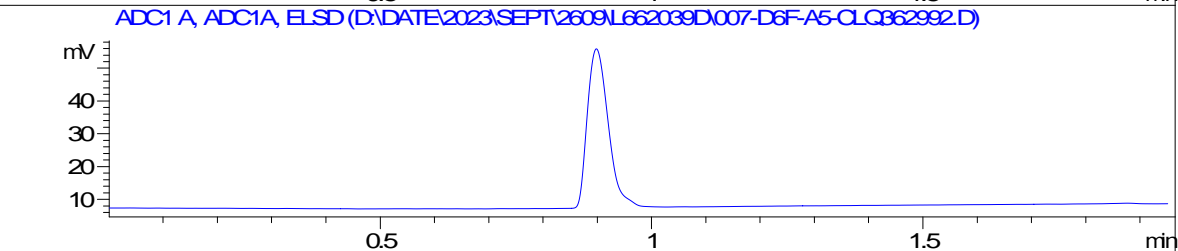
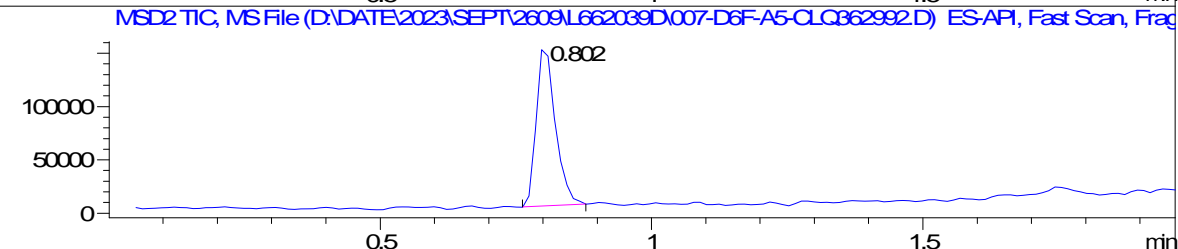
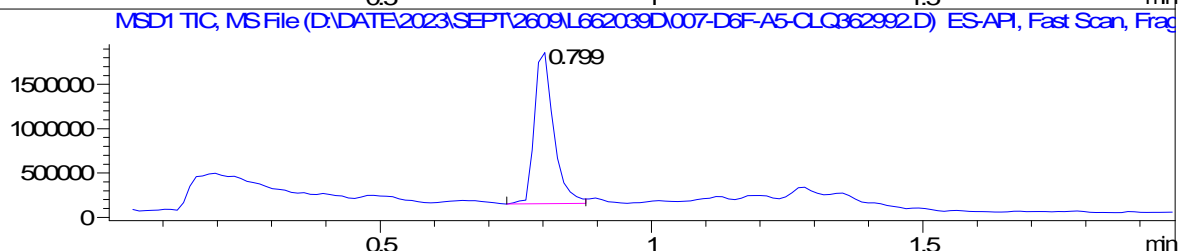
10c



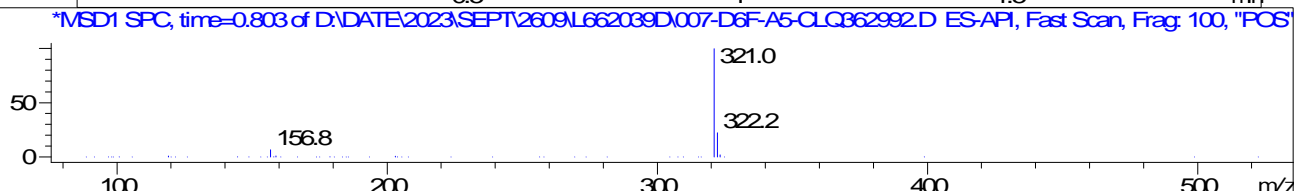
0

Mol Wt
Exact Mass

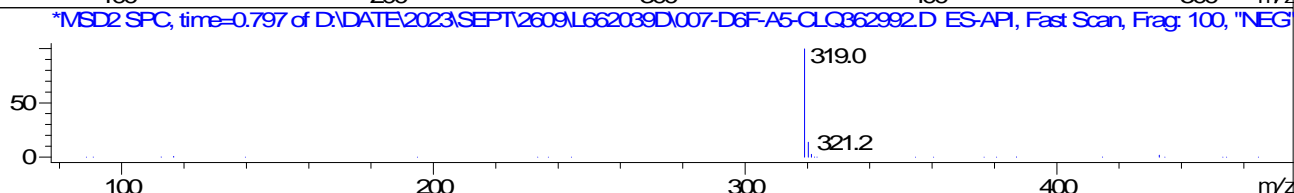
#	Time	Area%
1	0.787	100.00



RT 0.799

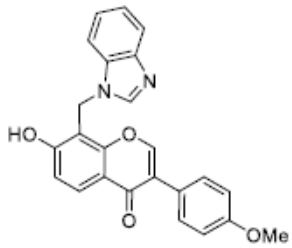
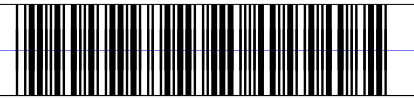


RT 0.802



MaxPeak: 100.00%
Ret_Time: 1.019 min

IBOX13686

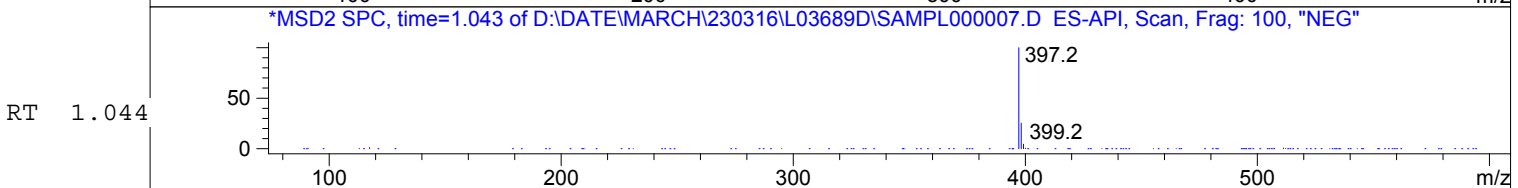
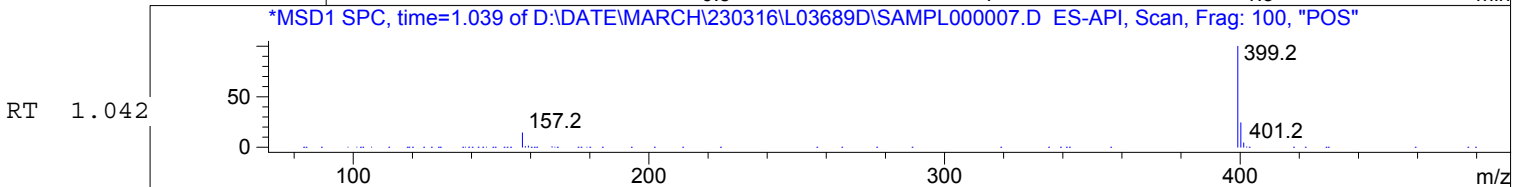
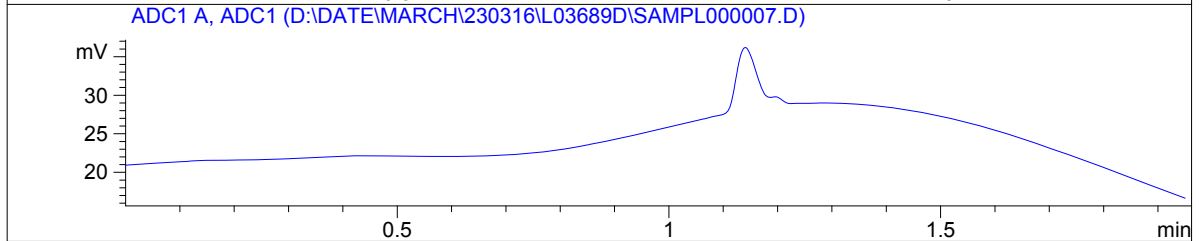
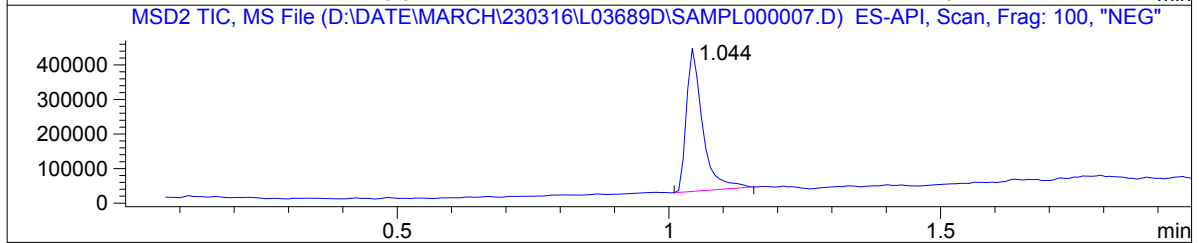
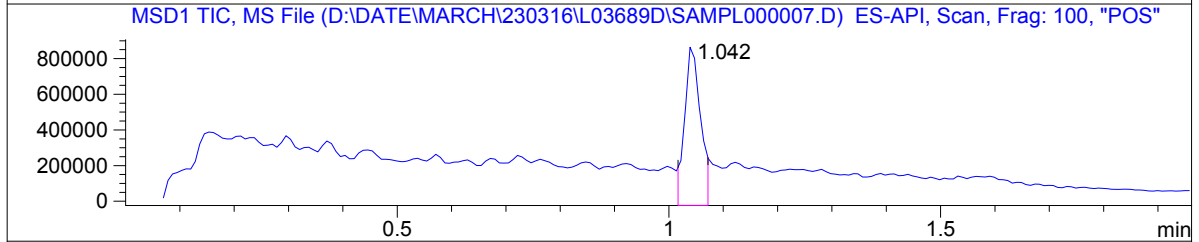
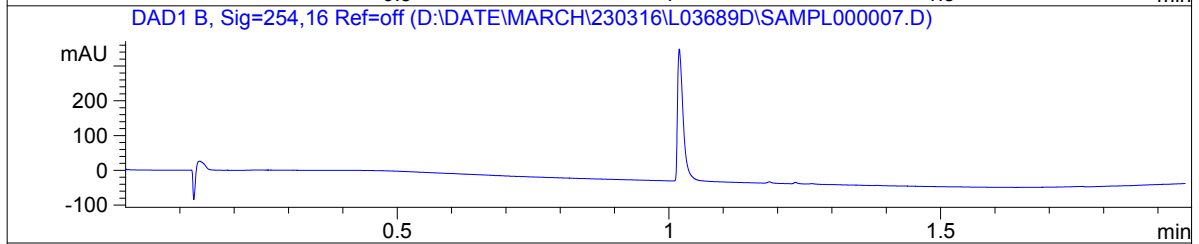
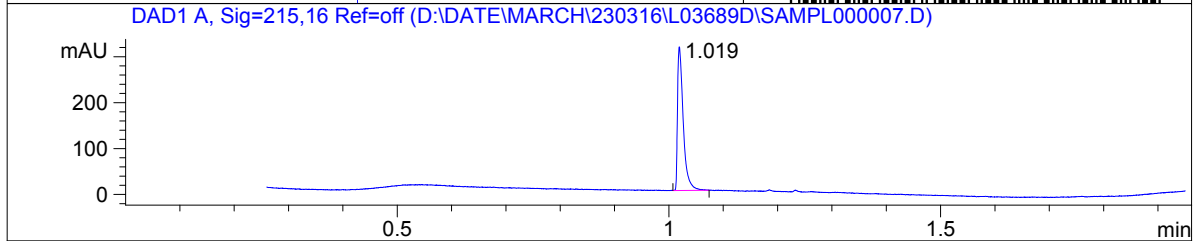


10d

Mol Wt
Exact Mass

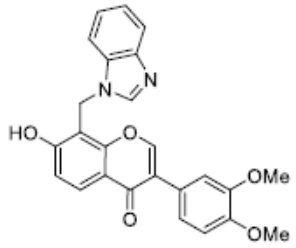
0

#	Time	Area%
1	1.019	100.00



MaxPeak: 98.09%
Ret_Time: 0.978 min

IBOX13684



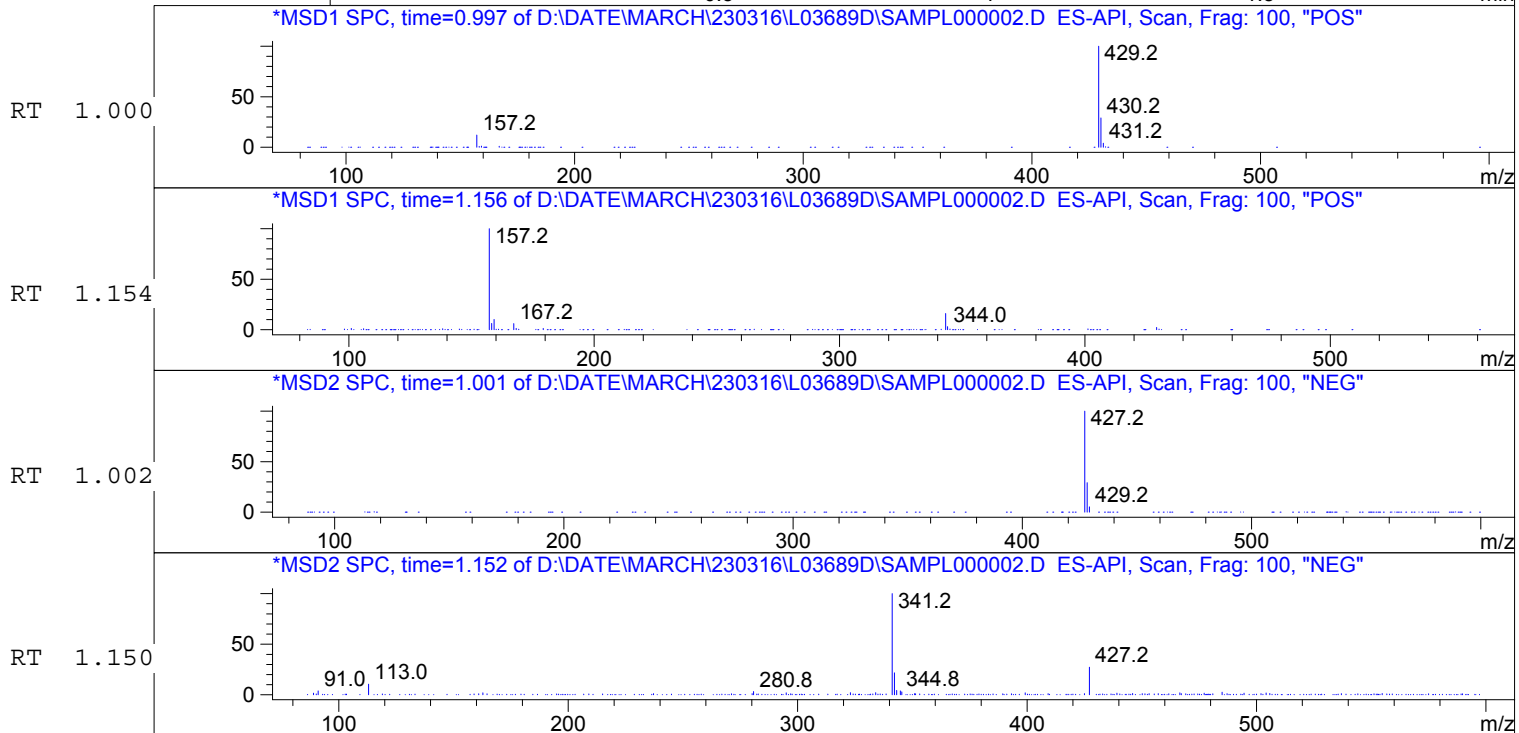
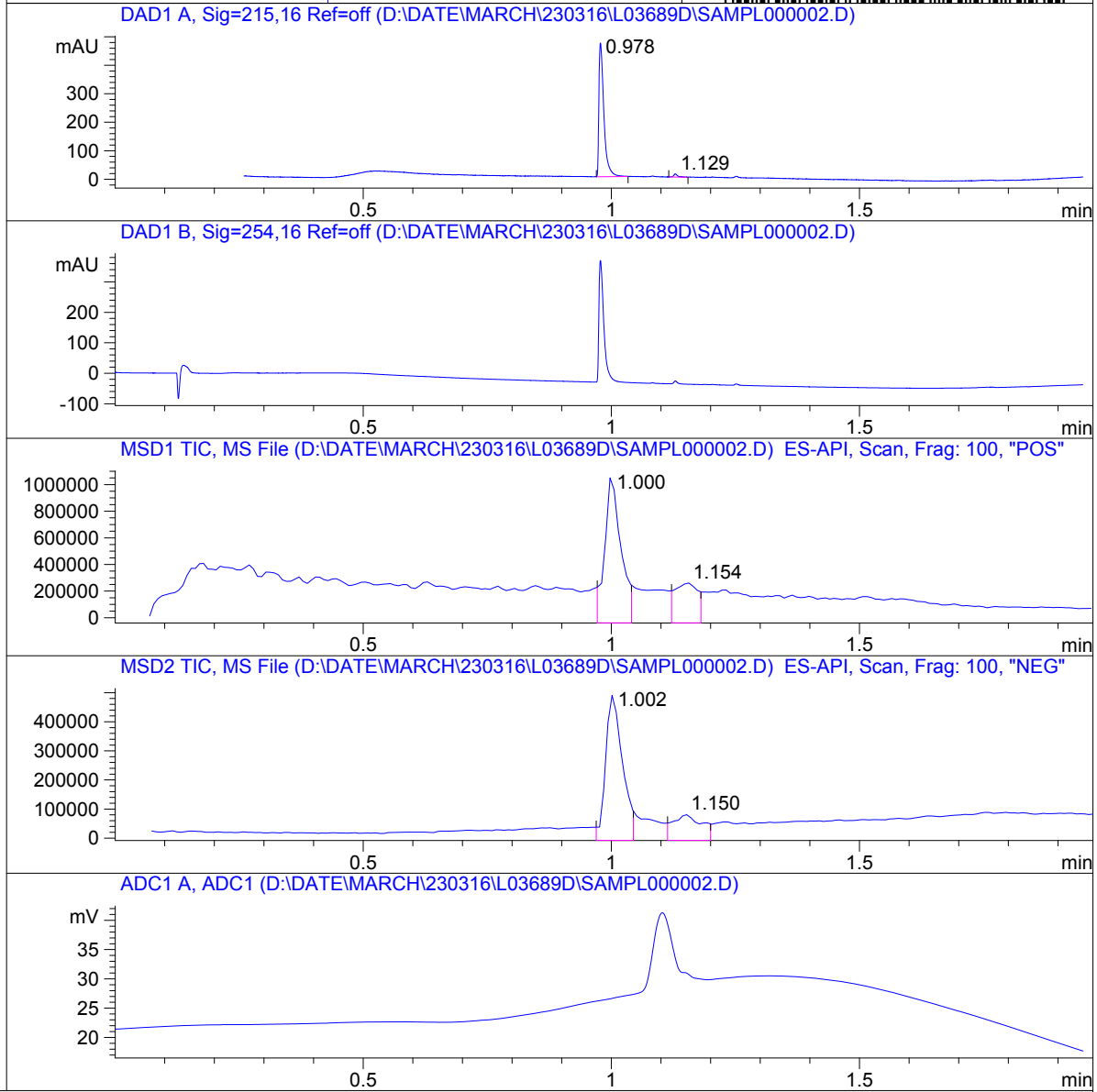
10e

Mol Wt
Exact Mass

0

Time Area%

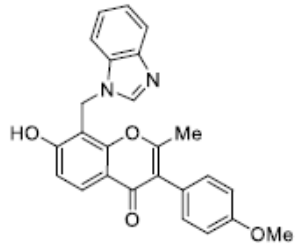
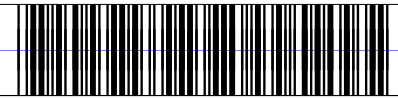
#	Time	Area%
1	0.978	98.09
2	1.129	1.91



S169

MaxPeak: 96.54%
Ret_Time: 1.014 min

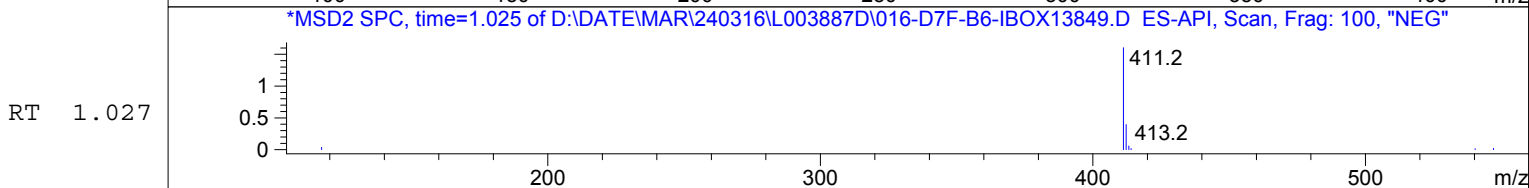
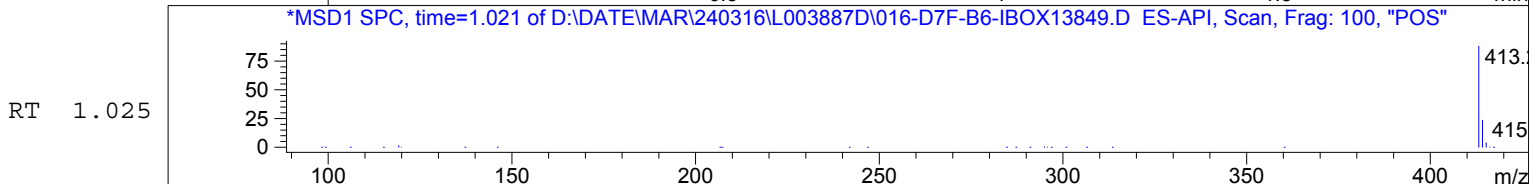
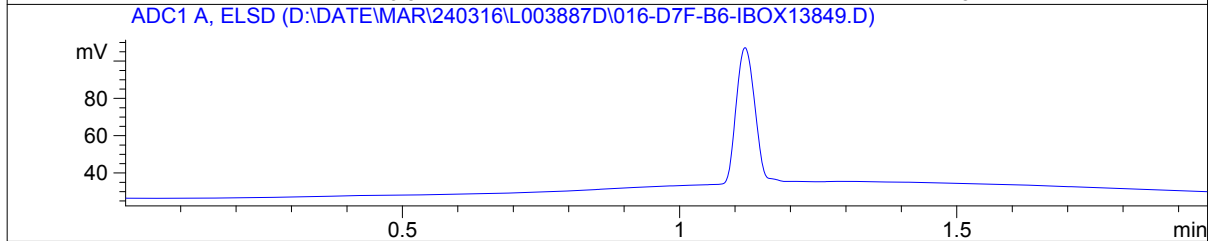
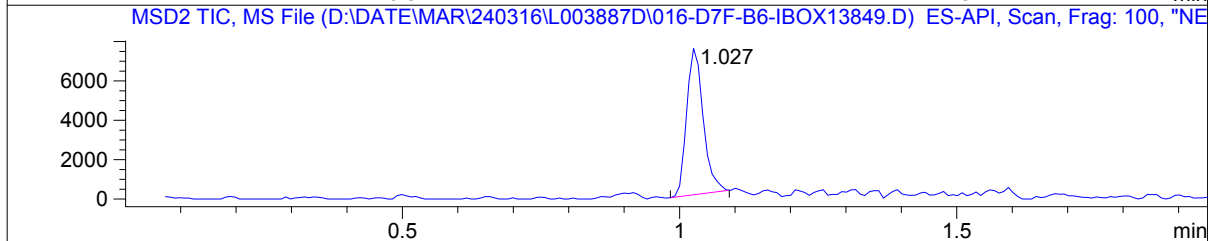
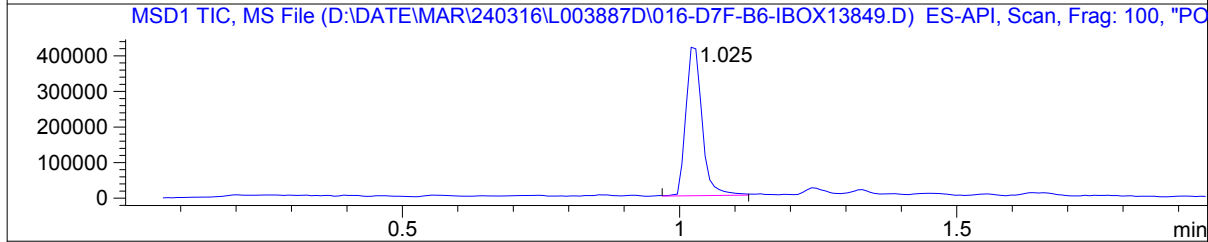
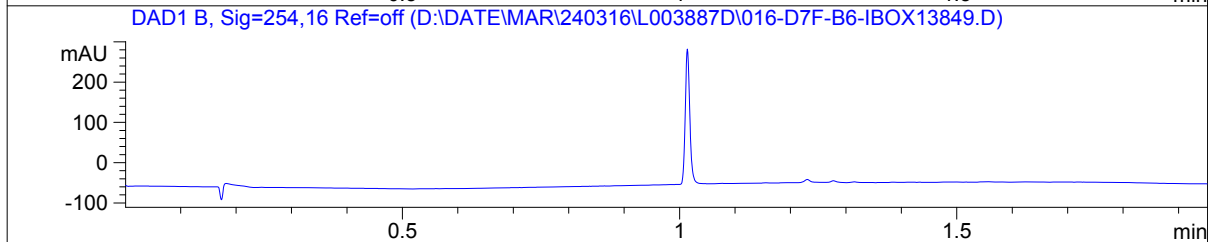
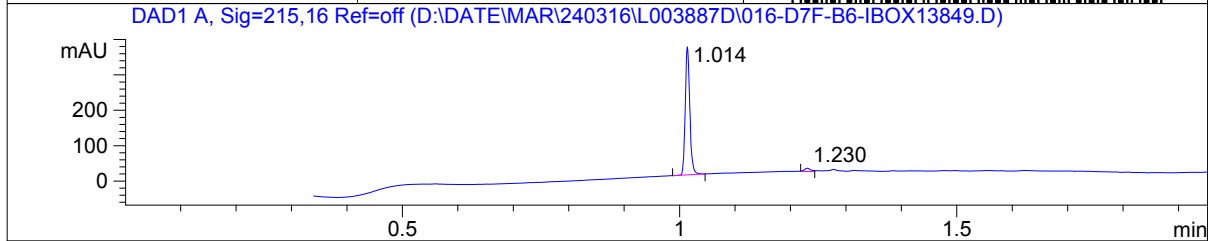
IBOX13849



10f

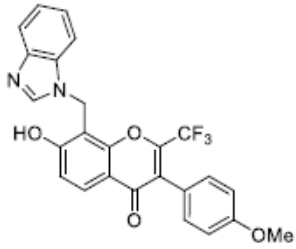
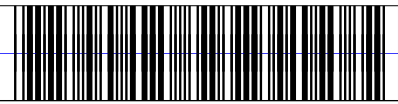
Mol Wt 0
Exact Mass

#	Time	Area%
1	1.014	96.54
2	1.230	3.46



MaxPeak: 100.00%
Ret_Time: 1.186 min

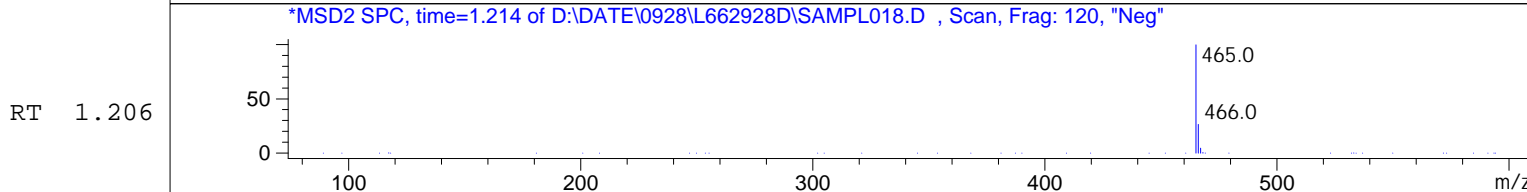
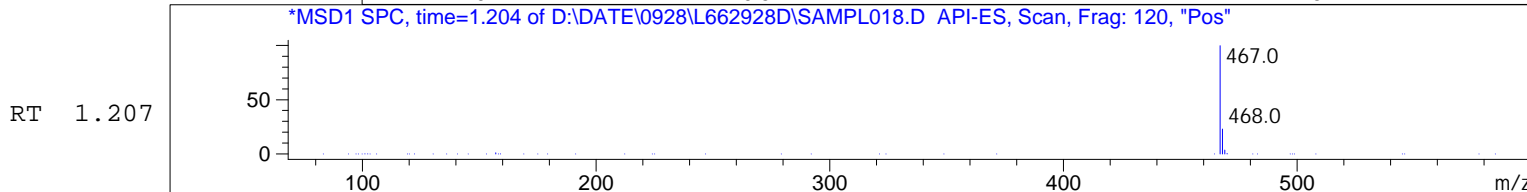
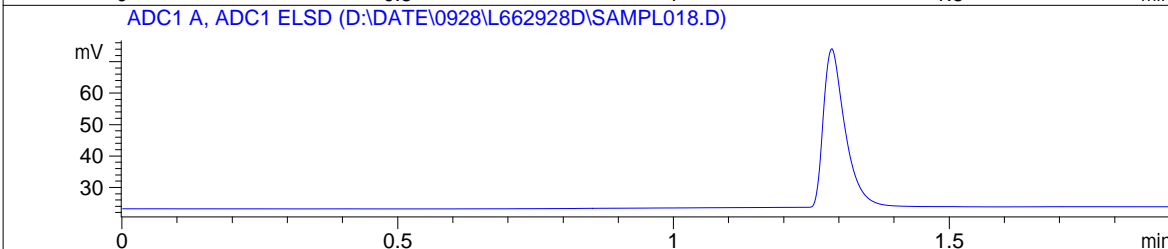
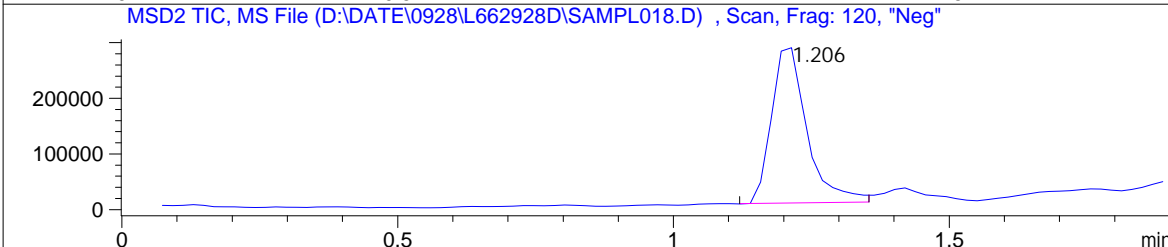
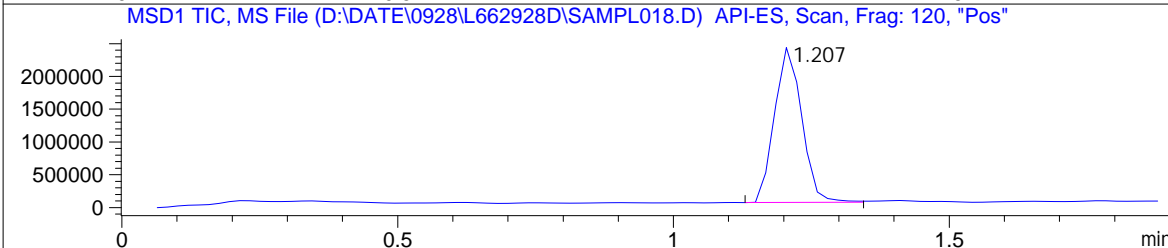
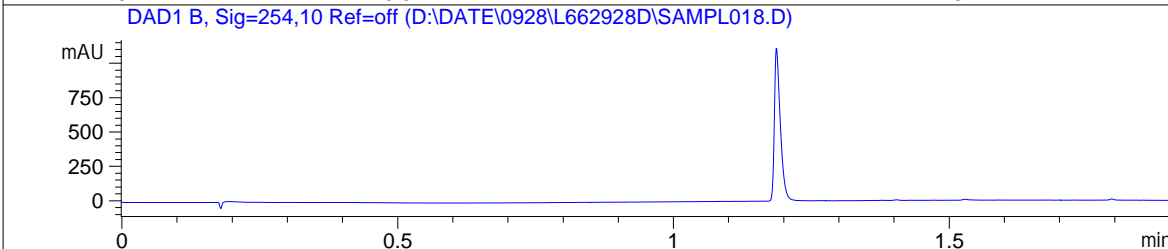
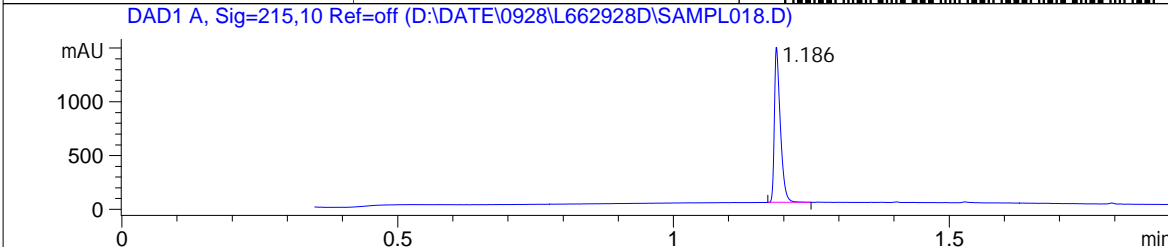
CLQ377163



10g

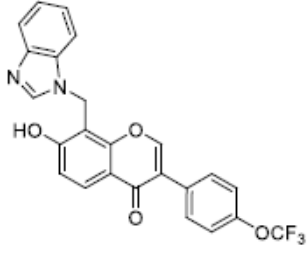
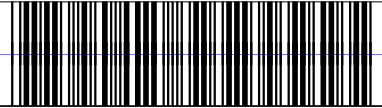
Mol Wt 0
Exact Mass

#	Time	Area%
1	1.186	100.00



MaxPeak: 100.00%
Ret_Time: 1.153 min

CLQ377170

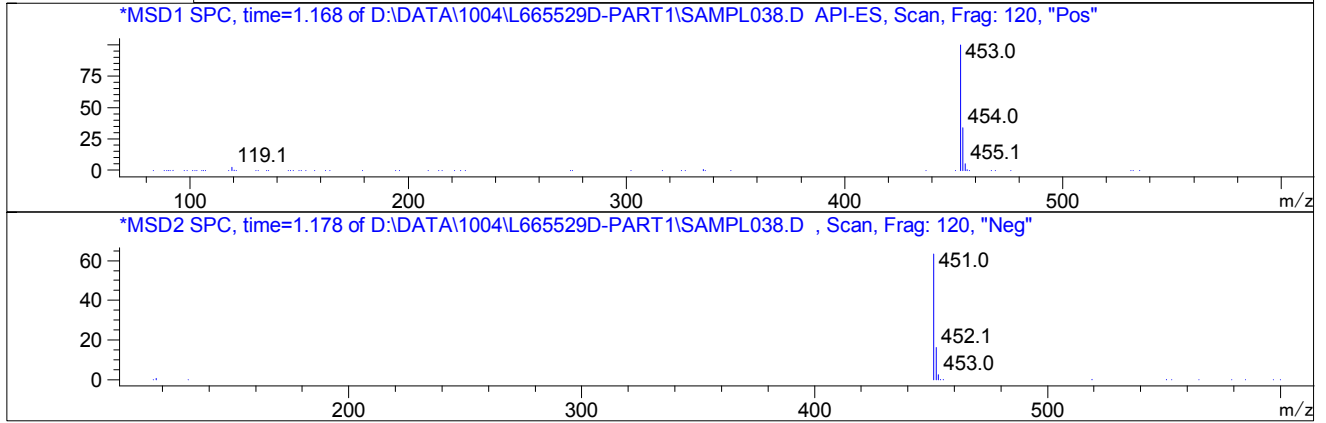
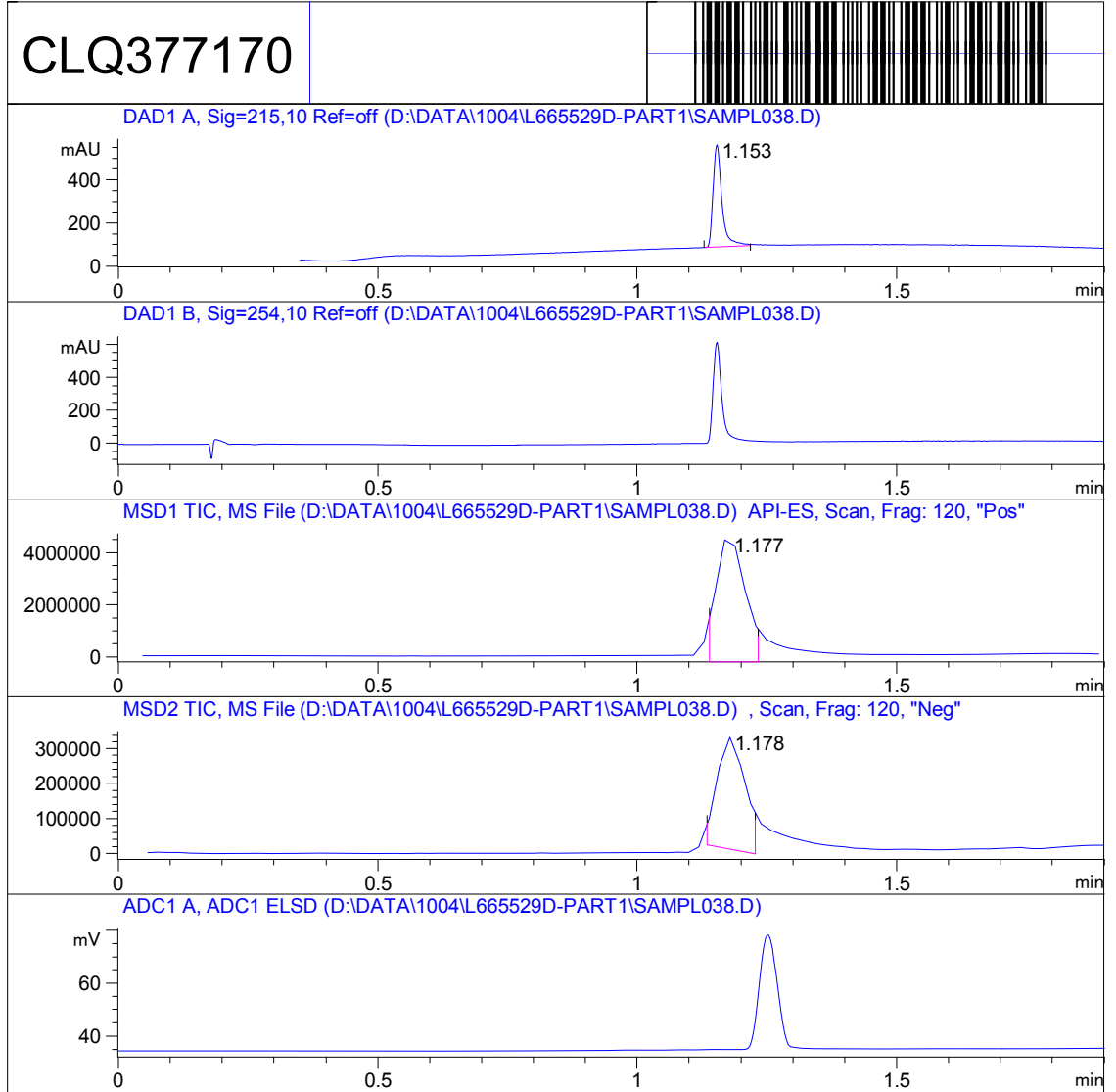


10h

Mol Wt
Exact Mass

#	Time	Area%
1	1.153	100.00

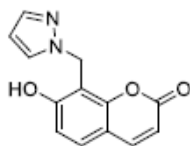
0



IBOX27390



MaxPeak: 100.00%
Ret_Time: 0.721 min

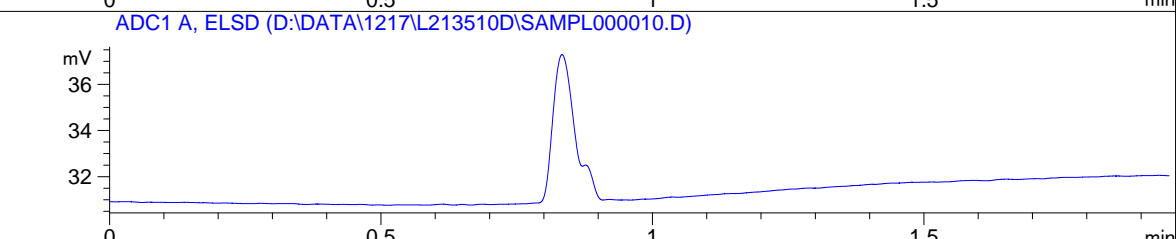
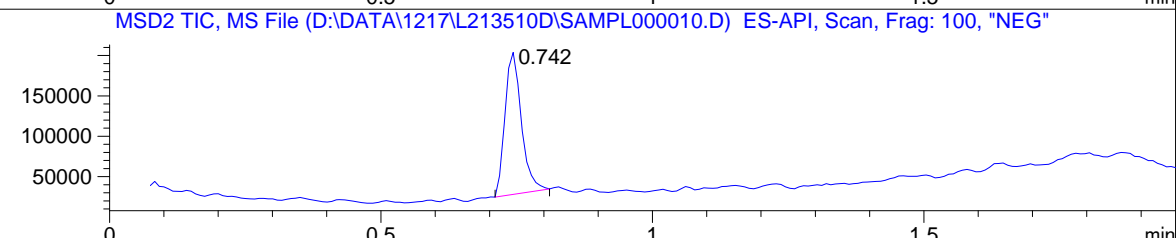
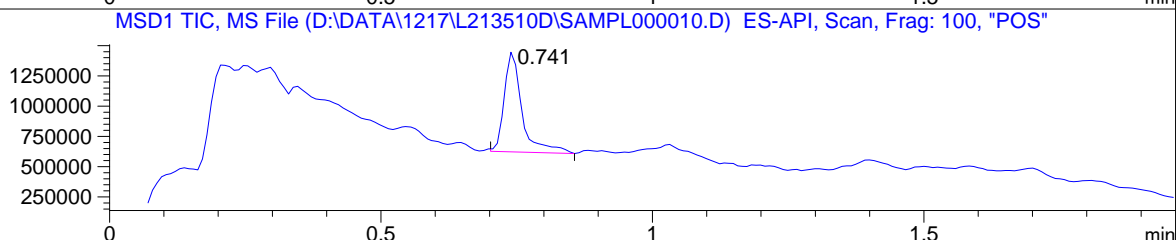
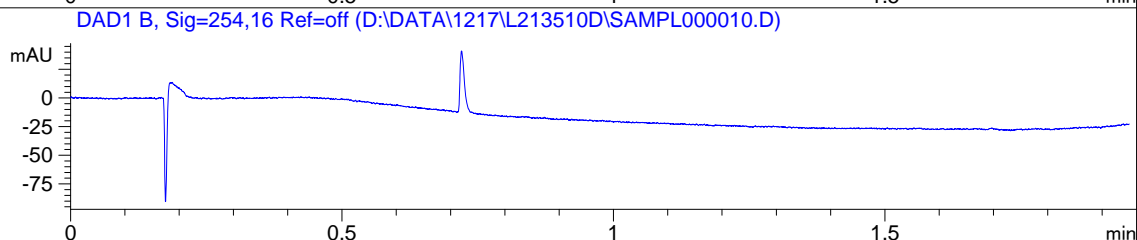
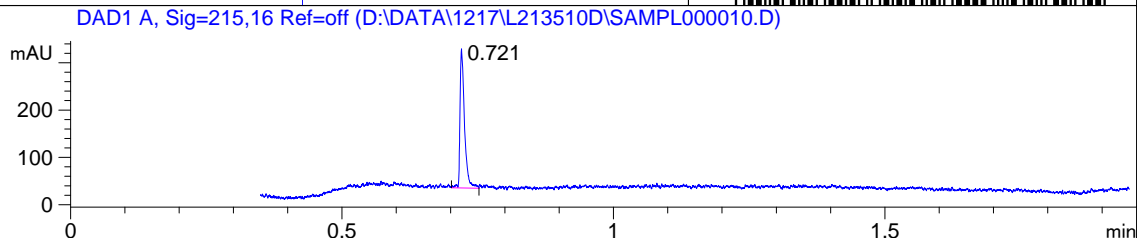


11a

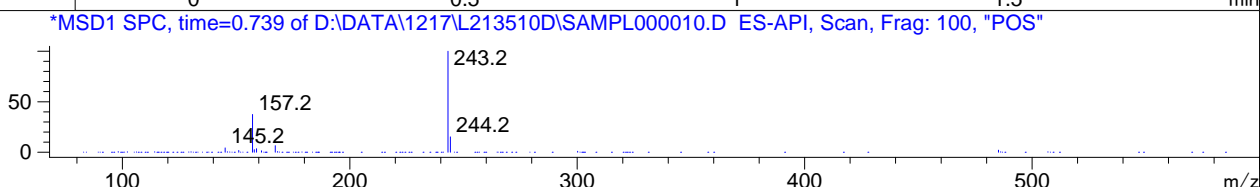
Mol Wt
Exact Mass

#	Time	Area%
1	0.721	100.00

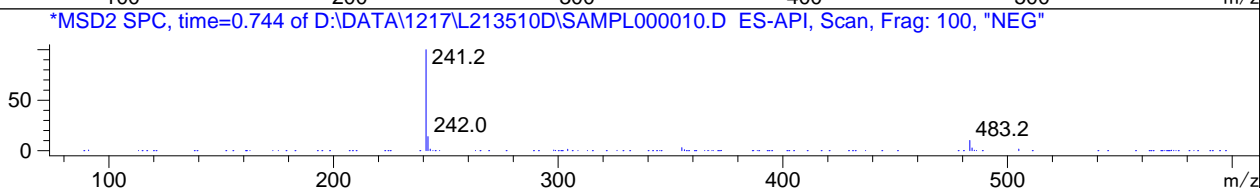
0



RT 0.741



RT 0.742

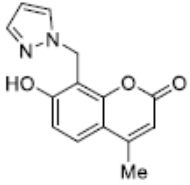


MaxPeak: 86.52%
Ret_Time: 1.090 min

IBOX13615



11b

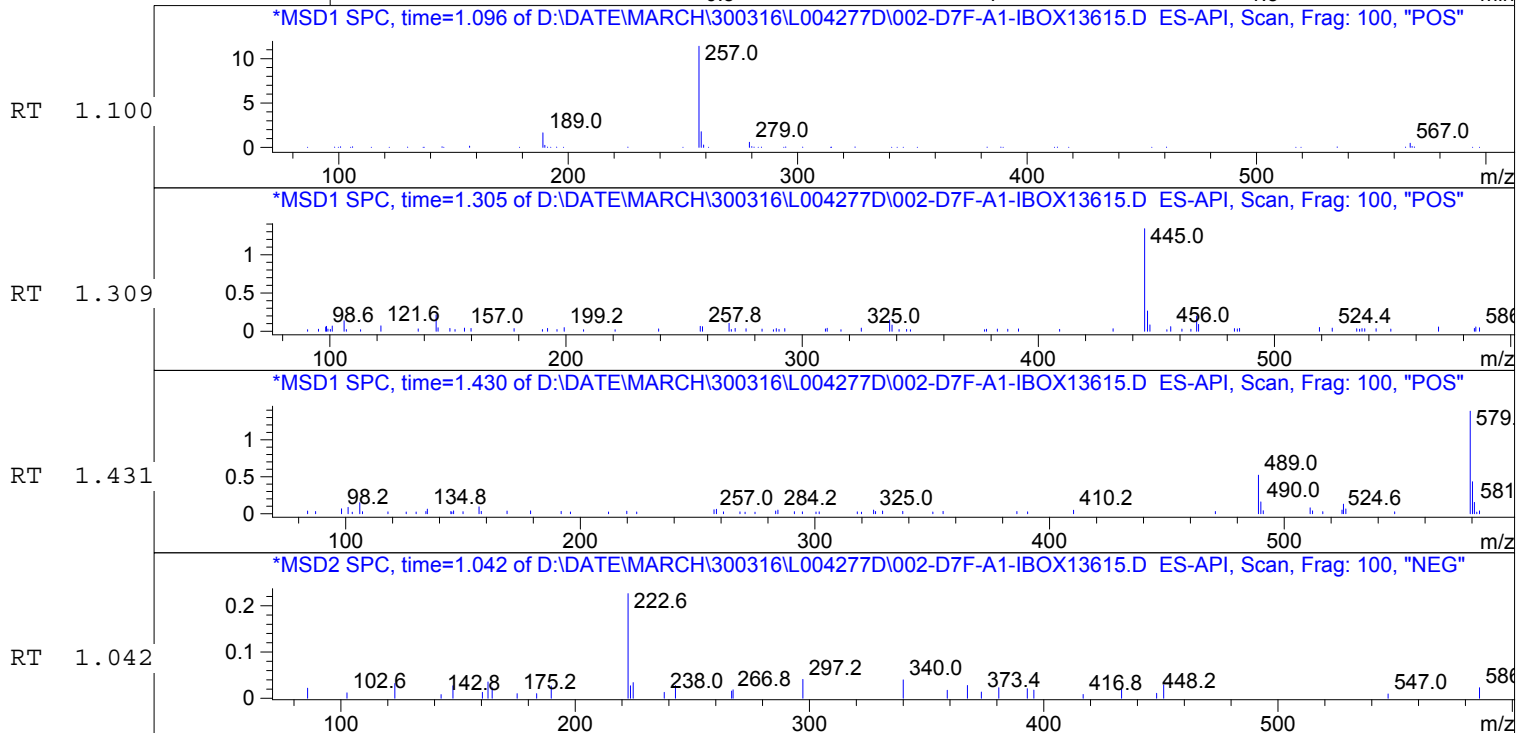
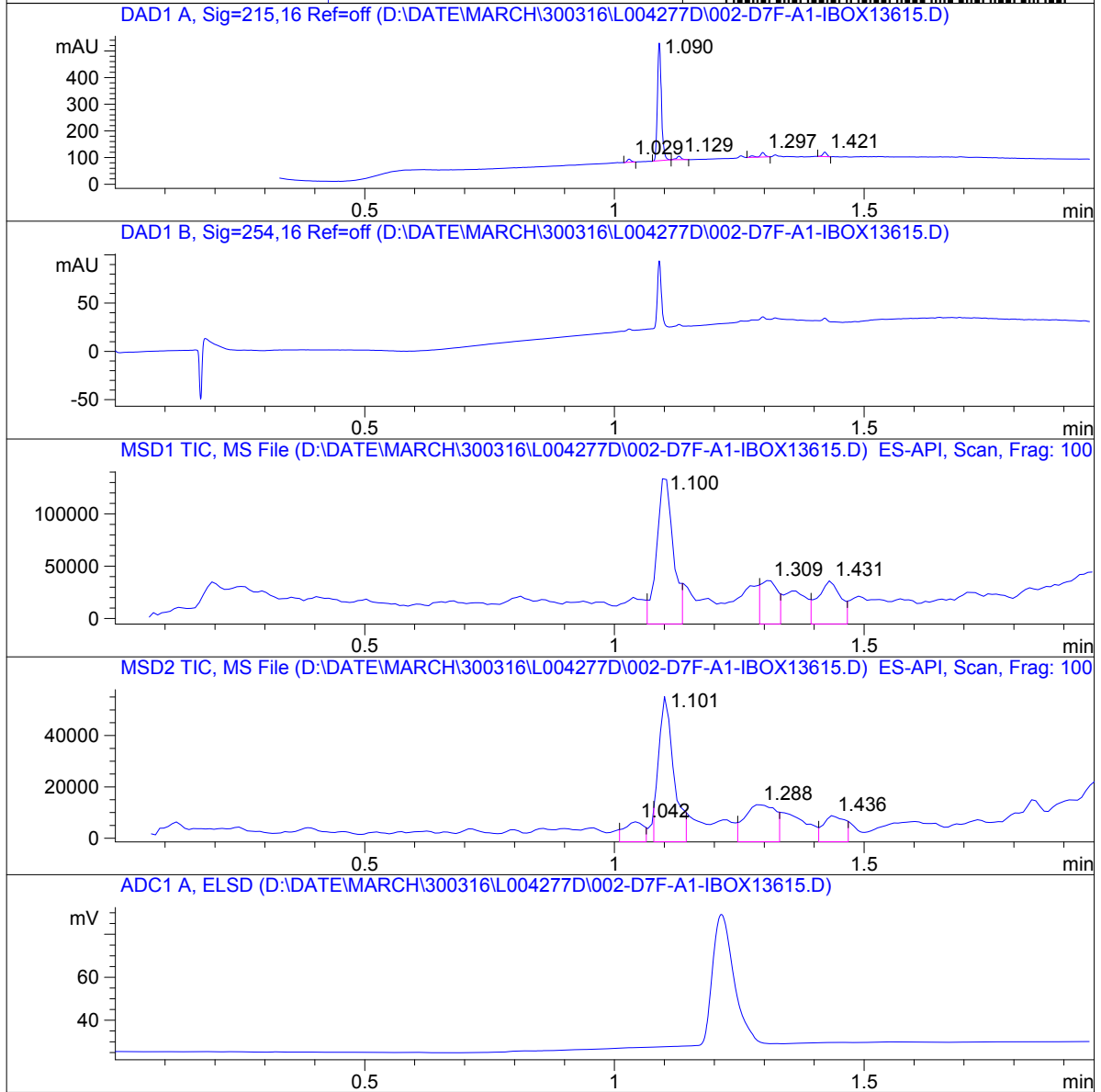


Mol Wt
Exact Mass

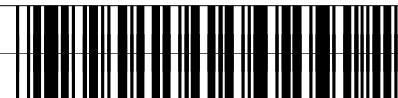
0

Time Area%

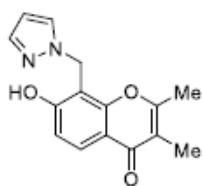
#	Time	Area%
1	1.029	2.32
2	1.090	86.52
3	1.129	3.03
4	1.297	4.85
5	1.421	3.29



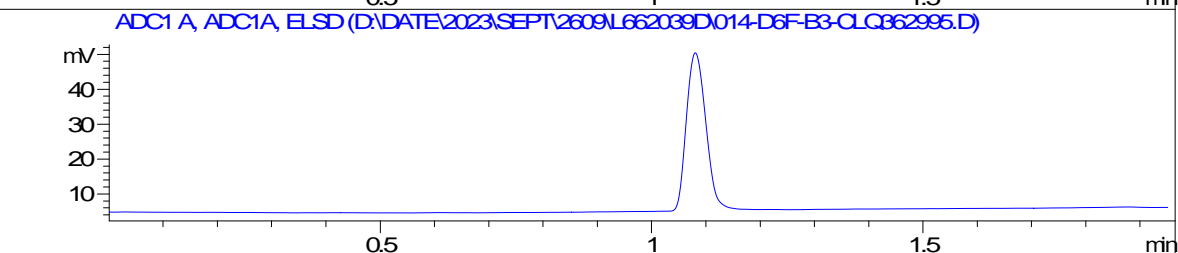
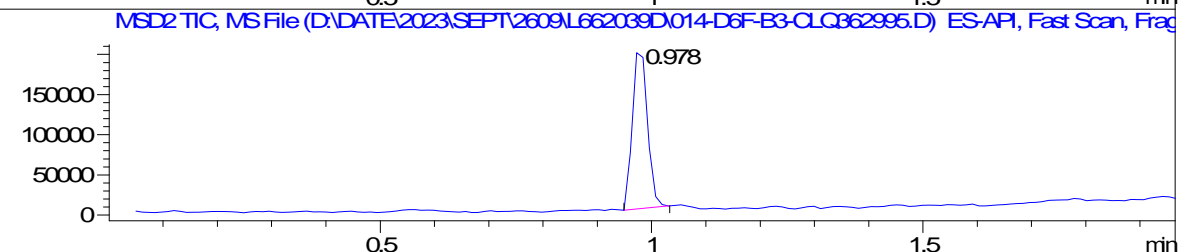
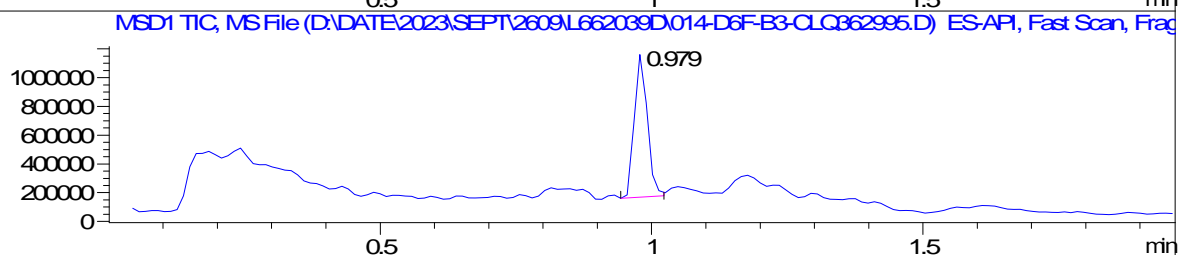
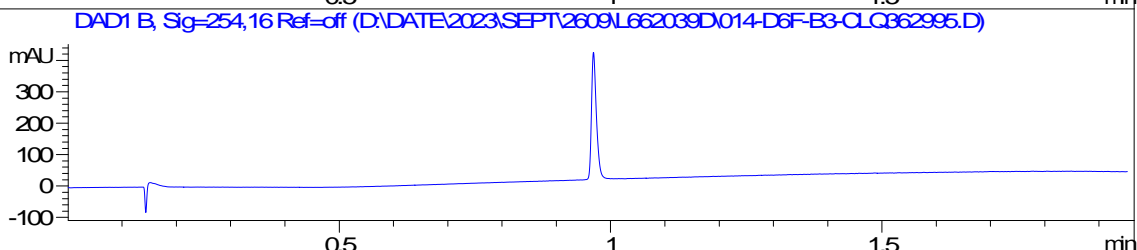
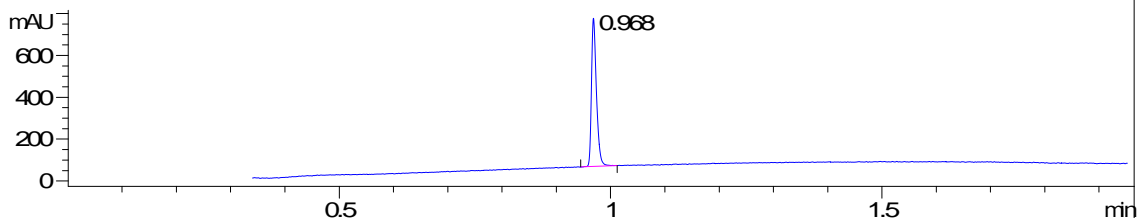
CLQ362995



MaxPeak: 100.00%
Ret_Time: 0.968 min



11c

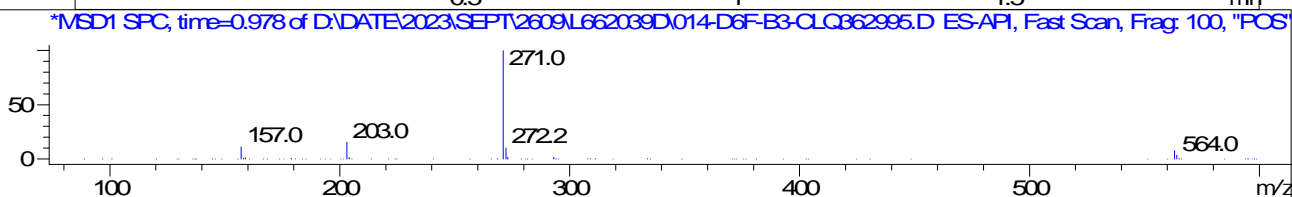


Mol Wt
Exact Mass

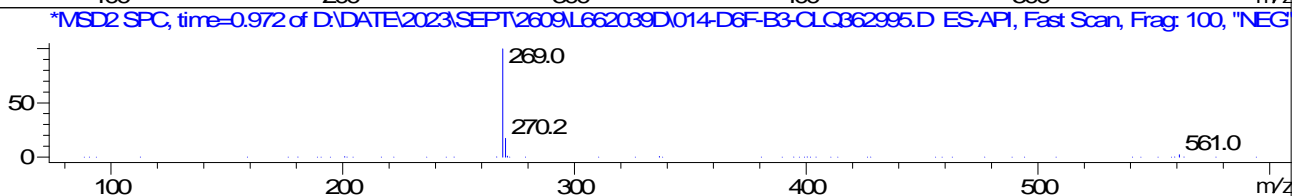
0

#	Time	Area%
1	0.968	100.00

RT 0.979



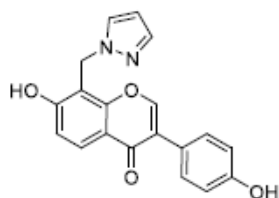
RT 0.978



IBOX14382



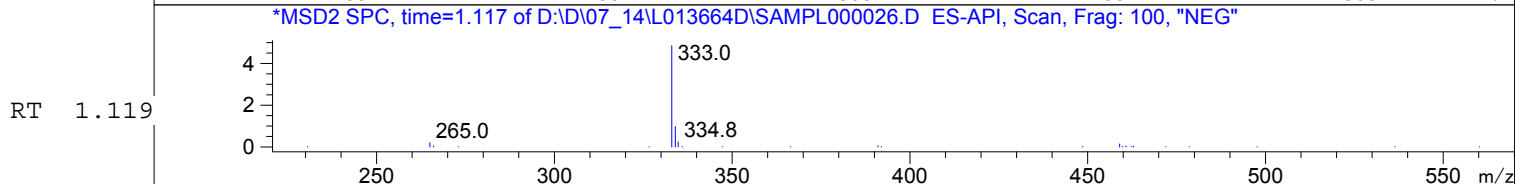
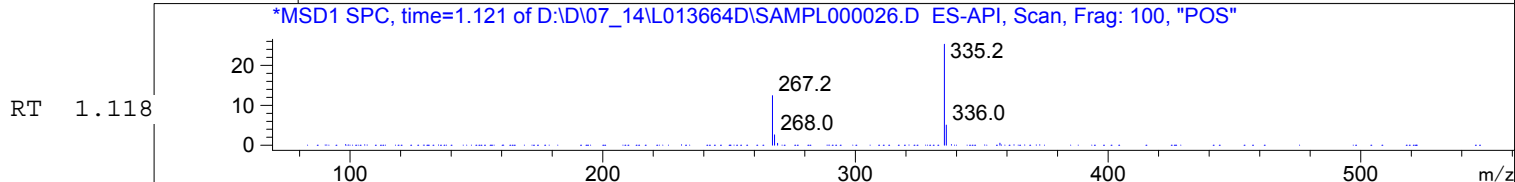
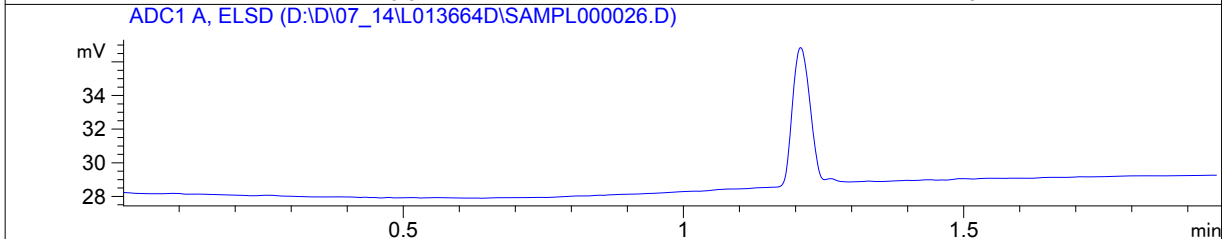
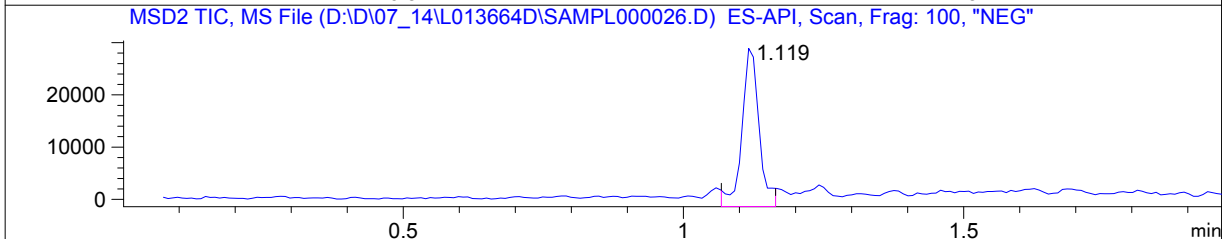
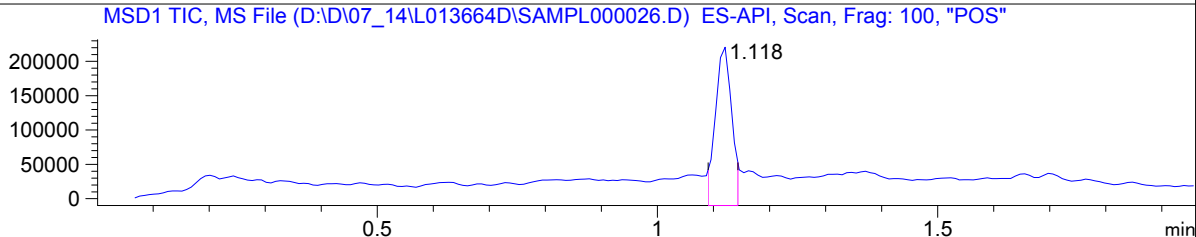
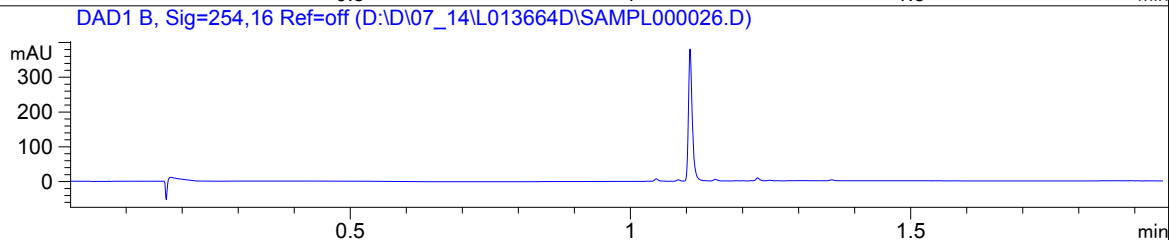
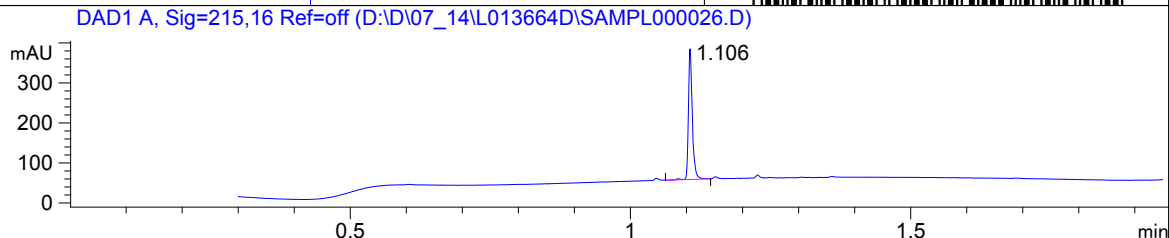
MaxPeak: 100.00%
Ret_Time: 1.106 min



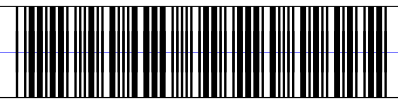
11d

Mol Wt 0
Exact Mass

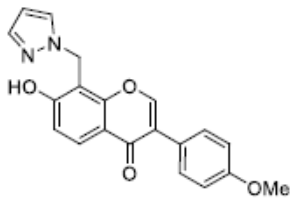
#	Time	Area%
1	1.106	100.00



CLQ377544



MaxPeak: 99.20%
Ret_Time: 1.039 min

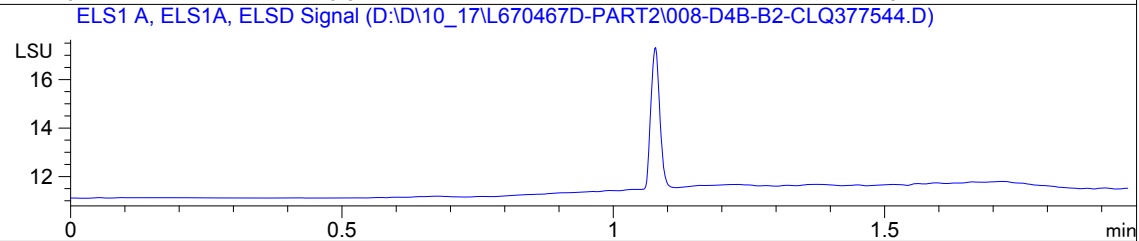
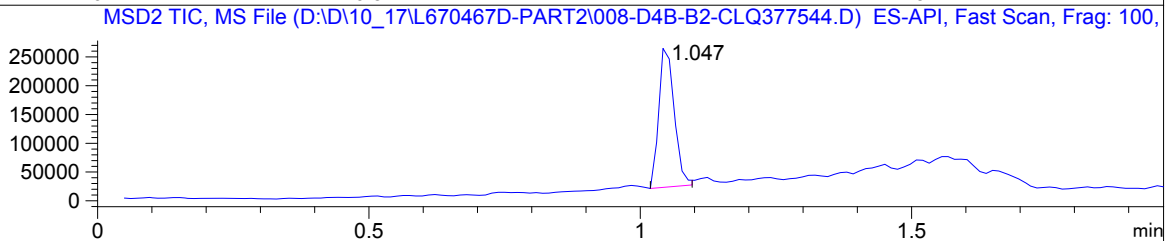
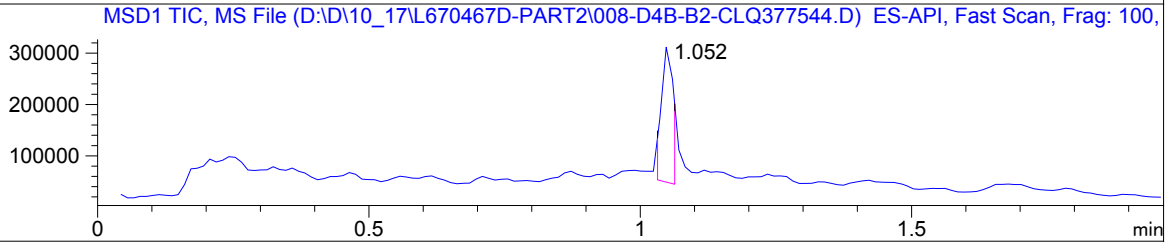
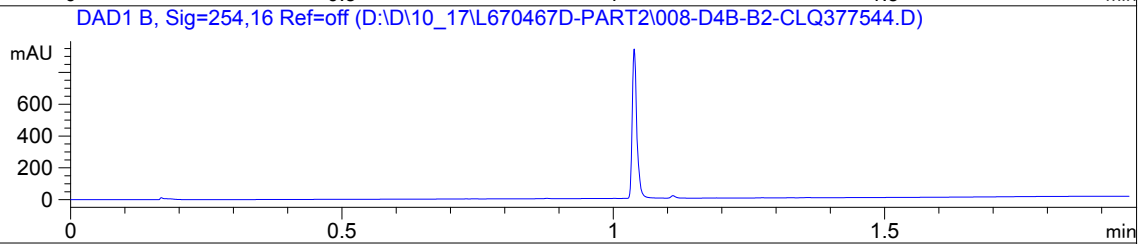
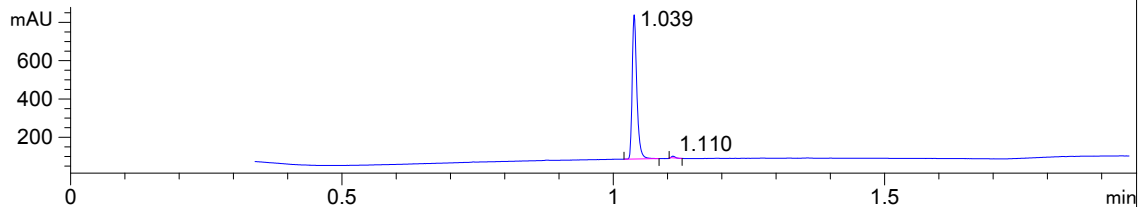


11e

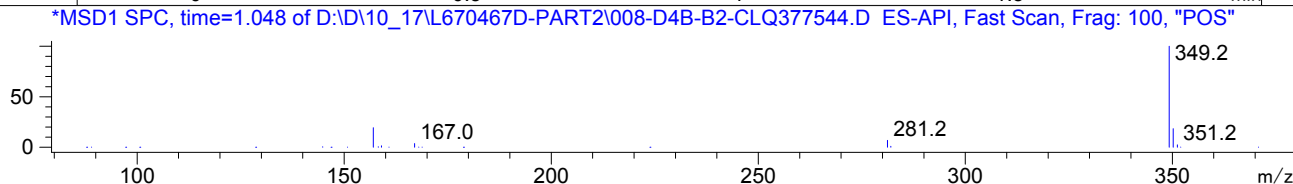
Mol Wt

Exact Mass

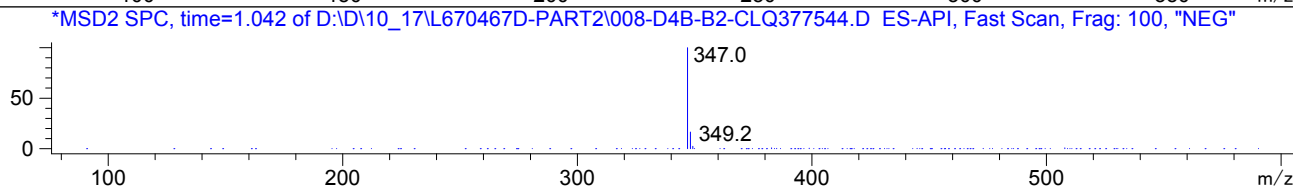
#	Time	Area%
1	1.039	99.20
2	1.110	0.80



RT 1.052



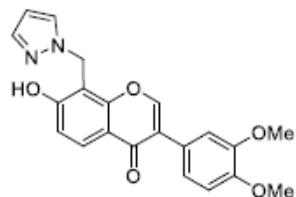
RT 1.047



CLQ377557



MaxPeak: 100.00%
Ret_Time: 1.014 min



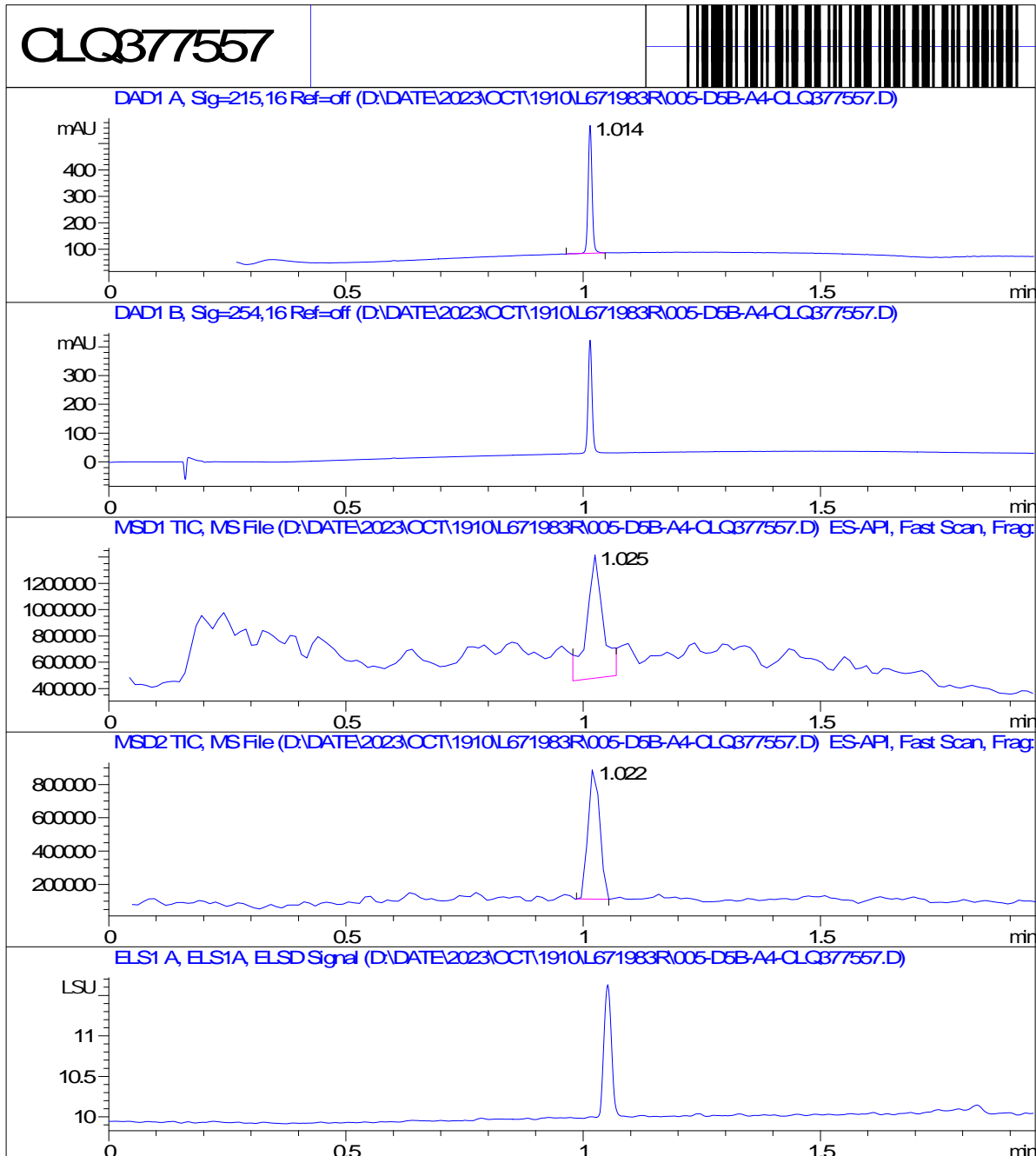
11f

Mol Wt

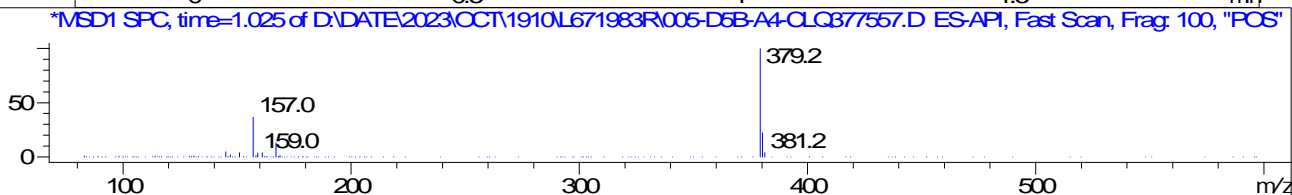
Exact Mass

#	Time	Area%
1	1.014	100.00

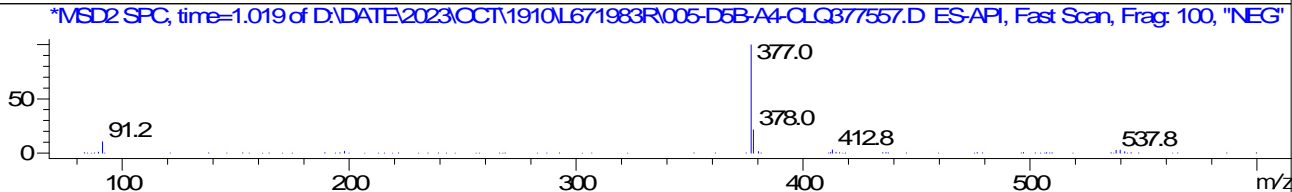
0



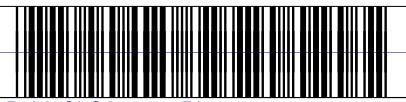
RT 1.025



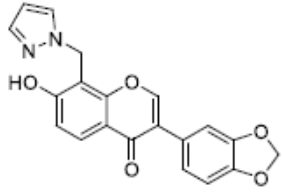
RT 1.022



CLQ377545



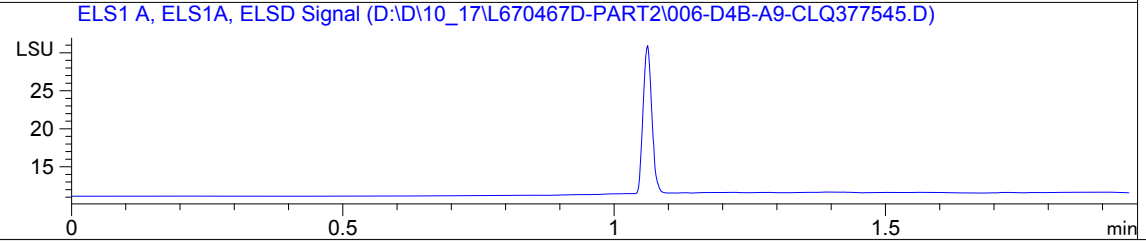
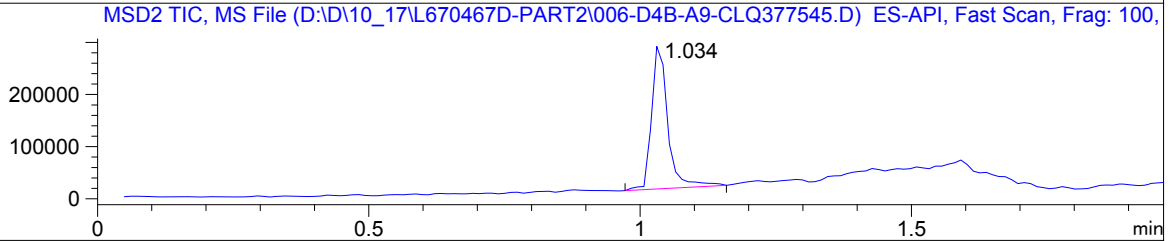
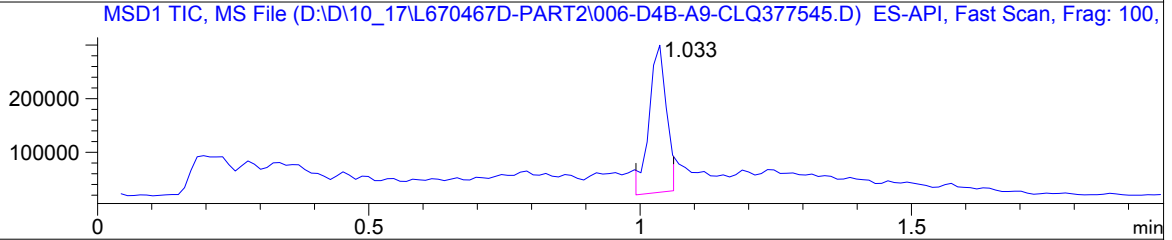
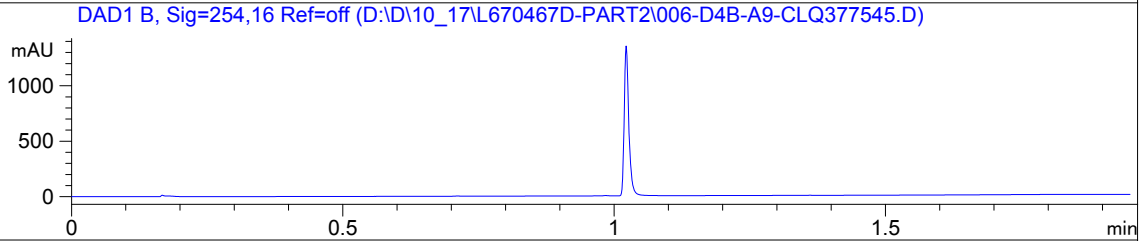
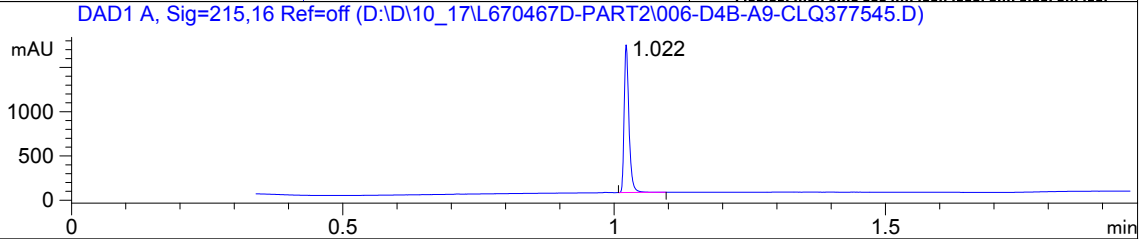
MaxPeak: 100.00%
Ret_Time: 1.022 min



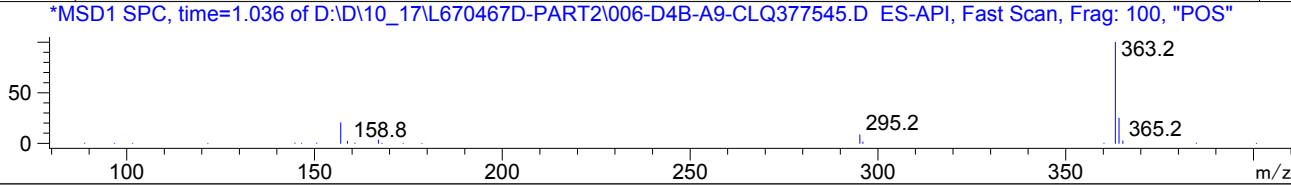
11g

Mol Wt 0
Exact Mass

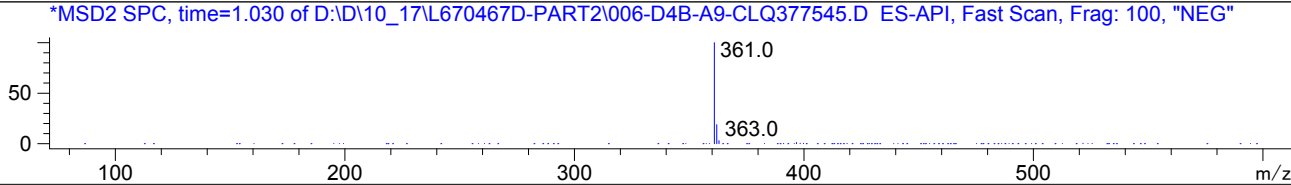
#	Time	Area%
1	1.022	100.00



RT 1.033

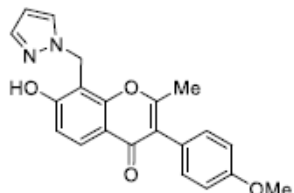
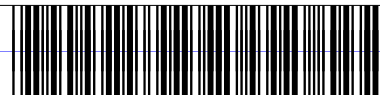


RT 1.034



MaxPeak: 100.00%
Ret_Time: 1.235 min

IBOX13834

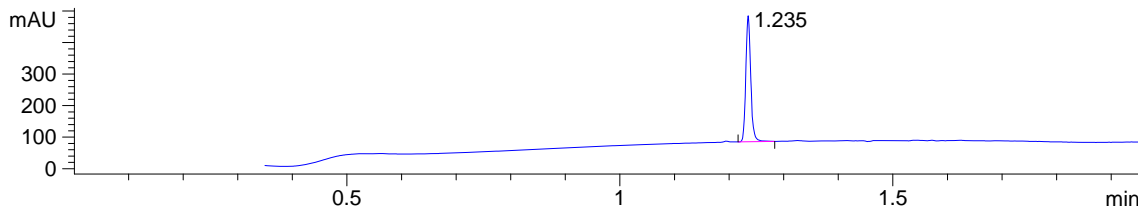


11h

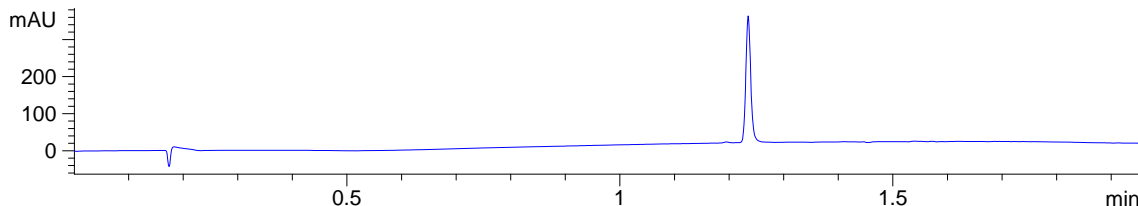
Mol Wt
Exact Mass

#	Time	Area%
1	1.235	100.00

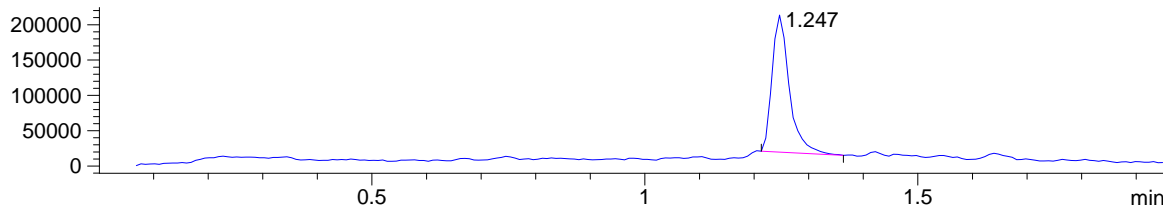
DAD1 A, Sig=215,16 Ref=off (D:\DATE\MART\230316\L003762D\011-D7F-B1-IBOX13834.D)



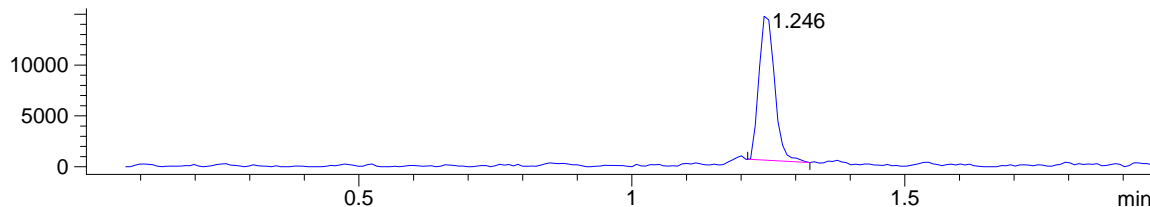
DAD1 B, Sig=254,16 Ref=off (D:\DATE\MART\230316\L003762D\011-D7F-B1-IBOX13834.D)



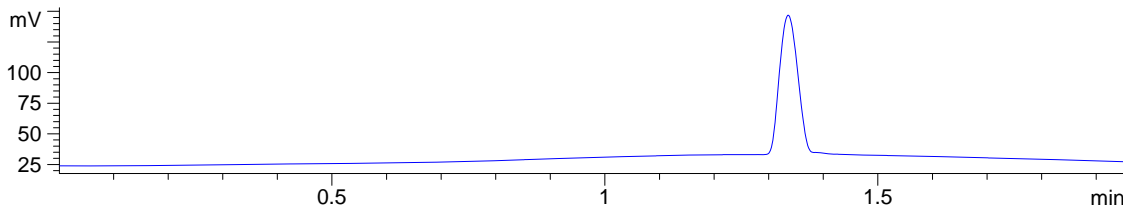
MSD1 TIC, MS File (D:\DATE\MART\230316\L003762D\011-D7F-B1-IBOX13834.D) ES-API, Scan, Frag: 100, "



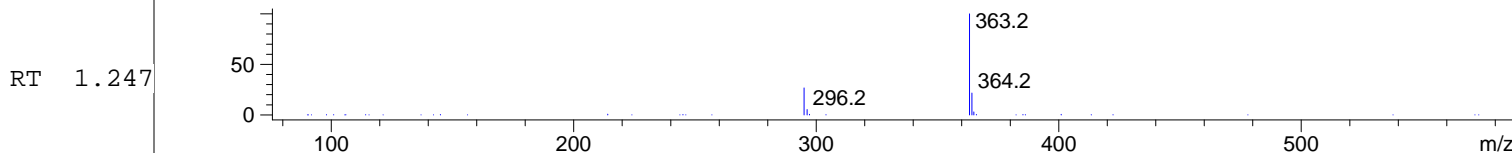
MSD2 TIC, MS File (D:\DATE\MART\230316\L003762D\011-D7F-B1-IBOX13834.D) ES-API, Scan, Frag: 100, "



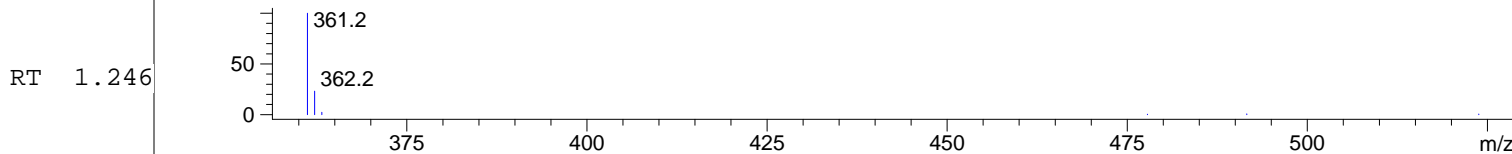
ADC1 A, ELSD (D:\DATE\MART\230316\L003762D\011-D7F-B1-IBOX13834.D)



*MSD1 SPC, time=1.247 of D:\DATE\MART\230316\L003762D\011-D7F-B1-IBOX13834.D ES-API, Scan, Frag: 100, "POS"

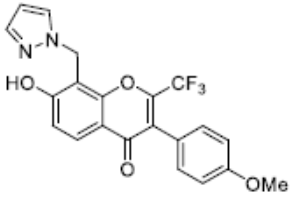
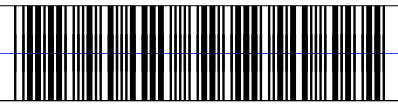


*MSD2 SPC, time=1.246 of D:\DATE\MART\230316\L003762D\011-D7F-B1-IBOX13834.D ES-API, Scan, Frag: 100, "NEG"



MaxPeak: 100.00%
Ret_Time: 1.398 min

CLQ377164

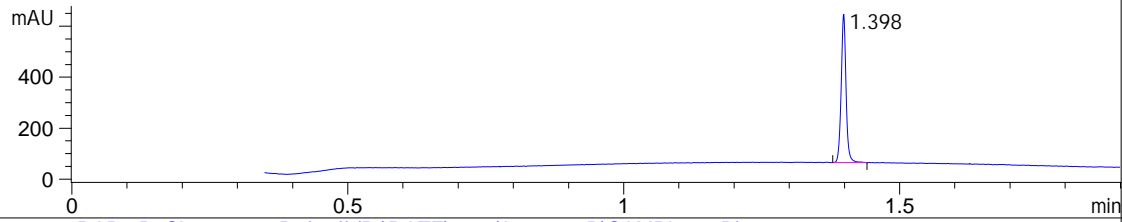


11i

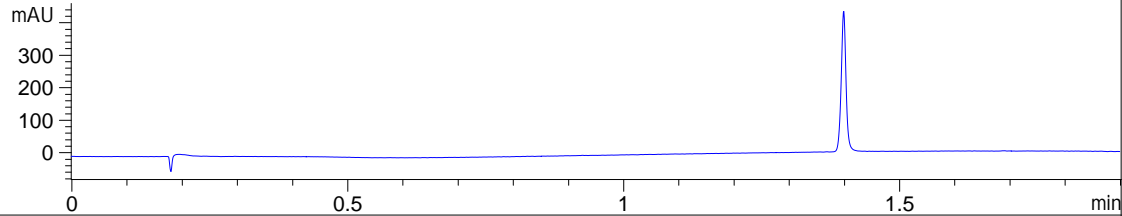
Mol Wt 0
Exact Mass

#	Time	Area%
1	1.398	100.00

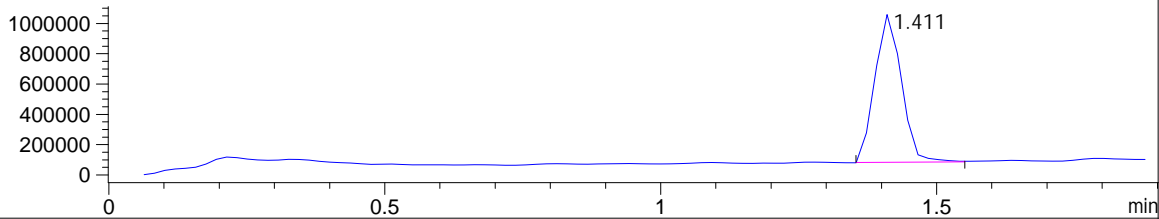
DAD1 A, Sig=215,10 Ref=off (D:\DATE\0928\L662928D\SAMPL023.D)



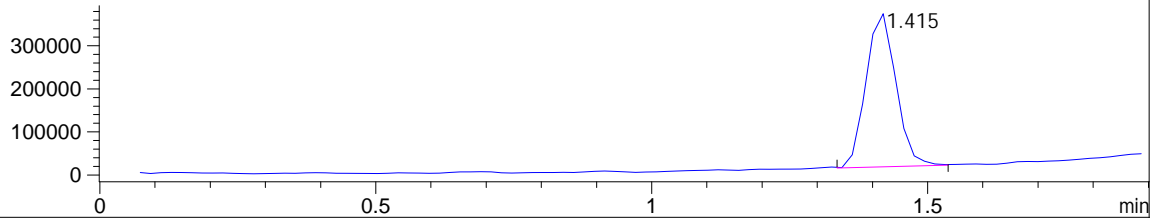
DAD1 B, Sig=254,10 Ref=off (D:\DATE\0928\L662928D\SAMPL023.D)



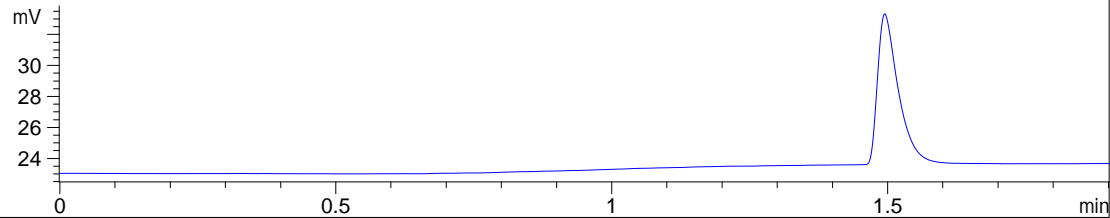
MSD1 TIC, MS File (D:\DATE\0928\L662928D\SAMPL023.D) API-ES, Scan, Frag: 120, "Pos"



MSD2 TIC, MS File (D:\DATE\0928\L662928D\SAMPL023.D) , Scan, Frag: 120, "Neg"

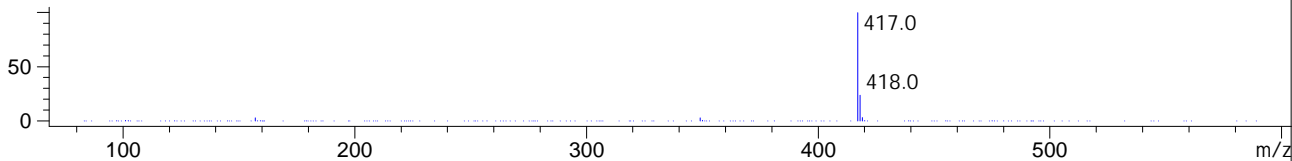


ADC1 A, ADC1 ELSD (D:\DATE\0928\L662928D\SAMPL023.D)



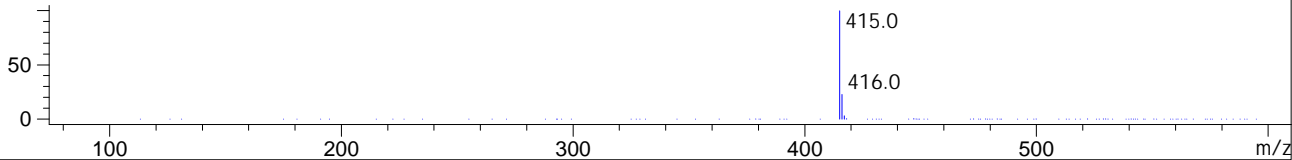
*MSD1 SPC, time=1.410 of D:\DATE\0928\L662928D\SAMPL023.D API-ES, Scan, Frag: 120, "Pos"

RT 1.411



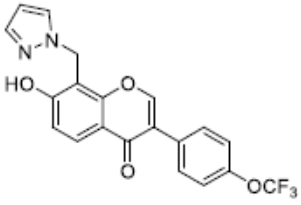
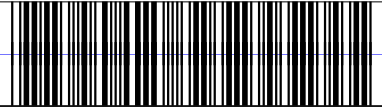
*MSD2 SPC, time=1.419 of D:\DATE\0928\L662928D\SAMPL023.D , Scan, Frag: 120, "Neg"

RT 1.415



MaxPeak: 100.00%
Ret_Time: 1.417 min

CLQ377171

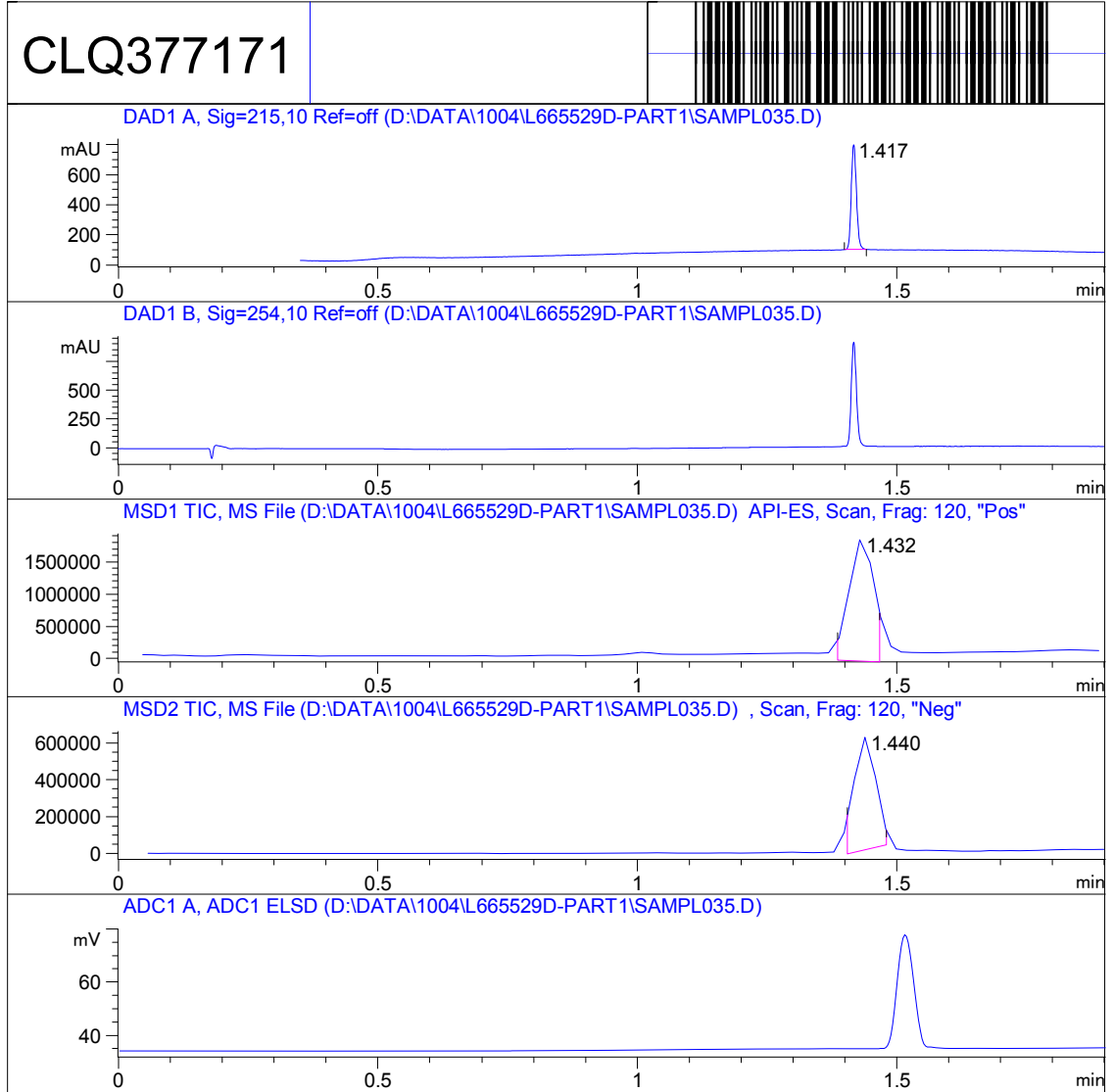


11j

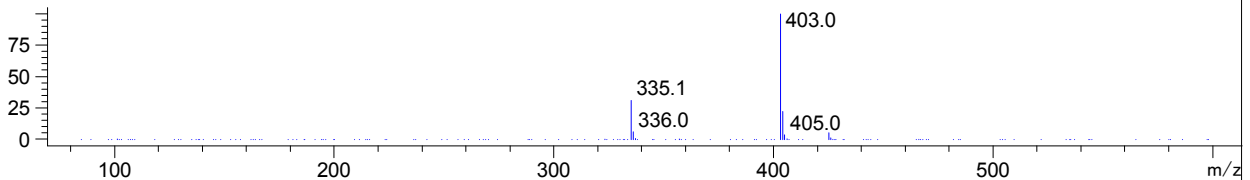
Mol Wt
Exact Mass

#	Time	Area%
1	1.417	100.00

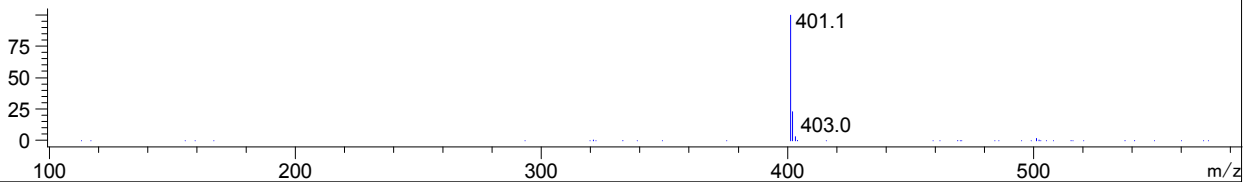
0



*MSD1 SPC, time=1.428 of D:\DATA\1004\L665529D-PART1\SAMPL035.D API-ES, Scan, Frag: 120, "Pos"

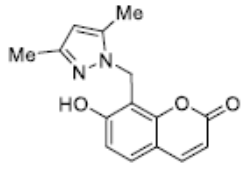
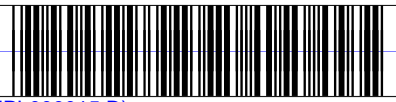


*MSD2 SPC, time=1.438 of D:\DATA\1004\L665529D-PART1\SAMPL035.D , Scan, Frag: 120, "Neg"



MaxPeak: 98.32%
Ret_Time: 1.131 min

IBOX13639

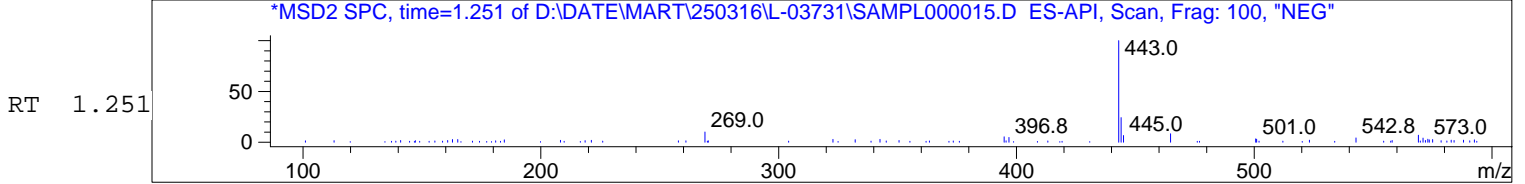
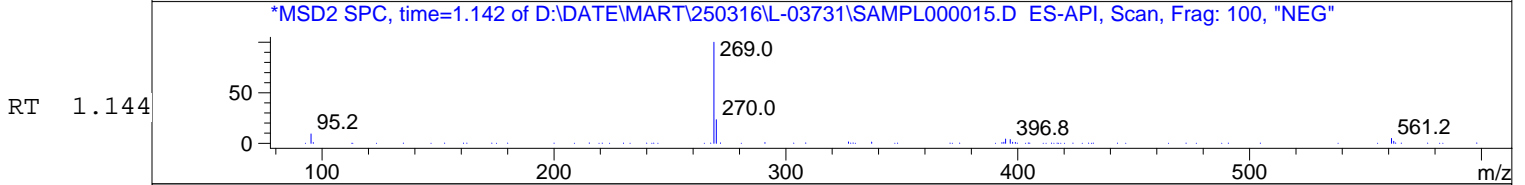
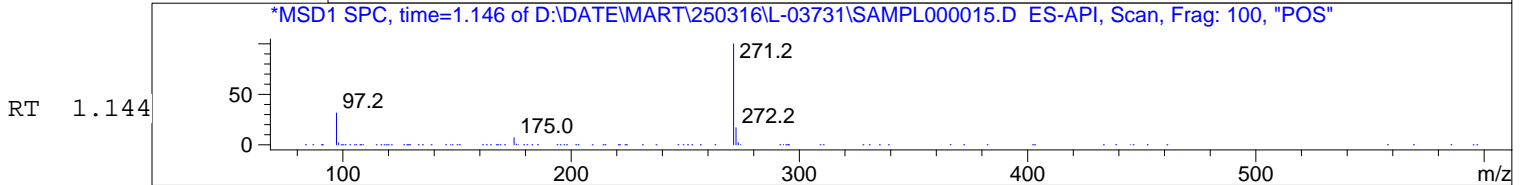
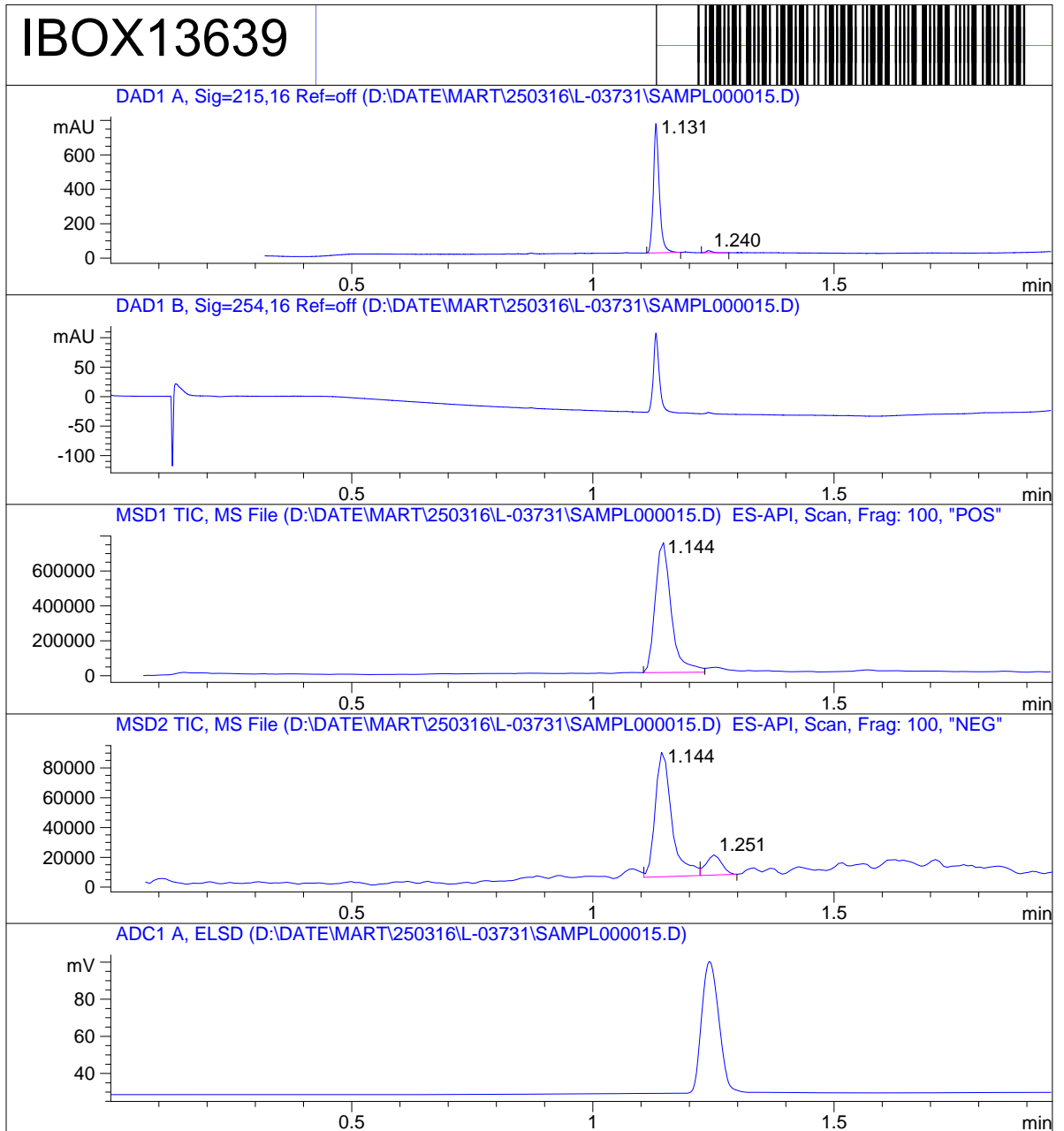


12a

0

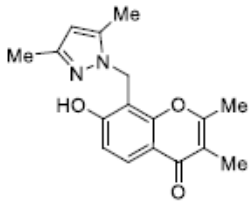
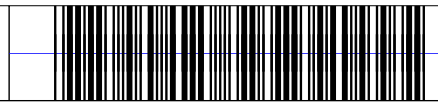
Mol Wt
Exact Mass

#	Time	Area%
1	1.131	98.32
2	1.240	1.68



MaxPeak: 100.00%
Ret_Time: 1.287 min

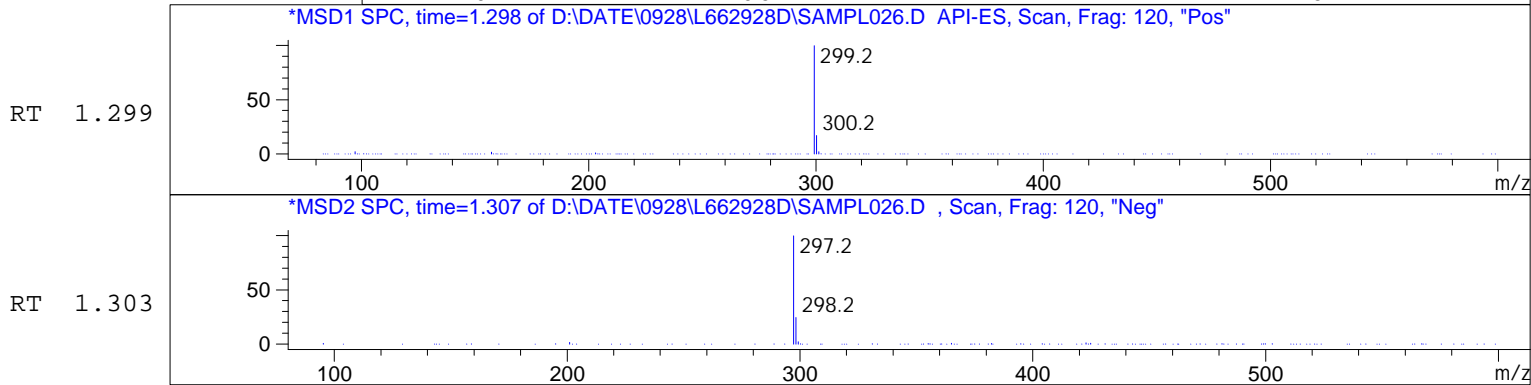
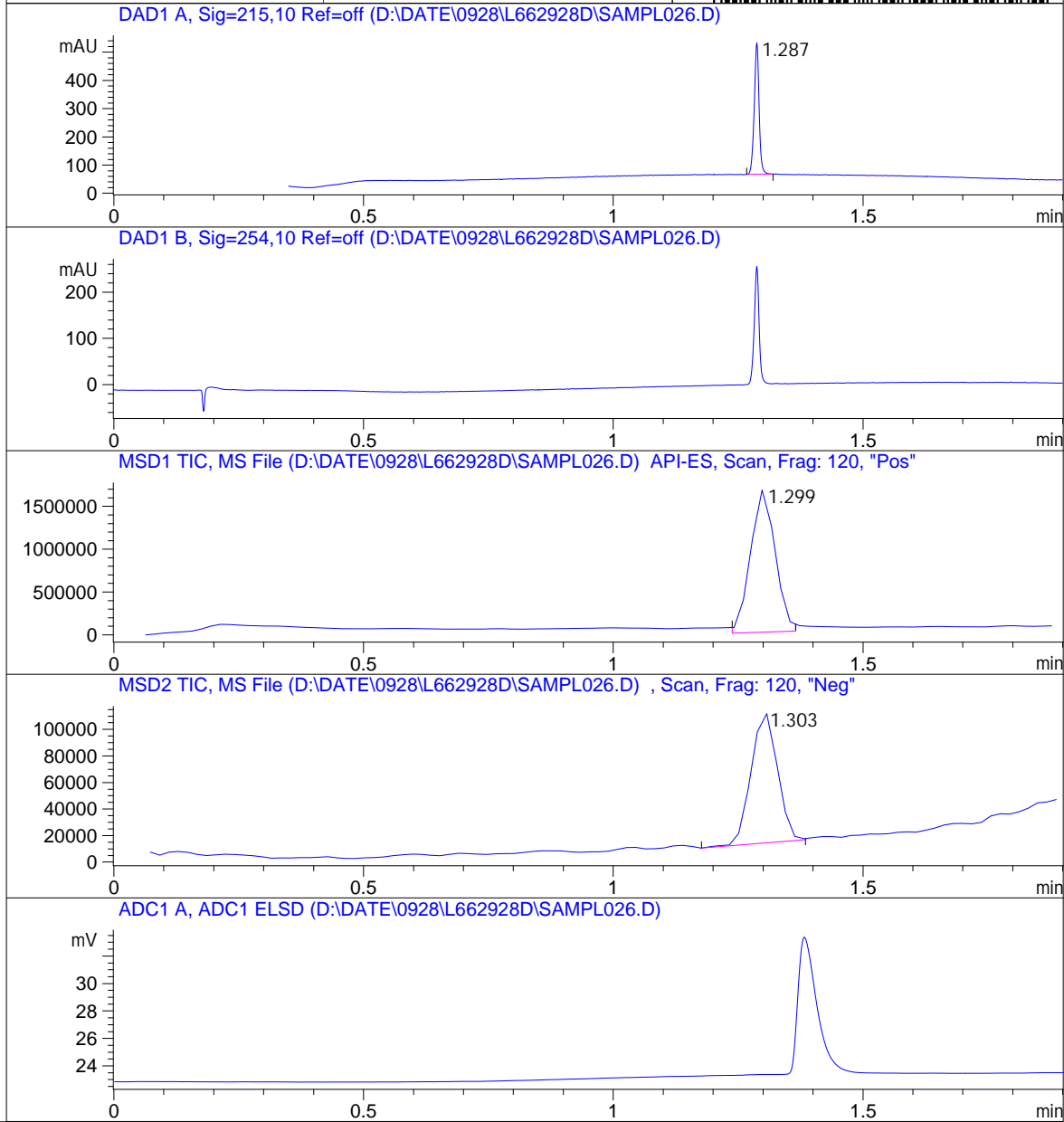
CLQ377168



12b

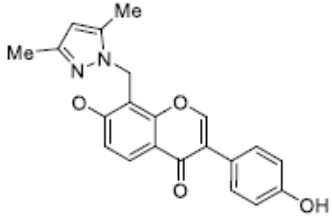
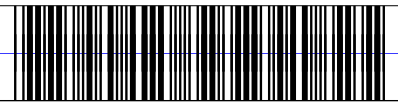
Mol Wt 0
Exact Mass

#	Time	Area%
1	1.287	100.00



MaxPeak: 90.26%
Ret_Time: 1.253 min

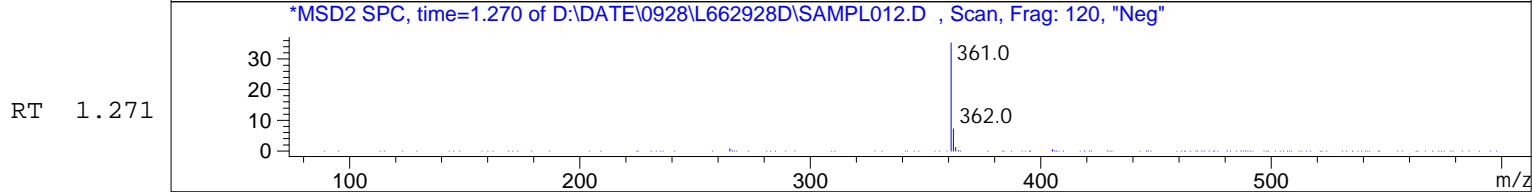
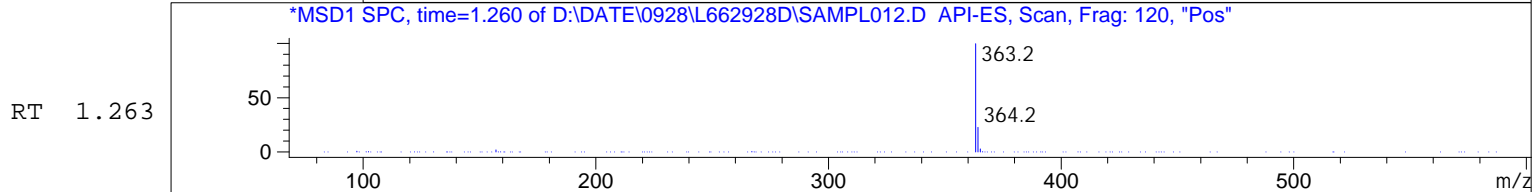
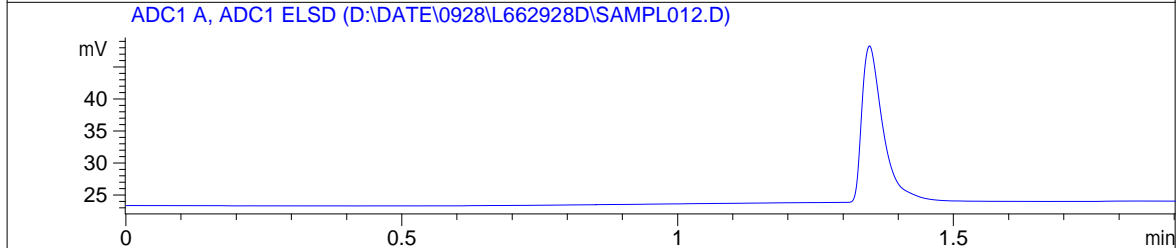
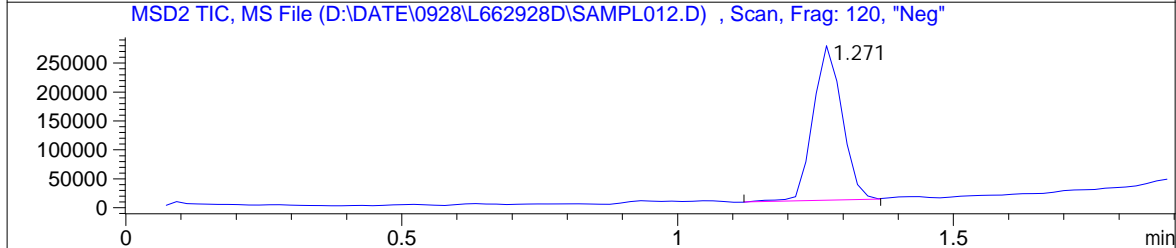
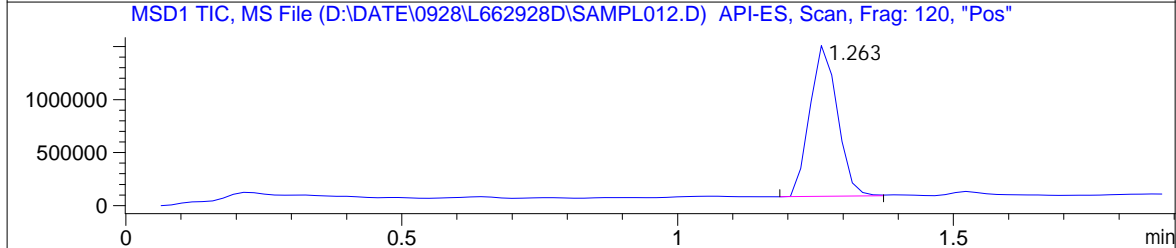
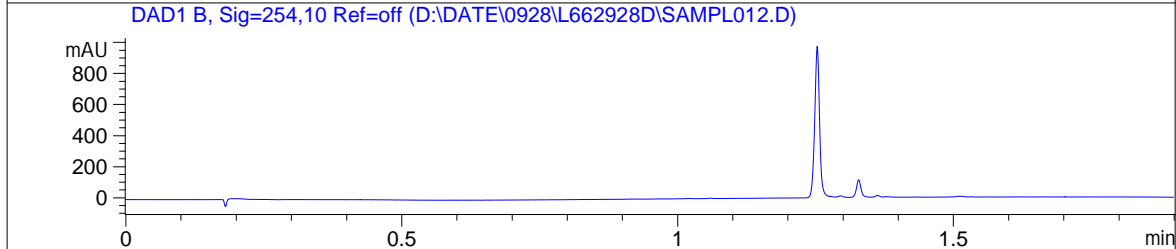
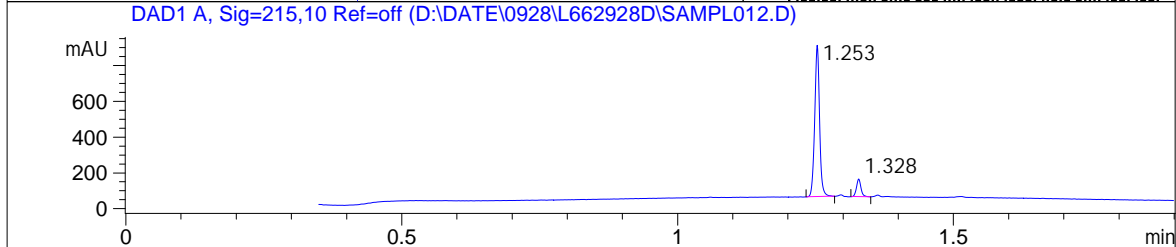
CLQ377167



12c

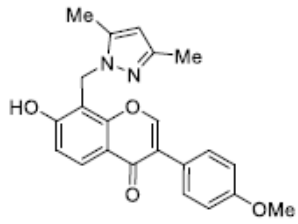
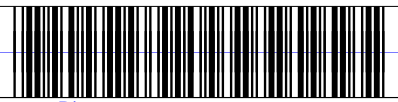
Mol Wt 0
Exact Mass

#	Time	Area%
1	1.253	90.26
2	1.328	9.74



MaxPeak: 100.00%
Ret_Time: 1.482 min

IBOX27740



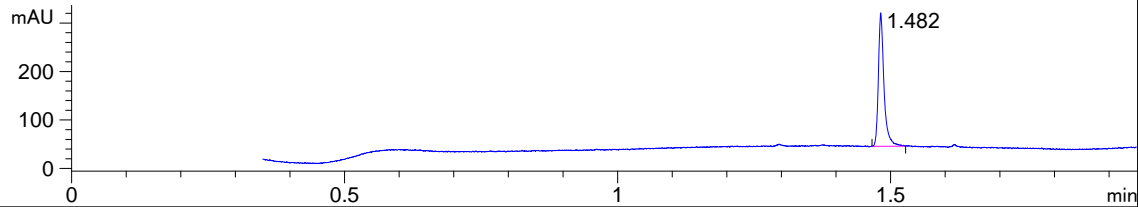
12d

Mol Wt 0

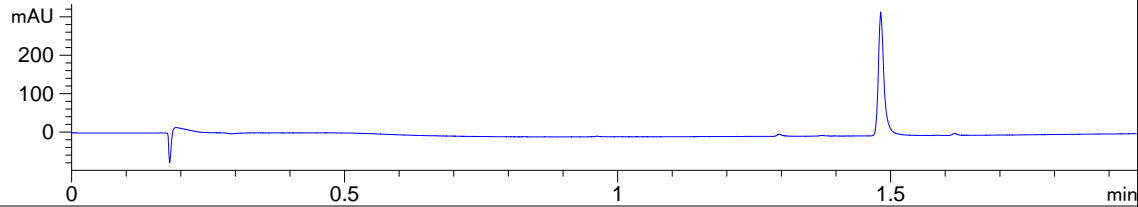
Exact Mass

#	Time	Area%
1	1.482	100.00

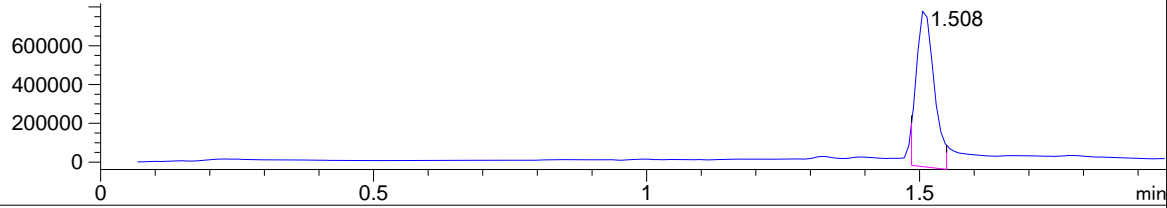
DAD1 A, Sig=215,16 Ref=off (D:\DATE\01 21\L220272D\SAMPL000011.D)



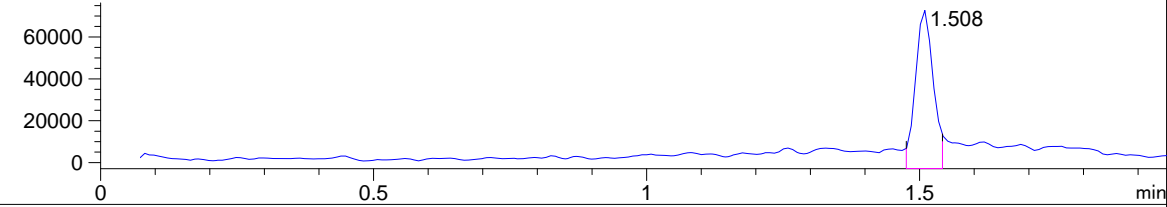
DAD1 B, Sig=254,16 Ref=off (D:\DATE\01 21\L220272D\SAMPL000011.D)



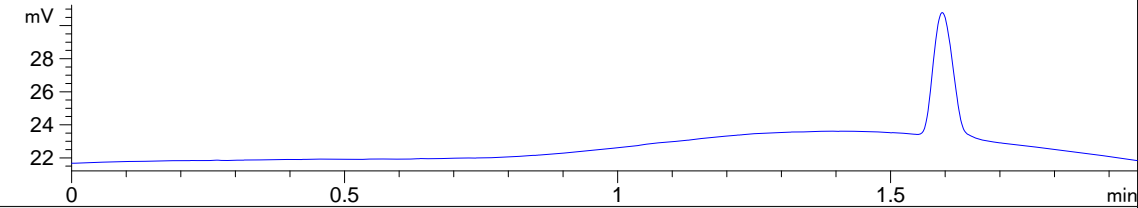
MSD1 TIC, MS File (D:\DATE\01 21\L220272D\SAMPL000011.D) ES-API, Scan, Frag: 100, "POS"



MSD2 TIC, MS File (D:\DATE\01 21\L220272D\SAMPL000011.D) ES-API, Scan, Frag: 100, "NEG"

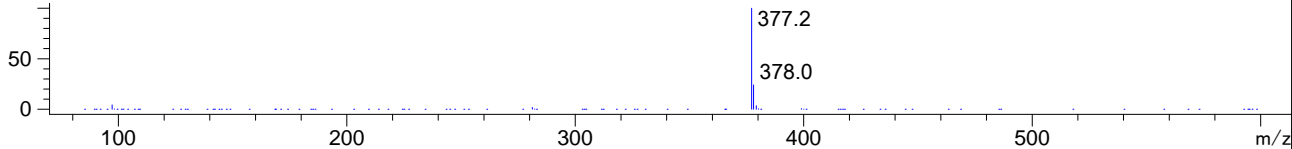


ADC1 A, ADC1 (D:\DATE\01 21\L220272D\SAMPL000011.D)



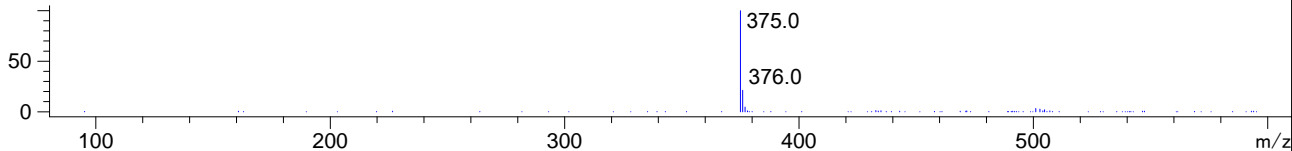
*MSD1 SPC, time=1.505 of D:\DATE\01 21\L220272D\SAMPL000011.D ES-API, Scan, Frag: 100, "POS"

RT 1.508



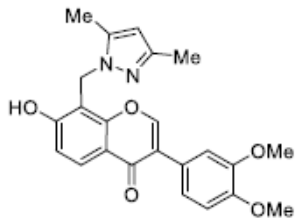
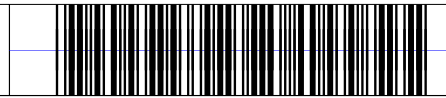
*MSD2 SPC, time=1.510 of D:\DATE\01 21\L220272D\SAMPL000011.D ES-API, Scan, Frag: 100, "NEG"

RT 1.508



MaxPeak: 95.89%
Ret_Time: 1.310 min

IBOX13687



12e

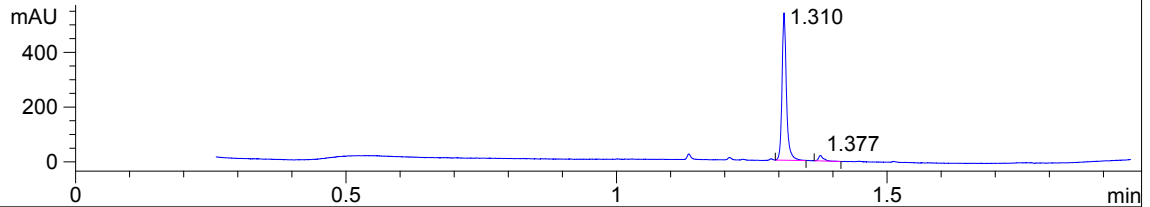
Mol Wt
Exact Mass

0

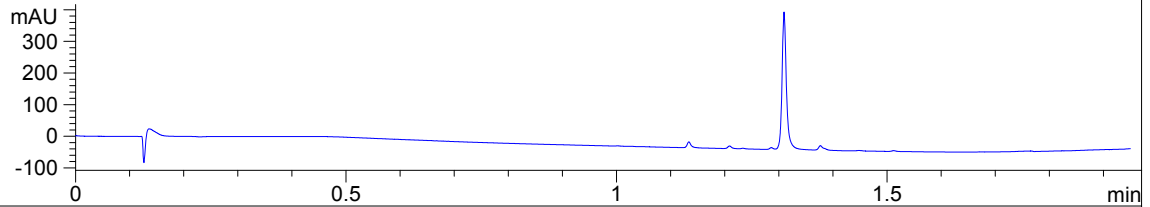
Time Area%

#	Time	Area%
1	1.310	95.89
2	1.377	4.11

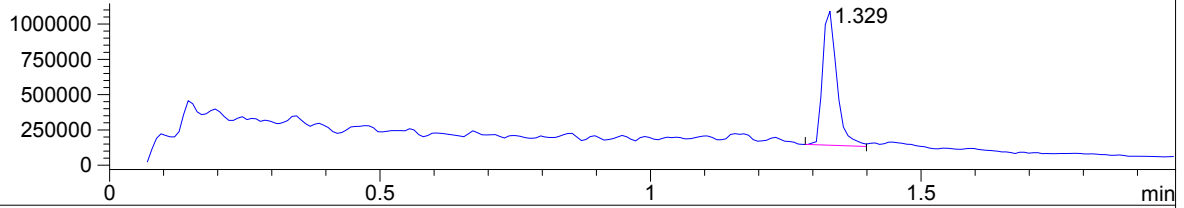
DAD1 A, Sig=215,16 Ref=off (D:\DATE\MARCH\230316\L03689D\SAMPL000006.D)



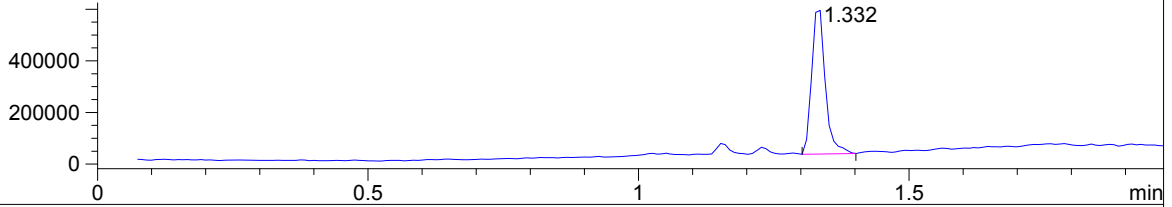
DAD1 B, Sig=254,16 Ref=off (D:\DATE\MARCH\230316\L03689D\SAMPL000006.D)



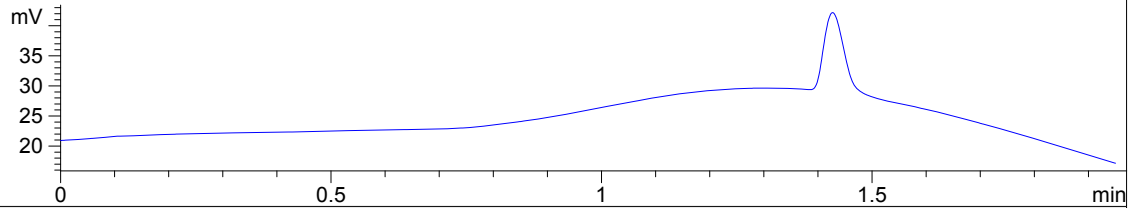
MSD1 TIC, MS File (D:\DATE\MARCH\230316\L03689D\SAMPL000006.D) ES-API, Scan, Frag: 100, "POS"



MSD2 TIC, MS File (D:\DATE\MARCH\230316\L03689D\SAMPL000006.D) ES-API, Scan, Frag: 100, "NEG"

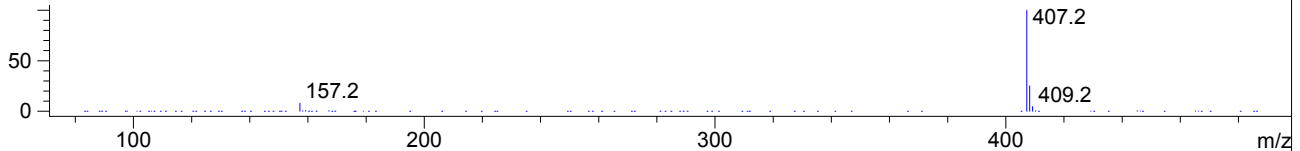


ADC1 A, ADC1 (D:\DATE\MARCH\230316\L03689D\SAMPL000006.D)



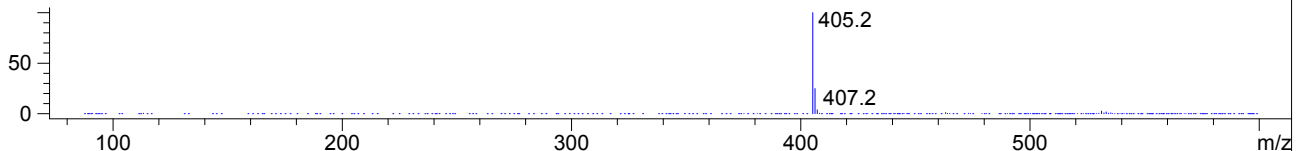
*MSD1 SPC, time=1.332 of D:\DATE\MARCH\230316\L03689D\SAMPL000006.D ES-API, Scan, Frag: 100, "POS"

RT 1.329

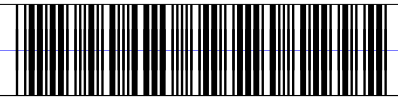


*MSD2 SPC, time=1.336 of D:\DATE\MARCH\230316\L03689D\SAMPL000006.D ES-API, Scan, Frag: 100, "NEG"

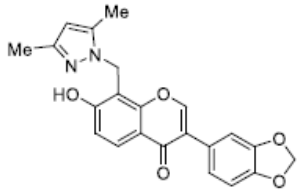
RT 1.332



CLQ377548



MaxPeak: 100.00%
Ret_Time: 1.186 min

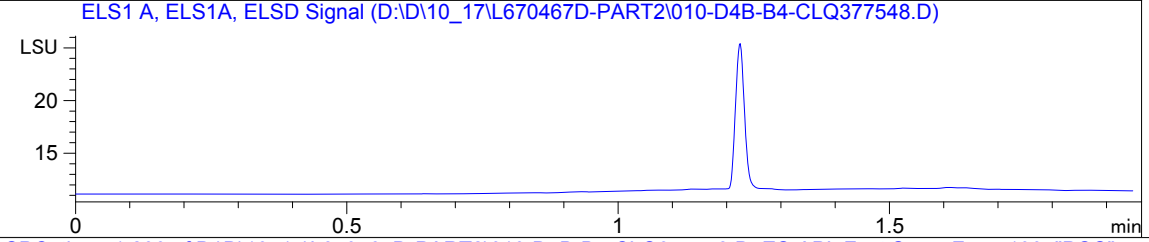
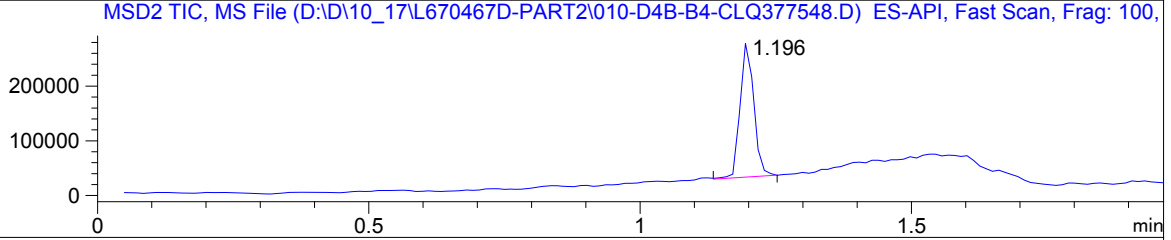
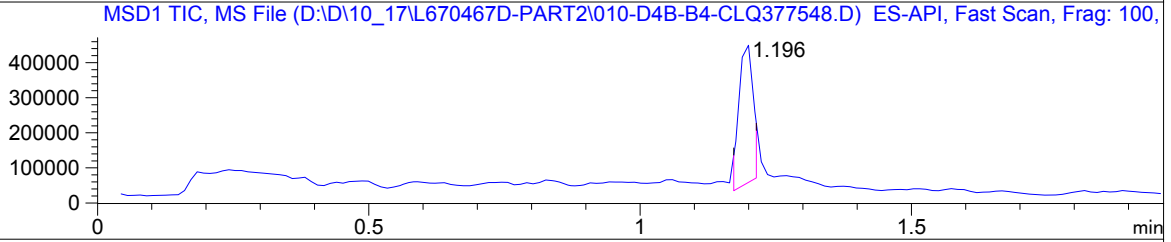
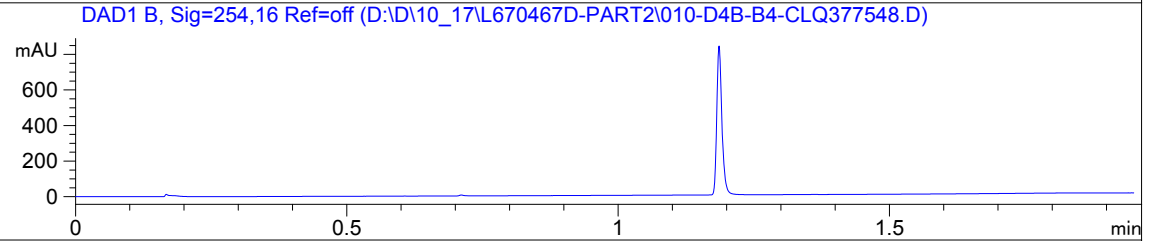
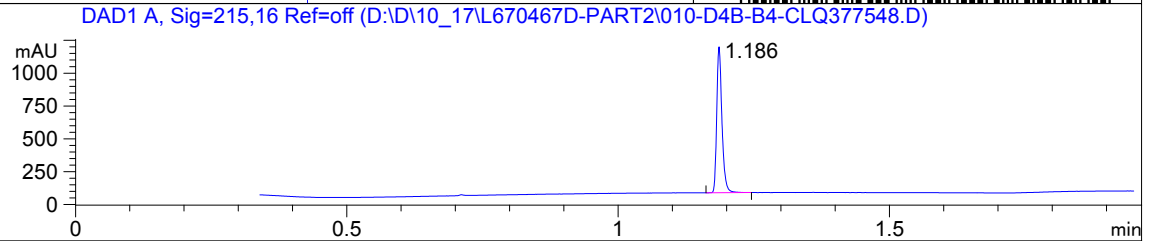


12f

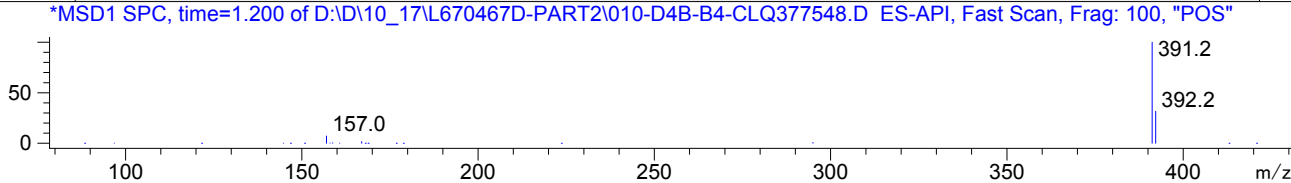
Mol Wt
Exact Mass

0

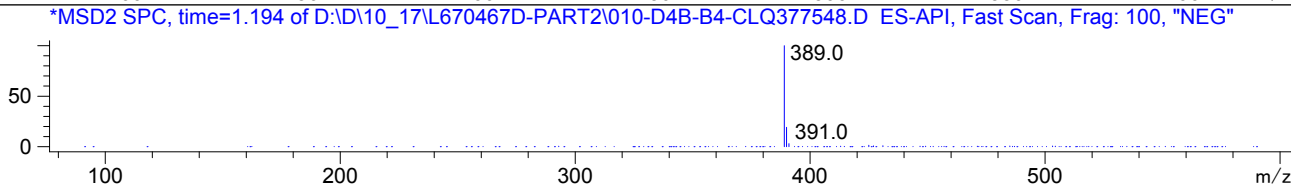
#	Time	Area%
1	1.186	100.00



RT 1.196

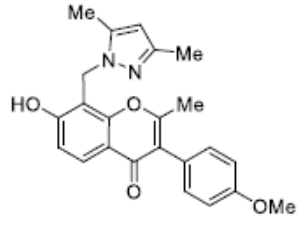
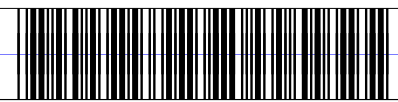


RT 1.196



MaxPeak: 100.00%
Ret_Time: 1.434 min

IBOX13847

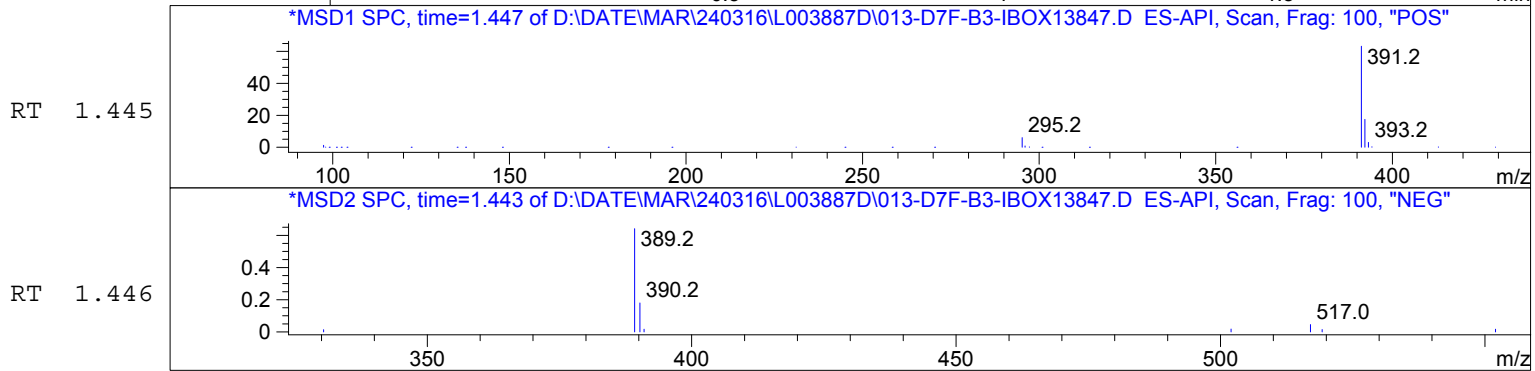
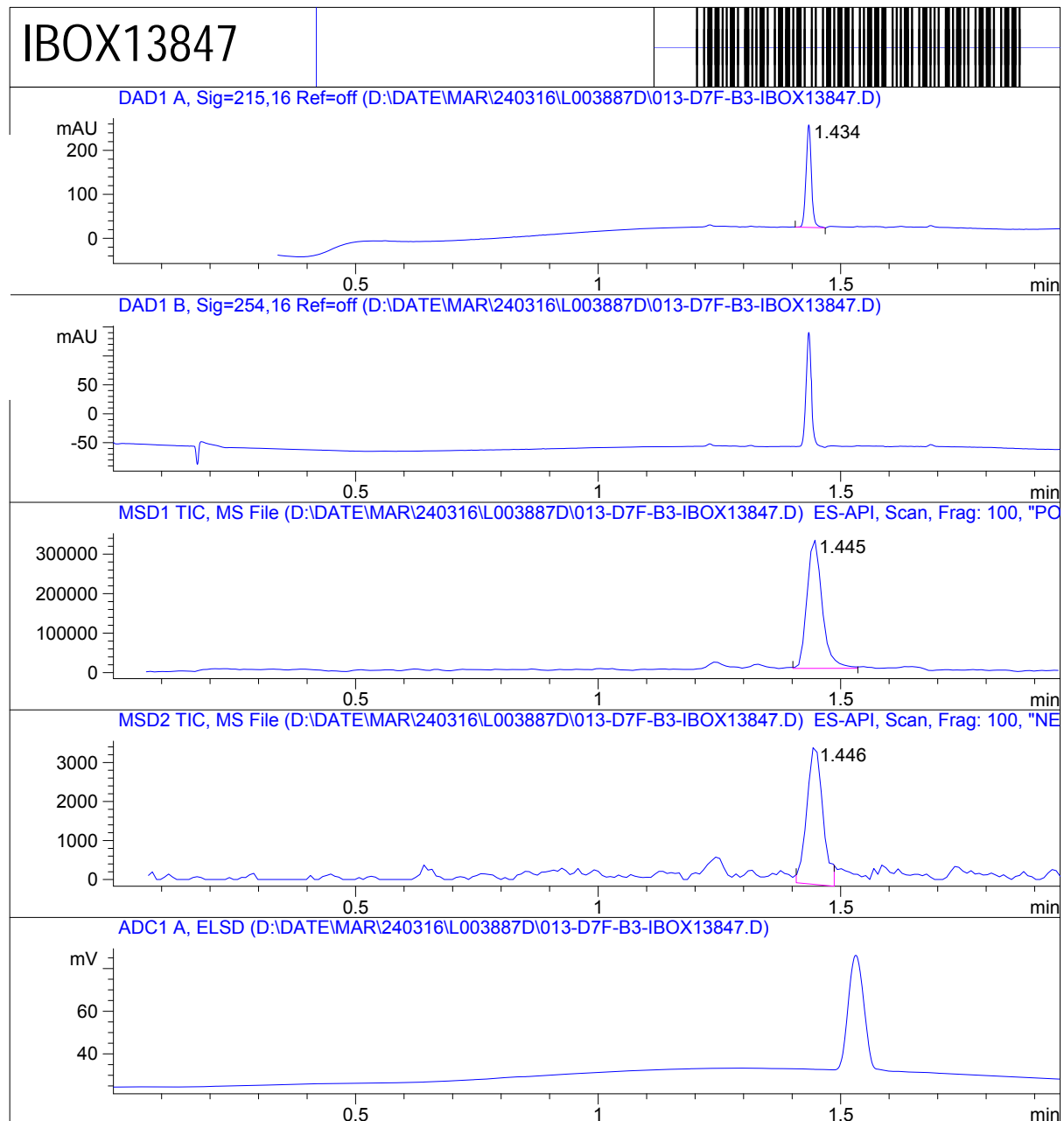


12g

Mol Wt

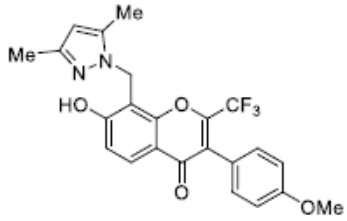
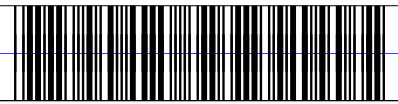
Exact Mass

#	Time	Area%
1	1.434	100.00



MaxPeak: 97.08%
Ret_Time: 1.616 min

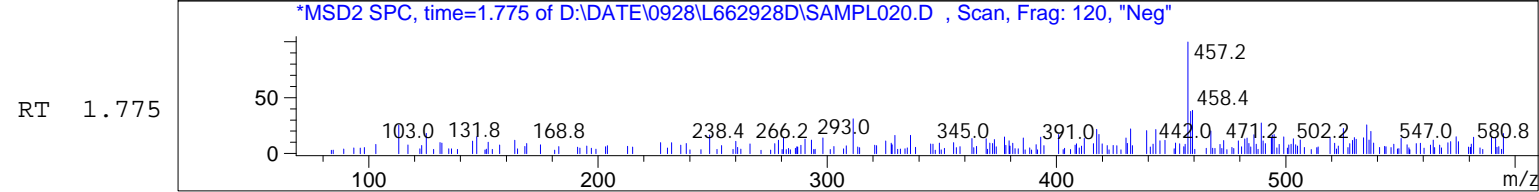
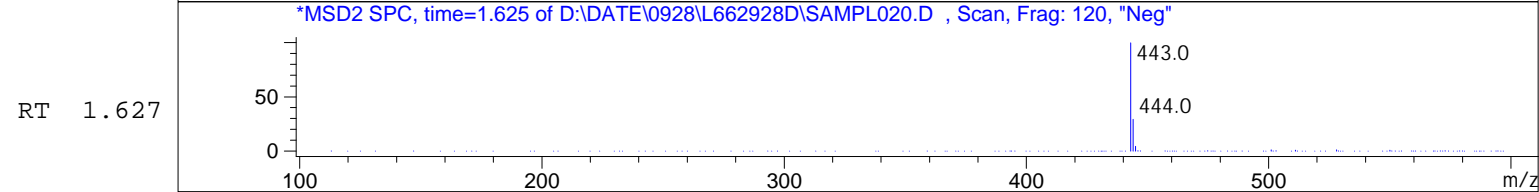
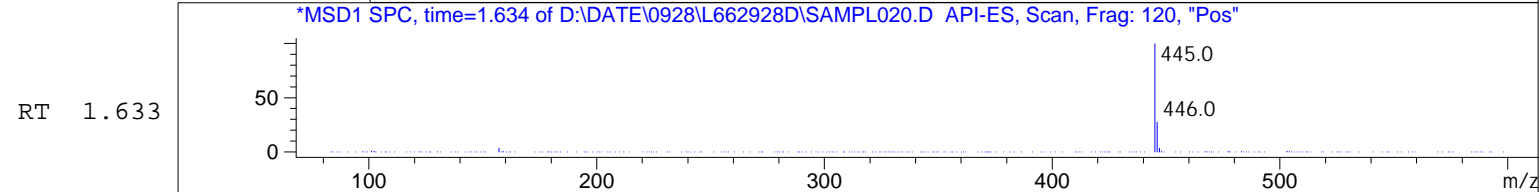
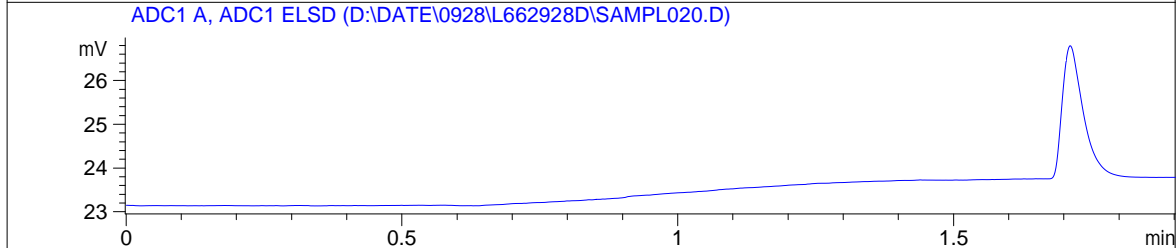
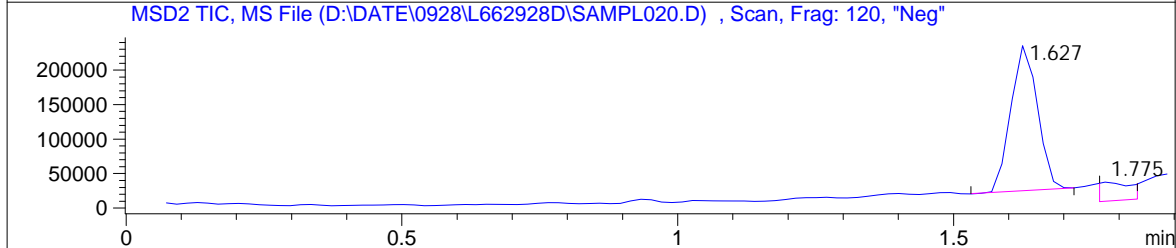
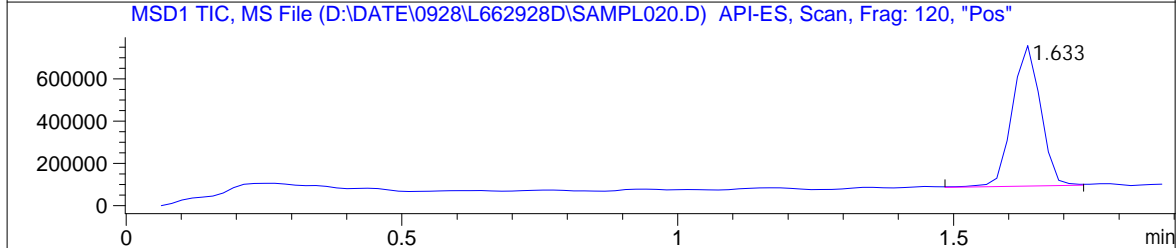
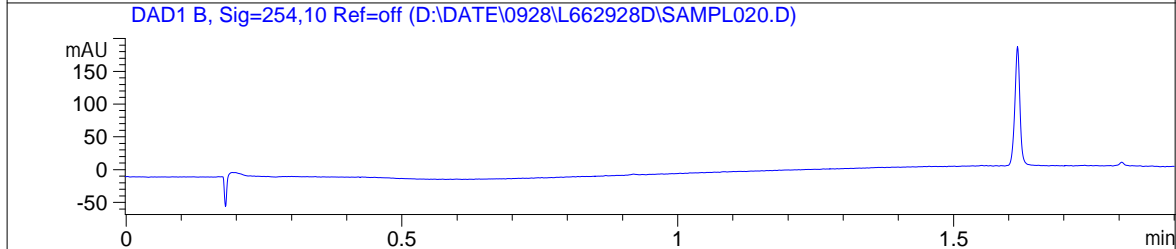
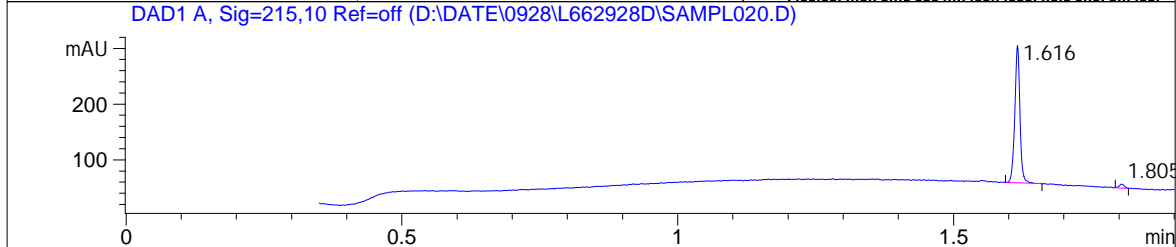
CLQ377165



12h

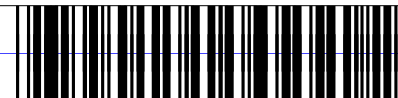
Mol Wt 0
Exact Mass

#	Time	Area%
1	1.616	97.08
2	1.805	2.92

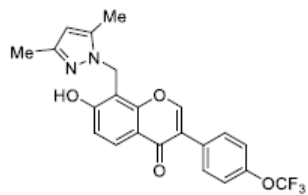


S190

CLQ362996



MaxPeak: 100.00%
Ret_Time: 1.446 min

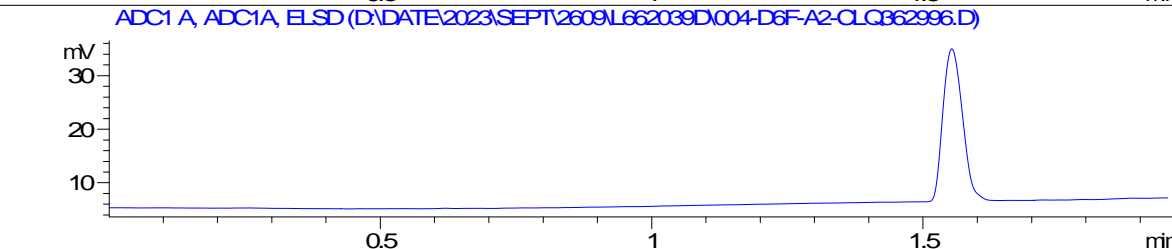
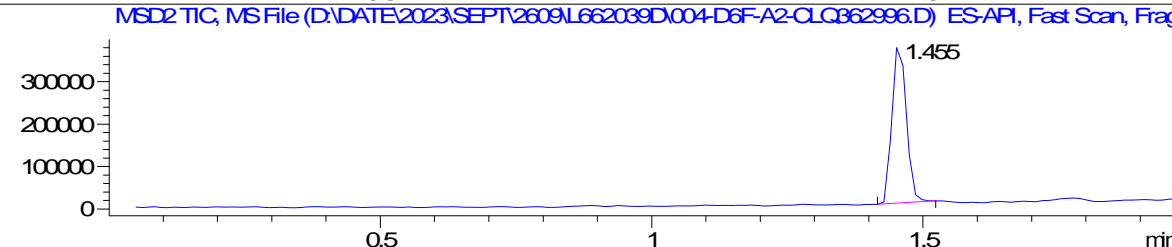
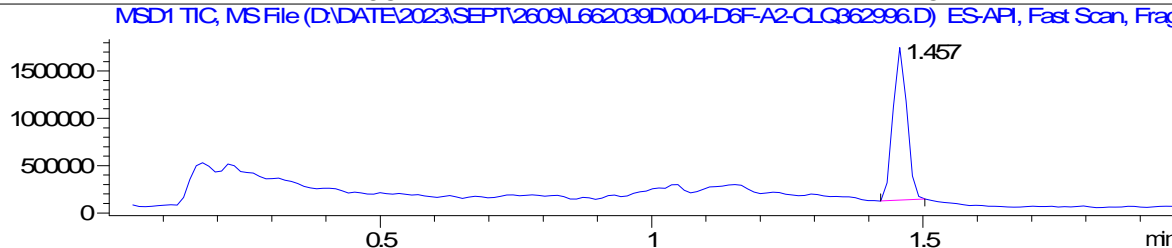
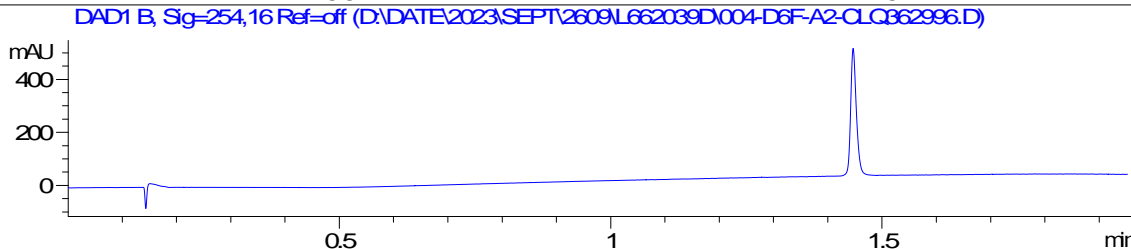
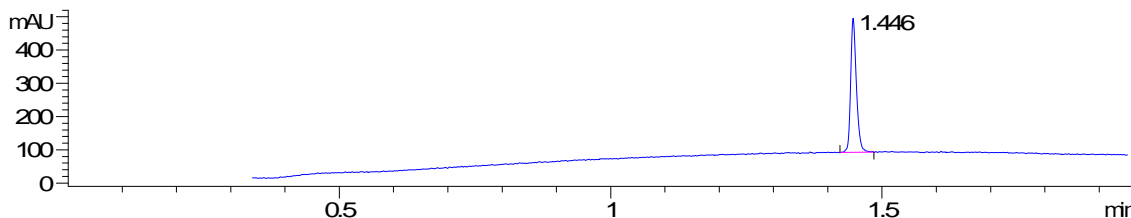


12i

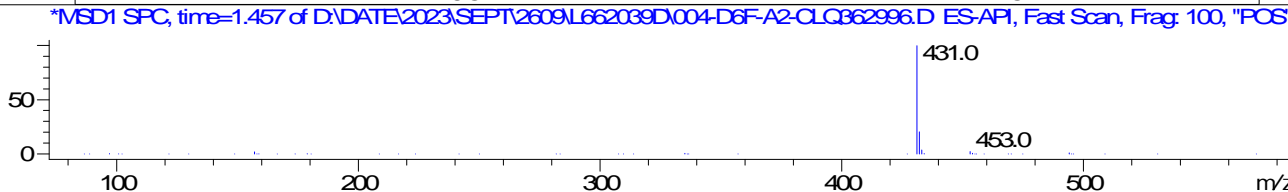
Mol Wt

Exact Mass

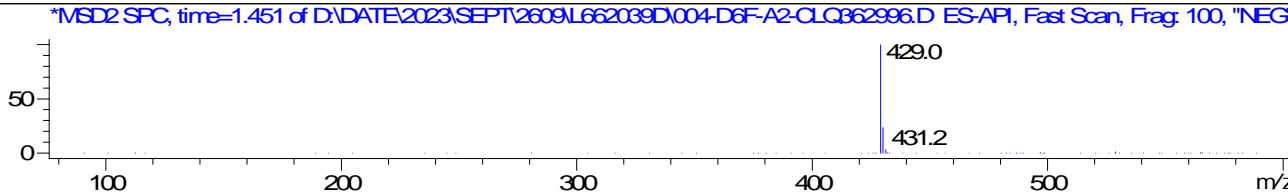
#	Time	Area%
1	1.446	100.00



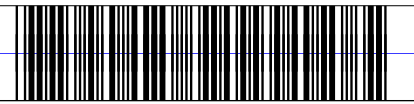
RT 1.457



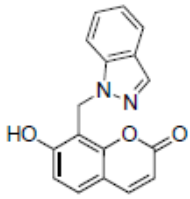
RT 1.455



CLQ379863



MaxPeak: 98.52%
Ret_Time: 0.914 min

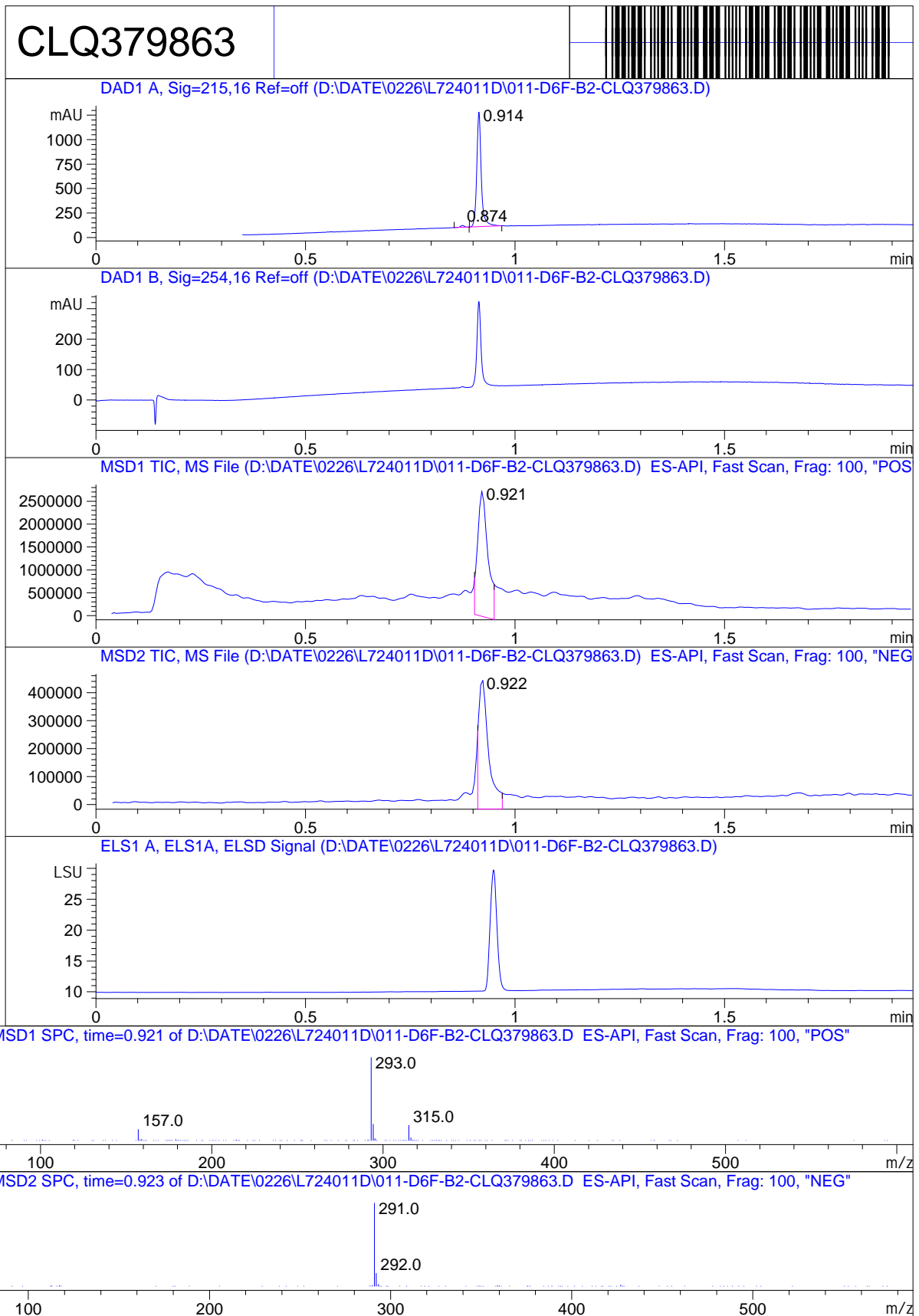


13a

Mol Wt

Exact Mass

#	Time	Area%
1	0.874	1.48
2	0.914	98.52

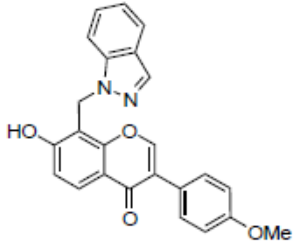
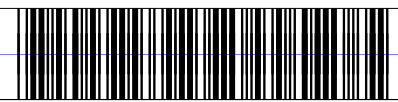


RT 0.921

RT 0.922

MaxPeak: 97.42%
Ret_Time: 1.389 min

IBOX13843

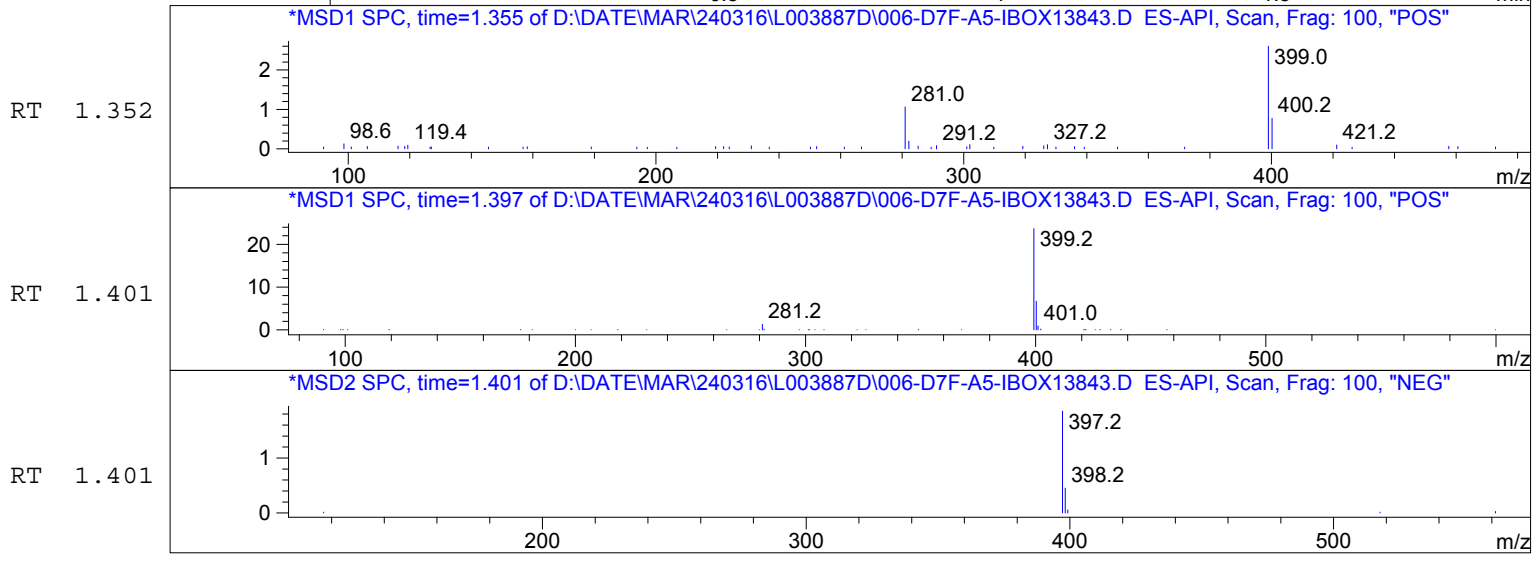
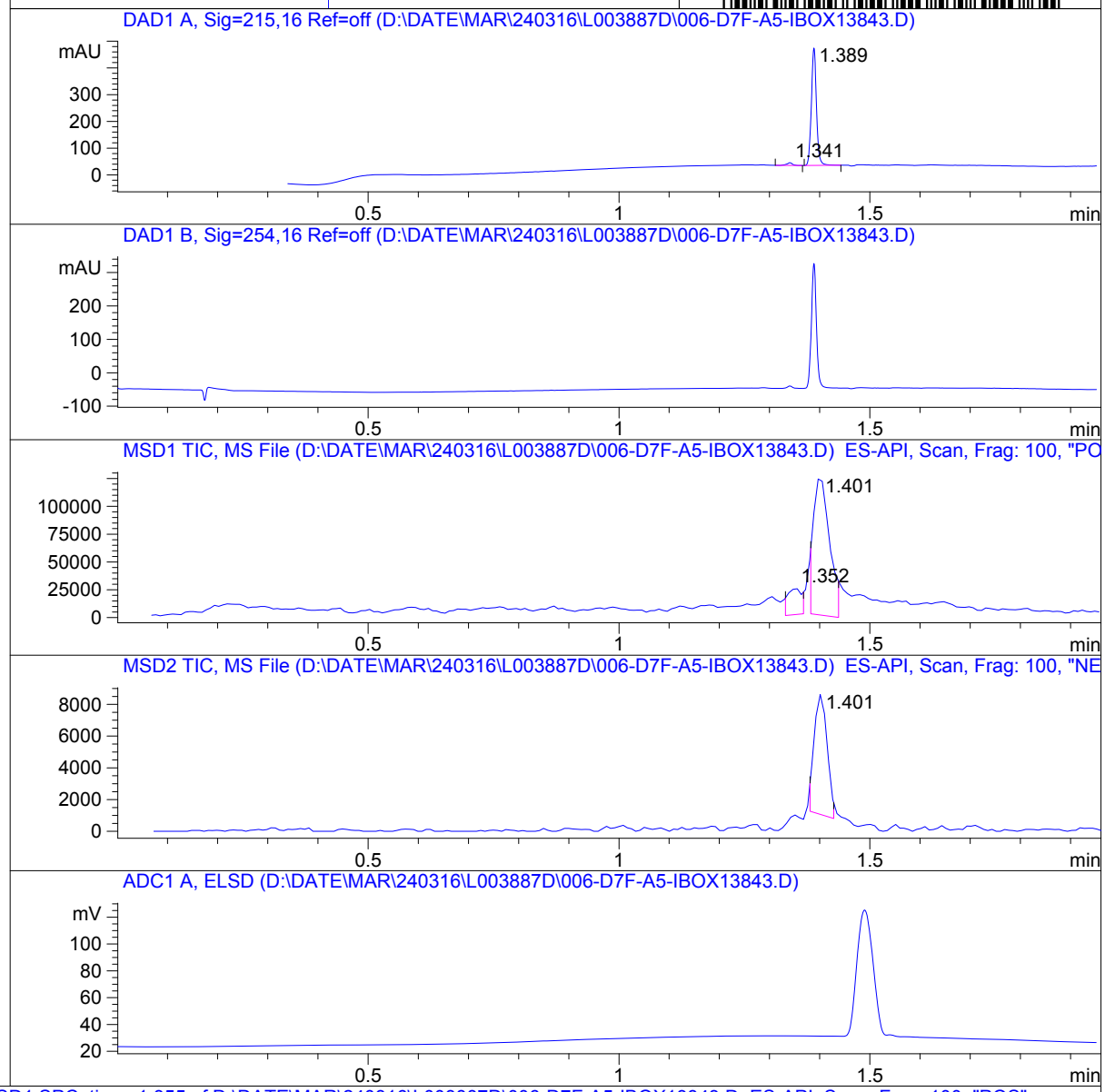


13b

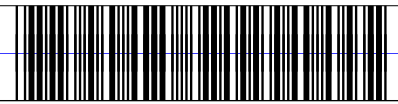
Mol Wt 0

Exact Mass

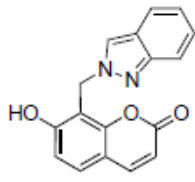
#	Time	Area%
1	1.341	2.58
2	1.389	97.42



CLQ379862

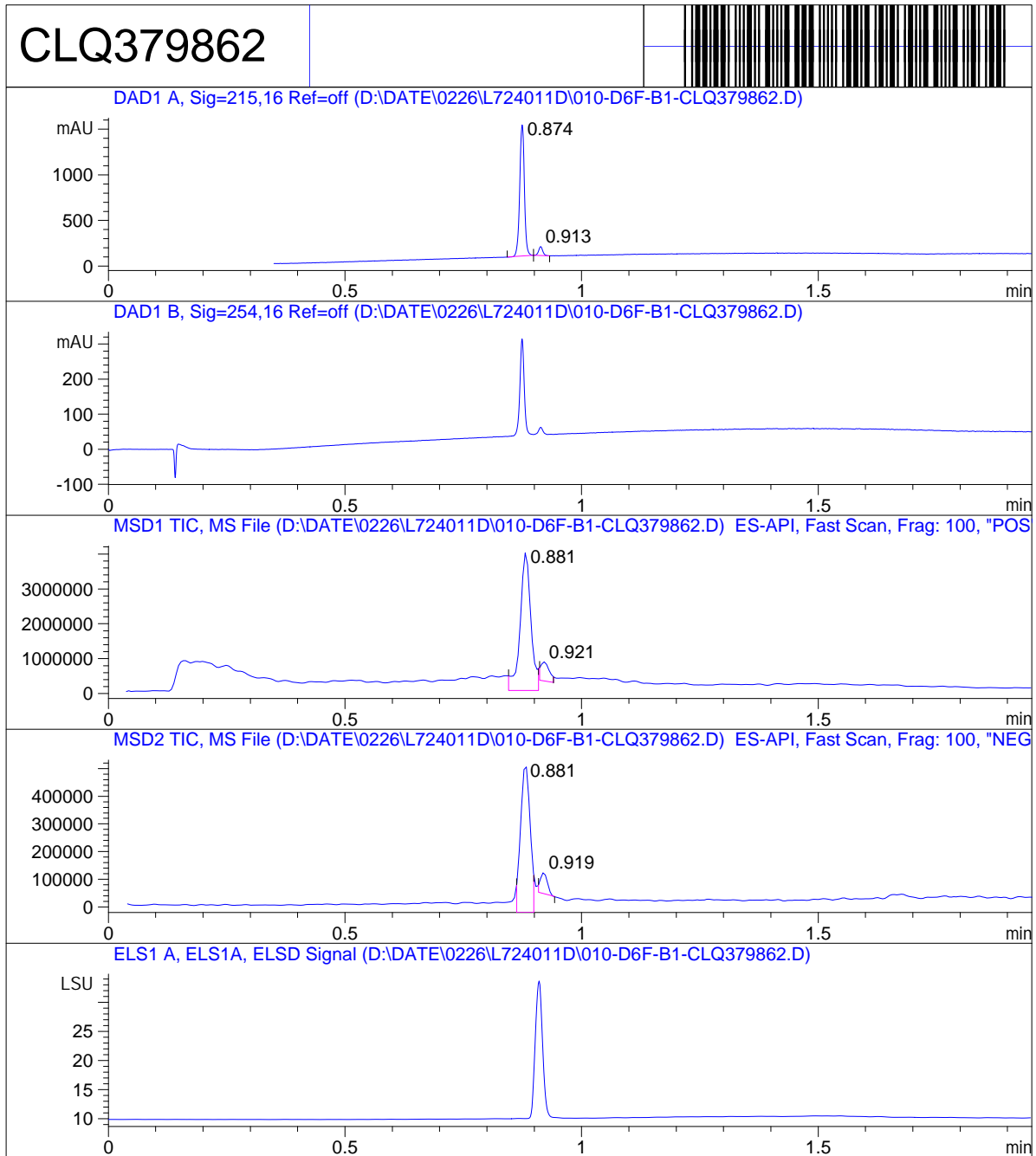


MaxPeak: 94.22%
Ret_Time: 0.874 min

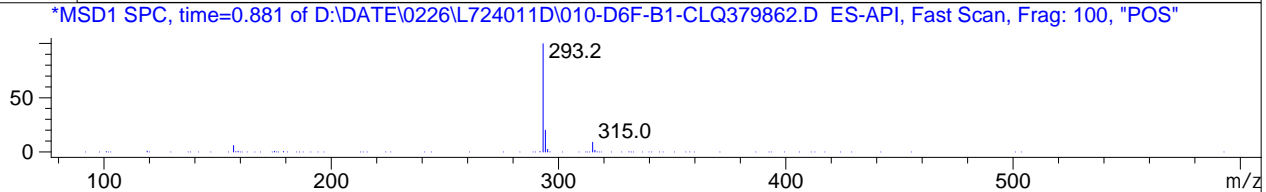


Mol Wt
Exact Mass

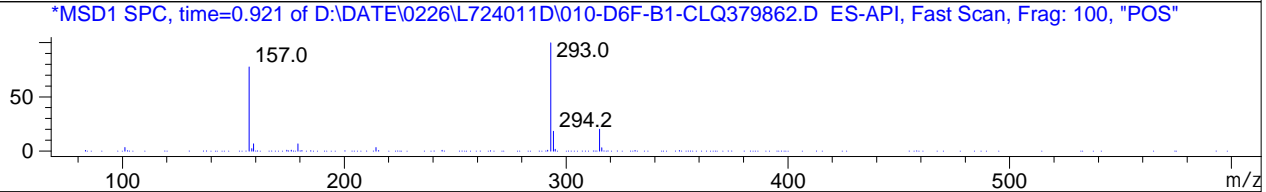
#	Time	Area%
1	0.874	94.22
2	0.913	5.78



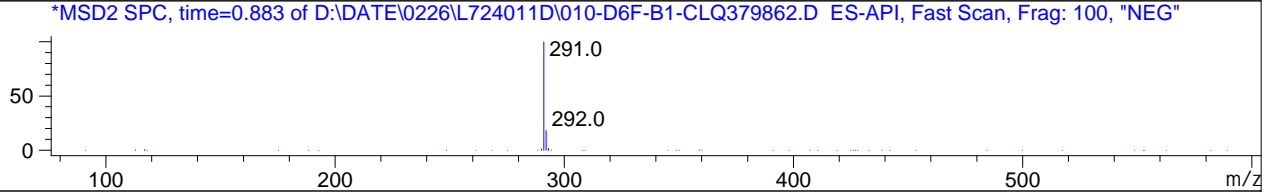
RT 0.881



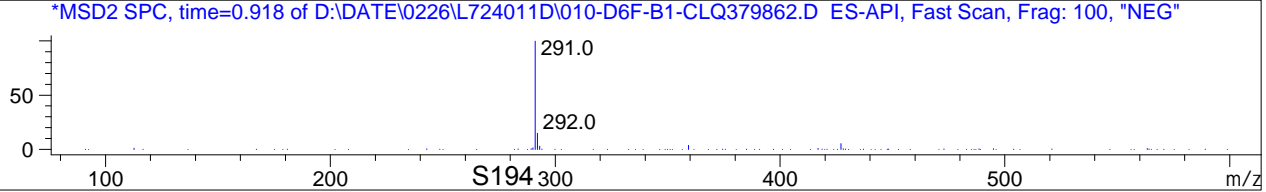
RT 0.921



RT 0.881

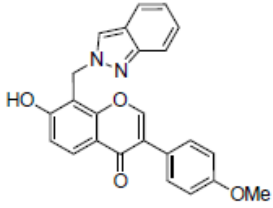
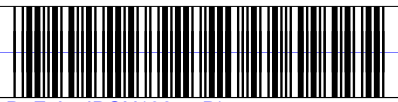


RT 0.919



MaxPeak: 93.44%
Ret_Time: 1.341 min

IBOX13844

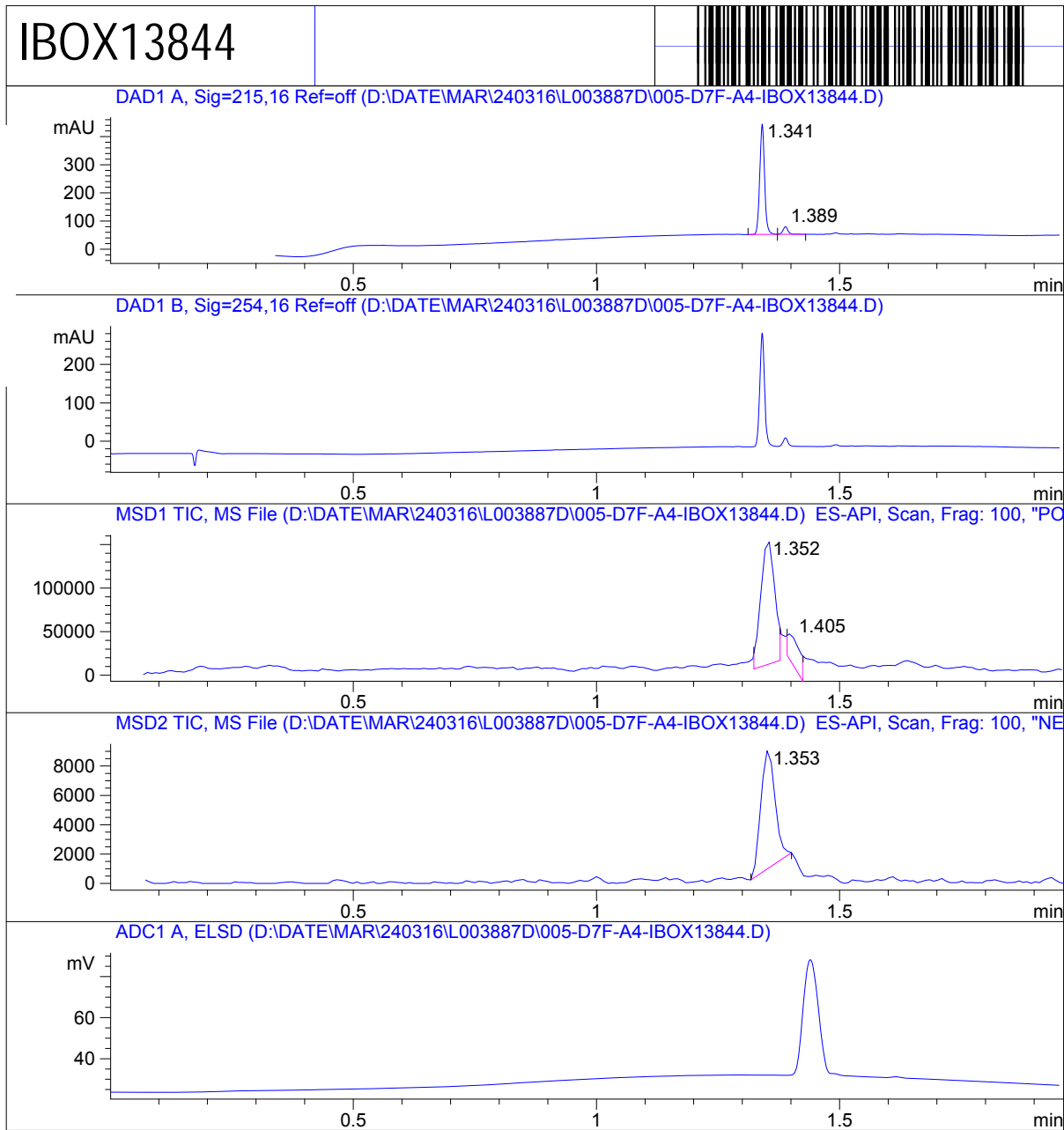


14b

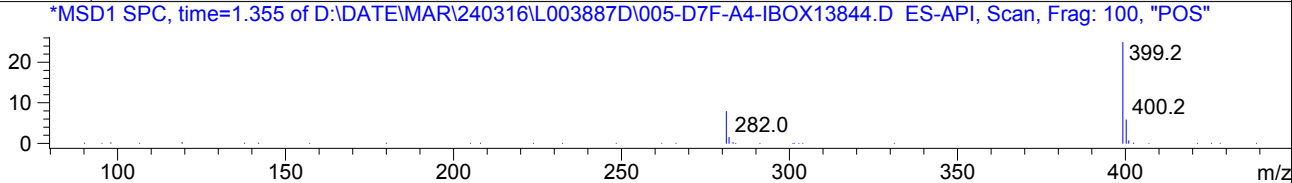
Mol Wt

Exact Mass

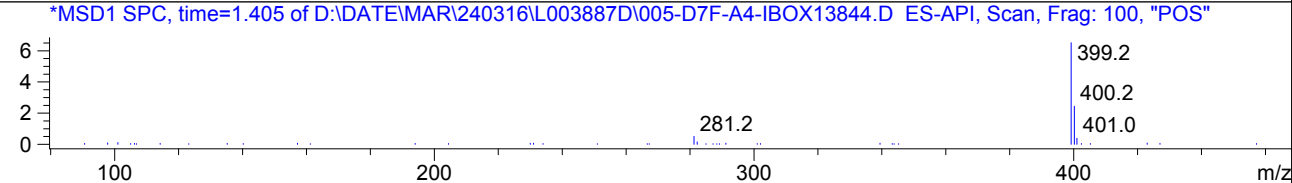
#	Time	Area%
1	1.341	93.44
2	1.389	6.56



RT 1.352



RT 1.405



RT 1.353

