Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Selective electrophilic di- and mono-fluorinations for the synthesis of 4-difluoromethyl and 4-fluoromethyl quinazolin(thi)ones by Selectfluor-mediated multi-component reaction

Ruiqin Zhang[a,b#], Renchao Ma[a#], Qinjiao Fu[a], Rener Chen[a], Zhiming Wang[a], Lei Wang[a], Yongmin Ma[a,b*]

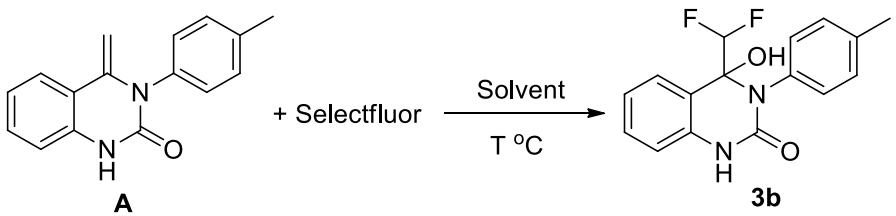
[a]Institute of Advanced Studies and School of Pharmaceutical and Chemical Engineering, Taizhou University, Jiaojiang, Zhejiang, 318000, P R China

[b]School of Pharmaceutical Science, Zhejiang Chinese Medical University, Hangzhou, 310053, P R China

Email: yongmin.ma@tzc.edu.cn

Contents

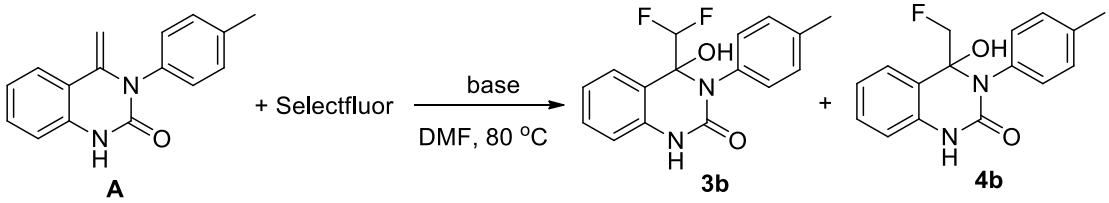
Table S1. Optimization of reaction conditions for *gem*-difluorination/hydroxylation of 4-methylene quinazolinone (**A**)[a]



Entry	Selectfluor (Equiv.)	Solvent	Time (h)	T (°C)	Yield (%)
1	1	DMF	6	80	35
2	2.2	DMF	6	80	69
3	3	DMF	6	80	71
4	4	DMF	6	80	70
5	2.2	Toluene	6	80	0
6	2.2	DMSO	6	80	22
7	2.2	DMAC	6	80	44
8	2.2	CH_3CN	6	80	13
9	2.2	DEF	6	80	30
10	2.2	NMF	6	80	59
11	2.2	DMF	2	80	15
12	2.2	DMF	4	80	39
13	2.2	DMF	10	80	72
14	2.2	DMF	14	80	73
15	2.2	DMF	6	r.t.	0
16	2.2	DMF	6	50	18
17	2.2	DMF	6	110	71

[a]Reaction conditions: **A** (1 mmol), Selectfluor, water (2 mmol) and solvent (3 ml) at the indicated reaction temperature .

Table S2. Optimization of reaction conditions for monofluorination/hydroxylation of 4-methylene quinazolinone (**A**)[a]



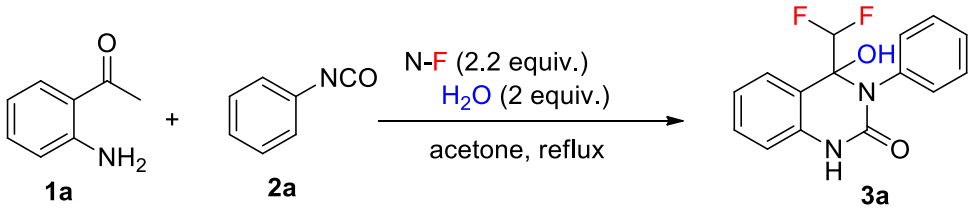
Entry	Base	Yield (%）	
		3b	**4b**
1	Et_3N	<5%	28%
2	$KHCO_3$	<5%	58%
3	Li_2CO_3	<5%	60%
4	KH_2PO_4	<5%	43%
5	NaOAc	<5%	59%
6	K_2CO_3	/	56%
7	$AcONH_4$	/	34%

[a]Reaction conditions: **A** (1 mmol), Selectfluor (1.1 mmol), water (2 mmol), base (2 equiv.) in DMF (3 ml) at 80 °C .

Experimental Section

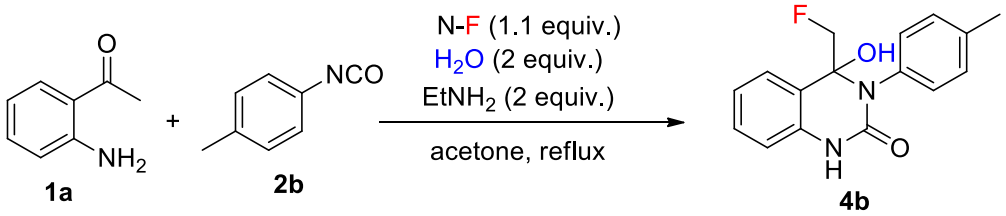
General methods. Starting materials, reagents and solvents were purchased commercial sources and used as received. ^{1}H and ^{13}C NMR spectra were recorded at 400 and 101(500 and 126) MHz, respectively. High-resolution mass spectra (HRMS) were performed with a Q-TOF-Premier mass spectrometer. Melting points were determined using a X-4 digital micro melting point apparatus. All reactions were monitored by thin-layer chromatography (TLC) using silica gel plates (silica gel 60 F_{254}). 3-Substituted quinazolin(thi)ones (**A**) were prepared according to our previous report (Yan H. *et al.*, *Front. Chem*. **2009**, *7*, 584). Their analytical data were identical with the reported data.

Typical experimental procedure for 4-(difluoromethyl)-4-hydroxy-3-substituted-3,4-dihydroquinazolin(thi)ones (3a as an example)



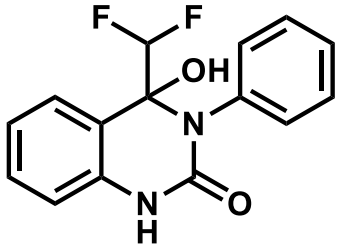
2-Aminoacetophenone (**1a**, 135 mg, 1 mmol), isocyanatobenzene (**2a**, 144 mg, 1.2 mmol), Selectfluor (779 mg, 2.2 mmol) and water (36 mg, 2 mmol) in acetone (3 mL) were refluxed in a sealed tube for 6 h. After completion, water (10 mL) was added into the reaction mixture and extracted with ethyl acetate (20 mL x 3). The combined organic phase was washed with saturated brine and dried over sodium sulfate. The solvent was removed under reduced pressure and the remaining residue was purified by column chromatography (PE:EA=3:1). Compound **3a** (241 mg, 83% yield) was obtained as a white solid.

Typical experimental procedure for 4-(fluoromethyl)-4-hydroxy-3-substituted-3,4-dihydroquinazolinones (4b as an example)

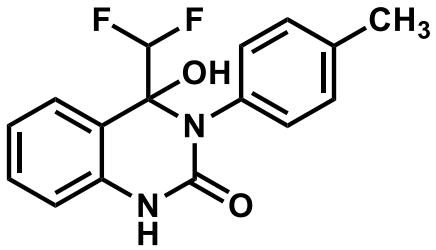


2-Aminoacetophenone (**1a**, 135 mg, 1 mmol), 1-isocyanato-4-methylbenzene (**2b**, 160 mg, 1.2 mmol), Selectfluor (390 mg, 1.1 mmol), water (36 mg, 2 mmol) and ethylamine (90 mg, 2 mmol) in acetone (3 mL) were refluxed in a sealed tube for 6 h. After completion, water (10 mL) was added into the reaction mixture and extracted with ethyl acetate (20 mL x 3). The combined organic phase was washed with saturated brine and dried over sodium sulfate. The solvent was removed under reduced pressure and the remaining residue was purified by column chromatography (PE:EA=3:1). Compound **4b** (163 mg, 57% yield) was obtained as a white solid.

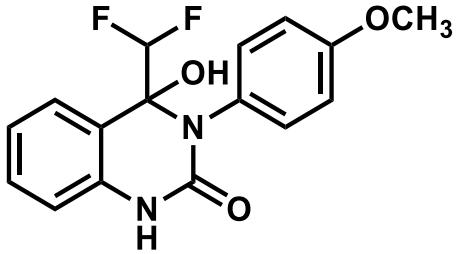
Spectra Data



4-(Difluoromethyl)-4-hydroxy-3-phenyl-3,4-dihydroquinazolin-2(1H)-one (3a): White solid (241 mg, 83%); mp 204-206 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.95 (s, 1H), 7.76 (d, J = 4.3 Hz, 1H), 7.49 – 7.34 (m, 5H), 7.8 (d, *J* = 7.2 Hz, 2H), 7.06 (t, J = 7.6 Hz, 1H), 6.94 (d, J = 8.1 Hz, 1H), 5.80 (t, J = 55.4 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.6, 137.1 (2), 132.3, 130.9, 128.7 (2), 127.9, 121.5, 117.4, 114.0 (dd, *J* = 244, 250 Hz), 113.9, 85.3 (dd, *J* = 23.2, 27.4 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.57 (ddd, *J* = 274, 55, 4.1 Hz), -134.52 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{15}H_{13}F_2N_2O_2^+$ $[M+H]^+$ 291.0940; found: 291.0935.

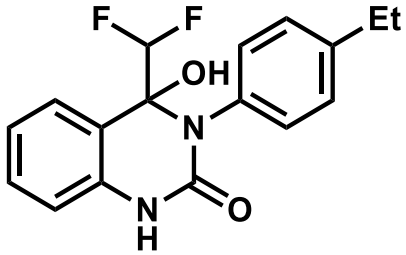


4-(Difluoromethyl)-4-hydroxy-3-(p-tolyl)-3,4-dihydroquinazolin-2(1H)-one (3b): White solid (237 mg, 78%); mp 214-215 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.94 (s, 1H), 7.69 (d, *J* = 4.4 Hz, 1H), 7.45 (d, *J* = 8.0 Hz, 1H), 7.35 (t, *J* = 7.2 Hz, 1H), 7.21- 7.11 (m, 4H), 7.04 (t, *J* = 7.6 Hz, 1H), 6.91 (d, *J* = 7.2 Hz, 1H), 5.77 (t, *J* = 55.2 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.7, 137.2, 137.1, 134.4, 132.0, 130.9, 129.2, 128.8, 121.4, 117.3, 114.0 (dd, *J* = 242, 252 Hz), 113.9, 85.2 (dd, *J* = 23.4, 28.1 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.60 (ddd, *J* = 273, 56, 3.4 Hz), -134.19 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_2^+$ $[M+H]^+$ 305.1096; found: 305.1083.

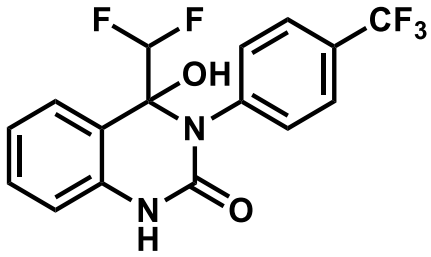


4-(Difluoromethyl)-4-hydroxy-3-(4-methoxyphenyl)-3,4-dihydroquinazolin-2(1H)-one (3c): White solid (218 mg, 68%); mp 180-181 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.90 (s, 1H), 7.67 (d, *J* = 4.0 Hz, 1H), 7.45 (d, *J* = 7.6 Hz, 1H), 7.35 (t, *J* = 8.8 Hz, 1H), 7.17 (d, *J* = 8.8

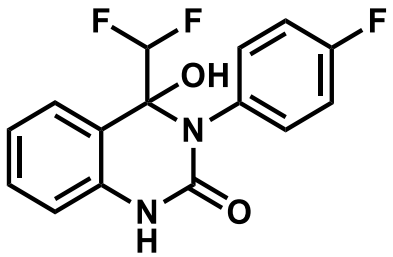
Hz, 2H), 7.04 (t, *J* = 7.4 Hz, 1H), 6.95 (d, *J* = 8.6 Hz, 2H), 6.91 (d, *J* = 8.0 Hz, 1H), 5.77 (t, *J* = 55.2 Hz, 1H), 3.78 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 158.8, 151.8, 137.1, 133.1, 130.9, 129.5, 128.8, 121.4, 117.4, 114.0 (dd, *J* = 234, 268 Hz), 113.9 (2), 88.1 (dd, *J* = 24.0, 27.1 Hz), 55.7. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.59 (ddd, *J* = 274, 55, 3.4 Hz), -134.76 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_3^+$ $[M+H]^+$ 321.1045; found: 321.1038.



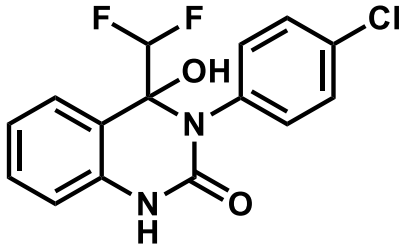
4-(Difluoromethyl)-3-(4-ethylphenyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3d): White solid (239 mg, 75%); mp 182-183°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.92 (s, 1H), 7.70 (d, *J* = 3.6 Hz, 1H), 7.45 (d, *J* = 7.2 Hz, 1H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.26 - 7.13 (m, 4H), 7.04 (t, *J* = 7.6 Hz, 1H), 6.91 (d, *J* = 8.0 Hz, 1H), 5.78 (t, *J* = 55.2 Hz, 1H), 2.64 (q, *J* = 7.6 Hz, 2H), 1.22 (t, *J* = 7.6 Hz, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.7, 143.4, 137.1, 134.6, 132.0, 130.9, 128.1 (2), 121.4, 117.4, 114.0 (dd, *J* = 242, 251 Hz), 113.9, 85.2 (dd, *J* = 23.4, 27.4 Hz), 28.3, 16.0. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.65 (ddd, *J* = 274, 55, 4.0 Hz), -134.63 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{17}H_{17}F_2N_2O_2^+$ $[M+H]^+$ 319.1253; found: 319.1252.



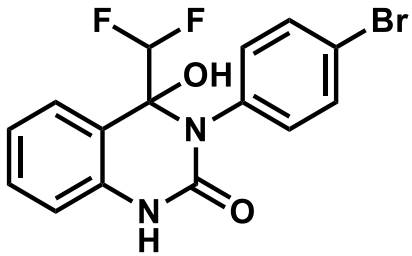
4-(Difluoromethyl)-4-hydroxy-3-(4-(trifluoromethyl)phenyl)-3,4-dihydroquinazolin-2(1H)-one (3e): White solid (236 mg, 66%); mp 180-181 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.16 (s, 1H), 8.09 (d, *J* = 2.8 Hz, 1H), 7.80 (d, *J* = 7.2 Hz, 2H), 7.49 (d, *J* = 7.2 Hz, 2H), 7.47 (d, *J* = 7.2 Hz, 1H), 7.38 (t, *J* = 7.2 Hz, 1H), 7.08 (t, *J* = 7.2 Hz, 1H), 6.94 (d, *J* = 7.4 Hz, 1H), 5.93 (t, *J* = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.4, 141.3, 136.9, 133.3, 131.1, 128.6, 128.4 (q, J = 31.5 Hz), 125.7 (q, *J* = 3.5 Hz), 124.8 (q, *J* = 271 Hz), 121.8, 117.5, 114.2 (dd, *J* = 249, 245 Hz), 114.1, 85.6 (dd, *J* = 26.3, 24.0 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -60.90, -129.60 (dd, *J* = 277, 57 Hz), -133.97 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{16}H_{12}F_5N_2O_2^+$ $[M+H]^+$ 359.0813; found: 359.0811.



4-(Difluoromethyl)-3-(4-fluorophenyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3f): White solid (228 mg, 74%); mp 232-233°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.99 (s, 1H), 7.80 (d, J = 4.0 Hz, 1H), 7.46 (d, J = 8.0 Hz, 2H), 7.37 (d, J = 8.4 Hz, 1H), 7.31 – 7.20 (m, 4H), 7.05 (t, J = 7.6 Hz, 1H), 6.93 (d, J = 7.6 Hz, 1H), 5.82 (t, J = 55.6 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 161.7 (d, J = 240 Hz), 151.6, 137.0, 134.1 (d, J = 8.8 Hz), 131.0, 128.7 (d, J = 3.2 Hz), 121.6, 117.4, 115.6, 115.4 (d, J = 22.4 Hz), 114.0, 113.9 (dd, J = 243, 265 Hz), 85.3 (d, J = 23.8, 26.5 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -115.01, -129.49 (ddd, J = 274, 56, 3.0 Hz), -134.48 (dd, J = 275, 56 Hz).
HRMS(ESI): calcd. for$C_{15}H_{12}F_3N_2O_2^+$ $[M+H]^+$ 309.0845; found: 309.0840.

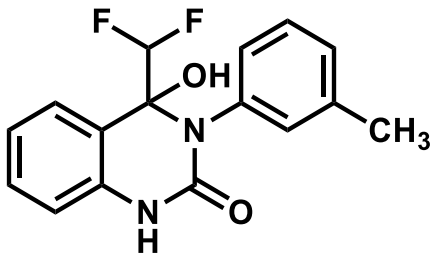


3-(4-Chlorophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3g): White solid (266 mg, 82%); mp 210-211 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.08 (s, 1H), 7.50 (s, 1H), 7.50 – 7.21 (m, 6H), 7.11 – 6.92 (m, 2H), 5.87 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.5, 138.7, 136.8, 132.6, 132.2, 131.2, 130.1, 128.1, 121.7, 117.5, 114.1, 114.0 (dd, J = 244, 257 Hz), 85.5 (dd, J = 24.3, 26.5 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.43 (dd, J = 274, 55 Hz), -134.59 (dd, J = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{15}H_{12}ClF_2N_2O_2^+$ $[M+H]^+$ 325.0550; found: 325.0553.

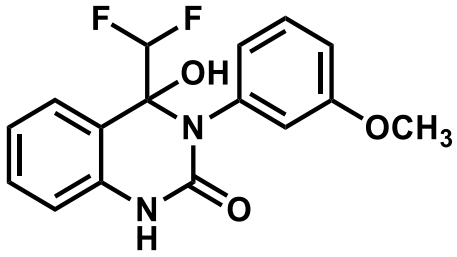


3-(4-Bromophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3h): White solid (283 mg, 77%); mp 234-235°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.02 (s, 1H), 7.84 (s, 1H), 7.61 (d, J = 8.4 Hz, 2H)), 7.46 (d, J = 7.6 Hz, 1H), 7.37 (d, t, J = 7.6 Hz, 1H), 7.22 (d, J = 8.4 Hz, 2H), 7.06 (d, J = 7.6 Hz, 1H), 6.93 (d, J = 7.6 Hz, 1H), 5.83 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.4, 136.9, 136.6, 134.4, 131.6, 131.0, 128.6, 121.6, 121.2, 117.4, 114.0, 113.9 (dd, J = 234, 252 Hz), 85.2 (dd, J = 23.3, 26.9 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.42 (dd, J = 275, 55 Hz), -134.27 (dd, J = 275, 55 Hz).

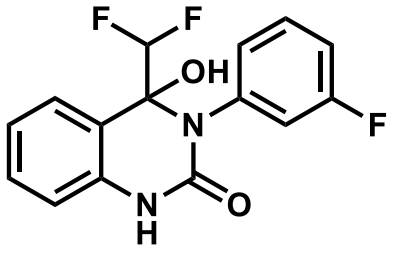
HRMS(ESI): calcd. for $C_{15}H_{12}BrF_2N_2O_2^+$ $[M+H]^+$ 369.0045; found: 369.0041.



4-(Difluoromethyl)-4-hydroxy-3-(m-tolyl)-3,4-dihydroquinazolin-2(1H)-one (3i): White solid (240 mg, 79%); mp 225-226°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.93 (s, 1H), 7.73 (d, J = 4.4 Hz, 1H), 7.47 – 7.16 (m, 4H), 7.09 – 7.02 (m, 3H), 6.93 (d, J = 7.6 Hz, 1H), 5.81 (t, J = 55.6 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.6, 137.9, 137.1, 136.7, 132.7, 130.9, 129.3, 128.7, 128.4, 121.4, 117.3, 115.4, 113.9, 113.8 (dd, J = 234, 245 Hz), 85.2 (dd, J = 22.5, 25.2 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.65 (ddd, J = 274, 55, 4.1 Hz), -134.56 (dd, J = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_2^+$ $[M+H]^+$ 305.1096; found: 305.1089.

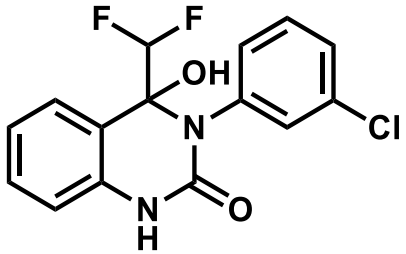


4-(Difluoromethyl)-4-hydroxy-3-(3-methoxyphenyl)-3,4-dihydroquinazolin-2(1H)-one (3j): White solid (214 mg, 67%); mp 190-191°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.93 (s, 1H), 7.71 (d, J = 4.4 Hz, 1H), 7.49 – 7.17 (m, 3H), 7.05 (t, J = 7.6 Hz, 1H), 6.98 – 6.90 (m, 2H), 6.87 – 6.80 (m, 2H), 5.83 (t, J = 55.2 Hz, 1H), 3.76 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 159.6, 151.5, 138.2, 137.1, 130.9, 129.2, 128.7, 124.5, 121.5, 118.3, 117.4, 113.9, 113.9 (dd, J = 232, 254 Hz), 113.6, 85.3 (dd, J = 23.7, 27.8 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.74 (dd, J = 275, 55 Hz), -134.52 (dd, J = 274, 56 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_3^+$ $[M+H]^+$ 321.1045; found: 321.1048.

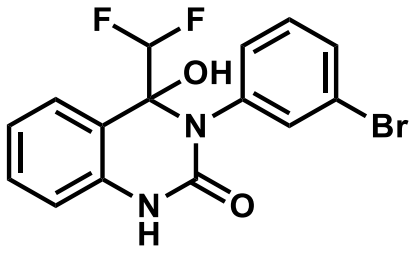


4-(Difluoromethyl)-3-(3-fluorophenyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3k): White solid (222 mg, 72%); mp 208-209°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.03 (s, 1H), 7.84 (d, J = 3.6 Hz, 1H), 7.49 – 7.20 (m, 4H), 7.15 – 7.03 (m, 3H), 6.94 (d, J = 7.6 Hz, 1H), 5.86 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 162.0 (d, J = 242 Hz), 151.4, 138.9 (d, J = 10.2 Hz), 136.9, 133.5, 131.0, 129.9 (d, J = 9.0 Hz), 128.6, 121.7, 119.4 (d, J = 21.8 Hz),

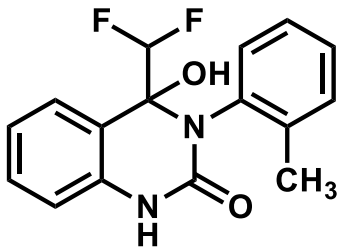
117.5, 115.0 (d, J = 20.6 Hz), 114.0, 113.9 (dd, J = 239, 255 Hz), 85.4 (dd, J = 24.2, 27.1 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -113.82, -129.56 (dd, J = 273, 56 Hz), -134.70 (dd, J = 275, 55 Hz).
HRMS(ESI): calcd. for $C_{15}H_{12}F_3N_2O_2^+$ $[M+H]^+$ 309.0845; found: 309.0847.



3-(3-Chlorophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3l): White solid (259 mg, 80%); mp 208-209°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.05 (s, 1H), 7.86 (d, J = 3.6 Hz, 1H), 7.44 – 7.20 (m, 6H), 7.07 (t, J = 7.6 Hz, 1H), 6.93 (d, J = 7.2 Hz, 1H), 5.87 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.4, 138.7, 136.9, 132.6, 132.2, 131.2, 131.0, 130.1, 128.6, 128.1, 121.7, 117.5, 114.0, 113.9 (dd, J = 233, 251 Hz), 85.4 (dd, J = 24.1, 26.4 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.43 (ddd, J = 274, 55, 2.2 Hz), -134.59 (dd, J = 274, 56 Hz).
HRMS(ESI): calcd. for $C_{15}H_{12}ClF_2N_2O_2^+$ $[M+H]^+$ 325.0550; found: 325.0546.

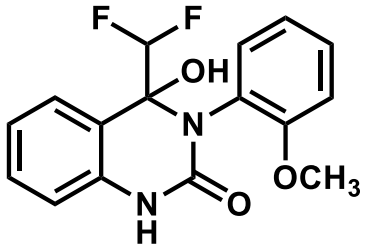


3-(3-Bromophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3m): Yellow solid (265 mg, 72%); mp 195-196°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.07 (s, 1H), 7.90 (d, J = 3.6 Hz, 1H), 7.61 – 7.28 (m, 6H), 7.07 (t, J = 8.0 Hz, 1H), 6.94 (d, J = 7.6 Hz, 1H), 5.87 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.5, 138.8, 136.8, 135.0, 131.5, 131.0, 130.9, 130.5, 128.6, 121.7, 120.9, 117.5, 114.0, 114.0 (dd, J = 237, 250 Hz), 85.4 (dd, J = 23.9, 27.0 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.39 (dd, J = 274, 55 Hz), -134.55 (dd, J = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{15}H_{12}BrF_2N_2O_2^+$ $[M+H]^+$ 369.0045; found: 369.0049.

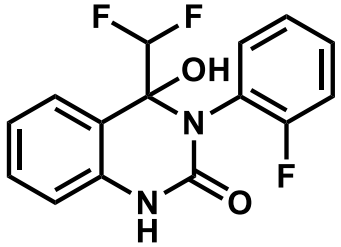


4-(Difluoromethyl)-4-hydroxy-3-(o-tolyl)-3,4-dihydroquinazolin-2(1H)-one (3n): White solid (192 mg, 63%); mp 191-192°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.96 (s, 1H), 7.95 –

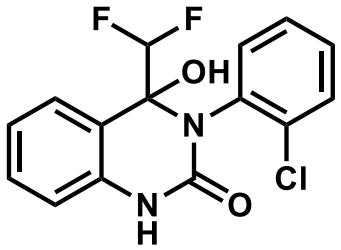
6.90 (m, 9H), 6.11 (t, J = 55.2 Hz, 1H), 2.09 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.4, 139.6, 137.3, 136.6, 131.3, 130.8, 130.7, 128.7 (d, J = 3.4 Hz), 128.2, 126.7, 121.3, 116.9, 114.2 (dd, J = 243, 252 Hz), 113.9, 85.8 (dd, J = 23.8, 27.1 Hz), 18.8. ^{19}F NMR (376 MHz, DMSO-d_6) δ -130.11 (dd, J = 273, 55 Hz), -134.52 (dd, J = 275, 56 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_2^+$ $[M+H]^+$ 305.1096; found: 305.1093.



4-(Difluoromethyl)-4-hydroxy-3-(2-methoxyphenyl)-3,4-dihydroquinazolin-2(1H)-one (3o): White solid (176 mg, 55%); mp 232-233°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.89 (s, 1H), 7.41 – 6.90 (m, 9H), 6.01 (t, J = 55.2 Hz, 1H), 3.66 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 157.6, 151.2, 137.4, 134.2, 134.0, 132.4, 130.8, 129.8, 126.1, 121.1, 120.4, 113.8, 112.2, 114.1 (dd, J = 220, 255 Hz), 85.6 (dd, J = 22.9, 25.0 Hz), 55.9. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.40 (dd, J = 271, 53 Hz), -131.98 (dd, J = 271, 53 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_3^+$ $[M+H]^+$ 321.1045; found: 321.1038.

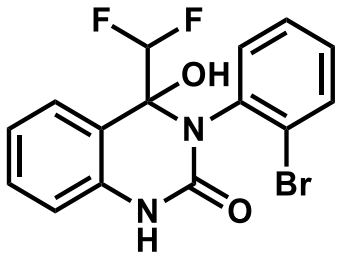


4-(Difluoromethyl)-3-(2-fluorophenyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3p): White solid (219 mg, 71%); mp 206-207°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.06 (s, 1H), 7.92 (d, J = 3.6 Hz, 1H), 7.50 – 7.20 (m, 6H), 7.08 (t, J = 7.2 Hz, 1H), 6.95 (d, J = 7.6 Hz, 1H), 5.71 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 160.3 (d, J = 247 Hz), 150.5, 136.9, 134.6, 131.0, 130.3, 128.4 (d, J = 2.7 Hz), 124.7 (d, J = 5.3 Hz), 124.2, 121.7, 117.6, 116.2 (d, J = 20.7 Hz), 114.1 (dd, J = 223, 245 Hz), 114.0, 85.7 (dd, J = 23.3, 26.2 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -116.98, -130.52 (dd, J = 274, 55 Hz), -133.01 (dd, J = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{15}H_{12}F_3N_2O_2^+$ $[M+H]^+$ 309.0845; found: 309.0846.

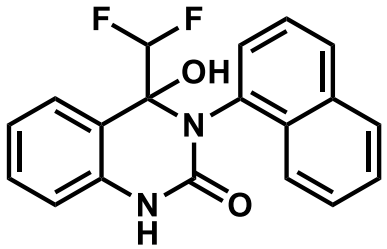


3-(2-Chlorophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3q): White solid (191 mg, 59%); mp 122-123°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.02 (s, 1H), 7.92 (s, 1H), 7.62 – 7.20 (m, 6H), 7.07 (t, J = 7.2 Hz, 1H), 6.94 (d, J = 8.0 Hz, 1H), 5.72 (t, J =

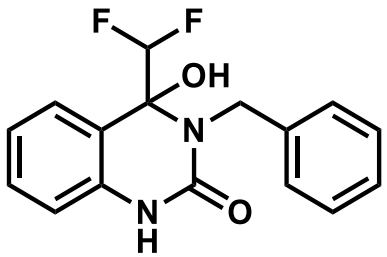
55.6 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 162.8, 149.6, 136.9, 136.2, 134.7, 134.3, 131.9, 130.1, 129.5, 128.5, 126.8, 121.9, 116.3, 114.3, 85.6 (t, J = 31.8 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -130.16 (dd, J = 273, 55, 4.1 Hz), -133.15 (dd, J = 274, 56 Hz).
HRMS(ESI): calcd. for $C_{15}H_{12}ClF_2N_2O_2^+$ $[M+H]^+$ 325.0550; found: 325.0544.



3-(2-Bromophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3r): Yellow solid (188 mg, 51%); mp 96-97°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.04 (s, 1H), 7.95 (d, J = 4.0 Hz, 1H), 7.72 (d, J = 8.0 Hz, 1H), 7.53 – 7.25 (m, 5H), 7.07 (t, J = 7.6 Hz, 1H), 6.95 (d, J = 8.0 Hz, 1H), 5.76 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 162.8, 149.8, 136.9, 136.4, 135.2, 133.5, 130.9, 129.9, 127.8, 126.6, 121.6, 117.4, 114.1, 113.8 (dd, J = 236, 241 Hz), 85.6 (dd, J =22.9, 31.5 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -130.16 (dd, J = 271, 55 Hz), -133.07 (dd, J = 273, 55 Hz).
HRMS(ESI): calcd. for $C_{15}H_{12}BrF_2N_2O_2^+$ $[M+H]^+$ 369.0045; found: 369.0048.

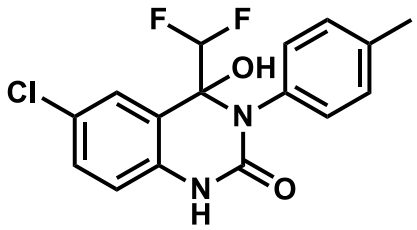


4-(Difluoromethyl)-4-hydroxy-3-(naphthalen-1-yl)-3,4-dihydroquinazolin-2(1H)-one (3s): Pink solid (153 mg, 45%); mp 154-156°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.10 (s, 1H), 8.15 – 7.29 (m, 10H), 7.19 – 6.99 (m, 2H), 6.20 (t, J = 55.6 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 150.8, 136.2, 133.3, 132.6, 129.9, 128.2, 127.7, 127.5, 127.0, 125.6, 125.3, 124.9, 124.5, 123.7, 120.4, 115.8, 114.6 (dd, J = 255, 264 Hz), 113.0, 85.1 (dd, J = 25.0, 27.4 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.77 (dd, J = 273, 55 Hz), -133.63 (dd, J = 273, 56 Hz).
HRMS(ESI): calcd. for $C_{19}H_{15}F_2N_2O_2^+$ $[M+H]^+$ 341.1096; found:341.1090.

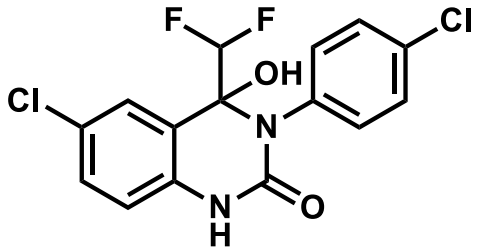


3-Benzyl-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3t): White

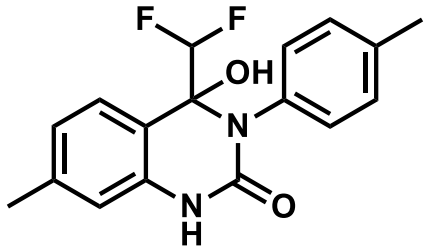
solid (195 mg, 64%); mp 203-204°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.82 (s, 1H), 7.95 (d, J = 4.0 Hz, 1H), 7.43 – 6.86 (m, 9H), 6.06 (t, J = 55.2 Hz, 1H), 4.70 (s, 2H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 152.0, 140.3, 137.1, 130.8, 128.4, 127.8, 126.8, 121.3, 127.9, 114.7 (dd, J = 227, 246 Hz), 114.5, 113.7, 85.0 (dd, J =25.0, 29.2 Hz), 44.6. ^{19}F NMR (376 MHz, DMSO-d_6) δ -131.10 (dd, J = 275, 55 Hz), -132.92 (dd, J = 271, 55 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_2^+$ $[M+H]^+$ 305.1096; found: 305.1093.



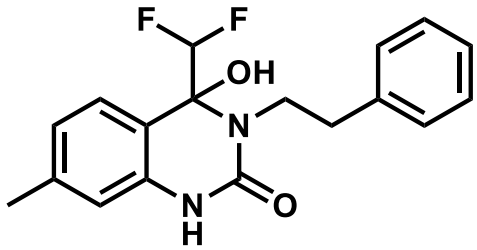
6-Chloro-4-(difluoromethyl)-4-hydroxy-3-(*p*-tolyl)-3,4-dihydroquinazolin-2(1H)-one (3u): White solid (250 mg, 74%); mp 225-226°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.10 (s, 1H), 7.88 (d, J = 4.0 Hz, 1H), 7.44 (dd, J = 8.4, 1.6 Hz, 1H), 7.40 (d, J = 1.6 Hz, 1H), 7.21 (d, J = 8.4 Hz, 1H), 7.12 (d, J = 8.4 Hz, 1H), 6.95 (d, J = 8.0 Hz, 1H), 5.83 (t, J = 55.2 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.4, 137.4, 136.2, 134.0, 131.9, 130.9, 129.3, 128.2 (d, J = 3.3 Hz), 125.1, 119.1, 115.8, 113.8 (dd, J = 243, 252 Hz), 84.9 (dd, J =23.7, 27.6 Hz), 21.1. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.83 (dd, J = 273, 54 Hz), -134.65 (dd, J = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{16}H_{14}ClF_2N_2O_2^+$ $[M+H]^+$ 339.0706; found: 339.0711.



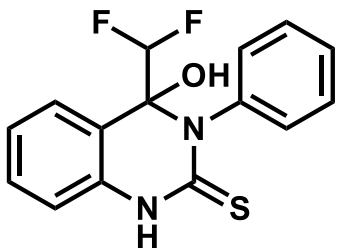
6-Chloro-3-(4-chlorophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (3v): Blown solid (276 mg, 77%); mp 231-232°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.21 (s, 1H), 8.01 (d, J = 3.6 Hz, 1H), 7.52 – 7.40 (m, 4H), 7.26 (d, J = 8.8 Hz, 1H), 6.96 (d, J = 8.4 Hz, 1H), 5.90 (t, J = 54.8 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.2, 136.0, 135.8, 134.0, 132.8, 131.1, 128.8, 128.1 (d, J = 3.4 Hz), 125.3, 119.2, 116.0, 113.9 (dd, J = 244, 249 Hz), 85.1 (dd, J =24.0, 27.0 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.75 (dd, J = 276, 56 Hz), -134.40 (dd, J = 276, 56 Hz).
HRMS(ESI): calcd. for $C_{15}H_{11}Cl_2F_2N_2O_2^+$ $[M+H]^+$ 359.0160; found: 359.0153.



4-(Difluoromethyl)-4-hydroxy-7-methyl-3-(*p*-tolyl)-3,4-dihydroquinazolin-2(1H)-one (3w): White solid (213 mg, 67%); mp 141-142°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.85 (s, 1H), 7.62 (d, J = 4.4 Hz, 1H), 7.32 (dd, J = 7.6, 2.0 Hz, 1H), 7.20 (d, J = 8.4 Hz, 2H), 7.13 (d, J = 8.4 Hz, 2H), 6.85 (d, J = 8.0 Hz, 1H), 6.71 (s, 1H), 5.73 (t, J = 55.6 Hz, 1H), 2.33 (s, 3H), 2.28 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.8, 140.5, 137.2, 137.0, 134.4, 132.0, 129.2, 128.7 (d, J = 3.4 Hz), 122.3, 114.6, 114.0, 113.9 (dd, J = 246, 252 Hz), 85.1 (dd, J =23.4, 27.7 Hz), 21.4, 21.1. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.41 (dd, J = 273, 55 Hz), -134.67 (dd, J = 273, 55 Hz).
HRMS(ESI): calcd. for $C_{17}H_{17}F_2N_2O_2^+$ $[M+H]^+$ 319.1253; found: 319.1253.

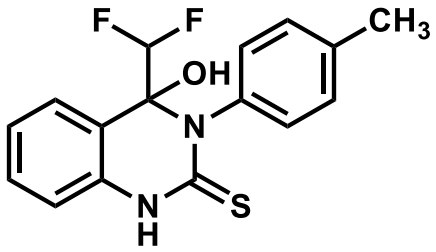


4-(Difluoromethyl)-4-hydroxy-7-methyl-3-phenethyl-3,4-dihydroquinazolin-2(1H)-one (3x): White solid (219 mg, 66%); mp 154-156°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.73 (s, 1H), 7.83 (s, 1H), 7.35 – 7.09 (m, 7H), 6.74 (s, 1H), 6.14 (t, J = 55.2 Hz, 1H), 3.73 (t, J = 8.8 Hz, 1H), 3.53 (t, J = 8.8 Hz, 1H), 2.95 – 2.80 (m, 2H), 2.21 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.7, 140.1, 133.3, 129.0, 128.9, 127.4, 127.2, 126.6, 116.2, 115.9, 114.4 (dd, J = 245, 249 Hz), 114.0, 84.5 (t, J = 24.3 Hz), 43.3, 36.4, 14.7. ^{19}F NMR (376 MHz, DMSO-d_6) δ -131.08 (dd, J = 275, 55 Hz), -133.17 (dd, J = 275, 55 Hz).
HRMS(ESI): calcd. for $C_{18}H_{19}F_2N_2O_2^+$ $[M+H]^+$ 333.1409; found:333.1402.

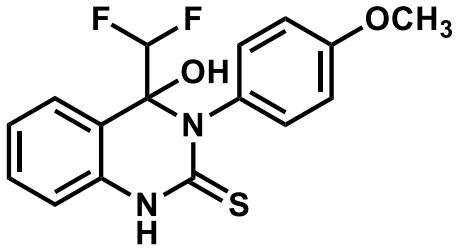


4-(Difluoromethyl)-4-hydroxy-3-phenyl-3,4-dihydroquinazoline-2(1H)-thione (3y): Pink solid (181 mg, 59%); mp 214-215°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.92 (s, 1H), 7.80 (d, J = 4.0 Hz, 1H), 7.46 – 7.34 (m, 5H), 7.26 (d, J = 7.2 Hz, 2H), 7.05 (t, J = 7.6 Hz, 1H), 6.93 (d, J = 8.0 Hz, 1H), 5.79 (t, J = 55.4 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.7, 137.0(2),

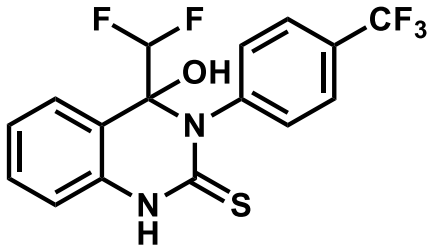
136.9(7), 132.2, 130.9, 128.6(9), 128.6(5), 128.0, 121.6, 117.3, 114.0 (dd, J = 229, 249 Hz), 113.9, 85.2 (dd, J = 23.4, 27.4 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.60 (ddd, J = 274, 55, 3.8 Hz), -134.49 (dd, J = 274, 55 Hz).
HRMS(ESI): calcd. for $C_{15}H_{13}F_2N_2OS^+$ $[M+H]^+$ 307.0711; found:307.0708.



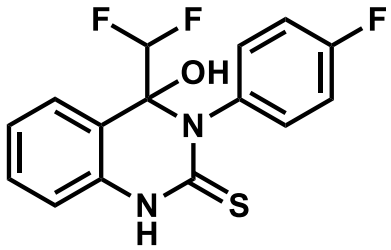
4-(Difluoromethyl)-4-hydroxy-3-(p-tolyl)-3,4-dihydroquinazoline-2(1H)thione (3z): Pink solid (198 mg, 62%); mp 132-133°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.91 (s, 1H), 7.68 (d, J = 4.1 Hz, 1H), 7.45 (d, J = 7.8 Hz, 1H), 7.35 (t, J = 7.7 Hz, 1H), 7.20 (d, J = 8.0 Hz, 2H), 7.13 (d, J = 8.0 Hz, 2H), 7.04 (t, J = 7.6 Hz, 1H), 6.91 (d, J = 8.0 Hz, 1H), 5.77 (t, J = 55.5 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.7, 137.2, 137.1, 134.4, 132.0, 130.9, 129.2, 128.8, 128.7, 121.4, 117.4, 114.0 (dd, J = 241, 252 Hz), 113.9, 85.2 (dd, J = 23.4, 26.9 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.60 (ddd, J = 274, 55, 3.4 Hz), -134.64 (dd, J = 274, 56 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2OS^+$ $[M+H]^+$ 321.0868; found:321.0874.



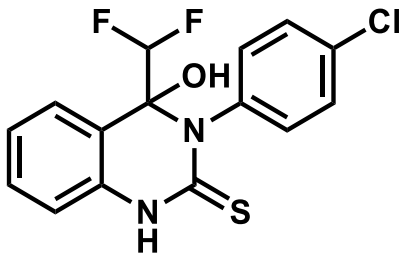
4-(Difluoromethyl)-4-hydroxy-3-(4-methoxyphenyl)-3,4-dihydroquinazoline-2(1H)-thione (3aa): Pink solid (175 mg, 52%); mp 136-137°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.90 (s, 1H), 7.67 (d, J = 4.0 Hz, 1H), 7.45 (d, J = 8.3 Hz, 1H), 7.35 (t, J = 7.8 Hz, 1H), 7.17 (d, J = 8.5 Hz, 2H), 7.04 (t, J = 7.6 Hz, 1H), 6.95 (d, J = 8.3 Hz, 2H), 6.91 (d, J = 8.4 Hz, 1H), 5.77 (t, J = 55.6 Hz, 1H), 3.78 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 158.8, 151.8, 137.1, 133.1, 130.9, 129.5, 128.8, 121.5, 117.3, 113.9, 113.8(6), 55.7. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.63 (dd, J = 274, 55 Hz), -133.77 (dd, J = 273, 56 Hz).
HRMS(ESI): calcd. for $C_{16}H_{15}F_2N_2O_2S^+$ $[M+H]^+$ 337.0817; found:337.0820.



4-(Difluoromethyl)-4-hydroxy-3-(4-(trifluoromethyl)phenyl)-3,4-dihydroquinazoline-2(1H)-thione (3ab): Pink solid (209 mg, 56%); mp 122-123°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.11 (s, 1H), 7.96 (s, 1H), 7.80 (d, J = 8.1 Hz, 2H), 7.51 (d, J = 8.0 Hz, 2H), 7.48 (d, J = 7.2 Hz, 1H), 7.39 (t, J = 7.7 Hz, 1H), 7.08 (t, J = 7.2 Hz, 1H), 6.95 (d, J = 8.0 Hz, 1H), 5.88 (t, J = 55.1 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.5, 141.3, 136.8, 133.3, 131.1, 128.5, 128.4 (q, J = 31.6 Hz), 125.7 (q, J = 3.5 Hz), 124.7 (q, J = 271 Hz), 121.8, 117.5, 114.2 (dd, J = 252, 244 Hz), 114.1, 85.6 (dd, J = 24.0, 26.2 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -60.95 (s), -129.41 (dd, J = 277, 56 Hz), -133.93 (dd, J = 274, 56 Hz).
HRMS(ESI): calcd. For $C_{16}H_{12}F_5N_2OS^+$ $[M+H]^+$ 375.0585; found:375.0589.

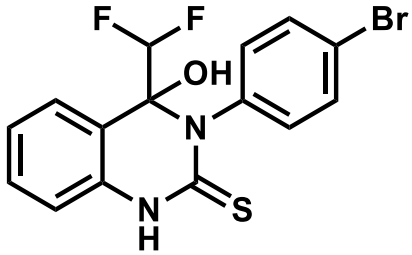


4-(Difluoromethyl)-3-(4-fluorophenyl)-4-hydroxy-3,4-dihydroquinazoline-2(1H)-thione (3ac): Pink solid (185 mg, 57%); mp 216-217°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.98 (s, 1H), 7.78 (d, J = 4.0 Hz, 1H), 7.46 (d, J = 7.6 Hz, 1H), 7.37 (td, J = 8.0, 1.2 Hz, 1H), 7.33 – 7.19 (m, 4H), 7.05 (td, J = 7.6, 0.8 Hz, 1H), 6.93 (dd, J = 8.0, 0.8 Hz, 1H), 5.81 (t, J = 55.4 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 161.6 (d, J = 242 Hz), 151.6, 137.0, 134.1 (d, J = 8.8 Hz), 133.3 (d, J = 3.1 Hz), 131.0, 128.7 (d, J = 3.4 Hz), 121.6, 117.4, 115.4 (d, J = 22.3 Hz), 114.1 (dd, J = 244, 250 Hz), 114.0, 85.3 (dd, J = 23.6, 27.5 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -115.02, -129.50 (dd, J = 274, 55 Hz), -134.48 (dd, J = 274, 55 Hz).
HRMS(ESI): calcd. For $C_{15}H_{12}F_3N_2OS^+$ $[M+H]^+$ 325.0617; found:325.0610.

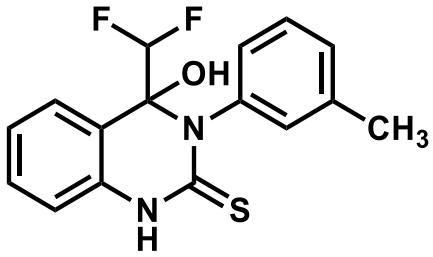


3-(4-Chlorophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazoline-2(1H)-thione (3ad): Pink solid (218 mg, 64%); mp 170-171°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.02 (s, 1H), 7.83 (s, 1H), 7.51 – 7.43 (m, 3H), 7.37 (t, J = 7.2 Hz, 1H), 7.28 (d, J = 7.2 Hz, 2H), 7.06

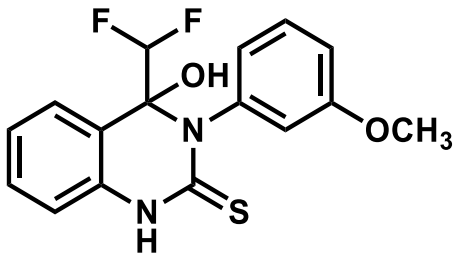
(t, *J* = 7.2 Hz, 1H), 6.93 (d, J = 7.2 Hz, 1H), 5.83 (t, *J* = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ151.5, 136.9, 136.2, 134.1, 132.6, 131.0, 128.7, 128.6, 121.6, 117.4, 114.1 (dd, *J* = 245, 250 Hz), 114.0, 85.4 (dd, *J* = 24.0, 27.1 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.44 (dd, *J* = 274, 56 Hz), -134.28 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. For $C_{15}H_{12}ClF_2N_2OS^+$ $[M+H]^+$ 341.0321; found:341.0325.



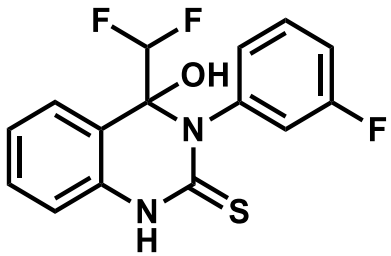
3-(4-Bromophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazoline-2(1H)-thione (3ae): Pink solid (188 mg, 49%); mp 181-182°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.02 (s, 1H), 7.82 (d, *J* = 3.8 Hz, 1H), 7.61 (d, *J* = 8.8 Hz, 2H), 7.47 (d, *J* = 8.0 Hz, 1H), 7.37 (t, *J* = 7.6 Hz, 1H), 7.22 (d, *J* = 8.8 Hz, 2H), 7.06 (t, *J* = 8.0 Hz, 1H), 6.93 (d, *J* = 8.0 Hz, 1H), 5.83 (t, *J* = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.4, 136.9, 136.6, 134.4, 131.6, 131.0, 128.6 (d, *J* = 3.3 Hz), 121.6, 117.4, 114.1 (dd, *J* = 243, 253 Hz), 114.0, 85.3 (dd, *J* = 24.0, 26.8 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.41 (ddd, *J* = 274, 56, 2.3 Hz), -134.31 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. For $C_{15}H_{12}BrF_2N_2OS^+$ $[M+H]^+$ 384.9816; found:384.9812.



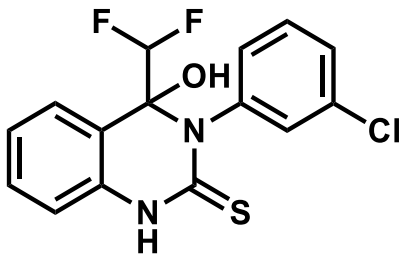
4-(Difluoromethyl)-4-hydroxy-3-(m-tolyl)-3,4-dihydroquinazoline-2(1H)-thione (3af): Pink solid (170 mg, 53%); mp 171-172°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.91 (s, 1H), 7.69 (d, *J* = 4.5 Hz, 1H), 7.45 (d, *J* = 8.0 Hz, 1H), 7.35 (t, *J* = 8.0 Hz, 1H), 7.28 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 7.6 Hz, 1H), 7.08 – 7.00 (m, 3H), 6.92 (d, *J* = 8.0 Hz, 1H), 5.80 (t, *J* = 55.2 Hz, 1H), 2.32 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.6, 137.9, 137.1, 137.0, 132.8, 130.9, 129.3, 128.7 (d, *J* = 3.1 Hz), 128.6, 128.4, 121.4, 117.3, 114.0 (dd, *J* = 241, 252 Hz), 113.9, 85.2 (dd, *J* = 23.7, 27.5 Hz), 21.4. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.69 (dd, *J* = 273, 56 Hz), -134.53 (dd, *J* = 274, 56 Hz).
HRMS(ESI): calcd. For $C_{16}H_{15}F_2N_2OS^+$ $[M+H]^+$ 321.0868; found:321.0861.



4-(Difluoromethyl)-4-hydroxy-3-(3-methoxyphenyl)-3,4-dihydroquinazoline-2(1H)-thione (3ag): Pink solid (175 mg, 52%); mp 179-180°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.94 (s, 1H), 7.72 (d, J = 3.2 Hz, 1H), 7.46 (d, J = 7.6 Hz, 1H), 7.37 (t, J = 7.6 Hz, 1H), 7.32 (t, J = 7.6 Hz, 1H), 7.05 (t, J = 7.6 Hz, 1H), 6.95 (d, J = 8.4 Hz, 1H), 6.93 (d, J = 7.6 Hz, 1H), 6.88 – 6.83 (m, 2H), 5.84 (t, J = 55.2 Hz, 1H), 3.77 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 159.5, 151.5, 138.1, 137.1, 130.9, 129.2, 128.7, 124.5, 121.4, 118.3, 117.4, 114.0 (dd, J = 241, 251 Hz), 113.9, 113.6, 85.3 (dd, J = 23.4, 27.7 Hz), 55.6. ^{19}F NMR (376 MHz, DMSO-d_6) δ -129.72 (dd, J = 274, 55 Hz), -134.38 (dd, J = 273, 55 Hz).
HRMS(ESI): calcd. For $C_{16}H_{15}F_2N_2O_2S^+$ $[M+H]^+$ 337.0817; found:337.0814.

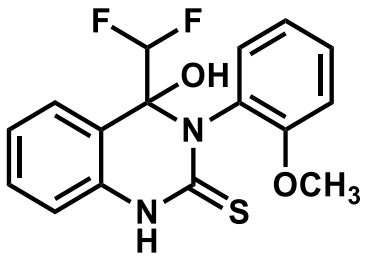


4-(Difluoromethyl)-3-(3-fluorophenyl)-4-hydroxy-3,4-dihydroquinazoline-2(1H)-thione (3ah): Pink solid (175 mg, 54%); mp 194-195°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.03 (s, 1H), 7.83 (d, J = 4.0 Hz, 1H), 7.48 – 7.42 (m, 2H), 7.33 (td, J = 8.1, 1.5 Hz, 1H), 7.23 (td, J = 8.0, 2.0 Hz, 1H), 7.13 (d, J = 8.0 Hz, 1H), 7.11 – 7.04 (m, 2H), 6.93 (dd, J = 8.0, 0.8 Hz, 1H), 5.86 (t, J = 55.2 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 162.0 (d, J = 242 Hz), 151.4, 138.9 (d, J = 10.2 Hz), 136.9, 131.0, 129.9 (d, J = 9.0 Hz), 128.6 (2C), 121.6, 119.4 (d, J = 21.7 Hz), 117.5, 115.0 (d, J = 20.5 Hz), 114.1 (dd, J = 241, 249 Hz), 114.0, 85.5 (dd, J = 23.6, 26.9 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -113.80, -129.56 (dd, J = 274, 55 Hz), -134.70 (dd, J = 275, 56 Hz).
HRMS(ESI): calcd. For $C_{15}H_{12}F_3N_2OS^+$ $[M+H]^+$ 325.0617; found:325.0618.

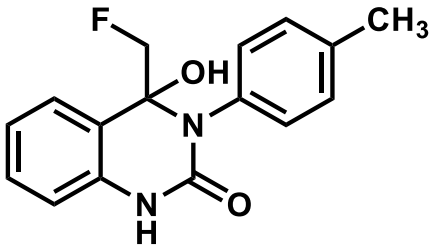


3-(3-Chlorophenyl)-4-(difluoromethyl)-4-hydroxy-3,4-dihydroquinazoline-2(1H)-thione (3ai): Pink solid (197 mg, 58%); mp 191-192°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.05 (s,

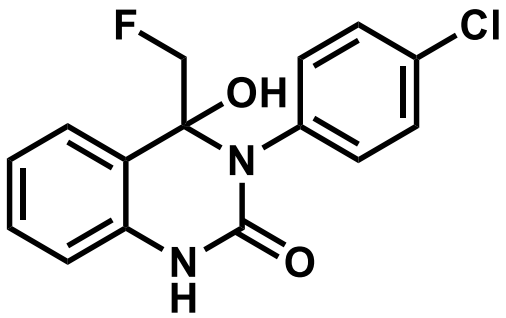
1H), 7.86 (d, *J* = 4.0 Hz, 1H), 7.48 – 7.43 (m, 3H), 7.37 (t, *J* = 8.4 Hz, 1H), 7.32 (s, 1H), 7.28 – 7.24 (m, 1H), 7.07 (t, *J* = 7.6 Hz, 1H), 6.94 (d, *J* = 8.0 Hz, 1H), 5.86 (t, J = 55.2, 1H). ^{13}C NMR (101 MHz, DMSO-*d*$_6$) δ 151.4, 138.7, 136.9, 132.6, 132.2, 131.2, 131.0, 130.1, 128.6 (d, *J* = 2.9 Hz), 128.1, 121.7, 117.5, 114.1 (dd, *J* = 242, 253 Hz), 114.0, 85.5 (dd, *J* = 24.1, 26.6 Hz). ^{19}F NMR (376 MHz, DMSO-*d*$_6$) δ -129.42 (dd, *J* = 275, 55 Hz), -134.59 (dd, *J* = 274, 55 Hz).
HRMS(ESI): calcd. For $C_{15}H_{12}ClF_2N_2OS^+$ $[M+H]^+$ 341.0321; found:325.0324.



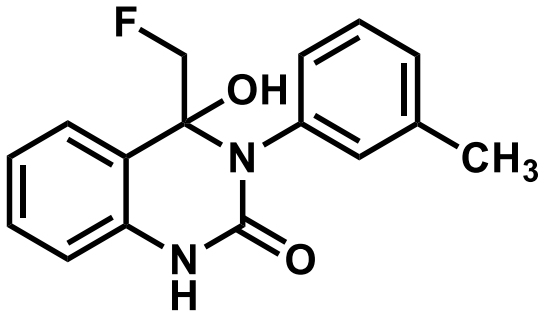
4-(Difluoromethyl)-4-hydroxy-3-(2-methoxyphenyl)-3,4-dihydroquinazoline-2(1H)-thione (3aj): Pink solid (158 mg, 47%); mp 215-216°C; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 9.82 (s, 1H), 7.60 (d, *J* = 3.2 Hz, 1H), 7.48 – 7.32 (m, 3H), 7.27 – 7.09 (m, 2H), 7.07 – 6.90 (m, 4H), 5.97 (t, *J* = 55.2 Hz, 1H), 3.66 (s, 3H). ^{13}C NMR (101 MHz, DMSO-*d*$_6$) δ 157.6, 150.8, 137.3, 134.3, 130.8, 129.7, 128.5, 125.5, 121.3, 120.2, 117.6, 113.9 (dd, *J* = 243, 251 Hz), 113.8, 112.5, 85.9 (dd, *J* = 22.9, 29.5 Hz), 55.9. ^{19}F NMR (376 MHz, DMSO-*d*$_6$) δ -128.68 (dd, *J* = 270, 54 Hz), -132.18 (dd, *J* = 270, 56 Hz).
HRMS(ESI): calcd. For $C_{16}H_{15}F_2N_2O_2S^+$ $[M+H]^+$ 337.0817; found:337.0821.



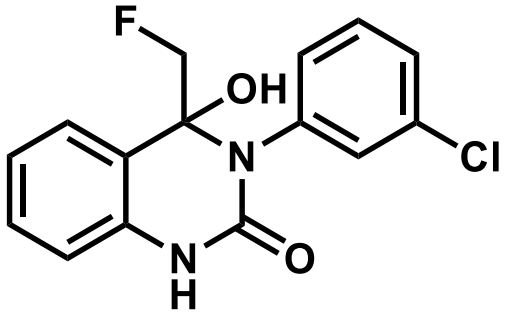
4-(Fluoromethyl)-4-hydroxy-3-(p-tolyl)-3,4-dihydroquinazolin-2(1H)-one (4b): White solid (163 mg, 57%); mp 187-188°C; ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 9.85 (s, 1H), 7.48 (d, *J* = 7.8 Hz, 1H), 7.30 (t, *J* = 8.0 Hz, 1H), 7.24 – 7.18 (m, 3H), 7.15 (d, *J* = 8.0 Hz, 1H), 7.15 (d, *J* = 8.0 Hz, 1H), 7.02 (t, *J* = 7.6 Hz, 1H), 6.90 (d, *J* = 8.0 Hz, 1H), 4.47 (dd, *J* = 46.5, 9.6 Hz, 1H), 4.07 (dd, *J* = 47.2, 9.7 Hz, 1H), 2.35 (s, 3H). ^{13}C NMR (101 MHz, DMSO-*d*$_6$) δ 151.9, 137.1, 136.9, 134.7, 131.8, 130.0, 129.2, 127.2, 121.7, 121.1, 113.9, 85.4 (d, *J* = 22.6 Hz), 84.0 (d, *J* = 172 Hz), 21.2. ^{19}F NMR (376 MHz, DMSO-*d*$_6$) δ -221.64 (t, *J* = 46 Hz).
HRMS(ESI): calcd. For $C_{16}H_{16}FN_2O_2^+$ $[M+H]^+$ 287.1190; found:287.1193.



3-(4-Chlorophenyl)-4-(fluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (4c): White solid (177 mg, 58%); mp 189-190°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.97 (s, 1H), 7.55 – 7.41 (m, 3H), 7.36 – 7.24 (m, 4H), 7.04 (t, J = 7.6 Hz, 1H), 6.91 (d, J = 8.0 Hz, 1H), 4.50 (dd, J = 46.3, 9.6 Hz, 1H), 4.05 (dd, J = 47.6, 9.6 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.7, 136.7, 136.4, 133.8, 132.6, 130.2, 128.8, 127.2, 121.9, 121.0, 114.1, 85.5 (d, J = 22.6 Hz), 84.0 (d, J = 172 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -221.88 (t, J = 48 Hz).
HRMS(ESI): calcd. For $C_{15}H_{13}ClFN_2O_2^+$ $[M+H]^+$ 307.0644; found:307.0636.

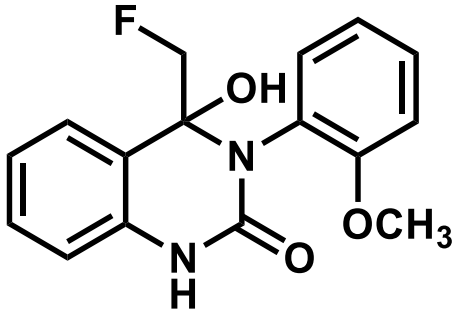


4-(Fluoromethyl)-4-hydroxy-3-(m-tolyl)-3,4-dihydroquinazolin-2(1H)-one (4d): White solid (163 mg, 57%); mp 171-172°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.87 (s, 1H), 7.48 (d, J = 7.6 Hz, 1H), 7.30 (t, J = 7.7 Hz, 2H), 7.23 – 7.17 (m, 2H), 7.10 – 7.05 (m, 2H), 7.03 (t, J = 7.6 Hz, 1H), 6.90 (d, J = 8.0 Hz, 1H), 4.48 (dd, J = 46.8, 9.6 Hz, 1H), 4.08 (dd, J = 47.2, 9.6 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.9, 137.8, 137.3, 136.8, 132.5, 130.0, 129.1, 128.6, 128.4, 127.2, 121.7, 121.1, 114.0, 85.4 (d, J = 22.6 Hz), 83.9 (d, J = 172 Hz), 21.4. ^{19}F NMR (376 MHz, DMSO-d_6) δ -221.41 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{16}H_{16}FN_2O_2^+$ $[M+H]^+$ 287.1190; found:287.1187.

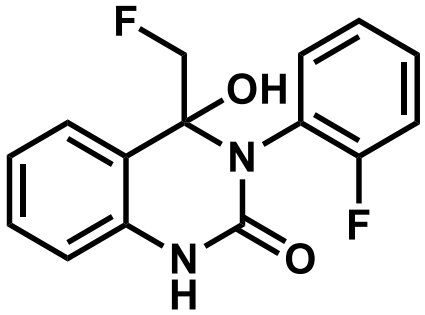


3-(3-Chlorophenyl)-4-(fluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (4e):

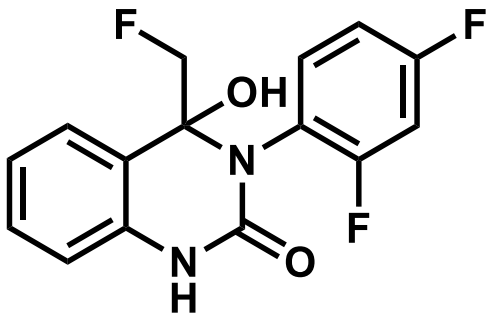
White solid (159 mg, 52%); mp 175-176°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.99 (s, 1H), 7.52 – 7.46 (m, 3H), 7.40 – 7.23 (m, 4H), 7.05 (t, J = 7.6 Hz, 1H), 6.92 (d, J = 7.6 Hz, 1H), 4.51 (dd, J = 46.0, 9.6 Hz, 1H), 4.06 (dd, J = 47.2, 9.6 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.7, 138.9, 136.6, 132.7, 132.0, 130.9, 130.3, 130.2, 128.1, 127.2, 122.0, 121.0, 114.1, 85.6 (d, J = 22.5 Hz), 84.0 (d, J = 172 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -221.84 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{15}H_{13}ClFN_2O_2^+$ $[M+H]^+$ 307.0644; found:307.0647.



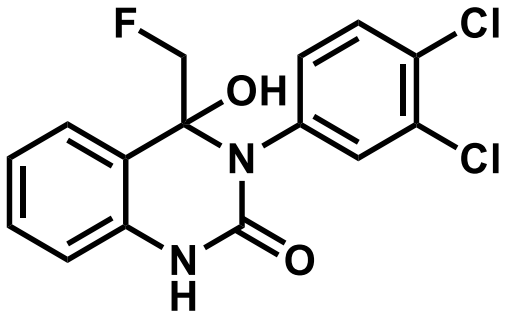
4-(Fluoromethyl)-4-hydroxy-3-(2-methoxyphenyl)-3,4-dihydroquinazolin-2(1H)-one (4f):
White solid (202 mg, 67%); mp 111-112°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.75 (s, 1H), 7.44 (t, J = 8.0 Hz), 7.37 – 7.27 (m, 3H), 7.15 – 6.88 (m, 5H), 4.33 (dd, J = 46.8, 9.6 Hz, 1H), 4.18 (dd, J = 47.2, 9.6 Hz, 1H), 3.73 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 157.6, 150.9, 136.7, 133.6, 129.9, 129.4, 127.3, 126.2, 121.5, 121.3, 120.1, 113.9, 112.3, 85.9 (d, J = 22.1 Hz), 84.1 (d, J = 176 Hz), 55.9. ^{19}F NMR (376 MHz, DMSO-d_6) δ -220.71 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{16}H_{16}FN_2O_3^+$ $[M+H]^+$ 303.1139; found:303.1145.



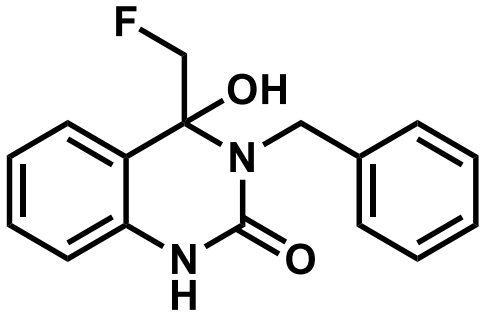
4-(Fluoromethyl)-3-(2-fluorophenyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (4g):
White solid (174 mg, 60%); mp 178-179°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.00 (s, 1H), 7.51 – 7.20 (m, 7H), 7.08 – 7.02 (m, 1H), 6.94 – 6.90 (m, 1H), 4.46 (dd, J = 46.3, 9.8 Hz, 1H), 4.02 (dd, J = 47.8, 9.8 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 160.2 (d, J = 248 Hz), 150.8, 136.6, 134.1, 130.2, 130.1 (d, J = 8.2 Hz), 127.1, 125.1 (d, J = 12.6 Hz), 124.3 (d, J = 3.4 Hz), 121.9, 121.0, 116.1 (d, J = 20.8 Hz), 114.1, 86.0 (d, J = 21.8 Hz), 84.1 (d, J = 175 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -117.99 (s), -220.61 (t, J = 49 Hz).
HRMS(ESI): calcd. For $C_{15}H_{13}F_2N_2O_2^+$ $[M+H]^+$ 291.0940; found: 291.0946.



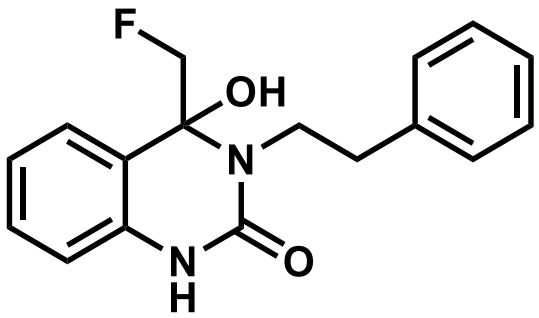
3-(2,4-Difluorophenyl)-4-(fluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (4h): White solid (219 mg, 71%); mp 188-189°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.04 (s, 1H), 7.54 – 7.30 (m, 5H), 7.17 – 7.10 (m, 1H), 7.08 – 7.03 (m, 1H), 6.95– 6.90 (m, 1H), 4.46 (dd, J = 46.2, 9.8 Hz, 1H), 4.03 (dd, J = 48.0, 9.6 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 161.9 (dd, J = 245, 11.8 Hz), 160.3 (dd, J = 237, 12.8 Hz), 150.8, 136.5, 135.1 (d, J = 10.1 Hz), 130.2, 127.1, 122.0, 121.6 (dd, J = 12.9, 3.9 Hz), 120.9, 114.2, 111.3 (d, J = 12.0, 3.6 Hz), 104.6 (t, J = 25.6 Hz), 86.0 (d, J = 22.7 Hz), 84.2 (d, J = 175 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -110.44 (s), -112.83 (s), -220.70 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{15}H_{12}F_3N_2O_2^+$ $[M+H]^+$ 309.0845; found:309.0848.



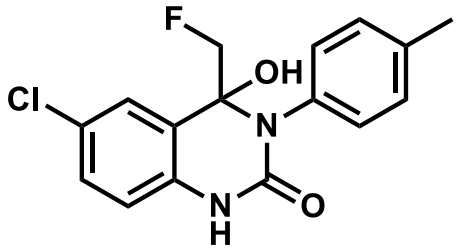
3-(3,4-Dichlorophenyl)-4-(fluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (4i): Yellow solid (173 mg, 51%); mp 180-181°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.06 (s, 1H), 7.72 (d, J = 8.8 Hz, 1H), 7.52 – 7.46 (m, 2H), 7.43 (d, J = 4.8 Hz, 1H), 7.33 (td, J = 7.6, 1.2 Hz, 1H), 7.28 (dd, J = 8.8, 2.4 Hz, 1H), 7.06 (td, J = 7.6, 0.8 Hz, 1H), 6.92 (d, J = 8.0 Hz, 1H), 4.53 (dd, J = 46.2, 9.9 Hz, 1H), 4.09 (dd, J = 47.5, 9.9 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.6, 137.6, 136.5, 133.9, 132.5, 131.0, 130.9, 130.7, 130.3, 127.2, 122.1, 120.9, 114.2, 85.7 (d, J = 22.6 Hz), 84.1 (d, J = 173 Hz). ^{19}F NMR (376 MHz, DMSO-d_6) δ -222.00 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{15}H_{12}Cl_2FN_2O_2^+$ $[M+H]^+$ 341.0254; found:341.0256.



3-Benzyl-4-(fluoromethyl)-4-hydroxy-3,4-dihydroquinazolin-2(1H)-one (4j): White solid (232 mg, 81%); mp 177-178°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.66 (s, 1H), 7.42 (d, J = 7.6 Hz, 1H), 7.34 (d, J = 7.6 Hz, 2H), 7.29 – 7.24 (m, 4H), 7.18 (t, J = 7.2 Hz, 1H), 7.00 (t, J = 7.6 Hz, 1H), 6.85 (d, J = 8.0 Hz, 1H), 4.66 (d, J = 4.0 Hz, 2H), 4.44 (q, J = 9.2 Hz, 1H), 4.32 (q, J = 49.6 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 152.4, 140.7, 136.7, 130.0, 128.3, 127.6, 127.1 126.7, 121.6, 121.1, 113.6, 85.5 (d, J = 173 Hz), 85.3 (d, J = 22.2 Hz), 43.8. ^{19}F NMR (376 MHz, DMSO-d_6) δ -222.09 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{16}H_{16}FN_2O_2^+$ $[M+H]^+$ 287.1190; found:287.1193.

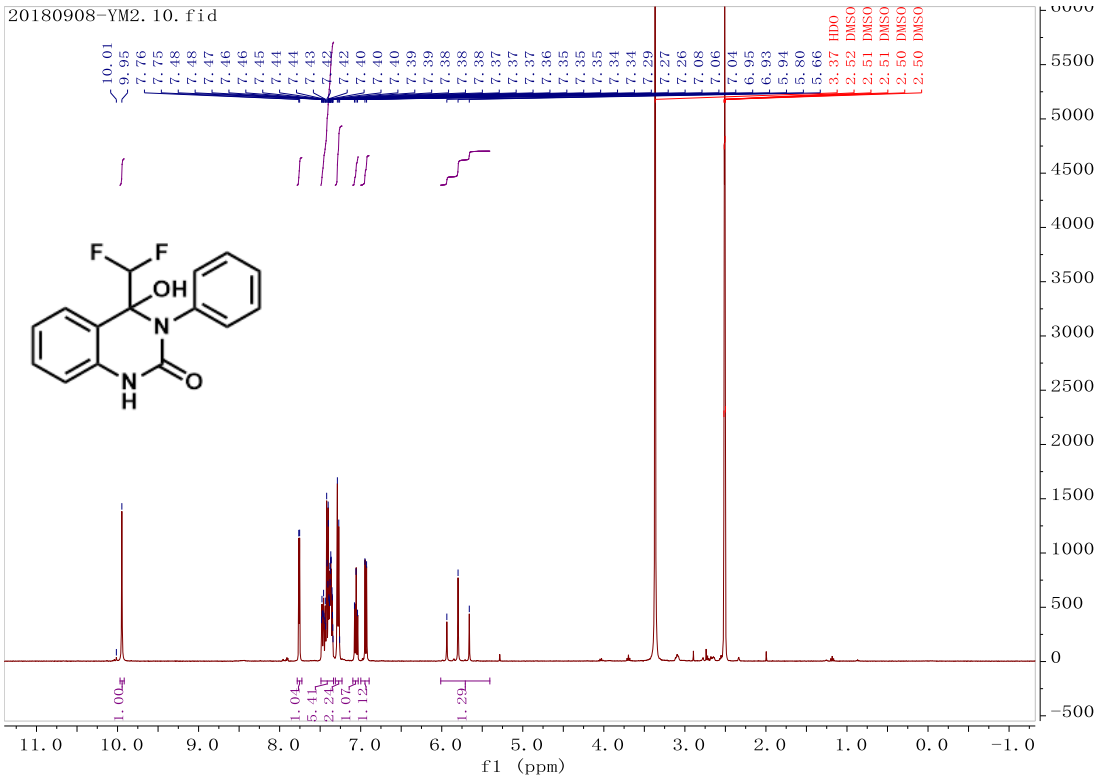


4-(Fluoromethyl)-4-hydroxy-3-phenethyl-3,4-dihydroquinazolin-2(1H)-one (4k): White solid (207 mg, 69%); mp 136-137°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.62 (s, 1H), 7.44 (d, J = 7.6 Hz, 1H), 7.35 – 7.19 (m, 7H), 7.00 (t, J = 7.6 Hz, 1H), 6.84 (d, J = 8.0 Hz, 1H), 4.55 (dd, J = 48, 9.6 Hz, 1H), 4.41 (dd, J = 46.8, 9.6 Hz, 1H), 3.71 – 3.63 (m, 2H), 2.95 – 2.82 (m, 2H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.9, 140.3, 136.7, 129.9, 129.0, 128.9, 127.0, 126.6, 121.5, 121.1, 113.6, 85.5 (d, J = 172 Hz), 85.0 (d, J = 22.4 Hz), 42.6, 36.5. ^{19}F NMR (376 MHz, DMSO-d_6) δ -222.75 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{17}H_{18}FN_2O_2^+$ $[M+H]^+$ 301.1347; found:301.1343.

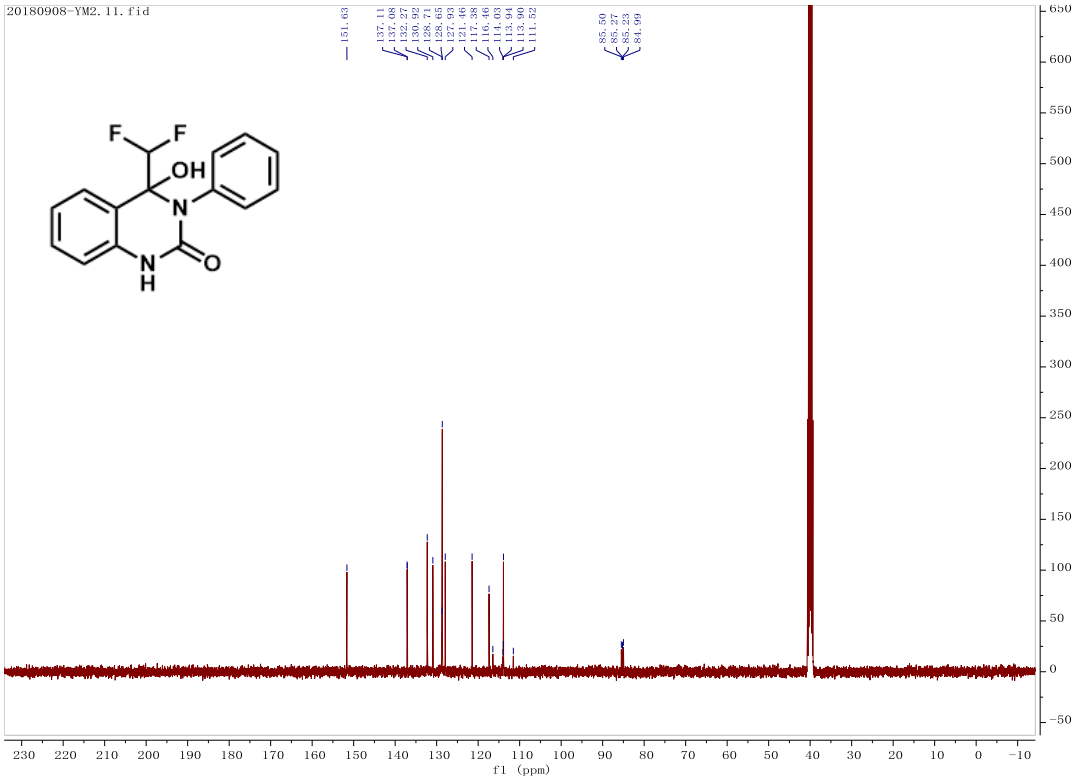


6-Chloro-4-(fluoromethyl)-4-hydroxy-3-(*p*-tolyl)-3,4-dihydroquinazolin-2(1H)-one (4l): White solid (163 mg, 51 %); mp 99-101°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.03 (s, 1H), 7.37 (dd, J = 8.4, 2.0 Hz, 1H), 7.32 (d, J = 2.0 Hz, 1H), 7.21 (d, J = 8.0 Hz, 2H), 7.13 (d, J = 8.0 Hz, 2H), 6.91 (d, J = 8.4 Hz, 1H), 4.54 (dd, J = 46.0, 10.0 Hz, 1H), 4.06 (dd, J = 47.2, 9.6 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.6, 137.3, 135.9, 134.4, 131.7, 130.1, 129.2, 126.9, 125.3, 123.0, 115.8, 85.1 (d, J = 22.7 Hz), 21.1. ^{19}F NMR (376 MHz, DMSO-d_6) δ -222.03 (t, J = 47 Hz).
HRMS(ESI): calcd. For $C_{16}H_{15}ClFN_2O_2^+$ $[M+H]^+$ 321.0801; found:321.0794.

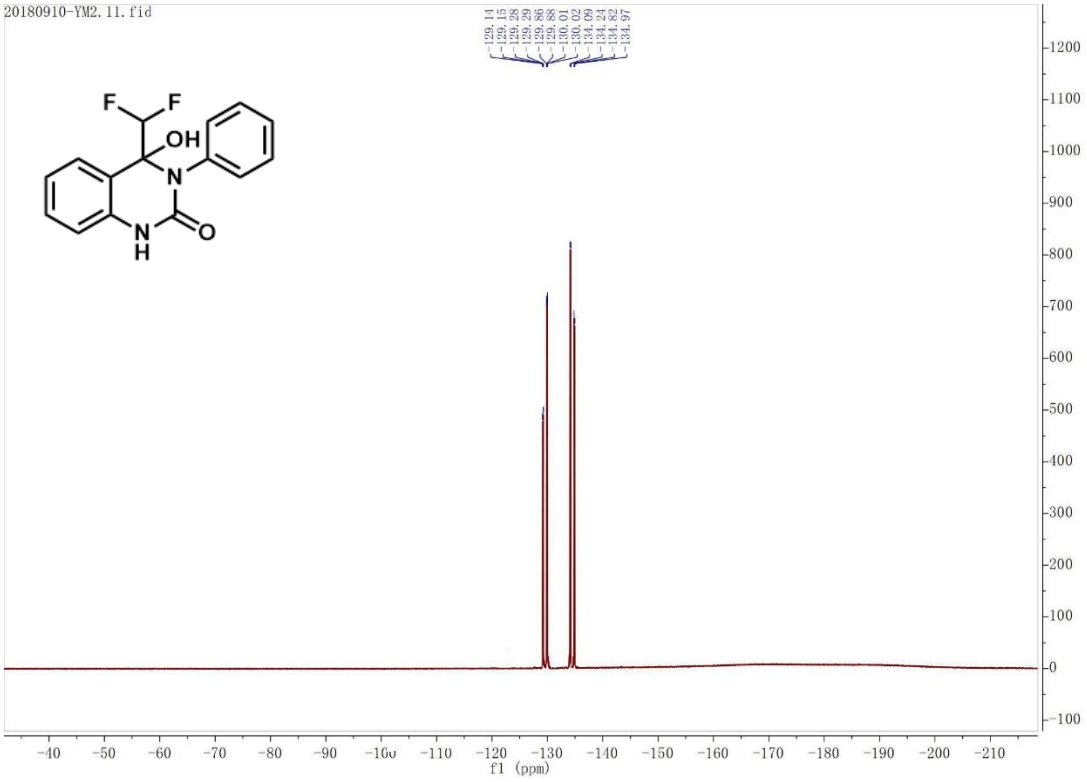
[1]H NMR of Compound **3a** (400 MHz, DMSO)



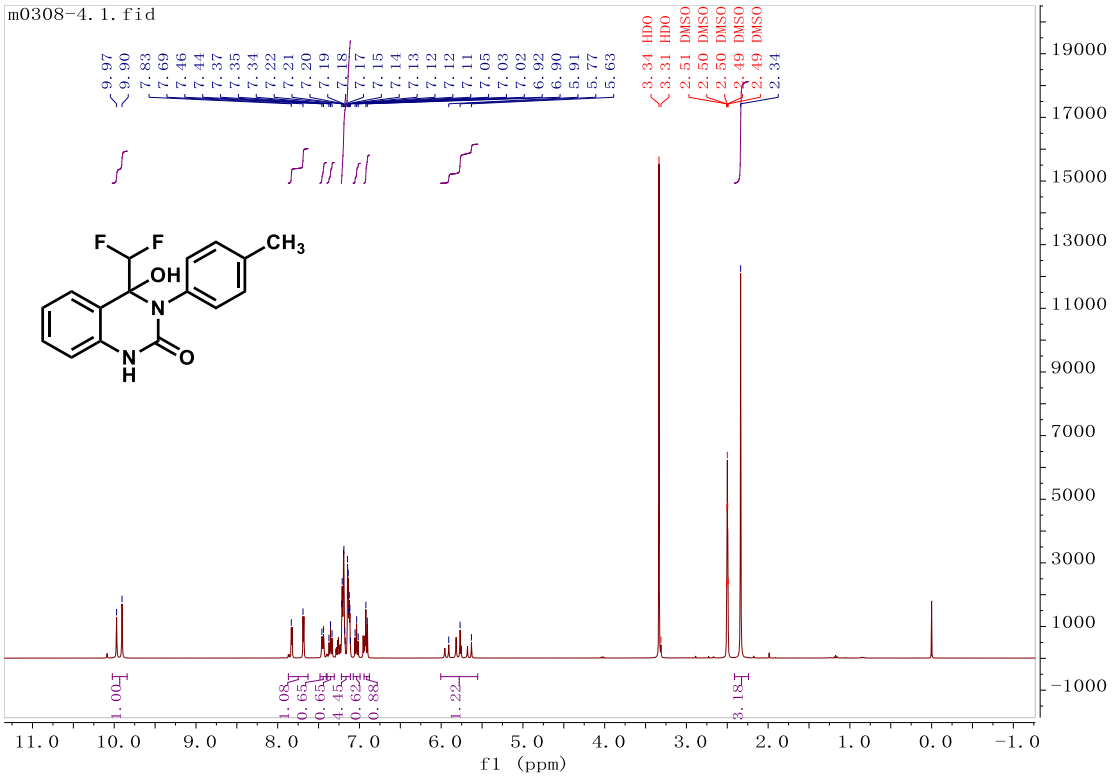
[13]C NMR of Compound **3a** (101 MHz, DMSO)



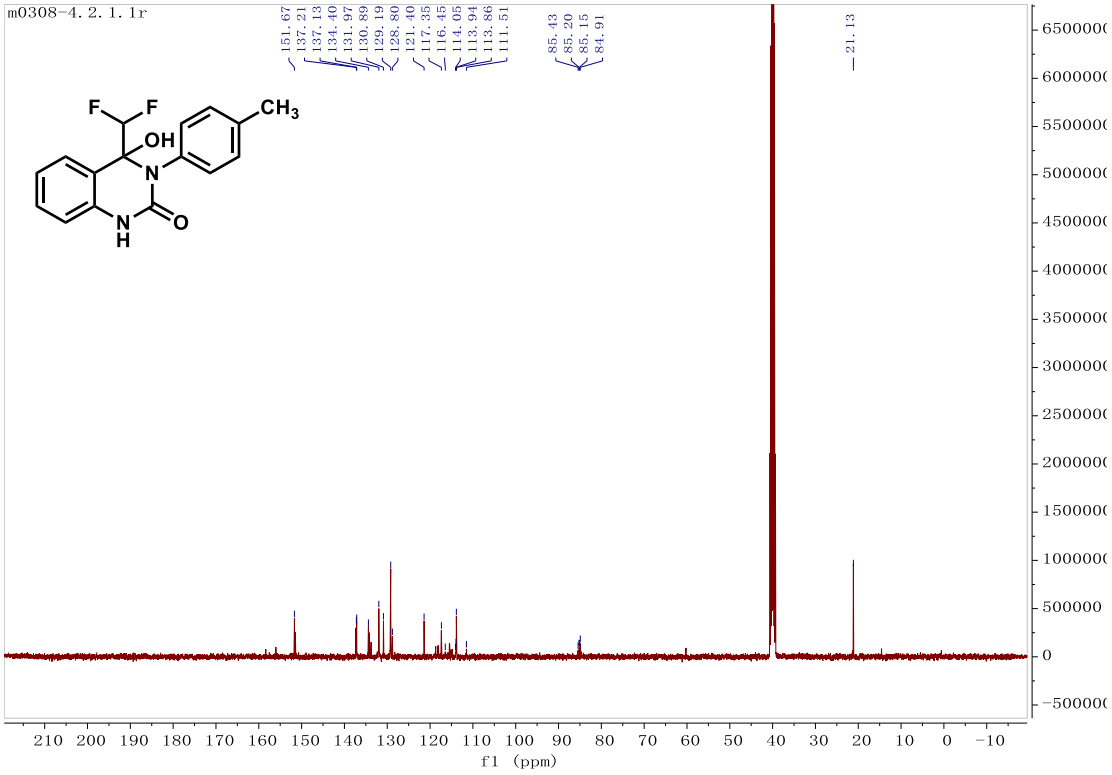
[19]F NMR of Compound **3a** (376 MHz, DMSO)



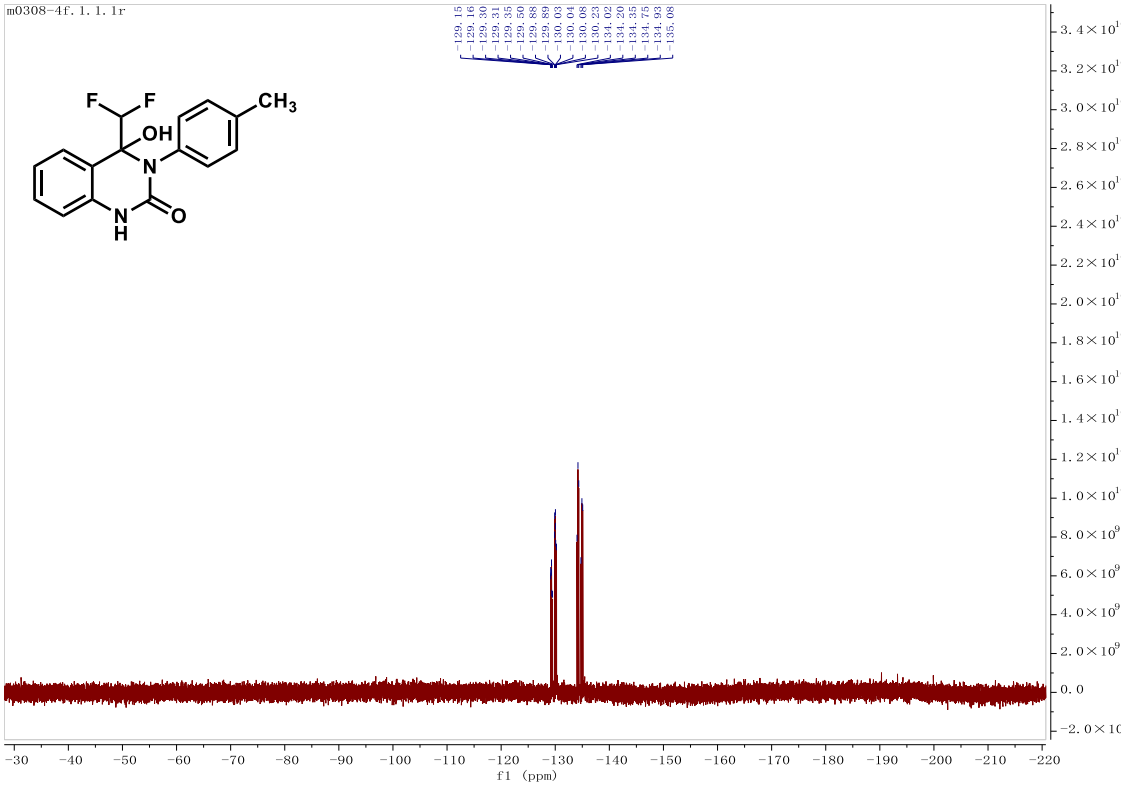
[1]H NMR of Compound **3b** (400 MHz, DMSO)



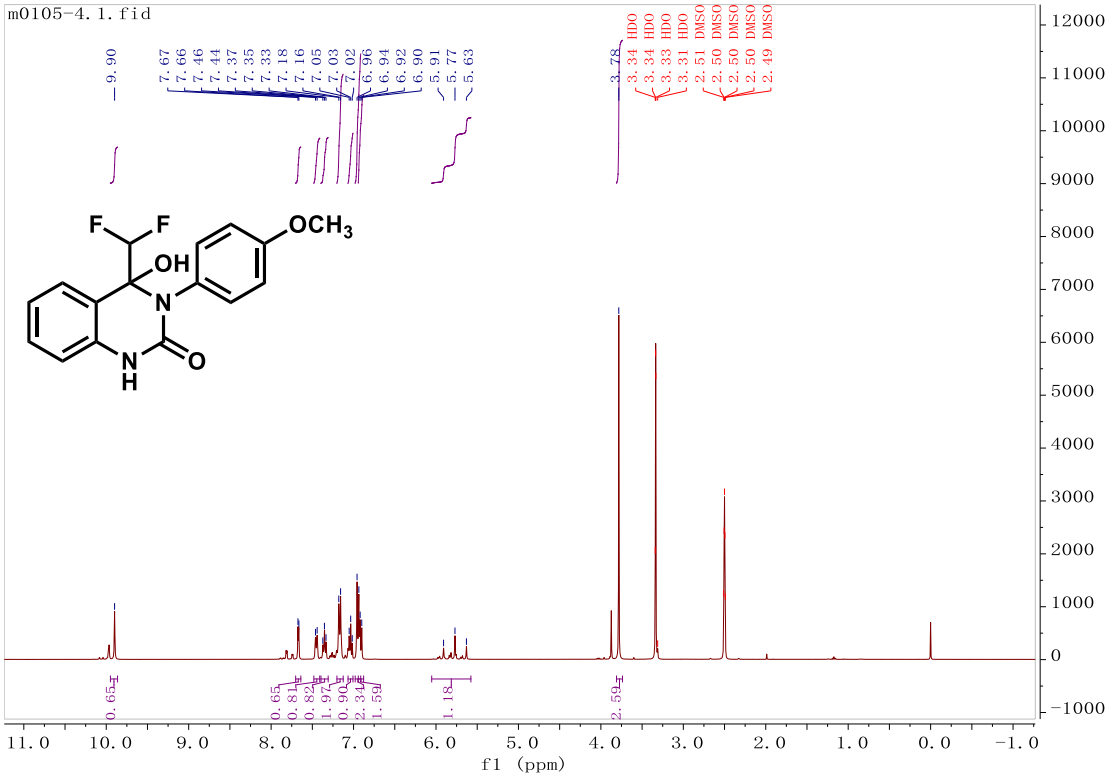
^{13}C NMR of Compound **3b** (101 MHz, DMSO)



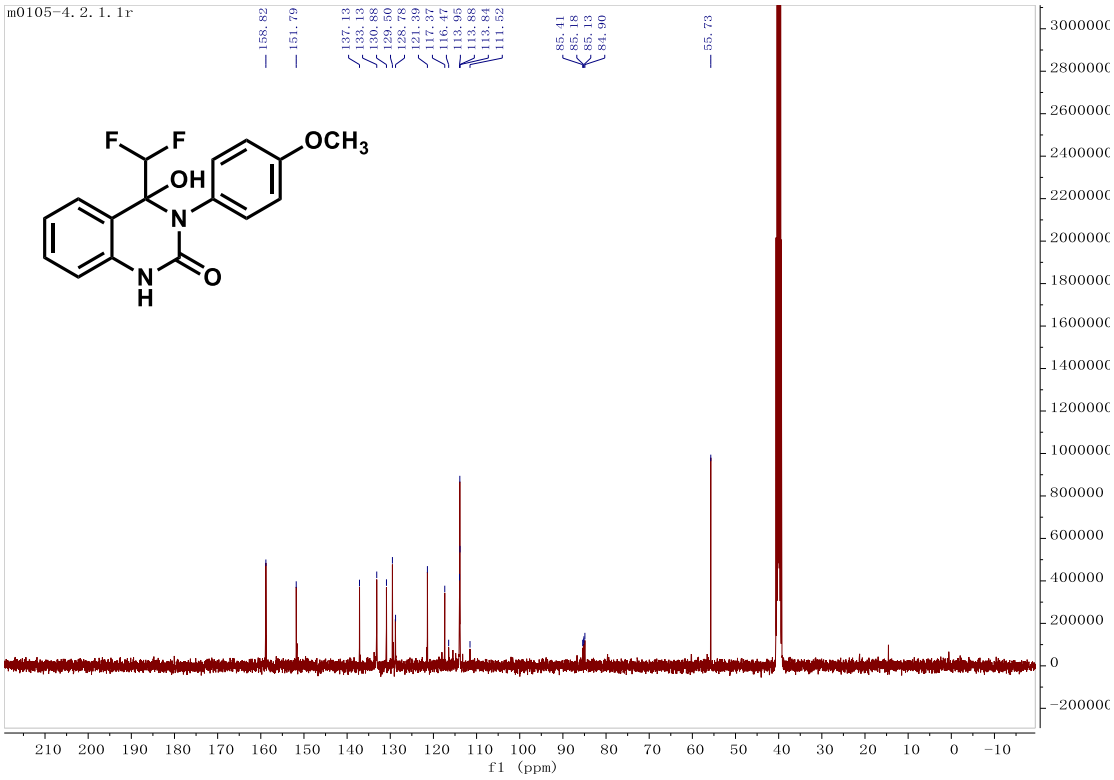
^{19}F NMR of Compound **3b** (376 MHz, DMSO)



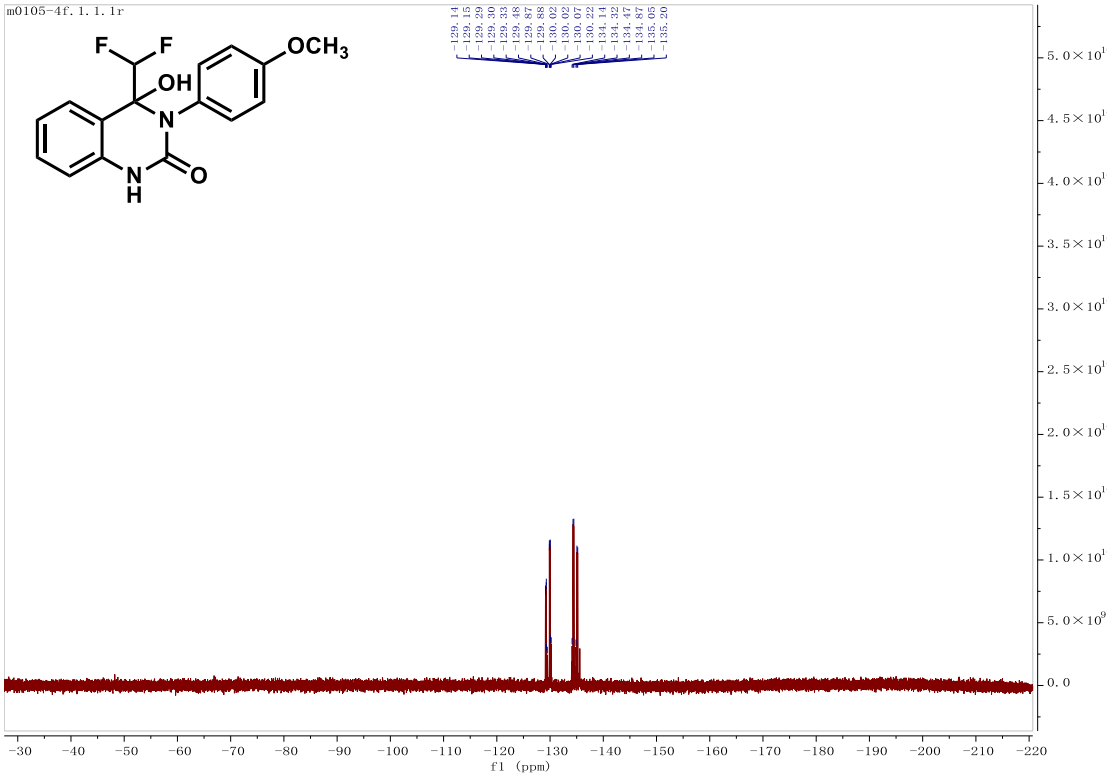
[1]H NMR of Compound **3c** (400 MHz, DMSO)



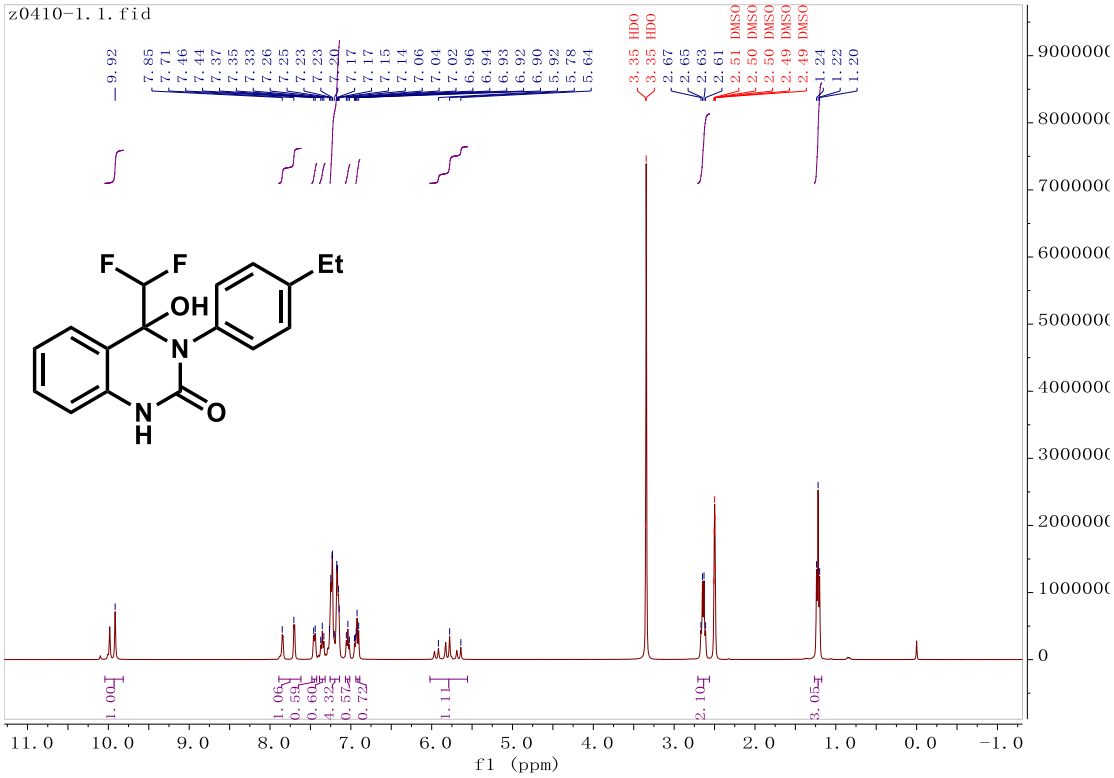
[13]C NMR of Compound **3c** (101 MHz, DMSO)



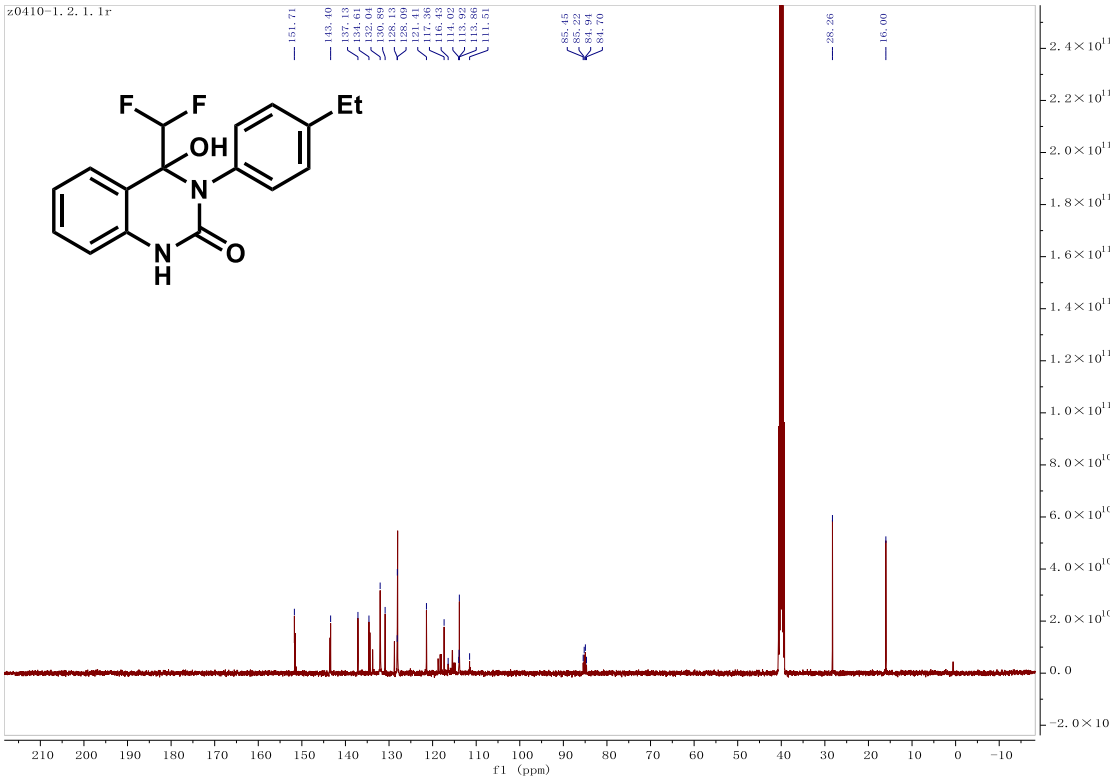
[19]F NMR of Compound **3c** (376 MHz, DMSO)



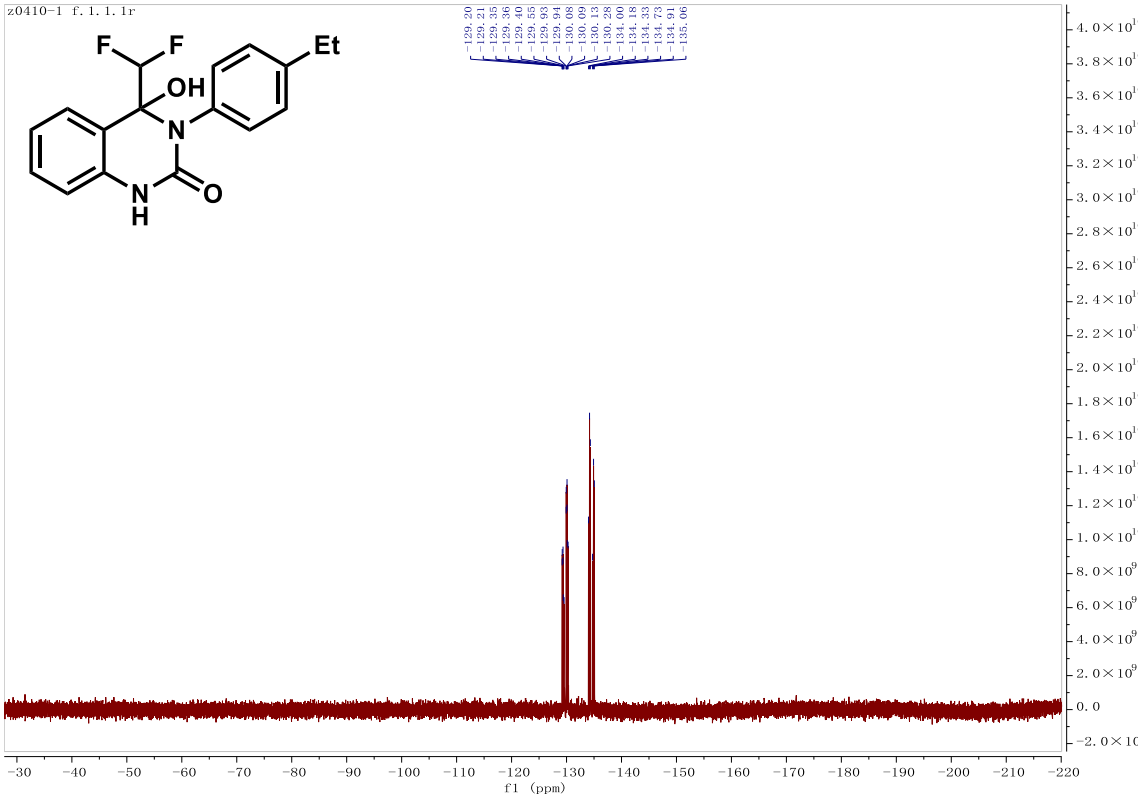
[1]H NMR of Compound **3d** (400 MHz, DMSO)



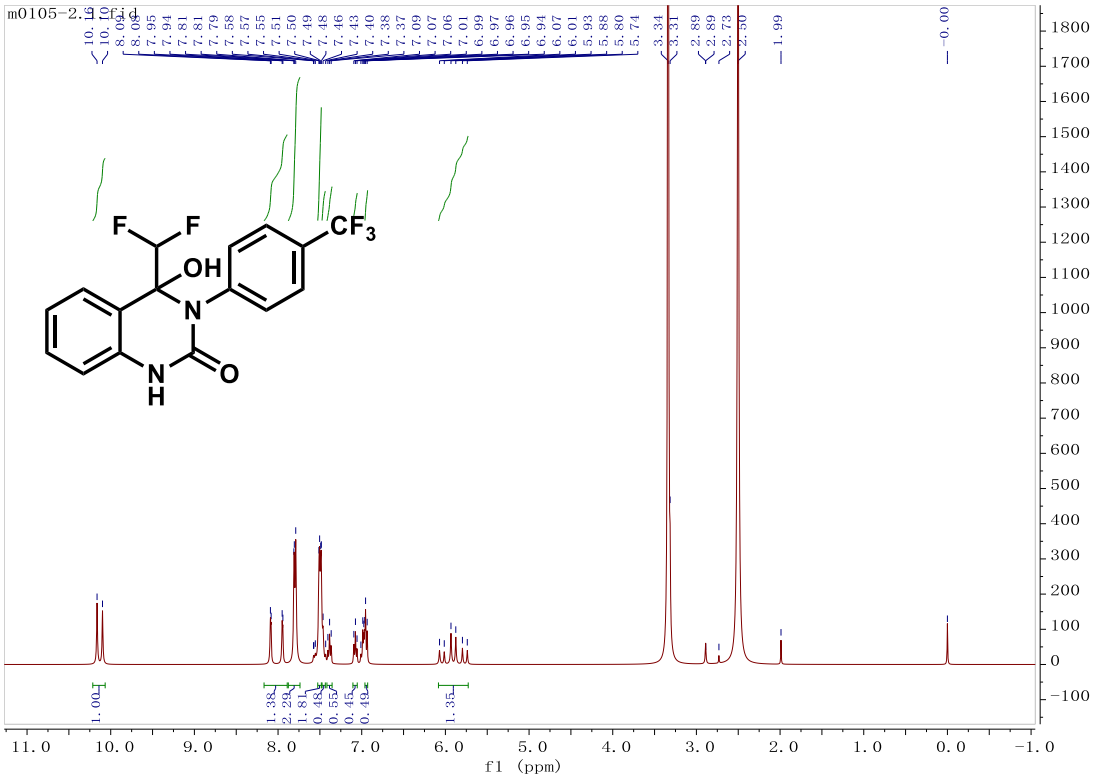
^{13}C NMR of Compound **3d** (101 MHz, DMSO)



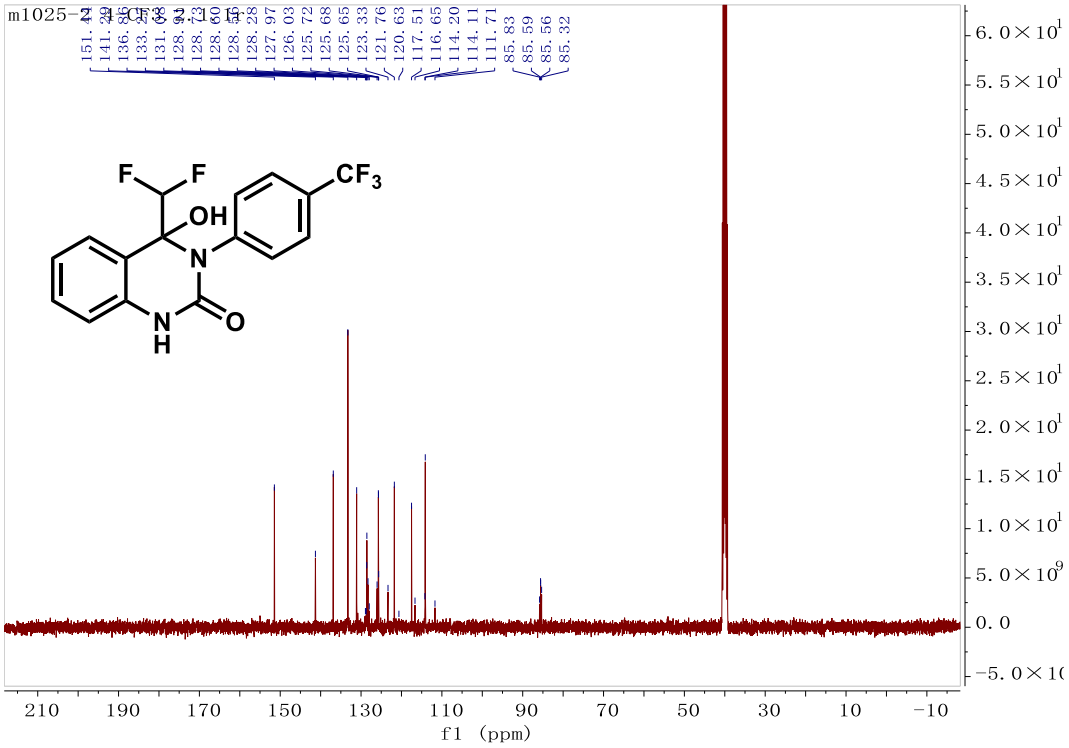
^{19}F NMR of Compound **3d** (376 MHz, DMSO)



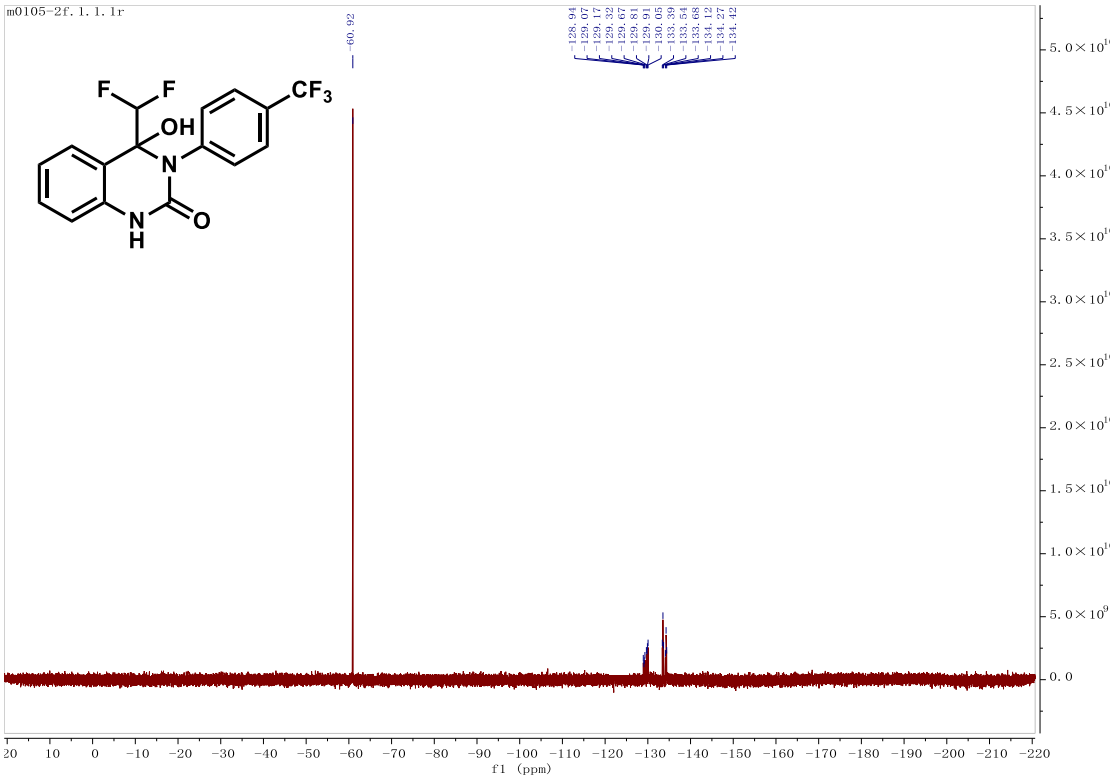
[1]H NMR of Compound **3e** (400 MHz, DMSO)



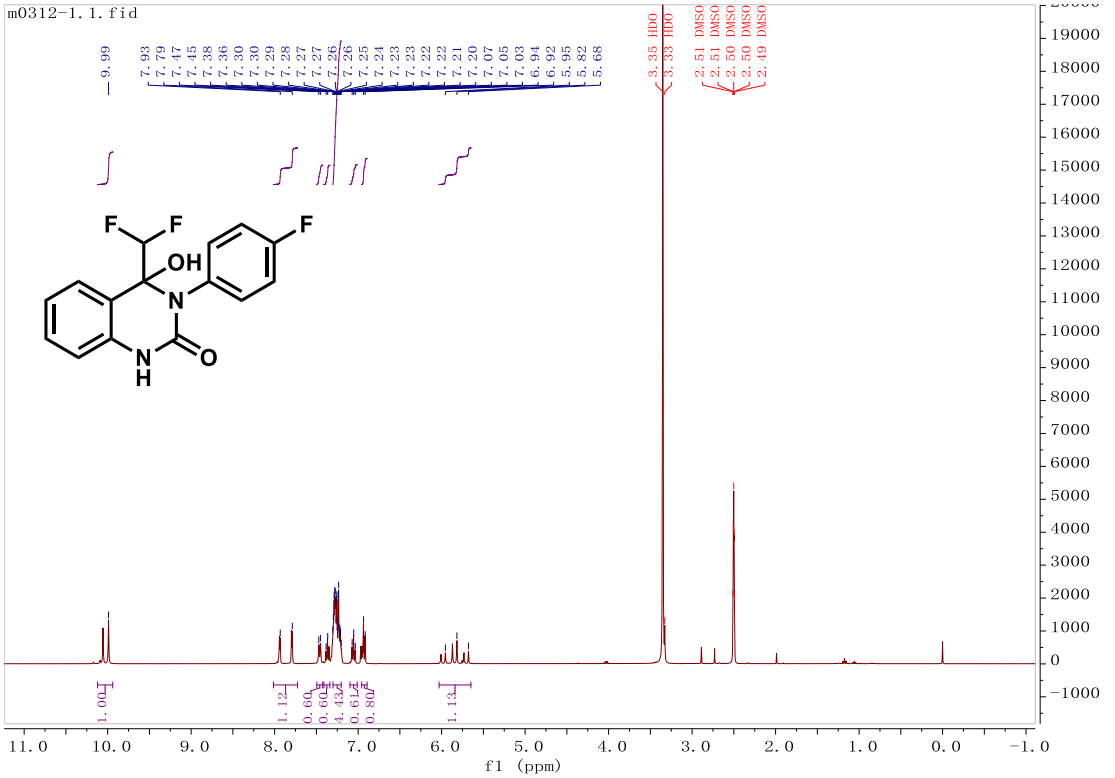
[13]C NMR of Compound **3e** (101 MHz, DMSO)



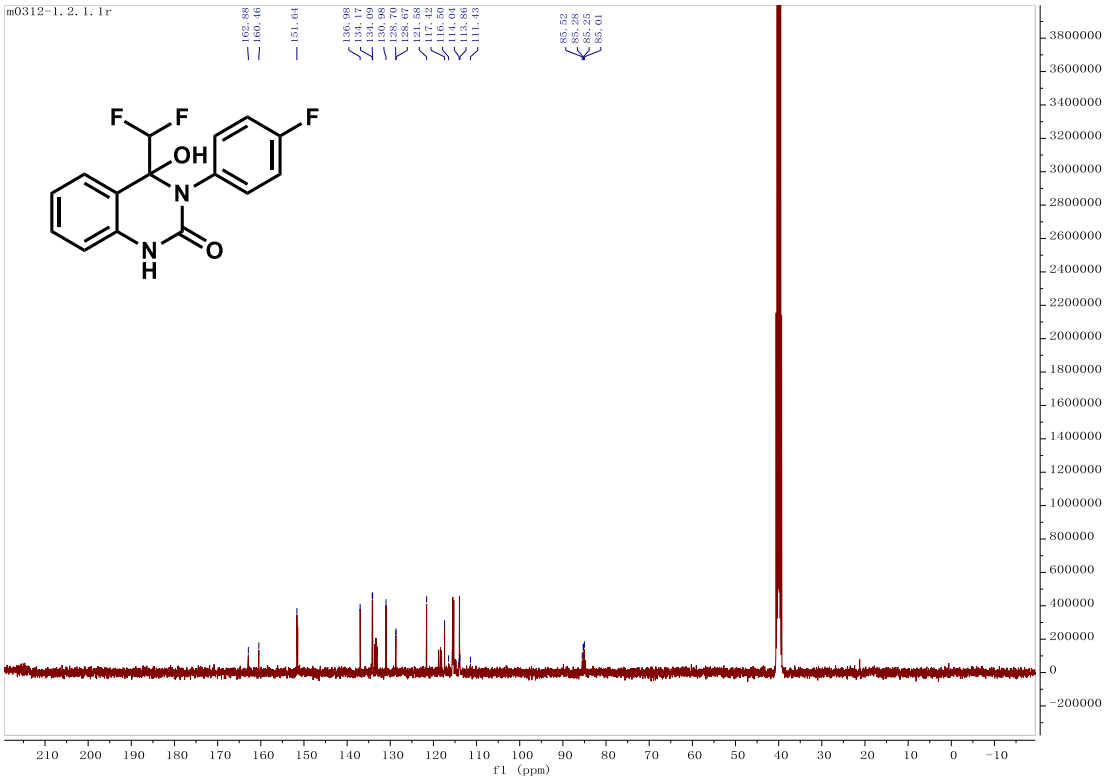
^{19}F NMR of Compound **3e** (376 MHz, DMSO)



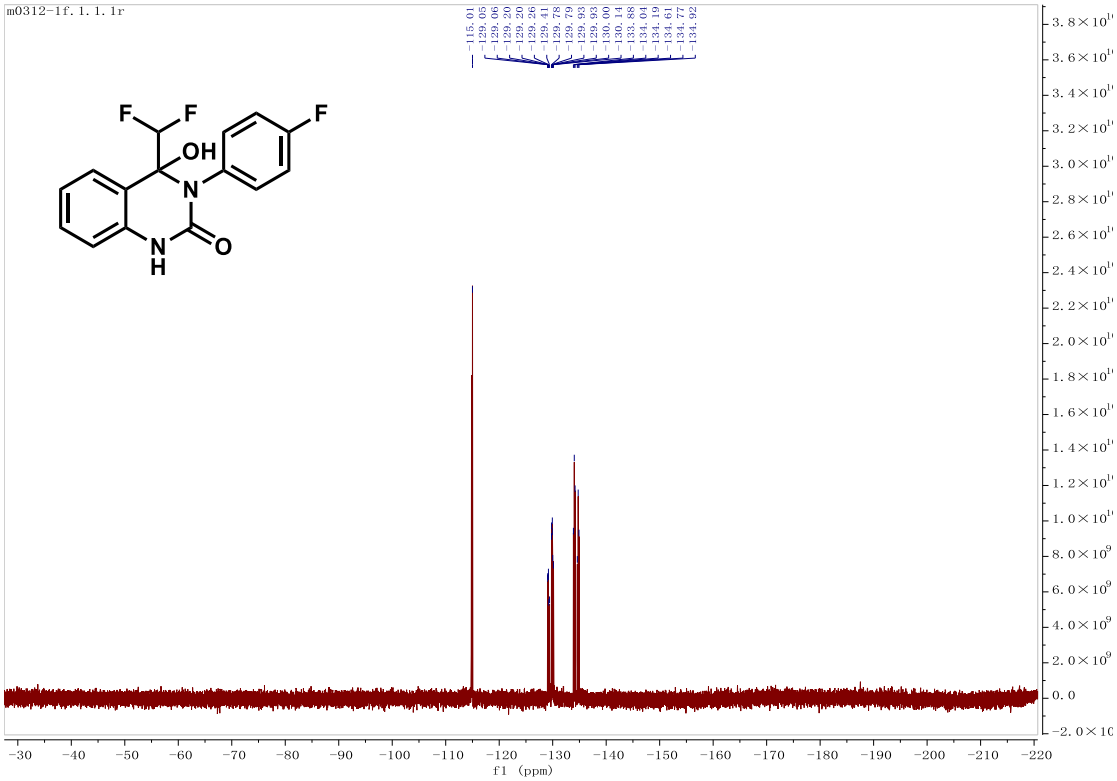
^{1}H NMR of Compound **3f** (400 MHz, DMSO)



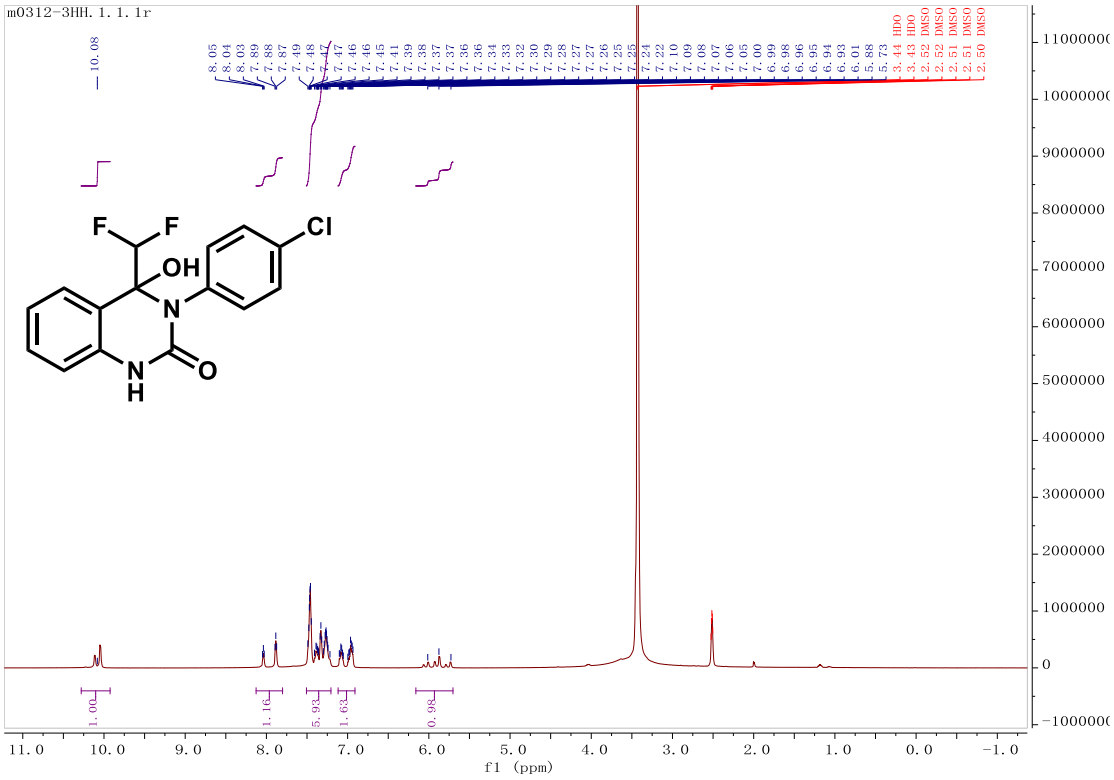
^{13}C NMR of Compound **3f** (101 MHz, DMSO)



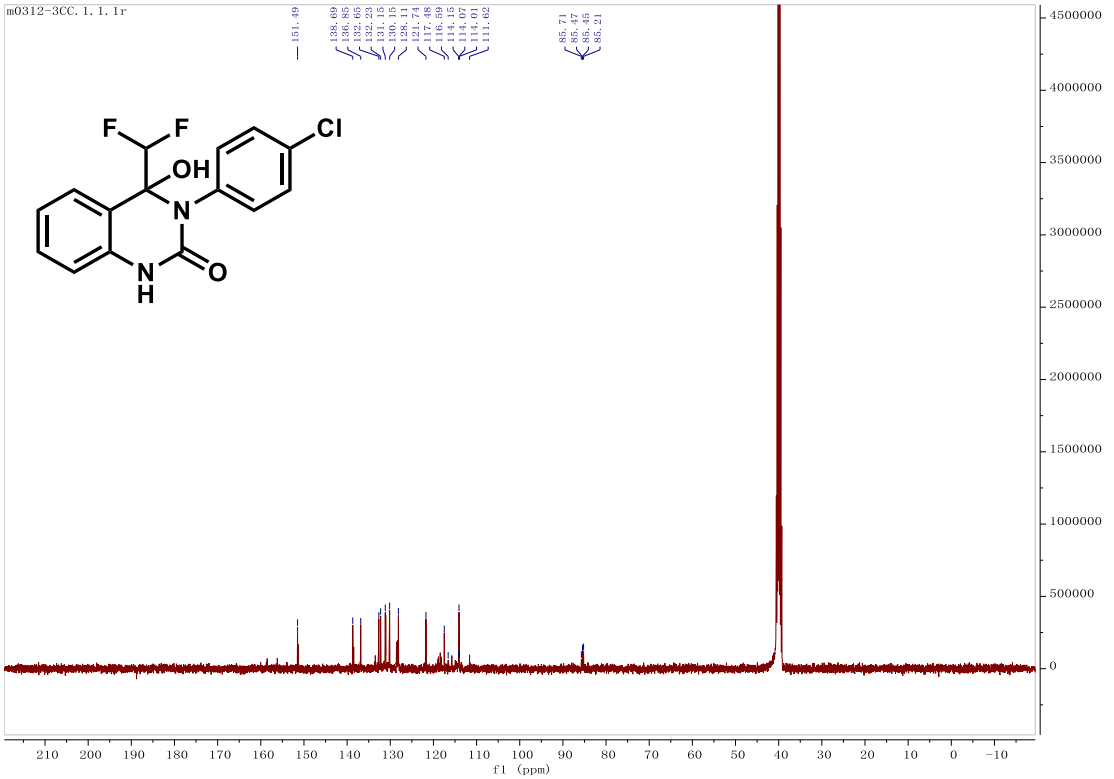
^{19}F NMR of Compound **3f** (376 MHz, DMSO)



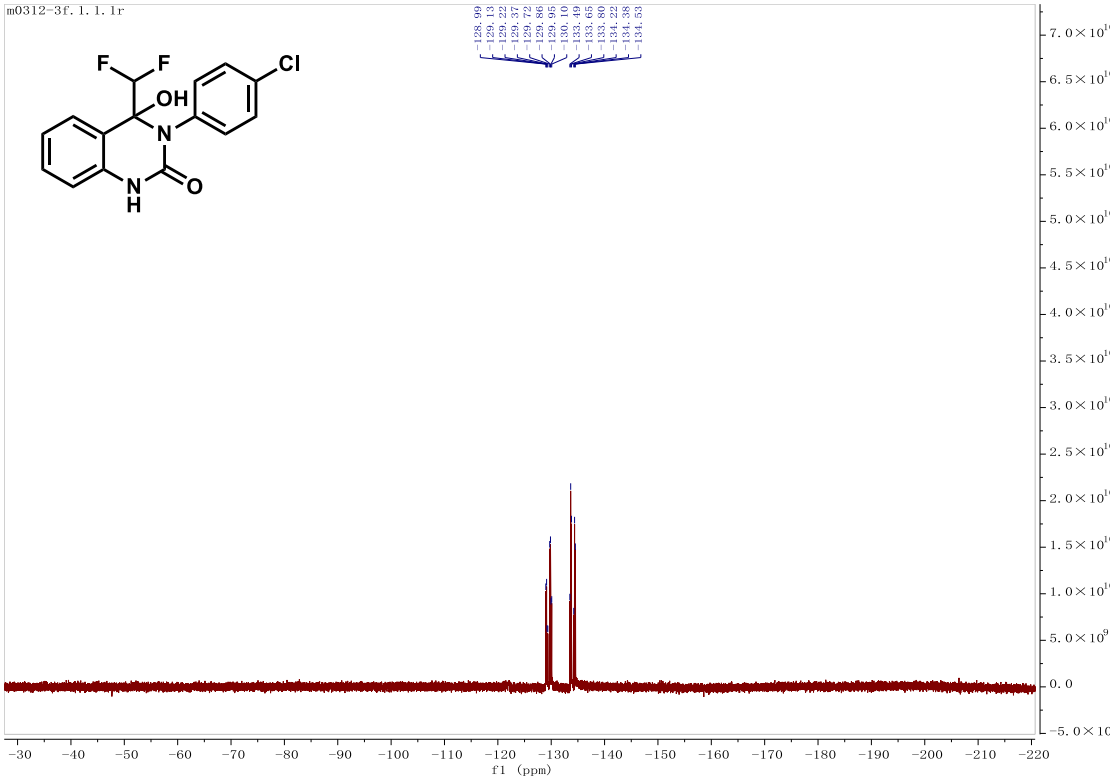
[1]H NMR of Compound **3g** (400 MHz, DMSO)



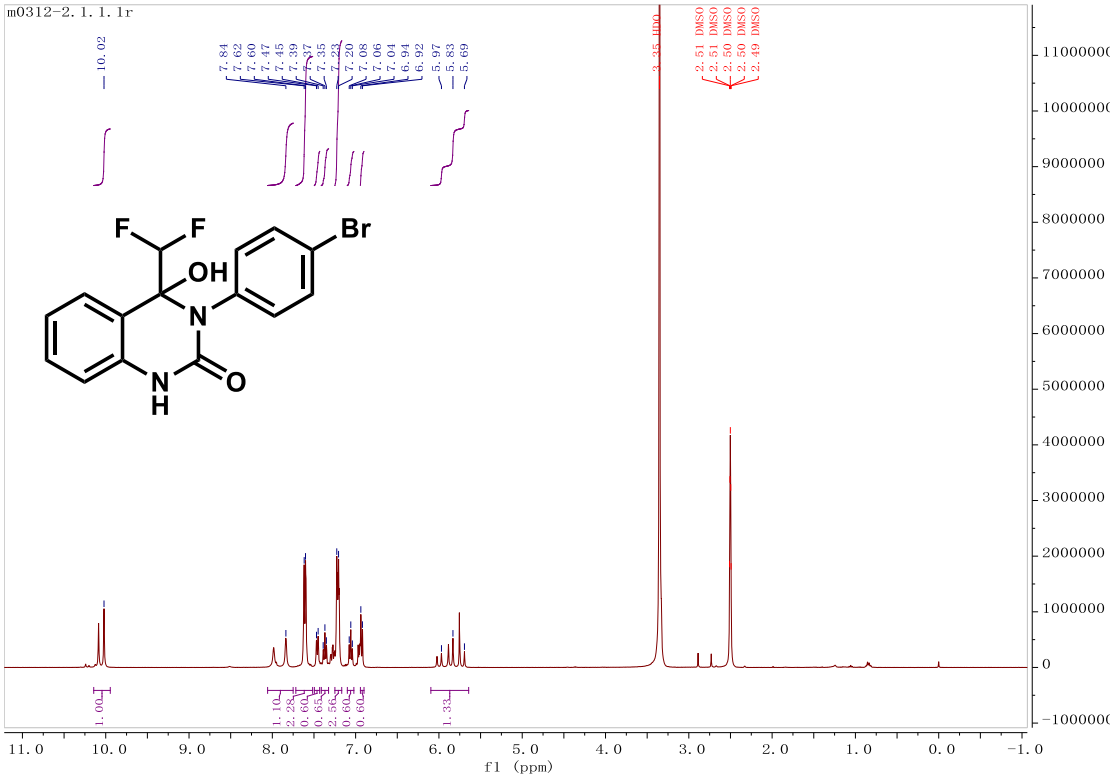
[13]C NMR of Compound **3g** (101 MHz, DMSO)



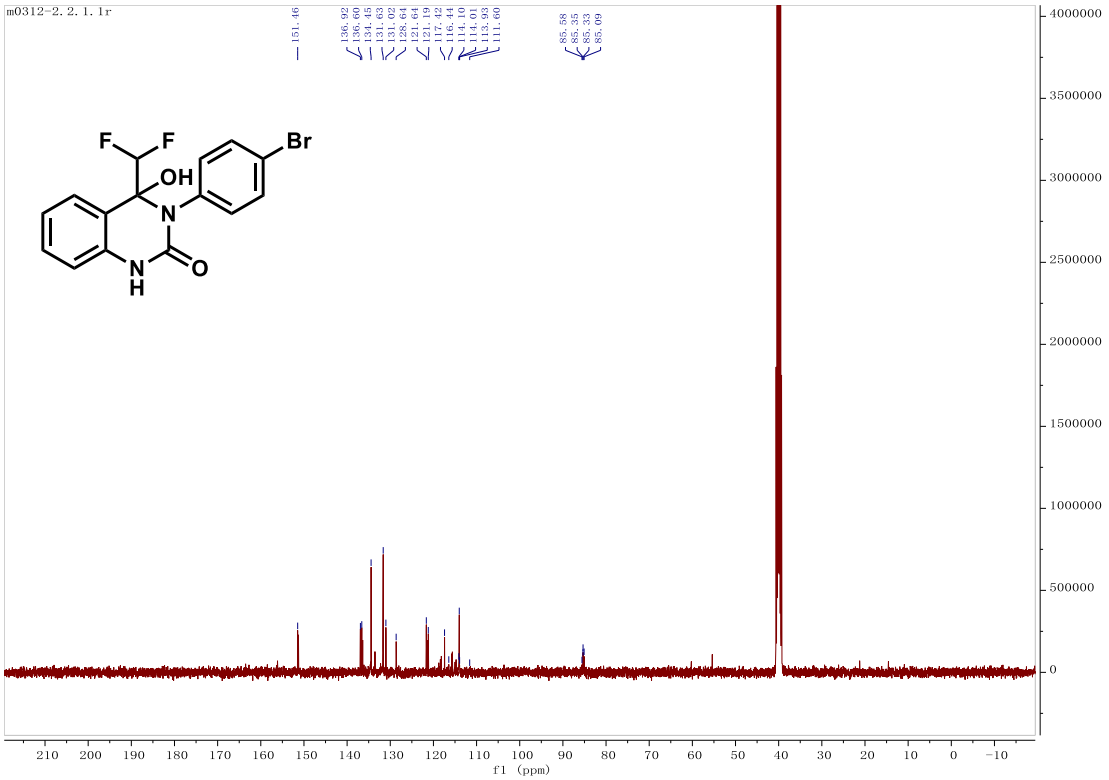
[19]F NMR of Compound **3g** (376 MHz, DMSO)



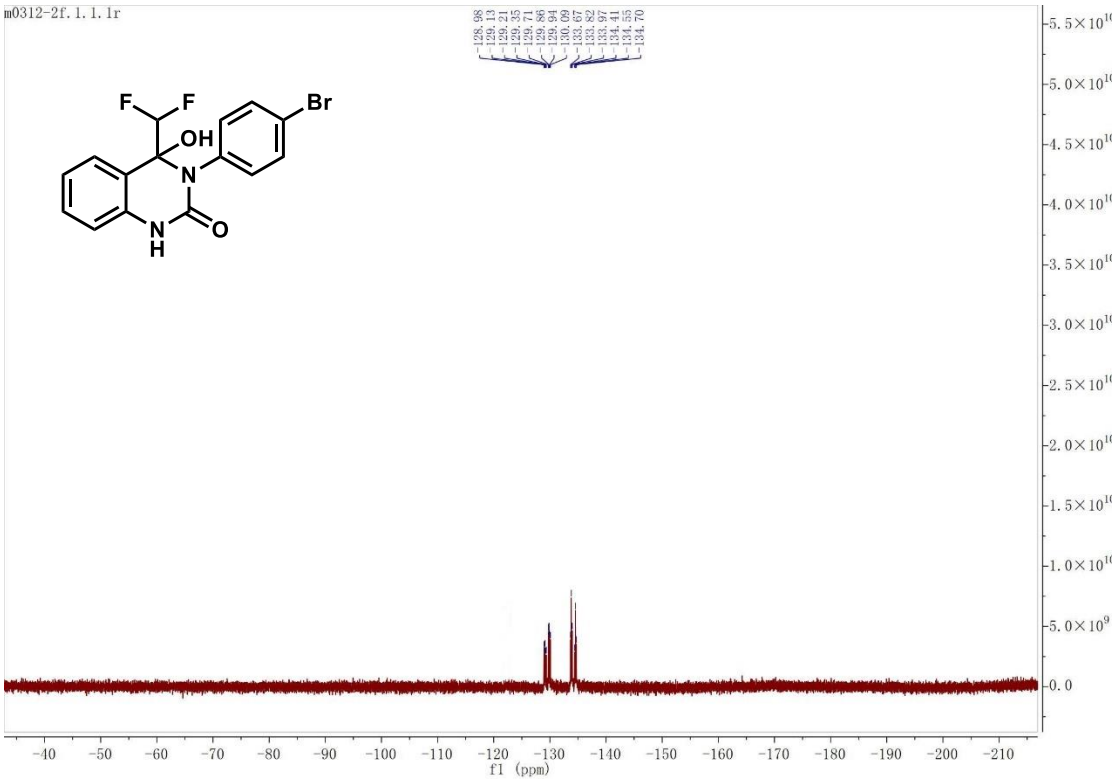
[1]H NMR of Compound **3h** (400 MHz, DMSO)



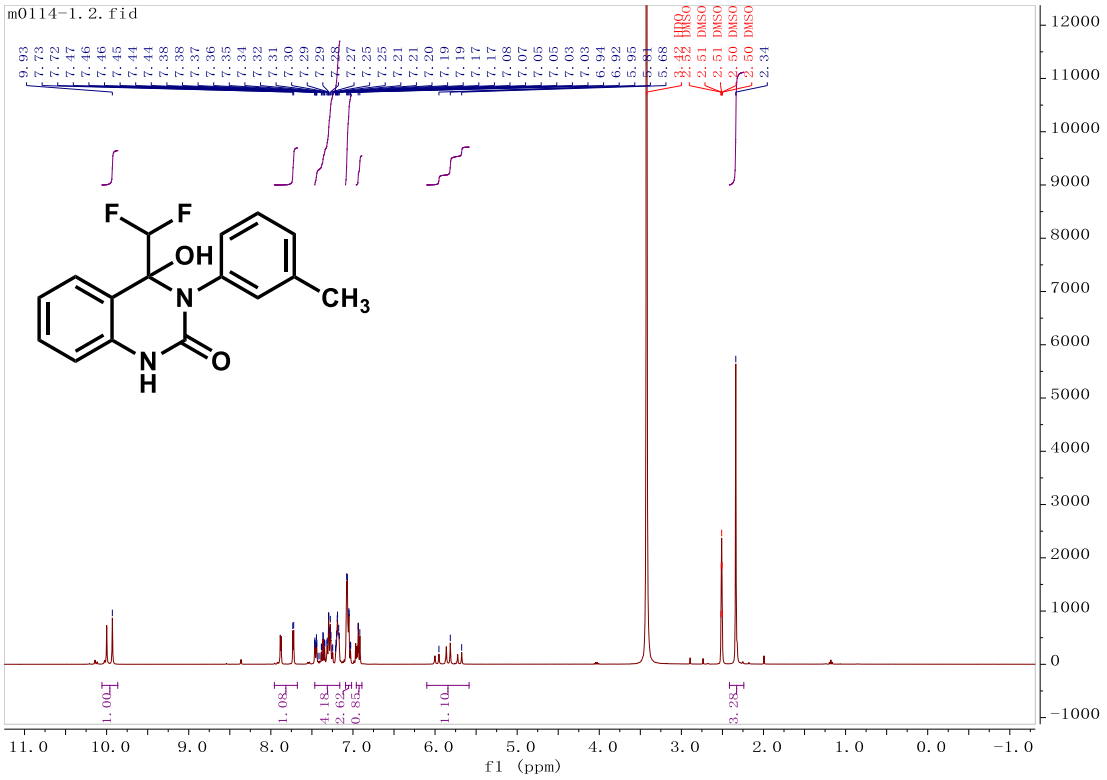
[13]C NMR of Compound **3h** (101 MHz, DMSO)



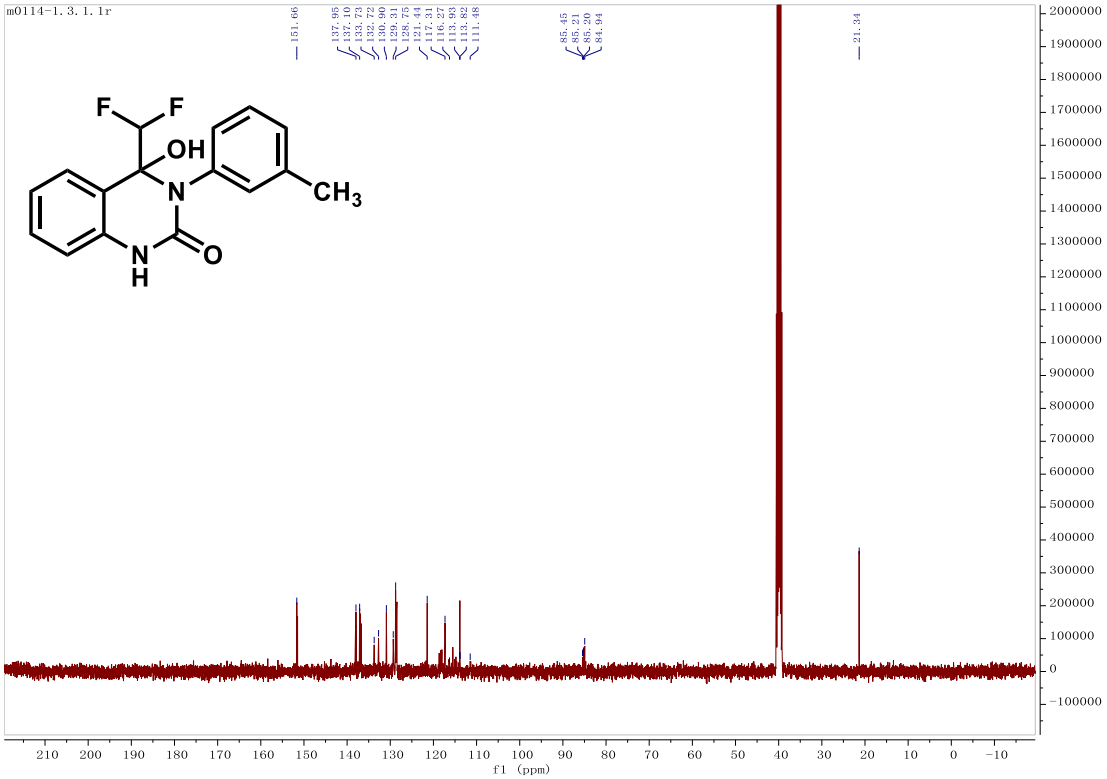
[19]F NMR of Compound **3h** (376 MHz, DMSO)



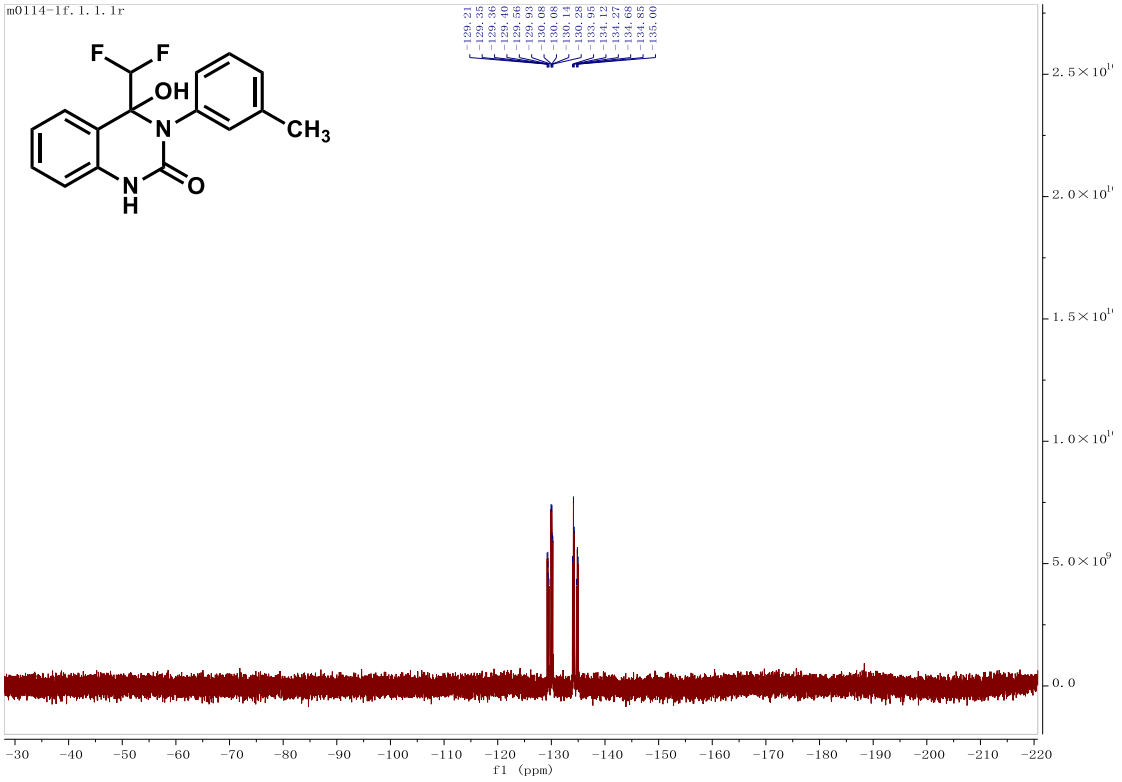
[1]H NMR of Compound **3i** (400 MHz, DMSO)



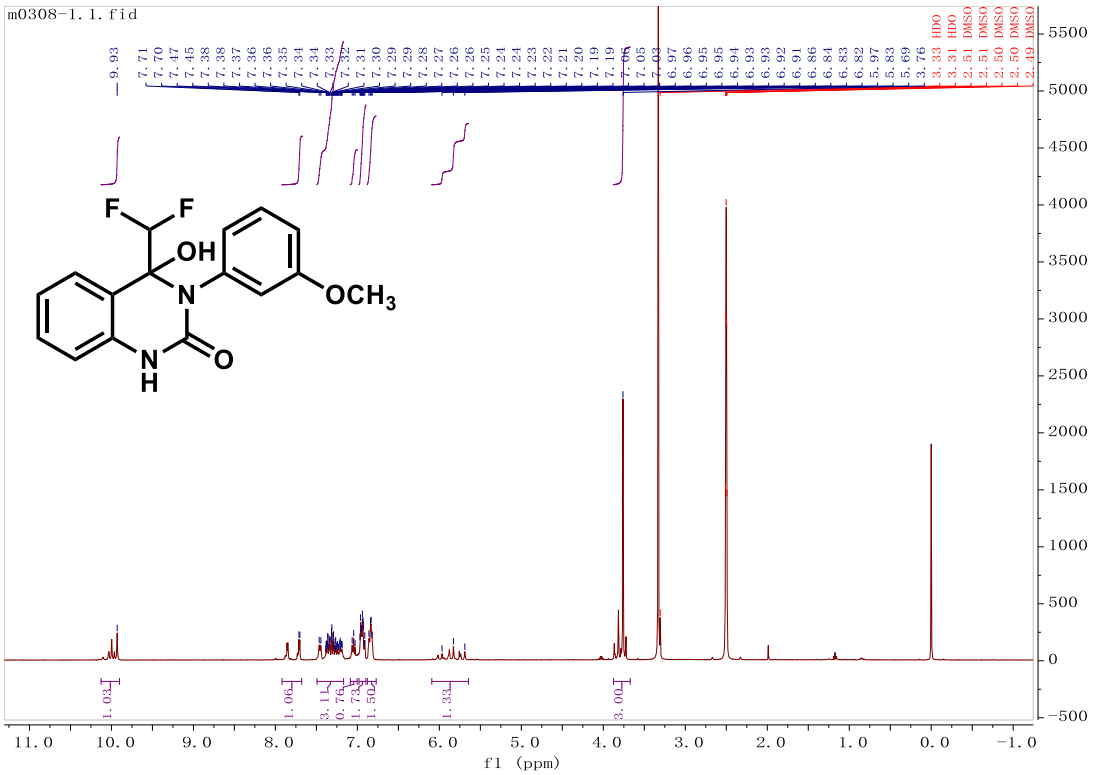
[13]C NMR of Compound **3i** (101 MHz, DMSO)



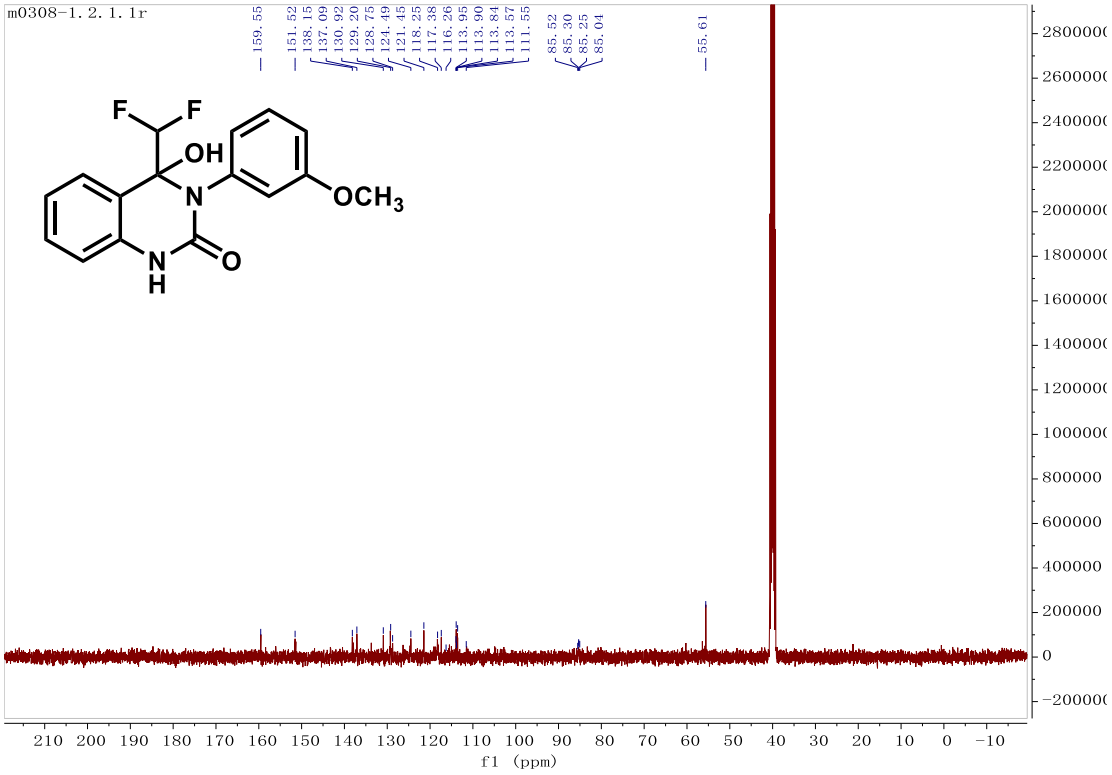
[19]F NMR of Compound **3i** (376 MHz, DMSO)



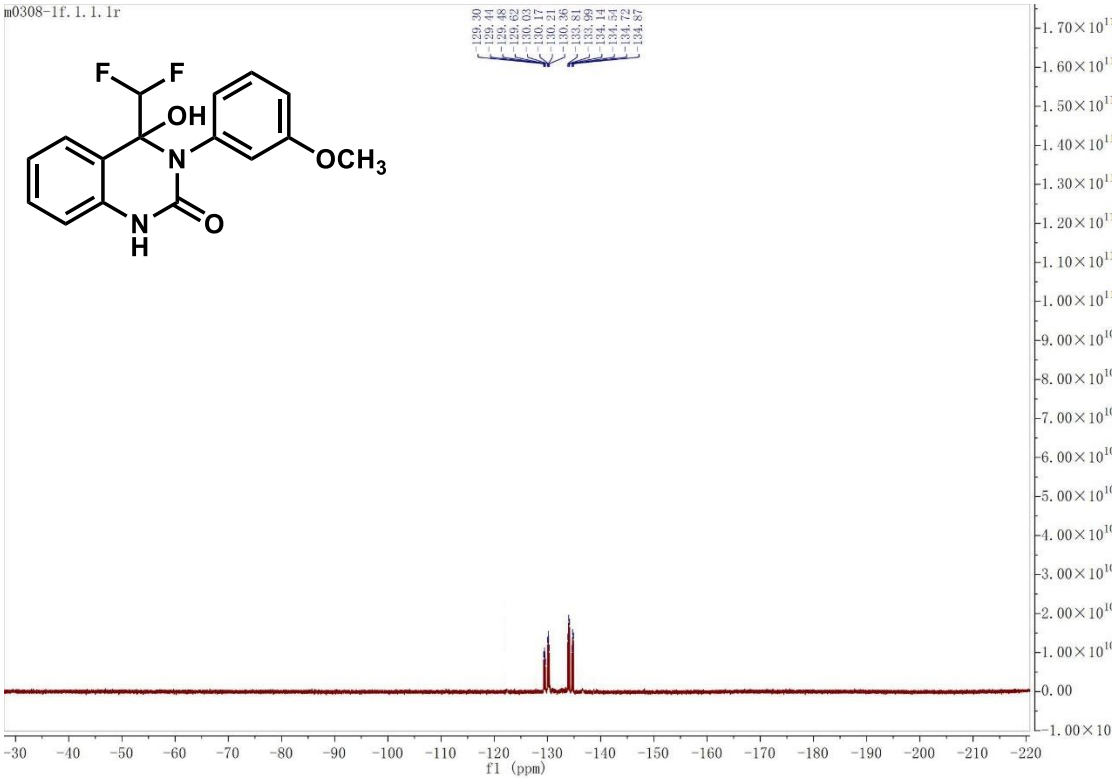
[1]H NMR of Compound **3j** (400 MHz, DMSO)



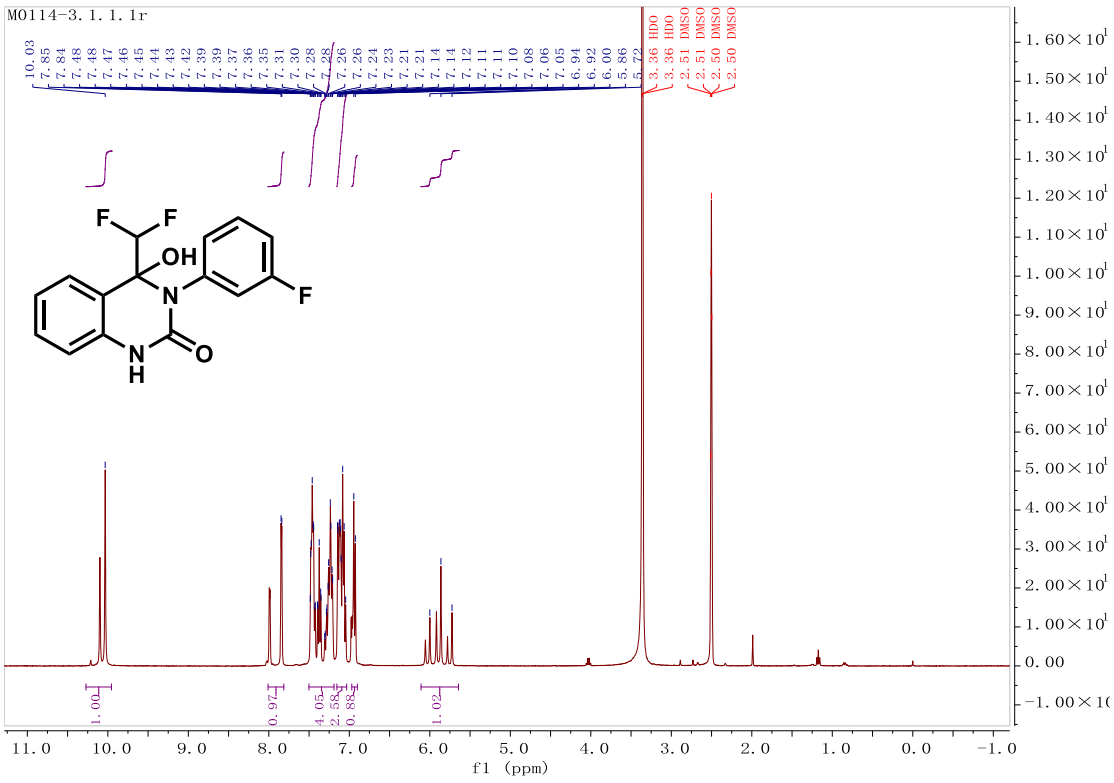
^{13}C NMR of Compound **3j** (101 MHz, DMSO)



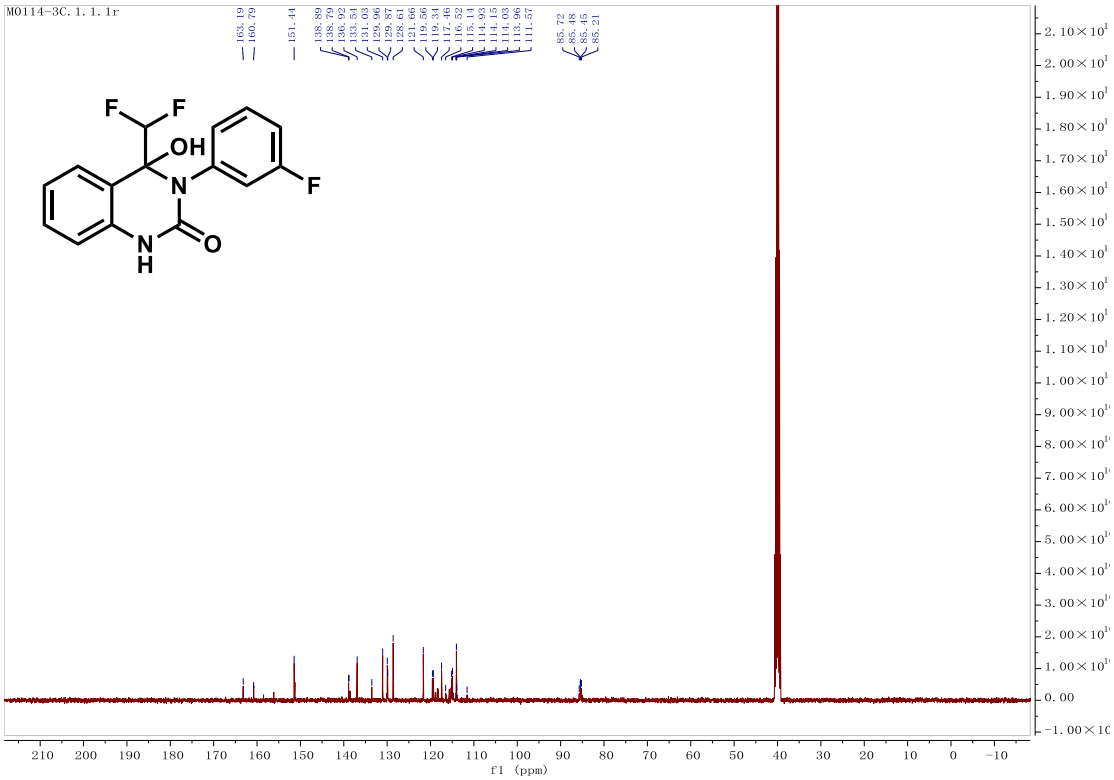
^{19}F NMR of Compound **3j** (376 MHz, DMSO)



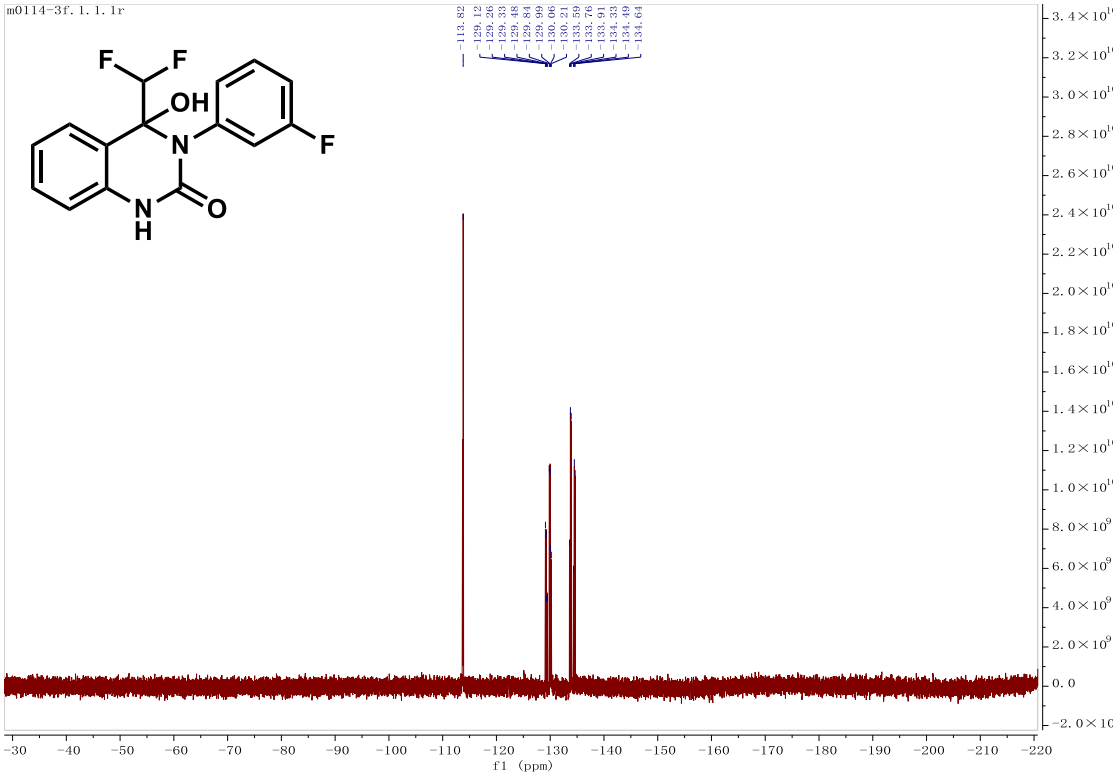
^{1}H NMR of Compound **3k** (400 MHz, DMSO)



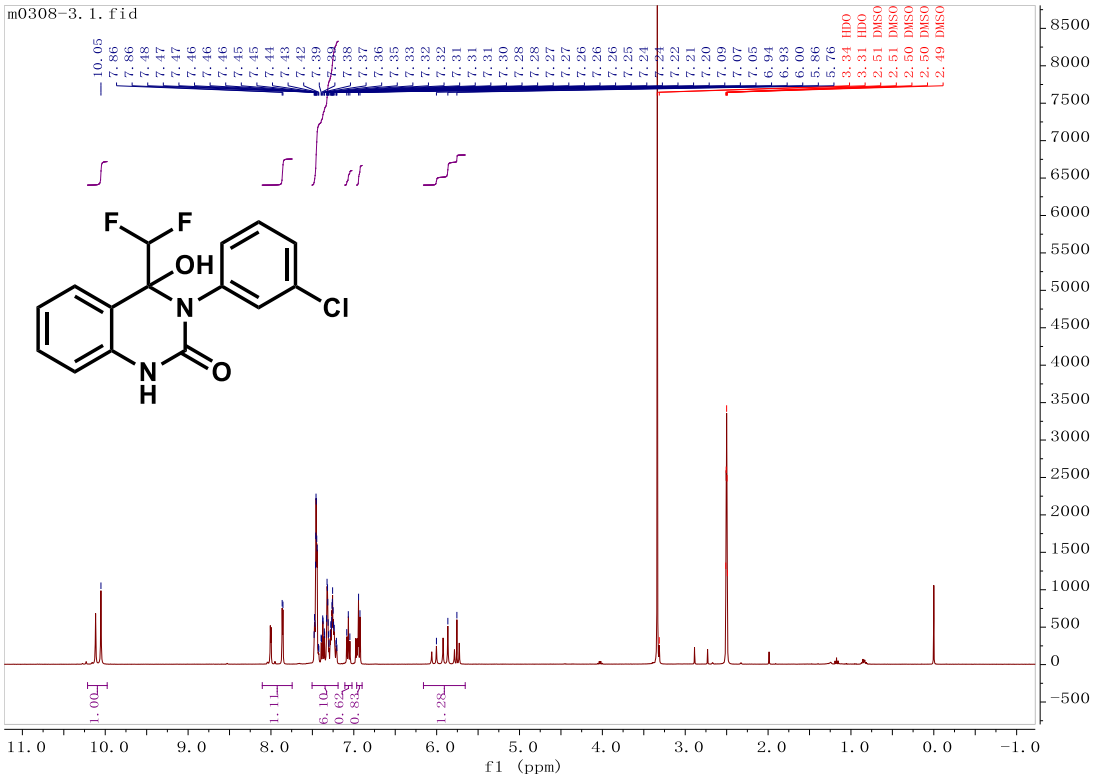
^{13}C NMR of Compound **3k** (101 MHz, DMSO)



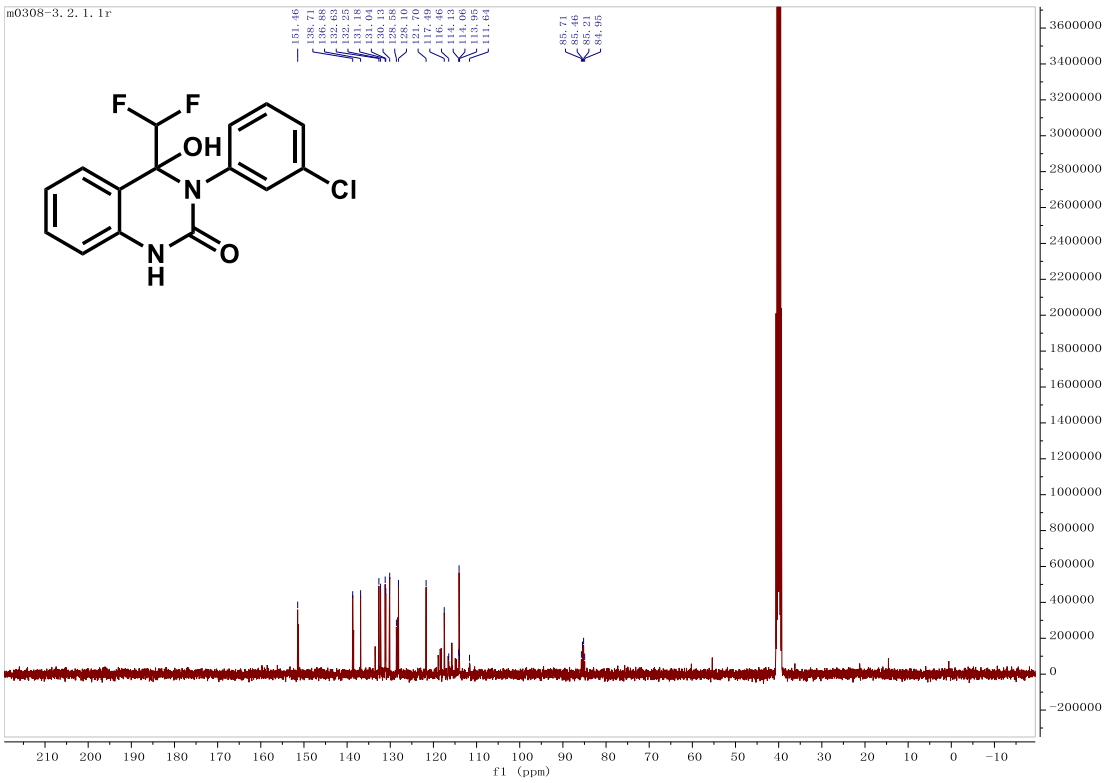
[19]F NMR of Compound **3k** (376 MHz, DMSO)



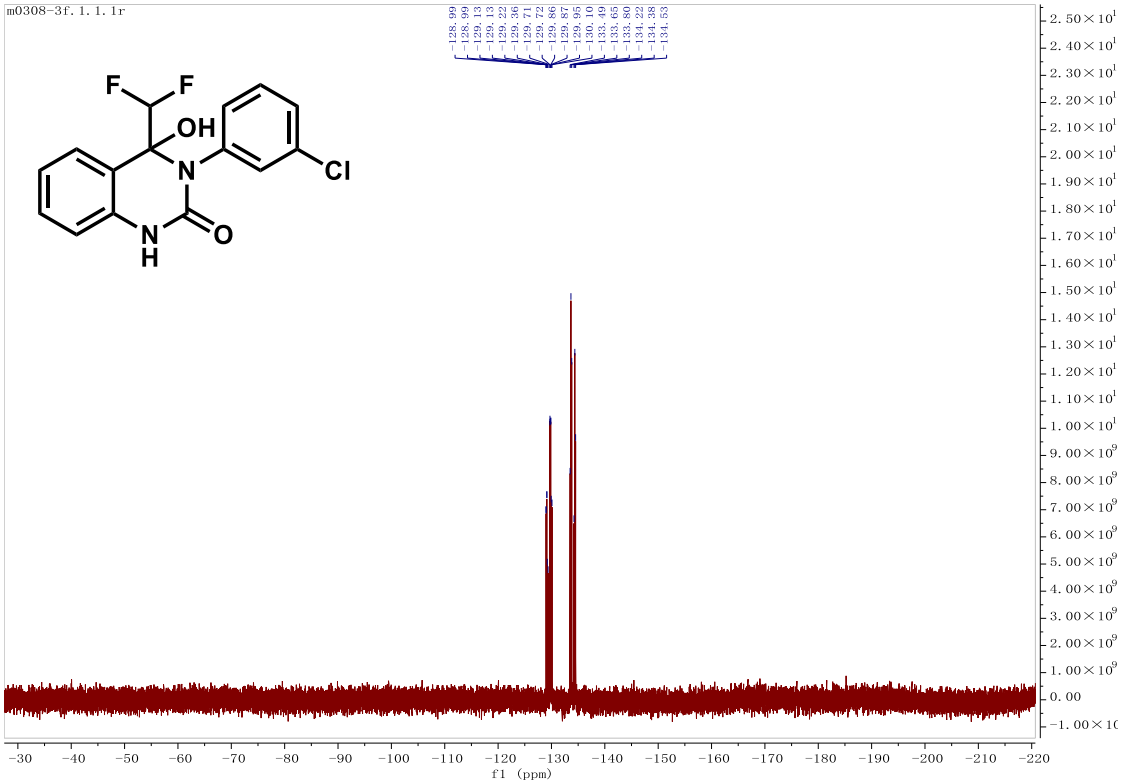
[1]H NMR of Compound **3l** (400 MHz, DMSO)



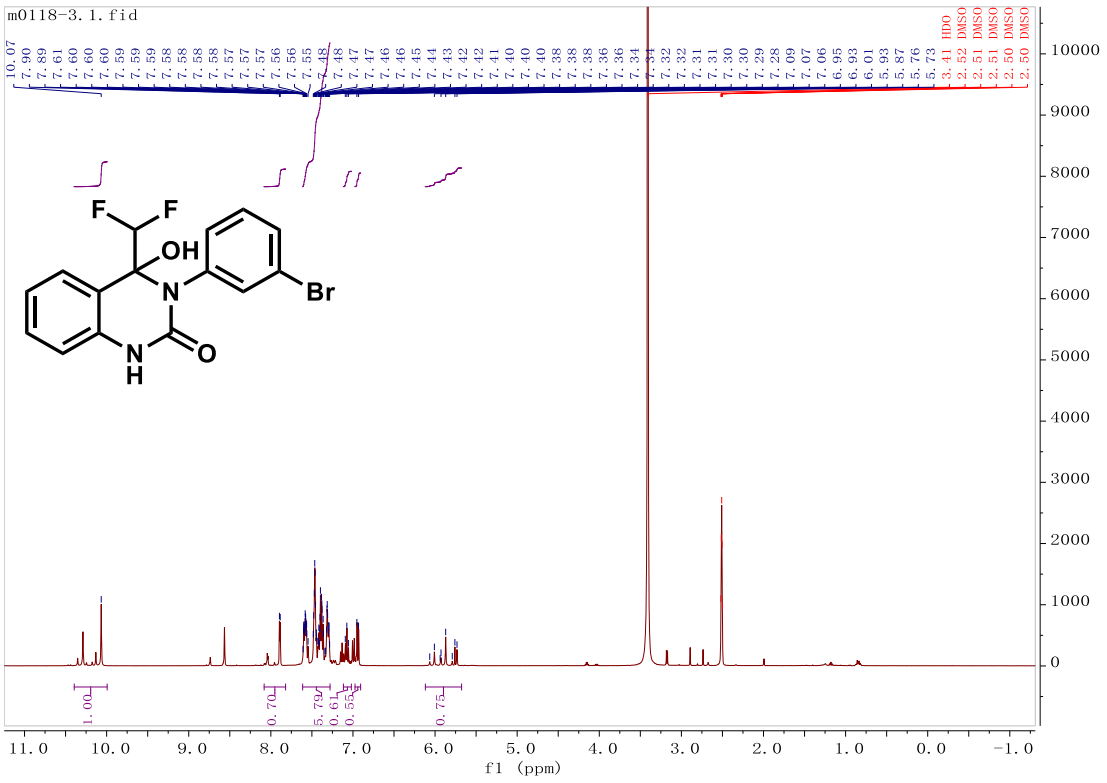
[13]C NMR of Compound **3l** (101 MHz, DMSO)



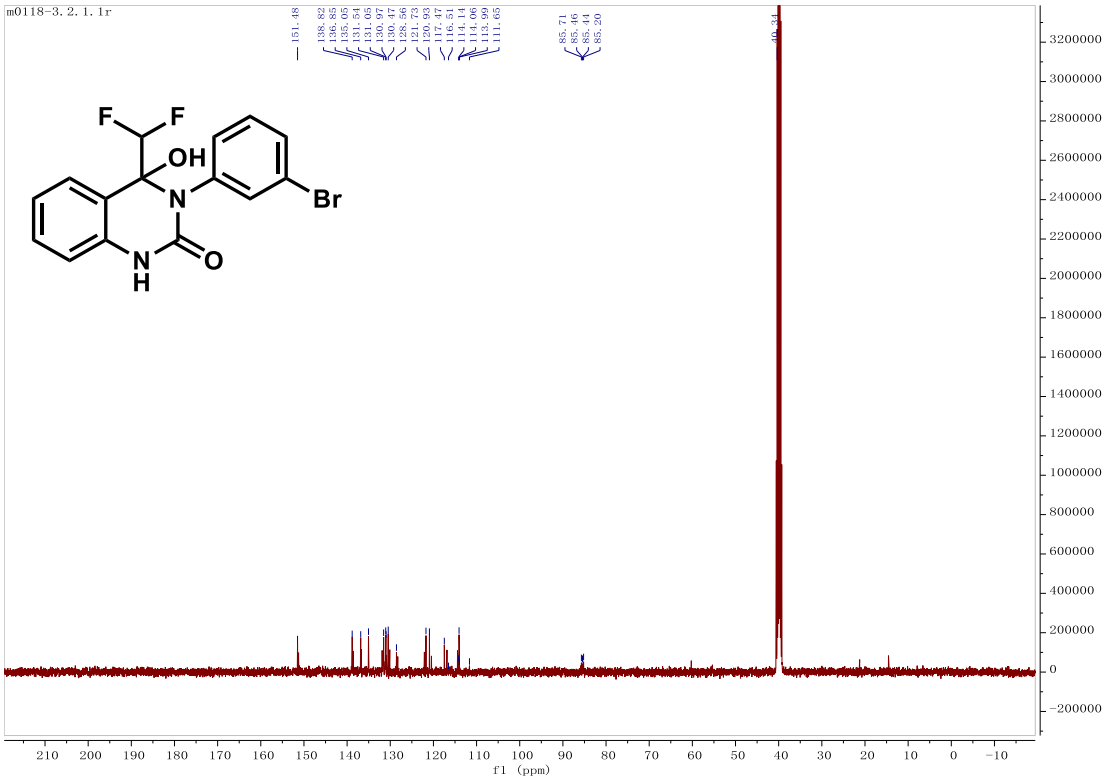
[19]F NMR of Compound **3l** (376 MHz, DMSO)



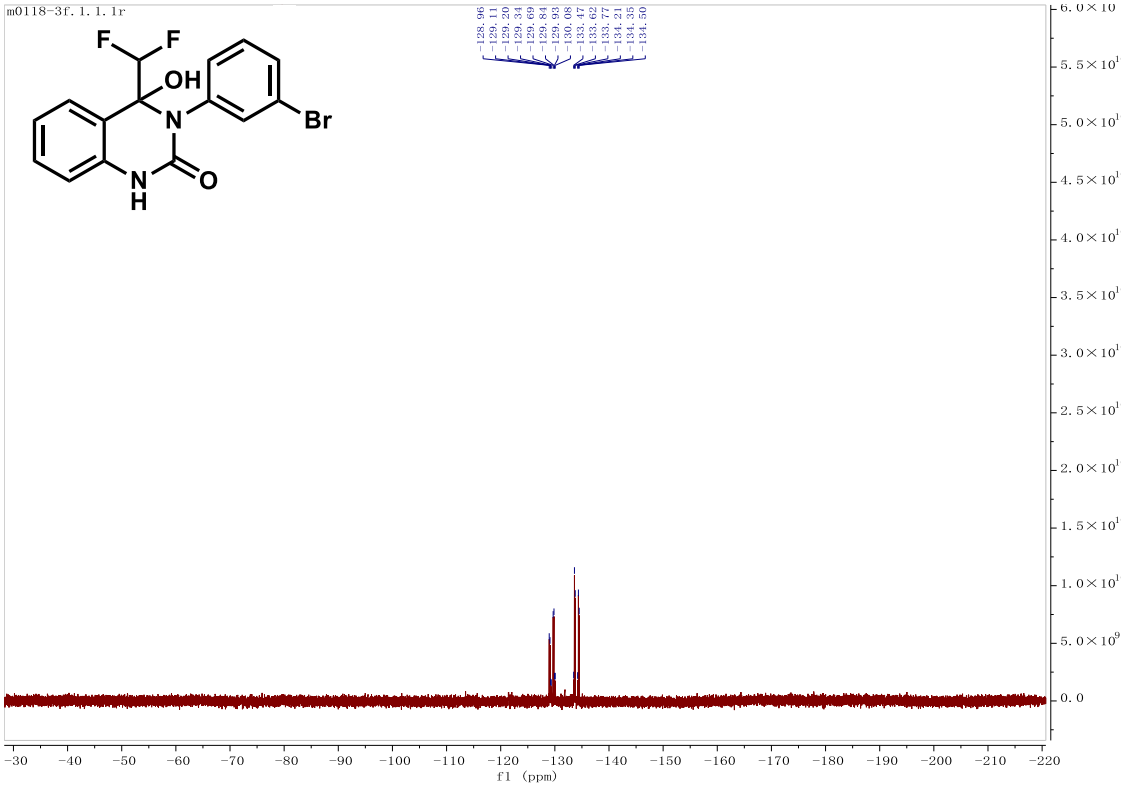
[1]H NMR of Compound **3m** (400 MHz, DMSO)



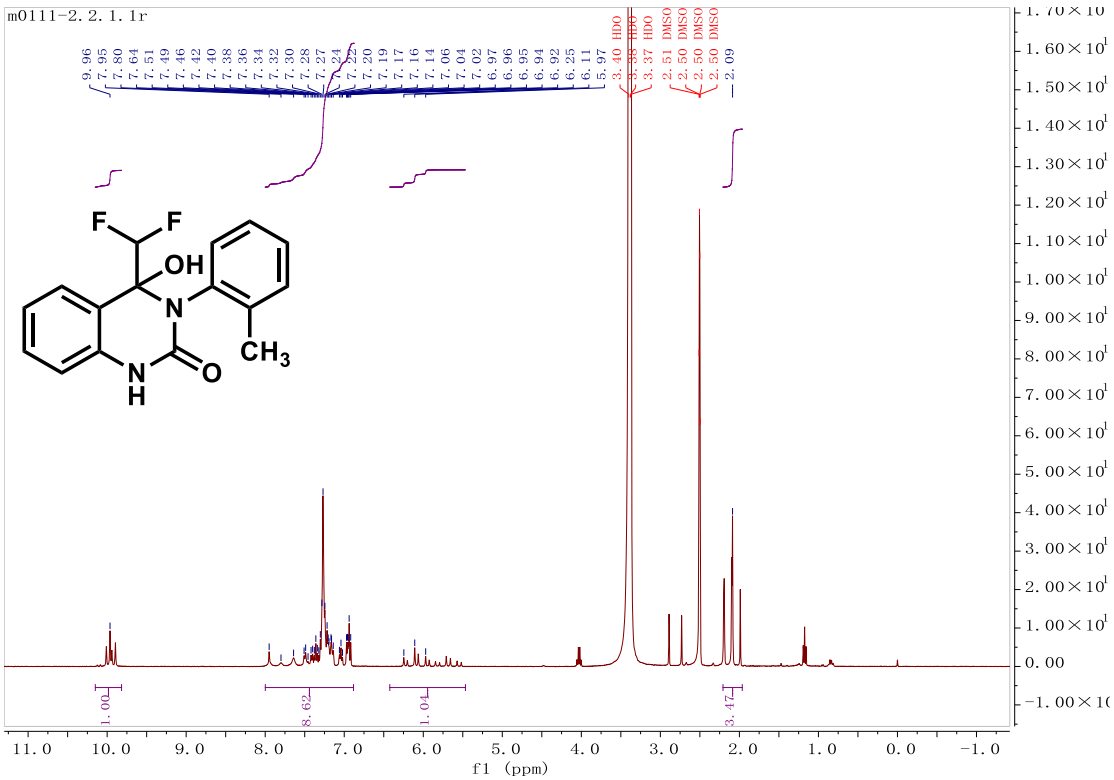
[13]C NMR of Compound **3m** (101 MHz, DMSO)



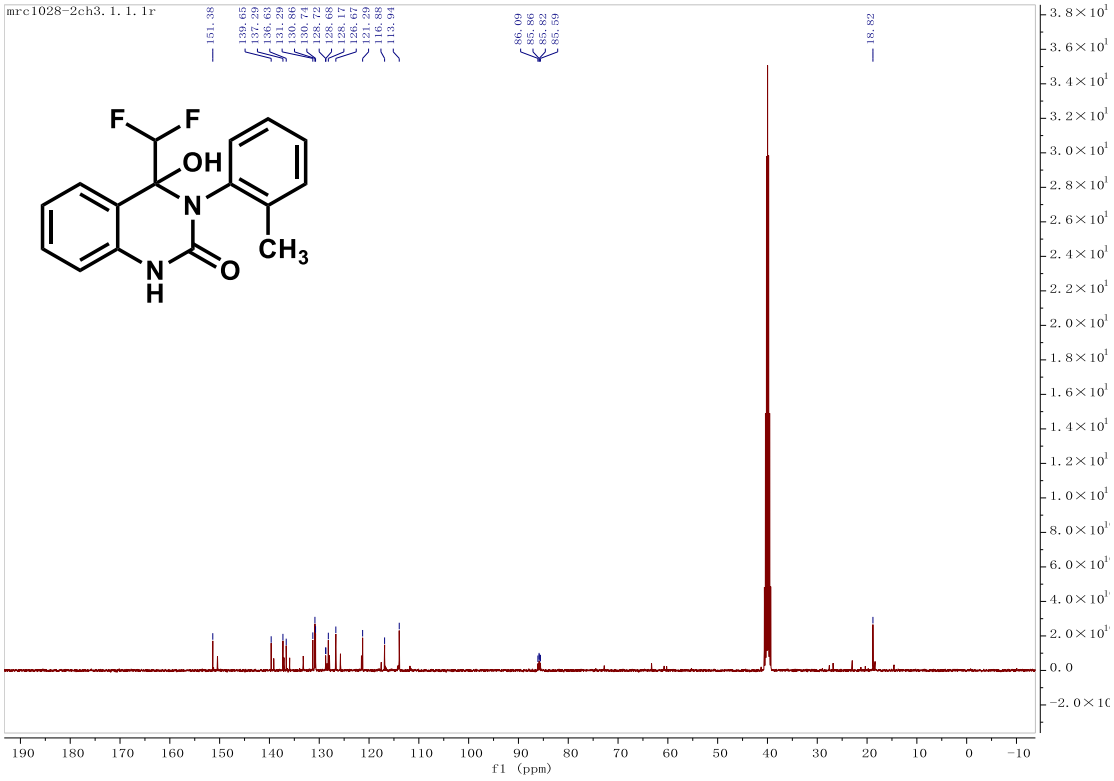
^{19}F NMR of Compound **3m** (376 MHz, DMSO)



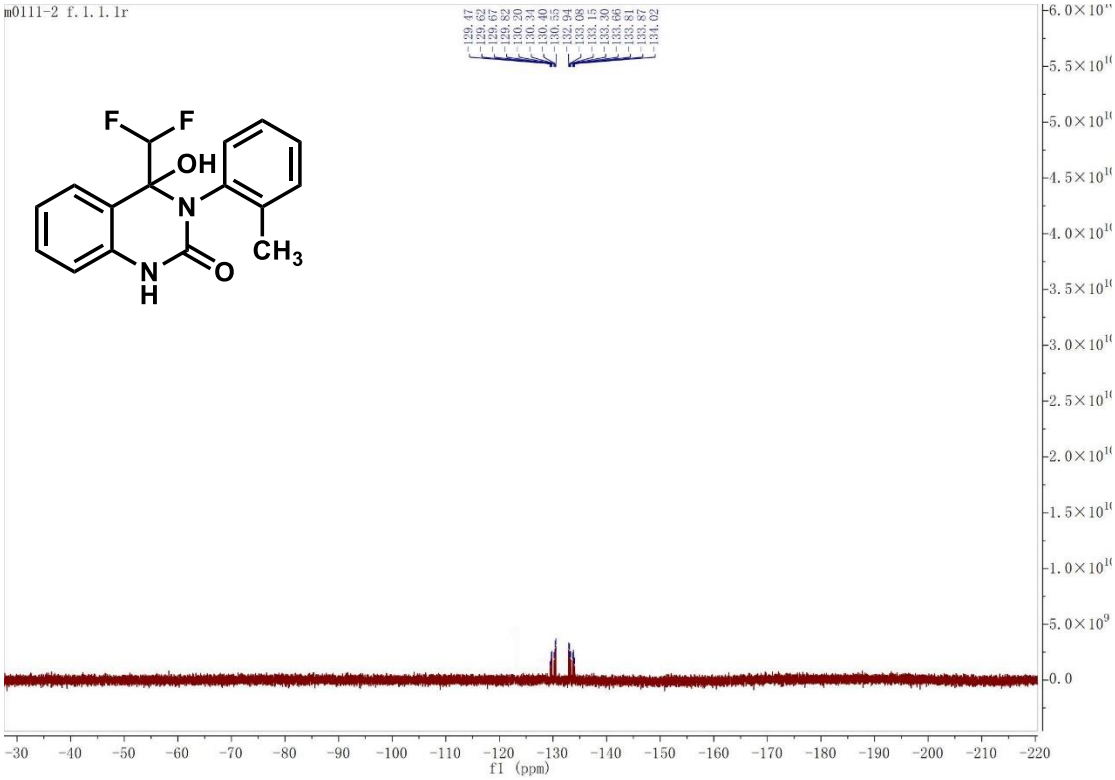
^{1}H NMR of Compound **3n** (400 MHz, DMSO)



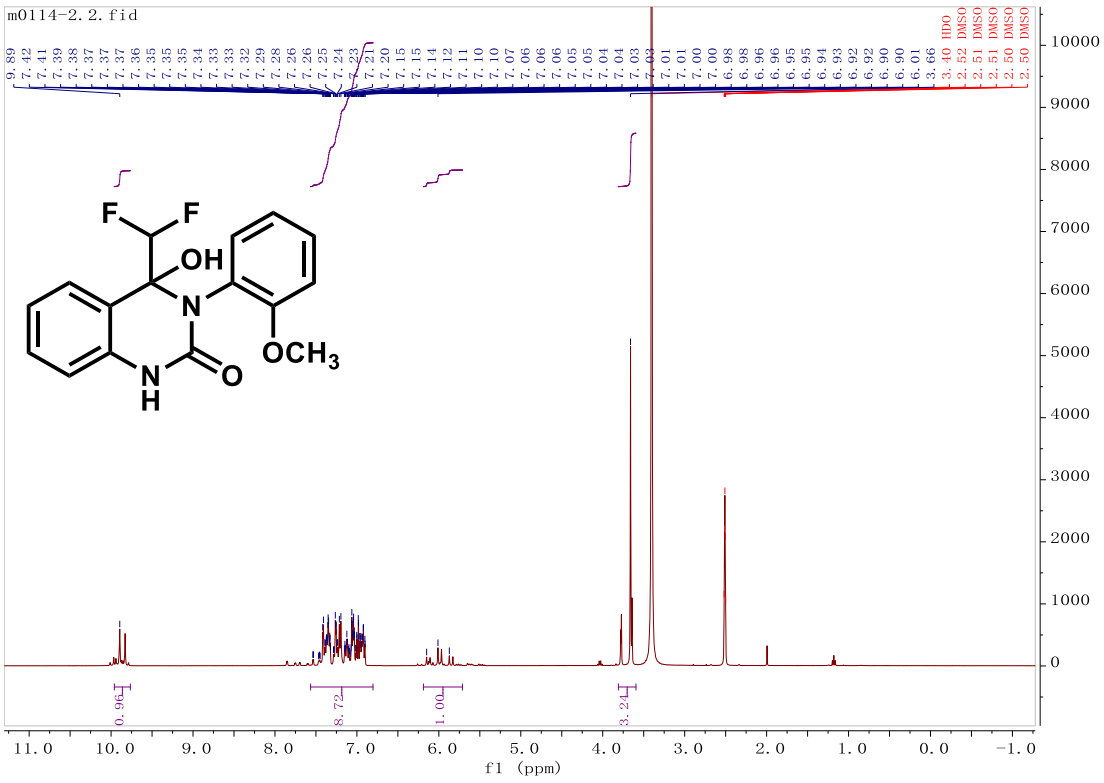
[13]C NMR of Compound **3n** (101 MHz, DMSO)



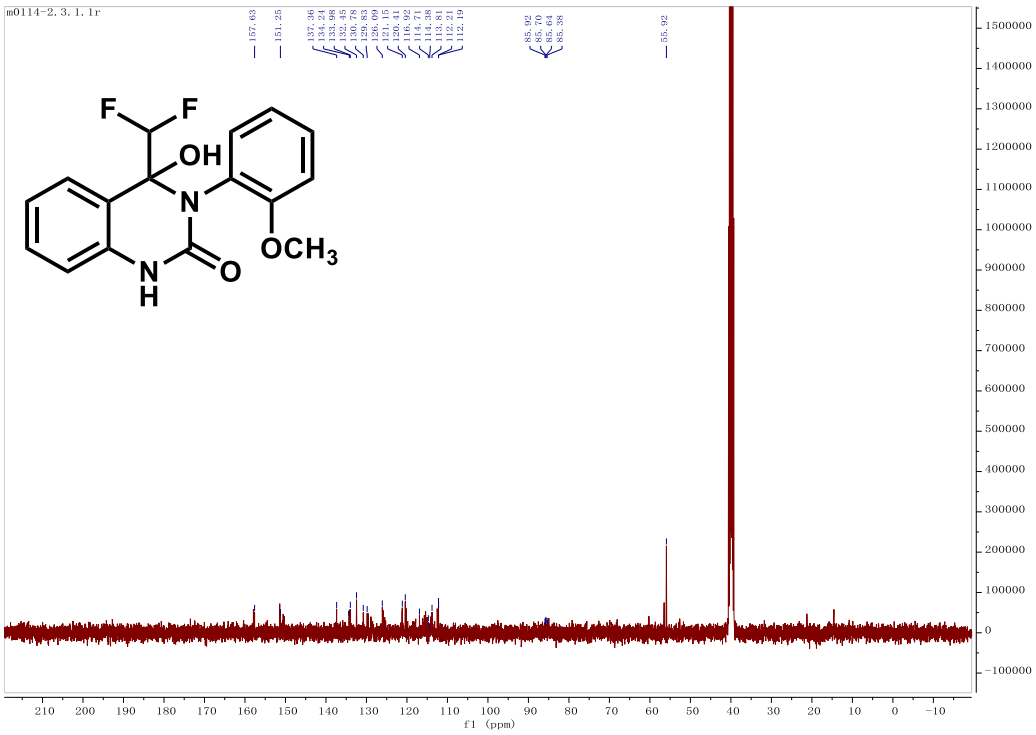
[19]F NMR of Compound **3n** (376 MHz, DMSO)



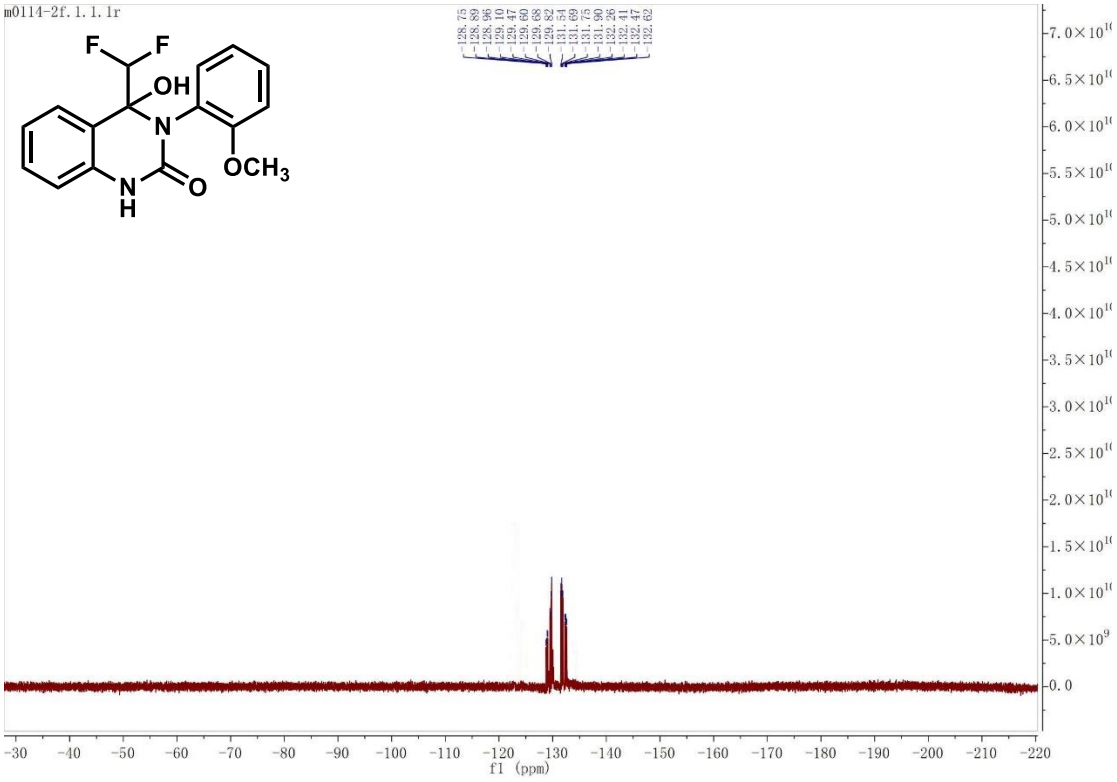
[1]H NMR of Compound **3o** (400 MHz, DMSO)



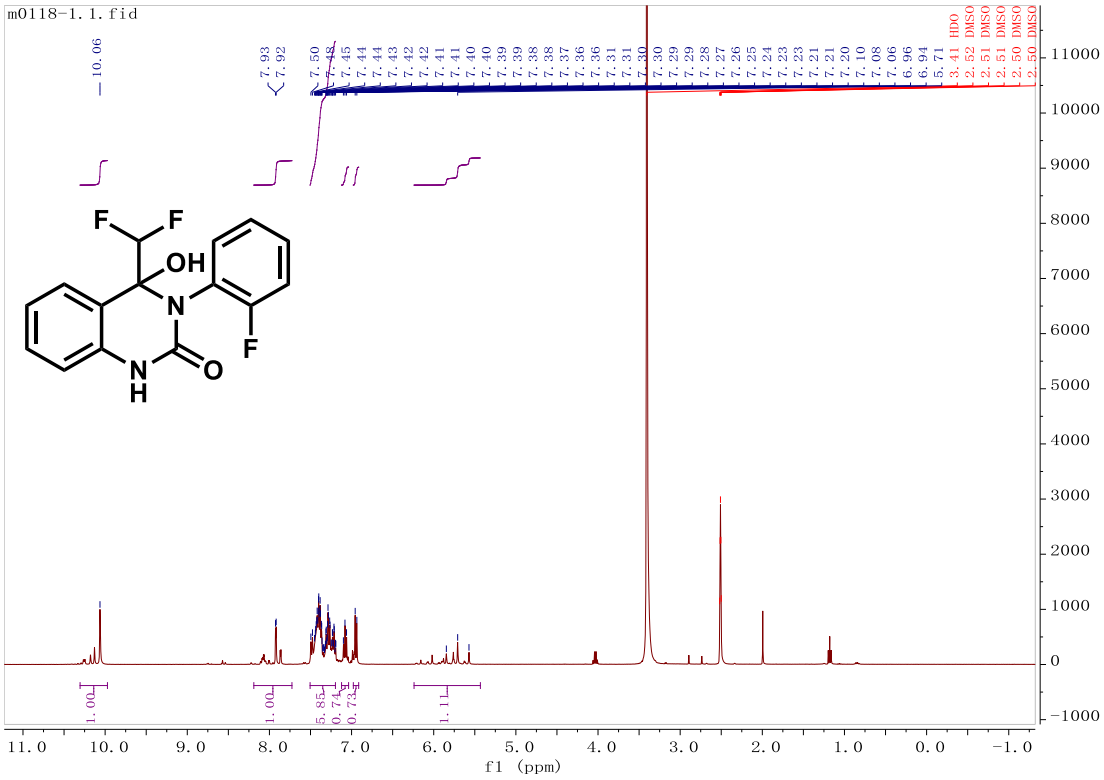
[13]C NMR of Compound **3o** (101 MHz, DMSO)



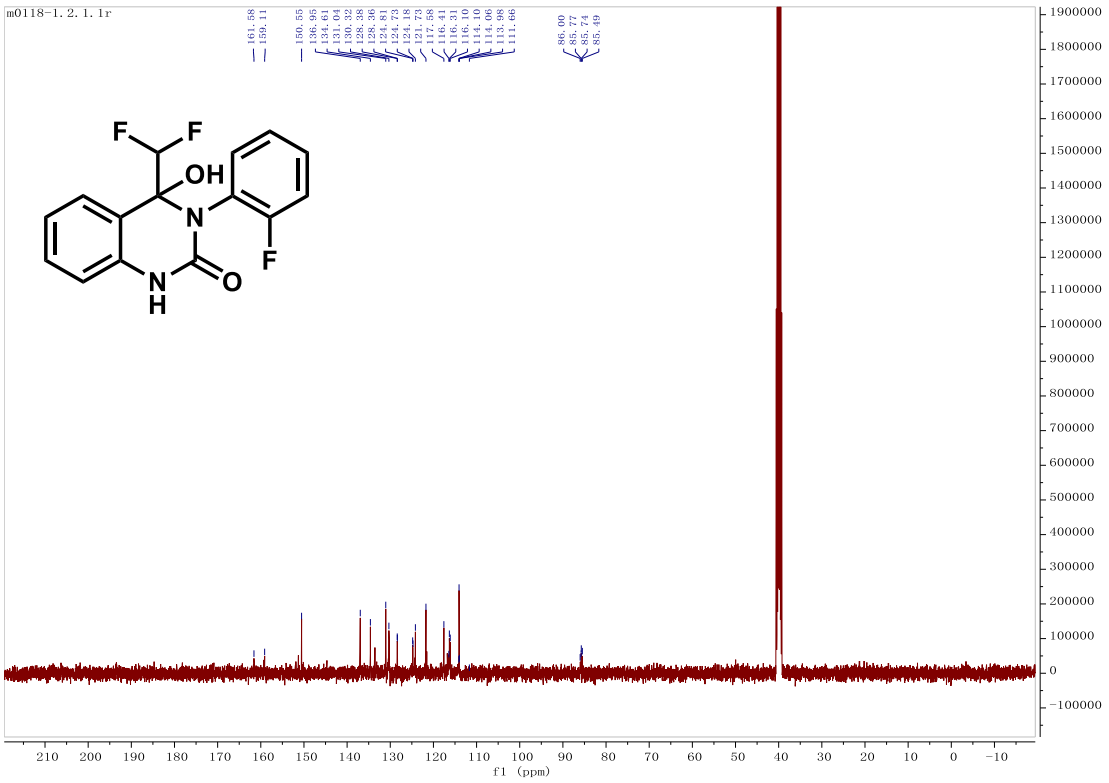
[19]F NMR of Compound **3o** (376 MHz, DMSO)



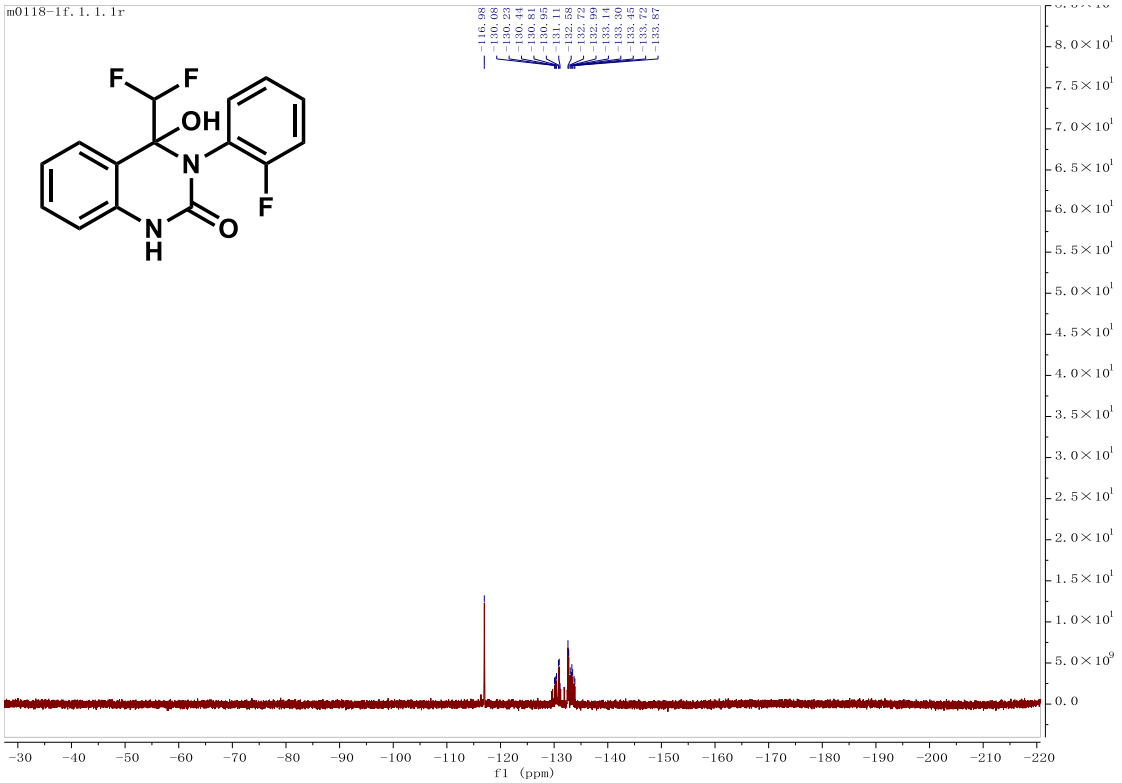
[1]H NMR of Compound **3p** (400 MHz, DMSO)



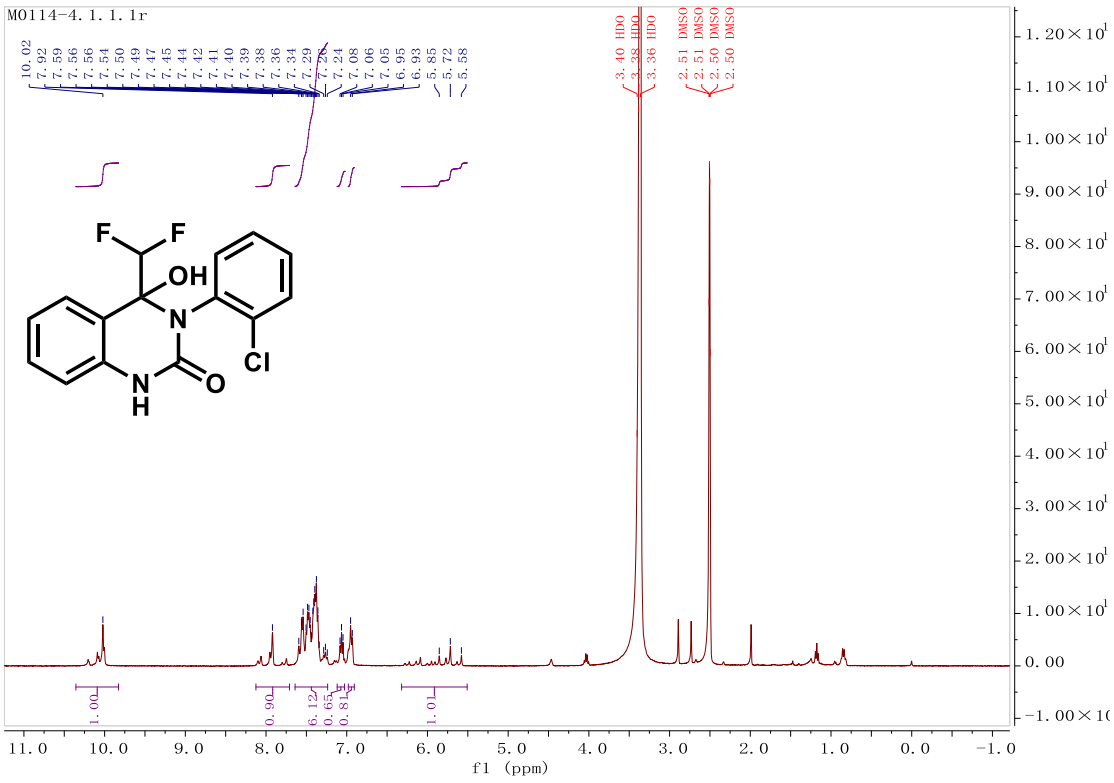
[13]C NMR of Compound **3p** (101 MHz, DMSO)



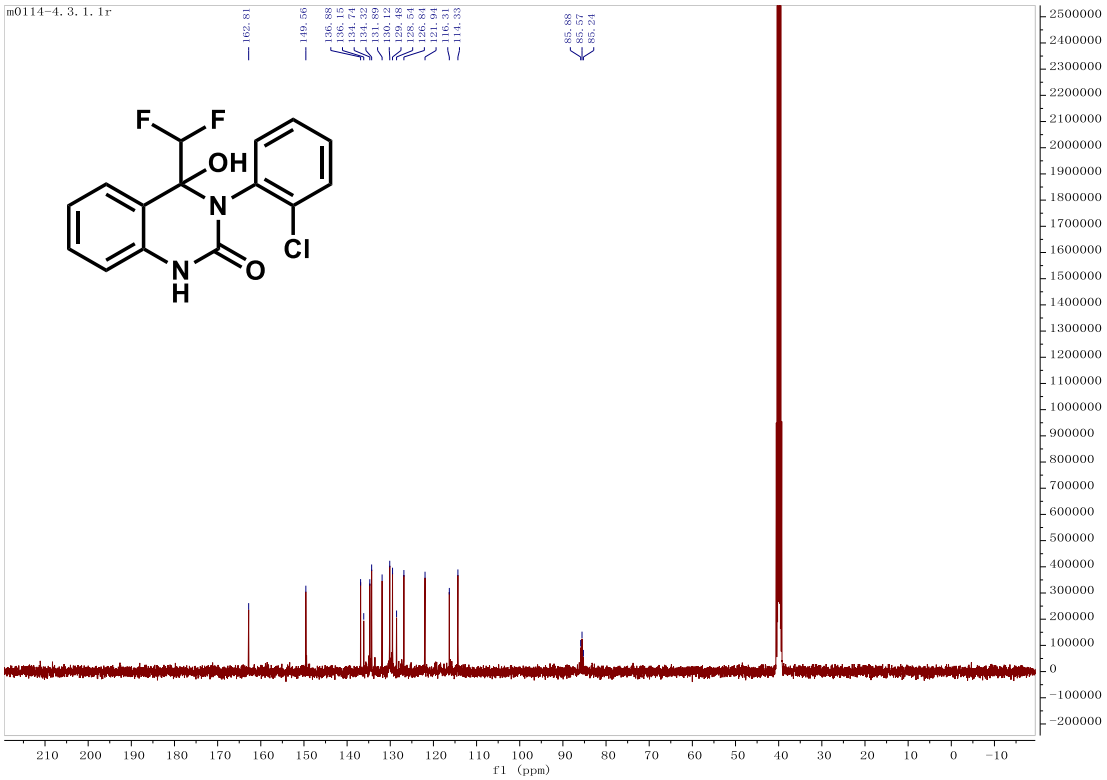
[19]F NMR of Compound **3p** (376 MHz, DMSO)



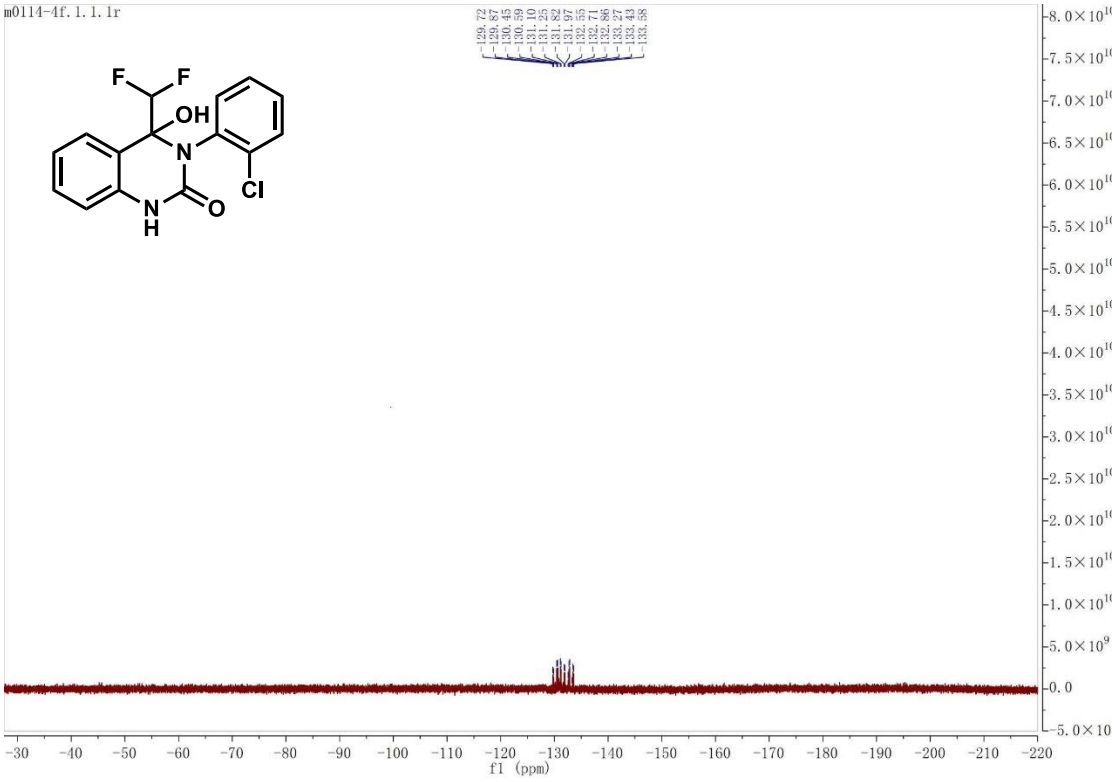
^{1}H NMR of Compound **3q** (400 MHz, DMSO)



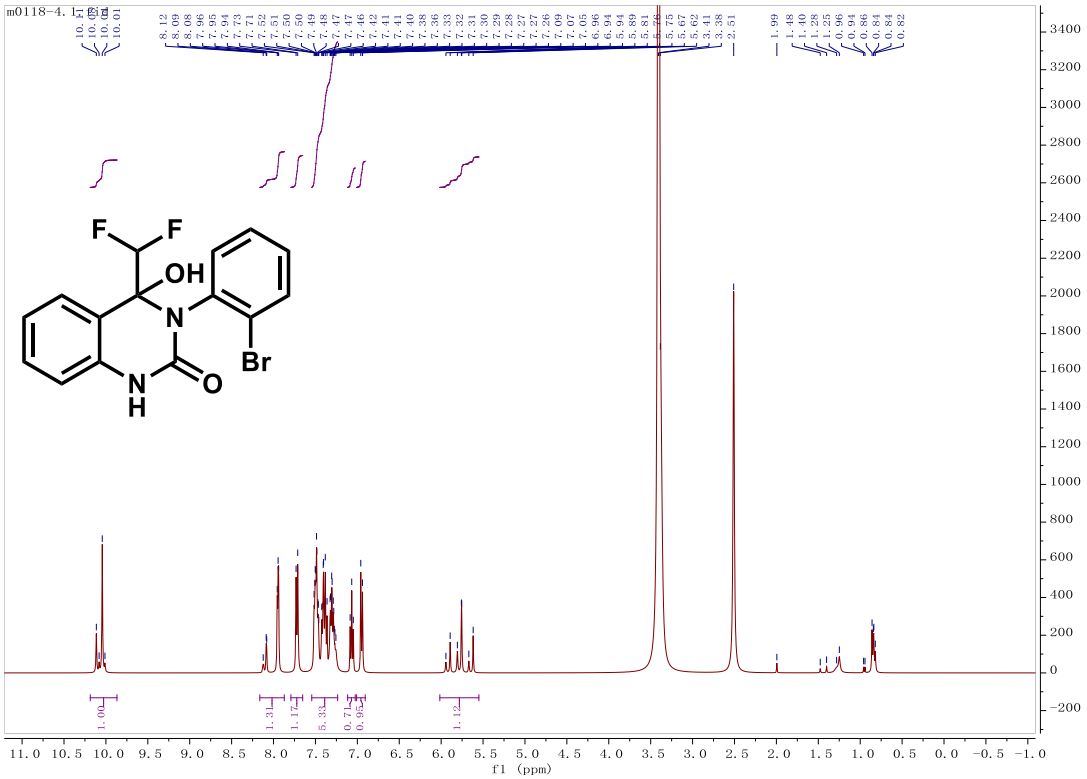
^{13}C NMR of Compound **3q** (101 MHz, DMSO)



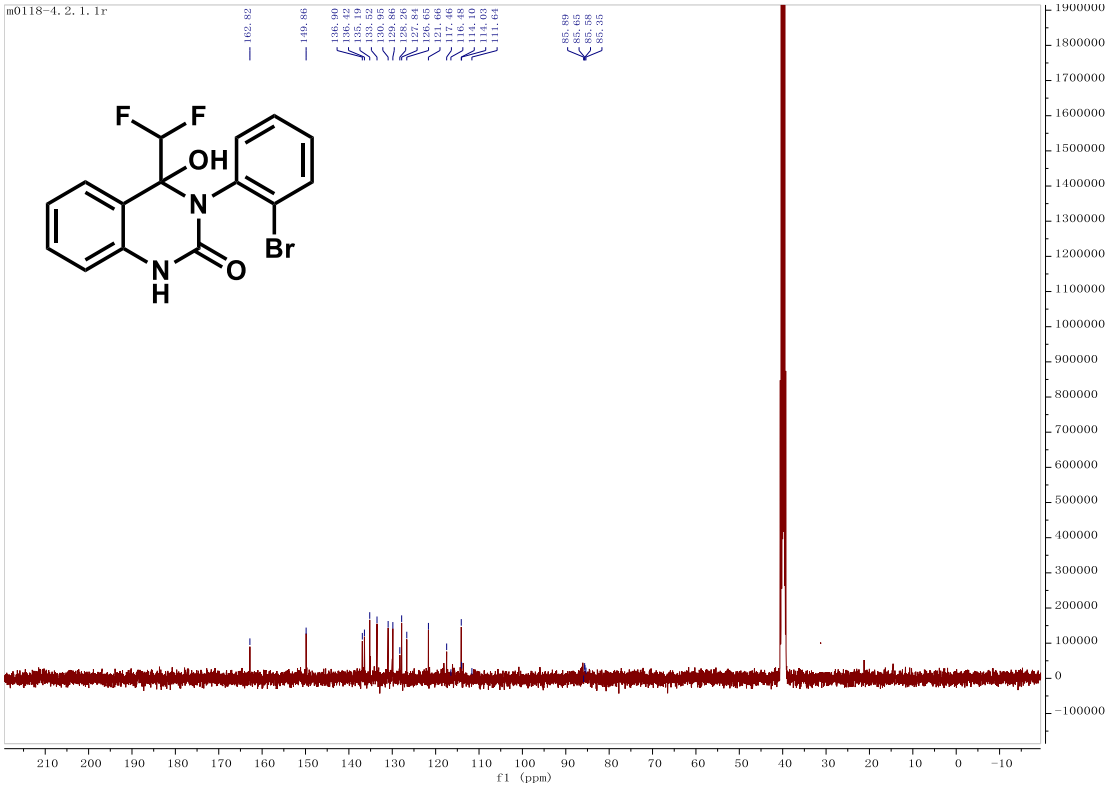
[19]F NMR of Compound **3q** (376 MHz, DMSO)



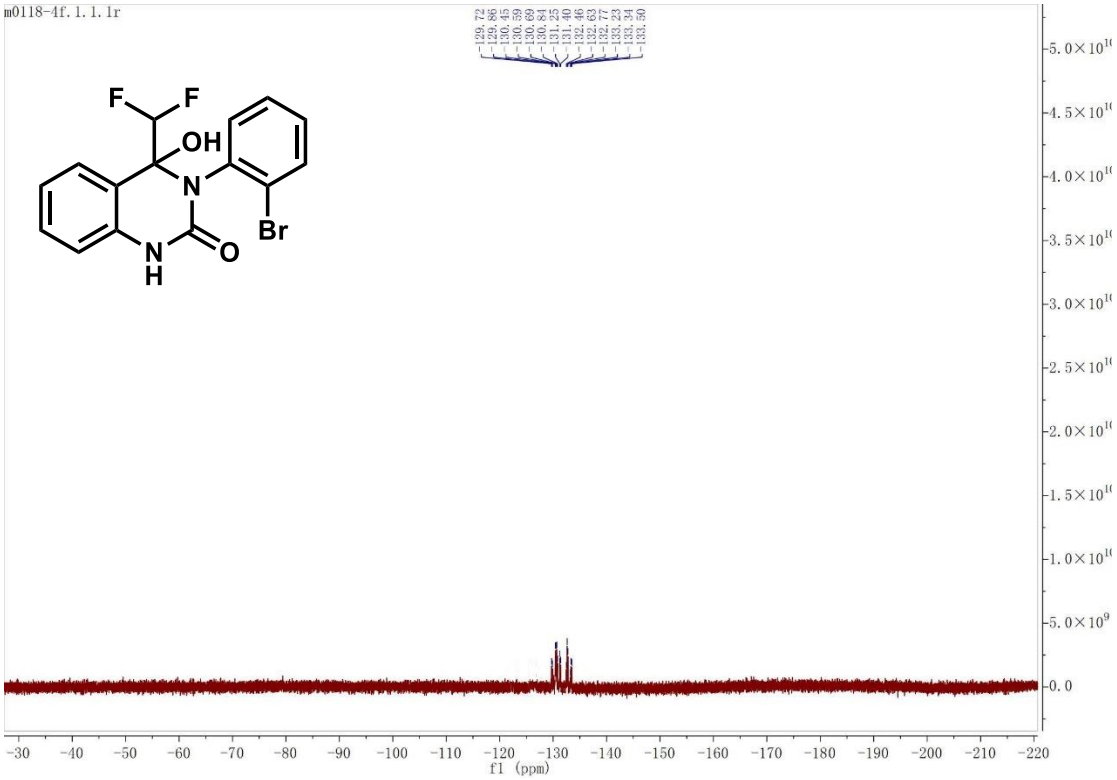
[1]H NMR of Compound **3r** (400 MHz, DMSO)



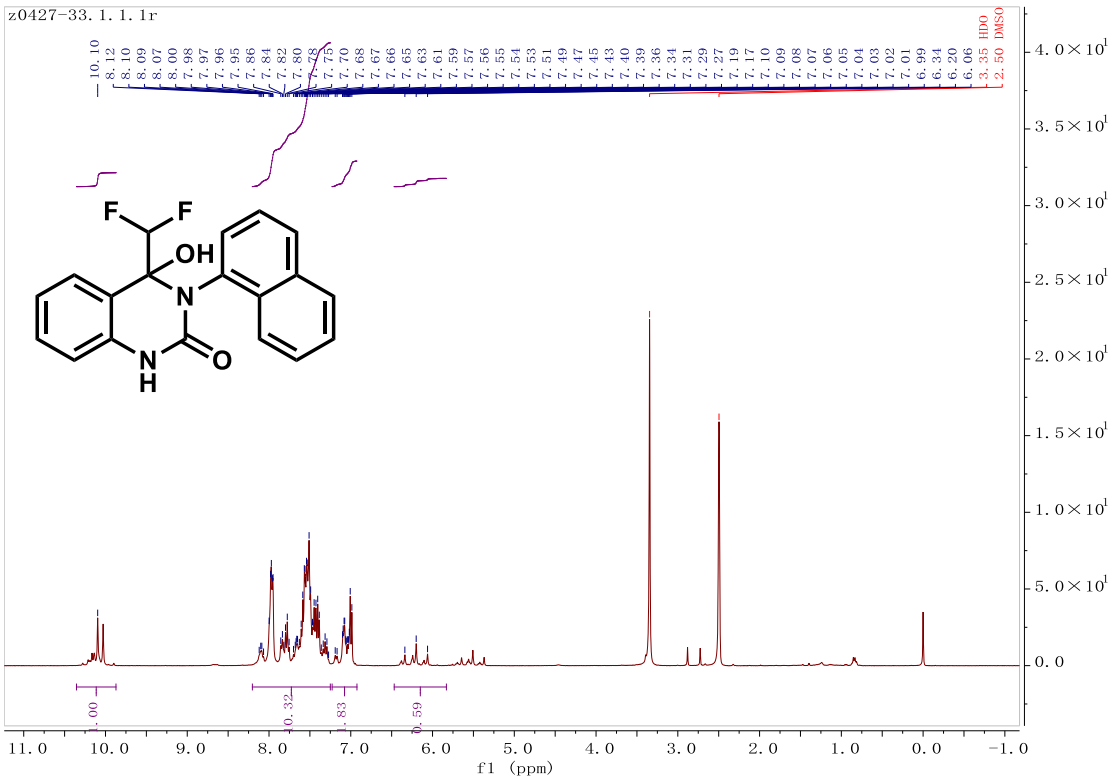
[13]C NMR of Compound **3r** (101 MHz, DMSO)



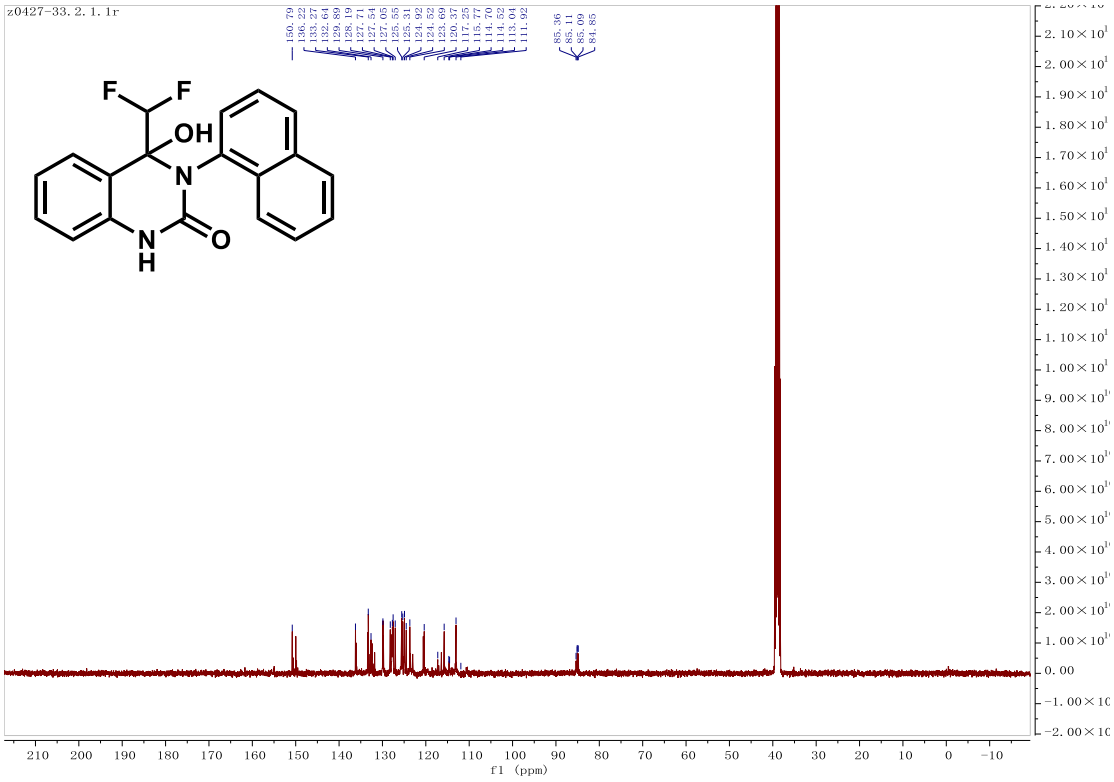
[19]F NMR of Compound **3r** (376 MHz, DMSO)



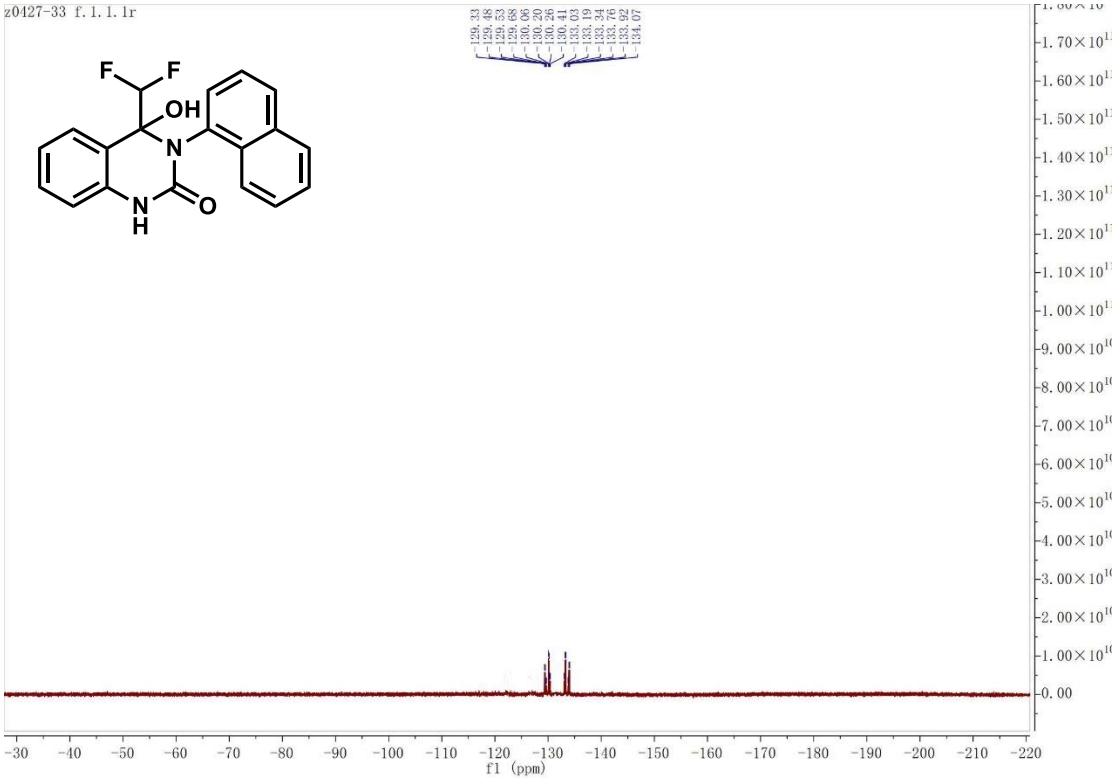
^{1}H NMR of Compound **3s** (400 MHz, DMSO)



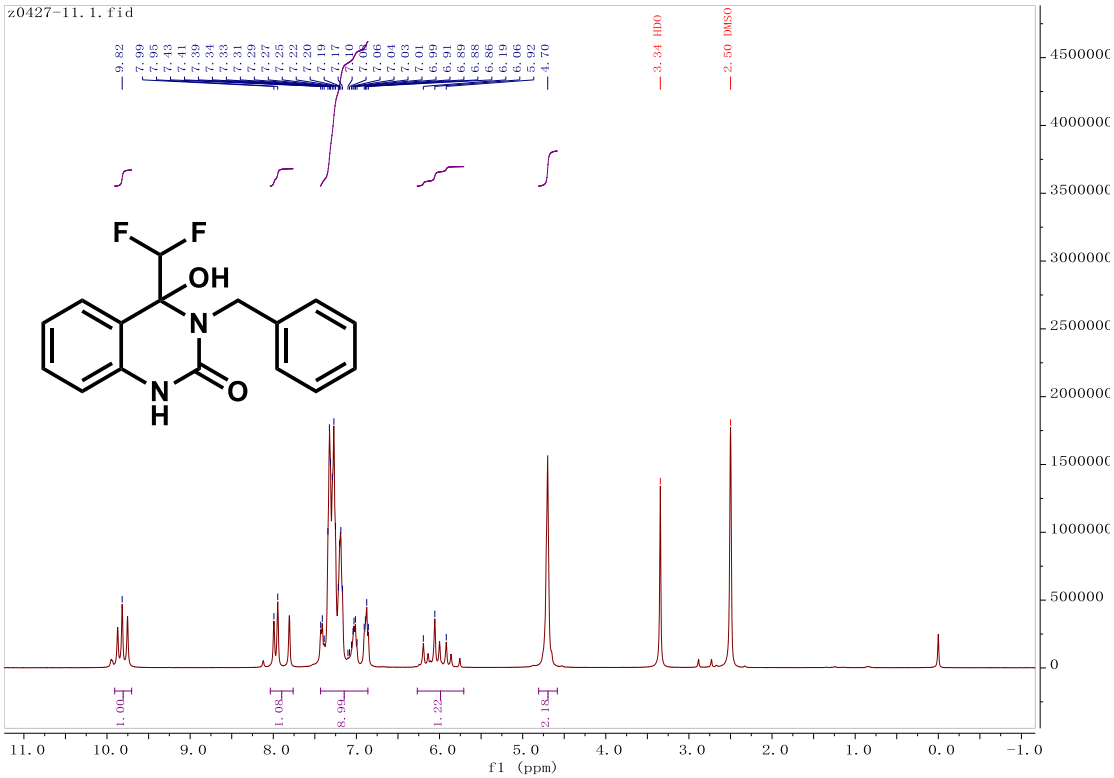
^{13}C NMR of Compound **3s** (101 MHz, DMSO)



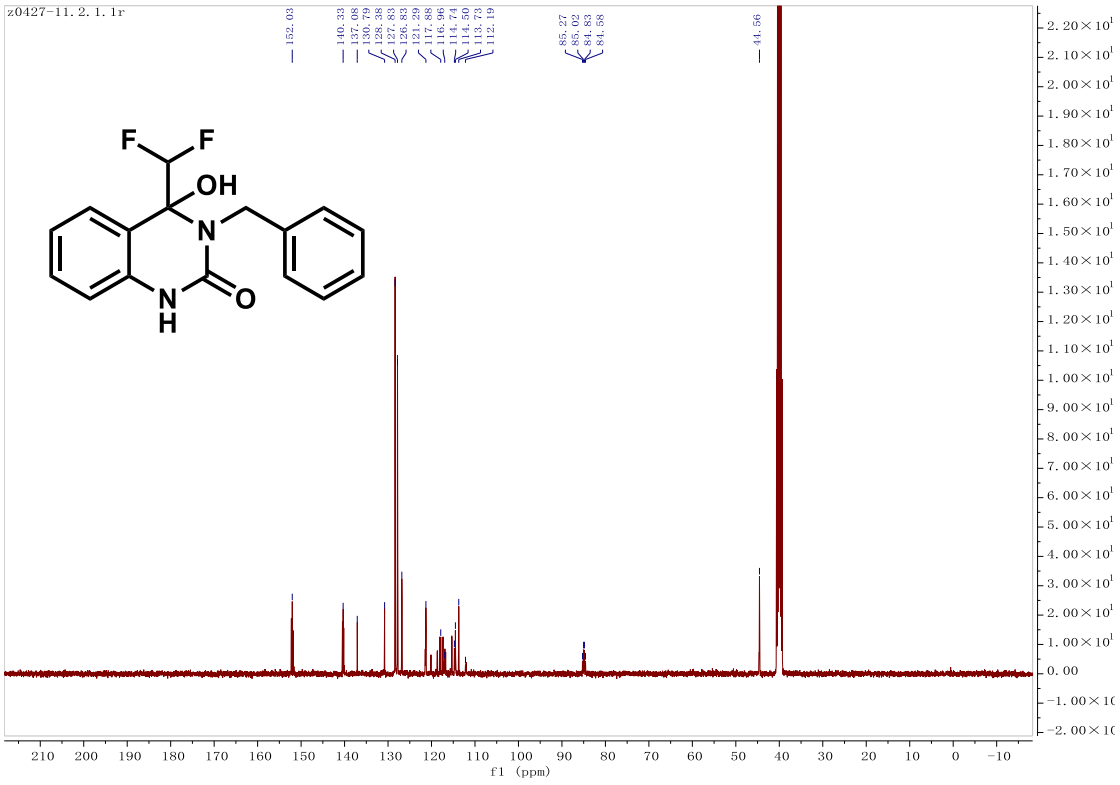
[19]F NMR of Compound **3s** (376 MHz, DMSO)



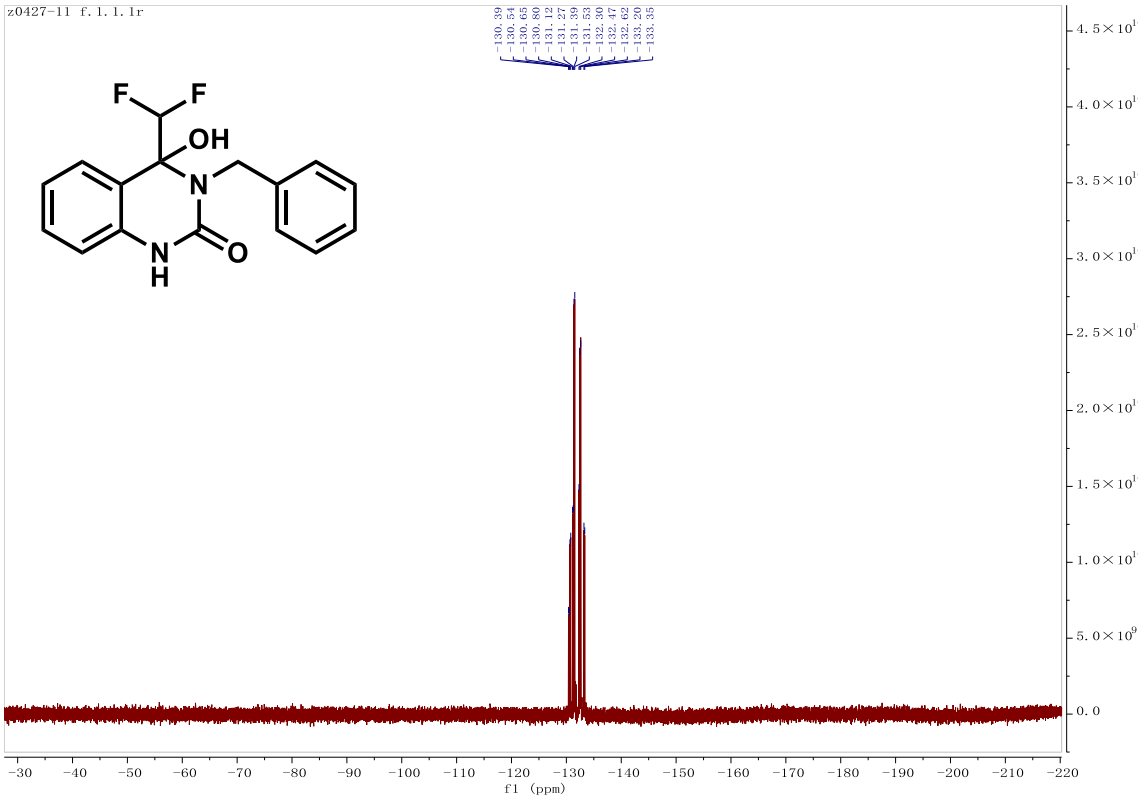
[1]H NMR of Compound **3t** (400 MHz, DMSO)



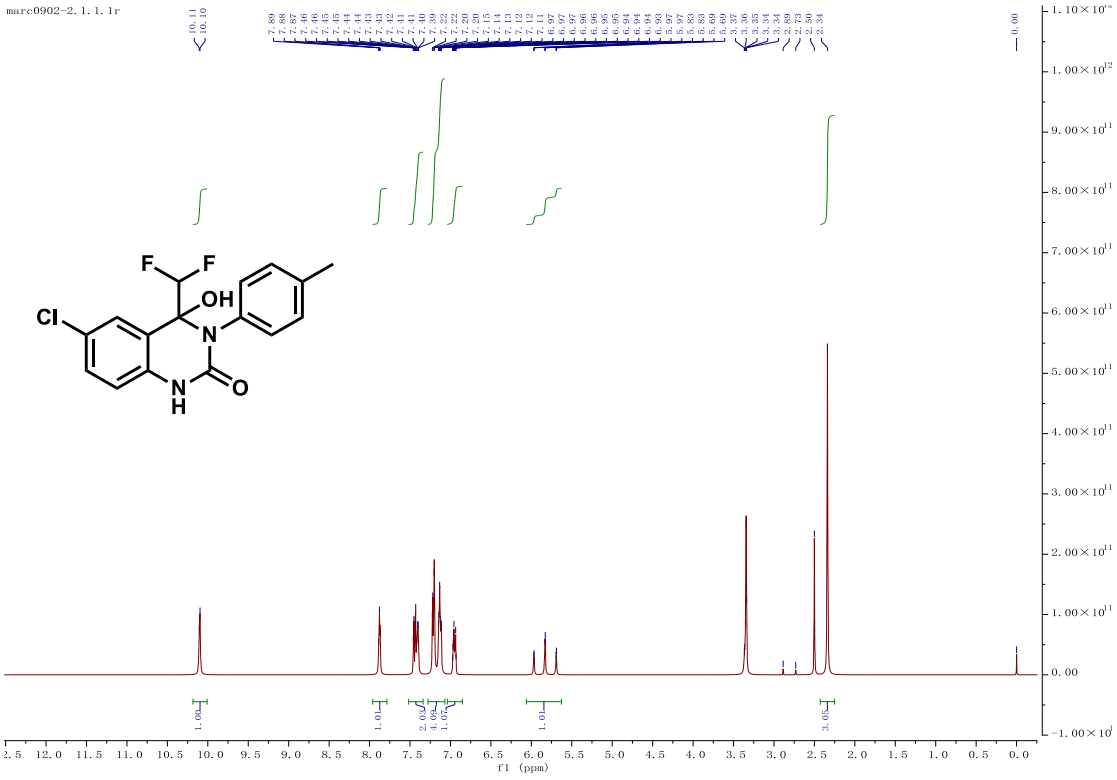
^{13}C NMR of Compound **3t** (101 MHz, DMSO)



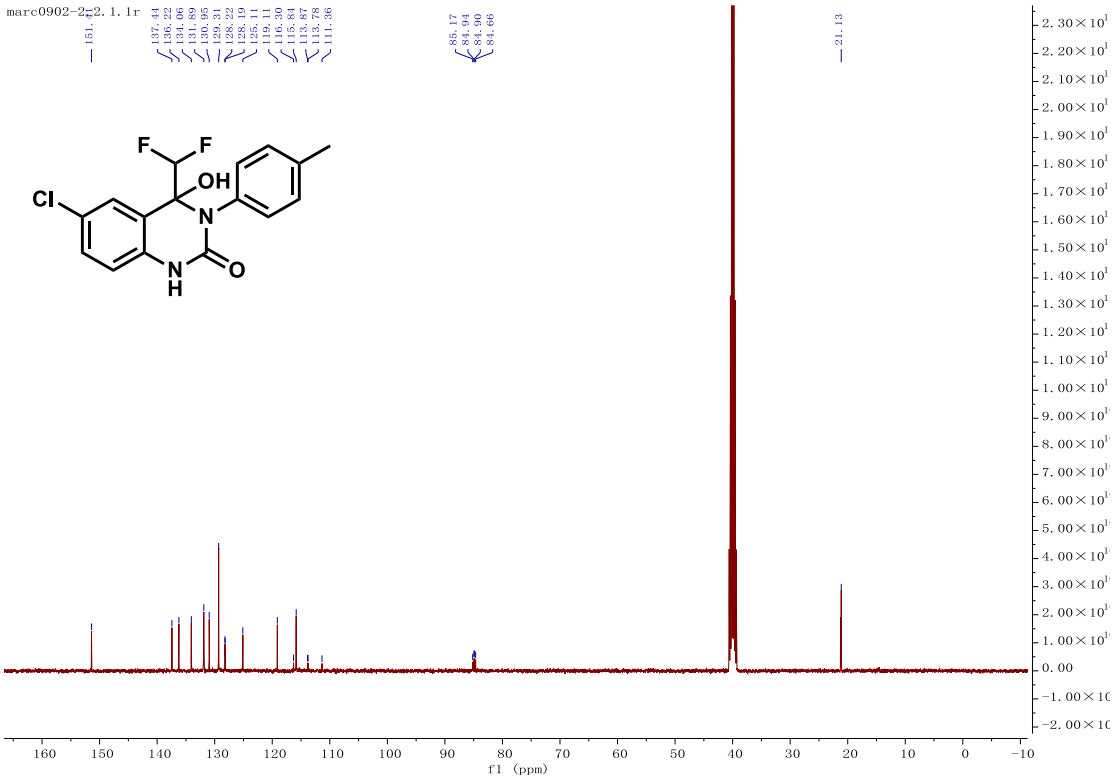
^{19}F NMR of Compound **3t** (376 MHz, DMSO)



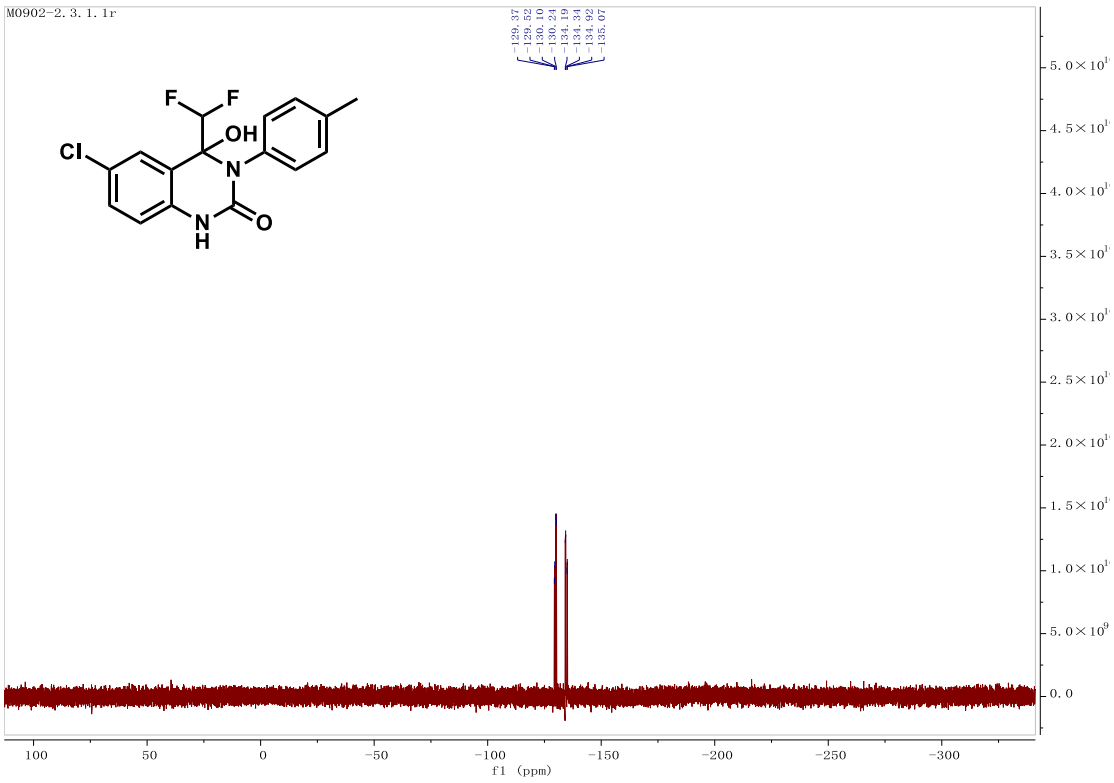
^{1}H NMR of Compound **3u** (400 MHz, DMSO)



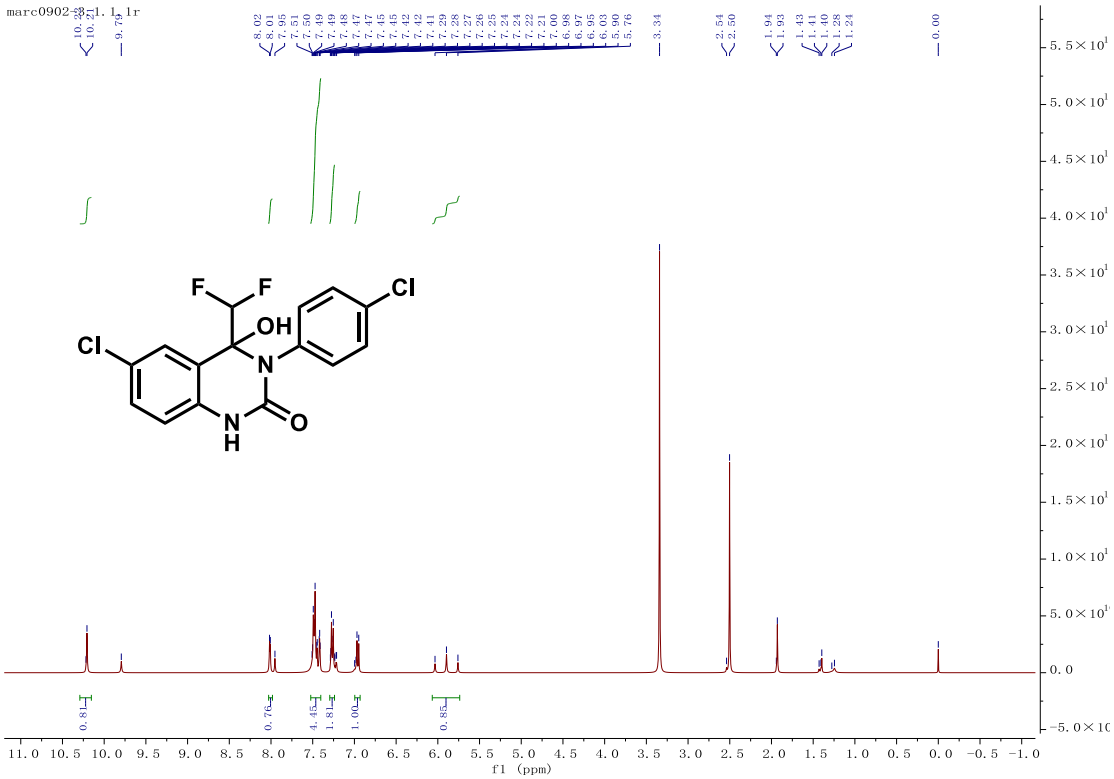
^{13}C NMR of Compound **3u** (101 MHz, DMSO)



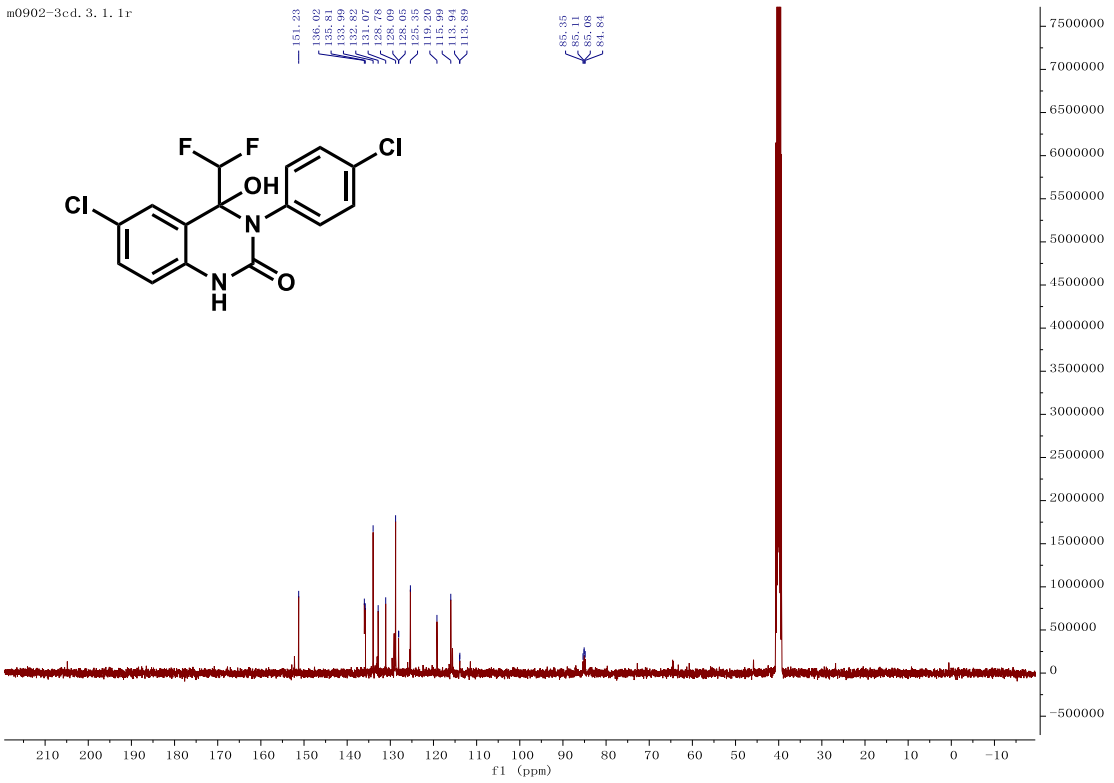
[19]F NMR of Compound **3u** (376 MHz, DMSO)



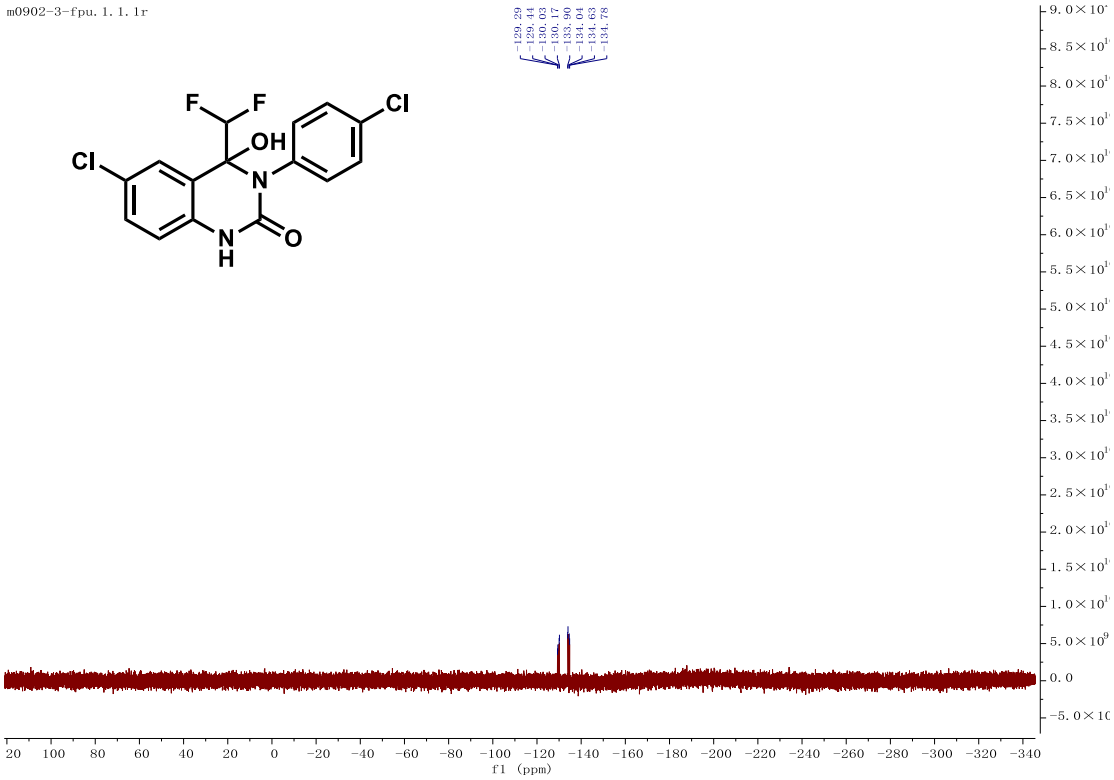
[1]H NMR of Compound **3v** (400 MHz, DMSO)



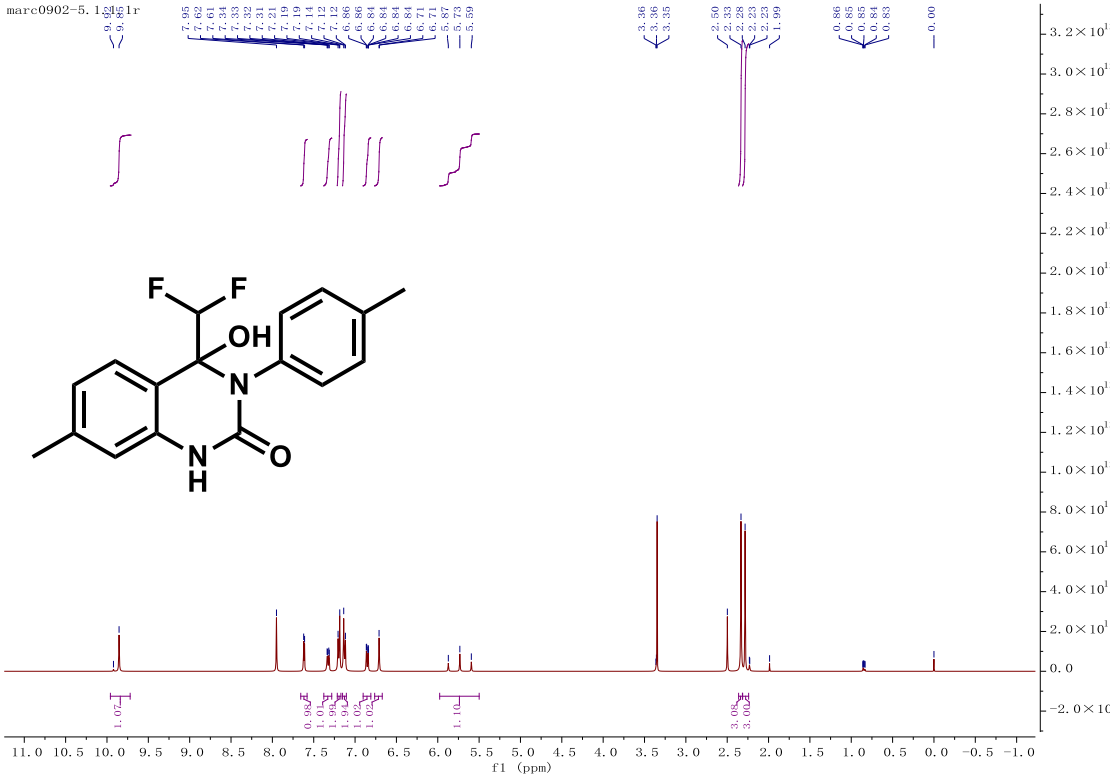
^{13}C NMR of Compound **3v** (101 MHz, DMSO)



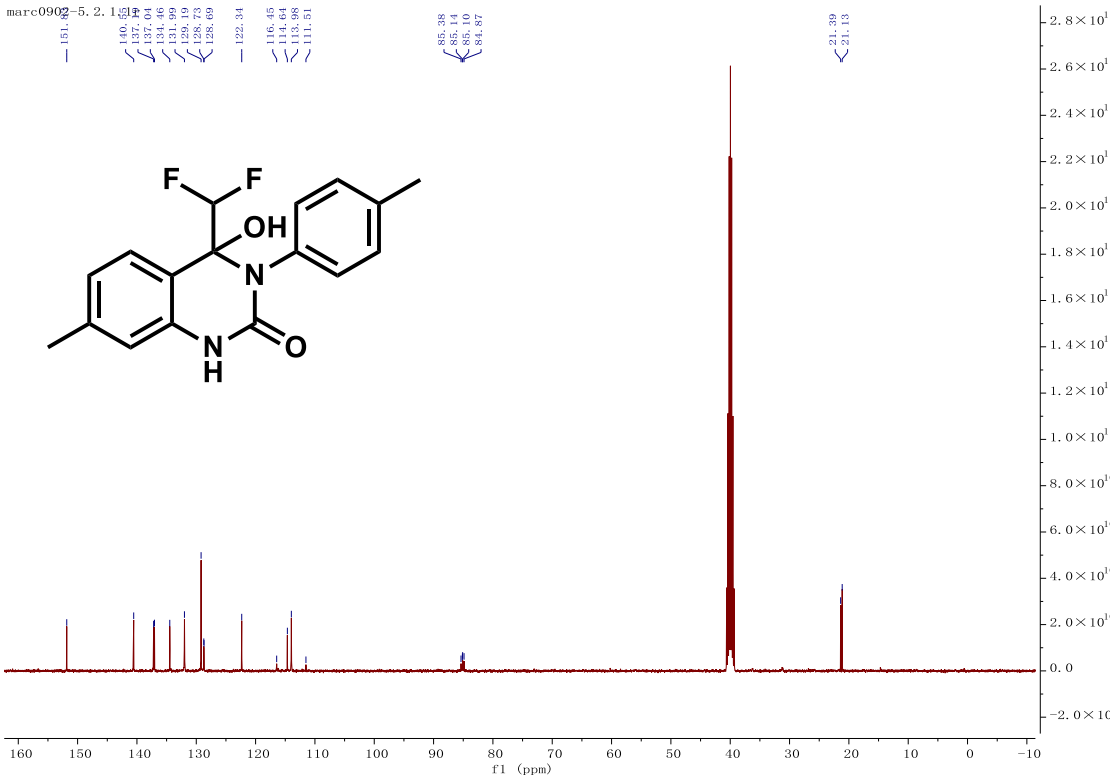
^{19}F NMR of Compound **3v** (376 MHz, DMSO)



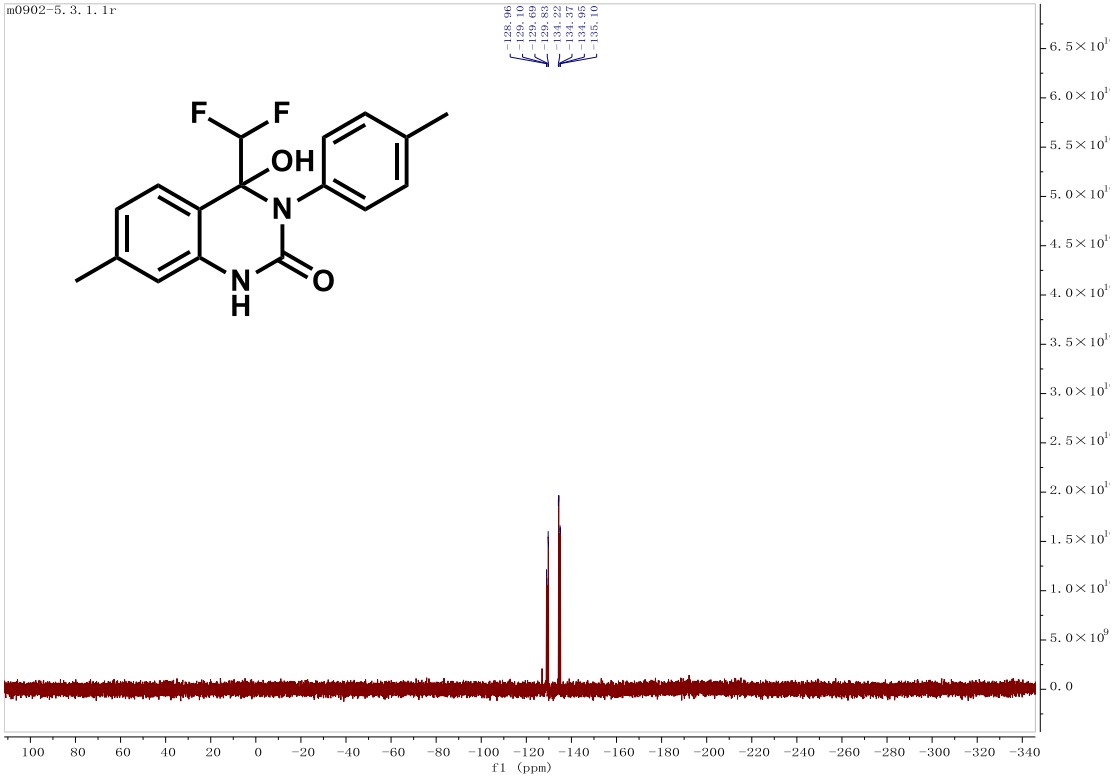
[1]H NMR of Compound **3w** (400 MHz, DMSO)



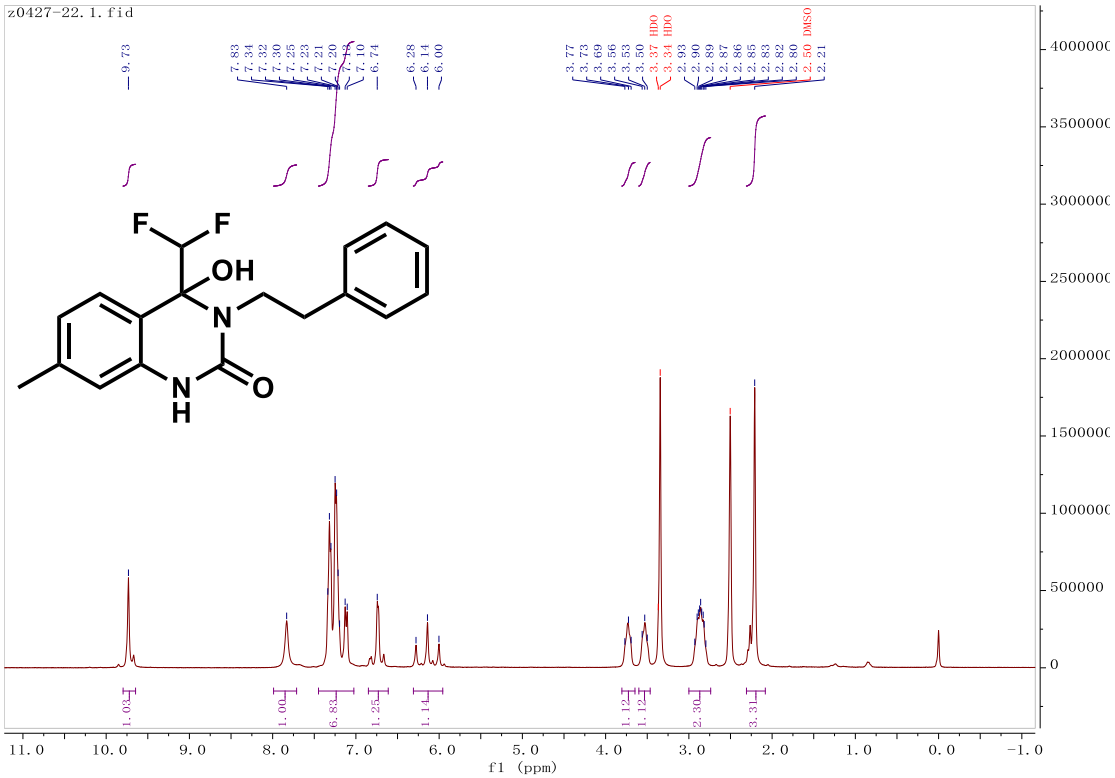
[13]C NMR of Compound **3w** (101 MHz, DMSO)



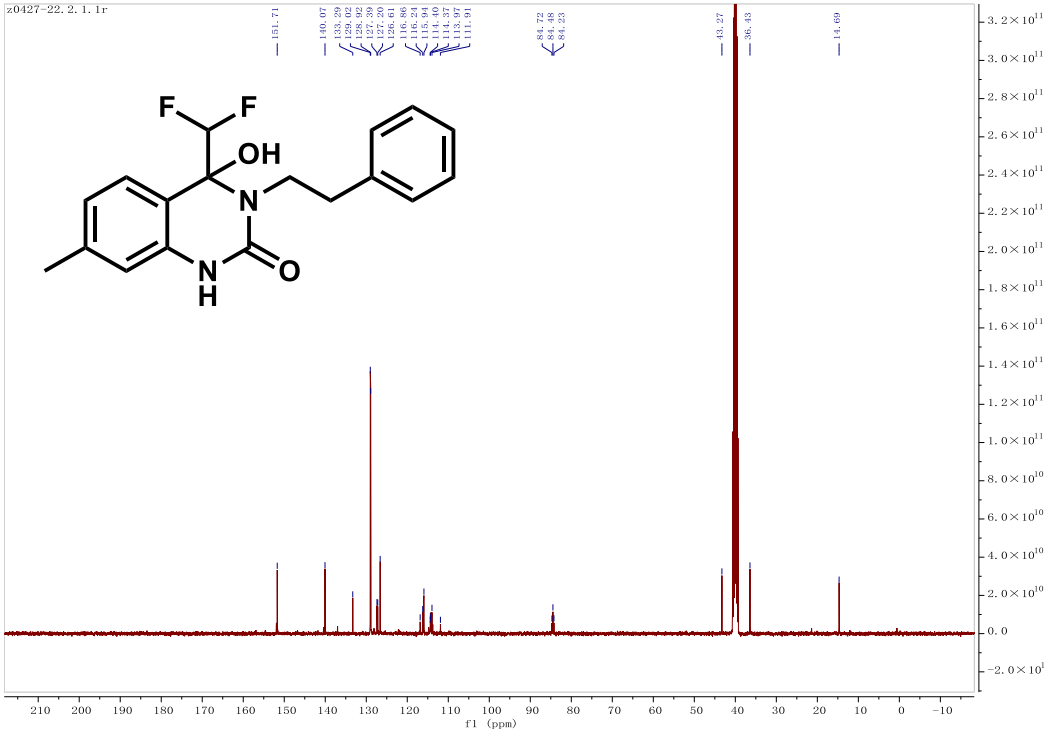
^{19}F NMR of Compound **3w** (376 MHz, DMSO)



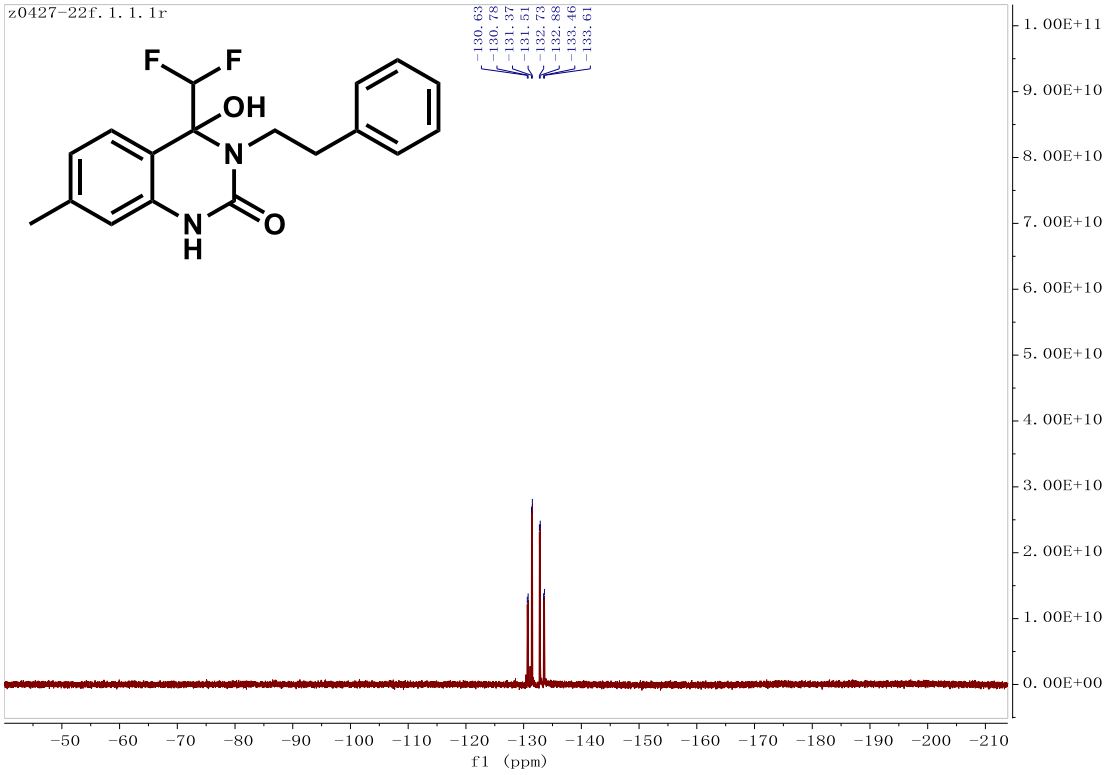
^{1}H NMR of Compound **3x** (400 MHz, DMSO)



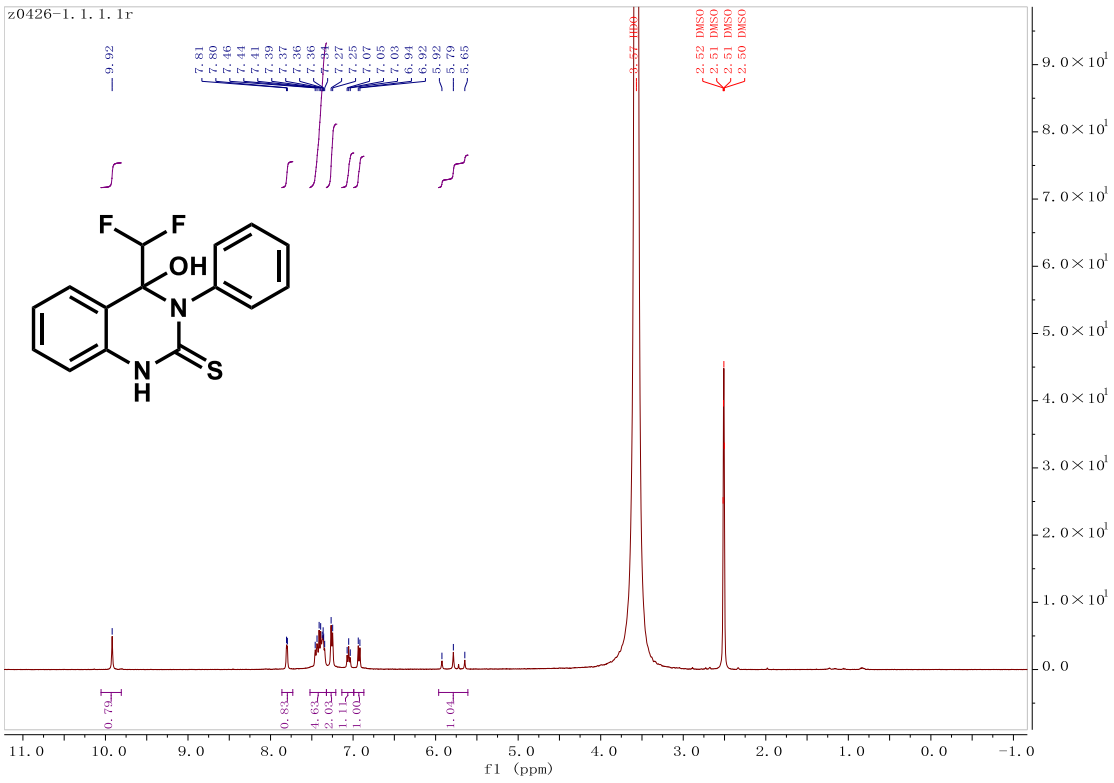
[13]C NMR of Compound **3x** (101 MHz, DMSO)



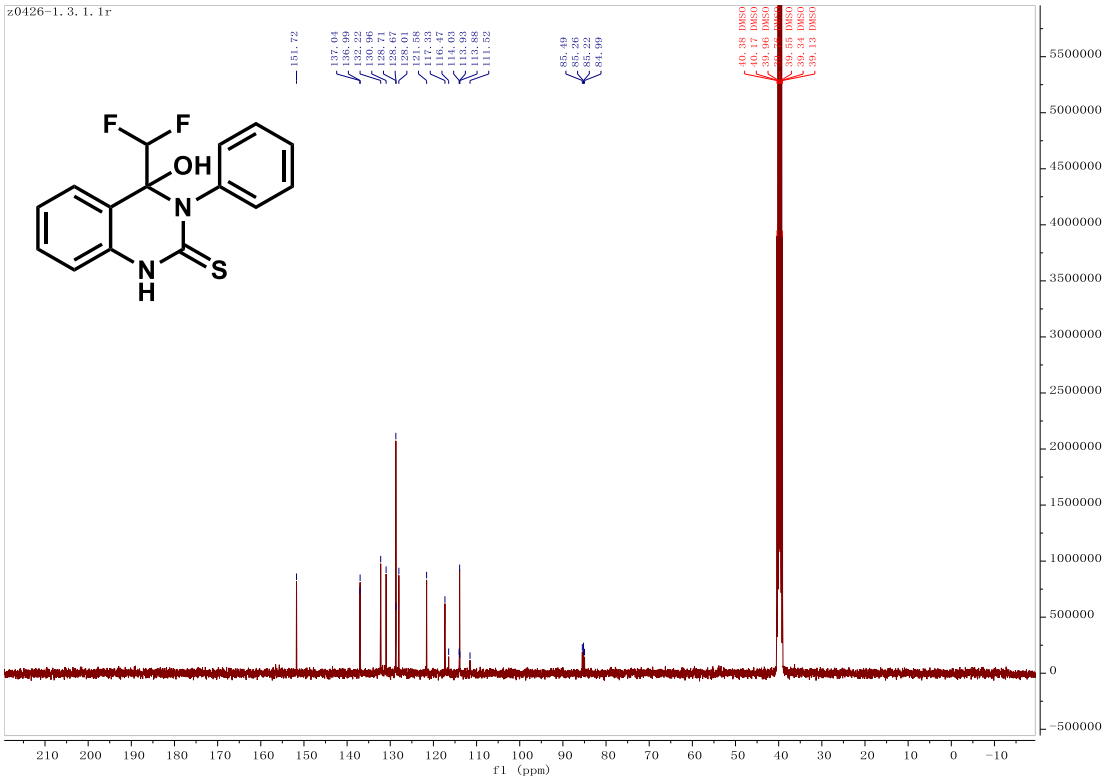
[19]F NMR of Compound **3x** (376 MHz, DMSO)



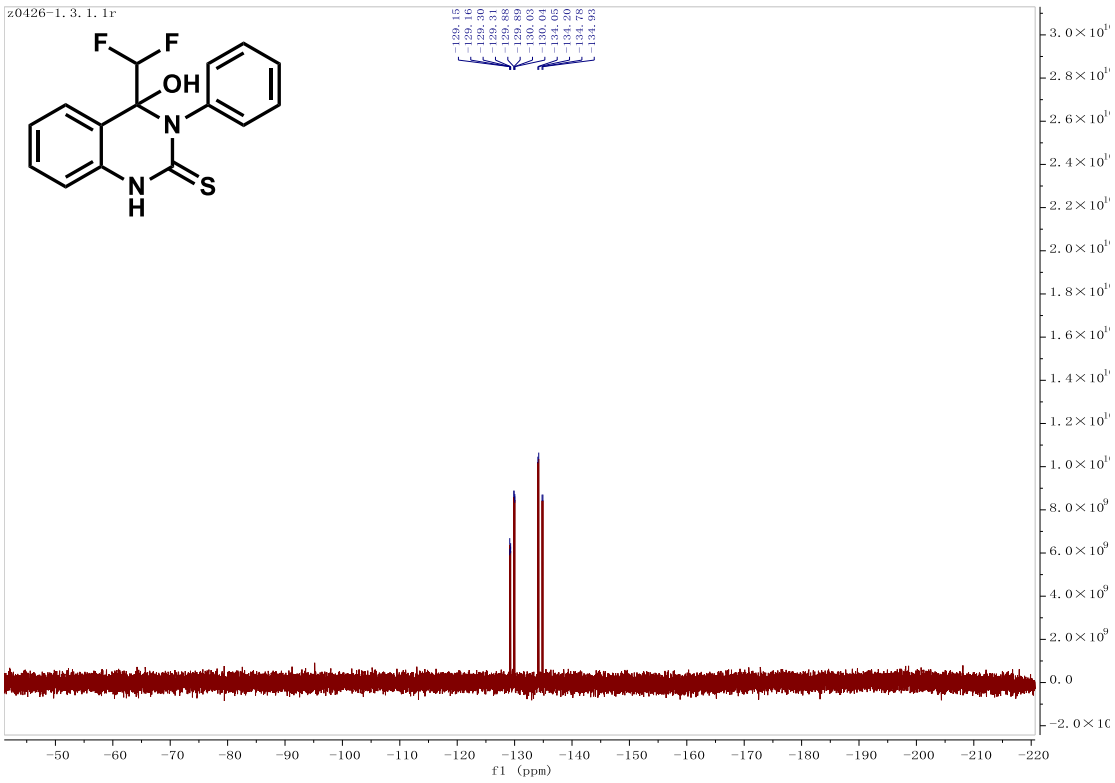
^{1}H NMR of Compound **3y** (400 MHz, DMSO)



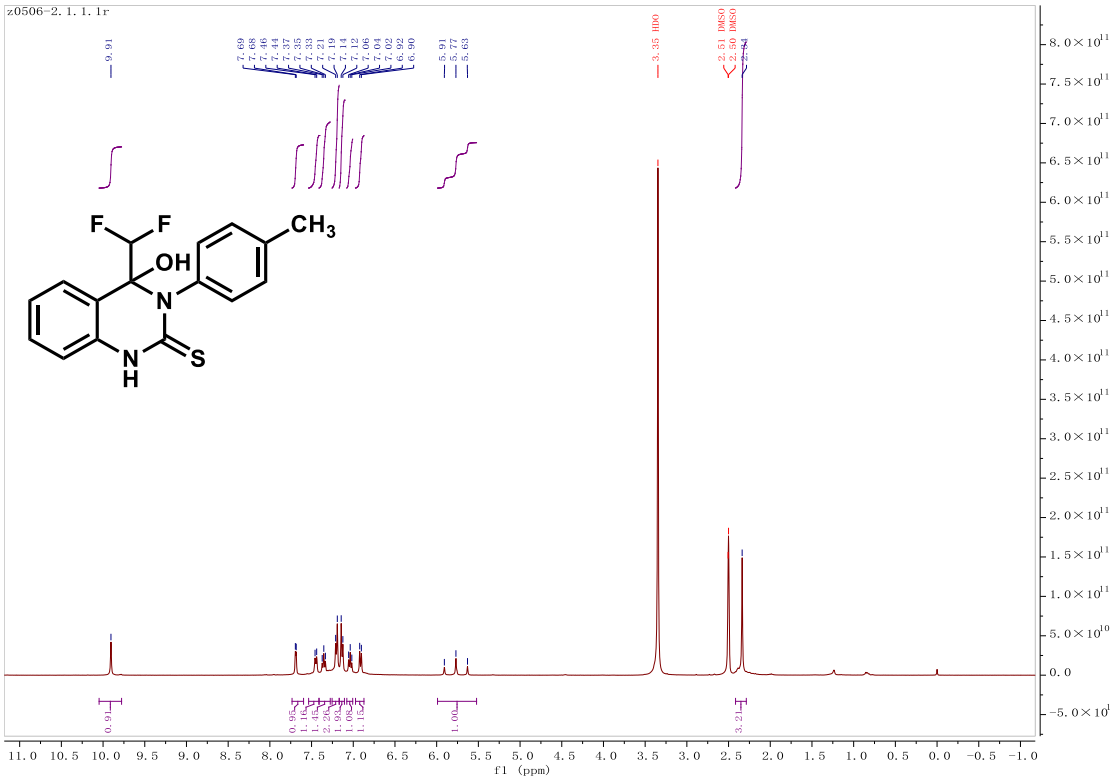
^{13}C NMR of Compound **3y** (101 MHz, DMSO)



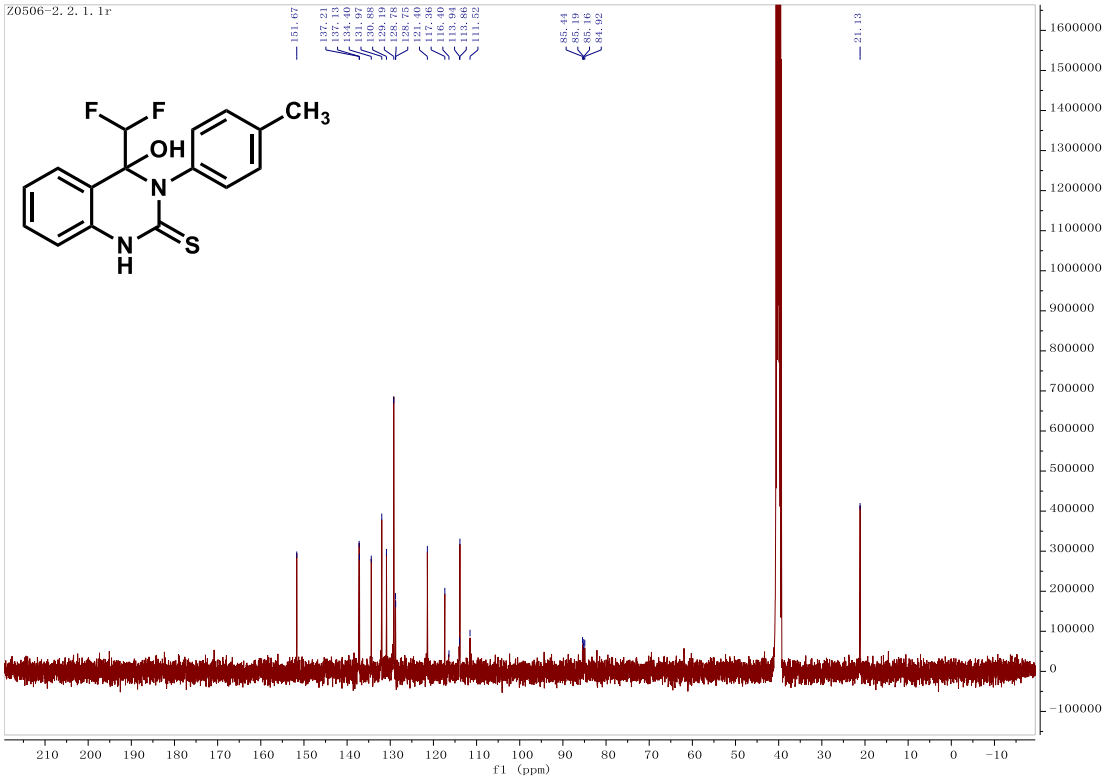
[19]F NMR of Compound **3y** (376 MHz, DMSO)



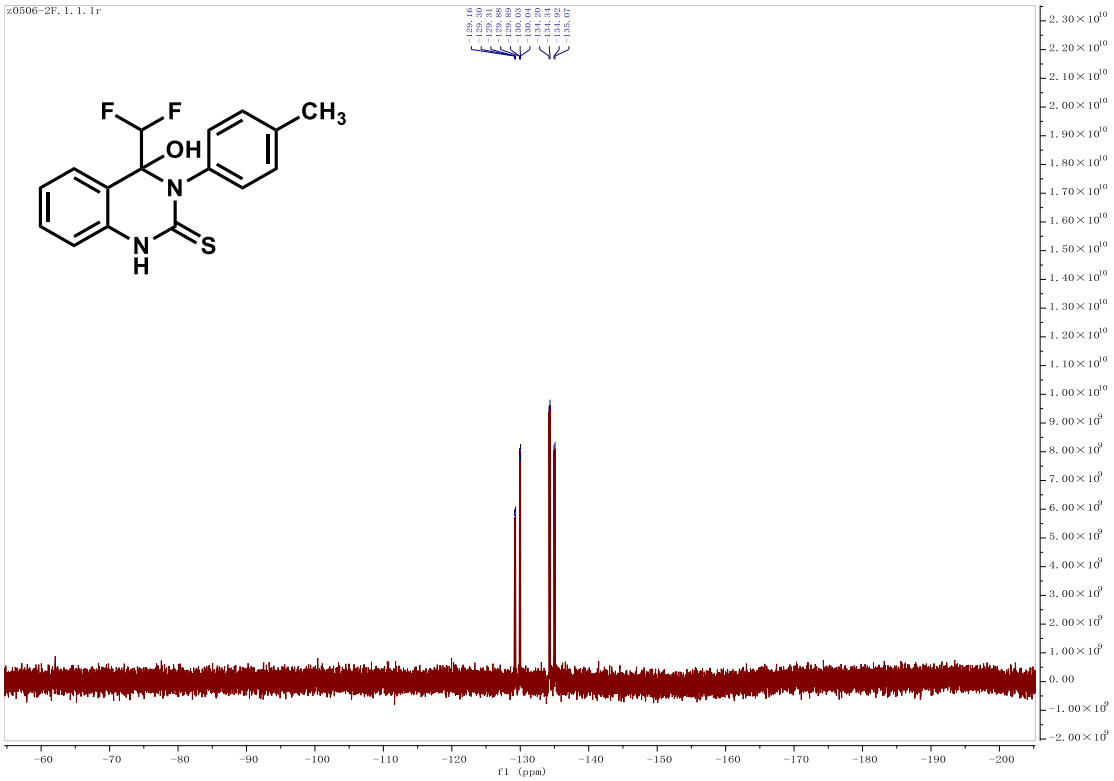
[1]H NMR of Compound **3z** (400 MHz, DMSO)



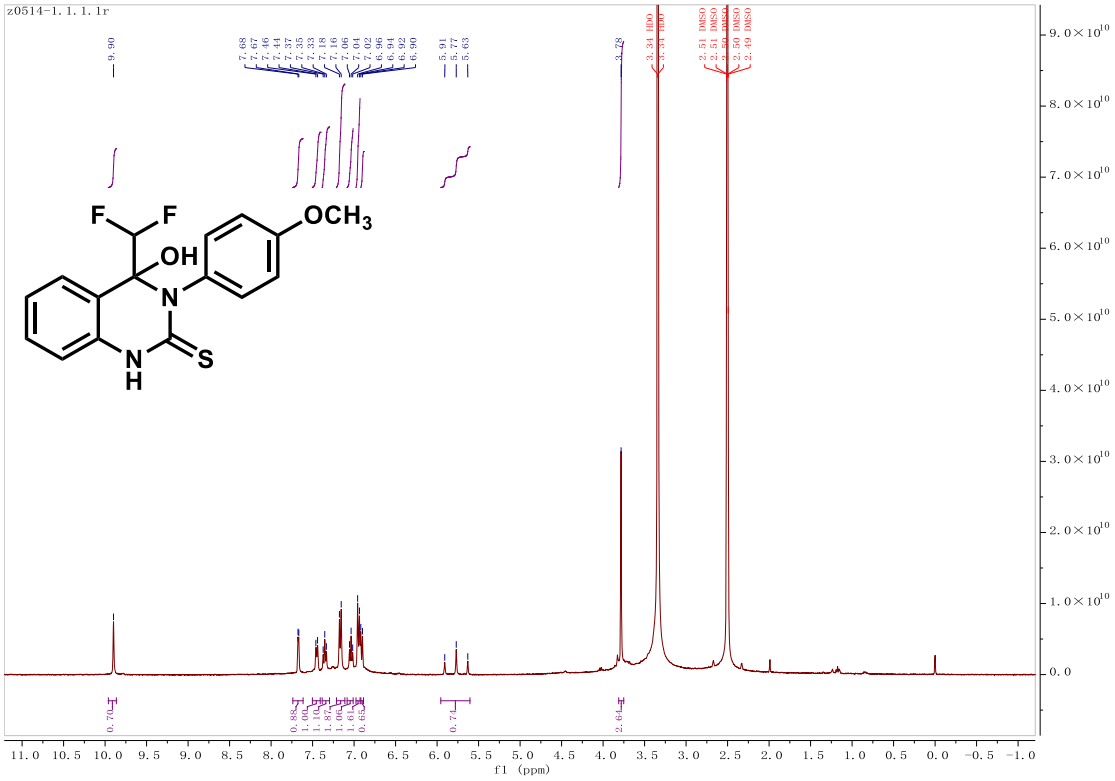
^{13}C NMR of Compound **3z** (101 MHz, DMSO)



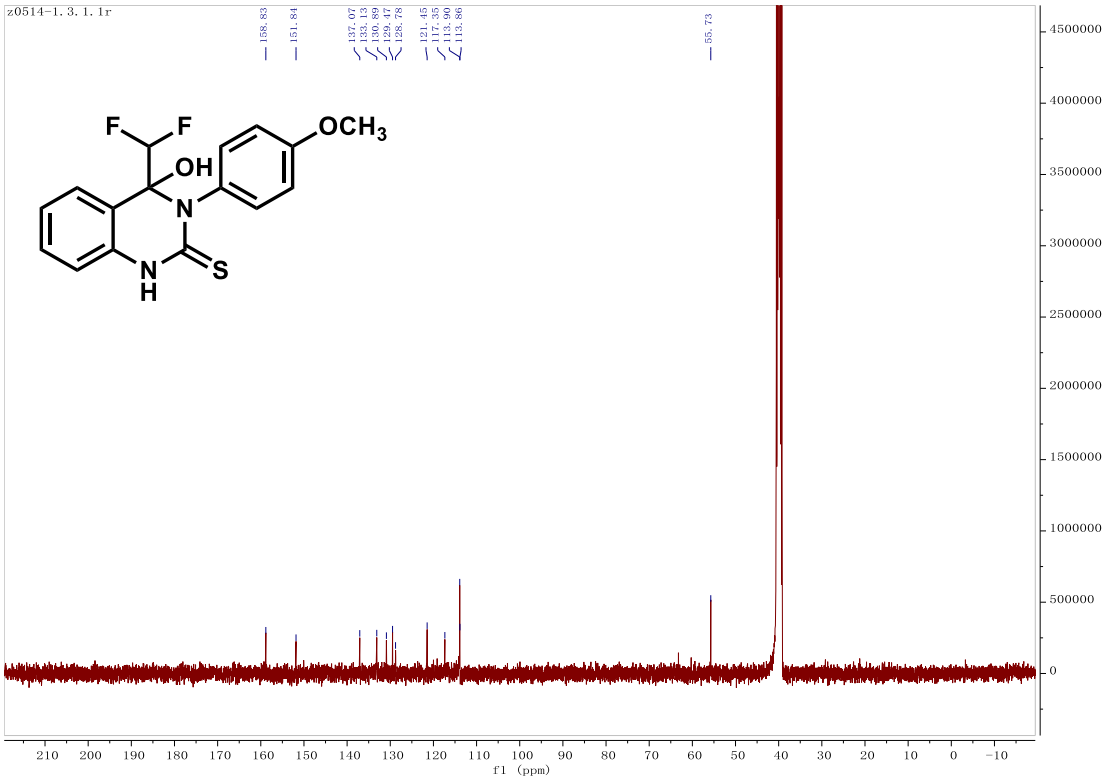
^{19}F NMR of Compound **3z** (376 MHz, DMSO)



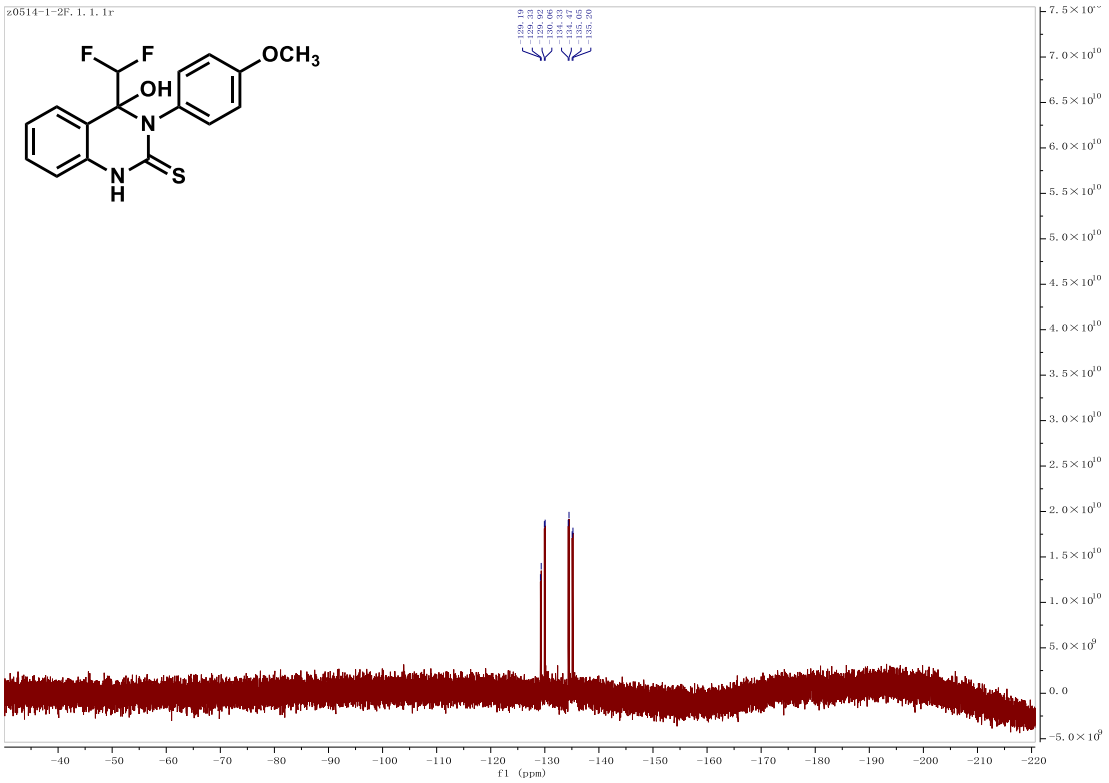
[1]H NMR of Compound **3aa** (400 MHz, DMSO)



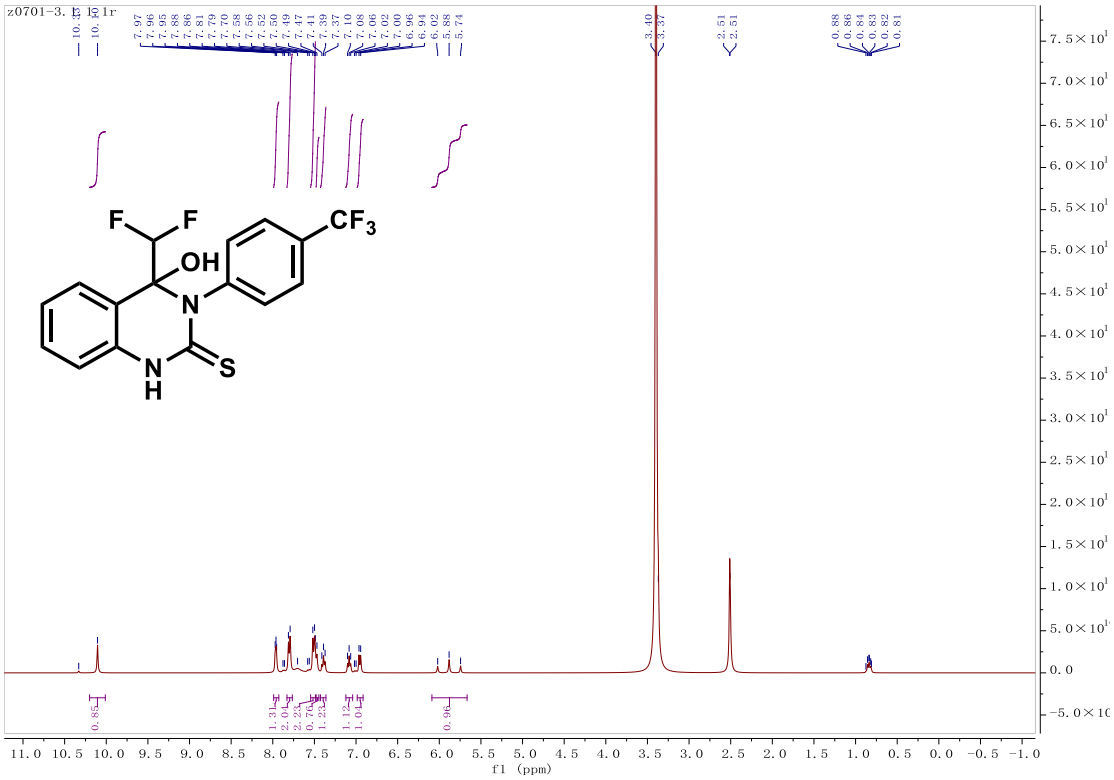
[13]C NMR of Compound **3aa** (101 MHz, DMSO)



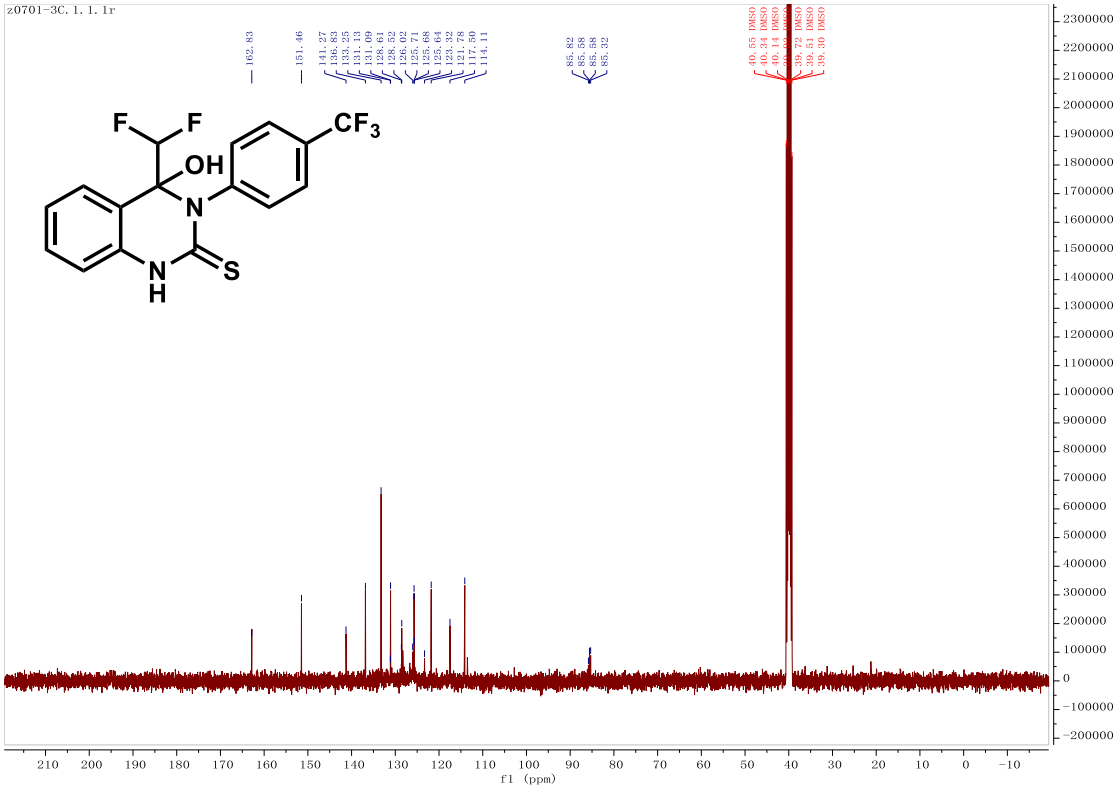
^{19}F NMR of Compound **3aa** (376 MHz, DMSO)



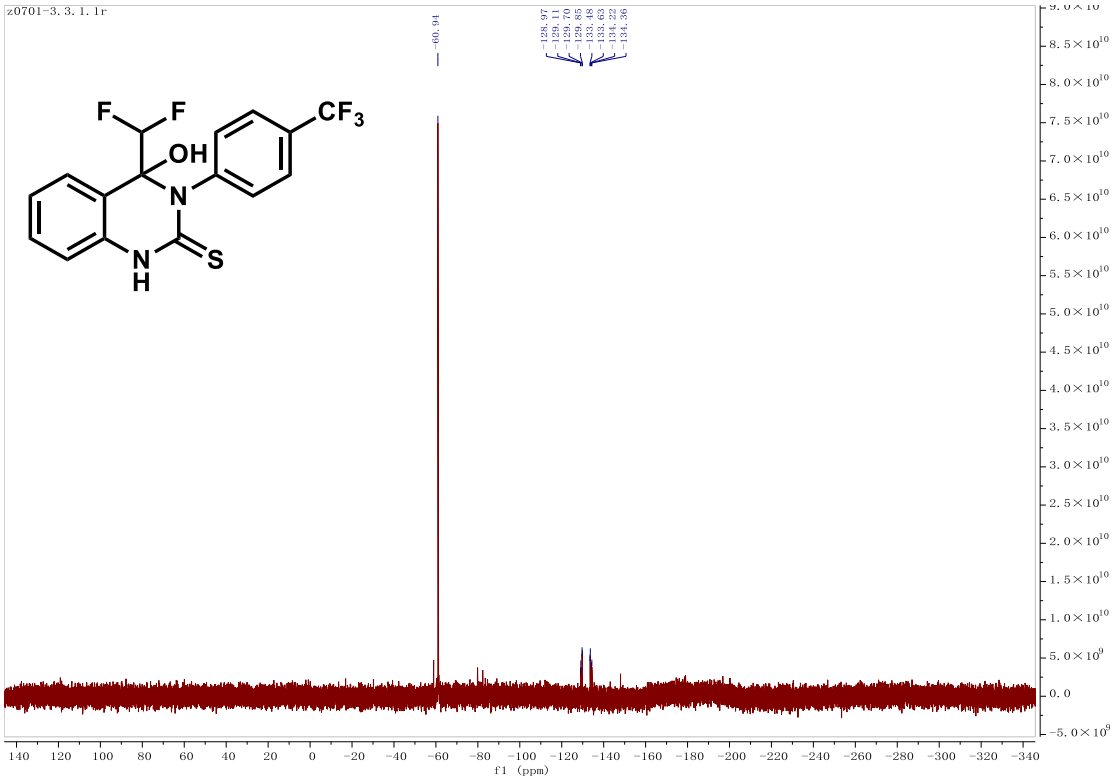
^{1}H NMR of Compound **3ab** (400 MHz, DMSO)



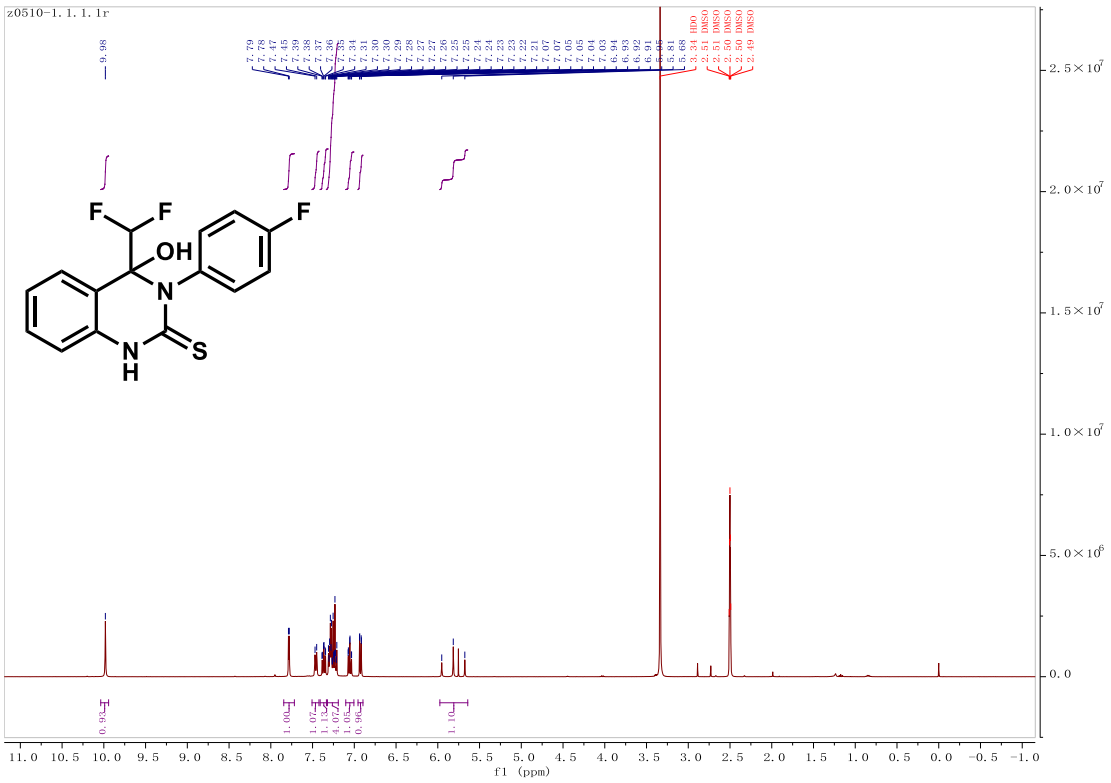
^{13}C NMR of Compound **3ab** (101 MHz, DMSO)



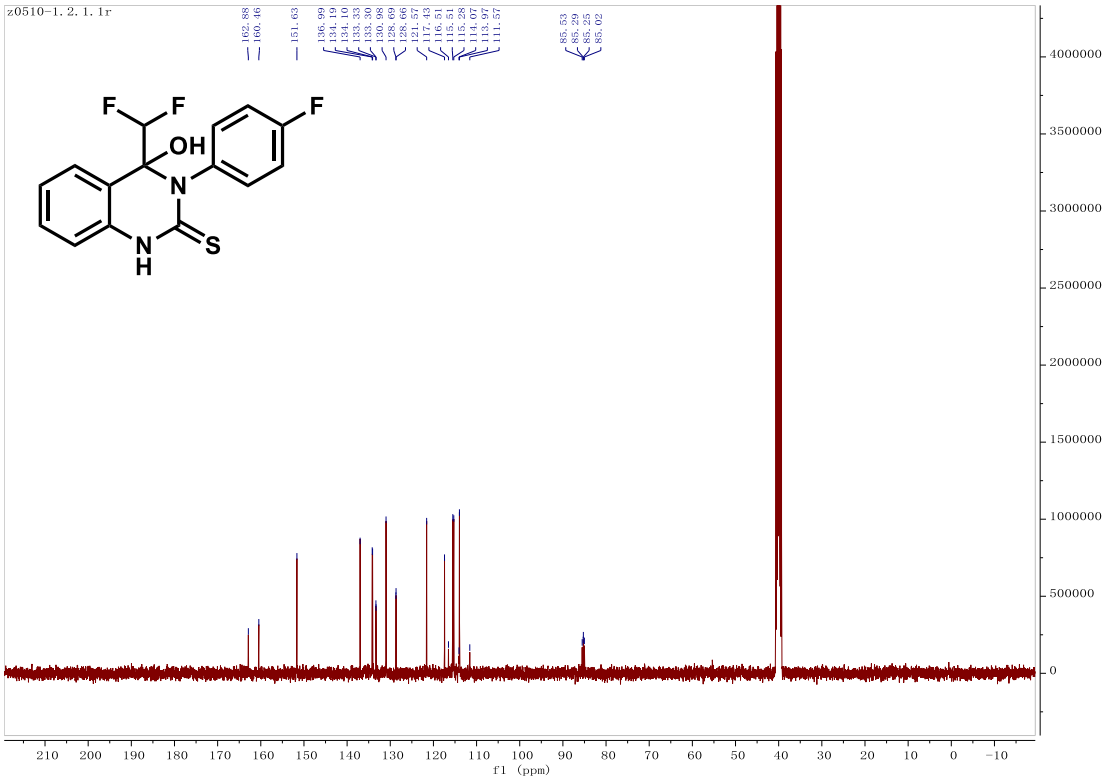
^{19}F NMR of Compound **3ab** (376 MHz, DMSO)



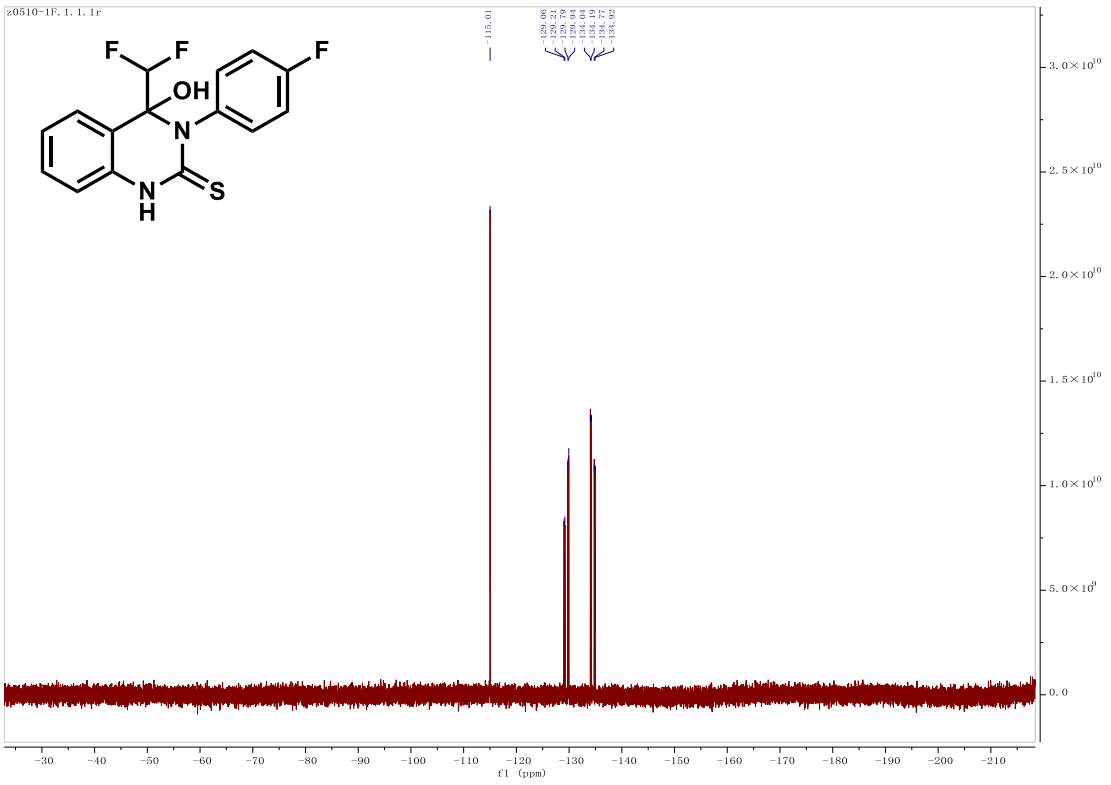
[1]H NMR of Compound **3ac** (400 MHz, DMSO)



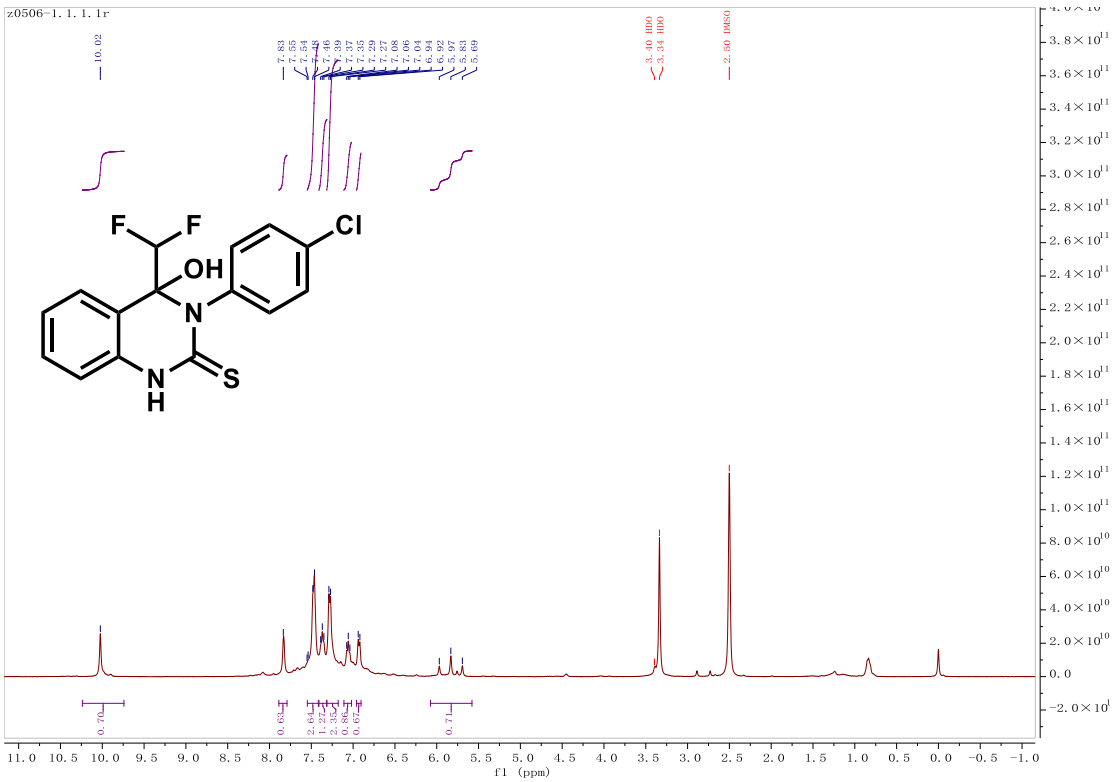
[13]C NMR of Compound **3ac** (101 MHz, DMSO)



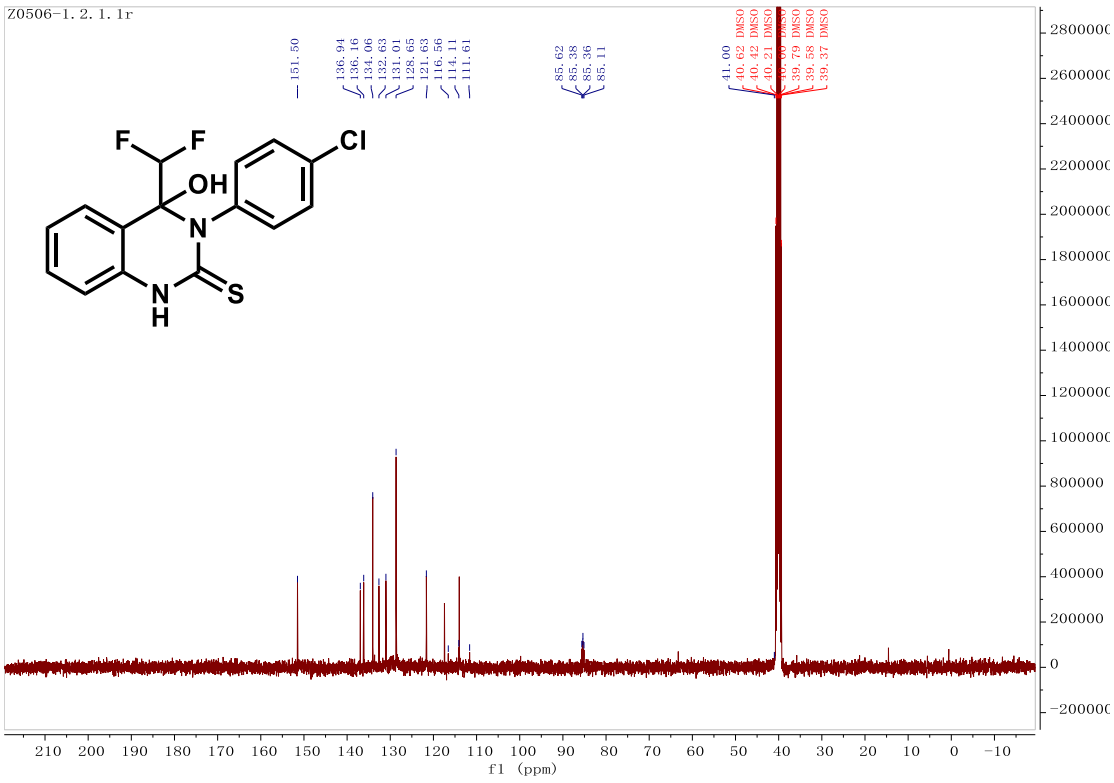
[19]F NMR of Compound **3ac** (376 MHz, DMSO)



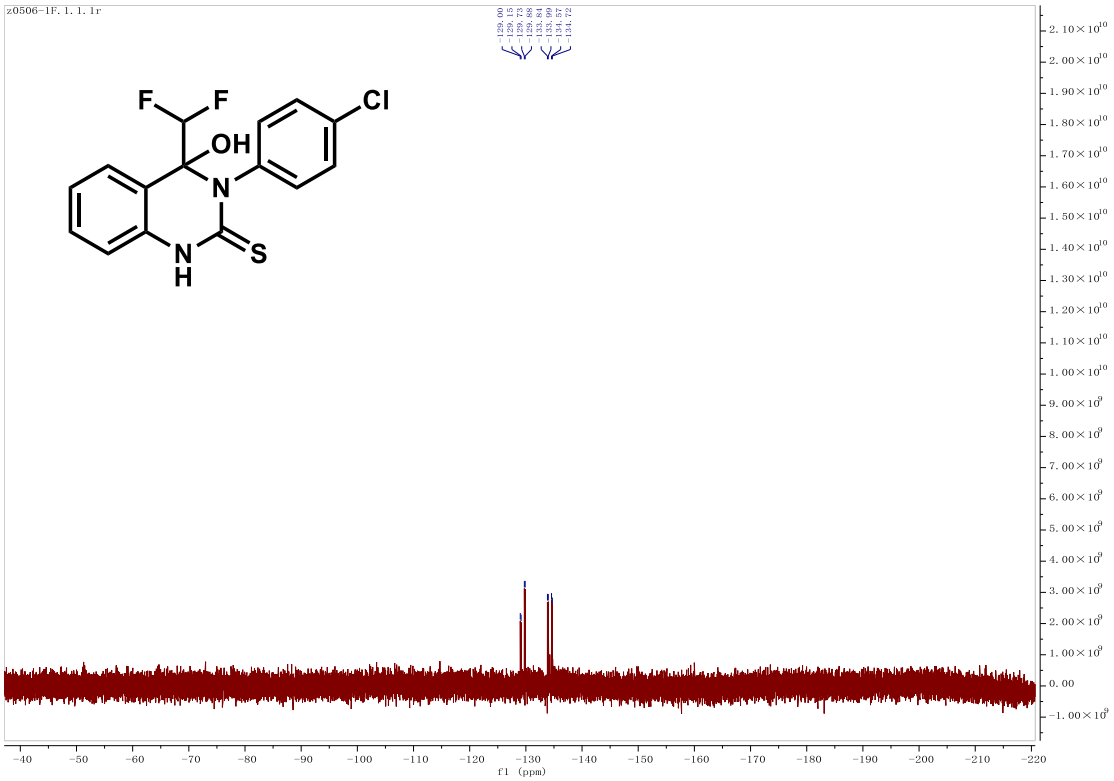
[1]H NMR of Compound **3ad** (400 MHz, DMSO)



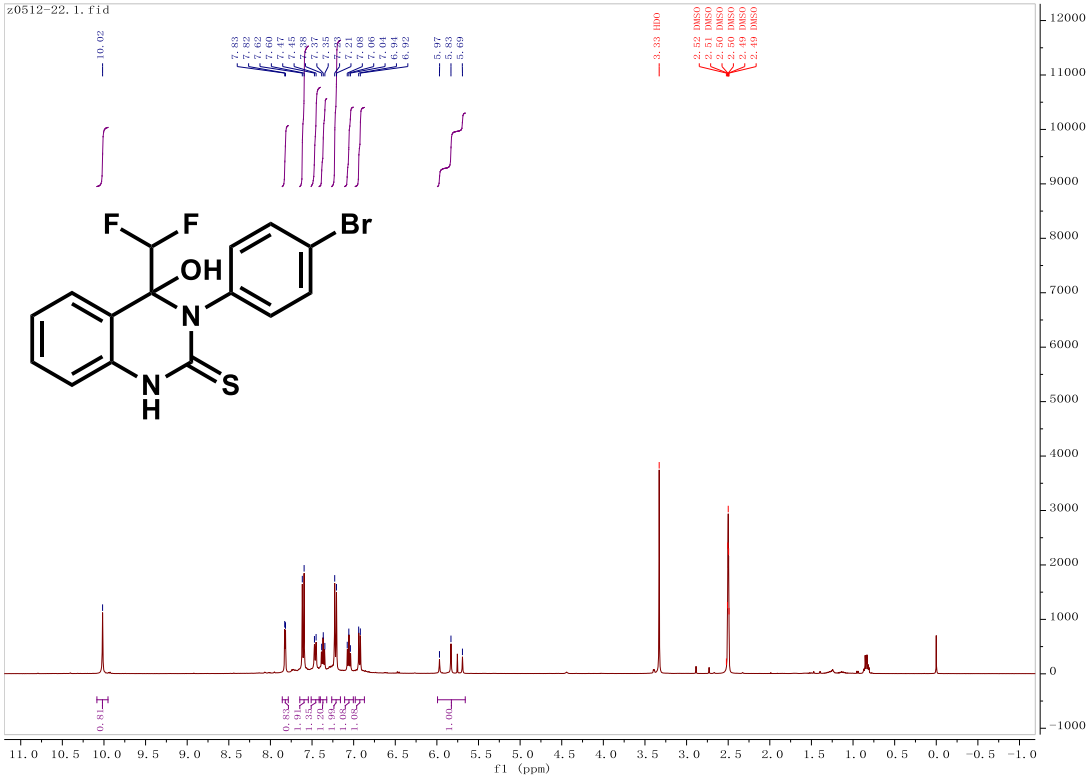
^{13}C NMR of Compound **3ad** (101 MHz, DMSO)



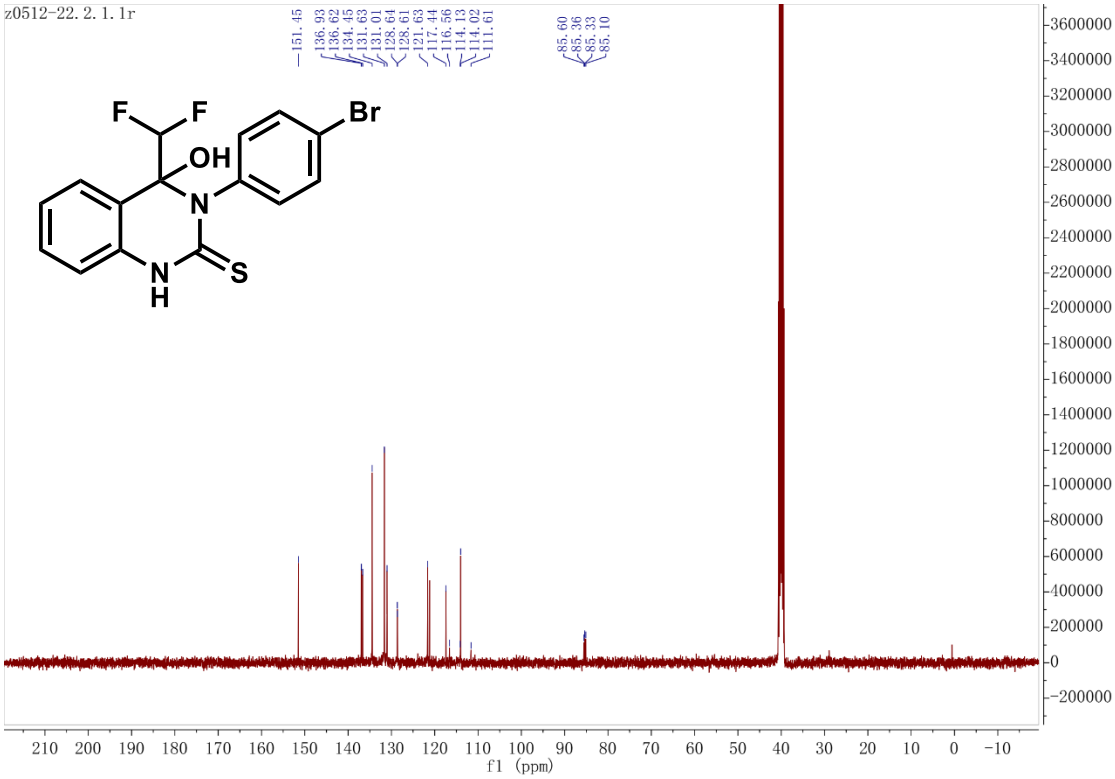
^{19}F NMR of Compound **3ad** (376 MHz, DMSO)



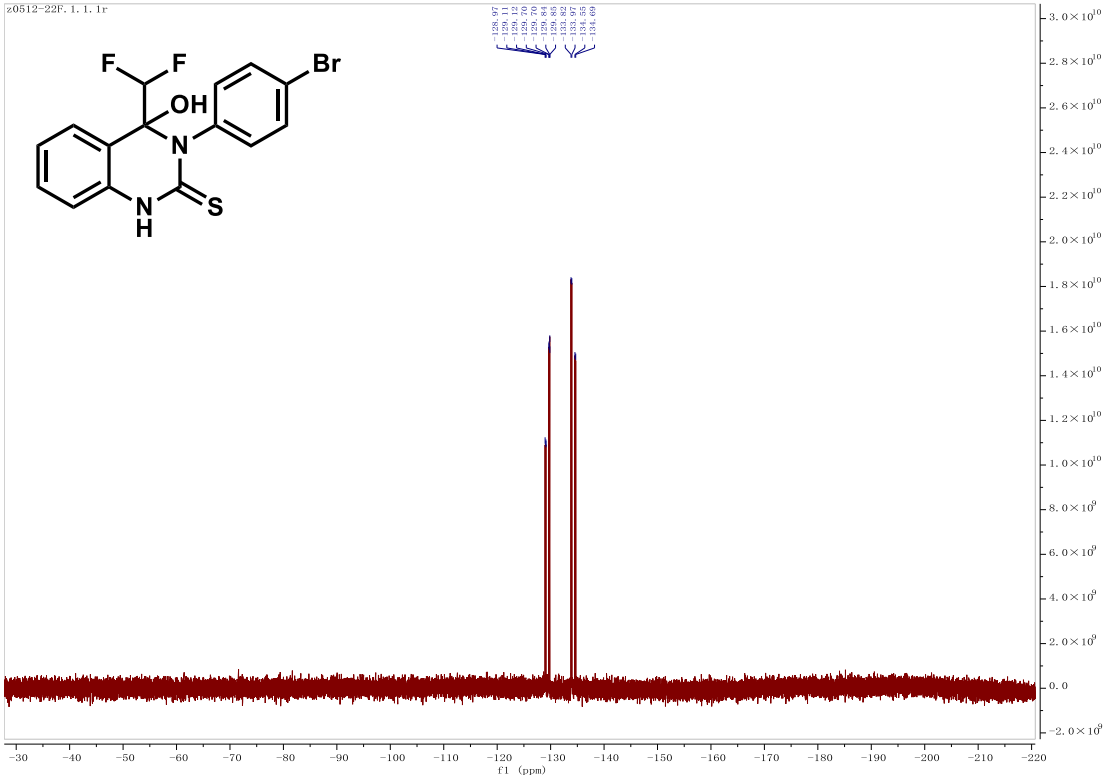
[1]H NMR of Compound **3ae** (400 MHz, DMSO)



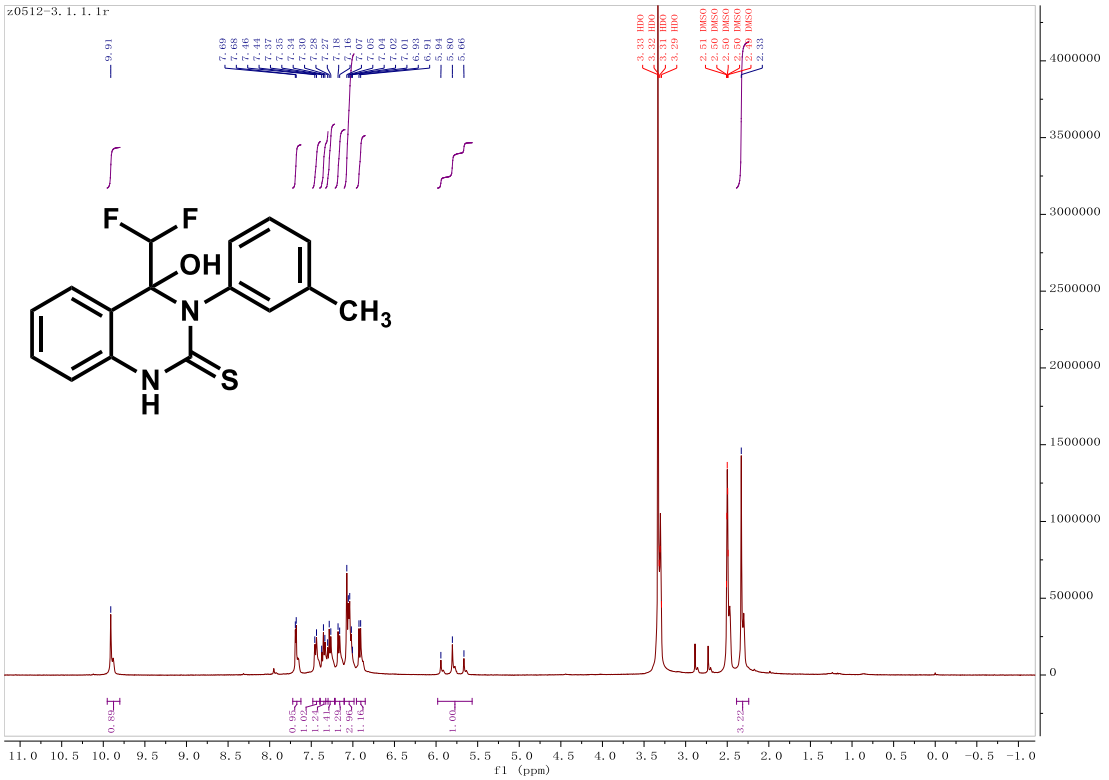
[13]C NMR of Compound **3ae** (101 MHz, DMSO)



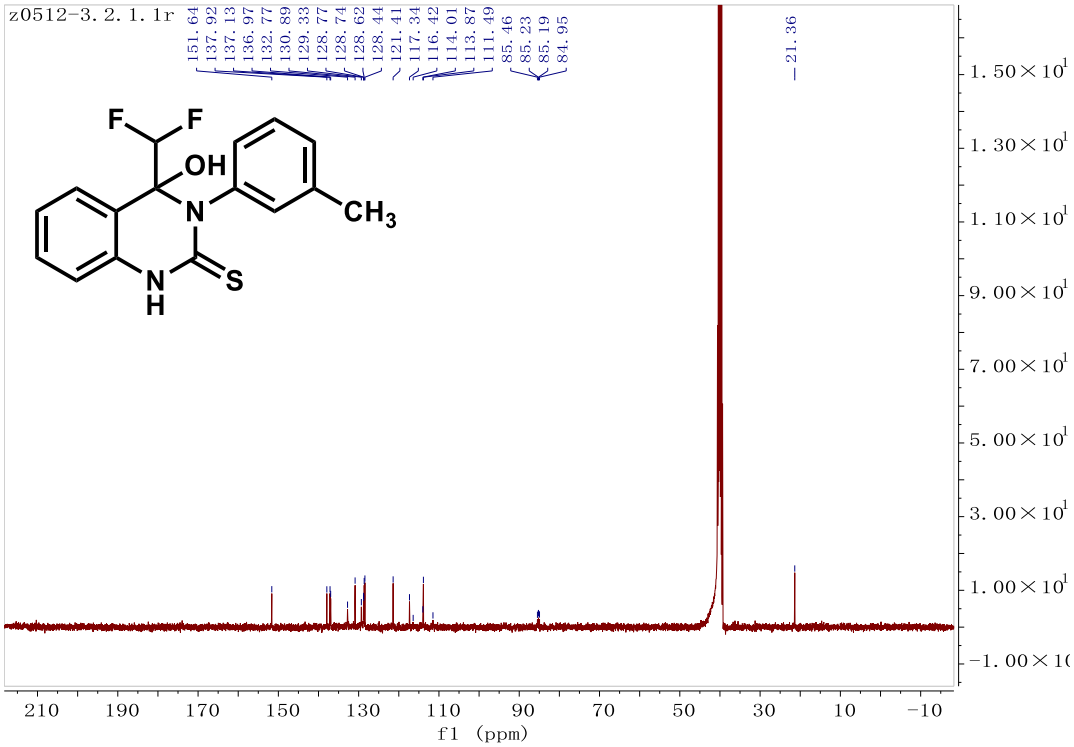
[19]F NMR of Compound **3ae** (376 MHz, DMSO)



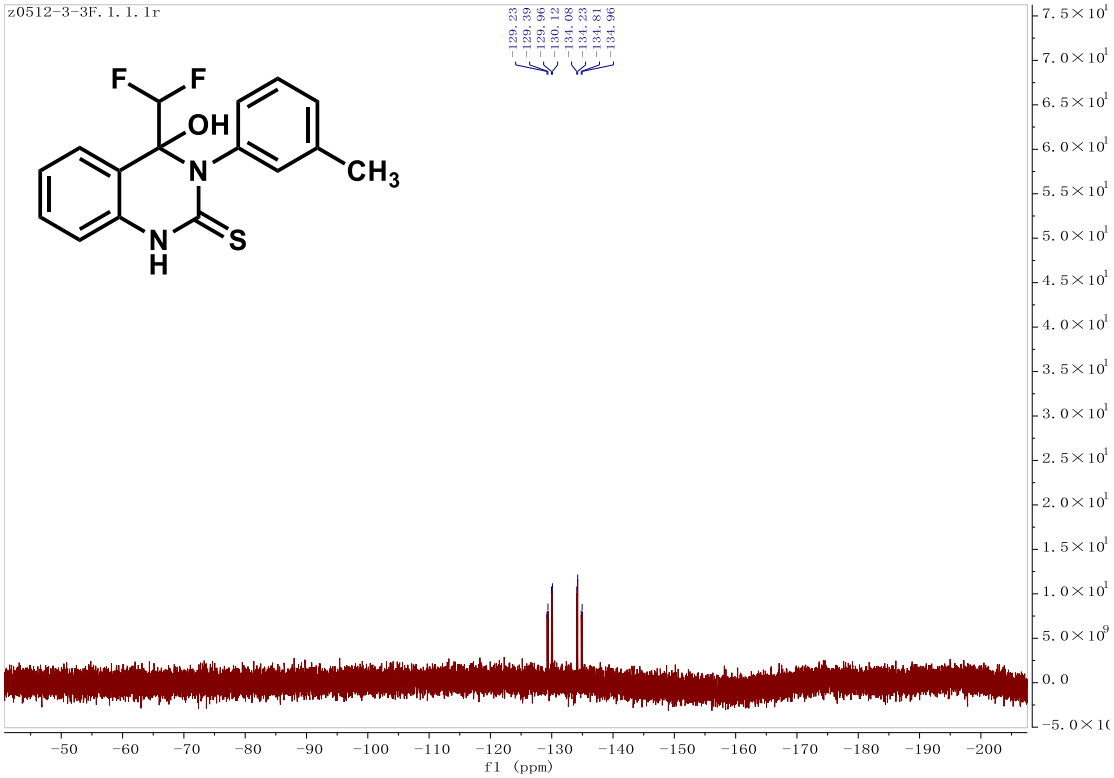
[1]H NMR of Compound **3af** (400 MHz, DMSO)



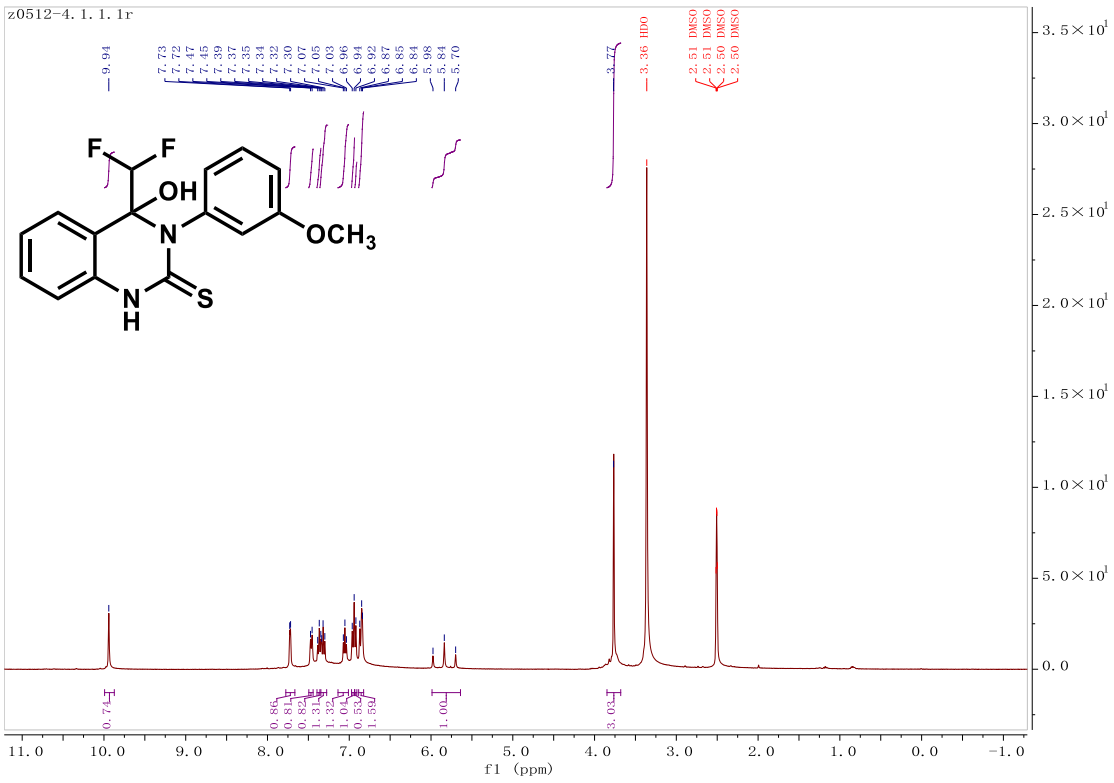
^{13}C NMR of Compound **3af** (101 MHz, DMSO)



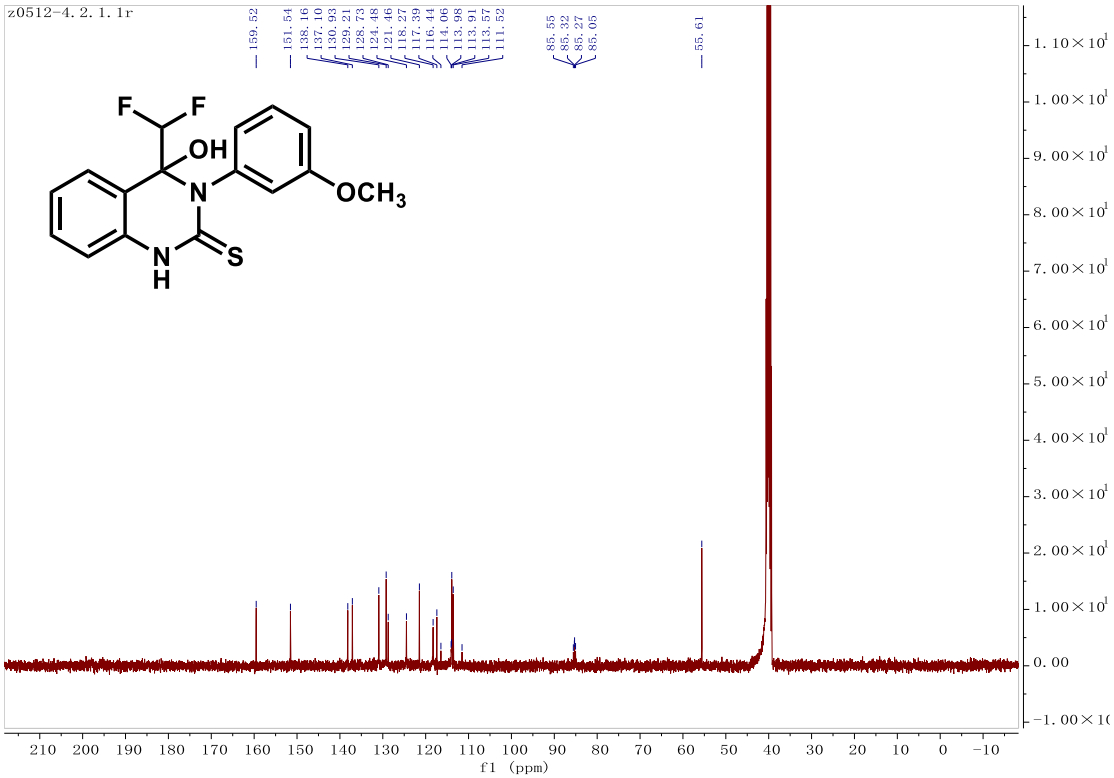
^{19}F NMR of Compound **3af** (376 MHz, DMSO)



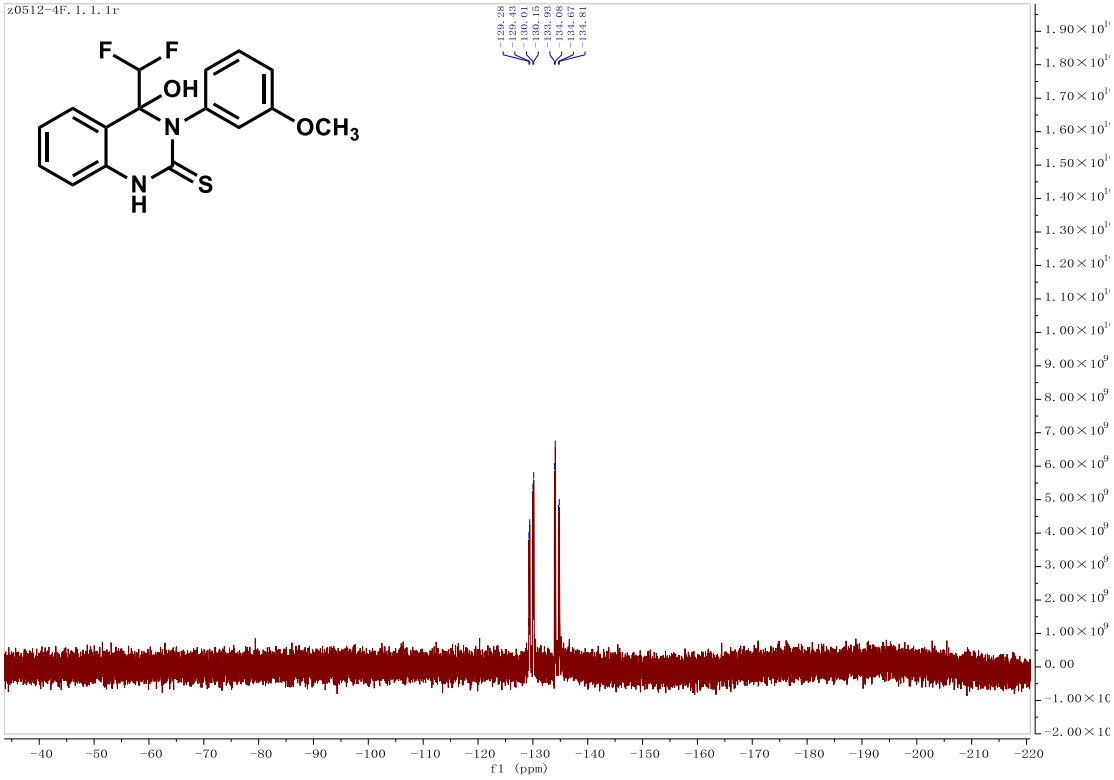
[1]H NMR of Compound **3ag** (400 MHz, DMSO)



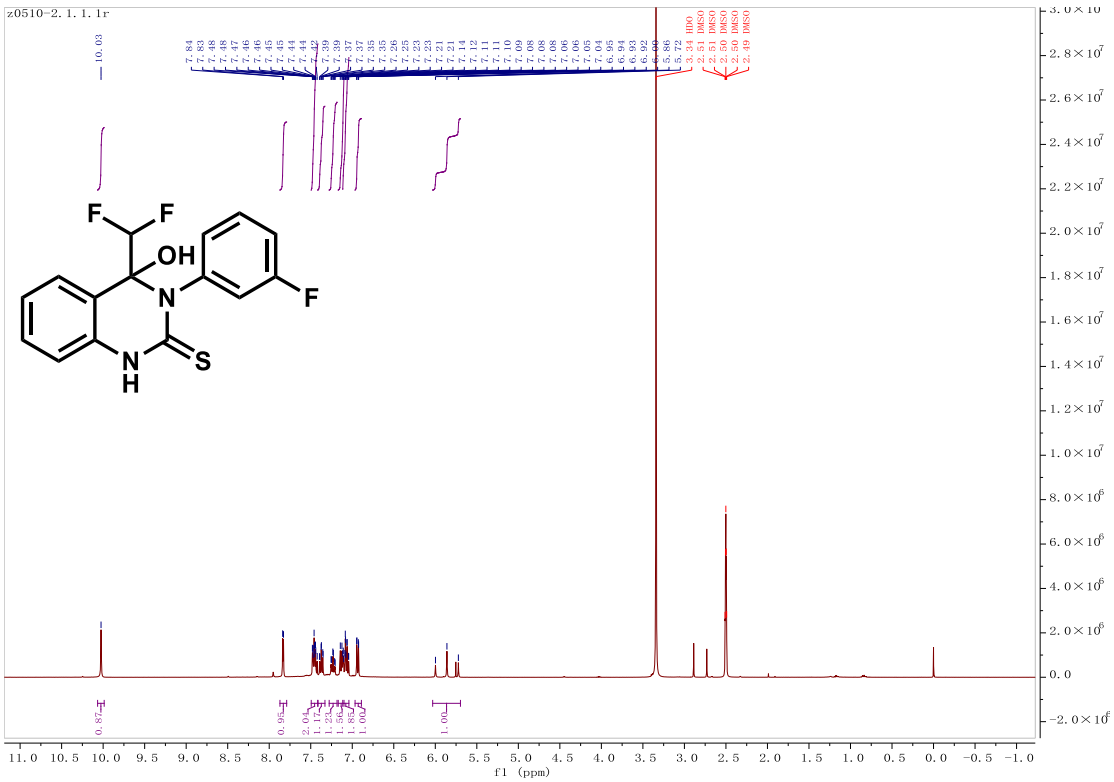
[13]C NMR of Compound **3ag** (101 MHz, DMSO)



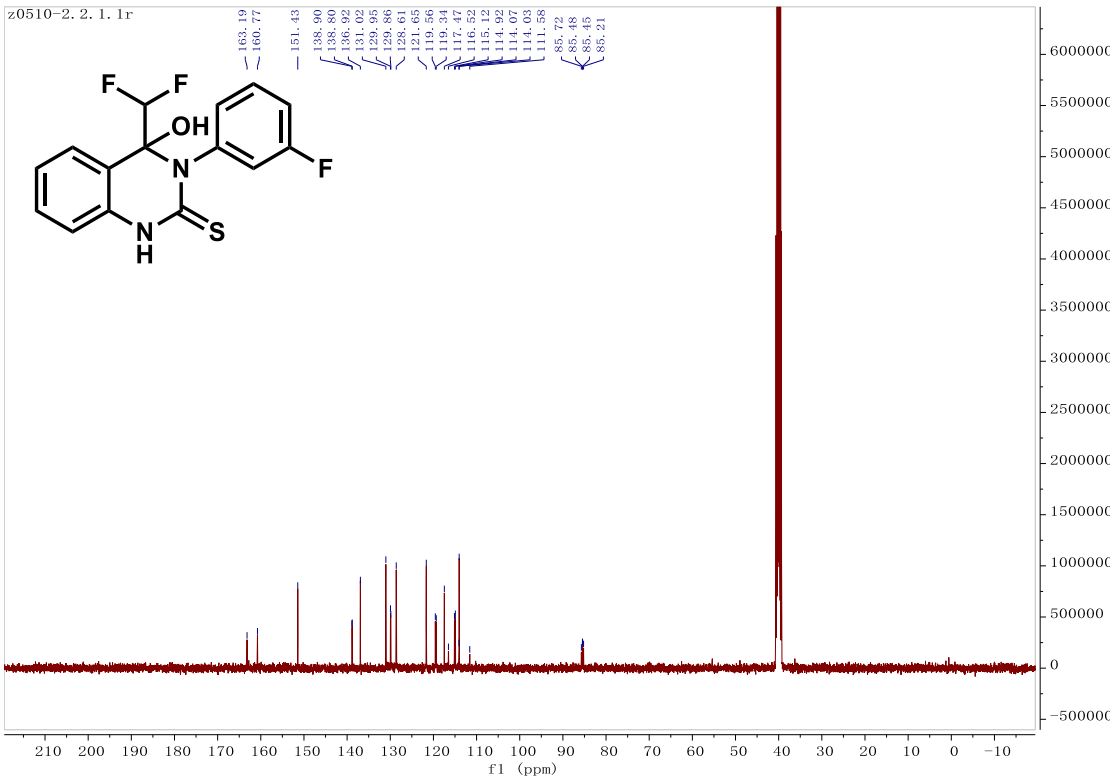
^{19}F NMR of Compound **3ag** (376 MHz, DMSO)



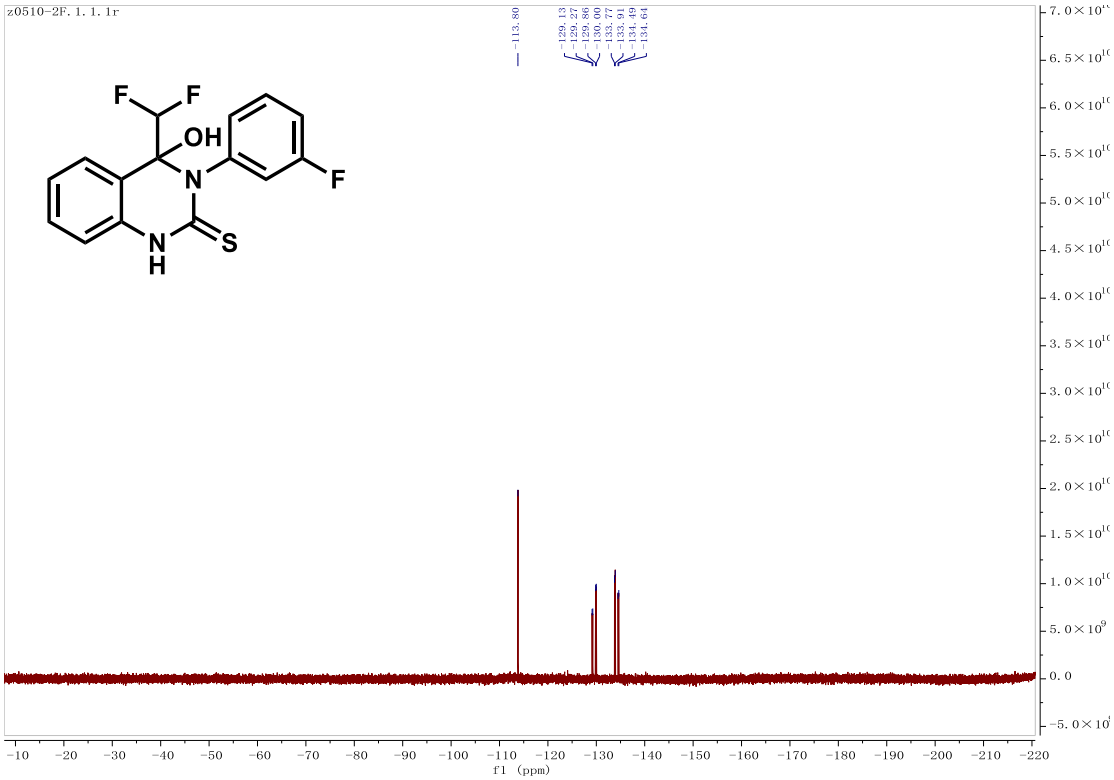
^{1}H NMR of Compound **3ah** (400 MHz, DMSO)



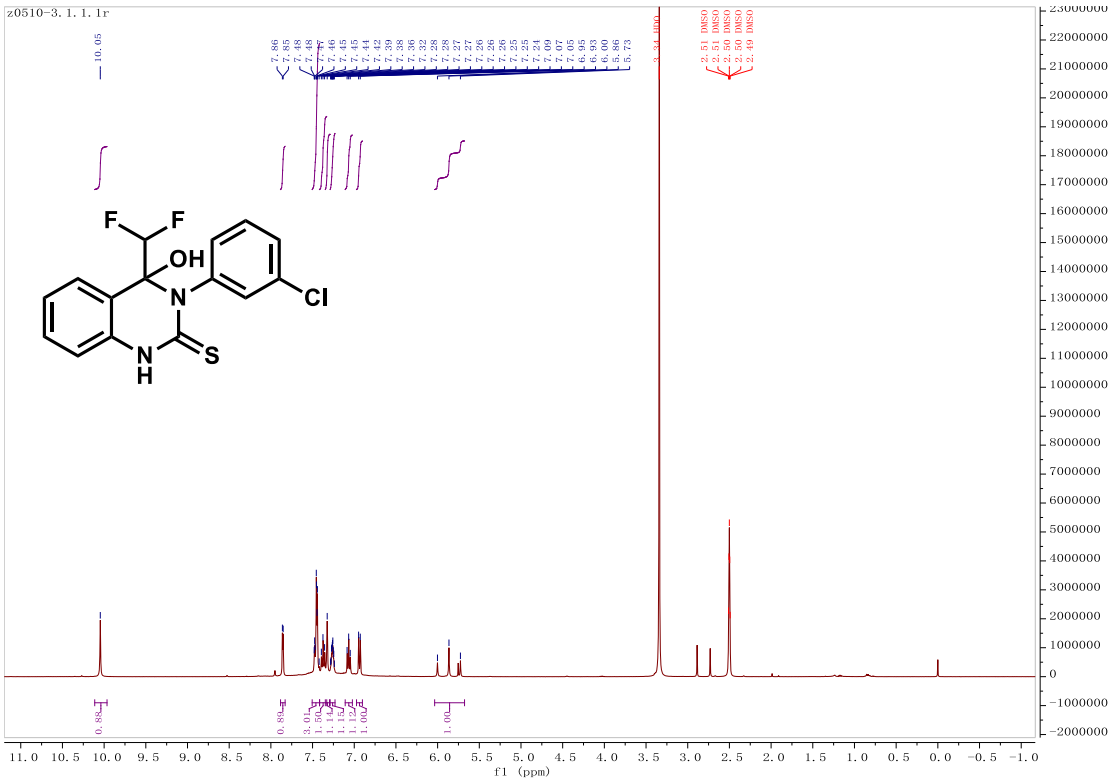
^{13}C NMR of Compound **3ah** (101 MHz, DMSO)



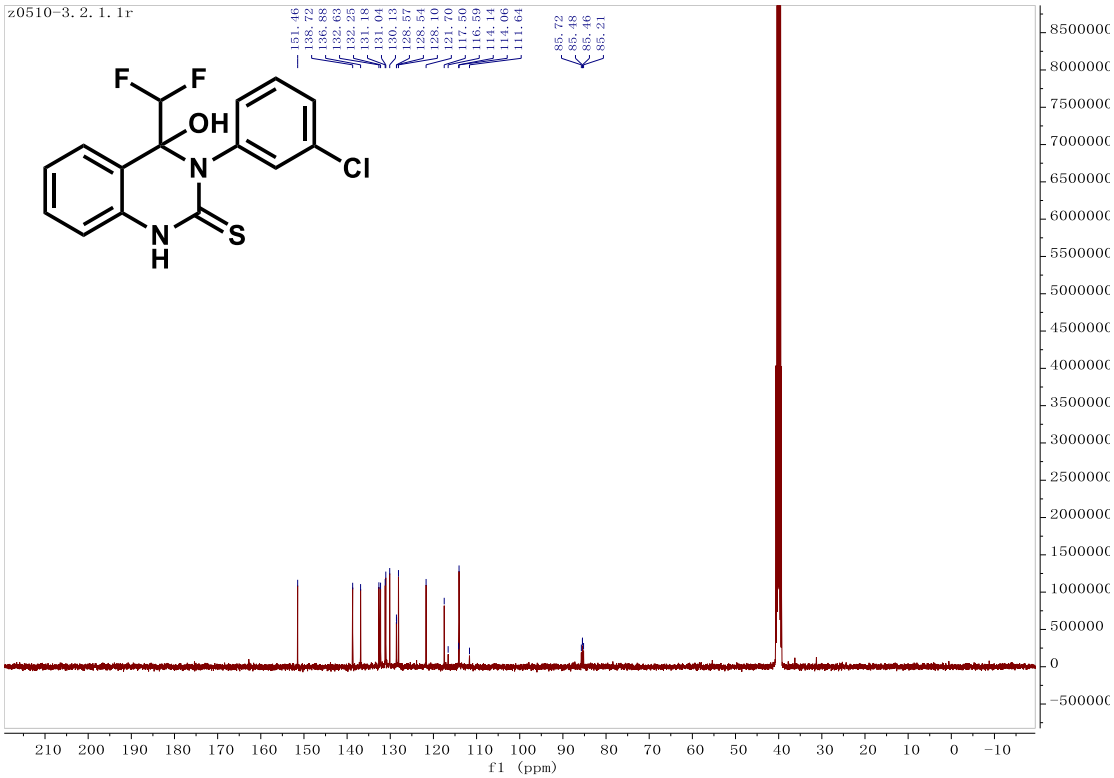
^{19}F NMR of Compound **3ah** (376 MHz, DMSO)



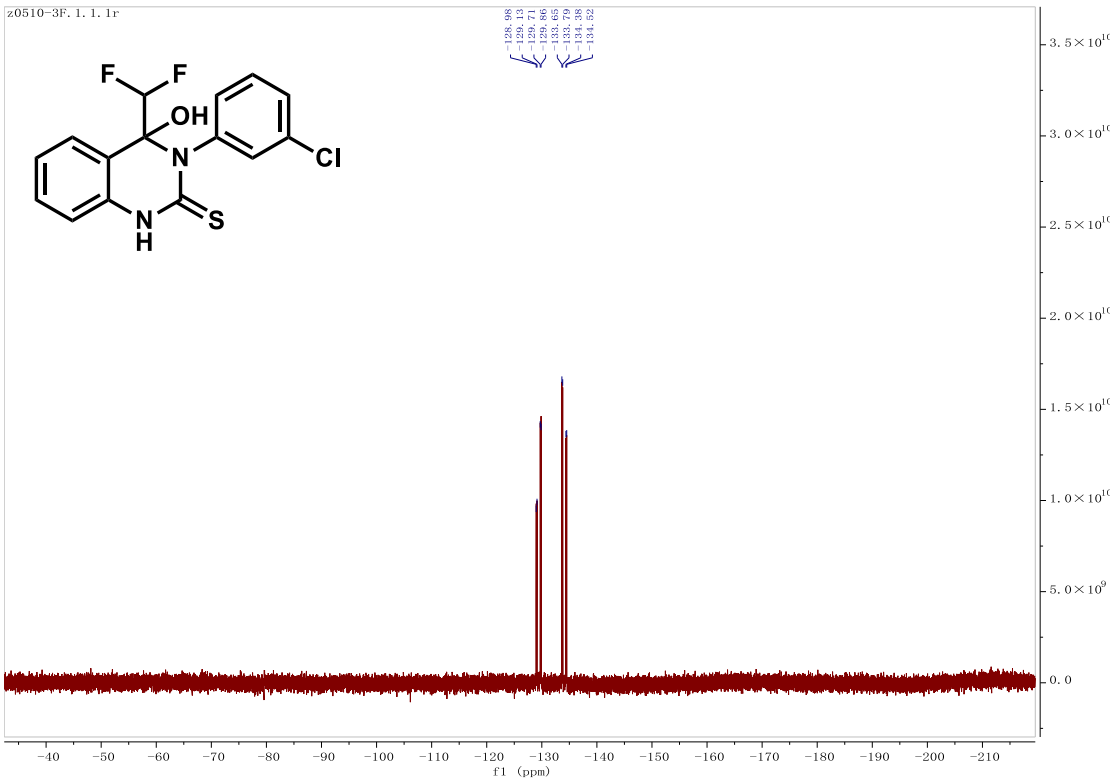
[1]H NMR of Compound **3ai** (400 MHz, DMSO)



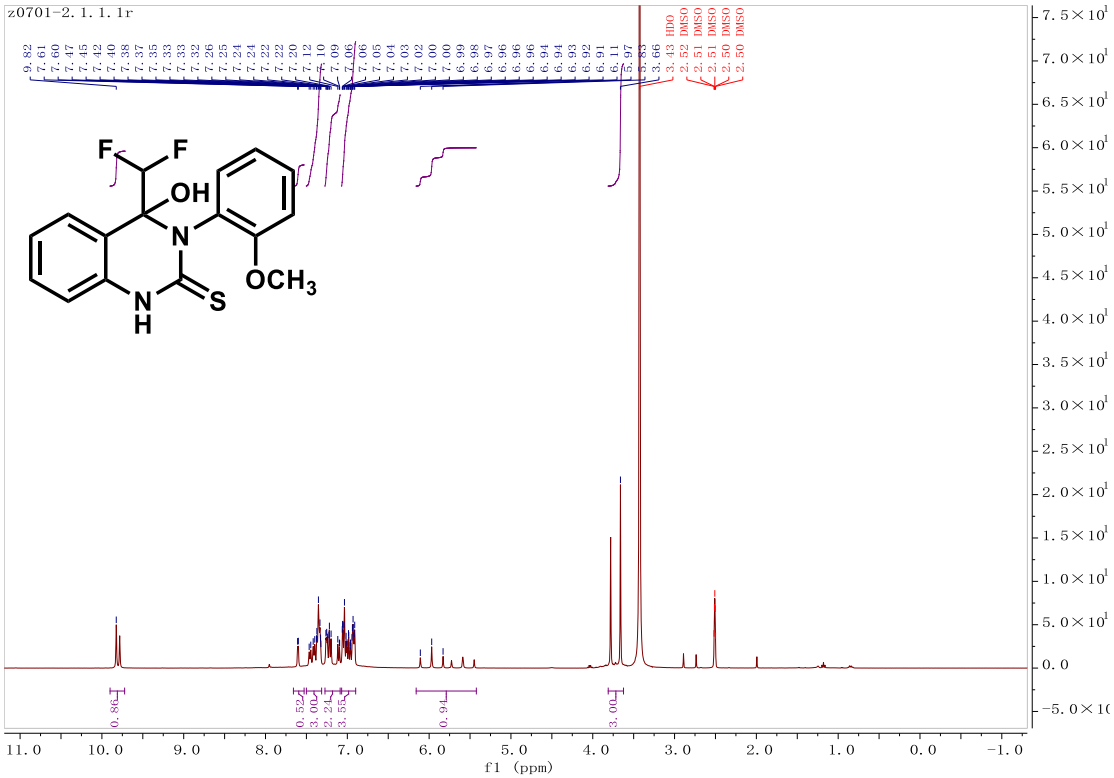
[13]C NMR of Compound **3ai** (101 MHz, DMSO)



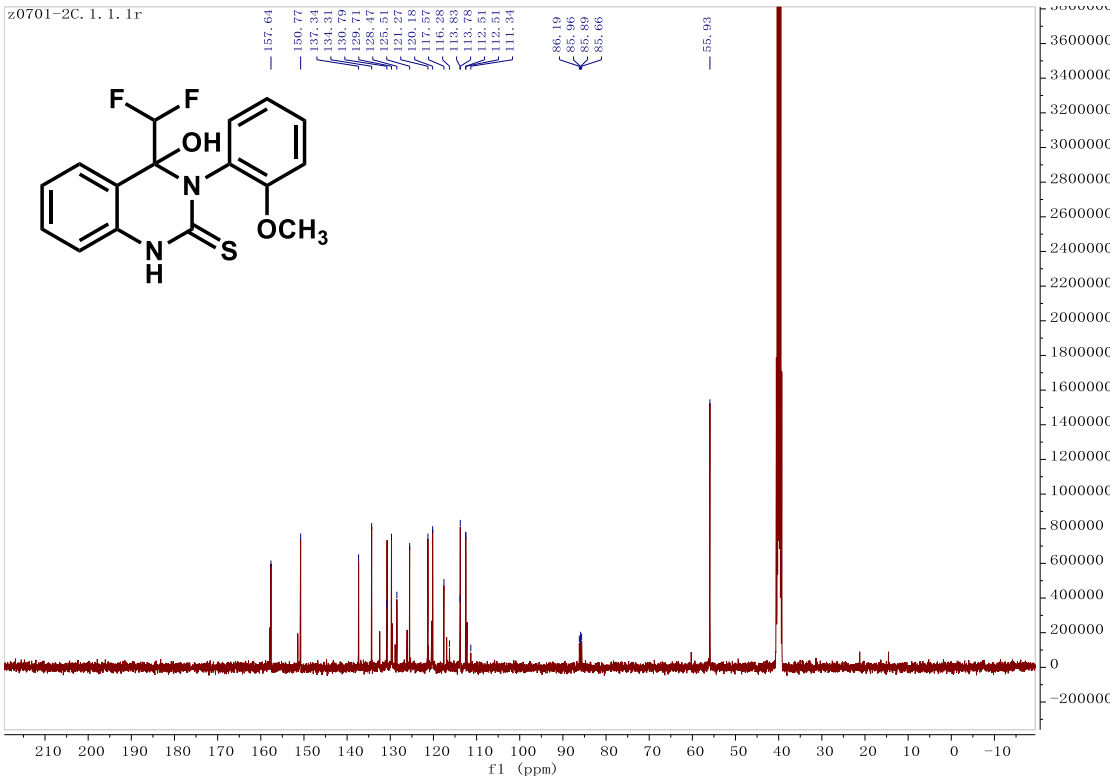
[19]F NMR of Compound **3ai** (376 MHz, DMSO)



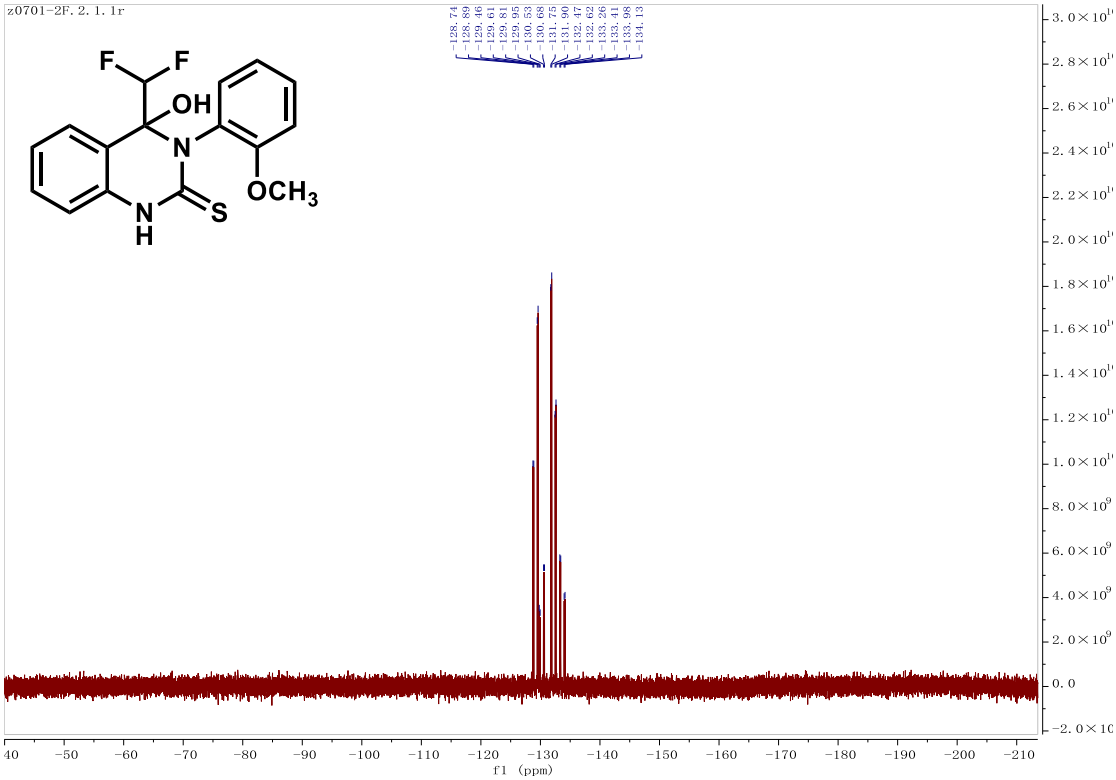
[1]H NMR of Compound **3aj** (400 MHz, DMSO)



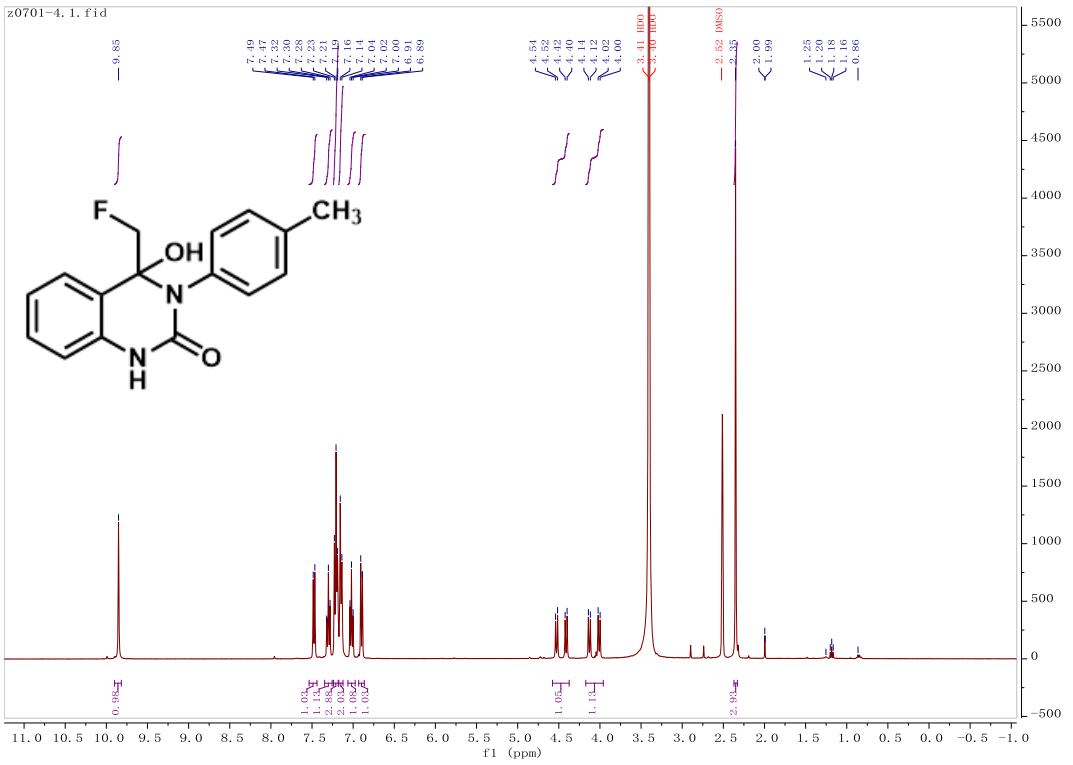
^{13}C NMR of Compound **3aj** (101 MHz, DMSO)



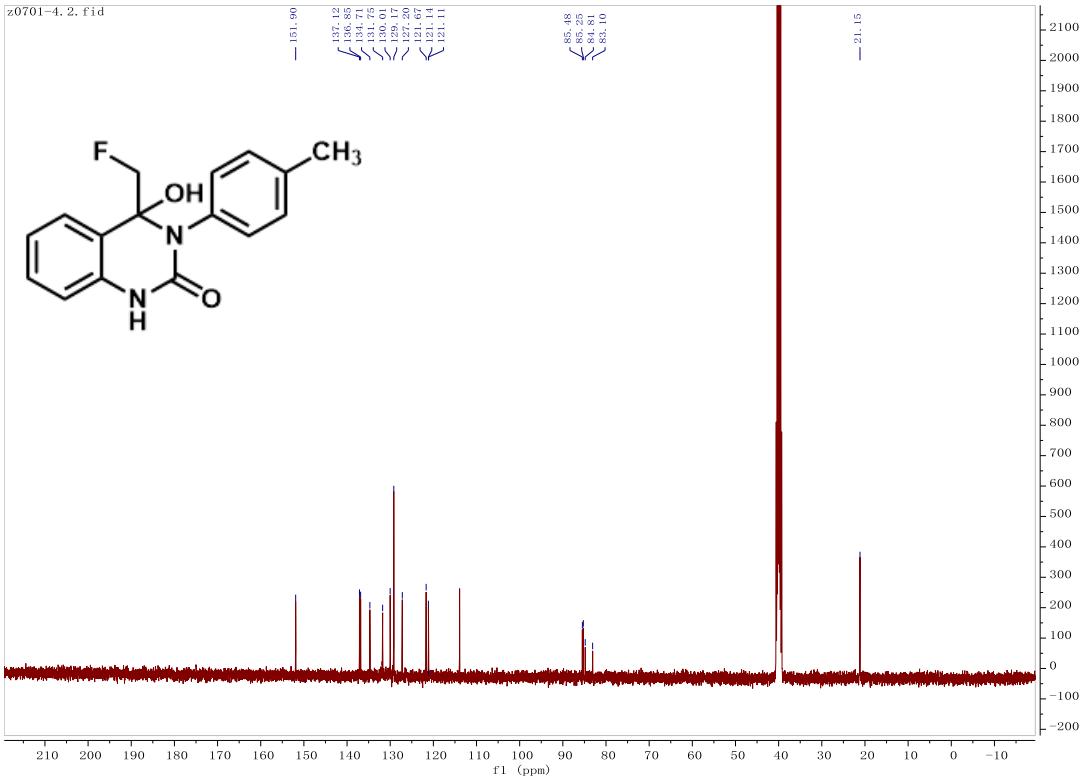
^{19}F NMR of Compound **3aj** (376 MHz, DMSO)



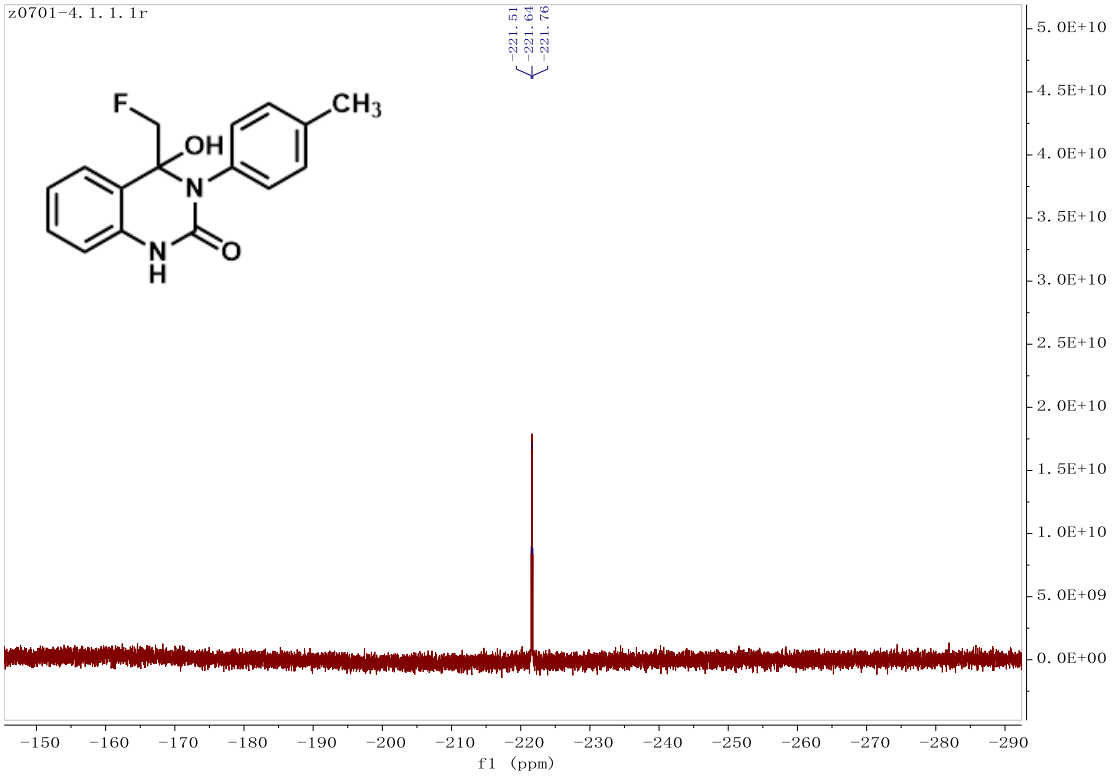
[1]H NMR of Compound **4b** (400 MHz, DMSO)



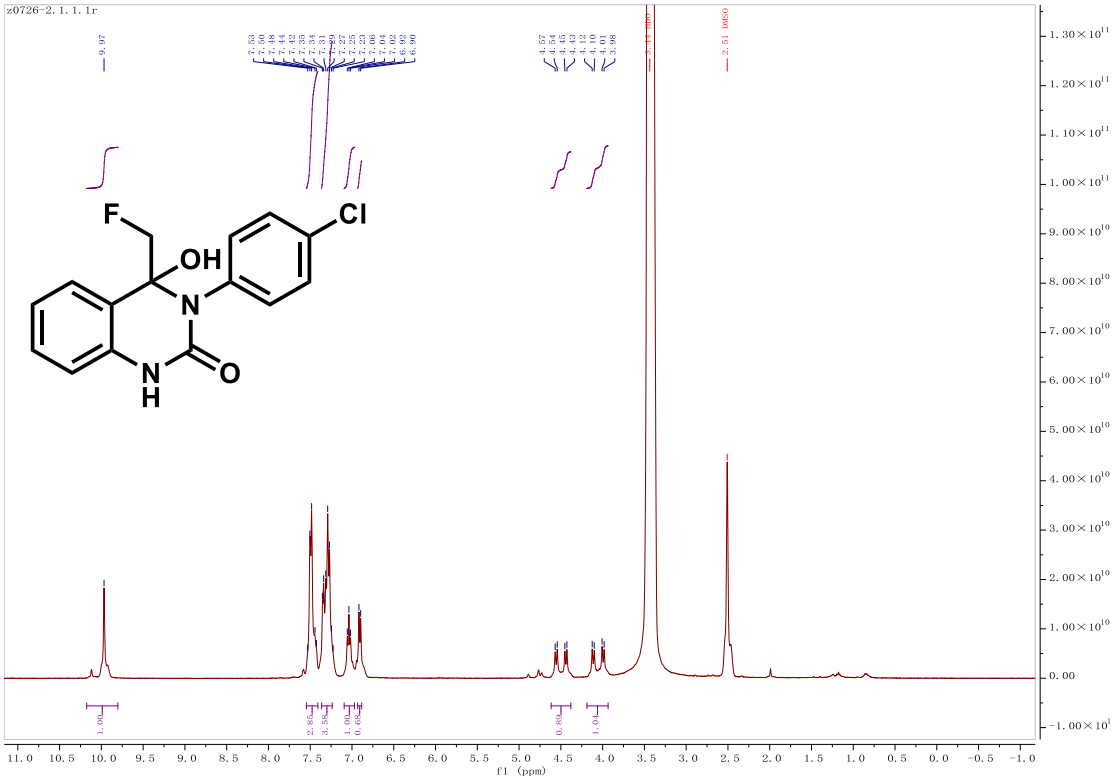
[13]C NMR of Compound **4b** (101 MHz, DMSO)



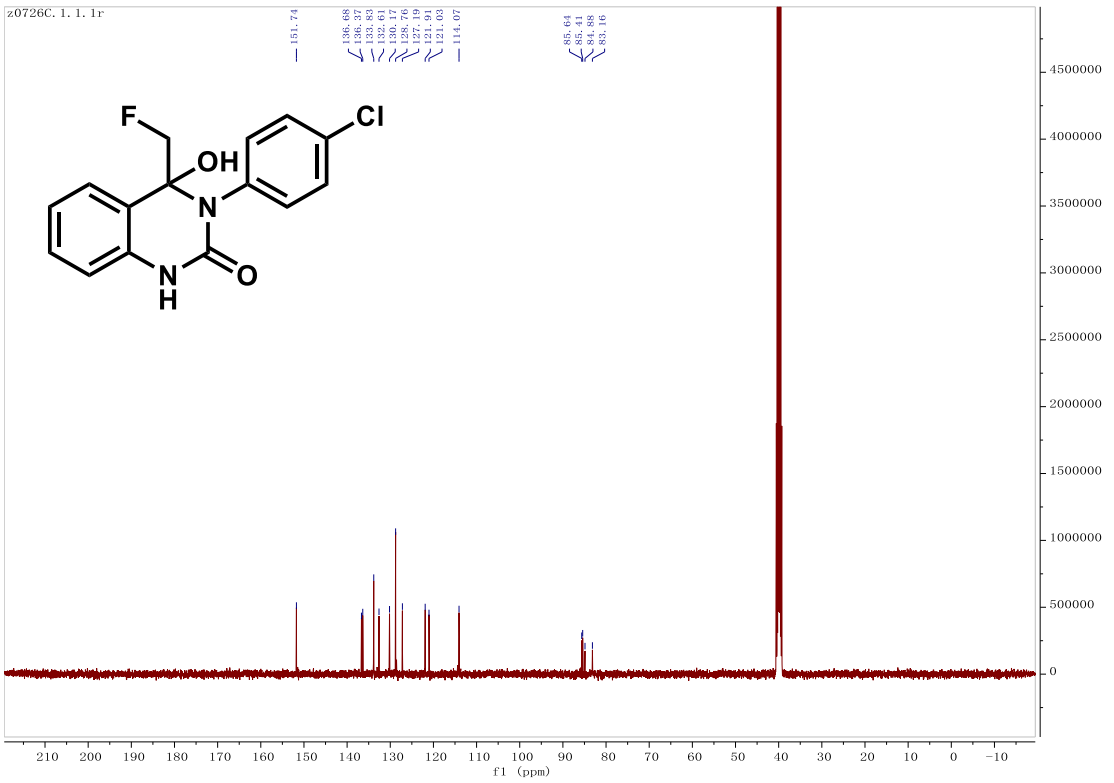
[19]F NMR of Compound **4b** (376 MHz, DMSO)



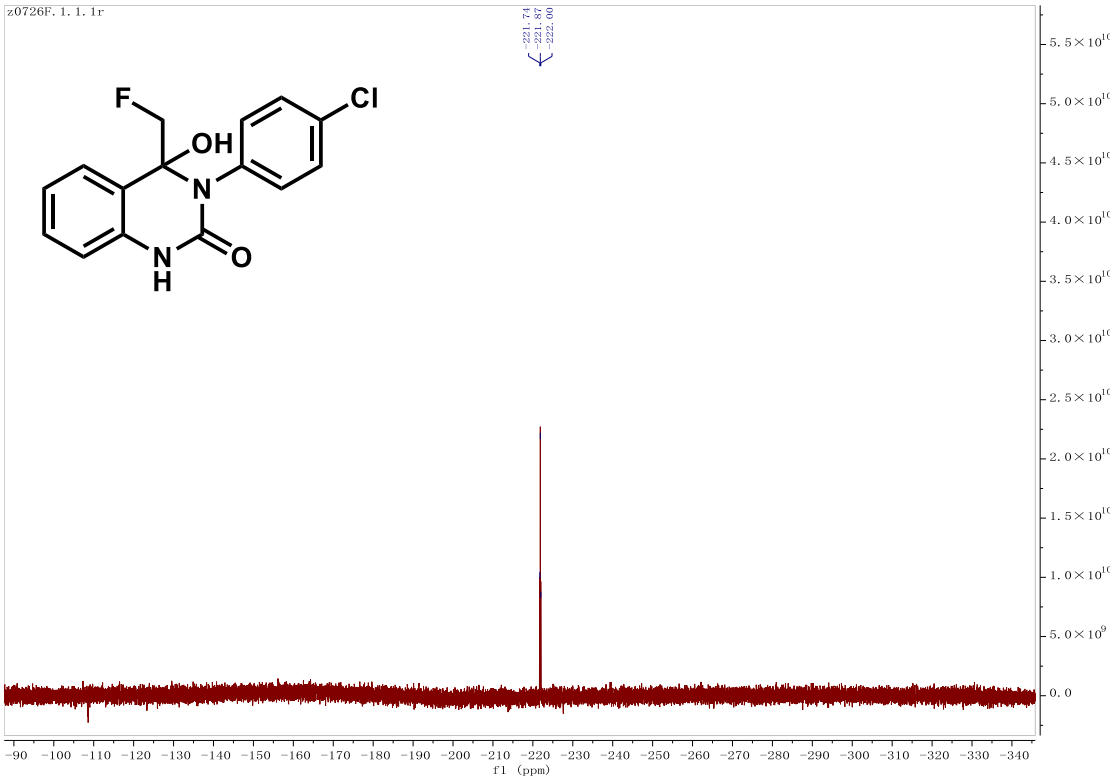
[1]H NMR of Compound **4c** (400 MHz, DMSO)



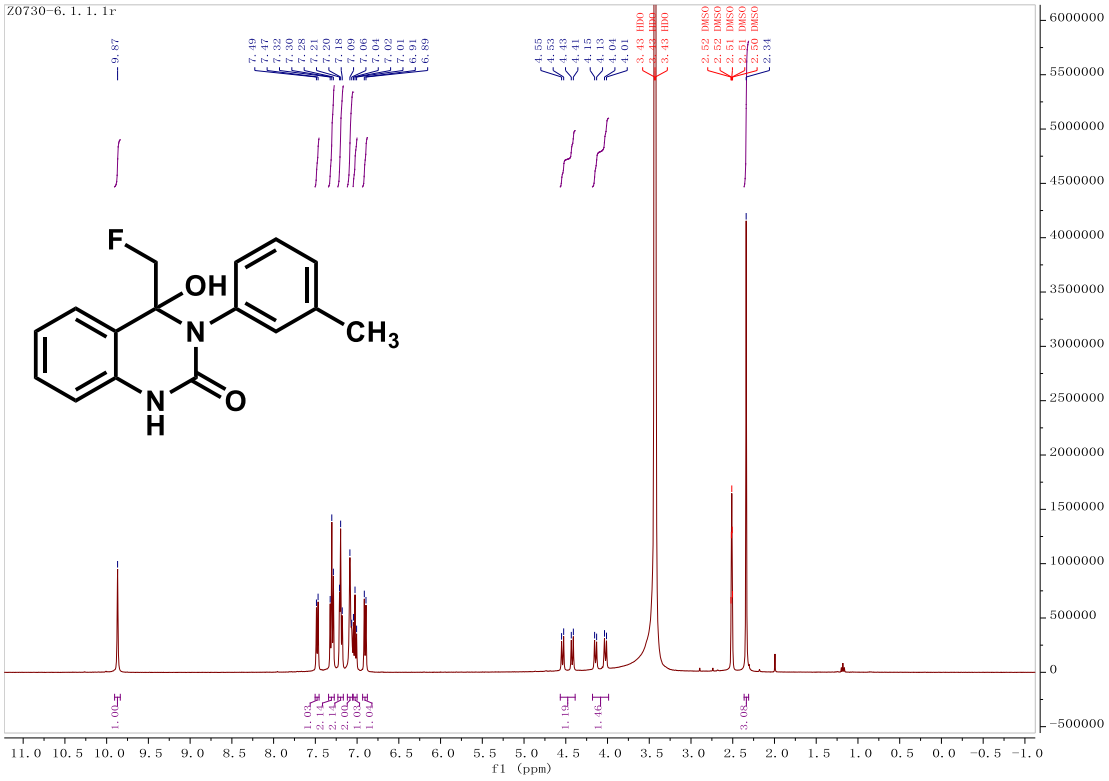
[13]C NMR of Compound **4c** (101 MHz, DMSO)



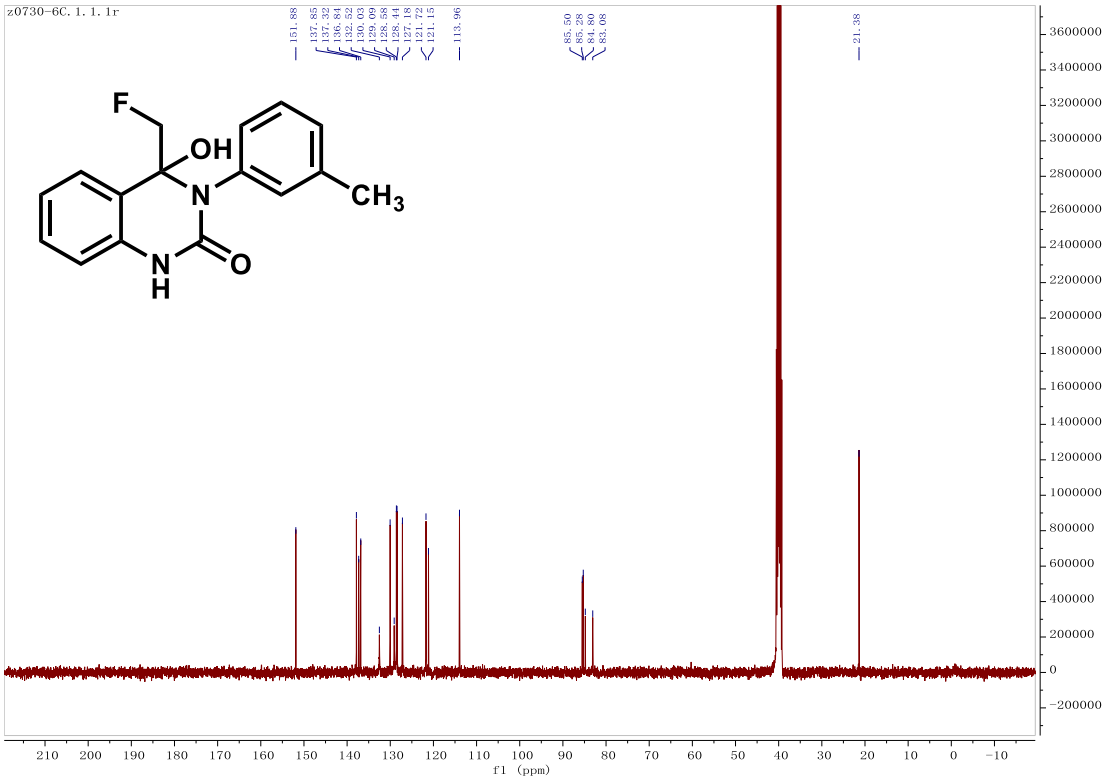
[19]F NMR of Compound **4c** (376 MHz, DMSO)



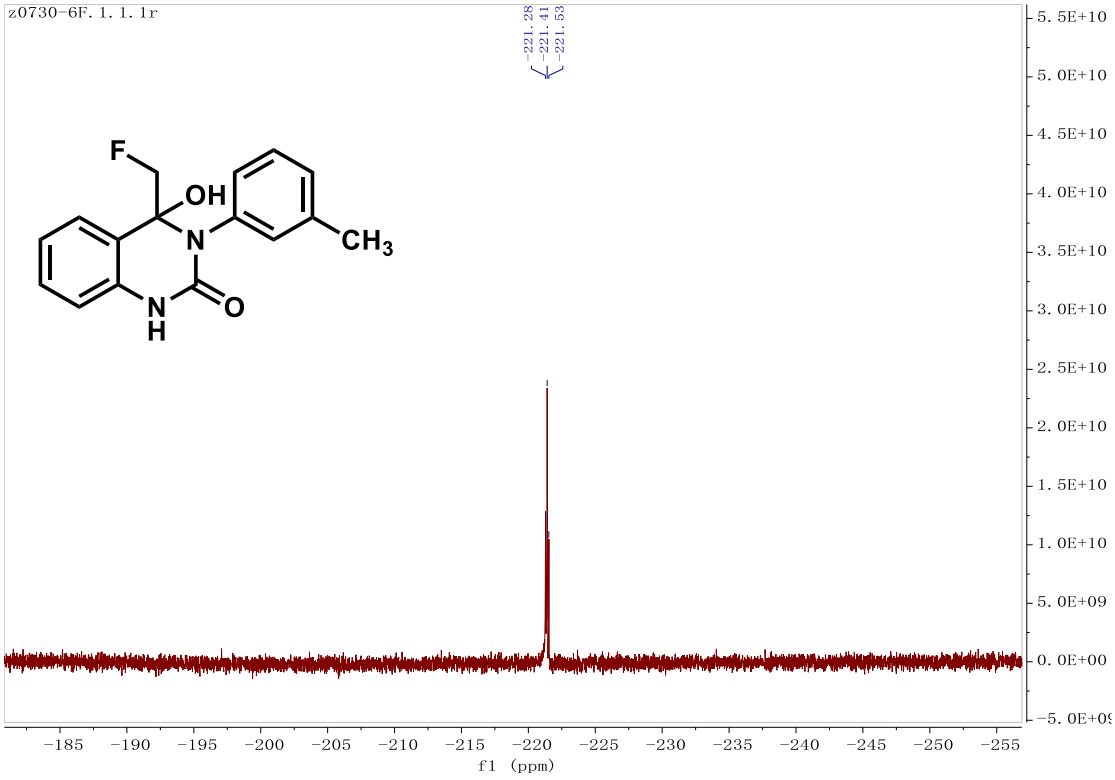
[1]H NMR of Compound **4d** (400 MHz, DMSO)



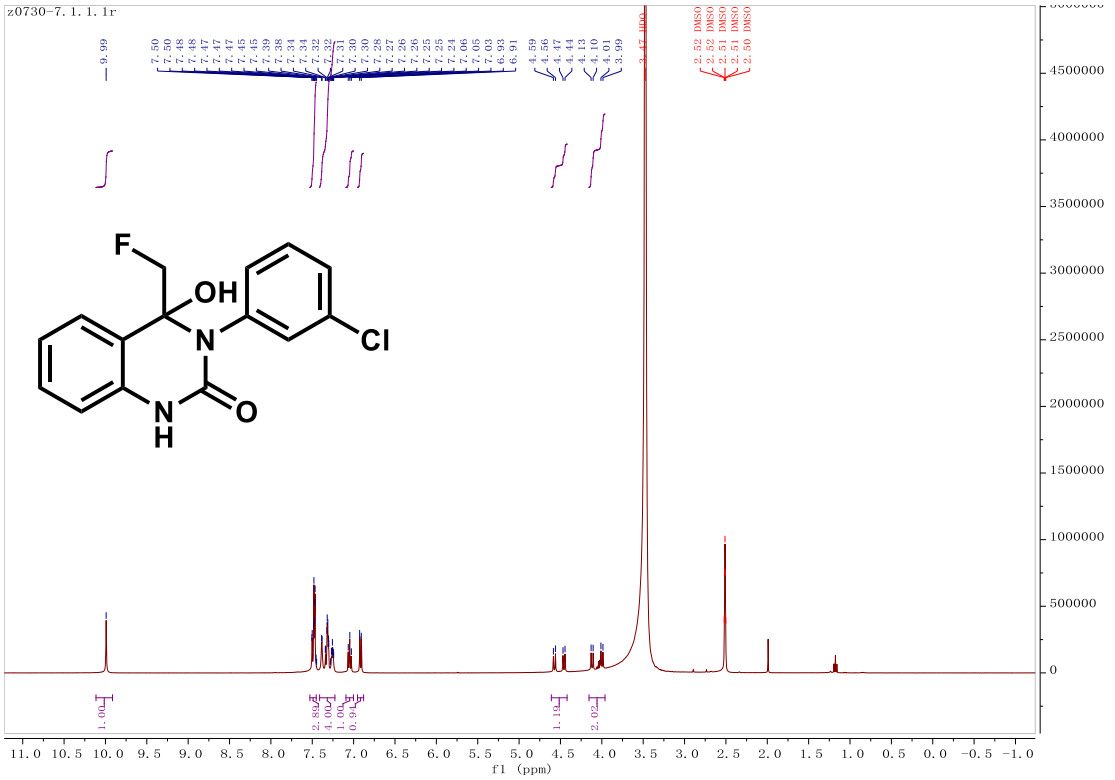
[13]C NMR of Compound **4d** (101 MHz, DMSO)



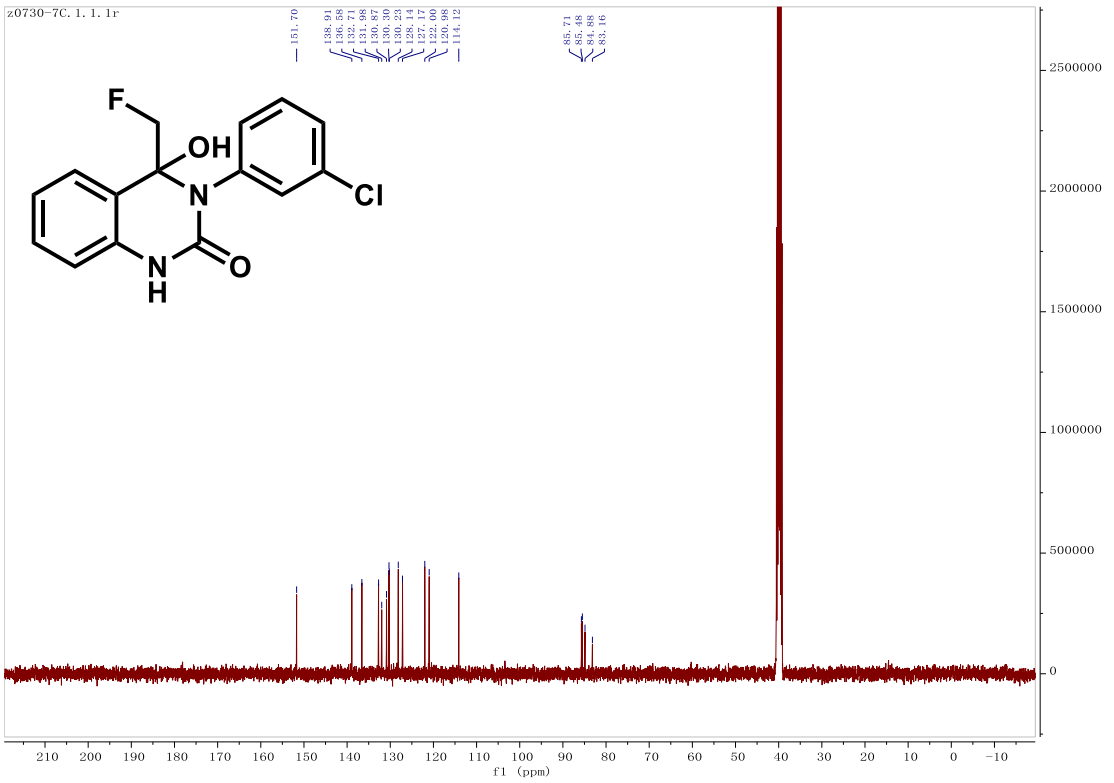
[19]F NMR of Compound **4d** (376 MHz, DMSO)



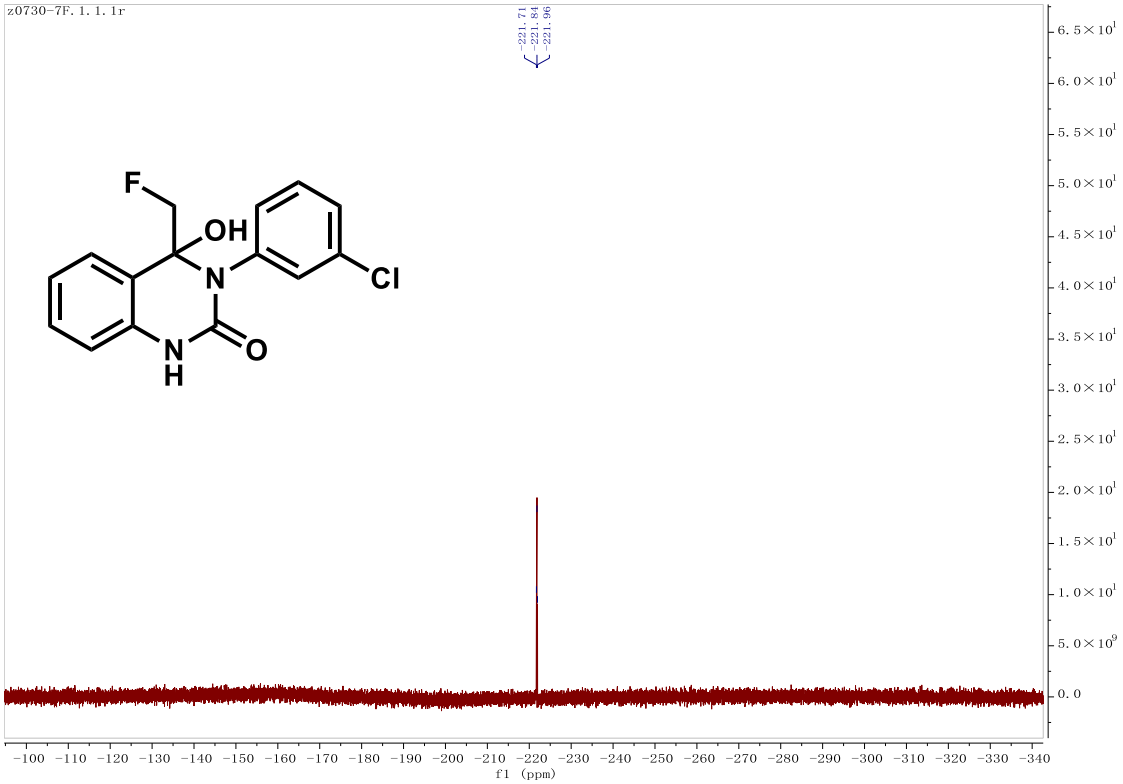
[1]H NMR of Compound **4e** (400 MHz, DMSO)



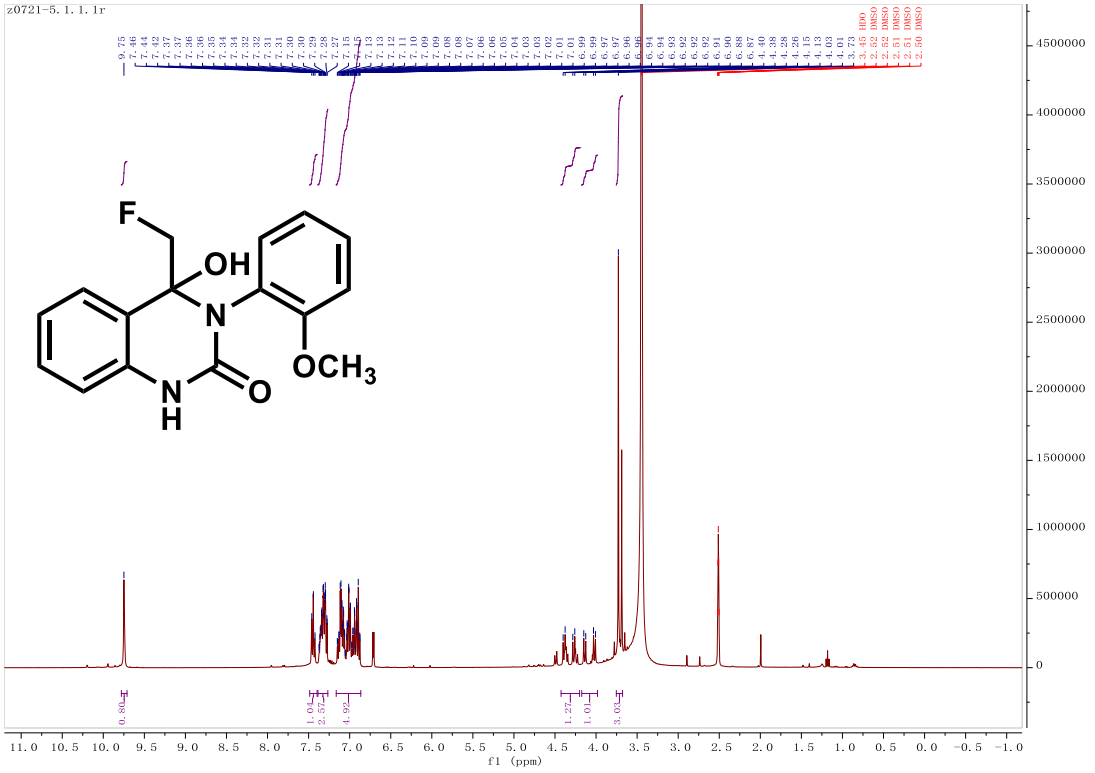
^{13}C NMR of Compound **4e** (101 MHz, DMSO)



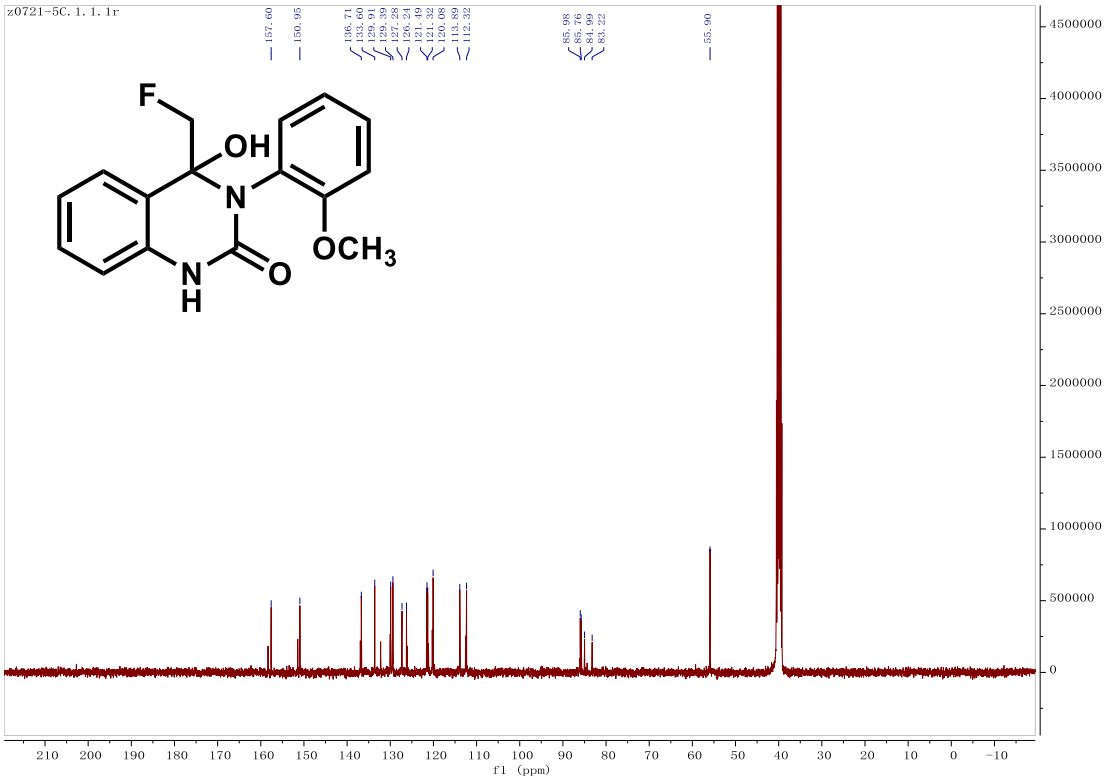
^{19}F NMR of Compound **4e** (376 MHz, DMSO)



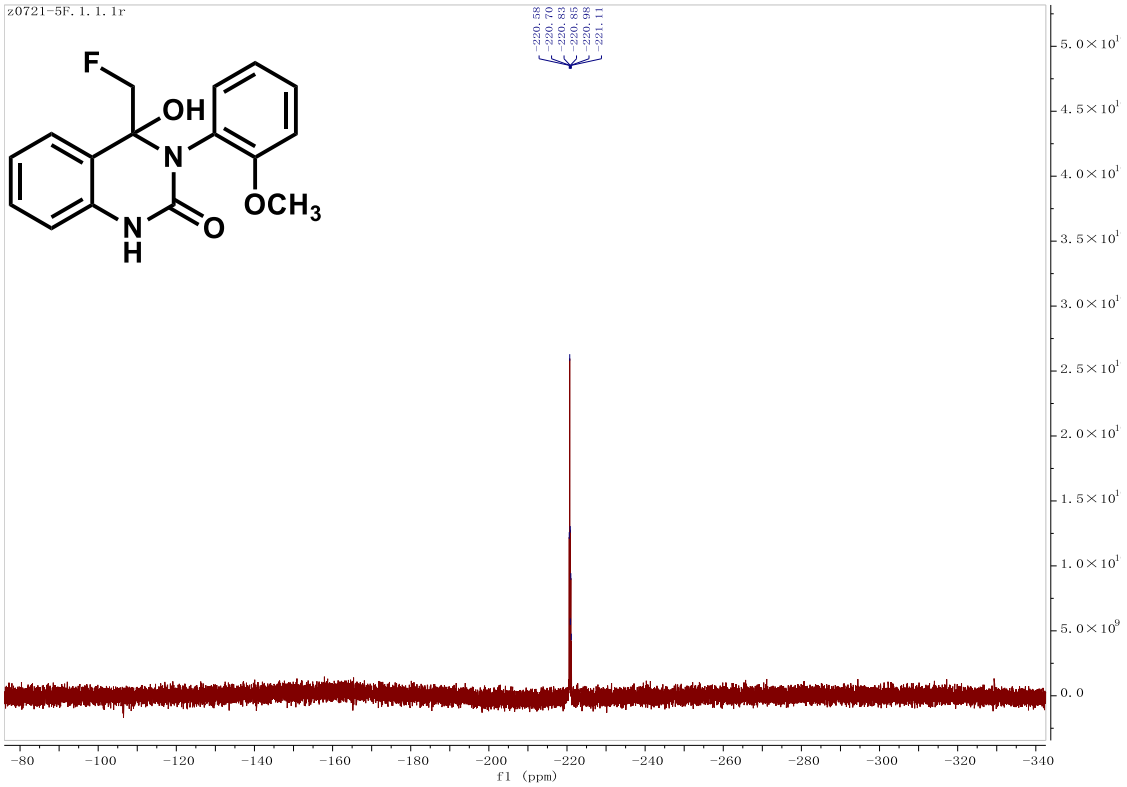
[1]H NMR of Compound **4f** (400 MHz, DMSO)



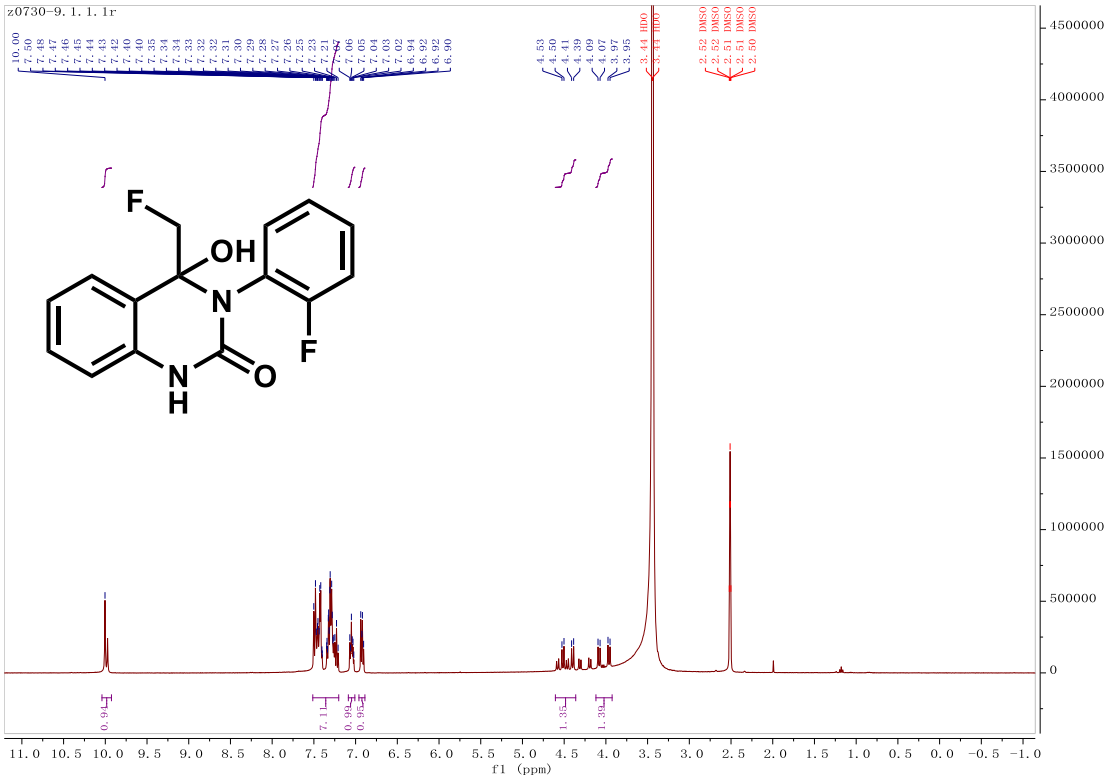
[13]C NMR of Compound **4f** (101 MHz, DMSO)



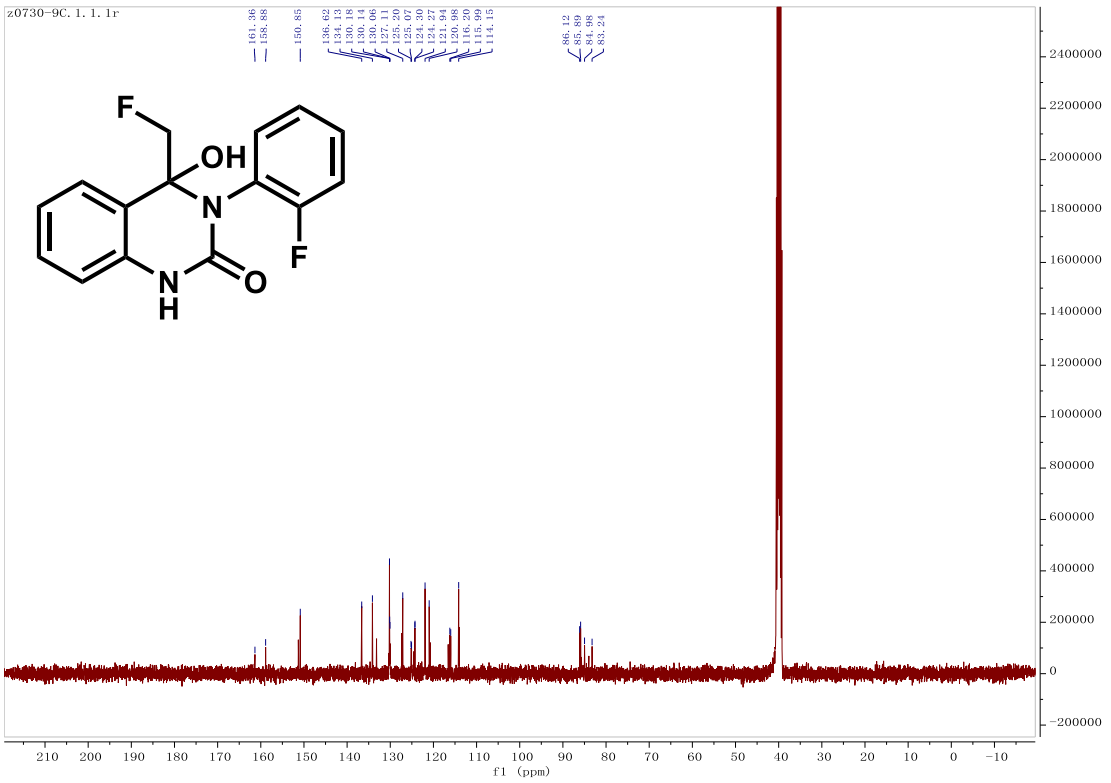
[19]F NMR of Compound **4f** (376 MHz, DMSO)



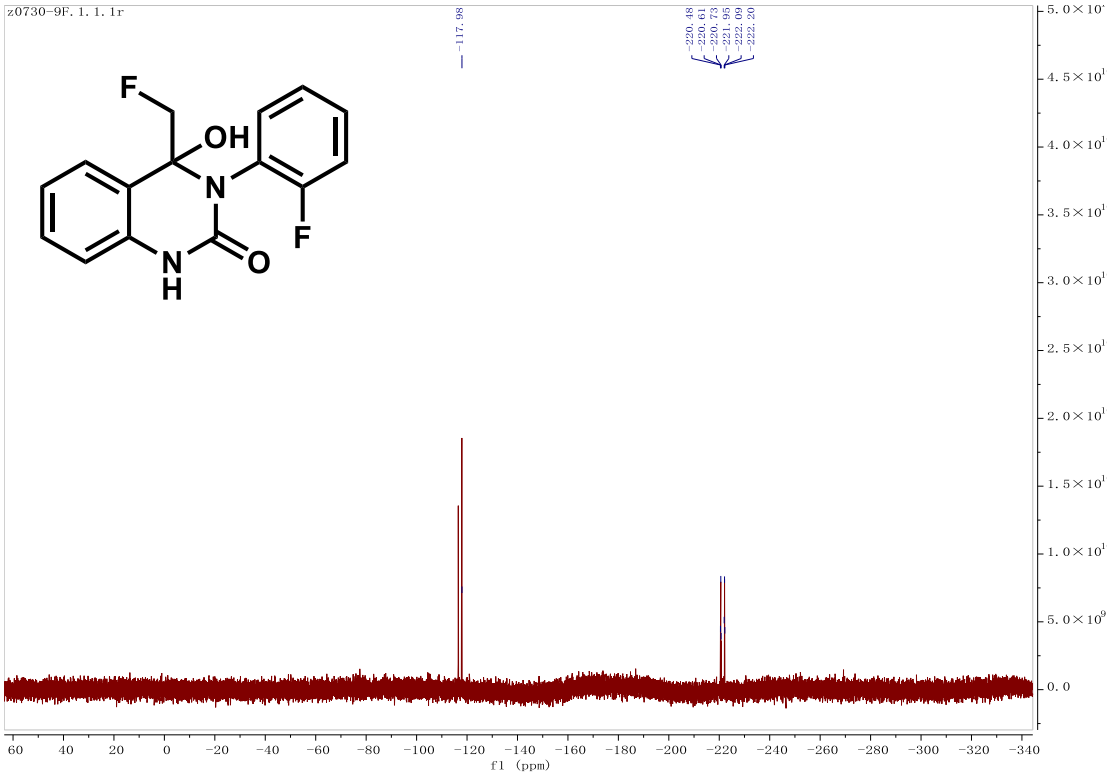
[1]H NMR of Compound **4g** (400 MHz, DMSO)



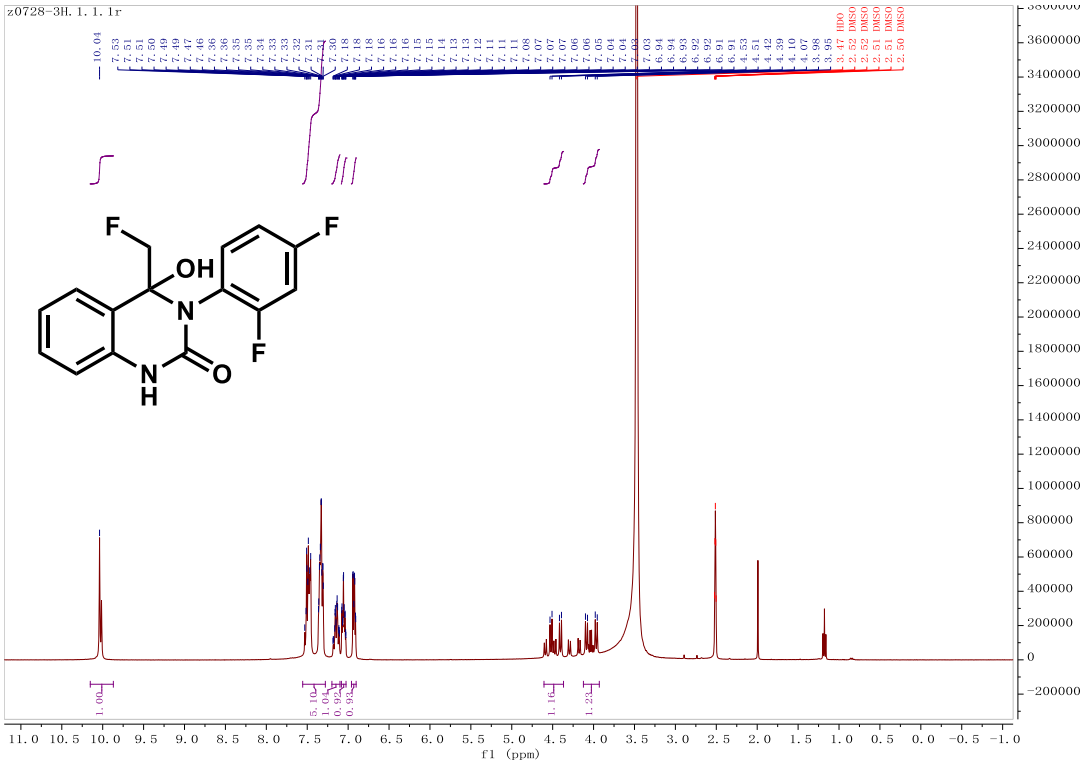
^{13}C NMR of Compound **4g** (101 MHz, DMSO)



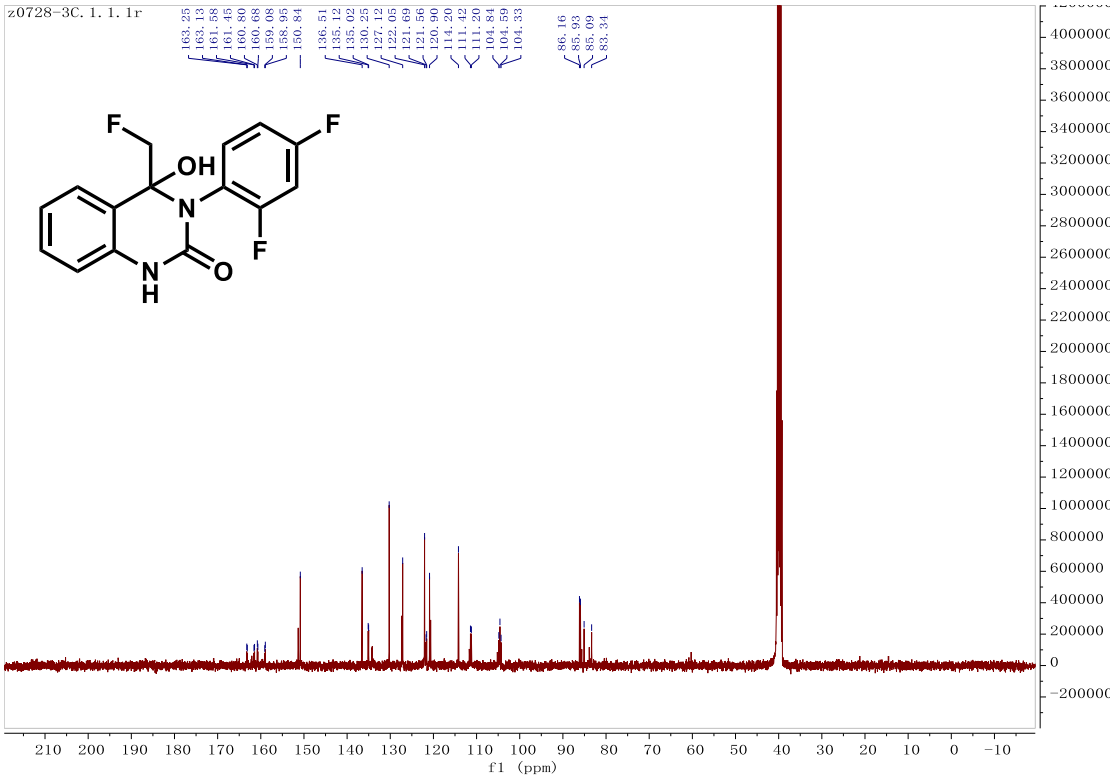
^{19}F NMR of Compound **4g** (376 MHz, DMSO)



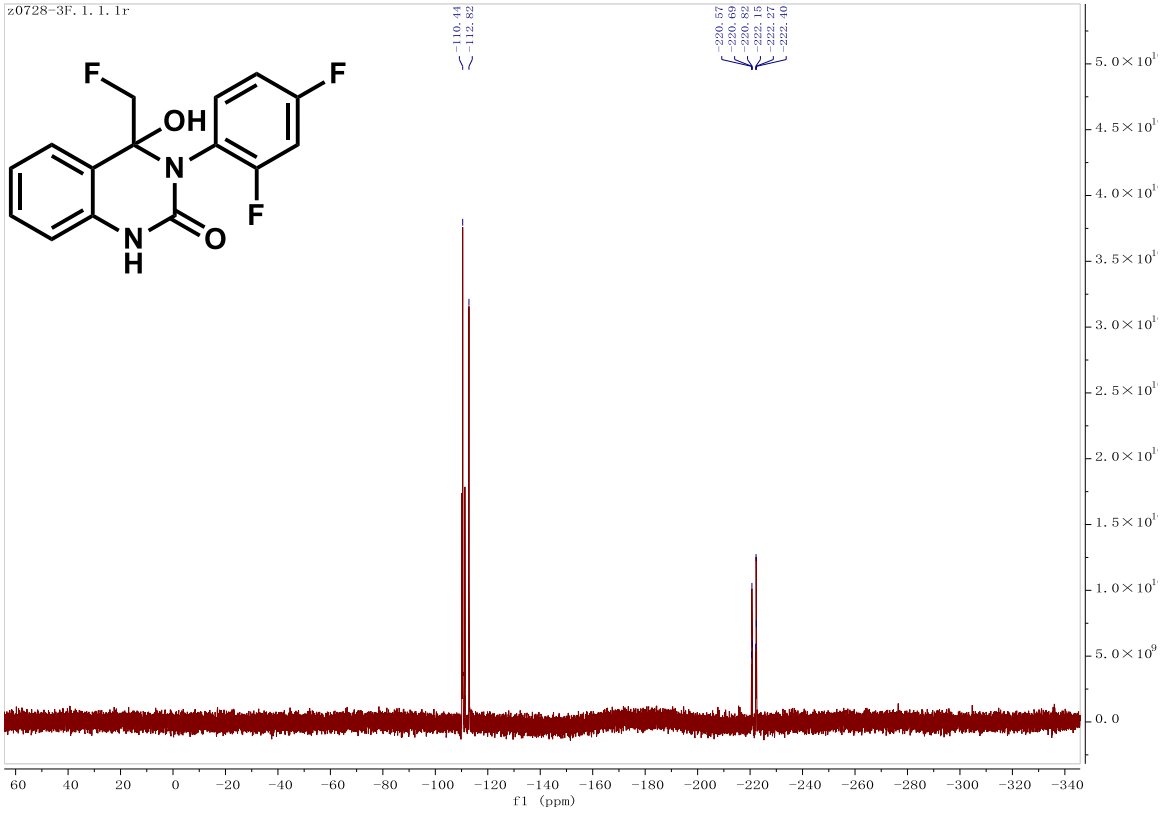
[1]H NMR of Compound **4h** (400 MHz, DMSO)



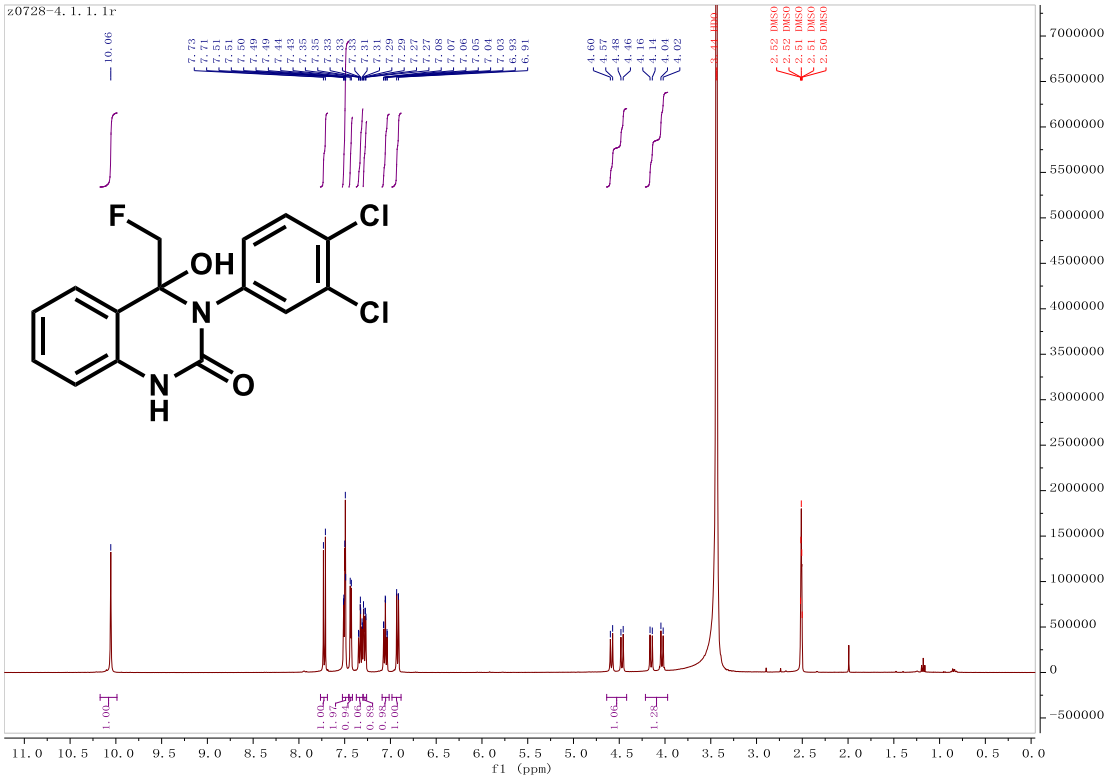
[13]C NMR of Compound **4h** (101 MHz, DMSO)



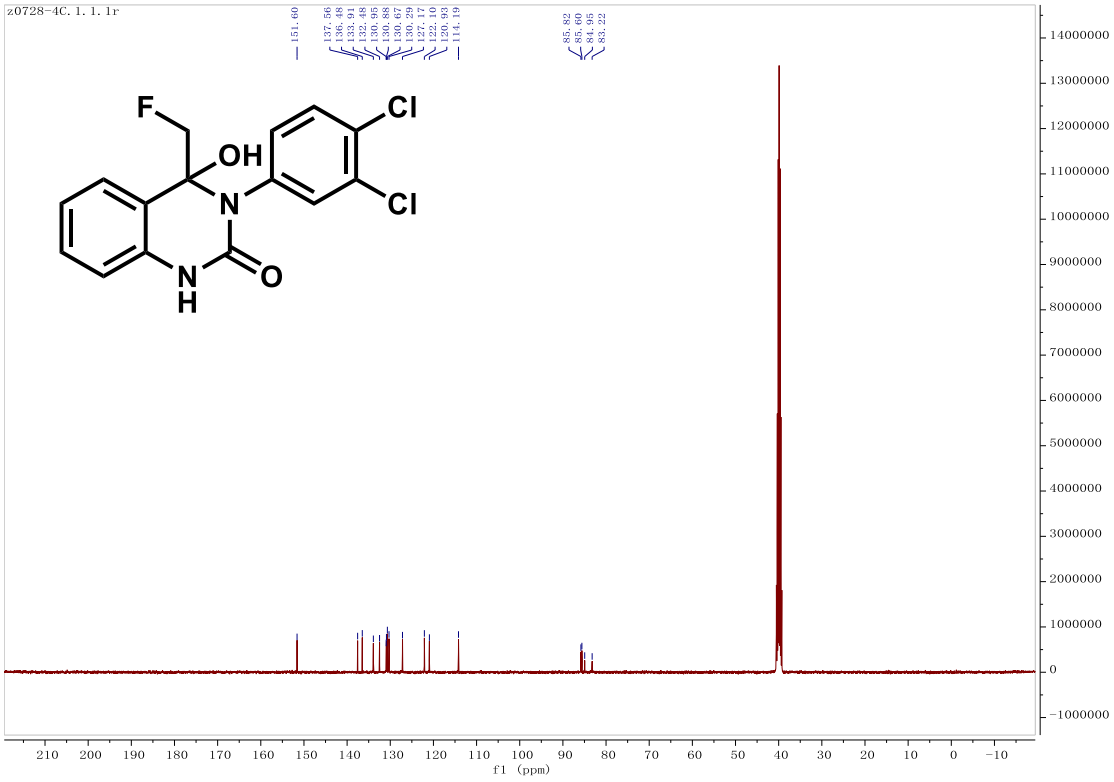
[19]F NMR of Compound **4h** (376 MHz, DMSO)



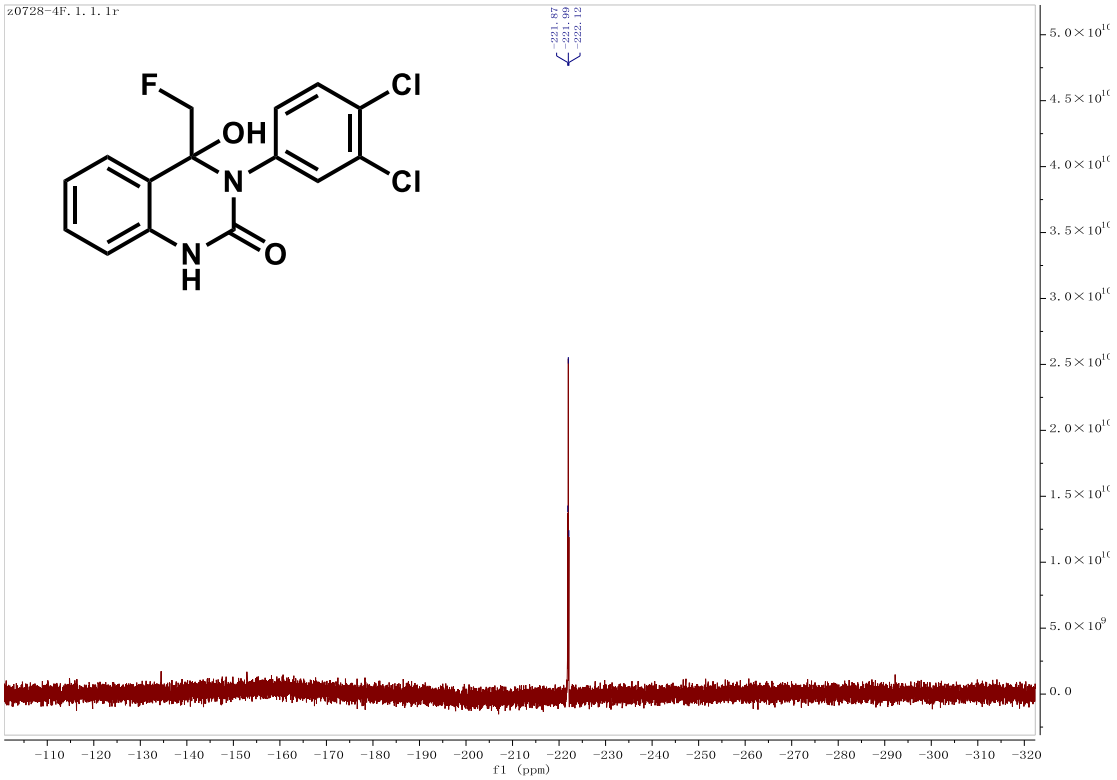
[1]H NMR of Compound **4i** (400 MHz, DMSO)



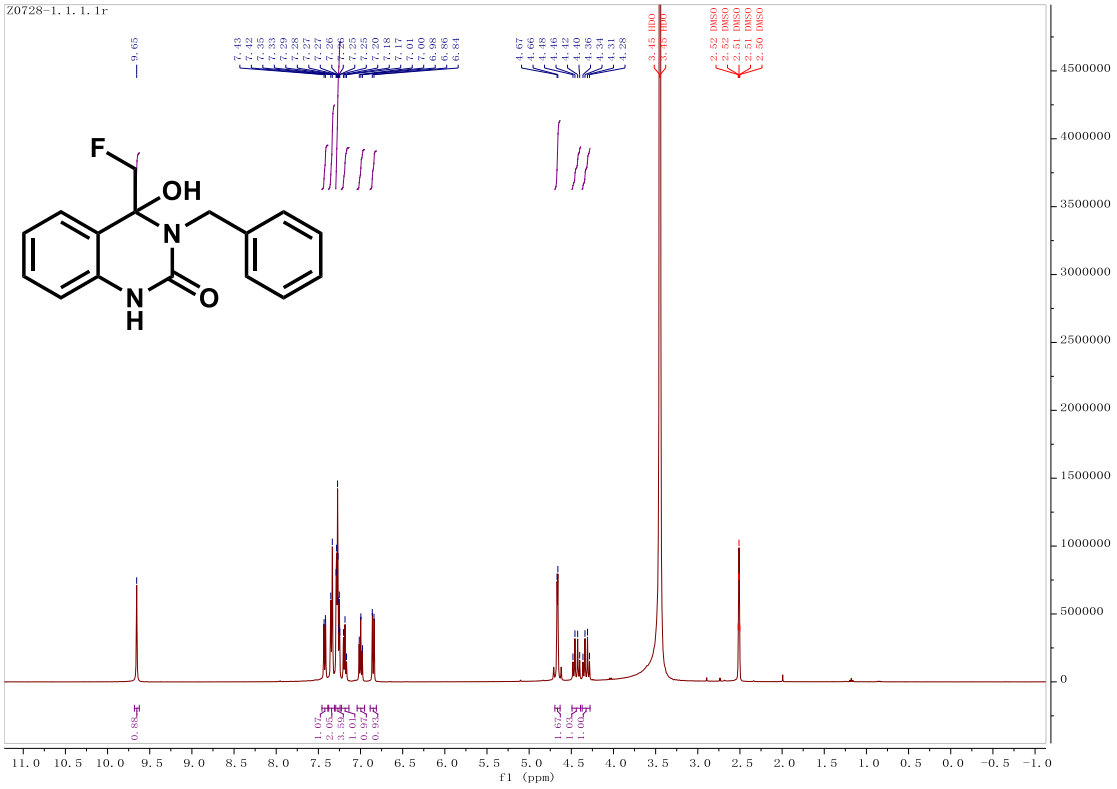
[13]C NMR of Compound **4i** (101 MHz, DMSO)



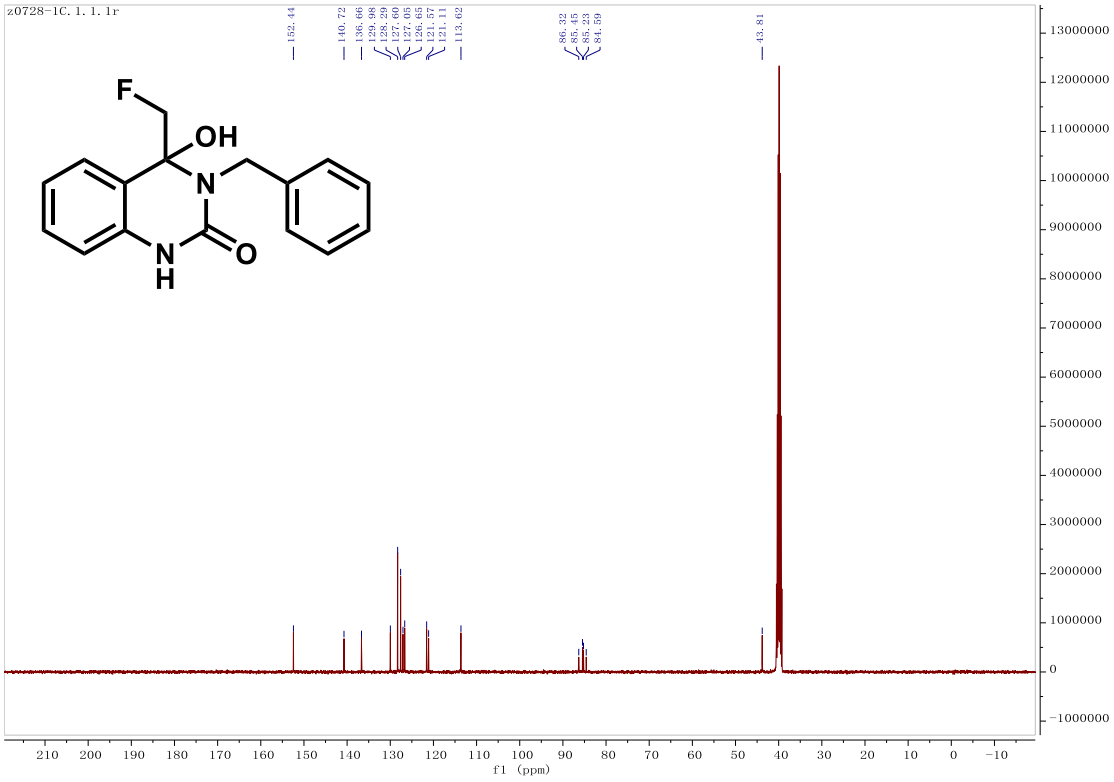
[19]F NMR of Compound **4i** (376 MHz, DMSO)



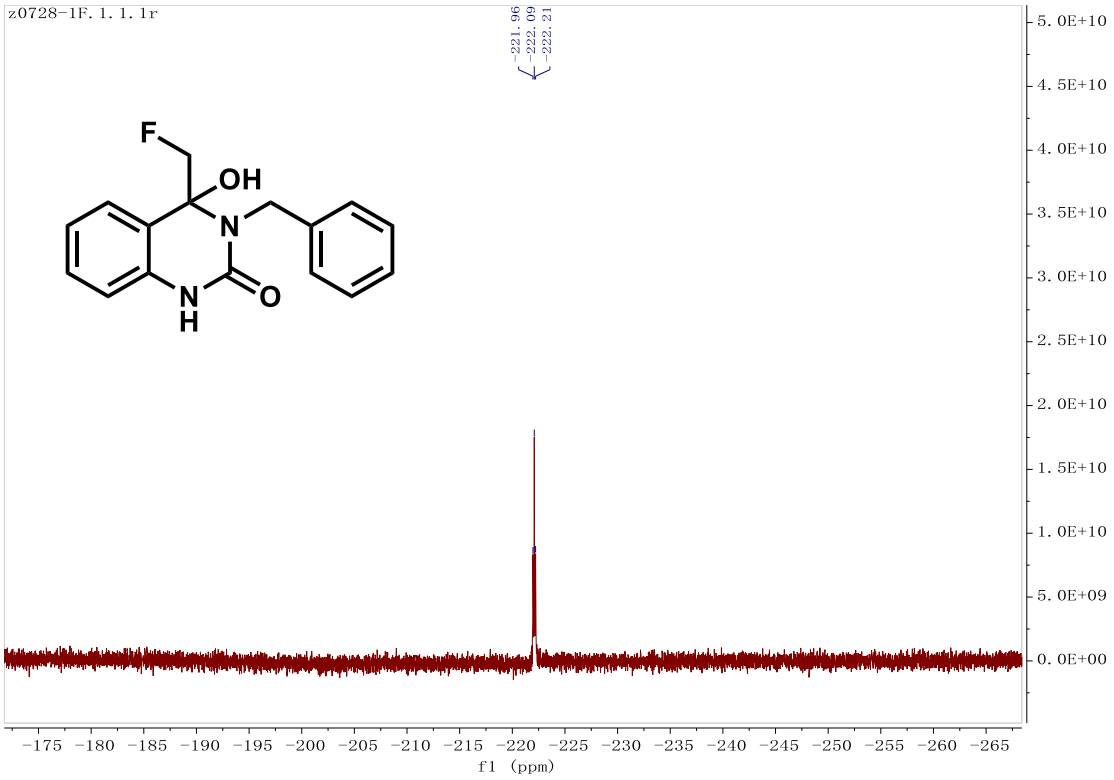
[1]H NMR of Compound **4j** (400 MHz, DMSO)



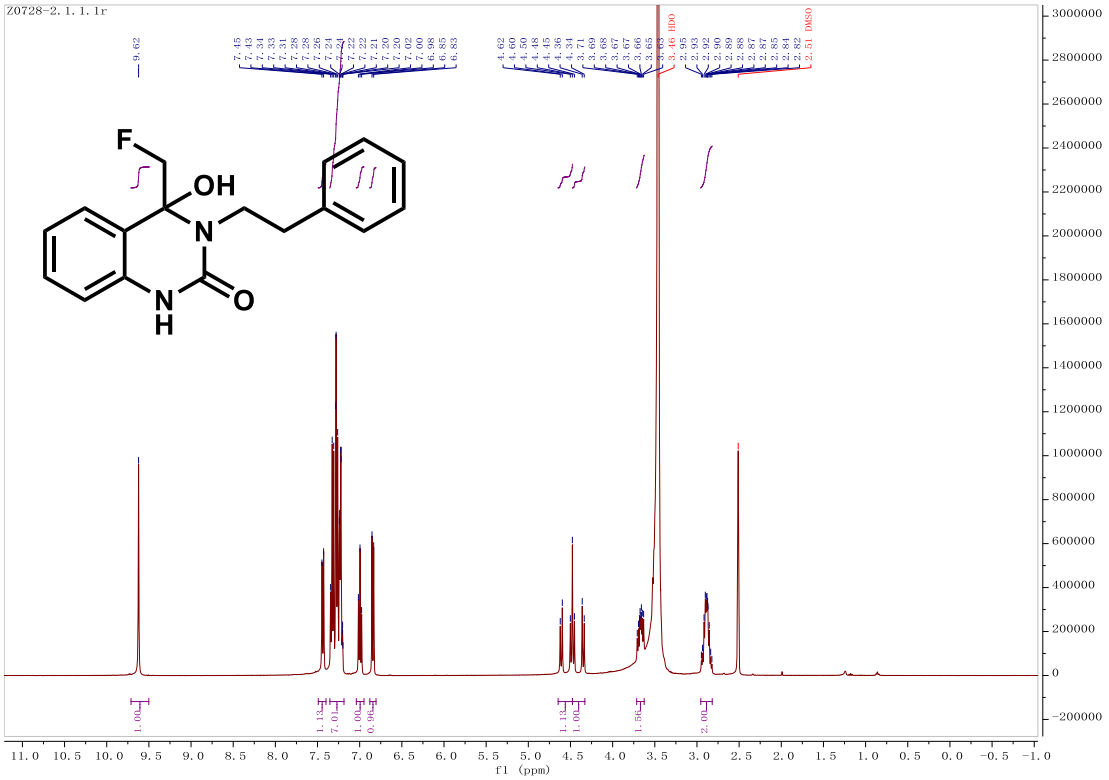
[13]C NMR of Compound **4j** (101 MHz, DMSO)



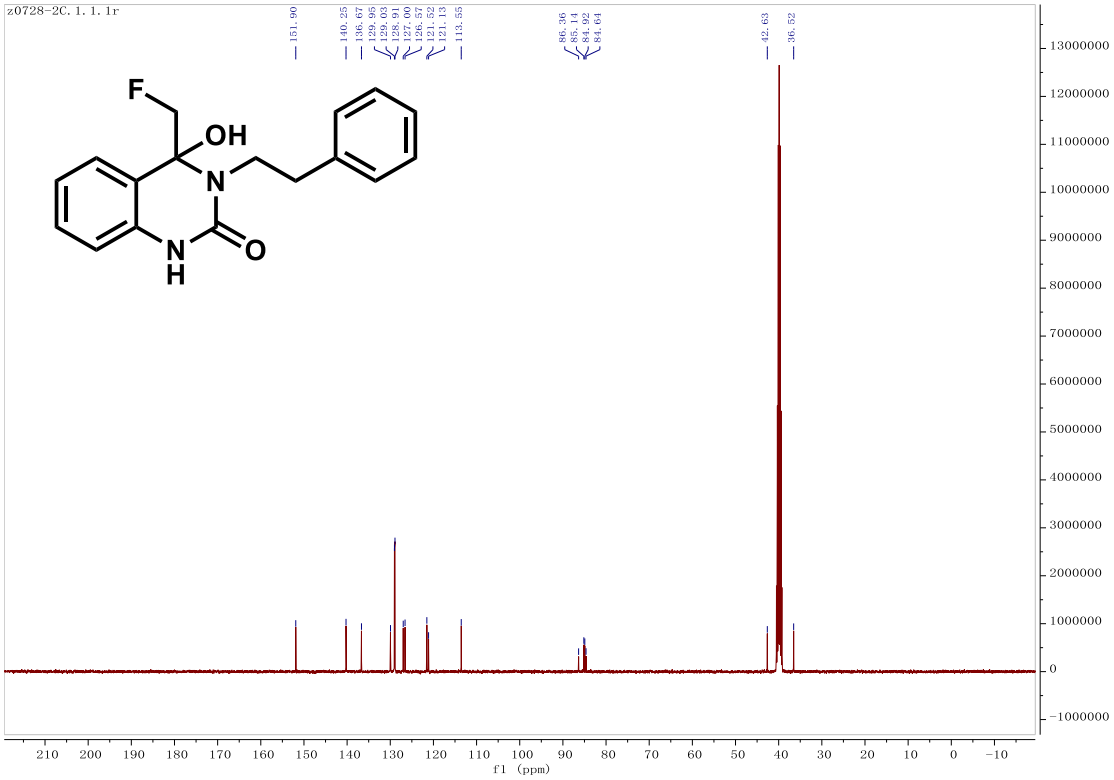
[19]F NMR of Compound **4j** (376 MHz, DMSO)



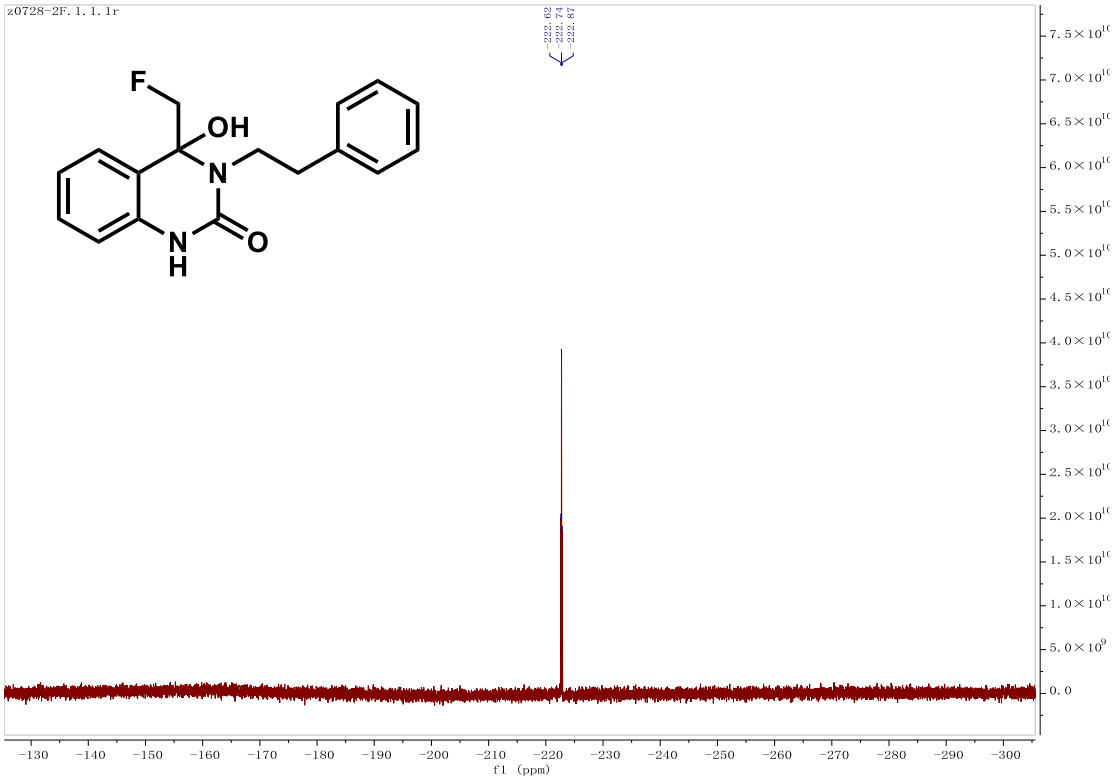
[1]H NMR of Compound **4k** (400 MHz, DMSO)



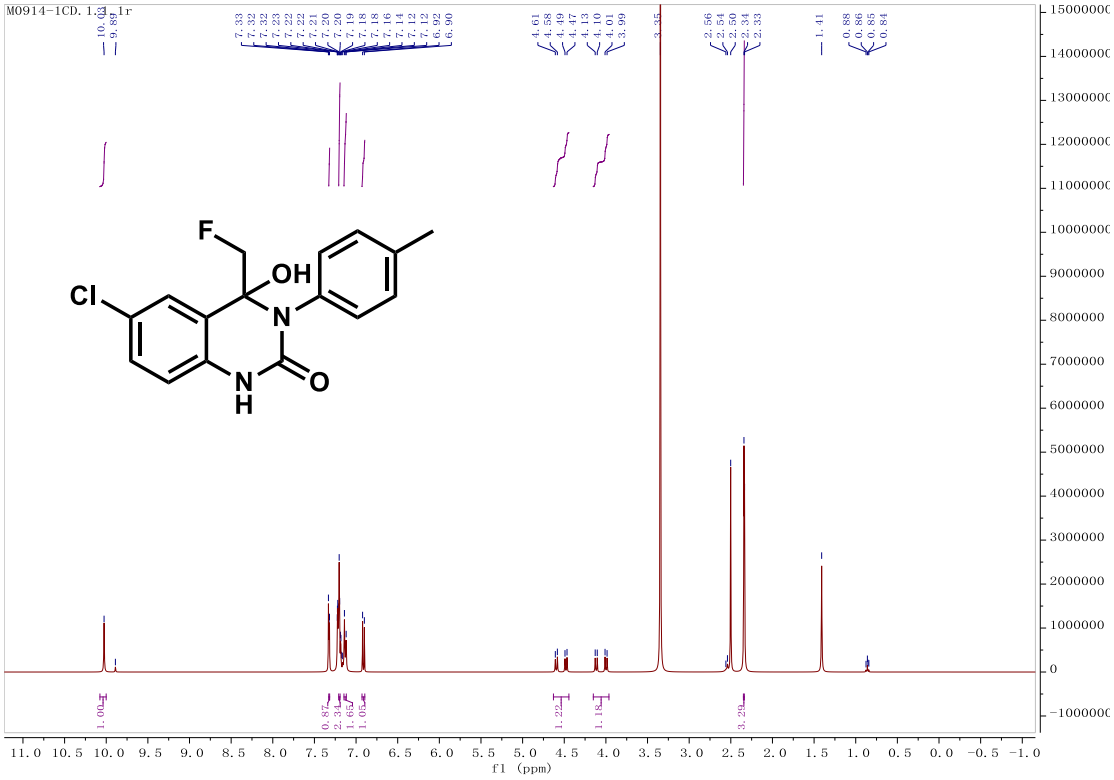
[13]C NMR of Compound **4k** (101 MHz, DMSO)



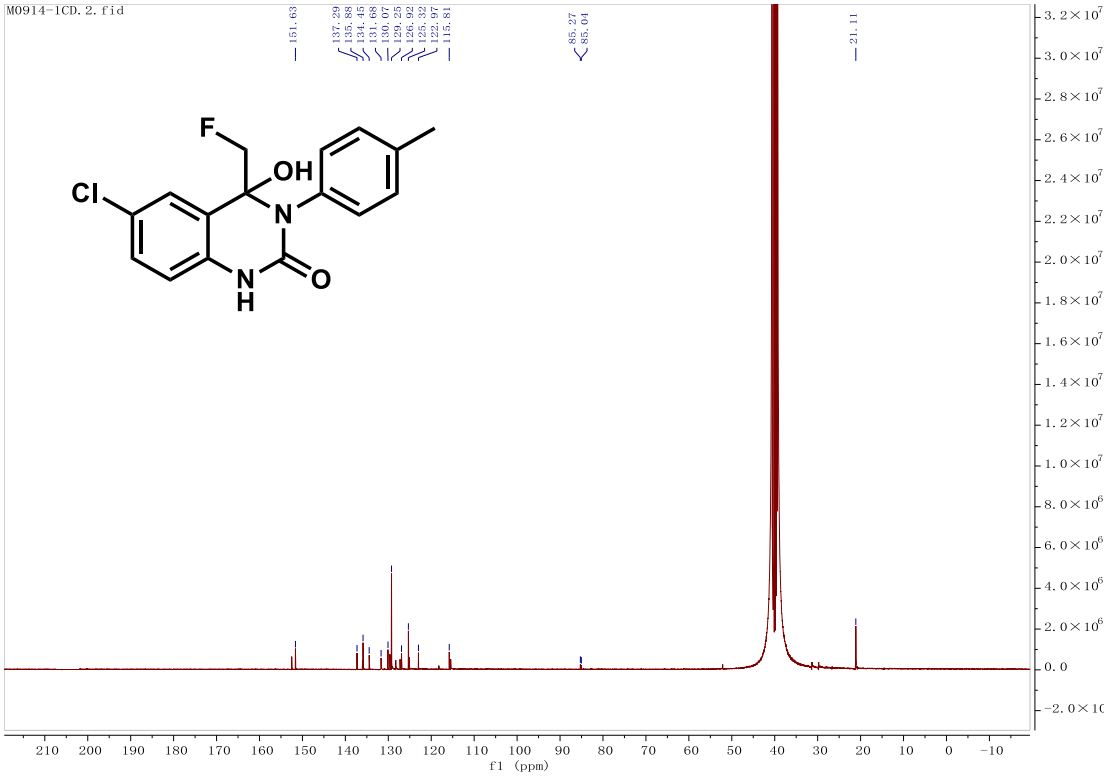
[19]F NMR of Compound **4k** (376 MHz, DMSO)



[1]H NMR of Compound **4l** (400 MHz, DMSO)



[13]C NMR of Compound **4l** (101 MHz, DMSO)



[19]F NMR of Compound **4l** (376 MHz, DMSO)