Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

for

Construction and transformations of 2,2-difluoro-2,3-dihydrofurans from enaminones and diflurocarbene

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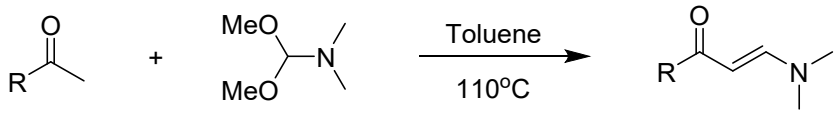
1. General Information

All chemicals were purchased from Adamas Reagent, Ltd, Energy chemical company, J&K Scientific Ltd, Alfa Aesa chemical company and so forth. Anhydrous solvents are commercially available (energy) and stored in a glove box. Unless otherwise stated, all experiments were conducted in a seal tube under air atmosphere. Reactions were monitored by TLC or GC-MS analysis. Flash column chromatography was performed over silica gel (200-300 mesh). ^{1}H-NMR and ^{13}C-NMR spectra were recorded in $CDCl_3$ on a Bruker Avance 500 spectrometer (500 MHz ^{1}H, 126 MHz ^{13}C, 471 MHz ^{19}F) at room temperature. Chemical shifts were reported in ppm on the scale relative to $CDCl_3$ (δ = 7.26 for ^{1}H-NMR, δ = 77.00 for ^{13}C-NMR) as an internal reference. Chemical shifts were reported in ppm on the scale relative to DMSO-d_6 (δ = 2.51 for ^{1}H-NMR, δ = 40.00 for ^{13}C-NMR) as an internal reference. High resolution mass spectra were recorded using Q-TOF time-of-flight mass spectrometer. Coupling constants (*J*) were reported in Hertz (Hz). Oil bath was used as heating source.

2. Material Synthesis

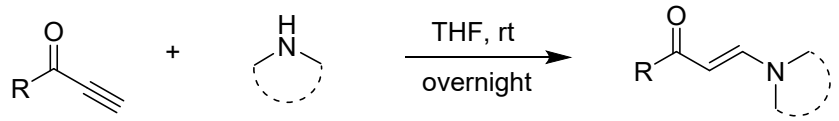
General procedure A for the synthesis of enaminones



A B **1**

To a stirred solution of ketone **A** (5.0 mmol, 1.0 equiv.) in toluene (5 mL), 1,1-dimethoxy N, N-dimethylmethanamine **B** (7.0 mmol, 1.4 equiv.) was added and stirred at 110 °C. After completion of the reaction (monitored by TLC), it was quenched with water, extracted with ethyl acetate and dried with anhydrous Na_2SO_4. Then the reaction mixture was concentrated under reduced pressure and purified by column chromatography (petroleum ether: ethyl acetate = 1: 1) to give the desired product **1**.

General procedure B for the synthesis of enaminones

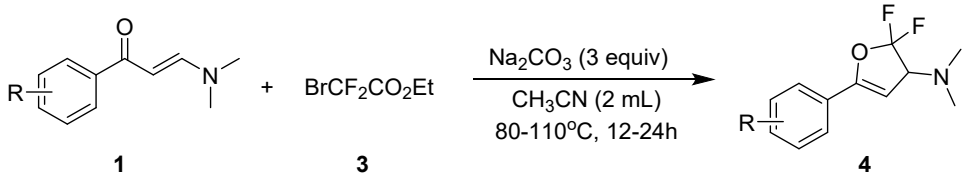


C D **2**

To a stirred solution of **C** (5.0 mmol, 1.0 equiv.) in THF (10 mL), amine **D** (12.0 mmol, 2.4 equiv.) was added dropwise and stirred at room temperature. After completion of the reaction (monitored by TLC), the reaction mixture is concentrated under reduced pressure and purified by column chromatography (petroleum ether: ethyl acetate) to give the desired product **2**.

3. Experimental Procedures

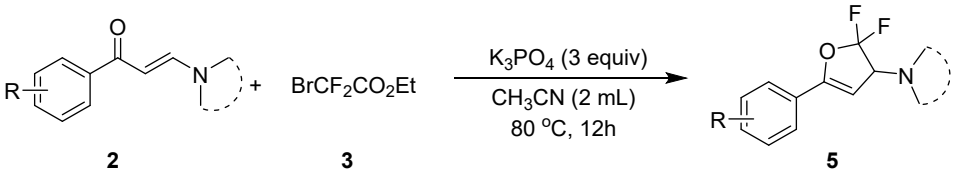
Conditions A



1 **3** **4**

In air, a 25 mL Schlenk tube was charged with **1** (0.2 mmol, 1 equiv) and Na_2CO_3 (63.6 mg, 3 equiv). The tube was evacuated and filled with nitrogen three times. Then, CH_3CN (2 mL) and $BrCF_2CO_2Et$ (103 μL, 4 equiv) were added and immersed into an oil bath preheated at 80-110°C. The reaction was allowed to stir for 12-24 h. Upon completion, removal of the solvent, the crude reaction mixture was purified on silica gel (petroleum ether: ethyl acetate) to afford the desired product **4**.

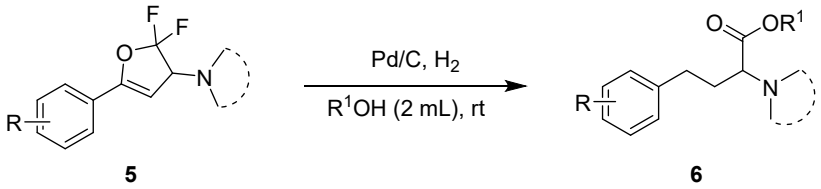
Conditions B



2 **3** **5**

In air, a 25 mL Schlenk tube was charged with **2** (0.2 mmol, 1 equiv) and K_3PO_4 (127.2 mg, 3 equiv). The tube was evacuated and filled with nitrogen three times. Then, CH_3CN (2 mL) and $BrCF_2CO_2Et$ (77 μL, 3 equiv) were added and immersed into an oil bath preheated at 80°C. The reaction was allowed to stir for 12 h. Upon completion, removal of the solvent, the crude reaction mixture was purified on silica gel (petroleum ether: ethyl acetate) to afford the desired product **5**.

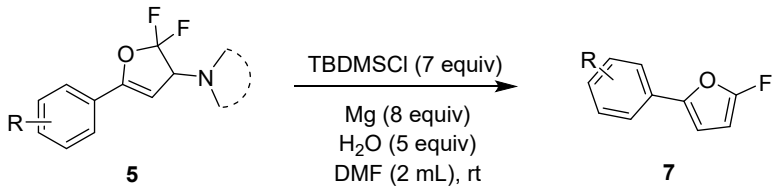
Conditions C



5 **6**

In air, a 25 mL Schlenk tube was charged with 5% Pd/C (20 mg), and the Schlenk tube was evacuated and filled with hydrogen. compound **5** (0.2 mmol, 1 equiv) was dissolved in R^1OH and added under hydrogen atmosphere. subsequently, the reaction was allowed to stir for 12 h at room temperature. Upon completion, removal of the solvent, the crude reaction mixture was purified on silica gel (petroleum ether: ethyl acetate) to afford the desired product **6**.

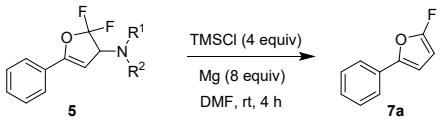
Conditions D



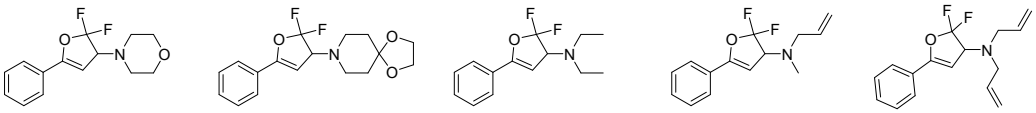
5 **7**

In air, a 25 mL Schlenk tube was charged with Mg (38.4 mg, 8 equiv). The tube was evacuated and filled with nitrogen three times. Compound **5** (0.2 mmol, 1 equiv) was weighed and dissolved in DMF. The weighed H_2O (18 μL, 5 equiv) and tert-butyldimethylsilyl chloride (211.0 mg, 7 equiv) were added to the mixture in turn. the reaction was allowed to stir for 4 h at room temperature. After completion of the reaction, it was quenched with NH_4Cl, extracted with ethyl acetate and dried with anhydrous Na_2SO_4. Then the reaction mixture was concentrated under reduced pressure and purified by column chromatography (petroleum ether) to afford the desired product **7**.

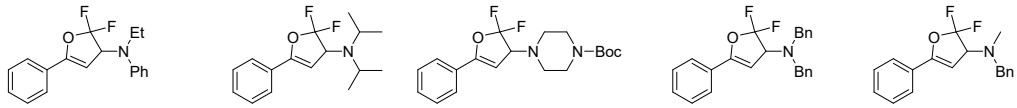
4. Explorations and optimizations



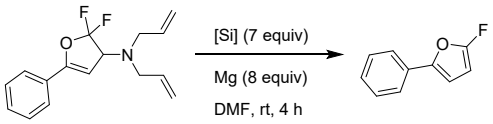
5 **7a**



45% 40% 8% 41% 51%

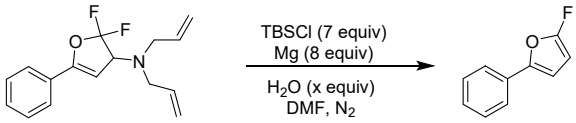


trace 14% 23% trace 34%



TBDMSCl TIPSCl TESCl **Si 4**

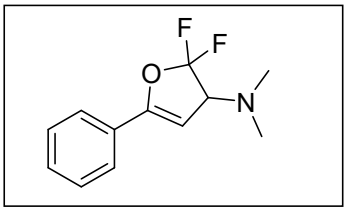
entry	[Si]	yield (%)
1	TBDMSCl	61
2	TIPSCl	53
3	TESCl	trace
4	**Si 4**	trace



entry	H_2O (x equiv)	yield(%)
1	0	61
2	5	82
3	10	78
4	20	trace

5. Characterization of Products

2,2-difluoro-N, N-dimethyl-5-phenyl-2,3-dihydrofuran-3-amine (4a)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil, yield: 82% (36.9 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

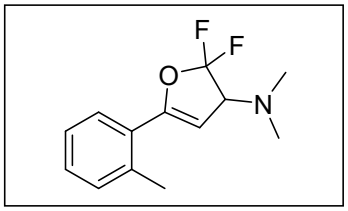
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.63 – 7.58 (m, 2H), 7.43 – 7.37 (m, 3H), 5.56 (t, J = 2.5 Hz, 1H), 4.16 (ddd, J = 15.1, 7.3, 2.7 Hz, 1H), 2.49 (s, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.3 (d, *J* = 150.8 Hz), -83.8 (d, *J* = 150.5 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.4 (d, *J* = 3.6 Hz), 131.224 (dd, *J* = 274.1, 271.2 Hz), 129.9, 128.6, 128.3, 125.4, 97.4 (d, *J* = 3.1 Hz), 71.1 (dd, *J* = 34.5, 19.0 Hz), 41.2 (d, *J* = 2.8 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{12}H_{14}F_2NO^+$ 226.1038; 226.1041

2,2-difluoro-N, N-dimethyl-5-(o-tolyl)-2,3-dihydrofuran-3-amine (4b)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 70% (33.5 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

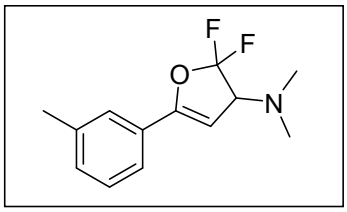
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.58 (dd, *J* = 8.1, 1.5 Hz, 1H), 7.33 (td, *J* = 7.4, 1.5 Hz, 1H), 7.26 (td, *J* = 6.4, 5.9, 3.0 Hz, 2H), 5.37 (t, *J* = 2.4 Hz, 1H), 4.19 (ddd, *J* = 15.2, 7.2, 2.7 Hz, 1H), 2.54 (s, 6H), 2.49 (s, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.8 (d, *J* = 151.6 Hz), -85.0 (dd, *J* = 151.3, 3.0 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.6 (d, *J* = 3.6 Hz), 136.7, 131.1, 130.8 (dd, *J* = 273.2, 270.4 Hz), 129.7, 128.2, 128.1, 125.9, 101.8 (d, *J* = 2.8 Hz), 71.1 (dd, *J* = 34.6, 19.0 Hz), 41.2 (d, *J* = 2.7 Hz), 21.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{16}F_2NO^+$ 240.1194; Found: 240.1193.

2,2-difluoro-N, N-dimethyl-5-(m-tolyl)-2,3-dihydrofuran-3-amine (4c)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 53% (25.3 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

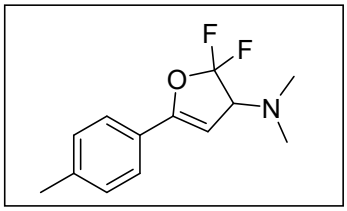
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.44 – 7.39 (m, 2H), 7.29 (t, *J* = 7.6 Hz, 1H), 7.20 (d, *J* = 7.6 Hz, 1H), 5.53 (t, *J* = 2.4 Hz, 1H), 4.15 (ddd, *J* = 15.1, 7.3, 2.7 Hz, 1H), 2.49 (s, 6H), 2.38 (s, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.3 (d, *J* = 150.8 Hz), -83.9 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.5 (d, *J* = 3.6 Hz), 138.3, 131.2 (dd, *J* = 273.2, 270.4 Hz), 130.7, 128.5, 128.2, 125.9, 122.5, 97.2 (d, *J* = 3.0 Hz), 71.0 (dd, *J* = 34.6, 18.9 Hz), 41.1 (d, *J* = 3.2 Hz), 21.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{16}F_2NO^+$ 240.1194; Found: 240.1196.

2,2-difluoro-N, N-dimethyl-5-(p-tolyl)-2,3-dihydrofuran-3-amine (4d)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 65% (31.1 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

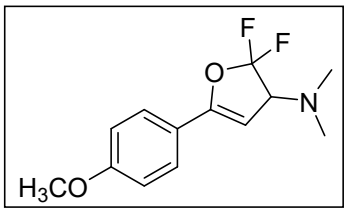
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.50 (d, *J* = 8.2 Hz, 2H), 7.20 (d, *J* = 8.0 Hz, 2H), 5.48 (t, *J* = 2.4 Hz, 1H), 4.14 (ddd, *J* = 15.1, 7.2, 2.7 Hz, 1H), 2.48 (d, *J* = 1.2 Hz, 6H), 2.38 (s, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.3 (d, *J* = 150.8 Hz), -83.9 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.5 (d, *J* = 3.8 Hz), 140.2, 131.2 (dd, *J* = 273.8, 270.9 Hz), 129.3, 125.5, 125.3, 96.4 (d, *J* = 3.0 Hz), 71.1 (dd, *J* = 34.6, 19.0 Hz), 41.1 (d, *J* = 2.8 Hz), 21.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{16}F_2NO^+$ 240.1194; Found: 240.1194.

2,2-difluoro-5-(4-methoxyphenyl)-N, N-dimethyl-2,3-dihydrofuran-3-amine (4e)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 71% (36.2 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

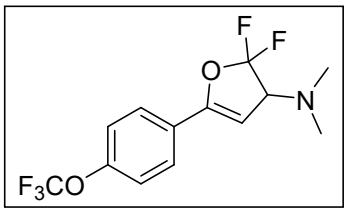
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.54 (d, *J* = 8.9 Hz, 2H), 6.91 (d, *J* = 8.9 Hz, 2H), 5.39 (t, *J* = 2.4 Hz, 1H), 4.13 (ddd, *J* = 15.0, 7.1, 2.8 Hz, 1H), 3.83 (s, 3H), 2.48 (d, *J* = 1.1 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.3 (d, *J* = 150.9 Hz), -84.0 (d, *J* = 151.1 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 160.9, 154.3 (d, *J* = 3.7 Hz), 131.2 (dd, *J* = 273.5, 271.1 Hz), 126.9, 120.9, 114.0, 95.2 (d, *J* = 3.0 Hz), 71.1 (dd, *J* = 34.6, 18.9 Hz), 55.4, 41.1.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{16}F_2NO_2^+$ 256.1144; Found: 256.1142.

2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethoxy) phenyl)-2,3-dihydrofuran-3-amine (4f)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 71% (43.9 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

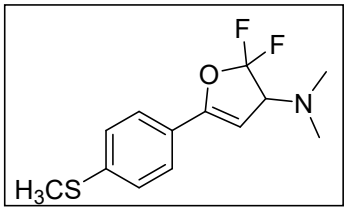
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.73 – 7.55 (m, 2H), 7.38 – 7.15 (m, 2H), 5.59 (t, *J* = 2.4 Hz, 1H), 4.19 (ddd, *J* = 15.0, 7.5, 2.8 Hz, 1H), 2.51 (d, *J* = 1.2 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -57.8, -61.4 (d, *J* = 150.7 Hz), -83.7 (d, *J* = 150.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.1, 150.2, 131.1 (dd, J = 273.5, 271.1 Hz), δ 127.00, 126.86, 120.96, 120.38 (q, *J* = 258.1 Hz), 98.19 (d, *J* = 3.1 Hz), 71.07 (dd, *J* = 34.6, 19.0 Hz), 41.09 (d, *J* = 2.3 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{13}F_5NO_2^+$ 310.0861; Found: 310.0862.

2,2-difluoro-N, N-dimethyl-5-(4-(methylthio) phenyl)-2,3-dihydrofuran-3-amine (4g)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 46% (25.0 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

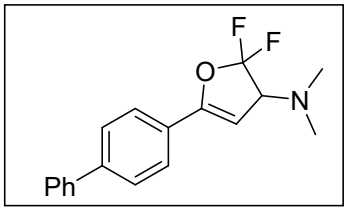
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.53 – 7.48 (m, 2H), 7.25 – 7.22 (m, 2H), 5.49 (t, *J* = 2.5 Hz, 1H), 4.13 (ddd, *J* = 15.0, 7.3, 2.7 Hz, 1H), 2.50 (s, 3H), 2.48 (d, *J* = 1.2 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.4 (d, *J* = 151.2 Hz), -83.8 (d, *J* = 150.8 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.0 (d, *J* = 3.9 Hz), 141.3, 131.2 (dd, *J* = 274.1, 271.1 Hz), 125.9, 125.7, 124.8, 96.7 (d, *J* = 3.1 Hz), 71.1 (dd, *J* = 34.5, 19.0 Hz), 41.1 (d, *J* = 3.2 Hz), 15.3.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{16}F_2NOS^+$ 272.0915; Found: 272.0917.

5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofuran-3-amine (4h)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 141 – 143 °C), yield: 76% (25.3 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

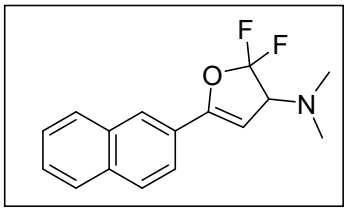
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.69 (d, *J* = 8.5 Hz, 2H), 7.66 – 7.60 (m, 4H), 7.50 – 7.44 (m, 2H), 7.41 – 7.36 (m, 1H), 5.60 (t, *J* = 2.5 Hz, 1H), 4.19 (ddd, *J* = 15.0, 7.3, 2.7 Hz, 1H), 2.51 (s, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.3 (d, *J* = 150.8 Hz), -83.8 (dd, *J* = 150.7, 2.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.2 (d, *J* = 3.7 Hz), 142.7, 140.2, 131.3 (dd, *J* = 274.1, 271.4 Hz), 128.9, 127.8, 127.3, 127.1, 127.1, 125.8, 97.5 (d, *J* = 3.1 Hz), 71.1 (dd, *J* = 34.5, 19.0 Hz), 41.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{18}H_{18}F_2NO^+$ 302.1351; Found: 302.1349.

2,2-difluoro-N, N-dimethyl-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (4i)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 64% (28.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

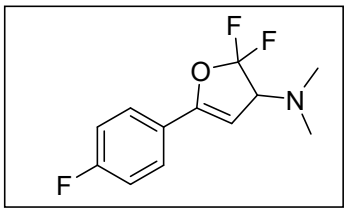
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.10 (d, *J* = 1.7 Hz, 1H), 7.92 – 7.80 (m, 3H), 7.64 (dd, *J* = 8.8, 1.8 Hz, 1H), 7.56 – 7.48 (m, 2H), 5.67 (t, *J* = 2.5 Hz, 1H), 4.21 (ddd, *J* = 15.0, 7.4, 2.7 Hz, 1H), 2.52 (s, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.3 (d, *J* = 150.7 Hz), -83.6 (d, *J* = 150.8 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.4 (d, *J* = 3.5 Hz), 133.9, 133.0, 131.3 (dd, *J* = 274.1, 271.4 Hz), 128.7, 128.4, 127.7, 127.2, 126.8, 125.4, 125.2, 122.4, 98.1 (d, *J* = 3.1 Hz), 71.2 (dd, *J* = 34.5, 19.0 Hz), 41.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{16}F_2NO^+$ 276.1194; Found: 276.1194.

2,2-difluoro-5-(4-fluorophenyl)-N, N-dimethyl-2,3-dihydrofuran-3-amine (4j)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 68% (33.0 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

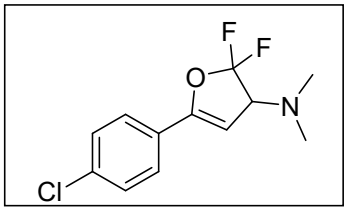
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.59 (dd, *J* = 8.9, 5.3 Hz, 2H), 7.08 (t, *J* = 8.7 Hz, 2H), 5.48 (t, *J* = 2.5 Hz, 1H), 4.14 (ddd, *J* = 15.0, 7.4, 2.7 Hz, 1H), 2.48 (d, *J* = 1.2 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.4 (d, *J* = 150.7 Hz), -83.8(d, *J* = 150.7 Hz), -110.0.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 163.6 (d, *J* = 250.6 Hz), 153.4 (d, *J* = 4.0 Hz), 131.2 (dd, *J* = 274.5, 271.5 Hz), 127.4 (d, *J* = 8.5 Hz), 124.5 (d, *J* = 3.2 Hz), 115.7 (d, *J* = 22.0 Hz), 97.1 (t, *J* = 2.7 Hz), 71.1 (dd, *J* = 34.4, 18.9 Hz), 41.1 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{12}H_{13}F_3NO^+$ 244.0944; Found: 244.0942.

5-(4-chlorophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofuran-3-amine (4k)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 69% (35.7 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

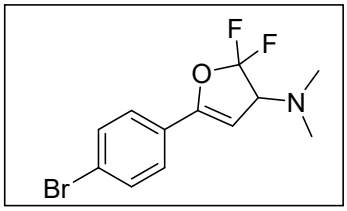
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.55 (d, *J* = 8.7 Hz, 2H), 7.39 (d, *J* = 8.6 Hz, 2H), 5.57 (t, *J* = 2.5 Hz, 1H), 4.17 (ddd, *J* = 15.0, 7.5, 2.7 Hz, 1H), 2.50 (d, *J* = 1.3 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.4 (d, *J* = 150.2 Hz), -83.7 (d, *J* = 150.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.3 (d, *J* = 3.8 Hz), 135.9, 131.1 (dd, *J* = 274.6, 271.7 Hz), 128.9, 126.7, 126.6, 98.0 (d, *J* = 2.9 Hz), 71.1 (dd, *J* = 34.5, 19.0 Hz), 41.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{12}H_{13}ClF_2NO^+$ 260.0648; Found: 260.0650.

5-(4-bromophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofuran-3-amine (4l)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 69% (42.0 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

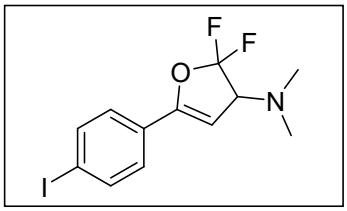
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.55 – 7.50 (m, 2H), 7.49 – 7.42 (m, 2H), 5.56 (t, *J* = 2.5 Hz, 1H), 4.13 (ddd, *J* = 15.0, 7.5, 2.7 Hz, 1H), 2.48 (s, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.4 (d, *J* = 150.5 Hz), -83.7 (d, *J* = 150.8 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.4 (d, *J* = 3.7 Hz), 131.8, 131.1 (dd, *J* = 274.7, 271.7 Hz), 127.1, 126.9, 124.2, 98.1 (d, *J* = 3.1 Hz), 71.1 (dd, *J* = 34.4, 19.0 Hz), 41.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{12}H_{13}BrF_2NO^+$ 304.0143; Found: 304.0144.

2,2-difluoro-5-(4-iodophenyl)-N, N-dimethyl-2,3-dihydrofuran-3-amine (4m)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 58% (40.7mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

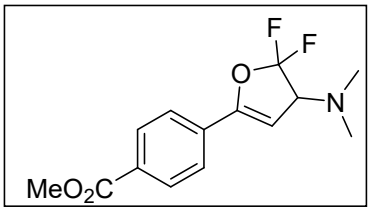
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.77 – 7.65 (m, 2H), 7.32 (d, *J* = 8.5 Hz, 2H), 5.57 (t, *J* = 2.4 Hz, 1H), 4.13 (ddd, *J* = 15.0, 7.5, 2.7 Hz, 1H), 2.47 (d, *J* = 1.2 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.4 (dd, *J* = 150.5, 5.4 Hz), -83.7 (dd, *J* = 150.2, 3.3 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.5 (d, *J* = 3.8 Hz), 137.8, 131.1 (dd, *J* = 274.7, 271.6 Hz), 127.7, 126.9, 98.3 (d, *J* = 3.1 Hz), 96.0, 71.1 (dd, *J* = 34.5, 19.0 Hz), 41.2 (d, *J* = 3.1 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{12}H_{13}F_2INO^+$ 352.0004; Found: 352.0009.

methyl 4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl) benzoate (4n)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 53% (30.0 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

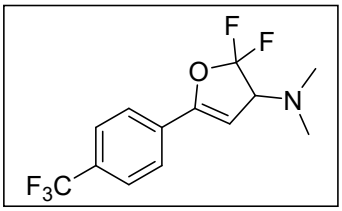
^{1}H NMR (500 MHz, Chloroform-*d*) ^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.09 – 8.01 (m, 2H), 7.70 – 7.62 (m, 2H), 5.69 (t, *J* = 2.4 Hz, 1H), 4.21 – 4.13 (m, 1H), 3.92 (s, 3H), 2.48 (d, *J* = 1.2 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.4 (d, *J* = 150.9 Hz), -83.5 (d, *J* = 150.4 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 166.4, 153.4 (d, *J* = 3.7 Hz), 132.2, 131.2, 131.1 (dd, *J* = 275.0, 271.6 Hz), 129.8, 125.3, 100.0 (d, *J* = 3.1 Hz), 71.1 (dd, *J* = 34.4, 19.0 Hz), 52.28, 41.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{14}H_{16}F_2NO_3^+$ 284.1093; Found: 284.1097.

2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethyl) phenyl)-2,3-dihydrofuran-3-amine (4o)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 69% (40.4 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

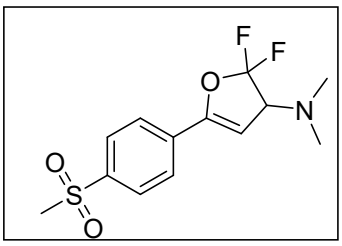
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.89 – 7.51 (m, 4H), 5.69 (t, *J* = 2.5 Hz, 1H), 4.18 (ddd, *J* = 14.9, 7.6, 2.8 Hz, 1H), 2.49 (s, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.5 (d, *J* = 150.2 Hz), -62.9, -83.6 (d, *J* = 150.6 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.0 (d, *J* = 3.9 Hz), 131.7 (q, *J* = 32.9 Hz), 131.5, 131.1 (dd, *J* = 275.2, 272.1 Hz), 125.6, 125.6 (d, *J* = 3.7 Hz), 123.8 (q, *J* = 272.2 Hz), 99.9 (d, *J* = 3.2 Hz), 71.1 (dd, *J* = 34.3, 19.1 Hz), 41.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{13}F_5NO^+$ 294.0912; Found: 294.0916.

2,2-difluoro-N, N-dimethyl-5-(4-(methylsulfonyl) phenyl)-2,3-dihydrofuran-3-amine (4p)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 42% (25.5mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

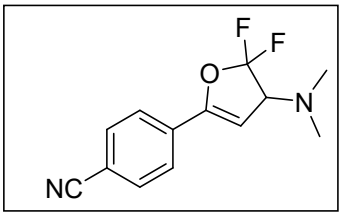
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.99 – 7.95 (m, 2H), 7.81 – 7.76 (m, 2H), 5.77 (t, *J* = 2.4 Hz, 1H), 4.19 (ddd, *J* = 14.9, 7.7, 2.7 Hz, 1H), 3.06 (d, *J* = 0.7 Hz, 3H), 2.48 (d, *J* = 1.3 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.53 (d, *J* = 150.1 Hz), -83.40 (d, *J* = 150.0 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 152.4 (d, *J* = 3.7 Hz), 141.4, 133.2, 130.0 (dd, *J* = 275.0, 271.6 Hz), 127.8, 126.2, 101.4 (d, *J* = 3.0 Hz), 71.1 (dd, *J* = 34.4, 19.1 Hz), 44.5, 41.3 (d, *J* = 2.9 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{16}F_2NO_3S^+$ 304.0813; Found: 304.0817.

4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl) benzonitrile (4q)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 78% (39.0 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

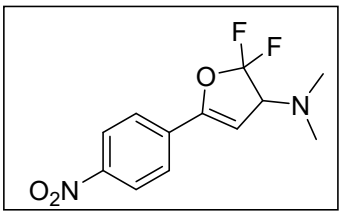
^{1}H NMR (500 MHz, Chloroform-*d*) ^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.68 (s, 4H), 5.73 (t, *J* = 2.4 Hz, 1H), 4.18 (ddd, *J* = 14.9, 7.7, 2.8 Hz, 1H), 2.47 (d, *J* = 1.1 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.49 (d, *J* = 150.1 Hz), -83.38 (d, *J* = 150.3 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 152.4 (d, *J* = 3.9 Hz), 132.4, 132.2, 131.0 (dd, *J* = 275.6, 272.4 Hz), 125.9, 118.3, 113.3, 101.3 (d, *J* = 3.4 Hz), 71.1 (dd, *J* = 34.4, 19.1 Hz), 41.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{13}H_{13}F_2N_2O^+$ 251.0990; Found: 251.0991.

2,2-difluoro-N, N-dimethyl-5-(4-nitrophenyl)-2,3-dihydrofuran-3-amine (4r)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow solid (mp: 68 – 70 ^{o}C), yield: 71% (38.3 mg), column chromatography (silica gel, PE: EA = 8:1, v/v).

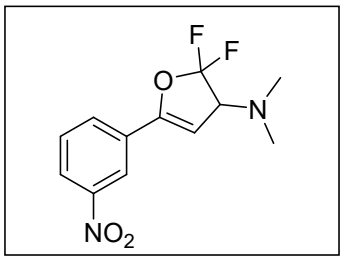
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.29 – 8.21 (m, 2H), 7.78 – 7.72 (m, 2H), 5.80 (t, *J* = 2.5 Hz, 1H), 4.20 (ddd, *J* = 15.0, 7.8, 2.8 Hz, 1H), 2.49 (d, *J* = 1.3 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.5 (d, *J* = 150.2 Hz), -83.3 (d, *J* = 150.1 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 152.2 (d, *J* = 3.7 Hz), 148.4, 133.9, 131.0 (dd, *J* = 275.8, 272.4 Hz), 126.2, 124.0, 102.1 (d, *J* = 3.2 Hz), 71.1 (dd, *J* = 34.3, 19.2 Hz), 41.3 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{12}H_{13}F_2N_2O_3^+$ 271.0889; Found: 271.0892.

2,2-difluoro-N, N-dimethyl-5-(3-nitrophenyl)-2,3-dihydrofuran-3-amine (4s)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil，yield: 46% (24.8 mg), column chromatography (silica gel, PE: EA = 8:1, v/v).

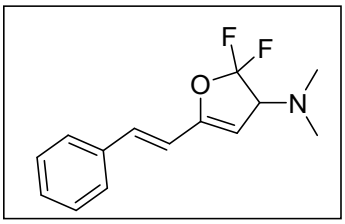
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.44 (t, *J* = 2.0 Hz, 1H), 8.24 (ddd, *J* = 8.2, 2.3, 1.1 Hz, 1H), 7.91 (dt, *J* = 7.8, 1.4 Hz, 1H), 7.60 (t, *J* = 8.0 Hz, 1H), 5.75 (t, *J* = 2.4 Hz, 1H), 4.20 (ddd, *J* = 15.0, 7.7, 2.7 Hz, 1H), 2.49 (d, *J* = 1.3 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.6 (d, *J* = 150.1 Hz), -83.5 (d, *J* = 150.0 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 151.9 (d, *J* = 3.8 Hz), 148.5, 131.0 (dd, *J* = 275.7, 272.5 Hz), 130.9, 129.9, 129.8, 124.4, 120.4, 100.4 (d, *J* = 3.2 Hz), 71.1 (dd, *J* = 34.4, 19.1 Hz), 41.3 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{12}H_{13}F_2N_2O_3^+$ 271.0889; Found: 271.0888.

(E)-2,2-difluoro-N, N-dimethyl-5-styryl-2,3-dihydrofuran-3-amine (4t)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil, yield: 68% (34.1 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

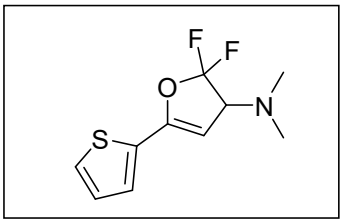
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.45 (dd, *J* = 7.3, 1.8 Hz, 2H), 7.35 (dd, *J* = 8.3, 6.6 Hz, 2H), 7.32 – 7.28 (m, 1H), 7.01 (d, *J* = 16.1 Hz, 1H), 6.55 (d, *J* = 16.1 Hz, 1H), 5.21 (t, *J* = 2.6 Hz, 1H), 4.09 (ddd, *J* = 14.6, 7.2, 2.8 Hz, 1H), 2.47 (d, *J* = 1.1 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.5 (d, *J* = 150.0 Hz), -83.5 (d, *J* = 150.0 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.6 (d, *J* = 3.8 Hz), 135.7, 133.7, 131.2 (dd, *J* = 274.3, 271.3 Hz), 128.8, 128.8, 127.0, 114.8, 101.9 (d, *J* = 3.1 Hz), 70.9 (dd, *J* = 34.3, 19.1 Hz), 41.2 (d, *J* = 2.8 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{14}H_{16}F_2NO^+$ 252.1194; Found: 252.1191.

2,2-difluoro-N, N-dimethyl-5-(thiophen-2-yl)-2,3-dihydrofuran-3-amine (4u)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil, yield: 58% (26.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

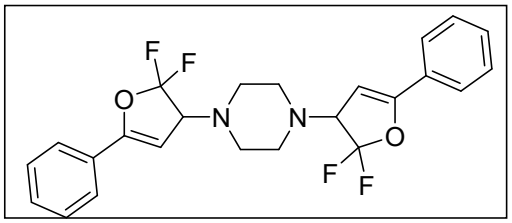
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.43 – 7.30 (m, 2H), 7.05 (dd, *J* = 5.0, 3.7 Hz, 1H), 5.38 (t, *J* = 2.5 Hz, 1H), 4.14 (ddd, *J* = 15.0, 7.1, 2.7 Hz, 1H), 2.48 (s, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.62 (d, *J* = 150.0 Hz), -83.81 (d, *J* = 150.0 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 149.6 (d, *J* = 4.5 Hz), 131.0 (dd, *J* = 274.6, 272.2 Hz), 130.9, 127.7, 127.3, 126.7, 96.5 (d, *J* = 2.7 Hz), 71.1 (dd, *J* = 34.4, 18.8 Hz), 41.1 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{10}H_{12}F_2NOS^+$ 232.0602; Found: 232.0603.

1,4-bis(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperazine (4v)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 164 – 166 ^{o}C), yield: 72% (64.2 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

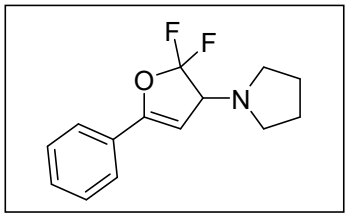
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.62 (dtd, *J* = 5.8, 3.5, 1.5 Hz, 4H), 7.46 – 7.36 (m, 6H), 5.60 (t, *J* = 2.4 Hz, 2H), 4.20 (ddd, *J* = 15.4, 7.1, 2.7 Hz, 2H), 2.91 (dq, *J* = 9.9, 4.9, 4.2 Hz, 4H), 2.84 – 2.76 (m, 4H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.6 (d, *J* = 27.9 Hz), -62.0 (d, *J* = 28.6 Hz), -82.7 (d, *J* = 389.7 Hz), -83.8 (d, *J* = 319.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.6 (d, *J* = 3.6 Hz), 130.8 (dd, *J* = 274.6, 272.2 Hz), 130.0, 128.6, 128.1, 125.4, 96.6 (d, *J* = 3.1 Hz), 70.9 (dd, *J* = 35.5, 18.9 Hz), 49.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{24}H_{23}F_4N_2O_2^+$ 447.1690; Found: 447.1689.

1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) pyrrolidine (5a)



Following the experimental procedures (Condition B) on 0.2 mmol scale, yellow oil, yield: 62% (31.1 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

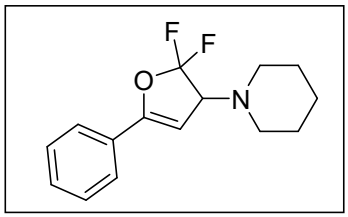
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.63 – 7.57 (m, 2H), 7.44 – 7.35 (m, 3H), 5.61 (t, *J* = 2.3 Hz, 1H), 4.24 (m, *J* = 15.6, 7.1, 2.6 Hz, 1H), 2.91 – 2.83 (m, 2H), 2.81 – 2.71 (m, 2H), 1.87 – 1.79 (m, 4H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.5 (d, *J* = 150.0 Hz), -82.8 (dd, *J* = 149.6, 2.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.1 (d, *J* = 3.3 Hz), 130.8 (dd, *J* = 274.6, 272.2 Hz), 129.8, 128.5 (d, *J* = 24.6 Hz), 125.3, 97.6 (d, *J* = 2.8 Hz), 68.5 (dd, *J* = 34.9, 19.3 Hz), 50.3 (d, *J* = 2.3 Hz), 24.1.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{14}H_{16}F_2NO^+$ 252.1194; Found: 252.1193.

1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperidine (5b)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil, yield: 95% (50.5 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

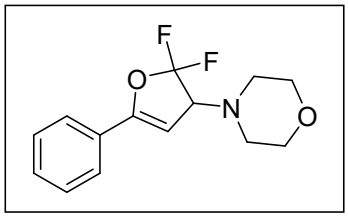
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.68 – 7.50 (m, 2H), 7.44 – 7.35 (m, 3H), 5.58 (t, *J* = 2.4 Hz, 1H), 4.15 (m, *J* = 15.5, 7.5, 2.7 Hz, 1H), 2.81 (m, *J* = 10.9, 4.9 Hz, 2H), 2.68 (m, *J* = 11.0, 5.0 Hz, 2H), 1.58 (m, *J* = 6.7, 5.0, 2.9 Hz, 4H), 1.48 (p, *J* = 5.7 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*)) δ -61.2 (d, *J* = 150.3 Hz), -83.1 (d, *J* = 150.0 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.1 (d, *J* = 3.8 Hz), 131.1 (dd, *J* = 274.5, 270.7 Hz), 129.8, 128.6, 128.4, 125.3, 97.4 (d, *J* = 3.2 Hz), 71.6 (dd, *J* = 34.7, 18.9 Hz), 50.3, 26.4, 24.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{15}H_{18}F_2NO^+$ 266.1351; Found: 266.1351.

4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) morpholine (5c)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil, yield: 92% (49.1mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

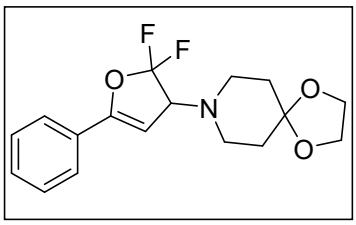
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.60 (m, *J* = 6.7, 3.1 Hz, 2H), 7.42 – 7.37 (m, 3H), 5.56 (t, *J* = 2.4 Hz, 1H), 4.13 (m, *J* = 15.2, 7.0, 2.7 Hz, 1H), 3.71 (t, *J* = 4.7 Hz, 4H), 2.85 (m, *J* = 10.0, 4.7 Hz, 2H), 2.74 (m, *J* = 10.9, 4.8 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*)) -61.8 (d, *J* = 150.6 Hz), -83.4 (d, *J* = 150.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.8 (d, *J* = 3.7 Hz), 130.8 (dd, *J* = 274.5, 270.7 Hz), 130.1, 128.6, 128.1, 125.4, 96.2 (d, *J* = 2.9 Hz), 71.1 (dd, *J* = 35.4, 18.9 Hz), 67.3, 49.6 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{14}H_{16}F_2NO_2^+$ 268.1144; Found: 268.1142.

8-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)-1,4-dioxa-8-azaspiro [4.5] decane (5d)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 136 – 138 ^{o}C), yield: 93% (60.2 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

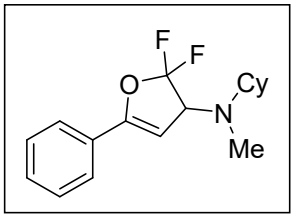
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.61 – 7.55 (m, 2H), 7.42 – 7.35 (m, 3H), 5.58 (t, *J* = 2.4 Hz, 1H), 4.19 (m, *J* = 15.7, 7.1, 2.7 Hz, 1H), 3.94 (s, 4H), 2.90 (m, *J* = 11.5, 6.0 Hz, 2H), 2.83 – 2.75 (m, 2H), 1.74 (t, *J* = 5.8 Hz, 4H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.9 (d, *J* = 150.1 Hz), -83.7 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.4 (d, *J* = 3.6 Hz), 130.8 (dd, *J* = 273.6, 270.0 Hz), 129.9, 128.6, 128.3, 125.3, 107.1, 97.1 (d, *J* = 2.8 Hz), 70.9 (dd, *J* = 35.5, 19.3 Hz), 64.3, 47.3, 35.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{20}F_2NO_3^+$ 324.1406; Found: 324.1410.

N-cyclohexyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5e)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 91% (53.5 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

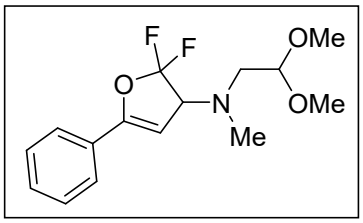
^{1}H NMR (500 MHz, Chloroform-*d*)δ 7.68 – 7.51 (m, 2H), 7.46 – 7.32 (m, 3H), 5.53 (t, *J* = 2.3 Hz, 1H), 4.43 (m, *J* = 16.3, 7.6, 2.7 Hz, 1H), 2.61 (tt, *J* = 10.8, 3.6 Hz, 1H), 2.37 (d, *J* = 1.2 Hz, 3H), 1.93 (m, *J* = 11.8, 5.9, 2.8 Hz, 2H), 1.86 – 1.75 (m, 2H), 1.65 (m, *J* = 12.7, 3.3, 1.7 Hz, 1H), 1.36 – 1.24 (m, 4H), 1.13 (tt, *J* = 12.5, 3.6 Hz, 1H).

^{19}F NMR (471 MHz, Chloroform-*d*) δδ -61.9 (d, *J* = 150.1 Hz), -83.7 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.3 (d, *J* = 3.6 Hz), 131.0 (dd, *J* = 272.0, 269.3 Hz), 129.7, 128.6, 128.5, 125.2, 99.4 (d, *J* = 3.6 Hz), 67.1 (dd, *J* = 35.5, 19.7 Hz), 62.3, 33.4 (d, *J* = 3.2 Hz), 30.9, 30.5, 26.1, 26.0, 25.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{22}F_2NO^+$ 294.1664; Found: 294.1662.

N-(2,2-dimethoxyethyl)-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5f)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 66% (39.6 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*)δ 7.61 – 7.56 (m, 2H), 7.42 – 7.36 (m, 3H), 5.54 (t, *J* = 2.4 Hz, 1H), 4.43 (t, *J* = 5.2 Hz, 1H), 4.33 (m, *J* = 14.4, 8.0, 2.8 Hz, 1H), 3.37 (d, *J* = 4.5 Hz, 6H), 2.82 (m, *J* = 51.7, 14.0, 5.1, 1.5 Hz, 2H), 2.58 (s, 3H).

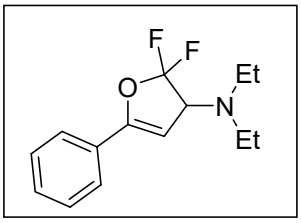
^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.8 (d, *J* = 150.9 Hz), -81.5 (d, *J* = 150.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.3 (d, *J* = 3.6 Hz), 131.3 (t, *J* = 273.4 Hz), 129.9, 128.6,

128.2, 125.3, 103.8, 98.3 (d, *J* = 3.5 Hz), 71.4 (dd, *J* = 34.0, 19.6 Hz), 54.4, 53.9, 53.7, 39.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{15}H_{20}F_2NO_3^+$ 300.1406; Found: 300.1402.

N, N-diethyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5g)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil, yield: 93% (47.2 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

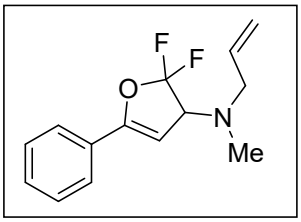
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.65 – 7.60 (m, 2H), 7.42 (m, *J* = 4.7, 3.6, 1.6 Hz, 3H), 5.58 (t, *J* = 2.4 Hz, 1H), 4.42 (m, *J* = 15.5, 8.2, 2.7 Hz, 1H), 2.84 – 2.70 (m, 4H), 1.12 (t, *J* = 7.2 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.5 (d, *J* = 150.3 Hz), -80.5 (d, *J* = 150.3 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.8 (d, *J* = 3.6 Hz), 131.3 (dd, *J* = 273.6, 270.9 Hz), 129.8, 128.6, 128.5, 125.3, 98.8 (d, *J* = 3.6 Hz), 68.4 (dd, *J* = 34.2, 19.6 Hz), 44.7, 14.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{14}H_{18}F_2NO^+$ 254.1351; Found: 254.1351.

N-allyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5h)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 92% (46.4 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.64 – 7.57 (m, 2H), 7.40 (m, *J* = 5.0, 2.0 Hz, 3H), 5.89 – 5.75 (m, 1H), 5.55 (t, *J* = 2.4 Hz, 1H), 5.30 – 5.10 (m, 2H), 4.32 (m, *J* = 15.0, 7.7, 2.7 Hz, 1H), 3.39 – 3.20 (m, 2H), 2.44 (d, *J* = 1.2 Hz, 3H).

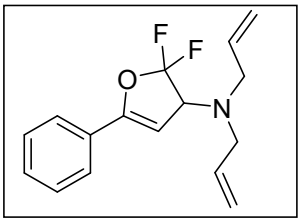
^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.9 (d, *J* = 150.8 Hz), -82.3 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.3 (d, *J* = 3.6 Hz), 135.8, 131.3 (dd, *J* = 273.9, 271.7 Hz), 129.9, 128.6, 128.3, 125.3, 117.6, 97.9 (d, *J* = 3.2 Hz), 69.8 (dd, *J* = 34.7, 19.3 Hz), 56.7, 37.6 (d, *J* =

3.0 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{14}H_{16}F_2NO^+$ 252.1194; Found: 252.1120.

N, N-diallyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5i)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil, yield: 95% (52.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

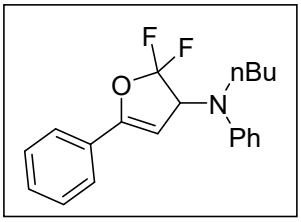
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.67 – 7.58 (m, 2H), 7.43 (m, *J* = 4.8, 4.3, 2.1 Hz, 3H), 5.92 – 5.78 (m, 2H), 5.56 (q, *J* = 2.1 Hz, 1H), 5.27 (m, *J* = 17.1, 1.8 Hz, 2H), 5.19 (m, *J* = 10.1, 1.6 Hz, 2H), 4.57 – 4.45 (m, 1H), 3.39 (m, *J* = 14.6, 5.5, 1.7 Hz, 2H), 3.30 (m, *J* = 14.7, 7.0 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.9 (d, *J* = 150.9 Hz), -80.5 (dd, *J* = 151.4, 1.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.1 (d, *J* = 3.6 Hz), 136.3, 131.3 (t, *J* = 272.1 Hz), 129.9, 128.6, 128.3, 125.3, 117.3, 98.4 (d, *J* = 3.6 Hz), 67.1 (dd, *J* = 34.8, 19.4 Hz), 53.3 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{18}F_2NO^+$ 278.1351; Found: 278.1353.

N-butyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5j)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 96% (63.3 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

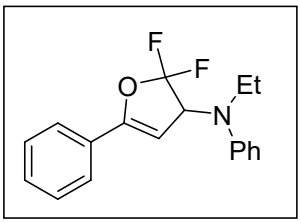
^{1}H NMR (500 MHz, Chloroform-*d*)δ 7.72 (m, *J* = 6.2, 3.9, 1.8 Hz, 2H), 7.55 – 7.46 (m, 3H), 7.35 (m, *J* = 9.0, 7.2, 2.0 Hz, 2H), 7.00 – 6.93 (m, 2H), 6.89 (m, *J* = 7.3, 1.8 Hz, 1H), 5.69 (t, *J* = 2.4 Hz, 1H), 5.31 (m, *J* = 12.8, 6.3, 2.8 Hz, 1H), 3.32 (m, *J* = 9.1, 5.9, 1.8 Hz, 2H), 1.78 – 1.66 (m, 1H), 1.64 – 1.55 (m, 1H), 1.51 (d, *J* = 2.1 Hz, 1H), 1.36 (m, *J* = 15.2, 7.6, 1.9 Hz, 3H), 0.97 (m, *J* = 7.4, 1.9 Hz, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -65.8 (d, *J* = 148.2 Hz), -80.8 (d, *J* = 148.6 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.8 (d, *J* = 3.3 Hz), 148.4, 130.2, 130.2 (t, *J* = 270.9 Hz), 129.3, 128.7, 128.2, 125.5, 118.3, 114.2, 97.5 (d, *J* = 3.2 Hz), 66.2 (dd, *J* = 37.3, 21.7 Hz), 46.8, 31.5, 30.4, 20.2, 13.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{20}H_{22}F_2NO^+$ 330.1664; Found: 330.1662.

N-ethyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5k)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 82 – 84 °C), yield: 94% (56.7mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

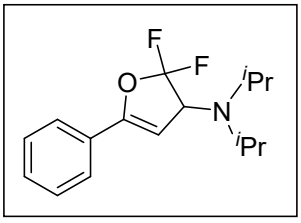
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.76 – 7.69 (m, 2H), 7.50 (m, *J* = 6.6, 2.6 Hz, 3H), 7.35 (tq, *J* = 7.2, 2.0 Hz, 2H), 6.97 (m, *J* = 8.8, 2.4 Hz, 2H), 6.89 (m, *J* = 7.5, 2.5 Hz, 1H), 5.70 (q, *J* = 2.6, 2.2 Hz, 1H), 5.31 (m *J* = 12.9, 6.3, 2.9 Hz, 1H), 3.44 (m, *J* = 7.1, 2.1 Hz, 2H), 1.30 – 1.23 (m, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -66.3 (d, *J* = 149.8 Hz), -80.7 (d, *J* = 149.8 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.8 (d, *J* = 3.7 Hz), 148.1, 130.3, 130.2 (t, *J* = 270.6 Hz), 129.4, 128.7, 128.1, 125.5, 118.3, 113.9, 97.4 (d, *J* = 3.0 Hz), 66.0 (dd, *J* = 37.5, 21.9 Hz), 41.2, 14.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{18}H_{18}F_2NO^+$ 302.1351; Found: 302.1352.

2,2-difluoro-N, N-diisopropyl-5-phenyl-2,3-dihydrofuran-3-amine (5l)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 63 – 65 °C), yield: 95% (53.5 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

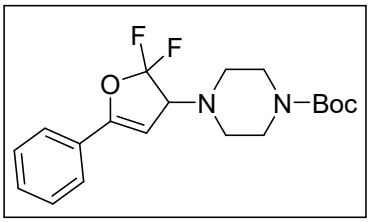
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.64 – 7.59 (m, 2H), 7.43 – 7.35 (m, 3H), 5.51 (t, *J* = 2.3 Hz, 1H), 4.46 (m, *J* = 17.1, 7.6, 2.7 Hz, 1H), 3.13 (p, *J* = 6.7 Hz, 2H), 1.11 (d, *J* = 6.7 Hz, 6H), 1.06 (d, *J* = 6.6 Hz, 6H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -68.8 (d, *J* = 150.6 Hz), -80.6 (d, *J* = 150.1 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 152.9 (d, *J* = 3.7 Hz), 130.6 (t, *J* = 268.7 Hz), 129.5, 128.8, 128.5, 125.2, 100.6 (d, *J* = 4.3 Hz), 62.7 (dd, *J* = 37.2, 21.1 Hz), 45.8, 22.9, 22.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{22}F_2NO^+$ 282.1664; Found: 282.1664.

tert-butyl 4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5m)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil, yield: 93% (68.1 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

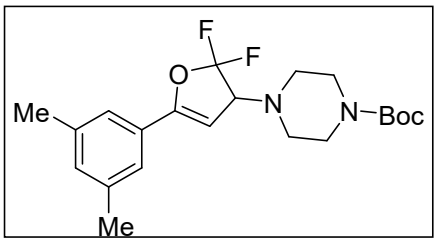
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.61 – 7.56 (m, 2H), 7.41 – 7.36 (m, 3H), 5.54 (t, *J* = 2.4 Hz, 1H), 4.18 (m, *J* = 15.2, 7.0, 2.7 Hz, 1H), 3.50 – 3.37 (m, 4H), 2.79 (m, *J* = 10.9, 5.0 Hz, 2H), 2.67 (m, *J* = 11.2, 5.1 Hz, 2H), 1.45 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.9 (d, *J* = 150.1 Hz), -83.7 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.8 (d, *J* = 3.6 Hz), 154.7, 130.7 (dd, *J* = 273.4, 270.6 Hz), 130.1, 128.6, 128.0, 125.4, 96.4 (d, *J* = 2.7 Hz), 79.8, 71.0 (dd, *J* = 35.5, 18.9 Hz), 48.9, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{25}F_2N_2O_3^+$ 367.1828; Found: 367.1826.

tert-butyl 4-(5-(3,5-dimethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5n)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 94% (74.3 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.21 (s, 2H), 7.02 (s, 1H), 5.50 (t, *J* = 2.4 Hz, 1H), 4.15 (m, *J* = 15.1, 6.9, 2.7 Hz, 1H), 3.42 (t, *J* = 5.2 Hz, 4H), 2.78 (m, *J* = 10.9, 5.0 Hz, 2H), 2.66 (m, *J* = 11.7, 5.5

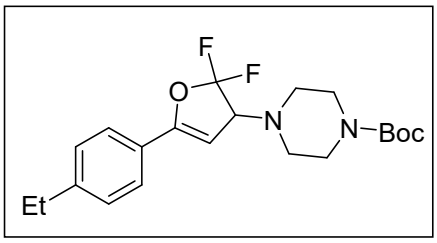
Hz, 2H), 2.33 (s, 6H), 1.46 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.8 (d, *J* = 150.5 Hz), -83.4 (d, *J* = 150.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 155.1, 154.7, 138.2, 131.8, 130.8 (*J* = 273.4, 270.6 Hz), 123.1, 96.02, 79.7, 71.0 (dd, *J* = 35.6, 18.9 Hz), 48.9, 28.4, 21.2.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{21}H_{29}F_2N_2O_3$+ 395.2141; Found: 395.2145.

tert-butyl 4-(5-(4-ethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5o)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 96% (75.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

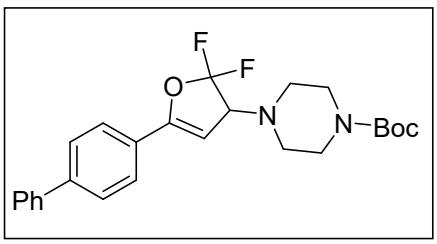
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.52 – 7.49 (m, 2H), 7.22 (d, *J* = 8.1 Hz, 2H), 5.48 (t, *J* = 2.4 Hz, 1H), 4.16 m, *J* = 15.2, 6.9, 2.7 Hz, 1H), 3.47 – 3.37 (m, 4H), 2.78 (m, *J* = 10.9, 5.1 Hz, 2H), 2.66 (q, *J* = 7.5 Hz, 4H), 1.45 (s, 9H), 1.23 (t, *J* = 7.6 Hz, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.8 (d, *J* = 150.6 Hz), -83.4 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 155.0, 154.7, 146.7, 130.8 (*J* = 273.4, 270.6 Hz), 128.1, 125.5, 125.4, 95.4 (d, *J* = 3.1 Hz), 79.7, 71.0 (dd, *J* = 35.5, 18.9 Hz), 48.9, 28.8, 28.4, 15.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{21}H_{29}F_2N_2O_3$+ 395.2141; Found: 395.2138.

tert-butyl 4-(5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5p)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 119 – 121 °C), yield: 95% (84.0 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.69 – 7.57 (m, 6H), 7.46 (m, *J* = 8.4, 6.9 Hz, 2H), 7.41 – 7.36

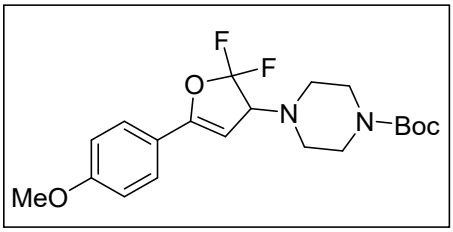
(m, 1H), 5.58 (t, *J* = 2.4 Hz, 1H), 4.21 (m, *J* = 15.1, 7.0, 2.7 Hz, 1H), 3.45 (t, *J* = 5.2 Hz, 4H), 2.81 (m, *J* = 11.0, 5.1 Hz, 2H), 2.70 (m, *J* = 11.2, 5.2 Hz, 2H), 1.47 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.8 (d, *J* = 150.9 Hz), -83.2 (d, *J* = 151.1 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.1 (d, *J* = 3.3 Hz), 130.8 (dd, *J* = 274.6, 272.2 Hz), 129.8, 128.5 (d, *J* = 24.6 Hz), 125.3, 97.6 (d, *J* = 2.8 Hz), 68.5 (dd, *J* = 34.9, 19.3 Hz), 50.3 (d, *J* = 2.3 Hz), 24.1.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{25}H_{29}F_2N_2O_3^+$ 443.2141; Found: 443.2145.

tert-butyl 4-(2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5q)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 85 – 87 °C), yield: 93% (73.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

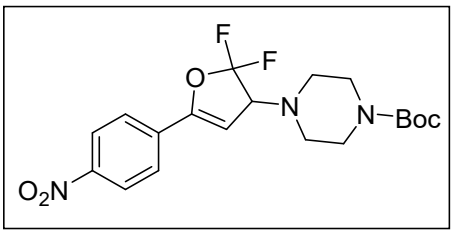
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.50 (d, *J* = 8.6 Hz, 2H), 7.35 (d, *J* = 8.7 Hz, 2H), 5.53 (t, *J* = 2.4 Hz, 1H), 4.16 (m, *J* = 15.2, 7.2, 2.7 Hz, 1H), 3.47 – 3.34 (m, 4H), 2.76 (m, *J* = 10.7, 5.0 Hz, 2H), 2.65 (m, *J* = 11.0, 5.0 Hz, 2H), 1.44 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.9 (d, *J* = 150.0 Hz), -83.1 (d, *J* = 150.6 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.7, 153.7 (d, *J* = 3.7 Hz), 136.0, 130.7 (dd, *J* = 273.9, 270.8 Hz), 128.9, 126.7, 126.5, 97.1 (d, *J* = 2.9 Hz), 79.7, 71.1 (dd, *J* = 35.3, 18.9 Hz), 48.9, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{20}H_{27}F_2N_2O_4^+$ 397.1933; Found: 397.1934.

tert-butyl 4-(2,2-difluoro-5-(4-nitrophenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5r)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 94% (77.4 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

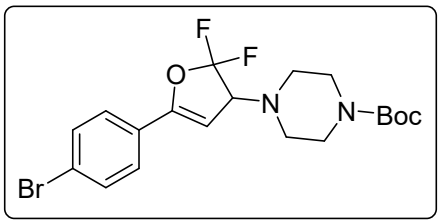
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.29 – 8.19 (m, 2H), 7.81 – 7.63 (m, 2H), 5.80 (t, *J* = 2.4 Hz, 1H), 4.22 (m, *J* = 15.1, 7.5, 2.8 Hz, 1H), 3.48 – 3.37 (m, 4H), 2.76 (m, *J* = 10.6, 5.0 Hz, 2H), 2.68 (m, *J* = 10.9, 5.0 Hz, 2H), 1.43 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.9 (d, *J* = 150.0 Hz), -82.7 (d, *J* = 150.0 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.6, 152.5 (d, *J* = 3.7 Hz), 148.4, 133.7, 130.5 (dd, *J* = 275.0, 271.7 Hz), 126.2, 124.0, 101.1 (d, *J* = 3.0 Hz), 79.8, 71.1 (dd, *J* = 35.3, 19.1 Hz), 49.0, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{24}F_2N_3O_5^+$ 412.1679; Found: 412.1674

tert-butyl 4-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5s)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 75% (66.7 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

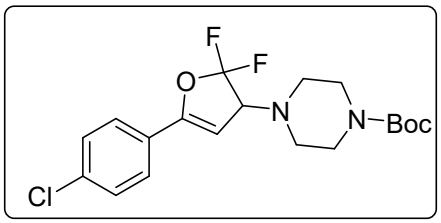
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.51 (dd, *J* = 8.7, 1.0 Hz, 2H), 7.45 – 7.40 (m, 2H), 5.55 (t, *J* = 2.3 Hz, 1H), 4.15 (m, *J* = 15.2, 7.2, 2.7 Hz, 1H), 3.49 – 3.33 (m, 4H), 2.76 (dt, *J* = 10.8, 5.0 Hz, 2H), 2.65 (dt, *J* = 10.7, 4.9 Hz, 2H), 1.44 (d, *J* = 1.0 Hz, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.8 (d, *J* = 150.9 Hz), -83.1 (d, *J* = 150.4 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.6, 153.8 (d, *J* = 3.6 Hz), 131.9, 130.7 (dd, *J* = 274.0, 270.9 Hz), 126.9, 126.9, 124.3, 97.2 (d, *J* = 2.7 Hz), 79.7, 71.1 (dd, *J* = 35.4, 19.0 Hz), 48.9, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{24}BrF_2N_2O_3^+$ 445.0933; Found: 445.0933.

tert-butyl 4-(5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl)piperazine-1-carboxylate 5(9t)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 72% (64.2 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

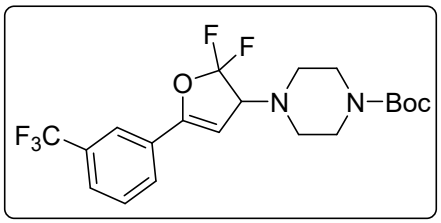
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.50 (d, *J* = 8.6 Hz, 2H), 7.35 (d, *J* = 8.7 Hz, 2H), 5.53 (t, *J* = 2.4 Hz, 1H), 4.16 (ddd, *J* = 15.2, 7.2, 2.7 Hz, 1H), 3.47 – 3.34 (m, 4H), 2.76 (dt, *J* = 10.7, 5.0 Hz, 2H), 2.65 (dt, *J* = 11.0, 5.0 Hz, 2H), 1.44 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.0 (d, *J* = 150.0 Hz), -83.1 (d, *J* = 150.6 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.7, 153.7 (d, *J* = 3.7 Hz), 136.0, 130.7 (dd, *J* = 273.9, 270.8 Hz), 128.9, 126.7, 126.5, 97.1 (d, *J* = 2.9 Hz), 79.7, 71.1 (dd, *J* = 35.3, 18.9 Hz), 48.9, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{24}ClF_2N_2O_3^+$ 401.1438; Found: 401.1439

tert-butyl-4-(2,2-difluoro-5-(3-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-yl)piperazine-1-carboxylate (5u)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 110 – 112 °C), yield: 98% (85.2 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

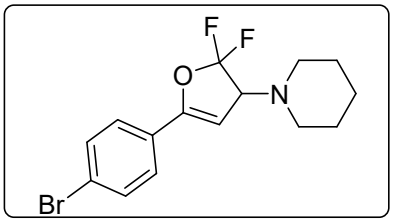
^{1}H NMR (500 MHz, Chloroform-*d*)δ 7.83 (s, 1H), 7.77 (d, *J* = 7.8 Hz, 1H), 7.64 (d, *J* = 7.8 Hz, 1H), 7.53 (t, *J* = 7.8 Hz, 1H), 5.67 (t, *J* = 2.4 Hz, 1H), 4.21 (ddd, *J* = 15.1, 7.2, 2.7 Hz, 1H), 3.43 (t, *J* = 5.0 Hz, 4H), 2.84 – 2.72 (m, 2H), 2.69 (q, *J* = 6.2, 5.8 Hz, 2H), 1.45 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.0 (d, *J* = 150.4 Hz), -62.9, -83.1 (d, *J* = 150.6 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.7, 153.3 (d, *J* = 3.6 Hz), 130.6 (dd, *J* = 273.9, 270.8 Hz), 131.3 (q, *J* = 32.9 Hz), 129.3, 128.8, 128.5, 126.6 (q, *J* = 3.7 Hz), 123.7 (q, *J* = 272.2 Hz), 122.2 (q, *J* = 3.8 Hz), 98.3 (d, *J* = 2.7 Hz), 79.8, 71.0 (dd, *J* = 35.3, 19.0 Hz), 48.9, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{20}H_{24}F_5N_2O_3^+$ 435.1702; Found: 435.1702.

1-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperidine (5v)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 84% (57.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

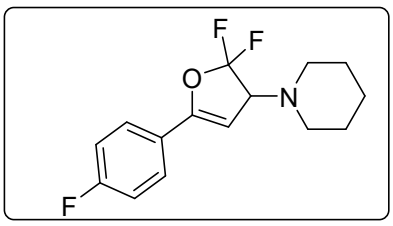
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.52 (d, *J* = 8.6 Hz, 2H), 7.45 (d, *J* = 8.6 Hz, 2H), 5.58 (t, *J* = 2.4 Hz, 1H), 4.13 (ddd, *J* = 15.5, 7.6, 2.7 Hz, 1H), 2.78 (dt, *J* = 11.0, 5.8 Hz, 2H), 2.67 (dt, *J* = 11.0, 5.0 Hz, 2H), 1.57 (tdd, *J* = 8.0, 6.1, 3.7 Hz, 4H), 1.47 (p, *J* = 5.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.2 (d, *J* = 149.9 Hz), -83.0 (d, *J* = 149.8 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.1 (d, *J* = 3.7 Hz), 131.8, 131.0 (dd, *J* = 275.2, 271.1 Hz), 127.2, 126.8, 124.0, 98.1 (d, *J* = 3.1 Hz), 71.7 (dd, *J* = 34.7, 18.9 Hz), 50.3, 26.4, 24.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{15}H_{17}BrF_2NO^+$ 344.0456; Found: 344.0461

1-(2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-yl)piperidine (5w)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 91% (51.6 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

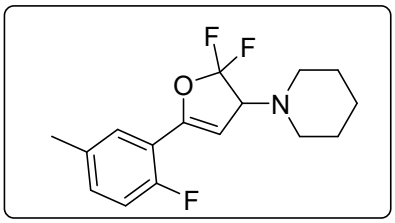
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.60 – 7.54 (m, 2H), 7.08 (t, *J* = 8.6 Hz, 2H), 5.51 (t, *J* = 2.5 Hz, 1H), 4.14 (ddd, *J* = 15.5, 7.5, 2.7 Hz, 1H), 2.79 (dt, *J* = 11.0, 5.2 Hz, 2H), 2.67 (dt, *J* = 11.0, 5.3 Hz, 2H), 1.62 – 1.52 (m, 4H), 1.47 (p, *J* = 5.8 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.2 (d, *J* = 150.0 Hz), -83.1 (d, *J* = 150.0 Hz), -110.2.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 163.6 (d, *J* = 250.6 Hz), 153.2 (d, *J* = 3.9 Hz), 131.0 (dd, *J* = 274.8, 271.0 Hz), 127.3 (d, *J* = 8.4 Hz), 124.6 (d, *J* = 3.4 Hz), 115.7 (d, *J* = 22.1 Hz), 97.0, 71.7 (dd, *J* = 34.7, 18.8 Hz), 50.2, 26.4, 24.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{15}H_{17}F_3NO^+$ 284.1257; Found: 284.1260.

1-(2,2-difluoro-5-(2-fluoro-5-methylphenyl)-2,3-dihydrofuran-3-yl) piperidine (5x)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 93% (55.4 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

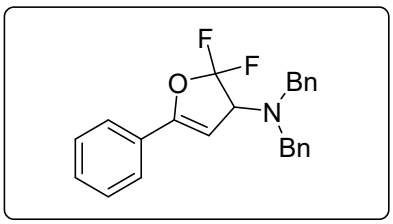
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.43 (dd, *J* = 7.2, 2.3 Hz, 1H), 7.12 (ddd, *J* = 7.7, 4.9, 2.3 Hz, 1H), 6.99 (dd, *J* = 11.2, 8.4 Hz, 1H), 5.80 (d, *J* = 2.6 Hz, 1H), 4.16 (ddd, *J* = 15.7, 7.7, 2.7 Hz, 1H), 2.79 (dt, *J* = 10.9, 5.4 Hz, 2H), 2.68 (dt, *J* = 11.0, 5.3 Hz, 2H), 2.33 (s, 3H), 1.58 (qq, *J* = 8.0, 4.2, 3.3 Hz, 4H), 1.47 (p, *J* = 6.0 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.0 (d, *J* = 150.0 Hz), -84.1 (d, *J* = 150.2 Hz), -116.6.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 158.8 (d, *J* = 251.1 Hz), 148.2, 133.8 (d, *J* = 3.6 Hz), 131.3 (d, *J* = 8.4 Hz), 130.4 (dd, *J* = 273.8, 269.9 Hz), 127.8 (d, *J* = 2.2 Hz), 116.1 (d, *J* = 11.2 Hz), 115.5 (d, *J* = 21.6 Hz), 103.3 (dd, *J* = 13.8, 2.9 Hz), 71.9 (dd, *J* = 34.7, 18.8 Hz), 50.3, 26.4, 24.4, 20.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{19}F_3NO^+$ 298.1413; Found: 298.1411

N, N-dibenzyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5y)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 70 – 72 °C), yield: 85% (64.2 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

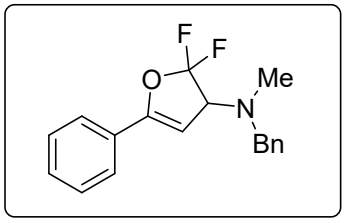
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.61 (dt, *J* = 6.0, 3.0 Hz, 2H), 7.49 – 7.36 (m, 11H), 7.34 – 7.28 (m, 2H), 5.56 (t, *J* = 2.6 Hz, 1H), 4.45 (dtd, *J* = 14.7, 4.6, 2.6 Hz, 1H), 3.98 (dd, *J* = 14.1, 3.5 Hz, 2H), 3.90 (dq, *J* = 14.0, 2.0 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.0 (d, *J* = 150.1 Hz), -80.3 (d, *J* = 150.1 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.5 (d, *J* = 3.5 Hz), 139.4, 131.7 (t, *J* = 273.0 Hz), 129.9, 128.8, 128.6, 128.4, 128.3, 127.3, 125.3, 98.4 (d, *J* = 3.4 Hz), 66.2 (dd, *J* = 34.4, 19.1 Hz), 54.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{24}H_{22}F_2NO^+$ 378.1664; Found: 378.1659

N-benzyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5z)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 99% (62.5 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

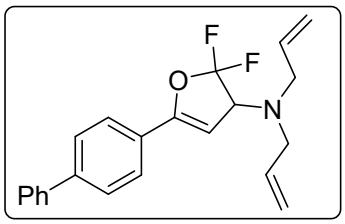
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.70 – 7.55 (m, 2H), 7.46 – 7.35 (m, 7H), 7.31 (ddt, *J* = 9.5, 3.8, 1.9 Hz, 1H), 5.61 (d, *J* = 2.2 Hz, 1H), 4.40 (ddt, *J* = 14.8, 7.8, 2.3 Hz, 1H), 3.99 – 3.74 (m, 2H), 2.48 (d, *J* = 1.5 Hz, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -61.5 (d, *J* = 150.7 Hz), -82.1 (d, *J* = 150.6 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.4 (d, *J* = 3.7 Hz), 139.3, 131.5 (t, *J* = 273.0 Hz), 130.0, 128.6, 128.6, 128.4, 128.3, 127.2, 125.4, 98.1 (d, *J* = 3.2 Hz), 70.2 (dd, *J* = 34.3, 19.3 Hz), 57.4, 38.0 (d, *J* = 2.6 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{18}H_{18}F_2NO^+$ 302.1351; Found: 302.1355

5-([1,1'-biphenyl]-4-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5aa)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 108 – 110 °C), yield: 85% (60.1 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

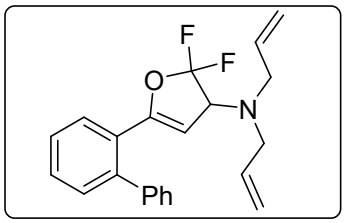
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.69 – 7.59 (m, 6H), 7.46 (dd, *J* = 8.4, 6.9 Hz, 2H), 7.42 – 7.35 (m, 1H), 5.83 (ddt, *J* = 16.7, 10.3, 6.2 Hz, 2H), 5.56 (t, *J* = 2.4 Hz, 1H), 5.24 (dt, *J* = 17.2, 1.6 Hz, 2H), 5.16 (dt, *J* = 10.0, 1.5 Hz, 2H), 4.50 (ddd, *J* = 15.1, 8.2, 2.8 Hz, 1H), 3.37 (ddt, *J* = 14.6, 5.6, 1.6 Hz, 2H), 3.32 – 3.25 (m, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.9 (d, *J* = 150.3 Hz), -80.5 (d, *J* = 150.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.9 (d, *J* = 3.6 Hz), 142.6, 140.2, 136.3, 131.3 (t, *J* = 273.0 Hz), 128.9, 127.8, 127.2, 127.2, 127.1, 125.8, 117.4, 98.5 (d, *J* = 3.6 Hz), 67.1 (dd, *J* = 34.8, 19.4 Hz), 53.3 (d, *J* = 2.4 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. For $C_{22}H_{22}F_2NO^+$ 354.1664; Found: 354.1660

5-([1,1'-biphenyl]-2-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5ab)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil， yield: 43% (30.4 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

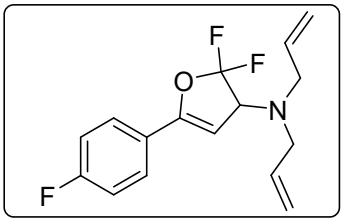
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.69 – 7.66 (m, 1H), 7.44 – 7.37 (m, 5H), 7.35 – 7.29 (m, 3H), 5.68 (ddt, *J* = 16.6, 10.1, 6.3 Hz, 2H), 5.20 – 5.03 (m, 4H), 4.47 (t, *J* = 2.3 Hz, 1H), 4.22 (ddd, *J* = 15.4, 8.6, 2.7 Hz, 1H), 3.23 – 3.05 (m, 4H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.5 (d, *J* = 151.0 Hz), -81.1 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.0 (d, *J* = 3.6 Hz), 141.5, 141.2, 136.1, 130.8 (dd, *J* = 273.8, 269.9 Hz), 130.7, 129.4, 128.8, 128.5, 127.9, 127.5, 127.5, 127.2, 117.4, 103.7 (d, *J* = 3.4 Hz), 67.2 (dd, *J* = 34.7, 19.2 Hz), 53.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. For $C_{22}H_{22}F_2NO^+$ 354.1664; Found: 354.1666

N, N-diallyl-2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-amine (5ac)



Following the experimental procedures (Condition A) on 0.2 mmol scale, yellow oil ， yield: 75% (44.4 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.42 – 7.35 (m, 2H), 7.33 – 7.26 (m, 1H), 7.11 (ddd, *J* = 9.3, 6.6, 2.4 Hz, 1H), 5.84 (ddt, *J* = 16.9, 10.1, 6.2 Hz, 2H), 5.58 (t, *J* = 2.4 Hz, 1H), 5.26 (dq, *J* = 17.2, 1.7

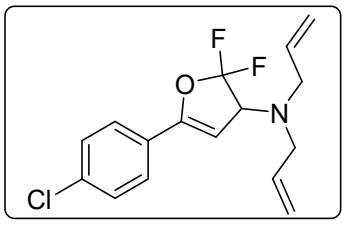
Hz, 2H), 5.18 (dq, *J* = 10.2, 1.4 Hz, 2H), 4.51 (ddd, *J* = 15.0, 8.4, 2.8 Hz, 1H), 3.37 (ddt, *J* = 14.6, 5.6, 1.7 Hz, 2H), 3.29 (ddd, *J* = 14.6, 7.0, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.1 (d, *J* = 150.3 Hz), -80.4 (d, *J* = 150.6 Hz), -112.3.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 162.8 (d, *J* = 246.5 Hz), 152.9 (t, *J* = 3.4 Hz), 136.1, 131.2 (t, *J* = 273.0 Hz), 130.4 (d, *J* = 8.2 Hz), 130.3 (d, *J* = 8.2 Hz), 121.0 (d, *J* = 3.1 Hz), 117.4, 116.8 (d, *J* = 21.3 Hz), 112.3 (d, *J* = 23.6 Hz), 99.8 (d, *J* = 3.6 Hz), 67.0 (dd, *J* = 34.6, 19.4 Hz), 53.3 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{17}F_3NO^+$ 296.1257; Found: 296.1255

N,N-diallyl-5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ad)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 114– 116 °C), yield: 68% (42.4 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

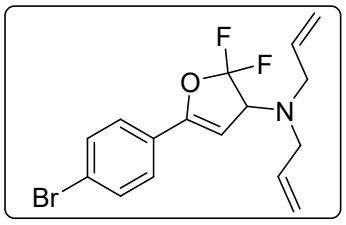
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.54 (d, *J* = 8.6 Hz, 2H), 7.39 (d, *J* = 8.6 Hz, 2H), 5.93 – 5.73 (m, 2H), 5.54 (t, *J* = 2.4 Hz, 1H), 5.27 (q, *J* = 1.6 Hz, 1H), 5.24 (d, *J* = 1.7 Hz, 1H), 5.19 (q, *J* = 1.5 Hz, 1H), 5.17 (t, *J* = 1.5 Hz, 1H), 4.50 (ddd, *J* = 15.0, 8.4, 2.7 Hz, 1H), 3.36 (ddt, *J* = 14.6, 5.5, 1.6 Hz, 2H), 3.28 (ddd, *J* = 14.6, 7.0, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.0 (d, *J* = 150.3 Hz), -80.4 (d, *J* = 150.3 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.0 (d, *J* = 3.6 Hz), 136.1, 135.8, 131.2 (dd, *J* = 273.9, 272.1 Hz), 128.9, 126.8, 126.6, 117.4, 99.0 (d, *J* = 3.5 Hz), 67.1 (dd, *J* = 34.6, 19.4 Hz), 53.3 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{17}ClF_2NO^+$ 312.0961; Found: 312.0960

N, N-diallyl-5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ae)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 82% (53.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

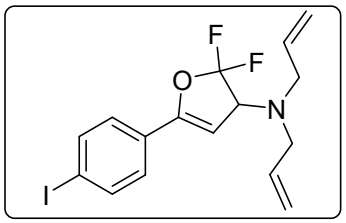
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.55 – 7.49 (m, 2H), 7.48 – 7.40 (m, 2H), 5.86 – 5.75 (m, 2H), 5.53 (t, *J* = 2.4 Hz, 1H), 5.23 (dq, *J* = 17.2, 1.6 Hz, 2H), 5.15 (dq, *J* = 10.2, 1.5 Hz, 2H), 4.47 (ddd, *J* = 15.1, 8.4, 2.7 Hz, 1H), 3.34 (ddt, *J* = 14.6, 5.5, 1.7 Hz, 2H), 3.26 (ddd, *J* = 14.6, 6.9, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.0 (d, *J* = 150.7 Hz), -80.3 (d, *J* = 150.1 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.1 (d, *J* = 3.6 Hz), 136.1, 131.8, 131.2 (dd, *J* = 273.9, 272.1 Hz), 127.2, 126.8, 124.1, 117.4, 99.1 (d, *J* = 3.6 Hz), 67.1 (dd, *J* = 34.7, 19.4 Hz), 53.3.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{17}BrF_2NO^+$ 356.0456; Found: 356.0454

N, N-diallyl-2,2-difluoro-5-(4-iodophenyl)-2,3-dihydrofuran-3-amine (5af)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown solid (mp: 51 – 53 °C), yield: 94% (75.9 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

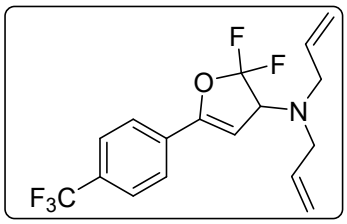
^{1}H NMR (500 MHz, Chloroform-*d*) ^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.73 (d, *J* = 8.5 Hz, 2H), 7.31 (d, *J* = 8.5 Hz, 2H), 5.87 – 5.74 (m, 2H), 5.54 (t, *J* = 2.4 Hz, 1H), 5.24 (q, *J* = 1.7 Hz, 1H), 5.21 (q, *J* = 1.7 Hz, 1H), 5.16 (q, *J* = 1.4 Hz, 1H), 5.14 (q, *J* = 1.5 Hz, 1H), 4.46 (ddd, *J* = 15.1, 8.4, 2.8 Hz, 1H), 3.33 (ddt, *J* = 14.6, 5.6, 1.6 Hz, 2H), 3.25 (ddd, *J* = 14.7, 7.0, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.0 (d, *J* = 150.2 Hz), -80.4 (d, *J* = 150.1 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.2 (d, *J* = 3.6 Hz), 137.8, 136.1, 131.2 (dd, *J* = 273.9, 272.1 Hz), 127.8, 126.8, 117.4, 99.3 (d, *J* = 3.6 Hz), 95.9, 67.1 (dd, *J* = 34.5, 19.5 Hz), 53.3 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{17}F_2INO^+$ 404.0317; Found: 404.0312

N, N-diallyl-2,2-difluoro-5-(4-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ag)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 90% (62.2 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

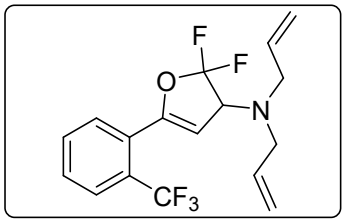
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.73 – 7.61 (m, 4H), 5.81 (ddt, *J* = 16.9, 10.0, 6.2 Hz, 2H), 5.66 (t, *J* = 2.3 Hz, 1H), 5.24 (dq, *J* = 17.2, 1.7 Hz, 2H), 5.16 (dt, *J* = 10.2, 1.5 Hz, 2H), 4.51 (ddd, *J* = 15.0, 8.5, 2.8 Hz, 1H), 3.34 (ddt, *J* = 14.5, 5.5, 1.6 Hz, 2H), 3.27 (ddd, *J* = 14.8, 7.0, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.9, -63.1 (d, *J* = 150.1 Hz), -80.3 (d, *J* = 150.5 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 152.7 (d, *J* = 3.6 Hz), 136.0, 131.6 (q, *J* = 33.0 Hz), 131.6, 131.1 (dd, *J* = 274.2, 272.3 Hz), 125.6 (d, *J* = 3.9 Hz), 125.6, 123.8 (q, *J* = 273.4 Hz), 117.5, 100.9 (d, *J* = 3.6 Hz), 67.0 (dd, *J* = 34.6, 19.5 Hz), 53.4 (d, *J* = 2.6 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{17}F_5NO^+$ 346.1225; Found: 346.1223

N,N-diallyl-2,2-difluoro-5-(2-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ah)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 52% (36.0 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

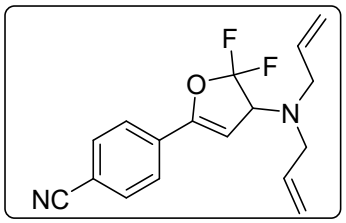
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.74 (dd, *J* = 7.9, 1.3 Hz, 1H), 7.64 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.59 (td, *J* = 7.6, 1.4 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 5.83 (dddd, *J* = 16.9, 10.0, 6.9, 5.7 Hz, 2H), 5.47 (t, *J* = 2.3 Hz, 1H), 5.27 (q, *J* = 1.7 Hz, 1H), 5.23 (q, *J* = 1.7 Hz, 1H), 5.18 (q, *J* = 1.4 Hz, 1H), 5.16 (t, *J* = 1.5 Hz, 1H), 4.49 (ddd, *J* = 15.6, 8.7, 2.7 Hz, 1H), 3.37 (ddt, *J* = 14.6, 5.6, 1.7 Hz, 2H), 3.29 (ddd, *J* = 14.6, 7.1, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -59.2, -63.7 (d, *J* = 151.3 Hz), -81.0 (d, *J* = 150.7 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 151.4 (d, *J* = 3.9 Hz), 136.1, 131.8, 130.9 (dd, *J* = 274.2, 272.3 Hz), 130.54, 129.91, 128.4 (q, *J* = 31.5 Hz), 127.77, 126.6 (q, *J* = 5.6 Hz), 124.5 (q, *J* = 273.4 Hz), 117.5, 104.8, 67.2 (dd, *J* = 34.7, 19.3 Hz), 53.3 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{17}F_5NO^+$ 346.1225; Found: 346.1225

4-(4-(diallylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzonitrile (5ai)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 84% (50.9 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

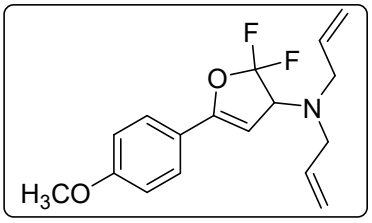
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.68 (s, 4H), 5.86 – 5.75 (m, 2H), 5.70 (dd, *J* = 2.8, 1.9 Hz, 1H), 5.27 – 5.13 (m, 4H), 4.51 (ddd, *J* = 15.0, 8.6, 2.8 Hz, 1H), 3.32 (ddt, *J* = 14.6, 5.7, 1.6 Hz, 2H), 3.26 (ddd, *J* = 14.6, 7.0, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) \ δ -63.1 (d, *J* = 150.0 Hz), -80.1 (d, *J* = 150.2 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 152.2 (d, *J* = 3.6 Hz), 135.9, 132.4, 132.2, 131.0 (dd, *J* = 274.7, 272.5 Hz), 125.8, 118.3, 117.6, 113.2, 102.3 (d, *J* = 3.7 Hz), 67.1 (dd, *J* = 34.6, 19.5 Hz), 53.4 (d, *J* = 2.6 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{17}F_2N_2O^+$ 303.1303; Found: 303.1305

N, N-diallyl-2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5aj)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 93% (57.3 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.53 (d, *J* = 8.9 Hz, 2H), 6.91 (d, *J* = 8.9 Hz, 2H), 5.88 – 5.76 (m, 2H), 5.37 (t, *J* = 2.4 Hz, 1H), 5.24 (dq, *J* = 17.2, 1.7 Hz, 2H), 5.15 (dq, *J* = 10.1, 1.5 Hz, 2H), 4.47

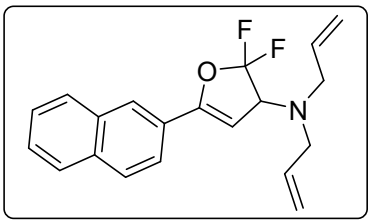
(ddd, *J* = 15.1, 8.0, 2.7 Hz, 1H), 3.83 (s, 3H), 3.36 (ddt, *J* = 14.5, 5.6, 1.6 Hz, 2H), 3.26 (ddd, *J* = 14.6, 7.0, 1.7 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.81 (d, *J* = 150.6 Hz), -80.65 (d, *J* = 150.8 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) ^{13}C NMR (126 MHz, Chloroform-*d*) δ 160.86, 153.98 (d, *J* = 3.5 Hz), 136.34, 134.24 – 128.70 (m), 126.84, 121.03, 117.26, 113.99, 96.15 (d, *J* = 3.4 Hz), 67.11 (dd, *J* = 34.6, 19.3 Hz), 55.34, 53.27 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{20}F_2NO_2^+$ 308.1457; Found: 308.1465

N, N-diallyl-2,2-difluoro-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (5ak)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 75% (49.2 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

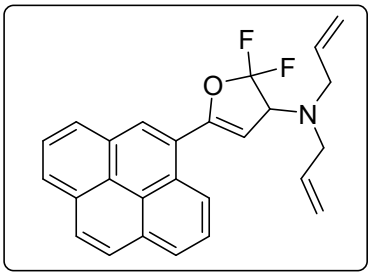
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.69 – 7.66 (m, 1H), 7.44 – 7.37 (m, 5H), 7.35 – 7.29 (m, 3H), 5.68 (ddt, *J* = 16.6, 10.1, 6.3 Hz, 2H), 5.20 – 5.03 (m, 4H), 4.47 (t, *J* = 2.3 Hz, 1H), 4.22 (ddd, *J* = 15.4, 8.6, 2.7 Hz, 1H), 3.23 – 3.05 (m, 4H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.5 (d, *J* = 151.0 Hz), -81.1 (d, *J* = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 153.0 (d, *J* = 3.6 Hz), 141.4 (d, *J* = 29.9 Hz), 136.1, 130.8 (dd, *J* = 274.7, 272.5 Hz), 130.7, 129.4, 129.1, 128.8, 128.5, 127.9, 127.5, 127.5, 127.2, 117.4, 103.7 (d, *J* = 3.4 Hz), 67.2 (dd, *J* = 34.7, 19.2 Hz), 53.2 (d, *J* = 2.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{20}H_{20}F_2NO^+$ 328.1507; Found: 328.1503

N,N-diallyl-2,2-difluoro-5-(pyren-4-yl)-2,3-dihydrofuran-3-amine (5al)



Following the experimental procedures (Condition A) on 0.2 mmol scale, white solid (mp: 56 – 58 °C), yield: 62% (49.8 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

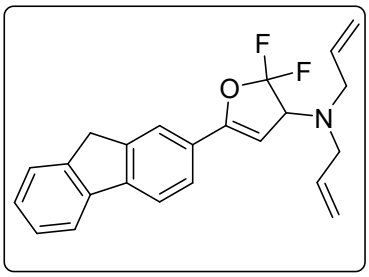
^{1}H NMR (500 MHz, Chloroform-*d*) δ 8.47 (d, *J* = 9.3 Hz, 1H), 8.15 (d, *J* = 7.6 Hz, 2H), 8.12 – 8.02 (m, 4H), 7.99 – 7.95 (m, 2H), 5.86 (ddt, *J* = 16.7, 10.1, 6.2 Hz, 2H), 5.60 (t, *J* = 2.3 Hz, 1H), 5.27 (dq, *J* = 17.1, 1.7 Hz, 2H), 5.17 (dq, *J* = 10.2, 1.4 Hz, 2H), 4.62 (ddd, *J* = 15.3, 8.2, 2.6 Hz, 1H), 3.47 (ddt, *J* = 14.4, 5.6, 1.6 Hz, 2H), 3.37 (ddd, *J* = 14.6, 7.0, 1.6 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.9 (d, J = 150.8 Hz), -80.8 (d, J = 150.9 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.7 (d, *J* = 3.3 Hz), 136.3, 132.4, 131.3 (dd, *J* = 274.7, 272.5 Hz), 131.2, 130.6, 128.7, 128.6, 128.6, 127.2, 126.3, 126.1, 125.9, 125.7, 124.8, 124.5, 124.5, 124.1, 123.2, 117.5, 104.2 (d, *J* = 3.2 Hz), 67.3 (dd, *J* = 34.7, 19.2 Hz), 53.5, 27.0.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{26}H_{22}F_2NO^+$ 402.1664; Found: 402.1664

N, N-diallyl-5-(9H-fluoren-2-yl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5am)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 67% (49.0 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

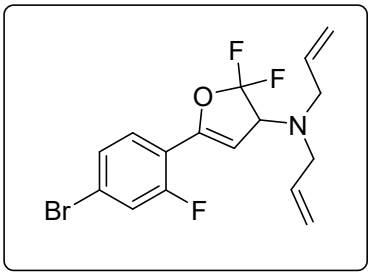
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.84 – 7.70 (m, 3H), 7.65 – 7.52 (m, 2H), 7.38 (dtd, *J* = 28.2, 7.4, 1.2 Hz, 2H), 5.86 (ddt, *J* = 16.7, 10.0, 6.2 Hz, 2H), 5.56 (t, *J* = 2.3 Hz, 1H), 5.27 (dq, *J* = 17.0, 1.7 Hz, 2H), 5.18 (dq, *J* = 10.1, 1.5 Hz, 2H), 4.53 (ddd, *J* = 15.0, 8.2, 2.7 Hz, 1H), 3.92 (s, 2H), 3.40 (ddt, *J* = 14.5, 5.5, 1.7 Hz, 2H), 3.31 (ddd, *J* = 14.9, 7.1, 1.8 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.9 (d, *J* = 150.5 Hz), -80.5 (d, *J* = 150.5 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 154.5 (d, *J* = 3.4 Hz), 143.8, 143.5, 143.4, 140.9, 136.3, 131.4 (dd, *J* = 274.7, 272.5 Hz), 127.4, 127.0, 126.6, 125.2, 124.3, 121.9, 120.3, 119.9, 117.4, 97.9 (d, *J* = 3.5 Hz), 67.1 (dd, *J* = 34.6, 19.4 Hz), 53.3, 36.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{23}H_{22}F_2NO^+$ 366.1664; Found: 366.1660

N, N-diallyl-5-(4-bromo-2-fluorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5an)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil，yield: 71% (53.1 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

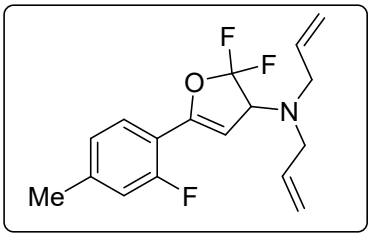
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.50 (t, *J* = 8.2 Hz, 1H), 7.37 – 7.28 (m, 2H), 5.87 – 5.74 (m, 3H), 5.25 (d, *J* = 1.7 Hz, 1H), 5.21 (d, *J* = 1.7 Hz, 1H), 5.16 (d, *J* = 1.6 Hz, 1H), 5.14 (d, *J* = 1.6 Hz, 1H), 4.48 (ddd, *J* = 15.3, 8.6, 2.8 Hz, 1H), 3.43 – 3.15 (m, 4H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -64.0 (d, *J* = 150.5 Hz), -81.3 (d, *J* = 150.3 Hz), -109.0.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 160.1 (d, *J* = 258.4 Hz), 147.3, 136.0, 133.0 (dd, *J* = 274.7, 272.5 Hz), 128.4 (d, *J* = 3.0 Hz), 127.8 (d, *J* = 3.6 Hz), 123.7 (d, *J* = 9.9 Hz), 119.7, 119.5, 117.6, 115.8 (d, *J* = 11.0 Hz), 105.1 (dd, *J* = 13.5, 3.6 Hz), 67.2 (dd, *J* = 34.6, 19.3 Hz), 53.4 (d, *J* = 2.6 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{16}BrF_3NO^+$ 374.0362; Found: 374.0368

N,N-diallyl-2,2-difluoro-5-(2-fluoro-4-methylphenyl)-2,3-dihydrofuran-3-amine (5ao)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 64% (39.7 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.50 (t, *J* = 7.9 Hz, 1H), 7.04 – 6.90 (m, 2H), 5.90 – 5.74 (m, 2H), 5.69 (q, *J* = 2.7 Hz, 1H), 5.26 – 5.19 (m, 2H), 5.18 – 5.11 (m, 2H), 4.49 (ddd, *J* = 15.2, 8.5, 2.8 Hz, 1H), 3.34 (ddt, *J* = 14.5, 5.7, 1.6 Hz, 2H), 3.26 (ddd, *J* = 14.6, 6.9, 1.6 Hz, 2H), 2.37 (s, 3H).

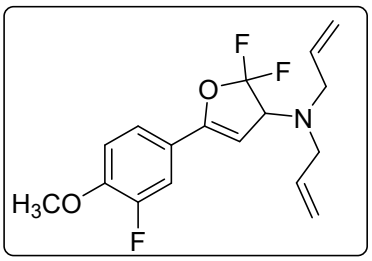
^{19}F NMR (471 MHz, Chloroform-*d*) δ -63.8 (d, *J* = 150.9 Hz), -81.5 (d, *J* = 150.9 Hz), -112.3.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 160.4 (d, *J* = 253.4 Hz), 148.3 (d, *J* = 3.7 Hz), 142.0 (d, *J* = 8.6 Hz), 136.2, 130.6 (dd, *J* = 274.7, 272.5 Hz), 127.2 (d, *J* = 2.8 Hz), 125.0 (d, *J* = 3.0 Hz), 117.4, 116.4

(d, *J* = 21.3 Hz), 113.8 (d, *J* = 11.4 Hz), 103.3 (dd, *J* = 13.4, 3.5 Hz), 67.2 (dd, *J* = 34.5, 19.2 Hz), 53.3 (d, *J* = 2.6 Hz), 21.3 (d, *J* = 1.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{19}F_3NO^+$ 310.1413; Found: 310.1416

N,N-diallyl-2,2-difluoro-5-(3-fluoro-4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5ap)



Following the experimental procedures (Condition A) on 0.2 mmol scale, brown oil， yield: 82% (53.4 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

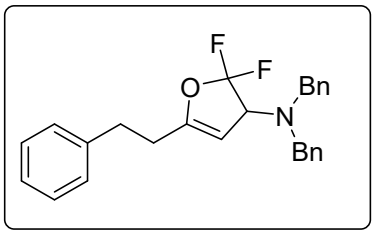
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.53 (t, *J* = 8.7 Hz, 1H), 6.75 – 6.63 (m, 2H), 5.88 – 5.73 (m, 2H), 5.60 (q, *J* = 2.7 Hz, 1H), 5.27 – 5.10 (m, 4H), 4.48 (ddd, *J* = 15.2, 8.3, 2.7 Hz, 1H), 3.82 (s, 3H), 3.34 (ddt, *J* = 14.6, 5.6, 1.6 Hz, 2H), 3.29 – 3.22 (m, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -68.6 (d, *J* = 150.9 Hz), -86.4 (d, *J* = 150.8 Hz), -113.8.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 161.7 (d, *J* = 11.6 Hz), 161.5 (d, *J* = 253.5 Hz), 148.2, 148.2 (d, *J* = 7.8 Hz), 136.3, 130.6 (dd, *J* = 274.7, 272.5 Hz), 128.2 (d, *J* = 4.3 Hz), 117.4 (d, *J* = 4.9 Hz), 109.7 (d, *J* = 2.8 Hz), 109.4 (d, *J* = 11.6 Hz), 102.3 (d, *J* = 25.0 Hz), 101.7 (dd, *J* = 12.9, 3.4 Hz), 67.2 (dd, *J* = 34.6, 19.3 Hz), 55.7, 53.3 (d, *J* = 2.6 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{19}F_3NO_2^+$ 326.1362; Found: 326.1369

N,N-dibenzyl-2,2-difluoro-5-phenethyl-2,3-dihydrofuran-3-amine (5aq)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 71% (57.5mg), column chromatography (silica gel, PE: EA = 20:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.40 – 7.34 (m, 8H), 7.29 (tdd, *J* = 7.3, 4.9, 2.3 Hz, 4H), 7.24 – 7.16 (m, 3H), 4.82 (qd, *J* = 2.2, 1.2 Hz, 1H), 4.25 – 4.13 (m, 1H), 3.82 – 3.70 (m, 4H), 2.88 (t, *J* = 7.6

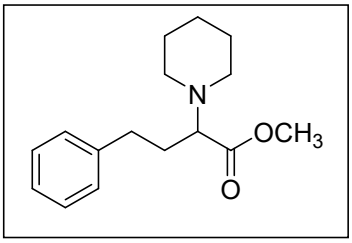
Hz, 2H), 2.57 (tt, *J* = 7.3, 1.5 Hz, 2H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.2 (d, *J* = 150.8 Hz), -80.8 (d, *J* = 150.8 Hz).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.0 (d, J = 2.9 Hz), 140.2, 139.5, 131.8 (dd, J = 274.7, 272.5 Hz), 128.7, 128.5, 128.4, 128.3, 127.1, 126.34, 99.7 (d, J = 3.5 Hz), 65.7 (dd, J = 34.5, 19.0 Hz), 54.2, 31.8, 29.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{26}H_{26}F_2NO^+$ 406.1982; Found: 406.1986

methyl 4-phenyl-2-(piperidin-1-yl) butanoate (6a)



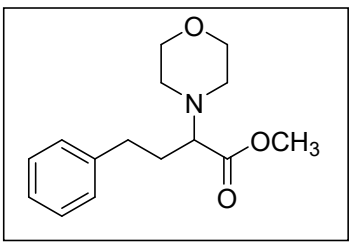
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 75% (39.3 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.33 – 7.28 (m, 2H), 7.22 (d, *J* = 7.6 Hz, 3H), 3.71 (s, 3H), 3.17 (t, *J* = 7.5 Hz, 1H), 2.66 (dtd, *J* = 19.6, 10.6, 9.1, 4.9 Hz, 4H), 2.48 (ddd, *J* = 11.2, 7.1, 3.4 Hz, 2H), 2.09 – 1.98 (m, 2H), 1.59 (ddqd, *J* = 25.2, 12.7, 6.4, 3.7 Hz, 4H), 1.47 (p, *J* = 5.9 Hz, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.8, 141.7, 128.6, 128.3, 125.9, 67.2, 50.9, 50.7, 32.3, 31.0, 26.6, 24.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{24}NO_2^+$ 262.1802; Found: 262.1805

methyl 2-morpholino-4-phenylbutanoate (6b)



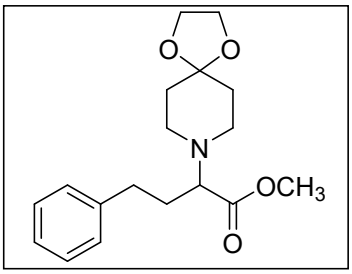
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 73% (38.6 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.32 – 7.28 (m, 2H), 7.24 – 7.17 (m, 3H), 3.78 – 3.65 (m, 7H), 3.17 (t, *J* = 7.6 Hz, 1H), 2.72 – 2.64 (m, 4H), 2.60 – 2.52 (m, 2H), 2.08 – 1.98 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.2, 141.4, 128.5, 128.4, 126.0, 67.4, 66.7, 51.1, 49.9, 32.1, 30.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{15}H_{22}NO_3^+$ 264.1594; Found: 264.1591

methyl 4-phenyl-2-(1,4-dioxa-8-azaspiro[4.5]decan-8-yl)butanoate (6c)



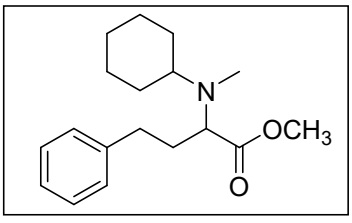
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 83% (53.2 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.29 – 7.23 (m, 2H), 7.20 – 7.15 (m, 3H), 3.93 (s, 4H), 3.68 (s, 3H), 3.19 (t, *J* = 7.5 Hz, 1H), 2.74 (dddd, *J* = 11.5, 7.5, 3.9, 1.2 Hz, 2H), 2.65 (td, *J* = 7.6, 2.2 Hz, 2H), 2.60 – 2.53 (m, 2H), 2.07 – 1.94 (m, 2H), 1.80 – 1.65 (m, 4H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.5, 141.5, 128.5, 128.4, 125.9, 107.3, 66.2, 64.2, 51.1, 35.5, 32.3, 31.0.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{18}H_{26}NO_4^+$ 320.1856; Found: 320.1855

methyl 4-phenyl-2-(piperidin-1-yl) butanoate (6d)



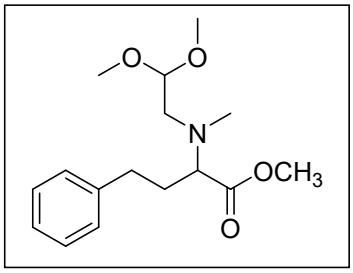
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 75% (43.5 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.32 (q, *J* = 7.7 Hz, 2H), 7.22 (q, *J* = 8.6, 7.9 Hz, 3H), 3.71 (d, *J* = 7.6 Hz, 3H), 3.45 (q, *J* = 7.3 Hz, 1H), 2.76 – 2.58 (m, 2H), 2.52 (ddt, *J* = 14.7, 11.3, 5.6 Hz, 1H), 2.41 (d, *J* = 7.1 Hz, 3H), 2.11 – 1.95 (m, 2H), 1.86 – 1.72 (m, 4H), 1.63 (td, *J* = 8.0, 4.0 Hz, 1H), 1.34 – 1.18 (m, 4H), 1.12 (ddt, *J* = 16.5, 7.9, 4.2 Hz, 1H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 174.5, 141.8, 128.5, 128.3, 125.9, 62.4, 61.3, 51.1, 32.7, 32.5, 31.9, 30.7, 30.3, 26.2, 26.0, 25.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{18}H_{28}NO_2^+$ 290.2115; Found: 290.2113

methyl 2-((2,2-dimethoxyethyl)(methyl)amino)-4-phenylbutanoate (6e)



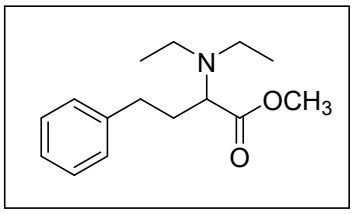
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 79% (46.9 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*)δ 7.30 – 7.25 (m, 2H), 7.22 – 7.16 (m, 3H), 4.42 (t, *J* = 5.2 Hz, 1H), 3.68 (s, 3H), 3.36 (d, *J* = 4.5 Hz, 6H), 3.28 (dd, *J* = 8.1, 6.9 Hz, 1H), 2.83 – 2.71 (m, 2H), 2.65 (ddd, *J* = 11.8, 8.4, 5.9 Hz, 2H), 2.42 (s, 3H), 2.08 – 1.90 (m, 2H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 173.2, 141.7, 128.6, 128.4, 125.9, 103.75, 66.1, 55.8, 53.8, 53.6, 51.0, 39.4, 32.4, 31.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{26}NO_4^+$ 296.1856; Found: 296.1862

methyl 2-(diethylamino)-4-phenylbutanoate (6f)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 67% (33.4 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

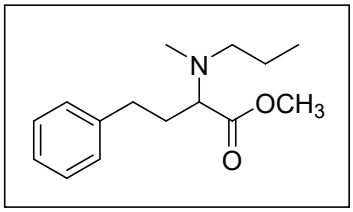
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.33 – 7.29 (m, 2H), 7.25 – 7.19 (m, 3H), 3.71 (s, 3H), 3.41 (dd, *J* = 7.8, 7.0 Hz, 1H), 2.81 – 2.64 (m, 4H), 2.52 (dq, *J* = 13.9, 6.9 Hz, 2H), 2.08 (ddt, *J* = 13.7, 9.4, 6.8 Hz, 1H), 1.96 (dddd, *J* = 13.7, 9.5, 7.8, 5.9 Hz, 1H), 1.06 (t, *J* = 7.1 Hz, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 174.0, 141.8, 128.5, 128.3, 125.9, 62.3, 54.1, 44.6, 32.6, 31.5,

14.1.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{15}H_{24}NO_2^+$250.1802; Found: 250.1799

methyl 2-(methyl(propyl)amino)-4-phenylbutanoate (6g)



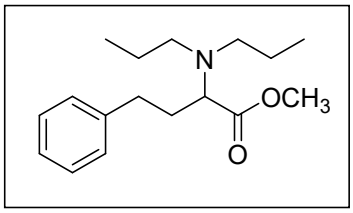
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 38% (19.0 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.33 – 7.28 (m, 2H), 7.21 (ddd, *J* = 8.0, 7.2, 1.2 Hz, 3H), 3.71 (s, 3H), 3.27 (t, *J* = 7.5 Hz, 1H), 2.69 (qdd, *J* = 13.7, 9.2, 6.4 Hz, 2H), 2.54 (ddd, *J* = 12.4, 8.9, 6.2 Hz, 1H), 2.39 (ddd, *J* = 12.4, 8.8, 5.8 Hz, 1H), 2.34 (s, 3H), 2.12 – 1.91 (m, 2H), 1.58 – 1.41 (m, 2H), 0.92 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 173.1, 141.7, 128.5, 128.4, 125.9, 65.6, 56.2, 50.9, 37.8, 32.4, 31.3, 21.3, 11.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{15}H_{24}NO_2^+$250.1802; Found: 250.1803

methyl 2-(dipropylamino)-4-phenylbutanoate (6h)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 42% (23.4 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

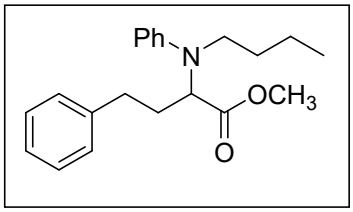
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.34 – 7.27 (m, 2H), 7.22 (dt, *J* = 8.0, 1.8 Hz, 3H), 3.70 (s, 3H), 3.36 (dd, *J* = 8.3, 6.5 Hz, 1H), 2.80 (ddd, *J* = 13.9, 9.7, 5.7 Hz, 1H), 2.61 (dddd, *J* = 29.0, 13.1, 9.4, 6.7 Hz, 3H), 2.45 (ddd, *J* = 13.3, 8.6, 5.0 Hz, 2H), 2.06 (ddt, *J* = 13.8, 9.7, 6.5 Hz, 1H), 1.93 (dddd, *J* = 13.8, 9.8, 8.2, 5.7 Hz, 1H), 1.53 – 1.37 (m, 4H), 0.90 (t, *J* = 7.3 Hz, 6H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 174.0, 142.0, 128.5, 128.3, 125.8, 62.9, 53.3, 50.9, 32.7, 31.7,

22.1, 11.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{28}NO_2^+$ 278.2115; Found: 278.2110

methyl 2-(butyl(phenyl)amino)-4-phenylbutanoate (6i)



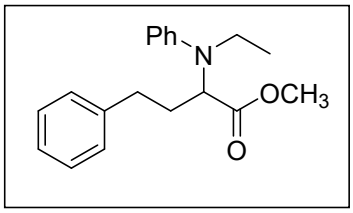
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 76% (49.5 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*)δ 7.37 – 7.31 (m, 2H), 7.30 – 7.18 (m, 5H), 6.87 – 6.75 (m, 3H), 4.34 (dd, *J* = 8.7, 5.9 Hz, 1H), 3.73 (s, 3H), 3.42 – 3.25 (m, 2H), 2.85 – 2.68 (m, 2H), 2.41 (ddt, *J* = 13.0, 9.3, 6.5 Hz, 1H), 2.23 (dtd, *J* = 14.4, 9.0, 5.8 Hz, 1H), 1.72 – 1.55 (m, 2H), 1.41 (q, *J* = 7.4 Hz, 2H), 1.01 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 173.5, 148.7, 141.2, 129.1, 128.6, 128.5, 126.1, 117.8, 114.7, 61.9, 51.8, 47.2, 32.7, 31.8, 30.4, 20.4, 14.0.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{21}H_{28}NO_2^+$ 326.2115; Found: 326.2109

methyl 2-(ethyl(phenyl)amino)-4-phenylbutanoate (6j)



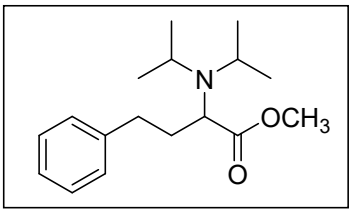
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 90% (53.8 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.37 – 7.20 (m, 7H), 6.86 – 6.77 (m, 3H), 4.37 (dd, *J* = 8.8, 6.0 Hz, 1H), 3.74 (s, 3H), 3.56 – 3.39 (m, 2H), 2.88 – 2.68 (m, 2H), 2.46 – 2.34 (m, 1H), 2.24 (dtd, *J* = 14.5, 9.0, 5.8 Hz, 1H), 1.26 (t, *J* = 7.0 Hz, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 173.5, 148.3, 141.2, 129.2, 128.6, 128.5, 126.2, 117.7, 114.3, 61.4, 51.9, 41.4, 32.7, 31.8, 14.0.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{24}NO_2^+$ 298.1802; Found: 298.1803

methyl 2-(diisopropylamino)-4-phenylbutanoate (6k)



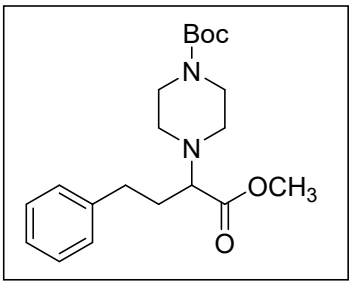
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 82% (45.6 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.34 – 7.27 (m, 2H), 7.24 – 7.19 (m, 3H), 3.70 (s, 3H), 3.48 (t, *J* = 7.4 Hz, 1H), 3.38 (hept, *J* = 6.7 Hz, 2H), 2.72 (ddd, *J* = 13.8, 10.3, 5.9 Hz, 1H), 2.59 (ddd, *J* = 13.8, 10.5, 5.5 Hz, 1H), 2.14 – 2.06 (m, 1H), 1.85 (dddd, *J* = 13.4, 10.6, 7.5, 5.9 Hz, 1H), 1.05 (dd, *J* = 6.7, 4.7 Hz, 12H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 176.0, 142.1, 128.4, 128.4, 125.8, 56.6, 51.3, 45.2, 33.6, 33.1, 23.5, 21.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{28}NO_2^+$ 278.2115; Found: 278.2116.

tert-butyl 4-(1-methoxy-1-oxo-4-phenylbutan-2-yl) piperazine-1-carboxylate (6l)



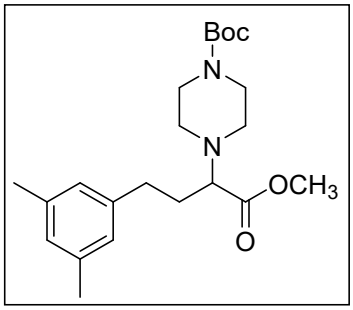
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 88% (64.0 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.28 (dd, *J* = 8.4, 6.5 Hz, 2H), 7.22 – 7.14 (m, 3H), 3.68 (d, *J* = 0.8 Hz, 3H), 3.48 – 3.33 (m, 4H), 3.18 (t, *J* = 7.5 Hz, 1H), 2.64 (dddd, *J* = 21.6, 10.8, 6.7, 3.1 Hz, 4H), 2.47 (q, *J* = 8.2, 6.3 Hz, 2H), 2.01 (tdd, *J* = 13.7, 10.4, 6.6 Hz, 2H), 1.45 (d, *J* = 0.8 Hz, 9H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.3, 154.7, 141.3, 128.5, 128.4, 126.0, 79.6, 66.4, 51.1, 49.2, 32.1, 30.6, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{20}H_{31}N_2O_4^+$ 363.2278; Found: 363.2282

tert-butyl 4-(4-(3,5-dimethylphenyl)-1-methoxy-1-oxobutan-2-yl)piperazine-1-carboxylate (6m)



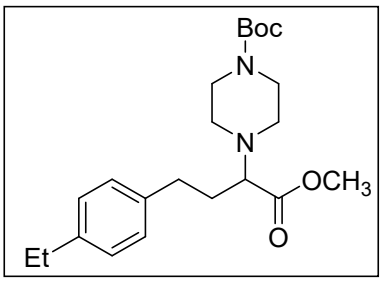
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 90% (70.3 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 6.85 – 6.77 (m, 3H), 3.69 (s, 3H), 3.44 (ddt, *J* = 15.3, 12.0, 5.9 Hz, 4H), 3.19 (t, *J* = 7.5 Hz, 1H), 2.66 – 2.53 (m, 4H), 2.51 – 2.42 (m, 2H), 2.28 (s, 6H), 2.04 – 1.91 (m, 2H), 1.45 (s, 9H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.3, 154.7, 141.2, 137.8, 127.6, 126.3, 79.6, 66.5, 51.1, 49.2, 32.0, 30.8, 28.4, 21.3.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{22}H_{35}N_2O_4^+$ 391.2591; Found: 391.2587

tert-butyl 4-(4-(4-ethylphenyl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6n)



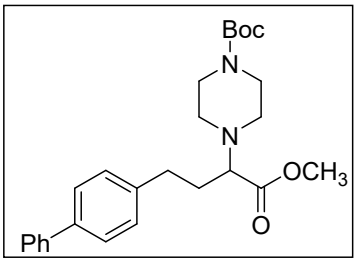
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 89% (67.7 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.15 – 7.06 (m, 4H), 3.67 (d, *J* = 1.1 Hz, 3H), 3.48 – 3.34 (m, 4H), 3.19 (t, *J* = 7.5 Hz, 1H), 2.67 – 2.57 (m, 6H), 2.52 – 2.42 (m, 2H), 2.06 – 1.92 (m, 2H), 1.45 (s, 9H), 1.22 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.3, 154.7, 141.9, 138.5, 128.4, 127.9, 79.6, 66.4, 51.1, 49.2, 31.7, 30.8, 28.5, 28.4, 15.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{22}H_{35}N_2O_4^+$ 391.2591; Found: 391.2595

tert-butyl 4-(4-([1,1'-biphenyl]-4-yl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6o)



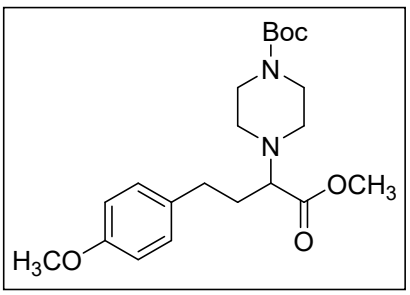
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 95% (83.4 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.61 – 7.56 (m, 2H), 7.55 – 7.51 (m, 2H), 7.43 (t, *J* = 7.7 Hz, 2H), 7.35 – 7.26 (m, 3H), 3.70 (s, 3H), 3.50 – 3.37 (m, 4H), 3.23 (t, *J* = 7.5 Hz, 1H), 2.72 (td, *J* = 7.5, 2.2 Hz, 2H), 2.69 – 2.63 (m, 2H), 2.50 (t, *J* = 9.8 Hz, 2H), 2.07 (dtd, *J* = 16.1, 7.8, 6.4 Hz, 2H), 1.48 (s, 9H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.2, 154.7, 141.0, 140.4, 139.0, 129.0, 128.8, 127.2, 127.1, 127.0, 79.6, 66.4, 51.1, 49.2, 31.8, 30.7, 28.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{22}H_{35}N_2O_4^+$ 439.2591; Found: 439.2529

tert-butyl 4-(1-methoxy-4-(4-methoxyphenyl)-1-oxobutan-2-yl)piperazine-1-carboxylate (6p)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 86% (67.8mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

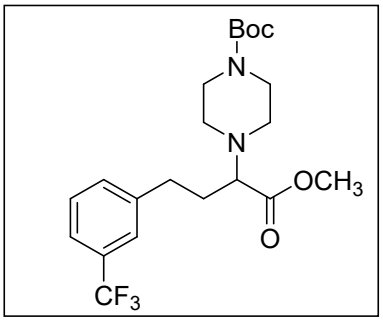
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.07 (d, *J* = 8.6 Hz, 2H), 6.80 (d, *J* = 8.6 Hz, 2H), 3.76 (s, 3H), 3.66 (s, 3H), 3.42 (ddt, *J* = 15.6, 12.4, 6.1 Hz, 4H), 3.15 (t, *J* = 7.5 Hz, 1H), 2.59 (q, *J* = 7.3 Hz, 4H), 2.48 – 2.41 (m, 2H), 2.01 – 1.90 (m, 2H), 1.43 (s, 9H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.3, 157.9, 154.7, 133.3, 129.4, 113.8, 79.6, 66.2, 55.2, 51.1,

49.1, 31.2, 30.9, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{26}H_{35}N_2O_4^+$ 393.2384; Found: 393.2387

tert-butyl 4-(1-methoxy-1-oxo-4-(3-(trifluoromethyl)phenyl)butan-2-yl)piperazine-1-carboxylate (6q)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 61% (52.6 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

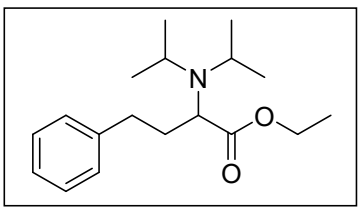
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.43 (dt, *J* = 3.7, 2.0 Hz, 2H), 7.40 – 7.33 (m, 2H), 3.66 (s, 3H), 3.41 (qdt, *J* = 13.2, 9.8, 3.8 Hz, 4H), 3.12 (t, *J* = 7.6 Hz, 1H), 2.77 – 2.67 (m, 2H), 2.63 (ddd, *J* = 10.8, 6.7, 3.5 Hz, 2H), 2.46 – 2.40 (m, 2H), 2.04 – 1.95 (m, 2H), 1.44 (s, 9H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -62.59.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 172.0, 154.7, 142.2, 131.9, 130.7 (q, *J* = 31.9 Hz), 128.8, 125.3 (d, *J* = 3.9 Hz), 124.2 (q, *J* = 272.2 Hz), 122.9 (q, *J* = 3.9 Hz), 79.6, 66.0, 51.1, 49.1, 31.9, 30.3, 28.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{21}H_{30}F_3N_2O_4^+$ 431.2152; Found: 431.2155

ethyl 2-(diisopropylamino)-4-phenylbutanoate (6r)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 89% (52.1 mg), column chromatography (silica gel, PE: EA = 15:1, v/v).

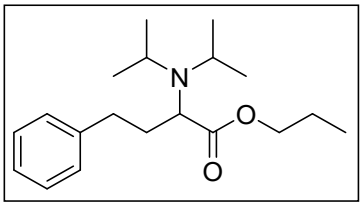
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.30 (dd, *J* = 8.2, 7.0 Hz, 2H), 7.24 – 7.18 (m, 3H), 4.15 (dddd,

J = 17.9, 10.8, 7.1, 3.7 Hz, 2H), 3.44 (t, *J* = 7.4 Hz, 1H), 3.37 (p, *J* = 6.6 Hz, 2H), 2.72 (ddd, *J* = 13.7, 10.4, 5.8 Hz, 1H), 2.58 (ddd, *J* = 13.7, 10.7, 5.4 Hz, 1H), 2.09 (dddd, *J* = 13.1, 10.5, 7.4, 5.4 Hz, 1H), 1.83 (dddd, *J* = 13.5, 10.8, 7.5, 5.9 Hz, 1H), 1.28 (t, *J* = 7.1 Hz, 3H), 1.04 (dd, *J* = 9.4, 6.6 Hz, 12H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 175.6, 142.2, 128.4, 128.4, 125.8, 60.0, 56.8, 45.2, 33.6, 33.2, 23.5, 22.0, 14.2.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{18}H_{30}NO_2^+$ 292.2271; Found: 292.2275

propyl 2-(diisopropylamino)-4-phenylbutanoate (6s)



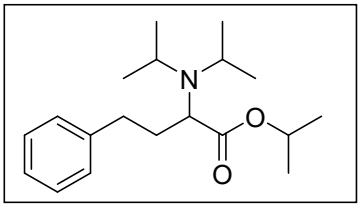
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 92% (56.3 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.30 (td, *J* = 7.2, 1.5 Hz, 2H), 7.23 – 7.17 (m, 3H), 4.09 – 3.99 (m, 2H), 3.45 (t, *J* = 7.4 Hz, 1H), 3.36 (p, *J* = 6.6 Hz, 2H), 2.70 (ddd, *J* = 13.8, 10.4, 6.0 Hz, 1H), 2.58 (ddd, *J* = 13.8, 10.6, 5.4 Hz, 1H), 2.14 – 2.05 (m, 1H), 1.82 (dddd, *J* = 13.3, 10.6, 7.3, 6.0 Hz, 1H), 1.72 – 1.63 (m, 2H), 1.03 (dd, *J* = 9.4, 6.6 Hz, 12H), 0.98 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 175.6, 142.2, 128.4, 128.4, 125.8, 65.8, 56.8, 45.2, 33.6, 33.2, 23.4, 22.0, 10.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{32}NO_2^+$ 306.2428; Found: 306.2432

isopropyl 2-(diisopropylamino)-4-phenylbutanoate (6t)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 87% (53.4 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

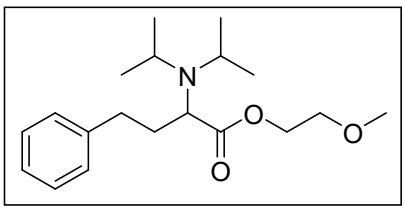
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.30 (t, *J* = 7.6 Hz, 2H), 7.21 (dd, *J* = 7.9, 2.3 Hz, 3H), 5.03

(hept, *J* = 6.3 Hz, 1H), 3.45 – 3.31 (m, 3H), 2.70 (ddd, *J* = 13.7, 10.5, 5.9 Hz, 1H), 2.57 (ddd, *J* = 13.7, 10.8, 5.3 Hz, 1H), 2.08 (dddd, *J* = 13.1, 10.5, 7.6, 5.3 Hz, 1H), 1.81 (dddd, *J* = 13.4, 10.7, 7.4, 6.0 Hz, 1H), 1.26 (dd, *J* = 9.4, 6.3 Hz, 6H), 1.03 (dd, *J* = 13.5, 6.6 Hz, 12H)

^{13}C NMR (126 MHz, Chloroform-*d*) δ 175.0, 142.3, 128.4, 128.4, 125.8, 67.0, 57.0, 45.1, 33.6, 33.2, 23.4, 22.1, 21.9, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{32}NO_2^+$ 306.2428; Found: 306.2431

2-methoxyethyl 2-(diisopropylamino)-4-phenylbutanoate (6u)



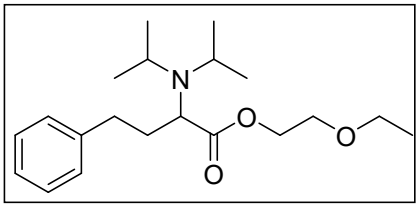
Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 79% (50.9 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.29 (td, *J* = 7.3, 1.4 Hz, 2H), 7.20 (dt, *J* = 8.3, 2.1 Hz, 3H), 4.27 – 4.18 (m, 2H), 3.60 (t, *J* = 4.8 Hz, 2H), 3.49 (t, *J* = 7.4 Hz, 1H), 3.41 – 3.32 (m, 5H), 2.71 (ddd, *J* = 13.7, 10.6, 5.8 Hz, 1H), 2.56 (ddd, *J* = 13.8, 10.8, 5.4 Hz, 1H), 2.08 (dddd, *J* = 13.5, 10.6, 7.3, 5.4 Hz, 1H), 1.83 (dddd, *J* = 13.5, 10.8, 7.6, 5.8 Hz, 1H), 1.03 (dd, *J* = 11.9, 6.7 Hz, 12H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 175.6, 142.2, 128.4, 128.4, 125.8, 70.5, 63.0, 58.8, 56.7, 45.2, 33.6, 33.1, 23.5, 21.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{19}H_{32}NO_3^+$ 322.2377; Found: 322.2377

2-ethoxyethyl 2-(diisopropylamino)-4-phenylbutanoate (6v)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 77% (51.9 mg), column chromatography (silica gel, PE: EA = 10:1, v/v).

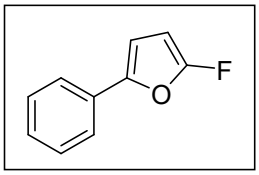
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.28 (dd, *J* = 8.1, 7.0 Hz, 2H), 7.22 – 7.15 (m, 3H), 4.29 – 4.16

(m, 2H), 3.63 (t, *J* = 4.9 Hz, 2H), 3.50 (dq, *J* = 14.7, 7.2 Hz, 3H), 3.36 (p, *J* = 6.7 Hz, 2H), 2.71 (ddd, *J* = 13.7, 10.5, 5.9 Hz, 1H), 2.57 (ddd, *J* = 13.7, 10.7, 5.4 Hz, 1H), 2.14 – 2.03 (m, 1H), 1.82 (dddd, *J* = 13.4, 10.7, 7.6, 5.9 Hz, 1H), 1.20 (t, *J* = 7.0 Hz, 3H), 1.02 (dd, *J* = 13.6, 6.6 Hz, 12H).

^{13}C NMR (126 MHz, Chloroform-*d*) δ 175.6, 142.2, 128.4, 128.3, 125.8, 68.4, 66.5, 63.2, 56.7, 45.2, 33.6, 33.1, 23.5, 21.9, 15.1.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{20}H_{34}NO_3^+$ 336.2533; Found: 336.2533

2-fluoro-5-phenylfuran (7a)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 82% (26.7 mg), column chromatography (silica gel, PE).

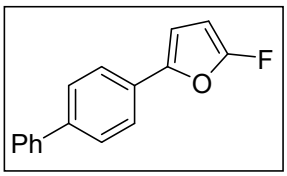
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.62 – 7.58 (m, 2H), 7.43 – 7.38 (m, 2H), 7.31 – 7.26 (m, 1H), 6.56 (t, *J* = 3.2 Hz, 1H), 5.54 (dd, *J* = 7.1, 3.4 Hz, 1H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -115.4.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.6 (d, *J* = 276.3 Hz), 144.3, 130.1, 128.7, 127.2, 123.0 (d, *J* = 1.7 Hz), 106.0, 83.1 (d, *J* = 12.8 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{10}H_8FO^+$163.0554; Found: 163.0558

2-([1,1'-biphenyl]-4-yl)-5-fluorofuran (7b)



Following the experimental procedures (Condition A) on 0.2 mmol scale, white solid (mp: 54 – 56 ^{o}C)，yield: 97% (46.3mg), column chromatography (silica gel, PE).

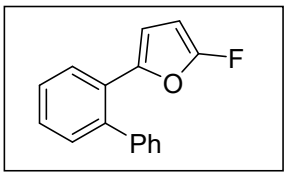
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.66 (dq, *J* = 9.2, 6.0, 3.8 Hz, 6H), 7.50 (q, *J* = 7.1, 6.6 Hz, 2H), 7.42 (t, *J* = 7.3 Hz, 1H), 6.61 (t, *J* = 3.4 Hz, 1H), 5.58 (dd, *J* = 7.1, 3.4 Hz, 1H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -115.0.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.7 (d, *J* = 276.2 Hz), 144.1, 140.5 (d, *J* = 3.8 Hz), 139.9 (d, *J* = 3.5 Hz), 129.0 (d, *J* = 3.4 Hz), 128.9 (d, *J* = 3.9 Hz), 127.5, 127.4, 126.9 (d, *J* = 3.4 Hz), 123.4 (d, *J* = 1.8 Hz), 106.2, 83.3 (d, *J* = 12.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{12}FO^+$ 239.0867; Found: 239.0866

2-([1,1'-biphenyl]-2-yl)-5-fluorofuran (7c)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 68% (32.6 mg), column chromatography (silica gel, PE).

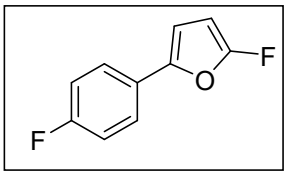
^{1}H NMR (500 MHz, DMSO-d_6) δ 7.64 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.47 – 7.37 (m, 5H), 7.27 (ddd, *J* = 16.5, 7.7, 1.5 Hz, 3H), 5.70 – 5.63 (m, 2H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -116.9.

^{13}C NMR (126 MHz, DMSO-d_6) δ 156.8 (d, *J* = 274.1 Hz), 143.4, 141.5, 139.3 (d, *J* = 1.8 Hz), 131.1, 129.0, 128.9, 128.3, 128.3, 128.1, 127.9, 127.1, 110.7, 83.9 (d, *J* = 12.3 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{16}H_{12}FO^+$ 239.0867; Found: 239.0867

2-fluoro-5-(4-fluorophenyl)furan (7d)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 81% (29.3 mg), column chromatography (silica gel, PE).

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.47 – 7.41 (m, 3H), 7.14 – 7.05 (m, 2H), 5.94 (dd, *J* = 7.0, 3.5 Hz, 1H).

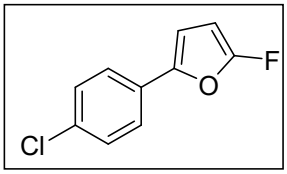
^{19}F NMR (471 MHz, DMSO-d_6) δ -112.6, -115.2.

^{13}C NMR (126 MHz, DMSO-d_6) δ 163.1 (d, *J* = 243.3 Hz), 157.3 (d, *J* = 275.6 Hz), 143.0 (d, *J* = 3.2 Hz), 132.0 (d, *J* = 8.9 Hz), 131.5 (d, *J* = 8.7 Hz), 119.1 (d, *J* = 2.7 Hz), 114.6 (d, *J* = 21.2 Hz), 109.9

(dd, *J* = 24.1, 1.9 Hz), 109.3, 84.8 (d, *J* = 12.3 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{10}H_7F_2O^+$ 181.0459; Found: 181.0458

2-(4-chlorophenyl)-5-fluorofuran (7e)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 84% (33.2 mg), column chromatography (silica gel, PE).

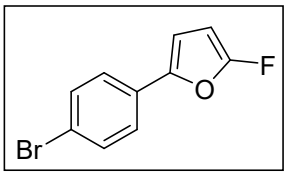
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.49 – 7.46 (m, 2H), 7.35 – 7.31 (m, 2H), 6.52 (t, *J* = 3.2 Hz, 1H), 5.52 (dd, *J* = 7.1, 3.4 Hz, 1H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -114.8.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.7 (d, *J* = 277.0 Hz), 143.3, 128.9, 128.5, 124.2 (d, *J* = 1.7 Hz), 106.5, 83.4 (d, *J* = 12.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{10}H_7ClFO^+$ 197.0164; Found: 197.0169

2-(4-bromophenyl)-5-fluorofuran (7f)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 81% (38.9 mg), column chromatography (silica gel, PE).

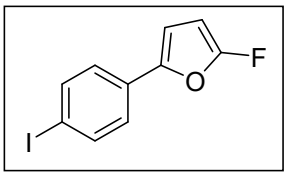
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.50 – 7.47 (m, 2H), 7.44 – 7.38 (m, 2H), 6.53 (t, *J* = 3.3 Hz, 1H), 5.52 (dd, *J* = 7.1, 3.4 Hz, 1H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -114.6.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 157.7 (d, *J* = 277.2 Hz), 143.3, 131.9, 129.0, 124.4 (d, *J* = 1.7 Hz), 120.9, 106.6, 83.4 (d, *J* = 12.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{10}H_7BrFO^+$ 240.9659; Found: 240.9655

2-fluoro-5-(4-iodophenyl) furan (7g)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 82% (47.3 mg), column chromatography (silica gel, PE).

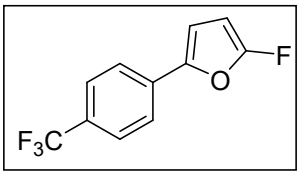
^{1}H NMR (500 MHz, DMSO-d_6) δ 7.79 – 7.72 (m, 2H), 7.43 – 7.37 (m, 2H), 7.00 (t, *J* = 3.4 Hz, 1H), 5.91 (dd, *J* = 6.9, 3.6 Hz, 1H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -115.3.

^{13}C NMR (126 MHz, DMSO-d_6) δ 157.2 (d, *J* = 275.5 Hz), 143.3, 138.1, 129.3, 125.1 (d, *J* = 1.8 Hz), 108.6, 93.5, 84.8 (d, *J* = 12.3 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C^{10}H^7FIO^+$ 288.9520; Found:272.0713

2-fluoro-5-(4-(trifluoromethyl)phenyl)furan (7h)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 90% (41.5 mg), column chromatography (silica gel, PE).

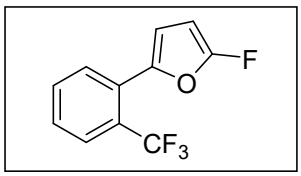
^{1}H NMR (500 MHz, DMSO-d_6) δ 7.78 (d, *J* = 8.3 Hz, 2H), 7.72 (d, *J* = 8.3 Hz, 2H), 7.16 (t, *J* = 3.5 Hz, 1H), 5.97 (dd, *J* = 7.0, 3.5 Hz, 1H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -61.2, -114.4.

^{13}C NMR (126 MHz, DMSO-d_6) δ 157.7 (d, *J* = 276.2 Hz), 142.7, 133.4, 127.8 (q, *J* = 31.5 Hz), 126.3 (q, *J* = 3.9 Hz), 124.6 (q, *J* = 269.6 Hz), 123.5 (d, *J* = 1.5 Hz), 110.5, 85.1 (d, *J* = 12.4 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{11}H_7F_4O^+$ 231.0428; Found: 231.0425

2-fluoro-5-(2-(trifluoromethyl)phenyl)furan (7i)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 82% (38.0 mg), column chromatography (silica gel, PE).

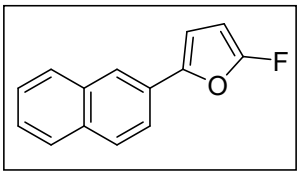
^{1}H NMR (500 MHz, DMSO-d_6) δ 7.83 (d, *J* = 7.9 Hz, 1H), 7.77 – 7.69 (m, 2H), 7.58 (ddt, *J* = 8.2, 5.7, 1.5 Hz, 1H), 6.80 (t, *J* = 3.4 Hz, 1H), 5.95 (dd, *J* = 6.9, 3.5 Hz, 1H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -58.7, -115.2.

^{13}C NMR (126 MHz, DMSO-d_6) δ 157.6 (d, *J* = 275.2 Hz), 141.0, 133.2, 130.5 (d, *J* = 1.6 Hz), 129.2, 128.1 (d, *J* = 2.3 Hz), 127.2 (q, *J* = 5.8 Hz), 125.5 (q, *J* = 30.2 Hz), 124.3 (q, *J* = 273.4 Hz), 112.4 (d, *J* = 2.6 Hz), 84.5 (d, *J* = 12.2 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{11}H_7F_4O^+$ 231.0428; Found: 231.0426

2-fluoro-5-(naphthalen-2-yl) furan (7j)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 95% (40.4 mg), column chromatography (silica gel, PE).

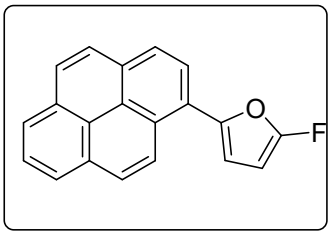
^{1}H NMR (500 MHz, DMSO-d_6) δ 8.09 (d, *J* = 1.8 Hz, 1H), 7.93 (dd, *J* = 9.1, 2.6 Hz, 2H), 7.88 (dd, *J* = 7.7, 1.5 Hz, 1H), 7.77 (dd, *J* = 8.6, 1.9 Hz, 1H), 7.53 – 7.45 (m, 2H), 7.06 (t, *J* = 3.4 Hz, 1H), 5.93 (dd, *J* = 7.0, 3.5 Hz, 1H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -115.5.

^{13}C NMR (126 MHz, DMSO-d_6) δ 157.3 (d, *J* = 275.2 Hz), 144.3, 133.5, 132.6, 129.0, 128.4, 128.1, 127.2, 126.6, 121.7 (d, *J* = 1.6 Hz), 121.1 (d, *J* = 1.9 Hz), 108.4, 84.7 (d, *J* = 12.4 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{14}H_{10}FO^+$ 213.0710; Found: 213.0713

2-fluoro-5-(pyren-1-yl)furan(7k)



Following the experimental procedures (Condition A) on 0.2 mmol scale, white solid (mp: 60 – 62 °C), yield: 53% (30.5 mg), column chromatography (silica gel, PE).

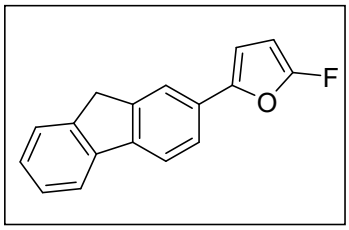
^{1}H NMR (500 MHz, DMSO-d_6) δ 8.58 (d, *J* = 9.3 Hz, 1H), 8.33 – 8.28 (m, 3H), 8.26 – 8.15 (m, 4H), 8.09 (t, *J* = 7.6 Hz, 1H), 7.10 (t, *J* = 3.4 Hz, 1H), 6.09 (dd, *J* = 6.9, 3.5 Hz, 1H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -115.3.

^{13}C NMR (126 MHz, DMSO-d_6) δ 157.8 (d, *J* = 274.9 Hz), 144.0, 131.4, 131.0, 130.7, 129.0, 128.3, 127.7, 127.1, 127.0, 126.2, 126.0, 125.8, 125.6, 124.7, 124.4, 124.3, 112.4, 84.7 (d, *J* = 12.1 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{20}H_{12}FO^+$ 287.0867; Found: 287.0861

2-(9H-fluoren-2-yl)-5-fluorofuran (7l)



Following the experimental procedures (Condition A) on 0.2 mmol scale, white solid (mp: 52 – 54 °C), yield: 83% (41.7 mg), column chromatography (silica gel, PE).

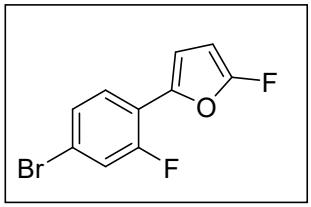
^{1}H NMR (500 MHz, DMSO-d_6) δ 7.91 (dd, *J* = 12.3, 7.7 Hz, 2H), 7.85 – 7.79 (m, 1H), 7.65 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.59 (d, *J* = 7.4 Hz, 1H), 7.42 – 7.36 (m, 1H), 7.32 (td, *J* = 7.4, 1.2 Hz, 1H), 6.99 (t, *J* = 3.4 Hz, 1H), 5.93 (dd, *J* = 7.0, 3.5 Hz, 1H), 3.95 (s, 2H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -116.1.

^{13}C NMR (126 MHz, DMSO-d_6) δ 157.1 (d, *J* = 274.6 Hz), 144.7, 144.2, 143.7, 141.1, 140.9, 128.4, 127.4, 127.3, 125.6, 122.1, 120.9, 120.6, 119.9, 107.4, 84.6 (d, *J* = 12.5 Hz), 36.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{17}H_{12}FO^+$ 251.0867; Found: 251.0872

2-(4-bromo-2-fluorophenyl)-5-fluorofuran (7m)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 69% (35.7 mg), column chromatography (silica gel, PE).

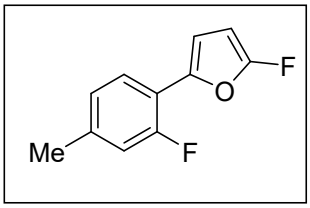
^{1}H NMR (500 MHz, DMSO-d_6) δ 7.60 (dd, *J* = 11.0, 2.0 Hz, 1H), 7.54 (t, *J* = 8.4 Hz, 1H), 7.44 (dd, *J* = 8.5, 1.9 Hz, 1H), 6.82 (q, *J* = 3.4 Hz, 1H), 5.94 (dd, *J* = 7.0, 3.6 Hz, 1H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -112.6, -115.3.

^{13}C NMR (126 MHz, DMSO-d_6) δ 158.7 (d, *J* = 47.5 Hz), 156.6 (dd, *J* = 68.5, 2.3 Hz), 137.9 (d, *J* = 3.0 Hz), 128.6 (d, *J* = 3.6 Hz), 126.9 (d, *J* = 3.6 Hz), 120.6 (d, *J* = 9.6 Hz), 120.0 (d, *J* = 24.5 Hz), 117.1 (d, *J* = 12.0 Hz), 113.0 (d, *J* = 11.3 Hz), 85.0 (d, *J* = 12.3 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{10}H_6BrF_2O^+$ 258.9565; Found: 258.9562

2-fluoro-5-(2-fluoro-4-methylphenyl) furan (7n)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil，yield: 79% (30.8 mg), column chromatography (silica gel, PE).

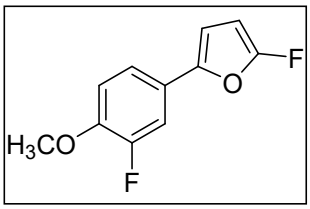
^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.54 (t, *J* = 8.0 Hz, 1H), 7.01 – 6.88 (m, 2H), 6.65 (q, *J* = 3.3 Hz, 1H), 5.53 (dd, *J* = 7.0, 3.4 Hz, 1H), 2.35 (s, 3H).

^{19}F NMR (471 MHz, Chloroform-*d*) δ -116.0, -116.3.

^{13}C NMR (126 MHz, Chloroform-*d*) δ 159.0 (dd, *J* = 122.1, 2.2 Hz), 156.9 (dd, *J* = 122.1, 2.2 Hz), 139.1 (d, *J* = 2.9 Hz), 138.7 (d, *J* = 8.1 Hz), 125.0 (d, *J* = 3.2 Hz), 125.0 (d, *J* = 3.2 Hz), 116.4 (d, *J* = 21.0 Hz), 115.5 (d, *J* = 12.1 Hz), 110.6 (d, *J* = 12.1 Hz), 83.2 (dd, *J* = 12.5, 2.0 Hz), 21.1 (d, *J* = 1.7 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{11}H_9F_2O^+$ 195.0616; Found: 195.0613

2-fluoro-5-(3-fluoro-4-methoxyphenyl)furan (7o)



Following the experimental procedures (Condition A) on 0.2 mmol scale, colorless oil， yield: 38% (16.1 mg), column chromatography (silica gel, PE).

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.59 – 7.52 (m, 1H), 6.96 (dt, *J* = 13.3, 2.1 Hz, 1H), 6.87 (dt, *J* = 8.7, 2.8 Hz, 1H), 6.65 (q, *J* = 3.3 Hz, 1H), 5.90 (dt, *J* = 7.0, 3.6 Hz, 1H), 3.80 (s, 3H).

^{19}F NMR (471 MHz, DMSO-d_6) δ -113.1, -117.2.

^{13}C NMR (126 MHz, DMSO-d_6) δ 160.3 (d, *J* = 11.2 Hz), 159.1 (dd, *J* = 248.6, 2.4 Hz), 156.9 (dd, *J* = 273.9, 1.6 Hz), 139.0 (d, *J* = 2.7 Hz), 126.6 (d, *J* = 4.5 Hz), 111.5 (d, *J* = 2.9 Hz), 110.5 (d, *J* = 12.5 Hz), 109.9 (dd, *J* = 10.0, 2.6 Hz), 102.8 (d, *J* = 25.3 Hz), 84.3 (d, *J* = 11.7 Hz), 56.2.

HRMS (ESI) m/z: $[M+H]^+$ Calcd. for $C_{11}H_9F_2O_2^+$ 211.0565; Found: 211.0561

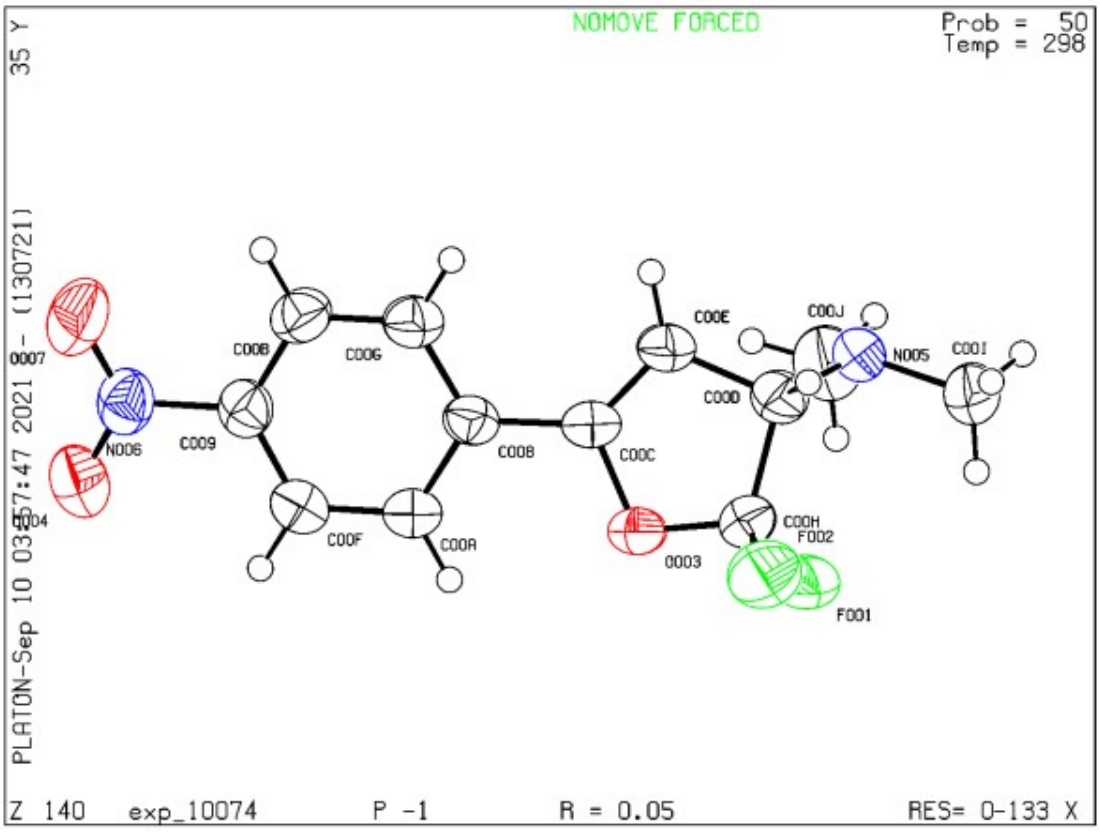
6. Crystal Data

Crystal data of 4r

Method for single crystals cultivation: a pure solid sample (10−20 mg) was dissolved in ethyl acetate (2 mL) in a vial at room temperature, and petroleum ether/hexane (2-3 mL) was added into the above solution slowly while keeping the sample completely dissolved. The vial was properly sealed with parafilm and kept at room temperature to allow the slow evaporation of the solvents until a single crystal was obtained.

The data were collected on a Agilent Gemini E diffractometer（Mo，50kV 40mA） instrument using Mo-Kαradiation (λ = 0.71073 Å) at 296 K and reducted by CrysAlisPro (Rigaku). The crystal structures were solved and refined using the SHELXTL software package. Refinements were performed with SHELXL-2013 using fullmatrix least-squares calculations on F2, with anisotropic displacement parameters for all the nonhydrogen atoms. The crystallographic data have already been deposited at the Cambridge Crystallographic Data Centre.

Crystallographic data for compound **4r** (CCDC-2108960) has been deposited with the Cambridge Crystallographic Data Centre, Copies of the data can be obtained, free of charge, on application to CCDC (Email:deposit@ccdc.cam.ac.uk). Thermal ellipsoids are drawn at 50% probability level



Bond precision: C-C = 0.0033A Wavelength=0.71073

Cell: a=7.7214(13) b=9.3290(16) c=9.6652(12)
alpha=112.760(14) beta=100.215(12) gamma=90.299(14)

Temperature: 298 K

	Calculated	Reported
Volume	629.80(19)	629.80(19)
Space group	P -1	P -1
Hall group	-P 1	-P 1
Moiety formula	C12 H12 Br F2 N2 O2	0.67(C12 H12 F2 N2 O3)
Sum formula	C12 H12 Br F2 N2 O2	C8 H8 F1.333 N1.333 O2
Mr	270.24	180.16
Dx,g cm-3	1.425	1.425
Z	2	3
Mu (mm-1)	0.122	0.122
F000	280.0	280.2

F000'	280.19	
h,k,lmax	9,11,11	9,11,11
Nref	2220	2212
Tmin,Tmax		0.661,1.000
Tmin'		

Correction method= # Reported T Limits: Tmin=0.661 Tmax=1.000
AbsCorr = MULTI-SCAN

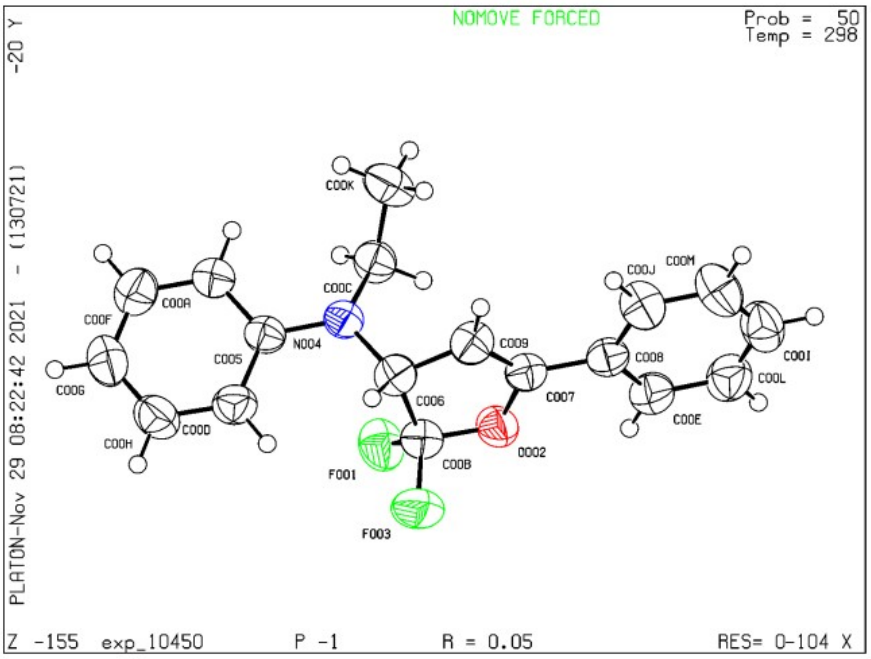
Data completeness= 0.996 Theta(max)= 25.000
R(reflections)= 0.0487 (1542) wR2(reflections)= 0.1576(2212)
S = 0.974 Npar= 173

Crystal data of 5k

Method for single crystals cultivation: a pure solid sample (10–20 mg) was dissolved in ethyl acetate (2 mL) in a vial at room temperature, and petroleum ether/hexane (2-3 mL) was added into the above solution slowly while keeping the sample completely dissolved. The vial was properly sealed with parafilm and kept at room temperature to allow the slow evaporation of the solvents until a single crystal was obtained.

The data were collected on a Agilent Gemini E diffractometer（Mo，50kV 40mA） instrument using Mo-Kαradiation (λ = 0.71073 Å) at 296 K and reducted by CrysAlisPro (Rigaku). The crystal structures were solved and refined using the SHELXTL software package. Refinements were performed with SHELXL-2013 using fullmatrix least-squares calculations on F2, with anisotropic displacement parameters for all the nonhydrogen atoms. The crystallographic data have already been deposited at the Cambridge Crystallographic Data Centre.

Crystallographic data for compound **5k** (CCDC-2124886) has been deposited with the Cambridge Crystallographic Data Centre, Copies of the data can be obtained, free of charge, on application to CCDC (Email:deposit@ccdc.cam.ac.uk). Thermal ellipsoids are drawn at 50% probability level



Bond precision: C-C = 0.0044A Wavelength=0.71073

Cell: a=9.4835(17) b=9.8772(13) c=9.941(2)
alpha=107.076(15) beta=117.98(2) gamma=93.602(12)

Temperature: 298 K

	Calculated	Reported
Volume	763.6(3)	763.6(3)
Space group	P -1	P -1
Hall group	-P 1	-P 1
Moiety formula	C18 H17 F2 N O	C18 H17 F2 N O
Sum formula	C18 H17 F2 N O	C18 H17 F2 N O
Mr	301.33	301.34
Dx,g cm-3	1.311	1.311
Z	2	2
Mu (mm-1)	0.098	0.098
F000	316.0	316.2
F000'	316.18	
h,k,lmax	11,11,11	11,11,11
Nref	2684	2677
Tmin,Tmax		0.817,1.000
Tmin'		

Correction method= # Reported T Limits: Tmin=0.817 Tmax=1.000
AbsCorr = MULTI-SCAN

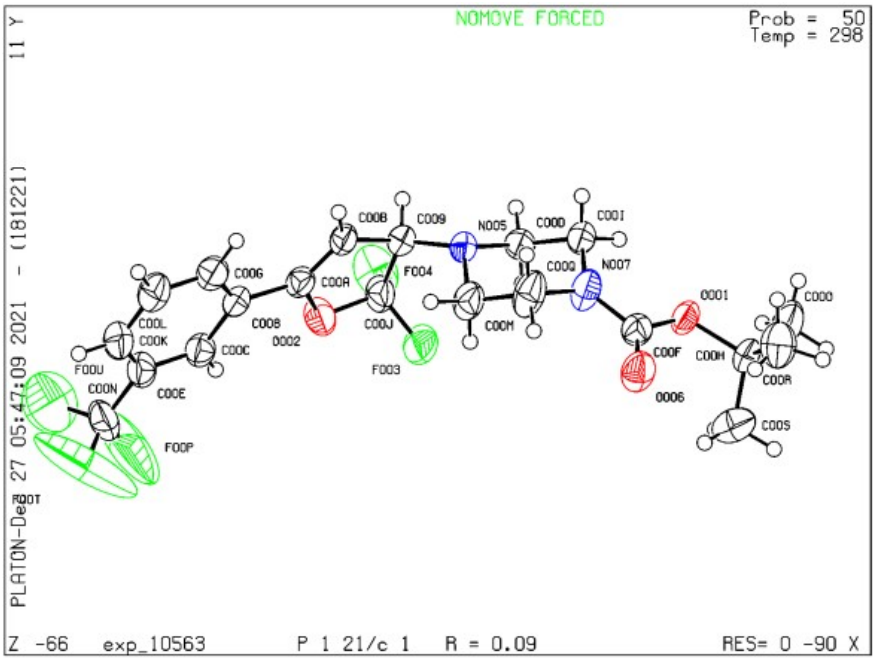
Data completeness= 0.997 Theta(max)= 25.000
R(reflections)= 0.0541(1669) wR2(reflections)= 0.1767(2677)
S = 0.937 Npar= 199

Crystal data of 5u

Method for single crystals cultivation: a pure solid sample (10–20 mg) was dissolved in ethyl acetate (2 mL) in a vial at room temperature, and petroleum ether/hexane (2-3 mL) was added into the above solution slowly while keeping the sample completely dissolved. The vial was properly sealed with parafilm and kept at room temperature to allow the slow evaporation of the solvents until a single crystal was obtained.

The data were collected on a Agilent Gemini E diffractometer（Mo，50kV 40mA） instrument using Mo-Kαradiation (λ = 0.71073 Å) at 296 K and reducted by CrysAlisPro (Rigaku). The crystal structures were solved and refined using the SHELXTL software package. Refinements were performed with SHELXL-2013 using fullmatrix least-squares calculations on F2, with anisotropic displacement parameters for all the nonhydrogen atoms. The crystallographic data have already been deposited at the Cambridge Crystallographic Data Centre.

Crystallographic data for compound **5u** (CCDC-2131035) has been deposited with the Cambridge Crystallographic Data Centre, Copies of the data can be obtained, free of charge, on application to CCDC (Email:deposit@ccdc.cam.ac.uk). Thermal ellipsoids are drawn at 50% probability level



Bond precision: C-C = 0.0057A Wavelength=0.71073

Cell:	a=12.2619(15)	b=10.4477(16)	c=16.5000(17)
	alpha=90	beta=99.896(12)	gamma=90

Temperature: 298 K

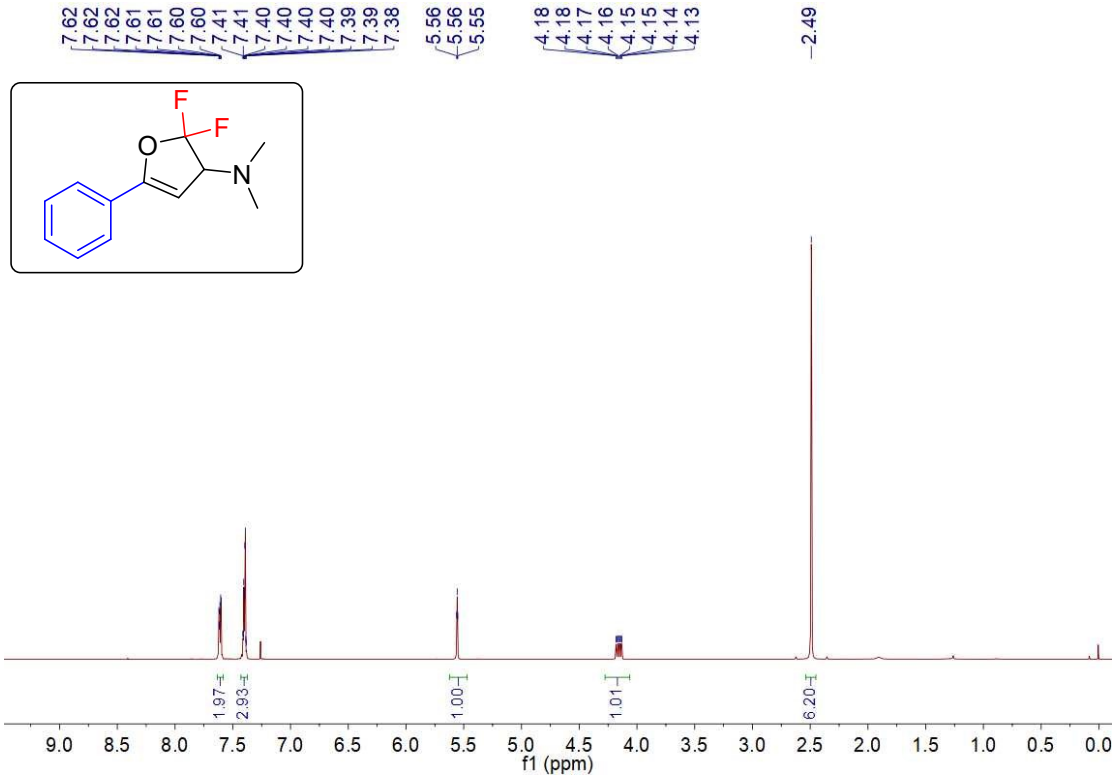
	Calculated	Reported
Volume	2082.3(5)	2082.3(5)
Space group	P 21/c	P 1 21/c 1
Hall group	-P 2ybc	-P 2ybc
Moiety formula	C20 H23 F5 N2 O3	C20 H23 F5 N2 O3
Sum formula	C20 H23 F5 N2 O3	C20 H23 F5 N2 O3
Mr	434.40	434.41
Dx,g cm-3	1.386	1.385
Z	4	4
Mu (mm-1)	0.123	0.123
F000	904.0	904.7
F000'	904.65	
h,k,lmax	14,12,19	14,12,19
Nref	3681	3668
Tmin,Tmax		0.608,1.000
Tmin'		

Correction method= # Reported T Limits: Tmin=0.608 Tmax=1.000
AbsCorr = MULTI-SCAN

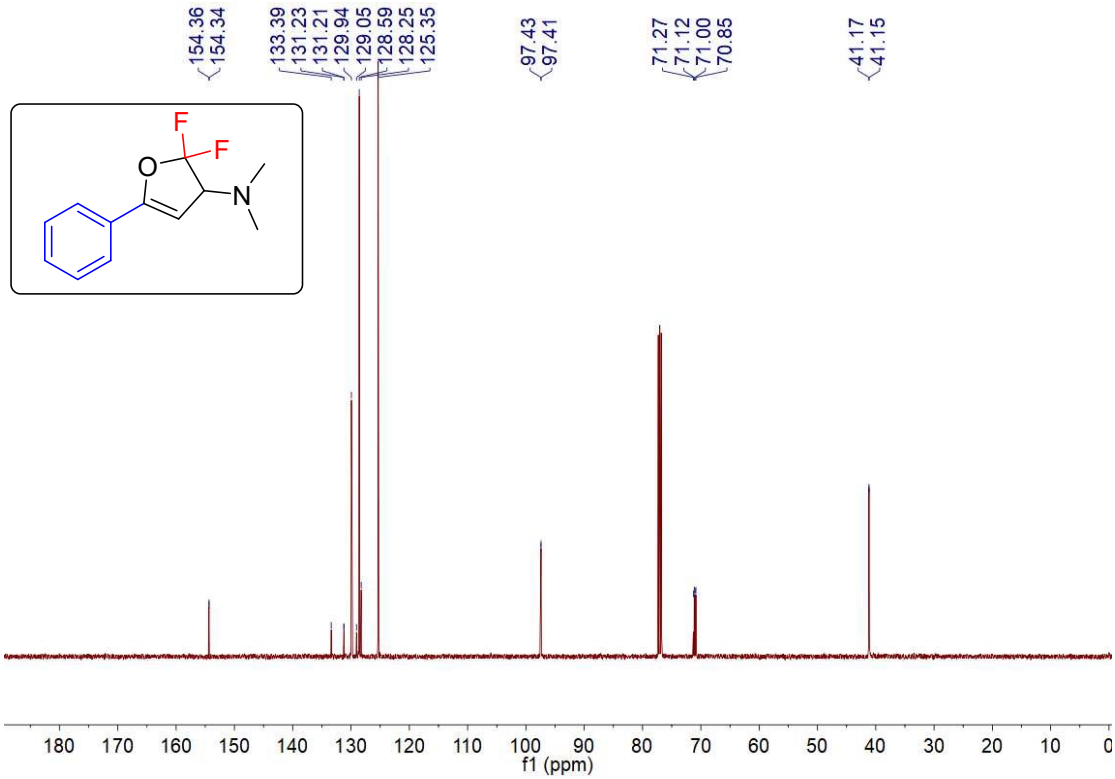
Data completeness= 0.996 Theta(max)= 25.000
R(reflections)= 0.0922(2547) wR2(reflections)= 0.2709(3668)
S = 1.606 Npar= 273

7. NMR Spectra

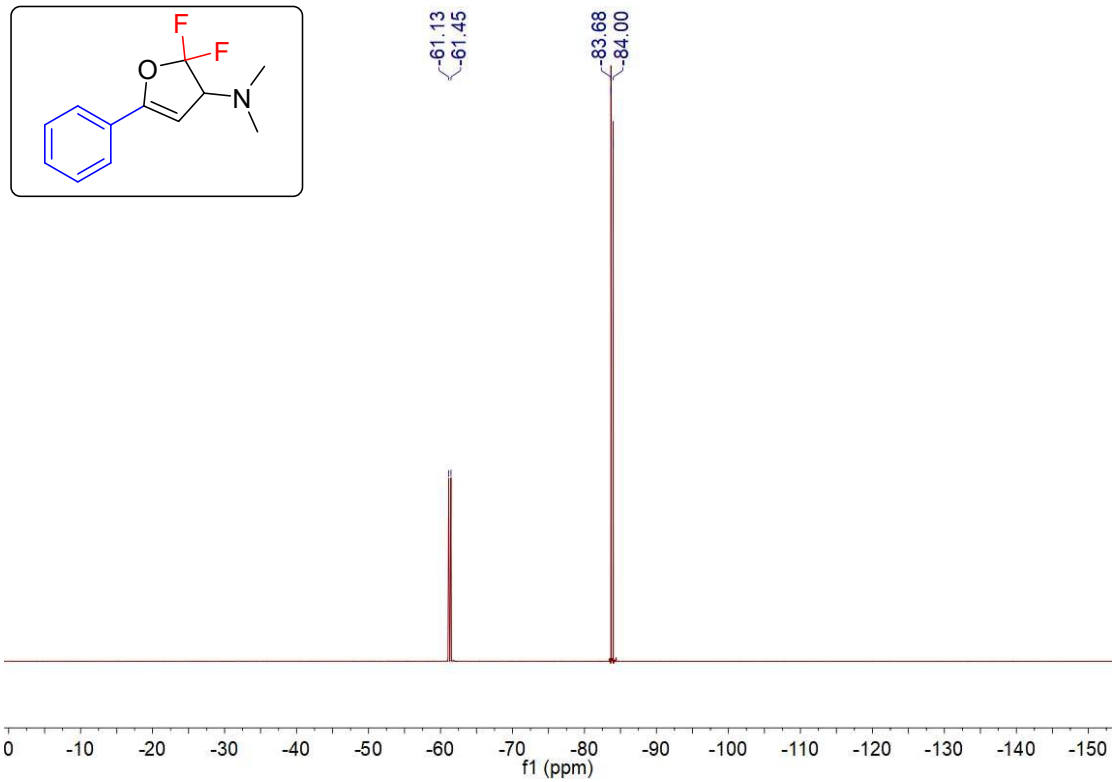
^{1}H spectrum ($CDCl_3$) of 2,2-difluoro-N, N-dimethyl-5-phenyl-2,3-dihydrofuran-3-amine (4a)



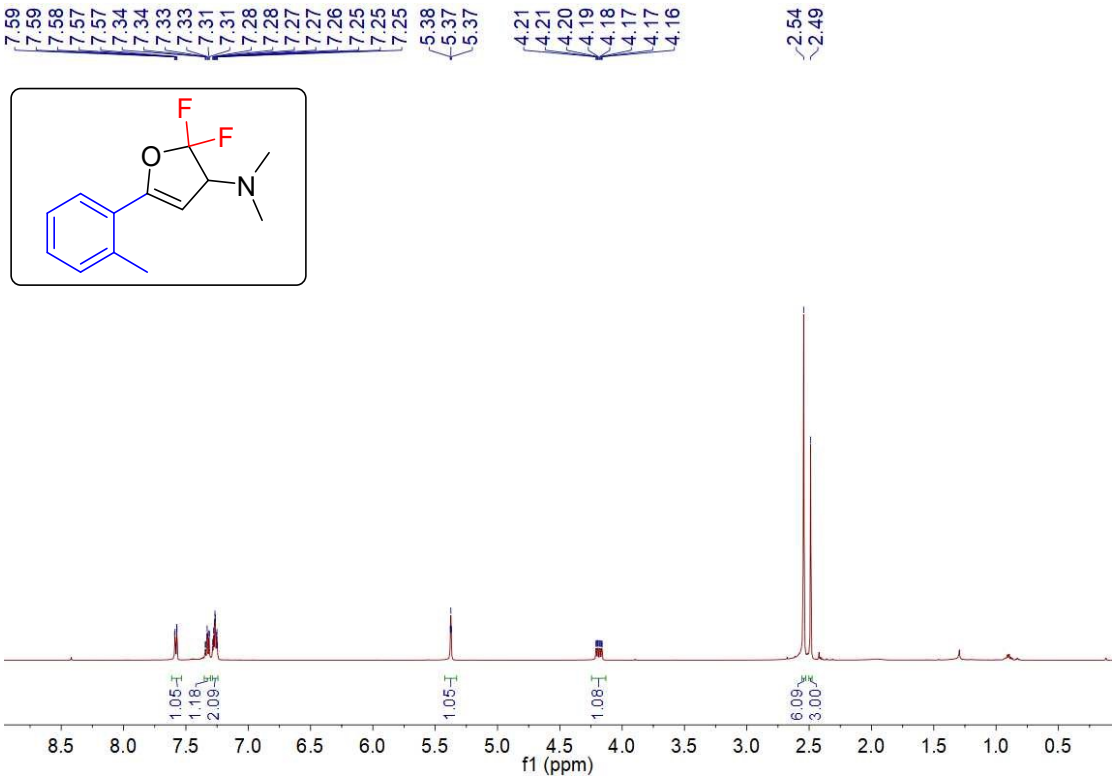
^{13}C spectrum ($CDCl_3$) of 2,2-difluoro-N, N-dimethyl-5-phenyl-2,3-dihydrofuran-3-amine (4a)



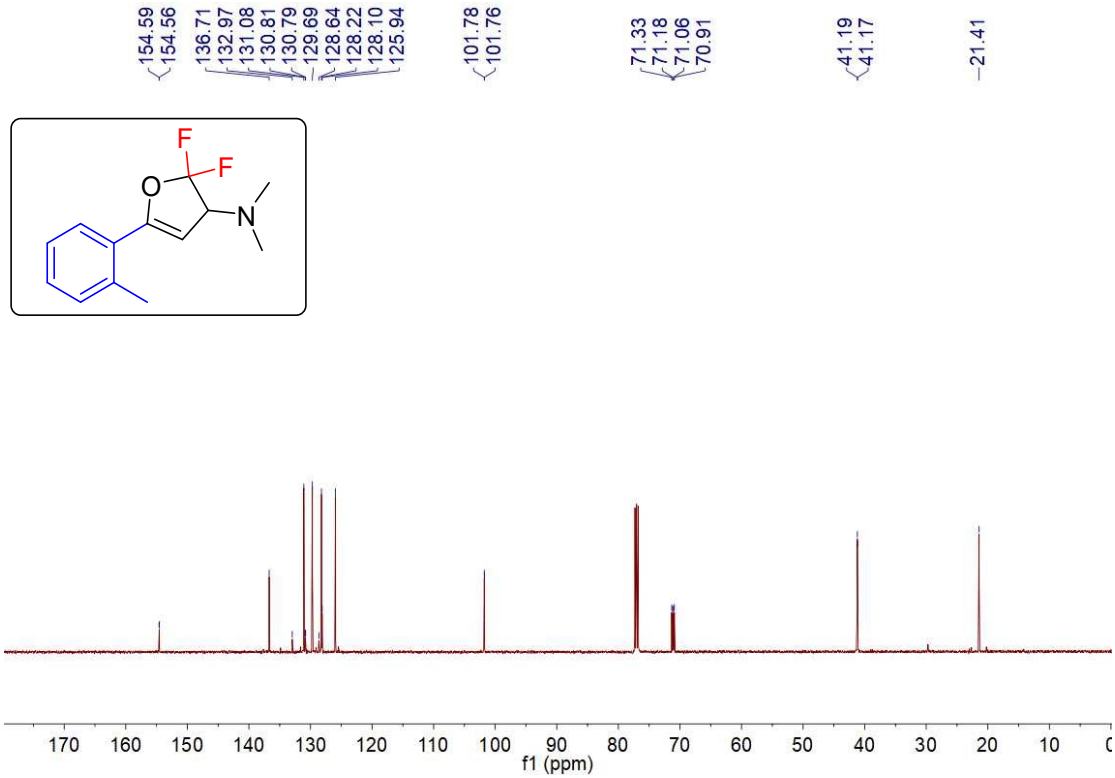
^{19}F spectrum ($CDCl_3$) of 2,2-difluoro-N, N-dimethyl-5-phenyl-2,3-dihydrofuran-3-amine (4a)



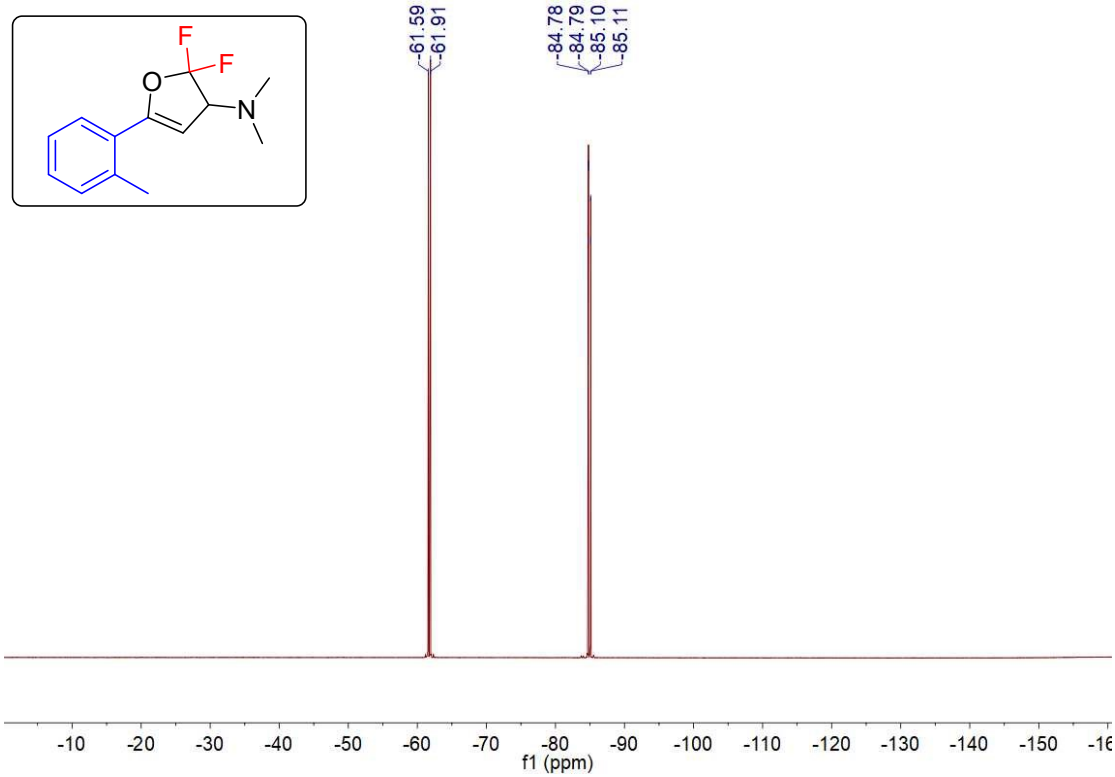
^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(o-tolyl)-2,3-dihydrofuran-3-amine (4b)



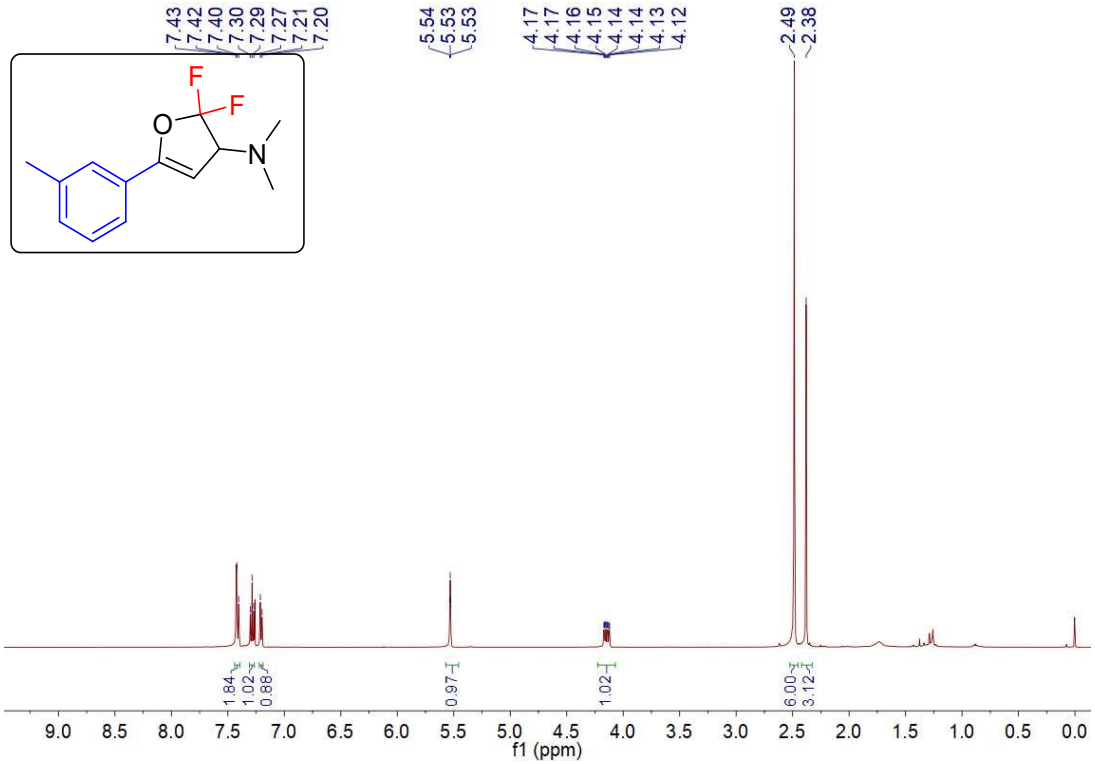
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(o-tolyl)-2,3-dihydrofuran-3-amine (4b)



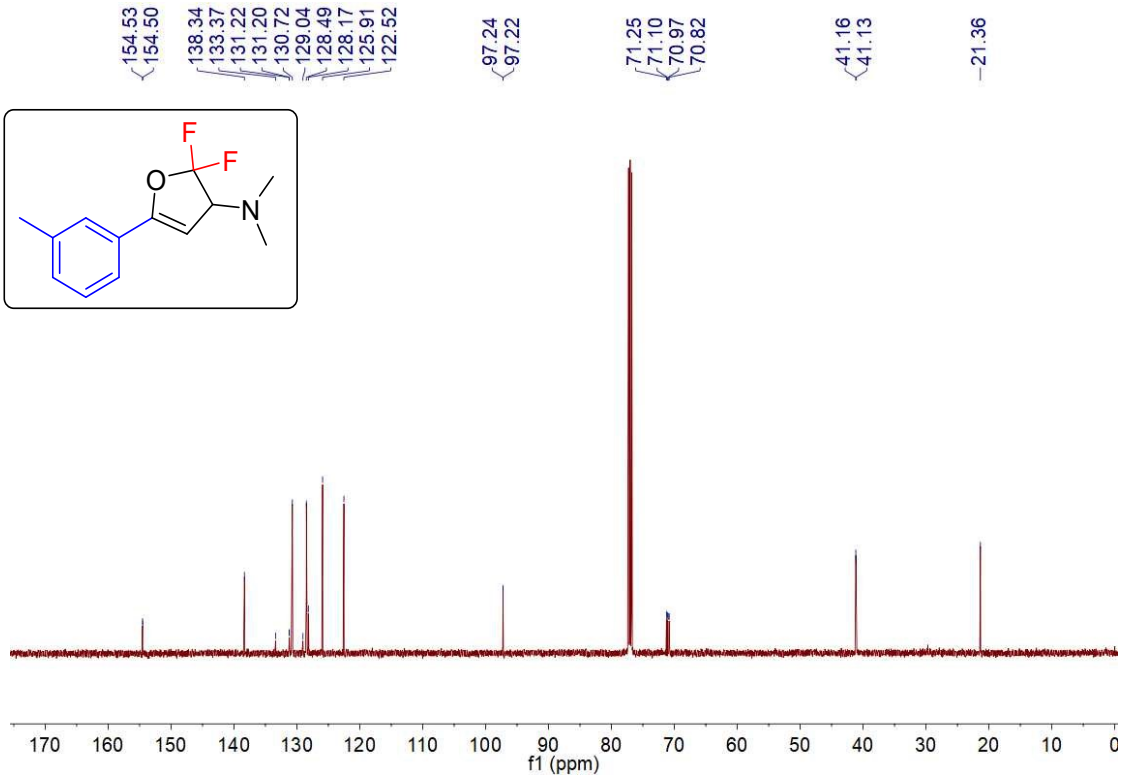
^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(o-tolyl)-2,3-dihydrofuran-3-amine (4b)



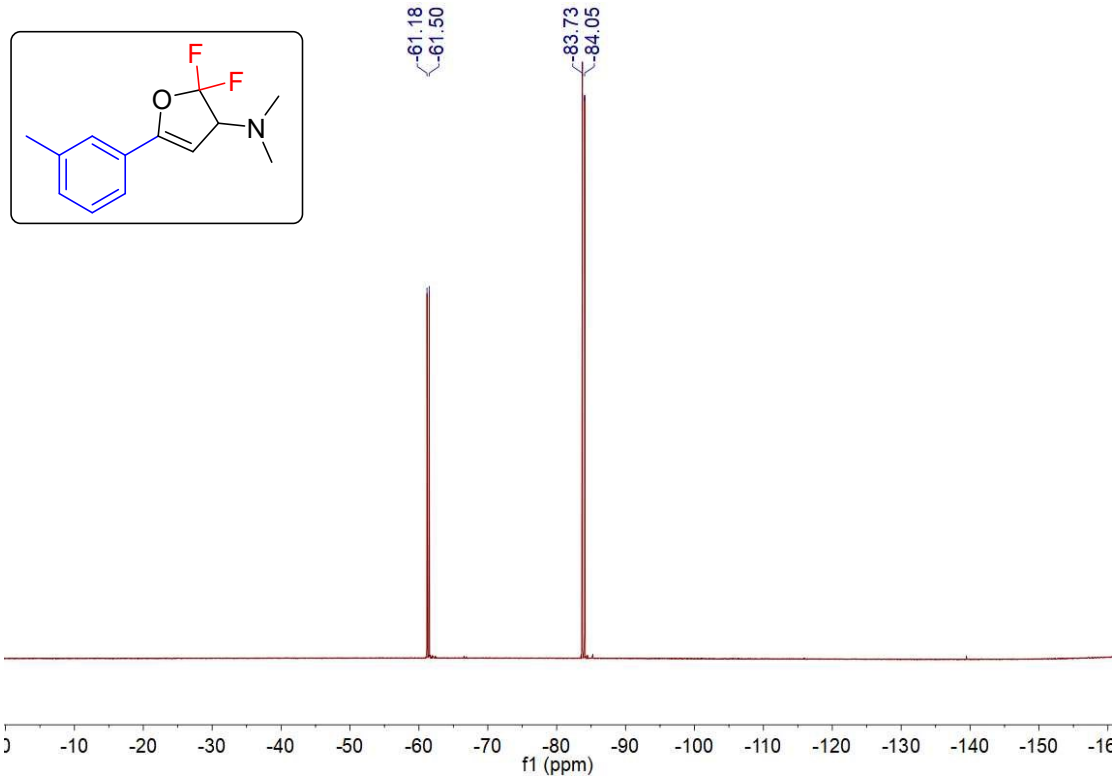
^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(m-tolyl)-2,3-dihydrofuran-3-amine (4c)



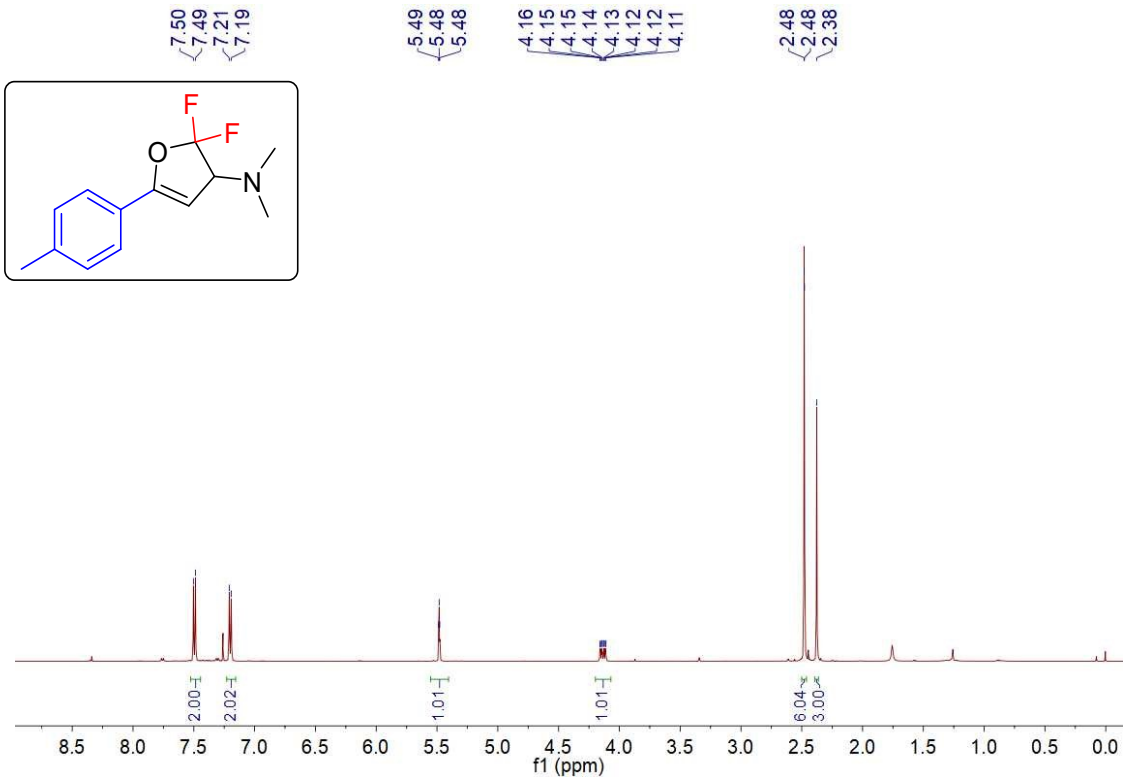
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(m-tolyl)-2,3-dihydrofuran-3-amine (4c)



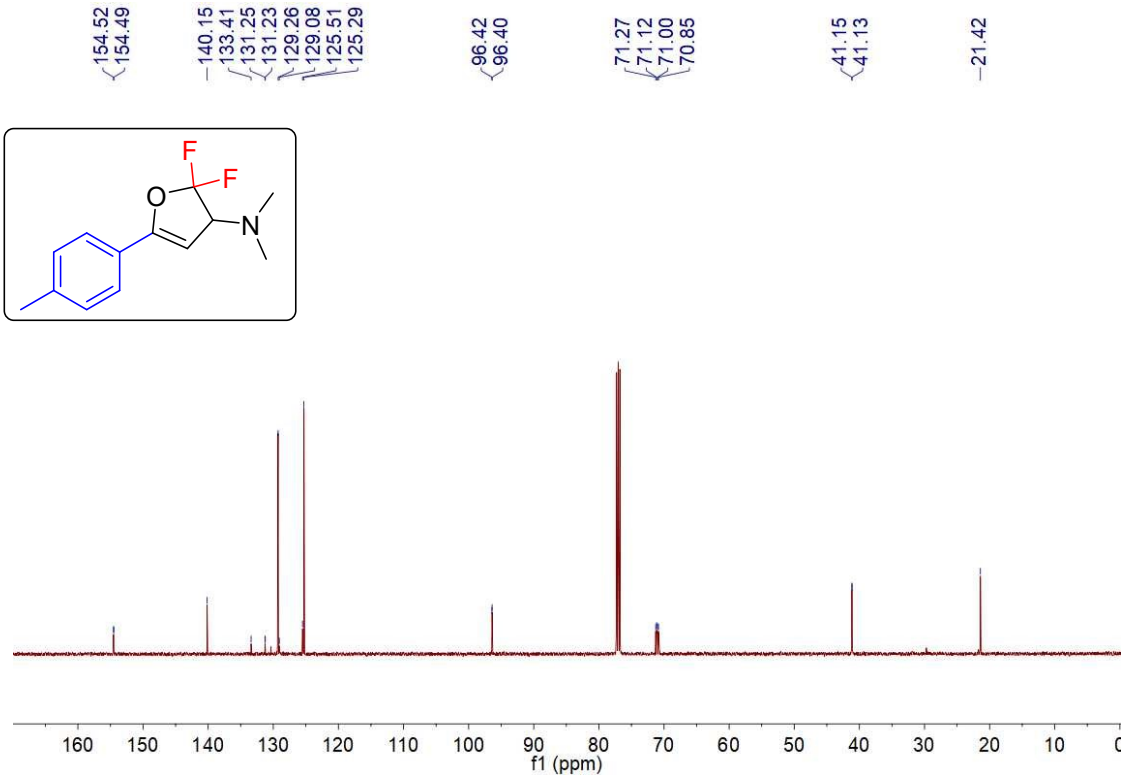
^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(m-tolyl)-2,3-dihydrofuran-3-amine (4c)



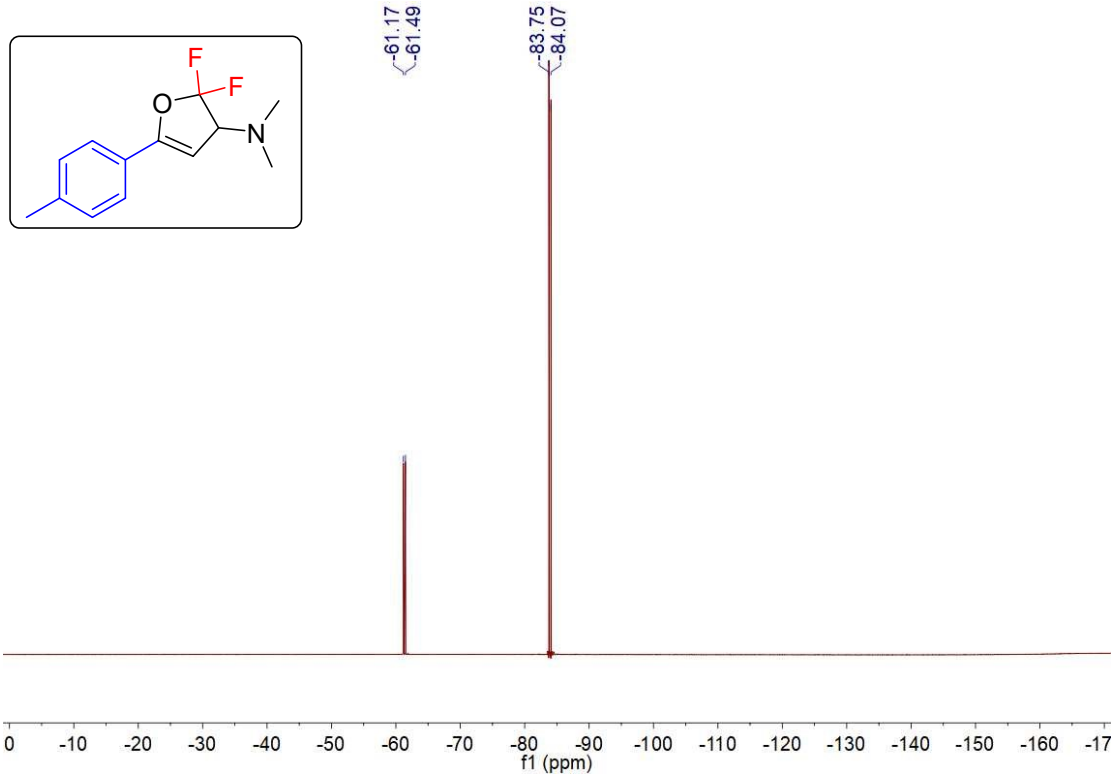
^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(p-tolyl)-2,3-dihydrofuran-3-amine (4d)



^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(p-tolyl)-2,3-dihydrofuran-3-amine (4d)

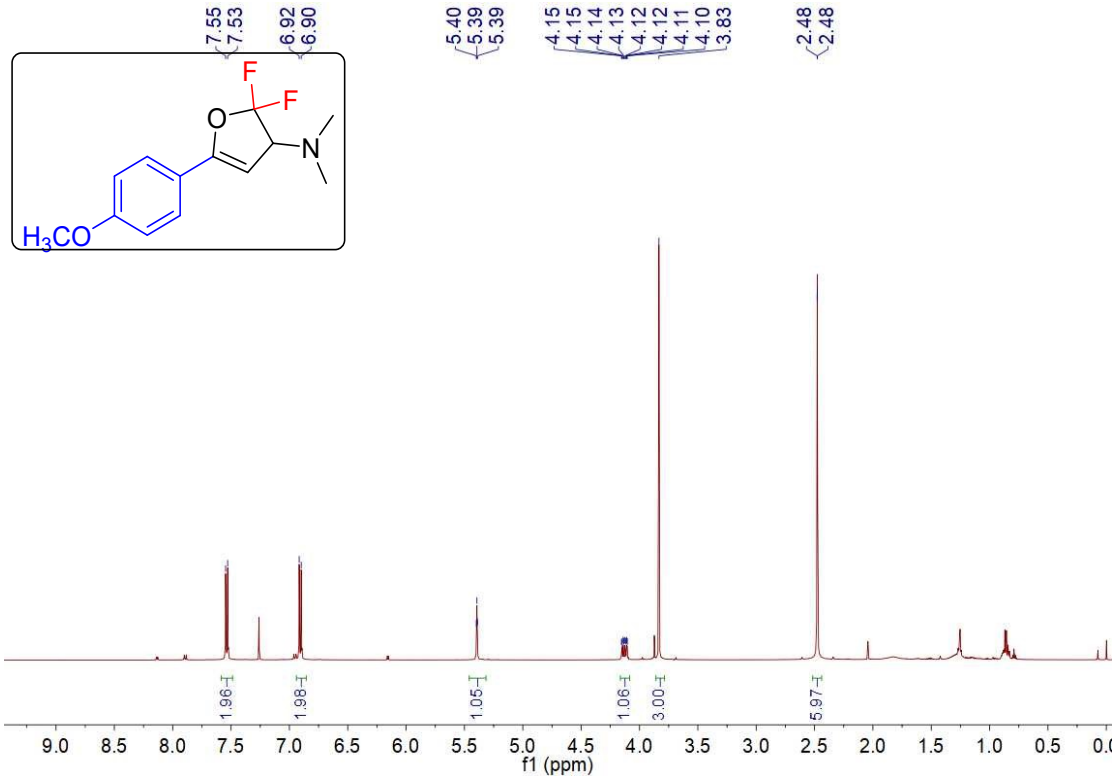


^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(p-tolyl)-2,3-dihydrofuran-3-amine (4d)

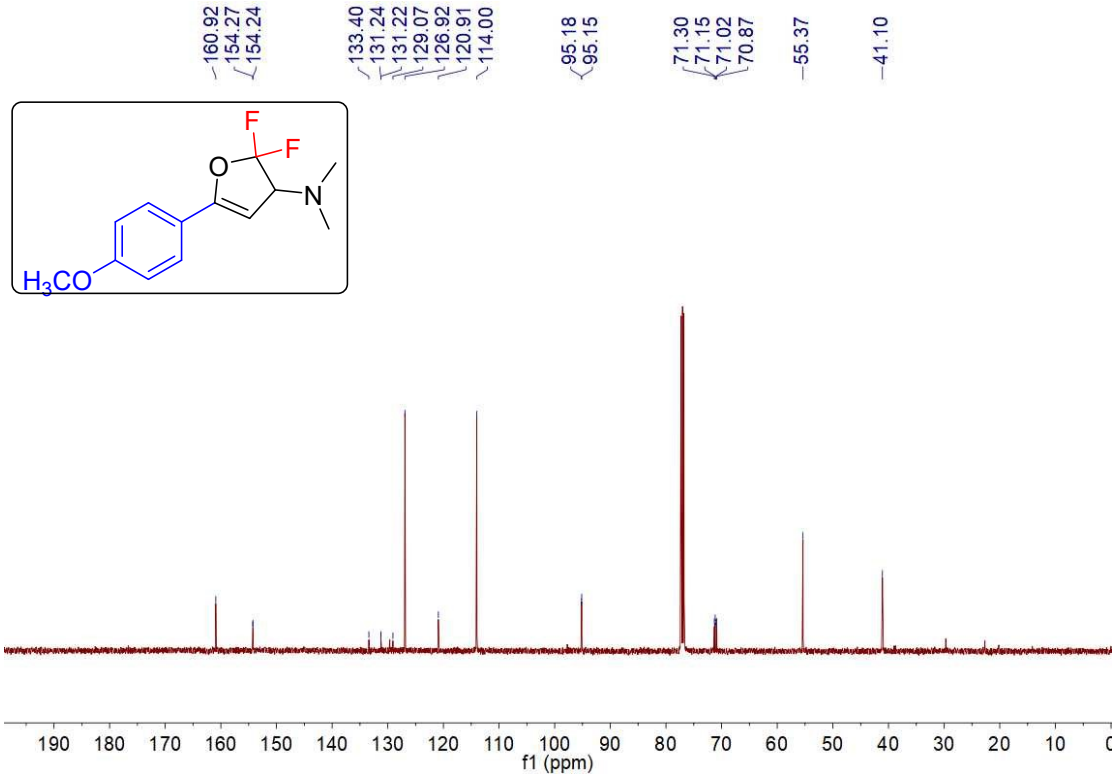


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-5-(4-methoxyphenyl)-N, N-dimethyl-2,3- dihydrofuran

-3-amine (4e)

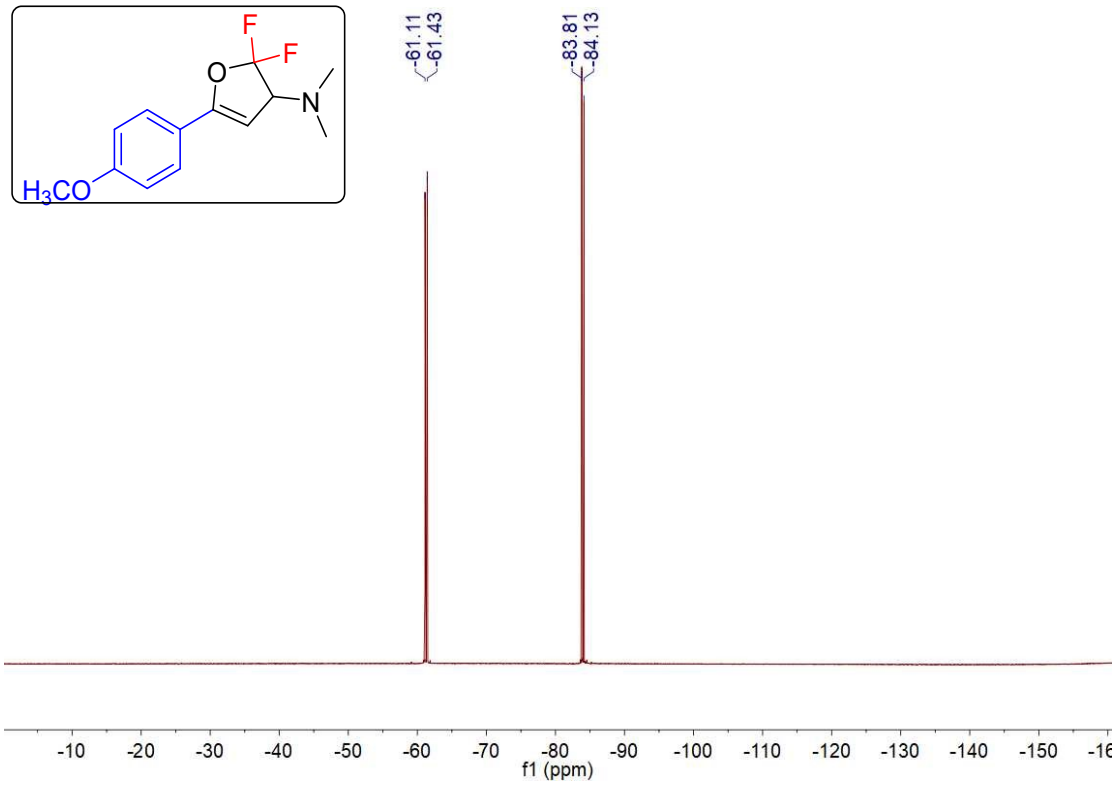


^{13}C spectrum ($CDCl_3$) 2,2-difluoro-5-(4-methoxyphenyl)-N, N-dimethyl-2,3-dihydrofuran -3-amine (4e)

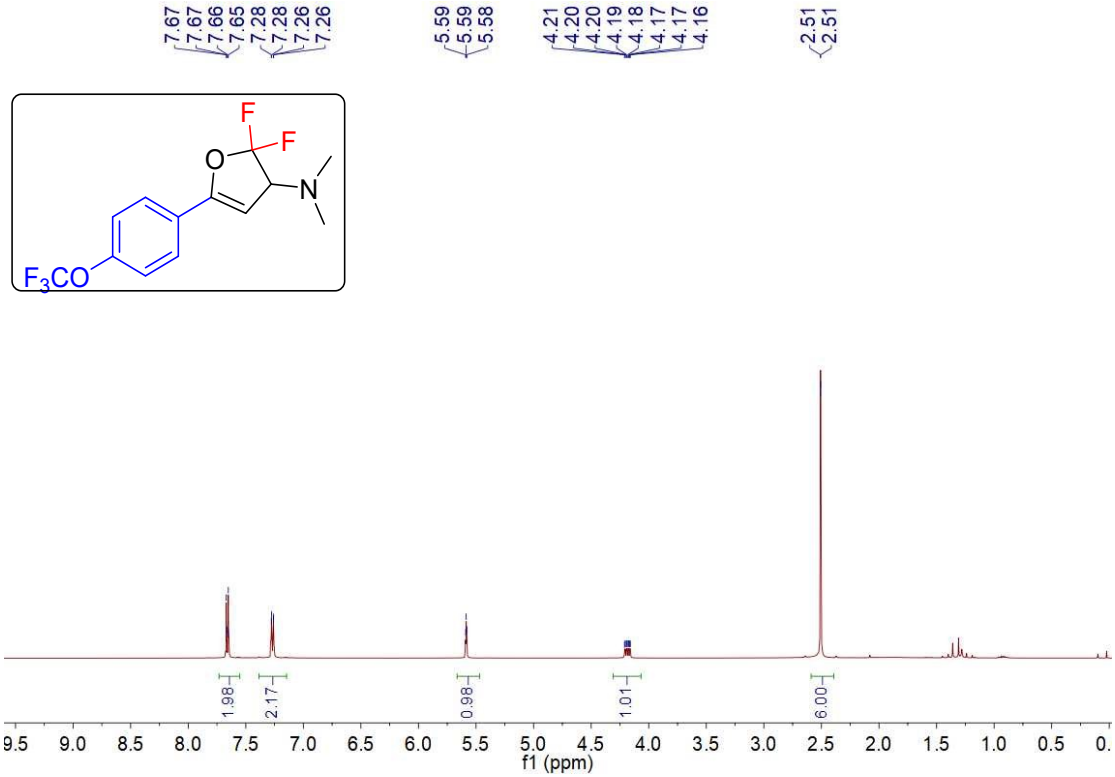


^{19}F spectrum ($CDCl_3$)2,2-difluoro-5-(4-methoxyphenyl)-N, N-dimethyl-2,3-dihydrofuran

-3-amine (4e)

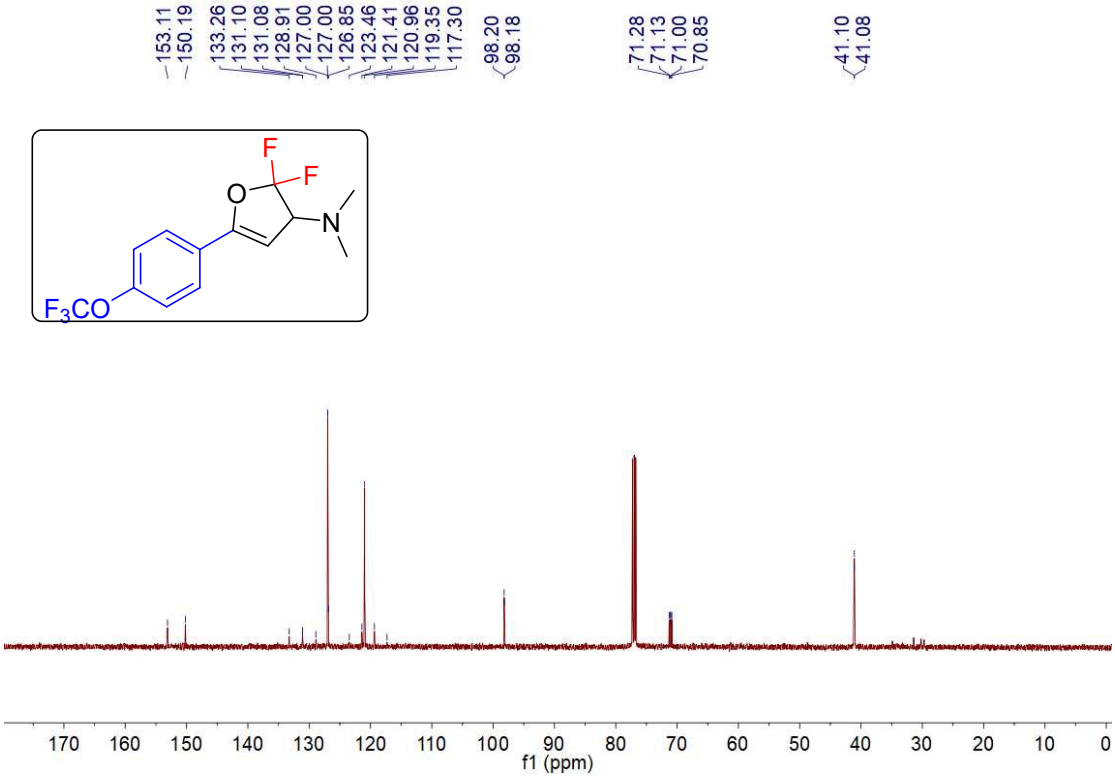


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethoxy)phenyl)
-2,3-dihydrofuran-3-amine (4f)



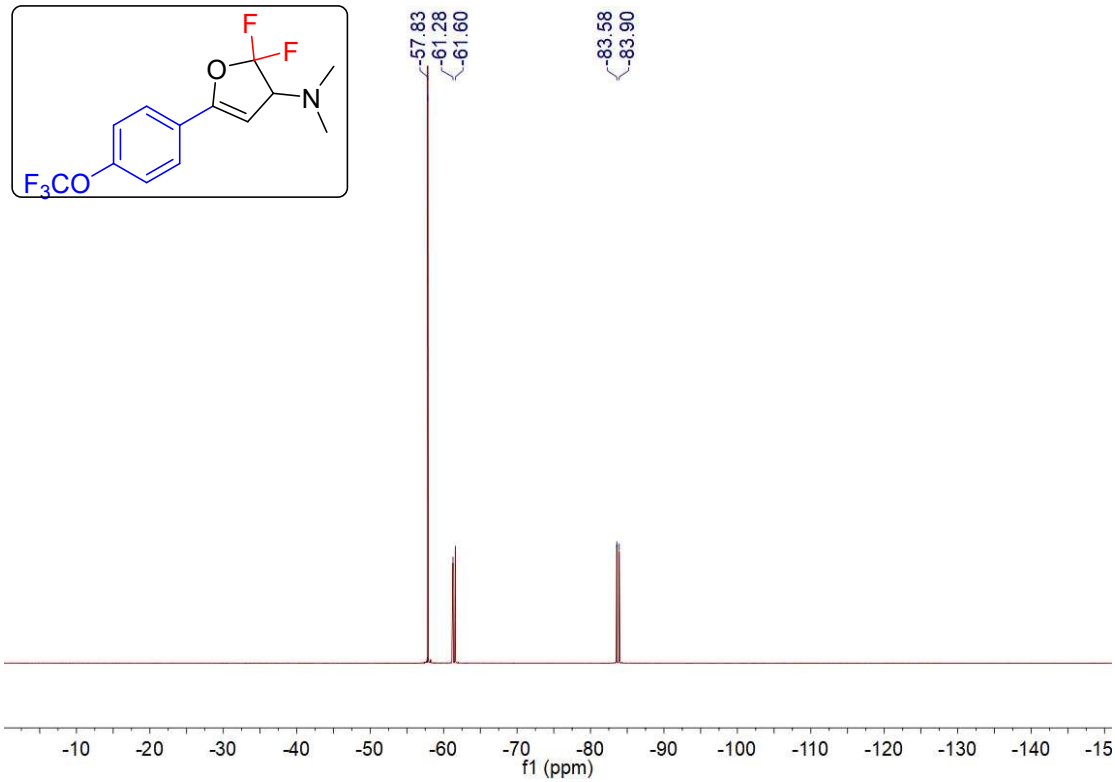
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethoxy)phenyl)

-2,3-dihydrofuran-3-amine (4f)



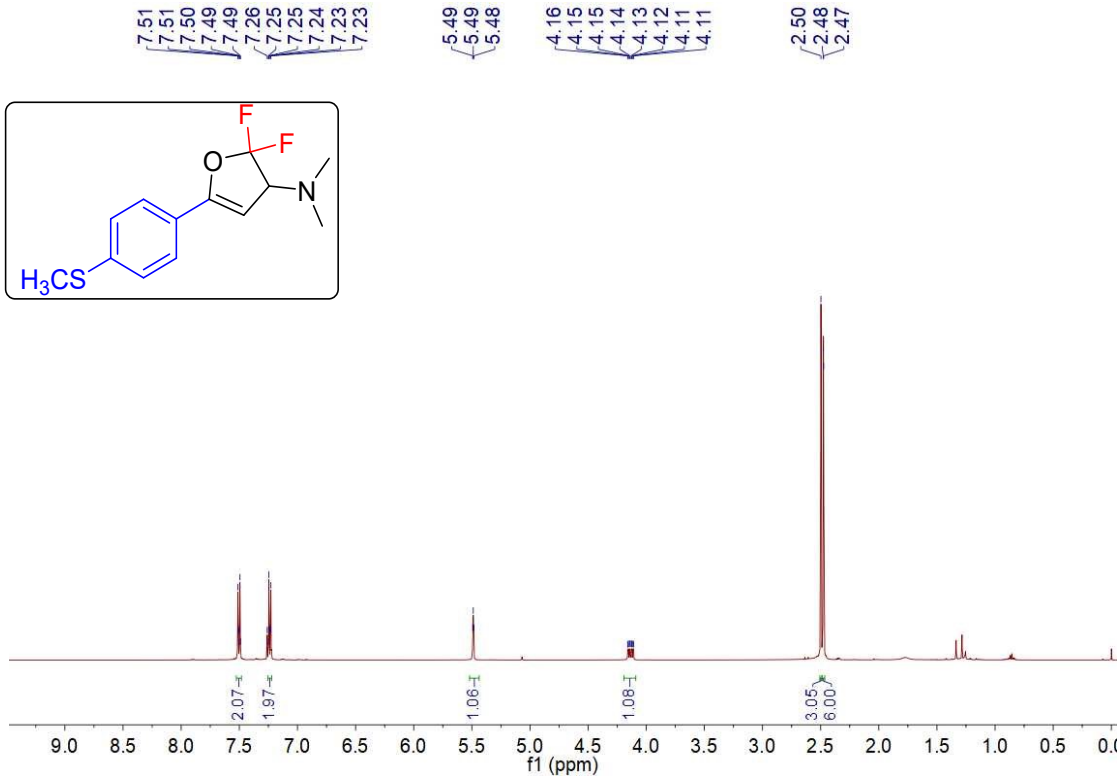
^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethoxy)phenyl)

-2,3-dihydrofuran-3-amine (4f)



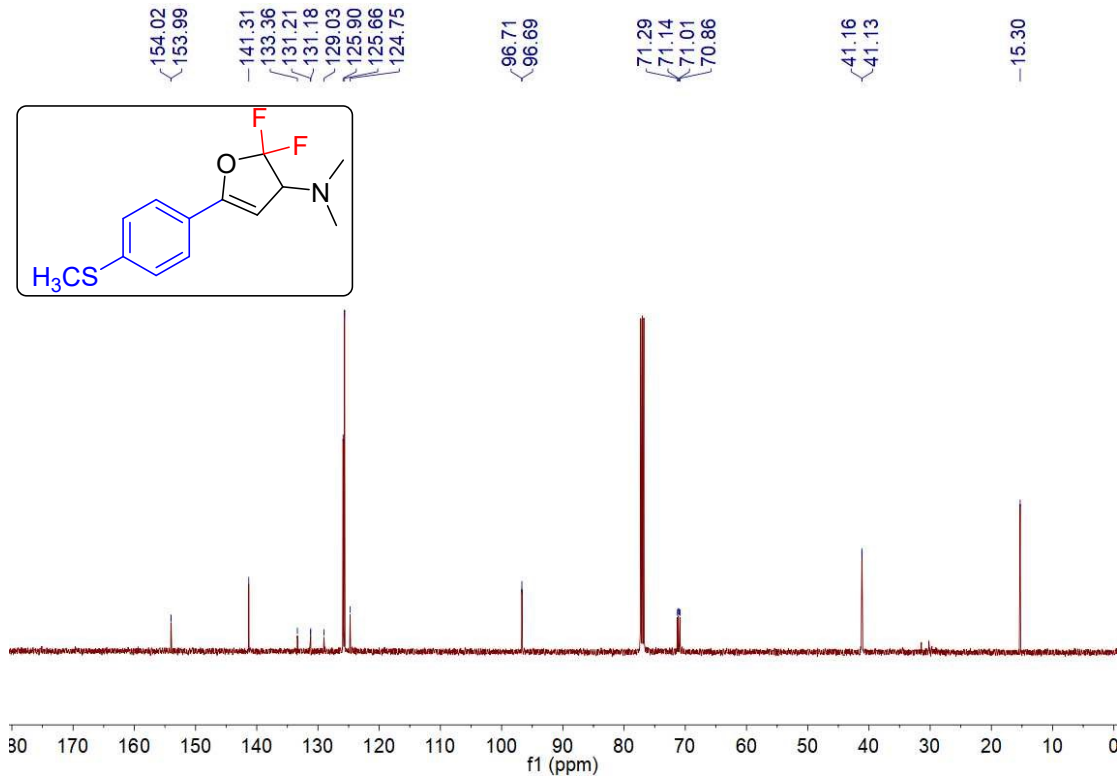
^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(methylthio)phenyl)

-2,3-dihydrofuran-3-amine (4g)



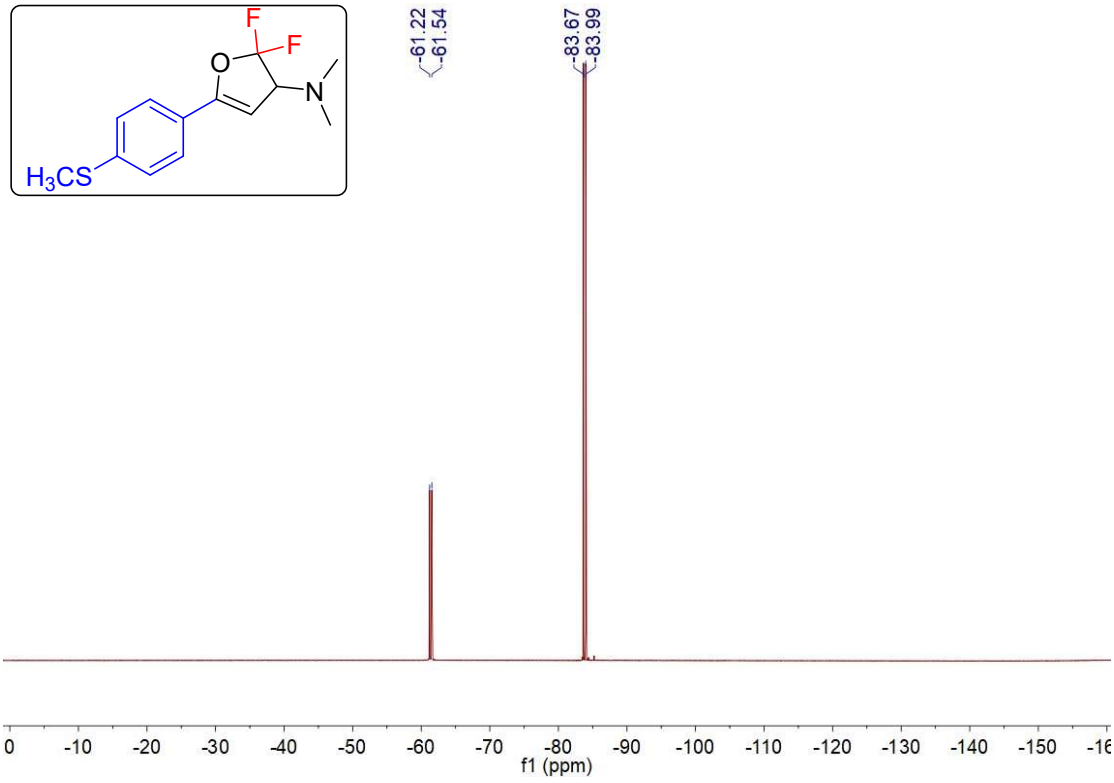
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(methylthio)phenyl)

-2,3-dihydrofuran-3-amine (4g)

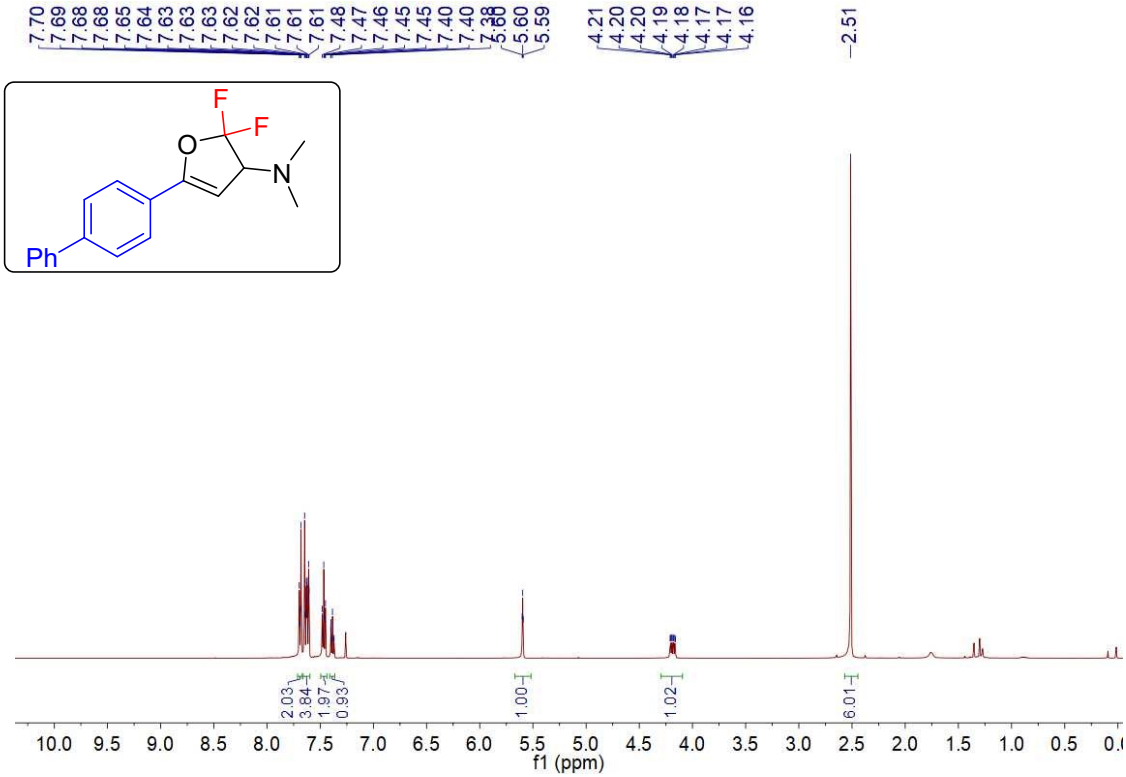


^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(4-(methylthio)phenyl)

-2,3-dihydrofuran-3-amine (4g)

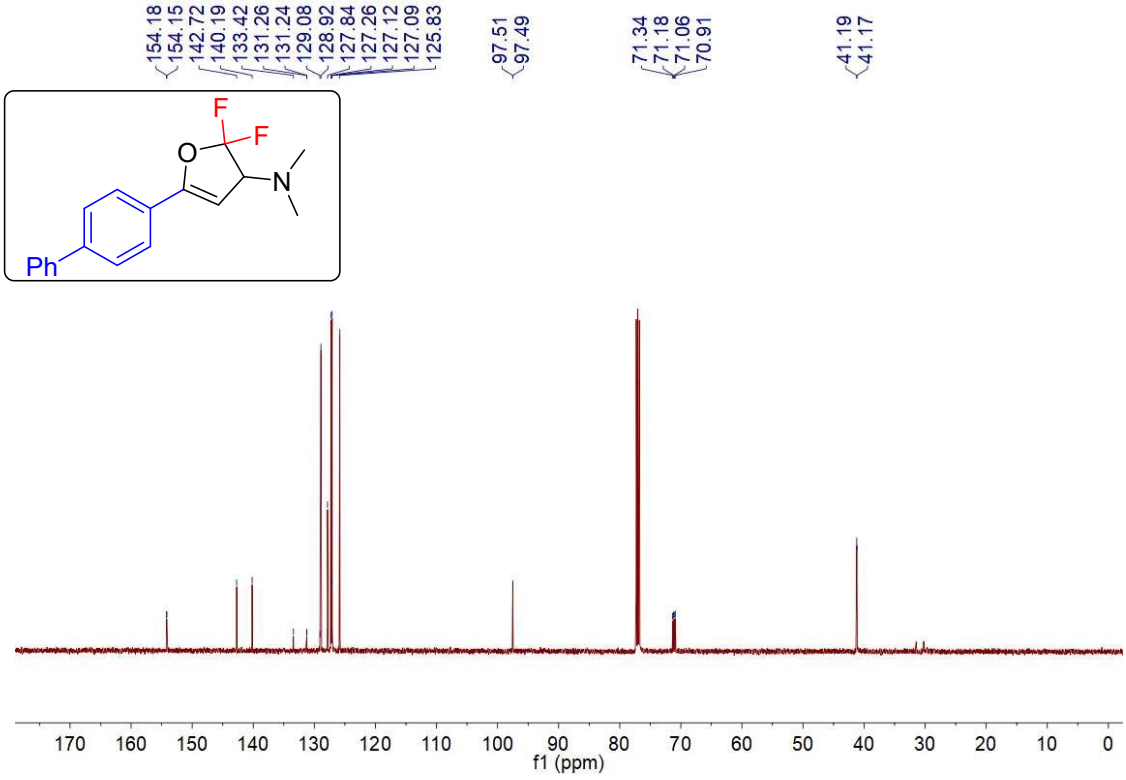


^{1}H spectrum ($CDCl_3$) 5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura n-3-amine (4h)



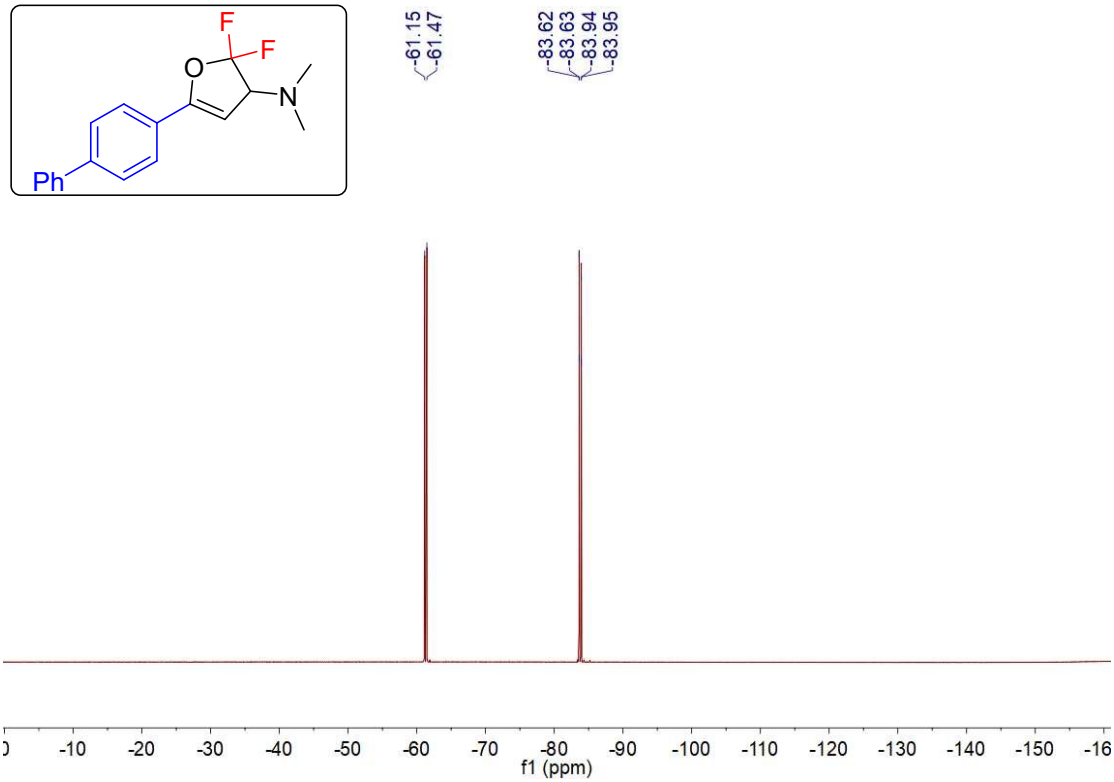
^{13}C spectrum ($CDCl_3$) 5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

n-3-amine (4h)

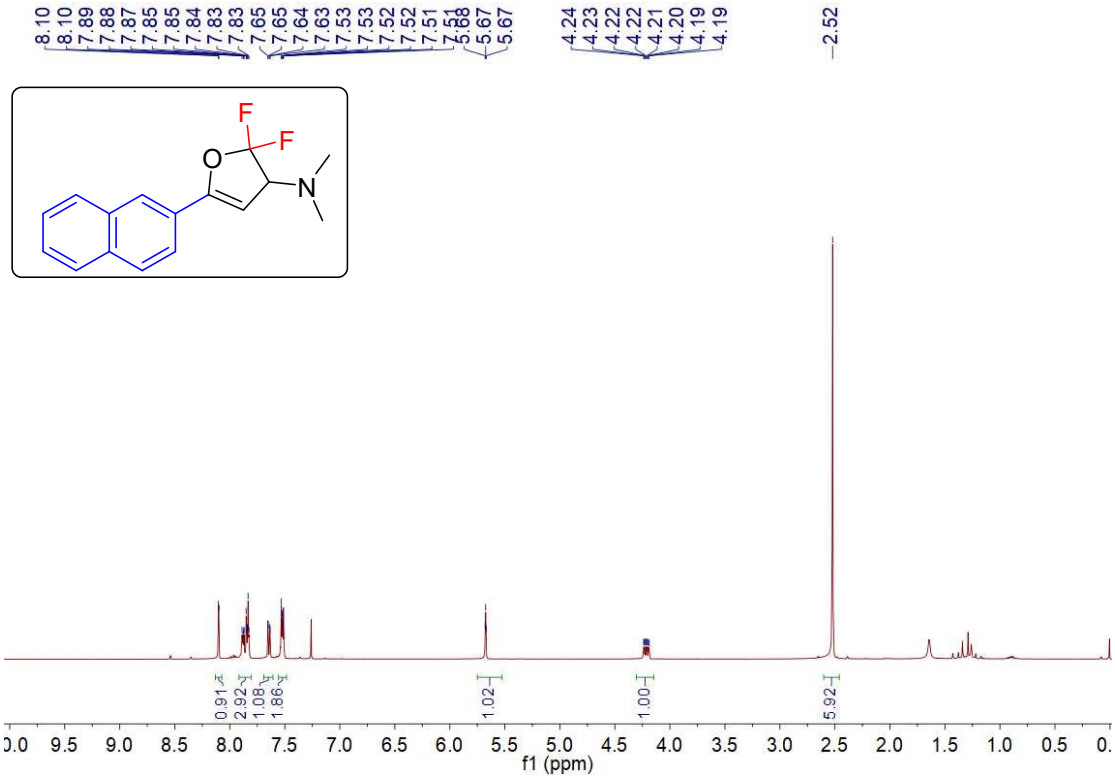


^{19}F spectrum ($CDCl_3$)5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

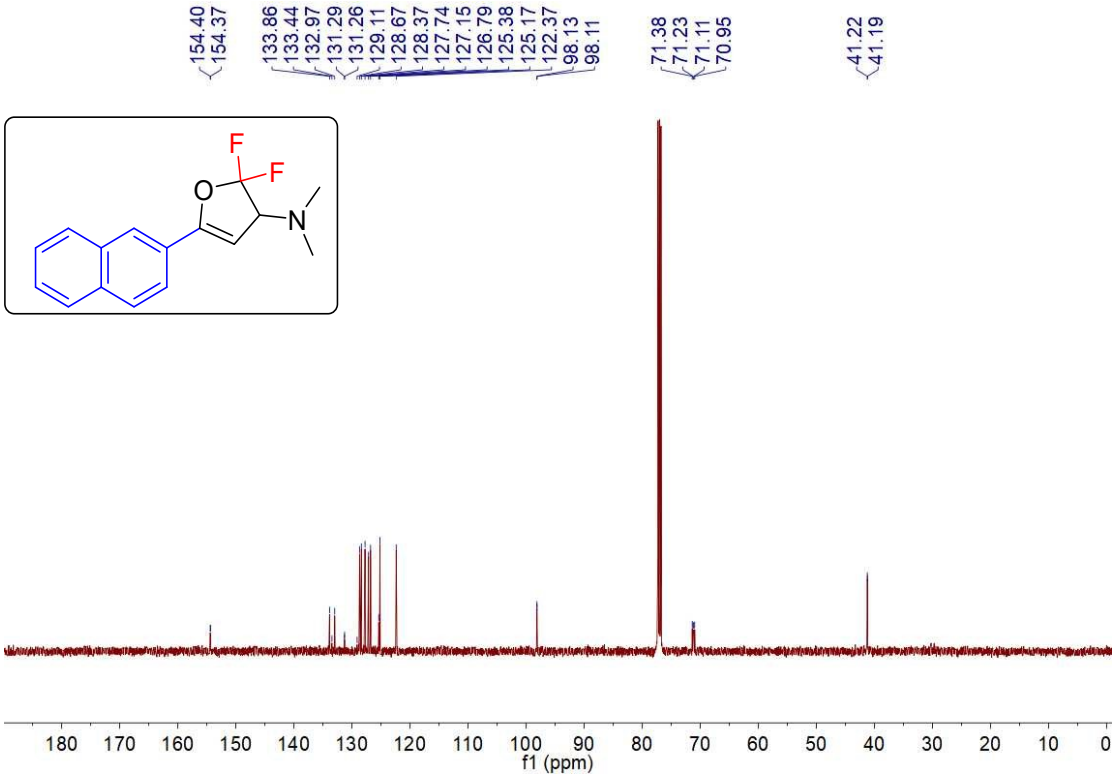
n-3-amine (4h)



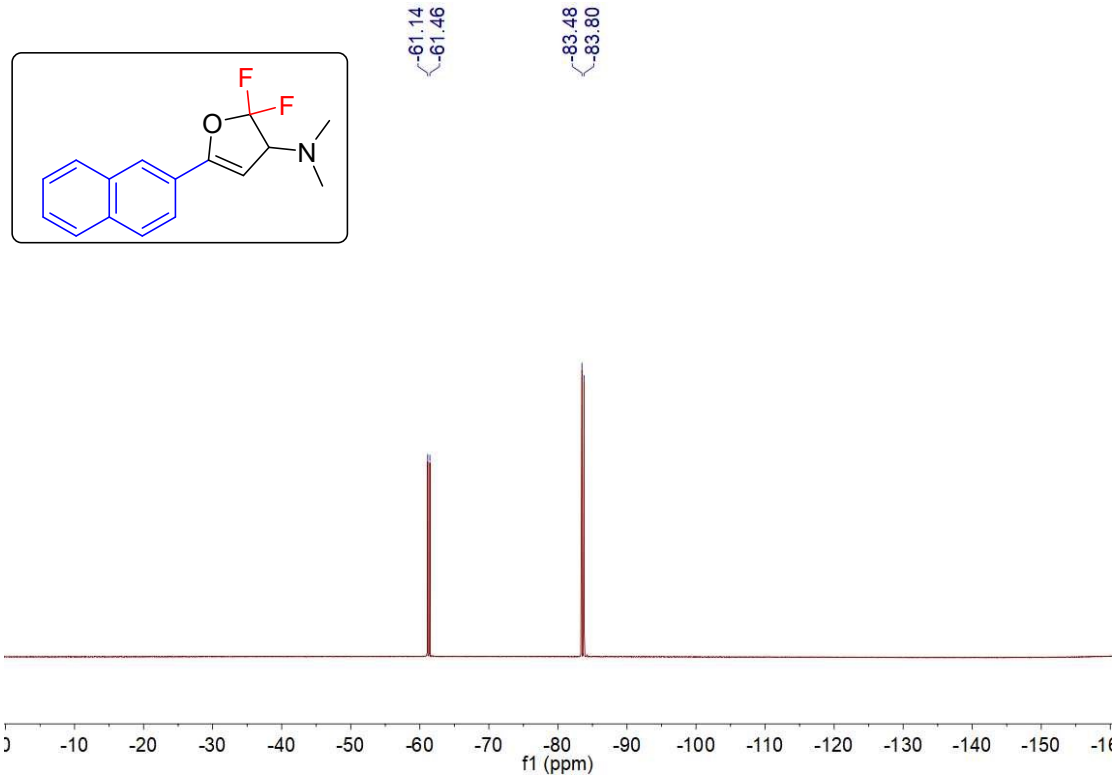
^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (4i)



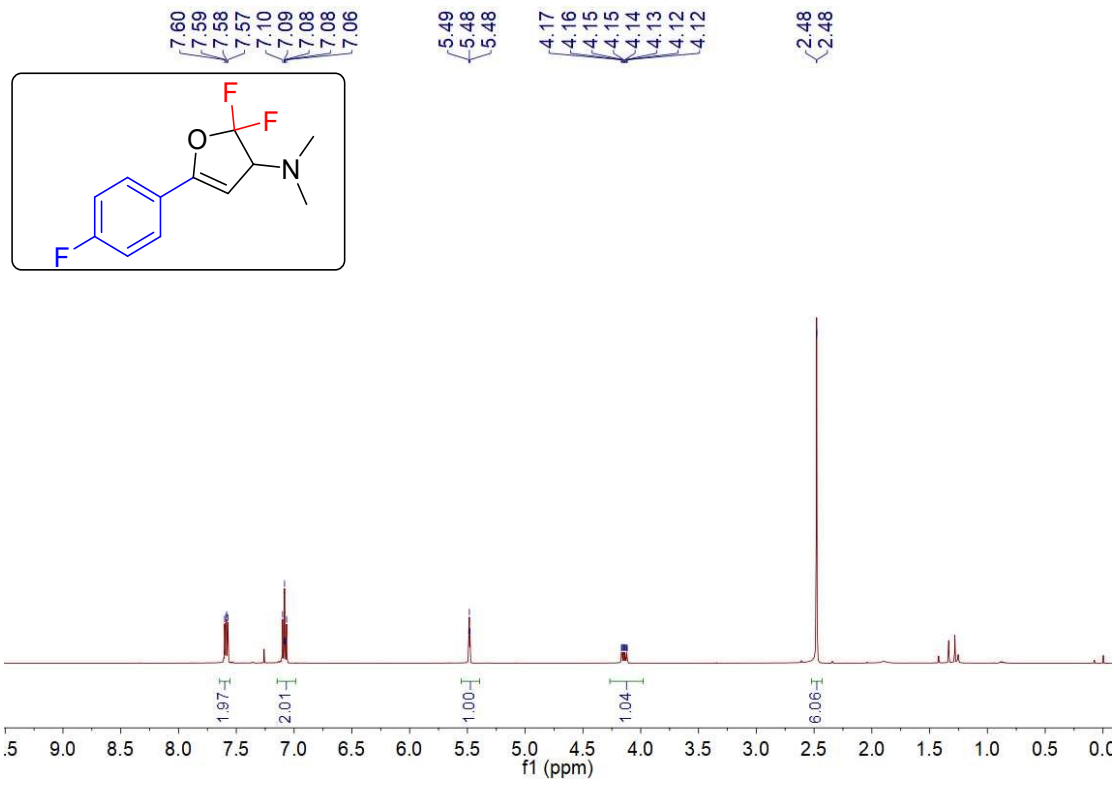
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (4i)



^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (4i)

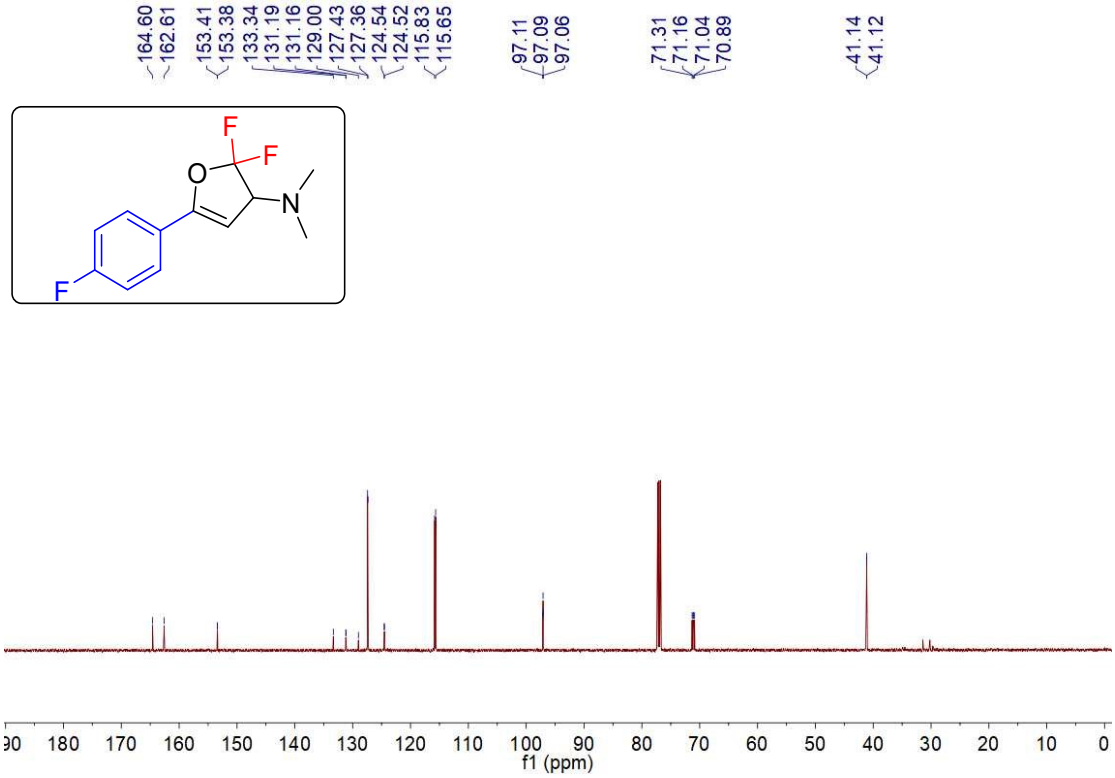


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-5-(4-fluorophenyl)-N, N-dimethyl-2,3-dihydrofuran-3-amine (4j)

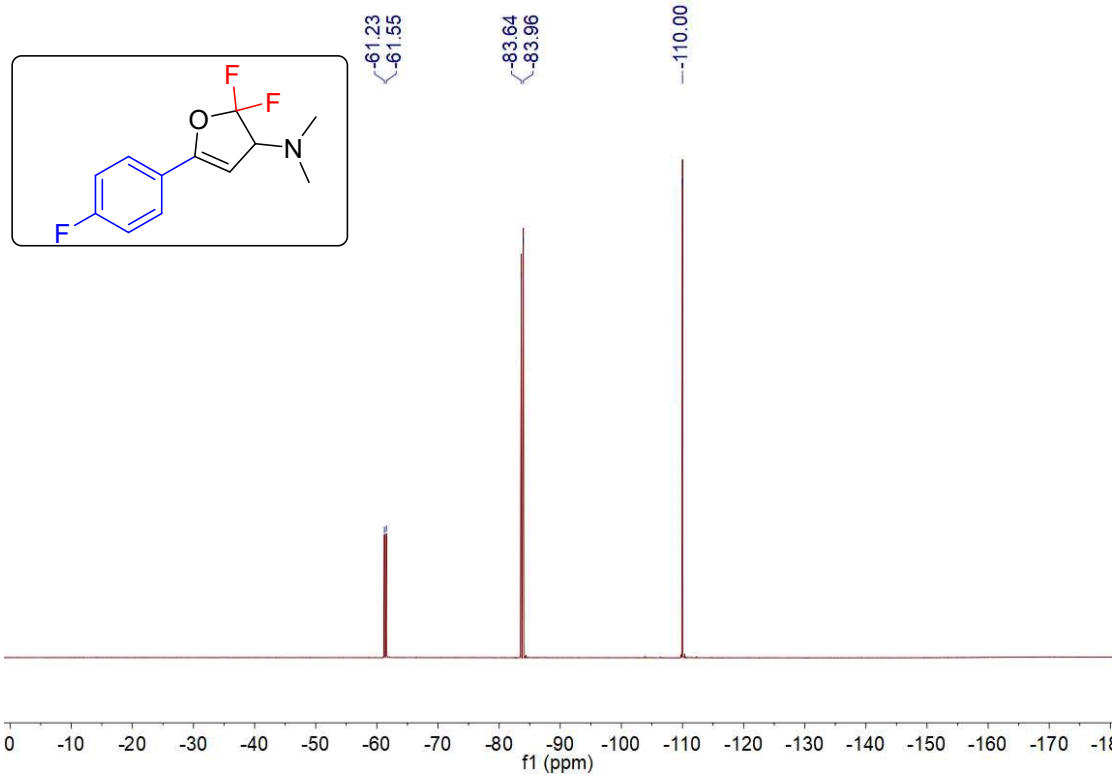


^{13}C spectrum ($CDCl_3$) 2,2-difluoro-5-(4-fluorophenyl)-N, N-dimethyl-2,3-dihydrofuran-3-amine

(4j)

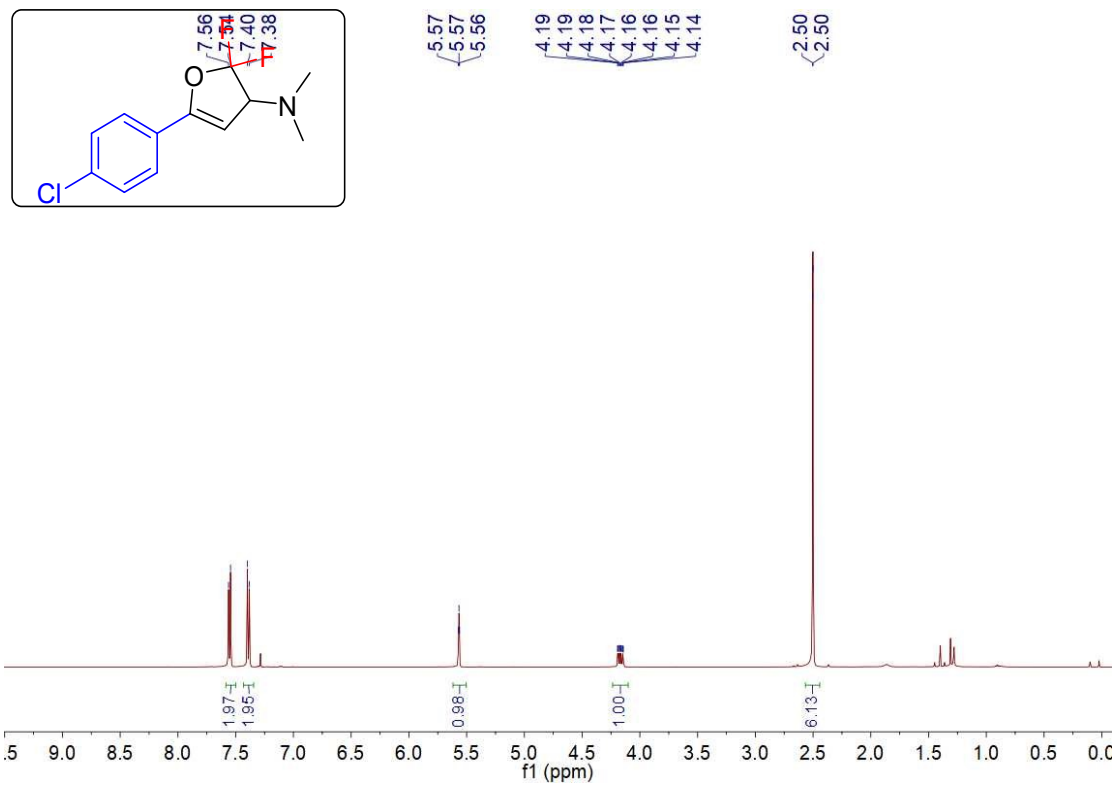


^{19}F spectrum ($CDCl_3$)2,2-difluoro-5-(4-fluorophenyl)-N, N-dimethyl-2,3-dihydrofuran-3-amine (4j)



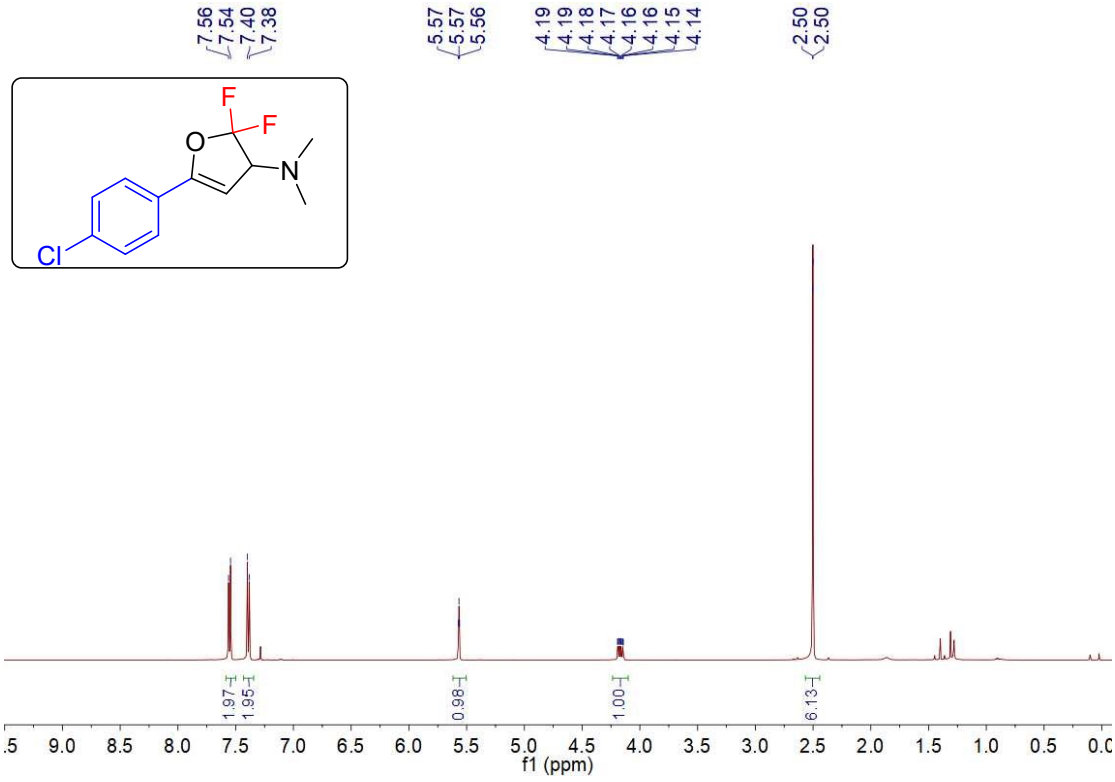
^{1}H spectrum ($CDCl_3$) 5-(4-chlorophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4k)



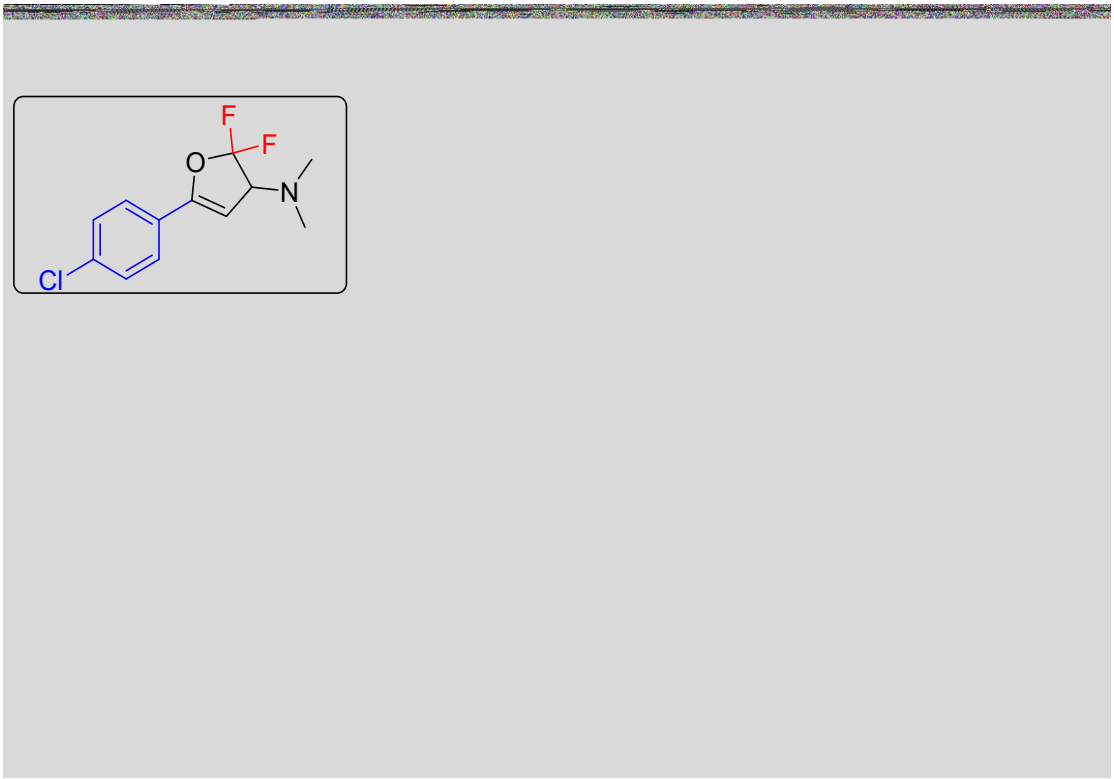
^{13}C spectrum ($CDCl_3$) 5-(4-chlorophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4k)



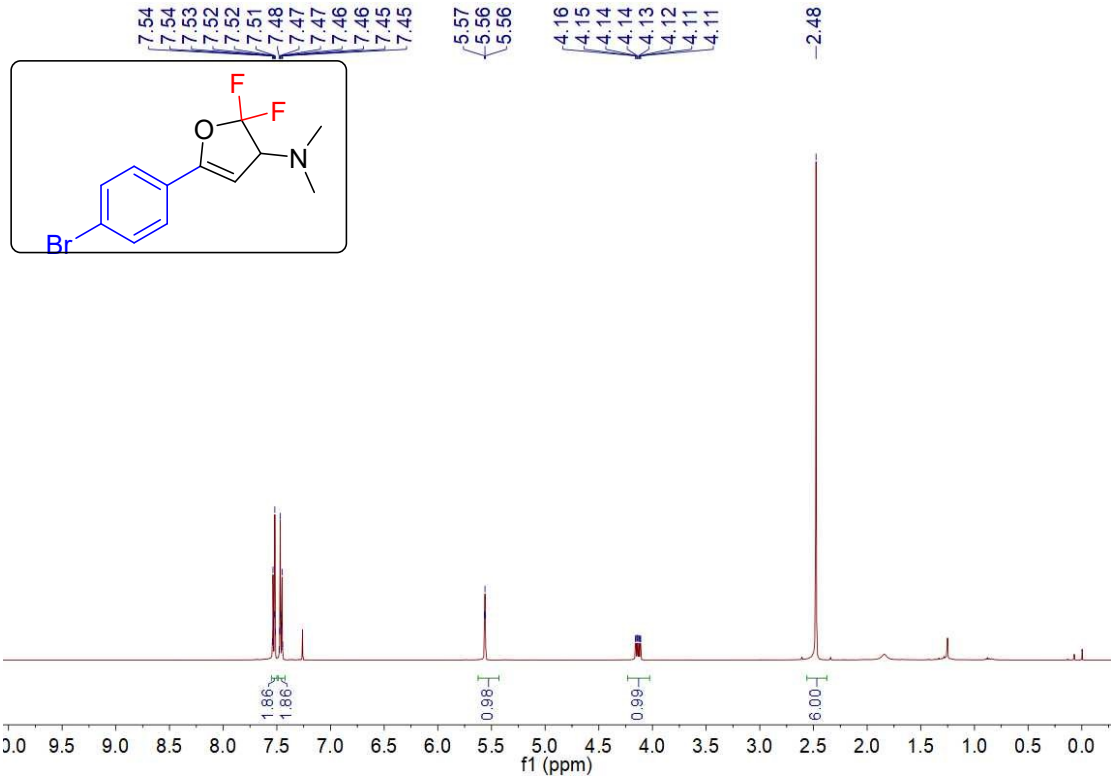
^{19}F spectrum ($CDCl_3$)5-(4-chlorophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4k)



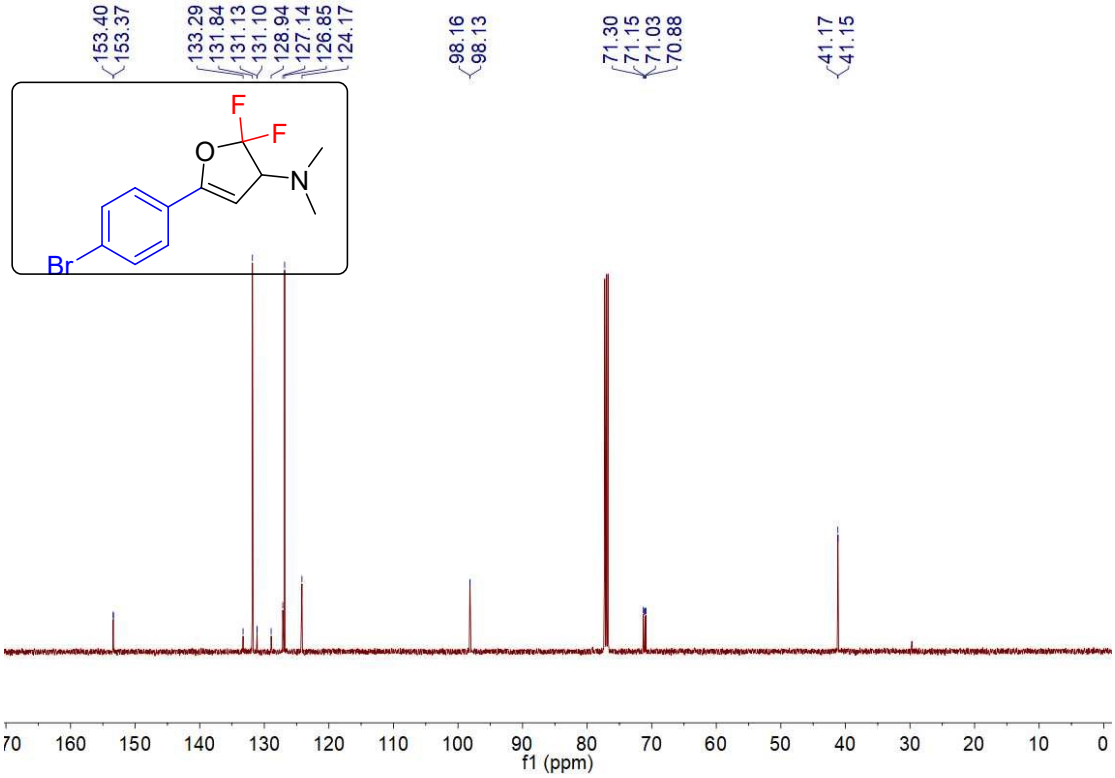
^{1}H spectrum ($CDCl_3$) 5-(4-bromophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4l)



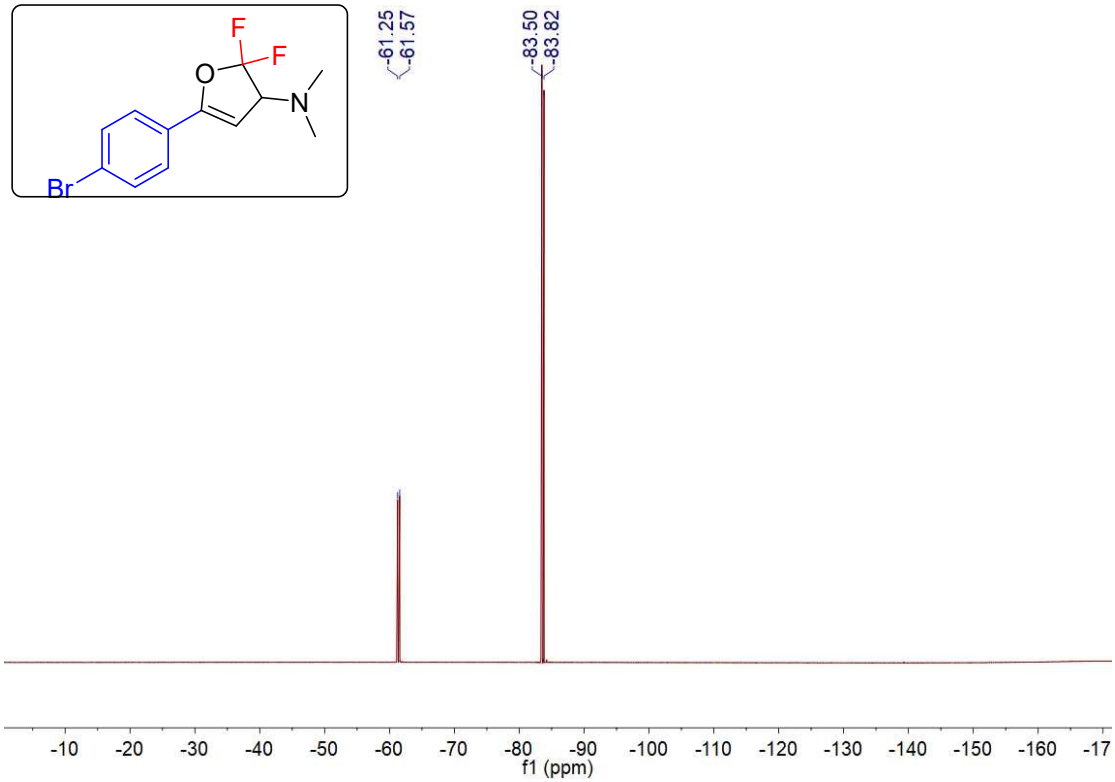
^{13}C spectrum ($CDCl_3$) 5-(4-bromophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4l)



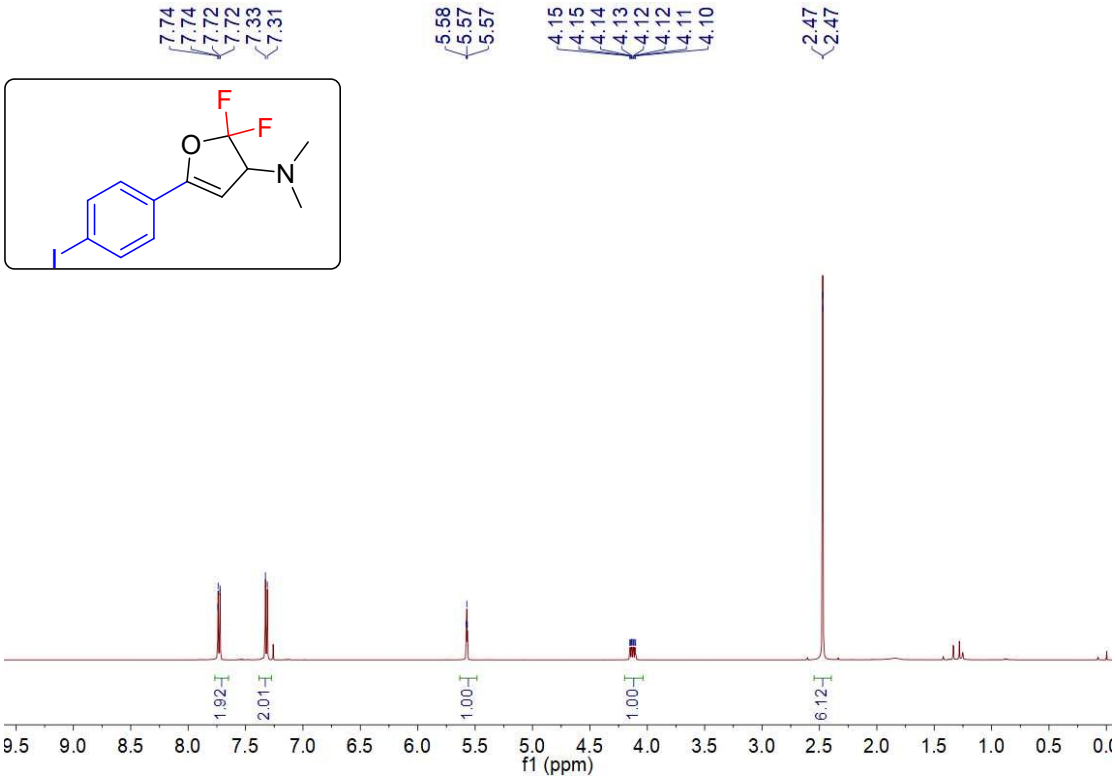
^{19}F spectrum ($CDCl_3$)5-(4-bromophenyl)-2,2-difluoro-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4l)



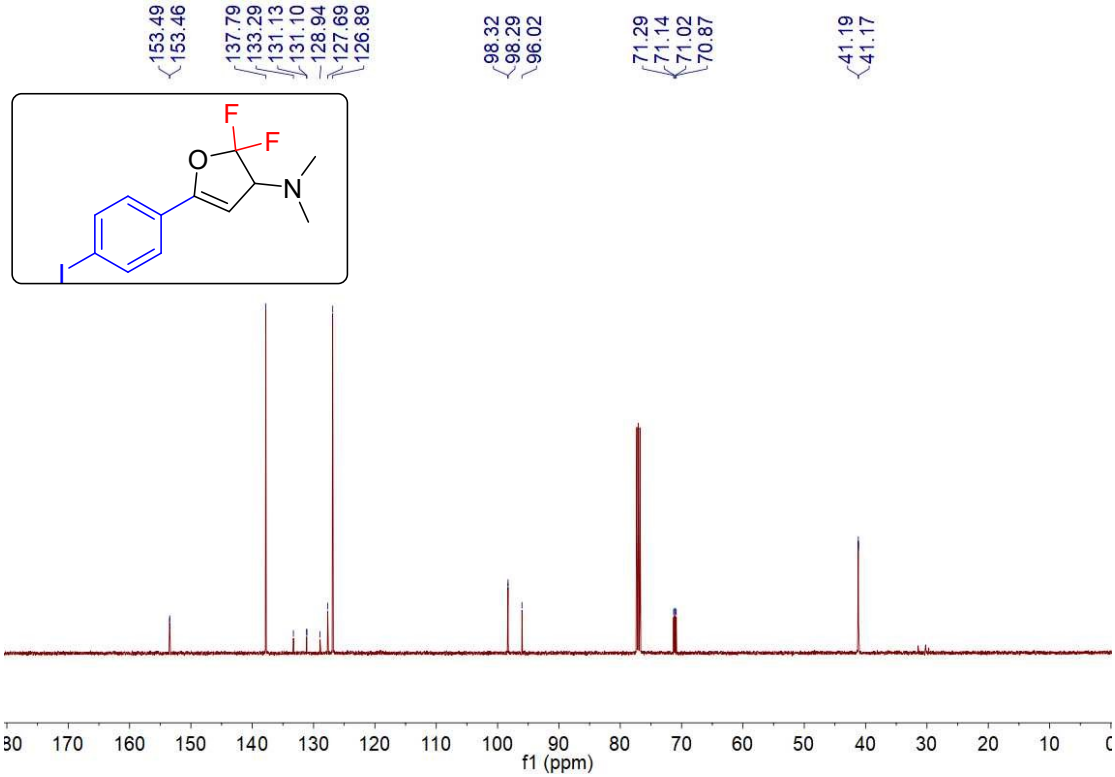
^{1}H spectrum ($CDCl_3$) 2,2-difluoro-5-(4-iodophenyl)-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4m)



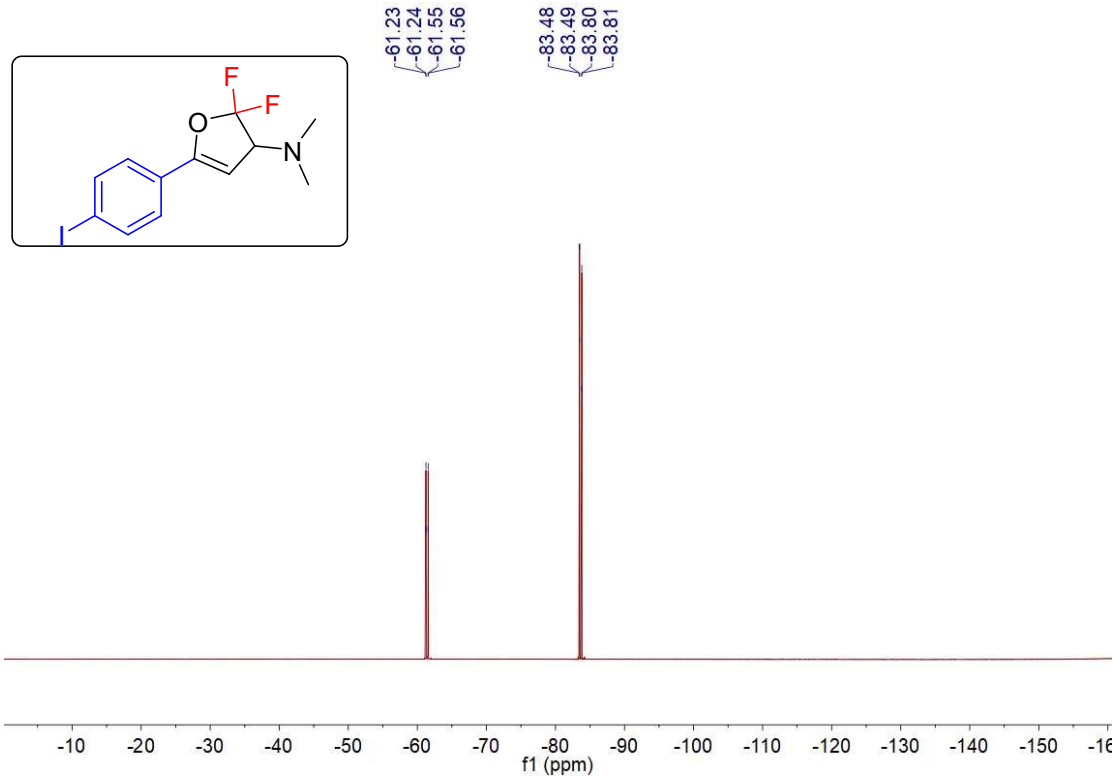
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-5-(4-iodophenyl)-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4m)

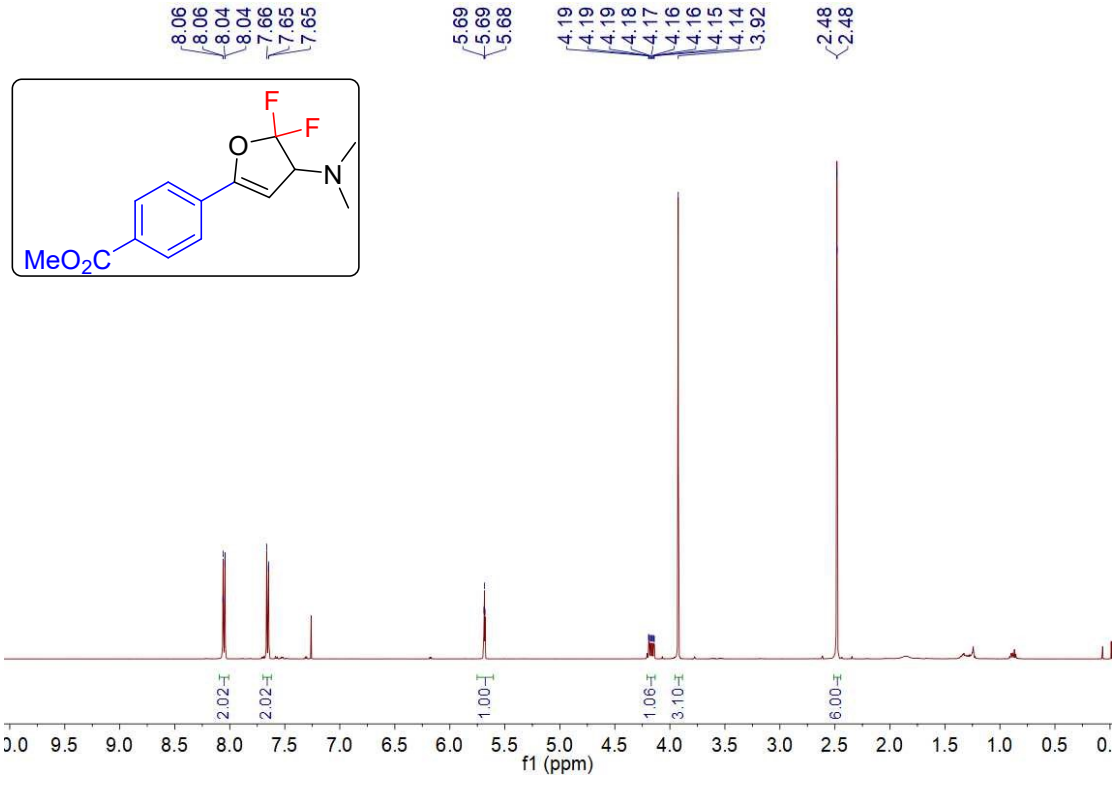


^{19}F spectrum ($CDCl_3$)2,2-difluoro-5-(4-iodophenyl)-N, N-dimethyl-2,3-dihydrofura

n-3-amine(4m)

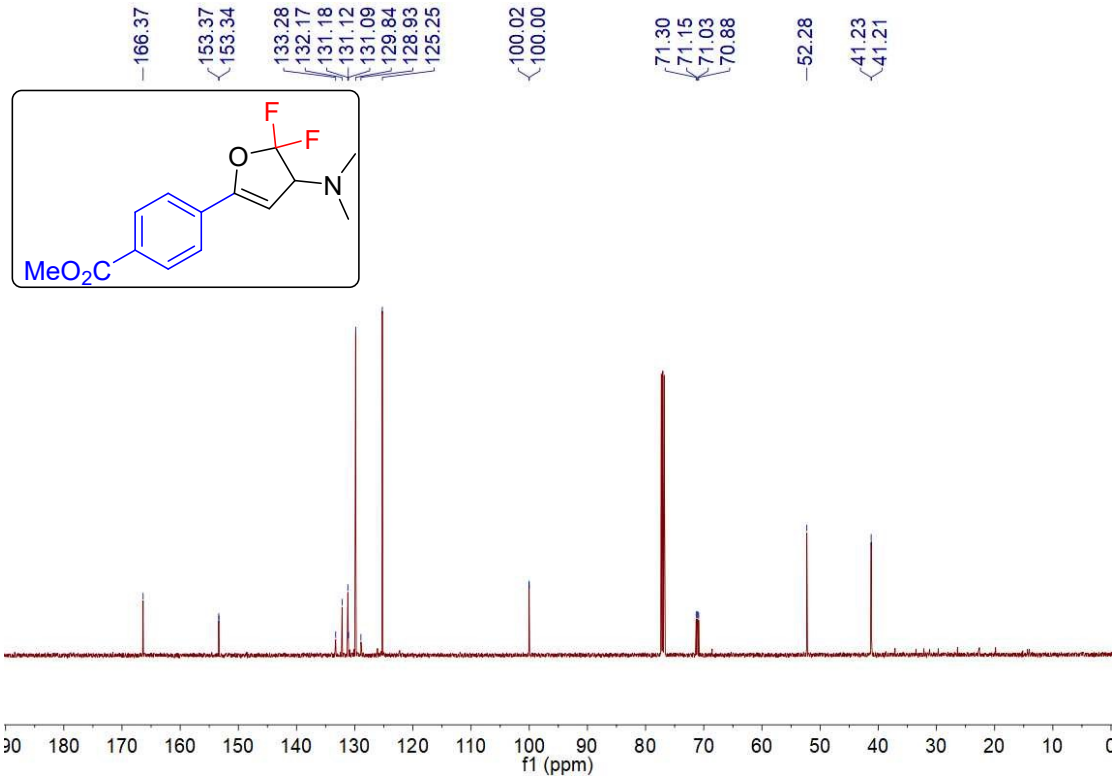


^{1}H spectrum ($CDCl_3$) methyl 4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzoate (4n)

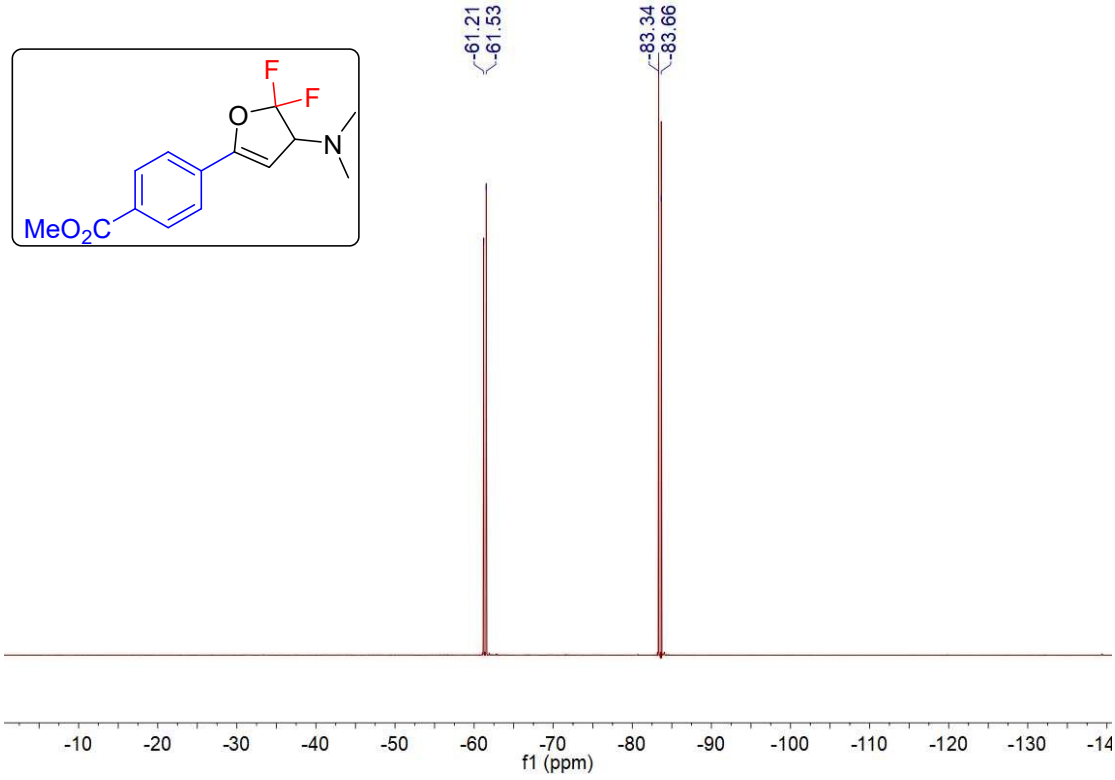


^{13}C spectrum ($CDCl_3$) methyl 4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzoate

(4n)

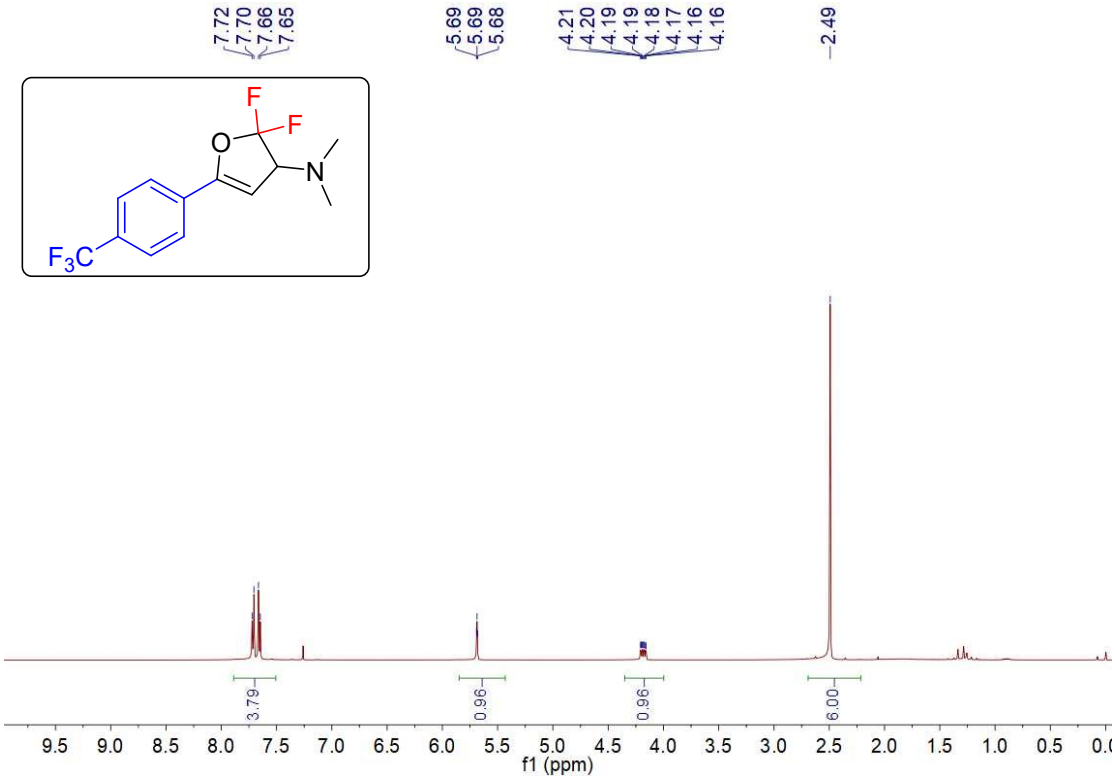


^{19}F spectrum ($CDCl_3$)methyl 4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzoate (4n)

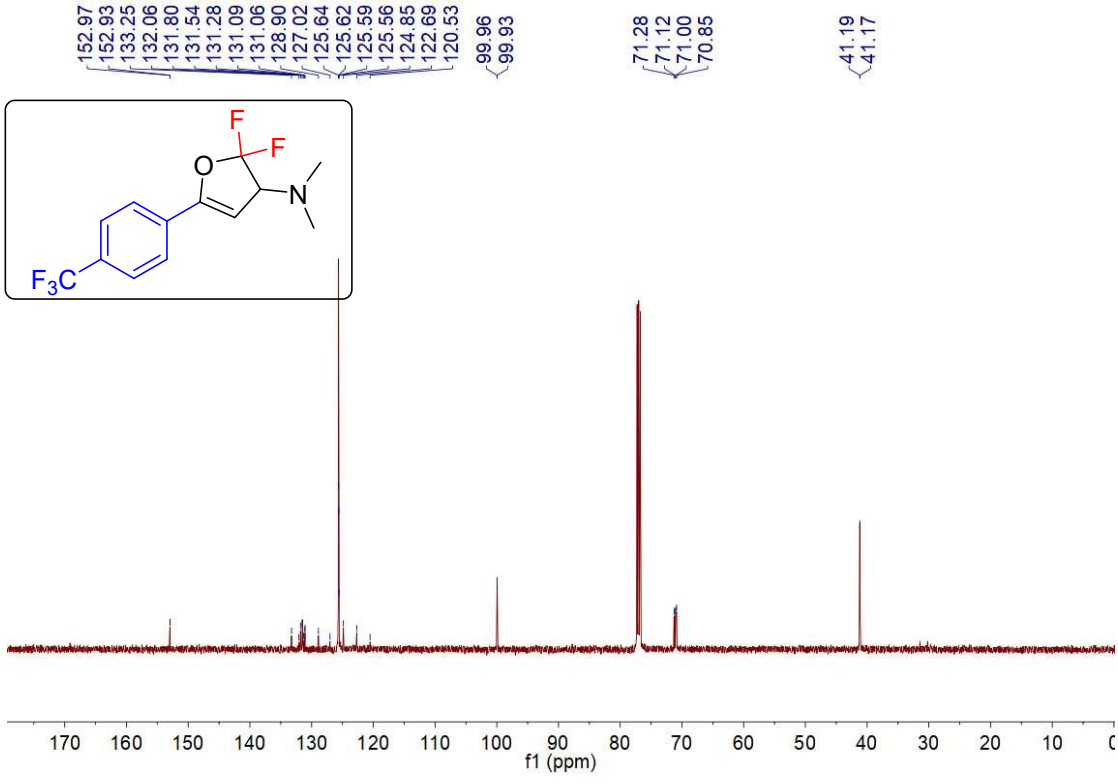


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethyl)phenyl)-2,3-dihydrofura

n-3-amine (4o)



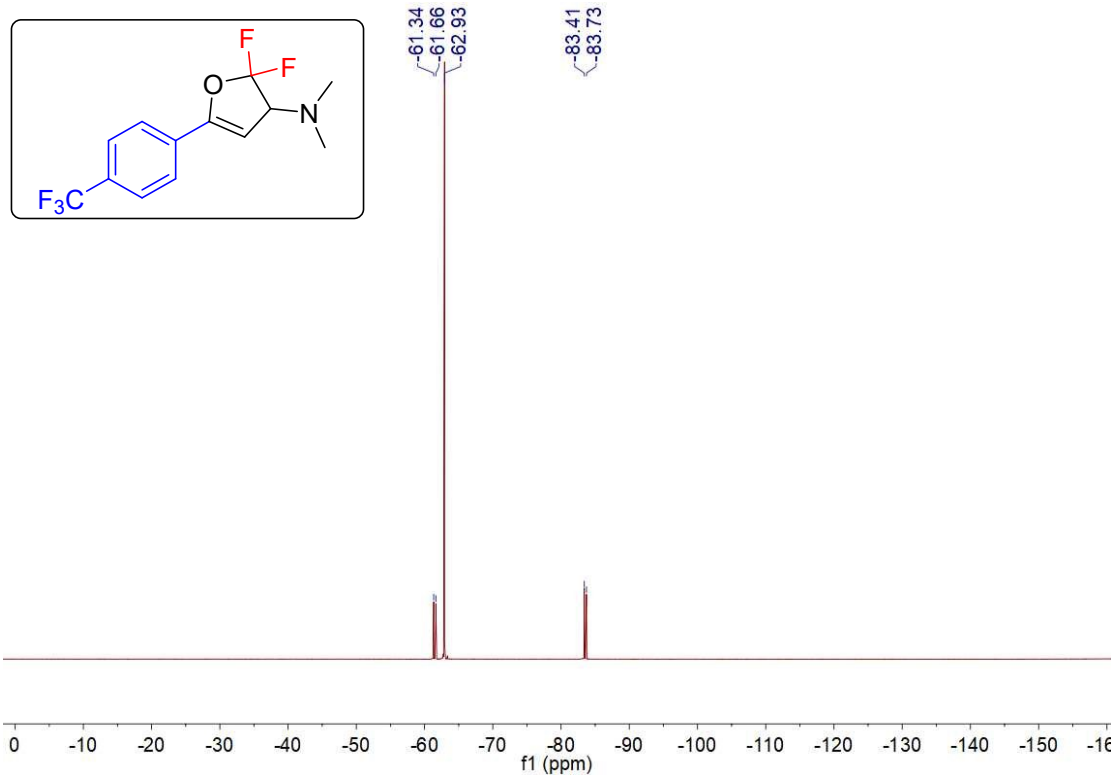
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethyl)phenyl)-2,3-dihydrofura n-3-amine (4o)



^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(4-(trifluoromethyl)phenyl)-2,3-

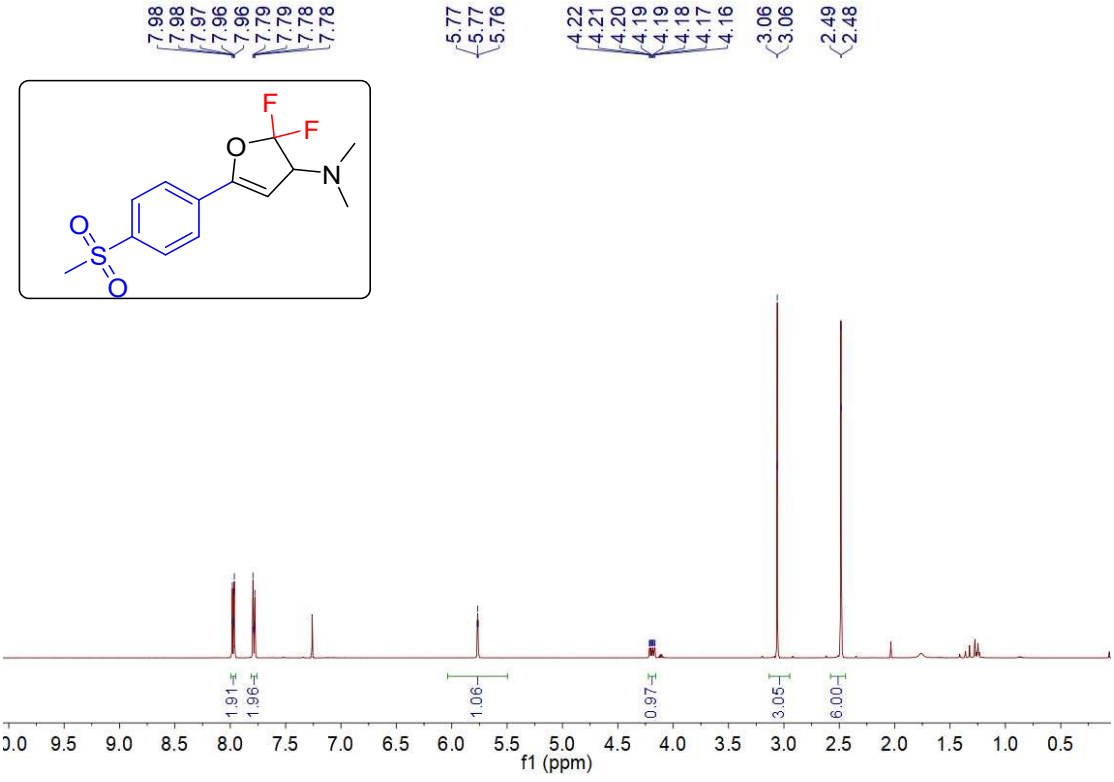
dihydrofuran

-3-amine (4o)

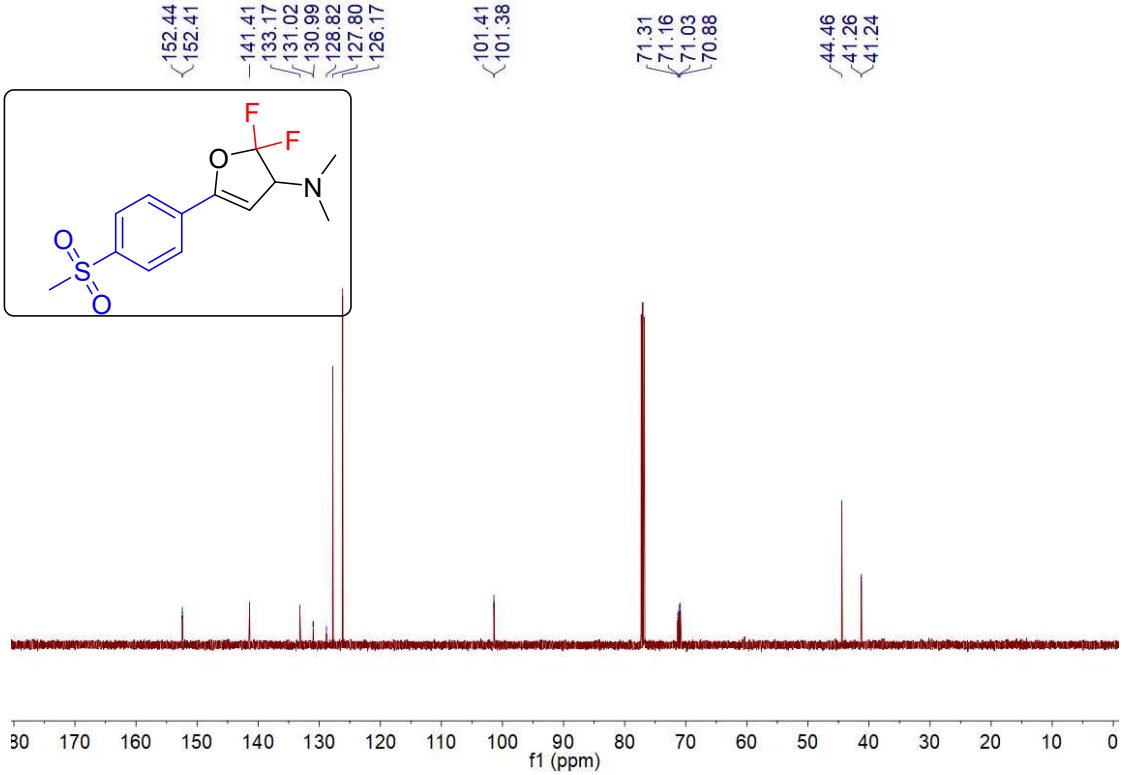


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(methylsulfonyl)phenyl)-2,3-dihydrofuran

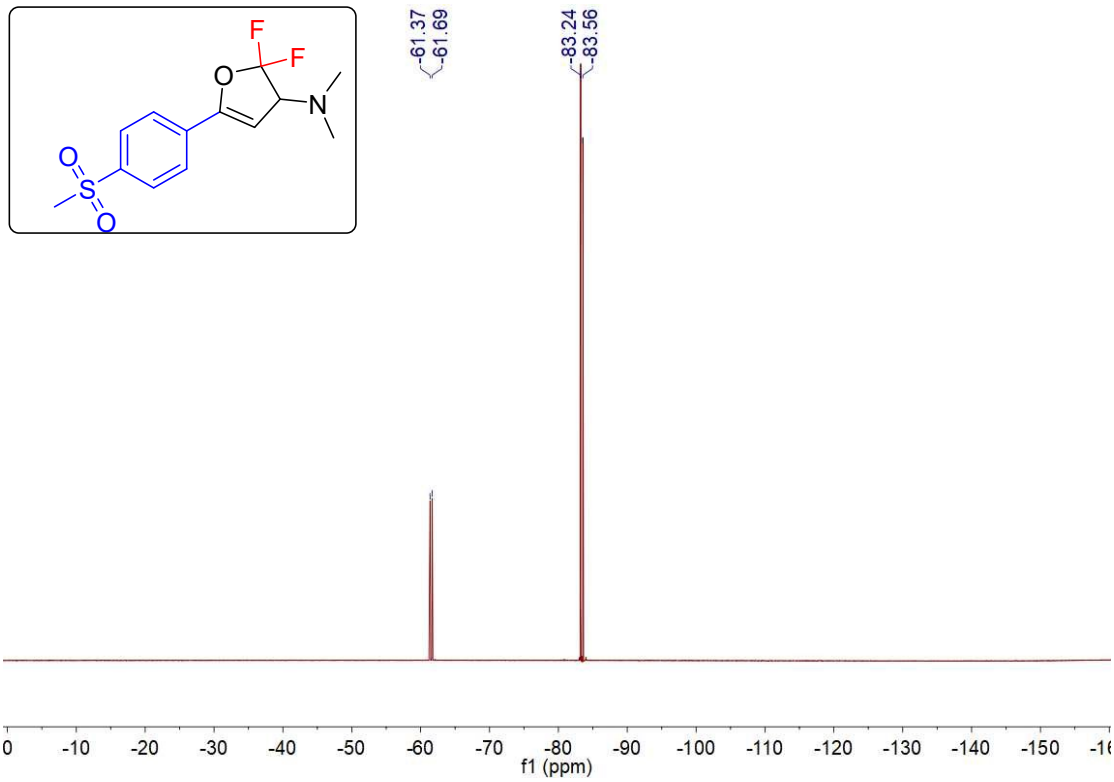
-3-amine (4p)



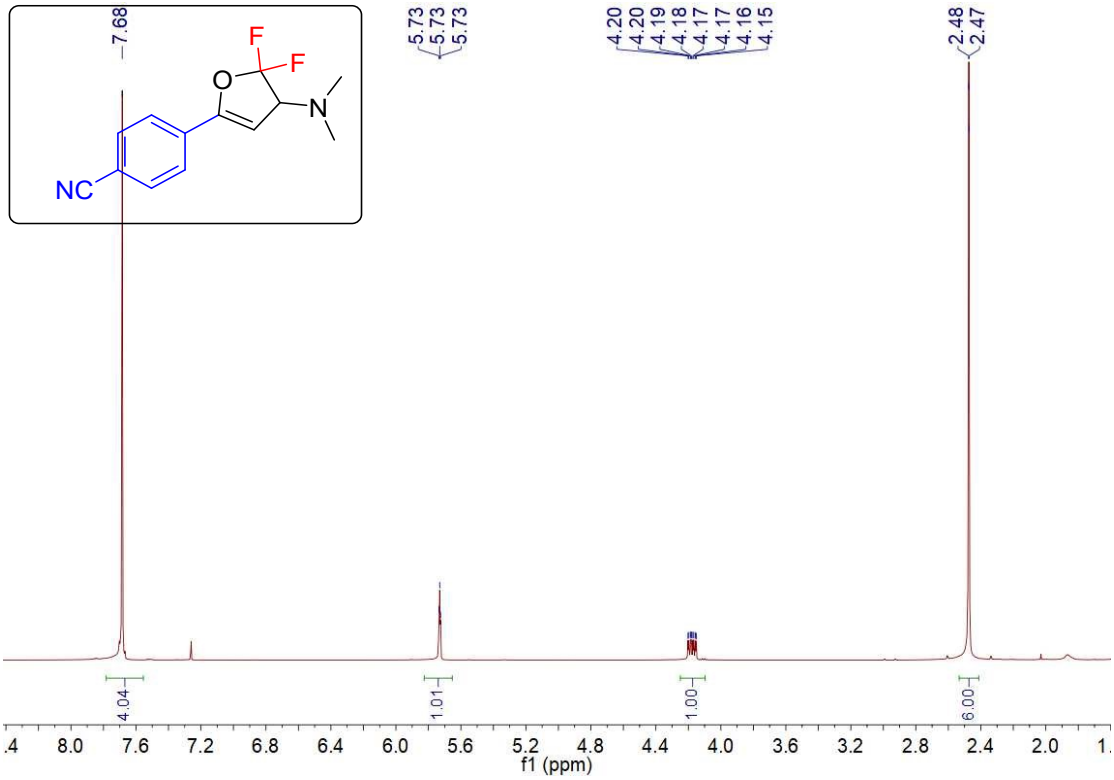
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N, N-dimethyl-5-(4-(methylsulfonyl)phenyl)-2,3-dihydrofuran-3-amine (4p)



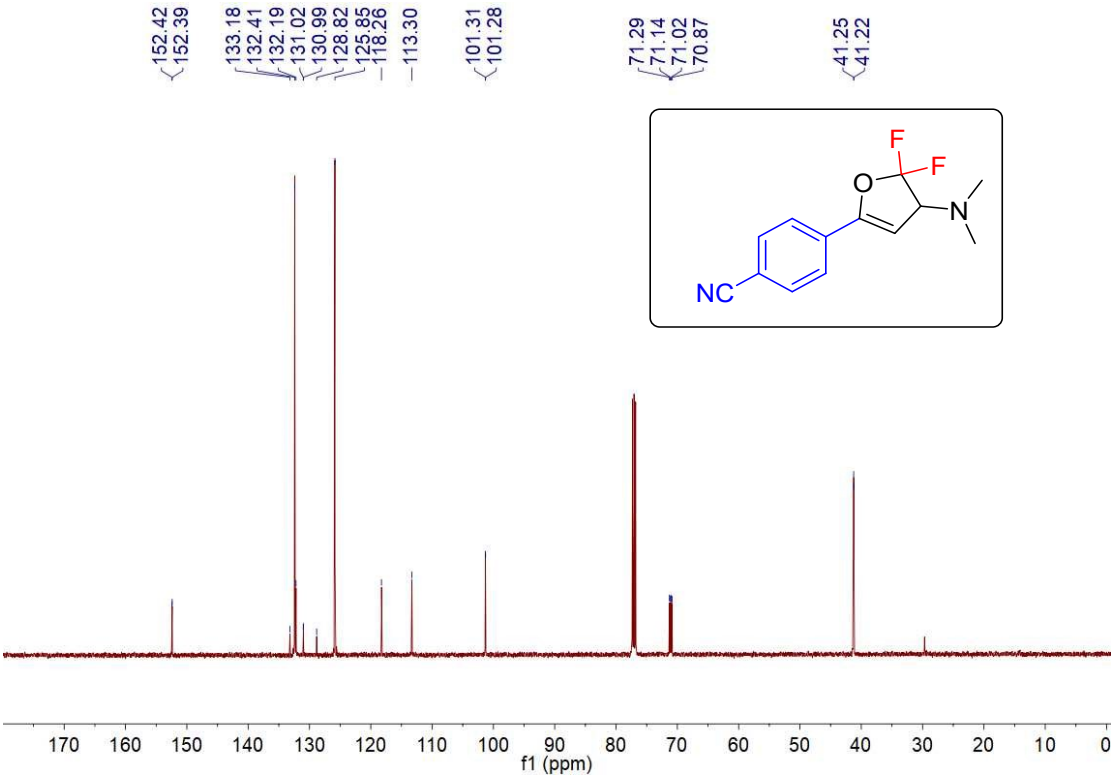
^{19}F spectrum ($CDCl_3$)2,2-difluoro-N, N-dimethyl-5-(4-(methylsulfonyl)phenyl)-2,3-dihydrofuran-3-amine (4p)



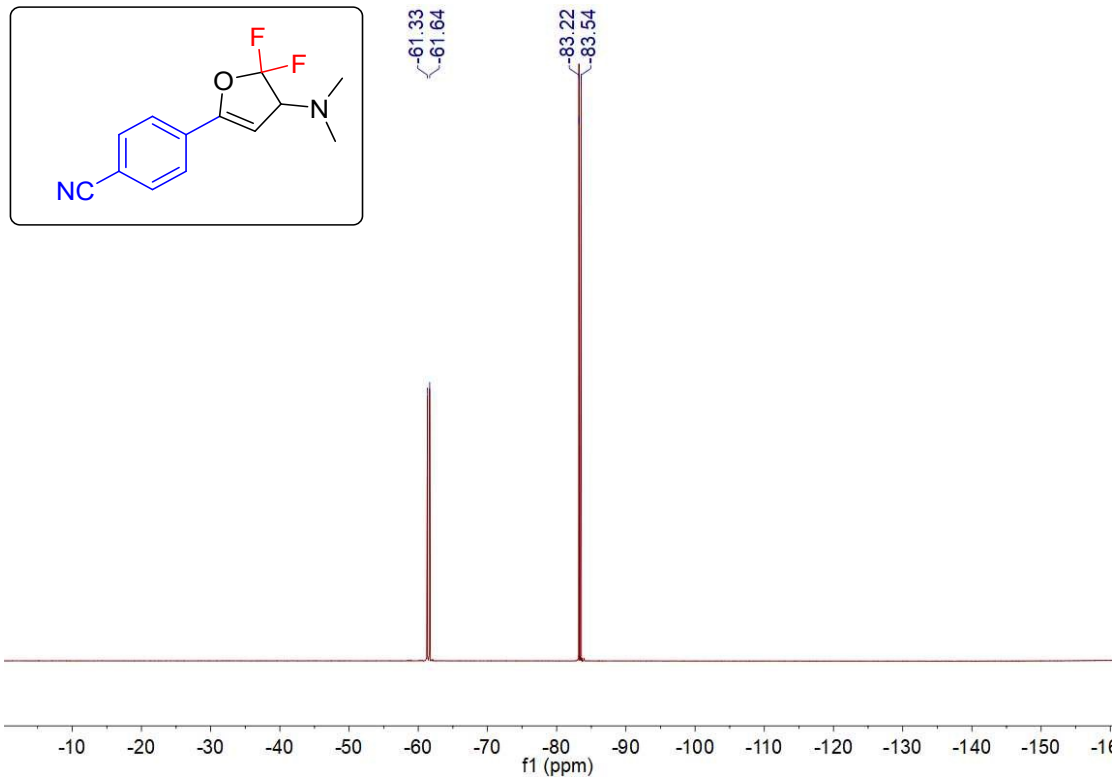
^{1}H spectrum ($CDCl_3$) 4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzonitrile (4q)



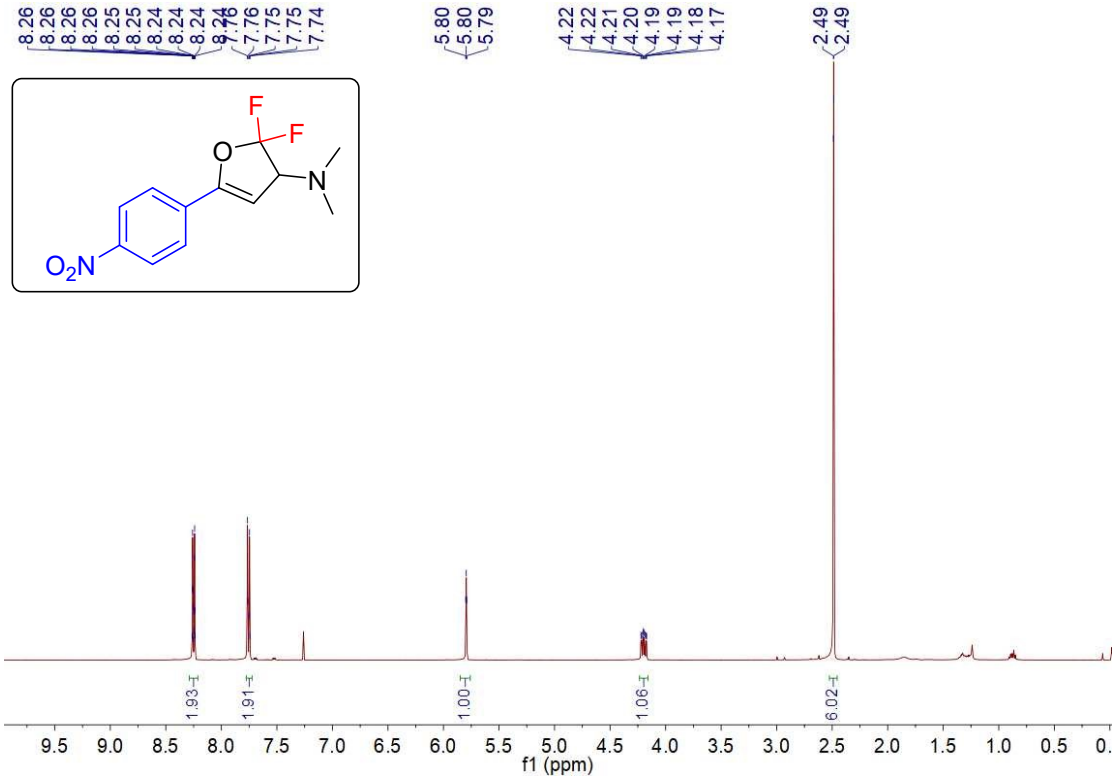
^{13}C spectrum ($CDCl_3$) 4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzonitrile (4q)



^{19}F spectrum ($CDCl_3$) 4-(4-(dimethylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzonitrile (4q)

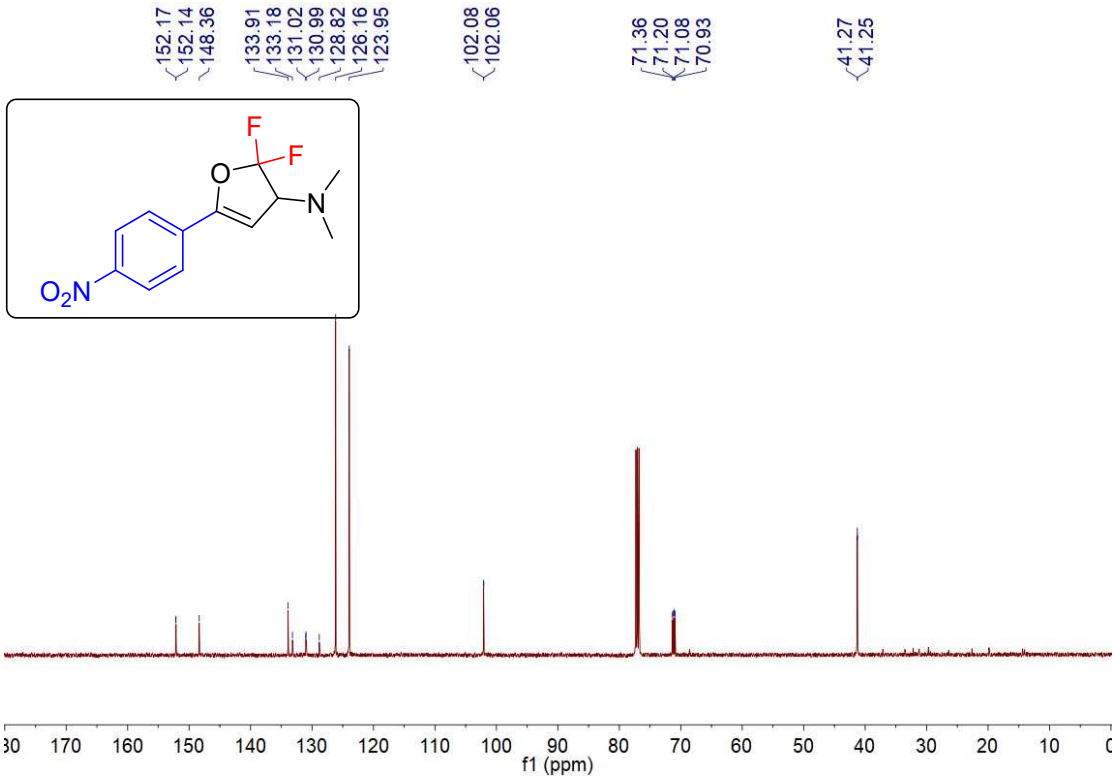


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(4-nitrophenyl)-2,3-dihydrofuran-3-amine (4r)

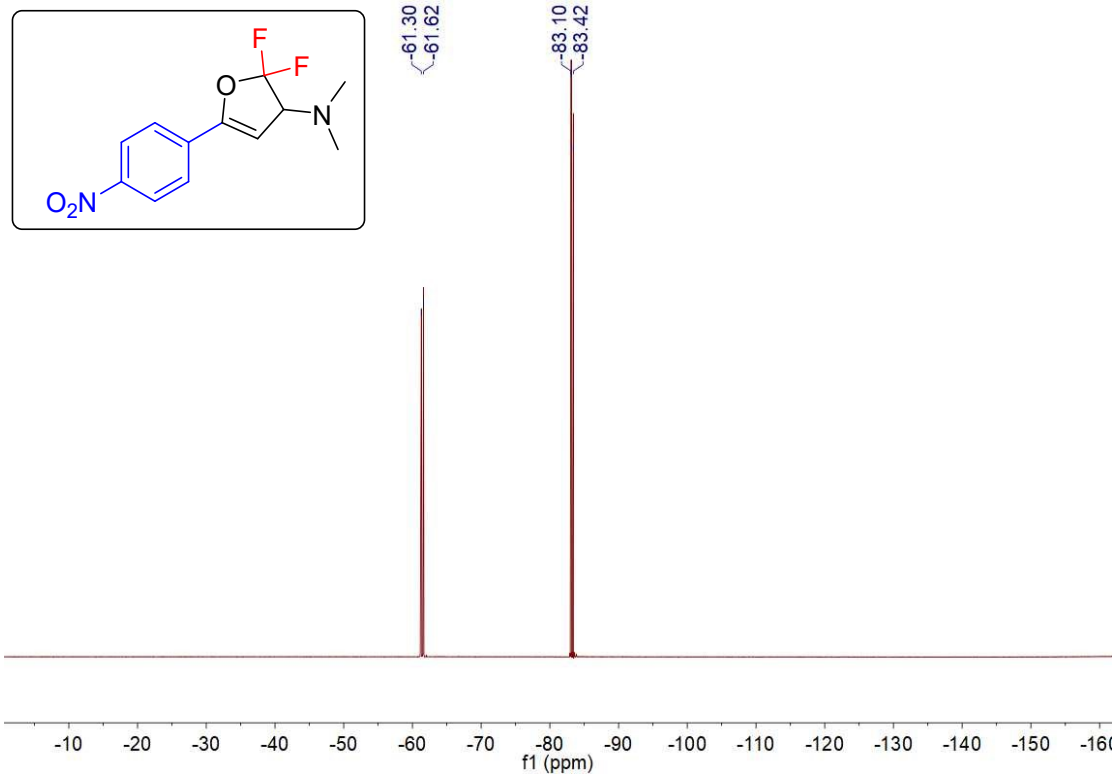


^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(4-nitrophenyl)-2,3-dihydrofuran-3-amine (

4r)

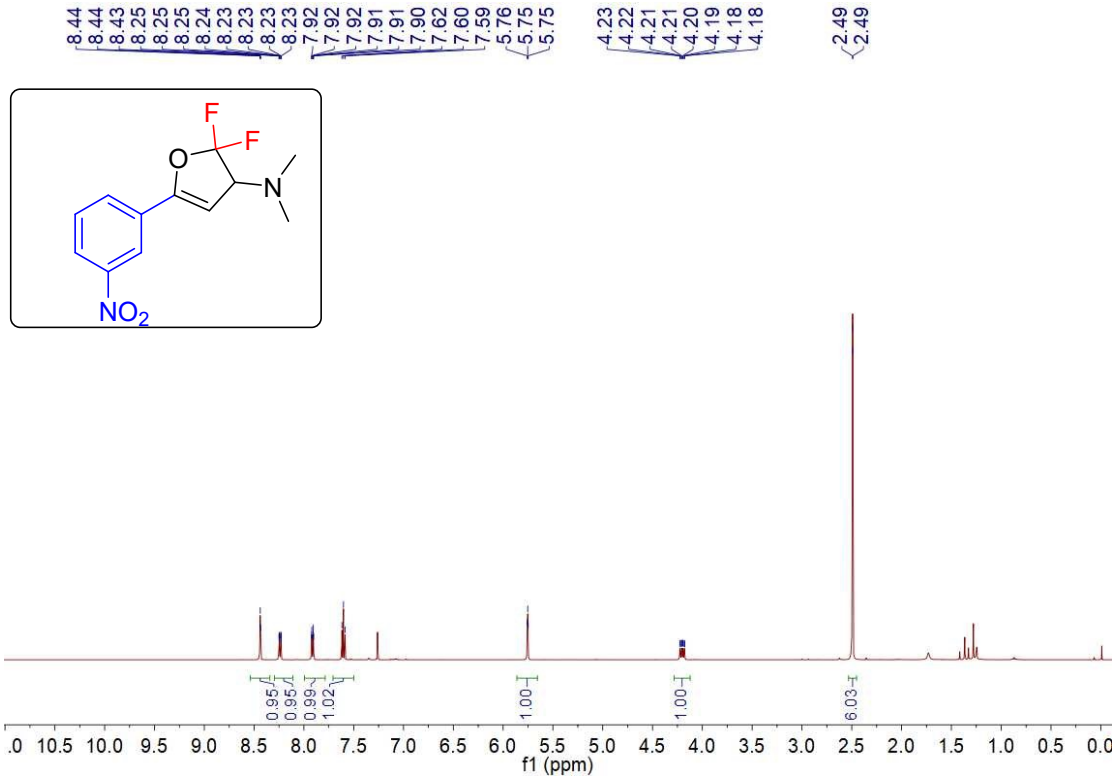


^{19}F spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(4-nitrophenyl)-2,3-dihydrofuran-3-amine (4r)

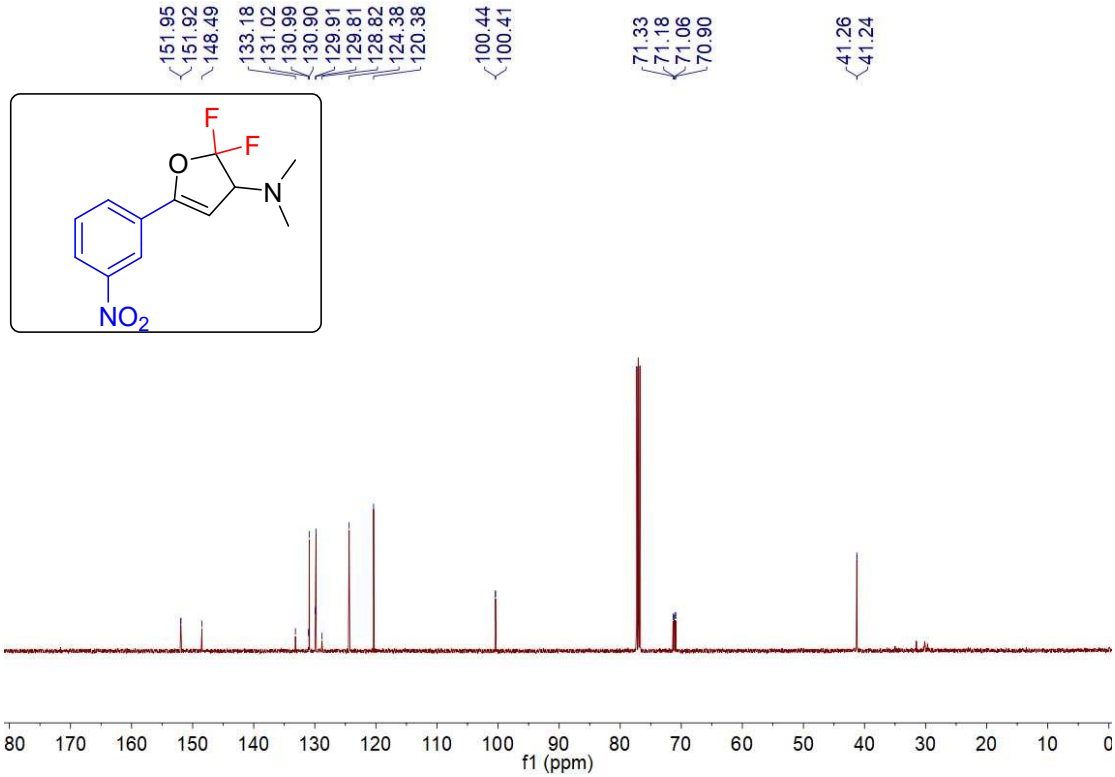


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(3-nitrophenyl)-2,3-dihydrofuran-3-amine

(4s)

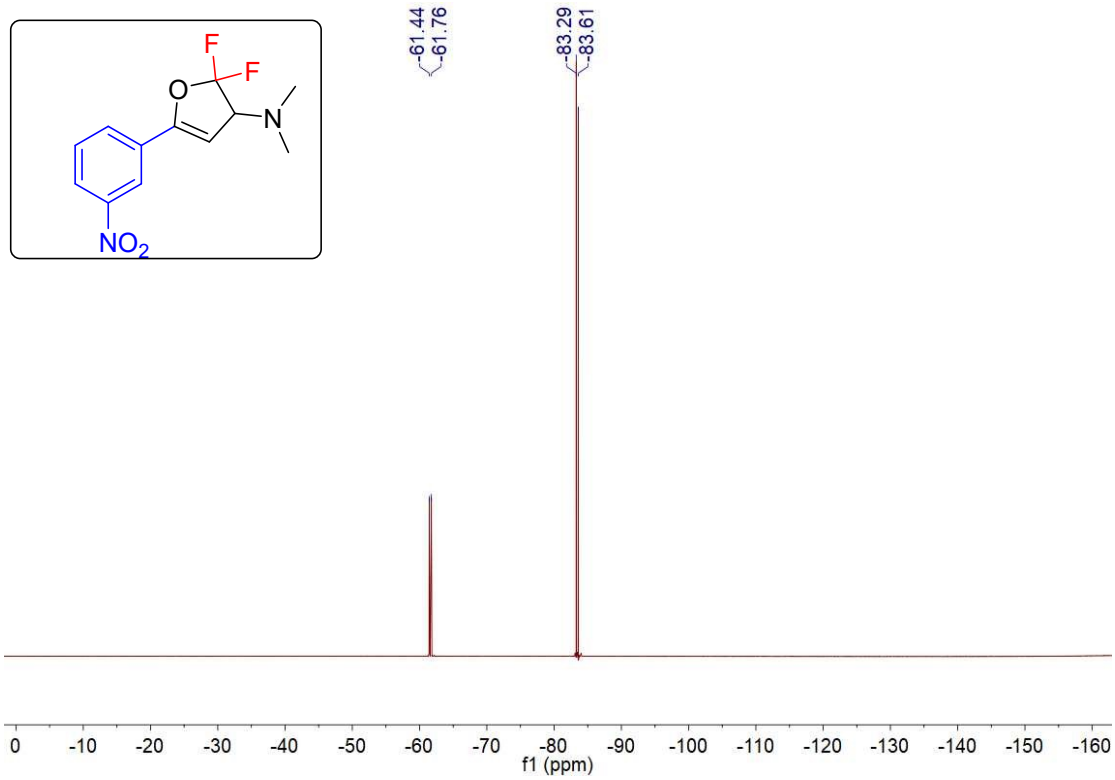


^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(3-nitrophenyl)-2,3-dihydrofuran-3-amine (4s)

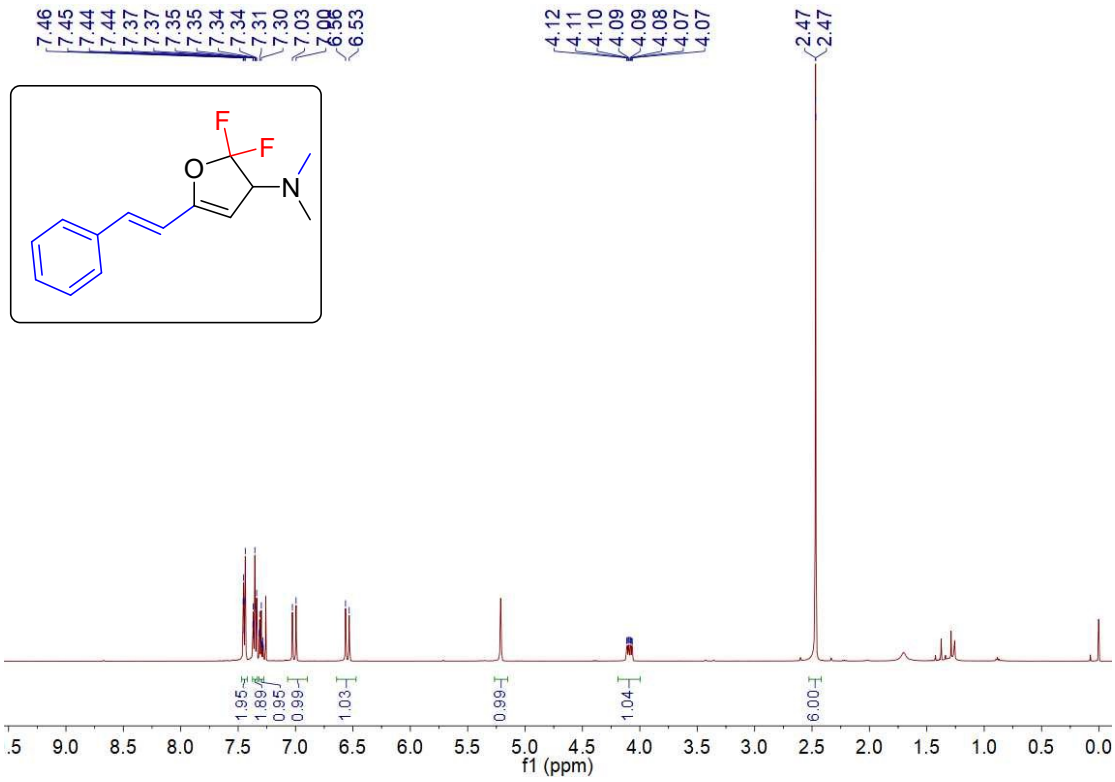


^{19}F spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(3-nitrophenyl)-2,3-dihydrofuran-3-amine

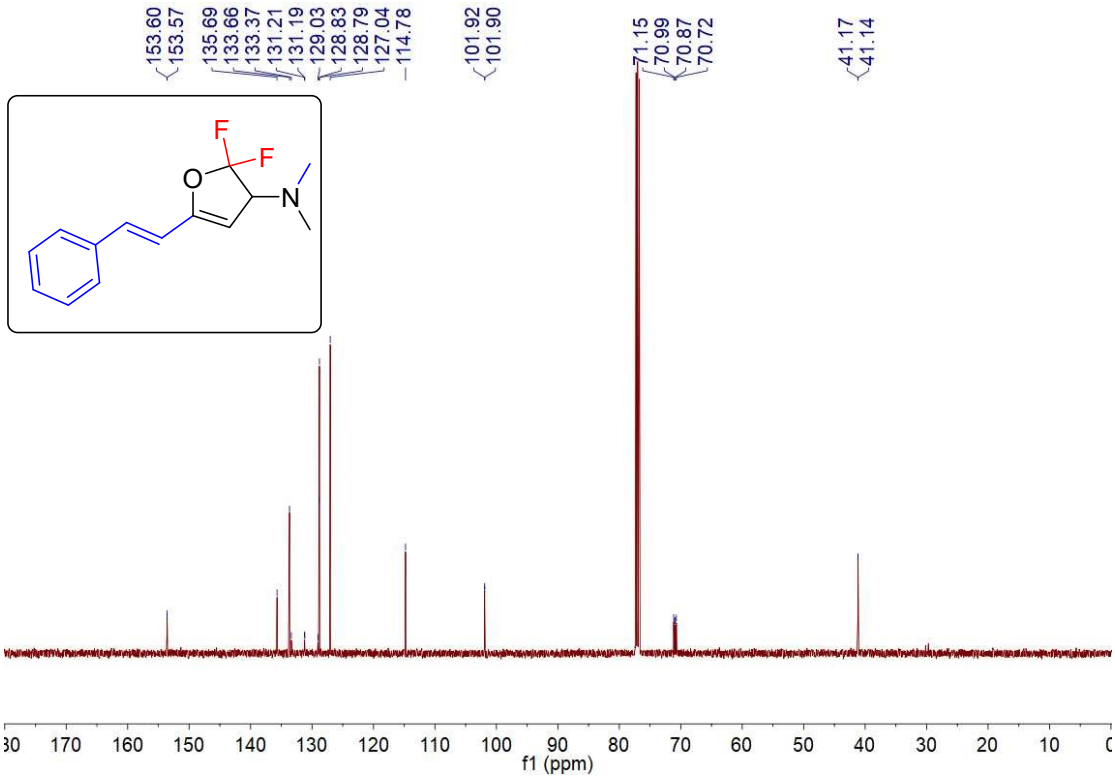
(4s)



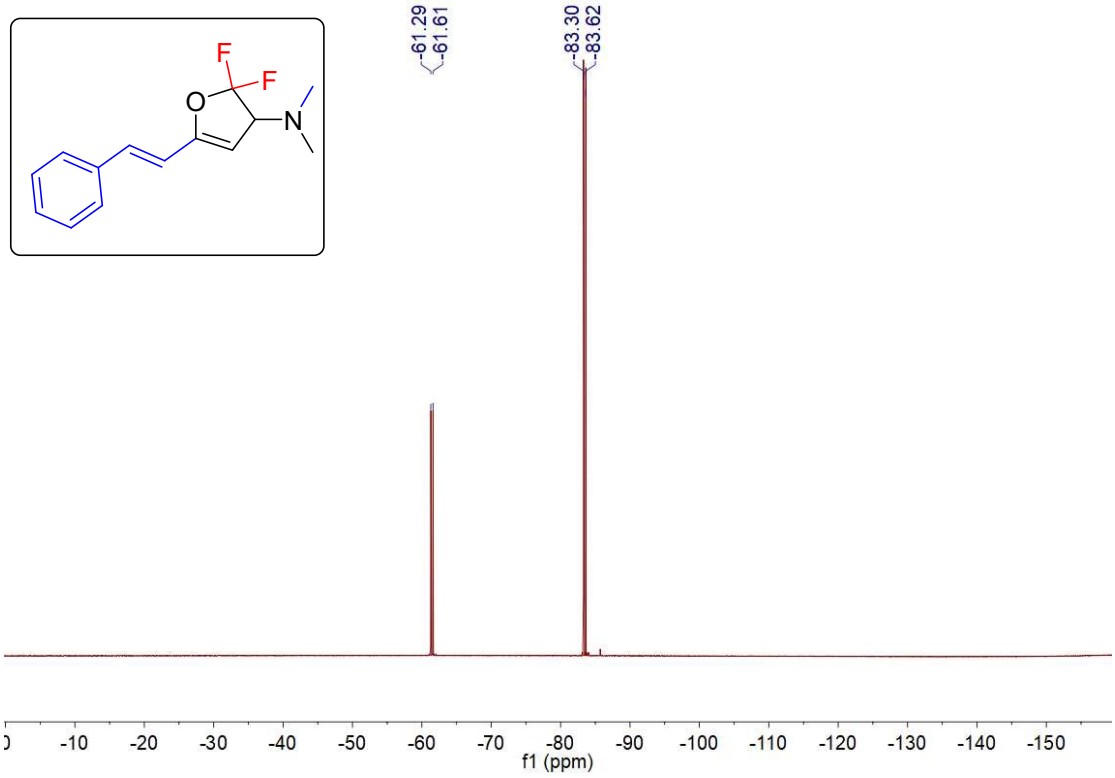
^{1}H spectrum ($CDCl_3$) (E)-2,2-difluoro-N,N-dimethyl-5-styryl-2,3-dihydrofuran-3-amine (4t)



^{13}C spectrum ($CDCl_3$) (E)-2,2-difluoro-N,N-dimethyl-5-styryl-2,3-dihydrofuran-3-amine (4t)

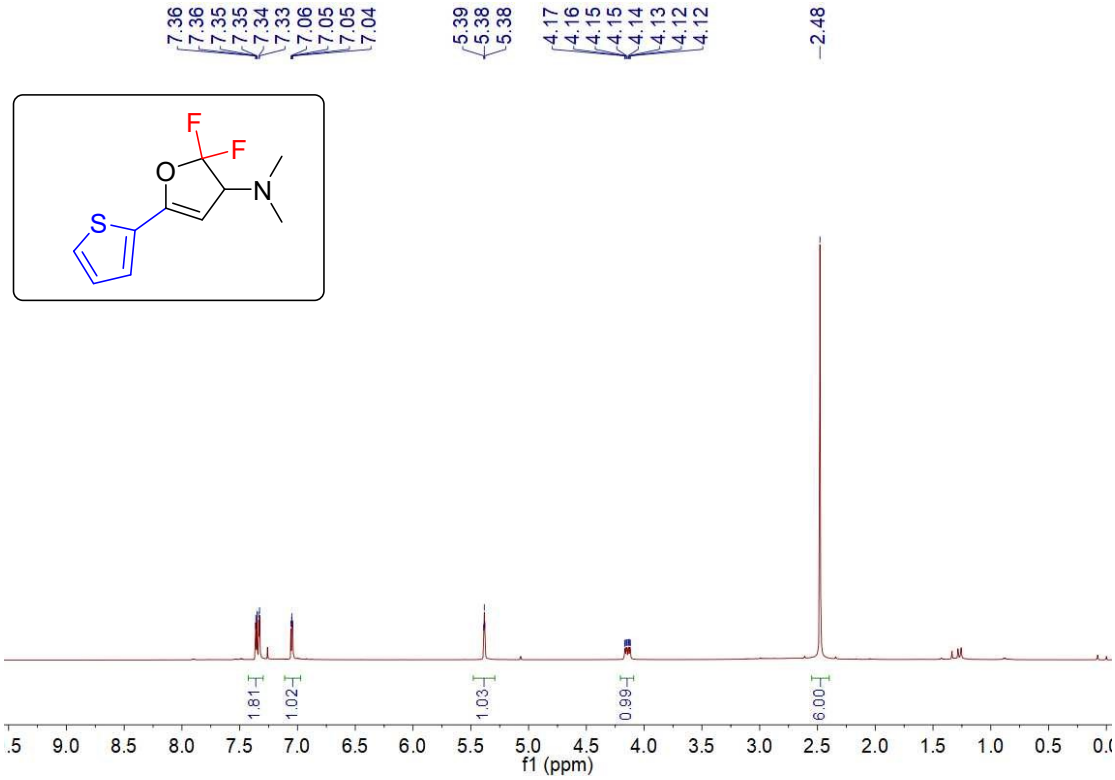


^{19}F spectrum ($CDCl_3$) (E)-2,2-difluoro-N,N-dimethyl-5-styryl-2,3-dihydrofuran-3-amine (4t)

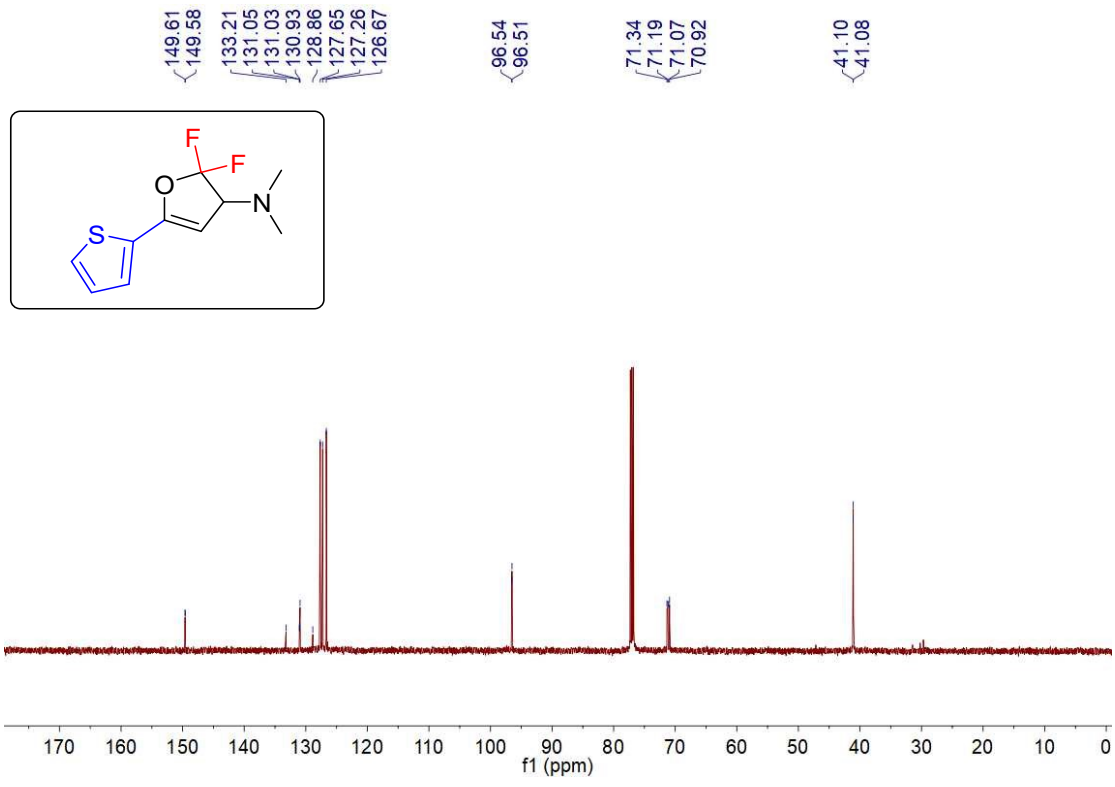


^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(thiophen-2-yl)-2,3-dihydrofuran-3-amine

(4u)

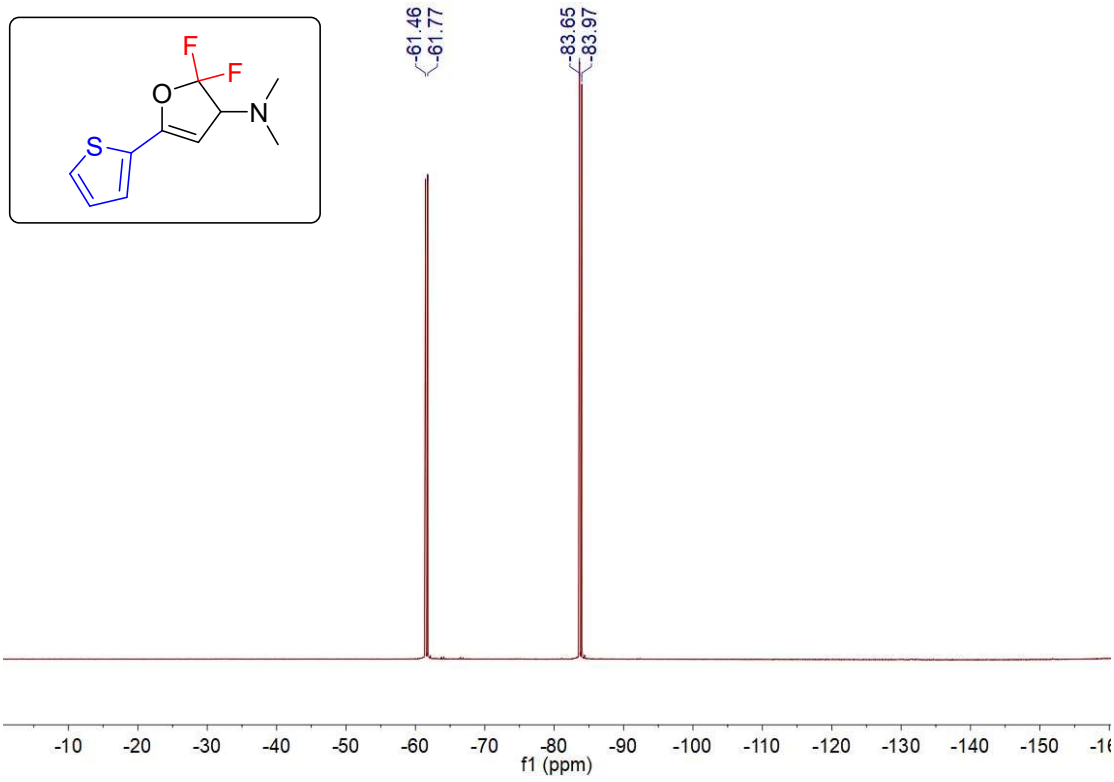


^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(thiophen-2-yl)-2,3-dihydrofuran-3-amine (4u)

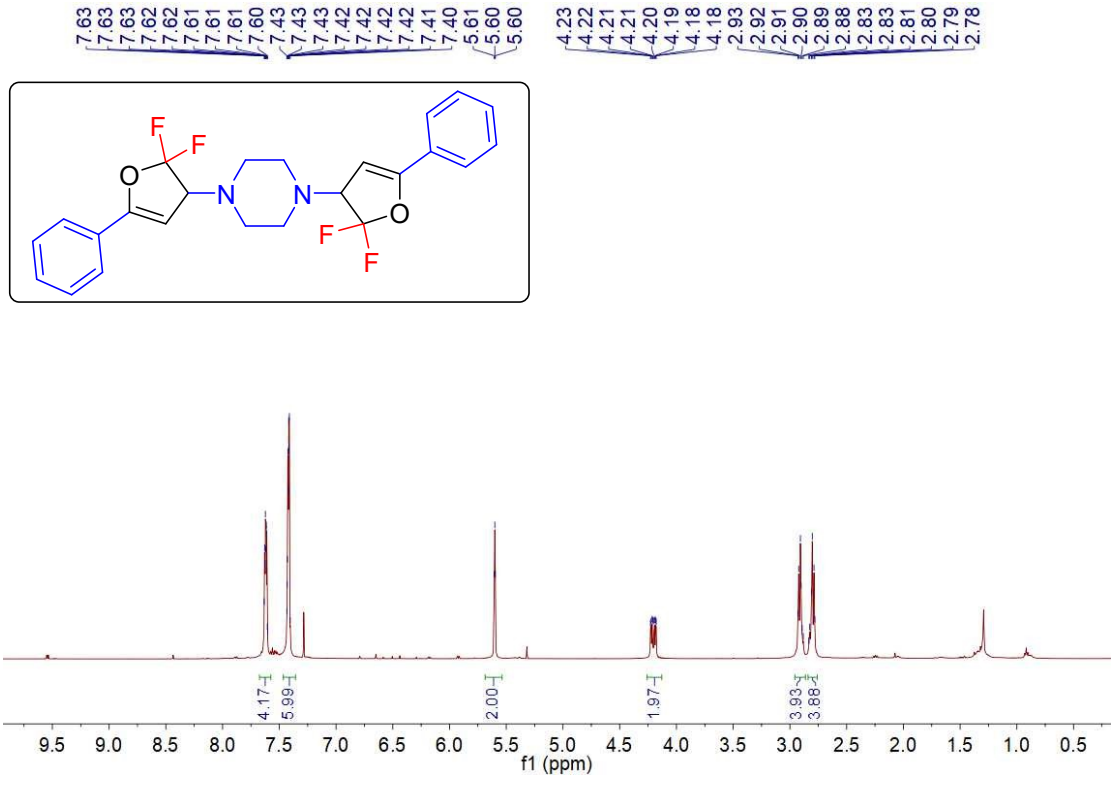


^{19}F spectrum ($CDCl_3$) 2,2-difluoro-N,N-dimethyl-5-(thiophen-2-yl)-2,3-dihydrofuran-3-amine

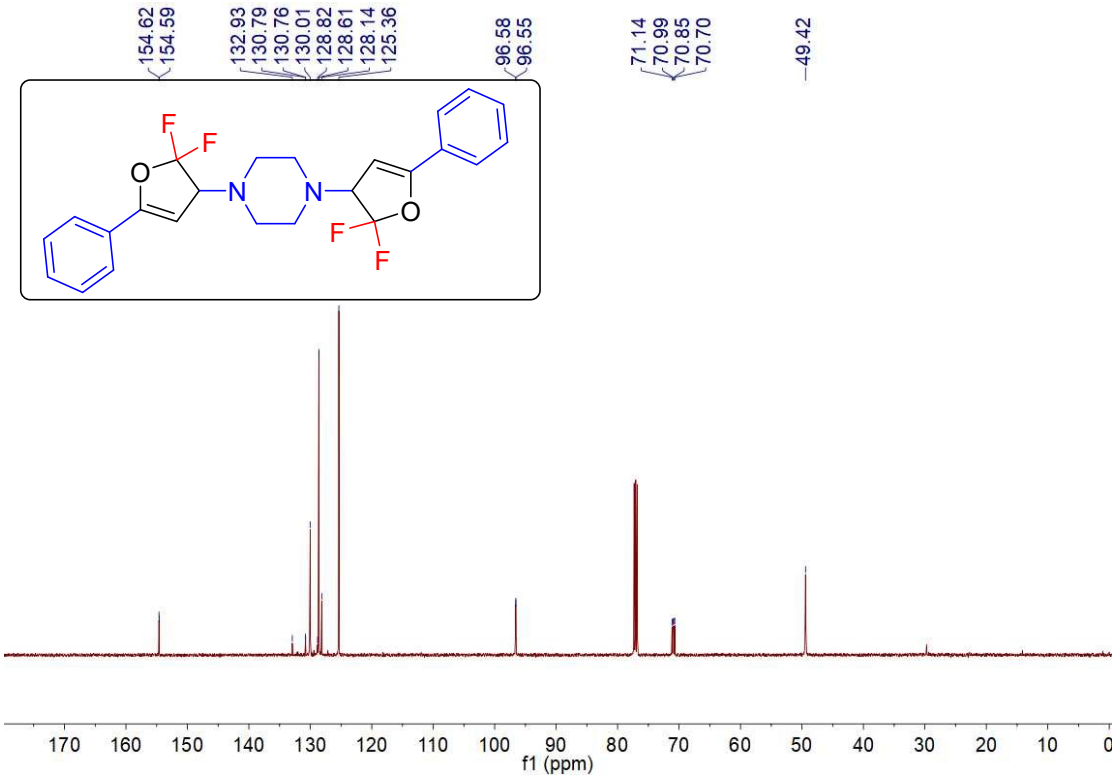
(4u)



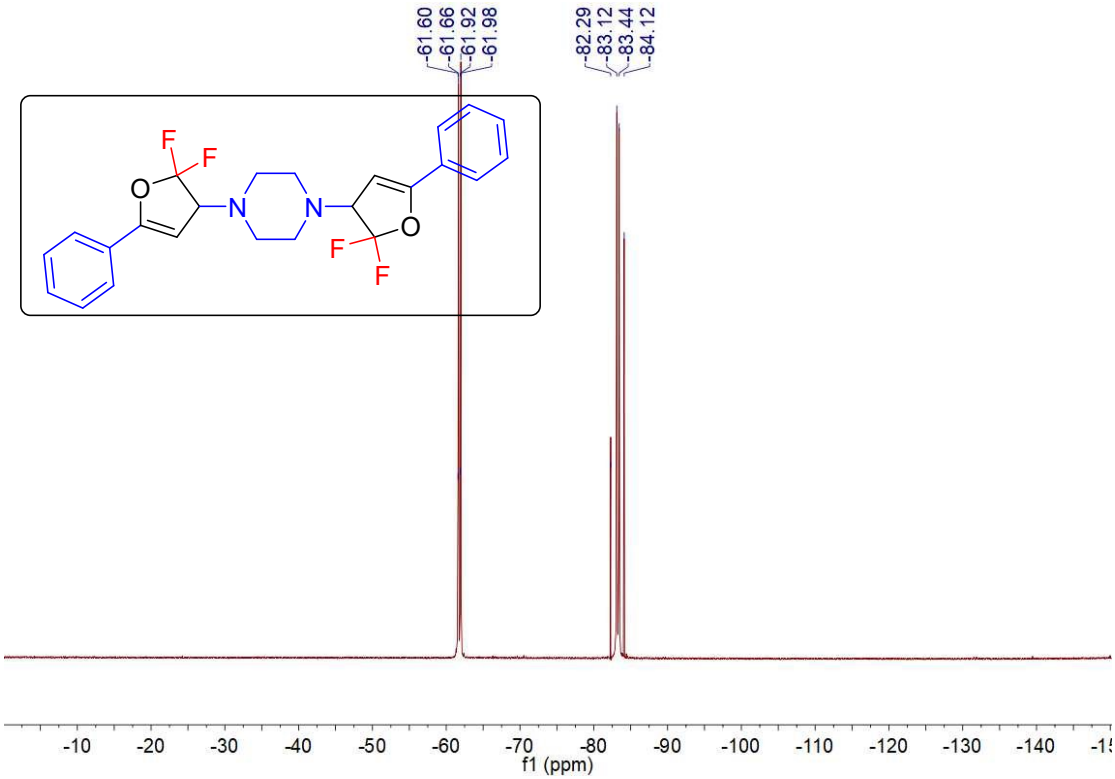
^{1}H spectrum ($CDCl_3$) 1,4-bis(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)piperazine (4v)



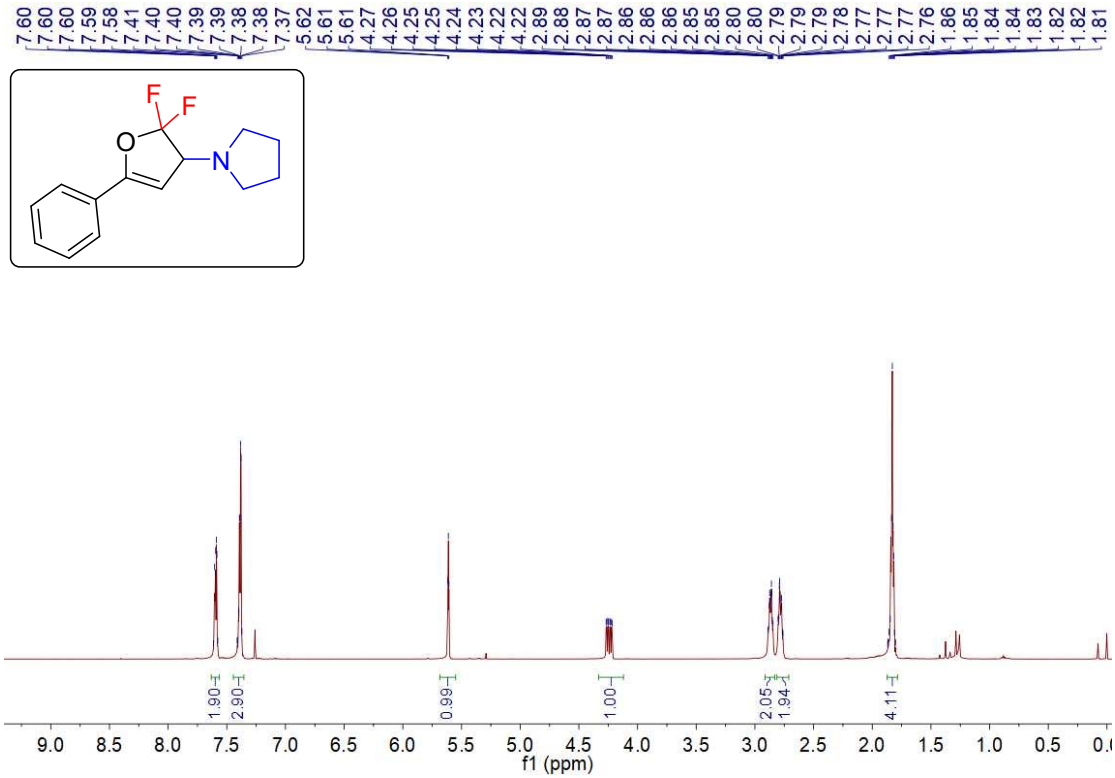
^{13}C spectrum ($CDCl_3$) 1,4-bis(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)piperazine (4v)



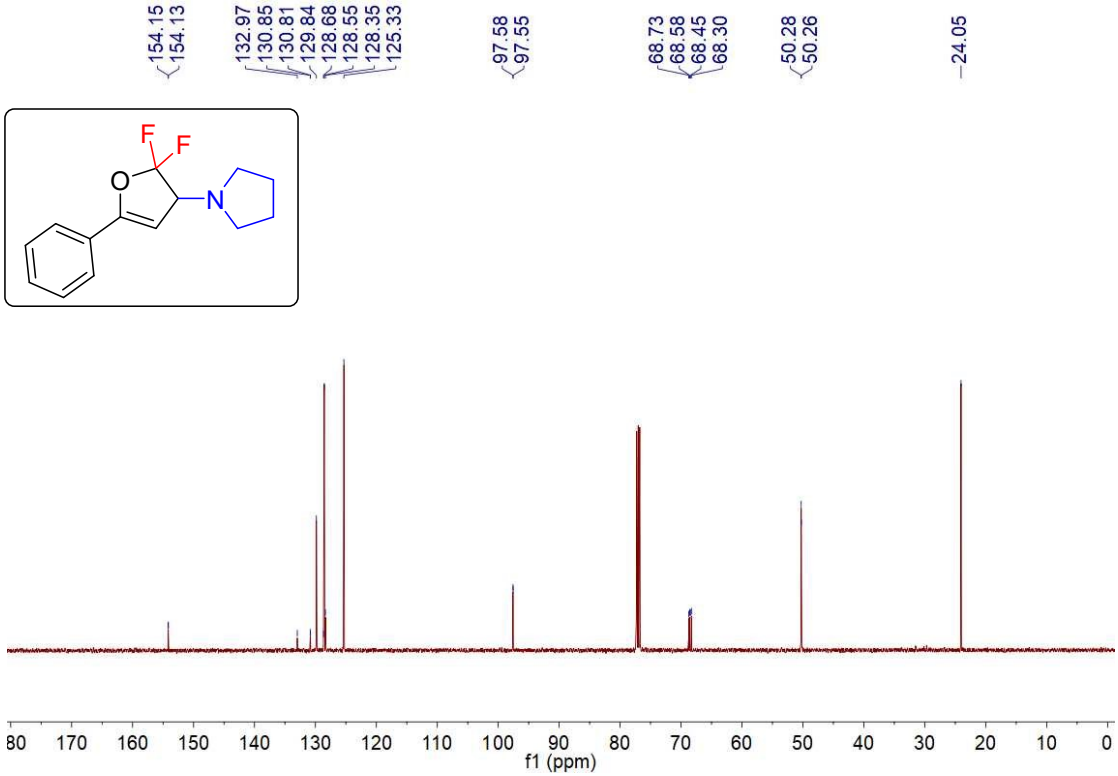
^{19}F spectrum ($CDCl_3$) 1,4-bis(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)piperazine (4v)



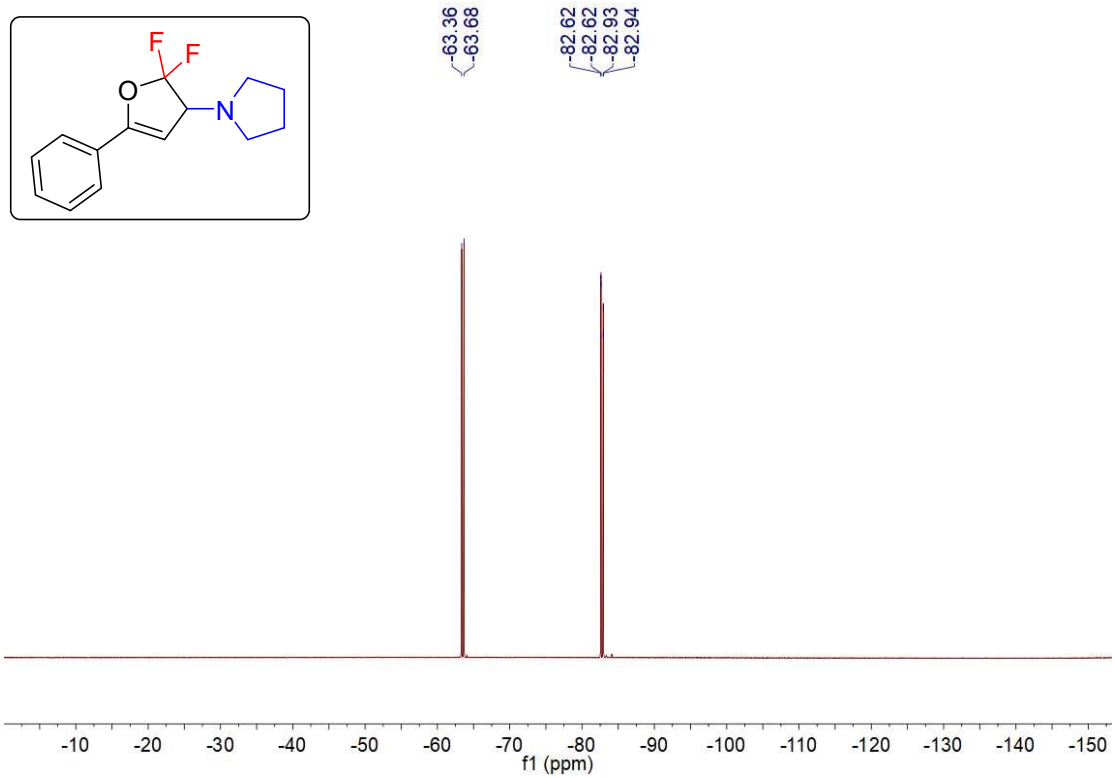
^{1}H spectrum ($CDCl_3$) 1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) pyrrolidine (5a)



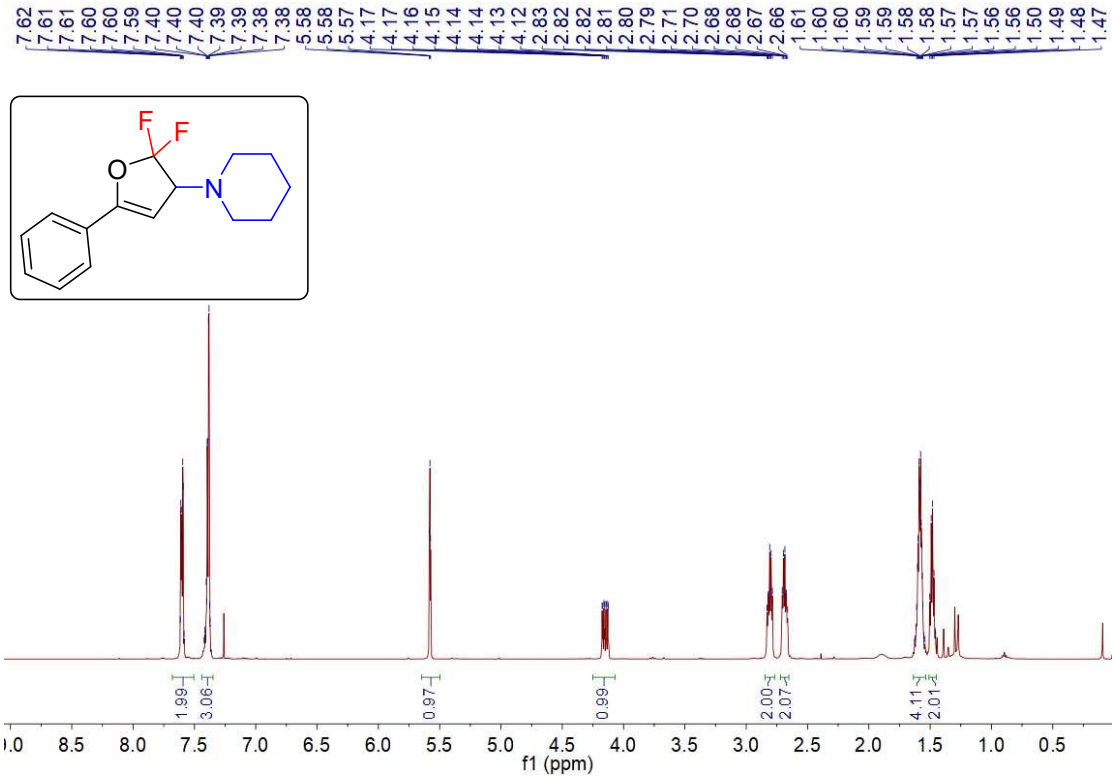
^{13}C spectrum ($CDCl_3$) 1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) pyrrolidine (5a)



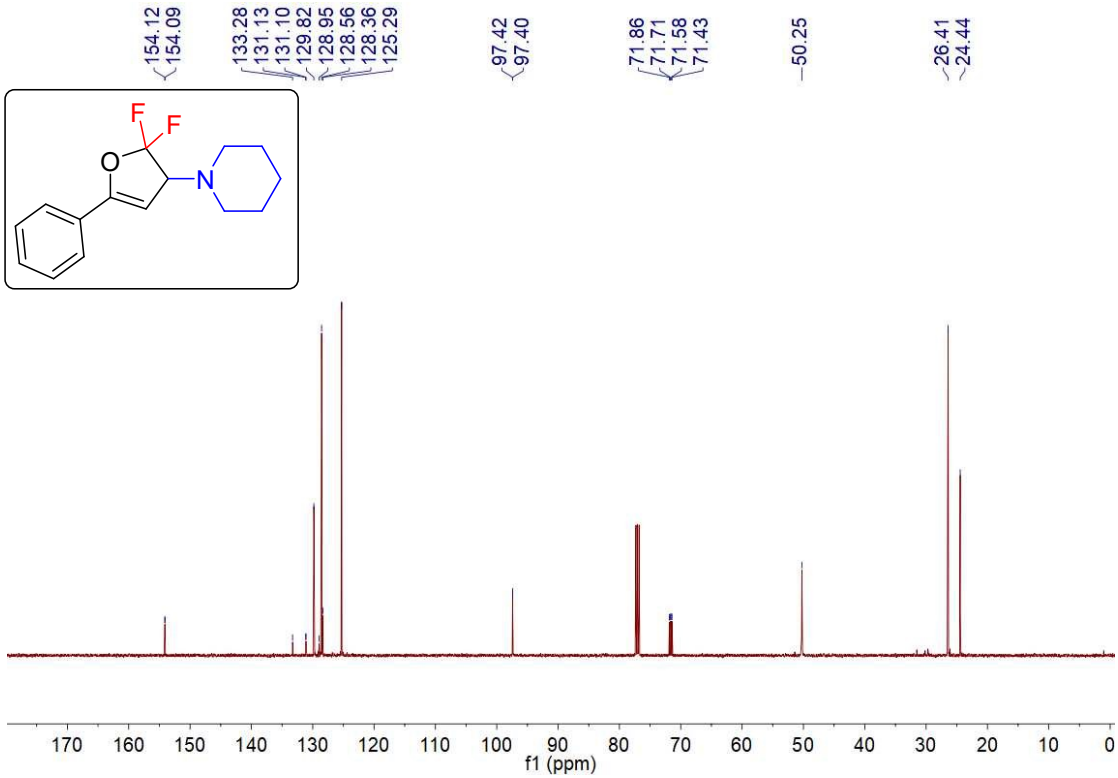
^{19}F spectrum ($CDCl_3$) 1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) pyrrolidine (5a)



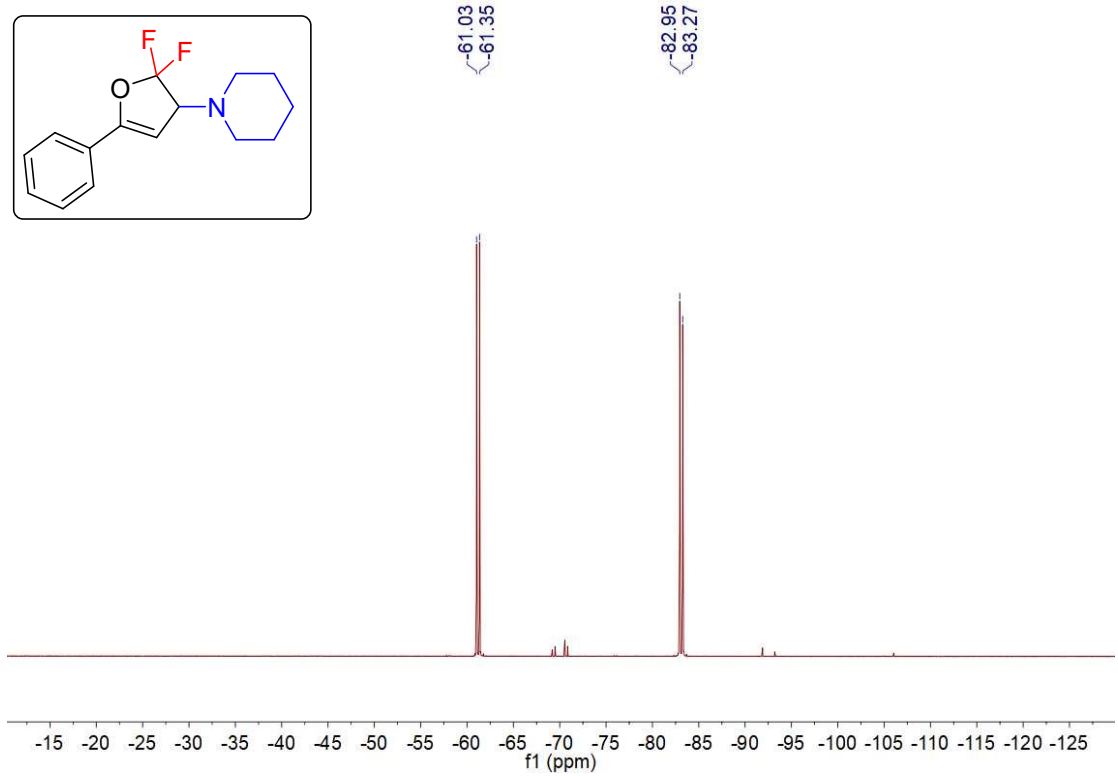
^{1}H spectrum ($CDCl_3$) 1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperidine (5b)



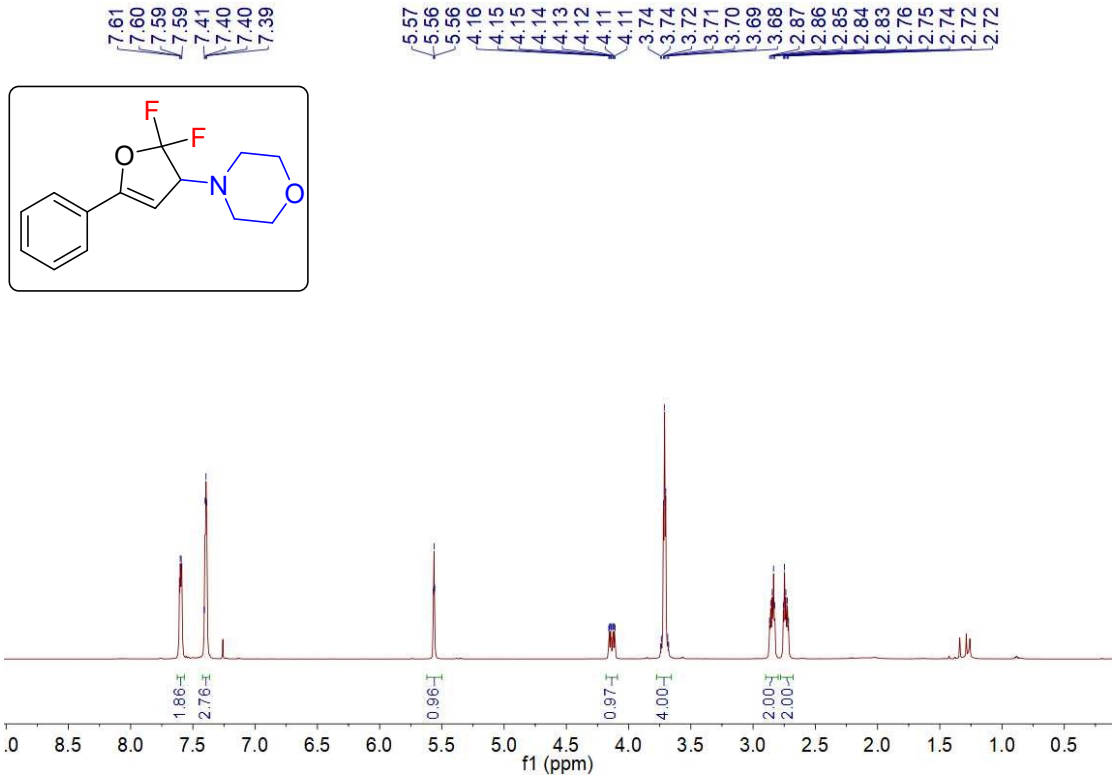
^{13}C spectrum ($CDCl_3$) 1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperidine (5b)



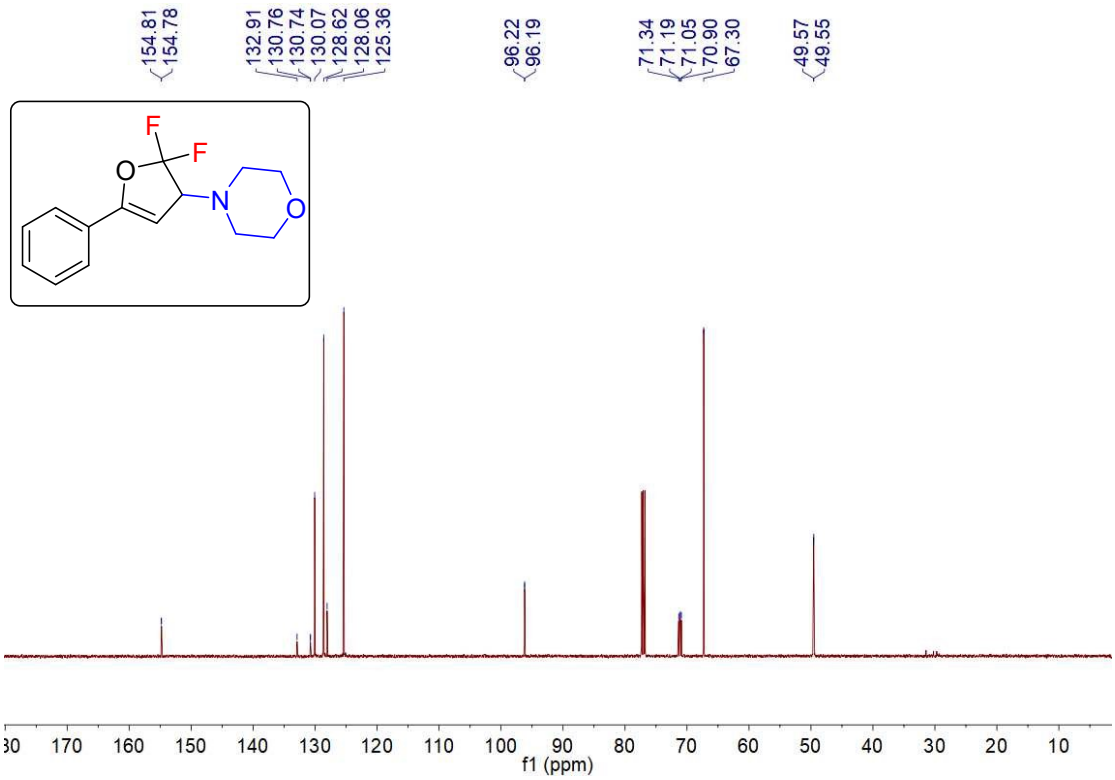
^{19}F spectrum ($CDCl_3$) 1-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperidine (5b)



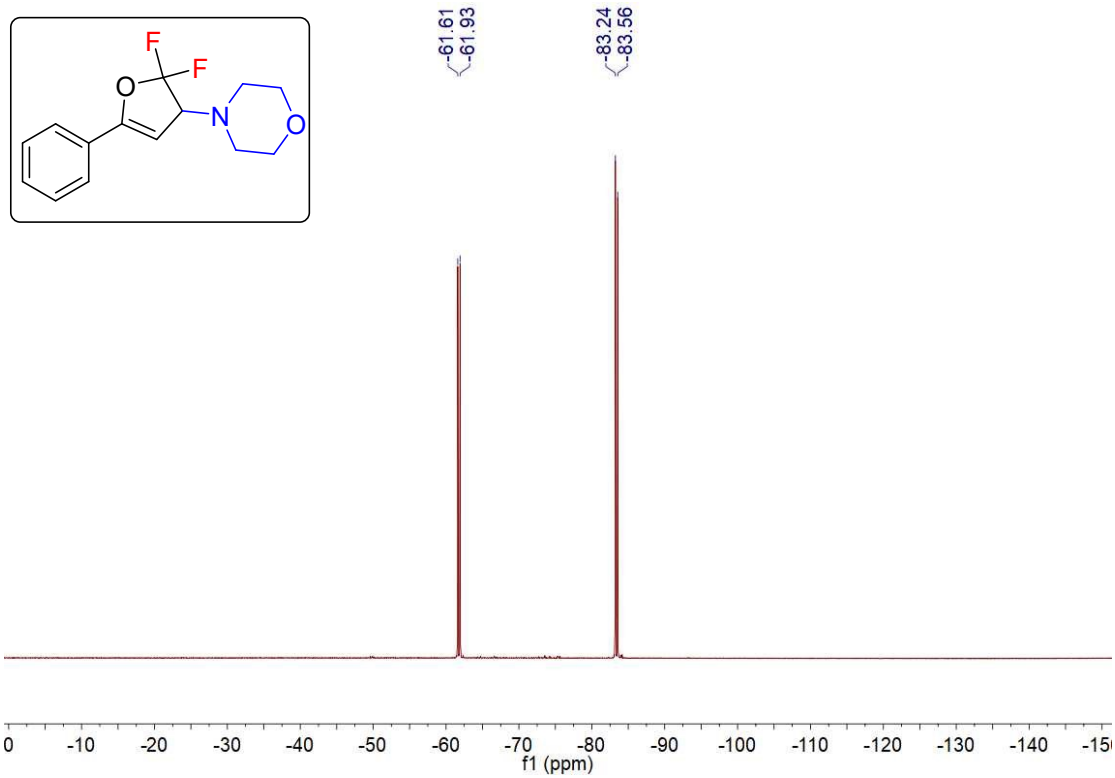
^{1}H spectrum ($CDCl_3$) 4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) morpholine (5c)



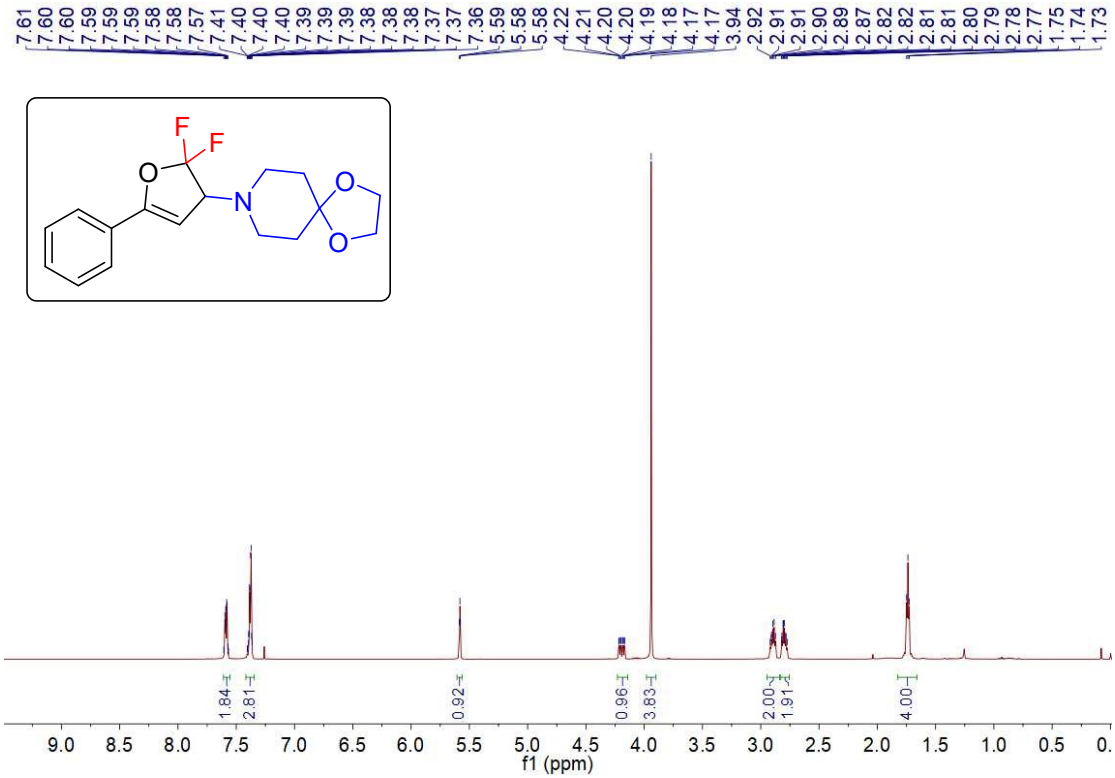
^{13}C spectrum ($CDCl_3$) 4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) morpholine (5c)



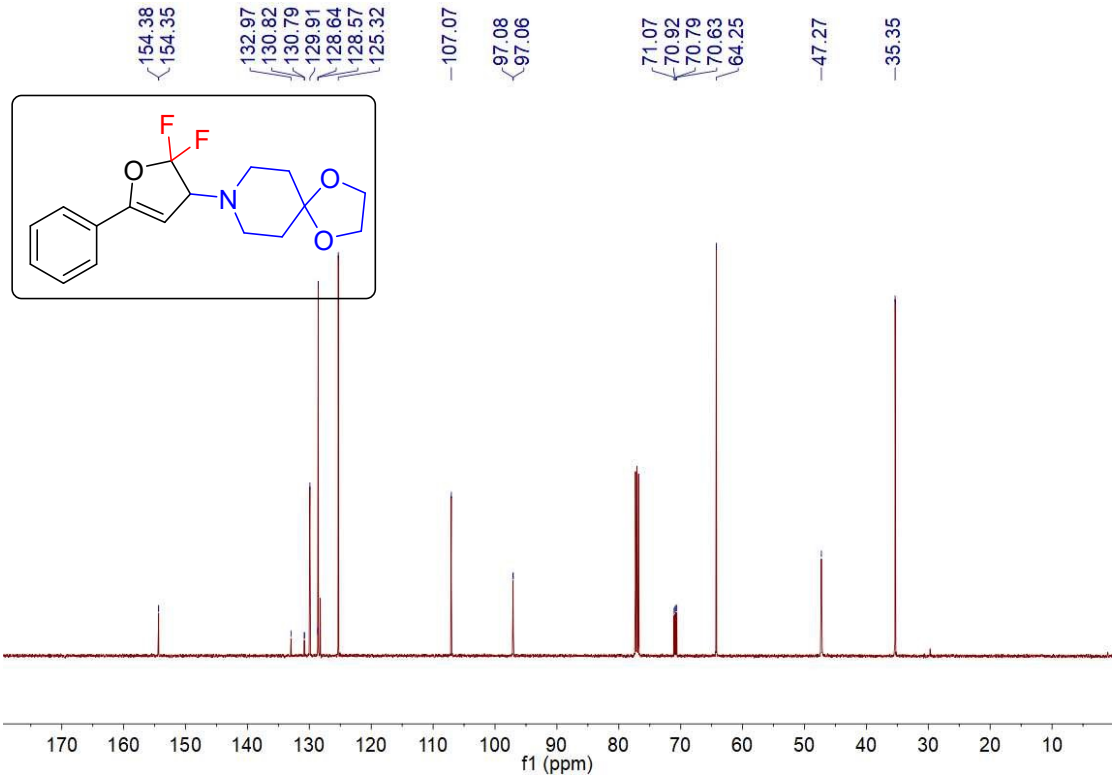
^{19}F spectrum ($CDCl_3$) 4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) morpholine 5c)



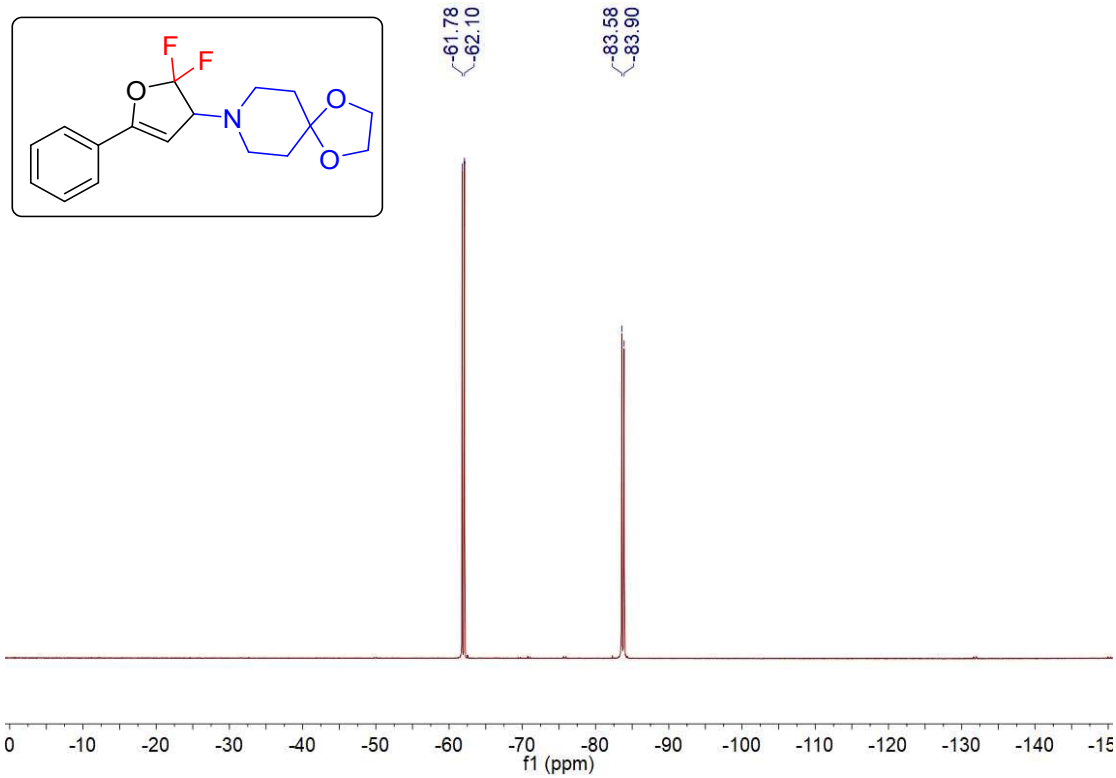
^{1}H spectrum ($CDCl_3$) 8-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)-1,4-dioxa-8-azaspiro [4.5]decane (5d)



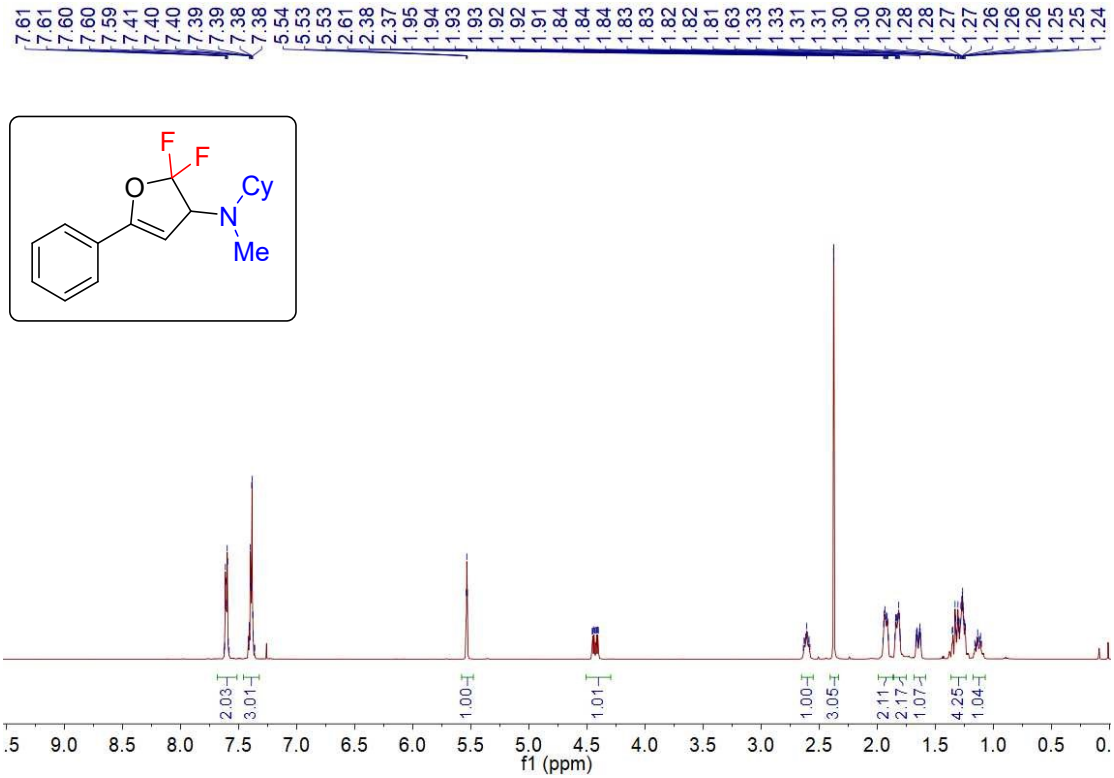
^{13}C spectrum ($CDCl_3$) 8-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)-1,4-dioxa-8-azaspiro [4.5]decane (5d)



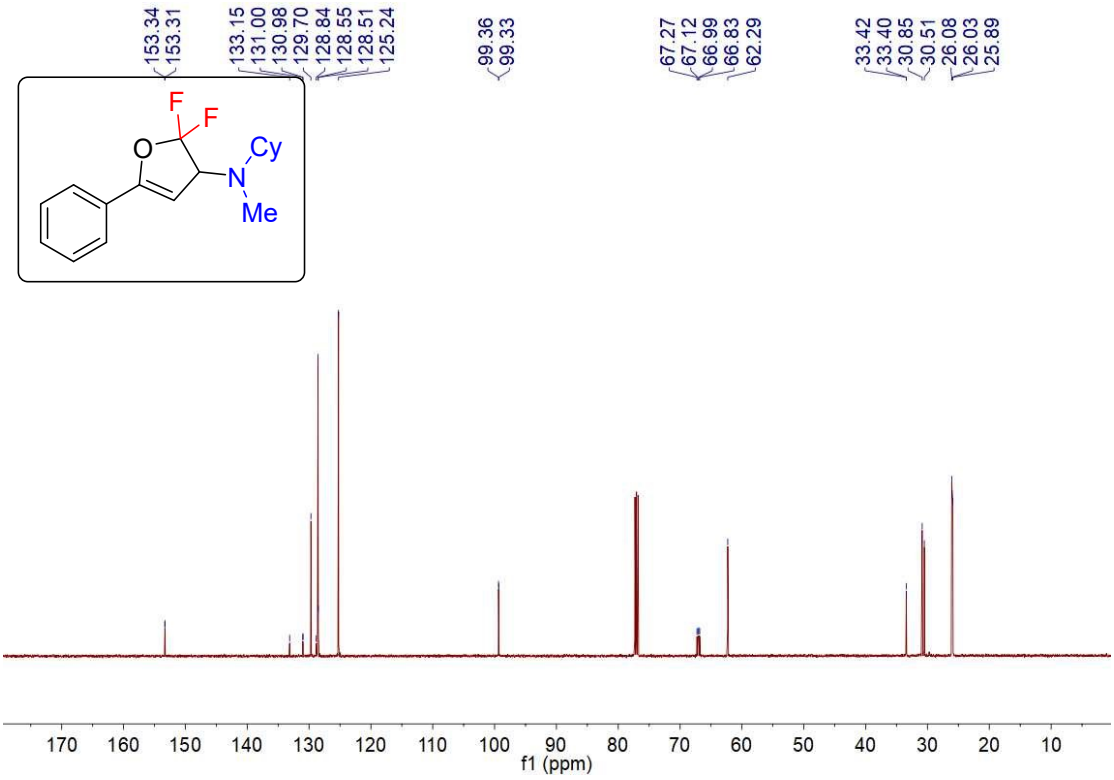
^{19}F spectrum ($CDCl_3$) 8-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)-1,4-dioxa-8-azaspiro [4.5]decane (5d)



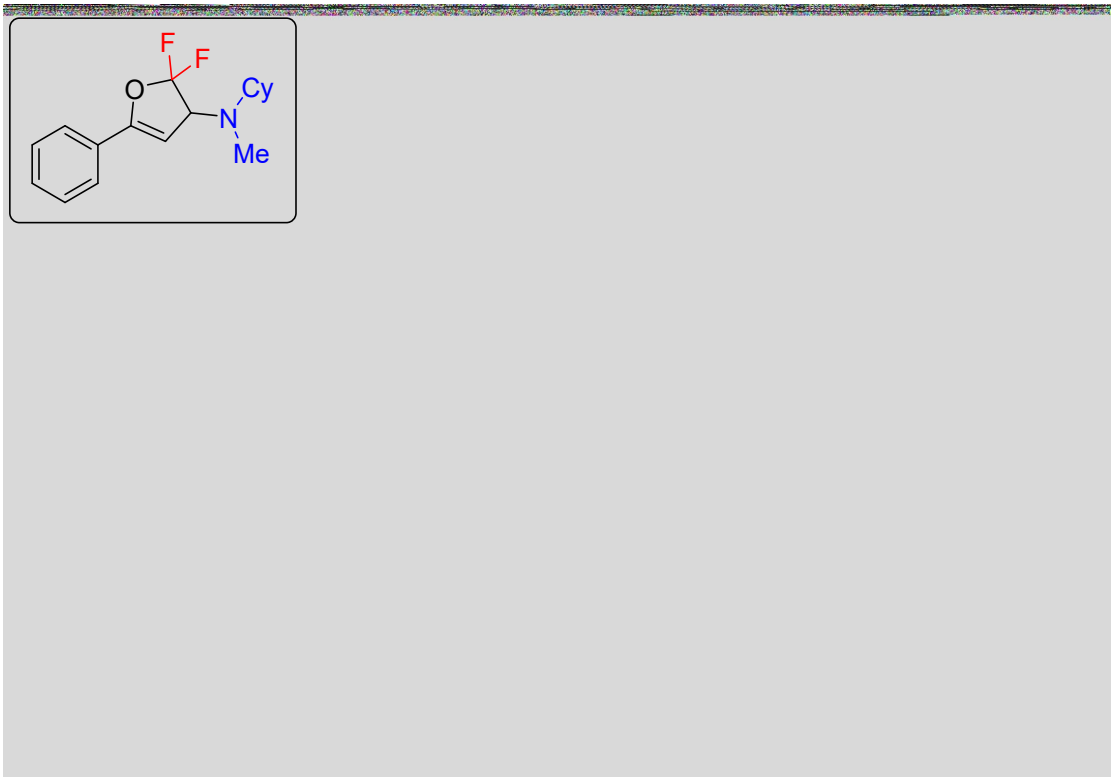
^{1}H spectrum ($CDCl_3$) N-cyclohexyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5e)



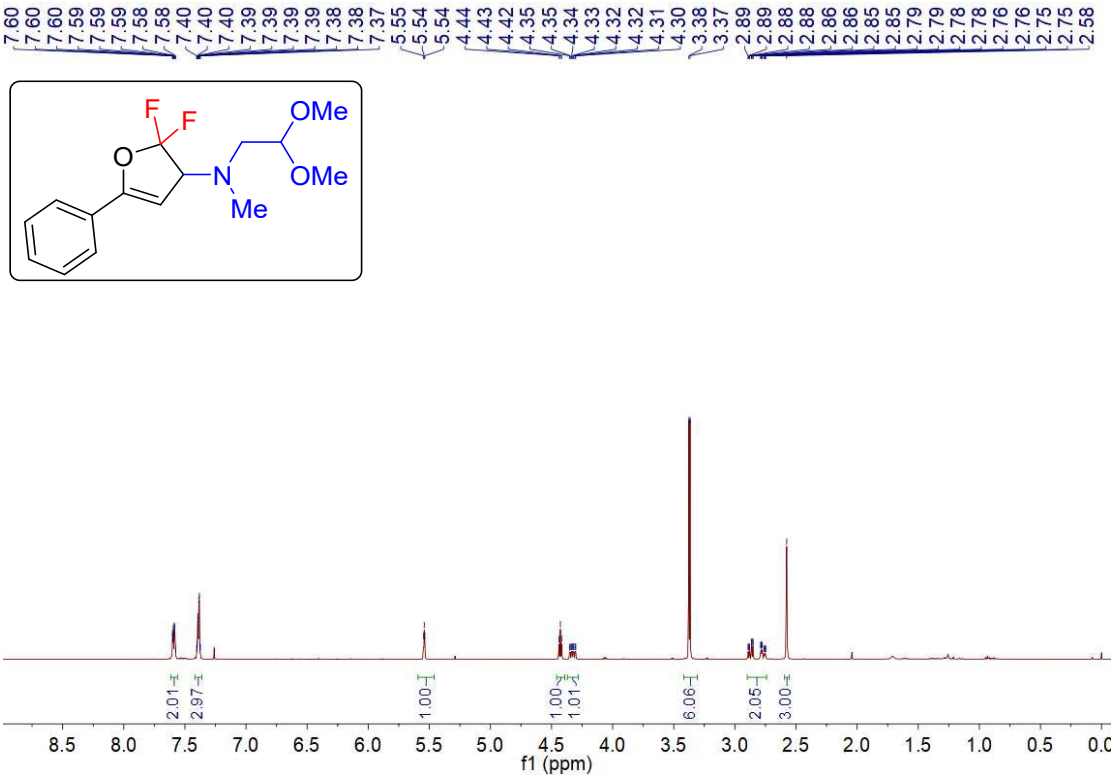
^{13}C spectrum ($CDCl_3$) N-cyclohexyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5e)



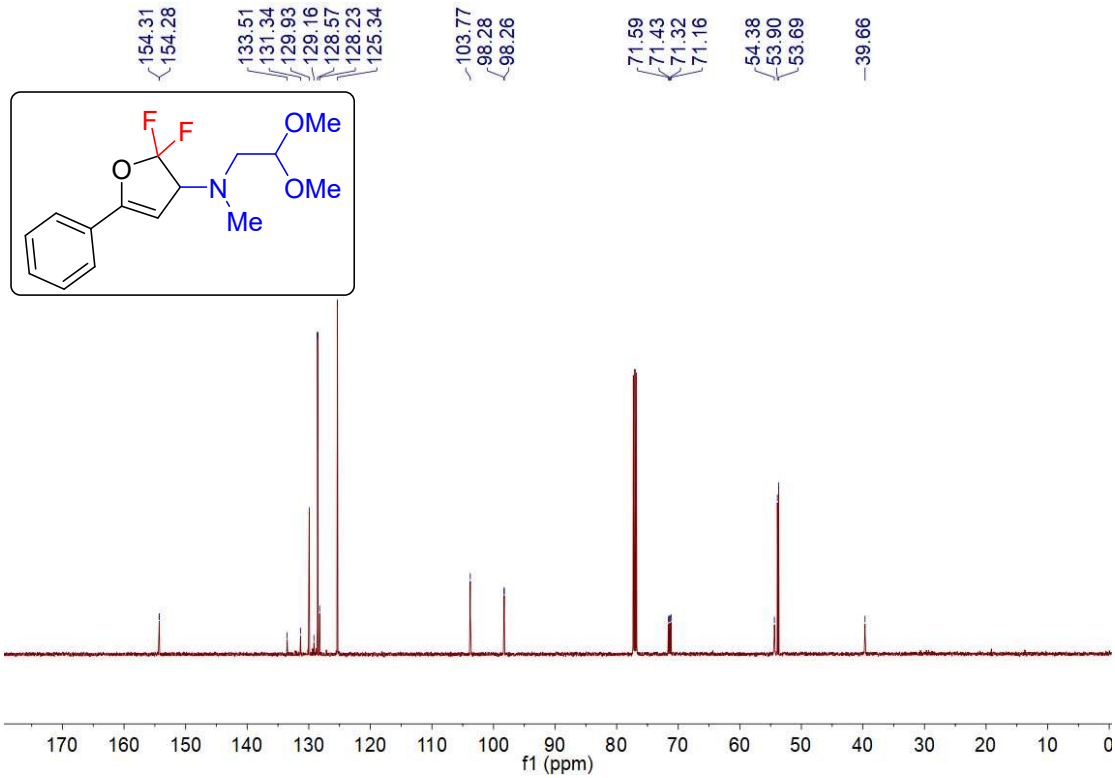
^{19}F spectrum ($CDCl_3$) N-cyclohexyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5e)



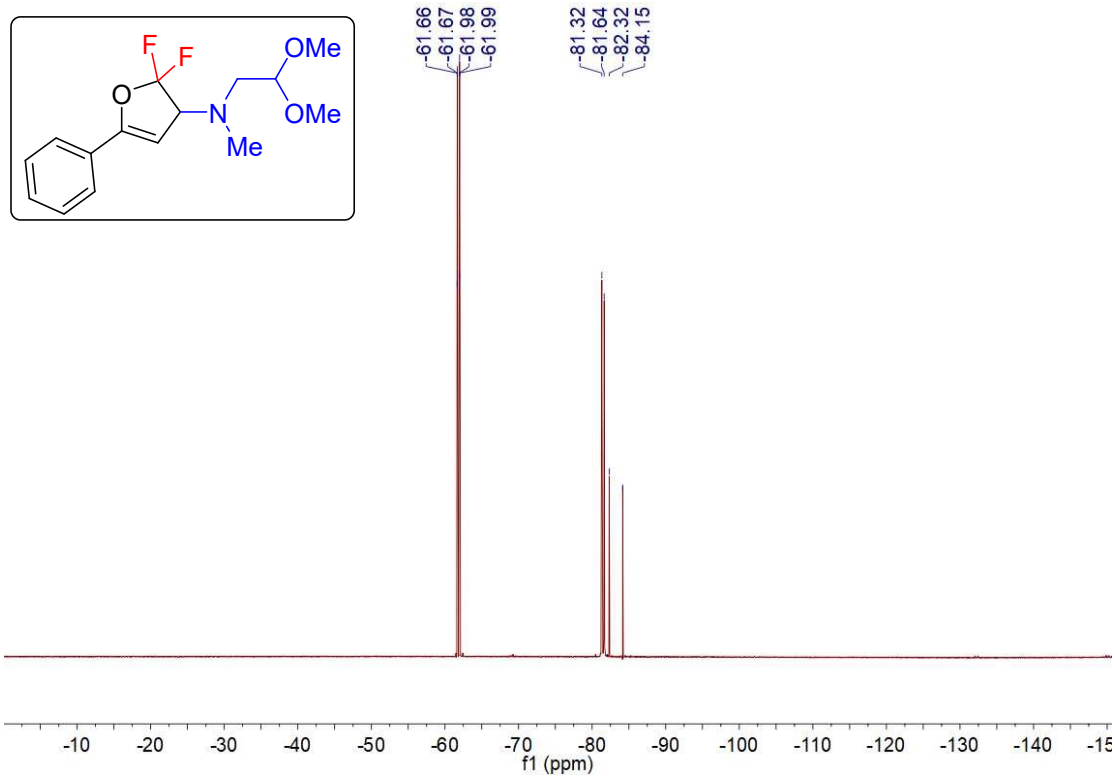
^{1}H spectrum ($CDCl_3$) N-(2,2-dimethoxyethyl)-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine(5f)



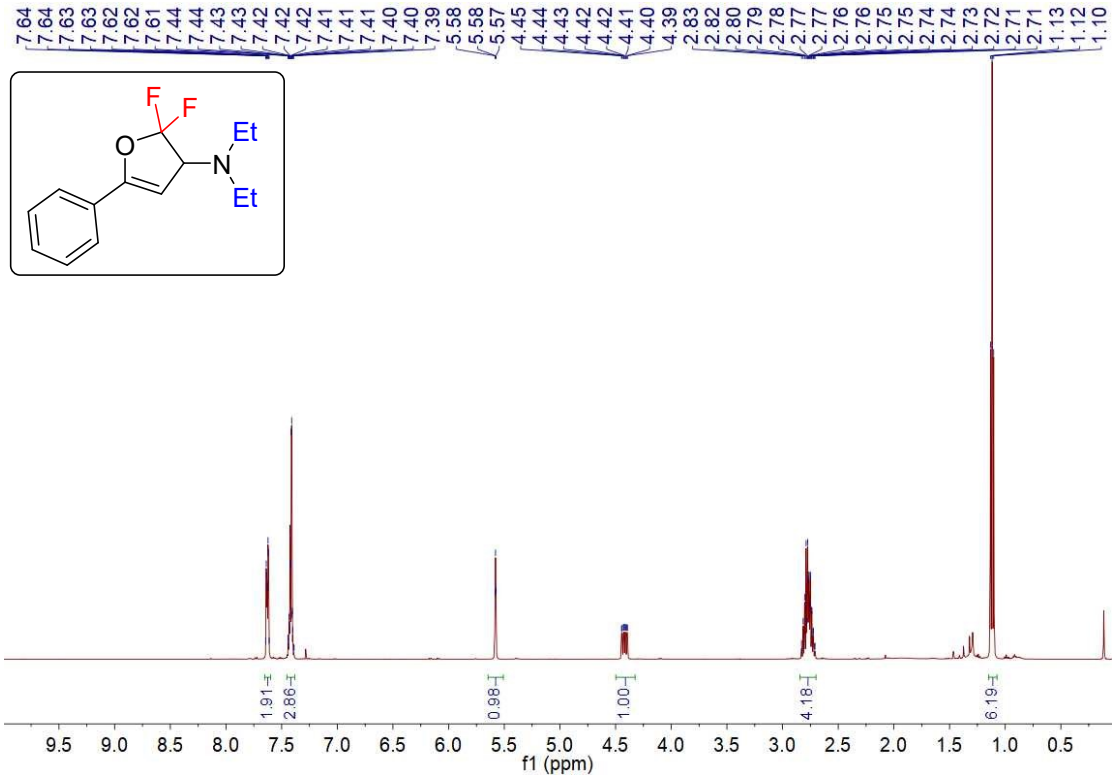
^{13}C spectrum ($CDCl_3$) N-(2,2-dimethoxyethyl)-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5f)



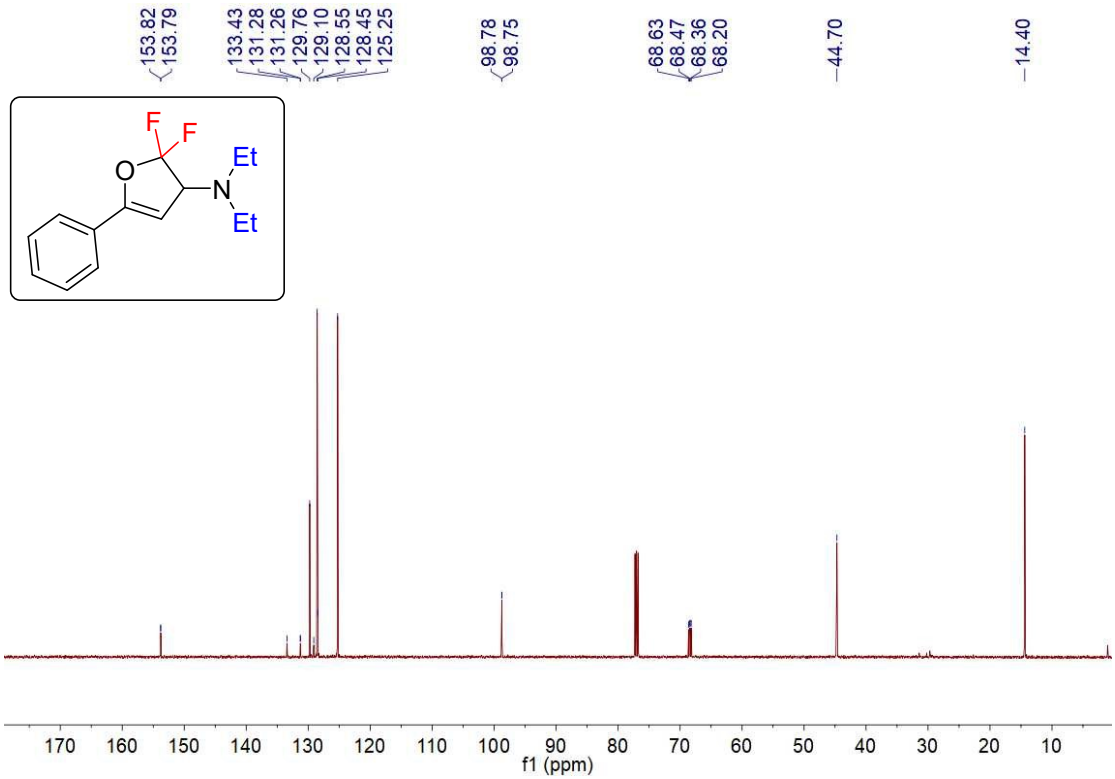
^{19}F spectrum ($CDCl_3$)N-(2,2-dimethoxyethyl)-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5f)



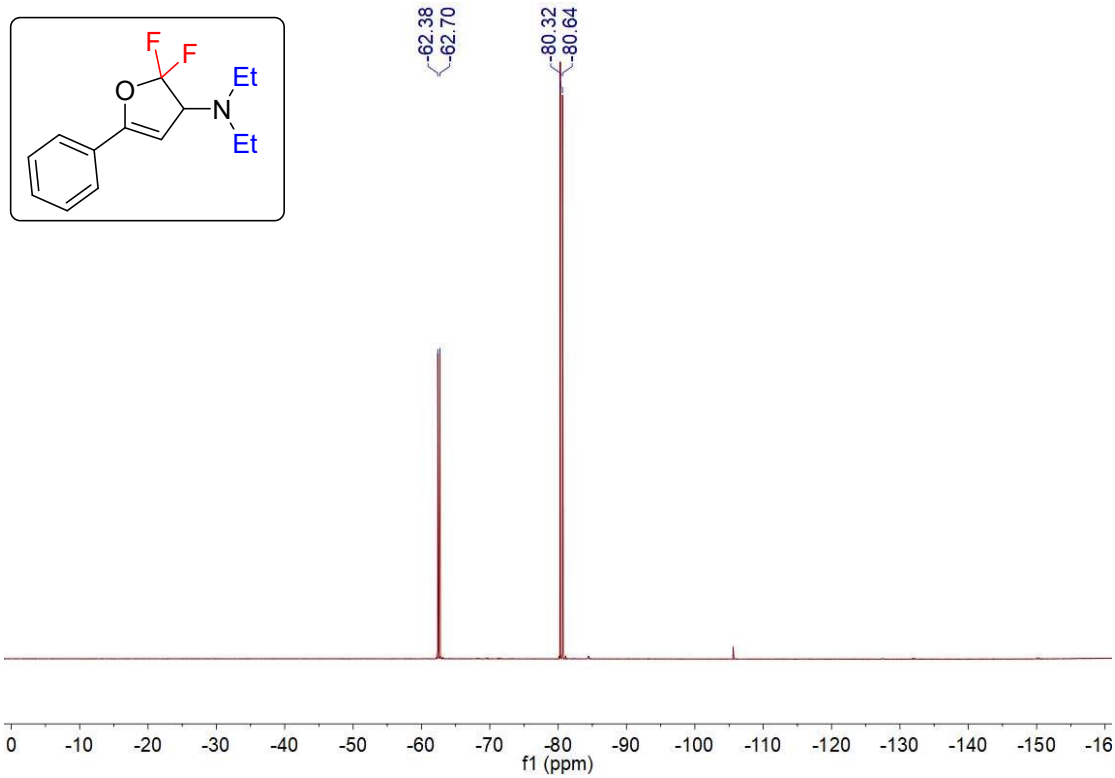
^{1}H spectrum ($CDCl_3$) N,N-diethyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5g)



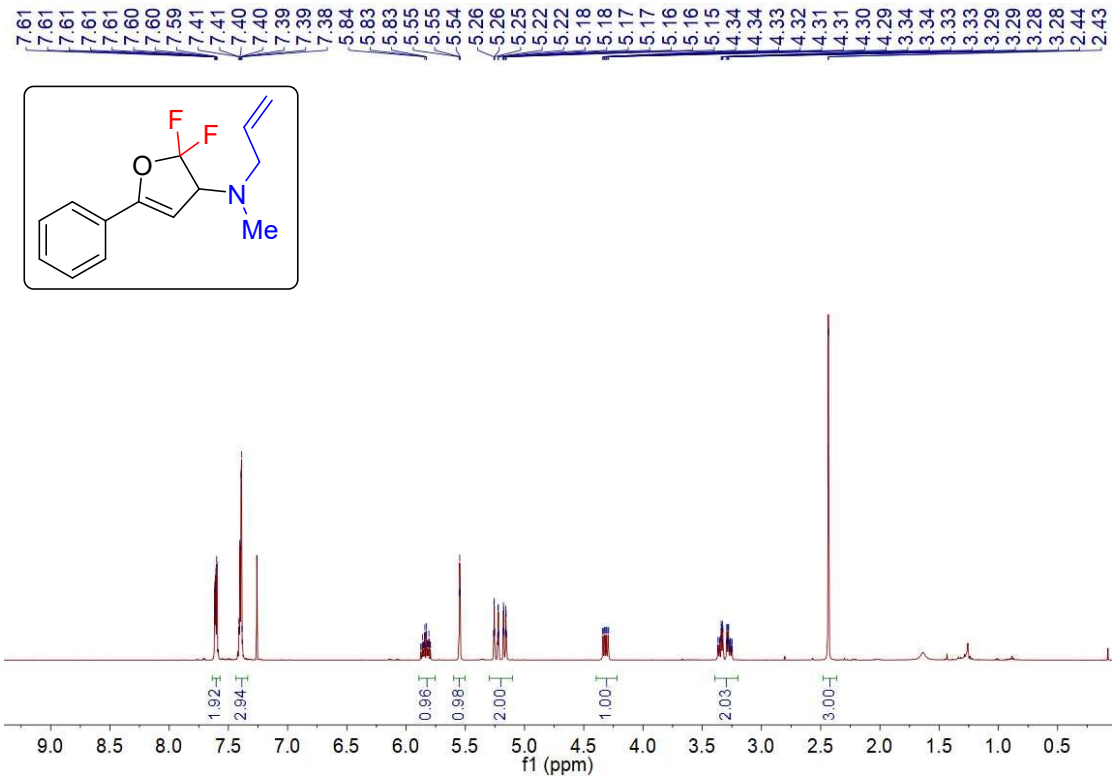
^{13}C spectrum ($CDCl_3$) N,N-diethyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5g)



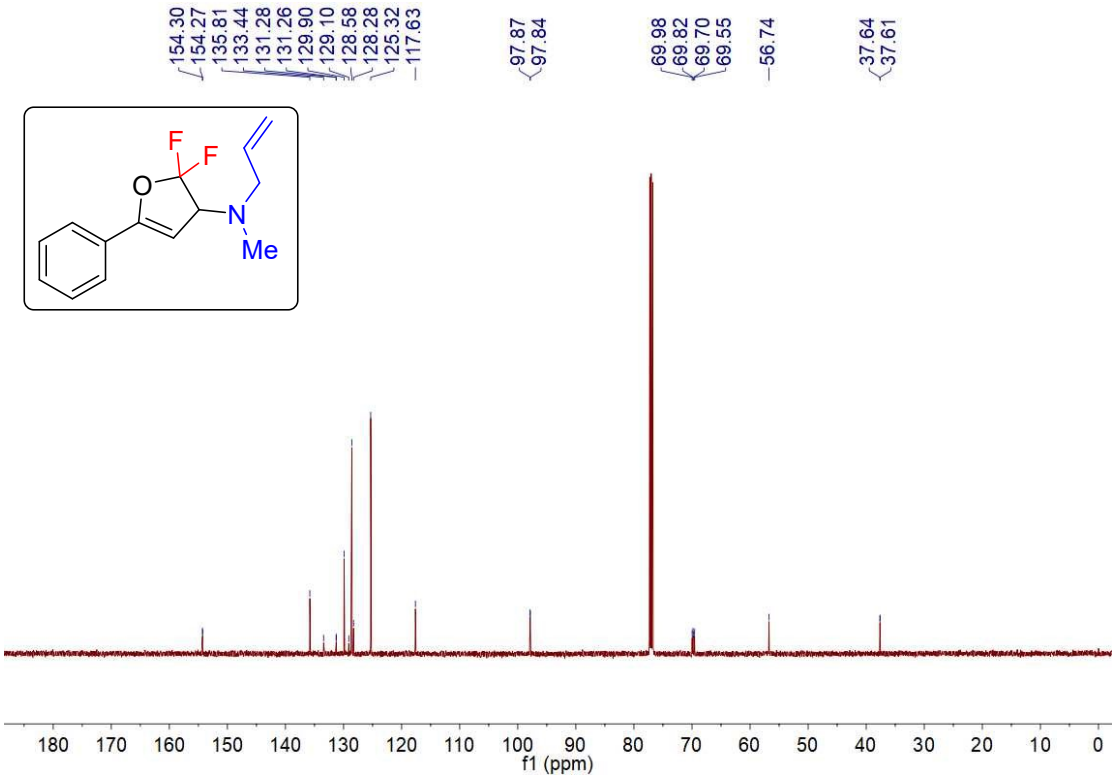
^{19}F spectrum ($CDCl_3$) N,N-diethyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5g)



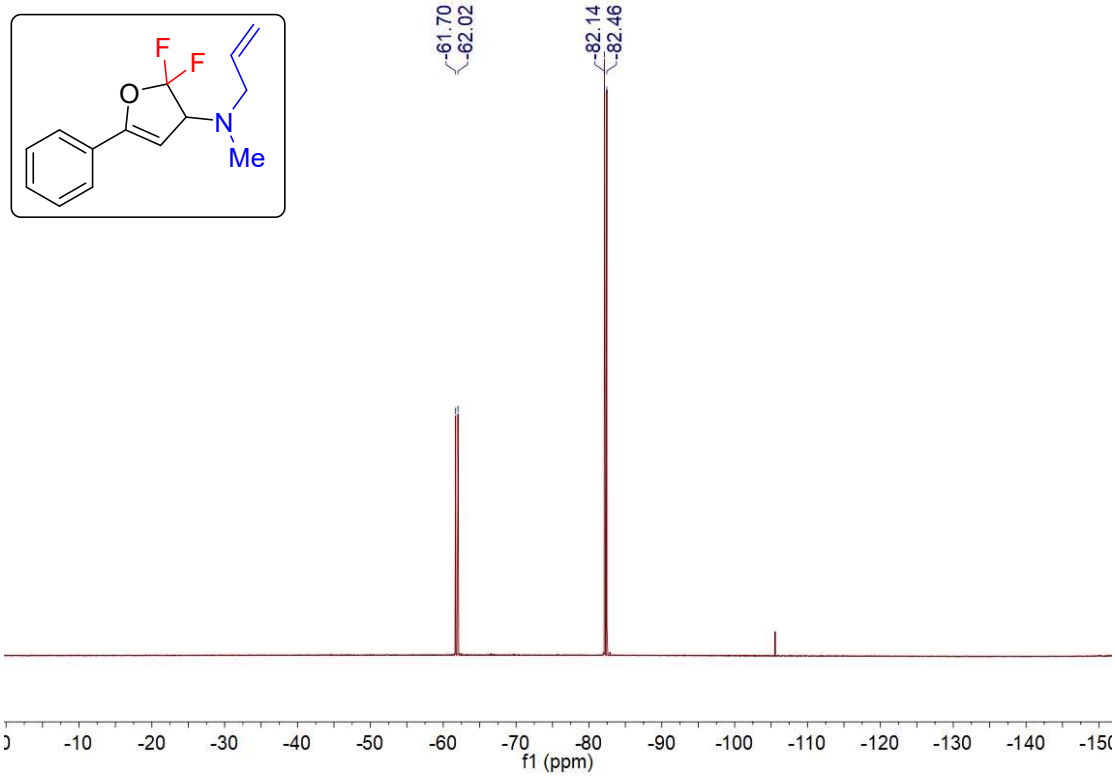
^{1}H spectrum ($CDCl_3$) N-allyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5h)



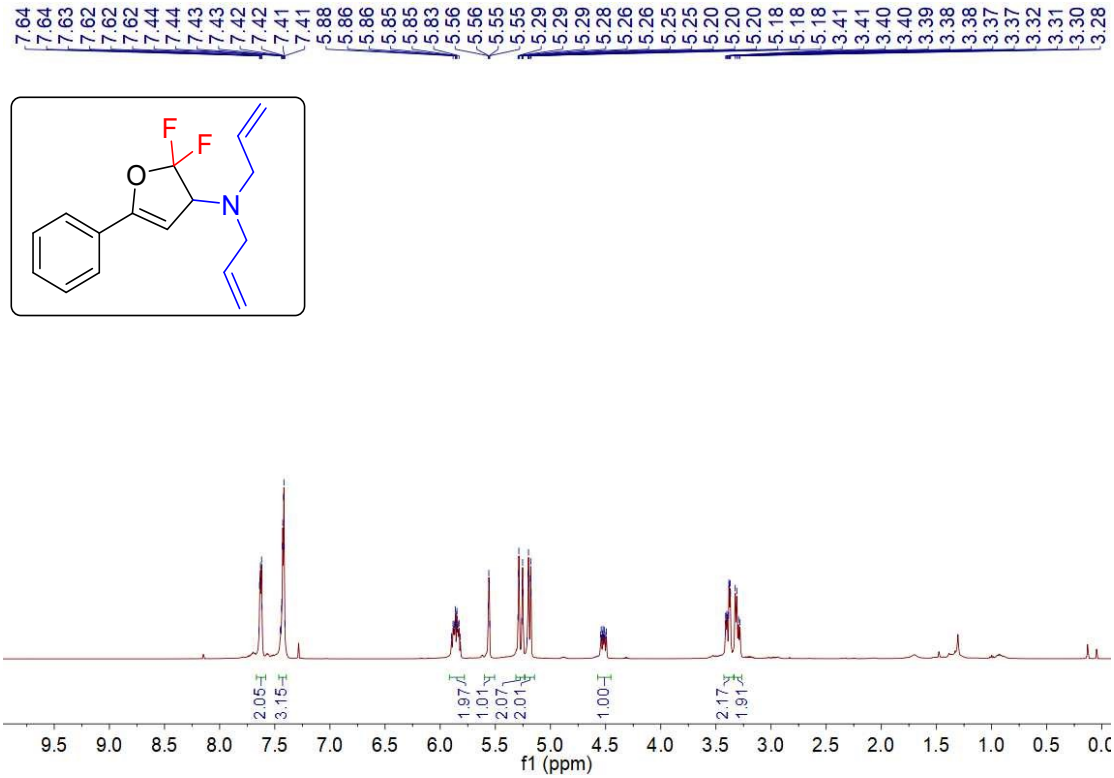
^{13}C spectrum ($CDCl_3$) N-allyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5h)



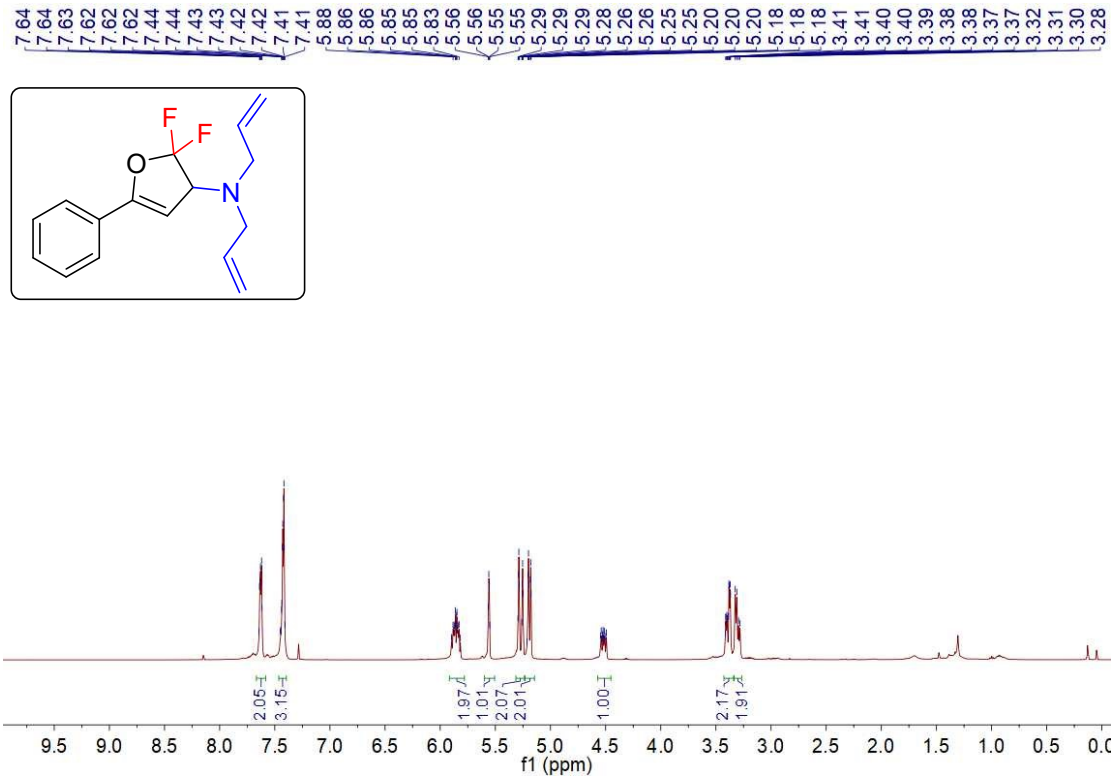
^{19}F spectrum ($CDCl_3$) N-allyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5h)



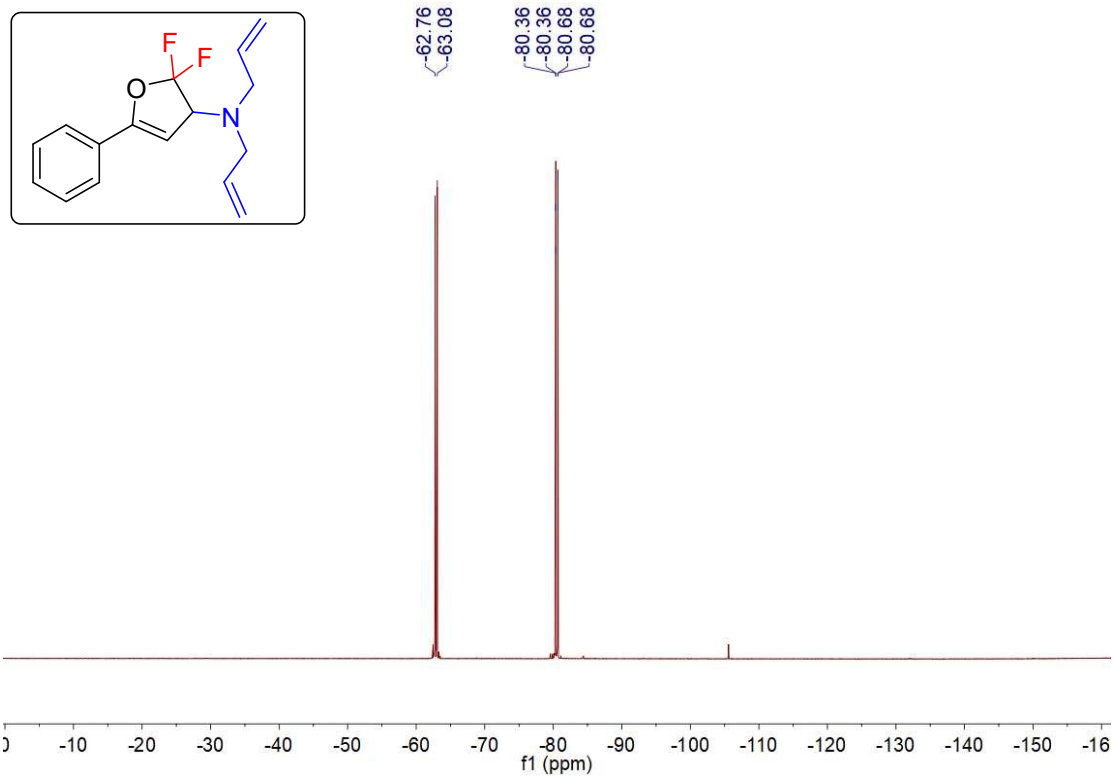
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5i)



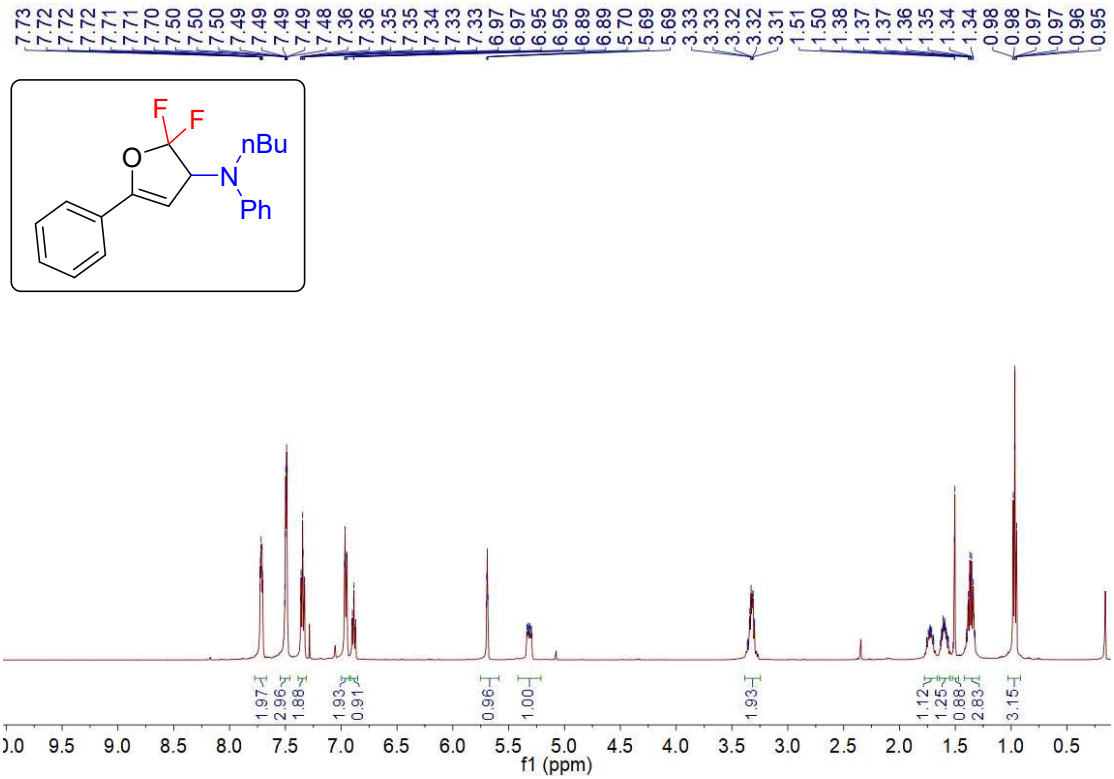
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5i)



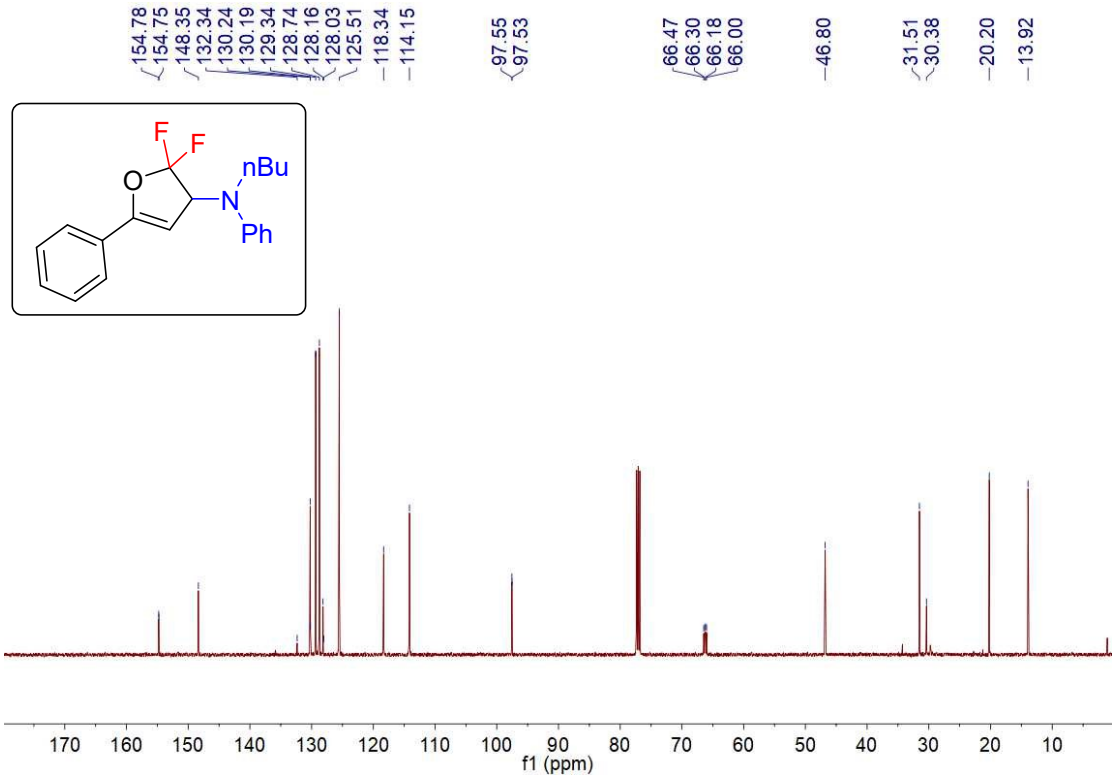
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5i)



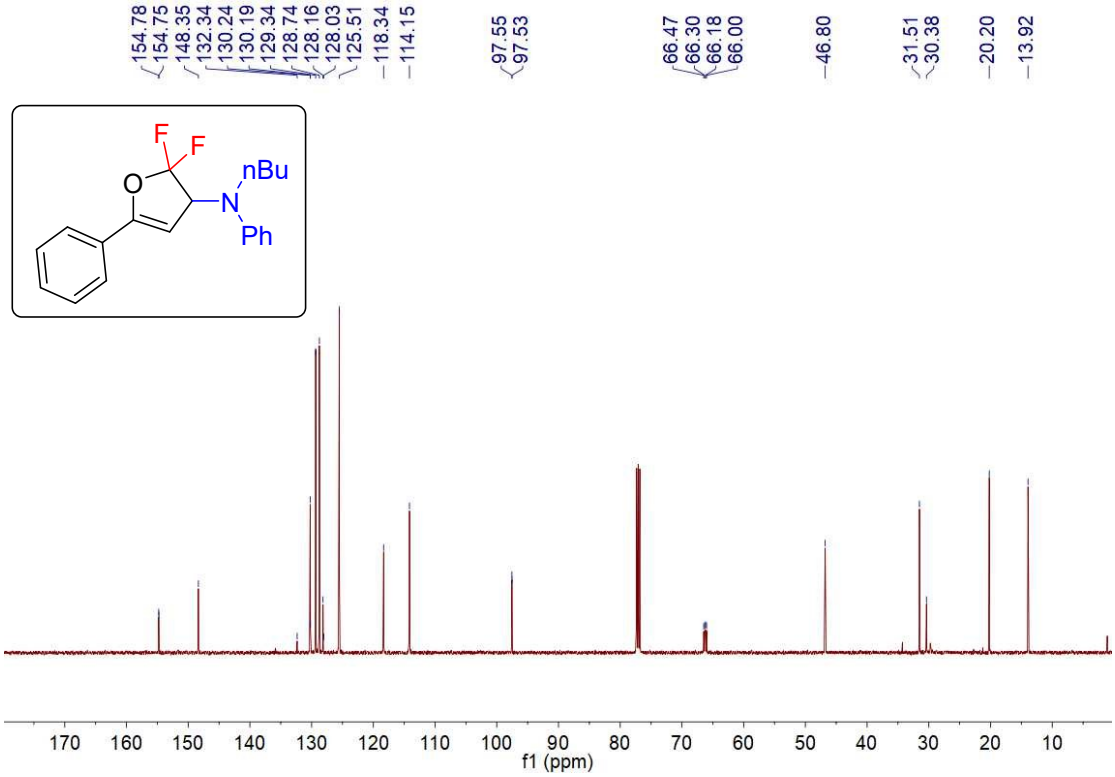
^{1}H spectrum ($CDCl_3$) N-butyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5j)



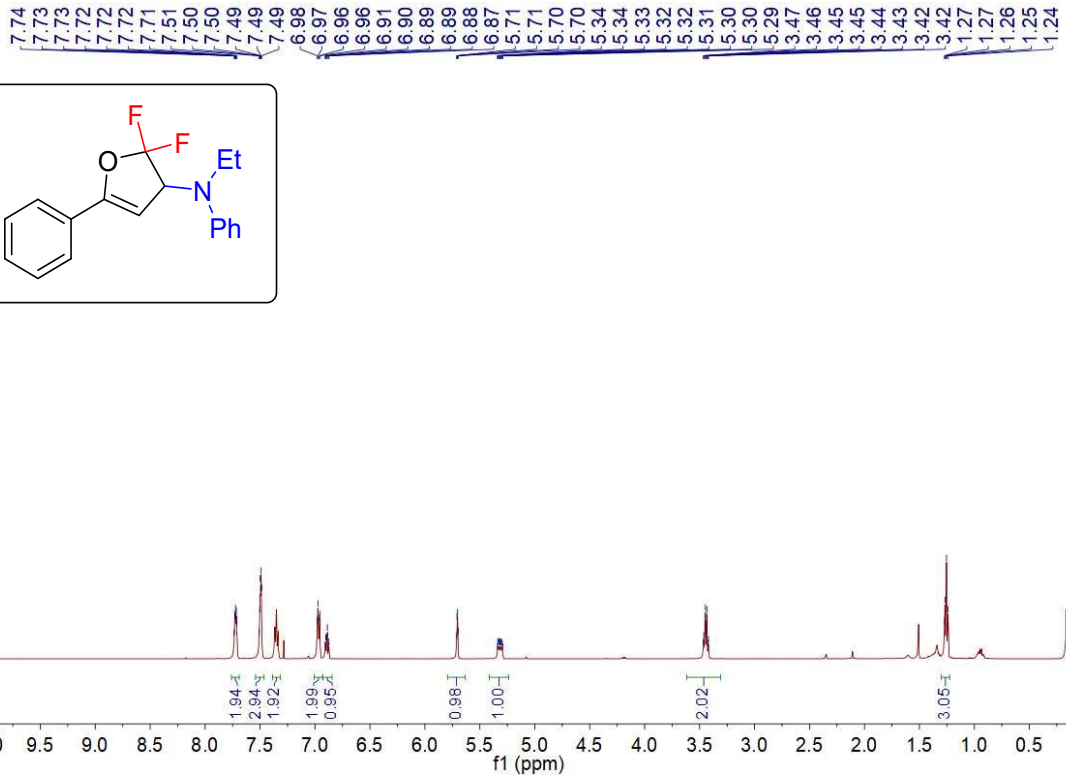
^{13}C spectrum ($CDCl_3$) N-butyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5j)



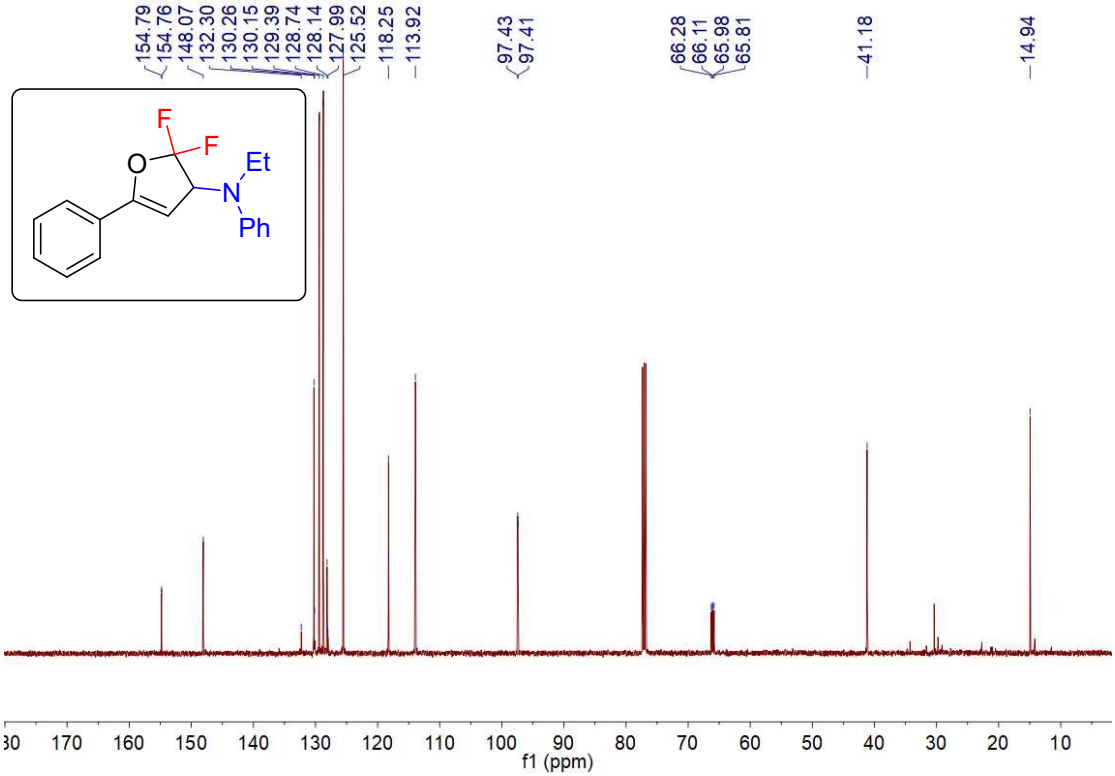
^{19}F spectrum ($CDCl_3$) N-butyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5j)



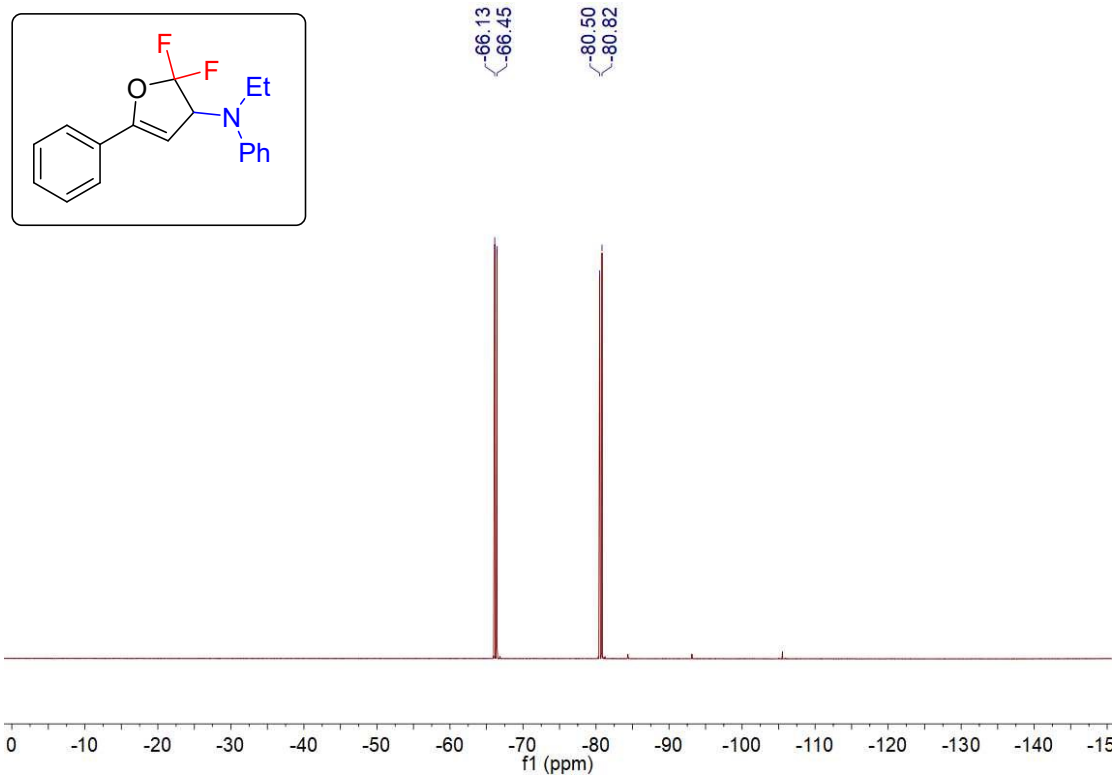
^{1}H spectrum ($CDCl_3$) N-ethyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5k)



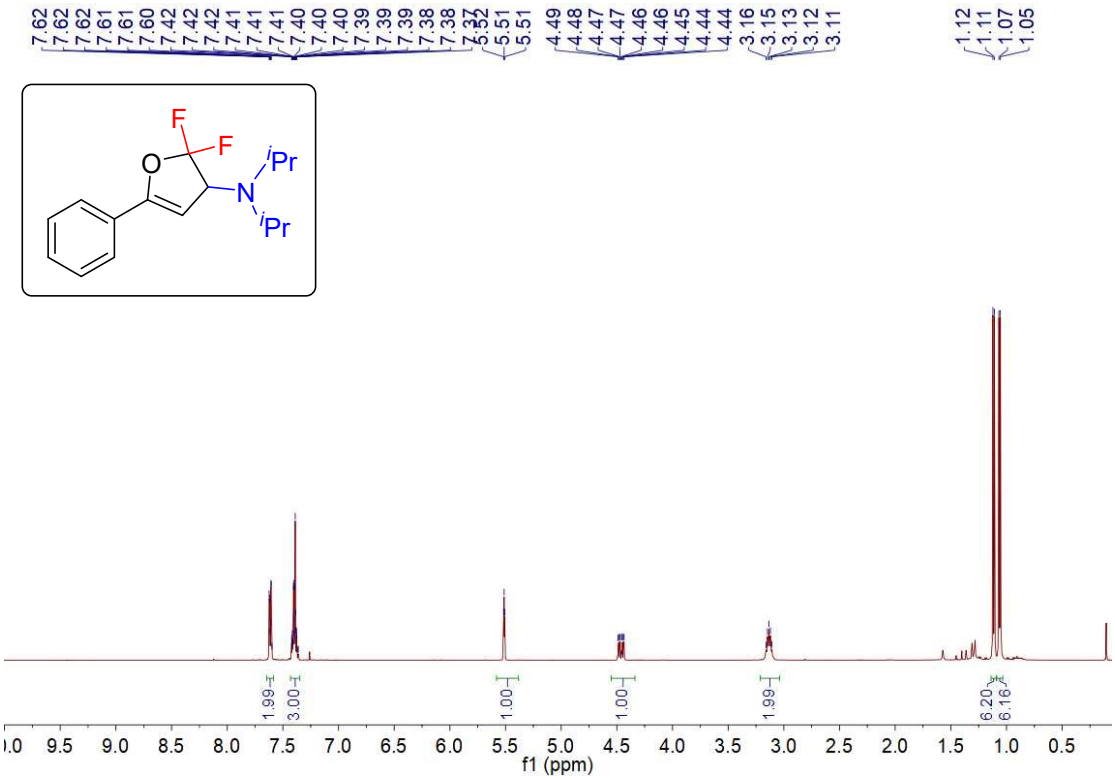
^{13}C spectrum ($CDCl_3$) N-ethyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5k)



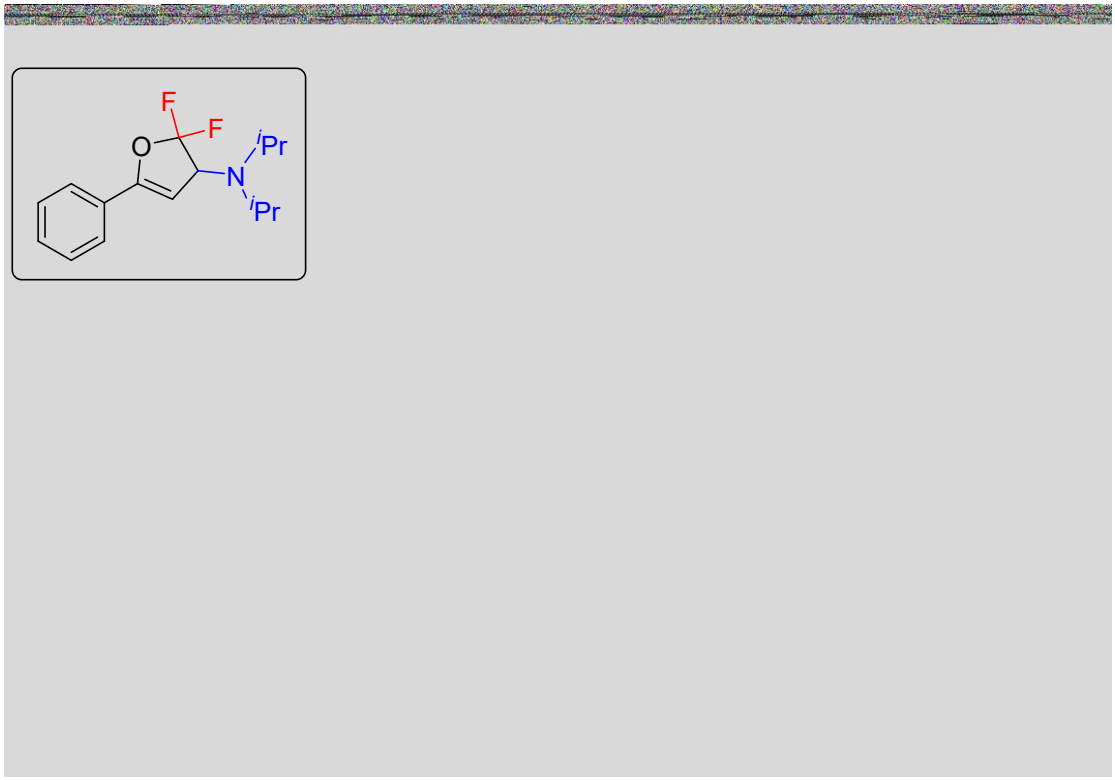
^{19}F spectrum ($CDCl_3$) N-ethyl-2,2-difluoro-N,5-diphenyl-2,3-dihydrofuran-3-amine (5k)



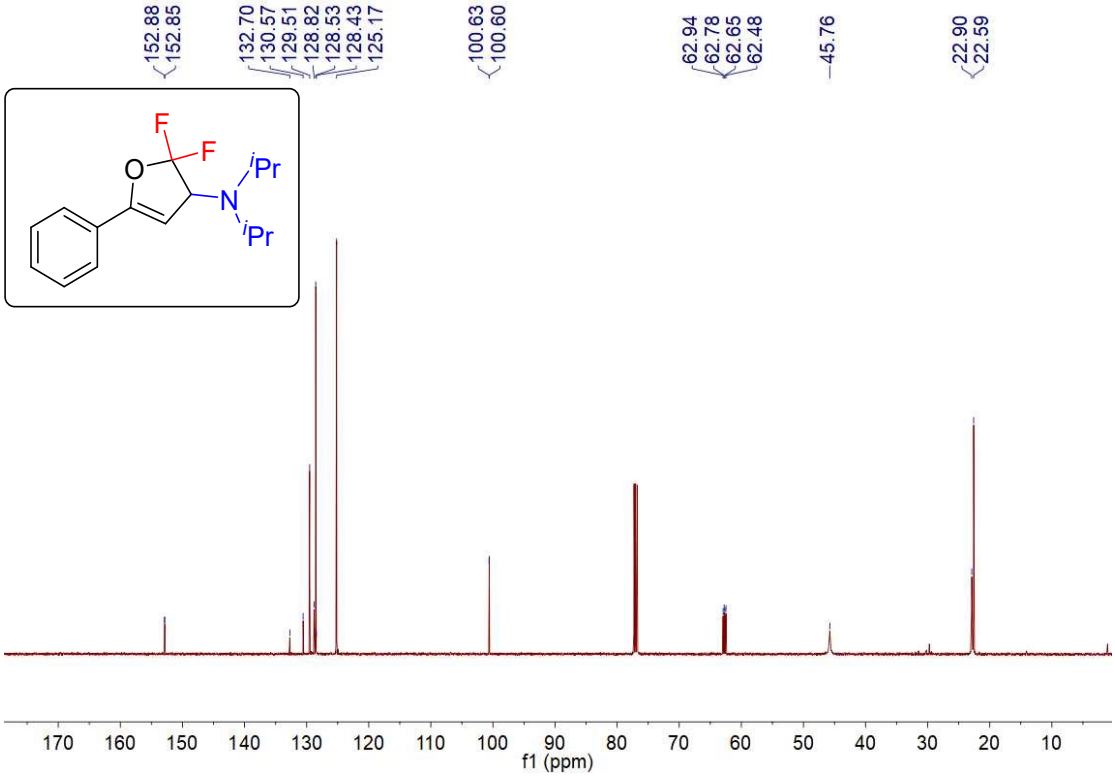
^{1}H spectrum ($CDCl_3$) 2,2-difluoro-N,N-diisopropyl-5-phenyl-2,3-dihydrofuran-3-amine (5l)



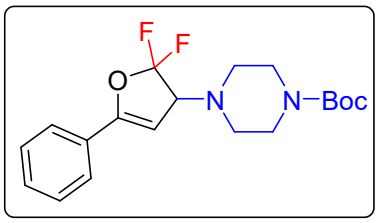
^{13}C spectrum ($CDCl_3$) 2,2-difluoro-N,N-diisopropyl-5-phenyl-2,3-dihydrofuran-3-amine (5l)

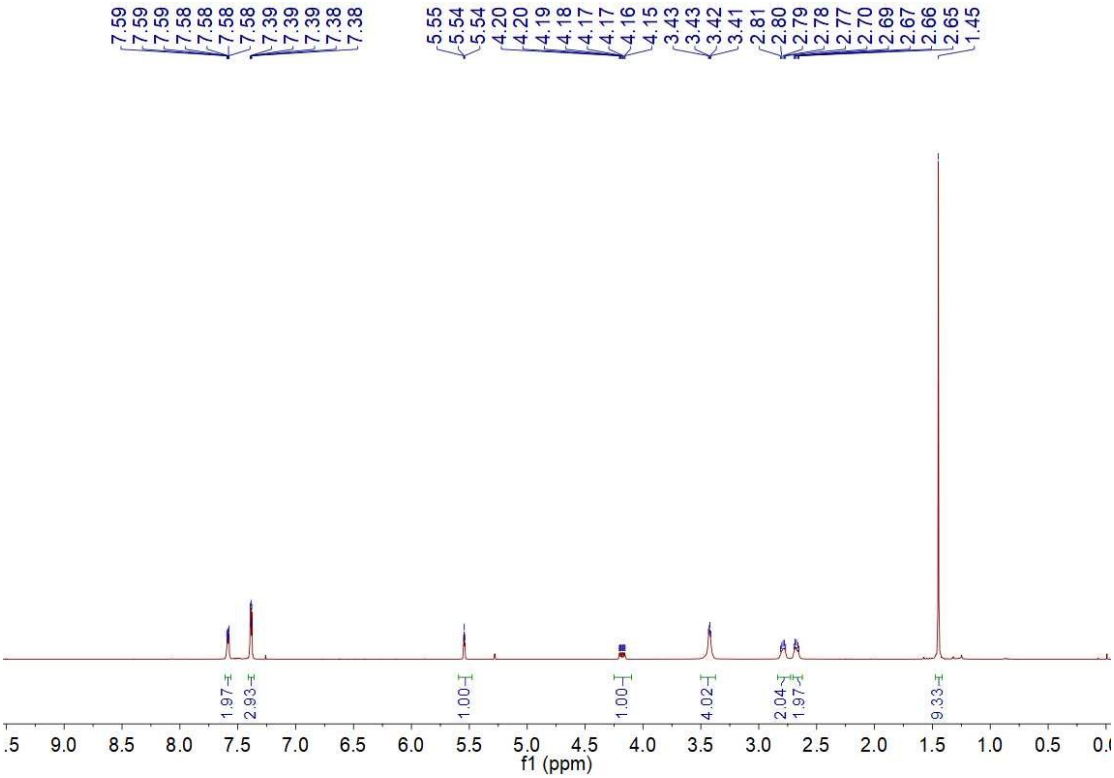


^{19}F spectrum ($CDCl_3$) 2,2-difluoro-N,N-diisopropyl-5-phenyl-2,3-dihydrofuran-3-amine (5l)

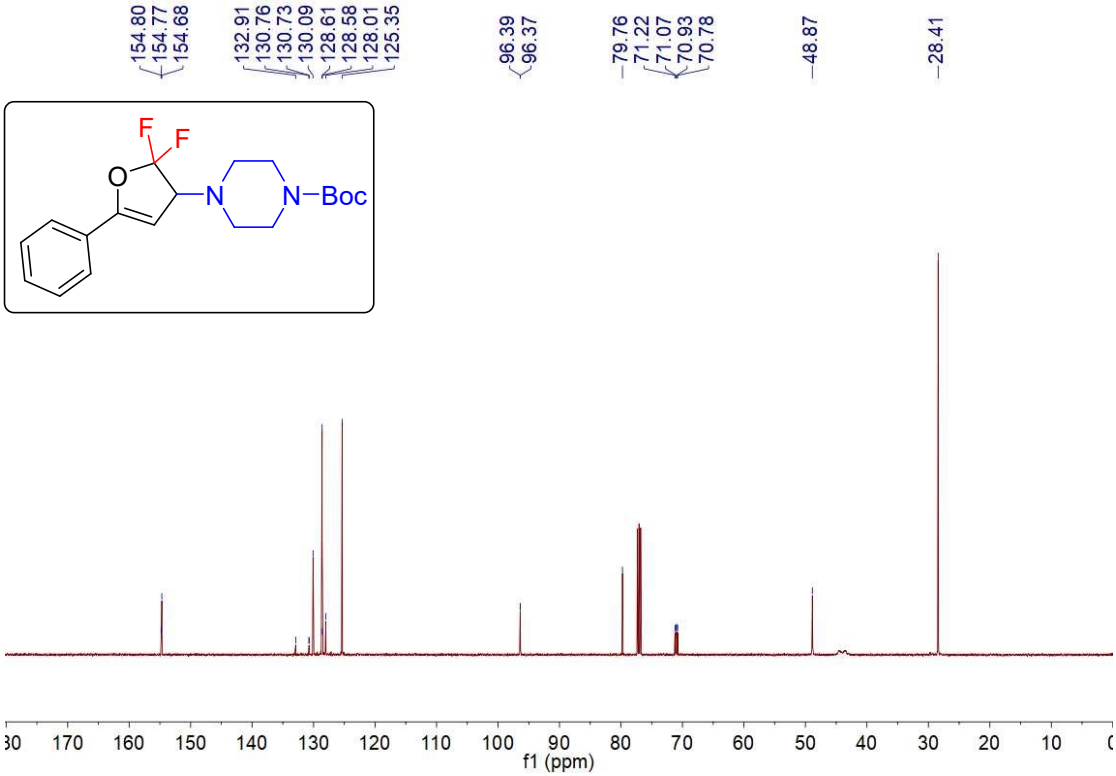


^{1}H spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl)piperazine-1-carboxylate (5m)

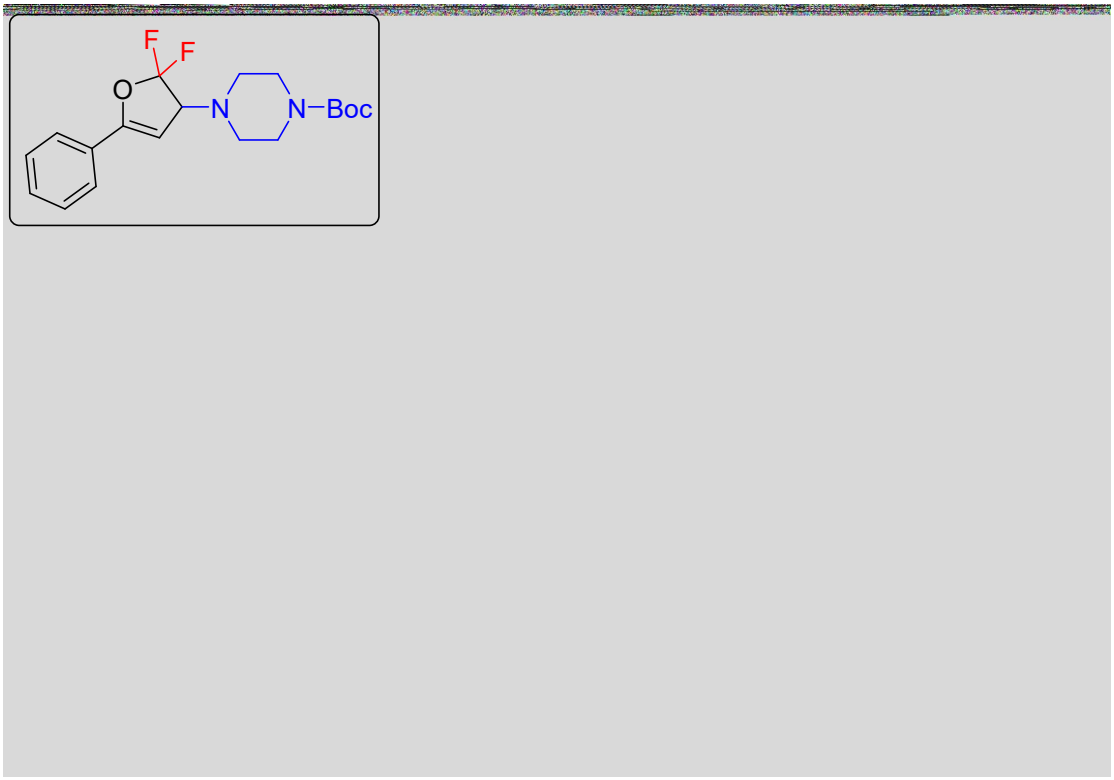




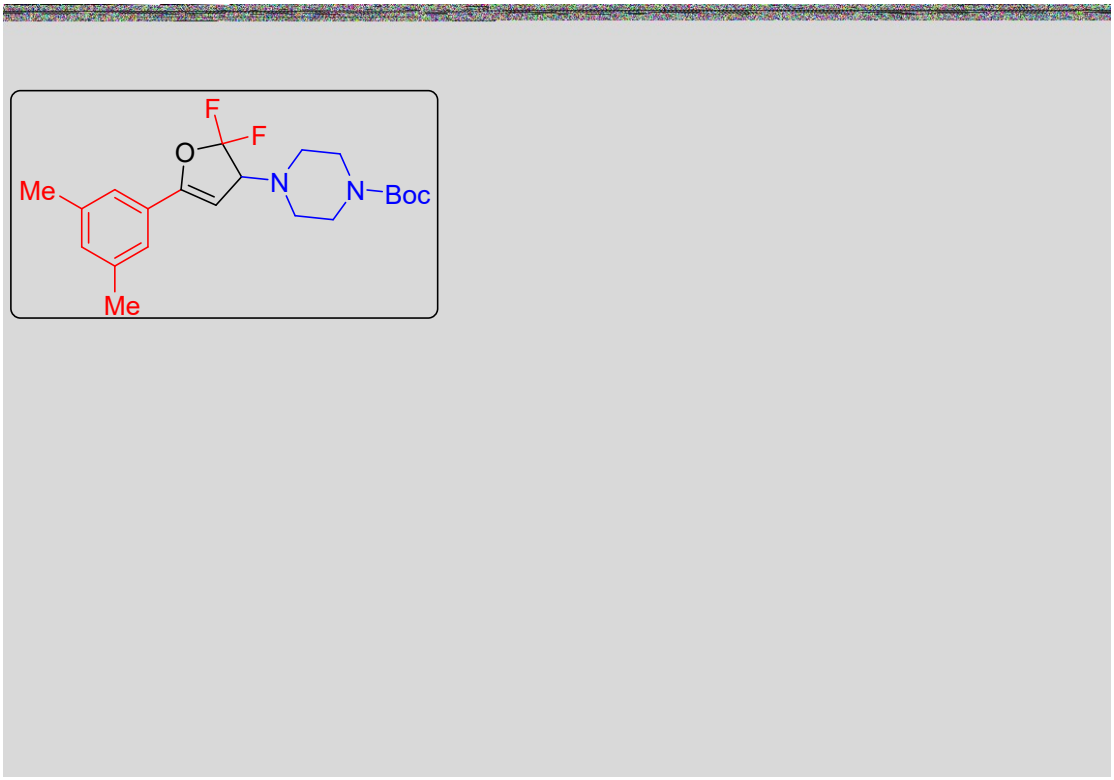
^{13}C spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5m)



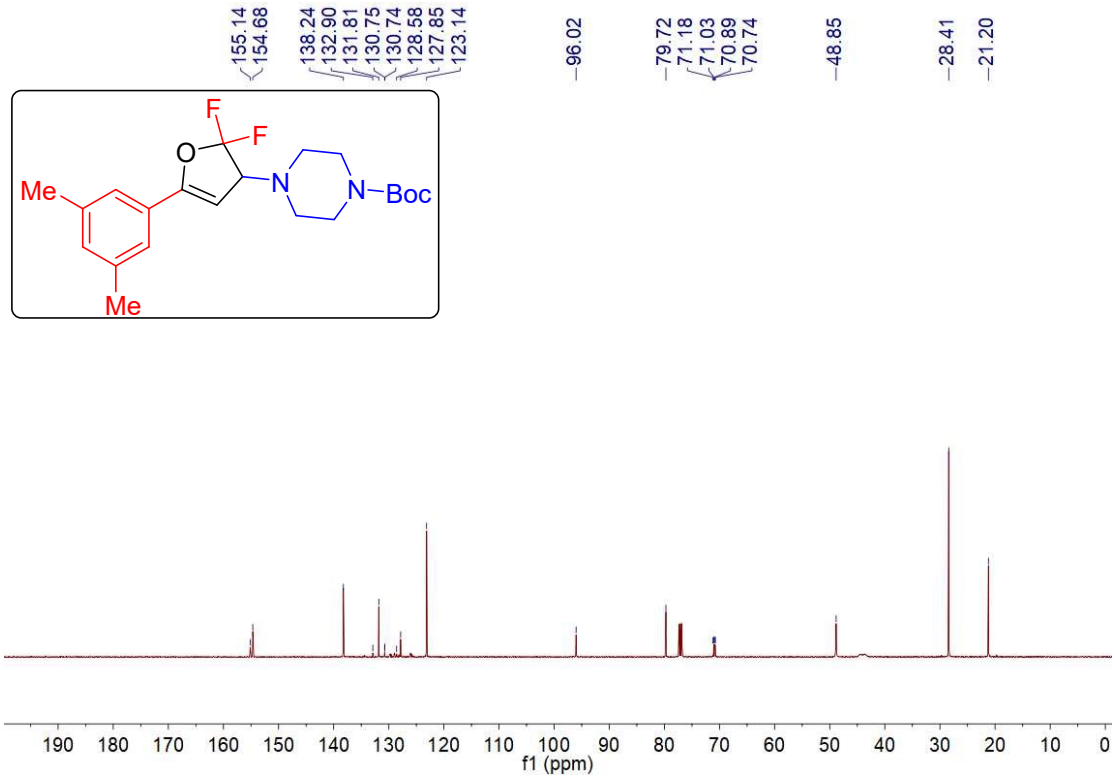
^{19}F spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5m)



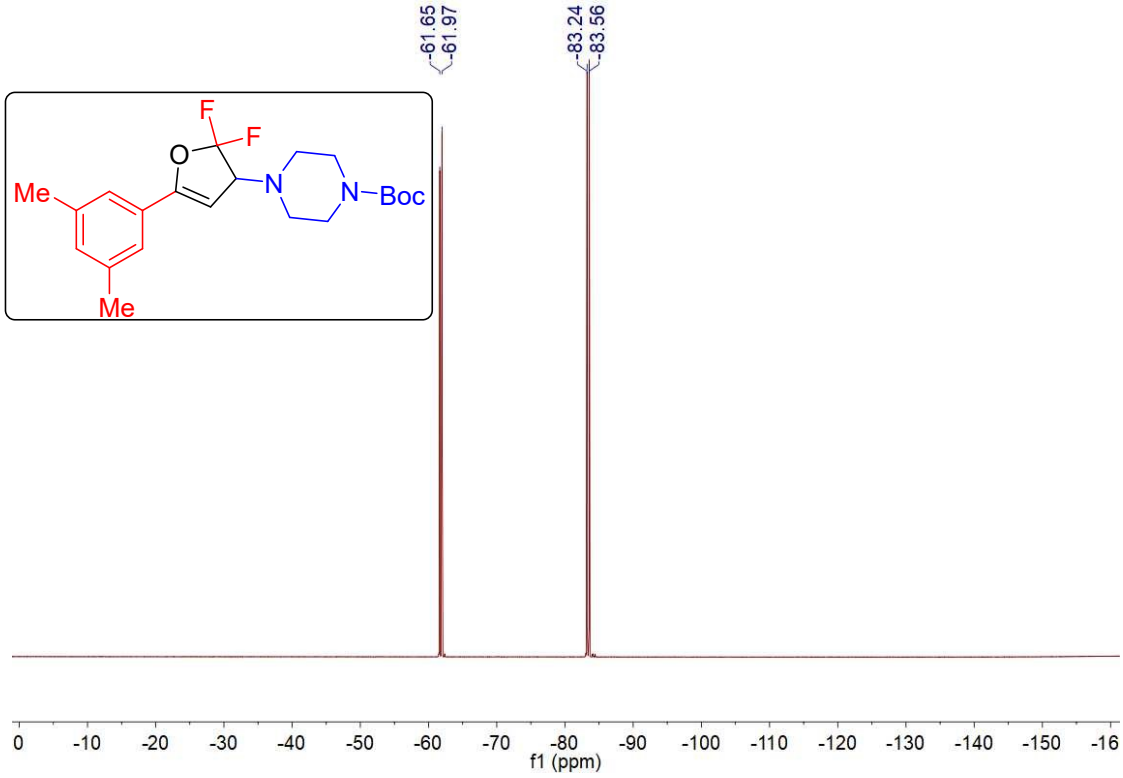
^{1}H spectrum ($CDCl_3$) tert-butyl4-(5-(3,5-dimethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5n)



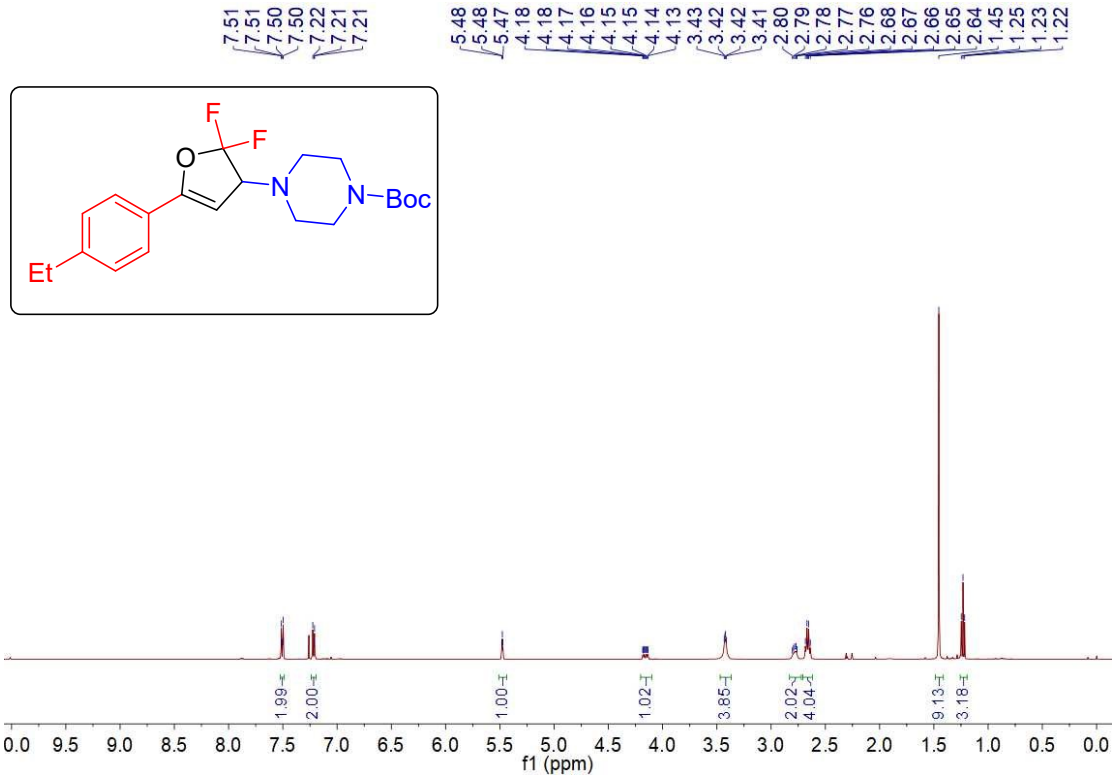
^{13}C spectrum ($CDCl_3$) tert-butyl4-(5-(3,5-dimethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5n)



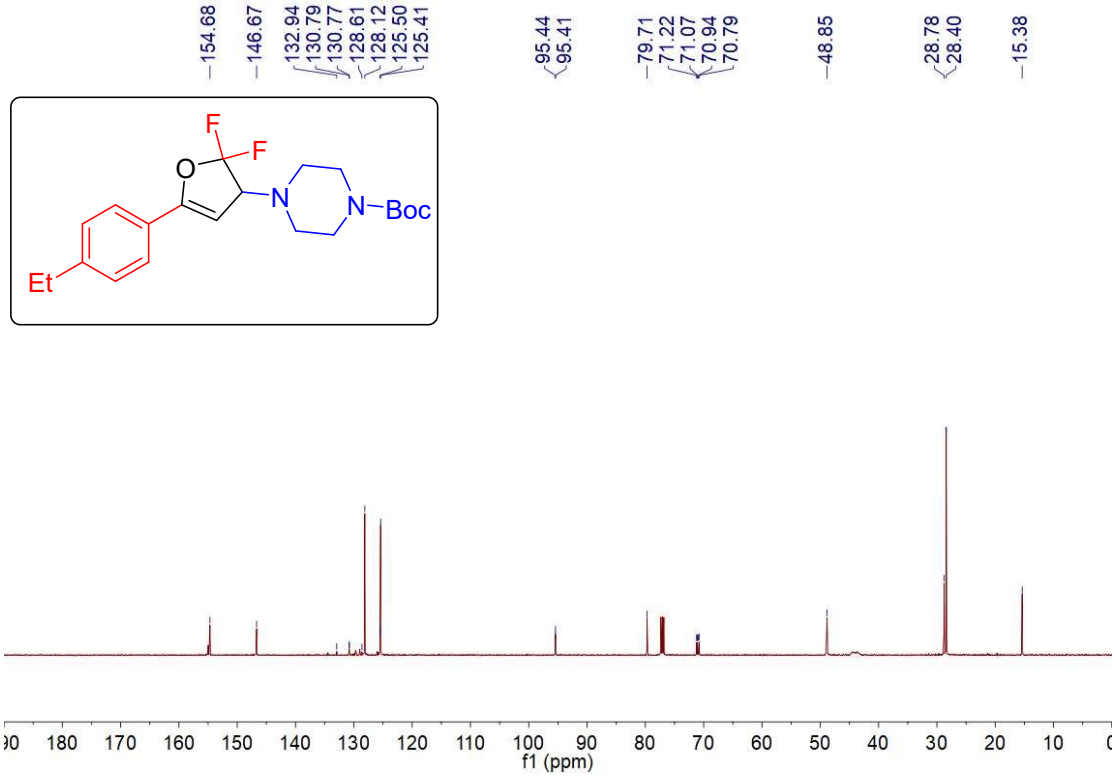
^{19}F spectrum ($CDCl_3$) tert-butyl4-(5-(3,5-dimethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5n)



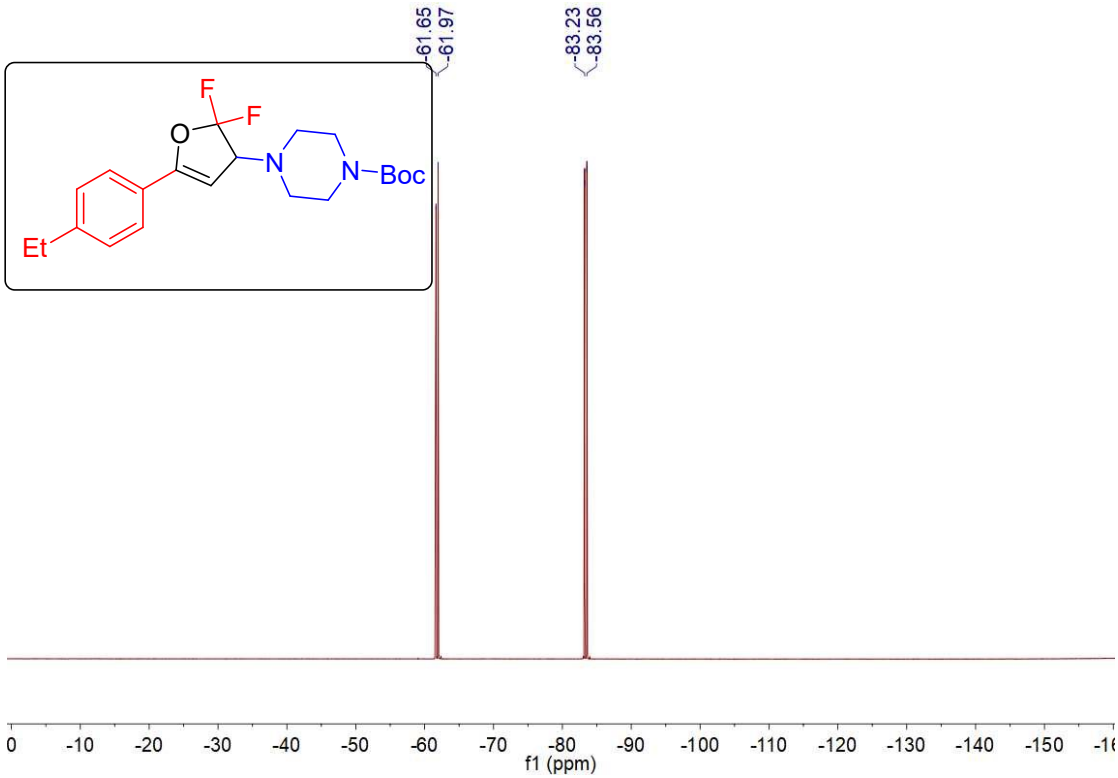
^{1}H spectrum ($CDCl_3$) tert-butyl4-(5-(4-ethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5o)



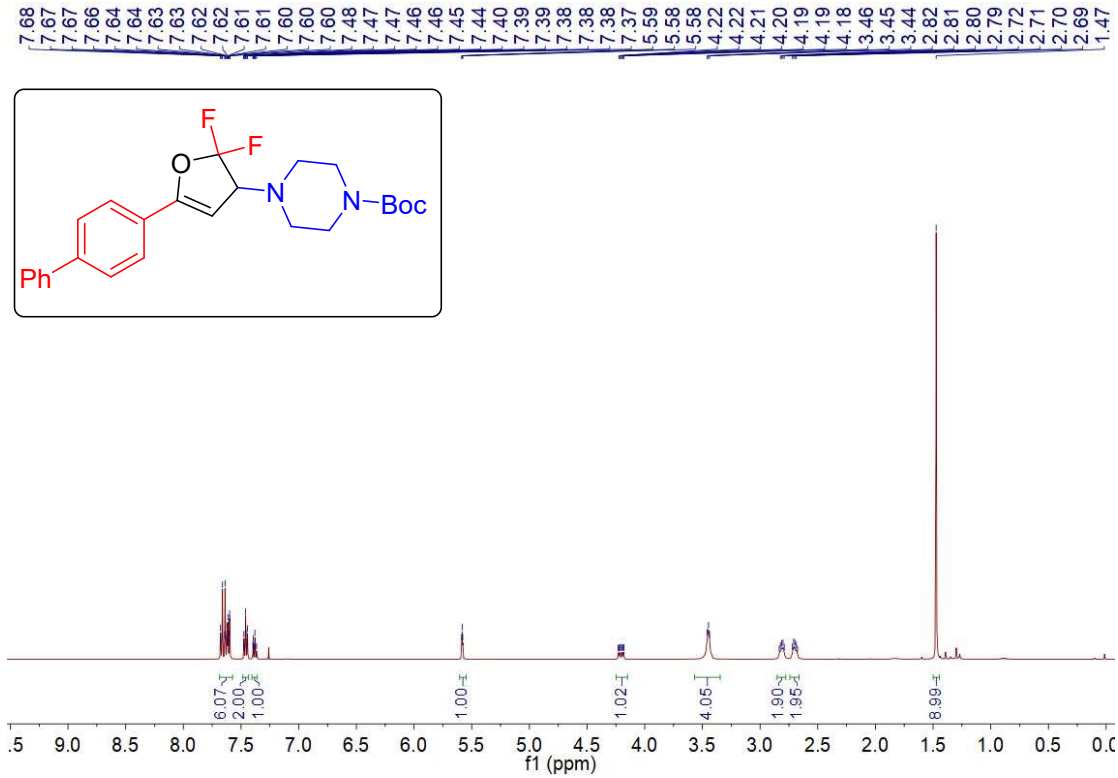
^{13}C spectrum ($CDCl_3$) tert-butyl4-(5-(4-ethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5o)



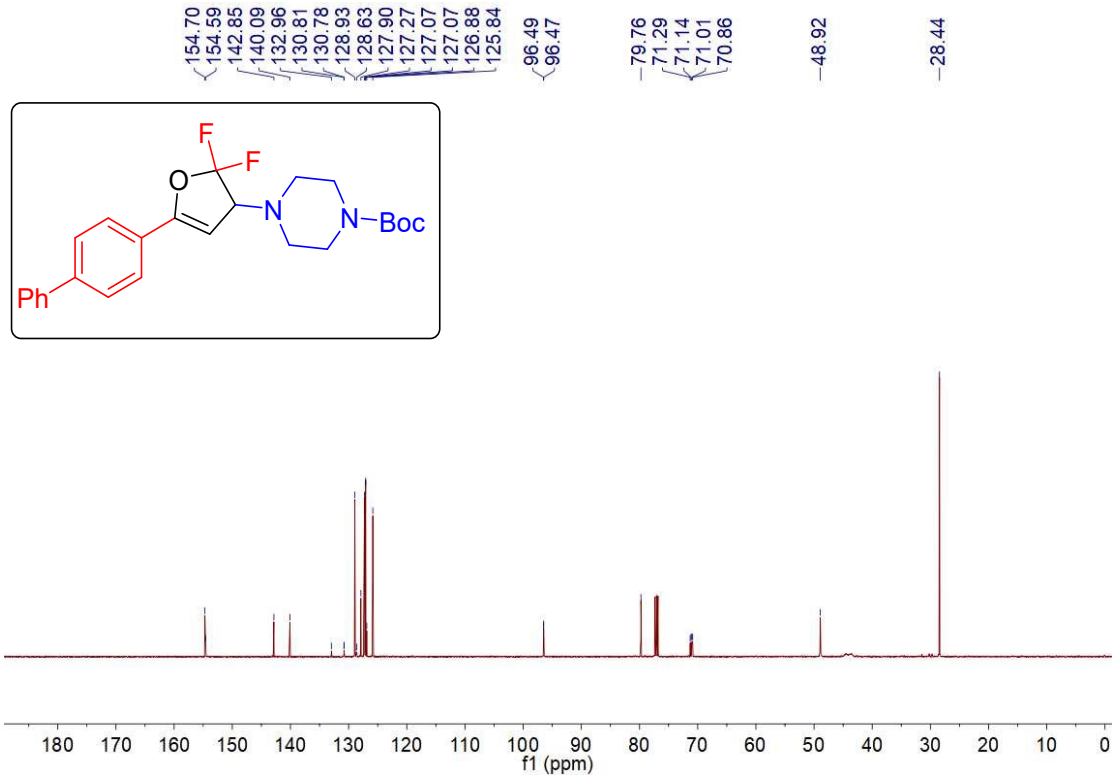
^{19}F spectrum ($CDCl_3$) tert-butyl4-(5-(4-ethylphenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5o)



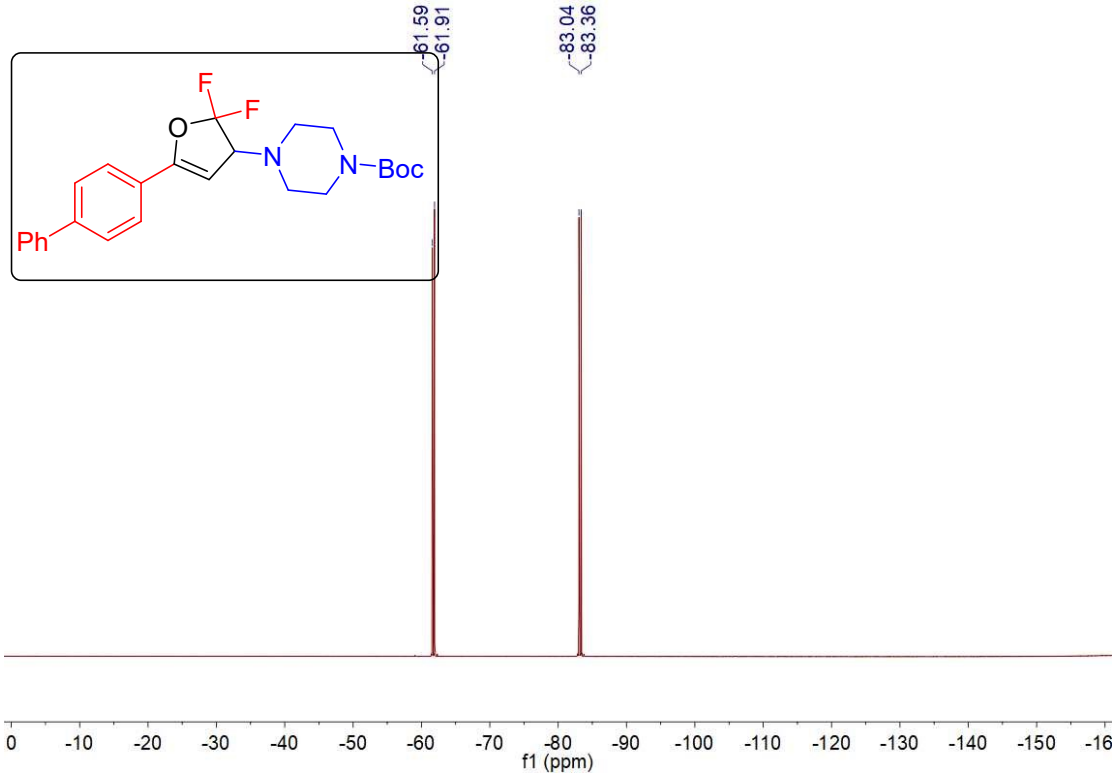
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5p)



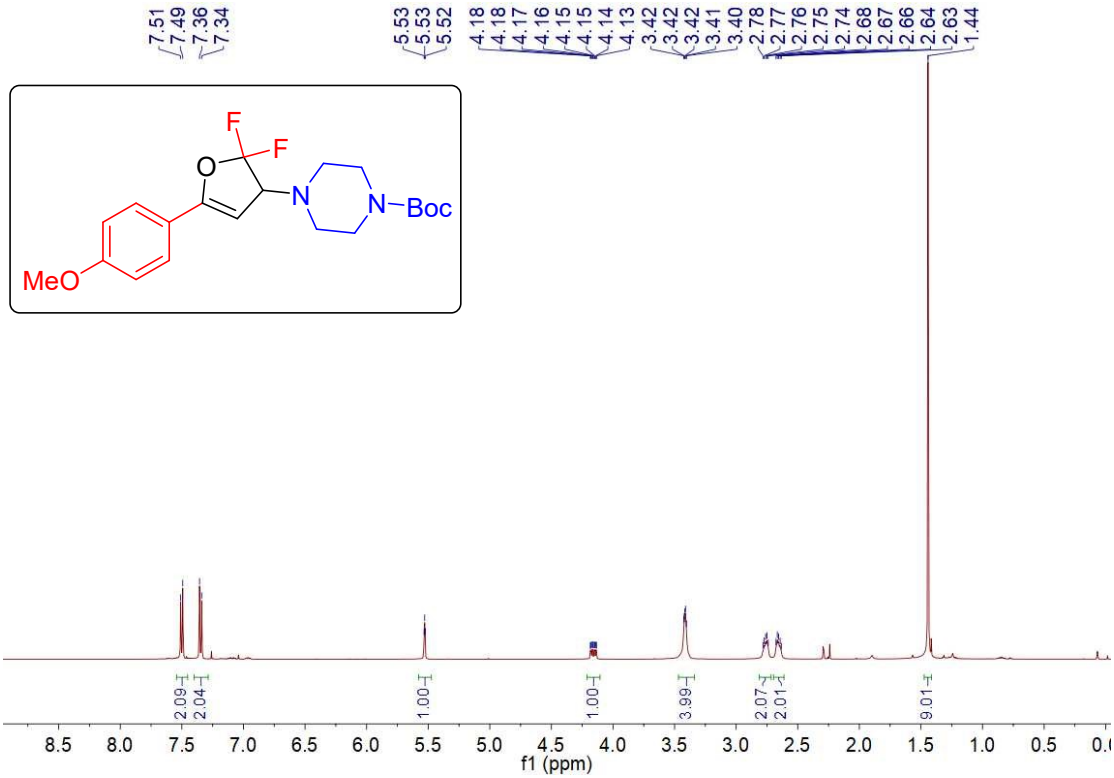
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5p)



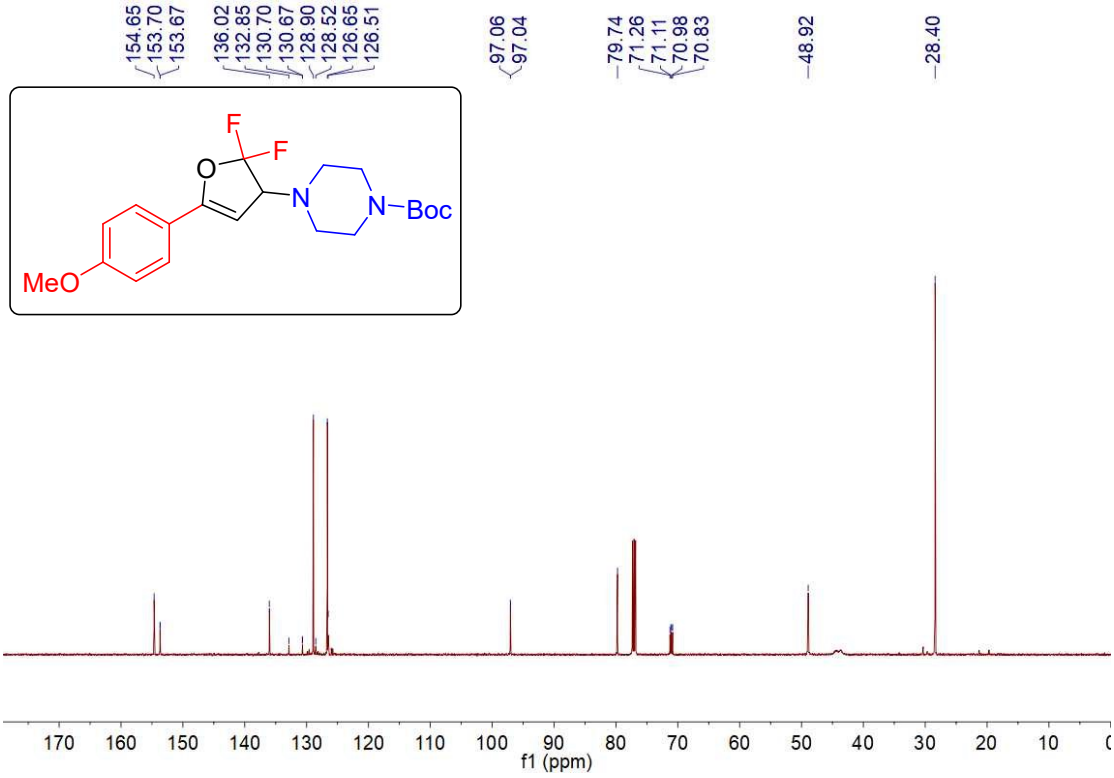
^{19}F spectrum ($CDCl_3$) tert-butyl 4-(5-([1,1'-biphenyl]-4-yl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5p)



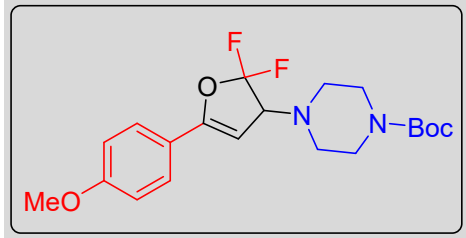
^{1}H spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5q)



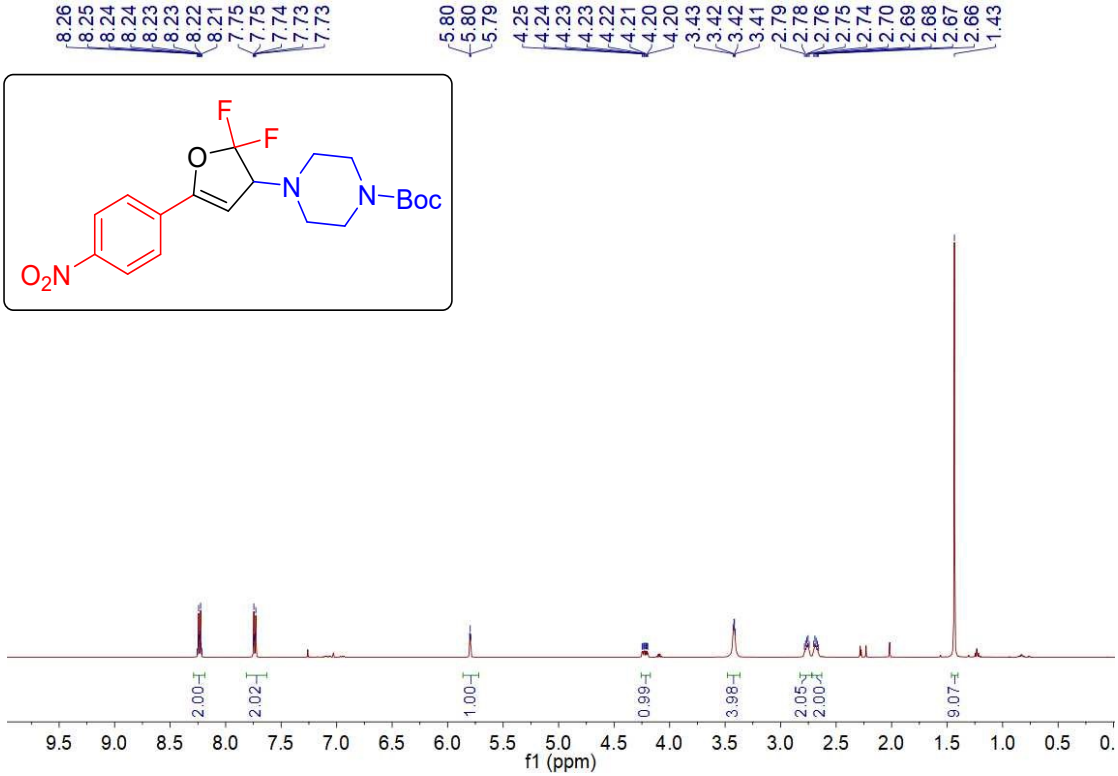
^{13}C spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5q)



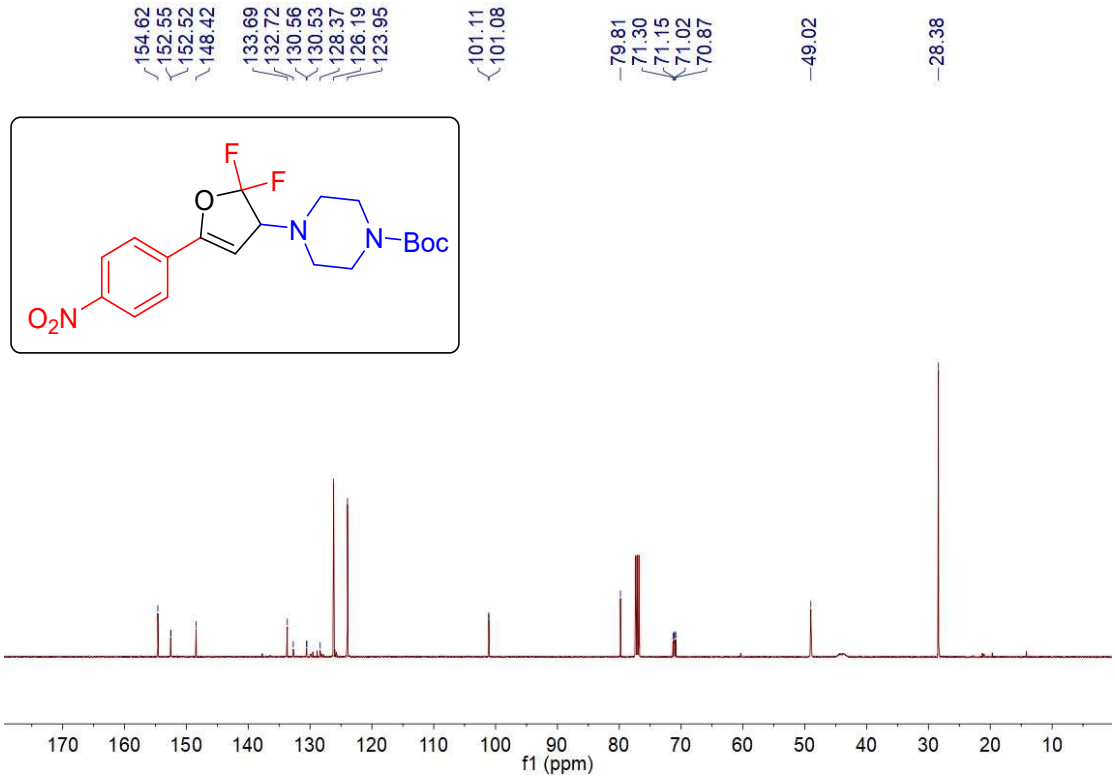
^{19}F spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5q)



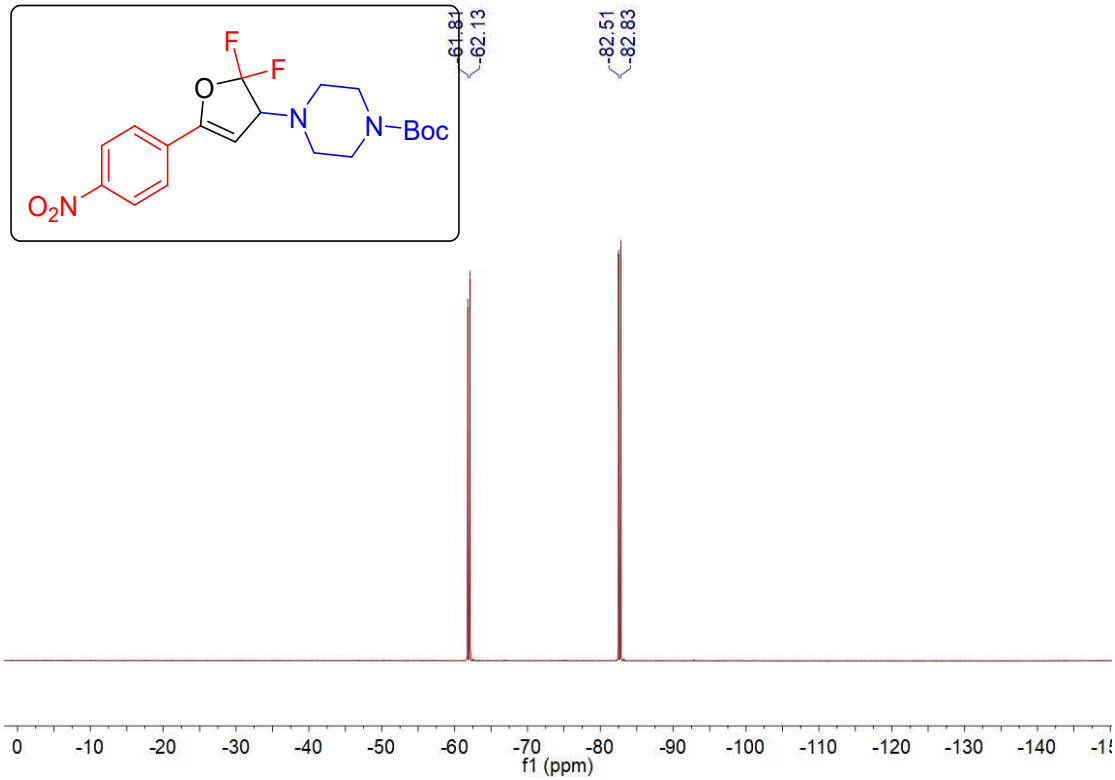
^{1}H spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(4-nitrophenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5r)



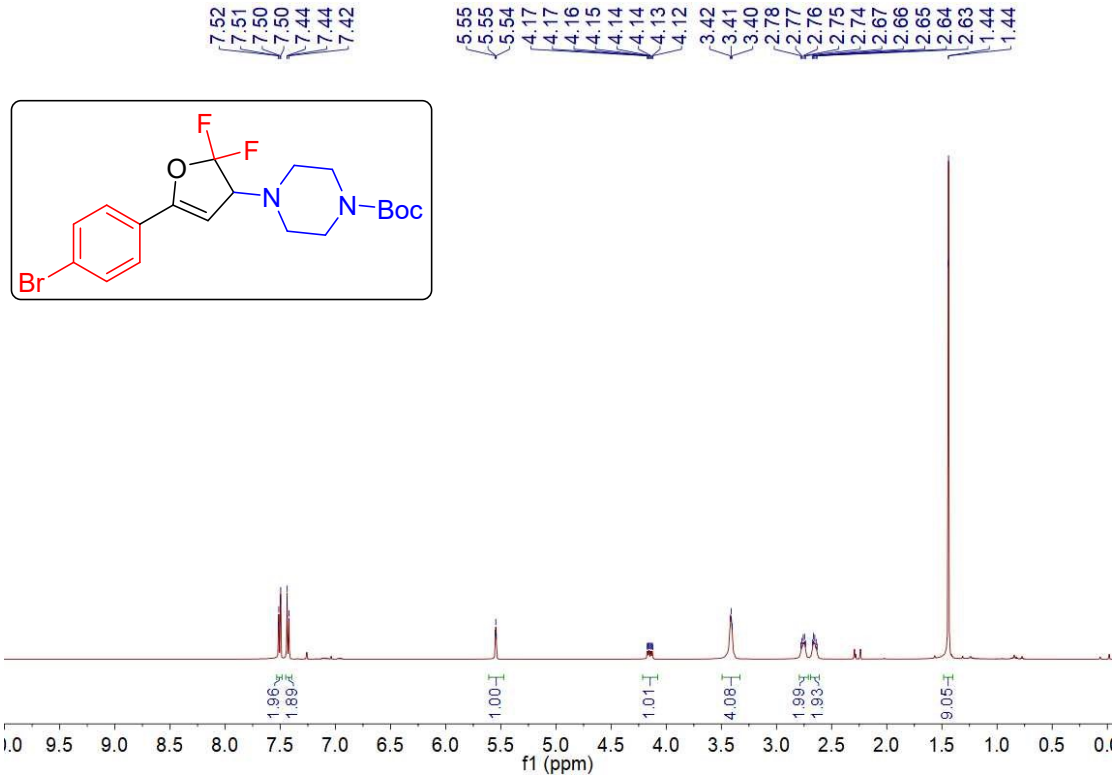
^{13}C spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(4-nitrophenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5r)



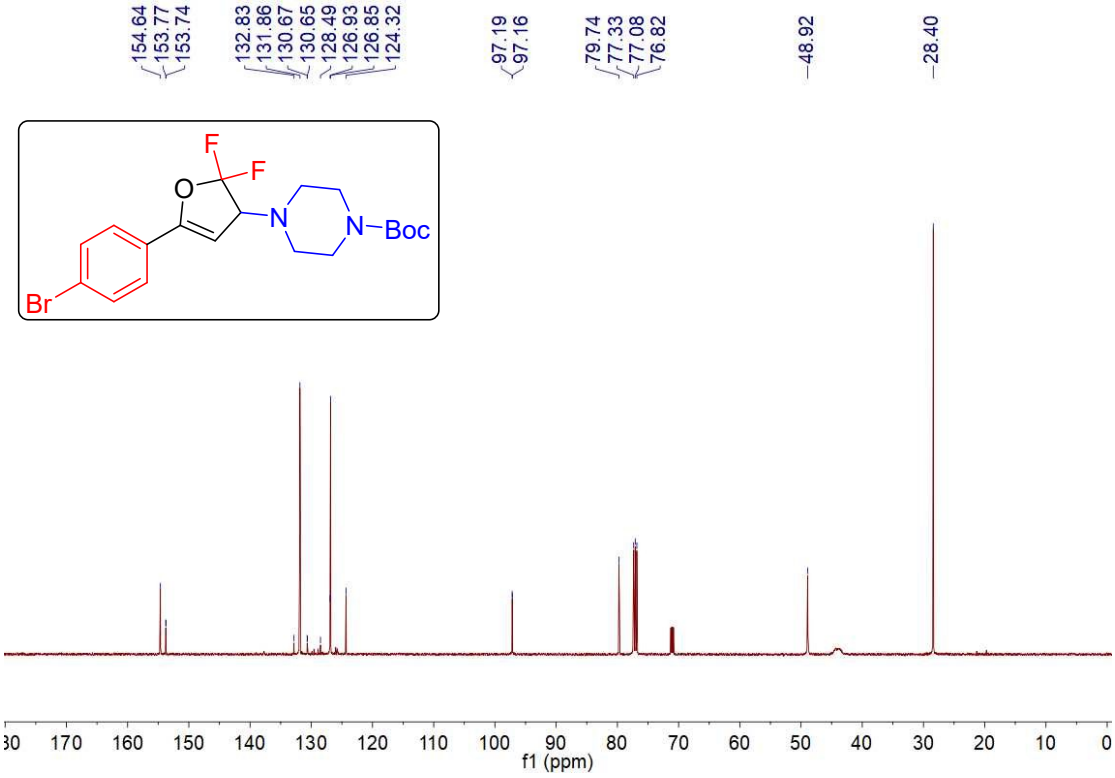
^{19}F spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(4-nitrophenyl)-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5r)



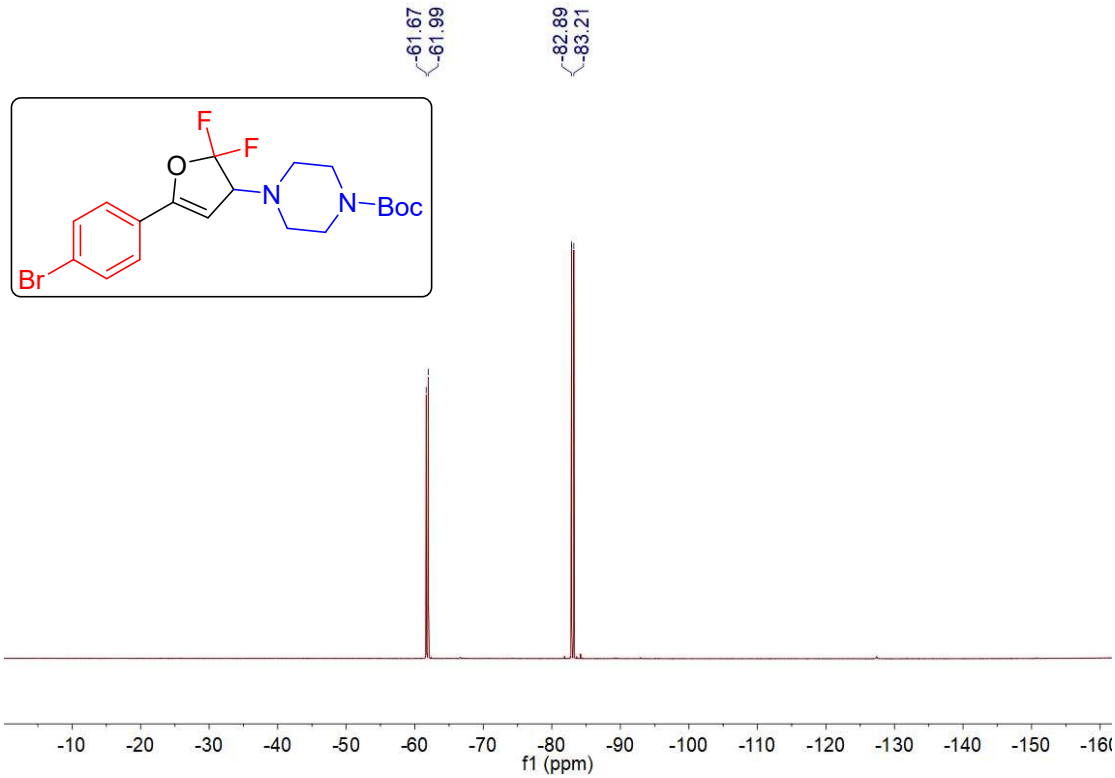
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5s)



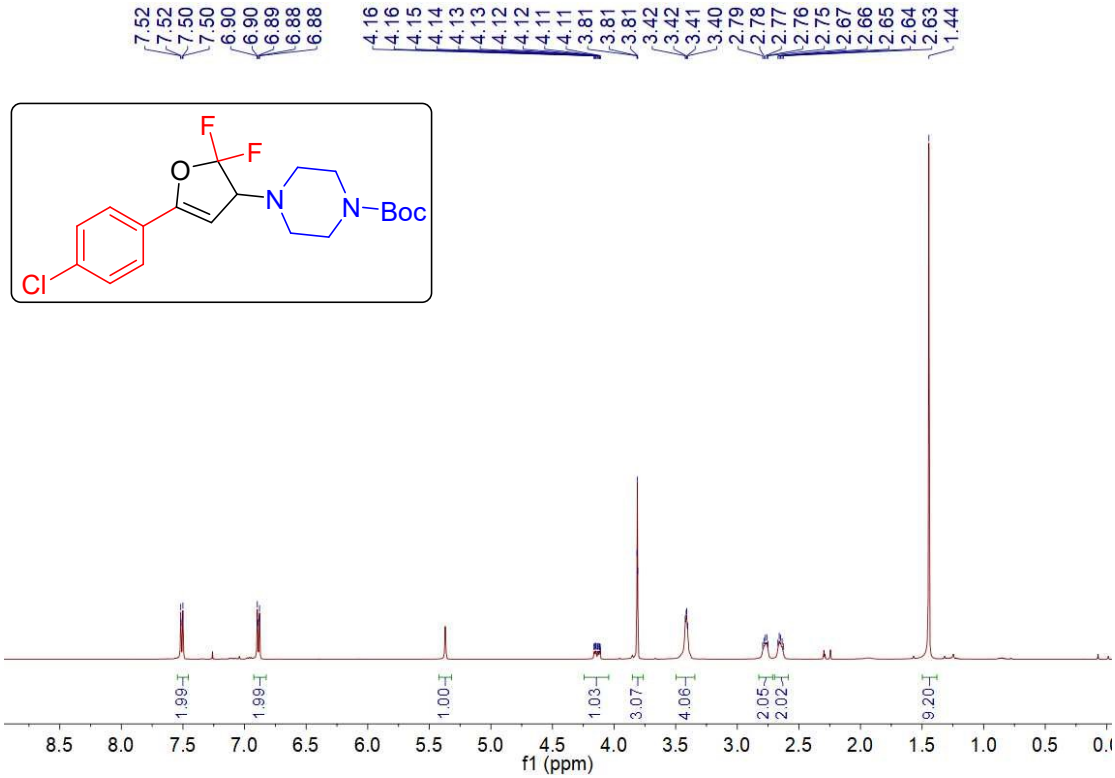
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5s)



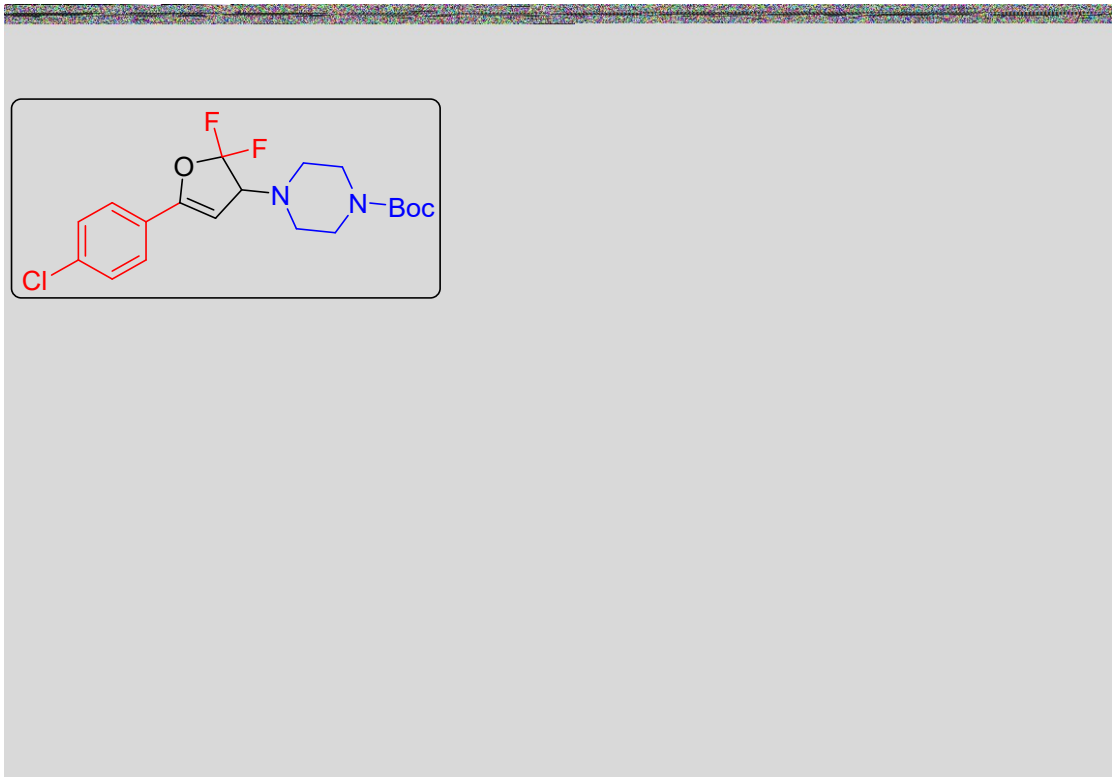
^{19}F spectrum ($CDCl_3$) tert-butyl 4-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5s)



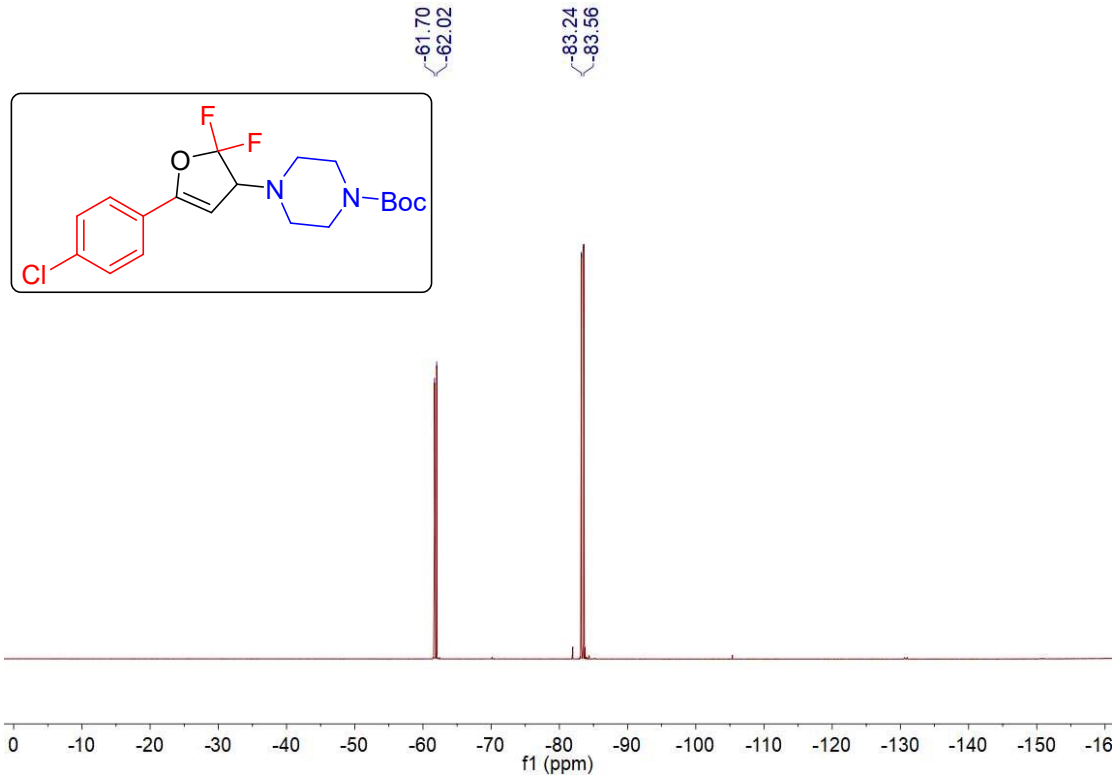
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5t)



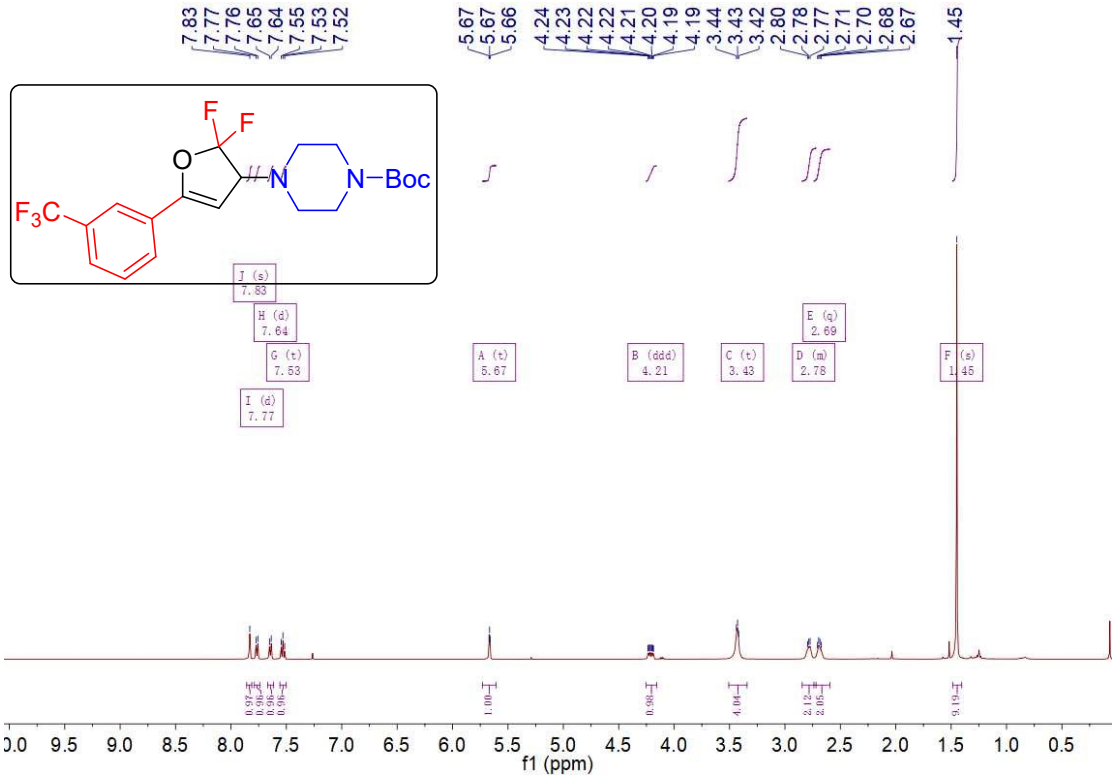
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5t)



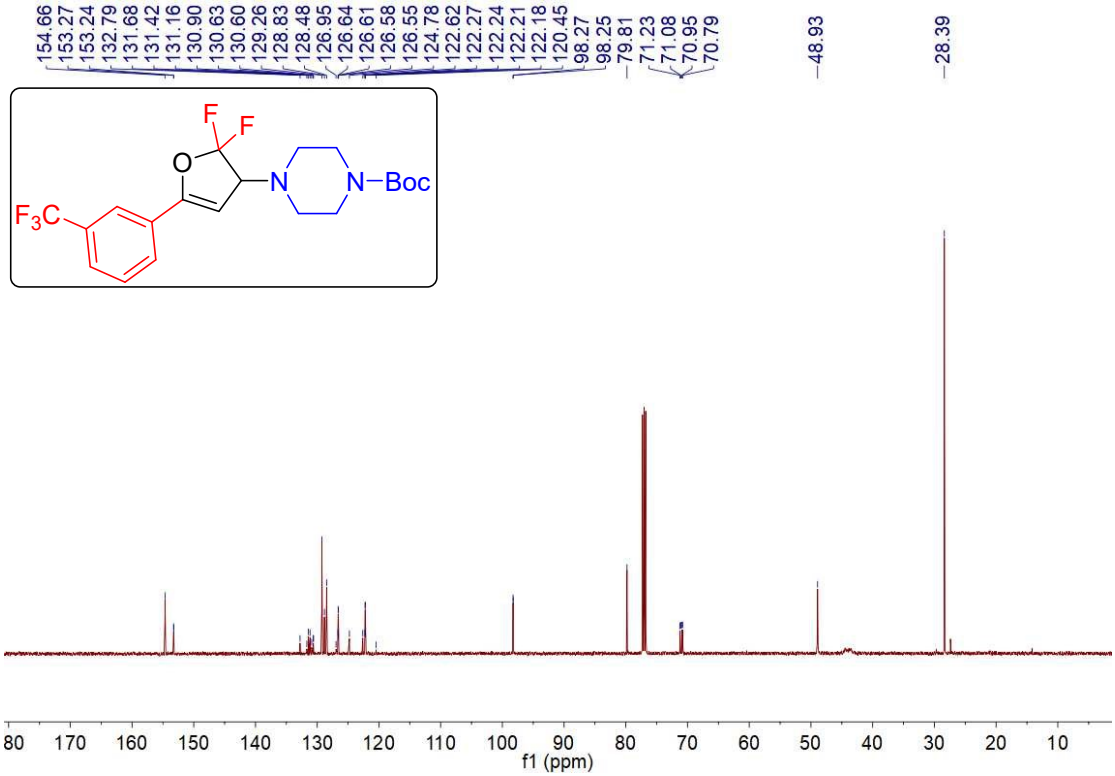
^{19}F spectrum ($CDCl_3$) tert-butyl 4-(5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl) piperazine-1-carboxylate (5t)



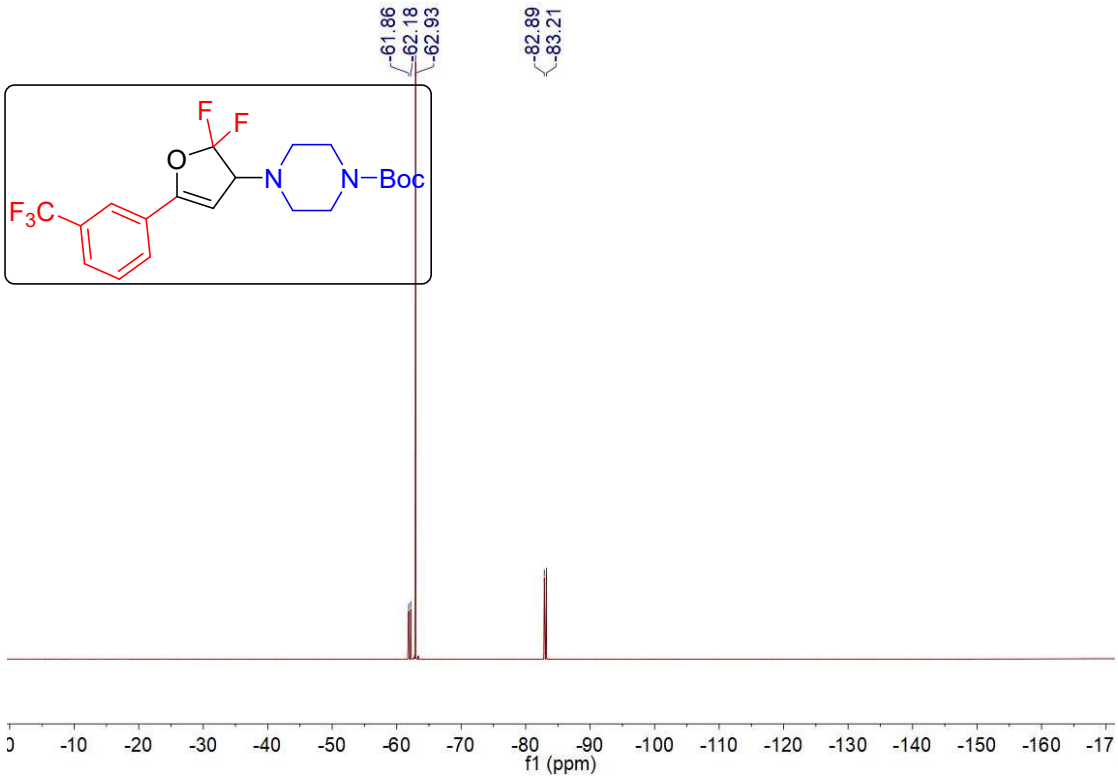
^{1}H spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(3-(trifluoromethyl)phenyl)-2,3-dihydro furan-3-yl)piperazine-1-carboxylate (5u)



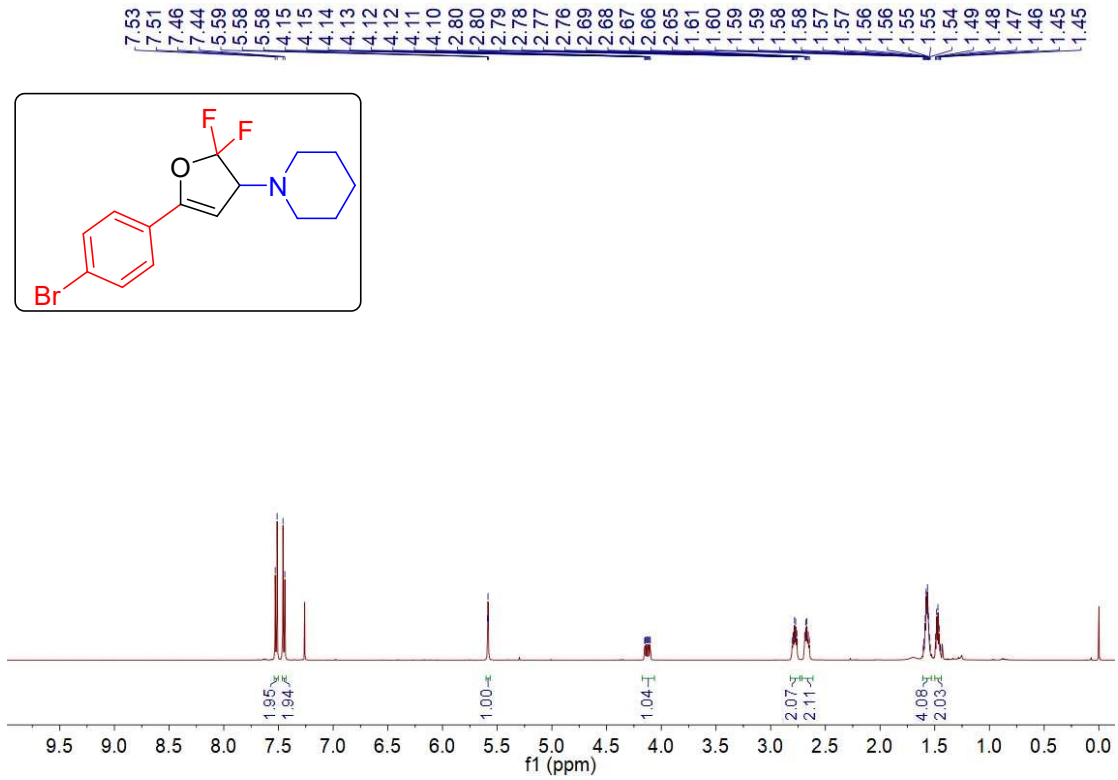
^{13}C spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(3-(trifluoromethyl)phenyl)-2,3-dihydro furan-3-yl)piperazine-1-carboxylate (5u)



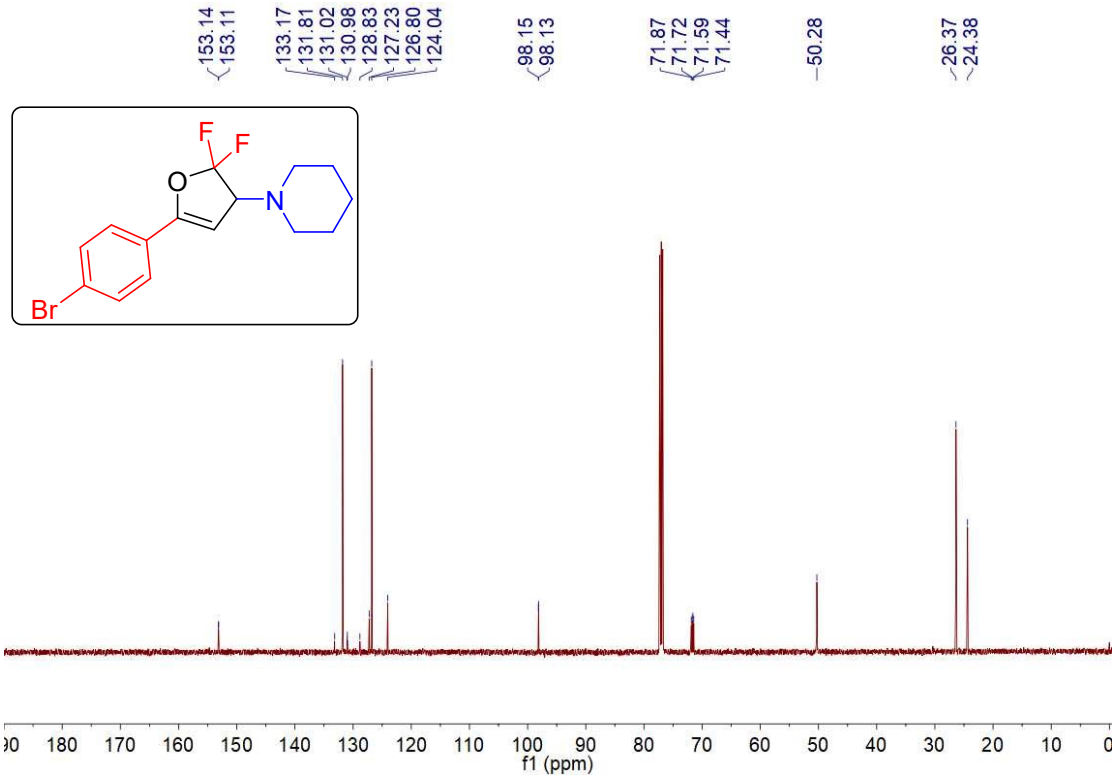
^{19}F spectrum ($CDCl_3$) tert-butyl4-(2,2-difluoro-5-(3-(trifluoromethyl)phenyl)-2,3-dihydro furan-3-yl)piperazine-1-carboxylate (5u)



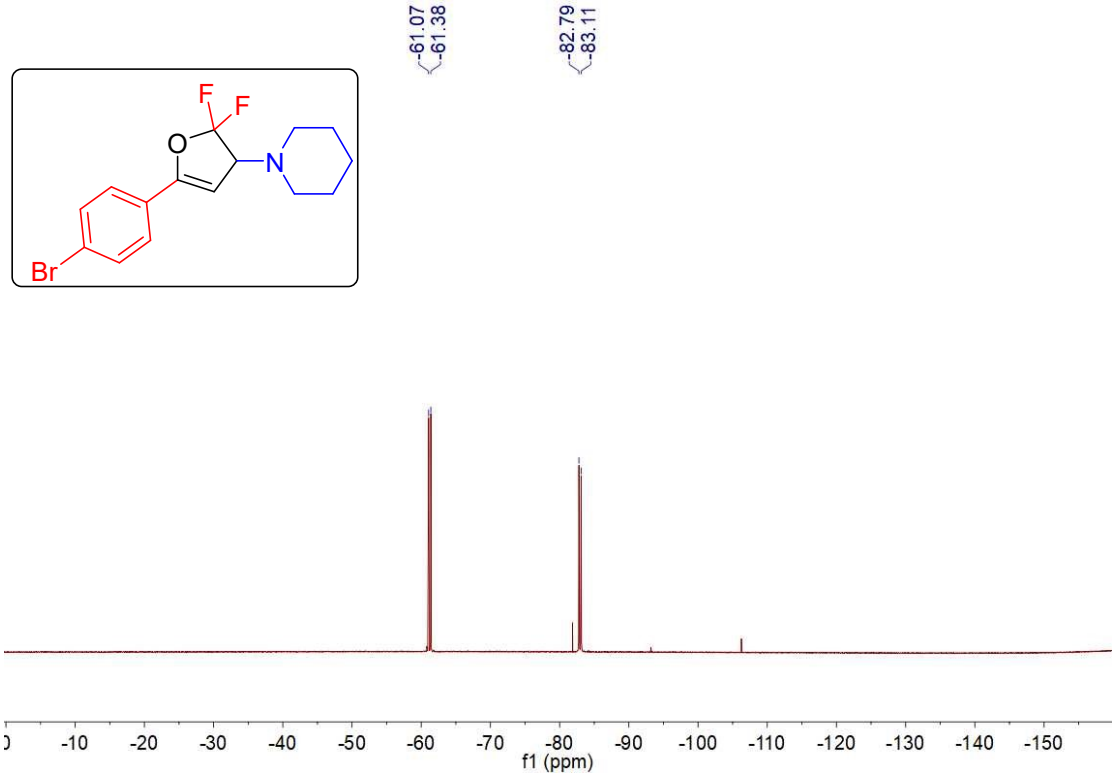
^{1}H spectrum ($CDCl_3$) 1-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl)piperidine (5v)



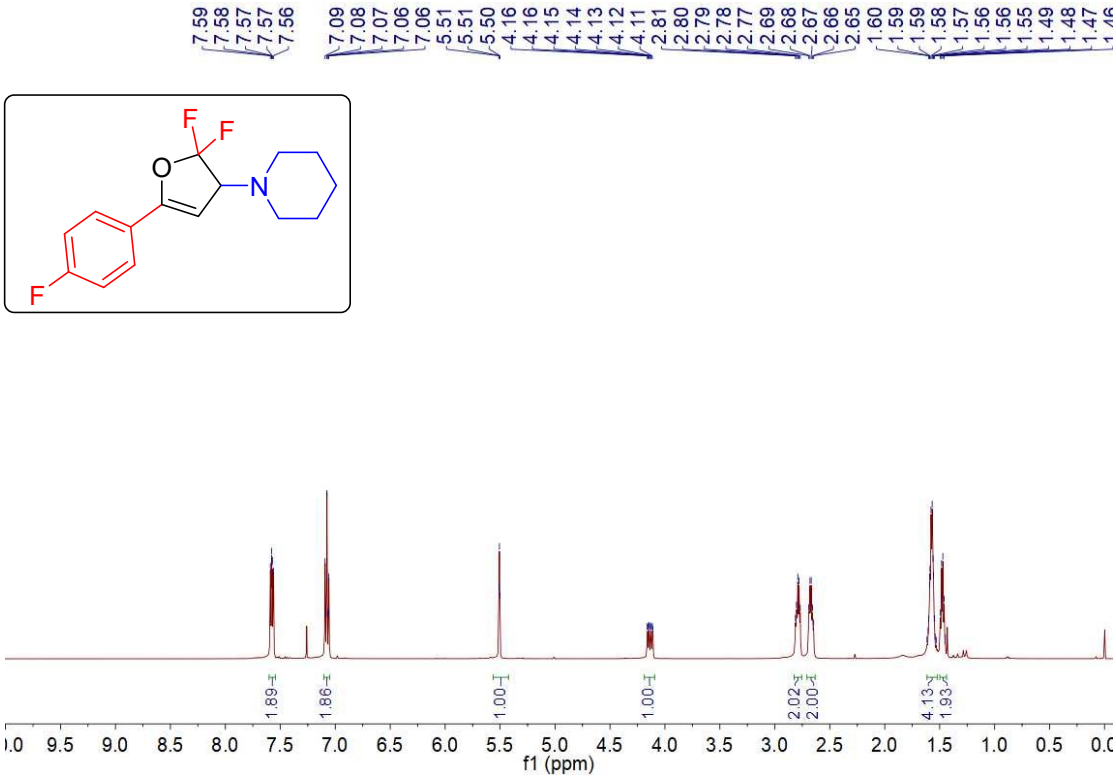
^{13}C spectrum ($CDCl_3$) 1-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl)piperidine (5v)



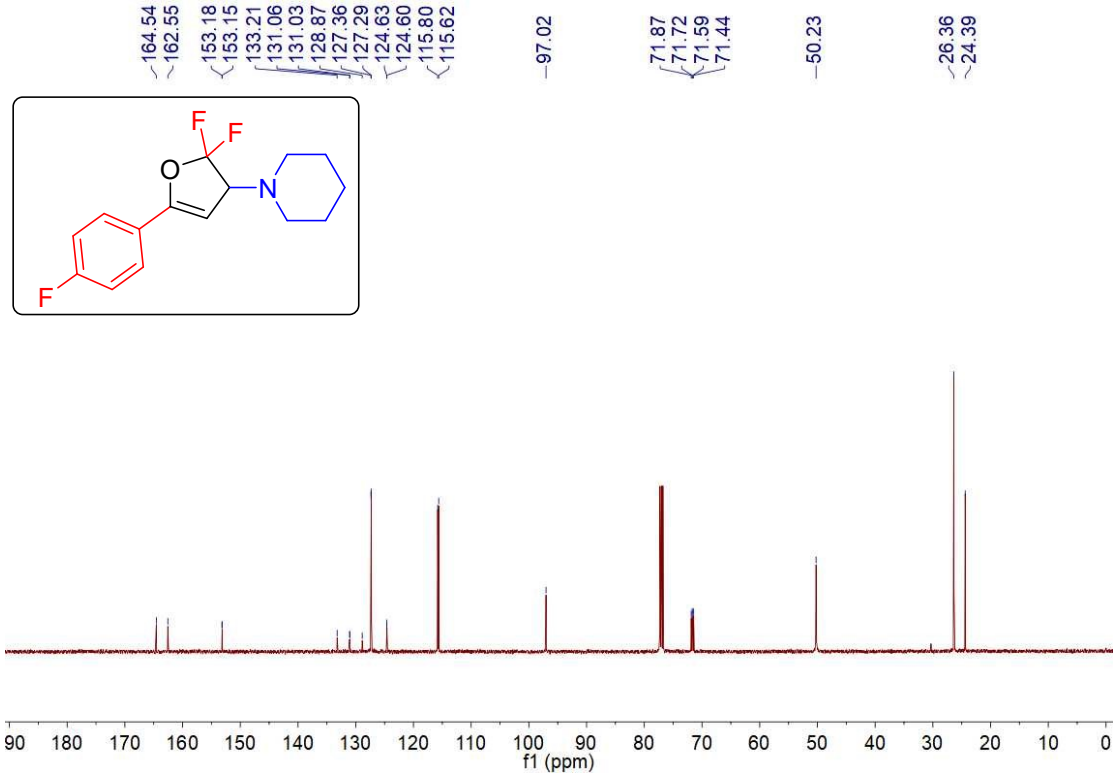
^{19}F spectrum ($CDCl_3$) 1-(5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-yl)piperidine (5v)



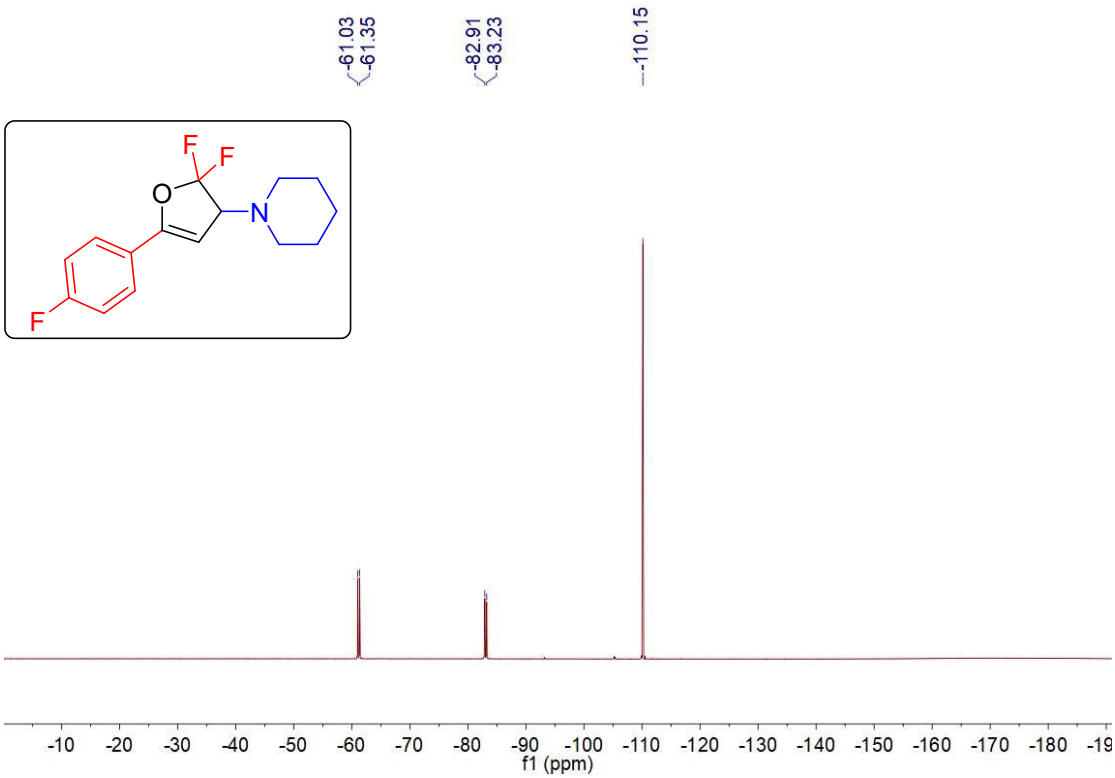
^{1}H spectrum ($CDCl_3$) 1-(2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-yl)piperidine (5w)



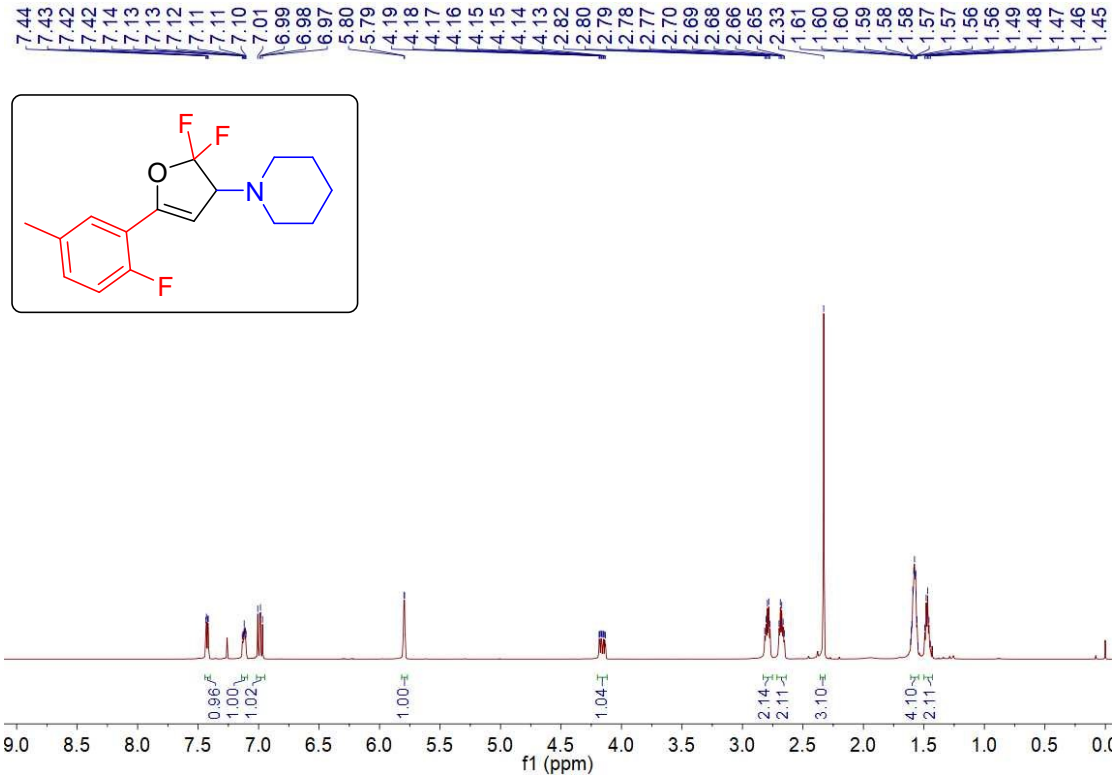
^{13}C spectrum ($CDCl_3$) 1-(2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-yl)piperidine (5w)



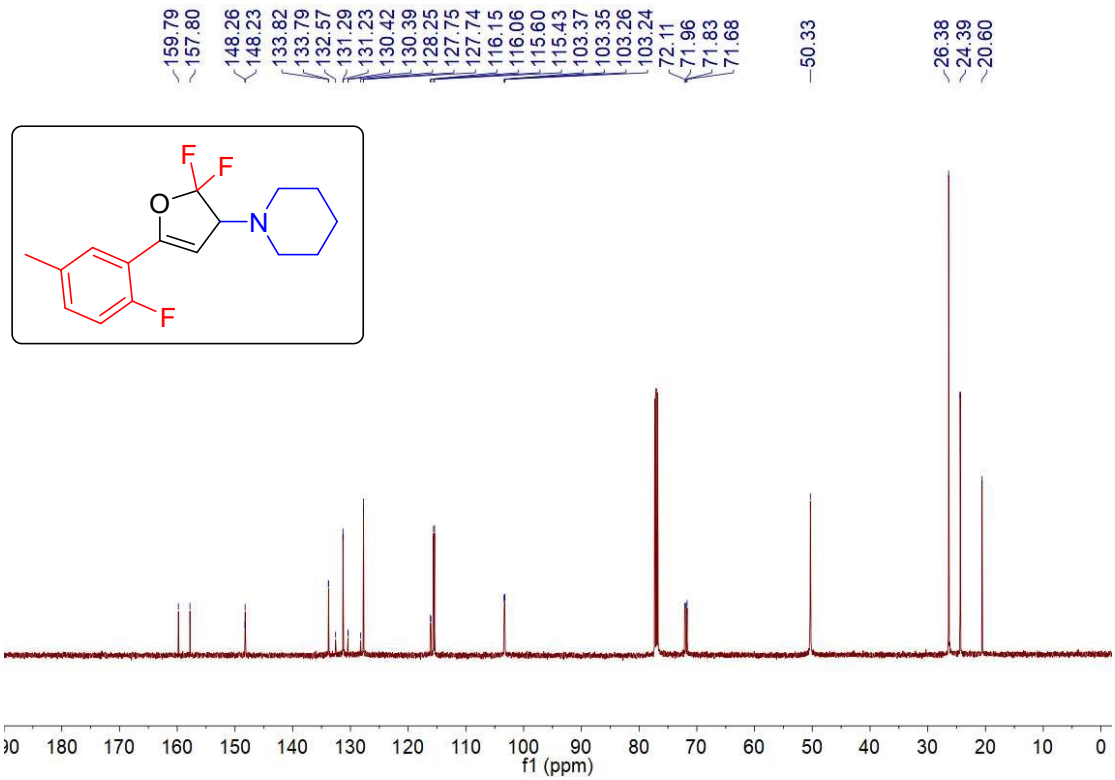
^{19}F spectrum ($CDCl_3$) 1-(2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-yl)piperidine (9w)



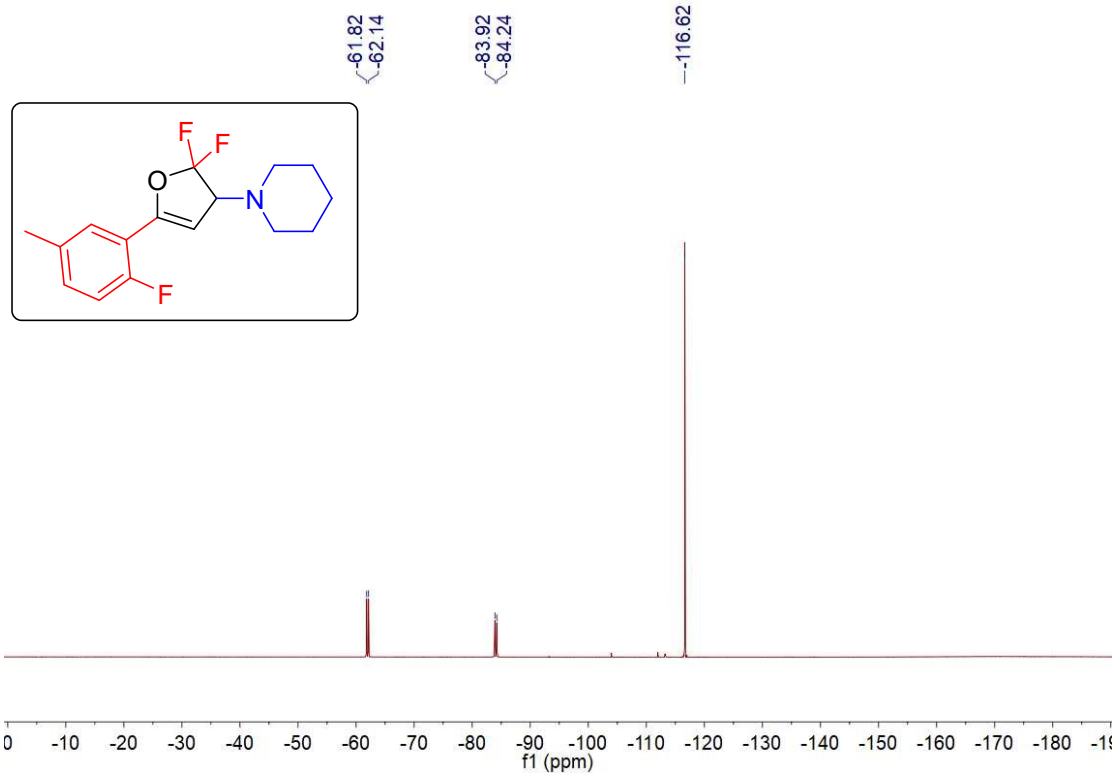
^{1}H spectrum ($CDCl_3$) 1-(2,2-difluoro-5-(2-fluoro-5-methylphenyl)-2,3-dihydrofuran-3-yl) piperidine (5x)



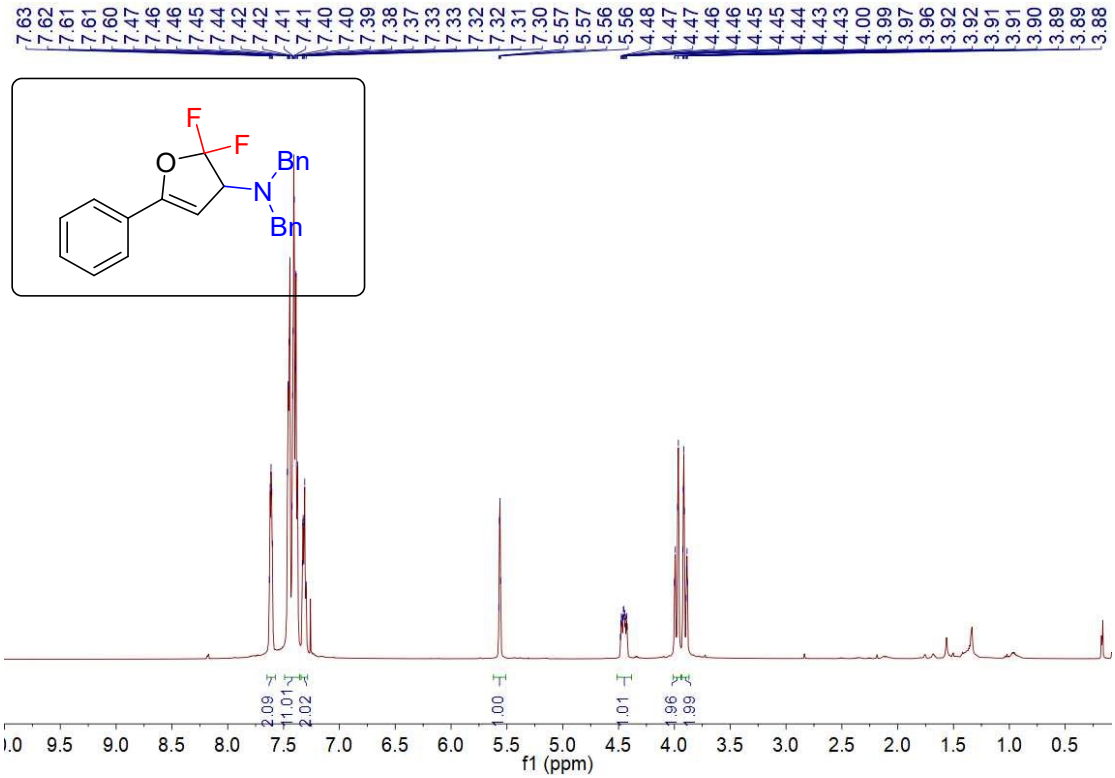
^{13}C spectrum ($CDCl_3$) 1-(2,2-difluoro-5-(2-fluoro-5-methylphenyl)-2,3-dihydrofuran-3-yl) piperidine (5x)



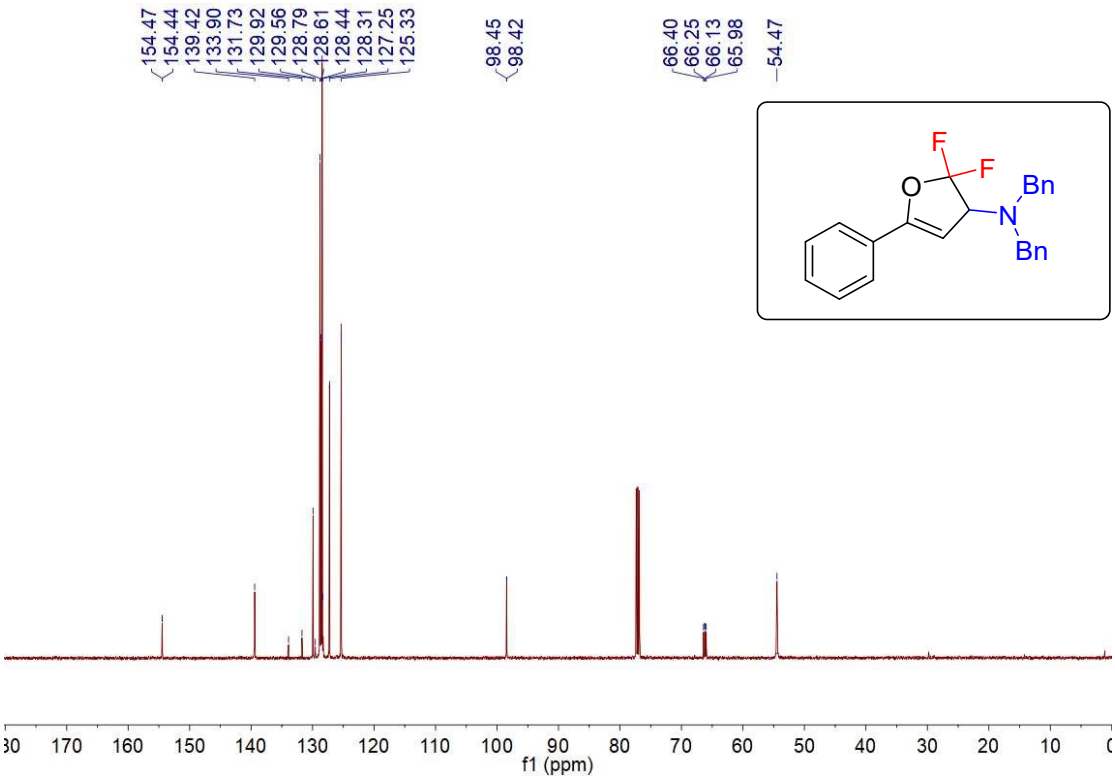
^{19}F spectrum ($CDCl_3$) 1-(2,2-difluoro-5-(2-fluoro-5-methylphenyl)-2,3-dihydrofuran-3-yl) piperidine (5x)



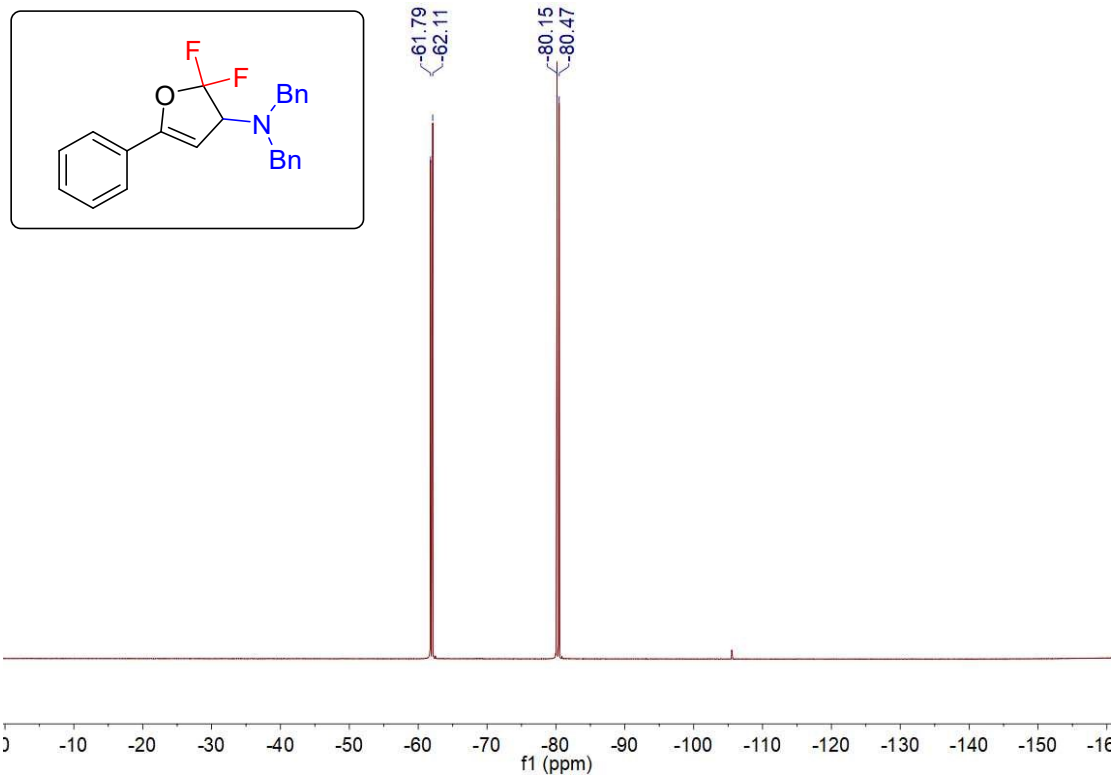
^{1}H spectrum ($CDCl_3$) N,N-dibenzyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5y)



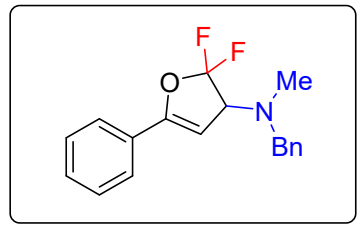
^{13}C spectrum ($CDCl_3$) N,N-dibenzyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5y)

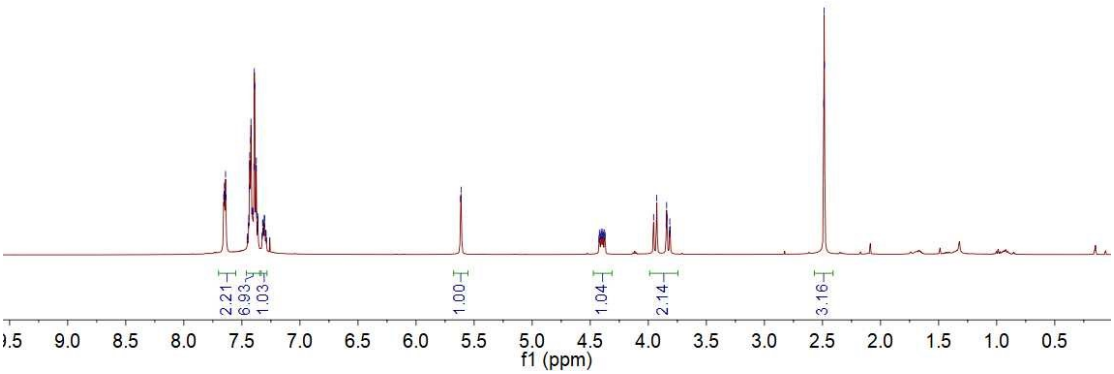


^{19}F spectrum ($CDCl_3$) N,N-dibenzyl-2,2-difluoro-5-phenyl-2,3-dihydrofuran-3-amine (5y)

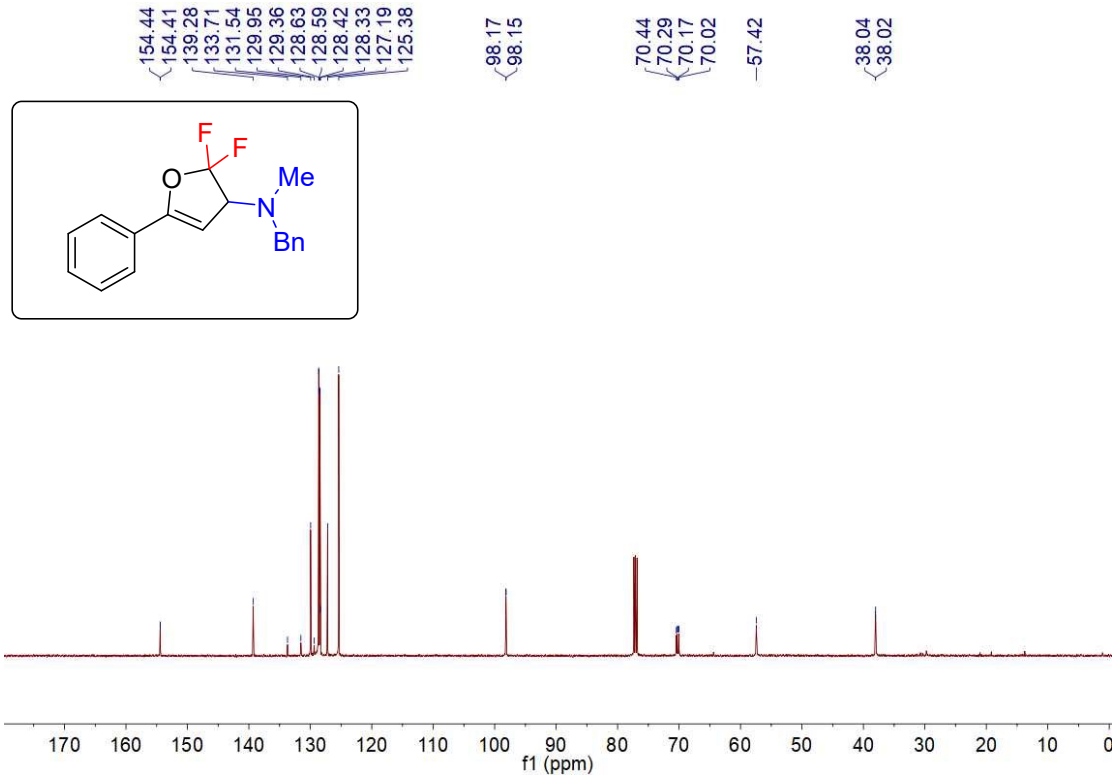


^{1}H spectrum ($CDCl_3$) N-benzyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5z)

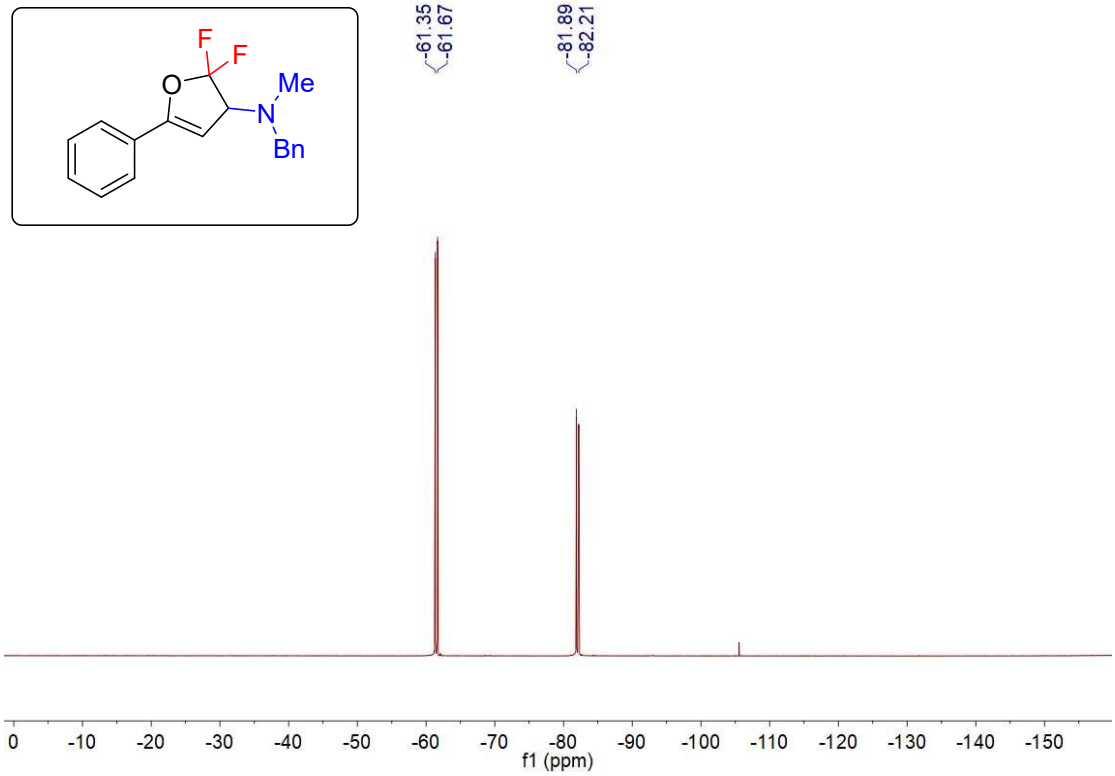




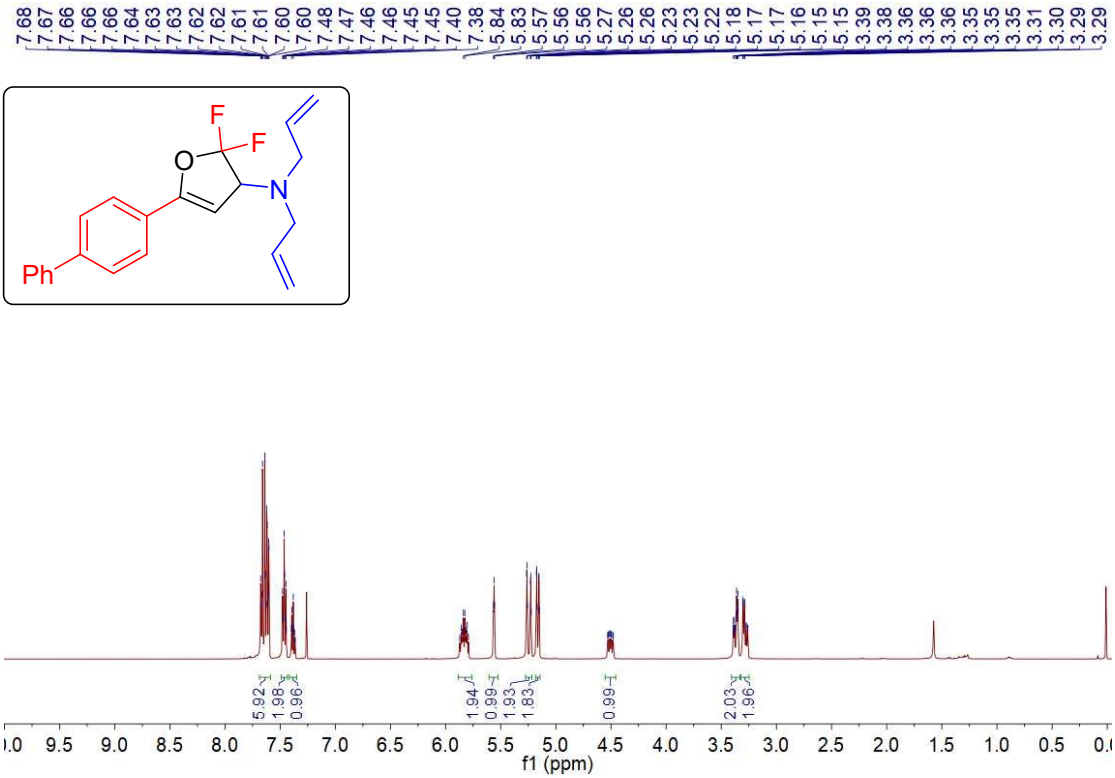
^{13}C spectrum ($CDCl_3$) N-benzyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5z)



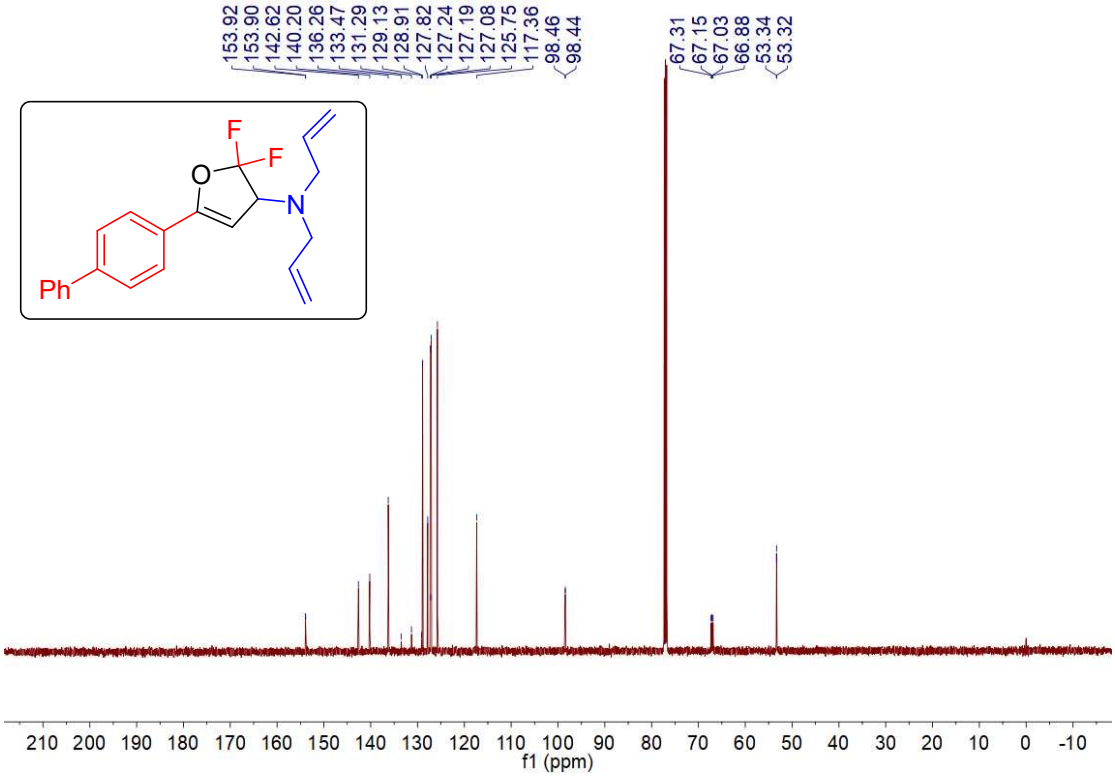
^{19}F spectrum ($CDCl_3$) N-benzyl-2,2-difluoro-N-methyl-5-phenyl-2,3-dihydrofuran-3-amine (5z)



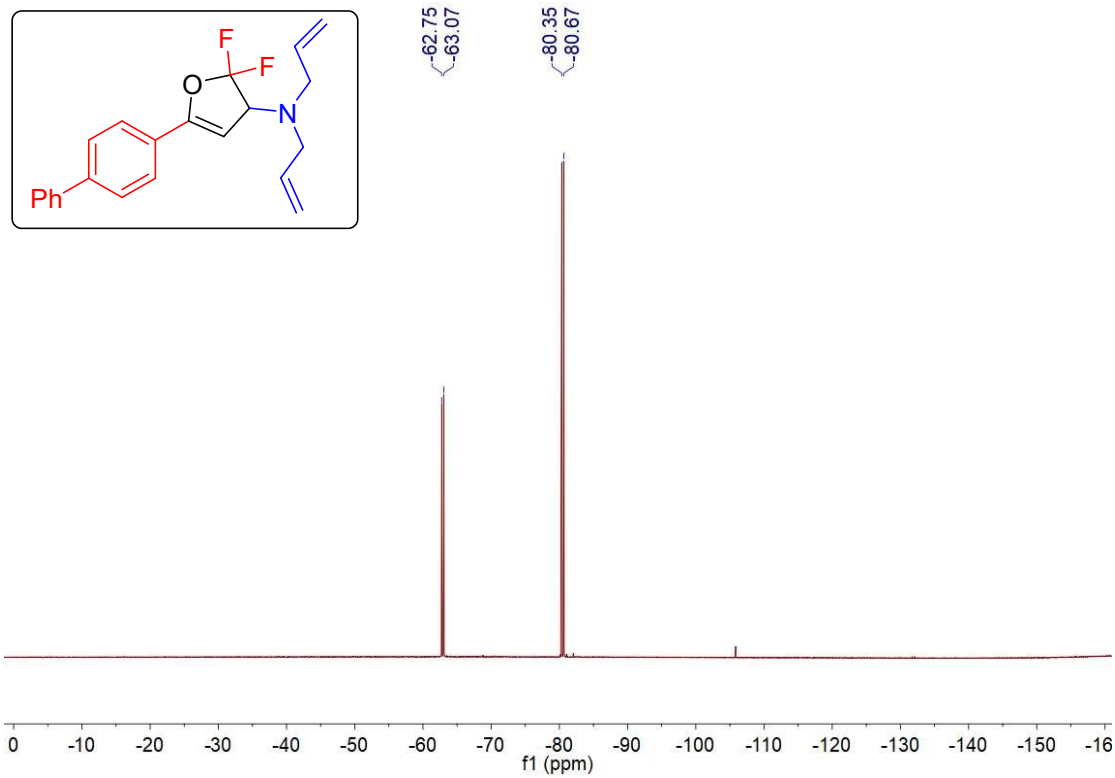
^{1}H spectrum ($CDCl_3$) 5-([1,1'-biphenyl]-4-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5aa)



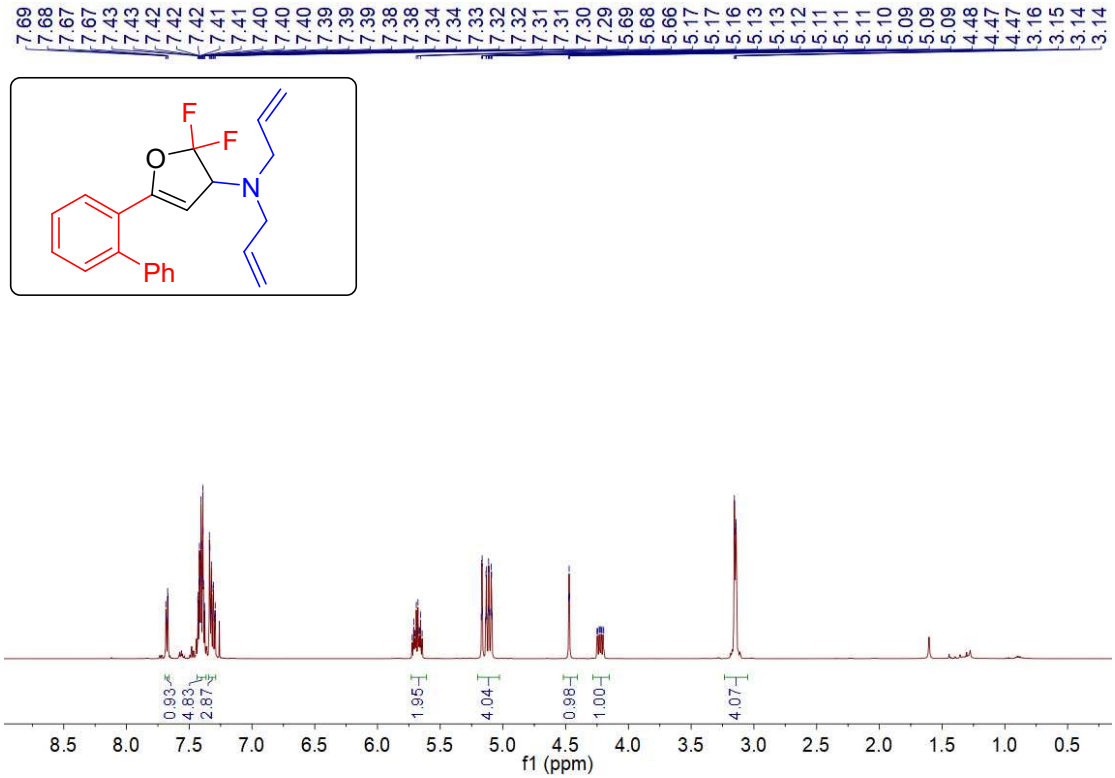
^{13}C spectrum ($CDCl_3$) 5-([1,1'-biphenyl]-4-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5aa)



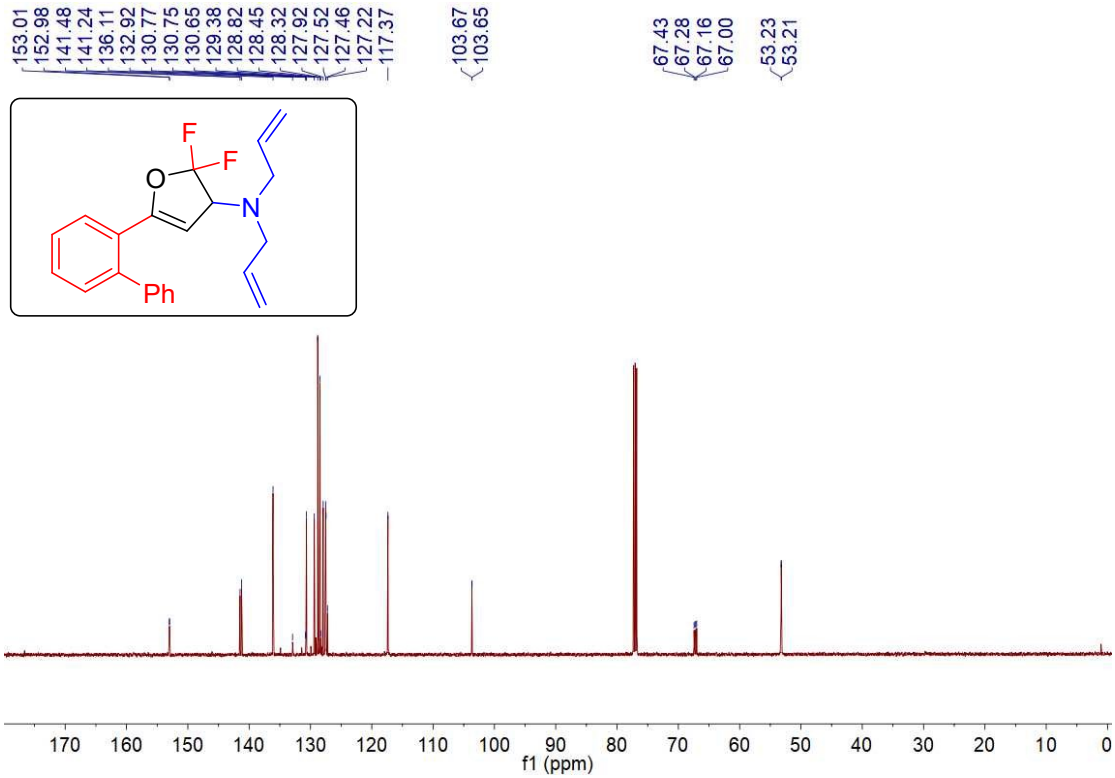
^{19}F spectrum ($CDCl_3$) 5-([1,1'-biphenyl]-4-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5aa)



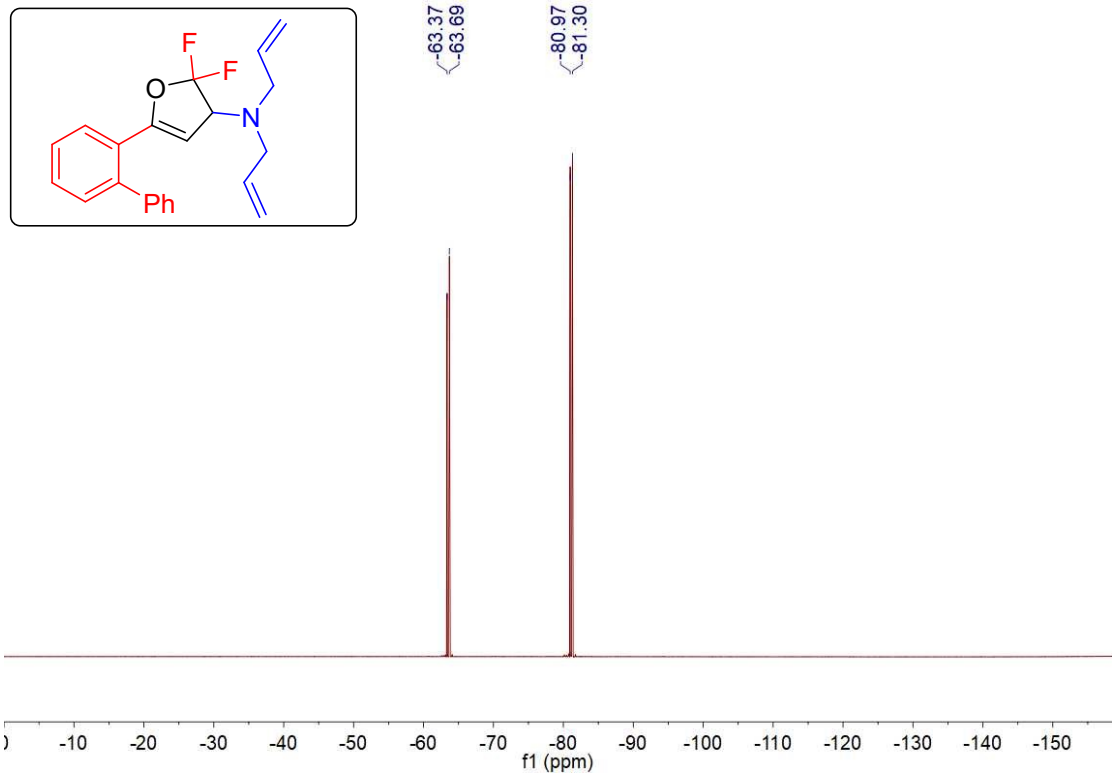
^{1}H spectrum ($CDCl_3$) 5-([1,1'-biphenyl]-2-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5ab)



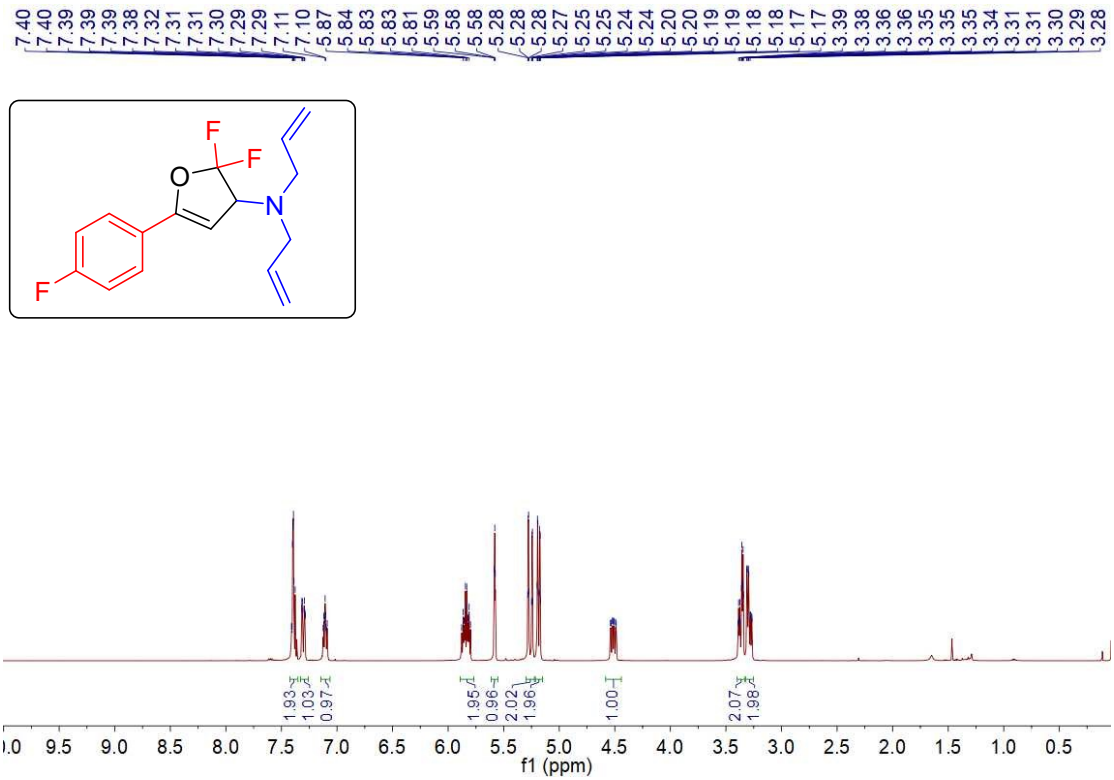
^{13}C spectrum ($CDCl_3$)5-([1,1'-biphenyl]-2-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5ab)



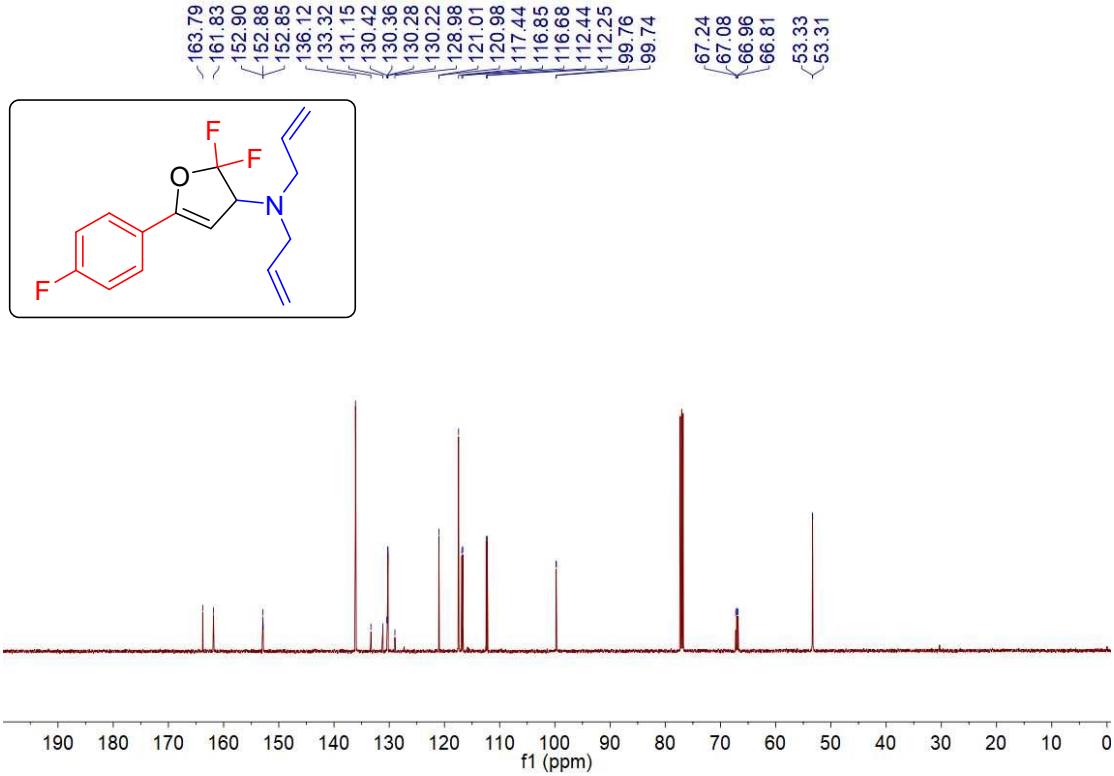
^{19}F spectrum ($CDCl_3$) 5-([1,1'-biphenyl]-2-yl)-N,N-diallyl-2,2-difluoro-2,3-dihydrofuran-3-amine (5ab)



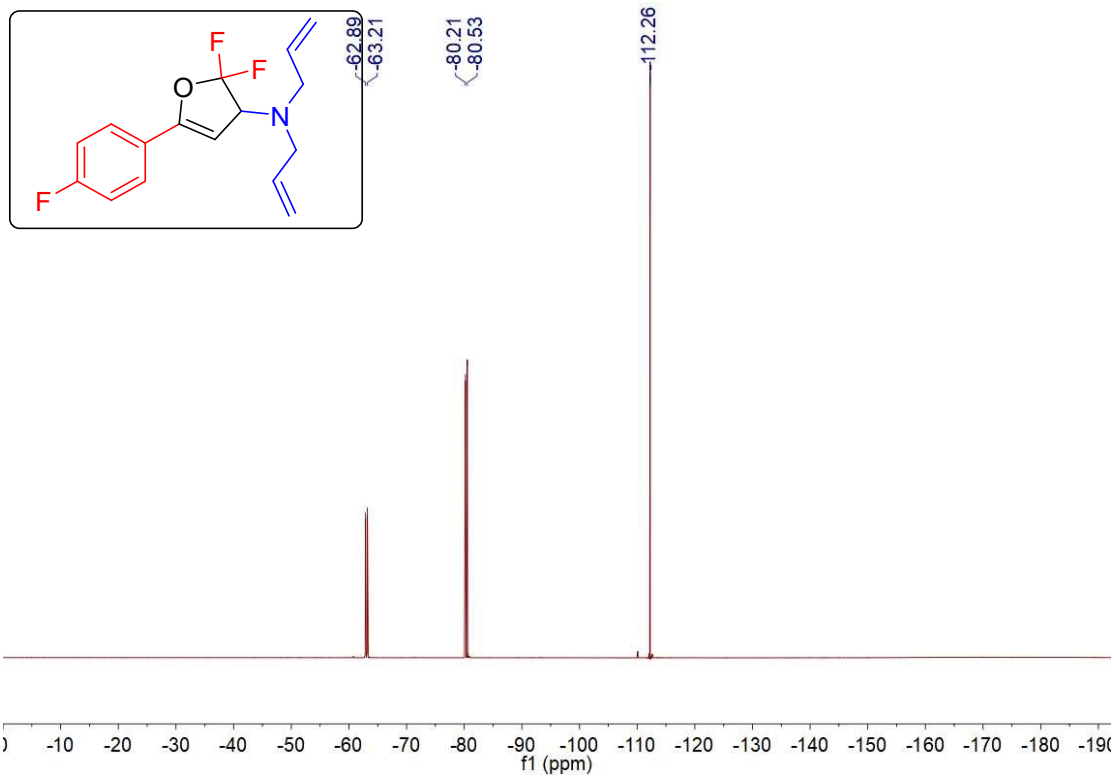
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-amine (5ac)



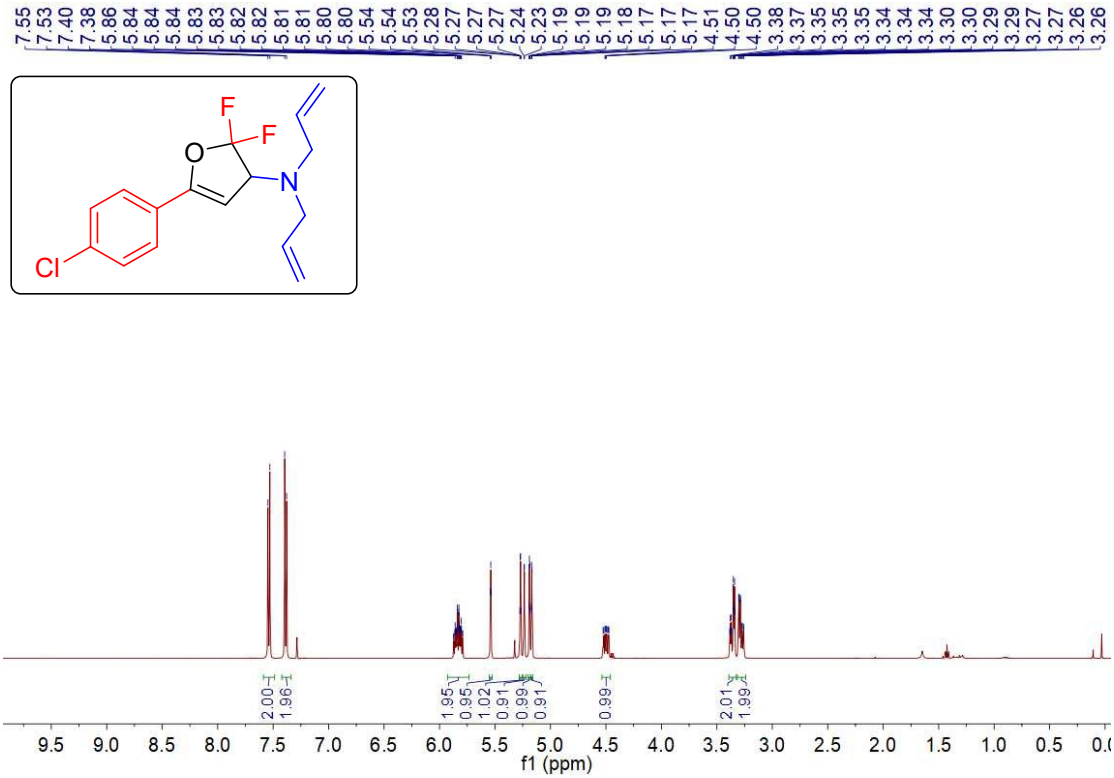
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-amine (5ac)



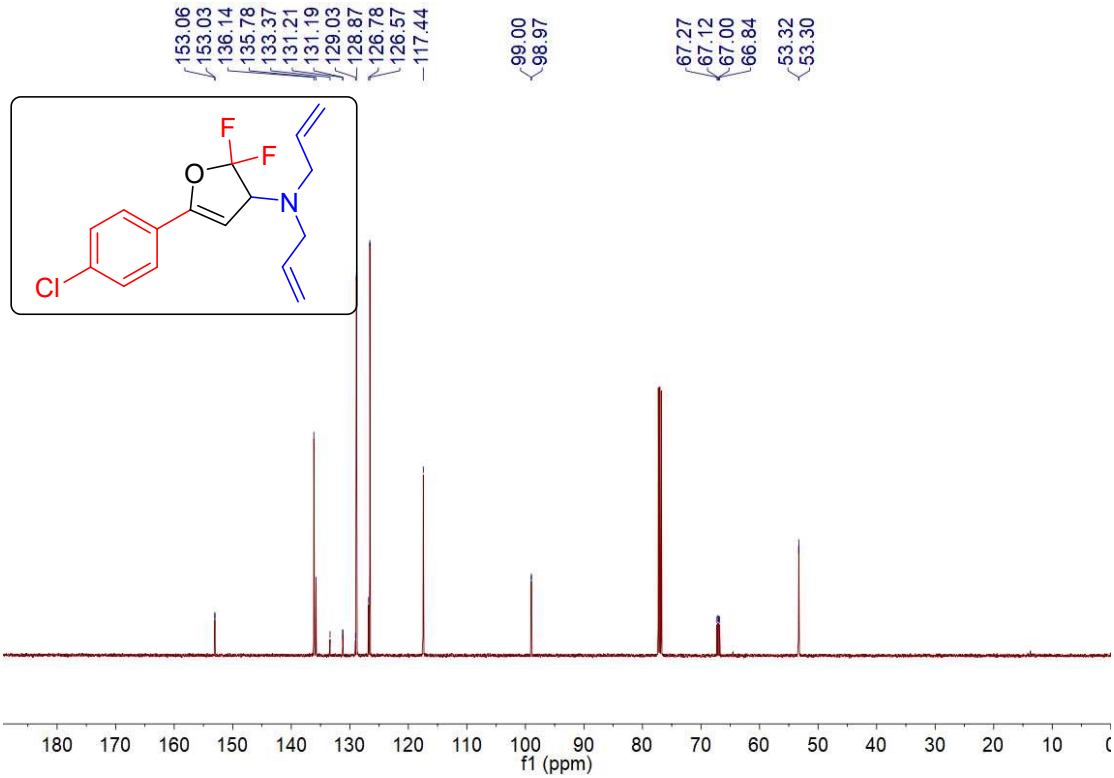
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-fluorophenyl)-2,3-dihydrofuran-3-amine (5ac)



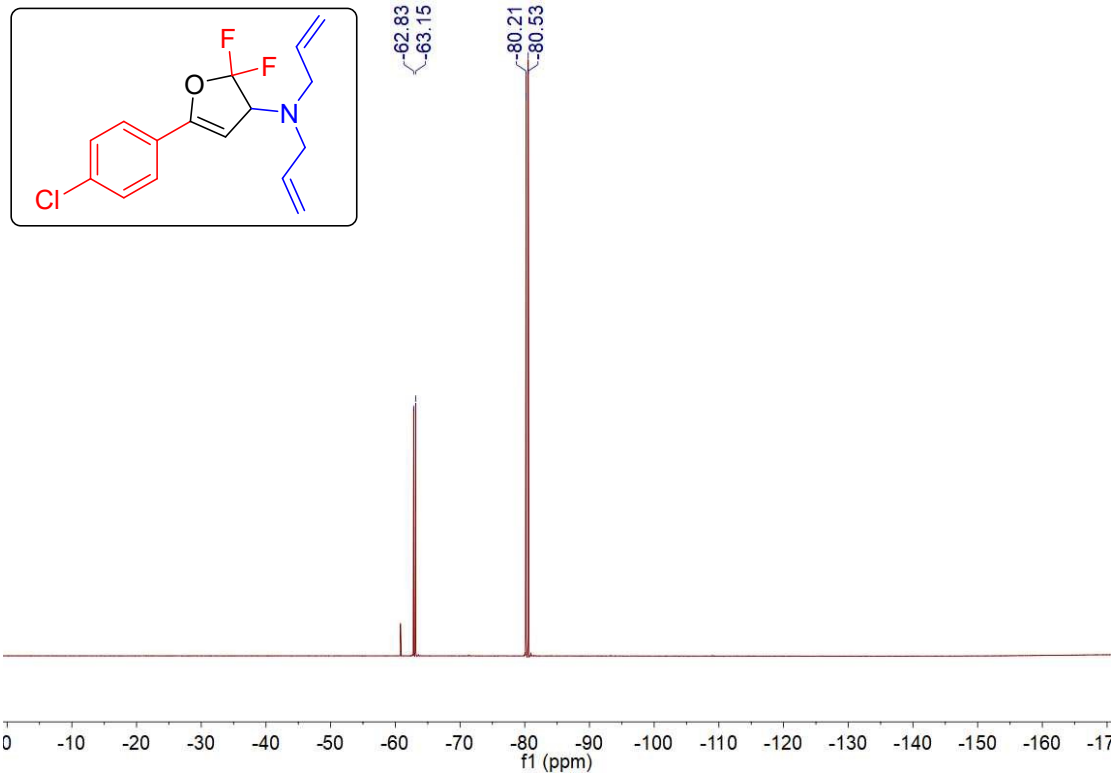
^{1}H spectrum ($CDCl_3$) N,N-diallyl-5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ad)



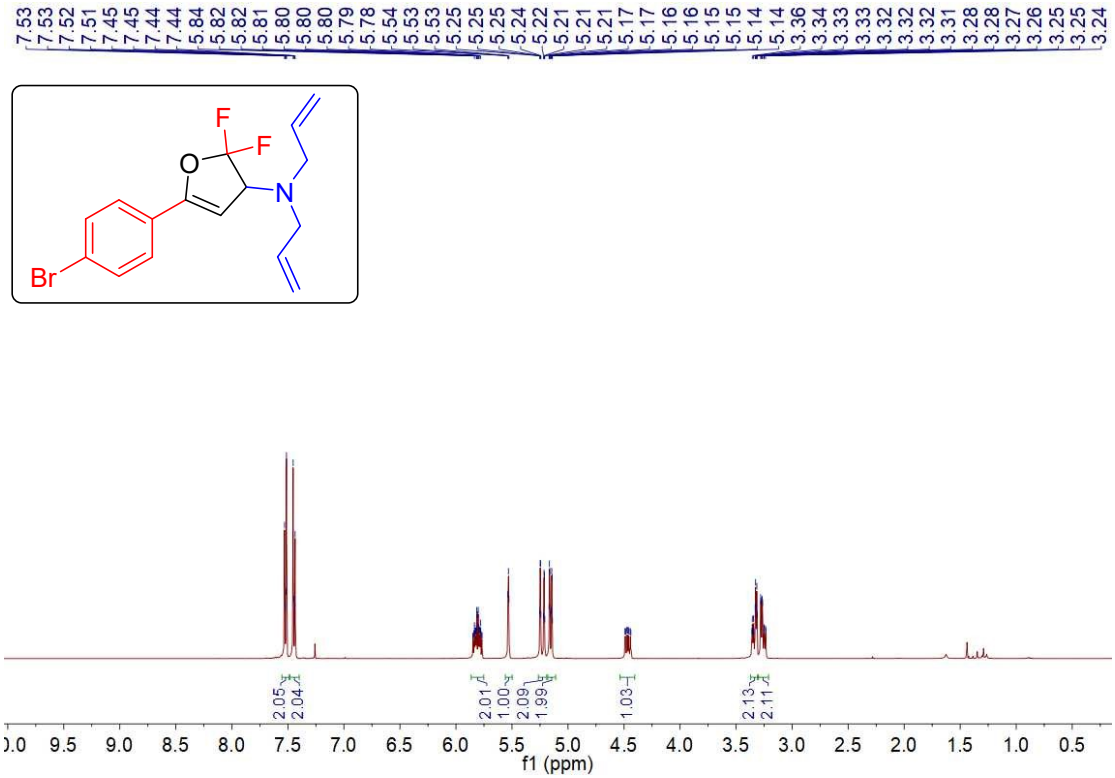
^{13}C spectrum ($CDCl_3$) N,N-diallyl-5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ad)



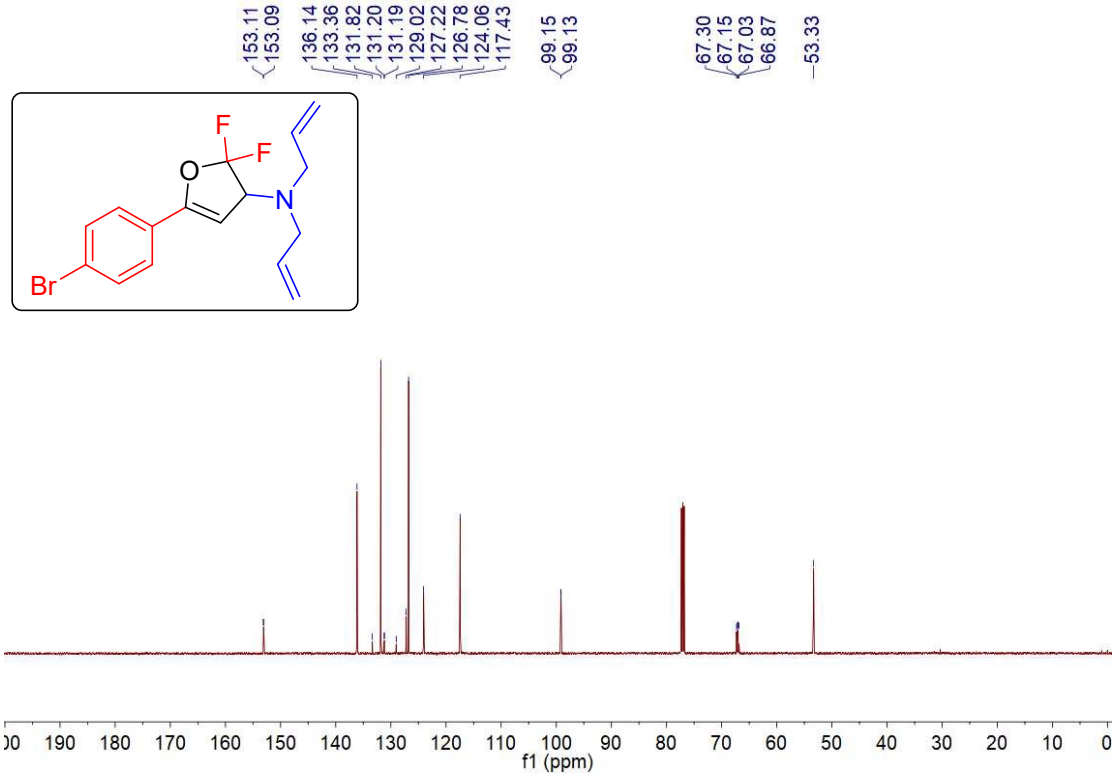
^{19}F spectrum ($CDCl_3$) N,N-diallyl-5-(4-chlorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ad)



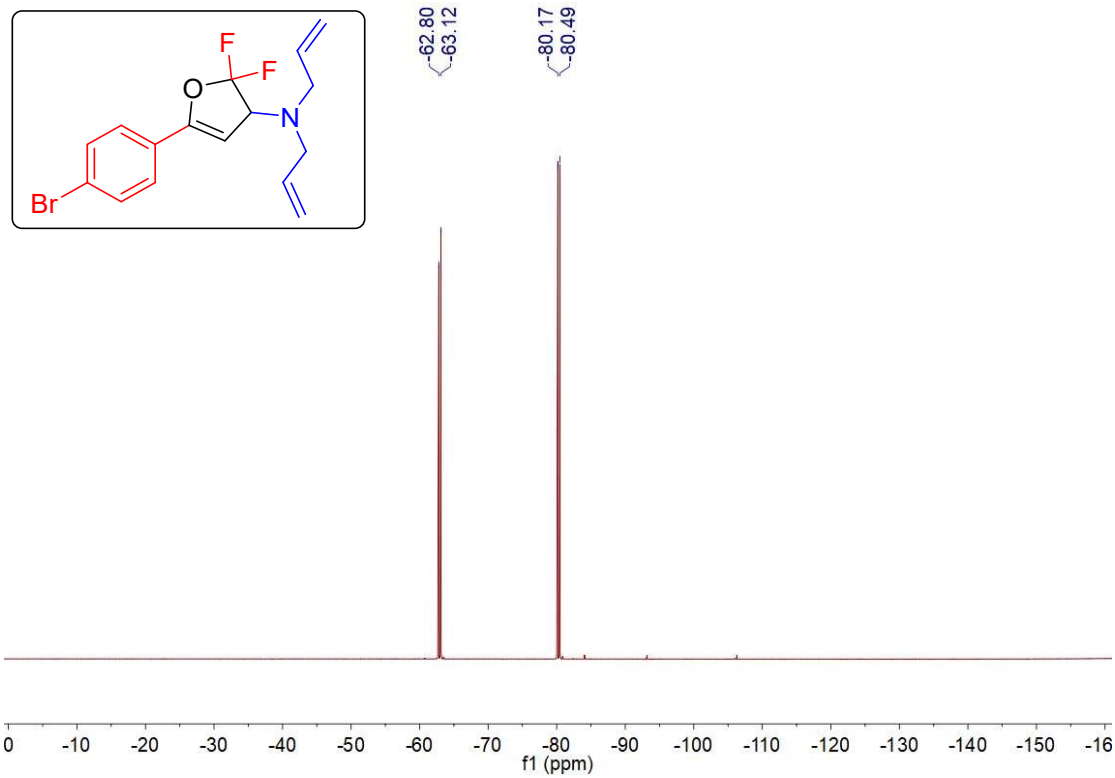
^{1}H spectrum ($CDCl_3$) N,N-diallyl-5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ae)



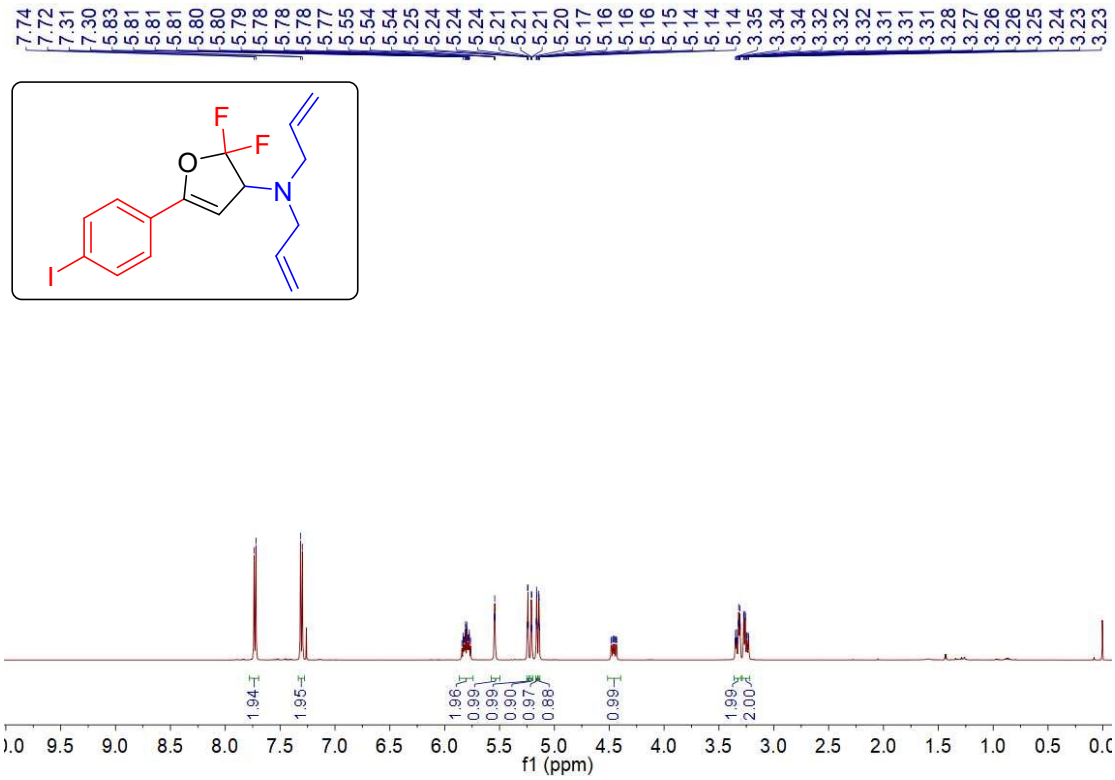
^{13}C spectrum ($CDCl_3$) N,N-diallyl-5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ae)



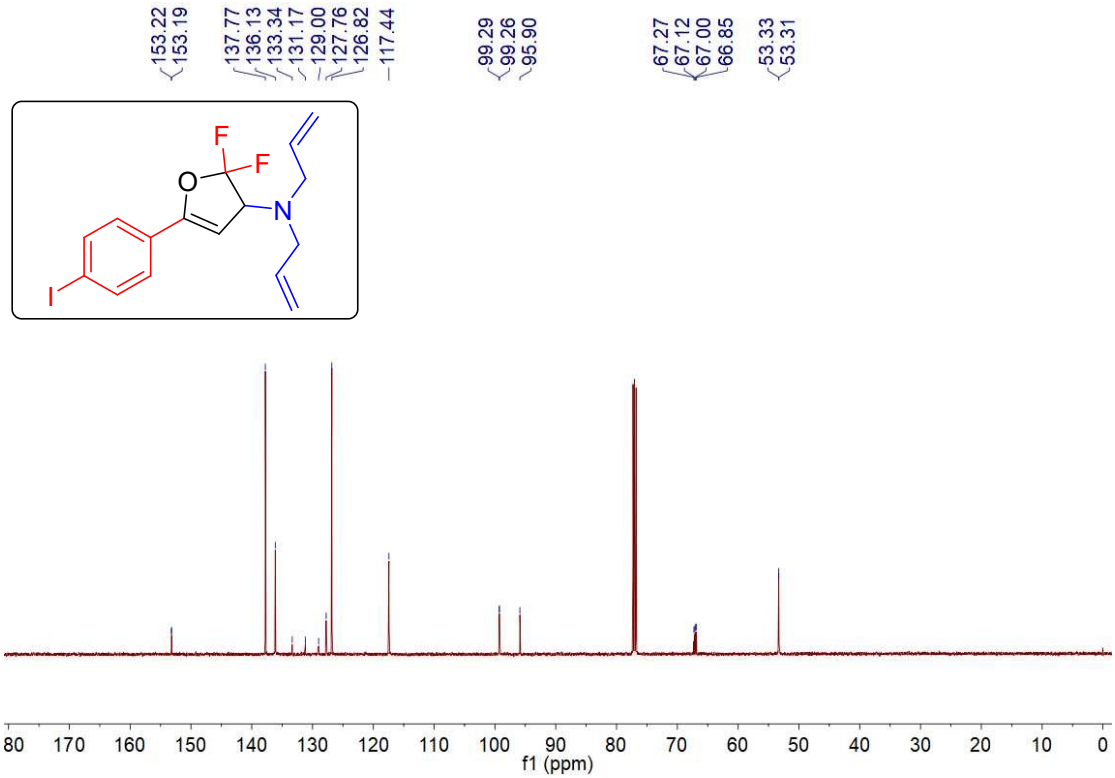
^{19}F spectrum ($CDCl_3$) N,N-diallyl-5-(4-bromophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5ae)



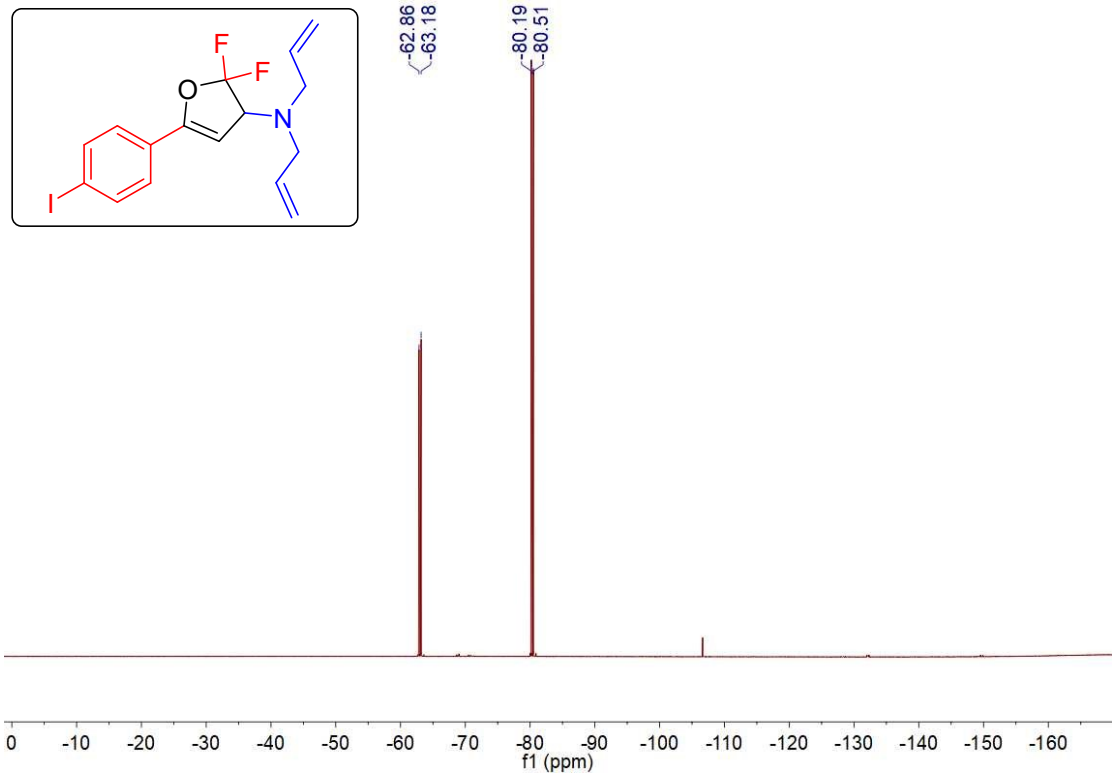
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-iodophenyl)-2,3-dihydrofuran-3-amine (5af)



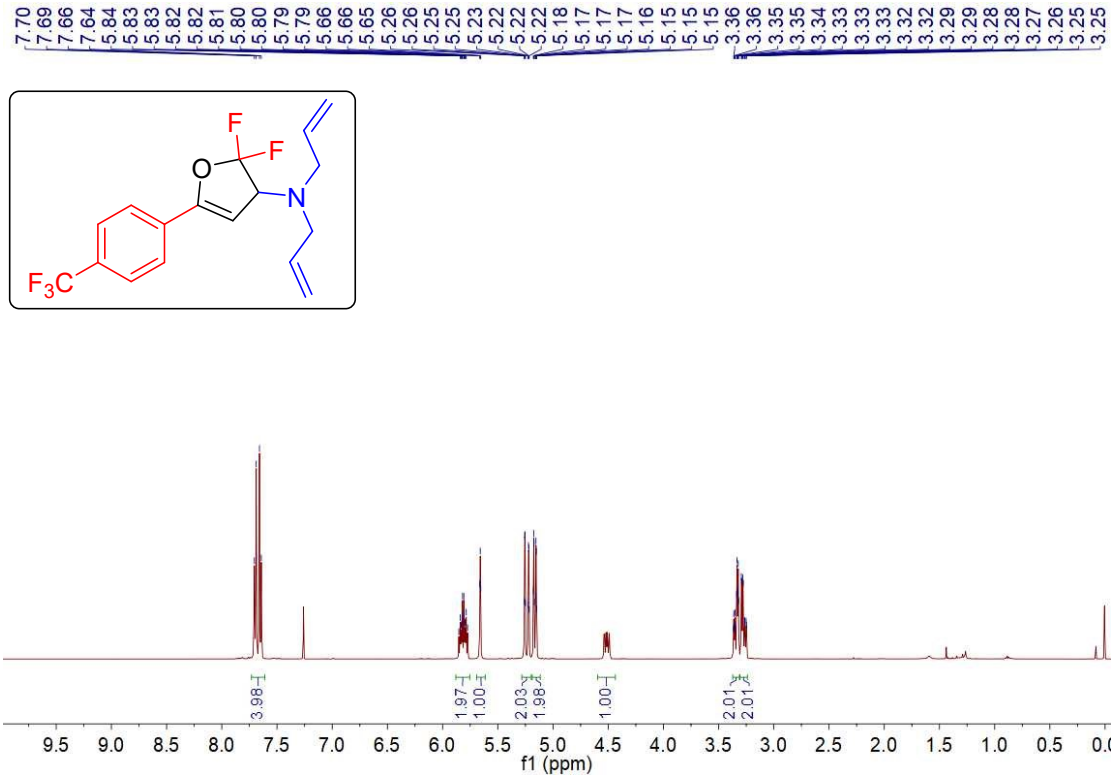
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-iodophenyl)-2,3-dihydrofuran-3-amine (5af)



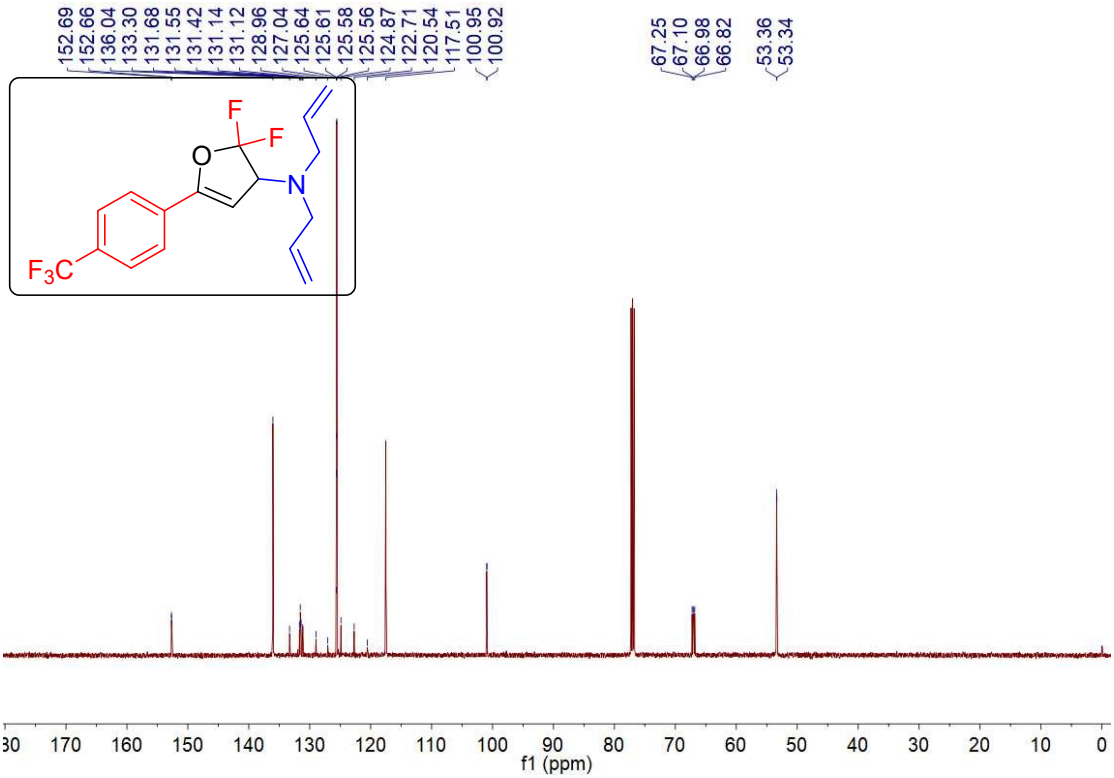
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-iodophenyl)-2,3-dihydrofuran-3-amine (5af)



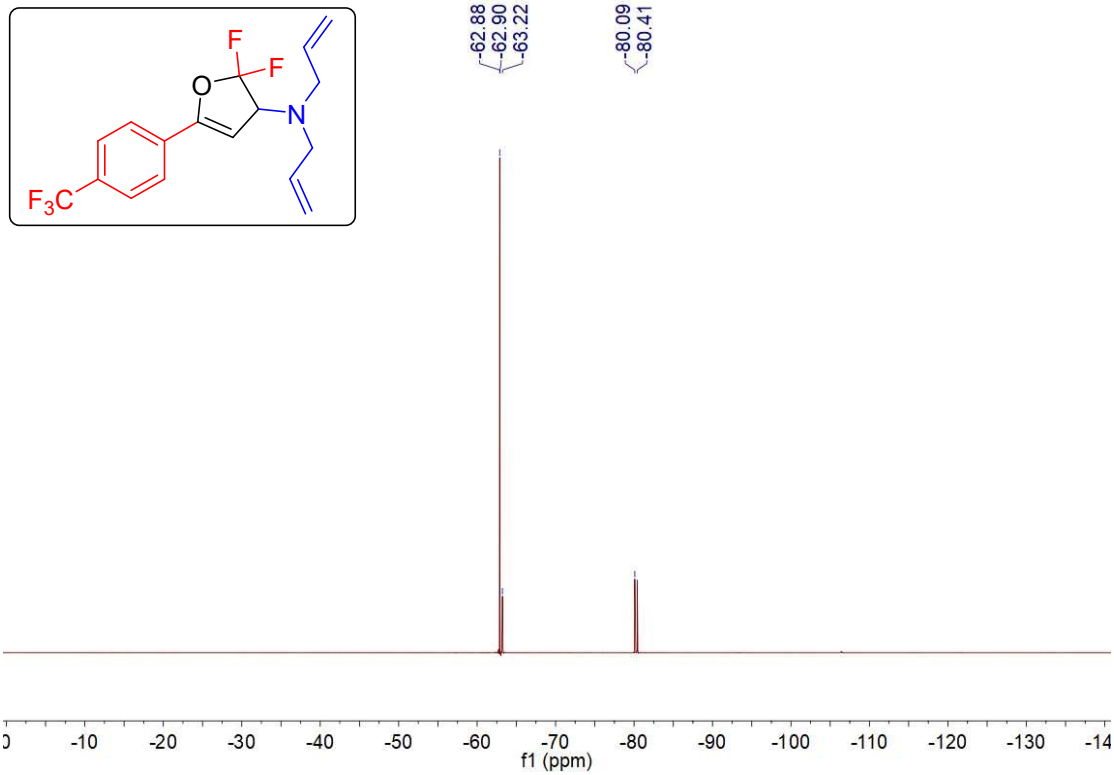
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ag)



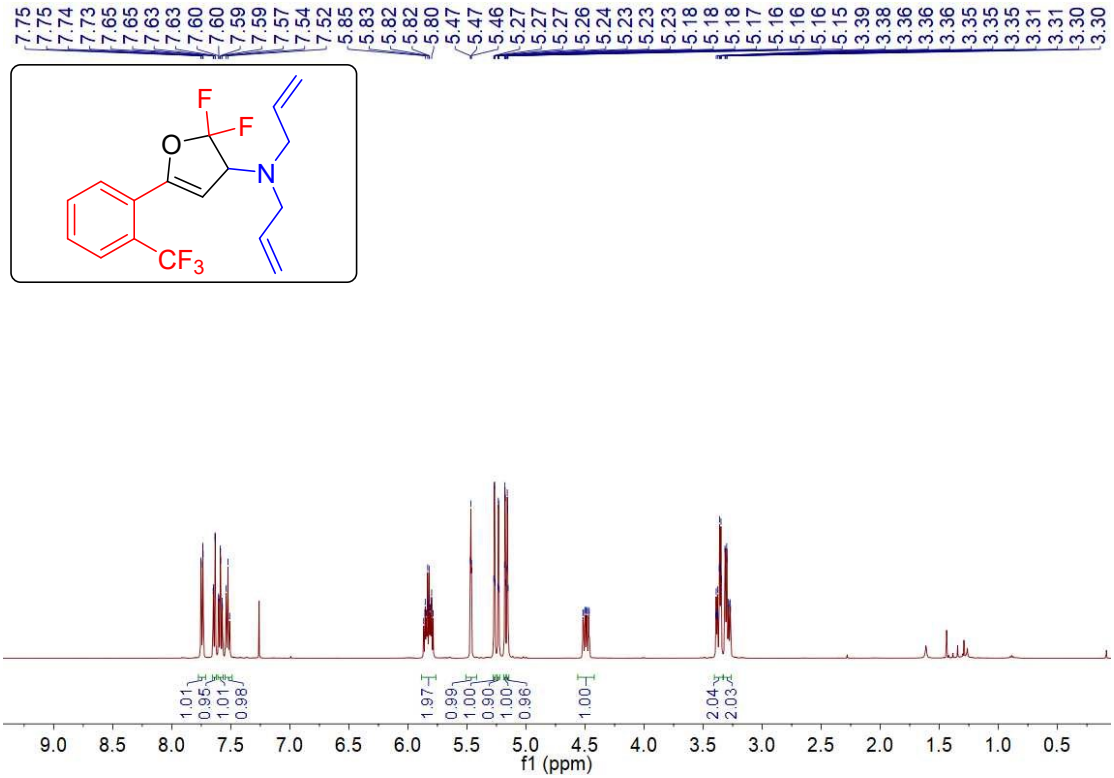
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ag)



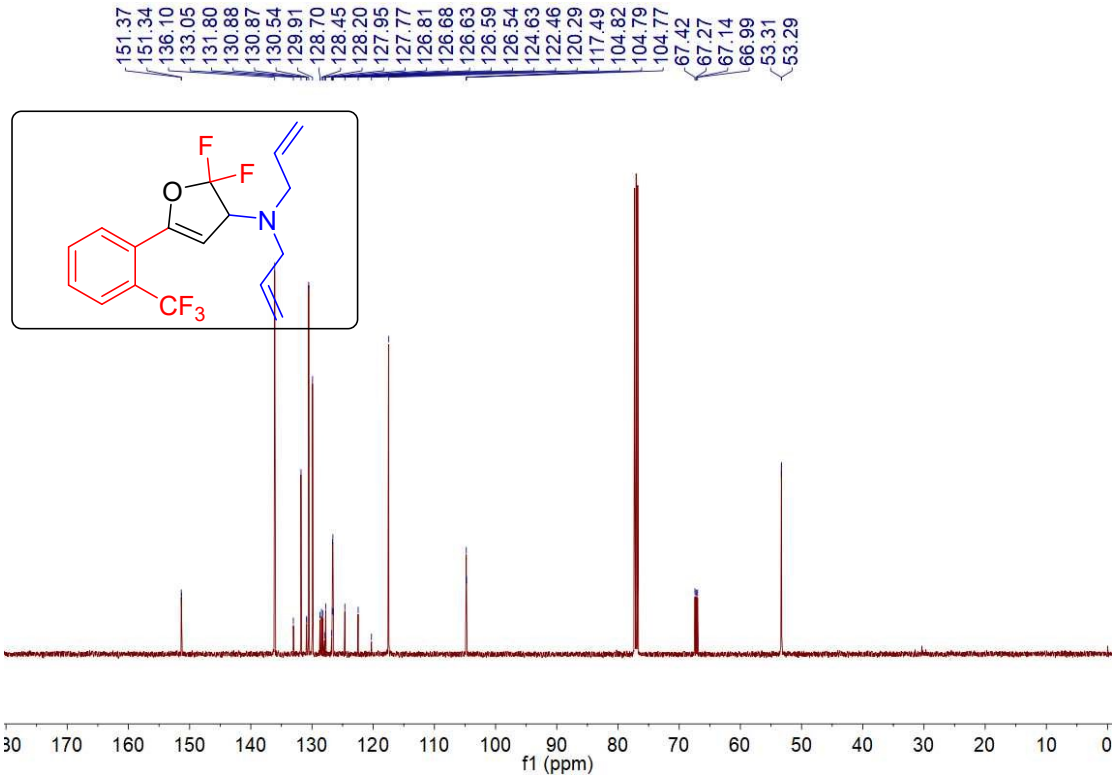
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ag)



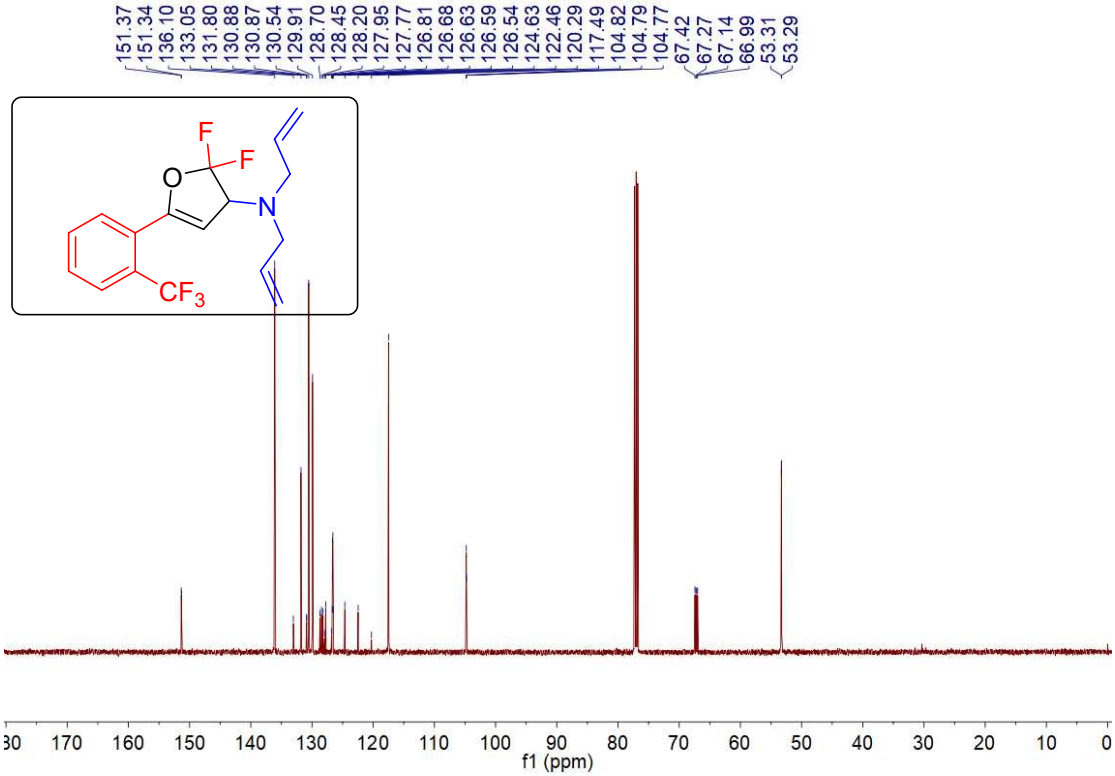
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(2-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ah)



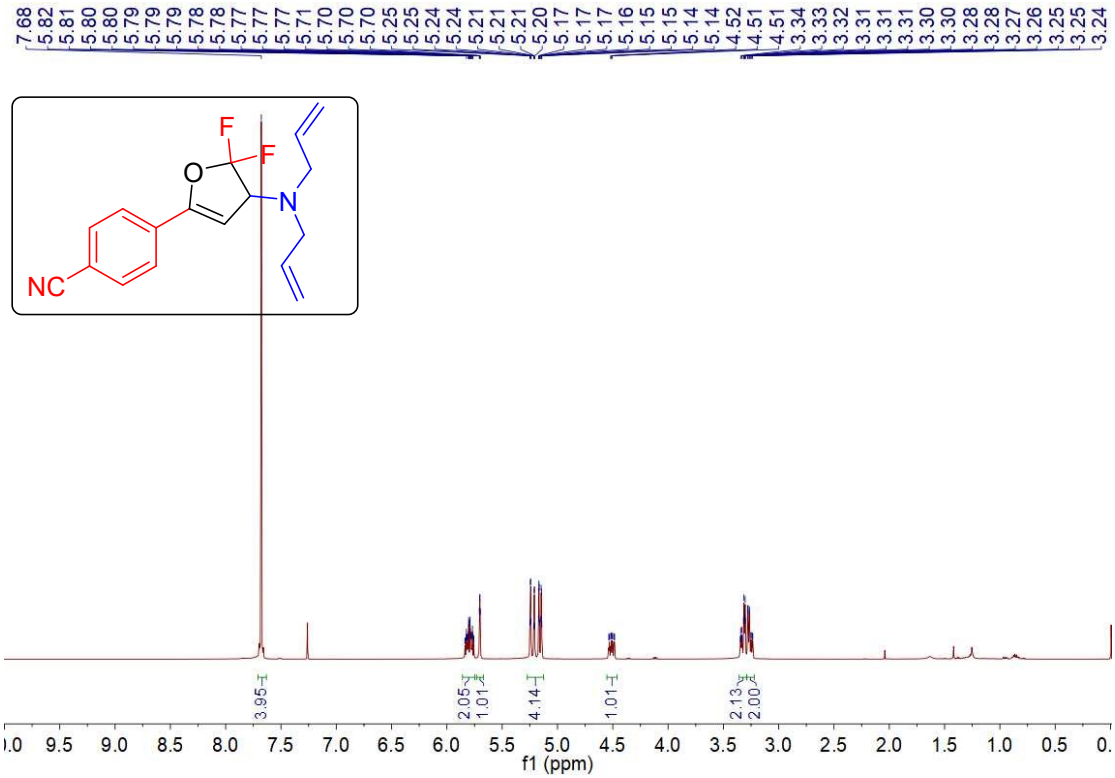
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(2-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ah)



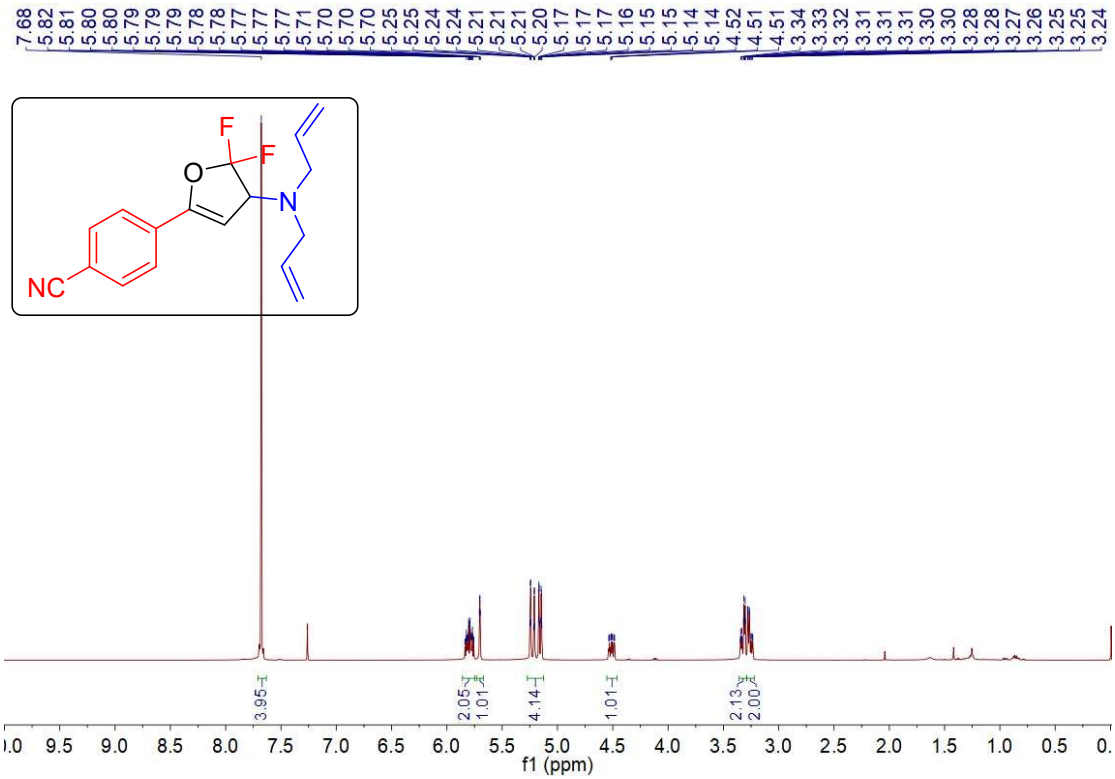
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(2-(trifluoromethyl)phenyl)-2,3-dihydrofuran-3-amine (5ah)



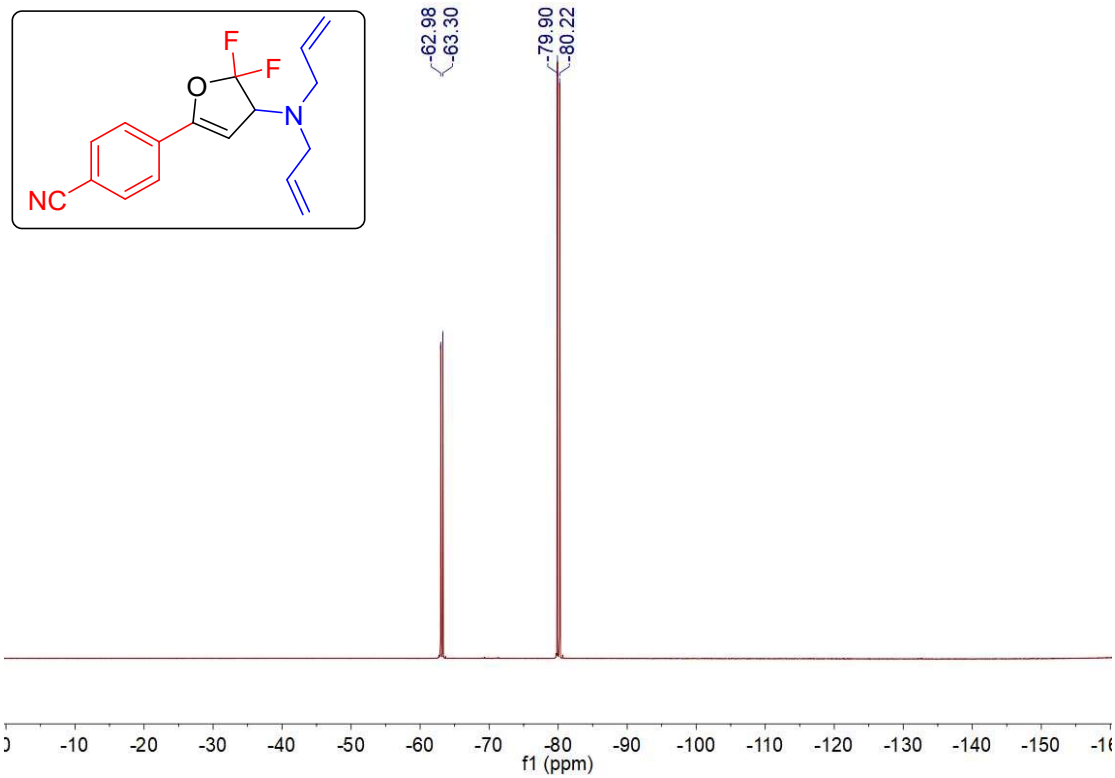
^{1}H spectrum ($CDCl_3$) 4-(4-(diallylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzonitrile (5ai)



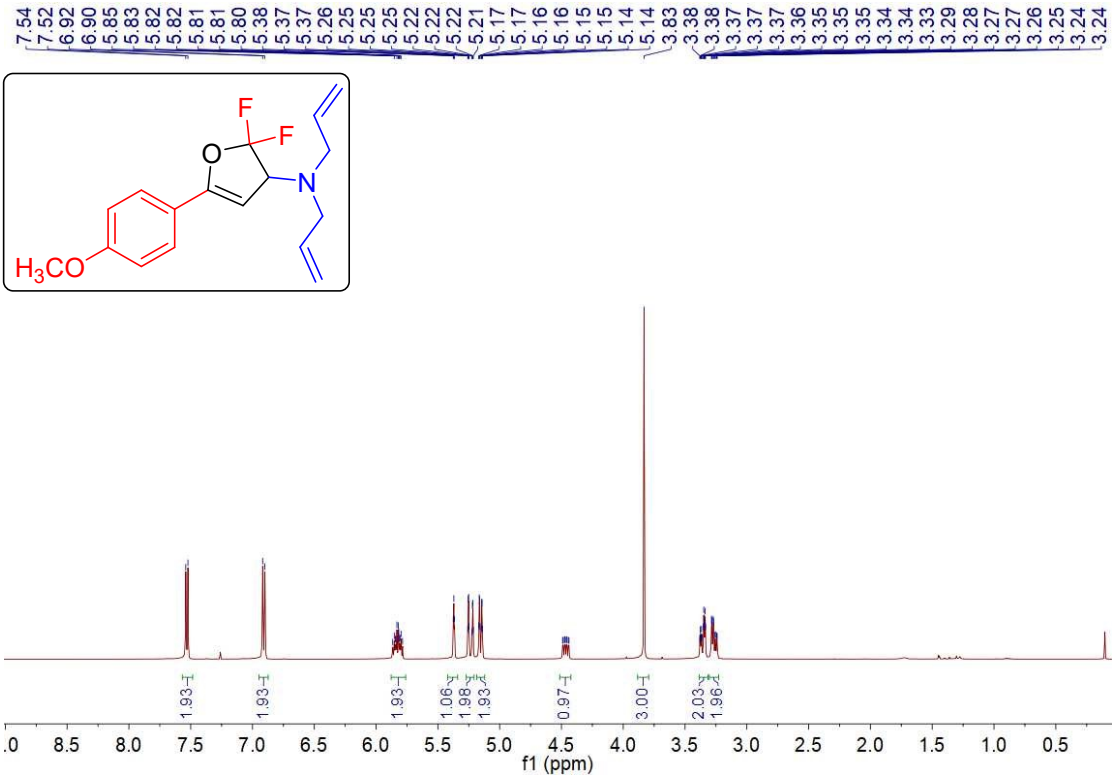
^{13}C spectrum ($CDCl_3$) 4-(4-(diallylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzonitrile (5ai)



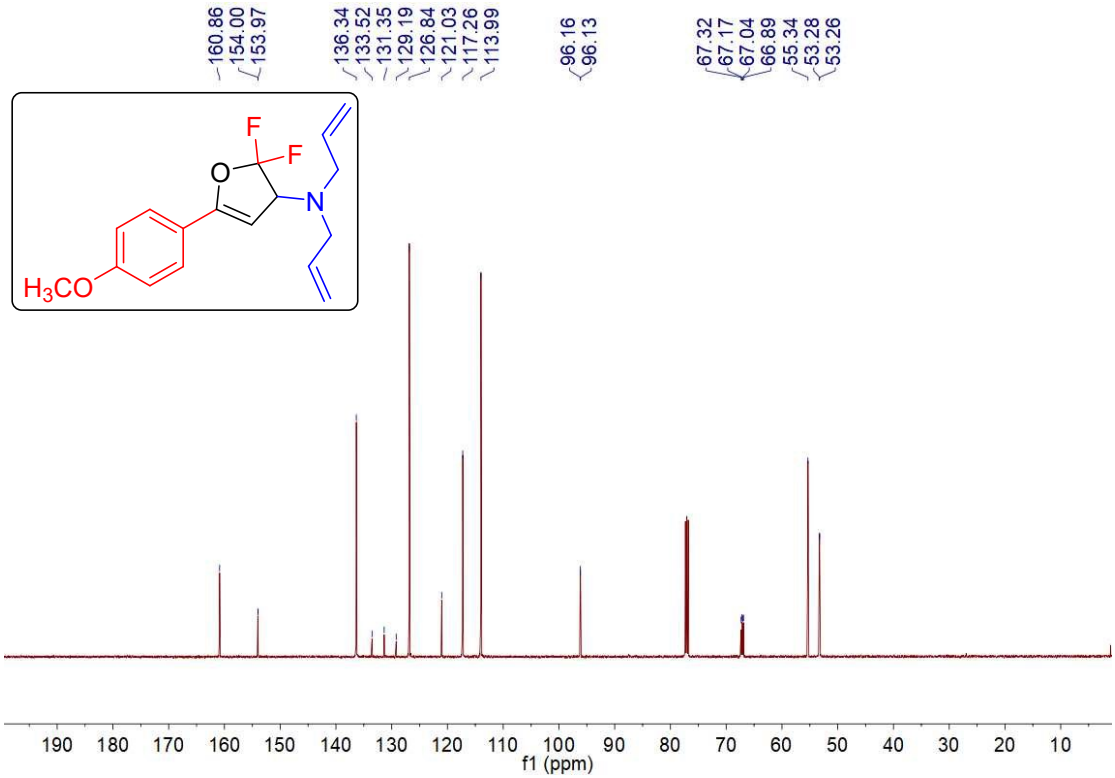
^{19}F spectrum ($CDCl_3$) 4-(4-(diallylamino)-5,5-difluoro-4,5-dihydrofuran-2-yl)benzonitrile (5ai)



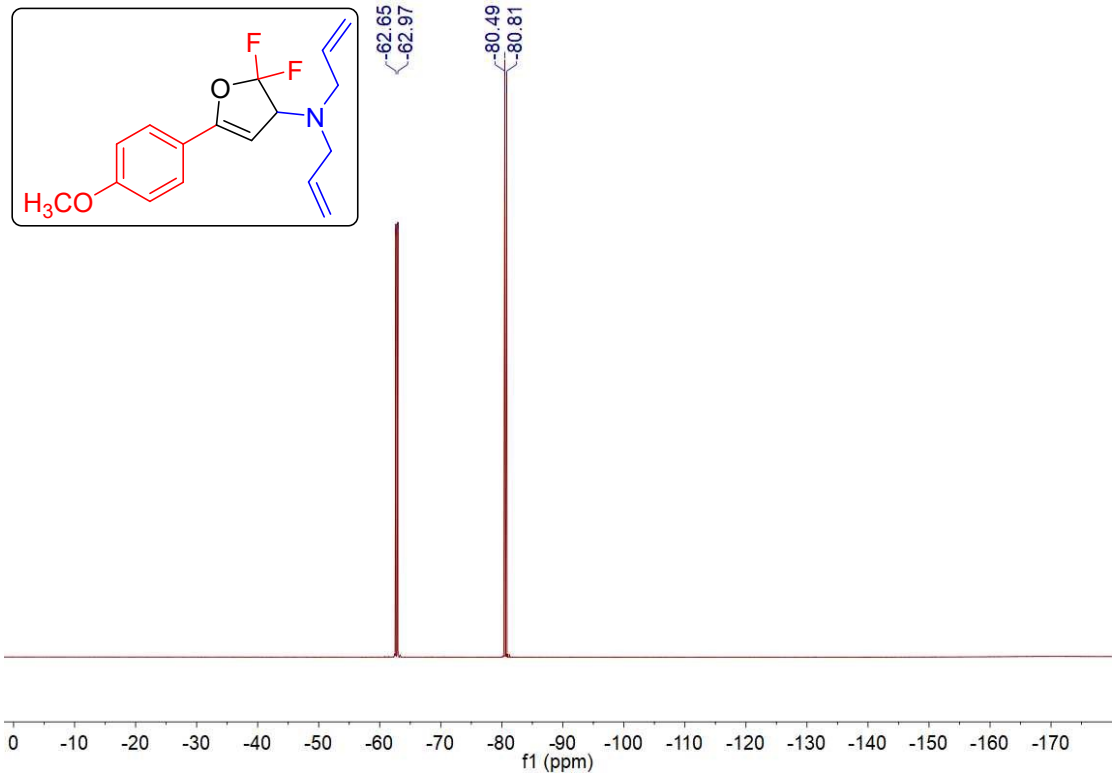
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5aj)



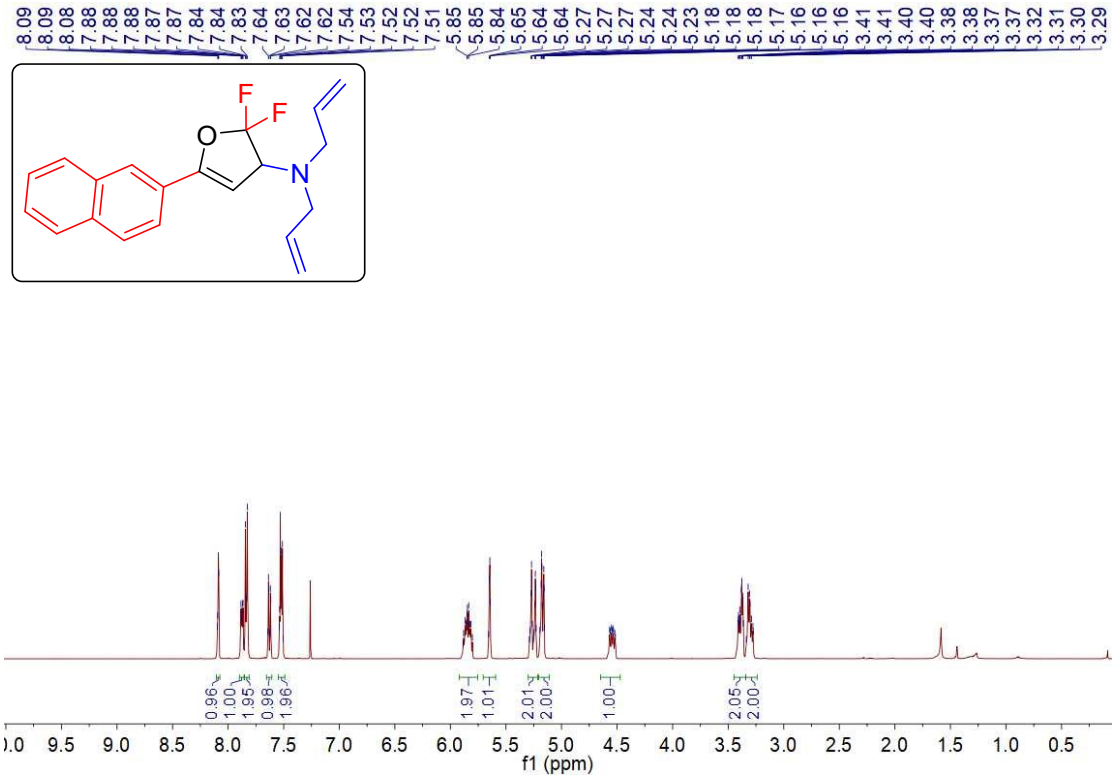
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5aj)



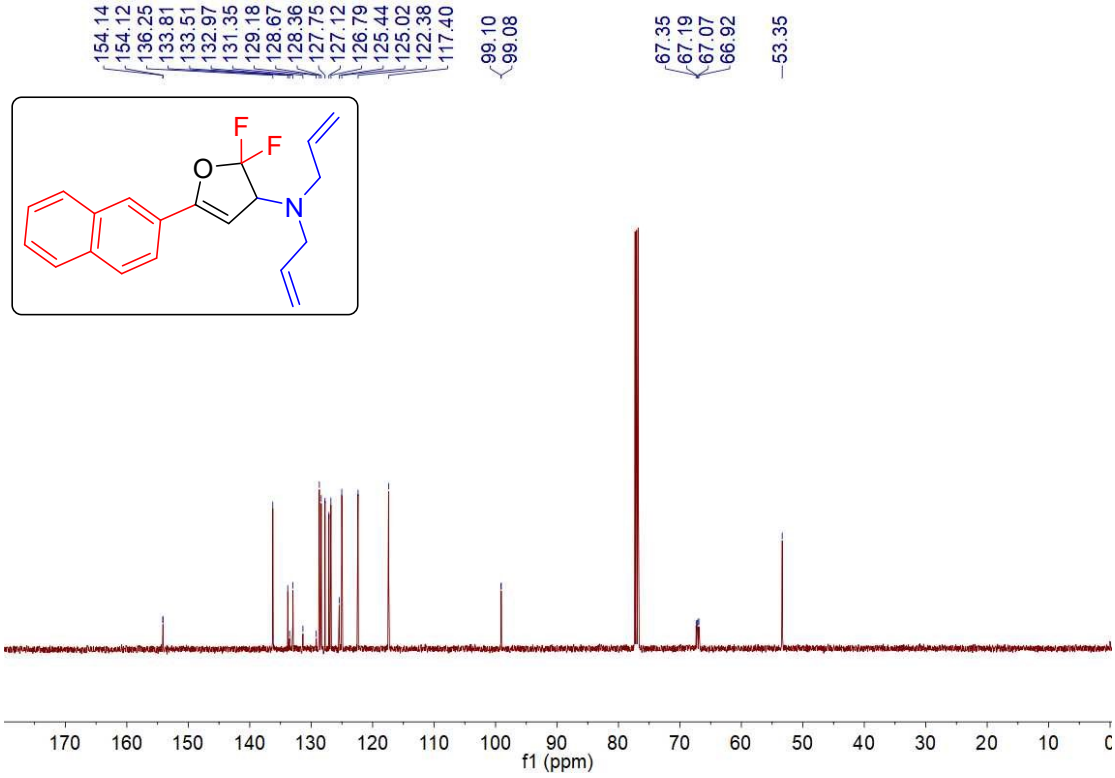
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5aj)



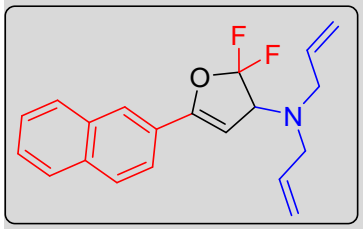
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (5ak)



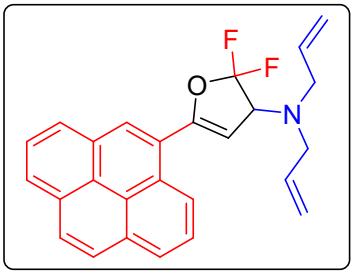
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (5ak)

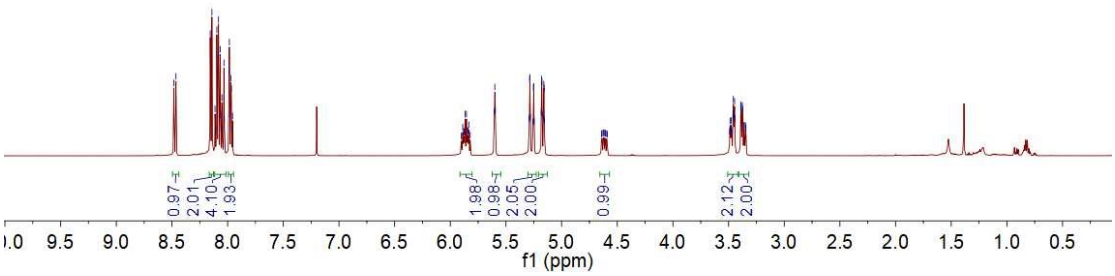


^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(naphthalen-2-yl)-2,3-dihydrofuran-3-amine (5ak)

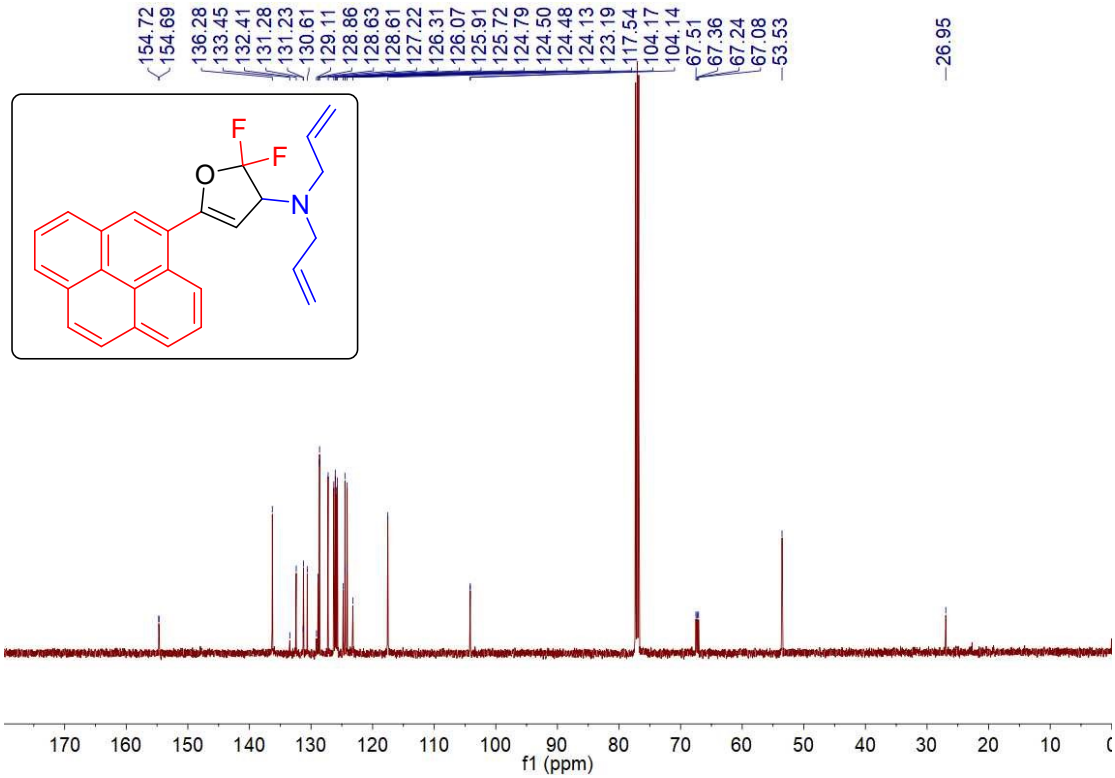


^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(pyren-4-yl)-2,3-dihydrofuran-3-amine (5al)

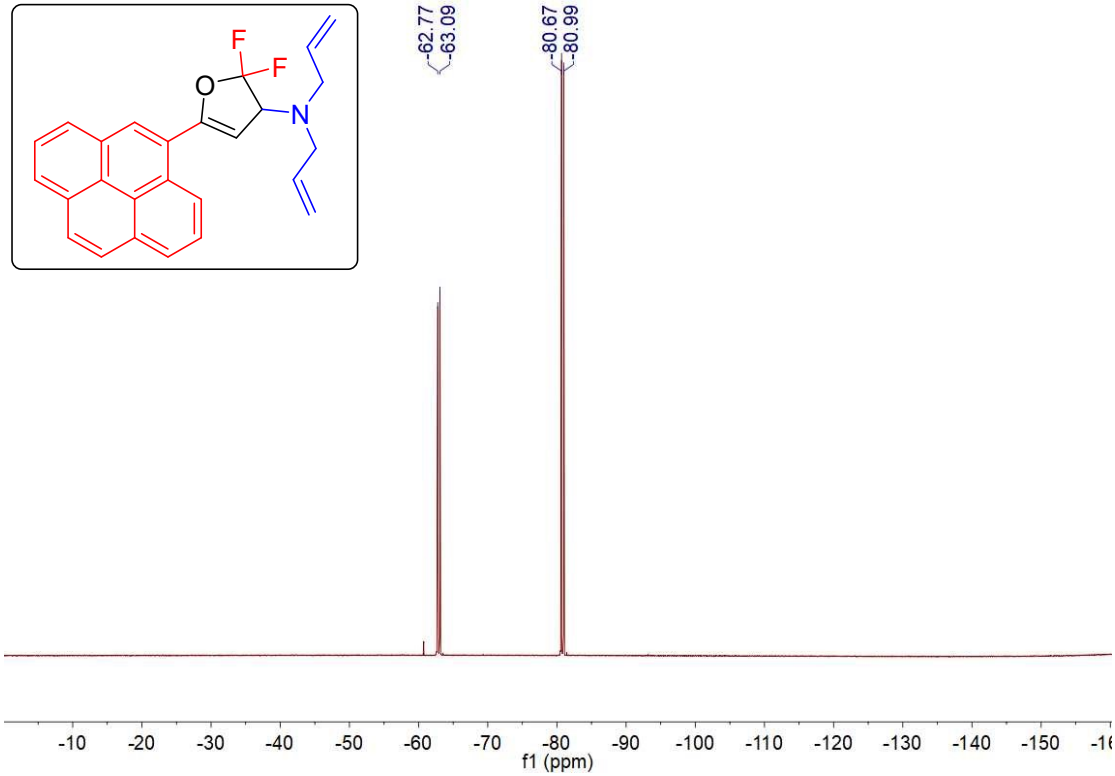




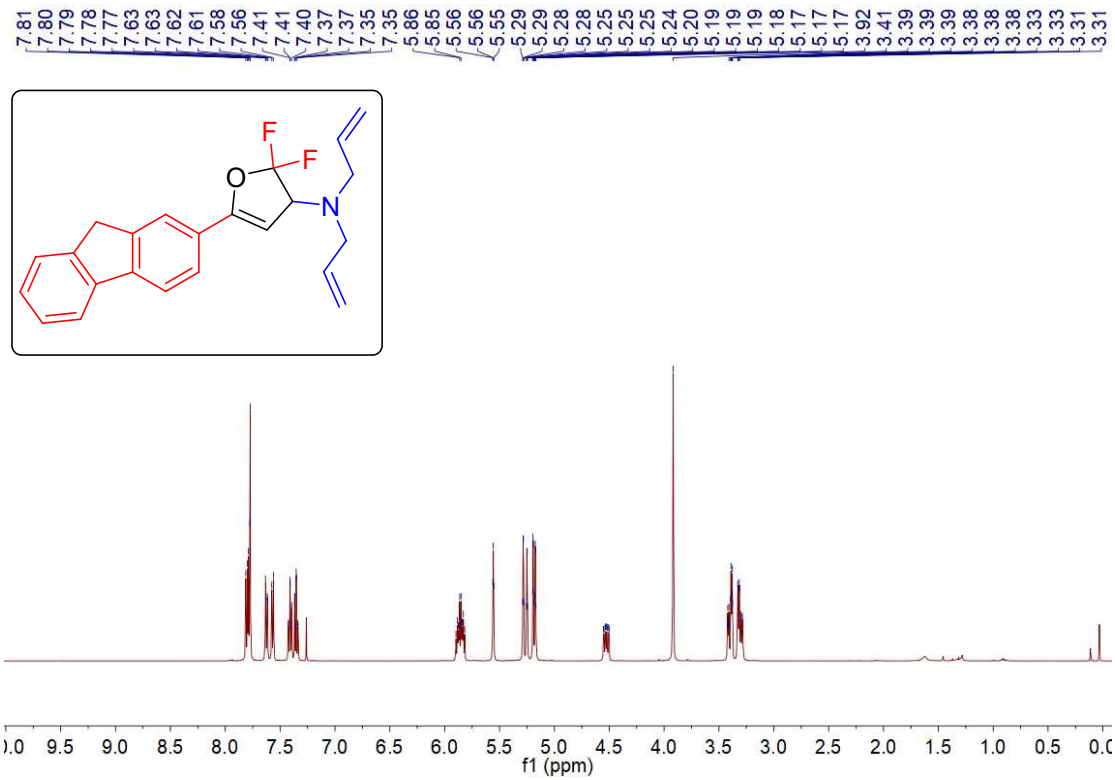
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(pyren-4-yl)-2,3-dihydrofuran-3-amine (5al)



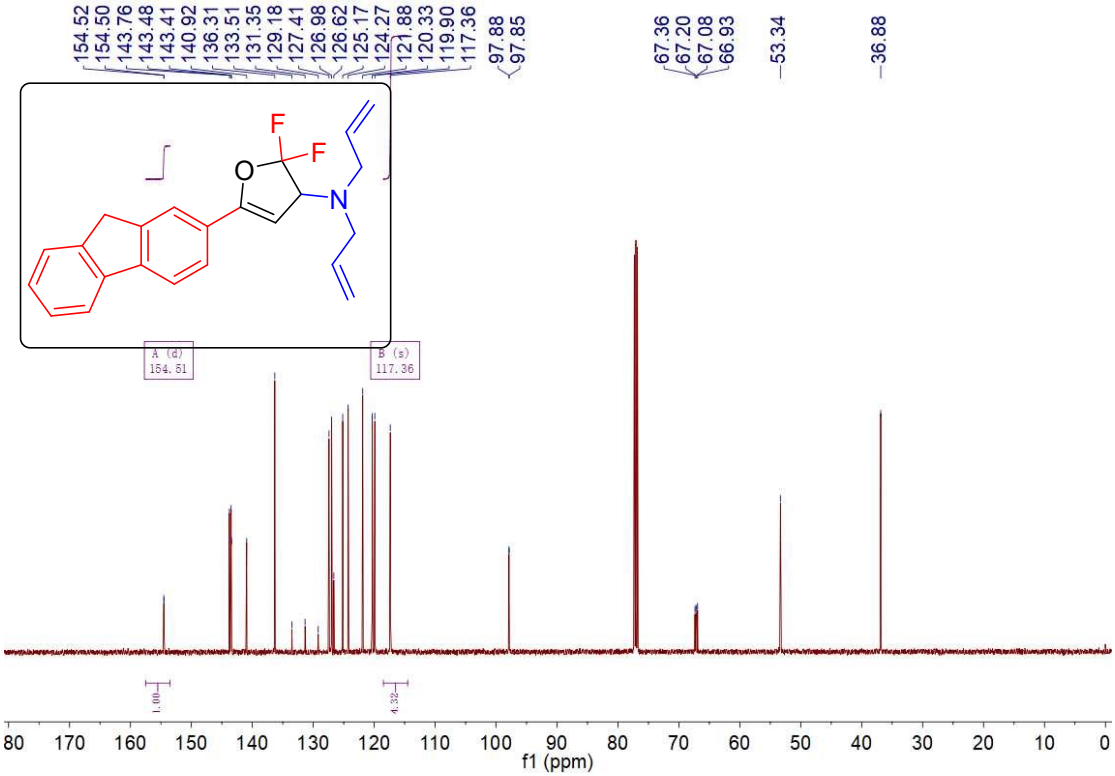
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(pyren-4-yl)-2,3-dihydrofuran-3-amine (5al)



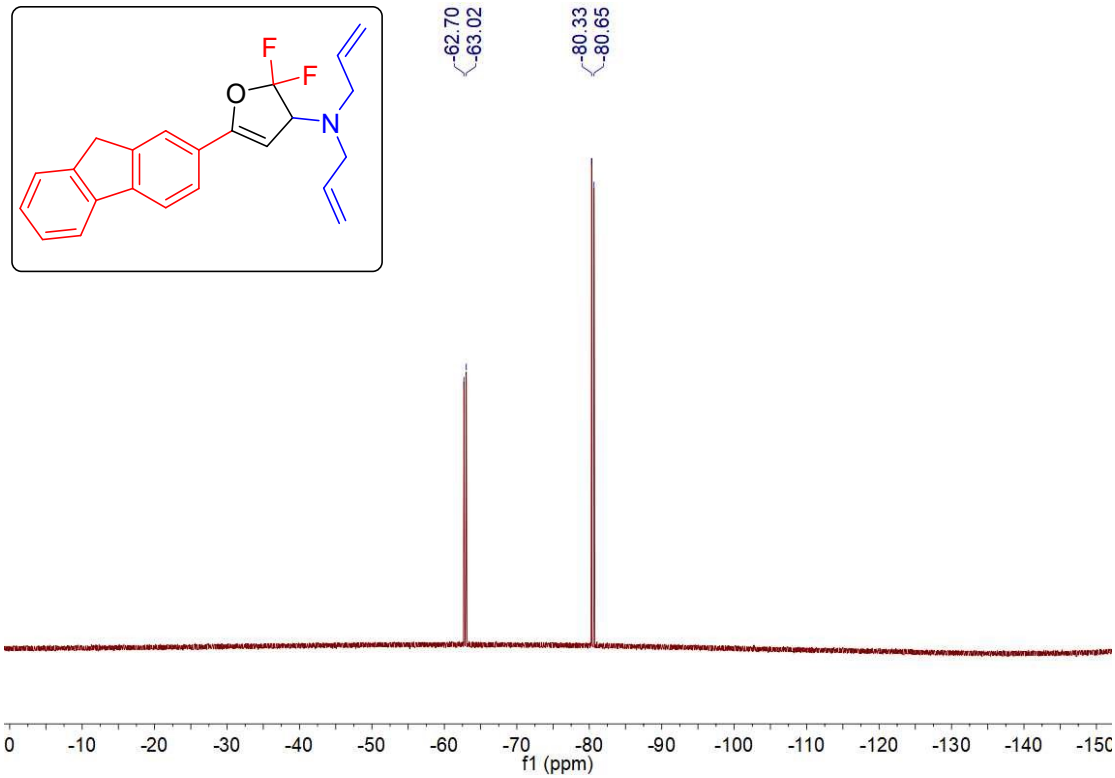
^{1}H spectrum ($CDCl_3$) N,N-diallyl-5-(9H-fluoren-2-yl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5am)



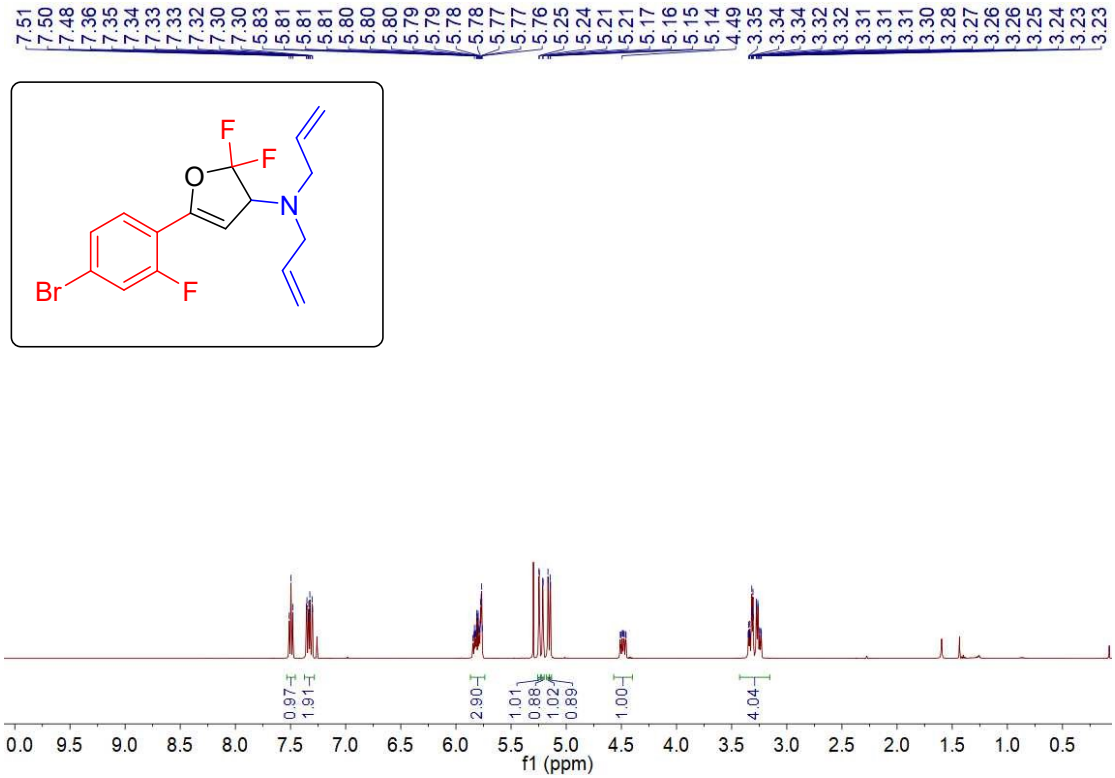
^{13}C spectrum ($CDCl_3$) N,N-diallyl-5-(9H-fluoren-2-yl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5am)



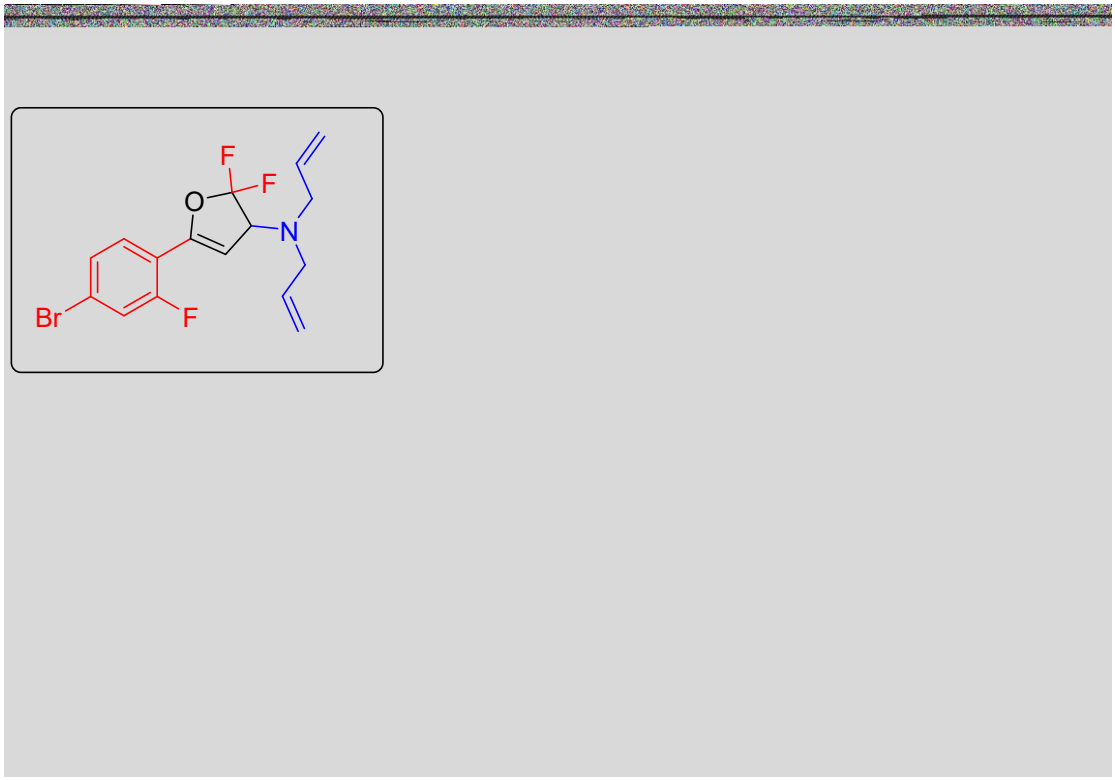
^{19}F spectrum ($CDCl_3$) N,N-diallyl-5-(9H-fluoren-2-yl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5am)



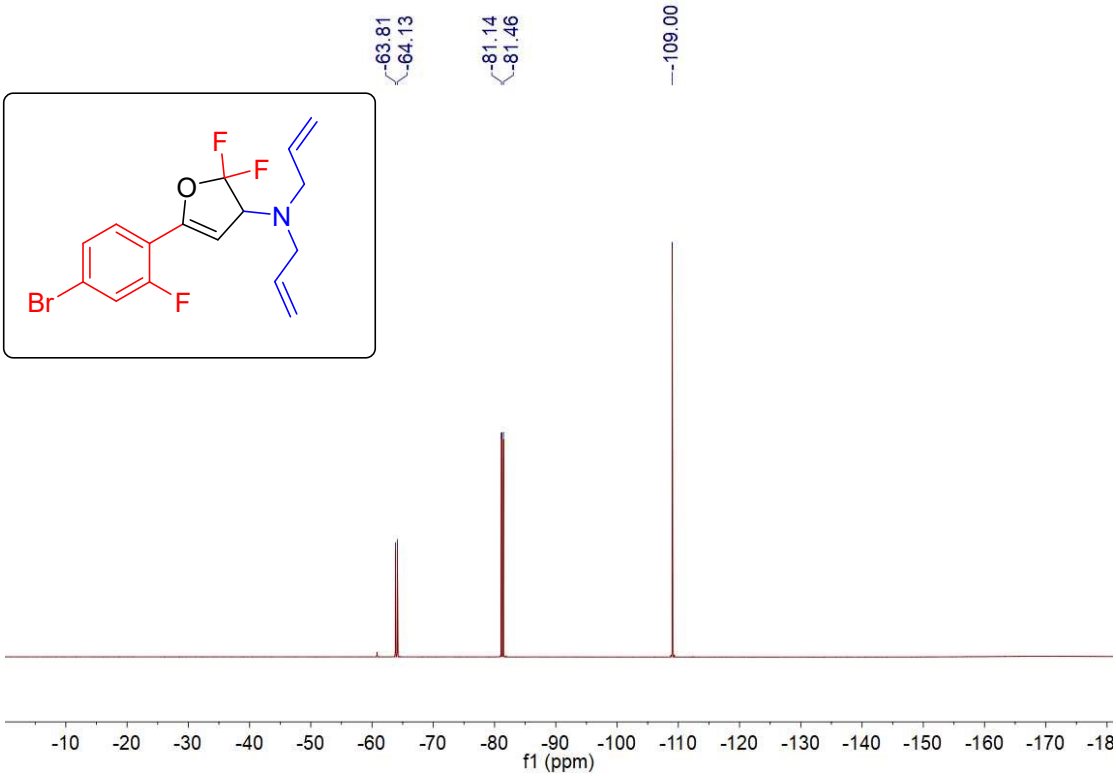
^{1}H spectrum ($CDCl_3$) N,N-diallyl-5-(4-bromo-2-fluorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5an)



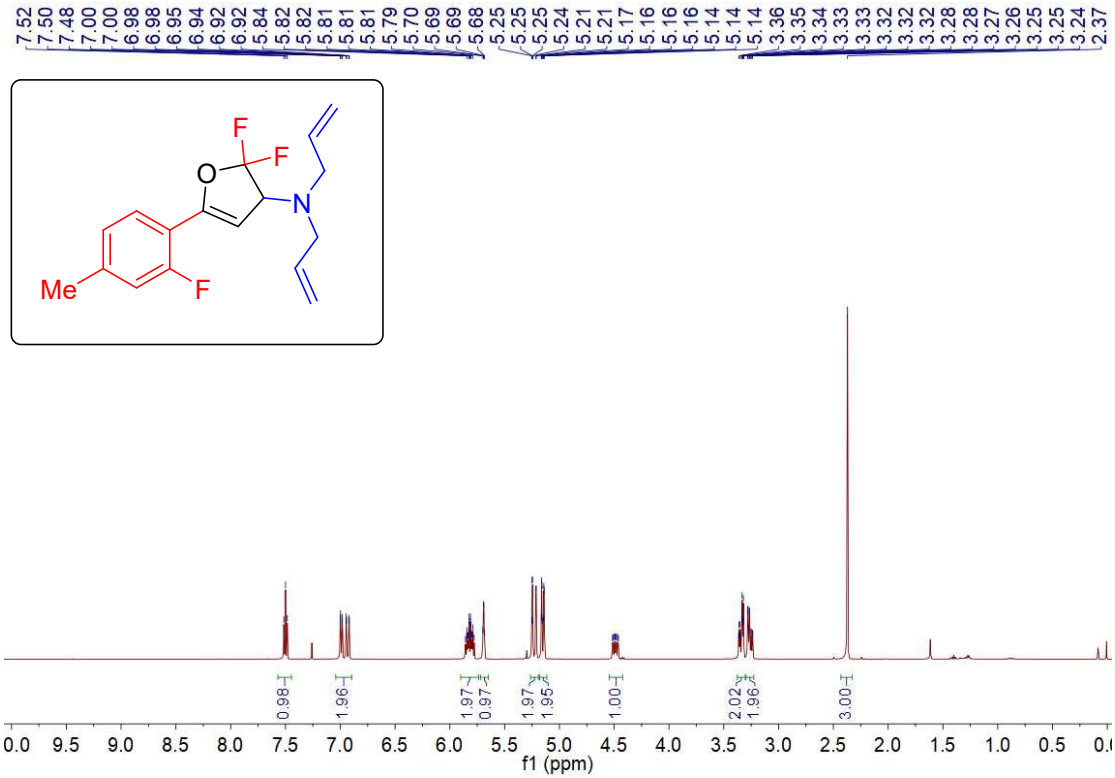
^{13}C spectrum ($CDCl_3$) N,N-diallyl-5-(4-bromo-2-fluorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5an)



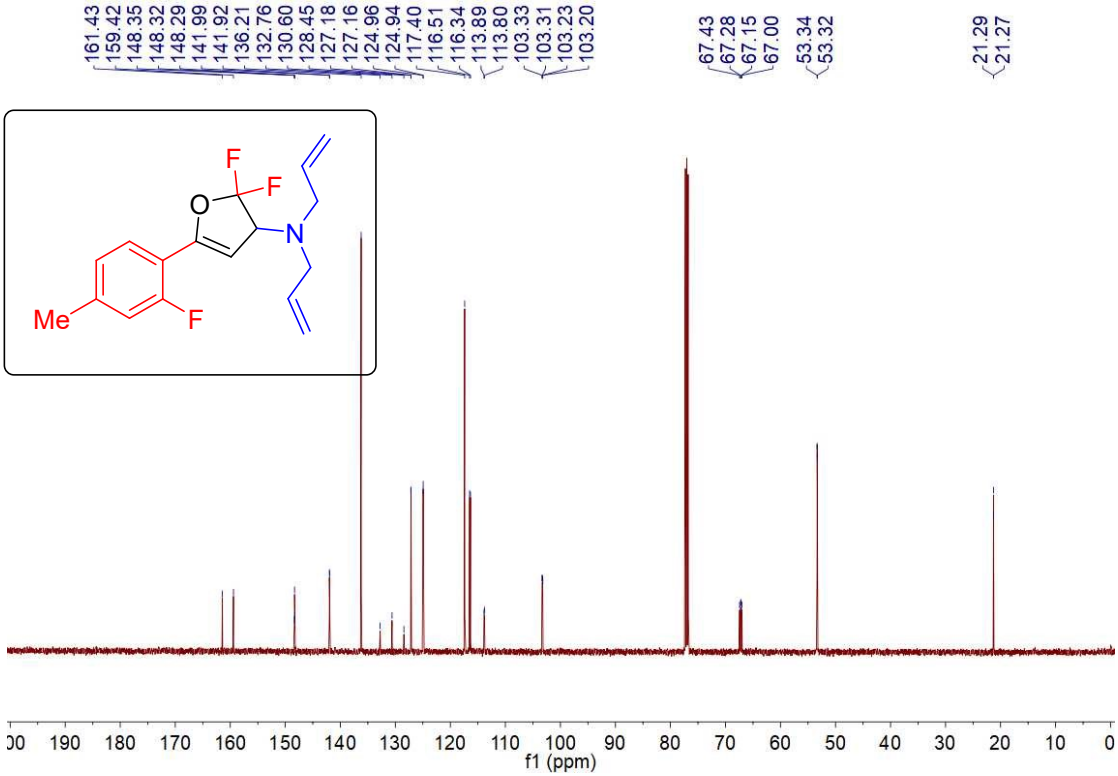
^{19}F spectrum ($CDCl_3$) N,N-diallyl-5-(4-bromo-2-fluorophenyl)-2,2-difluoro-2,3-dihydrofuran-3-amine (5an)



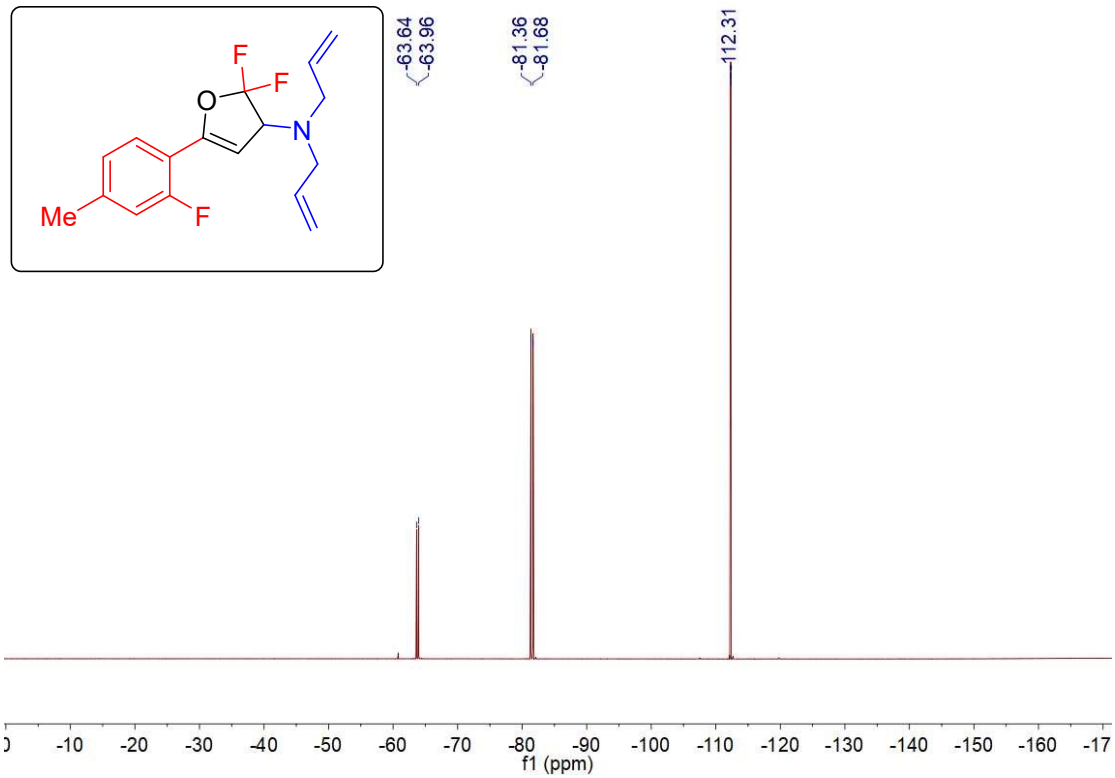
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(2-fluoro-4-methylphenyl)-2,3-dihydrofuran-3-amine (5ao)



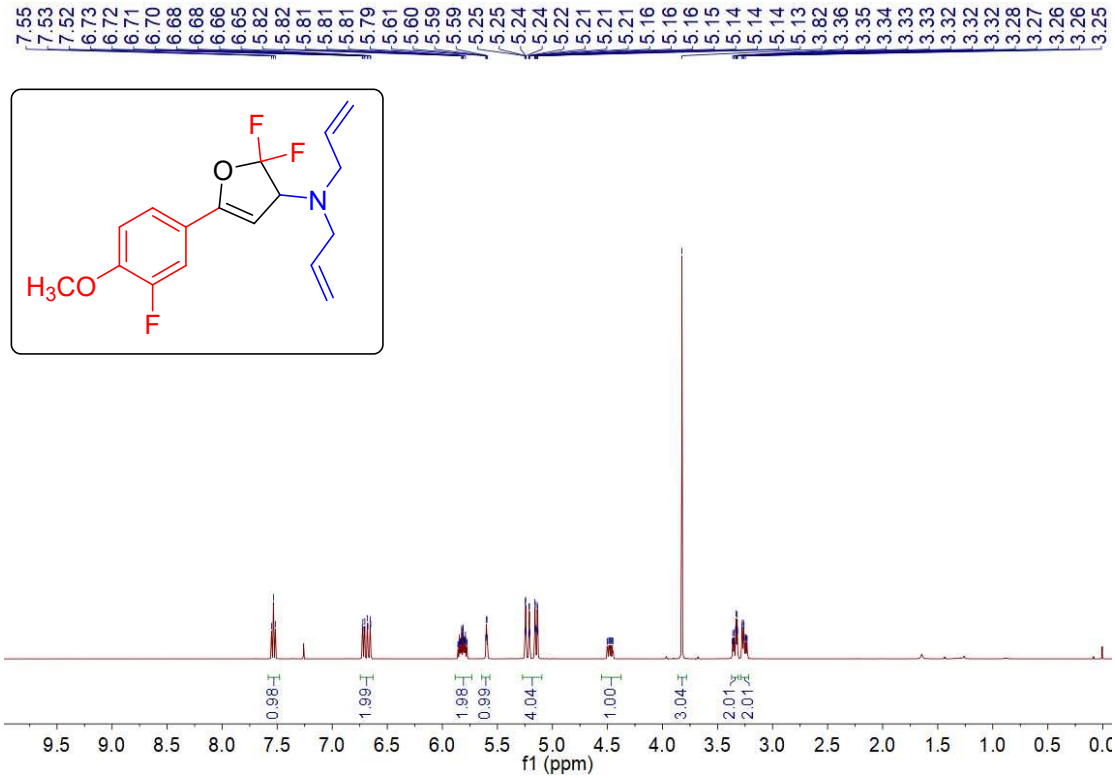
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(2-fluoro-4-methylphenyl)-2,3-dihydrofuran-3-amine (5ao)



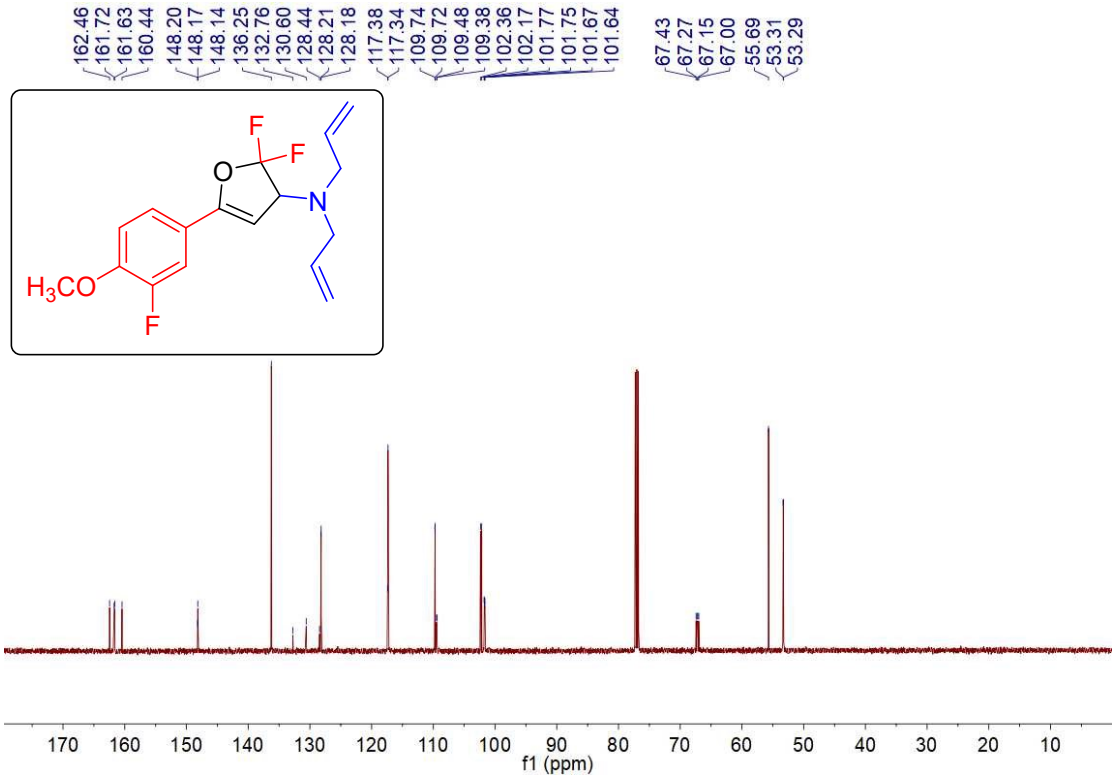
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(2-fluoro-4-methylphenyl)-2,3-dihydrofuran-3-amine (5ao)



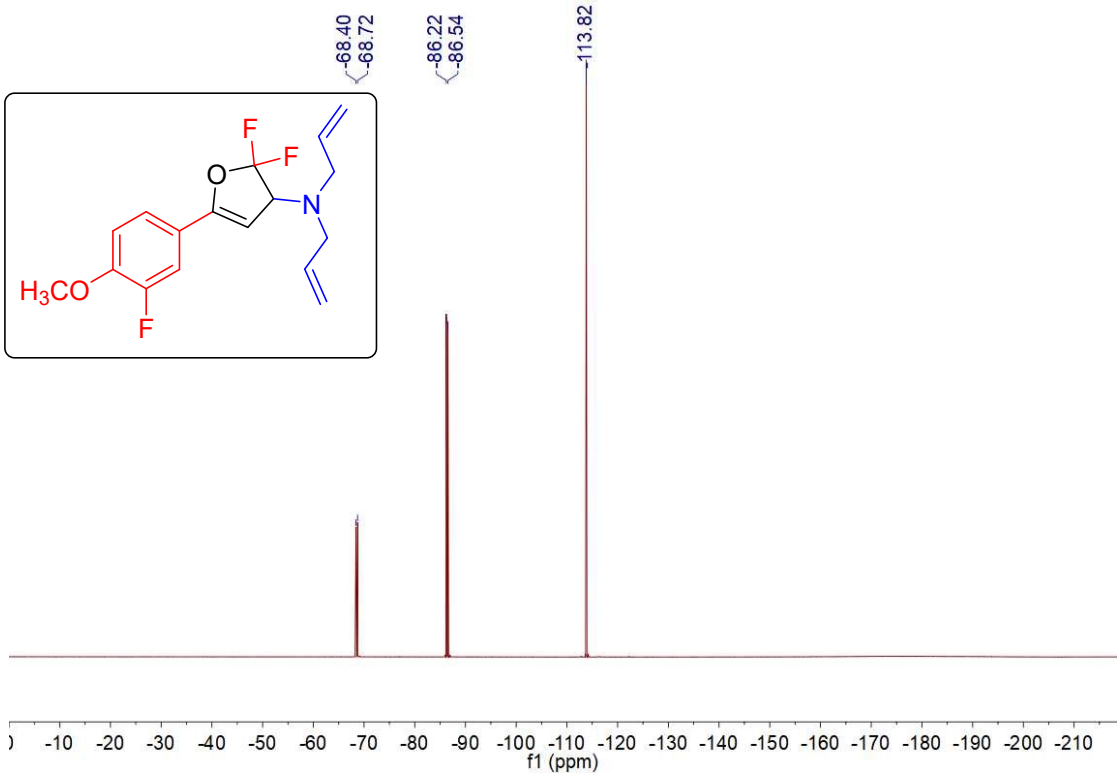
^{1}H spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(3-fluoro-4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5ap)



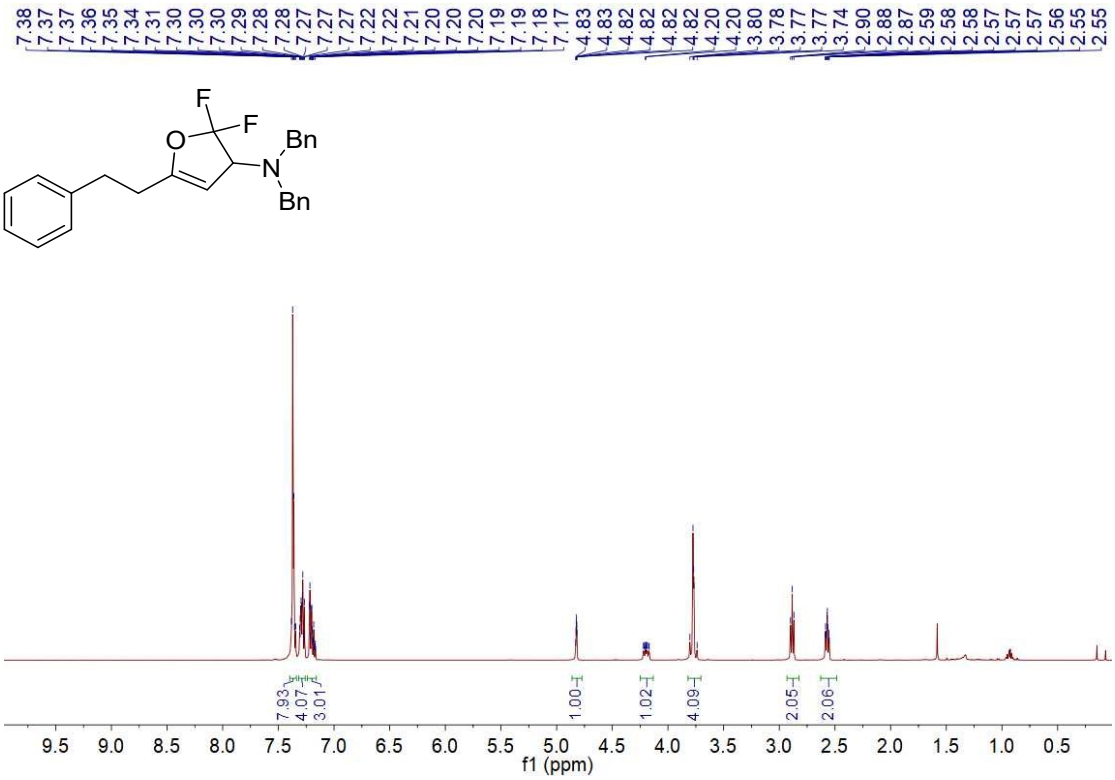
^{13}C spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(3-fluoro-4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5ap)



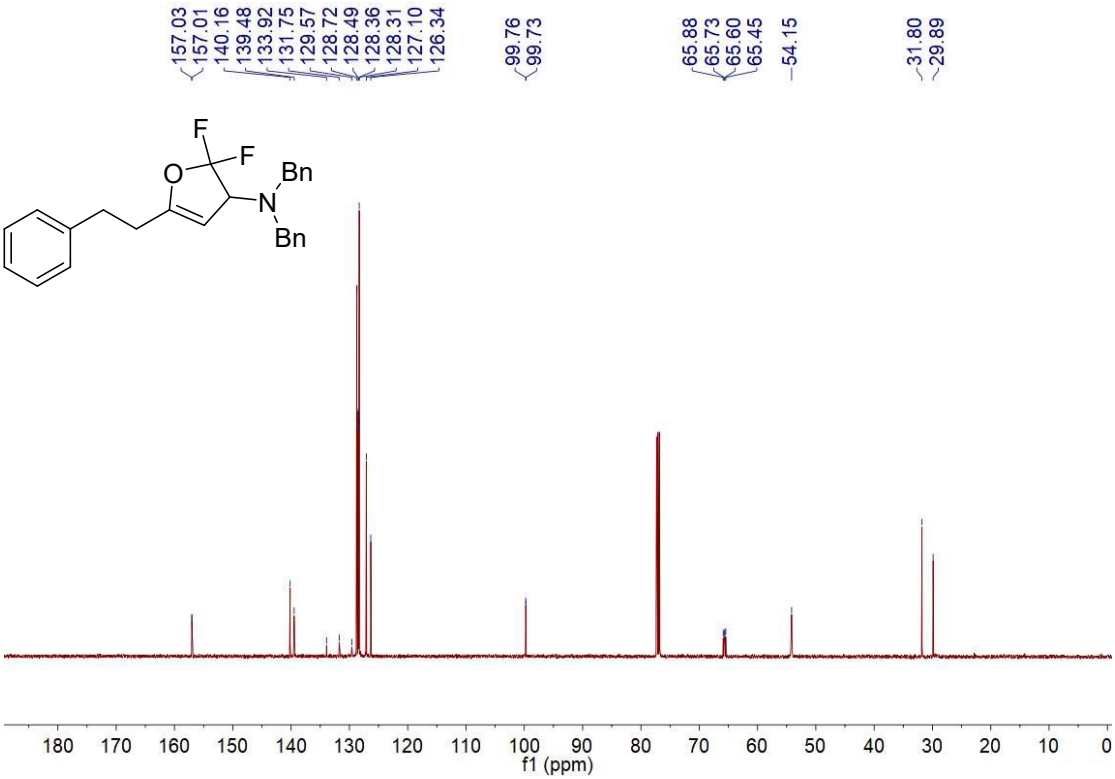
^{19}F spectrum ($CDCl_3$) N,N-diallyl-2,2-difluoro-5-(3-fluoro-4-methoxyphenyl)-2,3-dihydrofuran-3-amine (5ap)



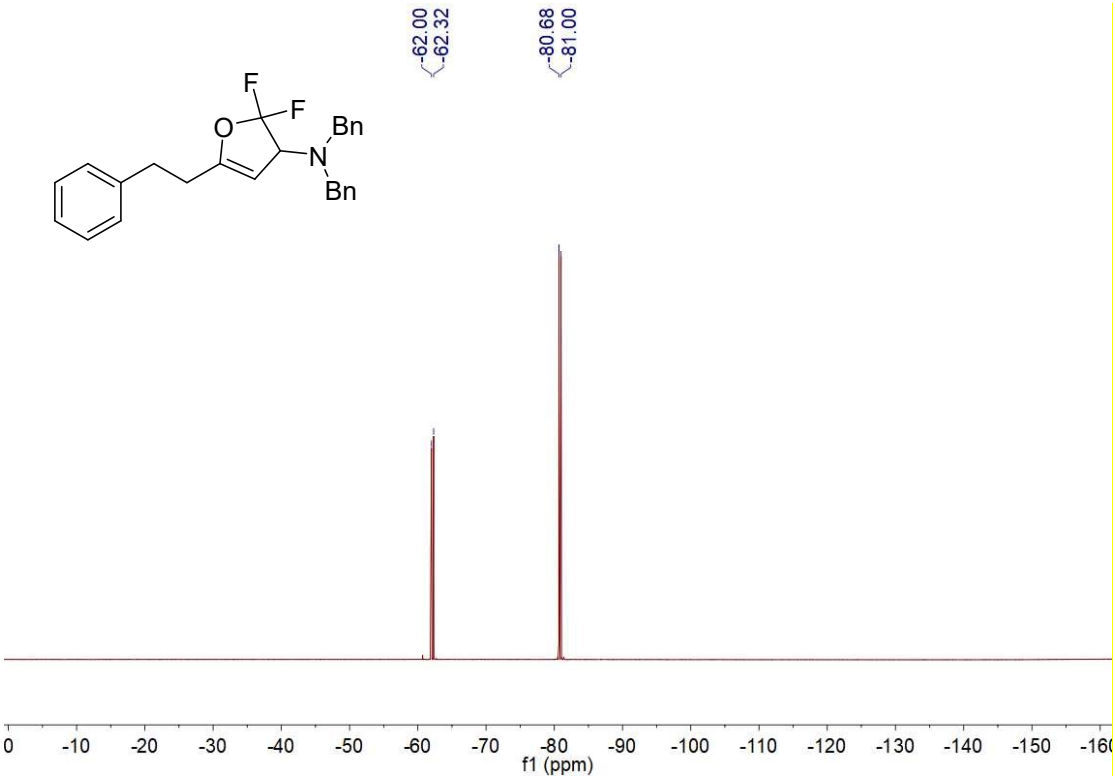
^{1}H spectrum ($CDCl_3$) N,N-dibenzyl-2,2-difluoro-5-phenethyl-2,3-dihydrofuran-3-amine(5aq)



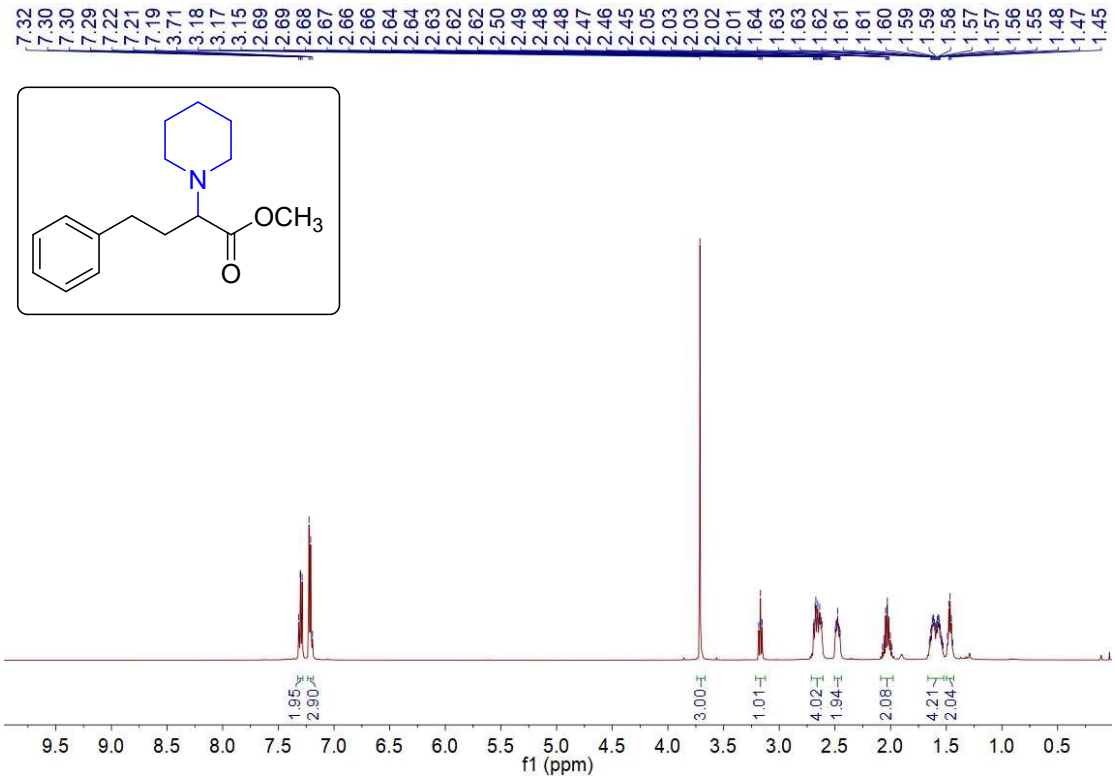
^{13}C spectrum ($CDCl_3$) N,N-dibenzyl-2,2-difluoro-5-phenethyl-2,3-dihydrofuran-3-amine(5aq)



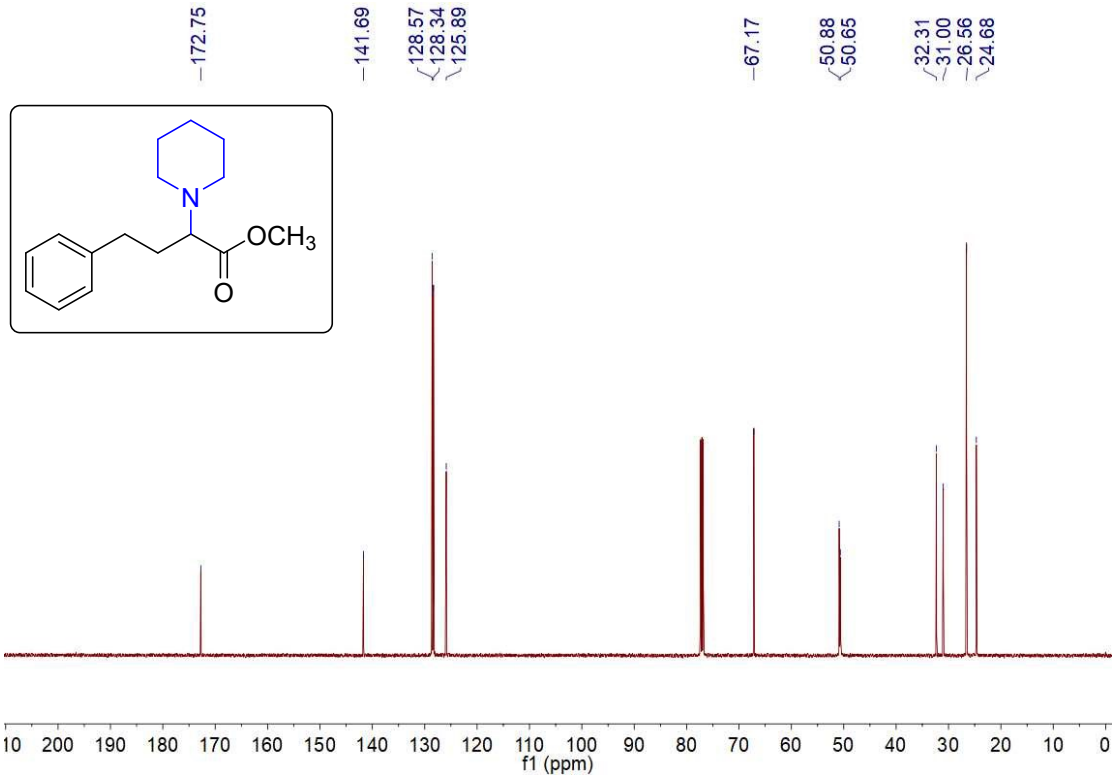
^{19}F spectrum ($CDCl_3$) N,N-dibenzyl-2,2-difluoro-5-phenethyl-2,3-dihydrofuran-3-amine(5aq)



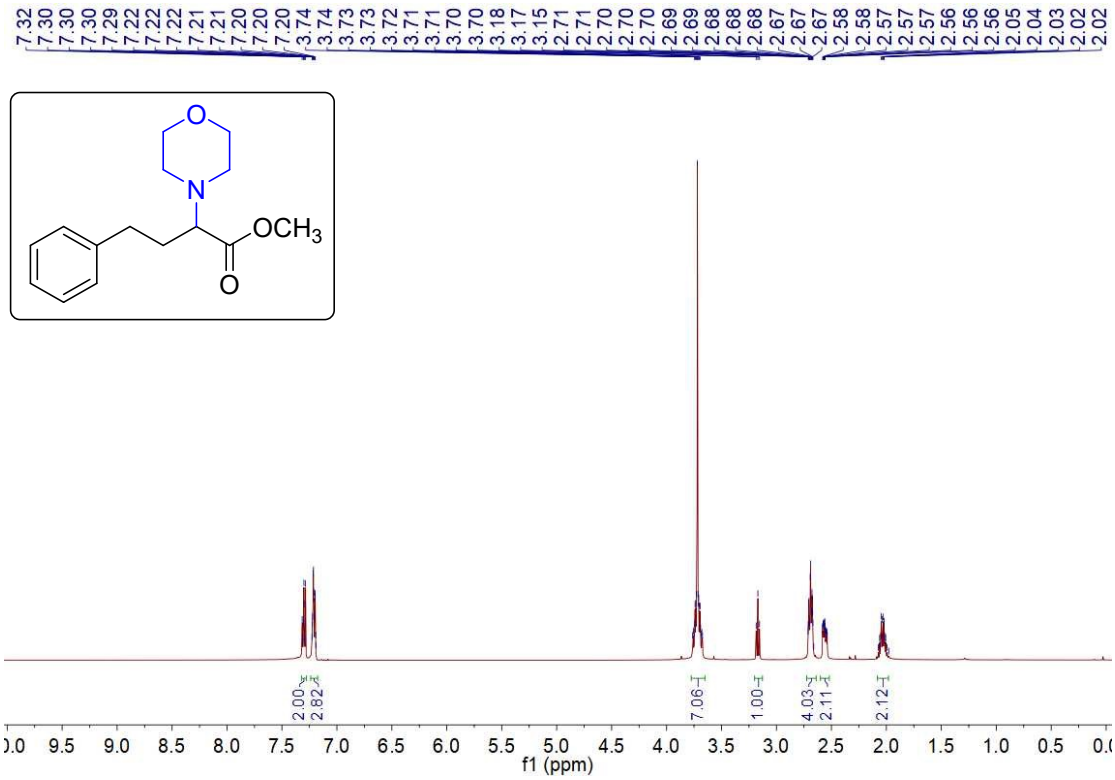
^{1}H spectrum ($CDCl_3$) methyl 4-phenyl-2-(piperidin-1-yl)butanoate (6a)



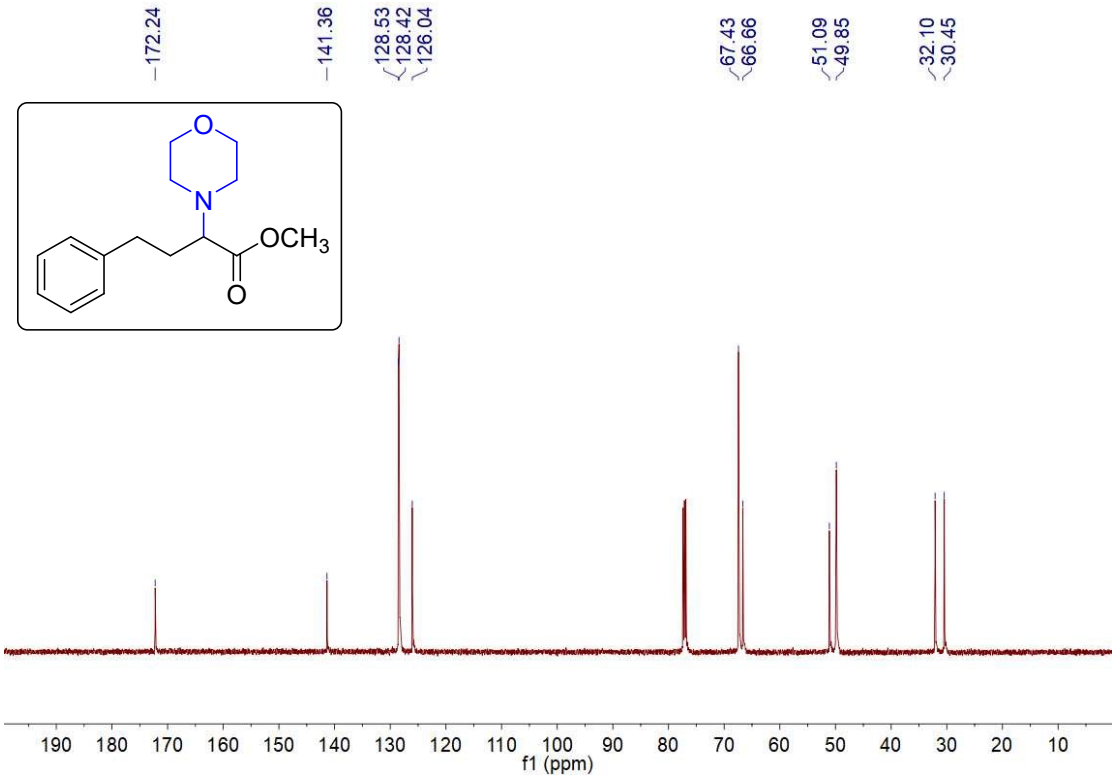
^{13}C spectrum ($CDCl_3$) methyl 4-phenyl-2-(piperidin-1-yl)butanoate (6a)



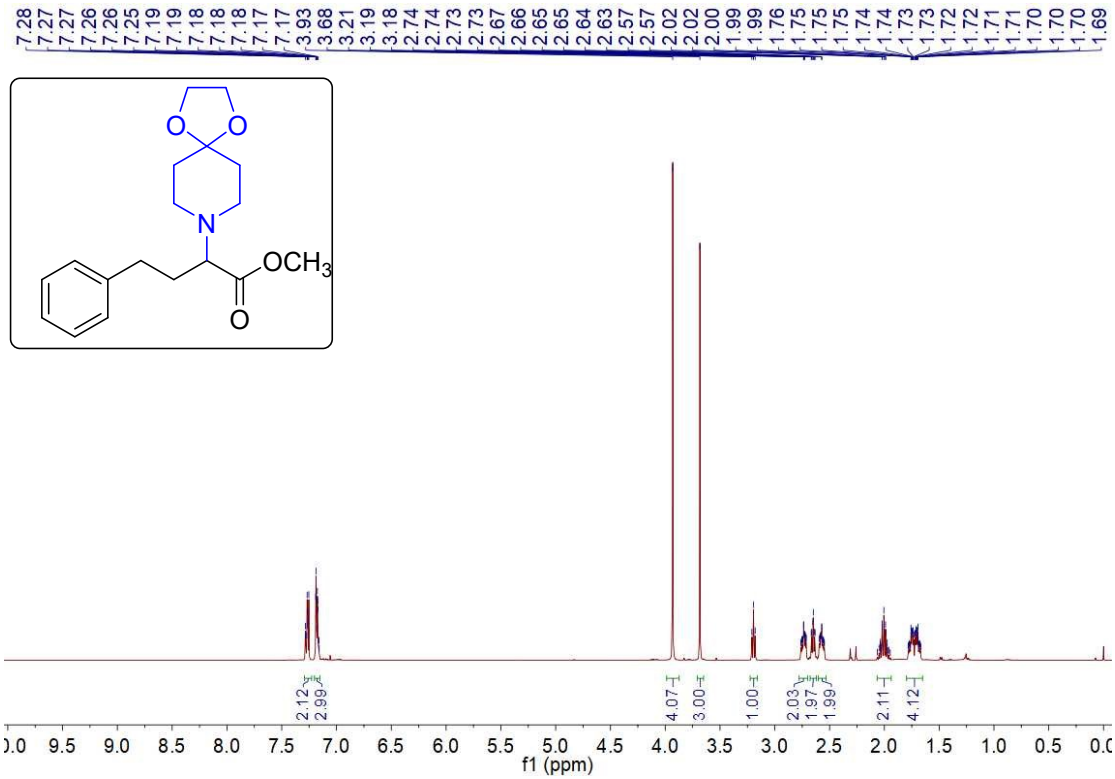
^{1}H spectrum ($CDCl_3$) methyl 2-morpholino-4-phenylbutanoate (6b)



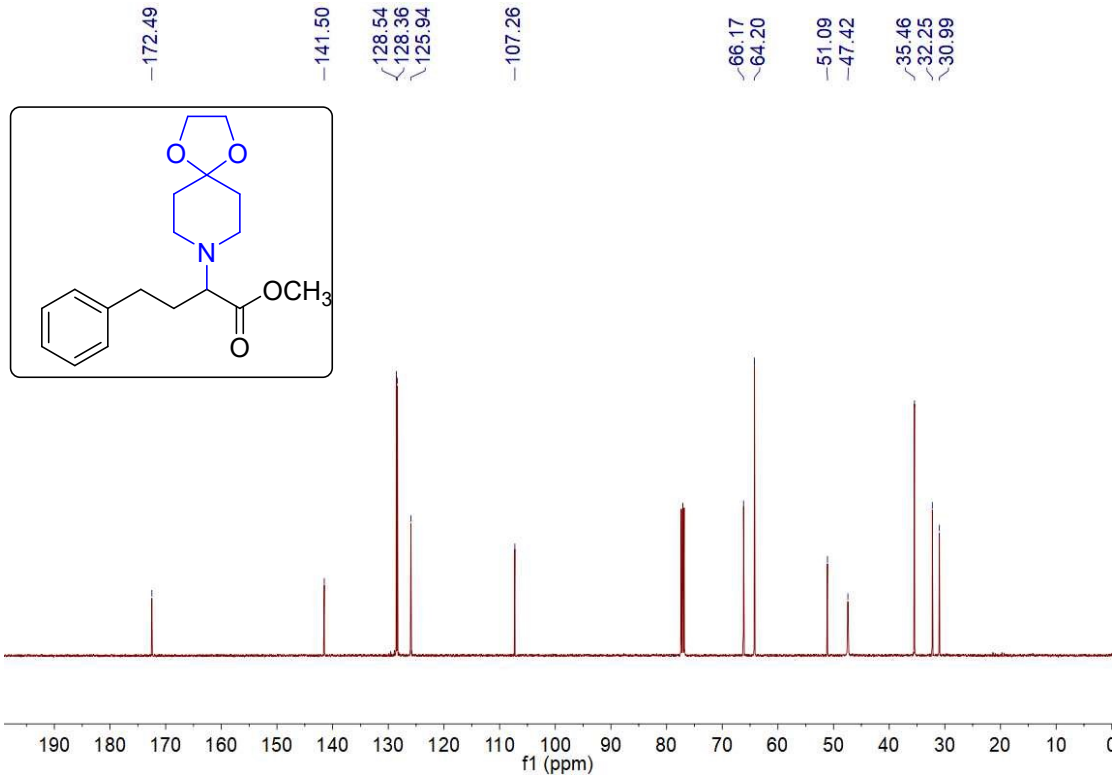
^{13}C spectrum ($CDCl_3$) methyl 2-morpholino-4-phenylbutanoate (6b)



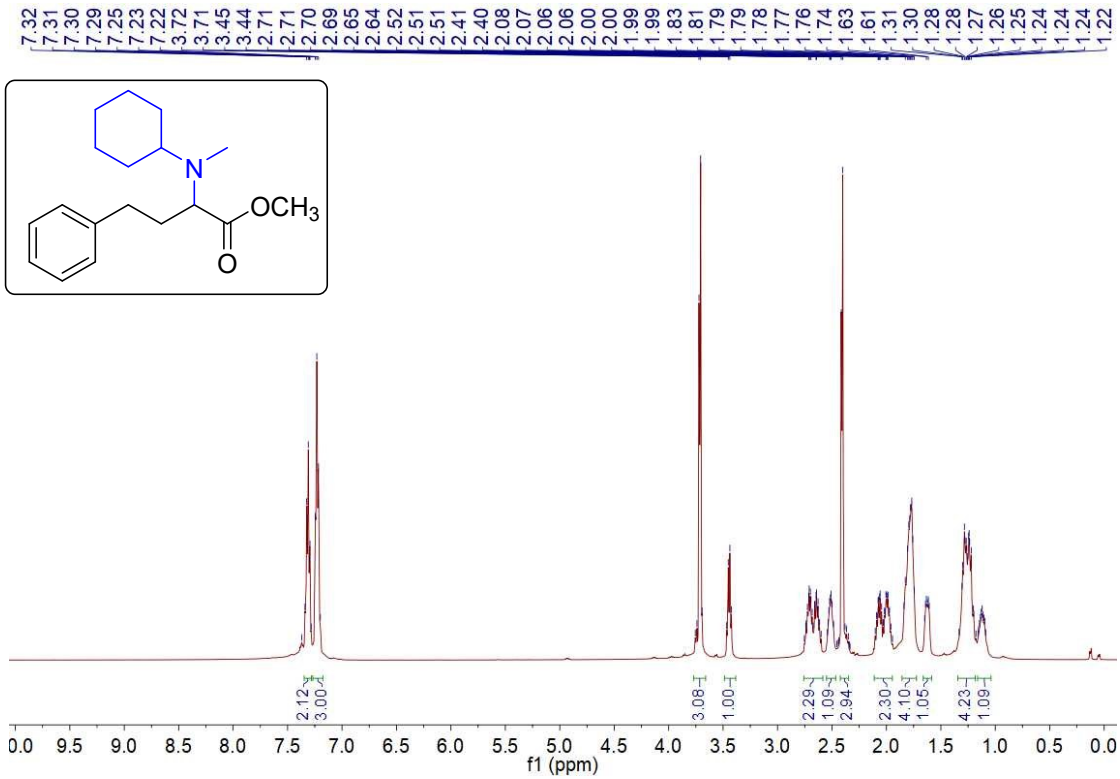
^{1}H spectrum ($CDCl_3$) methyl 4-phenyl-2-(1,4-dioxa-8-azaspiro[4.5]decan-8-yl)butanoate (6c)



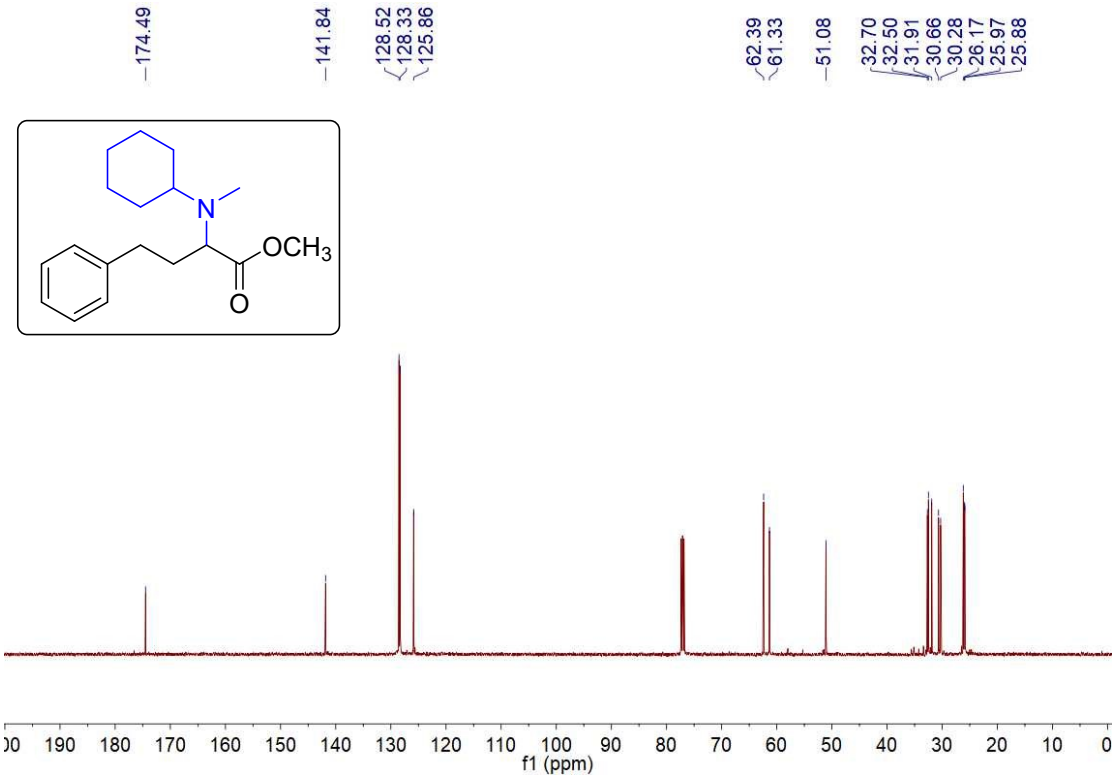
^{13}C spectrum ($CDCl_3$) methyl 4-phenyl-2-(1,4-dioxa-8-azaspiro[4.5]decan-8-yl)butanoate (6c)



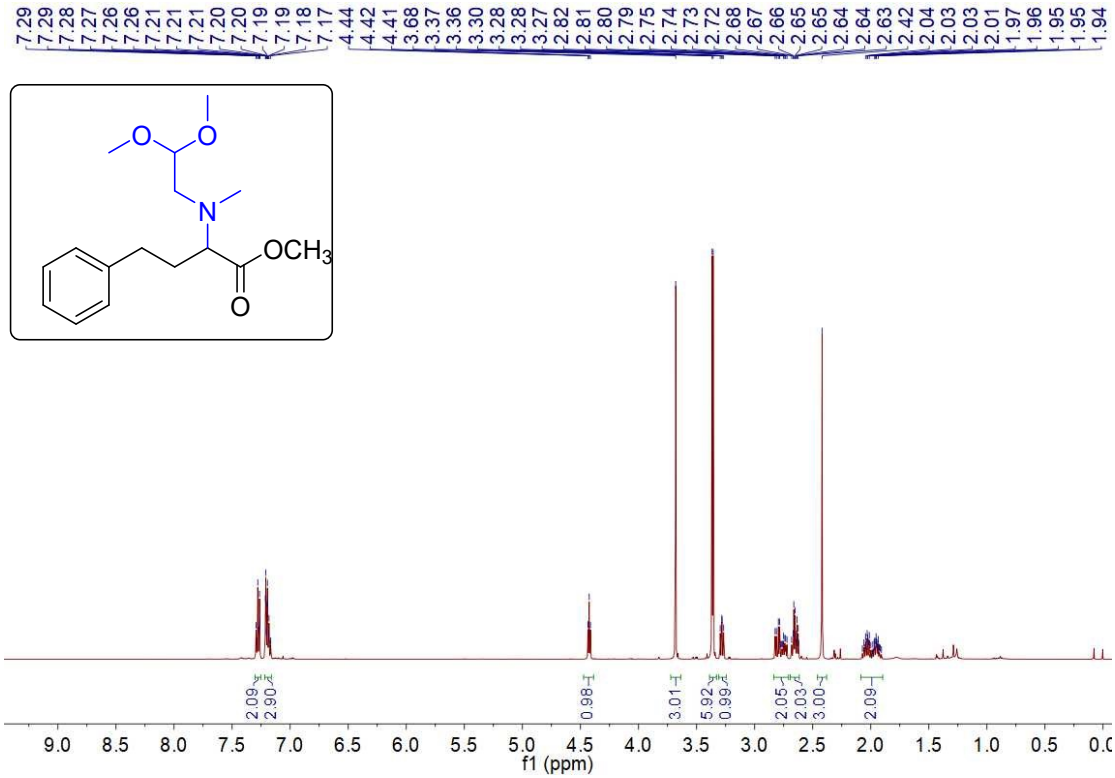
^{1}H spectrum ($CDCl_3$) methyl 2-(cyclohexyl(methyl)amino)-4-phenylbutanoate (6d)



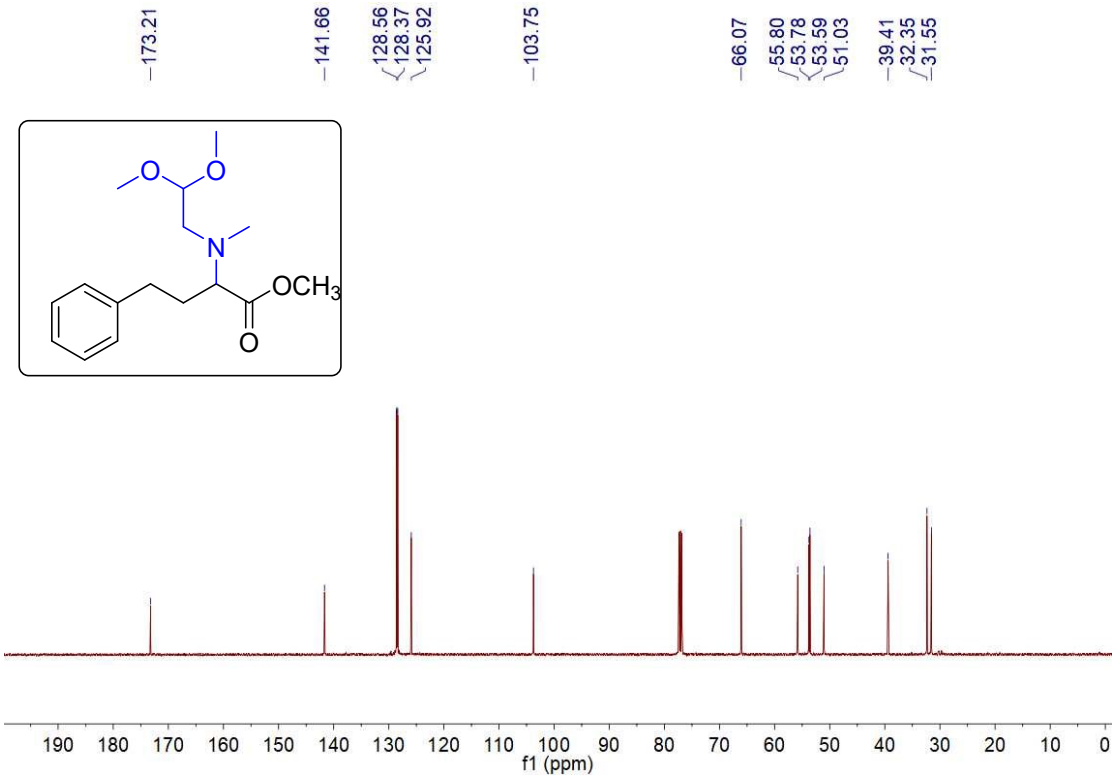
^{13}C spectrum ($CDCl_3$) methyl 2-(cyclohexyl(methyl)amino)-4-phenylbutanoate (6d)



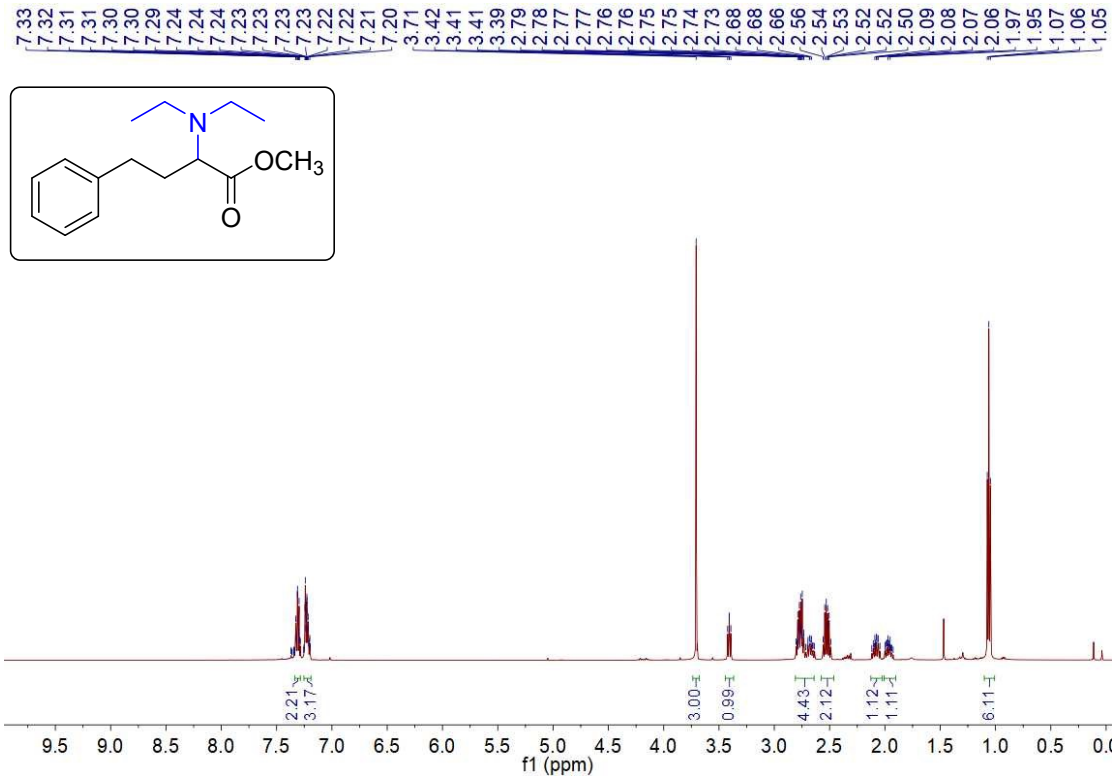
^{1}H spectrum ($CDCl_3$) methyl 2-((2,2-dimethoxyethyl)(methyl)amino)-4-phenylbutanoate (6e)



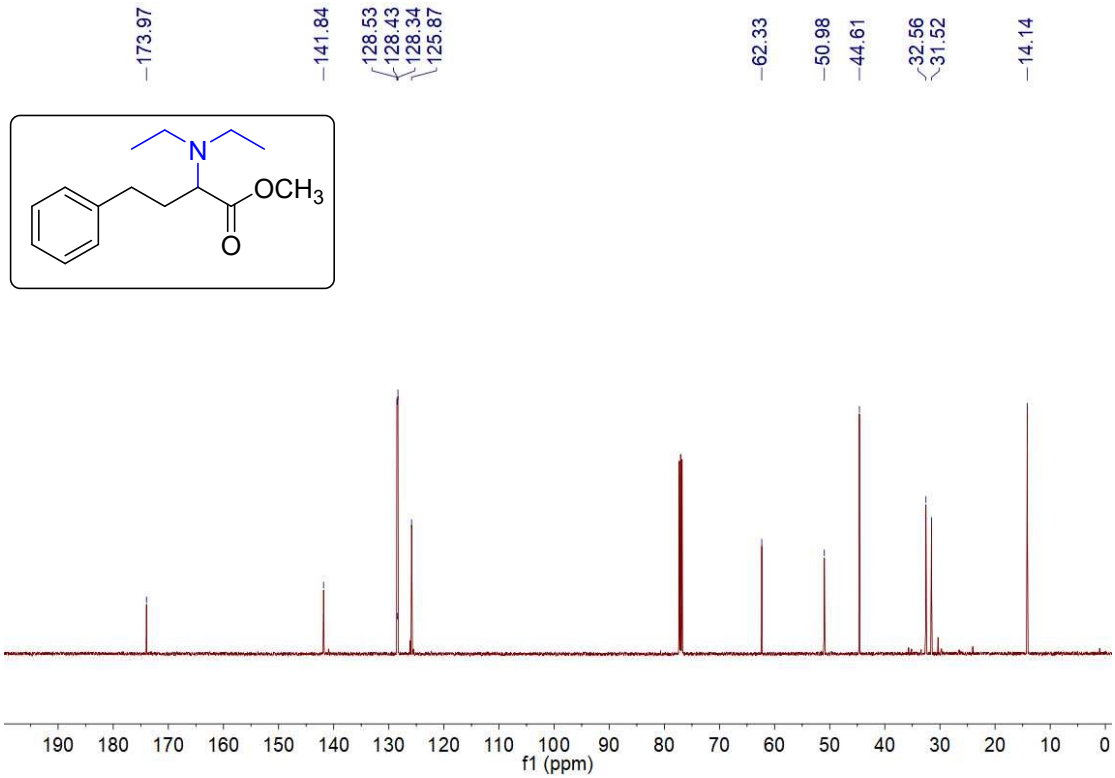
^{13}C spectrum ($CDCl_3$) methyl 2-((2,2-dimethoxyethyl)(methyl)amino)-4-phenylbutanoate (6e)



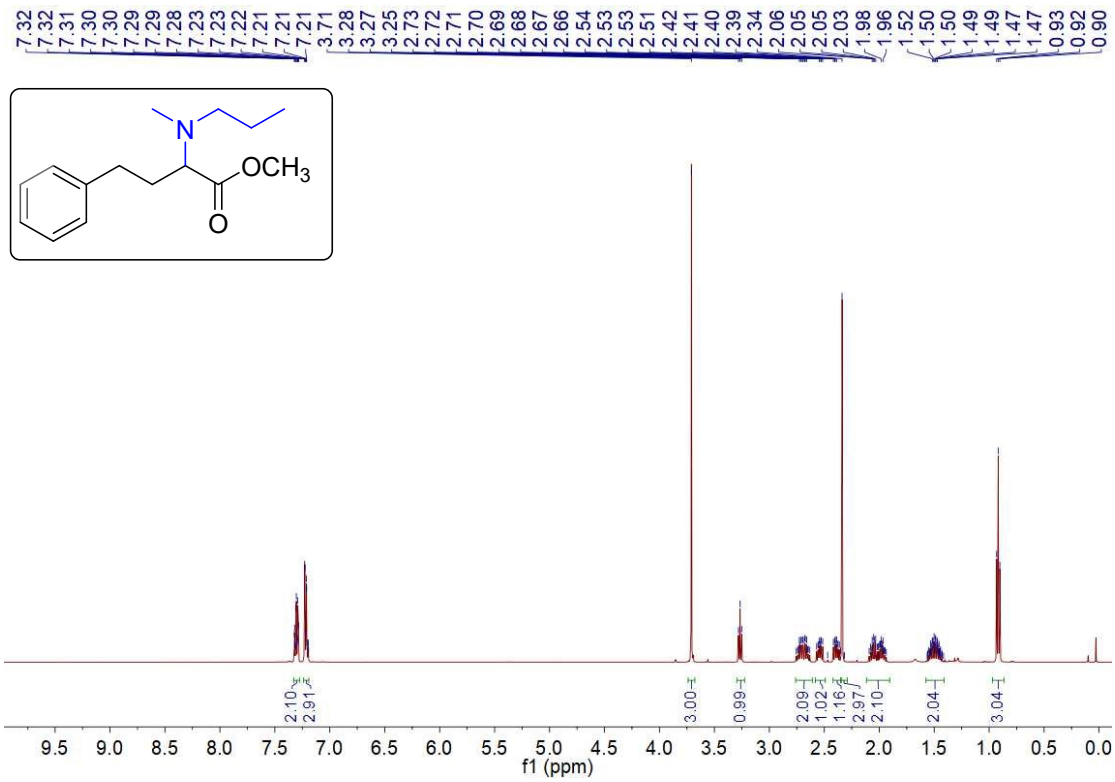
^{1}H spectrum ($CDCl_3$) methyl 2-(diethylamino)-4-phenylbutanoate (6f)



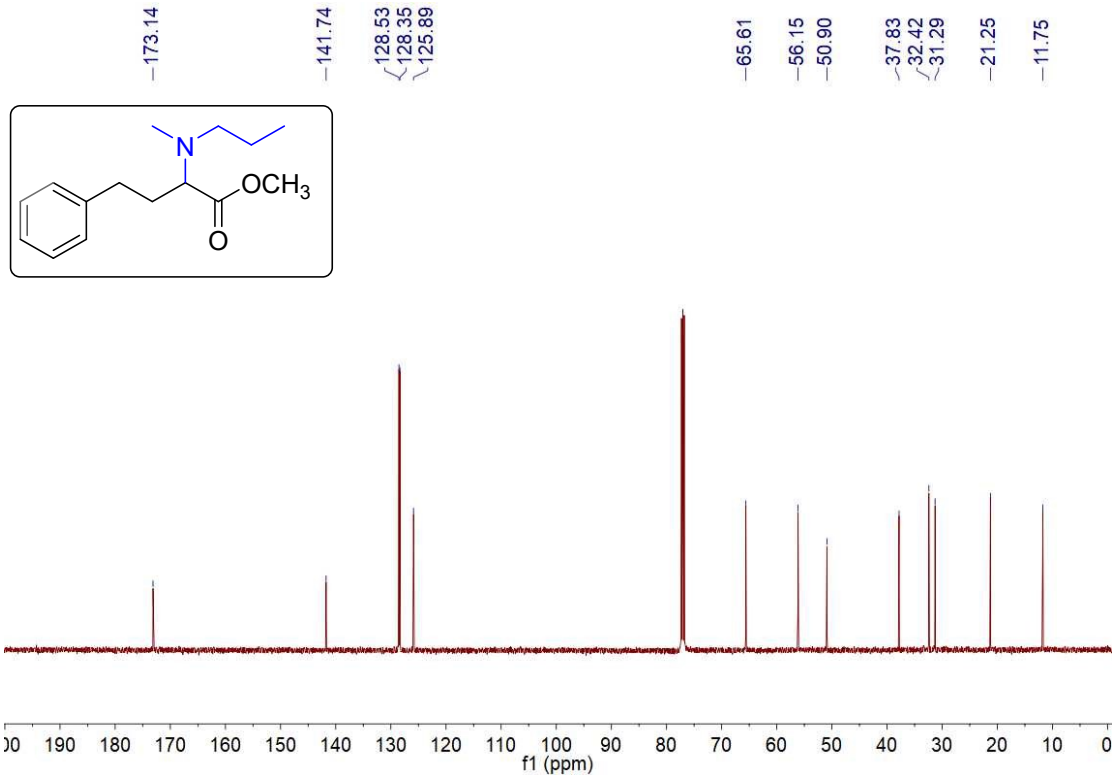
^{13}C spectrum ($CDCl_3$) methyl 2-(diethylamino)-4-phenylbutanoate (6f)



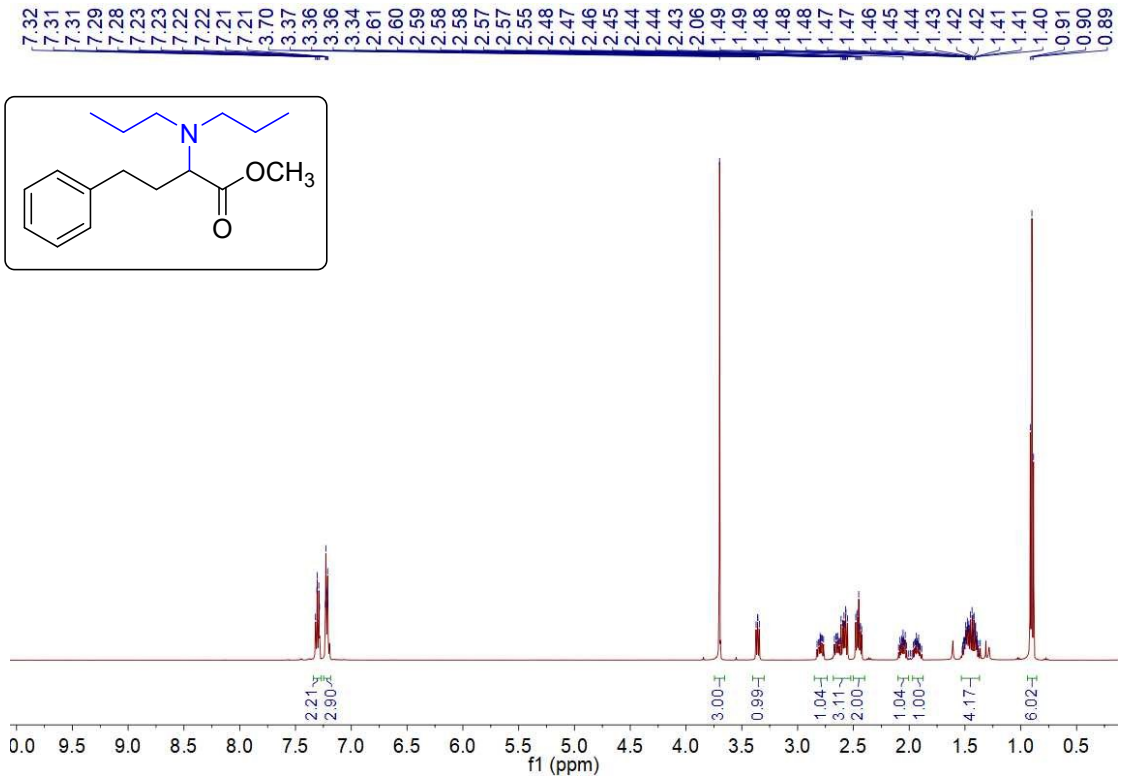
^{1}H spectrum ($CDCl_3$) methyl 2-(methyl(propyl)amino)-4-phenylbutanoate (6g)



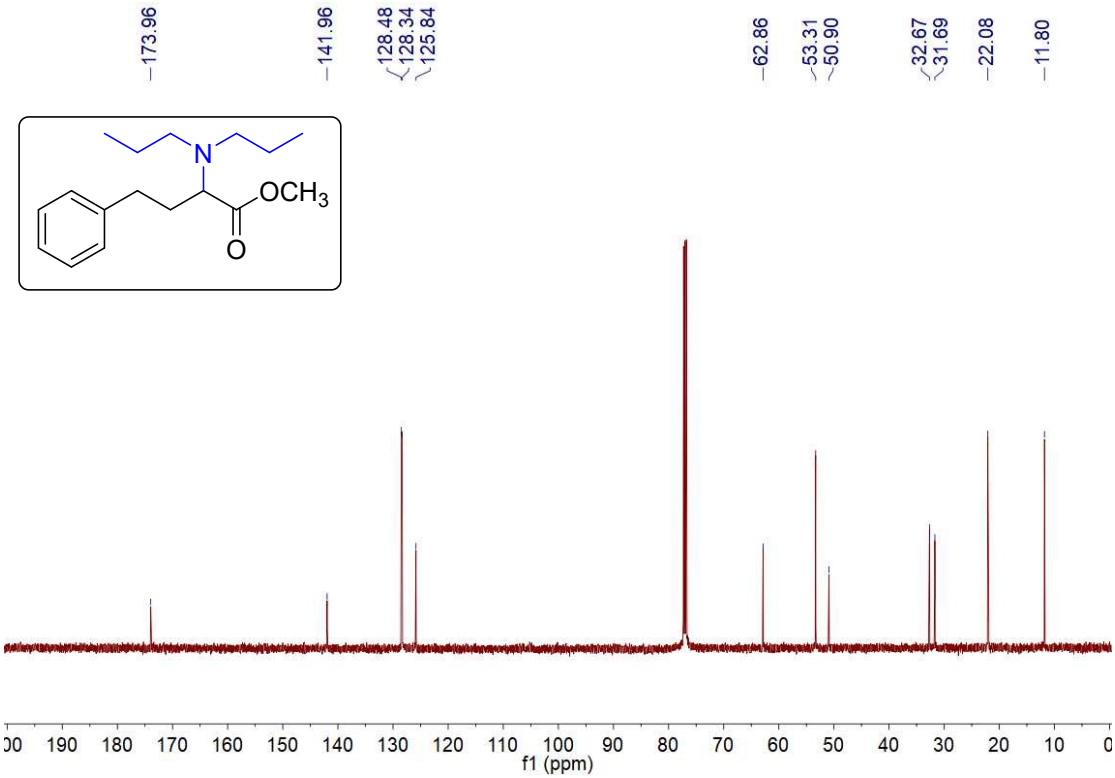
^{13}C spectrum ($CDCl_3$) methyl 2-(methyl(propyl)amino)-4-phenylbutanoate (6g)



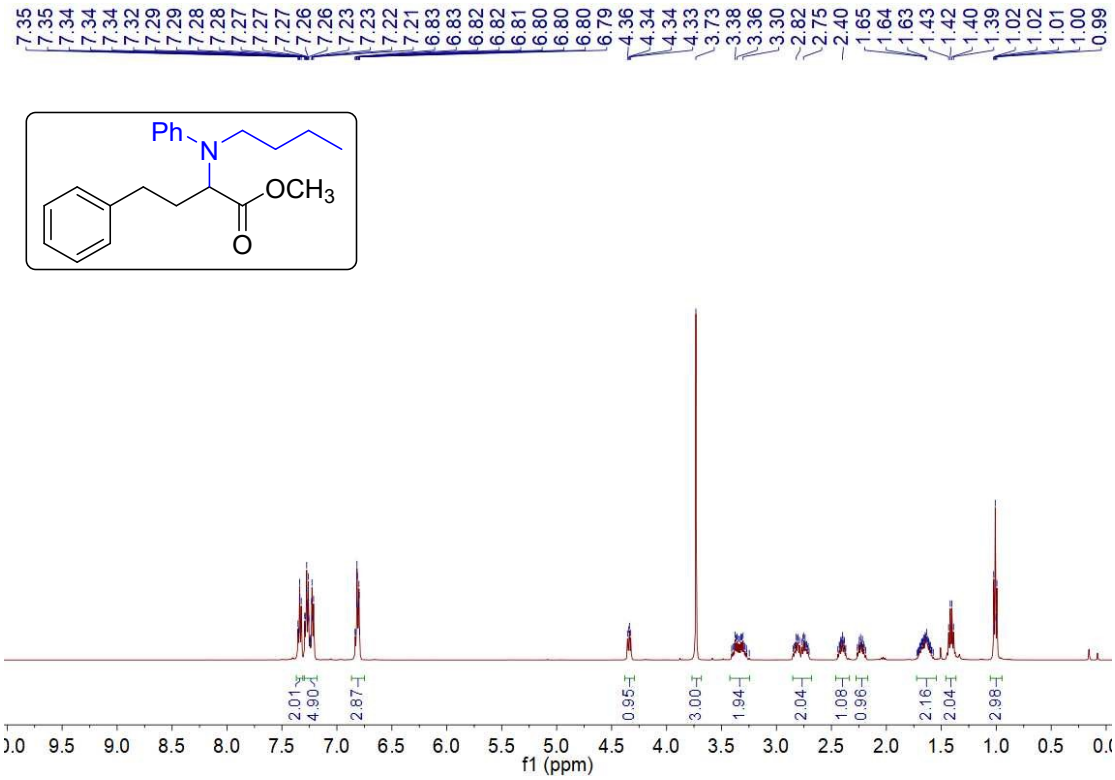
^{1}H spectrum ($CDCl_3$) methyl 2-(dipropylamino)-4-phenylbutanoate (6h)



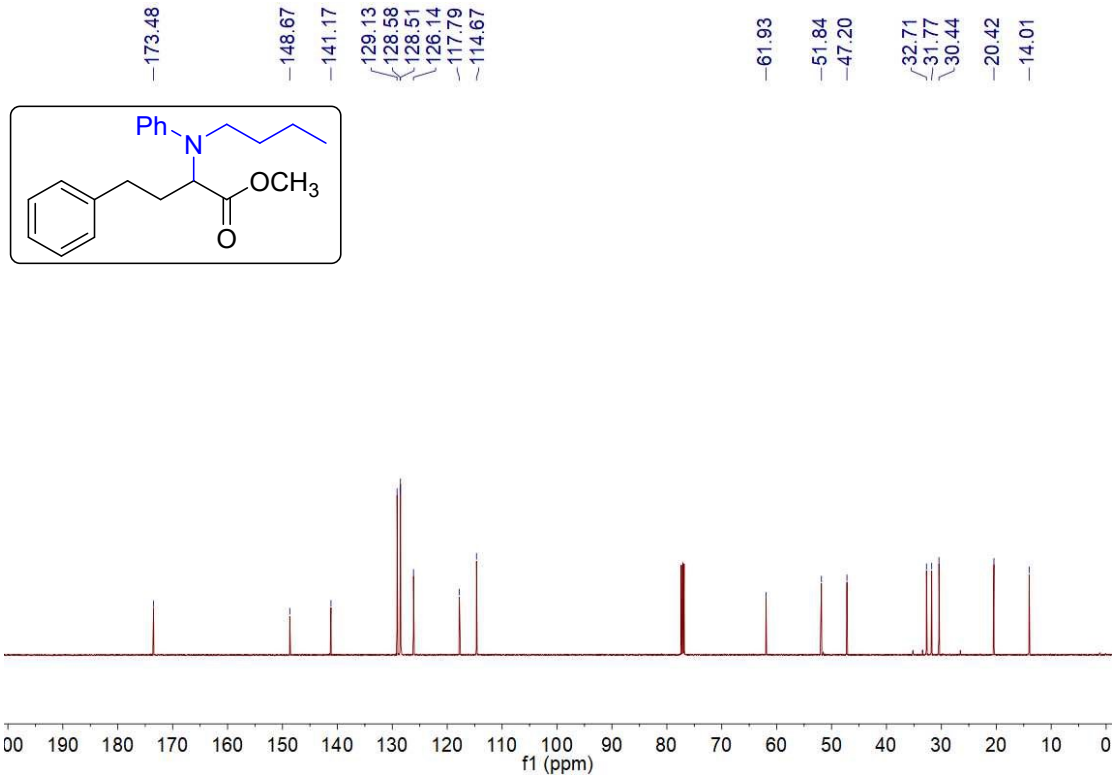
^{13}C spectrum ($CDCl_3$) methyl 2-(dipropylamino)-4-phenylbutanoate (6h)



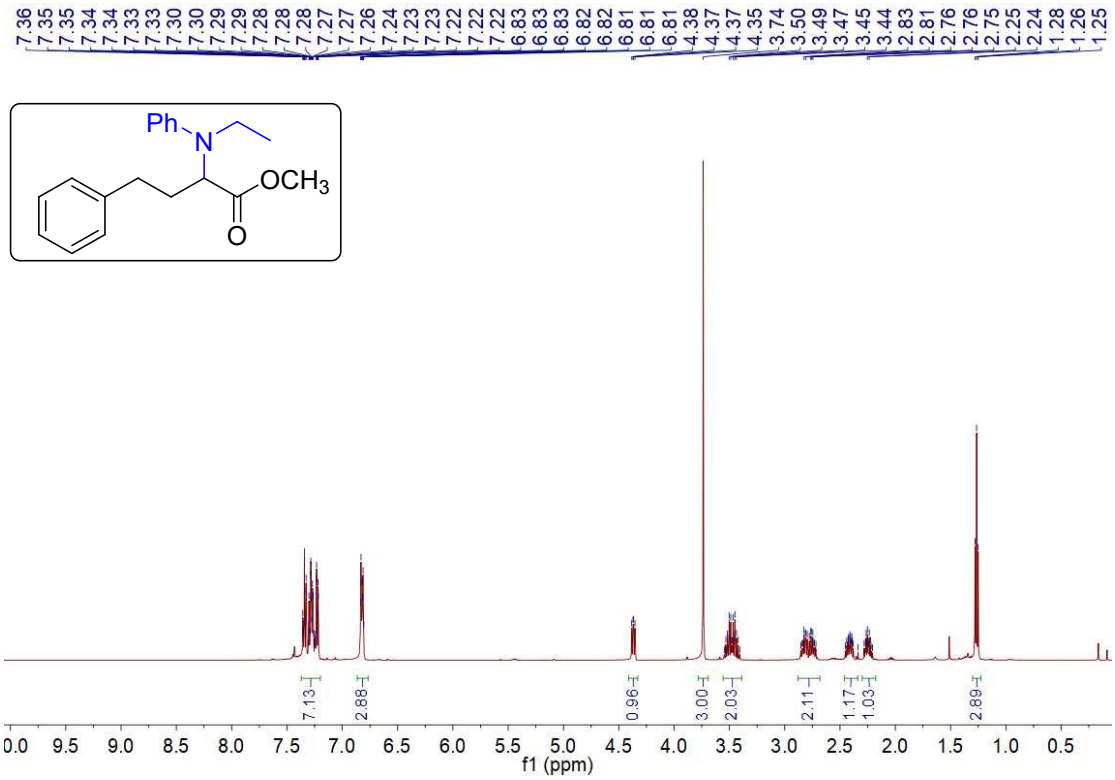
^{1}H spectrum ($CDCl_3$) methyl 2-(butyl(phenyl)amino)-4-phenylbutanoate (6i)



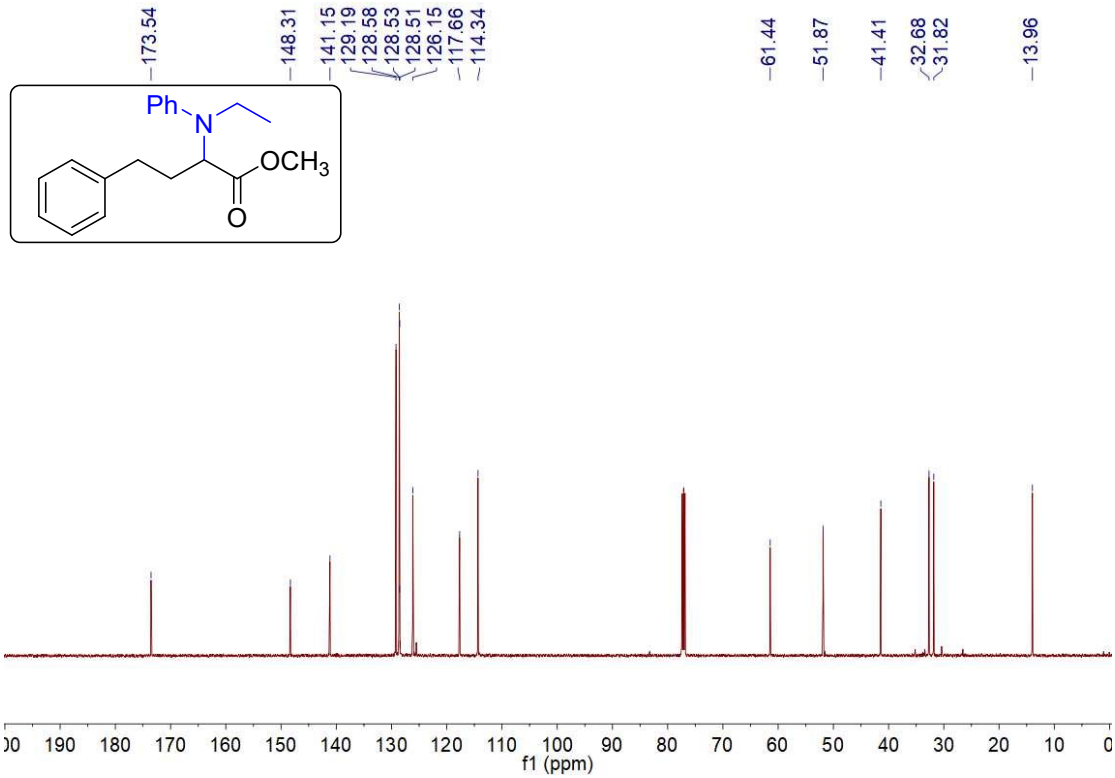
^{13}C spectrum ($CDCl_3$) methyl 2-(butyl(phenyl)amino)-4-phenylbutanoate (6i)



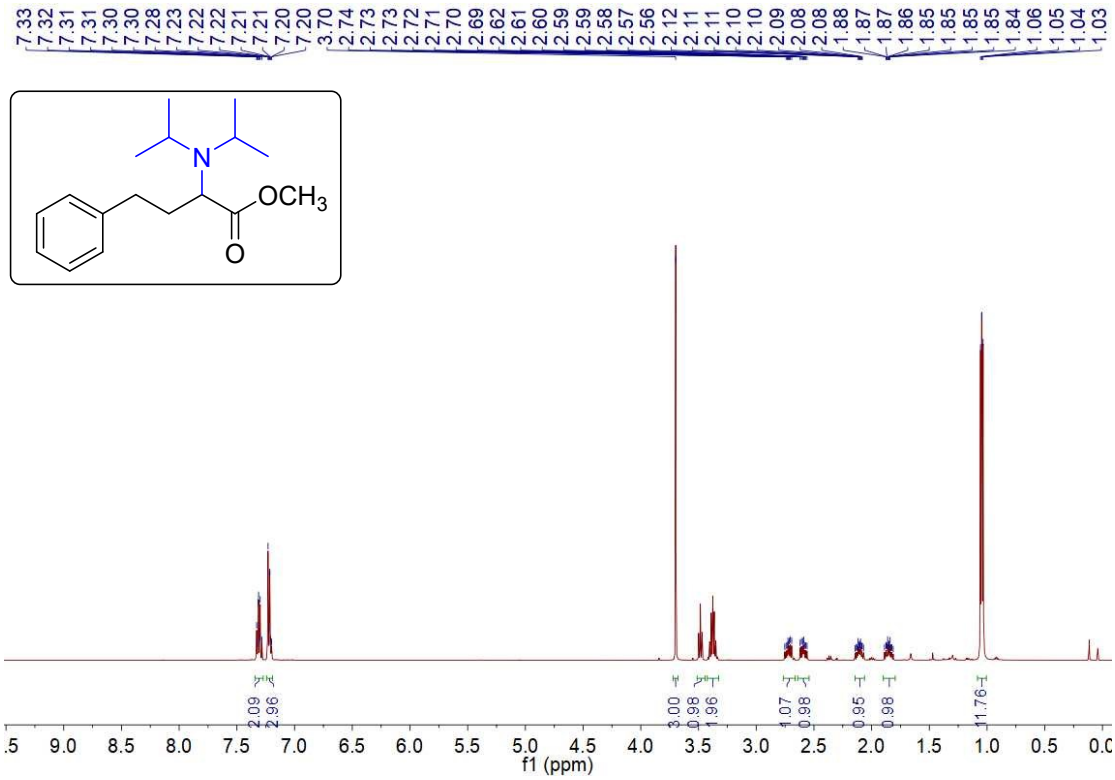
^{1}H spectrum ($CDCl_3$) methyl 2-(ethyl(phenyl)amino)-4-phenylbutanoate (6j)



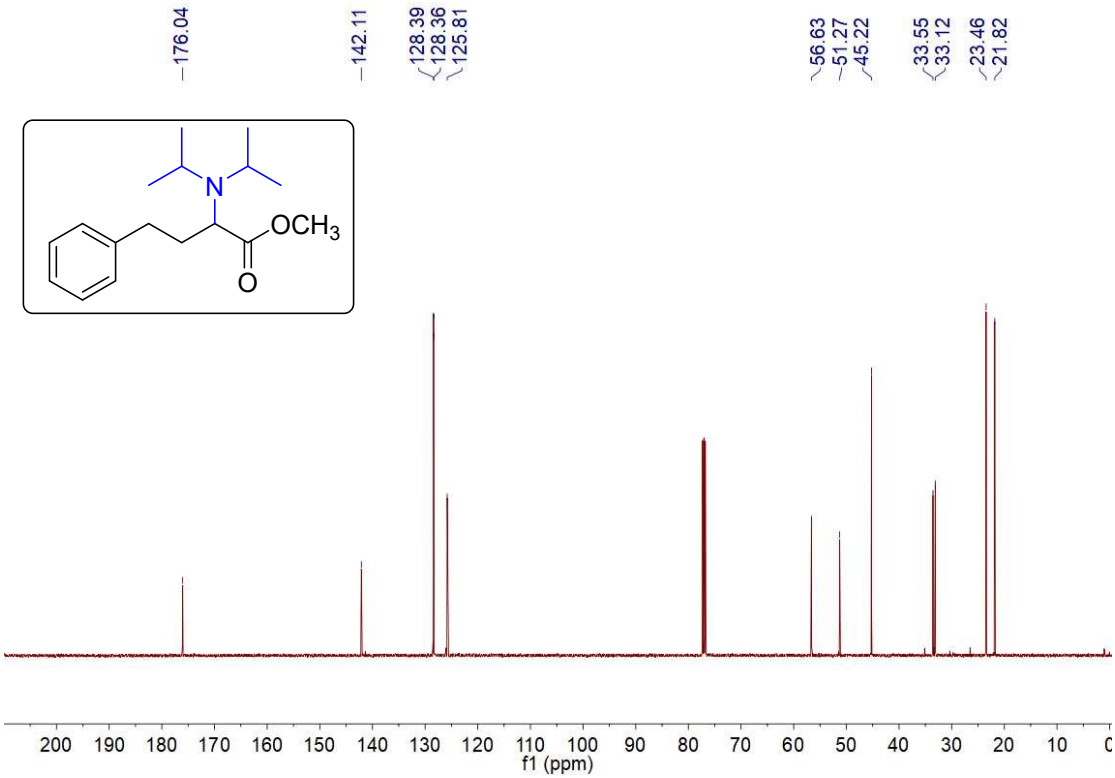
^{13}C spectrum ($CDCl_3$) methyl 2-(ethyl(phenyl)amino)-4-phenylbutanoate (6j)



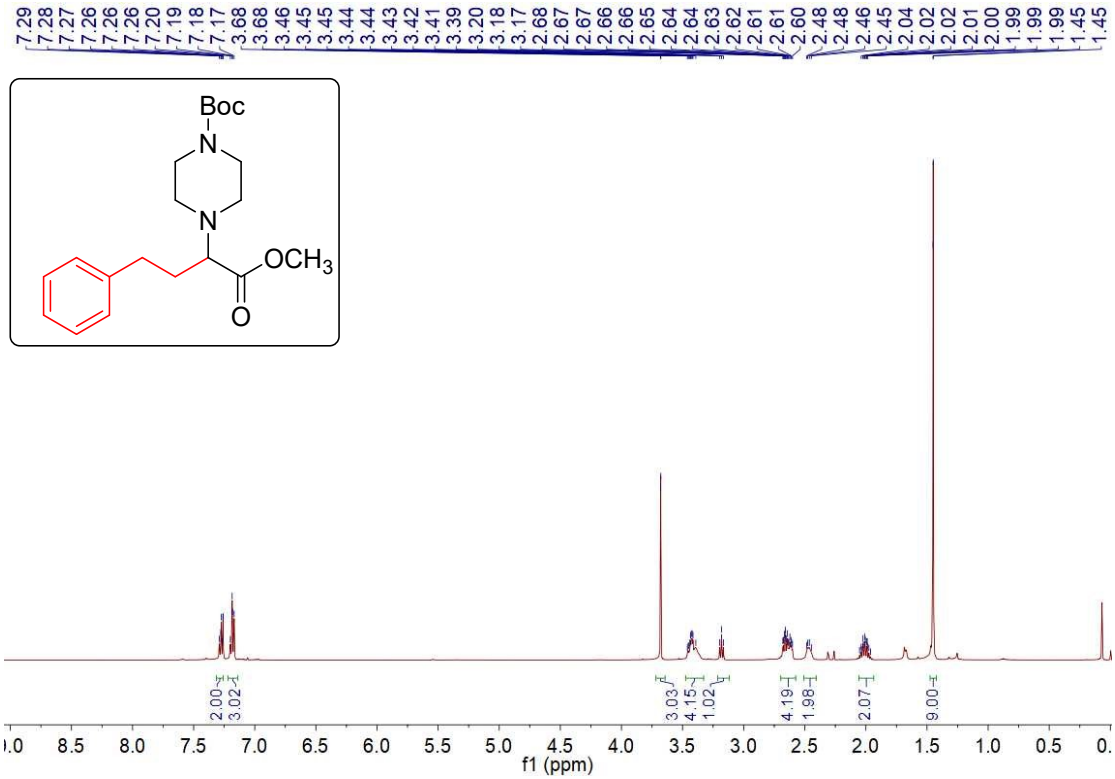
^{1}H spectrum ($CDCl_3$) methyl 2-(diisopropylamino)-4-phenylbutanoate (6k)



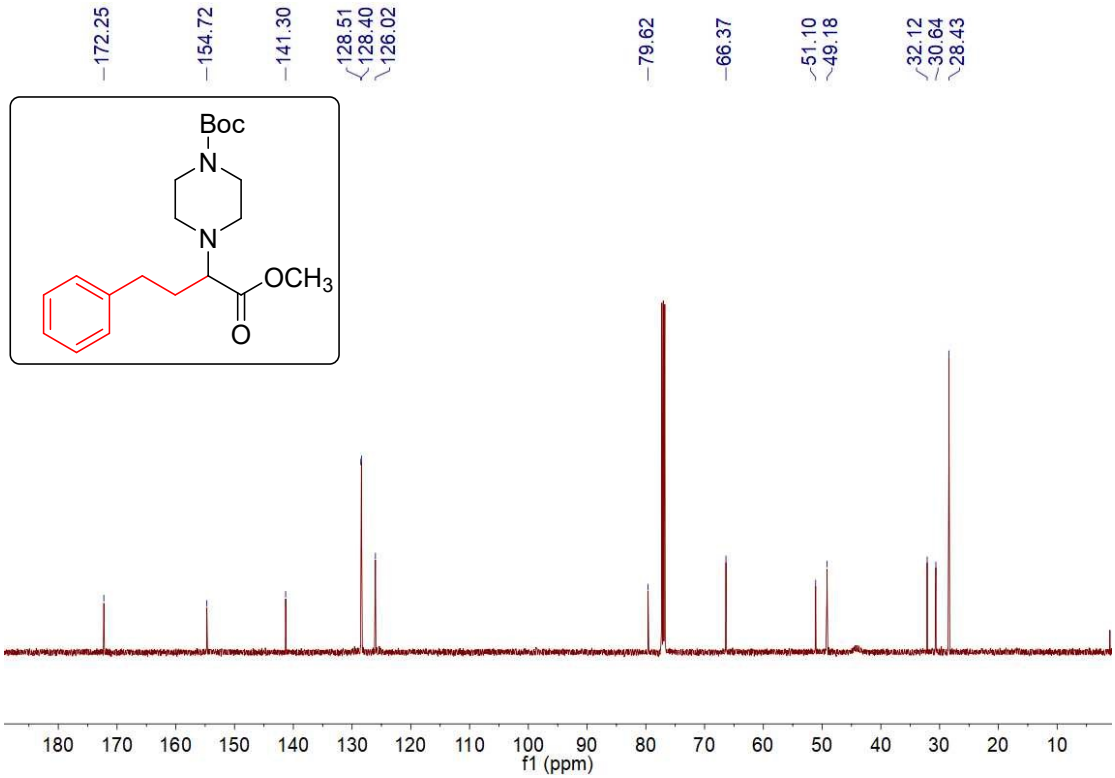
^{13}C spectrum ($CDCl_3$) methyl 2-(diisopropylamino)-4-phenylbutanoate (6k)



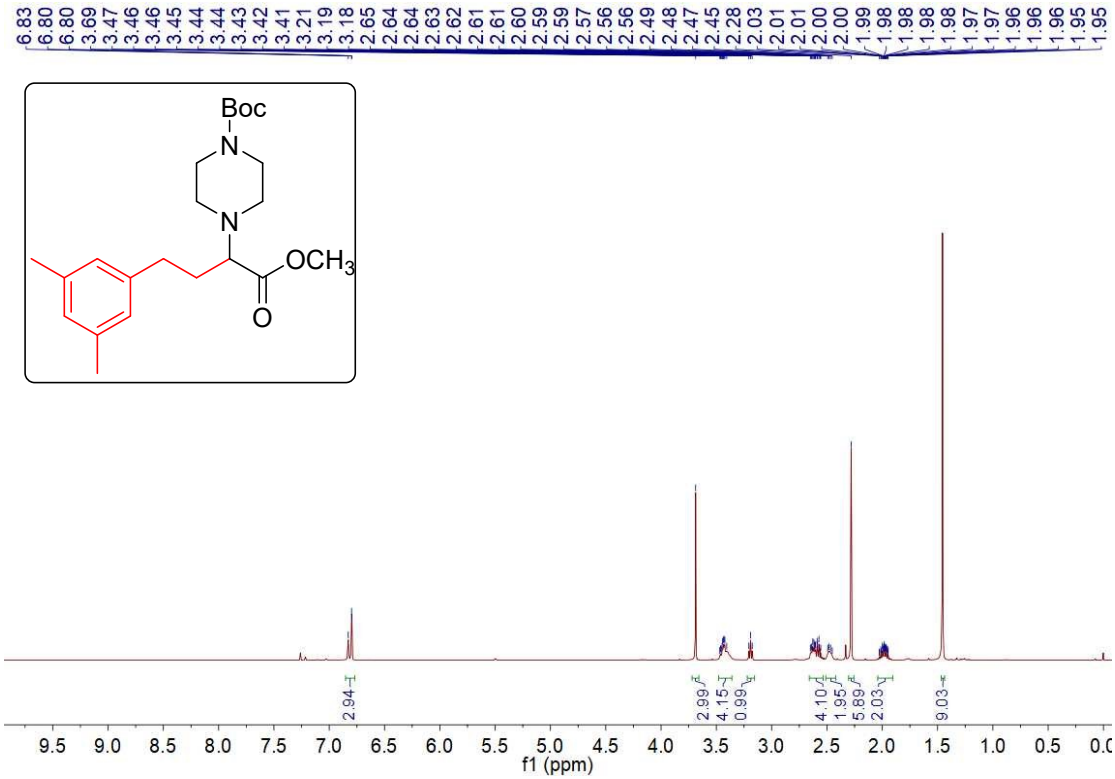
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(1-methoxy-1-oxo-4-phenylbutan-2-yl)piperazine-1 -carboxylate (6l)



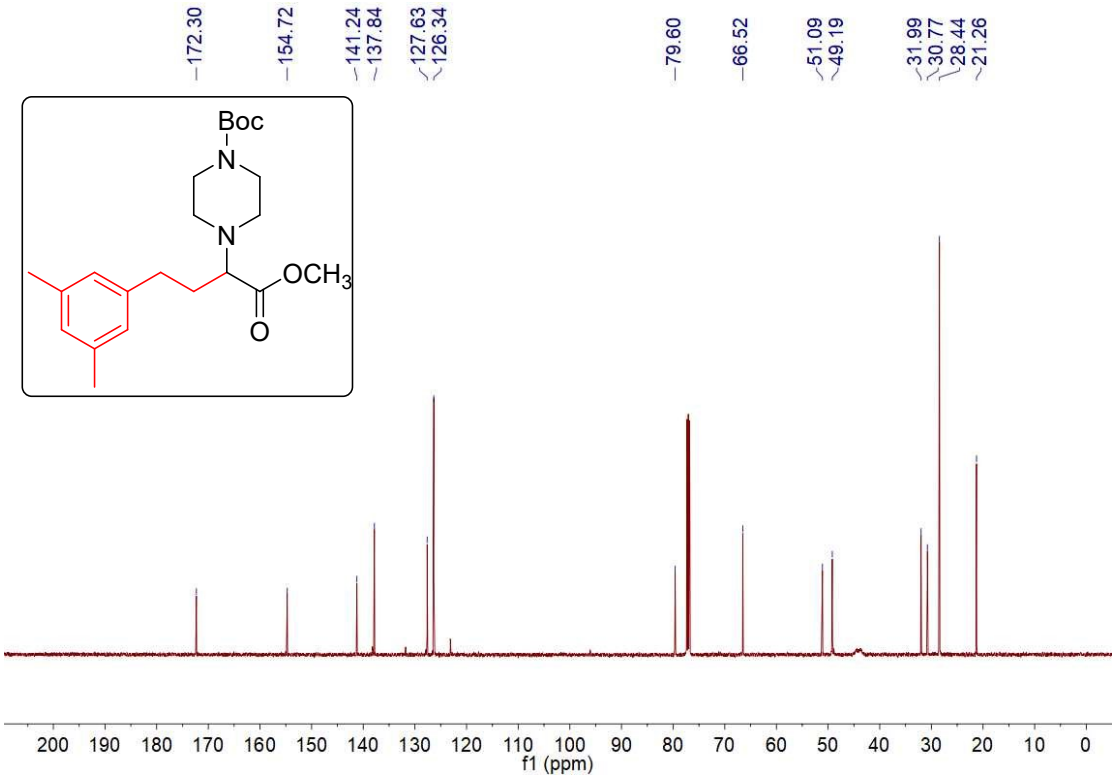
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(1-methoxy-1-oxo-4-phenylbutan-2-yl)piperazine-1 -carboxylate (6l)



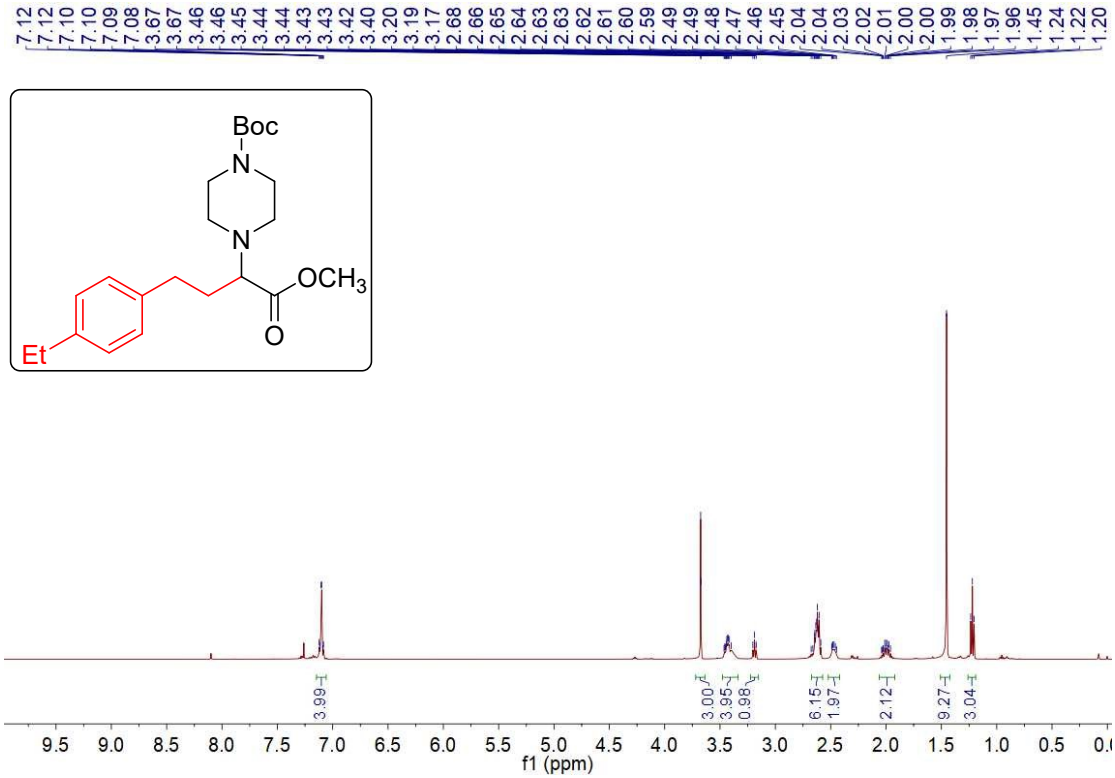
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(4-(3,5-dimethylphenyl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6m)



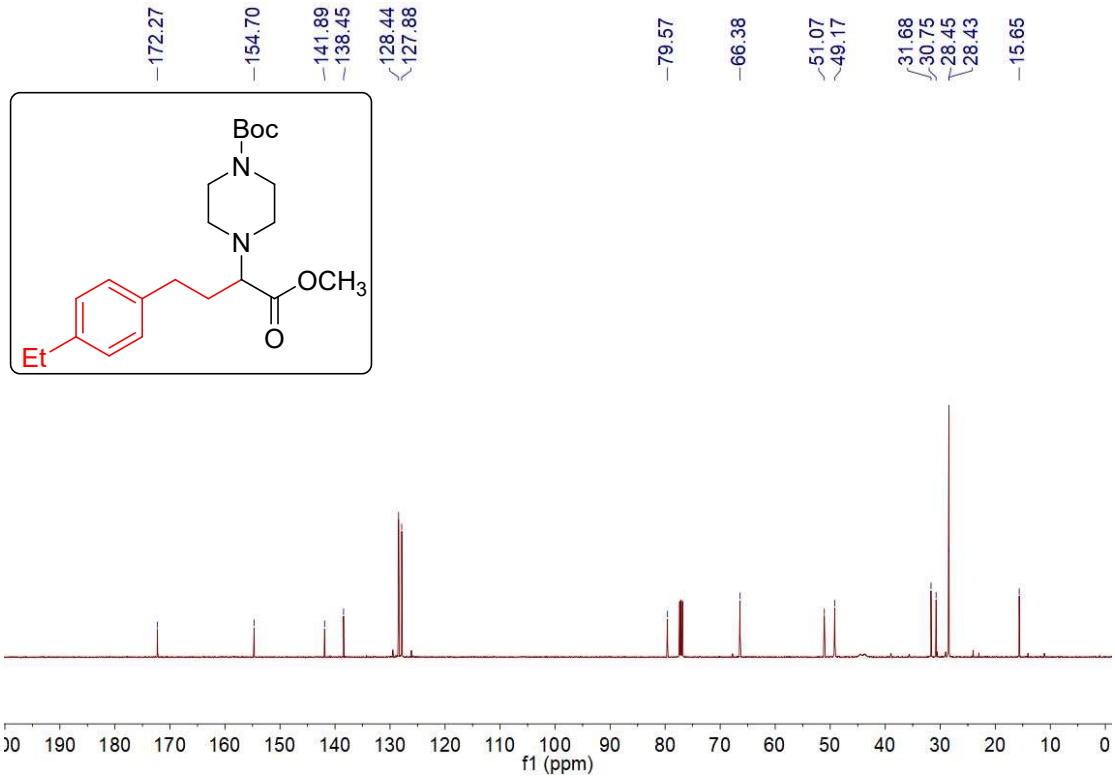
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(4-(3,5-dimethylphenyl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6m)



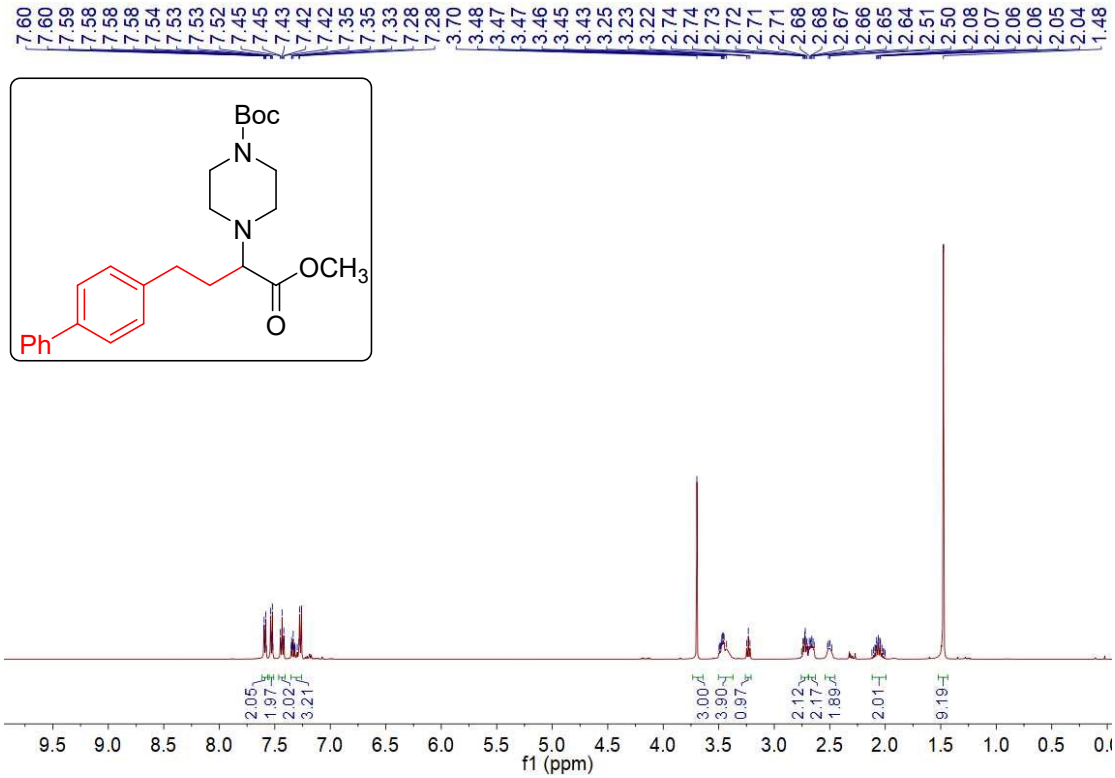
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(4-(4-ethylphenyl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6n)



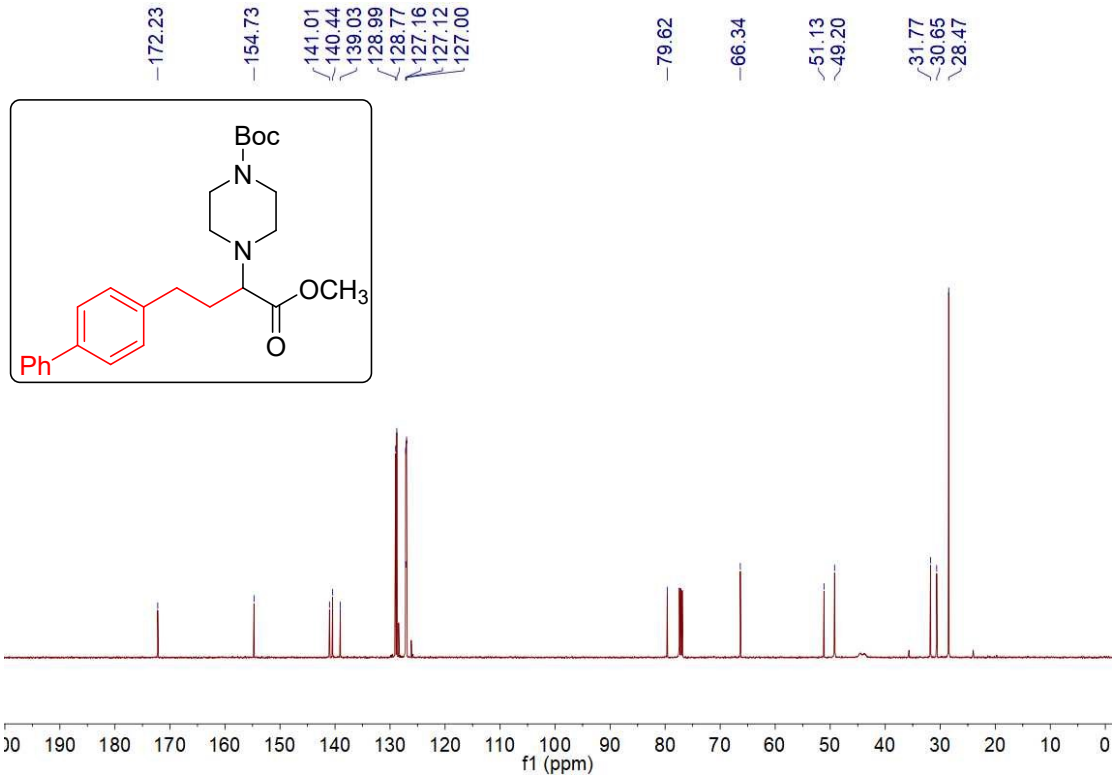
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(4-(4-ethylphenyl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6n)



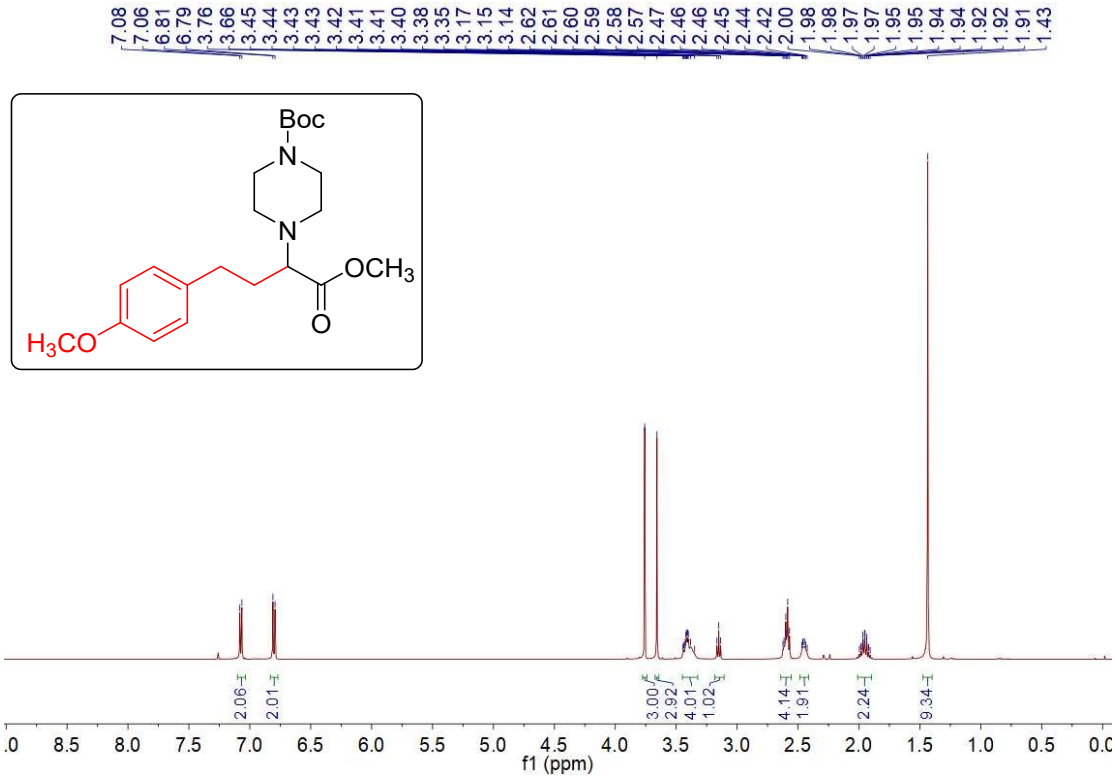
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(4-([1,1'-biphenyl]-4-yl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6o)



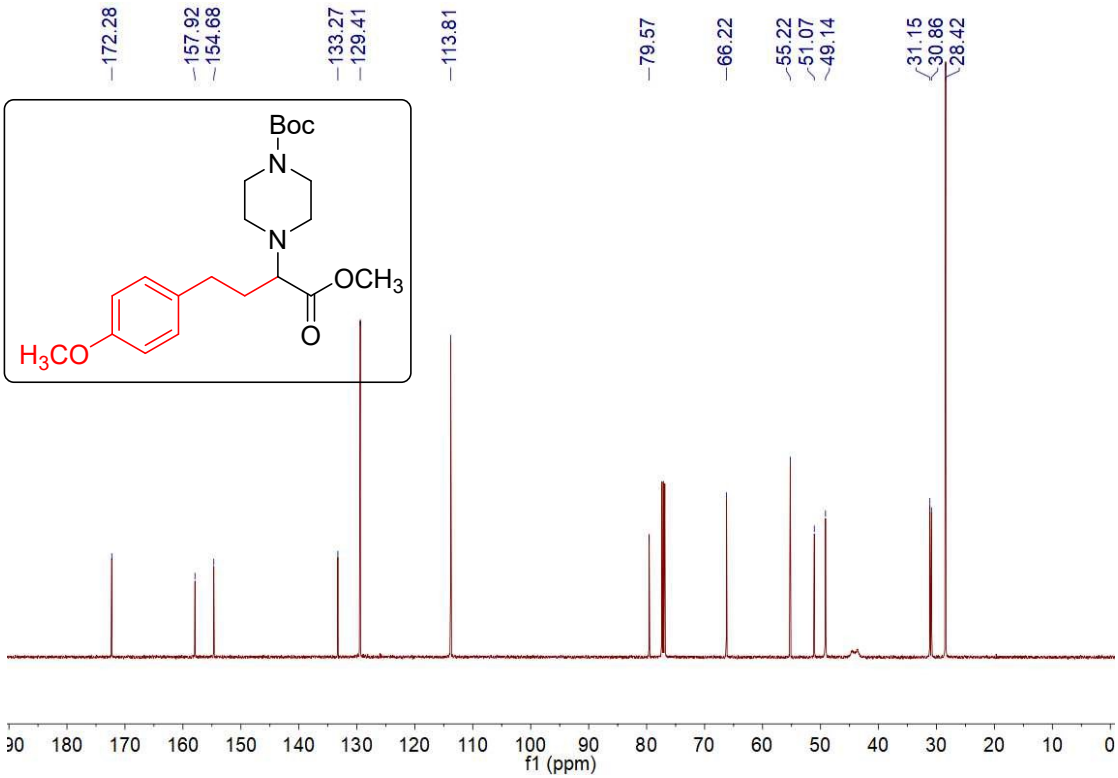
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(4-([1,1'-biphenyl]-4-yl)-1-methoxy-1-oxobutan-2-yl) piperazine-1-carboxylate (6o)



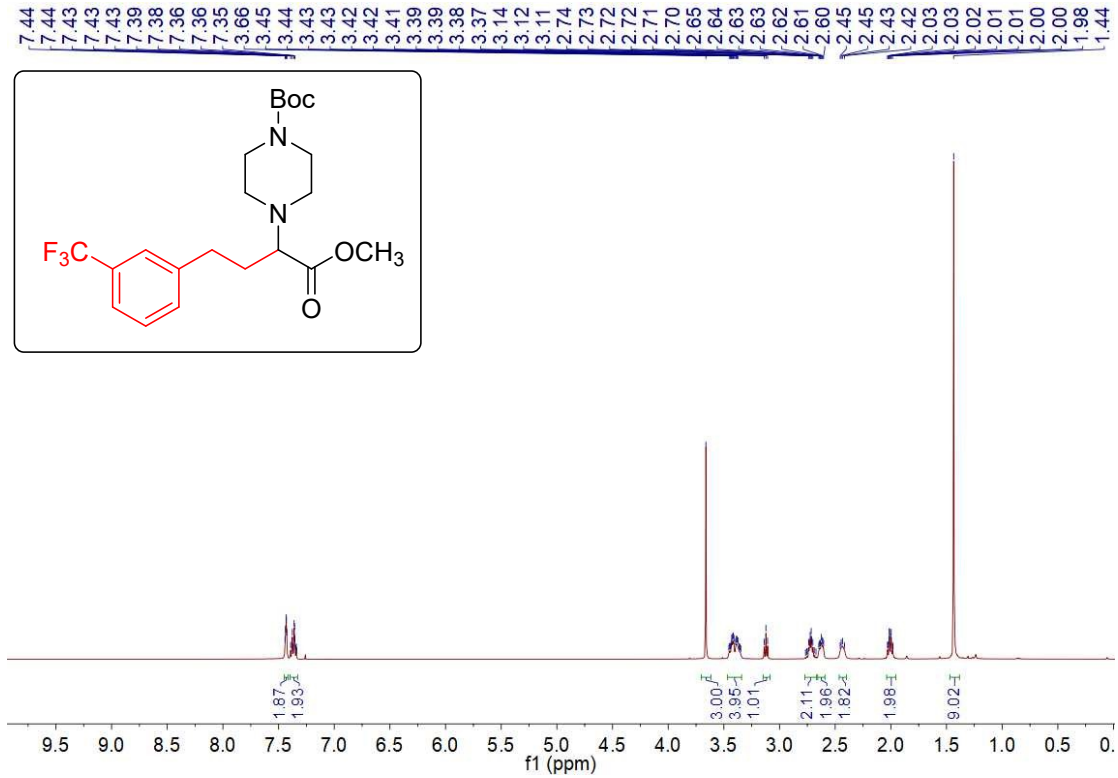
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(1-methoxy-4-(4-methoxyphenyl)-1-oxobutan-2-yl) piperazine-1-carboxylate (6p)



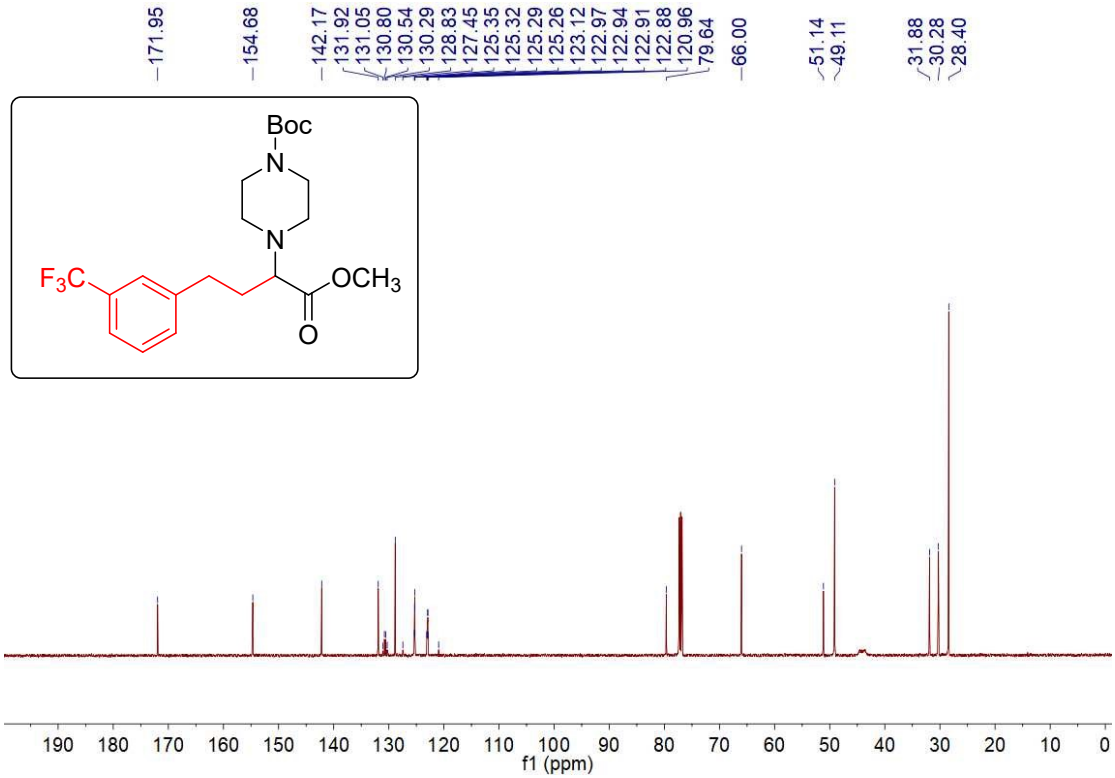
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(1-methoxy-4-(4-methoxyphenyl)-1-oxobutan-2-yl) piperazine-1-carboxylate (6p)



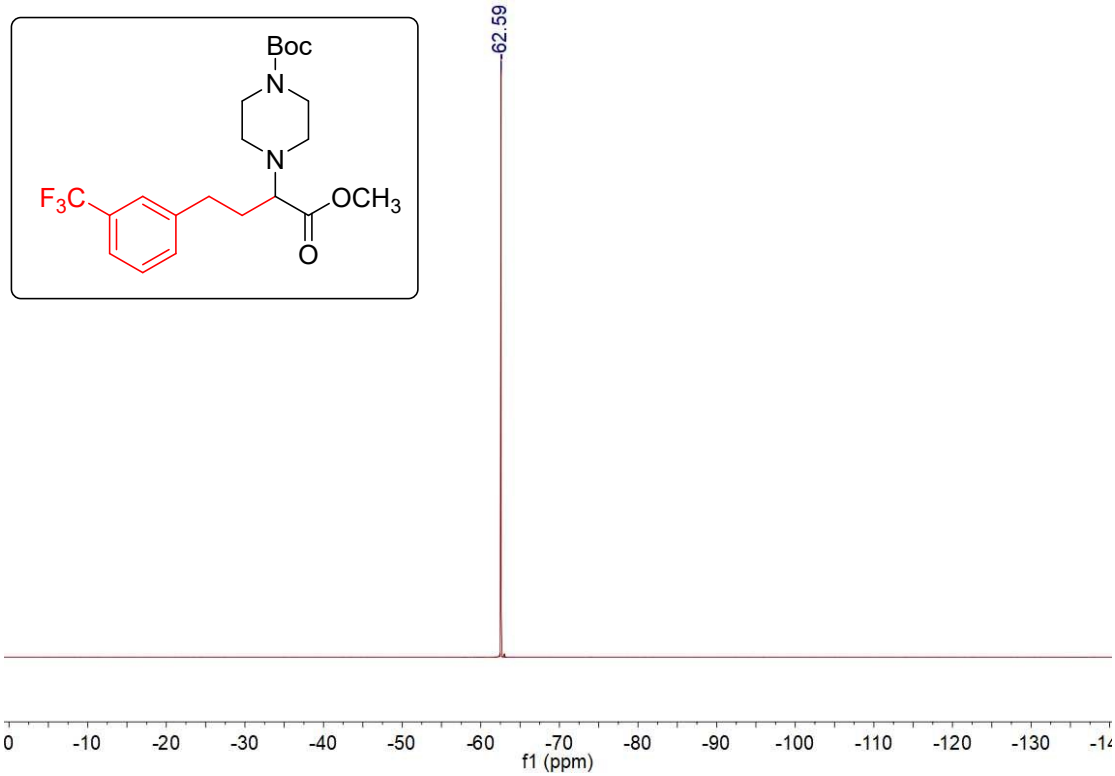
^{1}H spectrum ($CDCl_3$) tert-butyl 4-(1-methoxy-1-oxo-4-(3-(trifluoromethyl)phenyl)butan-2-yl) piperazine-1-carboxylate (6q)



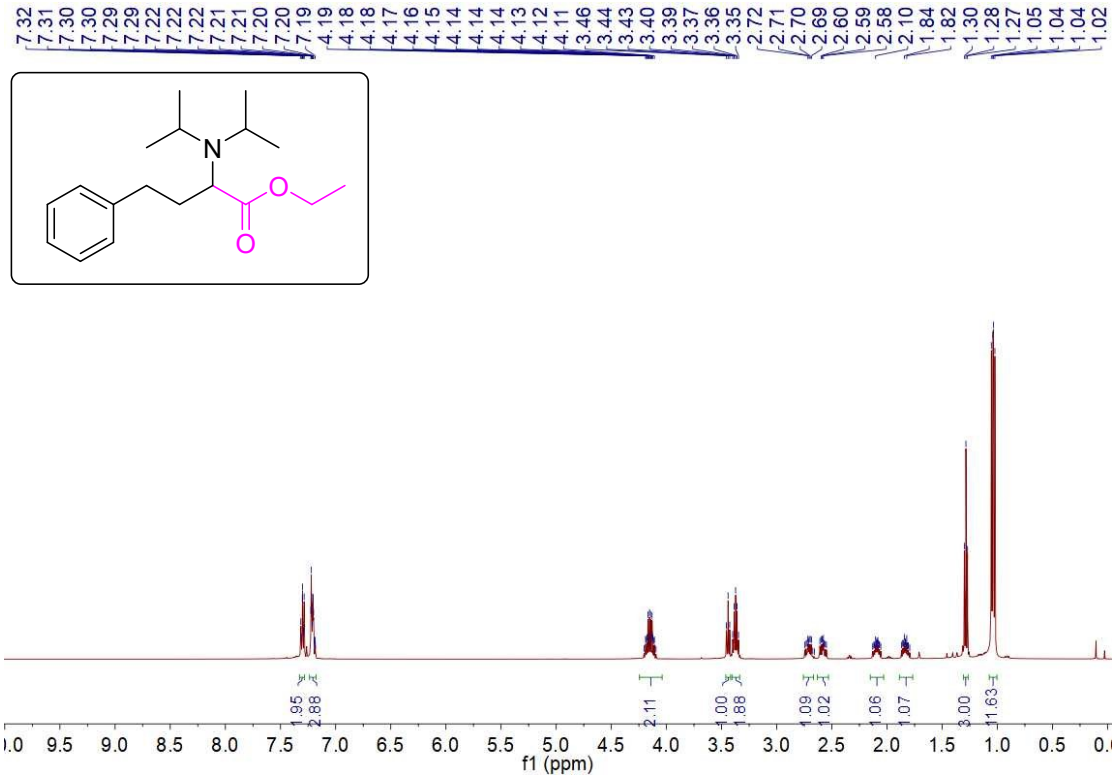
^{13}C spectrum ($CDCl_3$) tert-butyl 4-(1-methoxy-1-oxo-4-(3-(trifluoromethyl)phenyl)butan-2-yl) piperazine-1-carboxylate (6q)



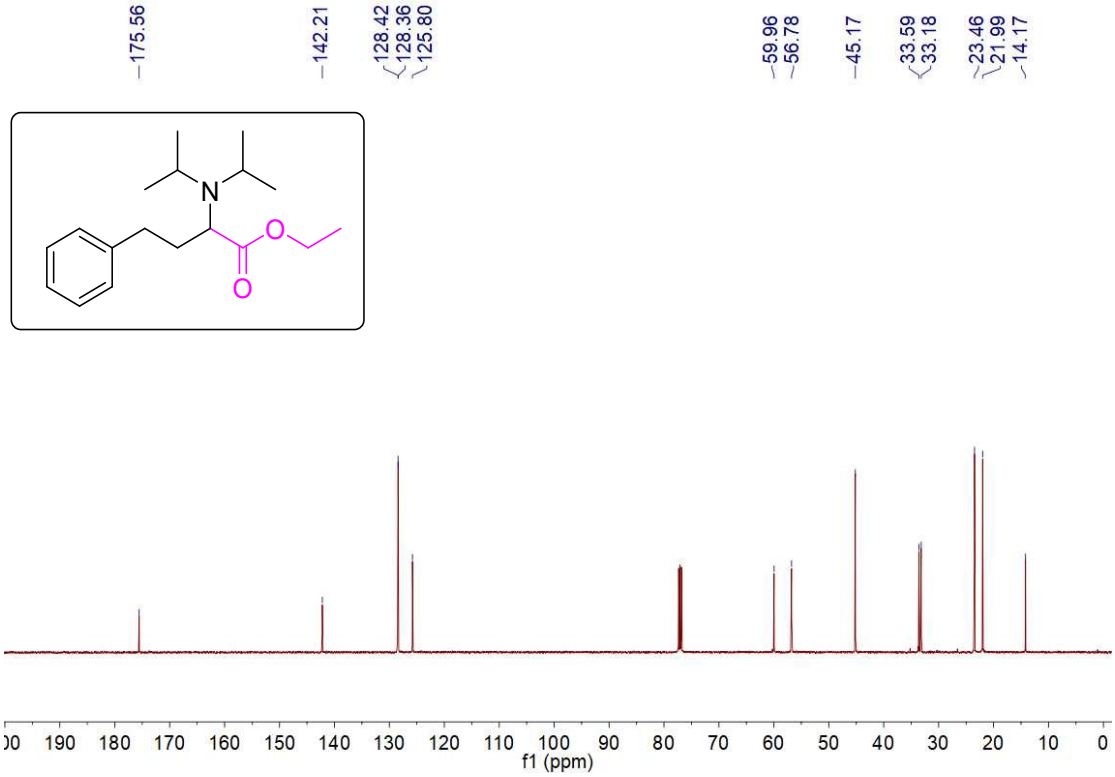
^{19}F spectrum ($CDCl_3$) tert-butyl 4-(1-methoxy-1-oxo-4-(3-(trifluoromethyl)phenyl)butan-2-yl) piperazine-1-carboxylate (6q)



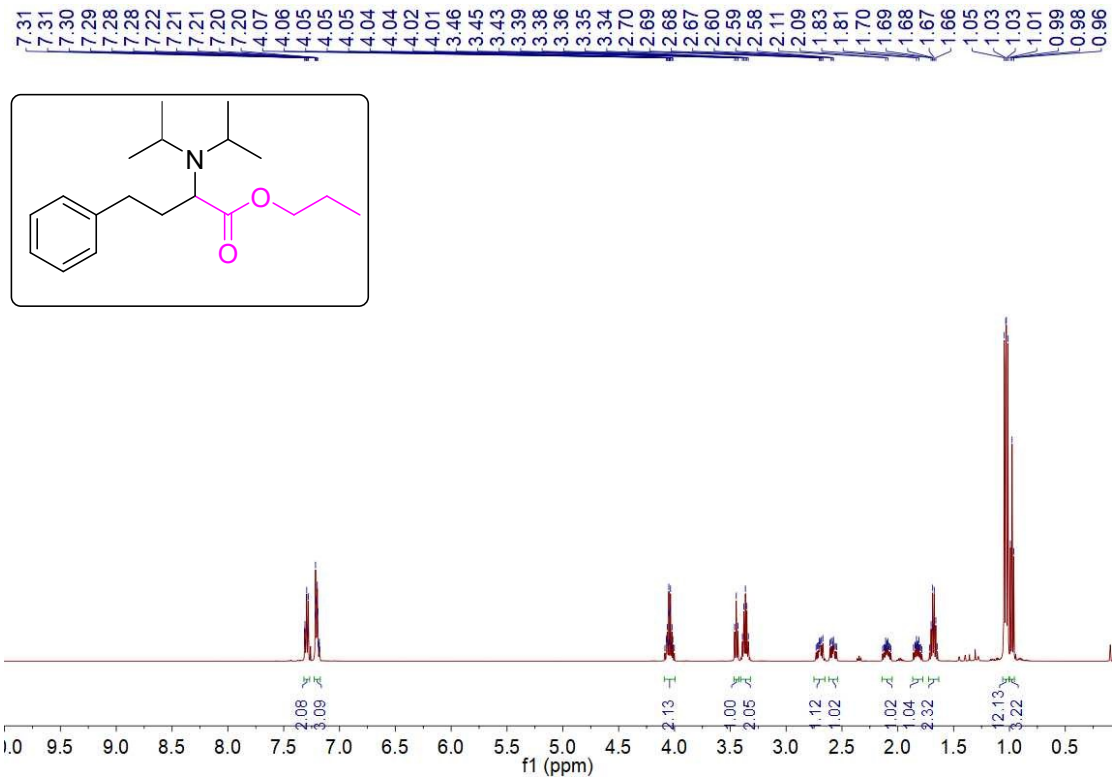
^{1}H spectrum ($CDCl_3$) ethyl 2-(diisopropylamino)-4-phenylbutanoate (6r)



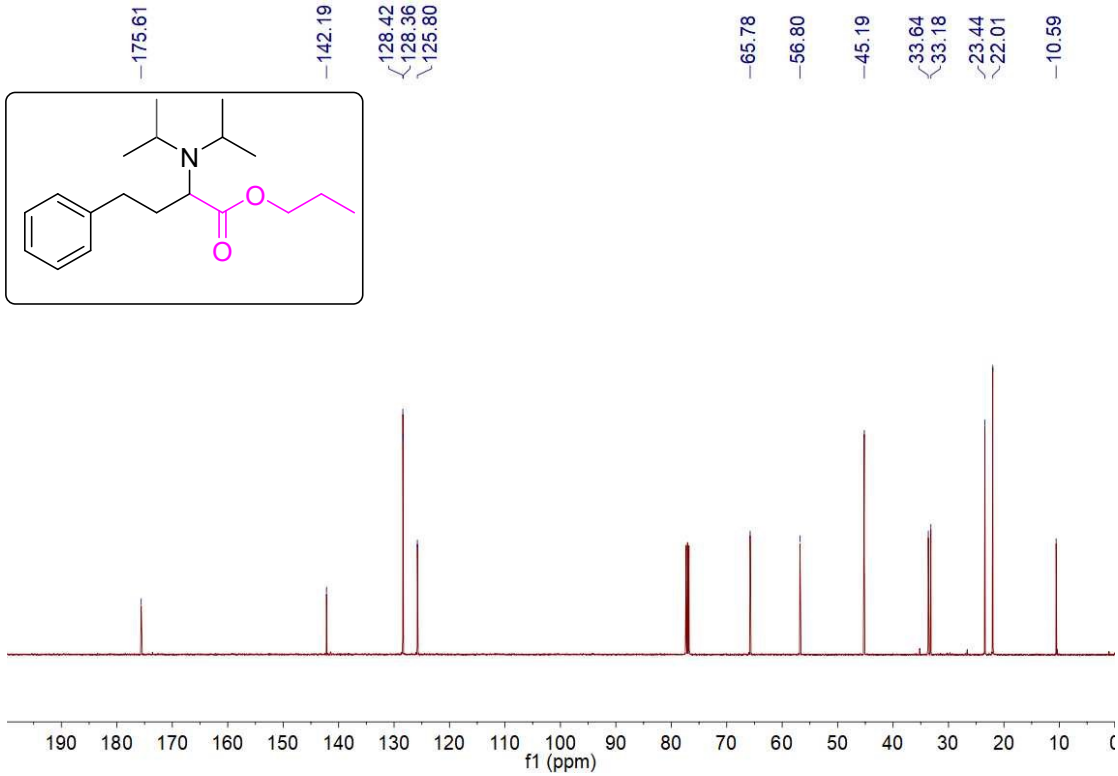
^{13}C spectrum ($CDCl_3$) ethyl 2-(diisopropylamino)-4-phenylbutanoate (6r)



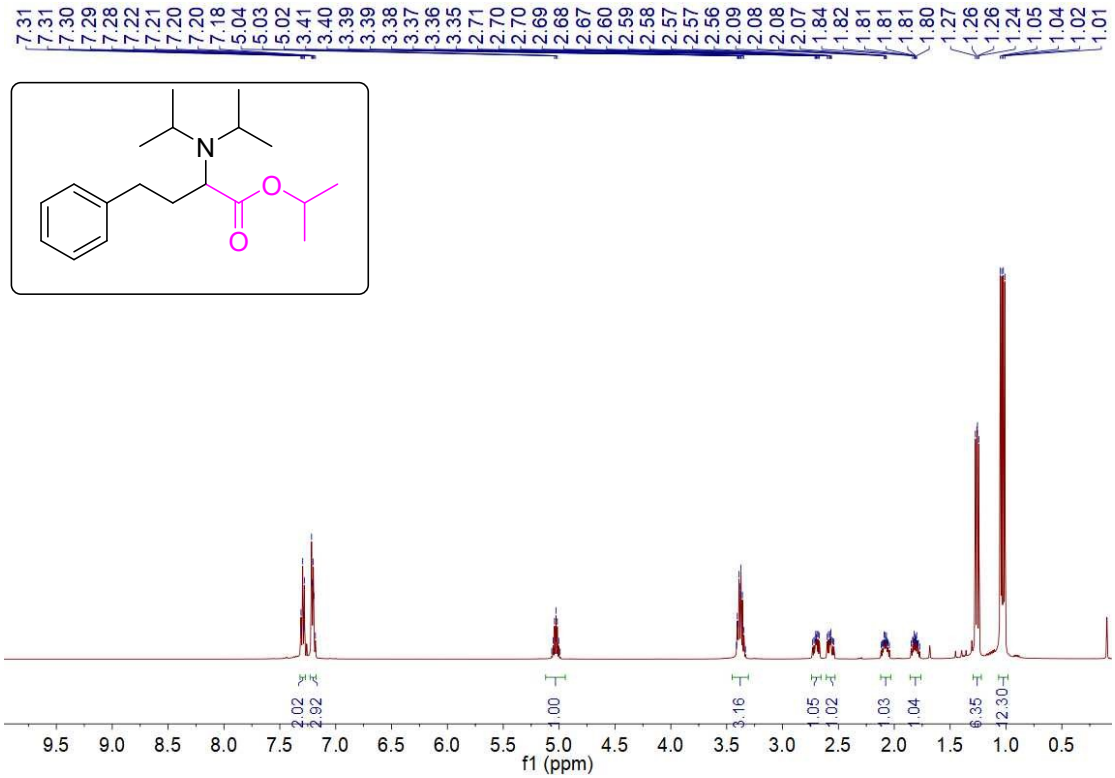
^{1}H spectrum ($CDCl_3$) propyl 2-(diisopropylamino)-4-phenylbutanoate (6s)



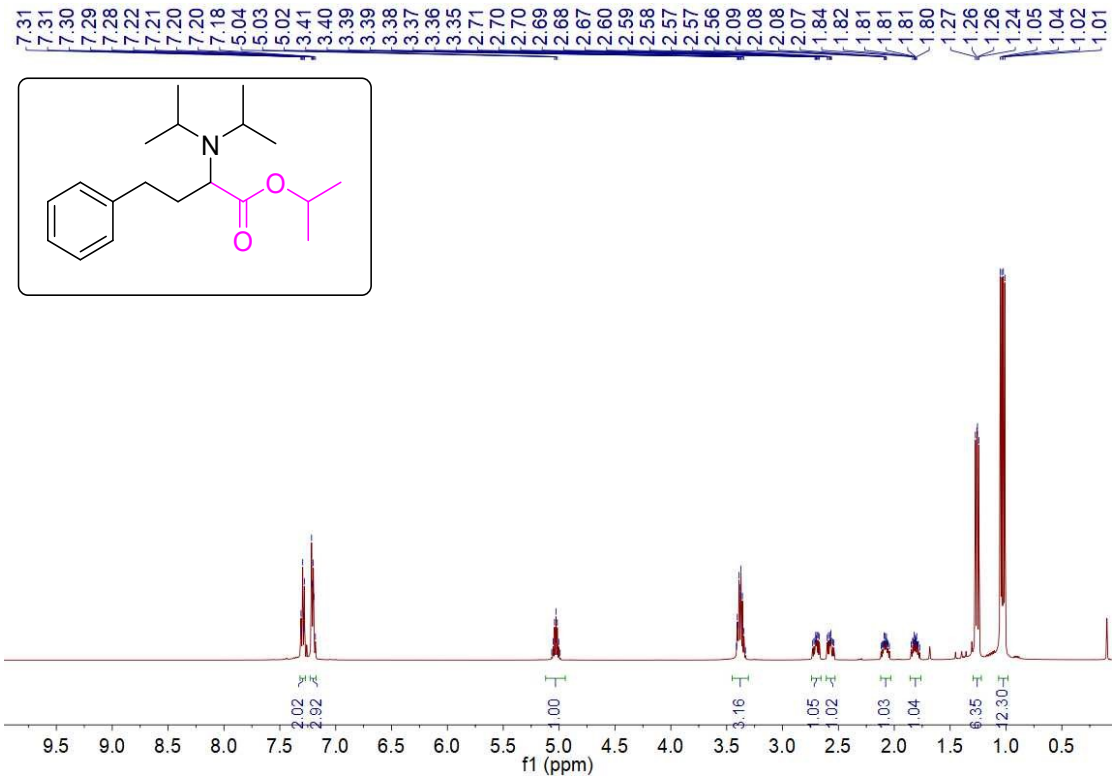
^{13}C spectrum ($CDCl_3$) propyl 2-(diisopropylamino)-4-phenylbutanoate (6s)



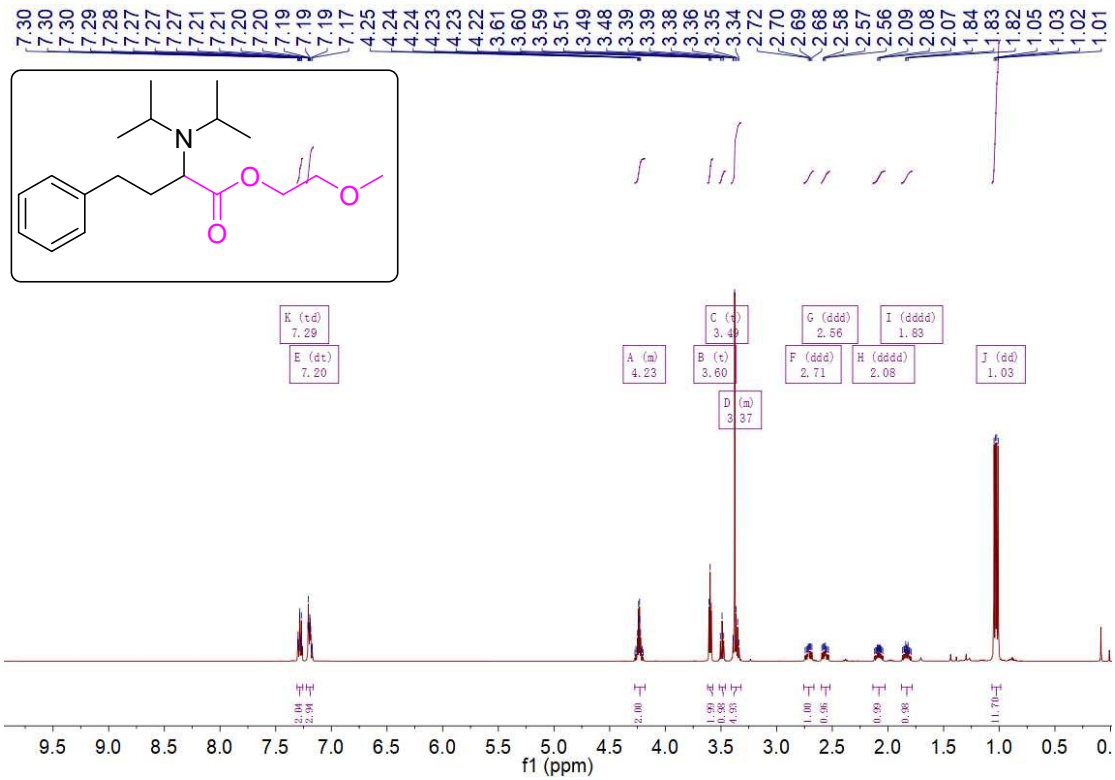
^{1}H spectrum ($CDCl_3$) isopropyl 2-(diisopropylamino)-4-phenylbutanoate (6t)



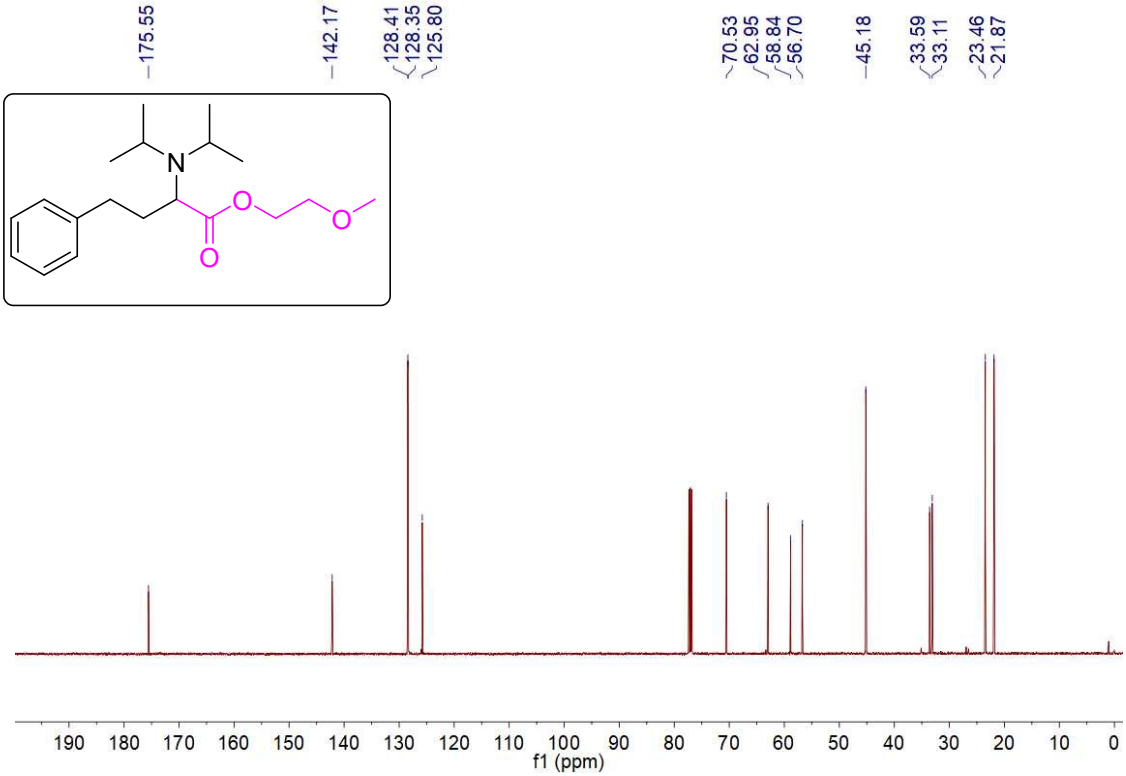
^{13}C spectrum ($CDCl_3$) isopropyl 2-(diisopropylamino)-4-phenylbutanoate (6t)



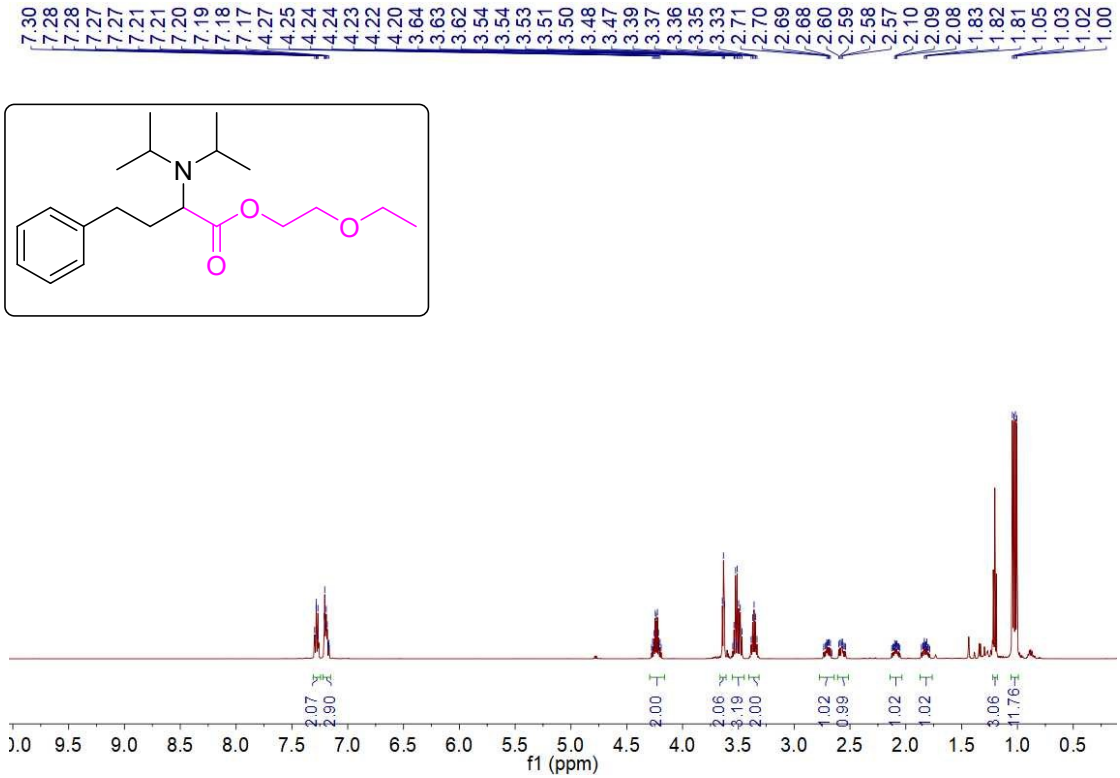
^{1}H spectrum ($CDCl_3$) 2-methoxyethyl 2-(diisopropylamino)-4-phenylbutanoate (6u)



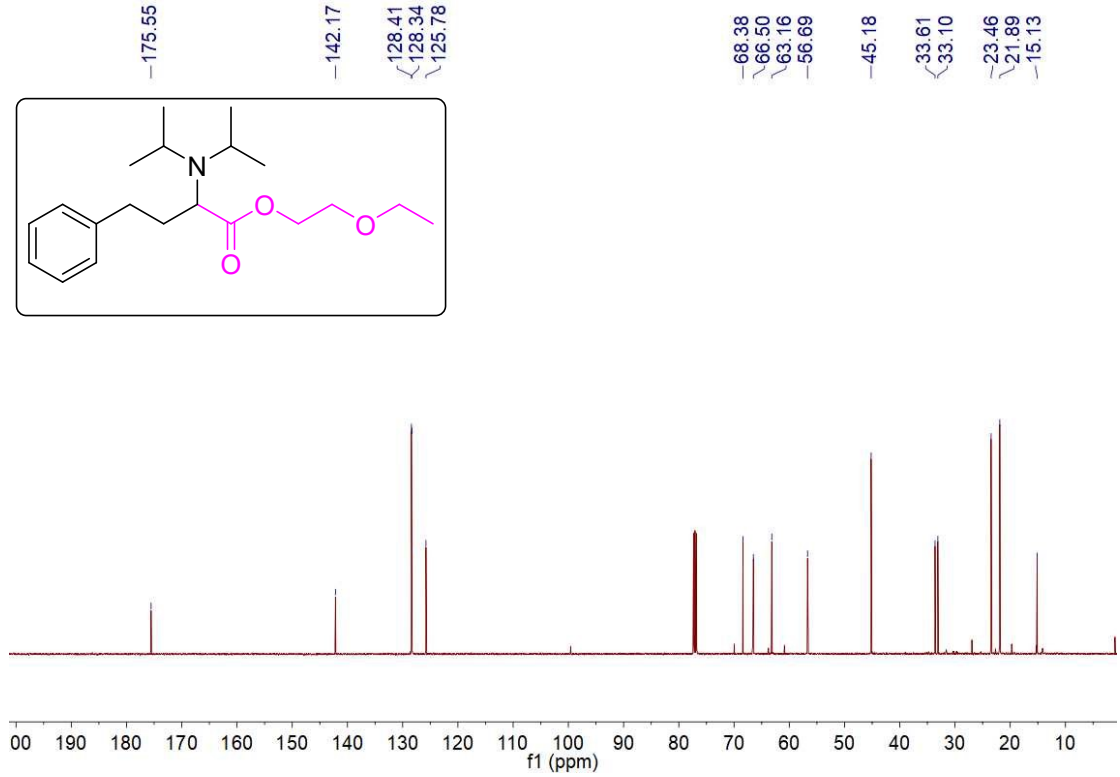
^{13}C spectrum ($CDCl_3$) 2-methoxyethyl 2-(diisopropylamino)-4-phenylbutanoate (6u)



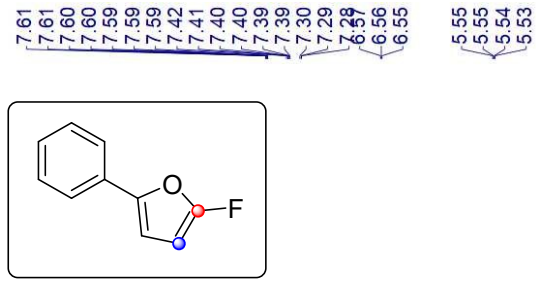
^{1}H spectrum ($CDCl_3$) 2-ethoxyethyl 2-(diisopropylamino)-4-phenylbutanoate (6v)

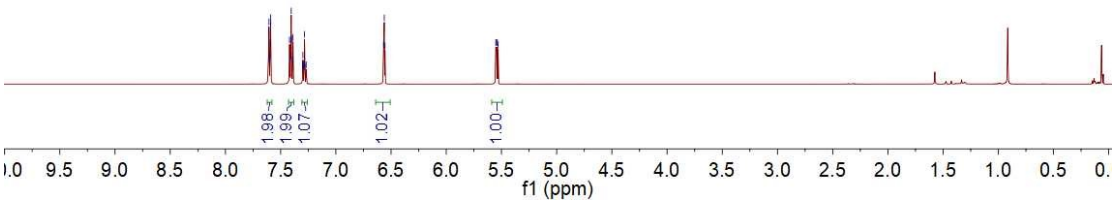


^{13}C spectrum ($CDCl_3$) 2-ethoxyethyl 2-(diisopropylamino)-4-phenylbutanoate (6v)

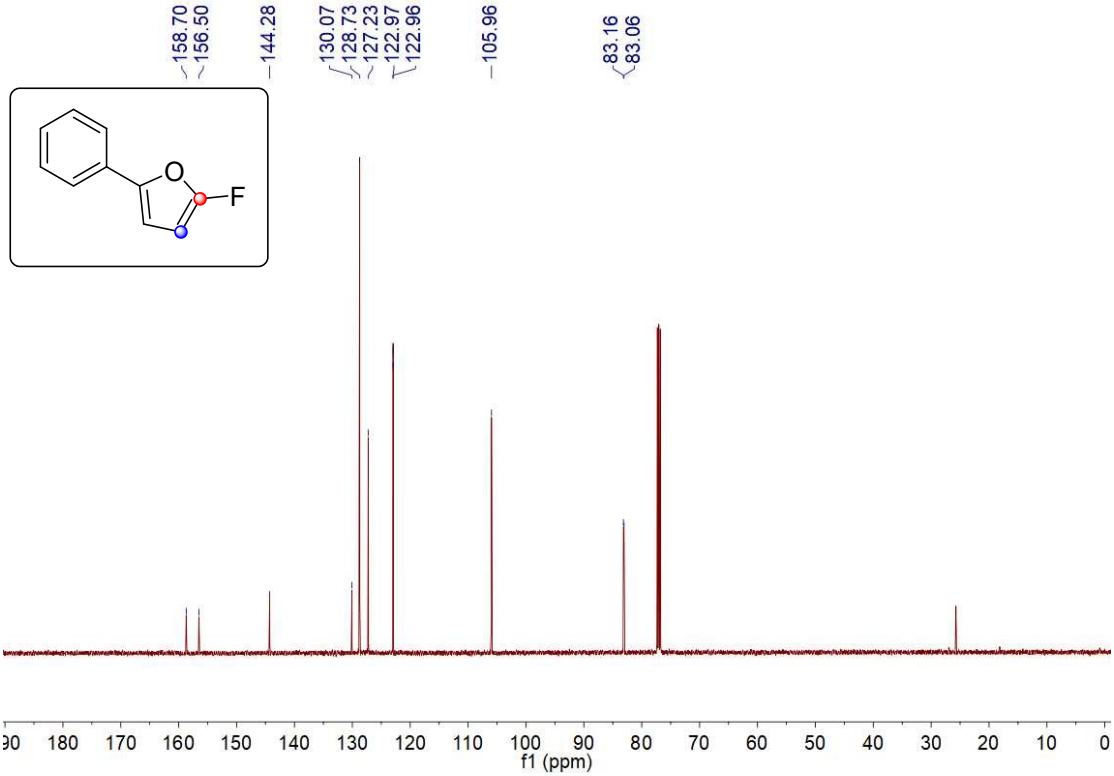


^{1}H spectrum ($CDCl_3$) 2-fluoro-5-phenylfuran (7a)

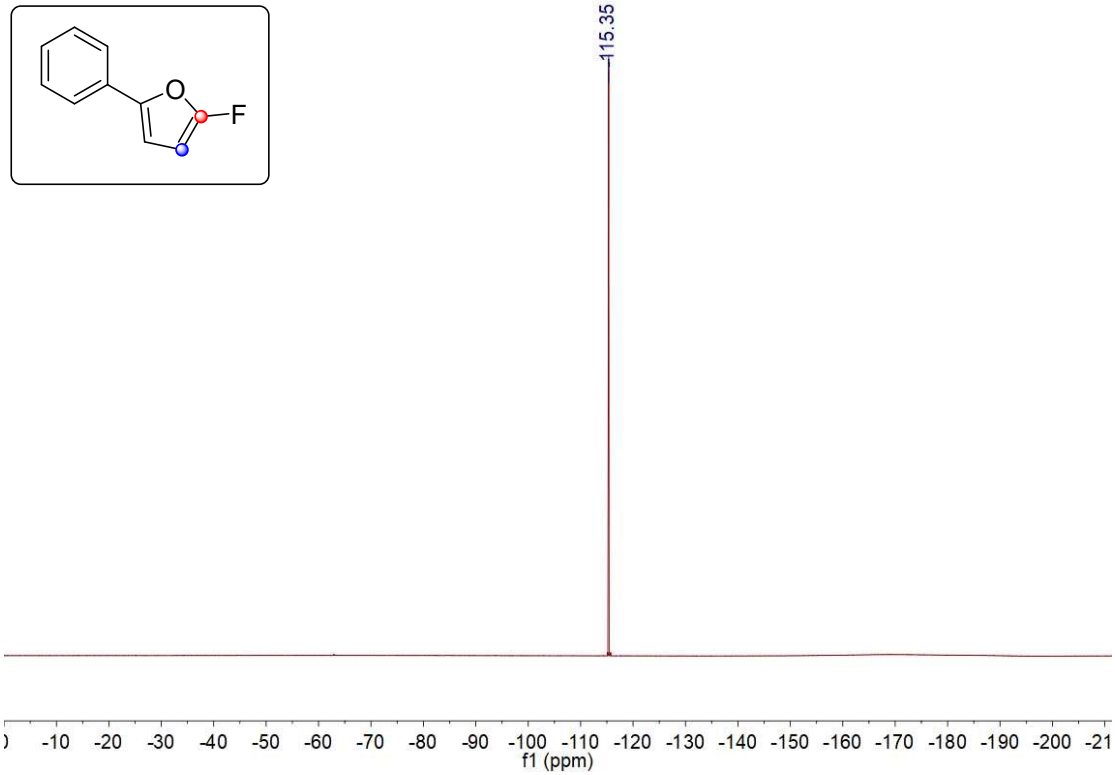




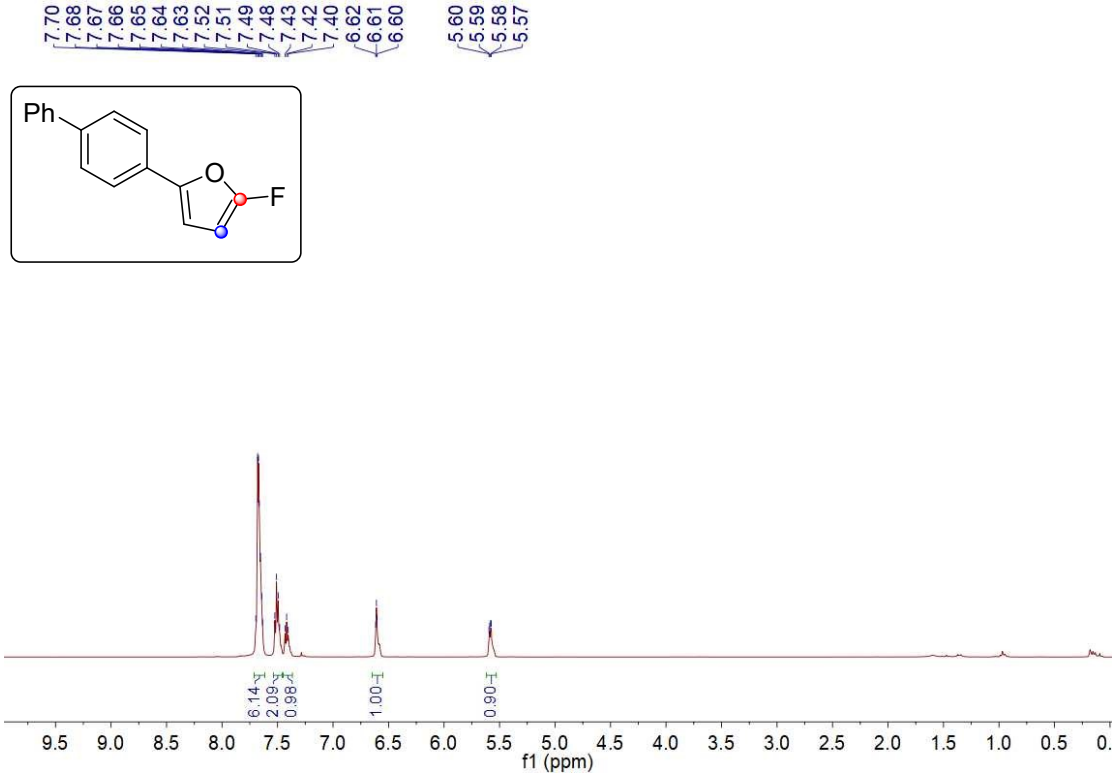
^{13}C spectrum ($CDCl_3$) 2-fluoro-5-phenylfuran (7a)



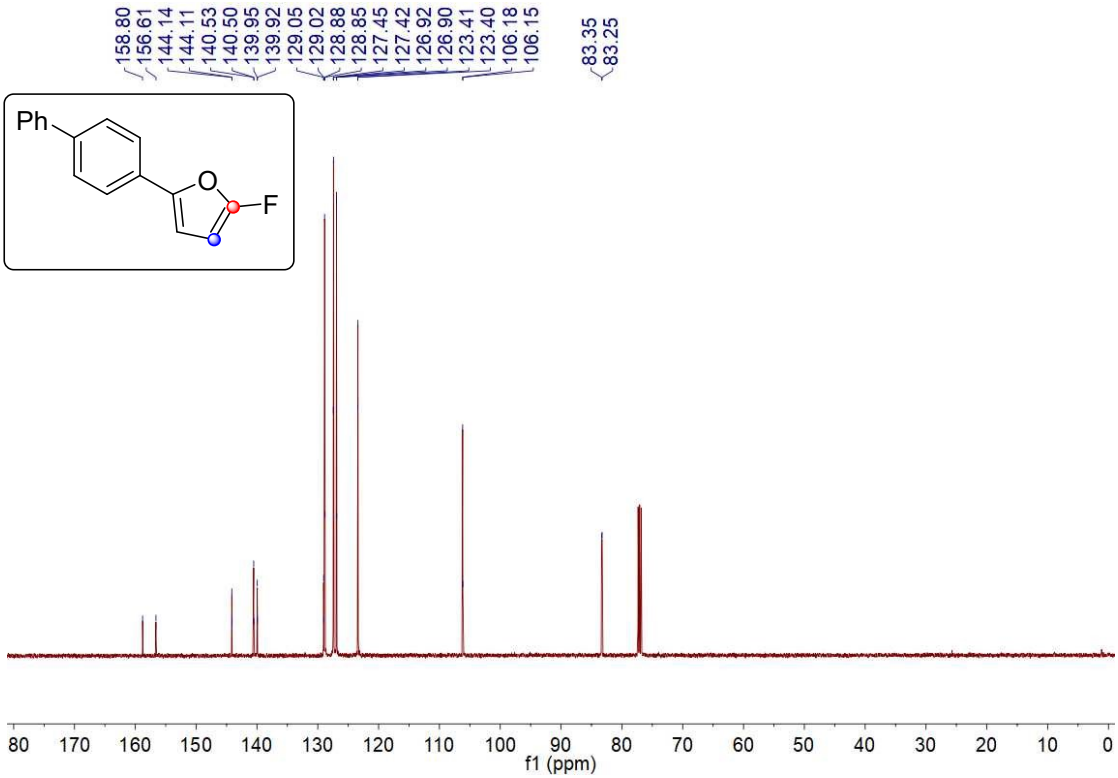
^{19}F spectrum ($CDCl_3$) 2-fluoro-5-phenylfuran (7a)



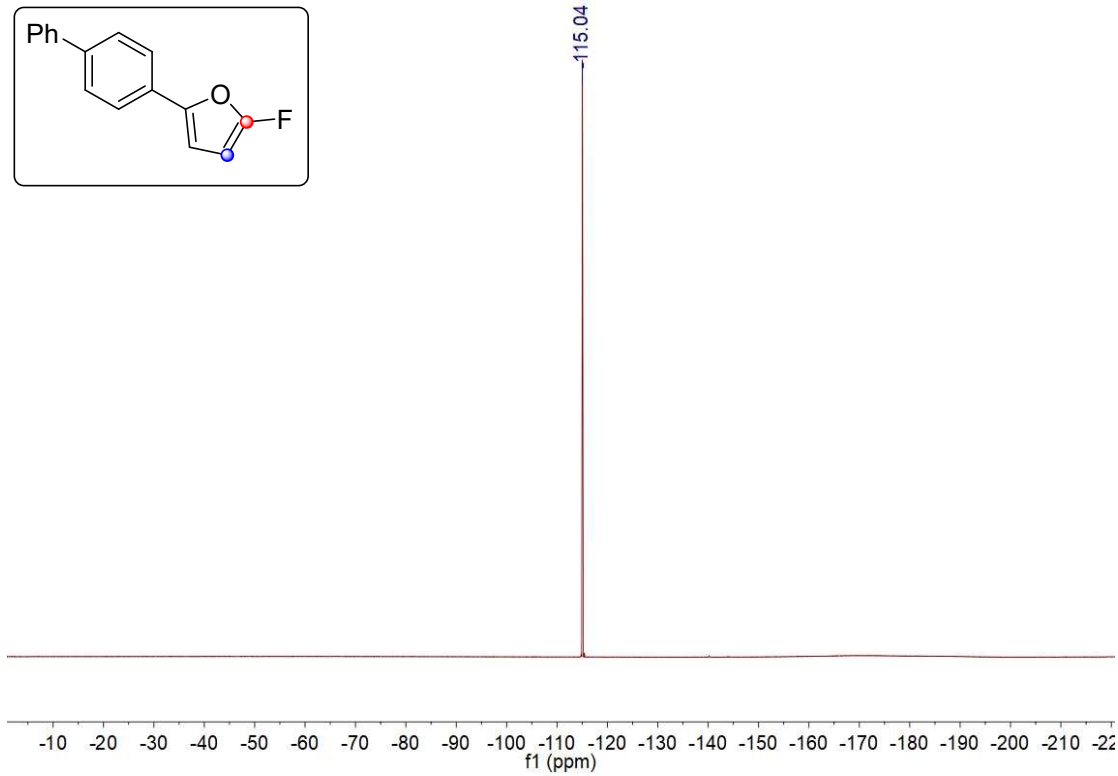
^{1}H spectrum ($CDCl_3$) 2-([1,1'-biphenyl]-4-yl)-5-fluorofuran (7b)



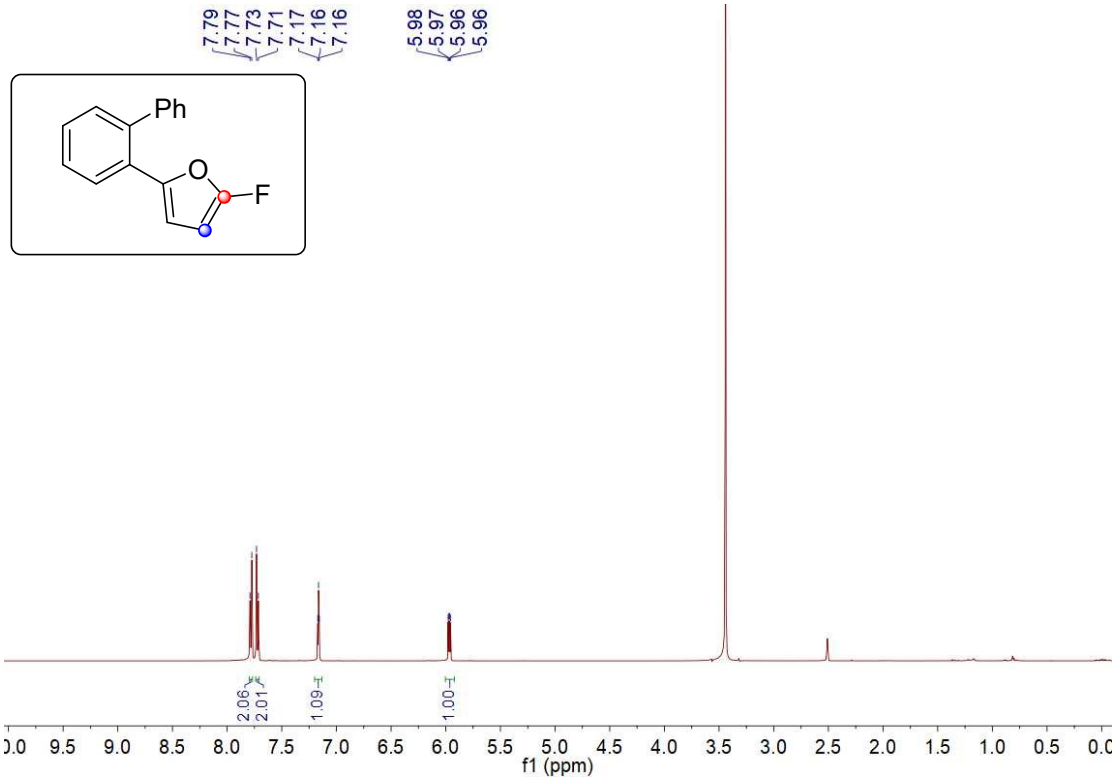
^{13}C spectrum ($CDCl_3$)2-([1,1'-biphenyl]-4-yl)-5-fluorofuran (7b)



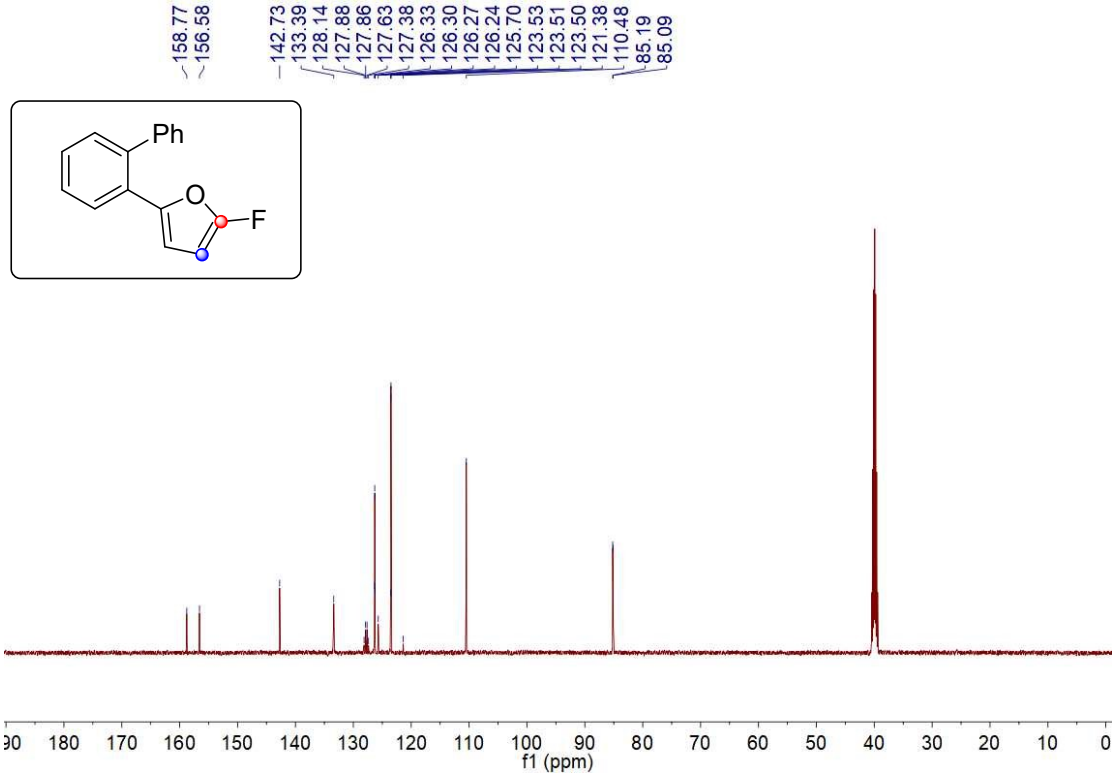
^{19}F spectrum ($CDCl_3$)2-([1,1'-biphenyl]-4-yl)-5-fluorofuran (7b)



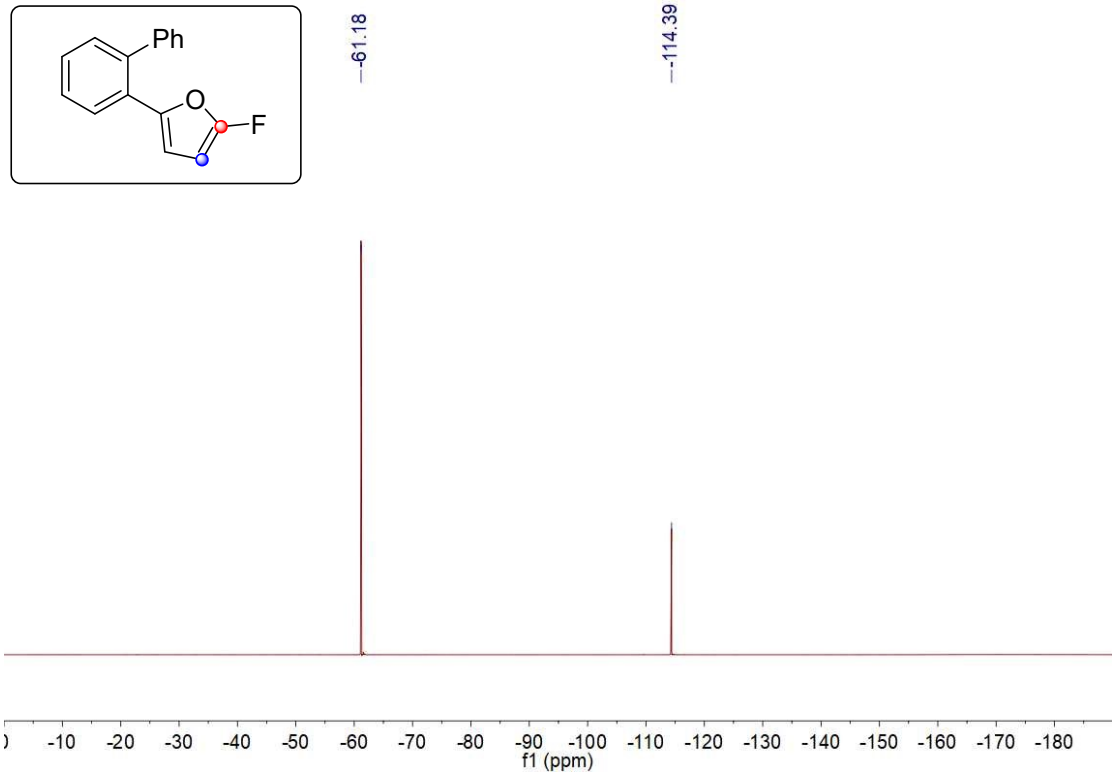
^{1}H spectrum (DMSO-d_6) 2-([1,1'-biphenyl]-2-yl)-5-fluorofuran (7c)



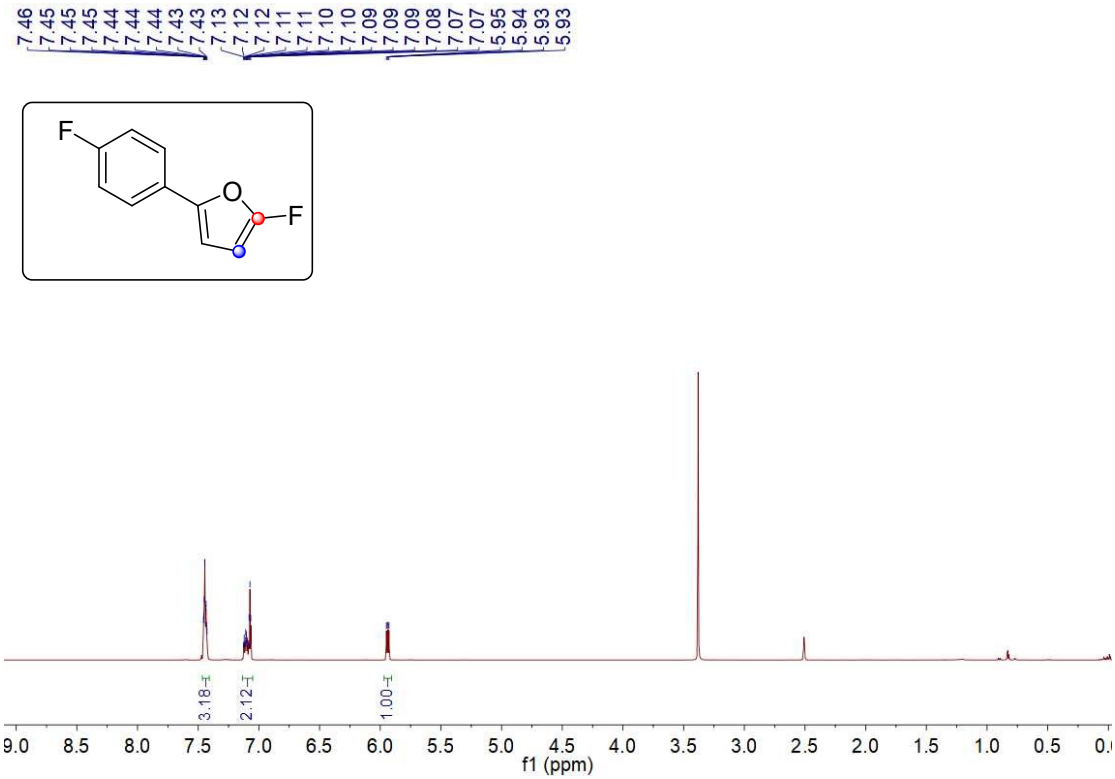
^{13}C spectrum (DMSO-d_6) 2-([1,1'-biphenyl]-2-yl)-5-fluorofuran (7c)



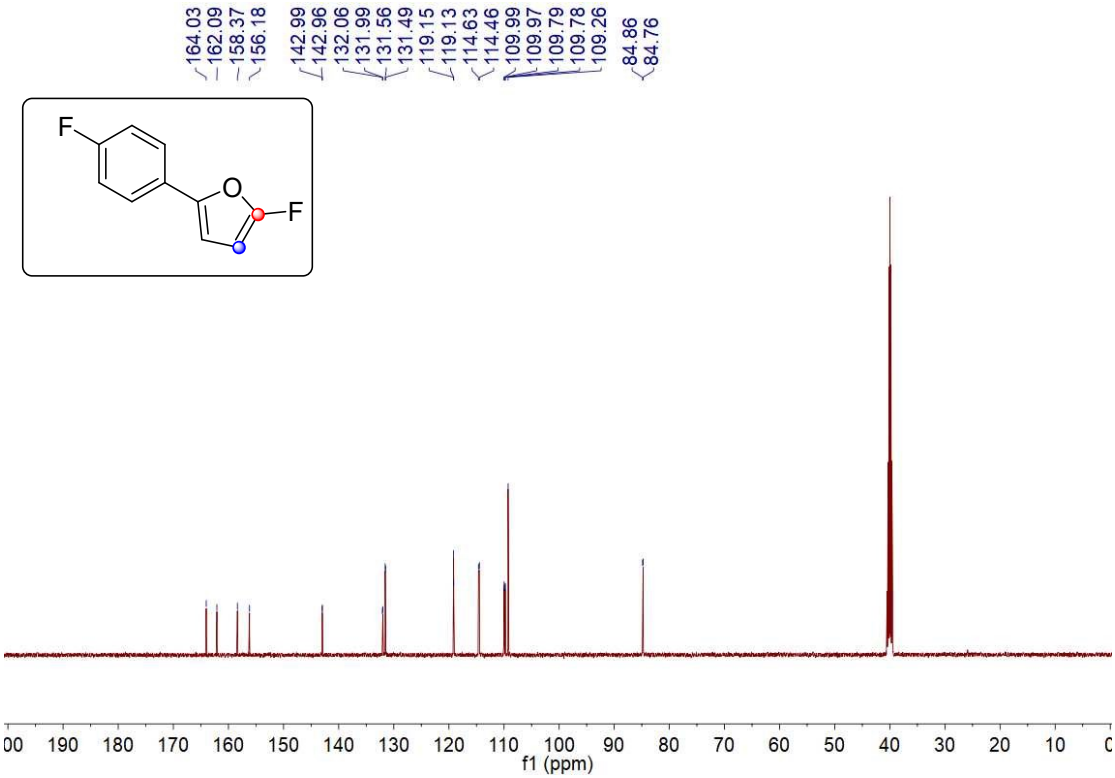
^{19}F spectrum (DMSO-d_6) 2-([1,1'-biphenyl]-2-yl)-5-fluorofuran (7c)



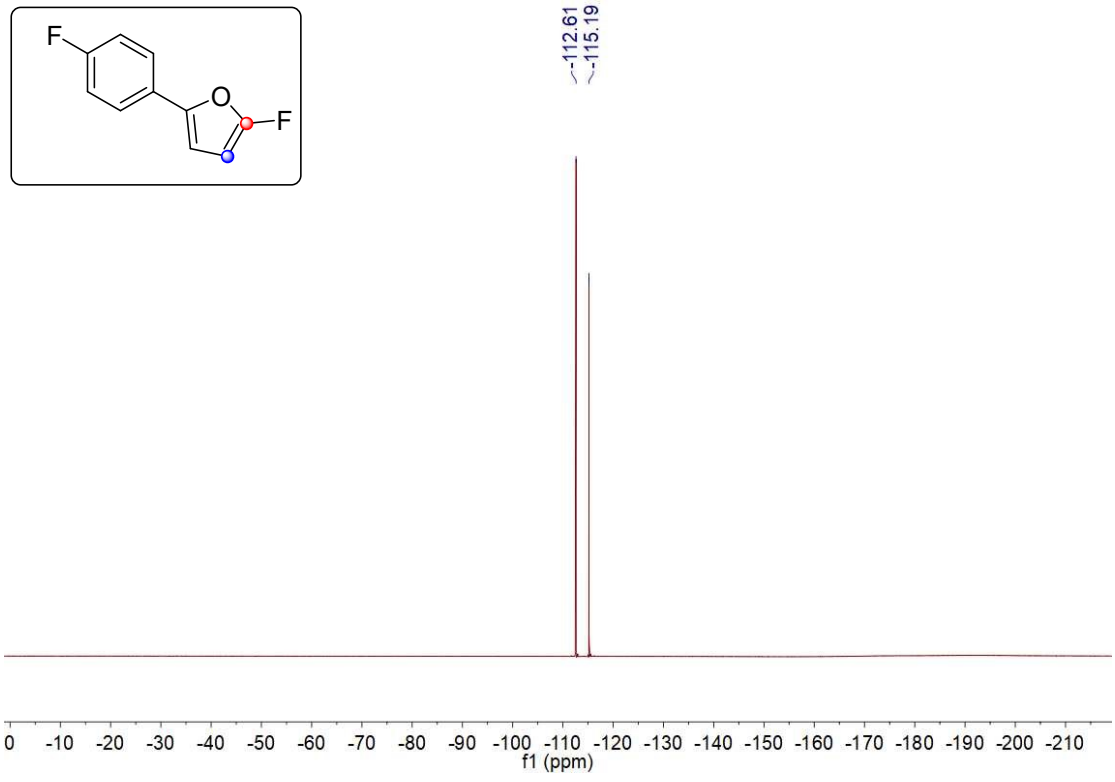
^{1}H spectrum (DMSO-d_6)2-fluoro-5-(4-fluorophenyl) furan (7d)



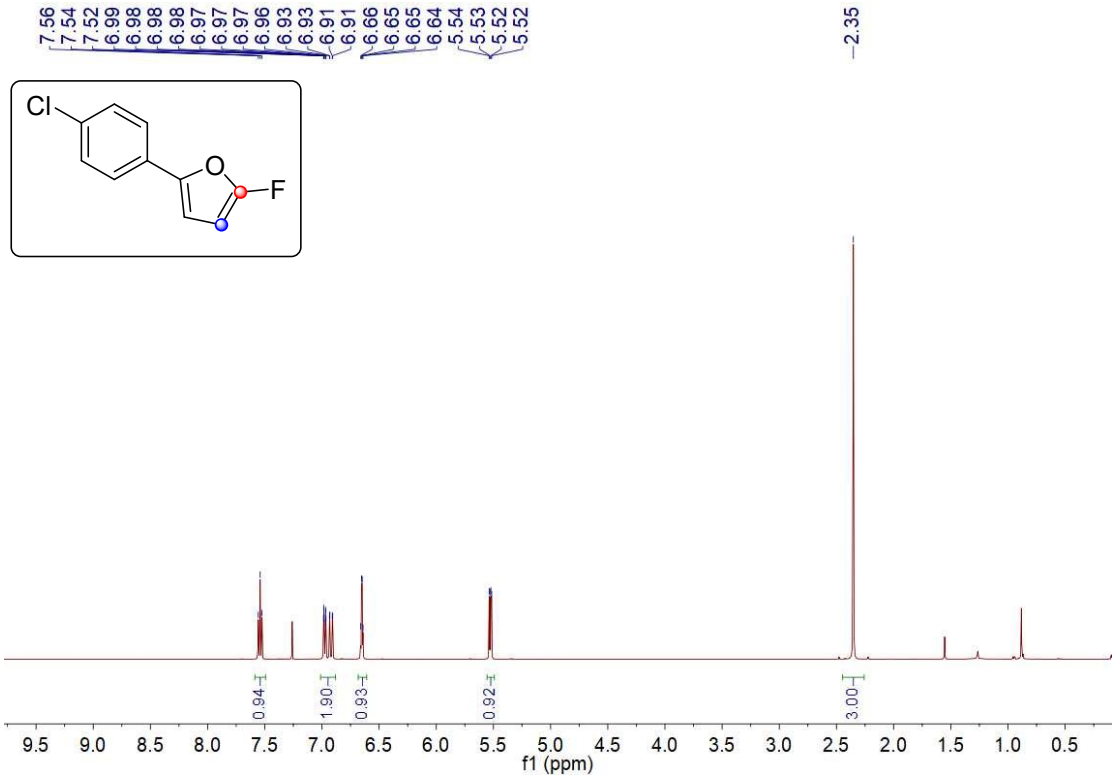
^{13}C spectrum (DMSO-d_6) 2-fluoro-5-(4-fluorophenyl) furan (7d)



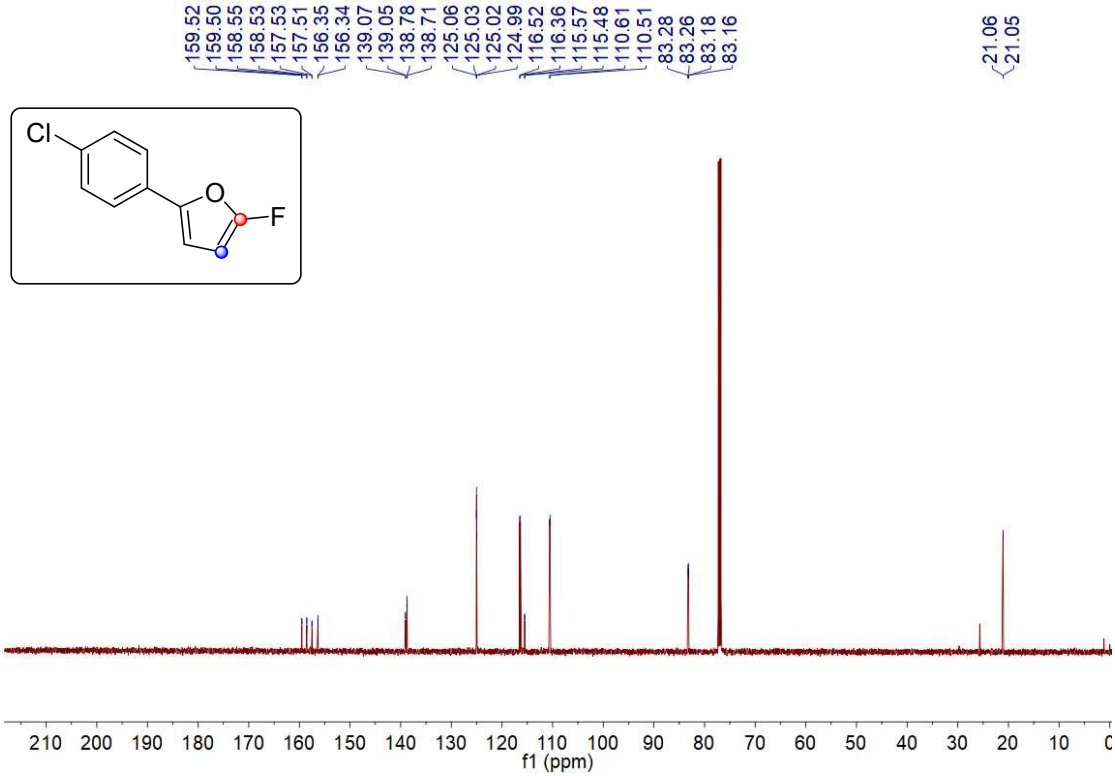
^{19}F spectrum (DMSO-d_6) 2-fluoro-5-(4-fluorophenyl) furan (7d)



^{1}H spectrum ($CDCl_3$) 2-(4-chlorophenyl)-5-fluorofuran (7e)

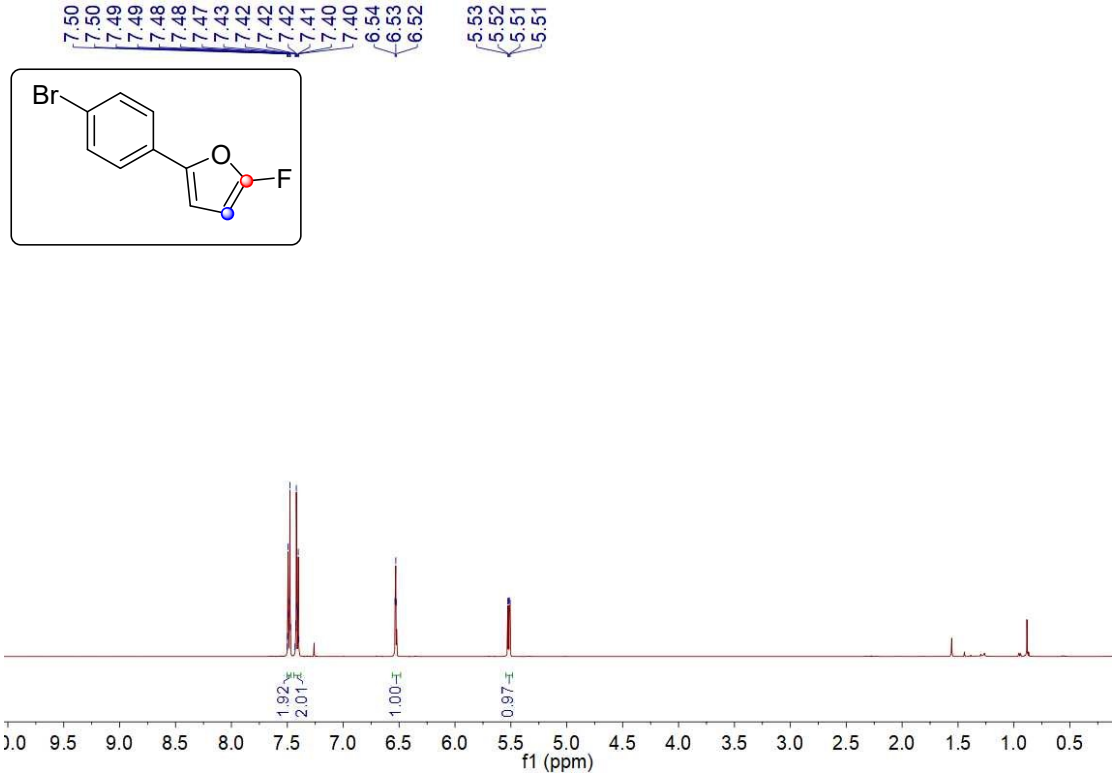


^{13}C spectrum ($CDCl_3$)2-(4-chlorophenyl)-5-fluorofuran (7e)

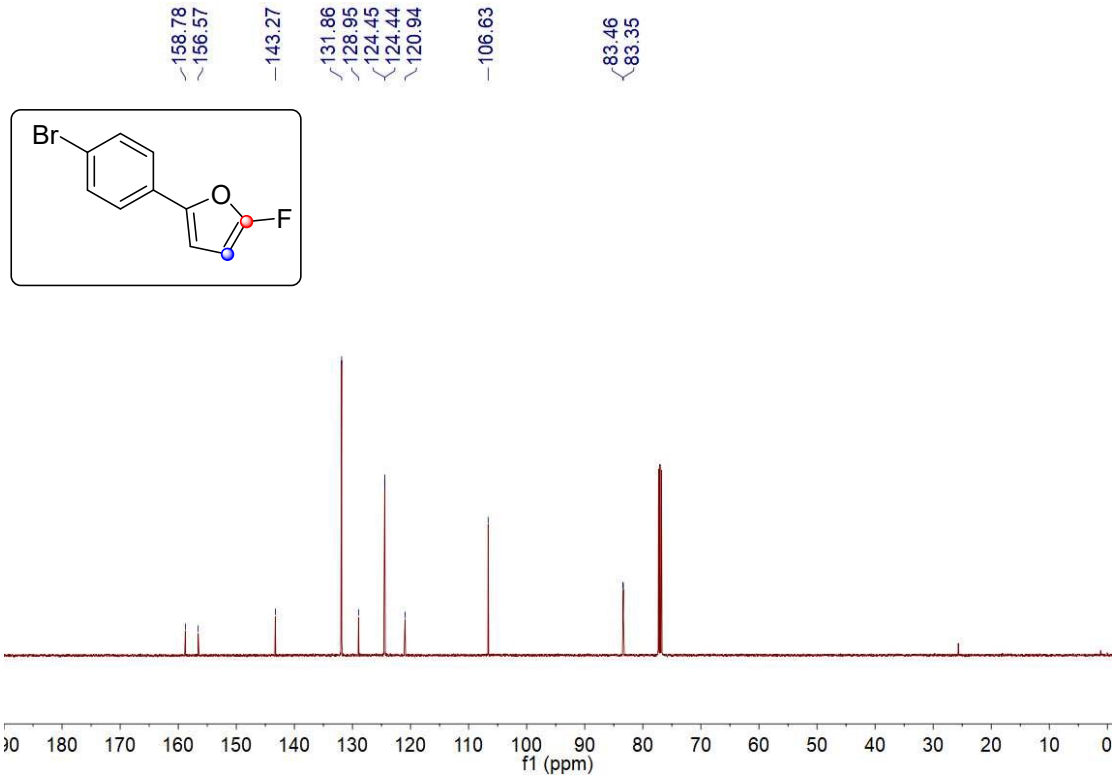


^{19}F spectrum ($CDCl_3$) 2-(4-chlorophenyl)-5-fluorofuran (7e)

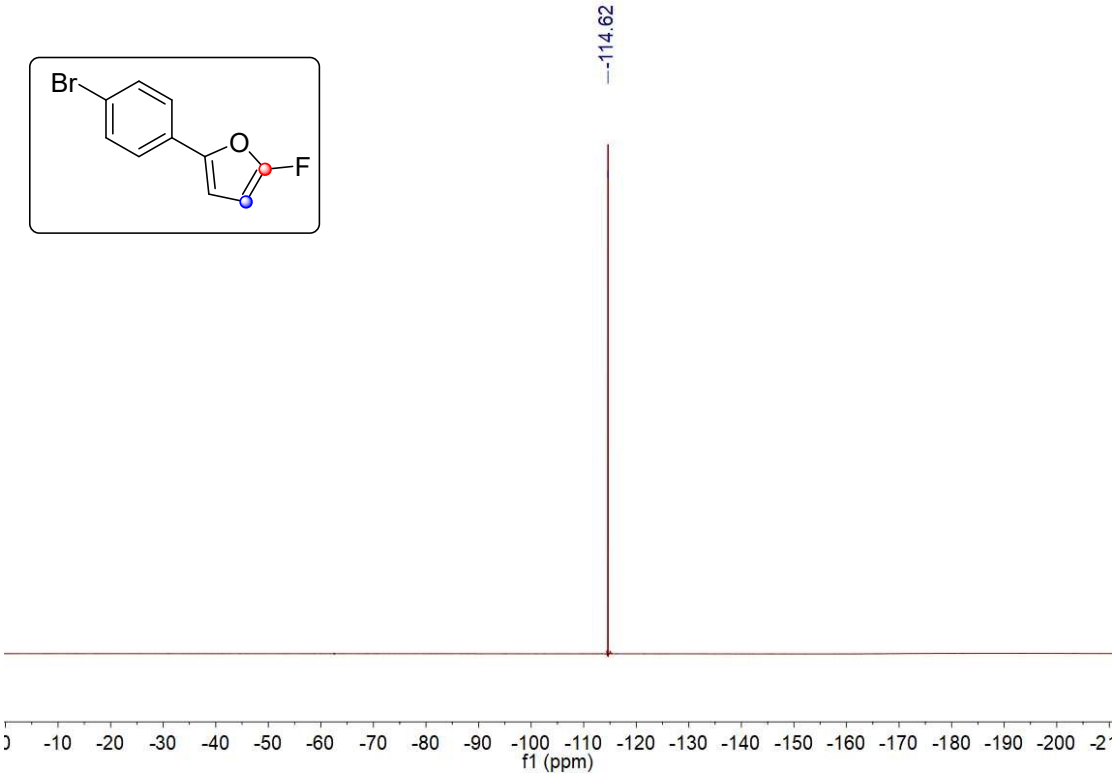
^{1}H spectrum ($CDCl_3$) 2-(4-bromophenyl)-5-fluorofuran (7f)



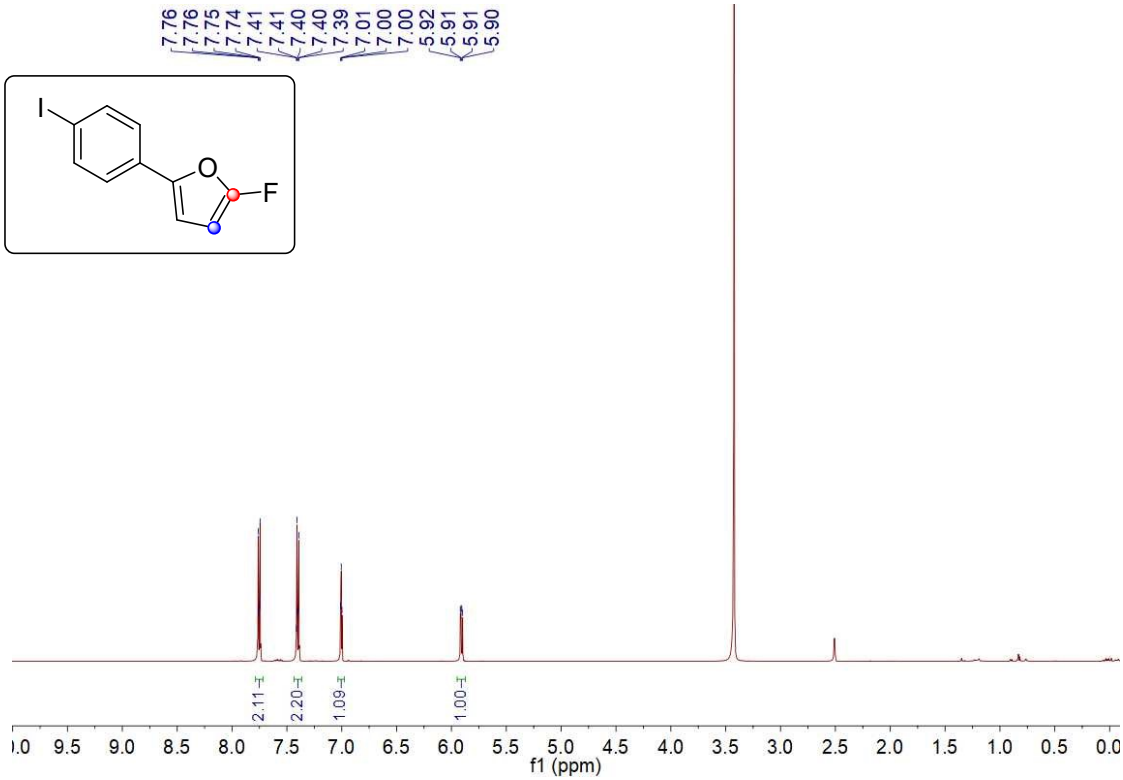
^{13}C spectrum ($CDCl_3$)2-(4-bromophenyl)-5-fluorofuran (7f)



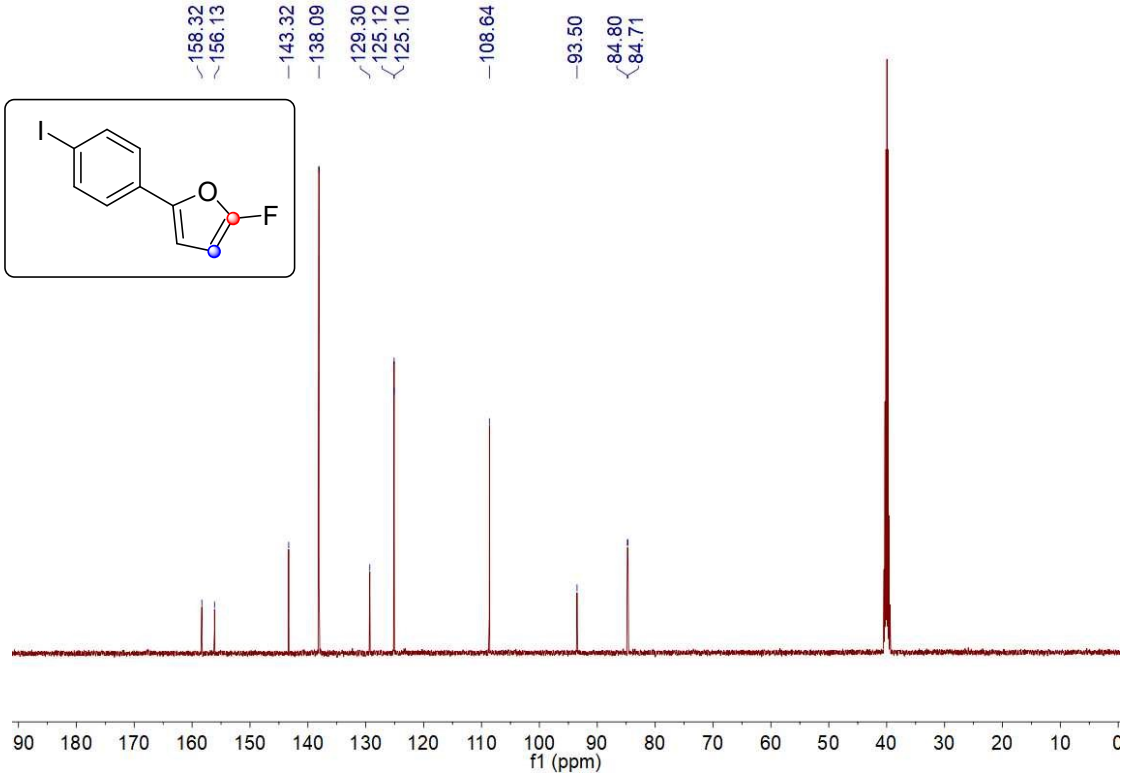
^{19}F spectrum ($CDCl_3$) 2-(4-bromophenyl)-5-fluorofuran (7f)



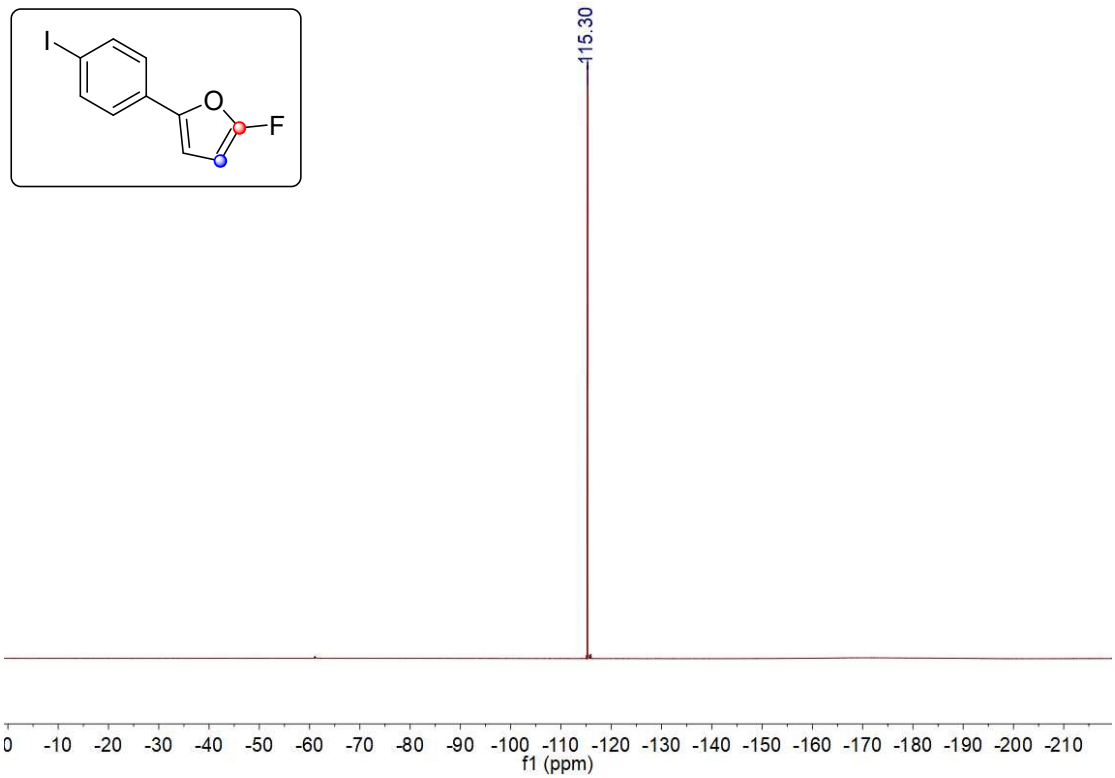
^{1}H spectrum (DMSO-d_6)2-fluoro-5-(4-iodophenyl)furan (7g)



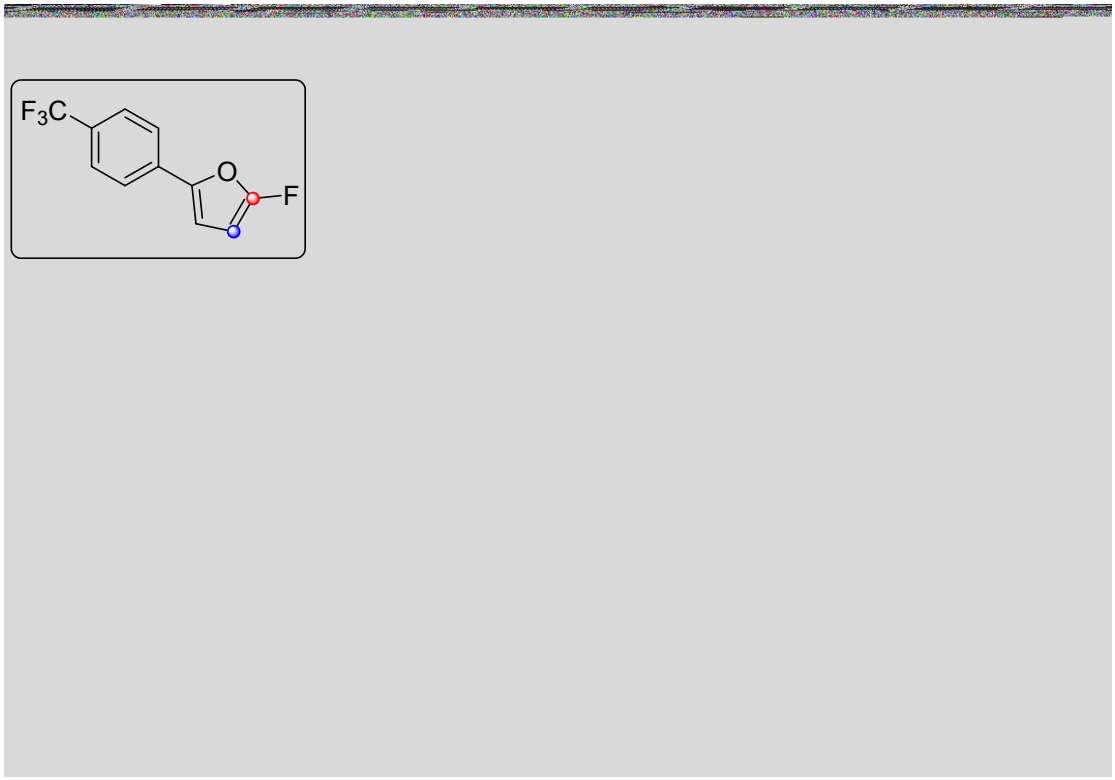
^{13}C spectrum (DMSO-d_6) 2-fluoro-5-(4-iodophenyl)furan (7g)



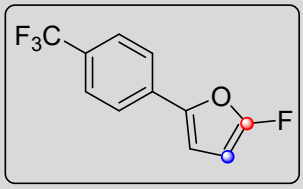
^{19}F spectrum (DMSO-d_6) 2-fluoro-5-(4-iodophenyl)furan (7g)



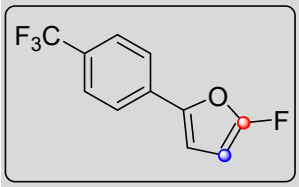
^{1}H spectrum (DMSO-d_6)2-fluoro-5-(4-(trifluoromethyl)phenyl)furan (7h)



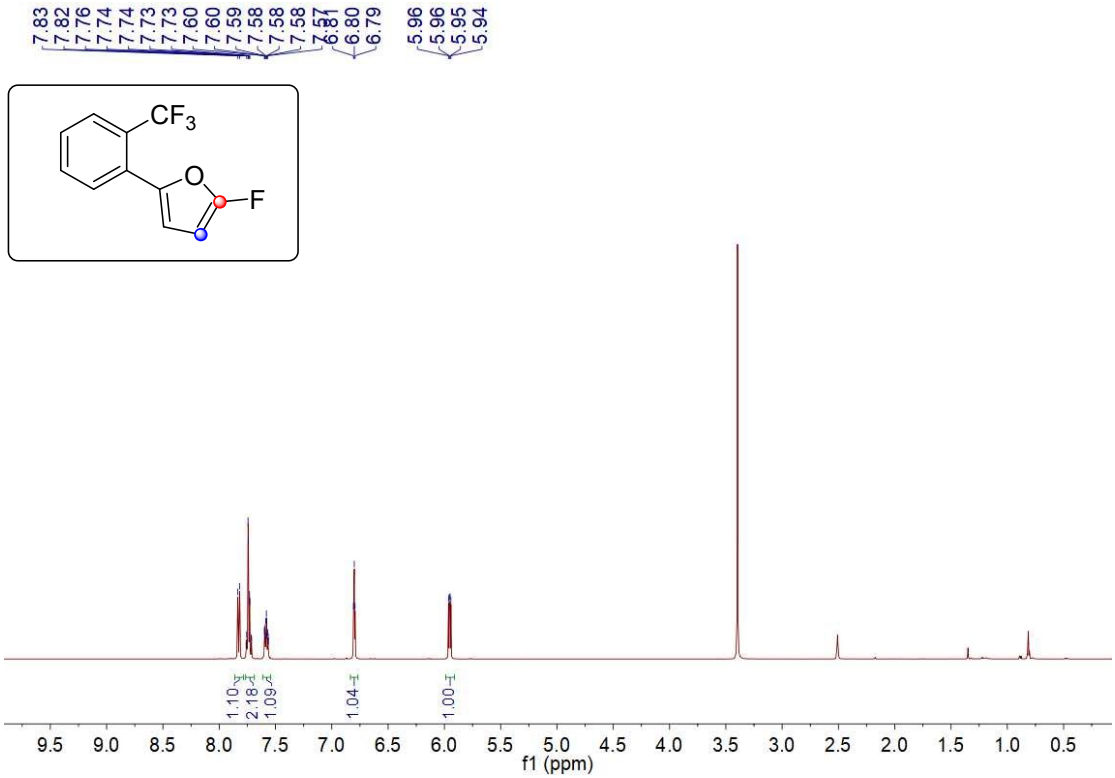
^{13}C spectrum (DMSO-d_6) 2-fluoro-5-(4-(trifluoromethyl)phenyl)furan (7h)



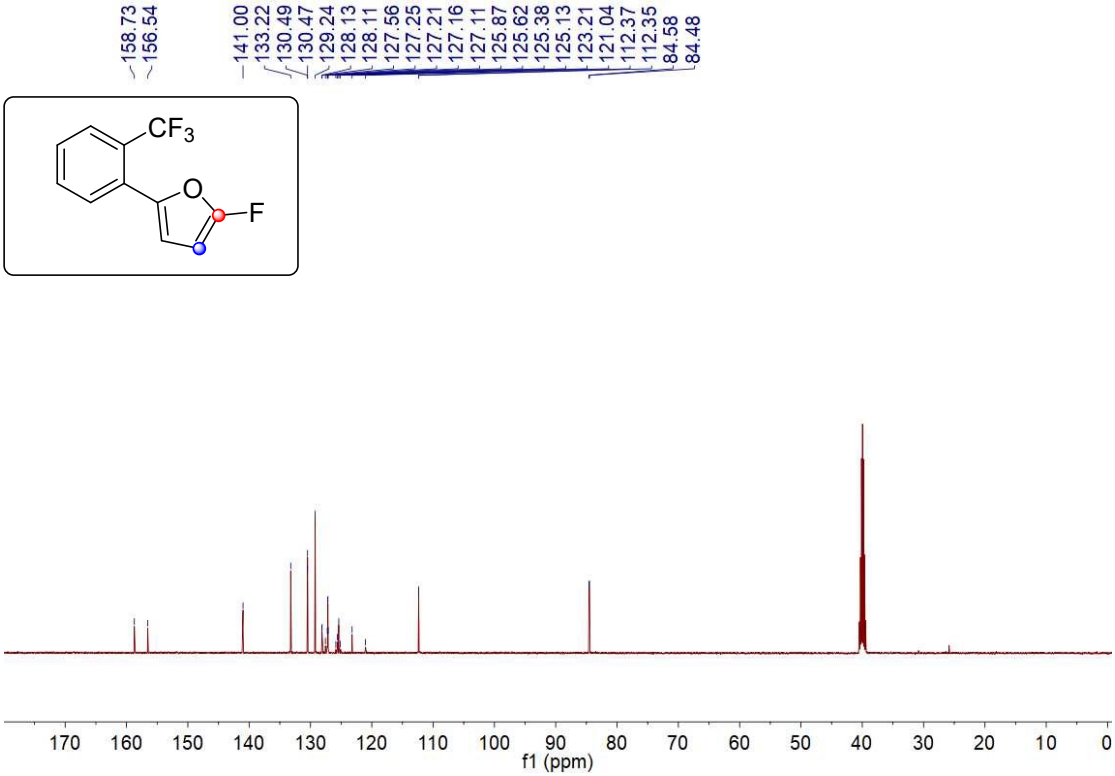
^{19}F spectrum (DMSO-d_6) 2-fluoro-5-(4-(trifluoromethyl)phenyl)furan (7h)



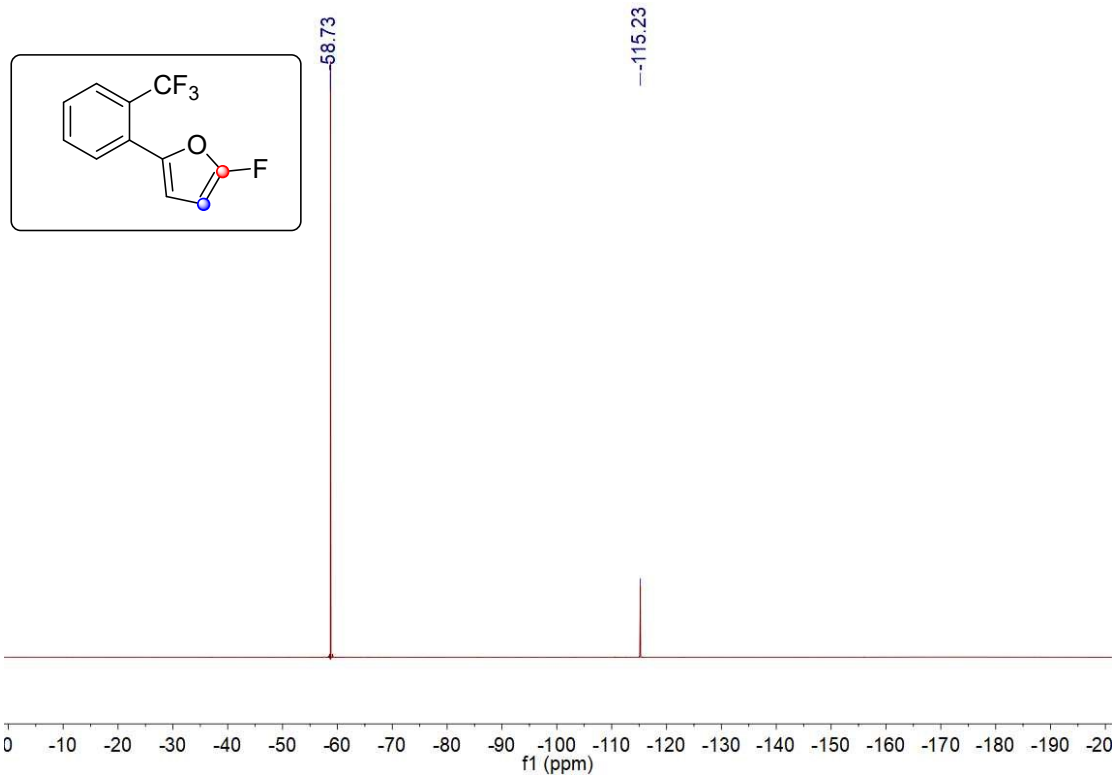
^{1}H spectrum (DMSO-d_6)2-fluoro-5-(2-(trifluoromethyl)phenyl)furan (7i)



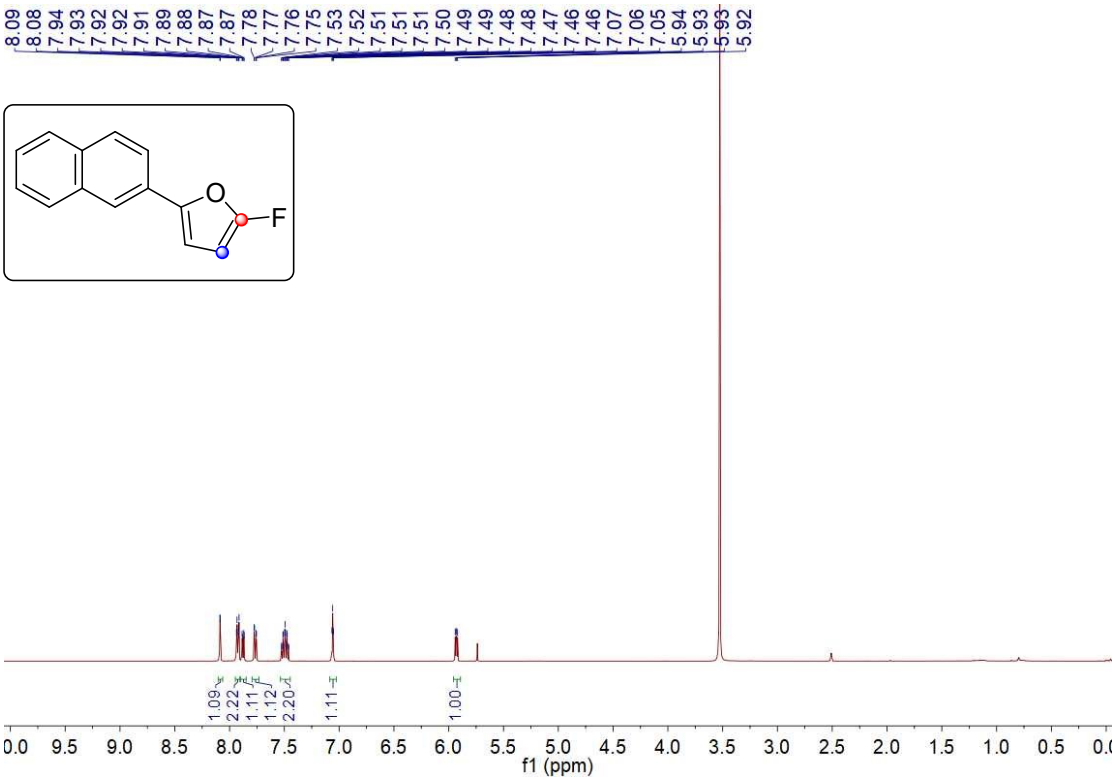
^{13}C spectrum (DMSO-d_6) 2-fluoro-5-(2-(trifluoromethyl)phenyl)furan (7i)



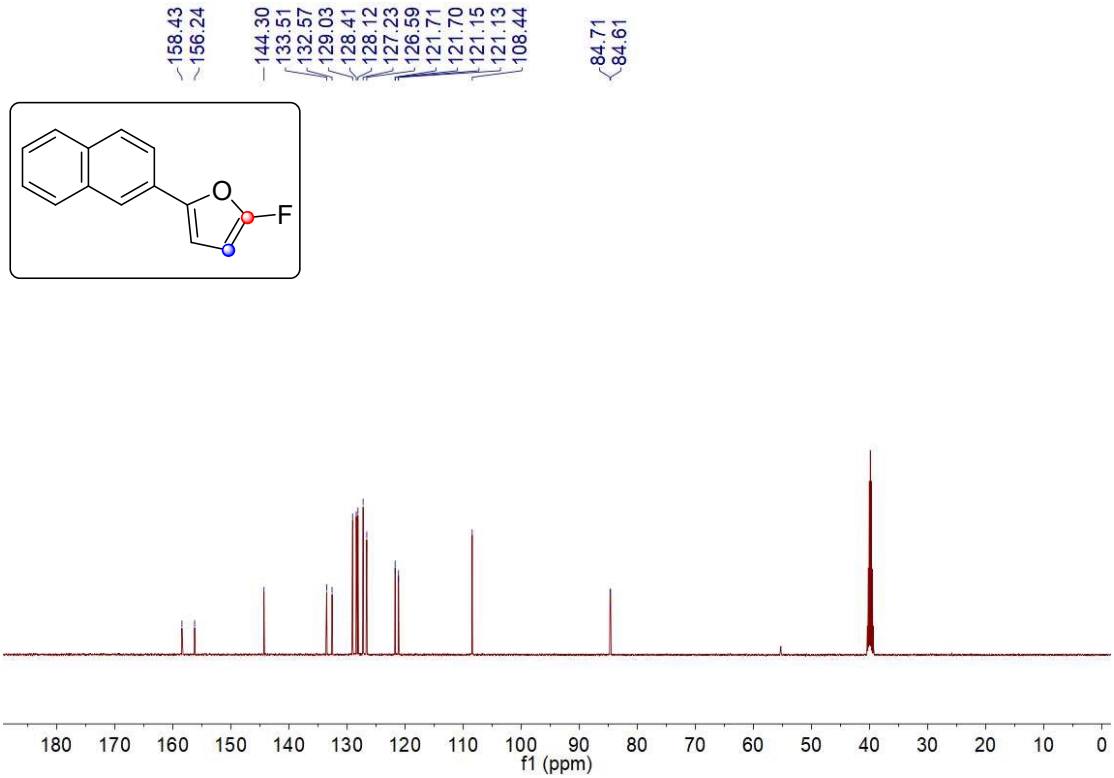
^{19}F spectrum (DMSO-d_6) 2-fluoro-5-(2-(trifluoromethyl)phenyl)furan (7i)



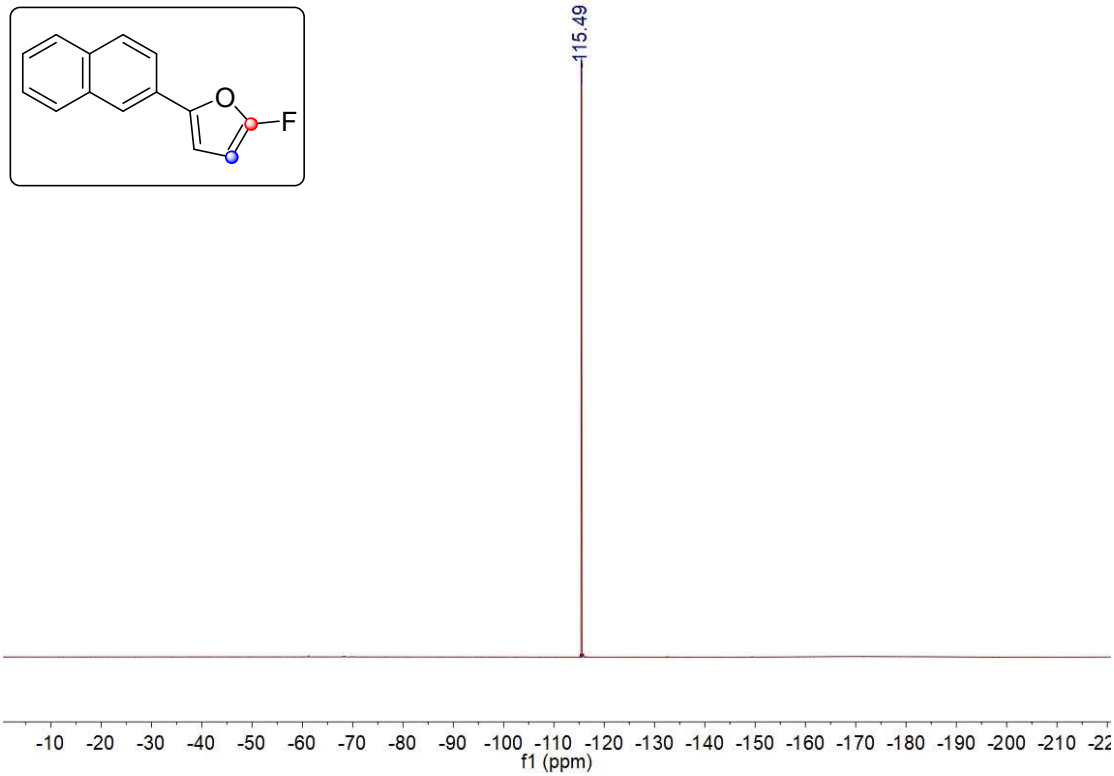
^{1}H spectrum (DMSO-d_6)2-fluoro-5-(naphthalen-2-yl)furan (7j)



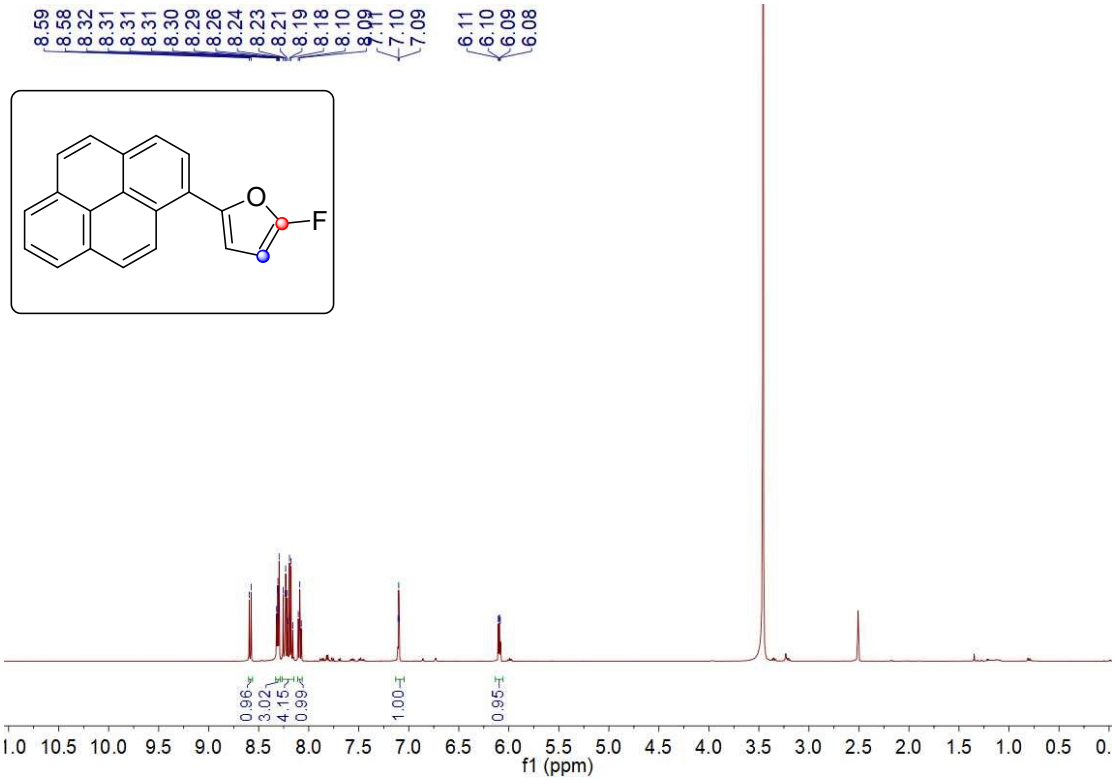
^{13}C spectrum (DMSO-d_6) 2-fluoro-5-(naphthalen-2-yl)furan (7j)



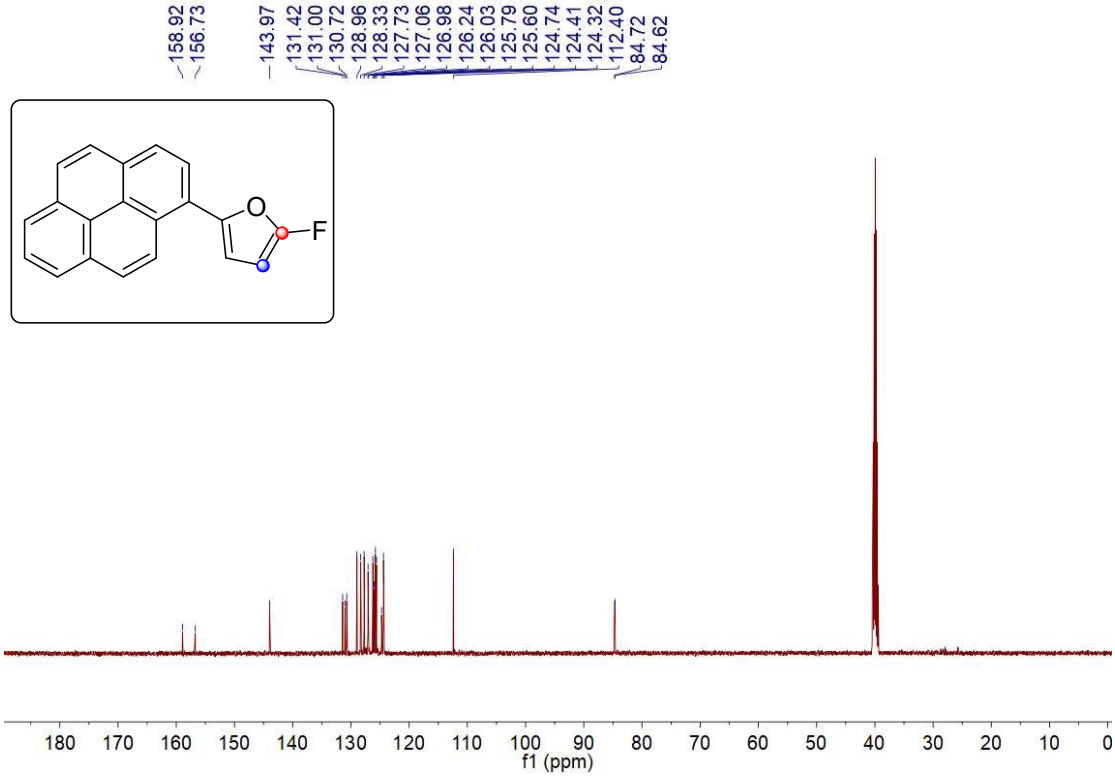
^{19}F spectrum (DMSO-d_6) 2-fluoro-5-(naphthalen-2-yl)furan (7j)



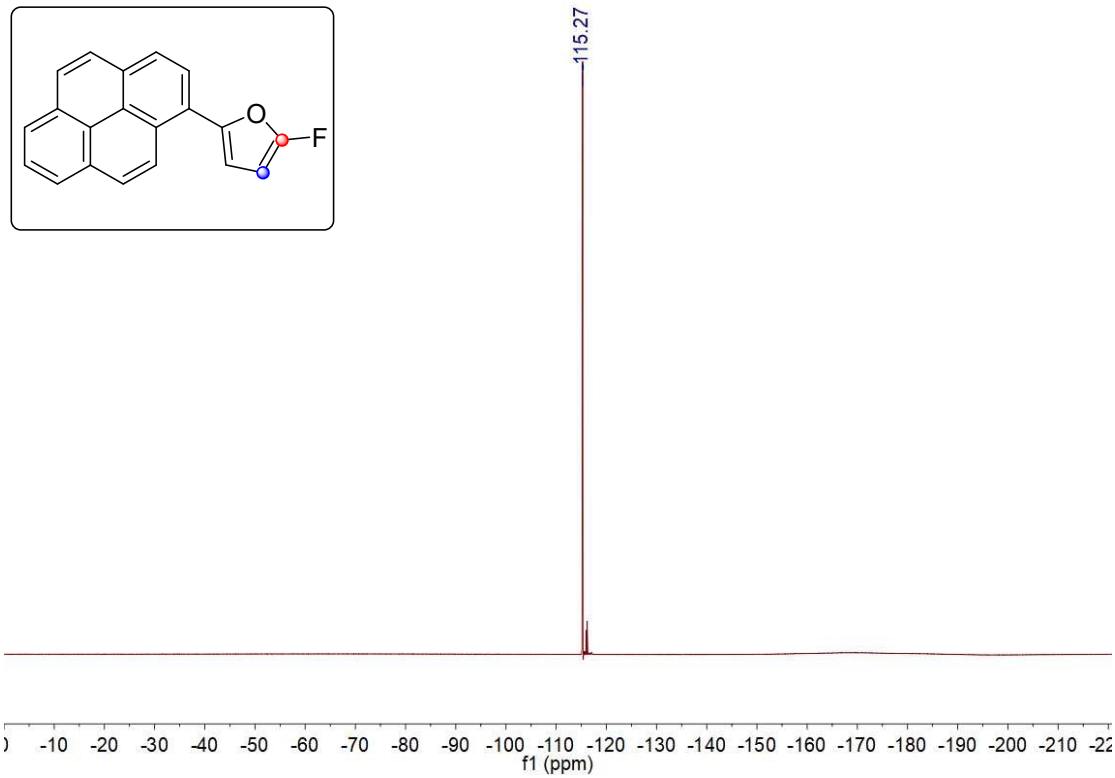
^{1}H spectrum (DMSO-d_6)2-fluoro-5-(pyren-1-yl)furan (7k)



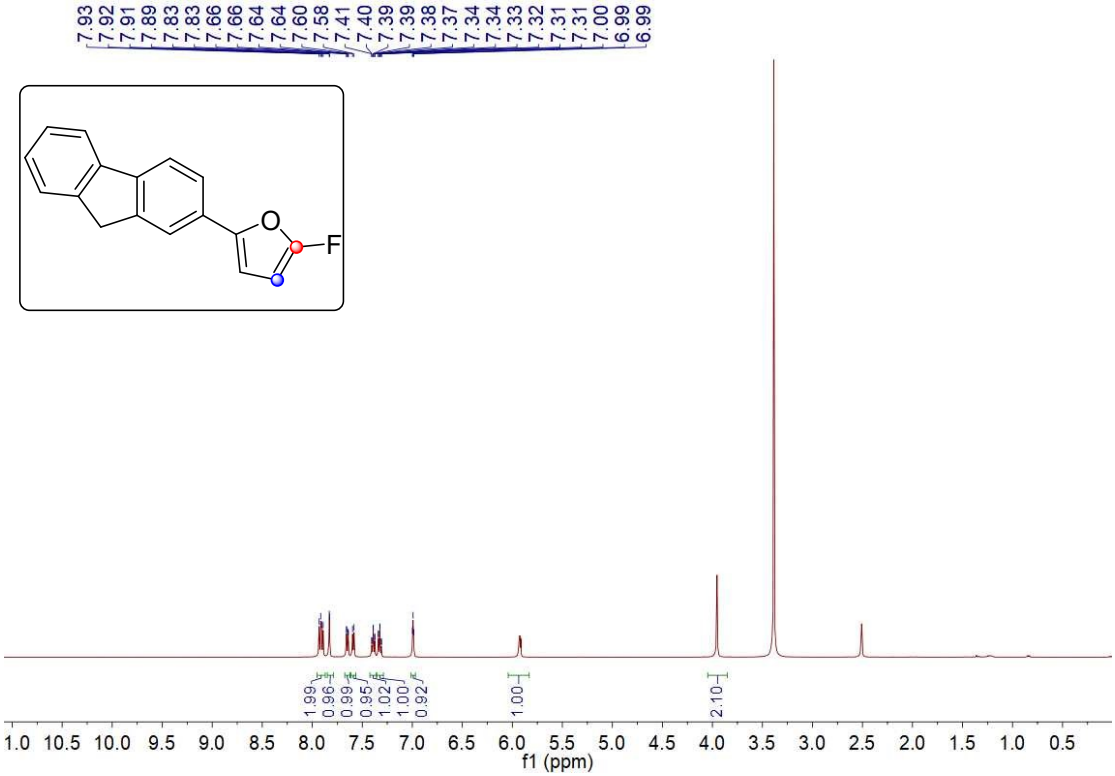
^{13}C spectrum (DMSO-d_6) 2-fluoro-5-(pyren-1-yl)furan (7k)



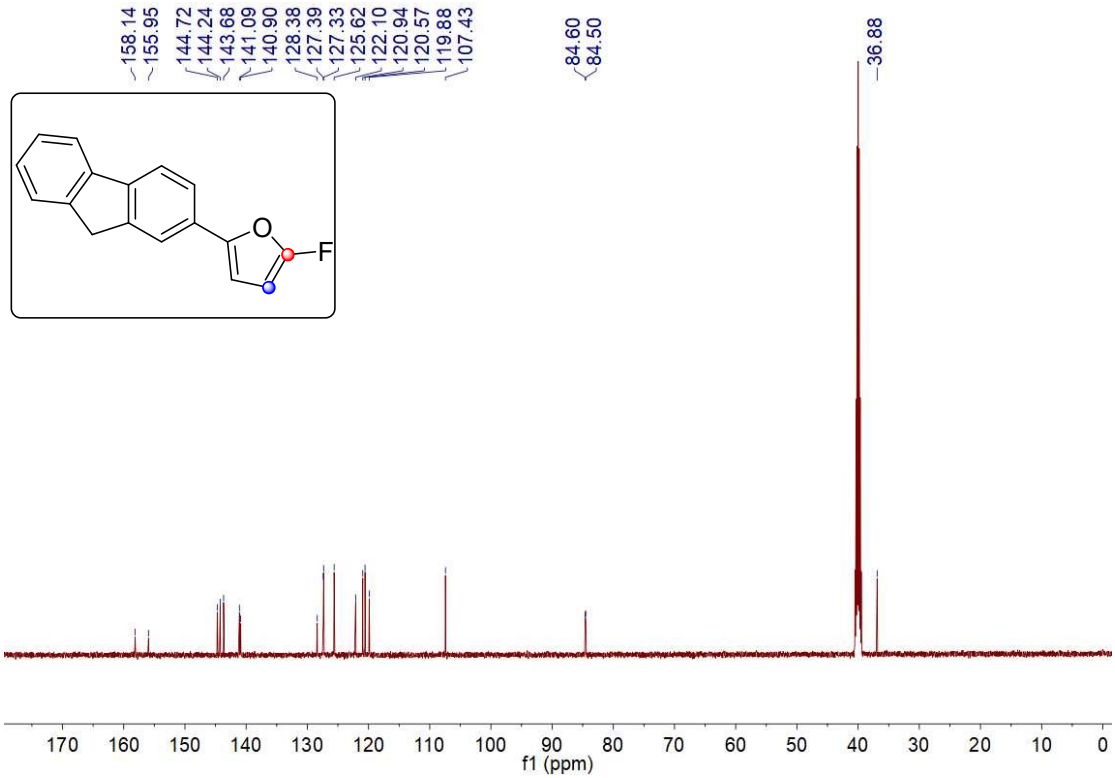
^{19}F spectrum (DMSO-d_6) 2-fluoro-5-(pyren-1-yl)furan (7k)



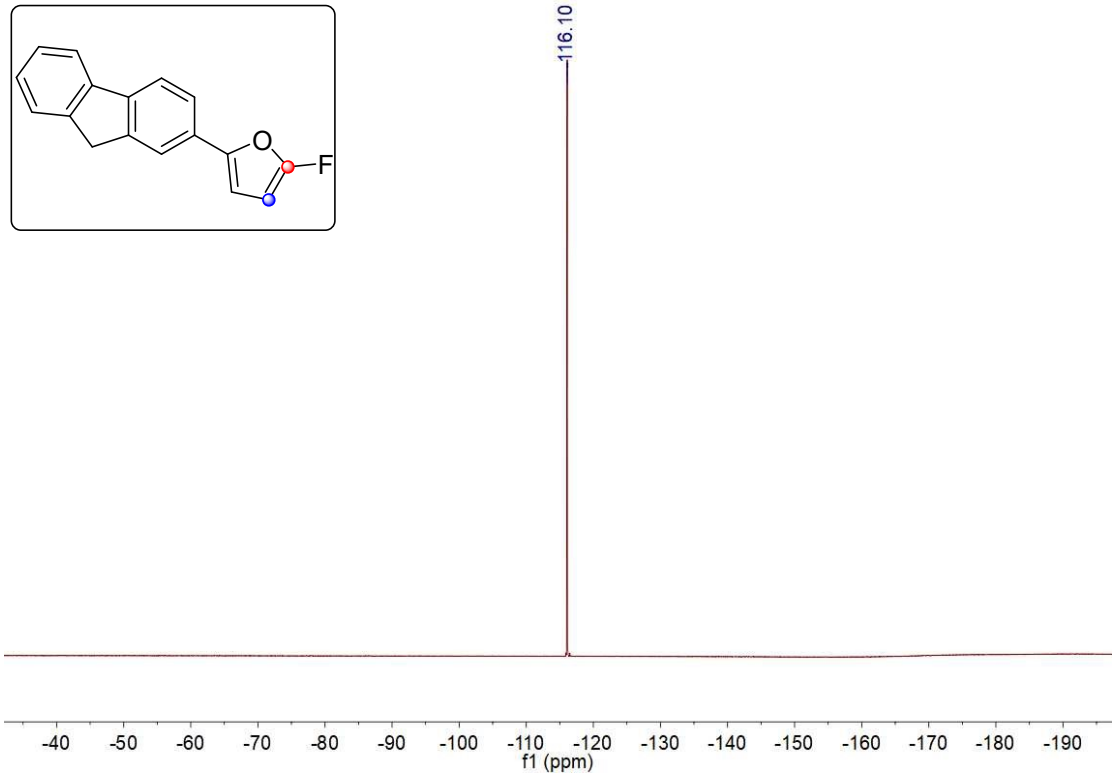
^{1}H spectrum (DMSO-d_6)2-(9H-fluoren-2-yl)-5-fluorofuran (7l)



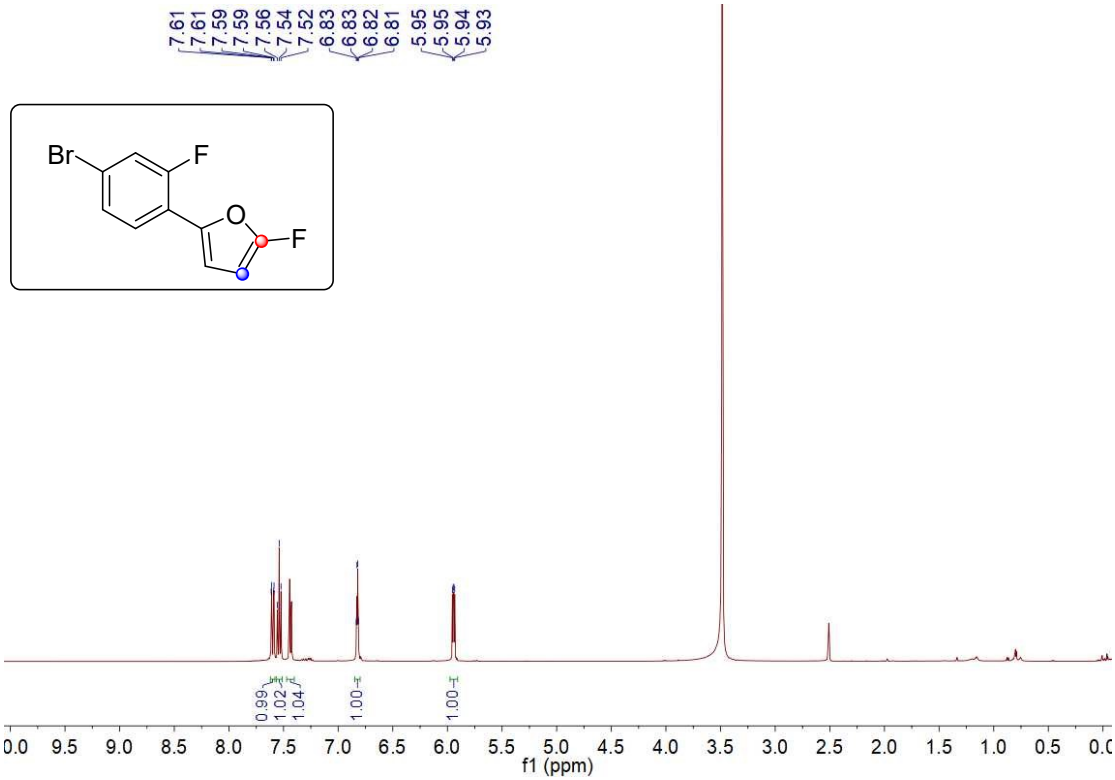
^{13}C spectrum (DMSO-d_6) 2-(9H-fluoren-2-yl)-5-fluorofuran (7l)



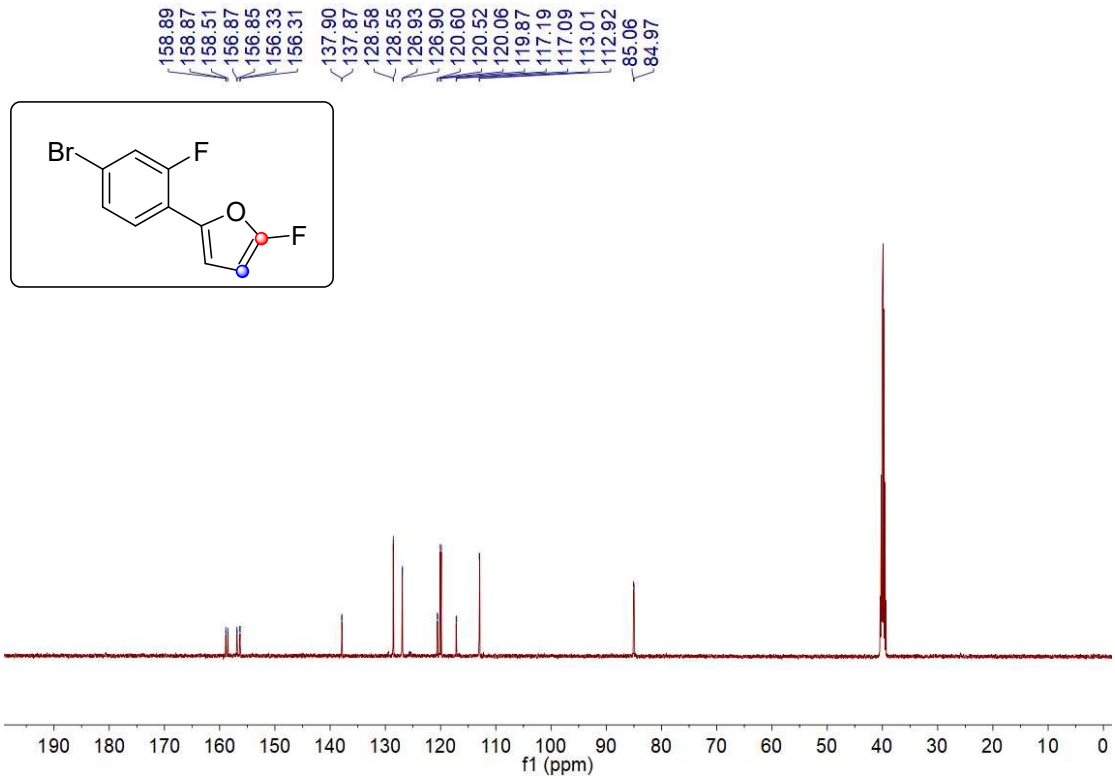
^{19}F spectrum (DMSO-d_6) 2-(9H-fluoren-2-yl)-5-fluorofuran (7l)



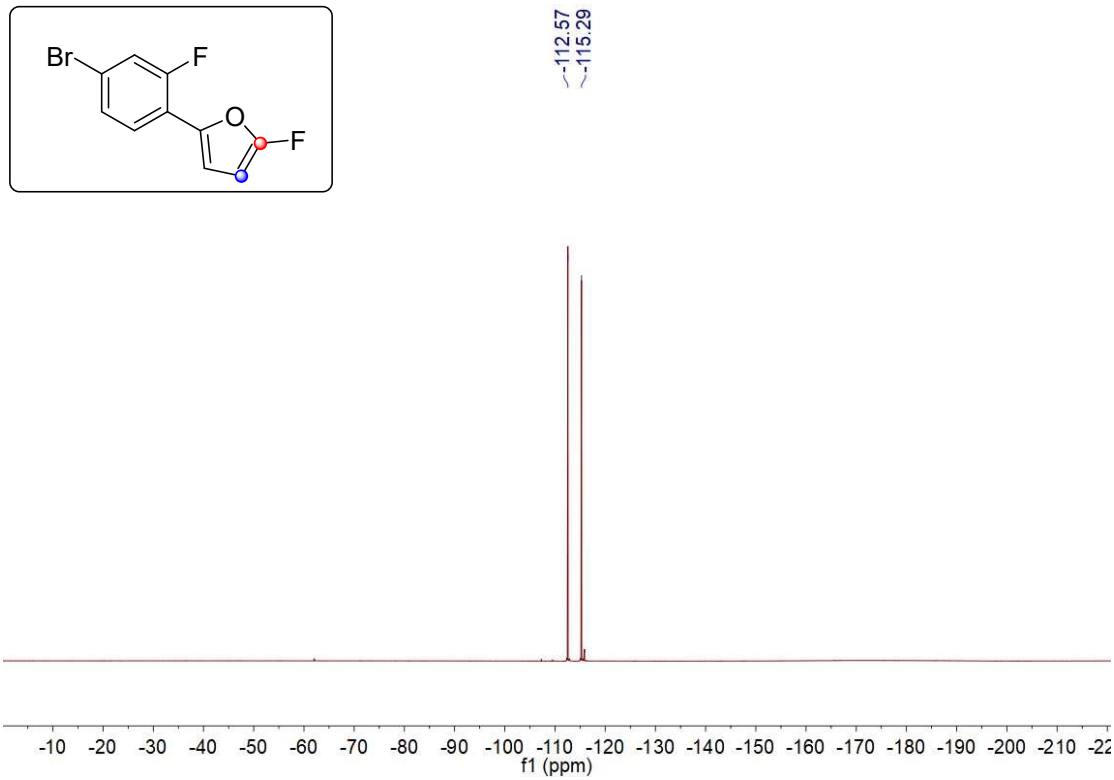
^{1}H spectrum (DMSO-d_6)2-(4-bromo-2-fluorophenyl)-5-fluorofuran (7m)



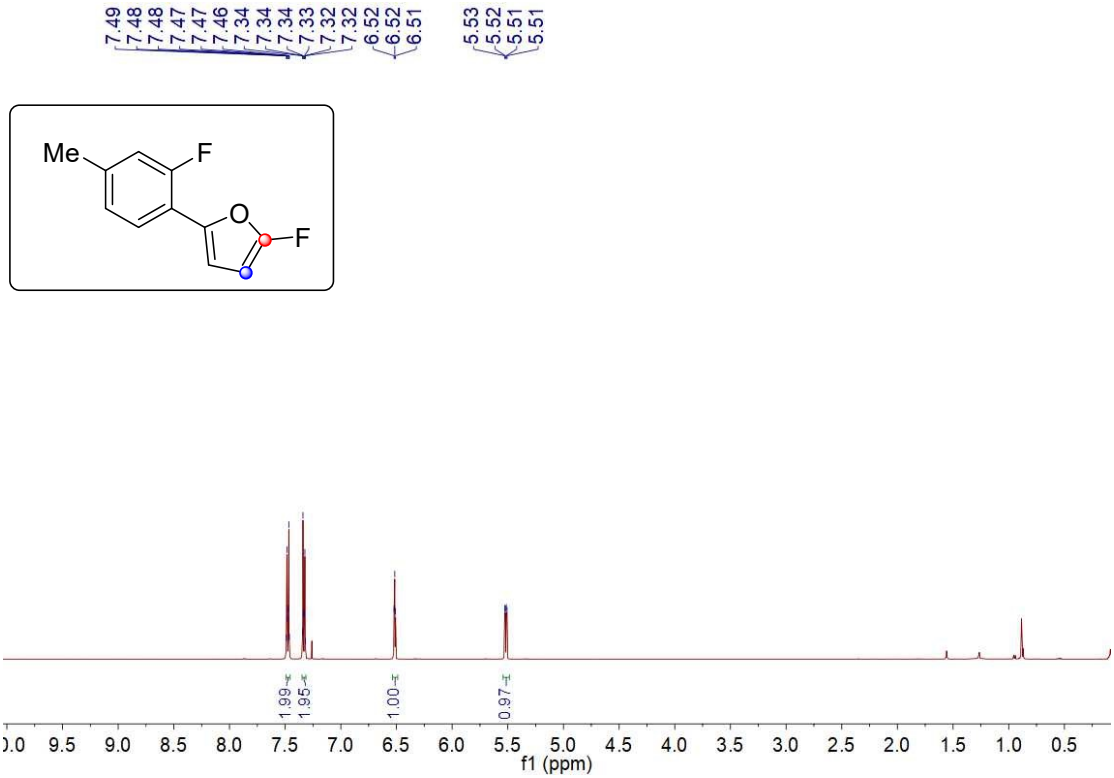
^{13}C spectrum (DMSO-d_6) 2-(4-bromo-2-fluorophenyl)-5-fluorofuran (7m)



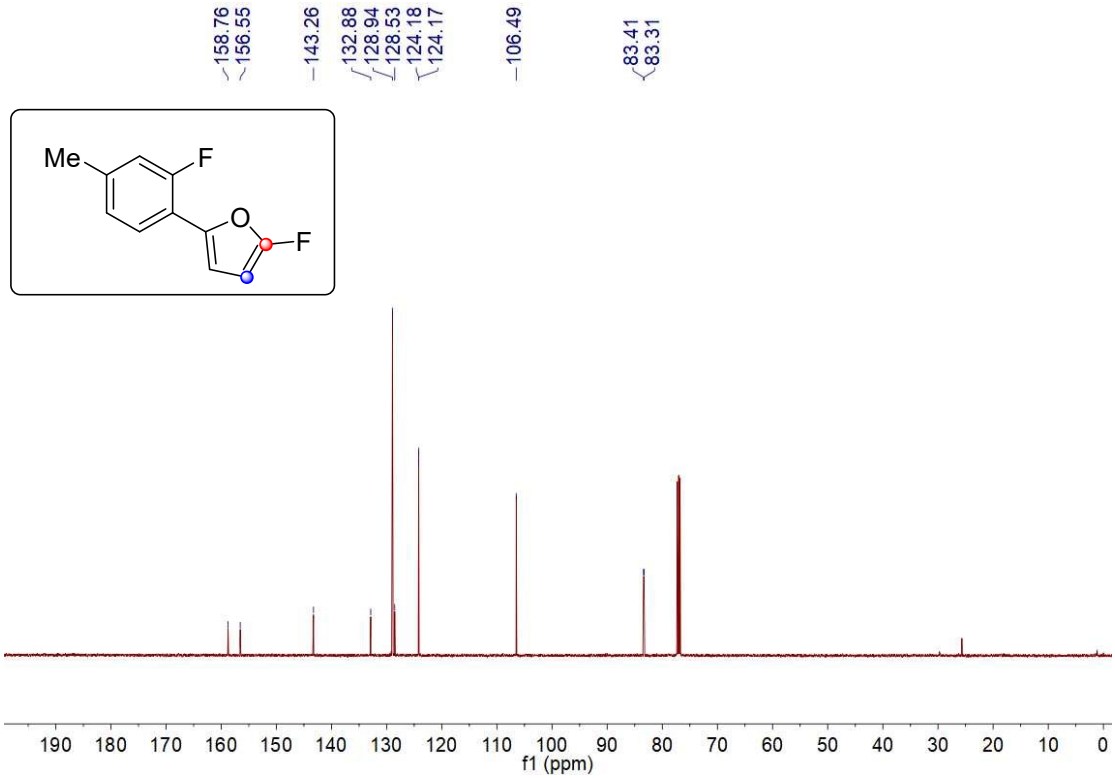
^{19}F spectrum (DMSO-d_6) 2-(4-bromo-2-fluorophenyl)-5-fluorofuran (7m)



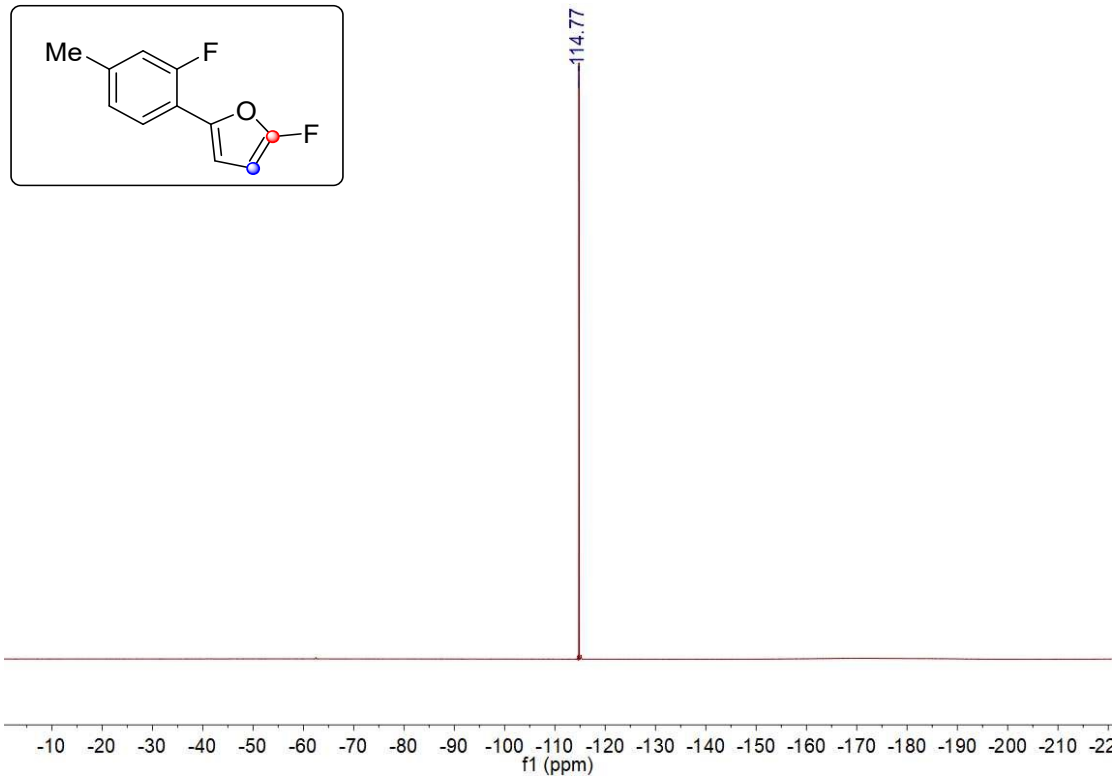
^{1}H spectrum ($CDCl_3$) 2-fluoro-5-(2-fluoro-4-methylphenyl)furan (7n)



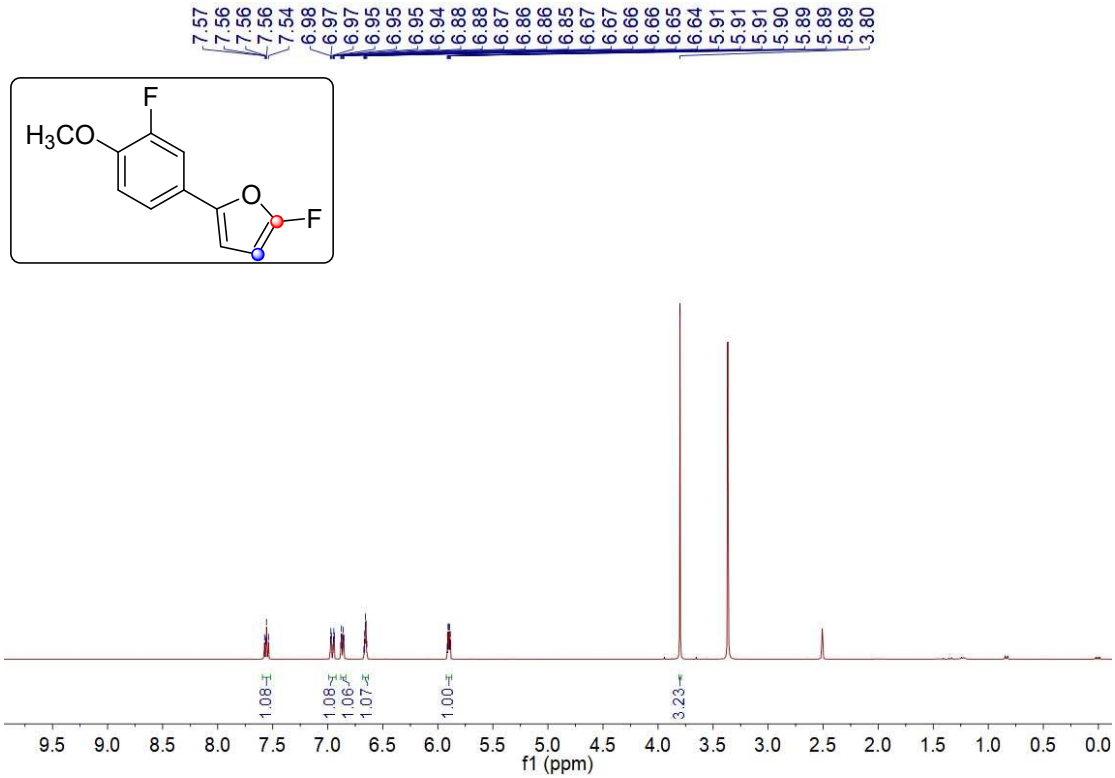
^{13}C spectrum ($CDCl_3$) 2-fluoro-5-(2-fluoro-4-methylphenyl)furan (7n)



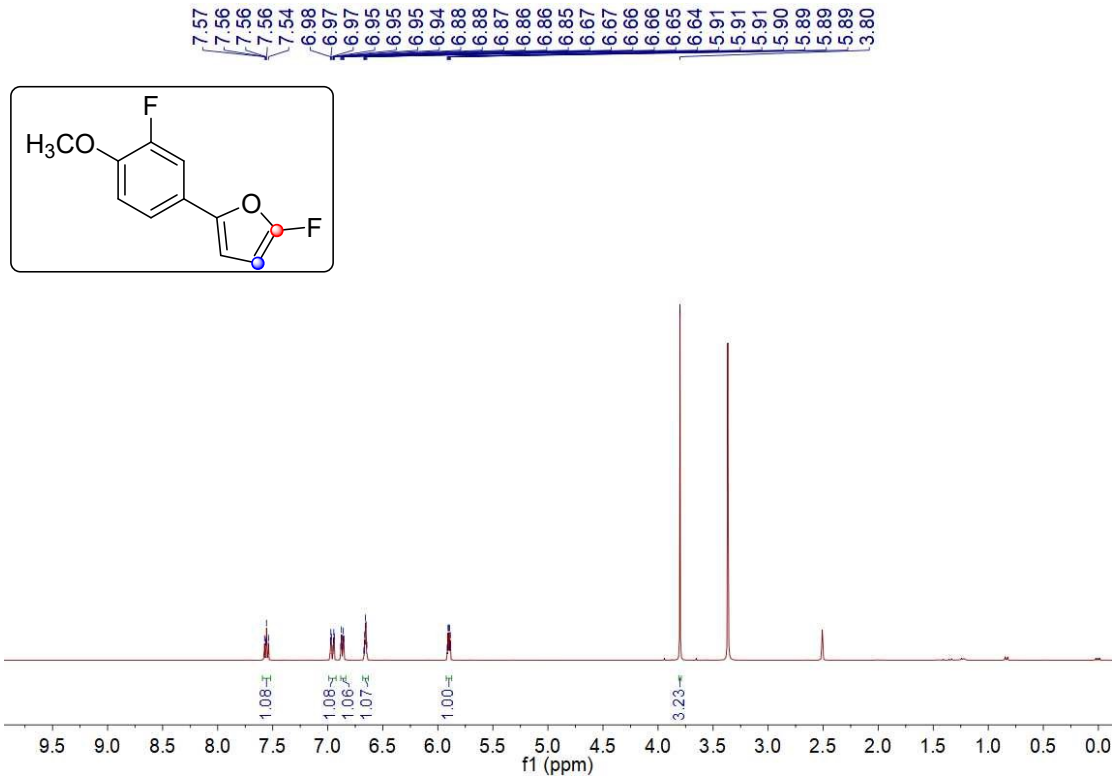
^{19}F spectrum ($CDCl_3$) 2-fluoro-5-(2-fluoro-4-methylphenyl)furan (7n)



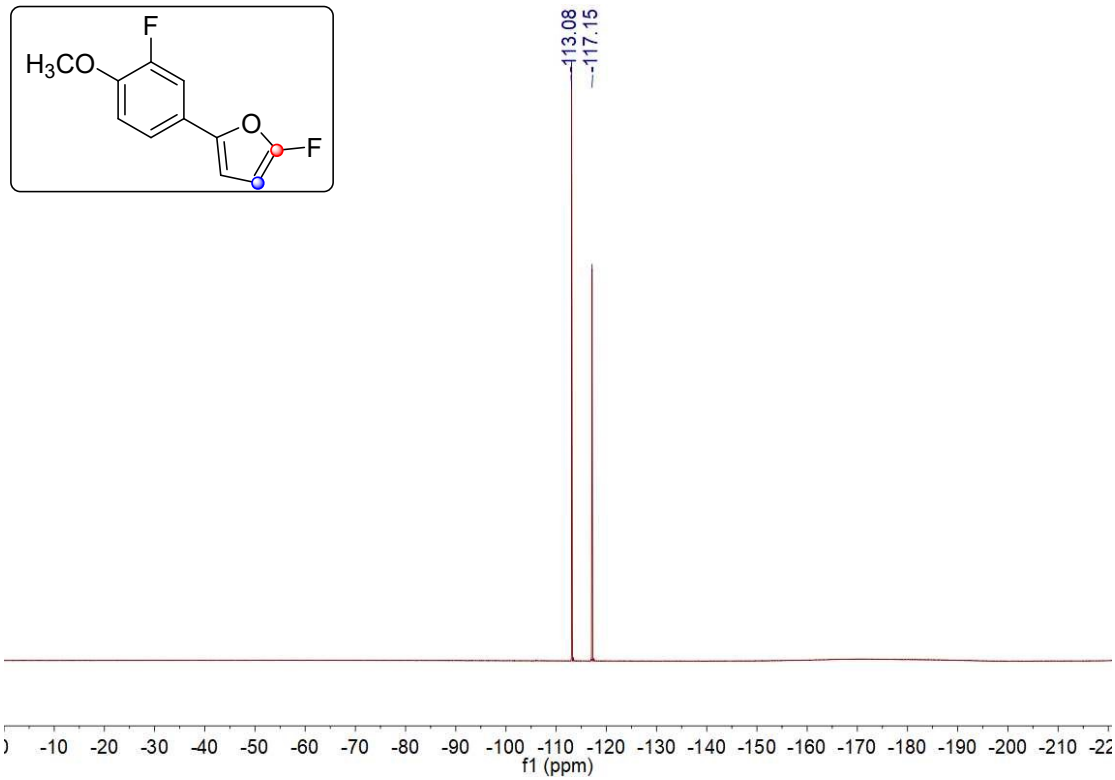
^{1}H spectrum (DMSO-d_6)2-fluoro-5-(3-fluoro-4-methoxyphenyl)furan (7o)



^{13}C spectrum (DMSO-d_6) 2-fluoro-5-(3-fluoro-4-methoxyphenyl)furan (7o)



^{19}F spectrum (DMSO-d_6) 2-fluoro-5-(3-fluoro-4-methoxyphenyl)furan (7o)


F
H3CO
O
F
-113.08
-117.15
-10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)