Supporting Information

Difunctionalization of *gem*-Difluoroalkenes for Amination and Heteroarylation via Metal-Free Photocatalysis

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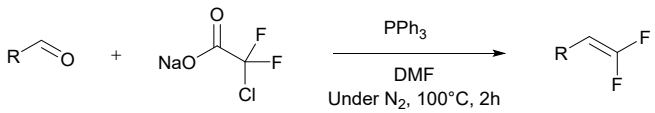
1. General methods

Unless otherwise noted, all the reagents were purchased from commercial suppliers and used without further purification. The 30W LED was purchased from Taobao (https://gpiled.taobao.com/, manufacture: Shenzhen Star Sources Lighting Technology Co., Ltd). A clip fan was placed over the reaction vials to cool down the reaction system during the whole process of the reaction. The progress of all the reactions was monitored by Agilent HPLC-MS (1200-6110). All the compounds were purified by column chromatography. Chromatography was performed on silica gel (100–200 mesh). Nuclear magnetic resonance spectra were recorded on Brucker Avance III 400/500/600 NMR spectrometer. Chemical shifts were reported in parts per million (ppm, δ). Proton coupling patterns are described as singlet (s), doublet (d), triplet (t), quartet (q) and multipet (m). Low-resolution mass spectra (LRMS) were recorded using Agilent HPLC-MS (1200-6110). High-resolution mass spectra (HRMS) were recorded on an Agilent 1290-6545 UHPLC-QTOF (ESI) mass spectrometer.

2. Experimental procedures

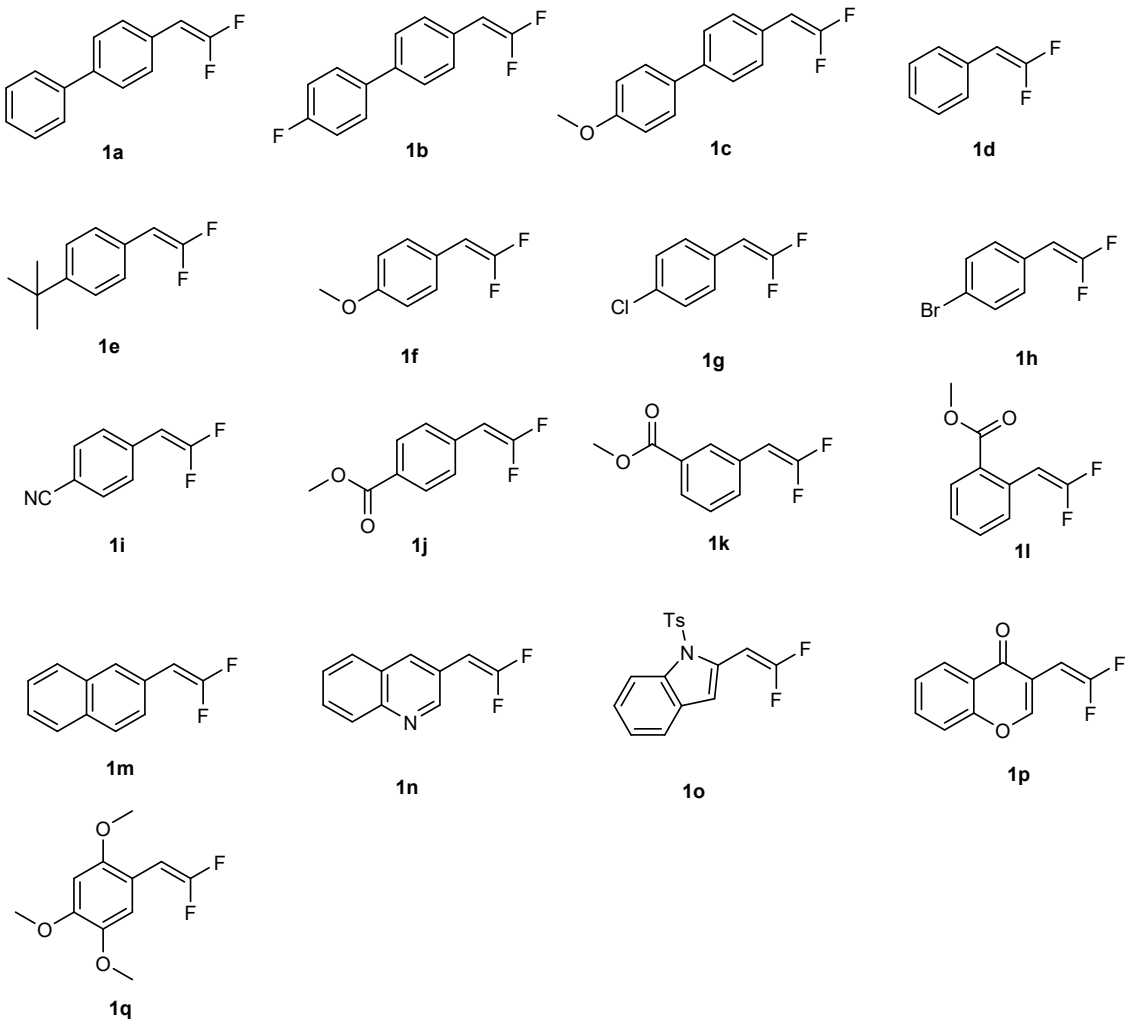
2.1. General procedure A for the preparation of *gem*-difluoroalkenes



gem-Difluoroalkenes were prepared as reported procedure. Aldehyde (1.0 mmol, 1.0 eq.) and triphenylphosphine (1.2 mmol, 1.2 eq.) were added to a 25 mL two-neck flask equipped with a magnetic stirrer. Then 3 mL anhydrous DMF was added under nitrogen and the mixture was heated to 100 ℃ in an oil bath. Sodium difluorochloroacetate (1.5 mmol, 1.5 eq.) was dissolved in anhydrous 1mL DMF and added to the reaction solution, stirring was continued for 2 h at 100 ℃. The reaction solution was then cooled to room temperature, 20 mL water and 10 × 3 mL ethyl acetate were added and the layers were separated. The organic phase was concentrated in vacuo and purified by column chromatography on silica gel to give the desired product.

gem-Difluoroalkenes **1a**-**1o** are reported compounds and the NMR data are in accordance with the literature. [1, 2]

List of all *Gem*-difluoroalkenes:

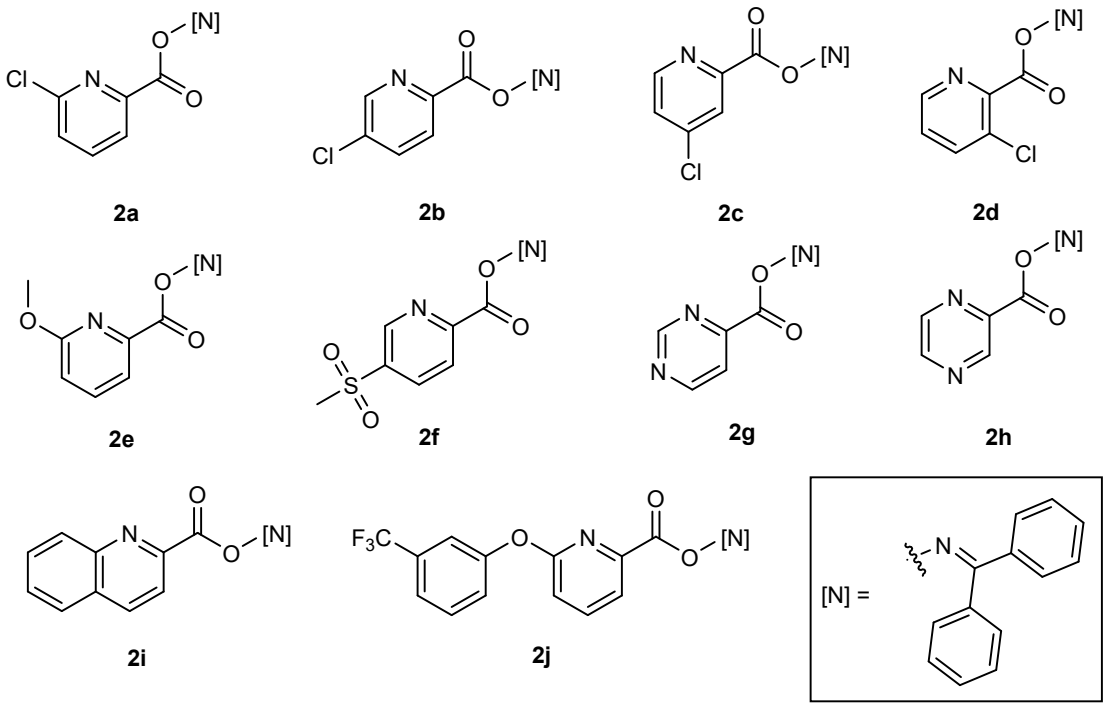


2.2. General procedure B for the preparation of oxime esters

Oxime esters were prepared as reported procedure. To a solution of ketoxime (2.0 mmol, 1.0 eq.) and carboxylic acid (2.0 mmol, 2.0 eq.) in 10 mL CH_2Cl_2, DMAP (0.2 mmol, 0.2 eq.) and EDCI (5.0 mmol, 2.5 eq.) were added. The mixture was stirred at room temperature under inert atmosphere until the reaction was complete as observed from HPLC-MS monitoring. Then 20 mL water was added and the CH_2Cl_2 layer was separated, dried over anhydrous Na_2SO_4 and concentrated. The crude was purified by silica gel column chromatography (petroleum ether / ethylacetate as eluent) to give the corresponding compound.

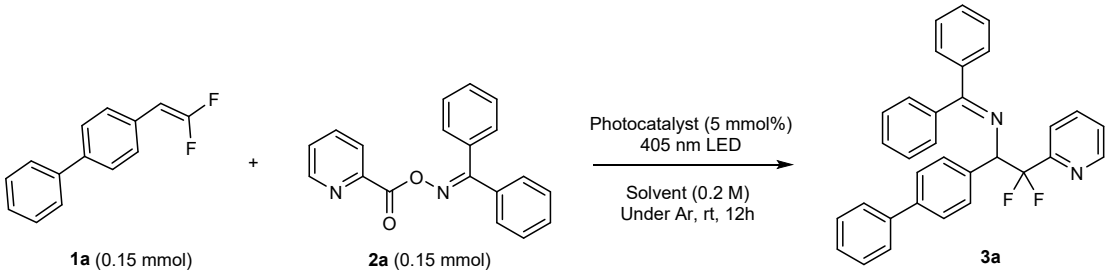
Oxime esters **2a**, **2c**, **2h** and **2i** are reported compounds and the NMR data are in accordance with the literature. [3]

List of all oxime esters:



2.3. Optimization of the reaction conditions

Table S1 Screening of photocatalysts and solvent

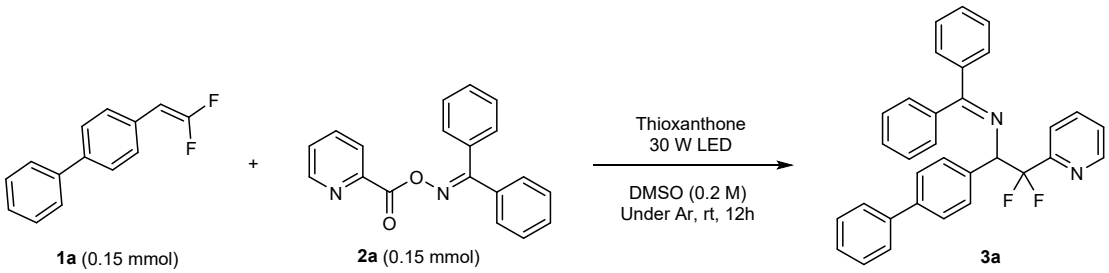


1a (0.15 mmol) **2a** (0.15 mmol) **3a**

Entry	Photocatalyst	Solvent	Yield (%)[a]
1	$[Ir(dF(CF_3)ppy)_2(dtbbpy)](PF_6)$	EtOAc	26
2	*fac*-$Ir(dFppy)_3$	EtOAc	20
3	4CzlPN	EtOAc	30
4	Thioxanthone	EtOAc	46
5	$[Ru(bpy)_3](PF_6)_2$	EtOAc	n.d.
6	Mes-Acr+BF4-	EtOAc	n.d.
7	$[Ir[dF(CF_3)_2ppy]_2(bpy)]PF_6$	EtOAc	24
8	Thioxanthone	DMSO	62
9	Thioxanthone	DMF	13
10	Thioxanthone	MeCN	40
11	Thioxanthone	THF	Trace
12	Thioxanthone	DCE	23

[a]Isolated yields

Table S2 Screening of wavelength

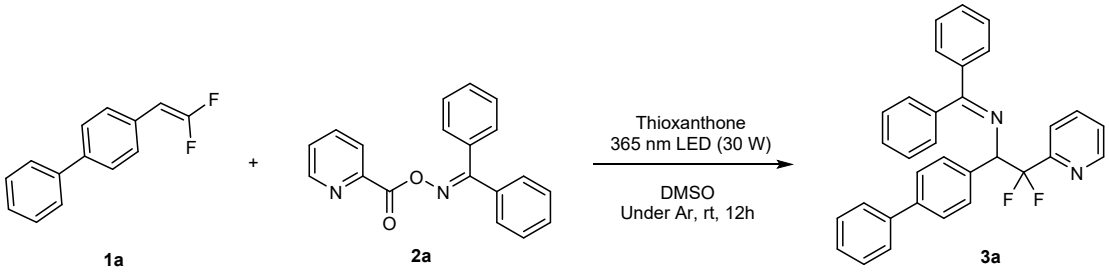


1a (0.15 mmol) + **2a** (0.15 mmol) → **3a**

Entry	Wavelength	Yield (%)[a]
1	405	62
2	440	trace
3	365	65

[a]Isolated yields

Table S3 Screening of substrate ratio and concentration

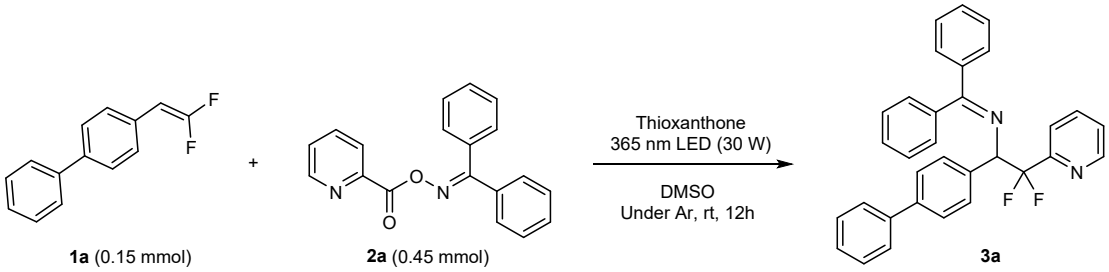


1a + **2a** → **3a**

Entry	**1a** / **2a** (mmol)	Concentration	Yield (%)[a]
1	0.15 / 0.15	0.2 M	65
2	0.15 / 0.15	0.1 M	59
3	0.15 / 0.15	0.4 M	52
4	0.15 / 0.15	0.05 M	40
5	0.15 / 0.30	0.2 M	69
6	0.15 / 0.45	0.2 M	71
7	0.30 / 0.15	0.2 M	56

[a]Isolated yields

Table S4 Control experiment



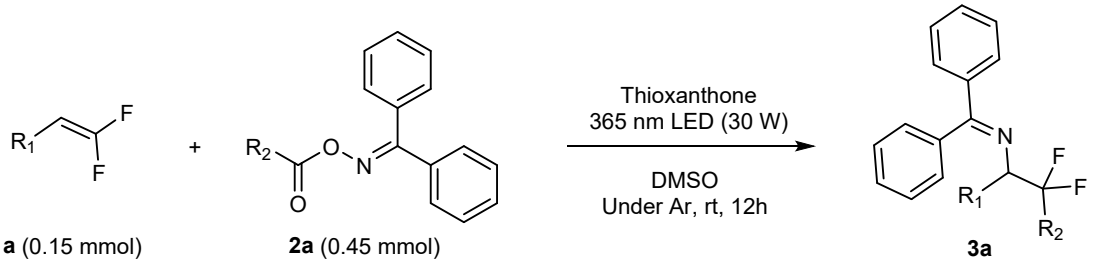
1a (0.15 mmol) + **2a** (0.45 mmol) → **3a**

Entry	Variation from standard conditions	Yield (%)[a]
1	none	71
2	4h	45
3	8h	67
4	16h	68

5	In the dark	n.d.
6	In the air	trace
7	no catalyst	trace

[a]Isolated yields

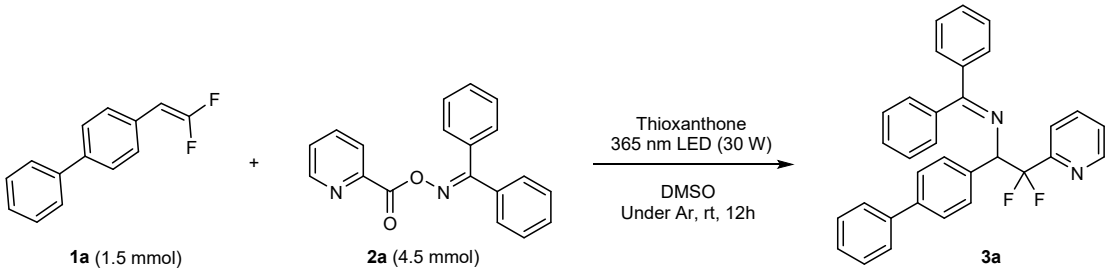
2.4. General procedure C for the difunctionalization of *gem*-difluoroalkenes



1a (0.15 mmol) **2a** (0.45 mmol) **3a**

To an oven dried 4 mL vial with a magnetic stir bar was added thioxanthone (0.008 mmol, 5 mol%), oxime esters (0.45 mmol, 3.0 eq.), gem-difluoroalkenes (0.15 mmol, 1.0 eq.), and dry DMSO (0.75 mL, 0.2 M). The vial was purged by argon for a short time (about 2 min). Then the vial was capped and stirred under irradiation with a 365 nm LED (30 W, distance app. 3 cm) for 12 hours. The reaction was kept under room temperature with a fan. After irradiation, the reaction mixture was transferred to a 25 mL round bottom flask with the aid of 3 × 3 mL DCM and 0.5 mL Et_3N. The solvent was removed under reduced pressure, and then the residue was purified by column chromatography on silica gel ethyl with acetate/petroleum ether (pre-basified with 0.3 % Et_3N in petroleum ether) to afford the desired products.

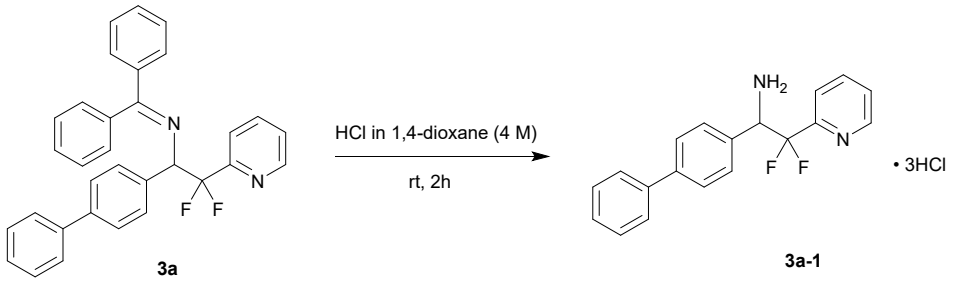
2.5. Scale-up reaction



1a (1.5 mmol) **2a** (4.5 mmol) **3a**

To an oven dried 20 mL vial with a magnetic stir bar was added thioxanthone (0.08 mmol, 5 mol%), oxime ester **2a** (4.5 mmol, 3.0 eq.), *gem*-difluoroalkene **1a** (1.5 mmol, 1.0 eq.), and dry DMSO (7.5 mL, 0.2 M). The vial was purged by argon for a short time (about 2 min). Then the vial was capped and stirred under irradiation with a 365 nm LED (30 W, distance app. 3 cm) for 12 hours. The reaction was kept under room temperature with a fan. After irradiation, the reaction mixture was transferred to a 100 mL round bottom flask with the aid of 15 × 3 mL DCM and 3 mL Et_3N. The solvent was removed under reduced pressure, and then the residue was purified by column chromatography on silica gel ethyl with 5% acetate/petroleum ether (pre-basified with 0.3 % Et3N in petroleum ether) to afford **3a** (468 mg, 60% yield).

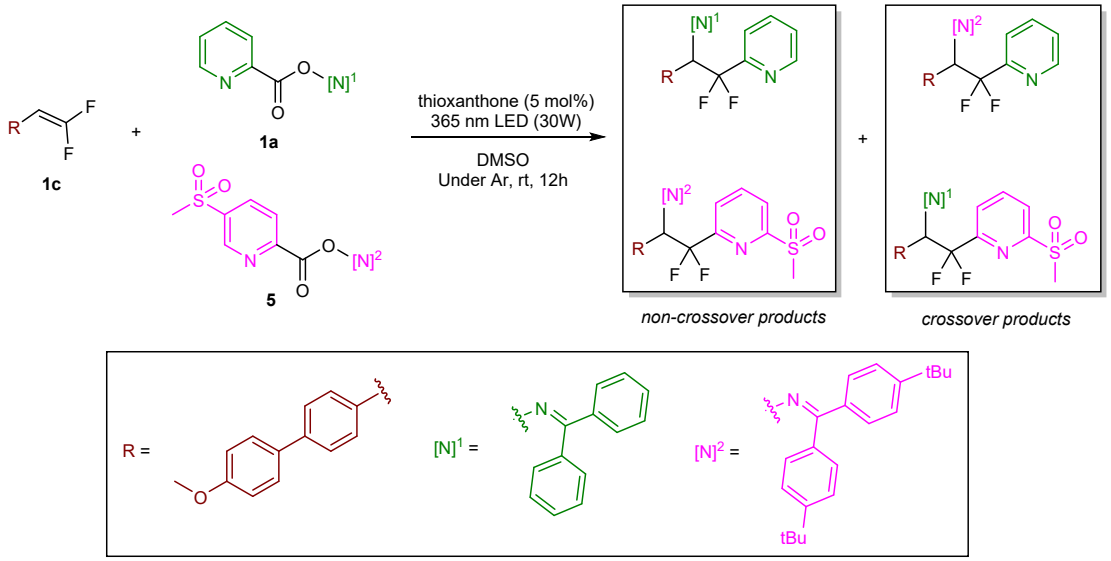
2.6. Benzophenone removal reaction



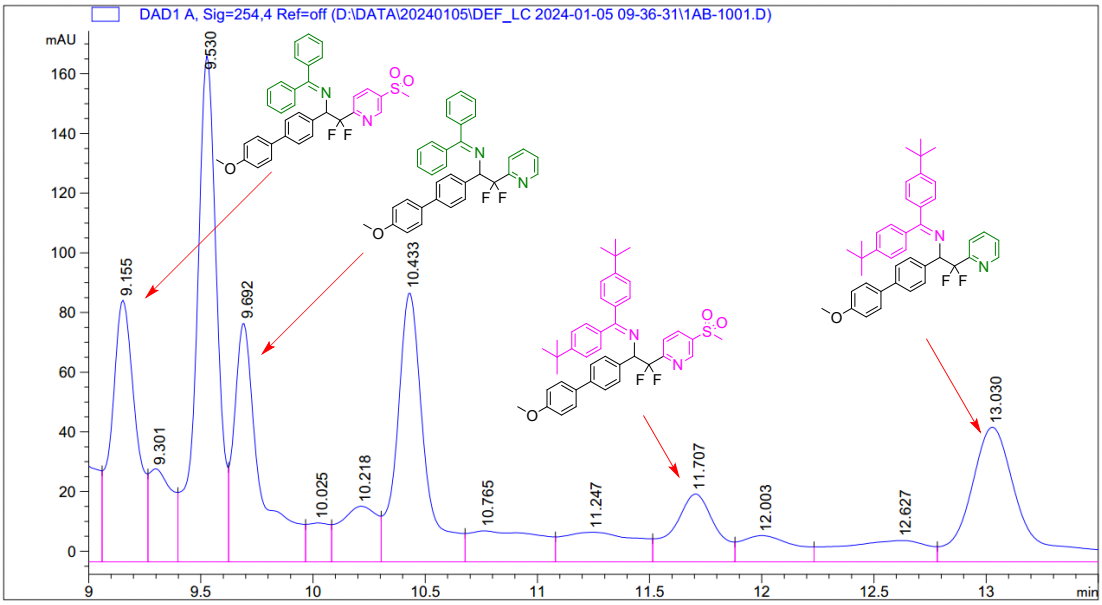
To a 25 mL pear-shaped flask equipped with a magnetic stirrer was added **3a** (0.5 mmol), 4 mL hydrogen chloride in 1,4-dioxane (4 M). The reaction mixture was stirred at room temperature for 2 h and filtered. The residue was washed with 20 mL DCM and dried to give product as an orange solid (192 mg, yield 91%).

3. Mechanistic studies

3.1. Radical crossover experiment



To an oven dried 4 mL vial with a magnetic stir bar was added thioxanthone (0.016 mmol, 5 mol%), oxime esters **1a** (0.45 mmol, 1.5 eq.), oxime esters **5** (0.45 mmol, 1.5 eq.), *gem*-difluoroalkenes (0.30 mmol, 1.0 eq.), and dry DMSO (1.50 mL, 0.2 M). The vial was purged by argon for a short time (about 1 min). Then the vial was capped and stirred under irradiation with a 365 nm LED (30 W, distance app. 3 cm) for 12 hours. The reaction was kept under room temperature with a fan. Then the crude reaction mixture was analyzed by HPLC-MS.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mAU
9.530
9.155
9.692
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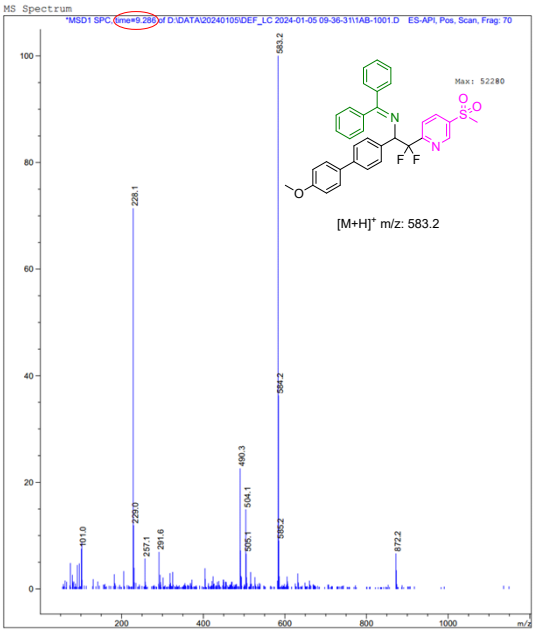
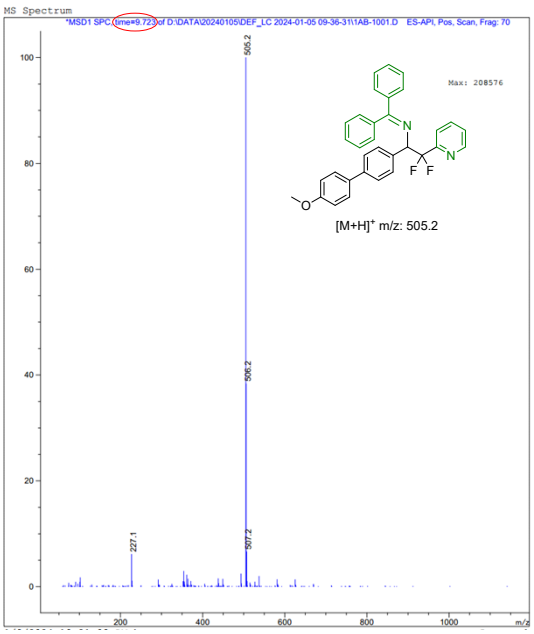
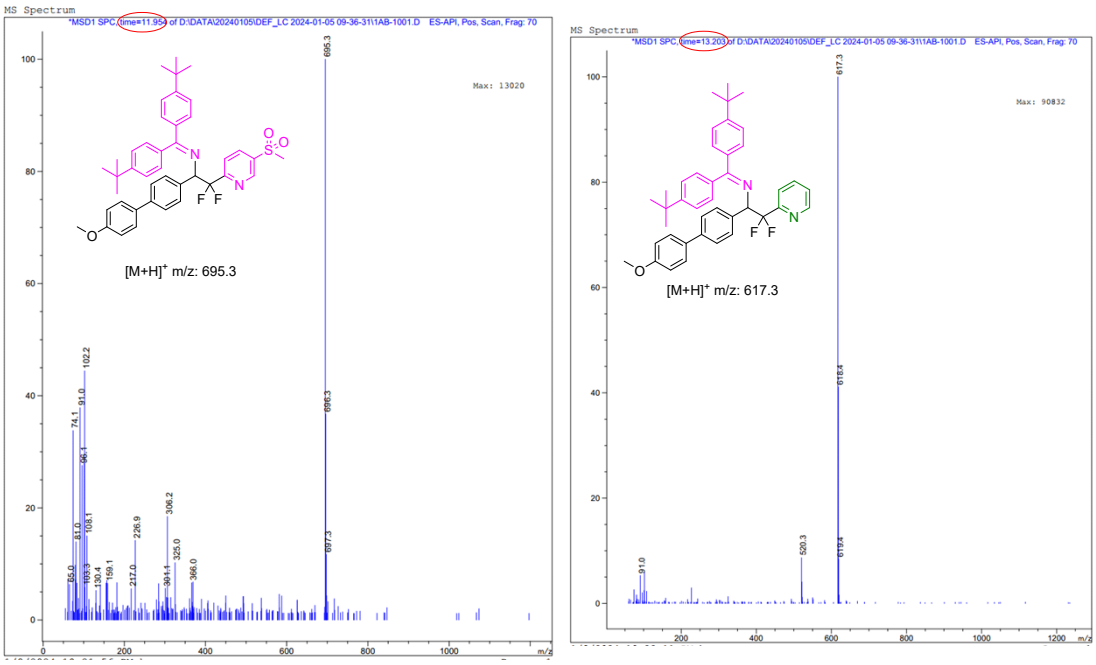
9.301
10.025
10.218
10.765
11.247
11.707
12.003
12.627
13.030
min


MS Spectrum
[M+H]+ m/z: 583.2

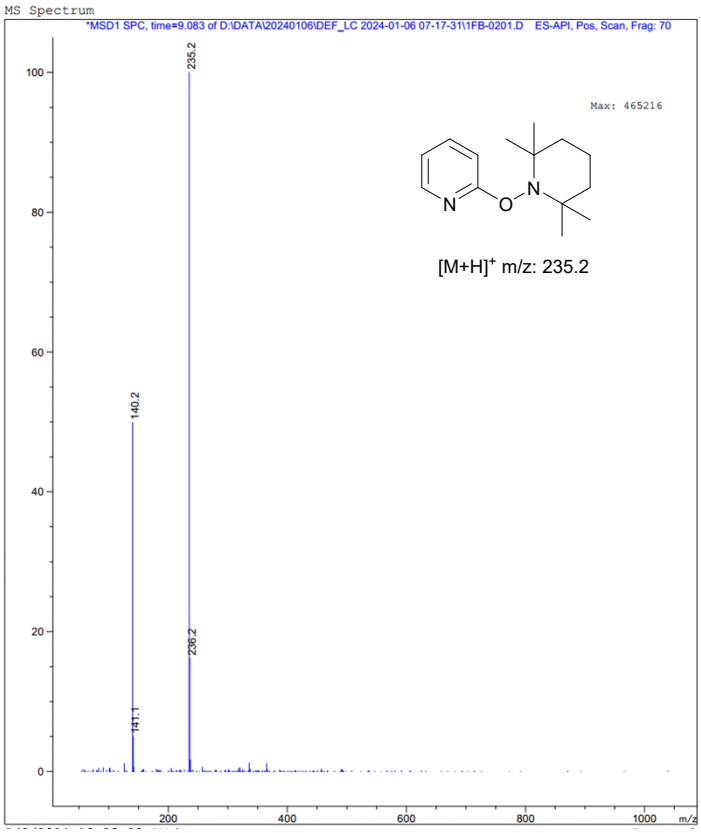

MS Spectrum
[M+H]+ m/z: 505.2



3.2. Radical trapping experiments

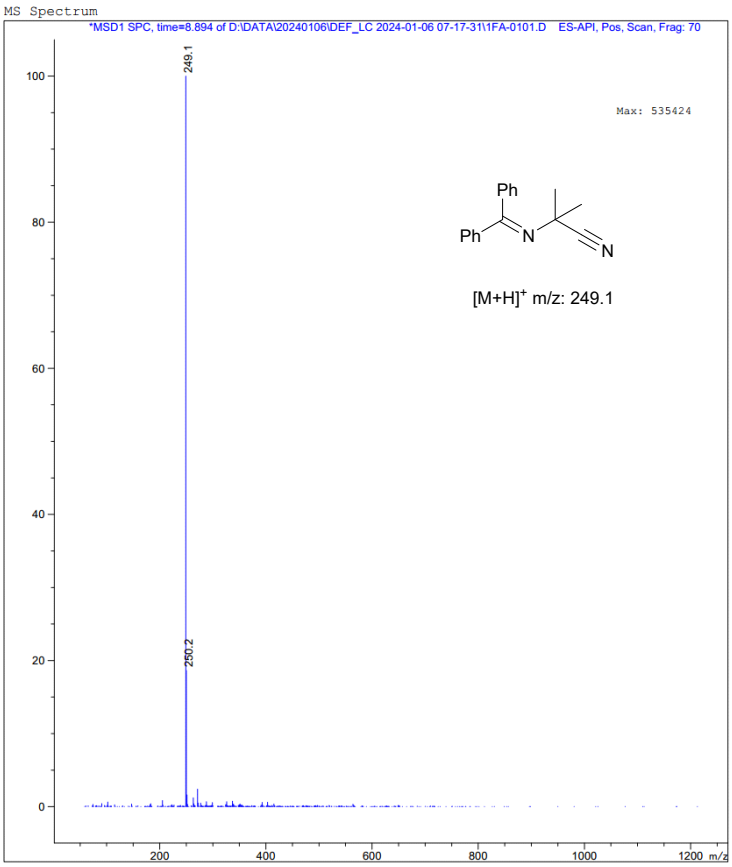
TEMPO/AIBN trapping experiments were conducted under standard condition following General procedure A using 3.0 equiv. TEMPO/AIBN as an additive. No trace of products was observed as determined from ESI-MS.

For TEMPO trapping experiment, the mass spectrum showed a peak corresponding to the coupled product between TEMPO radical and pyridyl radical.



For AIBN trapping experiment, the mass spectrum showed a peak corresponding to the coupled product between AIBN radical and imine radical.

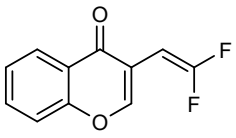
1c **2a** **3c** *no detected* **7** *detected by LC-MS*



1. S.-S. Yan, D.-S. Wu, J.-H. Ye, L. Gong, X. Zeng, C.-K. Ran, Y.-Y. Gui, J. Li and D.-G. Yu, ACS Catalysis, 2019, 9, 6987-6992.
2. H. J. Tang, L. Z. Lin, C. Feng and T. P. Loh, Angew Chem Int Ed Engl, 2017, 56, 9872-9876.
3. X. K. Qi, M. J. Zheng, C. Yang, Y. Zhao, L. Guo and W. Xia, J Am Chem Soc, 2023, 145, 16630-16641.

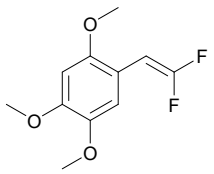
Characterization data of products

3-(2,2-difluorovinyl)-4H-chromen-4-one (**1p**)



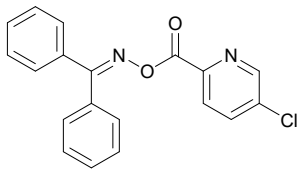
General procedure A was followed to obtain **1p** (112 mg, 54%) as a white solid.
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.25 – 8.21 (m, 1H), 8.14 (s, 1H), 7.70 – 7.67 (m, 1H), 7.47 – 7.40 (m, 2H), 5.60 (dd, J = 28.2, 2.2 Hz, 1H);
^{13}C NMR (151 MHz, $CDCl_3$) δ 175.43 (d, J = 2.4 Hz), 156.47 (dd, J = 294.4, 290.3 Hz), 156.14, 153.20 (dd, J = 12.3, 2.6 Hz), 134.04, 131.68 (d, J = 3.0 Hz), 126.28, 125.55, 123.28, 118.29, 71.86 (dd, J = 33.9, 14.6 Hz);
^{19}F NMR (471 MHz, $CDCl_3$) δ -80.15, -81.46.
HPLC-MS (ESI) m/z: 209.2 $[M+H]^+$.

1-(2,2-difluorovinyl)-2,4,5-trimethoxybenzene (**1q**)



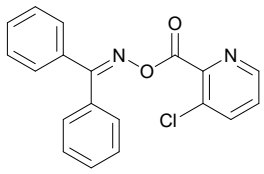
General procedure A was followed to obtain **1q** (96 mg, 42%) as a white solid.
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.01 (s, 1H), 6.51 (s, 1H), 5.59 (dd, *J* = 21.7, 9.9 Hz, 1H), 3.89 (s, 3H), 3.84 (s, 3H), 3.81 (s, 3H);
^{13}C NMR (151 MHz, $CDCl_3$) δ 155.91 (dd, *J* = 293.9, 287.7 Hz), 151.00 (dd, *J* = 4.3, 2.6 Hz), 148.98, 143.25, 111.77 (dd, *J* = 8.4, 2.8 Hz), 110.75 (t, *J* = 3.8 Hz), 97.58, 76.13 (dd, *J* = 27.9, 16.2 Hz), 56.76, 56.62, 56.17;
^{19}F NMR (471 MHz, $CDCl_3$) δ -85.34, -85.39.
HPLC-MS (ESI) m/z: 231.2 $[M+H]^+$.

diphenylmethanone O-(5-chloropicolinoyl) oxime (**2b**)



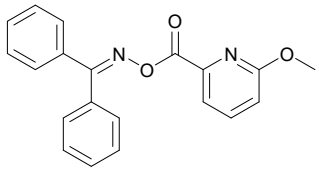
General procedure B was followed to obtain **2b** (471 mg, 70%) as a white solid.
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.66 (d, *J* = 2.0 Hz, 1H), 7.70 (dd, *J* = 8.4, 2.4 Hz, 1H), 7.67 – 7.64 (m, 3H), 7.50 – 7.46 (m, 4H), 7.43 – 7.37 (m, 4H).
^{13}C NMR (151 MHz, $CDCl_3$) δ 166.85, 161.62, 149.43, 145.02, 136.70, 136.01, 134.45, 132.54, 131.34, 130.03, 129.39, 129.08, 128.57, 128.40, 125.93.
HPLC-MS (ESI) m/z: 337.2 $[M+H]^+$.

diphenylmethanone O-(3-chloropicolinoyl) oxime (**2d**)



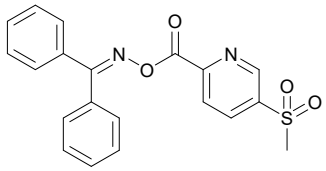
General procedure B was followed to obtain **2d** (416 mg, 62%) as a white solid.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.52 (dd, *J* = 4.6, 1.2 Hz, 1H), 7.73 (dd, *J* = 8.2, 1.2 Hz, 1H), 7.64 – 7.59 (m, 2H), 7.48 – 7.31 (m, 9H).
^{13}C NMR (151 MHz, $CDCl_3$) δ 166.68, 162.74, 147.52, 138.36, 134.65, 132.37, 131.27, 130.83, 129.93, 129.42, 129.29, 128.55, 128.27, 126.37.
HPLC-MS (ESI) m/z: 337.2 $[M+H]^+$.

diphenylmethanone O-(6-methoxypicolinoyl) oxime (**2e**)



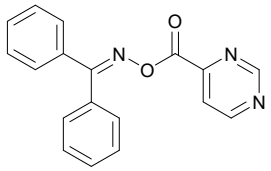
General procedure B was followed to obtain **2e** (452 mg, 68%) as a white solid.
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.2 Hz, 2H), 7.64 – 7.57 (m, 2H), 7.51 – 7.44 (m, 6H), 7.39 (t, *J* = 7.5 Hz, 2H), 6.87 (dd, *J* = 7.6, 1.3 Hz, 1H), 3.80 (s, 3H).
^{13}C NMR (151 MHz, $CDCl_3$) δ 165.79, 163.66, 162.66, 144.53, 139.01, 134.88, 132.85, 131.08, 129.67, 129.41, 129.35, 128.52, 128.18, 118.98, 115.63, 53.62
HPLC-MS (ESI) m/z: 333.2 $[M+H]^+$.

diphenylmethanone O-(5-(methylsulfonyl)picolinoyl) oxime (**2f**)



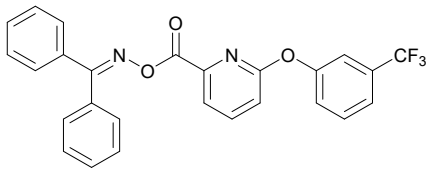
General procedure B was followed to obtain **2e** (456 mg, 60%) as a white solid.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.21 (d, *J* = 1.9 Hz, 1H), 8.29 (dd, *J* = 8.2, 2.3 Hz, 1H), 7.92 (d, *J* = 8.2 Hz, 1H), 7.68 – 7.64 (m, 2H), 7.52 – 7.47 (m, 4H), 7.45 – 7.39 (m, 4H), 3.11 (s, 3H).
^{13}C NMR (151 MHz, $CDCl_3$) δ 167.45, 161.02, 151.19, 148.92, 139.47, 136.78, 134.24, 132.35, 131.57, 130.22, 129.45, 129.09, 128.67, 128.49, 125.25, 44.84.
HPLC-MS (ESI) m/z: 381.2 $[M+H]^+$.

diphenylmethanone O-pyrimidine-4-carbonyl oxime (**2g**)



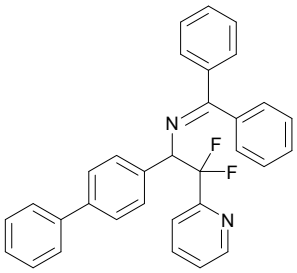
General procedure B was followed to obtain **2g** (316 mg, 52%) as a white solid.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.37 (s, 1H), 8.89 (d, *J* = 5.0 Hz, 1H), 7.66 (d, *J* = 7.5 Hz, 2H), 7.62 (d, *J* = 4.8 Hz, 1H), 7.54 – 7.46 (m, 6H), 7.44 – 7.37 (m, 6H).
^{13}C NMR (151 MHz, $CDCl_3$) δ 166.95, 160.75, 159.07, 158.64, 153.49, 133.70, 131.77, 131.05, 129.71, 128.93, 128.54, 128.14, 127.97, 120.44.
HPLC-MS (ESI) m/z: 304.2 $[M+H]^+$.

diphenylmethanone O-(6-(3-(trifluoromethyl)phenoxy)picolinoyl) oxime (**2j**)



General procedure B was followed to obtain **2j** (509 mg, 55%) as a white solid.
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.83 – 7.77 (m, 1H), 7.69 (d, *J* = 6.9 Hz, 1H), 7.62 (d, *J* = 7.1 Hz, 2H), 7.49 – 7.41 (m, 4H), 7.40 – 7.35 (m, 4H), 7.34 (d, *J* = 6.9 Hz, 2H), 7.28 (t, *J* = 7.6 Hz, 2H), 7.11 (d, *J* = 8.2 Hz, 1H).
^{13}C NMR (151 MHz, $CDCl_3$) δ 166.30, 162.18, 153.96, 145.36, 140.59, 134.87, 132.28, 132.03 (q, *J* = 32.7 Hz), 131.14, 130.02, 129.96, 129.45, 129.43, 128.53, 128.09, 124.29, 123.82 (q, *J* = 272.4 Hz), 121.32 (q, *J* = 3.6 Hz), 121.16, 117.82 (q, *J* = 3.6 Hz), 116.37.
HPLC-MS (ESI) m/z: 463.2 $[M+H]^+$.

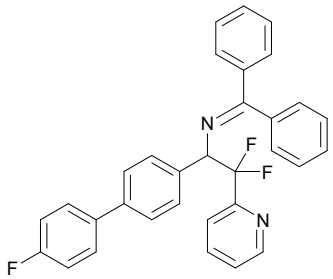
N-(1-([1,1'-biphenyl]-4-yl)-2,2-difluoro-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3a**)



General procedure C was followed to obtain **3a** (51 mg, 71%) as a yellow solid. m.p. 140-142 ℃.
IR (KBr, υ, cm^{-1}) 1630 (C=N), 1280 (C-F).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (d, *J* = 4.5 Hz, 1H), 7.75 (td, *J* = 7.7, 1.4 Hz, 1H), 7.68 (d, *J* = 7.8 Hz, 1H), 7.62 – 7.58 (m, 2H), 7.57 – 7.49 (m, 4H), 7.47 – 7.27 (m, 12H), 5.28 (dd, *J* = 18.0, 7.6 Hz, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.98, 154.44 (dd, *J* = 31.0, 25.3 Hz), 149.24, 141.02, 140.76, 139.53, 136.69, 136.53, 136.01, 130.52, 129.82, 128.86, 128.39, 128.11, 127.73, 127.36, 127.22, 126.87, 124.47, 121.74, 119.64 (dd, *J* = 251.6, 245.8 Hz), 69.85 (dd, *J* = 29.8, 22.4 Hz).
^{19}F NMR (471 MHz, $CDCl_3$) δ -102.08 (d, *J* = 249.2 Hz), -115.03 (d, *J* = 245.4 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{32}H_{24}F_2N_2$, 475.1980; found 475.1981.

N-(2,2-difluoro-1-(4'-fluoro-[1,1'-biphenyl]-4-yl)-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3b**)



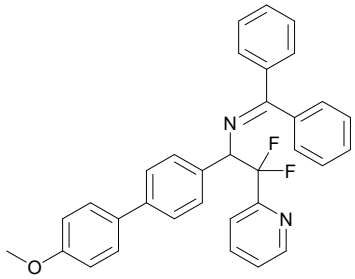
General procedure C was followed to obtain **3b** (52 mg, 70%) as a yellow solid. m.p. 145-147 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (d, *J* = 4.6 Hz, 1H), 7.75 (td, *J* = 7.8, 1.4 Hz, 1H), 7.67 (d, *J* = 7.8 Hz, 1H), 7.58 – 7.52 (m, 4H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.42 – 7.27 (m, 9H), 7.11 (t, *J* = 8.7 Hz, 2H), 6.73 (d, *J* = 6.8 Hz, 2H), 5.27 (dd, *J* = 18.0, 7.5 Hz, 1H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.03, 162.59 (d, *J* = 246.2 Hz), 154.41 (dd, *J* = 31.2, 24.8 Hz), 149.26, 139.80, 139.50, 137.15 (d, *J* = 3.0 Hz), 136.72, 136.55, 135.99, 130.56, 129.89, 128.87, 128.76 (d, *J* = 8.0 Hz), 128.41, 128.12, 127.71, 126.74, 124.50, 121.74, 119.60 (dd, *J* = 251.7, 245.4 Hz), 115.72 (d, *J*

= 21.4 Hz), 69.80 (dd, *J* = 30.0, 22.4 Hz).

^{19}F NMR (471 MHz, $CDCl_3$) δ -101.84 (d, *J* = 245.6 Hz), -115.29 (d, *J* = 245.4 Hz).

ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{32}H_{23}F_3N_2$, 493.1886; found 493.1887.

N-(2,2-difluoro-1-(4'-methoxy-[1,1'-biphenyl]-4-yl)-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3c**)



General procedure C was followed to obtain **3c** (57 mg, 76%) as a white solid. m.p. 156-158 ℃.

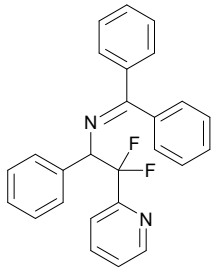
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (d, *J* = 4.6 Hz, 1H), 7.74 (td, *J* = 7.7, 1.6 Hz, 1H), 7.67 (d, *J* = 7.8 Hz, 1H), 7.57 – 7.52 (m, 4H), 7.49 – 7.46 (m, 2H), 7.42 – 7.33 (m, 6H), 7.32 – 7.26 (m, 3H), 6.99 – 6.95 (m, 2H), 6.75 – 6.71 (m, 2H), 5.26 (dd, *J* = 18.0, 7.6 Hz, 1H), 3.85 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.88, 159.25, 154.48 (dd, *J* = 31.0, 25.2 Hz), 149.24, 140.35, 139.56, 136.51, 136.02, 133.58, 130.49, 129.78, 128.86, 128.82, 128.38, 128.22, 128.10, 127.74, 126.41, 124.45, 121.74, 119.64 (dd, *J* = 251.7, 245.8 Hz), 114.30, 69.85 (dd, *J* = 29.9, 22.5 Hz), 55.48.

^{19}F NMR (753 MHz, $CDCl_3$) δ -102.11 (d, *J* = 245.2 Hz), -115.07 (d, *J* = 245.5 Hz).

ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{33}H_{26}F_2N_2O$, 505.2086; found 505.2088.

N-(2,2-difluoro-1-phenyl-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3d**)



General procedure C was followed to obtain **3d** (57 mg, 60%) as a yellow oil.

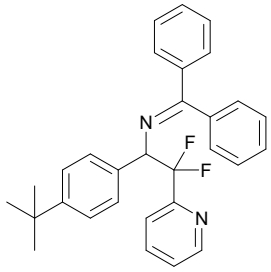
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.5 Hz, 1H), 7.72 (td, *J* = 7.7, 1.5 Hz, 1H), 7.63 (d, *J* = 7.9 Hz, 1H), 7.56 – 7.53 (m, 2H), 7.42 – 7.32 (m, 6H), 7.30 – 7.27 (m, 6H), 6.73 – 6.69 (m, 2H), 5.24 (dd, *J* = 17.8, 7.9 Hz, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.85, 154.47 (dd, *J* = 31.1, 25.4 Hz), 149.21, 139.53, 137.64, 137.63, 136.48, 136.02, 130.48, 129.46, 128.84, 128.79, 128.35, 128.12, 128.08, 128.00, 127.69, 124.42, 121.69, 119.60 (dd, *J* = 251.4, 246.2 Hz), 70.06 (dd, *J* = 29.6, 22.5 Hz).

^{19}F NMR (753 MHz, $CDCl_3$) δ -102.49 (d, *J* = 245.6 Hz), -114.98 (d, *J* = 245.5 Hz).

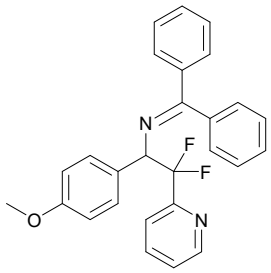
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{26}H_{20}F_2N_2$, 399.1667; found 399.1668.

N-(1-(4-(tert-butyl)phenyl)-2,2-difluoro-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3e**)



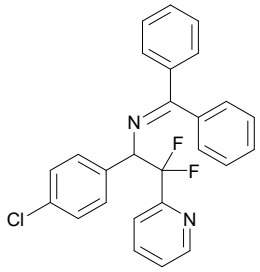
General procedure C was followed to obtain **3e** (49 mg, 72%) as a white solid. m.p. 123-125 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.54 (d, *J* = 4.5 Hz, 1H), 7.68 (td, *J* = 7.7, 1.5 Hz, 1H), 7.61 (d, *J* = 7.8 Hz, 1H), 7.52 – 7.45 (m, 2H), 7.38 – 7.28 (m, 4H), 7.26 – 7.20 (m, 7H), 6.64 (dd, *J* = 8.0, 1.2 Hz, 2H), 5.16 (dd, *J* = 18.6, 7.3 Hz, 1H), 1.27 (s, 9H).
^{13}C NMR (126 MHz, CDCl3) δ 170.49, 154.59 (dd, *J* = 31.5, 25.0 Hz), 150.75, 149.18, 139.63, 136.43, 135.99, 134.45, 130.38, 129.03, 128.82, 128.74, 128.28, 128.04, 127.77, 125.05, 124.37, 121.71, 119.62 (dd, *J* = 251.6, 245.7 Hz), 69.85 (dd, *J* = 30.3, 22.2 Hz), 34.63, 31.50.
^{19}F NMR (471 MHz, $CDCl_3$) δ -101.83 (d, *J* = 244.8 Hz), -115.66 (d, *J* = 263.0 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{30}H_{28}F_2N_2$, 455.2293; found 455.2292.

N-(2,2-difluoro-1-(4-methoxyphenyl)-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3f**)



General procedure C was followed to obtain **3f** (42 mg, 65%) as a white solid. m.p. 98-100 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.5 Hz, 1H), 7.76 – 7.70 (m, 1H), 7.63 (d, *J* = 7.8 Hz, 1H), 7.55 – 7.51 (m, 2H), 7.43 – 7.24 (m, 9H), 6.82 (d, *J* = 8.7 Hz, 2H), 6.74 – 6.68 (m, 2H), 5.17 (dd, *J* = 17.8, 7.9 Hz, 1H), 3.79 (s, 3H).
^{13}C NMR (126 MHz, CDCl3) δ 170.59, 159.34, 154.56 (dd, *J* = 30.9, 25.6 Hz), 149.19, 139.58, 136.45, 136.06, 130.44, 129.77, 128.81, 128.75, 128.34, 128.07, 127.70, 124.37, 121.70, 119.63 (dd, *J* = 251.2, 245.6 Hz), 113.58, 69.47 (dd, *J* = 29.8, 22.7 Hz), 55.30.
^{19}F NMR (471 MHz, $CDCl_3$) δ -102.67 (d, *J* = 244.8 Hz), -115.14 (d, *J* = 261.8 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{27}H_{22}F_2N_2O$, 429.1773; found 429.1773.

N-(1-(4-chlorophenyl)-2,2-difluoro-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3g**)



General procedure C was followed to obtain **3g** (41 mg, 63%) as a white solid. m.p. 140-142 ℃.

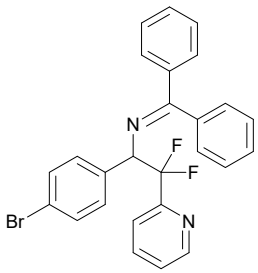
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.2 Hz, 1H), 7.74 (td, *J* = 7.7, 1.5 Hz, 1H), 7.64 (d, *J* = 7.8 Hz, 1H), 7.52 (dd, *J* = 8.3, 1.3 Hz, 2H), 7.41 – 7.32 (m, 4H), 7.31 – 7.25 (m, 7H), 6.69 (dd, *J* = 8.1, 1.3 Hz, 2H), 5.21 (dd, *J* = 17.7, 7.6 Hz, 1H).

^{13}C NMR (151 MHz, CDCl3) δ 171.33, 154.13 (dd, *J* = 31.1, 25.1 Hz), 149.26, 139.27, 136.60, 136.12, 135.84, 133.88, 130.72, 130.66, 128.92, 128.83, 128.45, 128.38, 128.13, 127.54, 124.57, 121.65, 119.38 (dd, *J* = 251.7, 245.8 Hz), 69.30 (dd, *J* = 29.9, 22.5 Hz).

^{19}F NMR (471 MHz, $CDCl_3$) δ -102.23 (d, *J* = 246.2 Hz), -115.17 (d, *J* = 263.3 Hz).

ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{26}H_{19}ClF_2N_2$, 433.1278; found 433.1280.

N-(1-(4-bromophenyl)-2,2-difluoro-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3h**)



General procedure C was followed to obtain **3h** (44 mg, 62%) as a white solid. m.p. 145-147 ℃.

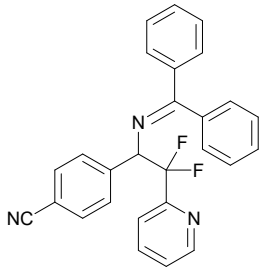
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.6 Hz, 1H), 7.75 (td, *J* = 7.7, 1.5 Hz, 1H), 7.65 (d, *J* = 7.9 Hz, 1H), 7.55 – 7.50 (m, 2H), 7.44 – 7.38 (m, 3H), 7.38 – 7.32 (m, 3H), 7.31 – 7.26 (m, 3H), 7.23 (d, *J* = 8.3 Hz, 2H), 6.70 (dd, *J* = 8.1, 1.3 Hz, 2H), 5.21 (dd, *J* = 17.7, 7.6 Hz, 1H).

^{13}C NMR (151 MHz, CDCl3) δ 171.37, 154.10 (dd, *J* = 31.1, 25.1 Hz), 149.26, 139.25, 136.63, 136.61, 135.83, 131.32, 131.07, 130.67, 128.93, 128.83, 128.45, 128.13, 127.54, 124.57, 122.17, 121.64, 119.31 (dd, *J* = 251.9, 245.8 Hz), 69.36 (dd, *J* = 29.9, 22.5 Hz).

^{19}F NMR (471 MHz, $CDCl_3$) δ -102.17 (d, *J* = 246.5 Hz), -115.16 (d, *J* = 263.4 Hz).

ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{26}H_{19}BrF_2N_2$, 477.0772; found 477.0772.

4-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(pyridin-2-yl)ethyl)benzonitrile (**3i**)



General procedure C was followed to obtain **3i** (36 mg, 56%) as a white solid. m.p. 122-124 ℃.

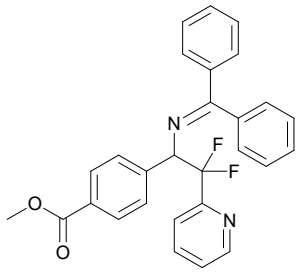
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.5 Hz, 1H), 7.77 (td, *J* = 7.7, 1.5 Hz, 1H), 7.67 (d, *J* = 7.9 Hz, 1H), 7.58 (d, *J* = 8.3 Hz, 2H), 7.54 – 7.46 (m, 4H), 7.44 – 7.26 (m, 7H), 6.69 – 6.63 (m, 2H), 5.31 (dd, *J* = 17.9, 7.0 Hz, 1H).

^{13}C NMR (126 MHz, CDCl3) δ 172.14, 153.78 (dd, *J* = 31.0, 24.9 Hz), 149.34, 143.00, 139.00, 136.74, 135.71, 131.95, 130.91, 130.24, 129.09, 128.87, 128.56, 128.21, 127.41, 124.76, 121.63, 119.26 (dd, *J* = 252.4, 246.1 Hz), 118.96, 111.93, 69.50 (dd, *J* = 30.0, 22.3 Hz).

^{19}F NMR (471 MHz, $CDCl_3$) δ -101.17 (d, *J* = 251.6 Hz), -115.32 (d, *J* = 264.9 Hz).

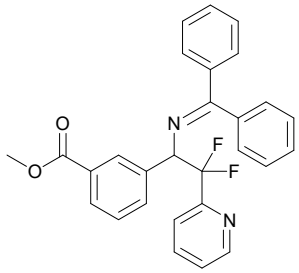
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{27}H_{19}F_2N_3$, 424.1620; found 424.1622.

methyl 4-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(pyridin-2-yl)ethyl)benzoate (**3j**)



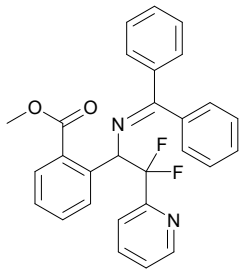
General procedure C was followed to obtain **3j** (49 mg, 71%) as a white solid. m.p. 114-116 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.3 Hz, 1H), 7.95 (d, *J* = 8.4 Hz, 2H), 7.74 (td, *J* = 7.7, 1.5 Hz, 1H), 7.64 (d, *J* = 7.8 Hz, 1H), 7.53 (dd, *J* = 8.3, 1.3 Hz, 2H), 7.44 – 7.37 (m, 4H), 7.34 (d, *J* = 7.5 Hz, 2H), 7.33 – 7.27 (m, 3H), 6.71 – 6.66 (m, 2H), 5.30 (dd, *J* = 17.6, 7.7 Hz, 1H), 3.91 (s, 3H).
^{13}C NMR (151 MHz, CDCl3) δ 171.61, 167.16, 154.06 (dd, *J* = 30.9, 25.1 Hz), 149.29, 142.77, 139.23, 136.62, 135.83, 130.71, 129.76, 129.48, 129.40, 128.94, 128.86, 128.47, 128.15, 127.53, 124.60, 121.64, 119.42 (dd, *J* = 251.9, 246.3 Hz), 69.75 (dd, *J* = 29.7, 22.5 Hz), 52.24.
^{19}F NMR (471 MHz, $CDCl_3$) δ -102.10 (d, *J* = 246.4 Hz), -114.73 (d, *J* = 263.4 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{28}H_{22}F_2N_2O_2$, 457.1722; found 457.1724.

methyl 3-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(pyridin-2-yl)ethyl)benzoate (**3k**)



General procedure C was followed to obtain **3k** (51 mg, 75%) as a yellow oil.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (d, *J* = 4.5 Hz, 1H), 8.03 (s, 1H), 7.97 (dt, *J* = 7.7, 1.3 Hz, 1H), 7.74 (td, *J* = 7.7, 1.5 Hz, 1H), 7.65 (d, *J* = 7.8 Hz, 1H), 7.58 – 7.52 (m, 3H), 7.42 – 7.26 (m, 8H), 6.70 – 6.66 (m, 2H), 5.31 (dd, *J* = 18.0, 7.4 Hz, 1H), 3.89 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.48, 154.17 (dd, *J* = 31.2, 25.0 Hz), 167.13, 149.29, 139.30, 138.04, 136.59, 135.90, 134.07, 130.65, 130.16, 129.35, 128.93, 128.91, 128.46, 128.24, 128.12, 127.55, 124.56, 121.65, 119.43 (dd, *J* = 251.8, 245.8 Hz), 69.70 (dd, *J* = 30.0, 22.3 Hz), 52.20.
^{19}F NMR (471 MHz, $CDCl_3$) δ -101.77 (d, *J* = 249.4 Hz), -115.42 (d, *J* = 264.1 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{28}H_{22}F_2N_2O_2$, 457.1722; found 457.1723.

methyl 2-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(pyridin-2-yl)ethyl)benzoate (**3l**)



General procedure C was followed to obtain **3l** (36 mg, 52%) as a yellow oil.

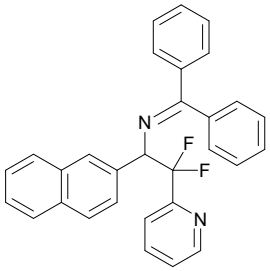
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (d, *J* = 4.4 Hz, 1H), 8.00 (d, *J* = 7.9 Hz, 1H), 7.79 – 7.74 (m, 1H), 7.72 – 7.66 (m, 1H), 7.57 (d, *J* = 7.2 Hz, 2H), 7.54 – 7.47 (m, 2H), 7.34 (m, 8H), 6.73 (d, *J* = 6.9 Hz, 2H), 6.47 (dd, *J* = 17.3, 7.3 Hz, 1H), 3.55 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 171.43, 167.55, 154.44 (dd, *J* = 30.2, 26.3 Hz),149.24, 139.52, 138.20, 136.84, 136.34, 131.66, 131.44, 130.66, 130.53, 130.27, 128.89, 128.45, 128.37, 128.10, 127.62, 127.57, 124.35, 121.61, 119.80 (dd, *J* = 252.0, 247.2 Hz), 64.32 (dd, *J* = 29.1, 22.1 Hz), 51.89.

^{19}F NMR (471 MHz, $CDCl_3$) δ -101.22 (d, *J* = 253.0 Hz), -114.13 (d, *J* = 263.8 Hz).

ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{28}H_{22}F_2N_2O_2$, 457.1722; found 457.1721.

N-(2,2-difluoro-1-(naphthalen-1-yl)-2-(pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**3m**)



General procedure C was followed to obtain **3m** (54 mg, 80%) as a white solid. m.p. 96-98 ℃.

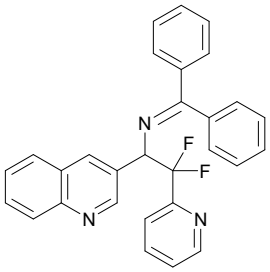
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.61 (d, *J* = 4.6 Hz, 1H), 7.84 – 7.75 (m, 4H), 7.73 (td, *J* = 7.8, 1.6 Hz, 1H), 7.66 (d, *J* = 7.8 Hz, 1H), 7.56 (dd, *J* = 8.4, 1.3 Hz, 2H), 7.53 (d, *J* = 8.7 Hz, 1H), 7.47 – 7.44 (m, 2H), 7.41 – 7.35 (m, 2H), 7.34 – 7.27 (m, 5H), 6.70 (dd, *J* = 8.1, 1.2 Hz, 2H), 5.40 (dd, *J* = 17.8, 7.8 Hz, 1H).

^{13}C NMR (151 MHz, CDCl3) δ 171.19, 154.43 (dd, *J* = 31.1, 25.1 Hz), 149.28, 139.52, 136.55, 135.99, 135.22, 133.25, 130.54, 128.89, 128.86, 128.67, 128.38, 128.32, 128.12, 127.73, 127.71, 127.66, 127.22, 126.06, 125.92, 124.49, 121.67, 119.73 (dd, *J* = 251.7, 245.9 Hz), 70.17 (dd, *J* = 29.6, 22.4 Hz.

^{19}F NMR (471 MHz, $CDCl_3$) δ -102.10 (d, *J* = 245.7 Hz), -114.67 (d, *J* = 262.9 Hz).

ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{30}H_{22}F_2N_2$, 449.1824; found 449.1825.

N-(2,2-difluoro-2-(pyridin-2-yl)-1-(quinolin-3-yl)ethyl)-1,1-diphenylmethanimine (**3n**)



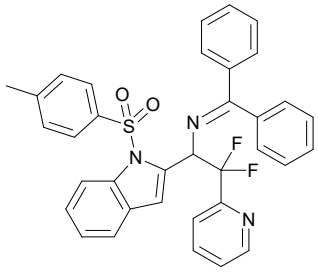
General procedure C was followed to obtain **3n** (39 mg, 58%) as a brown oil.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.78 (d, *J* = 1.8 Hz, 1H), 8.62 (d, *J* = 4.5 Hz, 1H), 8.23 (s, 1H), 8.09 (d, *J* = 8.4 Hz, 1H), 7.80 (d, *J* = 8.3 Hz, 1H), 7.77 – 7.68 (m, 3H), 7.58 – 7.51 (m, 3H), 7.43 – 7.27 (m, 7H), 6.73 – 6.67 (m, 2H), 5.51 (dd, *J* = 17.7, 7.6 Hz, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 172.09, 153.91 (dd, *J* = 31.1, 25.1 Hz), 151.46, 149.39, 147.93, 139.12, 136.81, 136.77, 135.82, 130.83, 130.81, 129.68, 129.32, 129.11, 128.91, 128.64, 128.22, 128.18, 127.97, 127.43, 126.75, 124.76, 121.63, 119.45 (dd, *J* = 251.8, 245.8 Hz), 68.02 (dd, *J* = 30.2, 22.5 Hz).

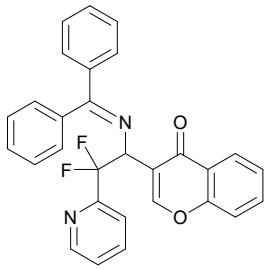
^{19}F NMR (471 MHz, $CDCl_3$) δ -101.53 (d, *J* = 247.9 Hz), -114.65 (d, *J* = 265.0 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{29}H_{21}F_2N_3$, 450.1776; found 450.1776.

N-(2,2-difluoro-2-(pyridin-2-yl)-1-(1-tosyl-1H-indol-2-yl)ethyl)-1,1-diphenylmethanimine (**3o**)



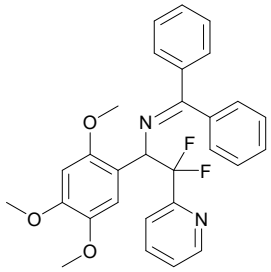
General procedure C was followed to obtain **3o** (55 mg, 62%) as a yellow oil.
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.57 (d, *J* = 4.5 Hz, 1H), 7.93 (d, *J* = 8.3 Hz, 1H), 7.69 (d, *J* = 8.2 Hz, 2H), 7.66 (d, *J* = 7.5 Hz, 1H), 7.59 – 7.53 (m, 4H), 7.44 (s, 1H), 7.39 – 7.35 (m, 2H), 7.32 – 7.26 (m, 6H), 7.17 (d, *J* = 8.2 Hz, 2H), 7.13 (t, *J* = 7.6 Hz, 1H), 6.66 (d, *J* = 7.4 Hz, 2H), 5.51 (dd, *J* = 16.7, 8.8 Hz, 1H), 2.32 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.34, 154.11 (dd, *J* = 30.2, 25.9 Hz), 149.27, 144.97, 139.23, 136.53, 135.61, 135.35, 135.11, 130.65, 130.02, 129.90, 128.88, 128.43, 128.13, 127.56, 126.94, 126.22, 124.69, 124.54, 123.28, 121.89, 119.67 (dd, *J* = 251.2, 246.1 Hz), 119.43, 119.41, 113.50, 63.77 (dd, *J* = 30.2, 23.9 Hz), 21.69.
^{19}F NMR (753 MHz, $CDCl_3$) δ -103.01 (d, *J* = 246.3 Hz), -112.76 (d, *J* = 245.0 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{35}H_{27}F_2N_3OS$, 592.1865; found 592.1864.

3-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(pyridin-2-yl)ethyl)-4H-chromen-4-one (**3p**)



General procedure C was followed to obtain **3p** (55 mg, 30%) as a yellow solid. m.p. 93-95 ℃.
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.55 (d, *J* = 4.5 Hz, 1H), 8.37 (s, 1H), 8.13 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.71 (td, *J* = 7.7, 1.4 Hz, 1H), 7.64 (ddd, *J* = 8.6, 7.2, 1.6 Hz, 1H), 7.58 – 7.54 (m, 3H), 7.46 – 7.40 (m, 2H), 7.39 – 7.35 (m, 4H), 7.32 – 7.27 (m, 3H), 6.87 – 6.81 (m, 2H), 5.83 (dd, *J* = 15.6, 8.4 Hz, 1H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 174.92, 171.83, 157.55, 156.10, 153.80 (dd, *J* = 30.0, 25.5 Hz), 149.20, 139.49, 136.54, 135.62, 133.58, 130.70, 129.14, 129.04, 128.59, 128.16, 127.60, 126.42, 125.21, 124.56, 124.15, 121.49, 121.29 (dd, *J* = 251.8, 247.4 Hz)121.19, 118.22, 60.08 (dd, *J* = 29.8, 23.3 Hz).
^{19}F NMR (753 MHz, $CDCl_3$) δ -103.82 (d, *J* = 246.0 Hz), -113.67 (d, *J* = 261.6 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{29}H_{20}F_2N_2O_2$, 467.1566; found 467.1566.

N-(2,2-difluoro-2-(pyridin-2-yl)-1-(2,4,5-trimethoxyphenyl)ethyl)-1,1-diphenylmethanimine (**3q**)



General procedure C was followed to obtain **3q** (44 mg, 60%) as a yellow oil.

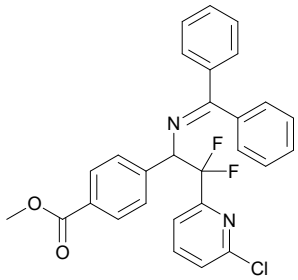
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.61 (d, *J* = 4.6 Hz, 1H), 7.72 (td, *J* = 7.7, 1.5 Hz, 1H), 7.60 (d, *J* = 7.9 Hz, 1H), 7.53 (d, *J* = 7.1 Hz, 2H), 7.37 – 7.26 (m, 7H), 7.18 (s, 1H), 6.74 (d, *J* = 6.7 Hz, 2H), 6.35 (s, 1H), 5.72 (dd, *J* = 17.5, 7.9 Hz, 1H), 3.87 (s, 3H), 3.81 (s, 3H), 3.43 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.69, 154.75 (dd, *J* = 30.3, 26.0 Hz),151.68, 149.27, 149.06, 142.93, 139.75, 136.64, 136.18, 130.29, 128.76, 128.33, 128.11, 128.03, 127.69, 124.19, 121.87, 120.22 (dd, *J* = 251.1, 245.9 Hz), 117.42, 114.42, 96.80, 61.79 (dd, *J* = 30.6, 23.0 Hz), 56.69, 56.32, 56.07.

^{19}F NMR (753 MHz, $CDCl_3$) δ -102.78 (d, *J* = 244.0 Hz), -114.67 (d, *J* = 259.9 Hz).

ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{29}H_{26}F_2N_2O_3$, 489.1984; found 489.1985.

methyl 4-(2-(6-chloropyridin-2-yl)-1-((diphenylmethylene)amino)-2,2-difluoroethyl)benzoate (**4a**)



General procedure C was followed to obtain **4a** (46 mg, 63%) as a white solid. m.p. 139-141 ℃.

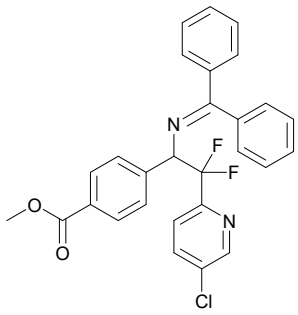
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (d, *J* = 8.3 Hz, 2H), 7.73 (t, *J* = 7.8 Hz, 1H), 7.63 (d, *J* = 7.5 Hz, 1H), 7.50 (d, *J* = 8.5 Hz, 2H), 7.45 (d, *J* = 8.1 Hz, 2H), 7.42 (d, *J* = 7.3 Hz, 1H), 7.40 – 7.32 (m, 4H), 7.29 (d, *J* = 7.7 Hz, 2H), 6.72 (d, *J* = 6.9 Hz, 2H), 5.31 (dd, *J* = 19.5, 6.3 Hz, 1H), 3.91 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 171.93, 167.14, 154.82 (dd, *J* = 33.9, 25.3 Hz), 151.24, 142.45, 139.36, 139.12, 135.75, 130.80, 129.92, 129.56, 129.44, 129.05, 128.85, 128.57, 128.18, 125.57, 120.01, 118.70 (dd, *J* = 252.9, 246.3 Hz), 69.20 (dd, *J* = 30.5, 21.2 Hz), 52.25.

^{19}F NMR (471 MHz, $CDCl_3$) δ -99.12 (d, *J* = 249.3 Hz), -117.13 (d, *J* = 268.0 Hz).

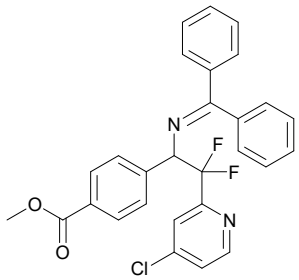
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{28}H_{21}ClF_2N_2O_2$, 491.1332; found 491.1334.

methyl 4-(2-(5-chloropyridin-2-yl)-1-((diphenylmethylene)amino)-2,2-difluoroethyl)benzoate (**4b**)



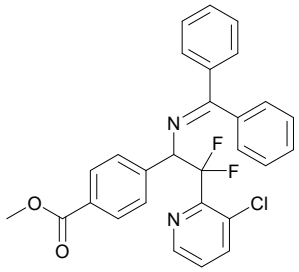
General procedure C was followed to obtain **4b** (38 mg, 52%) as a white solid. m.p. 103-105 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.53 (d, *J* = 2.2 Hz, 1H), 7.94 (d, *J* = 8.3 Hz, 2H), 7.72 (dd, *J* = 8.4, 2.3 Hz, 1H), 7.59 (d, *J* = 8.4 Hz, 1H), 7.57 – 7.53 (m, 2H), 7.42 – 7.28 (m, 8H), 6.74 – 6.70 (m, 2H), 5.28 (dd, *J* = 17.1, 7.9 Hz, 1H), 3.91 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.85, 167.09, 152.23 (dd, *J* = 31.5, 26.2 Hz), 148.22, 142.50, 139.11, 136.36, 135.78, 133.23, 130.87, 129.92, 129.44, 129.01, 128.87, 128.54, 128.23, 127.50, 122.64, 119.25 (dd, *J* = 251.6, 246.4 Hz), 69.59 (dd, *J* = 29.4, 22.9 Hz), 52.25.
^{19}F NMR (471 MHz, $CDCl_3$) δ -101.34 (d, *J* = 248.5 Hz), -113.56 (d, *J* = 264.3 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{28}H_{21}ClF_2N_2O_2$, 491.1332; found 491.1335.

methyl 4-(2-(4-chloropyridin-2-yl)-1-((diphenylmethylene)amino)-2,2-difluoroethyl)benzoate (**4c**)



General procedure C was followed to obtain **4c** (31 mg, 42%) as a white solid. m.p. 135-137 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (d, *J* = 5.2 Hz, 1H), 7.95 (d, *J* = 8.3 Hz, 2H), 7.71 (s, 1H), 7.53 (d, *J* = 8.5 Hz, 2H), 7.43 – 7.28 (m, 1H), 6.71 (d, *J* = 7.0 Hz, 2H), 5.28 (dd, *J* = 17.6, 7.7 Hz, 1H), 3.91 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.96, 167.10, 155.67 (dd, *J* = 31.3, 26.0 Hz), 150.17, 144.97, 142.41, 139.11, 135.81, 130.87, 129.95, 129.46, 129.03, 128.88, 128.52, 128.24, 127.53, 124.98, 122.49, 119.02 (dd, *J* = 252.5, 247.4 Hz), 69.53 (dd, *J* = 29.5, 22.4 Hz), 52.26.
^{19}F NMR (471 MHz, $CDCl_3$) δ -101.65 (d, *J* = 247.7 Hz), -114.61 (d, *J* = 264.9 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{28}H_{21}ClF_2N_2O_2$, 491.1332; found 491.1332.

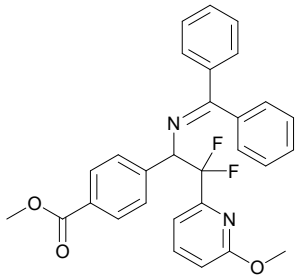
methyl 4-(2-(3-chloropyridin-2-yl)-1-((diphenylmethylene)amino)-2,2-difluoroethyl)benzoate (**4d**)



General procedure C was followed to obtain **4d** (37 mg, 50%) as a white solid. m.p. 115-117 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (d, *J* = 4.5 Hz, 1H), 7.95 (d, *J* = 8.3 Hz, 2H), 7.71 (d, *J* = 8.1 Hz, 1H), 7.63 – 7.58 (m, 2H), 7.44 (d, *J* = 8.2 Hz, 2H), 7.42 – 7.34 (m, 4H), 7.33 – 7.24 (m, 3H), 6.75 (d, *J* = 7.0 Hz, 2H), 5.44 (dd, *J* = 16.7, 8.5 Hz, 1H), 3.91 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.69, 167.14, 149.91 (t, *J* = 26.6 Hz), 146.58, 142.45, 139.49, 139.16, 135.98, 130.76, 129.89, 129.62, 129.45, 129.09, 128.95, 128.43, 128.15, 127.62, 125.47, 119.34 (dd, *J* = 256.1, 247.8 Hz), 69.45 (dd, *J* = 28.0, 22.0 Hz), 52.23.
^{19}F NMR (471 MHz, $CDCl_3$) δ -101.09 (d, *J* = 261.0 Hz), -109.03 (d, *J* = 253.9 Hz).

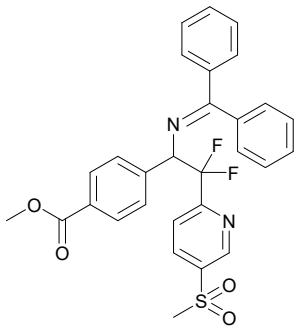
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{28}H_{21}ClF_2N_2O_2$, 491.1332; found 491.1334.

methyl 4-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(6-methoxypyridin-2-yl)ethyl)benzoate (**4e**)



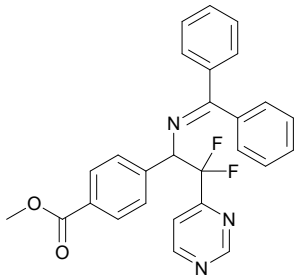
General procedure C was followed to obtain **4e** (38 mg, 52%) as a white solid. m.p. 106-108 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.95 (d, *J* = 8.3 Hz, 2H), 7.60 – 7.54 (m, 3H), 7.47 – 7.34 (m, 6H), 7.30 (t, *J* = 7.5 Hz, 2H), 7.18 (d, *J* = 7.3 Hz, 1H), 6.78 (d, *J* = 6.8 Hz, 2H), 6.71 (d, *J* = 8.3 Hz, 1H), 5.34 (dd, *J* = 15.2, 9.8 Hz, 1H), 3.91 (s, 3H), 3.68 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.34, 167.16, 163.58, 151.14 (dd, *J* = 30.1, 26.4 Hz), 142.94, 139.40, 138.94, 136.05, 130.67, 129.73, 129.49, 129.38, 128.96, 128.85, 128.36, 128.15, 127.81, 119.14 (dd, *J* = 251.3, 247.2 Hz), 114.11, 112.23, 69.55 (dd, *J* = 28.1, 22.8 Hz), 53.44, 52.22.
^{19}F NMR (471 MHz, $CDCl_3$) δ -105.22 (d, *J* = 243.7 Hz), -112.22 (d, *J* = 243.9 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{29}H_{24}F_2N_2O_3$, 487.1827; found 487.1828.

Methy l4-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(5-(methylsulfonyl)pyridin-2-yl)ethyl)benzoate (**4f**)



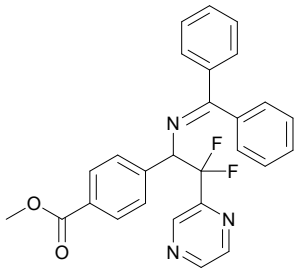
General procedure C was followed to obtain **4f** (38 mg, 48%) as a white solid. m.p. 177-179 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.10 (d, *J* = 2.0 Hz, 1H), 8.30 (dd, *J* = 8.2, 2.2 Hz, 1H), 7.95 (d, *J* = 8.3 Hz, 2H), 7.88 (d, *J* = 8.2 Hz, 1H), 7.55 – 7.49 (m, 2H), 7.43 – 7.28 (m, 8H), 6.71 (d, *J* = 6.9 Hz, 2H), 5.33 (dd, *J* = 17.2, 7.8 Hz, 1H), 3.91 (s, 3H), 3.10 (s, 3H).
^{13}C NMR (151 MHz, $CDCl_3$) δ 172.37, 167.00, 159.07 (dd, *J* = 31.5, 26.0 Hz), 148.07, 142.03, 138.83, 137.68, 136.19, 135.60, 131.07, 130.11, 129.52, 129.41, 129.12, 128.83, 128.61, 128.30, 127.39, 122.25, 119.00 (dd, *J* = 252.2, 246.7 Hz), 69.39 (dd, *J* = 29.0, 22.6 Hz), 52.30, 44.98.
^{19}F NMR (471 MHz, $CDCl_3$) δ -101.23 (d, *J* = 250.1 Hz), -113.90 (d, *J* = 265.8 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{29}H_{24}F_2N_2O_4S$, 535.1498; found 535.1499.

methyl 4-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(pyrimidin-4-yl)ethyl)benzoate (**4g**)



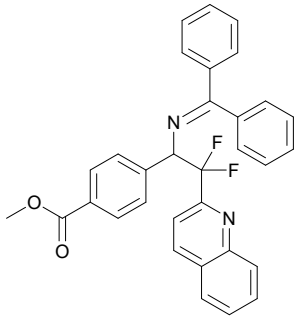
General procedure C was followed to obtain **4g** (37mg, 54%) as a white solid. m.p. 123-125 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.23 (s, 1H), 8.85 (d, *J* = 5.1 Hz, 1H), 7.95 (d, *J* = 8.3 Hz, 2H), 7.65 (d, *J* = 5.0 Hz, 1H), 7.53 (d, *J* = 7.2 Hz, 2H), 7.43 – 7.28 (m, 8H), 6.71 (d, *J* = 6.9 Hz, 2H), 5.27 (dd, *J* = 17.4, 7.7 Hz, 1H), 3.91 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 172.38, 167.02, 162.00 (dd, *J* = 32.8, 26.3 Hz), 158.68, 158.07, 141.90, 138.87, 135.60, 131.03, 130.14, 130.10, 129.53, 129.41, 129.14, 128.86, 128.60, 128.27, 127.42, 118.78, 118.47 (dd, *J* = 252.0, 246.7 Hz), 69.22 (dd, *J* = 28.7, 22.3 Hz), 52.29.
^{19}F NMR (471 MHz, $CDCl_3$) δ -103.83 (d, *J* = 255.2 Hz), -116.49 (d, *J* = 250.3 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{27}H_{21}F_2N_3O_2$, 458.1675; found 458.1677.

methyl 4-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(pyrazin-2-yl)ethyl)benzoate (**4h**)



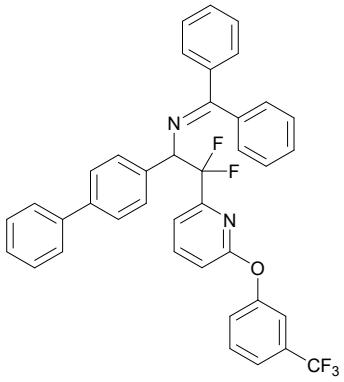
General procedure C was followed to obtain **4h** (31 mg, 45%) as a white solid. m.p. 120-123 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.94 (s, 1H), 8.62 (d, *J* = 2.3 Hz, 1H), 8.55 (s, 1H), 7.94 (d, *J* = 8.3 Hz, 2H), 7.55 (d, *J* = 7.2 Hz, 2H), 7.43 – 7.28 (m, 8H), 6.73 (d, *J* = 7.0 Hz, 2H), 5.24 (dd, *J* = 16.4, 7.9 Hz, 1H), 3.91 (s, 3H).
^{13}C NMR (201 MHz, $CDCl_3$) δ 172.28, 167.02, 149.60 (dd, *J* = 30.3, 26.7 Hz), 145.71, 143.68, 143.60, 142.07, 138.87, 135.73, 131.03, 130.10, 129.53, 129.36, 129.09, 128.88, 128.59, 128.31, 127.45, 119.09 (dd, *J* = 251.4, 247.1 Hz), 69.70 (dd, *J* = 29.0, 23.6 Hz), 52.27.
^{19}F NMR (753 MHz, $CDCl_3$) δ -102.00 (d, *J* = 253.1 Hz), -114.28 (d, *J* = 266.7 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{27}H_{21}F_2N_3O_2$, 458.1675; found 458.1675.

methyl 4-(1-((diphenylmethylene)amino)-2,2-difluoro-2-(quinolin-2-yl)ethyl)benzoate (**4i**)



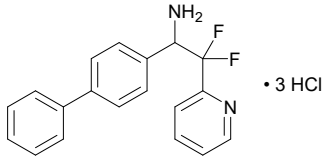
General procedure C was followed to obtain **4i** (43 mg, 56%) as a yellow solid. m.p. 133-135 ℃.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.22 (d, *J* = 8.5 Hz, 1H), 8.05 (d, *J* = 8.5 Hz, 1H), 7.97 (d, *J* = 8.3 Hz, 2H), 7.84 (d, *J* = 8.1 Hz, 1H), 7.80 – 7.73 (m, 2H), 7.59 (t, *J* = 7.2 Hz, 1H), 7.53 – 7.46 (m, 4H), 7.41 (t, *J* = 7.5 Hz, 1H), 7.36 – 7.21 (m, 5H), 6.58 (d, *J* = 7.0 Hz, 2H), 5.50 (dd, *J* = 18.5, 6.9 Hz, 1H), 3.91 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 171.62, 167.21, 154.47 (dd, *J* = 31.9, 24.3 Hz), 147.43, 142.85, 139.18, 136.85, 135.89, 130.67, 130.11, 129.83, 129.65, 129.42, 128.91, 128.86, 128.38, 128.22, 128.11, 127.86, 127.62, 119.49 (dd, *J* = 252.3, 246.8 Hz), 118.49, 70.02 (dd, *J* = 30.3, 21.9 Hz), 52.24.
^{19}F NMR (471 MHz, $CDCl_3$) δ -99.45 (d, *J* = 248.0 Hz), -115.30 (d, *J* = 265.8 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{32}H_{24}F_2N_2O_2$, 507.1879; found 507.1881.

N-(1-([1,1'-biphenyl]-4-yl)-2,2-difluoro-2-(6-(3-(trifluoromethyl)phenoxy)pyridin-2-yl)ethyl)-1,1-diphenylmethanimine (**4j**)



General procedure C was followed to obtain **4j** (51 mg, 54%) as a yellow oil.
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 (t, *J* = 7.8 Hz, 1H), 7.58 (d, *J* = 7.8 Hz, 4H), 7.45 (dt, *J* = 14.9, 7.9 Hz, 7H), 7.39 – 7.27 (m, 9H), 7.25 – 7.18 (m, 2H), 6.93 (d, *J* = 8.2 Hz, 1H), 6.71 (d, *J* = 7.1 Hz, 2H), 5.14 (dd, *J* = 16.1, 9.4 Hz, 1H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 170.95, 161.92, 154.08, 152.54 (dd, *J* = 31.1, 27.0 Hz),140.92, 140.68, 140.31, 139.58, 136.54, 135.87, 131.91 (q, *J* = 32.7 Hz), 130.55, 129.93, 129.79, 128.89, 128.87, 128.73, 128.29, 128.13, 127.56, 127.39, 127.17, 126.78, 124.32, 123.89 (q, *J* = 272.4 Hz), 121.21 (q, *J* = 3.6 Hz), 119.12 (dd, *J* = 250.8, 246.5 Hz), 118.11 (q, *J* = 3.6 Hz), 116.93, 112.90, 110.94, 106.34, 69.29 (dd, *J* = 28.1, 22.8 Hz).
^{19}F NMR (471 MHz, $CDCl_3$) δ -62.52, -103.77 (d, *J* = 248.6 Hz), -111.77 (d, *J* = 260.3 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{39}H_{27}F_5N_2O$, 635.2116; found 635.2114.

1-([1,1'-biphenyl]-4-yl)-2,2-difluoro-2-(pyridin-2-yl)ethan-1-amine trihydrochloride (**3a-1**)

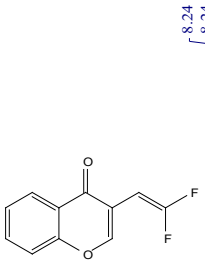


Benzophenone removal reaction was followed to obtain **3a-1** (192 mg, 91%) as an orange solid.
^{1}H NMR (500 MHz, DMSO) δ 9.42 (br, 2H), 8.74 (d, *J* = 4.6 Hz, 1H), 7.91 (td, *J* = 7.8, 1.6 Hz, 1H), 7.68 – 7.62 (m, 4H), 7.59 – 7.54 (m, 2H), 7.51 – 7.42 (m, 4H), 7.40 – 7.35 (m, 1H), 5.77 (br, 3H), 5.56 – 5.49 (m, 1H).

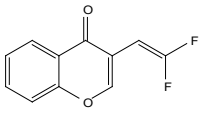
^{13}C NMR (126 MHz, DMSO) δ 150.24 (t, *J* = 28.6 Hz),149.67, 141.04, 138.89, 138.09, 129.69, 129.52, 129.01, 127.96, 126.70, 126.62, 126.24, 120.96, 118.39 (t, *J* = 249.5 Hz), 56.52 (t, *J* = 25.5 Hz).
^{19}F NMR (471 MHz, DMSO) δ -97.16 (d, *J* = 257.3 Hz), -112.83 (d, *J* = 268.7 Hz).
ESI-HRMS (m/z) $[M+H]^+$ calcd for $C_{19}H_{16}F_2N_2$, 311.1354; found 311.1356.

NMR Data

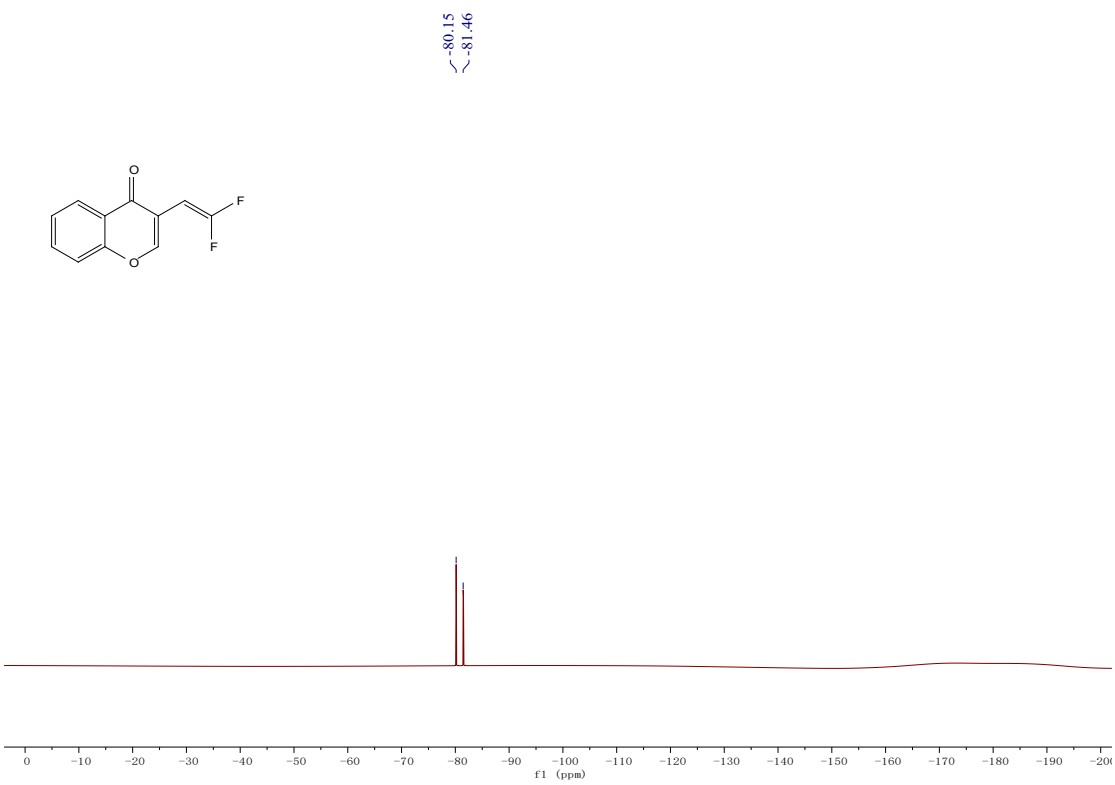
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **1p**



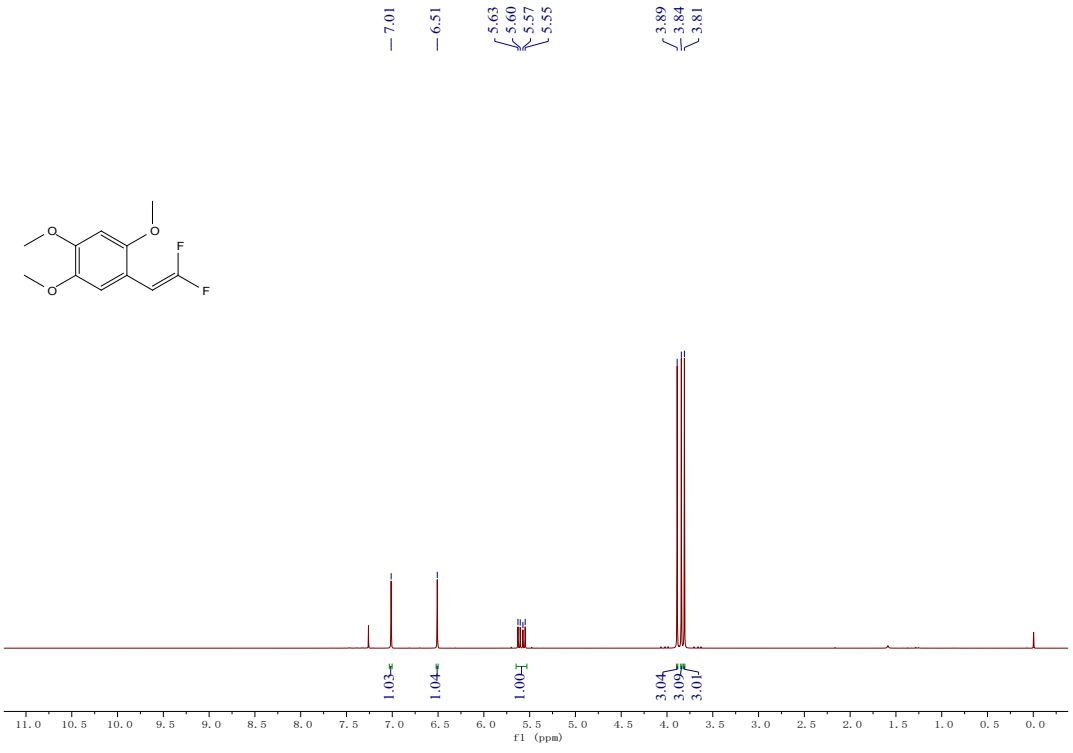
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **1p**



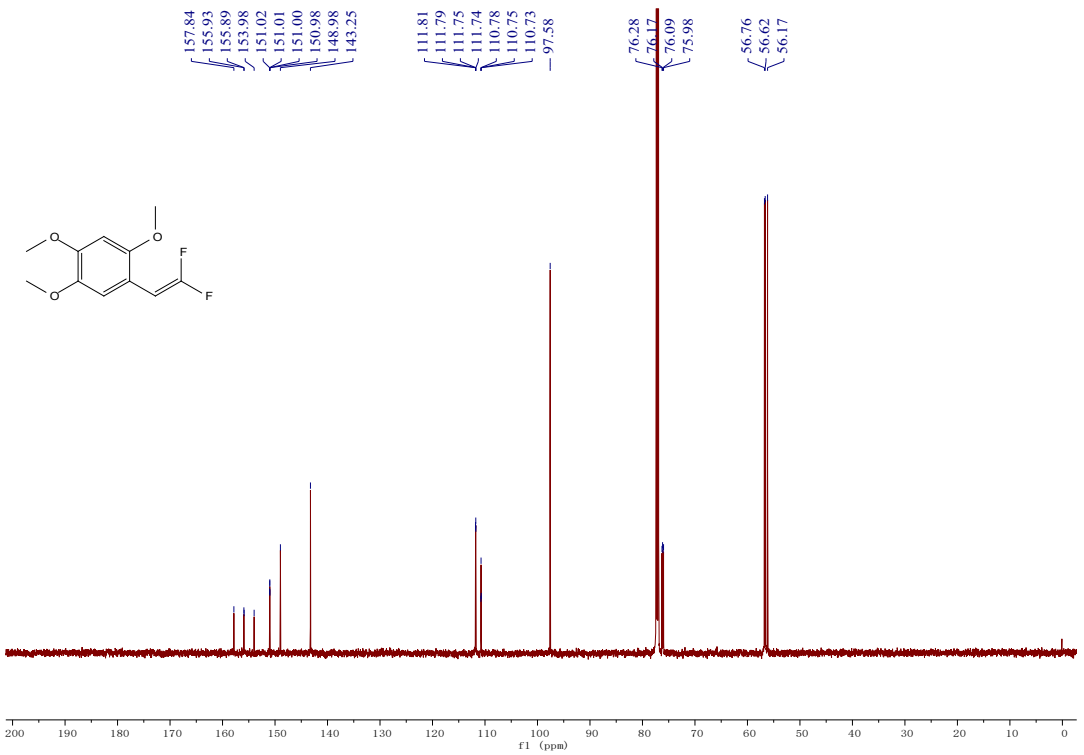
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **1p**



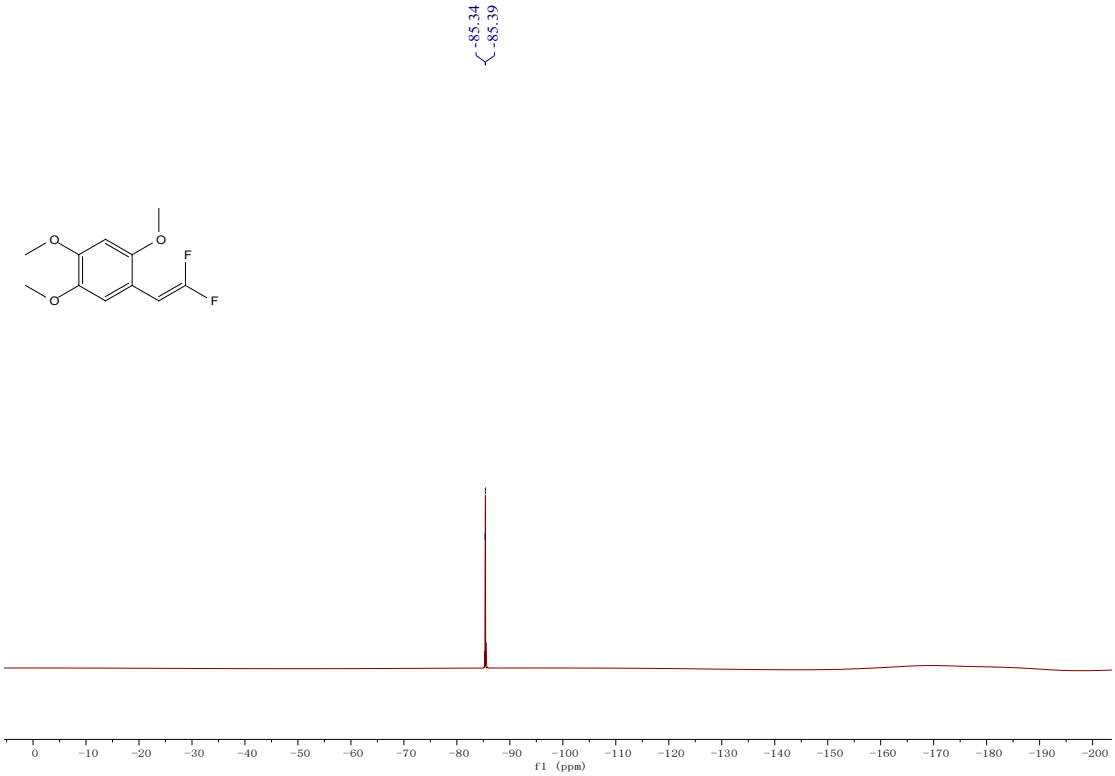
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **1q**



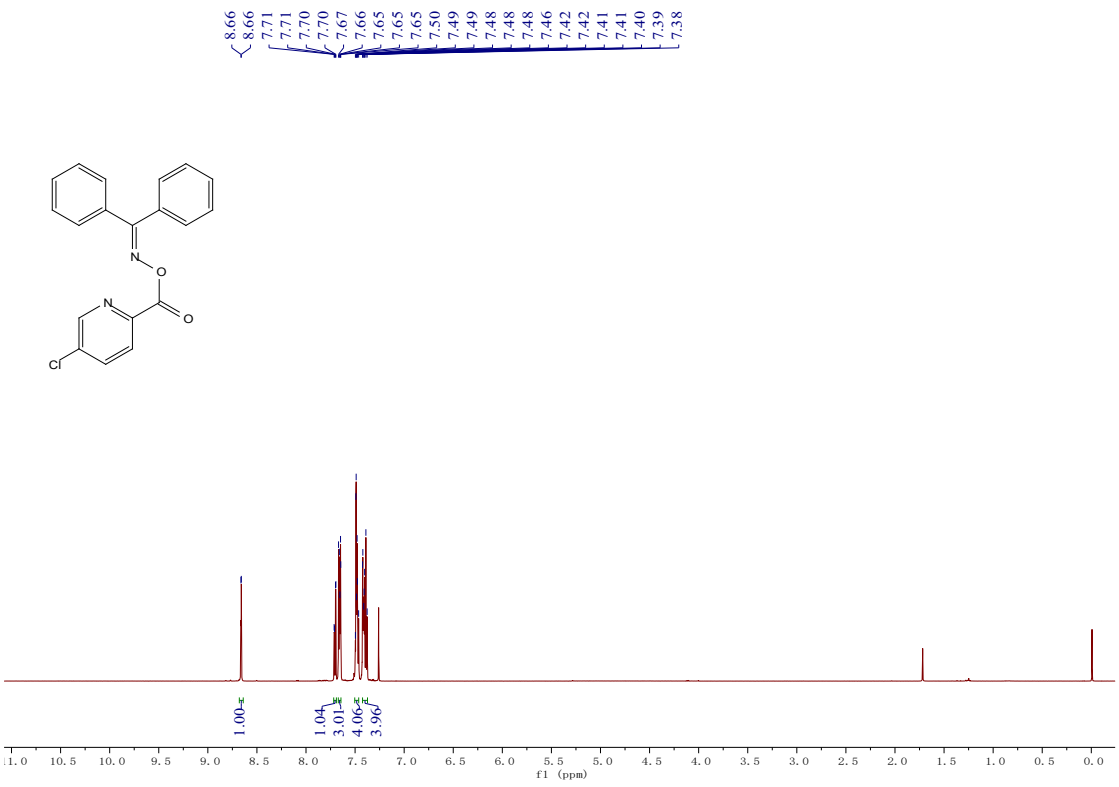
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **1q**



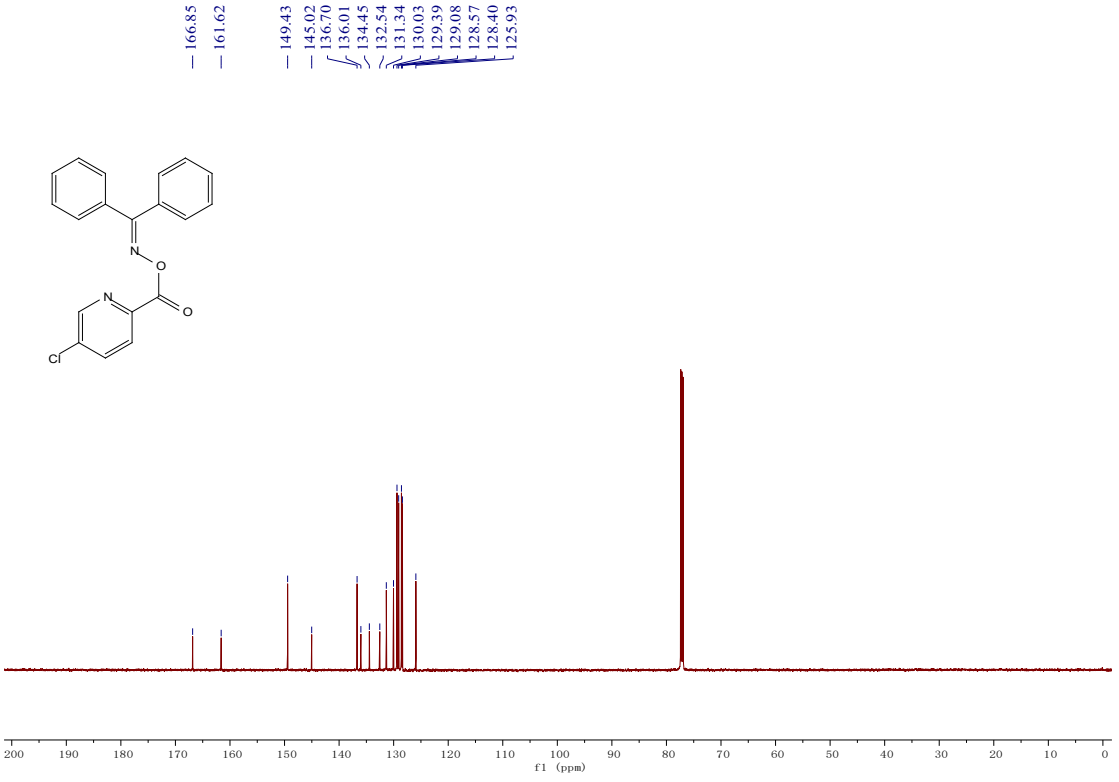
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **1q**



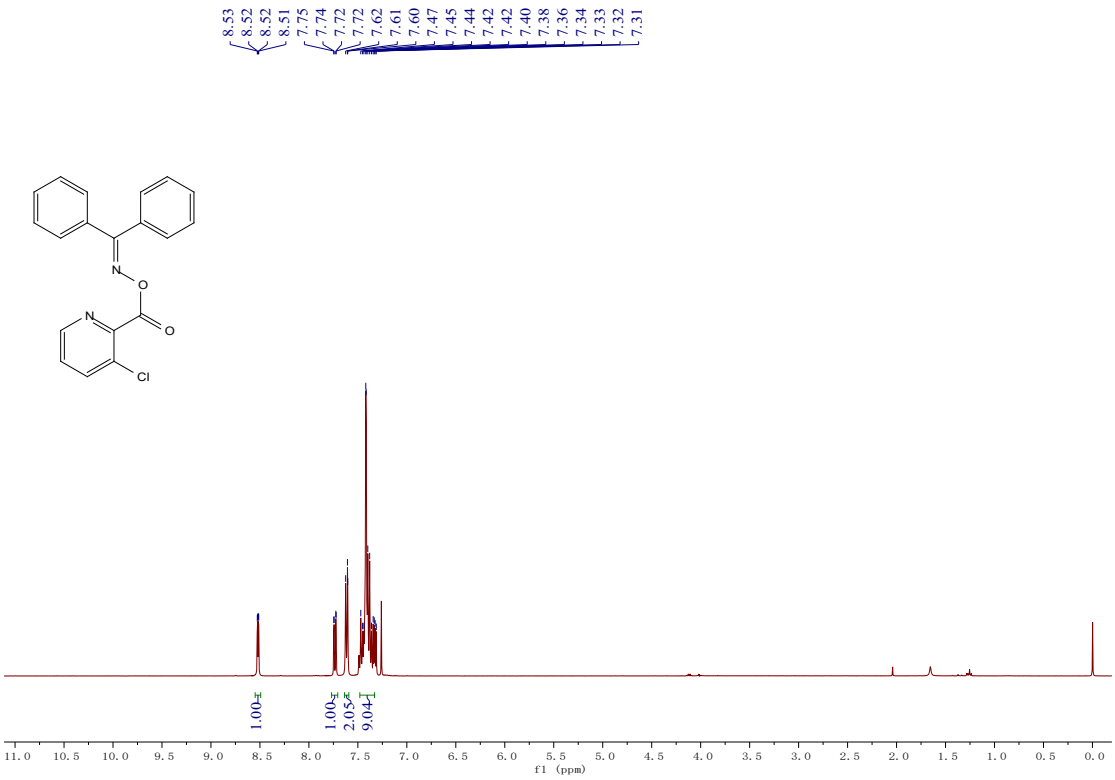
^{1}H NMR (600 MHz, $CDCl_3$) spectrum of **2b**



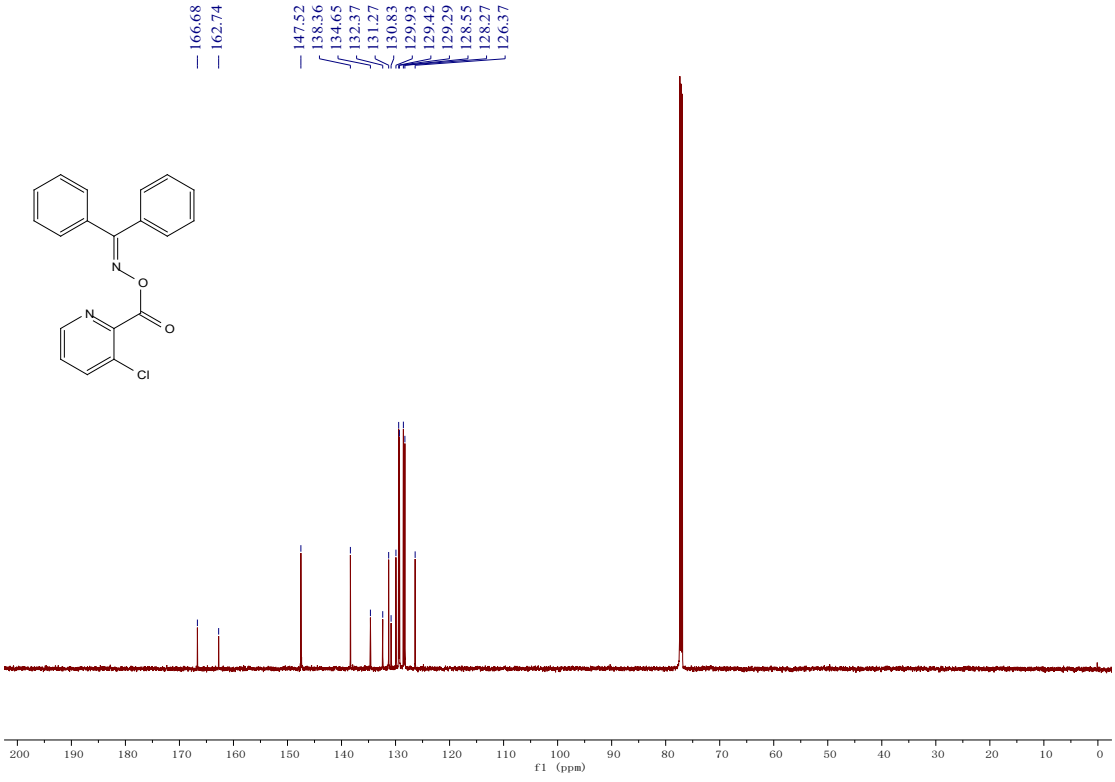
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **2b**



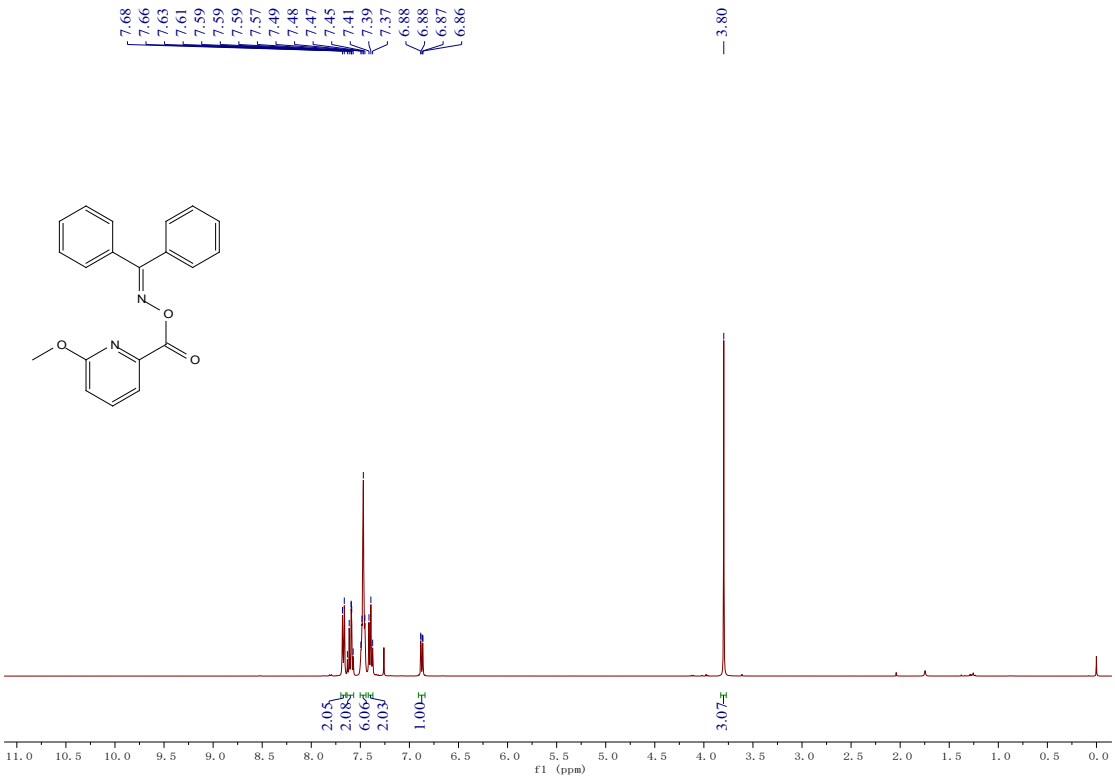
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **2d**



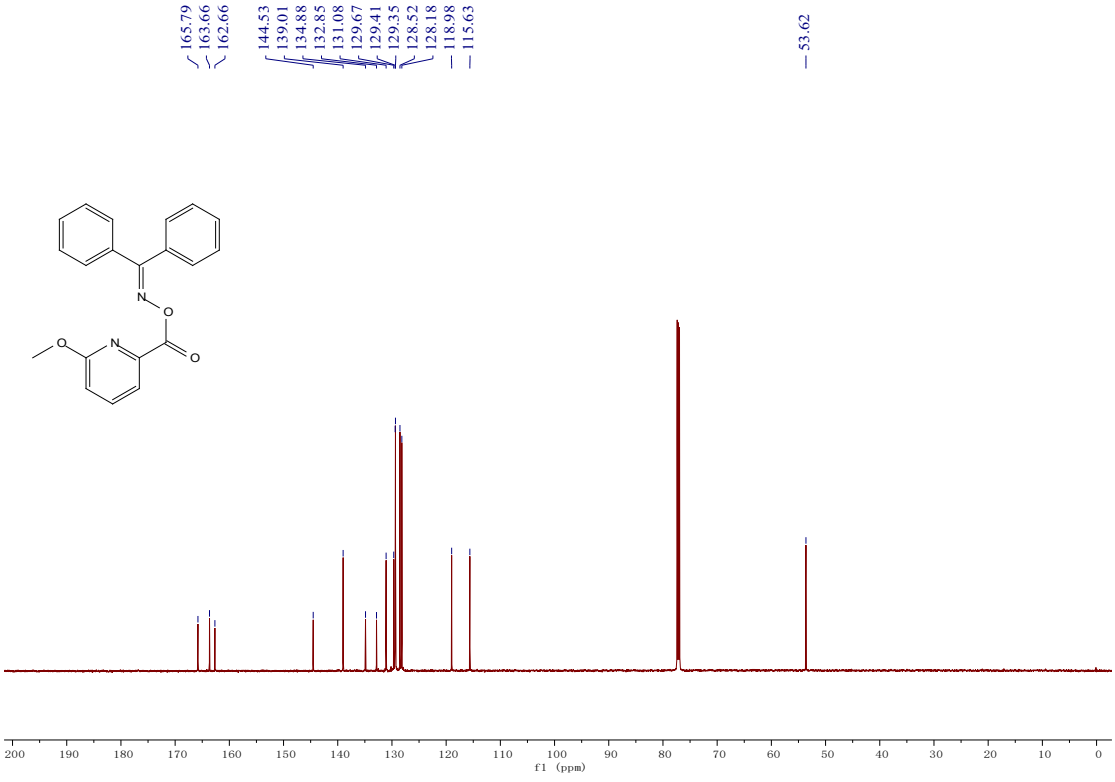
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **2d**



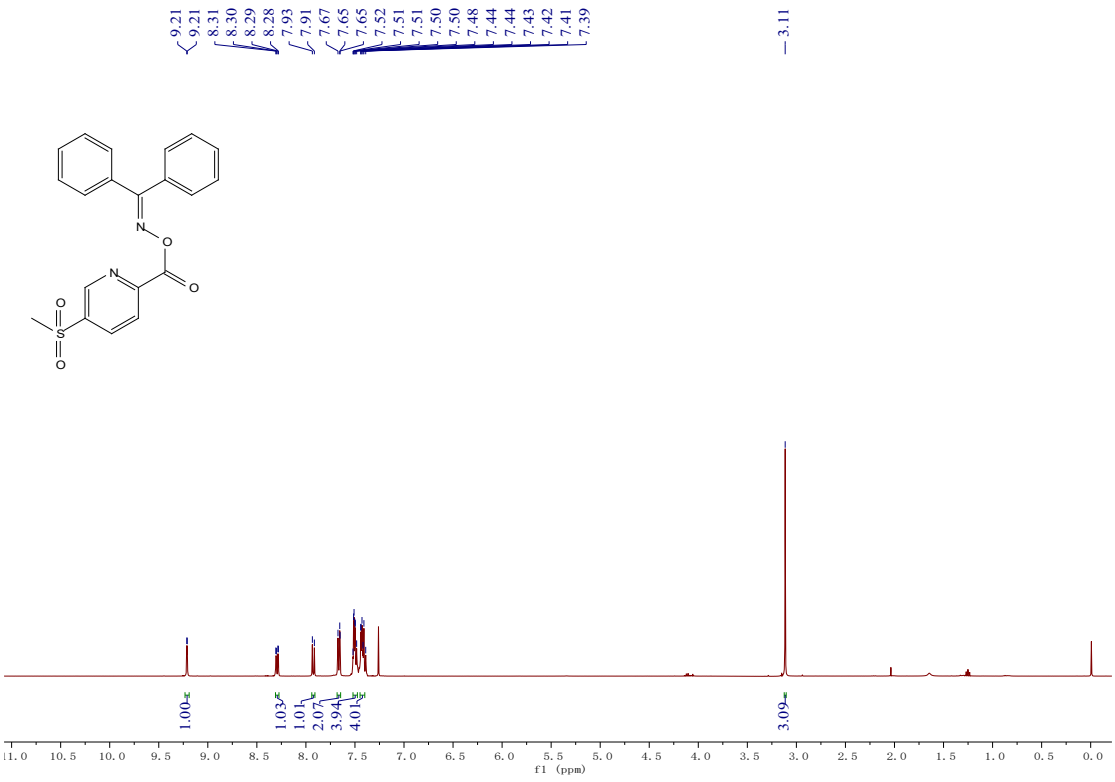
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **2e**



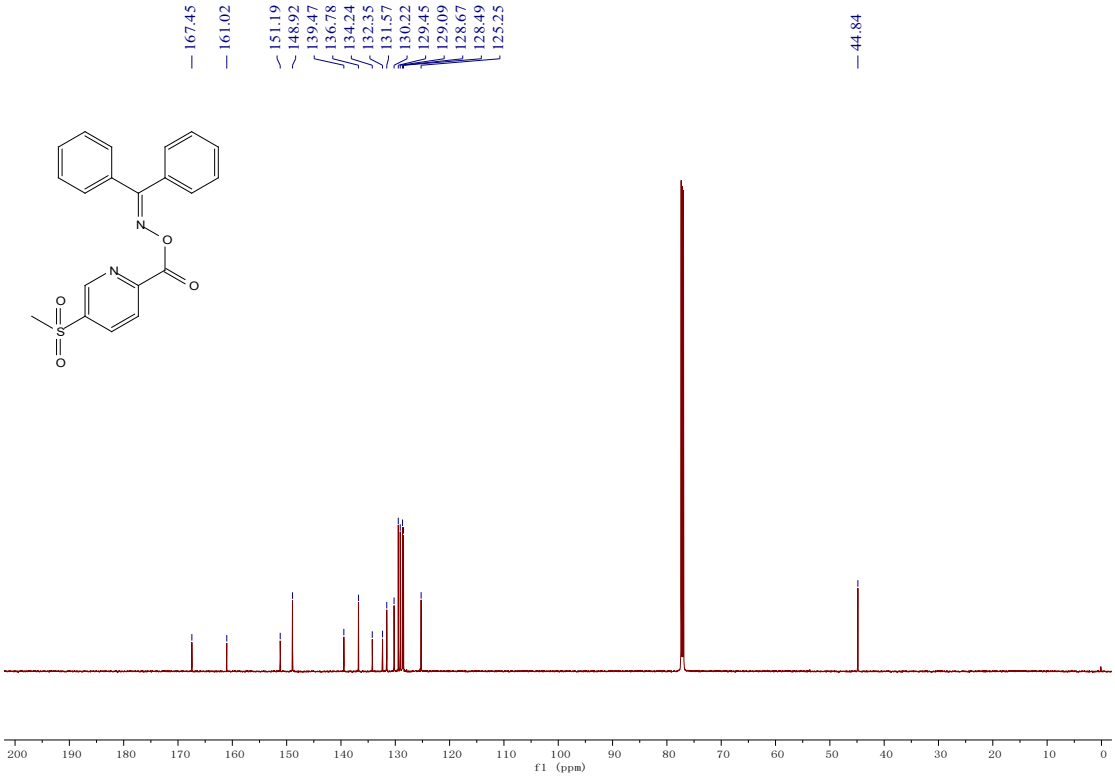
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **2e**



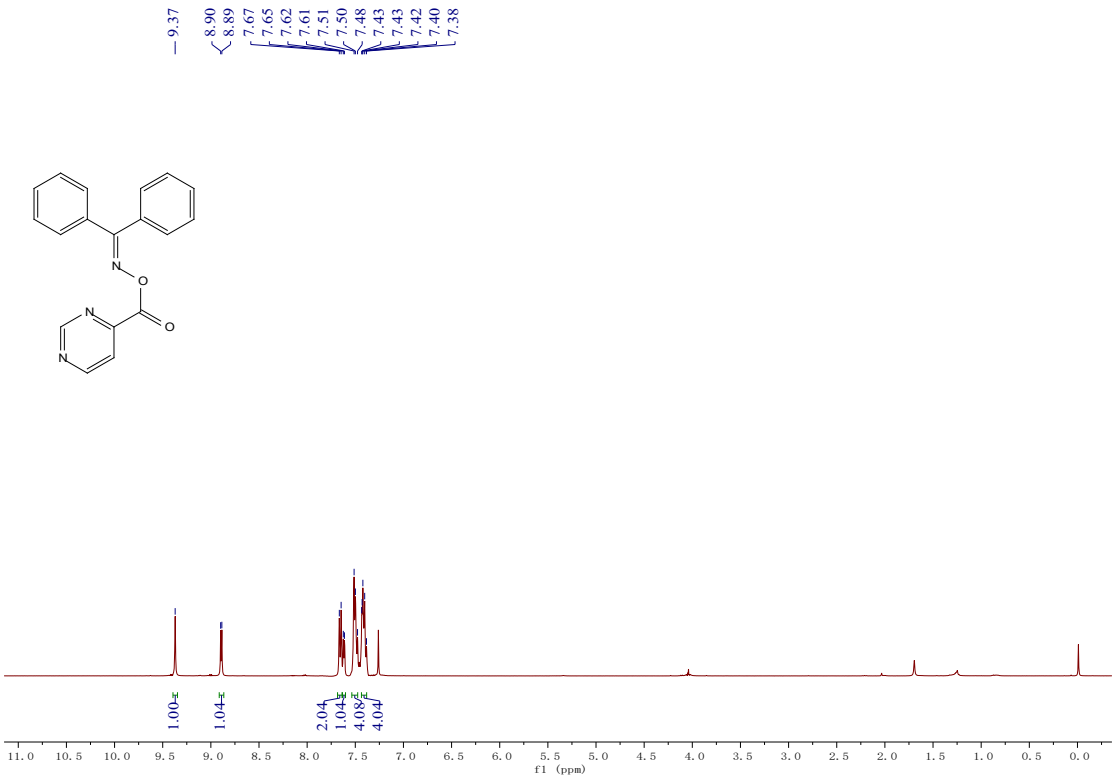
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **2f**



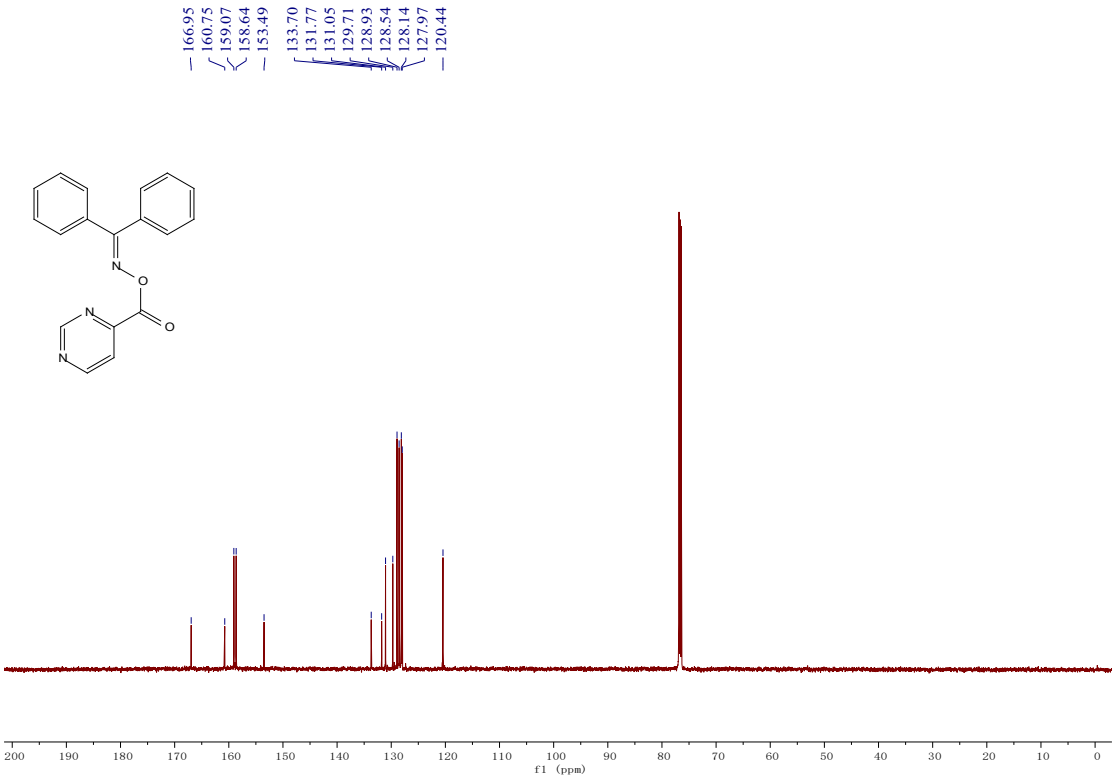
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **2f**



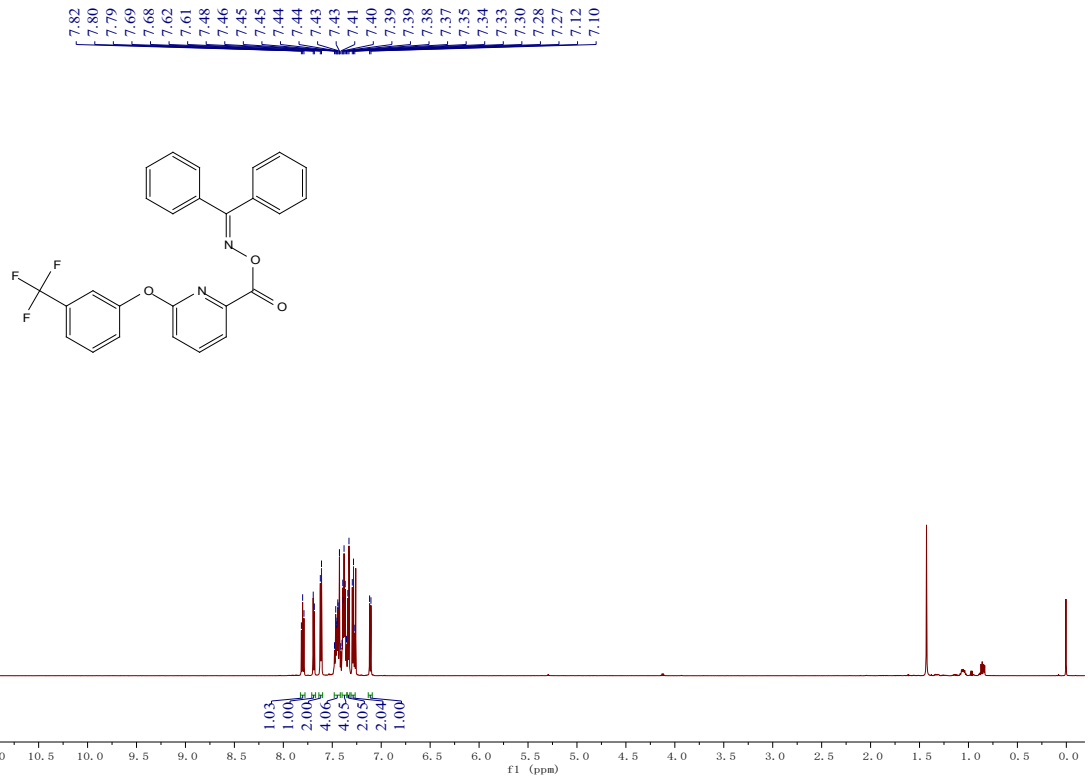
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **2g**



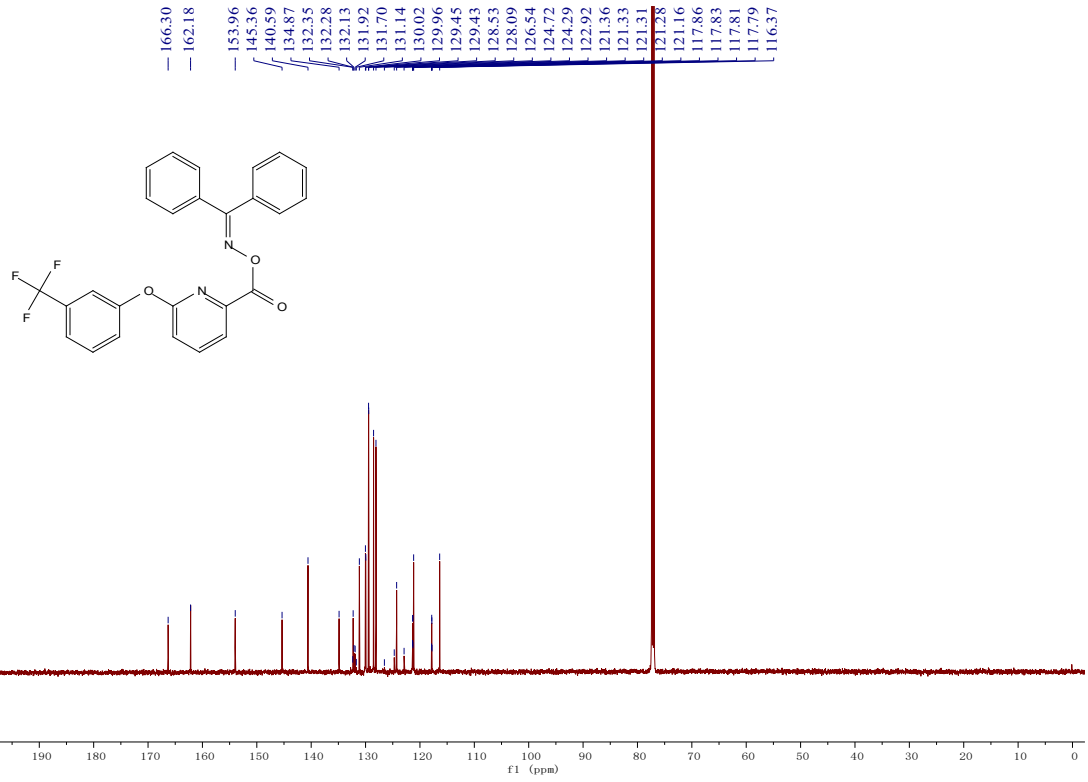
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **2g**



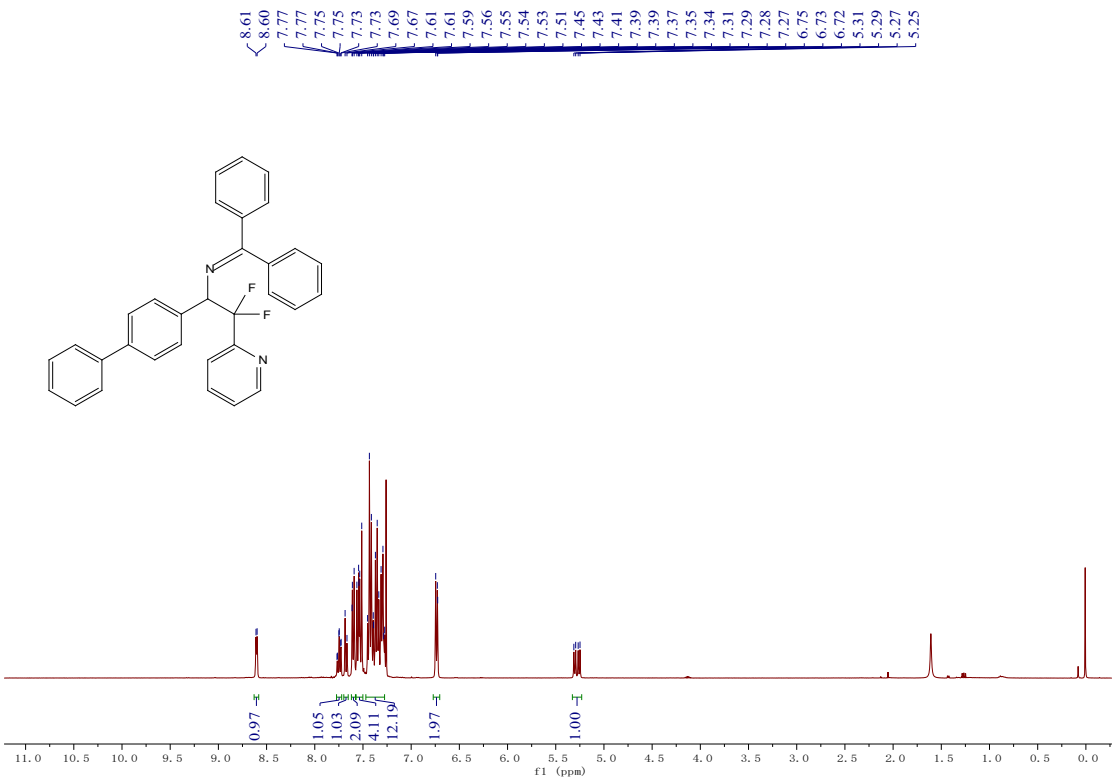
^{1}H NMR (600 MHz, $CDCl_3$) spectrum of **2j**



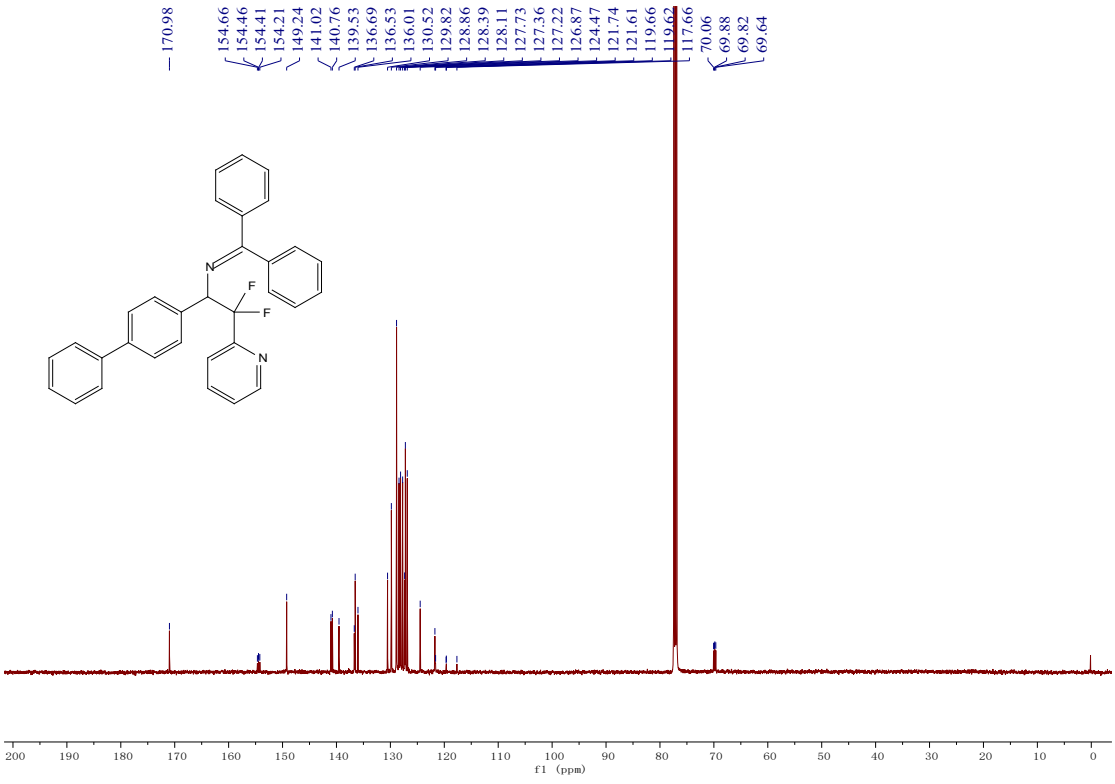
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **2j**



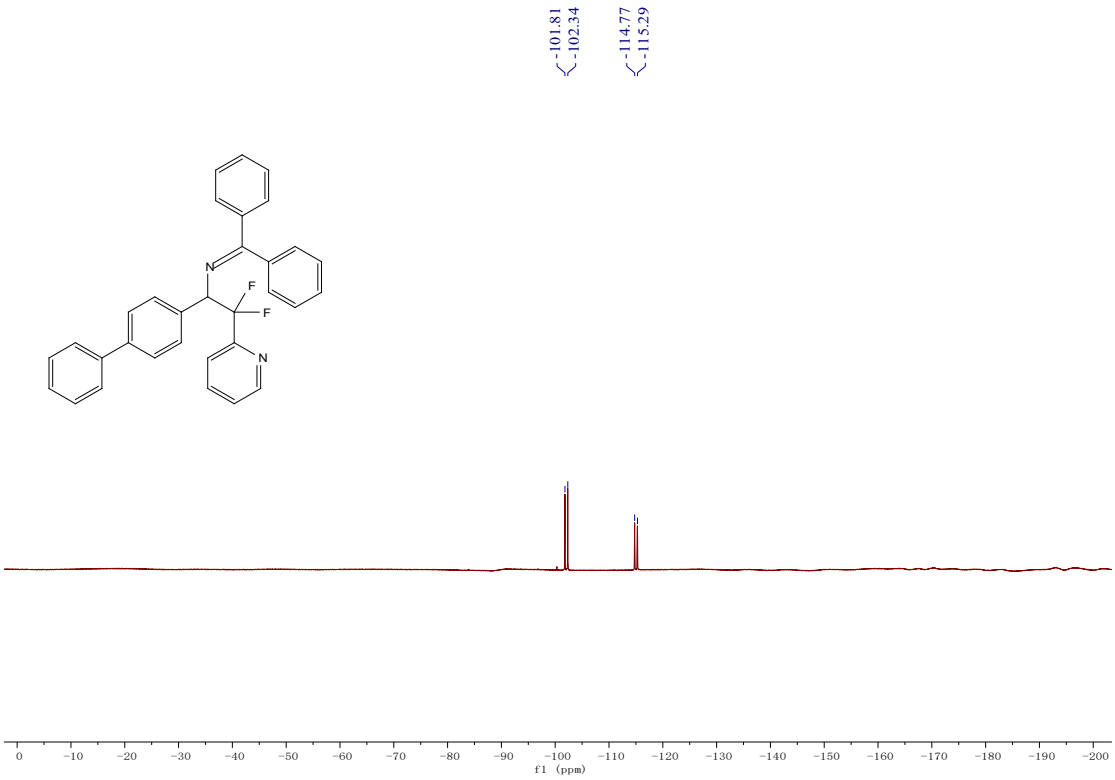
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3a**



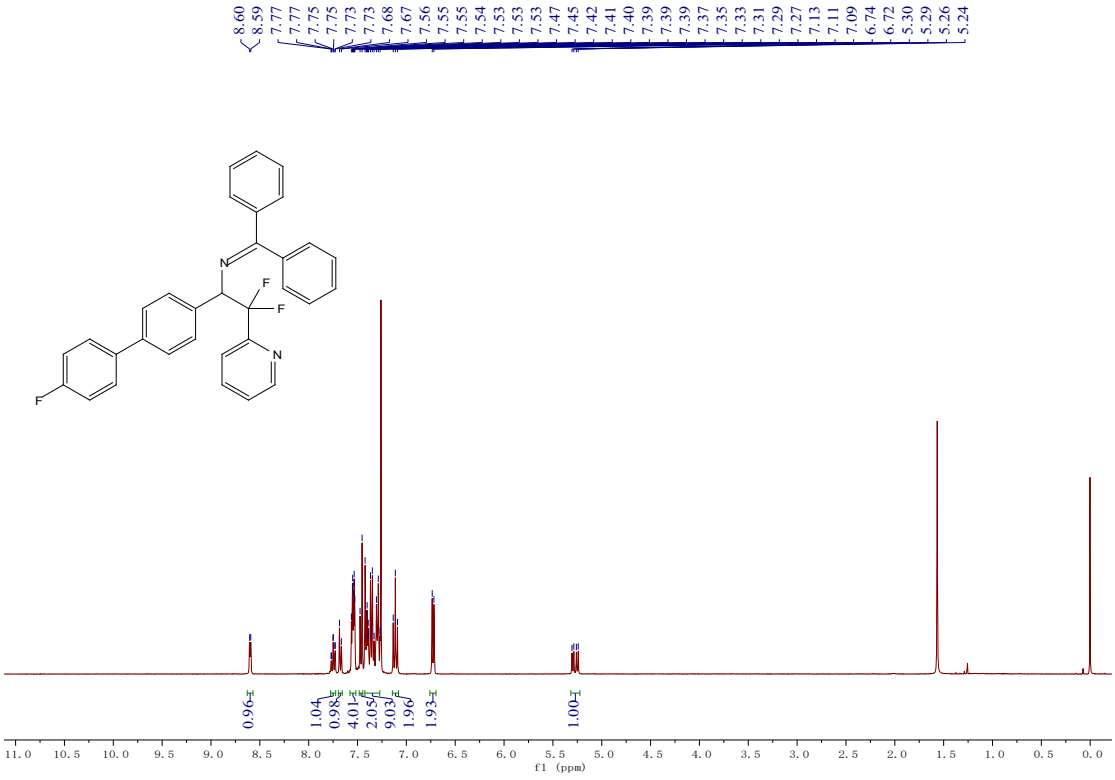
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3a**



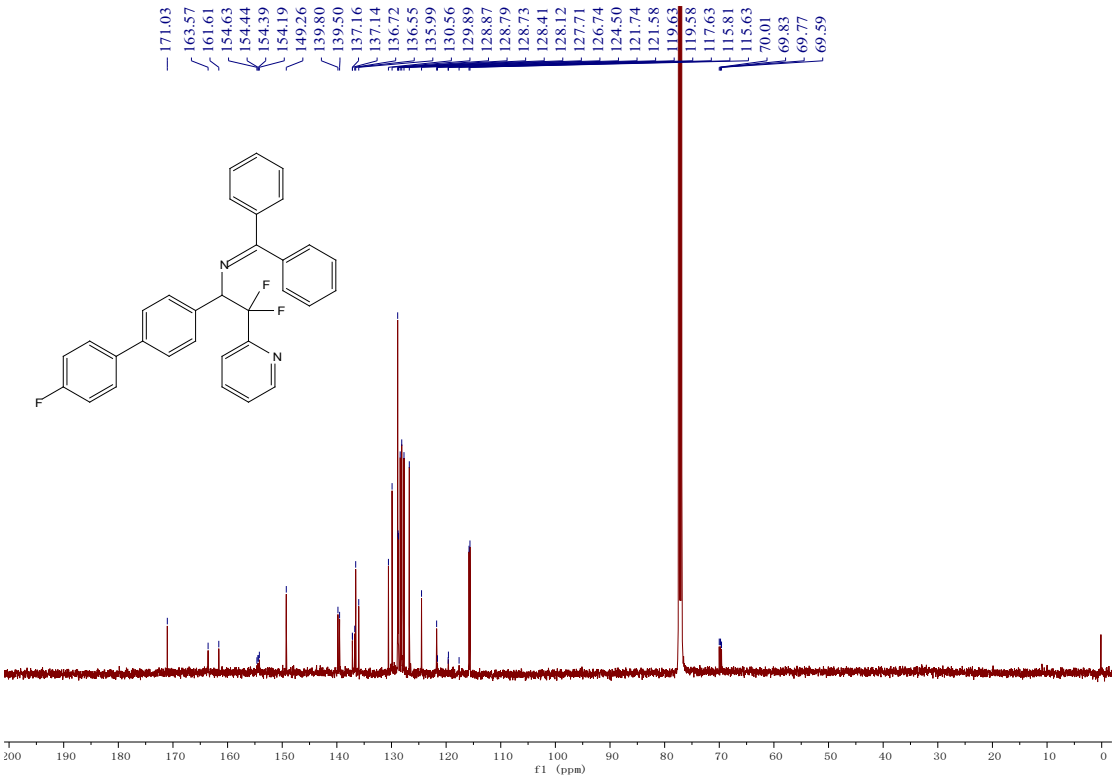
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3a**



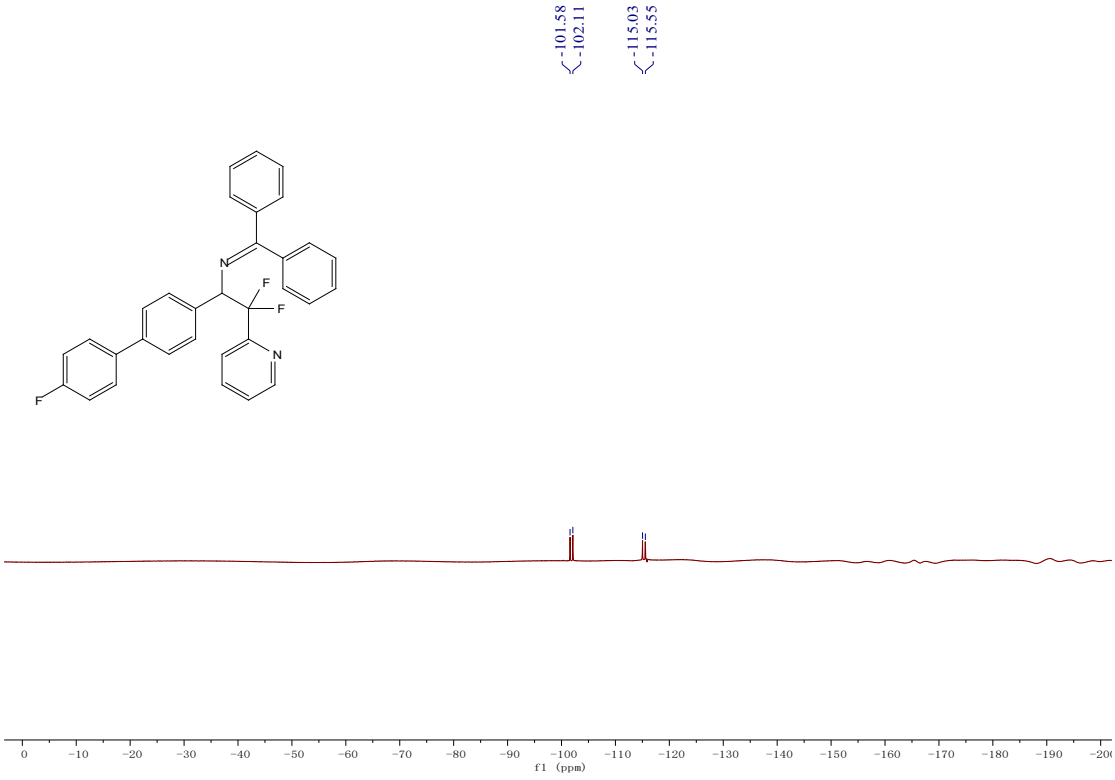
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3b**



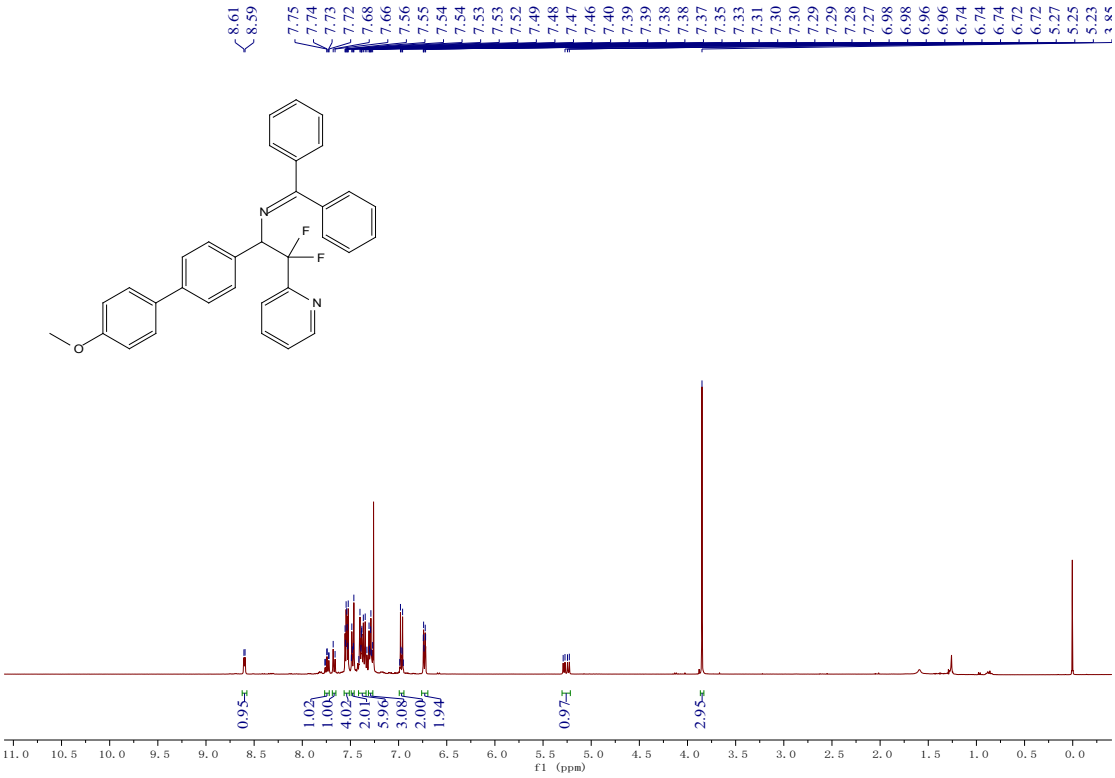
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3b**



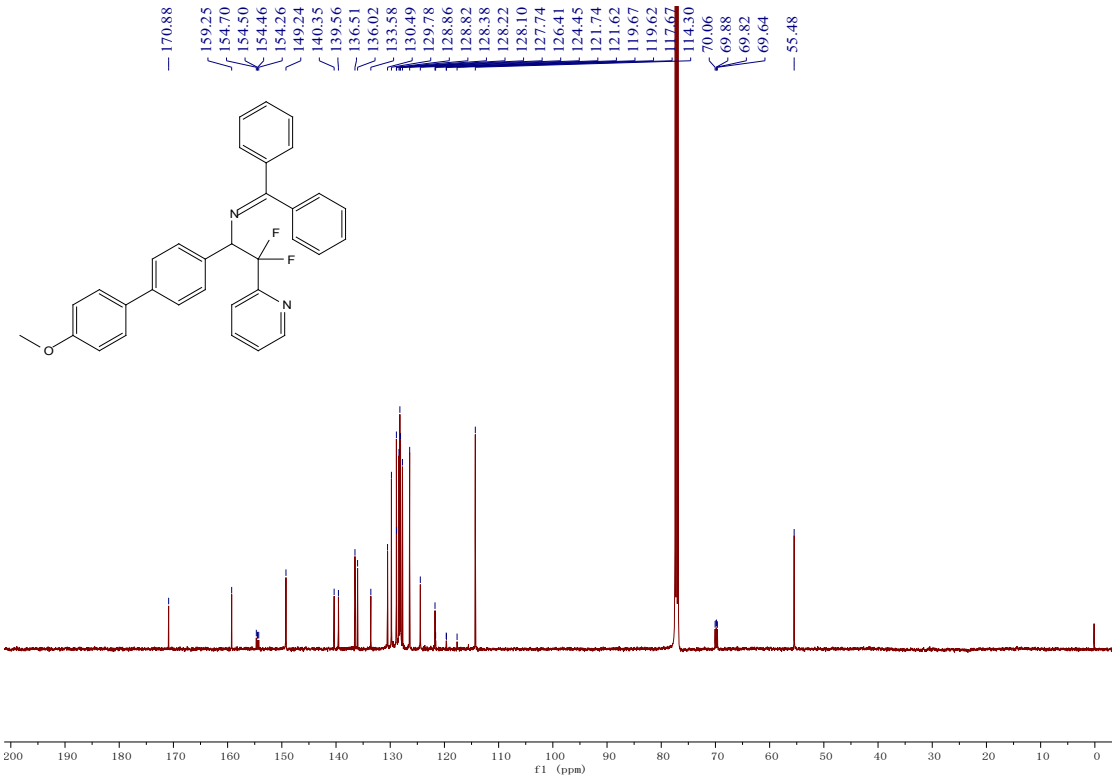
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3b**



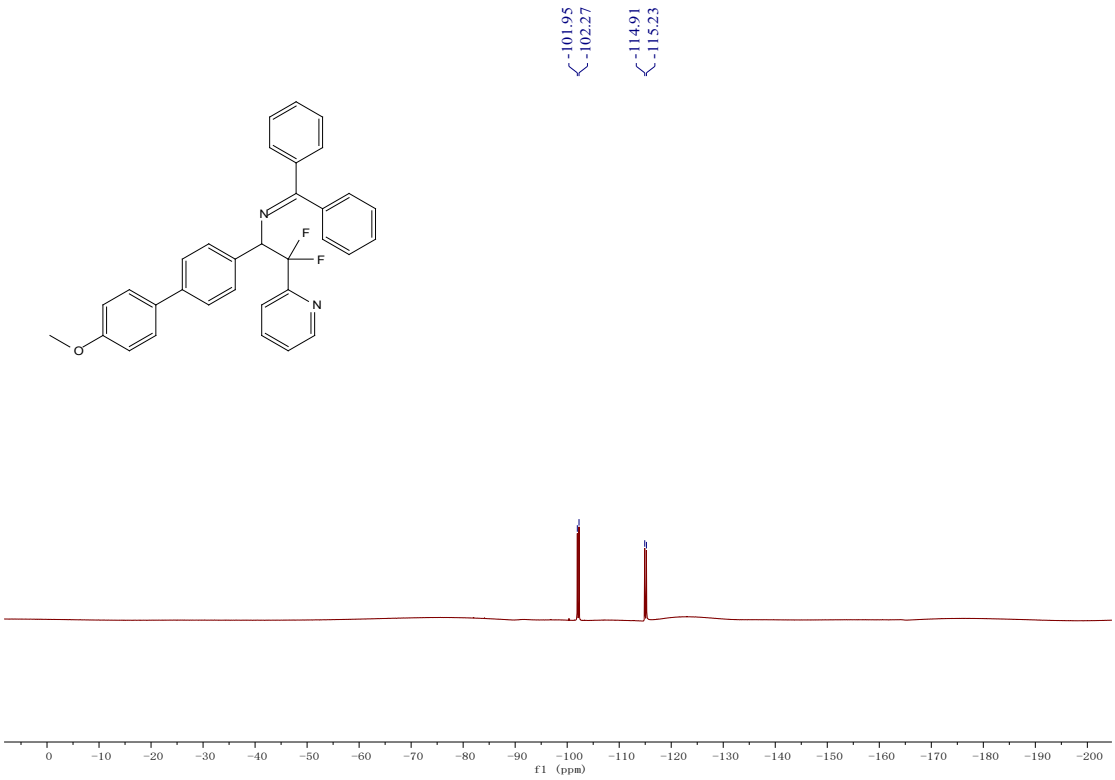
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3c**



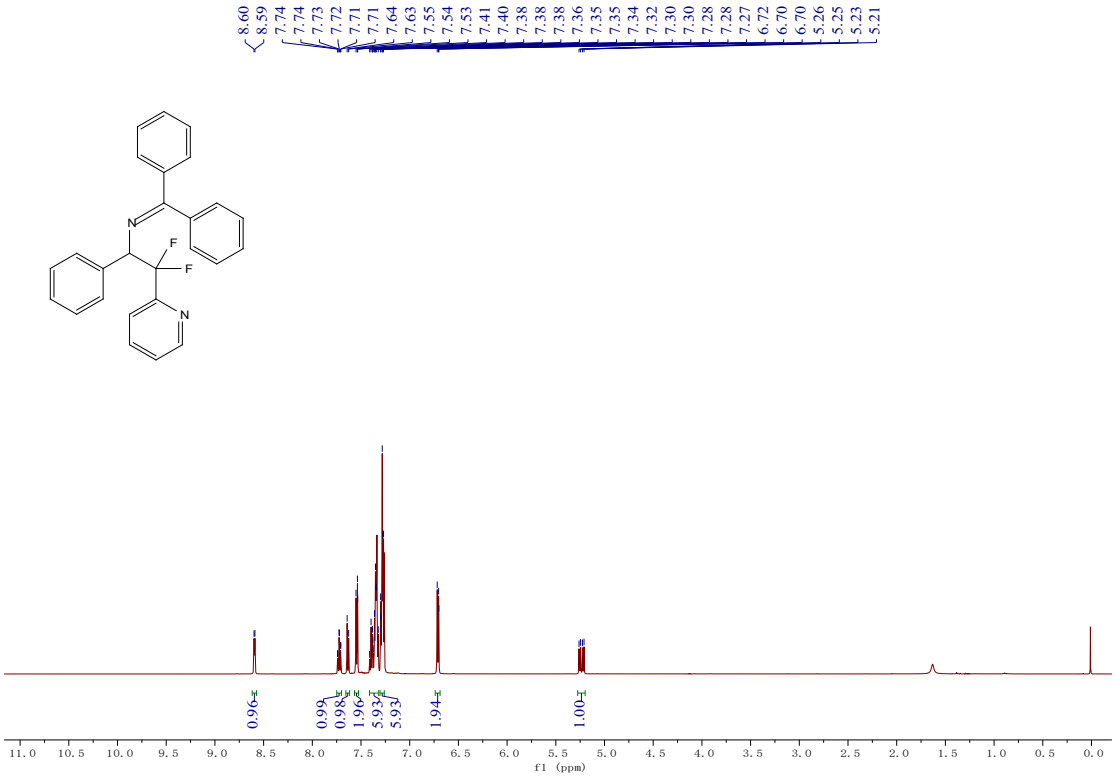
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3c**



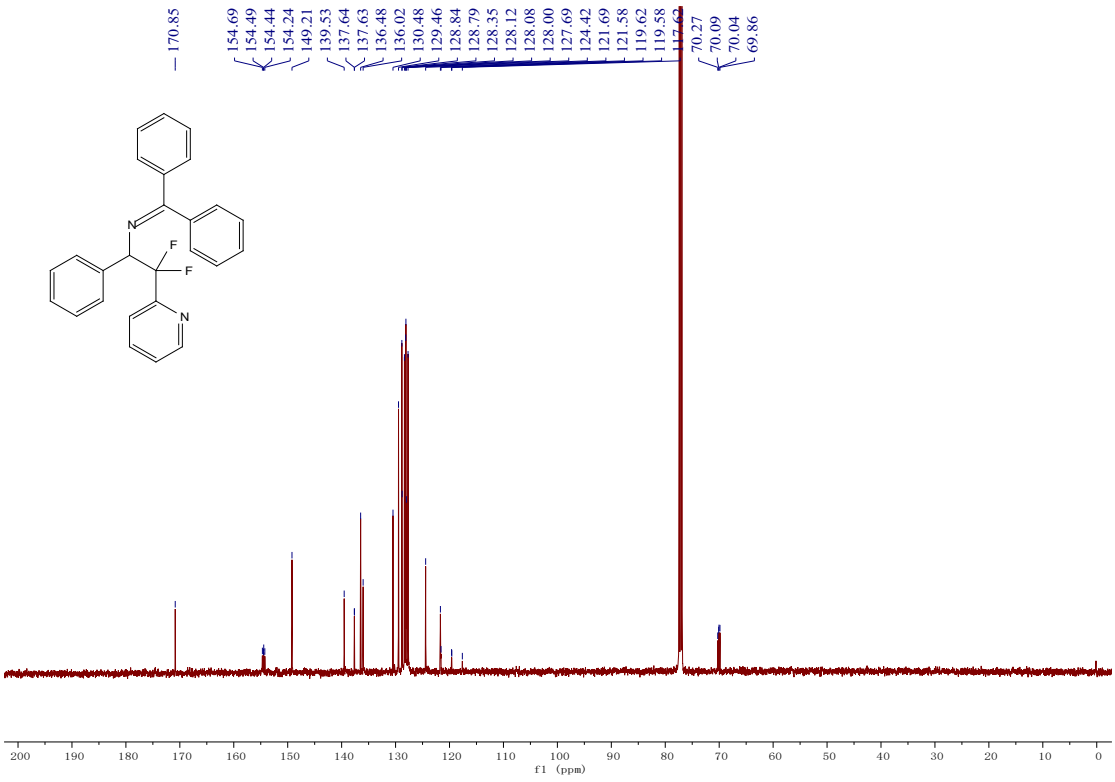
^{19}F NMR (753 MHz, $CDCl_3$) spectrum of **3c**



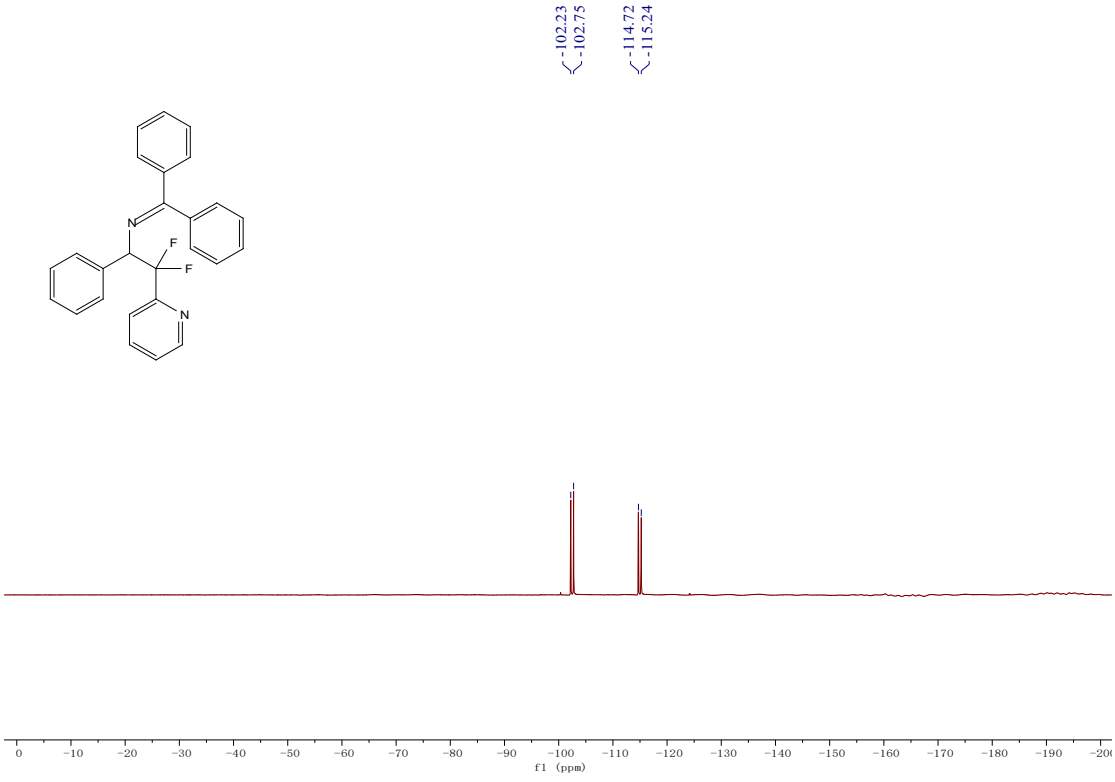
^{1}H NMR (500 MHz, $CDCl_3$) spectrum of **3d**



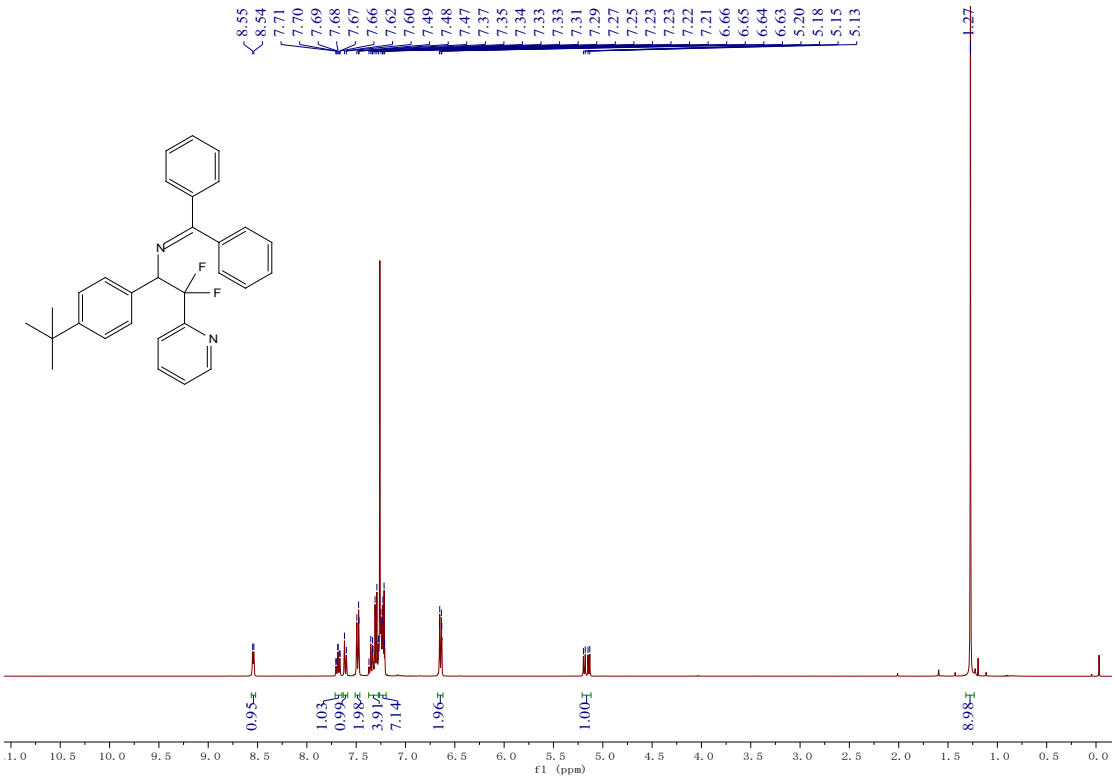
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3d**



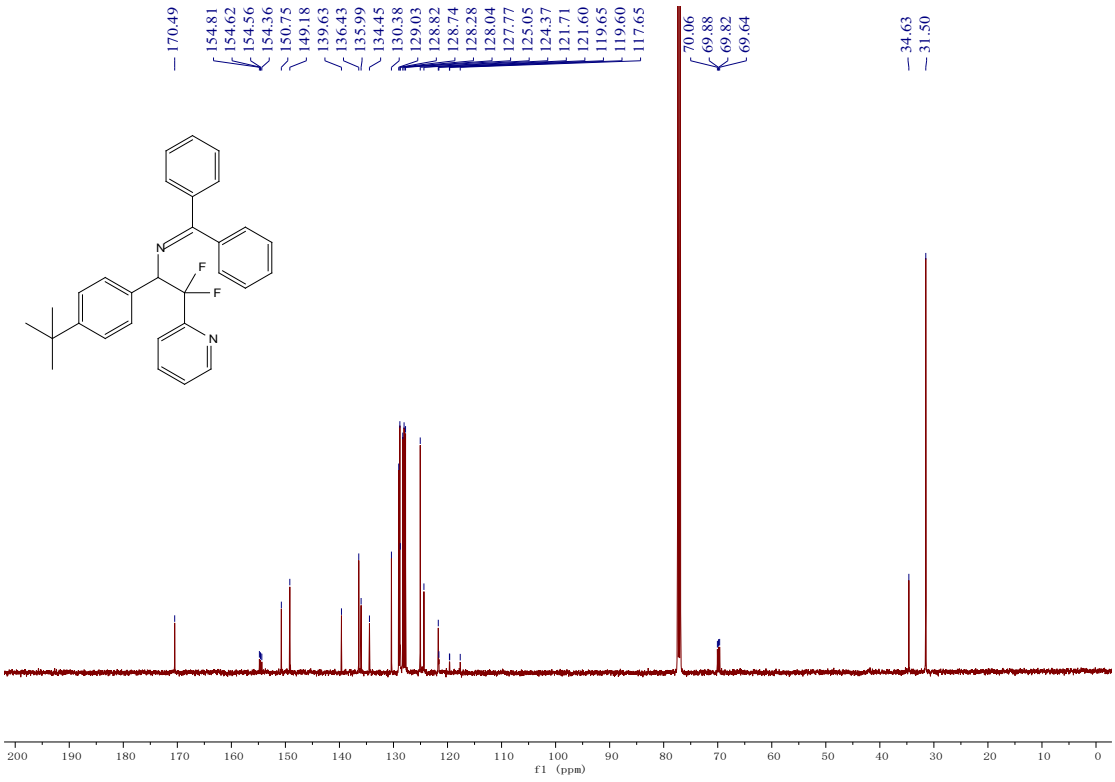
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3d**



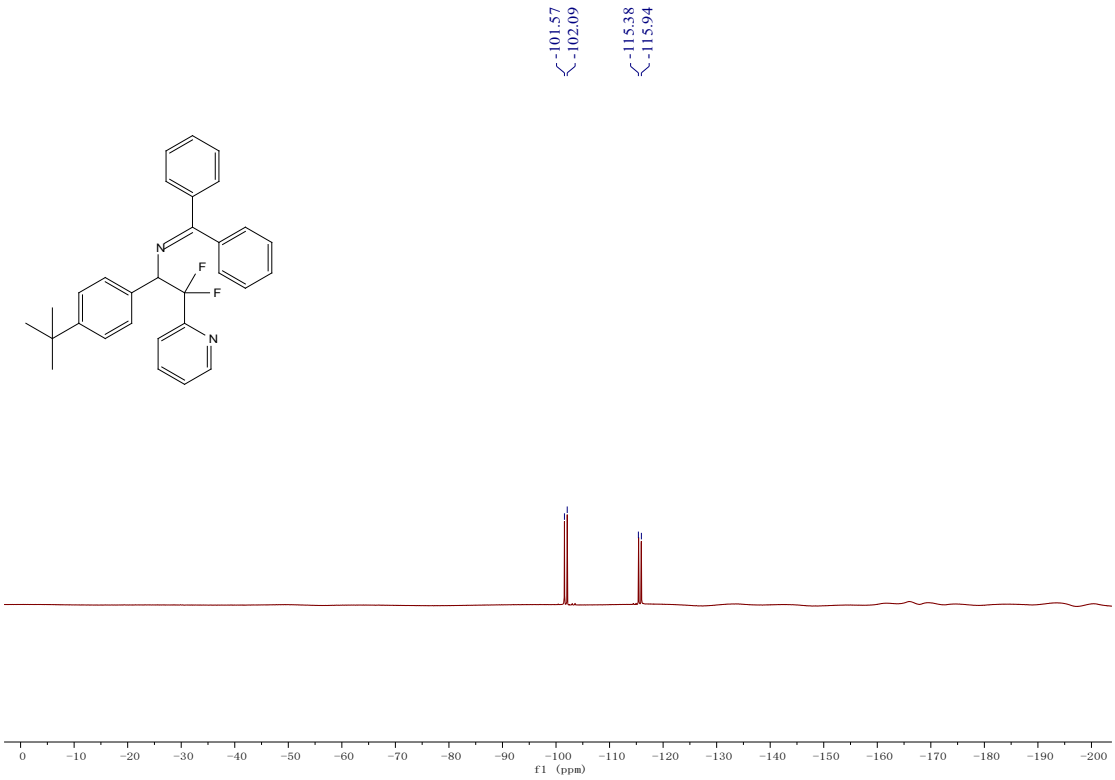
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3e**



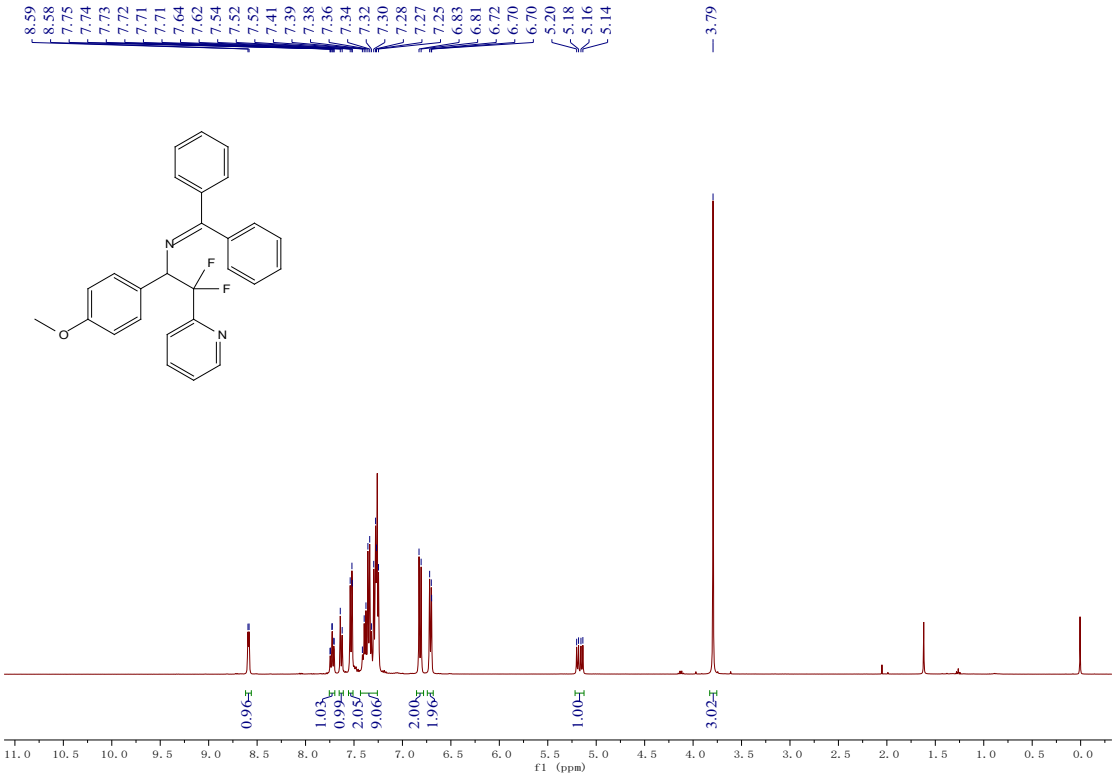
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3e**



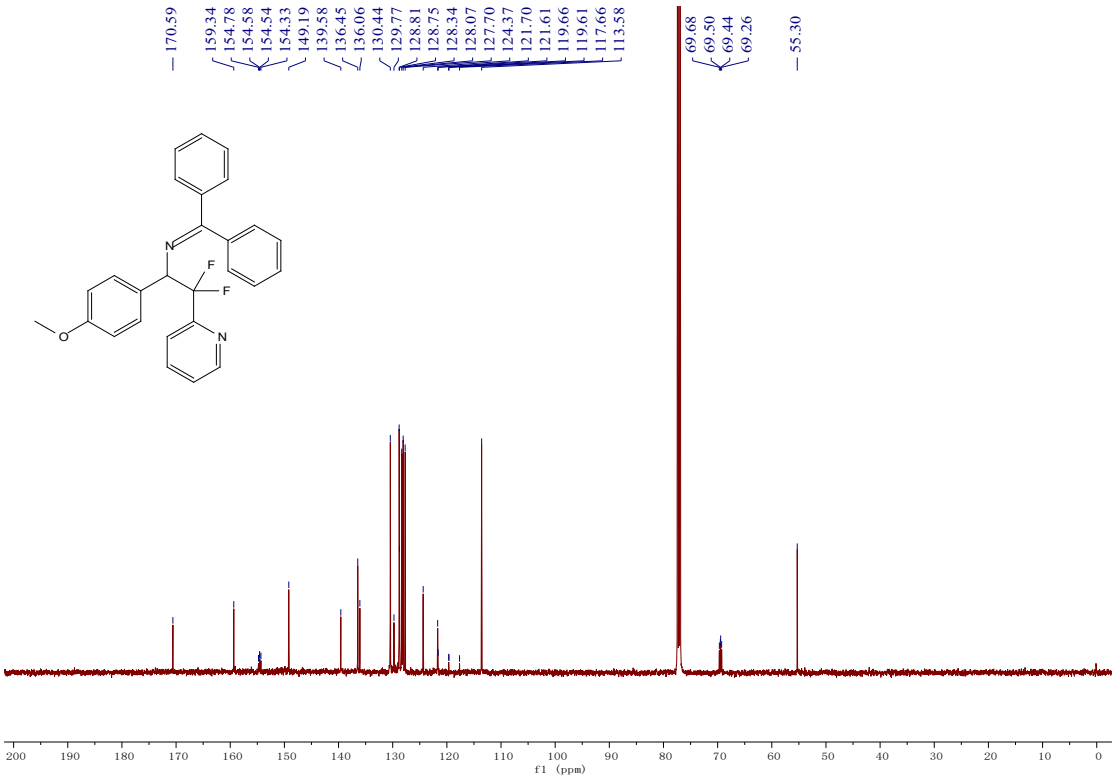
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3e**



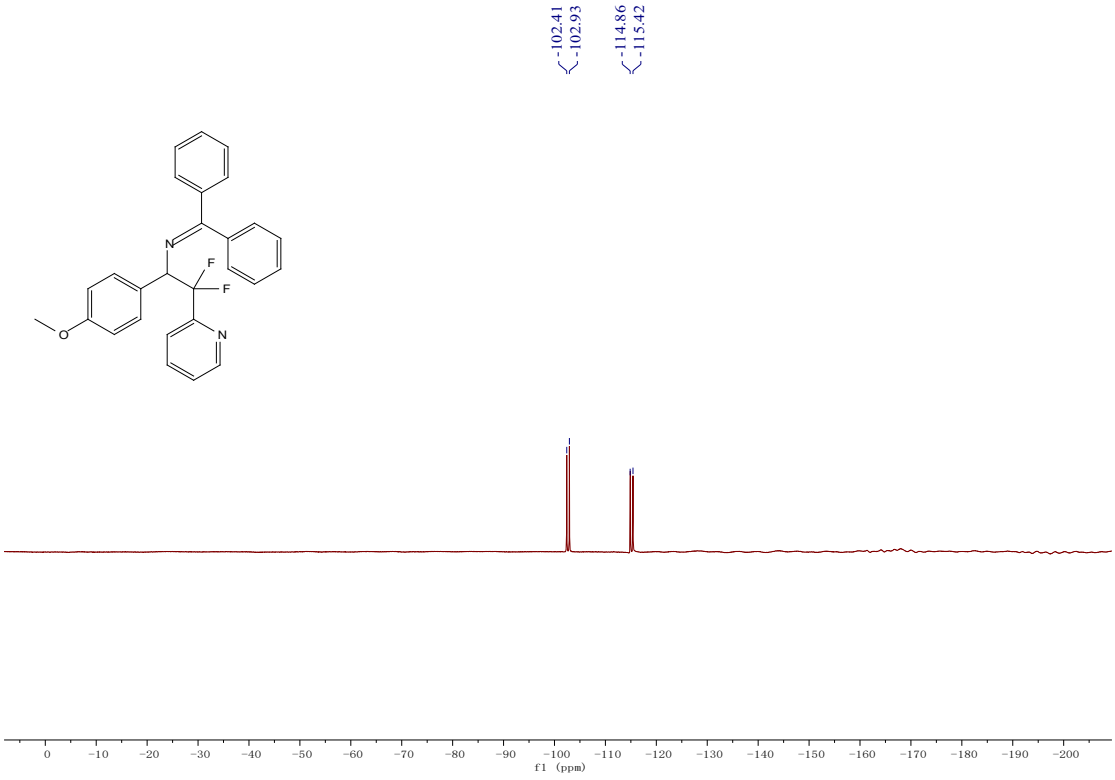
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3f**



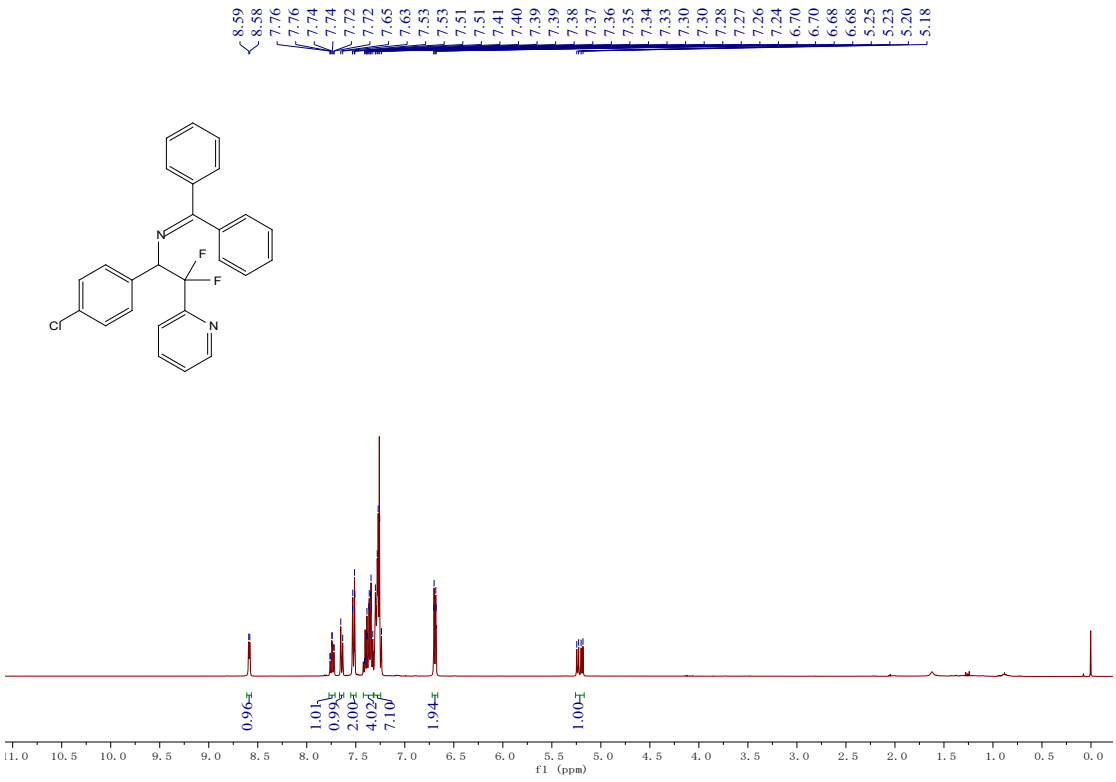
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3f**



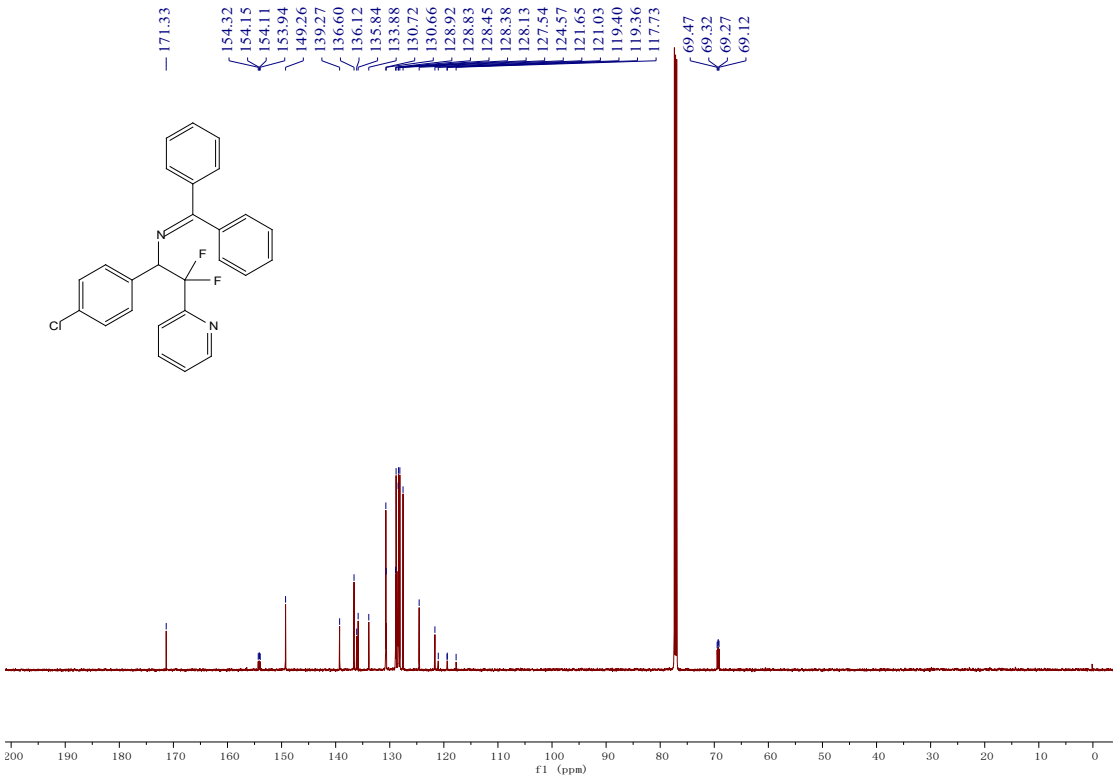
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3f**



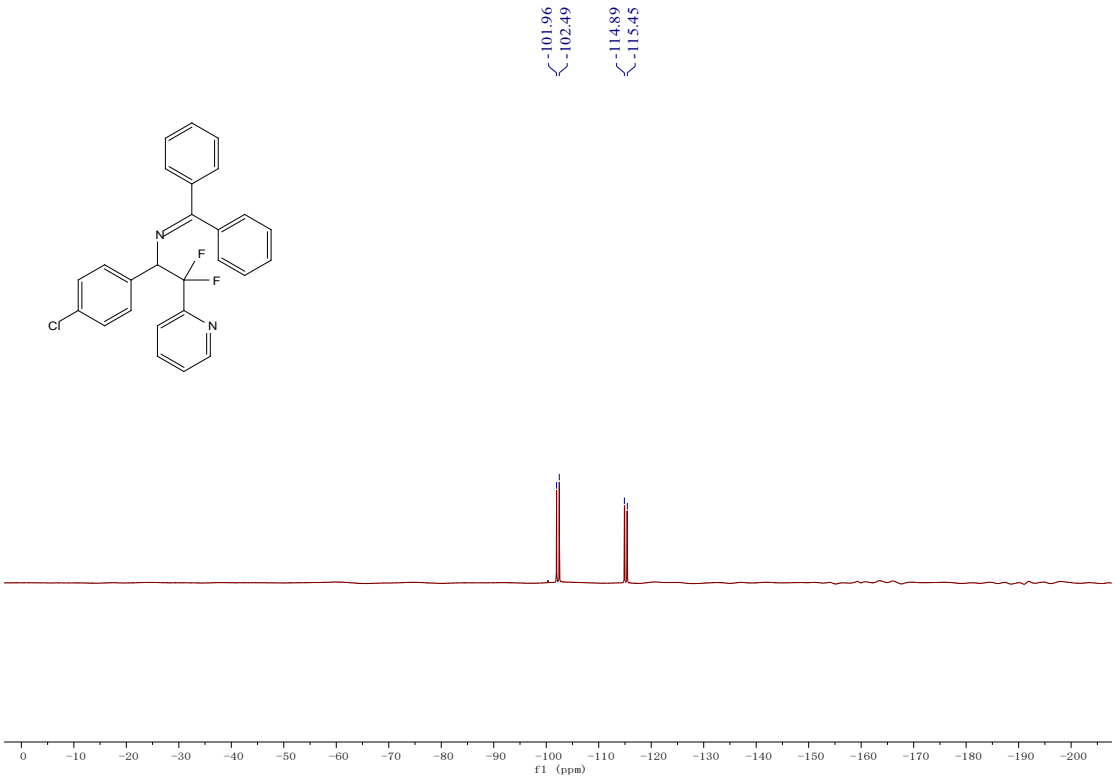
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3g**



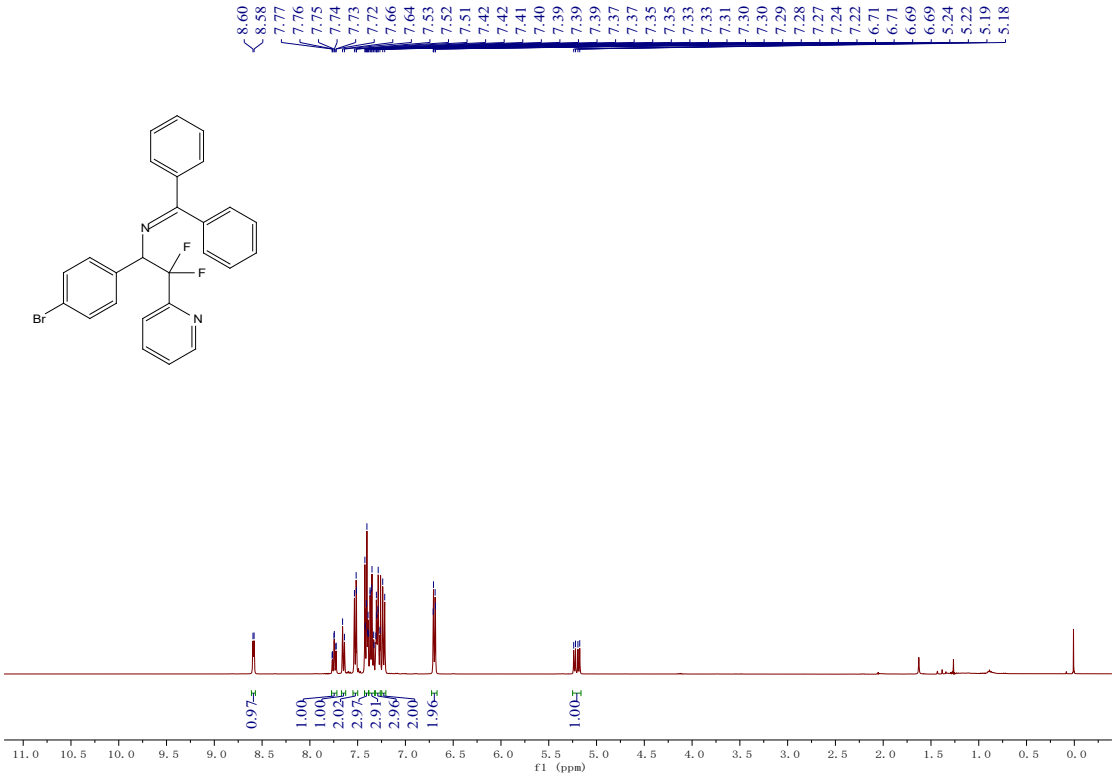
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **3g**



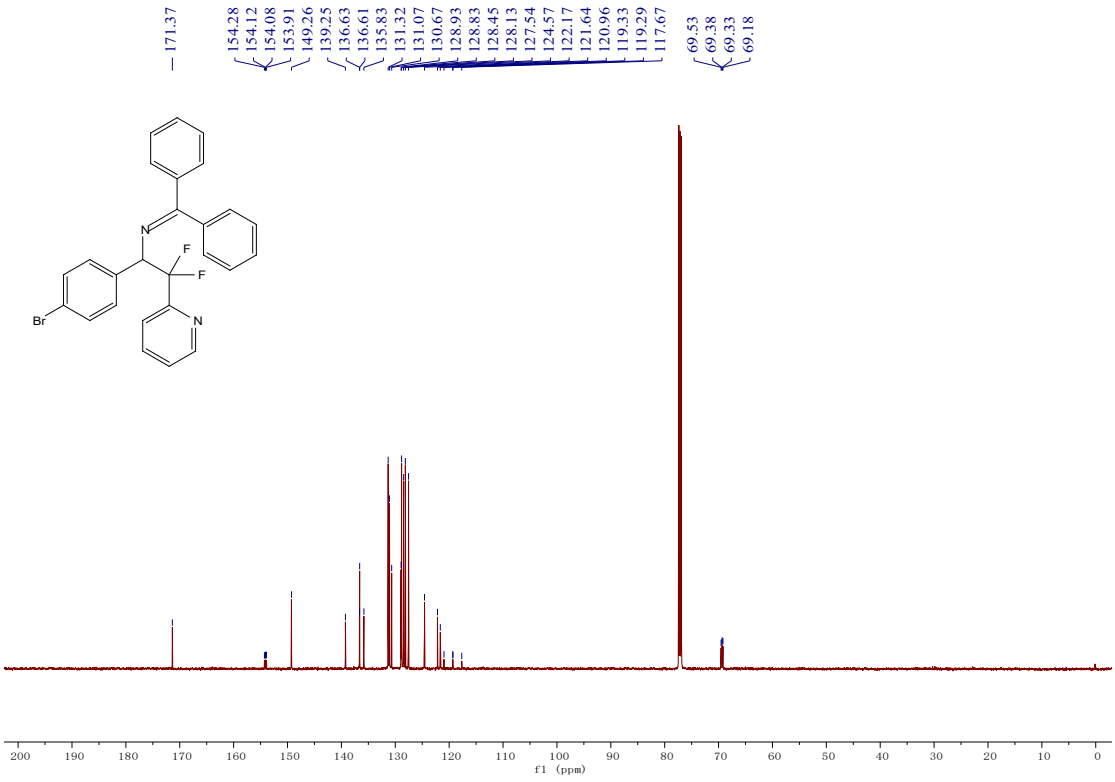
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3g**



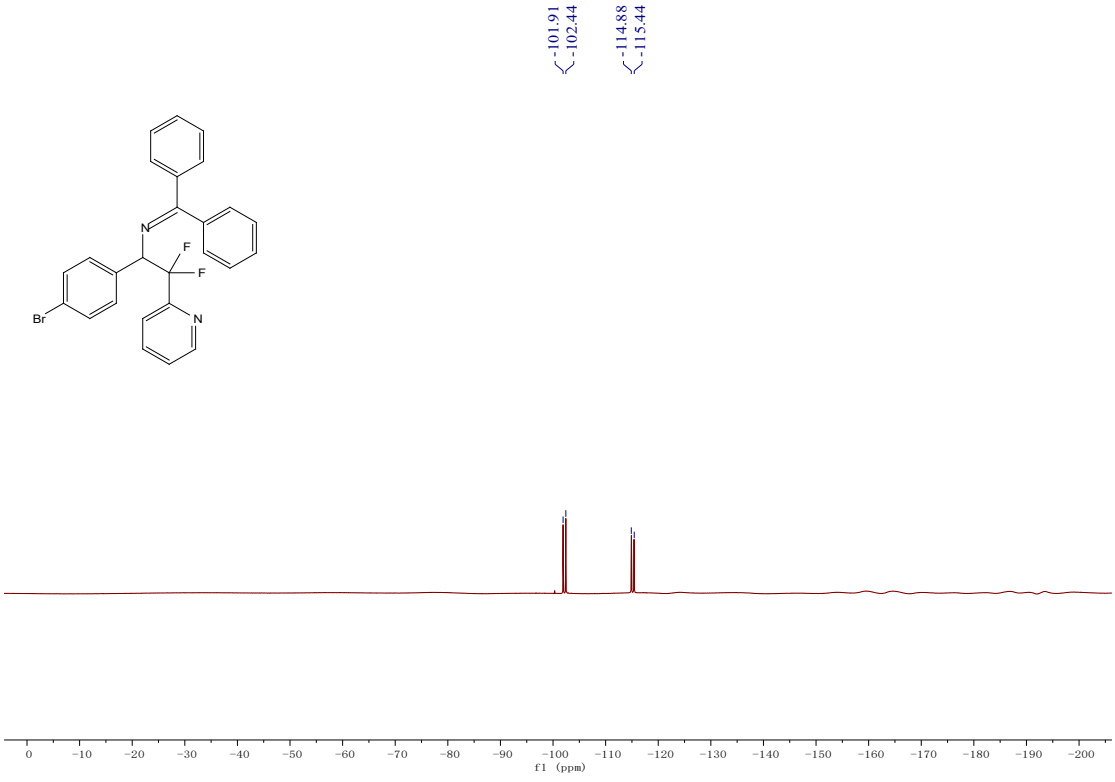
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3h**



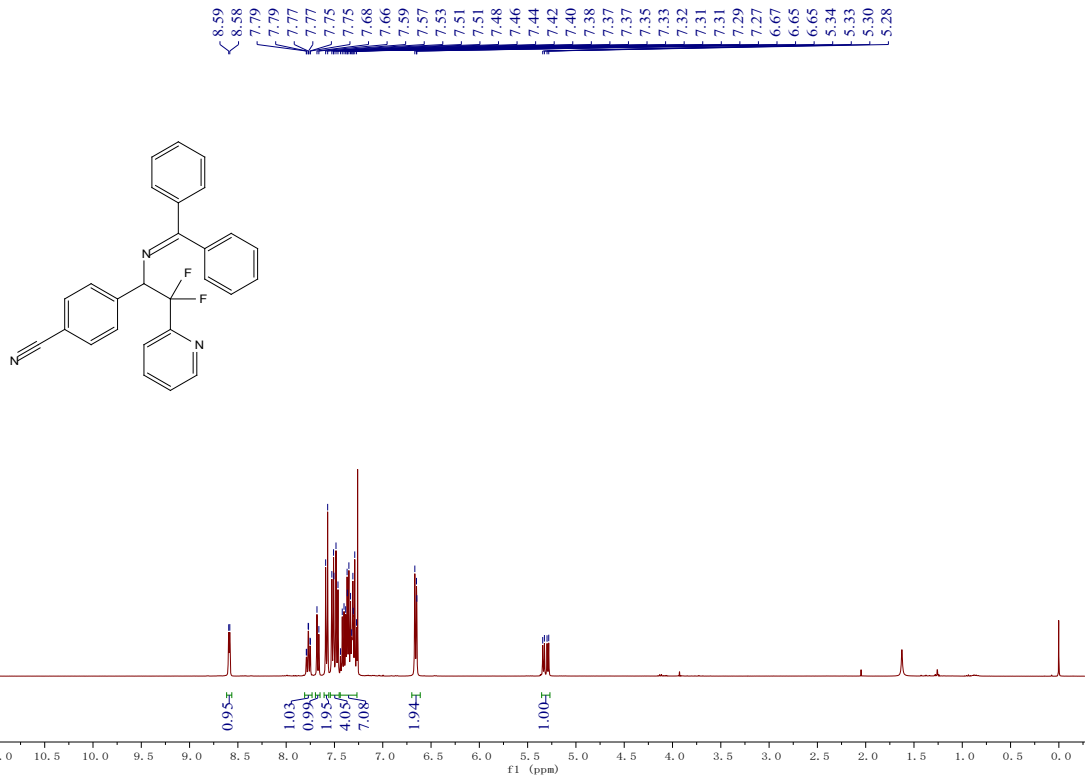
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **3h**



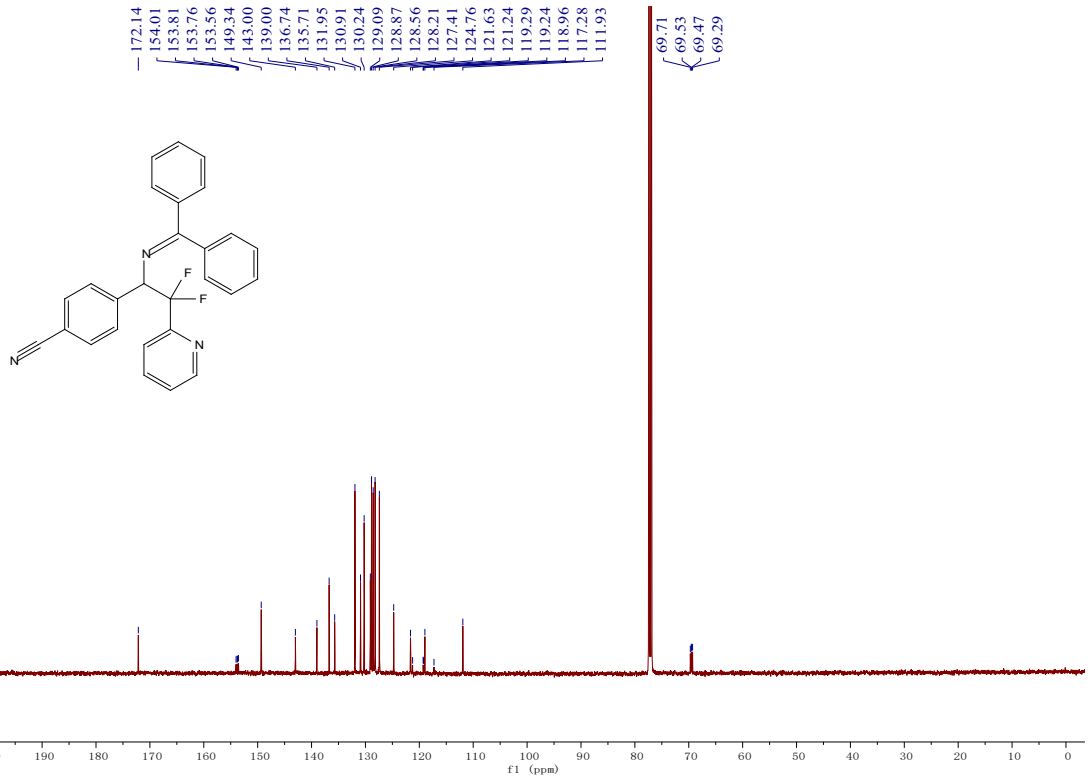
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3h**



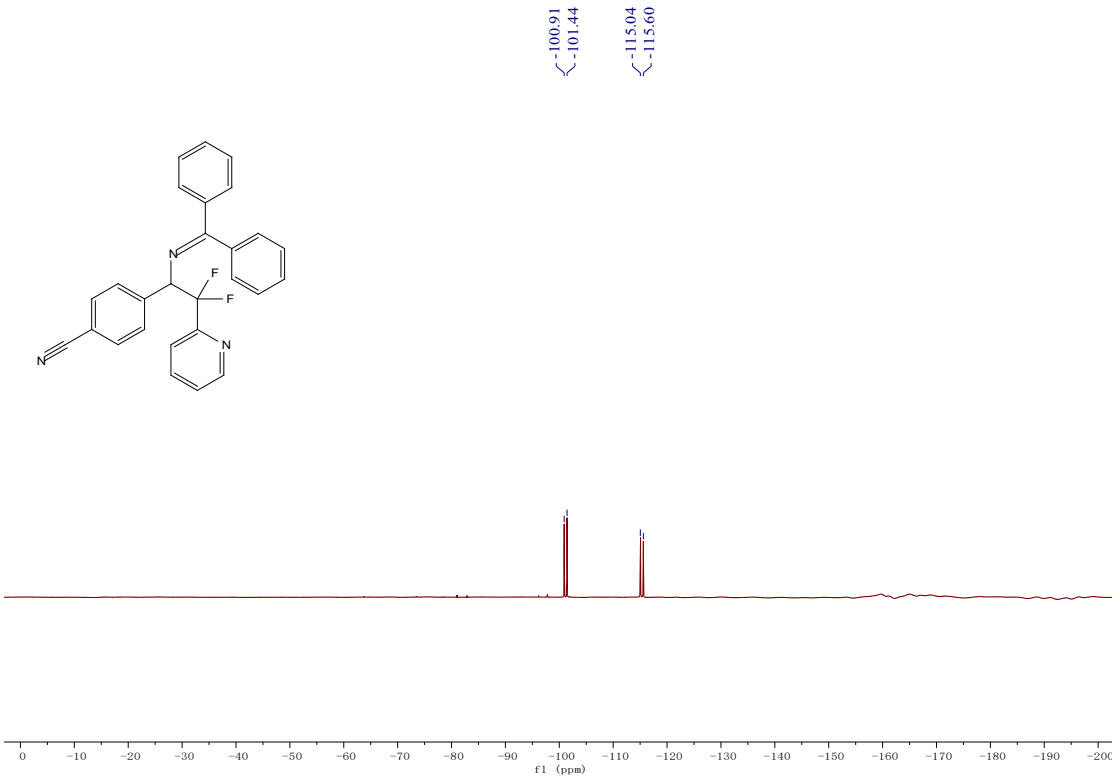
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3i**



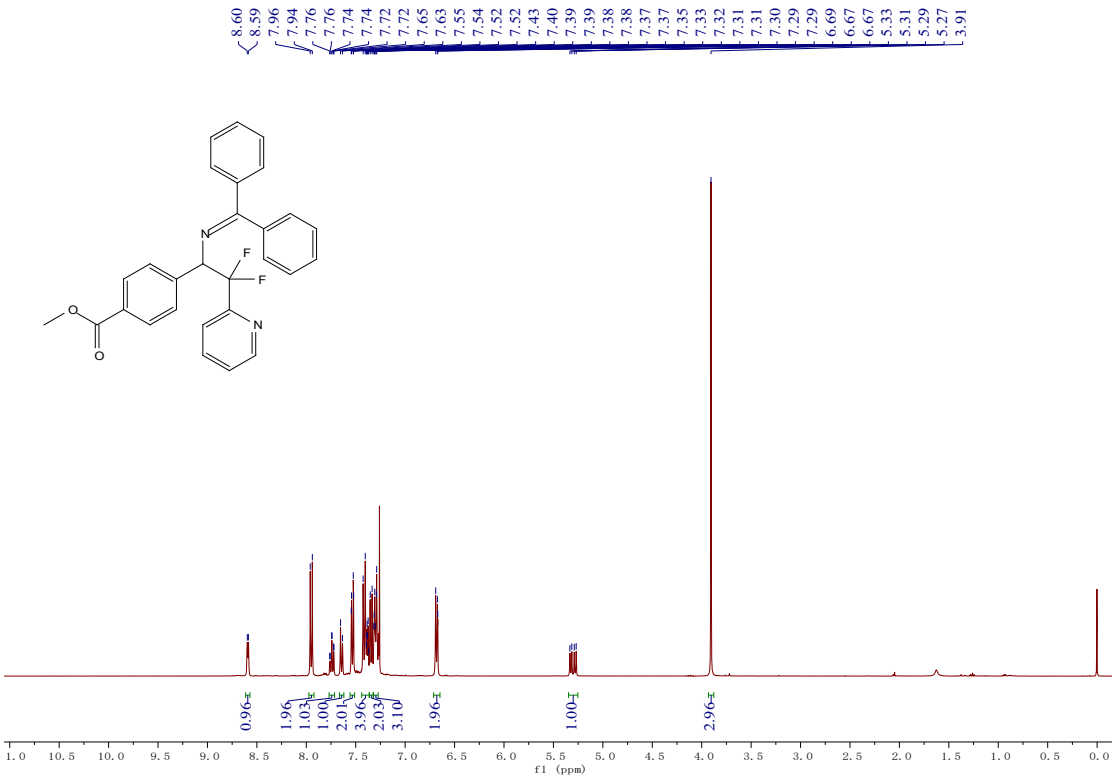
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3i**



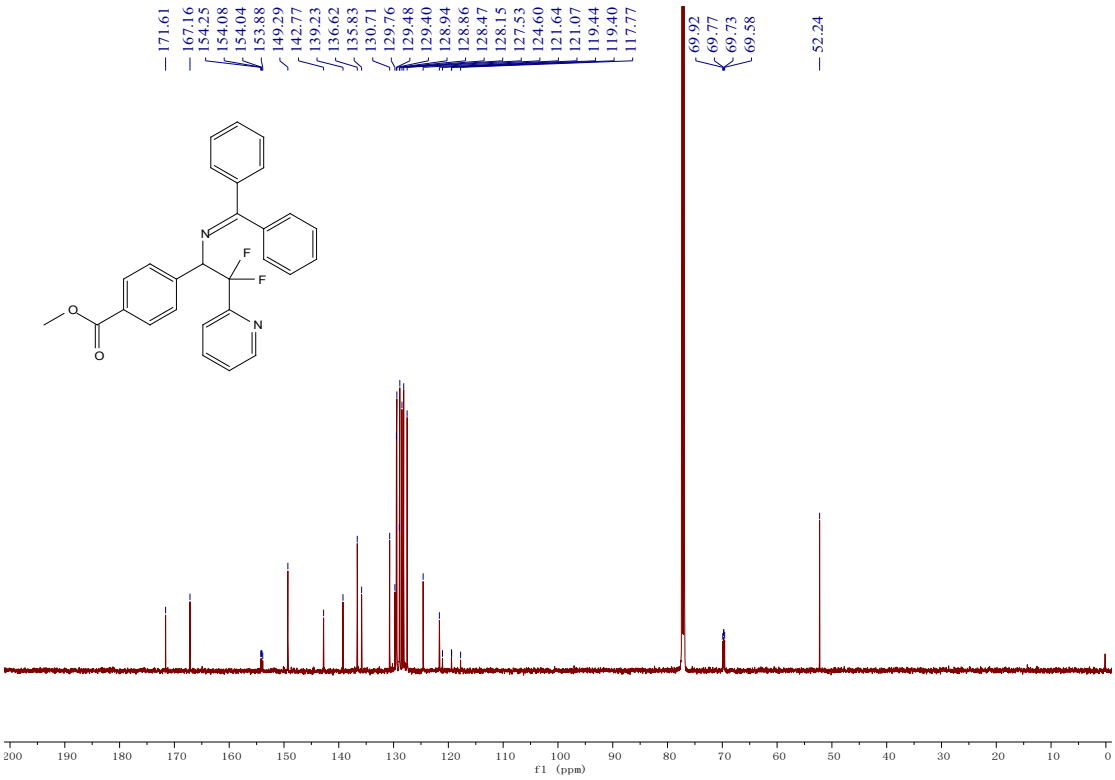
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3i**



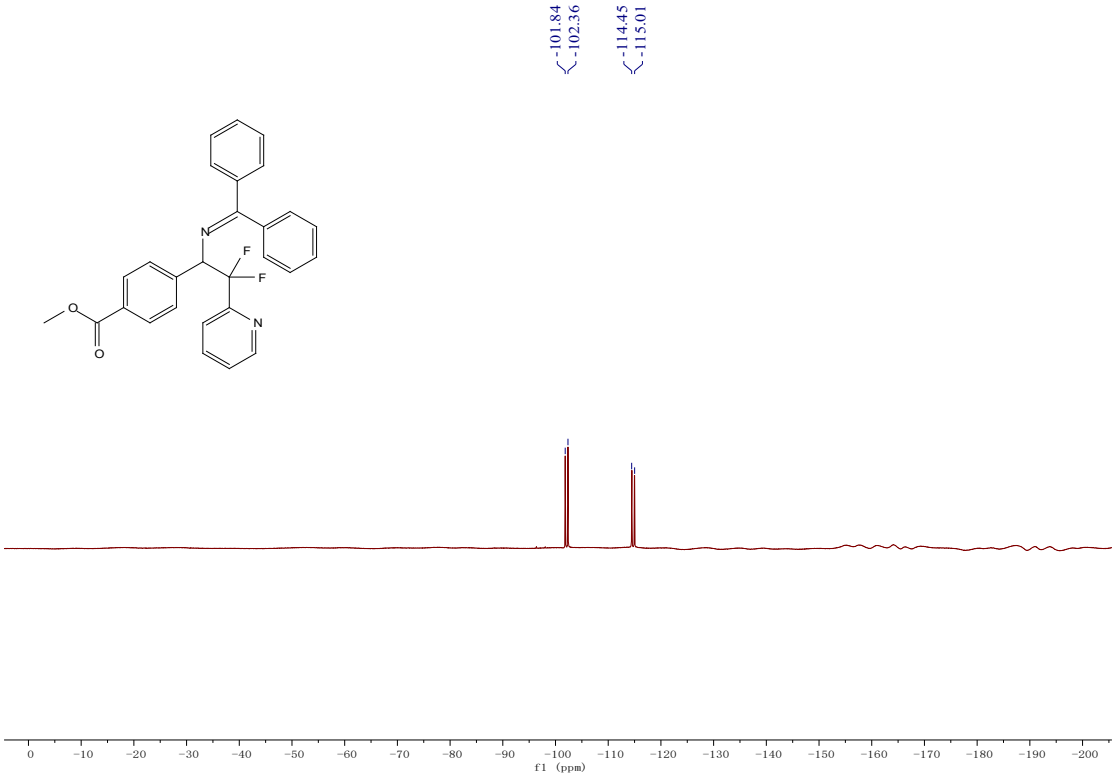
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3j**



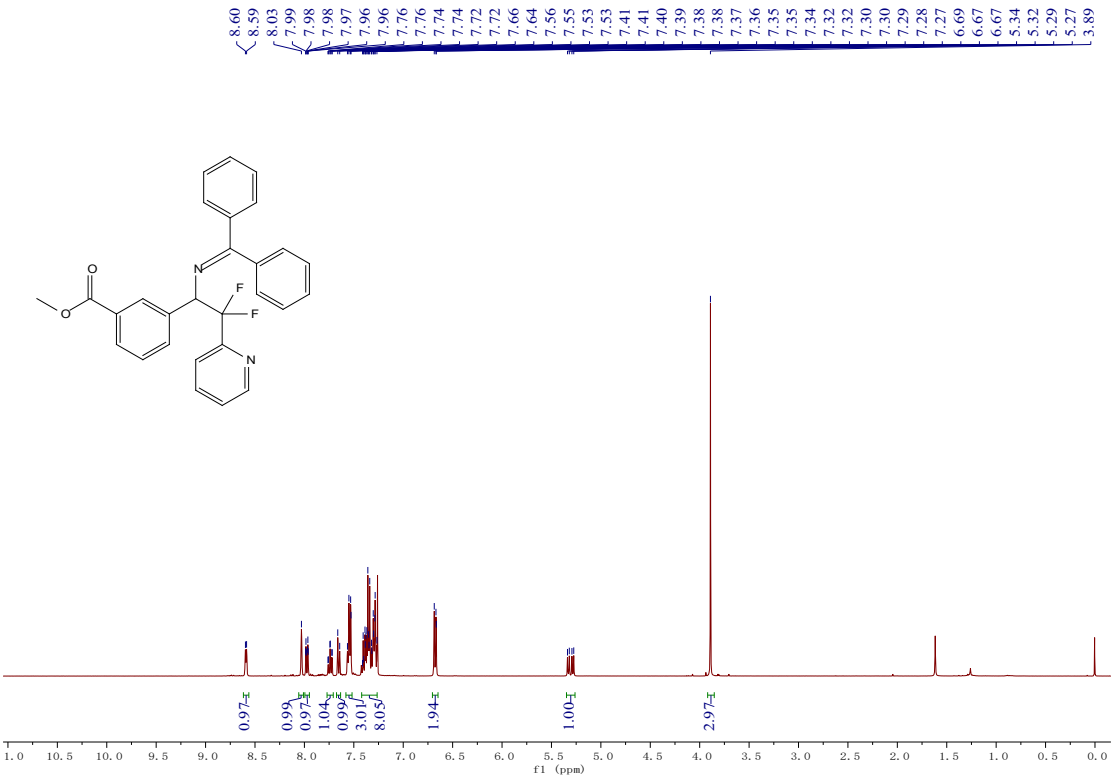
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3j**



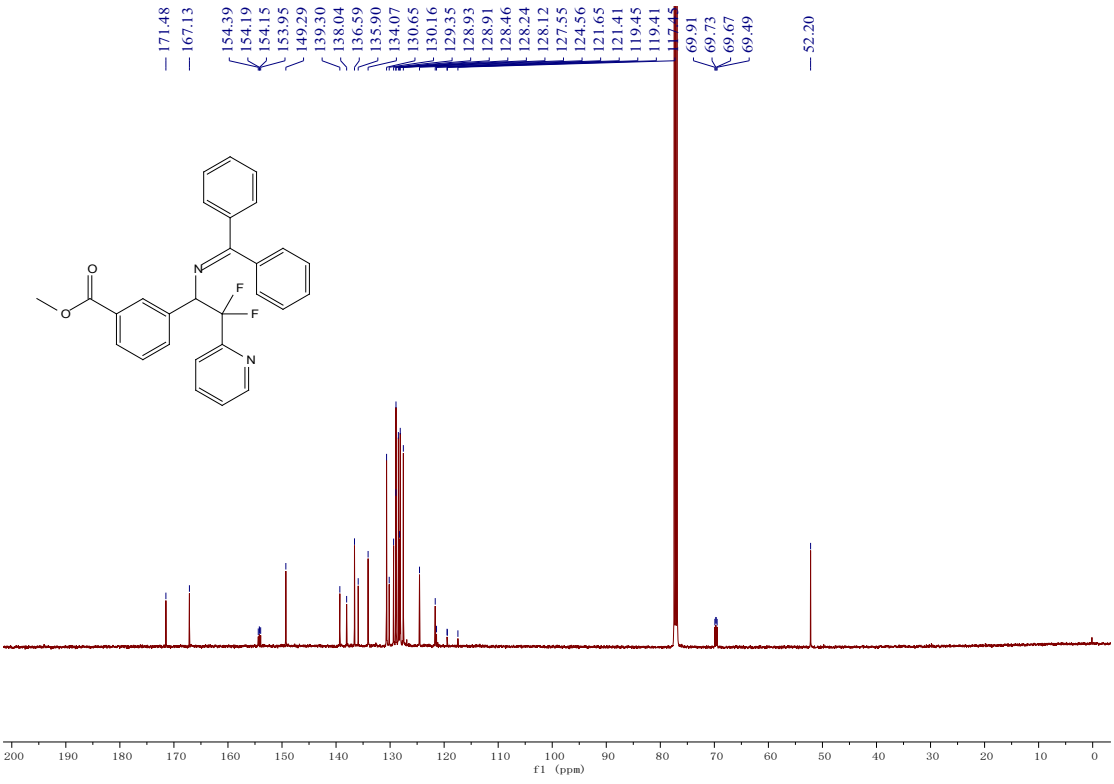
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3j**



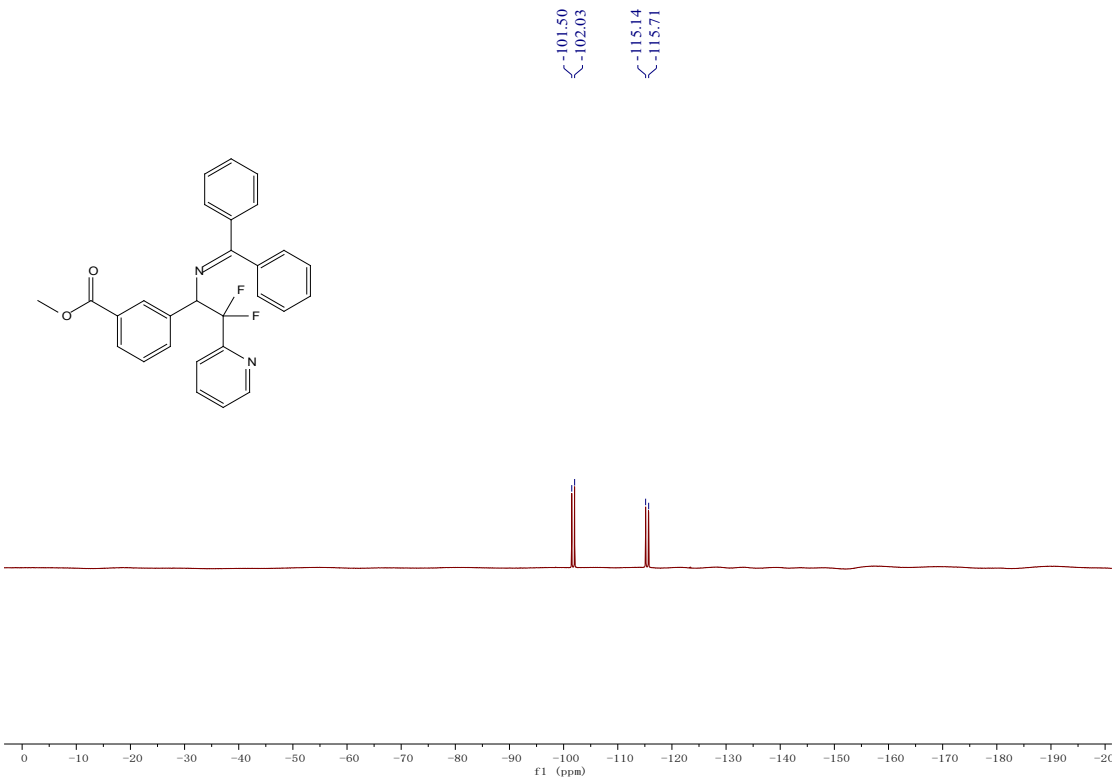
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3k**



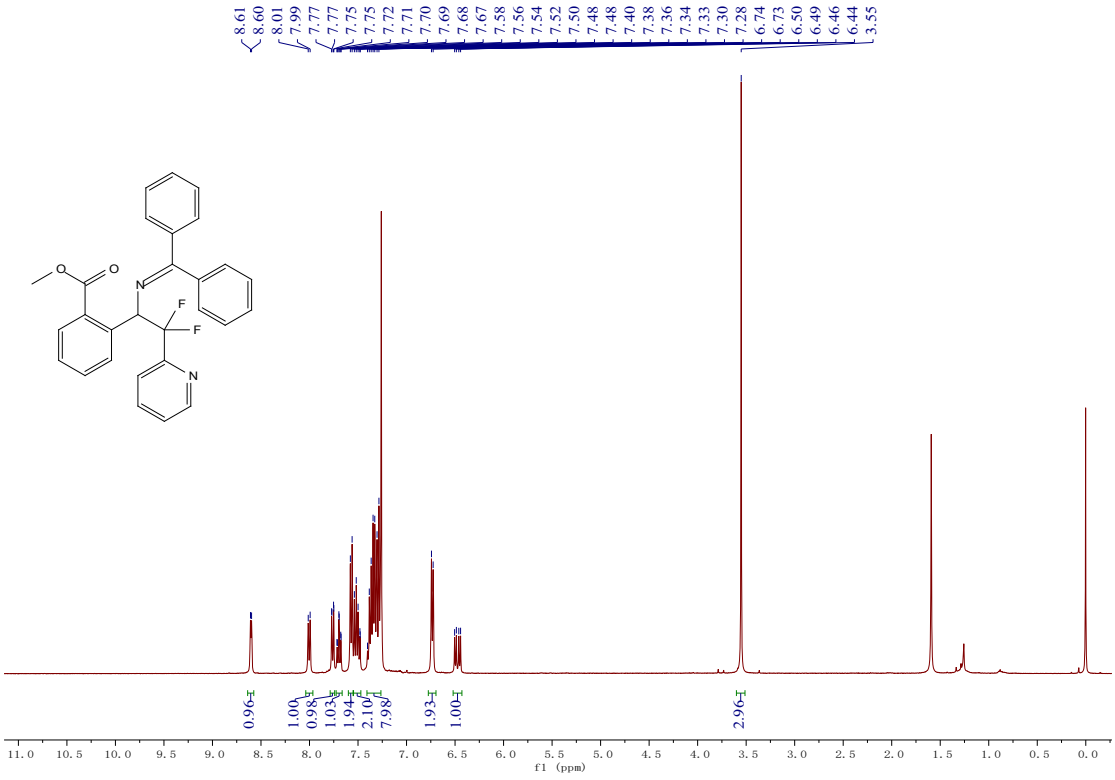
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3k**



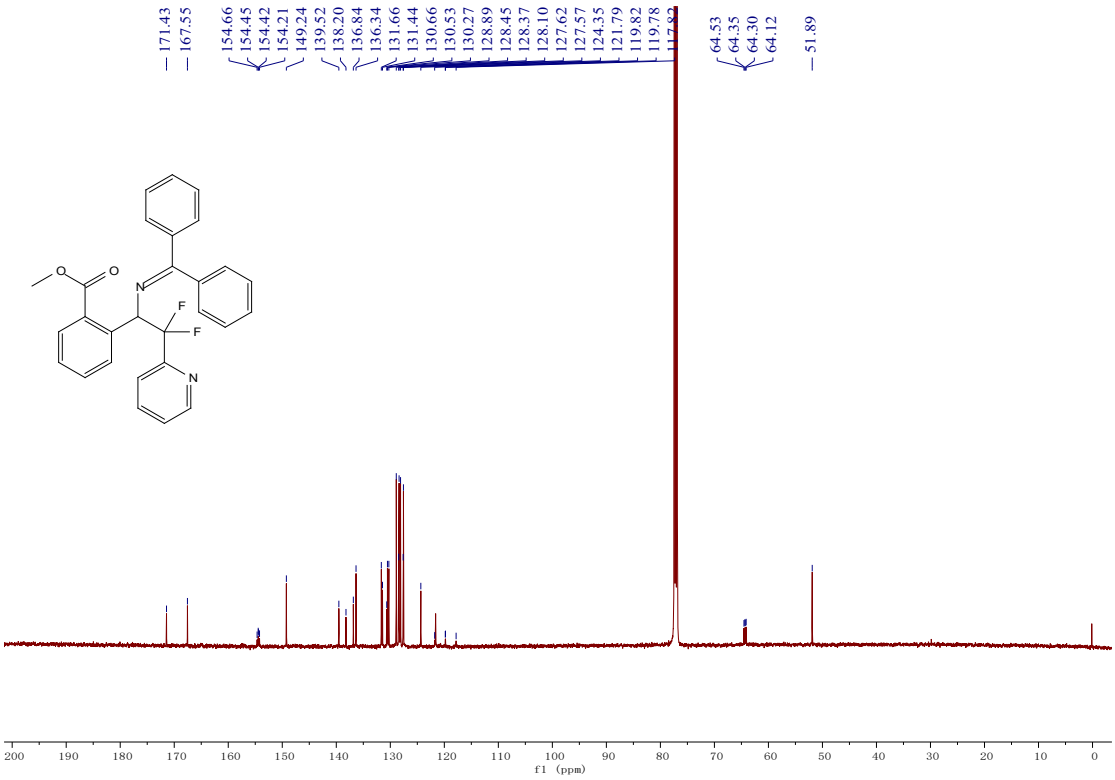
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3k**



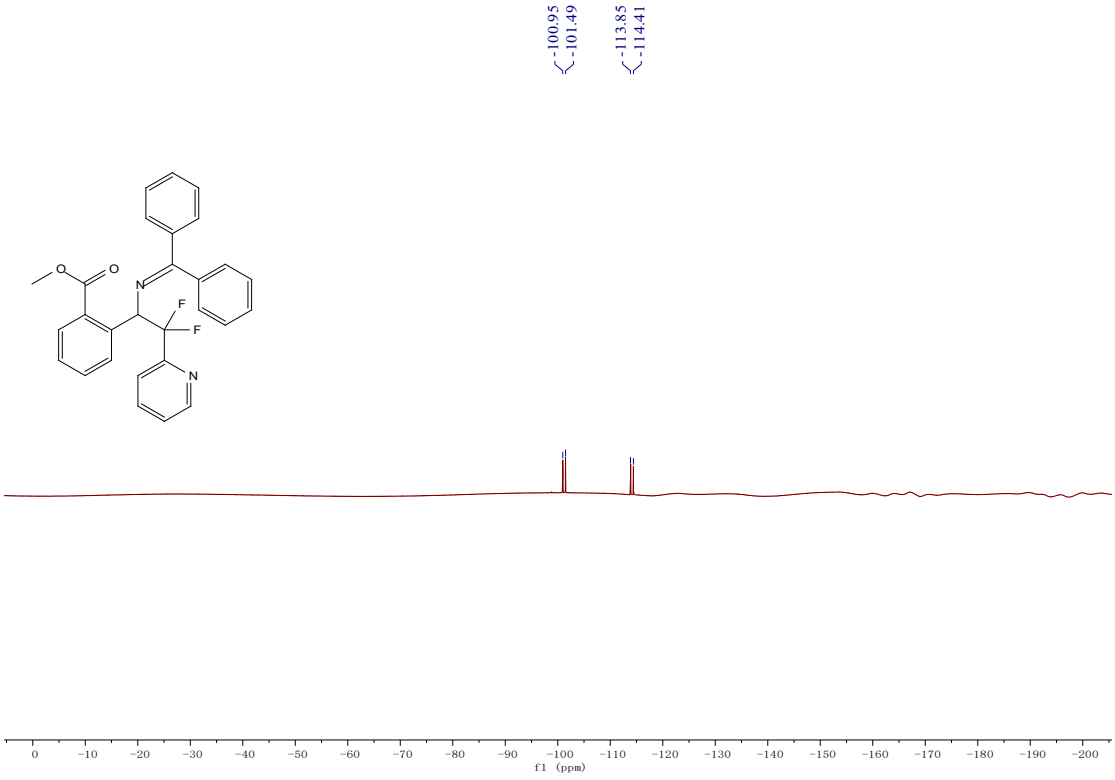
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3l**



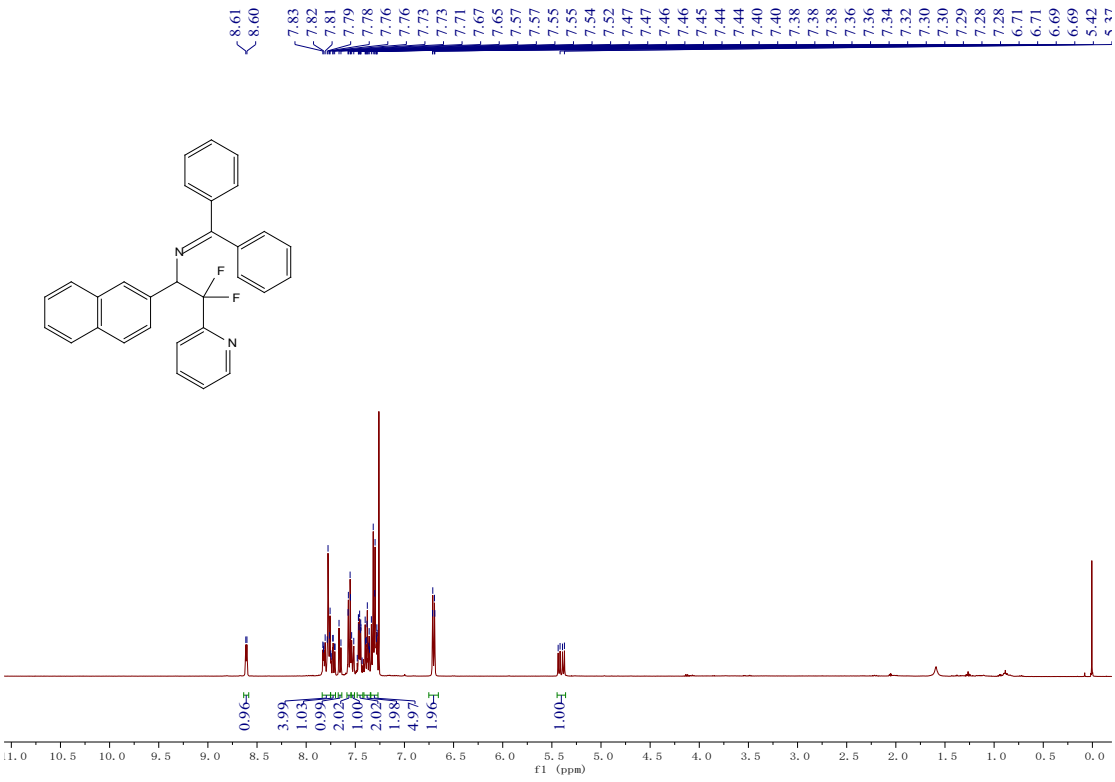
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3l**



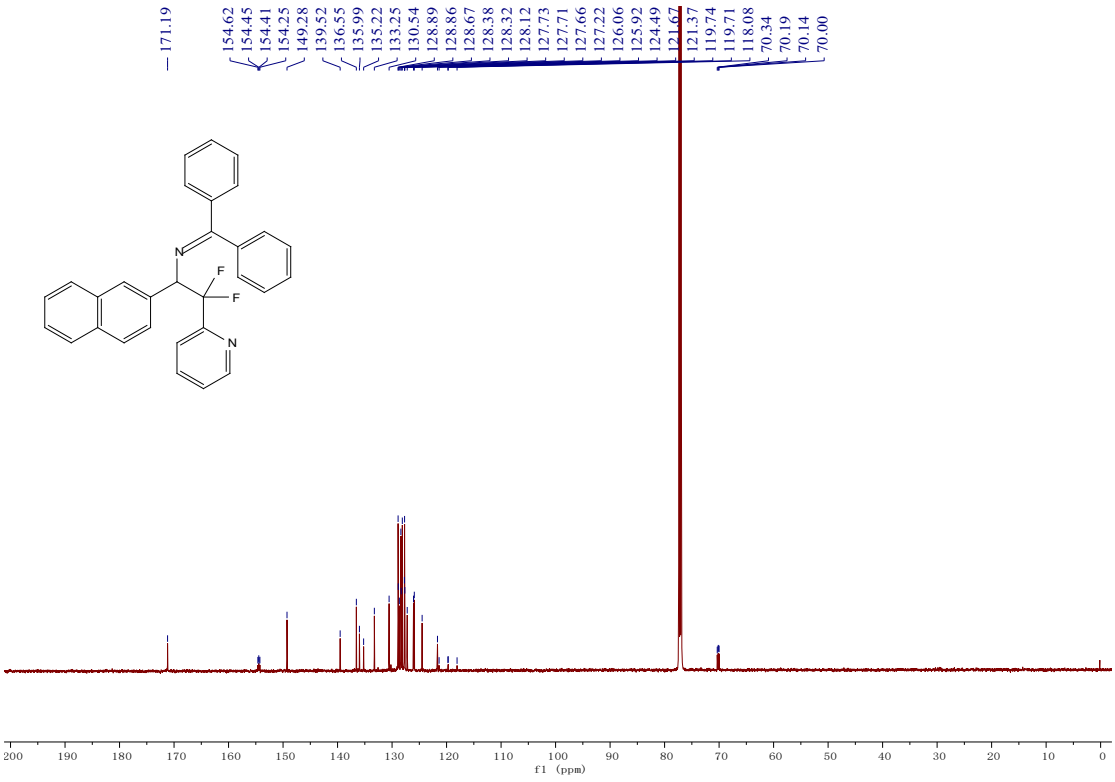
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3l**



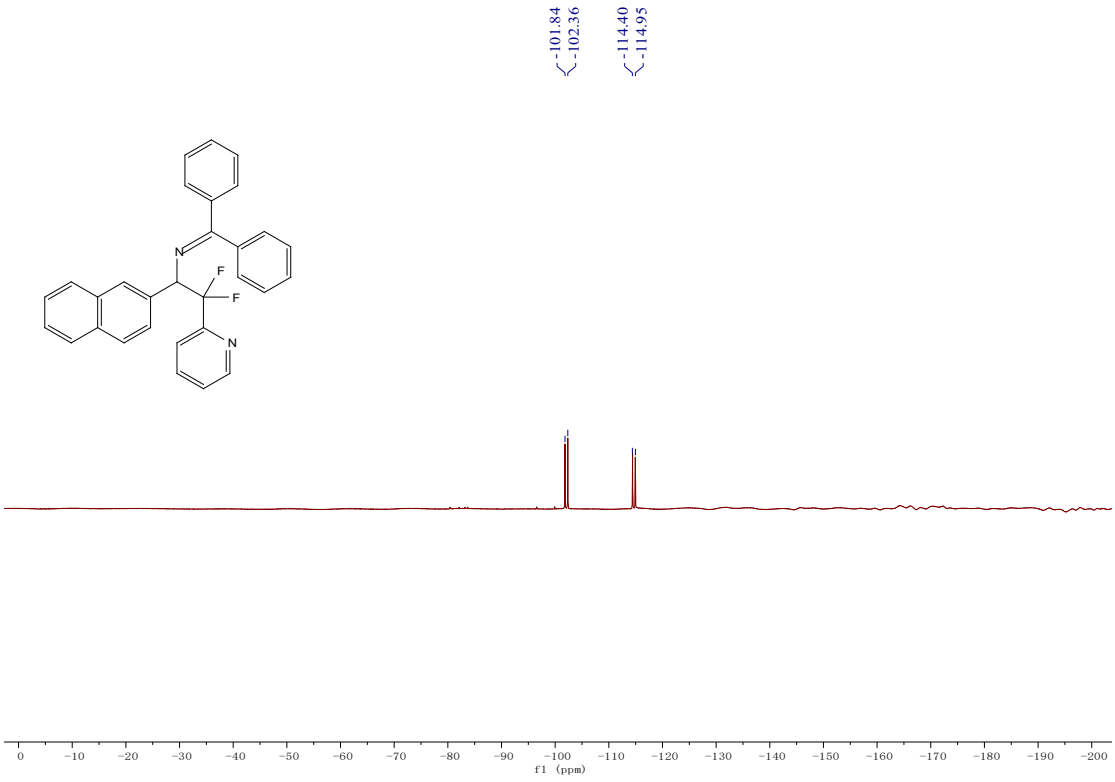
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3m**



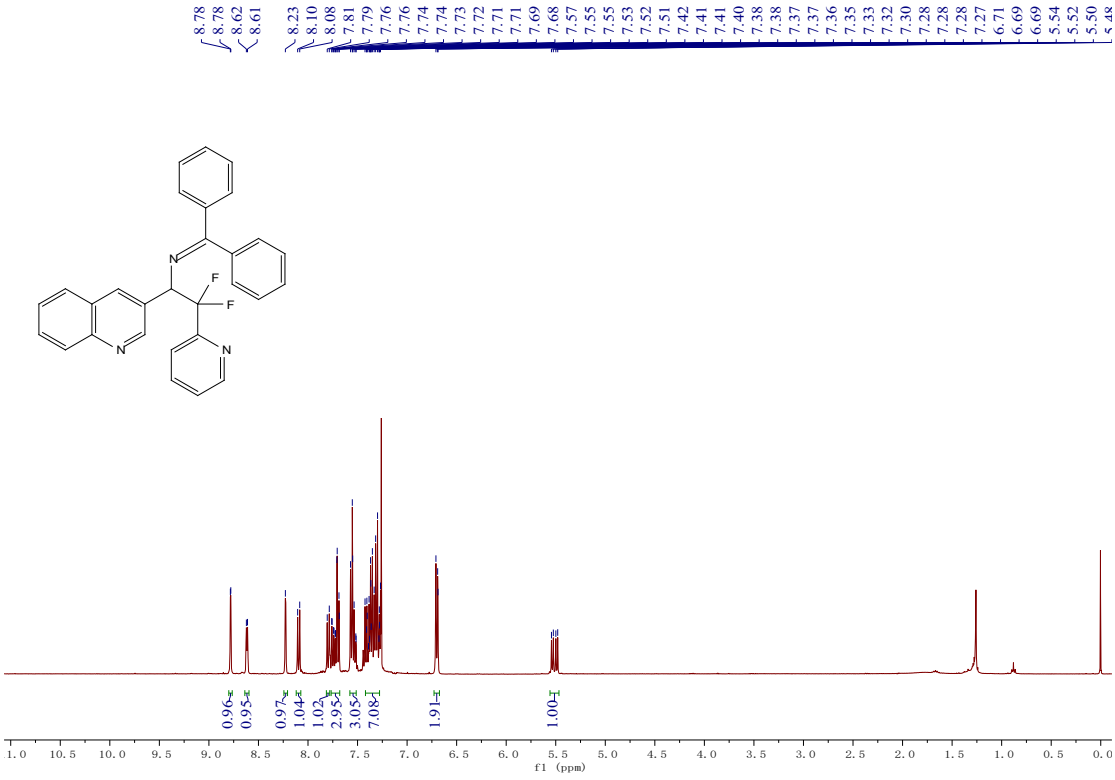
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **3m**



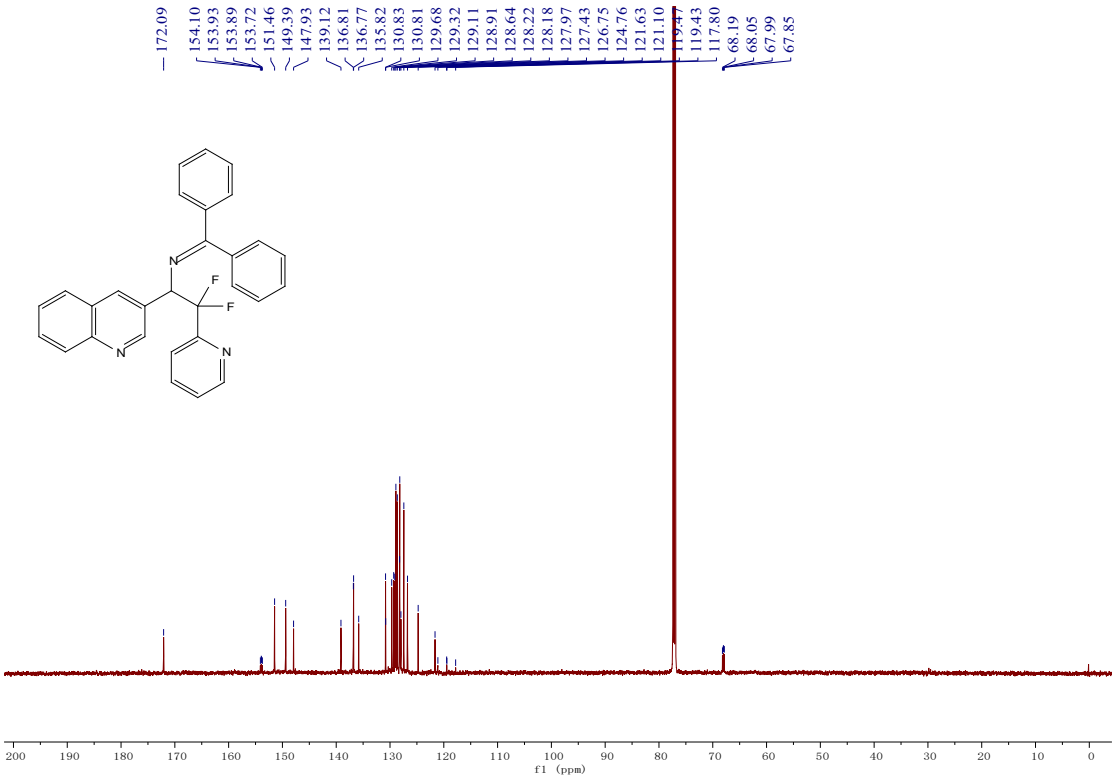
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3m**



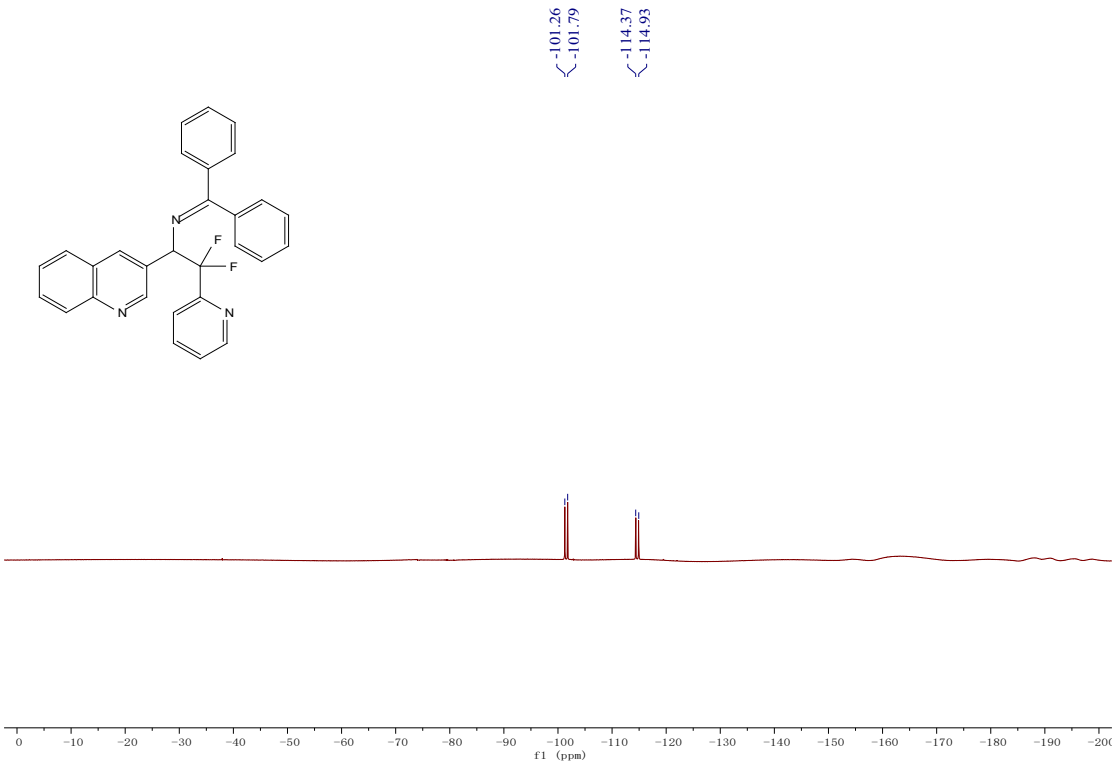
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3n**



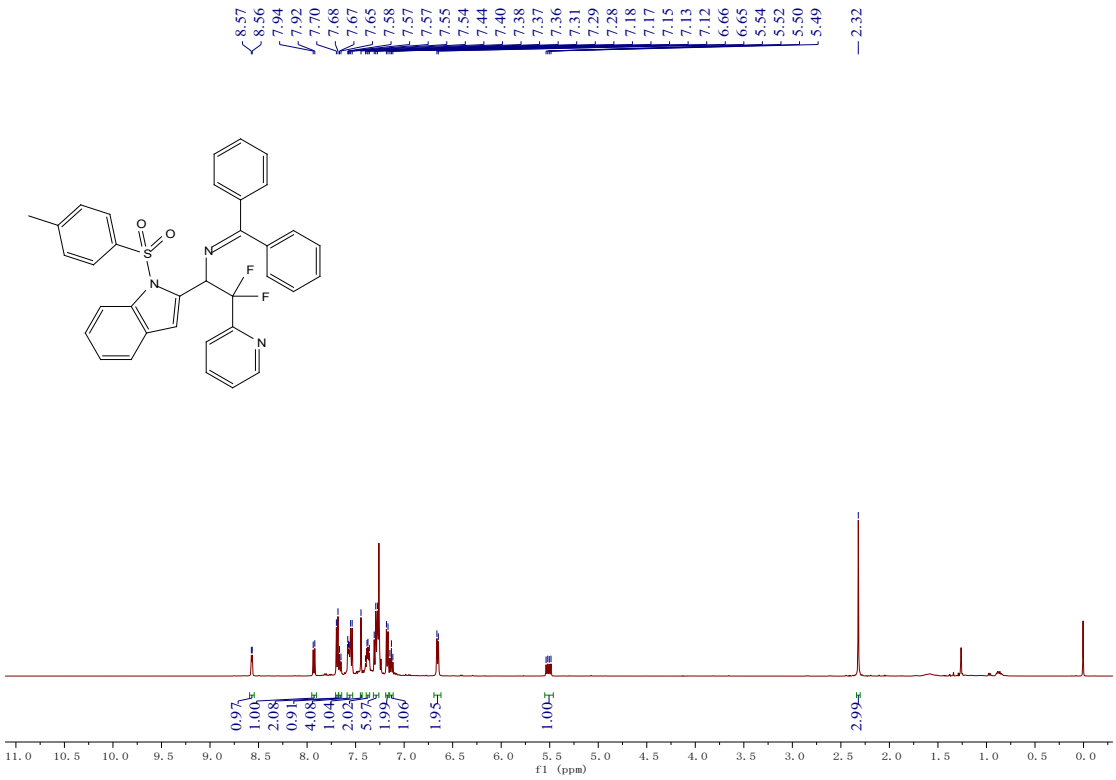
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **3n**



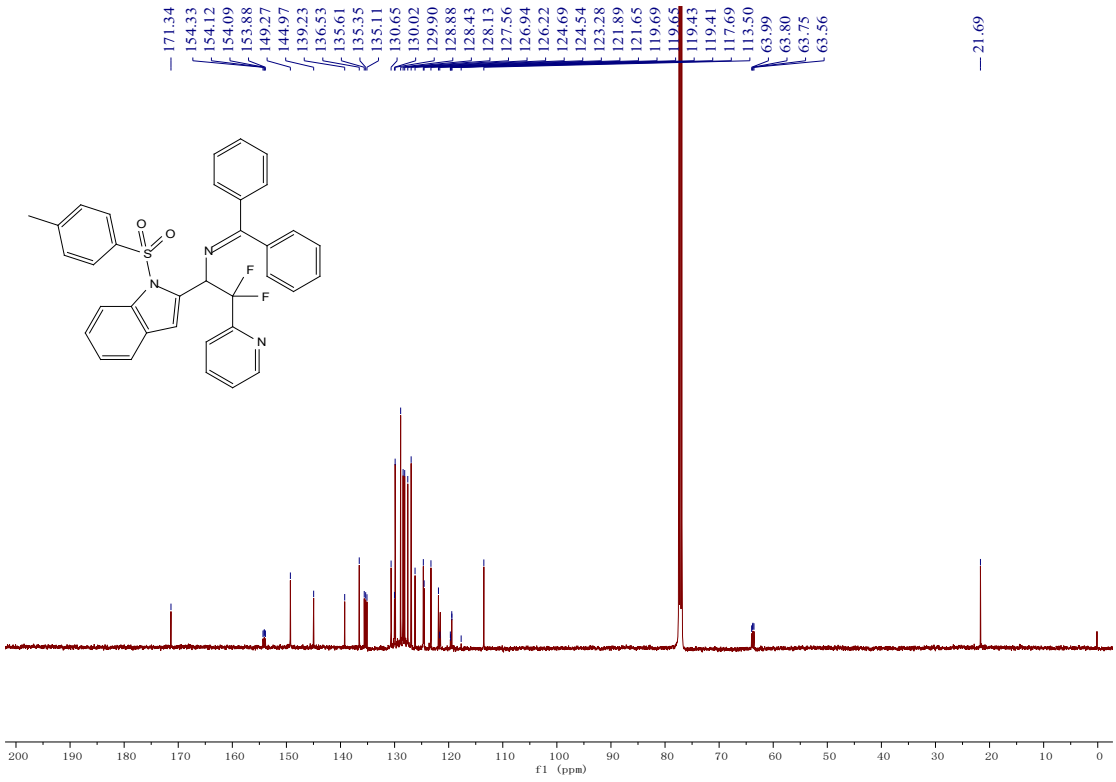
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **3n**



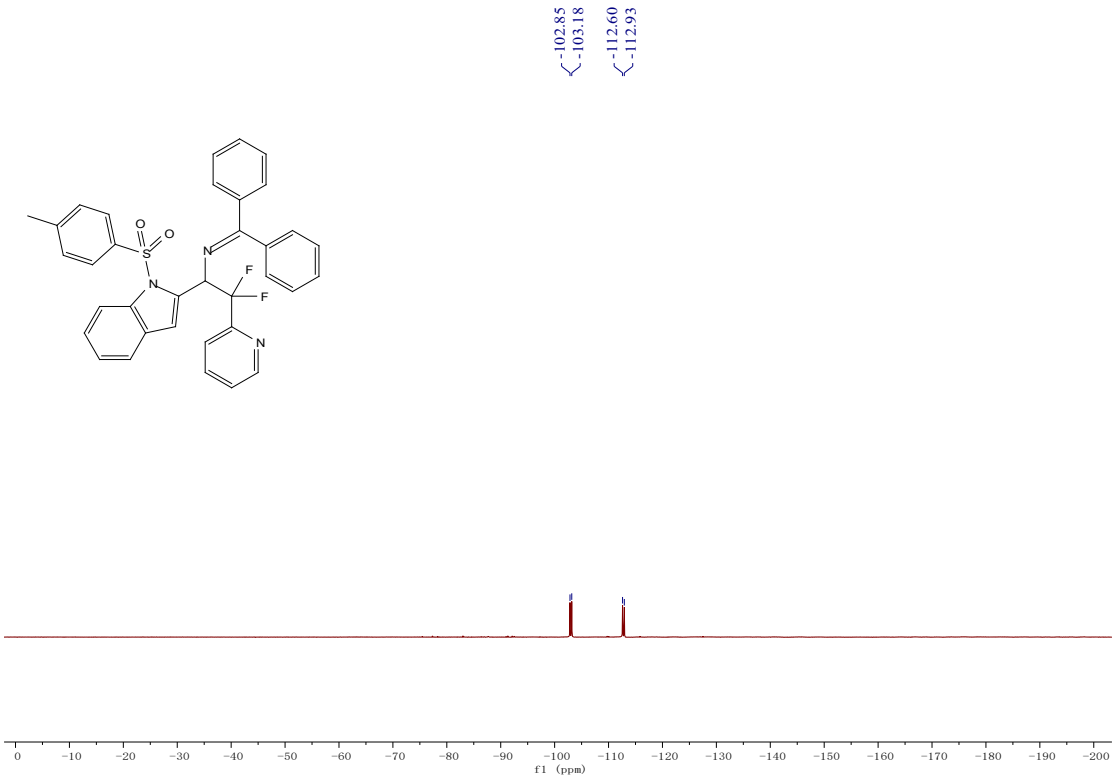
^{1}H NMR (500 MHz, $CDCl_3$) spectrum of **3o**



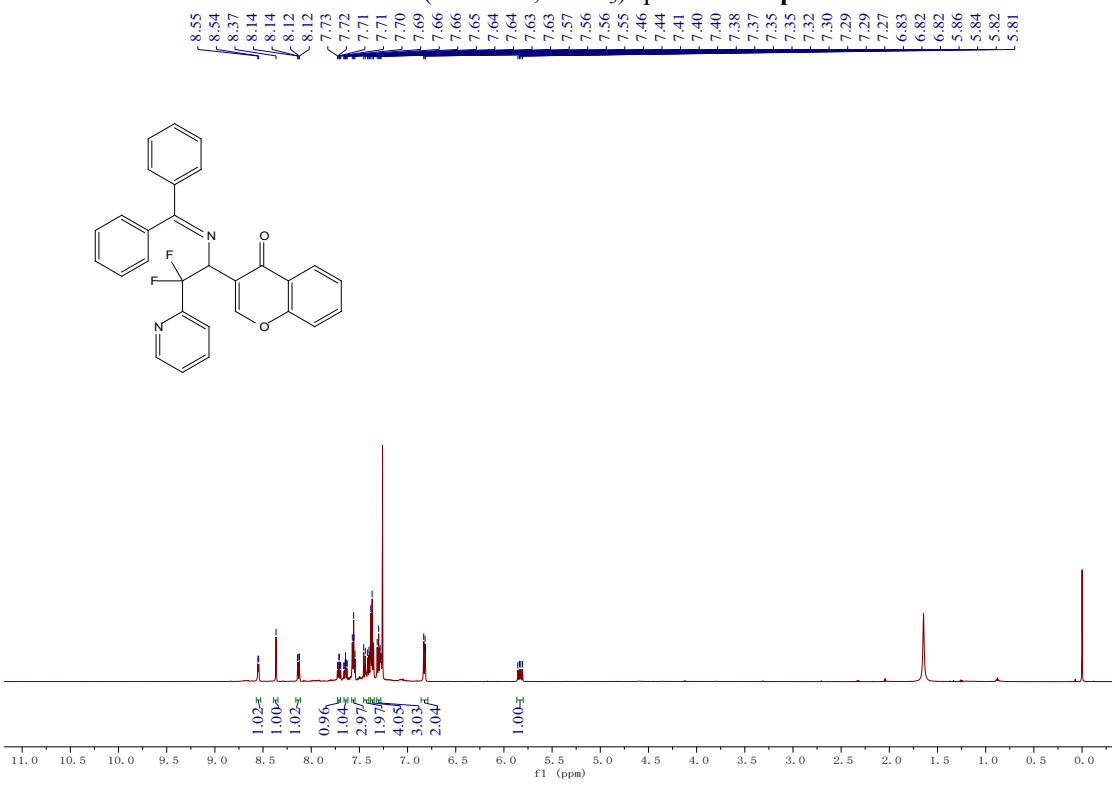
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3o**



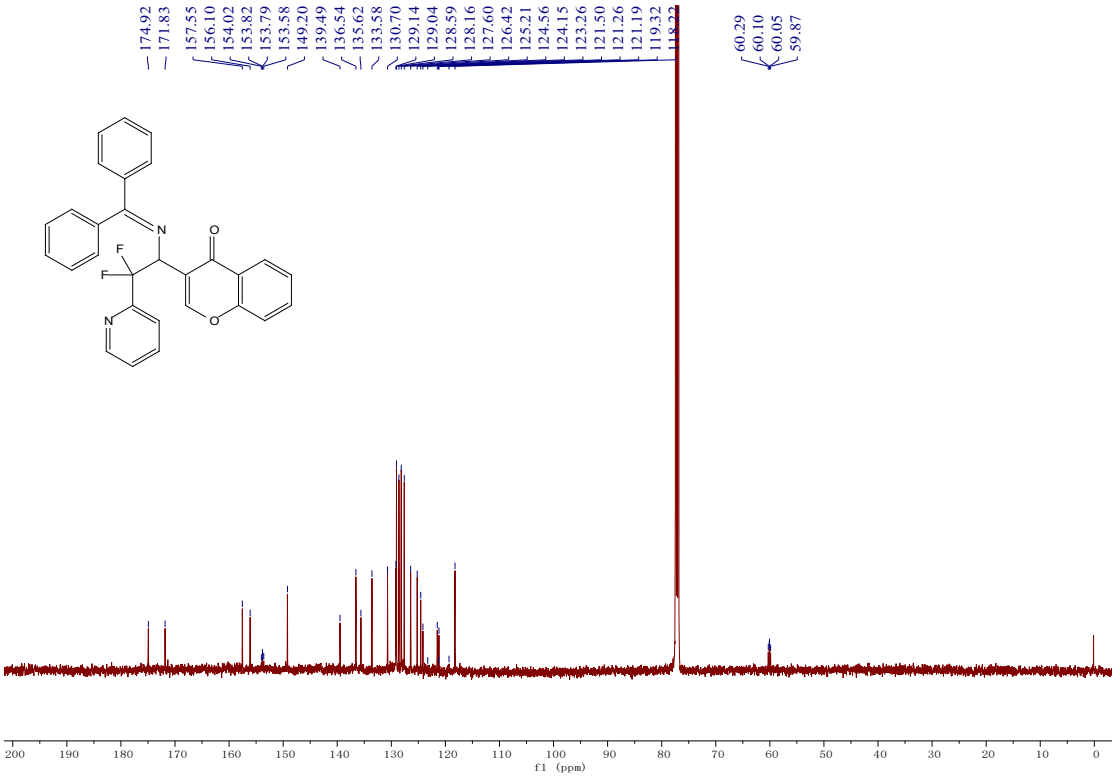
^{19}F NMR (753 MHz, $CDCl_3$) spectrum of **3o**



^{1}H NMR (500 MHz, $CDCl_3$) spectrum of **3p**

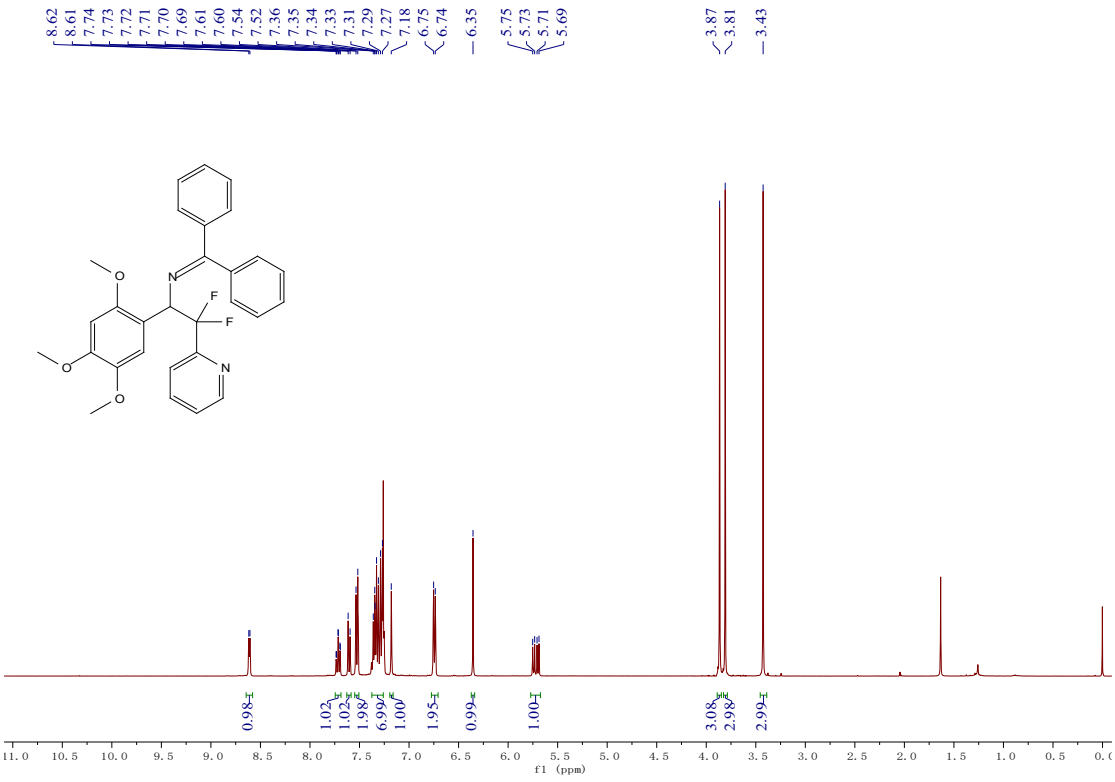


^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3p**

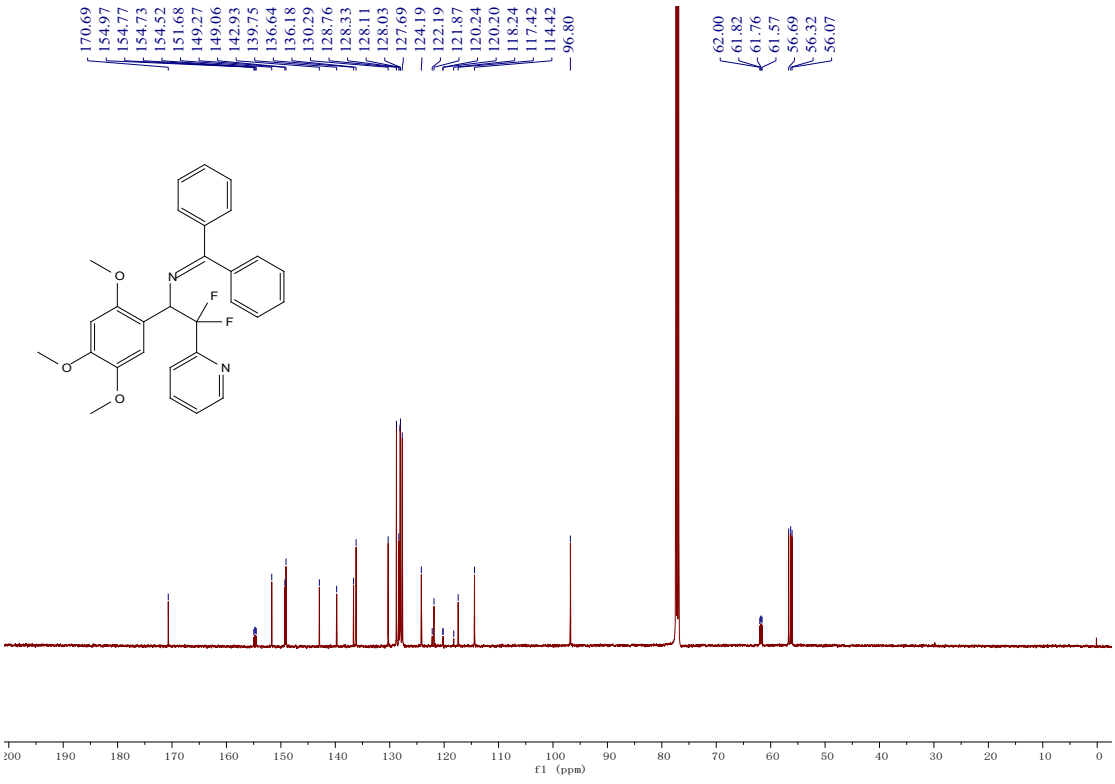


^{19}F NMR (753 MHz, $CDCl_3$) spectrum of **3p**

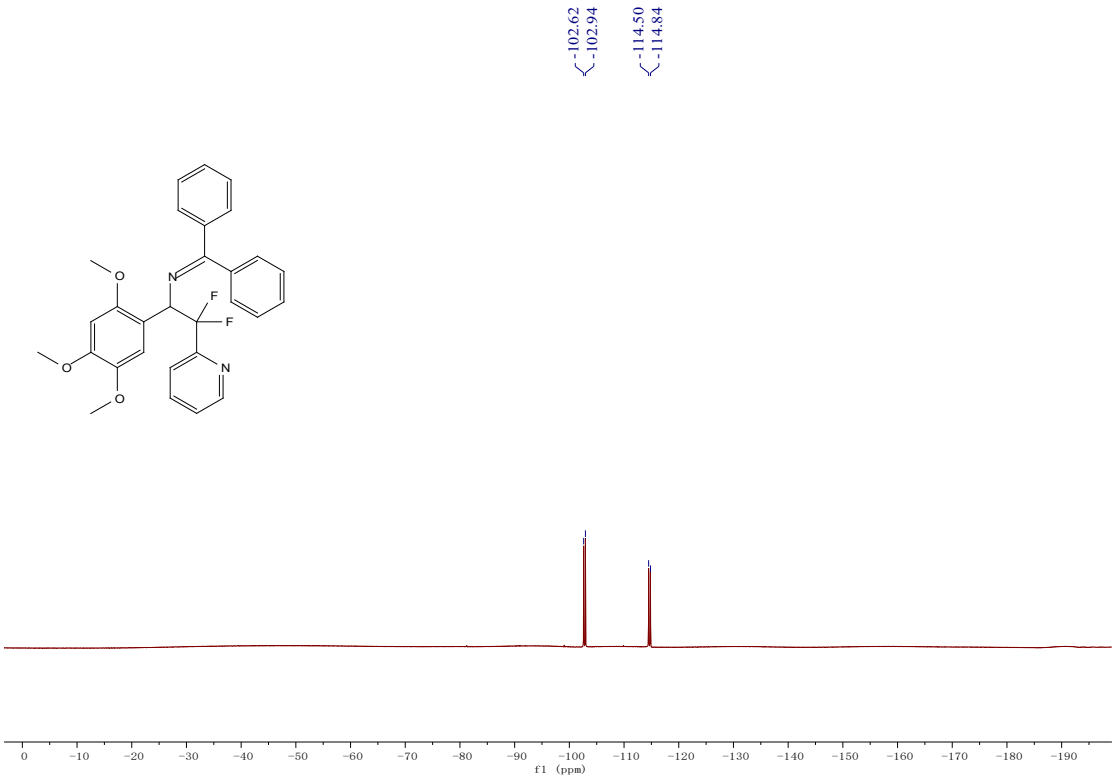
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **3q**



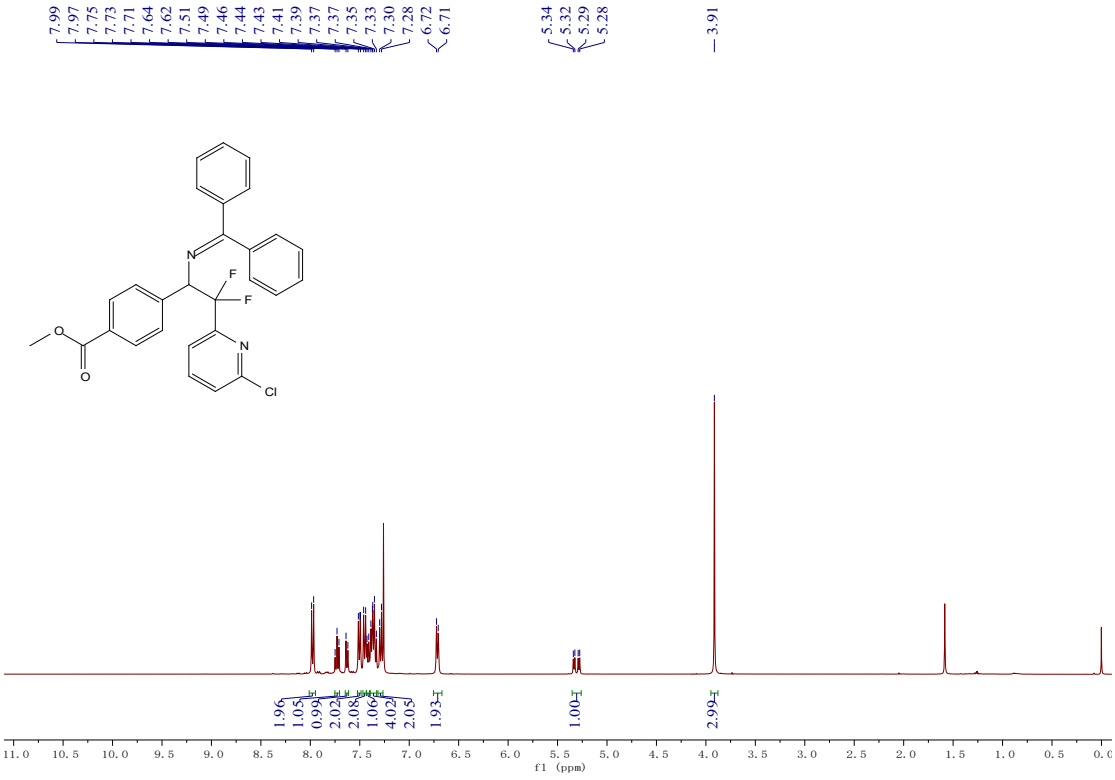
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **3q**



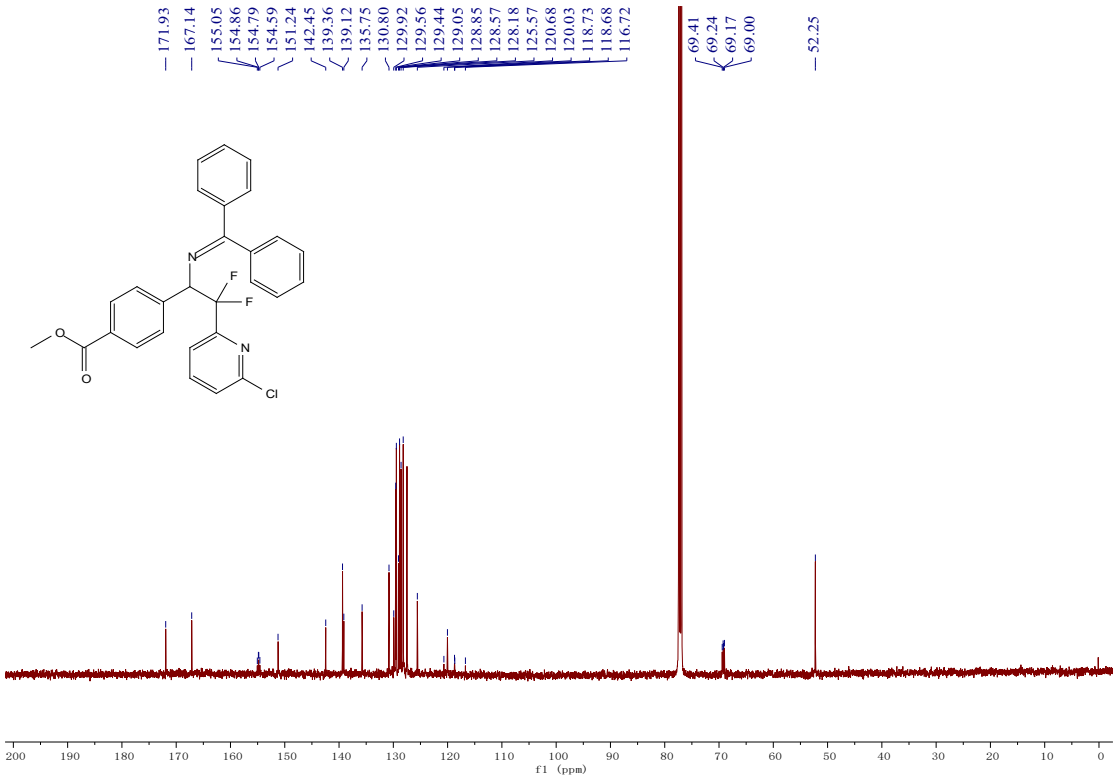
^{19}F NMR (753 MHz, $CDCl_3$) spectrum of **3q**



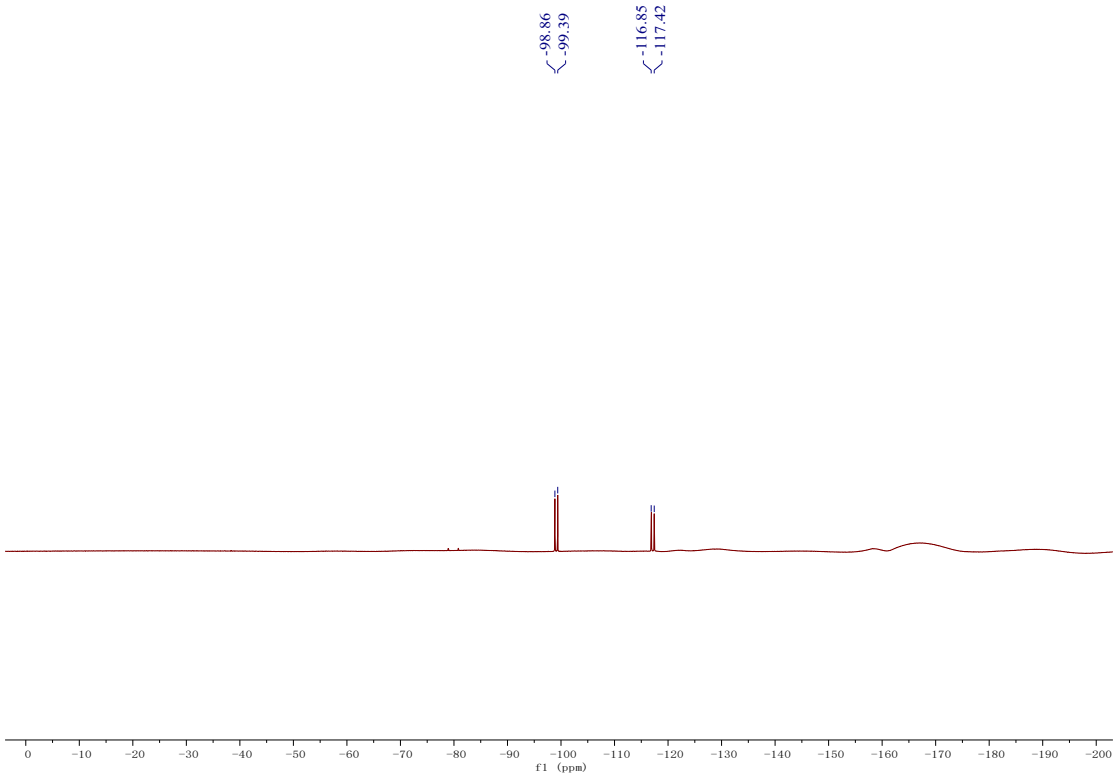
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4a**



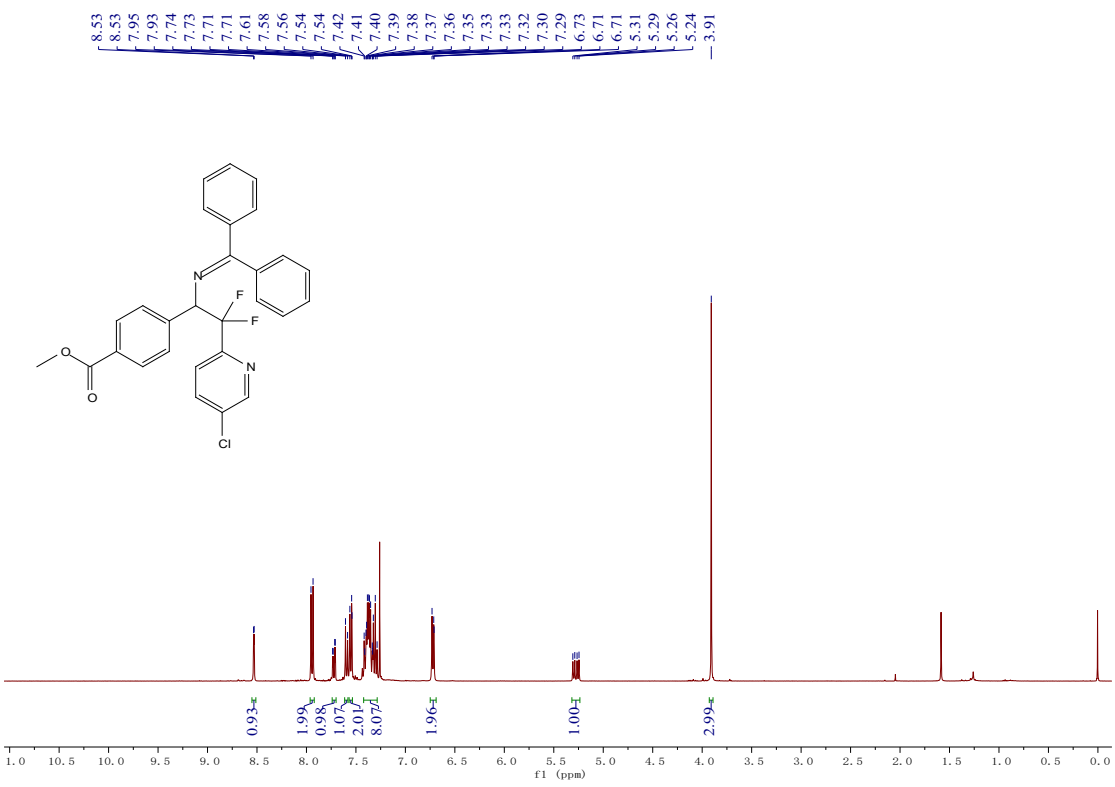
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4a**



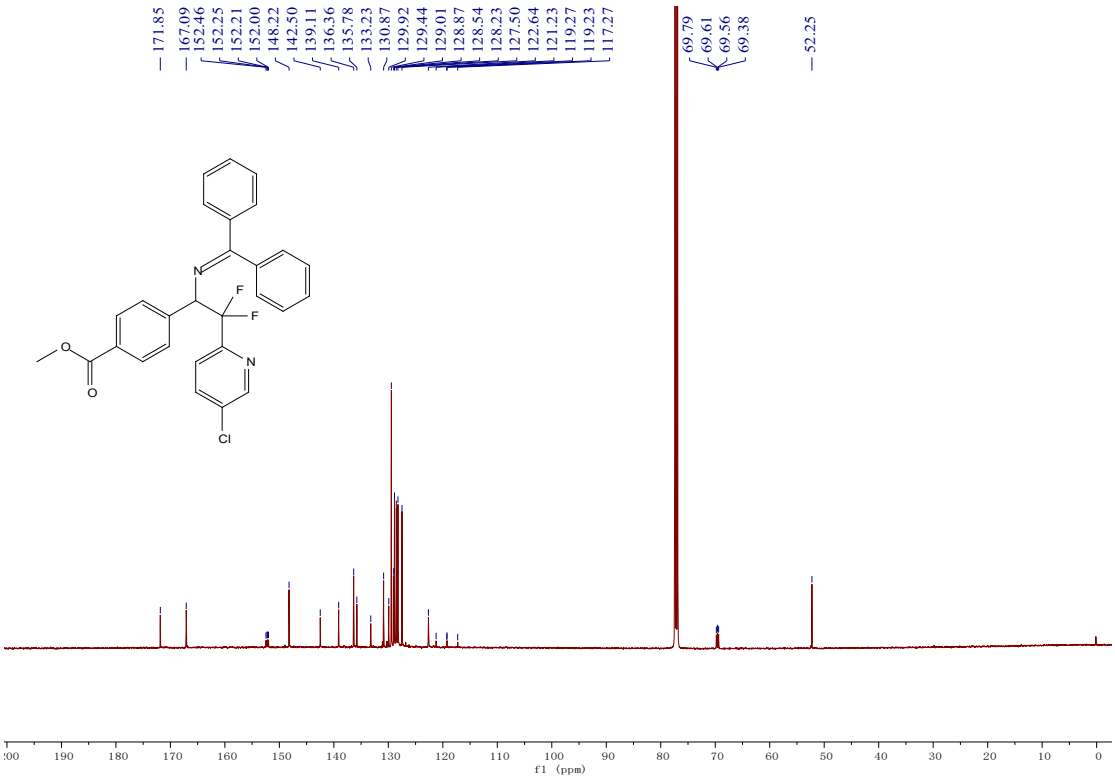
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4a**



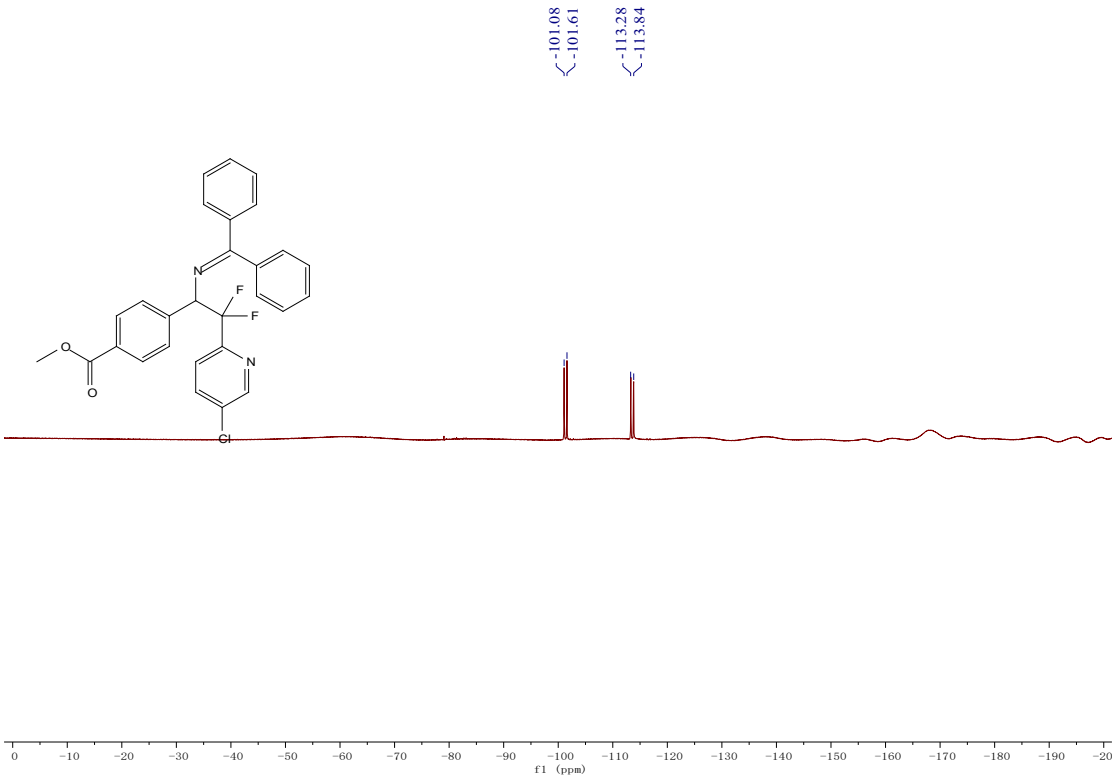
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4b**



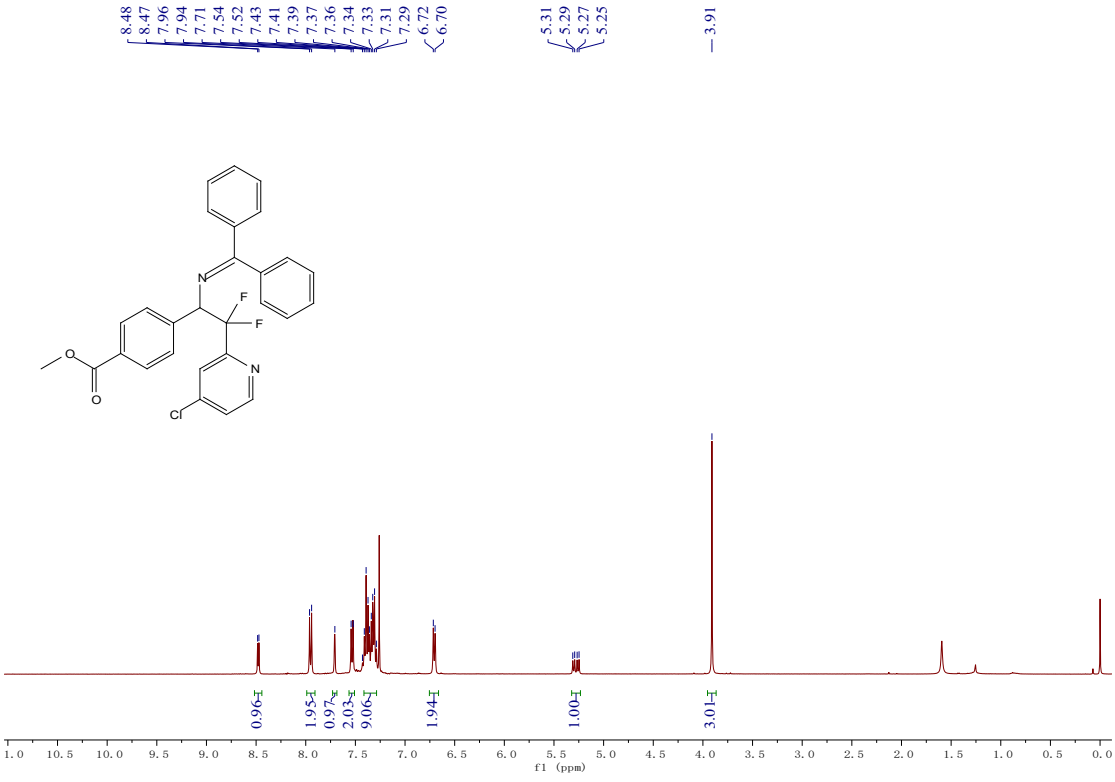
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4b**



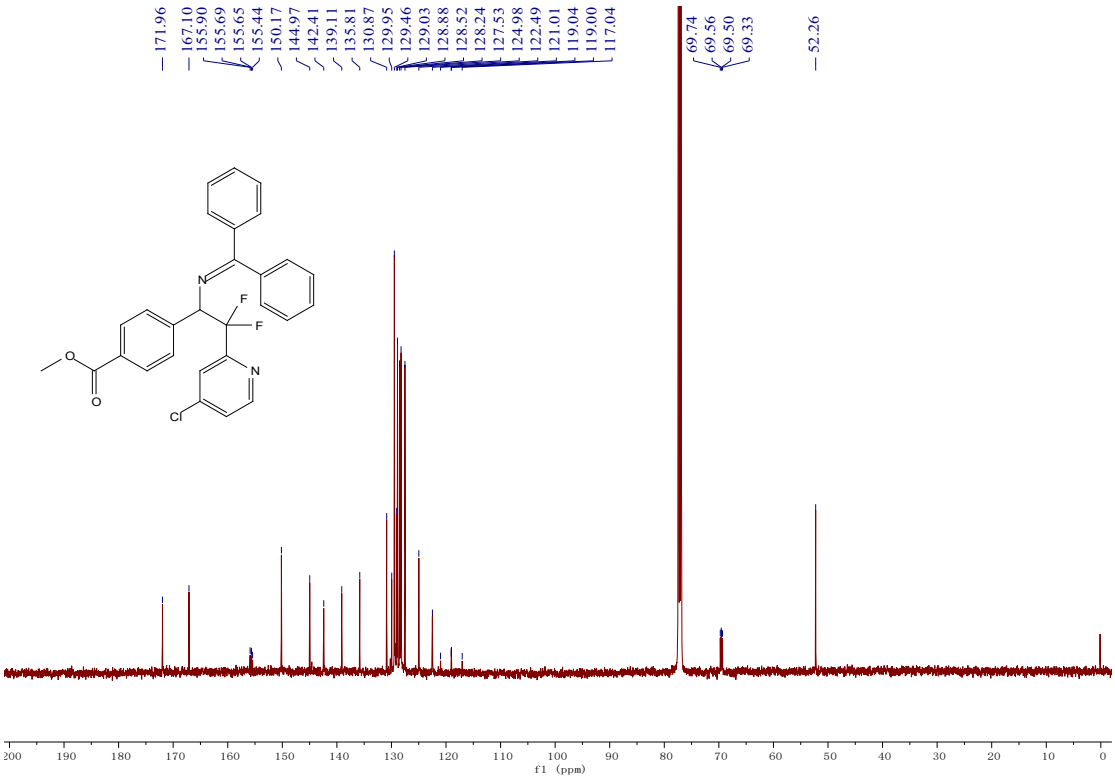
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4b**



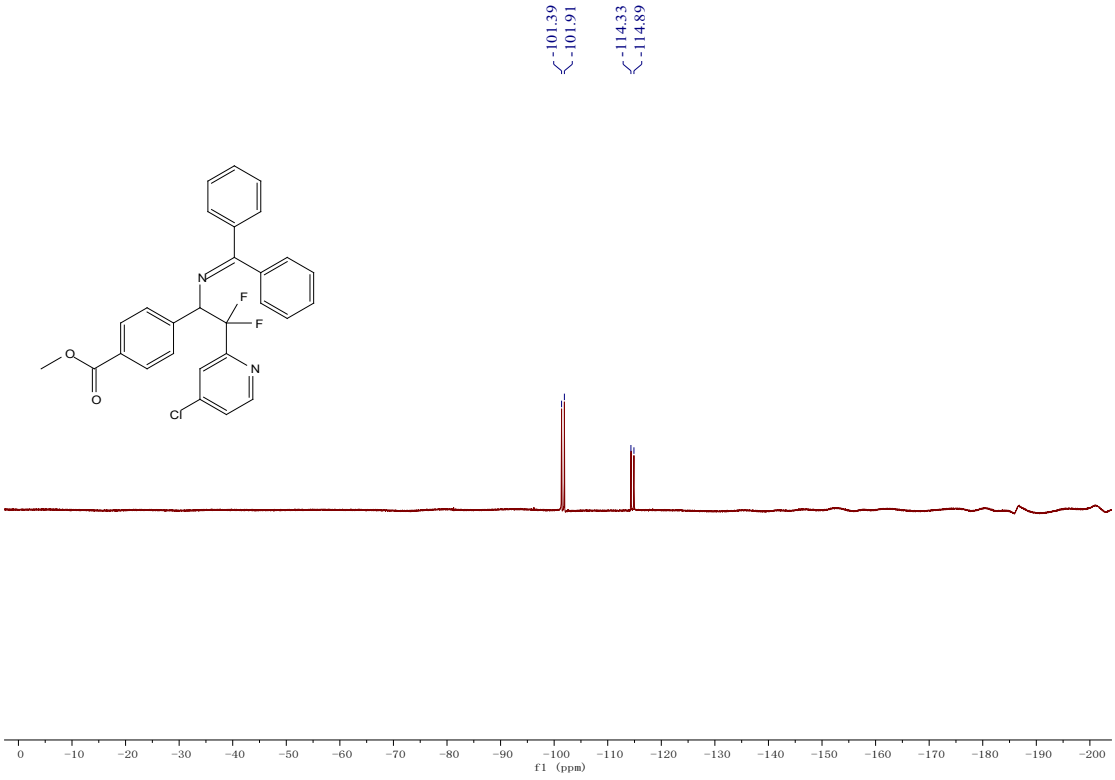
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4c**



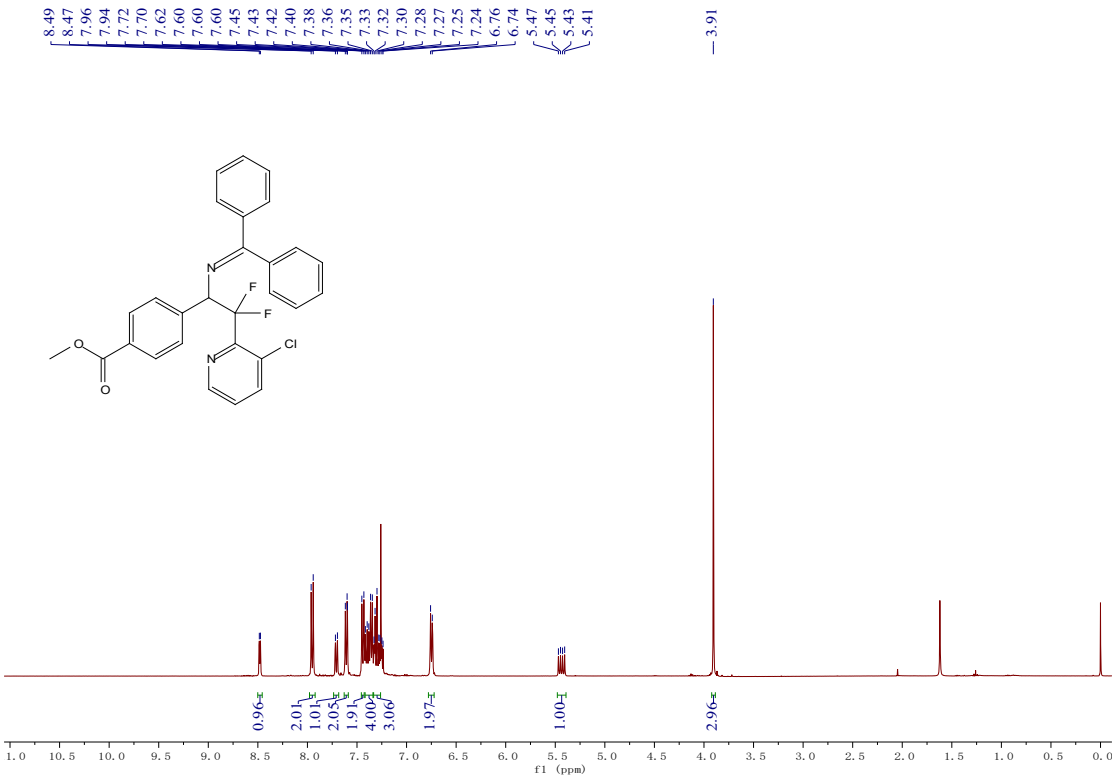
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4c**



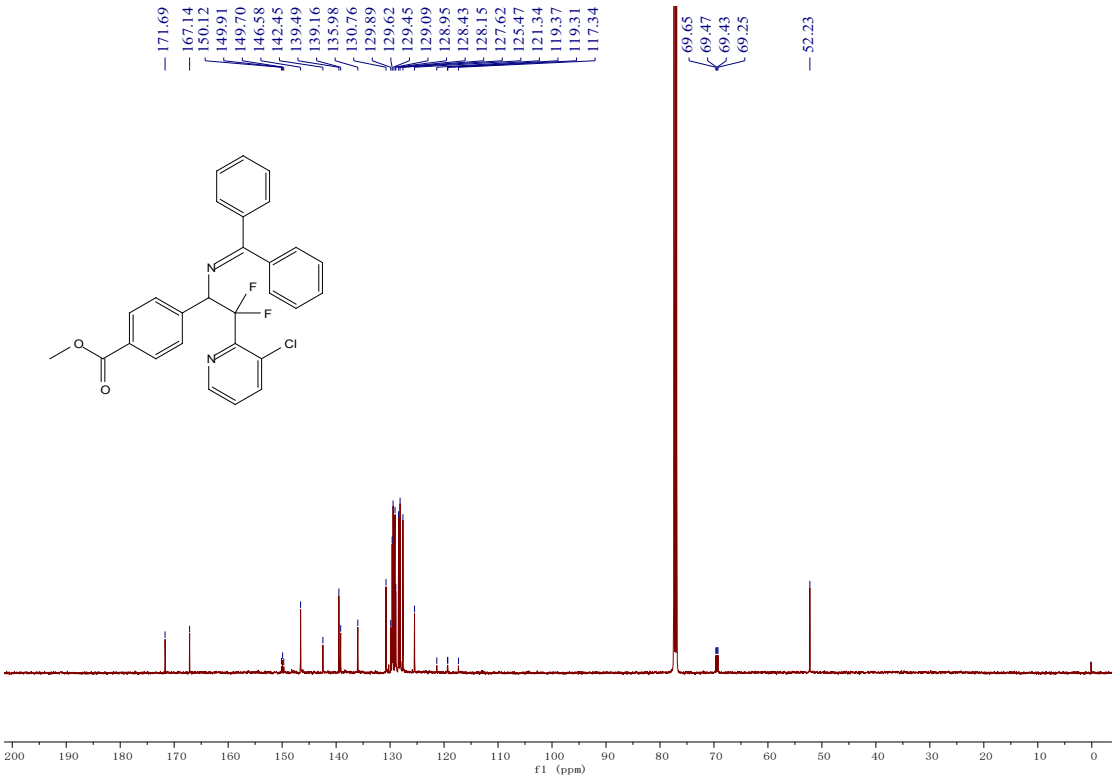
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4c**



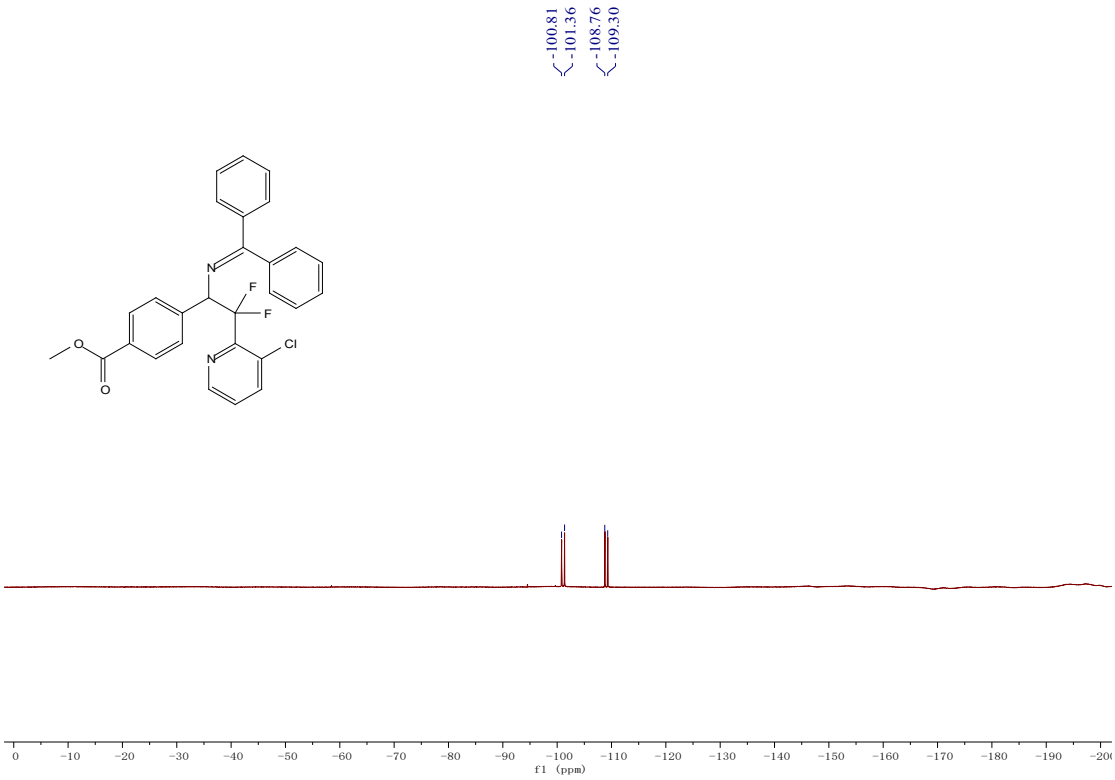
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4d**



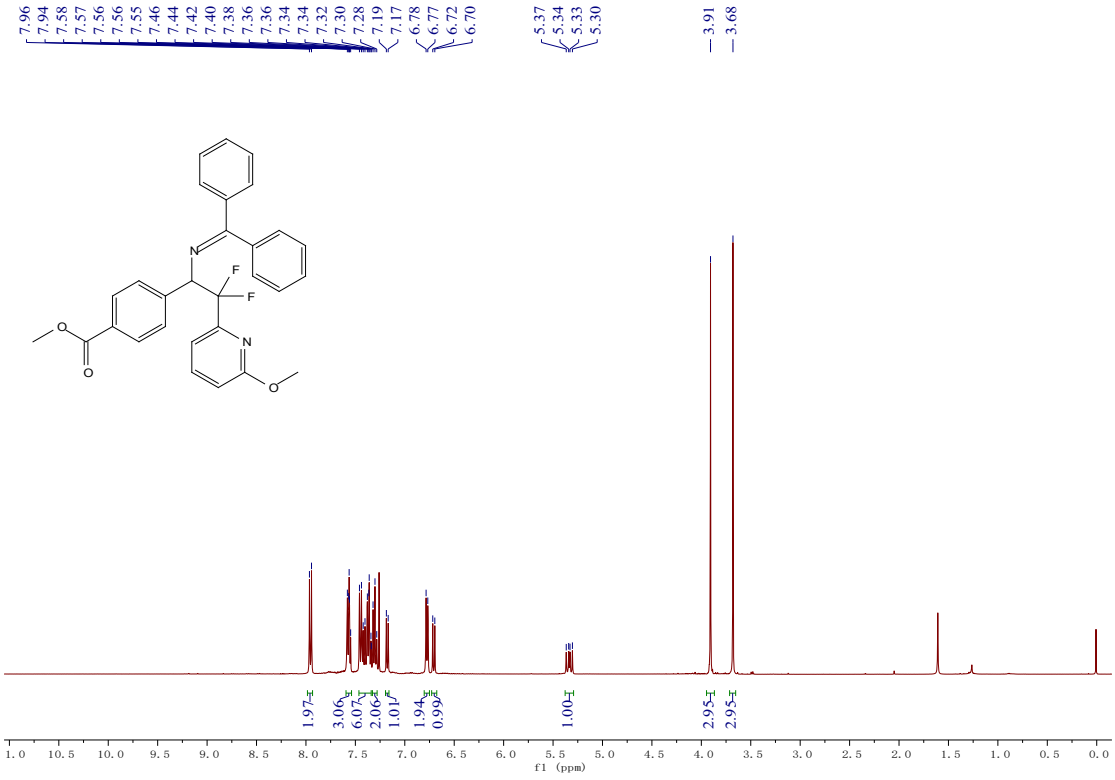
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4d**



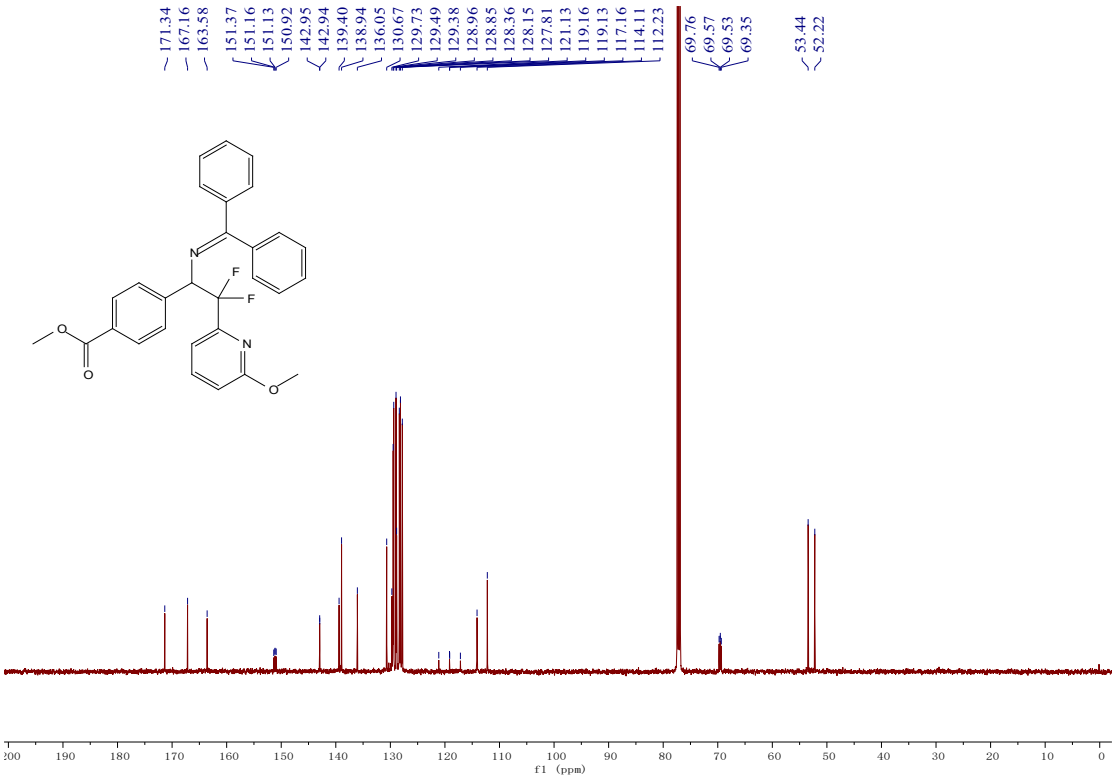
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4d**



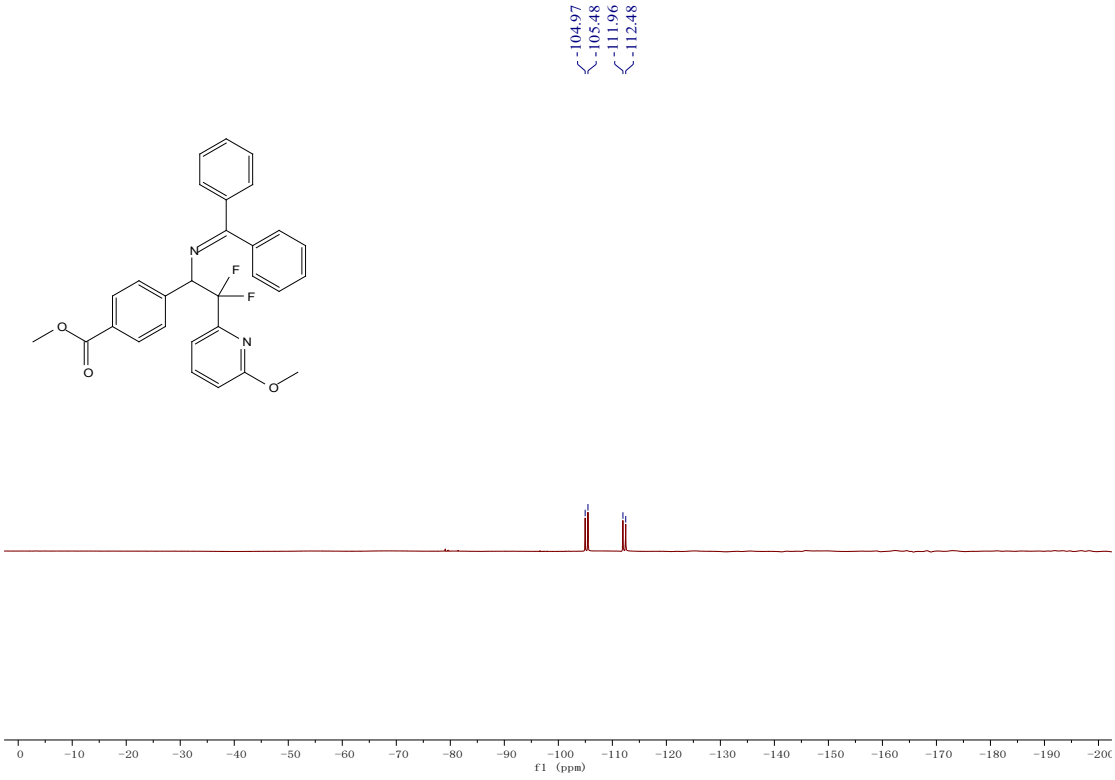
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4e**



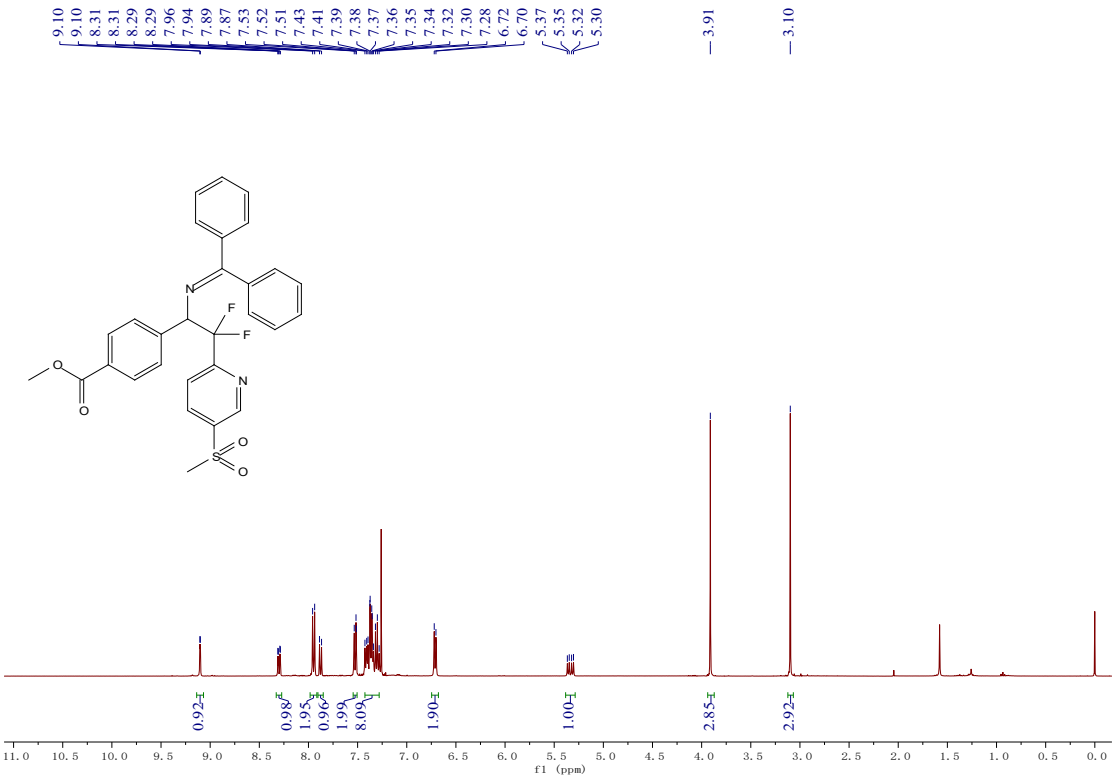
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4e**



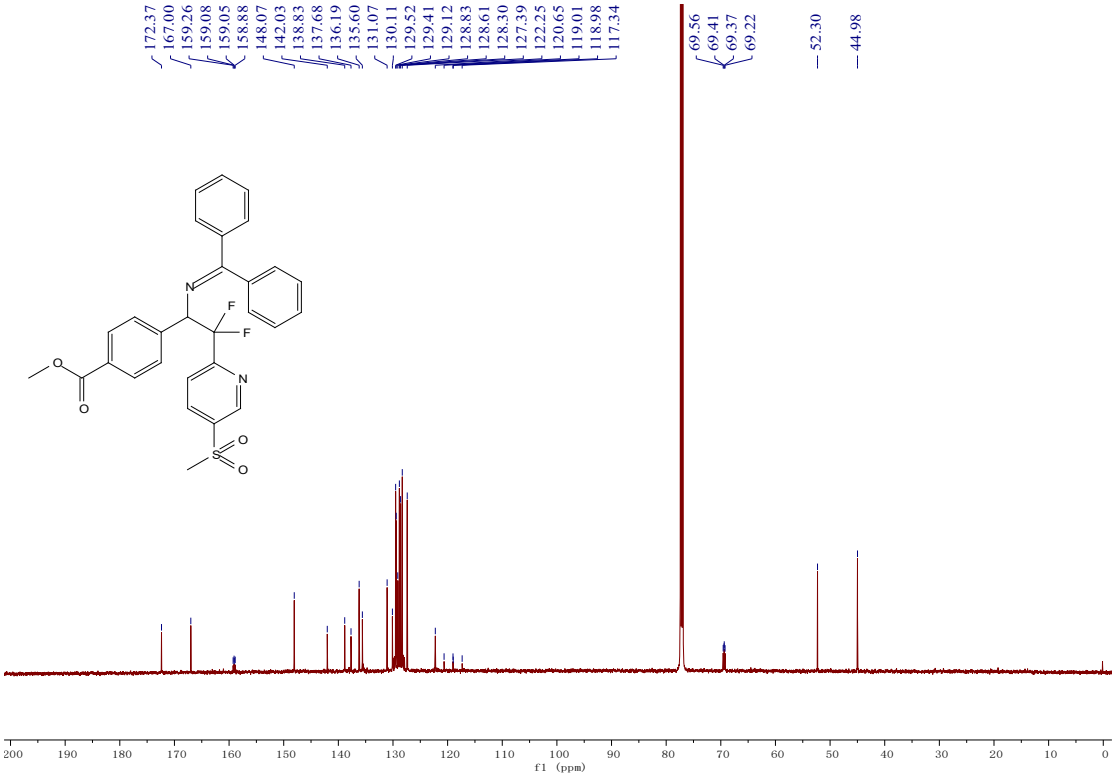
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4e**



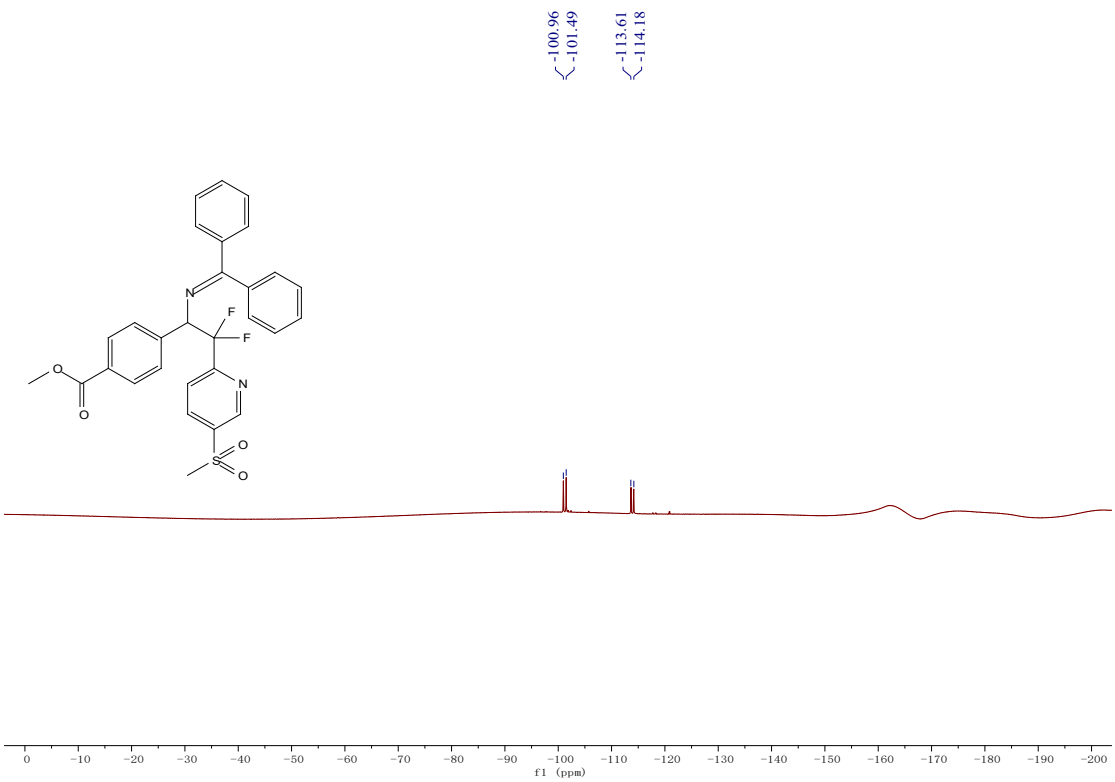
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4f**



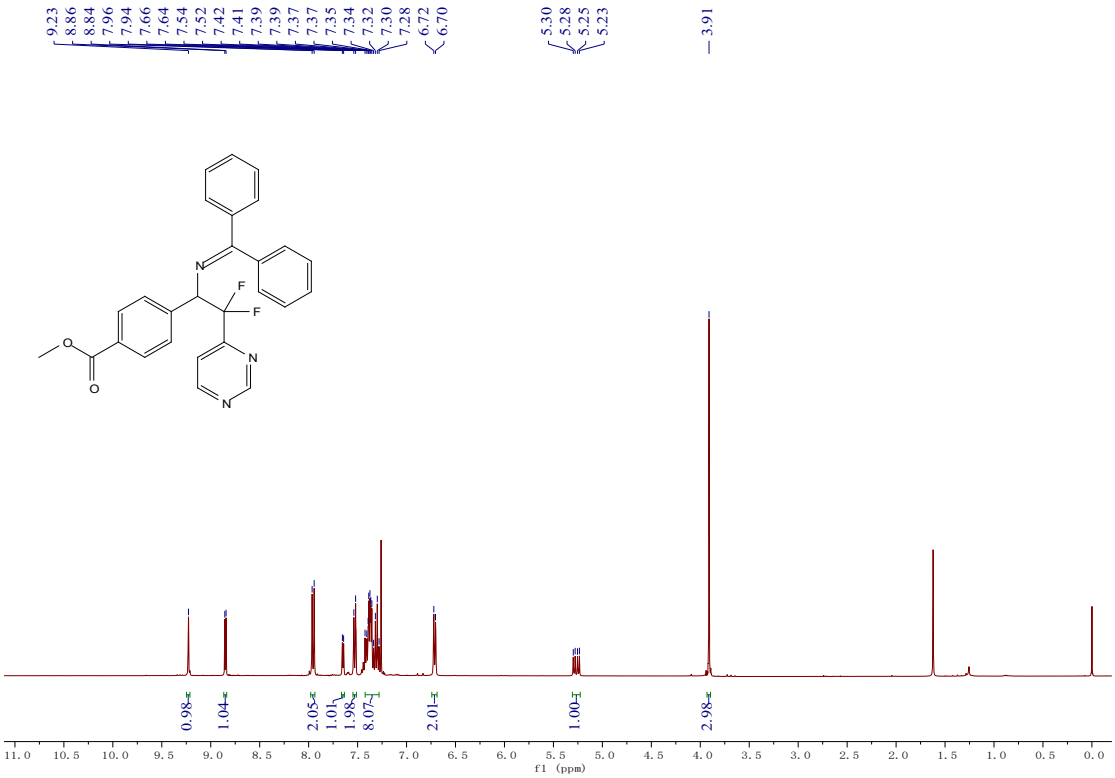
^{13}C NMR (151 MHz, $CDCl_3$) spectrum of **4f**



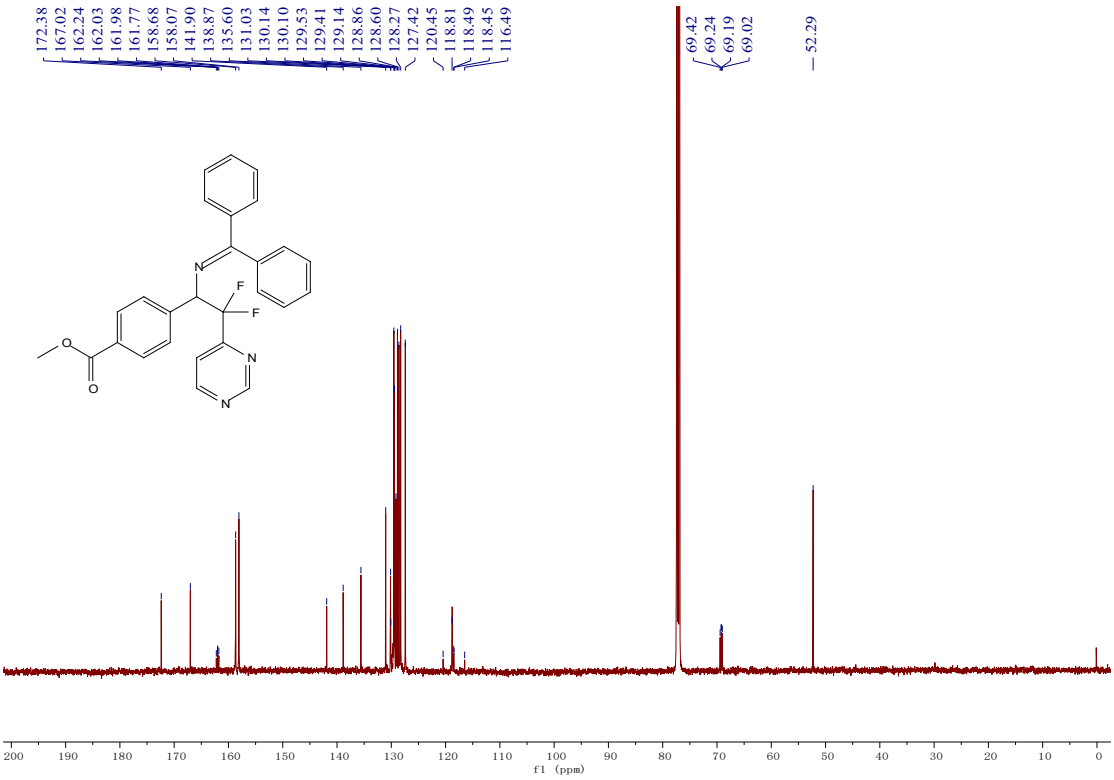
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4f**



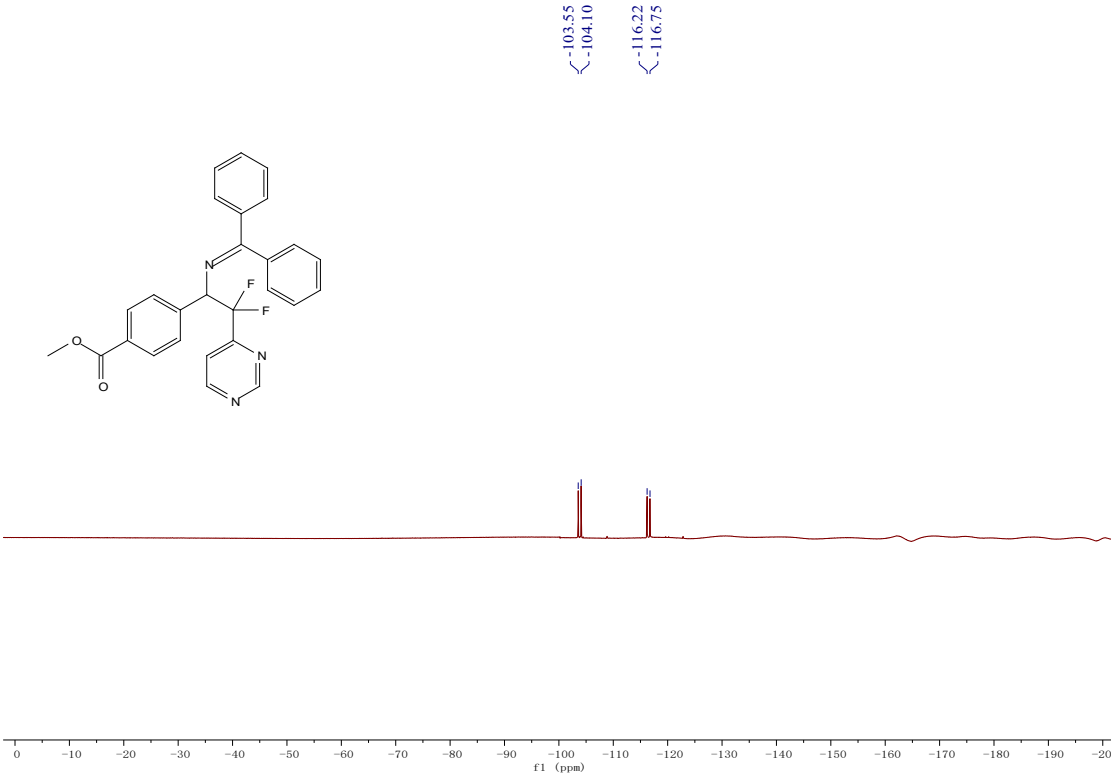
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4g**



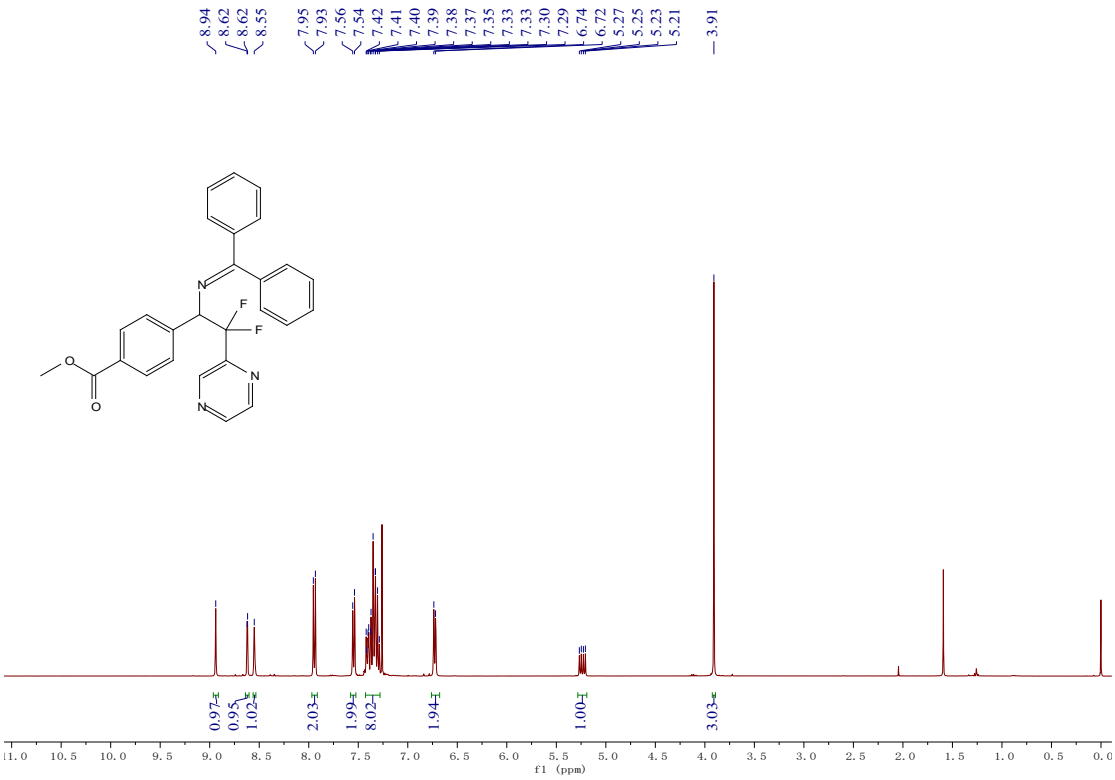
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4g**



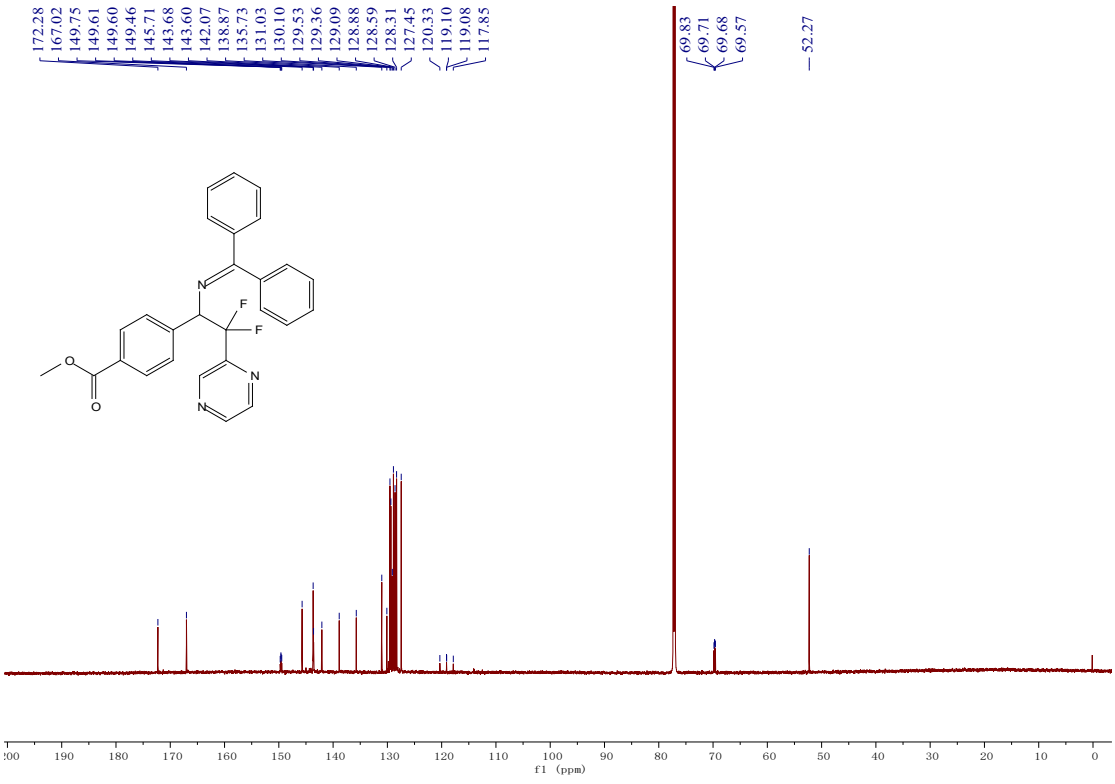
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4g**



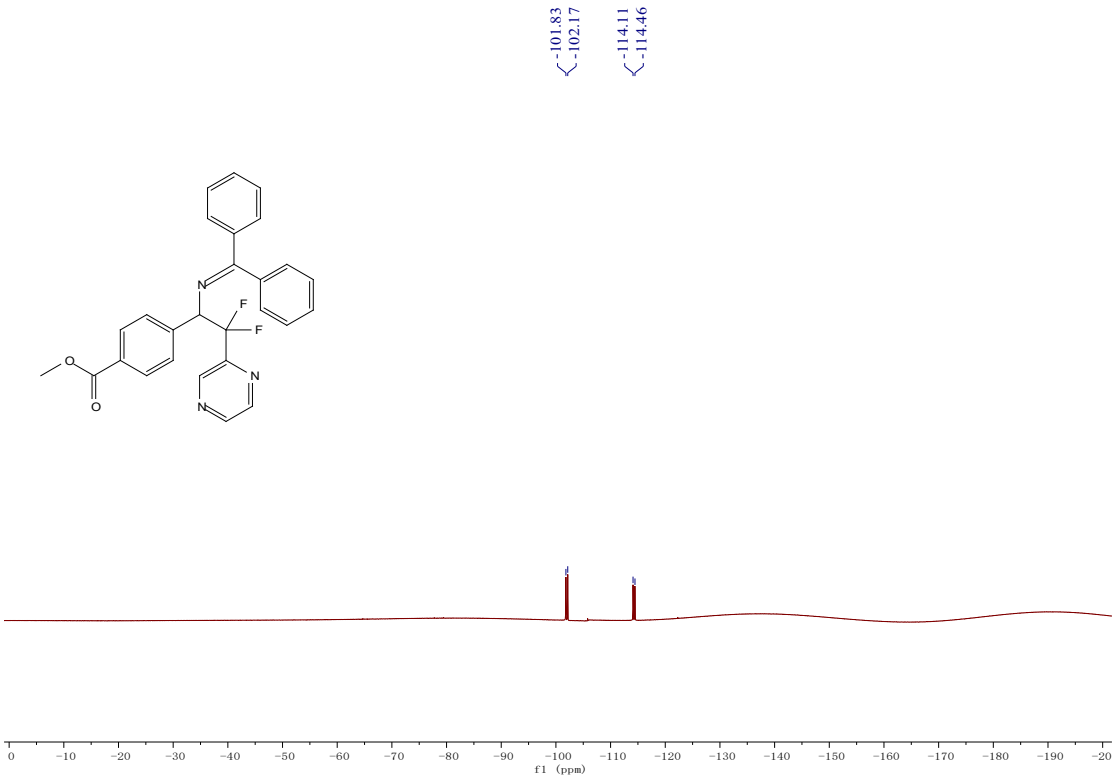
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4h**



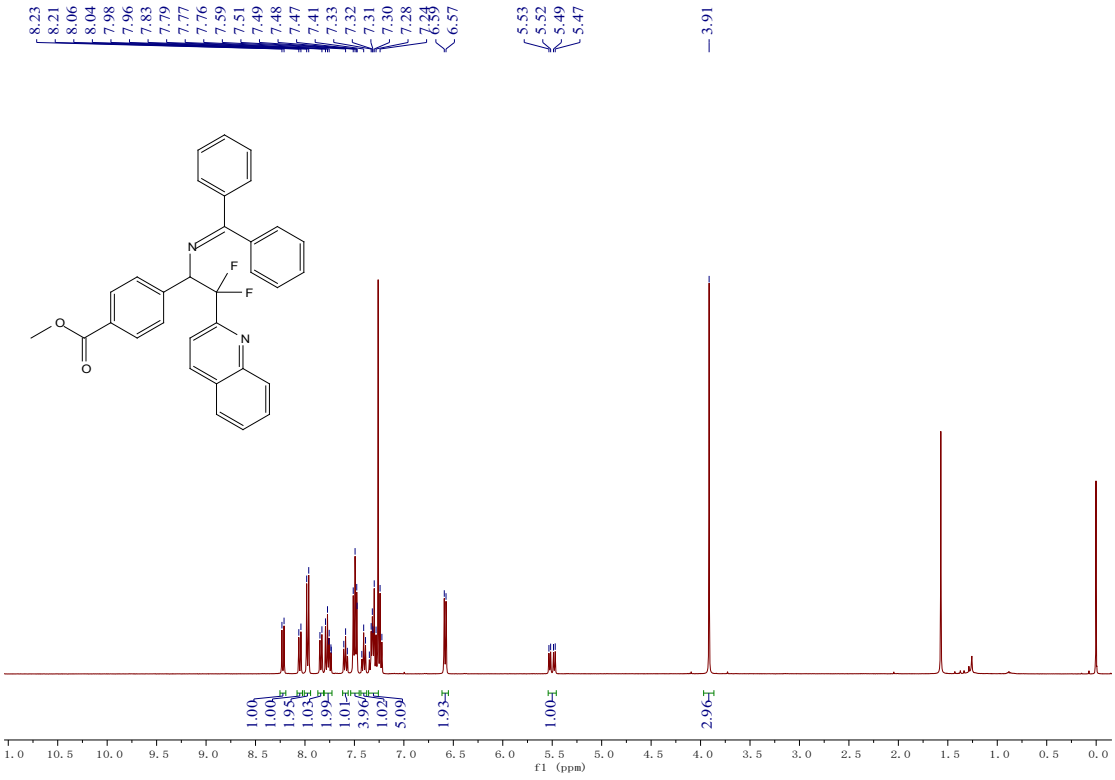
^{13}C NMR (201 MHz, $CDCl_3$) spectrum of **4h**



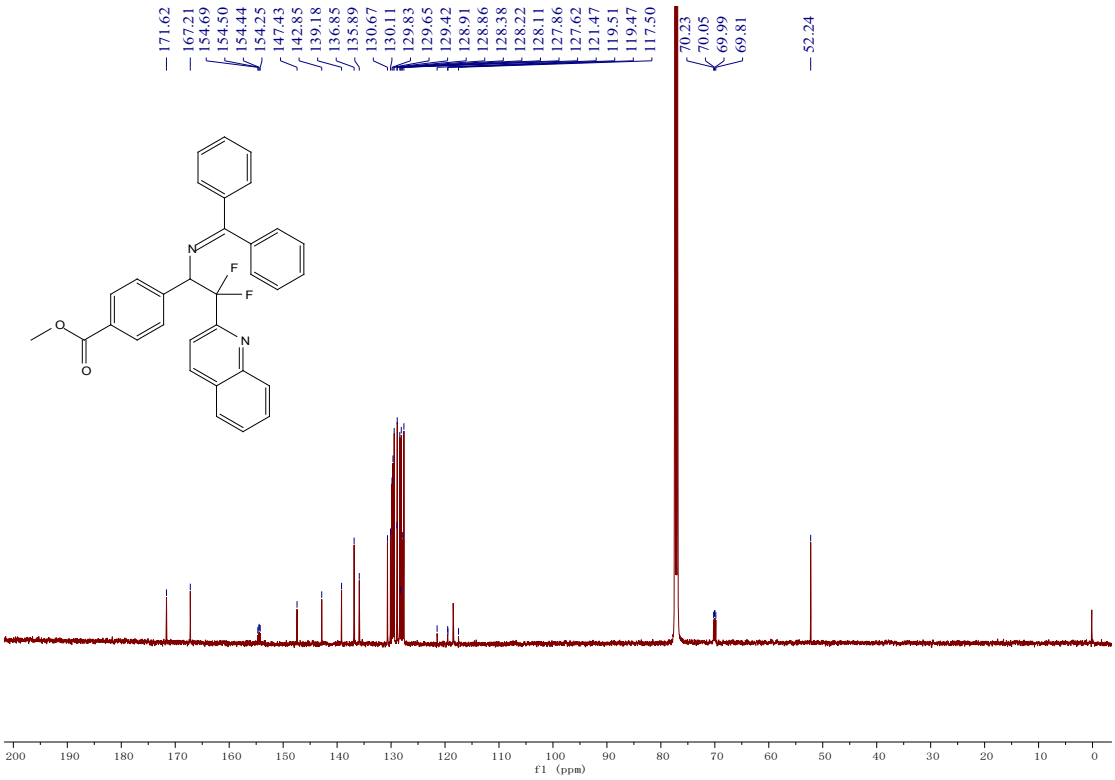
^{19}F NMR (753 MHz, $CDCl_3$) spectrum of **4h**



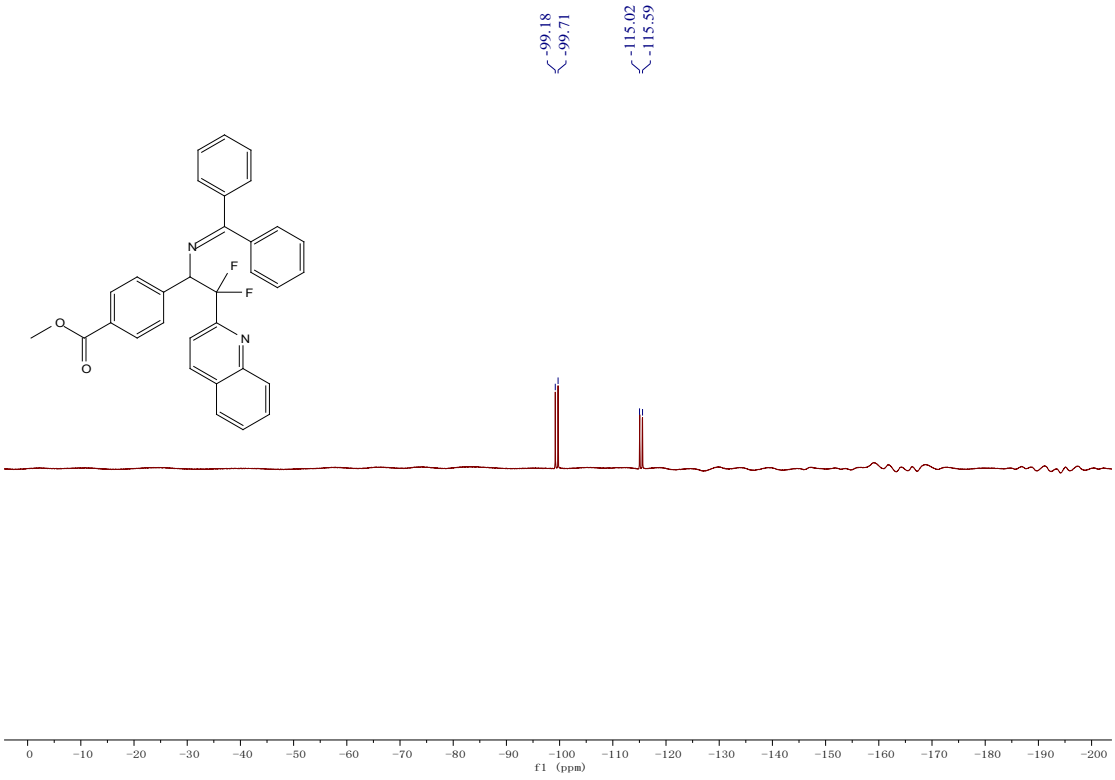
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4i**



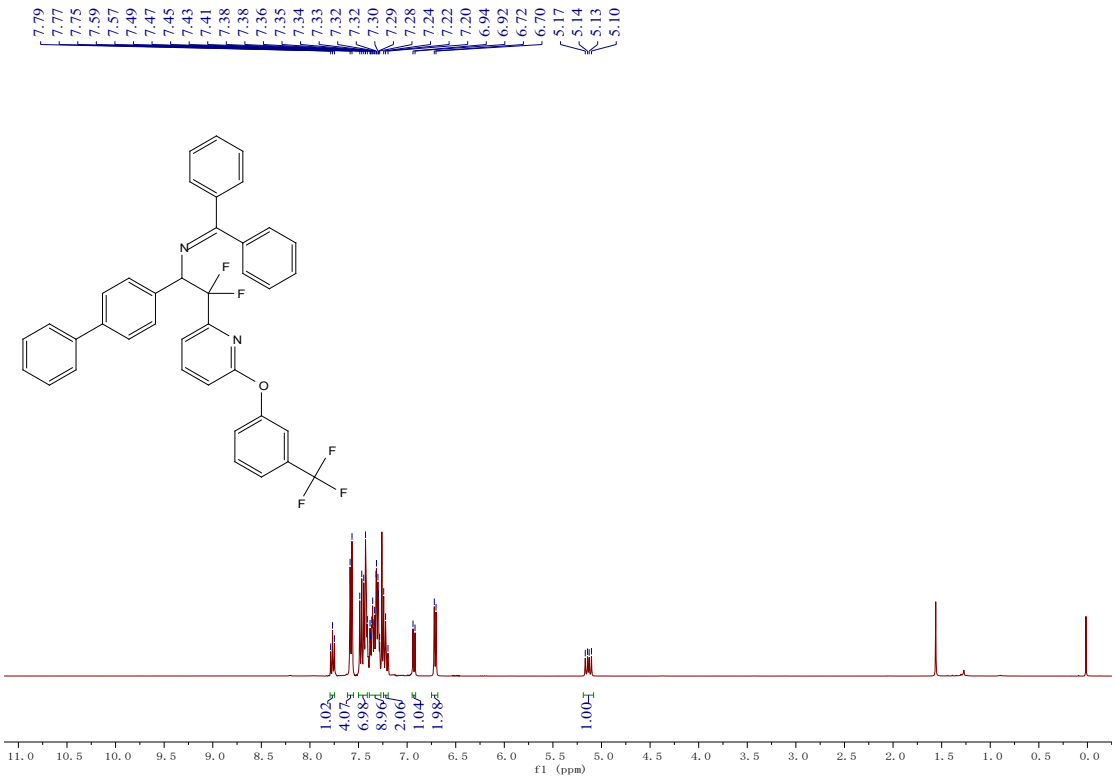
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4i**



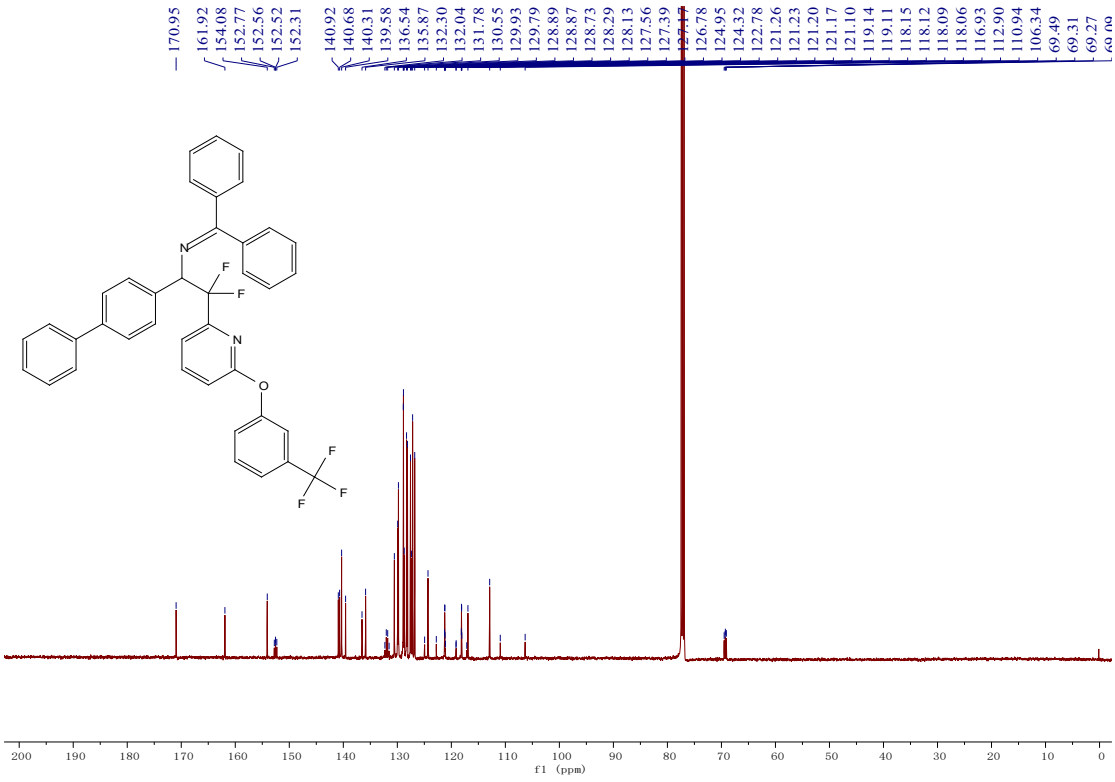
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4i**



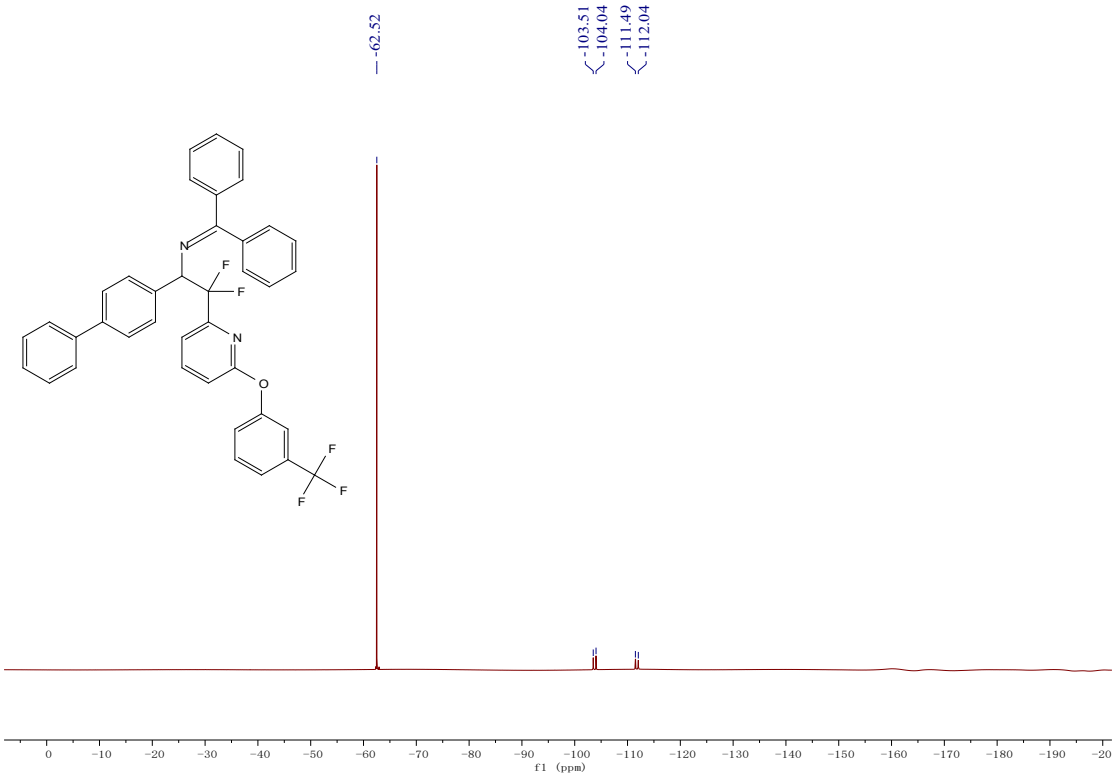
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4j**



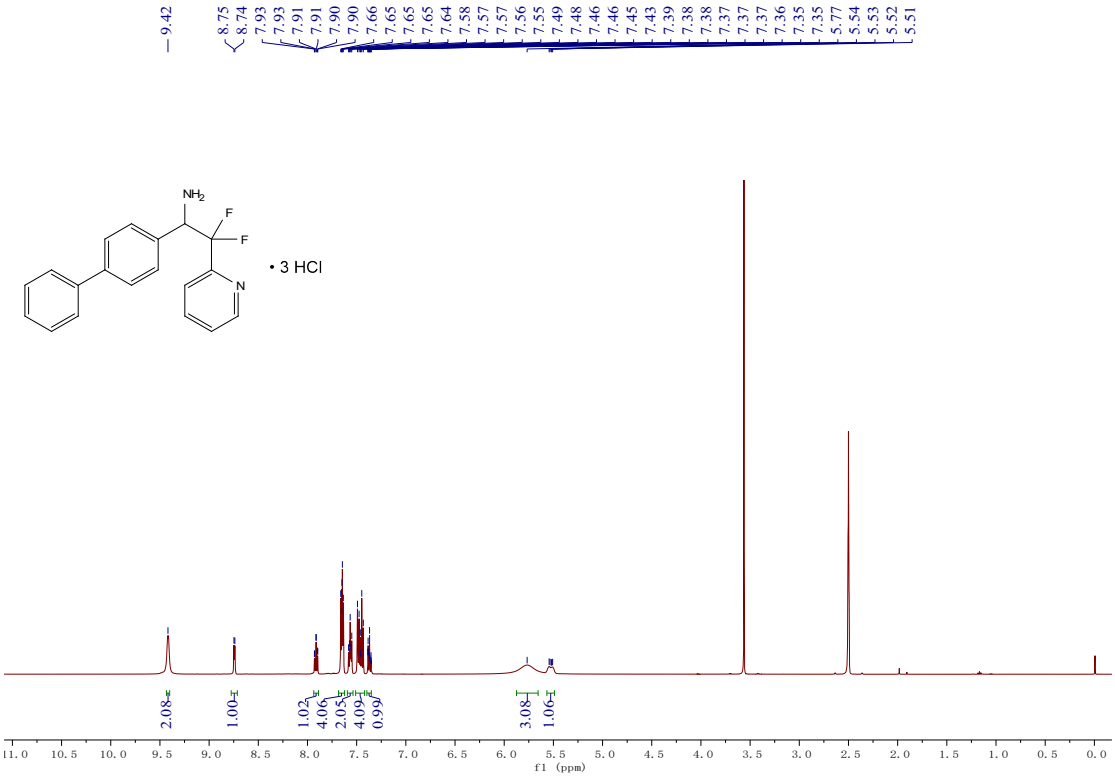
^{13}C NMR (126 MHz, $CDCl_3$) spectrum of **4j**



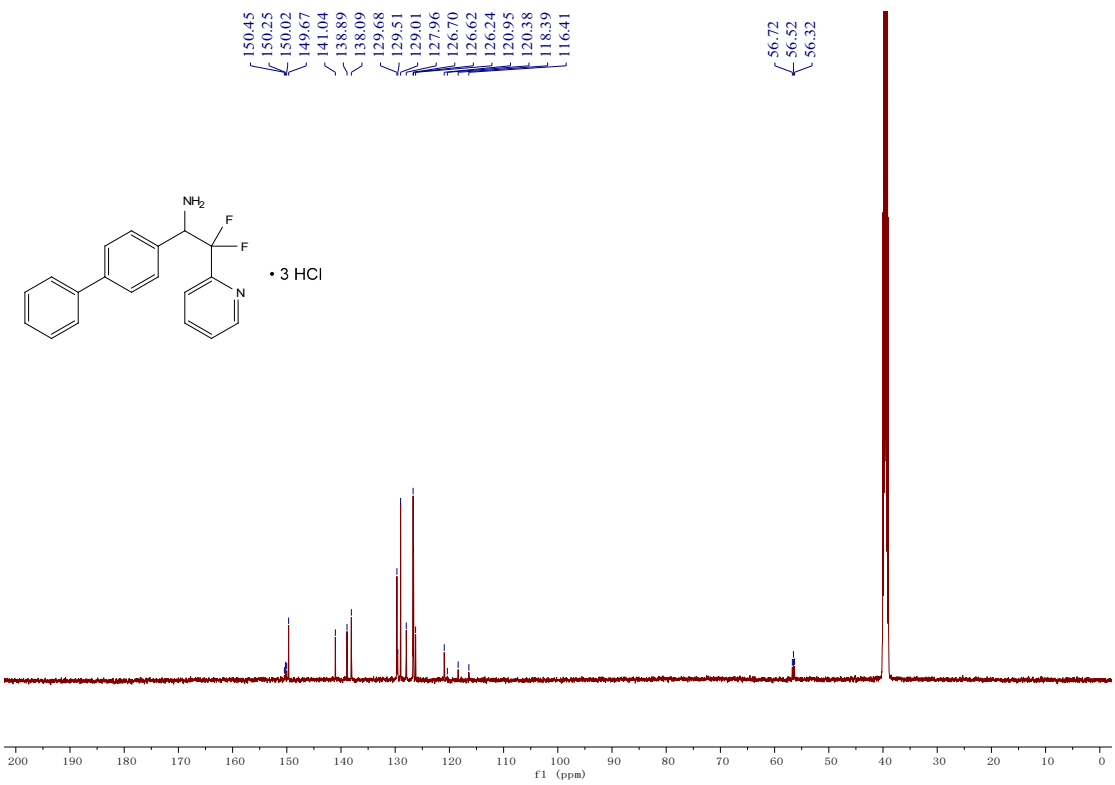
^{19}F NMR (471 MHz, $CDCl_3$) spectrum of **4j**



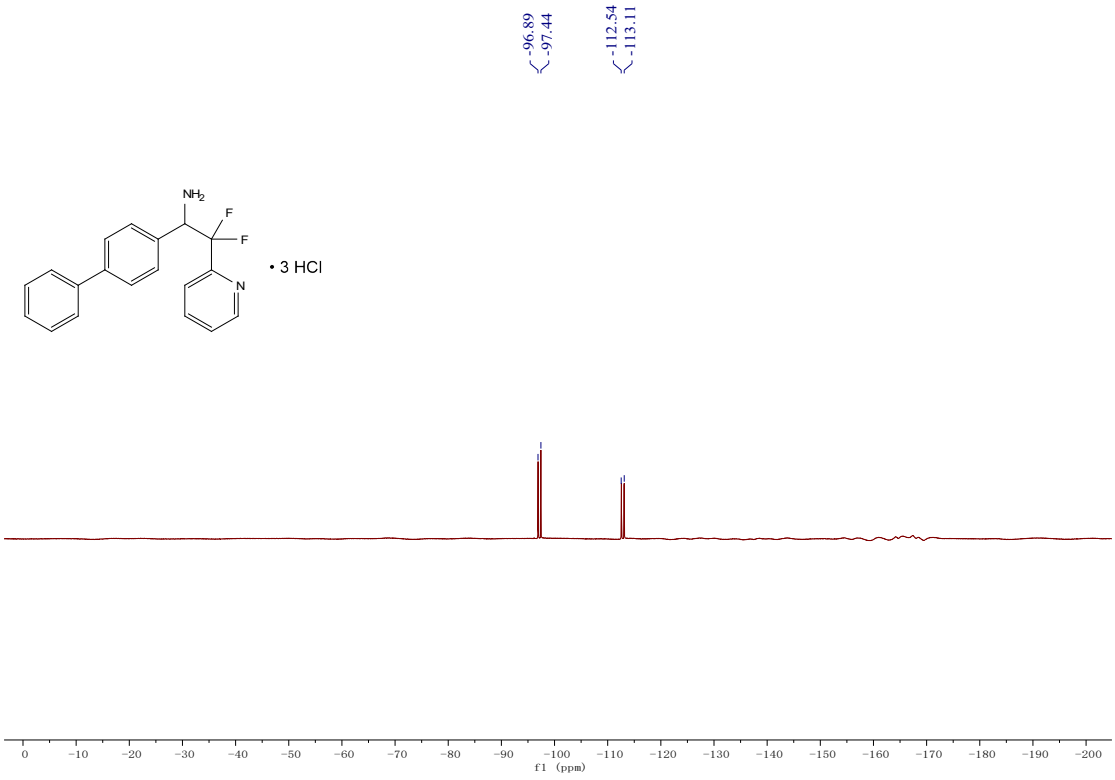
^{1}H NMR (500 MHz, DMSO) spectrum of **3a-1**



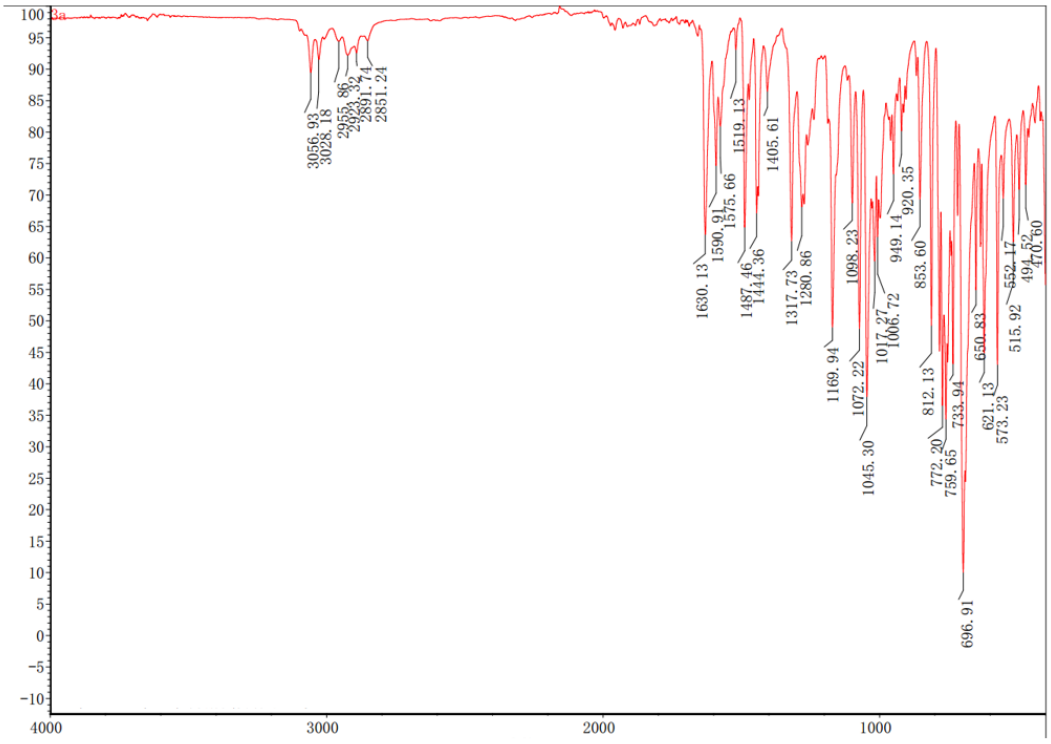
^{13}C NMR (126 MHz, DMSO) spectrum of **3a-1**



^{19}F NMR (471 MHz, DMSO) spectrum of **3a-1**



IR Data of 3a


3a
3056.93
3028.18
2955.86
2923.32
2891.74
2851.24
1630.13
1590.91
1575.66
1519.13
1487.46
1444.36
1405.61
1317.73
1280.86
1169.94
1098.23
1072.22
1045.30
1017.27
1006.72
949.14
920.35
853.60
812.13
772.20
759.65
733.94
696.91
650.83
621.13
573.23
552.17
515.92
494.52
470.60
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
-10
4000
3000
2000
1000