Electronic Supplementary Information for:

Visible-light promoted generation of *p*-(*N*,*N*-dimethyl)benzyl equivalents and their reactions with quinols: an easy access to diarylalkanes

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I. General information

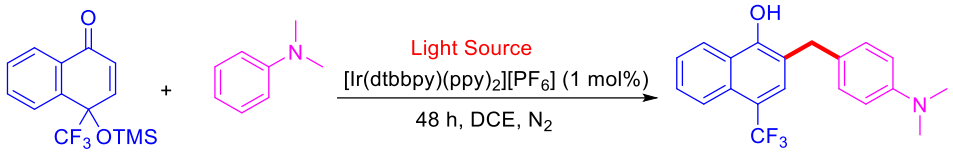
All reagents and catalysts were purchased from commercial sources and used without further purification. Reactions were monitored by thin-layer chromatography (TLC) carried out on 0.25 mm Tsingdao silica gel plates (GF-254) using UV light as visualizing agent. Tsingdao silica gel (60, particle size 0.040–0.063 mm) was used for flash column chromatography. NMR spectra were recorded on a Brüker Advance 600 (^{1}H: 600 MHz, ^{13}C: 150 MHz, ^{19}F NMR: 565 MHz) and Brüker Advance 500 (^{1}H: 500 MHz, ^{13}C: 125 MHz) at ambient temperature. Data were reported as chemical shifts in ppm relative to TMS (0 ppm) for ^{1}H NMR and $CDCl_3$ (77.0 ppm) for ^{13}C NMR. All ^{1}H NMR spectra were reported in delta (d) units, parts per million (ppm) downfield from the internal standard. Coupling constants are reported in Hertz (Hz). The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad. Infrared spectroscopy (IR) was obtained by Fourier Transform Infrared Spectrometer (FT-IR). High-resolution mass spectra (HRMS) were obtained using a Bruker micro TOF II focusspectrometer (ESI).

Blue LEDs (5 W, λ = 465 nm) was purchased from Wattecs (parallel light reactor, WP-TEC-1020HC). Quartz tube (15 mL) was used as the irradiation vessel and the Blue LEDs irradiated at the bottom with a 1–1.5 cm distance. Blue LEDs (15 W, λ = 465–470 nm) was purchased from Merck (SynLEDZ742680). Airtight glass tube (10 mL) was used as the irradiation vessel and the Blue LEDs irradiated at the bottom with a 1–1.5 cm distance. Blue LEDs (40 W, λ = 456 nm) was purchased from Kessil (PR160) with flask (15 mL and 75mL) as the irradiation vessel with a 5–6 cm distance.

Varian cary50 was used for UV-*vis* absorption analysis; spectrofluorometer (Edinburgh FS5) was used for Stern-Volmer fluorescence quenching experiments; and CH Instruments (CHI 660E) was used for Cyclic Voltammetry experiments.

II. Additional optimization of reaction conditions

The effect of light source[a]



1a **2a** **3a**

Entry	Light source	Yield of **3a** (%)[b]
1	Blue light (15 W)	56
2	White light (5 W)	49
3	UV light (5 W)	Trace
4	Green light (5 W)	21
5	Yellow light (5 W)	N. R.[c]
6	Blue light (5 W)	50
7	Blue light (40 W)	52

[a] **1a** (0.3 mmol), **2a** (5.0 eq), [Ir(dtbbpy)(ppy)$_2$][PF$_6$] (1 mol%) in DCE (2 mL) at room temperature for 48 h under irradiation with 15 W blue LED light.
[b] Isolated yields. [c] No reaction was observed.

III. Mechanistic studies

a. UV-*vis* Absorption Spectra

UV-*vis* spectra were carried out using the DCE solution of trifluoromethyl-containing quinol **1a** (2×10^{-5} mol, 2×10^{-4} M in DCE), *N,N*-dimethyl aniline **2a** (2×10^{-5} mol, 2×10^{-4} M in DCE), [Ir(dtbbpy)(ppy)$_2$][PF$_6$] (1×10^{-6} mol, 6×10^{-6} M in DCE) respectively, and their mixture. It was shown that [Ir(dtbbpy)(ppy)$_2$][PF$_6$] has strongest ultraviolet absorption at the reaction wavelength (465 nm) and is the best photosensitizer.

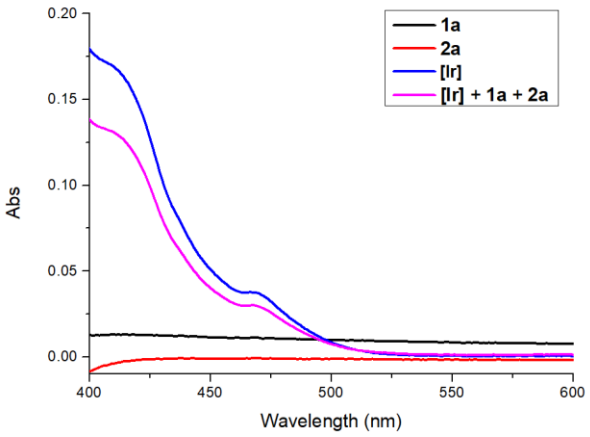


Figure S1. UV-*vis* spectra of trifluoromethyl-containing quinol **1a**, *N,N*-dimethyl aniline **2a**, [Ir(dtbbpy)(ppy)$_2$][PF$_6$] respectively and their mixture.

b. Emission Quenching Studies

Emission intensities were recorded by spectrofluorometer (Edinburgh FS5) at ambient temperature. The DCE solution of [Ir(dtbbpy)(ppy)$_2$][PF$_6$] were excited at 485 nm and the emission intensity at 562 nm was observed. Firstly, the emission spectrum of a 5×10^{-5} M solution of [Ir(dtbbpy)(ppy)$_2$][PF$_6$] in DCE was collected. Then, appropriate amount of quencher was added to the measured solution and the emission spectrum of the sample was collected. The Stern-Volmer emission quenching studies tell that the *N,N*-dimethyl arylamine is easier than trifluoromethylated quinol to quench the excited photosensitizer.

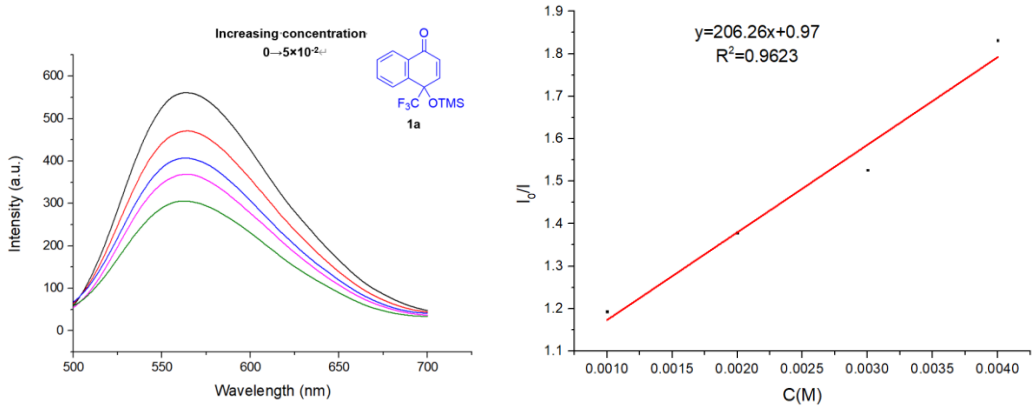


Figure S2. Ir(dtbbpy)(ppy)$_2$][PF$_6$] emission quenching by trifluoromethylated quinol **1a.**

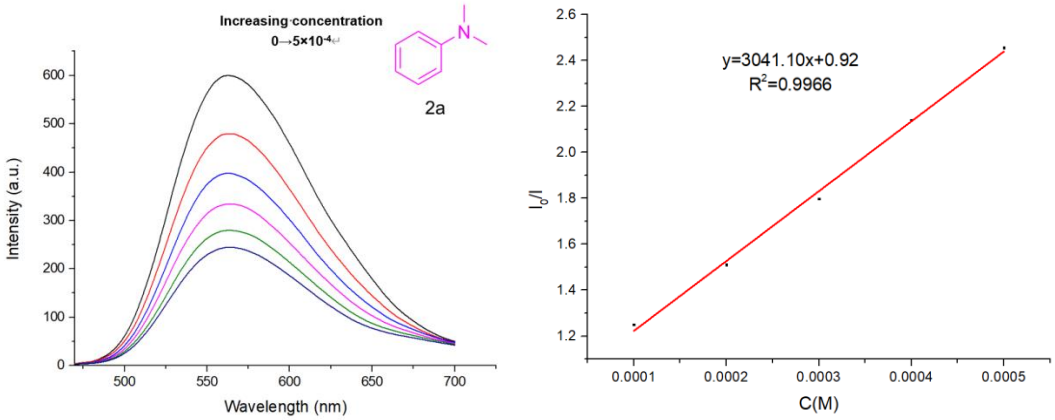


Figure S3. [Ir(dtbbpy)(ppy)$_2$][PF$_6$] emission quenching by *N,N*-dimethyl aniline **2a.**

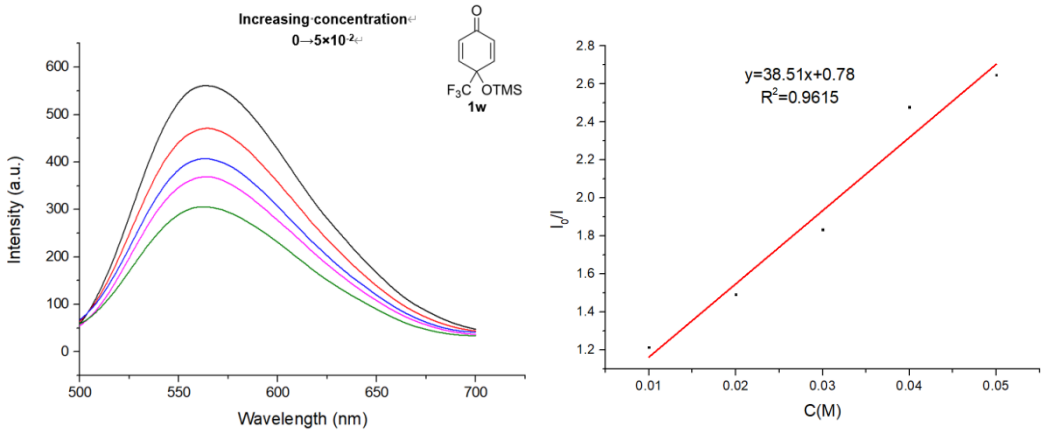


Figure S4. [Ir(dtbbpy)(ppy)$_2$][PF$_6$] emission quenching by 4-trifluoromethyl-*p*-quinol **1w.**

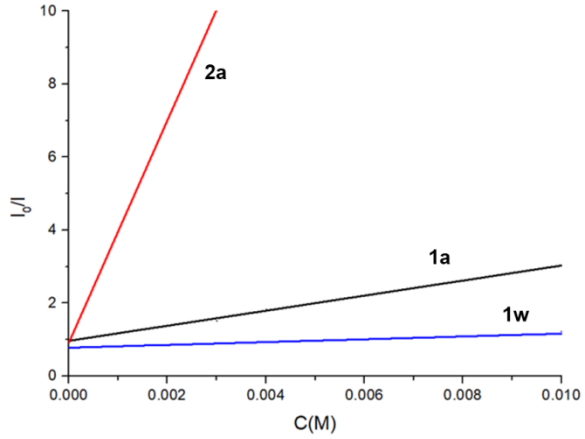


Figure S5. Emission-quenching experiments of [Ir(dtbbpy)(ppy)$_2$][PF$_6$] with trifluoromethylated quinol **1a**, *N,N*-dimethyl aniline **2a** and 4-trifluoromethyl-*p*-quinol **1w**.

c. Cyclic Voltammetry Experiments

For the electrochemical measurements, a three-electrode system connected to an electrochemical station was used: A reference electrode, Ag/AgCl in 0.1 M KCl; A glassy carbon electrode as the working electrode; and a Pt wire as the counter electrode. All electrochemical measurements were performed in degassed DMF under dry N_2 atmosphere.

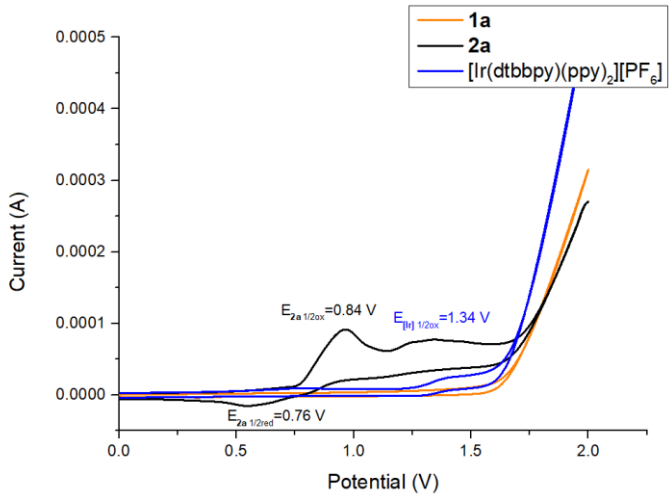
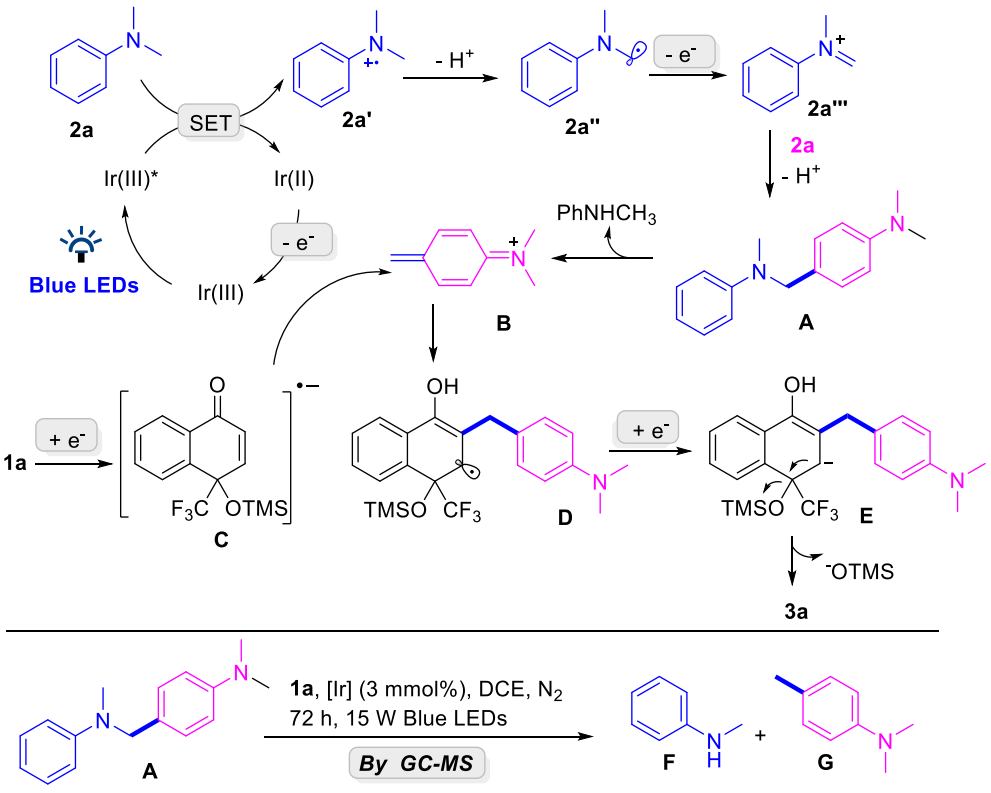
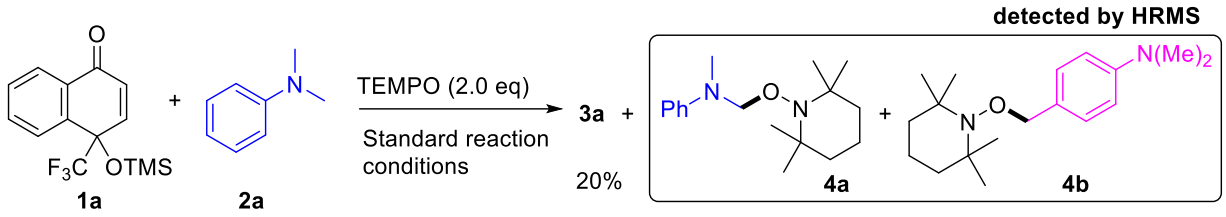


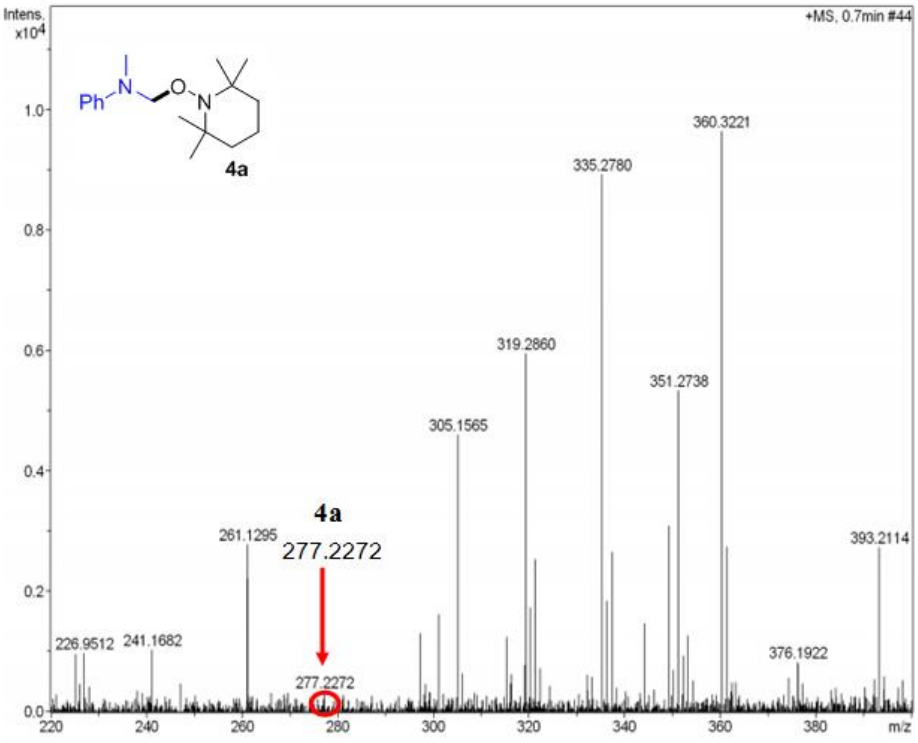
Figure S6. CV spectra of trifluoromethylated quinol **1a** (3 mM), *N,N*-dimethyl aniline **2a** (3 mM) and $[Ir(dtbbpy)(ppy)_2][PF_6]$ (3 mM) in 0.1 M NBu_4PF_6 in degassed DMF (20 mL) with scan rate 100 mV/s.

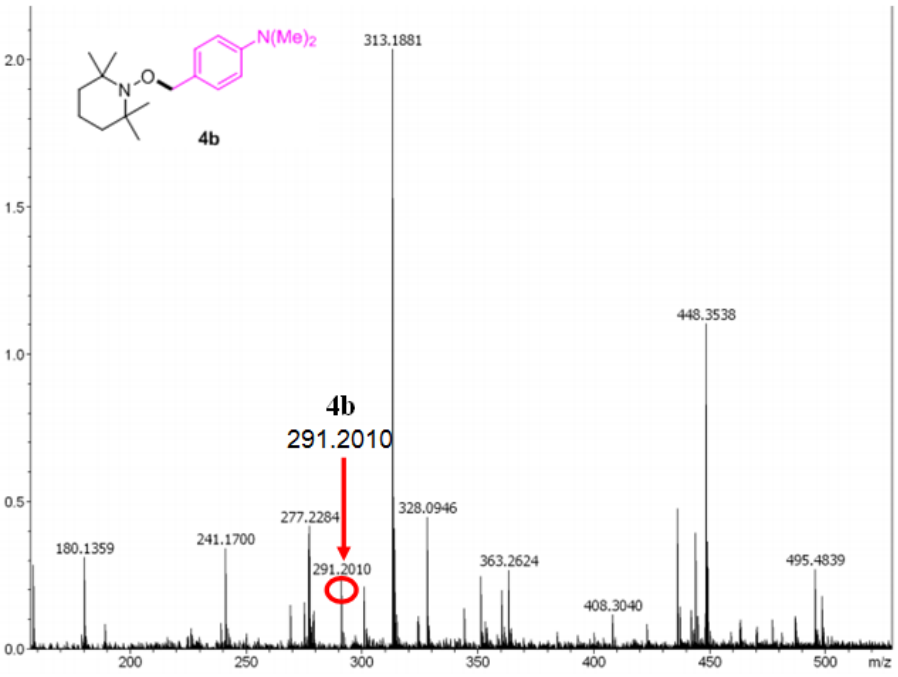
Plausible Mechanism



d. Radical trapping experiments

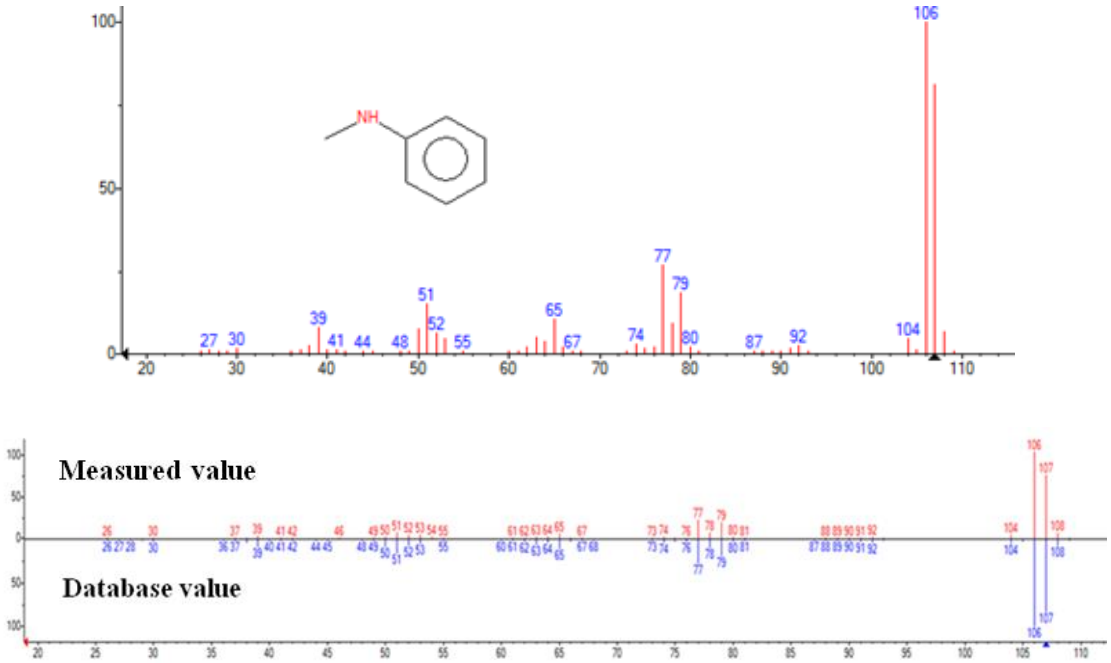






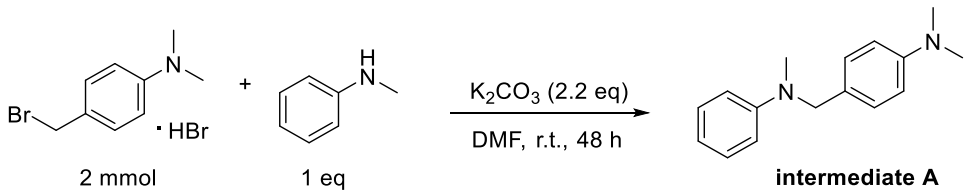
e. Detection of by-product

Detection of *N*-methylaniline by GC-MS



f. Capture of intermediate B

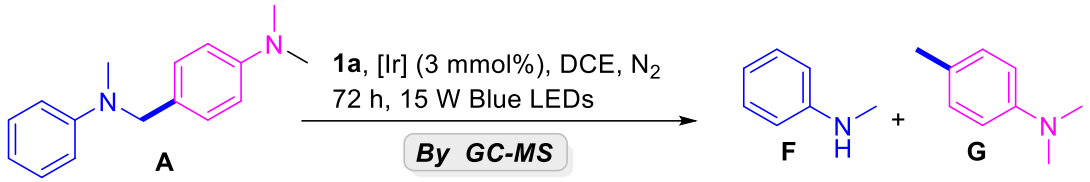
i) Synthesis of intermediate A[1]



In a round-bottomed flask, the salt of 4-(bromomethyl)-*N,N*-dimethylaniline (426 mg, 2 mmol) was dissolved in 5 mL of acetone, neutralized with K_2CO_3 (304 mg, 2.2 mmol), and stirred for 5 min. This reaction mixture was added to a 25 mL round-bottomed flask equipped with a magnetic stirring bar, followed by the addition of of *N*-methylaniline (216 µL, 2 mmol) and residual K_2CO_3 (304 mg, 2.2 mmol) in 10 mL of dimethylformamide (DMF). The reaction was stirred for 48 h at room temperature. After the completion of the reaction as indicated by TLC, the solution was concentrated in vacuo. Then the residue was purified by silica gel column chromatography (PE/EA = 15/1) to afford product, intermediate **A** (173 mg, 36%)

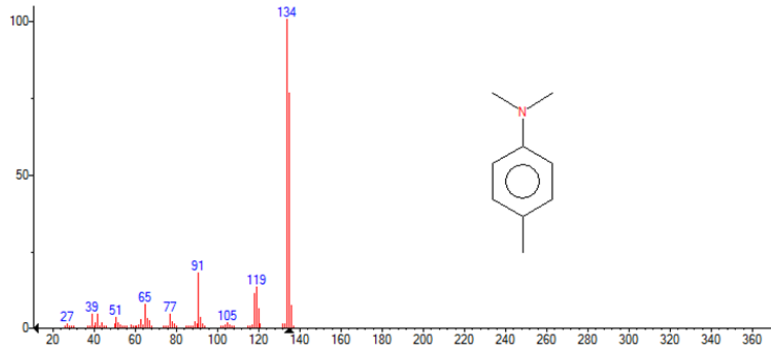
1. L. Leng, Y. Fu, P. Liu and J. M. Ready, Regioselective, Photocatalytic α-Functionalization of Amines. *J. Am. Chem. Soc.*, 2020, **142**, 11972–11977.

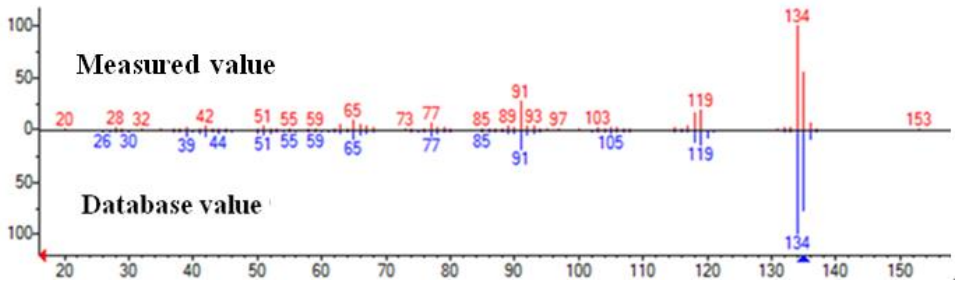
ii) Analysis for intermediate A and 1a by GC-MS



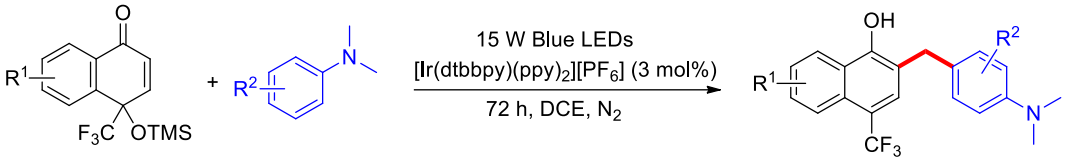
To a glass tube (10 mL) equipped with a stir-bar was added trifluoromethylated quinol **1a** (0.09 g, 0.3 mmol), [Ir(dtbbpy)(ppy)$_2$][PF$_6$] (8.2 mg, 0.009 mmol) and degassed with N_2. Then intermediate **A** (144 mg, 2 equiv.) and DCE (2 mL) were added under nitrogen atmosphere. The reaction mixture was stirred for 72 h under the irradiation of blue LED light (15 W). After the completion of the reaction as indicated by TLC. Intermediate *N*-methylaniline **F** and **G**, which was proposed to come from *p*-(*N,N*-dimethyl)benzyl equivalent **B** was dectected from GC-MS analysis, indicating the formation of *p*-(*N,N*-dimethyl)benzyl equivalents **B** in this visible-light mediated transformations.

Detection of aromatization derivative G by GC-MS



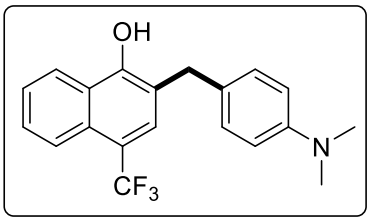


IV. Experimental procedures and analytical data



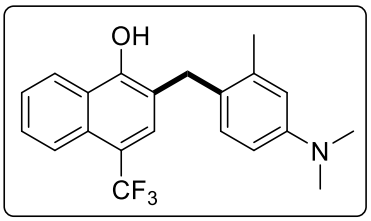
1 **2** **3**

Typical synthetic procedure (with **3a** as an example): To a glass tube (10 mL) equipped with a stir-bar was added trifluoromethylated quinol **1a** (0.09 g, 0.3 mmol), [Ir(dtbbpy)(ppy)$_2$][PF$_6$] (8.2 mg, 0.009 mmol) and degassed with N_2. Then *N,N*-dimethyl aniline **2a** (190 μL, 1.5 mmol) and DCE (2 mL) were added under nitrogen atmosphere. The reaction mixture was stirred for 72 h under the irradiation of blue LED light (15 W). After the completion of the reaction as indicated by TLC, the solution was concentrated in vacuo. Then the residue was purified by silica gel column chromatography (PE/EA = 5/1) to afford product **3a** (79.6 mg, 77%).



3a: 2-(4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-ol

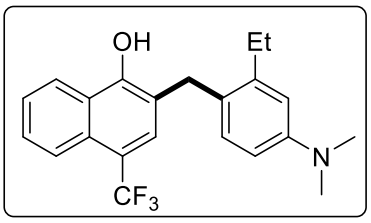
Yellow oil. 79.6 mg (77%). **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.23 (d, *J* = 9.0 Hz, 1H), 8.14 (d, *J* = 9.0 Hz, 1H), 7.73 (s, 1H), 7.59 (t, *J* = 7.8 Hz, 1H), 7.52 (t, *J* = 7.8 Hz, 1H), 7.14 (d, *J* = 8.4 Hz, 2H), 6.71 (d, *J* = 8.4 Hz, 2H), 5.76 (br, 1H), 4.10 (s, 2H), 2.94 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 153.0, 150.0, 129.5, 129.2, 128.3 (q, *J* = 5.9 Hz), 127.4, 125.8, 125.4, 124.9, 125.0 (q, *J* = 270.9 Hz), 124.0 (q, *J* = 2.1 Hz), 122.2, 118.3, 118.1 (q, *J* = 30.0 Hz), 113.3, 40.6, 36.3. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -55.59. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{18}F_3NO^+$ 346.1413; Found 346.1415.



3b: 2-(4-(dimethylamino)-2-methylbenzyl)-4-(trifluoromethyl)naphthalen-1-ol

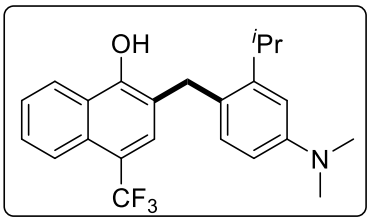
Brown oil. 73.2 mg (68%). **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.25 (d, *J* = 8.4 Hz, 1H), 8.16 (d, *J* = 8.4 Hz, 1H), 7.70 (s, 1H), 7.61 (t, *J* = 7.8 Hz, 1H), 7.54 (t, *J* = 7.8 Hz, 1H), 7.04 (d, *J* = 8.4 Hz, 1H), 6.66 (s, 1H), 6.59 (d, *J* = 8.4 Hz, 1H), 5.87 (br, 1H), 4.08 (s, 2H), 2.96 (s, 6H), 2.28 (s, 3H). **^{13}C NMR**

(150 MHz, $CDCl_3$): δ 153.1, 150.1, 137.9, 129.5, 128.2 (q, *J* = 5.9 Hz), 127.3, 125.7, 125.4, 124.5 (q, *J* = 270.6 Hz), 124.1, 123.9 (q, *J* = 2.1 Hz), 123.1, 122.3, 118.1 (q, *J* = 29.9 Hz), 117.4, 115.4, 110.8, 40.6, 34.6, 20.4. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.20. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{21}H_{21}F_3NO^+$ 360.1570; Found 360.1569.



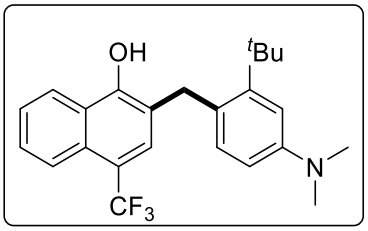
3c: 2-(4-(dimethylamino)-2-ethylbenzyl)-4-(trifluoromethyl)naphthalen-1-ol

Yellow oil. 77.2 mg (69%). **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.26 (d, *J* = 8.5 Hz, 1H), 8.17 (d, *J* = 8.5 Hz, 1H), 7.72 (s, 1H), 7.61 (t, *J* = 7.5 Hz, 1H), 7.55 (t, *J* = 7.5 Hz, 1H), 7.04 (d, *J* = 8.5 Hz, 1H), 6.72 (s, 1H), 6.60 (d, *J* = 8.5 Hz, 1H), 5.98 (br, 1H), 4.13 (s, 2H), 2.98 (s, 6H), 2.67 (q, *J* = 7.5 Hz, 2H), 1.21 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 153.0, 150.3, 143.7, 129.8, 129.3, 128.2 (q, *J* = 6.9 Hz), 127.3, 127.0 (q, *J* = 277.7 Hz), 125.7, 125.4, 123.9 (q, *J* = 2.3 Hz), 122.6, 122.3, 118.1 (q, *J* = 35.9 Hz), 117.8, 113.8, 111.1, 40.6, 33.8, 26.5, 14.8. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.53. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{22}H_{23}F_3NO^+$ 374.1726; Found 374.1726.



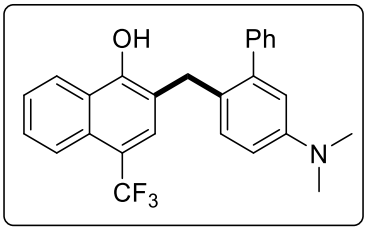
3d: 2-(4-(dimethylamino)-2-isopropylbenzyl)-4-(trifluoromethyl)naphthalen-1-ol

White solid. 81.3 mg (70%). mp: 116−117 °C. **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.27 (d, *J* = 8.0 Hz, 1H), 8.18 (d, *J* = 8.0 Hz, 1H), 7.71 (s, 1H), 7.62 (t, *J* = 7.5 Hz, 1H), 7.55 (t, *J* = 7.5 Hz, 1H), 7.07 (d, *J* = 8.5 Hz, 1H), 6.80 (s, 1H), 6.61 (d, *J* = 8.5 Hz, 1H), 6.02 (br, 1H), 4.17 (s, 2H), 3.22–3.17 (m, 1H), 3.00 (s, 6H), 1.22 (d, *J* = 7.0 Hz, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 153.0, 150.5, 148.5, 130.0, 129.2, 128.0 (q, *J* = 6.0 Hz), 127.3, 125.7, 125.4, 125.0 (q, *J* = 270.6 Hz), 123.9 (q, *J* = 2.0 Hz), 122.2, 121.7, 118.1 (q, *J* = 30.0 Hz), 118.0, 111.0, 110.6, 40.6, 34.0, 29.5, 23.6. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.51. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{23}H_{25}F_3NO^+$ 388.1883; Found 388.1895.



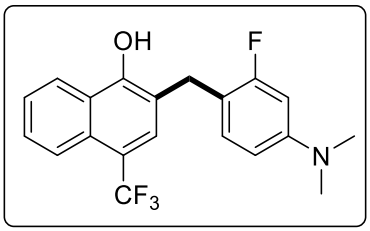
3e: 2-(2-(tert-butyl)-4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-ol

Yellow solid. 44.5 mg (37%). mp: 112−113 °C. **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.22 (d, *J* = 8.5 Hz, 1H), 8.13 (d, *J* = 8.5 Hz, 1H), 7.67 (s, 1H), 7.59 (t, *J* = 7.5 Hz, 1H), 7.52 (t, *J* = 7.5 Hz, 1H), 6.95 (d, *J* = 8.5 Hz, 1H), 6.92 (s, 1H), 6.52 (d, *J* = 8.5 Hz, 1H), 5.76 (br, 1H), 4.39 (s, 2H), 2.96 (s, 6H), 1.53 (s, 9H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.7, 149.7, 149.0, 132.2, 129.3, 128.5 (q, *J* = 6.0 Hz), 127.3, 125.7, 125.5, 125.0 (q, *J* = 270.6 Hz), 123.9 (q, *J* = 2.1 Hz), 122.3, 118.8, 118.0 (q, *J* = 30.2 Hz), 111.5, 111.1, 40.6, 36.2, 35.6, 31.3. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.61. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{24}H_{27}F_3NO^+$ 402.2039. Found 402.2040.



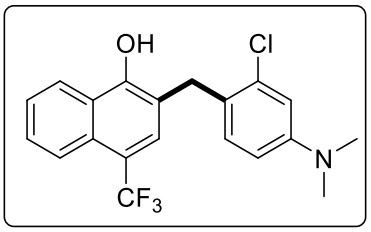
3f: 2-((5-(dimethylamino)-[1,1'-biphenyl]-2-yl)methyl)-4-(trifluoromethyl)naphtalen-1-ol

Brown oil. 102.3 mg (81%). **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.21 (d, *J* = 8.5 Hz, 1H), 8.13 (d, *J* = 8.0 Hz, 1H), 7.59 (t, *J* = 7.0 Hz, 1H), 7.52 (t, *J* = 7.0 Hz, 1H), 7.41 (s, 4H), 7.32 (s, 2H), 7.22 (d, *J* = 8.0 Hz, 1H), 6.74 (d, *J* = 8.5 Hz, 1H), 6.72 (s, 1H), 5.59 (br, 1H), 4.06 (s, 2H), 2.99 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.5, 149.6, 143.1, 141.7, 130.0, 129.1, 128.9, 128.3, 128.2 (q, *J* = 5.9 Hz), 127.3, 127.1, 125.6, 125.2, 124.9 (q, *J* = 270.6 Hz), 123.8 (q, *J* = 2.0 Hz), 122.8, 122.2, 118.6, 117.8 (q, *J* = 30.0 Hz), 114.7, 112.3, 40.4, 34.1. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.53. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{26}H_{23}F_3NO^+$ 422.1726; Found 422.1732.



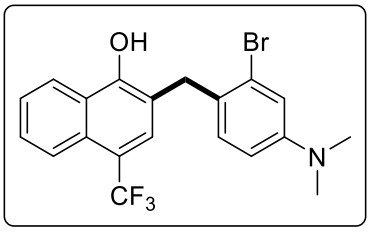
3g: 2-(4-(dimethylamino)-2-fluorobenzyl)-4-(trifluoromethyl)naphthalen-1-ol

Red oil. 65.3 mg (60%). **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.26 (d, *J* = 7.8 Hz, 1H), 8.11 (d, *J* = 7.8 Hz, 1H), 7.72 (s, 1H), 7.58 (t, *J* = 7.8 Hz, 1H), 7.54 (t, *J* = 7.8 Hz, 1H), 7.02 (t, *J* = 9.0 Hz, 1H), 6.44–6.42 (m, 2H), 5.91 (br, 1H), 4.04 (s, 2H), 2.92 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 161.6 (d, *J* = 239.0 Hz), 152.3, 151.4 (d, *J* = 11.0 Hz), 130.4 (d, *J* = 6.5 Hz), 129.4, 128.0 (q, *J* = 6.0 Hz), 127.4, 125.9, 125.3, 124.9 (q, *J* = 270.9 Hz), 124.0, 122.3, 118.4 (q, *J* = 30.0 Hz), 117.4, 111.6 (d, *J* = 16.5 Hz), 108.6 (d, *J* = 2.3 Hz), 99.5 (d, *J* = 26.9 Hz), 40.4, 28.8 (d, *J* = 2.6 Hz). **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.70 (s, 3F), -116.4 (s, 1F). **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{18}F_4NO^+$ 364.1319; Found 364.1313.



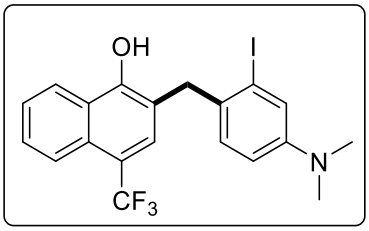
3h: 2-(2-chloro-4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-ol

Brown solid. 77.3 mg (68%). mp: 119−120 °C. **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.27 (d, *J* = 8.4 Hz, 1H), 8.13 (d, *J* = 8.4 Hz, 1H), 7.70 (s, 1H), 7.60 (t, *J* = 8.4 Hz, 1H), 7.55 (t, *J* = 8.4 Hz, 1H), 6.97−6.95 (m, 2H), 6.58 (d, *J* = 8.4 Hz, 1H), 5.79 (br, 1H), 4.16 (s, 2H), 2.92 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.5, 150.6, 130.3, 129.4, 128.2 (q, *J* = 6.0 Hz), 127.4, 125.9, 125.3, 125.2, 124.9 (q, *J* = 270.8 Hz), 124.0 (q, *J* = 2.6 Hz), 123.9, 122.3, 118.3 (q, *J* = 30.2 Hz), 117.2, 116.3, 112.2, 40.3, 35.6. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.63. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{18}ClF_3NO^+$ 380.1024; Found 380.1026.



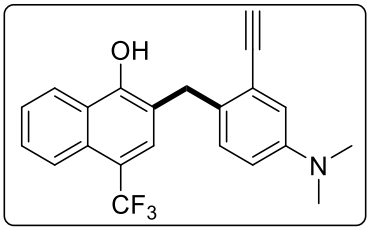
3i: 2-(2-bromo-4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-ol

Yellow solid. 77.9 mg (63%). mp: 107−108 °C. **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.27 (d, *J* = 8.4 Hz, 1H), 8.13 (d, *J* = 8.4 Hz, 1H), 7.69 (s, 1H), 7.60 (t, *J* = 7.8 Hz, 1H), 7.54 (t, *J* = 7.8 Hz, 1H), 6.96–6.95 (m, 2H), 6.58 (d, *J* = 8.4 Hz, 1H), 5.86 (br, 1H), 4.16 (s, 2H), 2.92 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.5, 150.6, 130.3, 129.4, 128.2 (q, *J* = 5.9 Hz), 127.4, 126.7 (q, *J* = 284.6 Hz), 125.9, 125.3, 125.2, 124.0 (q, *J* = 2.4 Hz), 123.9, 122.3, 118.3 (q, *J* =30.0 Hz), 117.2, 116.3, 112.2, 40.3, 35.6. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.66. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{18}BrF_3NO^+$ 424.0518; Found 424.0521.



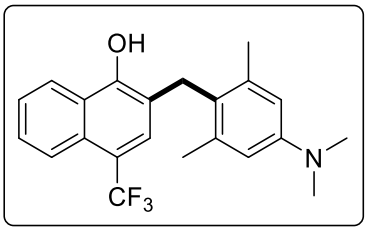
3j: 2-(4-(dimethylamino)-2-iodobenzyl)-4-(trifluoromethyl)naphthalen-1-ol

Yellow oil. 110.2 mg (78%). **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.27 (d, *J* = 8.5 Hz, 1H), 8.14 (d, *J* = 8.5 Hz, 1H), 7.67 (s, 1H), 7.62 (t, *J* = 8.0 Hz, 1H), 7.55 (t, *J* = 8.0 Hz, 1H), 7.24 (s, 1H), 6.89 (d, *J* = 8.5 Hz, 1H), 6.62 (d, *J* = 8.5 Hz, 1H), 5.66 (br, 1H), 4.14 (s, 2H), 2.92 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.6, 150.4, 129.4, 129.4, 128.3 (q, *J* = 6.3 Hz), 127.4, 127.2, 125.9, 125.3, 125.1 (q, *J* = 270.5 Hz), 124.0, 123.1, 122.3, 118.4 (q, *J* = 30.0 Hz), 117.4, 113.0, 102.0, 40.6, 40.3. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.63. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{18}IF_3NO^+$ 472.0380; Found 472.0376.



3k: 2-(4-(dimethylamino)-2-ethynylbenzyl)-4-(trifluoromethyl)naphthalen-1-ol

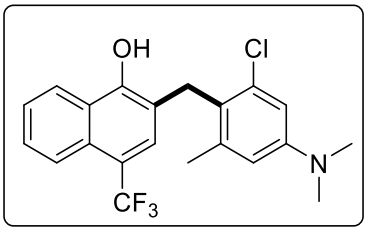
Yellow oil. 33.2 mg (30%). **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.27 (d, *J* = 8.5 Hz, 1H), 8.10 (d, *J* = 8.5 Hz, 1H), 7.77 (s, 1H), 7.57 (t, *J* = 8.0 Hz, 1H), 7.52 (t, *J* = 8.0 Hz, 1H), 7.07 (d, *J* = 8.5 Hz, 1H), 6.88 (s, 1H), 6.68 (d, *J* = 8.5 Hz, 1H), 6.21 (br, 1H), 4.23 (s, 2H), 3.45 (s, 1H), 2.92 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.5, 149.2, 129.6, 129.4, 128.3 (q, *J* = 6.0 Hz), 128.0, 127.3, 125.8, 125.3, 125.0 (q, *J* = 258.8 Hz), 123.9 (q, *J* = 2.4 Hz), 122.5, 121.3, 118.1 (q, *J* = 30.0 Hz), 117.9, 116.3, 114.5, 83.2, 81.7, 40.4, 33.9. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.66. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{22}H_{19}F_3NO^+$ 370.1413; Found 370.1413.



3n: 2-(4-(dimethylamino)-2,6-dimethylbenzyl)-4-(trifluoromethyl)naphthalen-1-ol

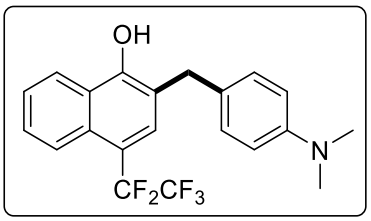
Yellow solid. 79.5 mg (71%). mp: 110−111 °C. **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.20 (d, *J* = 8.4 Hz, 1H), 8.09 (d, *J* = 8.4 Hz, 1H), 7.56 (t, *J* = 8.4 Hz, 1H), 7.53 (s, 1H), 7.51 (t, *J* = 8.4 Hz, 1H), 6.54 (s,

2H), 6.23 (br, 1H), 4.14 (s, 2H), 2.97 (s, 6H), 2.27 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 153.0, 149.9, 138.3, 128.9, 127.3 (q, *J* = 5.7 Hz), 127.2, 125.7, 125.4, 125.0 (q, *J* = 270.3 Hz), 123.9, 122.2, 121.2, 118.0 (q, *J* = 30.3 Hz), 116.5, 113.3, 40.5, 30.9, 21.1. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.62. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{22}H_{23}F_3NO^+$ 374.1726; Found 374.17328.



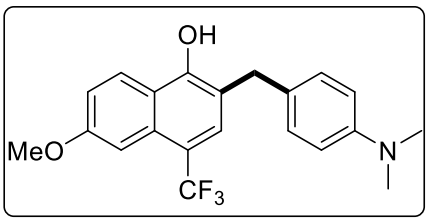
3o: 2-(2-chloro-4-(dimethylamino)-6-methylbenzyl)-4-(trifluoromethyl)naphthalen-1-ol

White solid. 77.8 mg (66%). mp: 182−183 °C. **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.24 (d, *J* = 8.0 Hz, 1H), 8.10 (d, *J* = 8.0 Hz, 1H), 7.57 (t, *J* = 8.0 Hz, 1H), 7.53 (t, *J* = 8.0 Hz, 1H), 7.48 (s, 1H), 6.69 (s, 1H), 6.52 (s, 1H), 6.00 (br, 1H), 4.22 (s, 2H), 2.96 (s, 6H), 2.24 (s, 3H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.3, 150.1, 139.7, 135.6, 129.1, 127.2, 127.1 (q, *J* = 6.0 Hz), 125.8, 125.2, 125.0 (q, *J* = 270.9 Hz), 124.0, 122.0, 120.8 (q, *J* = 3.2 Hz), 118.2 (q, *J* = 30.5 Hz), 116.7, 113.8, 111.1, 40.3, 30.3, 21.3. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.63. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{21}H_{20}ClF_3NO^+$ 394.1180; Found 394.1175.



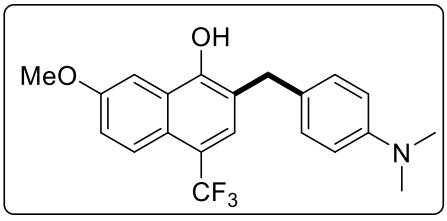
3p: 2-(4-(dimethylamino)benzyl)-4-(perfluoroethyl)naphthalen-1-ol

Yellow oil. 85.3 mg (72%). **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.25 (d, *J* = 8.4 Hz, 1H), 8.18 (d, *J* = 8.4 Hz, 1H), 7.70 (s, 1H), 7.56 (t, *J* = 7.8 Hz, 1H), 7.51 (t, *J* = 7.8 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 2H), 6.72 (d, *J* = 8.4 Hz, 2H), 5.84 (br, 1H), 4.11 (s, 2H), 2.94 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 153.4, 149.9, 130.8 (t, *J* = 8.4 Hz), 130.4, 129.5, 129.2, 127.3, 125.6, 125.5, 124.8, 124.4, 122.3, 118.7, 115.9 (qt, *J* = 253.2 Hz, *J* = 21.9 Hz), 115.4 (tq, *J* = 263.3 Hz, *J* = 38.9 Hz), 113.3, 40.6, 36.4. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -83.47 (s, 3F), -107.48 (s, 2F). **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{21}H_{19}F_5NO^+$ 396.1381; Found 3496.1380.



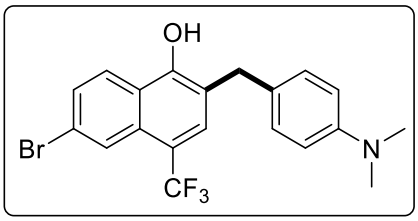
3q: 2-(4-(dimethylamino)benzyl)-6-methoxy-4-(trifluoromethyl)naphthalen-1-ol

Brown solid. 60.7 mg (54%). mp: 102−103 °C. **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.13 (d, *J* = 9.0 Hz, 1H), 7.70 (s, 1H), 7.41 (s, 1H), 7.17 (d, *J* = 9.0 Hz, 1H), 7.13 (d, *J* = 8.4 Hz, 2H), 6.71 (d, *J* = 8.4 Hz, 2H), 5.72 (br, 1H), 4.05 (s, 2H), 3.95 (s, 3H), 2.93 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 158.7, 153.2, 149.9, 131.1, 129.2, 128.9 (q, *J* = 5.9 Hz), 125.2 (q, *J* = 270.5 Hz), 125.1, 124.0, 120.6, 118.2, 116.8 (q, *J* = 30.0 Hz), 116.4, 113.3, 102.7, 55.3, 40.5, 36.2. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -59.32. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{21}H_{21}F_3NO_2^+$ 376.1519; Found 376.1527.



3r: 2-(4-(dimethylamino)benzyl)-7-methoxy-4-(trifluoromethyl)naphthalen-1-ol

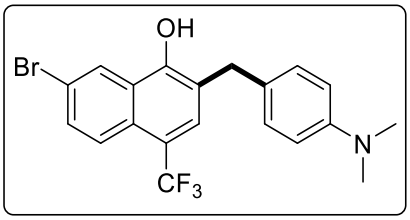
Brown solid. 49.5 mg (44%). mp: 98−99 °C. **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.07 (d, *J* = 9.0 Hz, 1H), 7.62 (s, 1H), 7.54 (s, 1H), 7.28 (d, *J* = 9.0 Hz, 1H) , 7.16 (d, *J* = 8.5 Hz, 2H), 6.73 (d, *J* = 8.5 Hz, 2H), 5.65 (br, 1H), 4.10 (s, 2H), 3.93 (s, 3H), 2.96 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 157.5, 151.9, 149.9, 129.2, 126.8, 125.0 (q, *J* = 271.2 Hz), 125.7 (q, *J* = 5.7 Hz), 125.6, 124.9, 124.8, 120.0, 118.8, 118.2 (q, *J* = 30.0 Hz), 113.3, 100.6, 55.2, 40.5, 36.4. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.45. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{21}H_{21}F_3NO_2^+$ 376.1519; Found 376.1534.



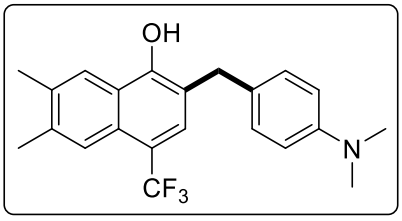
3s: 6-bromo-2-(4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-ol

Yellow oil. 67.1 mg (53%). **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.25 (s, 1H), 8.09 (d, *J* = 9.0 Hz, 1H), 7.72 (s, 1H), 7.58 (d, *J* = 9.0 Hz, 1H), 7.11 (d, *J* = 8.4 Hz, 2H), 6.70 (d, *J* = 8.4 Hz, 2H), 5.85 (br, 1H), 4.06 (s, 2H), 2.93 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 153.3, 150.0, 130.5, 129.4 (q, *J* = 5.7 Hz), 129.2, 129.2, 126.2 (q, *J* = 2.6 Hz), 124.7 (q, *J* = 270.6 Hz), 124.3, 124.0, 122.3, 118.8,

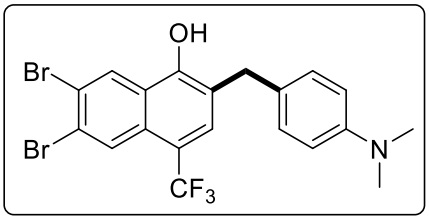
117.3 (q, J = 30.5 Hz), 113.3, 40.5, 36.4. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.71. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{18}BrF_3NO^+$ 424.0518; Found 424.0519.
For details please see the following **HMBC spectra analysis of 3s and 3t.**



3t: 7-bromo-2-(4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-ol
Yellow oil. 62.3 mg (49%). **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.39 (s, 1H), 7.96 (d, J = 9.0 Hz, 1H), 7.71 (s, 1H), 7.63 (d, J = 9.0 Hz, 1H), 7.11 (d, J = 8.4 Hz, 2H), 6.70 (d, J = 8.4 Hz, 2H), 5.81 (br, 1H), 4.08 (s, 2H), 2.93 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.2, 150.0, 130.7, 129.2, 128.6 (q, J = 5.9 Hz), 127.9, 126.7, 125.6 (q, J = 2.1 Hz), 125.0, 124.7 (q, J = 270.6 Hz), 124.3, 120.2, 119.4, 118.3 (q, J = 30.3 Hz), 113.4, 40.5, 36.4. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.72. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{18}BrF_3NO^+$ 424.0518; Found 424.0511.
For details please see the following **HMBC spectra analysis of 3s and 3t.**



3u: 2-(4-(dimethylamino)benzyl)-6,7-dimethyl-4-(trifluoromethyl)naphthalen-1-ol
Yellow solid. 64.9 mg (58%). mp: 114−115 °C. **^{1}H NMR** (500 MHz, $CDCl_3$): δ 7.94 (s, 1H), 7.84 (s, 1H), 7.61 (s, 1H), 7.11 (d, J = 8.5 Hz, 2H), 6.69 (d, J = 8.5 Hz, 2H), 5.62 (br, 1H), 4.06 (s, 2H), 2.92 (s, 6H), 2.45 (s, 3H), 2.42 (s, 3H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.3, 149.8, 137.3, 135.6, 129.5, 129.2, 127.4 (q, J = 5.7 Hz), 125.4, 125.2 (q, J = 270.0 Hz), 124.2, 123.6, 121.6, 117.5, 117.3 (q, J = 29.7 Hz), 113.3, 40.6, 36.2, 20.5, 20.2. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.59. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{22}H_{23}F_3NO^+$ 374.1726; Found 374.1736.

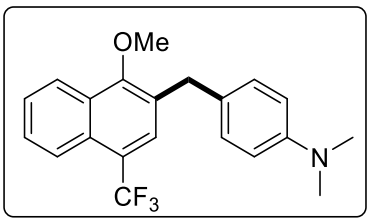


3v: 6,7-dibromo-2-(4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-ol

Green solid. 63.1 mg (42%). mp: 111−112 °C. **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.50 (s, 1H), 8.36 (s, 1H), 7.72 (s, 1H), 7.09 (d, *J* = 8.4 Hz, 2H), 6.69 (d, *J* = 8.4 Hz, 2H), 5.95 (br, 1H), 4.05 (s, 2H), 2.93 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 152.3, 150.0, 129.6 (q, *J* = 5.7 Hz), 129.2, 128.9, 128.5 (q, *J* = 2.4 Hz), 127.4, 125.3, 124.5, 124.4 (q, *J* = 270.6 Hz), 123.9, 122.5, 119.6, 117.3 (q, *J* = 30.6 Hz), 113.3, 40.5, 36.4. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -58.72. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{17}Br_2F_3NO^+$ 501.9624; Found 503.9590.

Synthesis of compound 5

To a solution of **3a** (104 mg, 0.3 mmol) in DMF (3 mL) was added K_2CO_3 (50 mg, 1.2 eq) and MeI (22.4 μL, 1.2 eq). The reaction mixture was stirred at room temperature until **3a** was completely consumed (TLC). The reaction was quenched by adding H_2O (25 mL) and extracted with ethyl acetate (3×5 mL). The organic layer was washed with water (3×10 mL), dried over anhydrous Na_2SO_4 and then concentrated in vacuo and purified via column chromatography using PE/EA (8:1 v/v) to obtain Yellow oil **5** (70.0 mg, 65%).

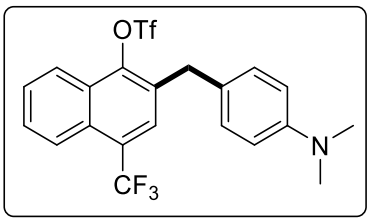


5: 4-((1-methoxy-4-(trifluoromethyl)naphthalen-2-yl)methyl)-*N*,*N*-dimethylaniline

Yellow oil. 70.0 mg (65%). **^{1}H NMR** (600 MHz, $CDCl_3$): δ 8.23−8.22 (m, 1H), 8.18−8.16 (m, 1H), 7.72 (s, 1H), 7.62−7.60 (m, 2H), 7.12 (d, *J* = 9.0 Hz, 2H), 6.71 (d, *J* = 9.0 Hz, 2H), 4.15 (s, 2H), 3.95 (s, 3H), 2.93 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 156.6, 149.3, 129.4, 128.8, 128.7, 128.2 (q, *J* = 5.9 Hz), 127.9, 127.1, 126.5, 124.6 (q, *J* = 271.5 Hz), 124.5 (q, *J* = 2.3 Hz), 122.8, 122.0 (q, *J* = 30.0 Hz), 113.0, 62.3, 40.7, 34.3. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -59.10. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{21}H_{21}F_3NO^+$ 360.1570; Found 360.1559.

Synthesis of compound 6

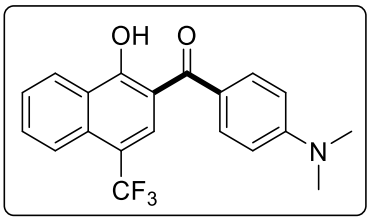
A solution of the **3a** (93.0 mg, 0.2 mmol) in DCM (2 mL) was cooled to 0 °C, pyridine (32.4 μL, 0.4 mmol) was added to the above solution, and trifluoromethanesulfonic anhydride (40.4 μL, 0.24 mmol) was added dropwise with stirring. The reaction was completed until **3a** was consumed (TLC). The reaction was quenched by adding H_2O and extracted with DCM (3×5 mL). The organic layer was washed with water (3×10 mL), dried over anhydrous Na_2SO_4 and then concentrated in vacuo and purified via column chromatography using PE/EA (10:1 v/v) to obtain pink oil **6** (60.1 mg, 63%).



6: 2-(4-(dimethylamino)benzyl)-4-(trifluoromethyl)naphthalen-1-yltrifluoromethanesulfonate
Pink oil. 60.1 mg (63%). **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.27 (d, *J* = 8.5 Hz, 1H), 8.23 (d, *J* = 8.5 Hz, 1H), 7.77−7.74 (m, 2H), 7.71 (t, *J* = 7.5 Hz, 1H), 7.13 (d, *J* = 8.5 Hz, 2H), 6.75 (d, *J* = 8.5 Hz, 2H), 4.28 (s, 2H), 2.97 (s, 6H). **^{13}C NMR** (125 MHz, $CDCl_3$): δ 149.6, 144.4, 131.5, 129.8, 129.2, 128.3, 128.2, 127.8, 127.5 (q, *J* = 6.0 Hz), 126.6 (q, *J* = 30.4 Hz), 125.4, 124.5 (q, *J* = 2.9 Hz), 123.8 (q, *J* = 272.3 Hz), 122.1, 118.7 (q, *J* = 318.3 Hz), 113.0, 40.5, 35.0. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -59.68 (s, 3F), -72.69 (s, 3F). **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{21}H_{18}F_6NO_3S^+$ 478.0906; Found 478.0917.

Synthesis of compound 7

To a solution of **3a** (104 mg, 0.3 mmol) and K_3PO_4 (96 mg, 0.45 mmol) in dry DCE (3 mL) was added PhIO (99 mg, 0.45 mmol), and the mixture was stirred at room temperature. The completion of reaction was monitored by TLC. Then the insolubles were filtered off, and the solution was extracted with CH_2Cl_2 (3×5 mL). Then, the solvent was removed by evaporation. The residue was purified via column chromatography using PE/EA (8:1 v/v) to obtain product **7** as a yellow solid (36.6 mg, 34%).



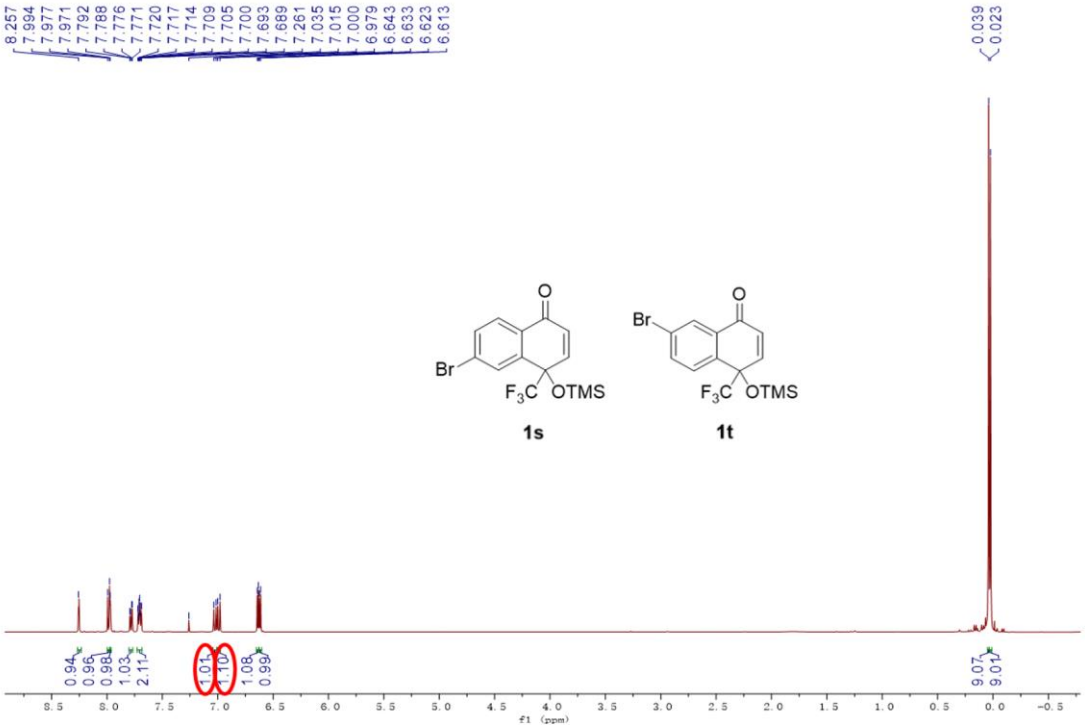
7: (4-(dimethylamino)phenyl)(1-hydroxy-4-(trifluoromethyl)naphthalen-2-yl)methanone
Yellow solid. 36.6 mg (34%). mp: 123−124 °C. **^{1}H NMR** (500 MHz, $CDCl_3$): δ 8.59 (d, *J* = 8.5 Hz, 1H), 8.15 (s, 1H), 8.11 (d, *J* = 8.5 Hz, 1H), 7.77−7.73 (m, 3H), 7.62 (t, *J* = 8.5 Hz, 1H), 6.75 (d, *J* = 9.0 Hz, 2H), 3.09 (s, 6H). **^{13}C NMR** (150 MHz, $CDCl_3$): δ 198.1, 165.8, 153.3, 132.2, 132.0, 131.0, 127.3 (q, *J* = 6.1 Hz), 126.4, 126.1, 124.9, 124.7 (q, *J* = 270.6 Hz), 124.1 (q, *J* = 2.4 Hz), 124.0, 115.6 (q, *J* = 30.3 Hz), 111.1, 110.9, 40.0. **^{19}F NMR** (565 MHz, $CDCl_3$): δ -59.33. **HRMS** (ESI) m/z: $(M+H)^+$ Calcd for $C_{20}H_{17}F_3NO_2^+$ 360.1206; Found 360.1215.

HMBC spectra analysis of 3s and 3t

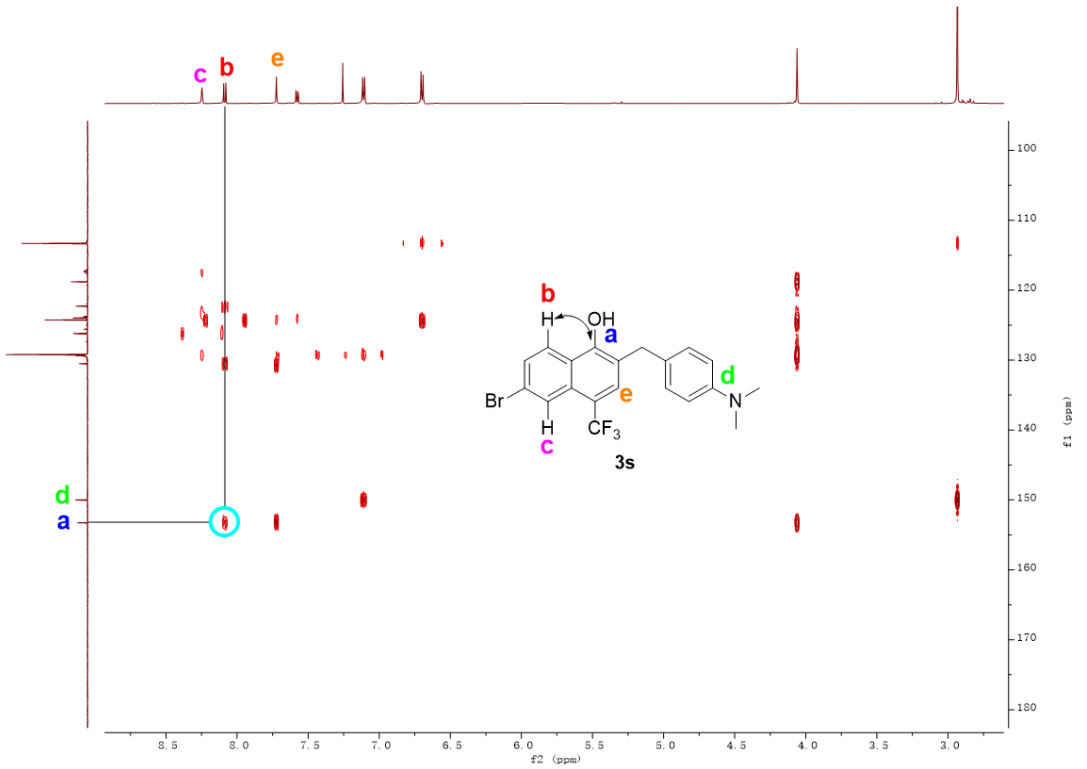
Synthetic procedure: To a glass tube (10 mL) equipped with a stir-bar was added trifluoromethylated quinol **1s** and **1t** (total 0.23 g, 0.6 mmol, the ratio of **1s**/**1t** is nearly 1:1), $[Ir(dtbbpy)(ppy)_2][PF_6]$ (16.5 mg, 0.018 mmol) and degassed with N_2. Then *N,N*-dimethyl aniline **2a** (380 μL, 1.5 mmol) and DCE (4 mL) were added under nitrogen atmosphere. The reaction mixture was stirred for 72 h under the irradiation of blue LED light (15 W). After the completion of the reaction as indicated by TLC, the solution was concentrated in vacuo. Then the residue was purified by silica gel column chromatography (PE/EA = 5/1) to afford product **3s** (67.1 mg, 53%) and **3t** (62.3 mg, 49%) separately.

^{1}H spectrum (500 MHz, $CDCl_3$) of compound 1s and 1t

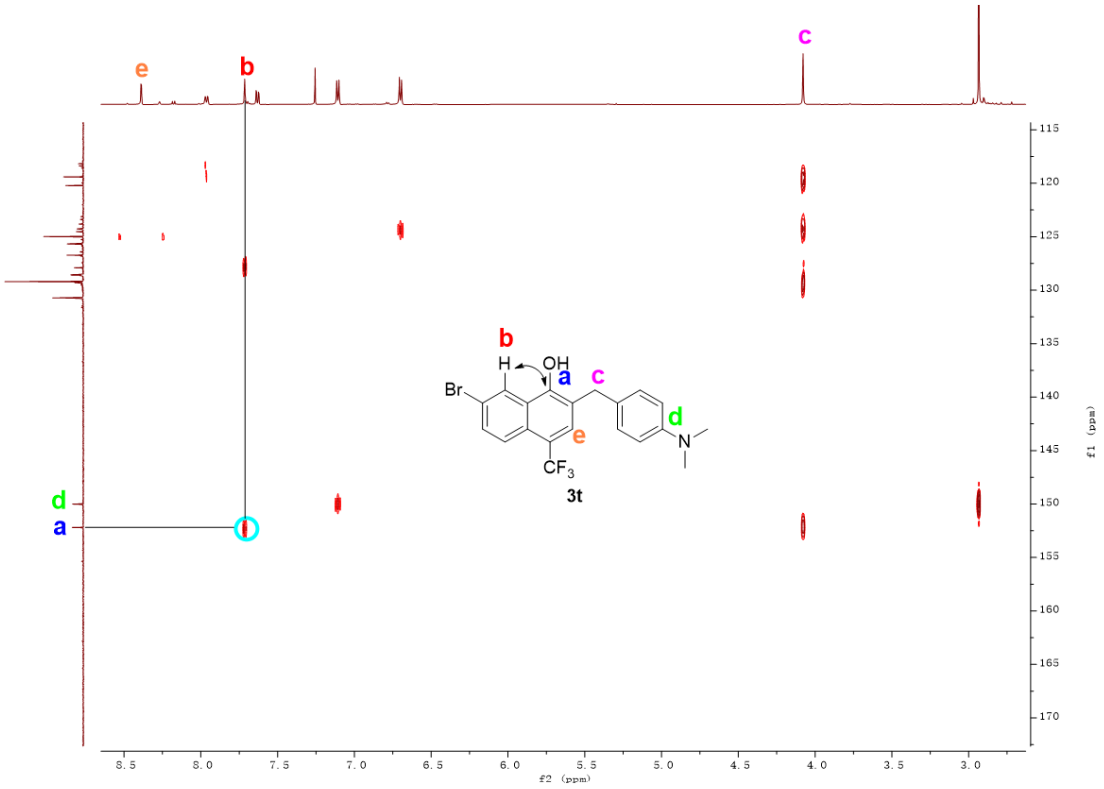
The ratio of **1s**/**1t** is nearly 1:1.



HMBC spectrum of compound 3s



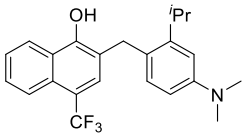
HMBC spectrum of compound 3t



V. Crystal data of compound 3d

Single-crystal X-ray diffraction data was collected at room temperature on a Oxford Diffraction Gemini R Ultra diffractometer, the X-ray generator using Mo-Kα (λ =0.71073 Å) radiation with a ω scan technique. The crystal structures were solved bydirect method of SHELXS-97[2] and refined by full-matrix least-squares techniques usingthe SHELXL-97 program. Drawing of the compound shows ellipsoid contour at the 30% probability level. Non-hydrogen atoms were refined anisotropic. CCDC deposition number: 2159660 (**3d**). Data can be obtained free of charge viawww.ccdc.cam.ac.uk/conts/retrieving.html (or from the Cambridge Crystallographic Data Center, 12 Union Road, Cambridge CB21EZ, UK; fax: (+44)1223-336-033; or deposit@ccdc.cam.ac.uk).

The single crystal of **3d** was cultivated from the mixed solvent of dichloromethane, ethyl acetate and petroleum ether with a volume ratio of 4:1:10 via solvent volatilization.



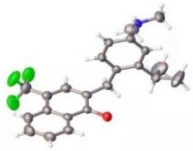


Table S1. Crystallographic data and structural refinement for **3d.**

Empirical formula	$C_{23}H_{24}F_3NO$
Formula weight	387.43
Crystal system	Triclinic
Space group	P -1
a (Å)	8.8092(7)
b (Å)	9.8034(8)
c (Å)	12.4843(10)
α (deg)	71.412(8)
β (deg)	74.369(7)
γ (deg)	85.988(7)
Volume (Å3)	983.96(15)
Z	4
Calculated density (mg/m^3)	1.291
Absorption coefficient (mm-1)	0.096
F(000)	400.0
Theta range for data collection (deg)	3.557 to 29.430
Reflections collected/unique	4548/3012
Goodness-of-fit on F2	1.048
Final R indices [I> 2σ(I)]	R1=0.0667, WR2 = 0.1749
R indices (all data)	R1= 0.0984, WR2 =0.2078

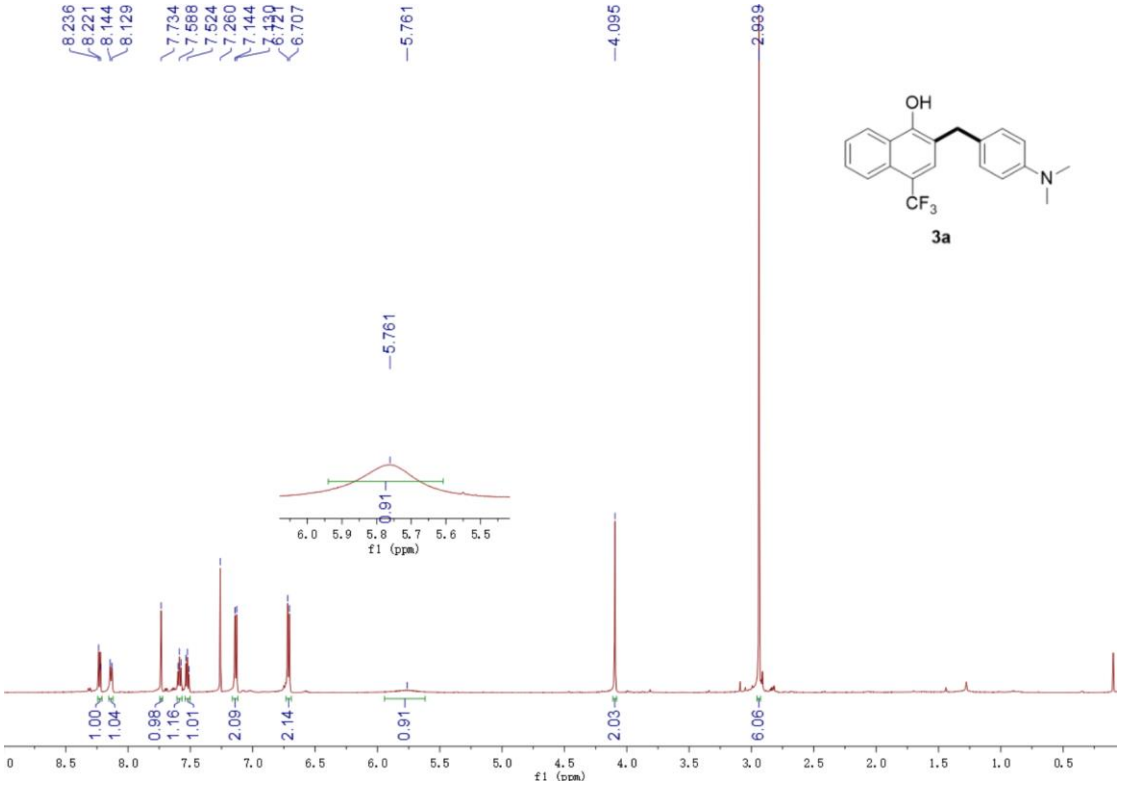
2. G. M. Sheldrick, *SHELXS-97, Programs for X-ray crystal Structure Solution*, University of Göttingen, Göttingen, Germany, 1997.

Table S2. Bond lengths [Å] and angles [°] for **3d**.

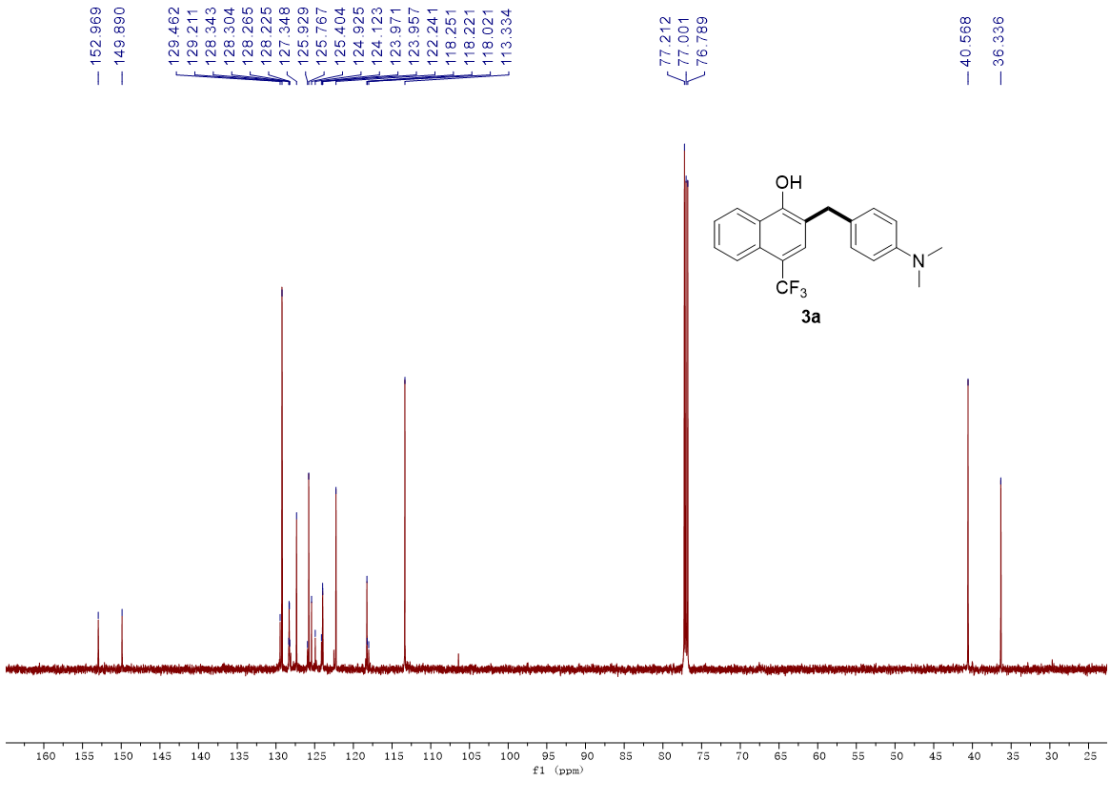
O(1)-C(4)	1.354(3)	C(5)-N(1)-C(24)	115.28(18)
N(1)-C(5)	1.441(3)	C(5)-N(1)-C(25)	111.50(18)
N(1)-C(24)	1.465(3)	C(24)-N(1)-C(25)	110.5(2)
N(1)-C(25)	1.470(3)	C(14)-C(3)-C(4)	119.2(2)
C(3)-C(4)	1.430(3)	C(16)-C(3)-C(4)	121.8(2)
C(3)-C(14)	1.421(3)	C(16)-C(3)-C(14)	118.97(19)
C(3)-C(16)	1.414(3)	O(1)-C(4)-C(3)	121.44(19)
C(4)-C(12)	1.371(3)	O(1)-C(4)-C(12)	116.99(18)
C(5)-C(8)	1.390(3)	C(12)-C(4)-C(3)	121.5(2)
C(5)-C(10)	1.377(3)	C(8)-C(5)-N(1)	123.73(19)
C(6)-C(7)	1.390(3)	C(10)-C(5)-N(1)	118.42(17)
C(6)-C(9)	1.523(3)	C(10)-C(5)-C(8)	117.85(19)
C(6)-C(13)	1.400(3)	C(7)-C(6)-C(9)	119.06(18)
C(7)-C(10)	1.376(3)	C(7)-C(6)-C(13)	117.55(18)
C(8)-C(13)	1.395(3)	C(13)-C(6)-C(9)	123.38(17)
C(9)-C(12)	1.510(3)	C(10)-C(7)-C(6)	122.65(19)
C(11)-C(12)	1.400(3)	C(5)-C(8)-C(13)	122.44(19)
C(11)-C(15)	1.371(3)	C(12)-C(9)-C(6)	112.47(16)
C(13)-C(23)	1.528(3)	C(7)-C(10)-C(5)	120.35(18)
C(14)-C(15)	1.429(3)	C(15)-C(11)-C(12)	122.7(2)
C(14)-C(17)	1.419(3)	C(4)-C(12)-C(9)	120.9(2)
C(15)-C(26)	1.487(4)	C(4)-C(12)-C(11)	118.25(19)
C(16)-C(18)	1.361(3)	C(11)-C(12)-C(9)	120.8(2)
C(17)-C(20)	1.359(4)	C(6)-C(13)-C(23)	121.34(19)
C(18)-C(20)	1.397(4)	C(8)-C(13)-C(6)	119.13(18)
F(3)-C(26)	1.329(4)	C(8)-C(13)-C(23)	119.52(19)
F(2)-C(26)	1.339(4)	C(3)-C(14)-C(15)	117.96(19)
F(1)-C(26)	1.330(4)	C(17)-C(14)-C(3)	117.9(2)
C(23)-C(27)	1.527(5)	C(17)-C(14)-C(15)	124.1(2)
C(23)-C(28)	1.479(4)	C(11)-C(15)-C(14)	120.1(2)
		C(11)-C(15)-C(26)	119.5(2)
		C(14)-C(15)-C(26)	120.4(2)
		C(18)-C(16)-C(3)	121.3(2)
		C(20)-C(17)-C(14)	121.1(2)
		C(16)-C(18)-C(20)	119.7(2)
		C(17)-C(20)-C(18)	121.0(2)
		C(27)-C(23)-C(13)	113.2(2)
		C(28)-C(23)-C(13)	111.2(2)
		C(28)-C(23)-C(27)	109.3(3)
F(2)-C(26)-C(15)	112.8(2)	F(3)-C(26)-C(15)	113.2(3)
F(1)-C(26)-C(15)	113.4(2)	F(3)-C(26)-F(2)	105.2(3)
F(1)-C(26)-F(2)	105.8(3)	F(3)-C(26)-F(1)	105.8(3)

VI. Copies of ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra

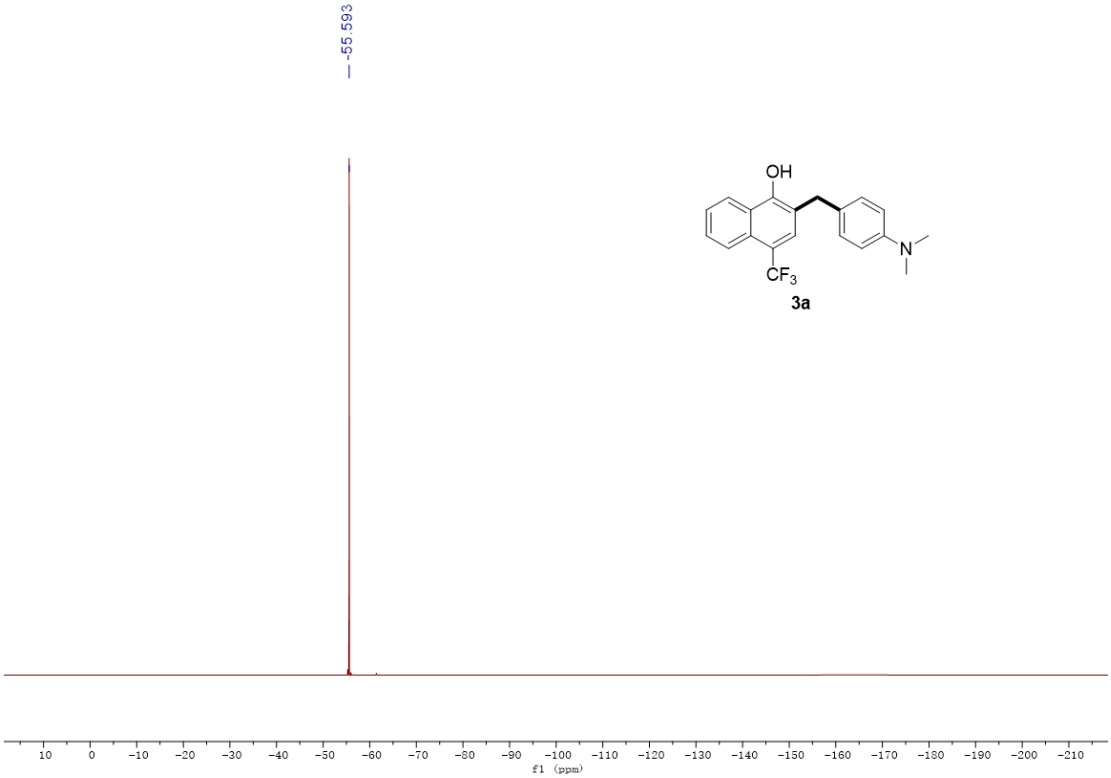
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3a



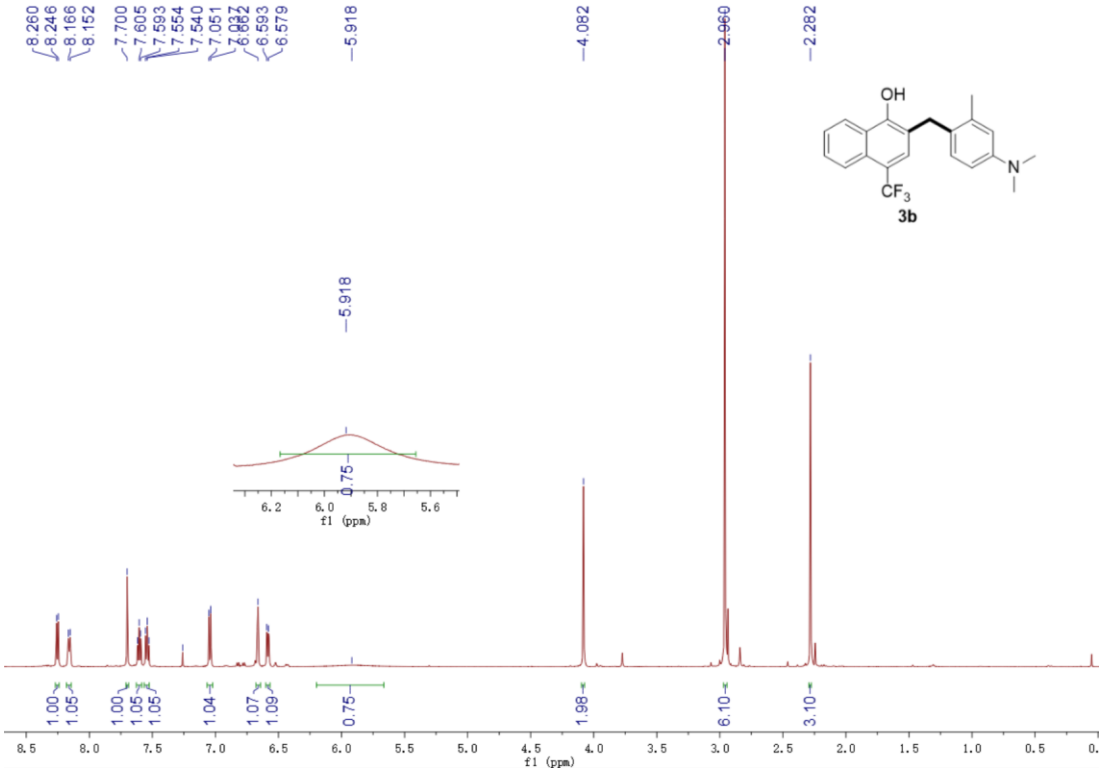
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3a



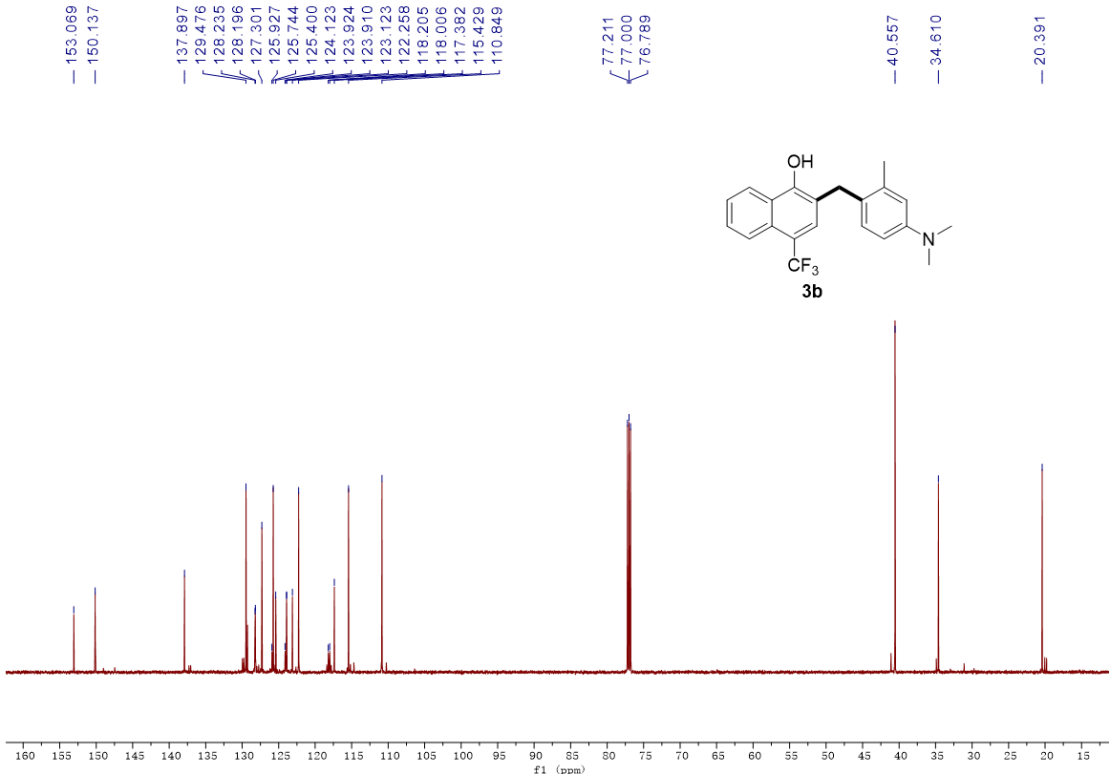
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3a



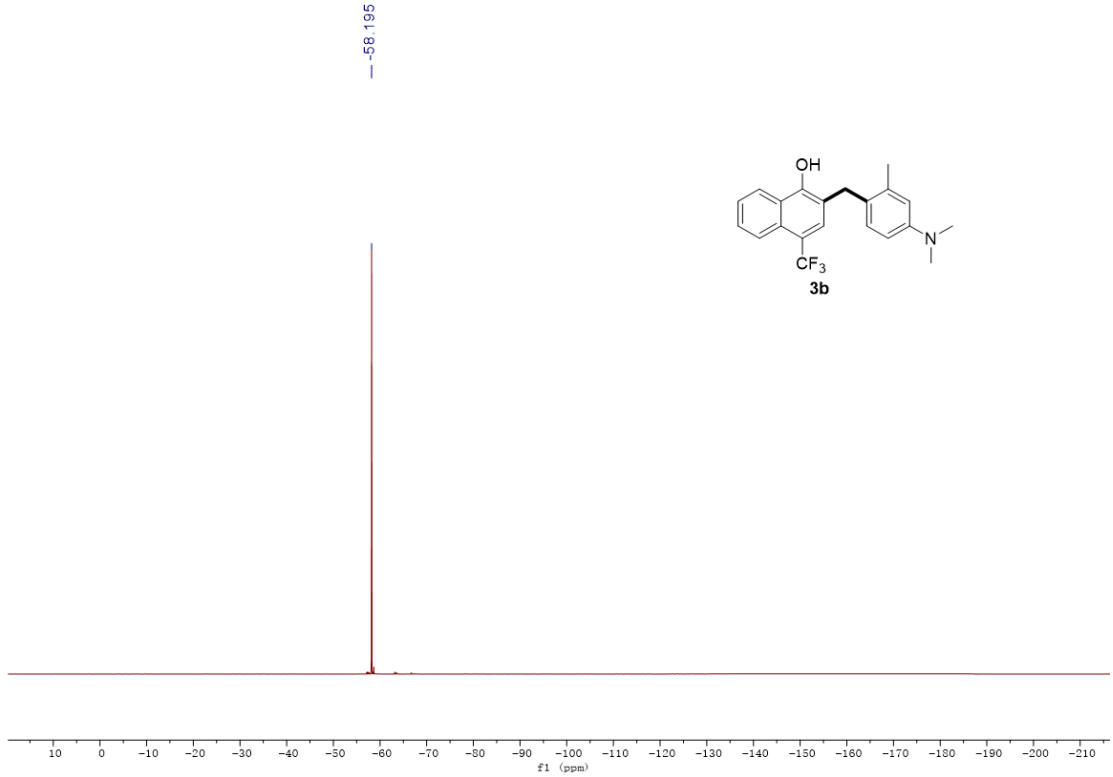
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3b



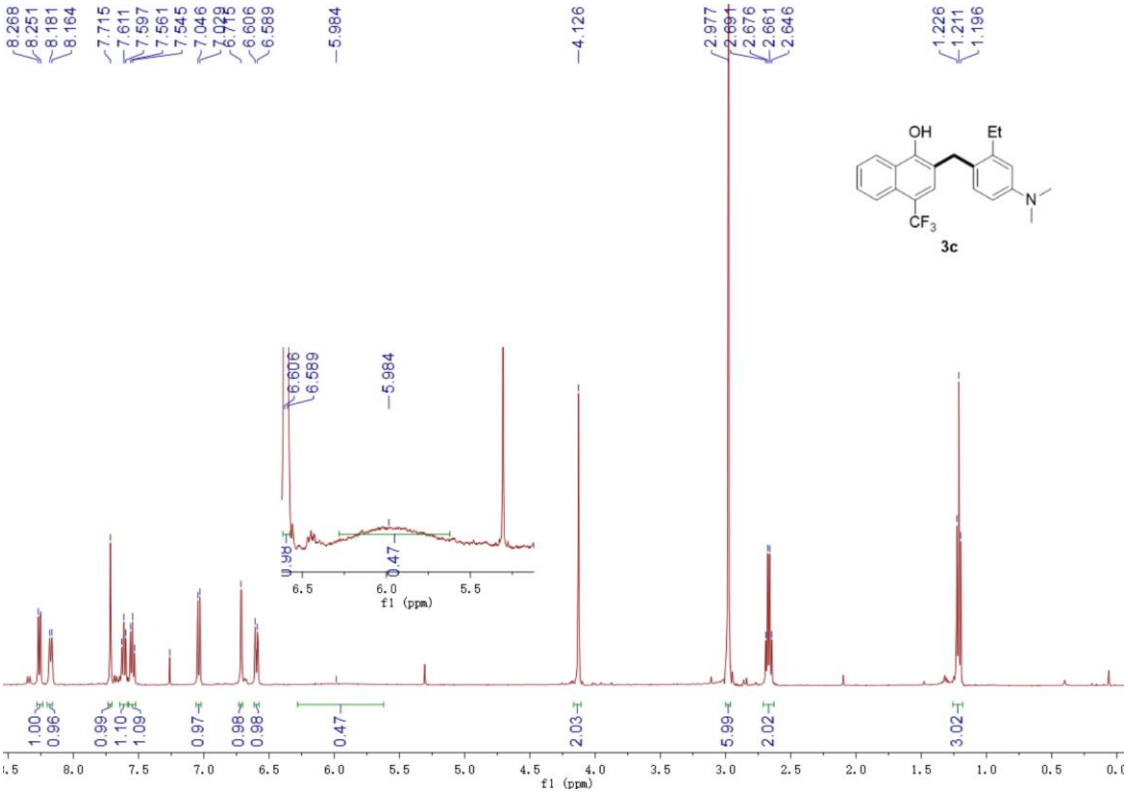
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3b



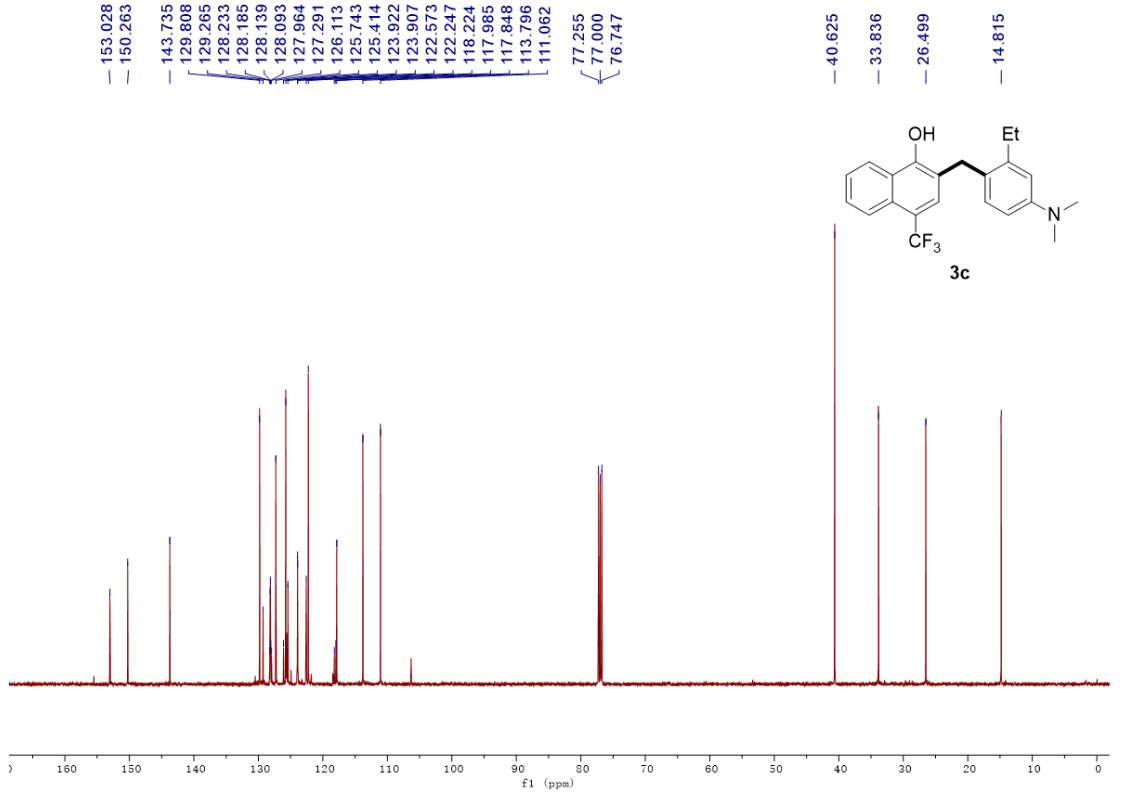
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3b



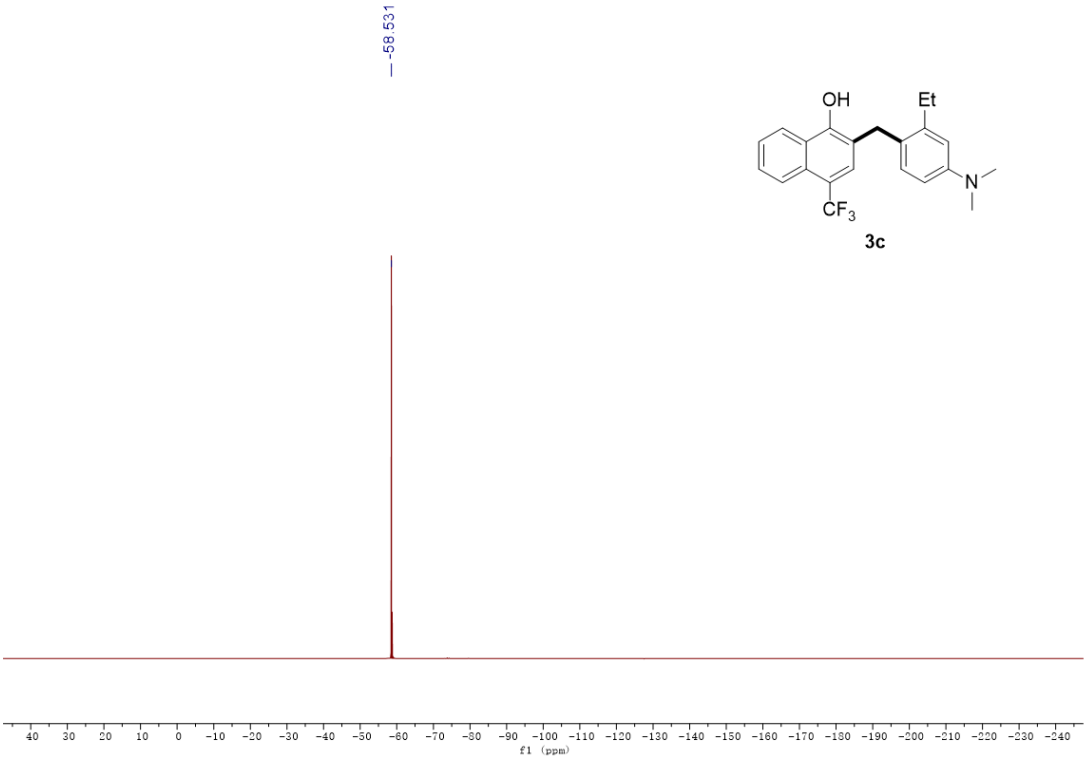
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3c



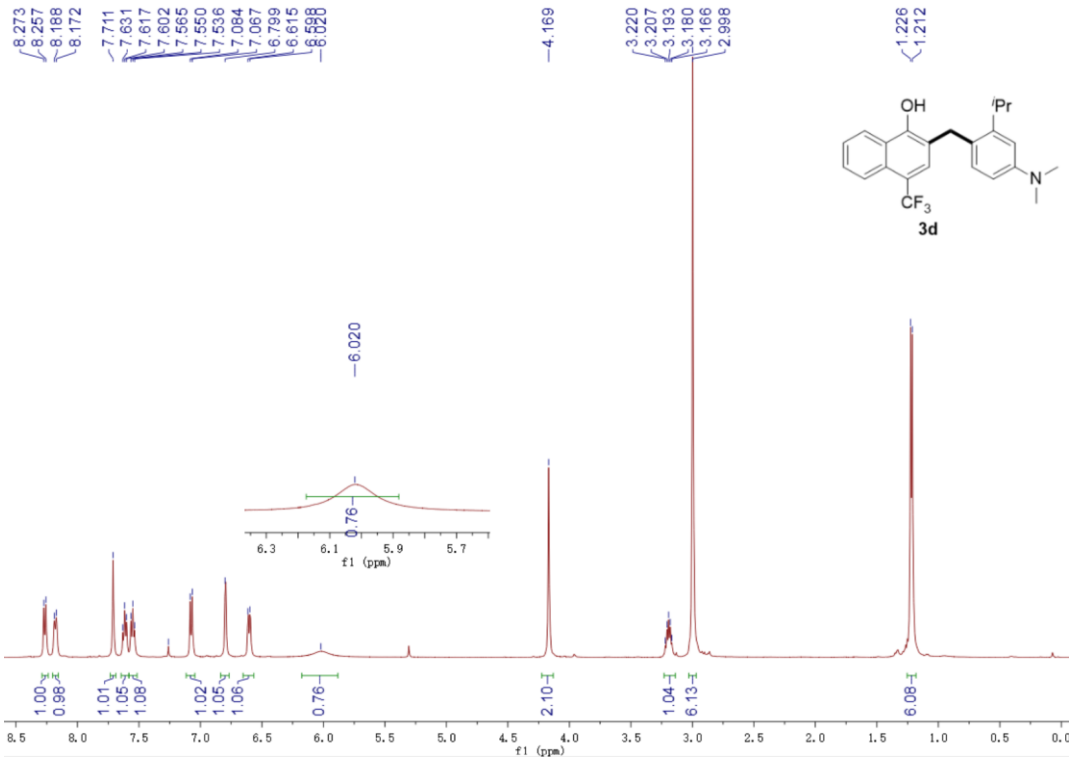
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3c



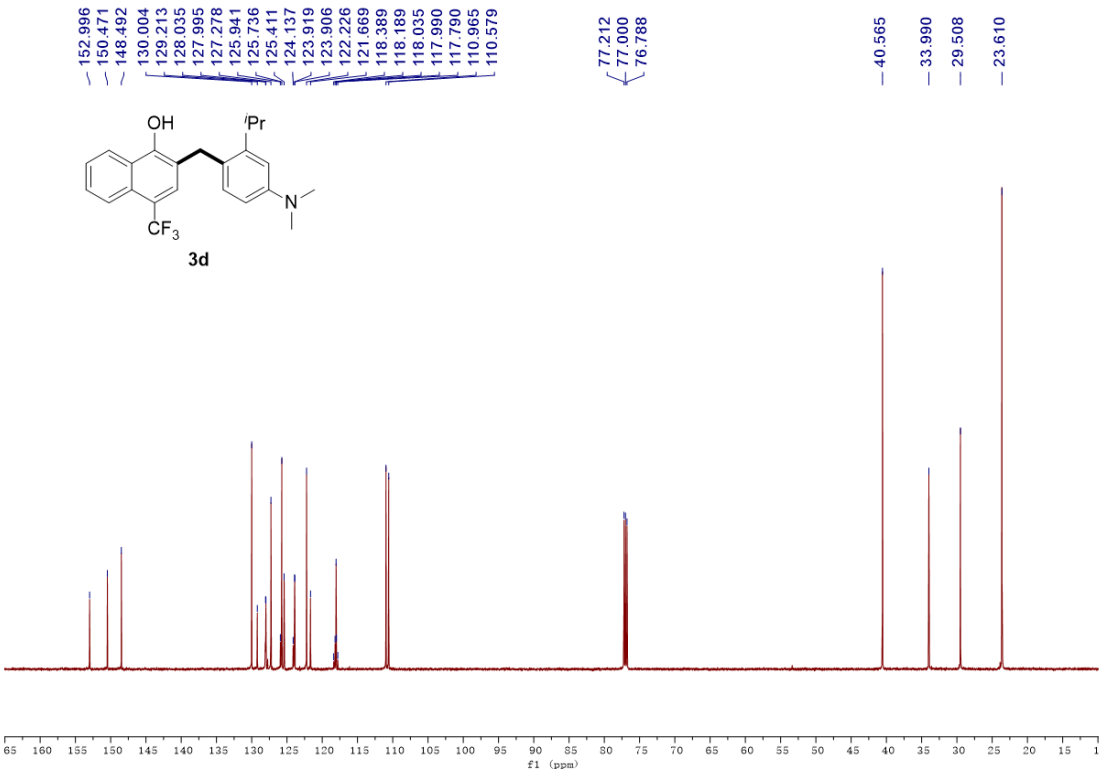
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3c



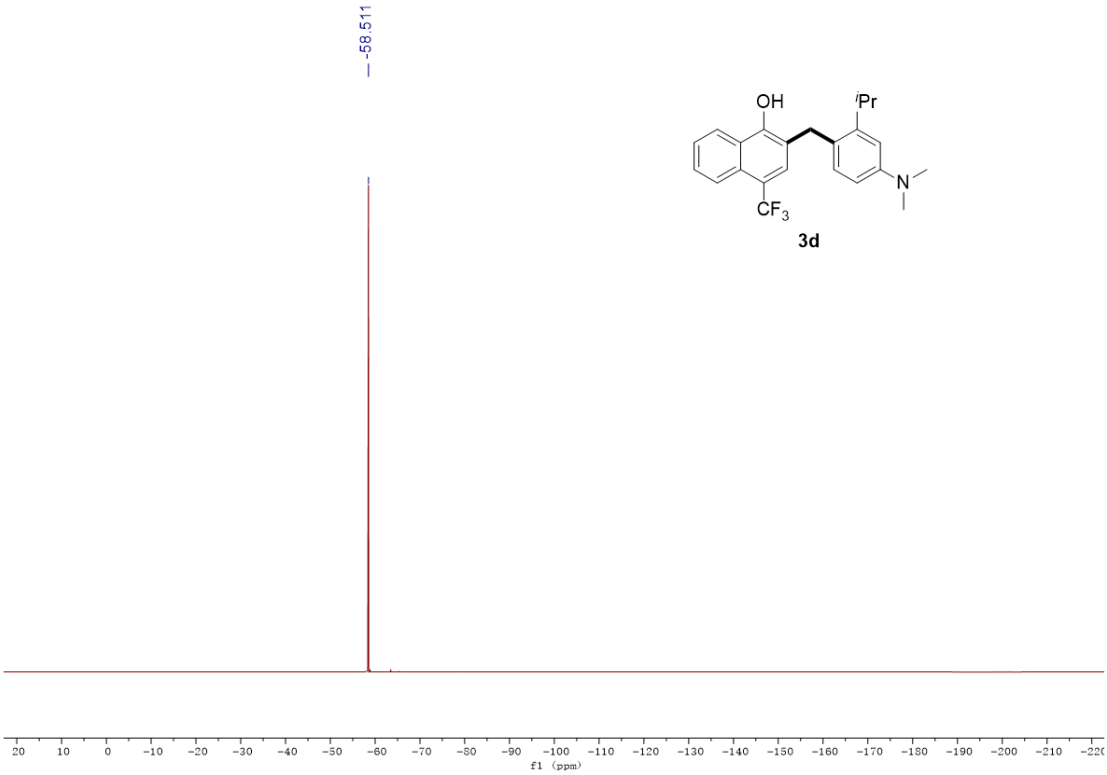
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3d



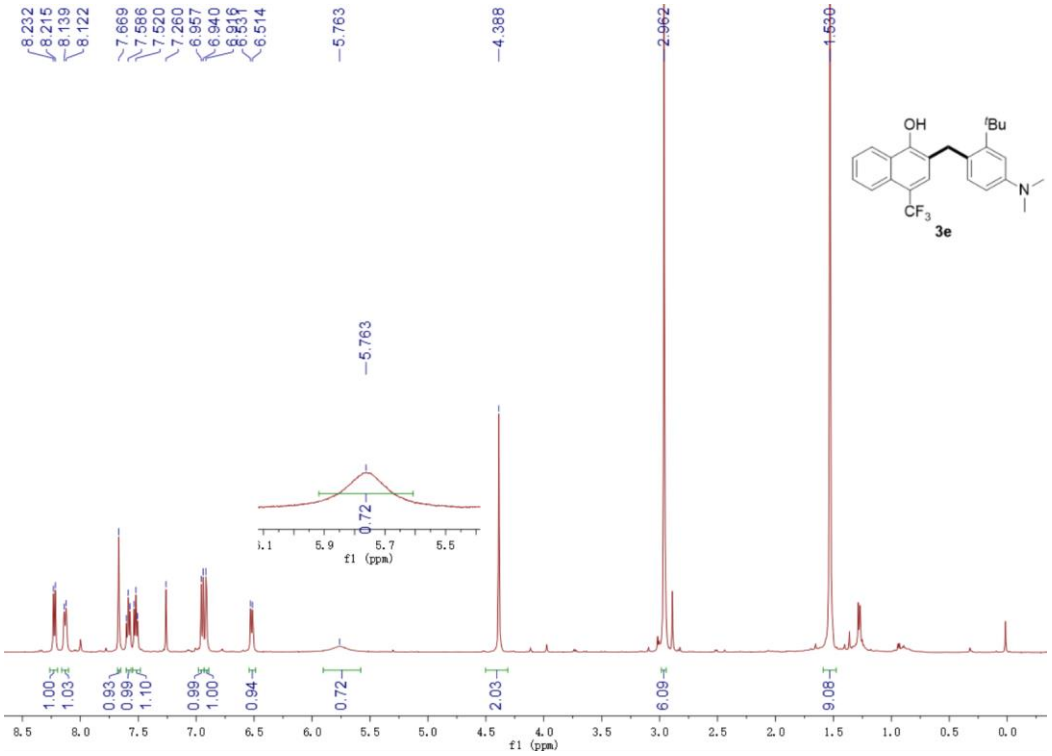
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3d



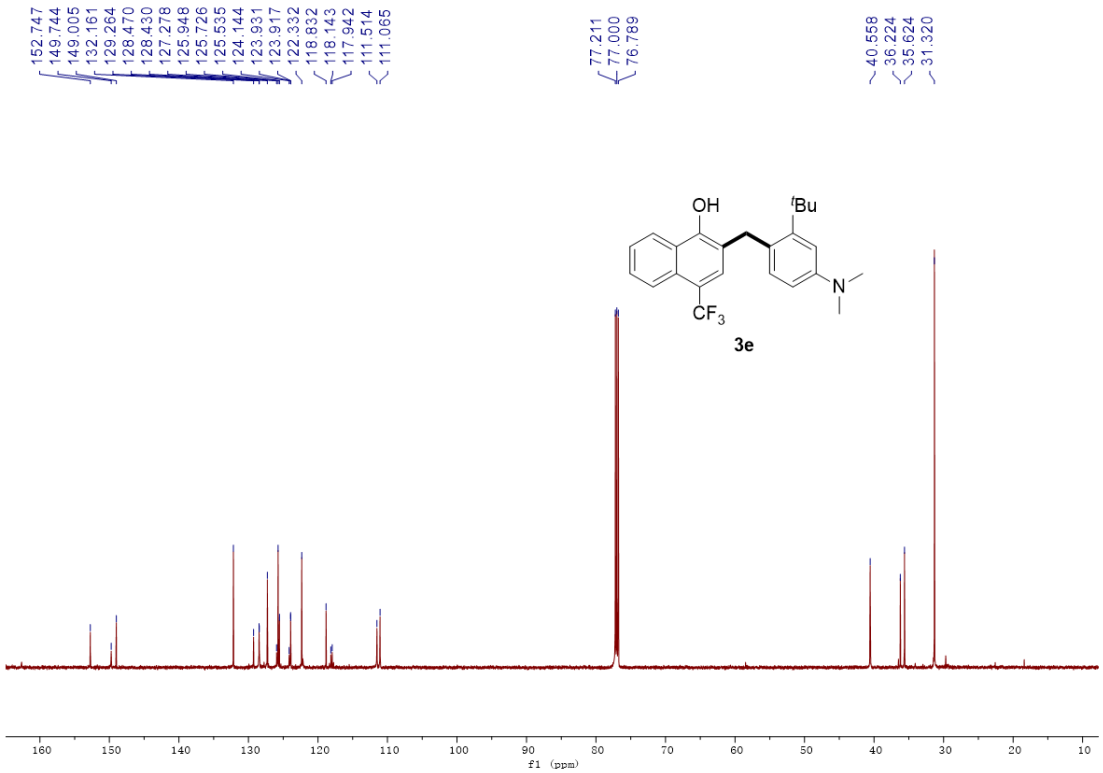
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3d



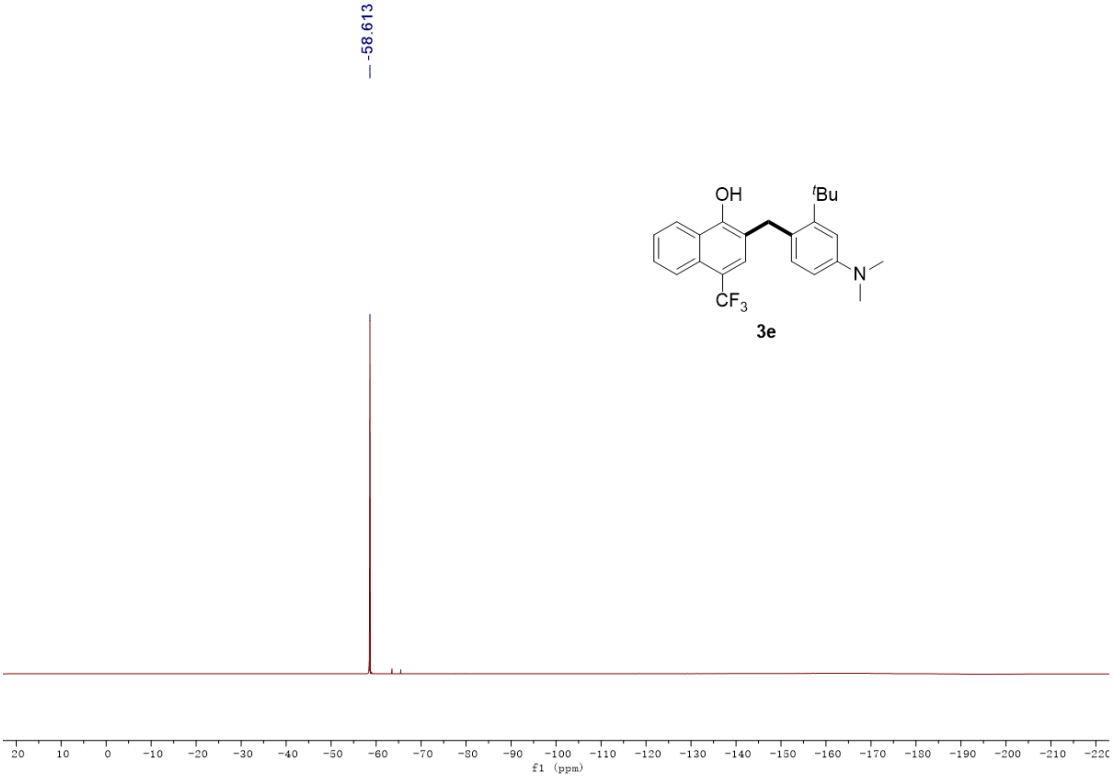
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3e



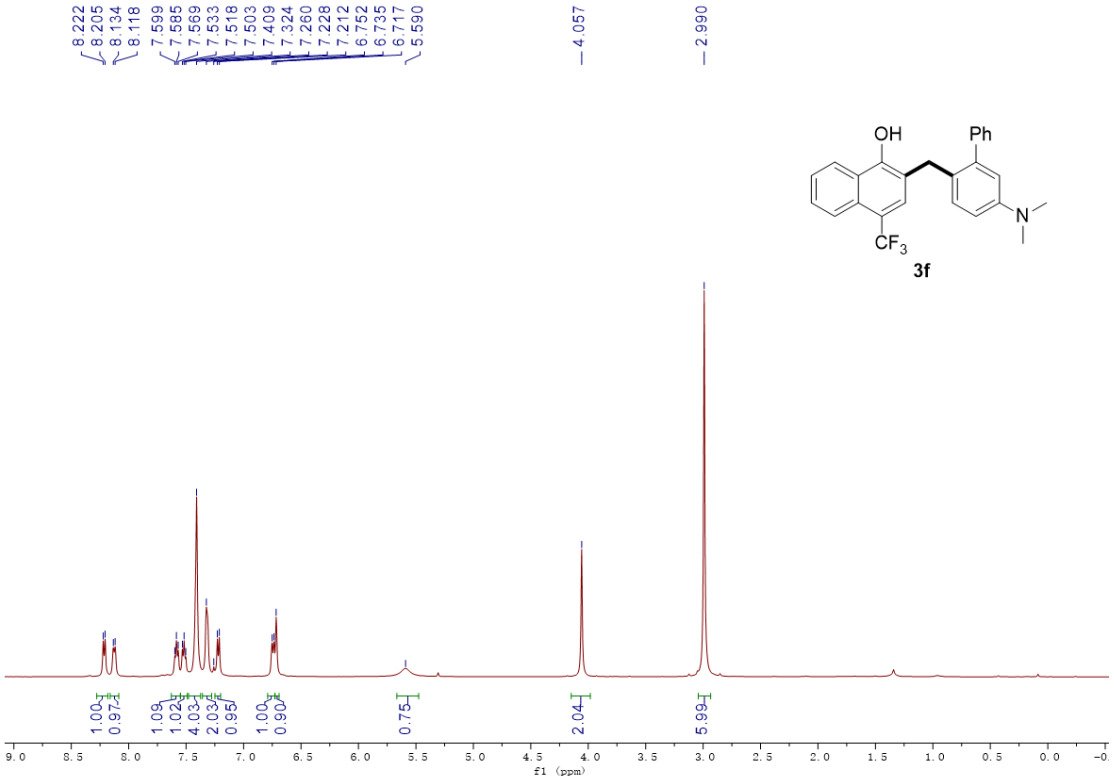
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3e



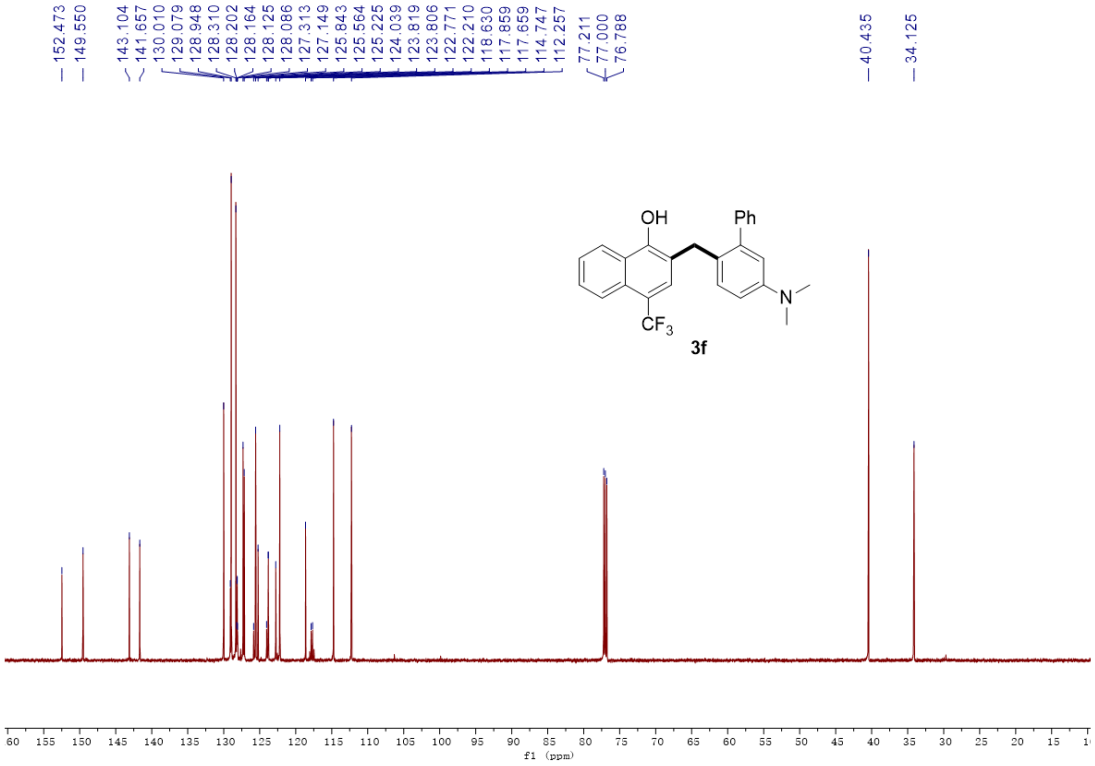
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3e



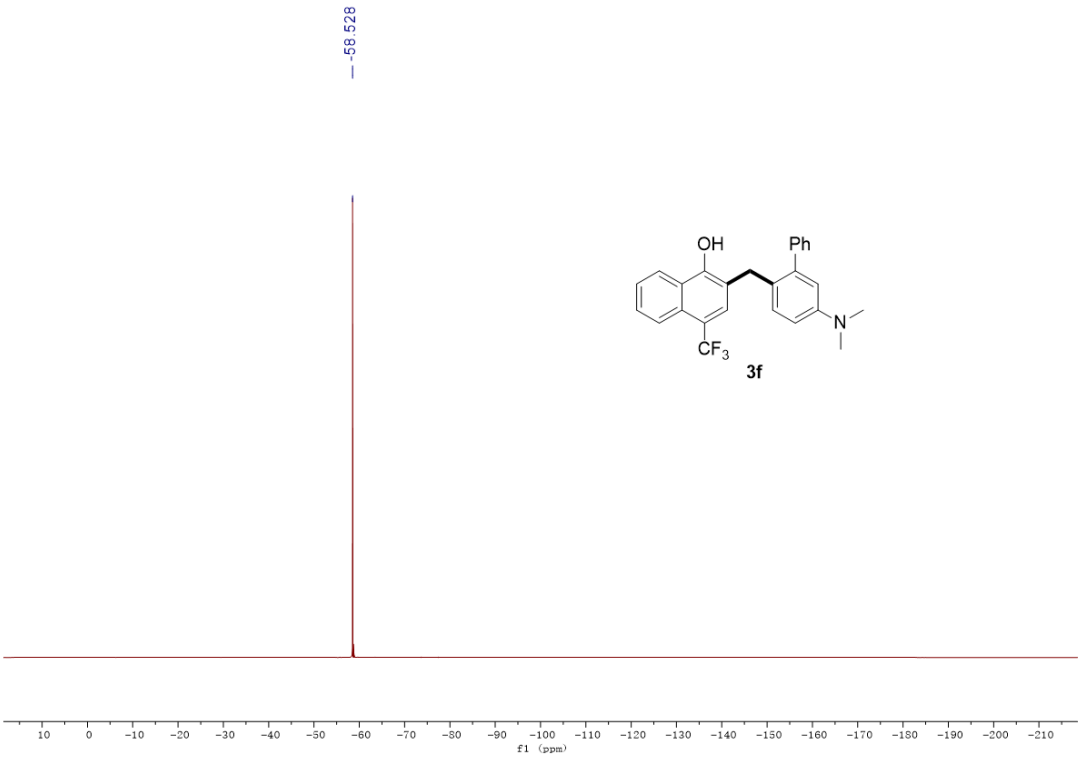
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3f



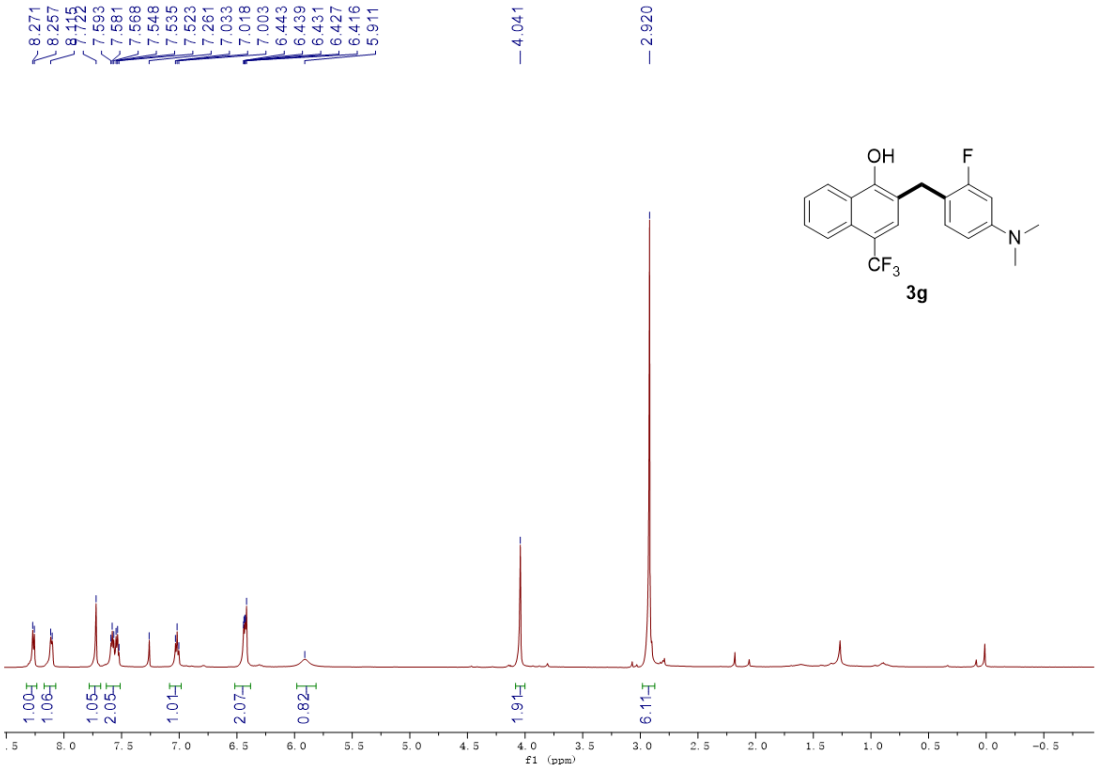
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3f



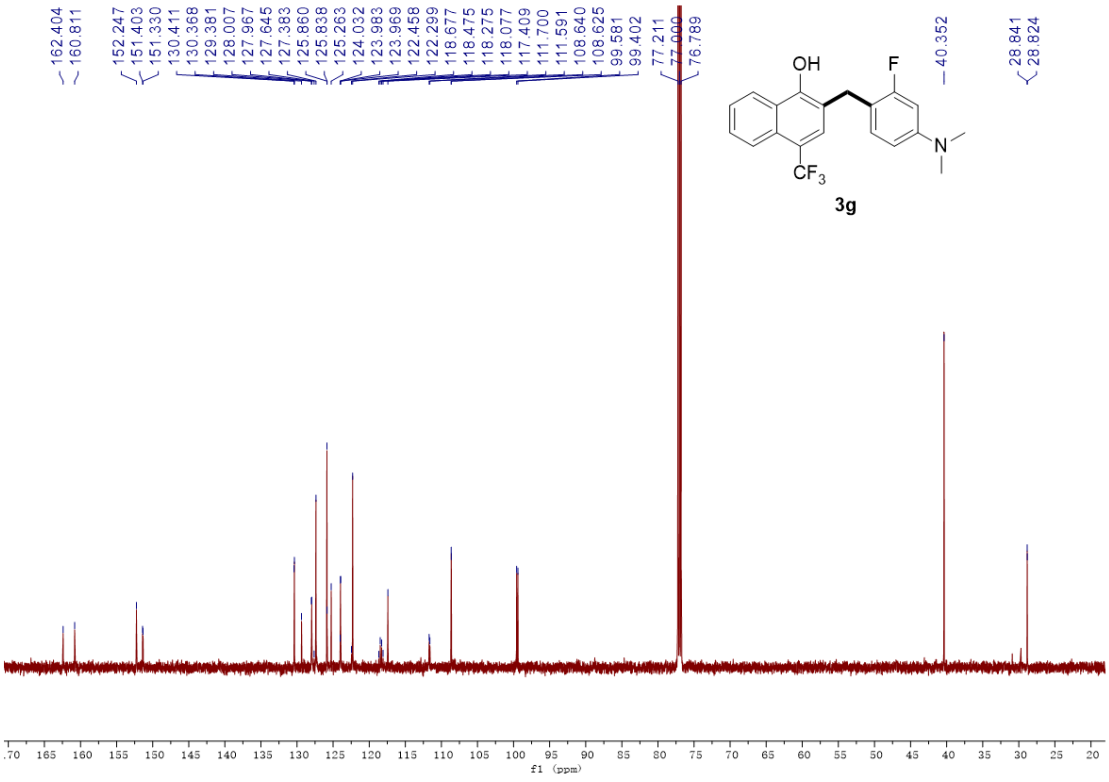
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3f



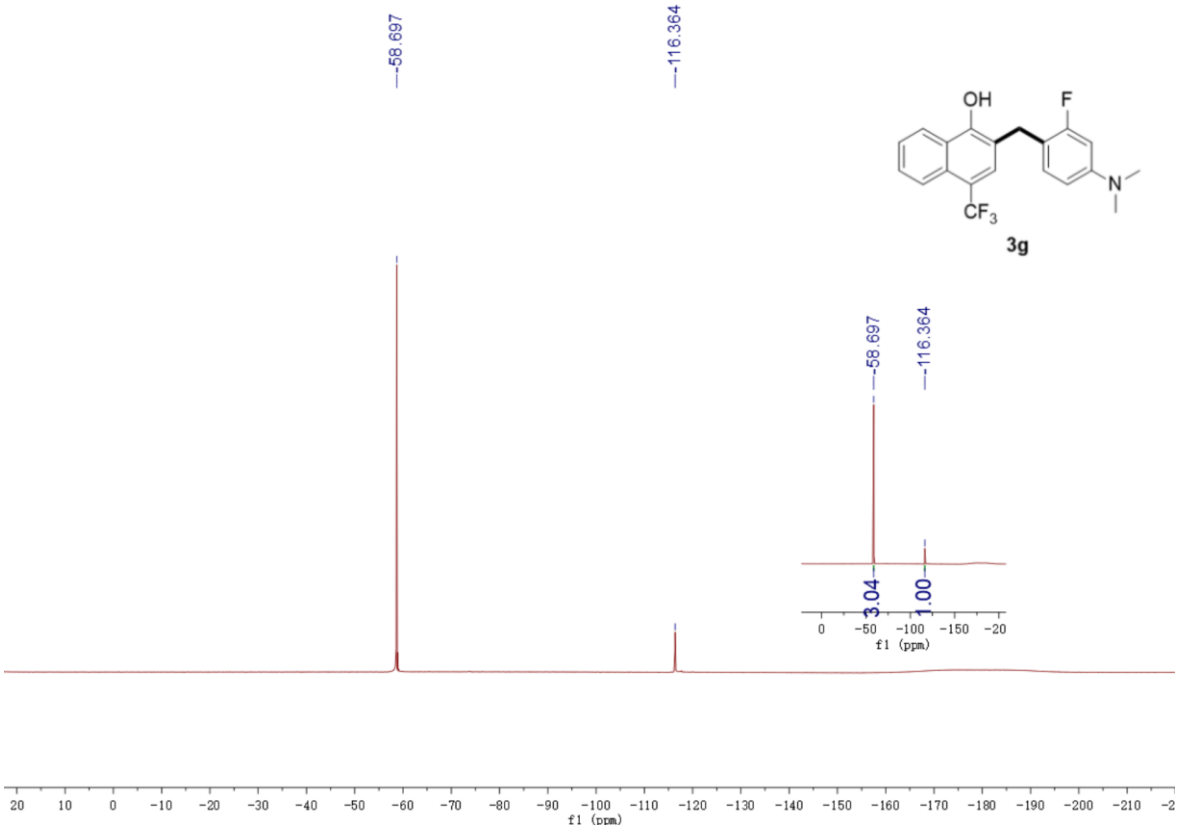
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3g



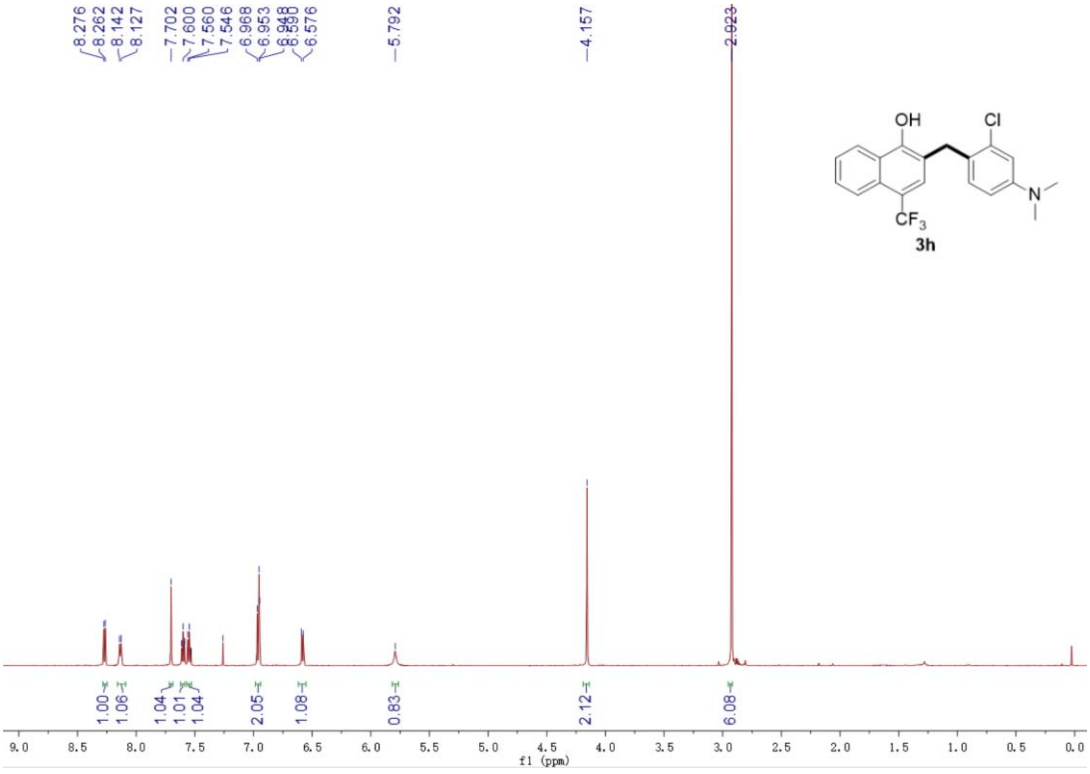
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3g



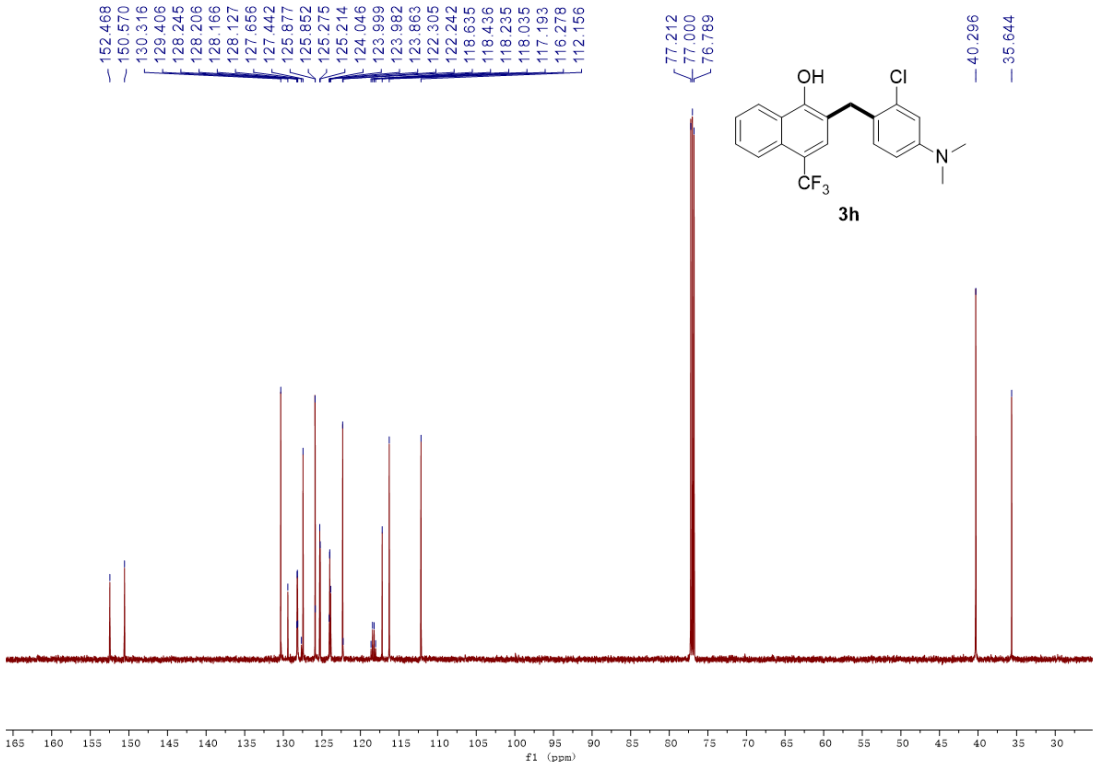
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3g



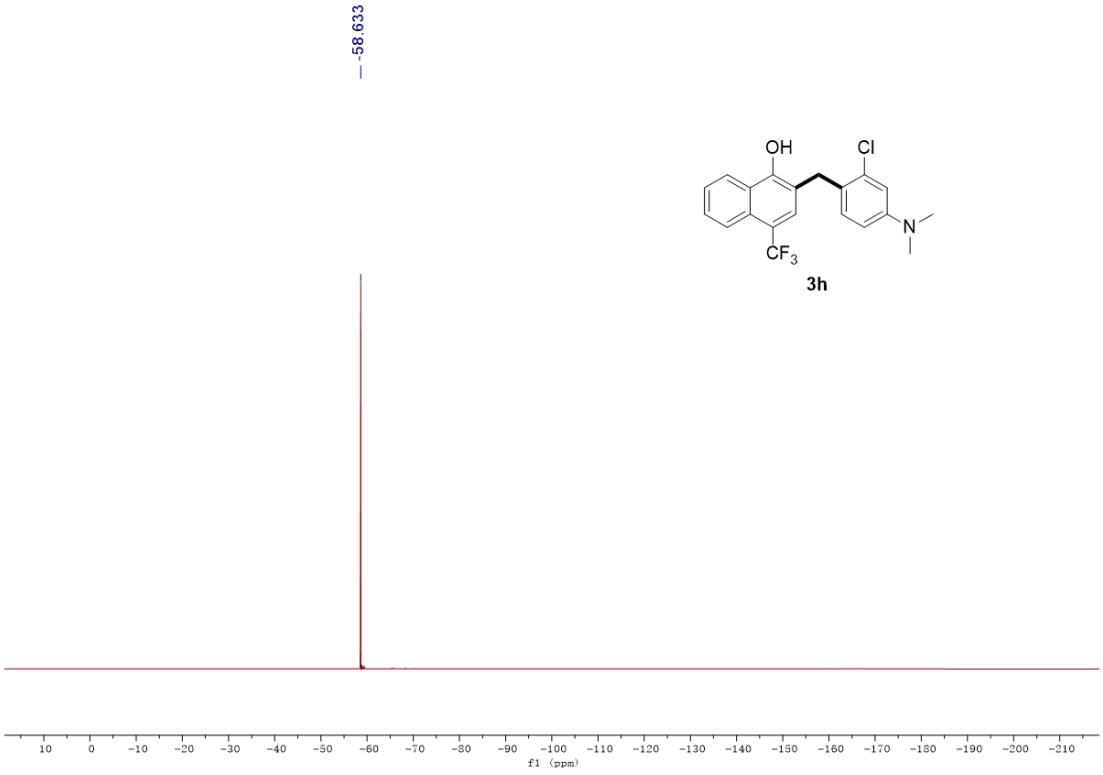
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3h



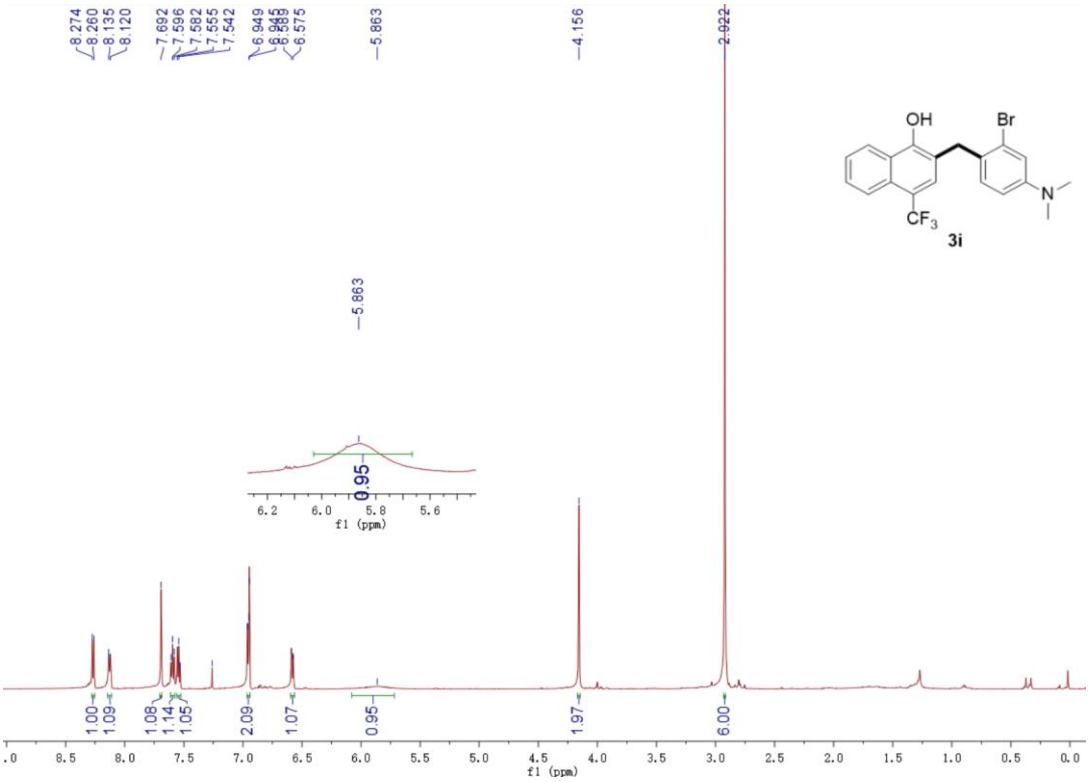
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3h



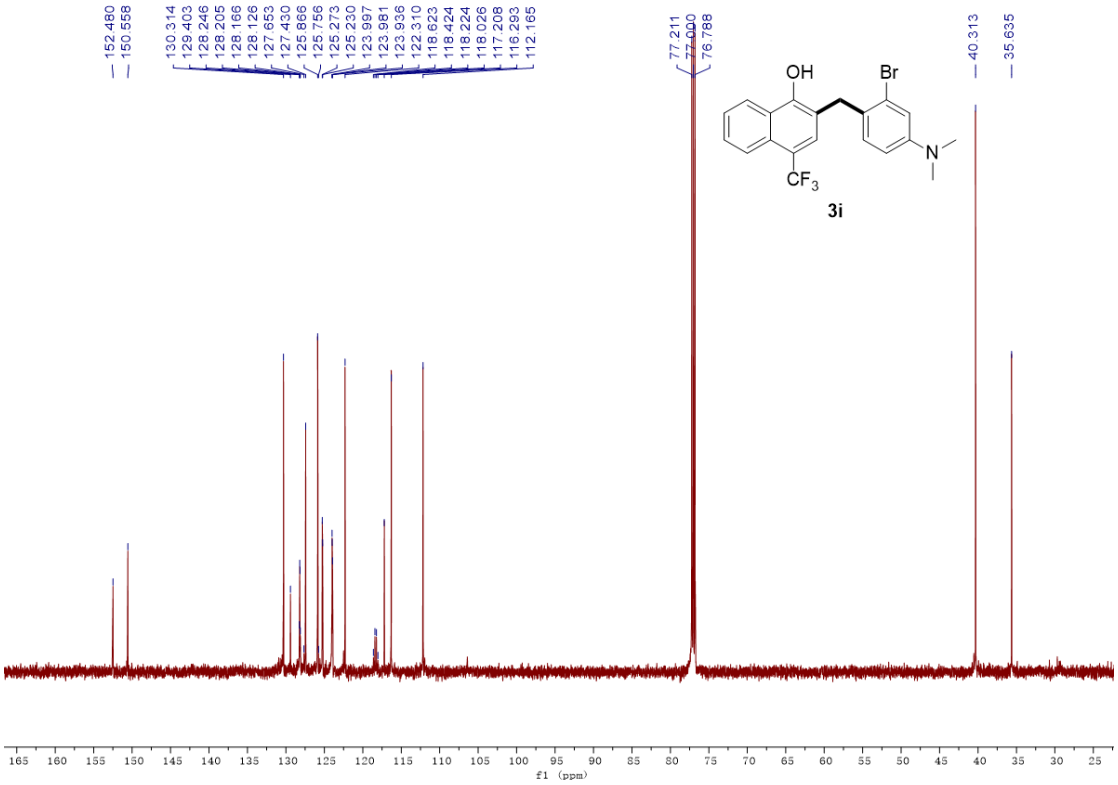
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3h



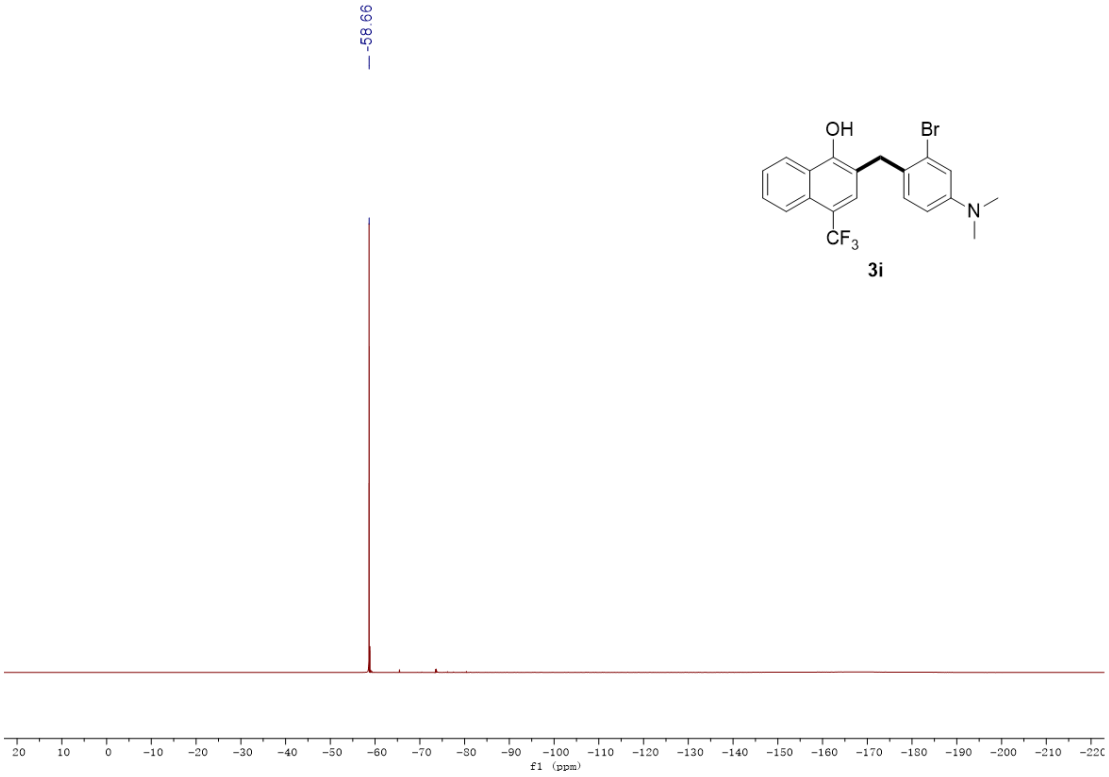
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3i



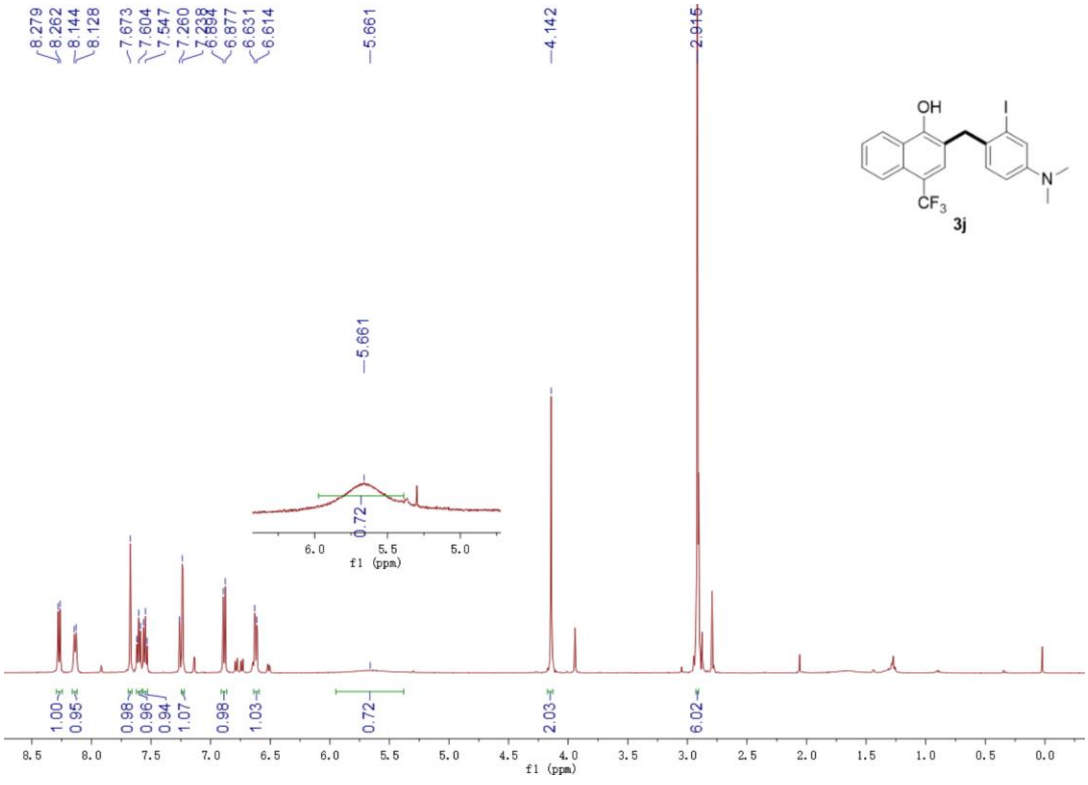
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3i



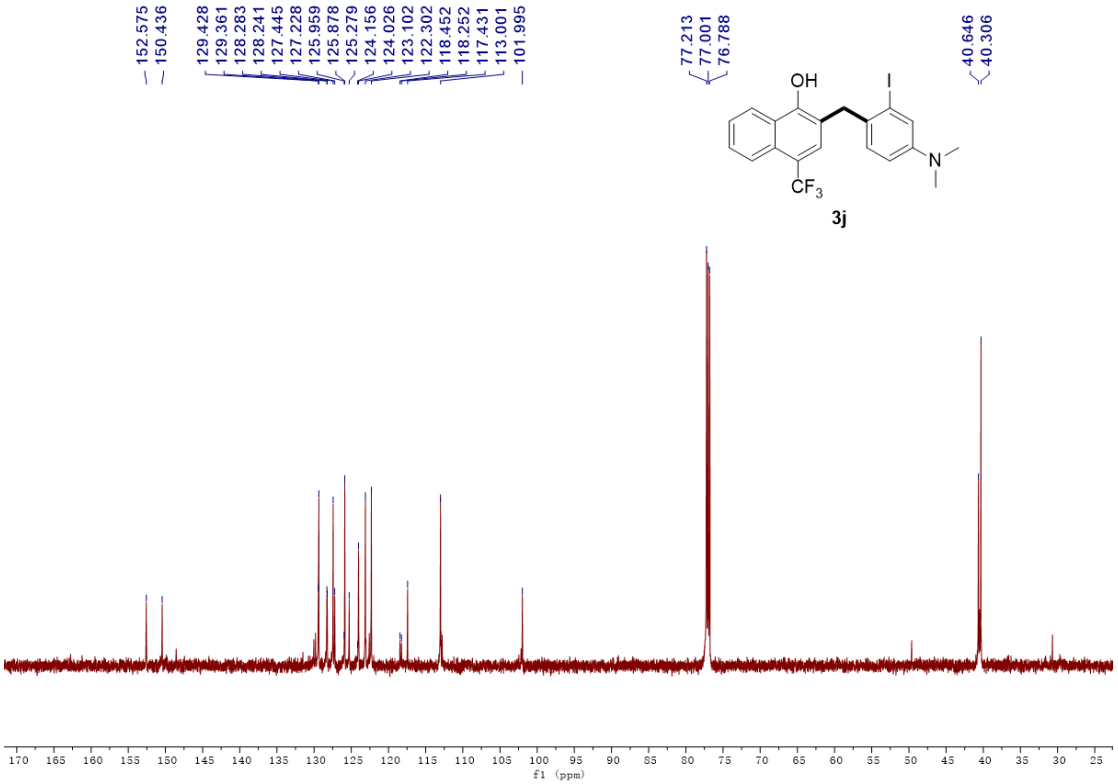
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3i



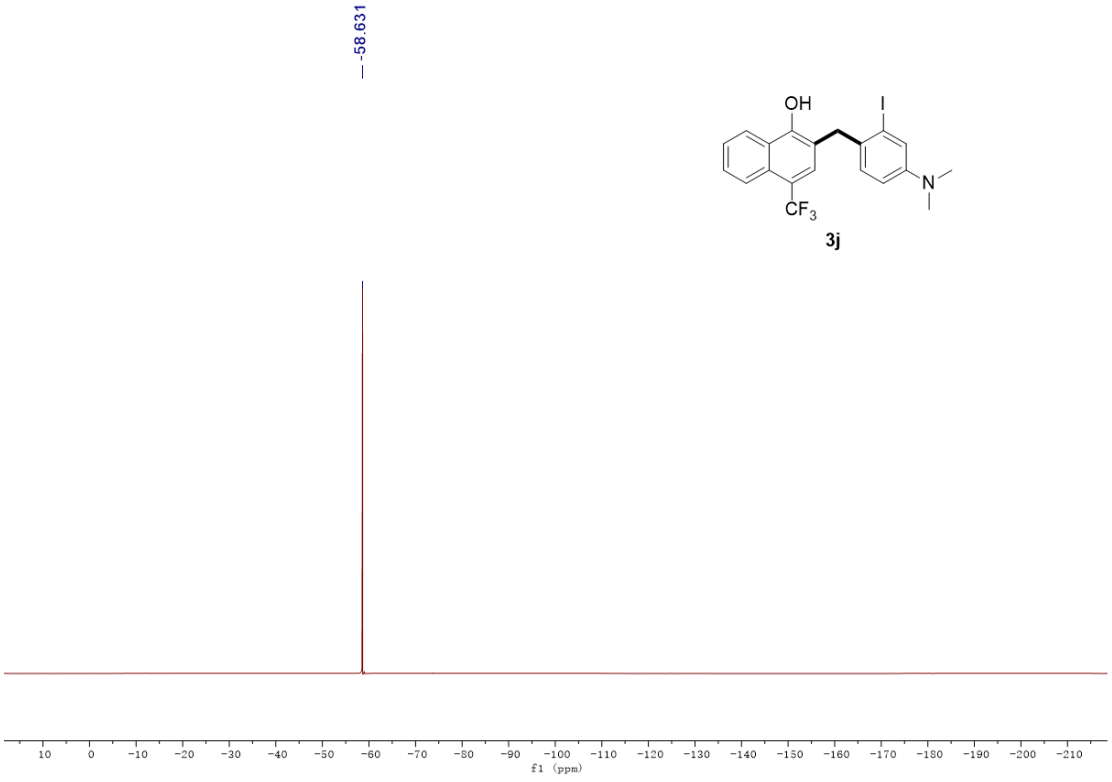
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3j



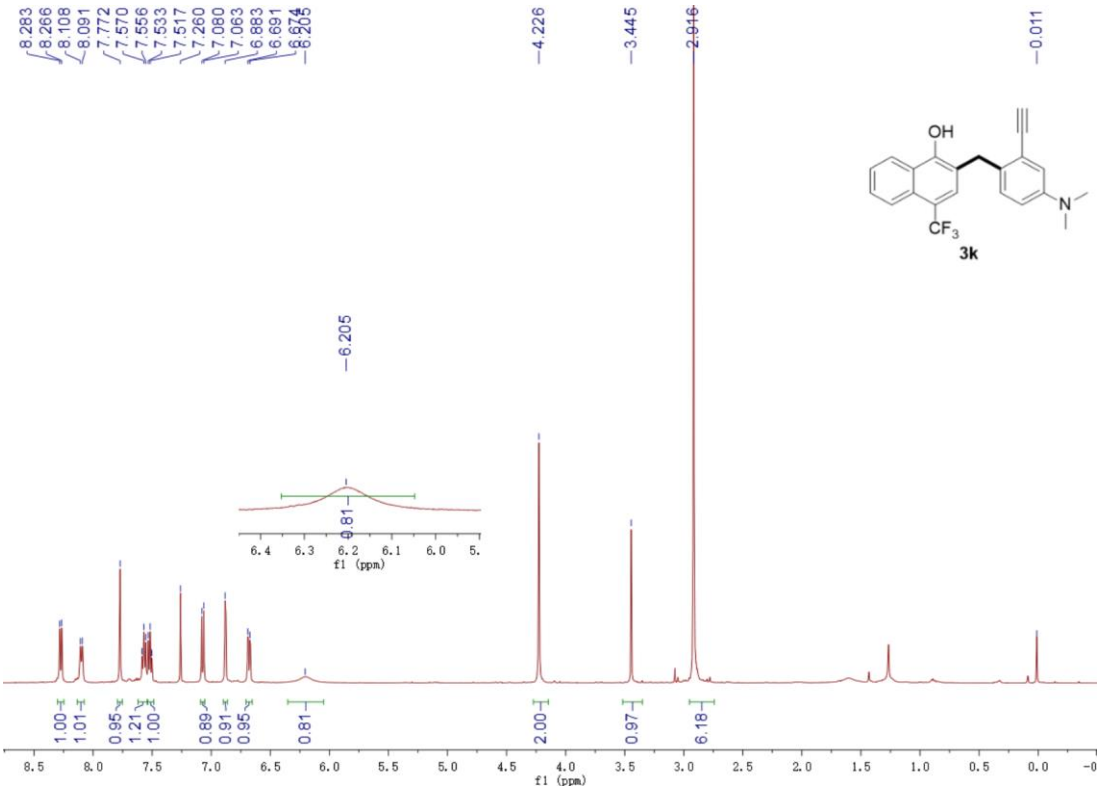
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3j



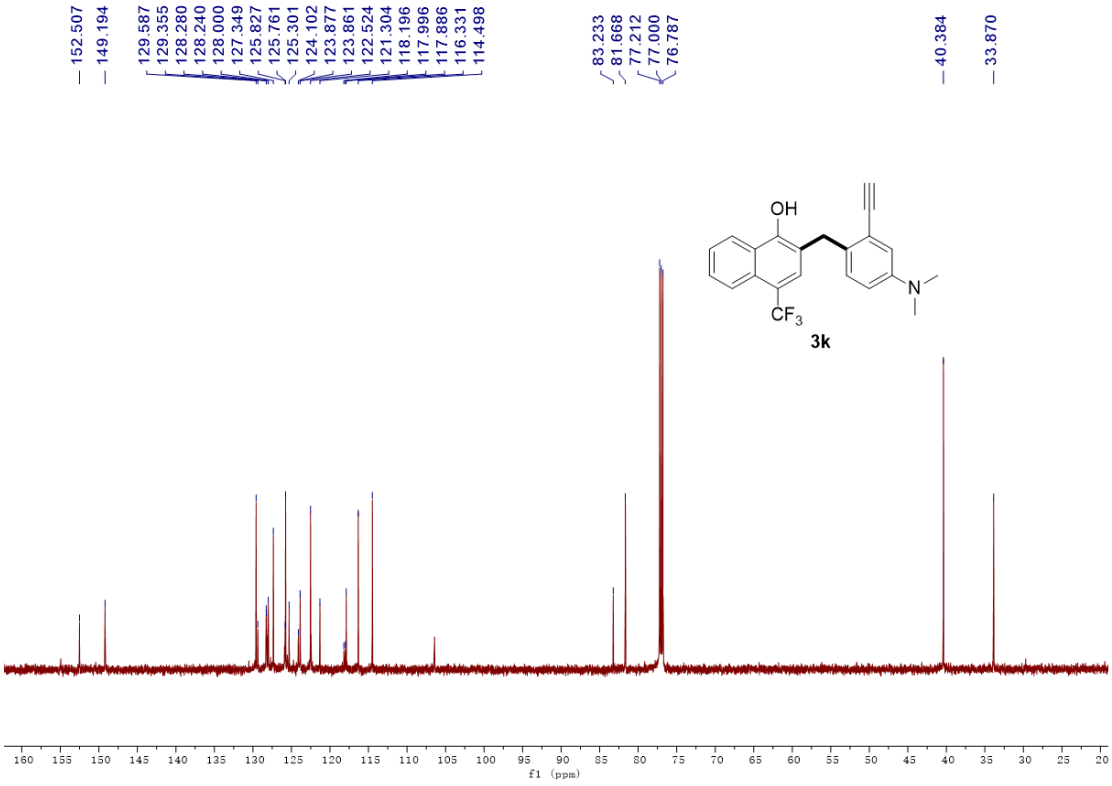
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3j



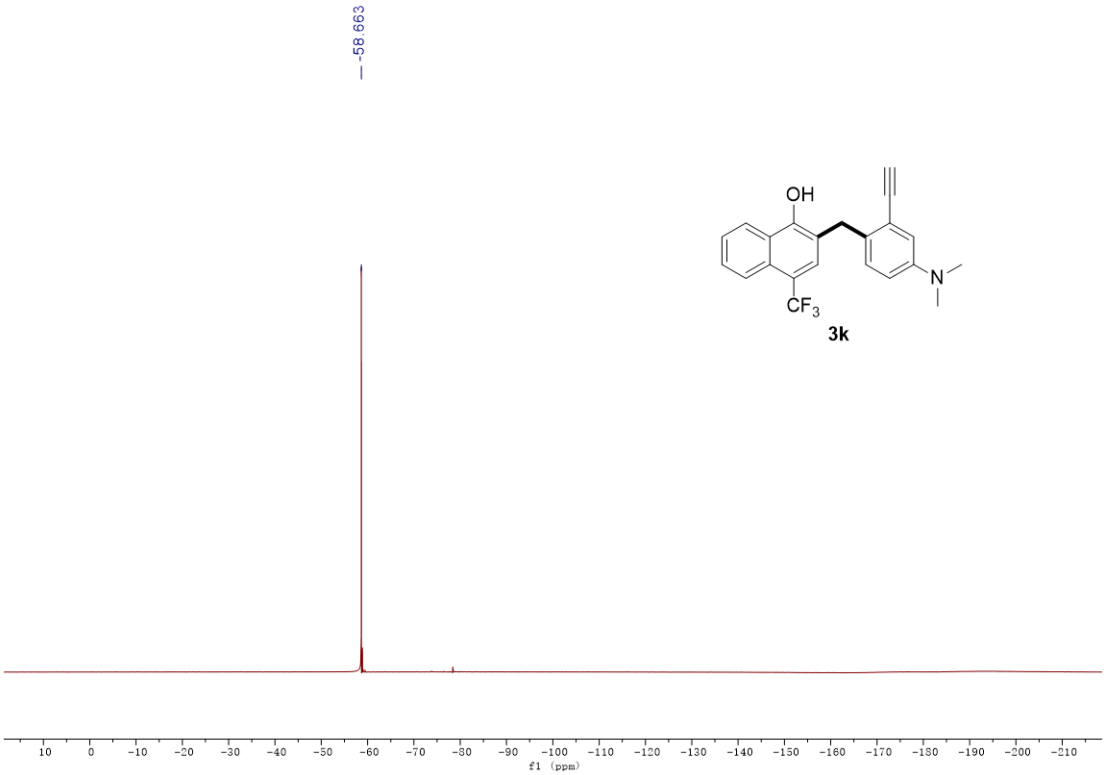
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3k



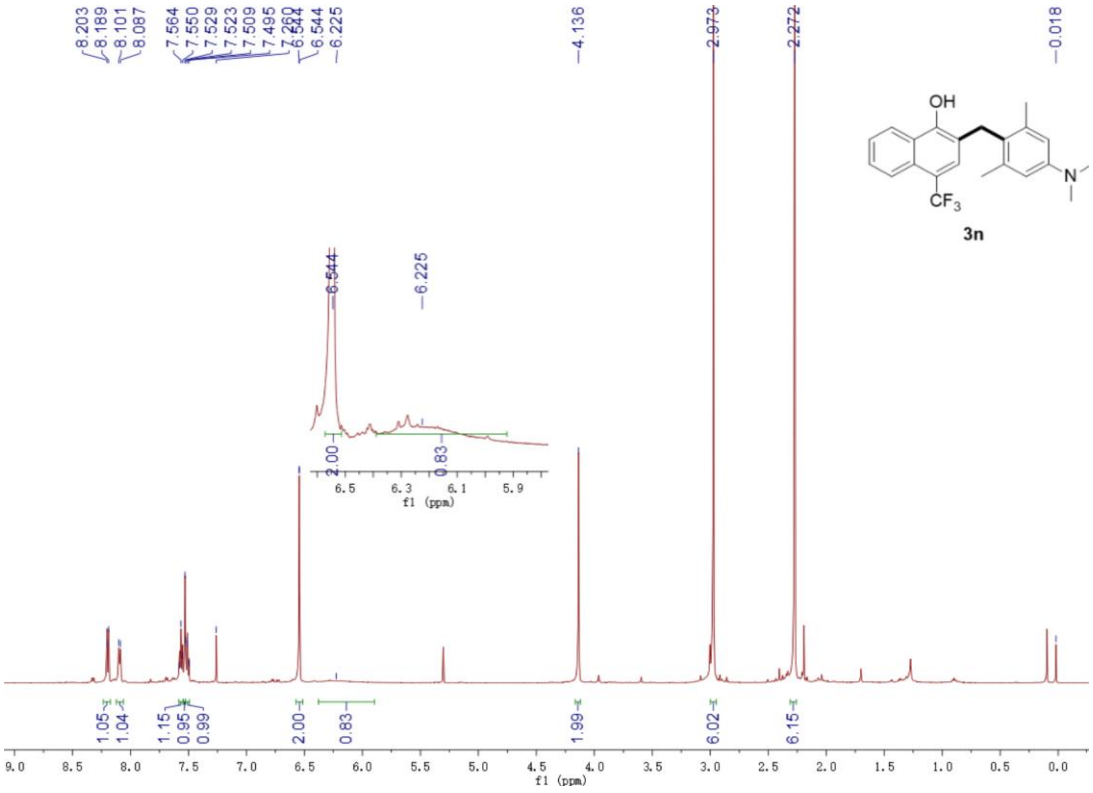
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3k



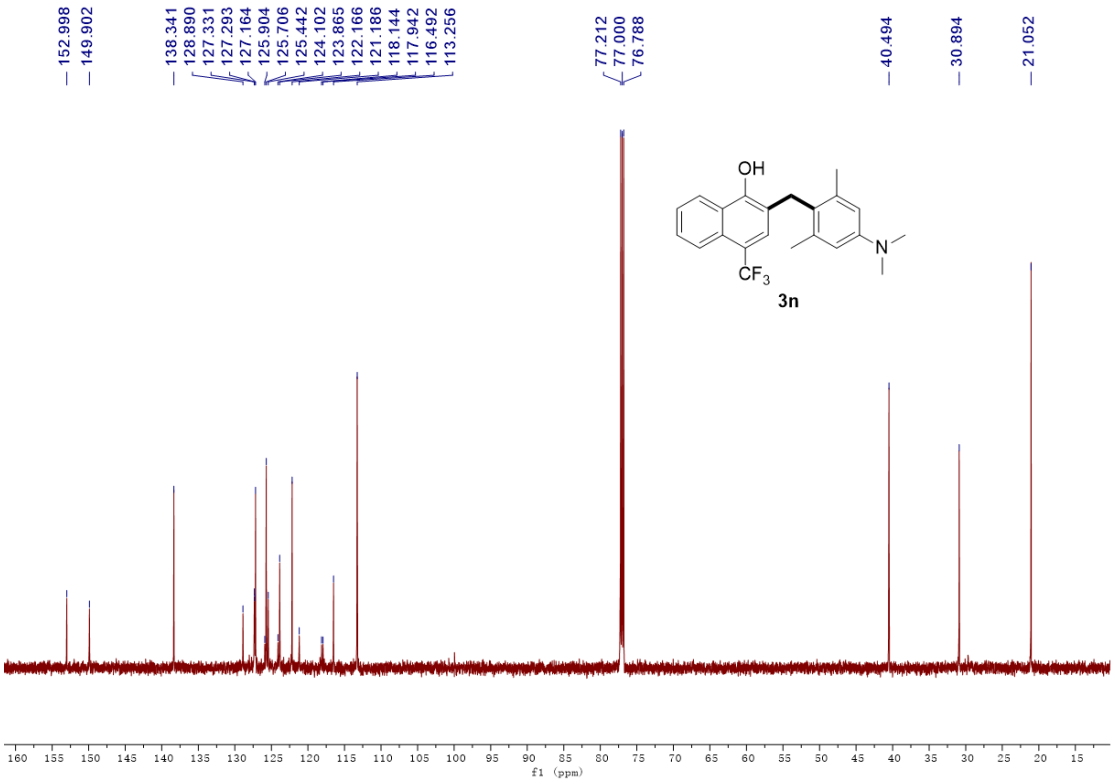
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3k



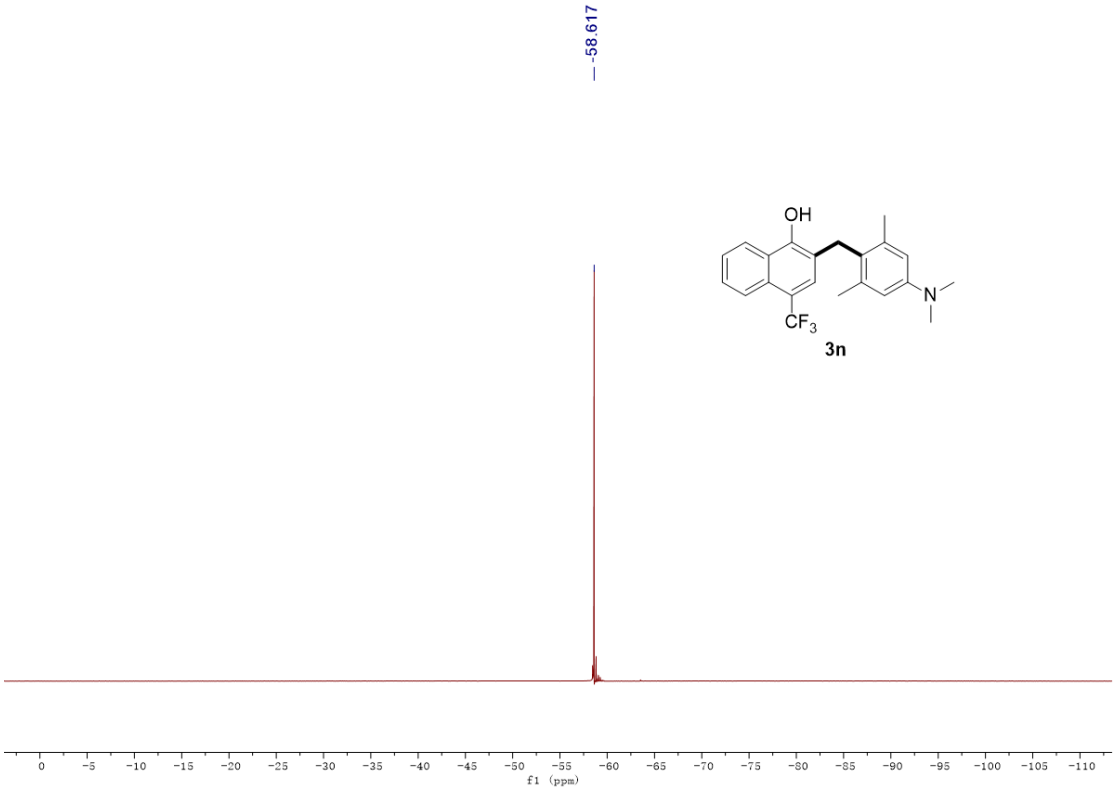
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3n



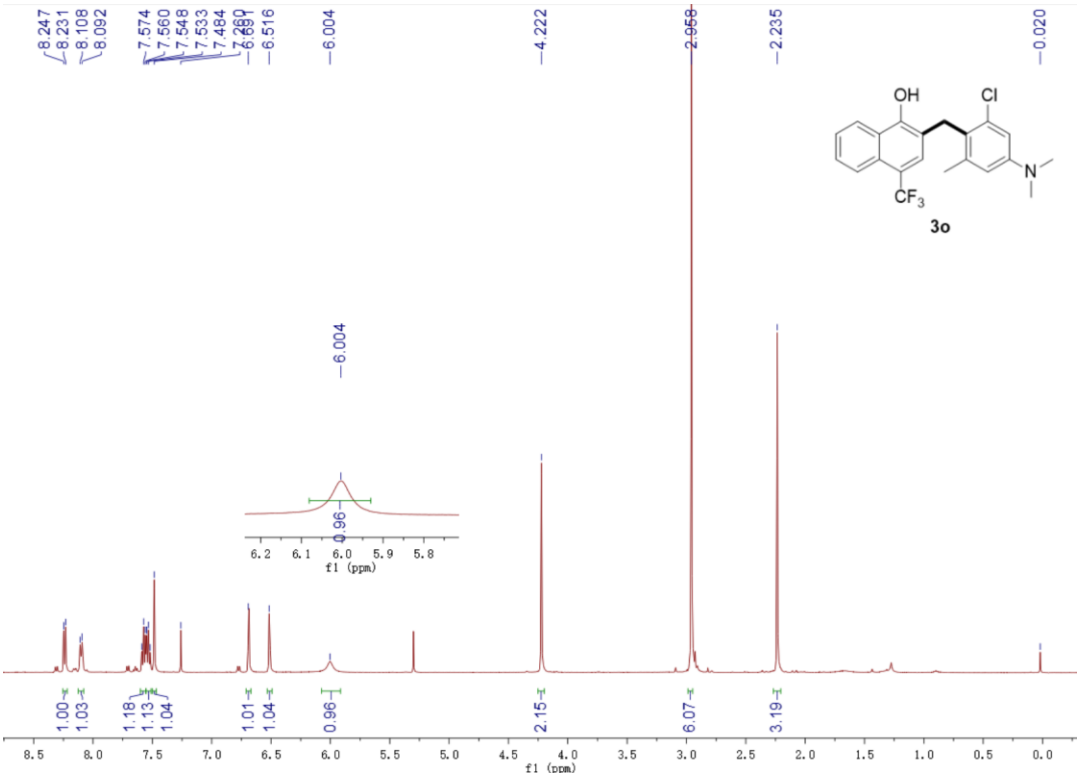
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3n



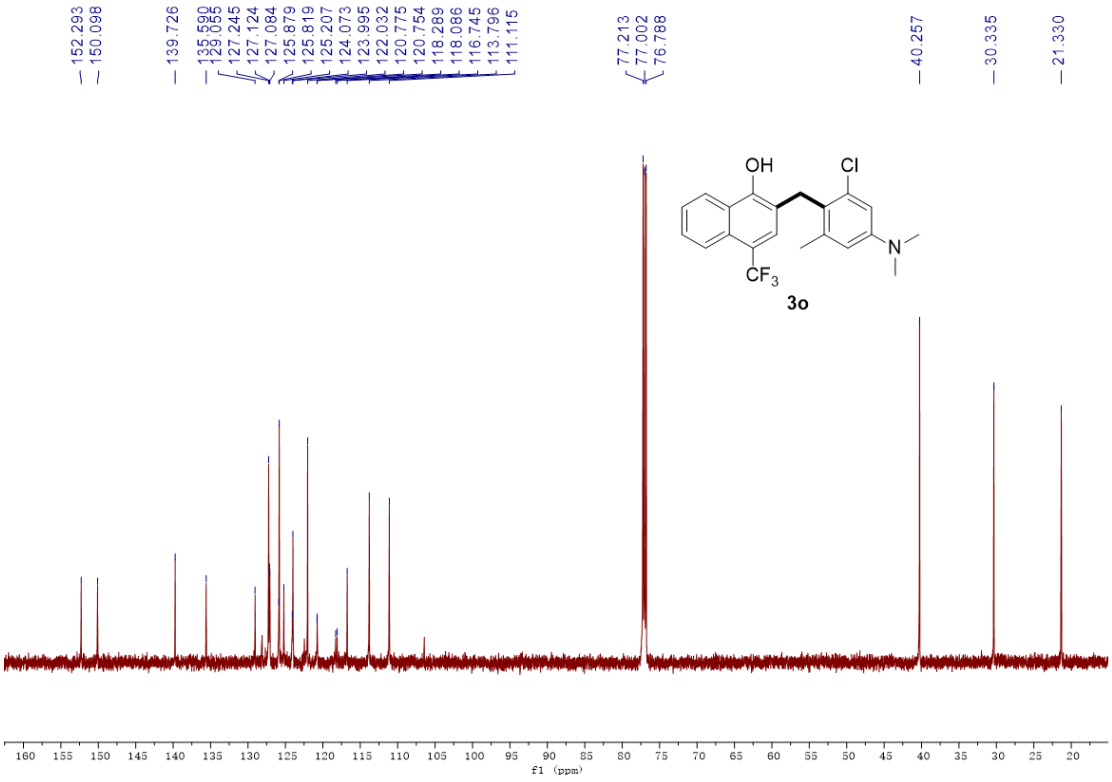
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3n



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

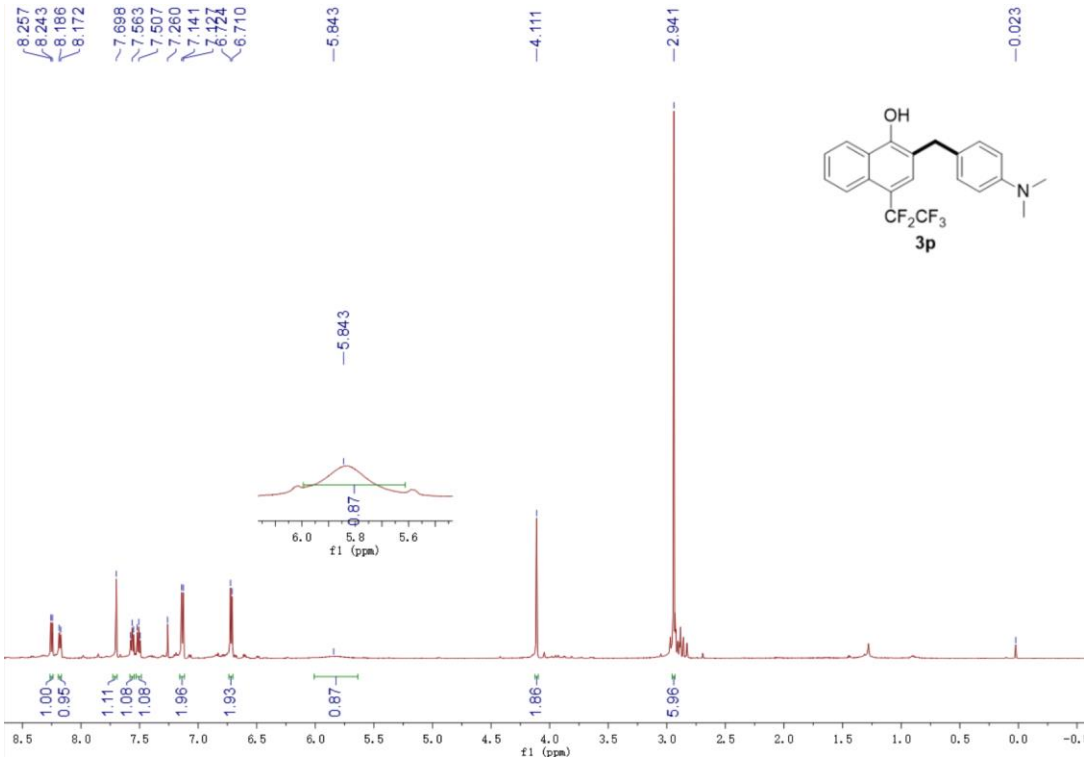


^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3o

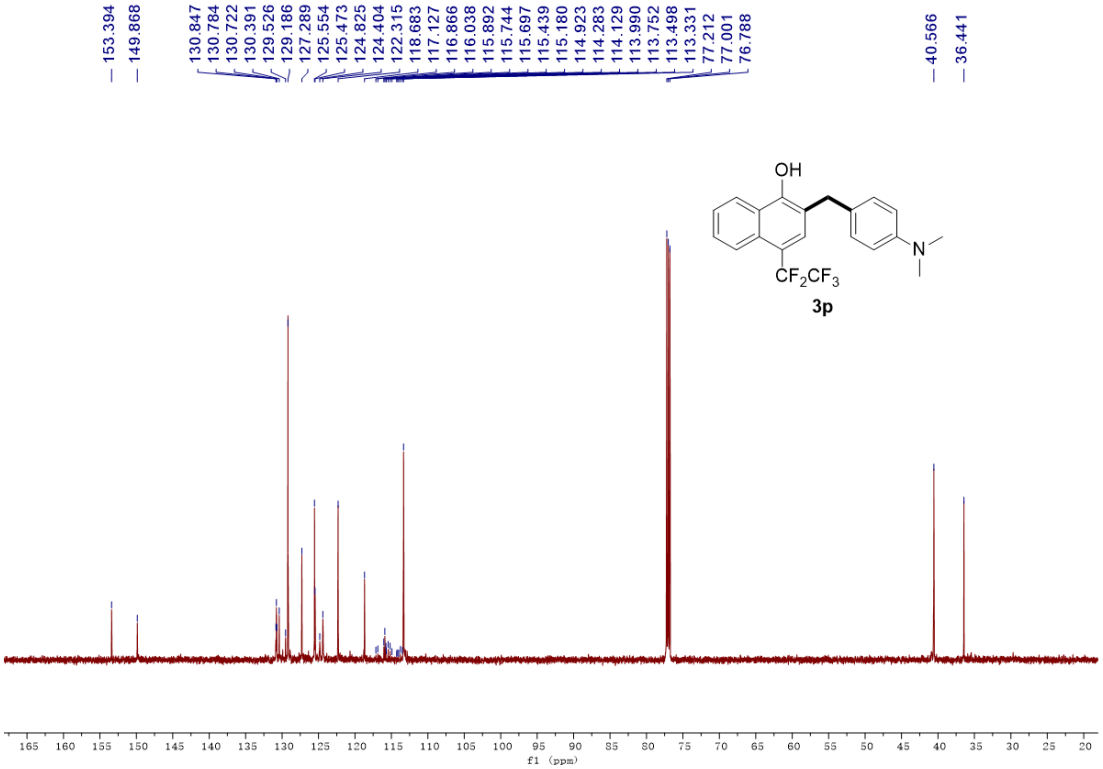


^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3o

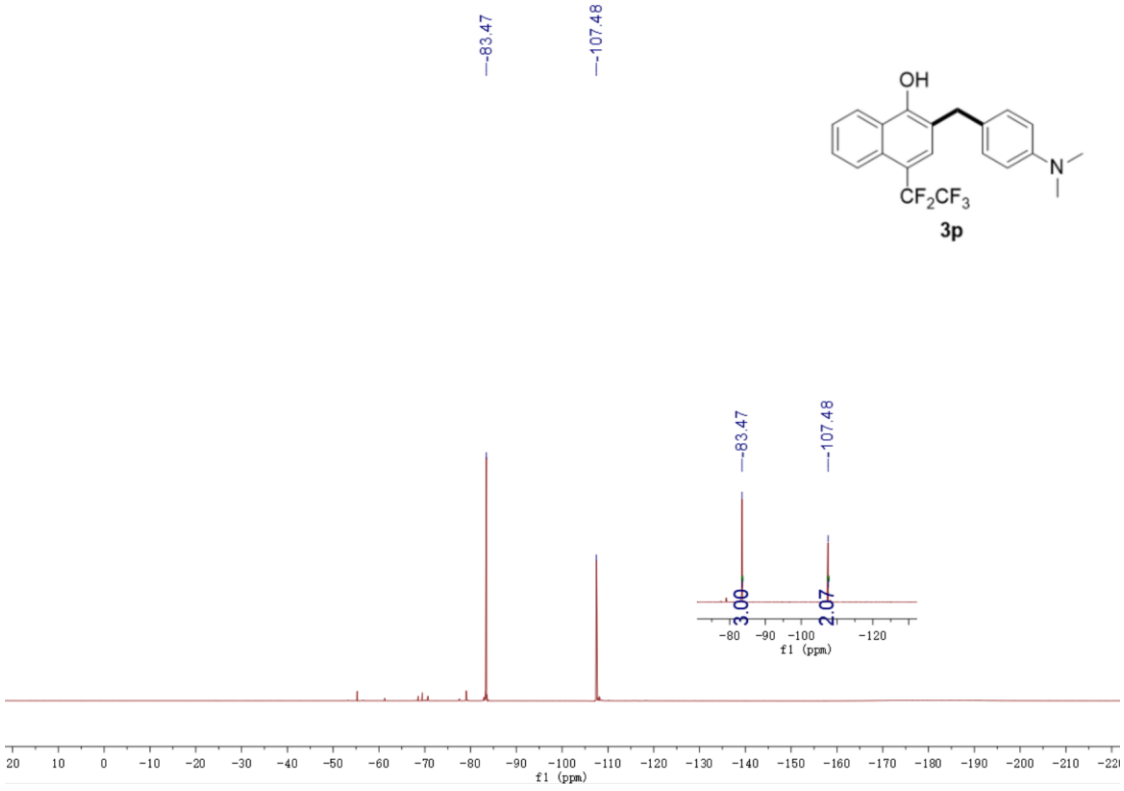
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3p



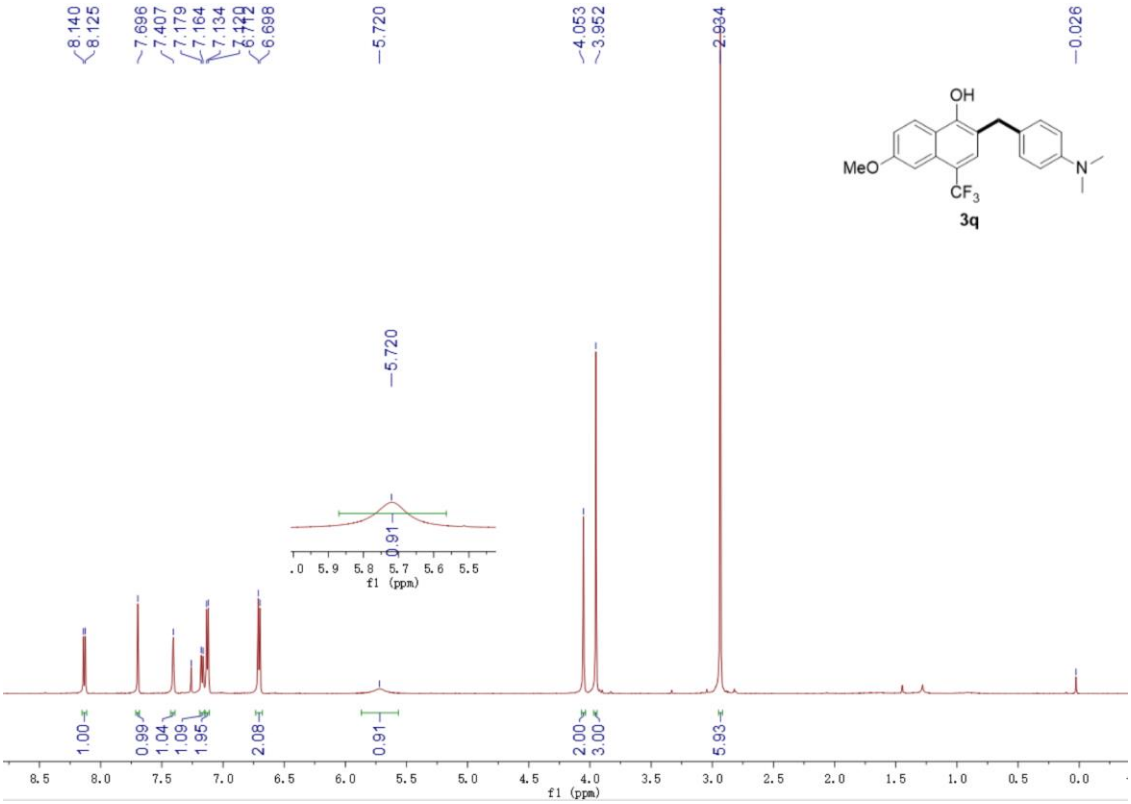
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3p



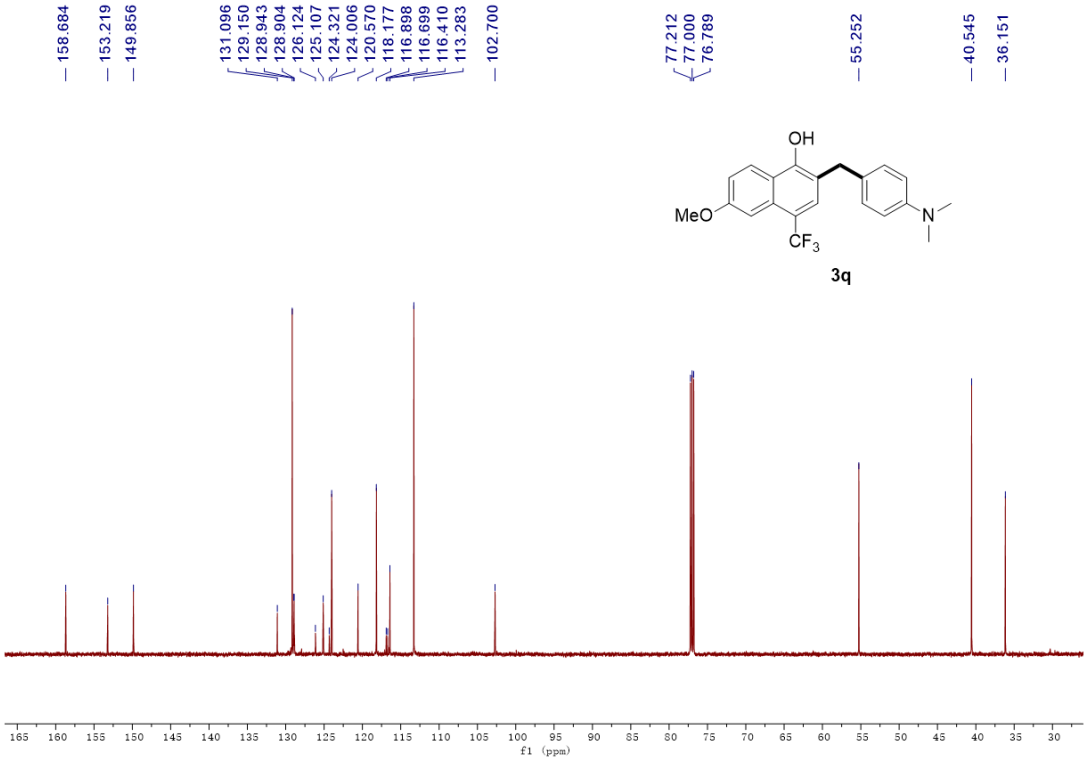
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3p



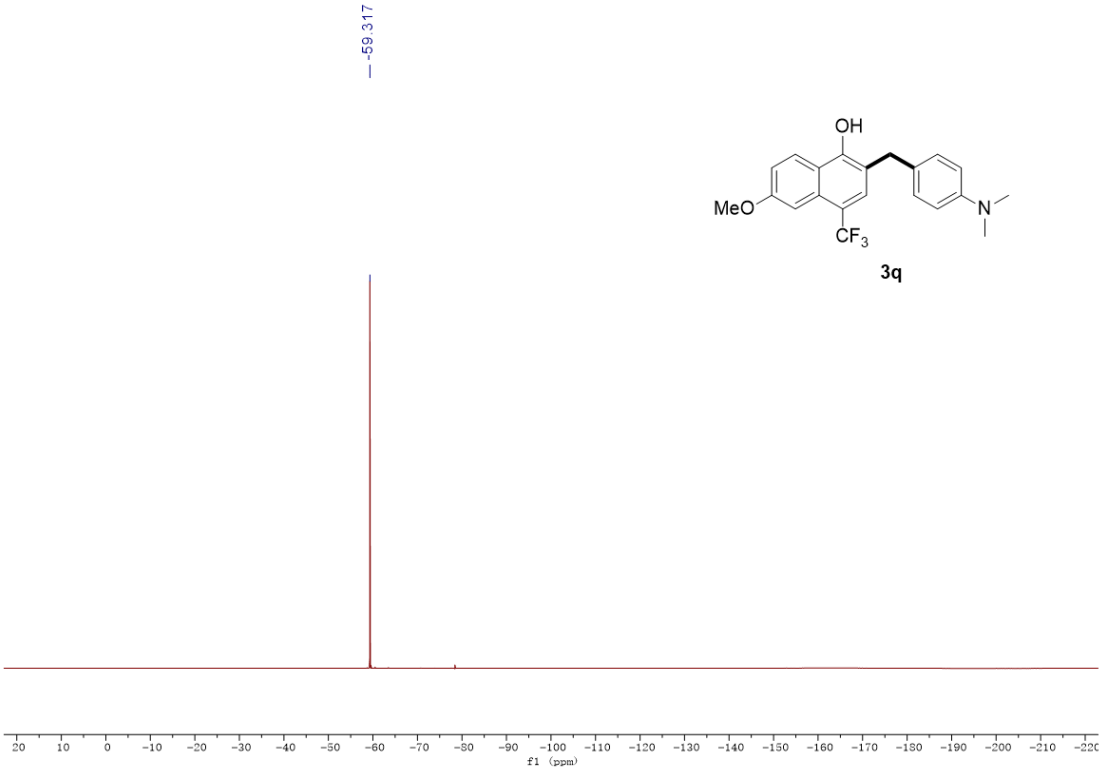
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3q



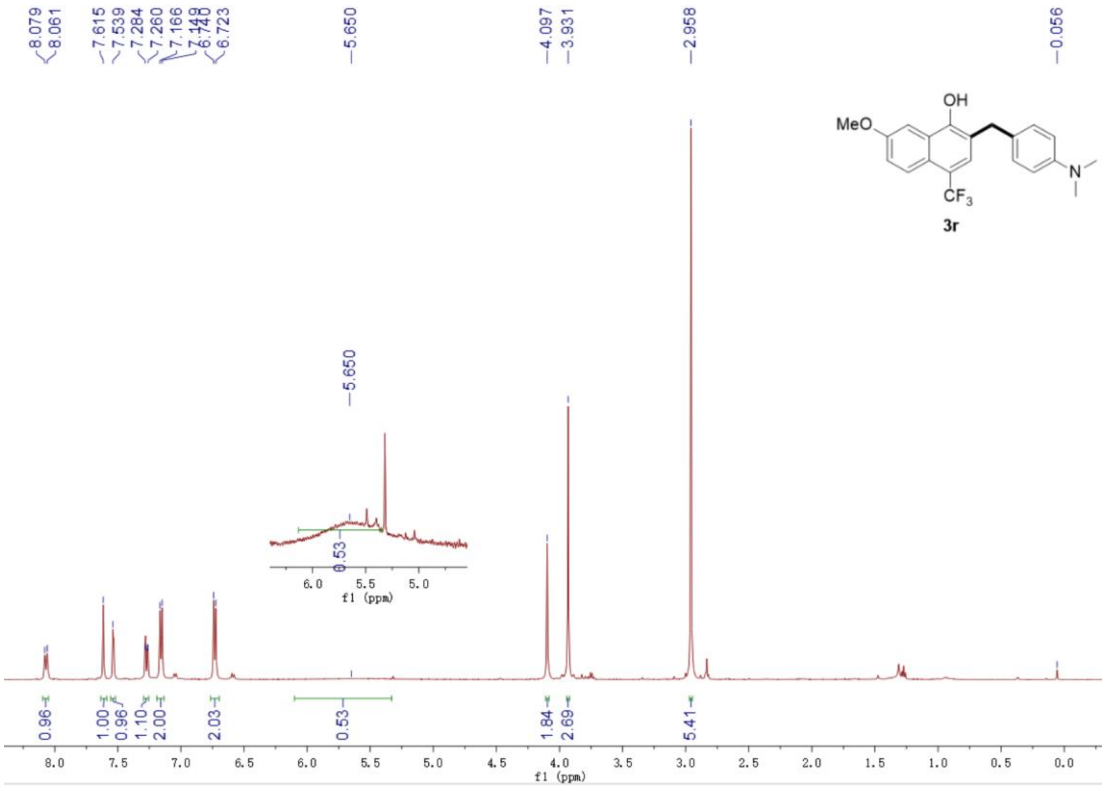
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3q



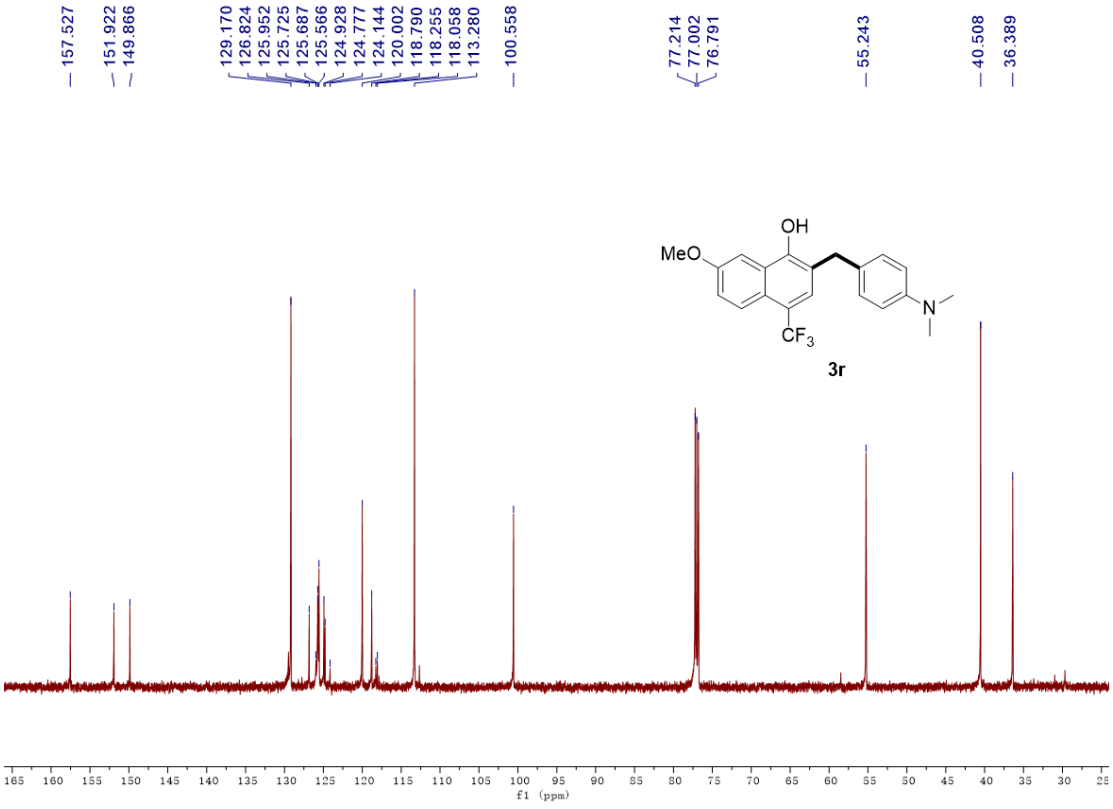
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3q



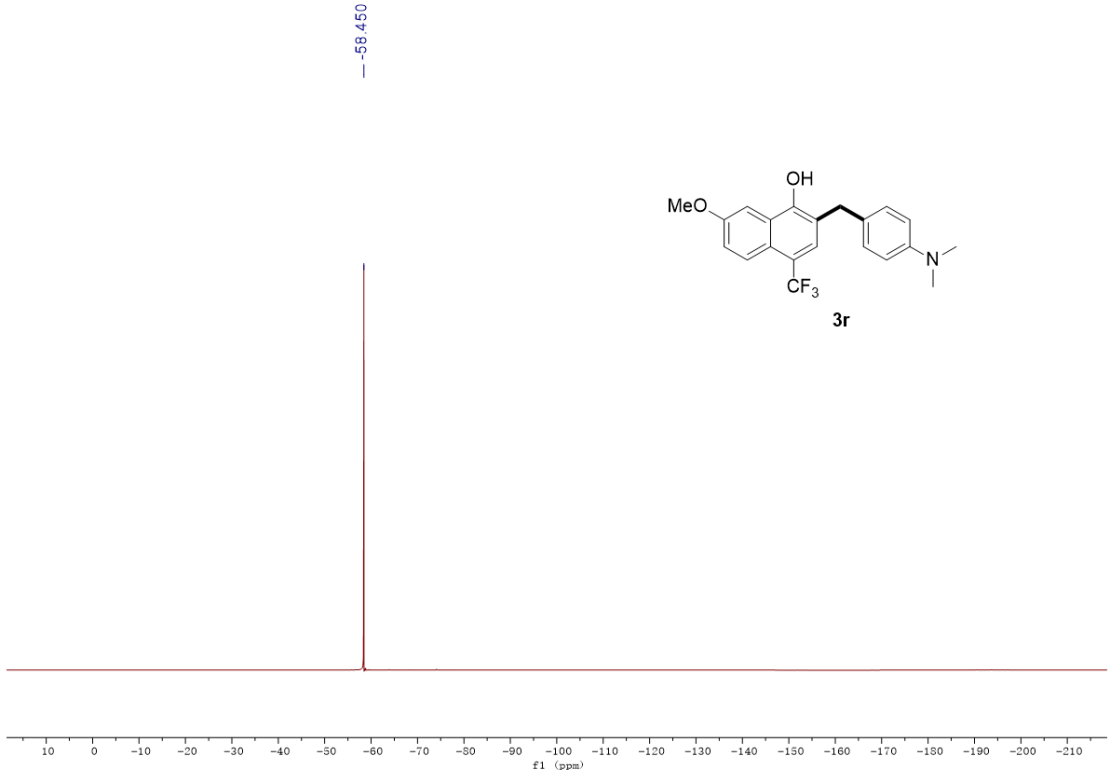
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3r



^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3r

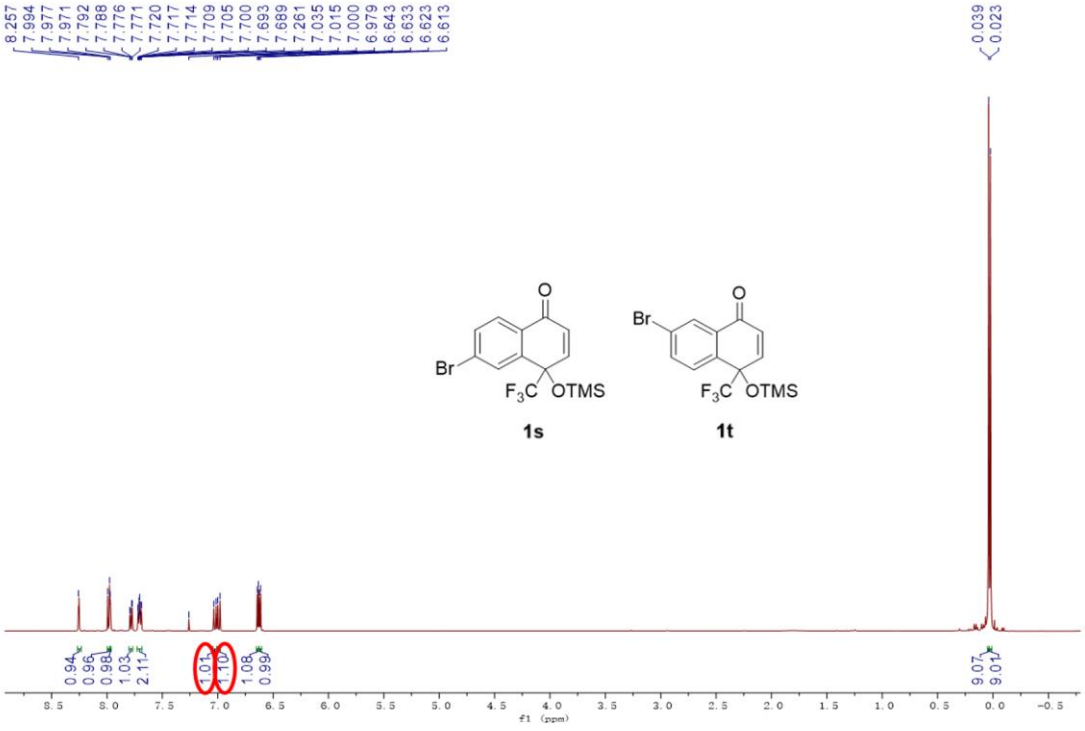


^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3r

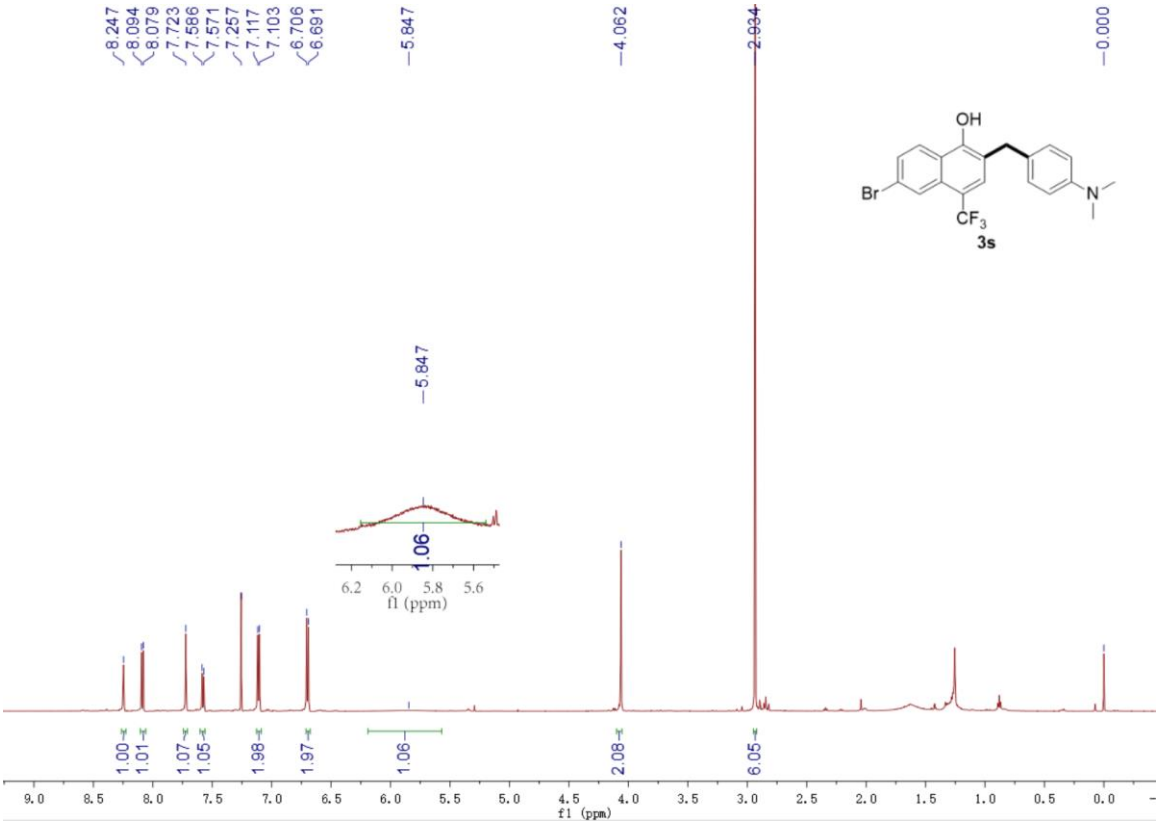


^{1}H spectrum (500 MHz, $CDCl_3$) of compound 1s and 1t

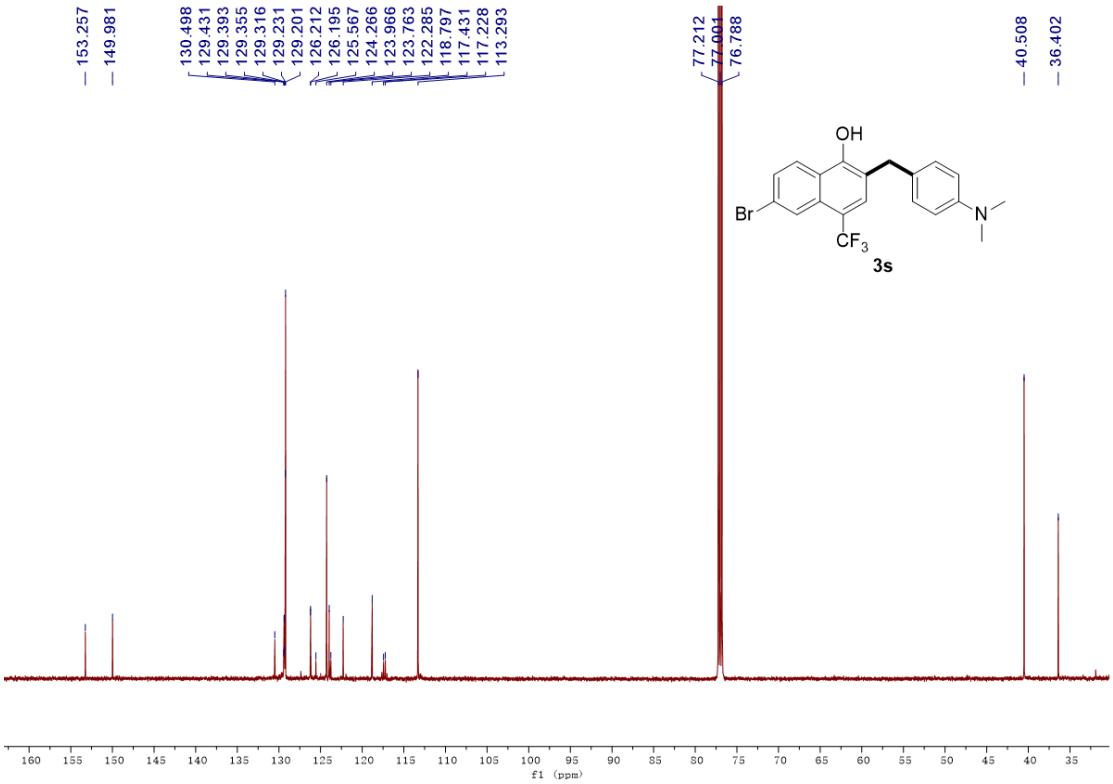
1:1



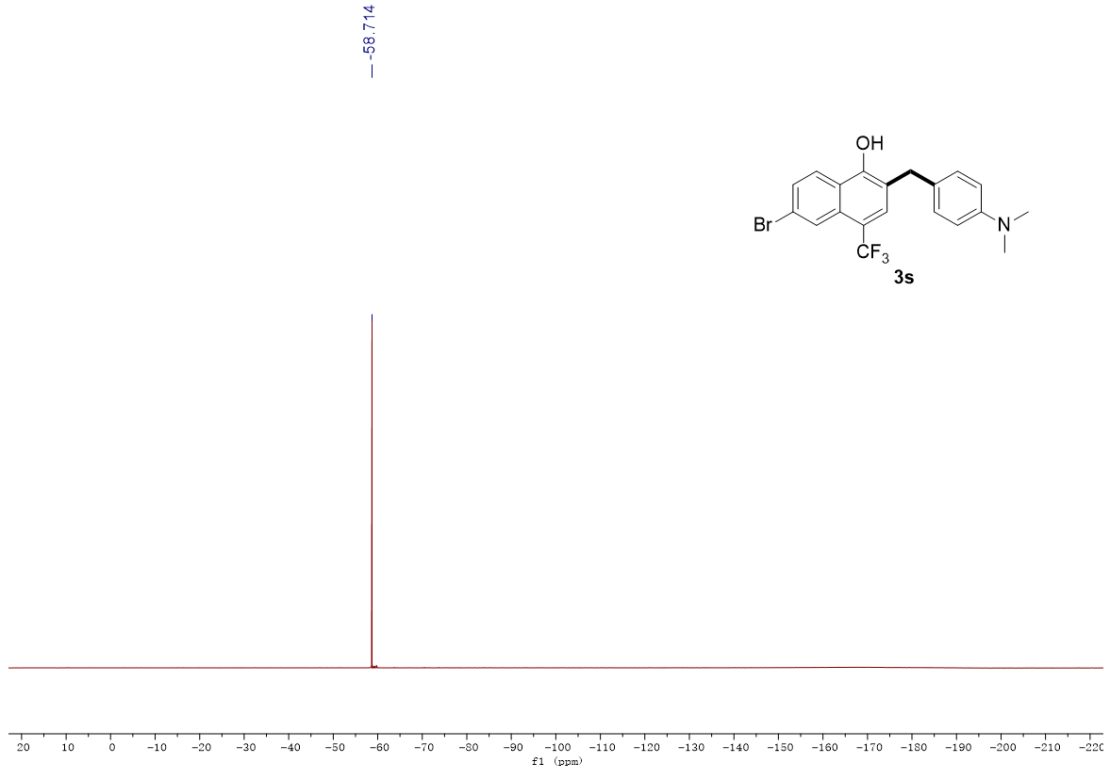
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3s



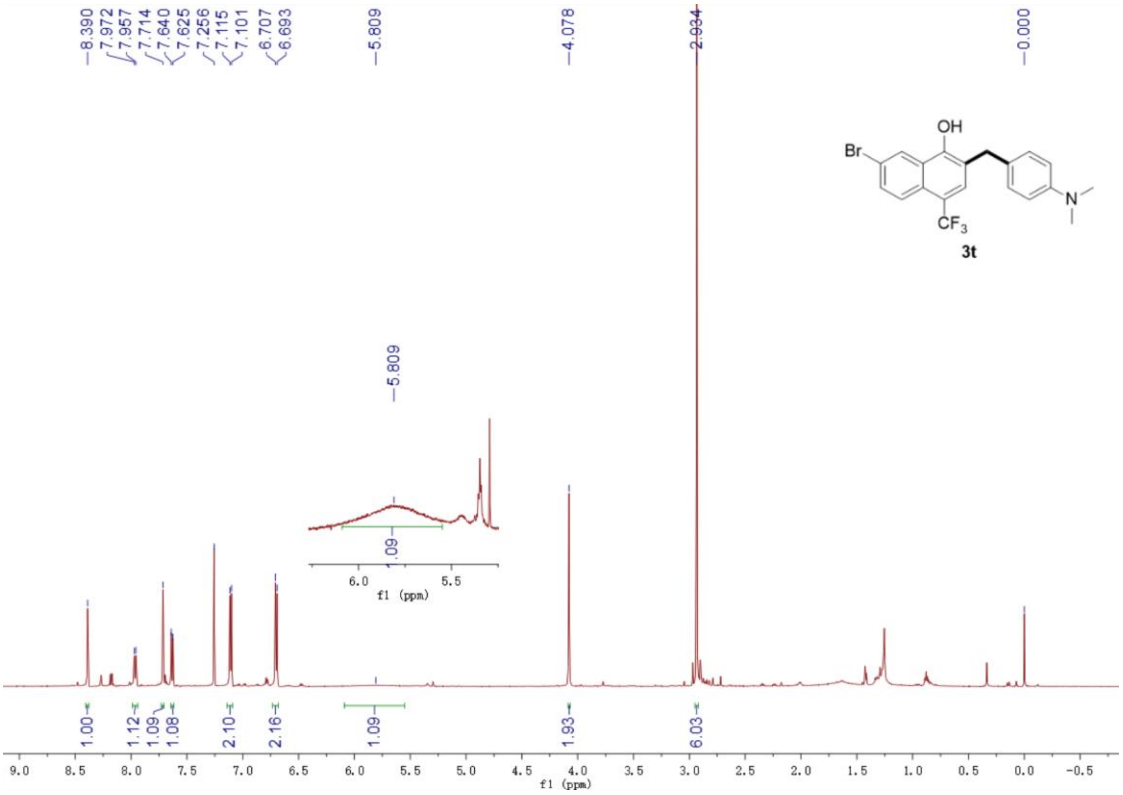
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3s



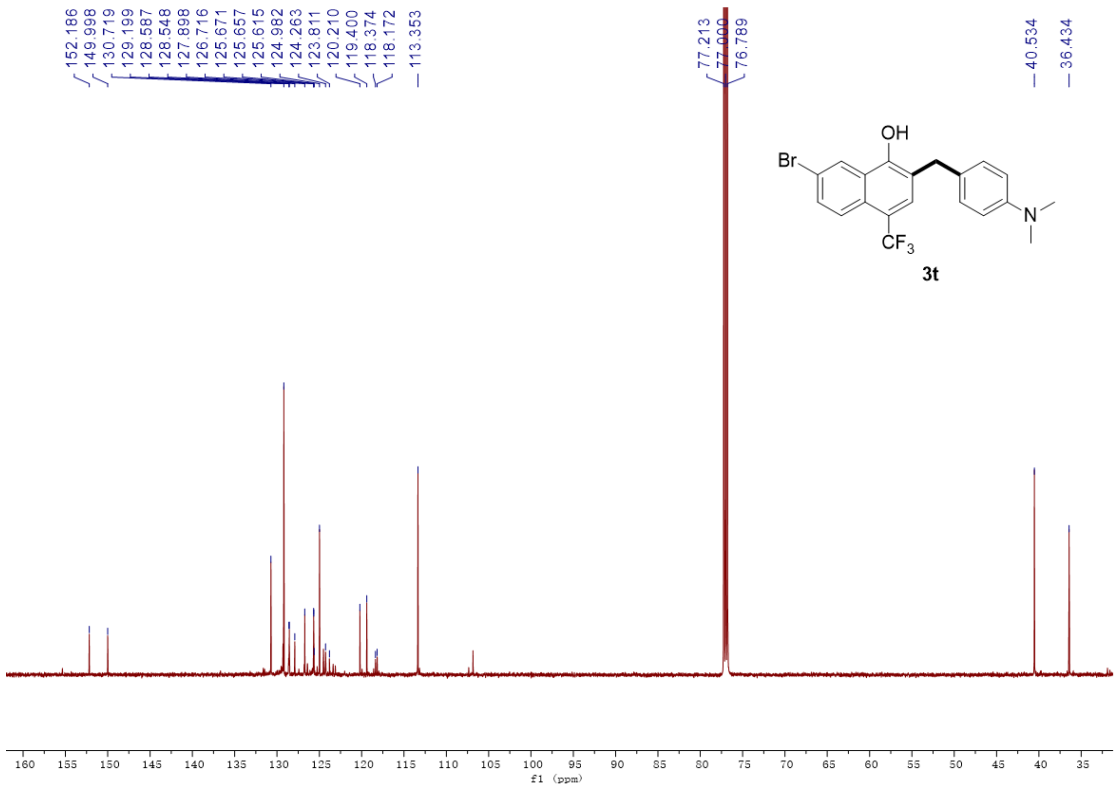
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3s



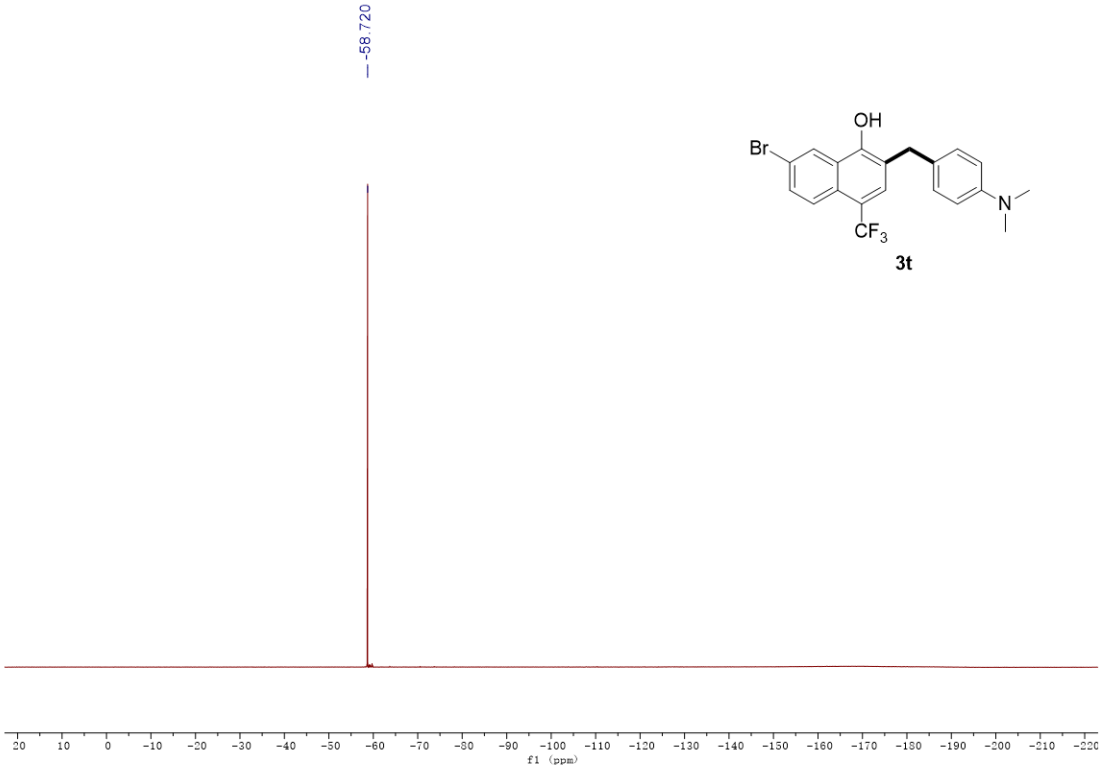
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3t



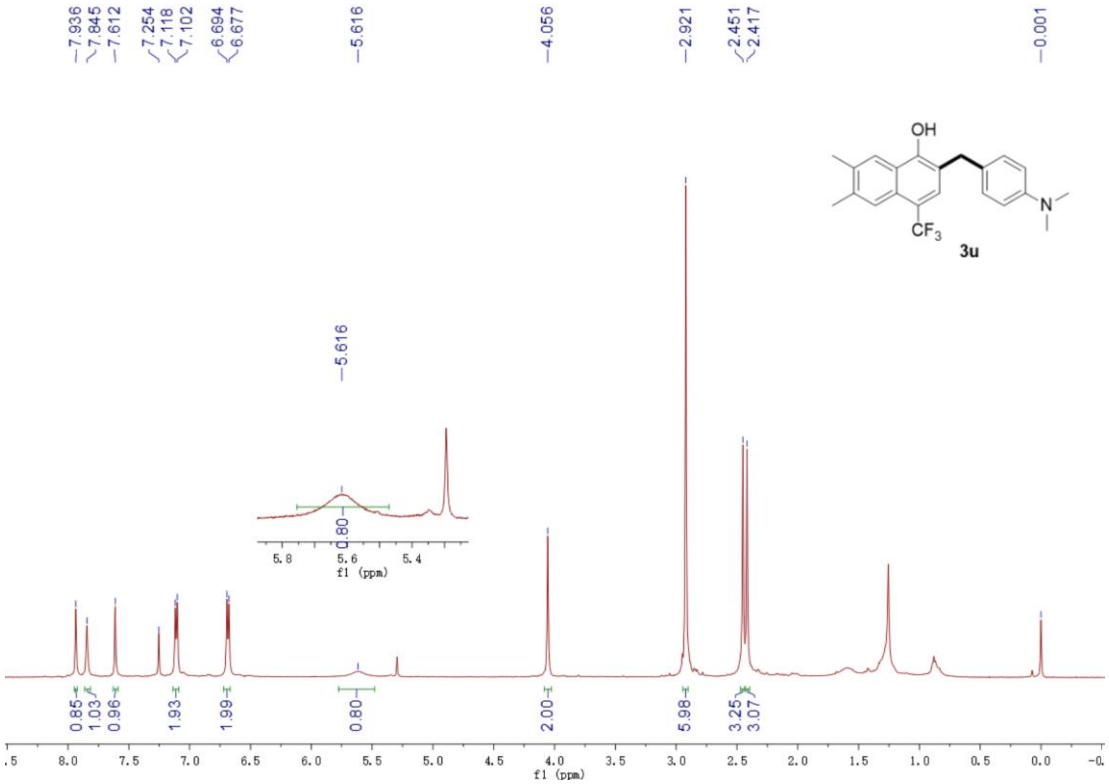
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3t



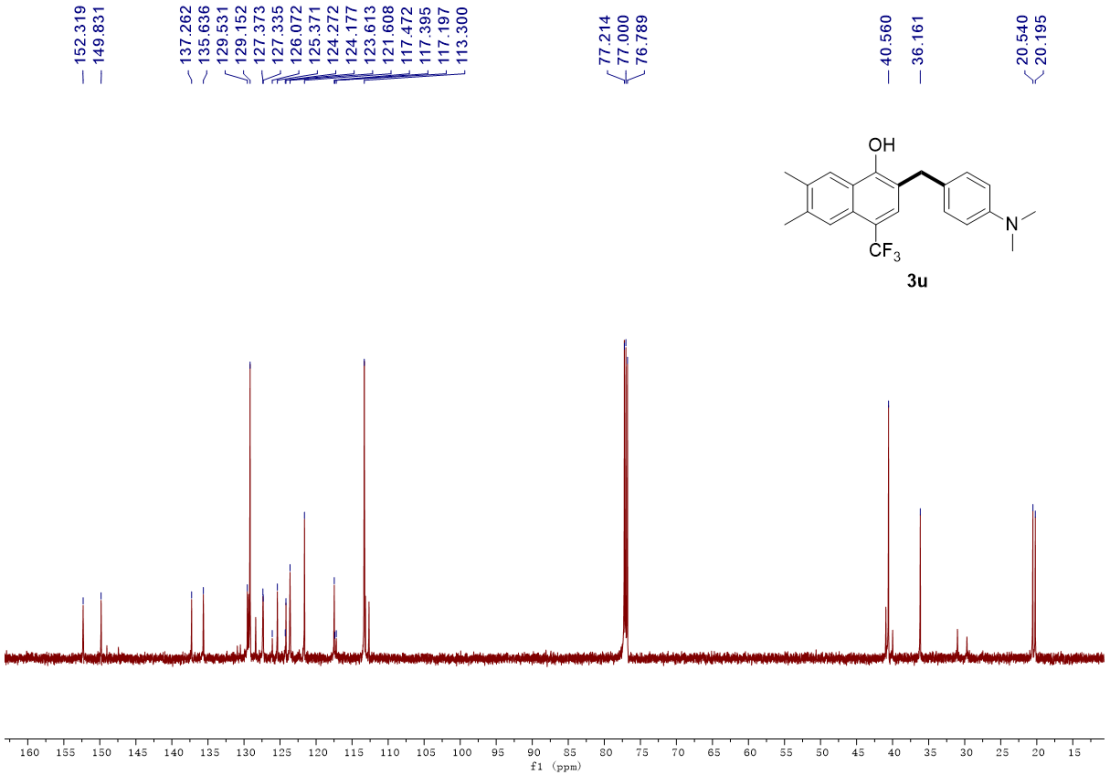
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3t



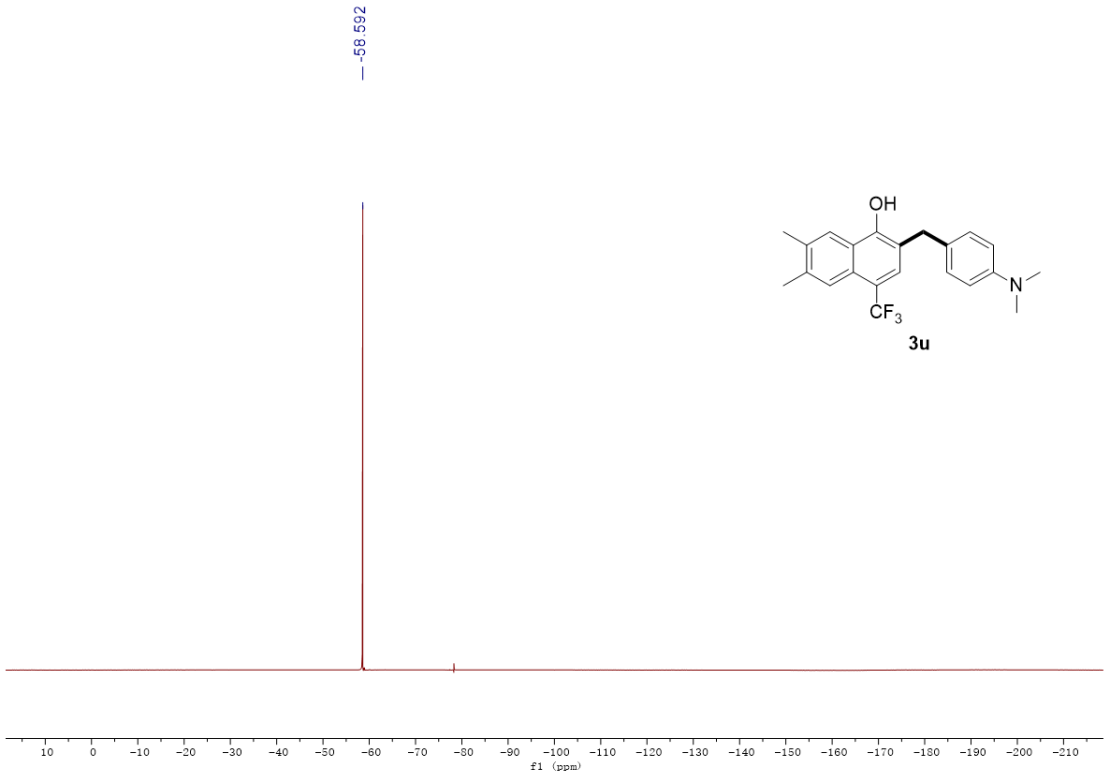
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 3u



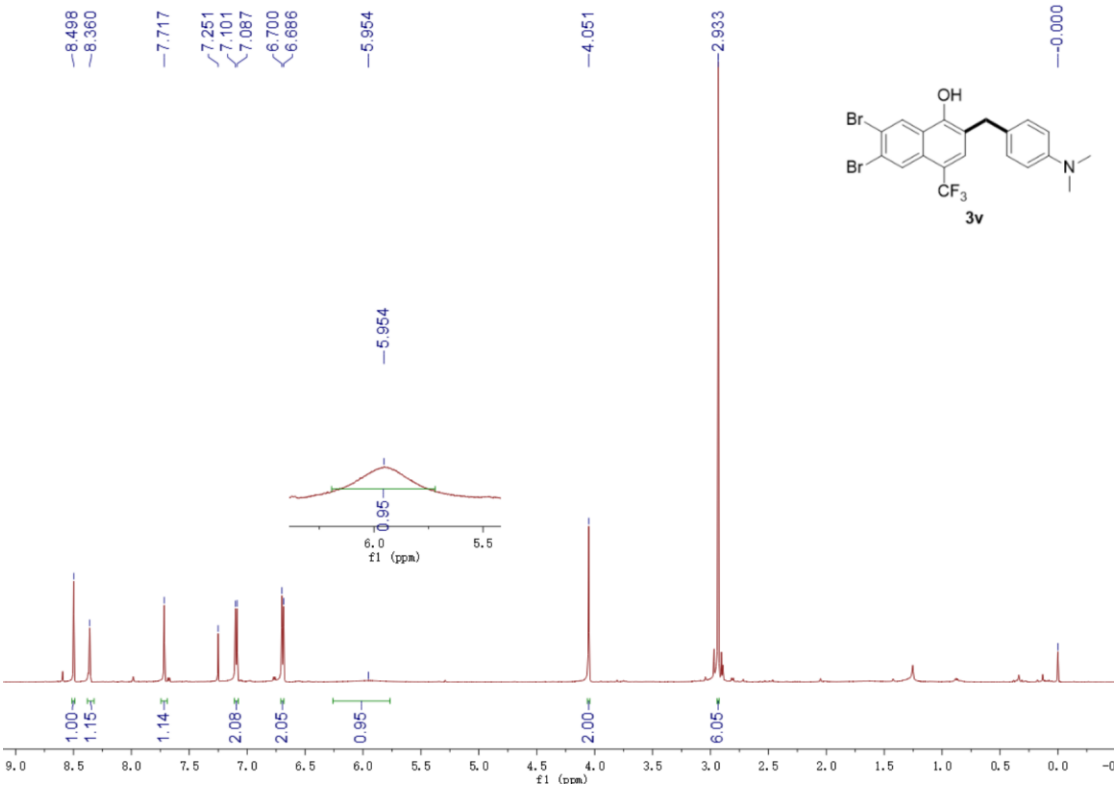
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3u



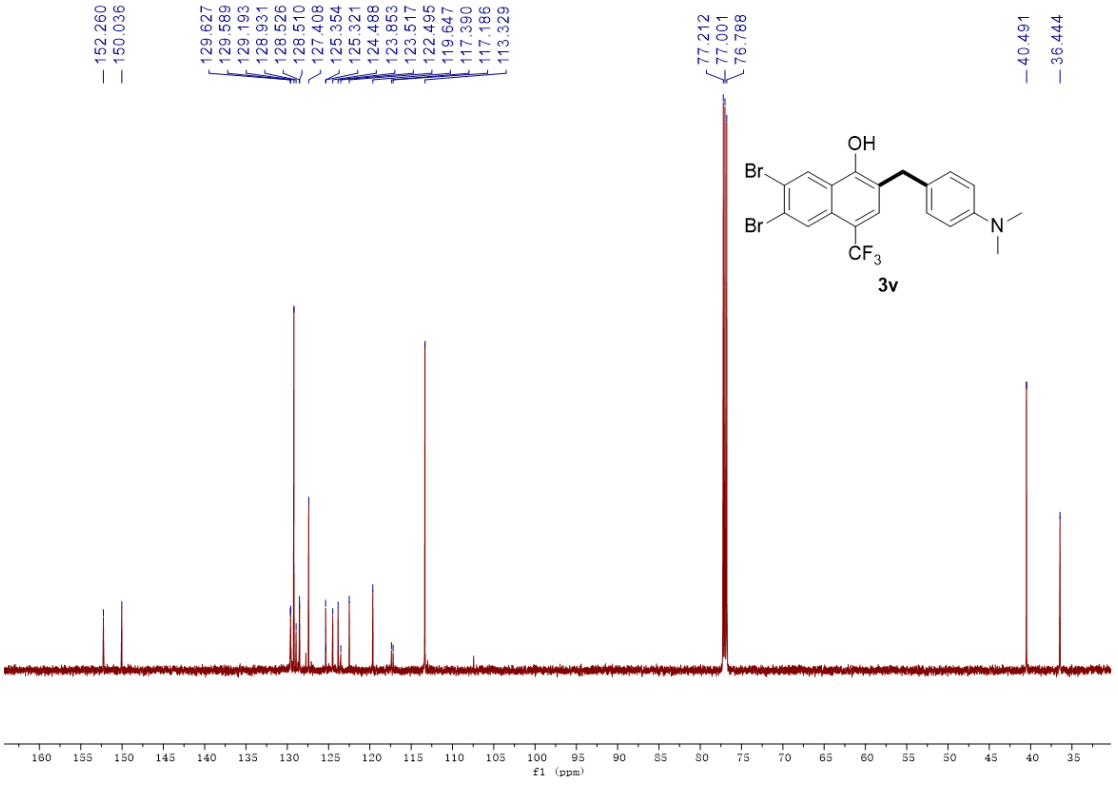
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3u



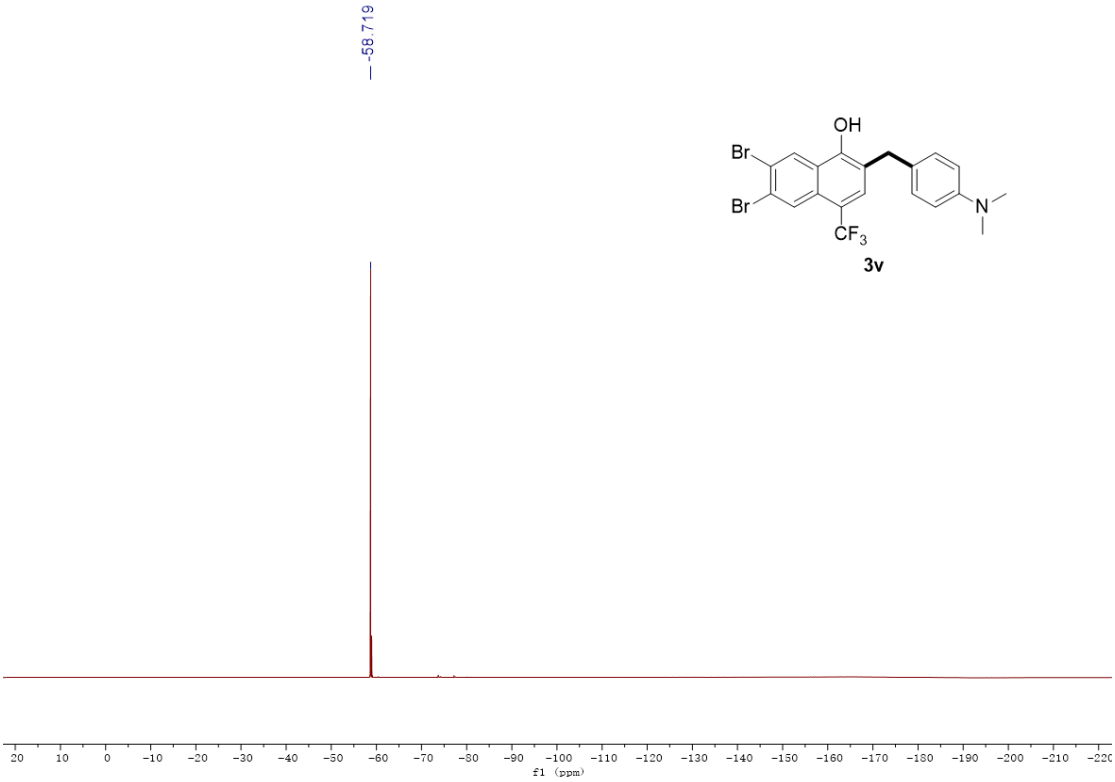
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 3v



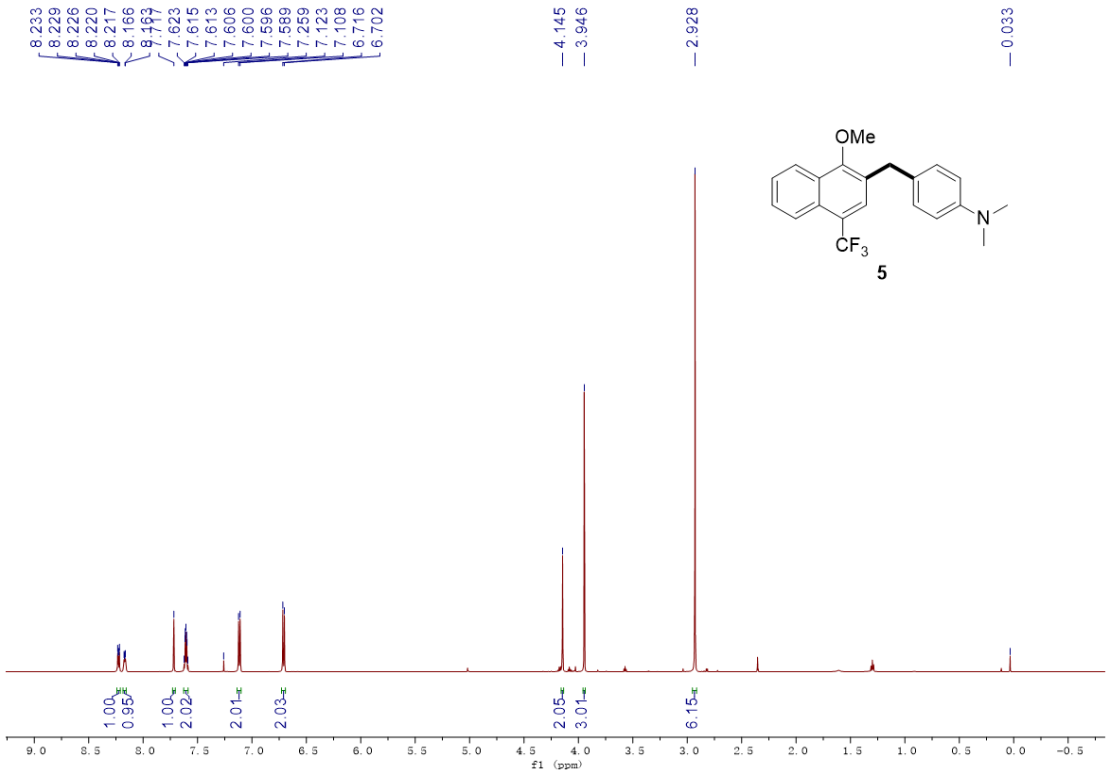
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 3v



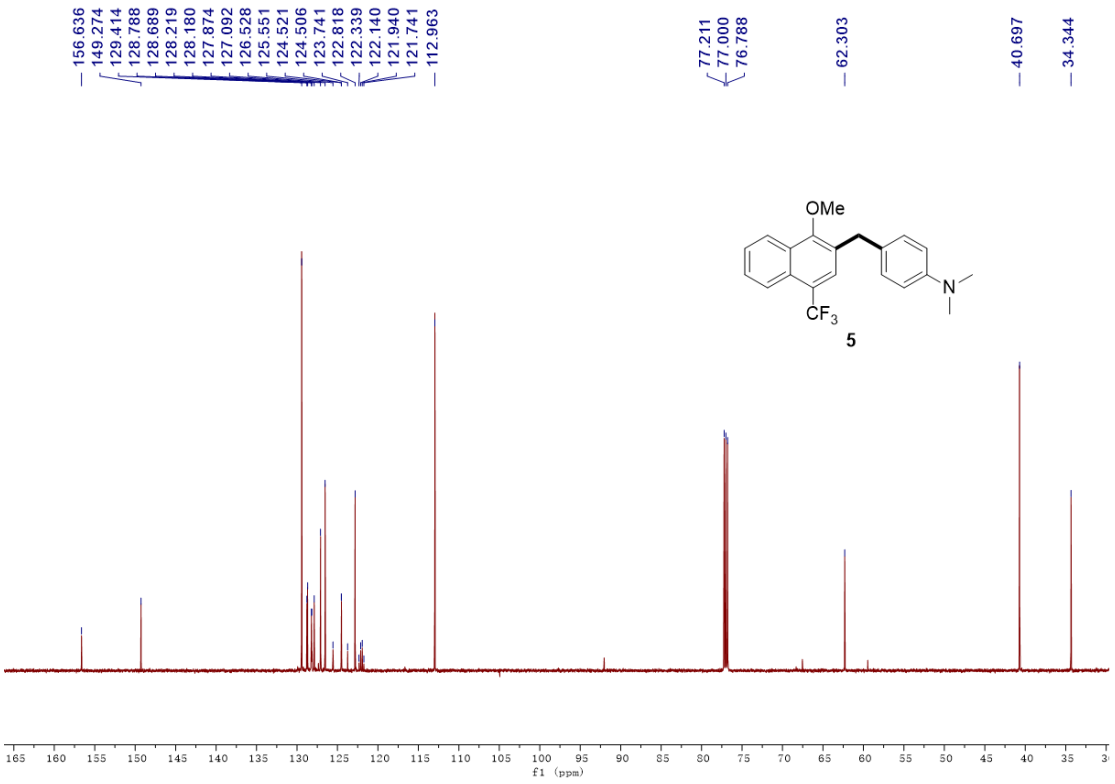
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 3v



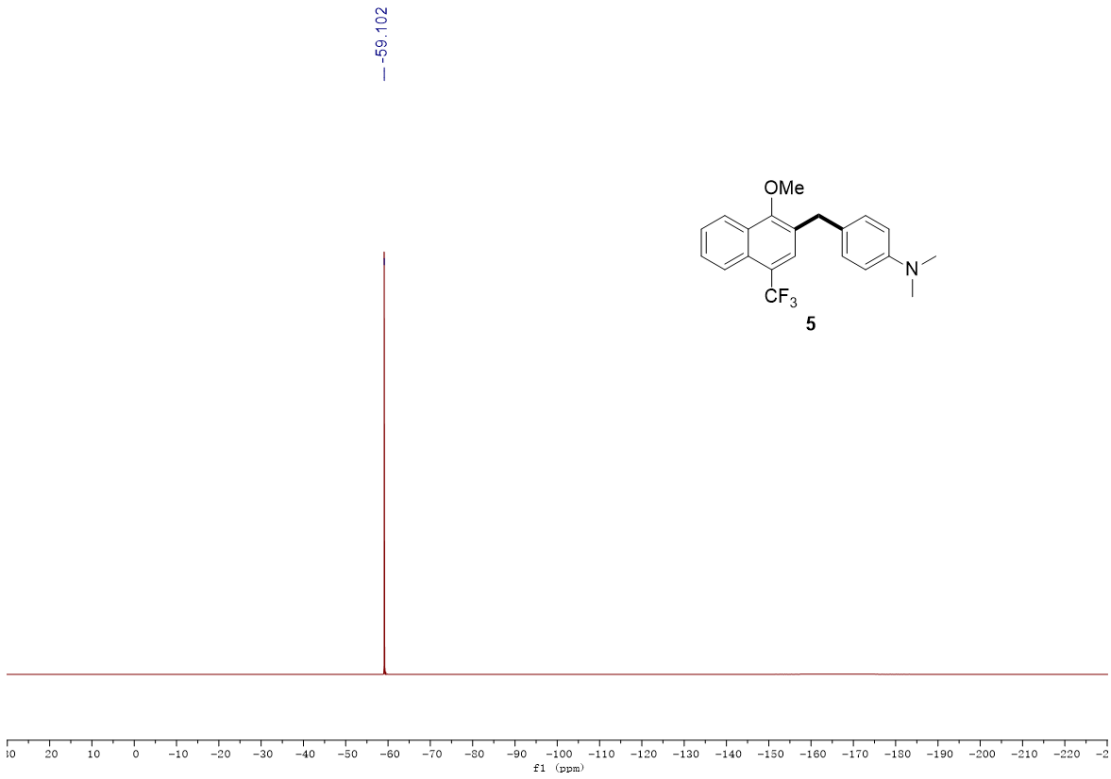
^{1}H spectrum (600 MHz, $CDCl_3$) of compound 5



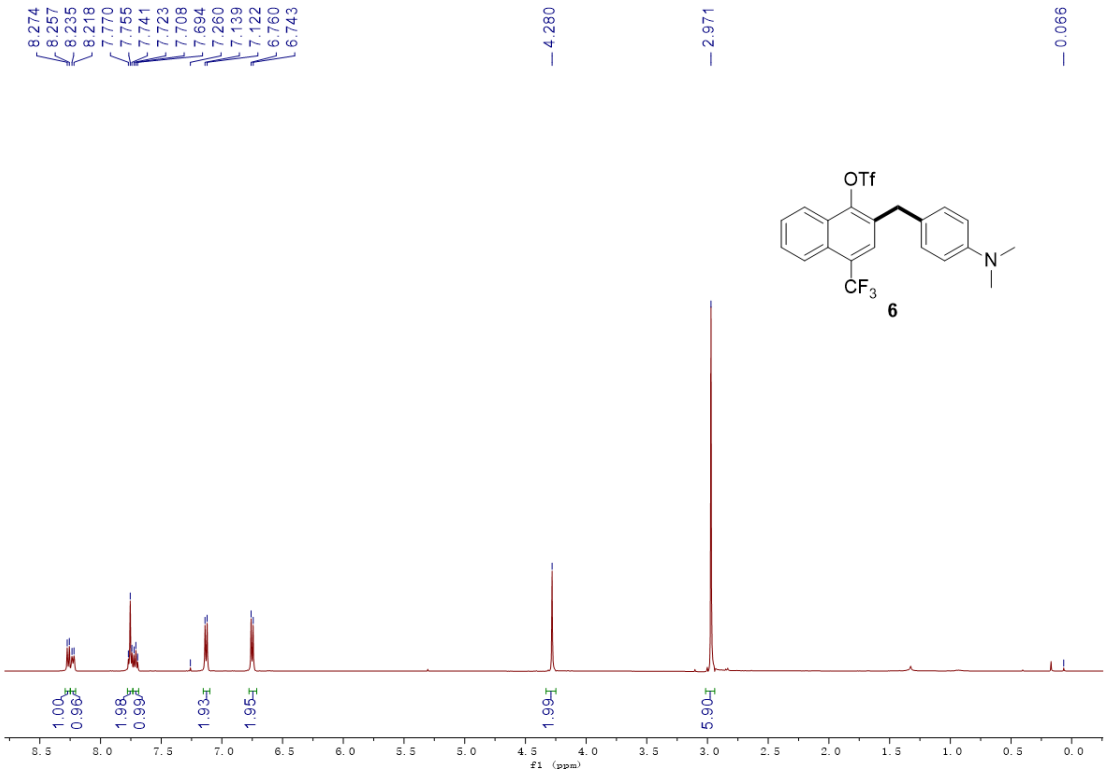
^{13}C spectrum (150 MHz, $CDCl_3$) of compound 5



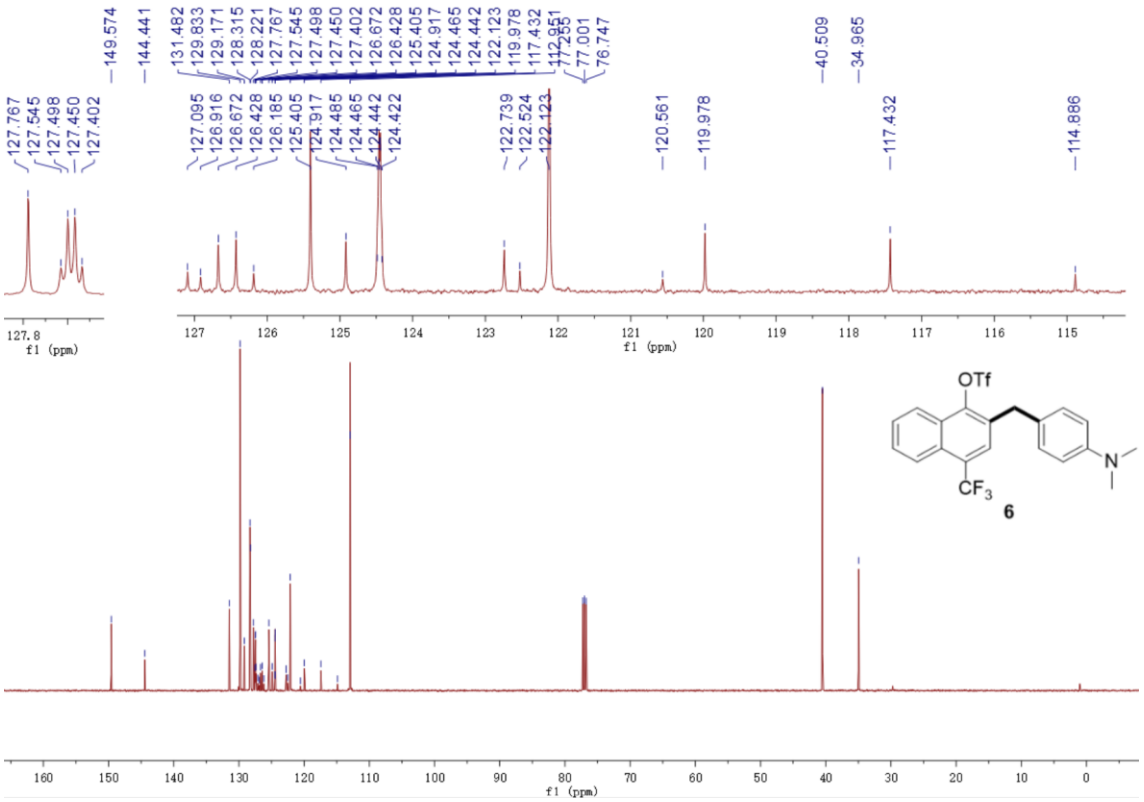
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 5



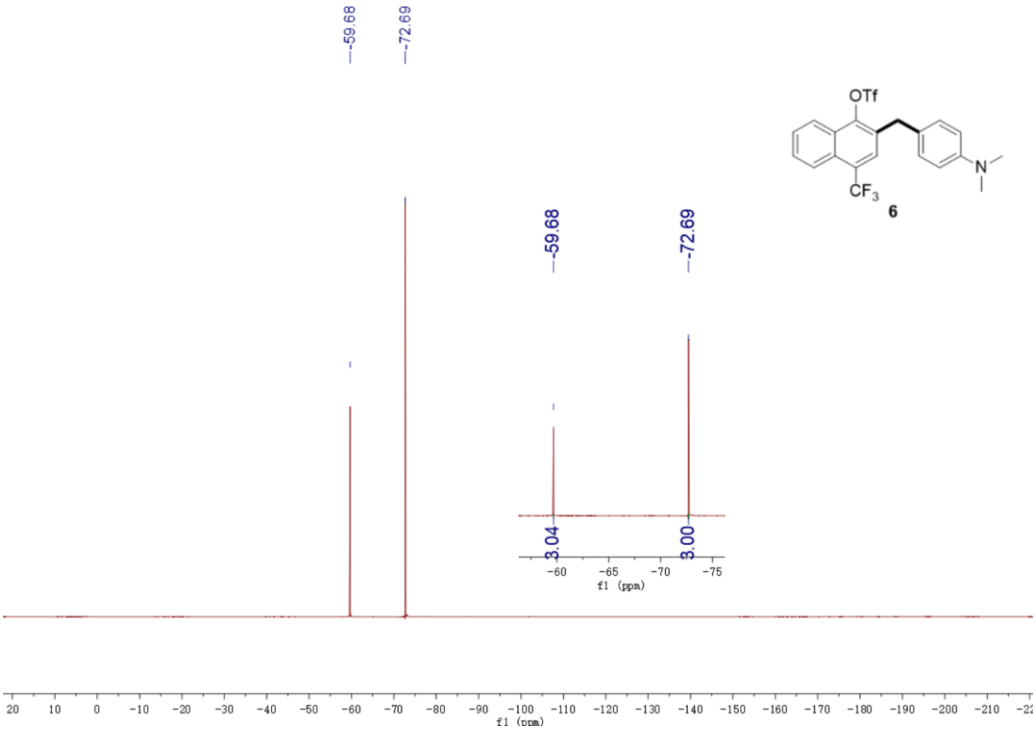
^{1}H spectrum (500 MHz, $CDCl_3$) of compound 6



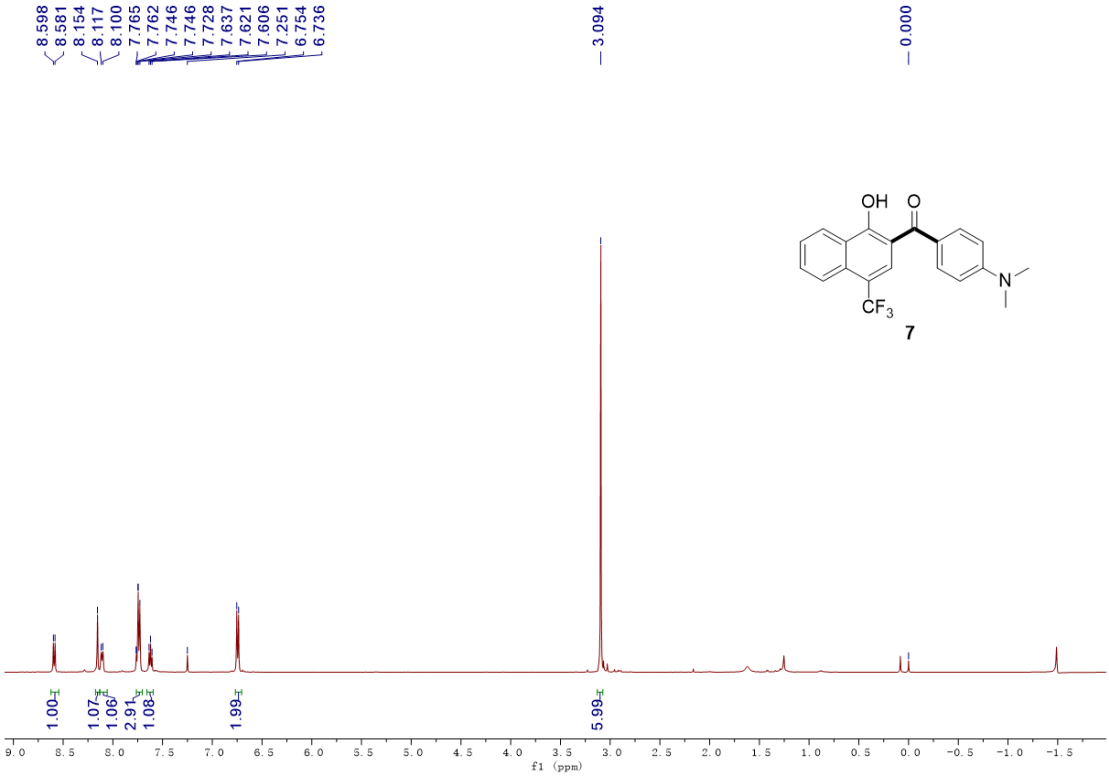
^{13}C spectrum (125 MHz, $CDCl_3$) of compound 6



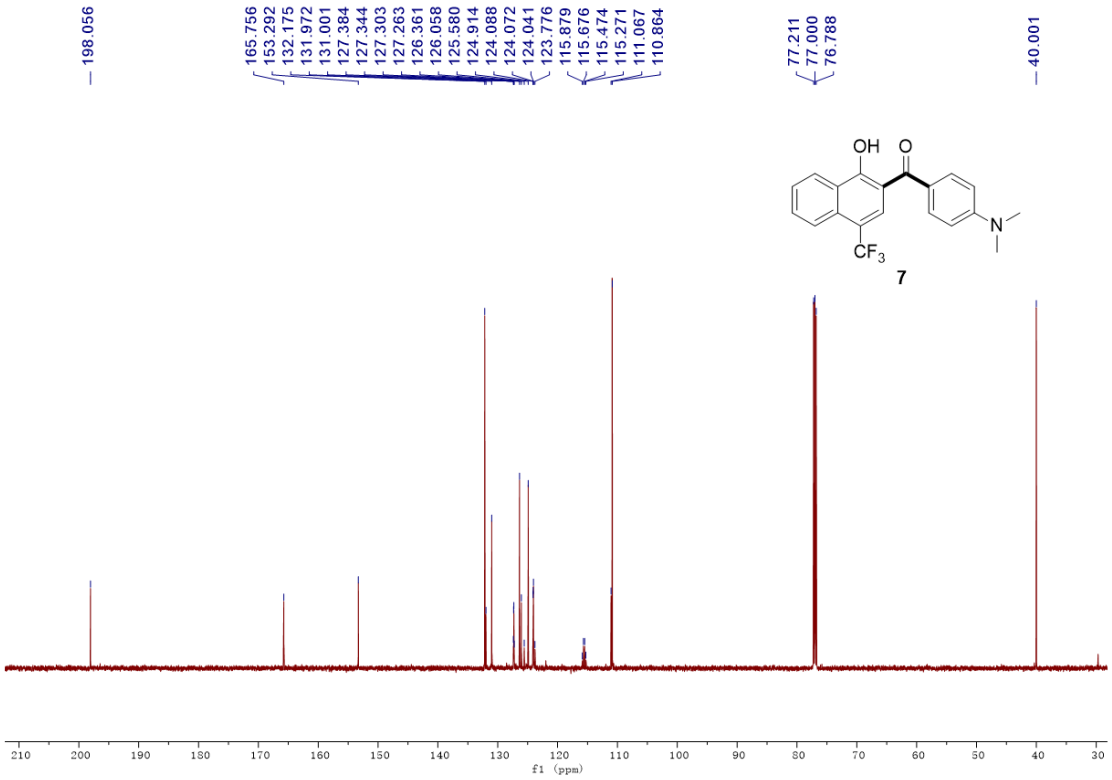
^{19}F spectrum (565 MHz, $CDCl_3$) of compound 6



^{1}H spectrum (500 MHz, $CDCl_3$) of compound 7



^{13}C spectrum (150 MHz, $CDCl_3$) of compound 7



^{19}F spectrum (565 MHz, $CDCl_3$) of compound 7