

Supporting Information

For

C-H activated controlled mono- and di-olefination of arenes in ionic liquid at room temperature

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A total of 66 pages, 94 figures.

General experimental information

The reactions were carried out in Schlenk tubes under an argon atmosphere. The substituted arenes were synthesized according to previously described methods. Other materials were purchased from commercial suppliers and used without further purification. All the reactions were monitored by thin-layer chromatography (TLC) and were visualized using UV light. The product purification was done using silica gel preparative thin layer chromatography (PTLC) (200×200×1 mm). These silica gel plates were directly purchased from Yantai Xinnuo Chemical Co. Ltd, China. ^1H and ^{19}F and ^{13}C NMR spectra were recorded with tetramethylsilane (TMS, $\delta = 0.00$ ppm) as the internal standard. ^1H NMR spectra was recorded at 600 MHz (Varian), ^{19}F NMR was recorded at 376 MHz (Varian) and ^{13}C NMR spectra was recorded at 150 MHz (Varian). High resolution mass spectroscopy (HRMS) data was collected on a Waters Micromass GCT instrument.

The H/D exchange experiment

To a 15ml sealed tube was charged with 2-phenylpyridine **1a** (15.2 mg, 0.1 mmol), [Ru(p-cymene)Cl₂]₂ (3.06 mg, 0.005 mmol), AgNTf₂ (3.88 mg, 0.01 mmol), Cu(OAc)₂ (36.3 mg, 0.2 mmol), [BMIM]NTf₂ (0.9 ml) and CD₃OD (0.1 ml). The mixture was stirred at room temperature for 4 hours. The mixture was extracted with diethyl ether and the upper phase (diethyl ether) was evaporated in vacuo. The residue was further purified by preparative thin layer chromatography of silica gel (developing solvent, acetone / petroleum ether =1:10 with several drops of triethylamine), affording the deuterated product. ¹H-NMR analyzed 43 % of the ortho-C-H within **1a** was deuterated. ¹H-NMR (600 MHz, DMSO): δ 8.43 (d, J = 8.4 Hz, 1H), 8.19-8.15 (m, 1.14H), 7.99 (d, J = 8.4Hz, 1H), 7.88 (t, J = 8.4Hz, 1H), 7.52-7.43 (m, 3H), 7.38-7.34 (m, 1H).

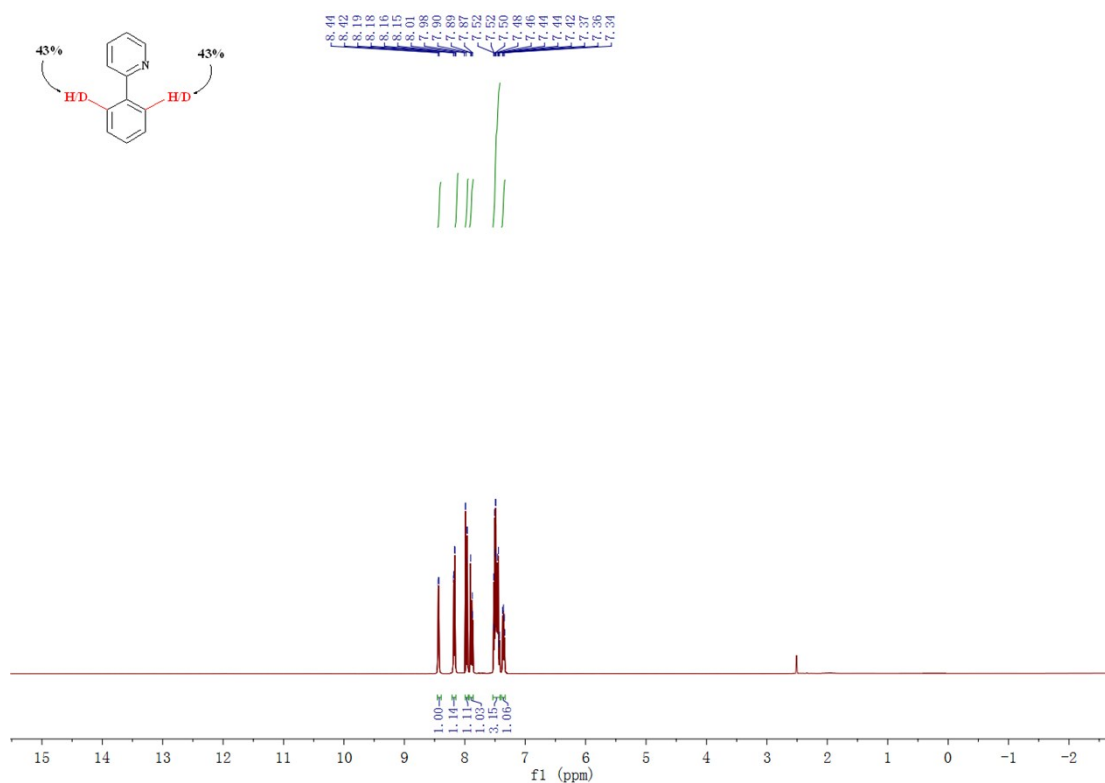


Figure S1 ¹H NMR spectrum of the H/D exchange experiment product in the [Ru(p-cymene) Cl₂]₂

catalytic system

To a 15ml sealed tube was charged with 2-phenylpyridine **1a** (15.2 mg, 0.1 mmol), [Cp*RhCl₂]₂ (3.09 mg, 0.005 mmol), AgNTf₂ (3.88 mg, 0.01 mmol), Cu(OAc)₂ (72.6 mg, 0.4 mmol), [BMIM]NTf₂ (0.9 ml) and CD₃OD (0.1 ml). The mixture was stirred at room temperature for 4 hours. The mixture was extracted with diethyl ether and the upper phase (diethyl ether) was evaporated in vacuo. The residue was further purified by preparative thin layer chromatography of silica gel (developing solvent, acetone / petroleum ether =1:10 with several drops of triethylamine), affording the deuterated product. ¹H-NMR analyzed 37 % of the ortho-C-H within **1a** was deuterated. ¹H-NMR (600 MHz, DMSO): δ 8.67 (d, J = 8.4 Hz, 1H), 8.11-8.07 (m, 1.26H), 7.97 (d, J = 8.4Hz, 1H), 7.89 (t, J = 8.4Hz, 1H), 7.54-7.42 (m, 3H), 7.39-7.33 (m, 1H).

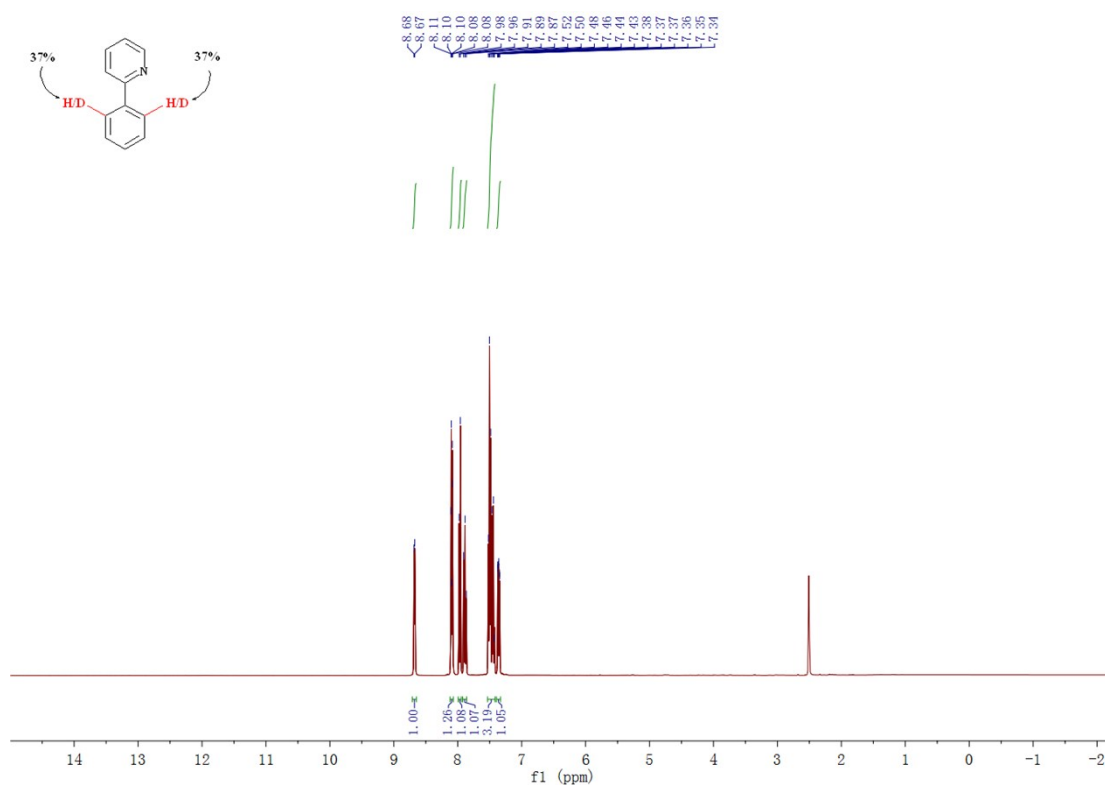
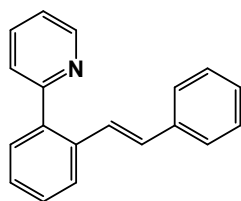


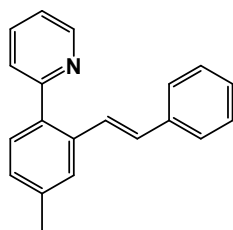
Figure S2 ¹H NMR spectrum of the H/D exchange experiment product in the [Cp*RhCl₂]₂ catalytic system

Spectral data of the obtained compounds

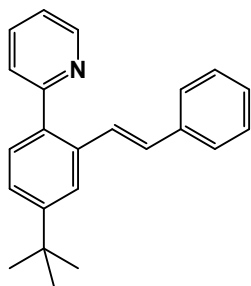
(E)-2-(2-styrylphenyl)pyridine, 3a, light yellow liquid, yield 85%, ^1H NMR (600MHz, DMSO- d_6): δ 8.71 (d, $J=8.4\text{Hz}$, 1H), 7.89 (t, $J=8.4\text{Hz}$, 1H), 7.85 (d, $J=8.4\text{Hz}$, 1H), 7.49 (t, $J=8.4\text{Hz}$, 2H), 7.45 (t, $J=8.4\text{Hz}$, 1H), 7.41-7.38 (m, 3H), 7.31 (t, $J=8.4\text{Hz}$, 2H), 7.23 (m, 2H), 7.19 (d, $J=16.2\text{Hz}$, 1H), 7.16-7.13 (m, 1H); ^{13}C NMR (150MHz, DMSO- d_6): δ 158.6, 149.7, 139.8, 137.6, 137.0, 135.4, 130.6, 130.0, 129.2, 129.0, 128.0, 127.3, 126.8, 126.4, 125.1, 122.7; HRMS (ESI): m/z Calcd. For $\text{C}_{19}\text{H}_{15}\text{NH}^+$: 258.1277, Found: 258.1279.



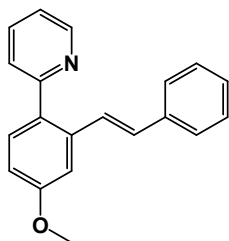
(E)-2-(4-methyl-2-styrylphenyl)pyridine, 3b, yellow liquid, yield 87%, ^1H NMR (600MHz, DMSO- d_6): δ 8.64 (d, $J=8.4\text{Hz}$, 1H), 7.82 (t, $J=8.4\text{Hz}$, 1H), 7.63 (s, 1H), 7.42 (d, $J=8.4\text{Hz}$, 1H), 7.34 (d, $J=8.4\text{Hz}$, 2H), 7.32-7.29 (m, 2H), 7.27 (d, $J=8.4\text{Hz}$, 1H), 7.23 (d, $J=16.2\text{Hz}$, 1H), 7.20-7.14 (m, 3H), 7.11 (d, $J=16.2\text{Hz}$, 1H), 2.35 (s, 3H); ^{13}C NMR (150MHz, DMSO- d_6): δ 158.7, 149.7, 138.4, 137.7, 137.3, 137.1, 135.3, 130.7, 129.8, 129.2, 128.9, 128.1, 127.4, 126.8, 125.1, 122.5, 21.4; HRMS (ESI): m/z Calcd. For $\text{C}_{20}\text{H}_{17}\text{NH}^+$: 272.1434, Found: 272.1433.



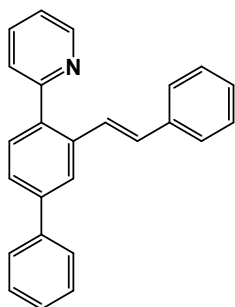
(E)-2-(4-(tert-butyl)-2-styrylphenyl)pyridine, 3c, light yellow liquid, yield 90%, ^1H NMR (600MHz, DMSO- d_6): δ 8.68 (d, $J=8.4\text{Hz}$, 1H), 7.86 (t, $J=8.4\text{Hz}$, 1H), 7.80 (d, $J=8.4\text{Hz}$, 1H), 7.47 (d, $J=8.4\text{Hz}$, 1H), 7.42-7.39 (m, 2H), 7.31 (t, $J=8.4\text{Hz}$, 2H), 7.27 (t, $J=8.4\text{Hz}$, 2H), 7.21-7.17 (m, 2H), 7.13 (d, $J=16.2\text{Hz}$, 1H), 6.66 (d, $J=16.2\text{Hz}$, 1H), 1.36 (s, 9H); ^{13}C NMR (150MHz, DMSO- d_6): δ 158.6, 151.4, 149.6, 137.7, 137.2, 137.0, 135.0, 130.4, 129.7, 129.1, 128.0, 127.9, 126.8, 126.6, 125.2, 125.0, 123.0, 122.5, 34.9, 31.5; HRMS (ESI): m/z Calcd. For $\text{C}_{23}\text{H}_{23}\text{NH}^+$: 314.1903, Found: 314.1900.



(E)-2-(4-methoxy-2-styrylphenyl)pyridine, 3d, yellow liquid, yield 87%, $^1\text{H NMR}$ (600MHz, CDCl_3): δ 8.71 (d, $J=8.4\text{Hz}$, 1H), 7.66 (t, $J=8.4\text{Hz}$, 1H), 7.24 (t, $J=8.4\text{Hz}$, 2H), 7.17-7.04 (m, 7H), 6.87 (t, $J=8.4\text{Hz}$, 2H), 6.60 (d, $J=16.2\text{Hz}$, 1H), 3.81 (s, 3H); $^{13}\text{C NMR}$ (150MHz, CDCl_3): δ 158.3, 148.4, 140.8, 135.0, 129.0, 127.5, 127.3, 127.1, 127.2, 126.5, 126.3, 125.5, 124.8, 120.9, 113.7, 107.1, 54.3; HRMS (ESI): m/z Calcd. For $\text{C}_{20}\text{H}_{17}\text{NH}^+$: 288.1383, Found: 288.1381.

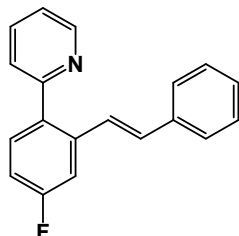


(E)-2-(3-styryl-[1,1'-biphenyl]-4-yl)pyridine, 3e, yellow liquid, yield 86 %, $^1\text{H NMR}$ (600MHz, $\text{DMSO}-d_6$): δ 8.76 (d, $J=8.4\text{Hz}$, 1H), 8.14 (d, $J=8.4\text{Hz}$, 1H), 7.96-7.91 (m, 1H), 7.84 (d, $J=8.4\text{Hz}$, 2H), 7.73-7.69 (m, 1H), 7.62 (d, $J=16.2\text{Hz}$, 1H), 7.58 (d, $J=8.4\text{Hz}$, 1H), 7.53 (t, $J=8.4\text{Hz}$, 2H), 7.48-7.42 (m, 4H), 7.38-7.30 (m, 4H), 7.27 (d, $J=8.4\text{Hz}$, 1H); $^{13}\text{C NMR}$ (150MHz, $\text{DMSO}-d_6$): δ 158.3, 149.8, 140.9, 140.1, 138.8, 137.7, 137.2, 136.1, 131.4, 130.6, 129.5, 129.2, 128.3, 128.2, 127.4, 127.3, 126.9, 126.4, 125.2, 124.7, 122.8; HRMS (ESI): m/z Calcd. For $\text{C}_{25}\text{H}_{19}\text{NH}^+$: 334.1590, Found: 334.1587.

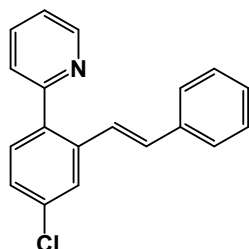


(E)-2-(4-fluoro-2-styrylphenyl)pyridine, 3f, light yellow liquid, yield 82%, $^1\text{H NMR}$ (600MHz,

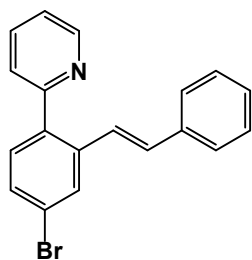
DMSO-*d*₆): δ 8.34 (s, 1H), 7.83 (d, *J*=8.4Hz, 1H), 7.69 (d, *J*=8.4Hz, 2H), 7.61-7.53 (m, 2H), 7.46-7.39 (m, 4H), 7.33 (t, *J*=8.4Hz, 4H), 7.29-7.23 (m, 4H), 7.08 (d, *J*=16.2Hz, 2H); ¹³C NMR (150MHz, DMSO-*d*₆): 162.0 (d, 244.5Hz), 154.8, 149.6, 137.5, 137.1, 136.8, 132.3 (d, *J*=13.5Hz), 130.5, 128.5, 128.1, 123.9, 122.1, 120.4, 110.7 (d, *J*=33Hz); ¹⁹F NMR (376MHz, DMSO-*d*₆): -113.31; **HRMS** (ESI): *m/z* Calcd. For C₁₉H₁₄FNH⁺:276.1183, Found:276.1182.



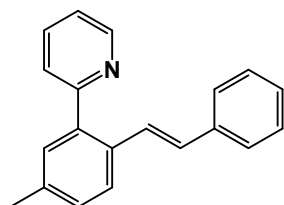
(*E*)-2-(4-chloro-2-styrylphenyl)pyridine, 3g, yellow solid, yield 84%, ¹H NMR (600MHz, CDCl₃): δ 8.80 (s, 1H), 7.78 (t, *J*=8.4Hz, 1H), 7.63 (d, *J*=8.4Hz, 1H), 7.37 (s, 1H), 7.25-7.10 (m, 6H), 6.98 (s, 1H), 6.91 (d, *J*=8.4Hz, 2H), 6.58 (d, *J*=16.2Hz, 1H); ¹³C NMR (150MHz, CDCl₃): δ 154.8, 149.6, 137.0, 136.4, 135.0, 131.2, 128.6, 128.4, 128.3, 127.9, 126.7, 126.0, 123.3, 122.4; **HRMS** (ESI): *m/z* Calcd. For C₁₉H₁₄NCIH⁺: 292.0888, Found: 292.0886.



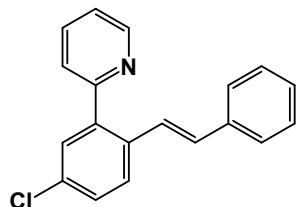
(*E*)-2-(4-bromo-2-styrylphenyl)pyridine, 3h, light yellow liquid, yield 86%, ¹H NMR (600MHz, DMSO-*d*₆): δ 8.66 (d, *J*=8.4Hz, 1H), 8.01 (s, 1H), 7.85 (t, *J*=8.4Hz, 1H), 7.52 (d, *J*=8.4Hz, 1H), 7.46 (d, *J*=8.4Hz, 1H), 7.39-7.17 (m, 8H), 7.12 (d, *J*=16.2Hz, 1H); ¹³C NMR (150MHz, DMSO-*d*₆): 157.6, 149.9, 138.8, 137.9, 137.3, 132.8, 132.1, 131.6, 130.7, 129.3, 128.8, 128.5, 127.1, 125.8, 125.2, 123.1, 122.7; **HRMS** (ESI): *m/z* Calcd. For C₁₉H₁₄BrNH⁺: 336.0382, Found: 336.0380.



(E)-2-(5-methyl-2-styrylphenyl)pyridine, 3i, light yellow liquid, yield 88%, ^1H NMR (600MHz, DMSO- d_6): δ 8.72 (d, $J=8.4\text{Hz}$, 1H), 7.90 (t, $J=8.4\text{Hz}$, 1H), 7.77 (d, $J=8.4\text{Hz}$, 1H), 7.50 (d, $J=8.4\text{Hz}$, 1H), 7.42-7.20 (m, 9H), 7.13 (d, $J=16.2\text{Hz}$, 1H), 2.38 (s, 3H); ^{13}C NMR (150MHz, DMSO- d_6): 158.7, 149.7, 139.8, 137.8, 137.5, 137.1, 132.7, 131.2, 129.8, 129.2, 129.1, 128.0, 127.2, 126.7, 126.3, 125.1, 122.7, 21.2; **HRMS** (ESI): m/z Calcd. For $\text{C}_{20}\text{H}_{17}\text{NH}^+$: 272.1434, Found: 272.1431.

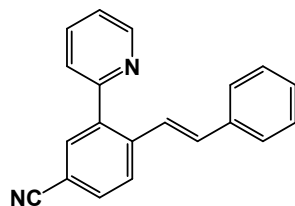


(E)-2-(5-chloro-2-styrylphenyl)pyridine, 3j, yellow solid, yield 83%, ^1H NMR (600MHz, DMSO- d_6): δ 8.74 (d, $J=8.4\text{Hz}$, 1H), 7.94 (d, $J=8.4\text{Hz}$, 1H), 7.89 (d, $J=8.4\text{Hz}$, 1H), 7.57-7.50 (m, 3H), 7.46-7.38 (m, 3H), 7.33 (t, $J=8.4\text{Hz}$, 2H), 7.26 (d, $J=8.4\text{Hz}$, 1H), 7.21 (s, 1H), 7.17 (d, $J=16.2\text{Hz}$, 1H); ^{13}C NMR (150MHz, DMSO- d_6): 157.0, 149.9, 141.3, 137.3, 134.5, 132.4, 130.9, 130.1, 129.3, 129.0, 128.4, 126.9, 126.1, 125.2, 123.3; **HRMS** (ESI): m/z Calcd. For $\text{C}_{19}\text{H}_{14}\text{ClNH}^+$: 292.0888, Found: 292.0889.

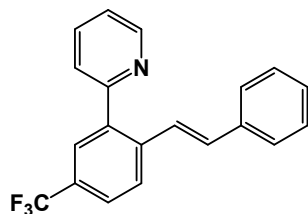


(E)-3-(pyridin-2-yl)-4-styrylbenzonitrile, 3k, light yellow liquid, yield 79%, ^1H NMR (600MHz, DMSO- d_6): δ 8.76 (d, $J=8.4\text{Hz}$, 1H), 8.08 (d, $J=8.4\text{Hz}$, 1H), 7.98-7.91 (m, 2H), 7.63 (t, $J=8.4\text{Hz}$, 1H), 7.50-7.42 (m, 3H), 7.36 (t, $J=8.4\text{Hz}$, 2H), 7.31-7.23 (m, 2H), 7.11 (q, $J=8.4\text{Hz}$, 1H), 7.00 (d, $J=16.2\text{Hz}$, 1H); ^{13}C NMR (150MHz, DMSO- d_6): 156.7, 149.9, 140.3, 137.5, 137.0, 134.4, 133.4,

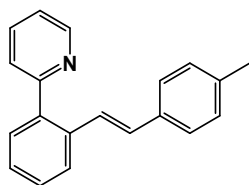
132.4, 129.3, 128.9, 128.3, 127.5, 127.3, 125.7, 125.3, 123.5, 119.2, 110.3; **HRMS** (ESI): m/z Calcd. For $C_{20}H_{14}N_2H^+$: 283.1230, Found: 283.1232.



(E)-2-(2-styryl-5-(trifluoromethyl)phenyl)pyridine, 3l, light yellow solid, yield 73%, **1H NMR** (600MHz, $DMSO-d_6$): δ 8.49 (s, 1H), 7.84 (d, $J=8.4Hz$, 1H), 7.69 (t, $J=8.4Hz$, 1H), 7.55 (s, 2H), 7.35 (d, $J=8.4Hz$, 1H), 7.23-7.17 (m, 3H), 7.11-7.02 (m, 4H), 6.96 (d, $J=16.2Hz$, 1H); **^{13}C NMR** (150MHz, $DMSO-d_6$): 154.7, 148.9, 139.5, 138.9, 138.2, 137.4, 134.6, 134.4, 130.6 (d, $J=16.5Hz$), 128.7, 128.1 (m), 127.7, 127.5, 125.9 (d, $J=22.5Hz$), 124.2 (q, $J=192Hz$); **^{19}F NMR** (376MHz, $DMSO-d_6$): -61.60; **HRMS** (ESI): m/z Calcd. For $C_{20}H_{14}F_3NH^+$: 326.1151, Found: 326.1149.

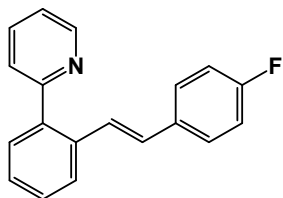


(E)-2-(2-(4-methylstyryl)phenyl)pyridine, 3m, light yellow liquid, yield 91%, **1H NMR** (600MHz, $CDCl_3$): δ 8.75(s, 1H), 7.74(d, $J=8.4Hz$, 2H), 7.54(d, $J=8.4Hz$, 1H), 7.44(t, $J=8.4Hz$, 1H), 7.41-7.32 (m, 2H), 7.27 (d, $J=8.4Hz$, 3H), 7.17 (s, 1H), 7.11 (t, $J=8.4Hz$, 2H), 7.01 (d, $J=16.2Hz$, 1H), 2.32 (s, 3H); **^{13}C NMR** (150MHz, $CDCl_3$): 158.8, 149.4, 137.5, 136.2, 135.9, 134.7, 130.2, 130.1, 129.3, 128.7, 127.5, 126.5, 126.4, 126.1, 125.2, 121.9, 21.2; **HRMS** (ESI): m/z Calcd. For $C_{20}H_{17}NH^+$: 272.1434, Found: 272.1431.

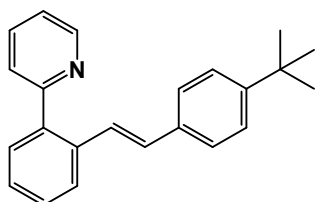


(E)-2-(2-(4-fluorostyryl)phenyl)pyridine, 3n, light yellow liquid, yield 85%, **1H NMR** (600MHz, $CDCl_3$): δ 8.77 (d, $J=8.4Hz$, 1H), 7.75 (d, $J=8.4Hz$, 1H), 7.56 (q, $J=8.4Hz$, 1H), 7.45 (t, $J=8.4Hz$,

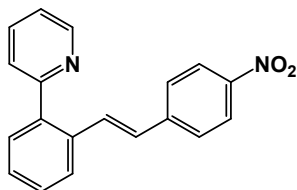
1H), 7.39-7.32 (m, 2H), 7.23-6.85 (m, 7H), 6.57 (d, J=16.2Hz, 1H); ¹³C NMR (150MHz, CDCl₃): 161.2 (d, 241.5Hz), 157.7, 149.5, 136.1, 130.2, 129.6 (d, J=7.5Hz), 128.7 (d, J=16.5Hz), 128.1, 128.0, 128.0, 127.9, 127.7, 127.3, 126.1, 123.4, 114.9 (d, J=19.5Hz); ¹⁹F NMR (376MHz, CDCl₃): -114.28; HRMS (ESI): *m/z* Calcd. For C₁₉H₁₄FNH⁺: 276.1183, Found: 276.1181.



(E)-2-(2-(4-(tert-butyl)styryl)phenyl)pyridine, 3o, light yellow liquid, yield 92%, ¹H NMR (600MHz, CDCl₃): δ 8.75(d, J=8.4Hz, 1H), 7.73(t, J=8.4Hz, 2H), 7.54(d, J=8.4Hz, 1H), 7.45(d, J=8.4Hz, 1H), 7.38(t, J=8.4Hz, 2H) 7.34-7.31 (m, 3H), 7.28(t, J=8.4Hz, 1H), 7.19 (d, J=16.2Hz, 1H), 7.16-7.11 (m, 1H), 7.04 (d, J=16.2Hz, 1H), 1.31 (s, 9H); ¹³C NMR (150MHz, CDCl₃): 158.9, 150.7, 149.5, 139.4, 136.0, 135.9, 134.8, 130.2, 129.9, 128.7, 127.5, 126.8, 126.3, 126.2, 125.6, 125.1, 121.9, 34.6, 31.3; HRMS (ESI): *m/z* Calcd. For C₂₃H₂₃NH⁺: 314.1903, Found: 314.1904.

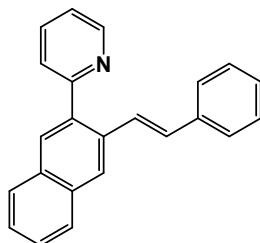


(E)-2-(2-(4-nitrostyryl)phenyl)pyridine, 3p, light yellow solid, yield 72%, ¹H NMR (600MHz, CDCl₃): δ 8.75 (d, J=8.4Hz, 1H), 7.75 (t, J=8.4Hz, 2H), 7.55 (d, J=8.4Hz, 1H), 7.44 (t, J=8.4Hz, 1H), 7.38 (t, J=8.4Hz, 2H), 7.35-7.31 (m, 3H), 7.30-7.27 (m, 1H), 7.20 (d, J=16.2Hz, 1H), 7.16-7.12 (m, 1H), 7.04 (d, J=16.2Hz, 1H); ¹³C NMR (150MHz, CDCl₃): 158.9, 150.7, 149.5, 139.4, 136.0, 135.9, 134.8, 130.2, 129.9, 128.7, 127.5, 126.8, 126.3, 126.2, 125.6, 125.1, 121.9; HRMS (ESI): *m/z* Calcd. For C₁₉H₁₄N₂O₂H⁺: 303.1128, Found: 303.1125.

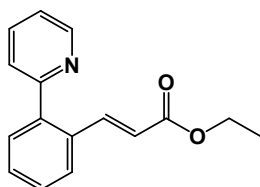


(E)-2-(3-styrylnaphthalen-2-yl)pyridine, 3q, light yellow solid, yield 91%, ¹H NMR (600MHz,

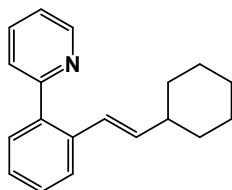
DMSO-*d*₆): δ 8.82 (s, 1H), 8.07 (d, *J*=8.4Hz, 1H), 8.03-7.96 (m, 3H), 7.54 (t, *J*=8.4Hz, 1H), 7.50-7.44 (m, 2H), 7.40 (t, *J*=8.4Hz, 1H), 7.35-7.28 (m, 5H), 7.22 (d, *J*=8.4Hz, 2H), 6.79 (d, *J*=16.2Hz, 1H); ¹³C NMR (150MHz, DMSO-*d*₆): 157.5, 150.2, 137.4, 137.2, 137.1, 132.9, 132.6, 132.4, 130.5, 129.2, 128.8, 128.4, 128.3, 127.1, 126.6, 126.5, 126.4, 126.2, 123.2, 123.2; **HRMS** (ESI): *m/z* Calcd. For C₂₃H₁₇NH⁺: 308.1434, Found: 308.1432.



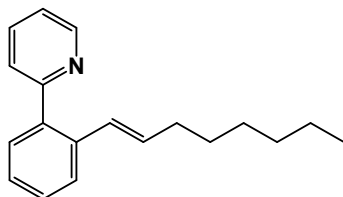
Ethyl (E)-3-(2-(pyridin-2-yl)phenyl)acrylate, 3r, light yellow liquid, yield 69%, ¹H NMR (600MHz, DMSO-*d*₆): δ 8.32 (s, 1H), 7.73-7.64 (m, 2H), 7.59 (d, *J*=8.4Hz, 1H), 7.35 (t, *J*=8.4Hz, 1H), 7.33-7.22 (m, 3H), 7.14 (s, 1H), 6.61 (s, 1H), 3.74 (q, *J*=8.4Hz, 2H), 0.84 (t, *J*=8.4Hz, 3H); ¹³C NMR (150MHz, DMSO-*d*₆): 171.3, 167.3, 140.8, 138.4, 134.1, 132.9, 130.9, 128.4, 127.9, 126.1, 122.9, 122.4, 60.8, 14.4; **HRMS** (ESI): *m/z* Calcd. For C₁₆H₁₅NO₂H⁺: 254.1176, Found: 254.1178.



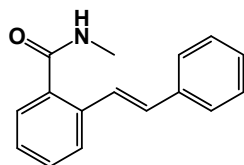
(E)-2-(2-(2-cyclohexylvinyl)phenyl)pyridine, 3s, white solid, yield 83%, ¹H NMR (600MHz, CDCl₃): δ 8.72 (s, 1H), 7.75 (t, *J*=8.4Hz, 2H), 7.75-7.19 (m, 7H), 7.30-7.27 (m, 1H), 6.43 (d, *J*=16.2Hz, 1H), 7.10 (q, *J*=8.4Hz, 1H), 2.16-1.98 (m, 1H), 1.91-1.64 (m, 4H), 1.61-0.95 (m, 6H); ¹³C NMR (150MHz, CDCl₃): 159.2, 149.4, 138.3, 136.4, 135.8, 130.0, 128.5, 126.9, 126.2, 125.9, 125.1, 121.7, 41.2, 32.9, 26.0; **HRMS** (ESI): *m/z* Calcd. For C₁₉H₂₁NH⁺: 264.1747, Found: 264.1746.



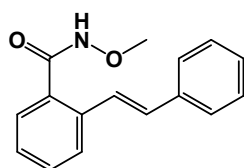
(E)-2-(2-(oct-1-en-1-yl)phenyl)pyridine, 3t, light yellow solid, yield 72%, ¹H NMR (600MHz, CDCl₃): δ 8.71 (s, 1H), 7.71 (t, J=8.4Hz, 1H), 7.58 (d, J=8.4Hz, 1H), 7.48-7.22 (m, 5H), 6.45 (d, J=16.2Hz, 1H), 6.23-6.08 (m, 1H), 2.14 (q, J=8.4Hz, 2H), 1.45-1.22 (m, 8H), 0.88 (t, J=8.4Hz, 3H); ¹³C NMR (150MHz, CDCl₃): 159.2, 149.4, 138.7, 136.3, 135.8, 132.8, 130.0, 128.5, 128.3, 126.9, 126.3, 125.0, 121.7, 33.2, 31.8, 29.2, 28.9, 22.7, 14.1; **HRMS** (ESI): *m/z* Calcd. For C₁₉H₂₃NH⁺: 266.1903, Found: 266.1906.



(E)-N-methyl-2-styrylbenzamide, 3u, light yellow liquid, yield 84%, ¹H NMR (600MHz, DMSO-*d*₆): δ 8.32 (s, 1H), 7.85 (d, J=8.4Hz, 1H), 7.52 (d, J=8.4Hz, 2H), 7.45 (t, J=8.4Hz, 2H), 7.41-7.32 (m, 4H), 7.29 (t, J=8.4Hz, 1H), 7.22 (d, J=16.2Hz, 1H), 2.79 (s, 3H); ¹³C NMR (150MHz, DMSO-*d*₆): 169.7, 137.5, 137.0, 135.1, 130.3, 130.0, 129.3, 128.3, 128.0, 127.8, 127.0, 126.3, 125.8, 26.6; **HRMS** (ESI): *m/z* Calcd. For C₁₆H₁₅NOH⁺: 238.1226, Found: 238.1223.

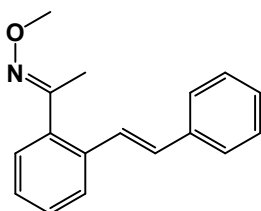


(E)-N-methoxy-2-styrylbenzamide, 3v, light yellow liquid, yield 82%, ¹H NMR (600MHz, CDCl₃): δ 8.41 (s, 1H), 7.62 (d, J=8.4Hz, 1H), 7.55 (d, J=8.4Hz, 1H), 7.42-7.31 (m, 6H), 7.23 (t, J=8.4Hz, 1H), 7.07 (d, J=8.4Hz, 1H), 6.97 (d, J=16.2Hz, 1H), 3.88 (s, 3H); ¹³C NMR (150MHz, CDCl₃): 166.6, 138.9, 137.8, 131.7, 130.7, 129.0, 128.7, 128.6, 128.4, 127.6, 127.0, 126.8, 126.6, 126.5, 125.7, 63.9; **HRMS** (ESI): *m/z* Calcd. For C₁₆H₁₅NO₂H⁺: 254.1176, Found: 254.1172.

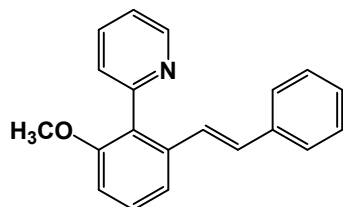


(E)-1-(2-((E)-styryl)phenyl)ethan-1-one O-methyl oxime, 3w, light yellow liquid, yield 88%, ¹H

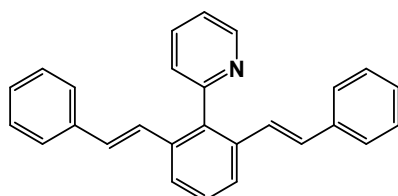
NMR (600MHz, CDCl₃): δ 7.66 (d, J=8.4Hz, 1H), 7.48 (d, J=8.4Hz, 2H), 7.34 (t, J=8.4Hz, 3H), 7.30-7.27 (m, 2H), 7.26-7.22 (m, 2H), 7.01 (d, J=16.2Hz, 1H), 4.00 (s, 3H), 2.20 (s, 3H); **¹³C NMR** (150MHz, CDCl₃): δ 156.7, 137.4, 136.7, 135.7, 130.4, 128.8, 128.7, 127.8, 127.6, 126.9, 126.6, 126.2, 62.0, 17.0; **HRMS** (ESI) : m/z Calcd. For C₁₇H₁₇NOH⁺: 252.1383, Found: 252.1386.



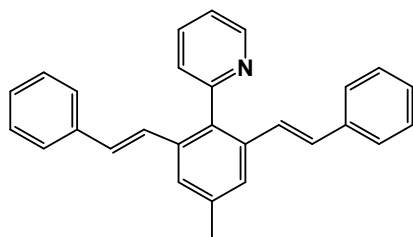
(E)-2-(2-methoxy-6-styrylphenyl)pyridine, 3x, light yellow solid, yield 85%, **¹H NMR** (600MHz, DMSO-*d*₆): δ 8.66 (d, J=8.4Hz, 1H), 7.84 (t, J=8.4Hz, 1H), 7.47 (d, J=8.4Hz, 1H), 7.41 (t, J=8.4Hz, 1H), 7.38-7.35 (m, 1H), 7.33 (d, J=8.4Hz, 1H), 7.27 (t, J=8.4Hz, 2H), 7.22 (t, J=8.4Hz, 2H), 7.19 (t, J=8.4Hz, 1H), 7.09 (d, J=16.2Hz, 1H), 7.04 (d, J=8.4Hz, 1H), 6.62 (d, J=16.2Hz, 1H), 3.67 (s, 3H); **¹³C NMR** (150MHz, DMSO-*d*₆): δ 157.3, 156.1, 149.6, 137.4, 137.0, 136.5, 130.1, 129.7, 129.5, 129.2, 128.2, 126.6, 126.5, 122.7, 117.8, 110.9, 56.1; **HRMS** (ESI) : m/z Calcd. For C₂₀H₁₇NOH⁺: 288.1383, Found: 288.1385.



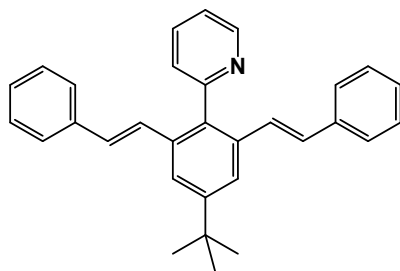
2-(2,6-di((E)-styryl)phenyl)pyridine, 3a', light yellow liquid, yield 91%, **¹H NMR** (600MHz, CDCl₃): δ 8.81 (d, J=8.4Hz, 1H), 7.19 (d, J=8.4Hz, 4H), 7.92 (s, 2H), 7.82 (d, J=8.4Hz, 2H), 7.69 (d, J=8.4Hz, 2H), 7.55-7.42 (m, 7H), 7.27 (t, J=8.4Hz, 1H), 7.10 (d, J=16.2Hz, 2H); **¹³C NMR** (150MHz, CDCl₃): δ 154.7, 149.4, 137.5, 137.2, 135.1, 132.5, 128.7, 128.5, 128.0, 126.8, 123.3, 122.4, 120.3; **HRMS** (ESI): m/z Calcd. For C₂₇H₂₁NH⁺: 360.1747, Found: 360.1749.



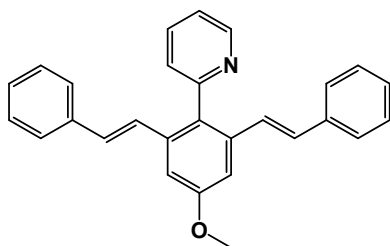
2-(4-methyl-2,6-di((E)-styryl)phenyl)pyridine, 3b', yellow liquid, yield 94%, ¹H NMR (600MHz, CDCl₃): δ 8.80 (s, 1H), 7.76 (t, J=8.4Hz, 1H), 7.52 (s, 2H), 7.33-7.23 (m, 10H), 7.21-7.16 (m, 2H), 6.97 (d, J=16.2Hz, 2H), 6.75 (d, J=16.2Hz, 2H), 2.48 (s, 3H); ¹³C NMR (150MHz, CDCl₃): δ 158.2, 149.4, 138.0, 137.5, 136.4, 136.1, 129.9, 128.5, 127.5, 127.1, 126.6, 126.5, 125.5, 125.5, 122.1, 21.5; HRMS (ESI): *m/z* Calcd. For C₂₈H₂₃NH⁺: 374.1903, Found: 374.1901.



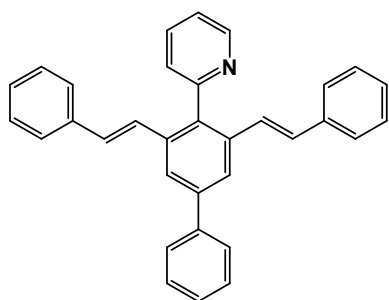
2-(4-(tert-butyl)-2,6-di((E)-styryl)phenyl)pyridine, 3c', light yellow solid, yield 96%, ¹H NMR (600MHz, CDCl₃): δ 8.78(d, J=8.4Hz, 1H), 7.75 (t, J=8.4Hz, 1H), 7.71 (s, 2H), 7.34-7.27 (m, 7H), 7.25-7.17 (m, 5H), 6.97 (d, J=16.2Hz, 2H), 6.80 (d, J=16.2Hz, 2H), 1.46 (s, 9H); ¹³C NMR (150MHz, CDCl₃): 158.0, 149.4, 149.2, 138.0, 137.3, 136.0, 132.2, 128.6, 128.1, 127.6, 127.2, 126.9, 126.6, 123.4, 122.0, 120.7, 35.5, 31.7; HRMS (ESI): *m/z* Calcd. For C₃₁H₂₉NH⁺: 416.2373, Found: 416.2376.



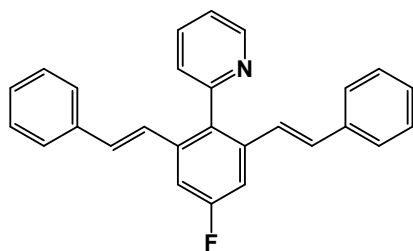
2-(4-methoxy-2,6-di((E)-styryl)phenyl)pyridine, 3d', yellow solid, yield 92%, ¹H NMR (600MHz, CDCl₃): δ 8.79 (d, J=8.4Hz, 1H), 7.74 (t, J=8.4Hz, 1H), 7.31-7.26 (m, 8H), 7.24-7.15 (m, 6H), 6.96 (d, J=16.2Hz, 2H), 6.76 (d, J=16.2Hz, 2H), 3.95 (s, 3H); ¹³C NMR (150MHz, CDCl₃): δ 159.5, 158.0, 149.4, 138.0, 137.3, 136.0, 132.2, 130.3, 128.6, 127.6, 127.2, 126.6, 122.0, 110.3, 55.5; HRMS (ESI): *m/z* Calcd. For C₂₈H₂₃NOH⁺: 390.1852, Found: 390.1855.



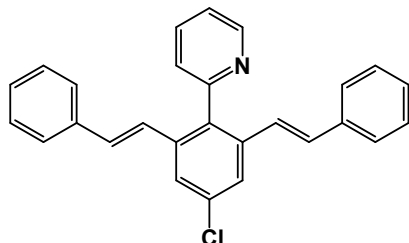
2-(3,5-di((E)-styryl)-[1,1'-biphenyl]-4-yl)pyridine, 3e', light yellow solid, yield 89%, ¹H NMR (600MHz, CDCl₃): δ 8.82 (d, J=8.4Hz, 1H), 7.90 (s, 2H), 7.79 (t, J=8.4Hz, 1H), 7.74 (d, J=8.4Hz, 2H), 7.52 (t, J=8.4Hz, 2H), 7.42 (t, J=8.4Hz, 2H), 7.37 (d, J=8.4Hz, 2H), 7.32-7.27 (m, 4H), 7.25 (s, 2H), 7.23-7.15 (m, 3H), 7.06 (d, J=16.2Hz, 2H), 6.83 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, CDCl₃): δ 155.1, 149.9, 141.1, 138.8, 138.6, 135.3, 134.9, 134.6, 132.8, 129.6, 129.3, 128.8, 128.5, 128.1, 127.1, 125.2, 123.1, 122.7; **HRMS** (ESI): *m/z* Calcd. For C₃₃H₂₅NH⁺: 436.2060, Found: 436.2062.



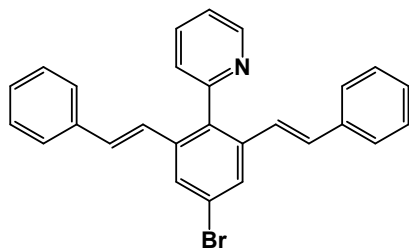
2-(4-fluoro-2,6-di((E)-styryl)phenyl)pyridine, 3f', light yellow solid, yield 88%, ¹H NMR (600MHz, DMSO-*d*₆): δ 8.34 (s, 1H), 7.83 (d, J=8.4Hz, 1H), 7.69 (d, J=8.4Hz, 2H), 7.61-7.53 (m, 2H), 7.46-7.39 (m, 4H), 7.33 (t, J=8.4Hz, 4H), 7.29-7.23 (m, 4H), 7.08 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, DMSO-*d*₆): 162.0 (d, 244.5Hz), 154.8, 149.6, 137.5, 137.1, 136.8, 132.3 (d, J=13.5Hz), 130.5, 128.5, 128.1, 123.9, 122.1, 120.4, 110.7 (d, J=33Hz); ¹⁹F NMR (376MHz, DMSO-*d*₆): -113.31; **HRMS** (ESI): *m/z* Calcd. For C₂₇H₂₀FNH⁺: 378.1653, Found: 378.1650.



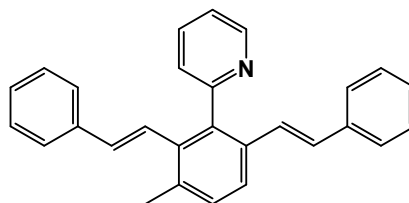
2-(4-chloro-2,6-di((E)-styryl)phenyl)pyridine, 3g', light yellow solid, yield 85%, ¹H NMR (600MHz, CDCl₃): δ 8.81(d, J=8.4Hz, 1H), 7.77 (t, J=8.4Hz, 1H), 7.65 (s, 2H), 7.33 (t, J=8.4Hz, 2H), 7.28-7.20 (m, 10H), 6.98 (d, J=16.2Hz, 2H), 6.68 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, DCI₃): 157.2, 149.7, 138.4, 136.9, 136.2, 134.5, 131.3, 128.6, 127.9, 126.7, 126.4, 125.8, 124.4, 122.4; **HRMS** (ESI): *m/z* Calcd. For C₂₇H₂₀NCIH⁺: 394.1357, Found: 394.1358.



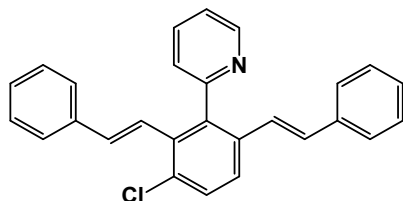
2-(4-bromo-2,6-di((E)-styryl)phenyl)pyridine, 3h', light yellow solid, yield 86%, ¹H NMR (600MHz, CDCl₃): δ 8.26 (d, J=8.4Hz, 1H), 7.48 (d, J=8.4Hz, 4H), 7.41-7.33 (m, 7H), 7.28 (d, J=8.4Hz, 2H), 7.19 (d, J=16.2Hz, 2H), 7.16 (d, J=8.4Hz, 2H), 7.01 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, CDCl₃): 155.0, 149.3, 137.0, 136.8, 134.2, 132.1, 129.4, 128.8, 128.5, 123.7, 122.3, 121.6, 120.7; **HRMS** (ESI): *m/z* Calcd. For C₂₇H₂₀BrNH⁺: 438.0852, Found: 438.0855.



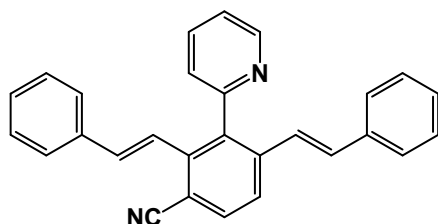
2-(3-methyl-2,6-di((E)-styryl)phenyl)pyridine, 3i', light yellow solid, yield 84%, ¹H NMR (600MHz, CDCl₃): δ 8.73 (s, 1H), 7.68 (t, J=8.4Hz, 1H), 7.62 (d, J=8.4Hz, 1H), 7.30-7.15 (m, 13H), 6.96 (d, J=16.2Hz, 1H), 6.85 (d, J=16.2Hz, 1H), 6.74 (d, J=16.2Hz, 1H), 6.22 (d, J=16.2Hz, 1H), 2.45 (s, 3H); ¹³C NMR (150MHz, CDCl₃): 159.3, 149.2, 139.0, 137.7, 136.6, 136.0, 134.9, 134.2, 130.6, 129.2, 128.5, 128.5, 127.4, 127.4, 127.2, 126.8, 126.5, 126.4, 126.2, 124.2, 121.8, 21.1; **HRMS** (ESI): *m/z* Calcd. For C₂₈H₂₃NH⁺: 374.1903, Found: 374.1901.



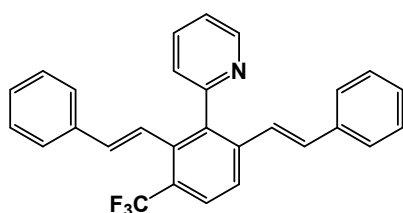
2-(3-chloro-2,6-di((E)-styryl)phenyl)pyridine, 3j', yellow solid, yield 80%, ¹H NMR (600MHz, CDCl₃): δ 8.76 (s, 1H), 7.61 (d, J=8.4Hz, 1H), 7.48 (d, J=8.4Hz, 1H), 7.25-7.17 (m, 11H), 7.00-6.93 (m, 2H), 6.69 (d, J=16.2Hz, 2H), 6.28 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, CDCl₃): 158.3, 137.1, 137.1, 136.5, 133.0, 128.6, 128.5, 128.1, 127.8, 127.7, 126.6, 126.4, 126.1, 125.3, 124.6; **HRMS** (ESI): *m/z* Calcd. For C₂₇H₂₀ClNH⁺: 394.1357, Found: 394.1358.



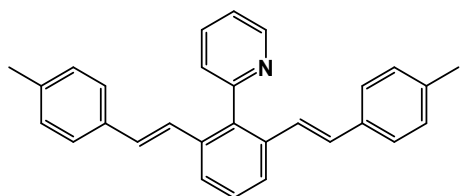
3-(pyridin-2-yl)-2,4-di((E)-styryl)benzonitrile, 3k', light yellow solid, yield 78%, ¹H NMR (600MHz, CDCl₃): δ 8.36 (d, J=8.4Hz, 1H), 7.61 (d, J=8.4Hz, 2H), 7.50 (d, J=8.4Hz, 4H), 7.41-7.27 (m, 9H), 7.21 (d, J=16.2Hz, 2H), 7.02 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, CDCl₃): 154.7, 149.7, 139.3, 137.7, 137.3, 135.6, 132.7, 130.5, 128.6, 128.5, 127.9, 127.6, 127.1, 123.9, 122.4, 120.6, 116.0, 109.5; **HRMS** (ESI): *m/z* Calcd. For C₂₈H₂₀N₂H⁺: 385.1699, Found: 385.1702.



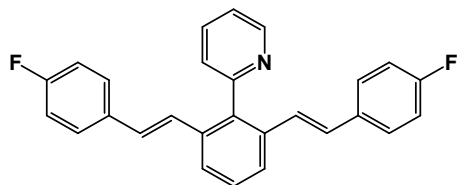
2-(2,6-di((E)-styryl)-3-(trifluoromethyl)phenyl)pyridine, 3l', yellow solid, yield 73%, ¹H NMR (600MHz, DMSO-*d*₆): δ 8.32 (d, J=8.4Hz, 1H), 7.85 (d, J=8.4Hz, 2H), 7.52 (d, J=8.4Hz, 4H), 7.45 (t, J=8.4Hz, 2H), 7.42-7.36 (m, 5H), 7.34-7.26 (m, 4H), 7.23 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, DMSO-*d*₆): 154.9, 149.4, 139.2, 136.9, 136.8, 134.4, 131.2 (d, J=33Hz), 128.7 (q, J=22.5Hz), 127.5, 126.5, 126.2 (d, J=6Hz), 126.0, 125.3, 122.0 (q, J=211.5Hz); ¹⁹F NMR (376MHz, DMSO-*d*₆): -61.36; **HRMS** (ESI): *m/z* Calcd. For C₂₈H₂₀F₃NH⁺: 428.1621, Found: 428.1619.



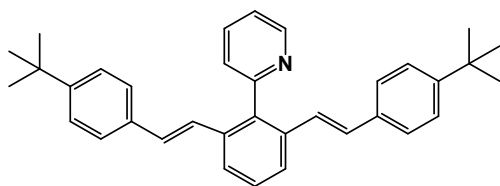
2-(2,6-bis((E)-4-methylstyryl)phenyl)pyridine, 3m', light yellow solid, yield 92%, ¹H NMR (600MHz, CDCl₃): δ 8.78(d, J=8.4Hz, 1H), 7.67(d, J=8.4Hz, 2H), 7.41(t, J=8.4Hz, 1H), 7.34-7.28 (m, 2H), 7.22 (s, 1H), 7.19-7.14 (m, 4H), 7.09-7.03 (m, 4H), 6.94 (d, J=16.2Hz, 2H), 6.70 (d, J=16.2Hz, 2H) 2.30 (s, 6H); ¹³C NMR (150MHz, CDCl₃): 158.3, 149.5, 138.4, 137.4, 136.7, 136.0, 134.7, 130.0, 129.2, 128.5, 126.4, 126.2, 124.6, 122.1, 21.2; HRMS (ESI): *m/z* Calcd. For C₂₉H₂₅NH⁺: 388.2060, Found: 388.2063.



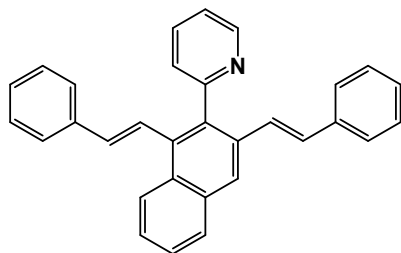
2-(2,6-bis((E)-4-fluorostyryl)phenyl)pyridine, 3n', light yellow solid, yield 86%, ¹H NMR (600MHz, CDCl₃): δ 8.79 (d, J=8.4Hz, 1H), 7.77 (t, J=8.4Hz, 1H), 7.66 (d, J=8.4Hz, 2H), 7.41 (t, J=8.4Hz, 1H), 7.37-7.27 (m, 2H), 7.24-7.15 (m, 4H), 6.98-6.88 (m, 6H), 6.65 (d, J=16.2Hz, 2H); ¹³C NMR (150MHz, CDCl₃): 161.9 (d, 244.5Hz), 158.1, 149.5, 136.3 (d, J=30Hz), 133.6, 129.0, 128.6, 128.0 (d, J=7.5Hz), 126.7, 126.4, 124.8, 122.3, 115.5 (d, J=21Hz); ¹⁹F NMR (376MHz, CDCl₃): -114.10; HRMS (ESI): *m/z* Calcd. For C₂₇H₁₉F₂NH⁺: 396.1558, Found: 396.1556.



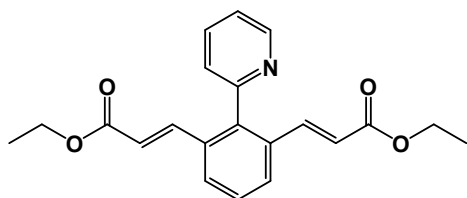
2-(2,6-bis((E)-4-(tert-butyl)styryl)phenyl)pyridine, 3o', light yellow solid, yield 94%, ¹H NMR (600MHz, CDCl₃): δ 8.77 (s, 1H), 7.65 (d, J=8.4Hz, 3H), 7.37 (t, J=8.4Hz, 2H), 7.27-7.11 (m, 9H), 6.95 (d, J=16.2Hz, 2H), 6.72 (d, J=16.2Hz, 2H), 1.26 (s, 18H); ¹³C NMR (150MHz, CDCl₃): 158.5, 150.7, 149.6, 138.6, 136.8, 136.1, 134.8, 130.0, 128.6, 126.5, 126.4, 125.6, 124.7, 122.2, 34.7, 31.4; HRMS (ESI): *m/z* Calcd. For C₃₅H₃₇NH⁺: 472.2999, Found: 472.2997.



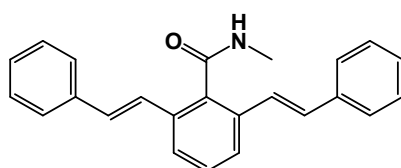
2-(1,3-di((E)-styryl)naphthalen-2-yl)pyridine, 3q', light yellow solid, yield 95%, **¹H NMR** (600MHz, DMSO-*d*₆): δ 8.66 (d, J=8.4Hz, 1H), 7.84 (t, J=8.4Hz, 2H), 7.47 (d, J=8.4Hz, 2H), 7.42-7.33 (m, 4H), 7.27 (t, J=8.4Hz, 3H), 7.24-7.18 (m, 5H), 7.09 (d, J=16.2Hz, 2H), 7.04 (d, J=8.4Hz, 2H), 6.62 (d, J=16.2Hz, 2H); **¹³C NMR** (150MHz, DMSO-*d*₆): 154.8, 149.1, 137.3, 137.0, 135.2, 134.2, 133.0, 132.4, 131.8, 129.0, 128.0, 127.4, 126.8, 125.5, 123.6, 121.8, 120.3; **HRMS** (ESI): *m/z* Calcd. For C₃₁H₂₃NH⁺: 410.1903, Found: 410.1901.



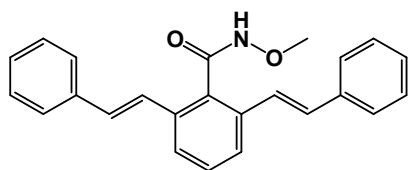
diethyl 3,3'-(2-(pyridin-2-yl)-1,3-phenylene)(2E,2'E)-diacrylate, 3r', light yellow solid, yield 65%, **¹H NMR** (600MHz, CDCl₃): δ 8.43 (d, J=8.4Hz, 1H), 7.77-7.65 (m, 4H), 7.51 (d, J=16.2Hz, 2H), 7.06 (d, J=8.4Hz, 1H), 6.80 (t, J=8.4Hz, 1H), 6.33 (d, J=16.2Hz, 2H), 4.23 (q, J=8.4Hz, 4H), 1.29 (t, J=8.4Hz, 6H); **¹³C NMR** (150MHz, CDCl₃): 167.4, 155.6, 149.4, 145.7, 136.4, 135.2, 129.9, 128.5, 126.5, 125.5, 122.1, 116.8, 61.6, 14.2; **HRMS** (ESI): *m/z* Calcd. For C₂₁H₂₁NO₄H⁺: 352.1543, Found: 352.1539.



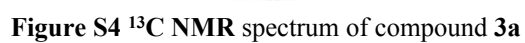
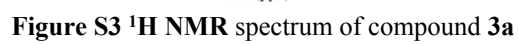
N-methyl-2,6-di((E)-styryl)benzamide, 3u', light yellow solid, yield 87%, **¹H NMR** (600MHz, DMSO-*d*₆): δ 8.46 (s, 1H), 7.55-7.47 (m, 4H), 7.34 (t, J=8.4Hz, 4H), 7.25-7.17 (m, 5H), 7.08 (d, J=8.4Hz, 2H), 6.85 (d, J=16.2Hz, 2H), 2.96 (s, 3H); **¹³C NMR** (150MHz, DMSO-*d*₆): 167.3, 137.8, 136.2, 135.5, 131.9, 131.3, 129.2, 128.6, 127.9, 127.5, 127.2, 126.7, 126.4, 125.8, 26.2; **HRMS** (ESI): *m/z* Calcd. For C₂₄H₂₁NOH⁺: 340.1696, Found: 340.1699.



N-methoxy-2,6-di(*E*-styryl)benzamide, **3v'**, light yellow solid, yield 88%, ¹H NMR (600MHz, CDCl₃): δ 7.68-7.62 (m, 2H), 7.47 (d, J=8.4Hz, 4H), 7.35 (t, J=8.4Hz, 4H), 7.31-7.22 (m, 4H), 7.19 (d, J=16.2Hz, 2H), 6.77 (d, J=16.2Hz, 2H), 3.81 (s, 3H); ¹³C NMR (150MHz, CDCl₃): 166.4, 140.9, 137.6, 132.5, 129.2, 129.0, 128.9, 128.7, 128.6, 128.6, 128.4, 128.3, 128.0, 128.0, 127.3, 127.1, 127.0, 126.8, 126.4, 125.3, 65.5; HRMS (ESI): *m/z* Calcd. For C₂₄H₂₁NO₂H⁺: 356.1645, Found: 356.1642.



Compound 3a



Compound 3b

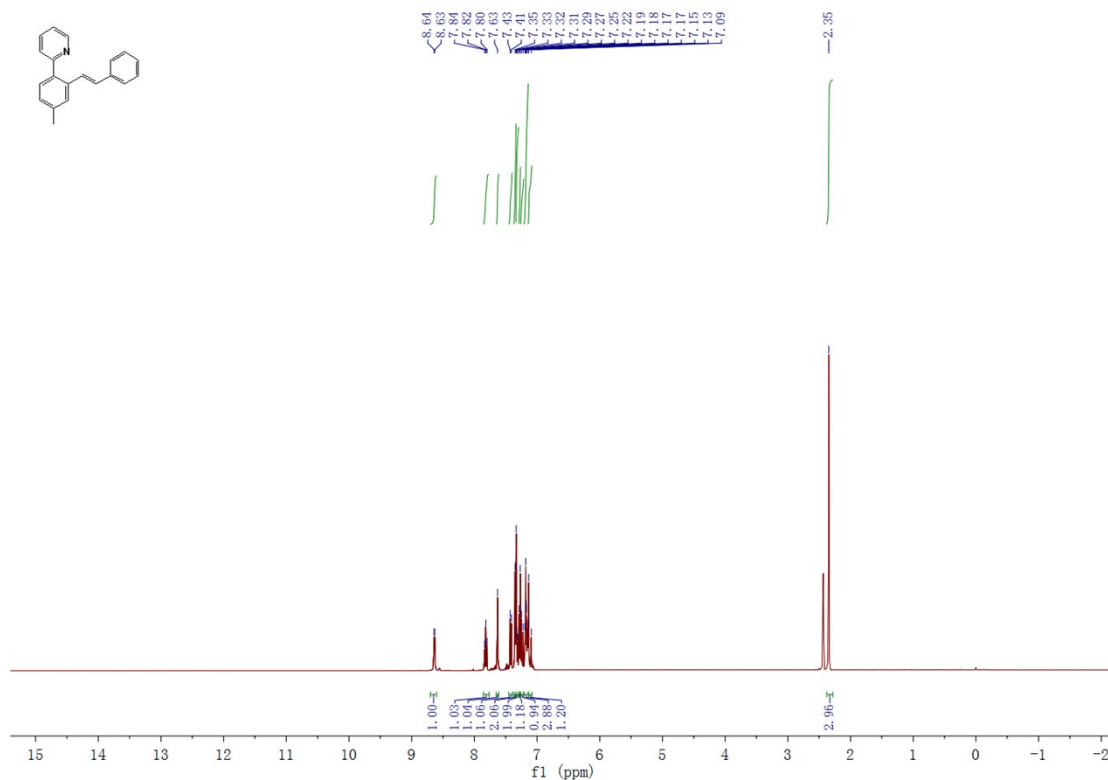


Figure S5 ¹H NMR spectrum of compound 3b

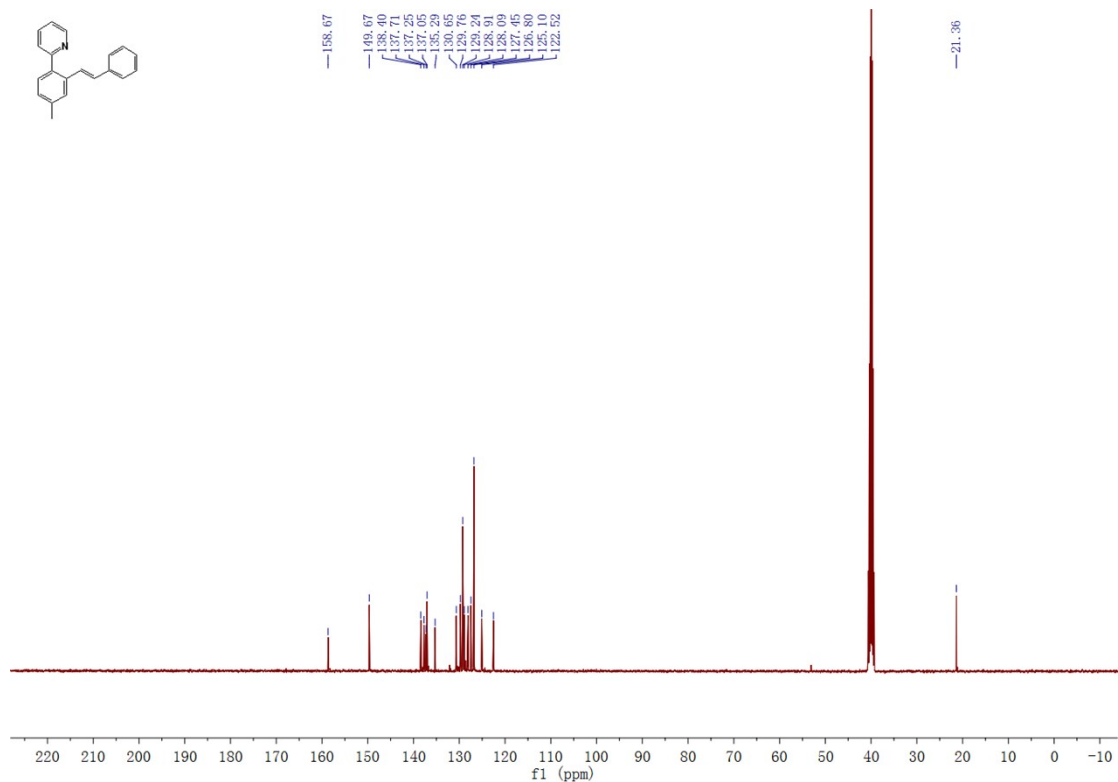


Figure S6 ¹³C NMR spectrum of compound 3b

Compound 3c

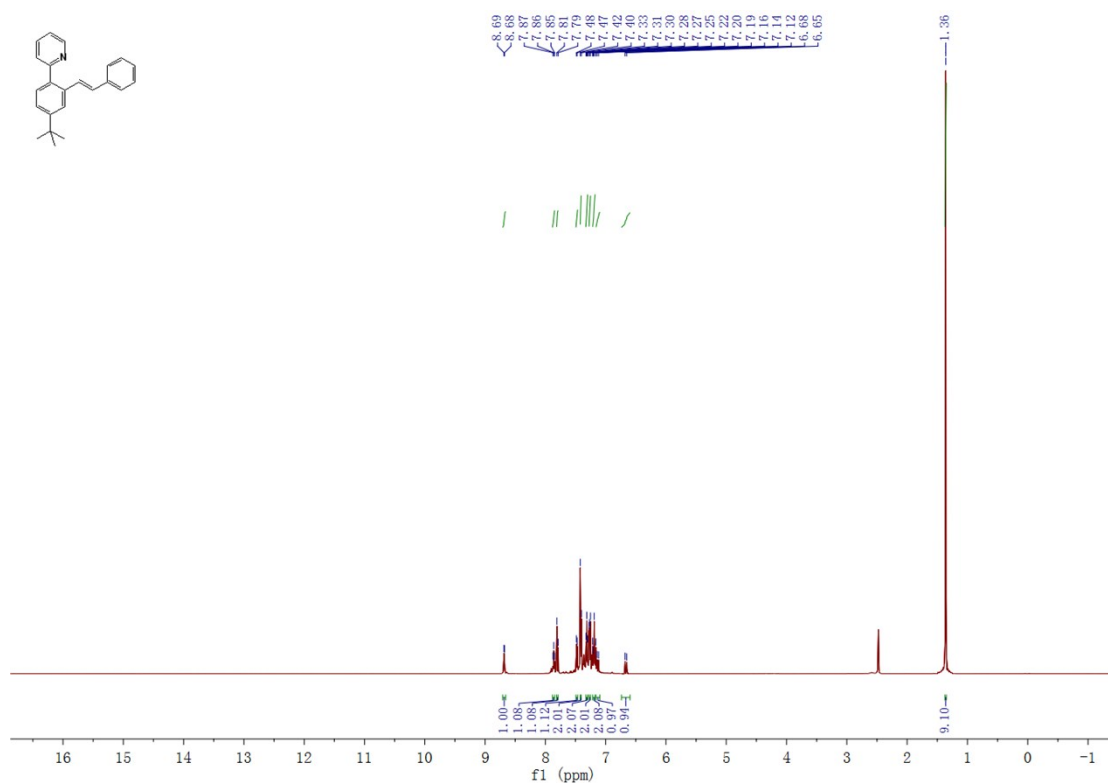


Figure S7 ¹H NMR spectrum of compound 3c

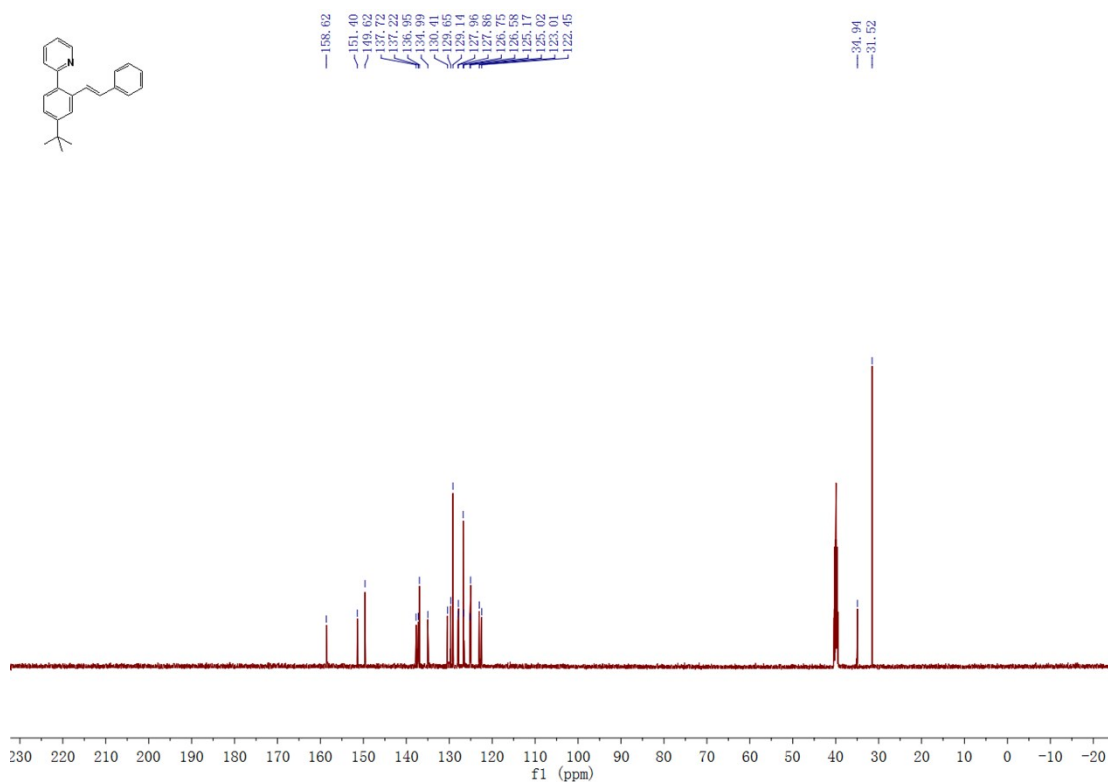


Figure S8 ¹³C NMR spectrum of compound 3c

Compound 3d

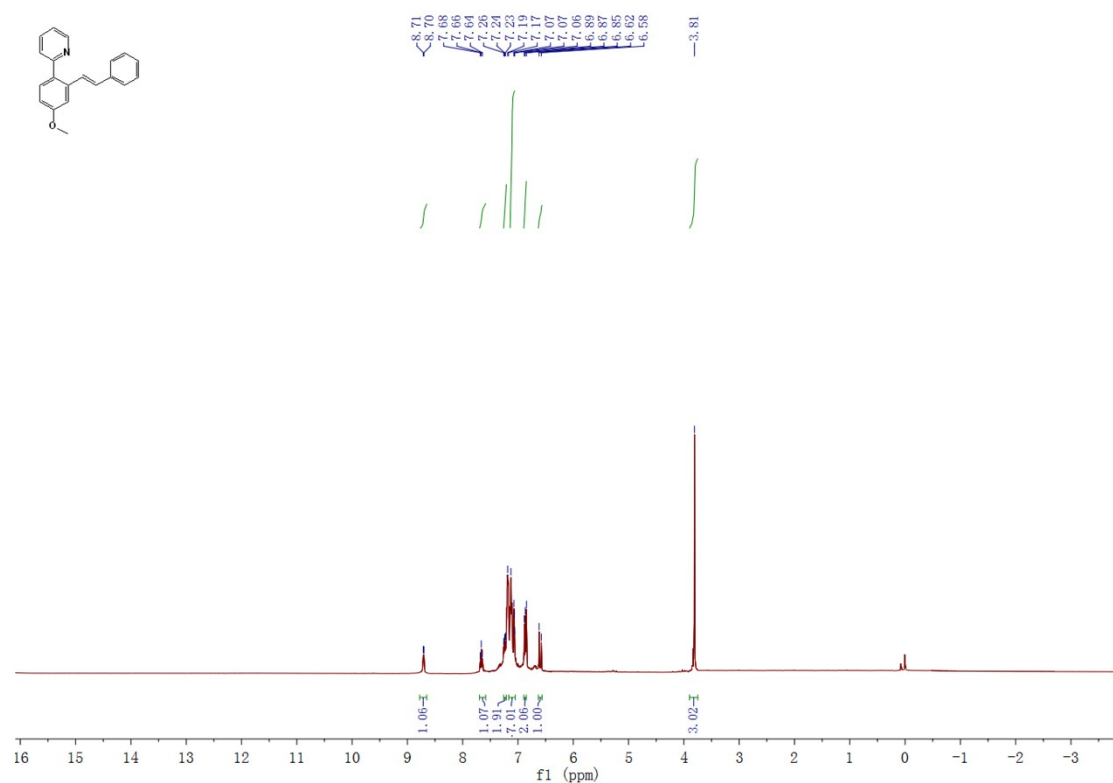


Figure S9 ¹H NMR spectrum of compound 3d

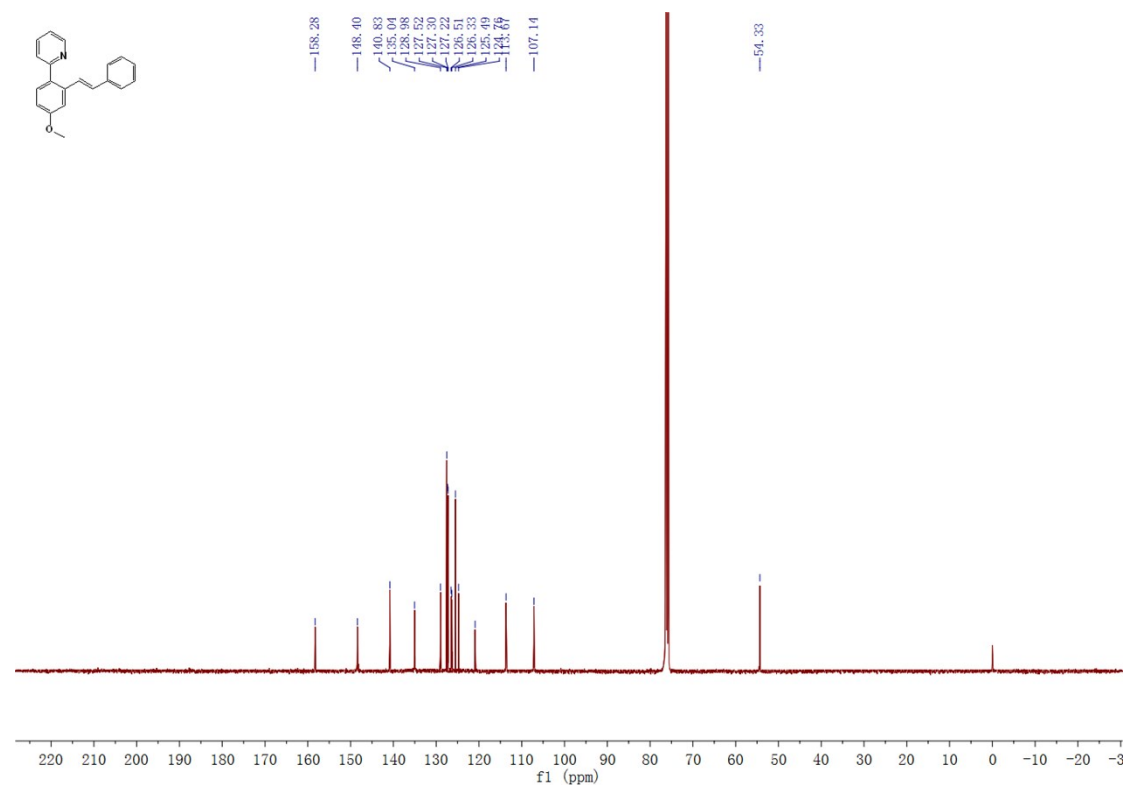


Figure S10 ¹³C NMR spectrum of compound 3d

Compound 3e

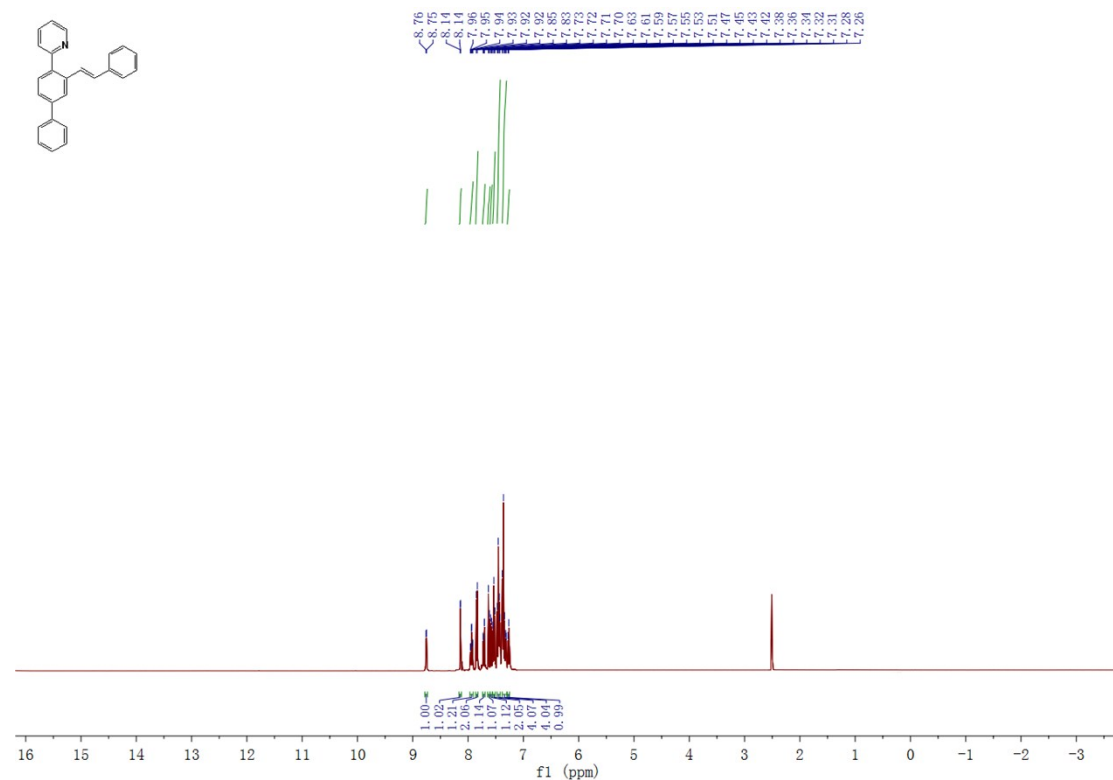


Figure S11 ¹H NMR spectrum of compound 3e

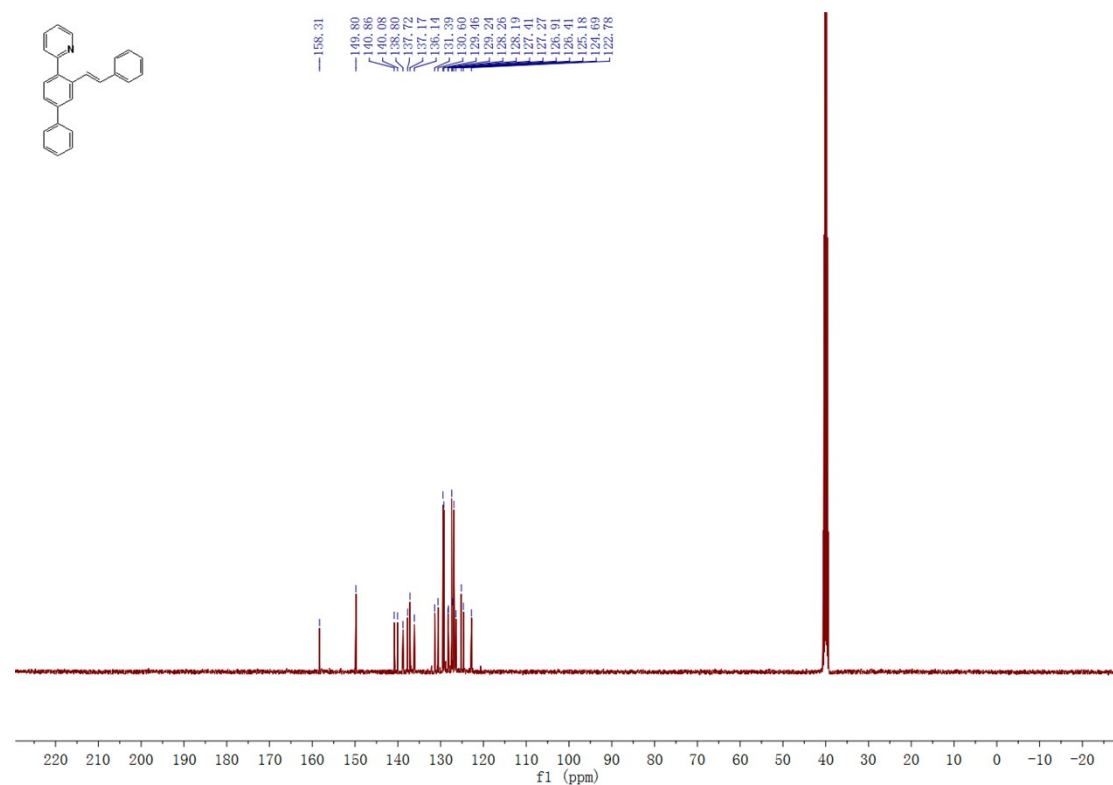


Figure S12 ¹³C NMR spectrum of compound 3e

Compound 3f

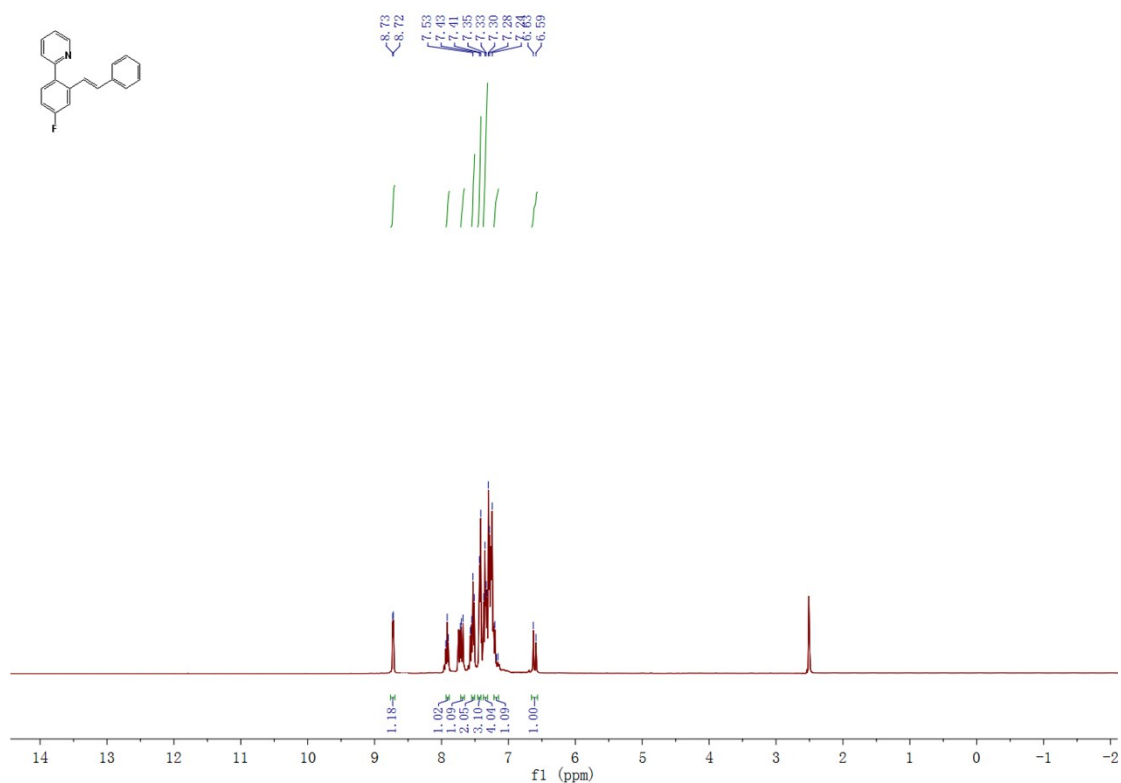


Figure S13 ¹H NMR spectrum of compound 3f

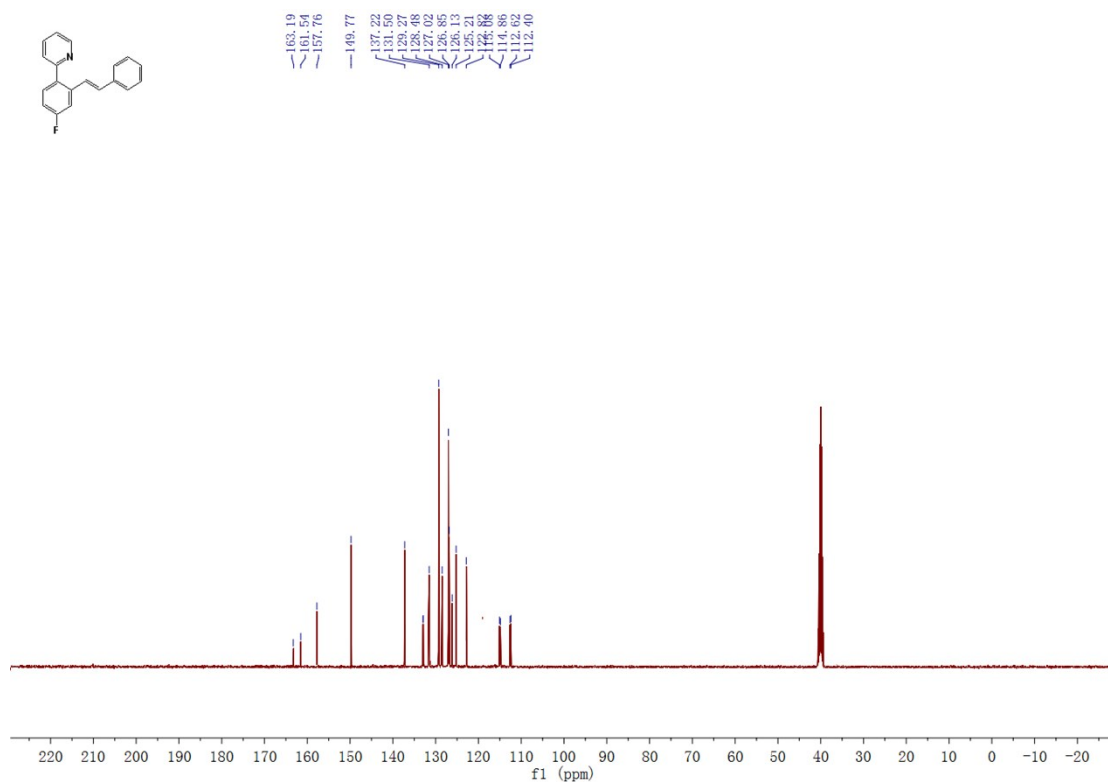


Figure S14 ¹³C NMR spectrum of compound 3f

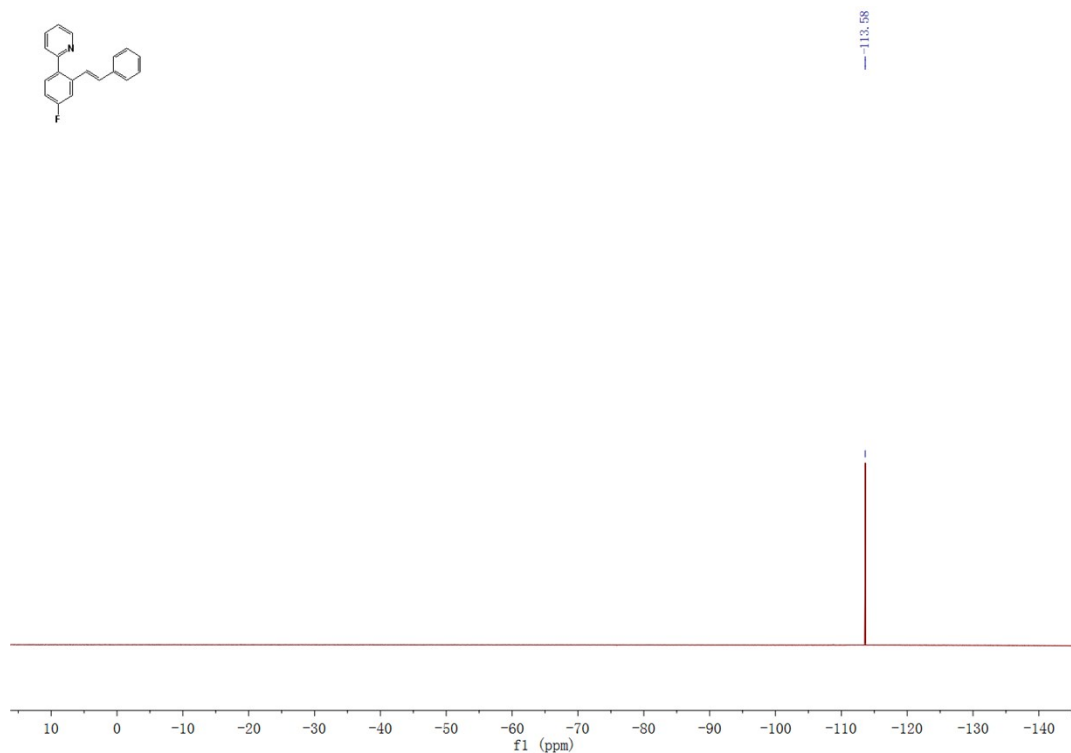


Figure S15 ¹⁹F NMR spectrum of compound **3f**

Compound **3g**

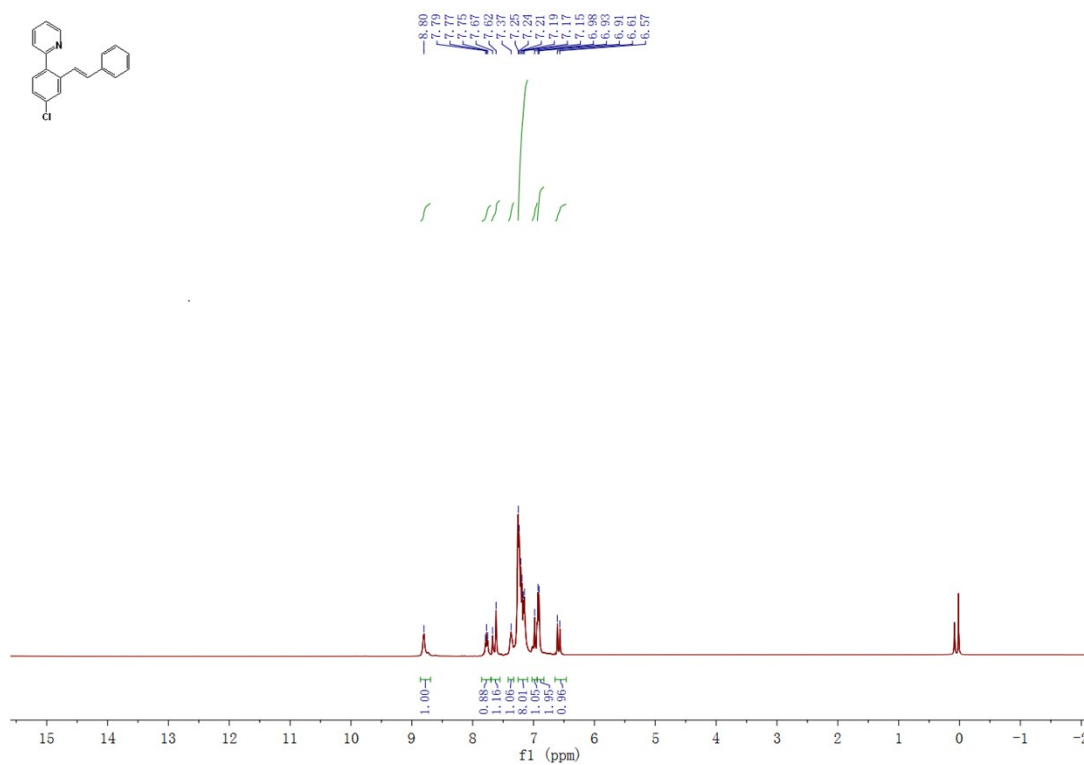


Figure S16 ¹H NMR spectrum of compound **3g**

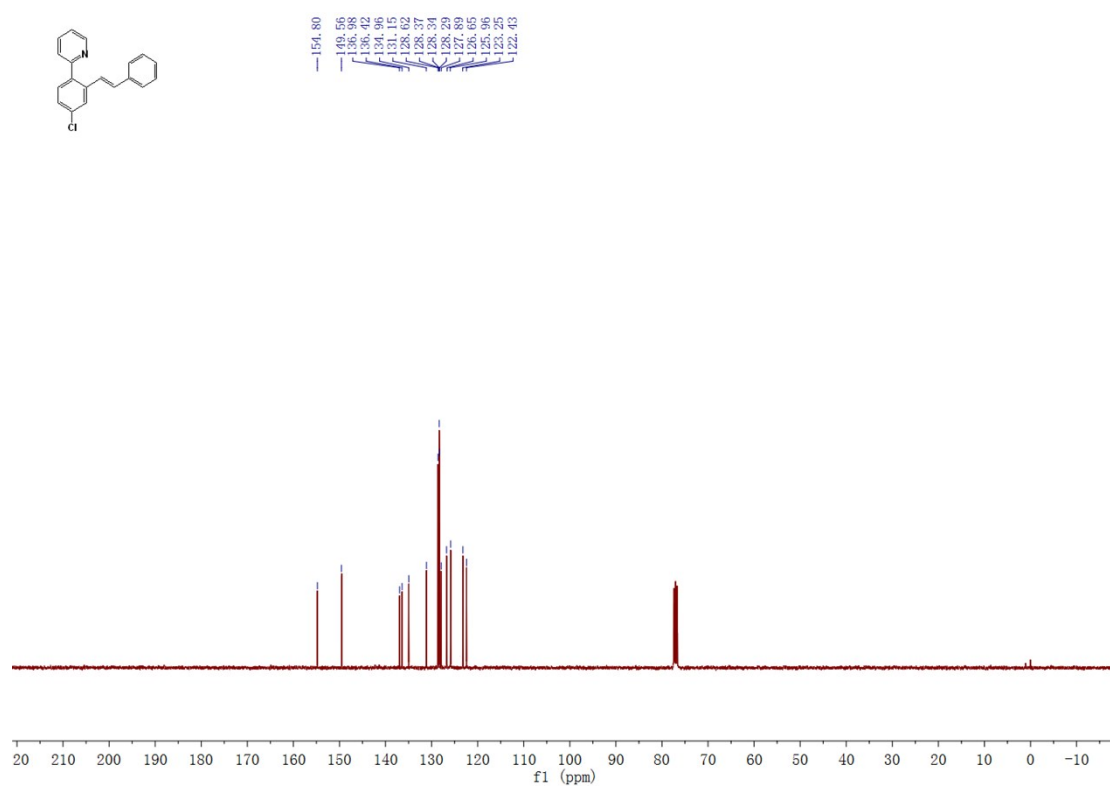


Figure S17 ¹³C NMR spectrum of compound 3g

Compound 3h

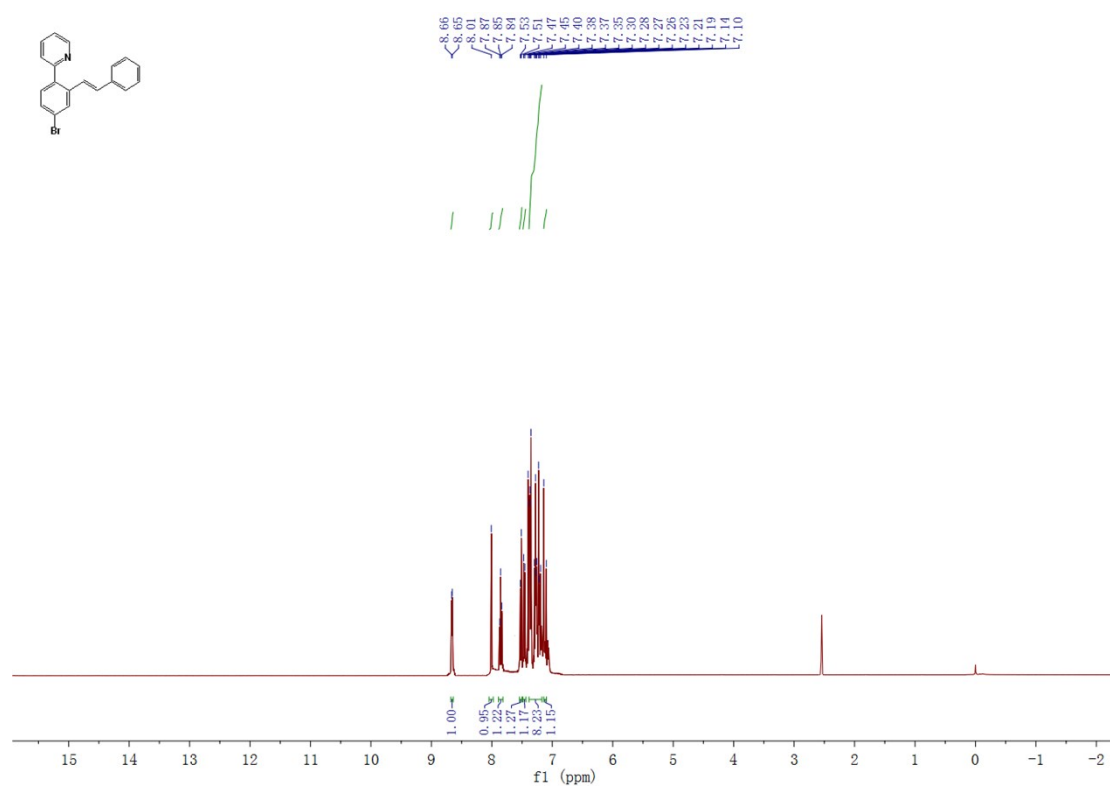


Figure S18 ¹H NMR spectrum of compound 3h

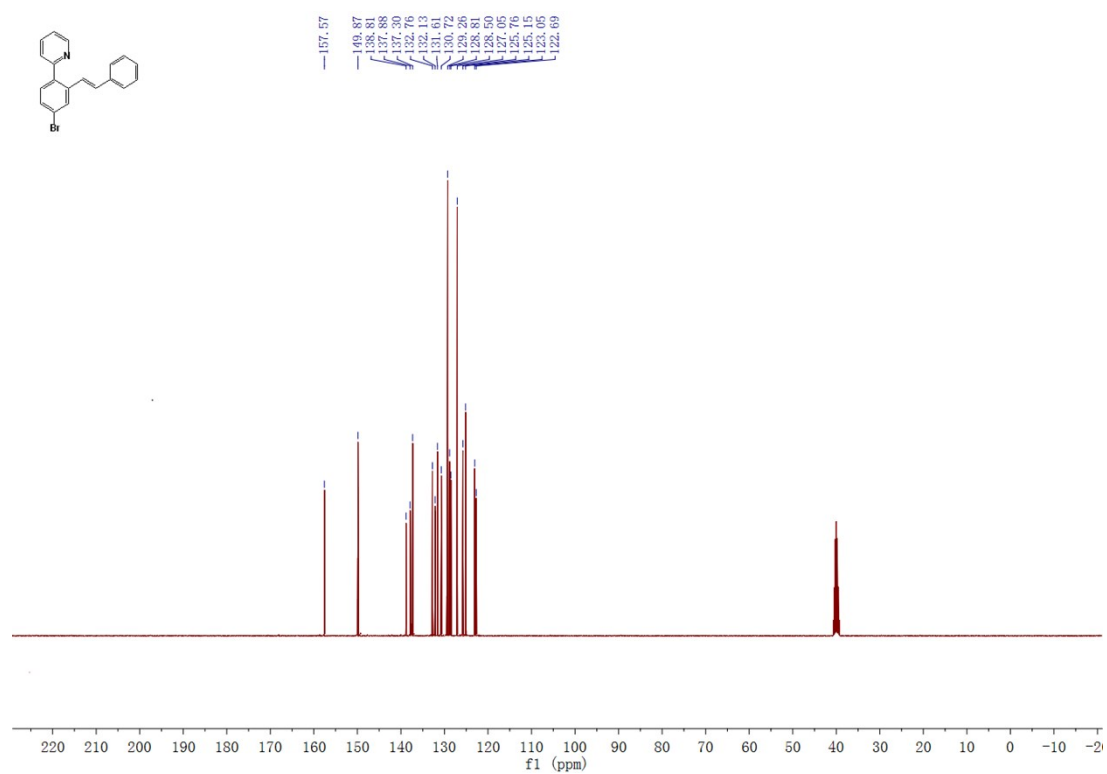


Figure S19 ¹³C NMR spectrum of compound **3h**

Compound **3i**

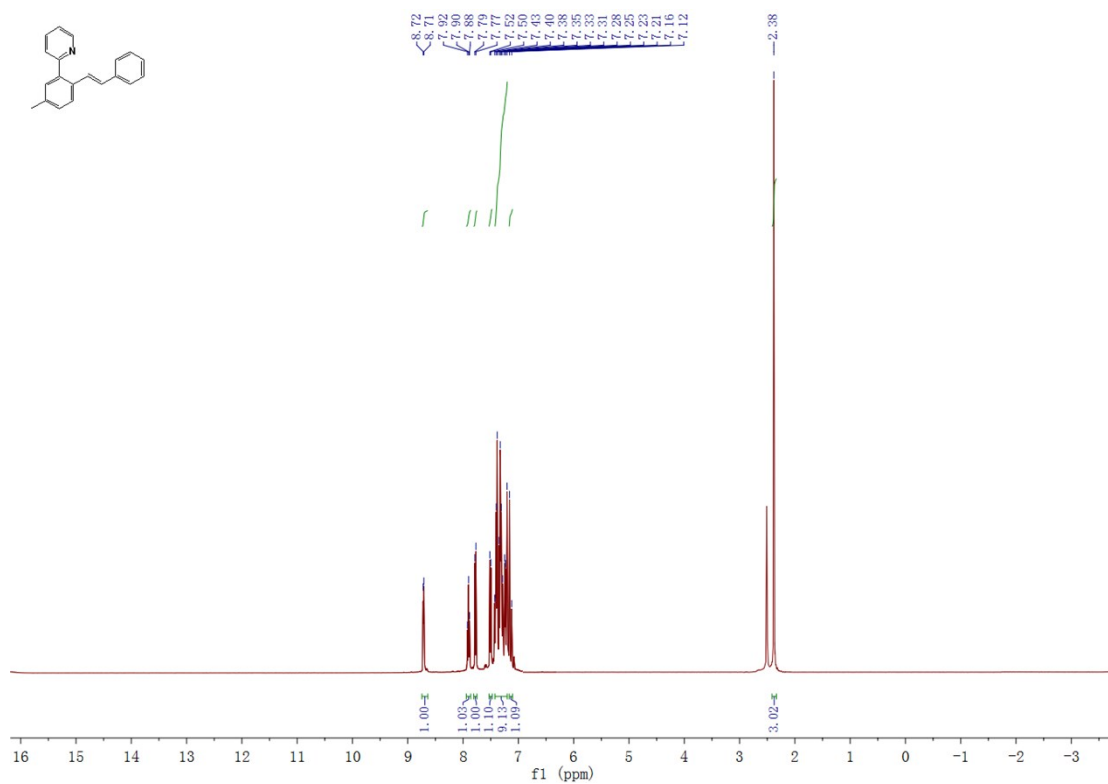


Figure S20 ¹H NMR spectrum of compound **3i**

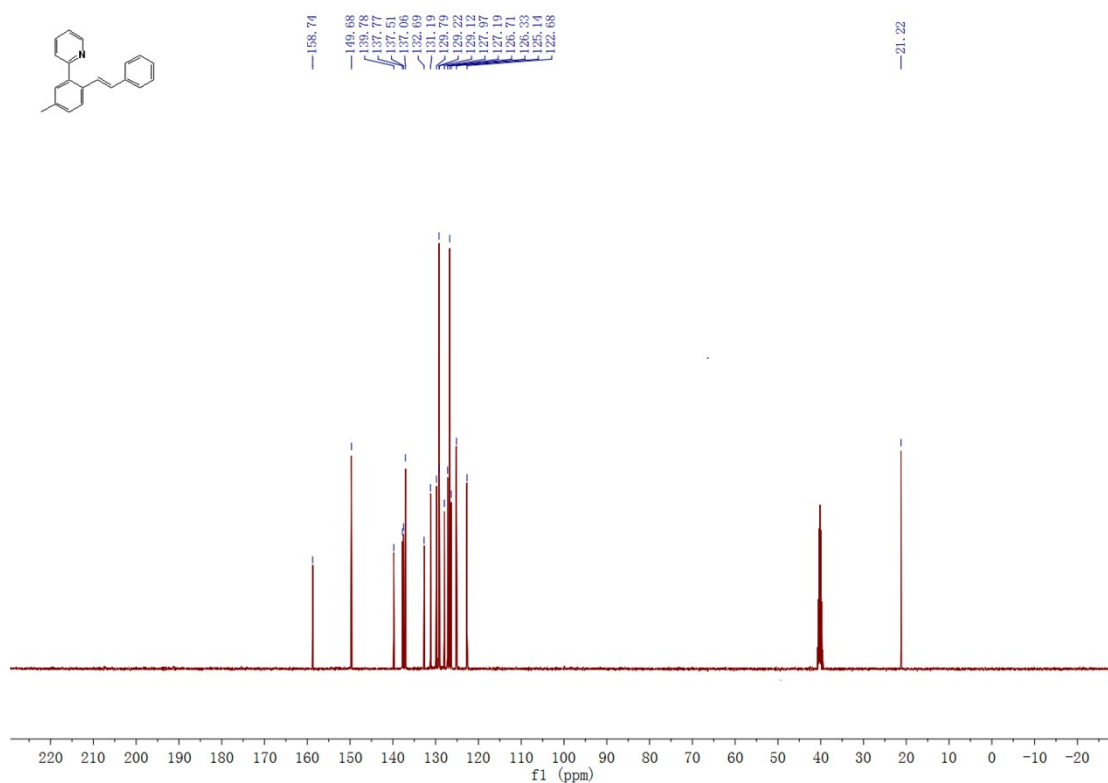


Figure S21 ¹³C NMR spectrum of compound **3i**

Compound **3j**

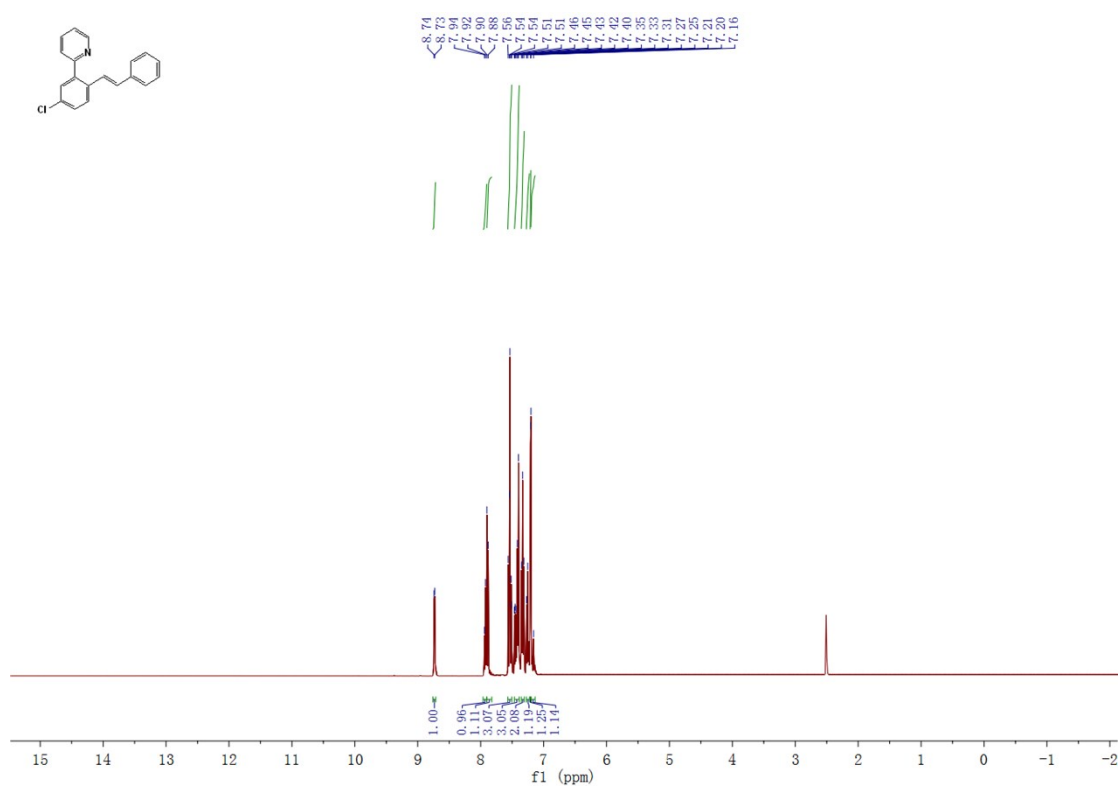


Figure S22 ¹H NMR spectrum of compound **3j**

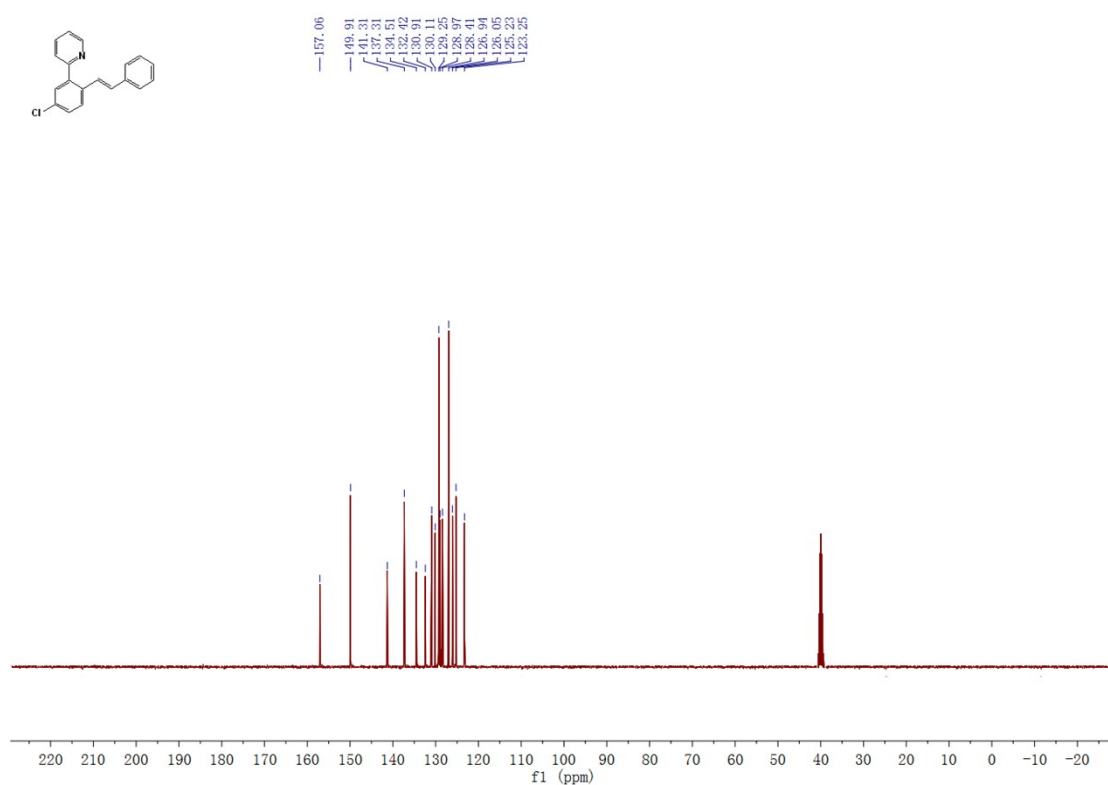


Figure S23 ¹³C NMR spectrum of compound 3j

Compound 3k

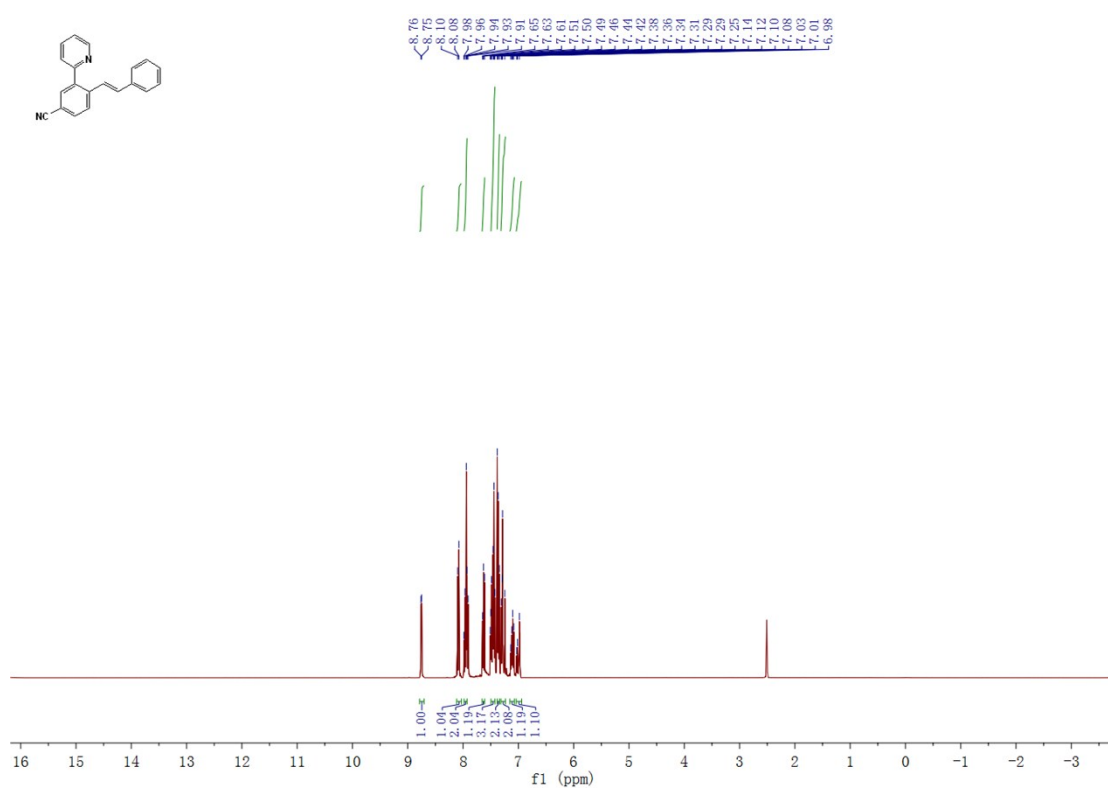


Figure S24 ¹H NMR spectrum of compound 3k

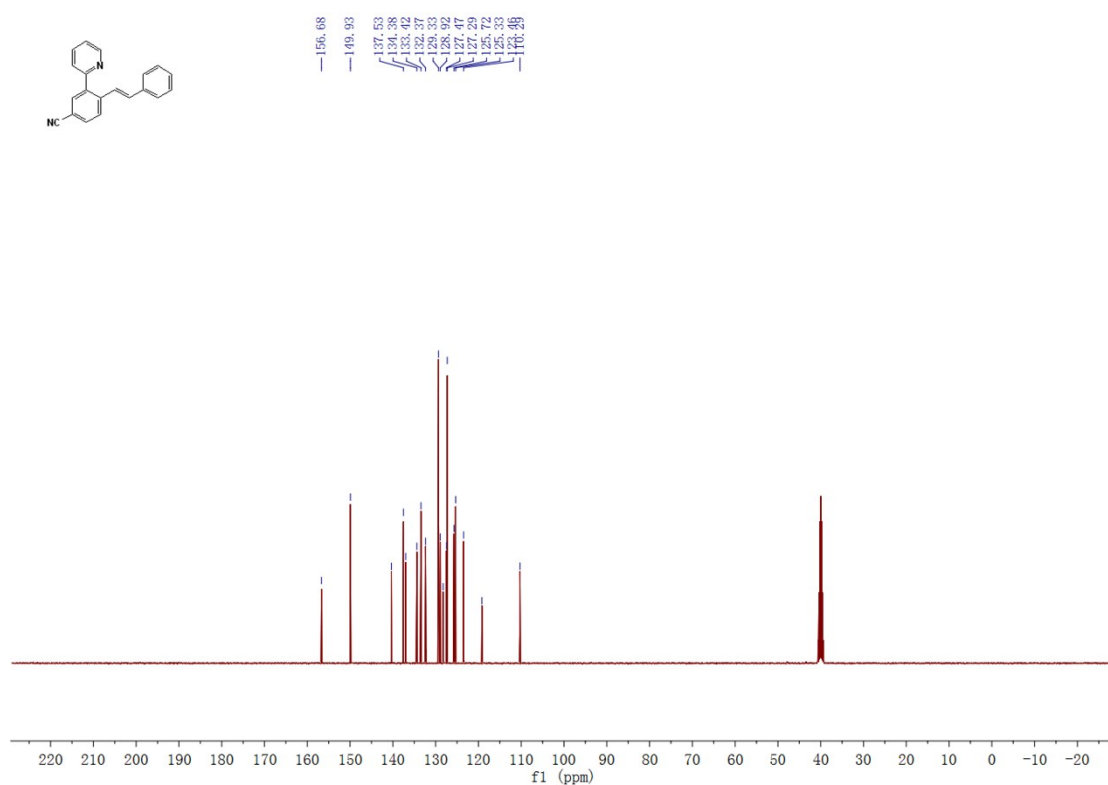


Figure S25 ¹³C NMR spectrum of compound **3k**

Compound **3l**

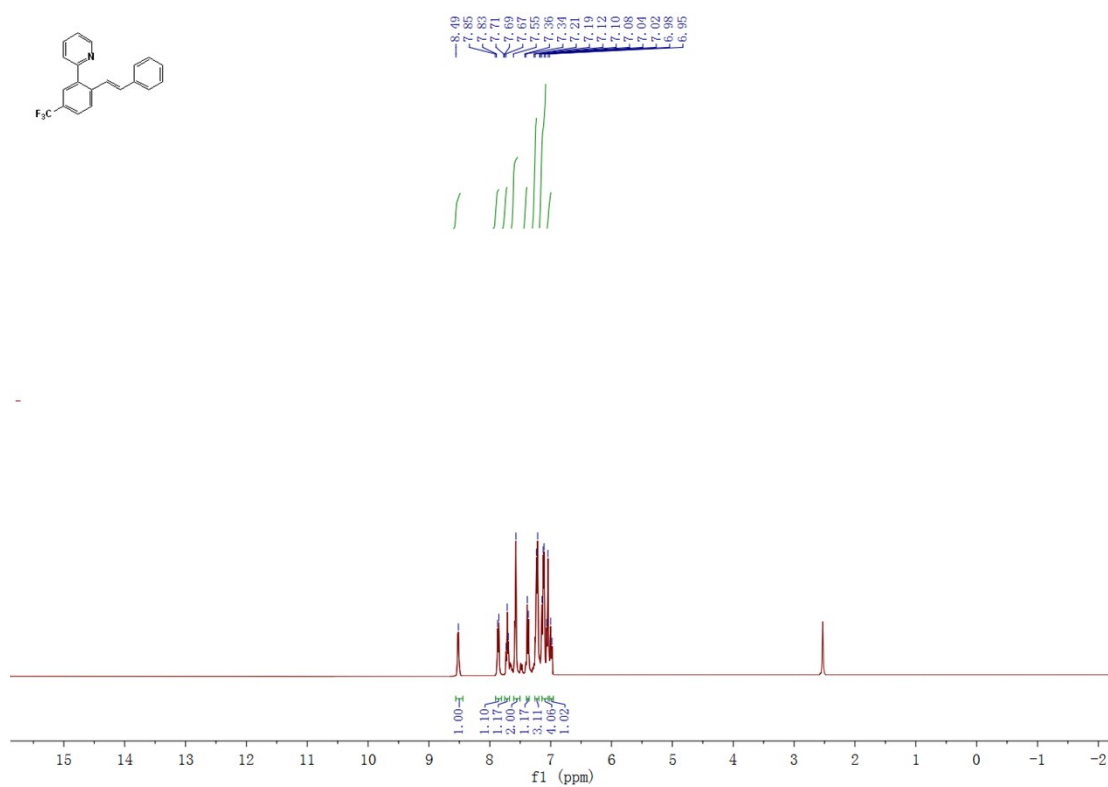


Figure S26 ¹H NMR spectrum of compound **3l**

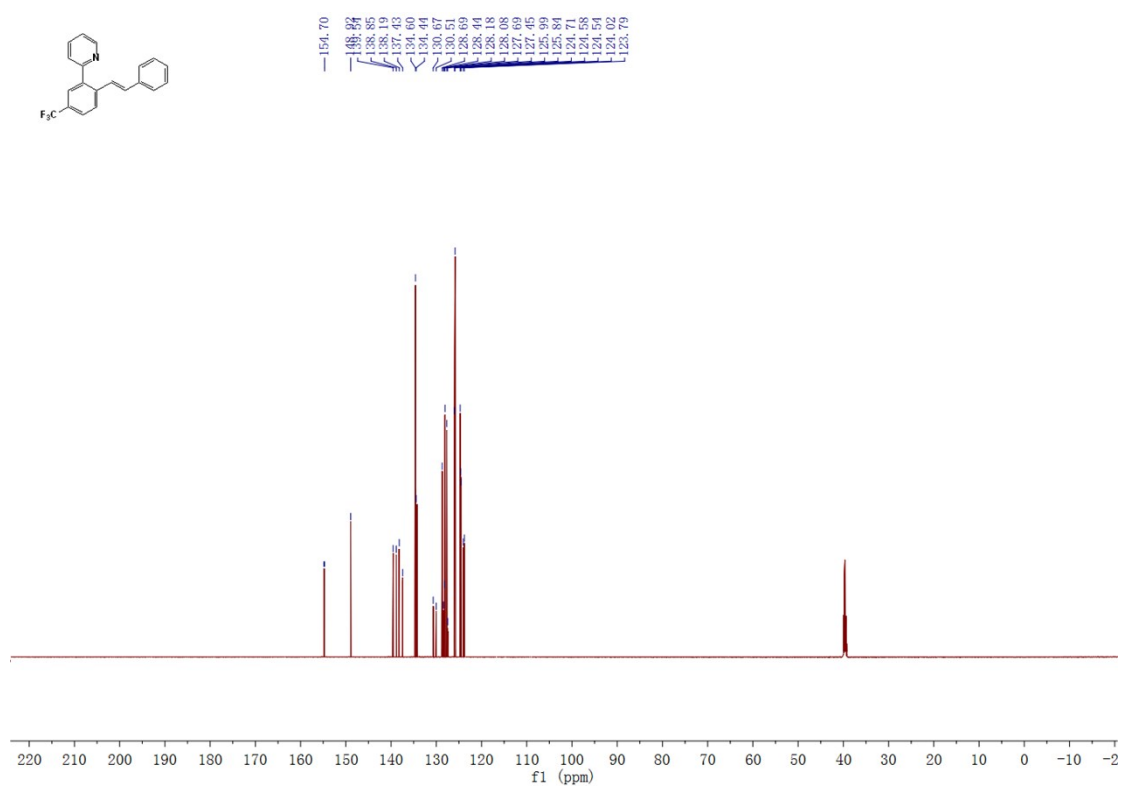


Figure S27 ¹³C NMR spectrum of compound **3l**

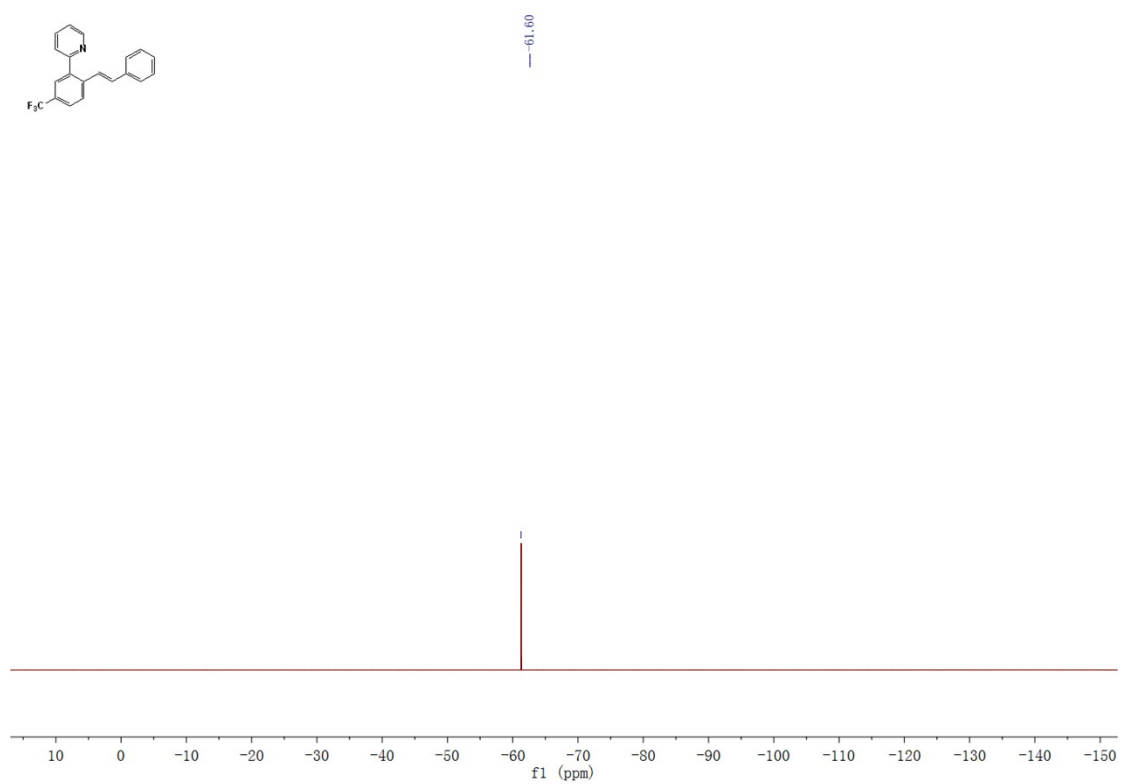


Figure S28 ¹⁹F NMR spectrum of compound **3l**

Chemical structure: Cc1ccc(cc1)/C=C/c2cc3ccccc3cc2-c4ccccc4

¹H NMR spectrum (ppm):

- 8.75
- 7.75
- 7.74
- 7.55
- 7.54
- 7.46
- 7.42
- 7.40
- 7.38
- 7.34
- 7.29
- 7.27
- 7.17
- 7.13
- 7.10
- 7.04
- 7.00
- 2.32

Integration values:

- 1.00
- 2.01
- 0.99
- 1.19
- 1.98
- 3.00
- 1.02
- 2.01
- 3.11

Chemical structure: Cc1ccc(cc1)/C=C/c2ccccc2-c3ccccc3

¹³C NMR spectrum (ppm):

- 158.76
- 149.36
- 137.47
- 136.15
- 135.87
- 134.74
- 130.20
- 130.10
- 129.31
- 127.52
- 126.49
- 126.43
- 126.4
- 125.11
- 121.91
- 21.21

Figure S30 ^{13}C NMR spectrum of compound **3m**

Compound 3n

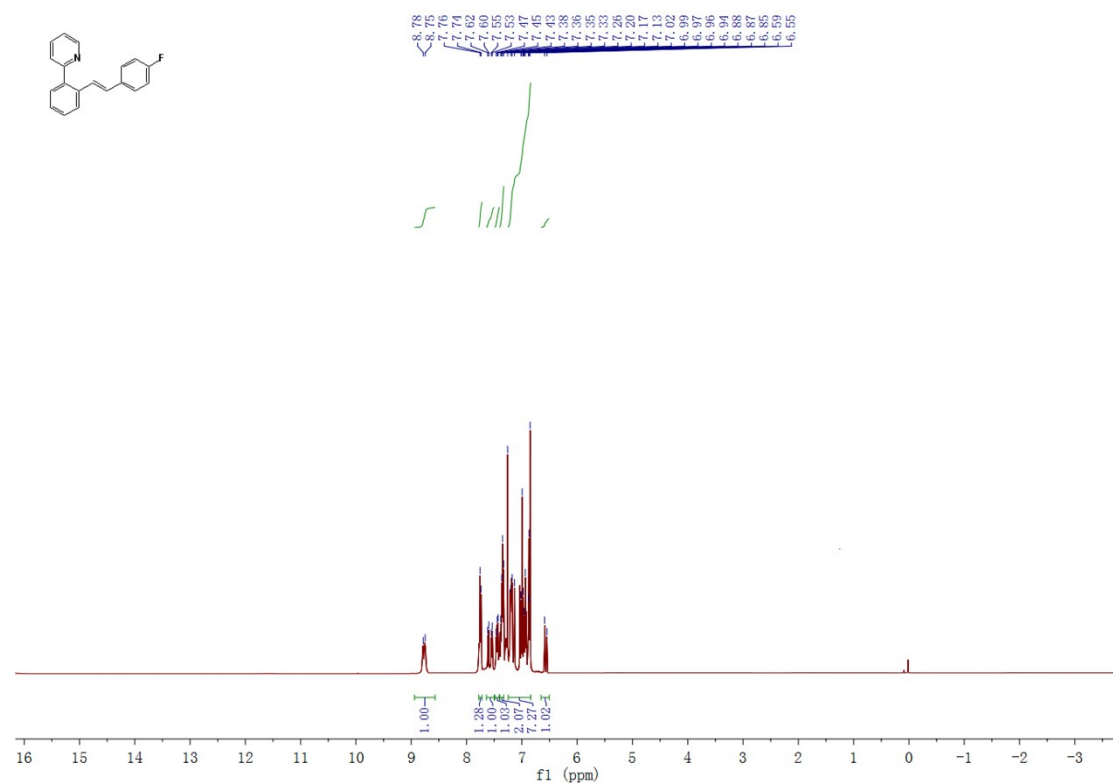


Figure S31 ¹H NMR spectrum of compound 3n

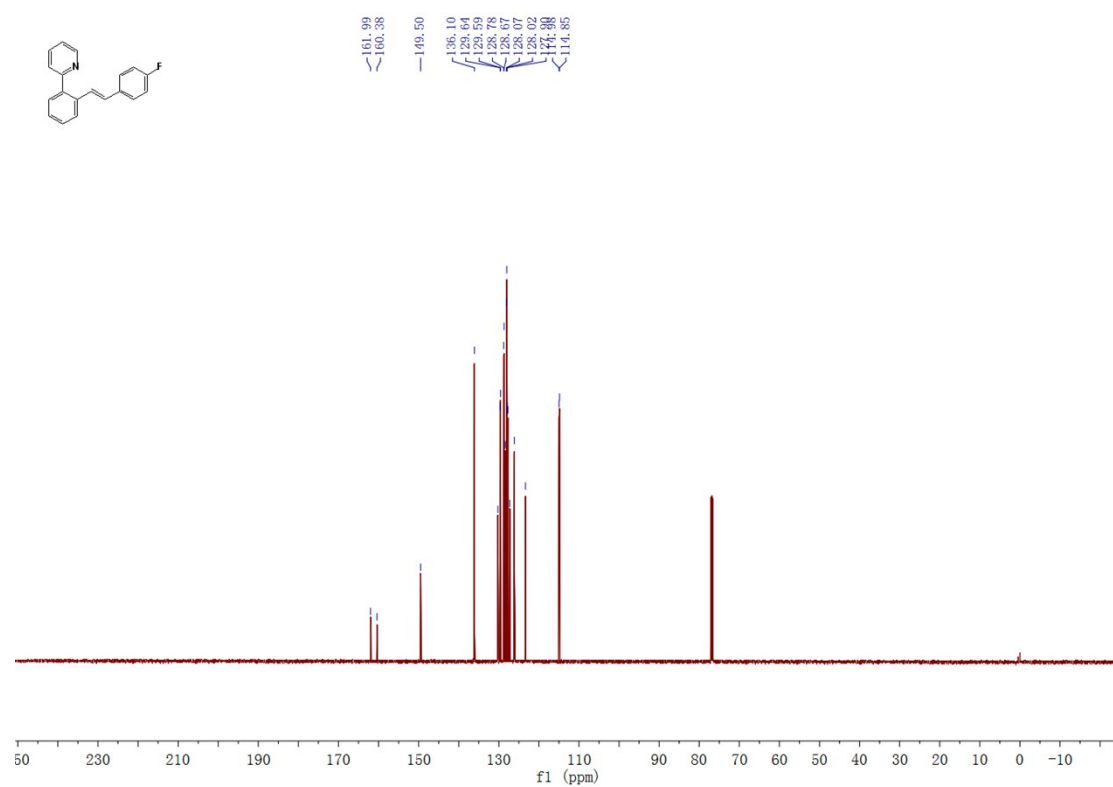


Figure S32 ¹³C NMR spectrum of compound 3n

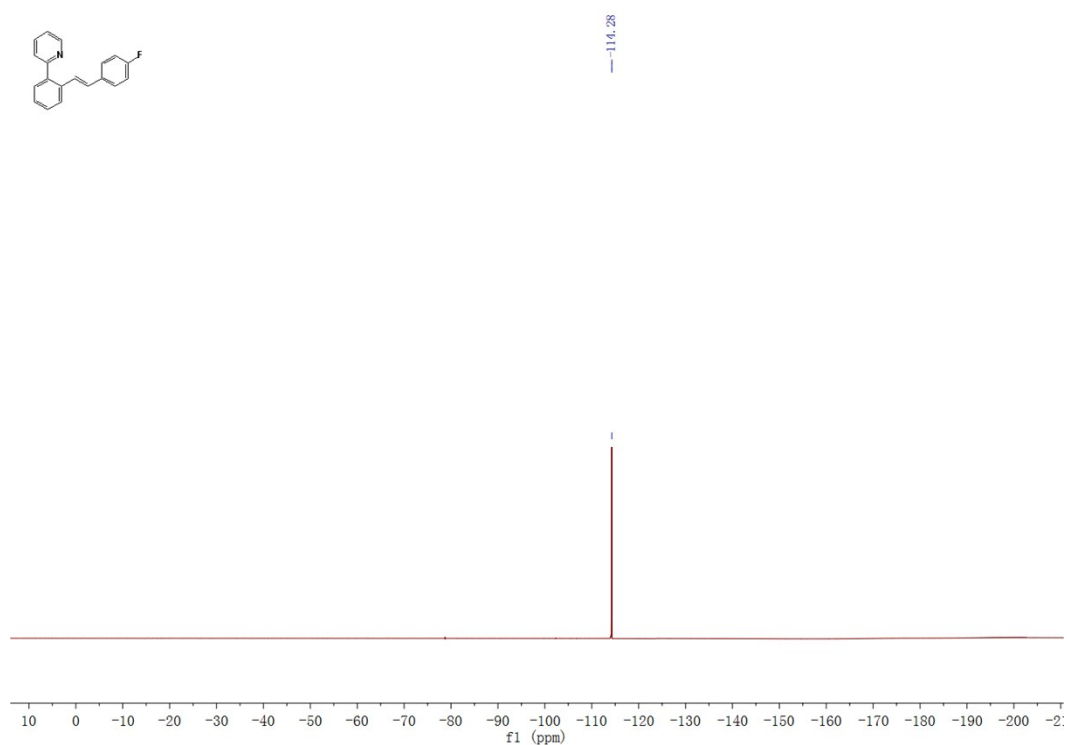


Figure S33 ^{19}F NMR spectrum of compound **3n**

Compound **3o**

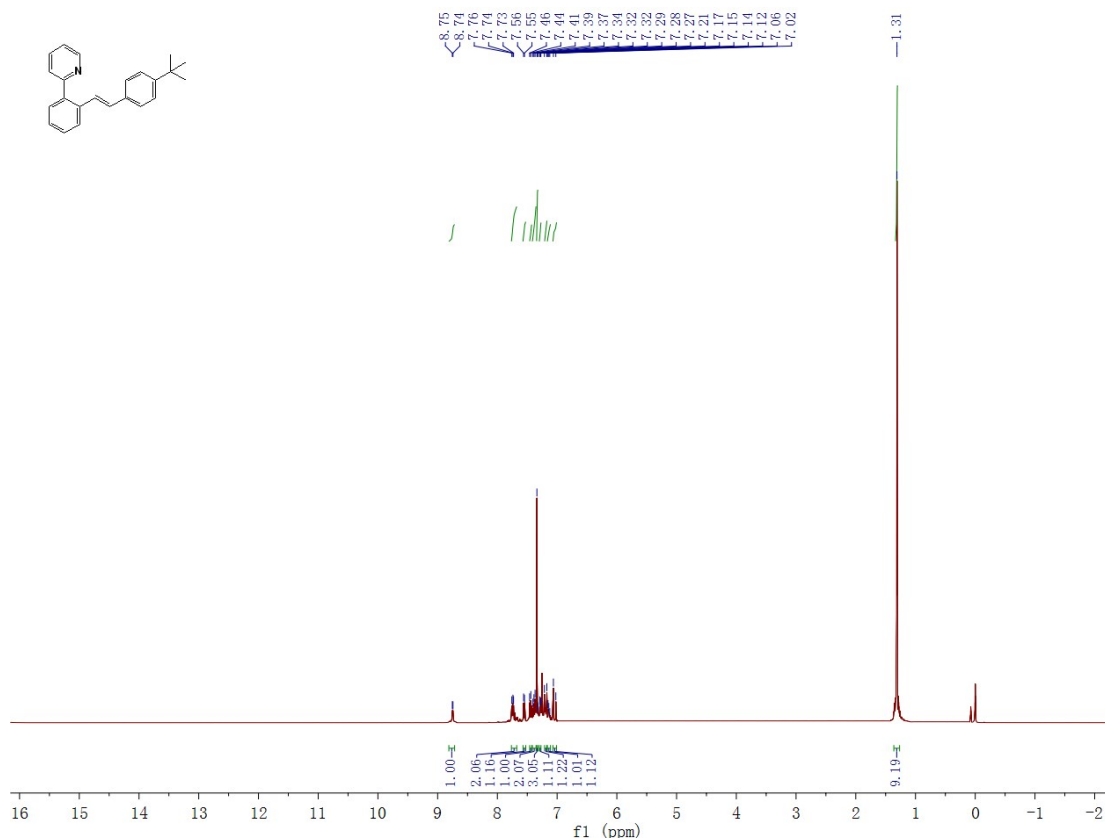


Figure S34 ^1H NMR spectrum of compound **3o**

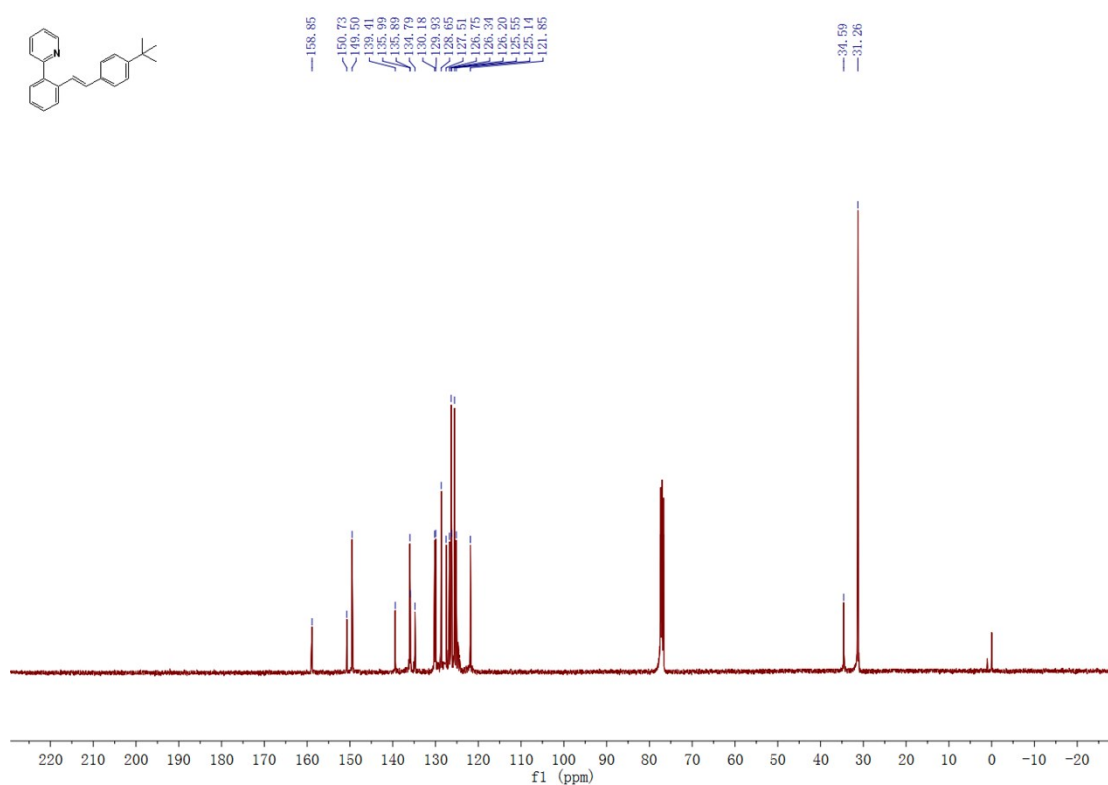


Figure S35 ¹³C NMR spectrum of compound 3o

Compound 3p

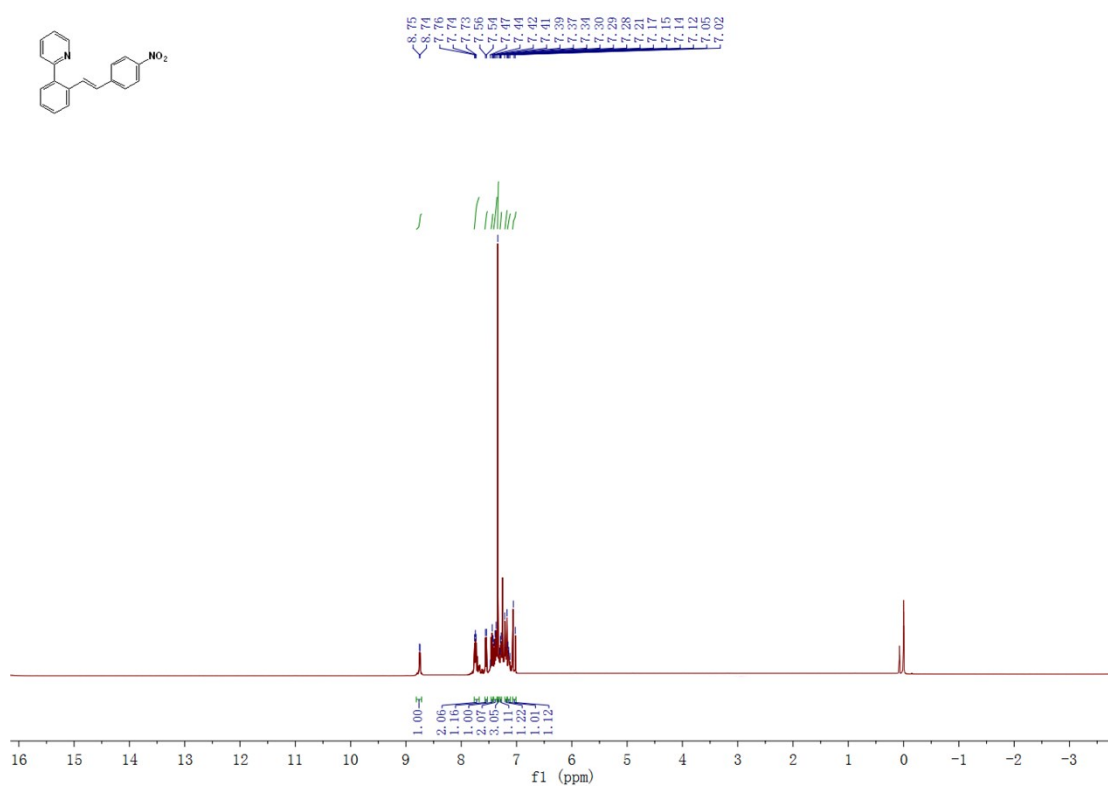


Figure S36 ¹H NMR spectrum of compound 3p

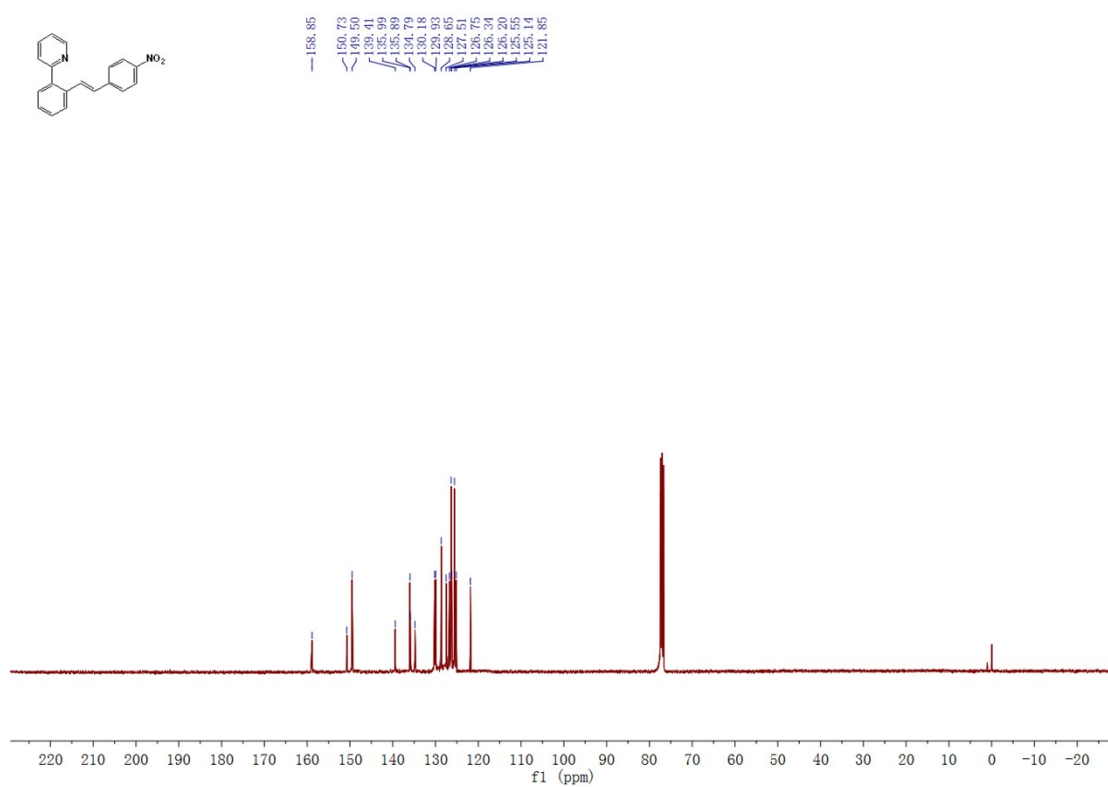


Figure S37 ¹³C NMR spectrum of compound 3p

Compound 3q

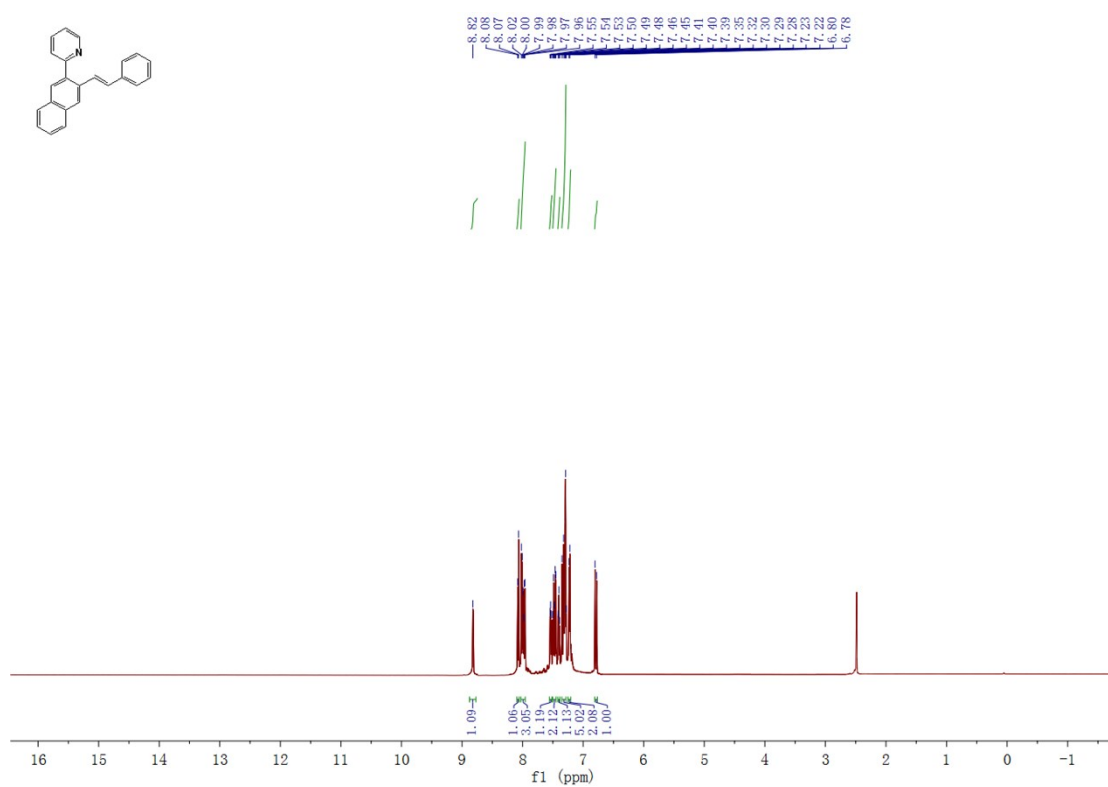


Figure S38 ¹H NMR spectrum of compound 3q

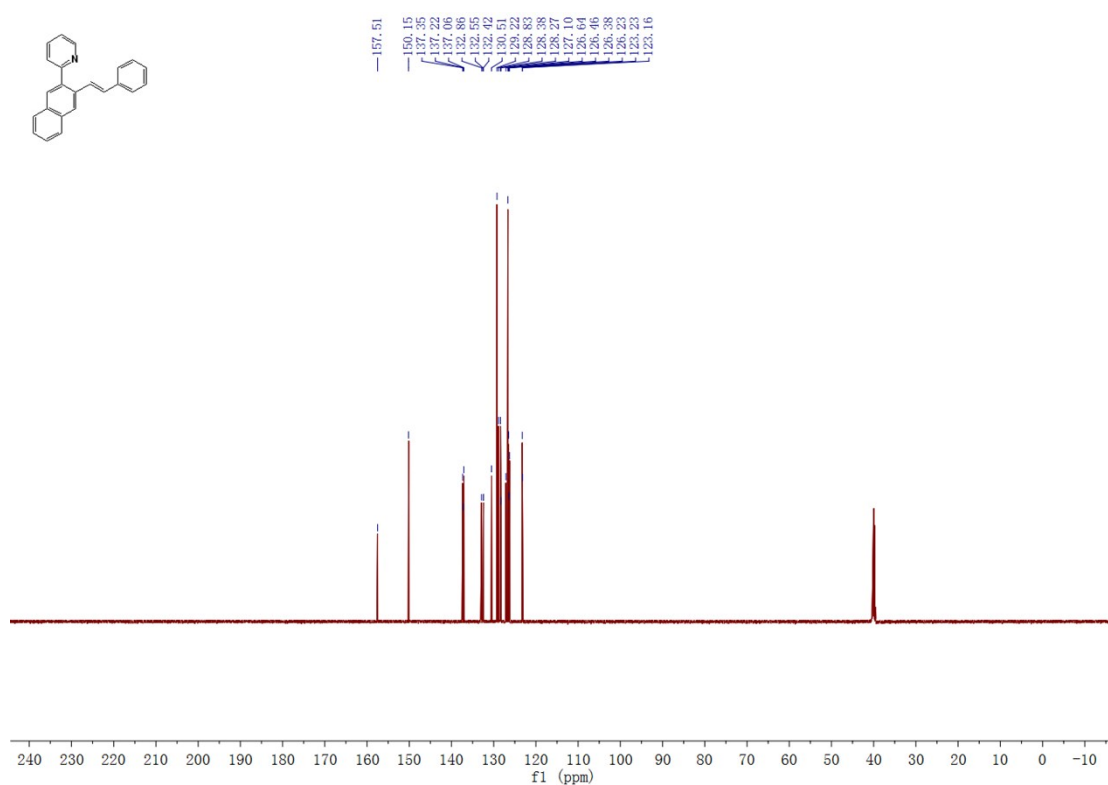


Figure S39 ¹³C NMR spectrum of compound **3q**

Compound **3r**

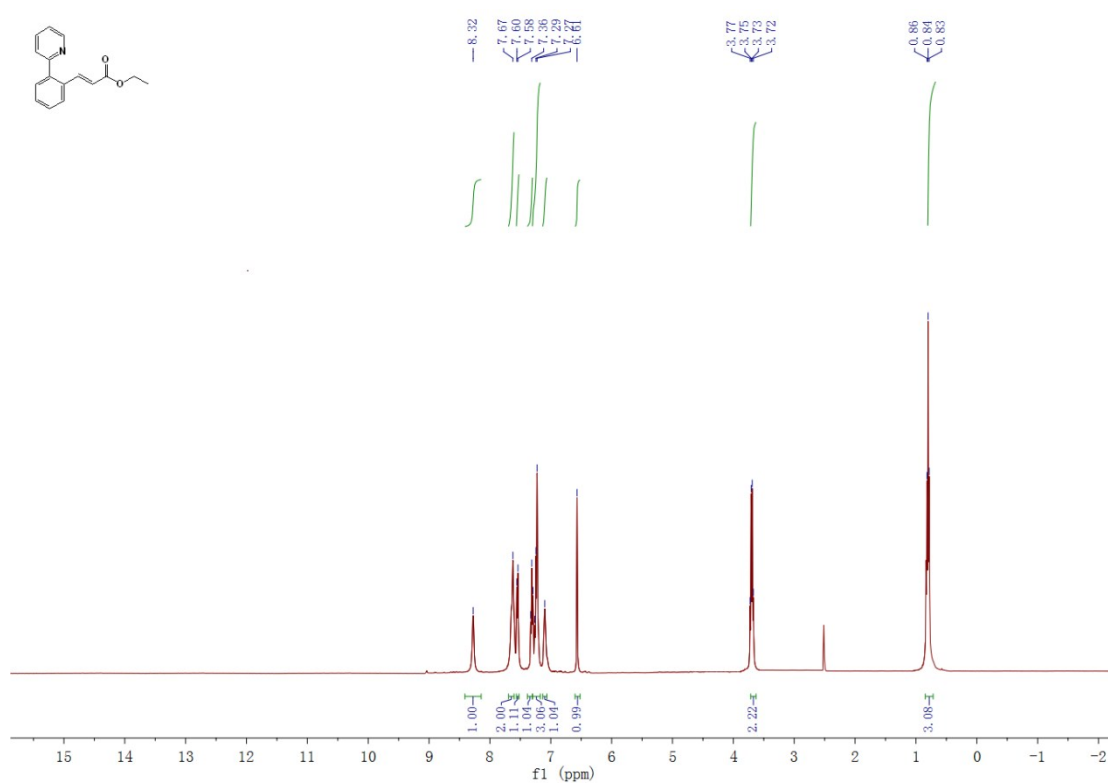


Figure S40 ¹H NMR spectrum of compound **3r**

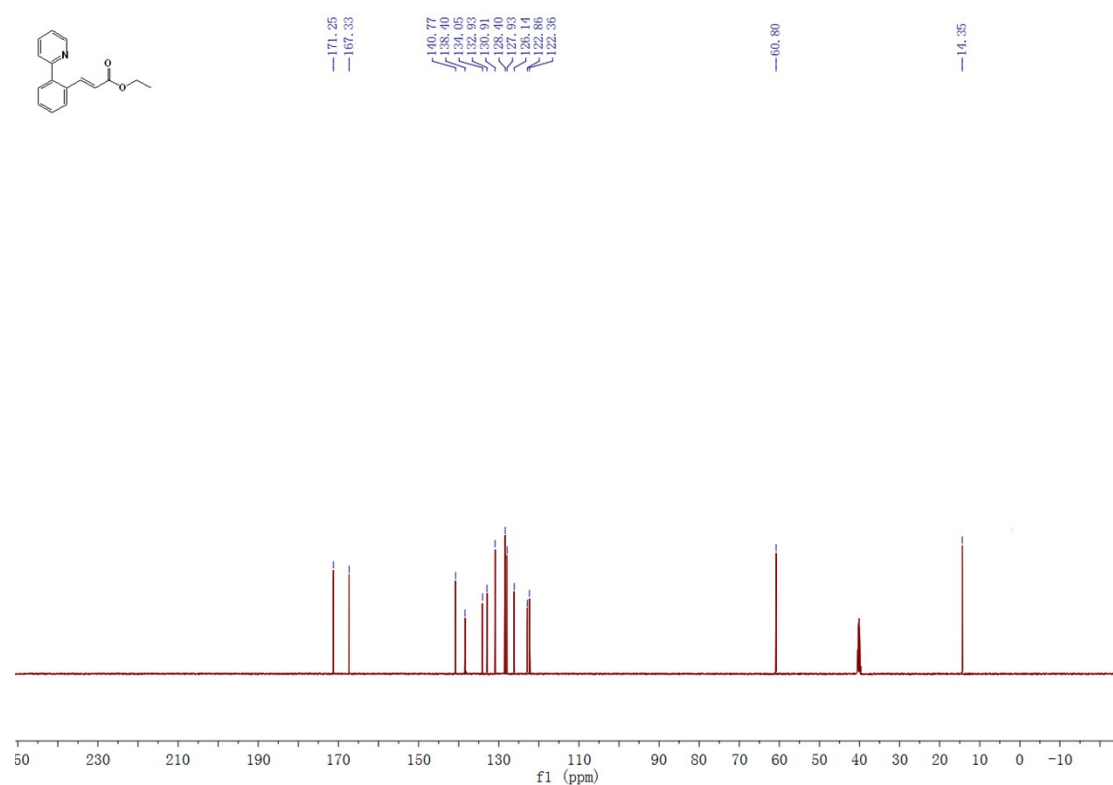


Figure S41 ¹³C NMR spectrum of compound **3r**

Compound **3s**

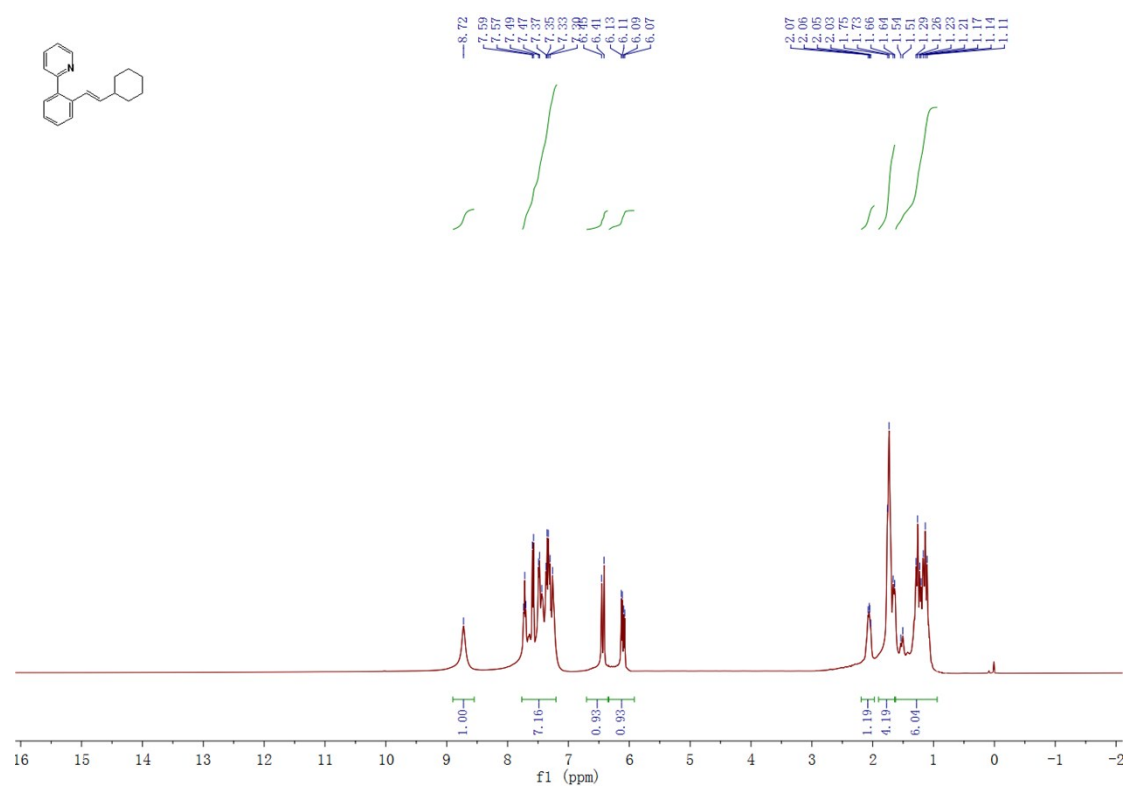


Figure S42 ¹H NMR spectrum of compound **3s**

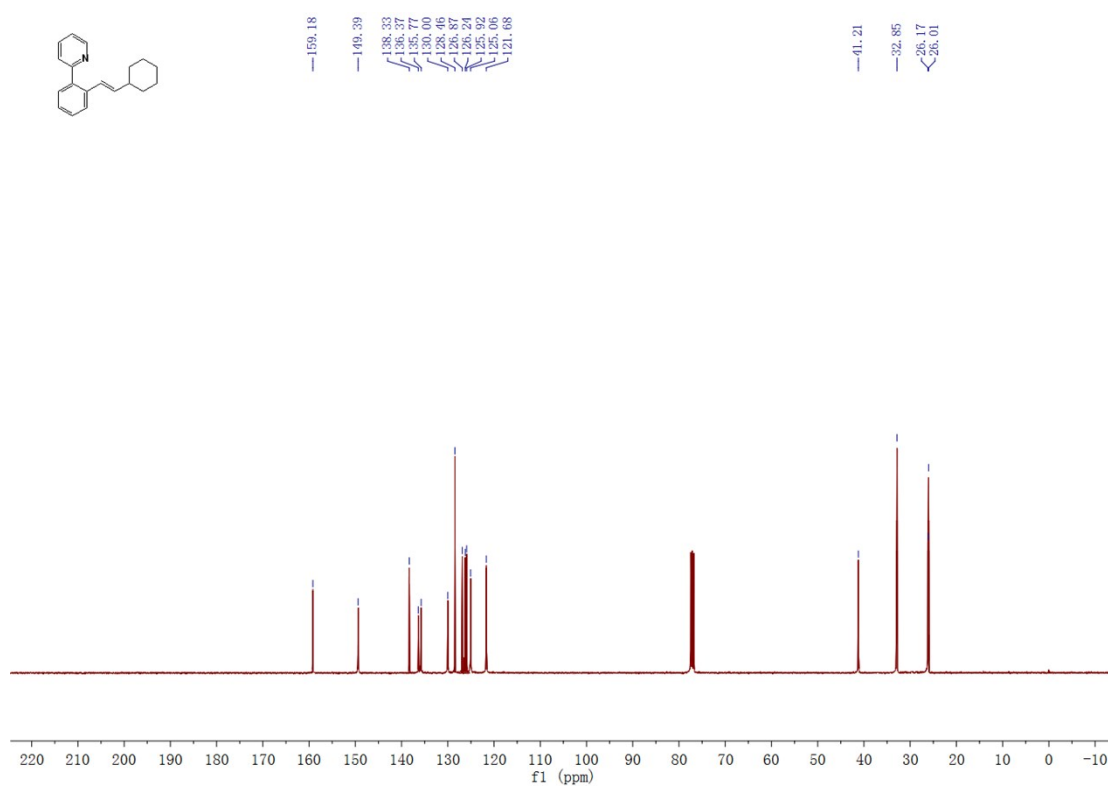


Figure S43 ^{13}C NMR spectrum of compound 3s

Compound 3t

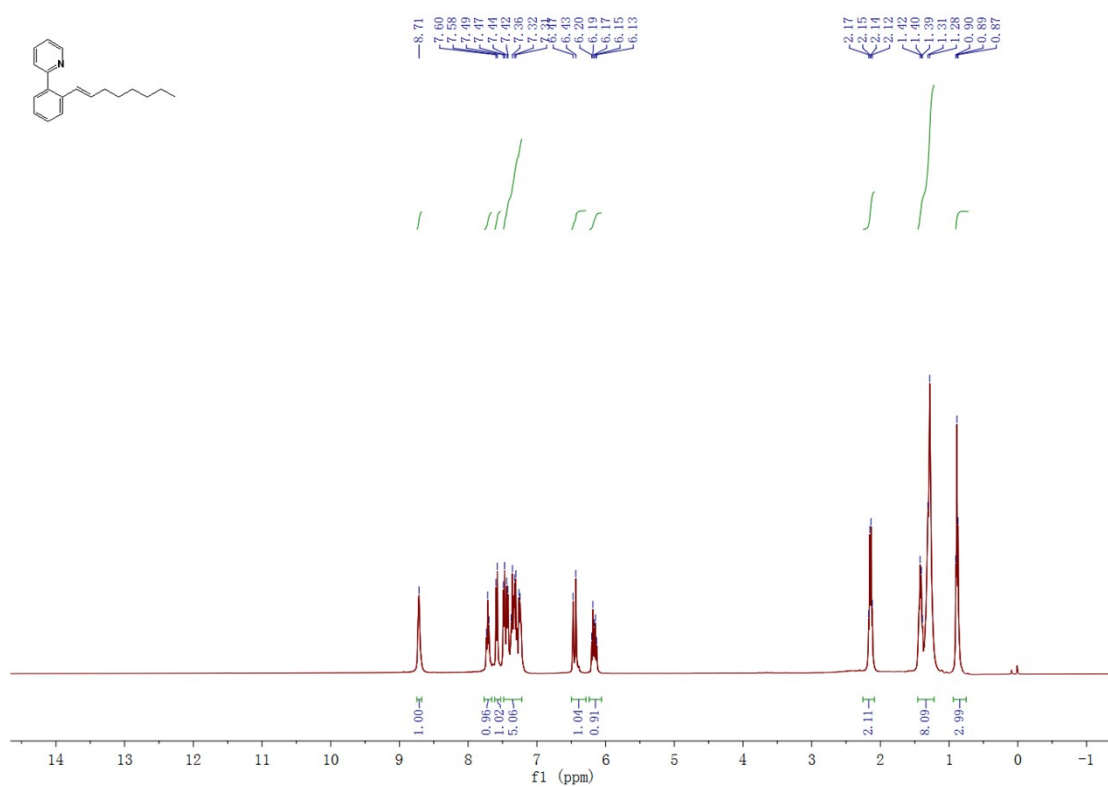


Figure S44 ^1H NMR spectrum of compound 3t

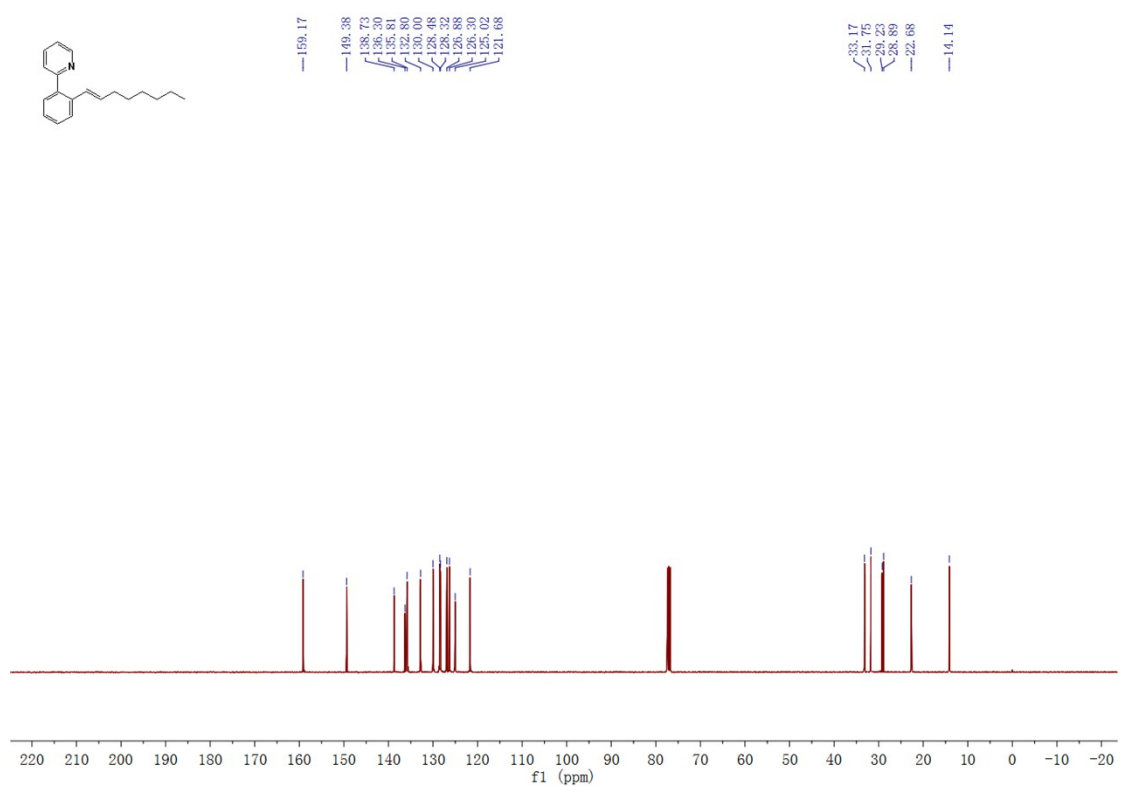


Figure S45 ¹³C NMR spectrum of compound 3t

Compound 3u

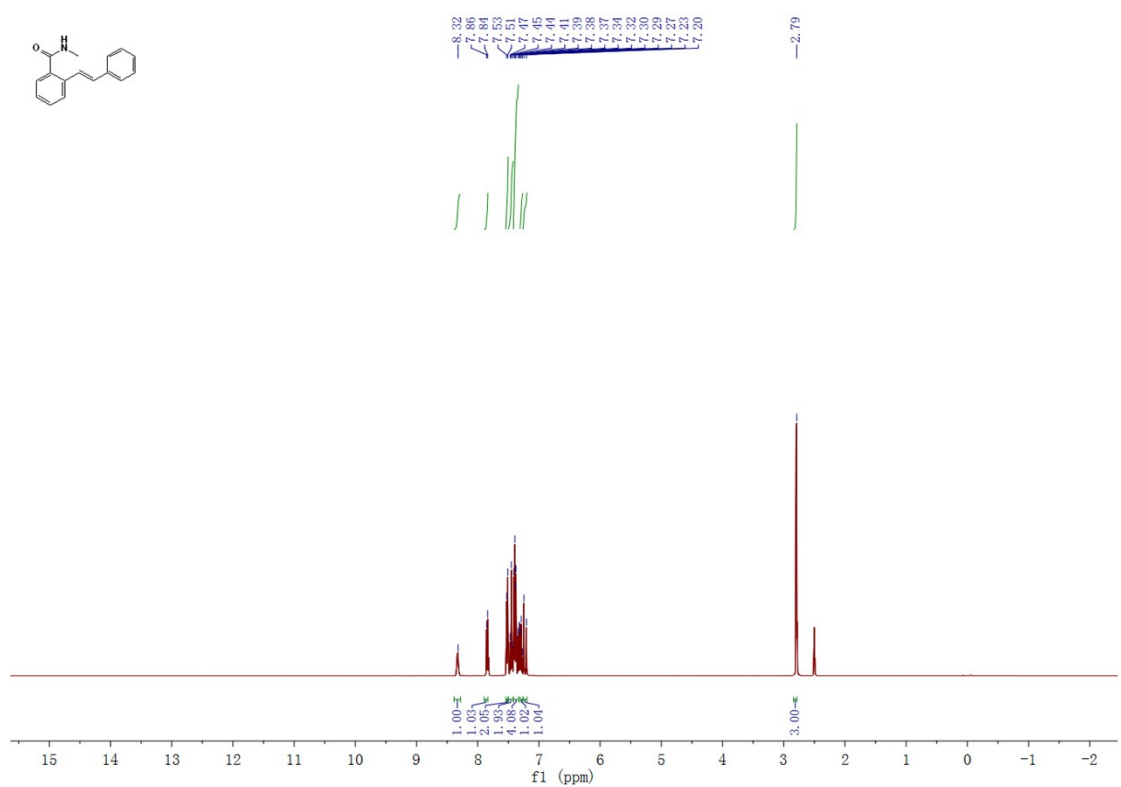


Figure S46 ¹H NMR spectrum of compound 3u

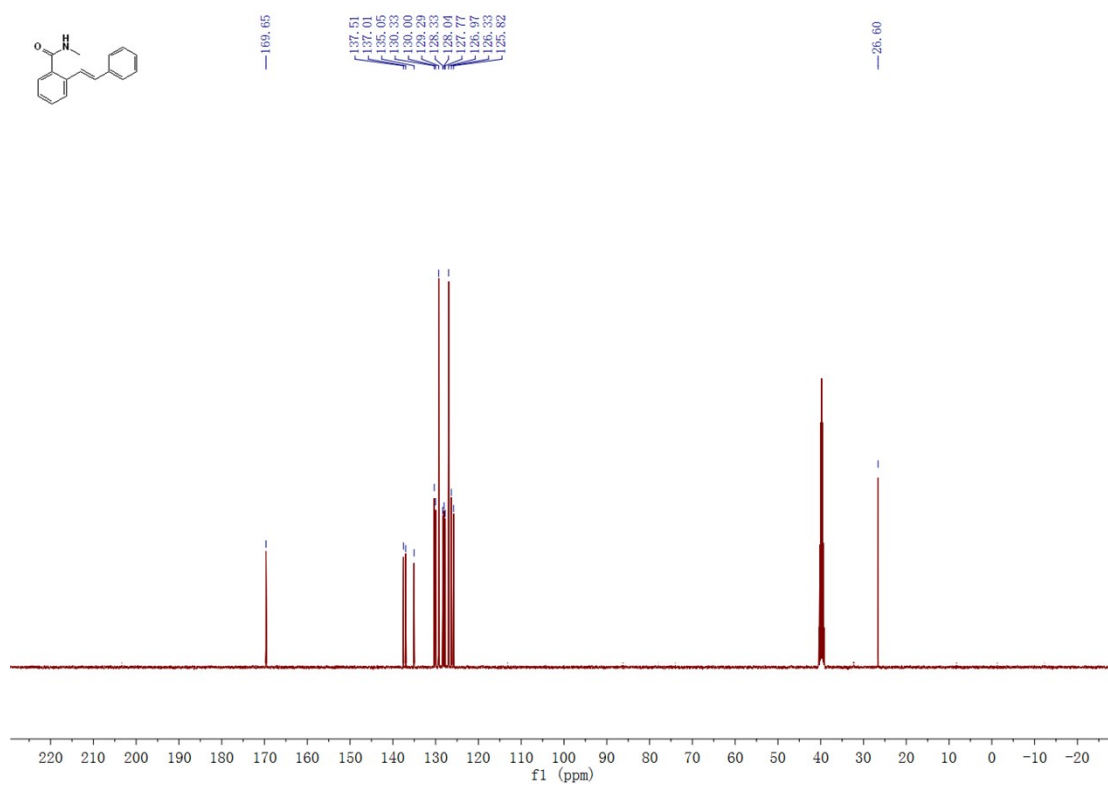


Figure S47 ¹³C NMR spectrum of compound **3u**

Compound **3v**

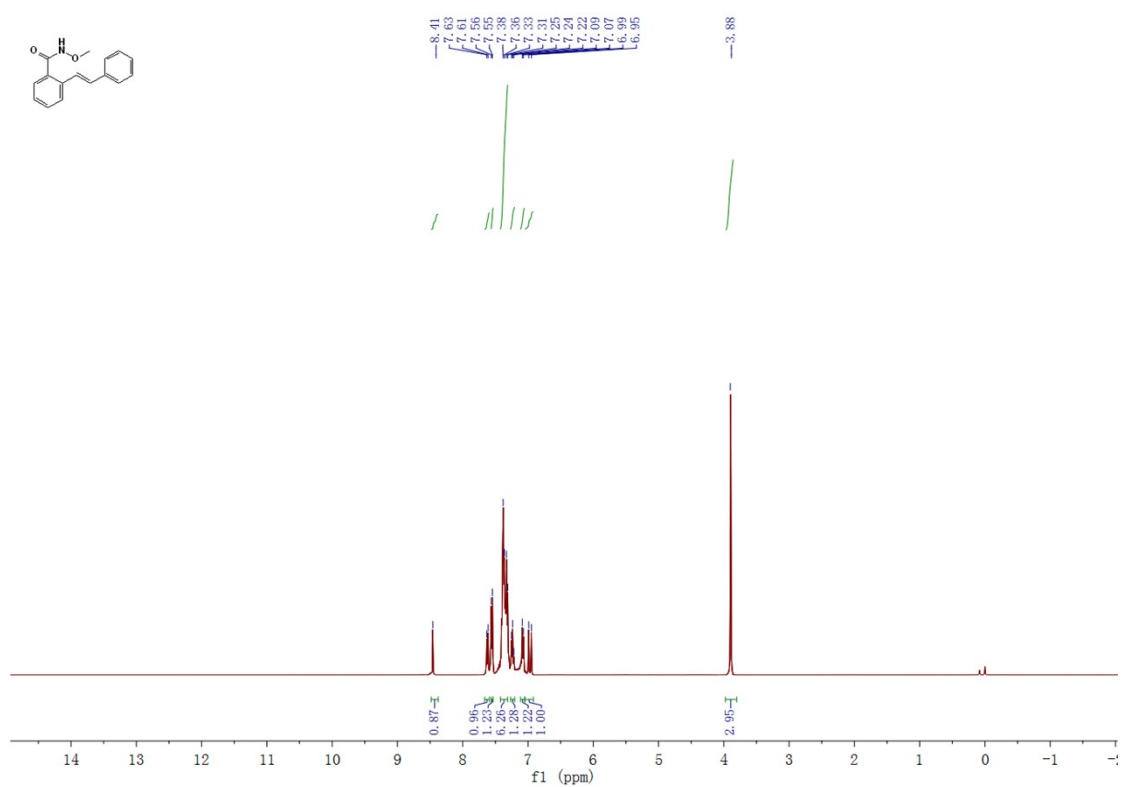


Figure S48 ¹H NMR spectrum of compound **3v**

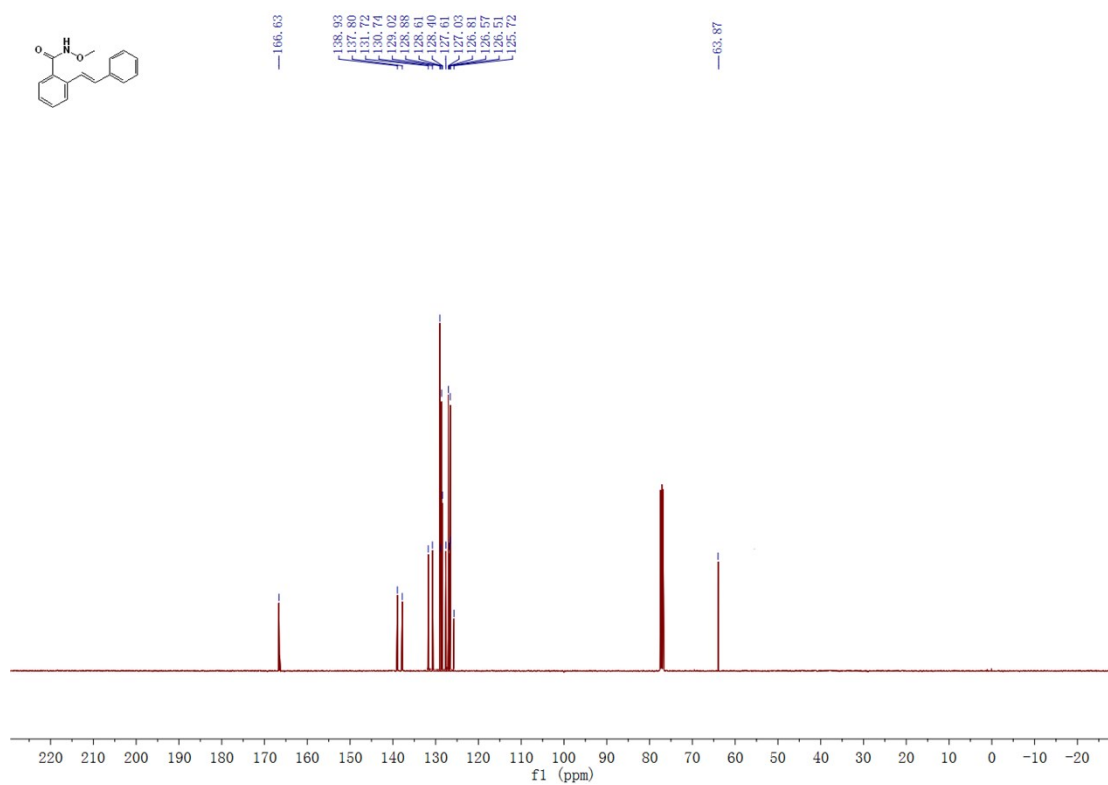


Figure S49 ¹³C NMR spectrum of compound 3v

Compound 3w

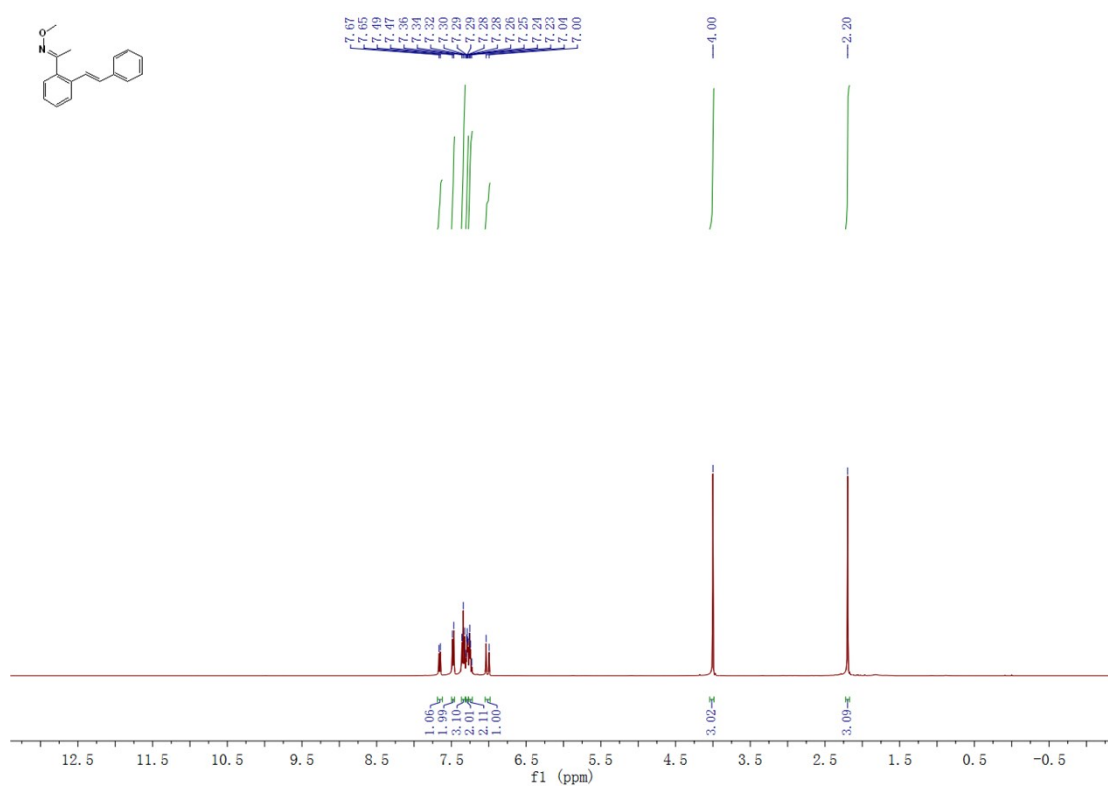


Figure S50 ¹H NMR spectrum of compound 3w

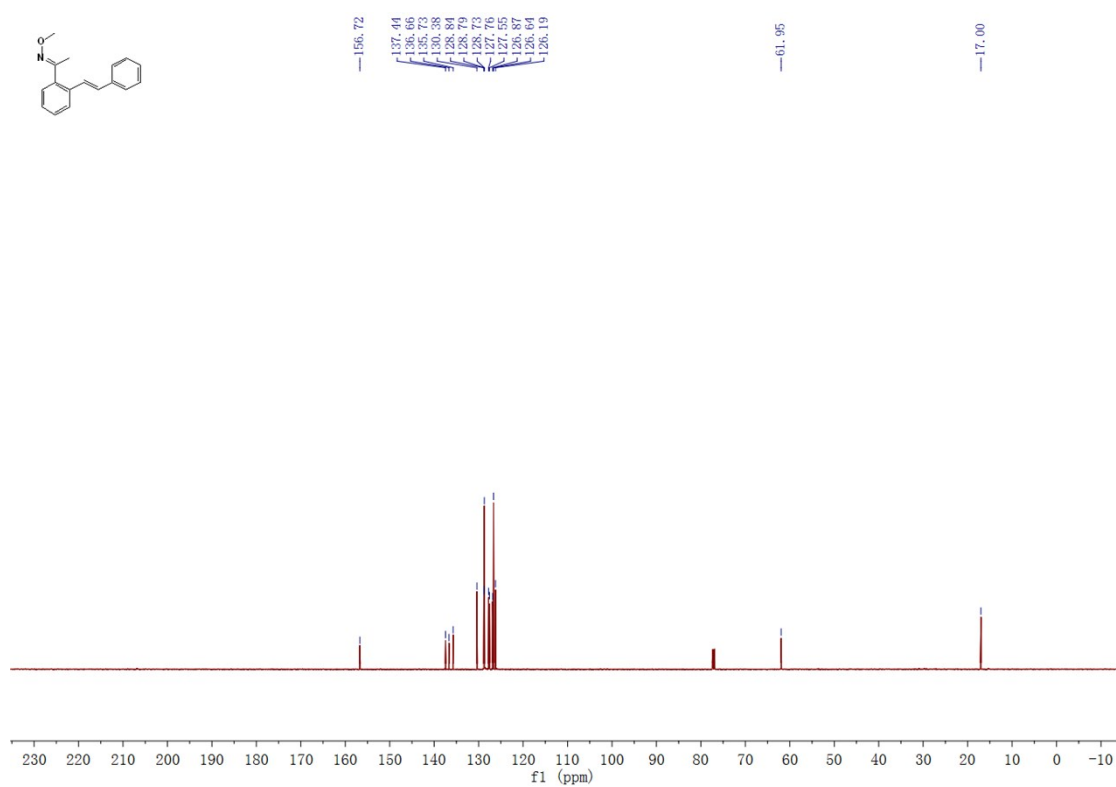


Figure S51 ¹³C NMR spectrum of compound 3w

Compound 3x

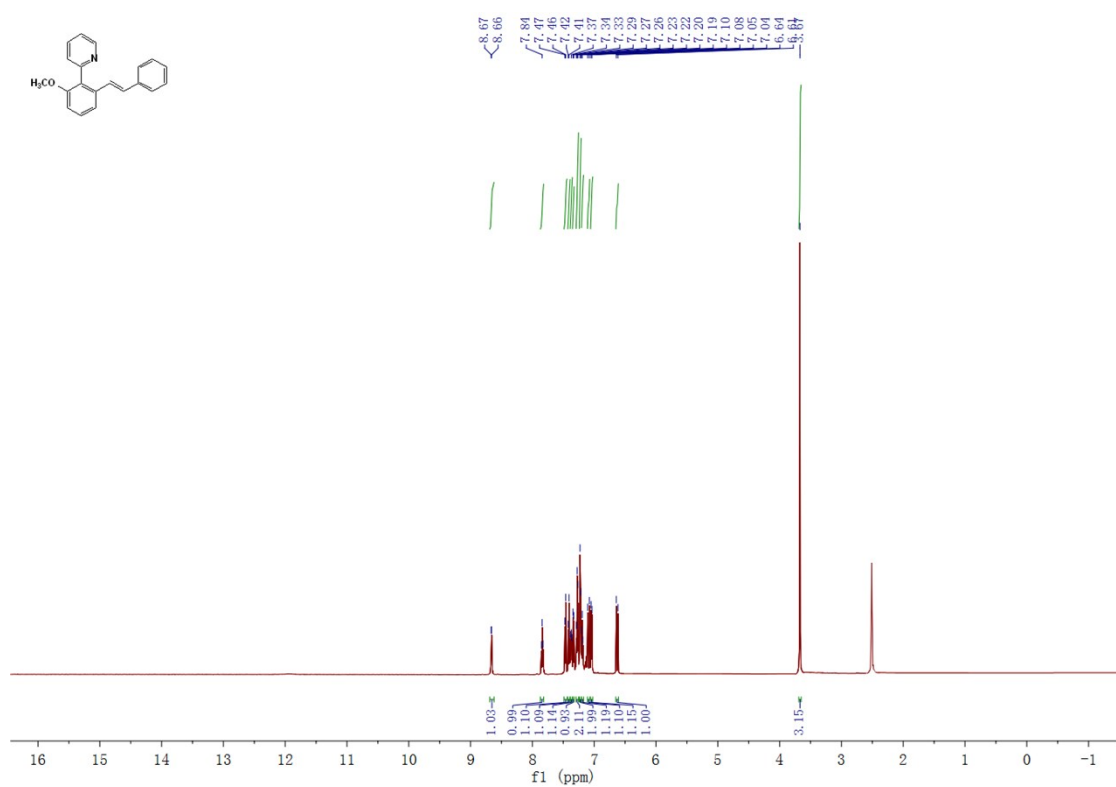


Figure S52 ¹H NMR spectrum of compound 3x

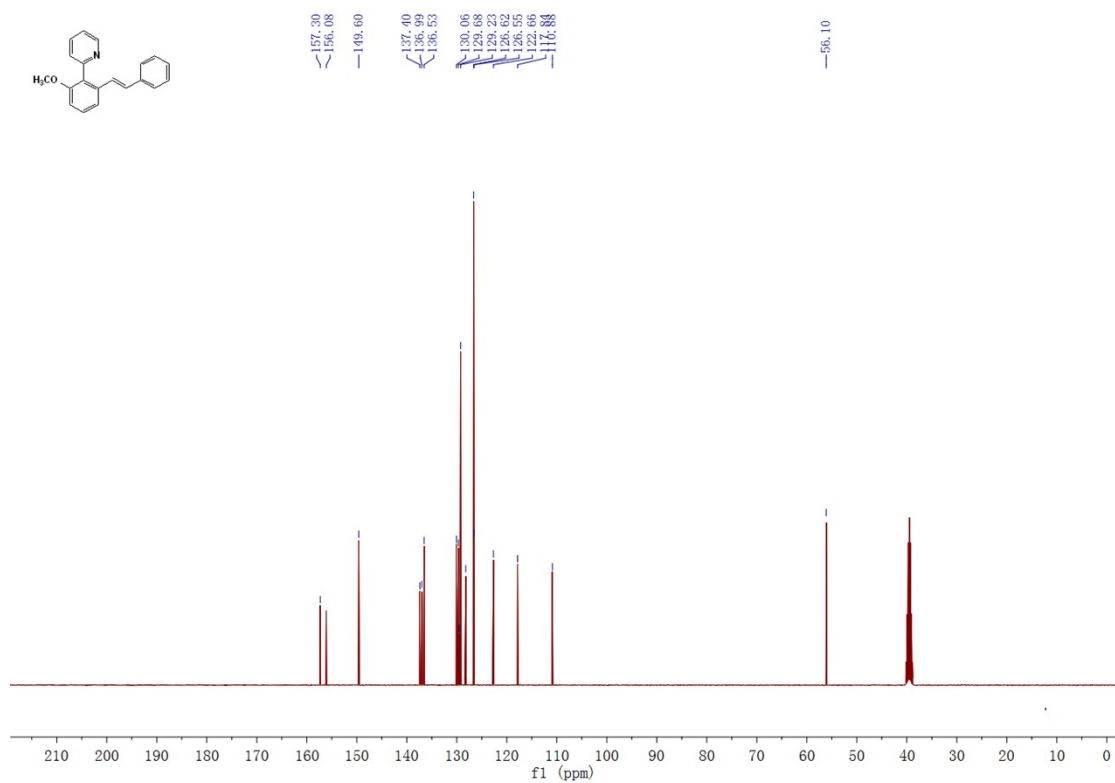


Figure S53 ¹³C NMR spectrum of compound **3x**

Compound **3a'**

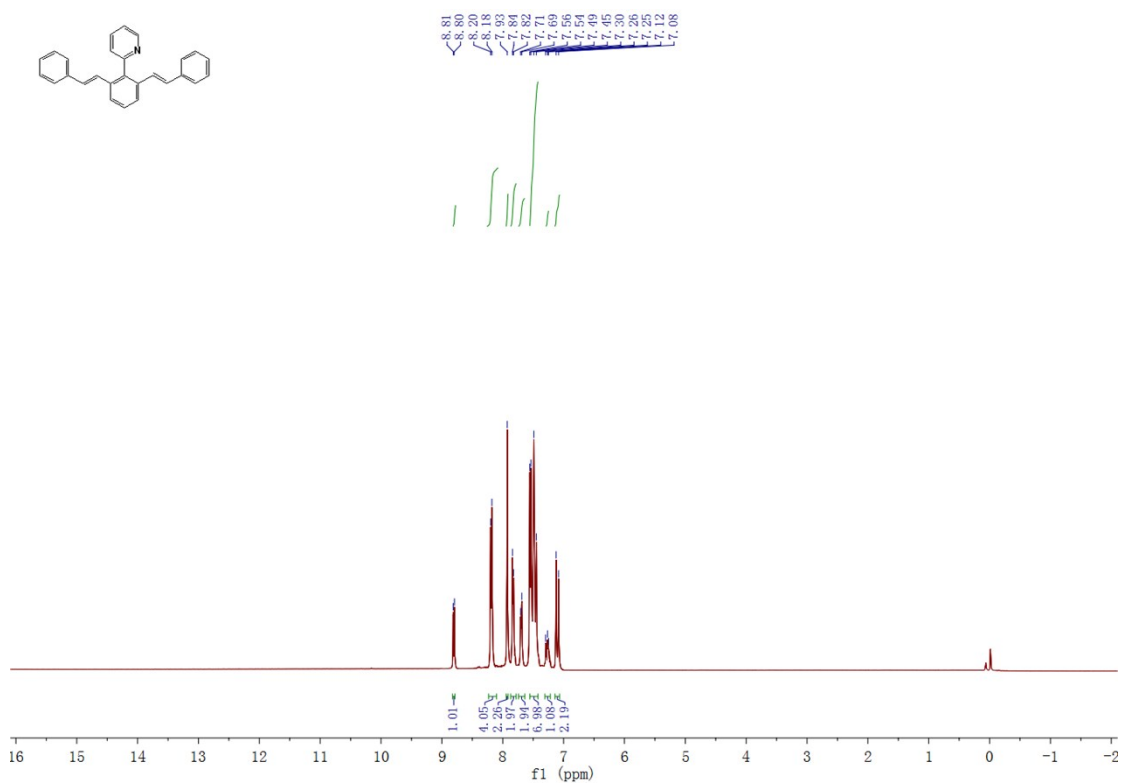


Figure S54 ¹H NMR spectrum of compound **3a'**

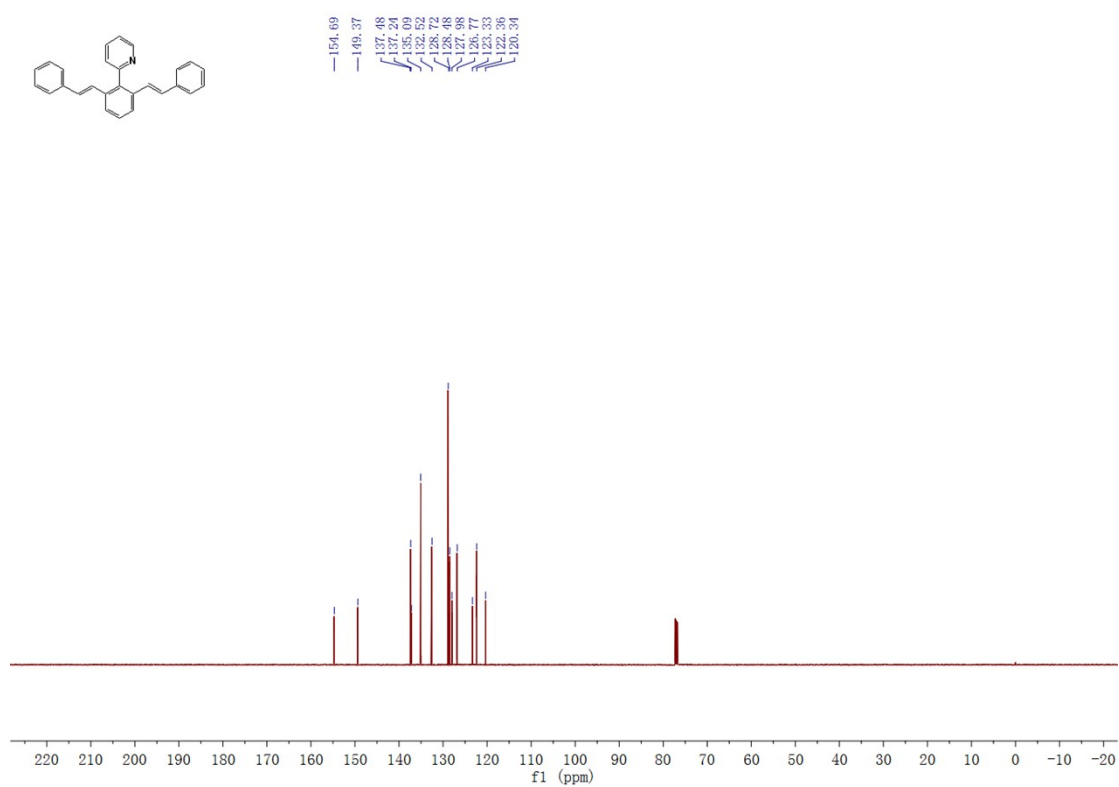


Figure S55 ^{13}C NMR spectrum of compound **3a'**

Compound **3b'**

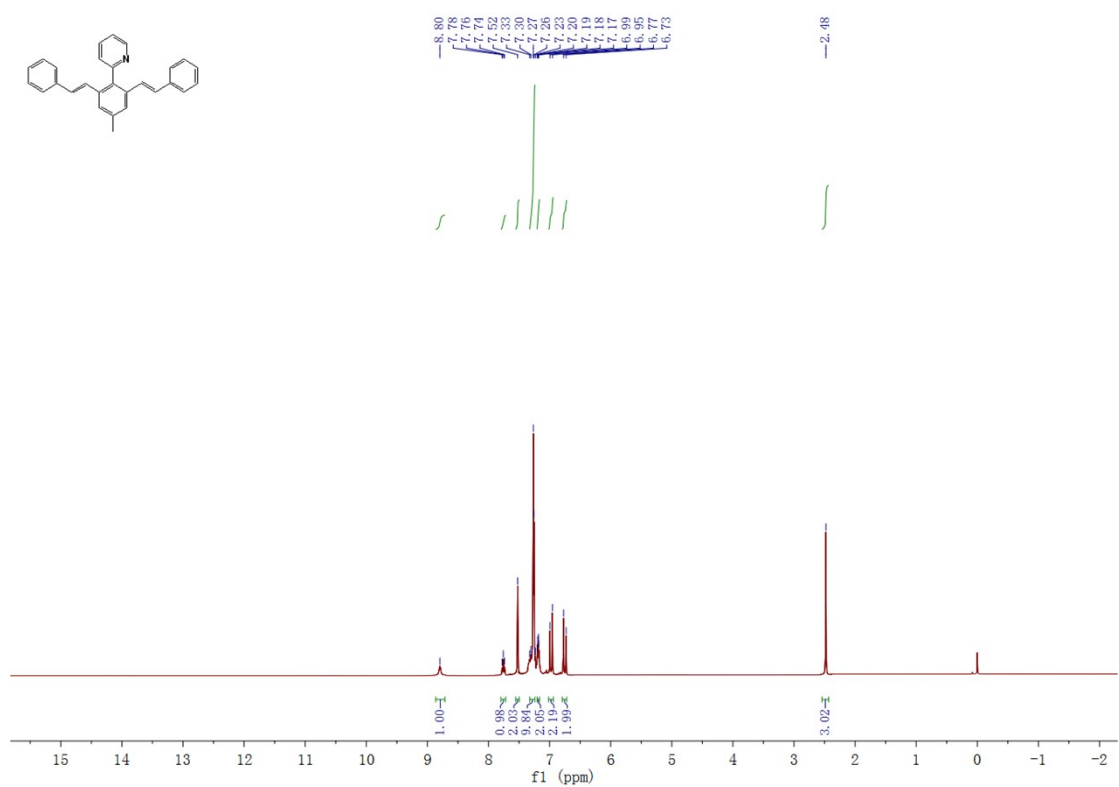


Figure S56 ^1H NMR spectrum of compound **3b'**

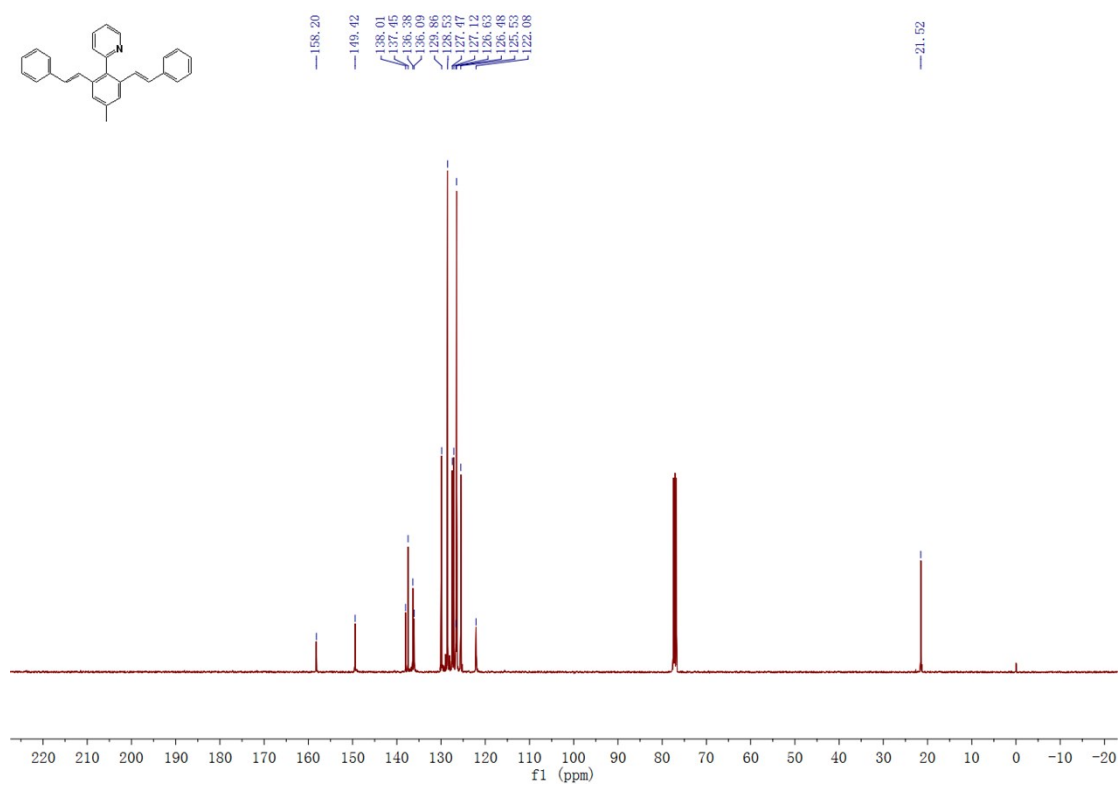


Figure S57 ^{13}C NMR spectrum of compound 3b'

Compound 3c'

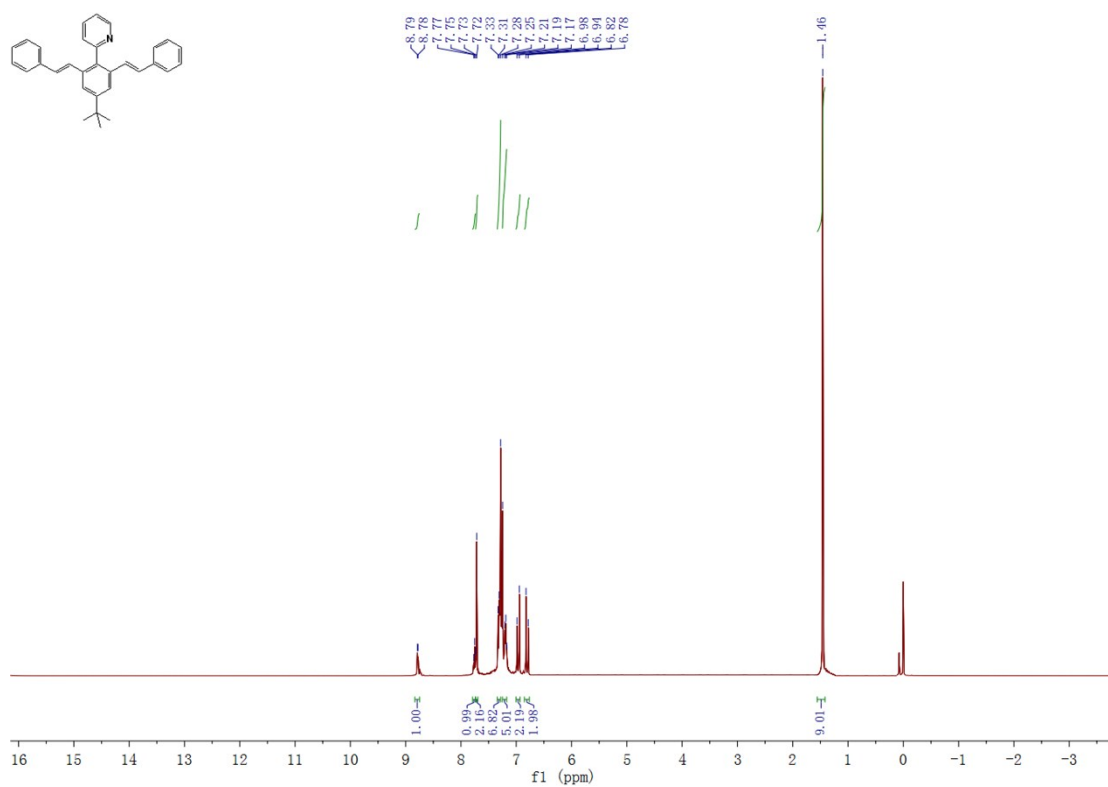
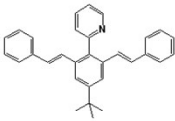


Figure S58 ^1H NMR spectrum of compound 3c'



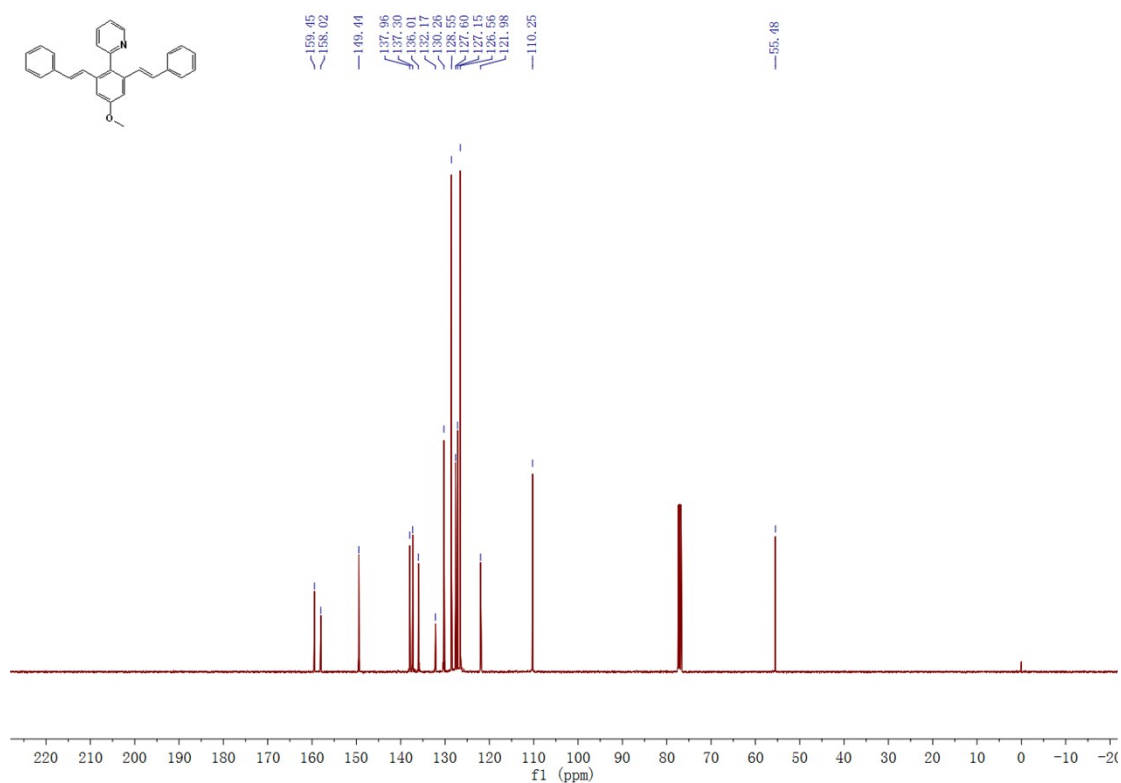


Figure S61 ^{13}C NMR spectrum of compound 3d'

Compound 3e'

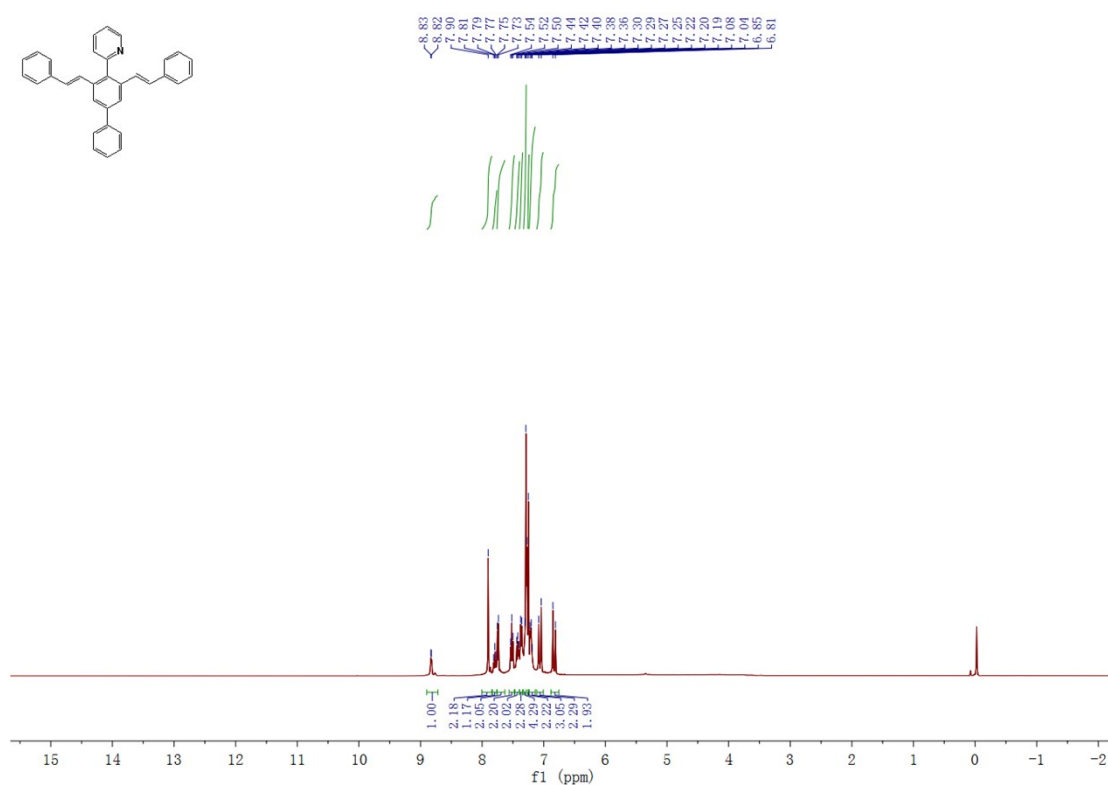


Figure S62 ^1H NMR spectrum of compound 3e'

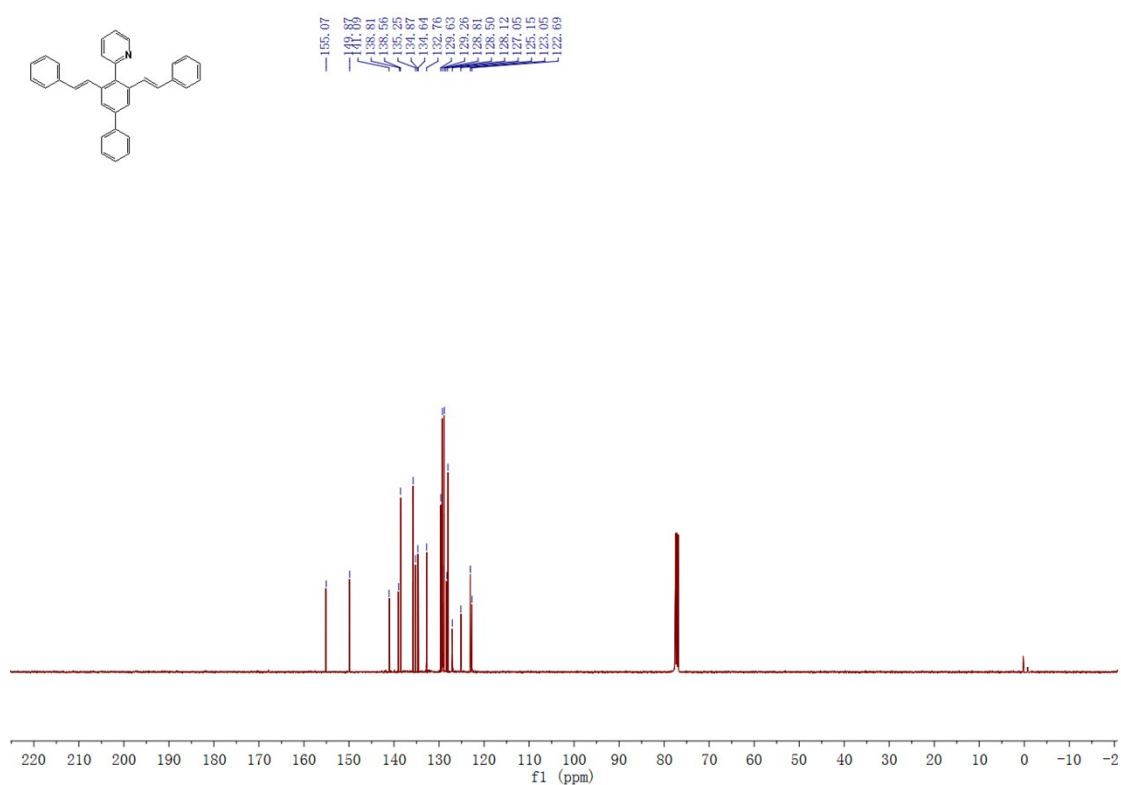


Figure S63 ^{13}C NMR spectrum of compound **3e'**

Compound 3f'

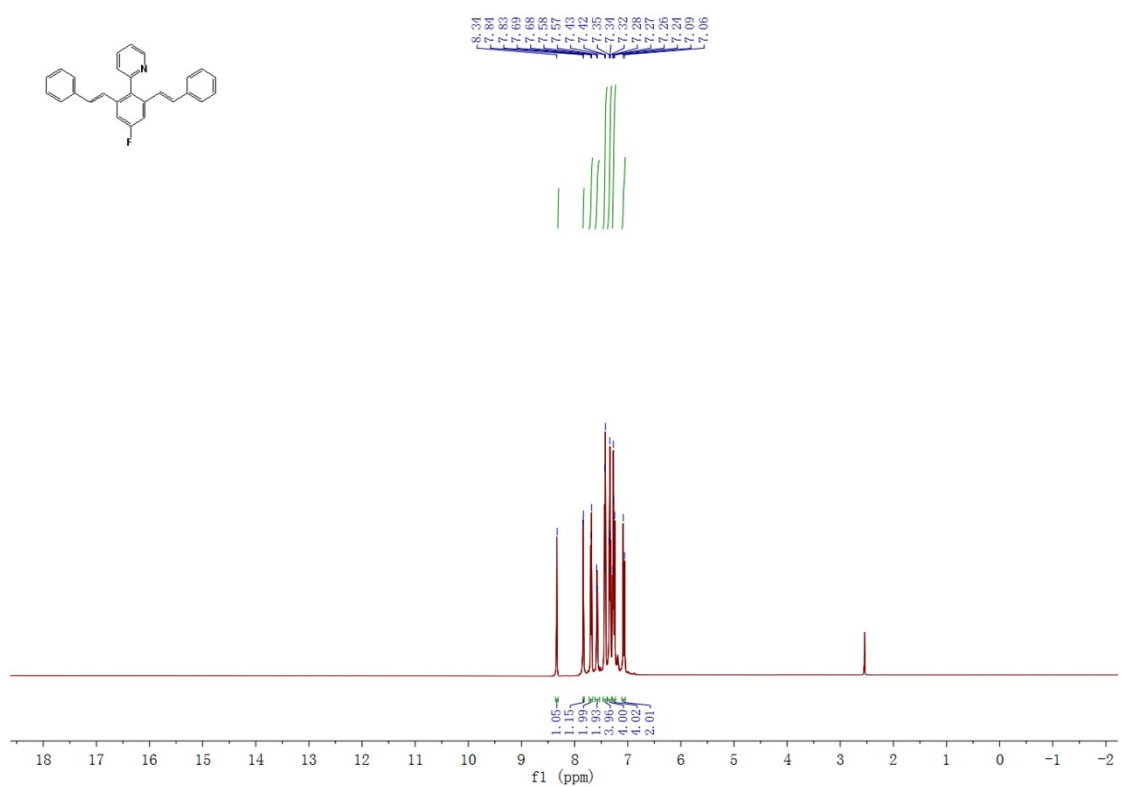


Figure S64 ^1H NMR spectrum of compound **3f'**

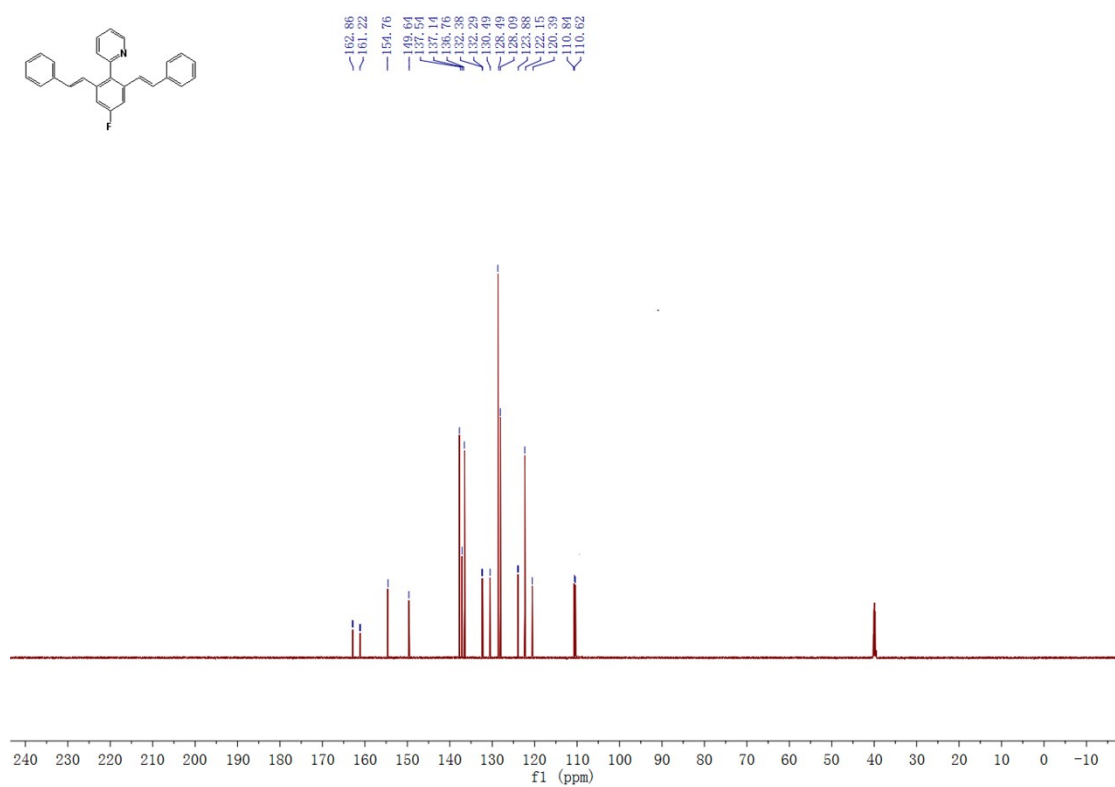


Figure S65 ^{13}C NMR spectrum of compound **3f'**

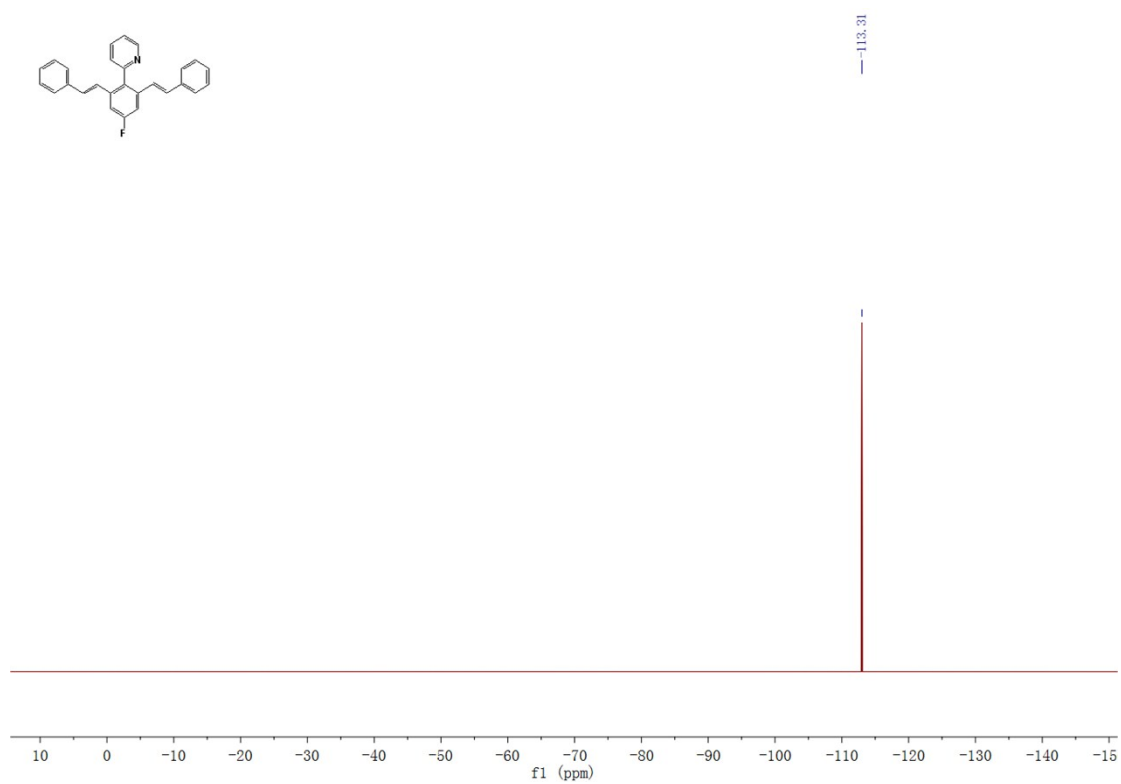


Figure S66 ^{19}F NMR spectrum of compound **3f'**

Compound 3g'

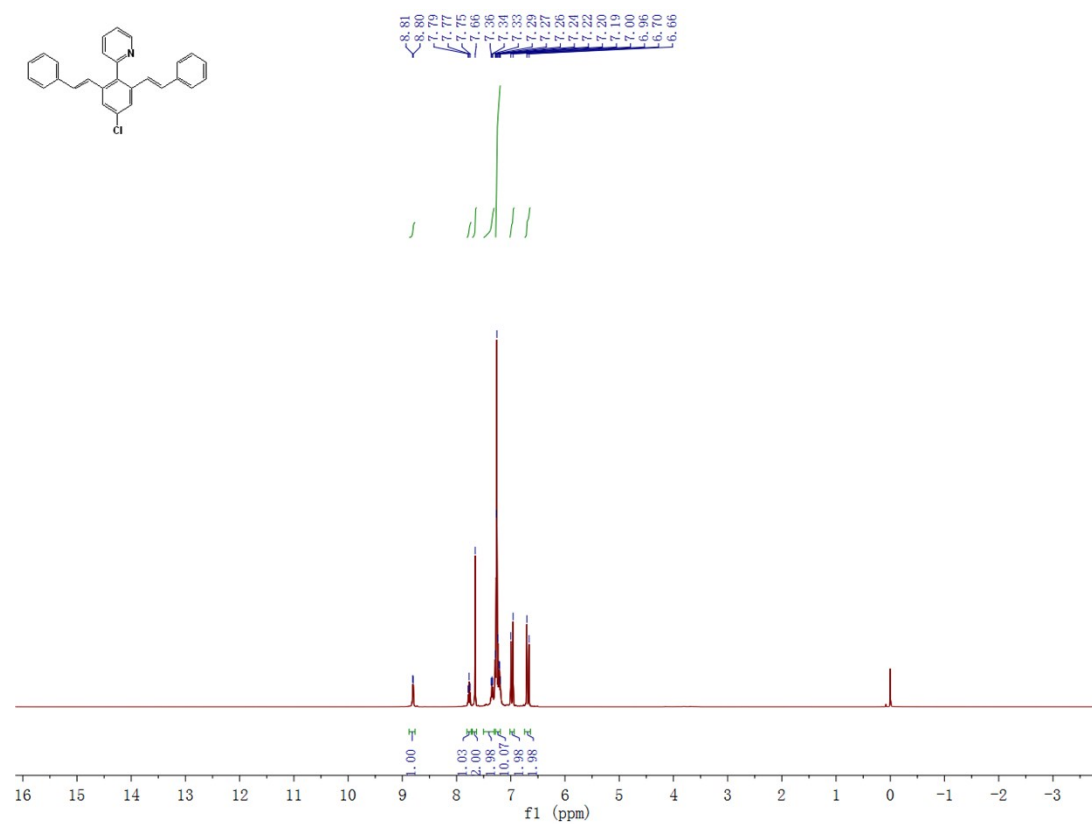


Figure S67 ¹H NMR spectrum of compound 3g'

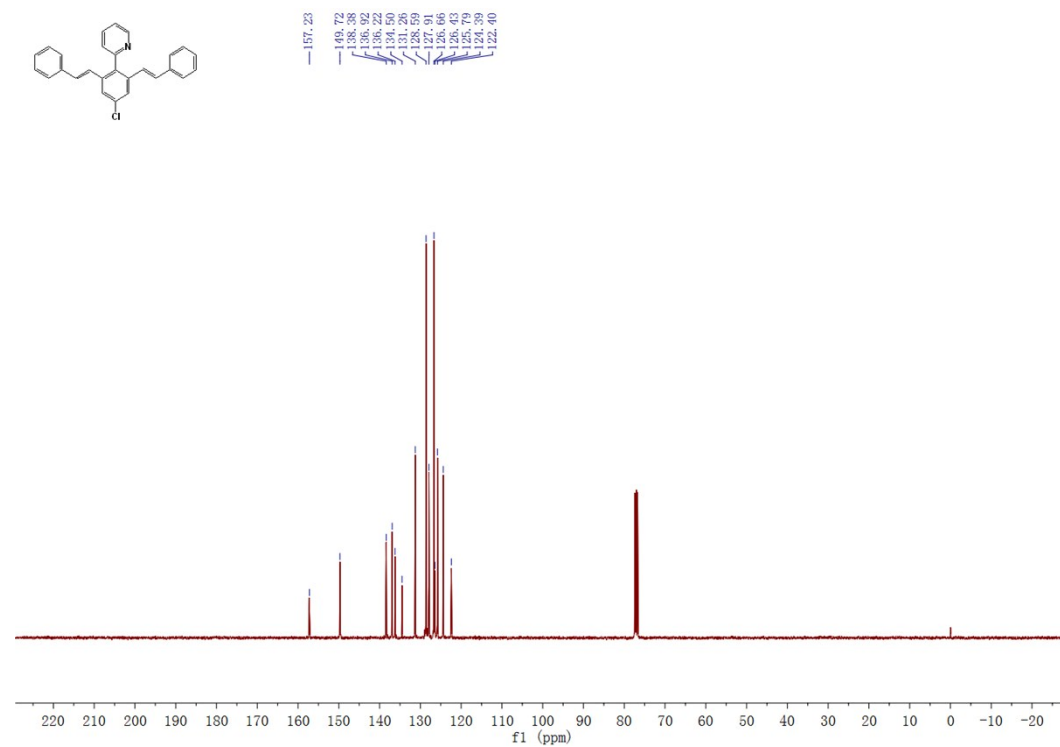


Figure S68 ¹³C NMR spectrum of compound 3g'

Compound 3h'

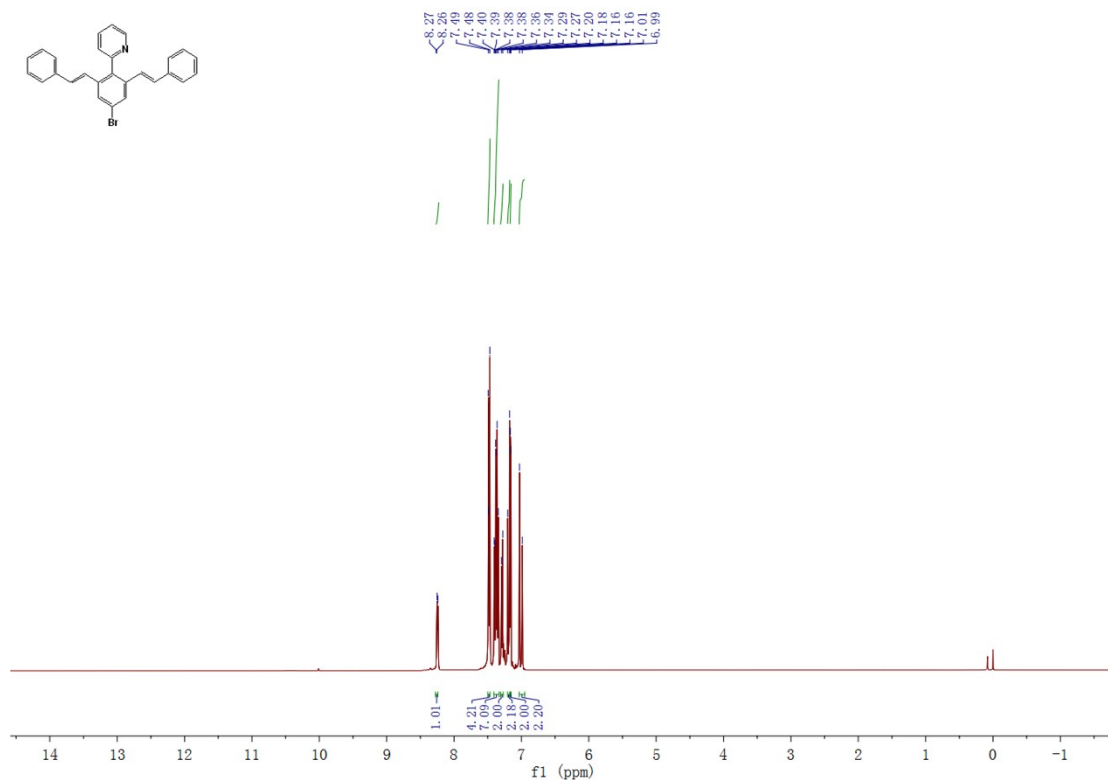


Figure S69 ¹H NMR spectrum of compound **3h'**

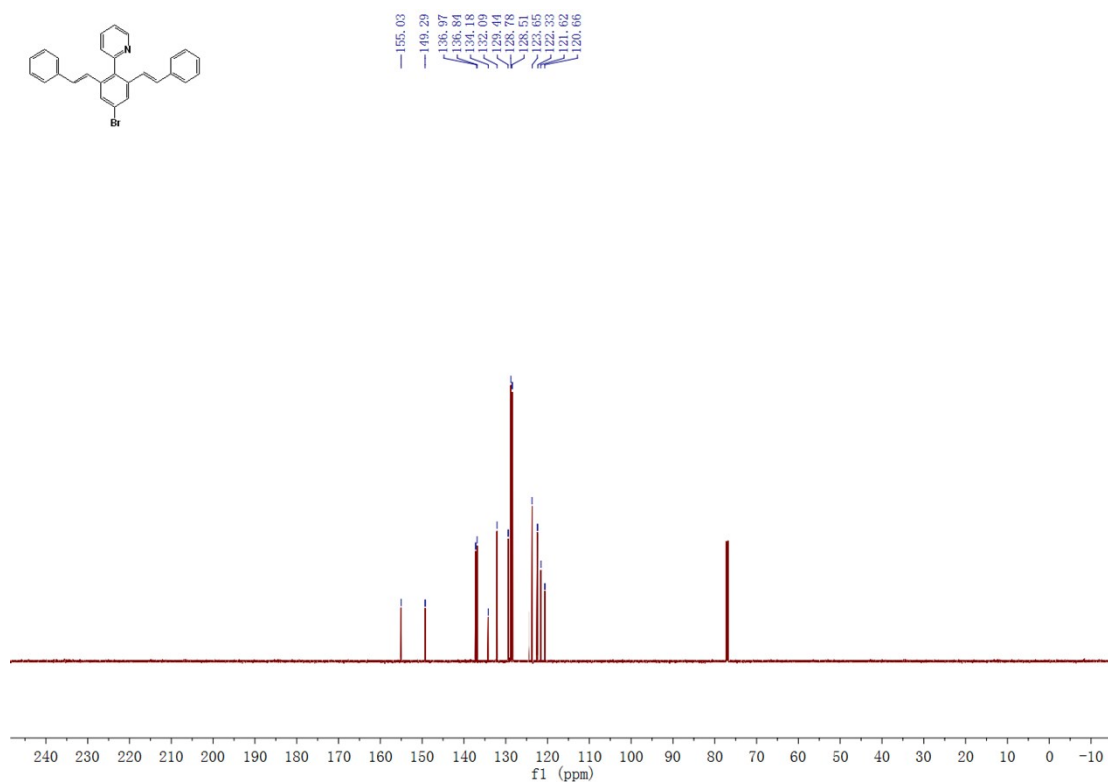


Figure S70 ¹³C NMR spectrum of compound **3h'**

Compound 3i'

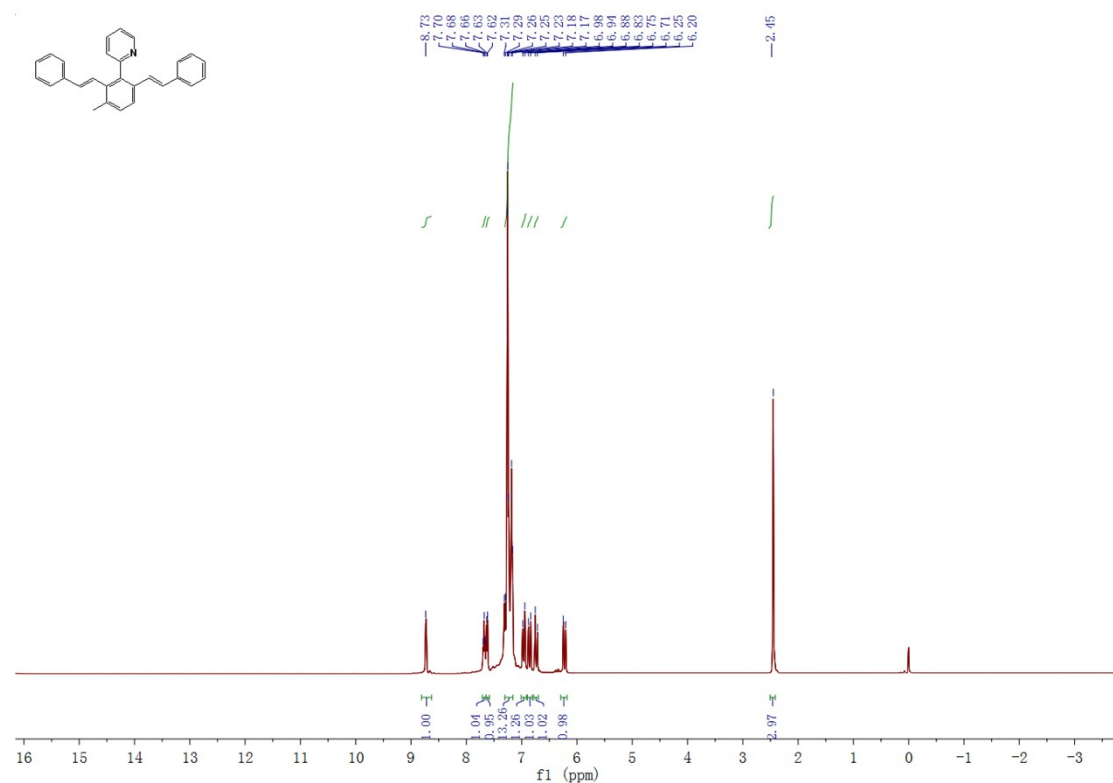


Figure S71 ¹H NMR spectrum of compound 3i'

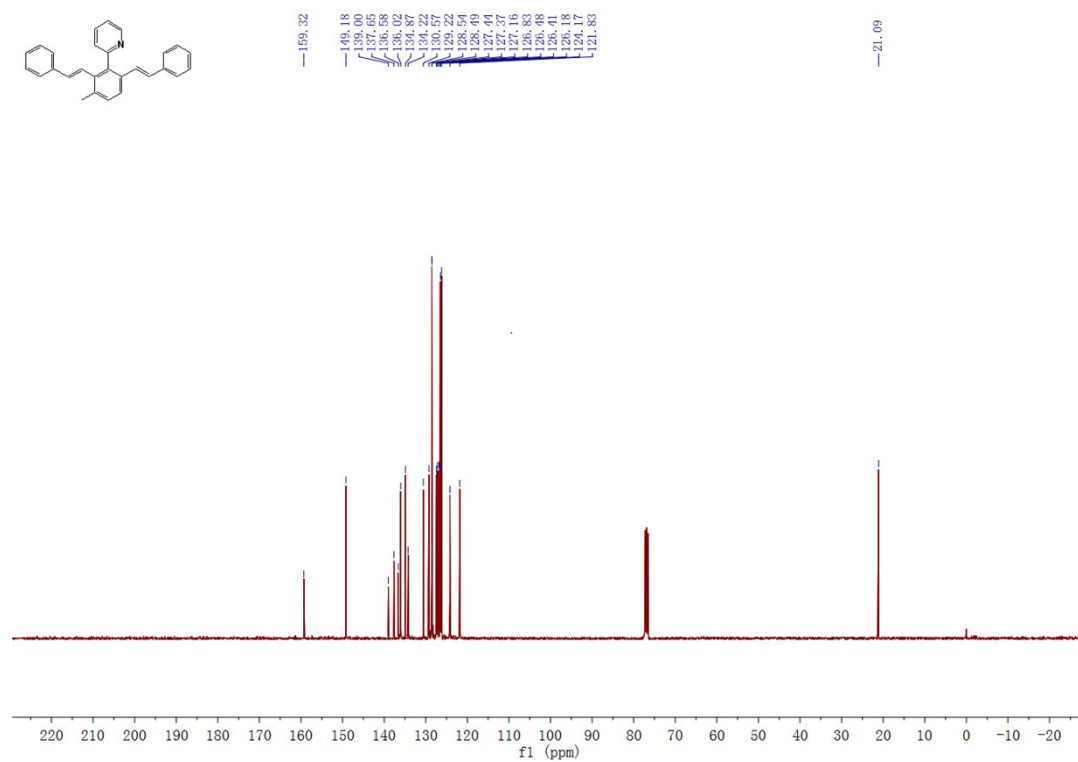


Figure S72 ¹³C NMR spectrum of compound 3i'

Compound 3j'

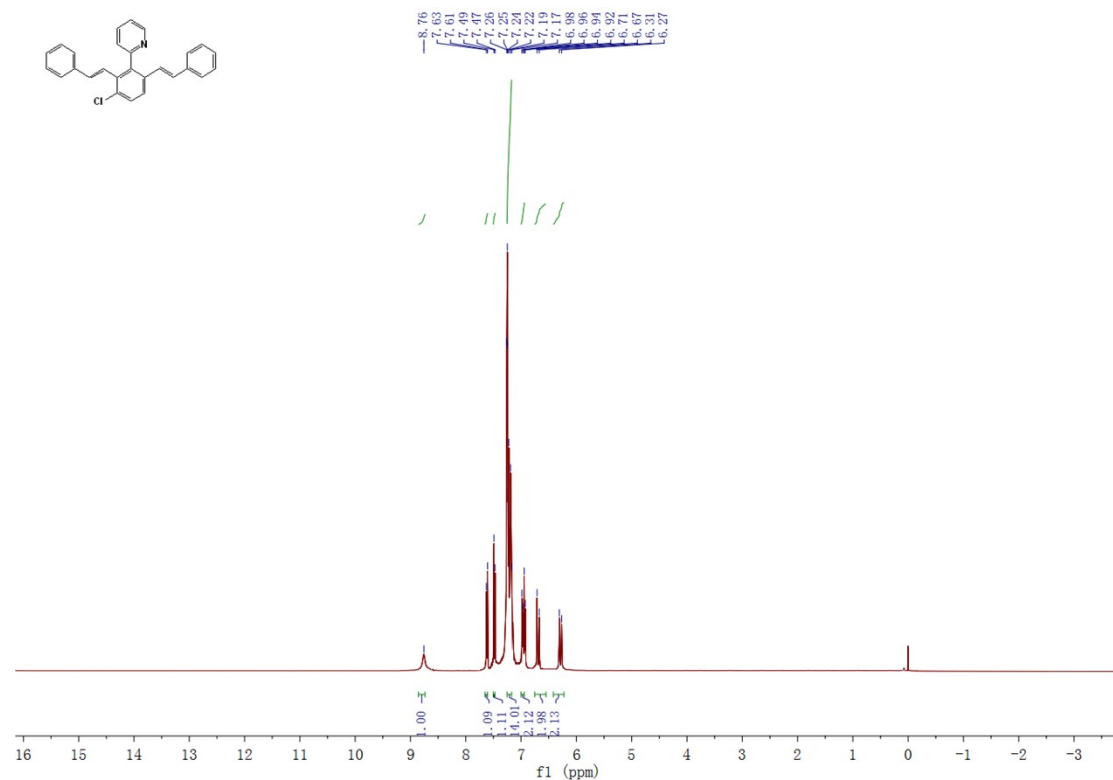


Figure S73 ¹H NMR spectrum of compound **3j'**

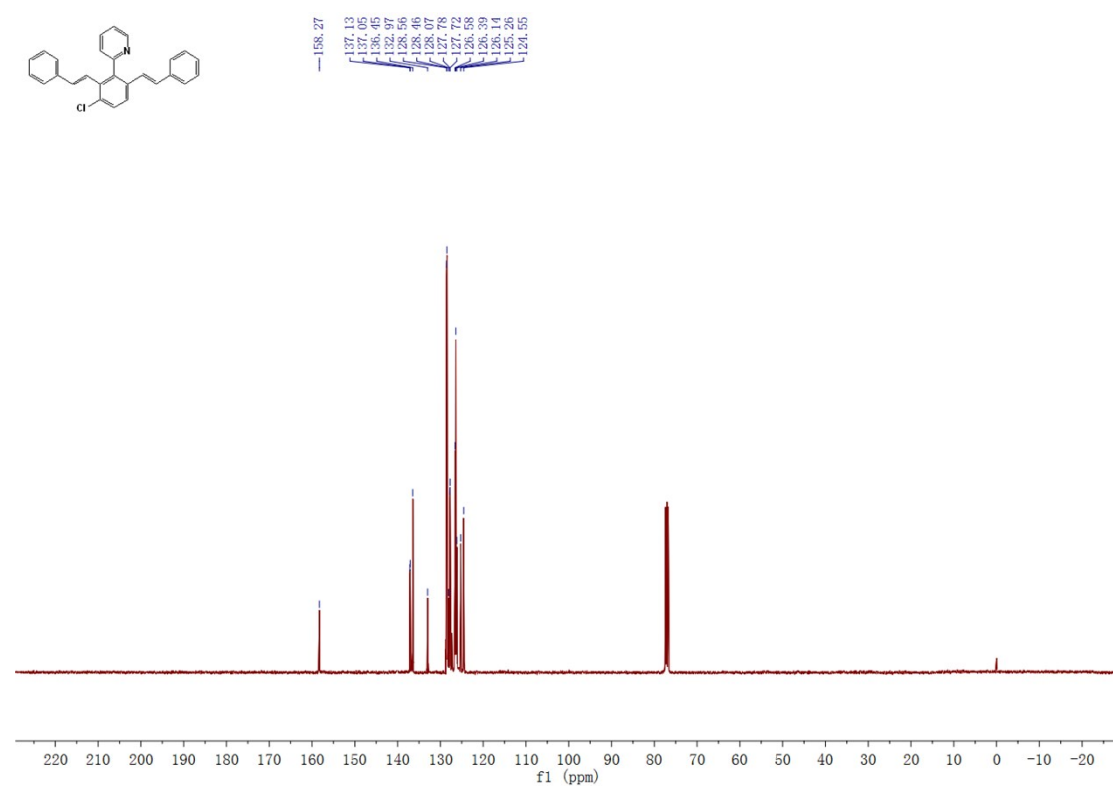


Figure S74 ¹³C NMR spectrum of compound **3j'**

Compound 3k'

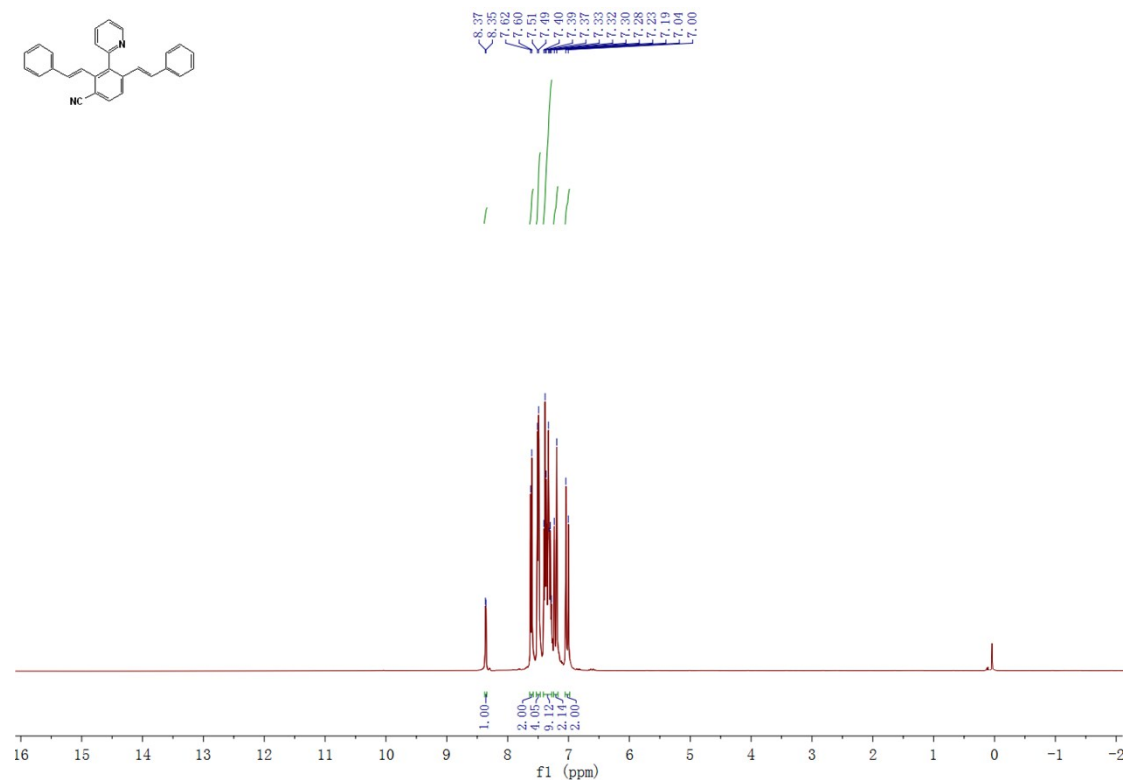


Figure S75 ¹H NMR spectrum of compound 3k'

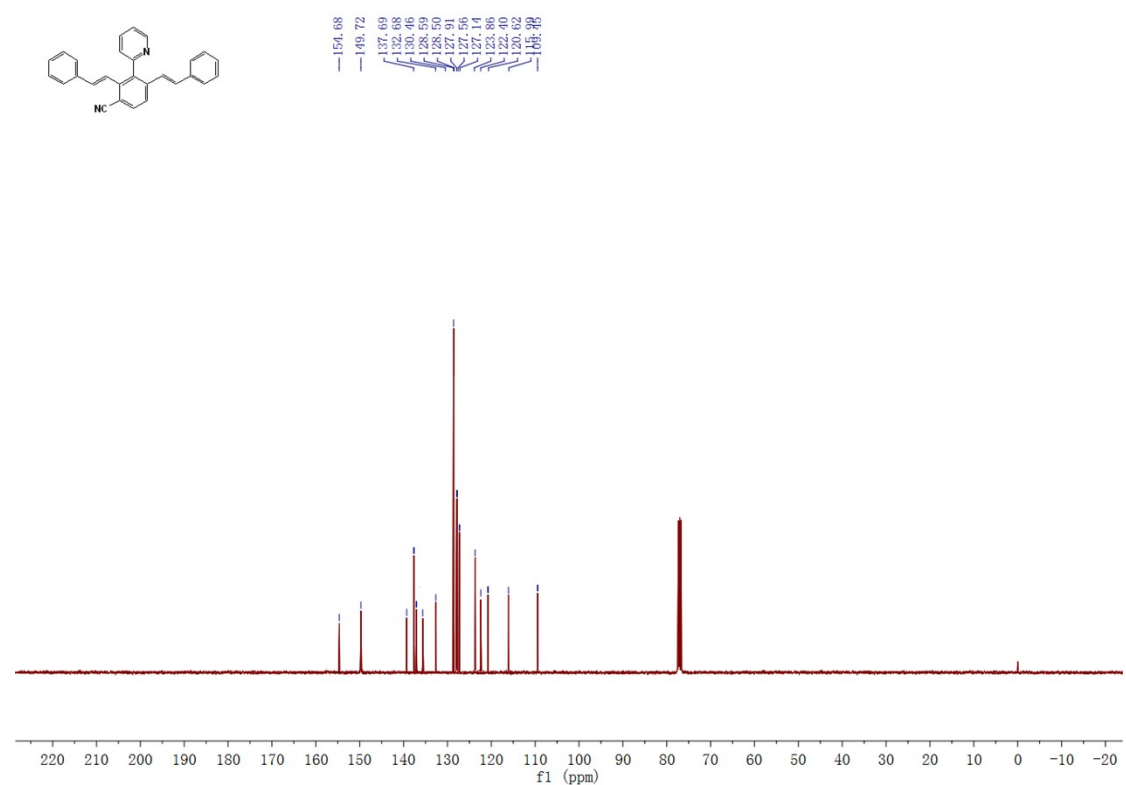


Figure S76 ¹³C NMR spectrum of compound 3k'

Compound 3I'

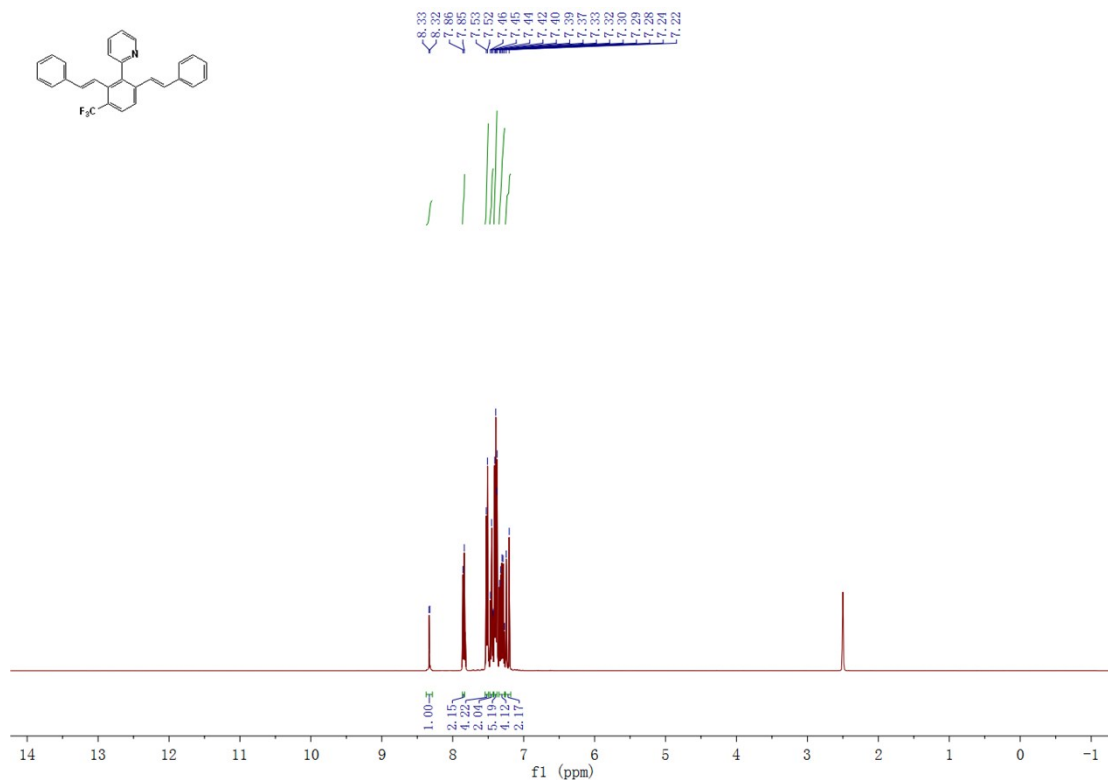


Figure S77 ¹H NMR spectrum of compound 3I'

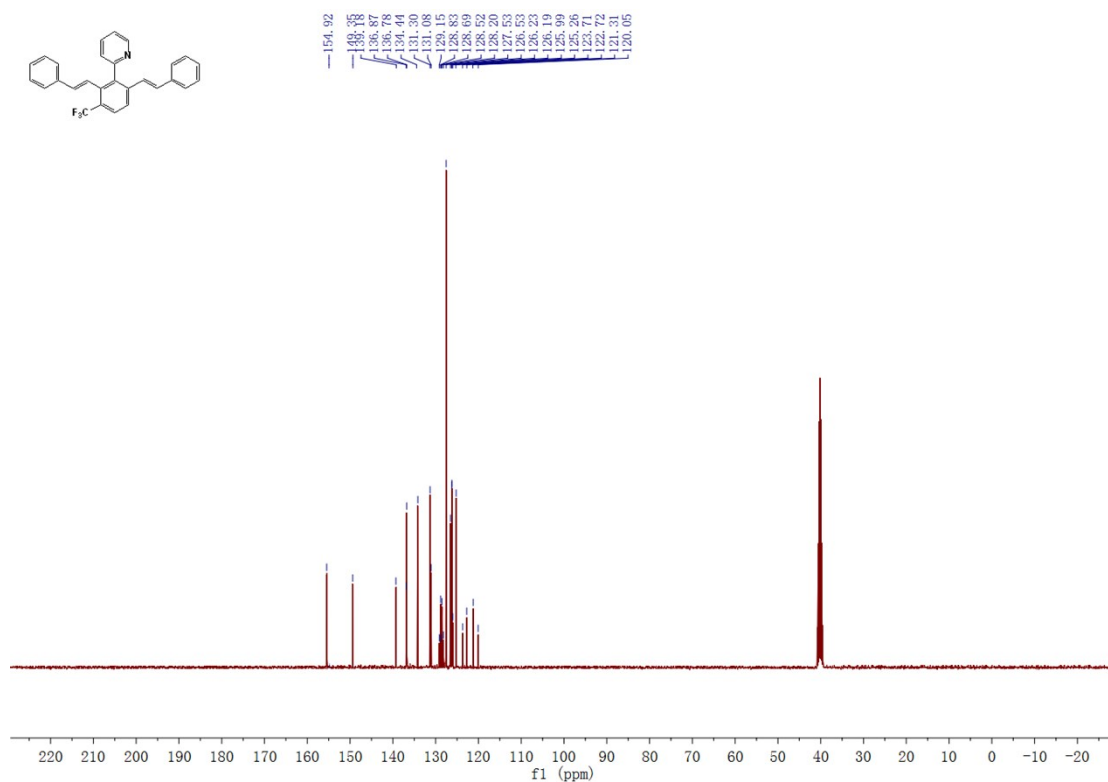


Figure S78 ¹³C NMR spectrum of compound 3I'

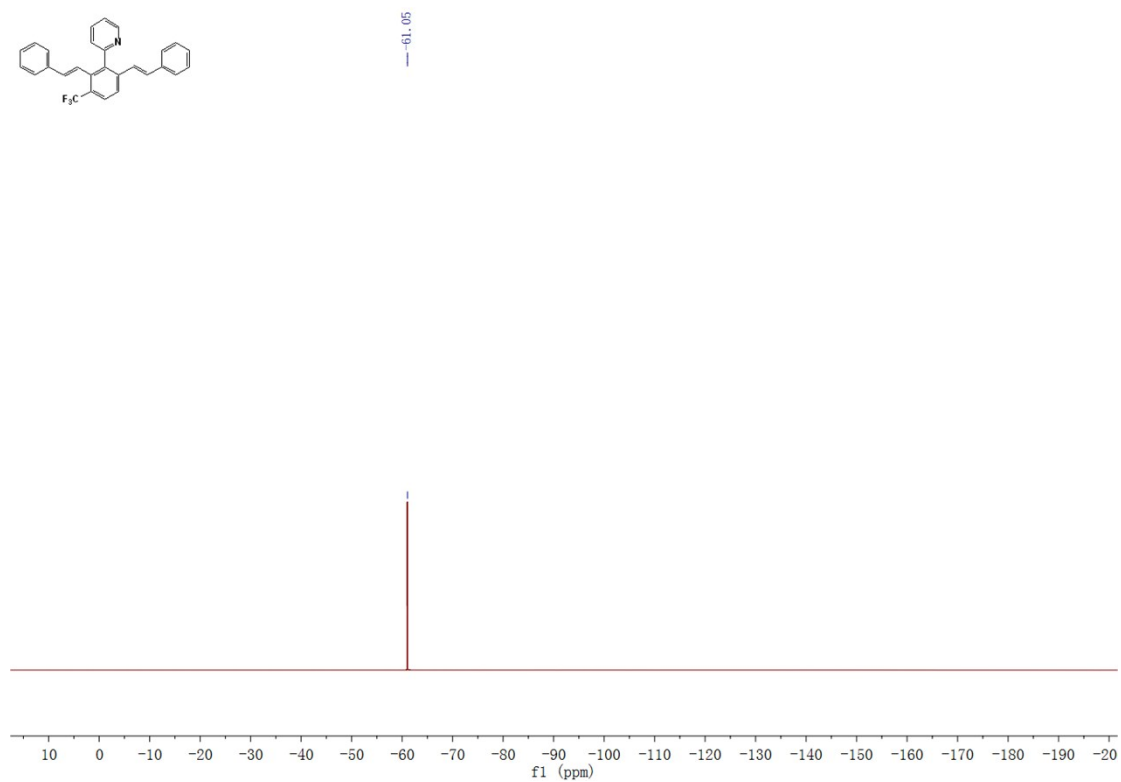


Figure S79 ¹⁹F NMR spectrum of compound 3I'

Compound 3m'

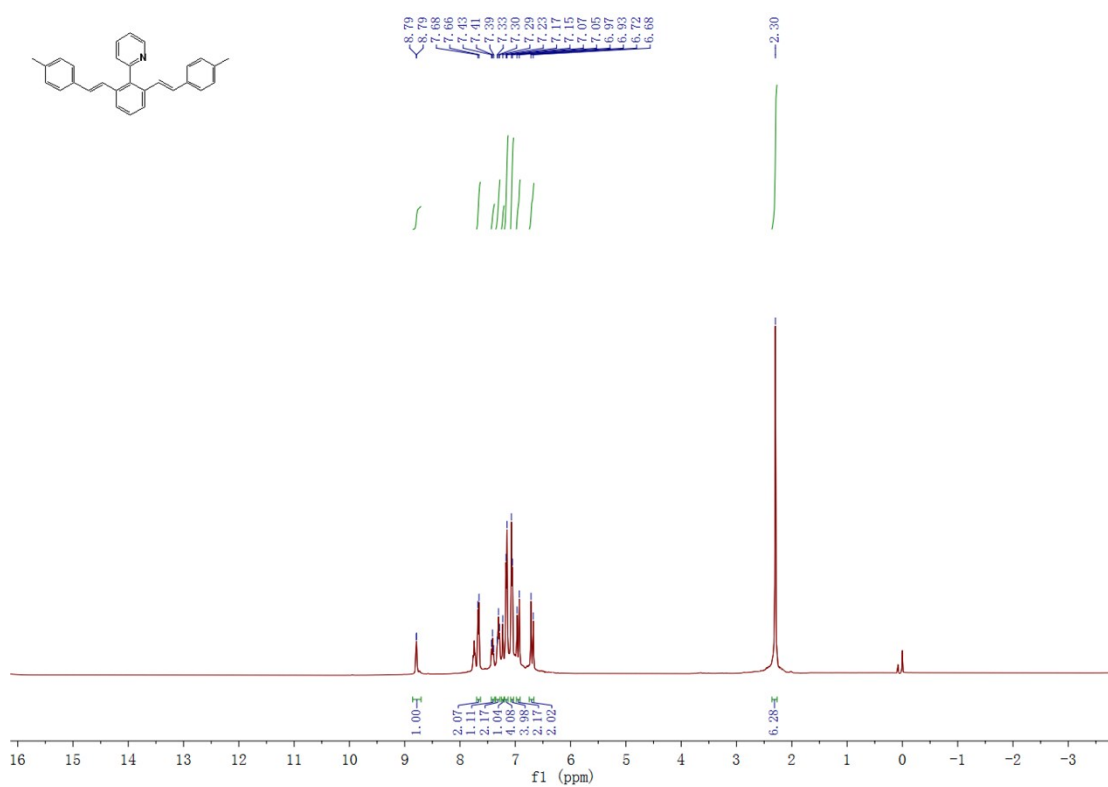


Figure S80 ¹H NMR spectrum of compound 3m'

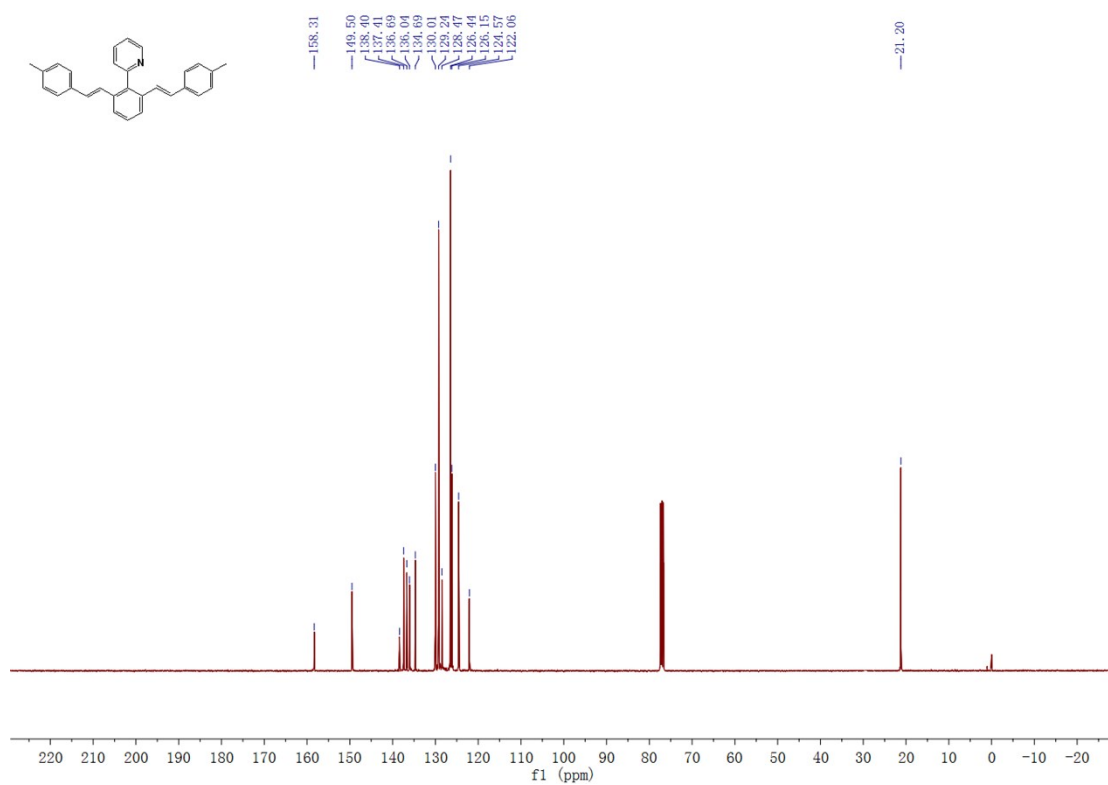


Figure S81 ^{13}C NMR spectrum of compound **3m'**

Compound **3n'**

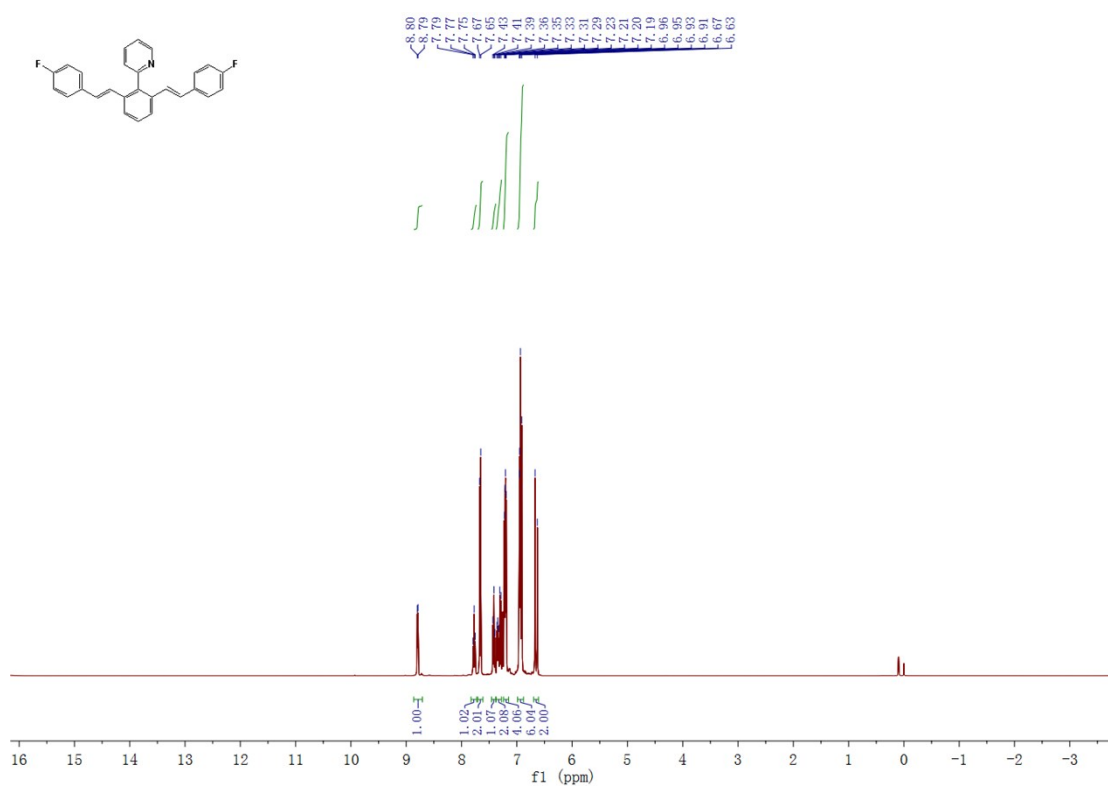


Figure S82 ^1H NMR spectrum of compound **3n'**

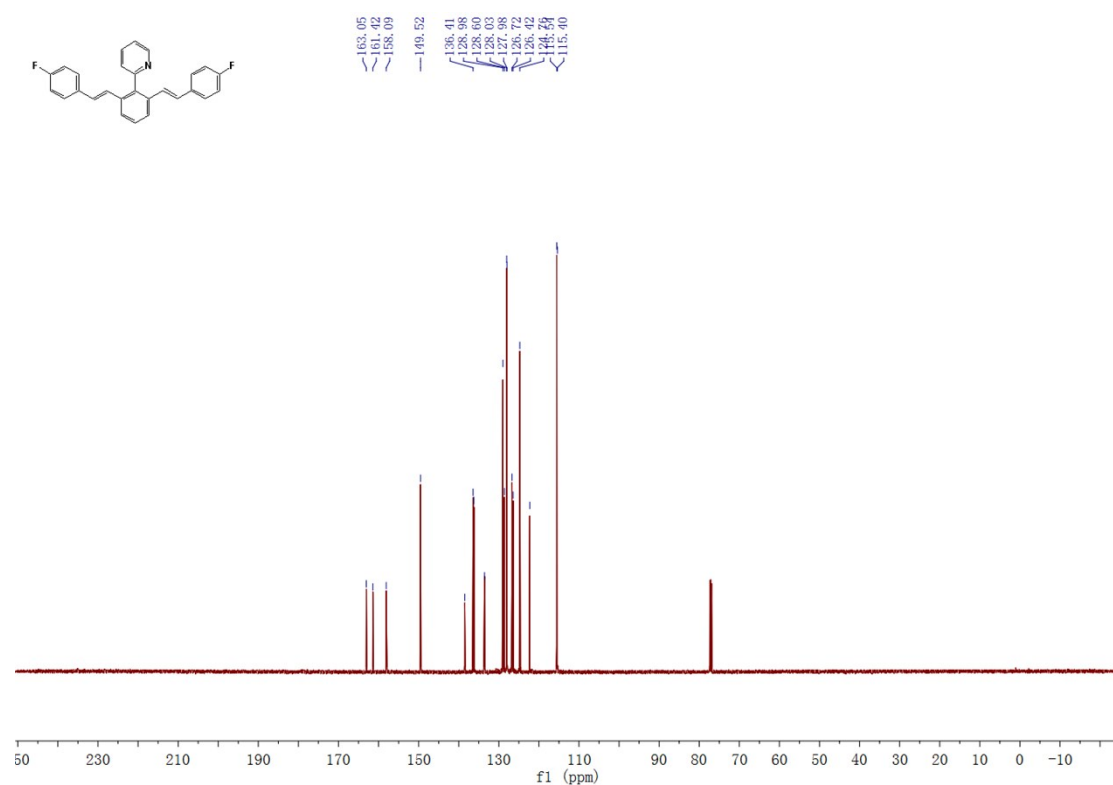


Figure S83 ^{13}C NMR spectrum of compound **3n'**

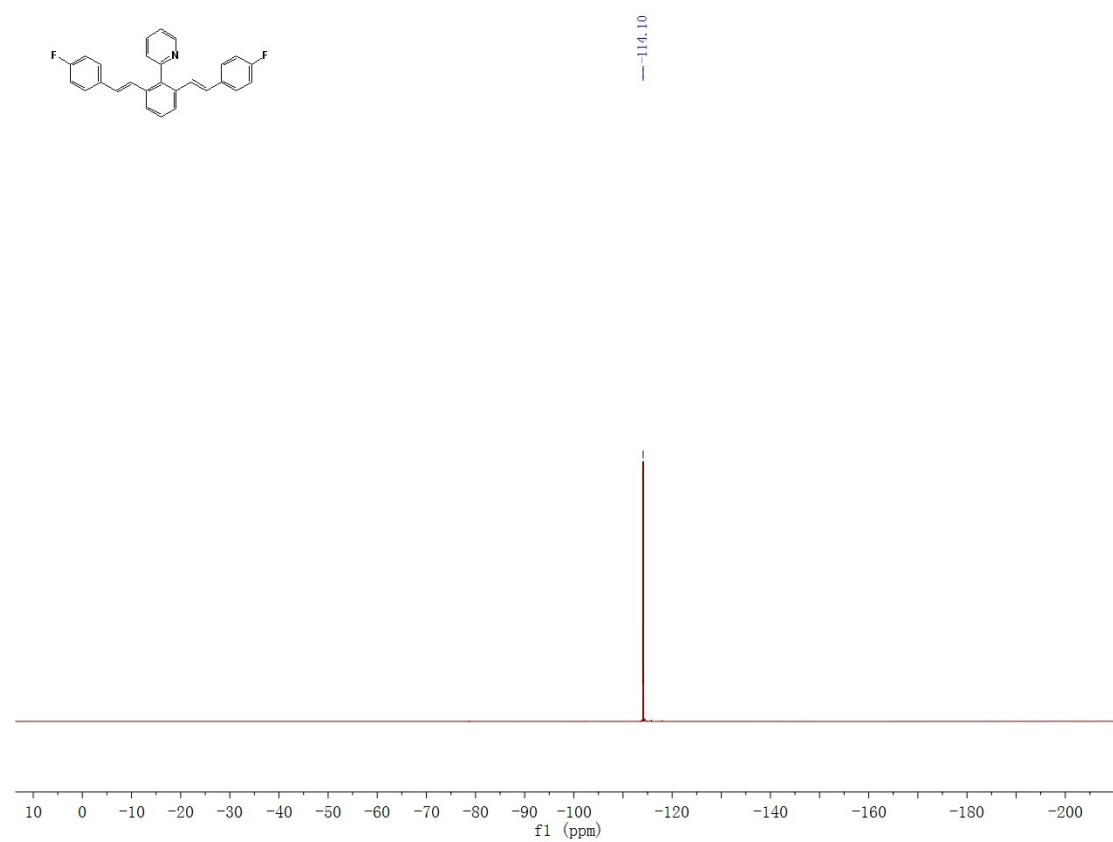


Figure S84 ^{19}F NMR spectrum of compound **3n'**

Compound 3o'

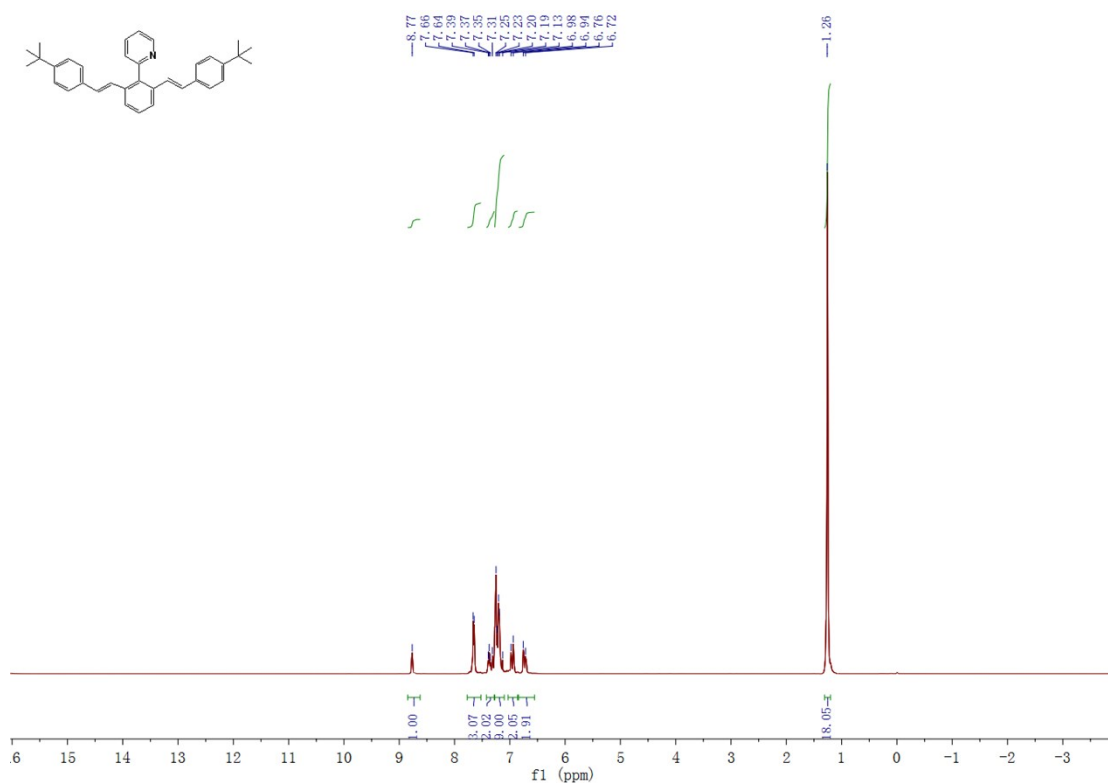


Figure S85 ^1H NMR spectrum of compound **3o'**

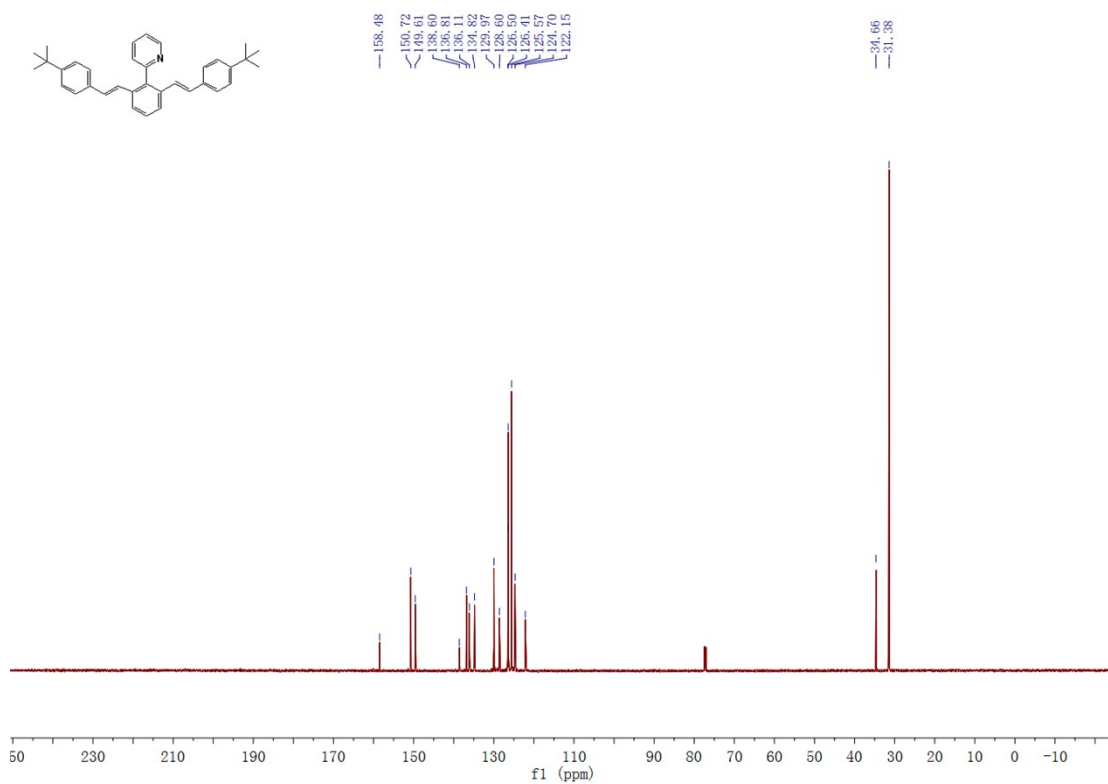


Figure S86 ^{13}C NMR spectrum of compound **3o'**

Compound 3q'

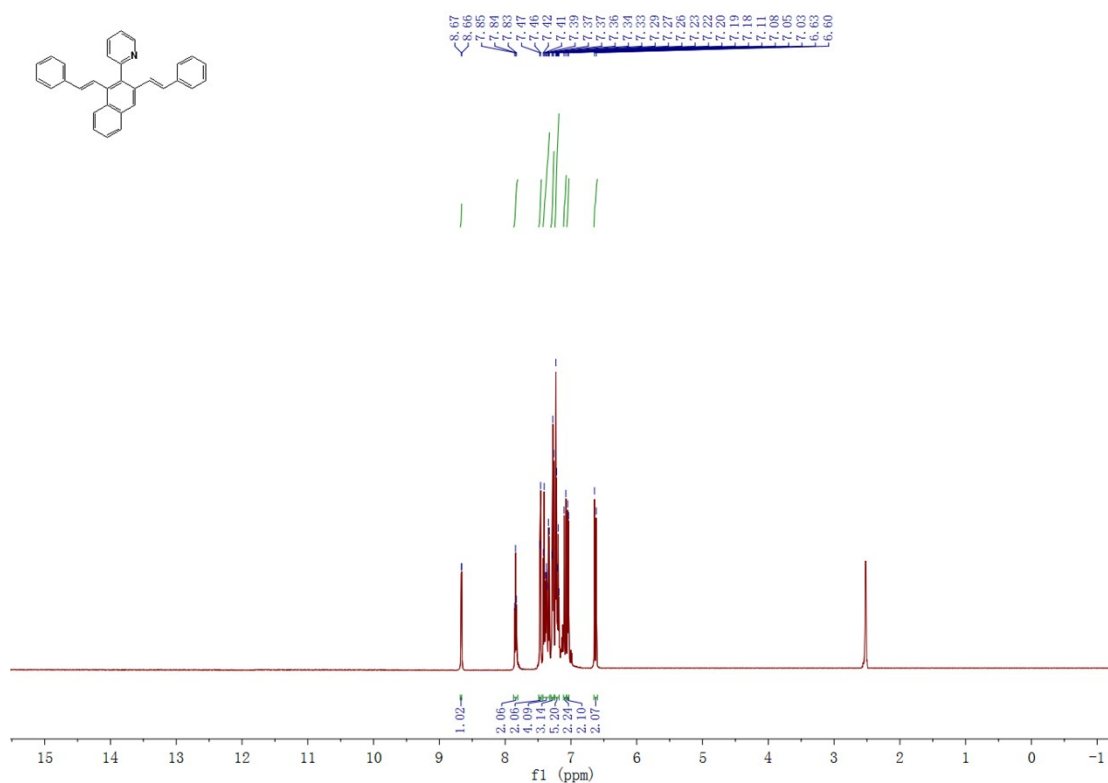


Figure S87 ¹H NMR spectrum of compound **3q'**

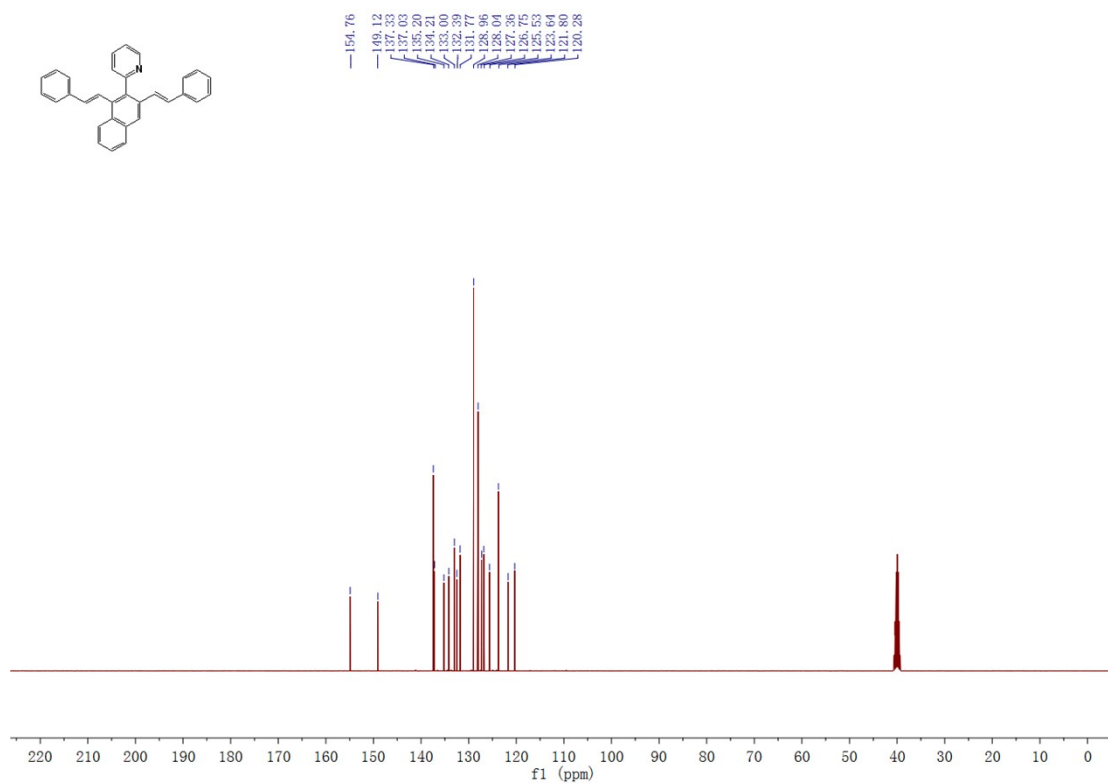


Figure S88 ¹³C NMR spectrum of compound **3q'**

Compound 3r'

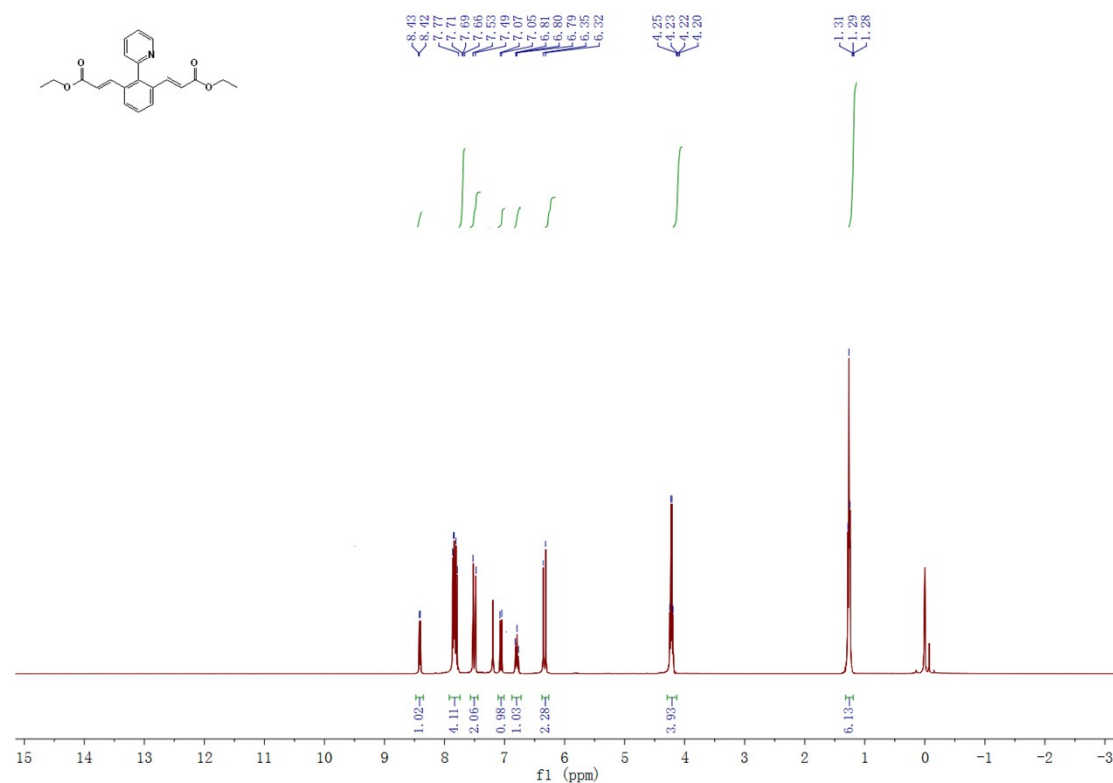


Figure S89 ¹H NMR spectrum of compound 3r'

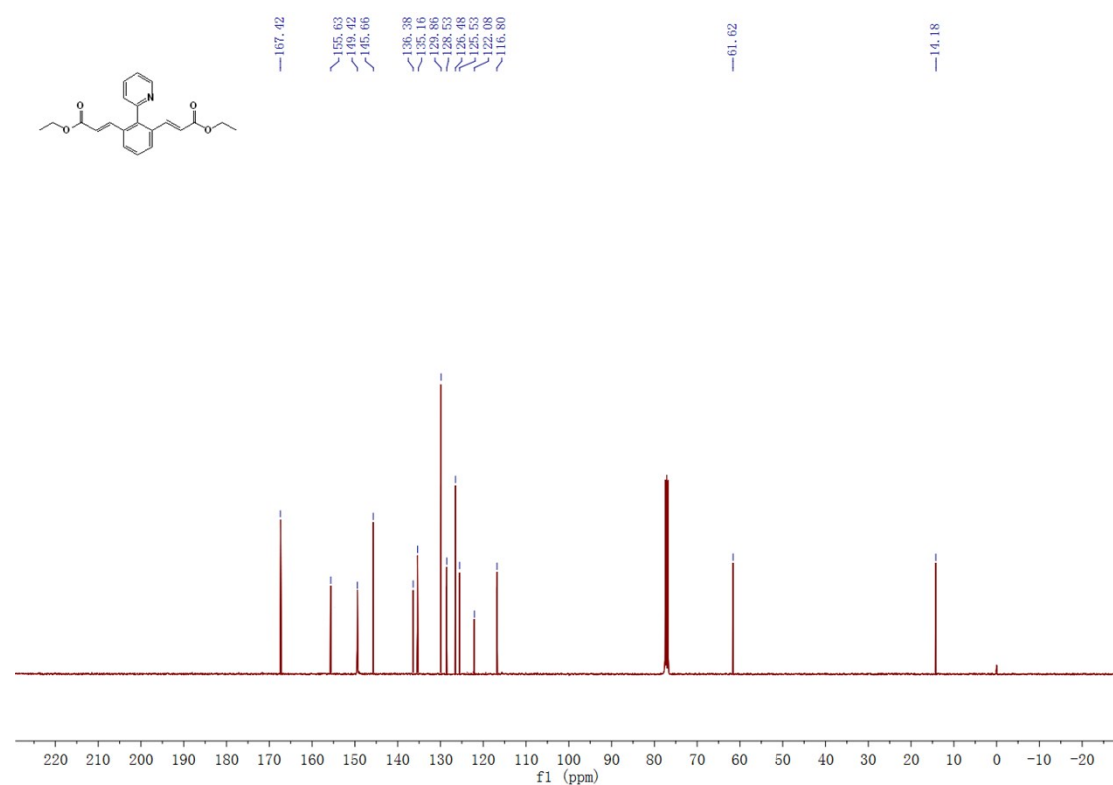


Figure S90 ¹³C NMR spectrum of compound 3r'

Compound 3u'

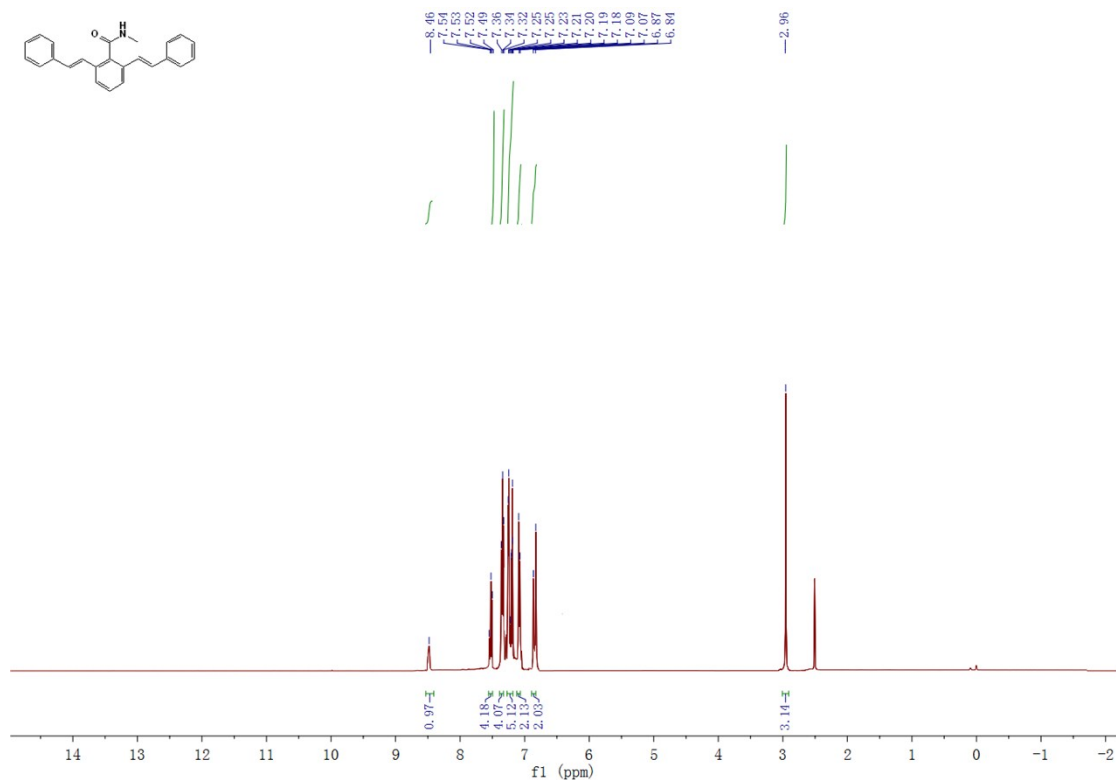


Figure S91 ¹H NMR spectrum of compound **3u'**

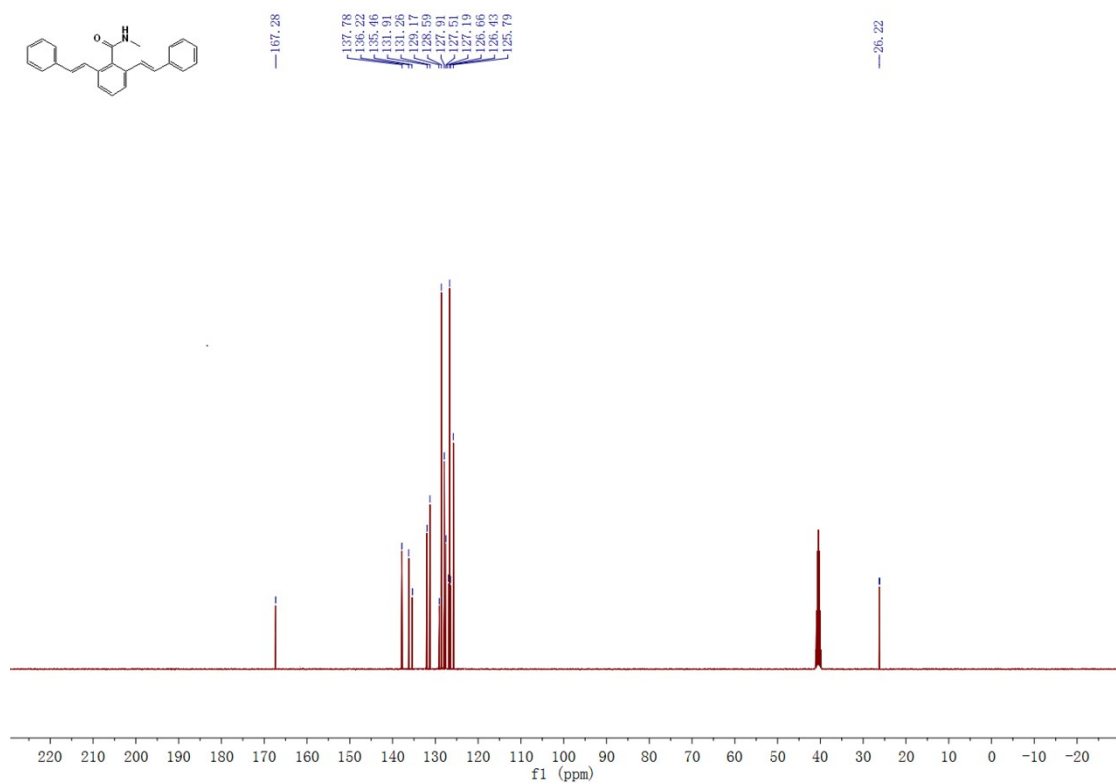


Figure S92 ¹³C NMR spectrum of compound **3u'**

Compound 3v'

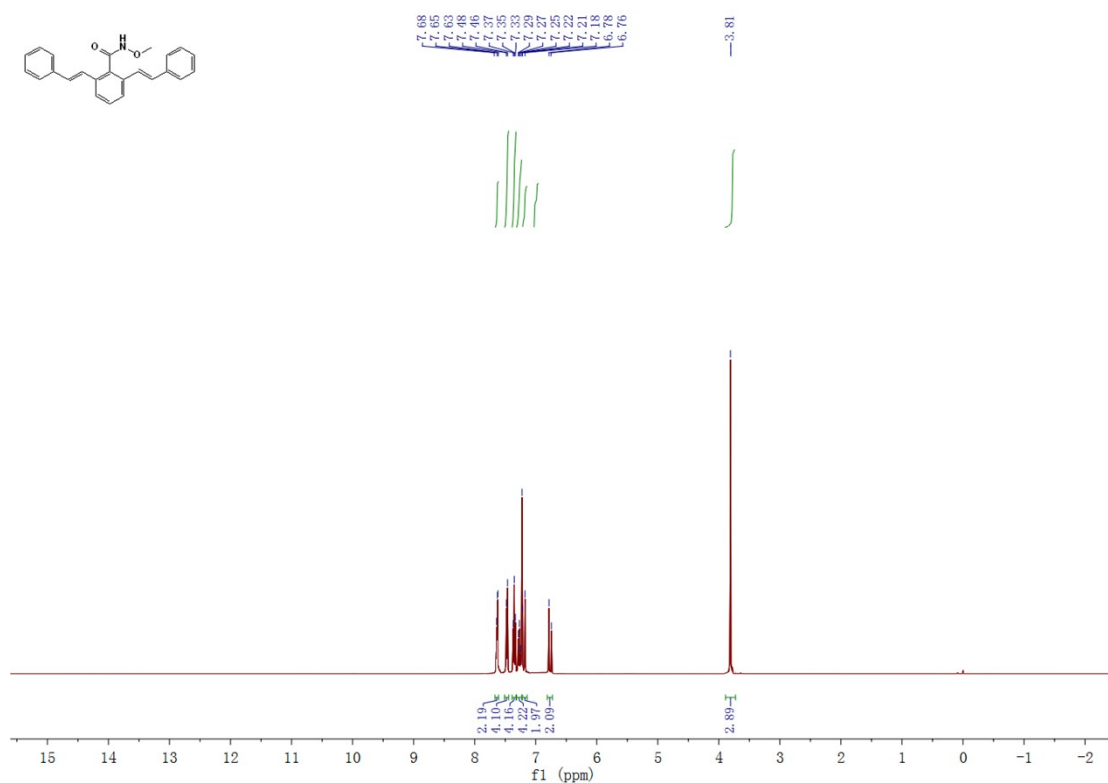


Figure S93 ¹H NMR spectrum of compound 3v'

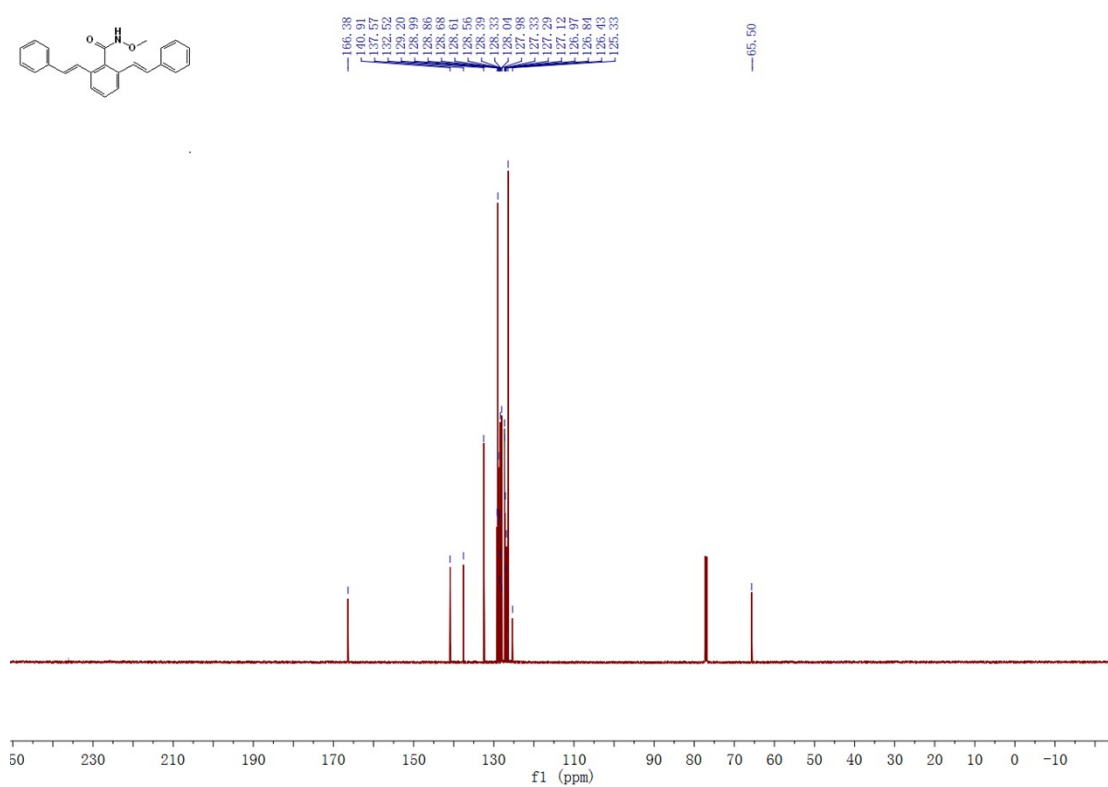


Figure S94 ¹³C NMR spectrum of compound 3v'