Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Metal-Free oxidative Trifluoromethylation of Indoles with CF_3SO_2Na

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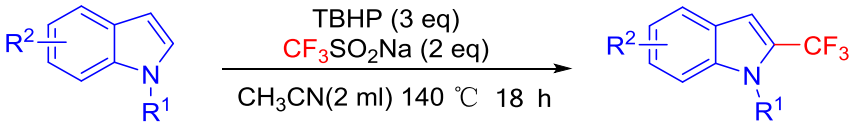
1. General

The raw materials and reagents were purchased from various commercial sources and were used without further purification. The reactions were developed at 140 ℃. Silica gel (300-400 mesh) was used for column chromatography. Analytical thin-layer chromatography (TLC) was visualized by UV-light. ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra were mostly operated on a 400 MHz, 101 MHz and 376 MHz spectrometer (^{1}H NMR: $CDCl_3$ at 7.26 ppm; ^{13}C NMR: $CDCl_3$ at 77.0 ppm). All chemical shift values, δ, and coupling constants, *J*, are quoted in ppm and Hz, respectively.

2. General Procedure for Synthesis

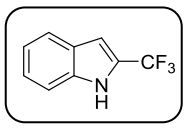


1 **2**

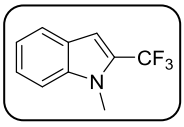
Indoles **1** (0.3 mmol), CF_3SO_2Na (0.6 mmol, 2 eq), TBHP (0.9 mmol, 3 eq) and CH_3CN (2 mL) were added into a sealed Pyrex test tube stirred at 140 °C under air. The reaction was stopped about 18 h and cooled to room temperature. Then, the crude product was purified by column chromatography on silica gel using ethyl acetate(EA) and petroleum ether(PE) as the developing solvent to give the products **2**.

3. Data of NMR for the Compounds

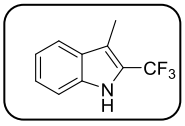
2-(trifluoromethyl)-*1H*-indole(2a):[1] Pale-yellow solid: mp 106-107℃, 61% yield, Known compound, **^{1}H NMR (400 MHz, CDCl3)** δ 8.37 (s, 1H), 7.68 (d, *J* = 8.0 Hz, 1H), 7.40 (d, *J* = 8.3 Hz, 1H), 7.32 (t, *J* = 7.6 Hz, 1H), 7.20 (dd, *J* = 14.6, 6.8 Hz, 1H), 6.92 (s, 1H). **^{19}F NMR (376 MHz, CDCl3)** δ -60.54 (s). **^{13}C NMR (101 MHz, CDCl3)** δ 136.13, 126.60, 125.73 (q, *J* = 38.8 Hz), 124.77, 122.08, 121.26 (q, *J* = 268.5 Hz), 121.13, 111.69, 104.27 (q, *J* = 3.3 Hz).



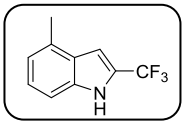
1-methyl-2-(trifluoromethyl)-*1H*-indole(2b):[2] colorless liquid, 56% yield, Known compound, **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.65 (d, *J* = 7.9 Hz, 1H), 7.34 (d, *J* = 2.8 Hz, 1H), 7.19-7.14 (m, 1H), 6.91 (s, 1H), 3.80 (s, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -59.53. **^{13}C NMR (126 MHz, $CDCl_3$)** δ 138.49, 127.17(q, *J* = 37.6 Hz), 125.64, 124.36, 122.57, 121.50(q, *J* = 267.0 Hz), 122.20, 120.63, 109.77, 104.24(q, *J* = 4.4 Hz), 30.58.



3-methyl-2-(trifluoromethyl)-*1H*-indole(2c):[1] yellow solid: mp 70-71℃, 73% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.21 (s, 1H), 7.68 (d, *J* = 8.0 Hz, 1H), 7.46 – 7.30 (m, 2H), 7.25 (dd, *J* = 17.2, 9.7 Hz, 1H), 2.49 (d, *J* = 1.2 Hz, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ = -58.63. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 135.19, 128.05, 124.74, 122.12 (q, *J* = 269.7 Hz), 121.53 (q, *J* = 36.9 Hz), 120.36 120.07, 114.05 (q, *J* = 2.9 Hz), 111.54, 8.29.

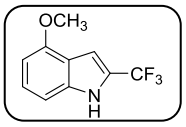


4-methyl-2-(trifluoromethyl)-1H-indole(2d): brown liquid, 76% yield, Known compound,



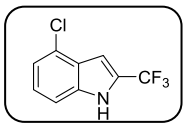
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29 (s, 1H), 7.13 (d, *J* = 4.2 Hz, 2H), 6.89 (dd, *J* = 10.6, 6.7 Hz, 2H), 2.46 (s, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.41. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 135.94, 131.78, 126.72, 125.10(q, *J* = 39.2 Hz), 124.90, 121.35(q, *J* = 268.5 Hz), 121.12, 109.21, 102.81(q, *J* = 3.4 Hz), 18.53. HRMS (ESI) m/z calculated for $[C_{10}H_9F_3N]^+$ 200.0682; Found: 200.0689.

4-methoxy-2-(trifluoromethyl)-*1H*-indole(2e):[3] white solid: mp 74-75℃, 79% yield, Known compound,



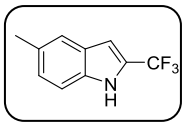
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24 (s, 1H), 7.11 (td, J_1 = 8.2, J = 3.2 Hz, 1H), 6.95 (d, *J* = 1.0 Hz, 1H), 6.81 (d, *J* = 8.3 Hz, 1H), 6.44 (dd, *J* = 7.8, 3.3 Hz, 1H), 3.81 (d, *J* = 2.7 Hz, 3H).**^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.35. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 154.17, 137.54, 125.75, 124.24(d, *J* = 38.8 Hz), 121.26(d, *J* =268.4 Hz), 117.78, 104.68, 101.85(d, *J* = 3.5 Hz), 100.41, 55.31.

4-chloro-2-(trifluoromethyl)-*1H*-indole(2f): reddish brown liquid, 51% yield, Known compound,



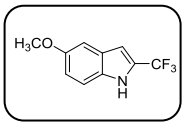
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.55 (s, 1H), 7.32 (d, *J* = 7.8 Hz, 1H), 7.26 – 7.18 (m, 2H), 7.05 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.74. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 136.66, 127.41, 126.23 (q, *J* = 40.4 Hz), 125.74, 125.37, 120.90 (q, *J* = 268.9 Hz), 120.86, 110.36, 102.92 (q, *J* = 3.0 Hz). HRMS (ESI) m/z calculated for $[C_9H_5ClF_3Na]^+$ 241.9955; Found: 241.9962.

5-methyl-2-(trifluoromethyl)-*1H*-indole(2g):[4] white solid: mp 122-123℃, 61% yield, Known compound,



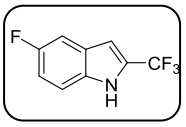
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.30 (s, 1H), 7.46 (s, 1H), 7.31 (d, *J* = 8.4 Hz, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 6.84 (s, 1H), 2.45 (s, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ = -60.52. **^{13}C NMR (101 MHz, $CDCl_3$)** δ134.49, 130.49, 126.89, 126.56, 125.71 (q, *J* = 39.4 Hz), 121.47, 121.30 (q, *J* = 268.6 Hz), 111.32, 103.77 (q, *J* = 3.3 Hz), 21.36.

5-methoxy-2-(trifluoromethyl)-*1H*-indole(2h):[1] yellow wax, 56% yield, Known compound,



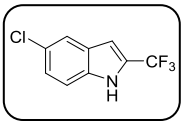
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.43 (s, 1H), 7.35 (d, *J* = 8.8 Hz, 1H). 7.15 (s, 1H), 7.05 (d, *J* = 8.7 Hz, 1H), 6.90 (s, 1H), 3.91 (s, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ = -60.51. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 154.90, 131.30, 127.09, 126.18 (q, *J* = 39.0 Hz), 121.20 (q, *J* = 268.7 HZ), 115.79, 112.56, 103.89 (q, *J* = 3.2 Hz), 102.80, 55.76.

5-fluoro-2-(trifluoromethyl)-*1H*-indole(2i):[4] yellow liquid, 68% yield, Known compound,



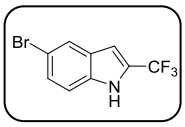
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.46 (s, 1H), 7.38-7.30 (m, 2H), 7.09 (td, *J* = 9.1, 2.4 Hz, 1H), 6.88 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.78, -122.56(td, J_1 =11.3 Hz, J_2 = 3.8 Hz). **^{13}C NMR (101 MHz, $CDCl_3$)** ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.35(d, *J* = 237.9 Hz), 132.66, 127.30(q, *J* = 39.4 Hz), 127.03(d, *J* = 10.1 Hz), 120.91(q, *J* = 268.7 Hz), 113.7(d, *J* = 27.3 Hz), 112.64(d, *J* = 9.1 Hz), 106.67(d, *J* = 24.2 Hz), 104.22(dq, *J* = 3.0 Hz).

5-chloro-2-(trifluoromethyl)-*1H*-indole(2j):[5] yellow liquid, 58% yield, Known compound,

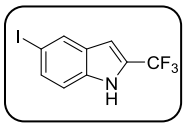


^{1}H NMR (400 MHz, $CDCl_3$) δ 8.52 (s, 1H), 7.65 (d, J = 1.3 Hz, 1H), 7.35 (d, J = 8.8 Hz, 1H), 7.28 (dd, J = 8.8, 1.9 Hz, 1H), 6.87 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.79. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 134.43, 127.59, 127.24, 126.85, 125.32, 121.40, 120.89 (q, *J* = 268.9 Hz), 112.82, 103.79 (q, *J* = 3.2 Hz).

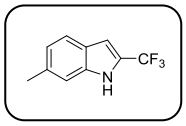
5-bromo-2-(trifluoromethyl)-*1H*-indole(2k):[5] reddish brown solid: mp 52-53 ℃, 54% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.2 (s, 1H), 7.81 (s, 1H), 7.40 (d, *J* = 7.0 Hz, 1H), 7.28 (dd, *J* = 14.2, 9.0 Hz, 1H), 6.86 (s, 1H).**^{19}F NMR (376 MHz, $CDCl_3$)** δ = -60.77. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 134.68, 128.23, 127.84, 126.86 (q, *J* = 39.3 Hz), 124.55, 120.84 (q, *J* = 269.1 Hz), 114.29, 113.19, 103.68 (q, *J* = 3.3 Hz).



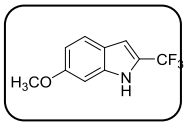
5-iodo-2-(trifluoromethyl)-*1H*-indole(2l):[6] brown solid: mp 173-174 ℃, 59% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ = 8.42 (s, 1H), 8.02 (s, 1H), 7.56 (s, 1H), 7.22 – 7.16 (m, 1H), 6.83 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ = -60.72 **^{13}C NMR (101 MHz, $CDCl_3$)** δ 135.11, 133.19, 130.89, 129.02, 126.46 (q, *J* = 39.1 Hz), 120.80 (q, *J* = 269.0 Hz), 113.61, 103.33 (q, *J* = 3.1 Hz), 84.46,.



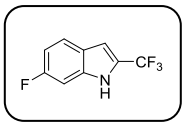
6-methyl-2-(trifluoromethyl)-*1H*-indole(2m): white solid: mp 106-107 ℃, 75% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.25 (s, 1H), 7.55 (d, *J* = 8.2 Hz, 1H), 7.18 (s, 1H), 7.02 (d, *J* = 8.2 Hz, 1H), 6.86 (s, 1H), 2.47 (s, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.45. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 136.65, 134.90, 125.03 (q, *J* = 39.0 Hz), 124.42, 123.09, 122.51 (q, *J* = 268.4Hz), 121.63, 111.41, 104.15 (q, *J*= 3.5 Hz), 21.81. HRMS (ESI) m/z calculated for $[C_{10}H_9F_3N]^+$ 200.0682; Found: 200.0687.



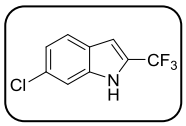
6-methoxy-2-(trifluoromethyl)-*1H*-indole(2n):[3] pale-yellow solid: mp 89-90 ℃, 60% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.36 (s, 1H), 7.53 (d, *J* = 8.7 Hz, 1H), 6.88 – 6.80 (m, 3H), 3.83 (s, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.35. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 158.20, 137.17, 124.46(q, *J* = 40.8 Hz), 122.75, 121.32 (q, *J* = 268.1 Hz), 120.80, 111.88, 104.32 (q, *J* = 3.4 Hz), 94.31, 55.54.



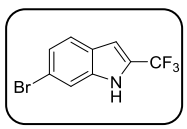
6-fluoro-2-(trifluoromethyl)-*1H*-indole(2o):[1] reddish brown liquid, 72% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.54 (s, 1H), 7.65 (dd, *J* = 8.6, 5.3 Hz, 1H), 7.15 (d, *J* = 9.2 Hz, 1H), 7.02 (t, *J* = 8.5 Hz, 1H), 6.96 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.69, -116.72(td, J_1 = 9.4 Hz, J_2 = 5.3 Hz) **^{13}C NMR (101 MHz, $CDCl_3$)** δ 161.23 (d, *J* = 242.5 Hz), 136.22(d, *J* = 13.8 Hz), 126.39 (d, *J* = 3.1 Hz), 123.24, 123.14, 121.00 (q, *J* = 268.5 Hz), 110.49 (d, *J* = 25.1 Hz), 104.37 (q, *J* = 3.6 Hz), 97.91(dq, *J* = 2.7 Hz).



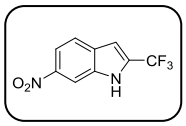
6-chloro-2-(trifluoromethyl)-*1H*-indole(2p):[1] reddish brown liquid, 61% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.40 (s, 1H), 7.58 (d, *J* = 8.5 Hz, 1H), 7.41 (s, 1H), 7.16 (dd, *J* = 8.5, 1.7 Hz, 1H), 6.90 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.73. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 136.42, 130.73,126.41 (q, *J* = 39.2 Hz), 125.13, 123.01, 122.15, 120.94 (q, *J* = 269.0 Hz), 111.61, 104.32 (q, *J* = 3.4 Hz).



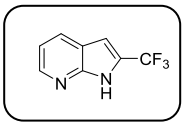
6-bromo-2-(trifluoromethyl)-*1H*-indole(2q): yellow liquid, 58% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.35 (s, 1H), 7.51 – 7.40 (m, 2H), 7.22 (d, *J* = 8.5 Hz, 1H), 6.81 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -60.72 (s). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 136.78, 126.29 (q, *J* = 39.3 Hz), 125.42, 124.68, 123.30, 120.90 (q, *J* = 269.1 Hz), 118.35, 114.64, 104.35 (q, *J* = 3.2 Hz). HRMS (ESI) m/z calculated for $[C_9H_5BrF_3NNa]^+$ 285.9450; Found: 285. 9455.



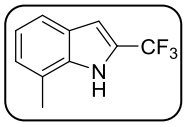
6-nitro-2-(trifluoromethyl)-*1H*-indole(2r):[7] bright yellow solid: mp 139-140 ℃, 51% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 9.30 (s, 1H), 8.46 (s, 1H), 8.10 (d, *J* = 8.7 Hz, 1H), 7.79 (d, *J* = 8.8 Hz, 1H), 7.04 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -61.27. **^{13}C NMR (126 MHz, $CDCl_3$)** δ 145.10, 134.70, 131.19,131.07(q, *J* = 42.7 Hz) , 122.45, 120.70(q, *J* = 193.9 Hz) , 116.22, 108.92, 104.29(q, *J* = 3.3 Hz).



2-(trifluoromethyl)-*1H*-pyrrolo[2,3-b]pyridine(2s):[8] brown yellow solid: mp 143-144 ℃, 64% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 14.35 (s, 1H), 8.47 (d, *J* = 3.6 Hz, 1H), 8.07 (d, *J* = 7.8 Hz, 1H), 7.22 – 7.18 (m, 1H), 6.88 (s, 1H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ -61.18. **^{13}C NMR (101 MHz, $CDCl_3$)** δ 148.53, 144.48, 131.43, 127.41 (q, *J* = 39.3 Hz), 121.36 (q, *J* = 245.4 Hz), 119.82, 116.87, 101.32 (q, *J* = 4.0 Hz).

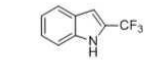


7-methyl-2-(trifluoromethyl)-*1H*-indole(2t):[3] reddish-brown liquid, 57% yield, Known compound, **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.21 (s, 1H), 7.45 – 7.41 (m, 1H), 7.05 – 7.00 (m, 2H), 6.84 (s, 1H), 2.40 (s, 3H). **^{19}F NMR (376 MHz, $CDCl_3$).** δ -60.39 (s). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 135.96, 126.19, 125.45 (q, *J* = 39.0 Hz) 125.09, 121.35, 121.39 (q, *J* = 268.7 Hz), 121.00, 119.70, 104.79 (q, *J* = 3.3 Hz), 16.49.

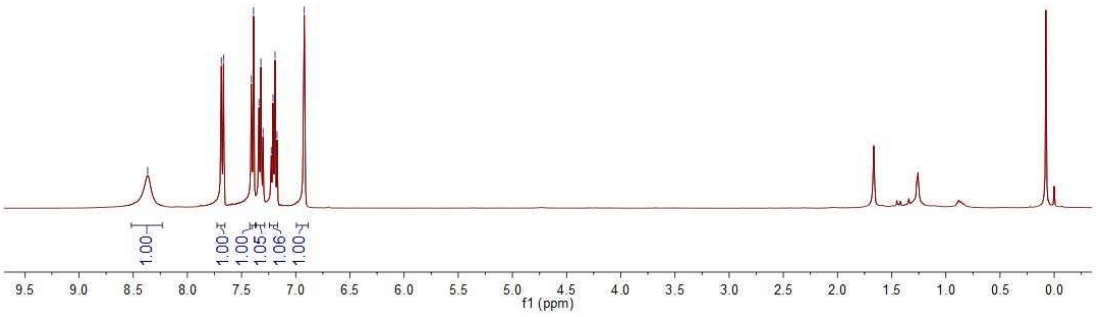


4. NMR Spectra for the Compounds

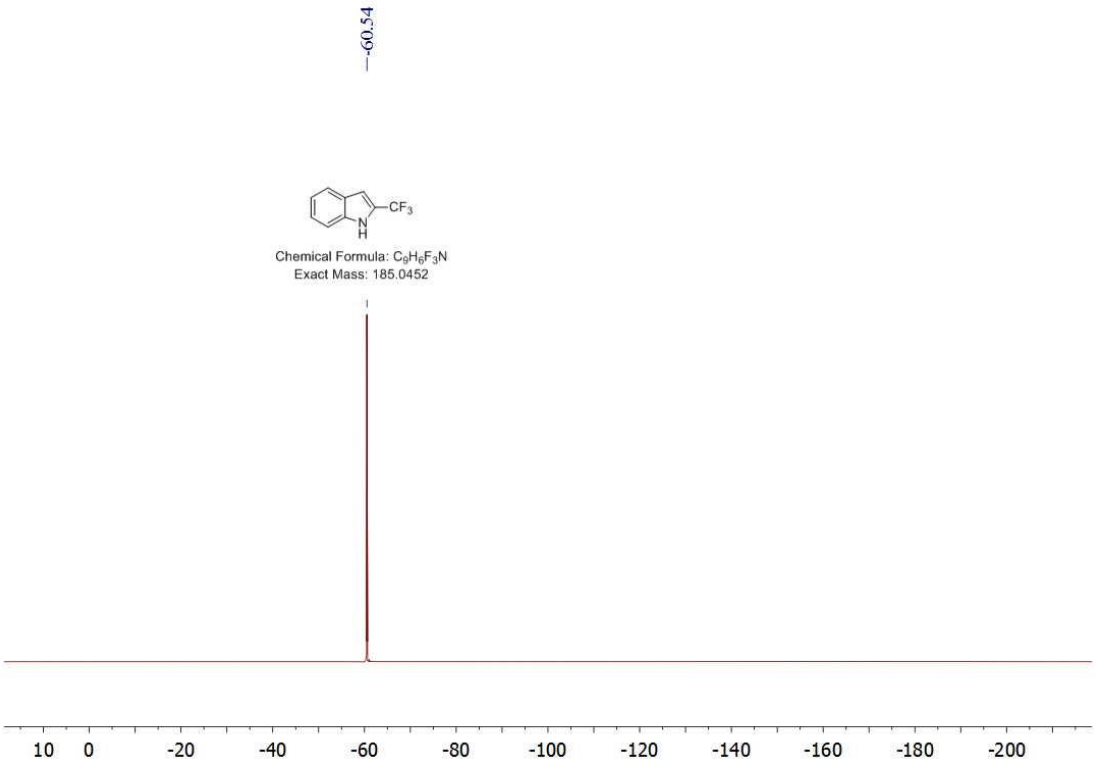
2-(trifluoromethyl)-*1H*-indole(2a)



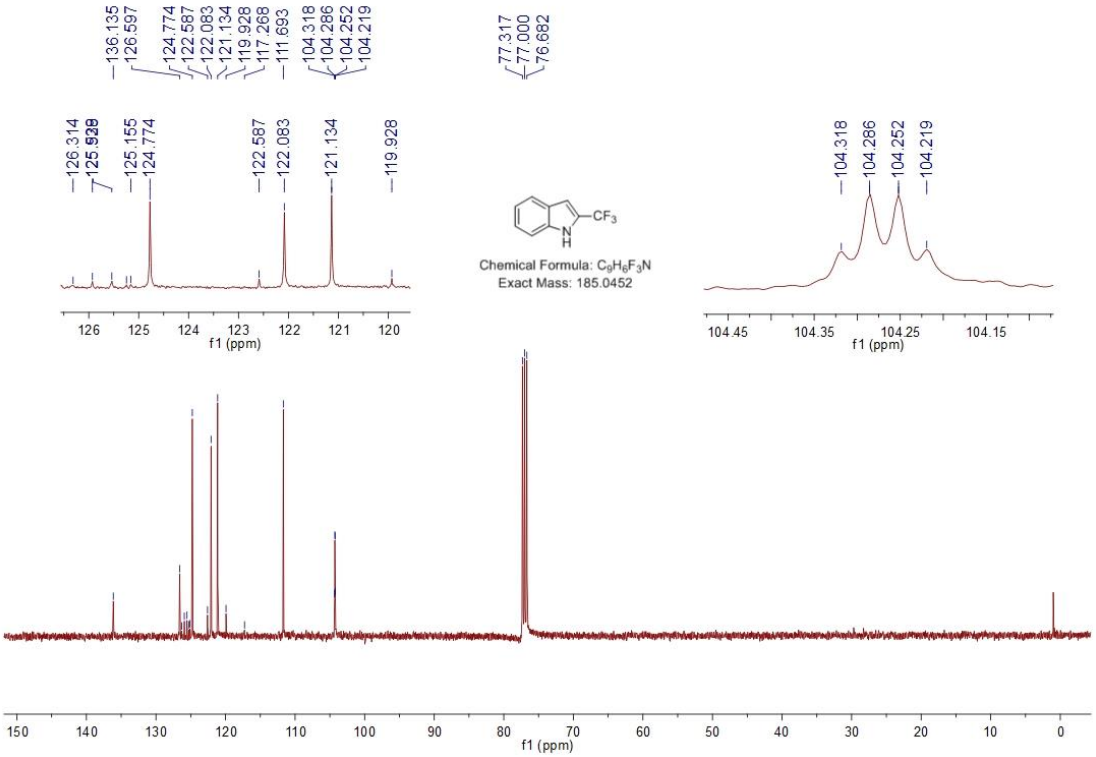
Chemical Formula: $C_9H_6F_3N$
Exact Mass: 185.0452



^{1}H NMR (400 MHz, $CDCl_3$)

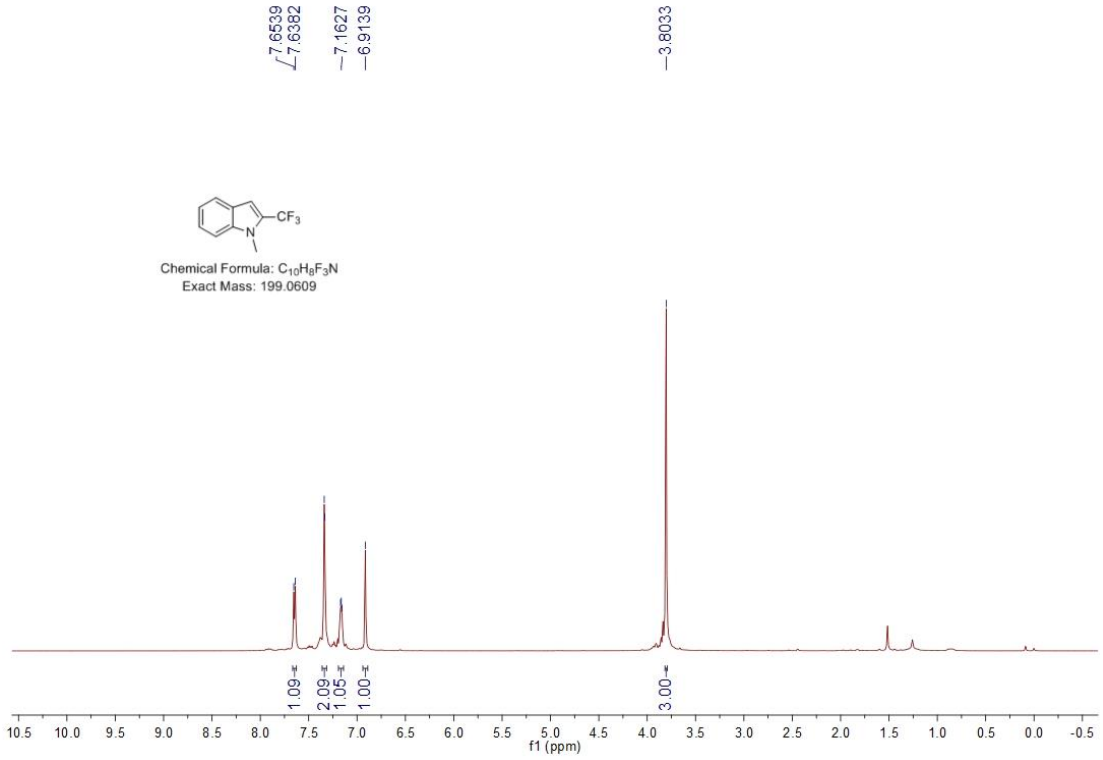


^{19}F NMR (376 MHz, $CDCI_3$)

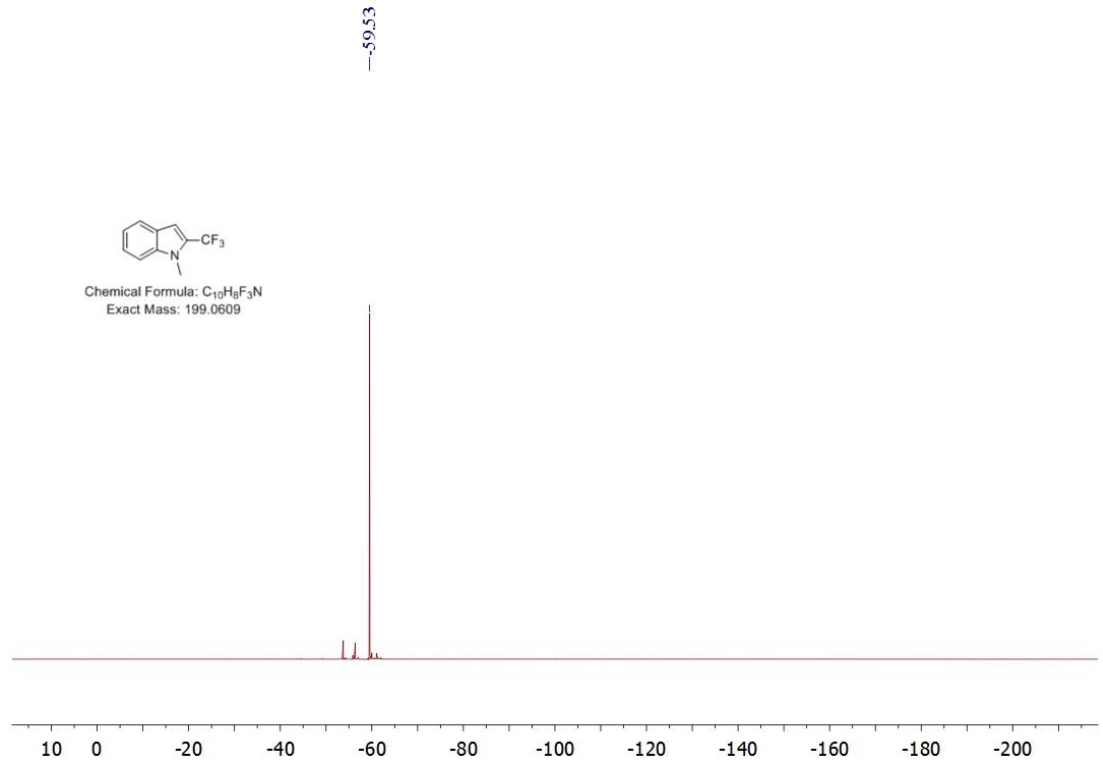


^{13}C NMR (101 MHz, $CDCl_3$)

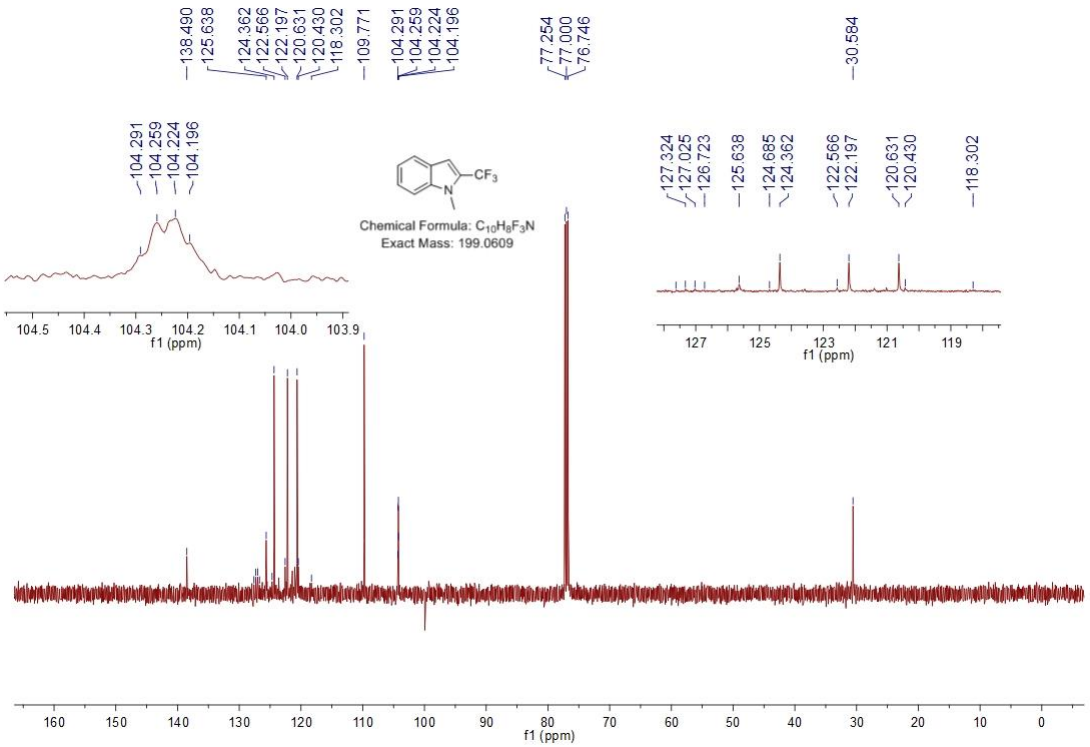
1-methyl-2-(trifluoromethyl)-*1H*-indole(2b)



^{1}H NMR (500 MHz, $CDCl_3$)

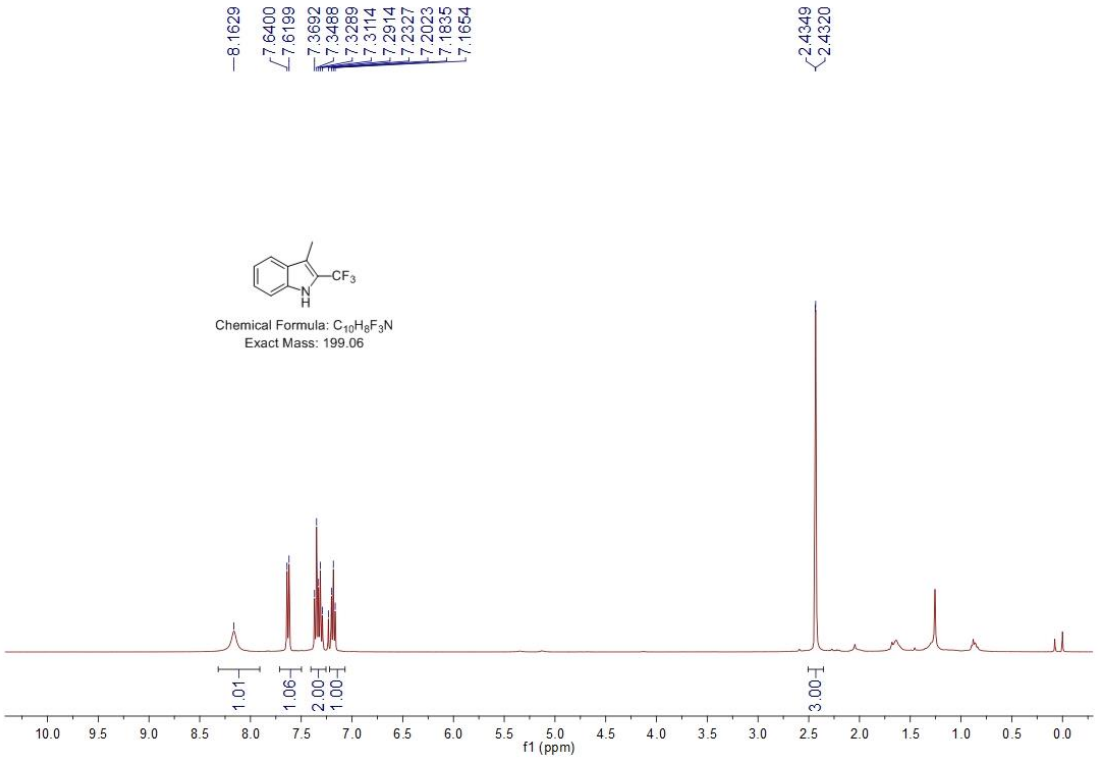


^{19}F NMR (376 MHz, $CDCl_3$)

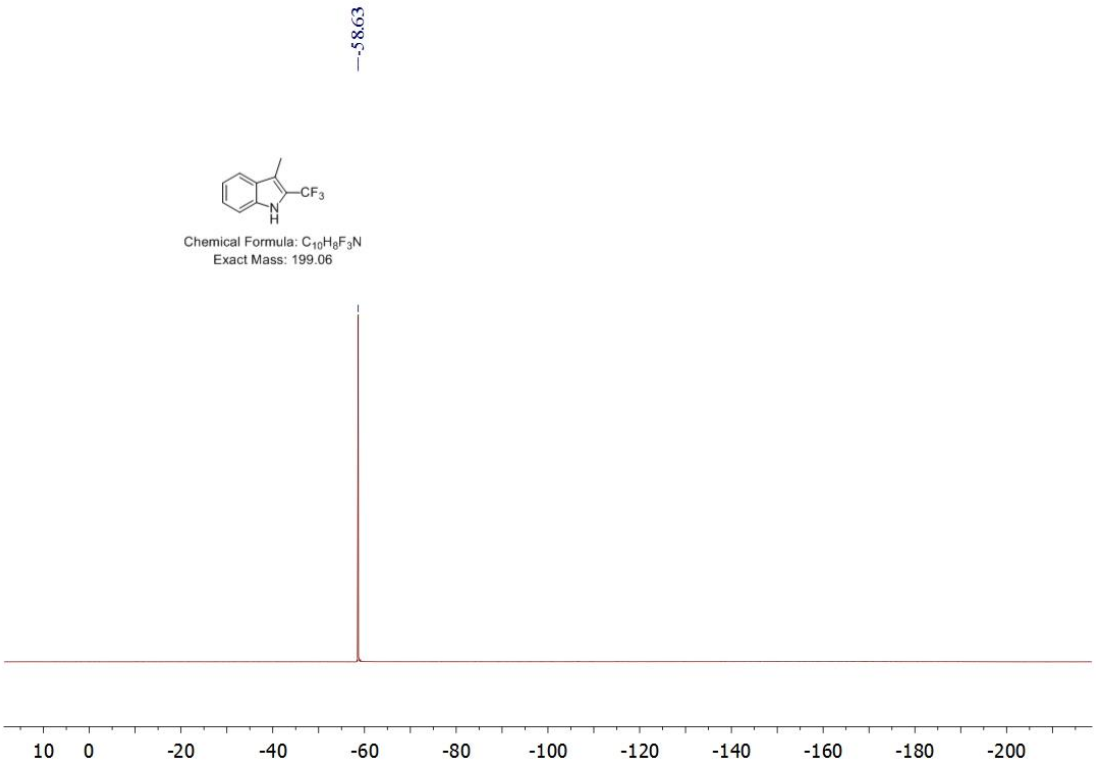


^{13}C NMR (126 MHz, $CDCl_3$)

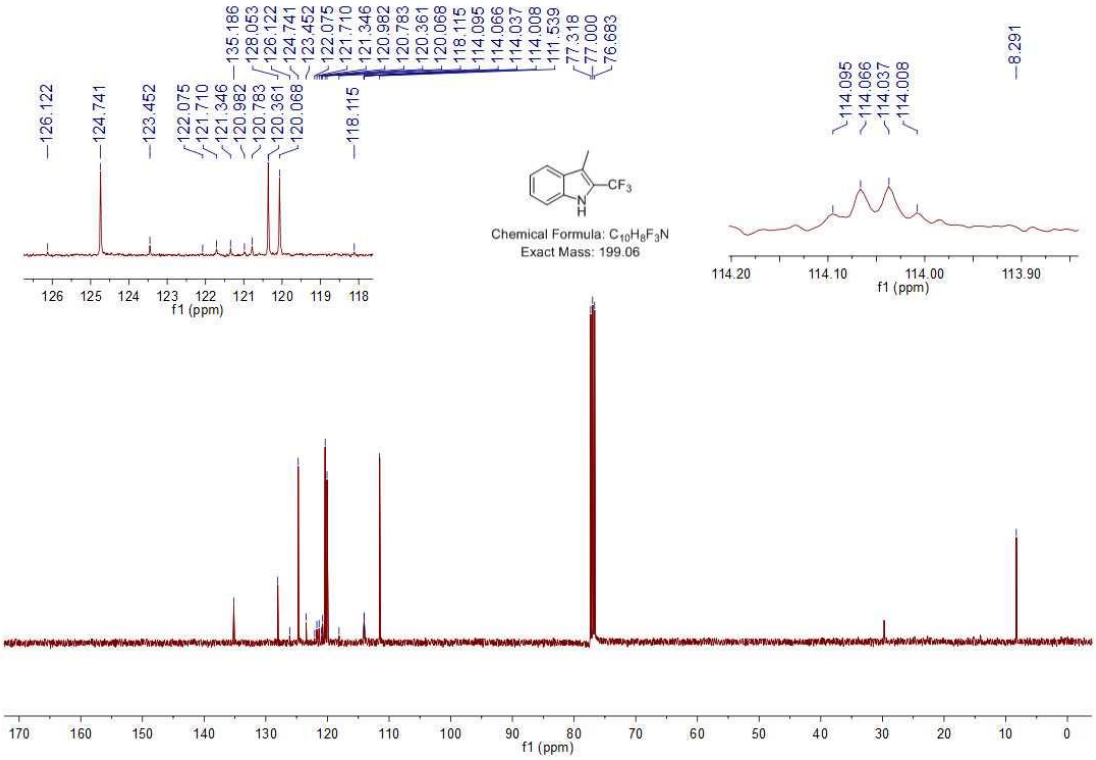
3-methyl-2-(trifluoromethyl)-*1H*-indole(2c)



^{1}H NMR (400 MHz, $CDCl_3$)

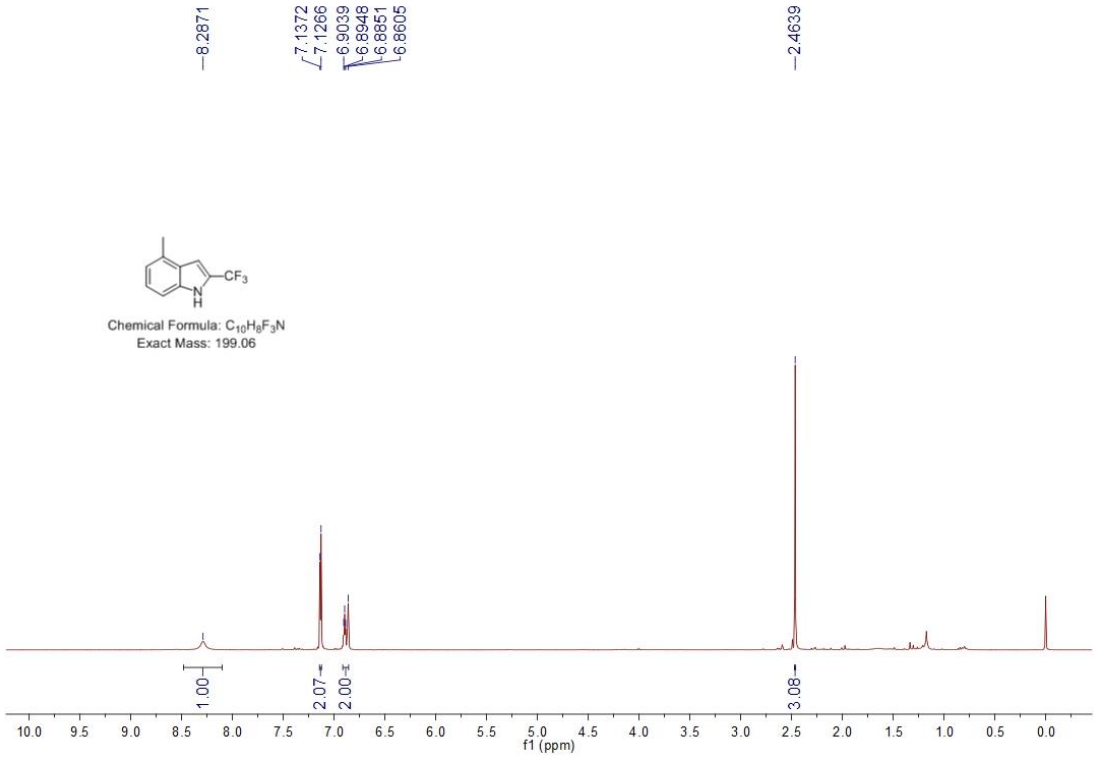


^{19}F NMR (376 MHz, $CDCI_3$)

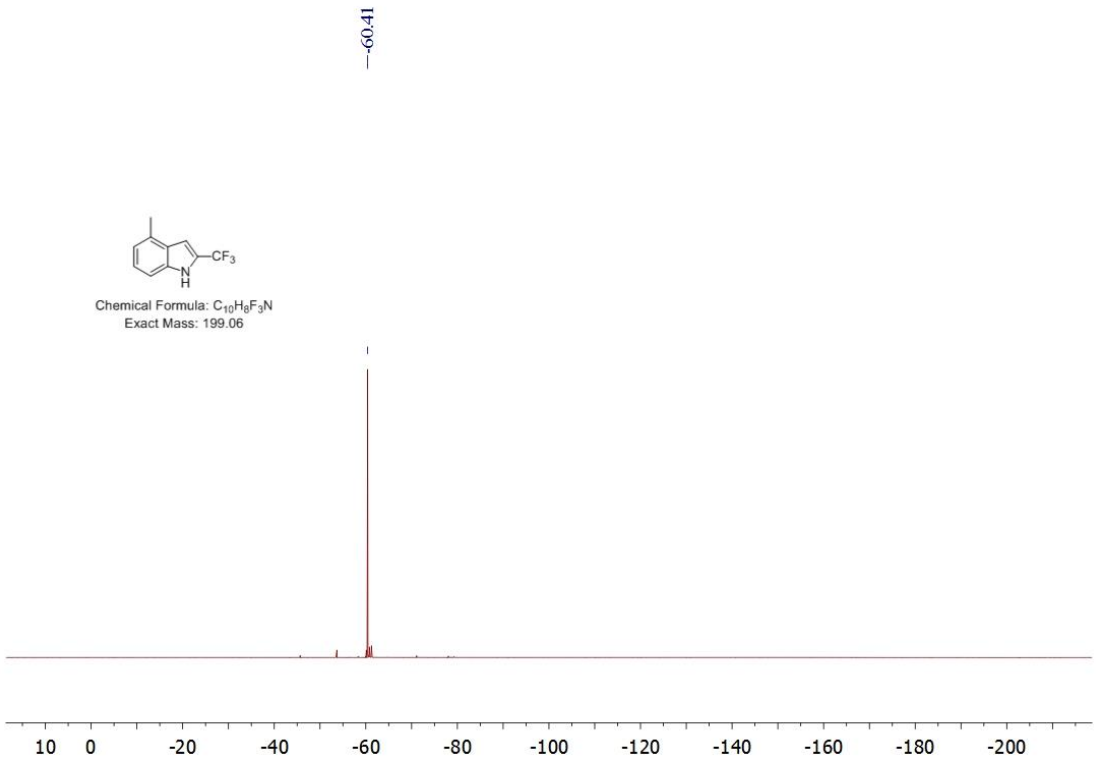


^{13}C NMR (101 MHz, $CDCl_3$)

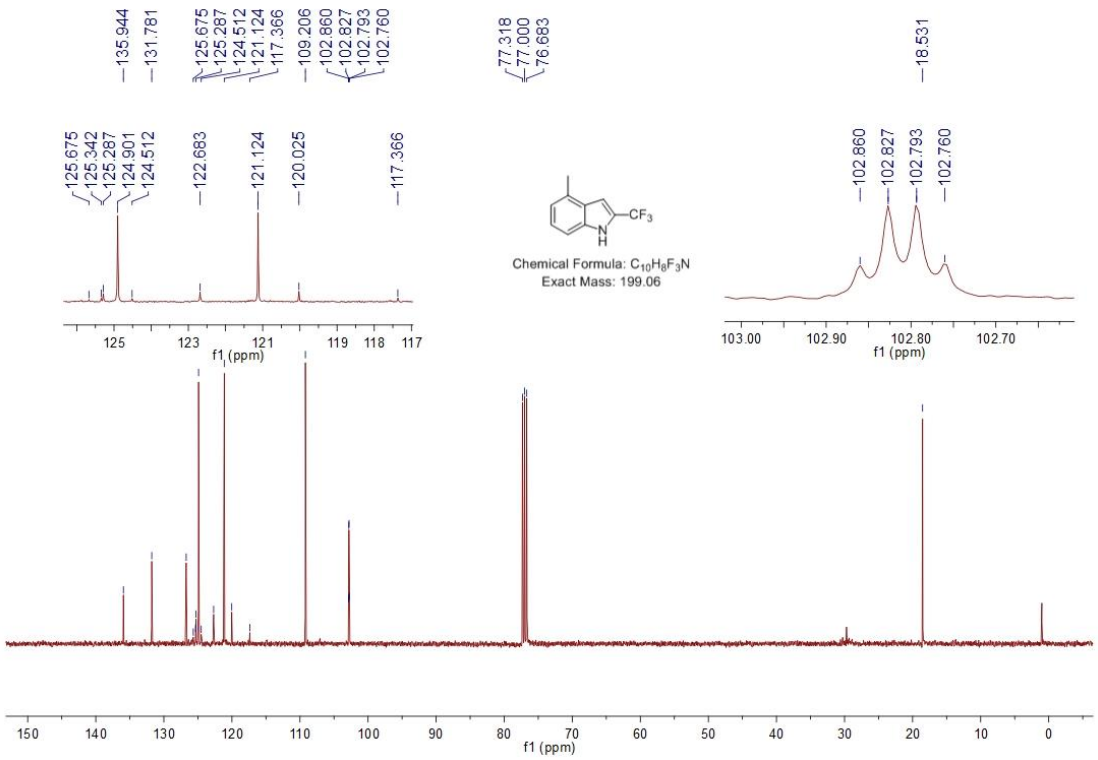
4-methyl-2-(trifluoromethyl)-*1H*-indole(2d)



^{1}H NMR (400 MHz, $CDCl_3$)

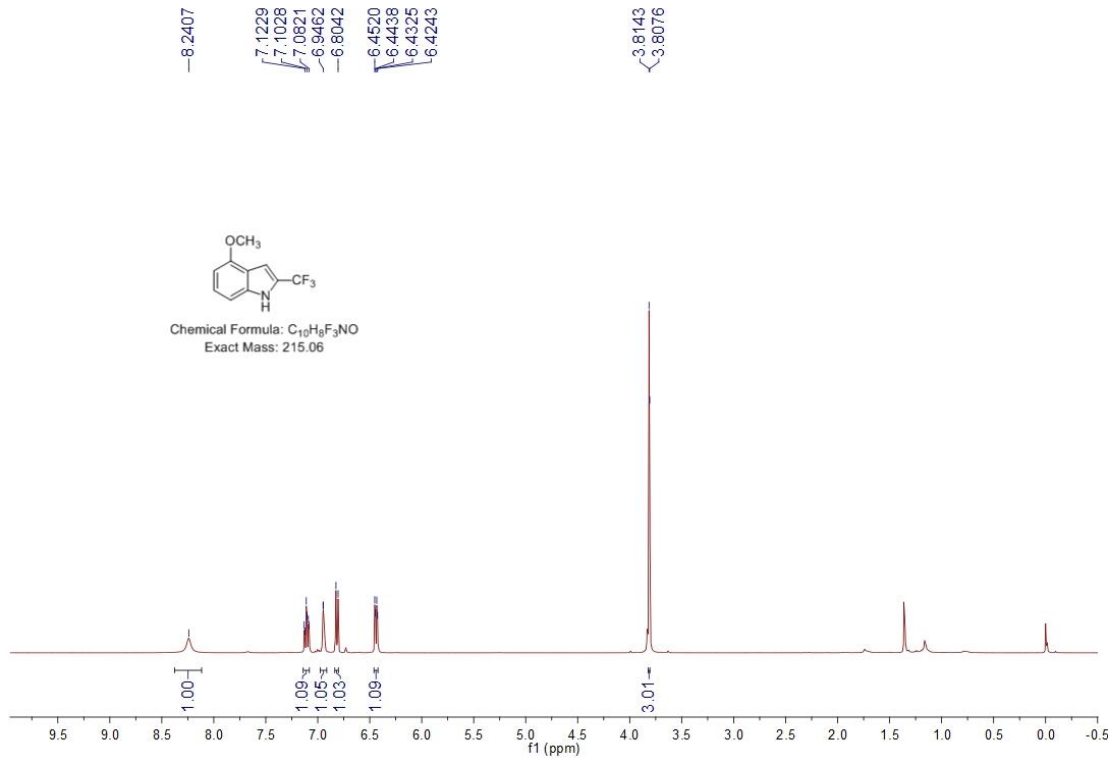


^{19}F NMR (376 MHz, $CDCl_3$)

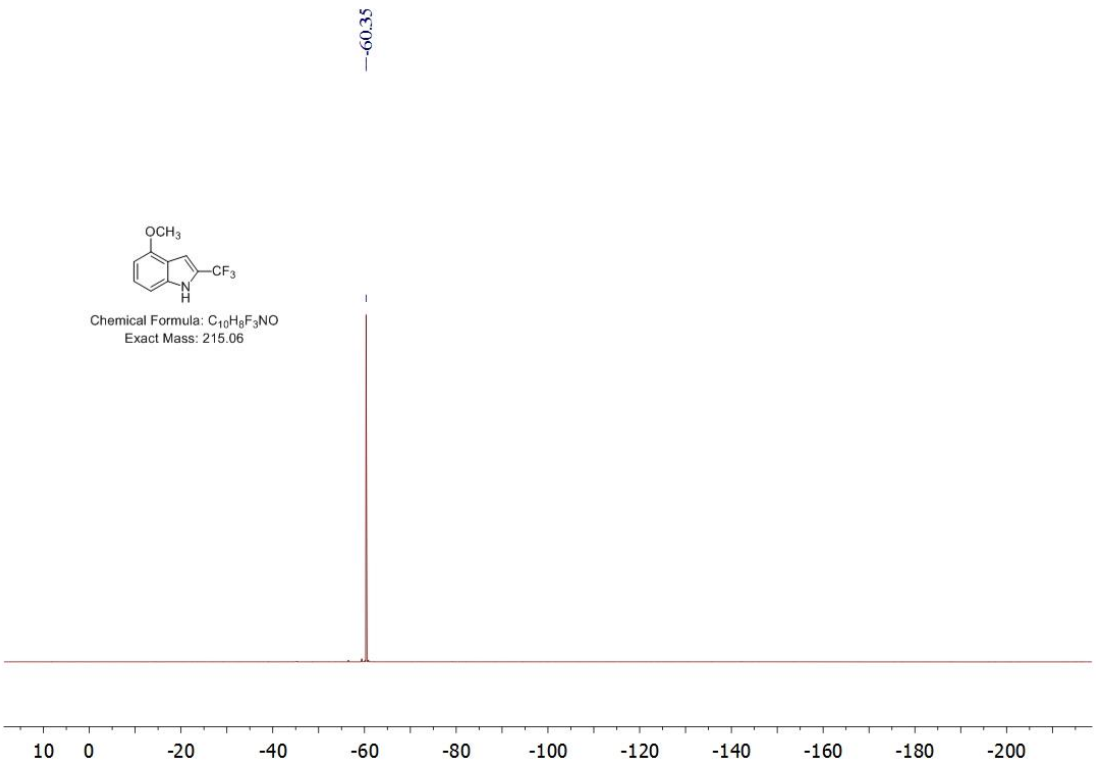


^{13}C NMR (101 MHz, $CDCl_3$)

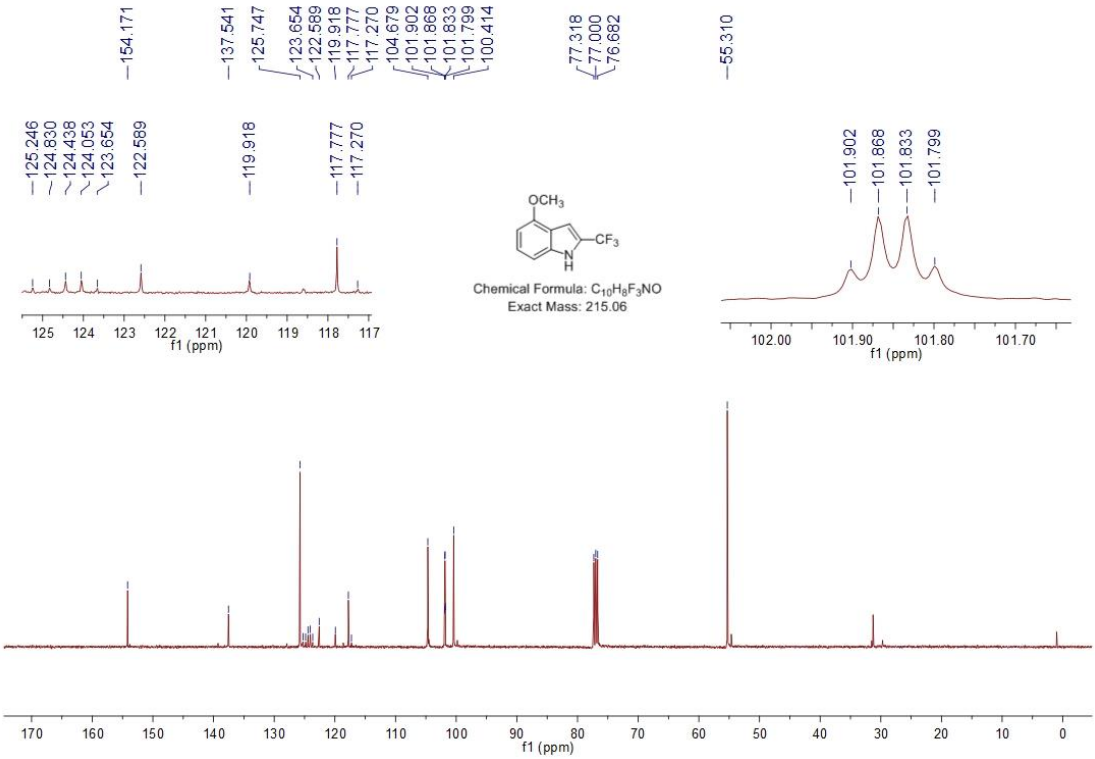
4-methoxy-2-(trifluoromethyl)-*1H*-indole(2e)



^{1}H NMR (400 MHz, $CDCl_3$)

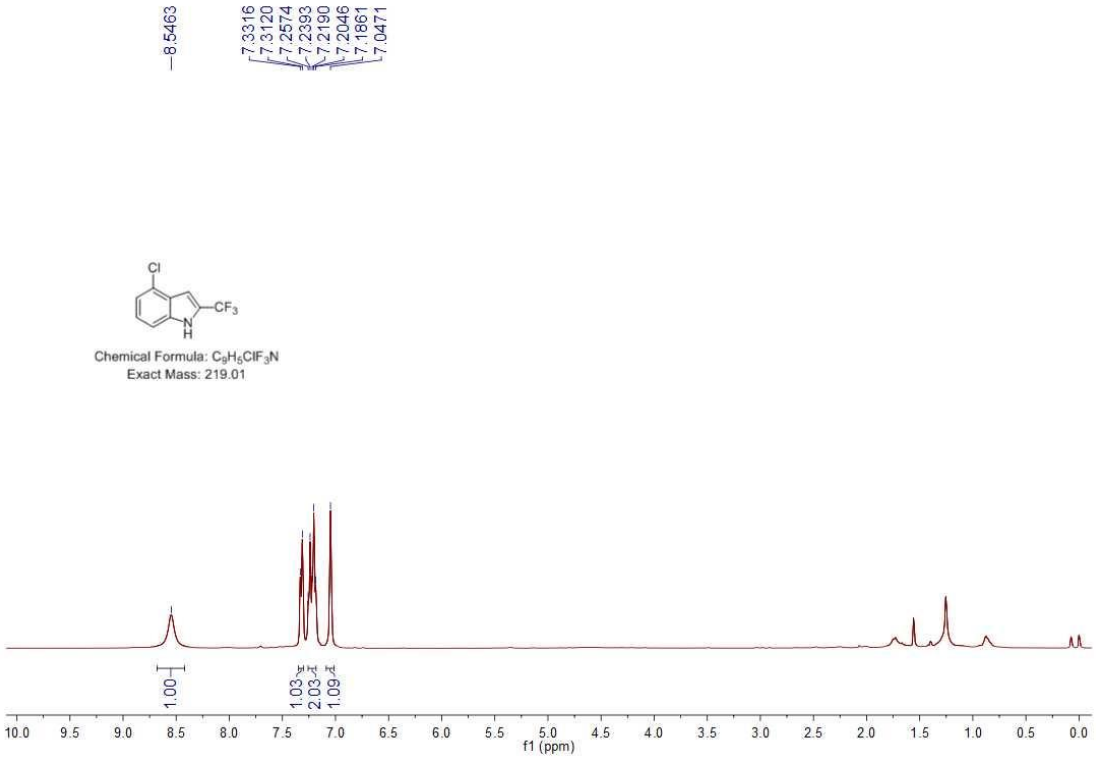


^{19}F NMR (376 MHz, $CDCl_3$)

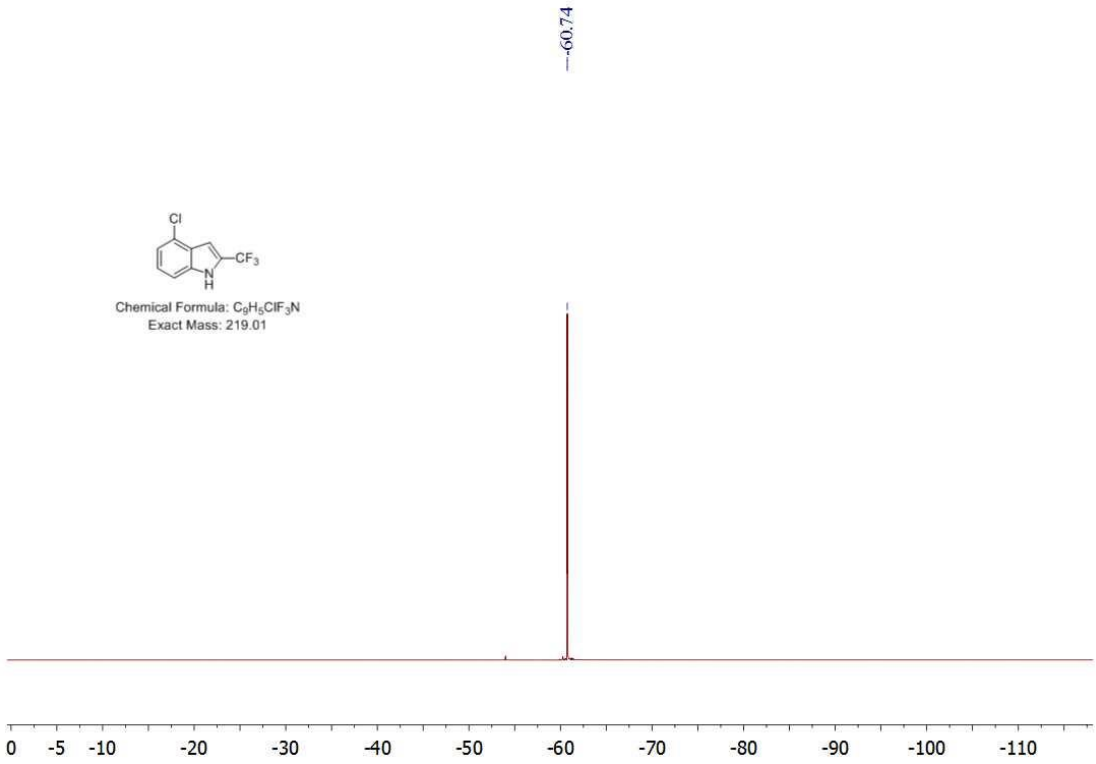


^{13}C NMR (101 MHz, $CDCl_3$)

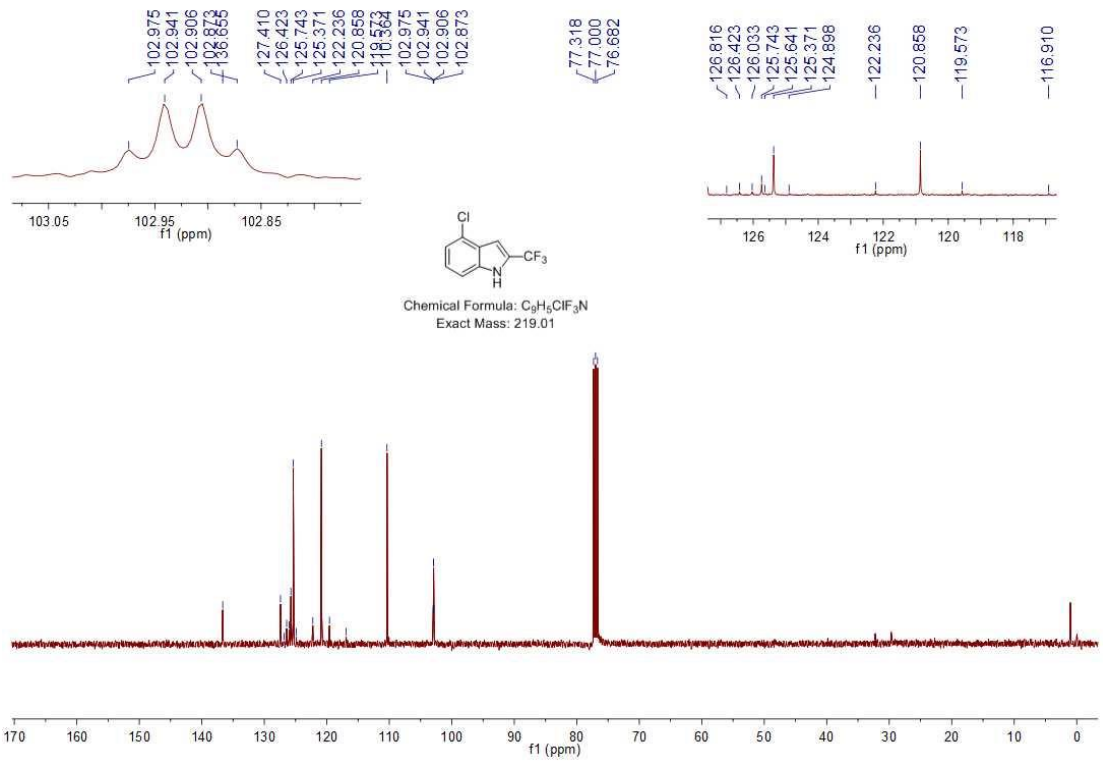
4-chloro-2-(trifluoromethyl)-*1H*-indole(2f)



^{1}H NMR (400 MHz, $CDCl_3$)

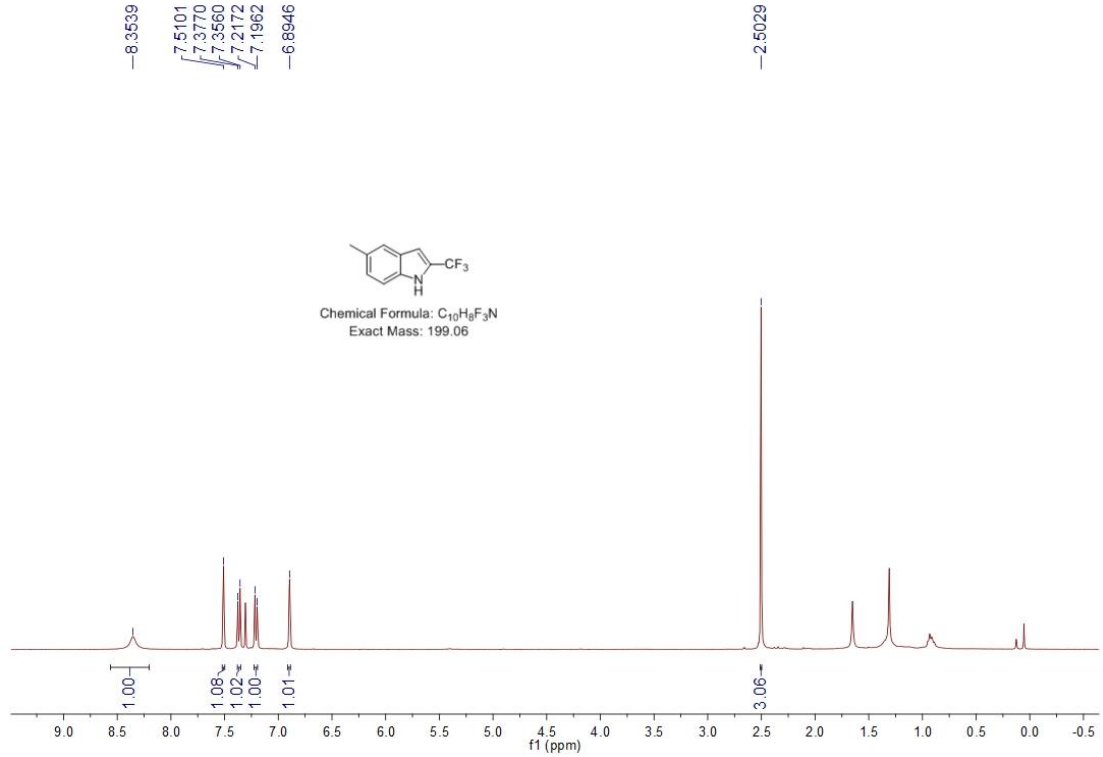


^{19}F NMR (376 MHz, $CDCl_3$)

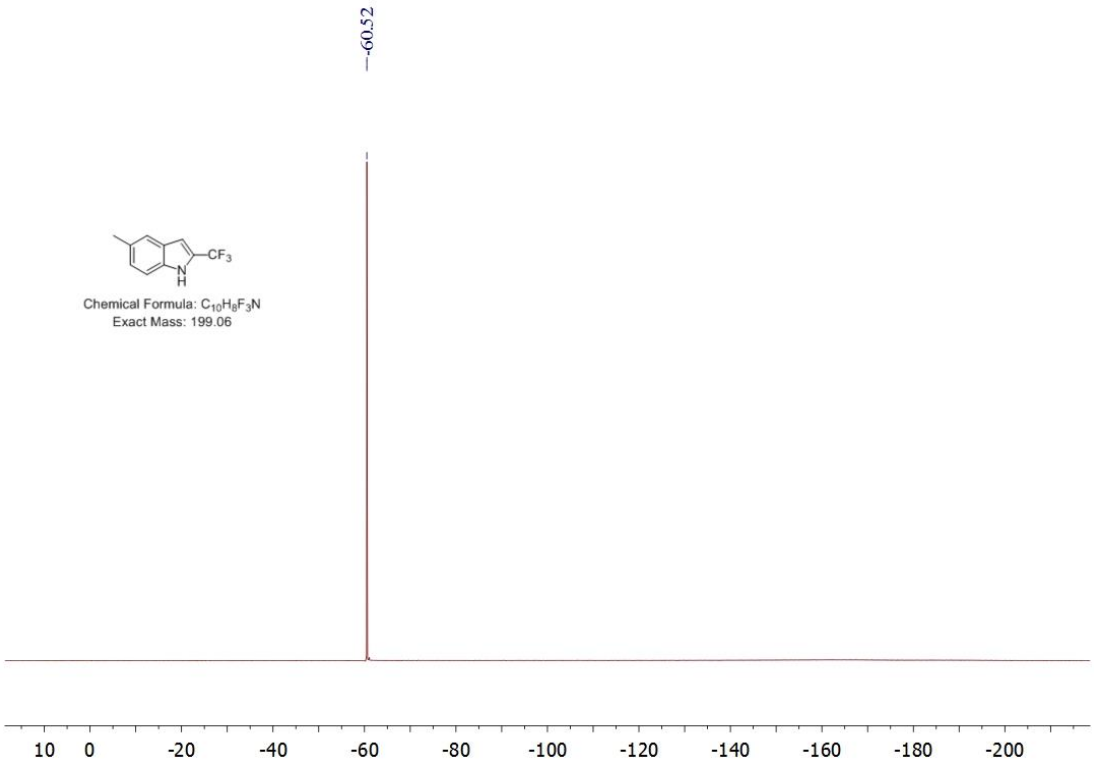


^{13}C NMR (101 MHz, $CDCl_3$)

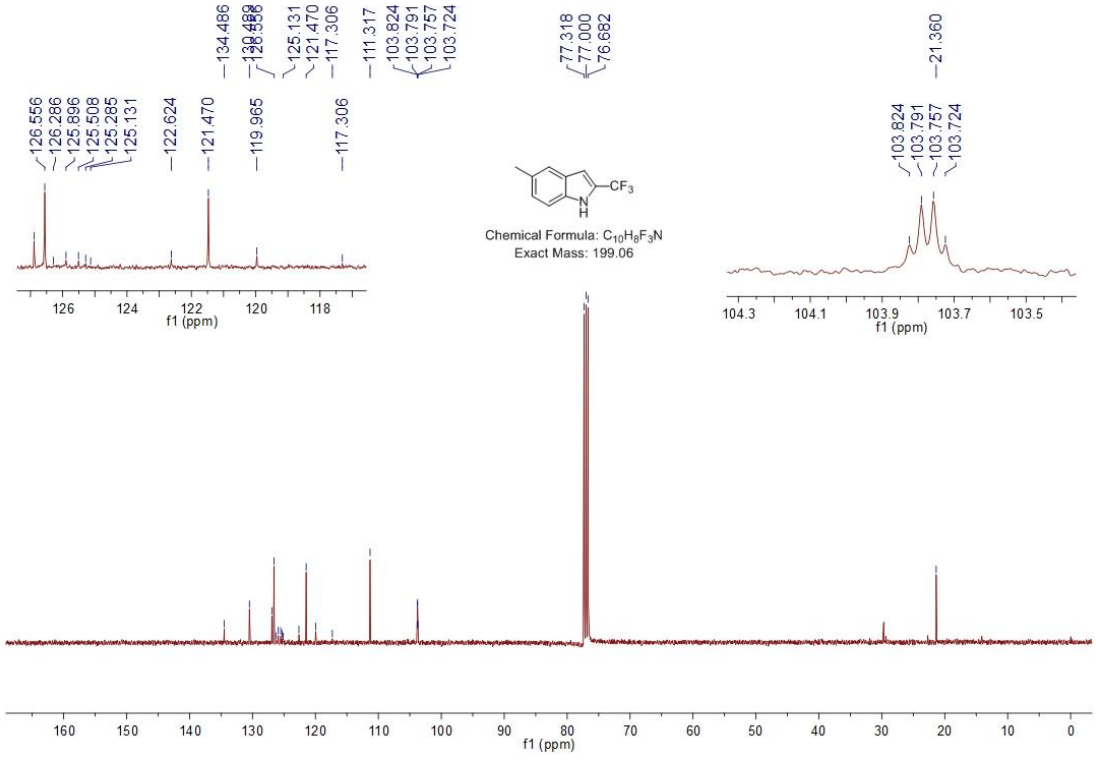
5-methyl-2-(trifluoromethyl)-*1H*-indole(2g)



^{1}H NMR (400 MHz, $CDCl_3$)

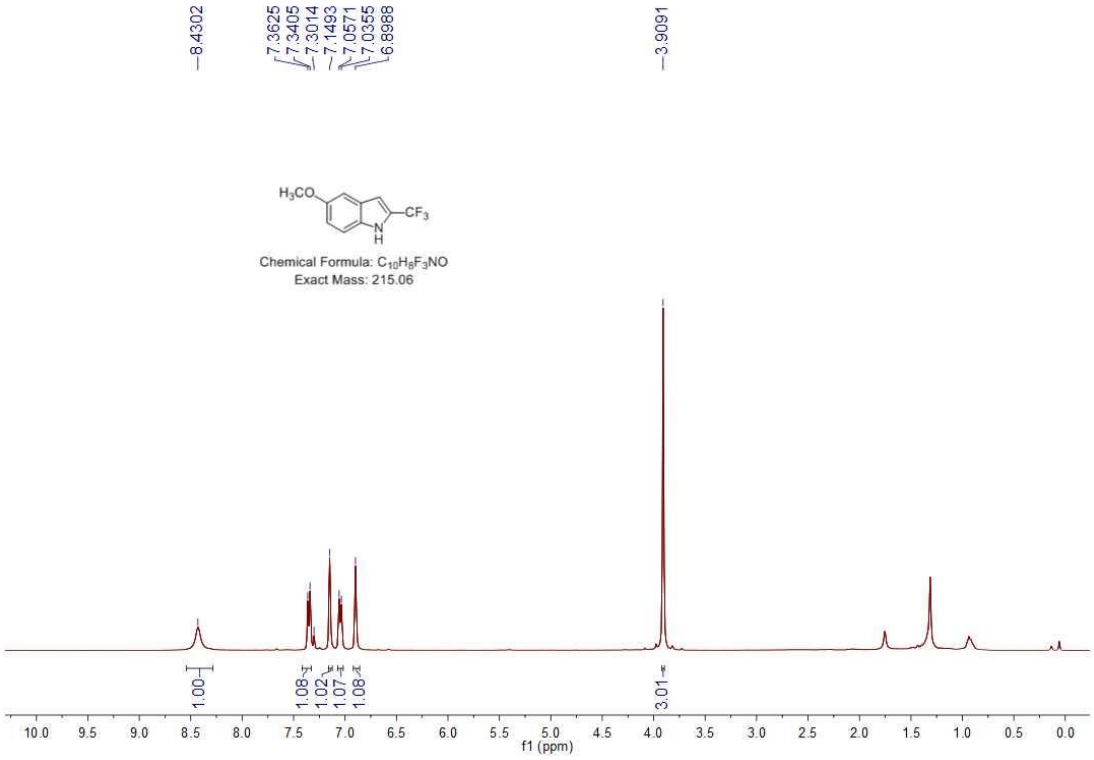


^{19}F NMR (376 MHz, $CDCl_3$)

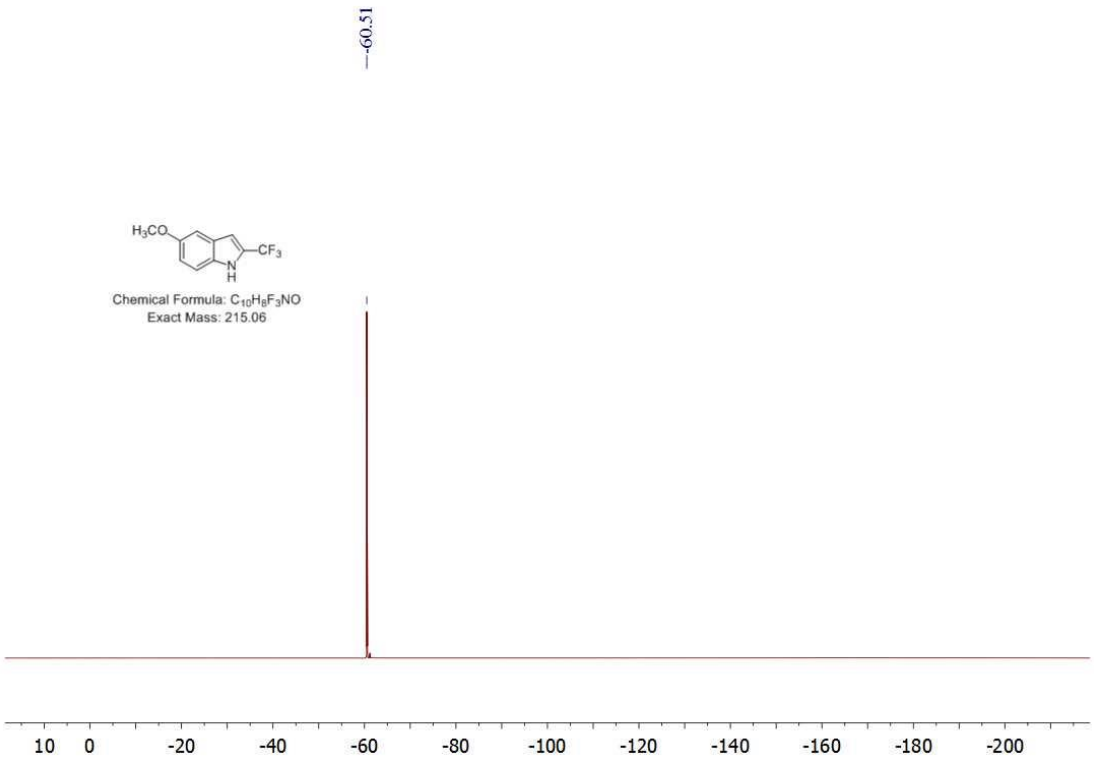


^{13}C NMR (101 MHz, $CDCl_3$)

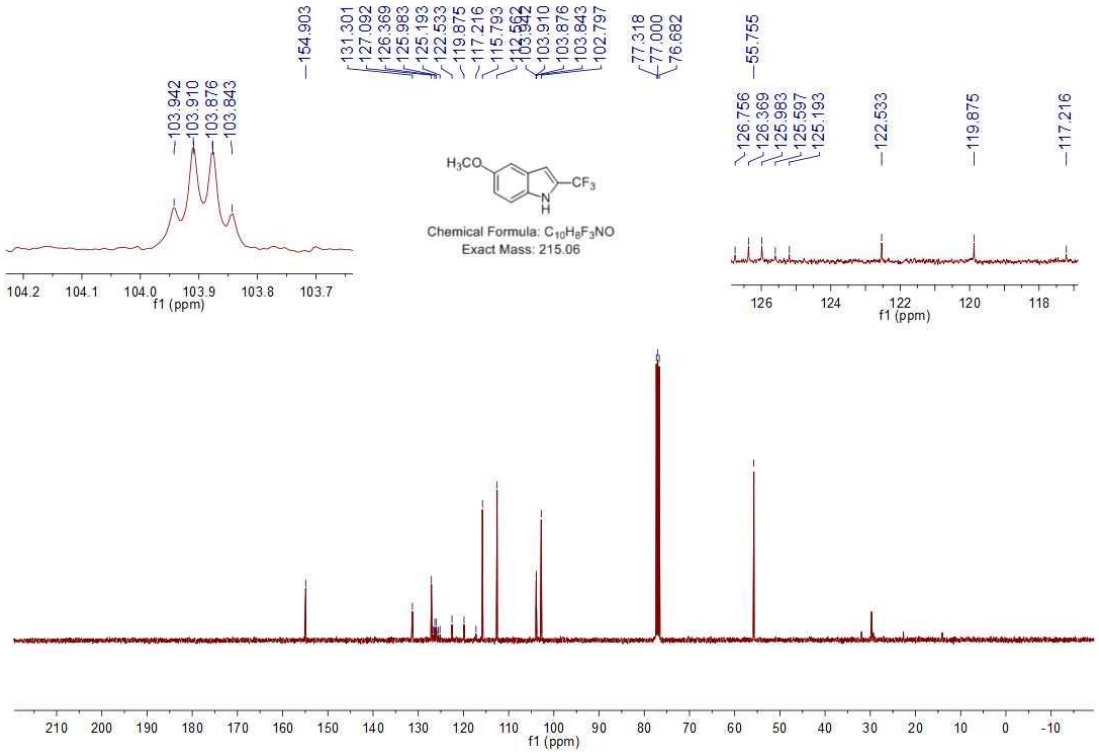
5-methoxy-2-(trifluoromethyl)-*1H*-indole(2h)



^{1}H NMR (400 MHz, $CDCl_3$)

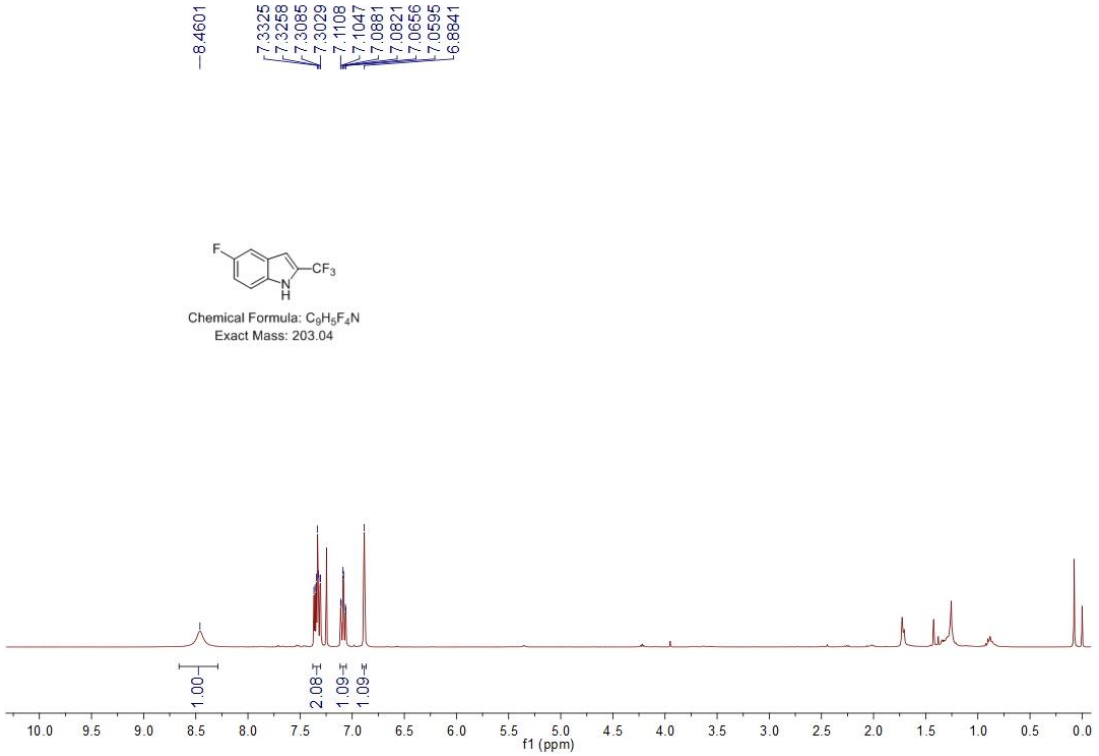


^{19}F NMR (376 MHz, $CDCl_3$)

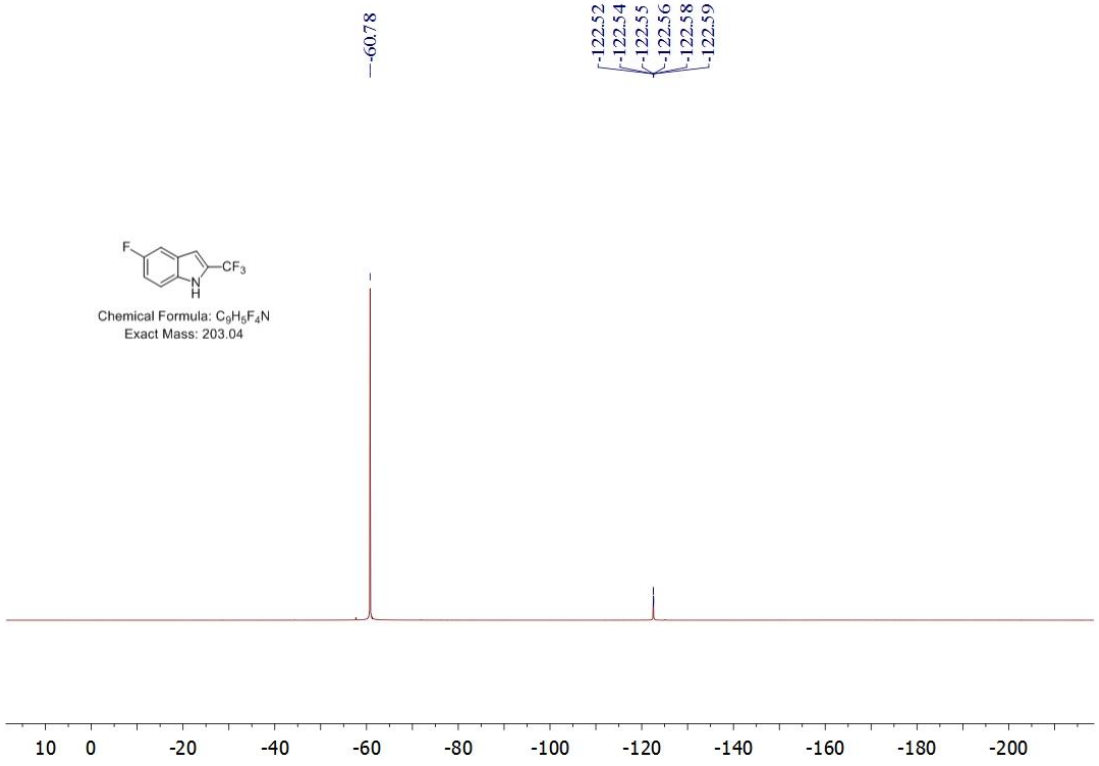


^{13}C NMR (101 MHz, $CDCl_3$)

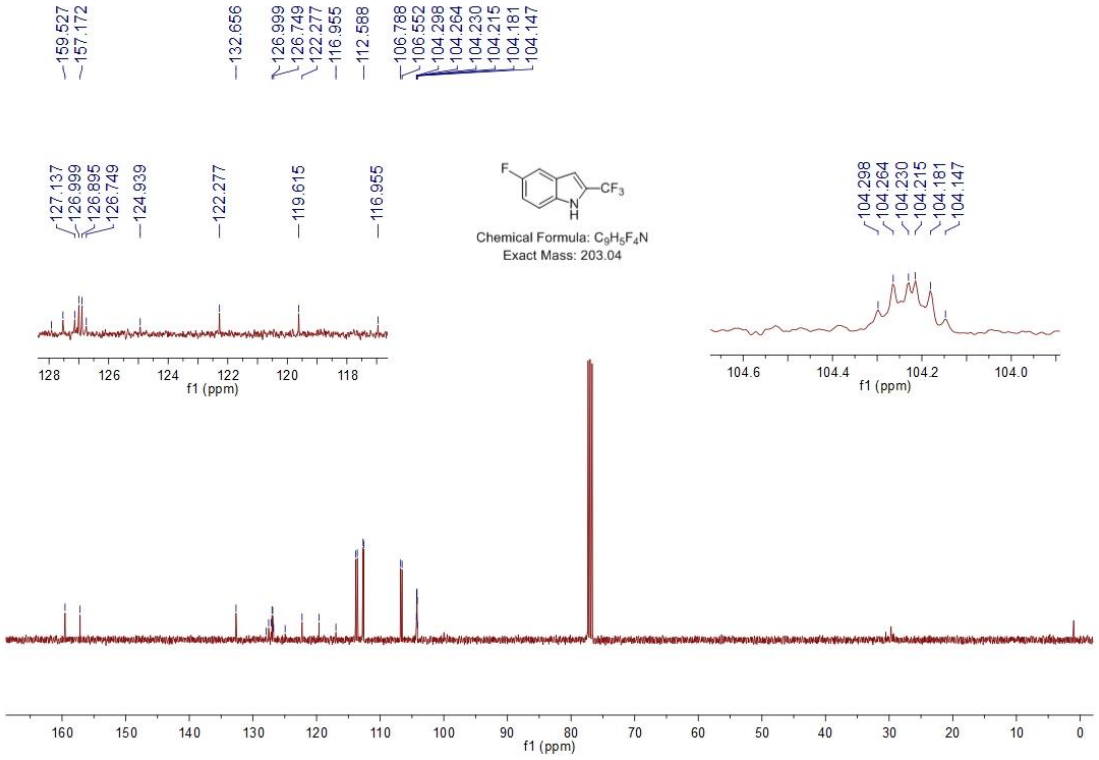
5-fluoro-2-(trifluoromethyl)-*1H*-indole(2i)



^{1}H NMR (400 MHz, $CDCl_3$)

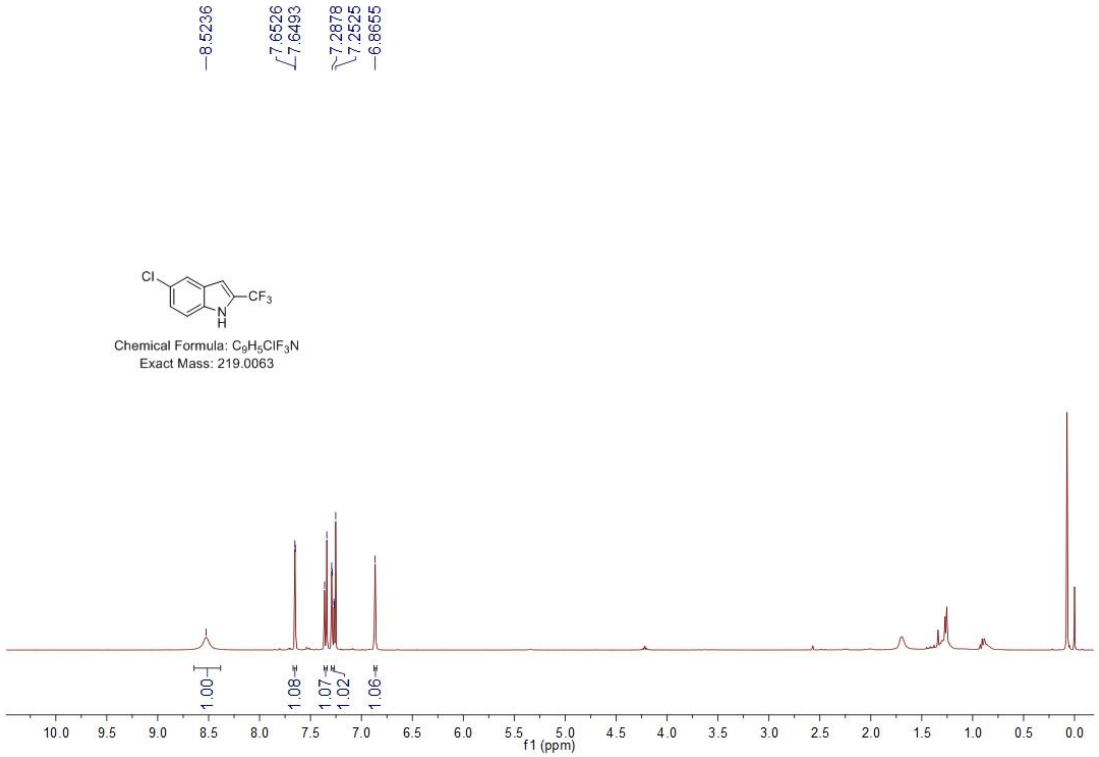


^{19}F NMR (376 MHz, $CDCl_3$)

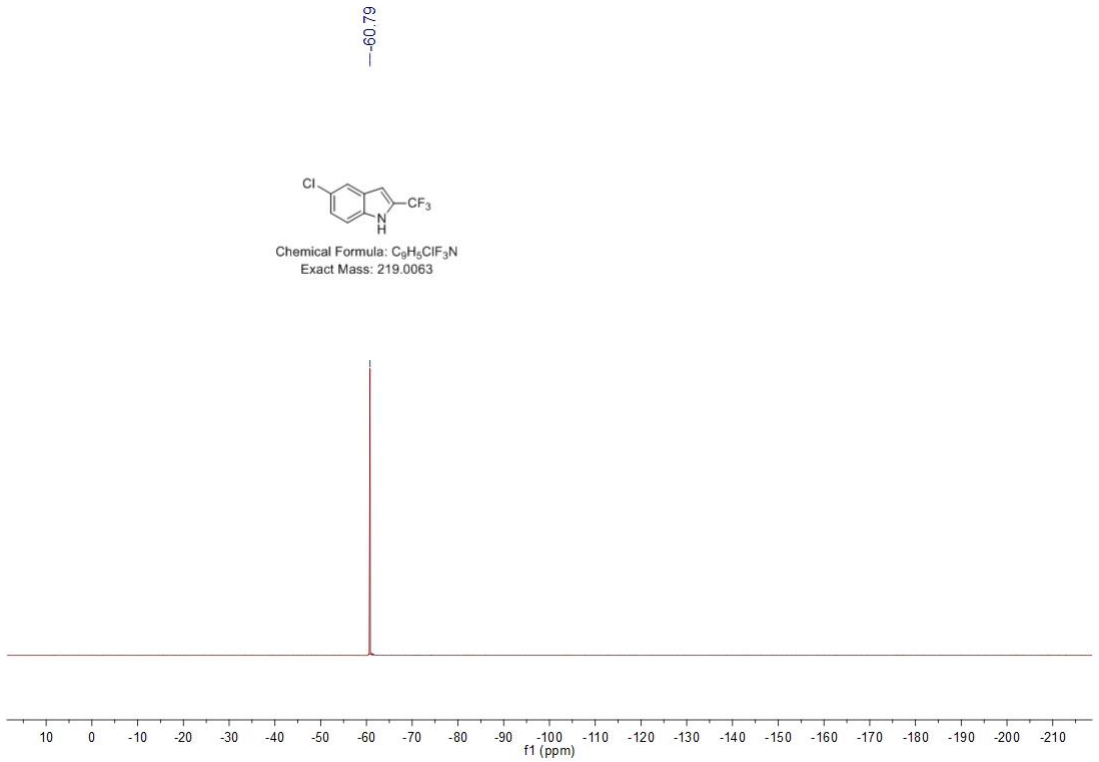


^{13}C NMR (101 MHz, $CDCl_3$)

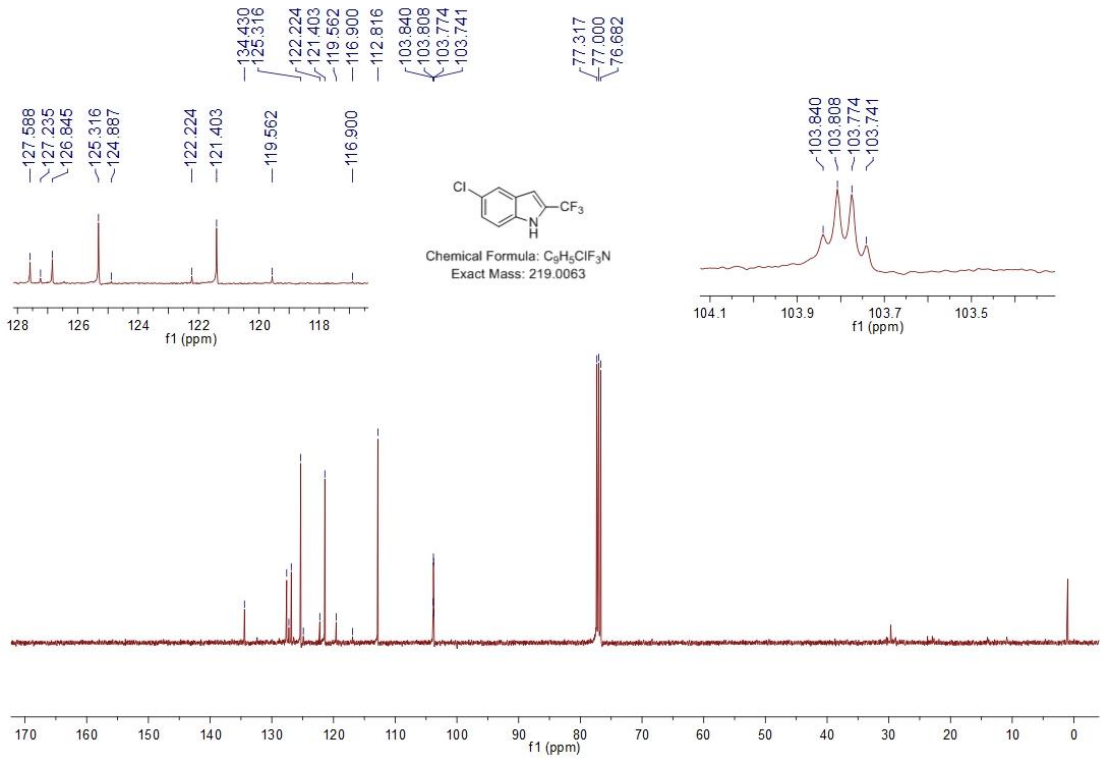
5-chloro-2-(trifluoromethyl)-*1H*-indole(2j)



^{1}H NMR (400 MHz, $CDCl_3$)

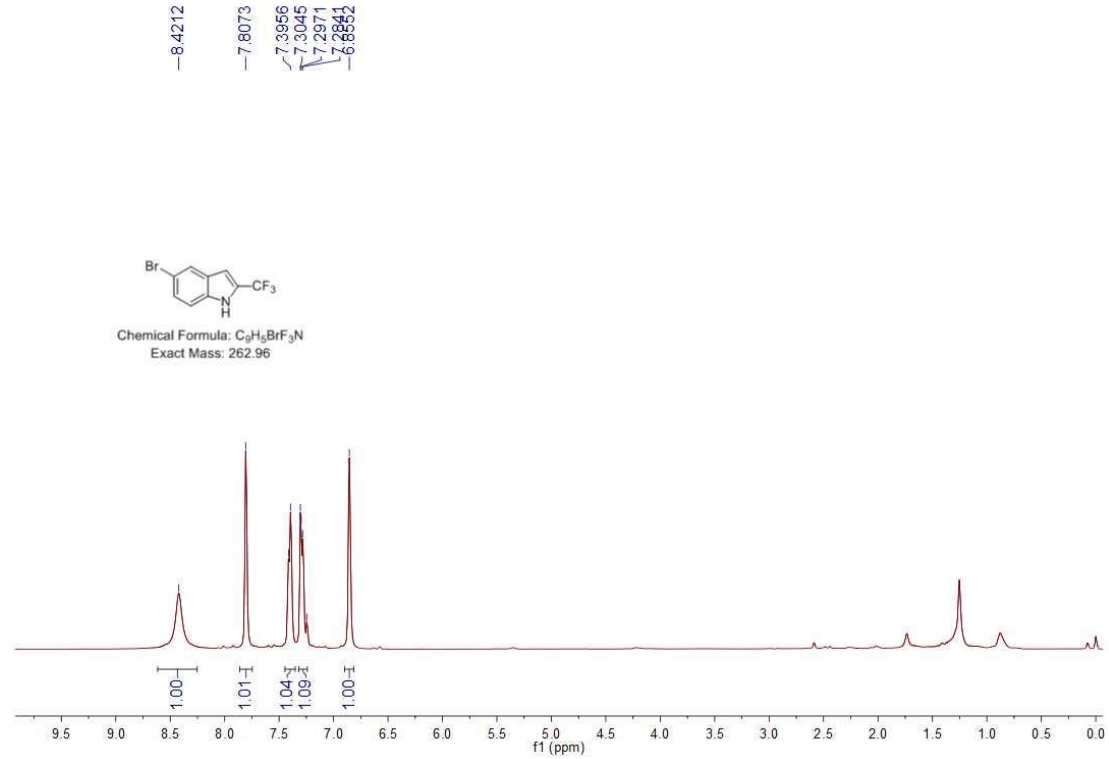


^{19}F NMR (376 MHz, $CDCl_3$)

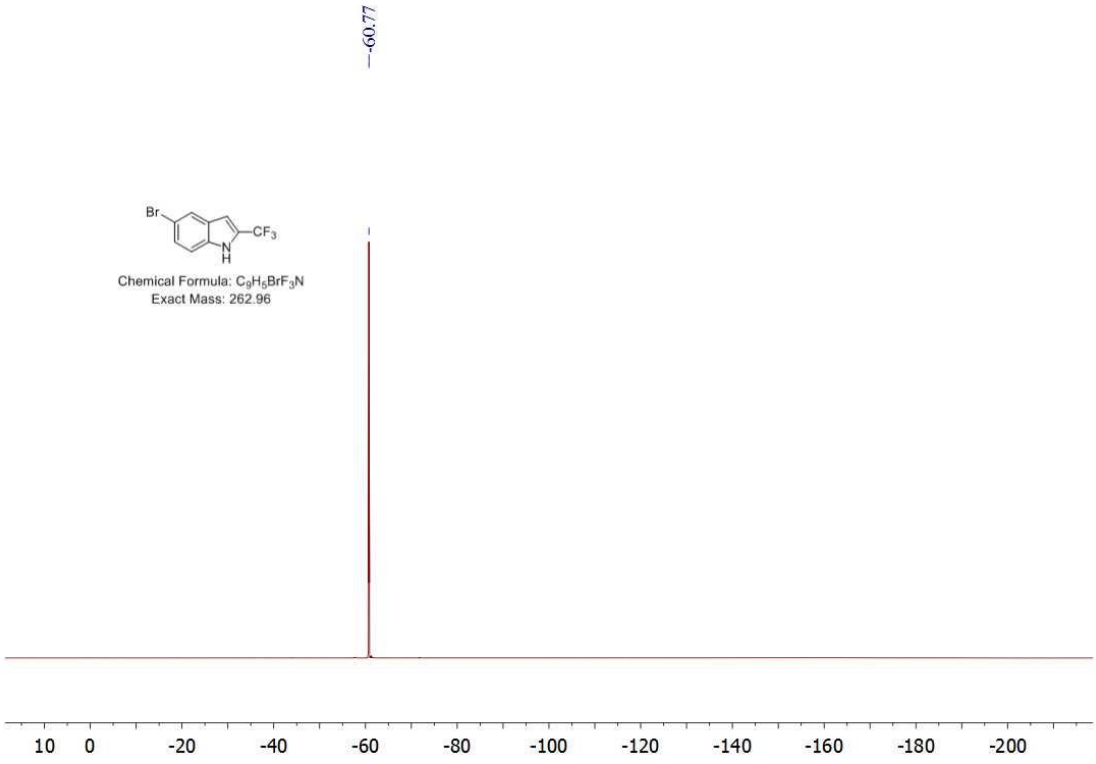


^{13}C NMR (101 MHz, $CDCl_3$)

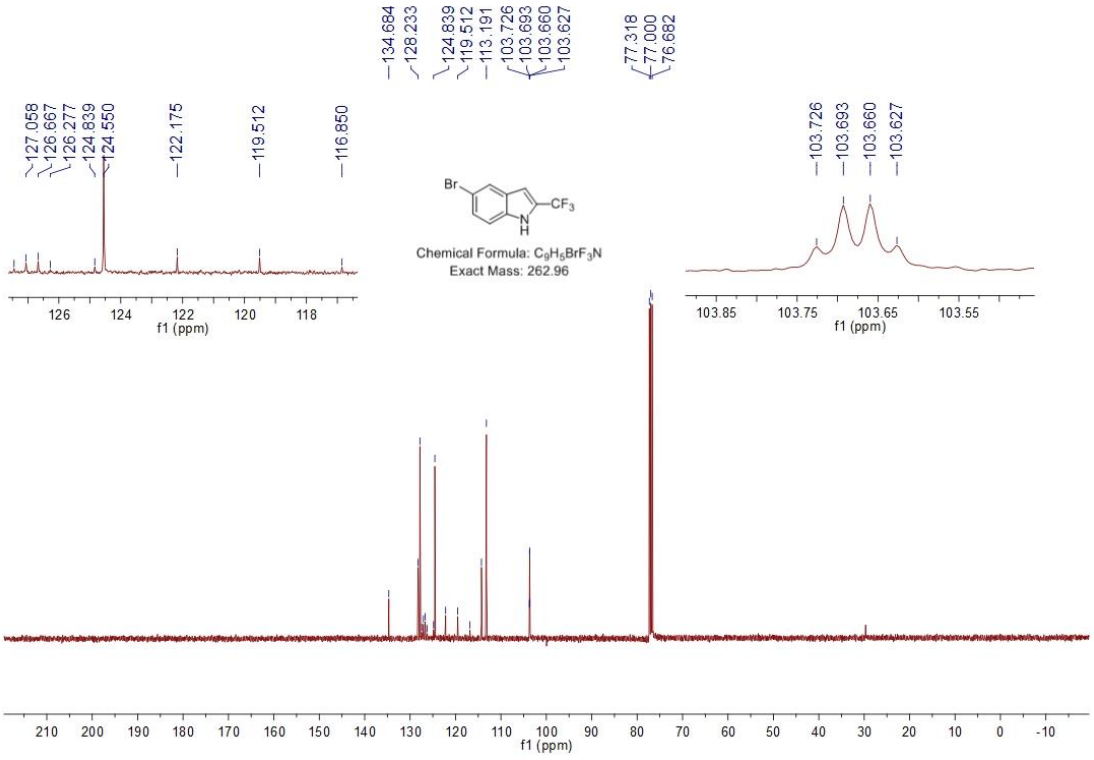
5-bromo-2-(trifluoromethyl)-*1H*-indole(2k)



^{1}H NMR (400 MHz, $CDCl_3$)

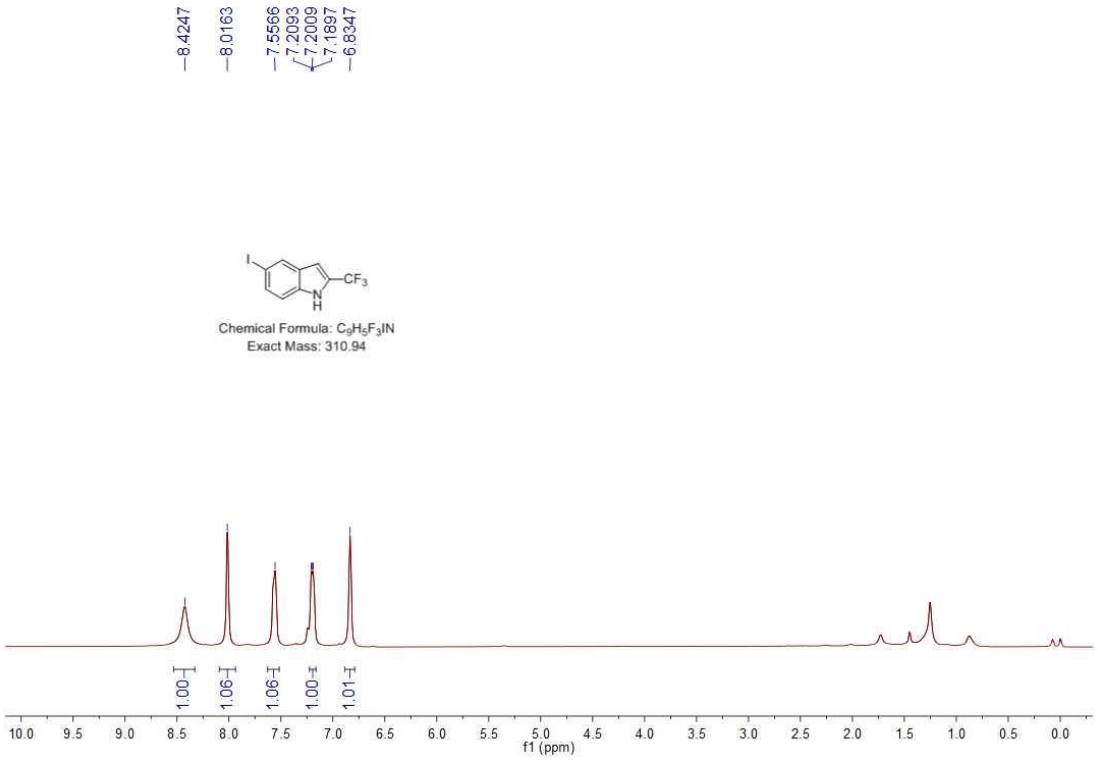


^{19}F NMR (376 MHz, $CDCl_3$)

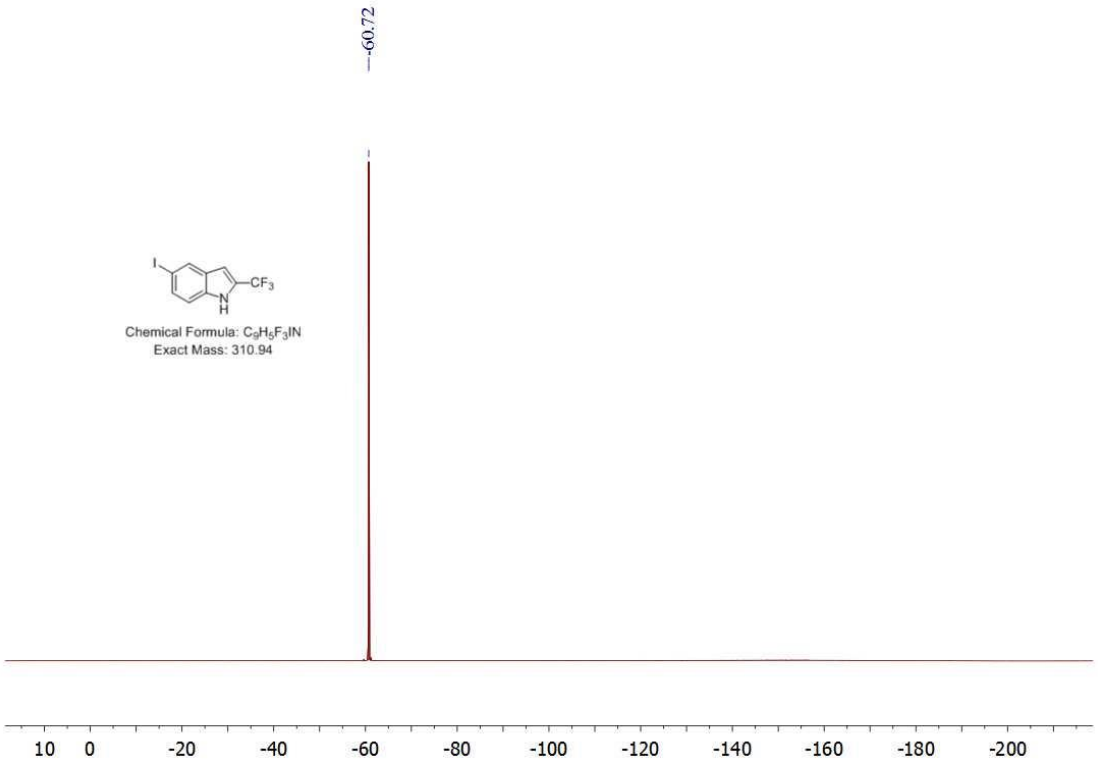


^{13}C NMR (101 MHz, $CDCl_3$)

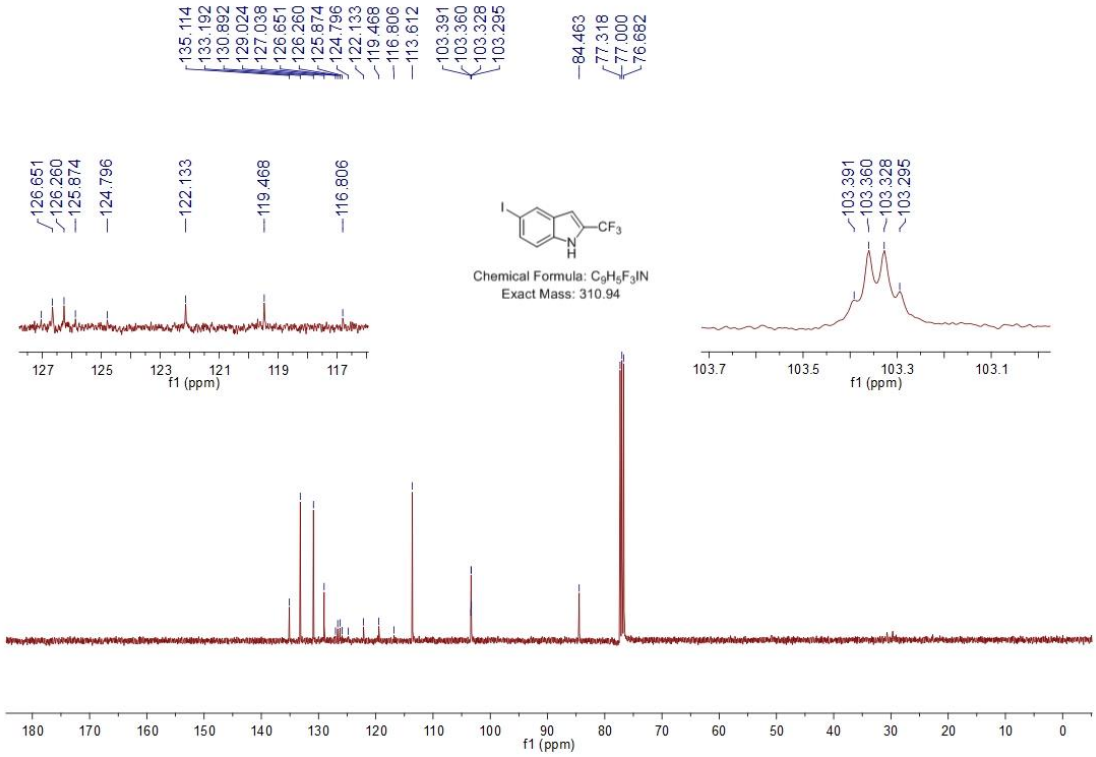
5-iodo-2-(trifluoromethyl)-*1H*-indole (2l)



^{1}H NMR (400 MHz, $CDCl_3$)

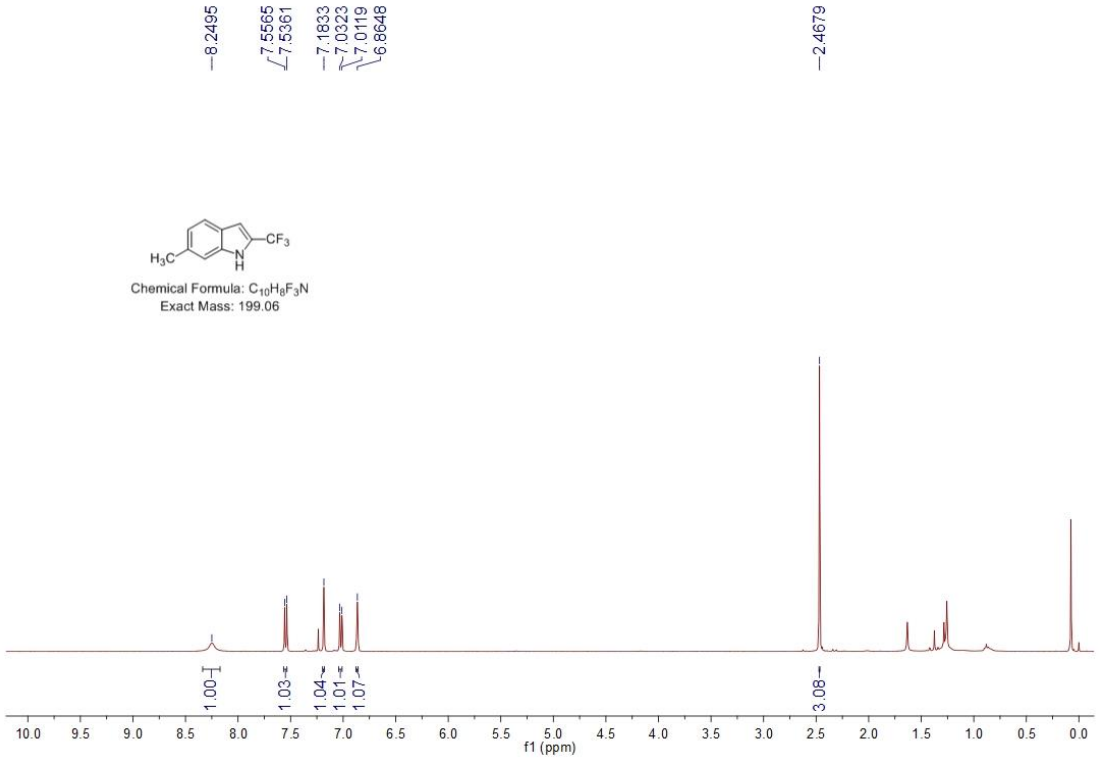


^{19}F NMR (376 MHz, $CDCl_3$)

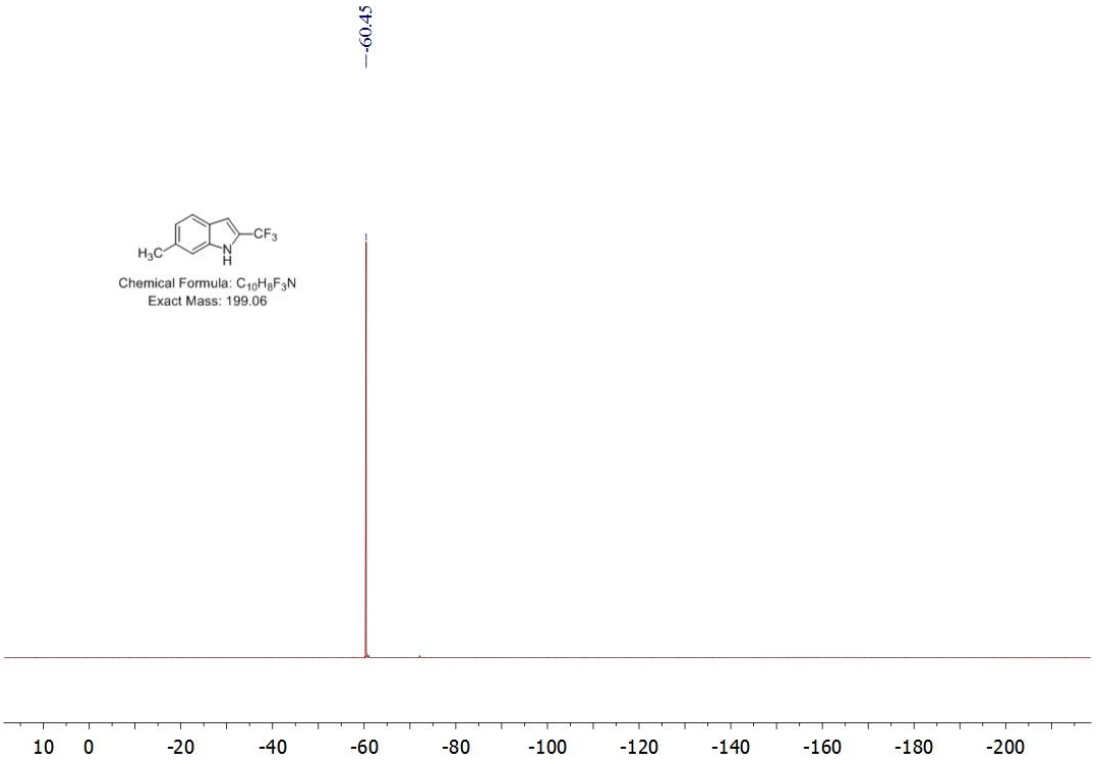


^{13}C NMR (101 MHz, $CDCl_3$)

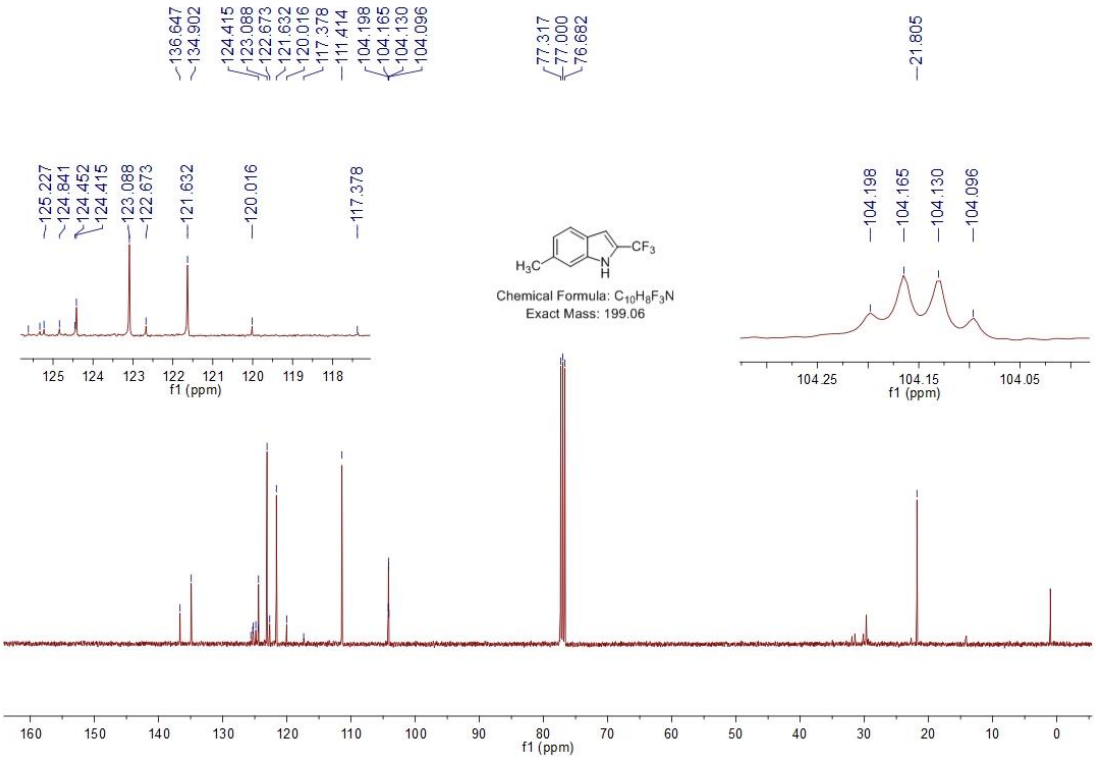
6-methyl-2-(trifluoromethyl)-*1H*-indole(2m)



^{1}H NMR (400 MHz, $CDCl_3$)

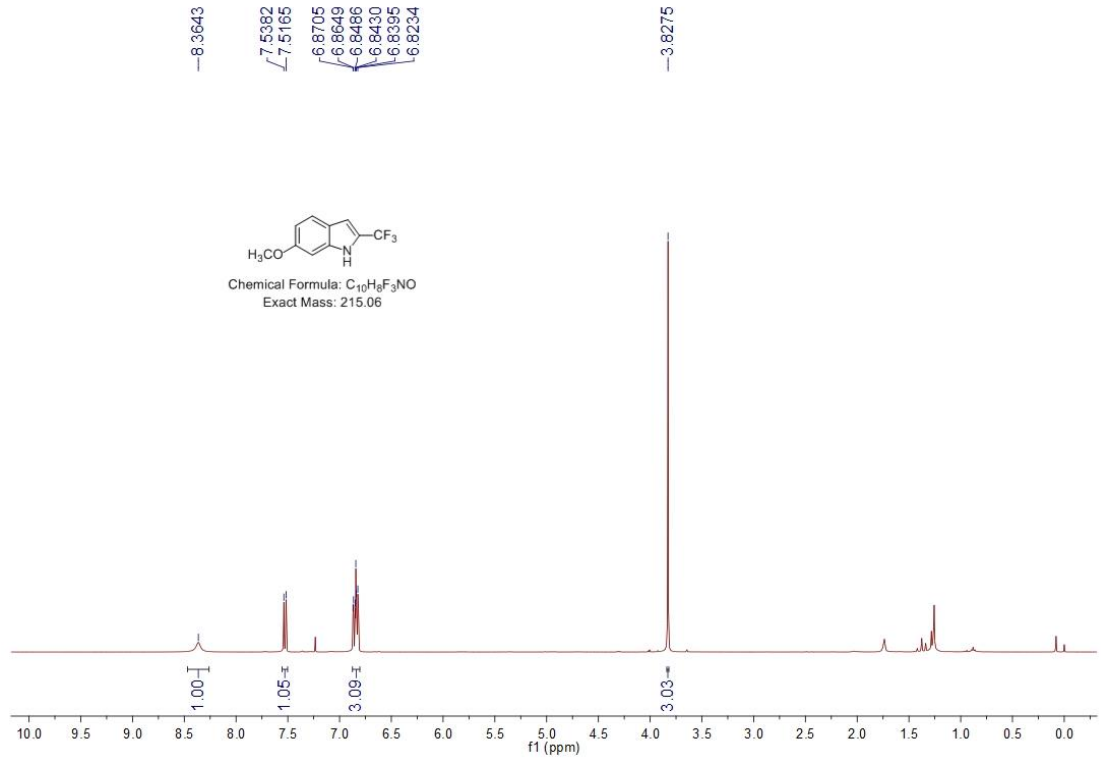


^{19}F NMR (376 MHz, $CDCl_3$)

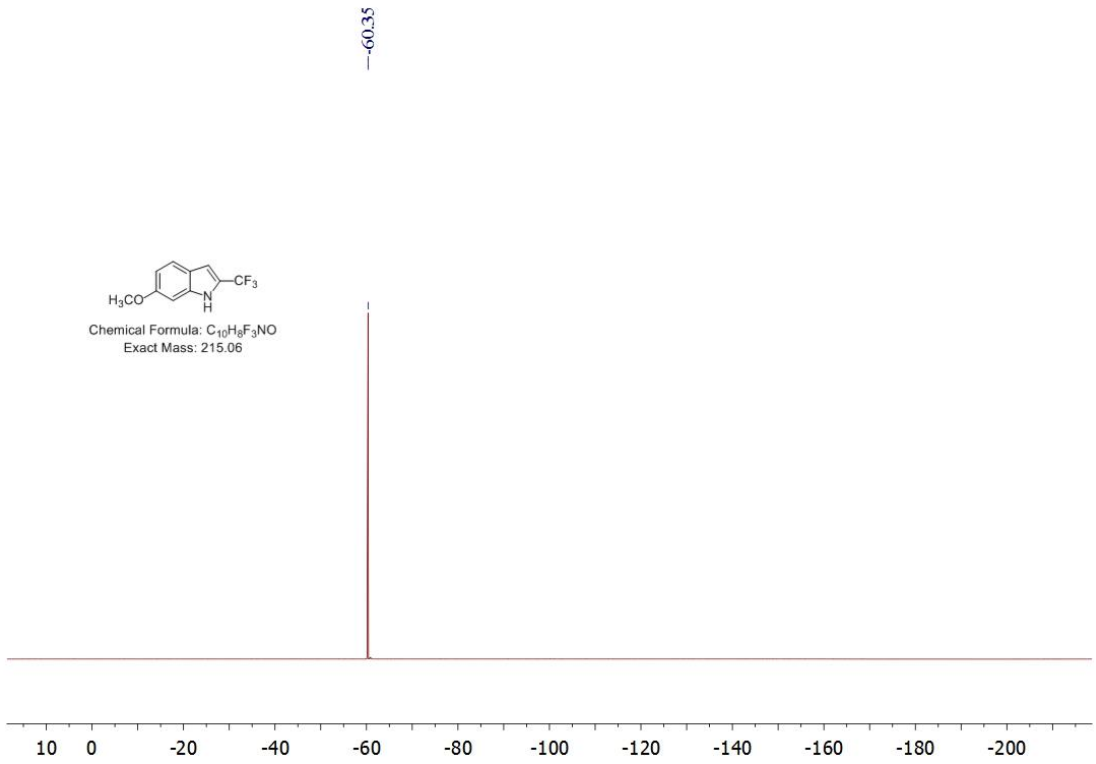


^{13}C NMR (101 MHz, $CDCl_3$)

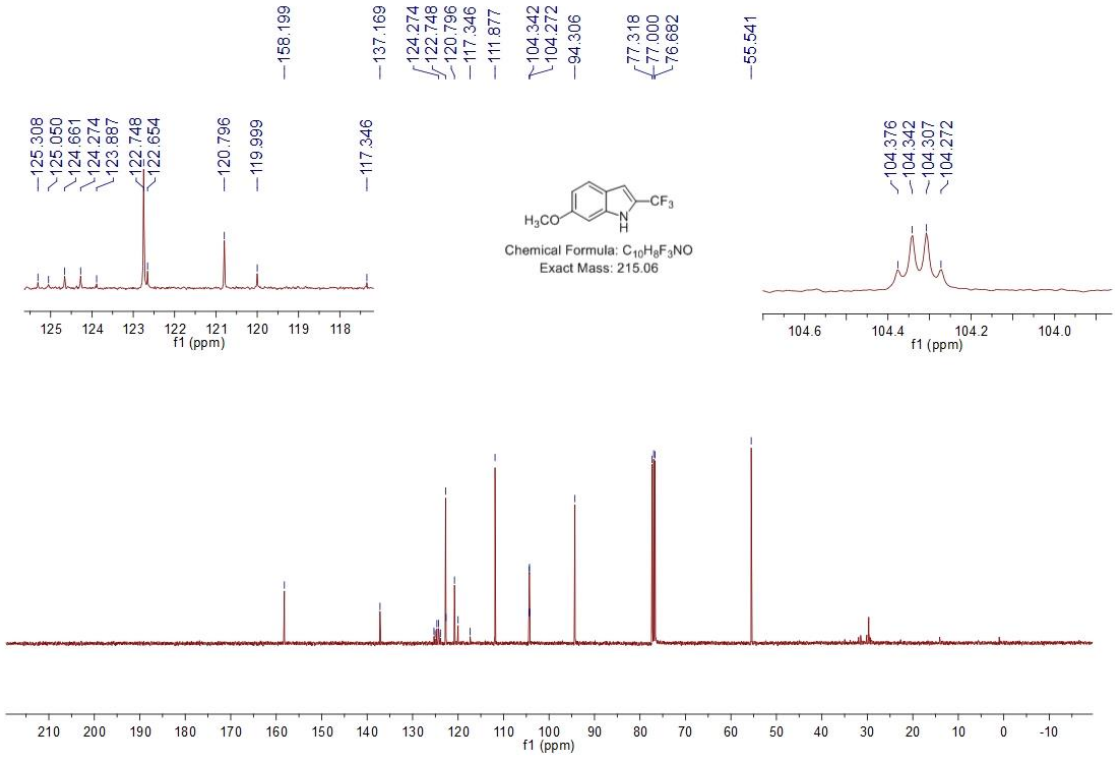
6-methoxy-2-(trifluoromethyl)-*1H*-indole(2n)



^{1}H NMR (400 MHz, $CDCl_3$)

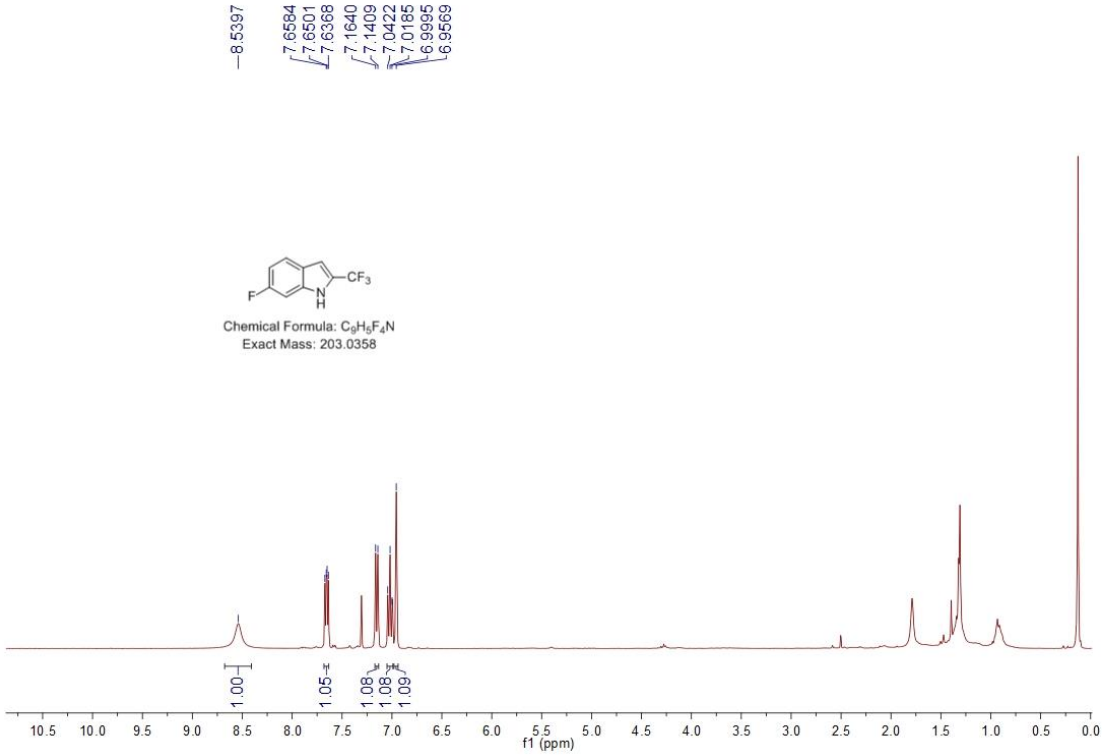


^{19}F NMR (376 MHz, $CDCl_3$)

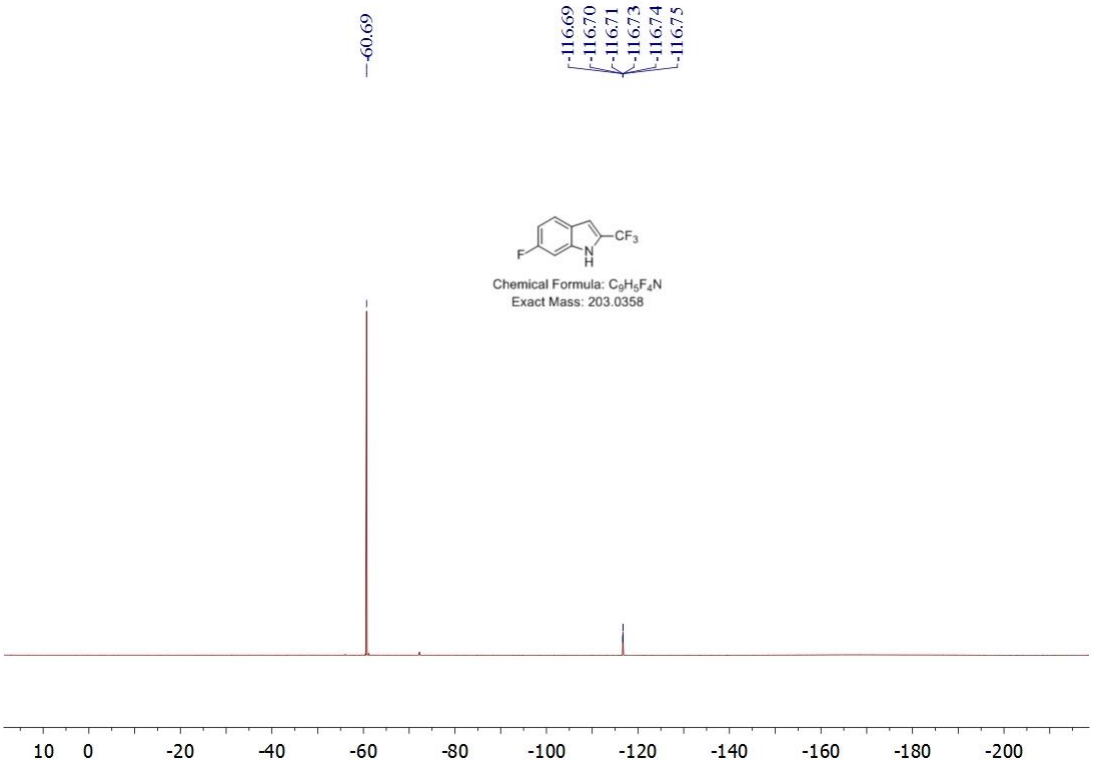


^{13}C NMR (101 MHz, $CDCl_3$)

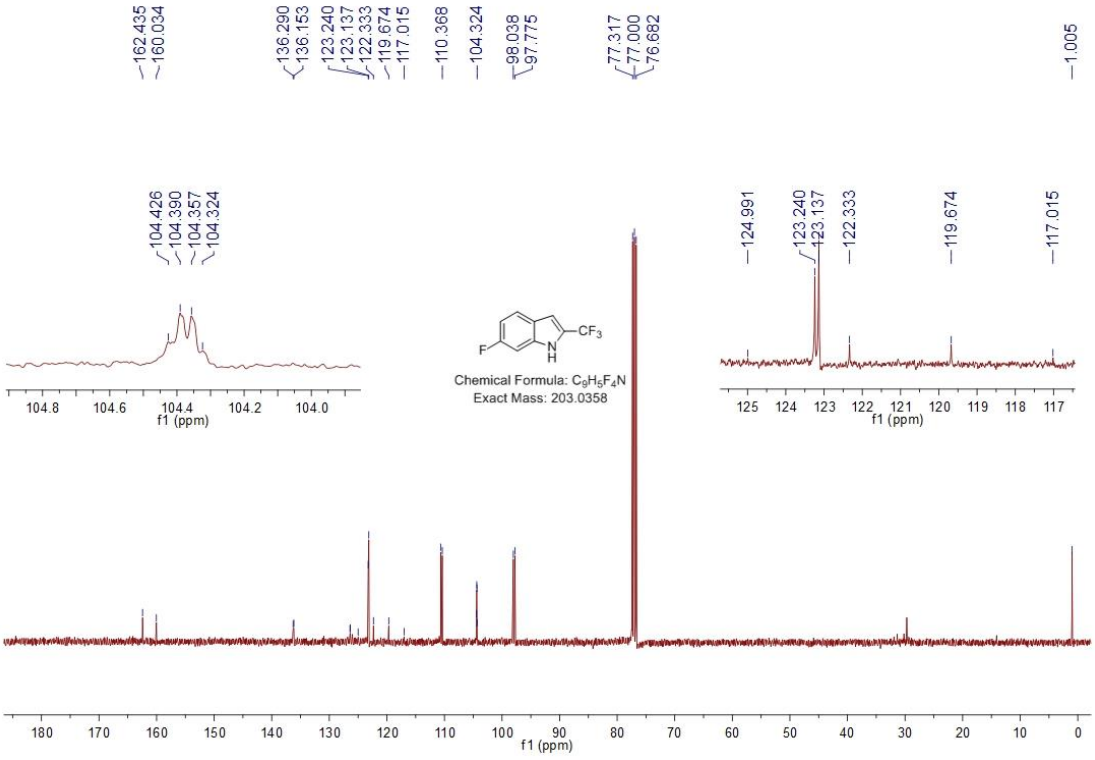
6-fluoro-2-(trifluoromethyl)-*1H*-indole(2o)



1H NMR (400 MHz, CDCl3)

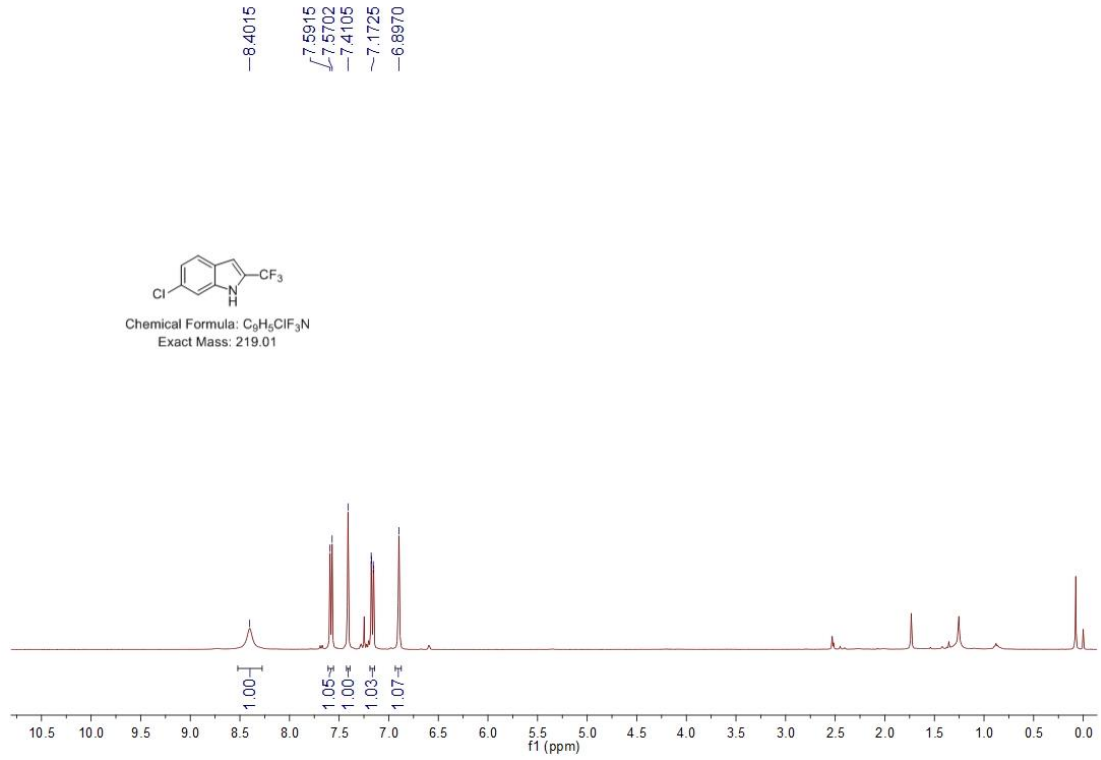


19F NMR (376 MHz, CDCl3)

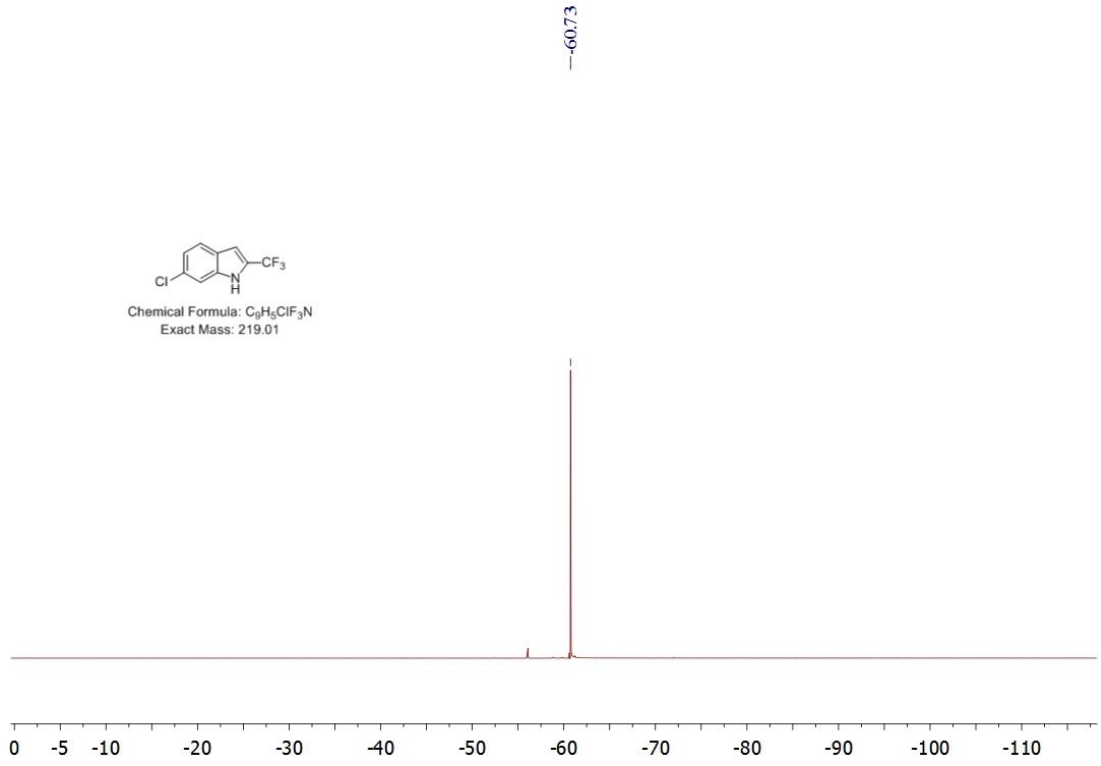


13C NMR (101 MHz, CDCl3)

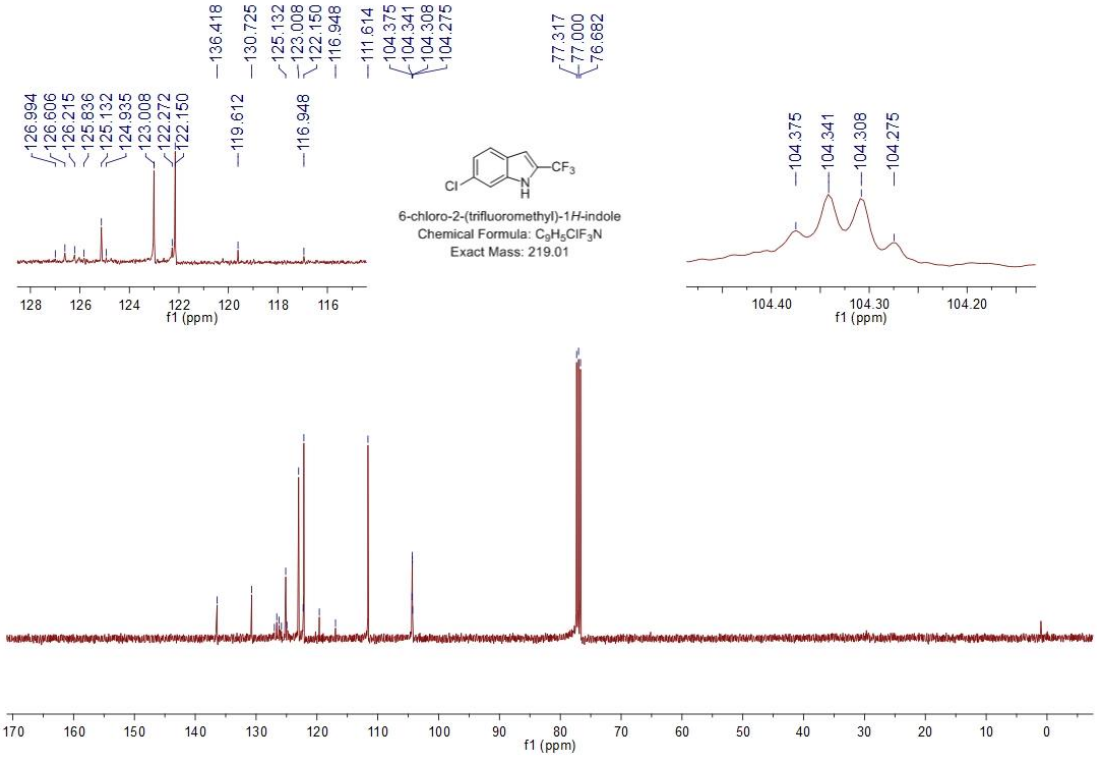
6-chloro-2-(trifluoromethyl)-*1H*-indole(2p)



^{1}H NMR (400 MHz, $CDCl_3$)

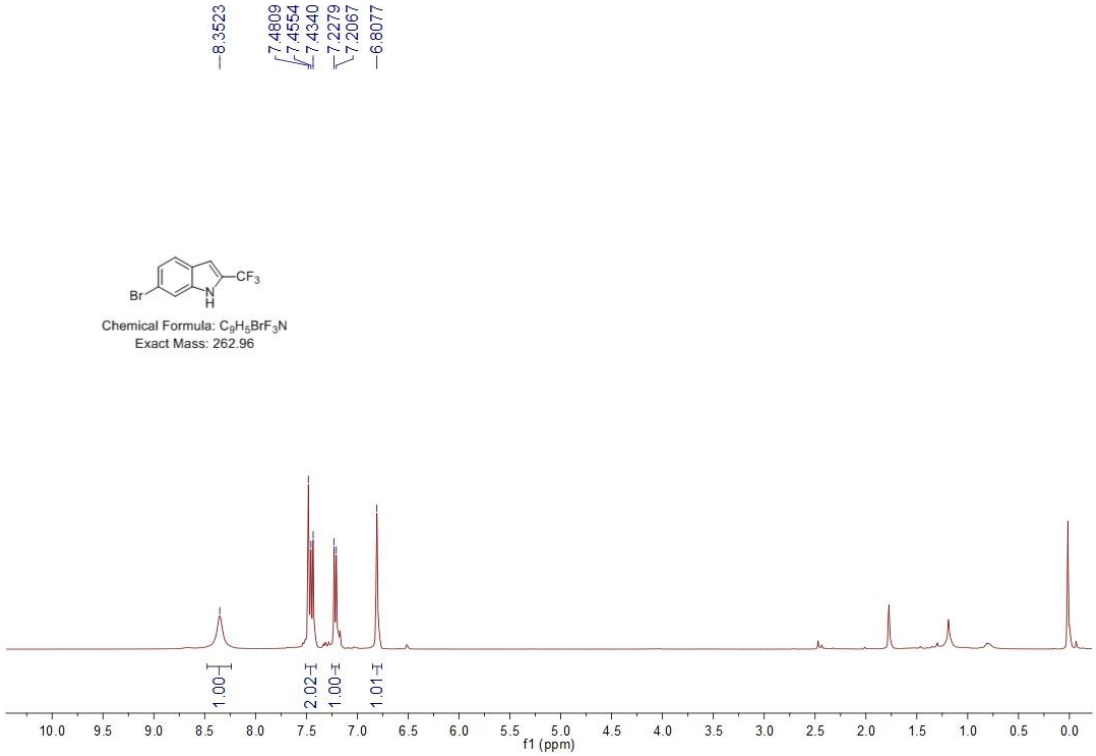


^{19}F NMR (376 MHz, $CDCl_3$)

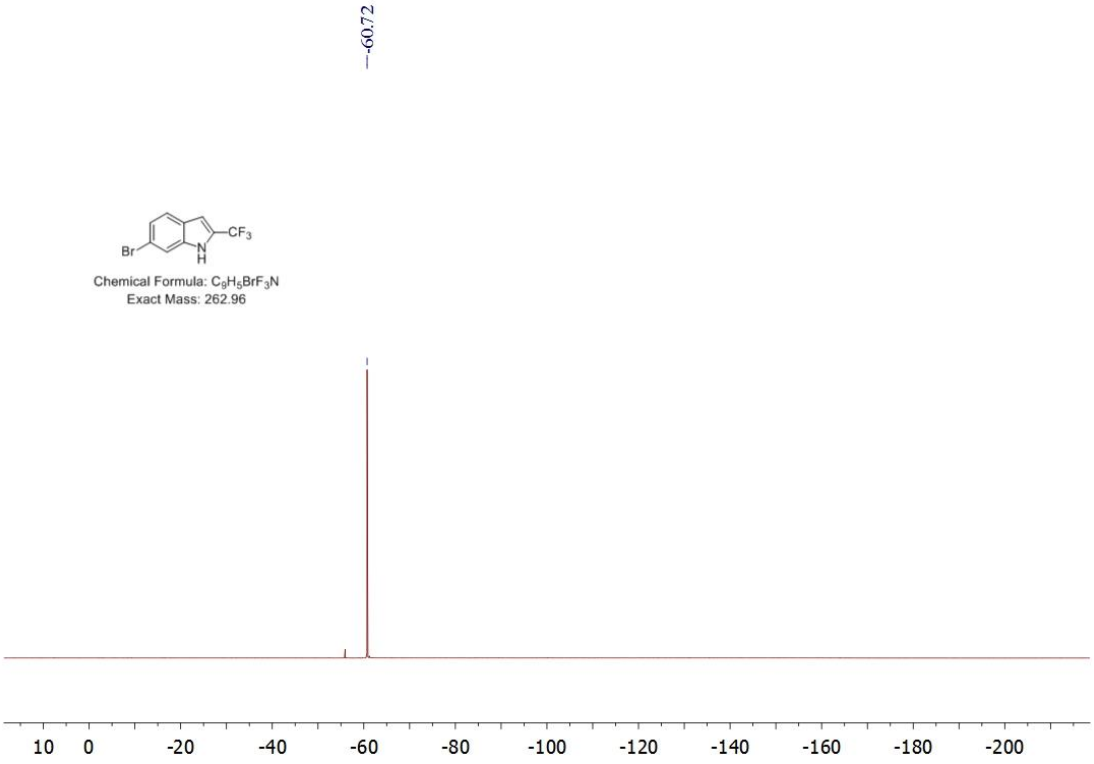


^{13}C NMR (101 MHz, $CDCl_3$)

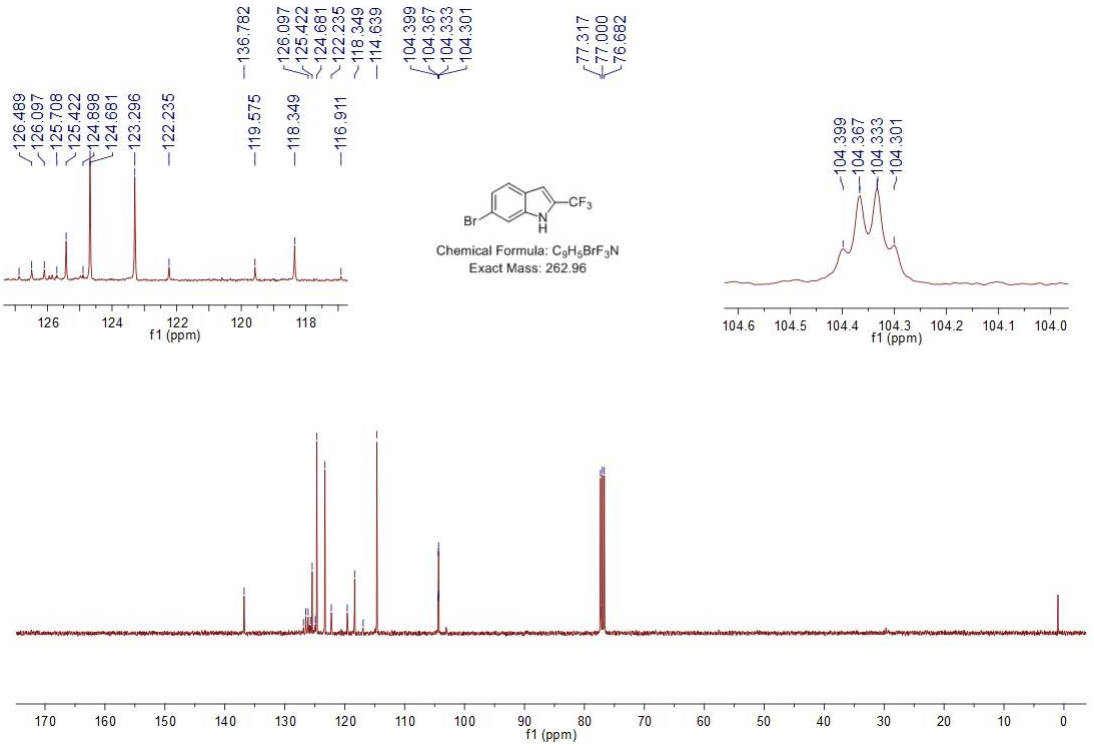
6-bromo-2-(trifluoromethyl)-*1H*-indole(2q)



^{1}H NMR (400 MHz, $CDCl_3$)

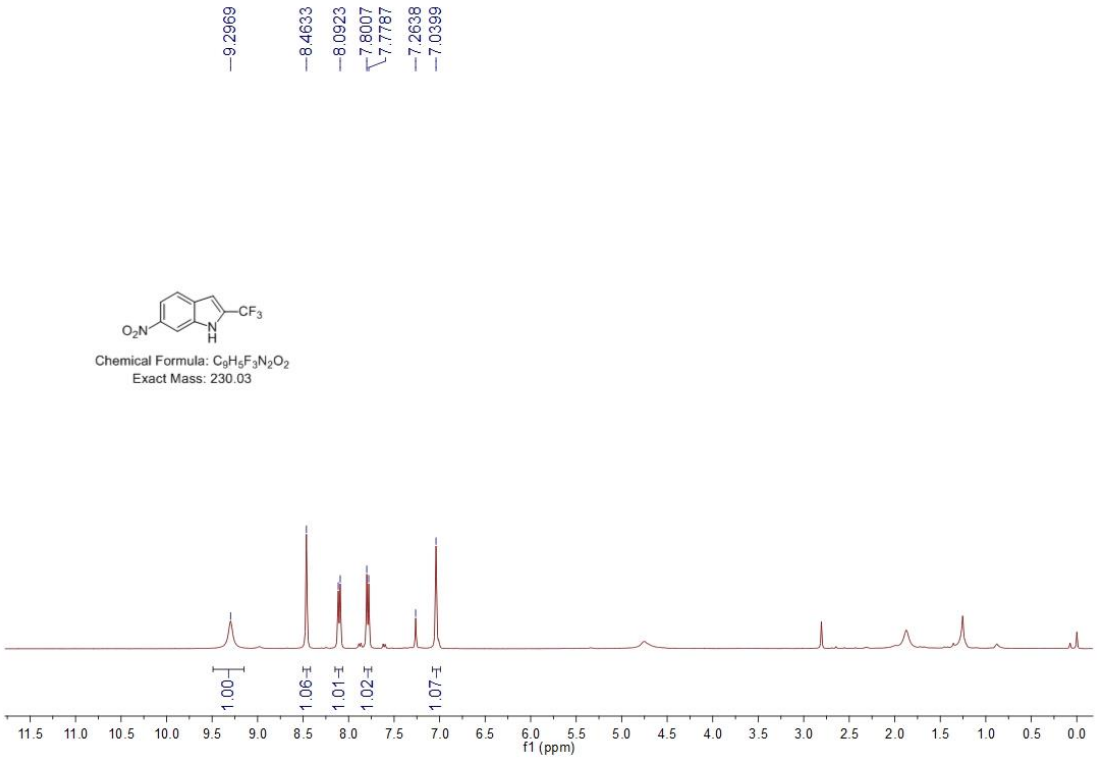


^{19}F NMR (376 MHz, $CDCl_3$)

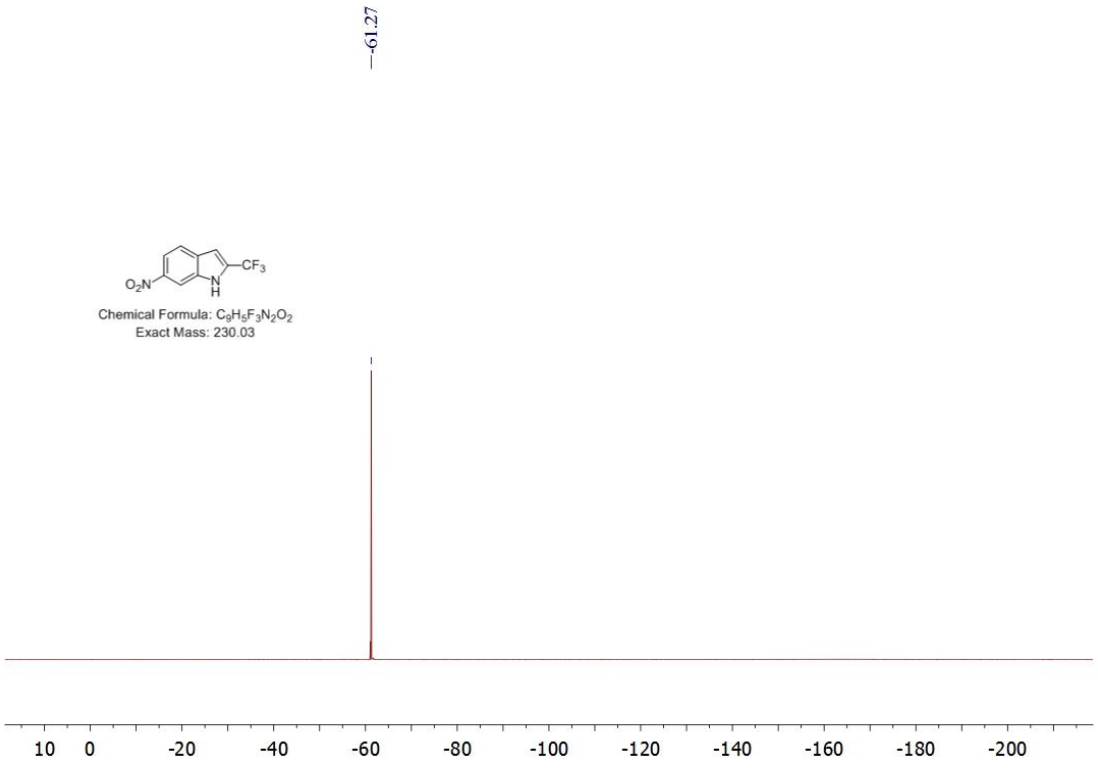


^{13}C NMR (101 MHz, $CDCl_3$)

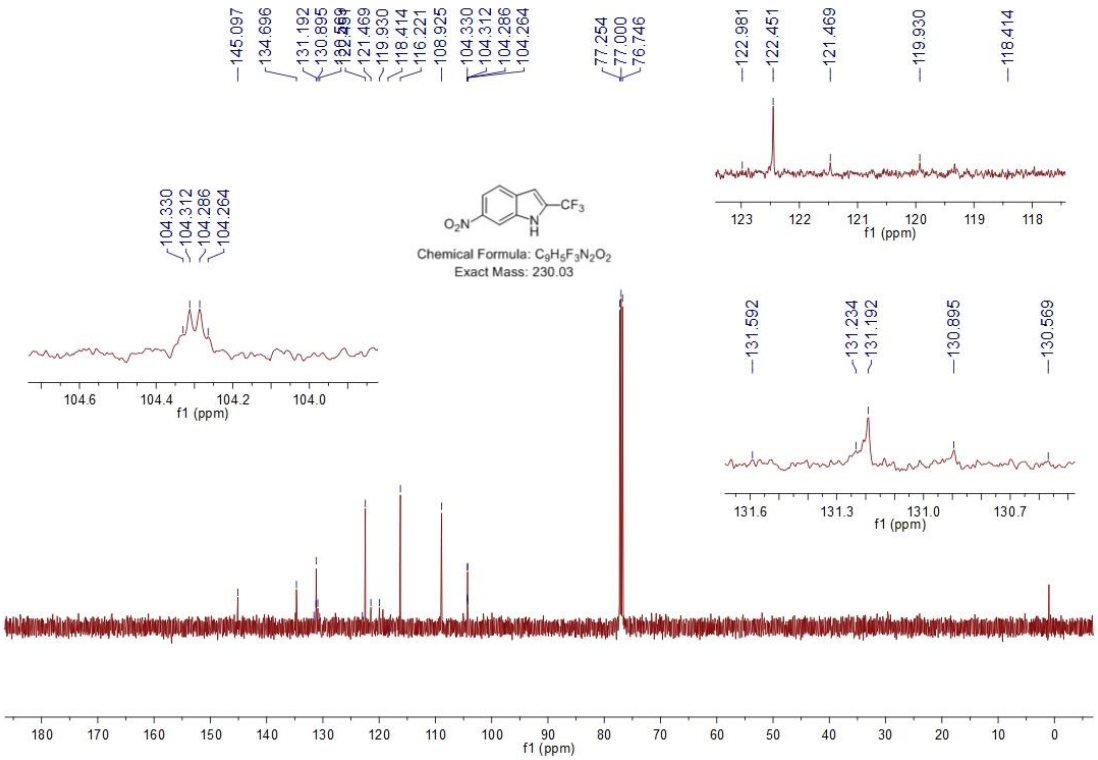
6-nitro-2-(trifluoromethyl)-*1H*-indole(2r)



^{1}H NMR (400 MHz, $CDCl_3$)

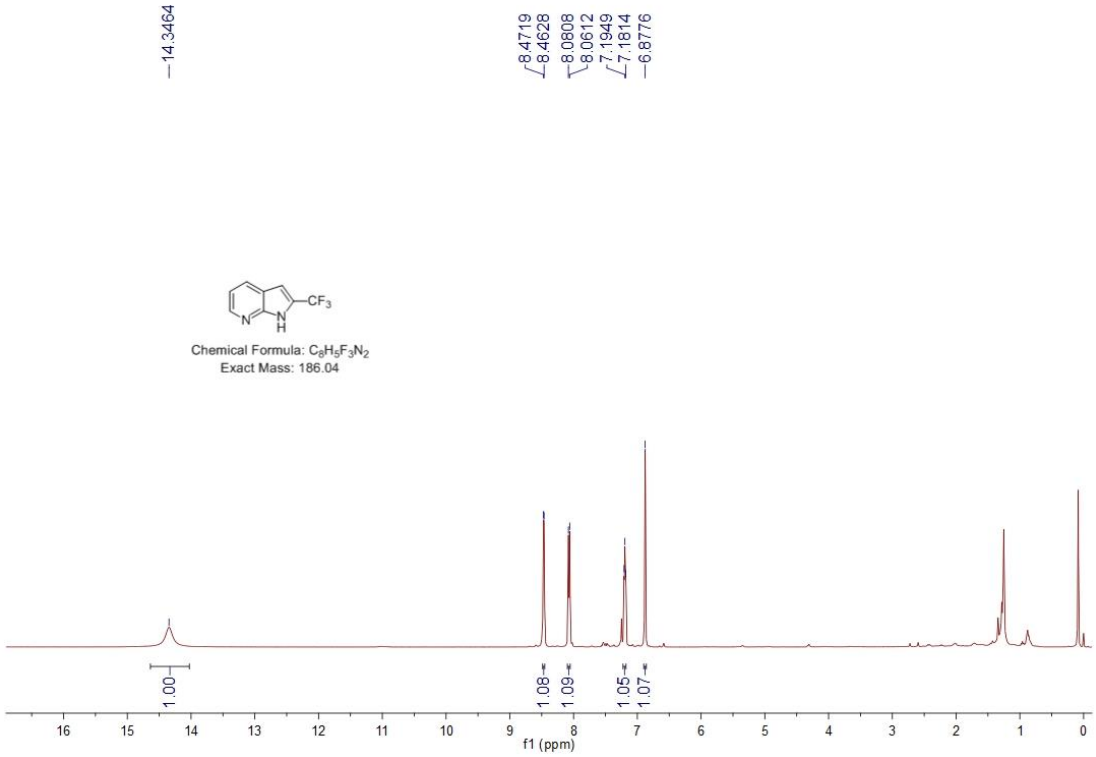


^{19}F NMR (376 MHz, $CDCl_3$)

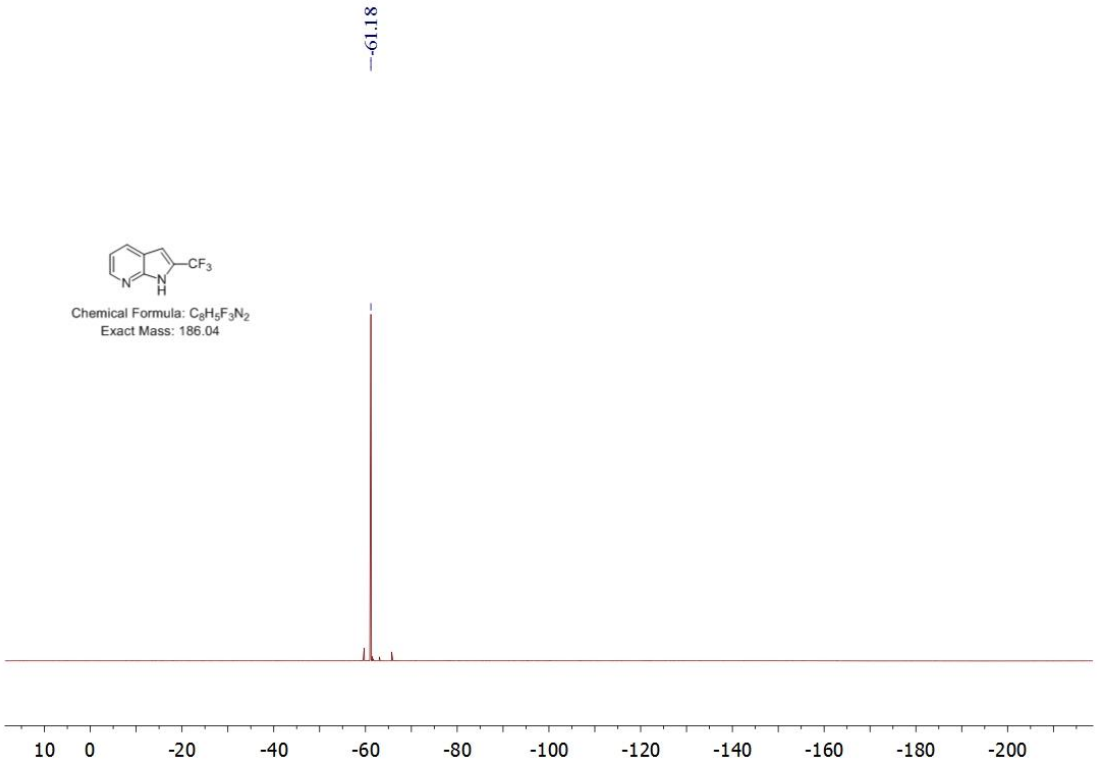


^{13}C NMR (101 MHz, $CDCl_3$)

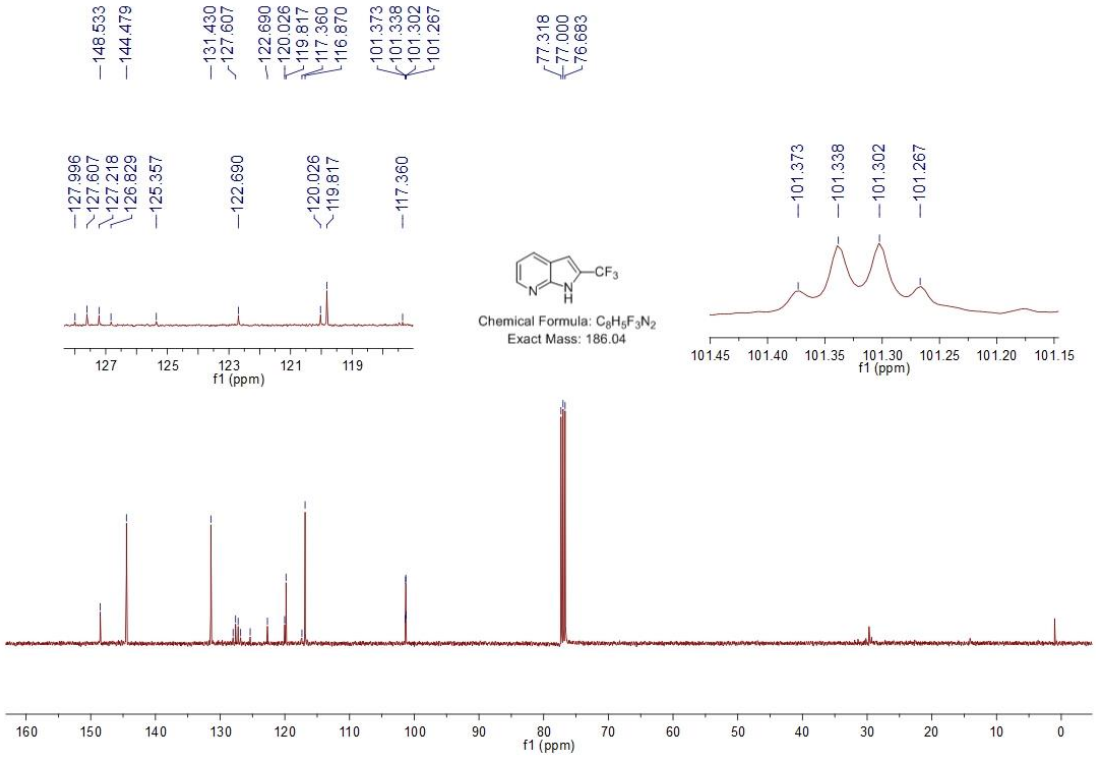
2-(trifluoromethyl)-*1H*-pyrrolo[2,3-b]pyridine(2s)



^{1}H NMR (400 MHz, $CDCl_3$)

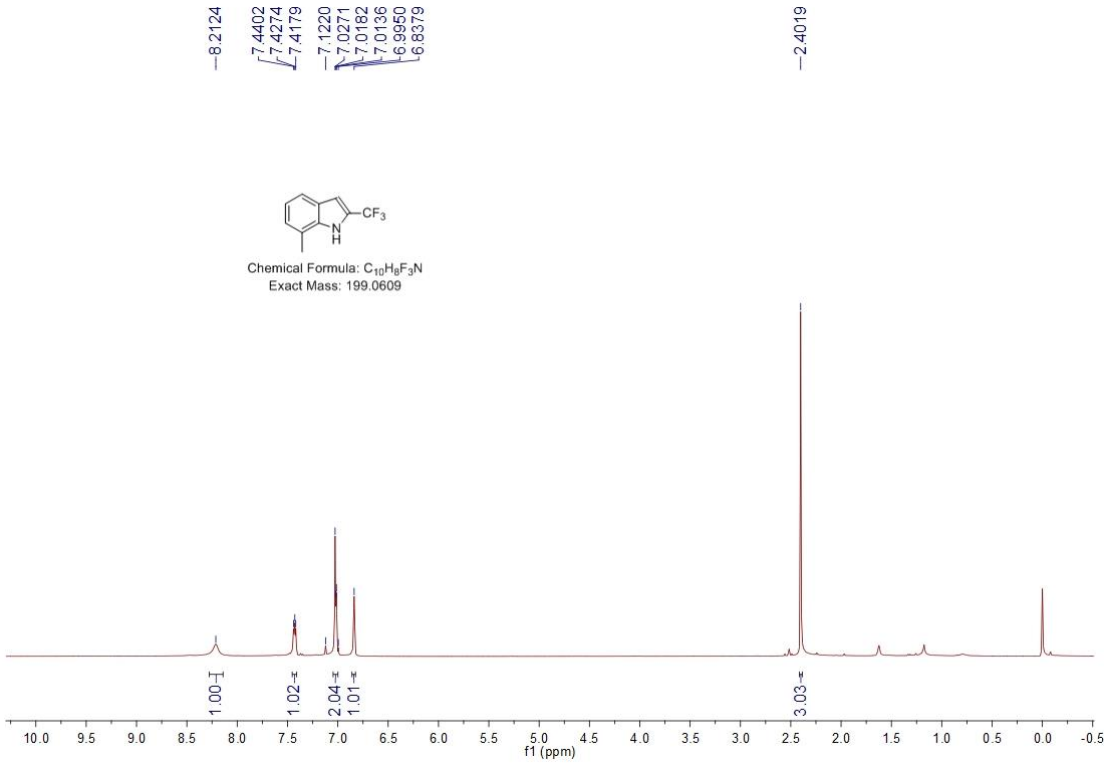


^{19}F NMR (376 MHz, $CDCl_3$)

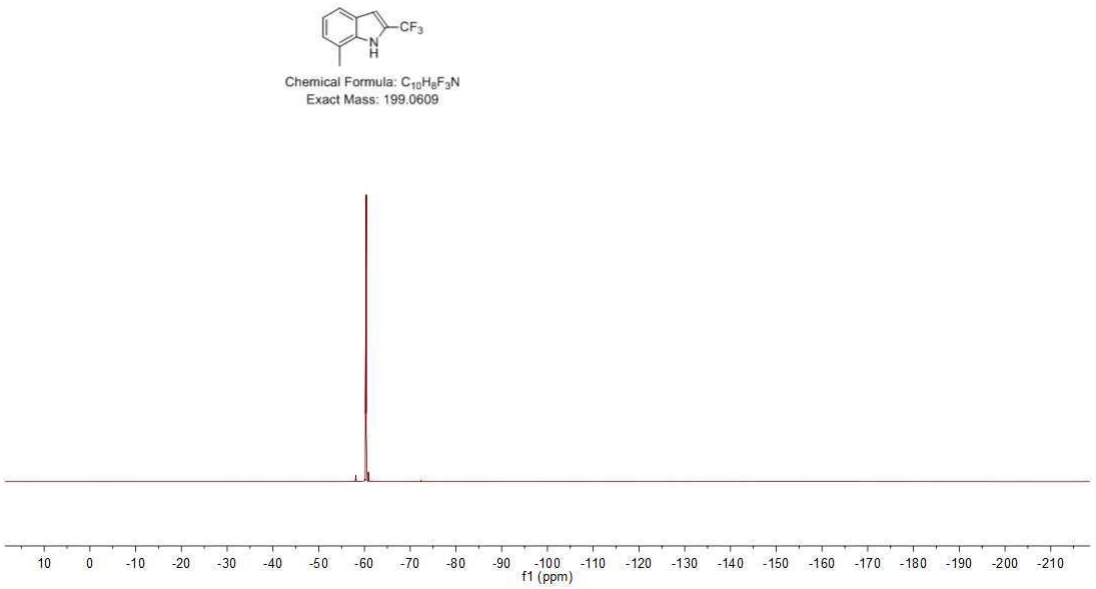


^{13}C NMR (101 MHz, $CDCl_3$)

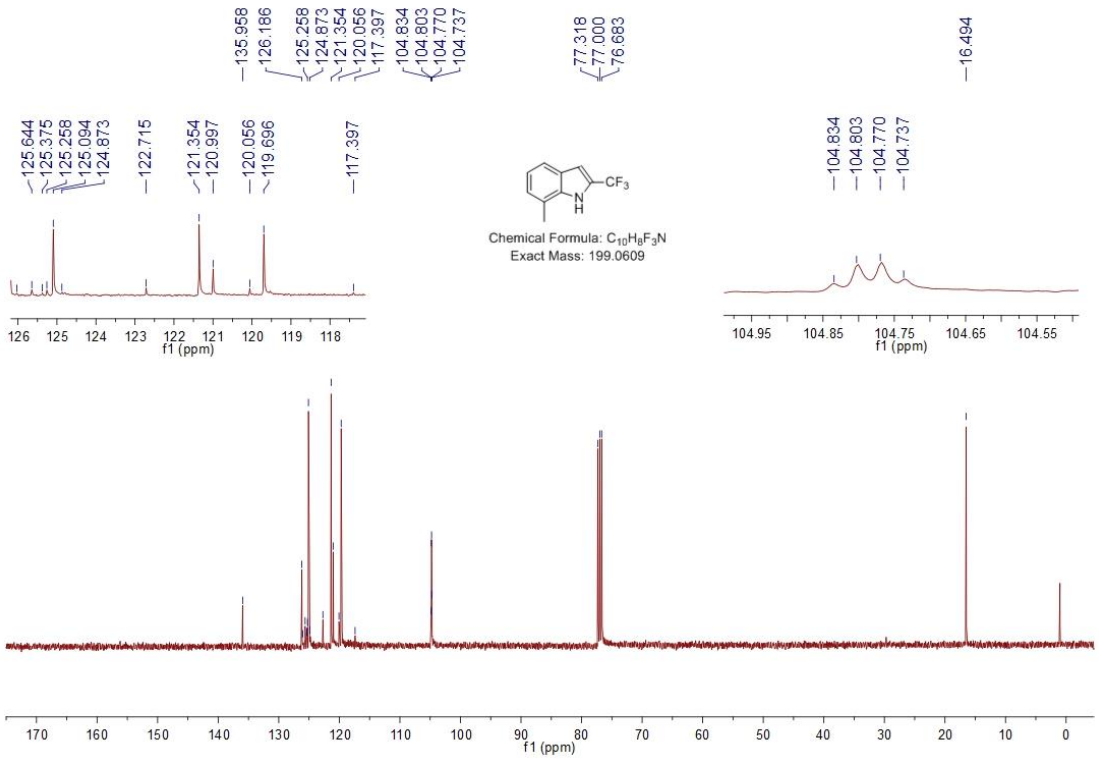
7-methyl-2-(trifluoromethyl)-*1H*-indole(2t)



^{1}H NMR (400 MHz, $CDCl_3$)

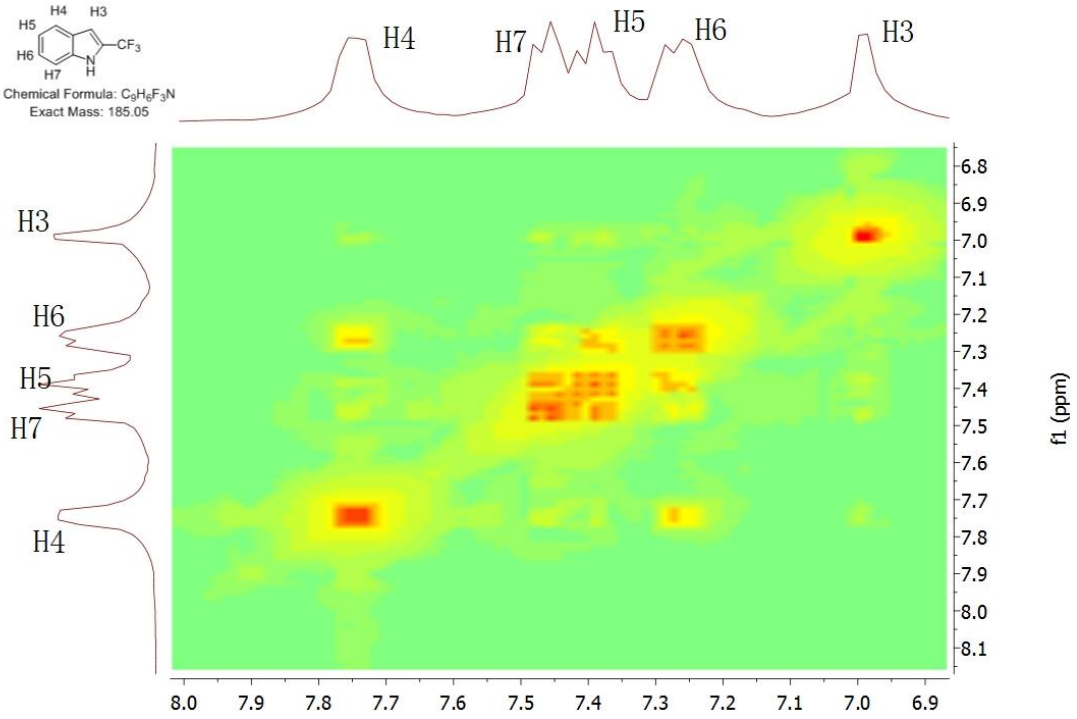


^{19}F NMR (376 MHz, $CDCl_3$)



^{13}C NMR (101 MHz, $CDCl_3$)

5. 2D NMR of 2-Trifluoromethylindole



6. Referance

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