Supporting Information

Copper-Catalyzed Intermolecular Oxidative Trifluoromethyl-arylation of Styrenes with $NaSO_2CF_3$ and Indoles involving C-H Functionalization

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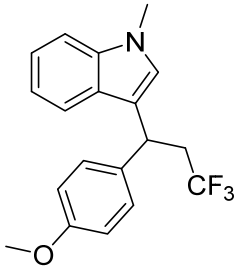
(A) Typical experimental procedure

To a Schlenk tube were added substrates alkenes **1** (0.2 mmol), $NaSO_2CF_3$ **2** (2 equiv) , indoles **2** (1.5 equiv) , TBPB (3 equiv), CuCl (10% mmol), $K_2S_2O_8$ (10% mmol) and MeCN (2 mL), the tube was then charged with argon. The mixture was stirred at 50 ºC until complete consumption of starting material as monitored by TLC and/or GC-MS analysis (about 20 h). After the reaction was finished, the reaction mixture was concentrated in vacuum, and the resulting residue was purified by silica gel column chromatography (hexane/ethyl acetate) to afford the desired product **4**.

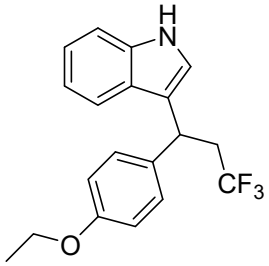
(B) Analytical data

1-Methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aaa):



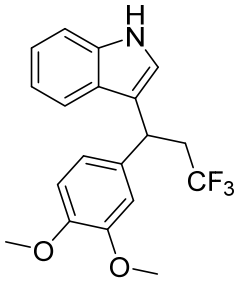
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.45 (d, *J* = 8.0 H, 1H), 7.28-7.23 (m, 3H), 7.22-7.19 (m, 1H), 7.07-7.04 (m, 1H), 6.85-6.82 (m, 2H), 6.77 (s, 1H), 4.57-4.54 (m, 1H), 3.78 (s, 3H), 3.73 (s, 3H), 3.03-2.78 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.68 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.2, 137.3, 134.9, 128.6, 126.6 (q, *J* = 276.1 Hz, 1H), 126.5, 126.0, 121.9, 119.2, 119.1, 117.2, 113.9, 109.3, 55.2, 40.1 (q, *J* = 26.6 Hz), 36.2 (q, *J* = 2.9 Hz), 32.8; LRMS (EI, 70eV) *m/z* (%): 334 (M^+, 14), 333 (31), 250(100), 206 (16); HRMS *m/z* (ESI) calcd for $C_{19}H_{19}F_3NO$ ($[M+H]^+$) 334.1413, found 334.1421.

3-(1-(4-Ethoxyphenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4baa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.97 (s, 1H), 7.46-7.43 (m, 1H), 7.33-7.31 (m, 1H), 7.24-7.21 (m, 2H), 7.18-7.15 (m, 1H), 7.07-7.04 (m, 1H), 6.93-6.92 (m, 1H), 6.84-6.81 (m, 2H), 4.57-4.54 (m, 1H), 3.98 (q, *J* = 7.0 Hz, 2H), 3.01-2.78 (m, 2H), 1.38 (t, *J* = 7.0 Hz, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.60 (t, *J* = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 157.7, 136.6, 134.6, 128.7, 126.6 (q, *J* = 276.3 Hz), 126.2, 122.4, 121.2, 119.6, 119.2, 118.7, 114.5, 111.2, 64.3, 40.0 (q, *J* = 26.6 Hz), 36.2 (q, *J* = 2.8 Hz), 14.9; LRMS (EI, 70eV) *m/z* (%):333 (M^+, 43), 250 (100), 222 (29); HRMS *m/z* (ESI) calcd for $C_{19}H_{19}F_3NO$ ($[M+H]^+$) 334.1413, found 413.1417.

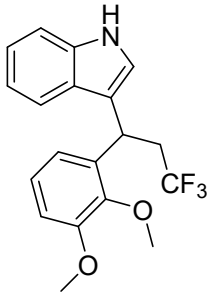
3-(1-(3,4-Dimethoxyphenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4caa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.00 (s, 1H), 7.38 (d, *J* = 8.0 Hz, 1H), 7.23 (d, *J* = 8.5 Hz, 1H), 7.10-7.07 (m, 1H), 7.00-6.96 (m, 1H), 6.84-6.79 (m, 2H), 6.75 (d, *J* = 2.0 Hz, 1H), 6.71 (d, *J* = 8.0 Hz, 1H), 4.49-4.46 (m, 1H), 3.75 (s, 3H), 3.73 (s, 3H), 2.92-2.75 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.57 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 148.9, 147.7, 136.6, 135.3, 126.6 (q, *J* = 276.1 Hz), 126.2, 122.4, 121.3, 119.7, 119.6, 119.1, 118.4, 111.3, 111.2, 111.1, 55.9, 55.8, 40.0 (q, *J* = 26.6 Hz), 36.7 (q, *J* = 3.1 Hz), 29.8; LRMS (EI, 70eV) *m/z* (%): 349 (M^+, 41),

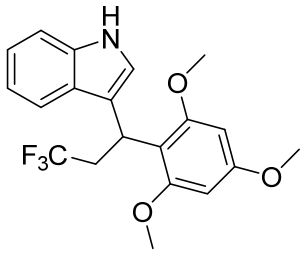
266 (100), 250 (11); HRMS *m/z* (ESI) calcd for $C_{19}H_{19}F_3NO_2$ ($[M+H]^+$) 350.1362, found 350.1371.

3-(1-(2,3-Dimethoxyphenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4daa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.00 (s, 1H), 7.61-7.59 (m, 1H), 7.33-7.31 (m, 1H), 7.18-7.14 (m, 1H), 7.09-7.05 (m, 1H), 7.00-6.96 (m, 2H), 6.88-6.86 (m, 1H), 6.79-6.77 (m, 1H), 5.11-5.08 (m, 1H), 3.85 (s, 3H), 3.79 (s, 3H), 2.98-2.92 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.61 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 152.8, 146.5, 136.4, 136.3, 126.6 (q, *J* = 276.3 Hz), 126.4, 123.8, 122.3, 121.3, 120.1, 119.6, 119.2, 118.2, 111.1, 110.7, 60.6, 55.7, 39.2 (q, *J* = 26.6 Hz), 29.9 (q, *J* = 2.75 Hz); LRMS (EI, 70eV) *m/z* (%): 349 (M^+, 45), 266 (100), 250 (11); HRMS *m/z* (ESI) calcd for $C_{19}H_{19}F_3NO_2$ ($[M+H]^+$) 350.1362, found 350.1365.

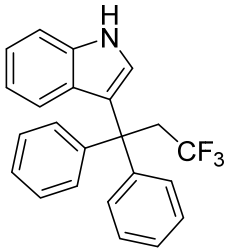
3-(3,3,3-Trifluoro-1-(2,4,6-trimethoxyphenyl)propyl)-1*H*-indole (4eaa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.13 (s, 1H), 7.51 (d, *J* = 8.0 Hz, 1H), 7.37-7.35 (m, 1H), 7.21-7.18 (m, 1H), 7.11-7.08 (m, 1H), 6.99 (d, *J* = 2.0 Hz, 1H), 6.55 (s, 2H), 4.57-4.53 (m, 1H), 3.82 (s, 3H), 3.81 (s, 6H), 3.02-2.81 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.72 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 153.2, 138.5, 136.7, 136.6, 128.0 (q, *J* = 115.0 Hz), 126.2, 122.4, 121.4, 119.7, 118.0, 111.4, 104.8, 60.8, 56.1, 40.1 (q, *J* = 26.9 Hz), 37.4 (q, *J* = 2.9

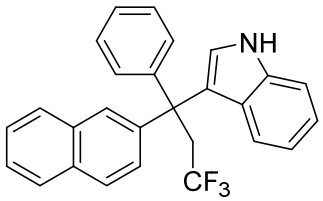
Hz); LRMS (EI, 70eV) *m/z* (%): 379 (M^+, 42), 296 (100), 235 (7); HRMS *m/z* (ESI) calcd for $C_{20}H_{21}F_3NO_3$ ($[M+H]^+$) 380.1468, found 380.1487.

3-(3,3,3-Trifluoro-1,1-diphenylpropyl)-1*H*-indole (4faa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.00 (s, 1H), 7.40 (d, *J* = 8.0 Hz, 4H, 7.32 (d, *J* = 8.0 Hz, 1H), 7.26-7.23 (m, 4H), 7.18 (t, *J* = 7.3 Hz, 2H), 7.12 (t, *J* = 7.5 Hz, 1H) , 6.97-6.95 (m, 2H), 6.89 (t, *J* = 7.5 Hz, 1H), 3.63 (q, *J* = 10.5 Hz, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.40 (t, *J* = 10.3 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 144.8, 136.8, 128.4, 127.9, 126.4 (2C), 126.0 (q, *J* = 277.6 Hz), 124.4, 121.9, 121.8, 120.4, 119.3, 111.3, 49.8 (q, *J* = 1.75 Hz), 43.5 (q, *J* = 26.3 Hz); LRMS (EI, 70eV) *m/z* (%): 365 (M^+, 26), 282 (100), 204 (15); HRMS *m/z* (ESI) calcd for $C_{23}H_{19}F_3N$ ($[M+H]^+$) 366.1464, found 366.1472.

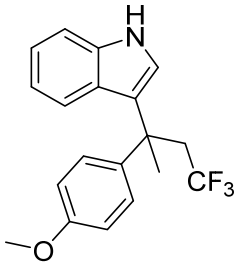
3-(3,3,3-Trifluoro-1-(naphthalen-2-yl)-1-phenylpropyl)-1*H*-indole (4gaa):



Colorless liquid; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.10 (s, 1H), 7.90 (s, 1H), 7.77-7.74, (m, 2H), 7.67 (d, *J* =8.5 Hz, 1H), 7.49-7.42 (m, 5H), 7.33 (d, *J* = 8.0 Hz, 1H), 7.27-7.23 (m, 2H), 7.19 (t, *J* = 7.3 Hz, 1H), 7.12 (t, *J* = 7.5 Hz, 1H), 7.01-6.98 (m, 2H), 6.87 (t, *J* = 7.5 Hz, 1H), 3.74 (q, *J* = 11.0 Hz, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.43 (t, *J* = 10.3 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 144.6, 142.3, 136.8, 133.0, 132.0, 128.5, 128.4, 128.0, 127.5, 127.4, 127.3, 126.6, 126.4, 126.2, 126.1 (q, *J* = 277.5 Hz),

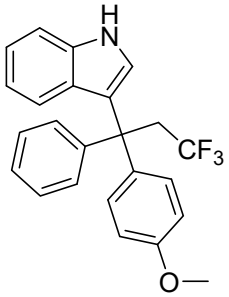
126.0, 124.7, 121.9, 121.8, 119.9, 119.4, 111.3, 49.9 (q, J = 1.1 Hz), 43.4 (q, J = 26.4 Hz); LRMS (EI, 70eV) *m/z* (%): 400 (M^+, 10), 105 (100), 271 (62), 285 (61), 400 (16); HRMS *m/z* (ESI) calcd for $C_{27}H_{20}F_3N$ ([M+H]$^+$) 416.1621, found 416.1608.

3-(4,4,4-Trifluoro-2-(4-methoxyphenyl)butan-2-yl)-1*H*-indole (4haa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.99 (s, 1H), 7.33 (d, J = 8.0 Hz, 1H), 7.24-7.21 (m, 2H), 7.13-7.10 (m, 1H), 7.06 (d, J = 2.5 Hz, 1H), 6.97 (d, J = 8.0 Hz, 1H), 6.09-6.87 (m, 1H), 6.81-6.78 (m, 2H), 3.76 (s, 3H), 3.17-2.95 (m, 2H), 1.90 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.41 (t, J = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 157.8, 138.8, 137.1, 127.7, 125.7, 124.4 (q, J = 258.4 Hz), 121.9, 121.1, 121.0, 119.2, 113.7, 113.5, 111.3, 55.2, 44.2 (q, J = 25.3 Hz), 39.4 (q, J = 1.25 Hz), 27.5; LRMS (EI, 70eV) *m/z* (%): 333 (M^+, 41), 318 (30), 250 (100); HRMS *m/z* (ESI) calcd for $C_{19}H_{19}F_3NO$ ([M+H]$^+$) 334.1413, found 334.1419.

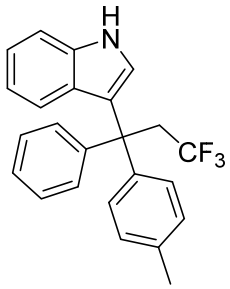
3-(3,3,3-Trifluoro-1-(4-methoxyphenyl)-1-phenylpropyl)-1*H*-indole (4iaa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.06 (s, 1H), 7.40 (d, J = 7.0 Hz, 2H), 7.34 (d, J = 8.0 Hz, 1H), 7.31-7.30 (m, 2H), 7.25-7.24 (m, 2H), 7.20-7.17 (m, 1H), 7.14-7.11 (m, 1H), 6.99-6.97 (m, 2H), 6.92-6.88 (m, 1H), 6.80-6.78 (m, 2H), 3.77 (s, 3H), 3.61 (q, J = 11.0 Hz, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.46 (t, J = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 157.8, 145.2, 136.8 (2C), 129.6, 128.2, 127.9, 126.3 (2C), 126.0 (q, J = 277.8 Hz), 124.3, 121.9, 121.8, 120.7, 119.2, 113.1, 111.3,

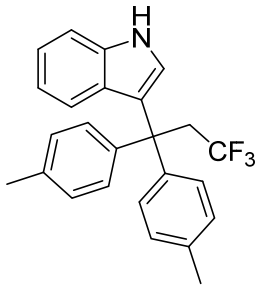
55.2, 49.2 (q, J = 1.3 Hz), 43.7 (q, J = 26.3 Hz); HRMS *m/z* (ESI) calcd for $C_{24}H_{21}F_3NO$ ($[M+H]^+$) 396.1570, found 396.1574.

3-(3,3,3-Trifluoro-1-phenyl-1-(*p*-tolyl)propyl)-1*H*-indole (4jaa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.02 (s, 1H), 7.41-7.39 (m, 2H), 7.33 (d, J = 8.5 Hz, 1H), 7.29-7.28 (m, 2H), 7.25-7.23 (m, 2H), 7.19-7.17 (m, 1H), 7.14-7.10 (m, 1H), 7.06 (d, J = 8.0 Hz, 2H), 6.98-6.96 (m, 2H), 6.91-6.88 (m, 1H), 3.62 (q, J = 10.5 Hz, 2H), 2.28 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.48 (t, J = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 145.0, 141.9, 136.8, 135.9, 128.6, 128.3, 128.2, 127.9, 126.4, 126.3, 124.4, 124.0 (q, J = 223.6 Hz), 121.9, 121.8, 120.4, 119.2, 49.4 (q, J = 1.75 Hz), 43.5 (q, J = 26.1 Hz), 20.9; HRMS *m/z* (ESI) calcd for $C_{24}H_{21}F_3N$ ($[M+H]^+$) 380.1621, found 380.1631.

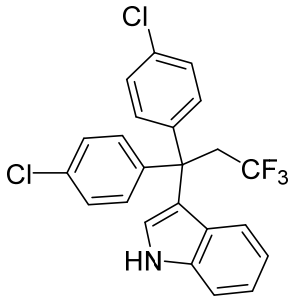
3-(3,3,3-Trifluoro-1,1-di-*p*-tolylpropyl)-1*H*-indole (4kaa):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.00 (s, 1H), 7.32 (d, J = 8.0 Hz, 1H), 7.29-7.27 (m, 4H), 7.13-7.10 (m, 1H), 7.06 (s, 2H), 7.04 (s, 2H), 6.99-6.96 (m, 2H), 6.91-6.88 (m, 1H), 3.60 (q, J = 11.0 Hz, 3H), 2.28 (s, 6H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.51 (t, J = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 142.1, 136.8, 135.8, 128.6, 128.1, 126.4, 124.4, 124.1 (q, J = 228.6 Hz), 121.9, 121.8, 119.2, 114.4, 111.2, 49.1 (q, J = 1.1 Hz), 43.4 (q, J = 25.9 Hz), 20.9; LRMS (EI, 70eV) *m/z* (%):

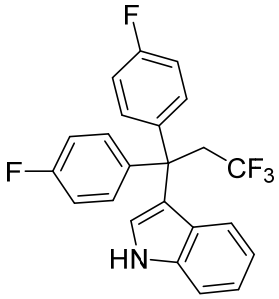
393 (M^+, 22), 310 (100), 218 (8), 294 (5); HRMS *m/z* (ESI) calcd for $C_{25}H_{23}F_3N$ ($[M+H]^+$) 394.1777, found 394.1783.

3-(1,1-bis(4-chlorophenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4laa):



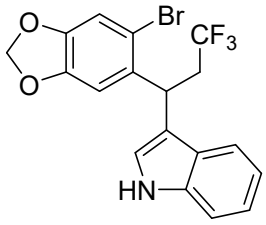
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.12 (s, 1H), 7.36-7.35 (m, 1H), 7.32-7.29 (m, 4H), 7.25-7.22 (m, 4H), 7.16-7.13 (m, 1H), 6.97 (d, *J* = 3.0 Hz, 1H), 6.93-6.92 (m, 2H), 3.56 (q, *J* = 10.5 Hz, 2H) ; ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.43 (t, *J* = 10.3 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 142.8, 136.9, 132.6, 129.8, 128.2, 125.8, 125.7 (q, *J* = 277.6 Hz), 124.1, 122.2, 121.5, 119.7, 119.6, 111.5, 49.2 (q, *J* = 1.7 Hz), 43.6 (q, *J* = 26.6 Hz); LRMS (EI, 70eV) *m/z* (%): 433 (M^+, 25), 350 (100), 314 (15); HRMS *m/z* (ESI) calcd for $C_{23}H_{17}Cl_2F_3N$ ($[M+H]^+$) 434.0685, found 434.0697.

3-(3,3,3-trifluoro-1,1-bis(4-fluorophenyl)propyl)-1*H*-indole (4maa):



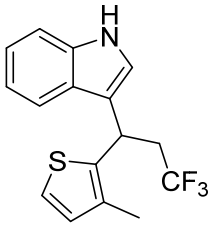
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.11 (s, 1H), 7.35-7.32 (m, 5H), 7.15-7.12 (m, 1H), 6.96-6.91 (m, 7H), 3.57 (q, *J* = 10.5 Hz, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -56.43 (t, *J* = 10.8 Hz, 3F), -116.29 (m, 2F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 162.3, 160.3, 140.2, 140.1, 136.9, 130.1, 130.0, 127.6 (q, *J* = 277.7 Hz), 125.9, 123.9, 122.1, 121.6, 120.5, 119.5, 114.9, 114.7, 111.4, 48.9 (q, *J* = 0.6 Hz), 44.1 (q, *J* = 26.5 Hz); LRMS (EI, 70eV) *m/z* (%): 401 (M^+, 25), 318 (100), 314 (15); HRMS *m/z* (ESI) calcd for $C_{23}H_{17}F_5N$ ($[M+H]^+$) 402.1276, found 402.1287.

3-(1-(6-Bromobenzo[*d*][1,3]dioxol-5-yl)-3,3,3-trifluoropropyl)-1*H*-indole (4naa):



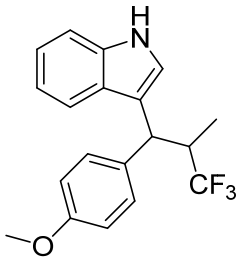
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.06 (s, 1H), 7.50-7.48 (m, 1H), 7.35 (d, *J* = 7.5 Hz, 1H), 7.20-7.17 (m, 1H), 7.09-7.06 (m, 2H), 7.03 (s, 1H), 6.65 (s, 1H), 5.91 (d, *J* = 1.5 Hz, 1H), 5.86 (d, *J* = 1.5 Hz, 1H), 5.15 (t, *J* = 7.3 Hz, 1H), 2.94-2.69 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.48 (t, *J* = 10.3 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 147.6, 147.1, 136.4, 135.2, 127.9 (q, *J* = 276.4 Hz), 126.3, 122.6, 121.1, 119.9, 119.3, 117.3, 114.1, 112.7, 111.2, 108.5, 101.7, 39.2 (q, *J* = 27.6 Hz), 35.7 (q, *J* = 3.0 Hz); LRMS (EI, 70eV) *m/z* (%): 413 (M^++2, 37), 411 (M^+, 30), 332 (52), 249 (100), 191 (27); HRMS *m/z* (ESI) calcd for $C_{18}H_{14}BrF_3NO_2$ ($[M+H]^+$) 412.0155, found 412.0163.

3-(3,3,3-Trifluoro-1-(3-methylthiophen-2-yl)propyl)-1*H*-indole(4oaa):



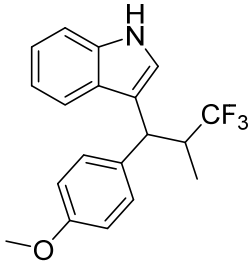
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.00 (s, 1H), 7.53-7.51 (m, 1H), 7.34-7.32 (m, 1H), 7.19-7.17 (m, 1H), 7.11-7.08 (m, 1H), 7.05 (d, *J* = 5.0 Hz, 1H), 7.01 (d, *J* = 2.5 Hz, 1H), 4.94-4.92 (m, 1H), 3.05-2.80 (m, 2H), 2.27 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.64 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 140.4, 136.4, 133.1, 130.0, 124.3, 127.4, 126.0, 125.3 (q, *J* = 236.0 Hz), 122.5, 122.2, 121.3, 119.8, 118.8, 118.1, 114.4, 41.0 (q, *J* = 27.0 Hz), 30.1 (q, *J* = 3.1 Hz), 13.8; LRMS (EI, 70eV) *m/z* (%): 309 (M^+, 38), 226 (100), 210 (7); HRMS *m/z* (ESI) calcd for $C_{16}H_{15}F_3NS$ ($[M+H]^+$) 310.0872, found 310.0879

3-(3,3,3-Trifluoro-1-(4-methoxyphenyl)-2-methylpropyl)-1*H*-indole (4paa From E-1p):



Colorless oil, dr = 1:1; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.99 (d, *J* = 18.5 Hz, 2H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.34 (d, *J* = 8.0 Hz, 1H), 7.30-7.26 (m, 4H), 7.23-7.19 (m, 2H), 7.09-7.04 (m, 3H), 7.01 (d, *J* = 7.5 Hz, 1H), 6.81-6.78 (m, 4H), 4.57 (d, *J* = 6.0 Hz, 1H), 4.42 (d, *J* = 9.0 Hz, 1H), 3.75 (s, 3H), 3.73 (s, 3H), 3.16-3.08 (m, 2H), 1.19 (d, *J* = 7.0 Hz, 3H), 1.12 (d, *J* = 7.5 Hz, 3H) ; ^{19}F NMR (470 MHz, $CDCl_3$); δ -68.42 (d, *J* = 8.4 Hz, 3F), -69.16 (d, *J* = 9.4 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.3, 158.0, 136.3, 136.1, 135.1, 132.9, 130.2, 128.9, 128.2 (q, *J* = 278.8 Hz), 128.1 (q, *J* = 279.5 Hz), 127.1, 126.7, 122.2, 121.6, 121.1, 119.6, 119.5, 119.4, 119.3, 118.1, 117.2, 113.7, 113.6, 111.2, 111.1, 55.2, 43.0 (q, *J* = 24.0 Hz), 42.5 (q, *J* = 2.1 Hz), 41.8 (q, *J* = 24.5 Hz), 41.4 (q, *J* = 2.3 Hz), 12.7 (q, *J* = 3.1 Hz), 11.5 (q, *J* = 2.9 Hz); LRMS (EI, 70eV) *m/z* (%): 333 (M^+, 19), 236 (100), 192 (14), 221 (7); HRMS *m/z* (ESI) calcd for $C_{19}H_{18}F_3NO$ ($[M+H]^+$) 334.1413, found 334.1419.

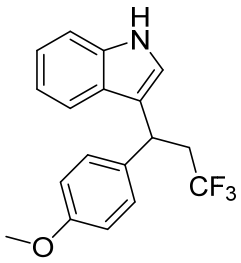
3-(3,3,3-trifluoro-1-(4-methoxyphenyl)-2-methylpropyl)-1*H*-indole (4paa from *Z*-1p):



Colorless oil; dr = 1:1.2; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.98 (d, *J* = 18.5 Hz, 2H), 7.55-7.53 (m, 1H), 7.35-7.33 (m, 1H), 7.31-7.29 (m, 2H), 7.27-7.26 (m, 2H), 7.21-7.19 (m, 2H), 7.17-7.12 (m, 2H), 7.09-7.06 (m, 3H), 7.03-6.99 (m, 1H),

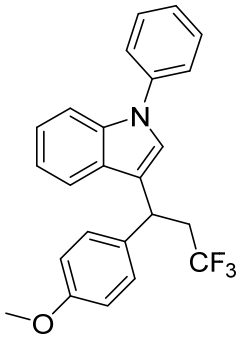
6.81-6.78 (m, 4H), 4.56 (d, *J* = 6.5 Hz, 1H), 4.42 (d, *J* = 9.0 Hz, 1H), 3.75 (s, 3H), 3.73 (s, 3H), 3.16-3.08 (m, 2H), 1.19 (d, *J* = 7.0 Hz, 3H), 1.12 (d, *J* = 7.0 Hz, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -68.46 (d, *J* = 8.5 Hz, 3F), -69.19 (d, *J* = 9.4 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.3, 158.0, 136.3, 135.1, 132.9, 130.2, 128.9, 128.2 (q, *J* = 275.4 Hz), 128.1 (q, *J* = 279.4 Hz), 127.0, 126.7, 122.2, 121.6, 121.1, 119.6, 119.5, 119.4, 119.3, 118.1, 117.1, 113.7, 113.6, 111.2, 111.1, 55.2, 43.0 (q, *J* = 23.8 Hz), 42.5 (q, *J* = 2.3 Hz), 41.9 (q, *J* = 24.3 Hz), 41.4 (q, *J* = 2.3 Hz), 12.7 (q, *J* = 3.0 Hz), 11.5 (q, *J* = 3.0 Hz); LRMS (EI, 70eV) *m/z* (%): 333 (M^+, 19), 236 (100), 192 (14), 221 (7); HRMS *m/z* (ESI) calcd for $C_{19}H_{18}F_3NO$ ($[M+H]^+$) 334.1413, found 334.1419.

3-(3,3,3-Trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aab):



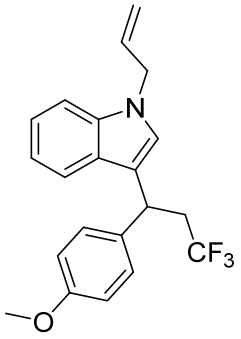
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.99 (s, 1H), 7.45-7.43 (m, 1H), 7.33-7.31 (m, 1H), 7.25-7.23 (m, 2H), 7.18-7.15 (m, 1H), 7.07-7.04 (m, 1H), 6.93-6.92 (m, 1H), 6.84-6.82 (m, 2H), 4.57-4.54 (m, 1H), 3.76 (s, 3H), 3.01-2.79 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.61 (t, *J* = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.3, 136.6, 134.8, 128.7, 126.6 (q, *J* = 276.3 Hz), 122.4, 121.2, 119.6, 119.1, 118.7, 113.9, 113.3, 55.2, 40.0 (q, *J* = 26.8 Hz), 36.2 (q, *J* = 3.0 Hz);^{19}F NMR (282 MHz,$CDCl_3$) δ: LRMS (EI, 70eV) *m/z* (%): 319 (M^+, 39), 236 (100), 192 (14), 211 (7); HRMS *m/z* (ESI) calcd for $C_{18}H_{16}F_3NO$ ($[M+H]^+$) 320.1257, found 320.1262.

1-Phenyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole(4aac):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.35-7.8.34 (m, 1H), 7.72 (d, *J* = 7.5 Hz, 3H), 7.54-7.50 (m, 2H), 7.34-7.25 (m, 5H), 7.07-7.04 (m, 1H), 6.88-6.86 (m, 2H), 4.60-4.57 (m, 1H), 3.79 (s, 3H), 3.05-2.83 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.50 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.5, 147.8, 143.9, 138.3, 134.0, 130.5, 129.4, 128.7, 127.8, 126.9 (q, *J* = 277.8 Hz), 126.3, 124.6, 123.9, 120.2, 117.6, 116.5, 114.1, 55.3, 39.8 (q, *J* = 27.0 Hz), 36.3 (q, *J* = 2.6 Hz); LRMS (EI, 70eV) *m/z* (%): 396 (M^+, 26), 313 (100), 269 (16); HRMS *m/z* (ESI) calcd for $C_{24}H_{21}F_3NO$ ($[M+H]^+$) 396.1570, found 396.1578.

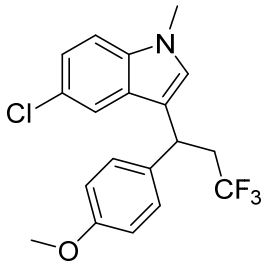
1-Allyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aad):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.44-7.43 (m, 1H), 7.25-7.22 (m, 3H), 7.18-7.15 (m, 1H), 7.05-7.02 (m, 1H), 6.84-6.81 (m, 3H), 5.98-5.90 (m, 1H), 5.18-5.15 (m, 1H), 5.05-5.01 (m, 1H), 4.65-4.63 (m, 2H), 4.57-4.54 (m, 1H), 3.74 (s, 3H), 2.99-2.77 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.53 (t, *J* = 10.3 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.3, 136.8, 134.9, 133.5, 128.7, 126.8, 126.6 (q, *J* = 276.1 Hz), 125.0, 122.0, 119.3 (2C), 117.5, 117.3, 114.0, 109.8, 55.2, 48.8, 40.2 (q, *J* = 26.6 Hz), 36.3 (q, *J* = 2.8 Hz); LRMS (EI, 70eV) *m/z* (%): 359

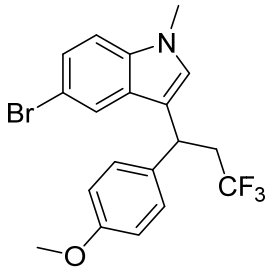
(M^+, 37), 276 (100), 235 (10); HRMS *m/z* (ESI) calcd for $C_{21}H_{21}F_3NO$ ($[M+H]^+$) 360.1570, found 360.1577.

5-Chloro-1-methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole(4aae):



Colorless oil; ^1H NMR (500 MHz, $CDCl_3$) δ: 7.39-7.38 (m, 1H), 7.22-7.21 (m, 2H), 7.18-7.16 (m, 1H), 7.14-7.12 (m, 1H), 6.86-6.82 (m, 3H), 4.49-4.47 (m, 1H), 3.78 (s, 3H), 3.71 (s, 3H), 2.95-2.76 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.63 (t, *J* = 10.3 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.3, 135.7, 134.5, 128.5, 127.5, 127.2, 126.4 (q, *J* = 276.4 Hz), 124.9, 122.2, 118.6, 116.7, 114.0, 110.4, 55.2, 40.1 (q, *J* = 27.0 Hz), 36.0 (q, *J* = 3.3 Hz), 33.0; LRMS (EI, 70eV) *m/z* (%): 367 (M^+, 31), 284 (100), 269 (6), 206 (19),; HRMS *m/z* (ESI) calcd for $C_{19}H_{18}ClF_3NO$ ($[M+H]^+$) 368.1024, found 368.1029.

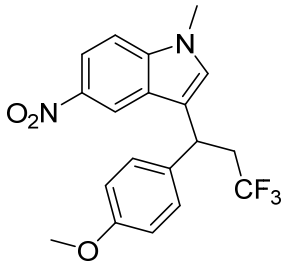
5-Bromo-1-methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aaf):



Colorless oil; ^1H NMR (500 MHz, $CDCl_3$) δ: 7.56 (s, 1H), 7.22-7.12 (m, 4H), 6.84 (t, *J* = 10.8 Hz, 3H), 4.48 (t, *J* = 7.0 Hz, 1H), 3.78 (s, 3H), 3.71 (s, 3H), 2.92-2.76 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.64 (t, *J* = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.4, 136.0, 134.5, 131.8, 128.5, 127.1, 126.9 (q, *J* = 330.1 Hz), 124.8, 121.6, 116.7, 114.9, 114.0, 112.5, 110.9, 55.2, 40.1 (q, *J* = 26.8 Hz), 35.9

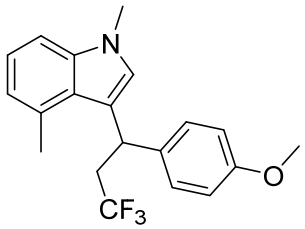
(q, *J* = 2.3 Hz), 32.9; LRMS (EI, 70eV) *m/z* (%): 413 (M^++2, 32), 411 (M^+, 30), 332 (50), 249 (100), 428 (13); HRMS *m/z* (ESI) calcd for $C_{19}H_{18}BrF_3NO$ ($[M+H]^+$) 412.0518, found 412.0527.

1-Methyl-5-nitro-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole(4aag):



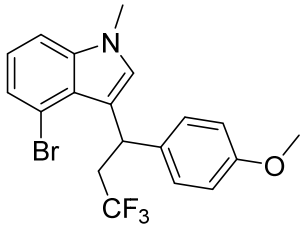
Yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.39 (d, *J* =2.5Hz, 1H), 8.11-8.08 (m, 1H), 7.28 (d, *J* =9Hz, 1H), 7.24-7.22 (m, 2H), 7.03 (s, 1H), 6.86-6.85 (m, 2H), 4.58 (t, *J* = 7.3 Hz, 1H), 3.82 (s, 3H), 3.78, (s, 3H), 2.98-2.81 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.57 (t, *J* = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ:158.5, 141.3, 140.0, 128.9, 128.4, 126.3 (q, *J* = 275.8 Hz), 125.2, 119.9, 117.7, 116.6, 114.2, 109.3, 55.3, 40.1, (q, *J* = 27.0 Hz), 35.8, (q, *J* = 2.8 Hz), 33.3; LRMS (EI, 70eV) *m/z* (%): 379 (M^+,50), 380 (11), 296 (100), 235 (7); HRMS *m/z* (ESI) calcd for $C_{19}H_{18}F_3N_2O_3$ ($[M+H]^+$) 379.1264, found 379.1271.

1,4-Dimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aah):



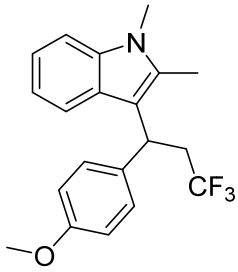
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.18-7.16 (m, 2H), 7.12-7.06 (m, 2H), 6.82-6.77 (m, 4H), 4.93-4.90 (m, 1H), 3.75 (s, 3H), 3.72 (s, 3H), 2.90-2.74 (m, 2H), 2.59 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.16 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.2, 137.5, 135.8, 130.8, 129.0, 126.5, 126.4 (q, *J* = 276.4 Hz), 125.4, 121.9, 121.1, 117.6, 113.9, 107.2, 55.2, 41.7 (q, *J* = 26.7 Hz), 36.6 (q, *J* = 2.8 Hz), 33.0, 20.8; LRMS (EI, 70eV) *m/z* (%): 347 (M^+, 40), 264 (100), 220 (15); HRMS *m/z* (ESI) calcd for $C_{20}H_{21}F_3NO$ ($[M+H]^+$) 348.1570, found 348.1578.

4-Bromo-1-methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aai):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.28-7.24 (m, 3H), 7.20 (d, *J* = 8.5 Hz, 1H), 7.02 (t, *J* = 8.0 Hz, 1H), 6.86-6.85 (m, 2H), 5.41-5.38 (m, 1H), 3.78 (s, 3H), 3.69 (s, 3H), 3.04-2.72 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.64 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.2, 138.4, 134.7, 129.1, 128.5, 125.7 (q, *J* = 276.6 Hz), 124.4, 124.1, 122.6, 118.0, 114.0, 113.8, 108.7, 55.2, 41.3 (q, *J* = 26.5 Hz), 35.0 (q, *J* = 2.9 Hz), 33.1; LRMS (EI, 70eV) *m/z* (%): 413 (M^++2, 36), 411 (M^+, 30), 328 (100), 248 (16), 206 (19); HRMS *m/z* (ESI) calcd for $C_{19}H_{18}BrF_3NO$ ($[M+H]^+$) 412.0518, found 412.0522.

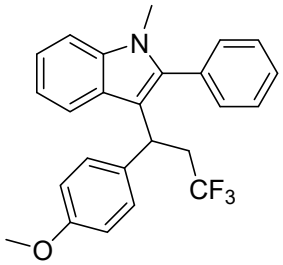
1,2-Dimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1H-indole (4aaj):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.42 (d, *J* = 7.5 Hz, 1H), 7.25-7.24 (m, 3H), 7.15-7.11 (m, 1H), 7.02-6.99 (m, 1H), 6.81-6.78 (m, 2H), 4.58-4.55 (m, 1H), 3.75 (s, 3H), 3.65 (s, 3H), 3.11-3.02 (m, 2H), 2.39 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -64.44 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 157.9, 137.0, 135.3, 133.3, 128.3, 126.9 (q, *J* = 275.9 Hz), 126.0, 120.5, 118.9 (2C), 113.8, 112.0, 108.9, 55.2, 38.8 (q, *J* = 26.3 Hz), 35.2 (q, *J* = 2.9 Hz), 29.6, 10.4; LRMS (EI, 70eV) *m/z* (%): 347

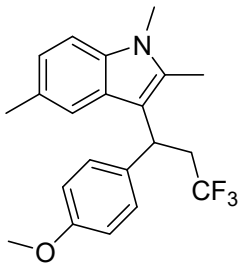
(M^+, 34), 264 (100), 220 (10); HRMS *m/z* (ESI) calcd for $C_{20}H_{21}F_3NO$ ($[M+H]^+$) 348.1570, found 348.1581.

1,4-Dimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aak):



Colorless oil; ^1H NMR (500 MHz, $CDCl_3$) δ: 7.61-7.59 (m, 1H), 7.46 (s, 3H), 7.36-7.31 (m, 3H), 7.25-7.22 (m, 1H), 7.19-7.17 (m, 2H), 7.13-7.10 (m, 1H), 6.78-6.75 (m, 2H), 4.44-4.41 (m, 1H), 3.73 (s, 3H), 3.52 (s, 3H), 3.13-2.90 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.50 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 157.9, 138.6, 137.4, 135.7, 131.7, 130.9, 129.2, 128.6, 128.5, 128.4, 126.8 (q, *J* = 276.1 Hz), 125.9, 121.6, 120.0, 119.5, 113.8, 109.8, 55.2, 39.0 (q, *J* = 26.6 Hz), 35.5 (q, *J* = 2.3 Hz), 30.8; LRMS (EI, 70eV) *m/z* (%): 409 (M^+, 43), 326 (100), 327 (9), 282 (12); HRMS *m/z* (ESI) calcd for $C_{25}H_{23}F_3NO$ ($[M+H]^+$) 410.1726, found 410.1733.

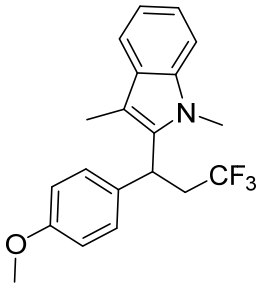
1,2,5-Trimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aal):



Colorless oil; ^1H NMR (500 MHz, $CDCl_3$) δ: 7.27-7.23 (m, 2H), 7.20 (s, 1H), 7.14 (d, *J* = 8.0 Hz, 1H), 6.96-6.95 (m, 1H), 6.81-6.78 (m, 2H), 4.55-4.52 (m, 1H), 3.75 (s, 3H), 3.62 (s, 3H), 3.08-3.04 (m, 2H), 2.40 (s, 3H), 2.36 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -64.47 (t, *J* = 10.8 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 157.9, 135.5, 135.4, 133.3, 128.3, 128.1 (q, *J* = 276.1 Hz), 127.8, 126.2, 122.0, 118.7, 113.7, 111.5, 108.6, 55.2, 38.9 (q, *J* = 26.3 Hz), 35.2 (q, *J* = 3.1 Hz), 29.6, 21.7, 10.4; LRMS

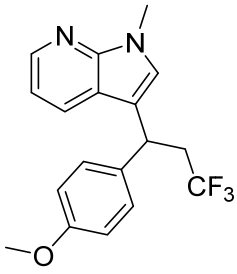
(EI, 70eV) *m/z* (%): 361 (M^+, 1), 324 (28), 105 (100), 202 (50); HRMS *m/z* (ESI) calcd for $C_{21}H_{23}F_3NO$ ($[M+H]^+$) 362.1726, found 362.1730.

1,3-Dimethyl-2-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aam):



Colorless oil; ^1H NMR (500 MHz, $CDCl_3$) δ: 7.56 (d, *J* = 8.0 Hz, 1H), 7.23-7.17 (m, 2H), 7.13-7.09 (m, 3H), 6.84-6.81 (m, 2H), 4.77-4.74 (m, 1H), 3.77 (s, 3H), 3.49 (s, 3H), 3.14-2.94 (m, 2H), 2.35 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -64.57 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.4, 136.9, 135.5, 132.2, 128.4, 128.2, 127.9 (q, *J* = 271.6 Hz), 121.4, 118.9, 118.5, 114.1, 108.7, 108.2, 55.3, 37.7 (q, *J* = 27.3 Hz), 34.3 (q, *J* = 2.6 Hz), 30.4, 9.4; LRMS (EI, 70eV) *m/z* (%): 347 (M^+, 45), 264 (100), 220 (20); HRMS *m/z* (ESI) calcd for $C_{20}H_{20}F_3NO$ ($[M+H]^+$) 348.1570, found 348.1583.

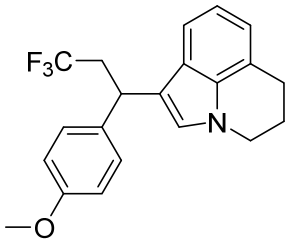
1-Methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-pyrrolo[2,3-*b*]pyridi ne (4aan):



Yellow oil; ^1H NMR (500 MHz, $CDCl_3$) δ: 8.31-8.30 (m, 1H), 7.67-7.66 (m, 1H), 7.22-7.20 (m 2H), 6.98-6.95 (m, 2H), 6.85-6.84 (m, 2H), 4.53-4.50 (m, 1H), 3.84 (s, 3H), 3.77 (s, 3H), 2.96-2.80 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.55 (t, *J* = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.4, 148.1, 143.1, 134.5, 128.6, 127.5, 126.5 (q, *J* = 275.9 Hz), 125.8, 119.0, 115.5, 115.2, 114.0, 55.2, 39.9 (q, *J* = 26.9 Hz),

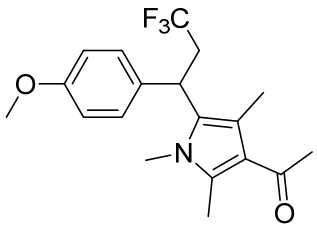
36.3 (q, J = 2.8 Hz), 31.2; LRMS (EI, 70eV) *m/z* (%): 334 (M^+, 34), 251 (100), 207 (11); HRMS *m/z* (ESI) calcd for $C_{18}H_{18}F_3N_2O$ ($[M+H]^+$) 335.1366, found 335.1374.

1-(3,3,3-Trifluoro-1-(4-methoxyphenyl)propyl)-5,6-dihydro-4*H*-pyrrolo[3,2,1-*ij*]quinoline (4aao):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.27-7.25 (m, 3H), 6.97-6.94 (m, 1H), 6.90-6.88 (m, 1H), 6.85-6.82 (m, 2H), 6.78 (s, 1H), 4.55-4.52 (m, 1H), 4.09-4.06 (m, 2H), 3.77 (s, 3H), 3.03-2.98 (m, 1H), 2.95 (t, J = 6.3 Hz, 3H), 2.87-2.80 (m, 1H), 2.23-2.18 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.68 (t, J = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.2, 135.1, 134.8, 128.7, 128.1 (q, J = 276.1 Hz), 124.0, 123.3, 121.9, 119.5, 118.8, 117.3, 116.7, 113.9, 55.2, 44.0, 40.1 (q, J = 26.6 Hz), 36.6 (q, J = 2.8 Hz), 24.7, 22.8; LRMS (EI, 70eV) *m/z* (%): 359 (M^+, 27), 276 (100), 232 (9); HRMS *m/z* (ESI) calcd for $C_{21}H_{21}F_3NO$ ($[M+H]^+$) 360.1570, found 360.1581.

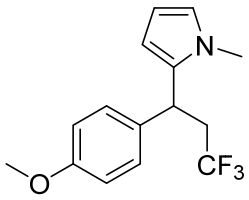
1-(1,2,4-Trimethyl-5-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-pyrrol-3-yl)ethan-1-one(4aap):



Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.07-7.05 (m, 2H), 6.86-6.84 (m, 2H), 4.61-4.58 (m, 1H), 3.79 (s, 3H), 3.20 (s, 3H), 3.07-3.01 (m, 1H), 2.83-2.76 (m, 1H), 2.45 (s, 3H), 2.44 (s, 3H), 2.25 (s, 3H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -64.63 (t, J = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 196.1, 158.3, 135.4, 132.3, 128.4, 127.8, 126.6

(q, J = 275.6 Hz), 121.7, 116.6, 114.1, 55.3, 37.3 (q, J = 26.9 Hz), 33.0 (q, J = 1.4 Hz), 31.6, 31.1, 12.5, 12.4; LRMS (EI, 70eV) *m/z* (%): 353 (M^+, 4), 278 (1), 223 (6), 149 (100); HRMS *m/z* (ESI) calcd for $C_{19}H_{23}F_3NO_2$ ($[M+H]^+$) 354.1675, found 354.1682.

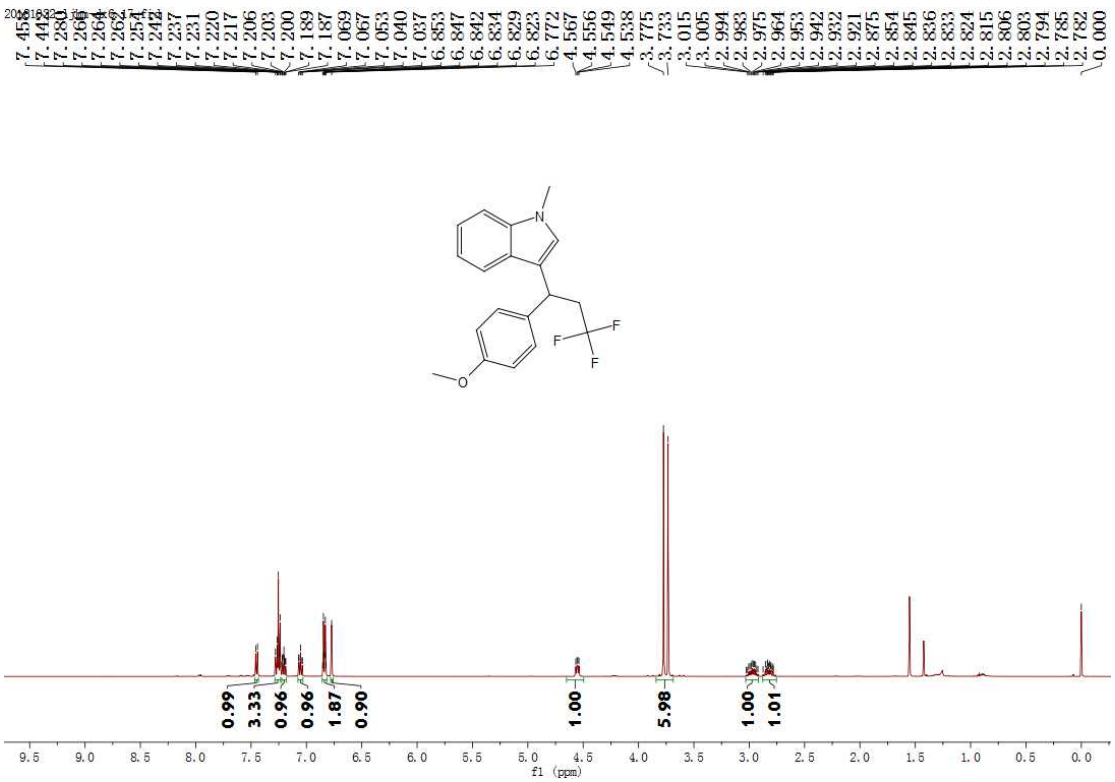
1-Methyl-2-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl-1*H*-pyrrole (4aaq):

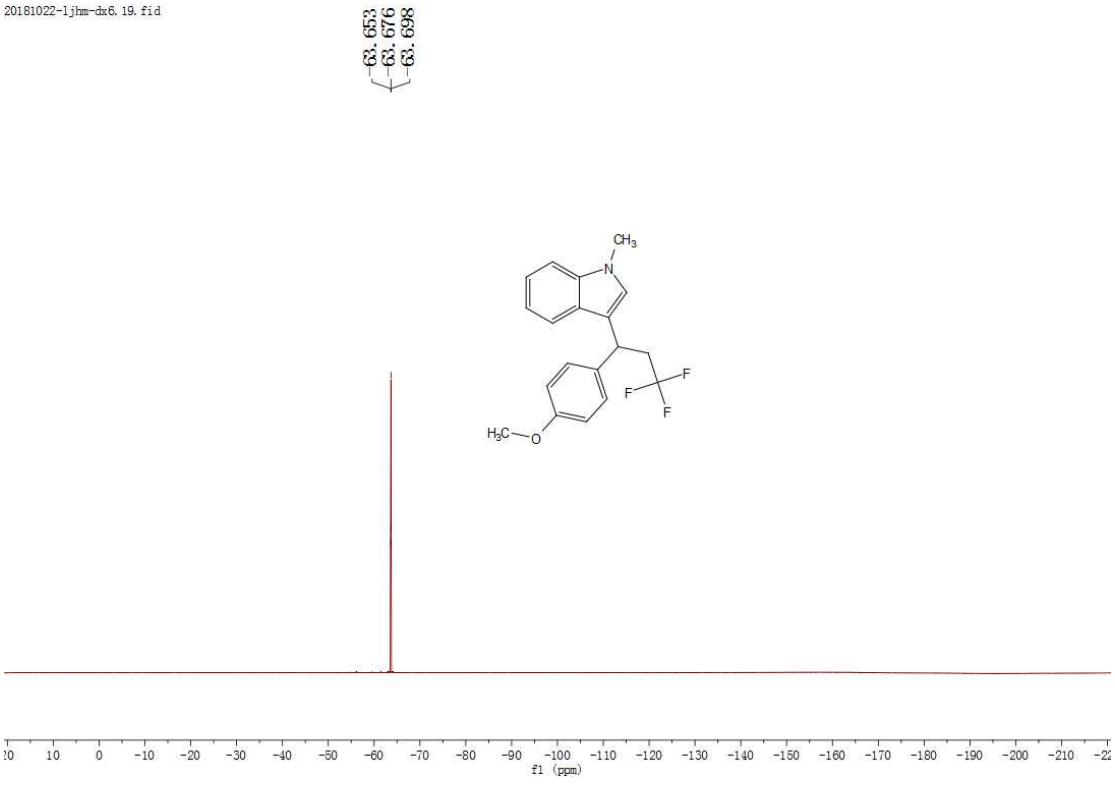


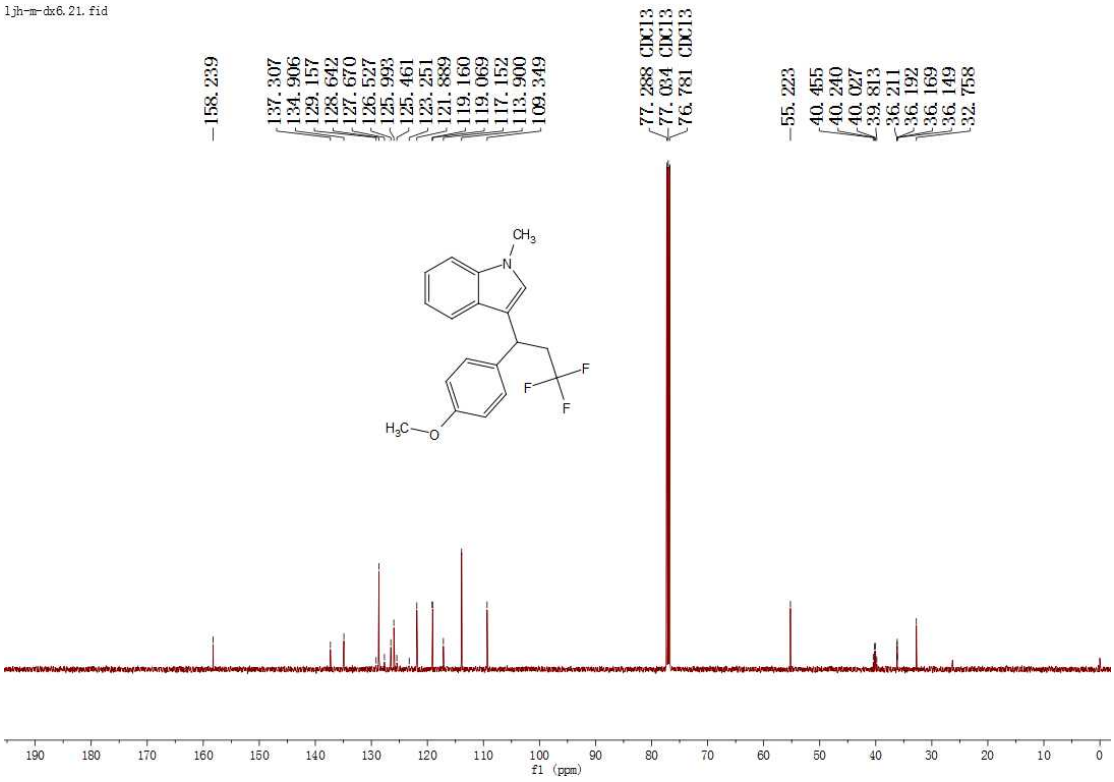
Colorless oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.08-7.06 (m, 2H), 6.83-6.80 (m, 2H), 6.52 (t, J = 2.0 Hz, 1H), 6.10 (t, J = 3.3 Hz, 2H), 4.23-4.20 (m, 1H), 3.77 (s, 3H), 3.31 (s, 3H), 2.92-2.65 (m, 2H); ^{19}F NMR (470 MHz, $CDCl_3$); δ -63.33 (t, J = 10.6 Hz, 3F). ^{13}C NMR (125 MHz, $CDCl_3$) δ: 158.4, 133.4, 129.8, 128.5, 126.4 (q, J = 275.8 Hz), 122.4, 114.0, 106.4, 105.6, 55.2, 40.3 (q, J = 27.1 Hz), 36.8 (q, J = 2.9 Hz), 33.9; LRMS (EI, 70eV) *m/z* (%): 283 (M^+, 30), 268 (25), 200 (100); HRMS *m/z* (ESI) calcd for $C_{15}H_{17}F_3NO$ ($[M+H]^+$) 284.1257, found 284.1261.

(C) Spectra

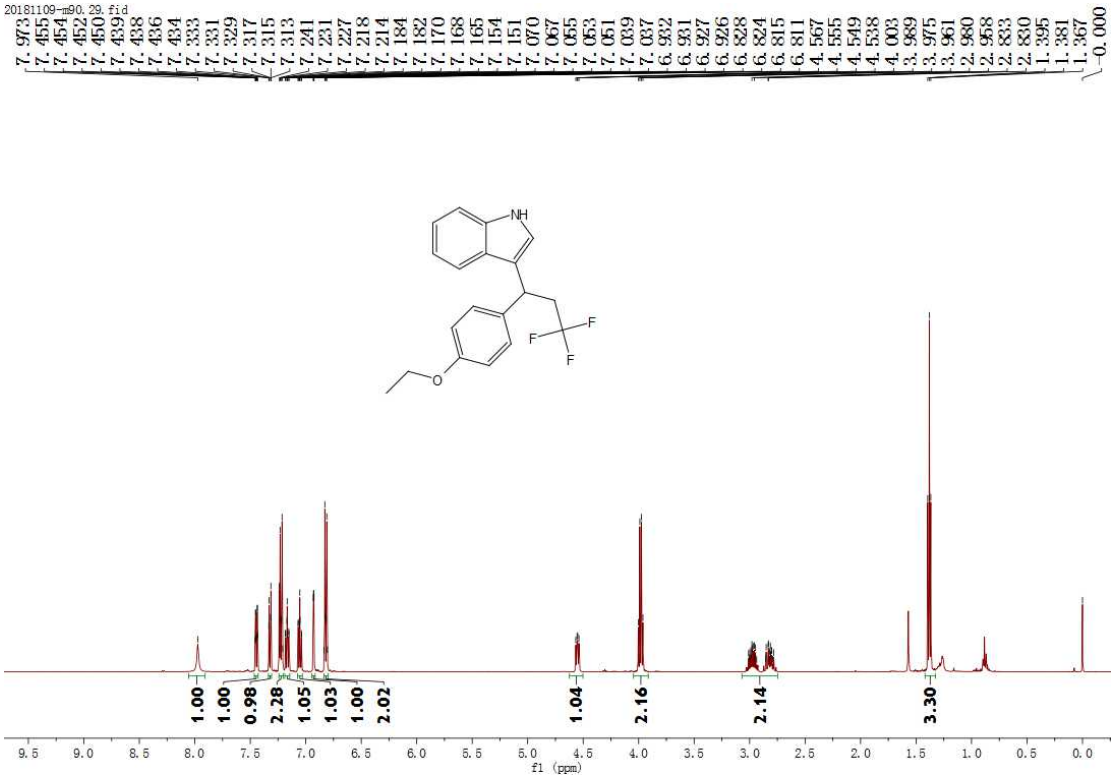
1-Methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aaa)

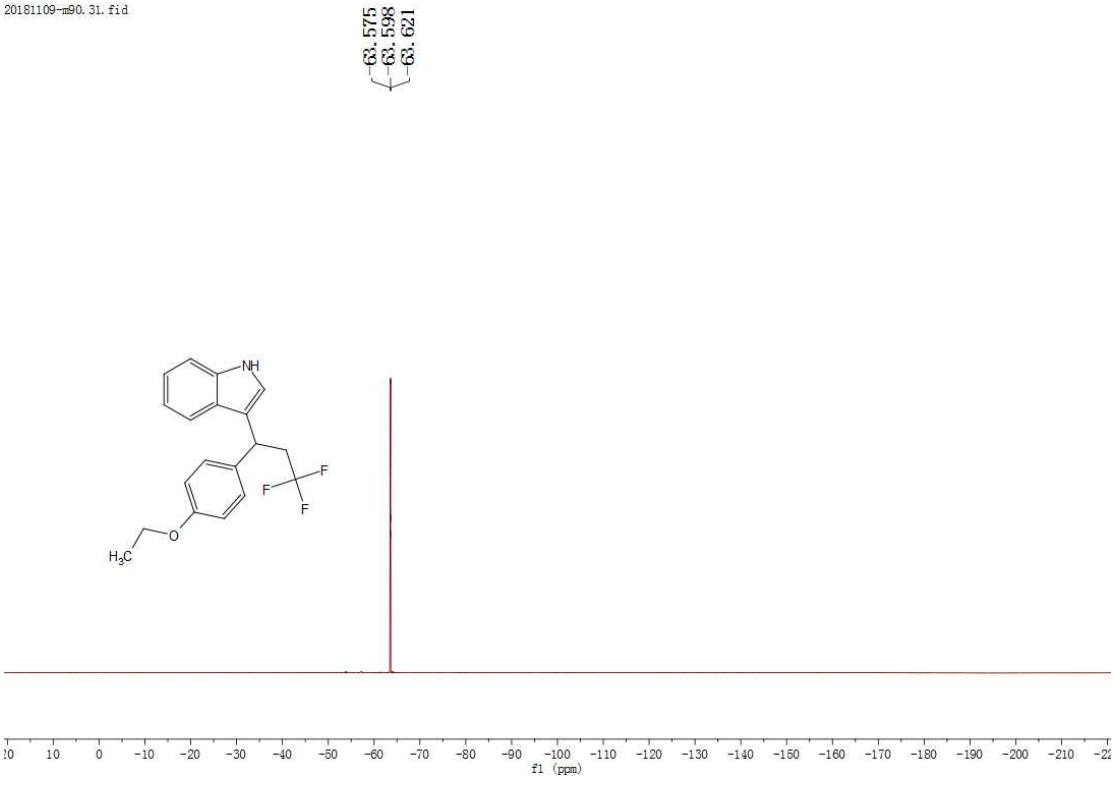


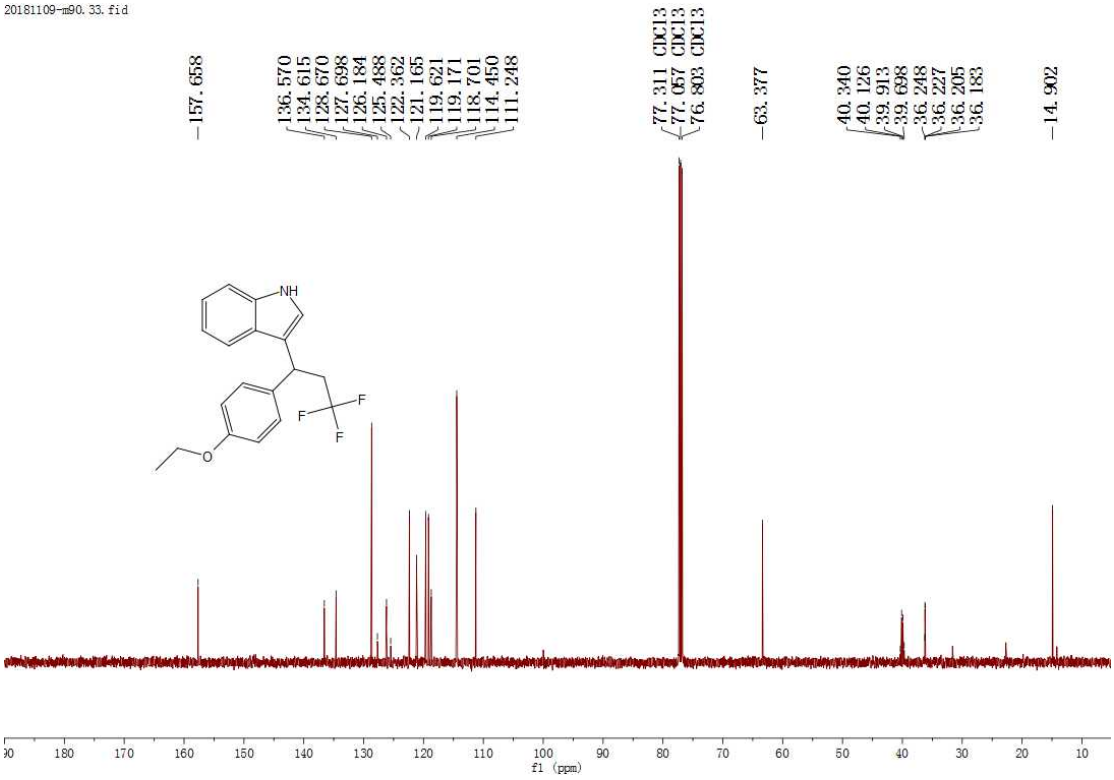



ljh-m-dx6.21.fid
158.239
137.307
134.906
129.157
128.642
127.670
126.527
125.993
125.461
123.251
121.889
119.160
119.069
117.152
113.900
109.349
77.288 CDCl3
77.034 CDCl3
76.781 CDCl3
55.223
40.455
40.240
40.027
39.813
36.211
36.192
36.169
36.149
32.758
CH3
N
F
F
F
H3C
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

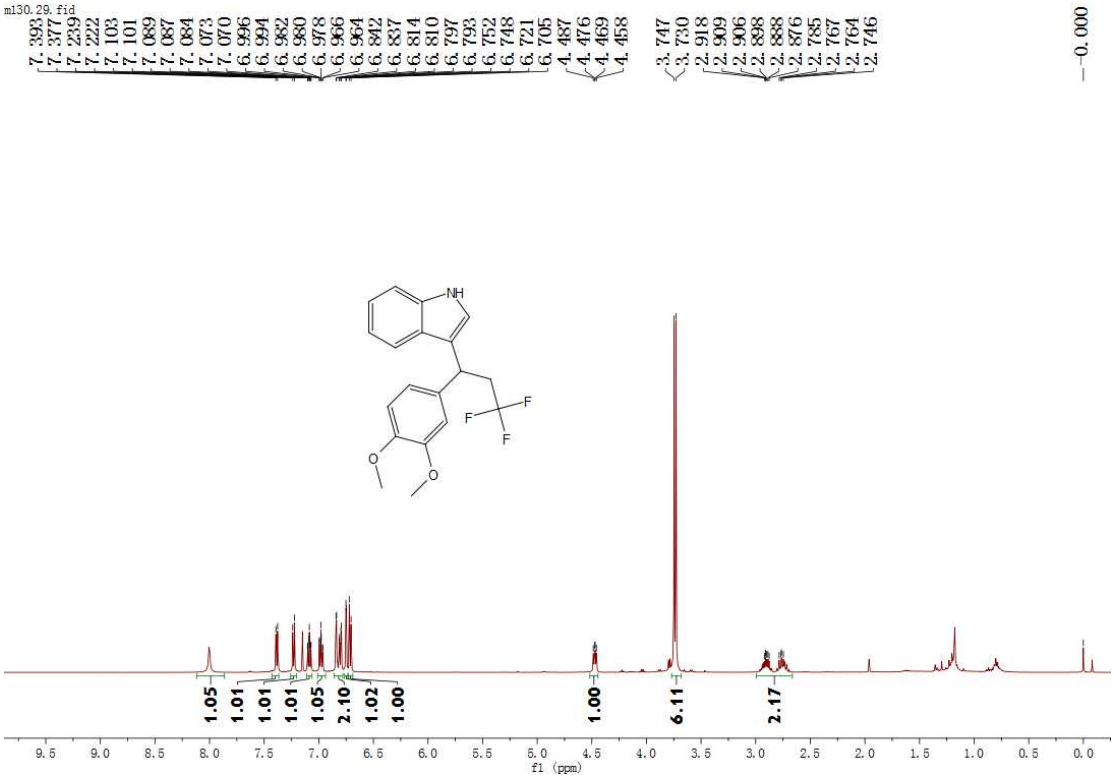
3-(1-(4-Ethoxyphenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4baa)

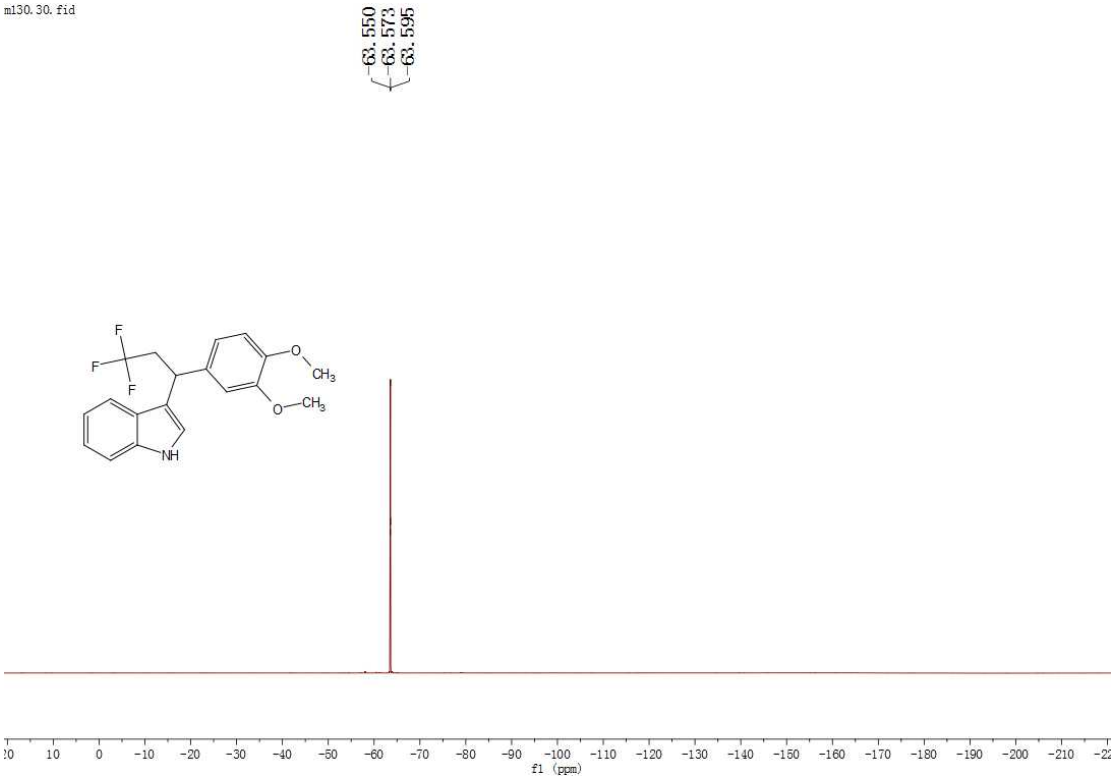




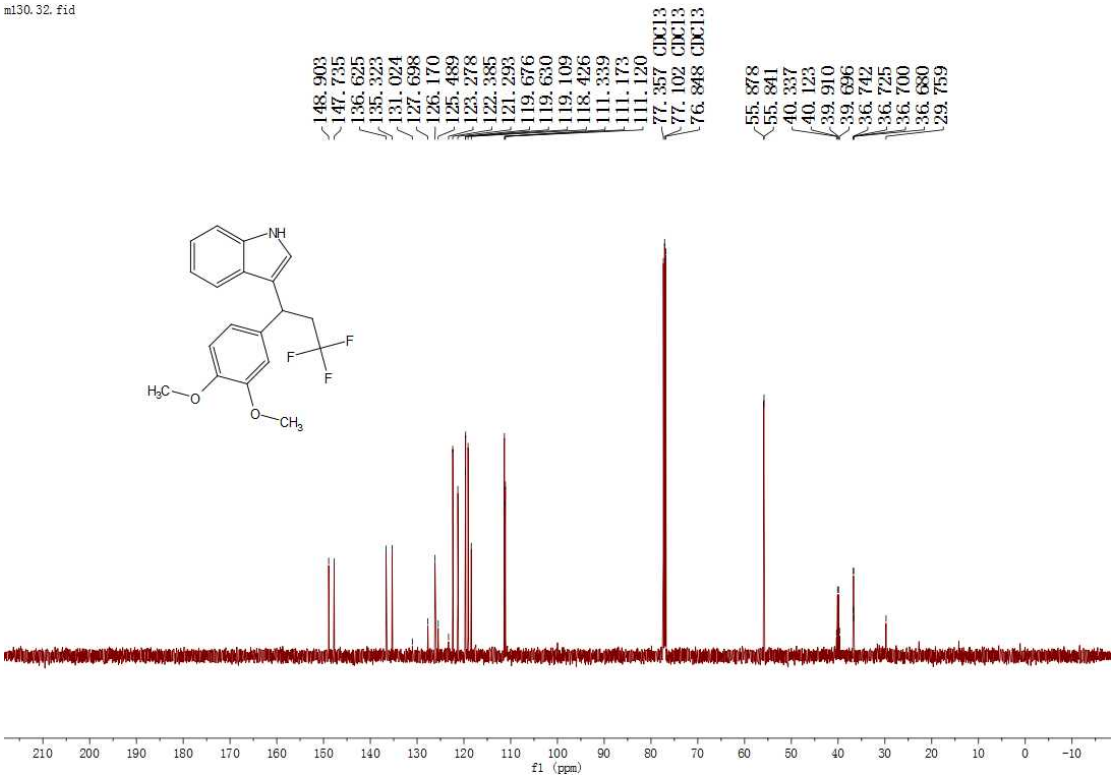

20181109-m90.33.fid
157.658
136.570
134.615
128.670
127.698
126.184
125.488
122.362
121.165
119.621
119.171
118.701
114.450
111.248
77.311 CDCl3
77.057 CDCl3
76.803 CDCl3
63.377
40.340
40.126
39.913
39.698
36.248
36.227
36.205
36.183
14.902
NH
F
F
F
O
f1 (ppm)

3-(1-(3,4-Dimethoxyphenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4caa)

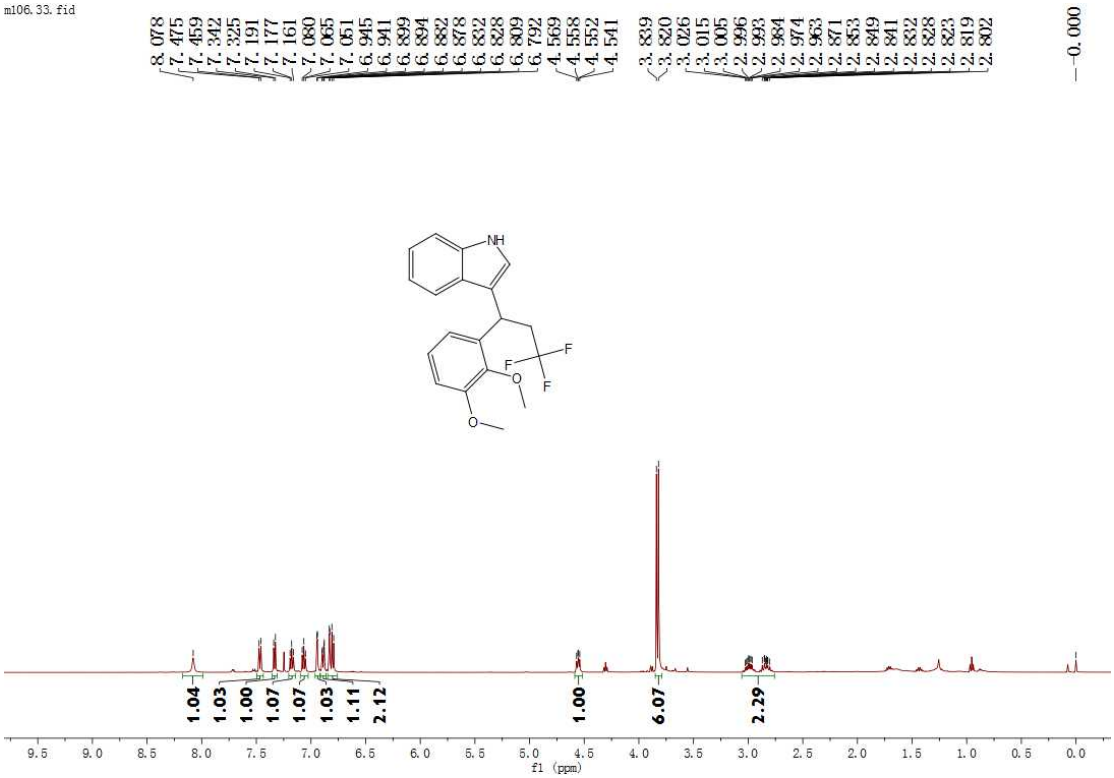


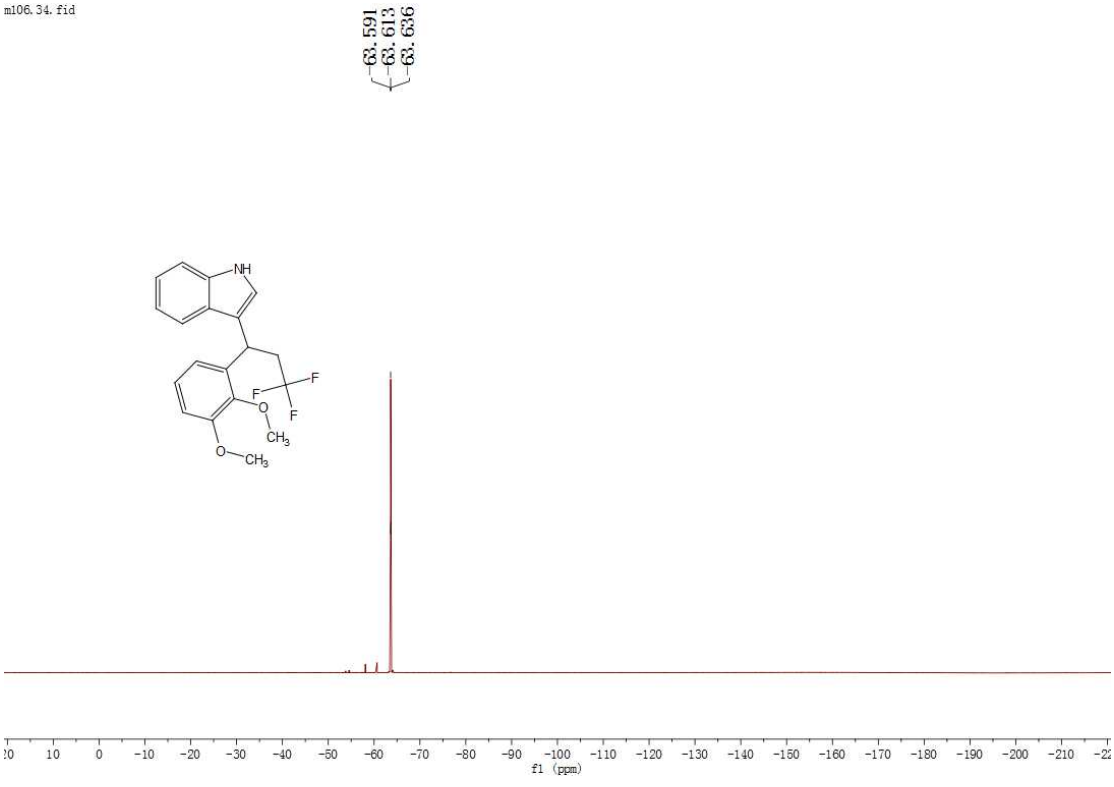


m130.32.fid


148.903
147.735
136.625
135.323
131.024
127.698
126.170
125.489
123.278
122.385
121.293
119.676
119.630
119.109
118.426
111.339
111.173
111.120
77.357 CDCl3
77.102 CDCl3
76.848 CDCl3
55.878
55.841
40.337
40.123
39.910
39.696
36.742
36.725
36.700
36.680
29.759
NH
F
F
F
H3C
O
O
CH3
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

3-(1-(2,3-Dimethoxyphenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4daa)



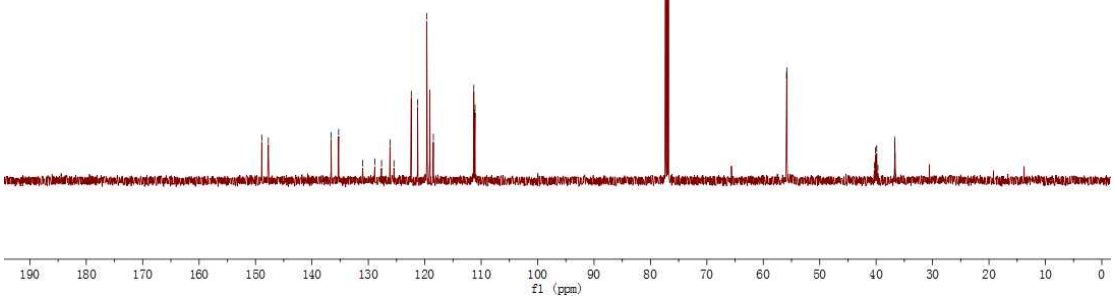


m106.36.fid

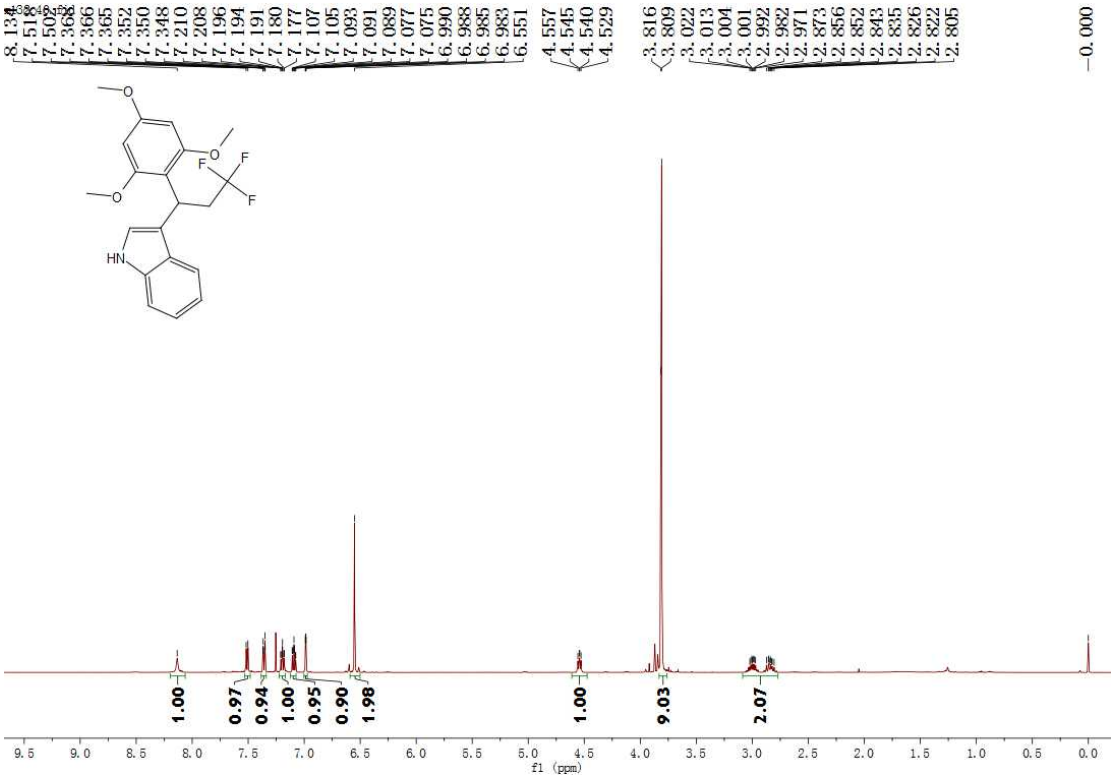
148.894
147.727
136.607
135.271
130.992
128.865
127.670
126.162
125.463
122.394
121.258
119.640
119.110
118.476
111.308
111.145
111.086

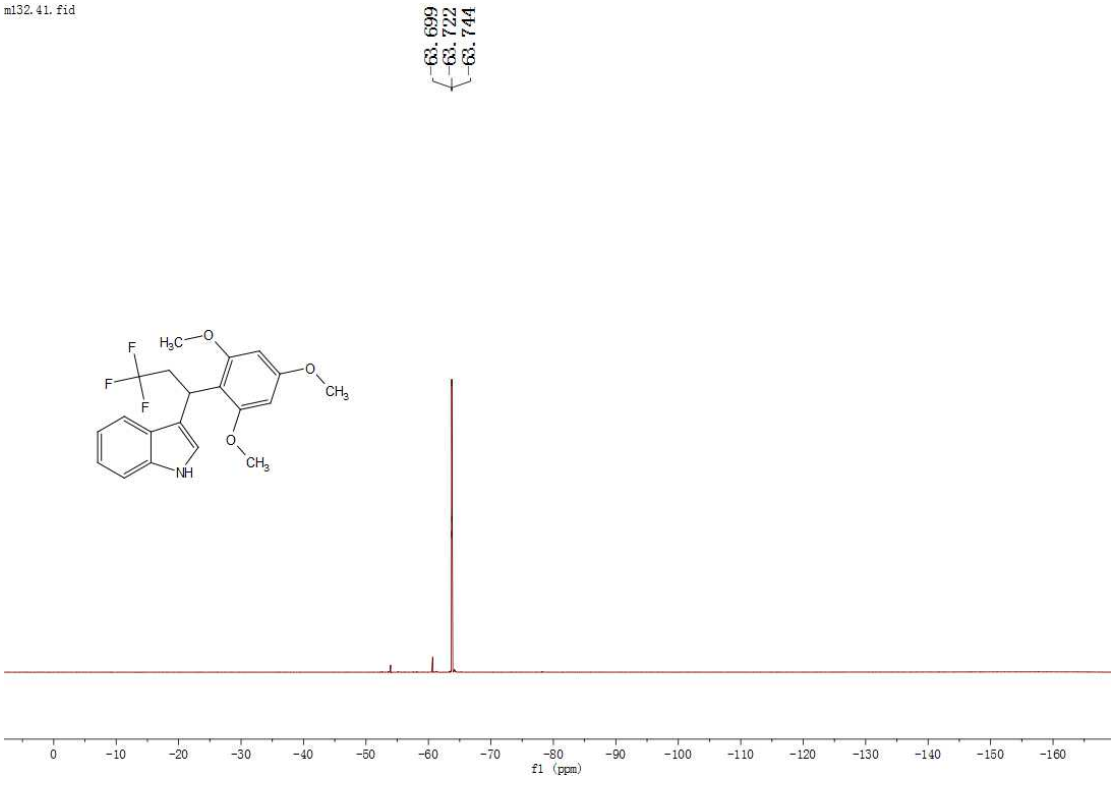
77.324 CDCl3
77.070 CDCl3
76.816 CDCl3

55.874
55.838
40.322
40.111
39.896
39.681
36.738
36.702
36.682
36.658



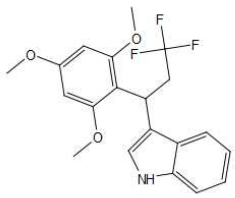
3-(3,3,3-Trifluoro-1-(2,4,6-trimethoxyphenyl)propyl)-1*H*-indole (4eaa)

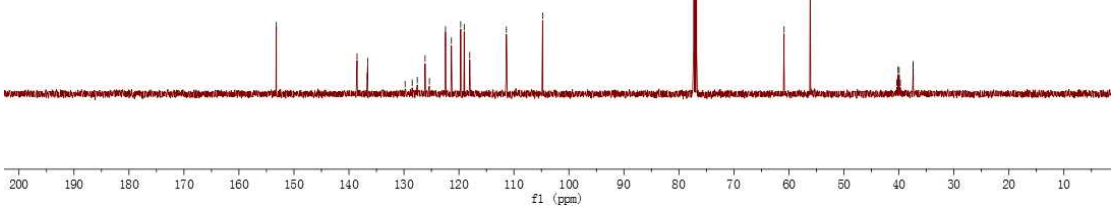




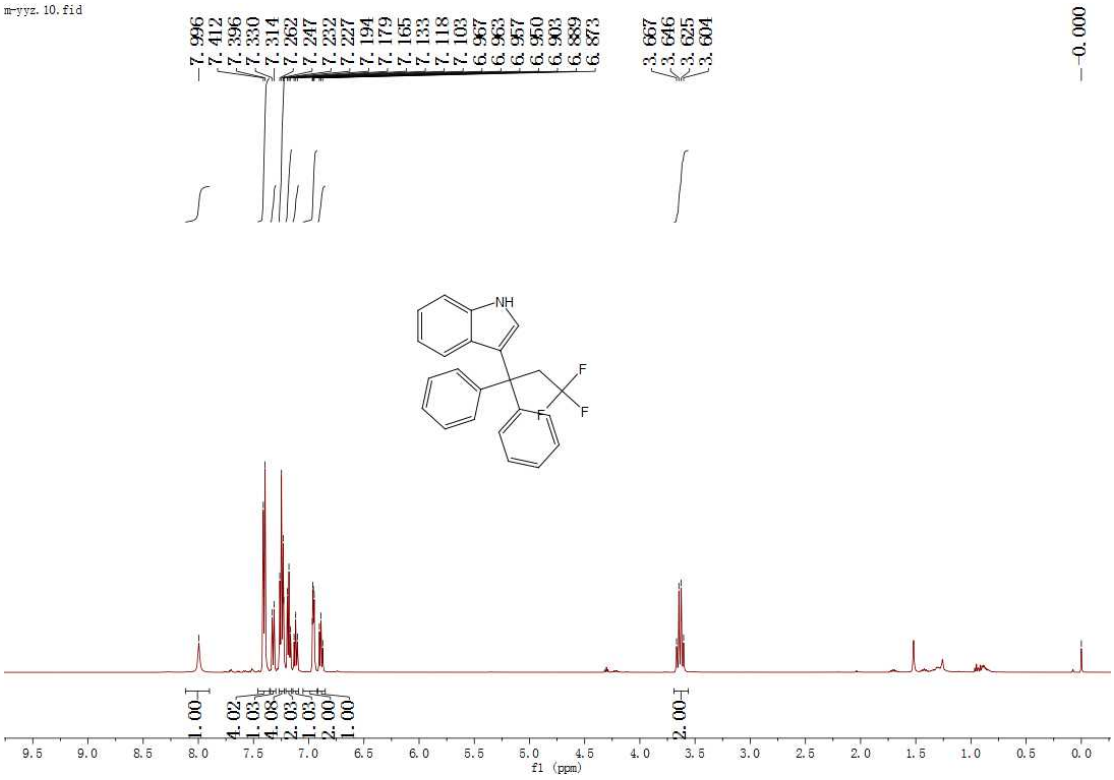
m132.43.fid

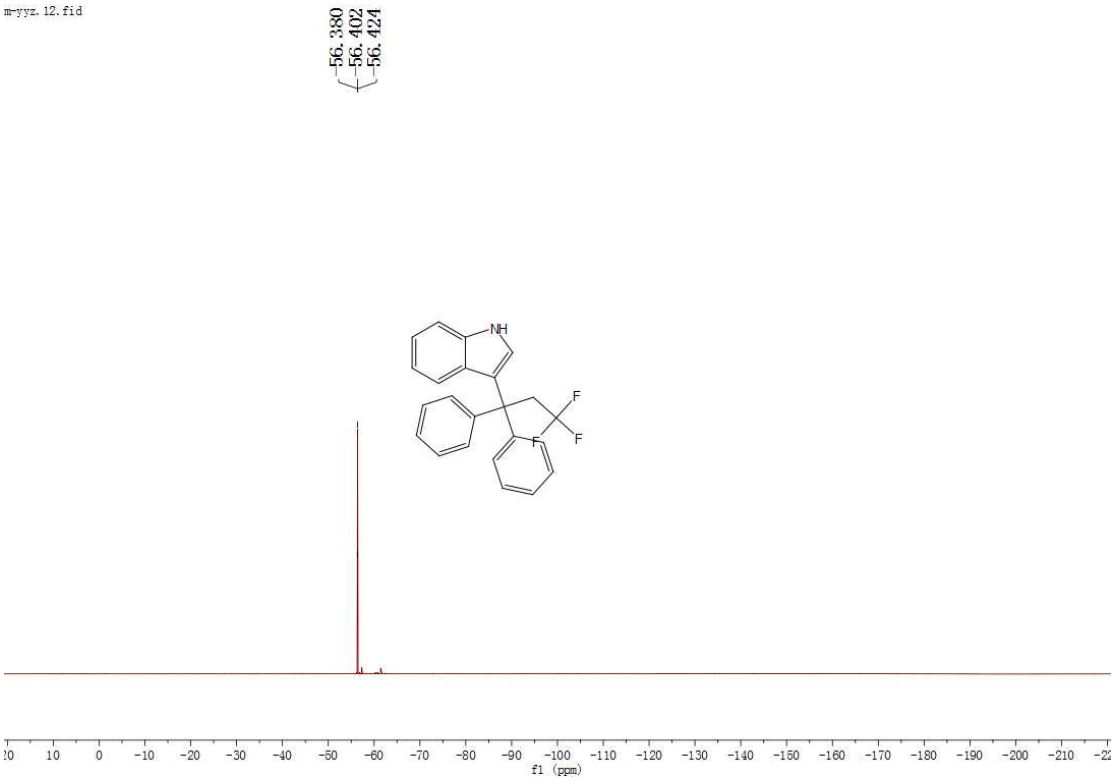
153.200
138.526
136.658
136.597
129.793
128.501
127.581
126.154
125.370
122.443
121.366
119.679
119.044
118.033
111.367
104.782
77.310 CDCl3
77.056 CDCl3
76.802 CDCl3
60.874
56.120
40.375
40.160
39.945
39.729
37.426
37.410
37.403
37.380



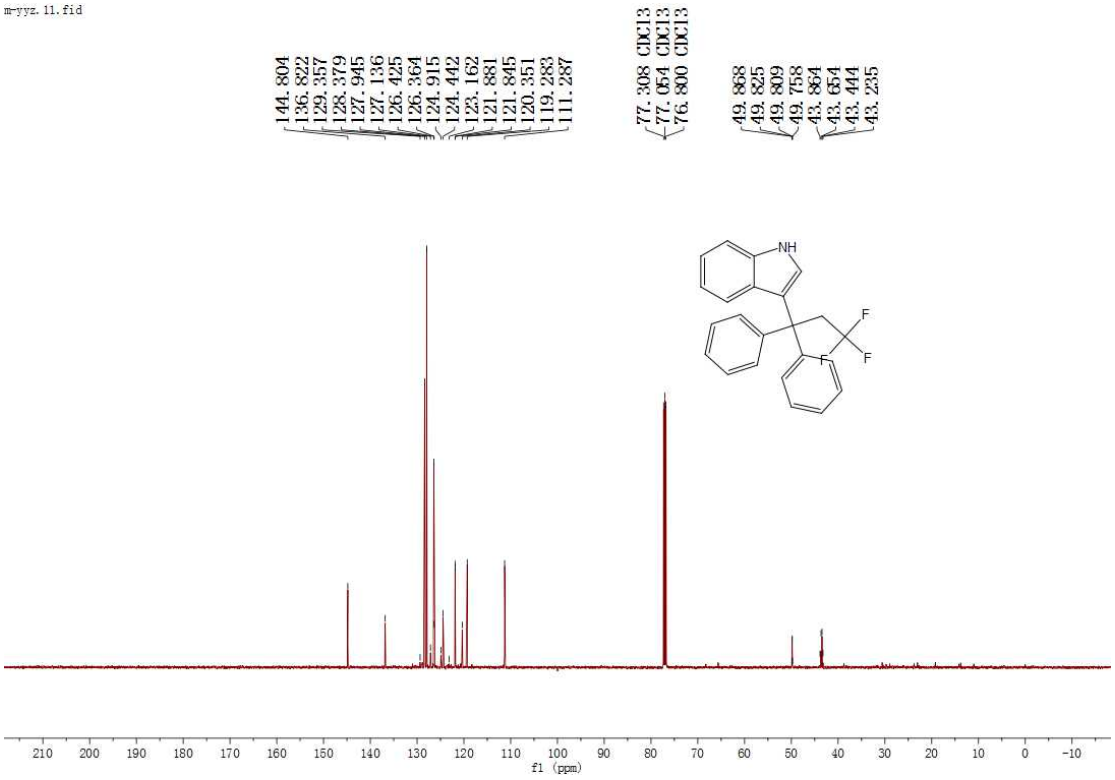


3-(3,3,3-Trifluoro-1,1-diphenylpropyl)-1*H*-indole (4faa)

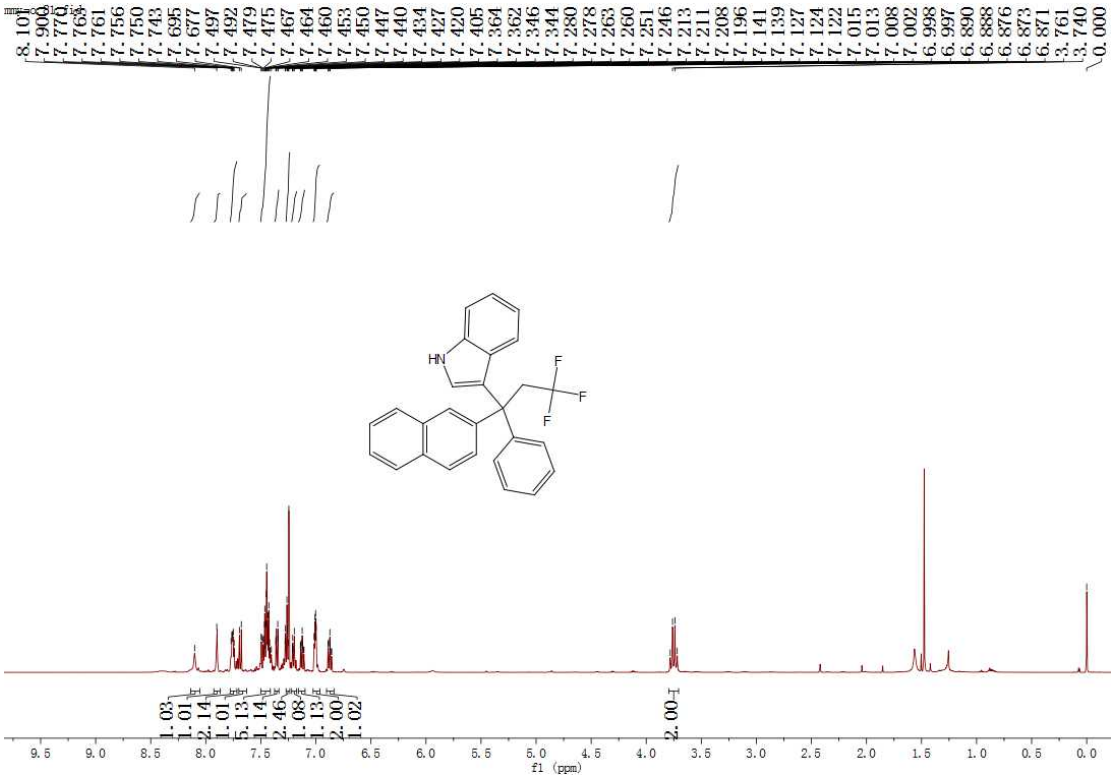


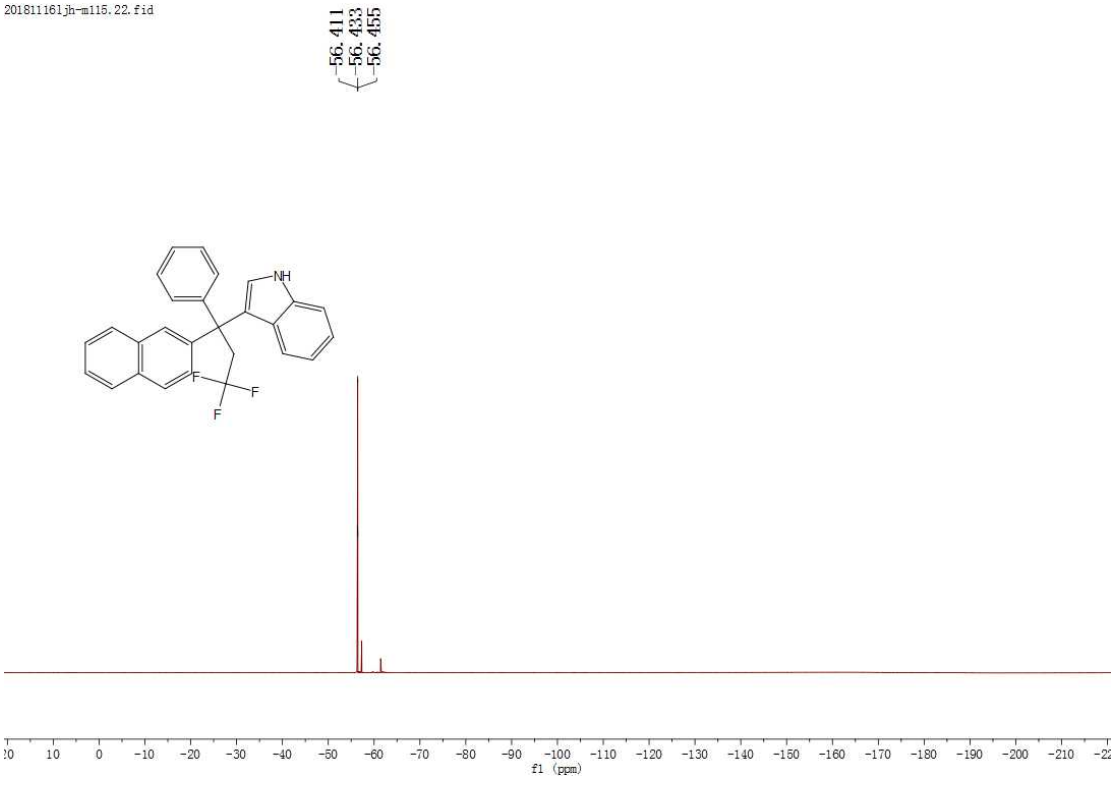


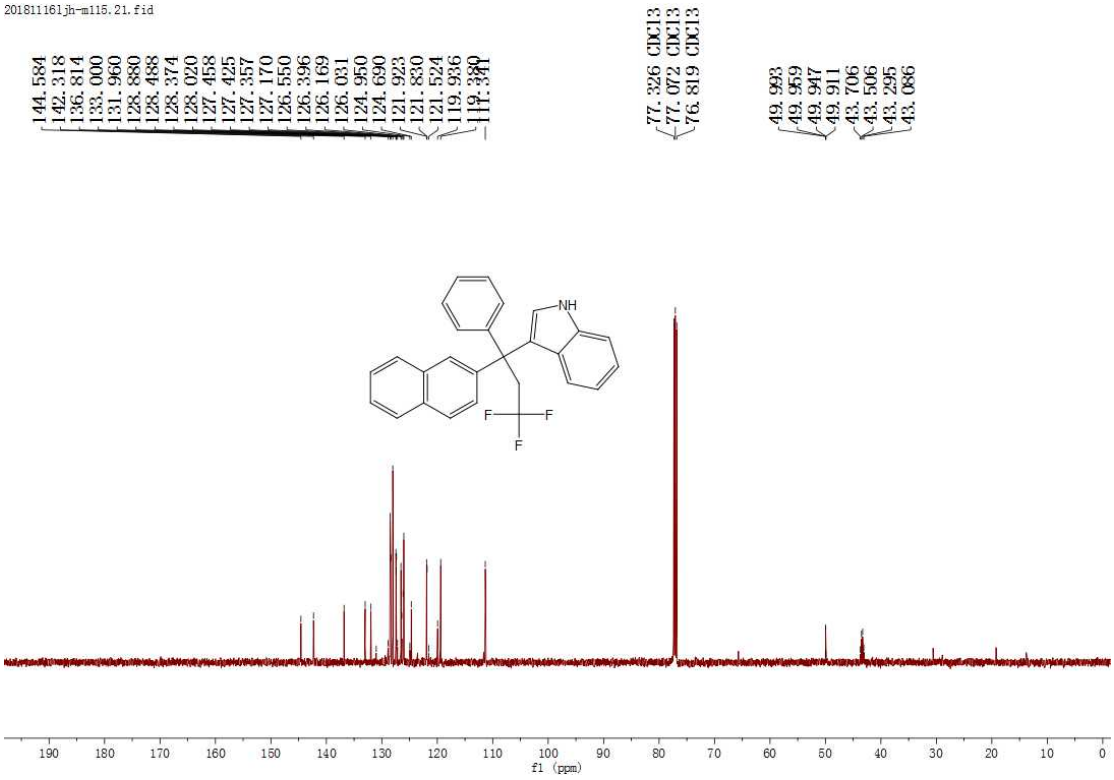
m-yyz.11.fid


144.804
136.822
129.357
128.379
127.945
127.136
126.425
126.364
124.915
124.442
123.162
121.881
121.845
120.351
119.283
111.287
77.308 CDCl3
77.054 CDCl3
76.800 CDCl3
49.868
49.825
49.809
49.758
43.864
43.654
43.444
43.235
NH
F
F
F
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

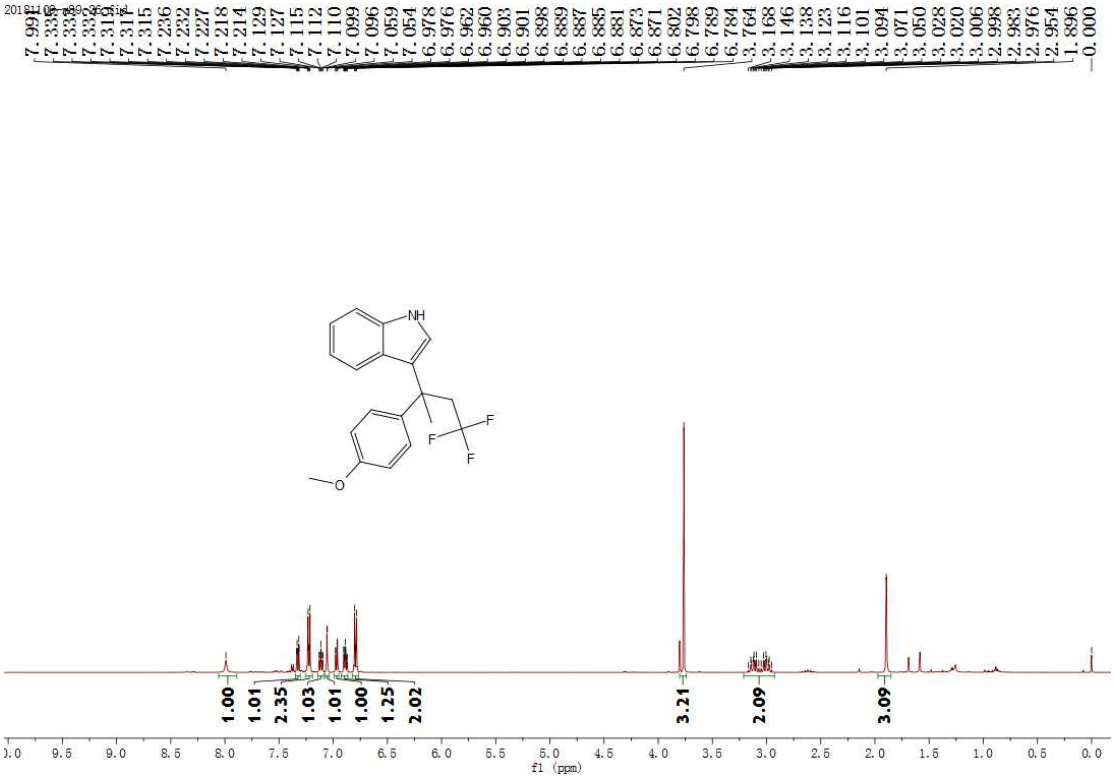
3-(3,3,3-Trifluoro-1-(naphthalen-2-yl)-1-phenylpropyl)-1*H*-indole (4gaa)

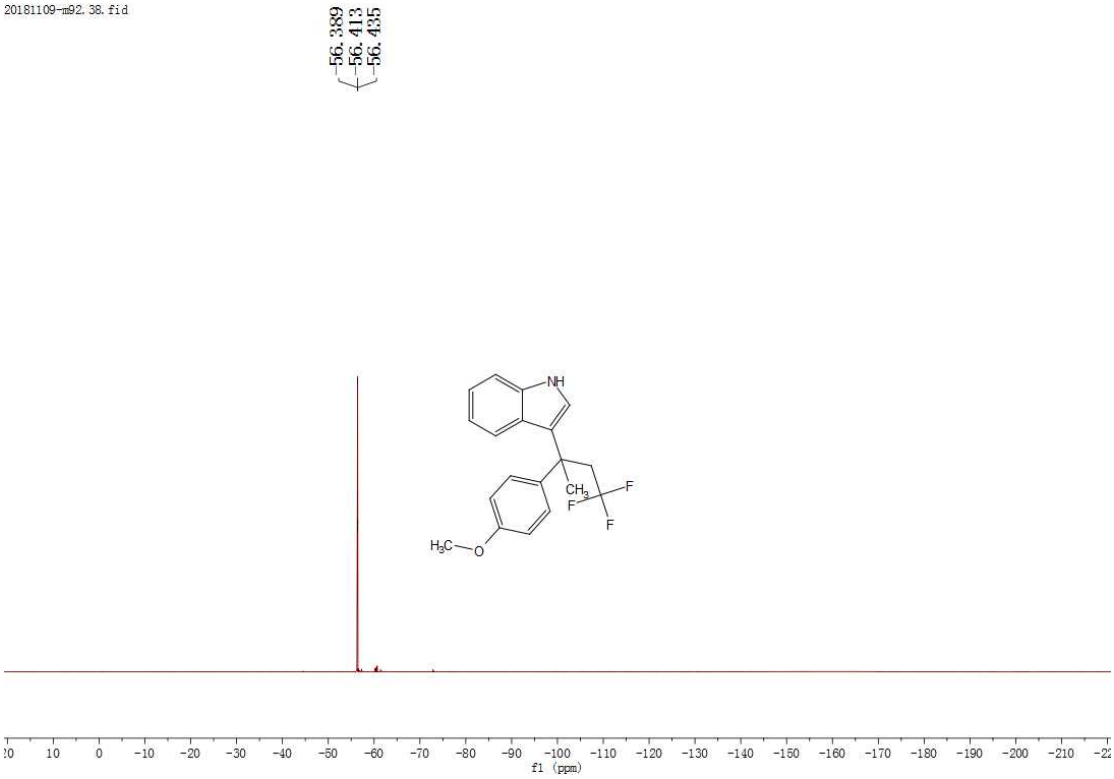


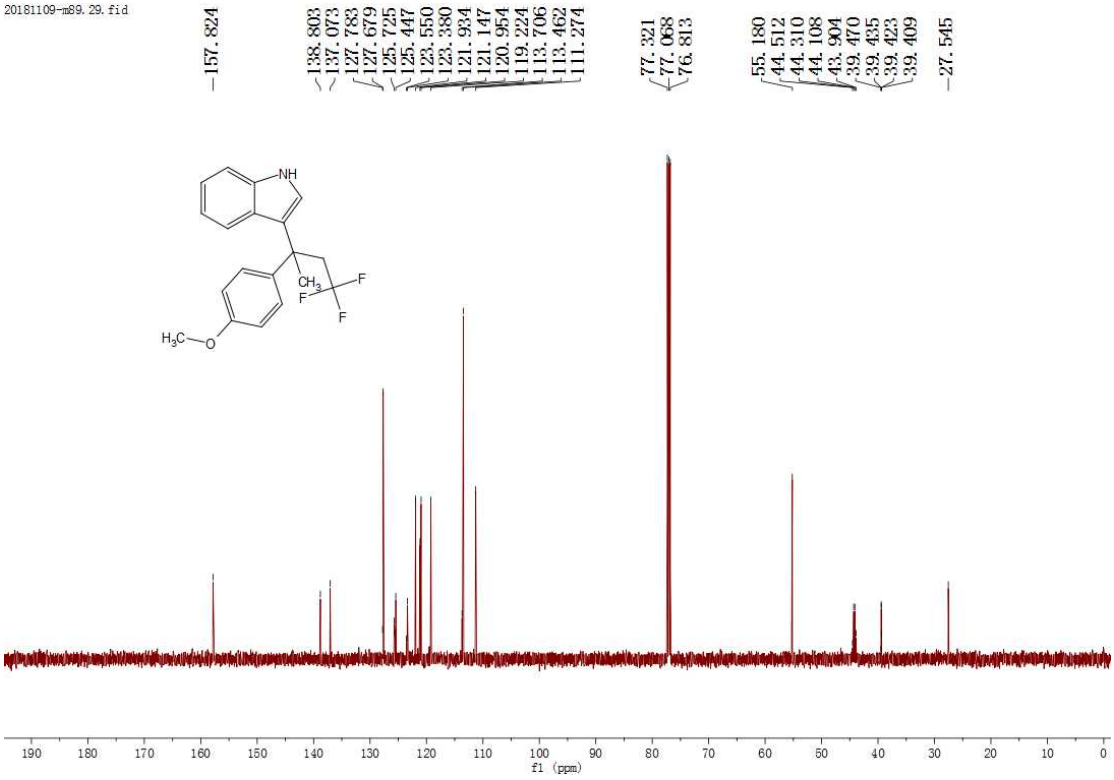



20181116ljh-m115.21.fid
144.584
142.318
136.814
133.000
131.960
128.880
128.488
128.374
128.020
127.458
127.425
127.357
127.170
126.550
126.396
126.169
126.031
124.950
124.690
121.923
121.830
121.524
119.936
77.326 CDCl3
77.072 CDCl3
76.819 CDCl3
49.993
49.959
49.947
49.911
43.706
43.506
43.295
43.086
NH
F
F
F
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

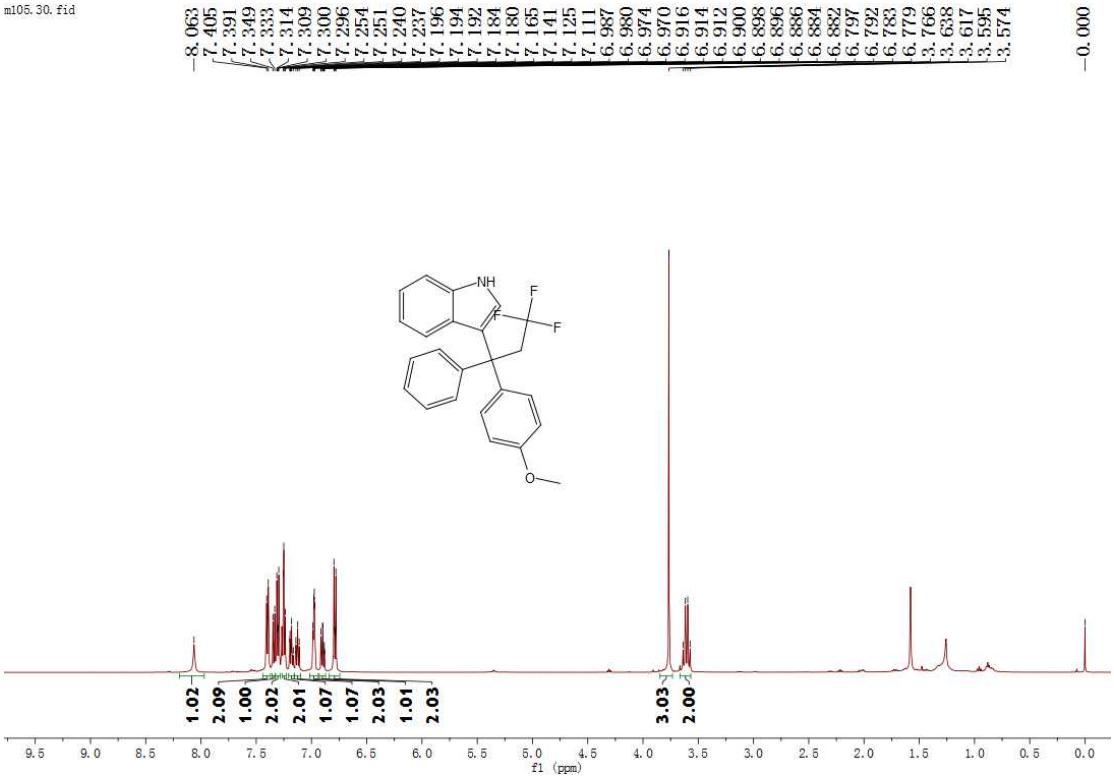
3-(4,4,4-Trifluoro-2-(4-methoxyphenyl)butan-2-yl)-1*H*-indole (4haa)

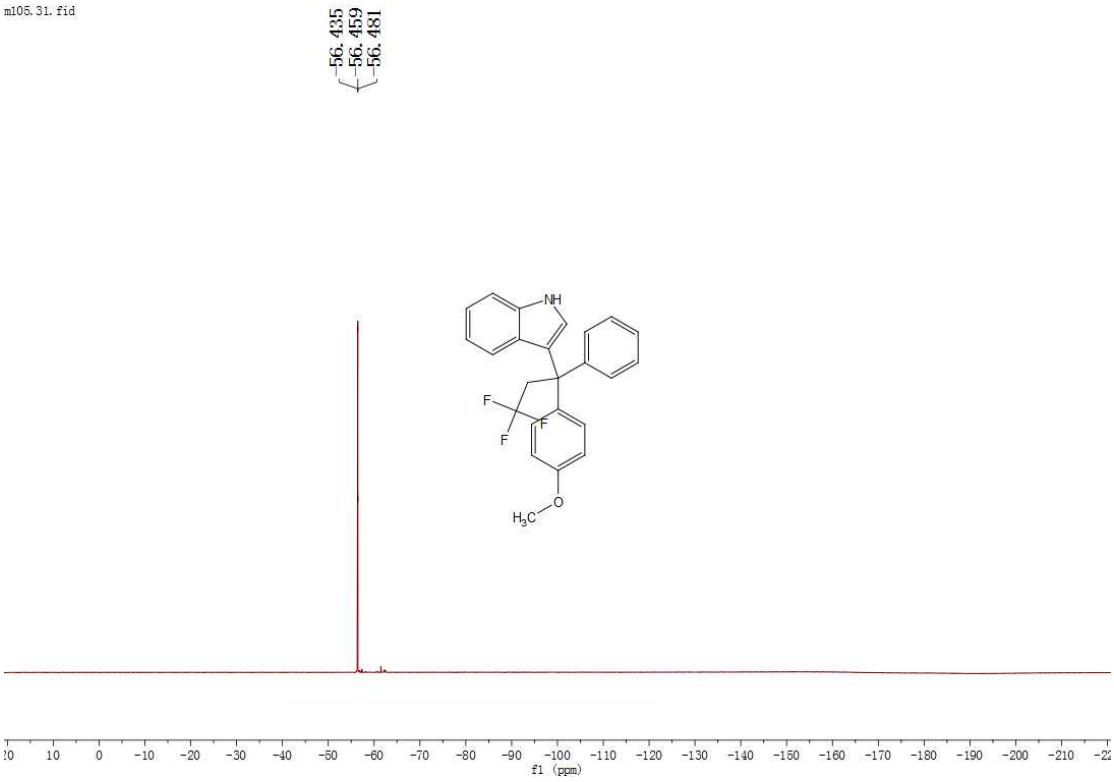


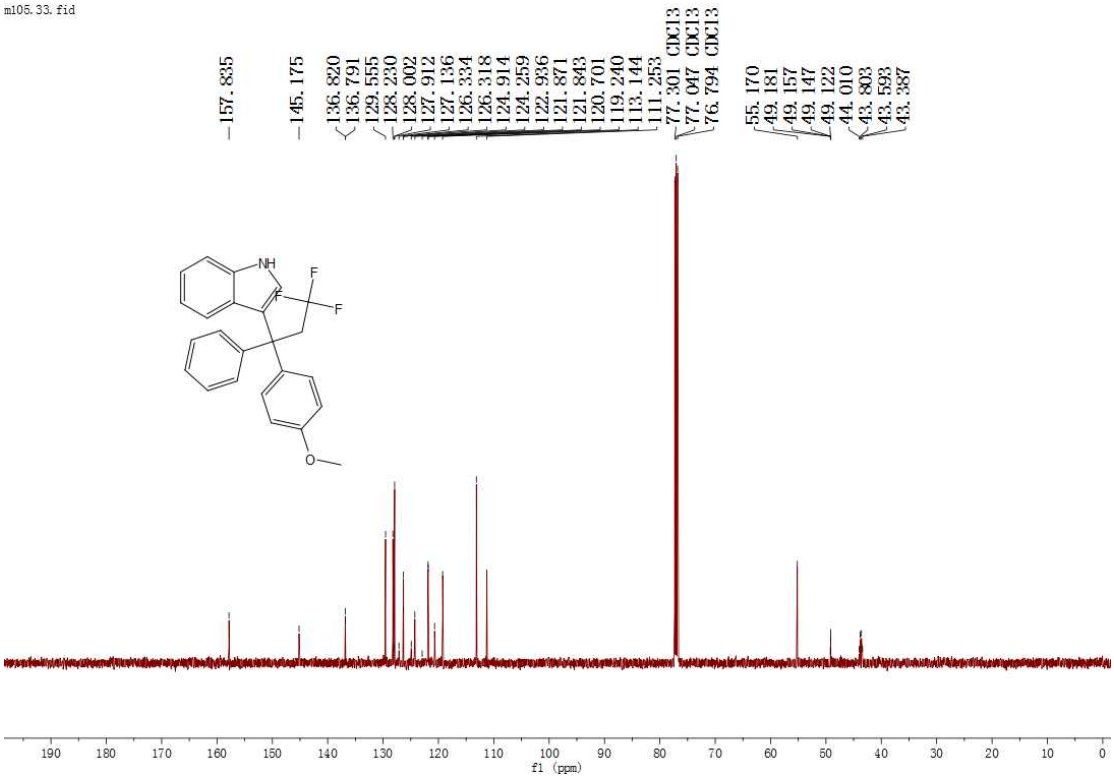



20181109-m89.29.fid
157.824
138.803
137.073
127.783
127.679
125.725
125.447
123.550
123.380
121.934
121.147
120.954
119.224
113.706
113.462
111.274
77.321
77.068
76.813
55.180
44.512
44.310
44.108
43.904
39.470
39.435
39.423
39.409
27.545
NH
CH3
F
F
F
H3C
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

3-(3,3,3-Trifluoro-1-(4-methoxyphenyl)-1-phenylpropyl)-1*H*-indole (4iaa)

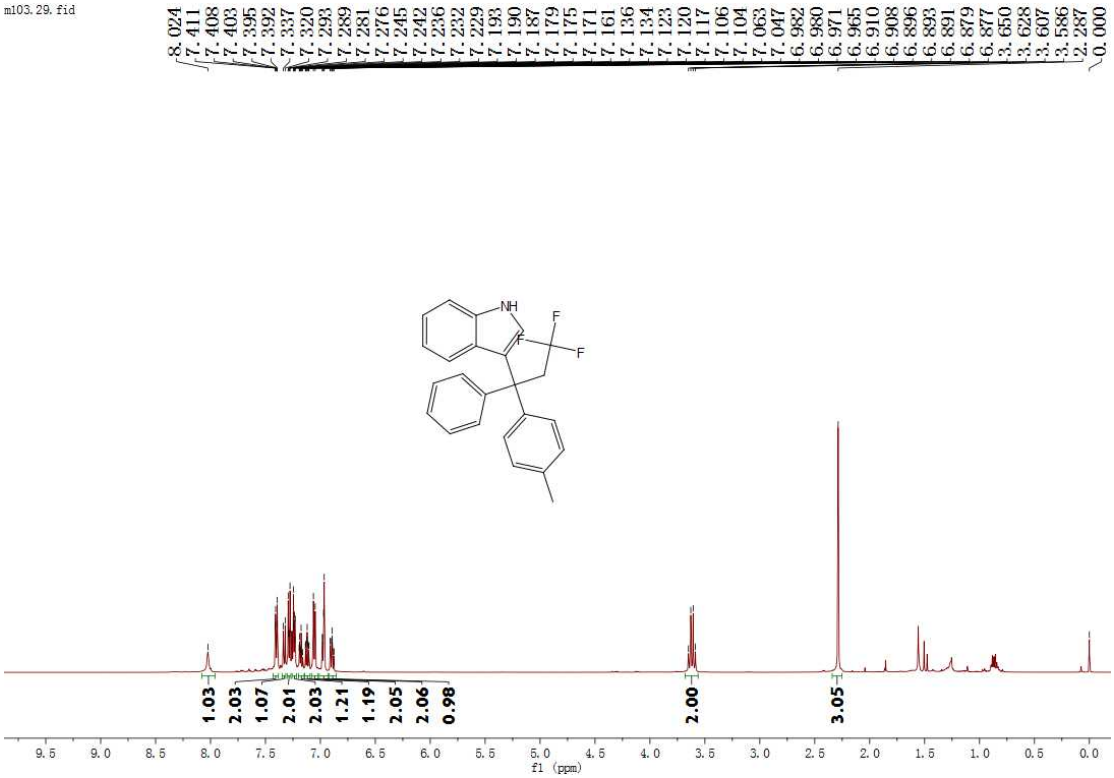




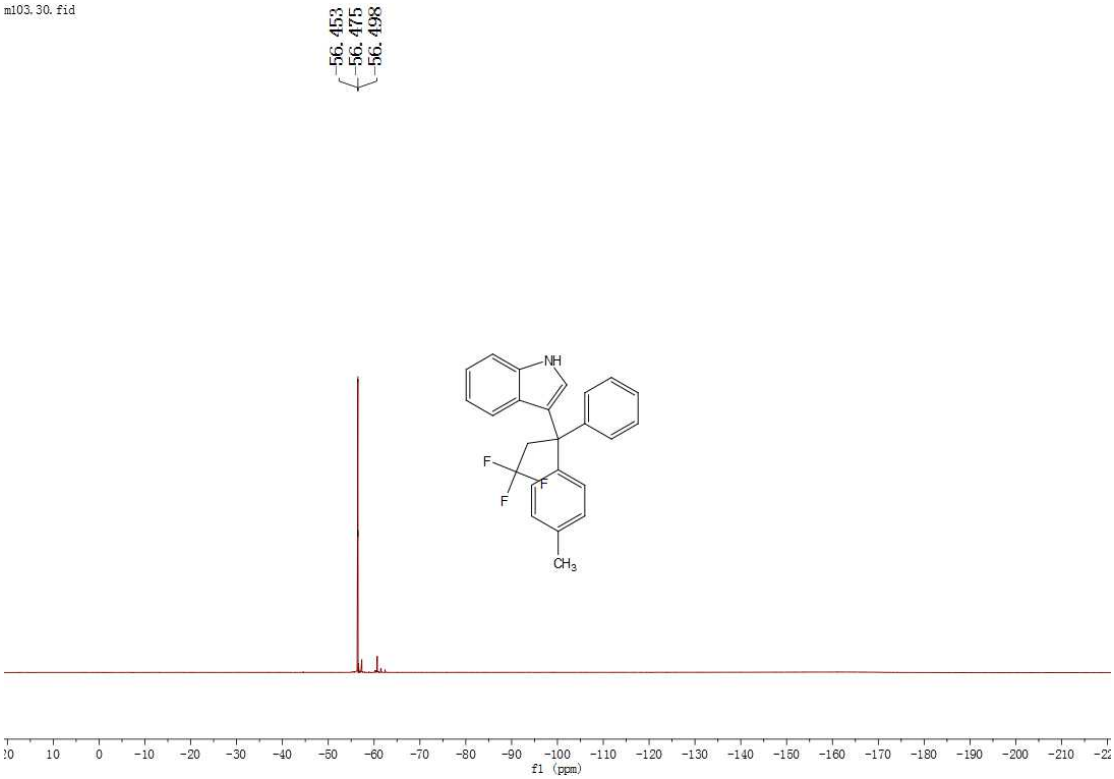

m105.33.fid
157.835
145.175
136.820
136.791
129.555
128.230
128.002
127.912
127.136
126.334
126.318
124.914
124.259
122.936
121.871
121.843
120.701
119.240
113.144
111.253
77.301 CDCl3
77.047 CDCl3
76.794 CDCl3
55.170
49.181
49.157
49.147
49.122
44.010
43.803
43.593
43.387
NH
F
F
F
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

3-(3,3,3-Trifluoro-1-phenyl-1-(*p*-tolyl)propyl)-1*H*-indole (4jaa)

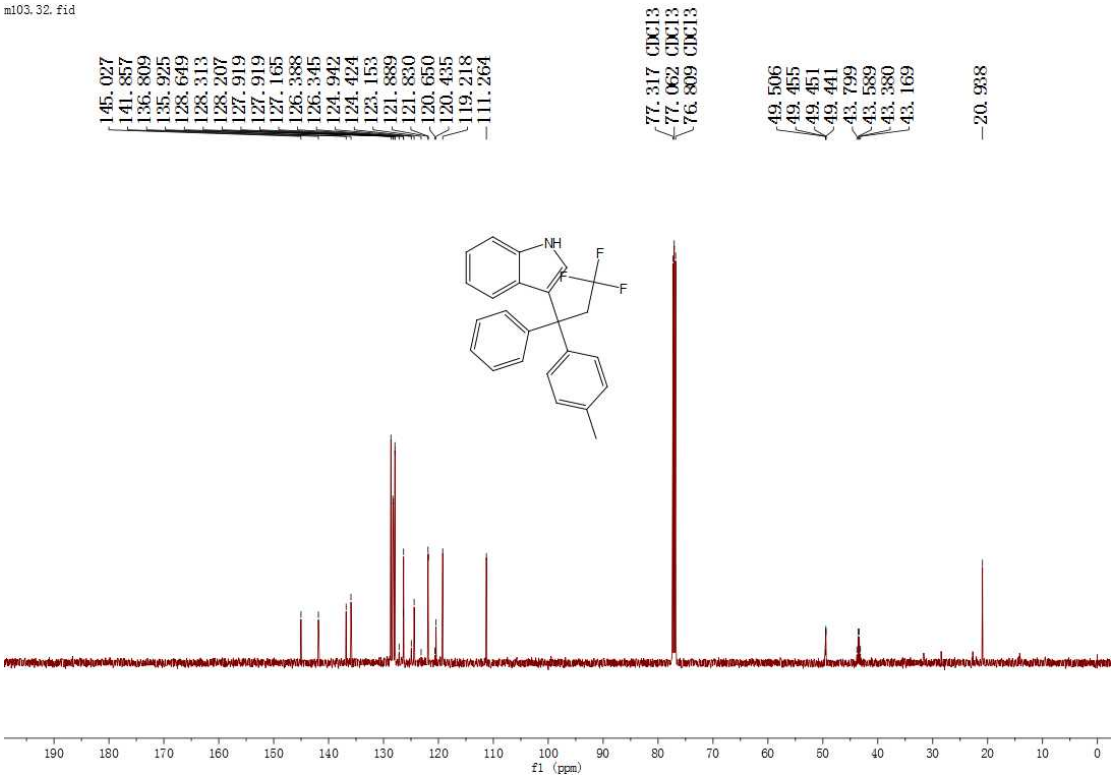
m103.29.fid



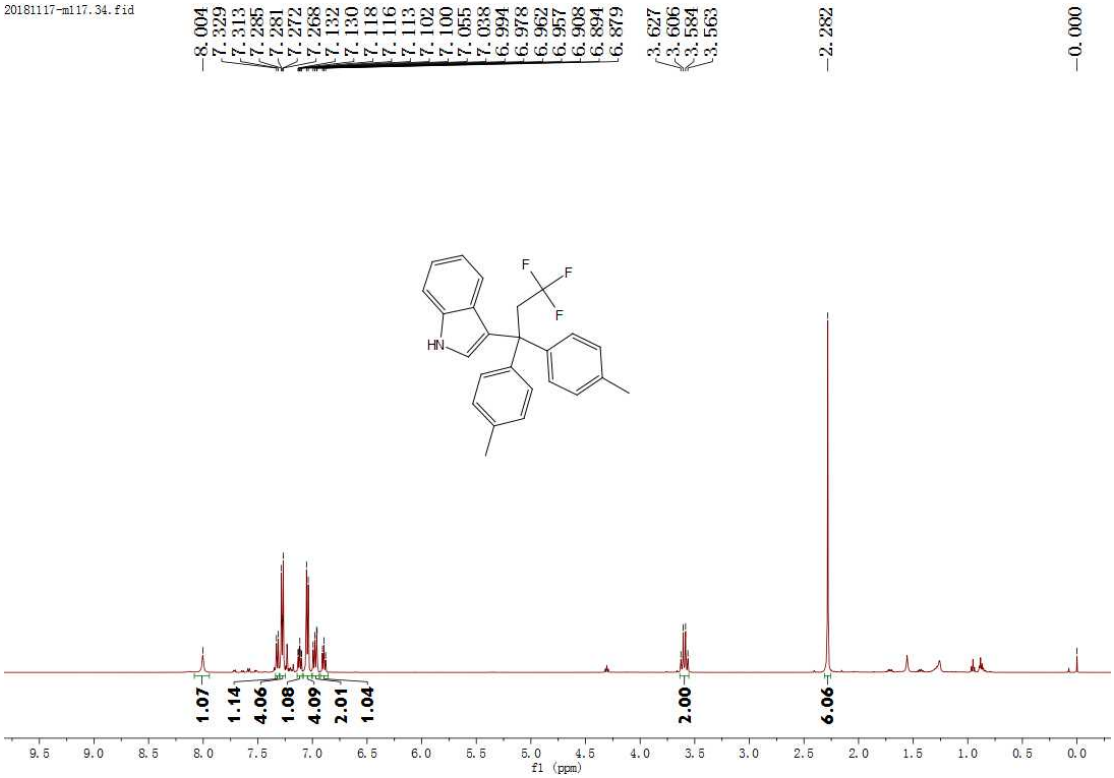
m103.30.fid

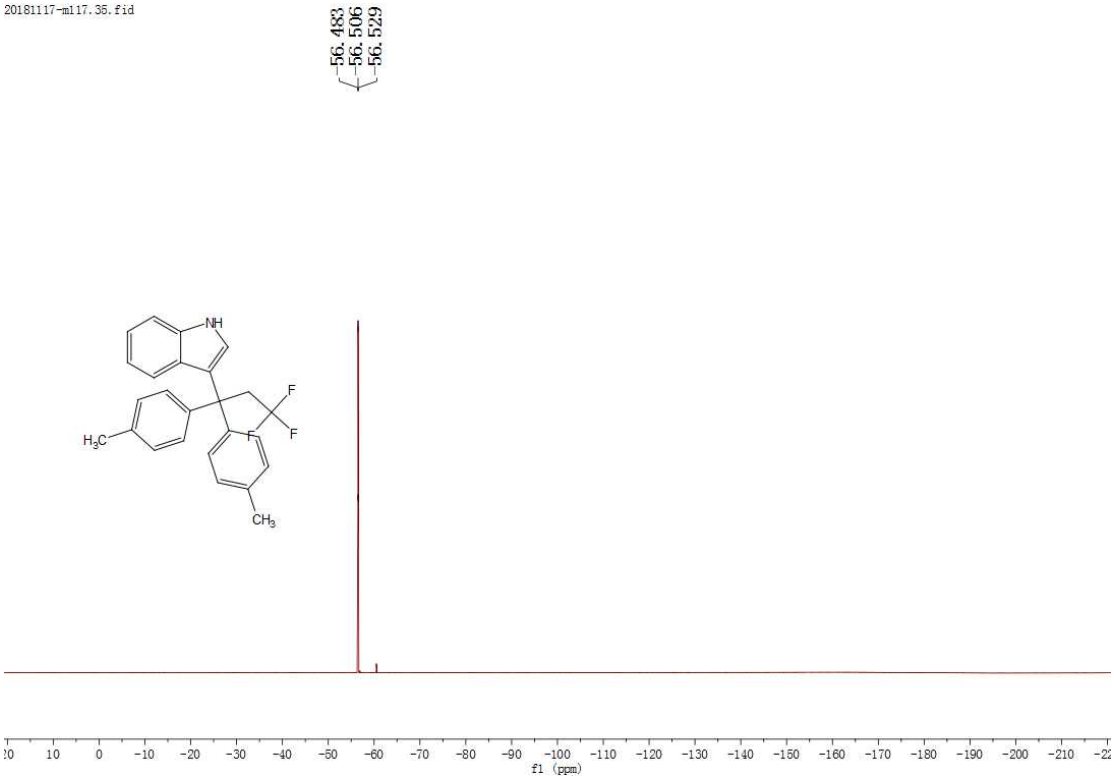


m103.32.fid


145.027
141.857
136.809
135.925
128.649
128.313
128.207
127.919
127.919
127.165
126.388
126.345
124.942
124.424
123.153
121.889
121.830
120.650
120.435
119.218
111.264
77.317 CDCl3
77.062 CDCl3
76.809 CDCl3
49.506
49.455
49.451
49.441
43.799
43.589
43.380
43.169
20.938
NH
F
F
F
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

3-(3,3,3-Trifluoro-1,1-di-*p*-tolylpropyl)-1*H*-indole (4kaa)





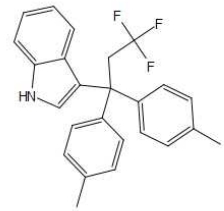
20181117-ml17.37.fid

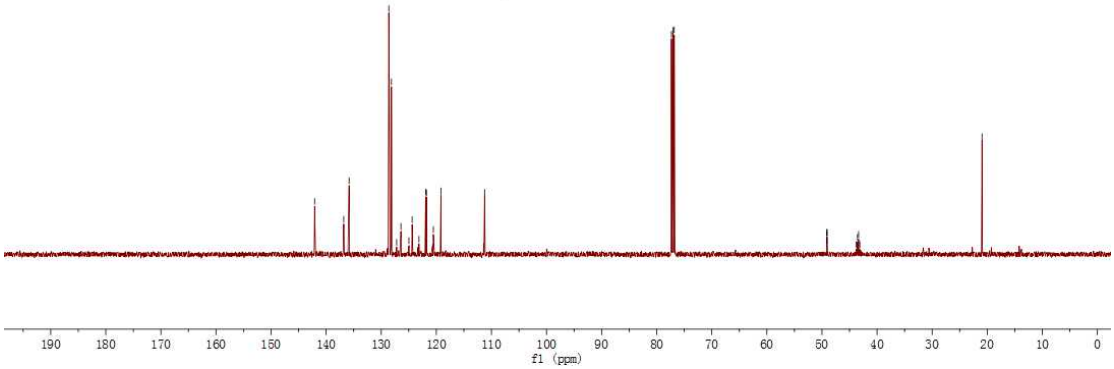
142.095
136.805
135.831
128.627
128.147
127.202
126.424
124.980
124.395
123.151
121.940
121.788
120.542
119.164
111.242

77.324 CDCl3
77.070 CDCl3
76.816 CDCl3

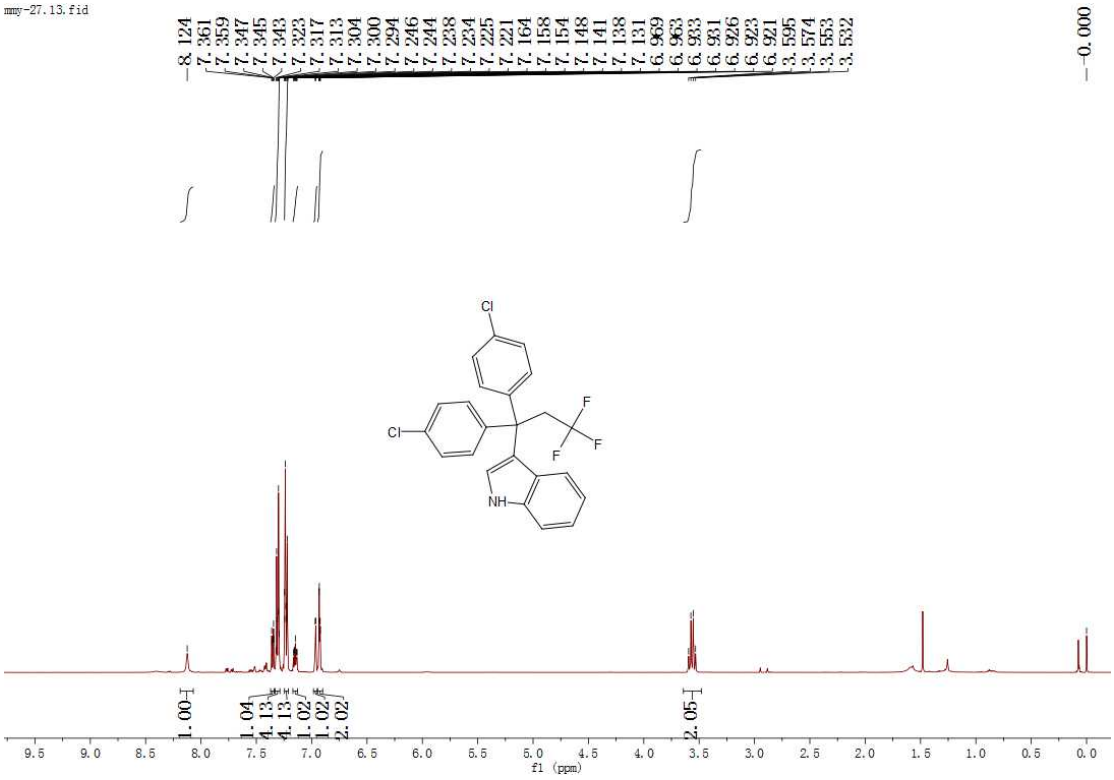
49.105
49.096
49.096
49.083
43.765
43.553
43.346
43.137

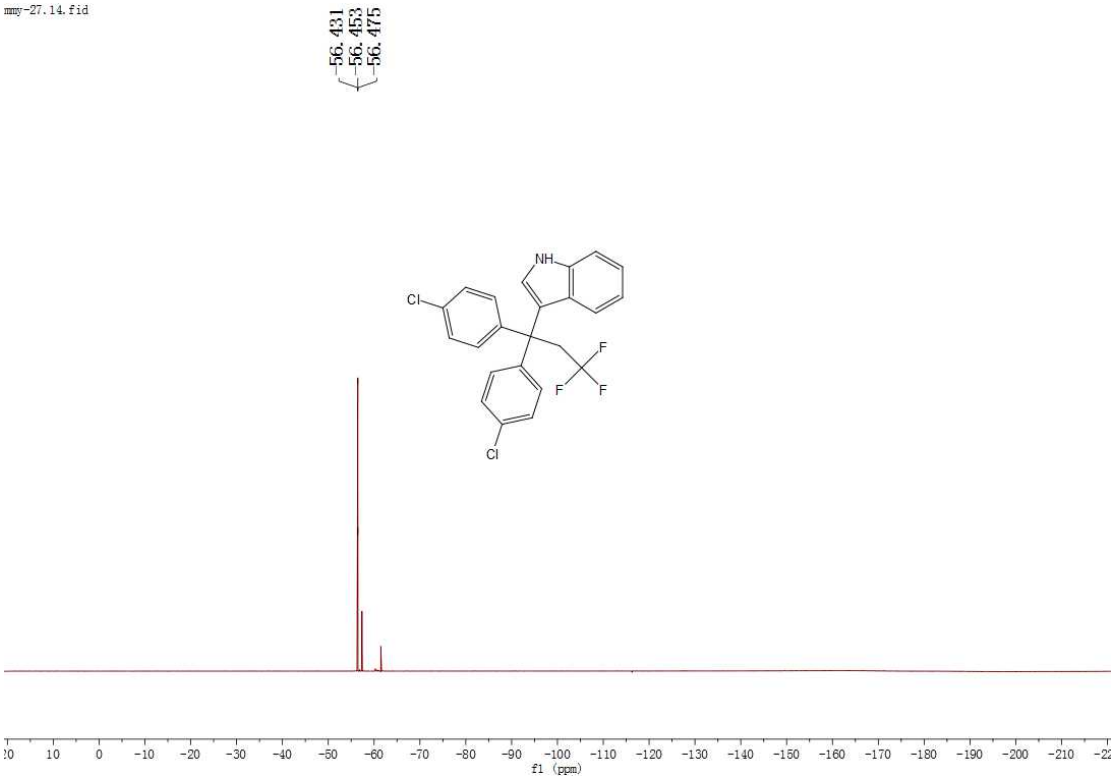
20.946



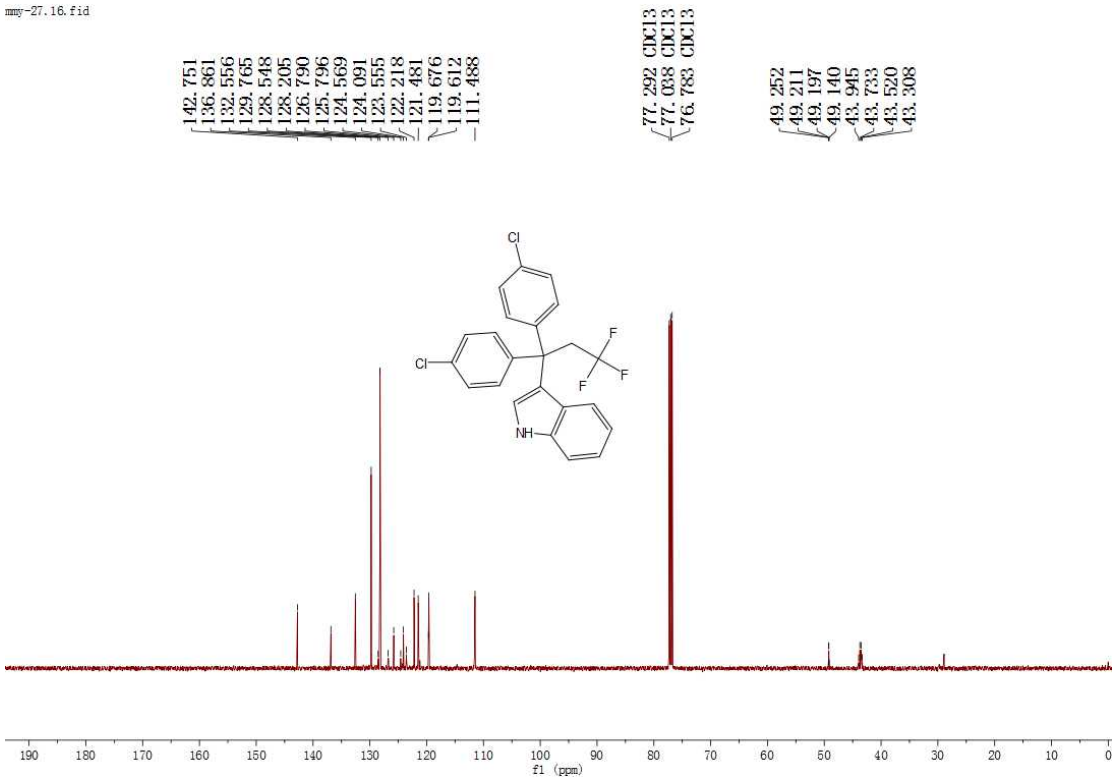


3-(1,1-bis(4-chlorophenyl)-3,3,3-trifluoropropyl)-1*H*-indole (4laa)

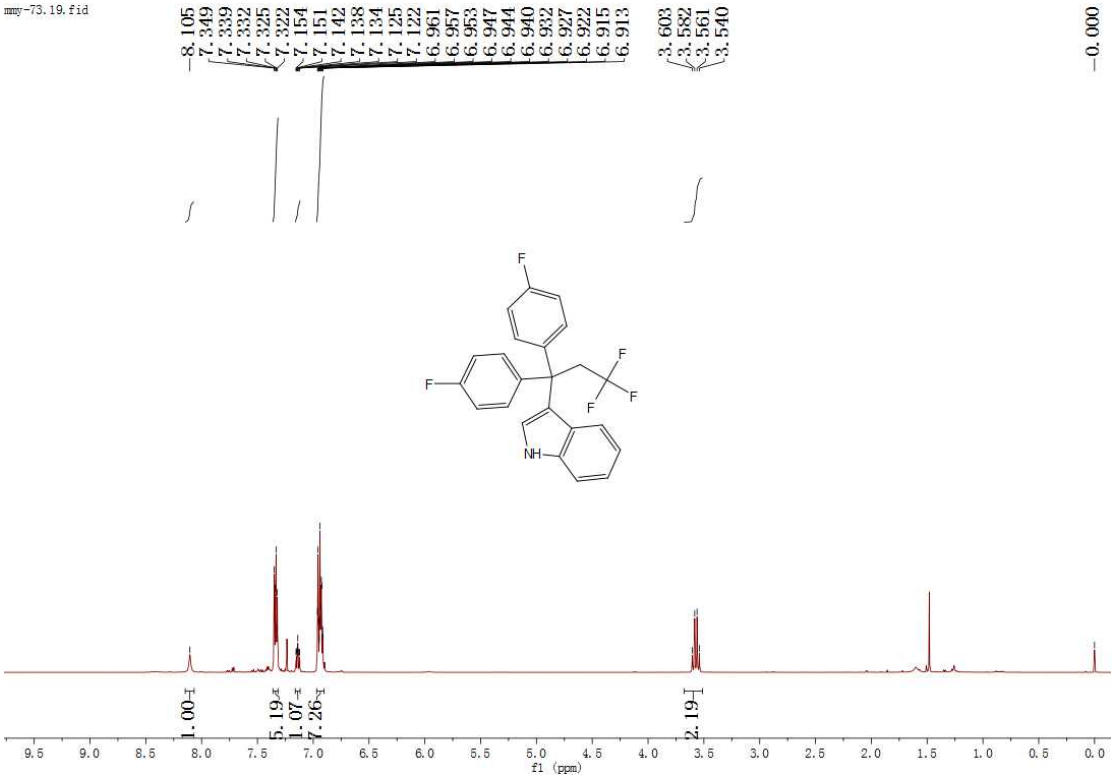


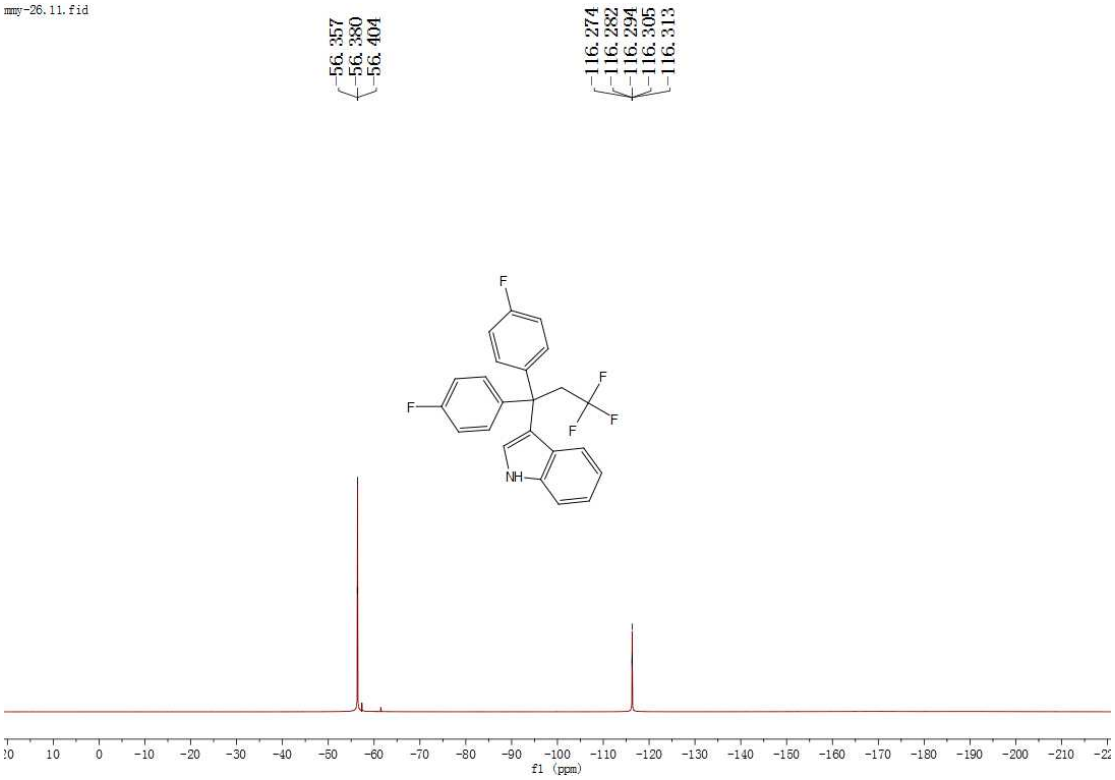


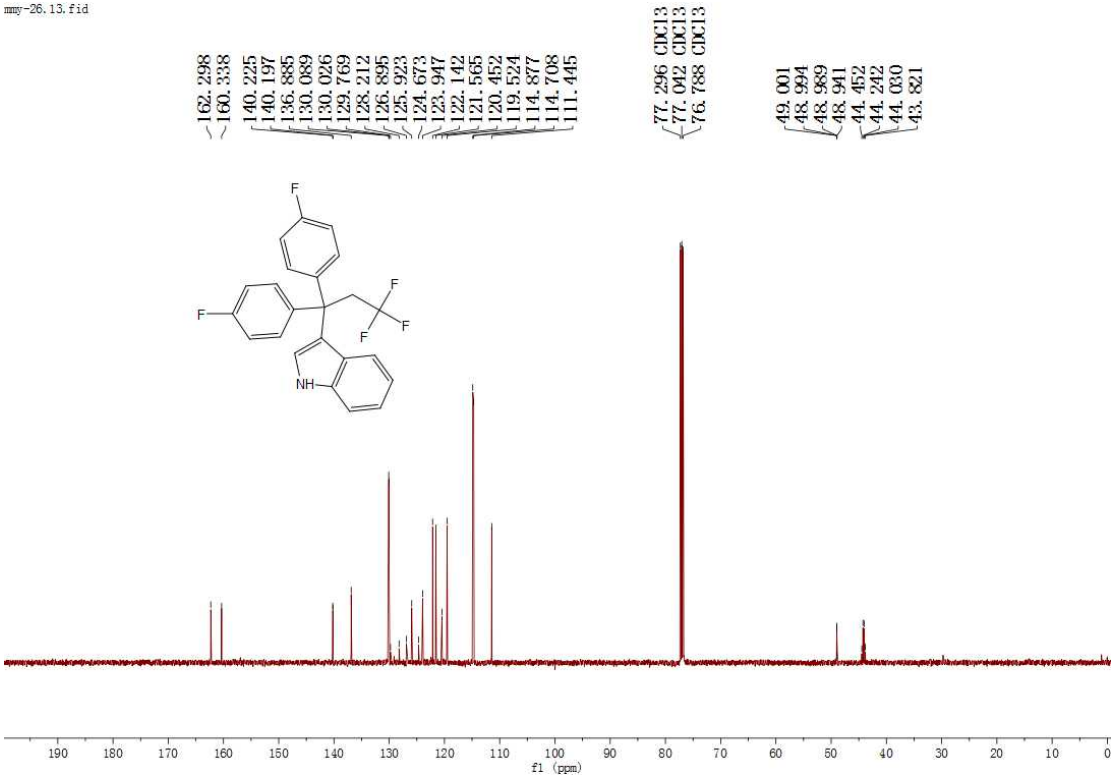
mmy-27.16.fid


142.751
136.861
132.556
129.765
128.548
128.205
126.790
125.796
124.569
124.091
123.555
122.218
121.481
119.676
119.612
111.488
77.292 CDCl3
77.038 CDCl3
76.783 CDCl3
49.252
49.211
49.197
49.140
43.945
43.733
43.520
43.308
Cl
Cl
F
F
F
NH
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

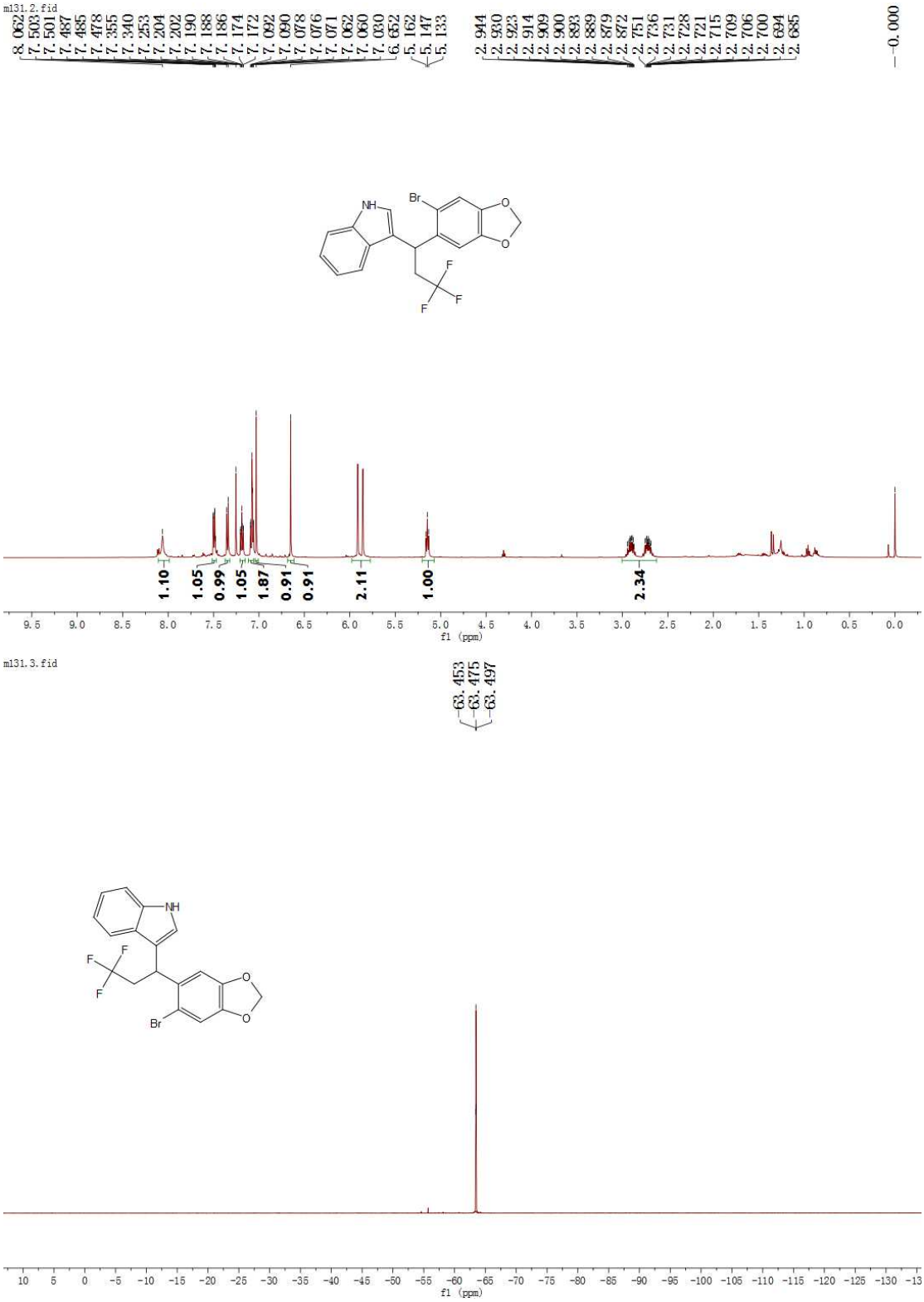
3-(3,3,3-trifluoro-1,1-bis(4-fluorophenyl)propyl)-1*H*-indole (4maa)

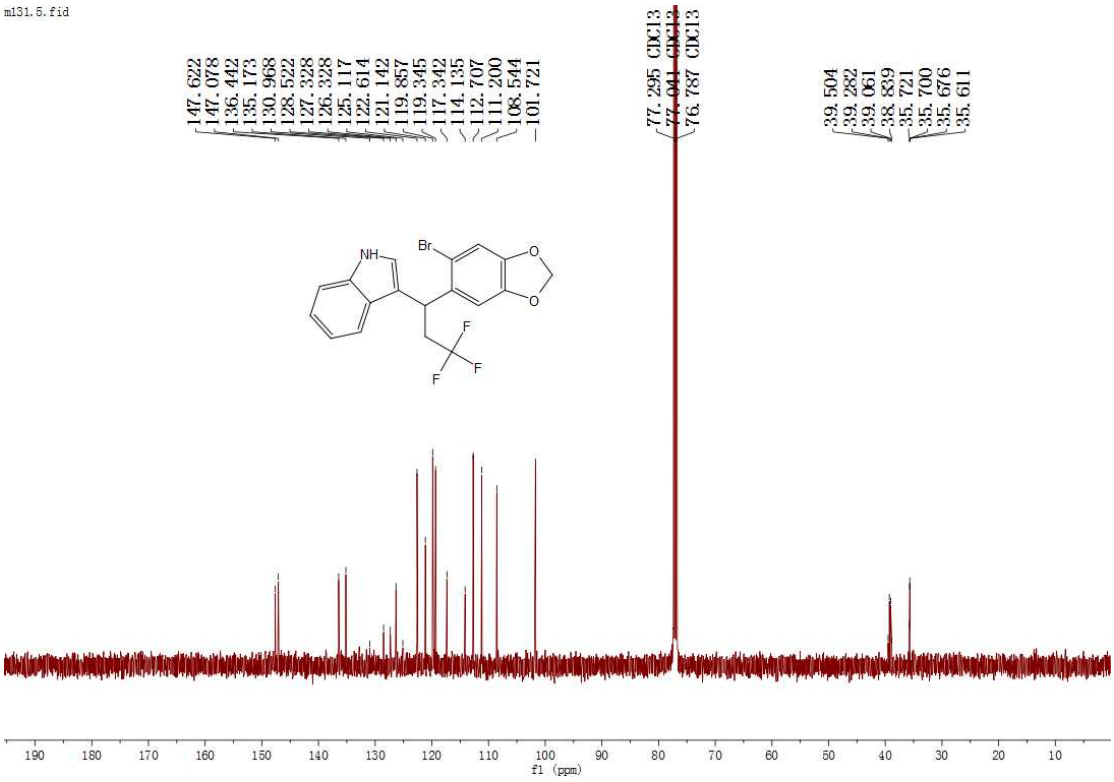




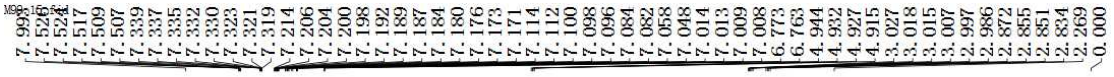

mmy-26.13.fid
162.298
160.338
140.225
140.197
136.885
130.089
130.026
129.769
128.212
126.895
125.923
124.673
123.947
122.142
121.565
120.452
119.524
114.877
114.708
111.445
77.296 CDCl3
77.042 CDCl3
76.788 CDCl3
49.001
48.994
48.989
48.941
44.452
44.242
44.030
43.821
F
F
F
F
NH
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

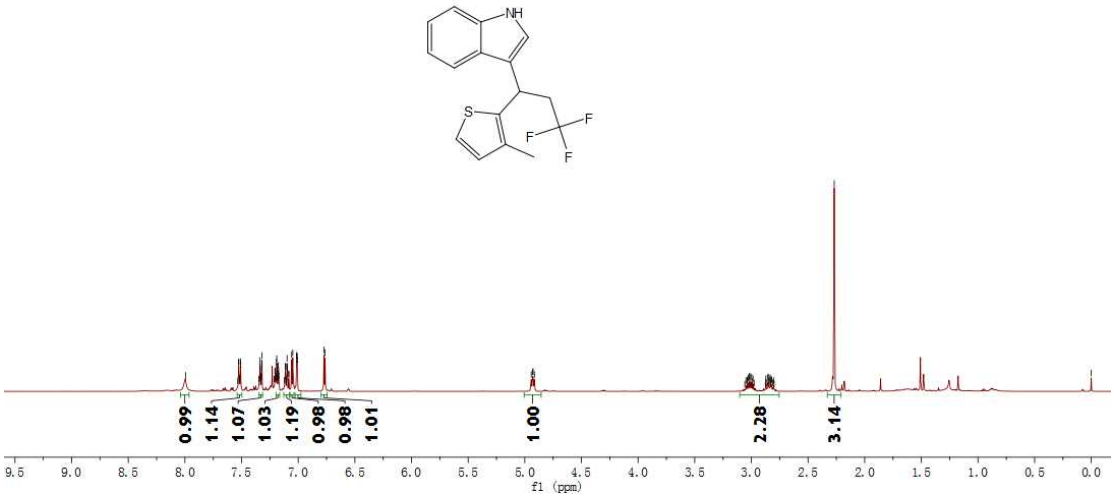
3-(1-(6-Bromobenzo[d][1,3]dioxol-5-yl)-3,3,3-trifluoropropyl)-1*H*-indole (4naa)



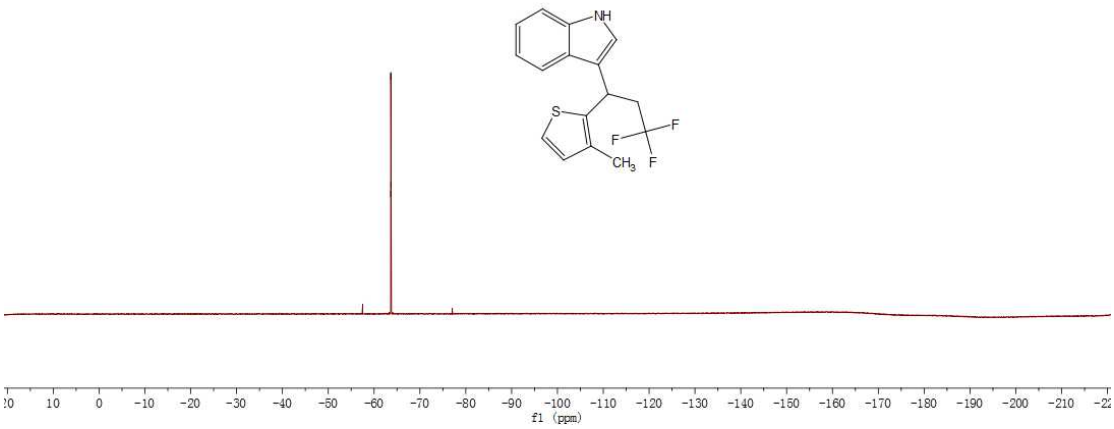

m131.5.fid
147.622
147.078
136.442
135.173
130.968
128.522
127.328
126.328
125.117
122.614
121.142
119.857
119.345
117.342
114.135
112.707
111.200
108.544
101.721
77.295 CDCl3
77.041 CDCl3
76.787 CDCl3
39.504
39.282
39.061
38.839
35.721
35.700
35.676
35.611
NH
Br
O
O
F
F
F
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

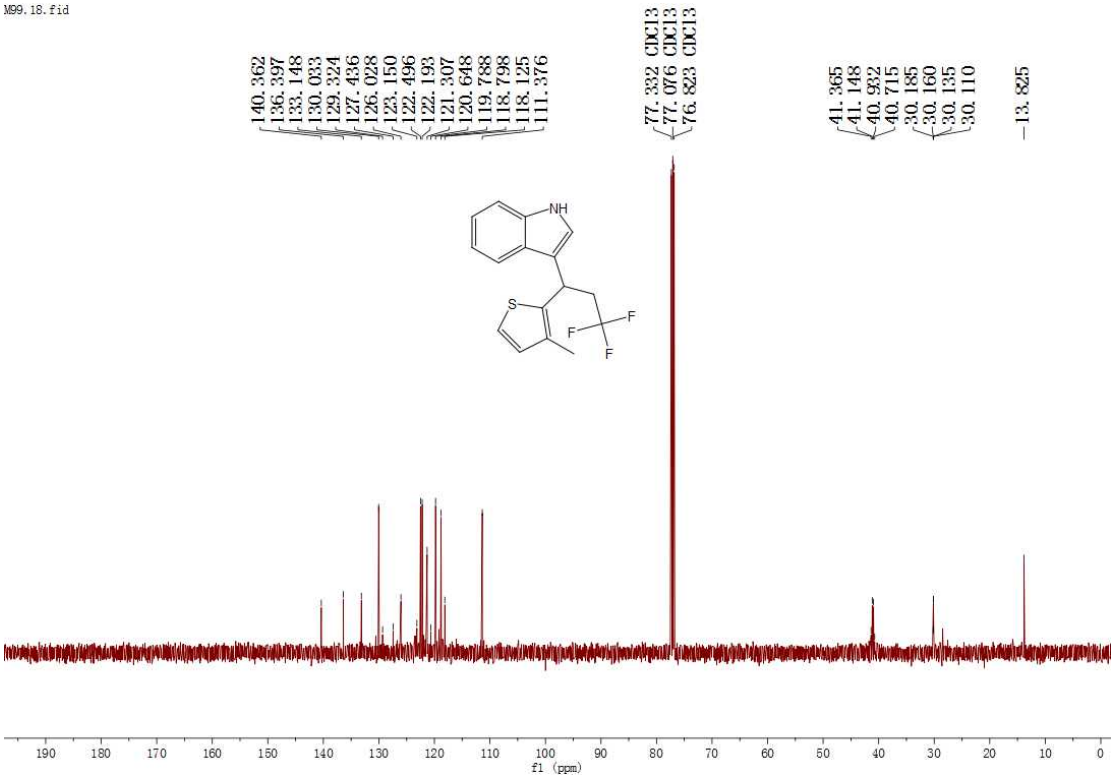
3-(3,3,3-Trifluoro-1-(3-methylthiophen-2-yl)propyl)-1*H*-indole(4oaa)



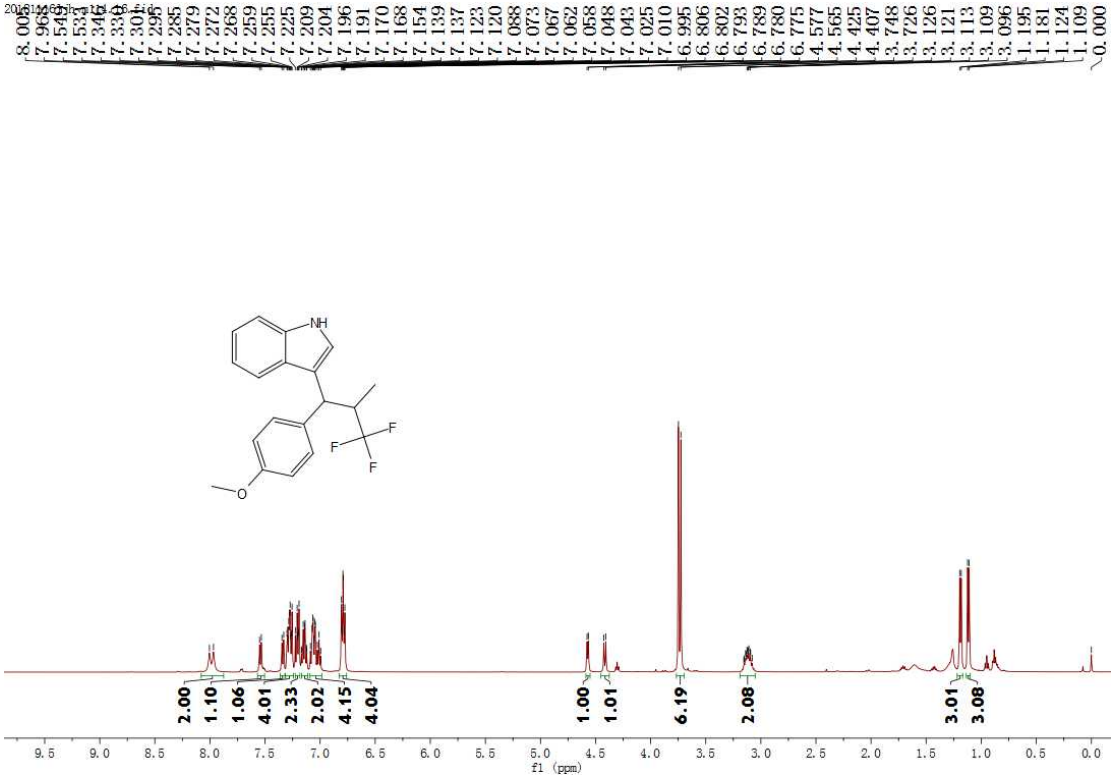


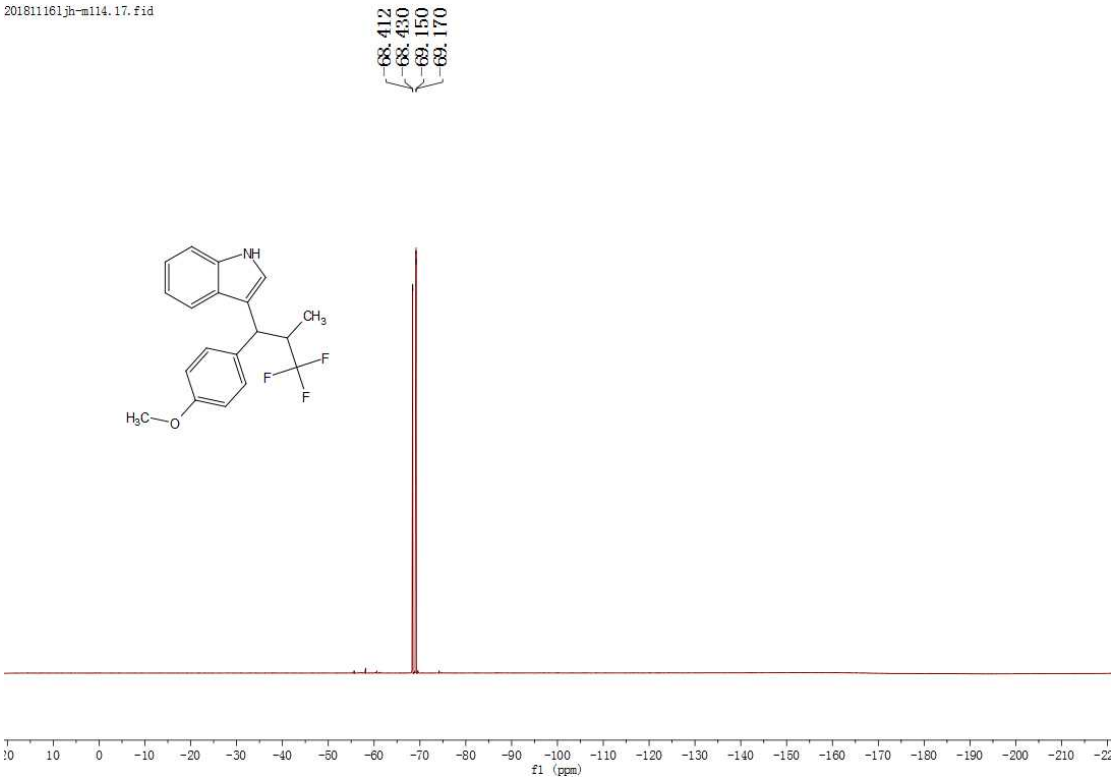
20181025-18.16.fid

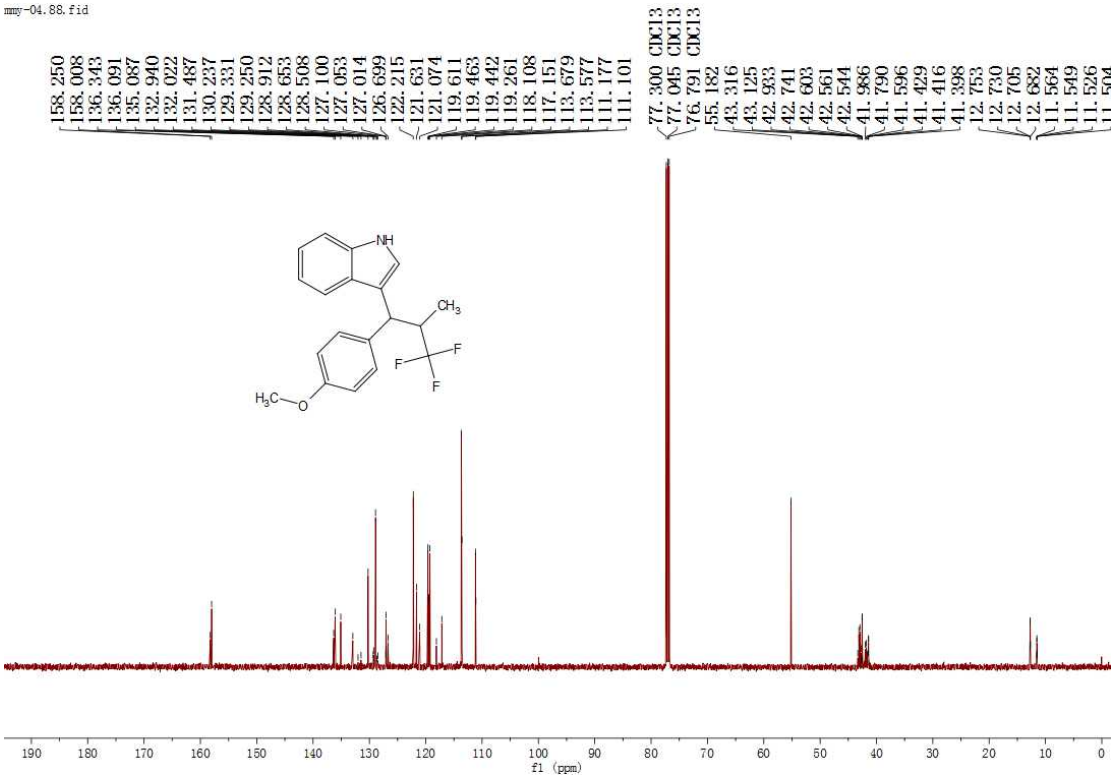



M99.18.fid
140.362
136.397
133.148
130.033
129.324
127.436
126.028
123.150
122.496
122.193
121.307
120.648
119.788
118.798
118.125
111.376
77.332 CDCl3
77.076 CDCl3
76.823 CDCl3
41.365
41.148
40.932
40.715
30.185
30.160
30.135
30.110
13.825
NH
S
F
F
F
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

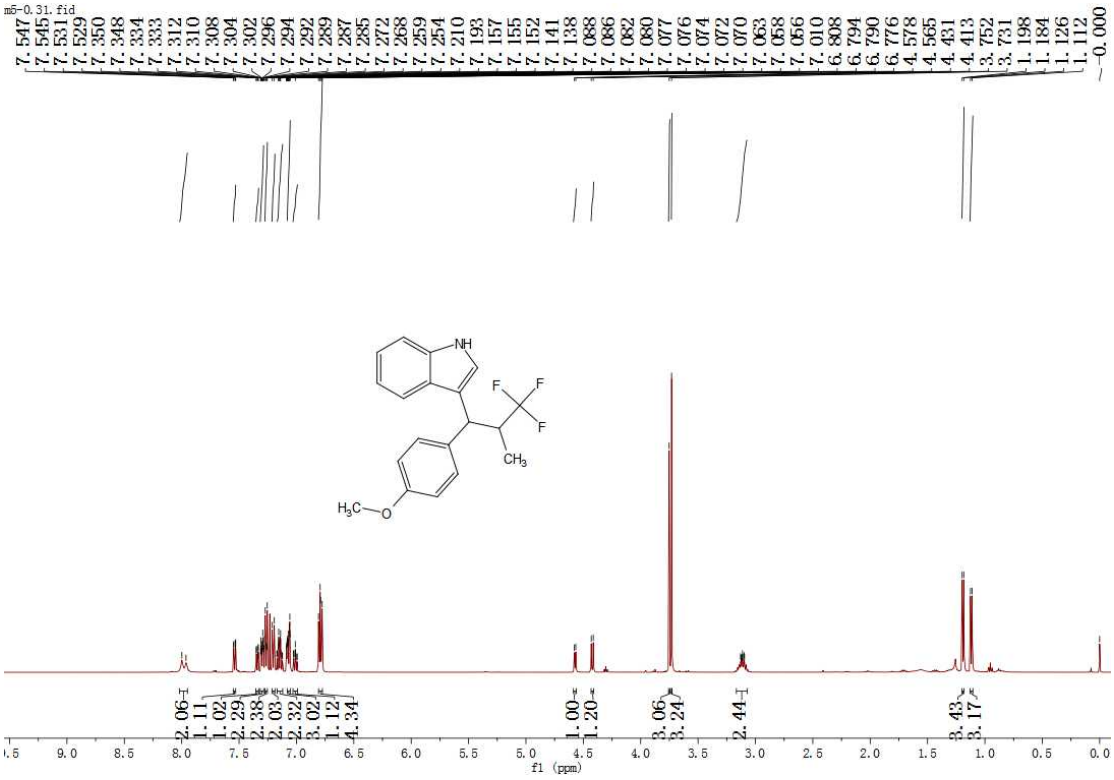
3-(3,3,3-Trifluoro-1-(4-methoxyphenyl)-2-methylpropyl)-1*H*-indole (4paa from E-1P)

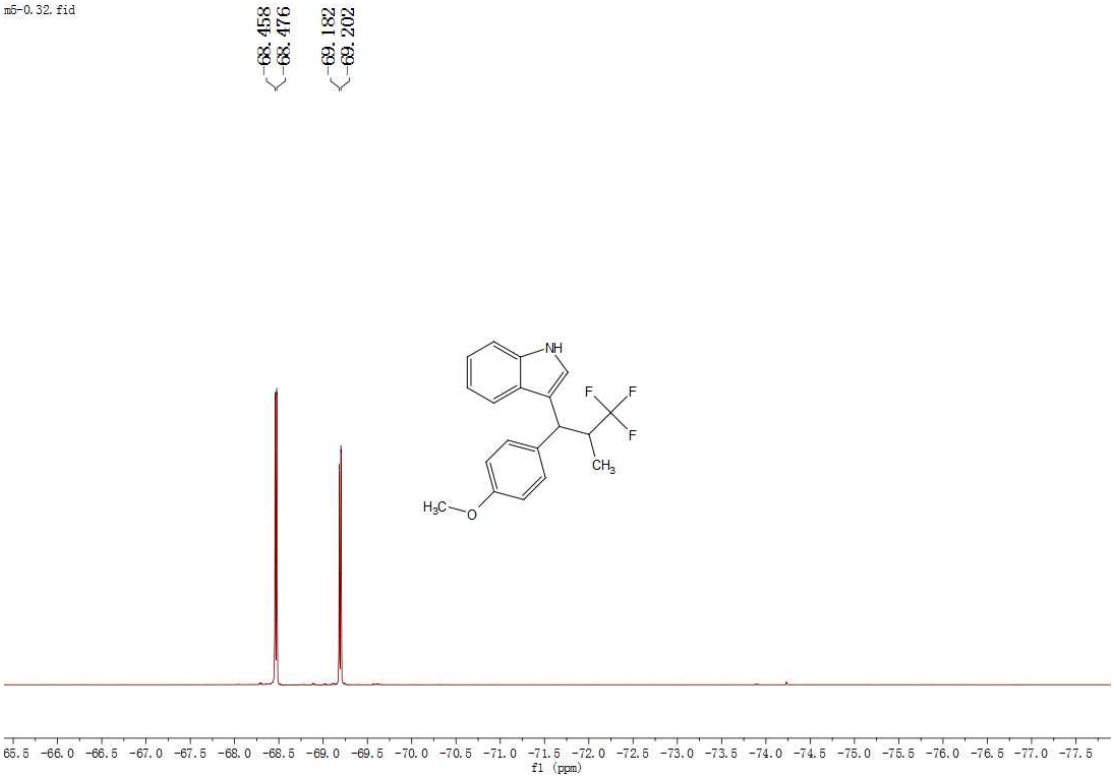


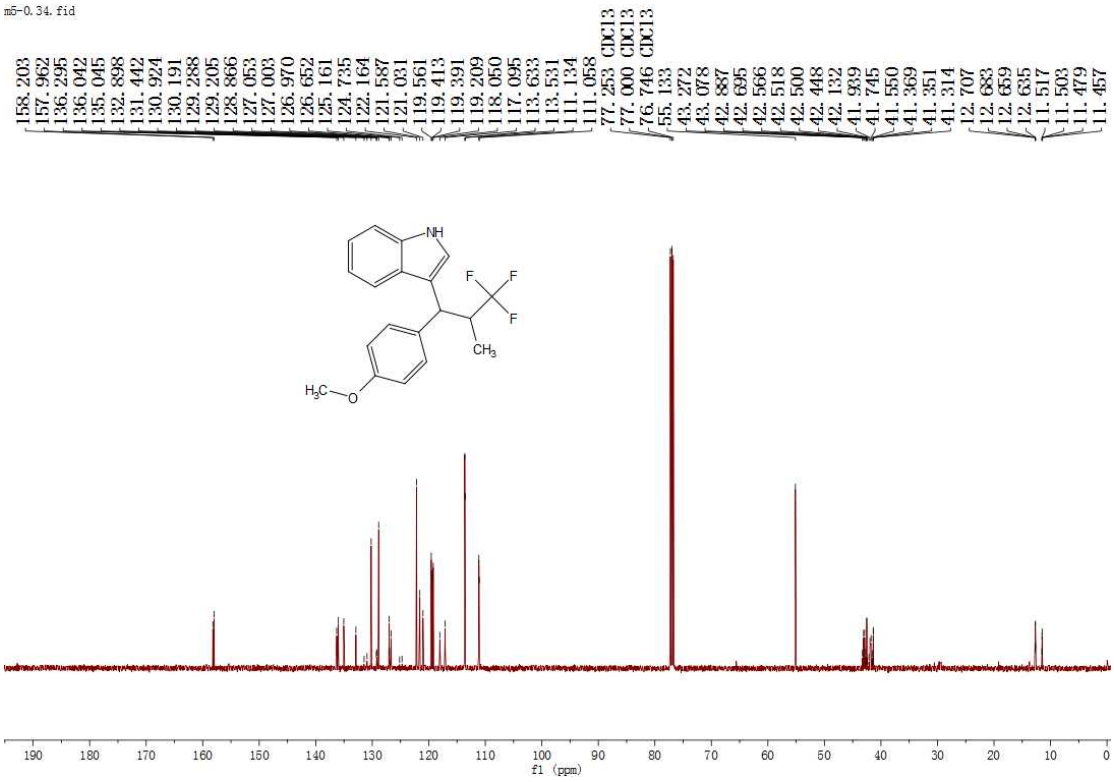



mmy-04.88.fid
158.250
158.008
136.343
136.091
135.087
132.940
132.022
131.487
130.237
129.331
129.250
128.912
128.653
128.508
127.100
127.053
127.014
126.699
122.215
121.631
121.074
119.611
119.463
119.442
119.261
118.108
117.151
113.679
113.577
111.177
111.101
77.300 CDCl3
77.045 CDCl3
76.791 CDCl3
55.182
43.316
43.125
42.933
42.741
42.603
42.561
42.544
41.986
41.790
41.596
41.429
41.416
41.398
12.753
12.730
12.705
12.682
11.564
11.549
11.526
11.504
NH
CH3
F
F
F
H3C
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

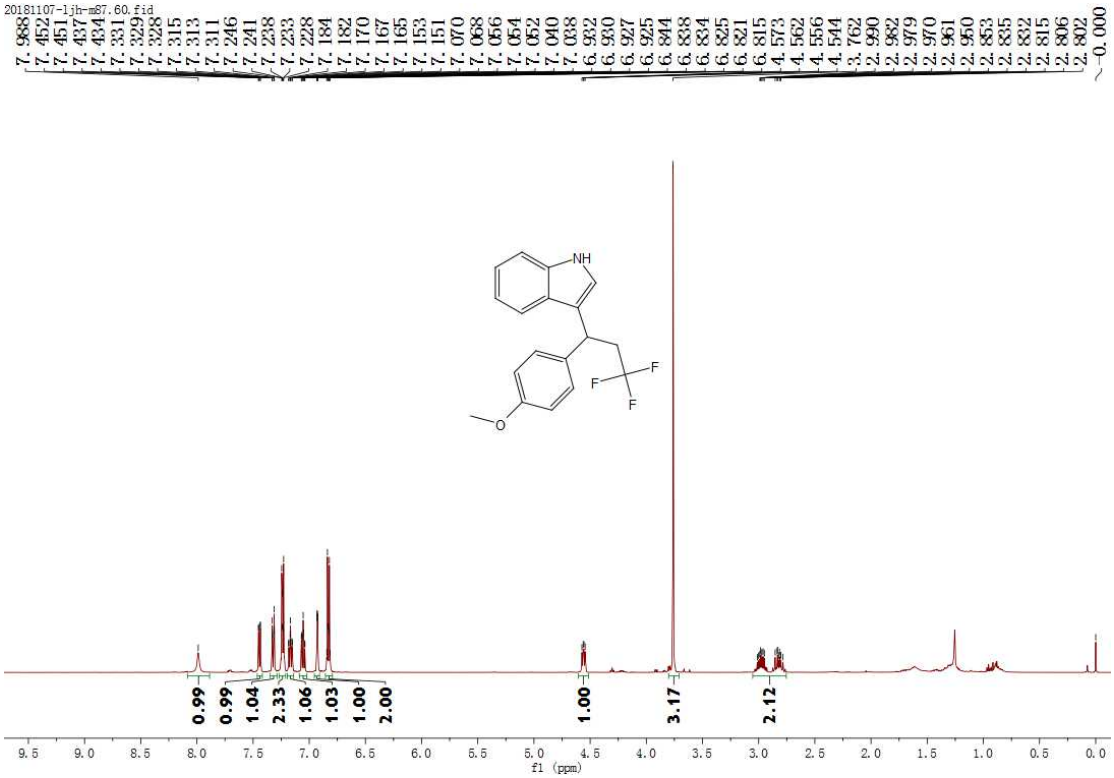
3-(3,3,3-Trifluoro-1-(4-methoxyphenyl)-2-methylpropyl)-1*H*-indole (4paa-From Z-1p)

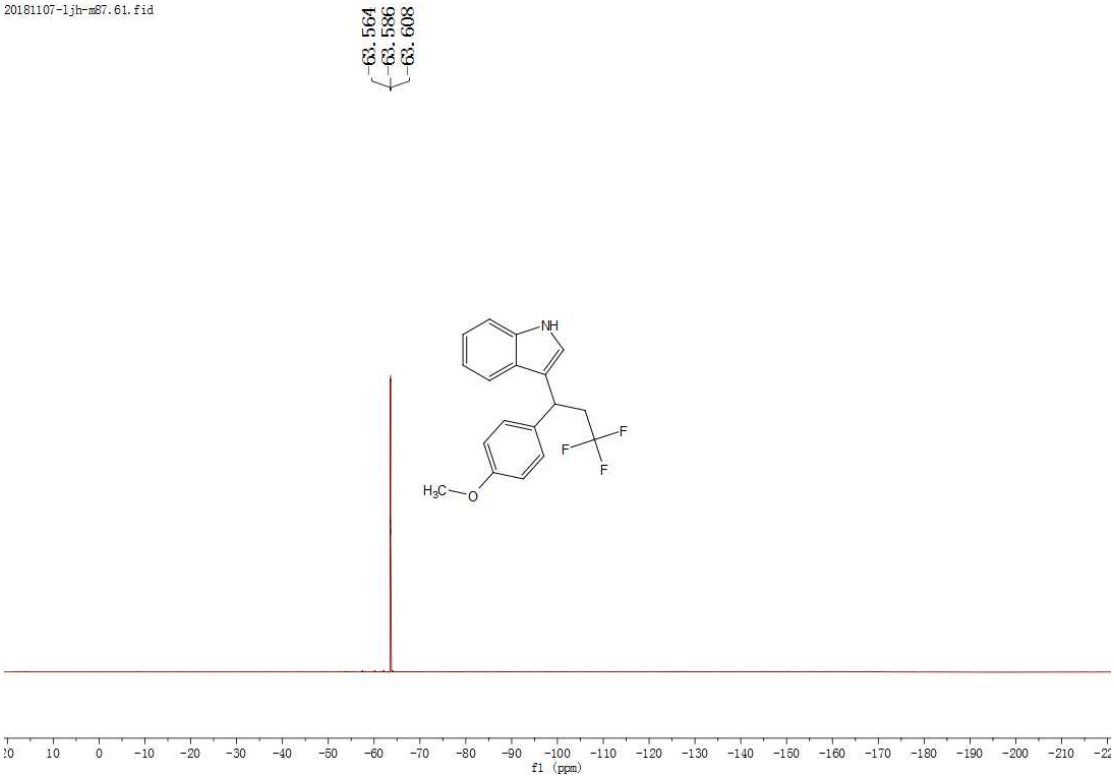


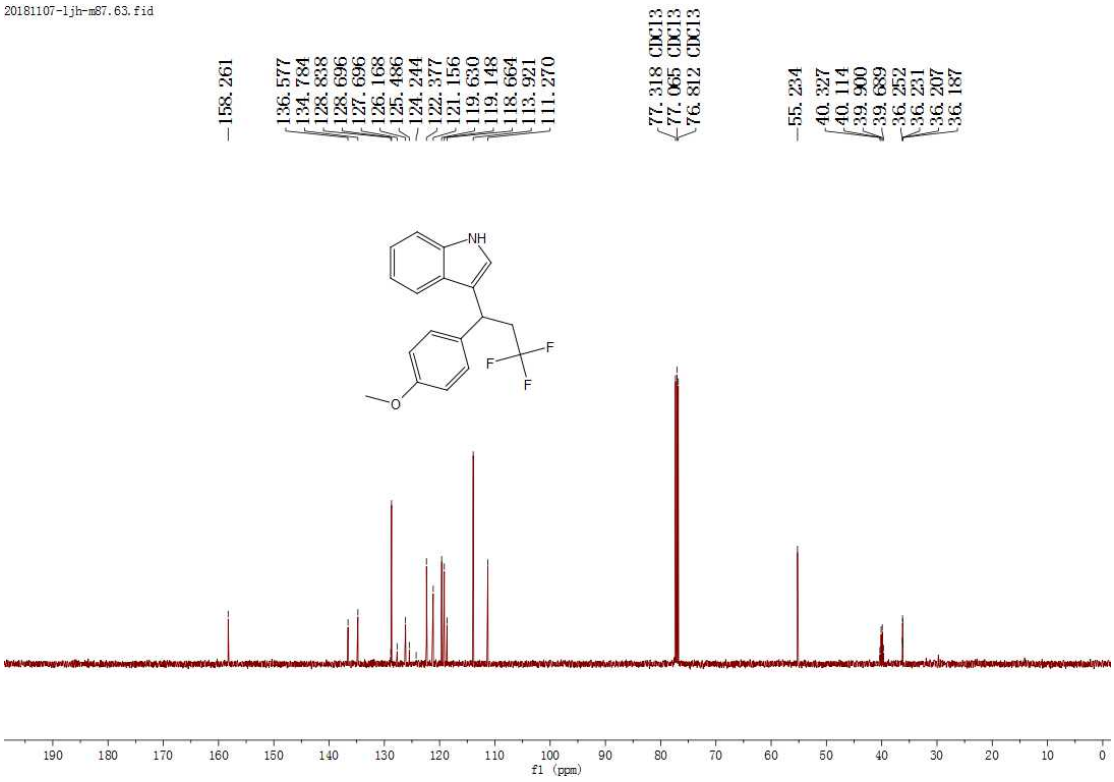



m5-0.34.fid
158.203
157.962
136.295
136.042
135.045
132.898
131.442
130.924
130.191
129.288
129.205
128.866
127.053
127.003
126.970
126.652
125.161
124.735
122.164
121.587
121.031
119.561
119.413
119.391
119.209
118.050
117.095
113.633
113.531
111.134
111.058
77.253 CDCl3
77.000 CDCl3
76.746 CDCl3
55.133
43.272
43.078
42.887
42.695
42.566
42.518
42.500
42.448
42.132
41.939
41.745
41.550
41.369
41.351
41.314
12.707
12.683
12.659
12.635
11.517
11.503
11.479
11.457
NH
F
F
F
CH3
H3C
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

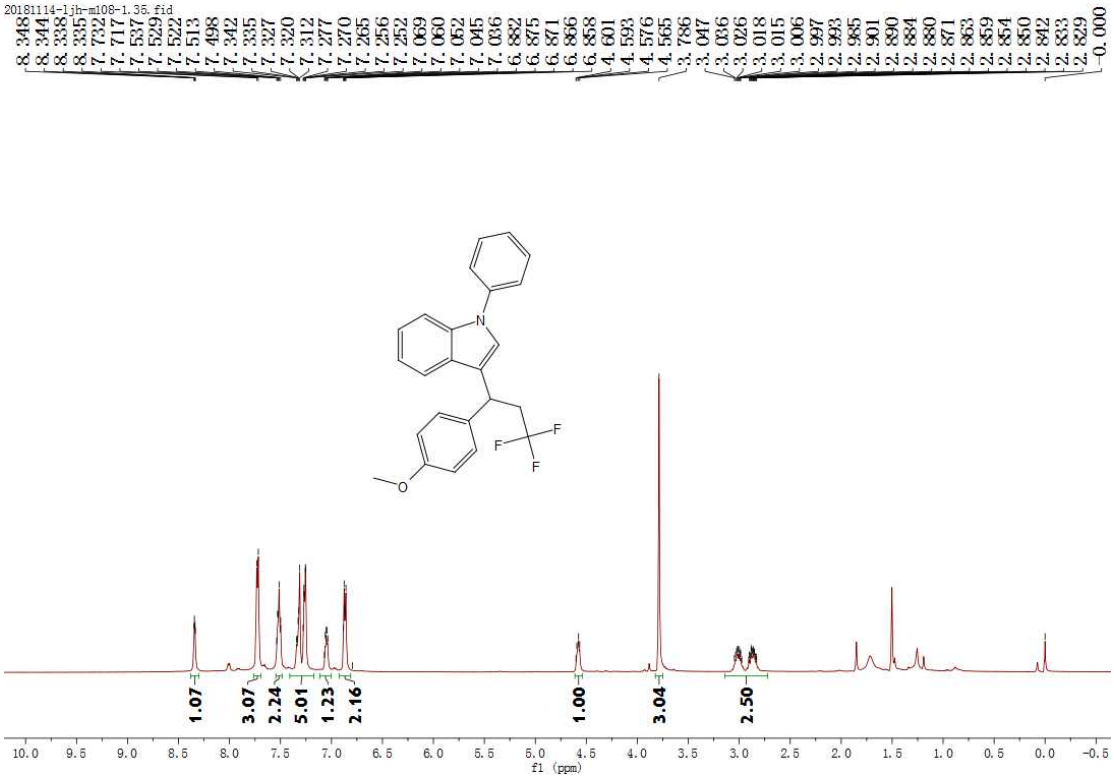
3-(3,3,3-Trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aab)

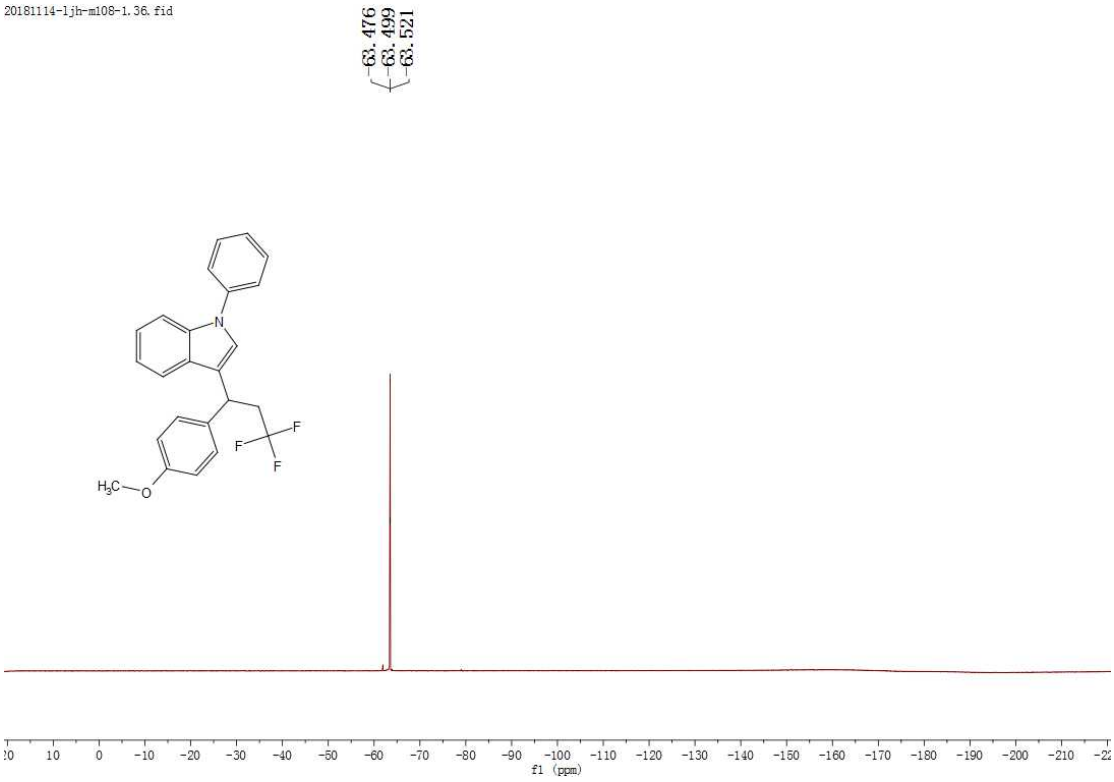


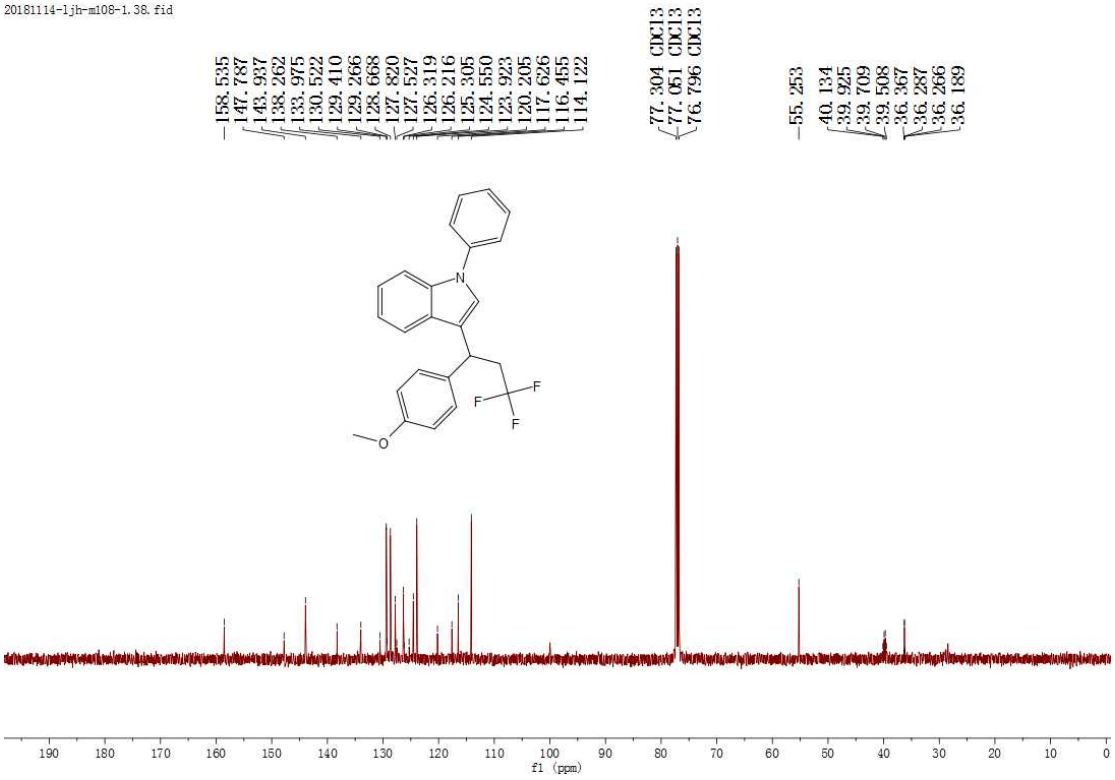



20181107-ljh-m87.63.fid
158.261
136.577
134.784
128.838
128.696
127.696
126.168
125.486
124.244
122.377
121.156
119.630
119.148
118.664
113.921
111.270
77.318 CDCl3
77.065 CDCl3
76.812 CDCl3
55.234
40.327
40.114
39.900
39.689
36.252
36.231
36.207
36.187
NH
F
F
F
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

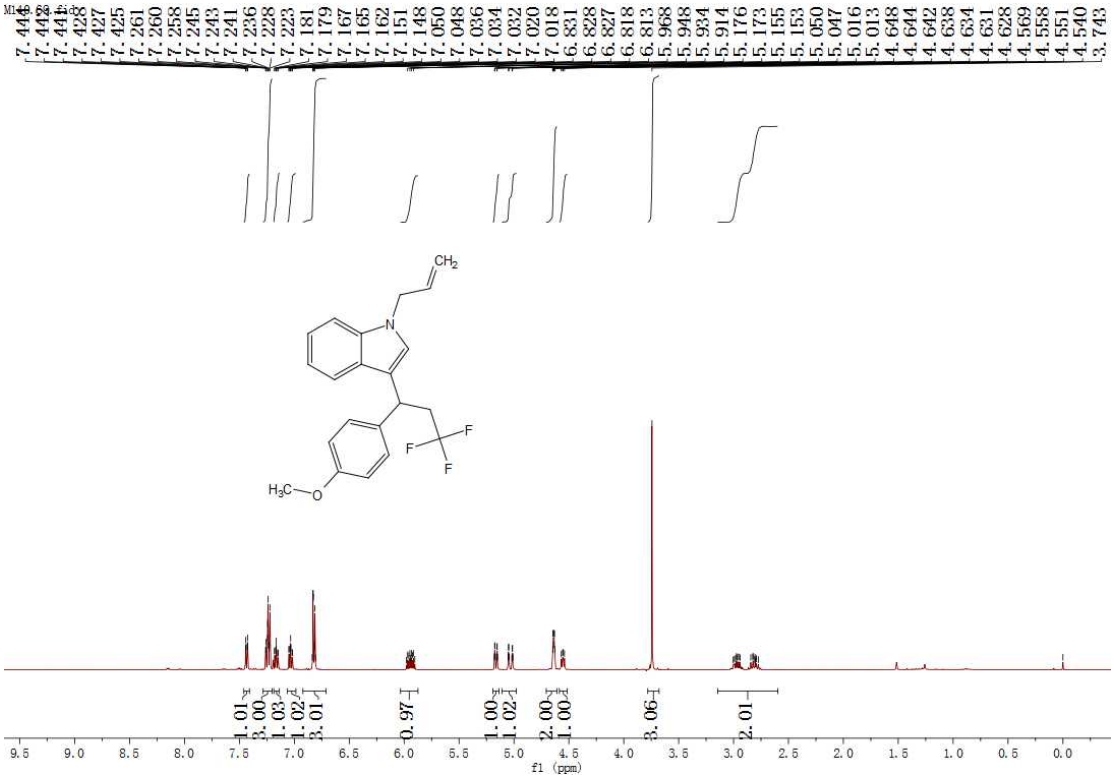
1-Phenyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole(4aac)

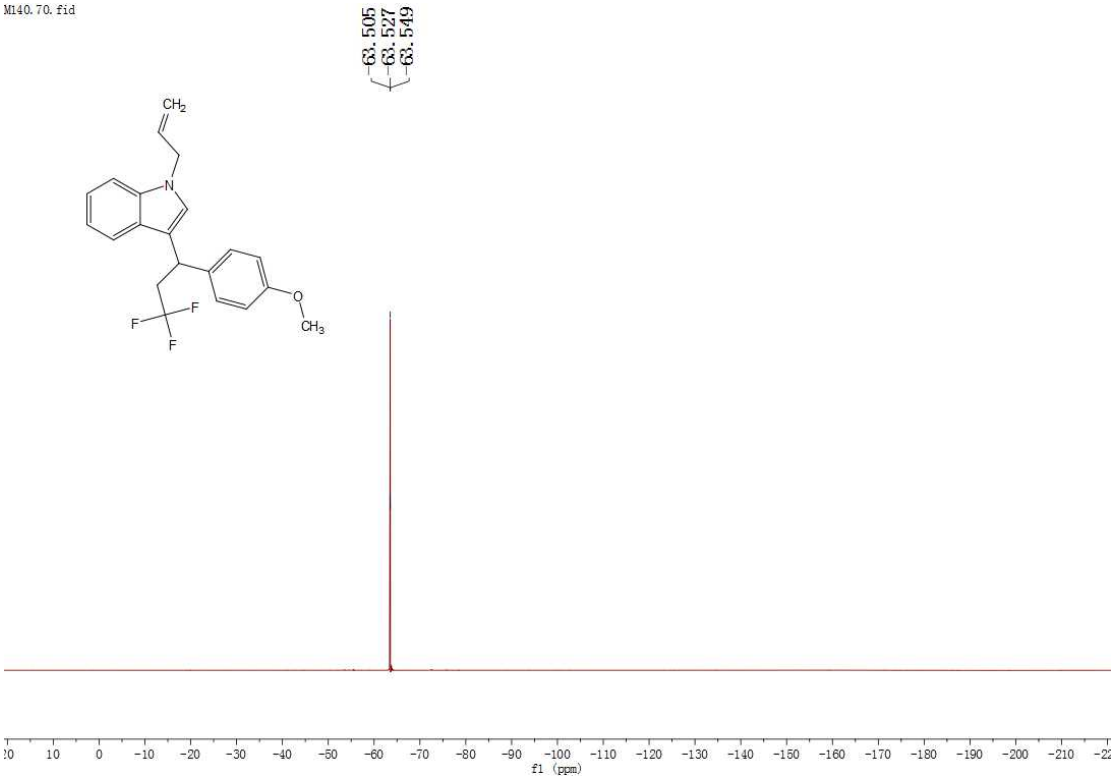




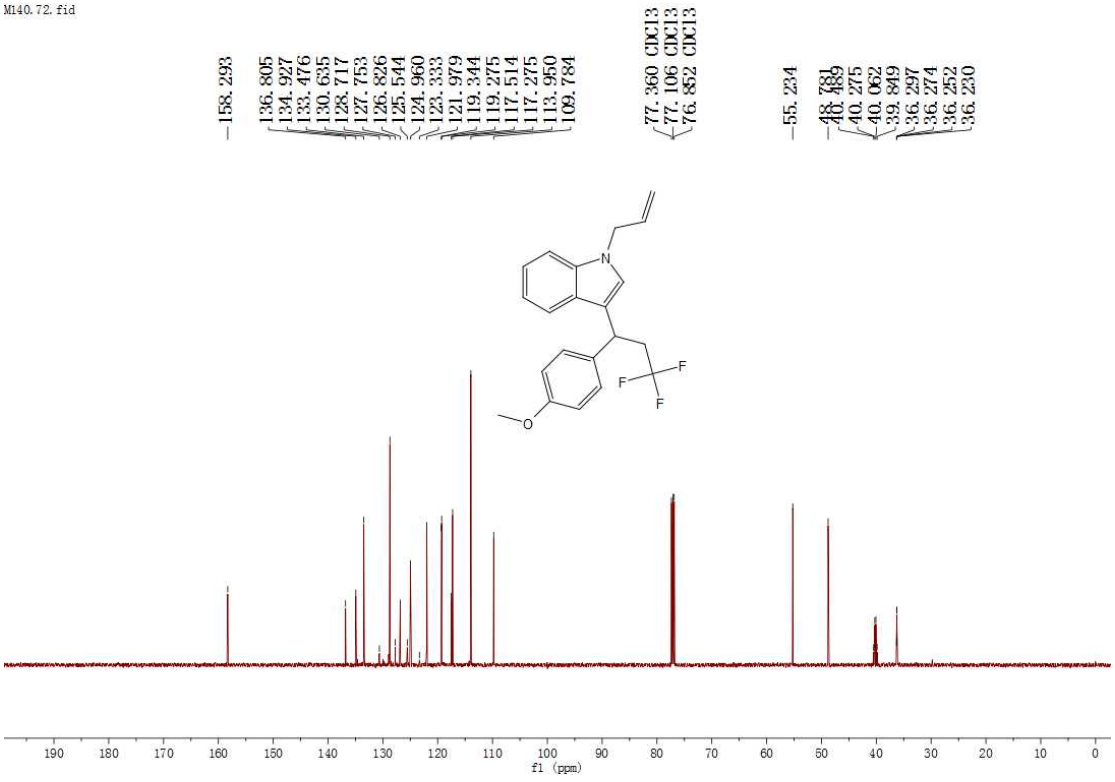

20181114-ljh-m108-1.38.fid
158.535
147.787
143.937
138.262
133.975
130.522
129.410
129.266
128.668
127.820
127.527
126.319
126.216
125.305
124.550
123.923
120.205
117.626
116.455
114.122
77.304 CDCl3
77.051 CDCl3
76.796 CDCl3
55.253
40.134
39.925
39.709
39.508
36.367
36.287
36.266
36.189
N
F
F
F
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

1-Allyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aad)

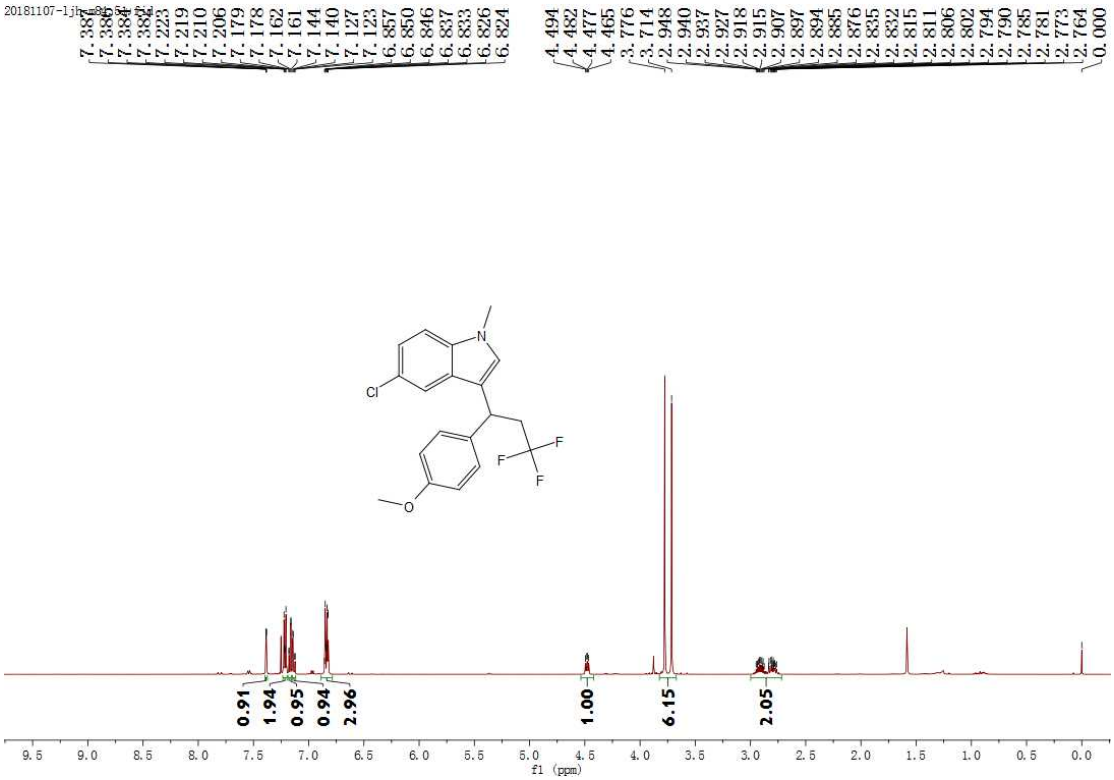


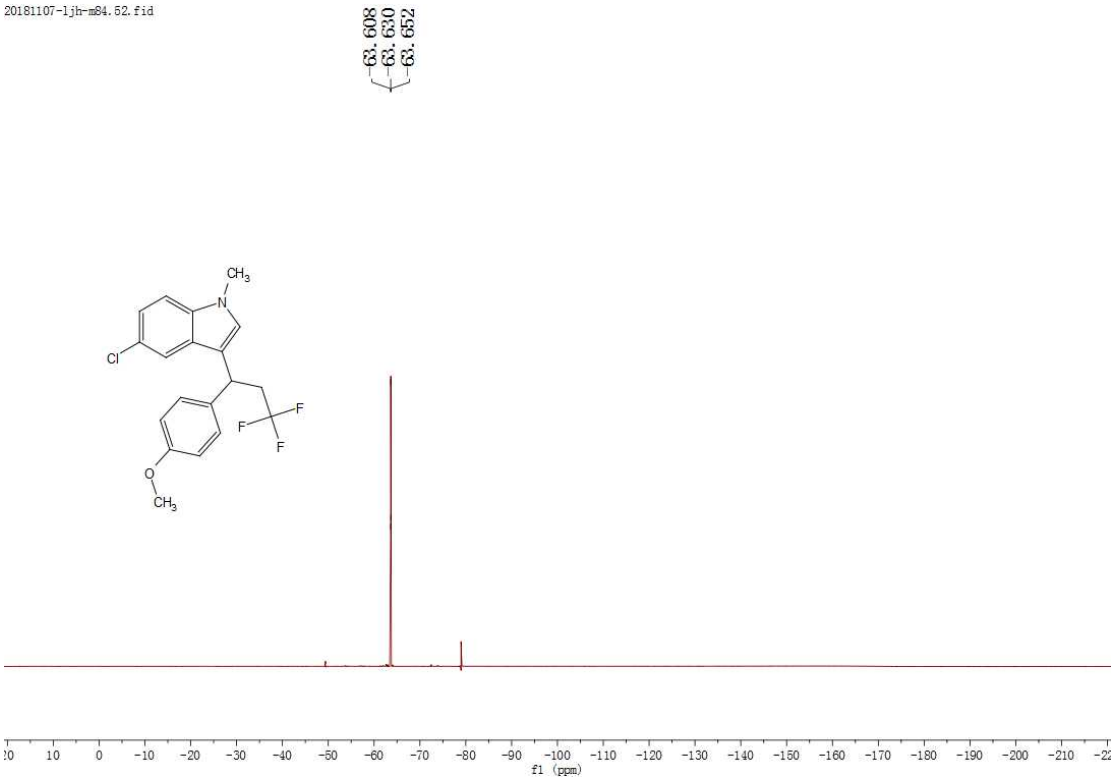


M140.72.fid


158.293
136.805
134.927
133.476
130.635
128.717
127.753
126.826
125.544
124.960
123.333
121.979
119.344
119.275
117.514
117.275
113.950
109.784
77.360 CDCl3
77.106 CDCl3
76.852 CDCl3
55.234
48.781
40.275
40.062
39.849
36.297
36.274
36.252
36.230
N
F
F
F
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

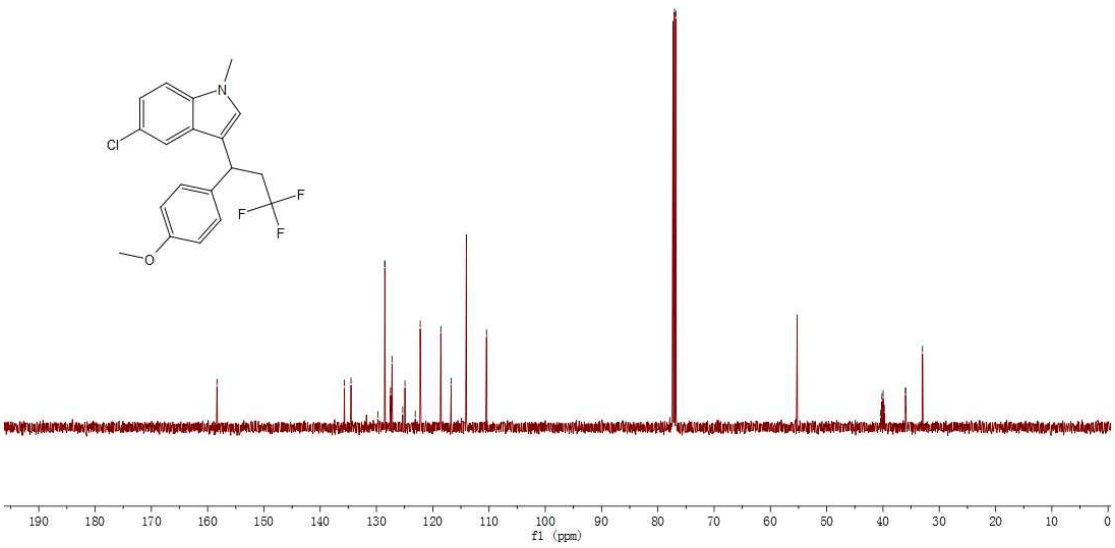
5-Chloro-1-methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole(4aae)



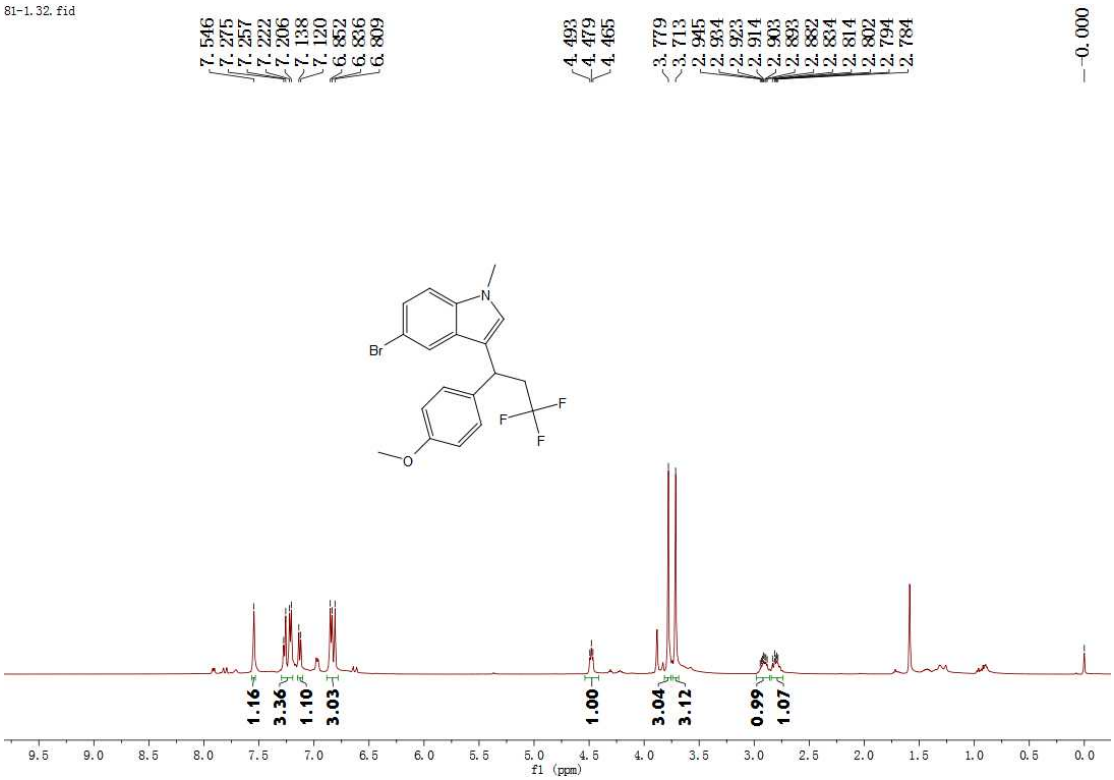


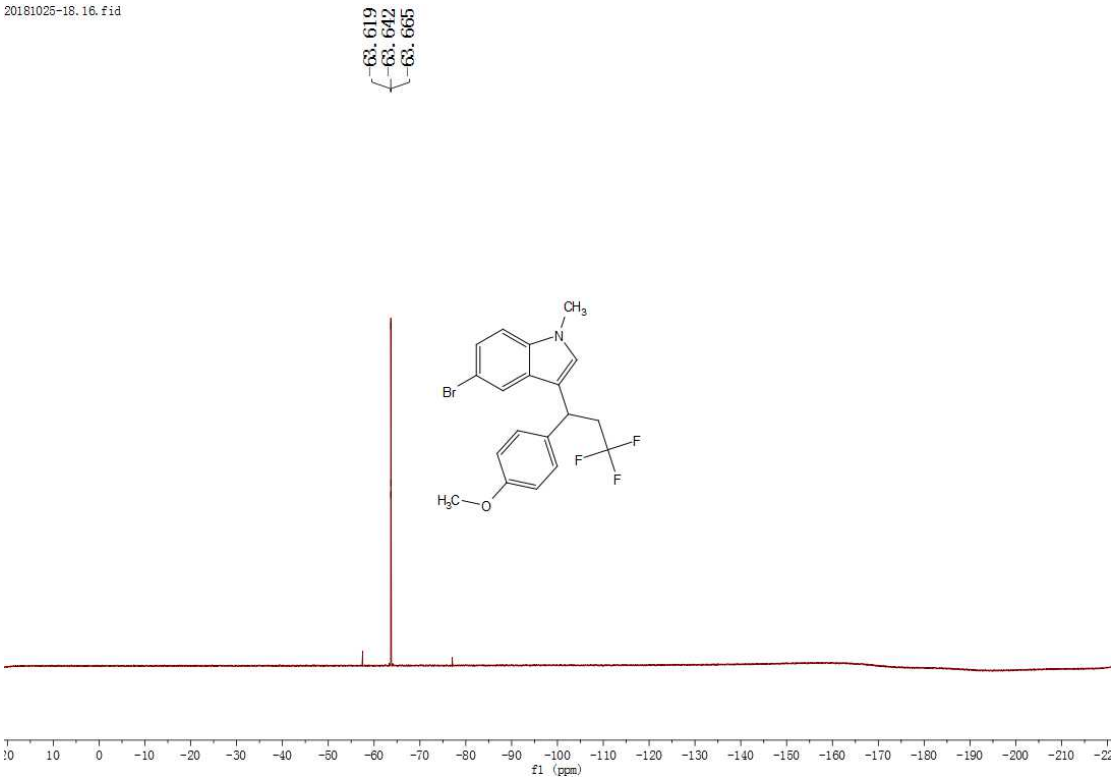
20181107-ljh-m84.54.fid

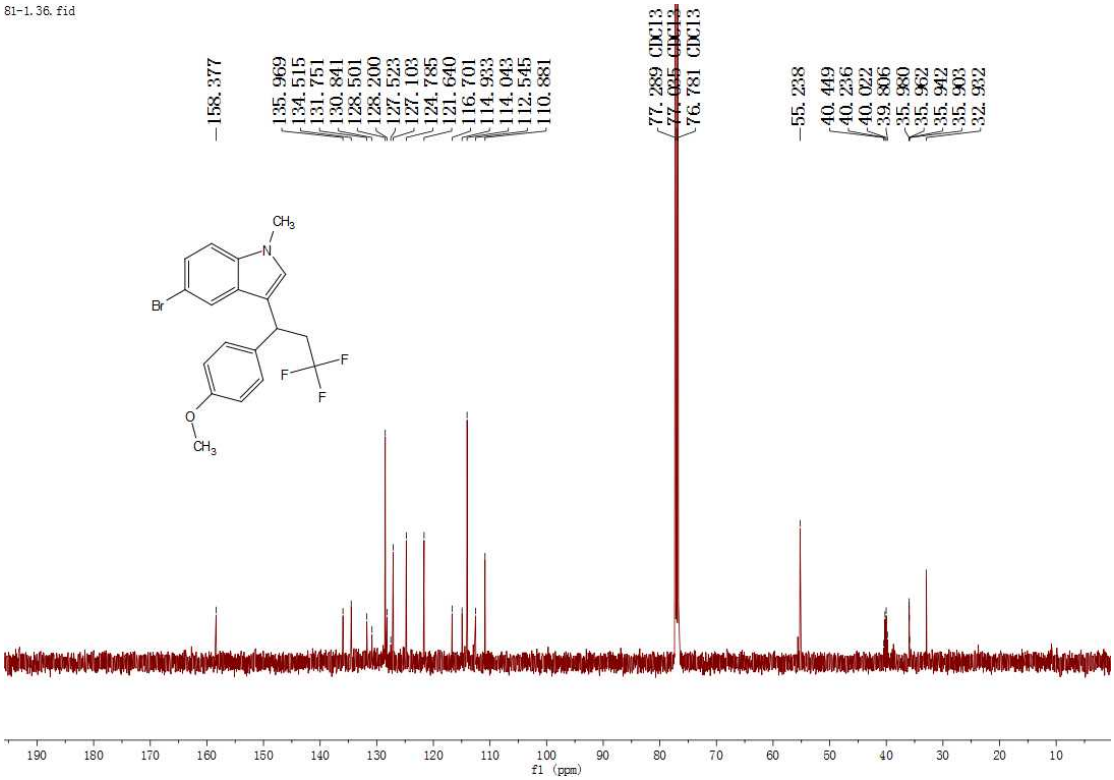
158.347
135.704
134.529
129.750
128.519
128.519
127.545
127.508
127.241
125.334
124.945
123.115
122.229
118.571
116.727
114.022
110.447
77.306 CDCl3
77.051 CDCl3
76.798 CDCl3
55.241
40.405
40.191
39.975
39.762
36.057
36.007
35.981
35.961
32.974



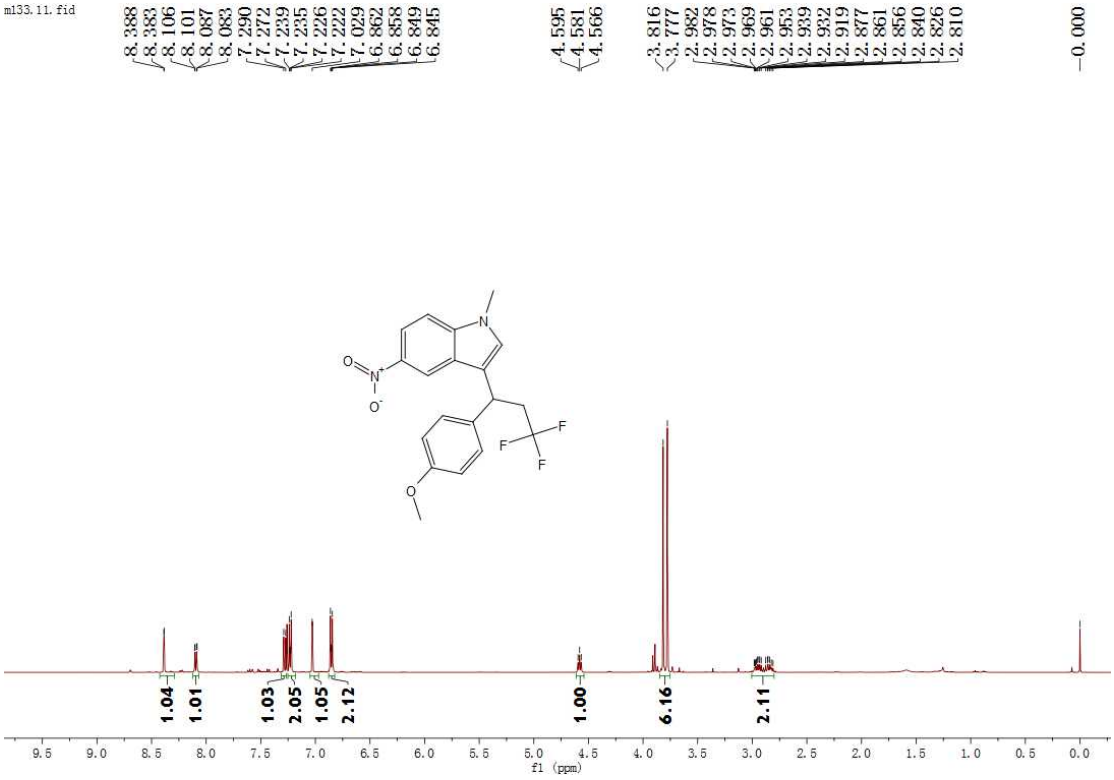
5-Bromo-1-methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aaf)

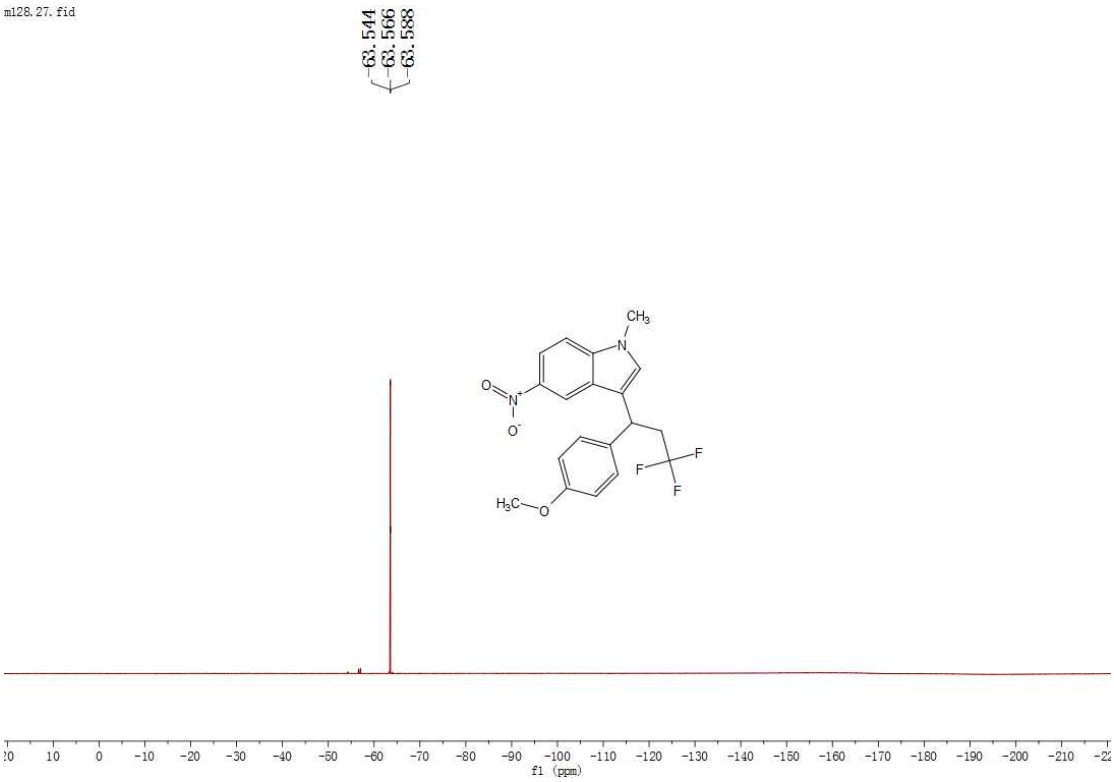


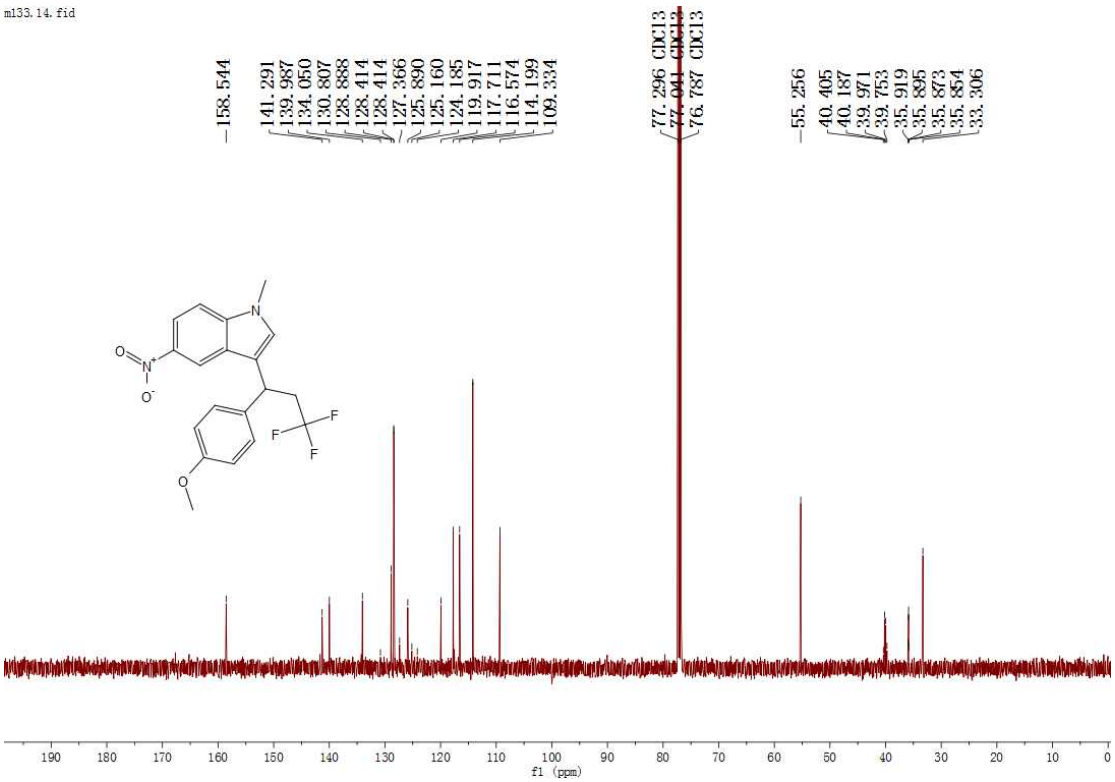



81-1.36.fid
158.377
135.969
134.515
131.751
130.841
128.501
128.200
127.523
127.103
124.785
121.640
116.701
114.933
114.043
112.545
110.881
77.289 CDCl3
77.035 CDCl3
76.781 CDCl3
55.238
40.449
40.236
40.022
39.806
35.980
35.962
35.942
35.903
32.932
CH3
N
Br
F
F
F
O
CH3
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

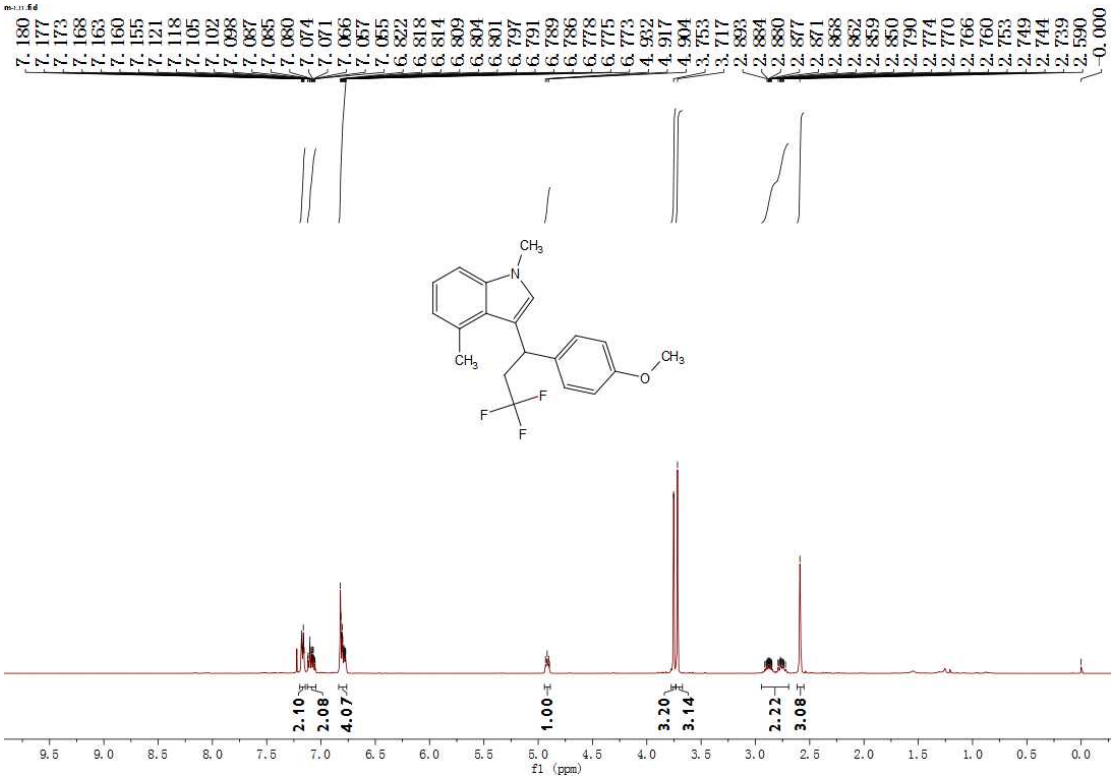
1-Methyl-5-nitro-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole(4aag)

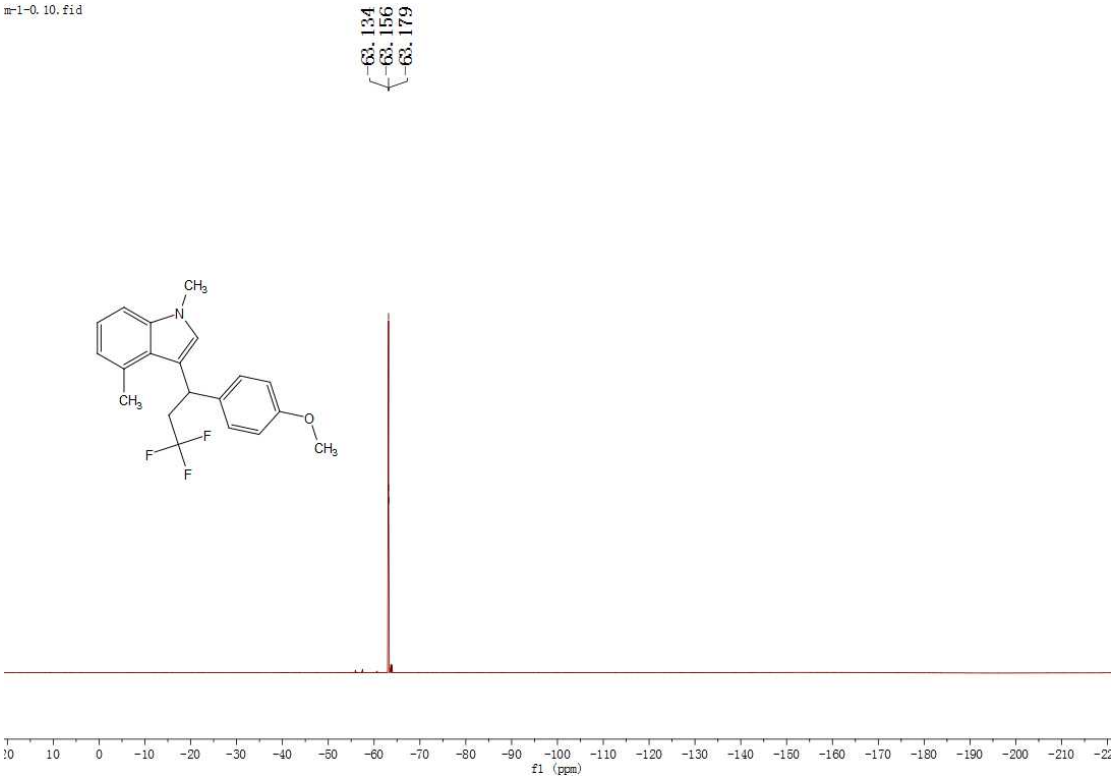




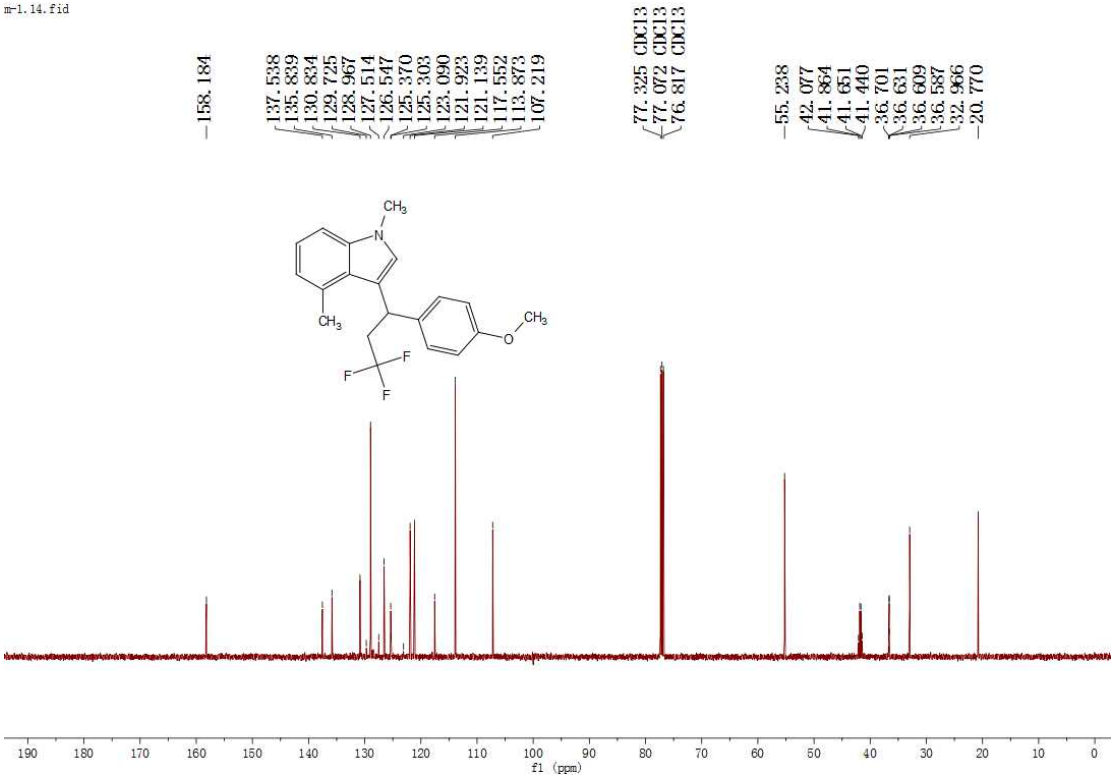

m133.14.fid
158.544
141.291
139.987
134.050
130.807
128.888
128.414
128.414
127.366
125.890
125.160
124.185
119.917
117.711
116.574
114.199
109.334
77.296 CDCl3
77.041 CDCl3
76.787 CDCl3
55.256
40.405
40.187
39.971
39.753
35.919
35.895
35.873
35.854
33.306
O
N+
O-
F
F
F
O
N
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

1,4-Dimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aah)

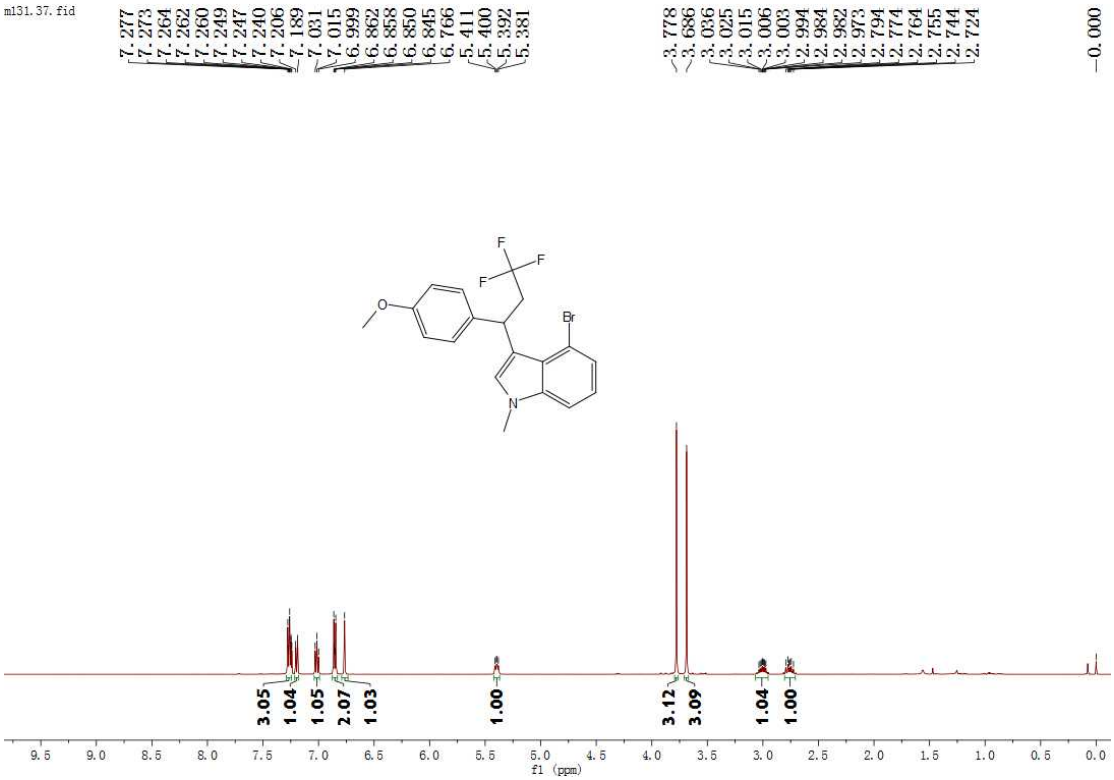


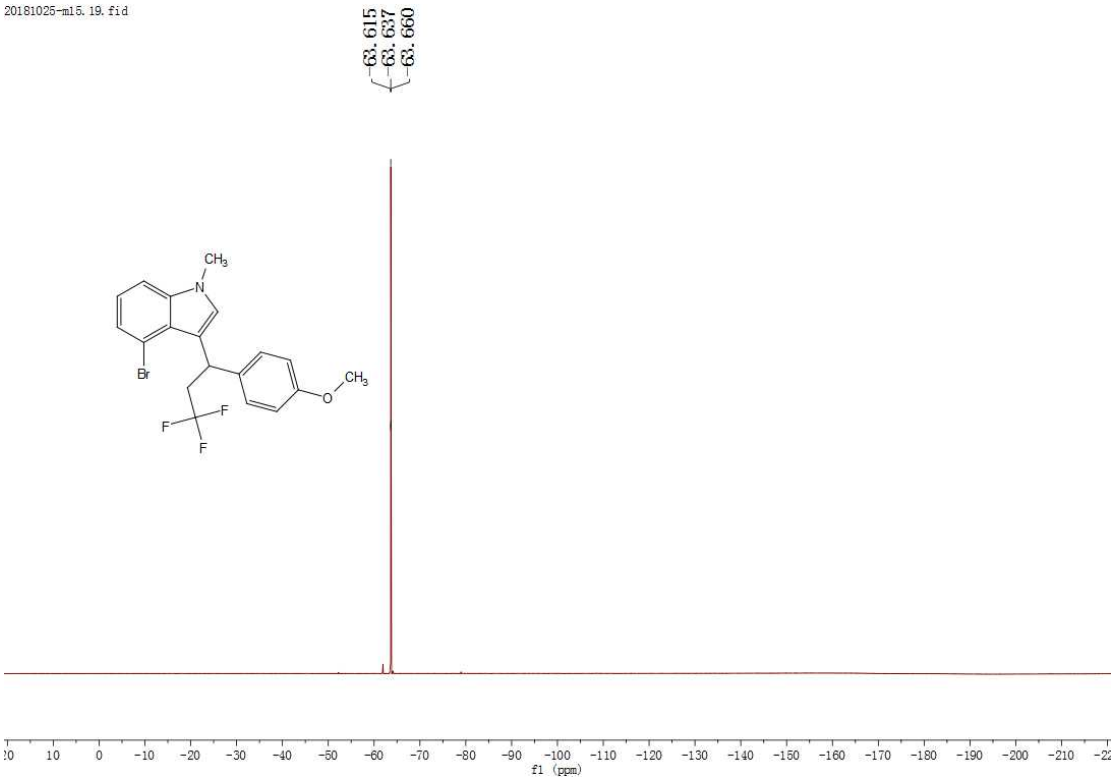


m-1.14.fid


158.184
137.538
135.839
130.834
129.725
128.967
127.514
126.547
125.370
125.303
123.090
121.923
121.139
117.552
113.873
107.219
77.325 CDCl3
77.072 CDCl3
76.817 CDCl3
55.238
42.077
41.864
41.651
41.440
36.701
36.631
36.609
36.587
32.966
20.770
CH3
N
CH3
O
CH3
F
F
F
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

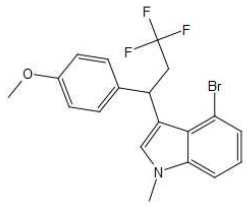
4-Bromo-1-methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aai)

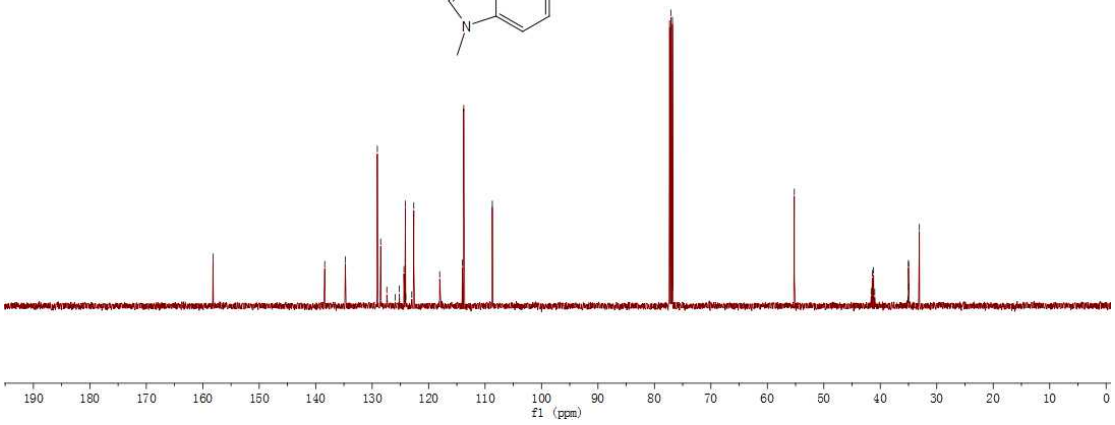




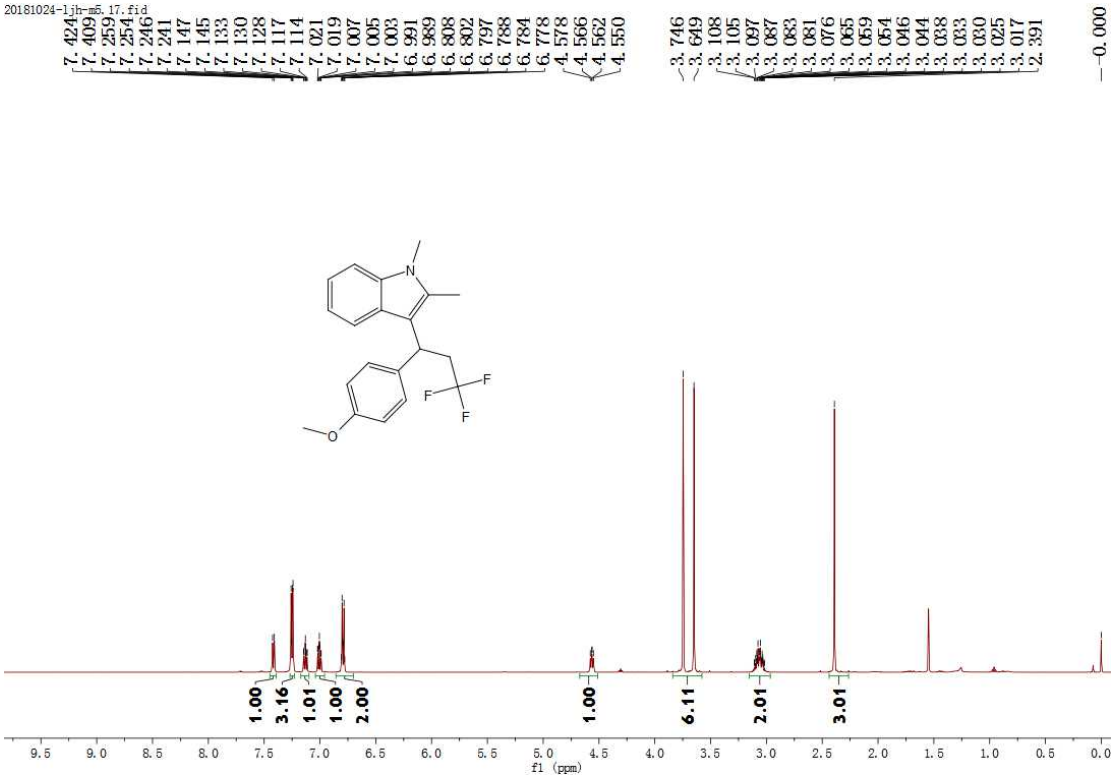
m131.40.fid

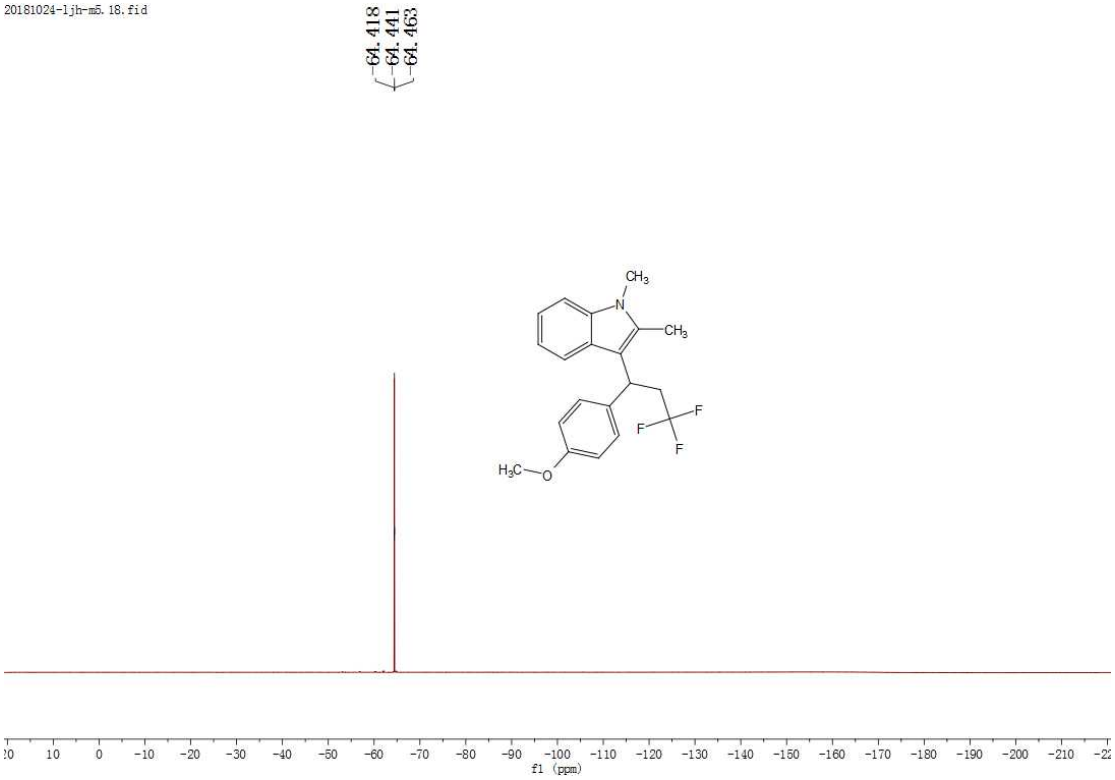
158.186
138.401
134.747
129.082
128.482
127.403
125.934
125.190
124.373
124.114
124.043
122.983
122.622
118.037
114.021
113.784
108.714
77.315
77.062
76.808
55.227
41.614
41.404
41.192
40.982
35.075
35.014
34.991
34.970
33.081

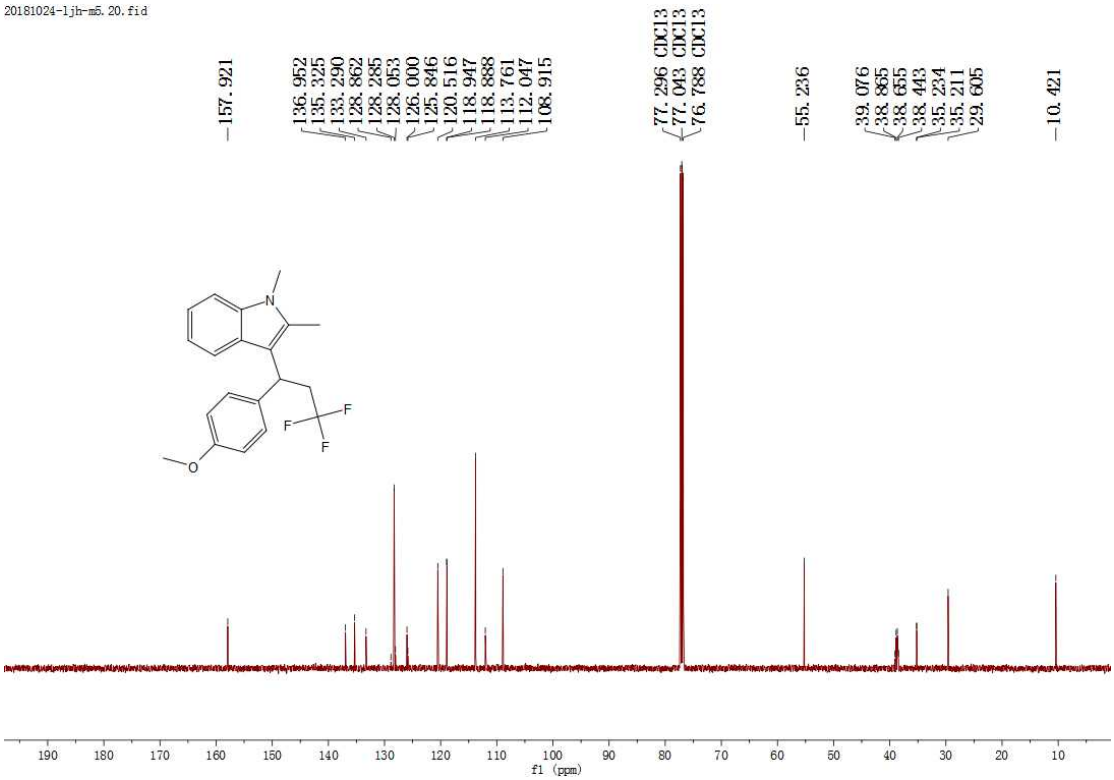




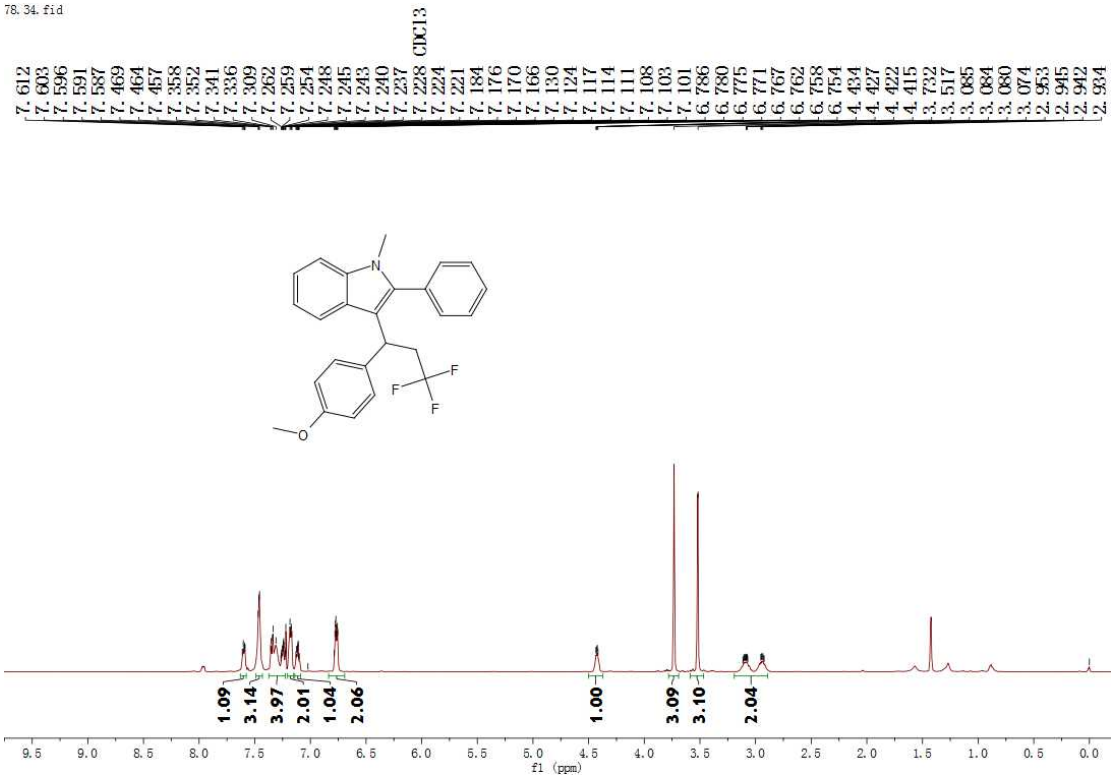
1,2-Dimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aaj)

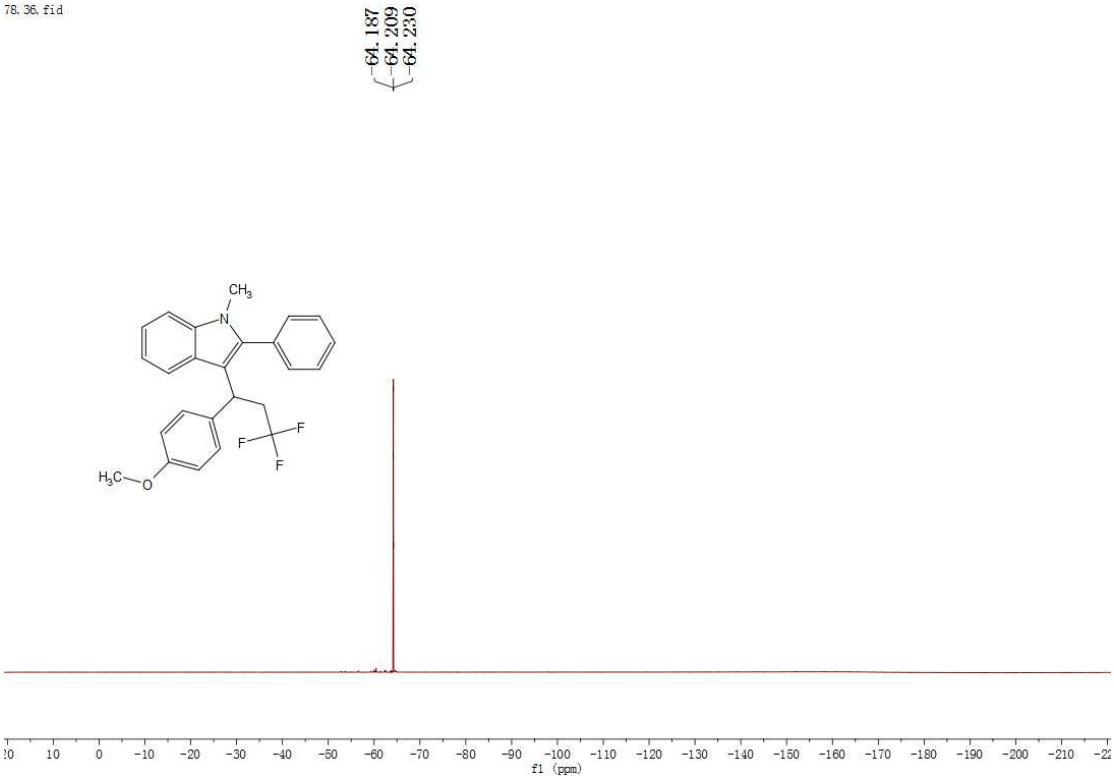




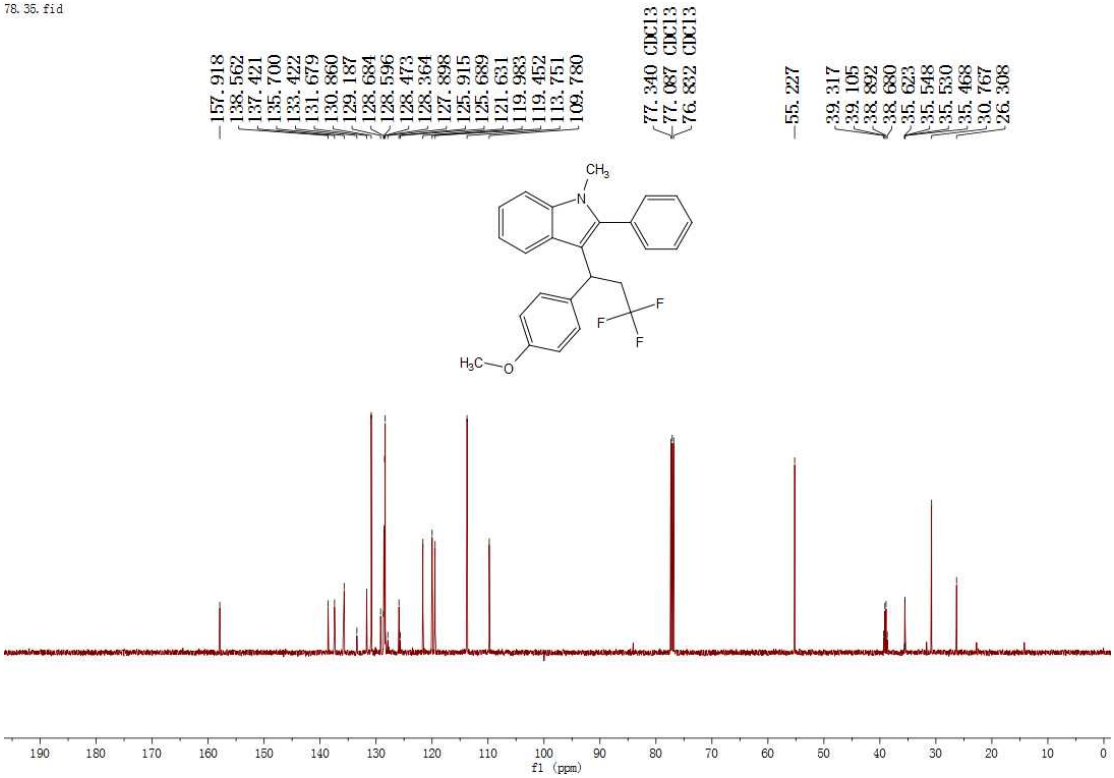

20181024-ljh-m5.20.fid
157.921
136.952
135.325
133.290
128.862
128.285
128.053
126.000
125.846
120.516
118.947
118.888
113.761
112.047
108.915
77.296 CDCl3
77.043 CDCl3
76.788 CDCl3
55.236
39.076
38.865
38.655
38.443
35.234
35.211
29.605
10.421
N
F
F
F
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

1,4-Dimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aak)

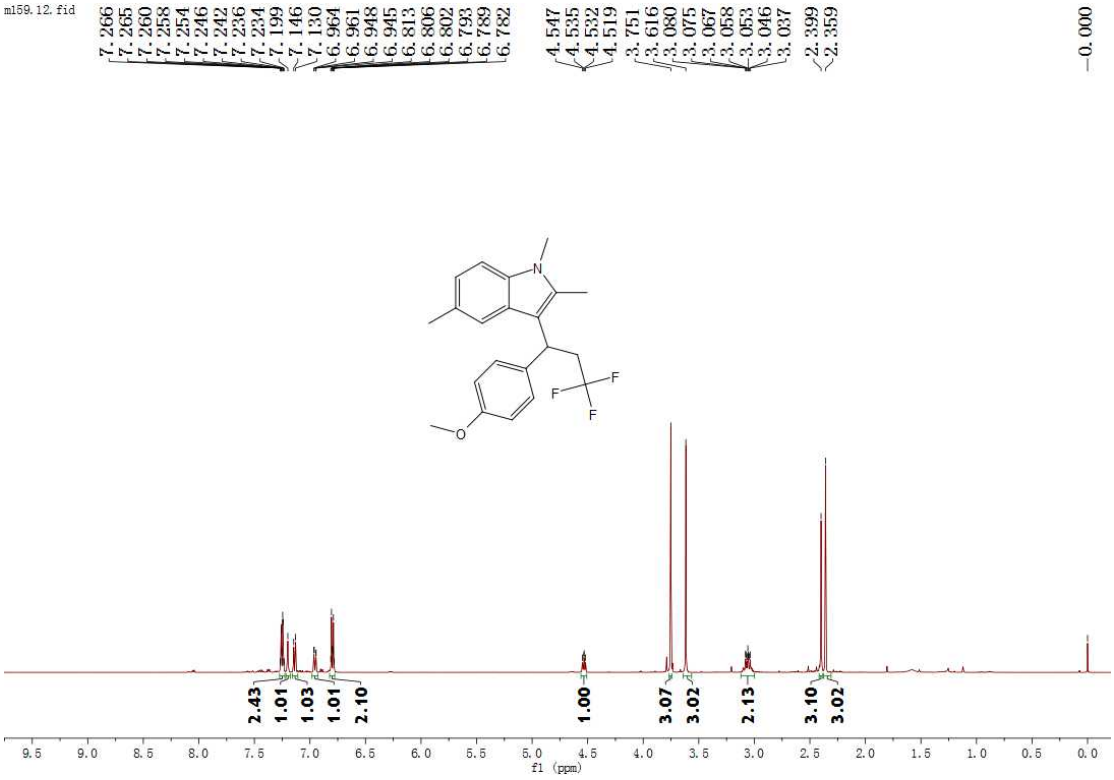


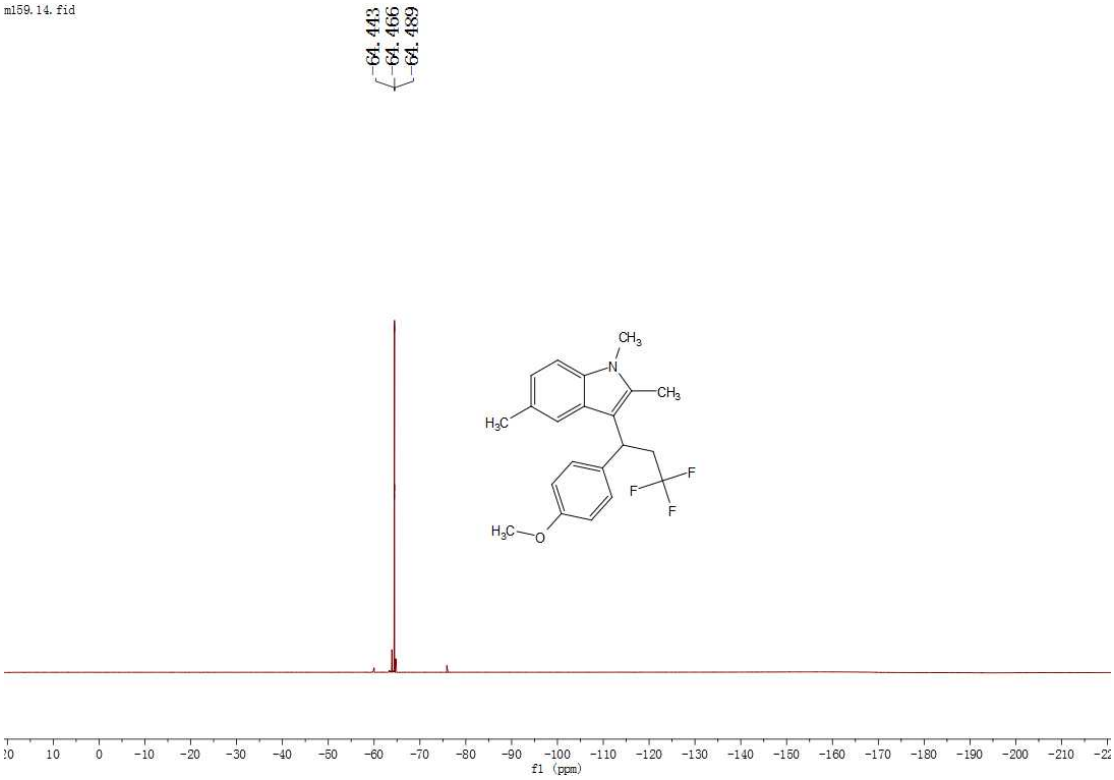


78.35.fid

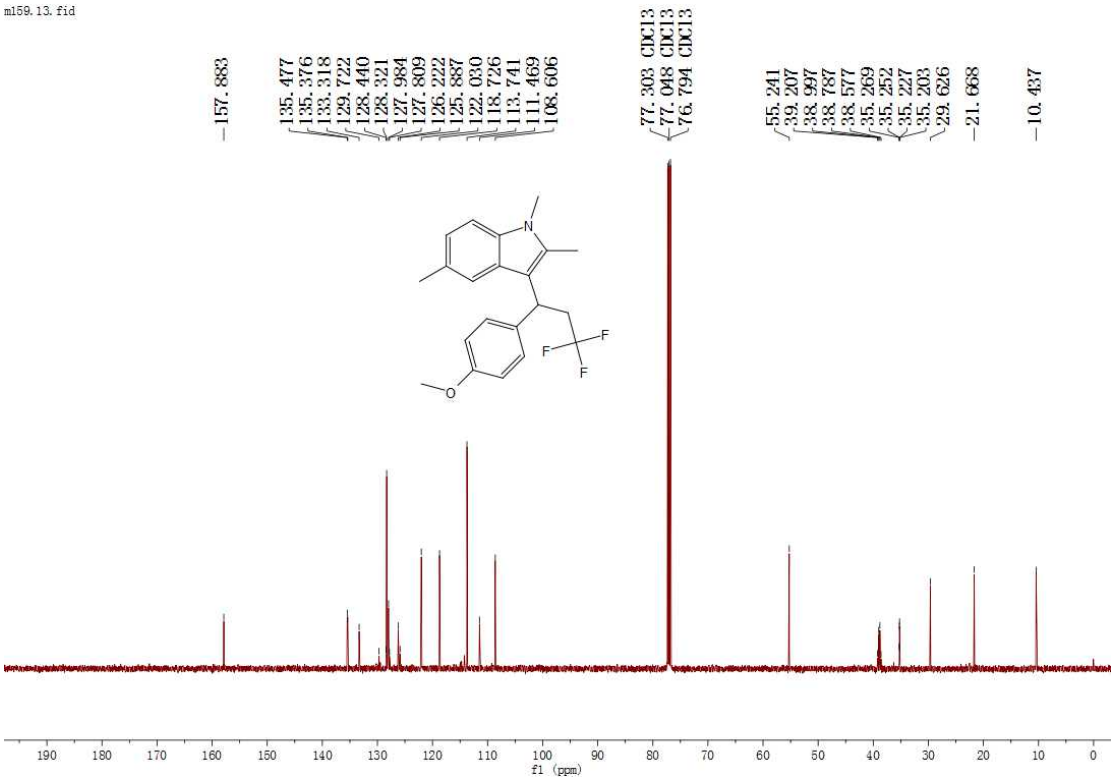

157.918
138.562
137.421
135.700
133.422
131.679
130.860
129.187
128.684
128.596
128.473
128.364
127.898
125.915
125.689
121.631
119.983
119.452
113.751
109.780
77.340 CDCl3
77.087 CDCl3
76.832 CDCl3
55.227
39.317
39.105
38.892
38.680
35.623
35.548
35.530
35.468
30.767
26.308
CH3
N
F
F
F
H3C
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

1,2,5-Trimethyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aal)

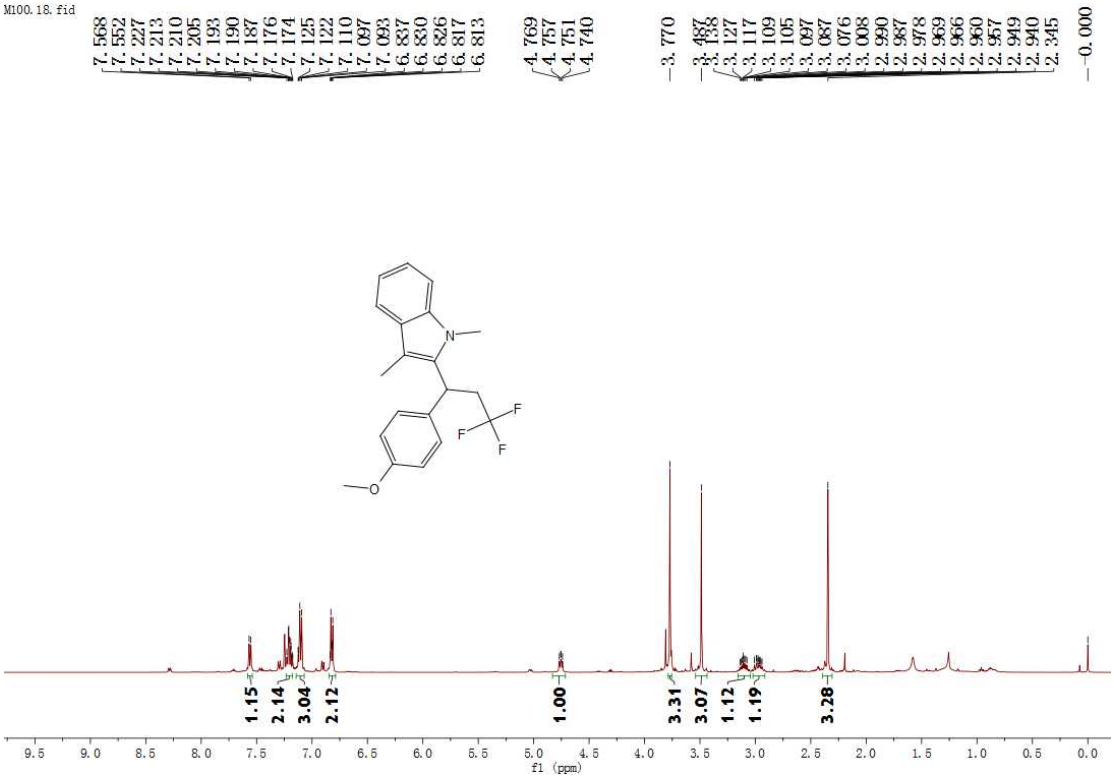


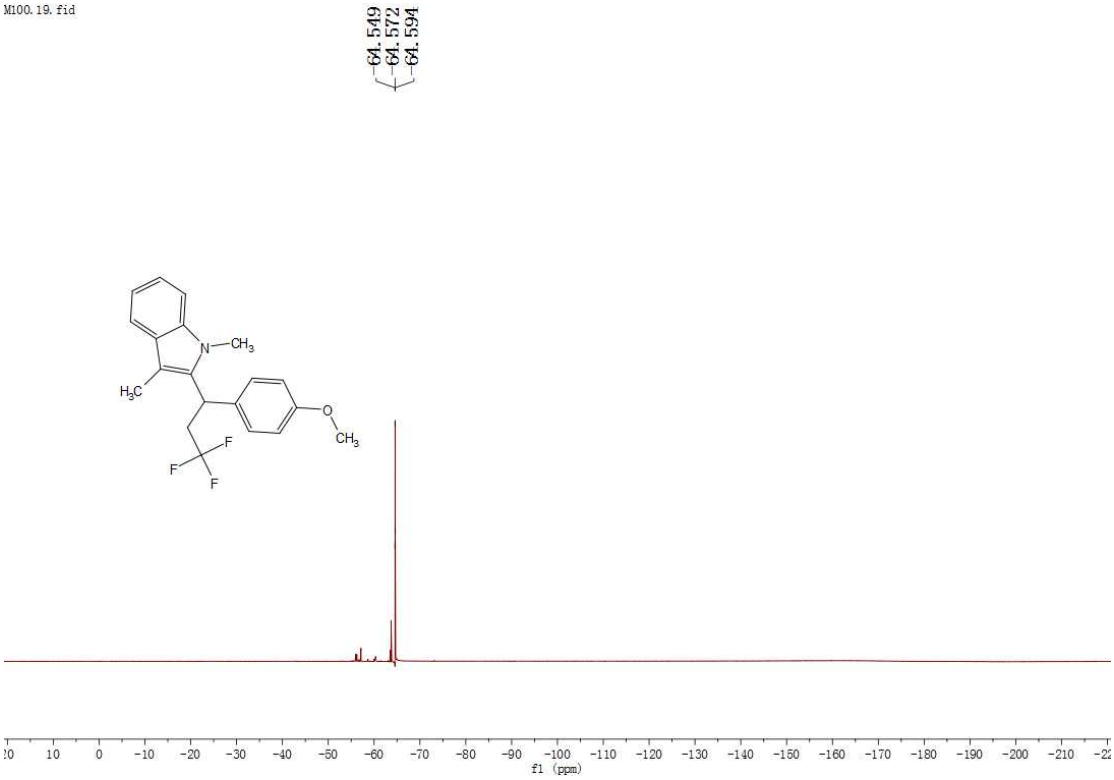


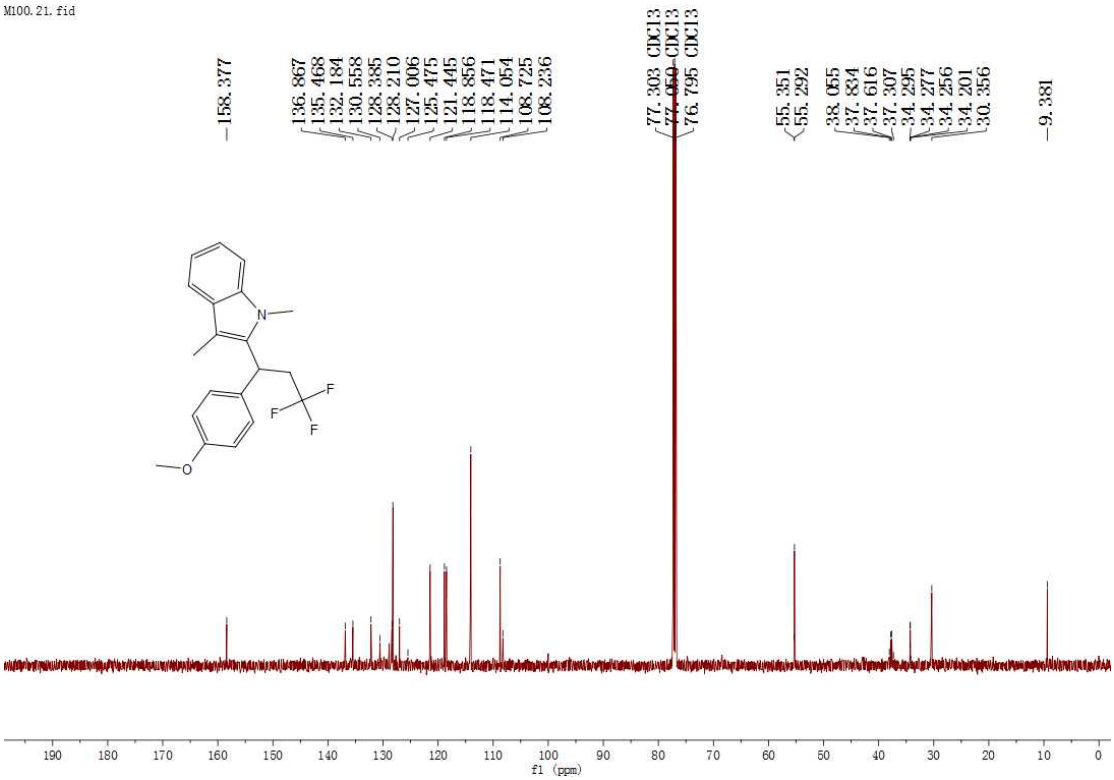
m159.13.fid


157.883
135.477
135.376
133.318
129.722
128.440
128.321
127.984
127.809
126.222
125.887
122.030
118.726
113.741
111.469
108.606
77.303 CDCl3
77.048 CDCl3
76.794 CDCl3
55.241
39.207
38.997
38.787
38.577
35.269
35.252
35.227
35.203
29.626
21.668
10.437
N
F
F
F
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

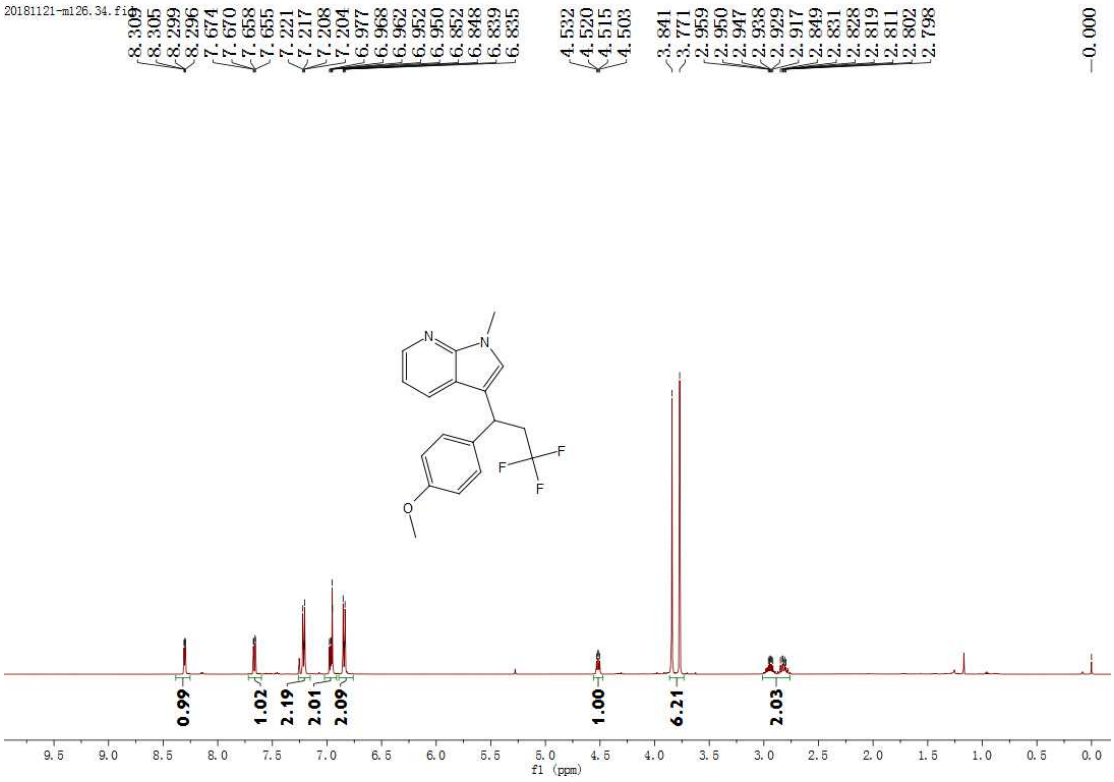
1,3-Dimethyl-2-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-indole (4aam)

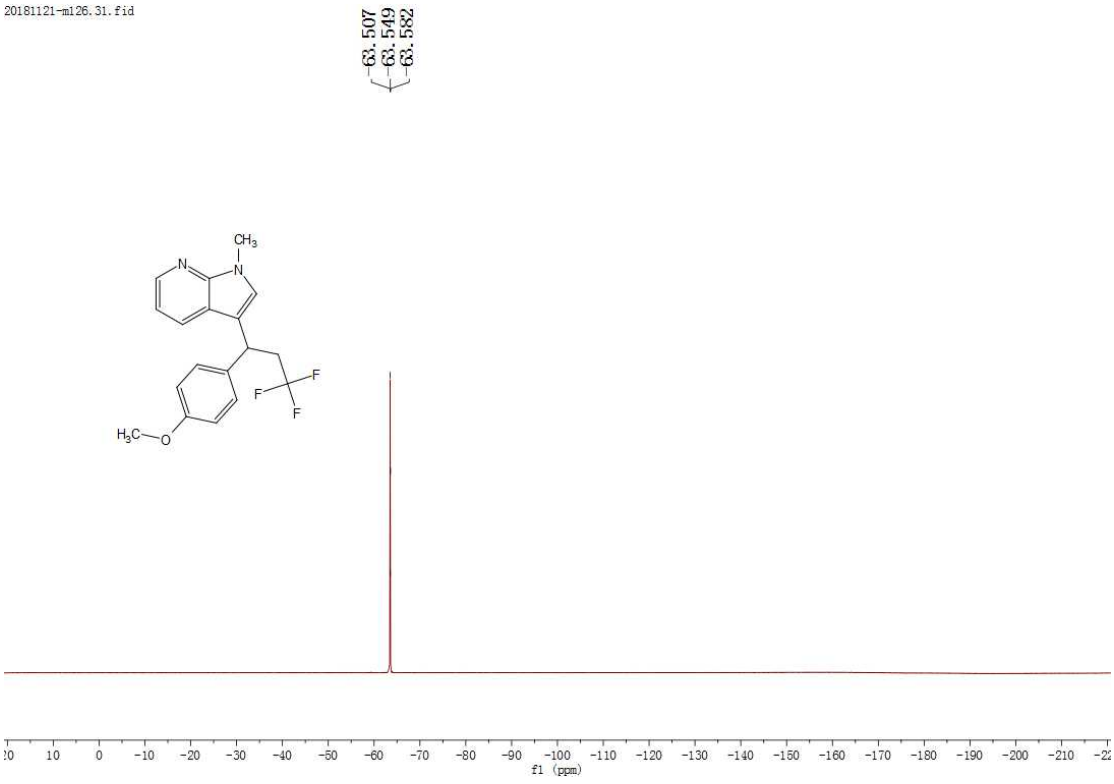




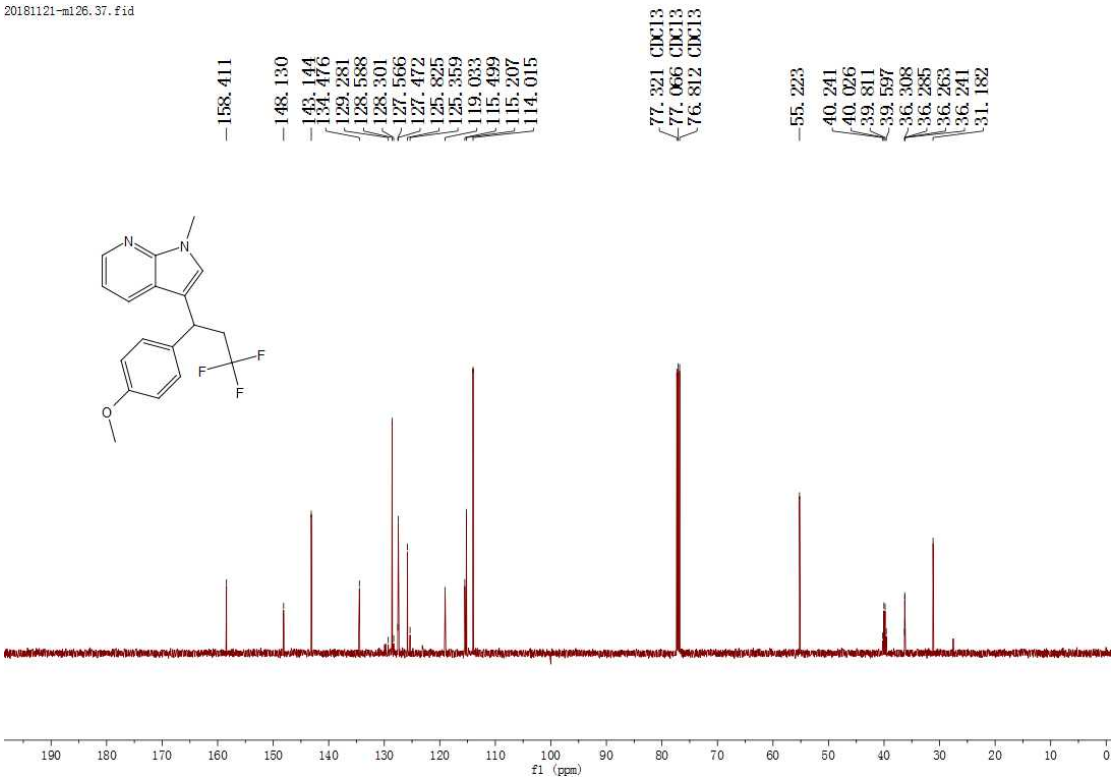

M100.21.fid
158.377
136.867
135.468
132.184
130.558
128.385
128.210
127.006
125.475
121.445
118.856
118.471
114.054
108.725
108.236
77.303 CDCl3
77.050 CDCl3
76.795 CDCl3
55.351
55.292
38.055
37.834
37.616
37.307
34.295
34.277
34.256
34.201
30.356
9.381
N
F
F
F
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

1-Methyl-3-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-pyrrolo[2,3-*b*]pyridine (4aan)

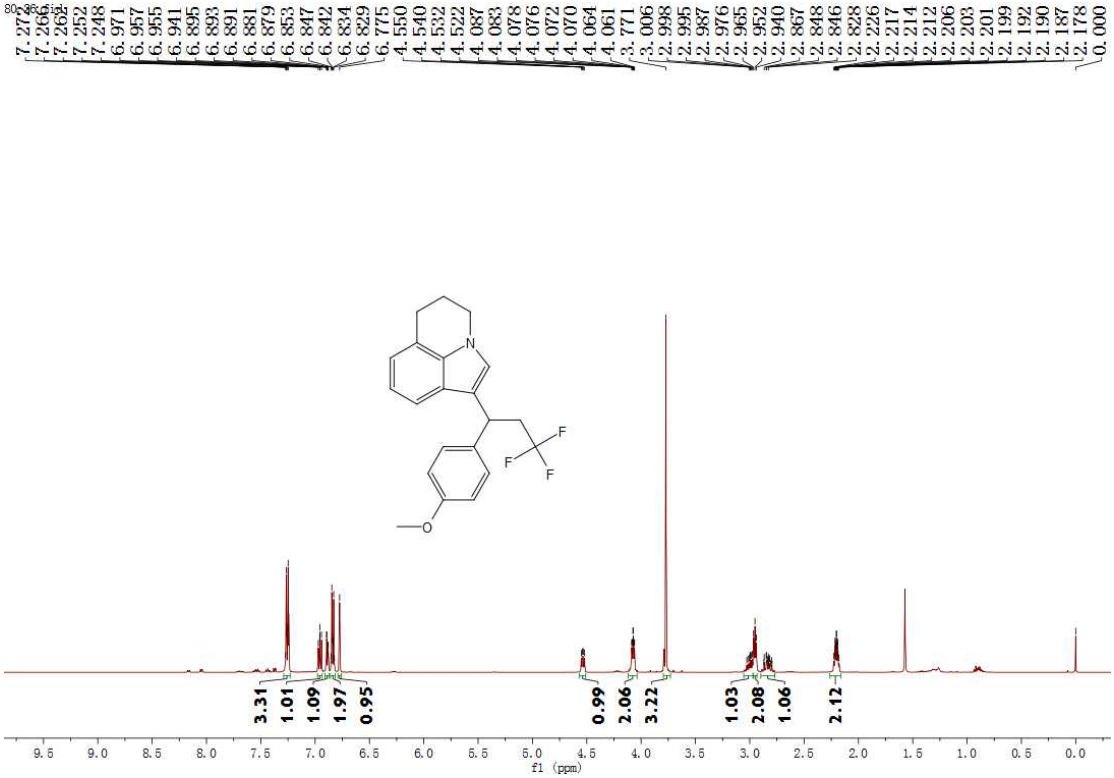


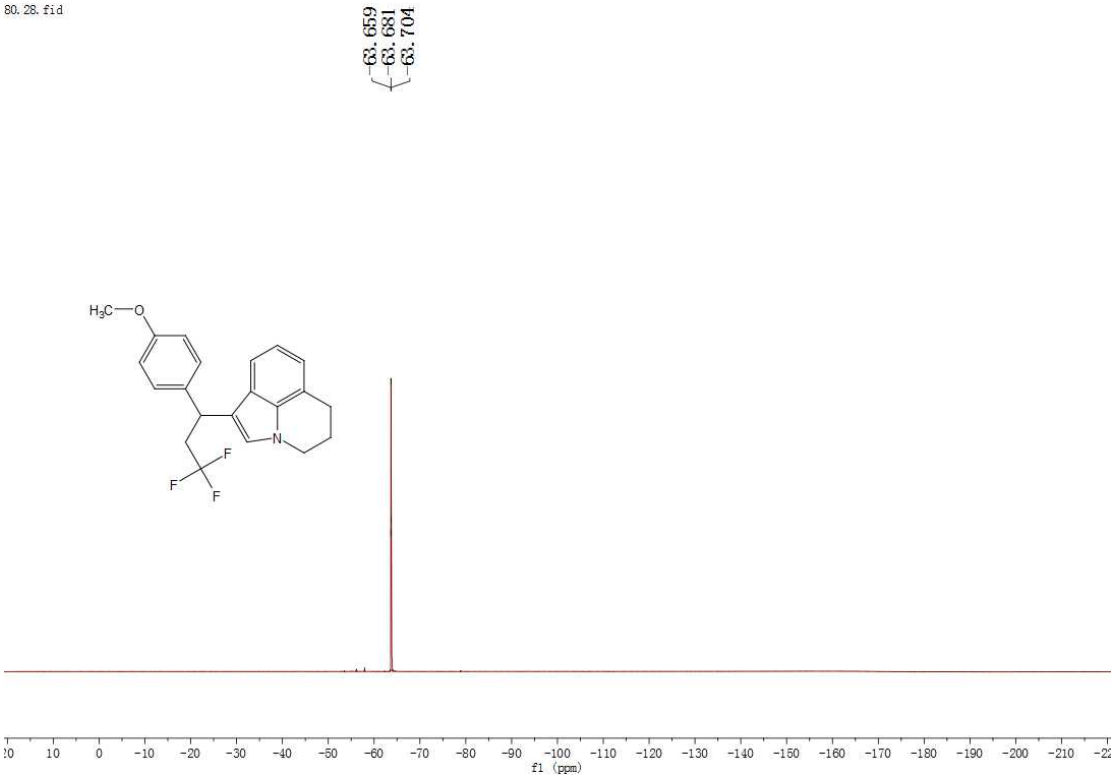


20181121-ml26.37.fid

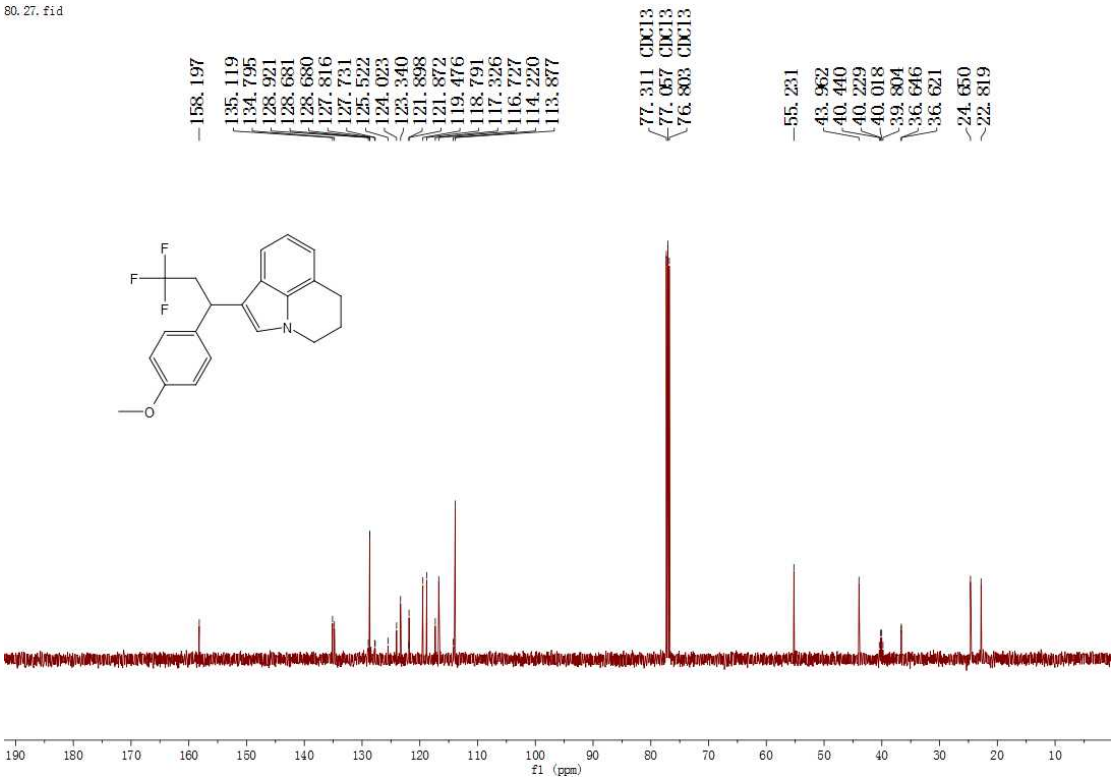


1-(3,3,3-Trifluoro-1-(4-methoxyphenyl)propyl)-5,6-dihydro-4*H*-pyrrolo[3,2,1-*ij*]quinoline (4aao)

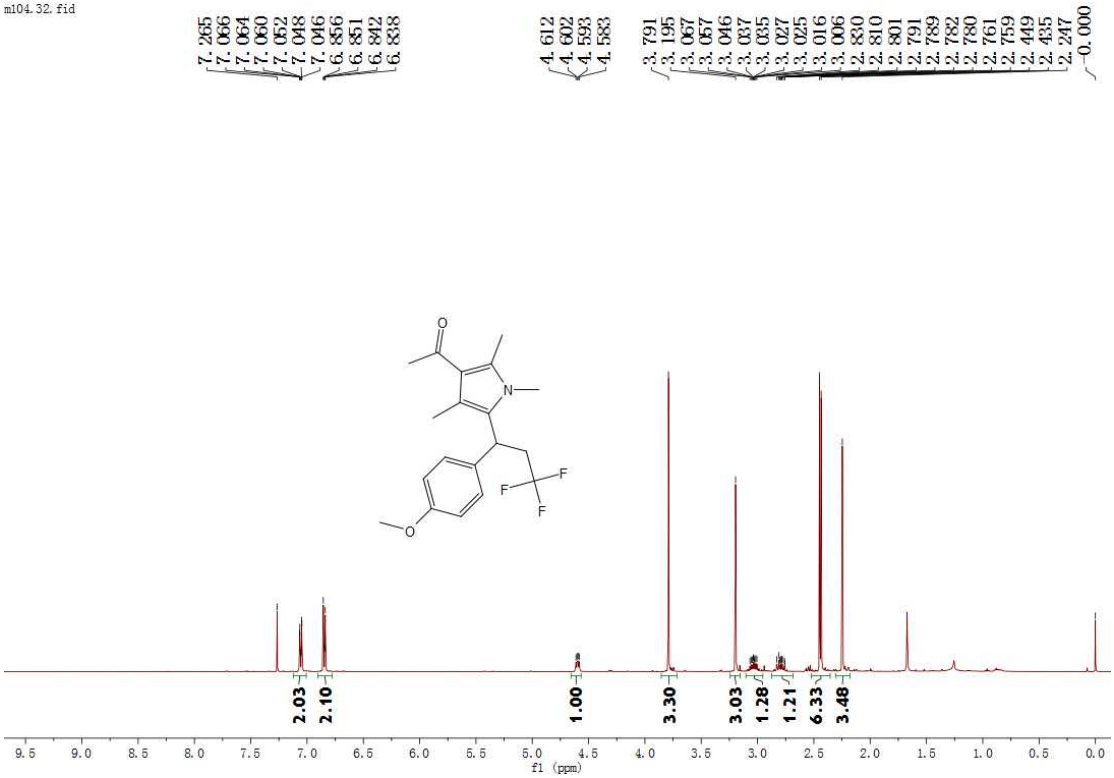


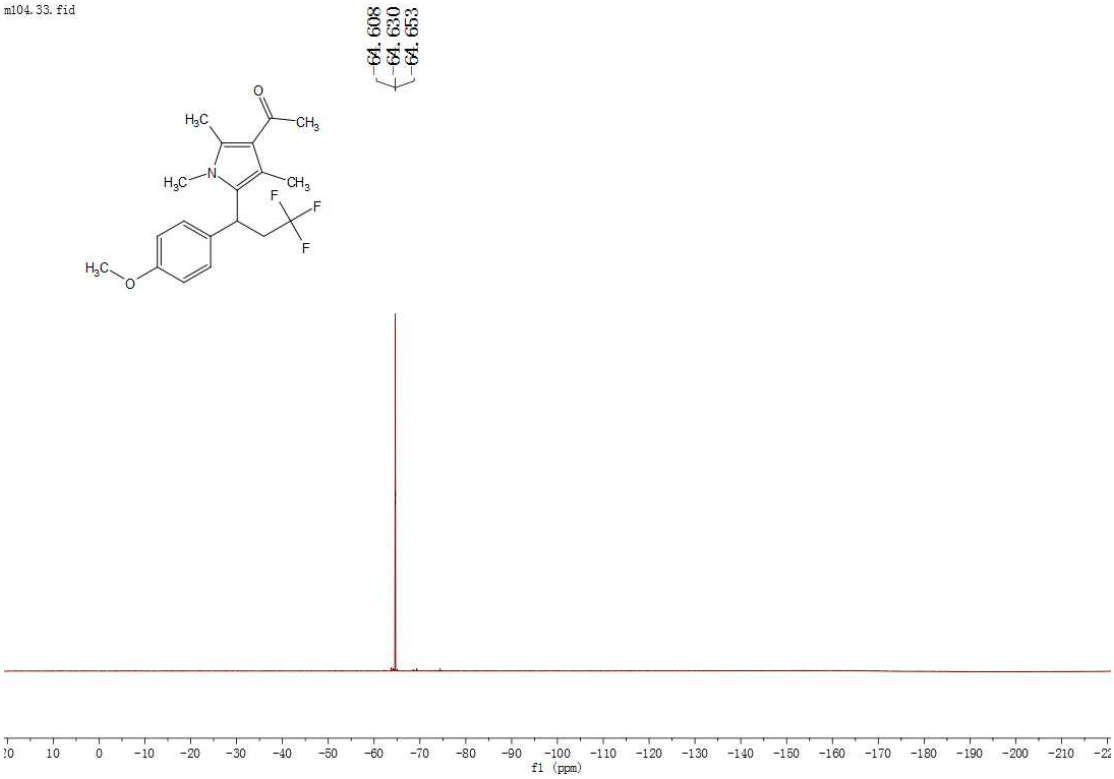


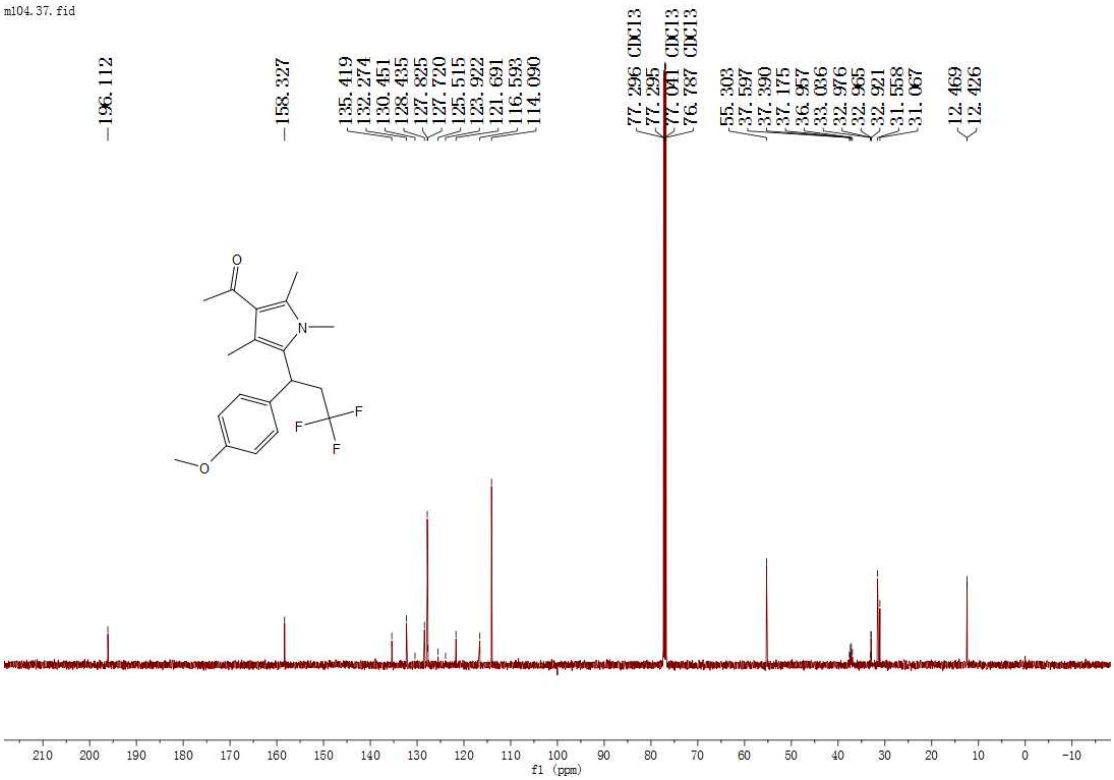
80.27.fid


158.197
135.119
134.795
128.921
128.681
128.680
127.816
127.731
125.522
124.023
123.340
121.898
121.872
119.476
118.791
117.326
116.727
114.220
113.877
77.311 CDCl3
77.057 CDCl3
76.803 CDCl3
55.231
43.962
40.440
40.229
40.018
39.804
36.646
36.621
24.650
22.819
F
F
F
N
O
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

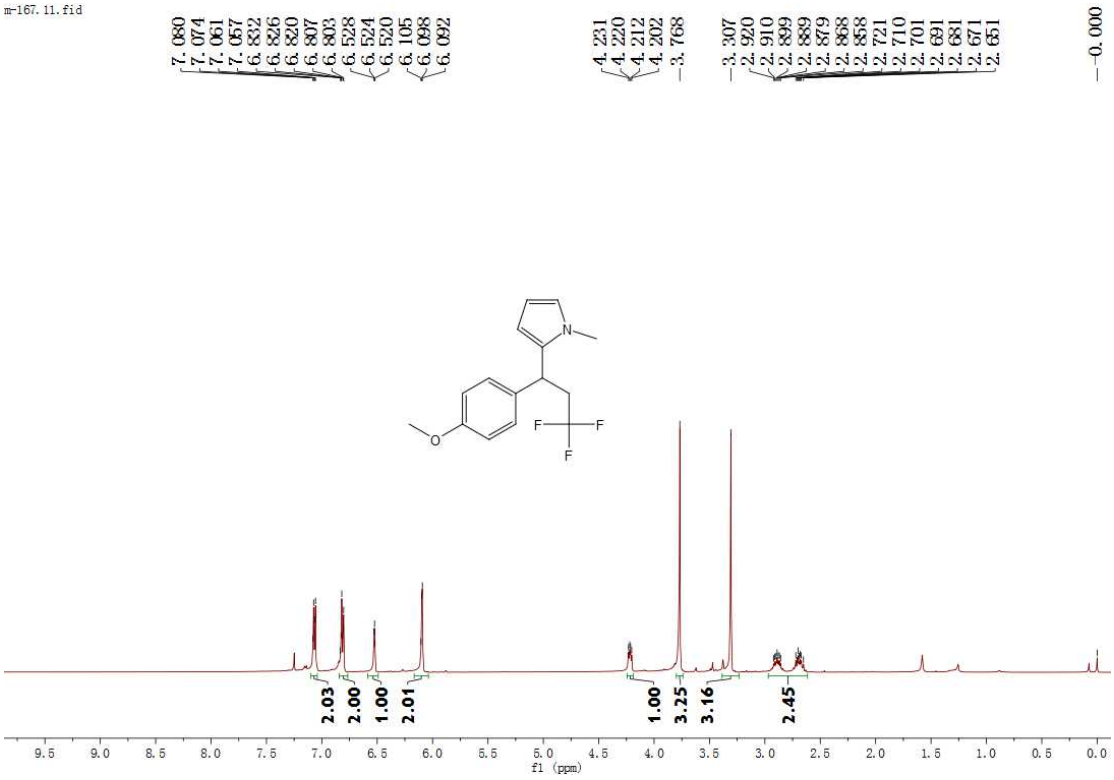
1-(1,2,4-Trimethyl-5-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-pyrrol-3-yl) ethan-1-one(4aap)

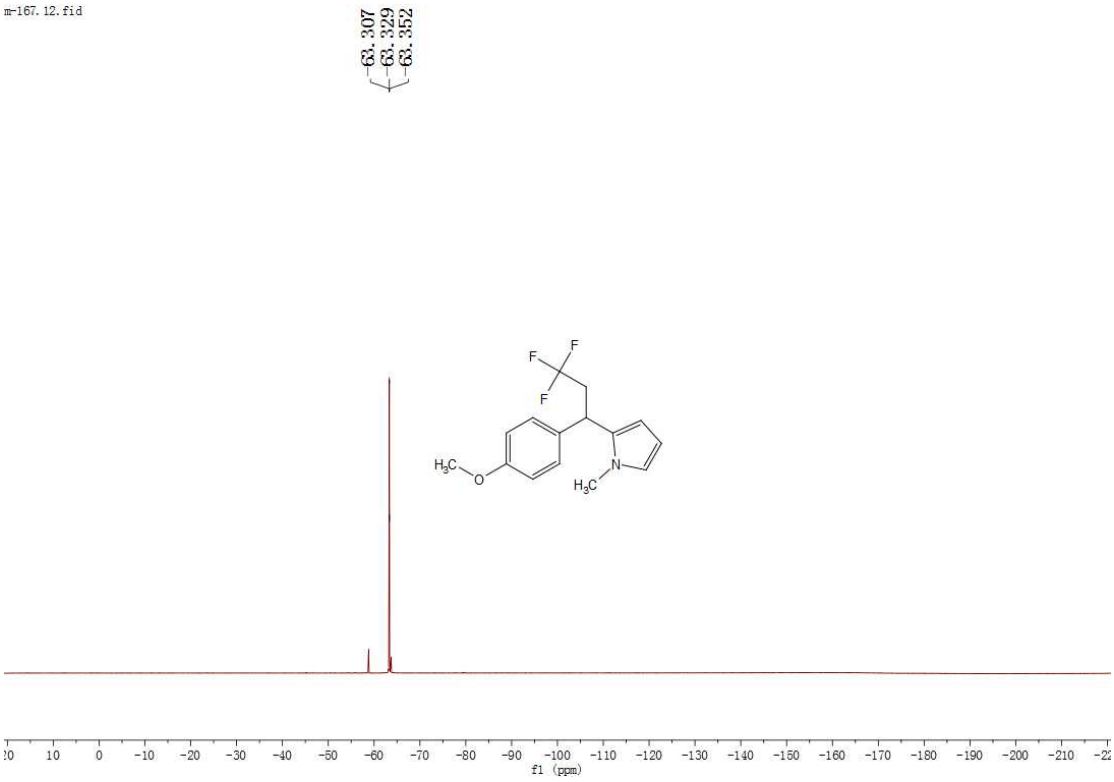





m104.37.fid
196.112
158.327
135.419
132.274
130.451
128.435
127.825
127.720
125.515
123.922
121.691
116.593
114.090
77.296 CDCl3
77.295
77.041 CDCl3
76.787 CDCl3
55.303
37.597
37.390
37.175
36.957
33.036
32.976
32.965
32.921
31.558
31.067
12.469
12.426
O
N
F
F
F
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

1-Methyl-2-(3,3,3-trifluoro-1-(4-methoxyphenyl)propyl)-1*H*-pyrrole (4aaq)





m-167.15.fid

158.430
133.430
129.678
128.884
128.464
127.471
125.265
123.058
122.360
114.048
106.442
105.600
77.314 CDCl3
77.060 CDCl3
76.806 CDCl3
55.237
40.605
40.387
40.170
39.953
36.859
36.781
36.758
36.735
33.901