

Regiocontrolled palladium-catalyzed direct C2-arylation of a difluorobenzo[*d*]imidazole

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Experimental Section

General: All reactions were carried out under an inert atmosphere with standard Schlenk techniques. ¹H NMR spectra were recorded on Bruker GPX (400 MHz) spectrometer. Chemical shifts (δ) were reported in parts per million relative to residual chloroform (7.26 ppm for ¹H; 77.16 ppm for ¹³C), constants were reported in Hertz. ¹H NMR assignment abbreviations were the following: singlet (s), doublet (d), triplet (t), quartet (q), doublet of doublets (dd), doublet of triplets (dt), and multiplet (m). ¹³C NMR spectra were recorded at 100 MHz on the same spectrometer and reported in ppm. All reagents were weighed and handled in air.

Preparation of the PdCl(C₃H₅)(dppb) catalyst:¹ An oven-dried 40 mL Schlenk tube equipped with a magnetic stirring bar under argon atmosphere, was charged with [Pd(C₃H₅)Cl]₂ (182 mg, 0.5 mmol) and dppb (426 mg, 1 mmol). 10 mL of anhydrous dichloromethane was added, then the solution was stirred at room temperature for twenty minutes. The solvent was removed in vacuum. The yellow powder was used without purification. ³¹P NMR (81 MHz, CDCl₃): δ 19.3 (s).

General procedure for the synthesis of C2-arylated 1-ethyl-6,7-difluoro-benzo[*d*]imidazole: To a 25 mL oven dried Schlenk tube, aryl bromide (1.5 mmol), 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), KO^tPiv (0.280 g, 2 mmol), DMA (2 mL) and PdCl(C₃H₅)(dppb) (30.5 mg, 0.05 mmol) were successively added. The reaction mixture was evacuated by vacuum-argon cycles (5 times) and stirred at 150 °C (oil bath temperature) for 48 hours. After cooling the reaction at room temperature and concentration, the crude mixture was purified by silica column chromatography to afford the C2-arylated 1-ethyl-6,7-difluorobenzo[*d*]imidazoles.

1-Ethyl-6,7-difluoro-2-(pyridin-3-yl)benzo[*d*]imidazole (1a)

Following general procedure, 3-bromopyridine (0.237 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **1a** in 53% (0.137 g) yield as a white solid: mp 96-98 °C.

¹H NMR (400 MHz, CDCl₃): δ 8.96 (s, 1H), 8.78 (d, *J* = 4.3 Hz, 1H), 8.05 (d, *J* = 6.2 Hz, 1H), 7.55-7.49 (m, 2H), 7.13 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.38 (q, *J* = 7.6 Hz, 2H), 1.52 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 151.9 (d, *J* = 2.2 Hz), 151.2, 149.7, 147.1 (dd, *J* = 241.4, 10.9 Hz), 141.6 (d, *J* = 2.1 Hz), 137.2 (dd, *J* = 239.7, 17.7 Hz), 137.0, 126.1, 124.4 (dd, *J* = 5.9, 5.2 Hz), 123.7, 115.5 (dd, *J* = 7.9, 4.2 Hz), 112.2 (d, *J* = 21.0 Hz), 41.7 (d, *J* = 3.5 Hz), 16.9 (d, *J* = 3.3 Hz).

LRMS calcd for M^+ $C_{14}H_{11}F_2N_3$ 259, found 259. HRMS calcd for $[M+Na]^+$ $C_{14}H_{11}F_2N_3Na$ 282.0813, found 282.0810.

4-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzonitrile (2)

Following general procedure, 4-bromobenzonitrile (0.273 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **2** in 50% (0.142 g) yield as a yellow solid: mp 168-170 °C.

1H NMR (400 MHz, $CDCl_3$): δ 7.85 (s, 4H), 7.51 (ddd, $J = 9.1, 3.8, 1.2$ Hz, 1H), 7.16 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.38 (q, $J = 7.6$ Hz, 2H), 1.52 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 152.6 (d, $J = 2.4$ Hz), 147.2 (dd, $J = 241.4, 10.9$ Hz), 141.4, 137.4 (dd, $J = 239.7, 17.7$ Hz), 134.0, 132.7, 130.1, 124.5 (dd, $J = 5.9, 5.2$ Hz), 118.2, 115.5 (dd, $J = 7.9, 4.2$ Hz), 114.1, 112.8 (d, $J = 21.0$ Hz), 41.9 (d, $J = 3.5$ Hz), 16.8 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{16}H_{11}F_2N_3$ 283, found 283. HRMS calcd for $[M+Na]^+$ $C_{16}H_{11}F_2N_3Na$ 306.0813, found 306.0803.

4-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzaldehyde (3)

Following general procedure, 4-bromobenzaldehyde (0.277 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **3** in 22% (0.063 g) yield as a white solid: mp 140-142 °C.

1H NMR (400 MHz, $CDCl_3$): δ 10.13 (s, 1H), 8.06 (d, $J = 8.3$ Hz, 2H), 7.90 (d, $J = 8.3$ Hz, 2H), 7.51 (ddd, $J = 9.1, 3.8, 1.2$ Hz, 1H), 7.16 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.40 (q, $J = 7.6$ Hz, 2H), 1.52 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 191.5, 153.5, 147.1 (dd, $J = 241.4, 10.9$ Hz), 141.5, 137.4 (dd, $J = 239.7, 17.7$ Hz), 135.3, 130.2, 130.1, 124.6 (m), 115.6 (dd, $J = 7.9, 4.2$ Hz), 112.4 (d, $J = 21.0$ Hz), 41.8 (d, $J = 3.5$ Hz), 16.8 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{16}H_{12}F_2N_2O$ 286, found 286. HRMS calcd for $[M+Na]^+$ $C_{16}H_{12}F_2N_2ONa$ 309.0810, found 309.0813.

(4-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)phenyl)(phenyl)methanone (4)

Following general procedure, 4-bromobenzophenone (0.392 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **4** in 42% (0.152 g) yield as a white solid: mp 162-164 °C.

1H NMR (400 MHz, $CDCl_3$): δ 7.97 (d, $J = 8.2$ Hz, 2H), 7.88-7.80 (m, 4H), 7.64 (t, $J = 7.8$ Hz, 1H), 7.55-7.51 (m, 3H), 7.16 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.42 (q, $J = 7.6$ Hz, 2H), 1.53 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 196.1, 153.8 (d, $J = 1.8$ Hz), 147.2 (dd, $J = 241.4, 10.9$ Hz), 141.5 (d, $J = 1.8$ Hz), 139.1, 137.3 (dd, $J = 239.7, 17.7$ Hz), 137.2, 133.3, 133.0, 130.5, 130.2, 129.4, 128.6, 124.5 (m), 115.5 (dd, $J = 7.9, 4.2$ Hz), 112.3 (d, $J = 21.0$ Hz), 41.8 (d, $J = 3.5$ Hz), 16.8 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{22}H_{16}F_2N_2O$ 362, found 362. HRMS calcd for $[M+Na]^+$ $C_{22}H_{16}F_2N_2ONa$ 385.1123, found 385.1124.

1-Ethyl-6,7-difluoro-2-(4-(trifluoromethyl)phenyl)benzo[d]imidazole (5)

Following general procedure, 4-bromobenzotrifluoride (0.338 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **5** in 41% (0.134 g) yield as a yellow solid: mp 126-128 °C.

1H NMR (400 MHz, $CDCl_3$): δ 7.84 (d, $J = 8.3$ Hz, 2H), 7.81 (d, $J = 8.3$ Hz, 2H), 7.51 (ddd, $J = 9.1, 3.8, 1.2$ Hz, 1H), 7.15 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.37 (q, $J = 7.6$ Hz, 2H), 1.51 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 153.4, 147.2 (dd, $J = 241.4, 10.9$ Hz), 141.5, 137.4 (dd, $J = 239.7, 17.7$ Hz), 133.2, 132.2 (q, $J = 32.8$ Hz), 129.9, 126.0 (q, $J = 1.8$ Hz), 124.5 (m), 124.4 (q, $J = 272.4$ Hz), 115.6 (dd, $J = 7.9, 4.2$ Hz), 112.3 (d, $J = 21.0$ Hz), 41.7 (d, $J = 3.5$ Hz), 16.8 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{16}H_{11}F_5N_2$ 326, found 326. HRMS calcd for $[M+Na]^+$ $C_{16}H_{11}F_5N_2Na$ 349.0735, found 349.0721.

2-(4-Chlorophenyl)-1-ethyl-6,7-difluorobenzo[d]imidazole (6)

Following general procedure, 4-bromochlorobenzene (0.287 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **6** in 36% (0.105 g) yield as a white solid: mp 127-129 °C.

¹H NMR (400 MHz, CDCl₃): δ 7.65 (d, *J* = 8.3 Hz, 2H), 7.53 (d, *J* = 8.3 Hz, 2H), 7.50 (ddd, *J* = 9.1, 3.8, 1.2 Hz, 1H), 7.12 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.35 (q, *J* = 7.6 Hz, 2H), 1.49 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 153.7, 147.1 (dd, *J* = 241.4, 10.9 Hz), 140.9, 137.6 (dd, *J* = 239.7, 17.7 Hz), 136.8, 130.8, 129.4, 127.7, 124.3 (m), 115.2 (dd, *J* = 7.9, 4.2 Hz), 112.3 (d, *J* = 21.0 Hz), 41.7 (d, *J* = 3.5 Hz), 16.7 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₅H₁₁ClF₂N₂ 292, found 292. HRMS calcd for [M+Na]⁺ C₁₅H₁₁ClF₂N₂Na 315.0471, found 315.0472.

1-Ethyl-6,7-difluoro-2-(4-fluorophenyl)benzo[*d*]imidazole (**7**)

Following general procedure, 4-fluorobromobenzene (0.263 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **7** in 43% (0.119 g) yield as a yellow solid: mp 86-88 °C.

¹H NMR (400 MHz, CDCl₃): δ 7.70 (dd, *J* = 8.2, 5.5 Hz, 2H), 7.50 (dd, *J* = 8.8, 3.8 Hz, 1H), 7.25 (t, *J* = 7.8 Hz, 2H), 7.14 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.36 (q, *J* = 7.6 Hz, 2H), 1.49 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 164.1 (d, *J* = 248.1 Hz), 153.8 (d, *J* = 2.0 Hz), 147.1 (dd, *J* = 241.4, 10.9 Hz), 140.4, 137.3 (dd, *J* = 239.7, 17.7 Hz), 131.6 (d, *J* = 8.5 Hz), 125.1 (d, *J* = 3.1 Hz), 124.1 (dd, *J* = 5.9, 5.2 Hz), 116.4 (d, *J* = 22.0 Hz), 115.0 (dd, *J* = 7.9, 4.2 Hz), 112.3 (d, *J* = 21.0 Hz), 41.8 (d, *J* = 3.5 Hz), 16.7 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₅H₁₁F₃N₂ 276, found 276. HRMS calcd for [M+Na]⁺ C₁₅H₁₁F₃N₂Na 299.0766, found 299.0758.

1-Ethyl-6,7-difluoro-2-phenylbenzo[*d*]imidazole (**8**)

Following general procedure, bromobenzene (0.263 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **8** in 39% (0.101 g) yield as a yellow solid: mp 90-92 °C.

¹H NMR (400 MHz, CDCl₃): δ 7.71-7.66 (m, 2H), 7.55-7.52 (m, 3H), 7.49 (ddd, *J* = 9.1, 3.8, 1.2 Hz, 1H), 7.11 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.36 (q, *J* = 7.6 Hz, 2H), 1.49 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 155.1, 147.0 (dd, *J* = 241.4, 10.9 Hz), 141.6, 137.4 (dd, *J* = 239.7, 17.7 Hz), 130.3, 129.7, 129.4, 129.0, 124.3 (m), 115.2 (dd, *J* = 7.9, 4.2 Hz), 111.8 (d, *J* = 21.0 Hz), 41.6 (d, *J* = 3.5 Hz), 16.7 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₅H₁₂F₂N₂ 258, found 258. HRMS calcd for [M+Na]⁺ C₁₅H₁₂F₂N₂Na 281.0728, found 281.0738.

1-Ethyl-6,7-difluoro-2-(*p*-tolyl)benzo[*d*]imidazole (**9**)

Following general procedure, 4-bromotoluene (0.257 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **9** in 56% (0.152 g) yield as a white solid: mp 134-136 °C.

¹H NMR (400 MHz, CDCl₃): δ 7.58 (d, *J* = 8.3 Hz, 2H), 7.47 (dd, *J* = 9.1, 3.8 Hz, 1H), 7.34 (d, *J* = 8.3 Hz, 2H), 7.10 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.35 (q, *J* = 7.6 Hz, 2H), 2.45 (s, 3H), 1.48 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 155.3, 146.9 (dd, *J* = 241.4, 10.9 Hz), 141.2, 140.5, 137.4 (dd, *J* = 239.7, 17.7 Hz), 129.7, 129.3, 124.3, 124.3 (m), 115.1 (dd, *J* = 7.9, 4.2 Hz), 111.7 (d, *J* = 21.0 Hz), 41.6 (d, *J* = 3.5 Hz), 21.6, 16.7 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₆H₁₄F₂N₂ 272, found 272. HRMS calcd for [M+Na]⁺ C₁₆H₁₄F₂N₂Na 295.1017, found 295.1001.

2-(4-(*tert*-Butyl)phenyl)-1-ethyl-6,7-difluorobenzo[*d*]imidazole (**10**)

Following general procedure, 4-*tert*-butylbromobenzene (0.320 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **10** in 42% (0.132 g) yield as a yellow solid: mp 120-122 °C.

¹H NMR (400 MHz, CDCl₃): δ 7.64 (d, *J* = 8.3 Hz, 2H), 7.54 (d, *J* = 8.3 Hz, 2H), 7.47 (dd, *J* = 9.1, 3.8 Hz, 1H), 7.10 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.38 (q, *J* = 7.6 Hz, 2H), 1.49 (t, *J* = 7.6 Hz, 3H), 1.38 (s, 9H).

^{13}C NMR (100 MHz, CDCl_3): δ 155.3 (d, $J = 2.2$ Hz), 153.6, 146.9 (dd, $J = 241.4, 10.9$ Hz), 141.5, 137.4 (dd, $J = 239.7, 17.7$ Hz), 129.2, 126.8, 125.9, 124.3 (m), 115.1 (dd, $J = 7.9, 4.2$ Hz), 111.7 (d, $J = 21.0$ Hz), 41.6 (d, $J = 3.5$ Hz), 35.1, 31.4, 16.8 (d, $J = 3.3$ Hz).

LRMS calcd for $\text{M}^+ \text{C}_{19}\text{H}_{20}\text{F}_2\text{N}_2$ 314, found 314. HRMS calcd for $[\text{M}+\text{Na}]^+ \text{C}_{19}\text{H}_{20}\text{F}_2\text{N}_2\text{Na}$ 337.1487, found 337.1473.

2-([1,1'-Biphenyl]-4-yl)-1-ethyl-6,7-difluorobenzo[d]imidazole (11)

Following general procedure, 4-bromobiphenyl (0.350 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **11** in 44% (0.147 g) yield as a white solid: mp 142-144 °C.

^1H NMR (400 MHz, CDCl_3): δ 7.81-7.74 (m, 4H), 7.67 (d, $J = 8.3$ Hz, 2H), 7.55-7.46 (m, 3H), 7.41 (t, $J = 7.8$ Hz, 1H), 7.12 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.42 (q, $J = 7.6$ Hz, 2H), 1.53 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, CDCl_3): δ 154.8 (d, $J = 2.2$ Hz), 147.0 (dd, $J = 241.4, 10.9$ Hz), 143.1, 141.4 (d, $J = 2.4$ Hz), 140.1, 137.4 (dd, $J = 239.7, 17.7$ Hz), 129.9, 129.1, 128.3, 128.1, 127.6, 127.3, 124.3 (m), 115.2 (dd, $J = 7.9, 4.2$ Hz), 111.8 (d, $J = 21.0$ Hz), 41.7 (d, $J = 3.5$ Hz), 16.8 (d, $J = 3.3$ Hz).

LRMS calcd for $\text{M}^+ \text{C}_{21}\text{H}_{16}\text{F}_2\text{N}_2$ 334, found 334. HRMS calcd for $[\text{M}+\text{H}]^+ \text{C}_{21}\text{H}_{17}\text{F}_2\text{N}_2$ 335.1354, found 335.1356.

1-Ethyl-6,7-difluoro-2-(4-methoxyphenyl)benzo[d]imidazole (12)

Following general procedure, 4-bromoanisole (0.280 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **12** in 20% (0.058 g) yield as a yellow solid: mp 110-112 °C.

^1H NMR (400 MHz, CDCl_3): δ 7.64 (d, $J = 8.4$ Hz, 2H), 7.49 (dd, $J = 8.3, 2.9$ Hz, 1H), 7.10 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 7.05 (d, $J = 8.4$ Hz, 2H), 4.36 (q, $J = 7.6$ Hz, 2H), 3.89 (s, 3H), 1.49 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, CDCl_3): δ 161.3, 155.0 (d, $J = 2.2$ Hz), 147.0 (dd, $J = 241.4, 10.9$ Hz), 141.2 (d, $J = 2.1$ Hz), 137.4 (dd, $J = 239.7, 17.7$ Hz), 130.9, 124.2 (m), 121.6, 114.8 (dd, $J = 7.9, 4.2$ Hz), 114.5, 111.7 (d, $J = 21.0$ Hz), 55.6, 41.6 (d, $J = 3.5$ Hz), 16.7 (d, $J = 3.3$ Hz).

LRMS calcd for $\text{M}^+ \text{C}_{16}\text{H}_{14}\text{F}_2\text{N}_2\text{O}$ 288, found 288. HRMS calcd for $[\text{M}+\text{H}]^+ \text{C}_{16}\text{H}_{15}\text{F}_2\text{N}_2\text{O}$ 289.1147, found 289.1147.

3-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzotrile (13)

Following general procedure, 3-bromobenzotrile (0.273 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **13** in 40% (0.113 g) yield as a white solid: mp 142-144 °C.

^1H NMR (400 MHz, CDCl_3): δ 8.02 (s, 1H), 7.94 (d, $J = 8.0$ Hz, 1H), 7.82 (d, $J = 8.0$ Hz, 1H), 7.68 (t, $J = 7.8$ Hz, 1H), 7.50 (ddd, $J = 9.1, 3.8, 1.2$ Hz, 1H), 7.14 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.37 (q, $J = 7.6$ Hz, 2H), 1.52 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, CDCl_3): δ 152.3, 147.3 (dd, $J = 241.4, 10.9$ Hz), 141.3, 137.4 (dd, $J = 239.7, 17.7$ Hz), 133.7, 133.6, 133.0, 131.1, 130.0, 124.5 (dd, $J = 5.9, 5.2$ Hz), 118.0, 115.5 (dd, $J = 7.9, 4.2$ Hz), 113.7, 112.6 (d, $J = 21.0$ Hz), 41.9 (d, $J = 3.5$ Hz), 16.8 (d, $J = 3.3$ Hz).

LRMS calcd for $\text{M}^+ \text{C}_{16}\text{H}_{11}\text{F}_2\text{N}_3$ 283, found 283. HRMS calcd for $[\text{M}+\text{Na}]^+ \text{C}_{16}\text{H}_{11}\text{F}_2\text{N}_3\text{Na}$ 306.0813, found 306.0804.

2-(3-Chlorophenyl)-1-ethyl-6,7-difluorobenzo[d]imidazole (14)

Following general procedure, 3-bromochlorobenzene (0.287 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **14** in 42% (0.123 g) yield as a yellow solid: mp 116-118 °C.

^1H NMR (400 MHz, CDCl_3): δ 7.73 (bs, 1H), 7.59 (d, $J = 8.1$ Hz, 1H), 7.57-7.47 (m, 3H), 7.14 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.39 (q, $J = 7.6$ Hz, 2H), 1.52 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, CDCl_3): δ 153.5, 147.1 (dd, $J = 241.4, 10.9$ Hz), 141.4, 137.3 (dd, $J = 239.7, 17.7$ Hz), 135.1, 131.4, 130.5, 130.2, 129.6, 127.4, 124.3 (m), 115.4 (dd, $J = 7.9, 4.2$ Hz), 112.1 (d, $J = 21.0$ Hz), 41.7 (d, $J = 3.5$ Hz), 16.7 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{15}H_{11}ClF_2N_2$ 292, found 292. HRMS calcd for $[M+Na]^+$ $C_{15}H_{11}ClF_2N_2Na$ 315.0471, found 315.0475.

1-Ethyl-6,7-difluoro-2-(3-fluorophenyl)benzo[d]imidazole (15)

Following general procedure, 3-fluorobromobenzene (0.263 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **15** in 45% (0.124 g) yield as a white solid: mp 81-83 °C.

1H NMR (400 MHz, $CDCl_3$): δ 7.55-7.45 (m, 3H), 7.42 (d, $J = 8.3$ Hz, 1H), 7.24 (t, $J = 7.8$ Hz, 1H), 7.10 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.38 (q, $J = 7.6$ Hz, 2H), 1.50 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 162.9 (d, $J = 248.1$ Hz), 153.5, 147.3 (dd, $J = 241.4, 10.9$ Hz), 141.3, 137.3 (dd, $J = 239.7, 17.7$ Hz), 131.5 (d, $J = 8.0$ Hz), 130.7 (d, $J = 8.4$ Hz), 125.1 (d, $J = 3.1$ Hz), 124.3 (dd, $J = 5.9, 5.2$ Hz), 117.4 (d, $J = 21.0$ Hz), 116.7 (d, $J = 23.1$ Hz), 115.4 (dd, $J = 7.9, 4.2$ Hz), 112.2 (d, $J = 21.0$ Hz), 41.7 (d, $J = 3.5$ Hz), 16.7 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{15}H_{11}F_3N_2$ 276, found 276. HRMS calcd for $[M+Na]^+$ $C_{15}H_{11}F_3N_2Na$ 299.0766, found 299.0756.

1-Ethyl-6,7-difluoro-2-(*m*-tolyl)benzo[d]imidazole (16)

Following general procedure, 3-bromotoluene (0.257 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **16** in 81% (0.220 g) yield as a yellow solid: mp 96-98 °C.

1H NMR (400 MHz, $CDCl_3$): δ 7.53 (s, 1H), 7.47 (dd, $J = 9.1, 3.8$ Hz, 1H), 7.45 (d, $J = 8.3$ Hz, 2H), 7.42 (t, $J = 7.8$ Hz, 1H), 7.34 (d, $J = 8.2$ Hz, 1H), 7.10 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.36 (q, $J = 7.6$ Hz, 2H), 2.45 (s, 3H), 1.48 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 155.3, 147.0 (dd, $J = 241.4, 10.9$ Hz), 141.4, 139.0, 137.4 (dd, $J = 239.7, 17.7$ Hz), 131.1, 130.3, 129.5, 128.8, 126.3, 124.2 (m), 115.1 (dd, $J = 7.9, 4.2$ Hz), 111.8 (d, $J = 21.0$ Hz), 41.6 (d, $J = 3.5$ Hz), 21.6, 16.7 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{16}H_{14}F_2N_2$ 272, found 272. HRMS calcd for $[M+Na]^+$ $C_{16}H_{14}F_2N_2Na$ 295.1017, found 295.1002.

2-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzotrile (17)

Following general procedure, 2-bromobenzotrile (0.273 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **17** in 30% (0.085 g) yield as a white solid: mp 104-106 °C.

1H NMR (400 MHz, $CDCl_3$): δ 7.88 (d, $J = 8.3$ Hz, 1H), 7.78 (t, $J = 7.8$ Hz, 1H), 7.70-7.64 (m, 2H), 7.53 (ddd, $J = 9.1, 3.8, 1.2$ Hz, 1H), 7.16 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.27 (q, $J = 7.6$ Hz, 2H), 1.39 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 150.9, 147.3 (dd, $J = 241.4, 10.9$ Hz), 140.5, 137.3 (dd, $J = 239.7, 17.7$ Hz), 133.8, 133.3, 133.0, 131.2, 130.7, 124.0 (m), 117.0, 115.9 (dd, $J = 7.9, 4.2$ Hz), 113.9, 112.4 (d, $J = 21.0$ Hz), 41.8 (d, $J = 3.5$ Hz), 16.6 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{16}H_{11}F_2N_3$ 283, found 283. HRMS calcd for $[M+Na]^+$ $C_{16}H_{11}F_2N_3Na$ 306.0813, found 306.0811.

2-(2-Chlorophenyl)-1-ethyl-6,7-difluorobenzo[d]imidazole (18)

Following general procedure, 2-bromochlorobenzene (0.287 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[d]imidazole (0.182 g, 1 mmol), affords **18** in 42% (0.123 g) yield as a yellow solid: mp 98-100 °C.

1H NMR (400 MHz, $CDCl_3$): δ 7.57-7.46 (m, 4H), 7.42 (t, $J = 8.1$ Hz, 1H), 7.12 (ddd, $J = 11.1, 8.8, 7.4$ Hz, 1H), 4.17 (q, $J = 7.6$ Hz, 2H), 1.33 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$): δ 152.2, 147.1 (dd, $J = 241.4, 10.9$ Hz), 141.5 (d, $J = 2.3$ Hz), 137.3 (dd, $J = 239.7, 17.7$ Hz), 134.5, 132.1, 131.8, 130.1, 129.3, 127.2, 123.5 (m), 115.5 (dd, $J = 7.9, 4.2$ Hz), 111.8 (d, $J = 21.0$ Hz), 41.5 (d, $J = 3.5$ Hz), 16.4 (d, $J = 3.3$ Hz).

LRMS calcd for M^+ $C_{15}H_{11}ClF_2N_2$ 292, found 292. HRMS calcd for $[M+Na]^+$ $C_{15}H_{11}ClF_2N_2Na$ 315.0471, found 315.0470.

1-Ethyl-6,7-difluoro-2-(2-fluorophenyl)benzo[d]imidazole (19)

Following general procedure, 2-fluorobromobenzene (0.263 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **19** in 40% (0.110 g) yield as a yellow solid: mp 80-82 °C.

¹H NMR (400 MHz, CDCl₃): δ 7.68-7.51 (m, 3H), 7.37 (t, *J* = 7.5 Hz, 1H), 7.27 (t, *J* = 7.8 Hz, 1H), 7.17 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.24 (q, *J* = 7.6 Hz, 2H), 1.40 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 160.2 (d, *J* = 250.0 Hz), 150.0 (d, *J* = 2.0 Hz), 147.1 (dd, *J* = 241.4, 10.9 Hz), 141.5 (m), 137.3 (dd, *J* = 239.7, 17.7 Hz), 132.7 (d, *J* = 8.23 Hz), 132.4 (d, *J* = 2.3 Hz), 124.9 (d, *J* = 3.5 Hz), 123.5 (m), 116.3 (d, *J* = 21.5 Hz), 115.4 (dd, *J* = 7.9, 4.2 Hz), 112.1 (d, *J* = 21.0 Hz), 41.8 (d, *J* = 3.5 Hz), 16.3 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₅H₁₁F₃N₂ 276, found 276. HRMS calcd for [M+Na]⁺ C₁₅H₁₁F₃N₂Na 299.0766, found 299.0758.

1-Ethyl-6,7-difluoro-2-(*o*-tolyl)benzo[*d*]imidazole (20)

Following general procedure, 2-bromotoluene (0.257 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **20** in 56% (0.152 g) yield as a yellow solid: mp 102-104 °C.

¹H NMR (400 MHz, CDCl₃): δ 7.47 (dd, *J* = 9.1, 3.8 Hz, 1H), 7.43 (t, *J* = 8.0 Hz, 1H), 7.38-7.29 (m, 3H), 7.11 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.12 (q, *J* = 7.6 Hz, 2H), 2.24 (s, 3H), 1.32 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 154.6 (d, *J* = 2.2 Hz), 147.0 (dd, *J* = 241.4, 10.9 Hz), 141.5, 138.1, 137.4 (dd, *J* = 239.7, 17.7 Hz), 130.7, 130.3, 130.0, 129.2, 126.0, 123.3 (m), 115.1 (dd, *J* = 7.9, 4.2 Hz), 111.6 (d, *J* = 21.0 Hz), 41.1 (d, *J* = 3.5 Hz), 19.8, 16.5 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₆H₁₄F₂N₂ 272, found 272. HRMS calcd for [M+Na]⁺ C₁₆H₁₄F₂N₂Na 295.1017, found 295.1007.

1-Ethyl-6,7-difluoro-2-(naphthalen-2-yl)benzo[*d*]imidazole (21)

Following general procedure, 2-bromonaphthalene (0.311 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **21** in 36% (0.111 g) yield as a yellow solid: mp 110-112 °C.

¹H NMR (400 MHz, CDCl₃): δ 8.21 (s, 1H), 8.01 (d, *J* = 8.4 Hz, 1H), 7.97-7.90 (m, 2H), 7.78 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.64-7.47 (m, 3H), 7.15 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.44 (q, *J* = 7.6 Hz, 2H), 1.52 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 155.1 (d, *J* = 2.2 Hz), 147.0 (dd, *J* = 241.4, 10.9 Hz), 141.5 (d, *J* = 1.8 Hz), 137.3 (dd, *J* = 239.7, 17.7 Hz), 133.9, 133.1, 129.6, 128.8, 128.7, 128.0, 127.6, 127.1, 126.8, 126.1, 124.4 (m), 115.2 (dd, *J* = 7.9, 4.2 Hz), 111.9 (d, *J* = 21.0 Hz), 41.8 (d, *J* = 3.5 Hz), 16.7 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₉H₁₄F₂N₂ 308, found 308. HRMS calcd for [M+H]⁺ C₁₉H₁₅F₂N₂Na 309.1198, found 309.1198.

1-Ethyl-6,7-difluoro-2-(pyridin-4-yl)benzo[*d*]imidazole (22)

Following general procedure, 4-bromopyridine hydrochloride (0.292 g, 1.5 mmol), 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol) and KO₂Piv (0.294 g, 3 mmol) affords **22** in 34% (0.087 g) yield as a yellow solid: mp 92-94 °C.

¹H NMR (400 MHz, CDCl₃): δ 8.84 (d, *J* = 5.8 Hz, 2H), 7.65 (d, *J* = 5.8 Hz, 2H), 7.53 (ddd, *J* = 9.1, 3.8, 1.2 Hz, 1H), 7.16 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.42 (q, *J* = 7.6 Hz, 2H), 1.55 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 152.0, 150.5, 147.3 (dd, *J* = 241.4, 10.9 Hz), 141.5 (d, *J* = 2.0 Hz), 137.5, 137.4 (dd, *J* = 239.7, 17.7 Hz), 124.6 (t, *J* = 6.0 Hz), 123.6, 115.8 (dd, *J* = 7.9, 4.2 Hz), 112.5 (d, *J* = 21.0 Hz), 41.8 (d, *J* = 3.5 Hz), 16.8 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₄H₁₁F₂N₃ 259, found 259. HRMS calcd for [M+Na]⁺ C₁₄H₁₁F₂N₃Na 282.0813, found 282.0812.

3-(1-Ethyl-6,7-difluorobenzo[*d*]imidazol-2-yl)quinoline (23)

Following general procedure, 3-bromoquinoline (0.312 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **23** in 60% (0.185 g) yield as a yellow solid: mp 97-99 °C.

¹H NMR (400 MHz, CDCl₃): δ 9.27 (d, *J* = 2.2 Hz, 1H), 8.57 (d, *J* = 2.2 Hz, 1H), 8.24 (d, *J* = 8.4 Hz, 1H), 7.97 (d, *J* = 8.4 Hz, 1H), 7.87 (t, *J* = 7.9 Hz, 1H), 7.69 (t, *J* = 7.9 Hz, 1H), 7.56 (ddd, *J* = 9.1, 3.8, 1.2 Hz, 1H), 7.17 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.47 (q, *J* = 7.6 Hz, 2H), 1.58 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 152.2 (d, *J* = 2.5 Hz), 149.7, 148.5, 147.3 (dd, *J* = 241.4, 10.9 Hz), 141.8, 137.3 (dd, *J* = 239.7, 17.7 Hz), 137.2, 131.2, 129.7, 128.5, 127.9, 127.3, 124.6 (m), 123.1, 115.5 (dd, *J* = 7.9, 4.2 Hz), 112.3 (d, *J* = 21.0 Hz), 41.9 (d, *J* = 3.5 Hz), 16.9 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₈H₁₃F₂N₃ 309, found 308. HRMS calcd for [M+Na]⁺ C₁₈H₁₃F₂N₃Na 332.0970, found 332.0956.

4-(1-Ethyl-6,7-difluorobenzo[*d*]imidazol-2-yl)isoquinoline (24)

Following general procedure, 4-bromoisquinoline (0.312 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **24** in 50% (0.154 g) yield as a yellow solid: mp 92-94 °C.

¹H NMR (400 MHz, CDCl₃): δ 9.43 (s, 1H), 8.70 (s, 1H), 8.12 (d, *J* = 8.4 Hz, 1H), 7.80-7.67 (m, 3H), 7.56 (ddd, *J* = 9.1, 3.8, 1.2 Hz, 1H), 7.17 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.21 (q, *J* = 7.6 Hz, 2H), 1.34 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 154.8, 150.9, 147.3 (dd, *J* = 241.4, 10.9 Hz), 144.3, 141.9, 137.3 (dd, *J* = 239.7, 17.7 Hz), 134.9, 132.0, 128.4, 128.3, 128.2, 124.4, 123.9 (m), 121.3, 115.6 (dd, *J* = 7.9, 4.2 Hz), 111.9 (d, *J* = 21.0 Hz), 41.7 (d, *J* = 3.5 Hz), 16.8 (d, *J* = 3.3 Hz).

LRMS calcd for M⁺ C₁₈H₁₃F₂N₃ 309, found 308. HRMS calcd for [M+Na]⁺ C₁₈H₁₃F₂N₃Na 332.0970, found 332.58.

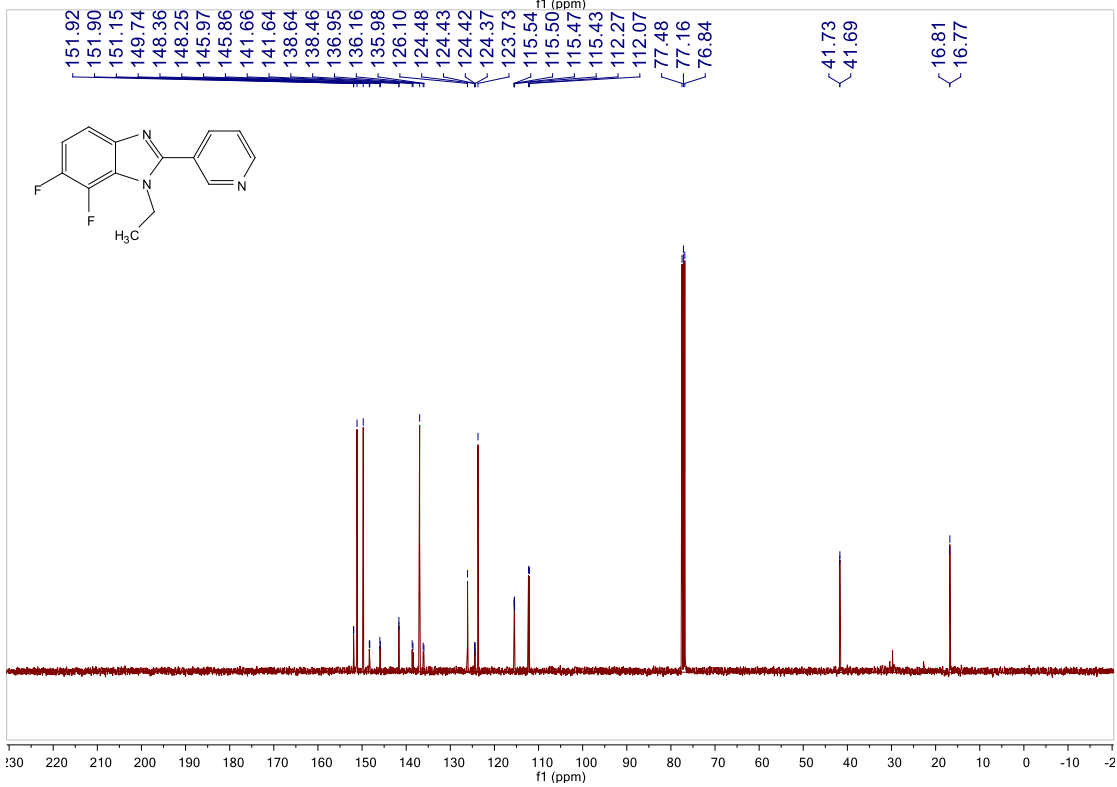
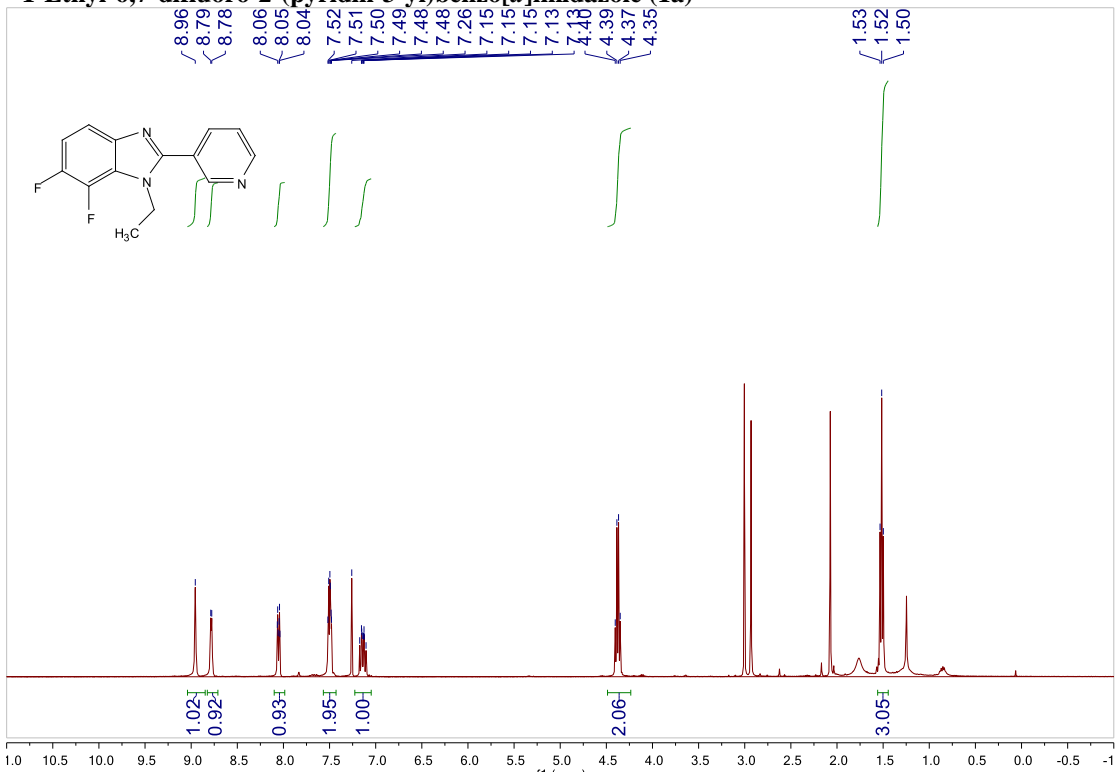
1-Ethyl-6,7-difluoro-2-(6-(trifluoromethyl)pyridin-2-yl)benzo[*d*]imidazole (25)

Following general procedure, 2-bromo-6-(trifluoromethyl)pyridine (0.339 g, 1.5 mmol) and 1-ethyl-6,7-difluoro-benzo[*d*]imidazole (0.182 g, 1 mmol), affords **25** in 43% (0.141 g) yield as a yellow solid: mp 115-117 °C.

¹H NMR (400 MHz, CDCl₃): δ 8.61 (d, *J* = 8.0 Hz, 1H), 8.07 (t, *J* = 7.8 Hz, 1H), 7.78 (d, *J* = 8.0 Hz, 1H), 7.54 (dd, *J* = 9.1, 3.8 Hz, 1H), 7.17 (ddd, *J* = 11.1, 8.8, 7.4 Hz, 1H), 4.99 (q, *J* = 7.6 Hz, 2H), 1.64 (t, *J* = 7.6 Hz, 3H).

¹³C NMR (100 MHz, CDCl₃): δ 150.1, 149.3 (d, *J* = 2.2 Hz), 147.6 (dd, *J* = 241.4, 10.9 Hz), 147.5 (q, *J* = 35.3 Hz), 140.8 (d, *J* = 2.2 Hz), 138.6, 137.7 (dd, *J* = 239.7, 17.7 Hz), 127.2 (d, *J* = 0.7 Hz), 125.6 (m), 121.5 (q, *J* = 274.1 Hz), 120.6 (q, *J* = 2.6 Hz), 115.7 (dd, *J* = 7.9, 4.2 Hz), 112.6 (d, *J* = 21.0 Hz), 43.4 (d, *J* = 3.5 Hz), 16.4.

LRMS calcd for M⁺ C₁₅H₁₀F₅N₃ 327, found 327. HRMS calcd for [M+Na]⁺ C₁₅H₁₀F₅N₃Na 350.0687, found 350.0683.

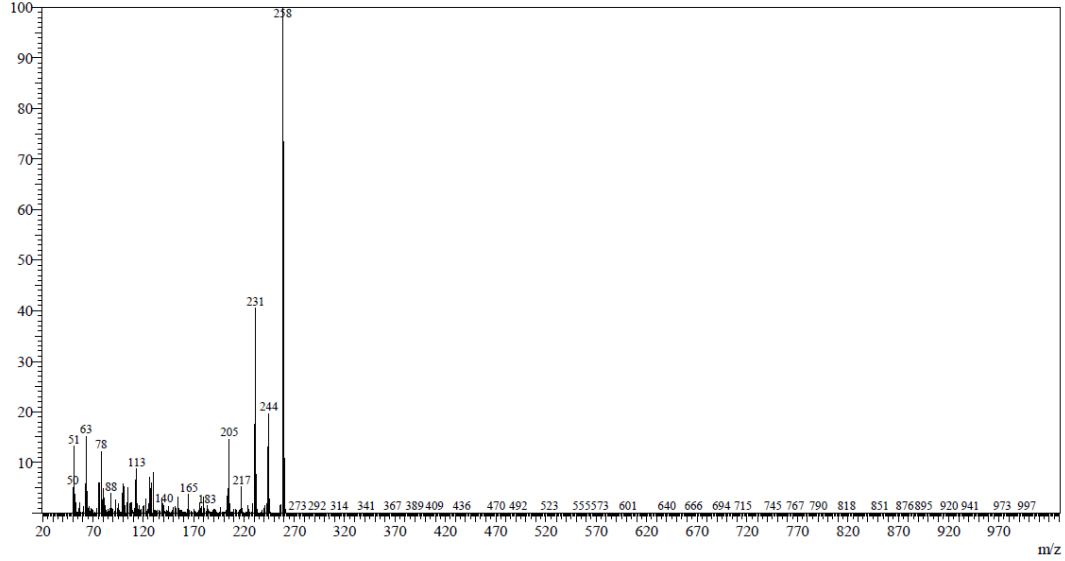
1-Ethyl-6,7-difluoro-2-(pyridin-3-yl)benzo[d]imidazole (1a)

Line#:2 R. Time:12.5(Scan#:1112)

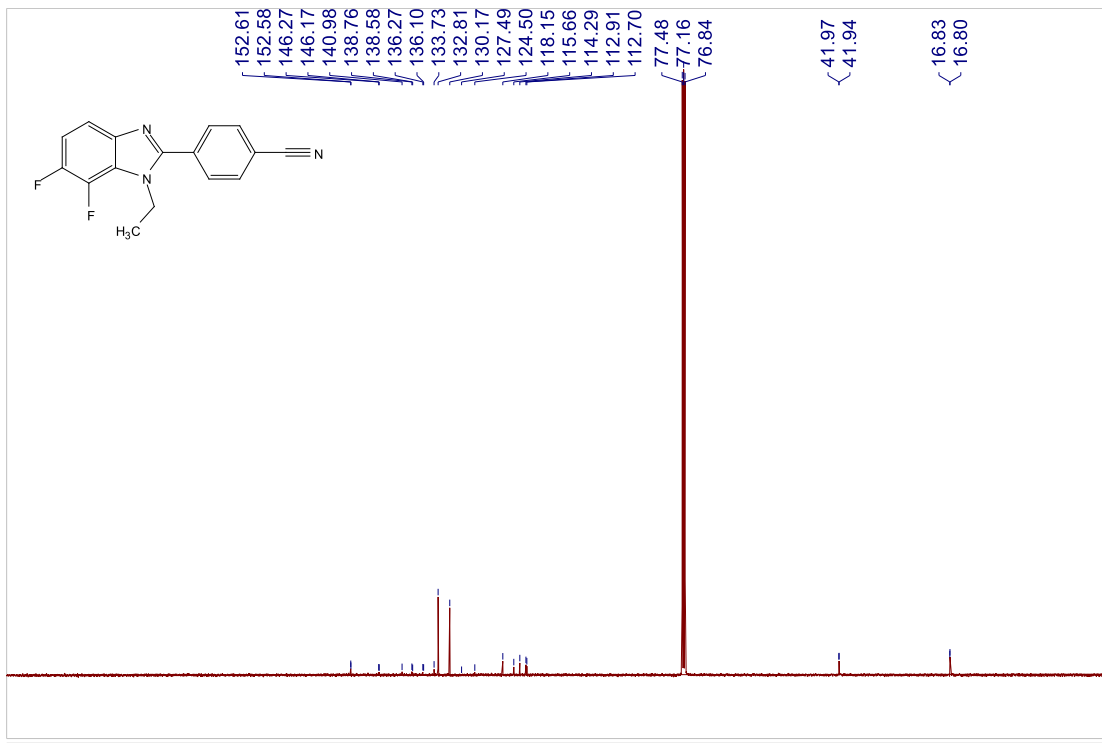
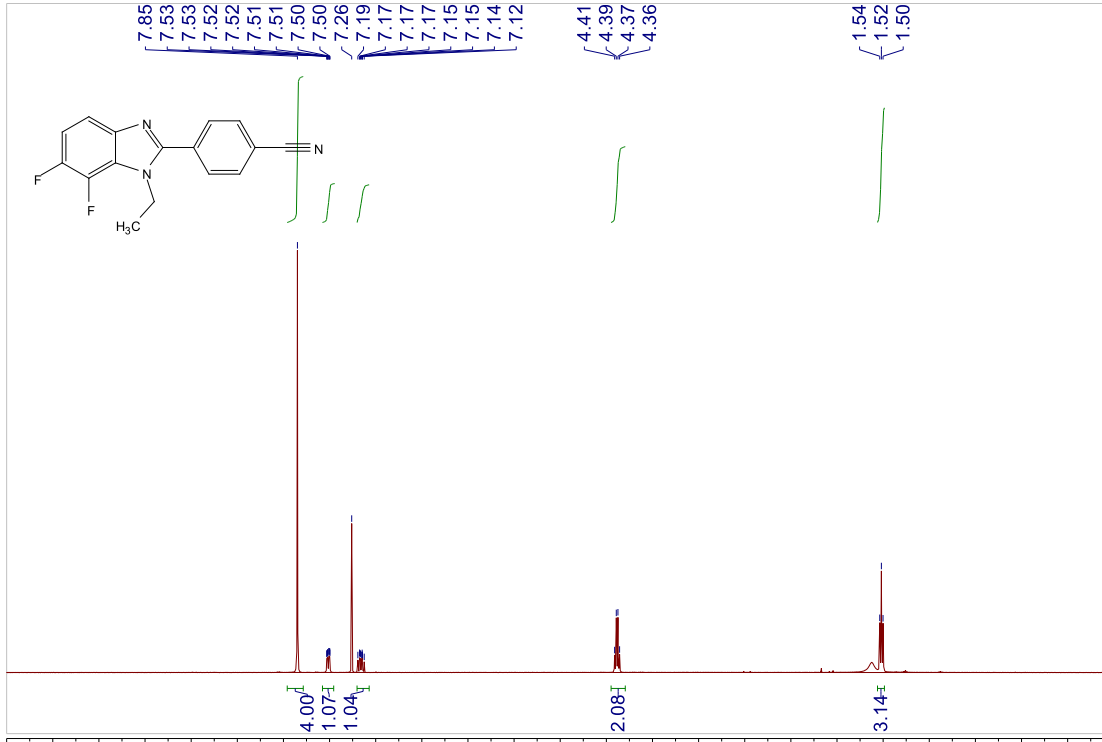
MassPeaks:576

RawMode:Averaged 12.5-12.5(1111-1113) BasePeak:258(593393)

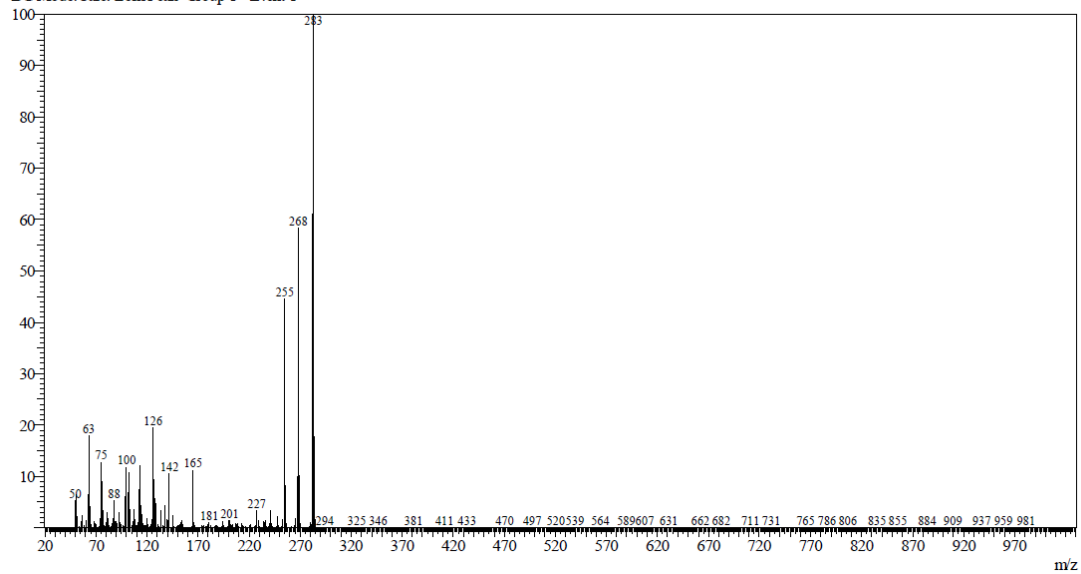
BG Mode:Calc. from Peak Group 1 - Event 1



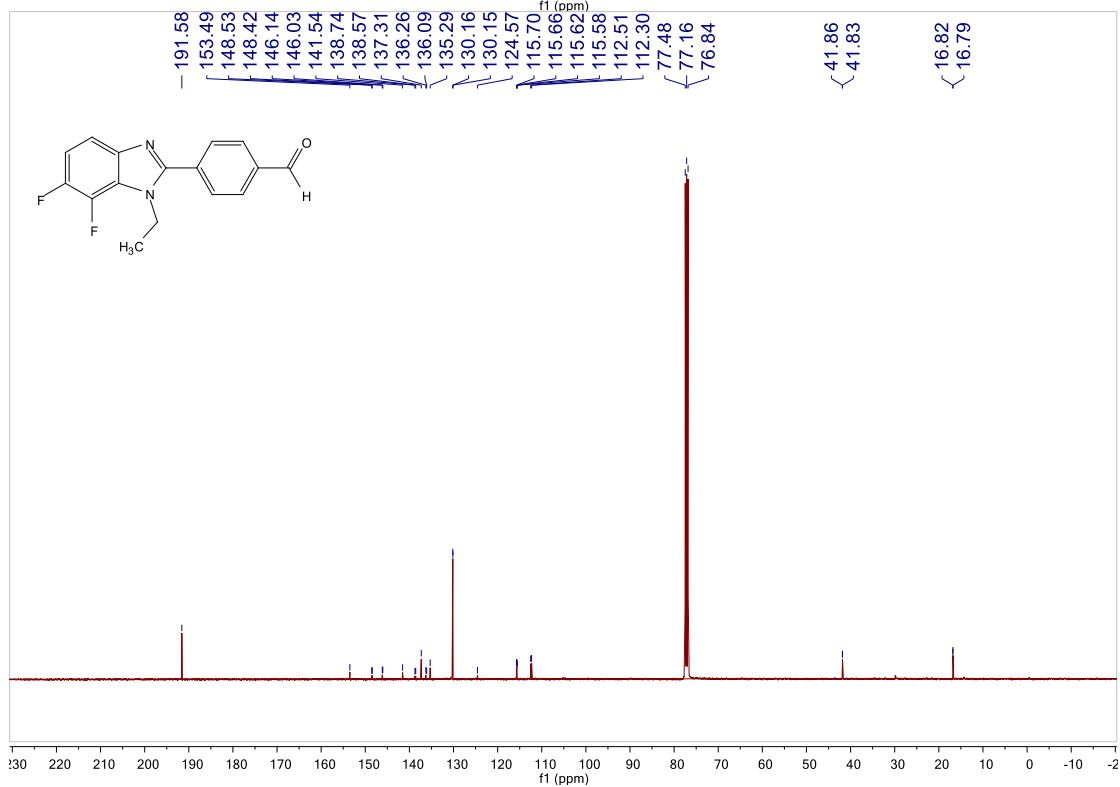
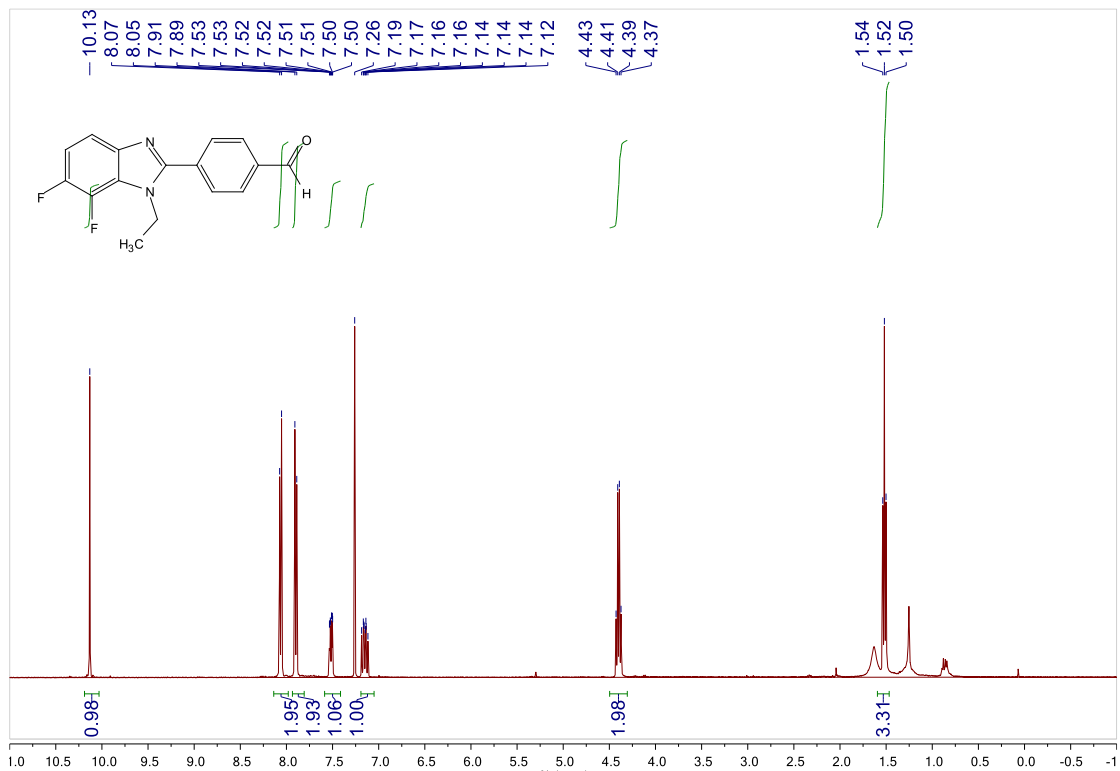
4-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzonitrile (2)



Line#: 4 R.Time: 14.1 (Scan#: 1210)
MassPeaks: 607
RawMode: Averaged 14.1-14.1 (1209-1211) BasePeak: 283 (586126)
BG Mode: Calc. from Peak Group 1 - Event 1



4-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzaldehyde (3)

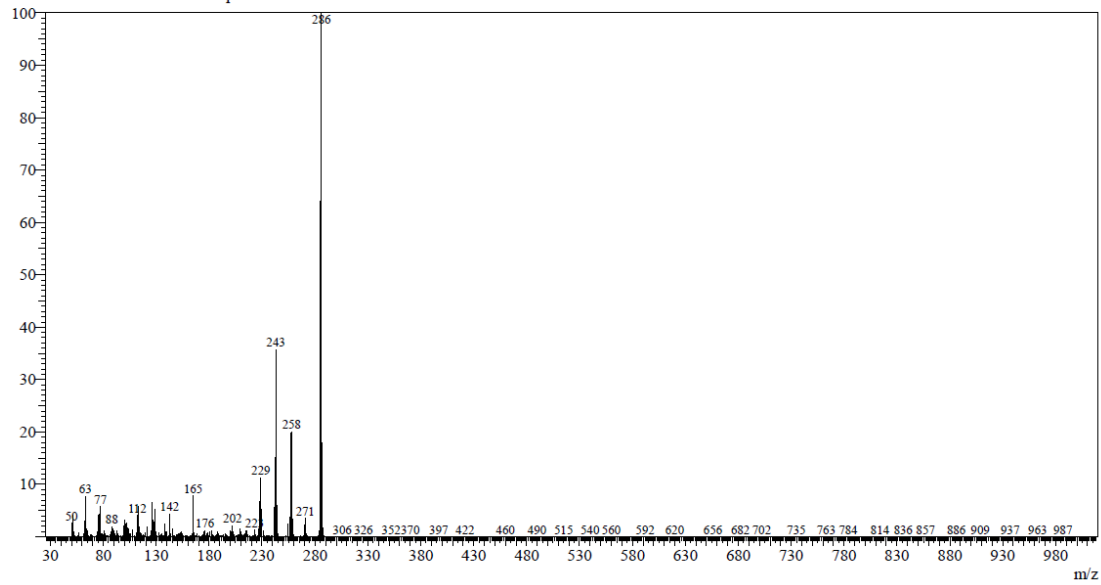


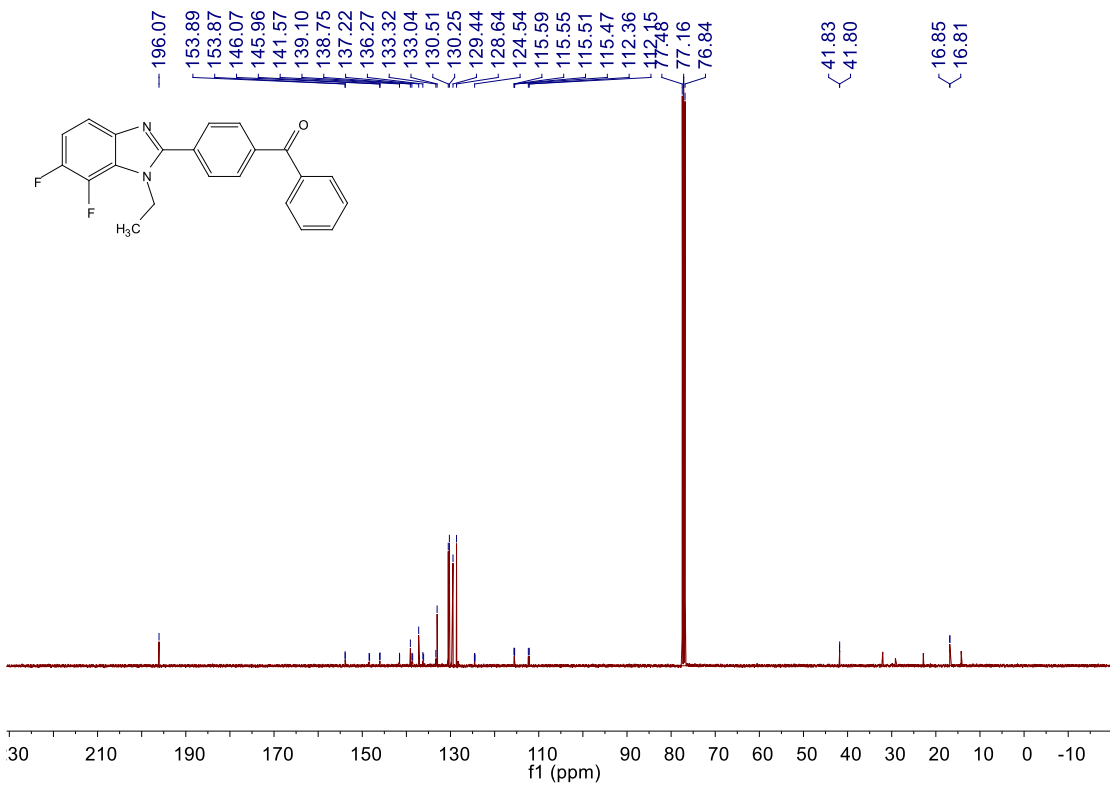
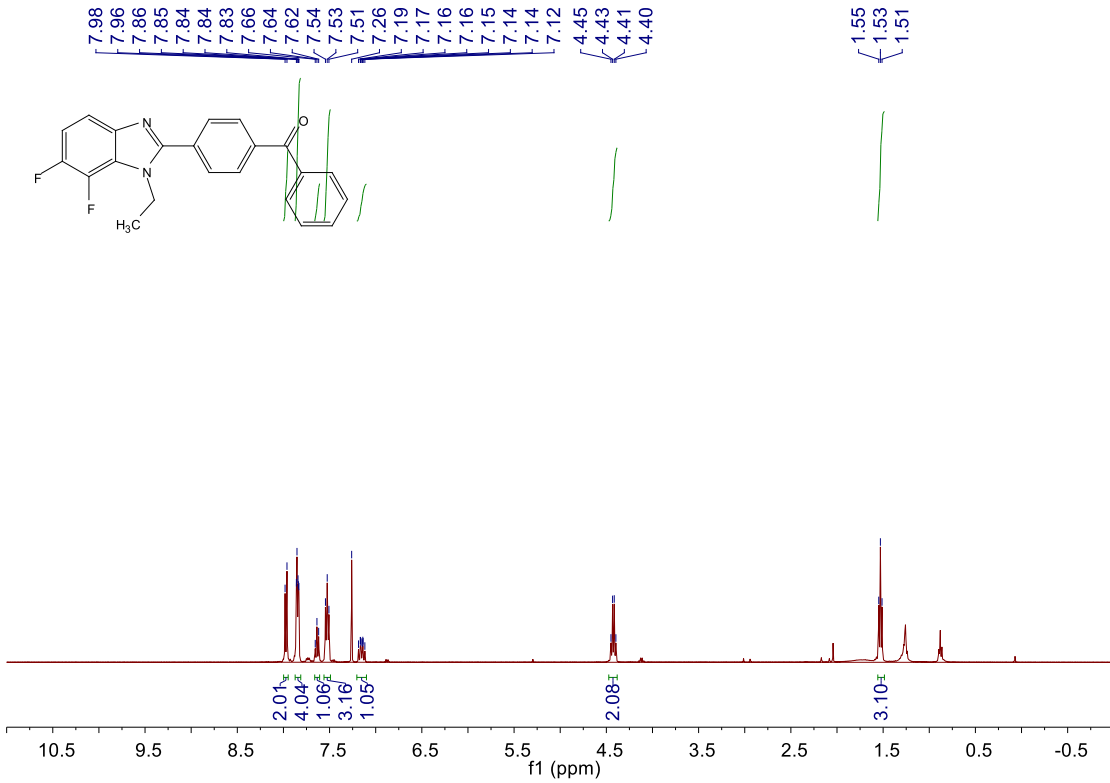
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MassPeaks:533

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BG Mode:Calc. from Peak Group 1 - Event 1



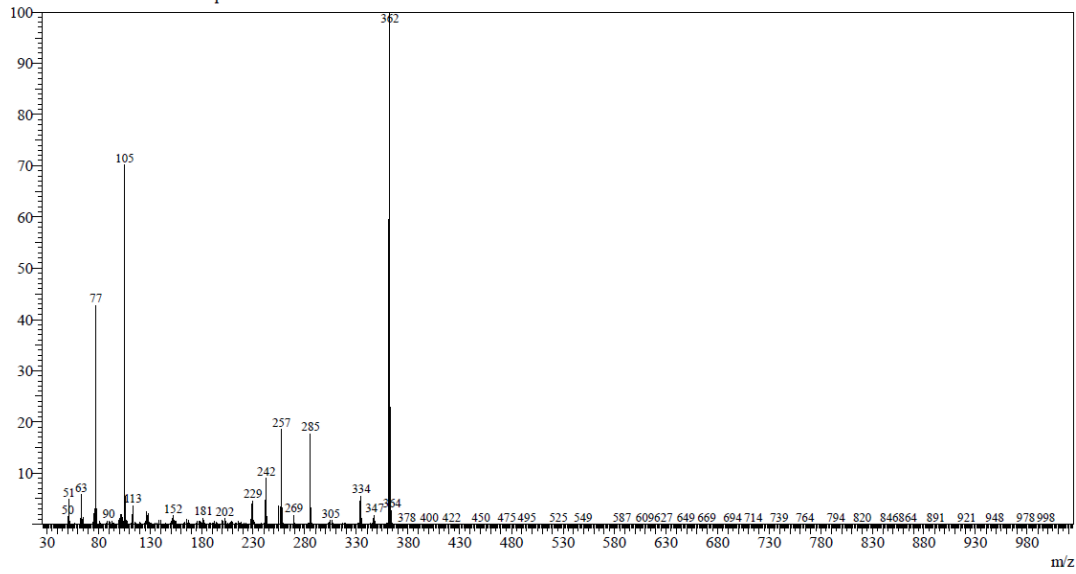
(4-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)phenyl)(phenyl)methanone (4)

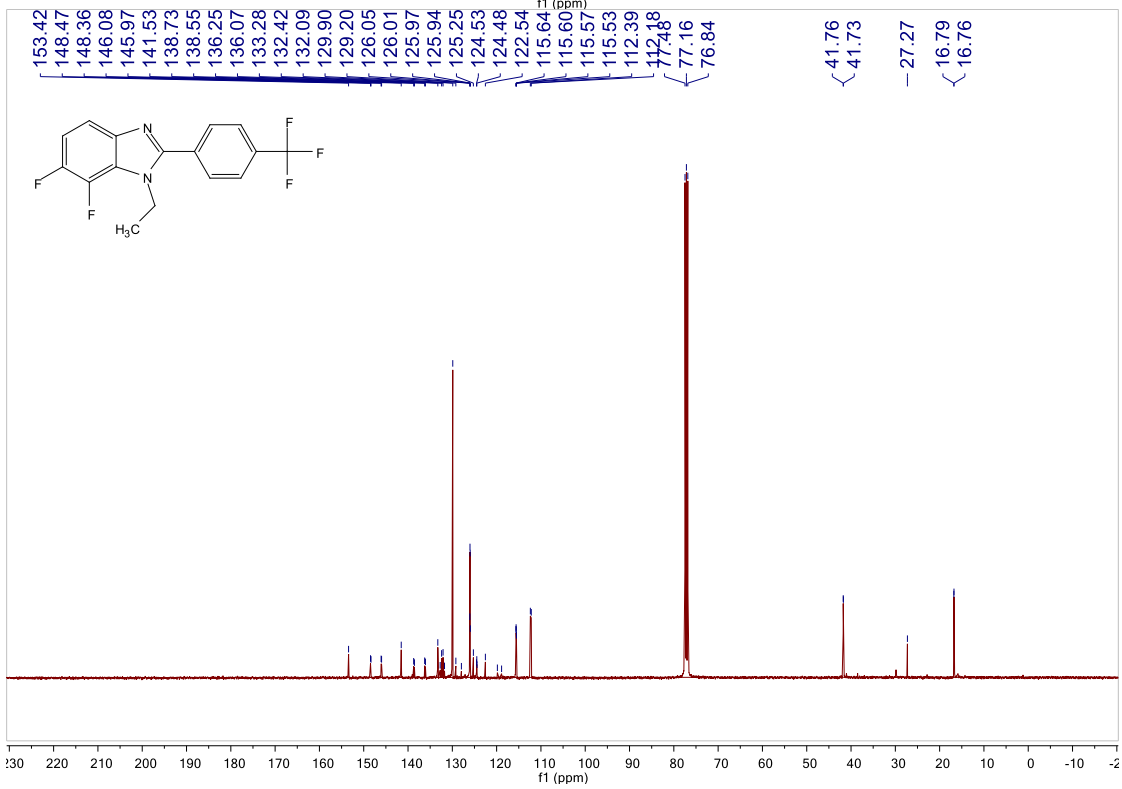
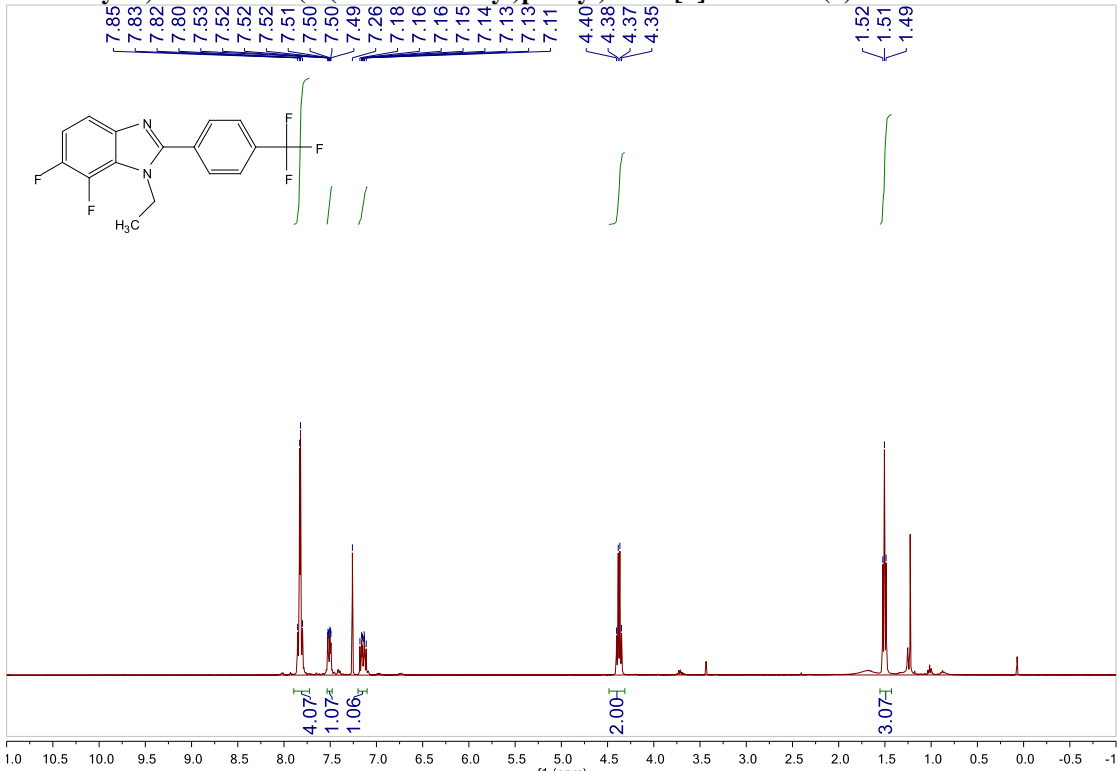
Line#:5 R.Time:24.3(Scan#:2889)

MassPeaks:658

RawMode:Averaged 24.3-24.3(2888-2890) BasePeak:362(261524)

BGMode:Calc. from Peak Group 1 - Event 1



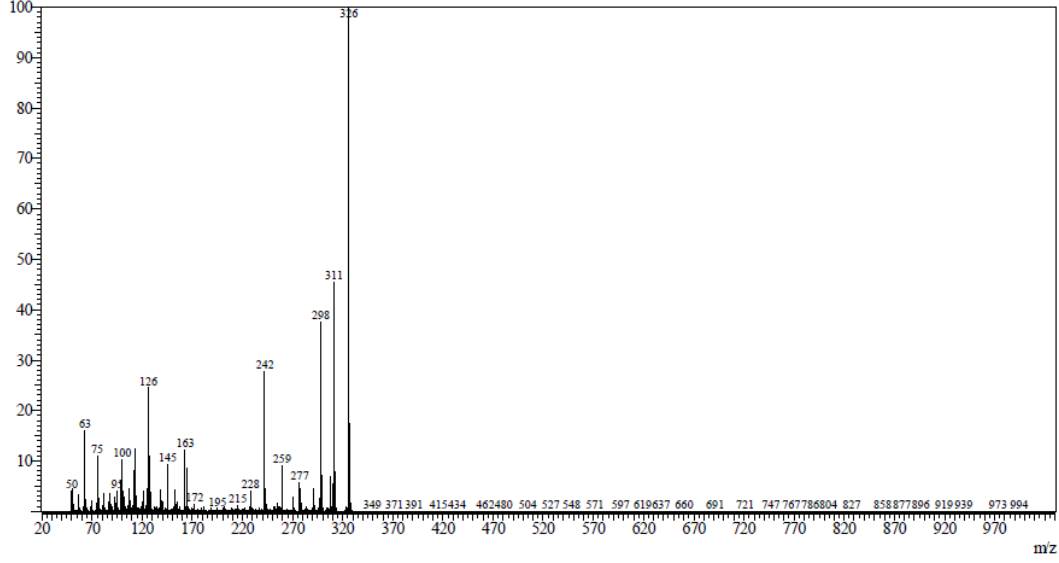
1-Ethyl-6,7-difluoro-2-(4-(trifluoromethyl)phenyl)benzo[d]imidazole (5)

Line#3 R.Time:11.8(Scan#:859)

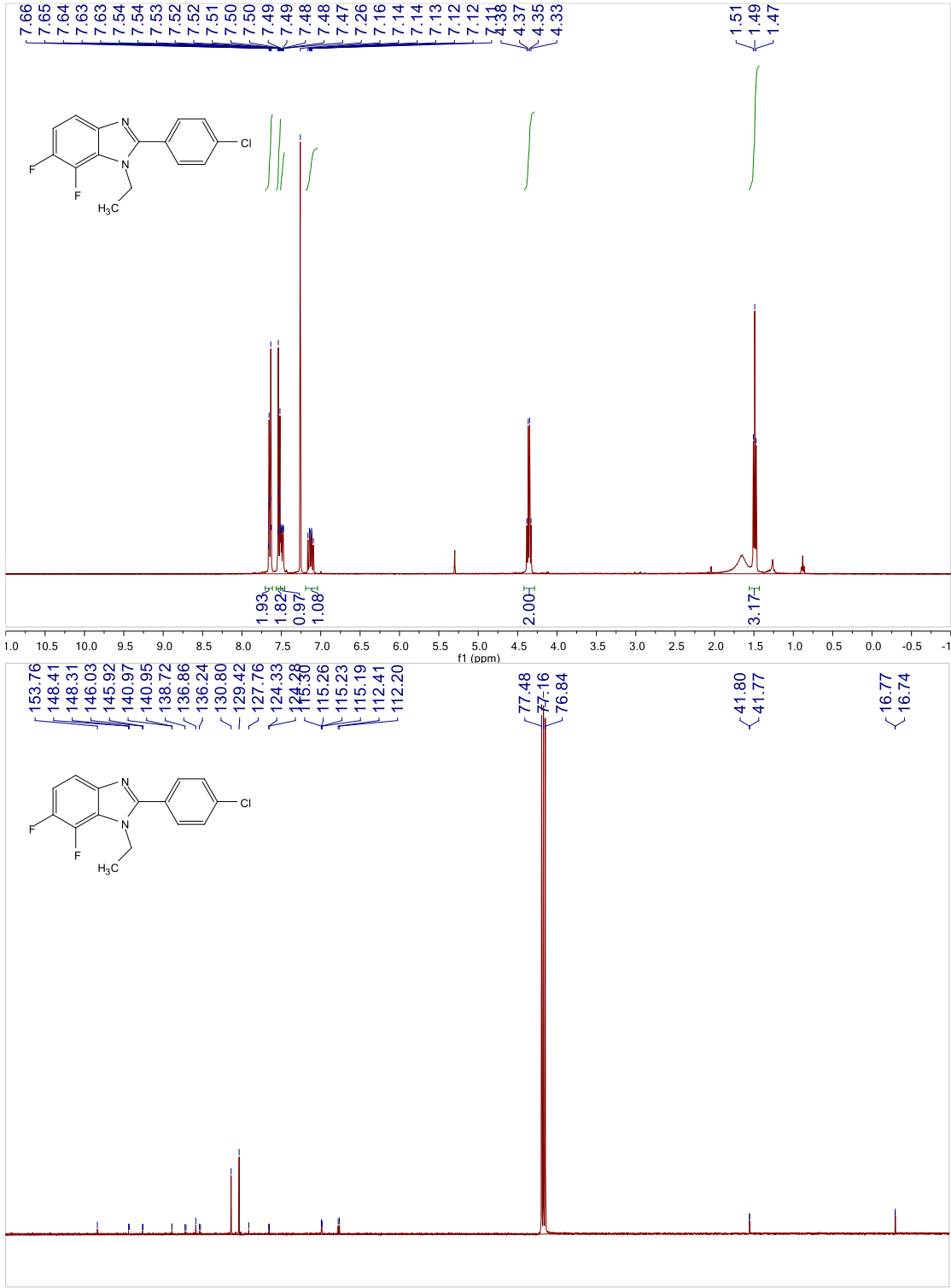
MassPeaks:637

RawMode:Averaged 11.8-11.8(858-860) BasePeak:326(473807)

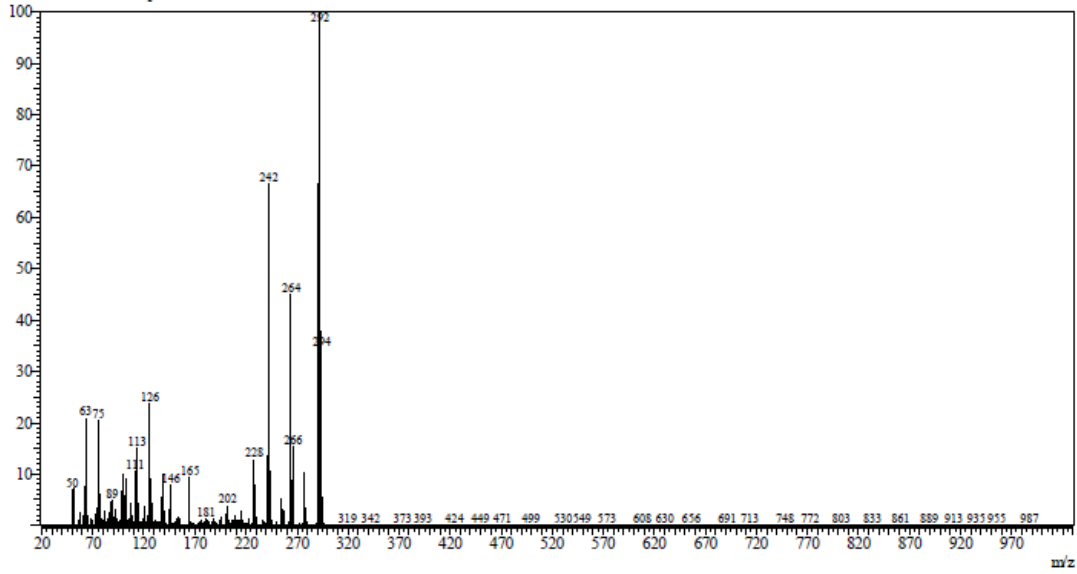
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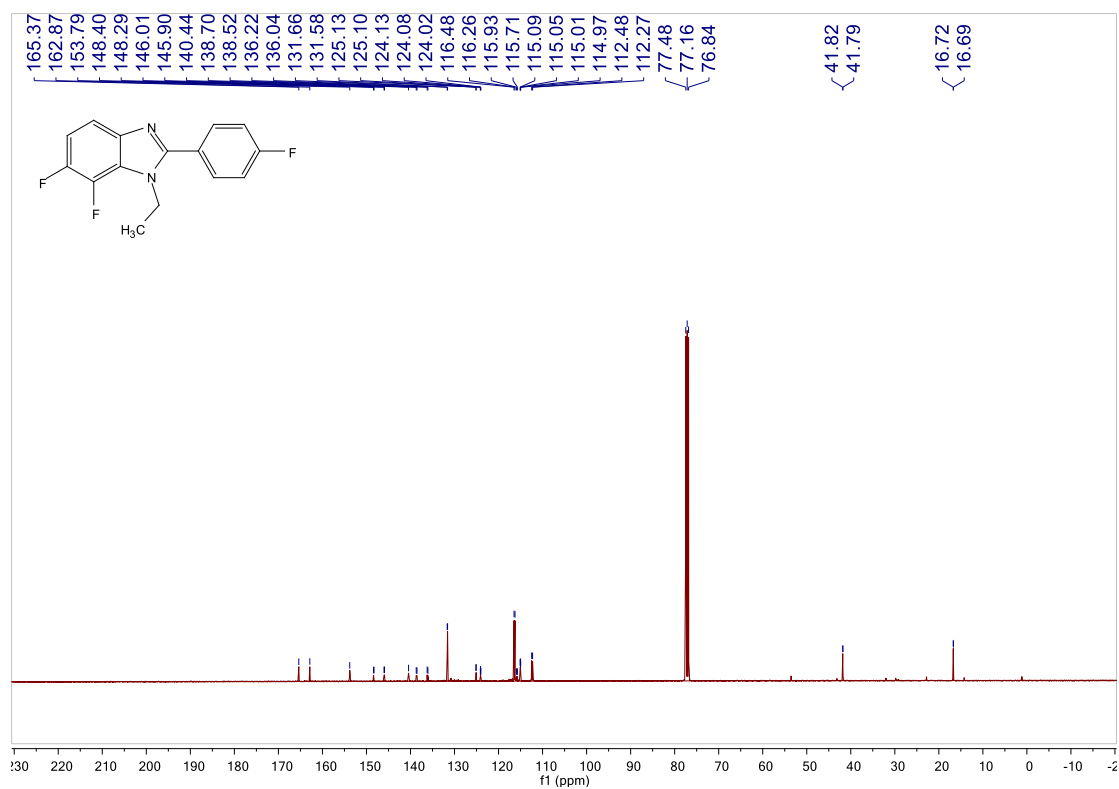
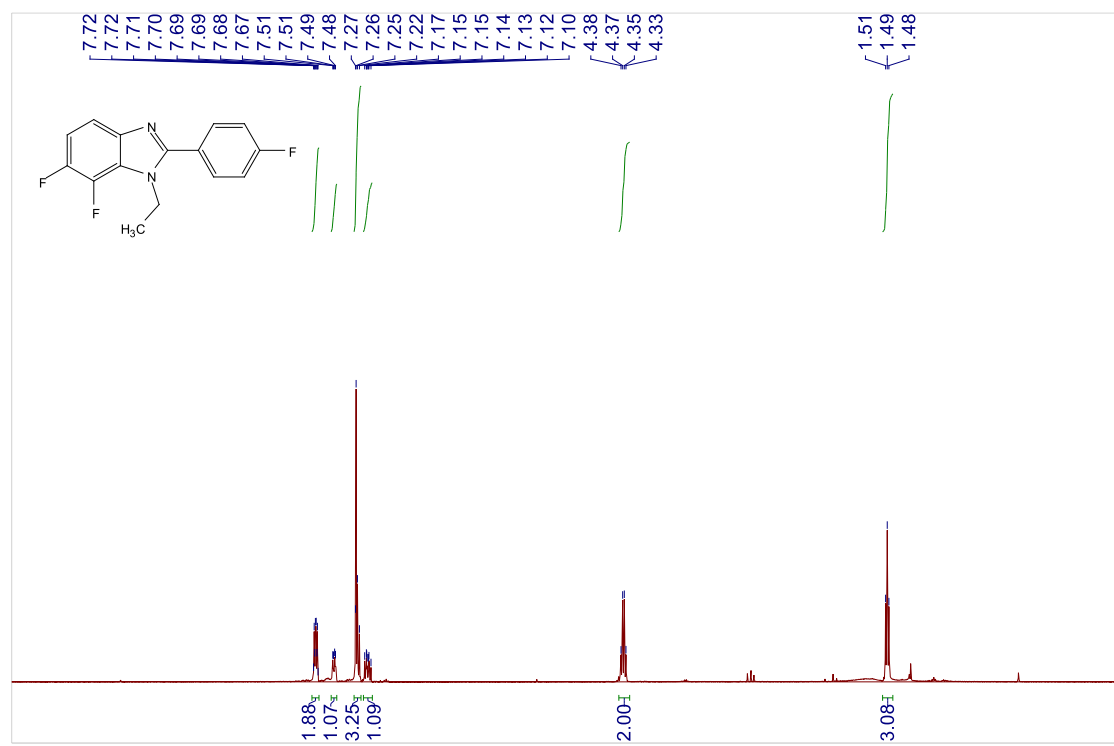
2-(4-Chlorophenyl)-1-ethyl-6,7-difluorobenzo[d]imidazole (6)



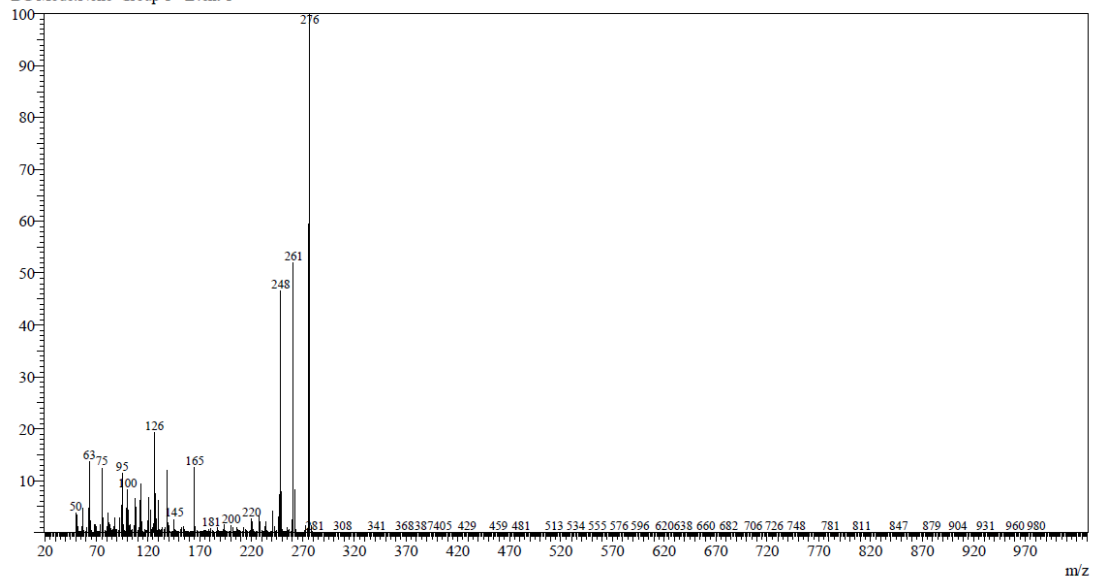
Line# 4 R.Time: 13.3(Scan#: 1082)
MassPeaks: 727
RawMode: Single 13.3(1082) BasePeak: 292(231862)
BGMode: None Group 1 - Event 1

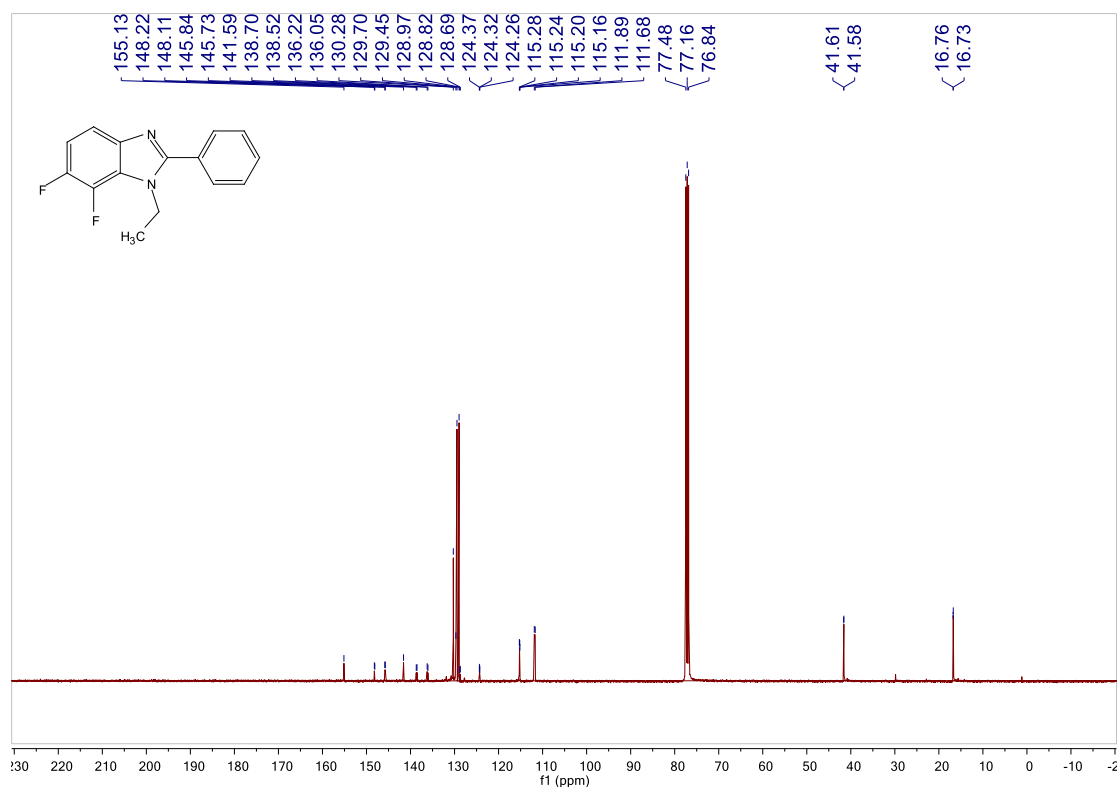
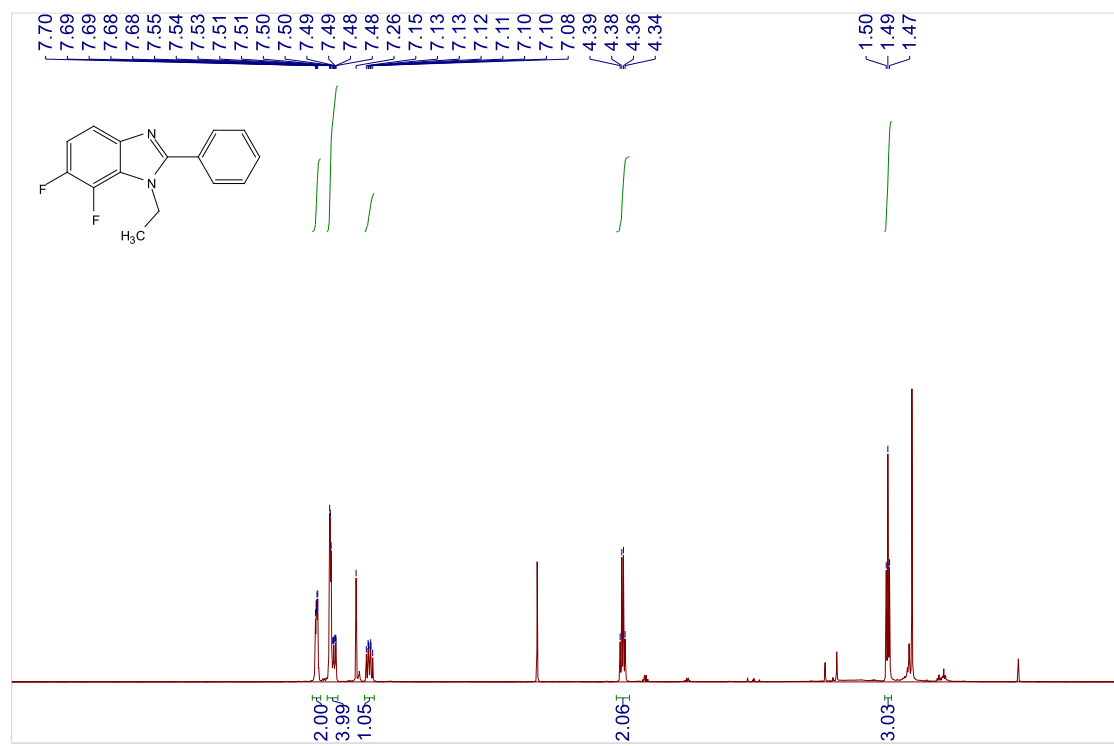


1-Ethyl-6,7-difluoro-2-(4-fluorophenyl)benzo[d]imidazole (7)



Line# 1 R Time: 12.0(Scan#:1043)
MassPeaks:755
RawMode:Single 12.0(1043) BasePeak:276(1309445)
BG Mode:None Group 1 - Event 1



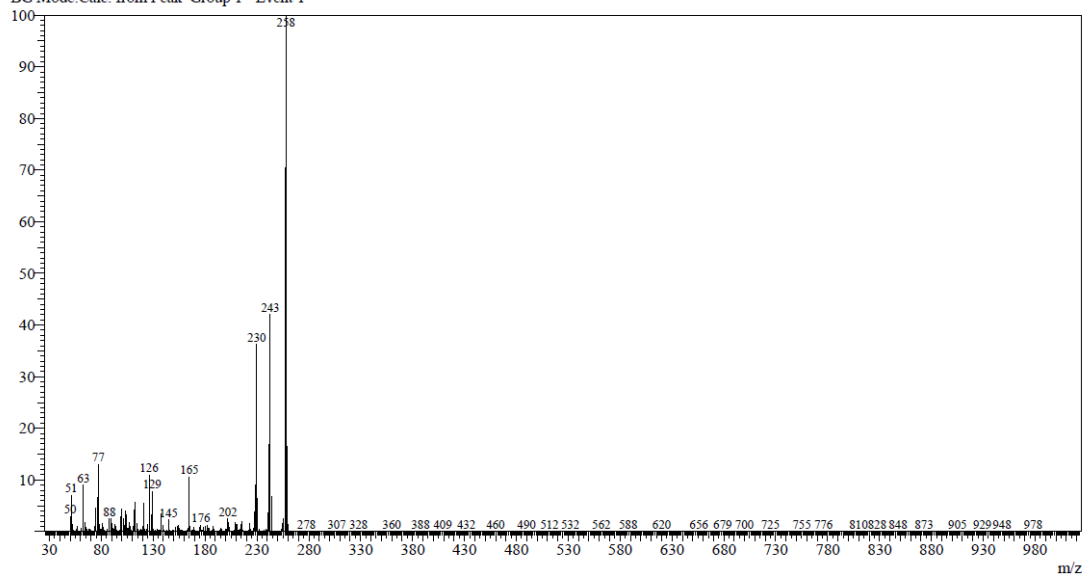
1-Ethyl-6,7-difluoro-2-phenylbenzo[d]imidazole (8)

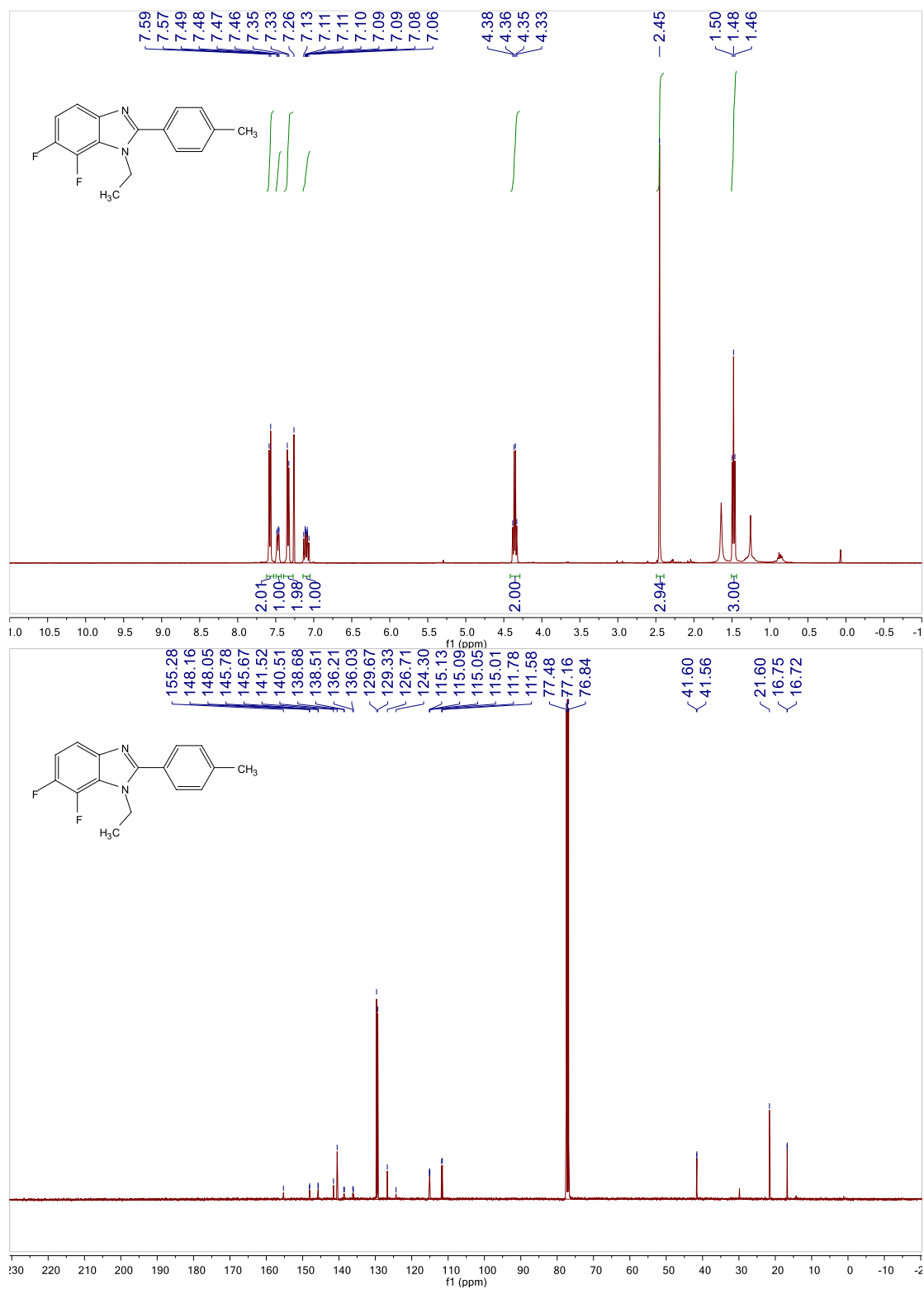
Line#:3 R.Time:12.0(Scan#:895)

MassPeaks:527

RawMode:Averaged 12.0-12.0(894-896) BasePeak:258(710308)

BG Mode:Calc. from Peak Group 1 - Event 1



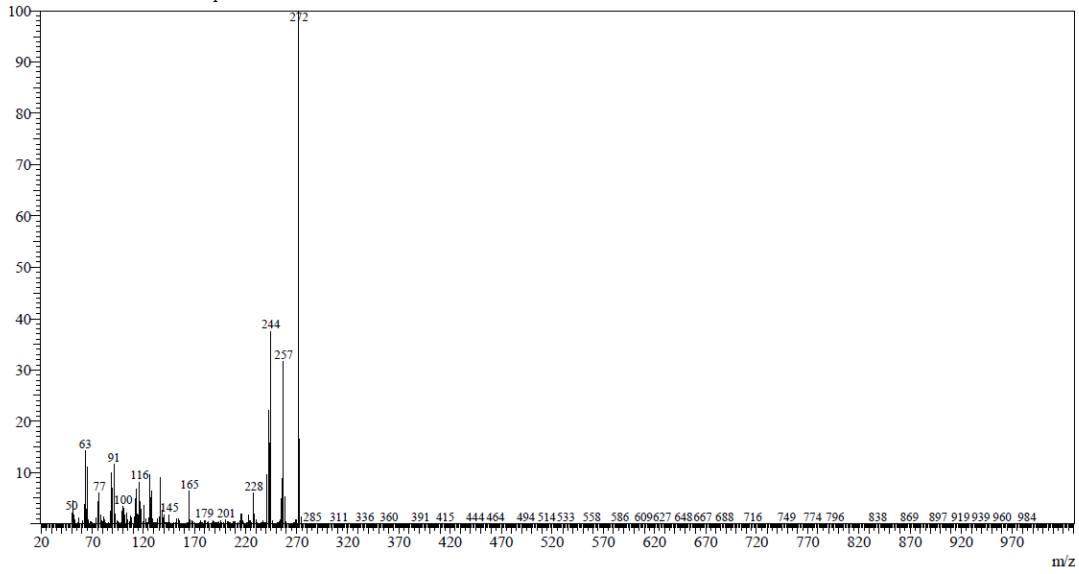
1-Ethyl-6,7-difluoro-2-(*p*-tolyl)benzo[d]imidazole (9)

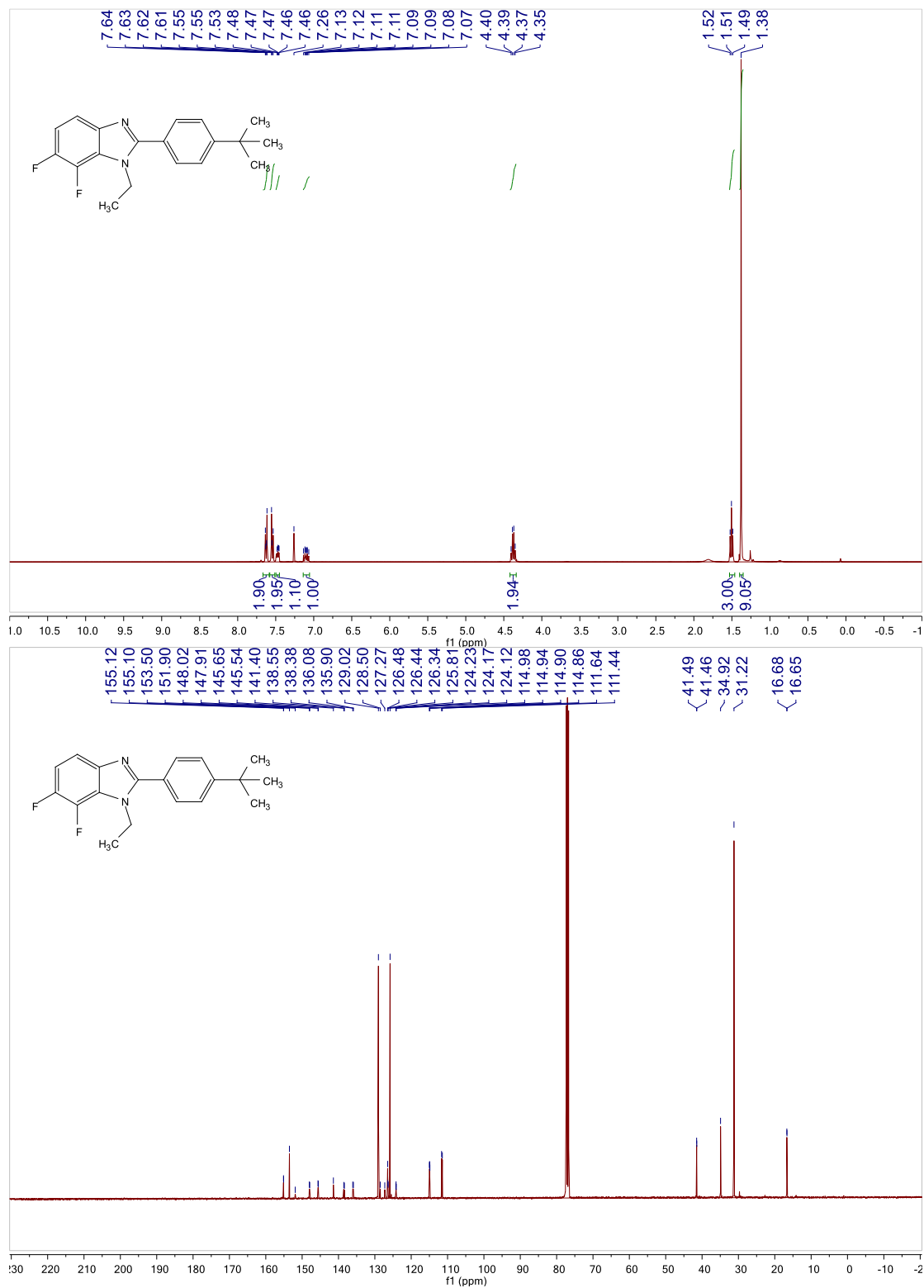
Line# 3 R.Time:12.8(Scan#:1012)

MassPeaks:589

RawMode:Averaged 12.8-12.8(1011-1013) BasePeak:272(253230)

BG Mode:Calc. from Peak Group 1 - Event 1



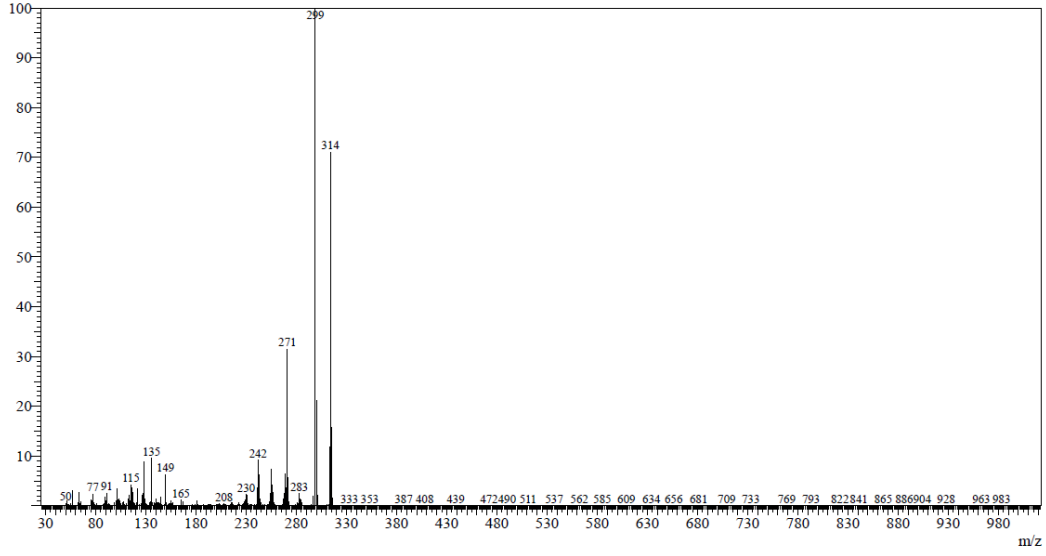
2-(4-(*tert*-Butyl)phenyl)-1-ethyl-6,7-difluorobenzo[*d*]imidazole (10)

Line#:3 R.Time:14.1(Scan#:1355)

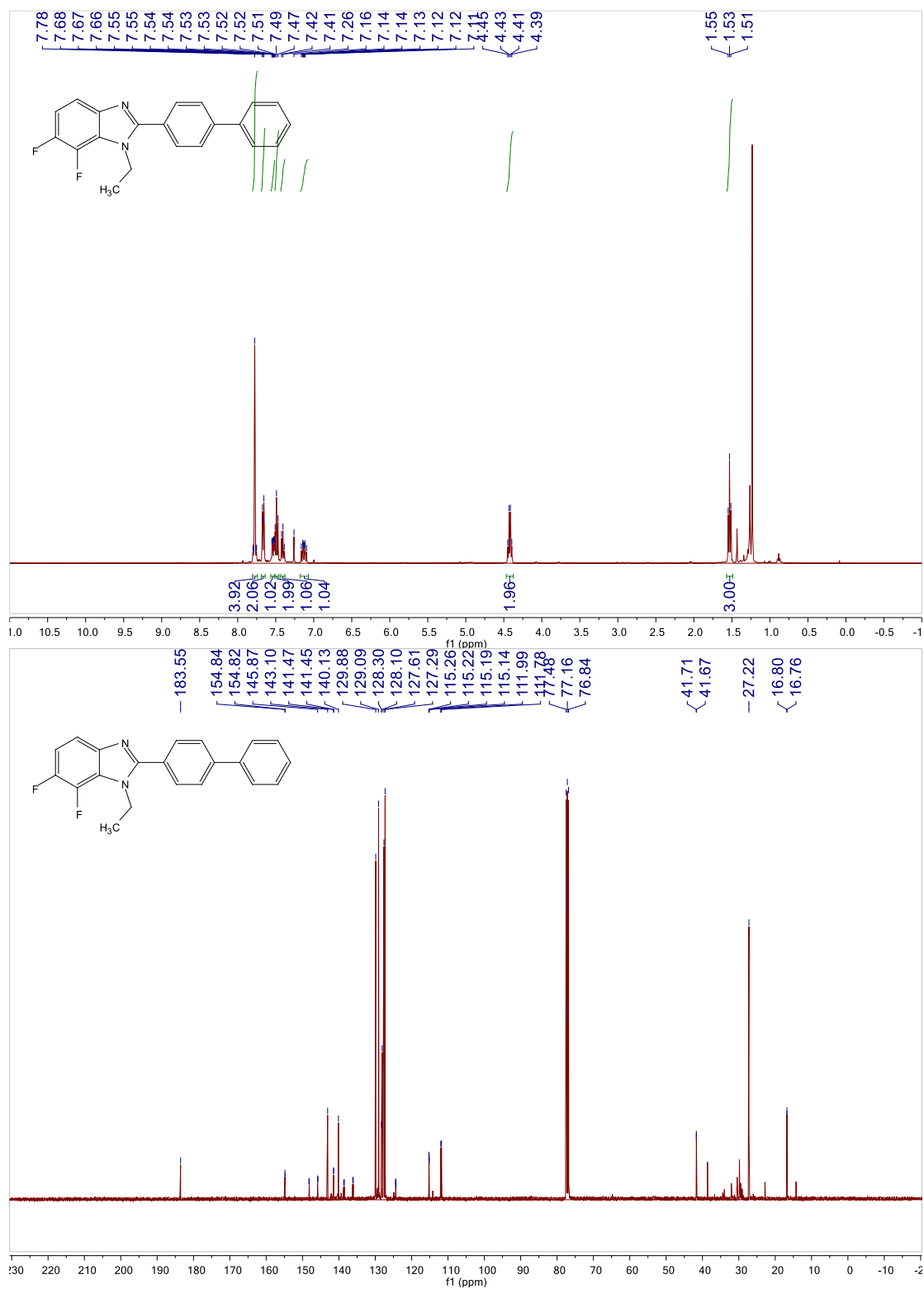
MassPeaks:570

RawMode:Averaged 14.1-14.1(1354-1356) BasePeak:299(670959)

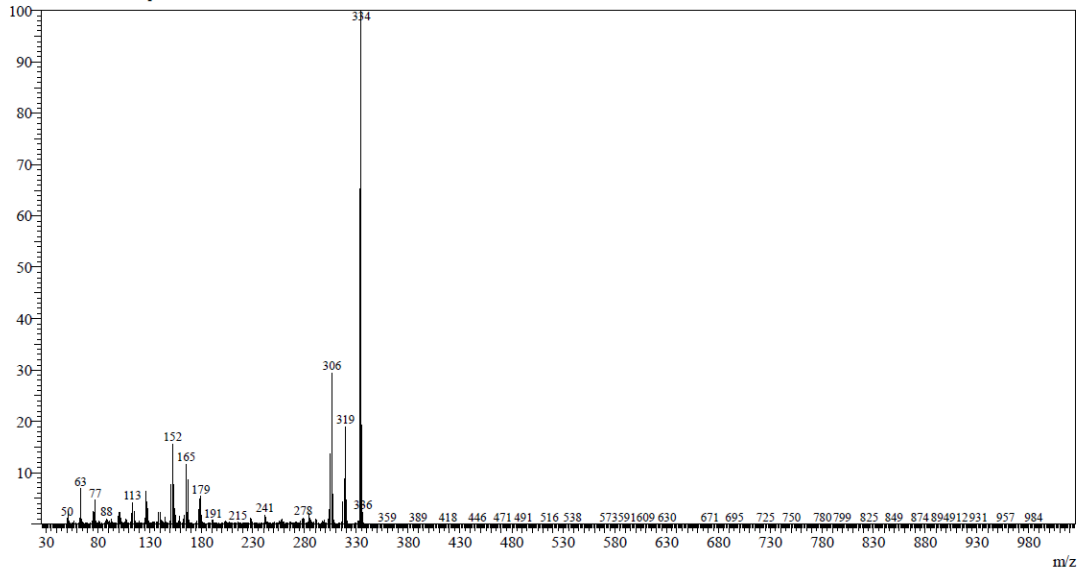
BG Mode:Calc. from Peak Group 1 - Event 1

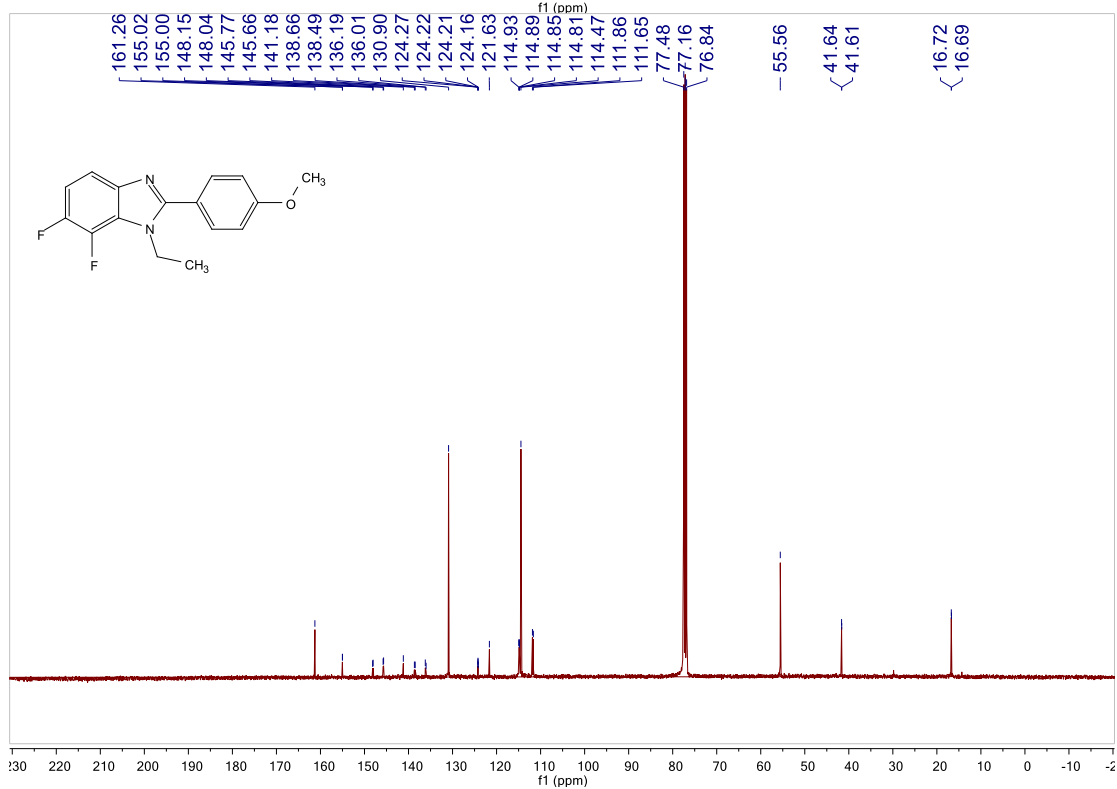
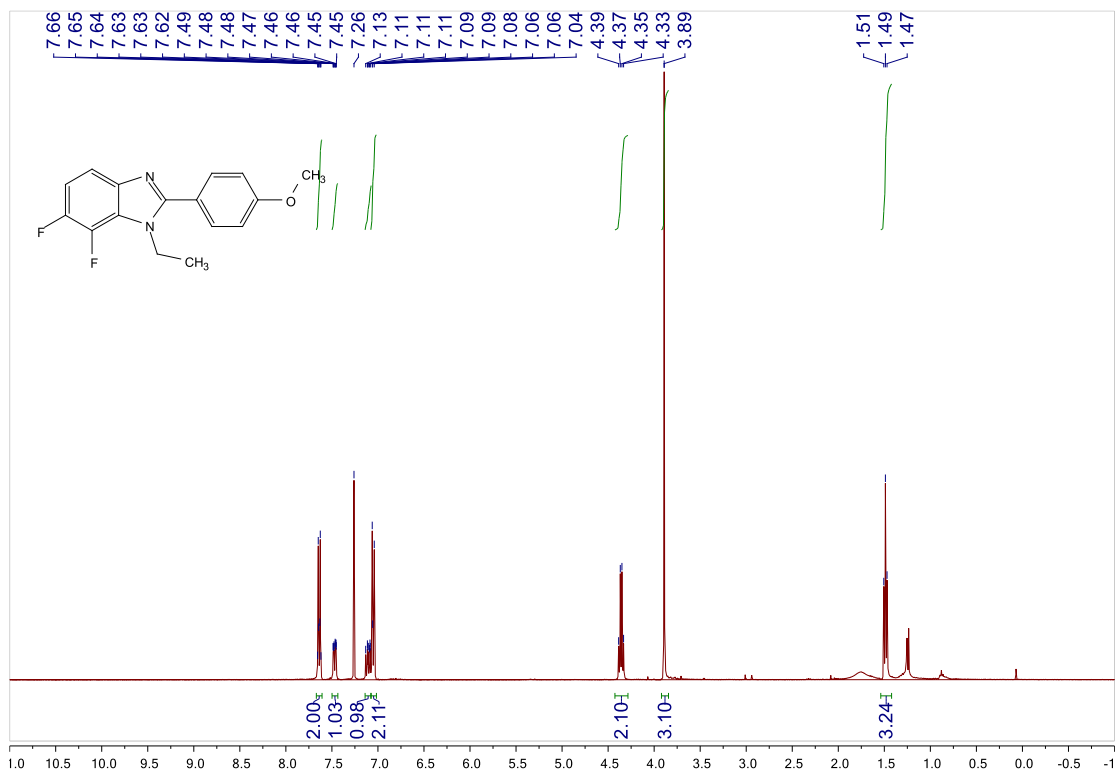


2-([1,1'-Biphenyl]-4-yl)-1-ethyl-6,7-difluorobenzimidazole (11)

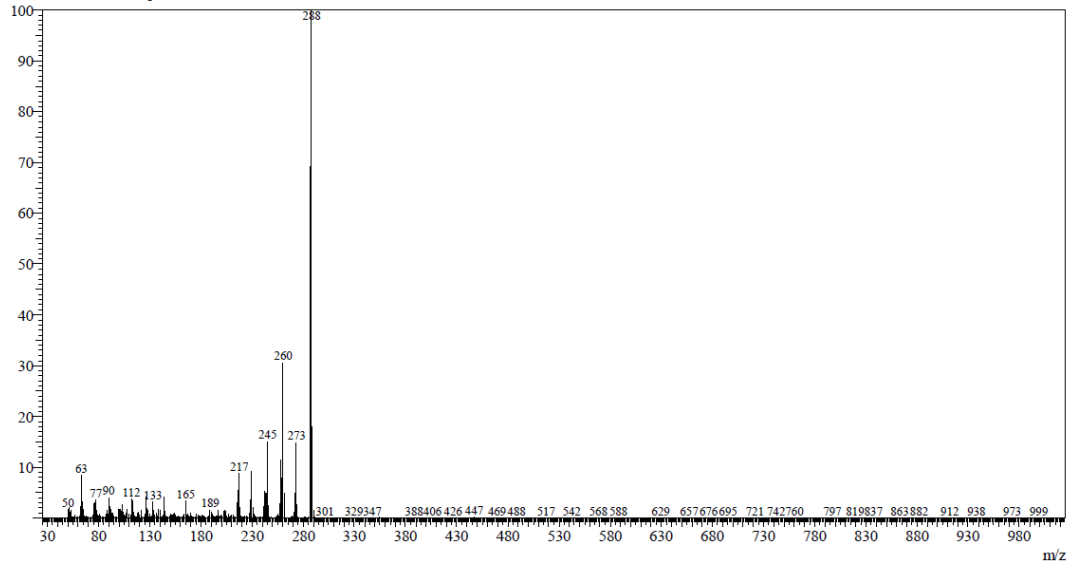


Line#: 1 R. Time: 19.3(Scan#: 2134)
MassPeaks: 824
RawMode: Single 19.3(2134) BasePeak: 334(284292)
BG Mode: None Group 1 - Event 1

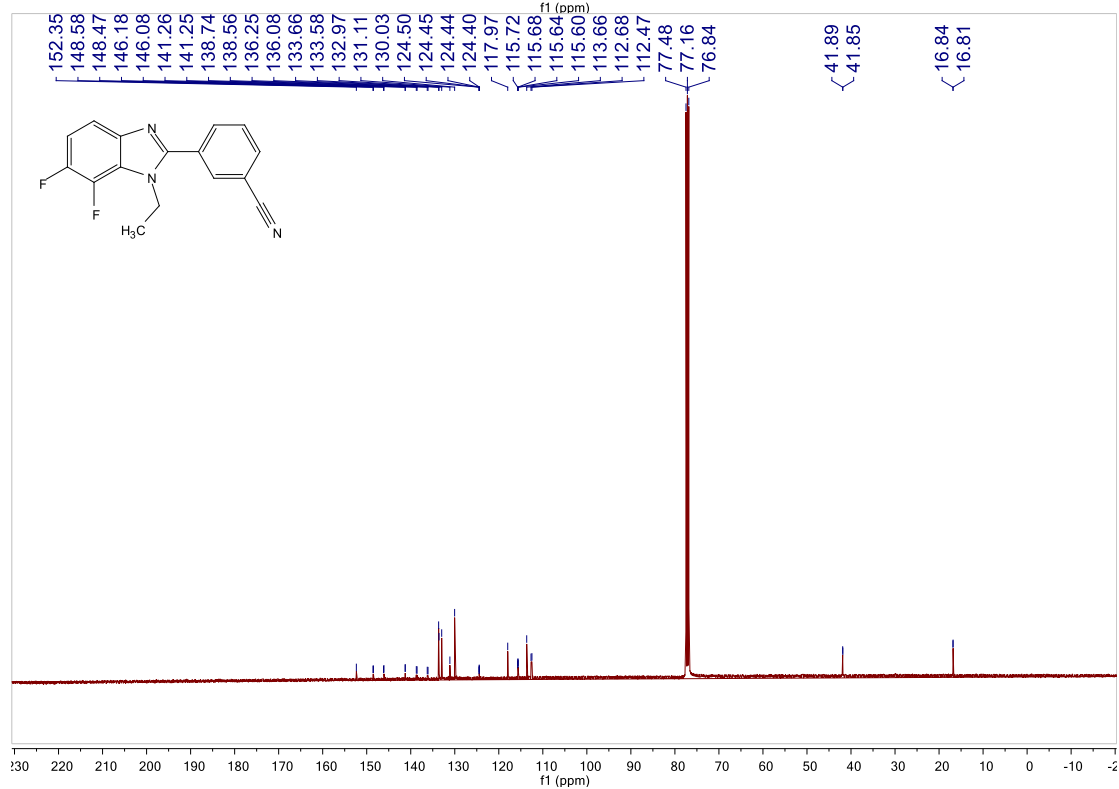
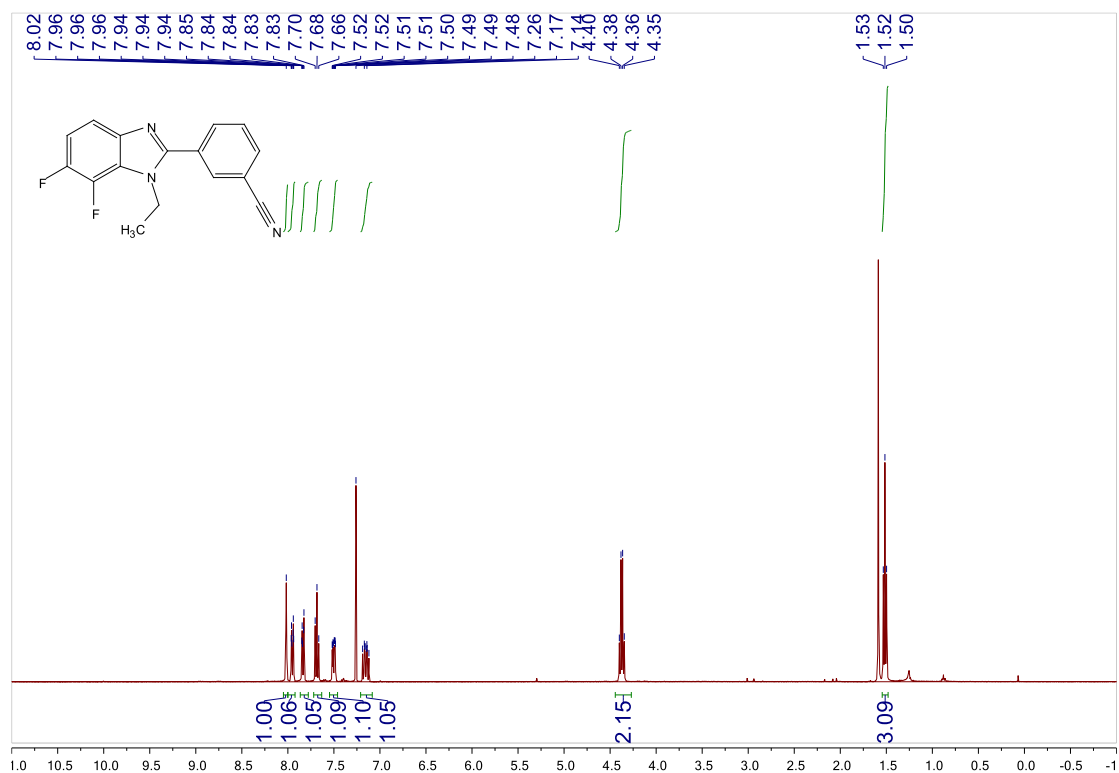


1-Ethyl-6,7-difluoro-2-(4-methoxyphenyl)benzo[d]imidazole (12)

Line#:1 R.Time:13.7(Scan#:1298)
MassPeaks:818
RawMode:Single 13.7(1298) BasePeak:288(226494)
BG Mode:None Group 1 - Event 1



3-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzonitrile (13)

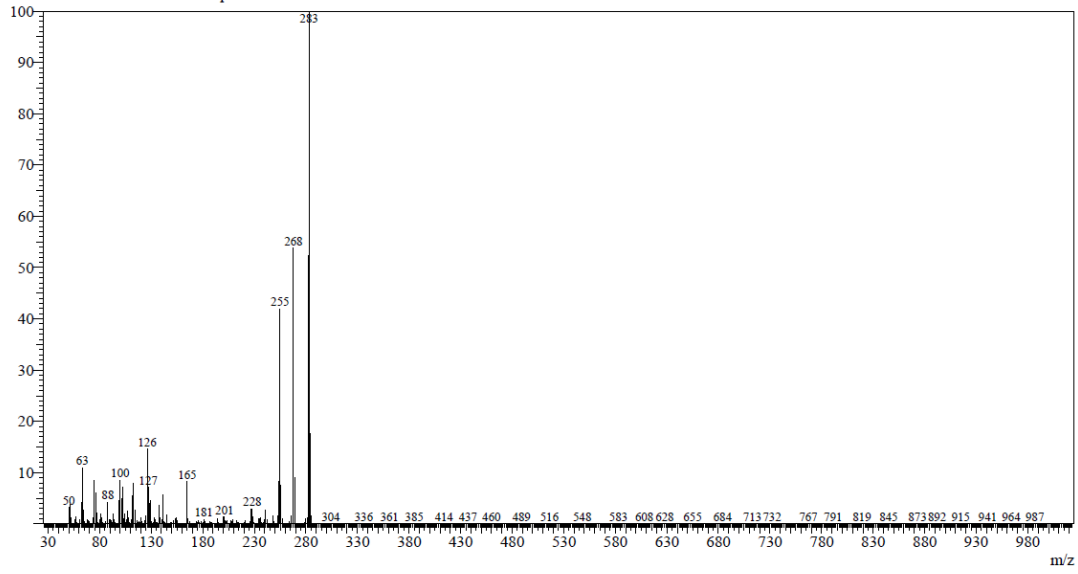


Line#:3 R.Time:13.8(Scan#:1159)

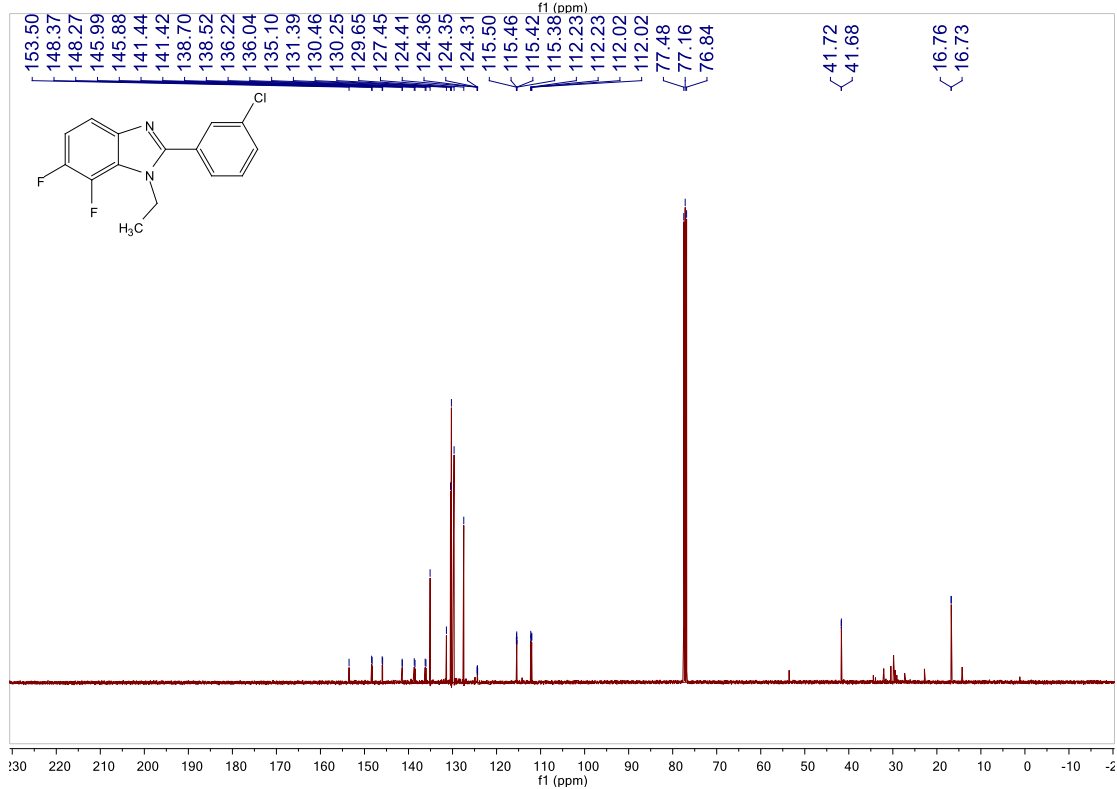
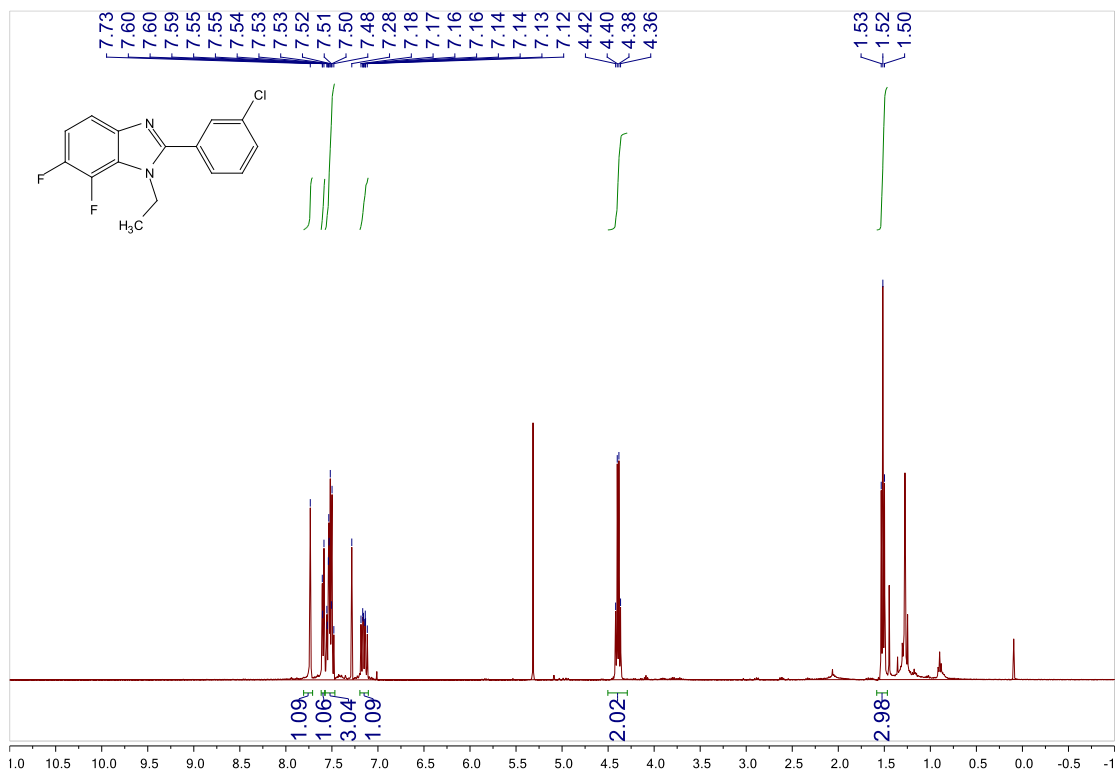
MassPeaks:621

RawMode:Averaged 13.8-13.8(1158-1160) BasePeak:283(683131)

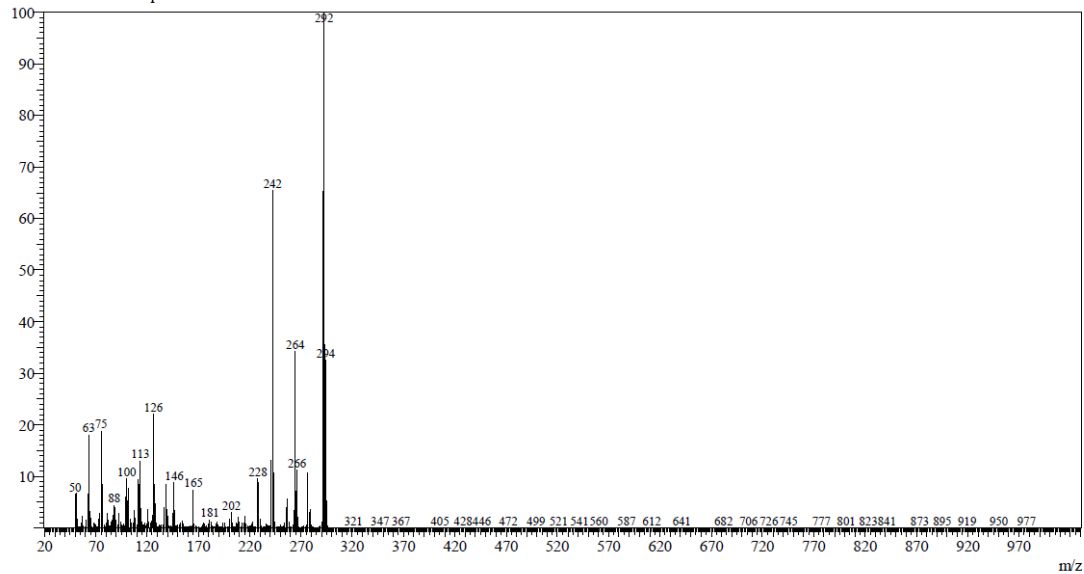
BG Mode:Calc. from Peak Group 1 - Event 1



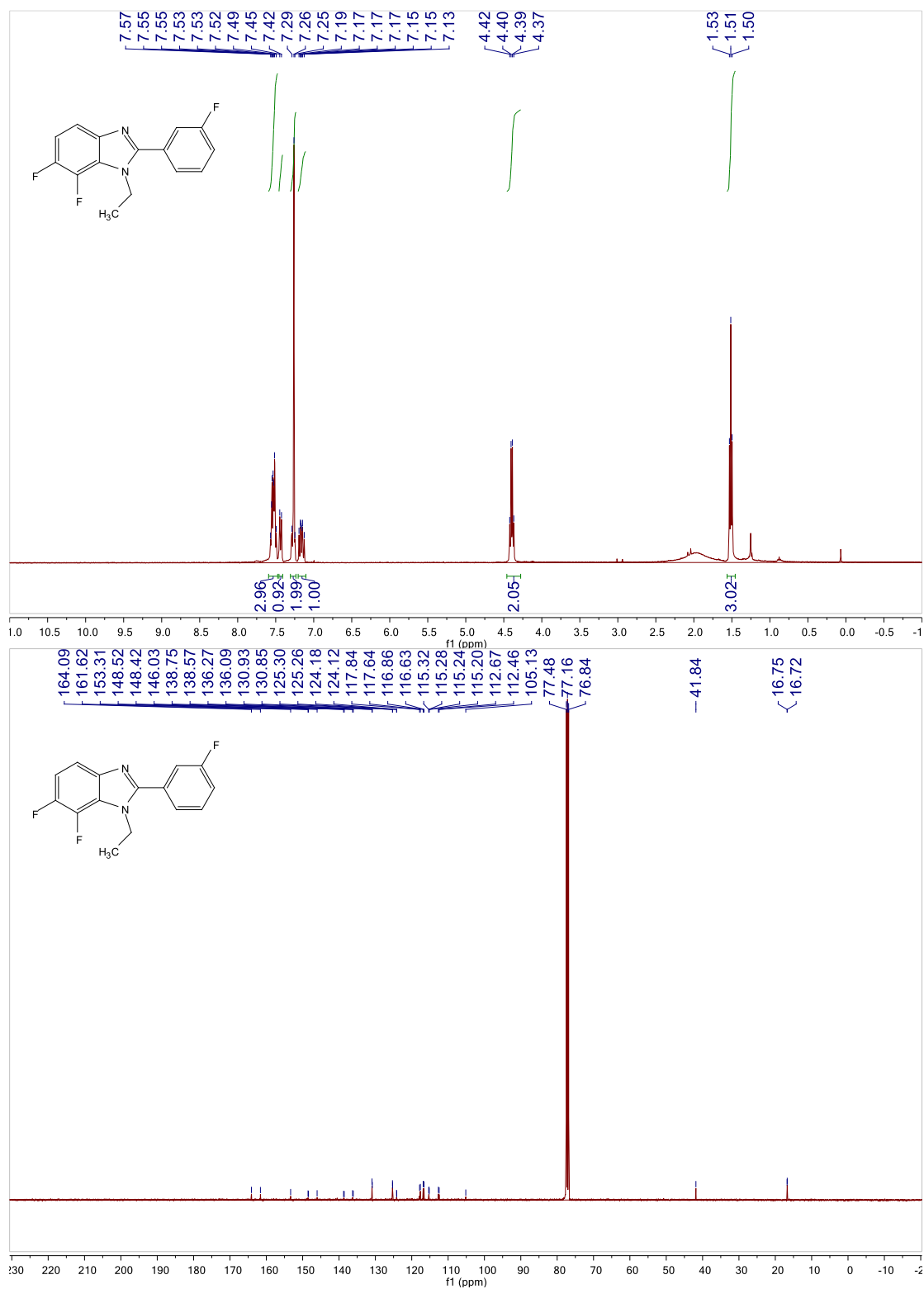
2-(3-Chlorophenyl)-1-ethyl-6,7-difluorobenzo[d]imidazole (14)



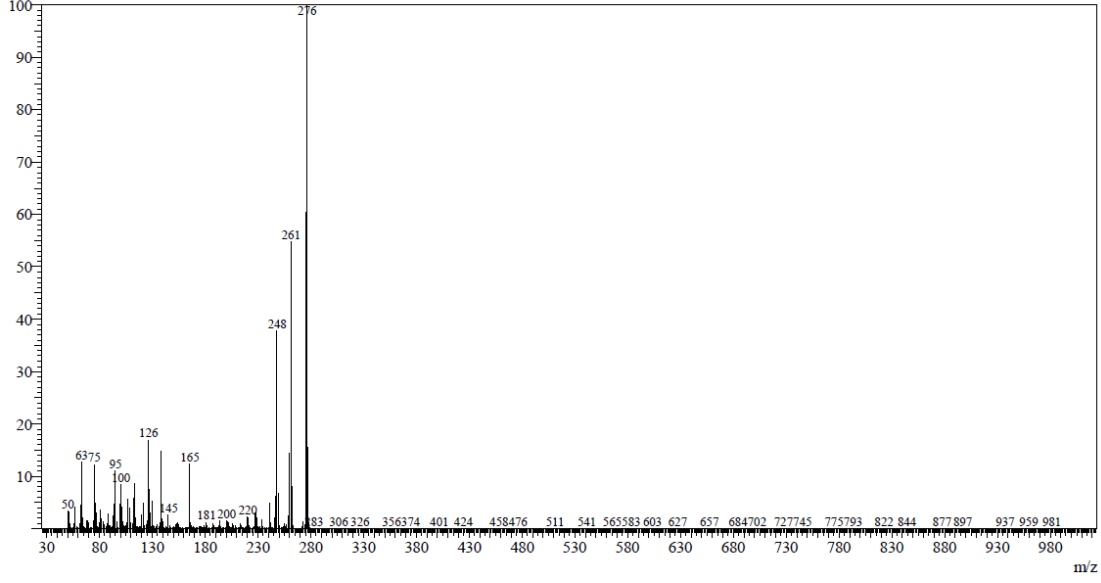
Line# 1 R.Time: 13.1(Scan#: 1212)
MassPeaks: 730
RawMode: Single 13.1(1212) BasePeak: 292(453545)
BG Mode: None Group 1 - Event 1

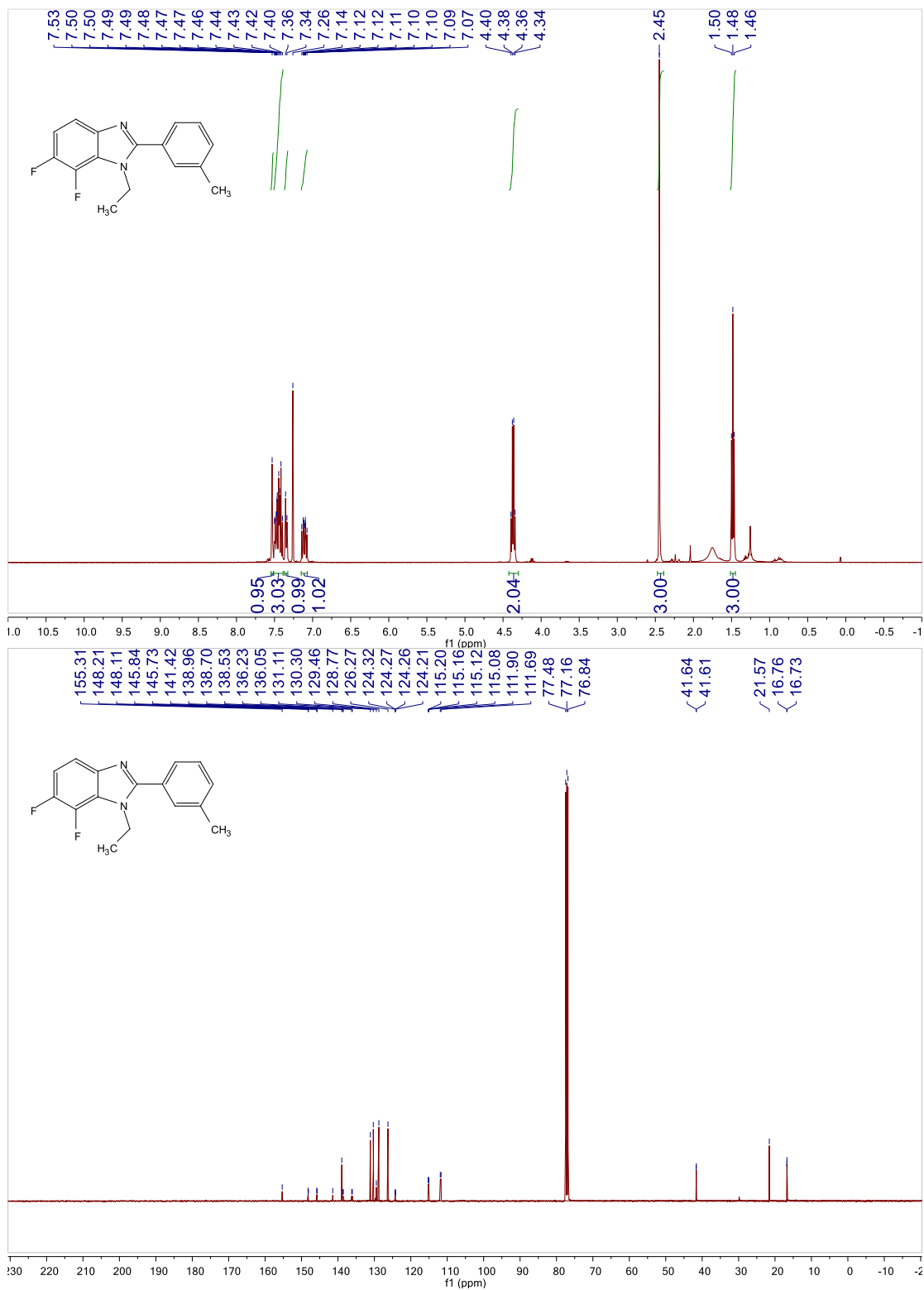


1-Ethyl-6,7-difluoro-2-(3-fluorophenyl)benzo[d]imidazole (15)



Line# 1 R.Time: 11.8(Scan#: 1013)
MassPeaks: 565
RawMode: Averaged 11.8-11.8(1012-1014) BasePeak: 276(459604)
BG Mode: Calc. from Peak Group 1 - Event 1



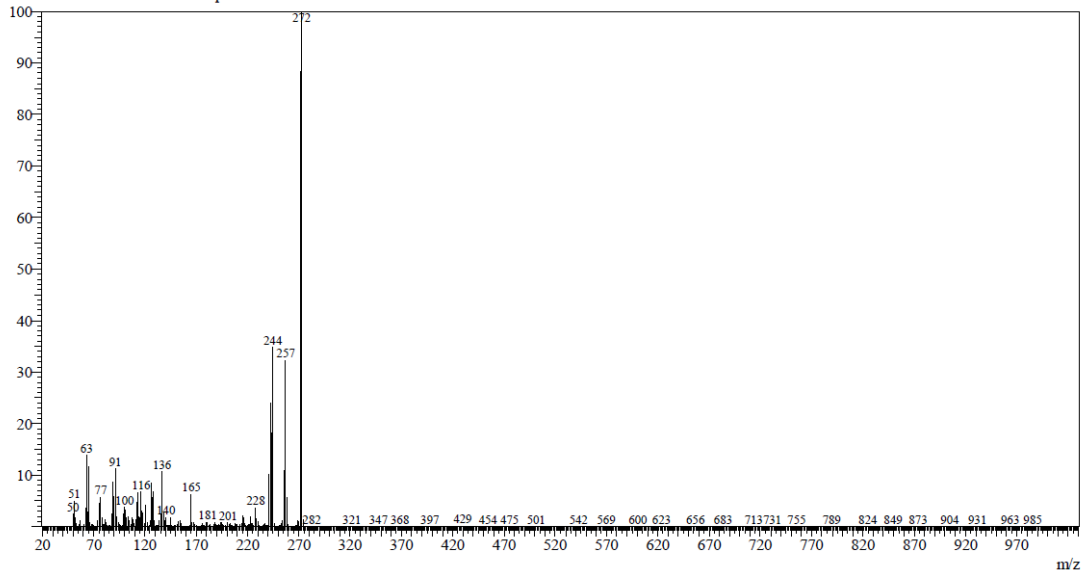
1-Ethyl-6,7-difluoro-2-(*m*-tolyl)benzo[*d*]imidazole (16)

Line#:3 R.Time:12.7(Scan#:991)

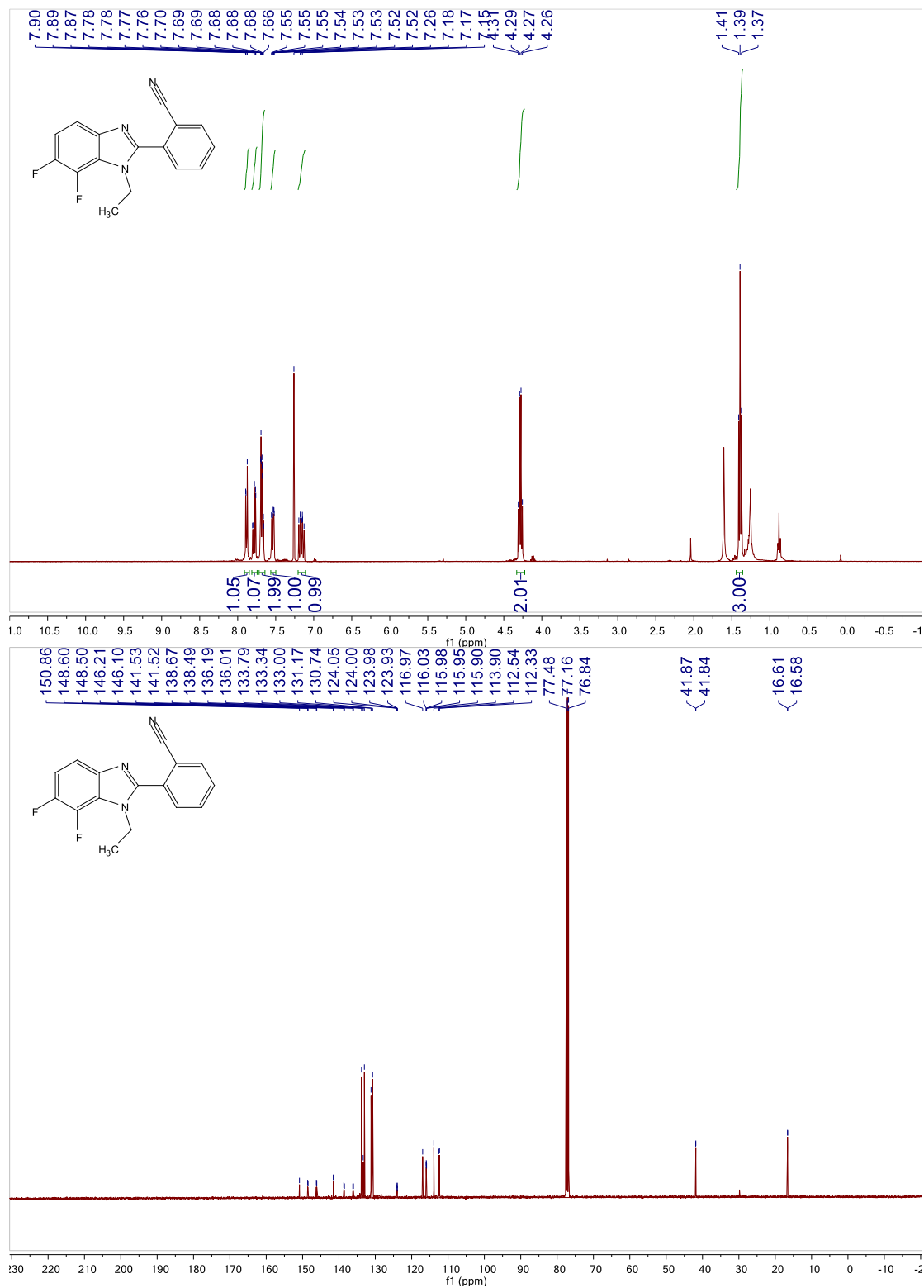
MassPeaks:623

RawMode:Averaged 12.6-12.7(990-992) BasePeak:272(356972)

BG Mode:Calc. from Peak Group 1 - Event 1



2-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)benzonitrile (17)

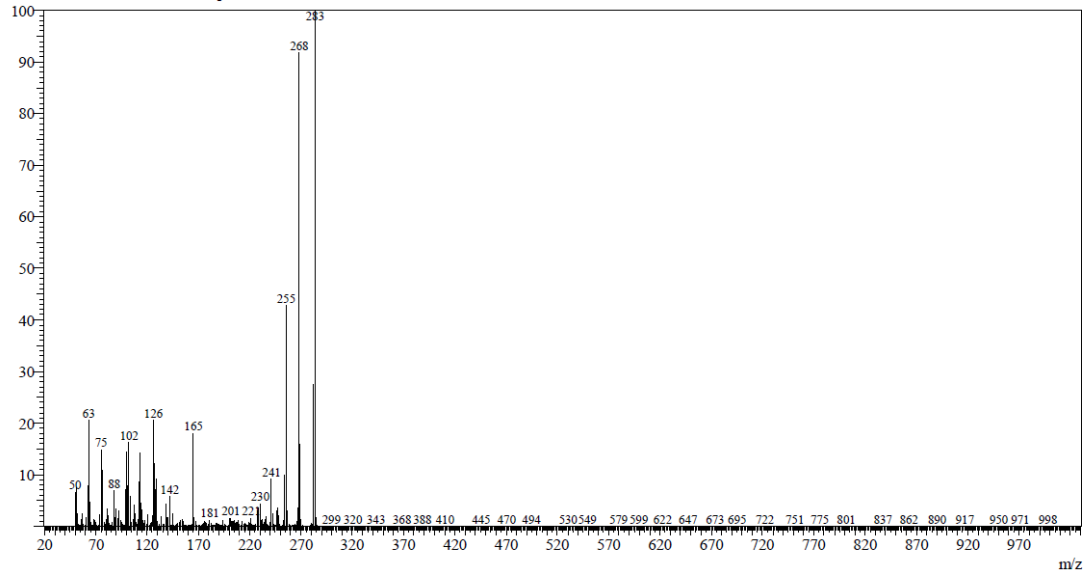


Line#4 R.Time:13.4(Scan#:1253)

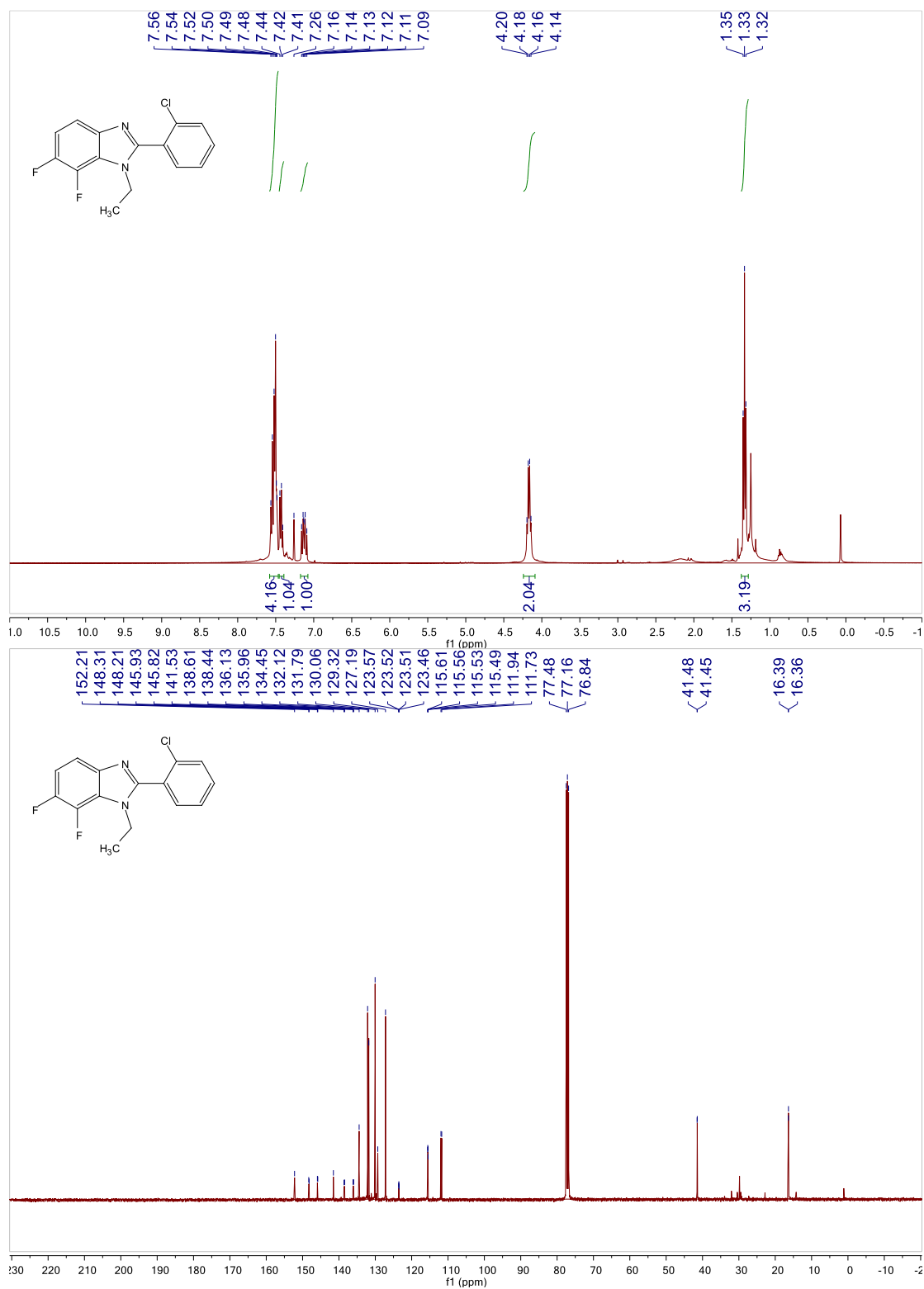
MassPeaks:607

RawMode:Averaged 13.4-13.4(1252-1254) BasePeak:283(524223)

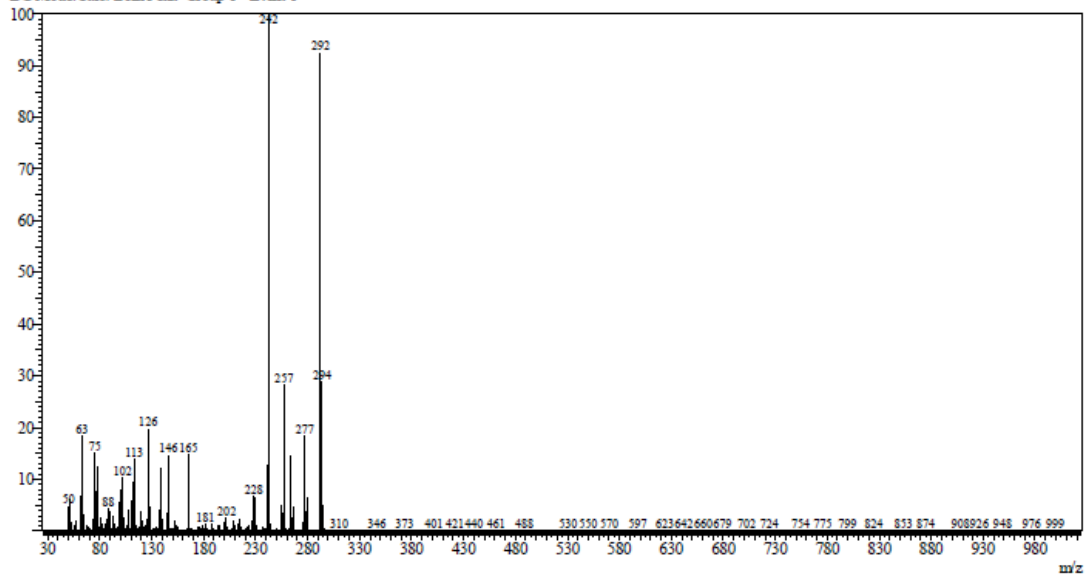
BG Mode:Calc. from Peak Group 1 - Event 1



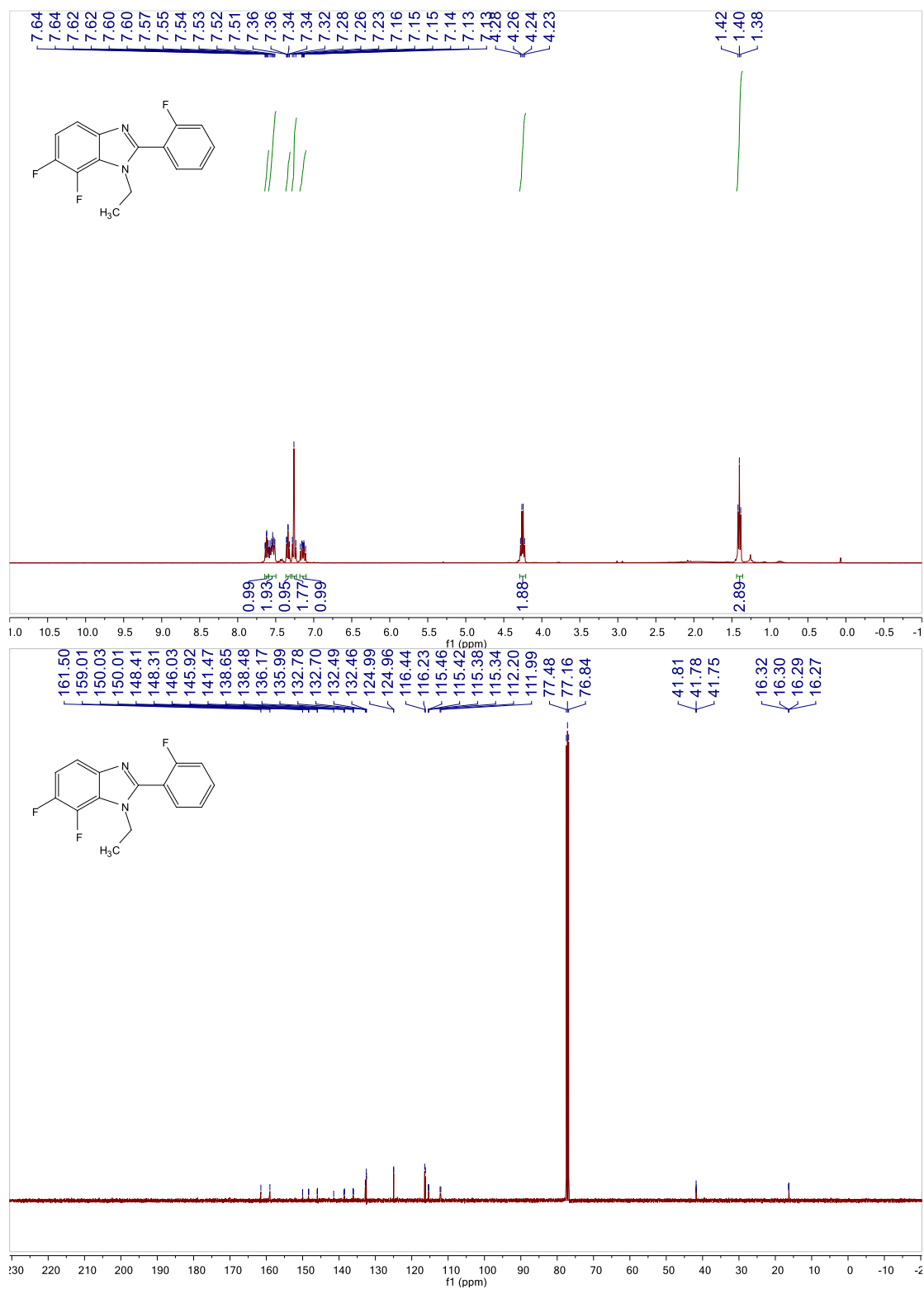
2-(2-Chlorophenyl)-1-ethyl-6,7-difluorobenzo[d]imidazole (18)



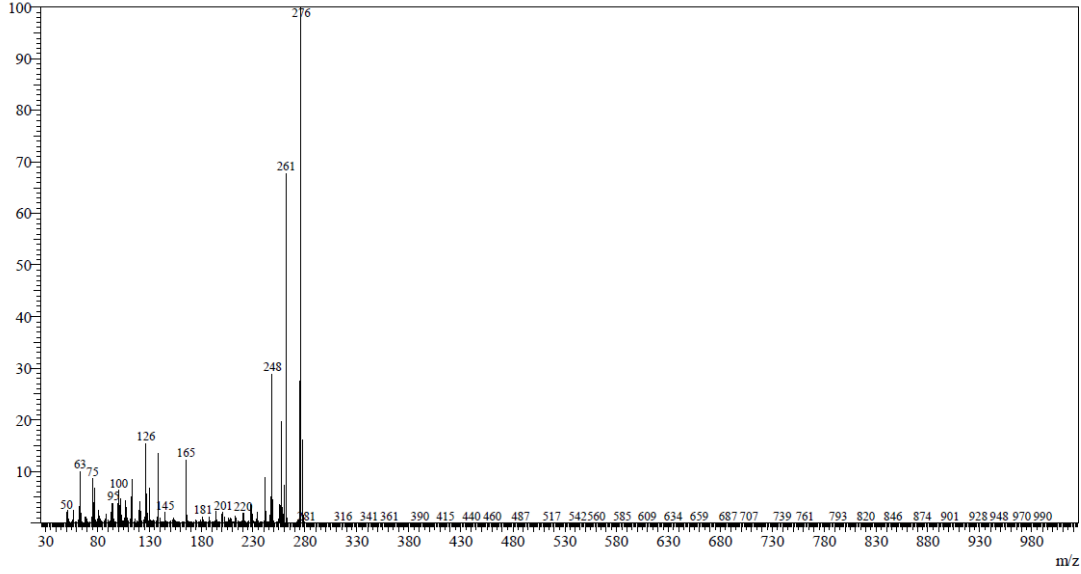
Line#3 R.Time:12.5(Scan#:1122)
MassPeaks:599
RawMode:Averaged 12.5-12.5(1121-1123) BasePeak:242(410921)
BG Mode:Calc. from Peak Group 1 - Event 1

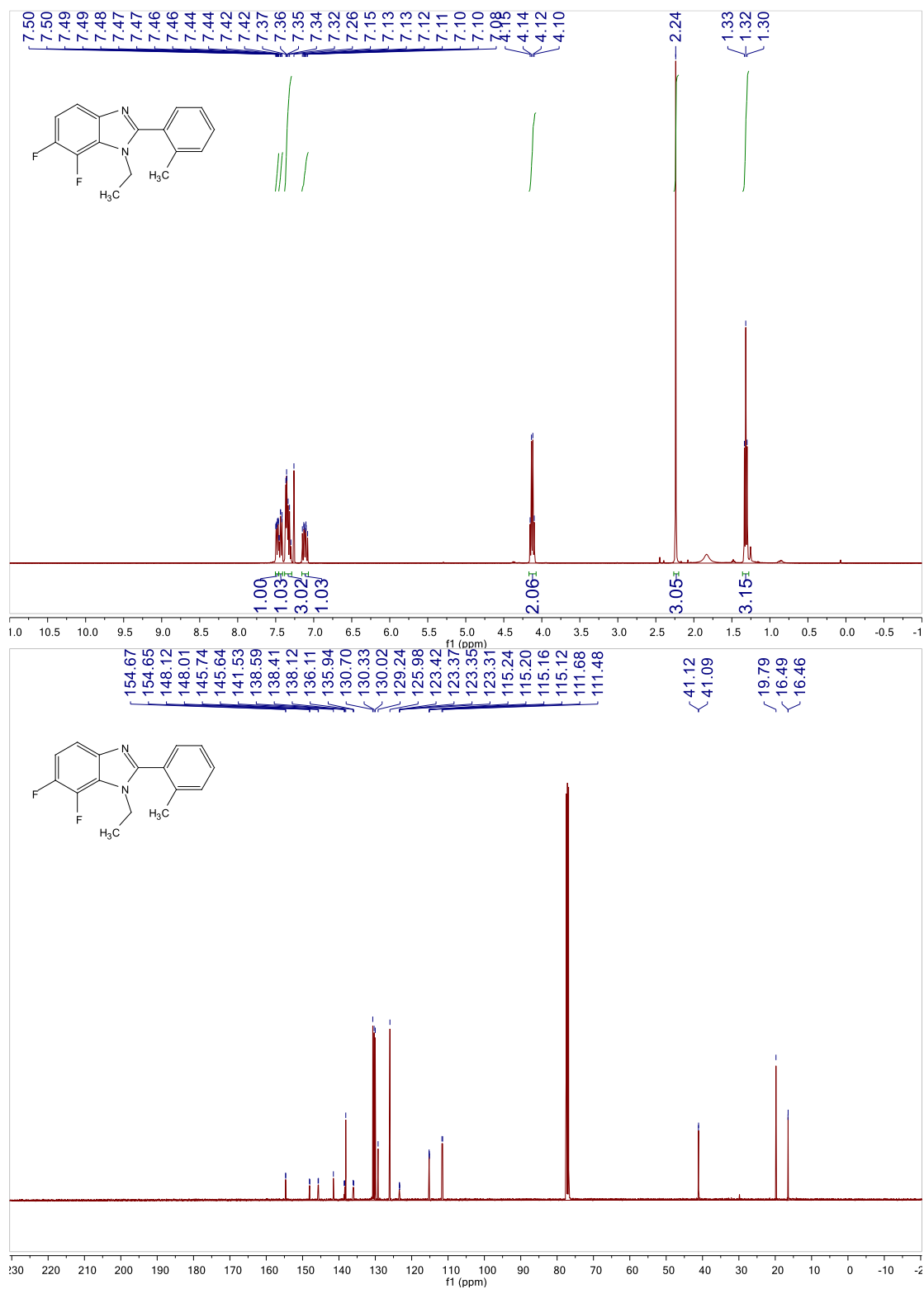


1-Ethyl-6,7-difluoro-2-(2-fluorophenyl)benzo[d]imidazole (19)



Line#:1 R.Time:11.7(Scan#:1003)
MassPeaks:777
RawMode:Single 11.7(1003) BasePeak:276(1234878)
BG Mode:None Group 1 - Event 1



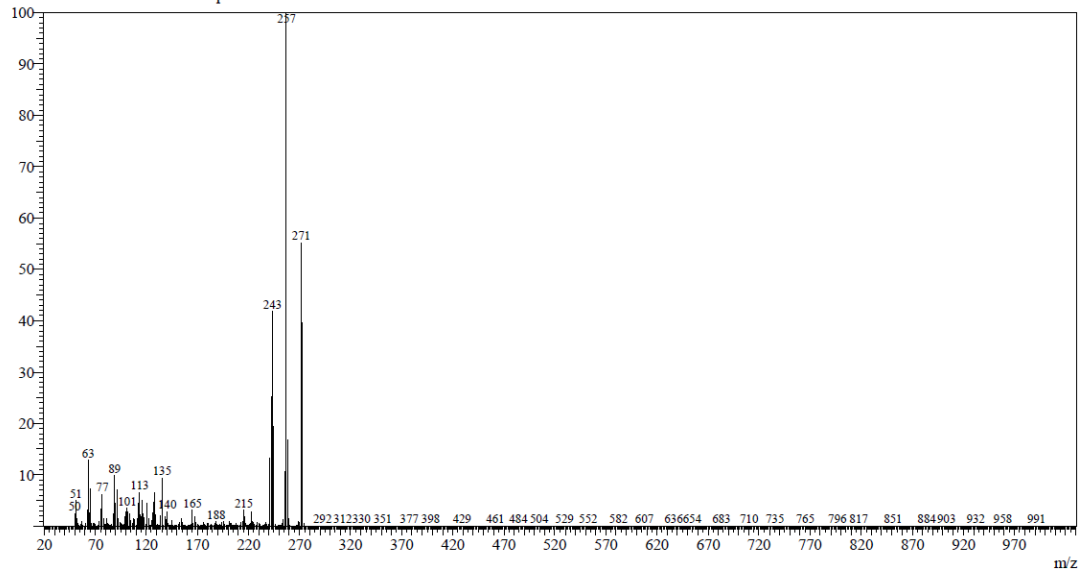
1-Ethyl-6,7-difluoro-2-(*o*-tolyl)benzo[d]imidazole (20)

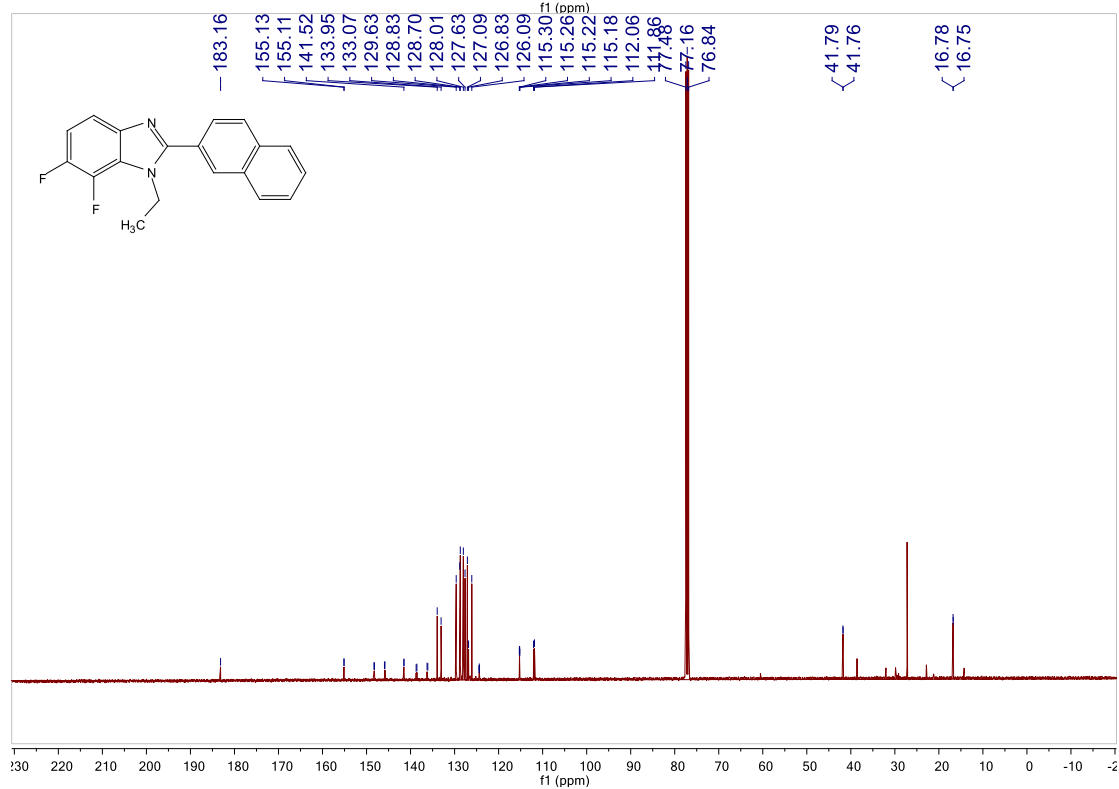
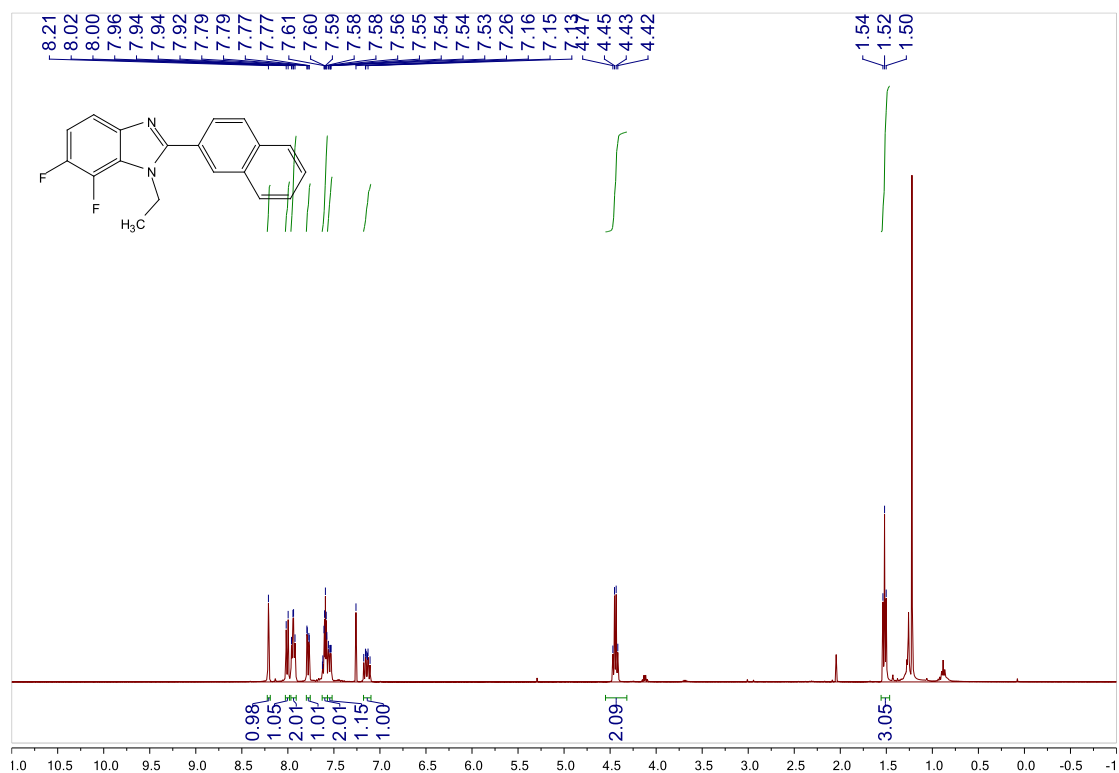
Line# 2 R Time: 12.1(Scan# 904)

MassPeaks: 605

RawMode: Averaged 12.1-12.1(903-905) BasePeak: 257(917154)

BG Mode: Calc. from Peak Group 1 - Event 1



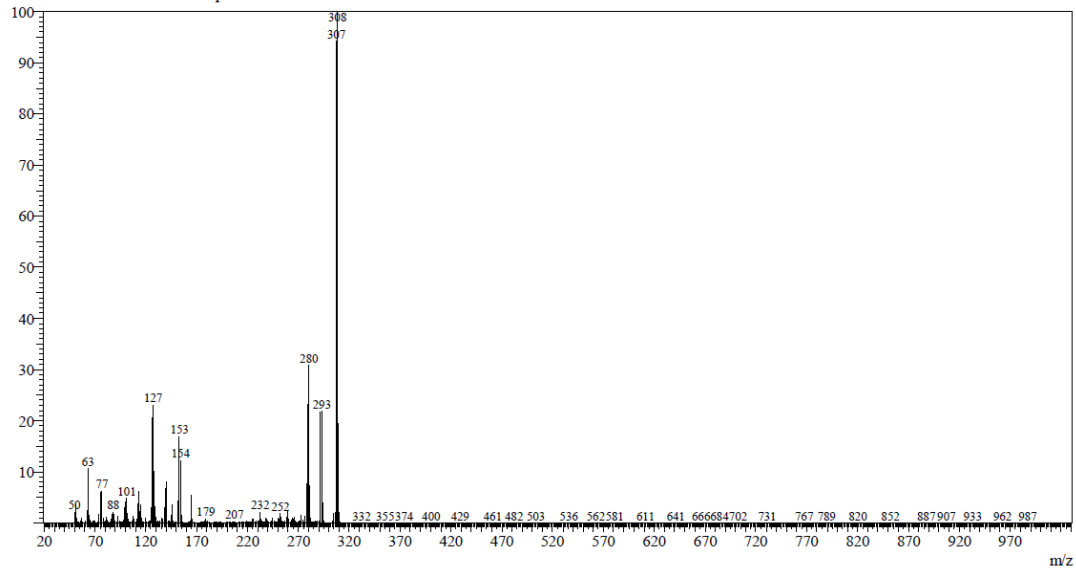
1-Ethyl-6,7-difluoro-2-(naphthalen-2-yl)benzo[d]imidazole (21)

Line# 4 R.Time: 16.5(Scan#: 1717)

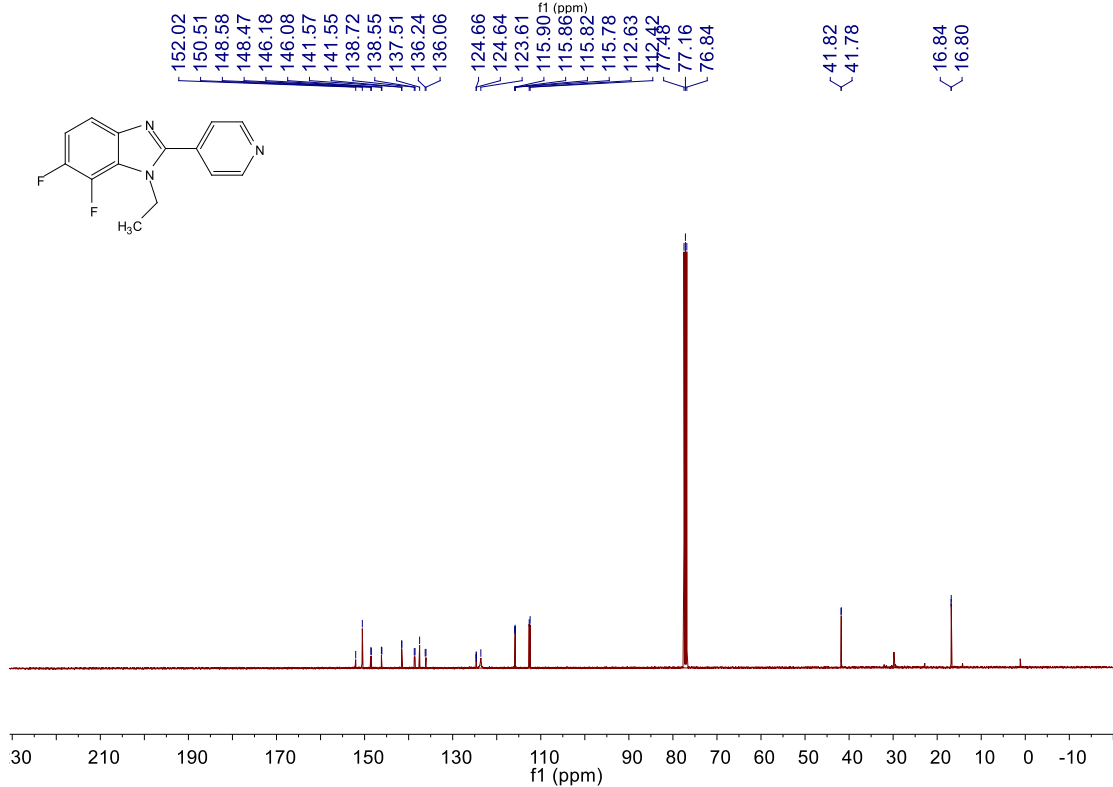
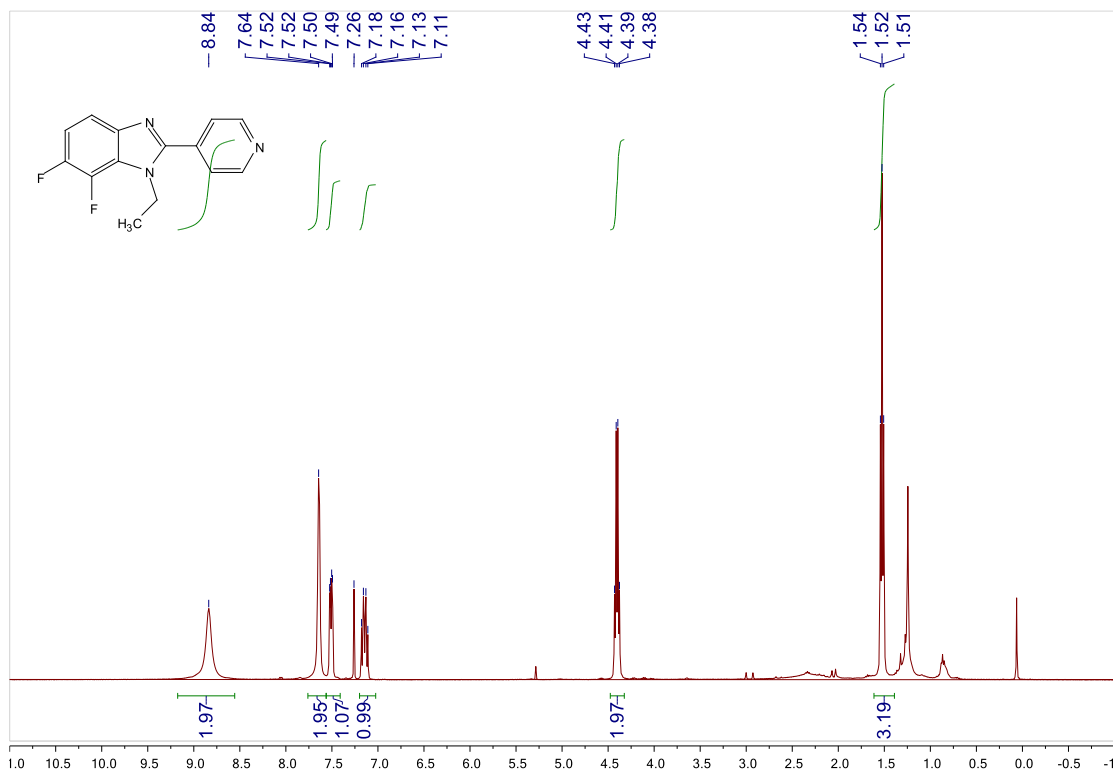
MassPeaks: 614

RawMode: Averaged 16.5-16.5(1716-1718) BasePeak: 308(388811)

BG Mode: Calc. from Peak Group 1 - Event 1



1-Ethyl-6,7-difluoro-2-(pyridin-4-yl)benzo[d]imidazole (22)

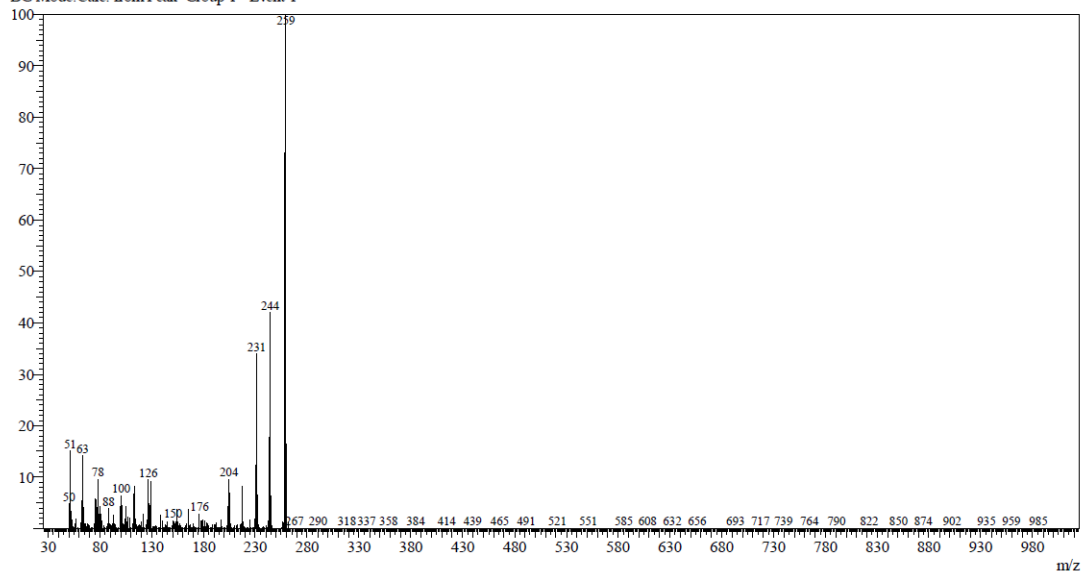


Line#:2 R_Time:12.3(Scan#:1088)

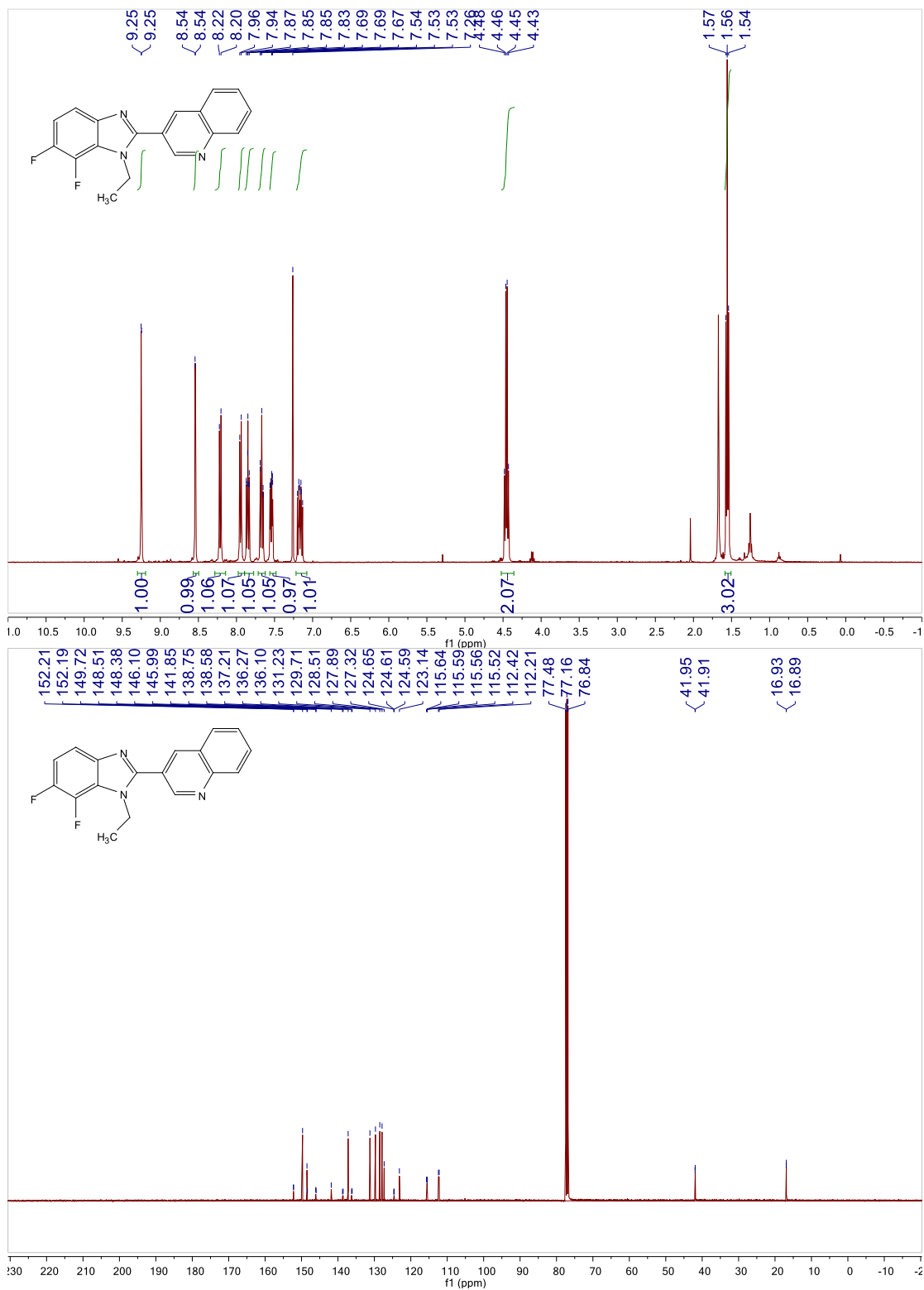
MassPeaks:581

RawMode:Averaged 12.3-12.3(1087-1089) BasePeak:259(533875)

BGMode:Calc. from Peak Group 1 - Event 1



3-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)quinoline (23)

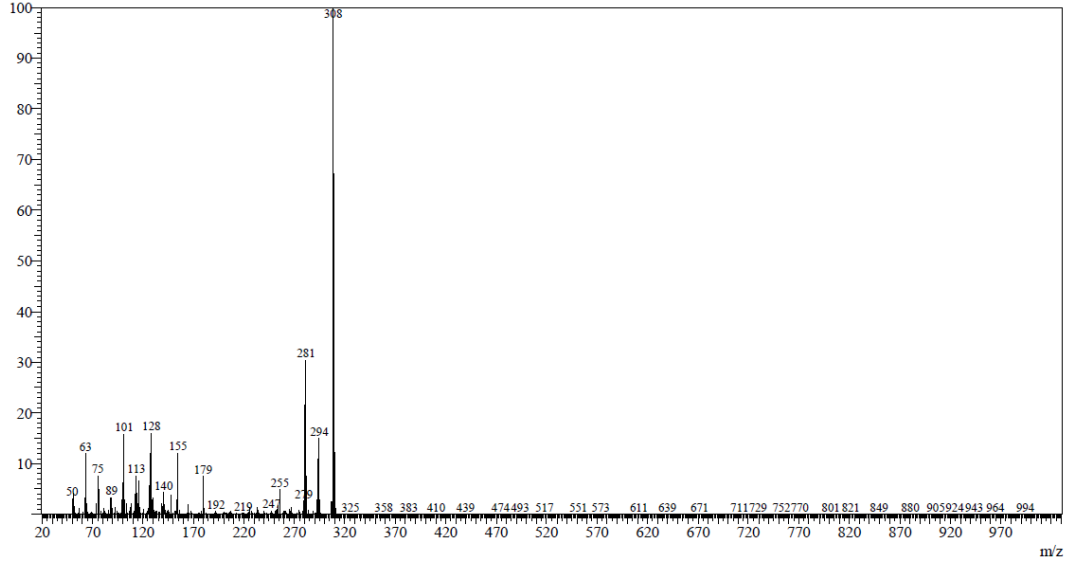


Line# 3 R.Time: 16.9(Scan#: 1774)

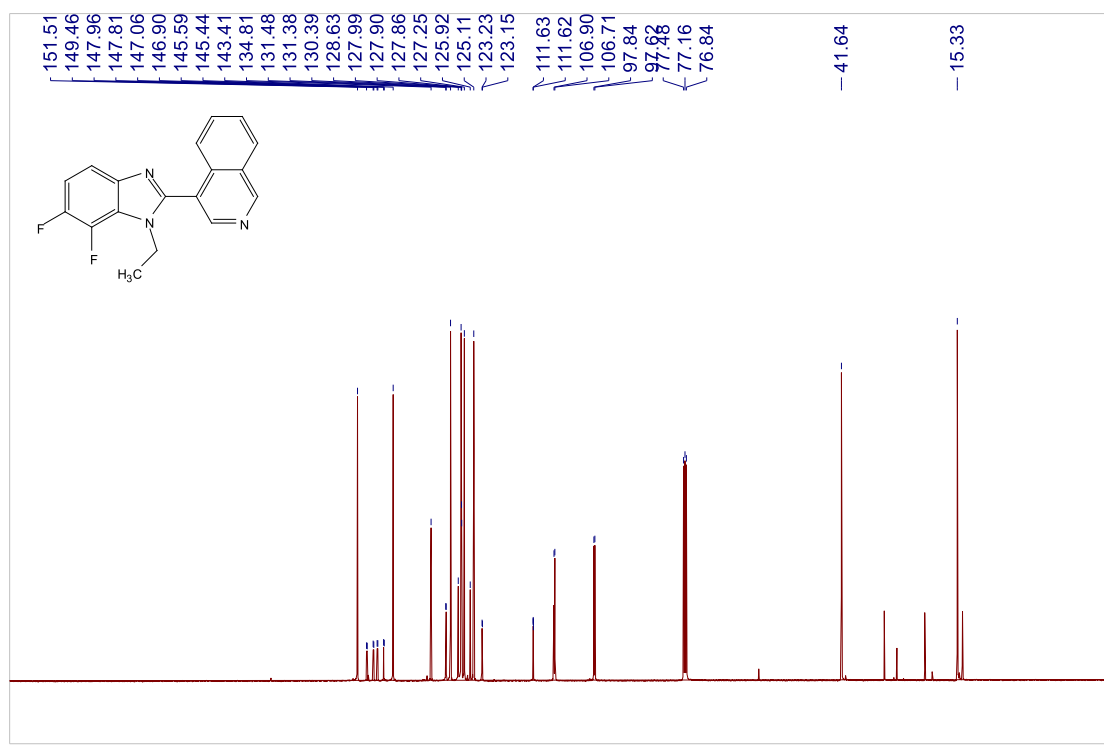
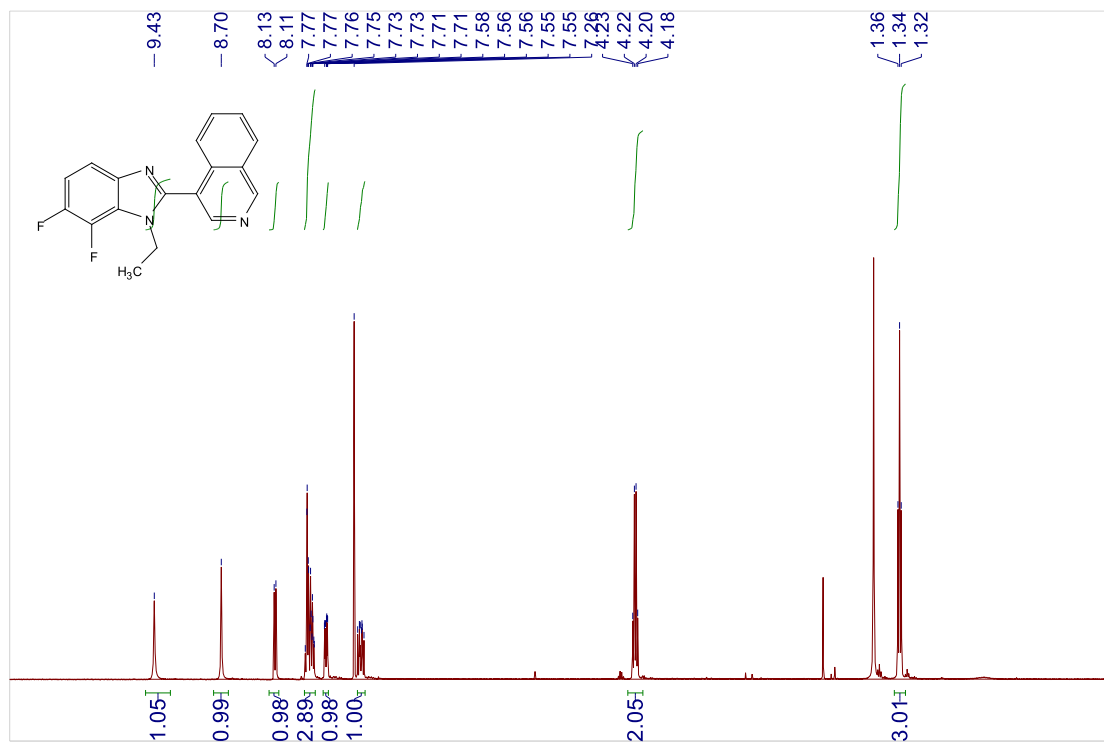
MassPeaks: 603

RawMode: Averaged 16.9-16.9(1773-1775) BasePeak: 308(618033)

BG Mode: Calc. from Peak Group 1 - Event 1



4-(1-Ethyl-6,7-difluorobenzo[d]imidazol-2-yl)isoquinoline (24)

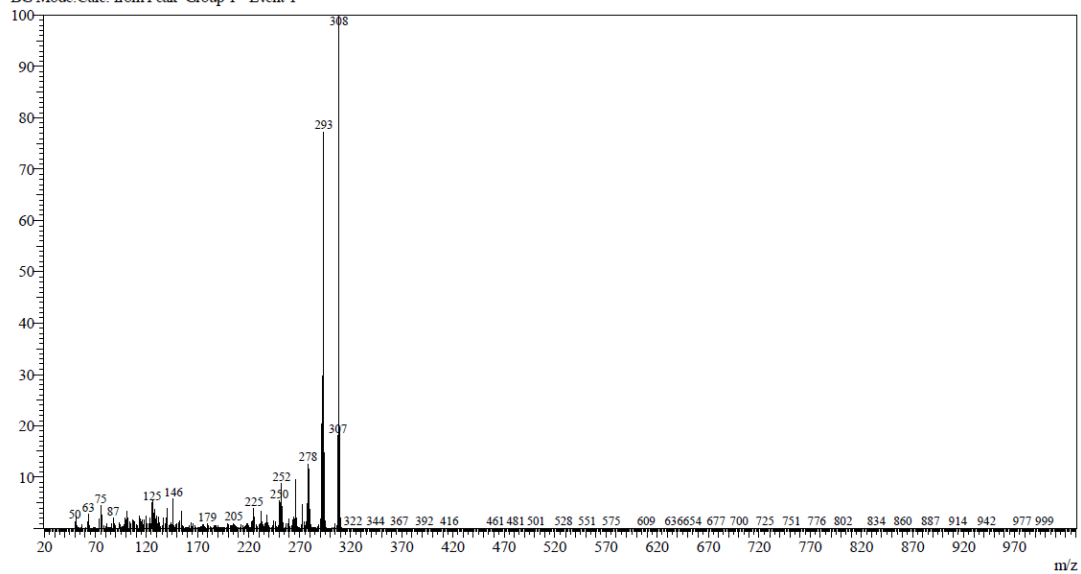


Line#:2 R.Time:15.9(Scan#:1471)

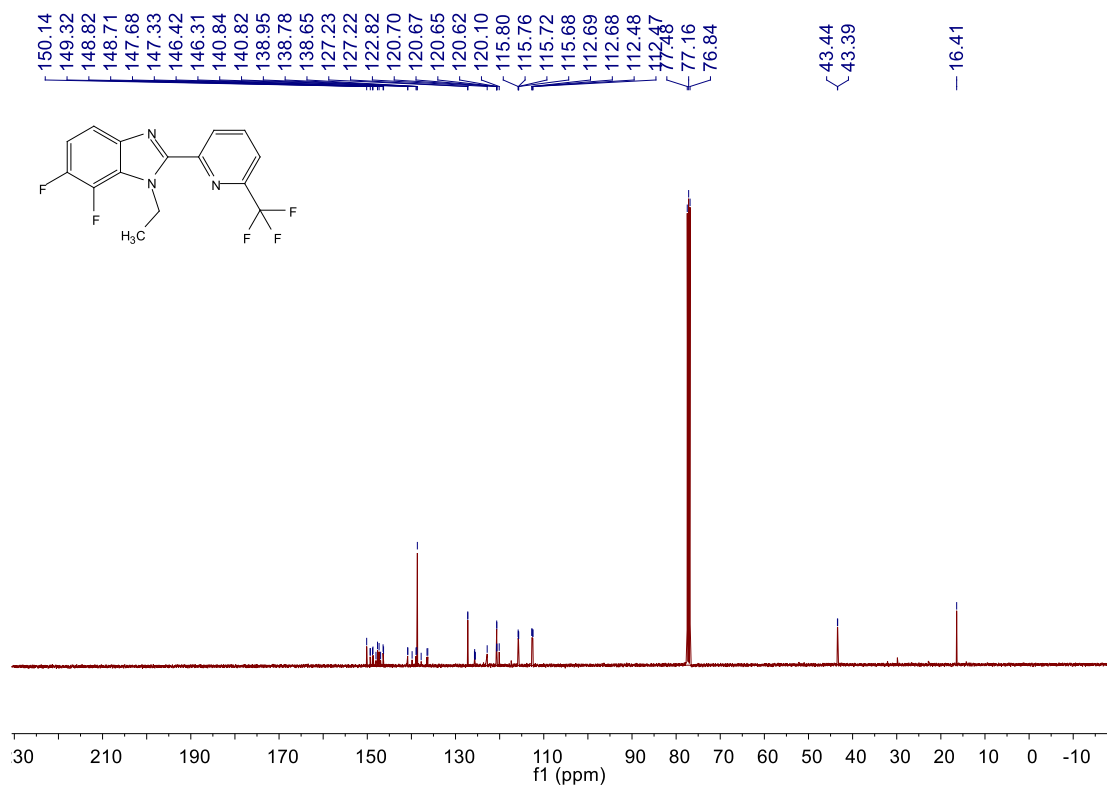
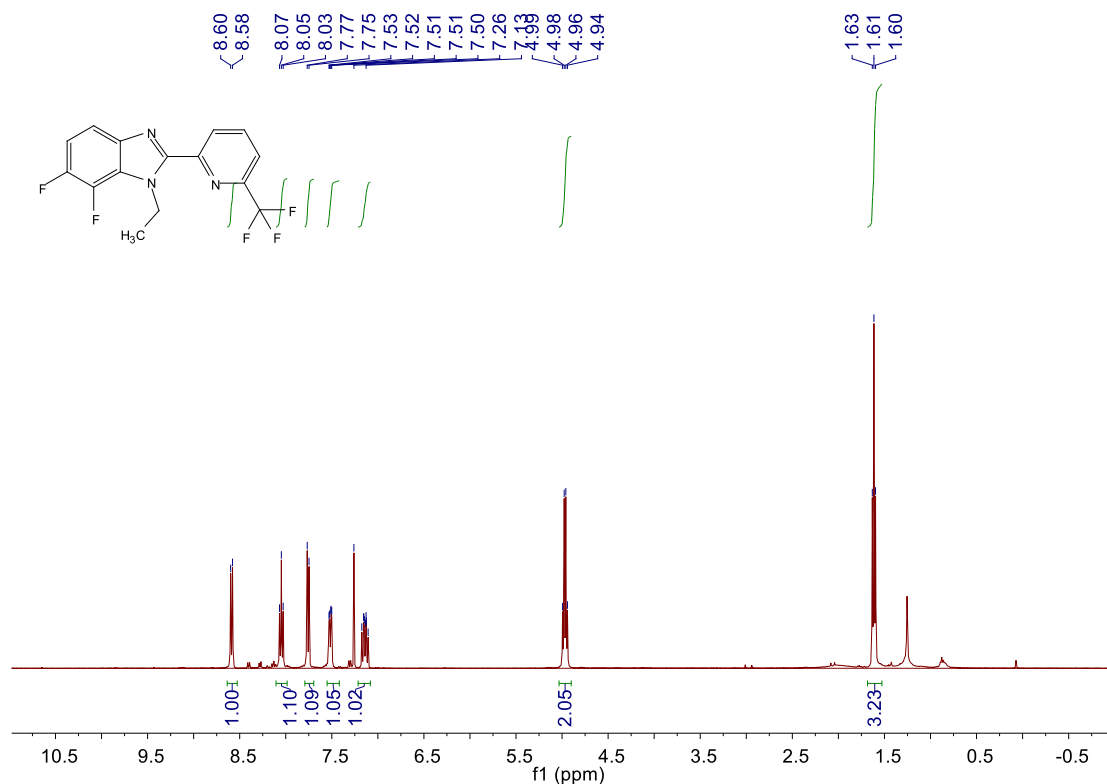
MassPeaks:614

RawMode:Averaged 15.8-15.9(1470-1472) BasePeak:308(224281)

BG Mode: Calc. from Peak Group 1 - Event 1



1-Ethyl-6,7-difluoro-2-(6-(trifluoromethyl)pyridin-2-yl)benzo[d]imidazole (25)



Line# 4 R.Time:11.5(Scan#:964)
MassPeaks:636
RawMode:Averaged 11.5-11.5(963-965) BasePeak:326(1728463)
BG Mode: Calc. from Peak Group 1 - Event 1

