Supporting Information for:

Direct Access to 2-(Hetero)arylated Pyridines from 6-Substituted 2-Bromopyridines *via* Phosphine-Free Palladium-Catalyzed C–H Bond Arylations: The Importance of the C6 Substituent

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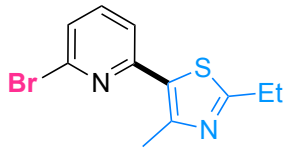
General information: All reactions were carried out under argon atmosphere with standard Schlenk techniques. DMA was purchased from Acros Organics and was not purified before use. ^{1}H NMR spectra were recorded on Bruker GPX (400 MHz) spectrometer. Chemical shifts (δ) were reported in parts per million relative to residual chloroform (7.26 ppm for ^{1}H; 77.0 ppm for ^{13}C), constants were reported in Hertz. ^{1}H 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). ^{13}C NMR spectra were recorded at 100 MHz on the same spectrometer and reported in ppm. All reagents were weighed and handled in air.

General Procedure A: As a typical experiment, the reaction of 2,6-dibromopyridine (355 mg, 1.5 mmol), (hetero)arene derivative (1 mmol), CF_3CO_2K (2 equiv. 304 mg) at 150 °C during 5 h in DMA (4 mL) in the presence of $Pd(OAc)_2$ (1 mol%) (see tables or schemes) under argon affords the desired product after evaporation of the solvent and purification by silica column chromatography.

General Procedure B: As a typical experiment, the reaction of 2,5-dibromopyridine (237 mg, 1 mmol), (hetero)arene derivative (2.5 mmol), KOAc (2 equiv., 196 mg) at 150 °C during 16 h in DMA (4 mL) in the presence of $Pd(OAc)_2$ (1 mol%) (see tables or schemes) under argon affords the desired product after evaporation of the solvent and purification by silica column chromatography.

General Procedure C: As a typical experiment, the reaction of the 6-substituted 2-bromopyridine (1 mmol), (hetero)arene derivative (1.5 mmol), KOAc (2 equiv., 196 mg) at 150 °C during 16 h in DMA (4 mL) in the

presence of $Pd(OAc)_2$ (1 mol%) (see tables or schemes) under argon affords the desired product after evaporation of the solvent and purification by silica column chromatography.

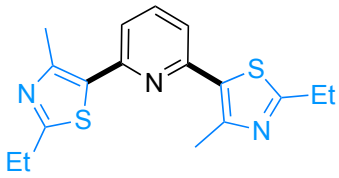


5-(6-Bromopyridin-2-yl)-2-ethyl-4-methylthiazole (2): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and 2-ethyl-4-methylthiazole (127 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **2** (249 mg, 88%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.51 (t, *J* = 7.8 Hz, 1H), 7.42 (dd, *J* = 1.0 and 7.8 Hz, 1H), 7.29 (dd, *J* = 1.0 and 7.8 Hz, 1H), 2.96 (q, *J* = 7.6 Hz, 2H), 2.61 (s, 3H), 1.36 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 172.6, 152.8, 150.2, 141.5, 138.7, 130.1, 125.6, 120.2, 27.0, 17.5, 14.1.

Elemental analysis: calcd (%) $C_{11}H_{11}BrN_2S$ for (283.18): C 46.66, H 3.92; found: C 46.97, H 3.51.

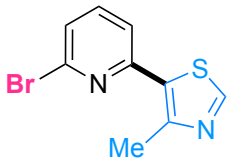


2,6-Bis(2-ethyl-4-methylthiazol-5-yl)pyridine (3): Following the general procedure **B** using 2,6-dibromopyridine (237 mg, 1 mmol) and 2-ethyl-4-methylthiazole (318 mg, 2.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **3** (300 mg, 91%).

^{1}H NMR (300 MHz, $CDCl_3$) δ (ppm) 7.54 (t, *J* = 7.7 Hz, 1H), 7.43 (d, *J* = 7.7 Hz, 1H), 7.33 (d, *J* = 7.7 Hz, 1H), 2.98 (q, *J* = 7.6 Hz, 4H), 2.30 (s, 6H), 1.38 (t, *J* = 7.6 Hz, 6H).

^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm) 172.4, 150.8, 141.5, 138.7, 125.6, 120.2, 26.9, 15.8, 14.1

Elemental analysis: calcd (%) $C_{17}H_{19}N_3S_2$ for (329.48): C 61.97, H 5.81; found: C 62.08, H 5.46.

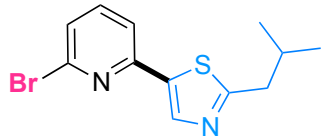


5-(6-Bromopyridin-2-yl)-4-methylthiazole (4): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and 4-methylthiazole (99 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **4** (117 mg, 46%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.72 (s, 1H), 7.58 (t, *J* = 7.8 Hz, 1H), 7.49 (d, *J* = 7.6 Hz, 1H), 7.37 (d, *J* = 7.7 Hz, 1H), 2.72 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 152.5, 151.4, 141.7, 138.9, 131.3, 126.2, 120.6, 17.6.

Elemental analysis: calcd (%) $C_9H_7BrN_2S$ for (255.13): C 42.37, H 2.77; found: C 42.54, H 3.09.

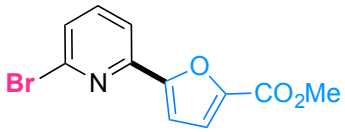


5-(6-Bromopyridin-2-yl)-2-isobutylthiazole (5): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and 2-isobutylthiazole (141 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **5** (232 mg, 78%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.11 (s, 1H), 7.55-7.72 (m, 2H), 7.34 (dd, *J* = 3.1 and 5.5 Hz, 1H), 2.89 (d, *J* = 7.2 Hz, 2H), 2.15-2.11(m, 1H), 1.01 (d, *J* = 6.6 Hz, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 173.0, 151.8, 141.9, 140.3, 138.9, 137.6, 126.4, 118.2, 42.7, 29.9, 22.3.

Elemental analysis: calcd (%) $C_{12}H_{13}BrN_2S$ for (297.21): C 48.49, H 4.41; found: C 48.62, H 4.76.



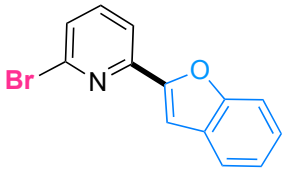
Methyl 5-(6-bromopyridin-2-yl)furan-2-carboxylate (6): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and methyl furan-2-carboxylate (126 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **6** (169 mg, 60%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.86 (d, *J* = 7.7 Hz, 1H), 7.62 (t, *J* = 7.7 Hz, 1H), 7.43 (d, *J* = 7.7 Hz, 1H), 7.29 (d, *J* = 3.6 Hz, 1H), 7.24 (d, *J* = 3.6 Hz, 1H), 3.94 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 154.2, 150.5, 144.3, 140.1, 137.4, 134.3, 122.8, 115.1, 113.4, 106.6, 47.3.

Elemental analysis: calcd (%) $C_{11}H_8BrNO_3$ for (282.09): C 46.84, H 2.86; found: C 46.98, H 3.02.

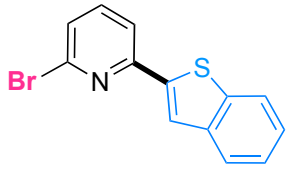
2-(Benzofuran-2-yl)-6-bromopyridine (7): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and benzofuran (118 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **7** (233 mg, 85%).



^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.90-7.84 (m, 1H), 7.70-7.61 (m, 2H), 7.57 (d, *J* = 7.6 Hz, 1H), 7.54 (s, 1H), 7.43 (d, *J* = 7.6 Hz, 1H), 7.37 (dt, *J* = 1.0 and 7.6 Hz, 1H), 7.32-7.26 (m, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 155.4, 153.6, 150.2, 142.2, 138.9, 128.3, 127.1, 125.6, 123.3, 121.9, 118.2, 111.5, 106.3.

Elemental analysis: calcd (%) $C_{13}H_8BrNO$ for (274.12): C 56.96, H 2.94; found: C 57.18, H 3.06.

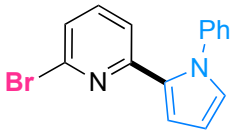


2-(Benzo[*b*]thiophen-2-yl)-6-bromopyridine (8): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and benzo[*b*]thiophene (134 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **8** (151 mg, 52%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.89 (s, 1H), 7.87-7.84 (m, 1H), 7.81 (dd, *J* = 3.5 and 5.6 Hz, 1H), 7.69 (d, *J* = 7.7 Hz, 1H), 7.56 (t, *J* = 7.7 Hz, 1H), 7.42-7.34 (m, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 153.6, 142.6, 142.0, 140.8, 140.2, 138.8, 126.7, 125.4, 124.7, 124.8, 122.6, 122.5, 118.4.

Elemental analysis: calcd (%) $C_{13}H_8BrNS$ for (290.18): C 53.81, H 2.78; found: C 54.06, H 2.56.

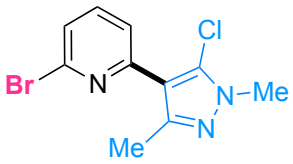


2-Bromo-6-(1-phenylpyrrol-2-yl)pyridine (9): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and 1-phenylpyrrole (143 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **9** (215 mg, 72%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.39-7.36 (m, 2H), 7.35 (t, *J* = 1.6 Hz, 1H), 7.28 (t, *J* = 6.7 Hz, 1H), 7.24-7.21 (m, 2H), 7.16 (d, *J* = 7.8 Hz, 1H), 6.96 (dd, *J* = 1.8 and 2.7 Hz, 1H), 6.90 (d, *J* = 7.7 Hz, 1H), 6.87 (dd, *J* = 1.8 and 3.7 Hz, 1H), 6.37 (dd, *J* = 2.8 and 3.7 Hz, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 152.2, 141.2, 140.7, 137.9, 131.6, 129.0, 127.1, 127.0, 126.0, 124.5, 120.0, 113.9, 109.7.

Elemental analysis: calcd (%) $C_{15}H_{11}BrN_2$ for (299.17): C 60.22, H 3.71; found: C 60.53, H 2.74.

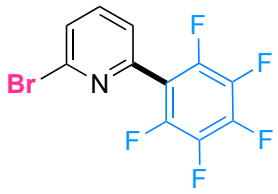


2-Bromo-6-(5-chloro-1,3-dimethylpyrazol-4-yl)pyridine (10): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and 5-chloro-1,3-dimethylpyrazole (131 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **10** (80 mg, 28%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.55 (t, *J* = 7.6 Hz, 1H), 7.50 (dd, *J* = 1.1 and 7.6 Hz, 1H), 7.34 (dd, *J* = 1.1 and 7.6 Hz, 1H), 3.82 (s, 3H), 2.44 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 152.5, 148.0, 141.5, 138.4, 126.3, 125.3, 121.0, 115.2, 36.2, 14.1.

Elemental analysis: calcd (%) $C_{10}H_9BrClN_3$ for (286.56): C 41.91, H 3.17; found: C 42.05, H 3.35.

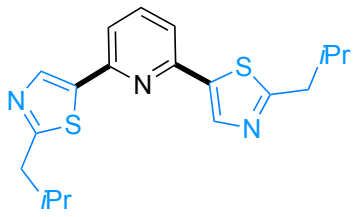


2-Bromo-6-(perfluorophenyl)pyridine (11): Following the general procedure **A** using 2,6-dibromopyridine (355 mg, 1.5 mmol) and 1,2,3,4,5-pentafluorobenzene (168 mg, 1 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **11** (188 mg, 58%).

^{1}H NMR (400 MHz, d_6-DMSO) δ (ppm) 7.91 (t, *J* = 7.8 Hz, 1H), 7.74 (d, *J* = 7.8 Hz, 1H), 7.67 (d, *J* = 7.8 Hz, 1H).

^{13}C NMR (100 MHz, d_6-DMSO) δ (ppm) 147.9, 144.1 (md, *J* = 246.0 Hz), 141.0, 140.3, 138.6 (md, *J* = 243.2 Hz), 138.3 (md, *J* = 243.2 Hz), 128.1, 125.6, 107.3 (t, *J* = 16.8 Hz).

Elemental analysis: calcd (%) $C_{11}H_3BrF_5N$ for (324.05): C 40.77, H 0.93; found: C 41.02, H 1.07.

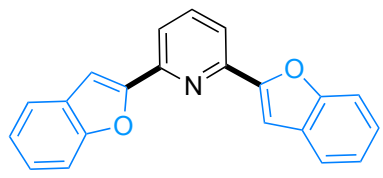


2,6-Bis(2-isobutylthiazol-5-yl)pyridine (12): Following the general procedure **B** using 2,6-dibromopyridine (237 mg, 1 mmol) and 2-isobutylthiazole (353 mg, 2.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **12** (222 mg, 62%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.09 (s, 2H), 7.65 (t, *J* = 7.8 Hz, 1H), 7.44 (d, *J* = 7.8 Hz, 2H), 2.87 (d, *J* = 7.2 Hz, 4H), 2.20-2.08 (m, 2H), 1.00 (d, *J* = 6.7 Hz, 12H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 172.6, 150.8, 139.5, 139.1, 137.4, 117.6, 42.7, 29.9, 22.3.

Elemental analysis: calcd (%) $C_{19}H_{23}N_3S_2$ for (357.53): C 63.83, H 6.48; found: C 64.05, H 6.59.

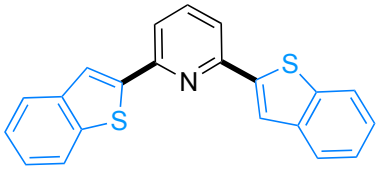


2,6-Di(benzofuran-2-yl)pyridine (13): Following the general procedure **B** using 2,6-dibromopyridine (237 mg, 1 mmol) and benzofuran (295 mg, 2.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **13** (193 mg, 62%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.89-7.86 (m, 4H), 7.69 (d, *J* = 7.7 Hz, 2H), 7.61 (s, 2H), 7.59 (d, *J* = 8.4 Hz, 2H), 7.36 (t, *J* = 7.4 Hz, 1H), 7.29 (d, *J* = 7.5 Hz, 2H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 155.4, 155.1, 149.3, 137.5, 128.9, 125.2, 123.2, 121.8, 118.8, 111.5, 105.3.

Elemental analysis: calcd (%) $C_{21}H_{13}NO_2$ for (311.34): C 81.01, H 4.21; found: C 81.26, H 4.49.

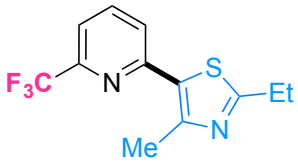


2,6-Bis(benzo[*b*]thiophen-2-yl)pyridine (14): Following the general procedure **B** using 2,6-dibromopyridine (237 mg, 1 mmol) and benzo[*b*]thiophene (336 mg, 2.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **14** (192 mg, 56%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.92 (s, 2H), 7.89 (d, *J* = 3.7 Hz, 1H), 7.86-7.82 (m, 2H), 7.81-7.75 (m, 2H), 7.70 (d, *J* = 7.5 Hz, 2H), 7.40-7.35 (m, 4H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 152.3, 144.7, 141.0, 140.5, 137.3, 125.1, 124.5, 124.2, 122.6, 121.4, 118.1.

Elemental analysis: calcd (%) $C_{21}H_{13}NS_2$ for (343.46): C 73.44, H 3.82; found: C 73.59, H 4.06.

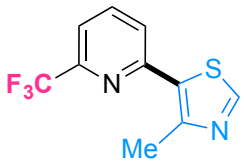


2-Ethyl-4-methyl-5-(6-(trifluoromethyl)pyridin-2-yl)thiazole (15): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 2-ethyl-4-methylthiazole (191 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **15** (250 mg, 92%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.85 (t, *J* = 7.9 Hz, 1H), 7.64 (d, *J* = 8.0 Hz, 1H), 7.50 (d, *J* = 7.7 Hz, 1H), 2.99 (q, *J* = 7.6 Hz, 2H), 2.69 (s, 3H), 1.39 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 172.7, 152.5, 151.0, 148.0 (q, *J* = 34.8 Hz), 137.9, 130.0, 124.1, 121.3 (q, *J* = 276.5 Hz), 117.6 (q, *J* = 2.7 Hz), 27.0, 17.6, 14.1.

Elemental analysis: calcd (%) $C_{12}H_{11}F_3N_2S$ for (272.29): C 52.93, H 4.07; found: C 53.12, H 4.29.

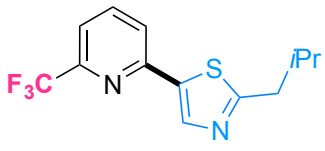


4-Methyl-5-(6-(trifluoromethyl)pyridin-2-yl)thiazole (16): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 4-methylthiazole (150 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **16** (220 mg, 90%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.73 (s, 1H), 7.90 (t, *J* = 7.9 Hz, 1H), 7.71 (d, *J* = 7.9 Hz, 1H), 7.55 (d, *J* = 7.9 Hz, 1H), 2.76 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 152.5, 152.2, 152.1, 148.2 (q, *J* = 35.0 Hz), 138.2, 131.1, 124.4, 121.3 (q, *J* = 276.5 Hz), 118.2 (q, *J* = 2.7 Hz), 17.6.

Elemental analysis: calcd (%) $C_{10}H_7F_3N_2S$ for (244.24): C 49.18, H 2.89; found: C 49.35, H 3.12.



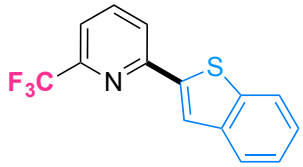
2-Isobutyl-5-(6-(trifluoromethyl)pyridin-2-yl)thiazole (17): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 2-isobutylthiazole (212 mg, 1.5 mmol), the residue was purified by

flash chromatography on silica gel to afford the desired compound **17** (269 mg, 94%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.14 (s, 1H), 7.82 (t, *J* = 7.8 Hz, 1H), 7.73 (d, *J* = 7.8 Hz, 1H), 7.49 (d, *J* = 7.8 Hz, 1H), 2.86 (d, *J* = 7.2 Hz, 2H), 2.15-2.08 (m, 1H), 0.98 (d, *J* = 6.7 Hz, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 173.4, 151.4, 148.2 (q, *J* = 34.8 Hz), 140.5, 138.1, 137.9, 121.9, 121.2 (q, *J* = 276.2 Hz), 118.5 (q, *J* = 2.7 Hz), 42.6, 30.3, 22.2.

Elemental analysis: calcd (%) $C_{13}H_{13}F_3N_2S$ for (286.32): C 54.54, H 4.58; found: C 54.76, H 4.86.

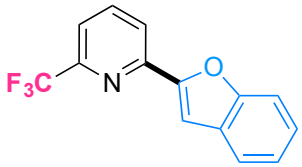


2-(Benzo[*b*]thiophen-2-yl)-6-(trifluoromethyl)pyridine (18): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and benzo[*b*]thiophene (201 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **18** (190 mg, 68%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.94 (s, 1H), 7.91-7.81 (m, 4H), 7.57 (dd, *J* = 2.2 and 6.4 Hz, 1H), 7.42-7.36 (m, 2H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 153.1, 148.2 (q, *J* = 34.8 Hz), 143.0, 141.0, 140.2, 138.0, 125.8, 124.7, 124.5, 122.8, 122.6, 122.0, 121.3 (d, *J* = 276.6 Hz), 118.8 (q, *J* = 2.8 Hz).

Elemental analysis: calcd (%) $C_{14}H_8F_3NS$ for (279.28): C 60.21, H 2.89; found: C 60.47, H 3.09.

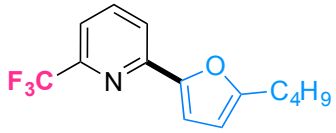


2-(Benzofuran-2-yl)-6-(trifluoromethyl)pyridine (19): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and benzofuran (177 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **19** (155 mg, 59%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.08 (d, *J* = 8.0 Hz, 1H), 7.96 (t, *J* = 8.0 Hz, 1H), 7.72-7.66 (m, 1H), 7.63 (s, 1H), 7.59 (dd, *J* = 0.8 and 9.2 Hz, 2H), 7.39 (ddd, *J* = 1.4, 7.3 and 8.3 Hz, 1H), 7.33-7.27 (m, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 155.5, 153.8, 149.7, 148.5 (q, *J* = 34.9 Hz), 138.2, 128.7, 125.7, 123.42, 122.0, 121.8, 121.4 (q, *J* = 270.8 Hz), 119.1 (q, *J* = 2.7 Hz), 111.5, 106.6.

Elemental analysis: calcd (%) $C_{14}H_8F_3NO$ for (263.22): C 63.88, H 3.06; found: C 64.03, H 3.21.

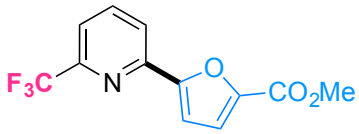


2-(5-Butylfuran-2-yl)-6-(trifluoromethyl)pyridine (20): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 2-butylfuran (186 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **20** (240 mg, 89%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.84-7.78 (m, 2H), 7.44 (dd, *J* = 1.2 and 7.3 Hz, 1H), 7.11 (d, *J* = 3.3 Hz, 1H), 6.15 (d, *J* = 3.3 Hz, 1H), 2.72 (t, *J* = 7.6 Hz, 2H), 1.73-1.66 (m, 2H), 1.43 (quint., *J* = 7.4 Hz, 2H), 0.95 (t, *J* = 7.4 Hz , 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 158.8, 150.8, 150.1, 148.0 (q, *J* = 34.5 Hz), 137.7, 122.9, 121.5 (q, *J* = 275.1 Hz), 117.4 (q, *J* = 2.9 Hz), 111.5, 107.9, 30.1, 28.0, 22.3, 13.8.

Elemental analysis: calcd (%) $C_{14}H_{14}F_3NO$ for (269.26): C 62.45, H 5.24; found: C 62.58, H 5.37.

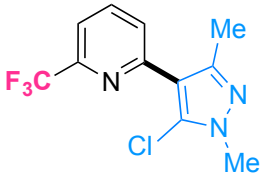


Methyl 5-(6-(trifluoromethyl)pyridin-2-yl)furan-2-carboxylate (21): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 2-butylfuran (189 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **21** (192 mg, 71%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.06 (d, *J* = 8.0 Hz, 1H), 7.94 (t, *J* = 8.0 Hz, 1H), 7.60 (d, *J* = 8.0 Hz, 1H), 7.28-7.26 (m, 2H), 3.93 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 158.9, 155.4, 148.6, 148.6 (q, *J* = 34.5 Hz), 145.0, 138.3, 121.8, 121.3 (q, *J* = 269.4 Hz), 119.9, 119.5 (q, *J* = 2.7 Hz), 111.8, 52.1.

Elemental analysis: calcd (%) $C_{12}H_8F_3NO_3$ for (271.20): C 53.15, H 2.97; found: C 53.32, H 3.19.

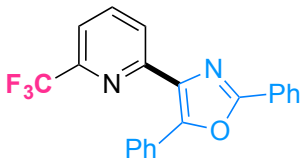


2-(5-Chloro-1,3-dimethyl-1*H*-pyrazol-4-yl)-6-(trifluoromethyl)pyridine (22): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 5-chloro-1,3-dimethylpyrazole (196 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **22** (234 mg, 85%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.88 (t, *J* = 7.9 Hz, 1H), 7.79 (d, *J* = 8.0 Hz, 1H), 7.55 (d, *J* = 7.1 Hz, 1H), 3.85 (s, 3H), 2.49 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 152.2, 148.5, 147.9 (q, *J* = 34.6 Hz), 137.5, 126.4, 124.6, 121.6 (q, *J* = 276.3 Hz), 117.4 (q, *J* = 2.7 Hz), 115.3, 36.2, 14.3.

Elemental analysis: calcd (%) $C_{11}H_9ClF_3N_3$ for (275.66): C 47.93, H 3.29; found: C 47.81, H 3.08.

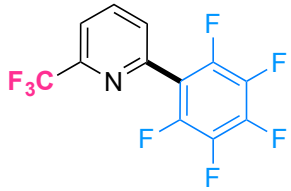


2,5-Diphenyl-4-(6-(trifluoromethyl)pyridin-2-yl)oxazole (23): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 2,5-diphenyloxazole (332 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **23** (311 mg, 85%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.36 (d, *J* = 8.2 Hz, 1H), 8.32 (dd, *J* = 1.8 and 7.8 Hz, 2H), 8.23-8.19 (m, 2H), 7.98 (t, *J* = 8.0 Hz, 1H), 7.64 (d, *J* = 7.3 Hz, 1H), 7.57-7.43 (m, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 159.8, 152.5, 149.6, 147.2 (q, *J* = 34.9 Hz), 137.9, 134.9, 130.6, 129.4, 128.9, 128.4, 128.2, 128.1, 127.0, 126.6, 125.3, 121.6 (q, *J* = 273.5 Hz), 118.9 (q, *J* = 2.7 Hz).

Elemental analysis: calcd (%) $C_{21}H_{13}F_3N_2O$ for (366.34): C 68.85, H 3.58; found: C 68.65, H 3.91.

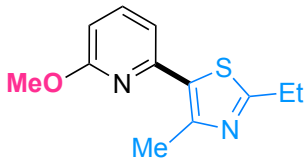


2-(Perfluorophenyl)-6-(trifluoromethyl)pyridine (24): Following the general procedure **C** using 2-bromo-6-(trifluoromethyl)pyridine (272 mg, 1 mmol) and 1,2,3,4,5-pentafluorobenzene (252 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **24** (266 mg, 85%).

^{1}H NMR (400 MHz, d_6-DMSO) δ (ppm) 7.98 (t, *J* = 7.9 Hz, 1H), 7.70 (d, *J* = 7.9 Hz, 1H), 7.65 (d, *J* = 7.9 Hz, 1H).

^{13}C NMR (100 MHz, d_6-DMSO) δ (ppm) 148.5, 147.2 (q, *J* = 34.5 Hz), 144.7 (dm, *J* = 245.8 Hz), 140.1, 138.6 (tdd, *J* = 5.3, 12.7 and 238.9 Hz), 138.1 (tt, *J* = 4.8 and 13.8 Hz), 129.9, 121.8 (q, *J* = 270.0 Hz), 121.0, 107.9 (t, *J* = 16.3 Hz).

Elemental analysis: calcd (%) $C_{12}H_3F_8N$ for (313.15): C 46.03, H 0.97; found: C 46.29, H 0.58.

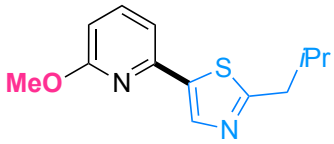


2-Ethyl-5-(6-methoxypyridin-2-yl)-4-methylthiazole (25): Following the general procedure **C** using 2-bromo-6-methoxypyridine (188 mg, 1 mmol) and 2-ethyl-4-methylthiazole (191 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **25** (124 mg, 53%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.56 (t, *J* = 7.8 Hz, 1H), 7.06 (d, *J* = 7.4 Hz, 1H), 6.61 (d, *J* = 8.2 Hz, 1H), 3.96 (s, 3H), 2.99 (q, *J* = 7.6 Hz, 2H), 2.69 (s, 3H), 1.40 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 171.4, 163.4, 149.2, 149.1, 139.0, 131.7, 114.2, 108.7, 53.4, 27.0, 17.7, 14.2.

Elemental analysis: calcd (%) $C_{12}H_{14}N_2OS$ for (234.32): C 61.51, H 6.02; found: C 62.84, H 6.29.

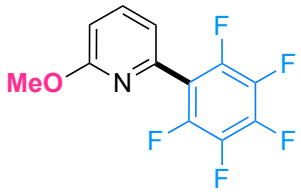


2-Isobutyl-5-(6-methoxypyridin-2-yl)thiazole (26): Following the general procedure **C** using 2-bromo-6-methoxypyridine (188 mg, 1 mmol) and 2-isobutylthiazole (212 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **26** (154 mg, 62%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.10 (s, 1H), 7.56 (t, *J* = 7.8 Hz, 1H), 7.18 (d, *J* = 7.4 Hz, 1H), 6.62 (d, *J* = 8.2 Hz, 1H), 3.97 (s, 3H), 2.89 (d, *J* = 7.2 Hz, 2H), 2.17-2.10 (m, 1H), 1.03 (d, *J* = 6.6 Hz, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 171.7, 163.7, 148.2, 139.4, 139.1, 112.1, 109.5, 53.4, 42.7, 29.9, 22.3.

Elemental analysis: calcd (%) $C_{13}H_{16}N_2OS$ for (248.34): C 62.87, H 6.49; found: C 62.91, H 6.59.

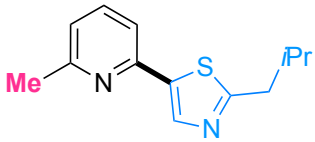


2-Methoxy-6-(perfluorophenyl)pyridine (27): Following the general procedure **C** using 2-bromo-6-methoxypyridine (188 mg, 1 mmol) and 1,2,3,4,5-pentafluorobenzene (252 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **27** (88 mg, 32%).

^{1}H NMR (400 MHz, d_6-DMSO) δ (ppm) 7.84 (t, *J* = 7.8 Hz, 1H), 7.18 (d, *J* = 7.3 Hz, 1H), 6.89 (d, *J* = 8.3 Hz, 1H), 3.85 (s, 3H).

^{13}C NMR (100 MHz, d_6-DMSO) δ (ppm) 163.3, 144.5, 144.2 (md, *J* = 241.5 Hz), 139.7, 138.2 (md, *J* = 239.7 Hz), 138.0 (md, *J* = 239.7 Hz), 119.1, 110.6, 108.6 (t, J = 18.7 Hz), 53.2.

Elemental analysis: calcd (%) $C_{12}H_6F_5NO$ for (275.18): C 52.38, H 2.20; found: C 52.49, H 2.49.

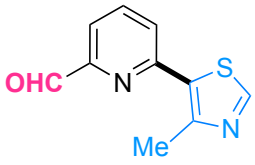


2-Isobutyl-5-(6-methylpyridin-2-yl)thiazole (28): Following the general procedure **C** using 2-bromo-6-methylpyridine (172 mg, 1 mmol) and 2-isobutylthiazole (212 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **28** (84 mg, 36%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.09 (s, 1H), 7.6 (t, *J* = 7.7 Hz, 1H), 7.45 (d, *J* = 7.8 Hz, 1H), 7.05 (d, *J* = 7.5 Hz, 1H), 2.91 (d, *J* = 7.3 Hz, 2H), 2.58 (s, 3H), 2.24-2.10 (m, 1H), 1.04 (d, *J* = 6.7 Hz, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 171.9, 158.8, 150.2, 139.7, 139.0, 136.9, 121.9, 116.6, 42.7, 29.9, 24.5, 22.4.

Elemental analysis: calcd (%) $C_{13}H_{16}N_2S$ for (232.34): C 67.20, H 6.94; found: C 67.49, H 7.18.

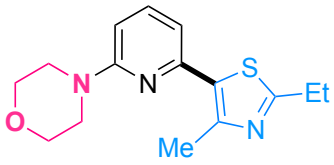


6-(4-Methylthiazol-5-yl)picolinaldehyde (29): Following the general procedure **C** using 6-bromopicolinaldehyde (186 mg, 1 mmol) and 4-methylthiazole (150 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **29** (86 mg, 42%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 10.11 (s, 1H), 8.80 (s, 1H), 7.97 (t, *J* = 7.6 Hz, 1H), 7.90 (d, *J* = 7.7 Hz, 1H), 7.82 (d, *J* = 7.7 Hz, 1H), 2.80 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 193.2, 152.8, 152.7, 152.6, 152.3, 151.4, 137.9, 125.8, 119.4, 17.7.

Elemental analysis: calcd (%) $C_{10}H_8N_2OS$ for (204.25): C 58.81, H 3.95; found: C 58.54, H 4.24.

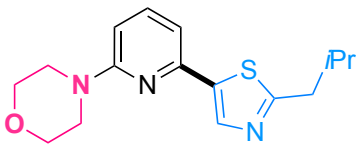


4-(6-(2-Ethyl-4-methylthiazol-5-yl)pyridin-2-yl)morpholine (30): Following the general procedure **C** using 4-(6-bromopyridin-2-yl)morpholine (243 mg, 1 mmol) and 2-ethyl-4-methylthiazole (191 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **30** (255 mg, 88%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.50 (dd, *J* = 7.5 and 8.5 Hz, 1H), 6.89 (d, *J* = 7.5 Hz, 1H), 6.49 (d, *J* = 8.5 Hz, 1H), 3.82 (dd, *J* = 4.6 and 5.5 Hz, 4H), 3.53 (dd, *J* = 4.1 and 5.6 Hz, 4H), 2.97 (q, *J* = 7.6 Hz, 2H), 2.65 (s, 3H), 1.38 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm) 171.4, 158.9, 149.9, 148.6, 138.2, 132.9, 111.4, 104.8, 66.8, 45.5, 27.1, 17.9, 14.4.

Elemental analysis: calcd (%) $C_{15}H_{19}N_3OS$ for (289.40): C 62.26, H 6.62; found: C 62.37, H 6.20.

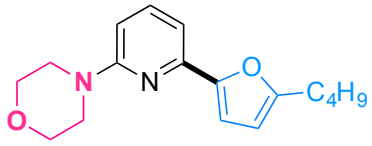


4-(6-(2-Isobutylthiazol-5-yl)pyridin-2-yl)morpholine (31): Following the general procedure **C** using 4-(6-bromopyridin-2-yl)morpholine (243 mg, 1 mmol) and 2-isobutylthiazole (212 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **31** (264 mg, 87%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.04 (s, 1H), 7.49 (dd, *J* = 7.5 and 8.6 Hz, 1H), 7.00 (d, *J* = 7.5 Hz, 1H), 6.50 (d, *J* = 8.6 Hz, 1H), 3.83 (dd, *J* = 4.0 and 5.3 Hz, 4H), 3.54 (dd, *J* = 4.0 and 5.3 Hz, 4H), 2.86 (d, *J* = 7.2 Hz, 2H), 2.23-2.05 (m, 1H), 1.01 (d, *J* = 6.7 Hz, 6H).

^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm) 171.7, 159.1, 148.9, 140.5, 138.8, 138.3, 109.2, 105.4, 66.9, 45.4, 42.8, 30.0, 22.4.

Elemental analysis: calcd (%) $C_{16}H_{21}N_3OS$ for (303.42): C 63.34, H 6.98; found: C 63.54, H 7.18.

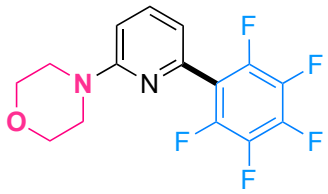


4-(6-(5-Butylfuran-2-yl)pyridin-2-yl)morpholine (32): Following the general procedure **C** using 4-(6-bromopyridin-2-yl)morpholine (243 mg, 1 mmol) and 2-butylfuran (186 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **32** (218 mg, 76%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.53 (dd, *J* = 7.6 and 8.4 Hz, 1H), 7.07 (d, *J* = 7.6 Hz, 1H), 6.90 (d, *J* = 3.3 Hz, 1H), 6.50 (d, *J* = 8.4 Hz, 1H), 6.11 (d, *J* = 3.3 Hz, 1H), 3.87 (dd, *J* = 4.3 and 5.6 Hz, 4H), 3.57 (dd, *J* = 4.3 and 5.6 Hz, 4H), 2.71 (t, *J* = 7.5 Hz, 2H), 1.69 (quint., *J* = 7.5 Hz, 2H), 1.49-1.41 (m, 2H), 0.96 (t, *J* = 7.3 Hz, 3H).

^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm) 170.9, 159.2, 152.8, 148.0, 138.2, 125.8, 115.8, 108.4, 105.0, 67.0, 45.8, 30.4, 28.2, 22.5, 14.0.

Elemental analysis: calcd (%) $C_{17}H_{22}N_2O_2$ for (286.38): C 71.30, H 7.74; found: C 71.56, H 7.58.

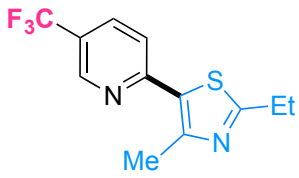


4-(6-(Perfluorophenyl)pyridin-2-yl)morpholine (33): Following the general procedure **C** using 4-(6-bromopyridin-2-yl)morpholine (243 mg, 1 mmol) and 1,2,3,4,5-pentafluorobenzene (252 mg, 1.5 mmol), the residue was purified by flash chromatography on silica gel to afford the desired compound **33** (211 mg, 64%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 7.32 (t, *J* = 7.9 Hz, 1H), 6.80 (d, *J* = 7.6 Hz, 1H), 6.52 (d, *J* = 8.6 Hz, 1H), 3.83 (dd, *J* = 4.3 and 5.6 Hz, 4H), 3.52 (dd, *J* = 4.3 and 5.6 Hz, 4H),

^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm) 171.6, 159.3, 144.9 (dm, *J* = 250.1 Hz), 138.2 (dm, *J* = 249.8 Hz), 127.8 (dm, *J* = 248.9 Hz), 138.0, 115.6, 107.1, 102.0 (t, *J* = 25.0 Hz), 66.6, 45.3.

Elemental analysis: calcd (%) $C_{15}H_{11}F_5N_2O$ for (330.25): C 54.55, H 3.36; found: C 54.20, H 3.43.

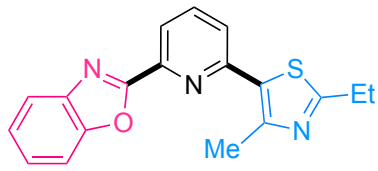


2-Ethyl-4-methyl-5-(5-(trifluoromethyl)pyridin-2-yl)thiazole (34): The reaction of 2-bromo-5-(trifluoromethyl)pyridine (226 mg, 1 mmol), 2-ethyl-4-methylthiazole (191 mg, 1.5 mmol), KOAc (196 mg, 2 equiv.) at 150 °C during 16 h in DMA (4 mL) in the presence of $PdCl(C_3H_5)$(dppb) (12 mg, 2 mol%) under argon affords after evaporation of the solvent and purification by silica column chromatography the desired product **34** (142 mg, 52%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.78 (s, 1H), 7.87 (dd, *J* = 2.4 and 8.4 Hz, 1H), 7.57 (d, *J* = 8.4 Hz, 1H), 2.95 (q, *J* = 7.6 Hz, 2H), 2.63 (s, 3H), 1.35 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 173.7, 155.5, 151.1, 146.7 (q, *J* = 4.1 Hz), 134.0 (q, *J* = 3.5 Hz), 131.0, 124.2 (q, *J* = 28.6 Hz), 123.7 (q, *J* = 273.5 Hz), 120.9, 27.3, 18.0, 14.3.

Elemental analysis: calcd (%) $C_{12}H_{11}F_3N_2S$ for (272.28): C 52.93, H 4.07; found: C 53.17, H 4.01.



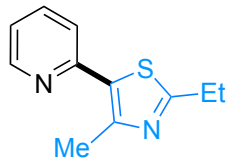
2-(6-(2-Ethyl-4-methylthiazol-5-yl)pyridin-2-yl)benzoxazole (38): The reaction of 5-(6-bromopyridin-2-yl)-2-ethyl-4-methylthiazole (**2**) (283 mg, 1 mmol), benzoxazole (179 mg, 1.5 mmol), Cs_2CO_3 (650 mg, 2 equiv.) at

150 °C during 16 h in DMF (4 mL) in the presence of $PdCl(C_3H_5)(dppb)$[1] (12 mg, 2 mol%) under argon affords after evaporation of the solvent and purification by silica column chromatography the desired product **38** (238 mg, 74%).

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.25 (d, *J* = 7.8 Hz, 1H), 7.92 (t, *J* = 7.8 Hz, 1H), 7.86 (dd, *J* = 2.1 and 7.3 Hz, 1H), 7.71-7.68 (m, 1H), 7.66 (d, *J* = 7.8 Hz, 1H), 7.47-7.36 (m, 2H), 3.06 (q, *J* = 7.6 Hz, 2H), 2.76 (s, 3H), 1.44 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 172.7, 161.3, 152.6, 151.2, 150.1, 146.1, 141.8, 137.7, 131.0, 126.1, 124.9, 123.6, 121.3, 120.7, 111.4, 27.1, 17.4, 14.3.

Elemental analysis: calcd (%) $C_{18}H_{15}N_3OS$ for (321.39): C 67.27, H 4.70; found: C 67.39, H 4.55.



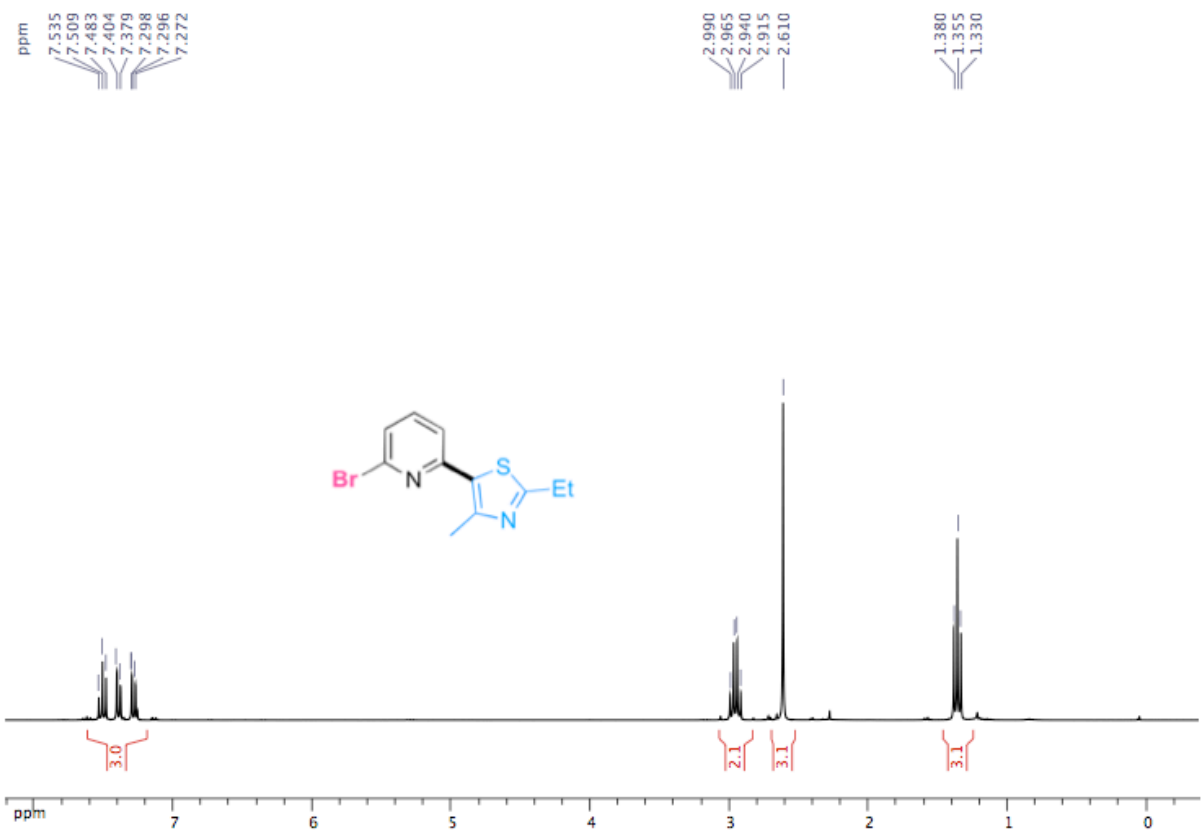
2-Ethyl-4-methyl-5-(pyridin-2-yl)thiazole (1): Autoclave was charged with 5-(6-bromopyridin-2-yl)-2-ethyl-4-methylthiazole (**2**) (283 mg, 1 mmol), Et_3N (270 µL; 2 mmol), Pd/C (29 mg, 10% of the weight of the 2-bromopyridine derivative) and MeOH (5 mL) and pressurized with hydrogen (3-5 bar). The crude mixture was stirred at 20 ºC during 16 h, and then the reaction was cooled down and filtered in the pad of Celite. After evaporation of the solvent and purification on silica gel **1** was isolated in 96% (0.196 g) yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm) 8.51 (d, *J* = 4.9 Hz, 1H), 7.62 (ddd, *J* = 1.9, 7.5 and 8.0 Hz, 1H), 7.44 (d, *J* = 8.0 Hz, 1H), 7.06 (dd, *J* = 4.9 and 7.5 Hz, 1H), 2.91 (q, *J* = 7.6 Hz, 2H), 2.56 (s, 3H), 1.31 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm) 172.1, 152.0, 149.8, 148.9, 136.6, 132.1, 121.6, 121.6, 27.1, 17.5, 14.3.

Elemental analysis: calcd (%) $C_{11}H_{12}N_2S$ for (204.29): C 64.67, H 5.92; found: C 64.98, H 6.27.

[1] Cantat, T.; Génin, E.; Giroud, C.; Meyer, G.; Jutand, A. *J. Organomet. Chem.* **2003**, *687*, 365-376.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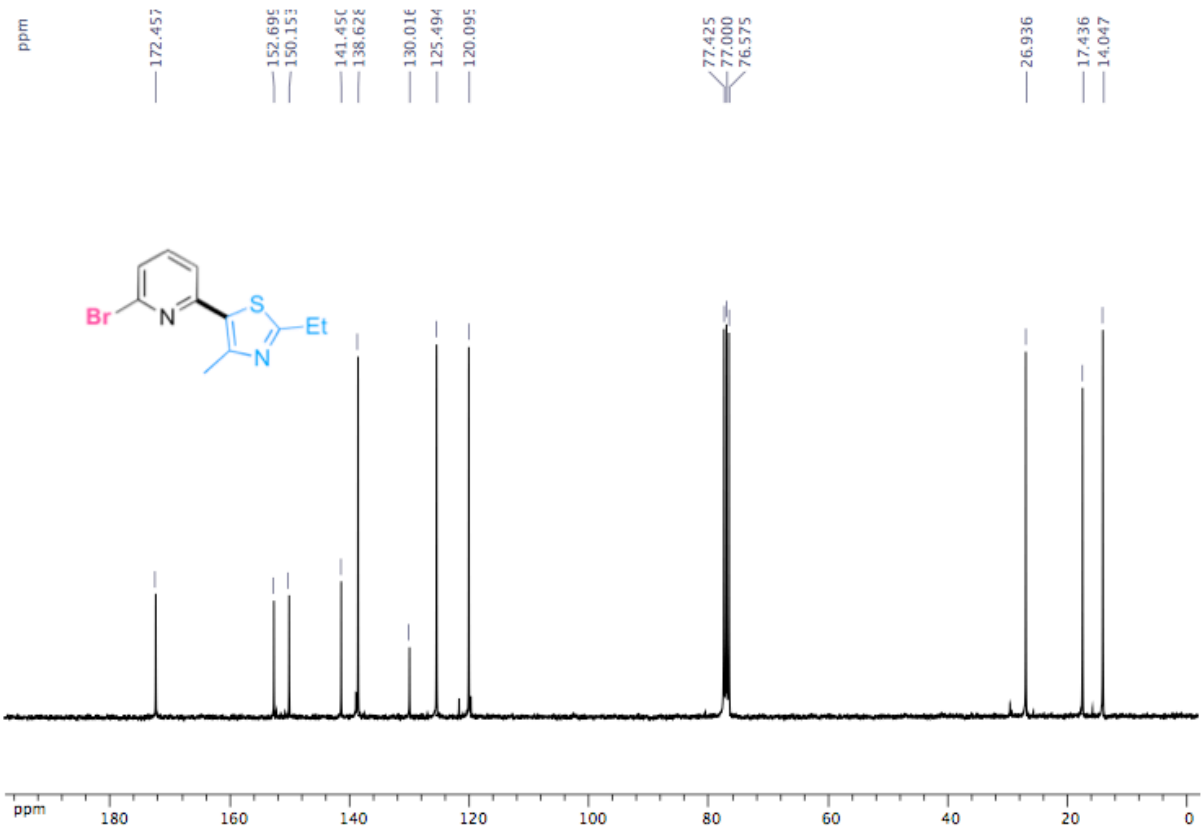
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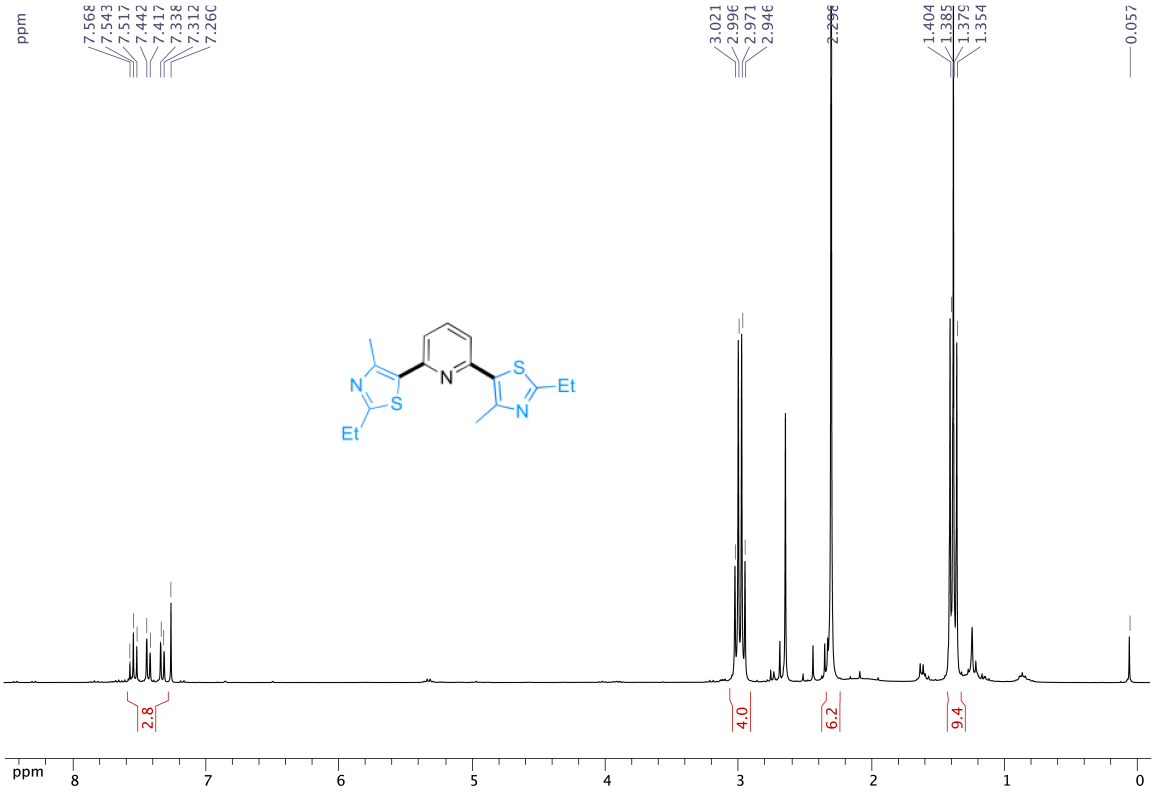
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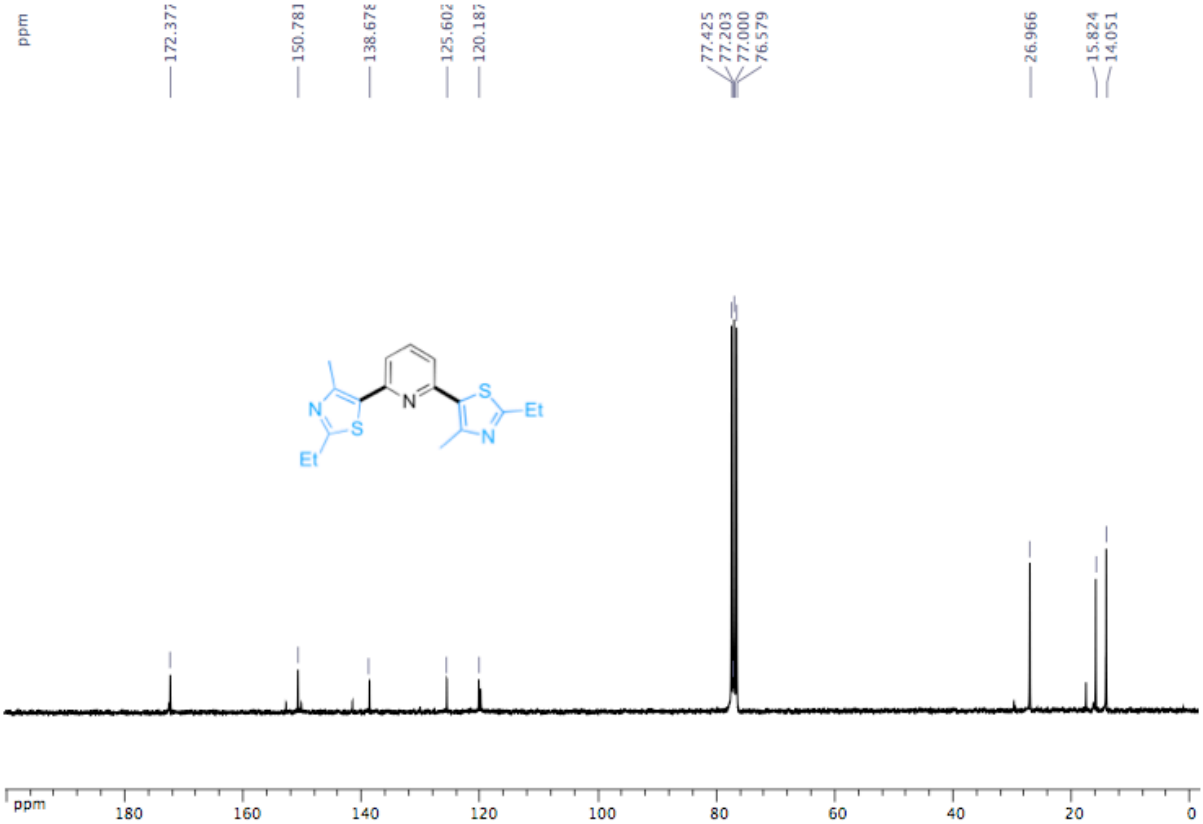
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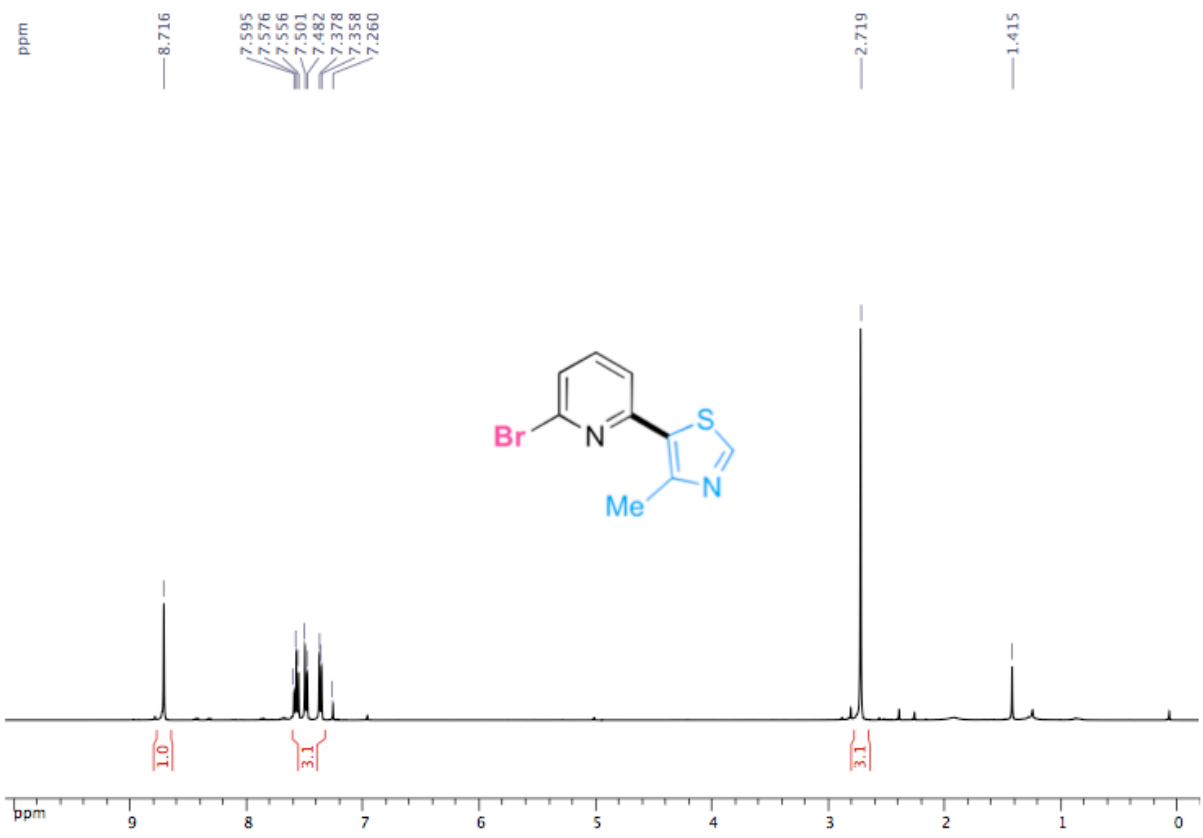
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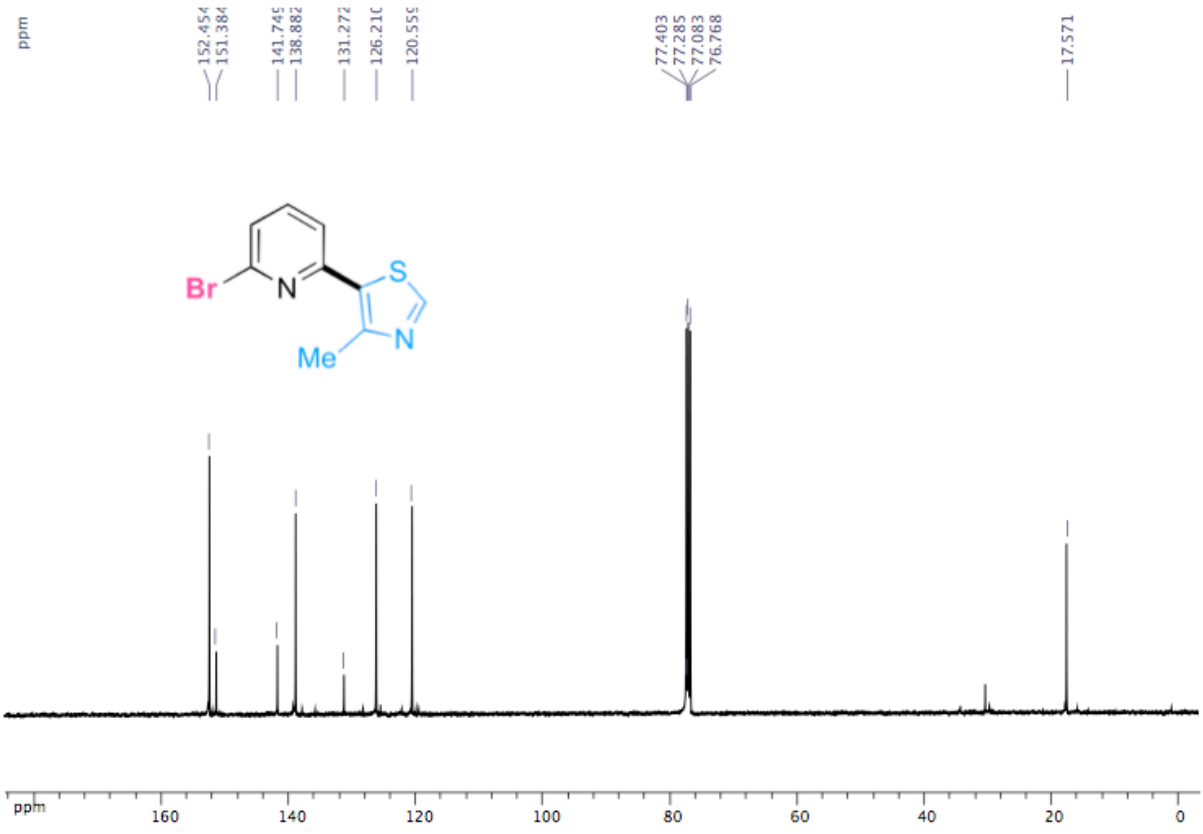
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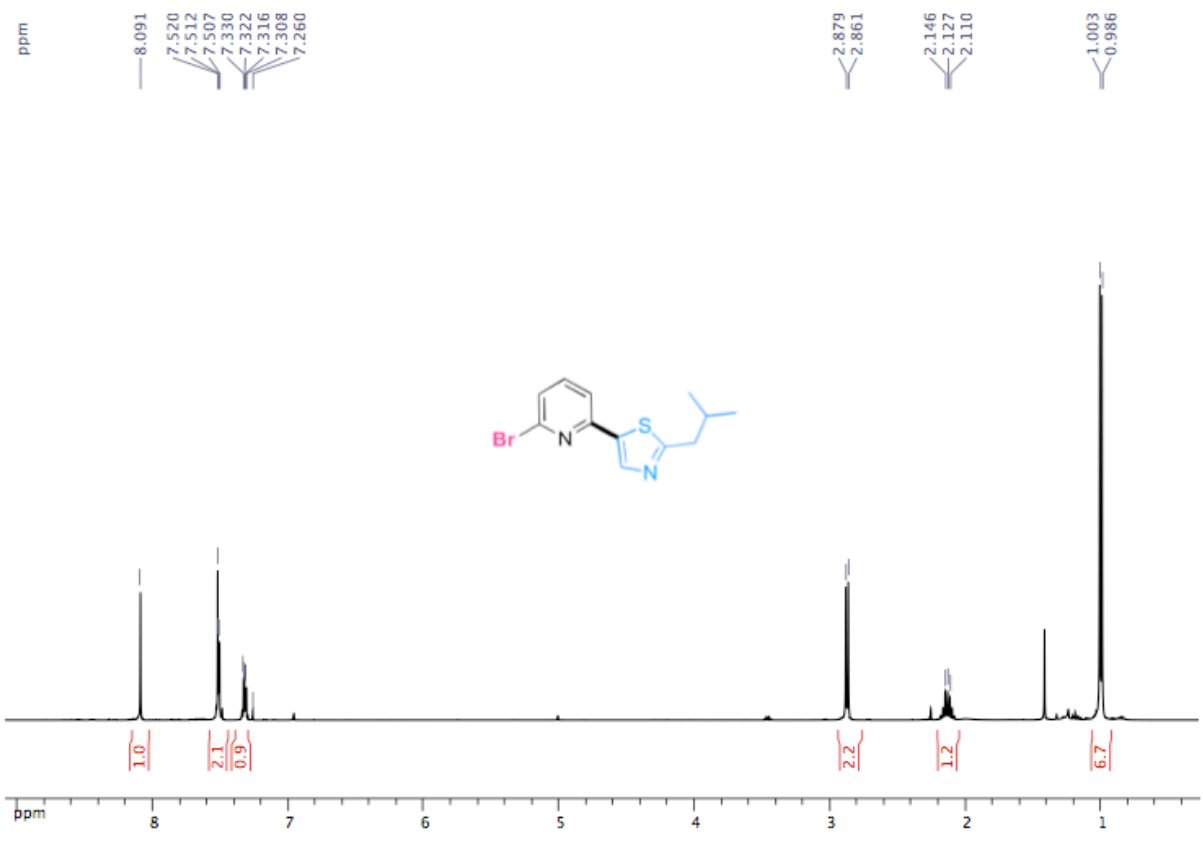
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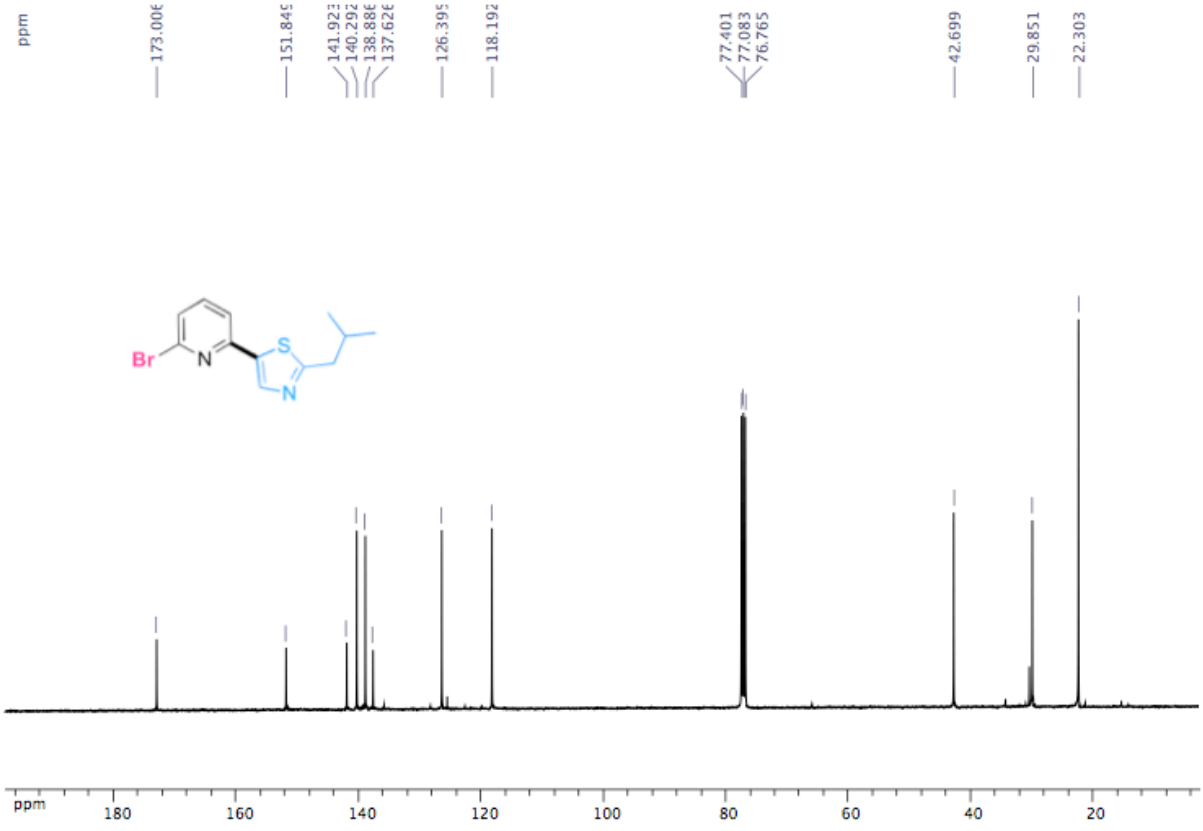
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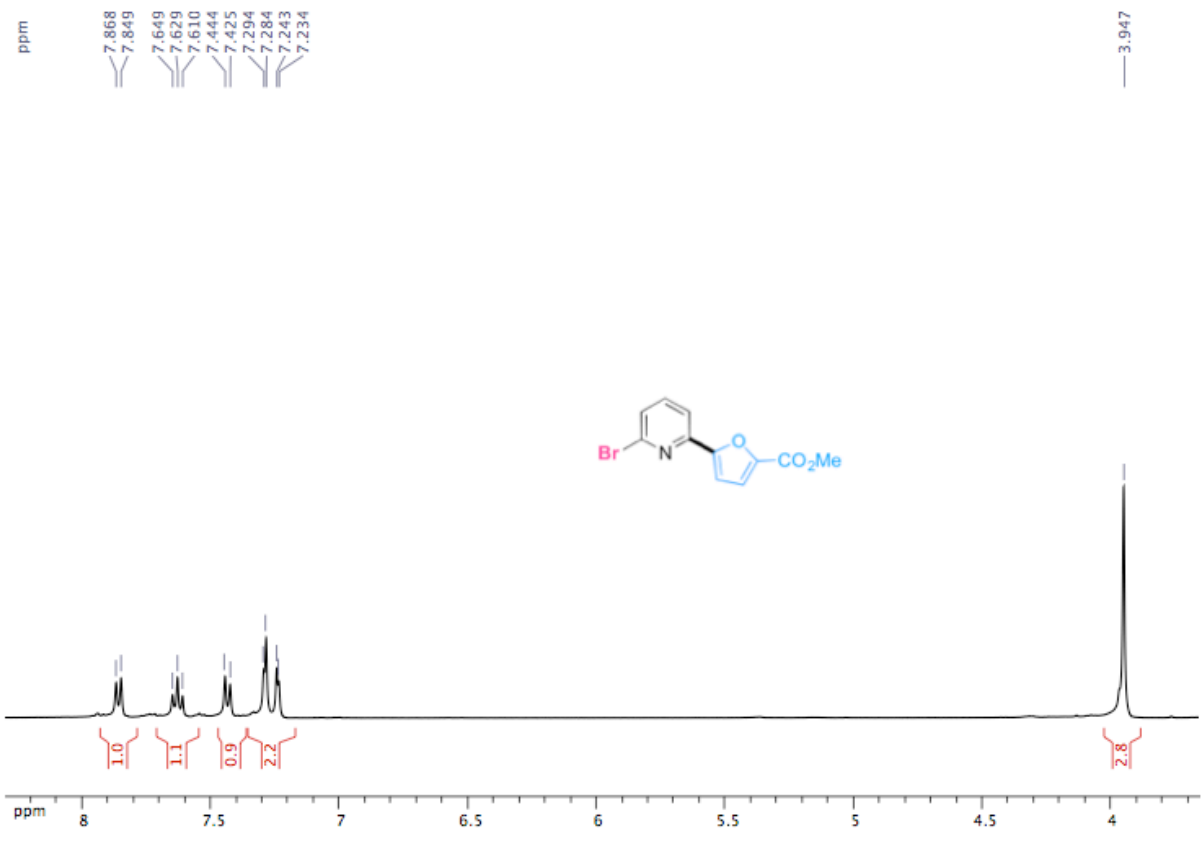
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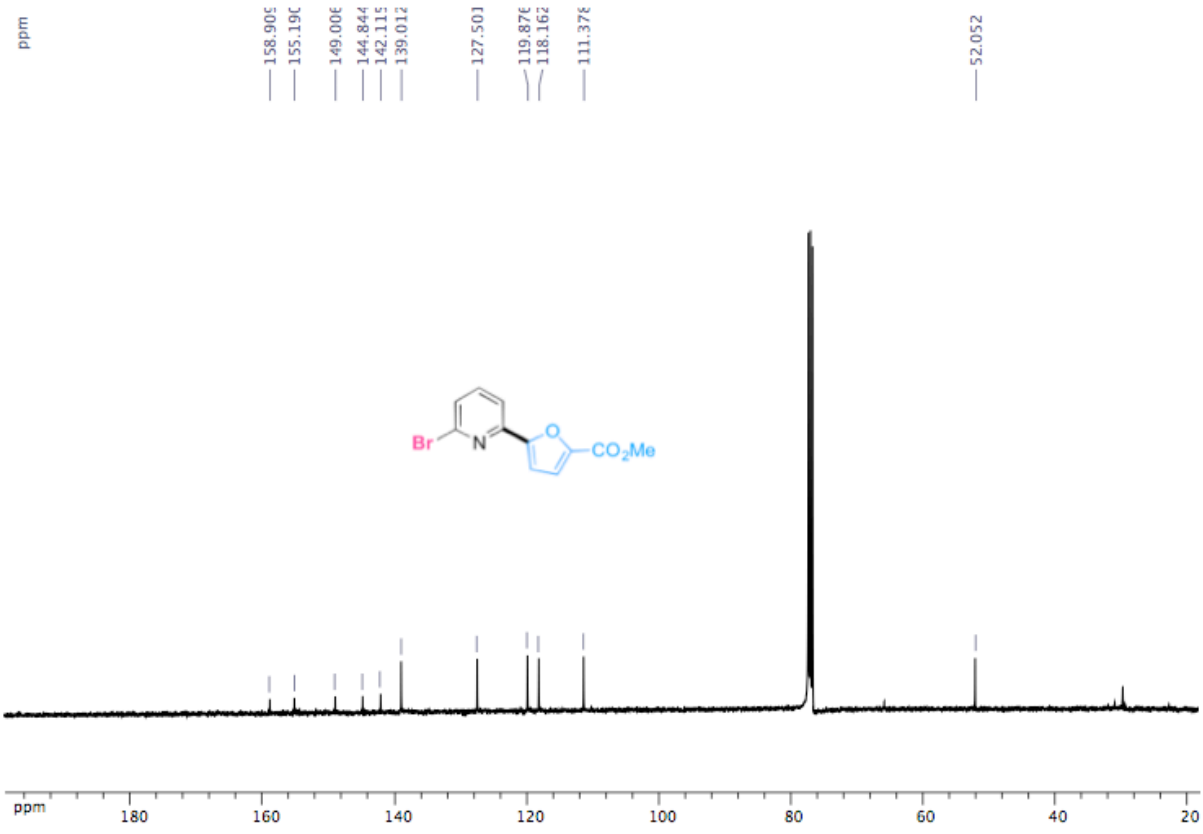
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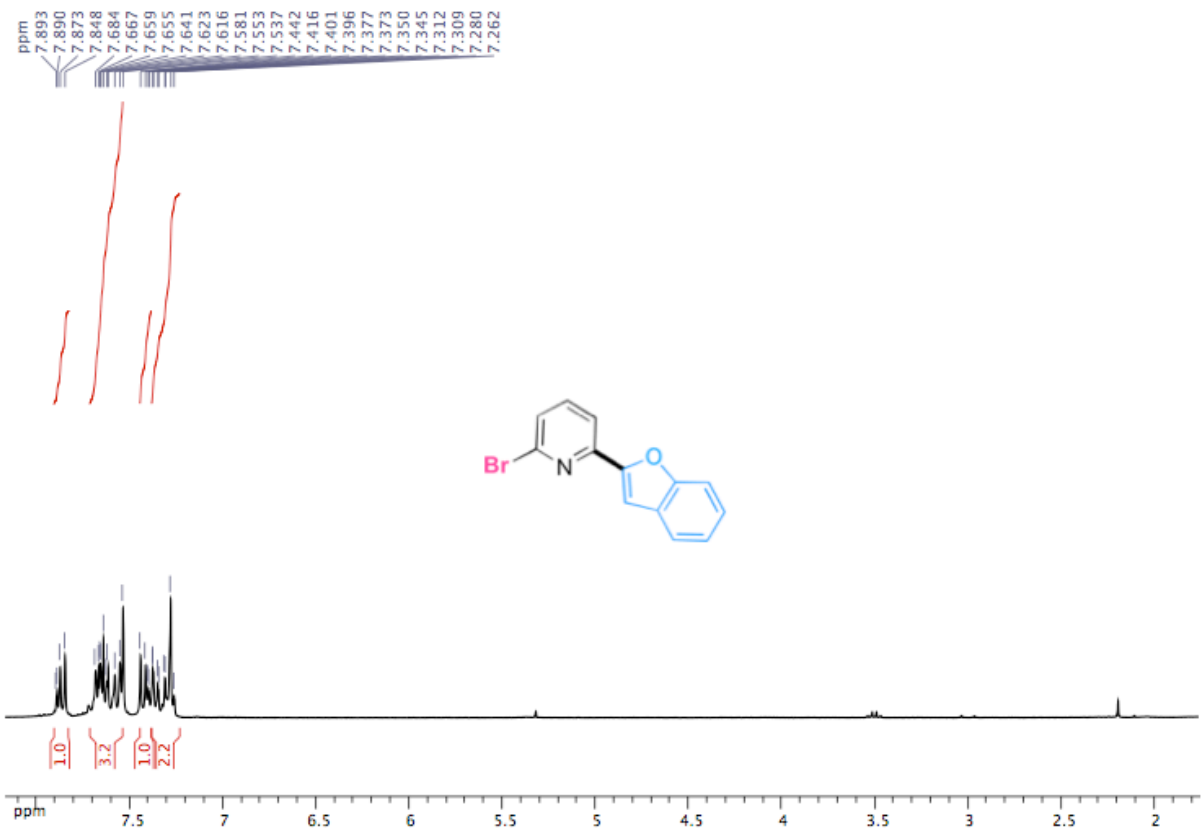
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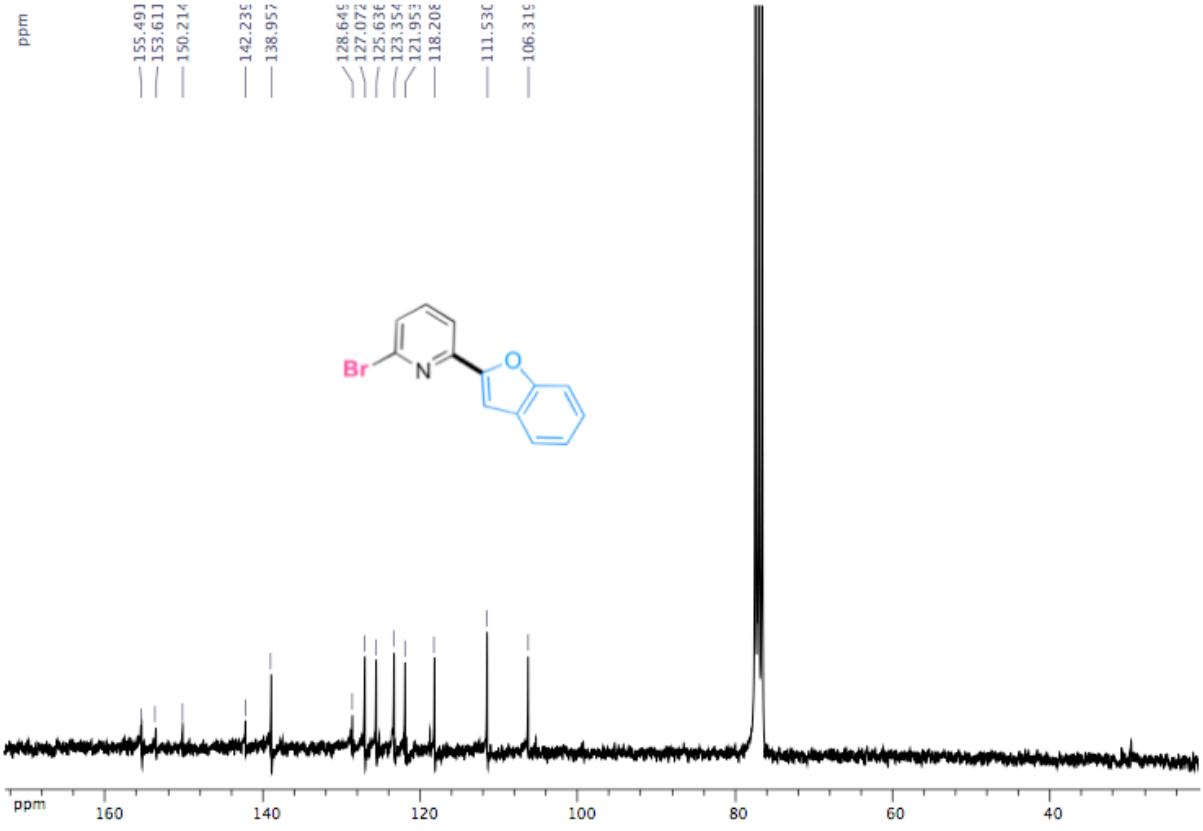
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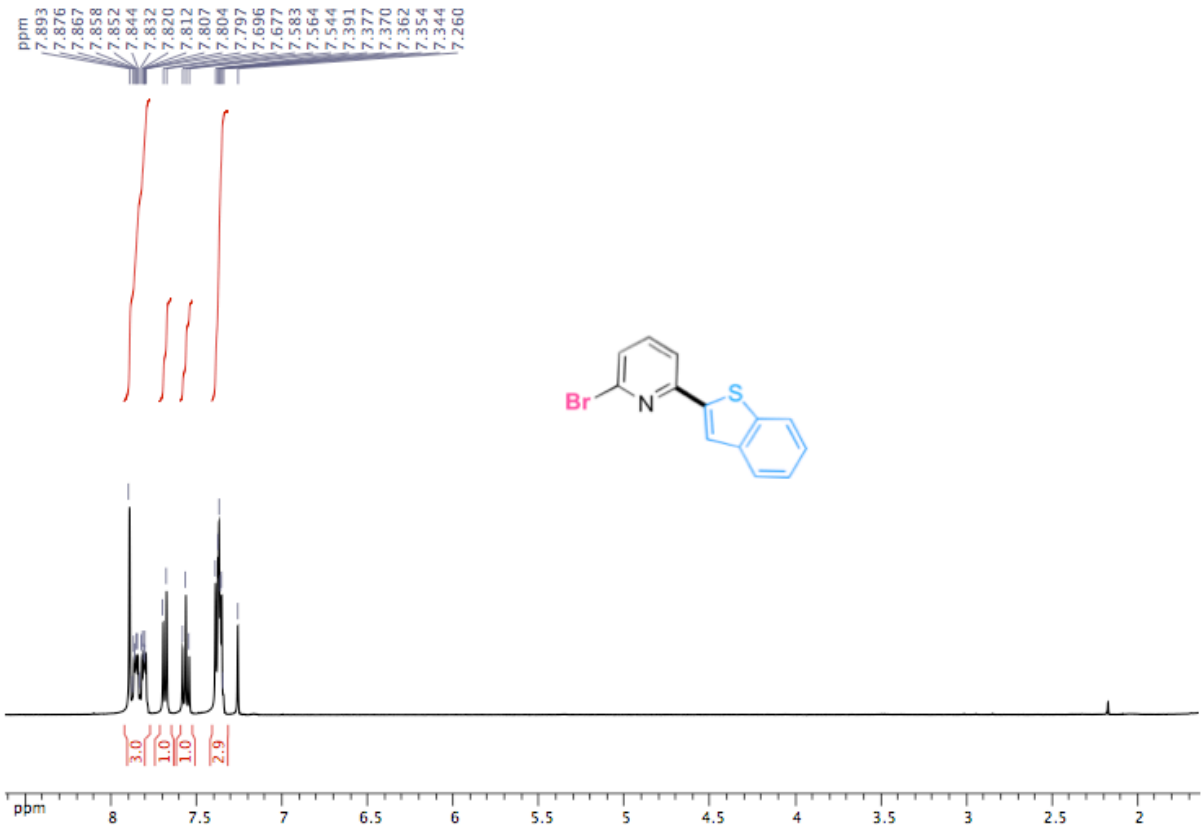
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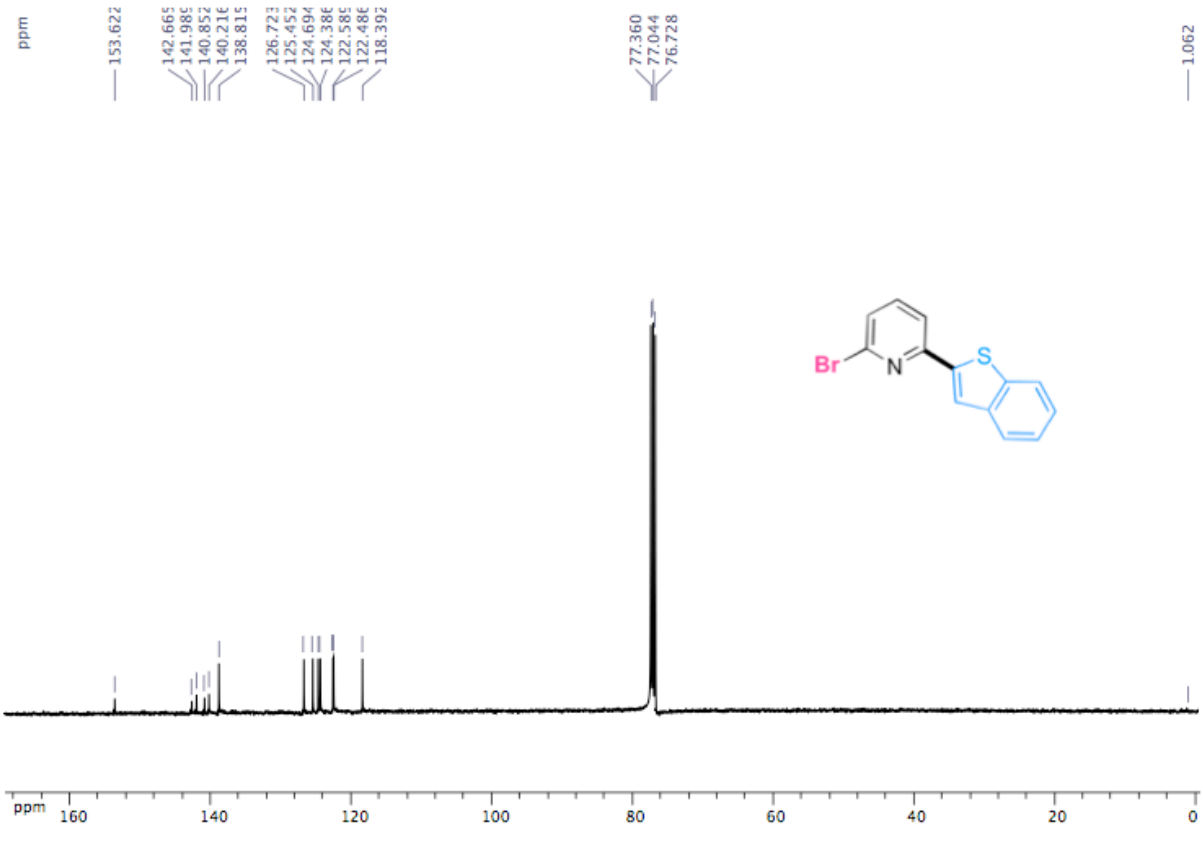
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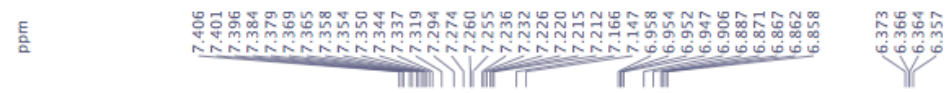
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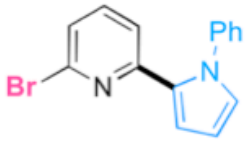
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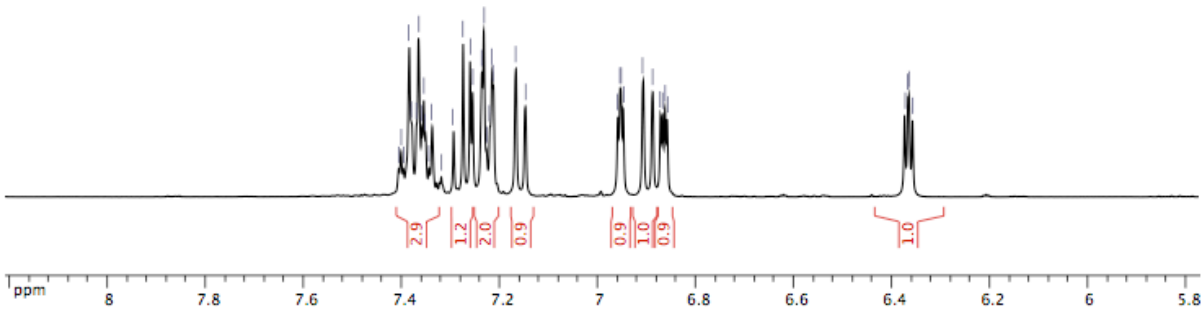
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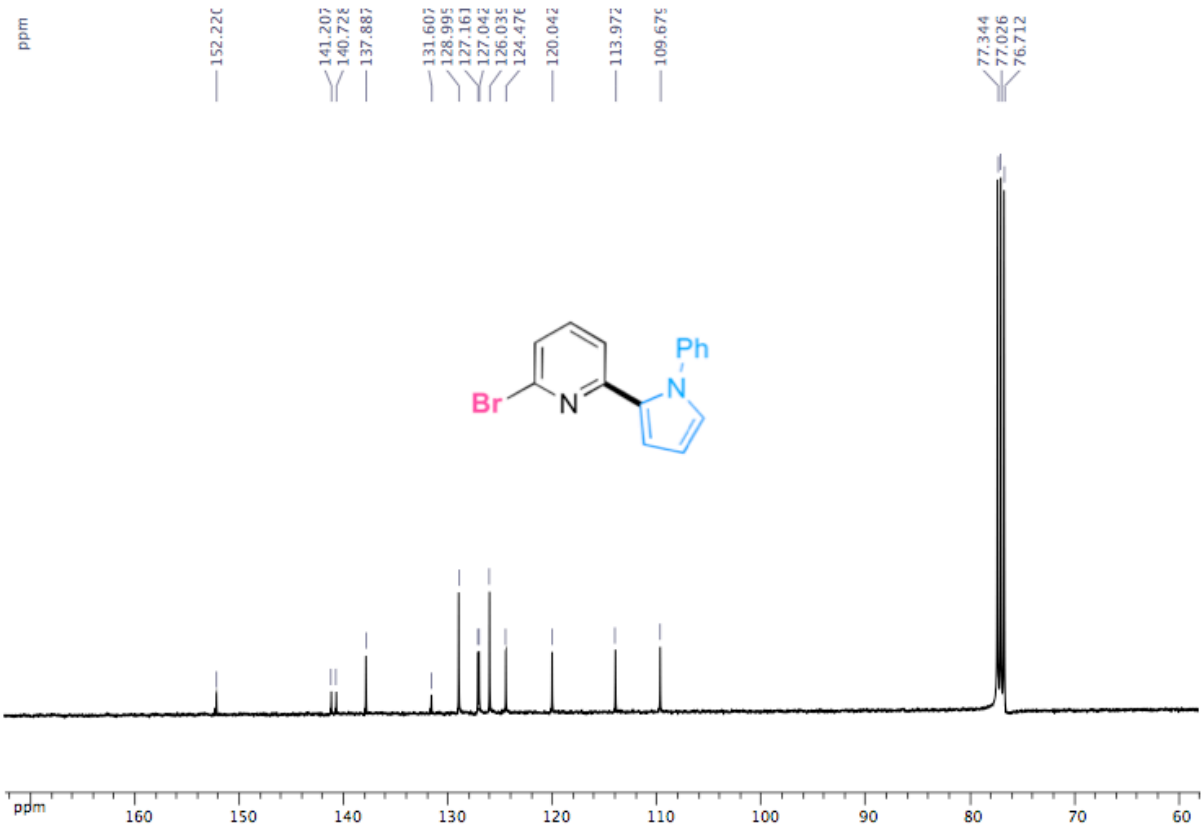
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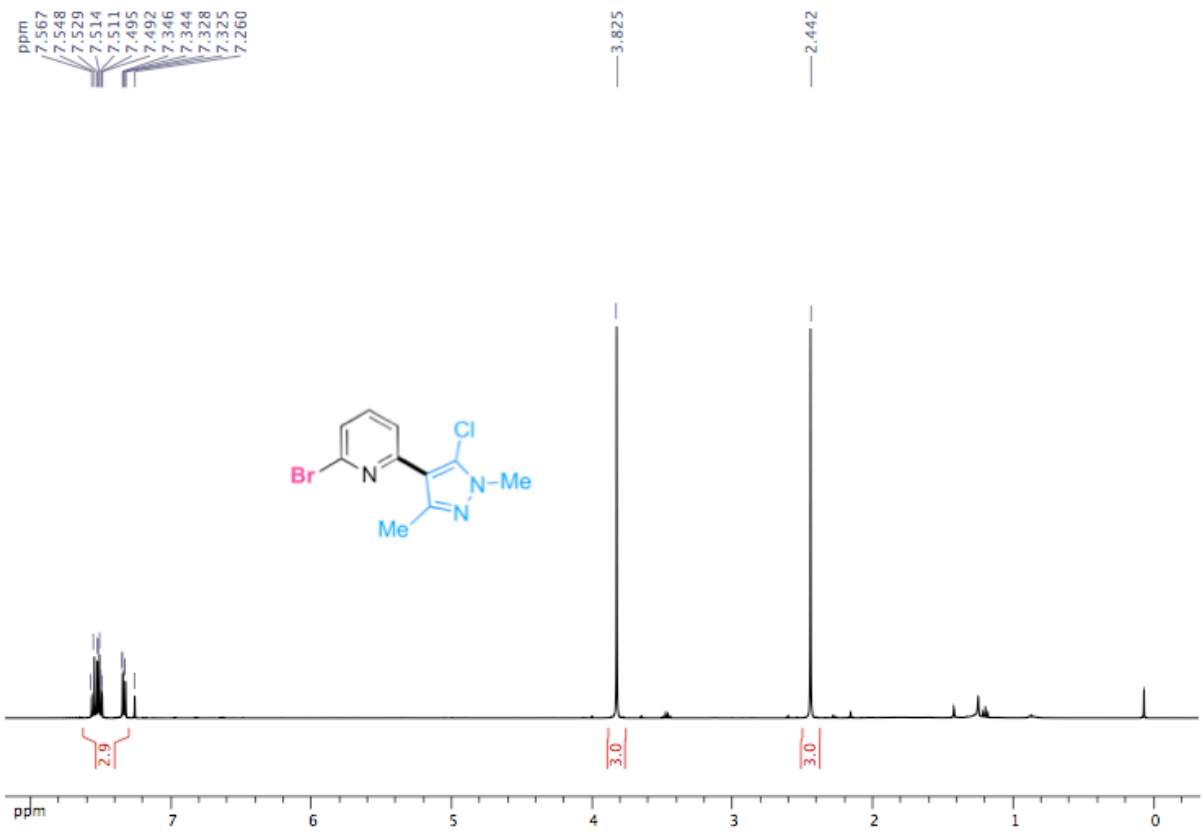
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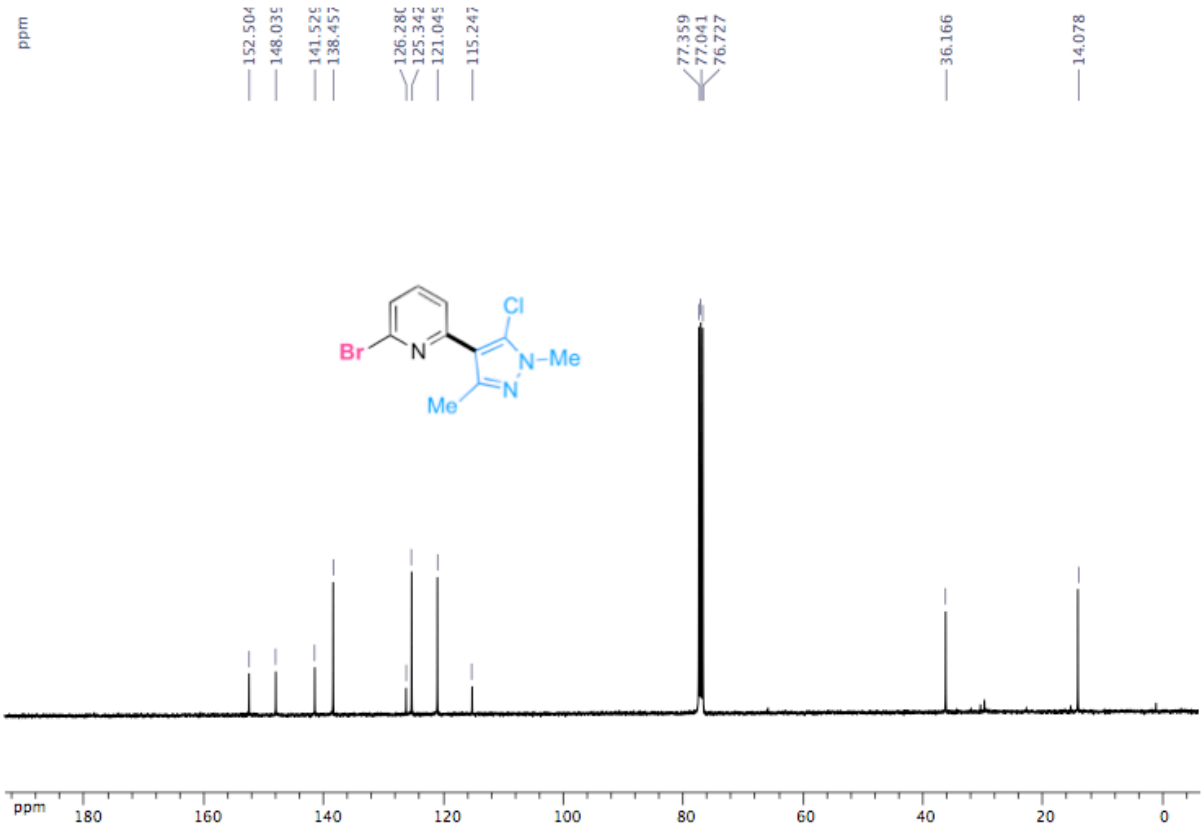
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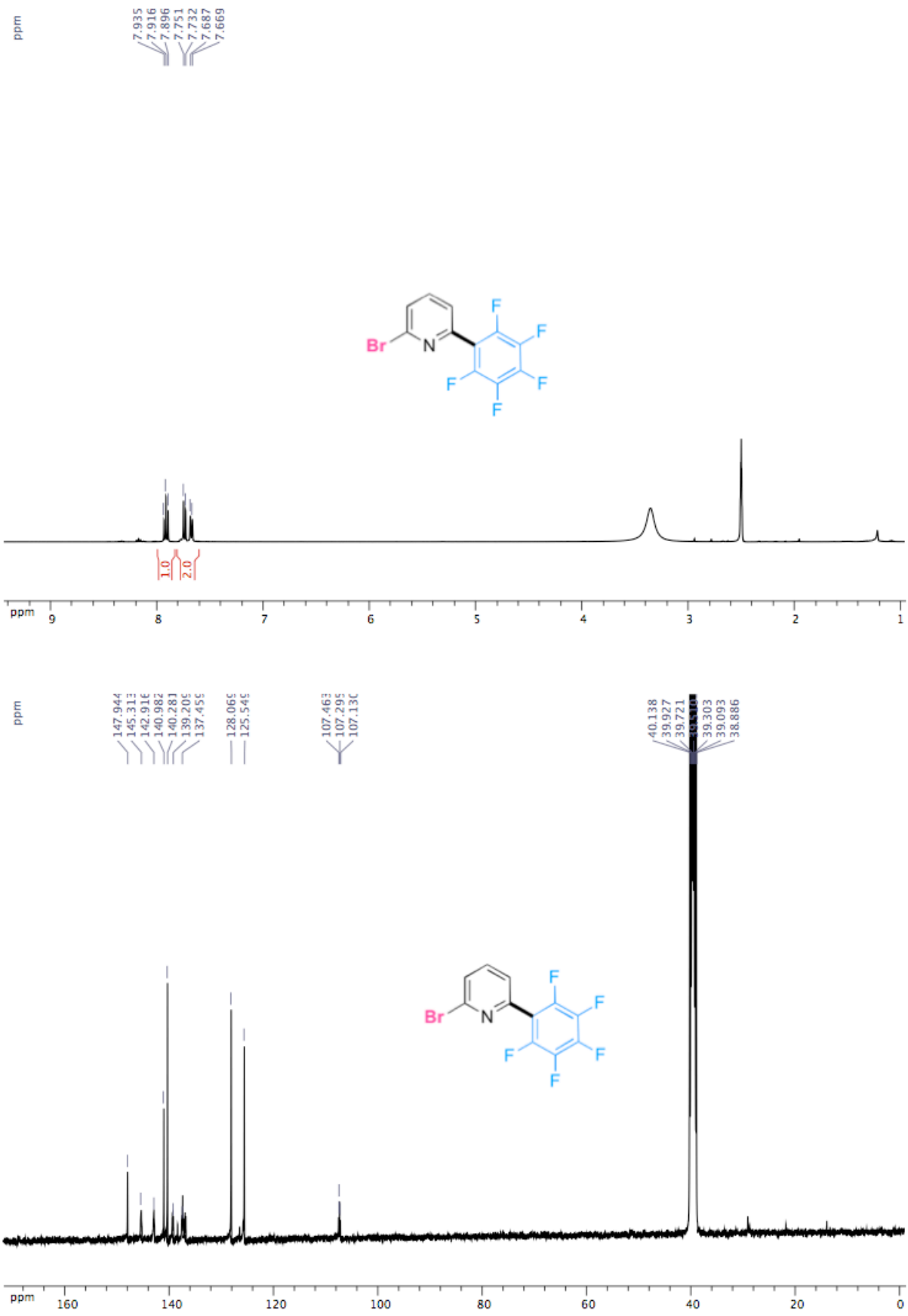
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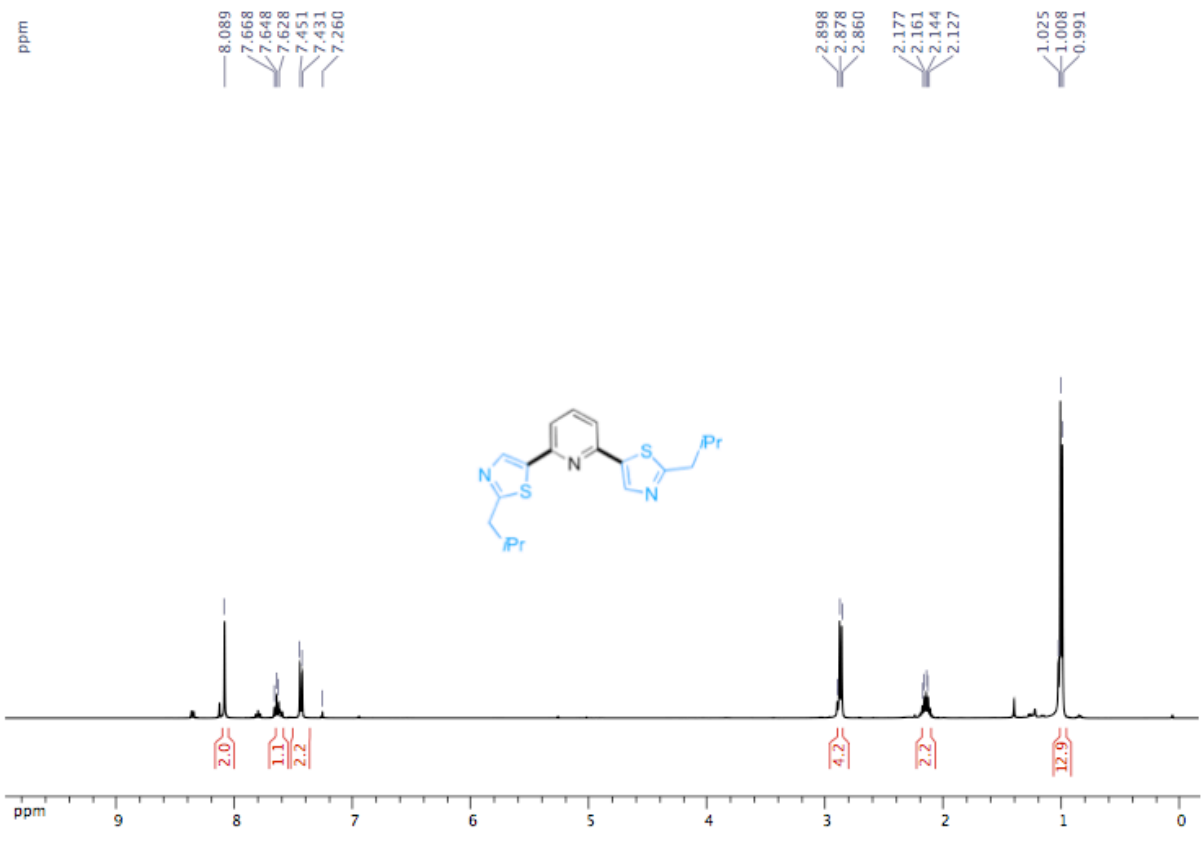
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iPr
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4
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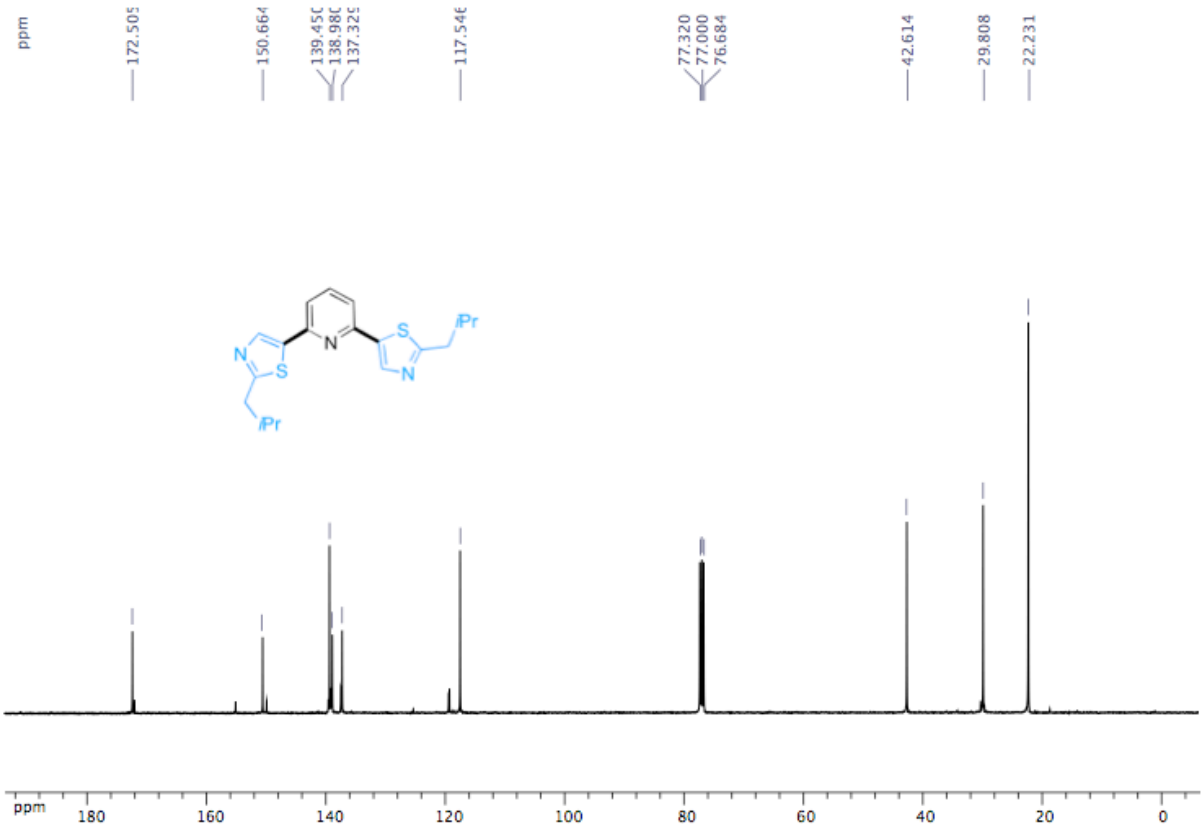
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172.505
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139.450
138.980
137.325
117.546
77.320
77.000
76.684
42.614
29.808
22.231
iPr
iPr
ppm
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140
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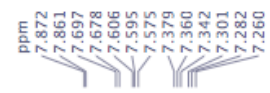
100
80
60
40
20
0


ppm
7.872
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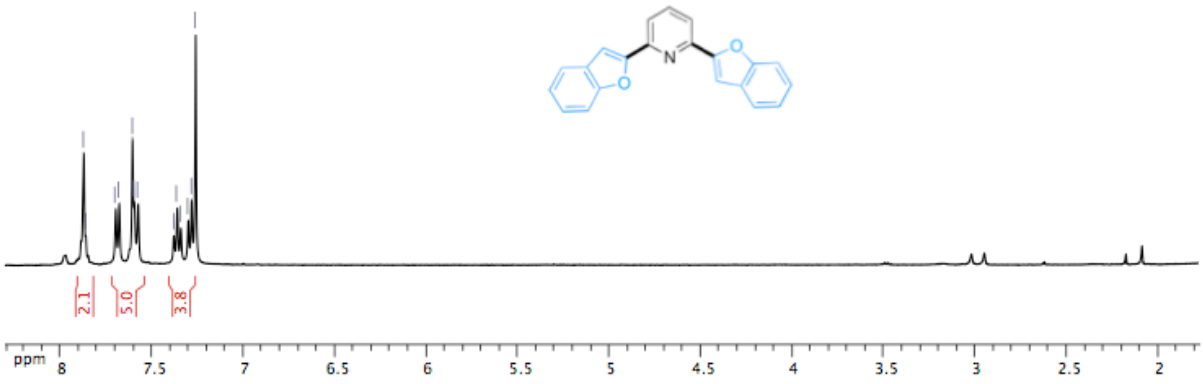
7.697
7.678
7.606
7.595
7.575
7.379
7.360
7.342
7.301
7.282
7.260


2.1
5.0
3.8
ppm
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6.5
6
5.5
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4.5
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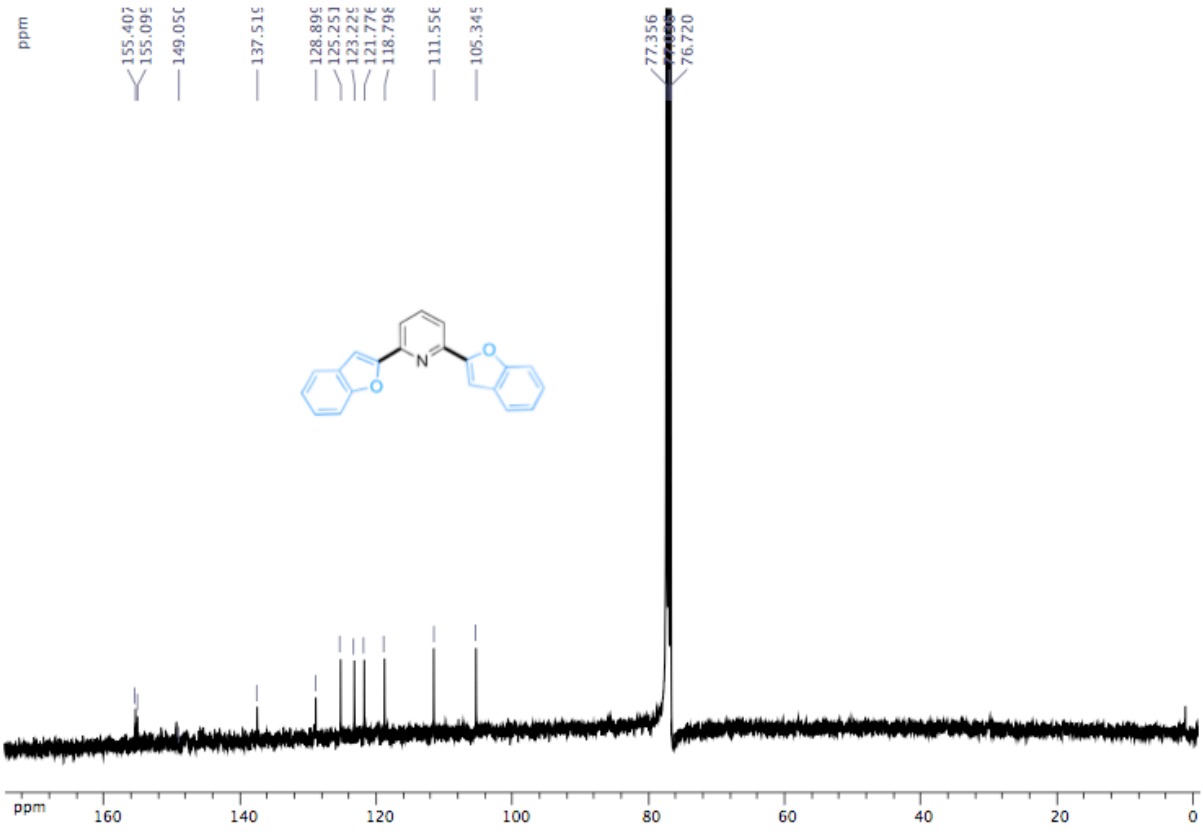
3.5
3
2.5
2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155.095
149.05
137.51
128.89
125.25
123.22
121.77
118.79
111.55
105.34
77.356
76.720
ppm
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140
120
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60
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20
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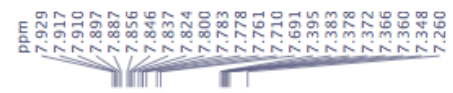
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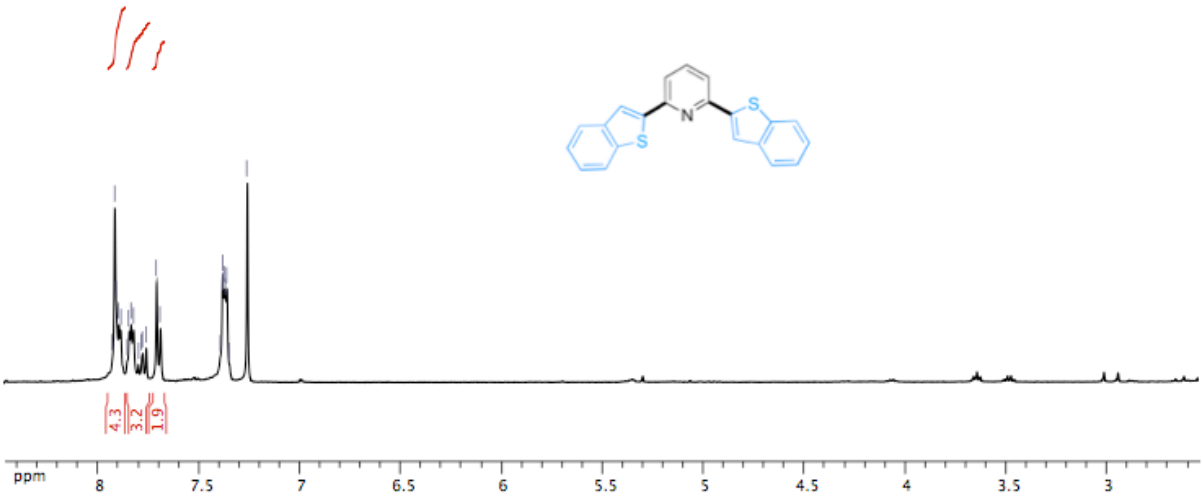
7.910
7.897
7.887
7.856
7.846
7.837
7.824
7.800
7.783
7.778
7.761
7.710
7.691
7.395
7.383
7.378
7.372
7.366
7.360
7.348
7.260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3.2
1.9
ppm
8
7.5
7
6.5
6
5.5
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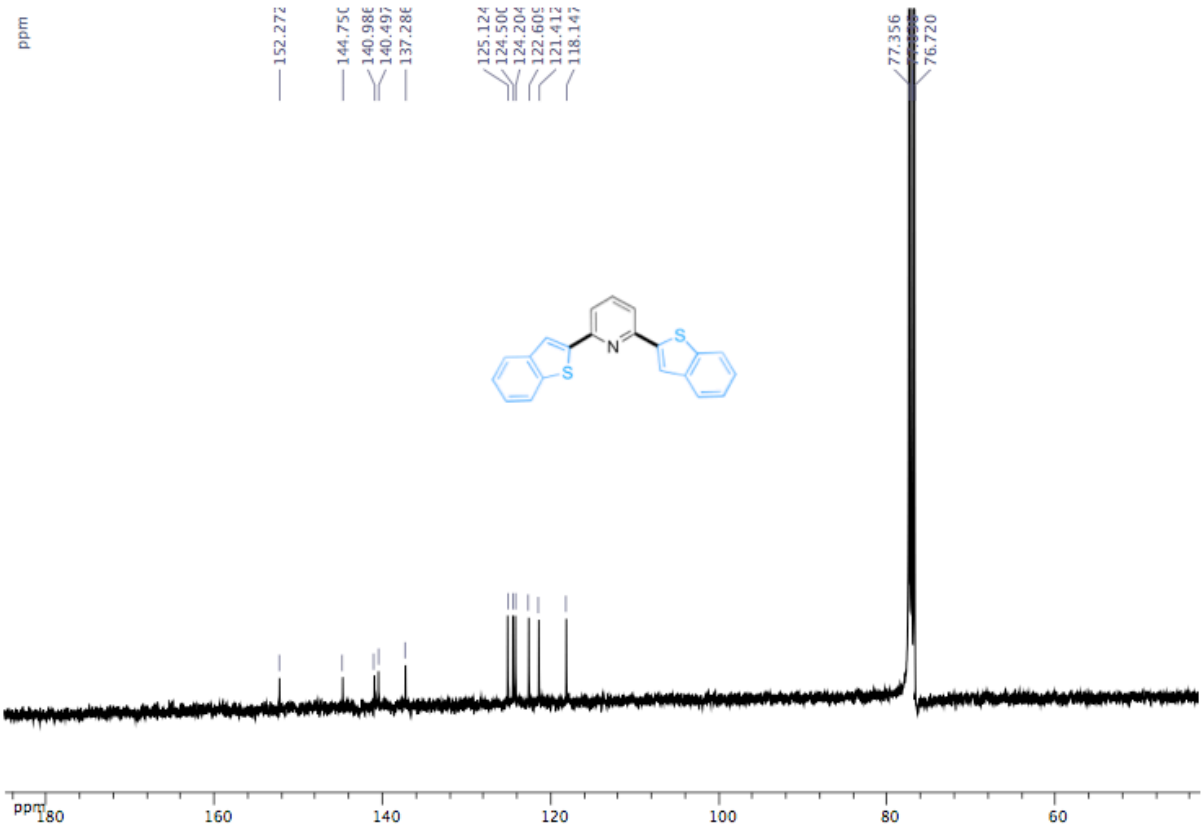
4.5
4
3.5
3


ppm
152.272
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140.497
137.288
125.124
124.500
124.204
122.605
121.412
118.147
77.356
76.720
ppm
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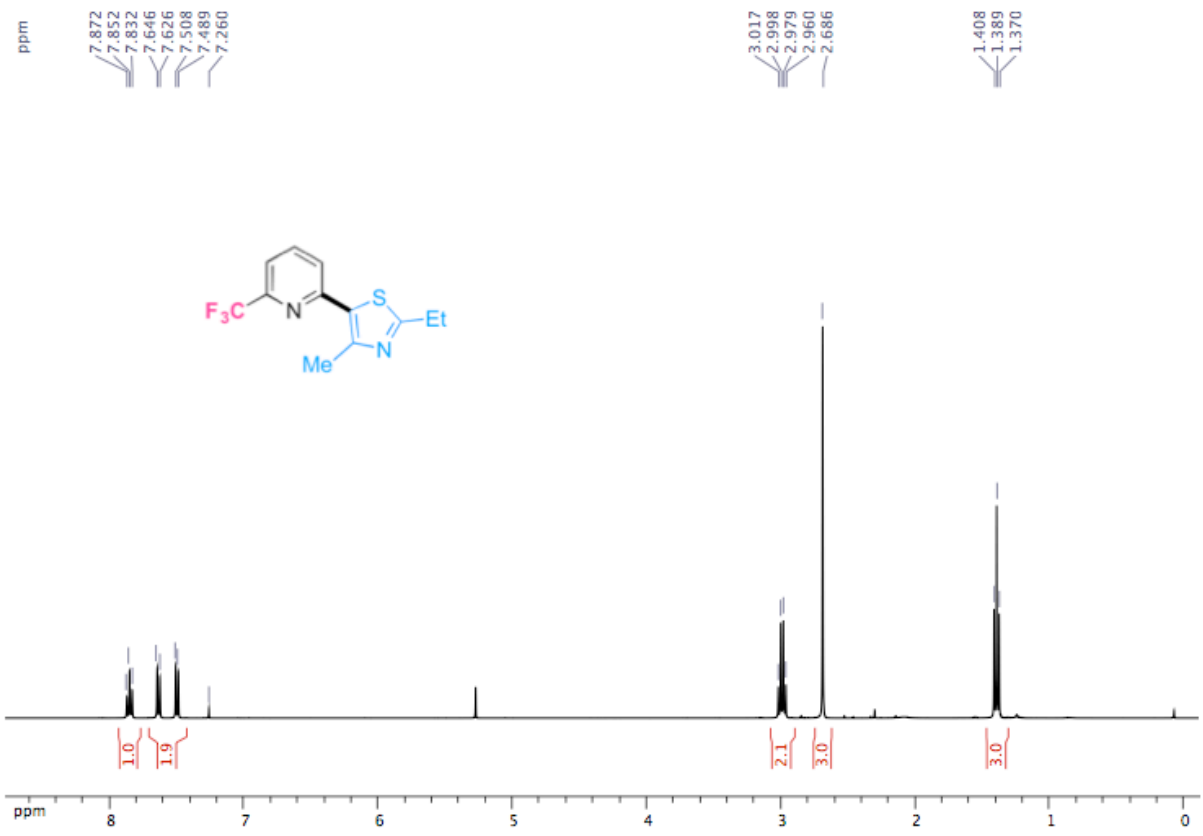
140
120
100
80
60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7.646
7.626
7.508
7.489
7.260
3.017
2.998
2.979
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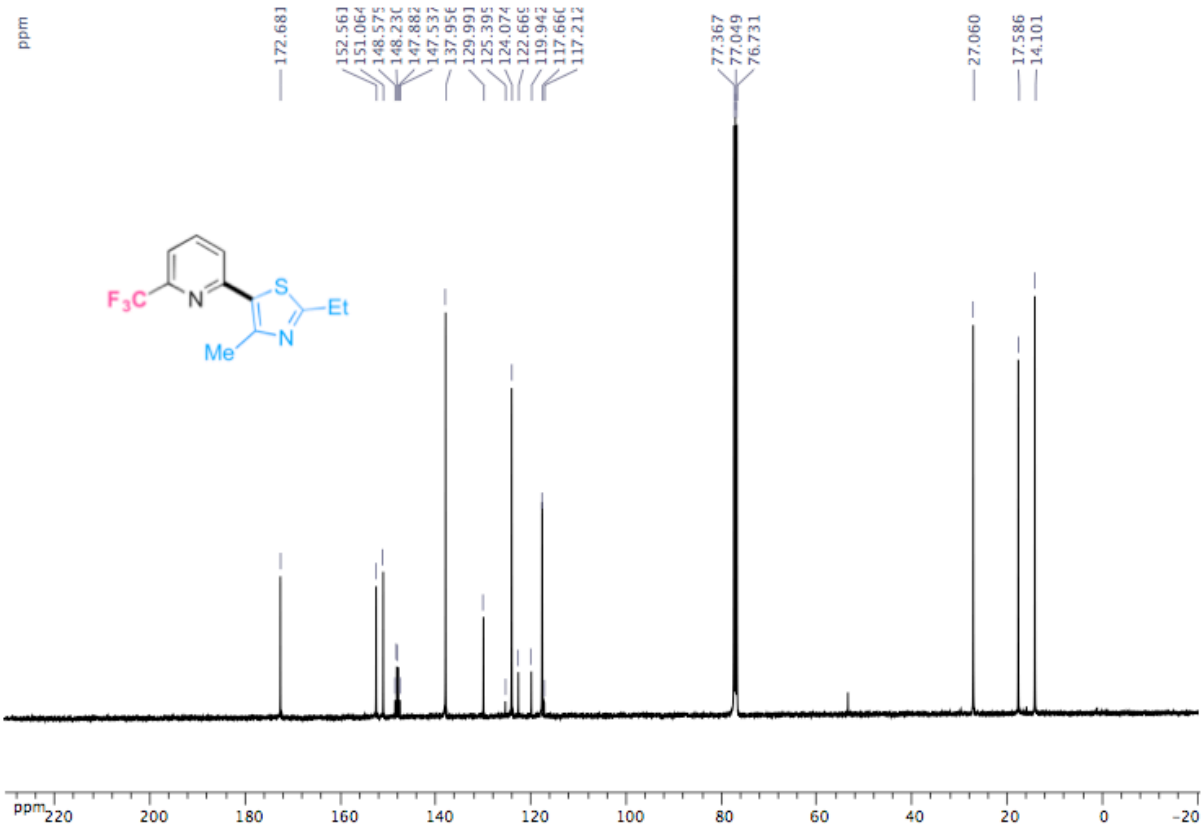
2.686
1.408
1.389
1.370
F3C
S
N
Et
N
Me
1.0
1.9
2.1
3.0
3.0
ppm
8
7
6
5
4
3
2
1
0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148.575
148.230
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147.537
137.956
129.991
125.395
124.074
122.665
119.942
117.660
117.212
77.367
77.049
76.731
27.060
17.586
14.101
F3C
S
N
Et
N
Me
ppm
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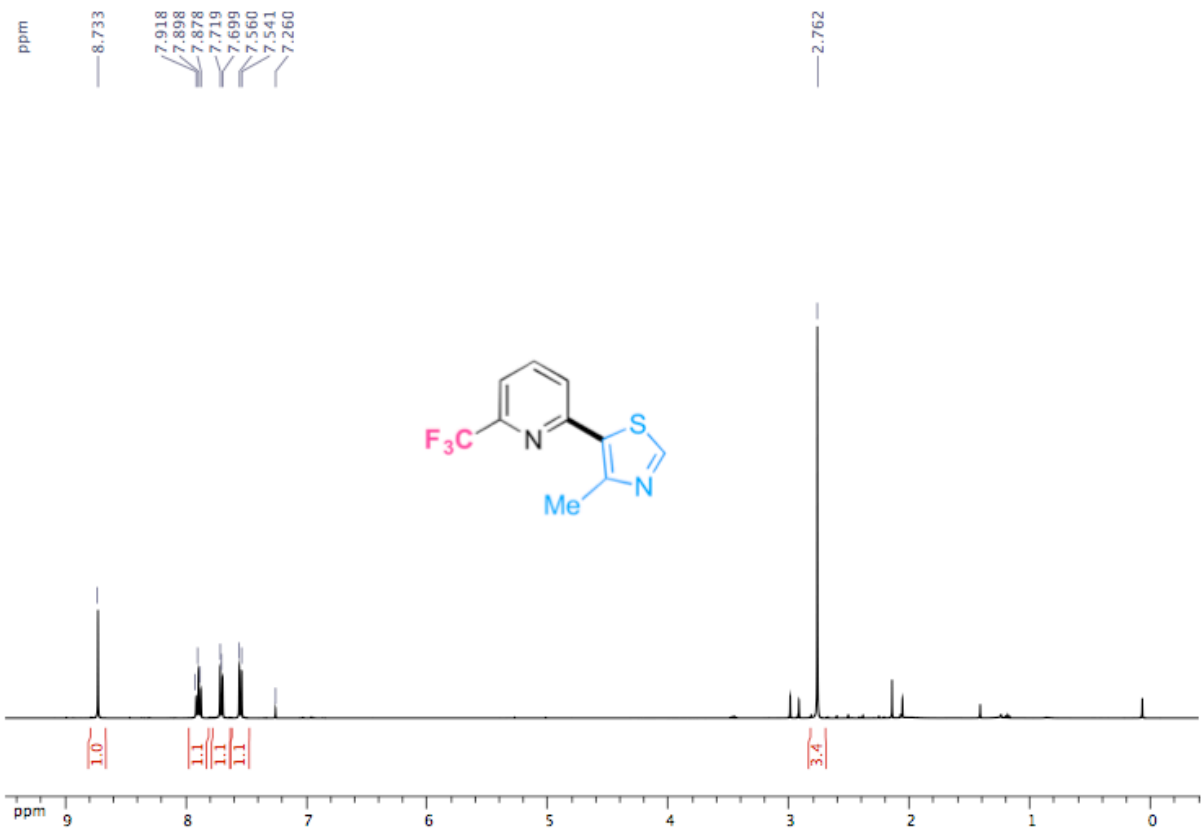
200
180
160
140
120
100
80
60
40
20
0
-20


ppm
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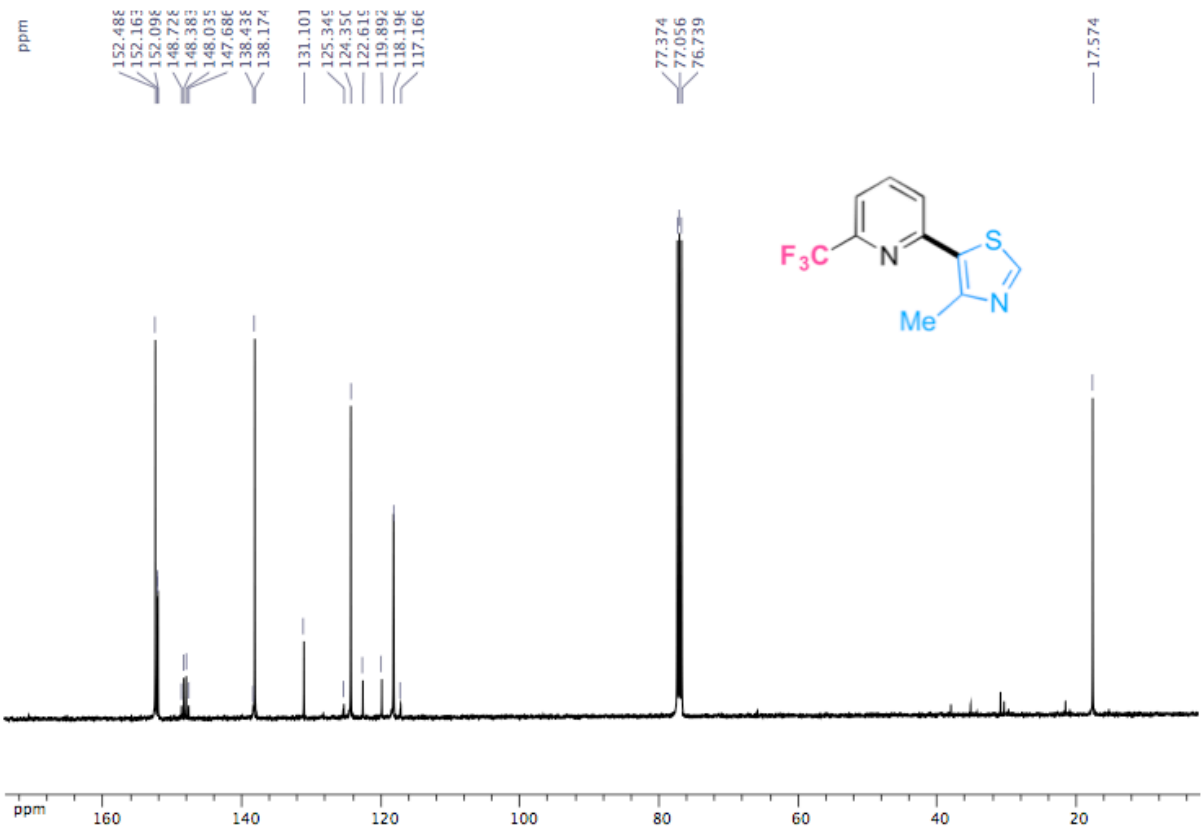
7.918
7.898
7.878
7.719
7.699
7.560
7.541
7.260
2.762
F3C
N
S
N
Me
1.0
1.1
1.1
1.1
3.4
ppm
9
8
7
6
5
4
3
2
1
0


ppm
77.374
77.056
76.739
17.574
F3C
N
S
N
Me
ppm
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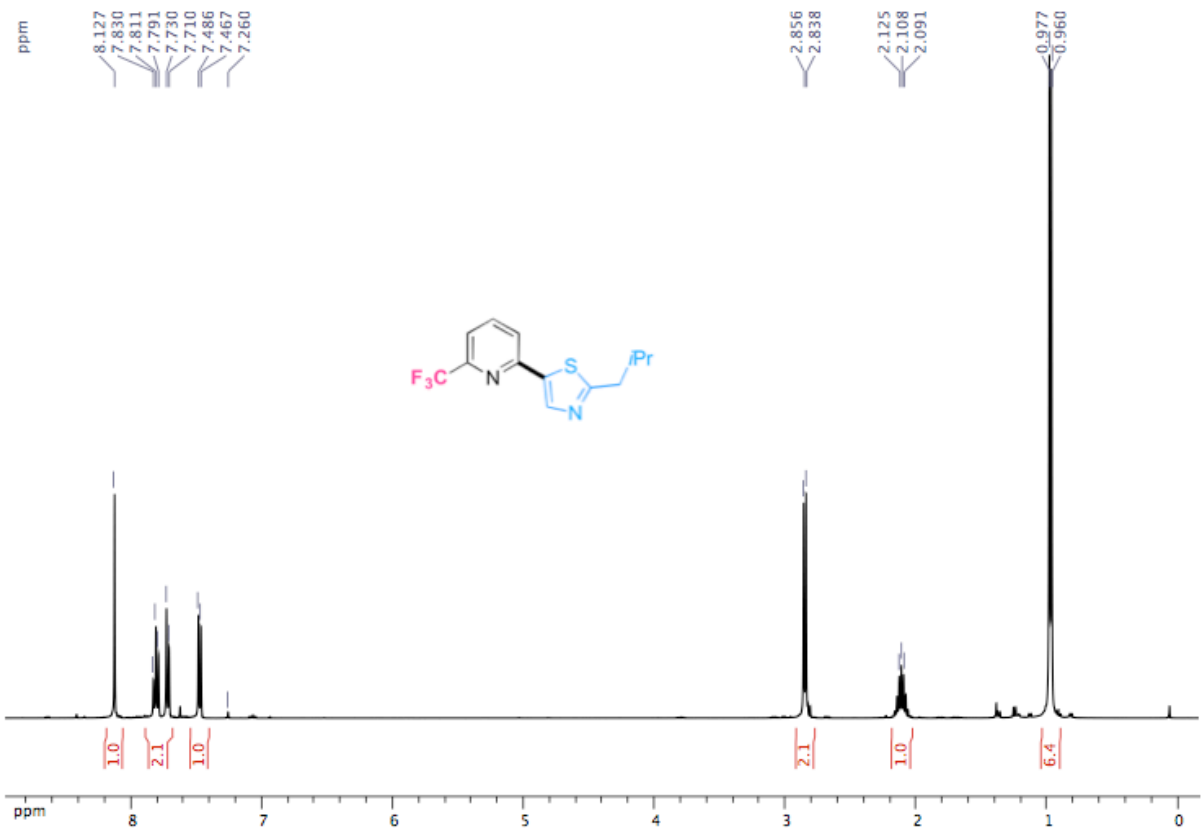
120
100
80
60
40
20


ppm
8.127
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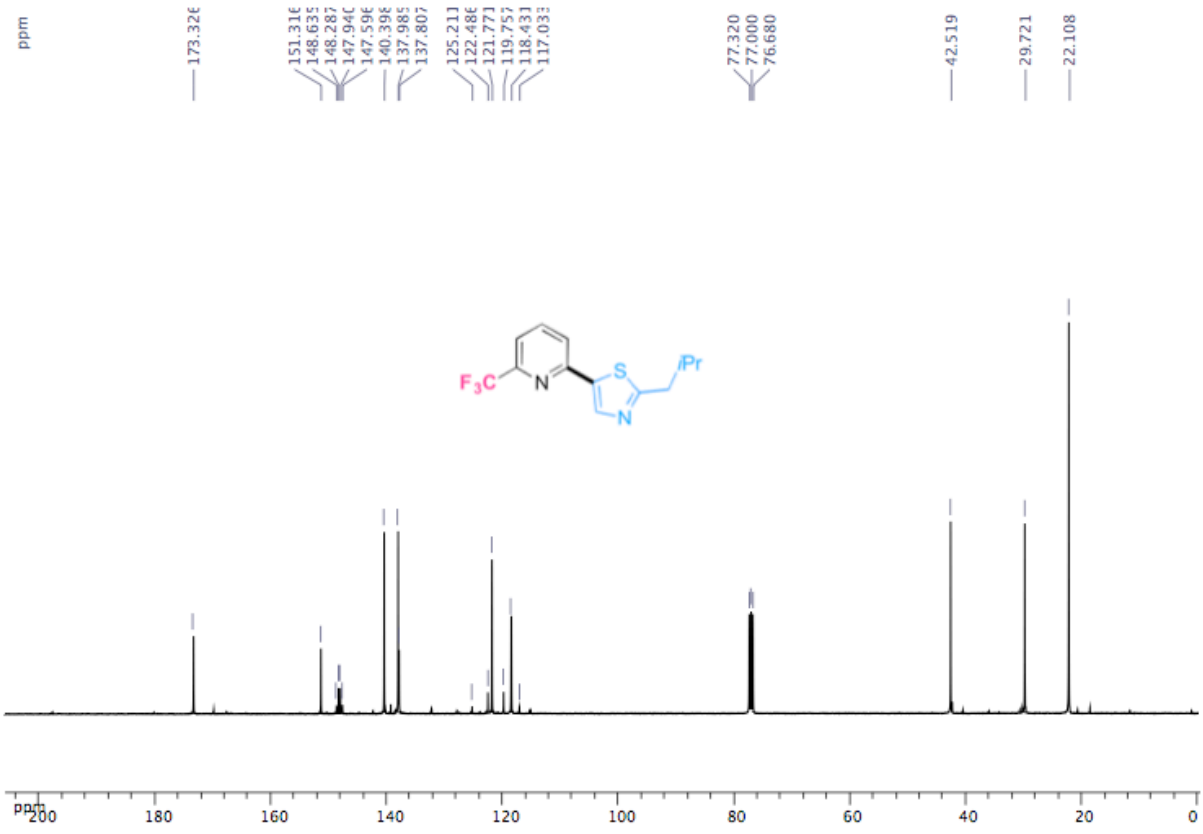
7.811
7.791
7.730
7.710
7.486
7.467
7.260
2.856
2.838
2.125
2.108
2.091
0.977
0.960
F3C
N
S
N
iPr
1.0
2.1
1.0
2.1
1.0
6.4
ppm
8
7
6
5
4
3
2
1
0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148.28
147.94
147.59
140.39
137.98
137.80
125.21
122.48
121.77
119.75
118.43
117.03
77.320
77.000
76.680
42.519
29.721
22.108
F3C
N
S
N
iPr
ppm
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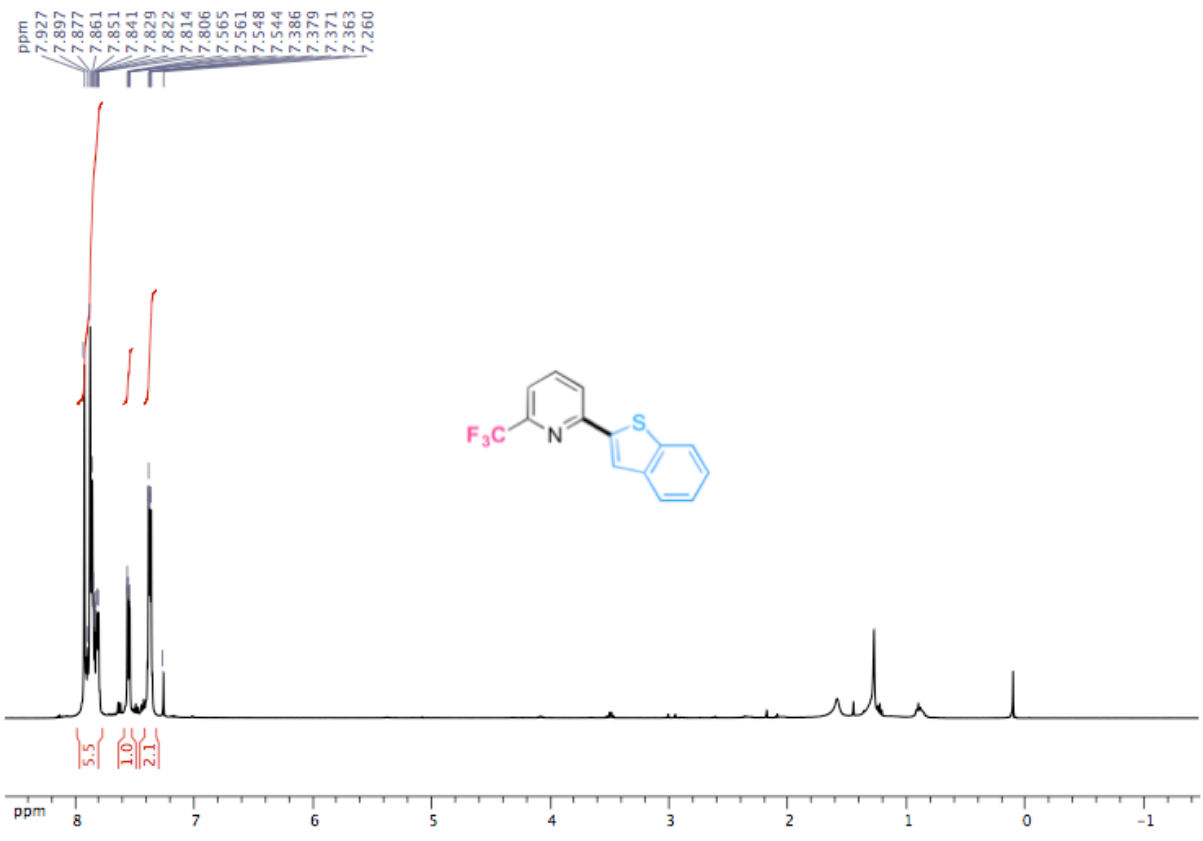
140
120
100
80
60
40
20
0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7.851
7.841
7.829
7.822
7.814
7.806
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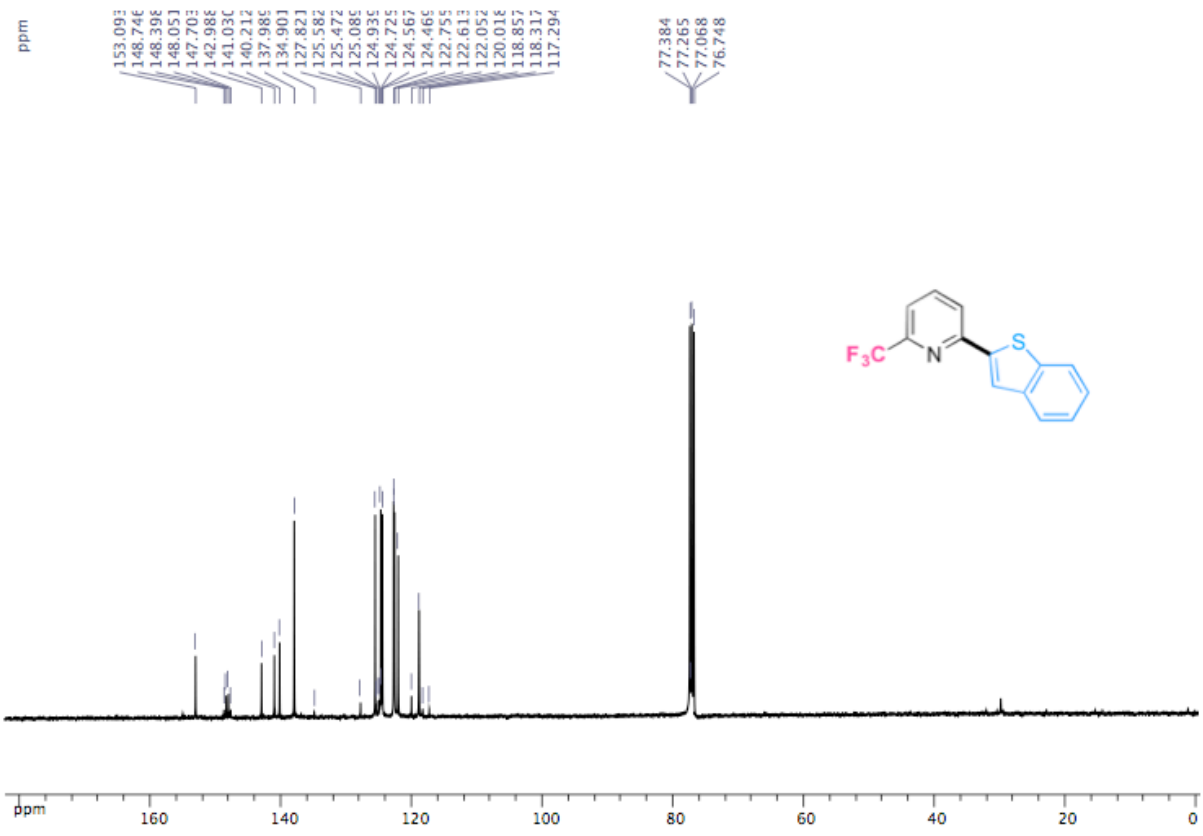
7.548
7.544
7.386
7.379
7.371
7.363
7.260
5.5
1.0
2.1
F3C
N
S
ppm
8
7
6
5
4
3
2
1
0
-1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148.051
147.703
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141.030
140.212
137.985
134.901
127.823
125.582
125.472
125.085
124.935
124.725
124.567
124.465
122.755
122.613
122.052
120.018
118.857
118.317
117.294
77.384
77.265
77.068
76.748
F3C
N
S
ppm
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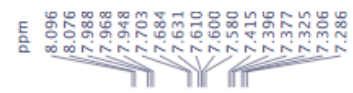
140
120
100
80
60
40
20
0


ppm
8.096
8.076
7.988
7.968
7.948
7.703
7.684
7.631
7.610
7.600
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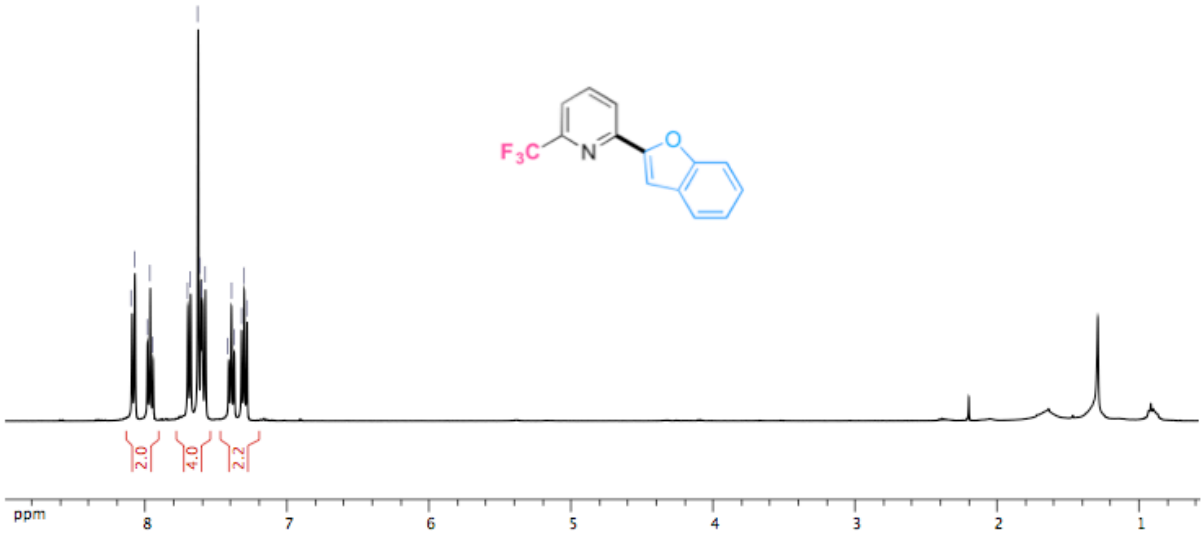
7.415
7.396
7.377
7.325
7.306
7.286


F3C
N
O
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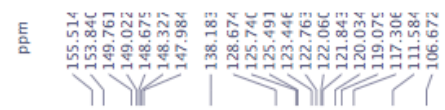
4.0
2.2
ppm
8
7
6
5
4
3
2
1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149.022
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148.327
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128.674
125.740
125.491
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121.843
120.034
119.075
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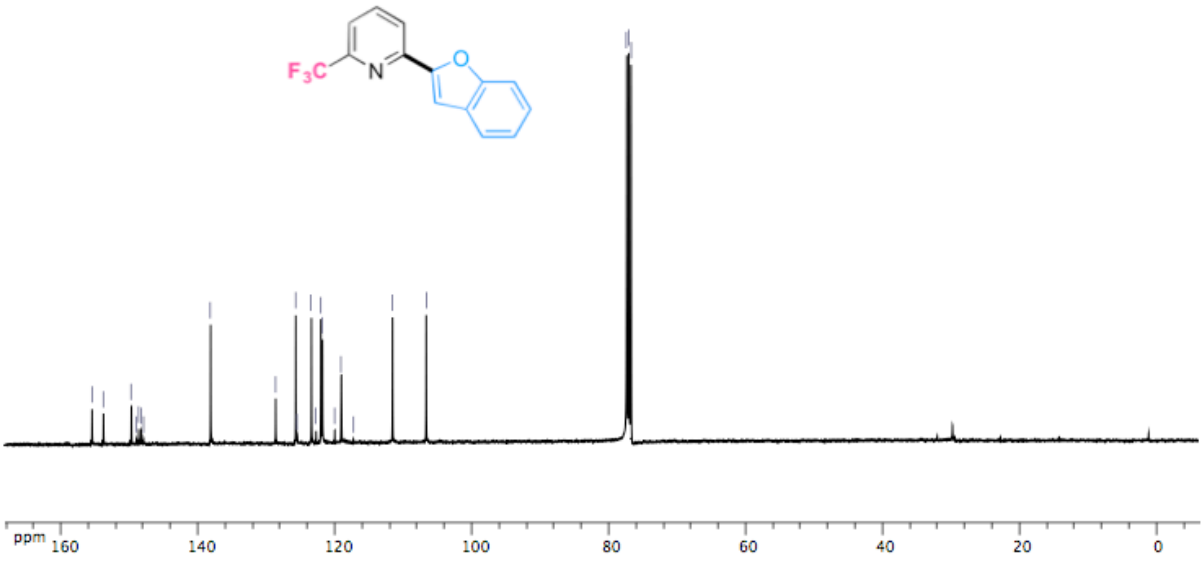
77.044
76.724


F3C
N
O
ppm
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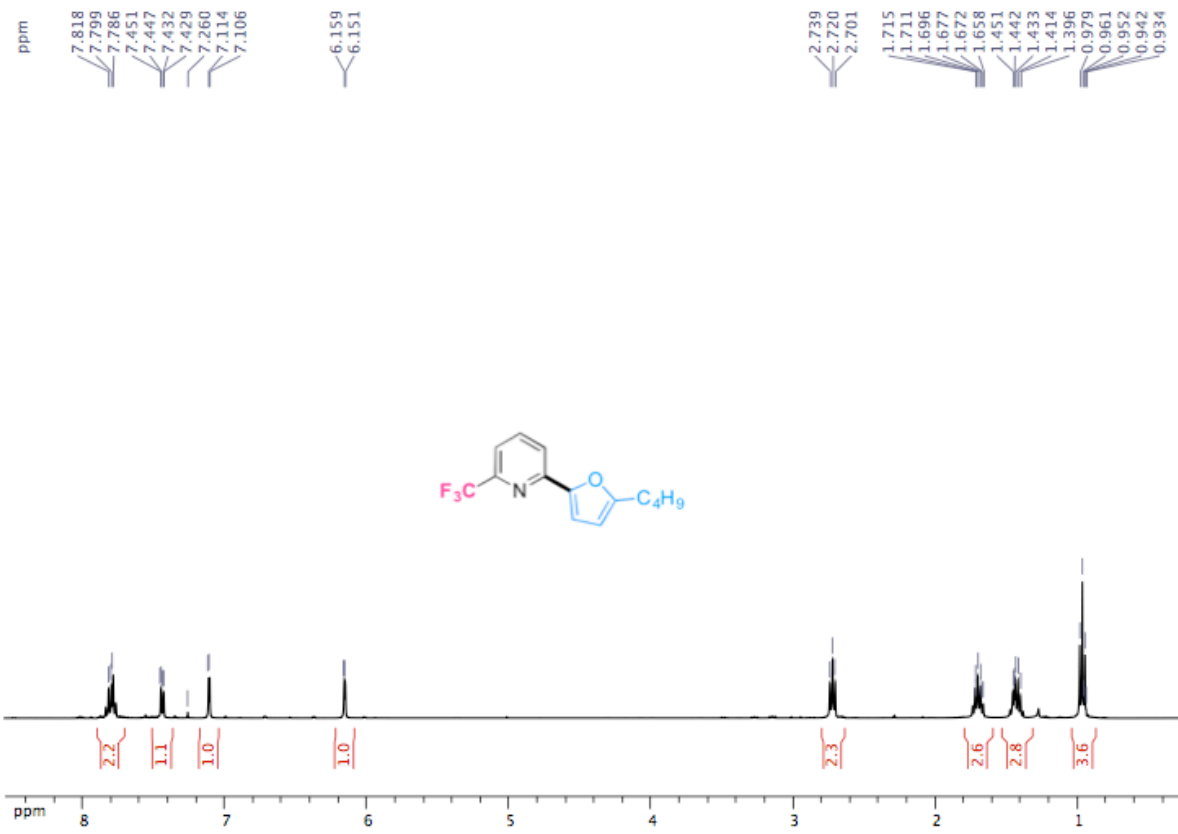
140
120
100
80
60
40
20
0


ppm
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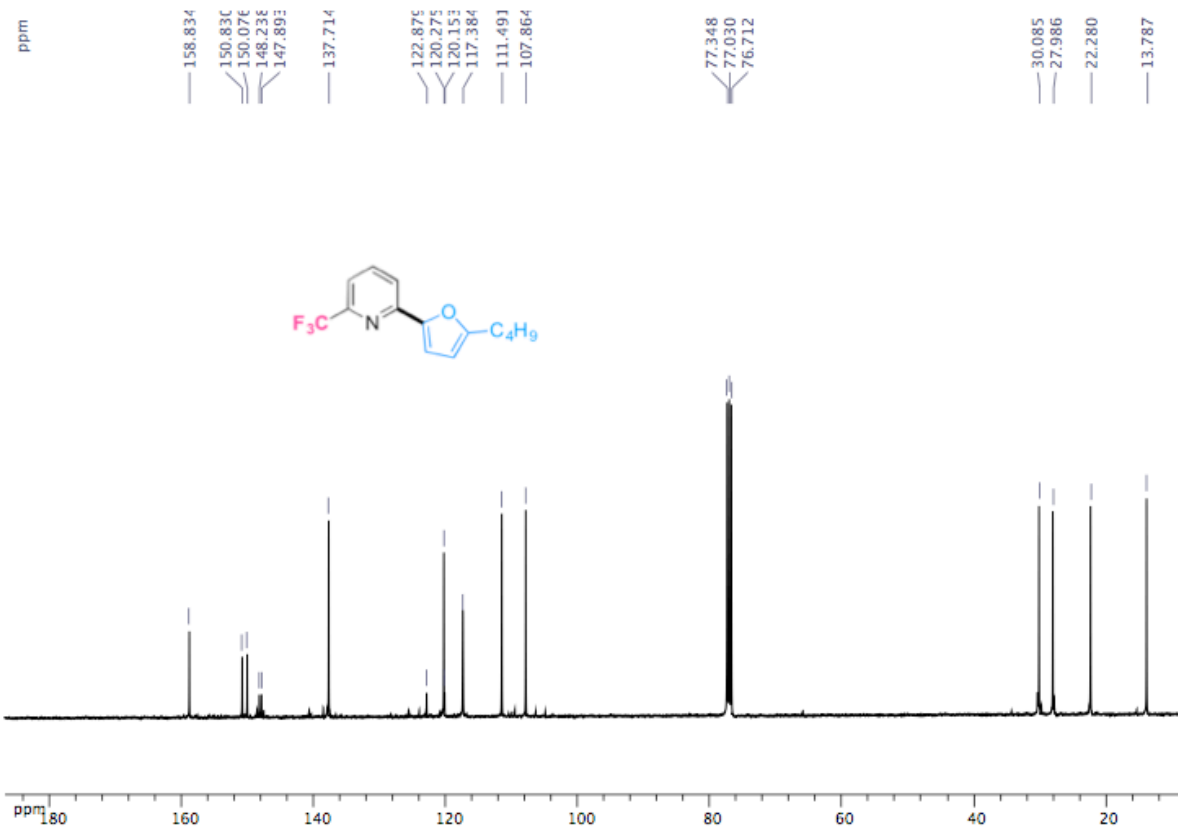
7.447
7.432
7.429
7.260
7.114
7.106
6.159
6.151
2.739
2.720
2.701
1.715
1.711
1.696
1.677
1.672
1.658
1.451
1.442
1.433
1.414
1.396
0.979
0.961
0.952
0.942
0.934
F3C
N
O
C4H9
2.2
1.1
1.0
1.0
2.3
2.6
2.8
3.6
ppm
8
7
6
5
4
3
2
1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148.238
147.893
137.714
122.875
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120.153
117.384
111.491
107.864
77.348
77.030
76.712
30.085
27.986
22.280
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F3C
N
O
C4H9
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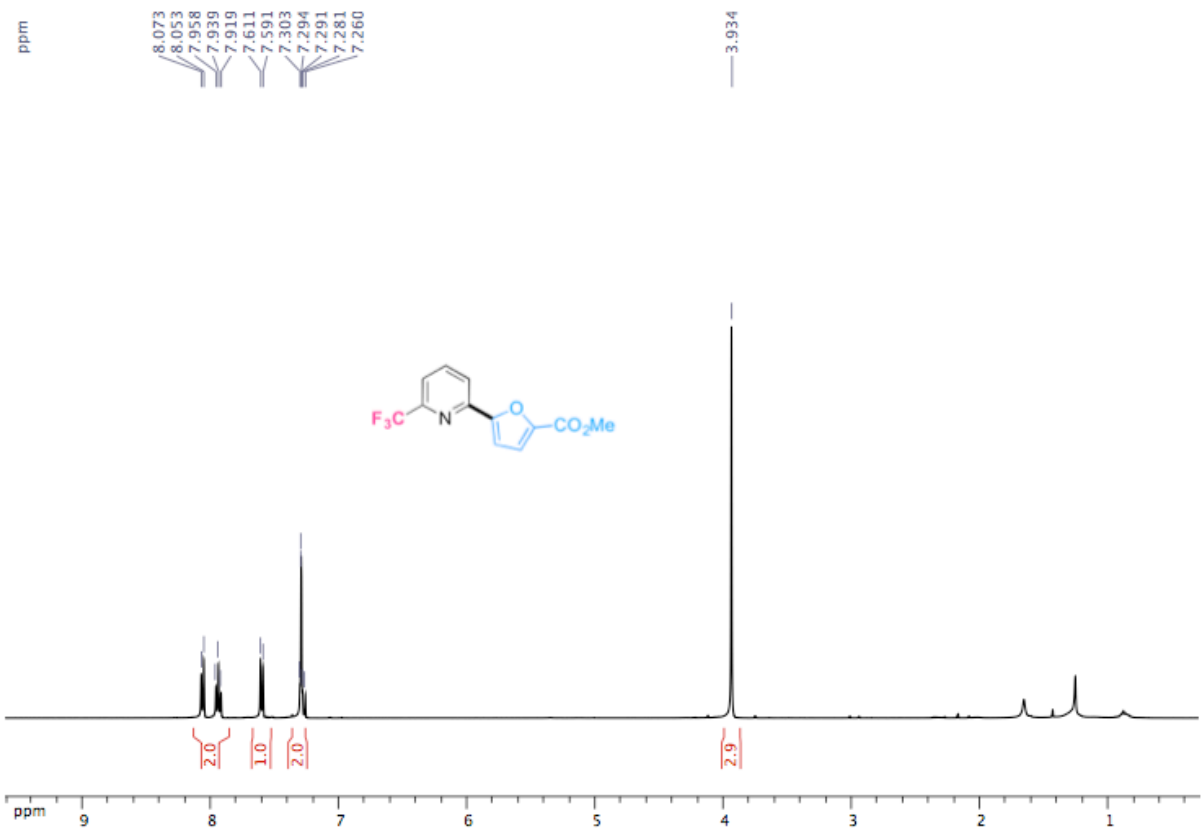
80
60
40
20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7.919
7.611
7.591
7.303
7.294
7.291
7.281
7.260
3.934
F3C
N
O
CO2Me
2.0
1.0
2.0
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ppm
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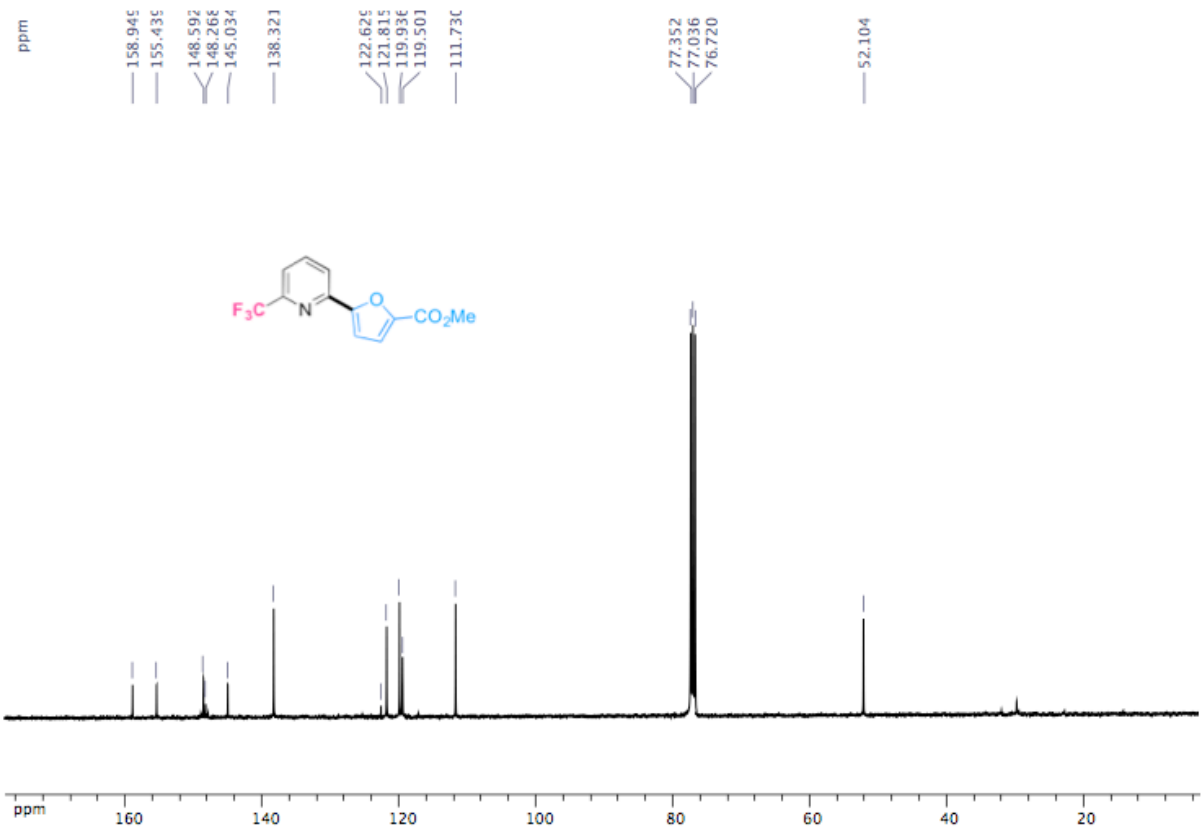
8
7
6
5
4
3
2
1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148.268
145.034
138.321
122.625
121.815
119.938
119.501
111.730
77.352
77.036
76.720
52.104
F3C
N
O
CO2Me
ppm
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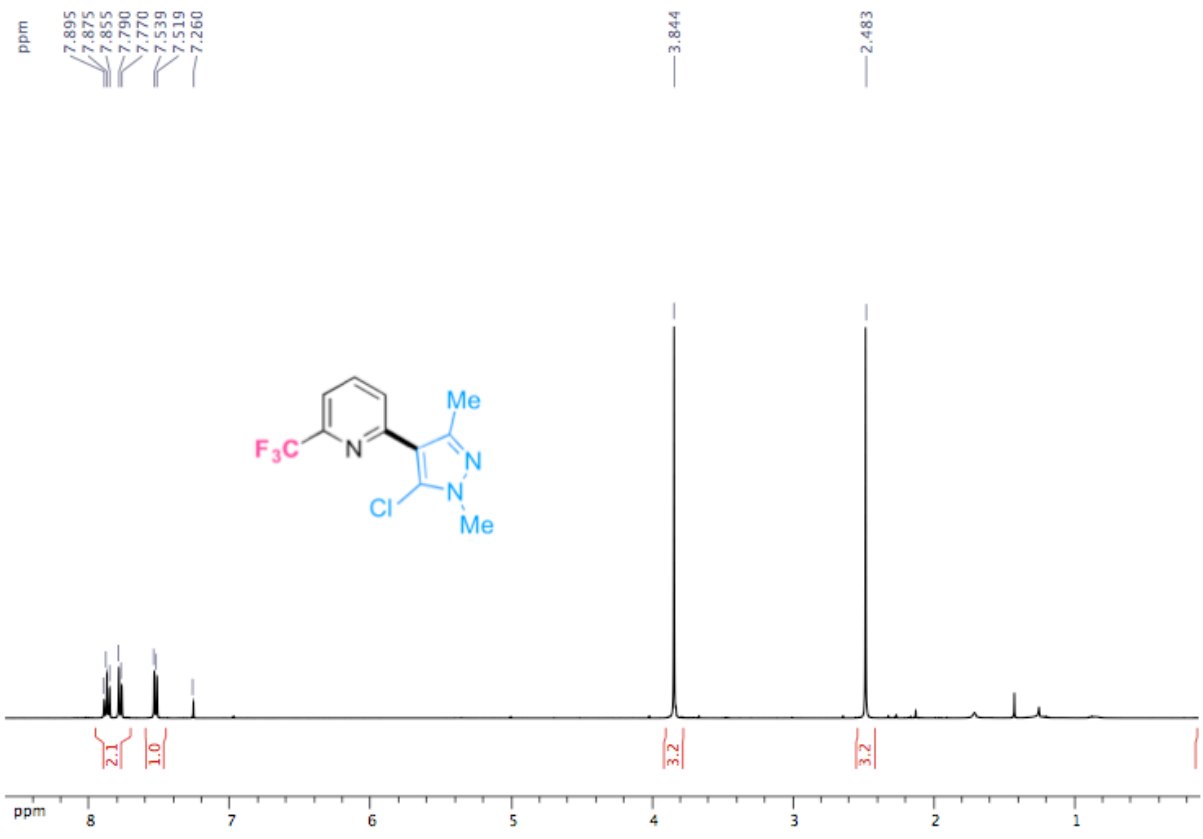
140
120
100
80
60
40
20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7.790
7.770
7.539
7.519
7.260
3.844
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Me
F3C
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Cl
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Me
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1.0
3.2
3.2
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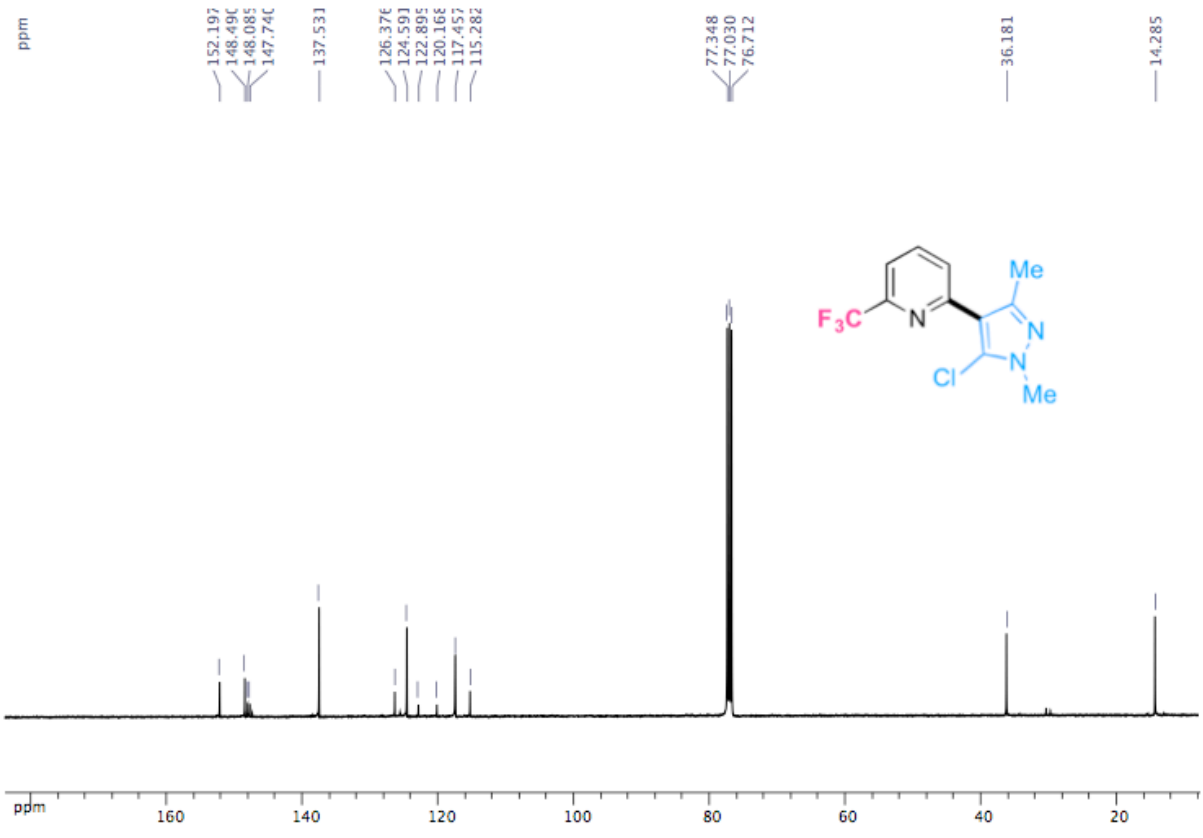
6
5
4
3
2
1


ppm
152.197
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148.085
147.740
137.531
126.376
124.591
122.895
120.168
117.457
115.282
77.348
77.030
76.712
36.181
14.285
Me
F3C
N
N
Cl
N
Me
ppm
160
140
120
100
80
60
40
20


ppm
8.343
8.323
8.304
8.286
8.196
8.188
8.177
8.173
7.955
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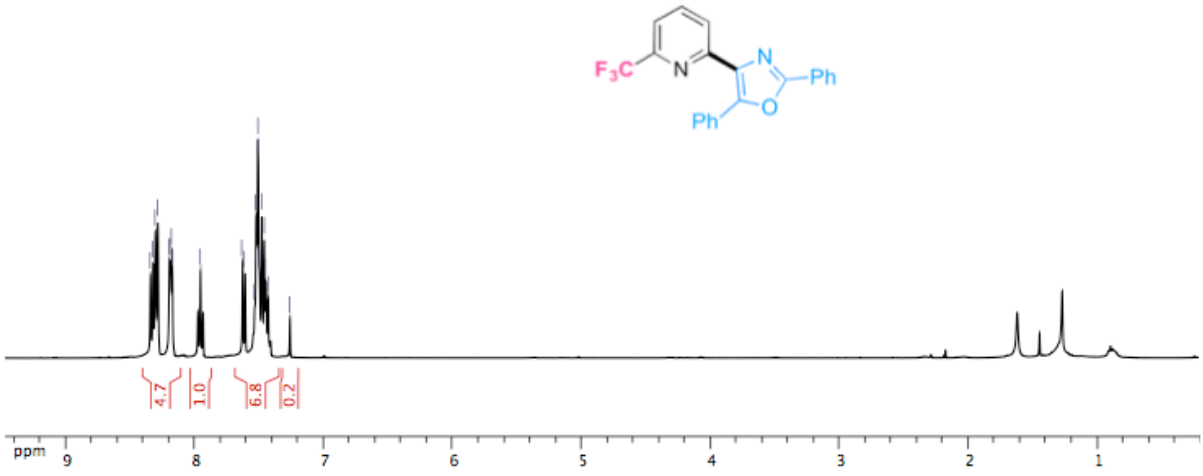
7.497
7.479
7.460
7.446
7.429
7.260


F3C
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ppm
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8
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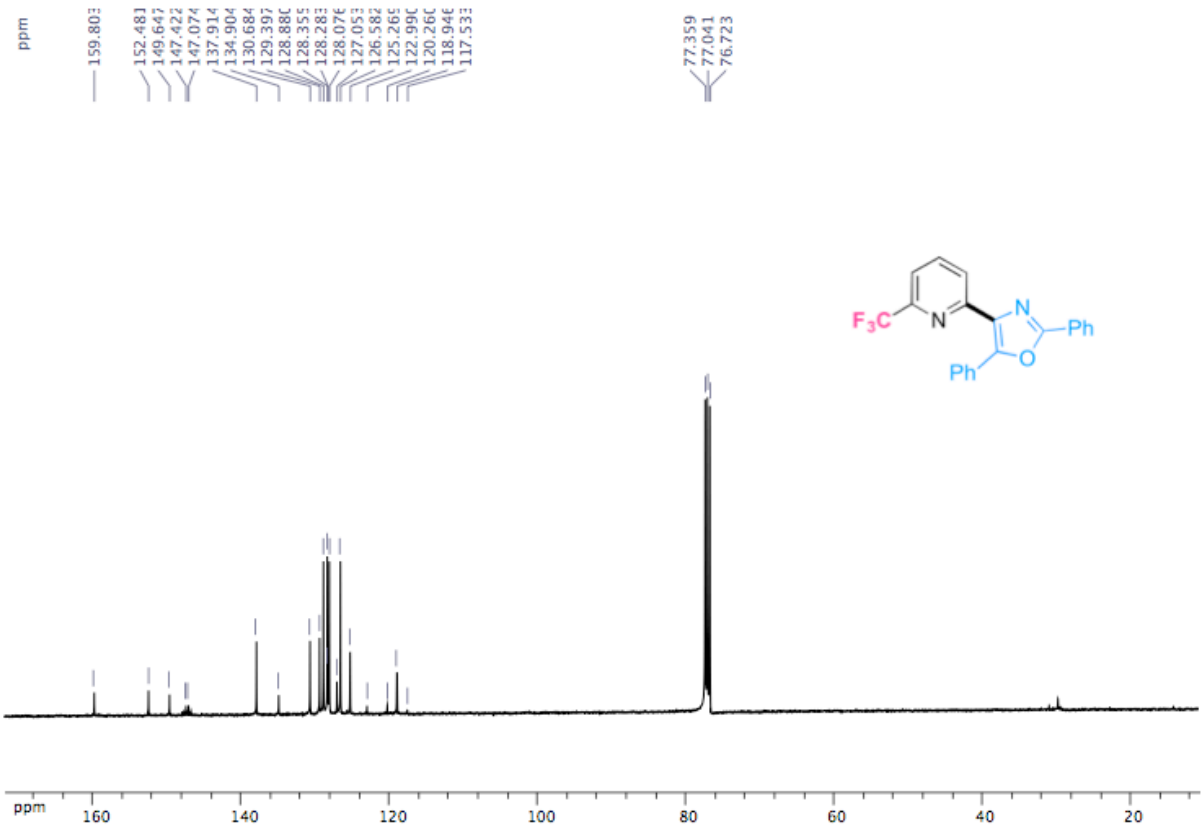
4
3
2
1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129.397
128.880
128.355
128.283
128.076
127.053
126.582
125.265
122.990
120.260
118.946
117.533
77.359
77.041
76.723
F3C
N
N
O
Ph
Ph
ppm
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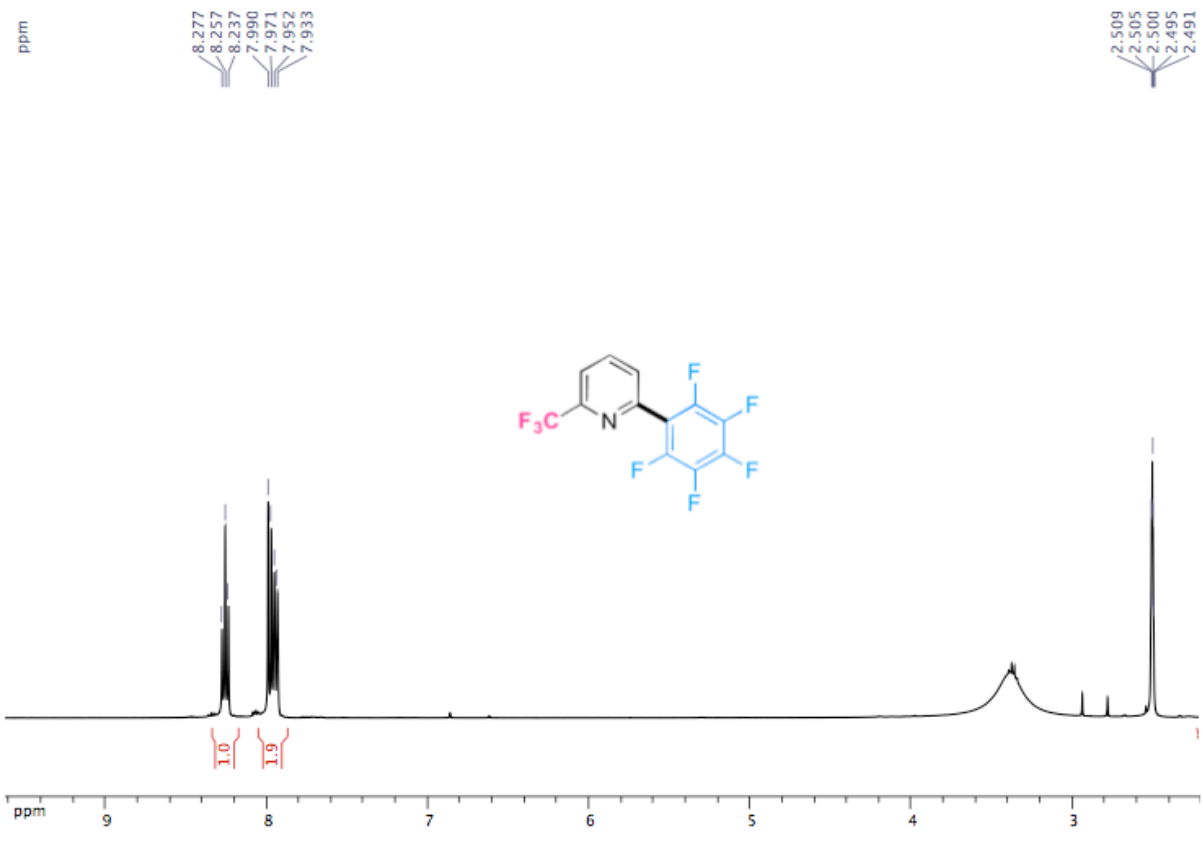
140
120
100
80
60
40
20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7.952
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2.505
2.500
2.495
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F
F
F
F
F
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ppm
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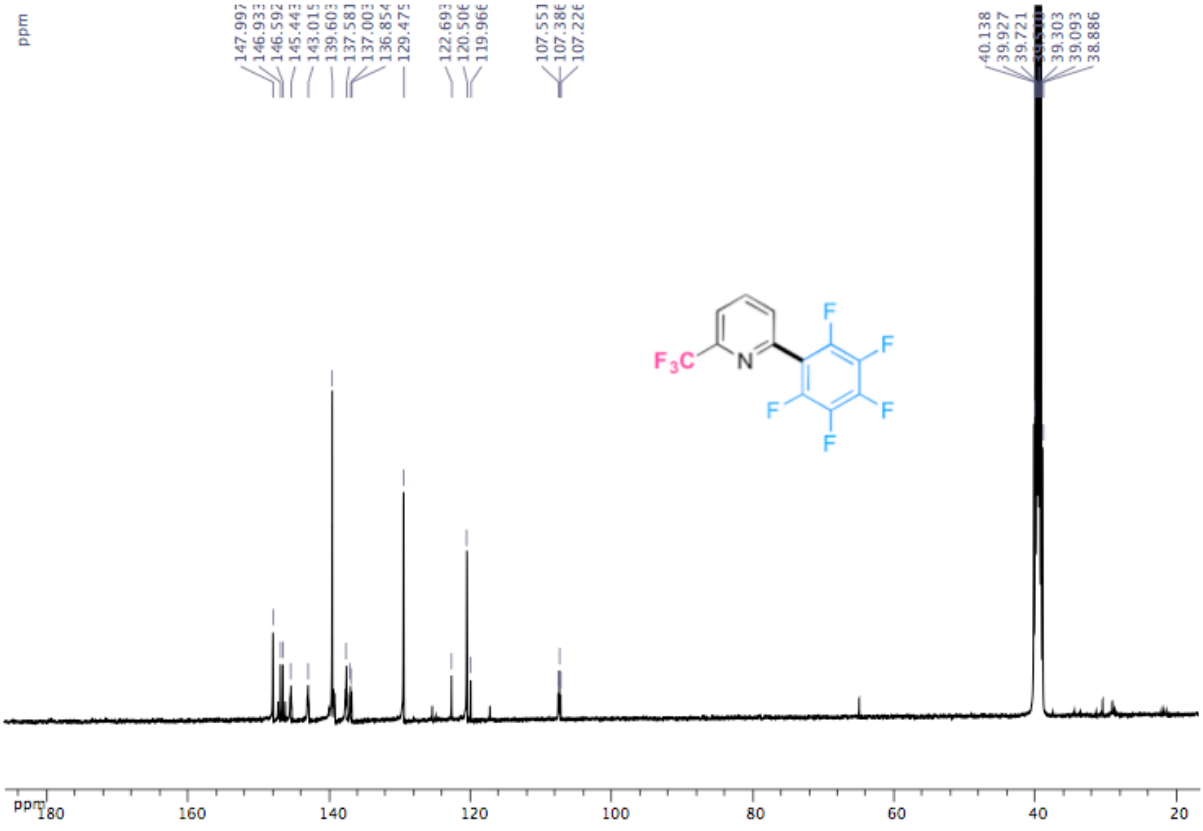
5
4
3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146.592
145.443
143.015
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136.854
129.475
122.693
120.506
119.966
107.551
107.386
107.226
40.138
39.927
39.721
39.303
39.093
38.886
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F
F
F
F
F
ppm
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160
140
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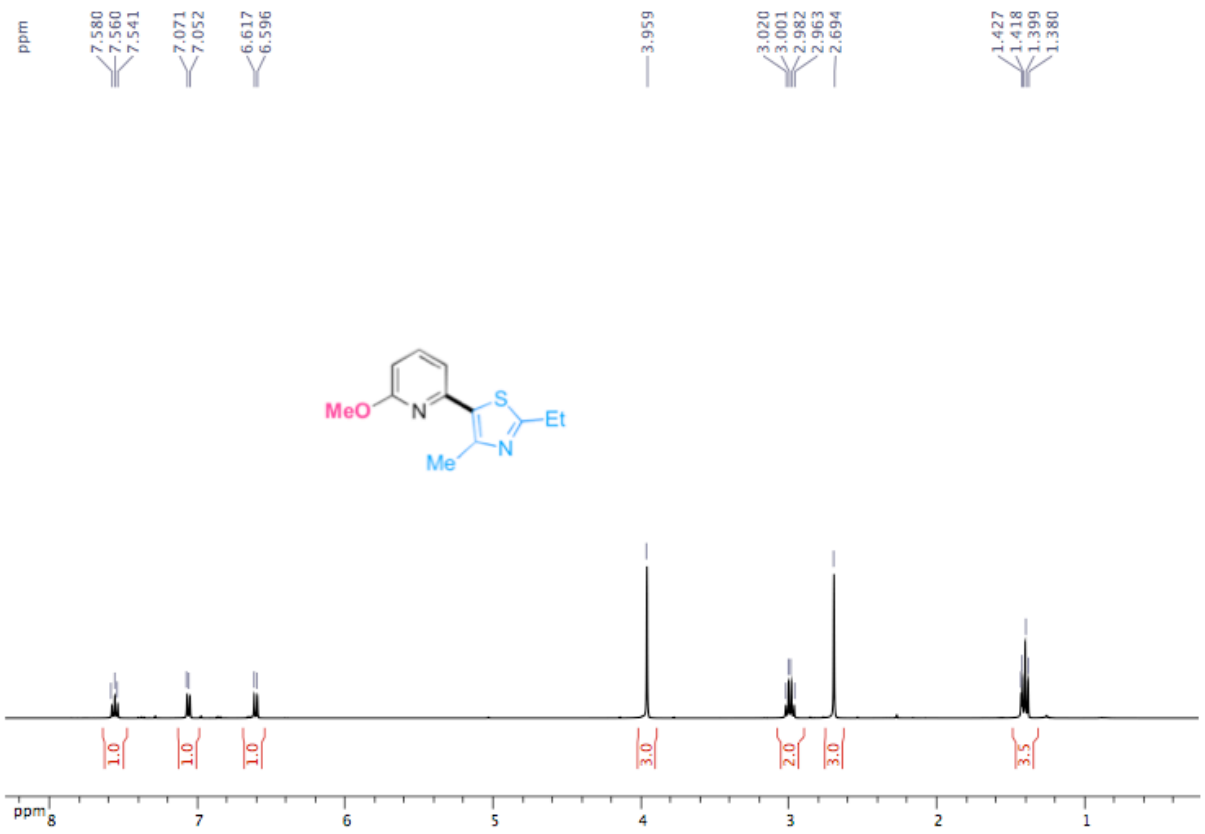
100
80
60
40
20


ppm
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7.560
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7.052
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6.596
3.959
3.020
3.001
2.982
2.963
2.694
1.427
1.418
1.399
1.380
MeO
N
S
Et
N
Me
1.0
1.0
1.0
3.0
2.0
3.0
3.5
ppm
8
7
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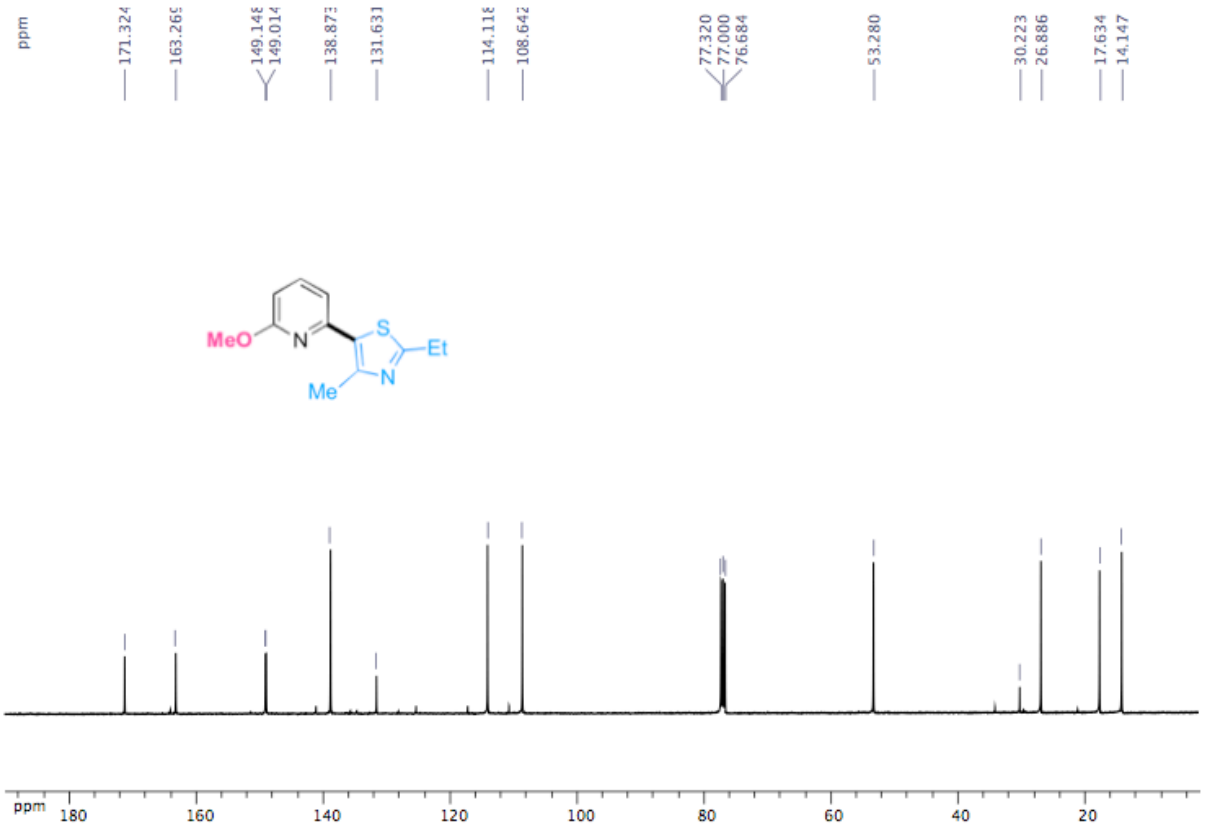
4
3
2
1


ppm
171.324
163.265
149.146
149.014
138.873
131.631
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108.642
77.320
77.000
76.684
53.280
30.223
26.886
17.634
14.147
MeO
N
S
Et
N
Me
ppm
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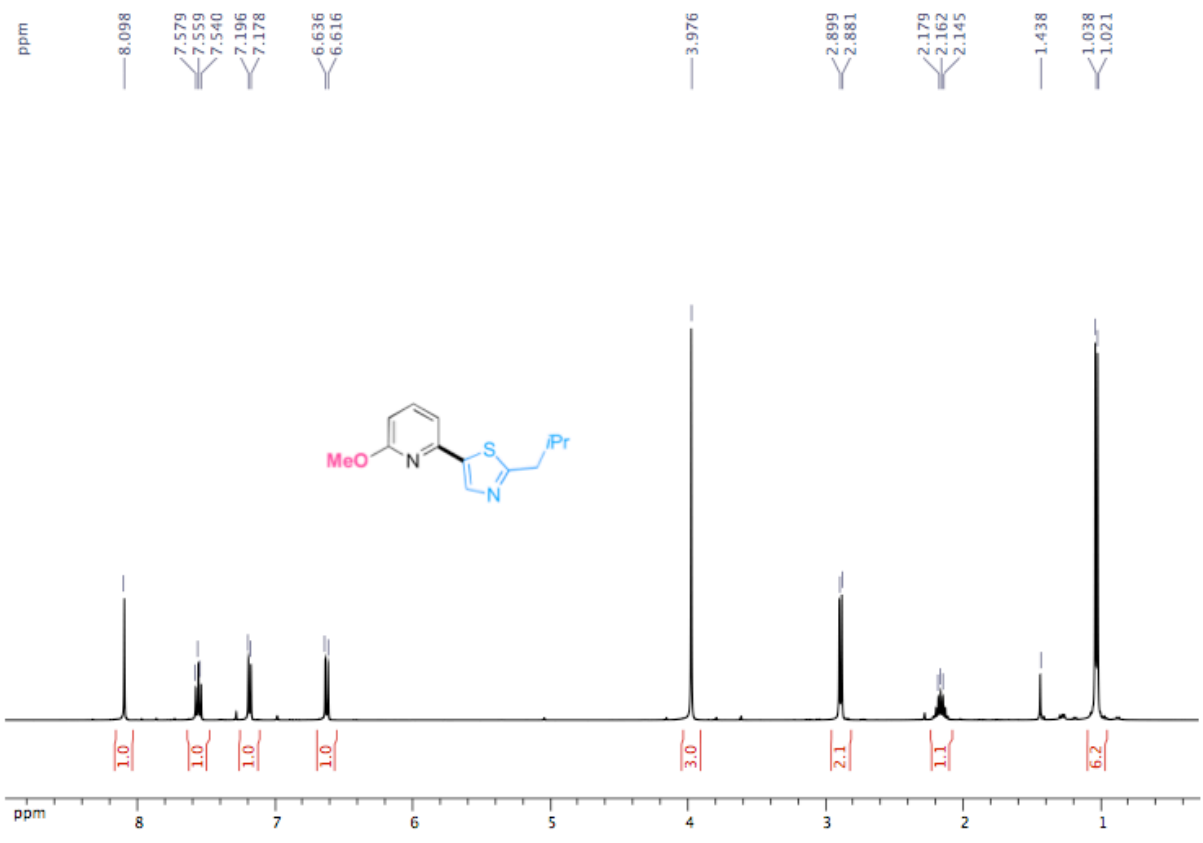
160
140
120
100
80
60
40
20


ppm
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7.579
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7.540
7.196
7.178
6.636
6.616
3.976
2.899
2.881
2.179
2.162
2.145
1.438
1.038
1.021
MeO
N
S
N
iPr
1.0
1.0
1.0
1.0
3.0
2.1
1.1
6.2
ppm
8
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2
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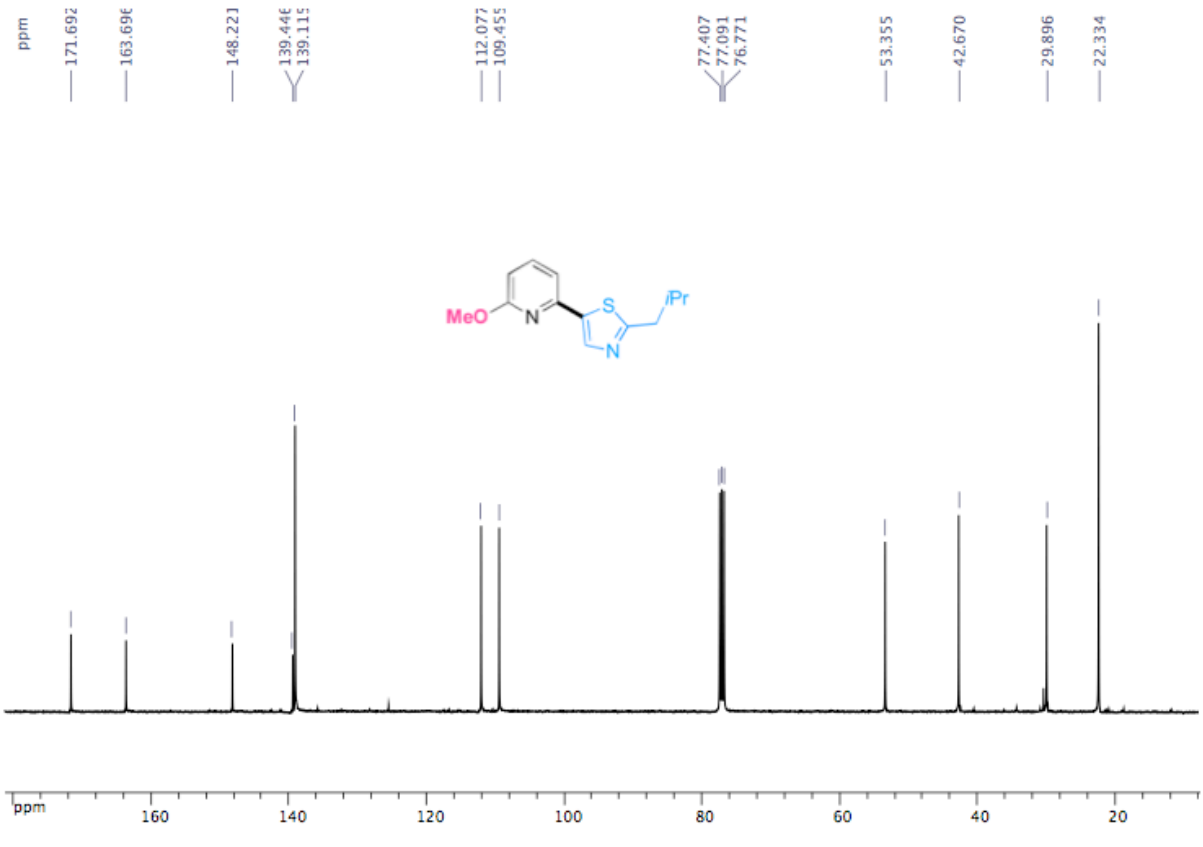
ppm
171.692
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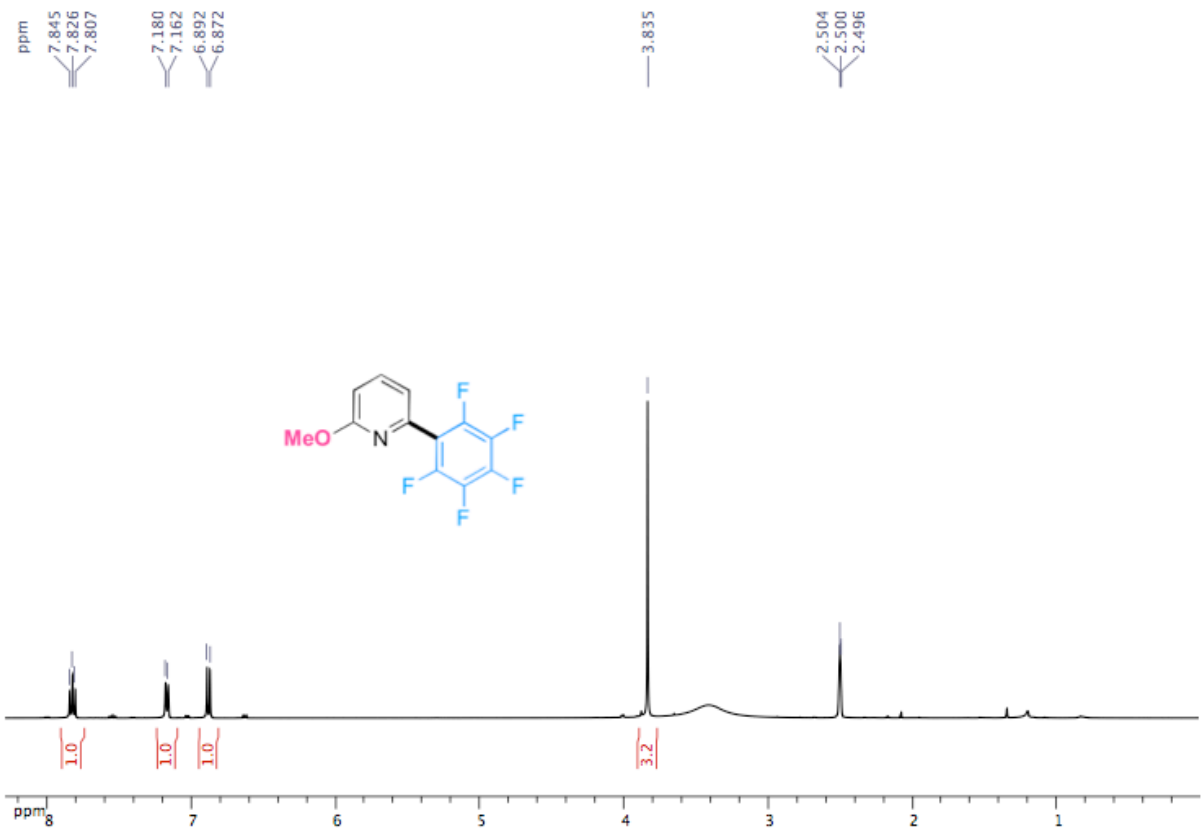
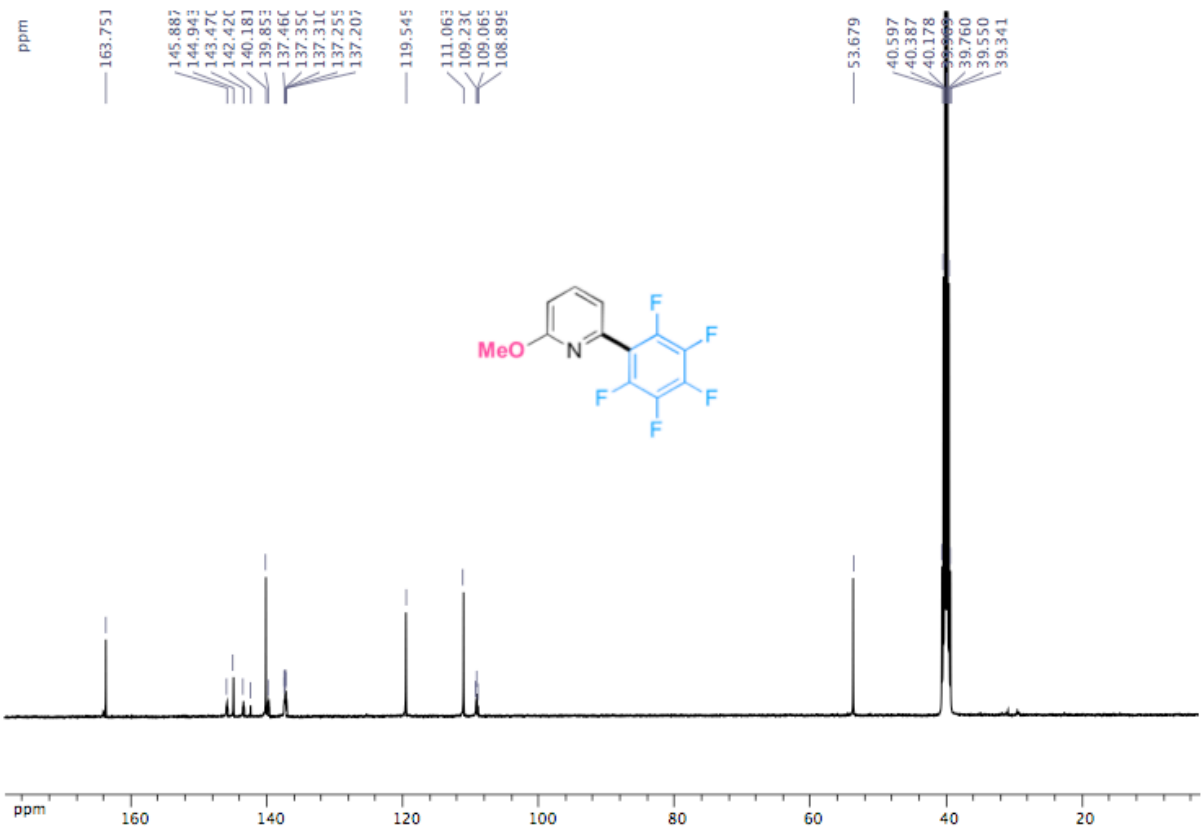
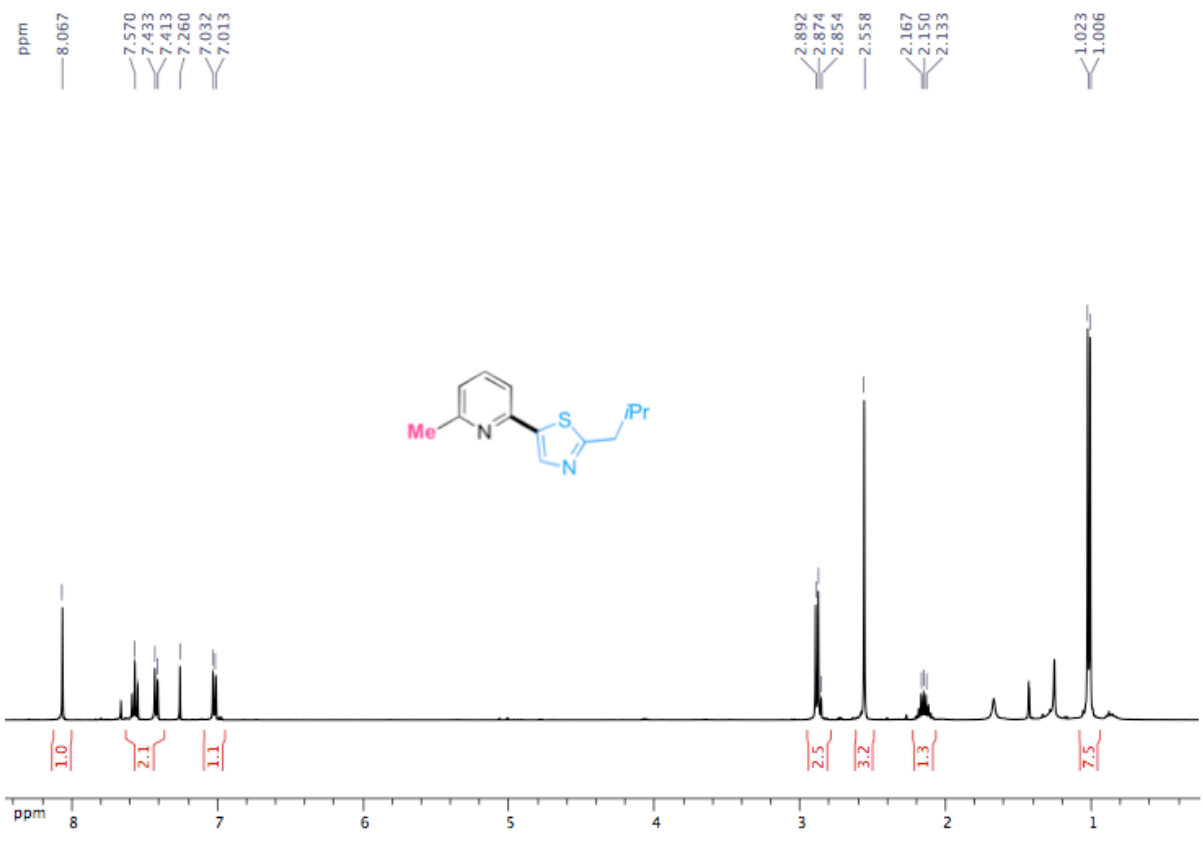
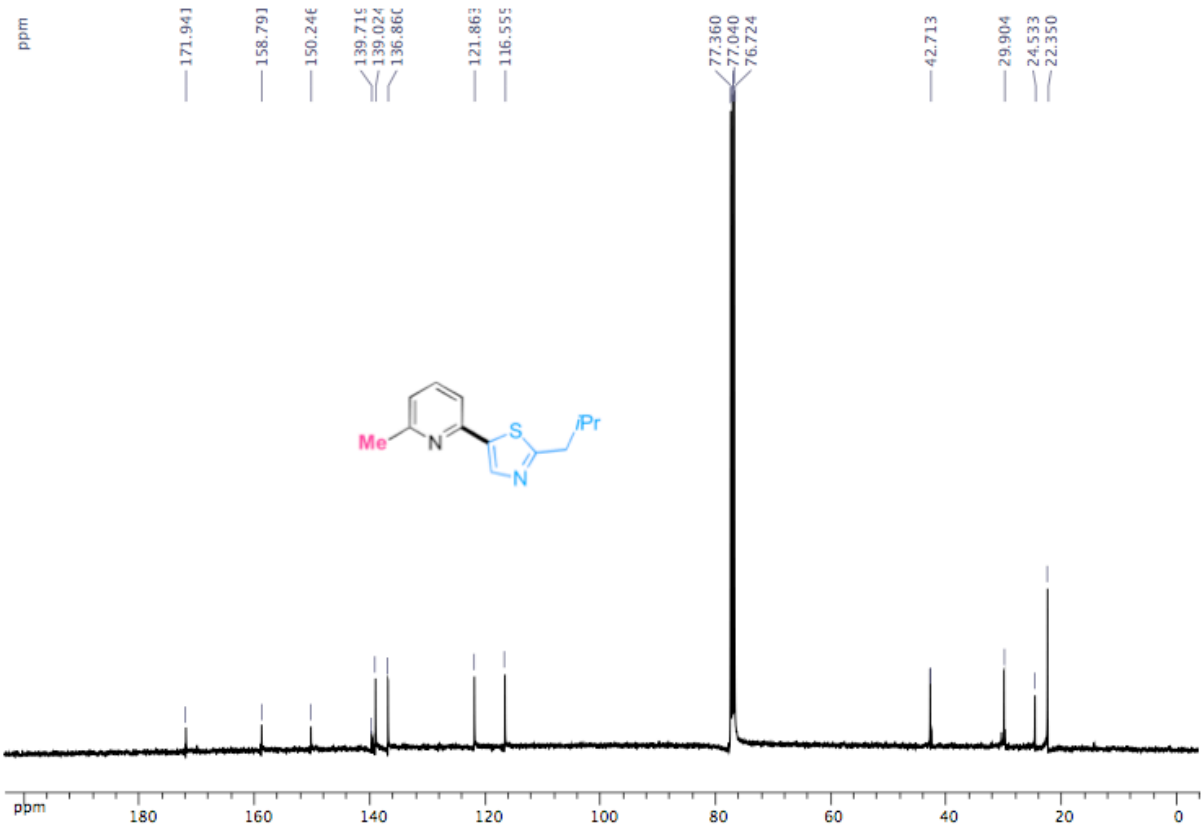
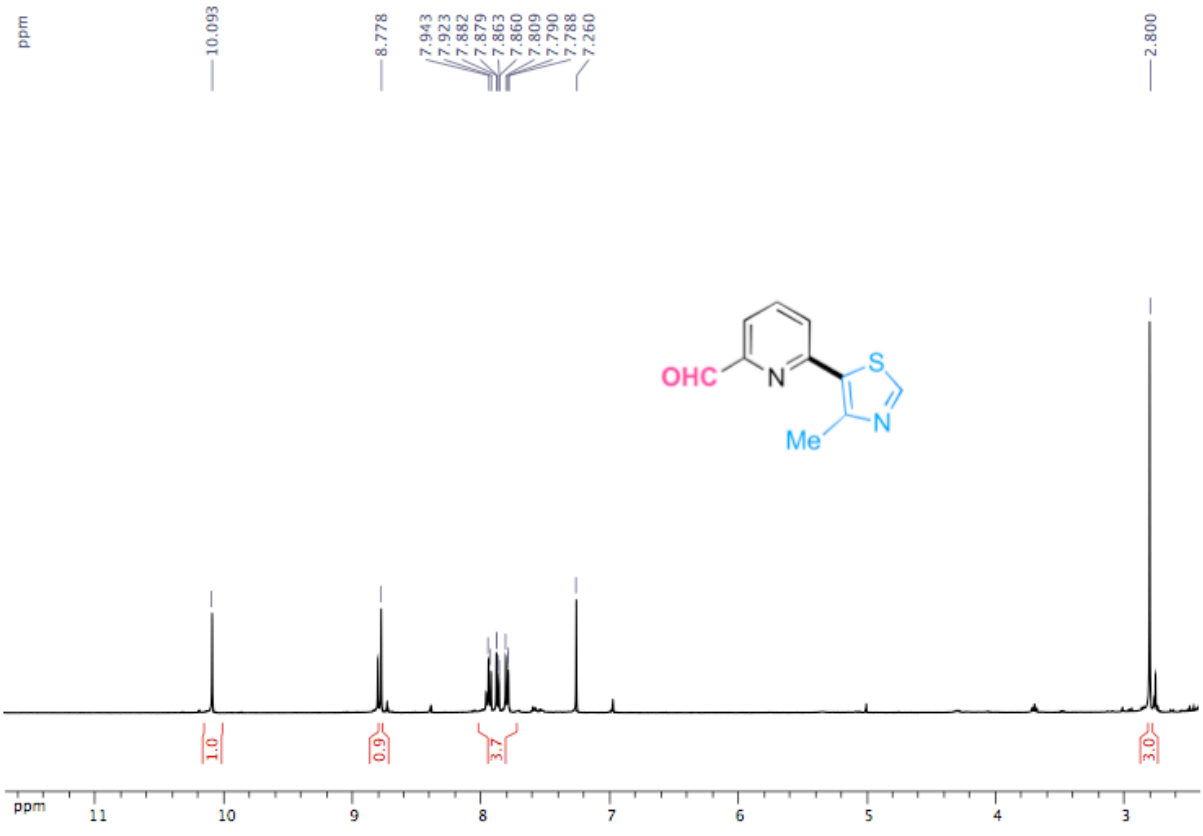
148.221
139.446
139.115
112.077
109.455
77.407
77.091
76.771
53.355
42.670
29.896
22.334
MeO
N
S
N
iPr
ppm
160
140
120
100
80
60
40
20

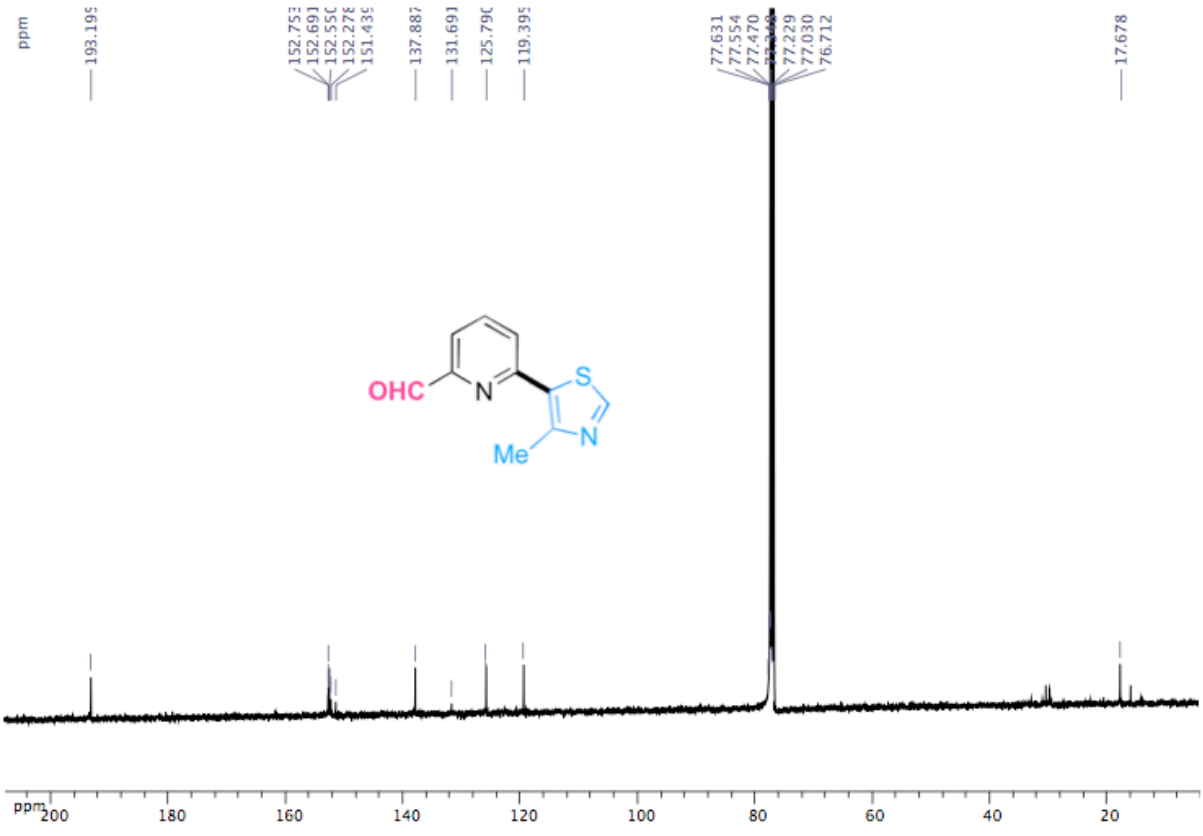

ppm
7.845
7.826
7.807
7.180
7.162
6.892
6.872
3.835
2.504
2.500
2.496
MeO
N
F
F
F
F
F
1.0
1.0
1.0
3.2
ppm
8
7
6
5
4
3
2
1

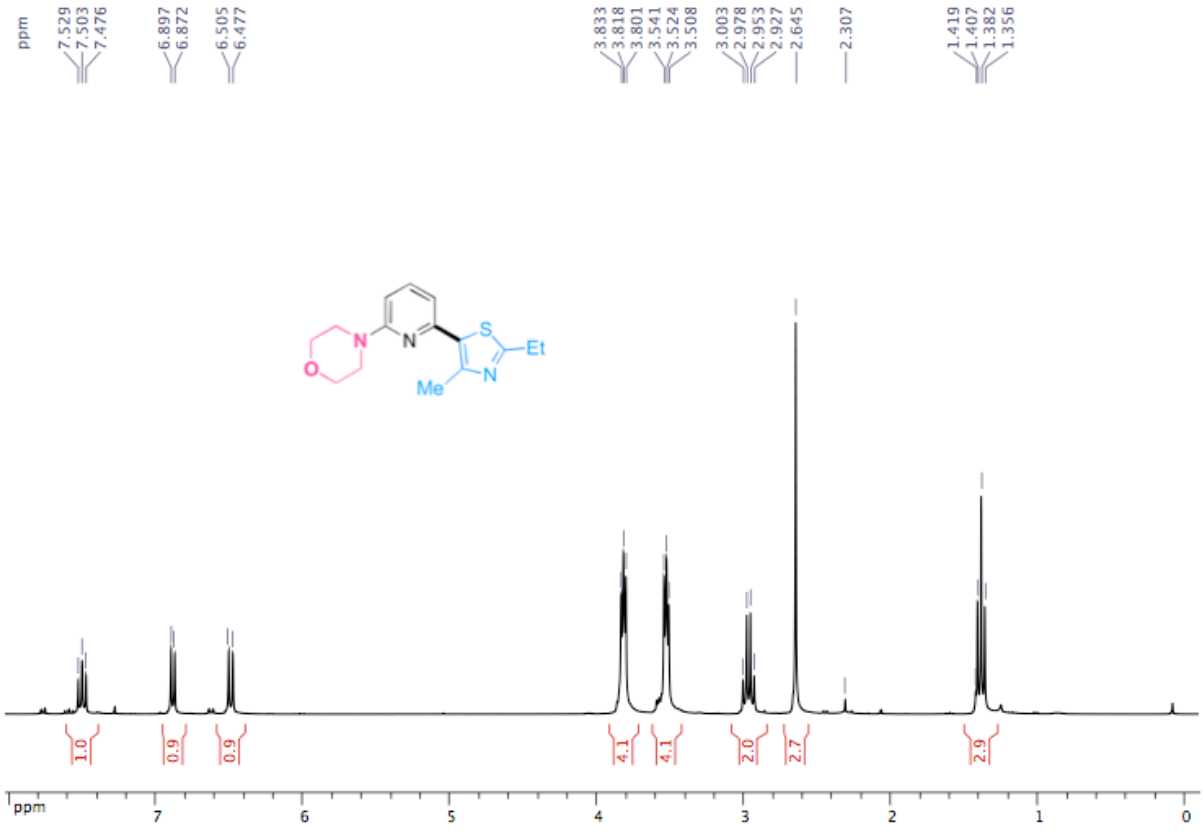

ppm
163.751
145.887
144.943
143.470
142.420
140.181
139.853
137.460
137.350
137.310
137.255
137.207
119.545
111.063
109.230
109.065
108.895
53.679
40.597
40.387
40.178
39.969
39.760
39.550
39.341
MeO
N
F
F
F
F
F
ppm
160
140
120
100
80
60
40
20

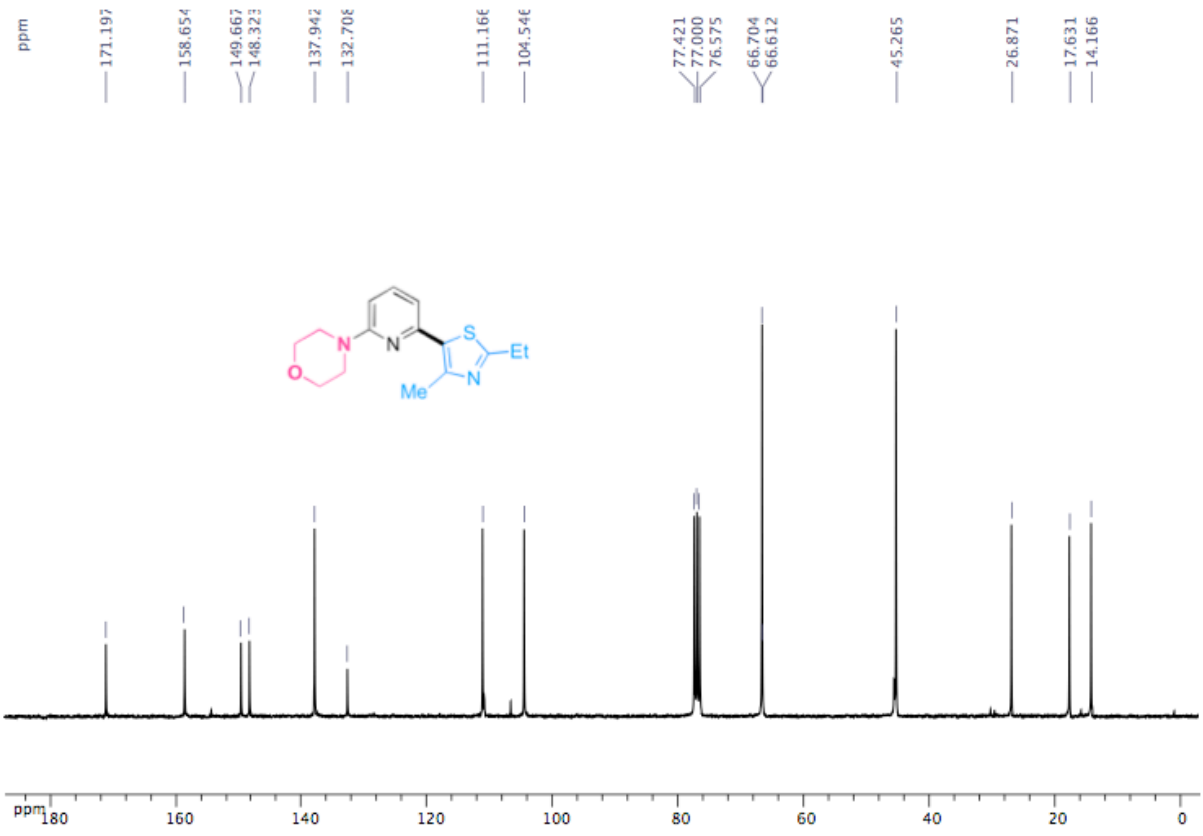

ppm
8.067
7.570
7.433
7.413
7.260
7.032
7.013
2.892
2.874
2.854
2.558
2.167
2.150
2.133
1.023
1.006
Me
N
S
N
iPr
1.0
2.1
1.1
2.5
3.2
1.3
7.5
ppm
8
7
6
5
4
3
2
1

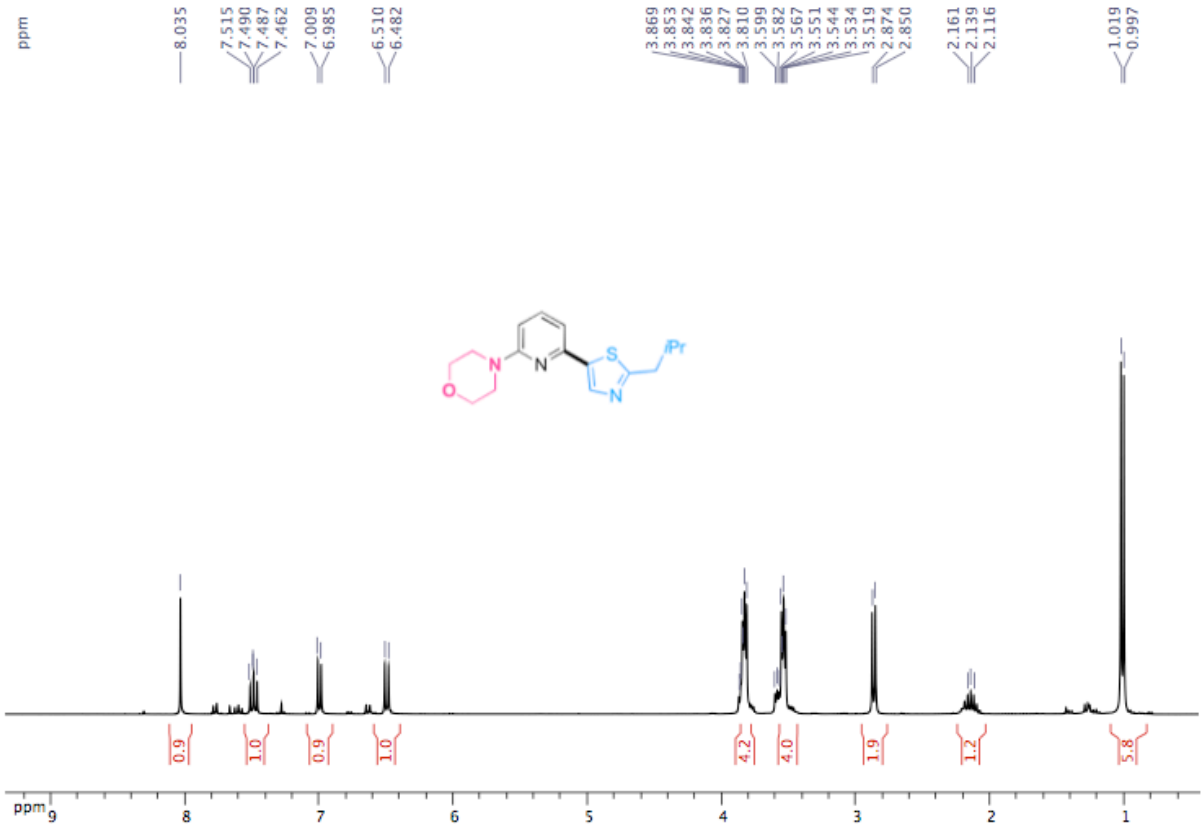

ppm
171.941
158.791
150.246
139.715
139.024
136.860
121.863
116.555
77.360
77.040
76.724
42.713
29.904
24.533
22.350
Me
N
S
N
iPr
ppm
180
160
140
120
100
80
60
40
20
0


ppm
10.093
8.778
7.943
7.923
7.882
7.879
7.863
7.860
7.809
7.790
7.788
7.260
2.800
OHC
N
S
N
Me
1.0
0.9
3.7
3.0
ppm
11
10
9
8
7
6
5
4
3


ppm
193.195
152.753
152.691
152.550
152.278
151.435
137.887
131.691
125.790
119.395
77.631
77.554
77.470
77.229
77.030
76.712
17.678
OHC
N
S
N
Me
ppm
200
180
160
140
120
100
80
60
40
20


ppm
7.529
7.503
7.476
6.897
6.872
6.505
6.477
3.833
3.818
3.801
3.541
3.524
3.508
3.003
2.978
2.953
2.927
2.645
2.307
1.419
1.407
1.382
1.356
N
O
N
S
Et
N
Me
1.0
0.9
0.9
4.1
4.1
2.0
2.7
2.9
ppm
7
6
5
4
3
2
1
0


ppm
171.197
158.654
149.667
148.323
137.942
132.708
111.166
104.546
77.421
77.000
76.575
66.704
66.612
45.265
26.871
17.631
14.166
N
O
N
S
Et
N
Me
ppm
180
160
140
120
100
80
60
40
20
0


ppm
8.035
7.515
7.490
7.487
7.462
7.009
6.985
6.510
6.482
3.869
3.853
3.842
3.836
3.827
3.810
3.599
3.582
3.567
3.551
3.544
3.534
3.519
2.874
2.850
2.161
2.139
2.116
1.019
0.997
iPr
0.9
1.0
0.9
1.0
4.2
4.0
1.9
1.2
5.8
ppm
9
8
7
6
5
4
3
2
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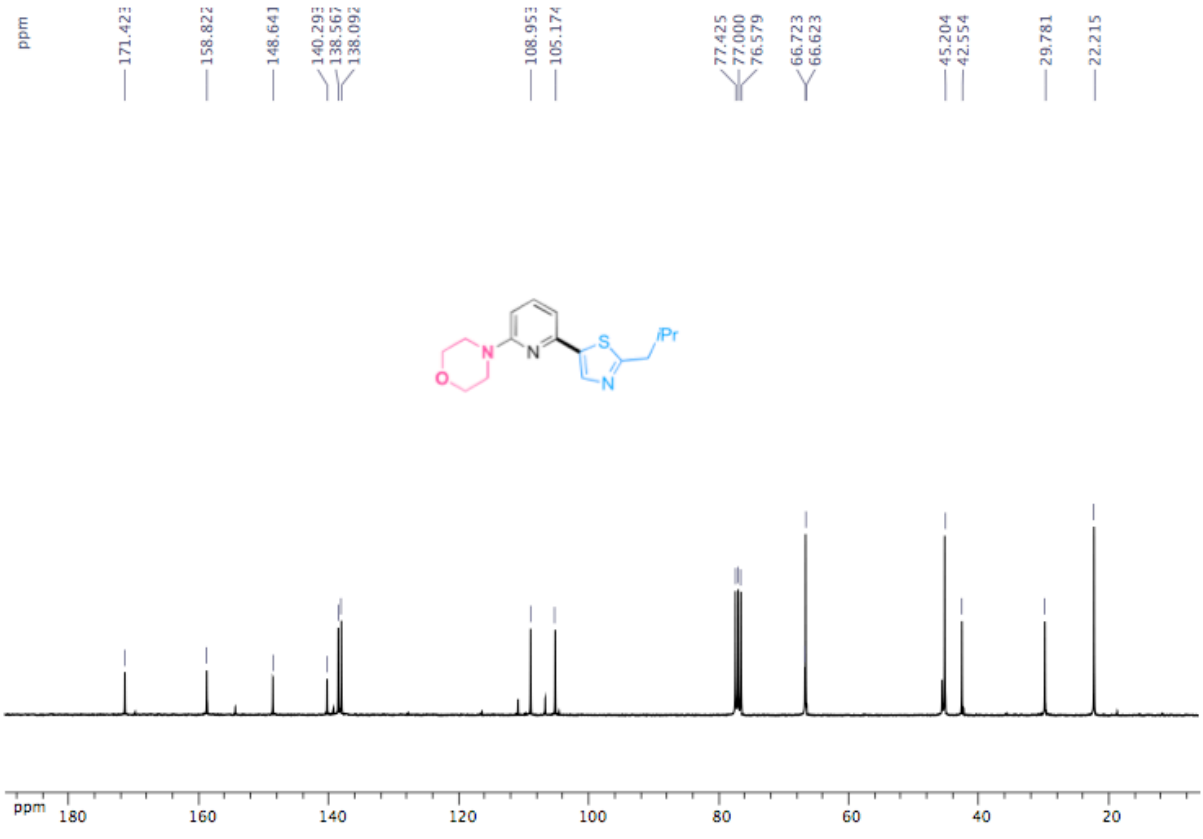
ppm
171.423
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148.641
140.293
138.567
138.092
108.953
105.174
77.425
77.000
76.579
66.723
66.623
45.204
42.554
29.781
22.215
iPr
ppm
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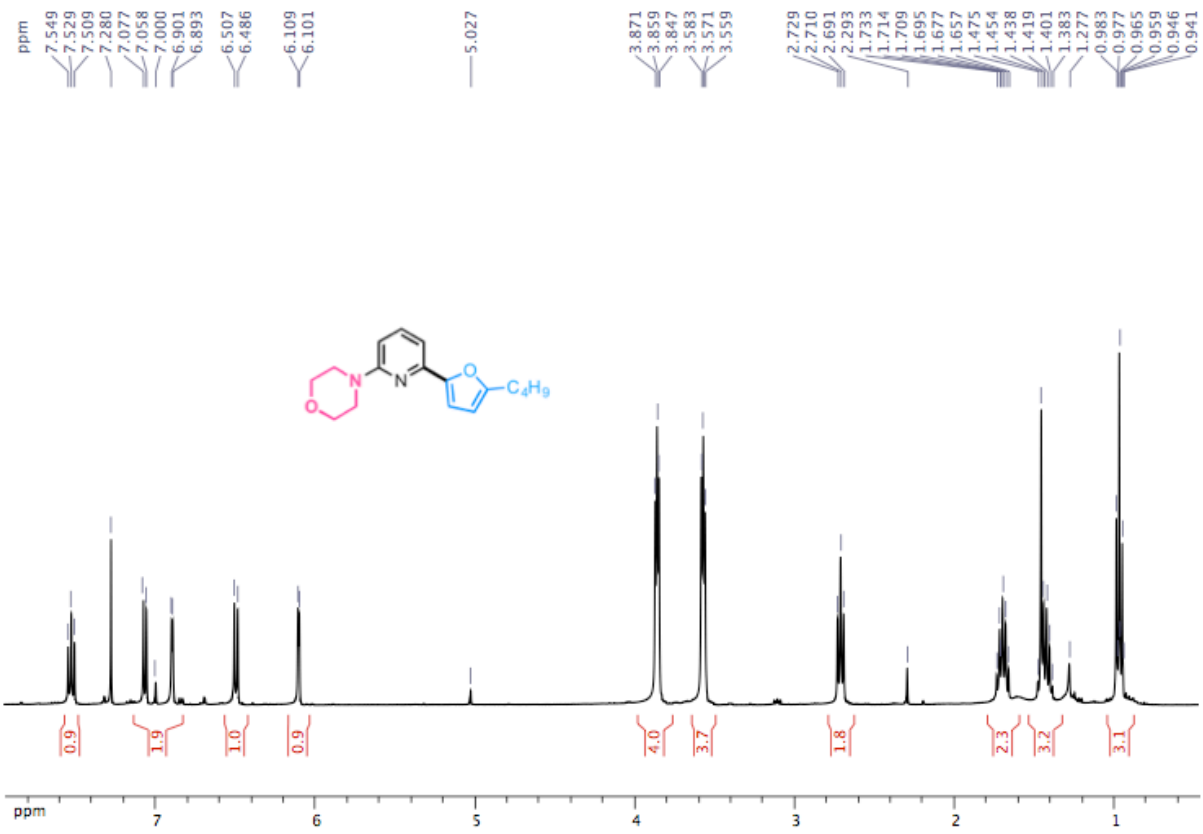
160
140
120
100
80
60
40
20


ppm
7.549
7.529
7.509
7.280
7.077
7.058
7.000
6.901
6.893
6.507
6.486
6.109
6.101
5.027
3.871
3.859
3.847
3.583
3.571
3.559
2.729
2.710
2.691
2.293
1.733
1.714
1.709
1.695
1.677
1.657
1.475
1.454
1.438
1.419
1.401
1.383
1.277
0.983
0.977
0.965
0.959
0.946
0.941
C4H9
0.9
1.9
1.0
0.9
4.0
3.7
1.8
2.3
3.2
3.1
ppm
7
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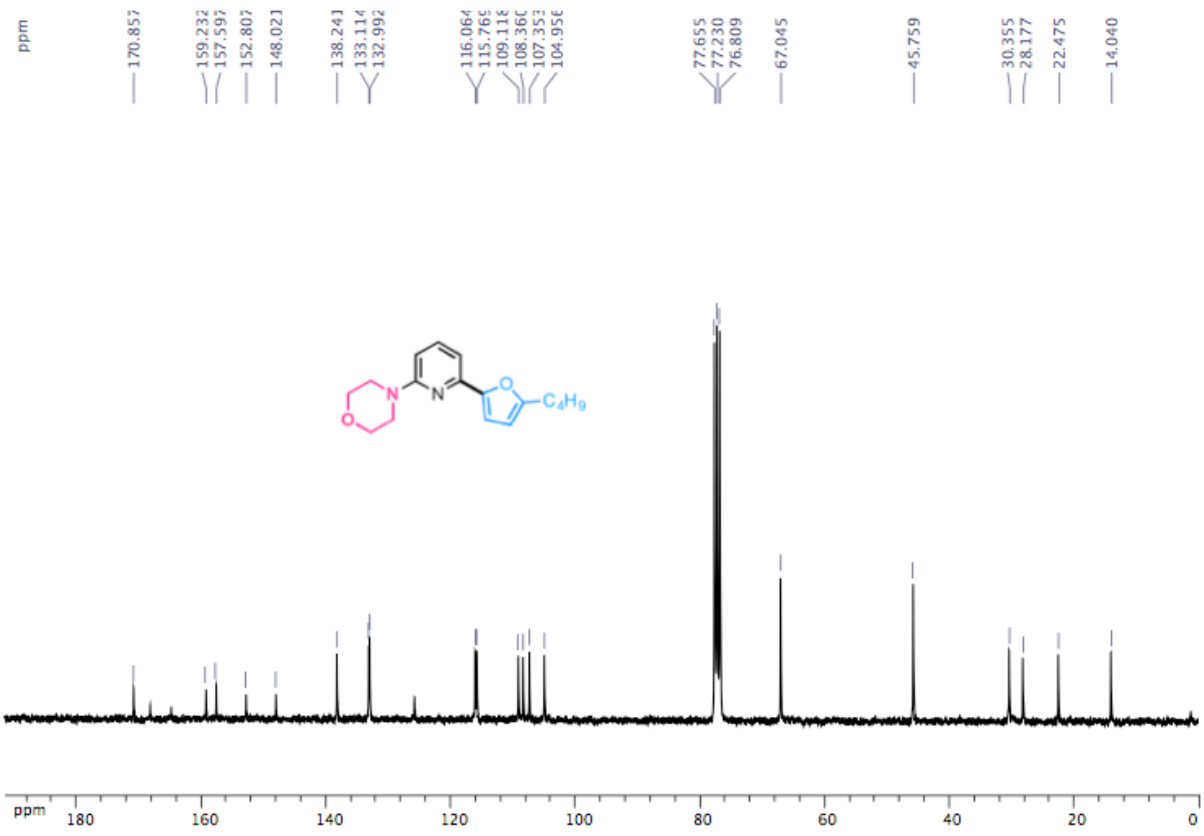
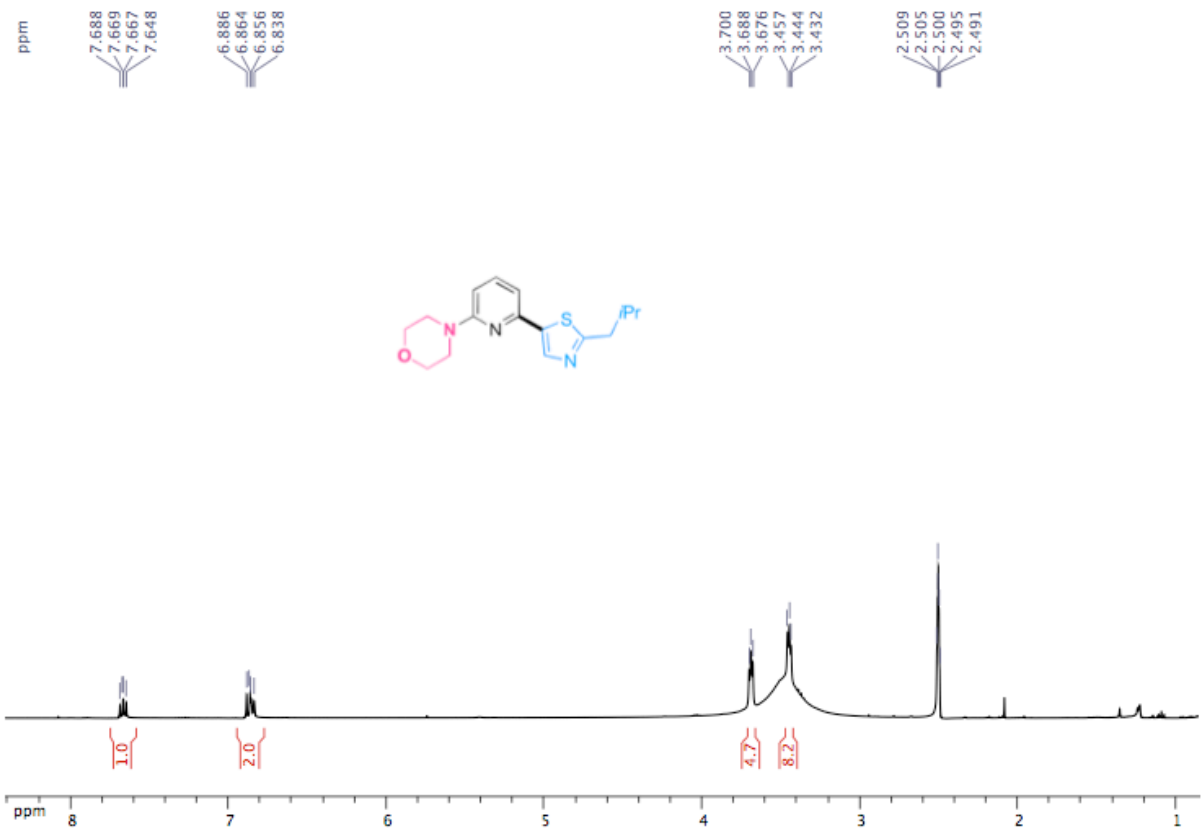
5
4
3
2
1


ppm
170.857
159.232
157.597
152.807
148.021
138.241
133.114
132.992
116.064
115.765
109.118
108.360
107.353
104.958
77.655
77.230
76.809
67.045
45.759
30.355
28.177
22.475
14.040
C4H9
ppm
180
160
140
120
100
80
60
40
20
0


ppm
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7.648
6.886
6.864
6.856
6.838
3.700
3.688
3.676
3.457
3.444
3.432
2.509
2.505
2.500
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2.491
iPr
1.0
2.0
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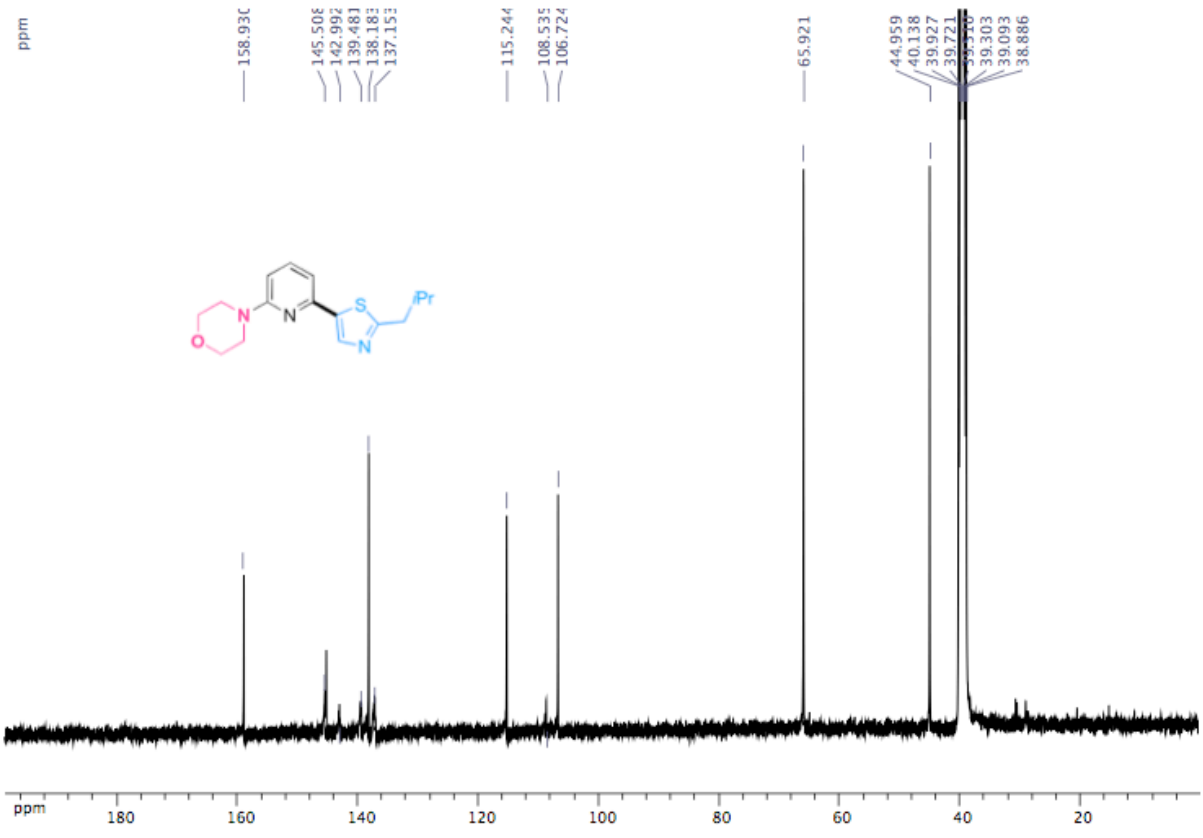
8.2
8
7
6
5
4
3
2
1


ppm
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139.481
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137.153
115.244
108.535
106.724
65.921
44.959
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39.927
39.721
39.303
39.093
38.886
iPr
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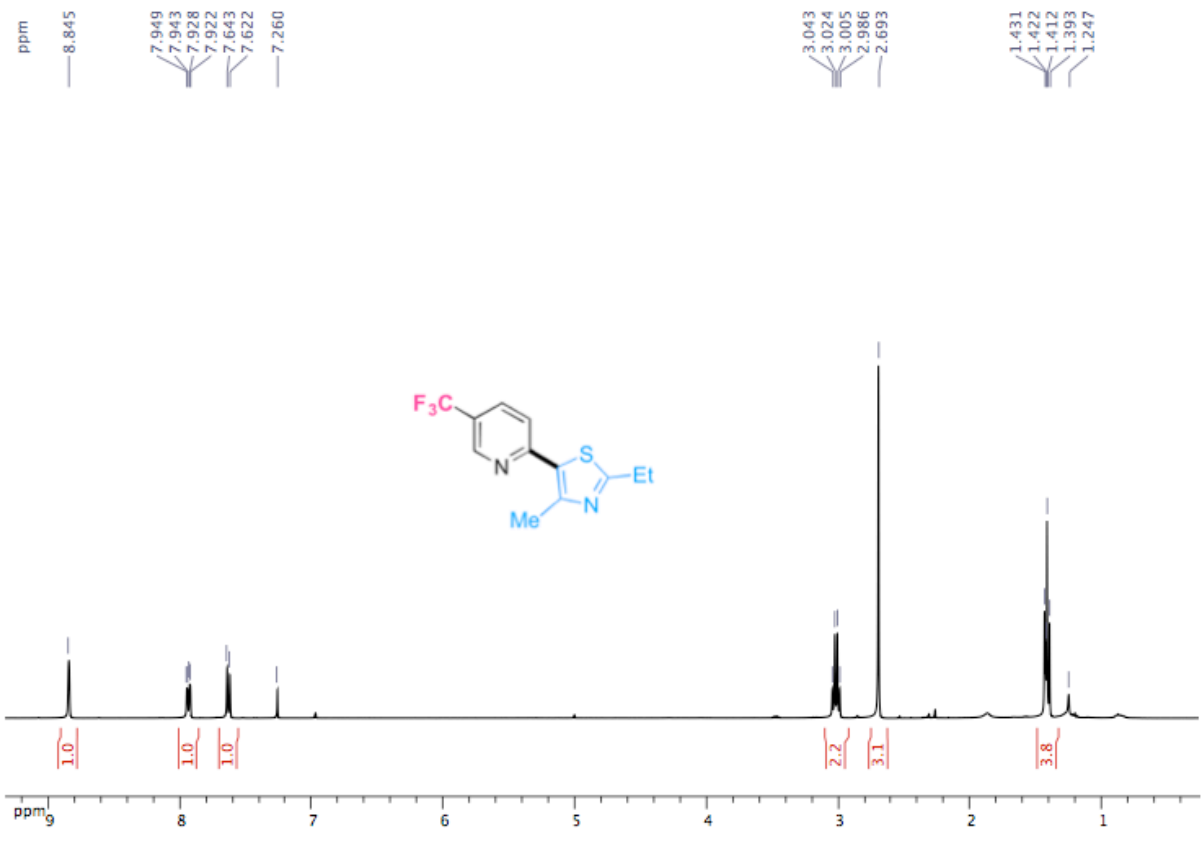
160
140
120
100
80
60
40
20


ppm
8.845
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7.928
7.922
7.643
7.622
7.260
3.043
3.024
3.005
2.986
2.693
1.431
1.422
1.412
1.393
1.247
F3C
N
S
Et
N
Me
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1.0
1.0
2.2
3.1
3.8
ppm
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8
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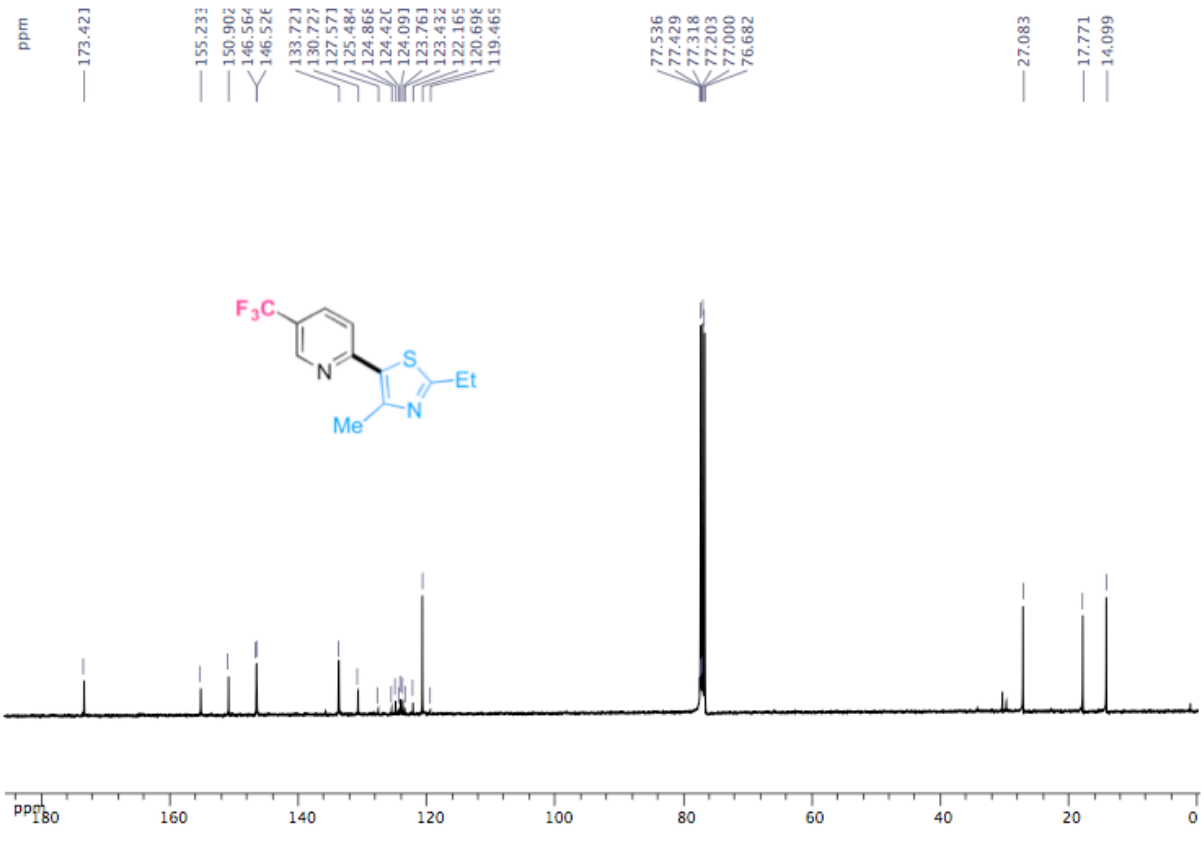
6
5
4
3
2
1


ppm
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150.902
146.564
146.526
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130.727
127.571
125.484
124.868
124.420
124.091
123.761
123.432
122.165
120.698
119.465
77.536
77.429
77.318
77.203
77.000
76.682
27.083
17.771
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F3C
N
S
Et
N
Me
ppm
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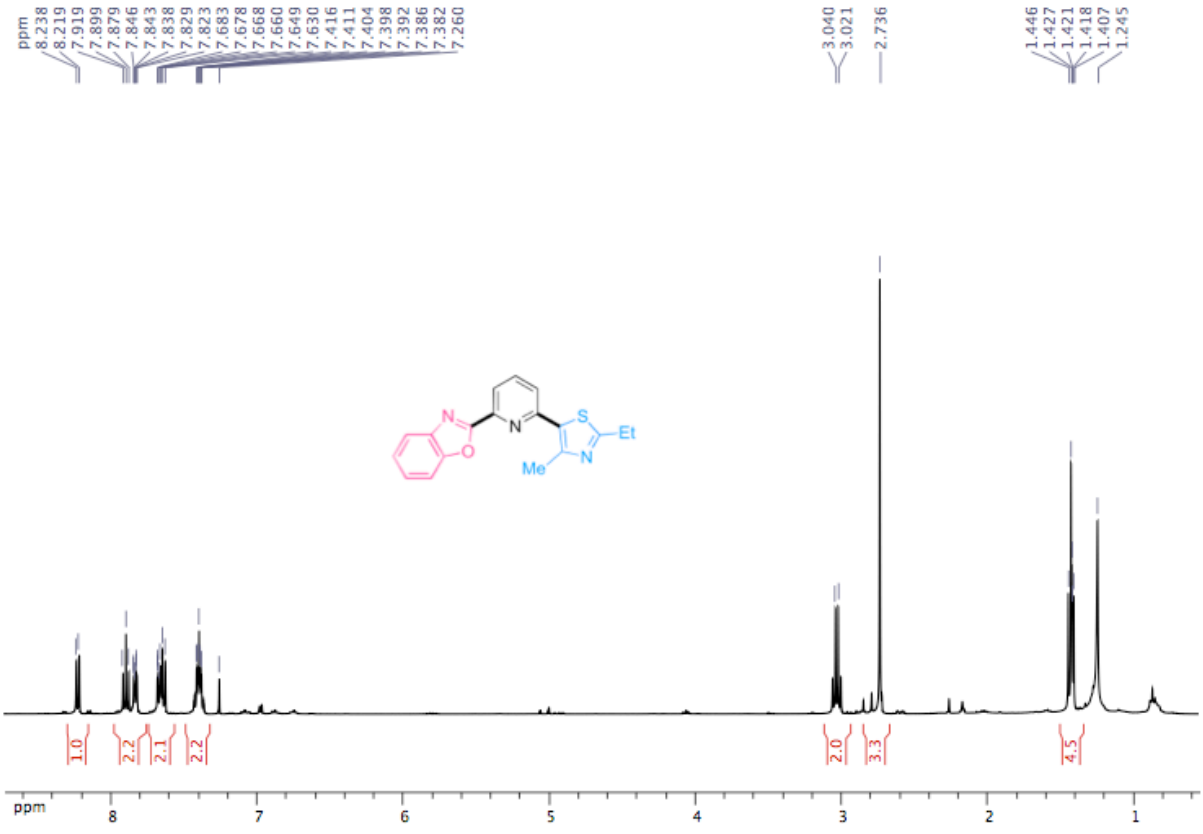
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7.879
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7.838
7.829
7.823
7.683
7.678
7.668
7.660
7.649
7.630
7.416
7.411
7.404
7.398
7.392
7.386
7.382
7.260
3.040
3.021
2.736
1.446
1.427
1.421
1.418
1.407
1.245
N
O
N
S
Et
Me
1.0
2.2
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2.2
2.0
3.3
4.5
ppm
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4
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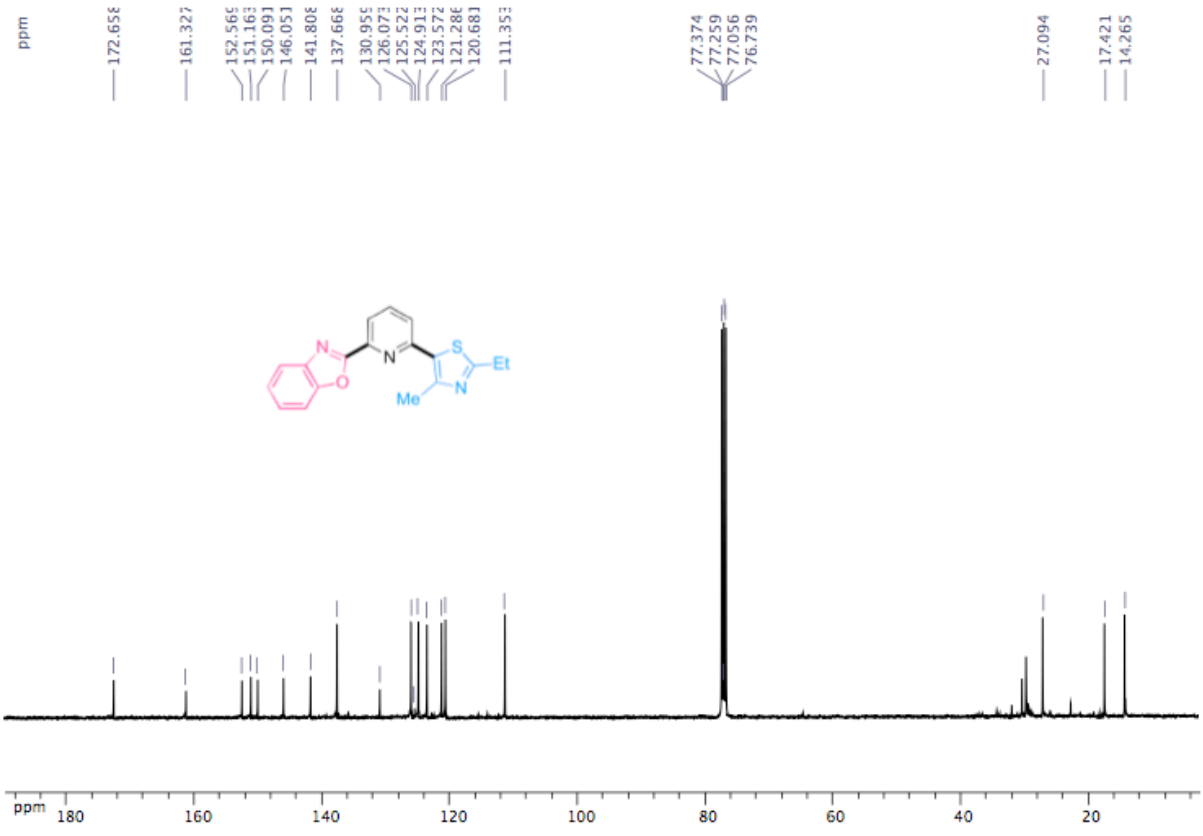
2
1


ppm
172.658
161.327
152.565
151.163
150.091
146.051
141.808
137.668
130.955
126.073
125.522
124.913
123.572
121.288
120.681
111.353
77.374
77.259
77.056
76.739
27.094
17.421
14.265
N
O
N
S
Et
Me
ppm
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160
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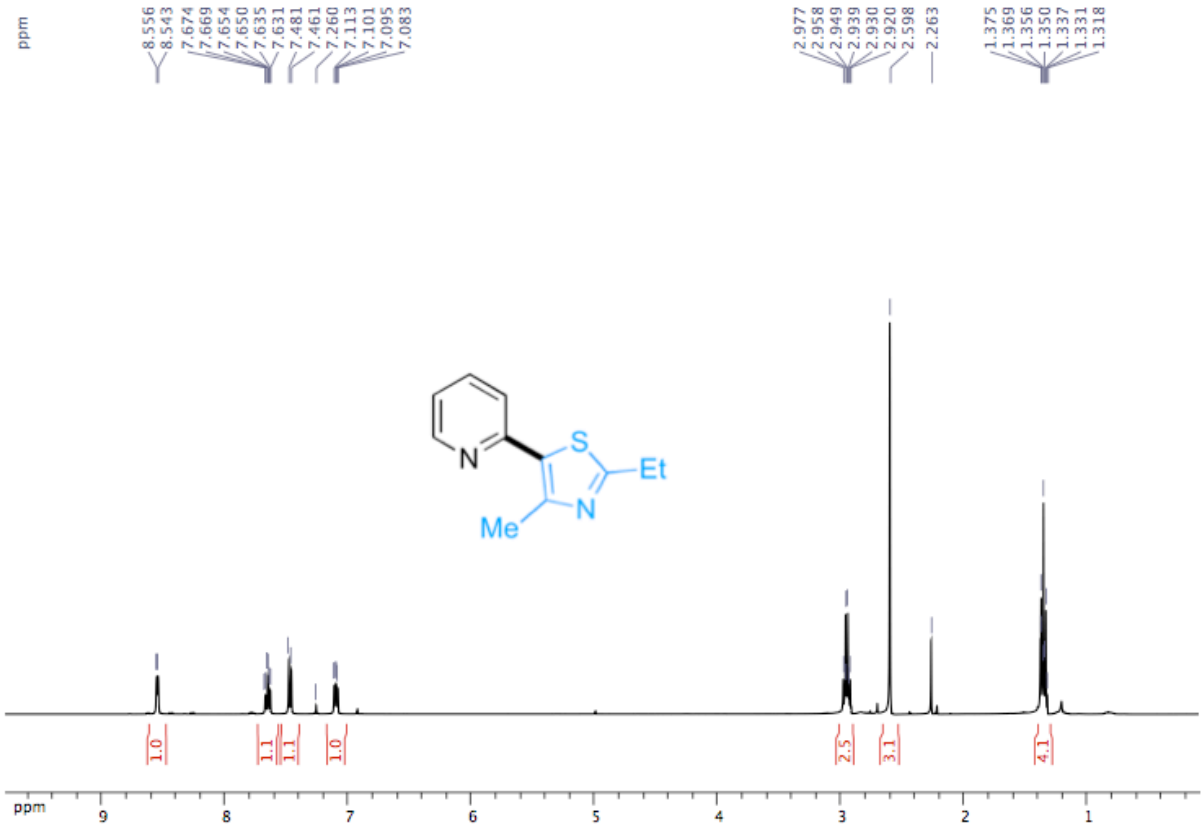
ppm
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7.654
7.650
7.635
7.631
7.481
7.461
7.260
7.113
7.101
7.095
7.083
2.977
2.958
2.949
2.939
2.930
2.920
2.598
2.263
1.375
1.369
1.356
1.350
1.337
1.331
1.318
N
S
Et
N
Me
1.0
1.1
1.1
1.0
2.5
3.1
4.1
ppm
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8
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4
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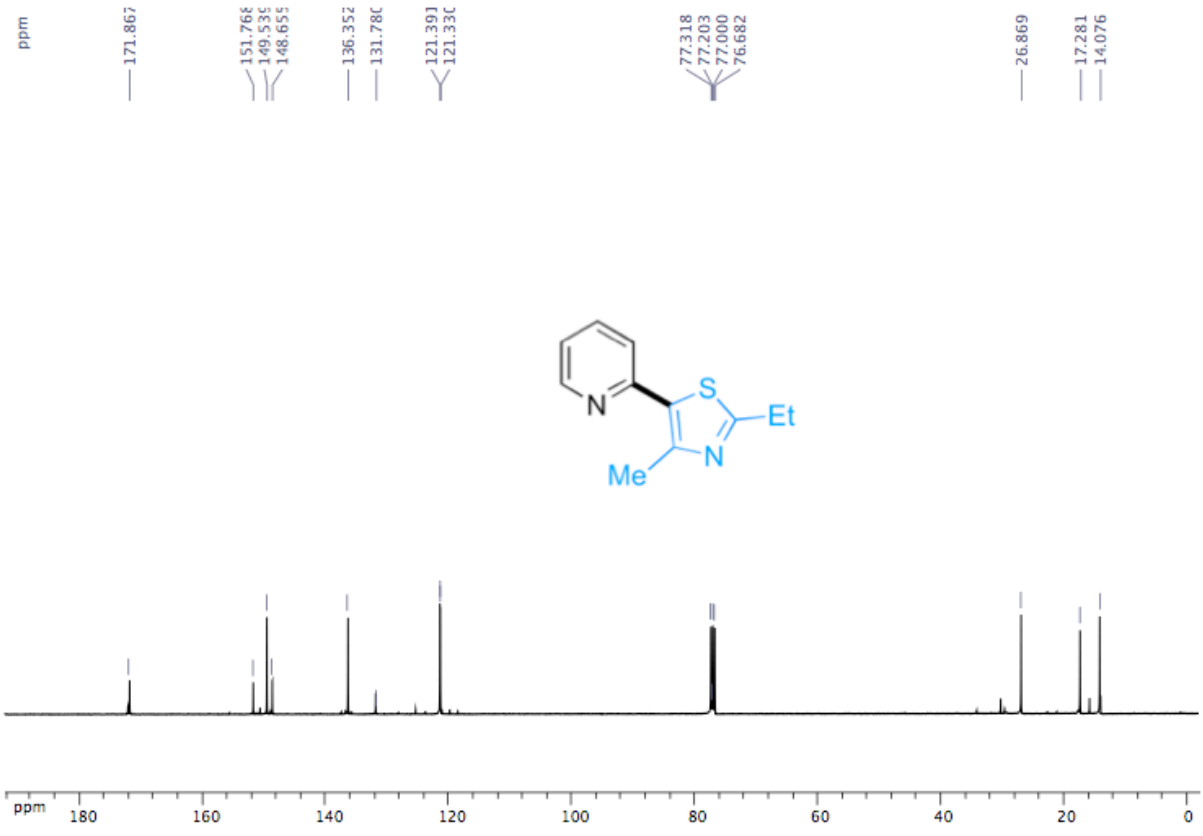
ppm
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136.352
131.780
121.391
121.330
77.318
77.203
77.000
76.682
26.869
17.281
14.076
N
S
Et
N
Me
ppm
180
160
140
120
100
80
60
40
20
0