Supporting Information

Experimental and Mechanistic Insights of Copper(II)-dioxygen Catalyzed Oxidative *N*-dealkylation of *N*-(2-pyridylmethyl)phenylamine and Its Derivatives

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Table S1. Crystallographic Data [a] for Compounds **1a-1b** and **1d-1f**.

compounds	[**1a**]	[**1b**]	[**1d**]	[**1e**]	[**1f**]
formula	$C_{20}H_{19}CuF_6N_3O_7S_2$	$C_{25}H_{21}CuF_3N_4O_5S$	$C_{28}H_{30}CuF_6N_6O_6S_2$	$C_{27}H_{27}CuF_6N_5O_6S_2$	$C_{33}H_{31}CuF_6N_5O_6S_2$
M	655.04	610.06	788.24	759.20	835.29
crystal system	orthorhombic	monoclinic	triclinic	triclinic	triclinic
space group	$P2_12_12_1$	$P2_1/n$	*P-1*	*P-1*	*P-1*
a, Å	8.68300(16)	13.4993(3)	10.1705(4)	8.9816(4)	10.0986(12)
b, Å	10.2079(2)	8.9437(2)	12.0872(4)	10.9461(4)	13.5819(14)
c, Å	27.0713(6)	20.9454(5)	14.4087(6)	16.4679(9)	15.2704(16)
α, deg	90	90	93.643(3)	81.550(4)	68.475(10)
β, deg	90	100.521(2)	110.216(4)	77.177(4)	72.790(10)
γ, deg	90	90	95.074(3)	87.632(3)	73.322(10)
V, Å^3	2399.47(8)	2486.30(11)	1647.25(11)	1561.44(13)	1823.2(3)
Z	4	4	2	2	2
μ, mm^{-1}	3.810	2.640	2.889	3.014	2.641
independent data	3815	4745	6209	5951	6796
refined parameters	358	352	442	427	591
R_1[b], wR_2[c] (I >2σ(I))	0.0232, 0.0589	0.0477, 0.1274	0.0581, 0.1854	0.0433, 0.1125	0.1146, 0.3084
R_1, wR_2 (all data)	0.0251, 0.0602	0.0609, 0.1360	0.0629, 0.1872	0.0521, 0.1168	0.1586, 0.3220

[a]T = 100(2) K, Cu Kα radiation (λ = 1.54184 Å). [b]$R_1 = \sum||F_o| - |F_c|| / \sum|F_o|$. [c]$wR_2 = \{\sum[w(F_o^2 - F_c^2)^2/(F_o^2)^2]\}^{1/2}$.

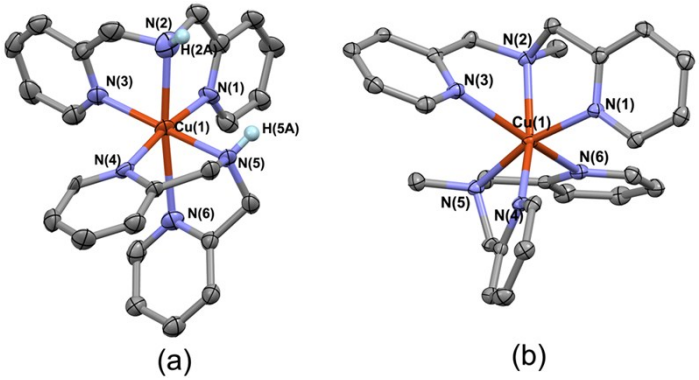


Figure S1 Crystal structures of **1c** (a) (Note: CIF file was NOT reported due to poor data; Structure was shown for comparison) and **1d** (b) (CCDC 1561119) showing 50% probability ellipsoid.

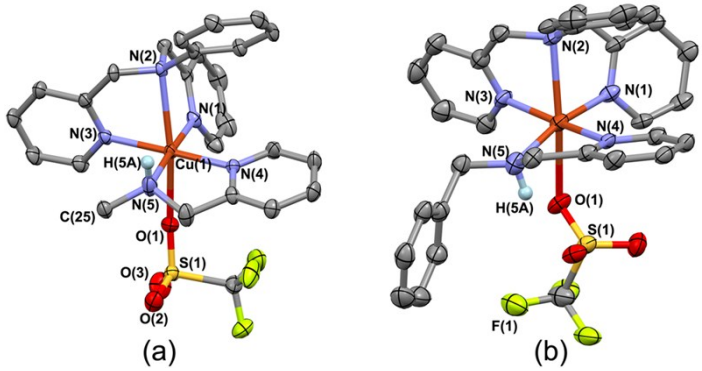


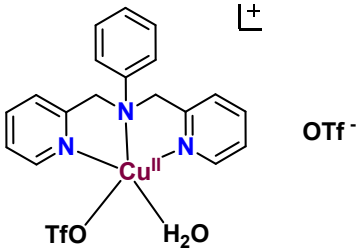
Figure S2 Crystal structures of complexes **1e** (a) (CCDC 1560850) and **1f** (b) (CCDC 1560839) showing 50% probability ellipsoid. These two structures are presented here for representation of the structure of $\{Cu^{II}(L_N)[(PyCH_2)NH(PhCH_3)]\}$ moiety from the point of analogues.

1. General Information

All chemicals were purchased from commercial suppliers and used without further purification. Solvent DMF and CH_3CN were dried over CaH_2 and stored in the presence of activated molecular sieve. Flash chromatography was performed on silica gel (200-300 mesh). The single crystal data of compounds were collected by a Cu-Kα rotating anode source at 100 K, using a Supernova diffractometer with the ω-scan method. ESI-MS were obtained using a Bruker Impact II quardrupole time-of-flight mass spectrometer. ^{1}H NMR spectra were recorded on Bruker Avance III (400 MHz) and chemical shifts are expressed in δ ppm values with reference to tetramethylsilane (TMS) as internal standard. NMR multiplicities are abbreviated as follows: s = singlet, d = doublet, m = multiplet. Coupling constants (J) are expressed in Hz. Product yields refer to isolated yields after column chromatography. All commercial reagents were purchased from Alfa, Sigma Aldrich, Energy Chemical or TCI.

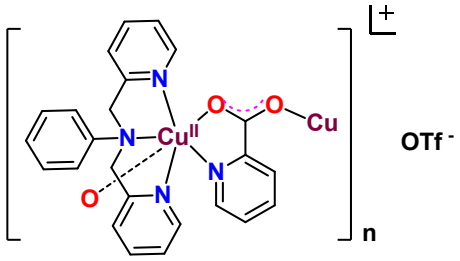
2. Experimental procedure for inorganic compounds

(1) $[Cu^{II}(L_N)(H_2O)(OTf)](OTf)$ (1a)



To a solution of $Cu(OTf)_2$ (18 mg, 0.05 mmol) and H_2O (0.1 mL) in MeCN (3 mL) was added a solution of *N*,*N*-bis(pyridin-2-ylmethyl)aniline (13.7 mg, 0.05 mmol) in MeCN (2 mL). The mixture was stirred for 5h under nitrogen atmosphere and concentrated under reduced pressure. The residue was washed with Et_2O and THF, dissolved in MeCN and diffused with Et_2O to yield the product as some green crystals (26.1mg, 80%). Anal. Calcd. (%) for $C_{20}H_{19}CuF_6N_3O_7S_2$: C, 36.67; H, 2.92; N, 6.41. Found (%) C, 36.45; H, 3.19; 6.73.

(2) $\{[Cu^{II}(L_N)(PyCOO)](OTf)\}_n$ (1b)

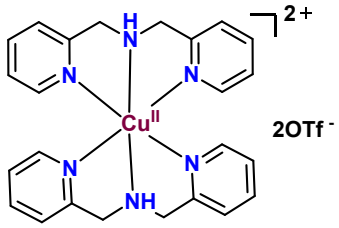


Method A: To a solution of compound **1a** (32.6 mg, 0.05 mmol) in MeCN/H_2O (5/0.1 mL) was added *N*-(pyridin-2-ylmethyl)aniline (9.2 mg, 0.05 mmol) and Et_3N (0.1 mL). The mixture was stirred overnight under O_2 atmosphere for 24 h and concentrated under reduced pressure. The residue was washed with Et_2O, dissolved in THF and diffused with Et_2O to yield the product as green crystals (16 mg, 53%). Anal. Calcd. (%) for $C_{25}H_{21}CuF_3N_4O_5S$: C, 49.22; H, 3.47; N, 9.18. Found (%) C, 48.86; H, 3.09; N, 9.87. ESI-MS (MeCN): m/z 460.3 for $[Cu(DPA\text{-}Ph)(PyCOO)]^+$.

Method B: A mixture of *N*,*N*-bis(pyridin-2-ylmethyl)aniline (13.7 mg, 0.05 mmol) and $Cu(OTf)_2$ (18 mg, 0.05 mmol) were stirred in MeCN/H_2O (5/0.1 mL) for 1 h before *N*-(pyridin-2-ylmethyl)-

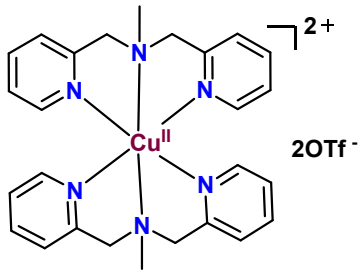
aniline (9.2 mg, 0.05 mmol) and Et_3N (0.1 mL) were added. The mixture was stirred in O_2 atmosphere for 24 h and solvent removed in vacuo. The residue was washed with Et_2O, dissolved in THF and diffused with Et_2O to afford the product as green crystals (15 mg, 50%).

(3) $[Cu^{II}(DPA)_2]$ $(CF_3SO_3)_2$ (1c)



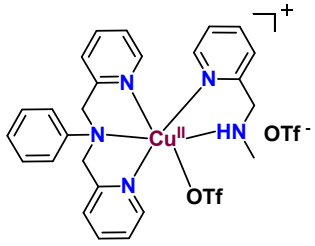
To a solution of compound **1a** (32.6mg, 0.05mmol) in MeCN (5 mL) was added di-(2-picolyl)amine (DPA) (10 mg, 0.05 mmol) and Et_3N (0.1 mL). The mixture was stirred overnight under O_2 atmosphere for 24h and concentrated under reduced pressure. The residue was washed with Et_2O and THF, dissolved in CH_3CN and diffused with Et_2O to yield the product as blue crystals (7.4 mg, 32%). Anal. Calcd. (%) for $C_{30}H_{34}CuF_6N_6O_6S_2$: C, 44.14; H, 4.20; N, 10.30. Found (%) C, 43.98; H, 4.51; 10.02

(4) $[Cu^{II}(DPA\text{-}CH_3)_2](CF_3SO_3)_2$ (1d)



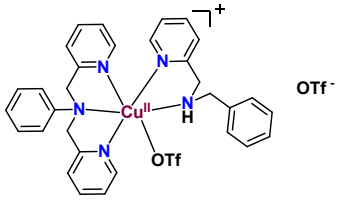
To a solution of compound **1a** (25 mg, 0.05 mmol) in MeCN (5 mL) was added N-methyl-N,N-di(2-pyridylmethyl)amine (DPA-CH_3) (11 mg, 0.05 mmol) and Et_3N (0.1 mL). The mixture was stirred overnight under O_2 atmosphere for 24h and concentrated under reduced pressure. The residue was washed with Et_2O and THF, dissolved in CH_3CN and diffused with Et_2O to yield the product as blue crystals (6.1 mg, 25%). Anal. Calcd. (%) for $C_{28}H_{30}CuF_6N_6O_6S_2$: C, 42.66; H, 3.84; N, 10.66. Found (%) C, 43.23; H, 3.21; 10.12.

(5) $[Cu^{II}(L_N)(PyCH_2NHCH_3)(CF_3SO_3)](CF_3SO_3)$ (1e)



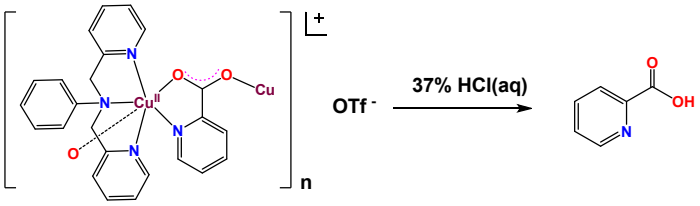
To a solution of compound **1a** (32.6 mg, 0.05 mmol) in MeCN (5 mL) was added *N*-methyl- 1-(pyridin-2-yl)methanamine (6.2 mg, 0.05 mmol) and Et_3N (0.1 mL). The mixture was stirred overnight under O_2 atmosphere for 24h and concentrated under reduced pressure. The residue was washed with Et_2O, dissolved in THF and diffused with Et_2O to yield the product as blue crystals (28.5 mg, 75%). Anal. Calcd. (%) for $C_{27}H_{27}CuF_6N_5O_6S_2$: C, 42.71; H, 3.58; N, 9.22. Found (%) C, 42.36; H, 3.12; 9.79.

(6) $[Cu^{II}(L_N)(PyCH_2NHCH_2Ph)(CF_3SO_3)](CF_3SO_3)$ (1f)



To a solution of compound **1a** (32.6 mg, 0.05 mmol) in MeCN (5 mL) was added N-benzyl- 1-(pyridin-2-yl)methanamine (9.9 mg, 0.05 mmol) and Et_3N (0.1 mL). The mixture was stirred overnight under O_2 atmosphere for 24h and concentrated under reduced pressure. The residue was washed with Et_2O, dissolved in THF and diffused with Et_2O to yield the product as blue crystals (22.1 mg, 53%). Anal. Calcd. (%) for $C_{33}H_{31}CuF_6N_5O_6S_2$: C, 47.45; H, 3.74; N, 8.38. Found (%) C, 47.94; H, 4.01; 8.12.

(7) PyCOOH



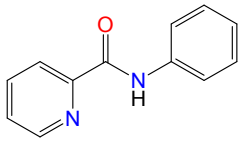
The compound **1b** (0.1 mmol) was stirred in concentrated HCl (37%, 1 mL) for 2 hours and the resultant solution was extracted with CH_2Cl_2 (3×20 mL). The combined organic layer was washed with water (3×10 mL) and dried over anhydrous Na_2SO_4 over night. The white solid was filtered off and the solvent was removed in vacuo. The residue was washed with Et_2O to give product as some white soild (6.4 mg, 61%).

3. General experimental procedure A-E for organic synthesis

General Experimental Procedure A

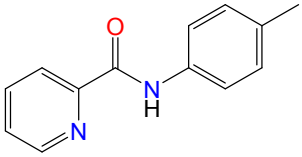
$Cu(OTf)_2$ (3.6 mg, 0.01 mmol), N,N-bis(pyridin-2-ylmethyl)phenylamine (L_N) (4.1 mg, 0.015 mmol), t-BuOK (22.4 mg, 0.2 mmol), *N*-(pyridin-2-ylmethyl)aniline derivatives (0.1 mmol) were mixed in dried DMF (1 mL) in a 35 mL Teflon screw-cap sealed tube. The tube was charged with O_2 (1 atm) and the mixture was vigorously stirred at RT for 24 h. After reaction was completed, the reaction mixture was diluted with dichloromethane (20 mL), filtered through a pad of silica gel and concentrated under reduced pressure. The crude product was purified on a silica gel column.

(8) N-phenylpicolinamide (2a)[1]



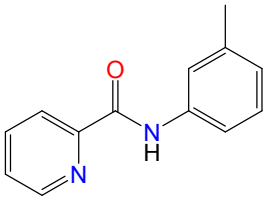
Following the general experimental procedure A presented above, using *N*-(pyridin-2-ylmethyl)aniline (18.4 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as yellow solid (75% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.20 – 9.91 (m, 1H), 8.64 (d, *J* = 4.7 Hz, 1H), 8.33 (d, *J* = 7.8 Hz, 1H), 7.93 (td, *J* = 7.7, 1.7 Hz, 1H), 7.85 – 7.78 (m, 2H), 7.56 – 7.46 (m, 1H), 7.42 (dd, *J* = 10.8, 5.1 Hz, 2H), 7.18 (t, *J* = 7.4 Hz, 1H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 162.01, 149.82, 147.99, 137.76, 137.71, 129.11, 126.48, 124.34, 122.43, 119.70. HRMS m/z (ESI) [M + Na^+]: 221.0685.

(9) N-(p-tolyl)picolinamide (2b)[2]



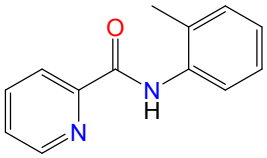
Following the general experimental procedure A presented above, using *4-methyl-N- (pyridin-2-ylmethyl)aniline* (19.8 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a white solid (92% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.99 (s, 1H), 8.63 (d, *J* = 4.7 Hz, 1H), 8.40 – 8.26 (m, 1H), 7.98 – 7.86 (m, 1H), 7.71 (t, *J* = 8.8 Hz, 2H), 7.55 – 7.45 (m, 1H), 7.20 (t, *J* = 10.0 Hz, 2H), 2.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.87, 149.95, 147.95, 137.66, 135.23, 133.93, 129.60, 126.36, 122.37, 119.68, 20.95.

(10) N-(m-tolyl)picolinamide (2c)[2]



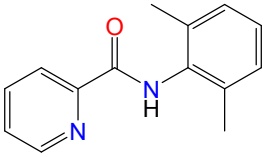
Following the general experimental procedure A presented above, using *3-methyl-N- (pyridin-2-ylmethyl)aniline* (19.8 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a colorless oil (68% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.07 (d, *J* = 44.7 Hz, 1H), 8.64 (ddd, *J* = 4.8, 1.6, 0.9 Hz, 1H), 8.32 (dt, *J* = 7.8, 1.0 Hz, 1H), 7.93 (td, *J* = 7.7, 1.7 Hz, 1H), 7.68 (d, *J* = 4.7 Hz, 1H), 7.60 (d, *J* = 8.0 Hz, 1H), 7.50 (ddd, *J* = 7.6, 4.8, 1.2 Hz, 1H), 7.29 (q, *J* = 3.1 Hz, 1H), 6.99 (d, *J* = 7.6 Hz, 1H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.96, 149.90, 147.96, 139.01, 137.69, 137.66, 128.92, 126.42, 125.16, 122.39, 120.34, 116.80, 21.55.

(11) N-(o-tolyl)picolinamide (2d)[3]



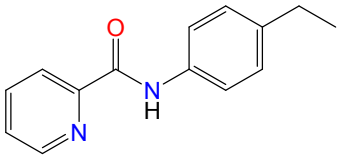
Following the general experimental procedure A presented above, using *2-methyl-N- (pyridin-2-ylmethyl)aniline* (19.8 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a colorless oil (51% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.12 (s, 1H), 8.65 (dd, *J* = 5.7, 4.9 Hz, 1H), 8.32 (dd, *J* = 13.3, 7.7 Hz, 2H), 7.94 (tdd, *J* = 5.4, 3.9, 1.8 Hz, 1H), 7.55 – 7.50 (m, 1H), 7.34 – 7.29 (m, 1H), 7.26 (d, *J* = 7.4 Hz, 1H), 7.11 (td, *J* = 7.5, 1.0 Hz, 1H), 2.45 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.92, 150.16, 148.10, 137.67, 130.42, 128.04, 126.91, 126.41, 124.58, 122.41, 121.33, 119.69, 17.76.

(12) N-(2, 6-dimethylphenyl)picolinamide (2e)[4]



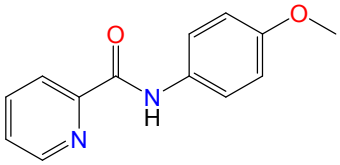
Following the general experimental procedure A presented above, using 2,6-dimethyl- N-(pyridin-2-ylmethyl)aniline (21.2 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a white solid (38% yield);^{1}H NMR (400 MHz, $CDCl_3$): δ 9.51 (s, 1H), 8.66 (ddd, *J* = 4.8, 1.6, 0.9 Hz, 1H), 8.33 (dt, *J* = 7.8, 1.0 Hz, 1H), 7.93 (td, *J* = 7.7, 1.7 Hz, 1H), 7.52 (ddd, *J* = 7.6, 4.8, 1.2 Hz, 1H), 7.18 – 7.13 (m, 3H), 2.33 (s, 6H).^{13}C NMR (101 MHz, $CDCl_3$): δ 161.92, 150.16, 148.10, 137.67, 130.42, 128.04, 126.91, 126.41, 124.58, 122.41, 121.33, 119.69, 17.76.

(13) N-(4-ethylphenyl)picolinamide (2f)



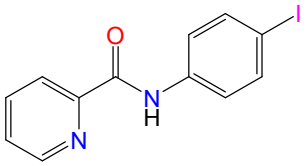
Following the general experimental procedure A presented above, using 4-ethyl-N- (pyridin-2-ylmethyl)aniline (21.2 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a colorless oil (70% yield);^{1}H NMR (400 MHz, $CDCl_3$): δ 10.00 (s, 1H), 8.64 (ddd, *J* = 4.8, 1.6, 0.9 Hz, 1H), 8.32 (dt, *J* = 7.9, 1.0 Hz, 1H), 7.93 (td, *J* = 7.7, 1.7 Hz, 1H), 7.77 – 7.68 (m, 2H), 7.56 – 7.45 (m, 1H), 7.23 (t, *J* = 9.6 Hz, 2H), 2.67 (q, *J* = 7.6 Hz, 2H), 1.30 – 1.26 (m, 3H).^{13}C NMR (101 MHz, $CDCl_3$): δ 161.92, 150.16, 148.10, 137.67, 130.42, 128.04, 126.91, 126.41, 124.58, 122.41, 121.33, 119.69, 17.76. HRMS m/z (ESI) [M + Na^+]: 249.0999.

(14) N-(4-methoxyphenyl)picolinamide (2g)[1]



Following the general experimental procedure A presented above, using 4-methoxy-N- (pyridin-2-ylmethyl)aniline (21.4 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a white solid (82% yield);^{1}H NMR (400 MHz, $CDCl_3$): δ 9.89 (d, *J* = 45.7 Hz, 1H), 8.63 (ddd, *J* = 4.8, 1.6, 0.9 Hz, 1H), 8.31 (dt, *J* = 7.9, 1.0 Hz, 1H), 7.92 (td, *J* = 7.7, 1.7 Hz, 1H), 7.81 – 7.67 (m, 2H), 7.49 (ddd, *J* = 7.6, 4.8, 1.2 Hz, 1H), 7.03 – 6.92 (m, 2H), 3.84 (s, 3H).^{13}C NMR (101 MHz, $CDCl_3$): δ 161.92, 150.16, 148.10, 137.67, 130.42, 128.04, 126.91, 126.41, 124.58, 122.41, 121.33, 119.69, 17.76.

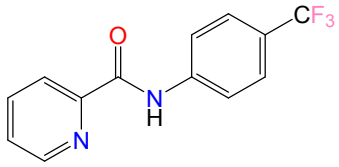
(15) N-(4-iodophenyl)picolinamide (2h)[1]



Following the general experimental procedure A presented above, using 4-iodo-N-(pyridin- 2-ylmethyl)aniline (31 mg , 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a white solid (80% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.11 (d, *J* = 44.9 Hz, 1H), 8.71 – 8.58 (m, 1H), 8.32 (t, *J* = 8.7 Hz, 1H), 7.94 (td,

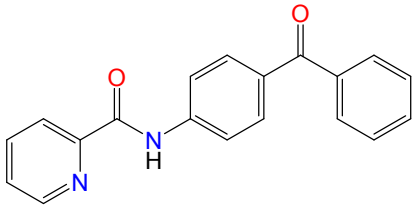
J = 7.7, 1.7 Hz, 1H), 7.76 – 7.65 (m, 2H), 7.65 – 7.57 (m, 2H), 7.52 (ddd, J = 7.6, 4.8, 1.2 Hz, 1H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 162.06, 149.50, 148.02, 138.02, 137.79, 137.53, 126.66, 122.47, 121.53, 87.50.

(16) N-(4-(trifluoromethyl)phenyl)picolinamide (2i)[2]



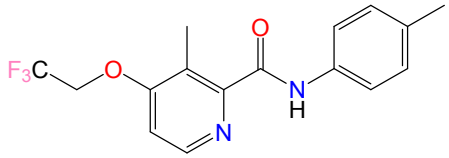
Following the general experimental procedure A presented above, using N-(pyridin-2-ylmethyl) -4-(trifluoromethyl)aniline (25.2 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a white solid (68% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.23 (s, 1H), 8.66 (d, J = 4.7 Hz, 1H), 8.34 (d, J = 7.8 Hz, 1H), 8.01 – 7.89 (m, 3H), 7.67 (d, J = 8.6 Hz, 2H), 7.55 (ddd, J = 7.5, 4.8, 1.1 Hz, 1H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 162.30, 149.28, 148.07, 140.75, 137.87, 126.85, 126.40, 126.36, 122.60, 119.34, 100.00.

(17) N-(4-benzoylphenyl)picolinamide (2j)



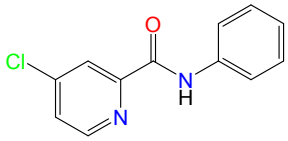
Following the general experimental procedure A presented above, using phenyl-(4-((pyridin- 2-ylmethyl)amino)phenyl)methanone (28.2 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (72% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.29 (s, 1H), 8.67 (ddd, J = 4.8, 1.6, 0.9 Hz, 1H), 8.34 (dt, J = 7.8, 1.0 Hz, 1H), 8.06 – 7.77 (m, 7H), 7.68 – 7.47 (m, 4H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 195.67, 162.31, 149.32, 148.09, 141.62, 137.93, 137.88, 133.10, 132.20, 131.76, 129.91, 128.29, 126.86, 122.61, 118.88. HRMS m/z (ESI) [M + H^+]: 303.1128.

(18) 3-methyl-N-(p-tolyl)-4-(2,2,2-trifluoroethoxy)picolinamide (2k)



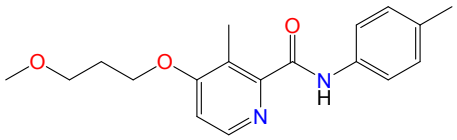
Following the general experimental procedure A presented above, using *4-methyl-N-((3-methyl- 4-(2,2,2-trifluoroethoxy)pyridin-2-yl)methyl)aniline* (31 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (70% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.12 (s, 1H), 8.40 (d, J = 5.4 Hz, 1H), 7.66 (t, J = 10.2 Hz, 2H), 7.20 (d, J = 8.2 Hz, 2H), 6.86 (d, J = 5.5 Hz, 1H), 4.46 (q, J = 7.8 Hz, 2H), 2.75 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.92, 150.16, 148.10, 137.67, 130.42, 128.04, 126.91, 126.41, 124.58, 122.41, 121.33, 119.69, 17.76. HRMS m/z (ESI) [M + Na^+]: 347.0978.

(19) 4-chloro-N-phenylpicolinamide (2l)[1]



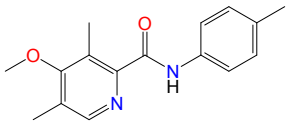
Following the general experimental procedure A presented above, using N-((4-chloropyridin-2-yl) -methyl)aniline (22 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a white solid (77% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.94 (s, 1H), 8.54 (d, *J* = 5.2 Hz, 1H), 8.33 (d, *J* = 1.9 Hz, 1H), 7.79 (dd, *J* = 8.5, 1.0 Hz, 2H), 7.54 – 7.48 (m, 1H), 7.47 – 7.39 (m, 2H), 7.25 – 7.14 (m, 1H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 160.79, 151.34, 148.88, 146.31, 137.43, 129.16, 126.64, 124.64, 123.09, 119.77.

(20) 4-(3-methoxypropoxy)-3-methyl-N-(p-tolyl)picolinamide (2m)



Following the general experimental procedure A presented above, using *N-((4-(3-methoxypropoxy)-3-methylpyridin-2-yl)methyl)-4-methylaniline* (30 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a white solid (61% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.19 (s, 1H), 8.33 (dd, *J* = 5.3, 1.9 Hz, 1H), 7.65 (d, *J* = 6.4 Hz, 2H), 7.19 (d, *J* = 6.9 Hz, 2H), 6.90 (dd, *J* = 5.3, 2.0 Hz, 1H), 4.17 (dd, *J* = 6.1, 4.0 Hz, 2H), 3.62 (td, *J* = 5.9, 2.2 Hz, 2H), 3.39 (d, *J* = 2.5 Hz, 3H), 2.70 (d, *J* = 2.1 Hz, 3H), 2.36 (d, *J* = 1.3 Hz, 3H), 2.16 (ddd, *J* = 9.8, 8.2, 5.9 Hz, 2H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 164.93, 163.96, 147.74, 146.26, 135.65, 133.51, 129.47, 125.64, 119.67, 108.02, 77.35, 77.03, 76.71, 68.79, 65.39, 58.82, 29.33, 20.93, 11.01. HRMS m/z (ESI) [M + H^+]: 315.1705.

(21) 4-methoxy-3,5-dimethyl-N-(p-tolyl)picolinamide (2n)

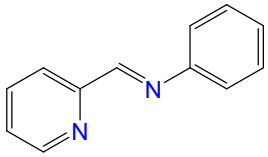


Following the general experimental procedure A presented above, using *N-((4-methoxy-3,5-dimethylpyridin-2-yl)methyl)-4-methylaniline* (25.6 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (46% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 10.11 (s, 1H), 8.25 (s, 1H), 7.64 (d, *J* = 8.4 Hz, 2H), 7.19 (d, *J* = 8.3 Hz, 2H), 3.82 (s, 3H), 2.74 (s, 3H), 2.35 (d, *J* = 3.7 Hz, 6H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.92, 150.16, 148.10, 137.67, 130.42, 128.04, 126.91, 126.41, 124.58, 122.41, 121.33, 119.69, 17.76. HRMS m/z (ESI) [M + Na^+]: 293.1260.

General Experimental Procedure B

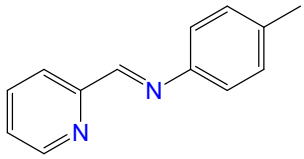
$Cu(OTf)_2$ (3.6 mg, 0.01 mmol), N,N-bis(pyridin-2-ylmethyl)phenylamine (L_N) (4.1 mg, 0.015 mmol), Et_3N (0.1 mL), *N*-(pyridin-2-ylmethyl)aniline derivatives (0.1 mmol) were mixed in dried DMF (1 mL) in a 35 mL Teflon screwcap sealed tube. The tube was charged with O_2 (1 atm) and the mixture was vigorously stirred at RT for 24 h. After reaction was completed, the reaction mixture was diluted with dichloromethane (20 mL), filtered through a pad of silica gel and concentrated under reduced pressure. The crude product was purified on a silica gel column.

(22) *N*-(pyridin-2-ylmethylene)aniline (3a)[5]



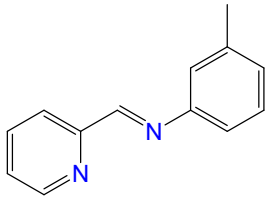
Following the general experimental procedure B presented above, using *N-(pyridin-2-ylmethyl) aniline* (18.3 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a yellow oil (83% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.85 – 8.60 (m, 2H), 8.22 (d, *J* = 7.7 Hz, 1H), 7.94 – 7.78 (m, 1H), 7.50 – 7.36 (m, 3H), 7.37 – 7.24 (m, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 160.65, 154.54, 150.96, 149.70, 136.74, 129.27, 126.78, 125.19, 121.93, 121.13. HRMS m/z (ESI) [M + H^+]: 183.0917.

(23) 4-methyl-N-(pyridin-2-ylmethylene)aniline (3b)[6]



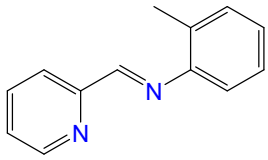
Following the general experimental procedure B presented above, using *4-methyl-N- (pyridin-2-ylmethyl)aniline* (19.8mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a yellow oil (88% yield); H NMR (400 MHz, $CDCl_3$): δ 8.77 – 8.71 (m, 1H), 8.64 (s, 1H), 8.22 (d, *J* = 7.9 Hz, 1H), 7.89 – 7.80 (m, 1H), 7.38 (ddd, *J* = 7.5, 4.8, 1.2 Hz, 1H), 7.25 (s, 4H), 2.41 (s, 3H).^{13}C NMR (101 MHz, $CDCl_3$): δ 159.71, 154.72, 149.69, 148.33, 136.68, 129.88, 125.02, 121.83, 121.13, 115.27, 76.73, 21.09.

(24) thyl-N-(pyridin-2-ylmethylene)aniline (3c)[7]



Following the general experimental procedure B presented above, using *3-methyl-N-(pyridin- 2-ylmethyl)aniline* (19.8 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a yellow oil (60% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.75 (d, *J* = 4.3 Hz, 1H), 8.62 (s, 1H), 8.21 (d, *J* = 7.9 Hz, 1H), 7.85 (td, *J* = 7.6, 1.4 Hz, 1H), 7.41 (ddd, *J* = 7.5, 4.9, 1.1 Hz, 1H), 7.33 (t, *J* = 7.6 Hz, 1H), 7.18 – 7.10 (m, 3H), 2.42 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 160.30, 149.71, 139.13, 137.10, 136.83, 129.08, 127.90, 127.62, 125.22, 122.02, 121.95, 118.09, 21.41.

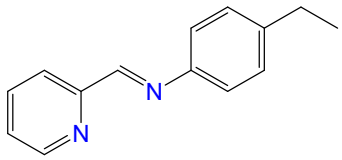
(25) 2-methyl-N-(pyridin-2-ylmethylene)aniline (3d)[8]



Following the general experimental procedure B presented above, using *2-methyl-N-(pyridin- 2-ylmethyl)aniline* (19.8mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a yellow oil (28% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.74 (d, *J* = 4.4 Hz, 1H), 8.54 (s, 1H), 8.29 (d, *J* = 7.9 Hz, 1H), 7.85 (td, *J* = 7.6,

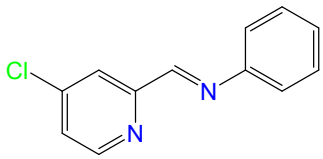
1.3 Hz, 1H), 7.40 (ddt, *J* = 7.7, 4.0, 2.0 Hz, 1H), 7.23 – 7.17 (m, 1H), 6.79 – 6.69 (m, 3H), 2.42 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.91, 150.06, 149.60, 136.67, 132.27, 130.40, 127.89, 126.83, 126.40, 125.07, 121.67, 117.58, 17.87.

(26) 4-ethyl-N-(pyridin-2-ylmethylene)aniline (3e)[9]



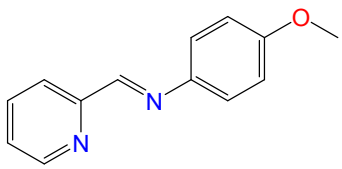
Following the general experimental procedure B presented above, using *4-ethyl-N-(pyridin-2-ylmethyl)aniline* (21 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a yellow oil (74% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.73 (ddd, *J* = 4.8, 1.6, 0.9 Hz, 1H), 8.65 (d, *J* = 4.7 Hz, 1H), 8.23 (d, *J* = 7.9 Hz, 1H), 7.83 (td, *J* = 7.6, 1.4 Hz, 1H), 7.38 (ddd, *J* = 7.5, 4.9, 1.1 Hz, 1H), 7.28 (s, 3H), 7.01 (d, *J* = 8.4 Hz, 1H), 6.69 – 6.63 (m, 1H), 2.71 (q, *J* = 7.6 Hz, 2H), 1.30 – 1.27 (m, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.72, 154.76, 149.68, 148.51, 143.18, 136.67, 128.68, 125.00, 121.83, 121.20, 115.29, 28.49, 15.59.

(27) N-((4-chloropyridin-2-yl)methylene)aniline (3f)



Following the general experimental procedure B presented above, using *N-((4-chloropyridin-2-yl)methyl)aniline* (22 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (10:1 v/v) to provide product as a yellow oil (82% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.69 – 8.57 (m, 2H), 8.27 (d, *J* = 1.7 Hz, 1H), 7.50 – 7.37 (m, 3H), 7.33 (t, *J* = 6.0 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.19, 156.07, 150.46, 145.04, 129.33, 127.92, 127.18, 125.29, 122.05, 121.17. Anal. Calcd. (%) for $C_{12}H_9N_2Cl$: C, 66.52; H, 4.19; N, 12.93. Found (%) C, 66.13; H, 4.68; 12.55.

(28) 4-methoxy-N-(pyridin-2-ylmethylene)aniline[6](3g)

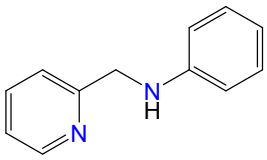


Following the general experimental procedure B presented above, using 4-methoxy-N- (pyridin-2-ylmethyl)aniline (22 mg, 0.1 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a yellow oil (51% yield); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.71 (ddd, *J* = 4.8, 1.6, 0.9 Hz, 1H), 8.64 (d, *J* = 4.7 Hz, 1H), 8.20 (dd, *J* = 4.9, 4.0 Hz, 1H), 7.85 – 7.77 (m, 1H), 7.39 – 7.32 (m, 3H), 7.00 – 6.94 (m, 2H), 3.85 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.96, 158.25, 154.86, 149.65, 143.69, 136.65, 124.84, 122.69, 121.67, 114.47, 55.50.

General Experimental Procedure C

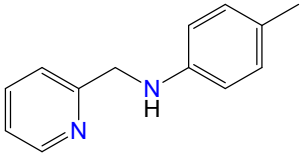
To a solution of 2-clormethyl-pridine hydrochloride (492 mg, 3 mmol) in H_2O (8 mL) was added aniline (3 mmol). The mixture was heated to 50°C and a solution of NaOH (240 mg, 6 mmol) in H_2O (2 mL) was quickly added. The dark brown mixture was stirred at 50°C for 24 h and the reacting solution was extracted with $CHCl_3$ (4×30 mL). The combined organic layer was dried over anhydrous Na_2SO_4 for 5 hours, filtered, and solvent was removed to give a brown oil. The crude product was purified on a silica gel column.

(29) N-(2-Pyridylmethyl)phenylamine[10]



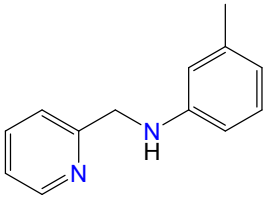
Following the general experimental procedure C presented above, using aniline (280 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a brown solid (82% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.62 (d, *J* = 4.8 Hz, 1H), 7.65 (td, *J* = 7.7, 1.7 Hz, 1H), 7.36 (d, *J* = 7.8 Hz, 1H), 7.26 – 7.13 (m, 3H), 6.87 – 6.65 (m, 3H), 4.49 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.62, 149.22, 147.96, 136.70, 129.31, 122.14, 121.63, 117.60, 113.37, 113.08, 49.31, 29.77.

(30) 4-methyl-N-(pyridin-2-ylmethyl)aniline[11]



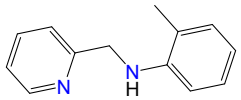
Following the general experimental procedure C presented above, using *p*-Toluidine (321 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (3:1 v/v) to provide product as brown oil (76% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.61 (d, *J* = 4.7 Hz, 1H), 7.65 (t, *J* = 7.6 Hz, 1H), 7.36 (d, *J* = 7.8 Hz, 1H), 7.23 – 7.17 (m, 1H), 7.02 (d, *J* = 8.1 Hz, 2H), 6.62 (d, *J* = 8.2 Hz, 2H), 4.47 (s, 2H), 2.26 (s, 3H).^{13}C NMR (101 MHz, $CDCl_3$): δ 158.86, 149.22, 145.65, 136.65, 129.76, 126.81, 122.06, 121.61, 113.21, 60.43, 49.69, 20.42, 14.23.

(31) 3-methyl-N-(pyridin-2-ylmethyl)aniline[12]



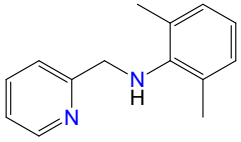
Following the general experimental procedure C presented above, using *m*-Toluidine (321 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (3:1 v/v) to provide product as a brown oil (92% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.67 – 8.60 (m, 1H), 7.66 (td, *J* = 7.7, 1.8 Hz, 1H), 7.36 (d, *J* = 7.8 Hz, 1H), 7.20 (dd, *J* = 6.9, 5.2 Hz, 1H), 7.11 (t, *J* = 7.7 Hz, 1H), 6.63 – 6.49 (m, 3H), 4.49 (s, 2H), 2.31 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.71, 149.21, 147.98, 139.05, 136.65, 129.16, 122.08, 121.59, 118.58, 113.88, 110.21, 49.35, 21.67.

(32) 2-methyl-N-(pyridin-2-ylmethyl)aniline[13]



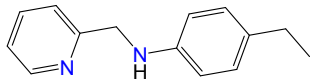
Following the general experimental procedure C presented above, using *o*-Toluidine (321 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a brown oil (82% yield). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.70 – 8.56 (m, 1H), 7.67 (td, *J* = 7.7, 1.8 Hz, 1H), 7.37 (d, *J* = 7.8 Hz, 1H), 7.25 – 7.10 (m, 3H), 6.70 (ddd, *J* = 38.6, 22.6, 4.3 Hz, 2H), 4.55 (s, 2H), 2.30 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.58, 149.26, 145.90, 136.65, 130.12, 127.14, 122.35, 122.12, 121.61, 117.22, 110.14, 77.43, 77.11, 76.79, 49.29, 17.63.

(33) 2,6-dimethyl-N-(pyridin-2-ylmethyl)aniline[14]



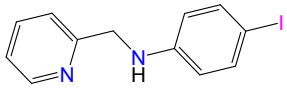
Following the general experimental procedure C presented above, using 2,6-dimethylaniline (363 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a brown oil (61% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.64 (dd, *J* = 4.8, 0.6 Hz, 1H), 7.66 (td, *J* = 7.7, 1.8 Hz, 1H), 7.30 – 7.26 (m, 1H), 7.24 – 7.19 (m, 1H), 7.03 (d, *J* = 7.5 Hz, 2H), 6.86 (dd, *J* = 9.3, 5.6 Hz, 1H), 4.32 (s, 2H), 2.36 (s, 6H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.15, 149.29, 146.15, 136.47, 129.53, 128.82, 122.13, 122.02, 121.89, 53.68, 18.68.

(34) 4-ethyl-N-(pyridin-2-ylmethyl)aniline



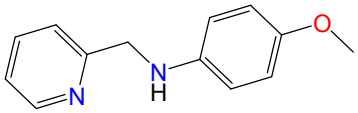
Following the general experimental procedure C presented above, using 4-ethylaniline (366 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (6:1 v/v) to provide product as a colorless oil (81% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.62 (ddd, *J* = 4.9, 1.6, 0.8 Hz, 1H), 7.65 (td, *J* = 7.7, 1.8 Hz, 1H), 7.37 (d, *J* = 7.8 Hz, 1H), 7.20 (dd, *J* = 6.9, 5.4 Hz, 1H), 7.06 (t, *J* = 5.6 Hz, 2H), 6.72 – 6.60 (m, 2H), 4.48 (s, 2H), 2.58 (q, *J* = 7.6 Hz, 2H), 1.23 (t, *J* = 7.6 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.91, 149.22, 145.91, 136.65, 133.44, 128.60, 122.06, 121.62, 113.21, 49.70, 27.96, 15.97. Anal. Calcd. (%) for $C_{14}H_{16}N_2$: C, 79.21; H, 7.60; N, 14.01. Found (%) C, 79.02; H, 7.93; 14.57.

(35) 4-iodo-N-(pyridin-2-ylmethyl)aniline[15]



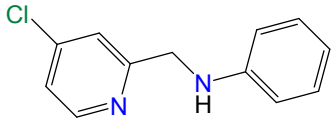
Following the general experimental procedure C presented above, using p-Iodoaniline (657 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (3:1 v/v) to provide product as a brown solid (77% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.59 (d, *J* = 4.4 Hz, 1H), 7.70 – 7.61 (m, 1H), 7.47 – 7.39 (m, 2H), 7.30 (d, *J* = 8.2 Hz, 1H), 7.20 (dd, *J* = 7.0, 5.1 Hz, 1H), 6.52 – 6.40 (m, 2H), 4.41 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 157.77, 149.22, 147.45, 137.79, 136.76, 122.30, 121.63, 115.30, 78.22, 77.49, 77.17, 76.86, 48.91.

(36) 4-methoxy-N-(pyridin-2-ylmethyl)aniline[12]



Following the general experimental procedure B presented above, using p-Anisidine (370 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (65% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.59 (d, J = 4.8 Hz, 1H), 7.64 (td, J = 7.7, 1.0 Hz, 1H), 7.40 – 7.32 (m, 1H), 7.22 – 7.15 (m, 1H), 6.86 – 6.76 (m, 2H), 6.71 – 6.59 (m, 2H), 4.43 (s, 2H), 3.75 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.87, 152.22, 149.18, 142.16, 136.68, 122.09, 121.69, 114.89, 114.31, 55.77, 50.24.

(37) N-((4-chloropyridin-2-yl)methyl)aniline

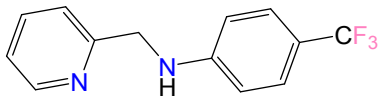


Following the general experimental procedure B presented above, using 4-chloro-2-(chloromethyl)-pyridine (594 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a yellow solid (62% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.50 (d, J = 5.3 Hz, 1H), 7.41 (d, J = 1.6 Hz, 1H), 7.21 (tt, J = 9.6, 1.9 Hz, 3H), 6.83 – 6.60 (m, 3H), 4.48 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 160.78, 150.11, 147.54, 144.93, 129.35, 122.61, 121.83, 117.98, 113.06, 49.23. HRMS m/z (ESI) [M + H^+]: 219.0685.

General Experimental Procedure D

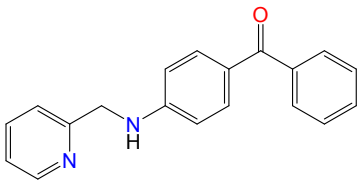
A mixture of 2-pyridinecarbaldehyde (300 mg, 0.3 mmol) and aniline (0.3 mmol) was heated to reflux in dry toluene for 3h. The solvent was removed under reduced pressure to afford the crude product, which was dissolved in CH_3OH/CH_2Cl_2 [2:8 (v/v), 10 mL] and the solution was cooled in an ice bath. $NaBH_4$ (52 mg, 1.39 mmol) was added in two batches between an interval of 30 mins. After the addition of $NaBH_4$ was completed, the mixture was stirred for an additional 2 h. The solution was then diluted with water (20 mL) and extracted with CH_2Cl_2 (3×20 mL). The organic layers were combined and dried with anhydrous Na_2SO_4. The solvent was removed under reduced pressure and the crude product was purified on a silica column.

(38) N-(pyridin-2-ylmethyl)-4-(trifluoromethyl)aniline[16]



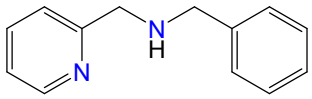
Following the general experimental procedure D presented above, using 4-(Trifluoromethyl)aniline (483 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (74% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.69 – 8.57 (m, 1H), 7.75 – 7.65 (m, 1H), 7.42 (t, J = 9.4 Hz, 2H), 7.32 (d, J = 7.8 Hz, 1H), 7.27 – 7.21 (m, 1H), 6.70 (d, J = 8.5 Hz, 2H), 5.44 – 5.17 (m, 1H), 4.50 (d, J = 5.3 Hz, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 157.24, 150.30, 149.26, 136.78, 126.64, 126.60, 123.66, 122.39, 121.62, 119.15, 118.83, 112.17, 48.53.

(39) phenyl(4-((pyridin-2-ylmethyl)amino)phenyl)methanone



Following the general experimental procedure D presented above, using (4-aminophenyl)-(phenyl)methanone (576 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (68% yield). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.61 – 8.49 (m, 1H), 7.63 (tt, *J* = 12.3, 6.1 Hz, 1H), 7.43 – 7.38 (m, 2H), 7.37 – 7.30 (m, 3H), 7.28 – 7.23 (m, 1H), 7.21 – 7.12 (m, 3H), 6.70 – 6.54 (m, 2H), 5.76 (s, 1H), 4.41 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.48, 149.14, 147.38, 144.43, 136.75, 133.32, 128.30, 127.99, 127.12, 126.40, 122.16, 121.63, 112.98, 77.42, 77.10, 76.78, 75.91, 49.21. HRMS m/z (ESI) [M + H^+]: 291.1492.

(40) N-benzyl-1-(pyridin-2-yl)methanamine

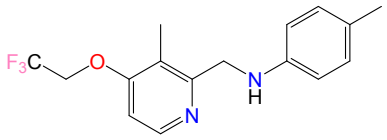


Following the general experimental procedure D presented above, using phenylmethanamine (321 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (1:3 v/v) to provide product as a yellow oil (90% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.58 (d, *J* = 4.3 Hz, 1H), 7.67 (dtd, *J* = 13.4, 7.7, 1.8 Hz, 1H), 7.42 – 7.31 (m, 5H), 7.30 – 7.23 (m, 1H), 7.18 (dd, *J* = 6.6, 5.0 Hz, 1H), 3.95 (s, 2H), 3.87 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.73, 149.32, 140.12, 136.47, 128.42, 128.28, 127.01, 122.39, 121.98, 54.51, 53.52.

General Experimental Procedure E

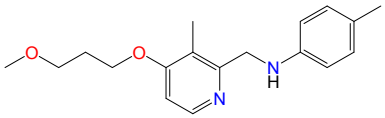
A mixture of 2-clormethyl-pridine hydrochloride derivatives (3 mmol), NaI (450 mg, 3 mmol), NaOH (240 mg, 6 mmol) and p-Toluidine (321 mg, 3 mmol) was heated to reflux in dry CH_3CN for 24h. After reaction was completed, the reaction mixture was diluted with dichloromethane (20 mL), filtered through a pad of silica gel and concentrated under reduced pressure. The crude product was purified on a silica gel column.

(41) 4-methyl-N-((3-methyl-4-(2,2,2-trifluoroethoxy)pyridin-2-yl)methyl)aniline



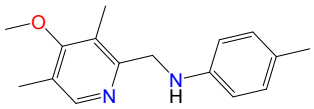
Following the general experimental procedure E presented above, using Aniline (280 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (54% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.41 (d, *J* = 5.7 Hz, 1H), 7.06 (d, *J* = 8.0 Hz, 2H), 6.71 (ddd, *J* = 14.4, 8.1, 4.1 Hz, 3H), 4.43 (q, *J* = 7.9 Hz, 2H), 4.35 (s, 2H), 2.28 (d, *J* = 7.2 Hz, 6H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.22, 156.81, 147.39, 145.90, 129.76, 126.49, 119.85, 113.23, 105.27, 65.55, 65.19, 46.76, 20.43, 9.52. HRMS m/z (ESI) [M + H^+]: 311.1367.

(42) N-((4-(3-methoxypropoxy)-3-methylpyridin-2-yl)methyl)-4-methylaniline



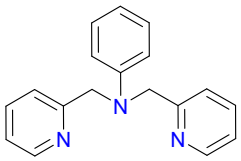
Following the general experimental procedure E presented above, using 2-(chloromethyl)-4- (3-methoxypropoxy)-3-methylpyridine hydrochloride (798 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (3:1 v/v) to provide product as a white solid (78% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.35 (d, J = 5.7 Hz, 1H), 7.04 (t, J = 13.7 Hz, 2H), 6.77 – 6.70 (m, 3H), 4.33 (s, 2H), 4.20 – 4.09 (m, 2H), 3.66 – 3.54 (m, 2H), 3.39 (s, 3H), 2.28 (d, J = 7.6 Hz, 3H), 2.22 (s, 3H), 2.13 (dd, J = 12.3, 6.1 Hz, 2H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 162.94, 155.64, 147.29, 146.11, 129.71, 126.23, 119.20, 113.20, 105.47, 68.95, 64.95, 58.80, 46.76, 29.42, 20.45, 9.64. HRMS m/z (ESI) [M + H^+]: 301.1911.

(43) N-((4-methoxy-3,5-dimethylpyridin-2-yl)methyl)-4-methylaniline



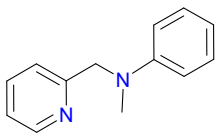
Following the general experimental procedure E presented above, using 2-(chloromethyl)-4 -methoxy-3,5-dimethylpyridine hydrochloride (666 mg, 3 mmol) as substrates instead, purified by column eluted with petroleum ether/EtOAc (3:1 v/v) to provide product as a white solid (72% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.25 (d, J = 5.6 Hz, 1H), 7.03 (d, J = 8.0 Hz, 2H), 6.83 (t, J = 8.5 Hz, 1H), 6.73 (d, J = 8.3 Hz, 2H), 4.43 (s, 2H), 3.94 (t, J = 10.1 Hz, 6H), 2.24 (d, J = 16.0 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.30, 151.61, 146.00, 145.32, 142.89, 129.67, 126.50, 113.48, 106.75, 60.83, 55.68, 44.16, 20.42. HRMS m/z (ESI) [M + H^+]: 257.1648.

(44) N-benzyl-N-(pyridin-2-ylmethyl)aniline[17]



To a solution of 2-clormethyl-pridine hydrochloride (984 mg, 6 mmol) in H_2O (10 mL) was added aniline (3 mmol). The mixture was heated to 50°C and an aqueous solution (2 mL) of NaOH (360 mg, 9 mmol) was quickly added. The dark brown mixture was stirred at 50°C for 24 h and the resultant solution was extracted with $CHCl_3$ (4×30 mL). The combined organic layers were combined and dried over anhydrous Na_2SO_4 for 10 hours, filtered, and the solvent was removed to give a brown oil. The crude product was purified on a silica column eluted with petroleum ether/EtOAc (1:2 v/v) to provide product as a white solid (80% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.67 – 8.57 (m, 2H), 7.64 (td, J = 7.7, 1.8 Hz, 2H), 7.29 (d, J = 7.0 Hz, 2H), 7.22 – 7.14 (m, 4H), 6.74 (td, J = 8.3, 4.6 Hz, 3H), 4.85 (s, 4H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.85, 149.73, 148.20, 136.85, 129.31, 122.04, 120.81, 117.22, 112.51, 57.30.

(45) N-methyl-N-(pyridin-2-ylmethyl)aniline[18]



To a mixture of *N*-(pyridin-2-ylmethyl)aniline (550 mg, 0.3 mmol), 40% formaldehyde (3.75 g, 50

mmol) and ethylic acid (4.5 mL) was added CH_3CN (15 mL). The mixture was vigorously stirred at RT for 24 h. $NaBH_4$ (52 mg, 1.39 mmol) was added in two batches between an interval of 30 mins in an ice bath. After the addition of $NaBH_4$ was completed, the mixture was stirred for an additional 2 h and at RT for 24 h. The solution was then diluted with water (20 mL) and extracted with CH_2Cl_2 (3×20 mL). The organic layer was combined and dried with anhydrous Na_2SO_4. Solvent was removed under reduced pressure, and the crude product was purified by on a silica column eluted with petroleum ether/EtOAc (5:1 v/v) to provide product as a white solid (66% yield). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.61 (dd, J = 4.1, 0.8 Hz, 1H), 7.62 (td, J = 7.7, 1.8 Hz, 1H), 7.28 – 7.16 (m, 4H), 6.83 – 6.71 (m, 3H), 4.68 (s, 2H), 3.14 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.42, 149.56, 149.25, 136.77, 129.24, 121.92, 120.76, 116.71, 112.21, 58.88, 39.09. Anal. Calcd. (%) for $C_{28}H_{30}CuF_6N_6O_6S_2$: C, 42.66; H, 3.84; N, 10.66. Found (%) C, 43.23; H, 3.21; 10.12.

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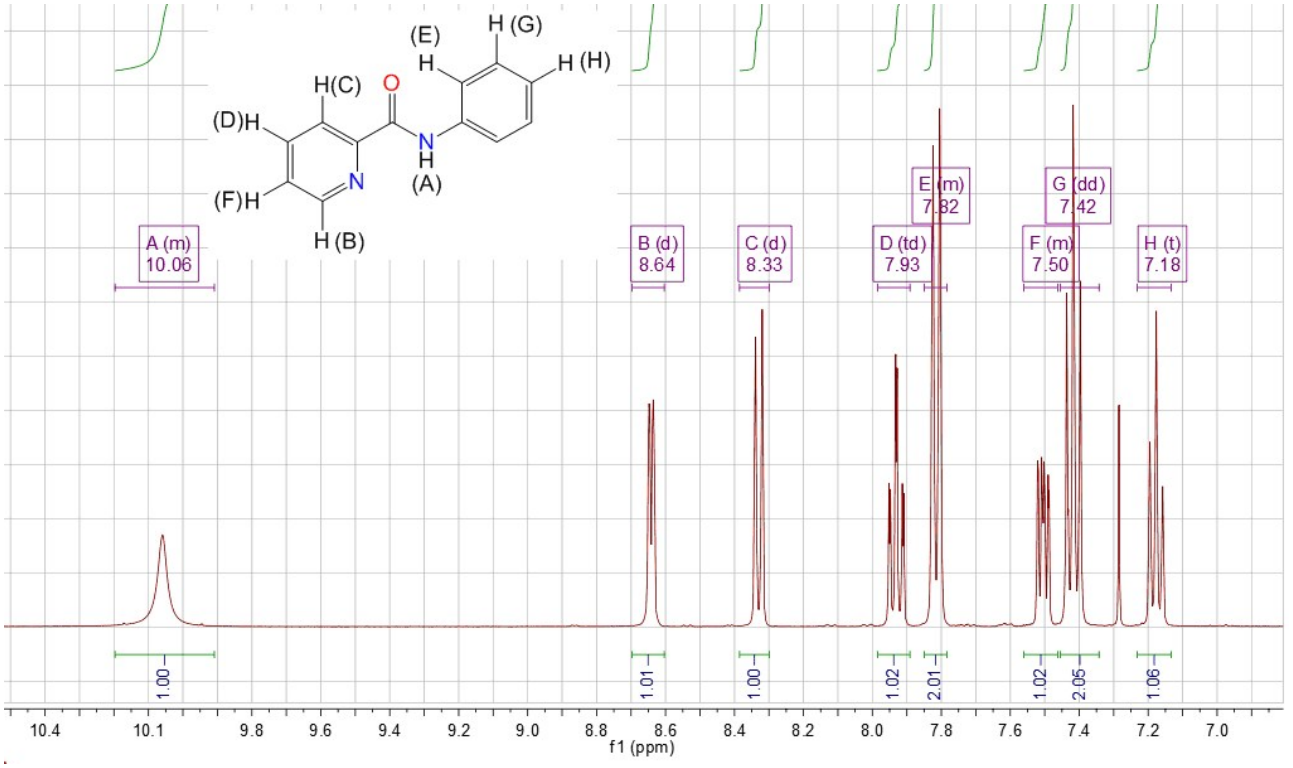
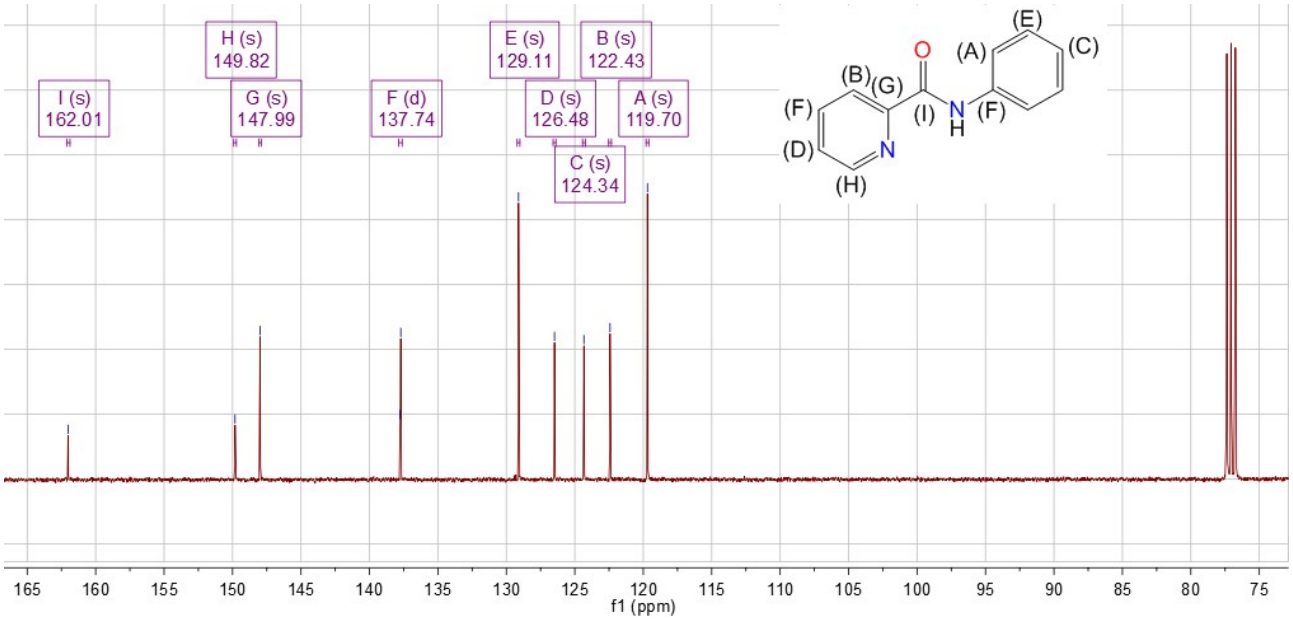
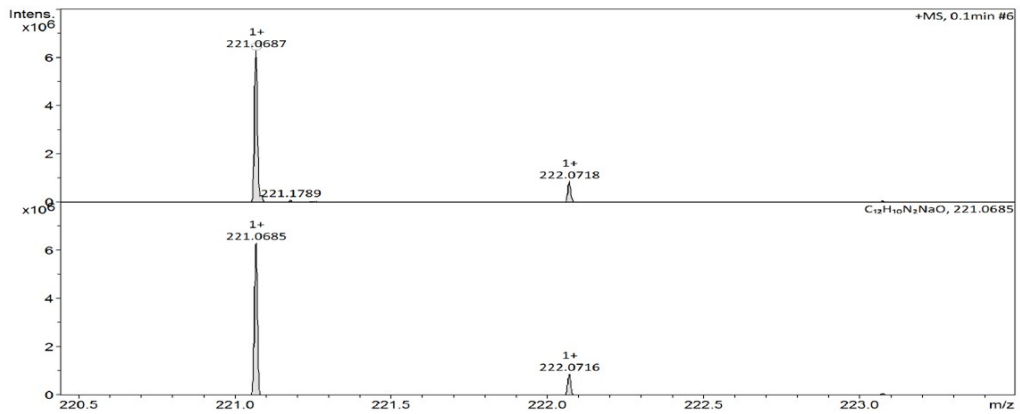
NMR and Mass spectra

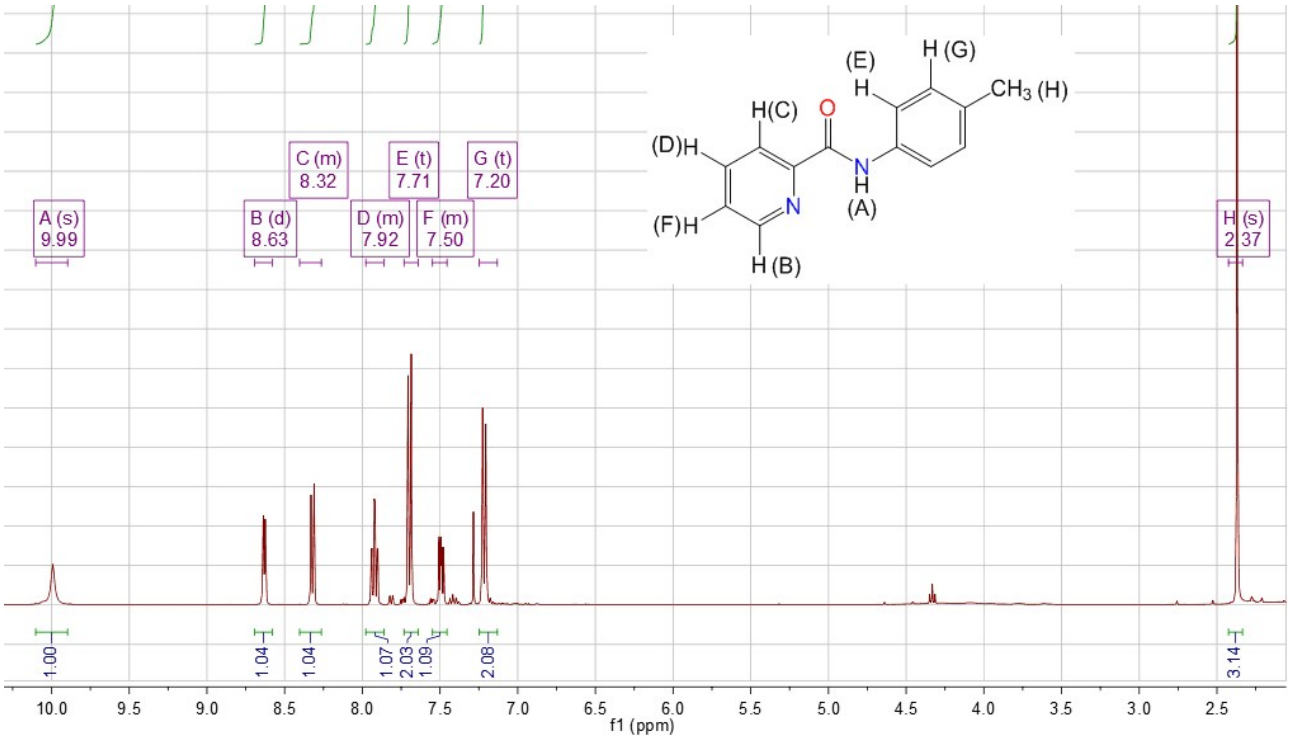
N-phenylpicolinamide

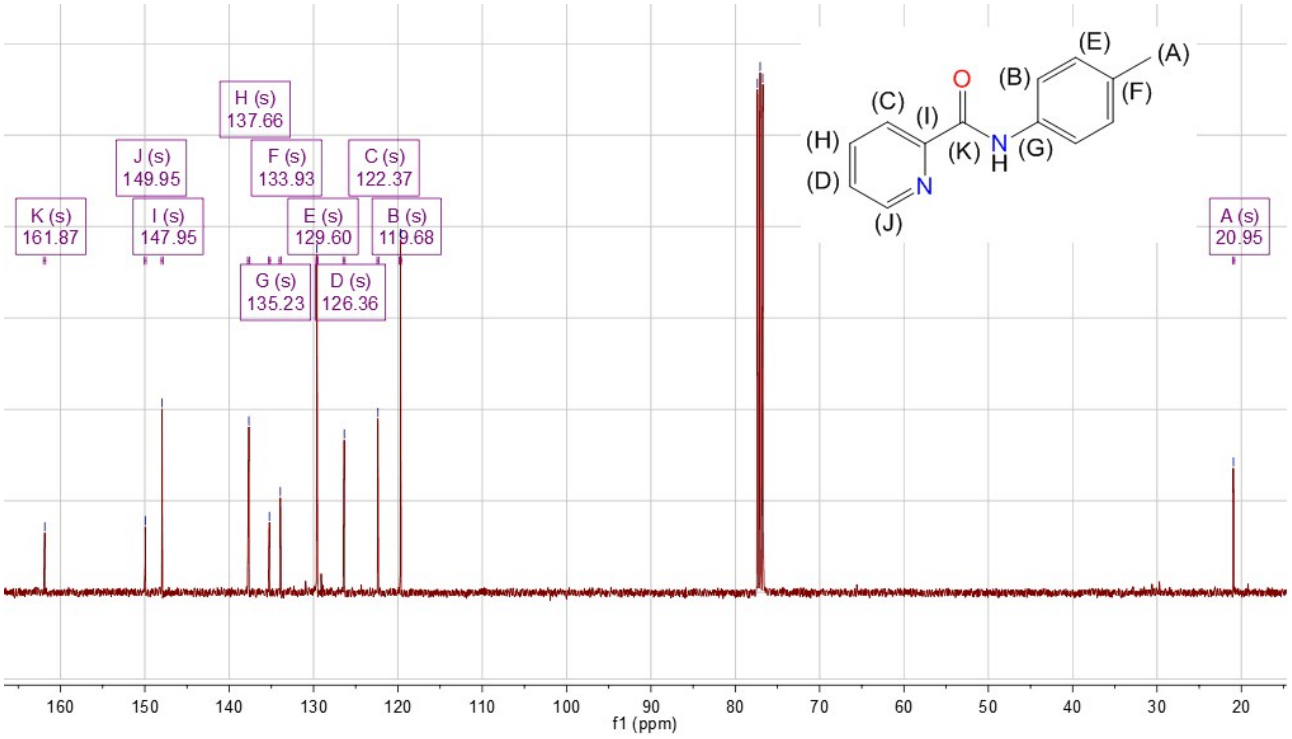






N-(p-tolyl)picolinamide





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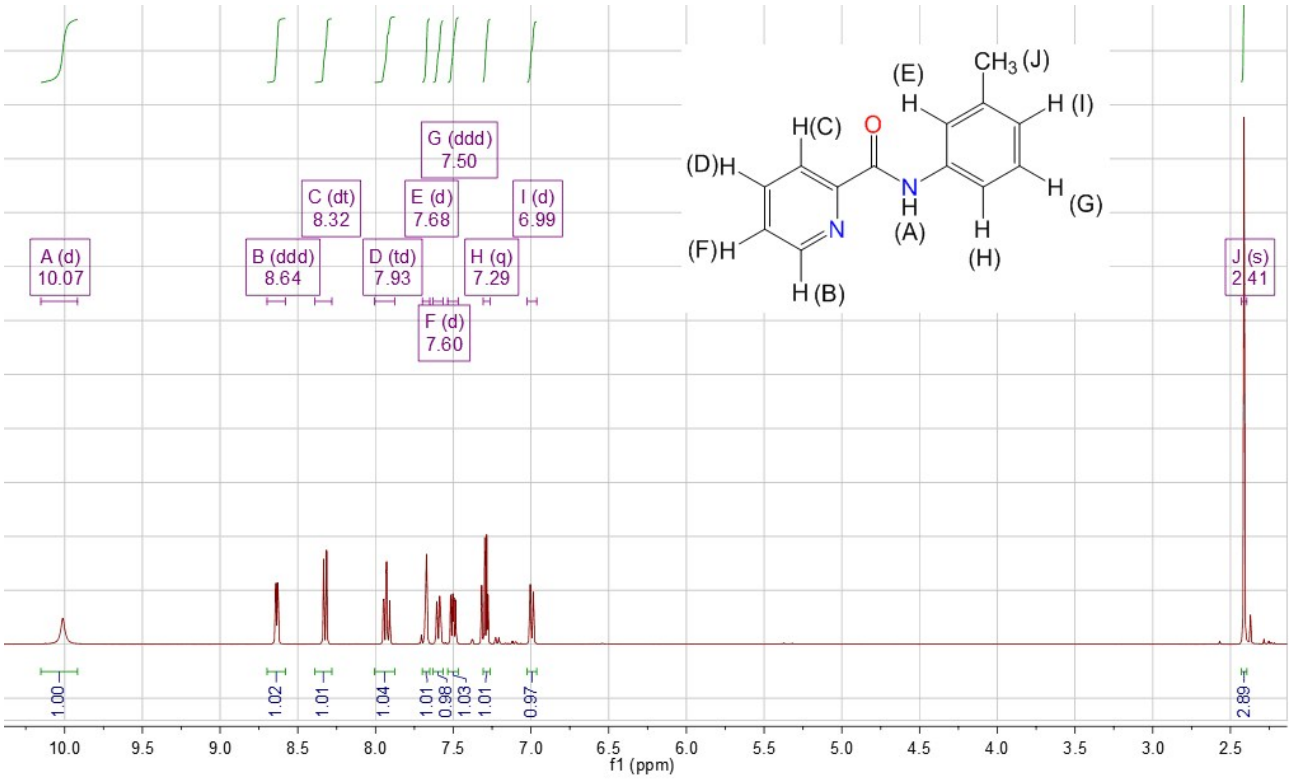
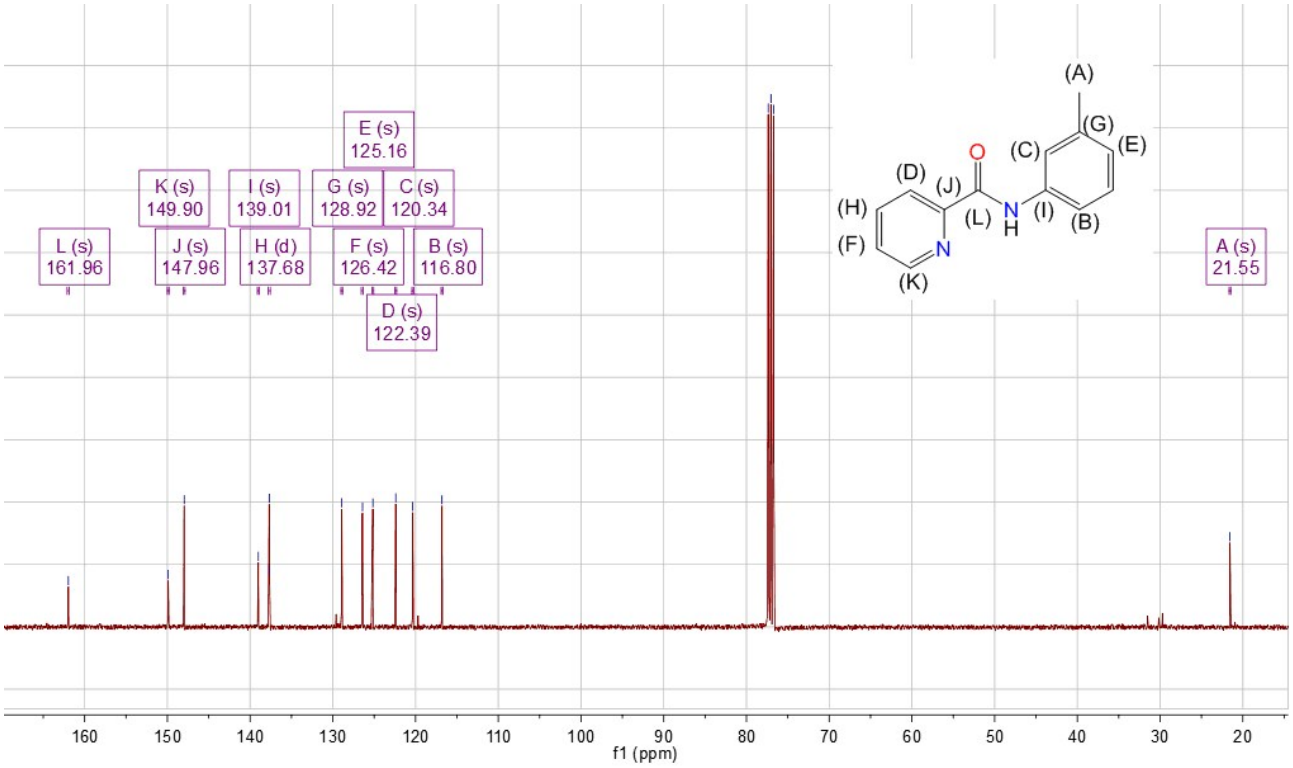
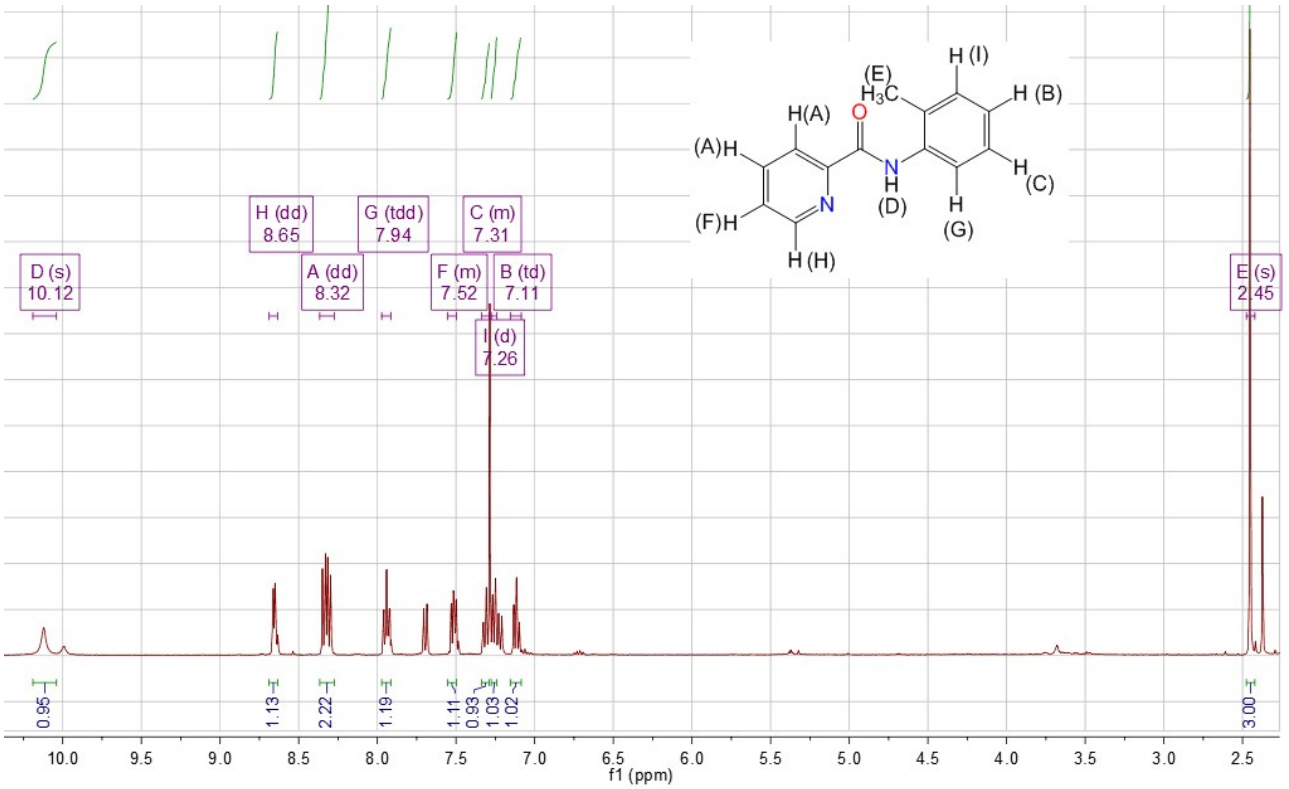
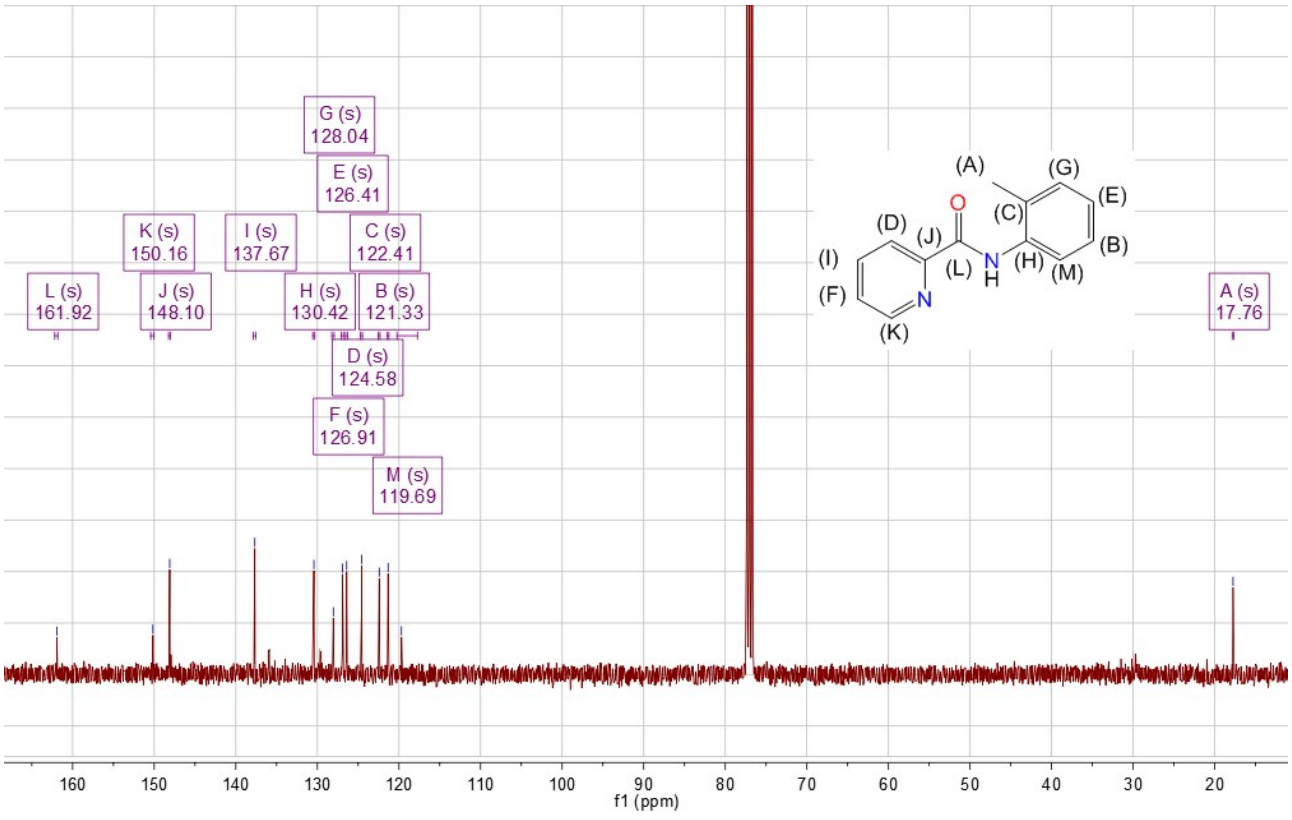


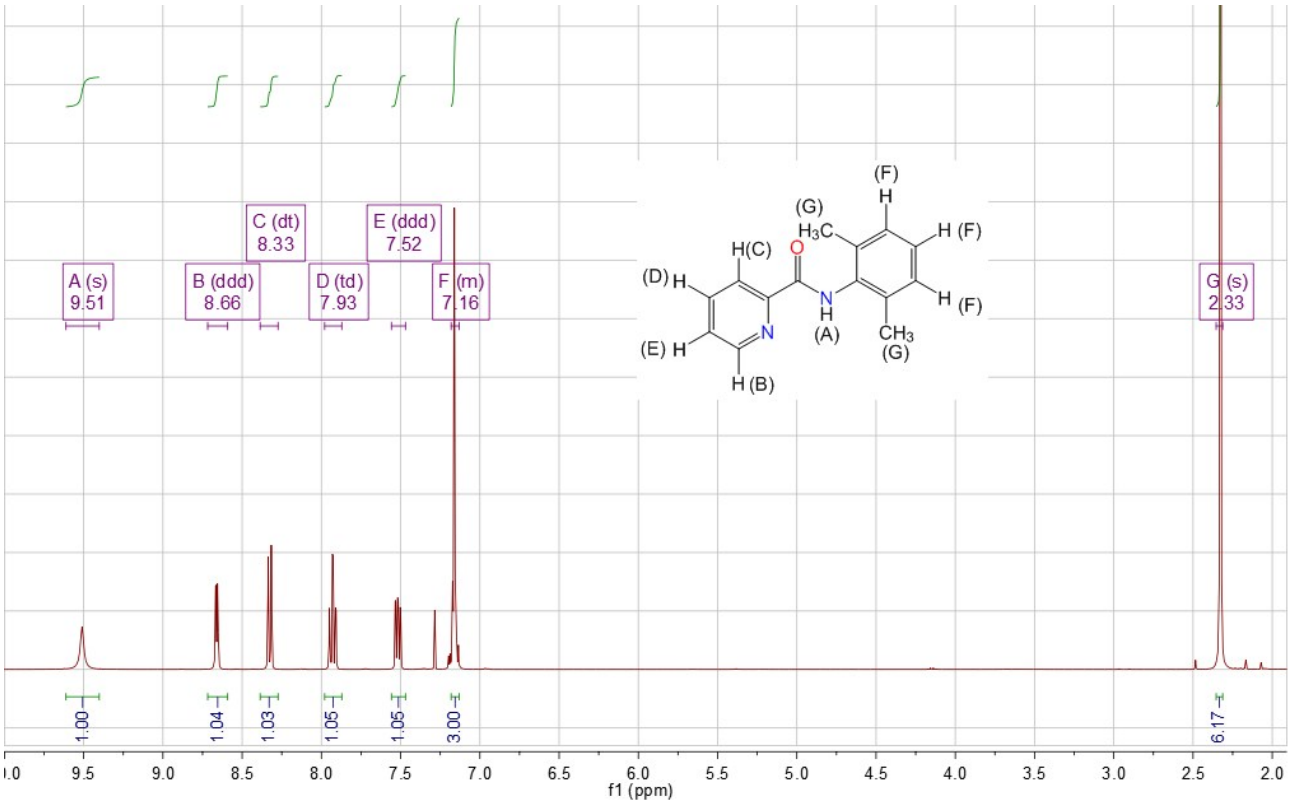


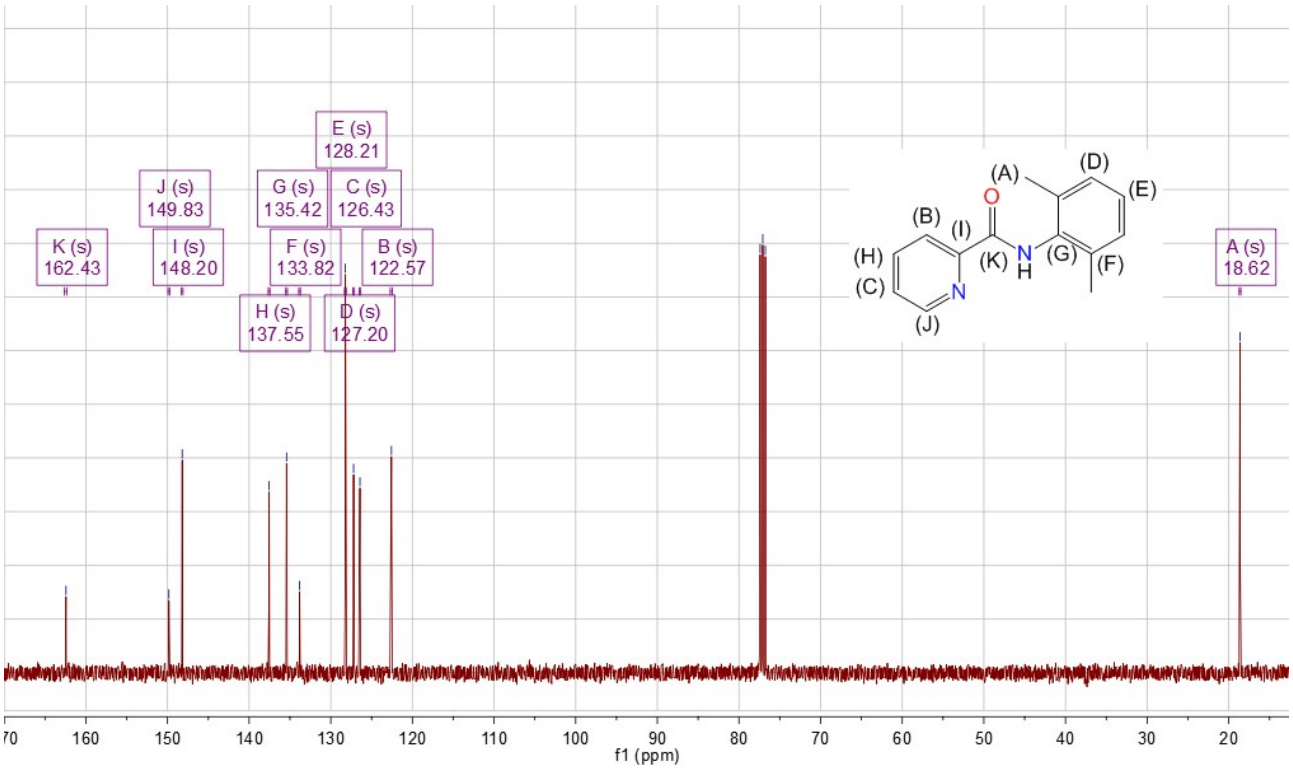
N-(o-tolyl)picolinamide



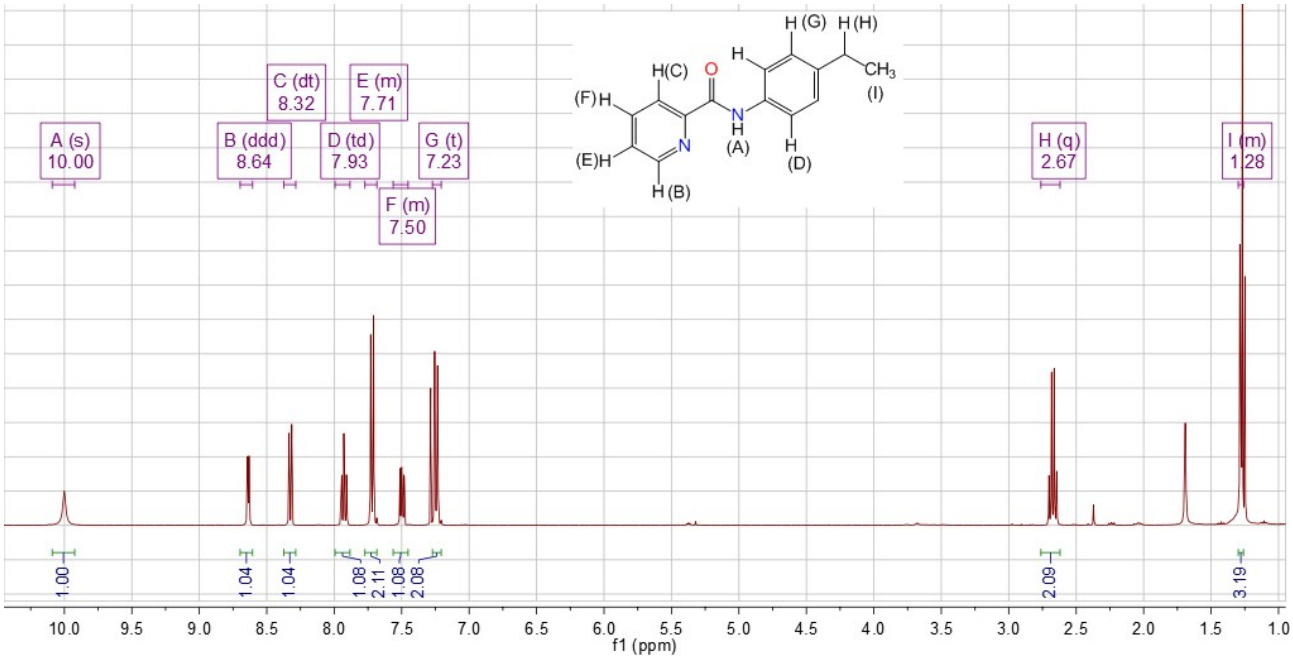


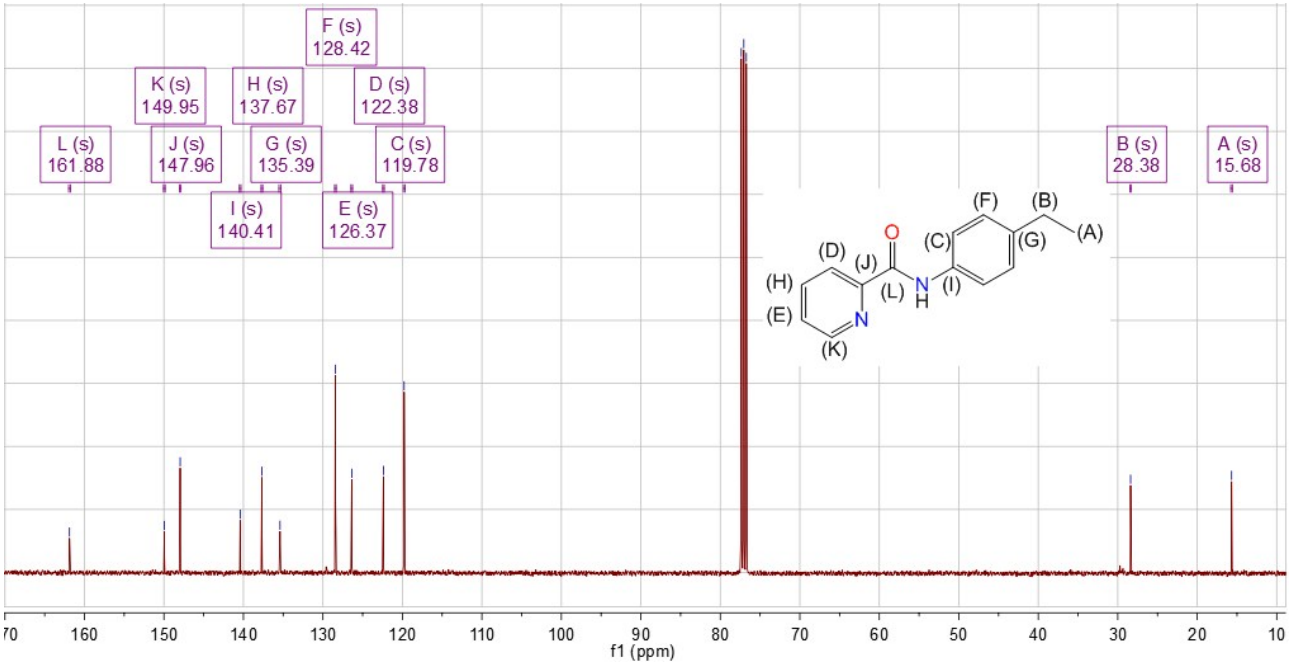
N-(2,6-dimethylphenyl)picolinamide

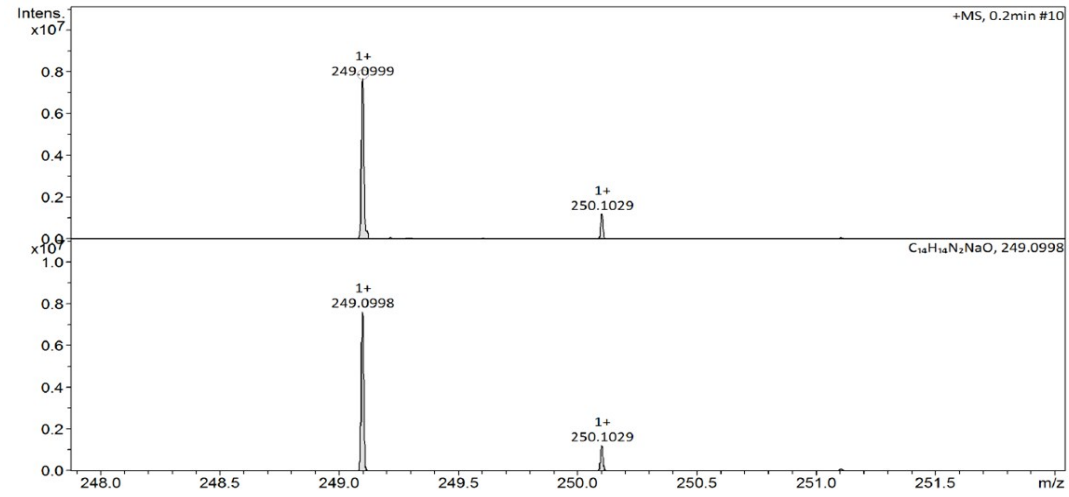




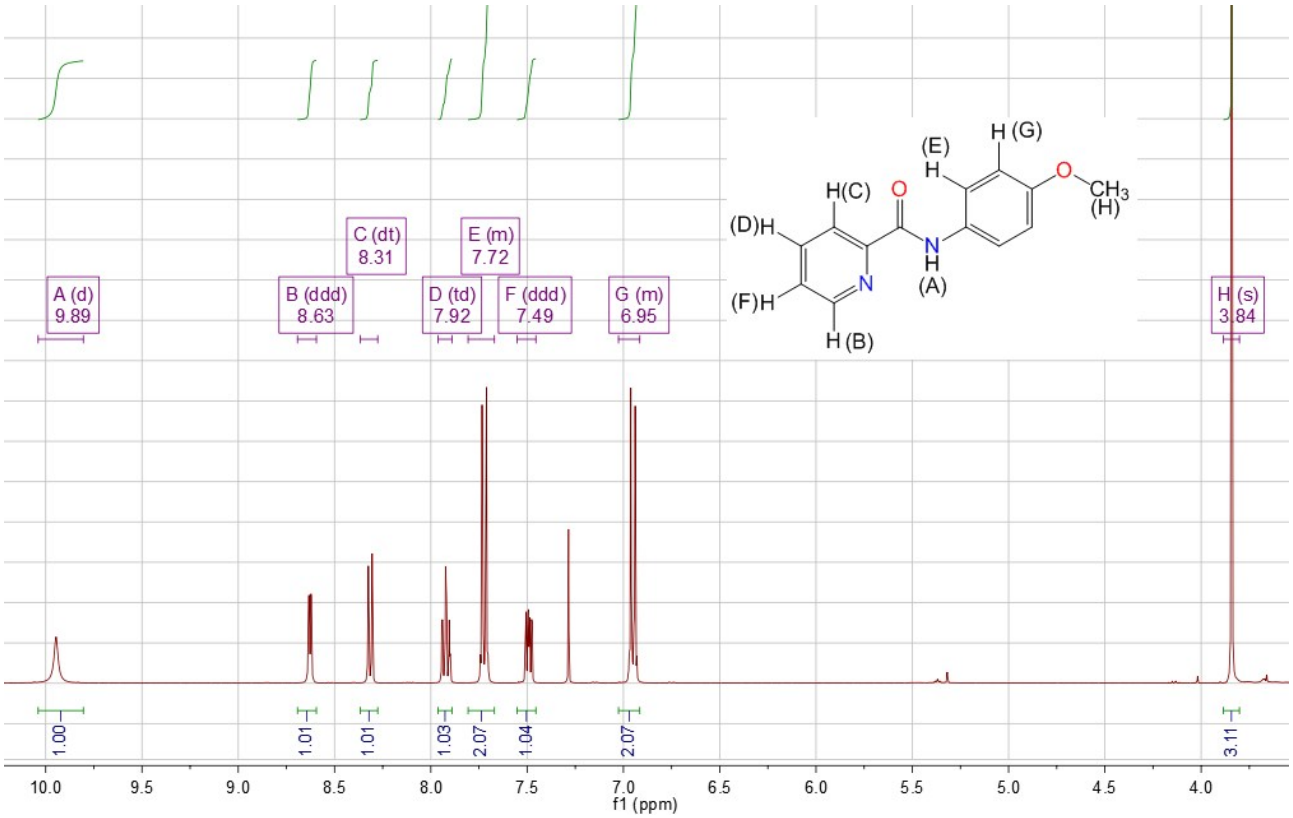
N-(4-ethylphenyl)picolinamide

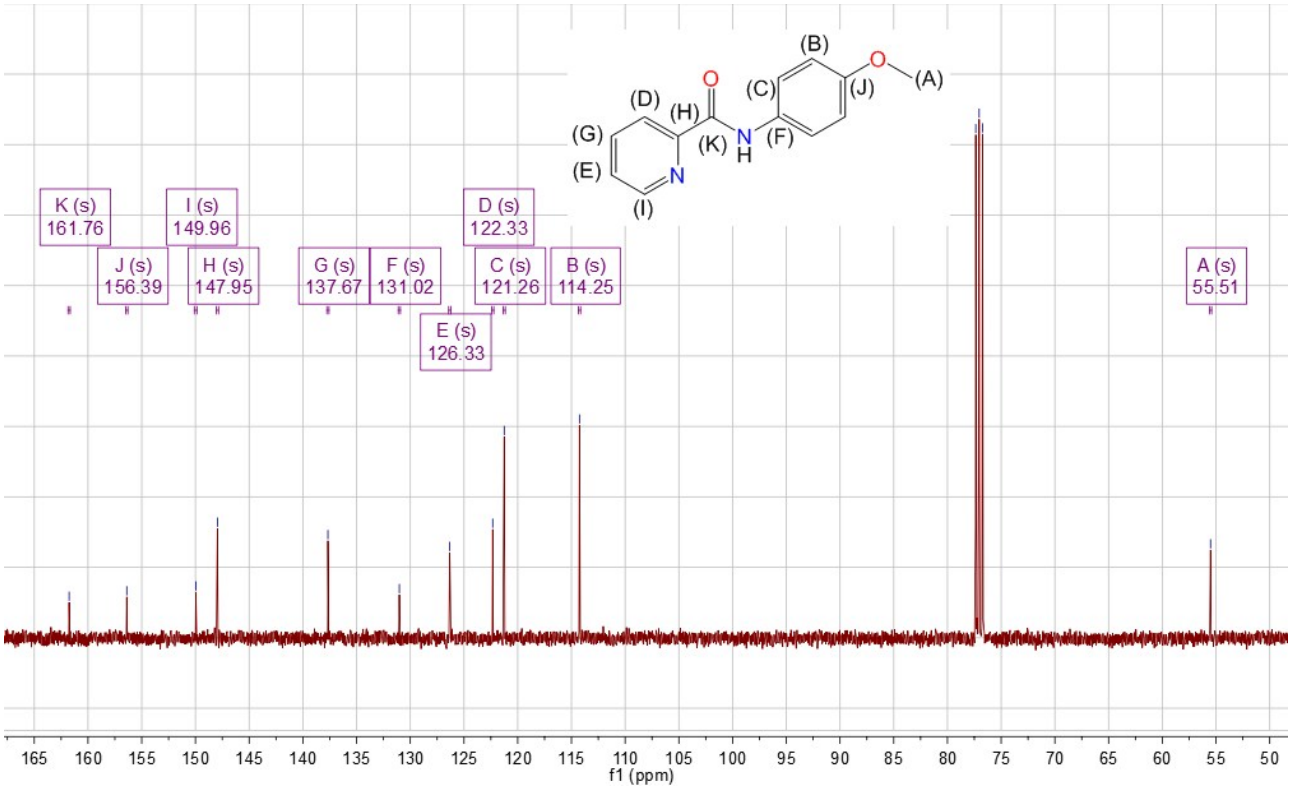




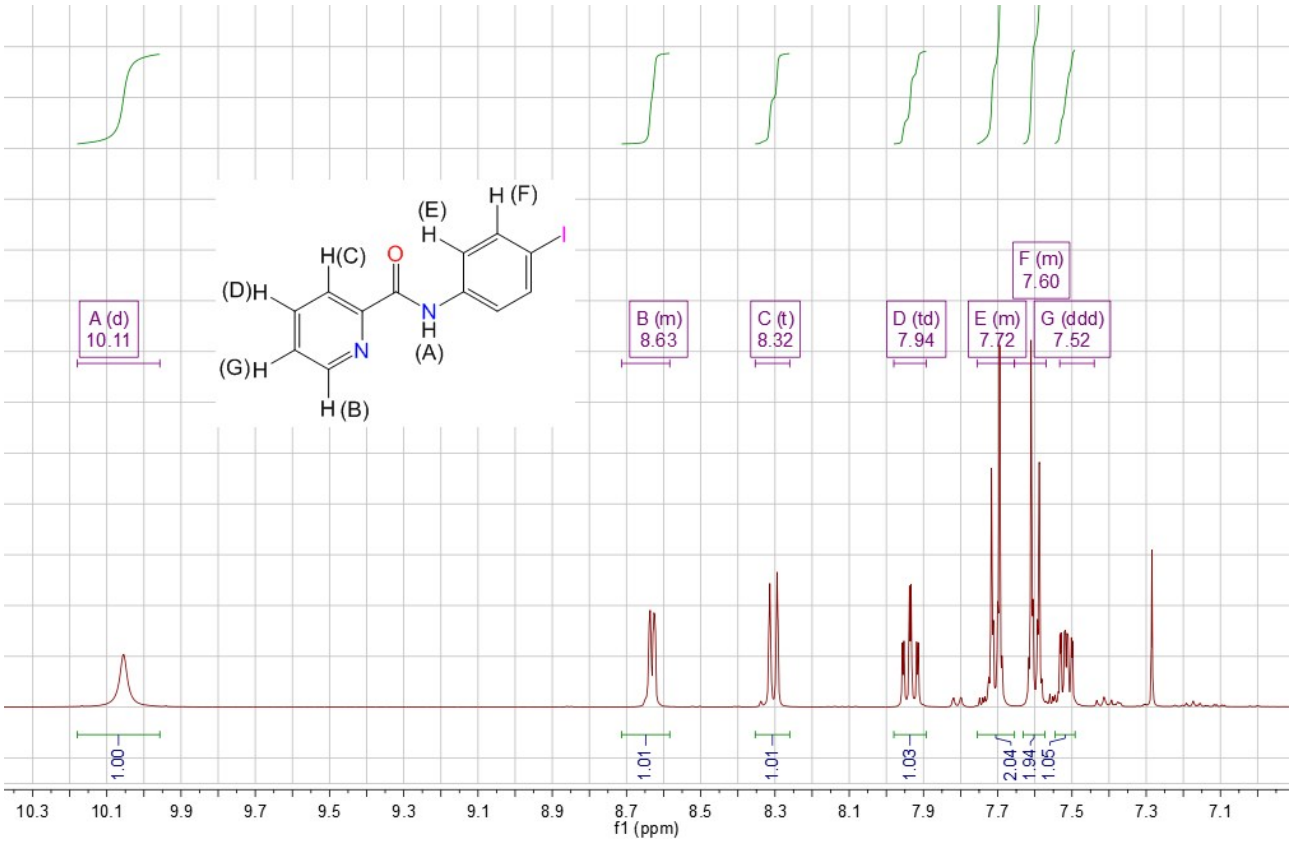


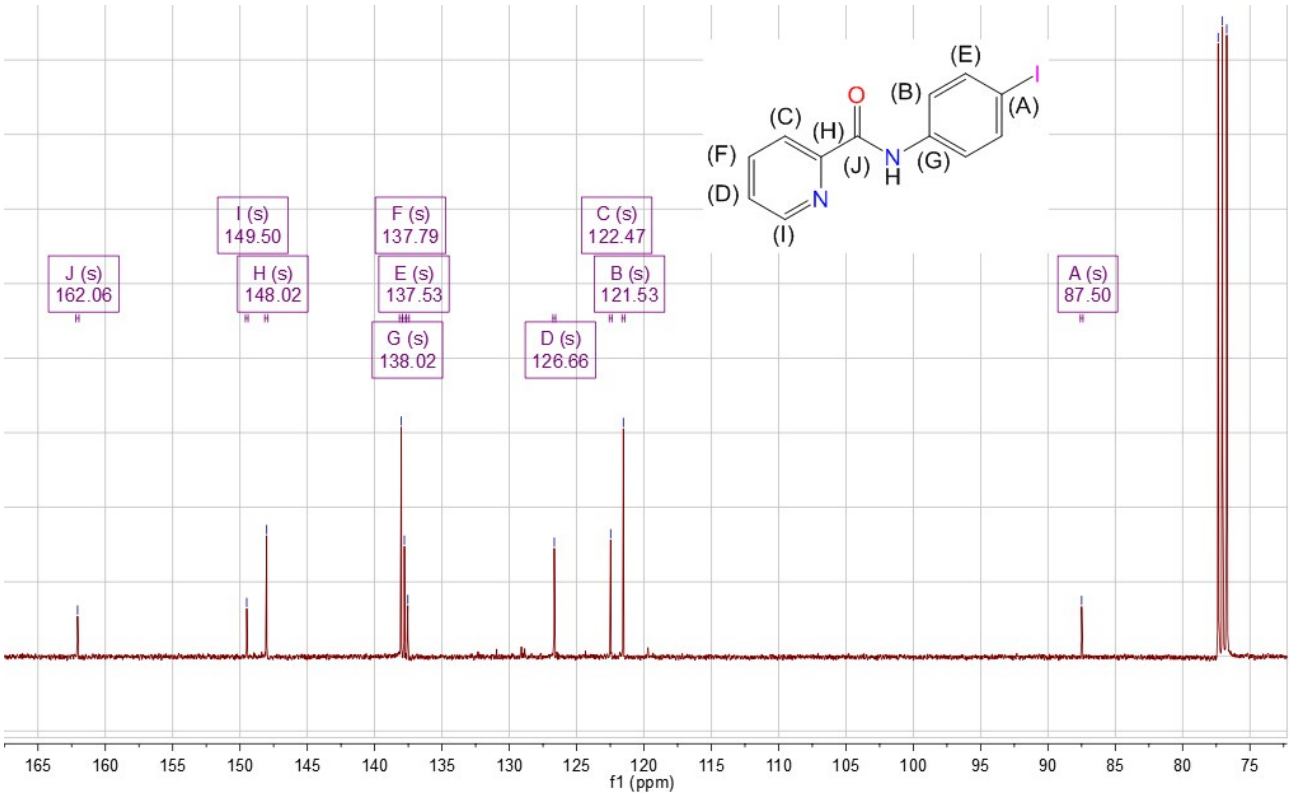
N-(4-methoxyphenyl)picolinamide



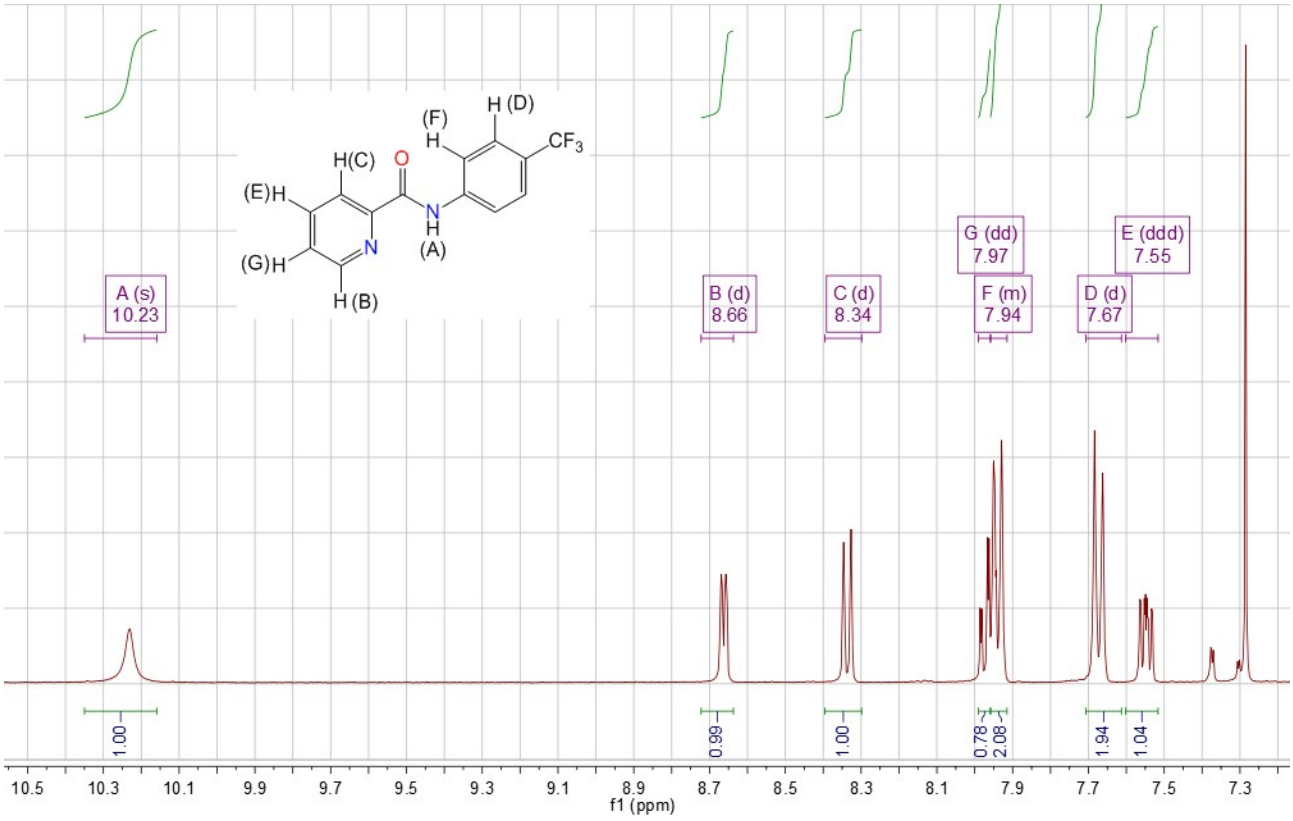


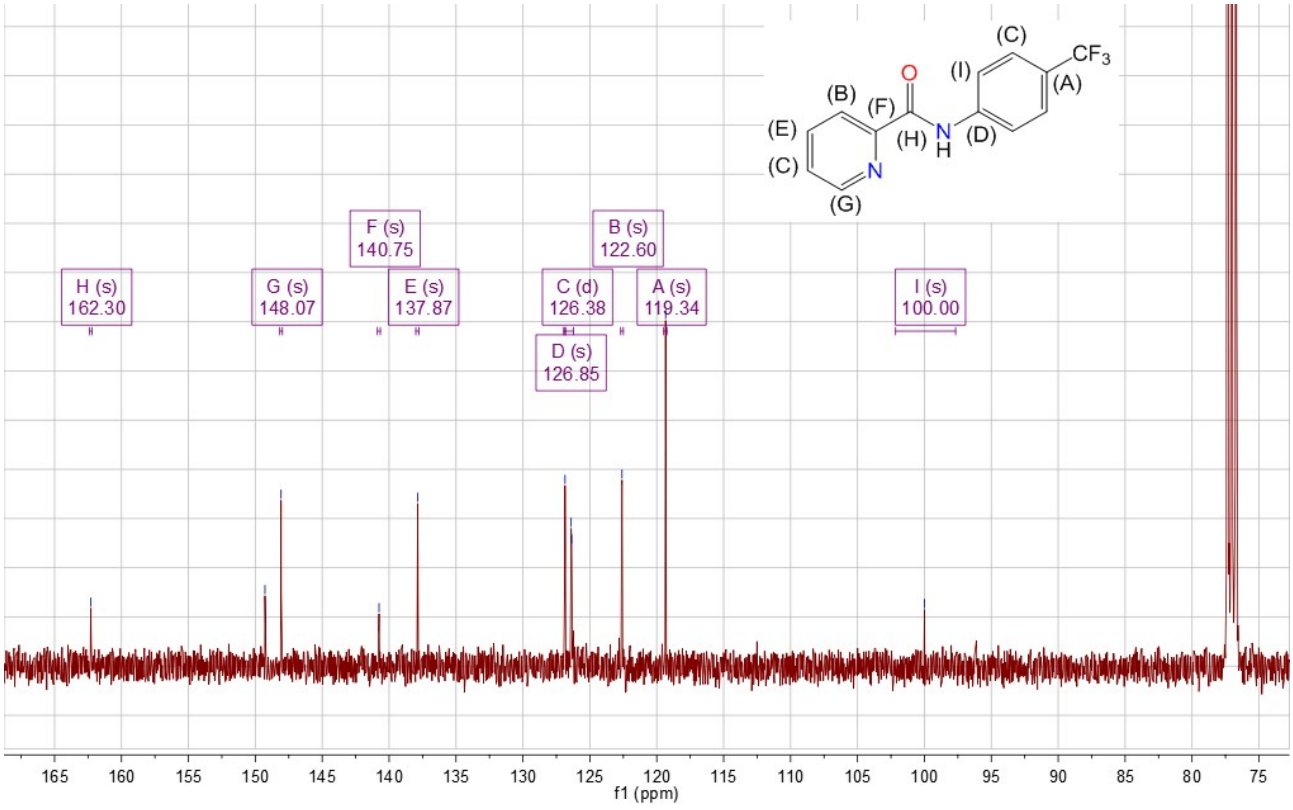
N-(4-iodophenyl)picolinamide



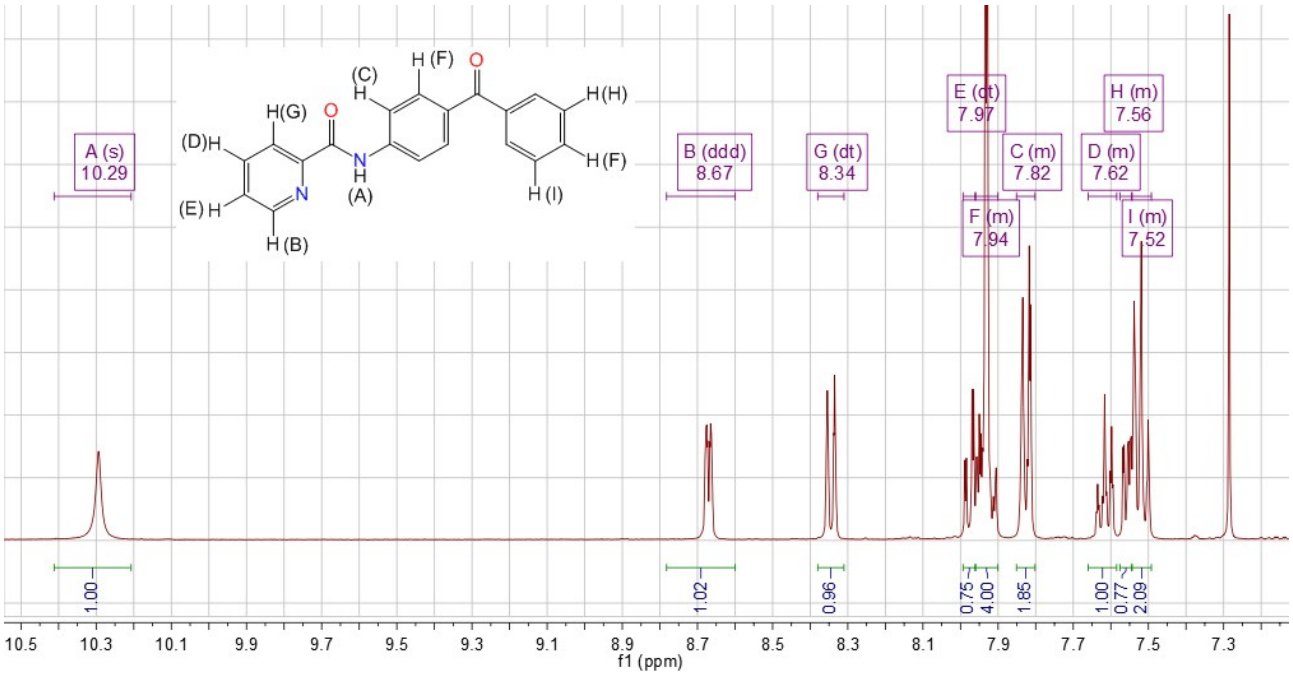


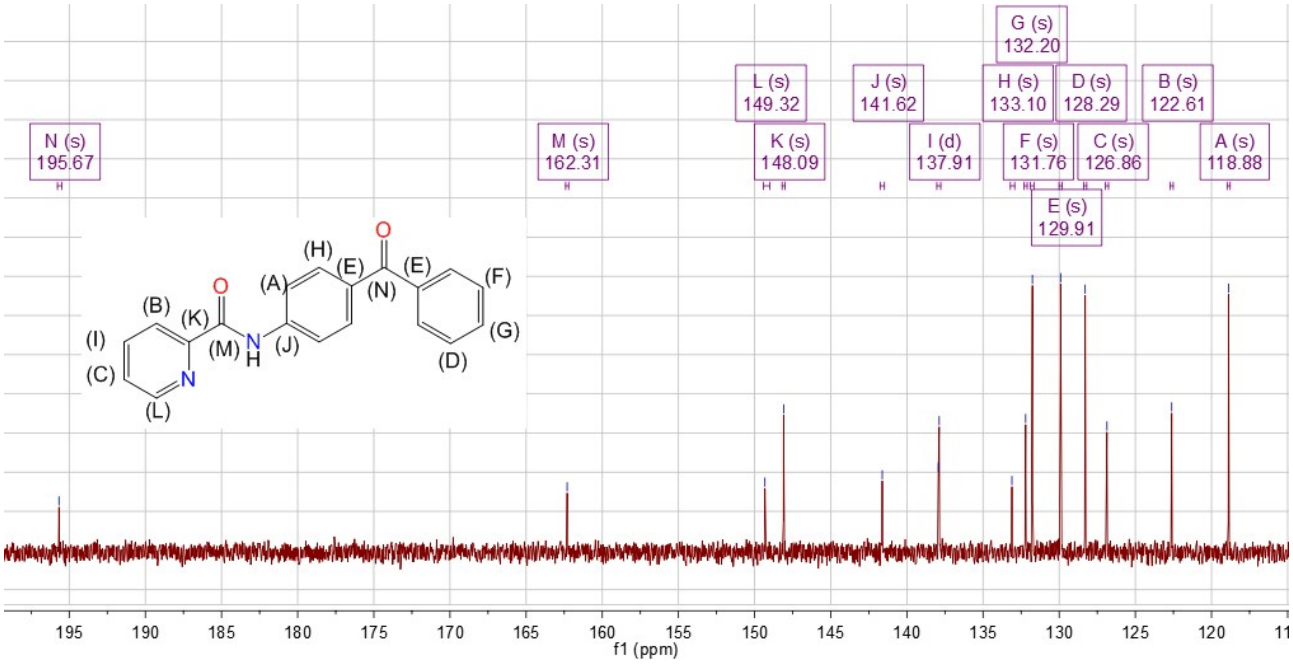
N-(4-(trifluoromethyl)phenyl)picolinamide

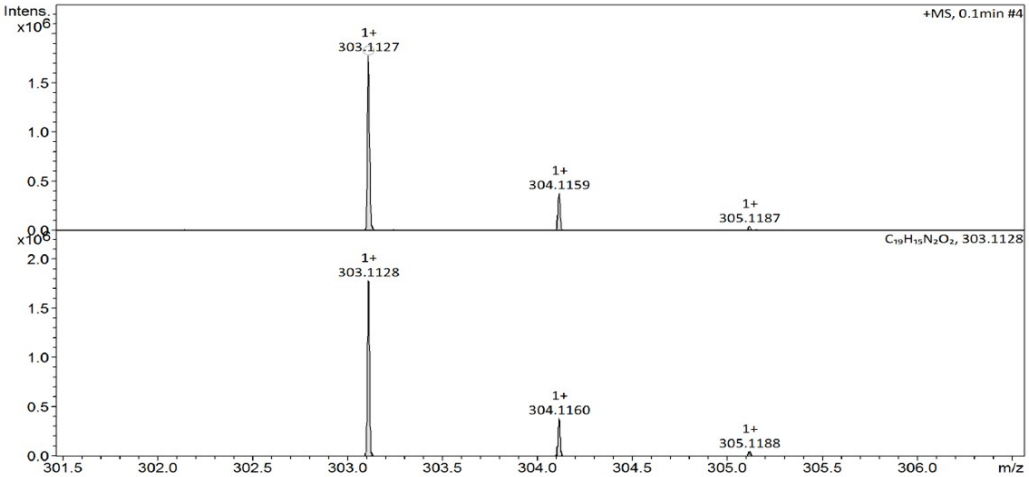




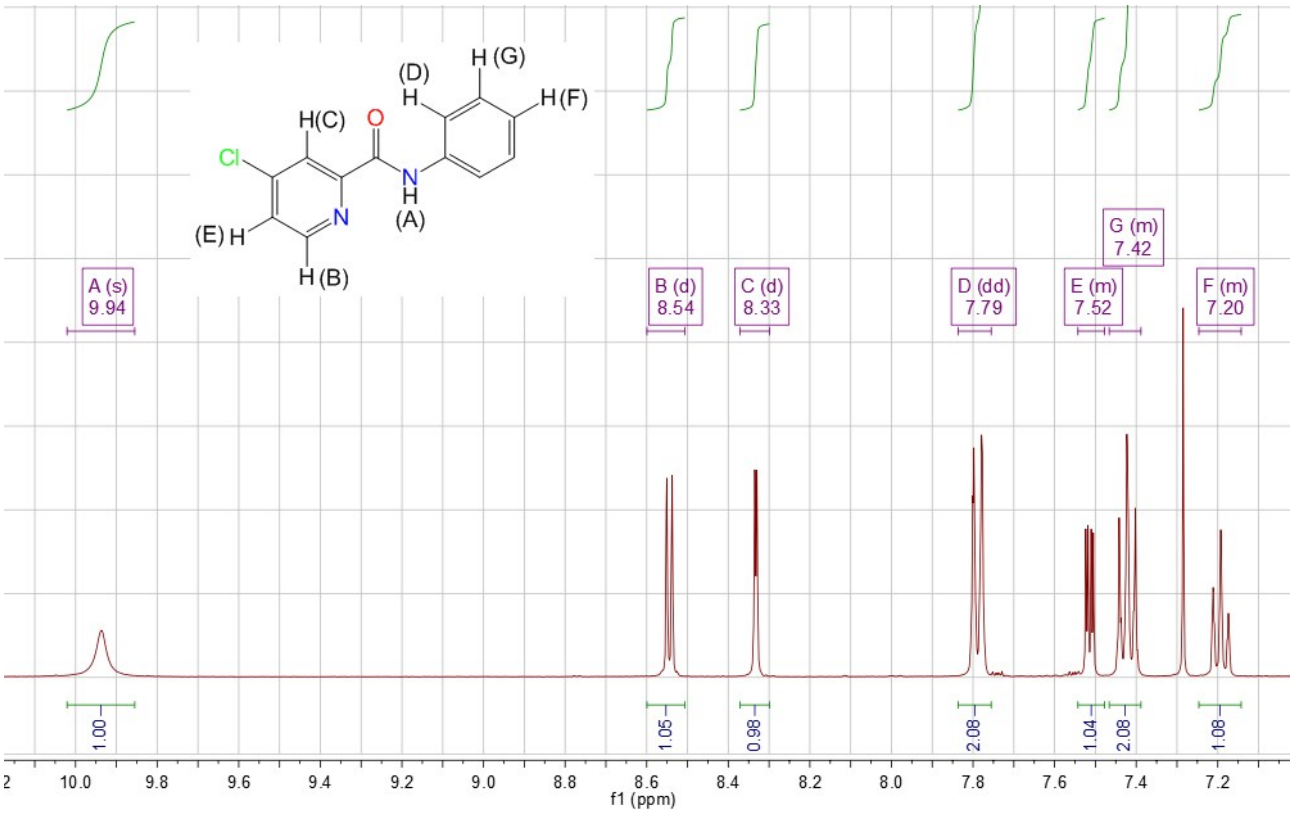
N-(4-benzoylphenyl)picolinamide

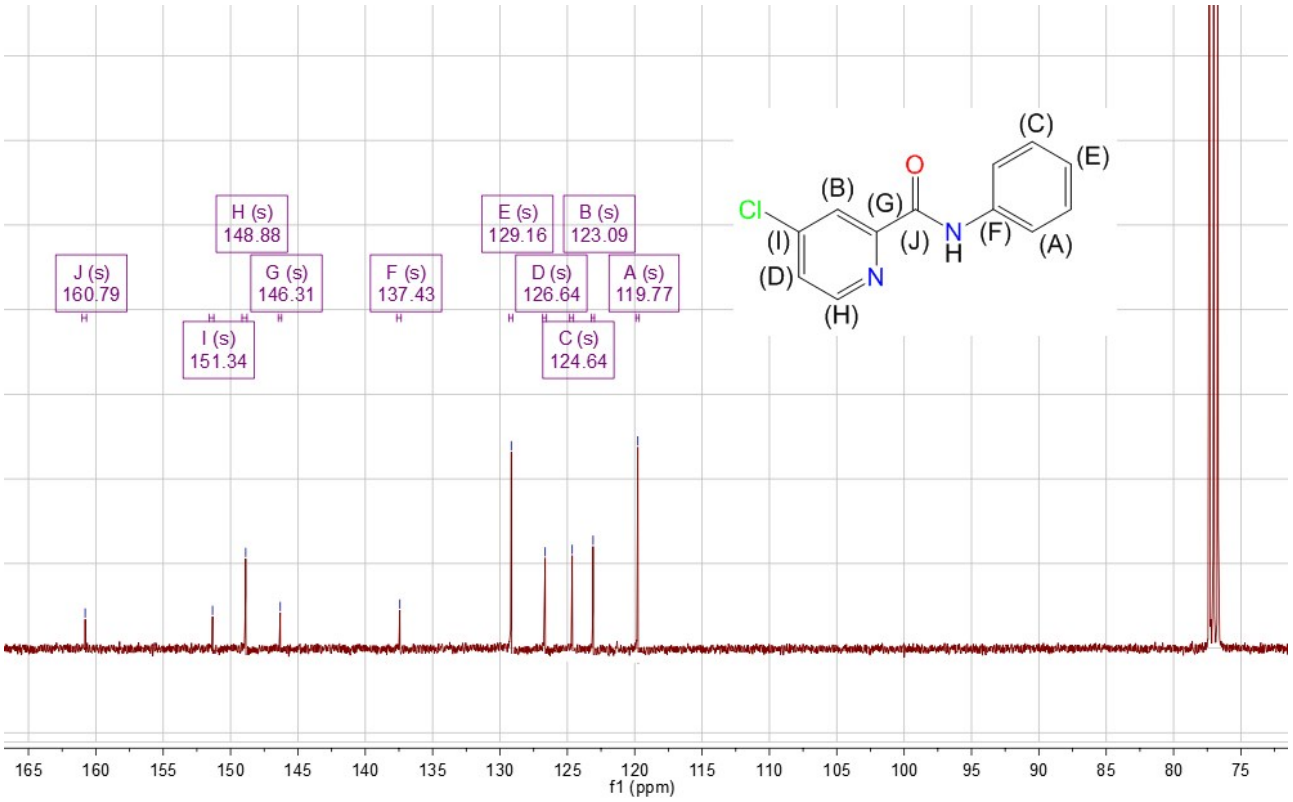




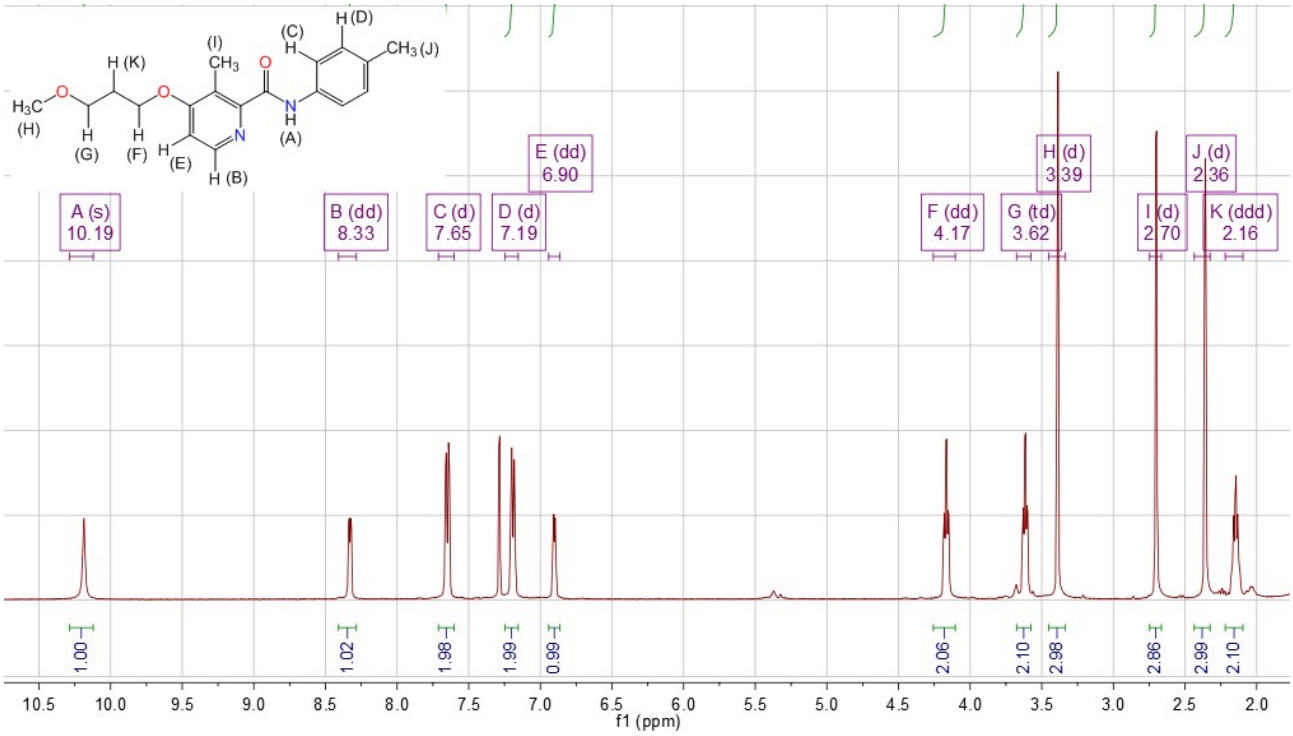


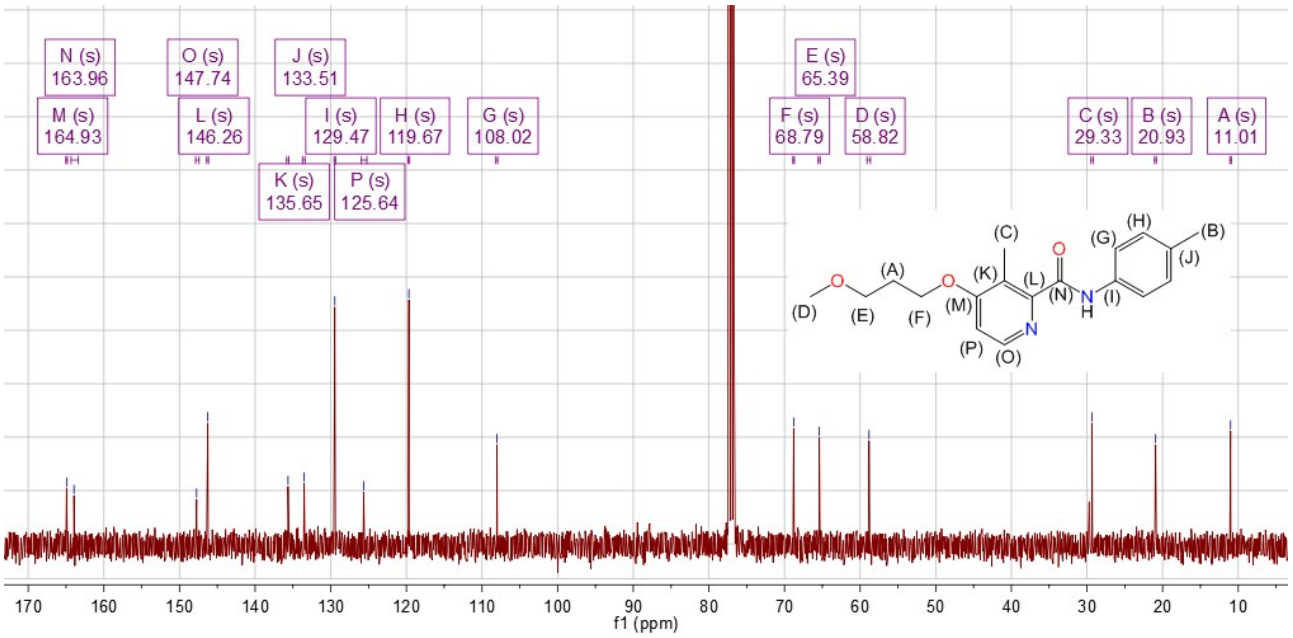
11, 4-chloro-N-phenylpicolinamide

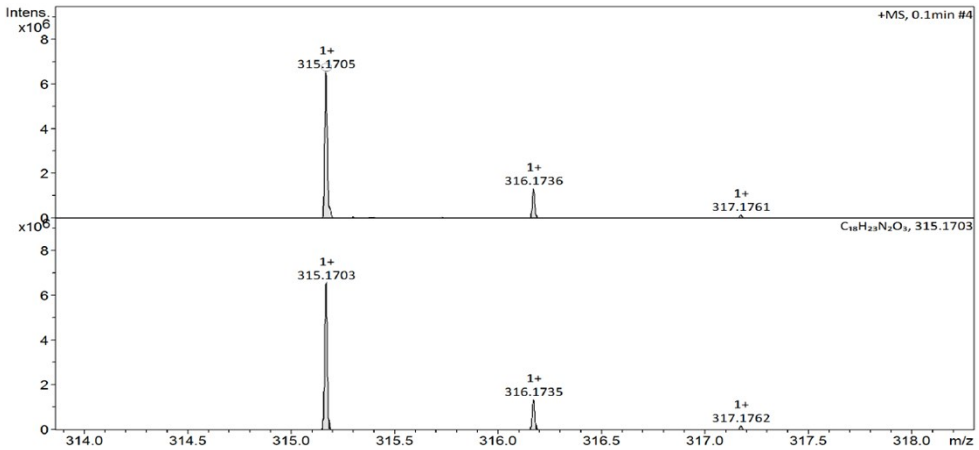




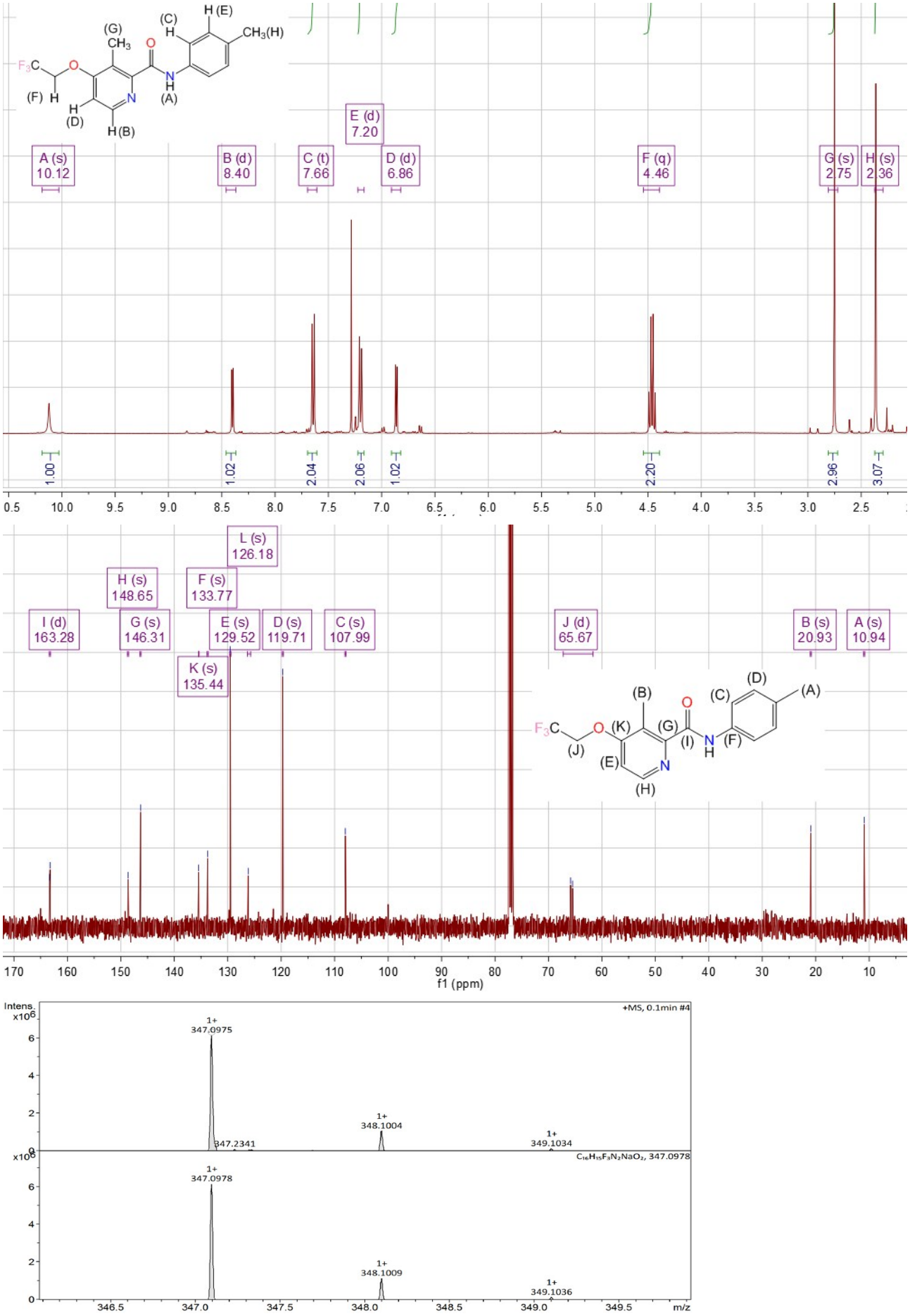
4-(3-methoxypropoxy)-3-methyl-N-(p-tolyl)picolinamide



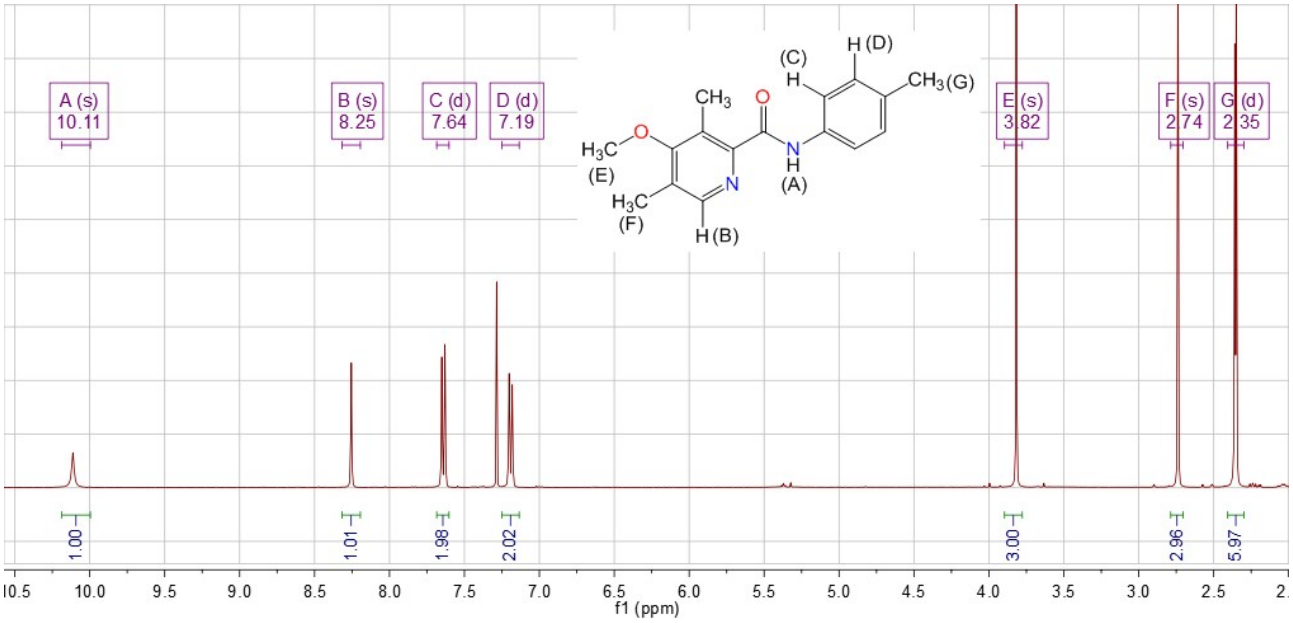


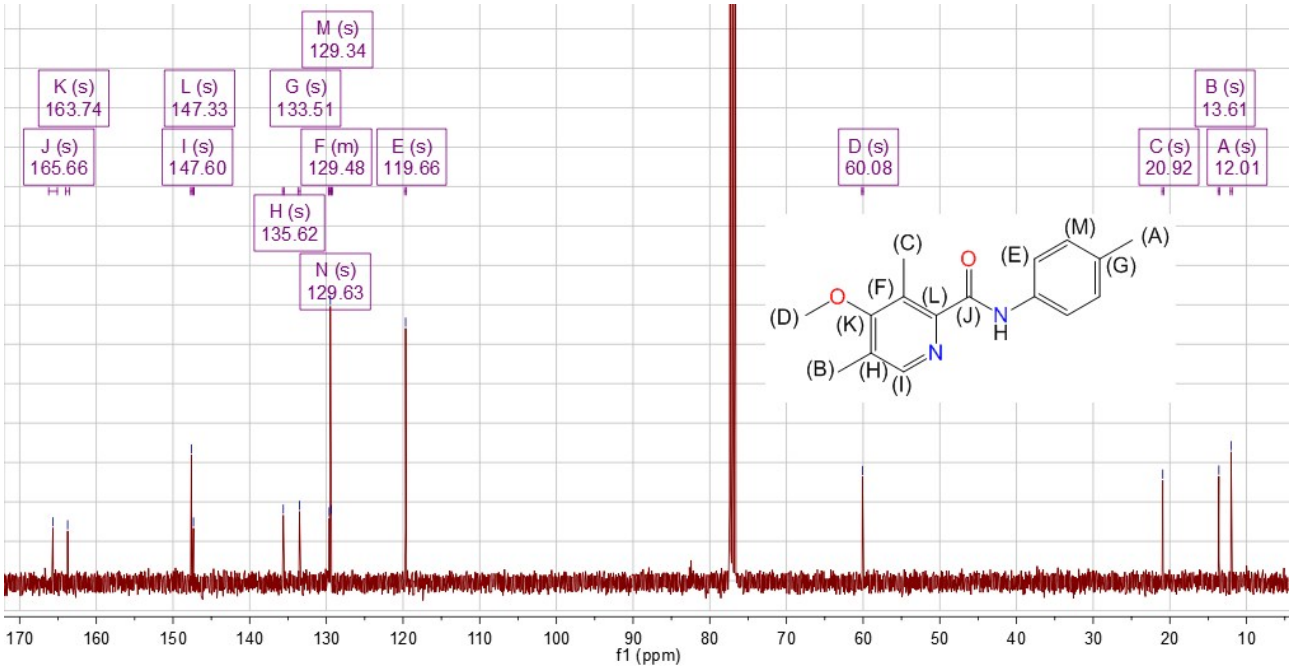


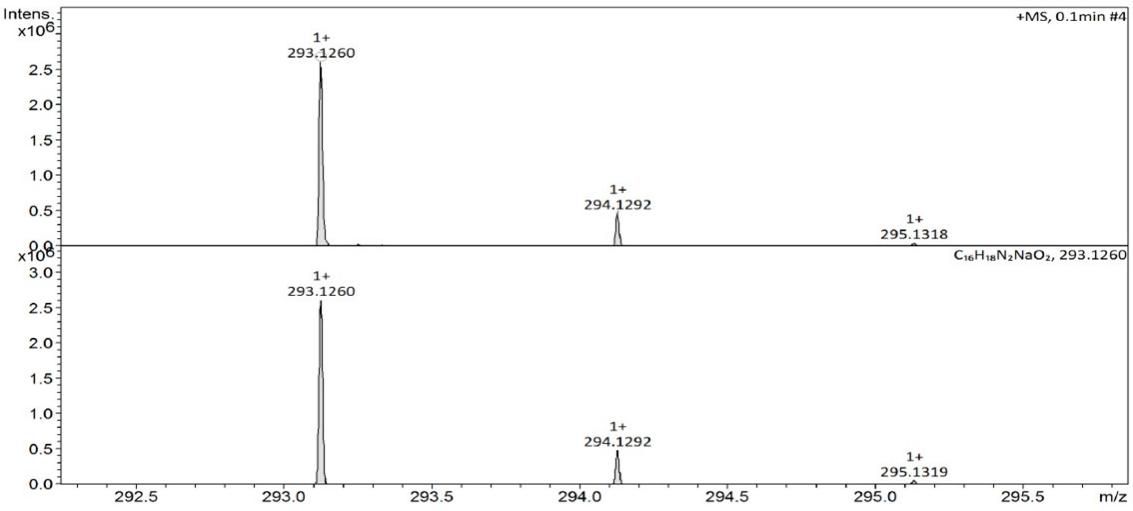
3-methyl-N-(p-tolyl)-4-(2,2,2-trifluoroethoxy)picolinamide



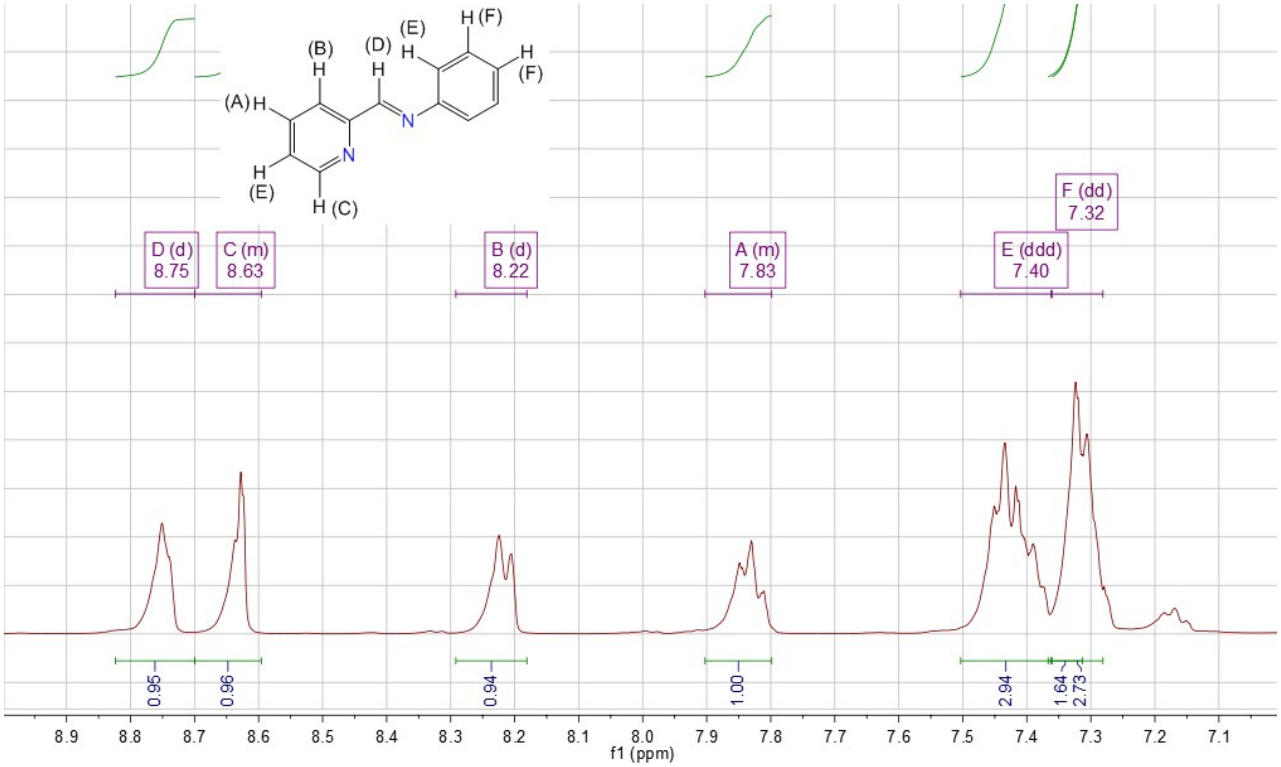
4-methoxy-3,5-dimethyl-N-(p-tolyl)picolinamide

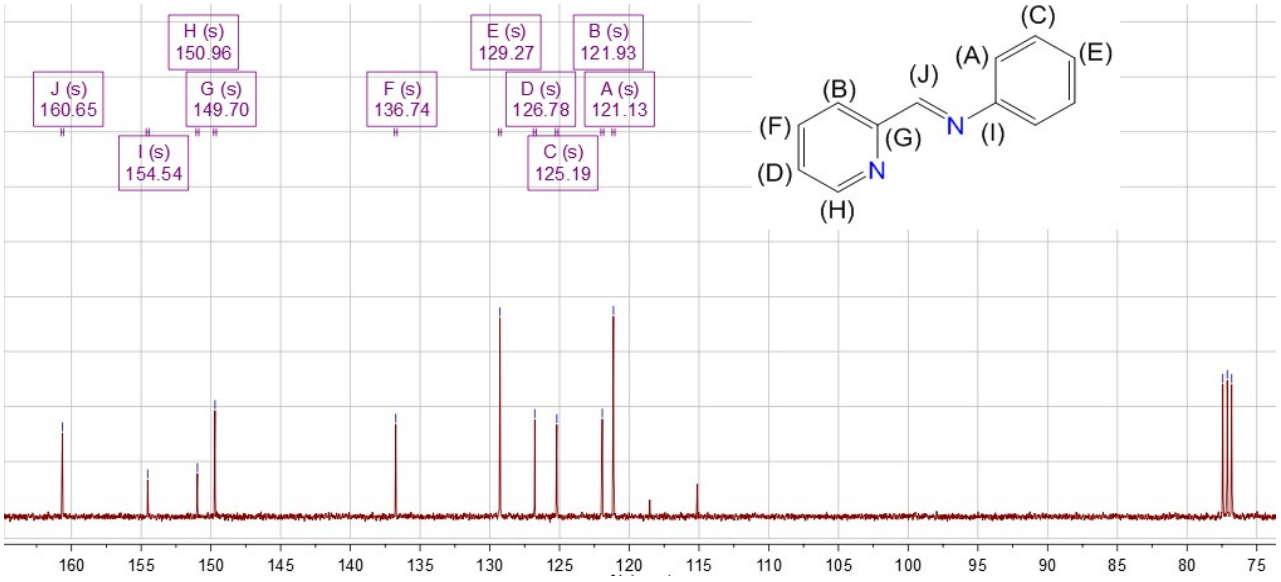


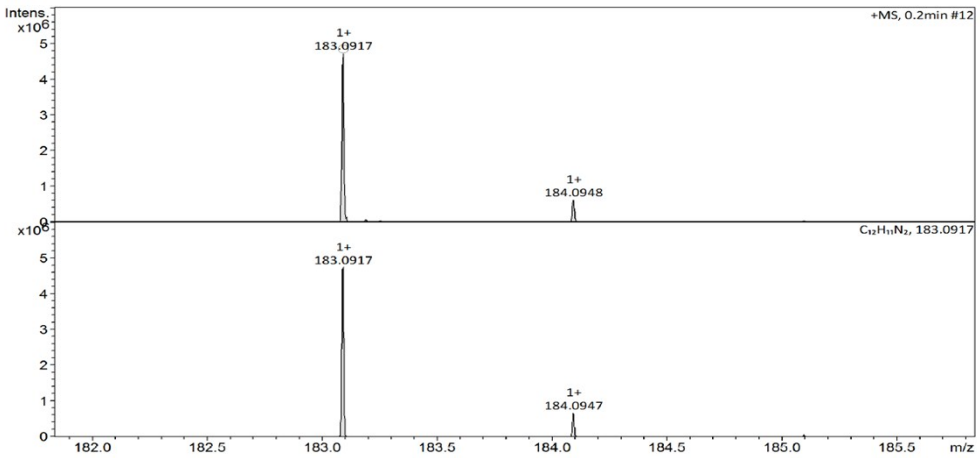




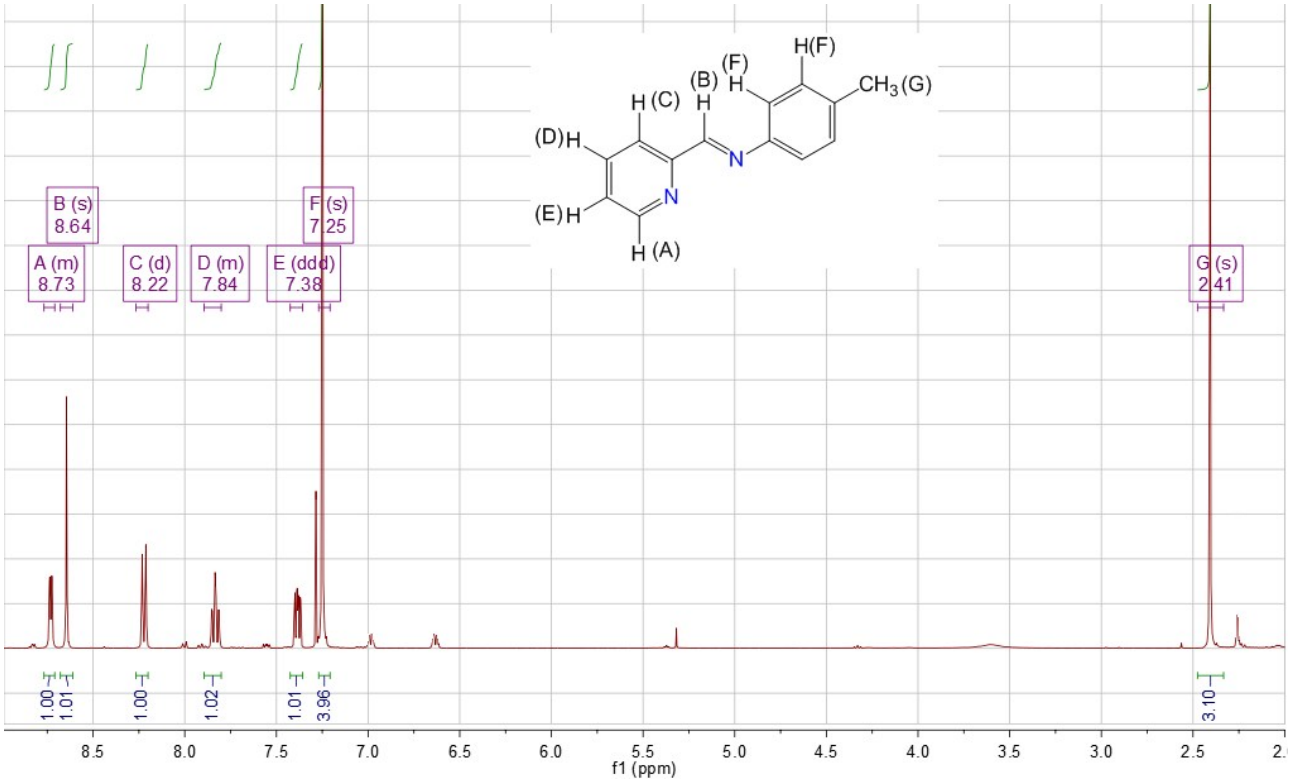
N-(pyridin-2-ylmethylene)aniline

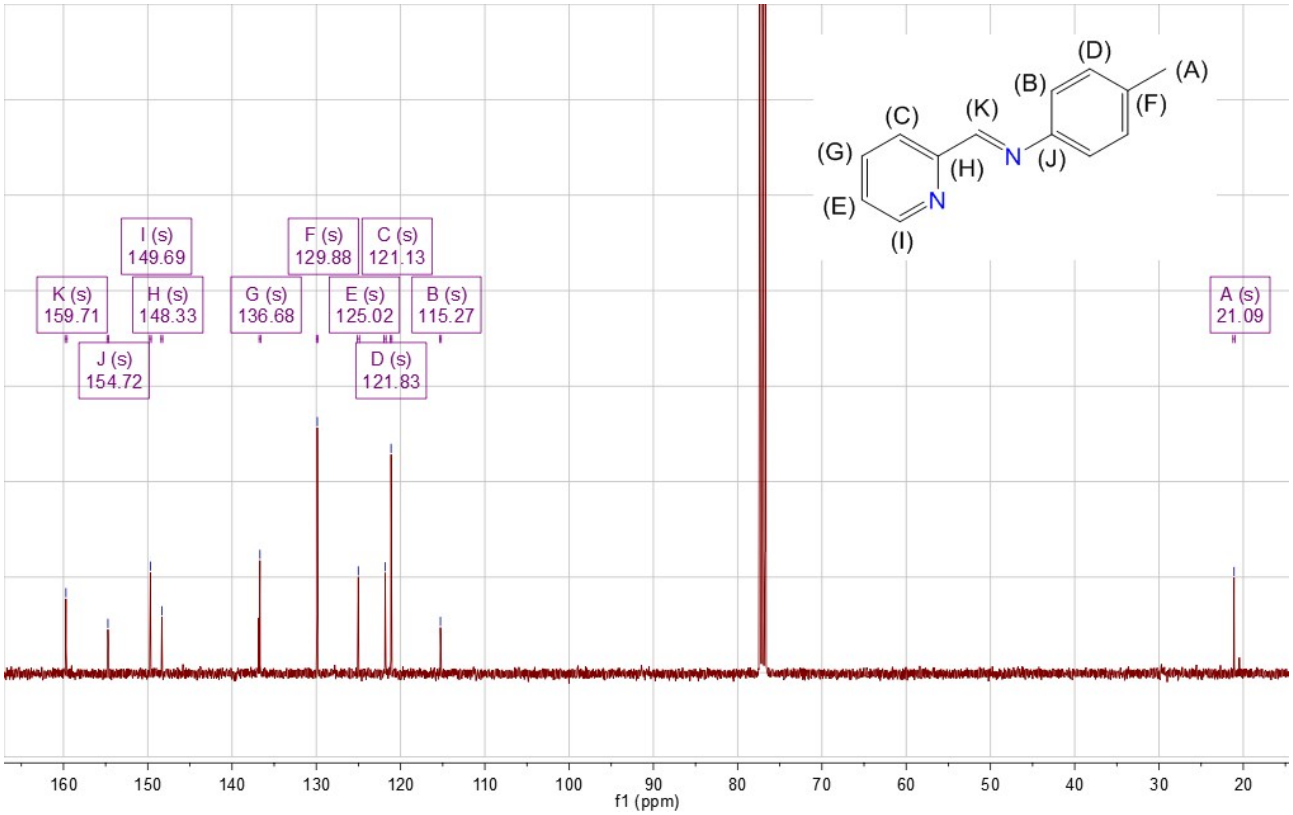




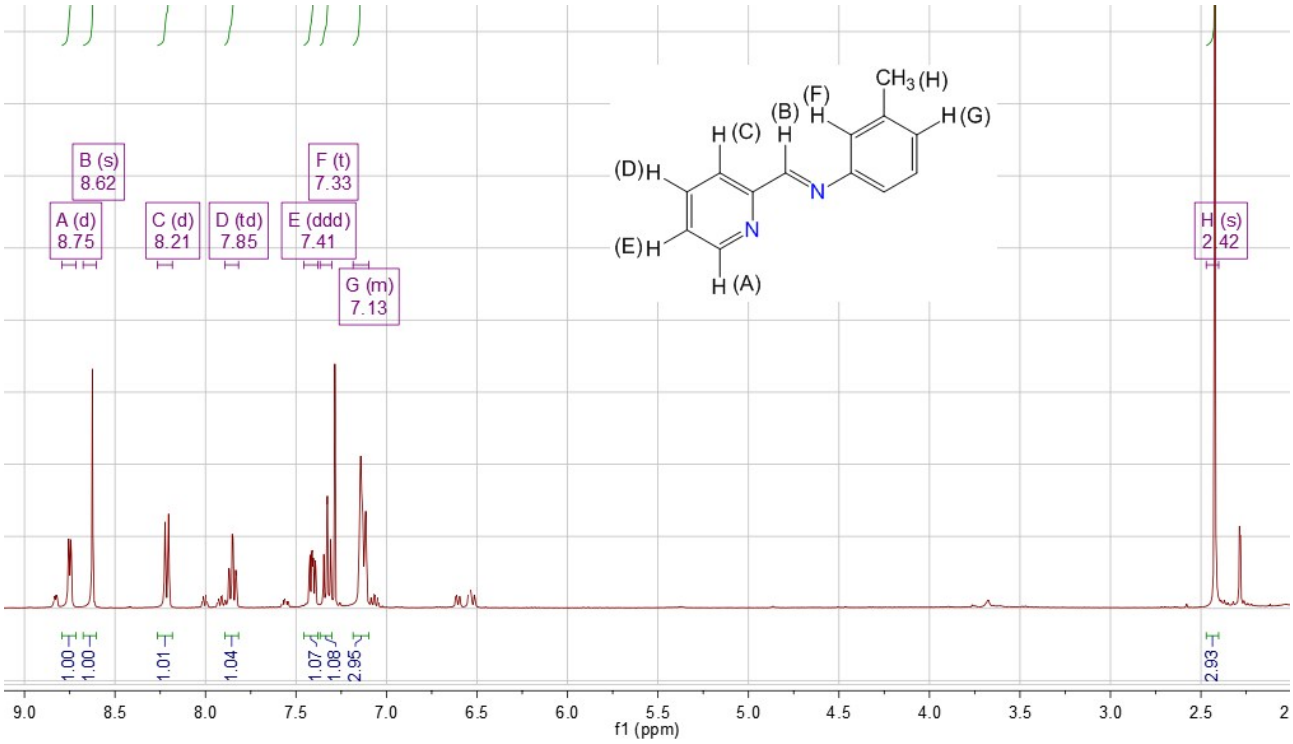


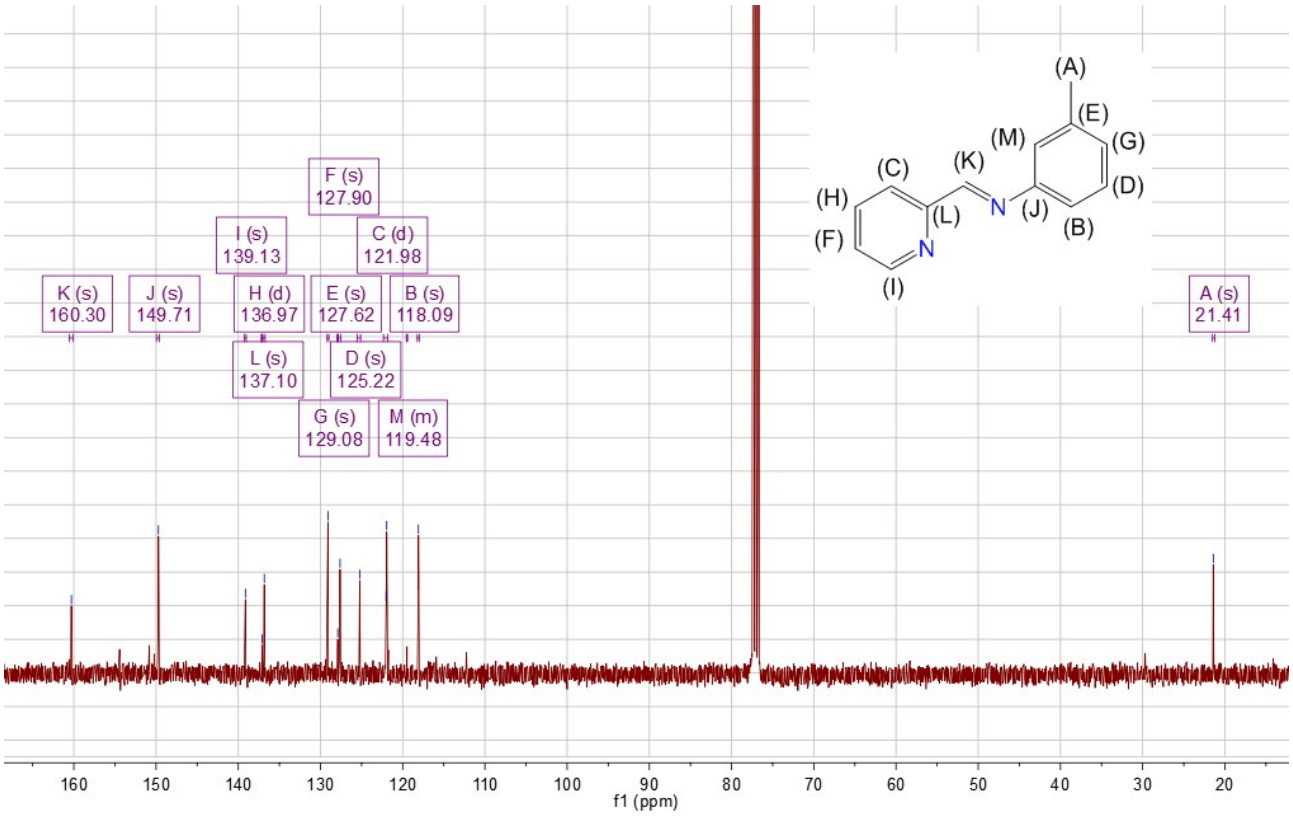
4-methyl-N-(pyridin-2-ylmethylene)aniline



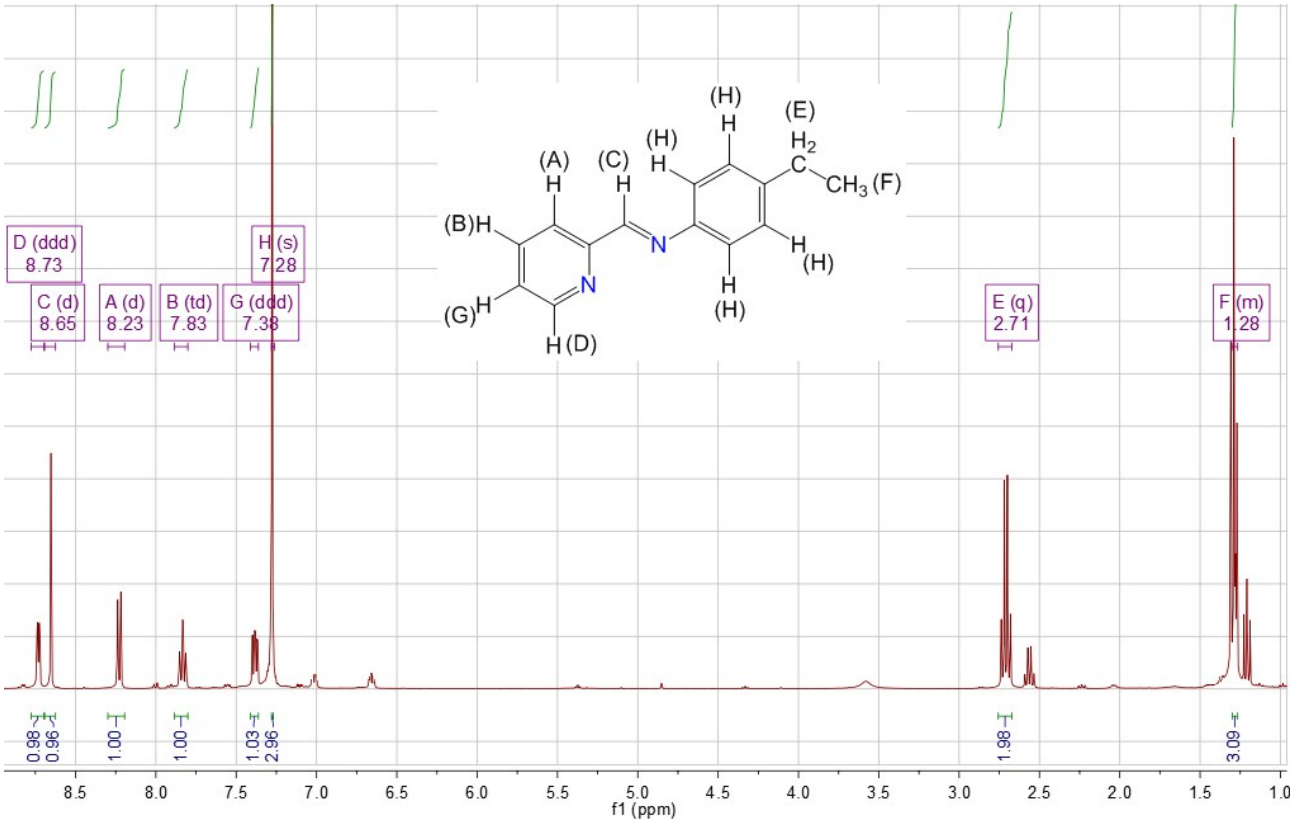


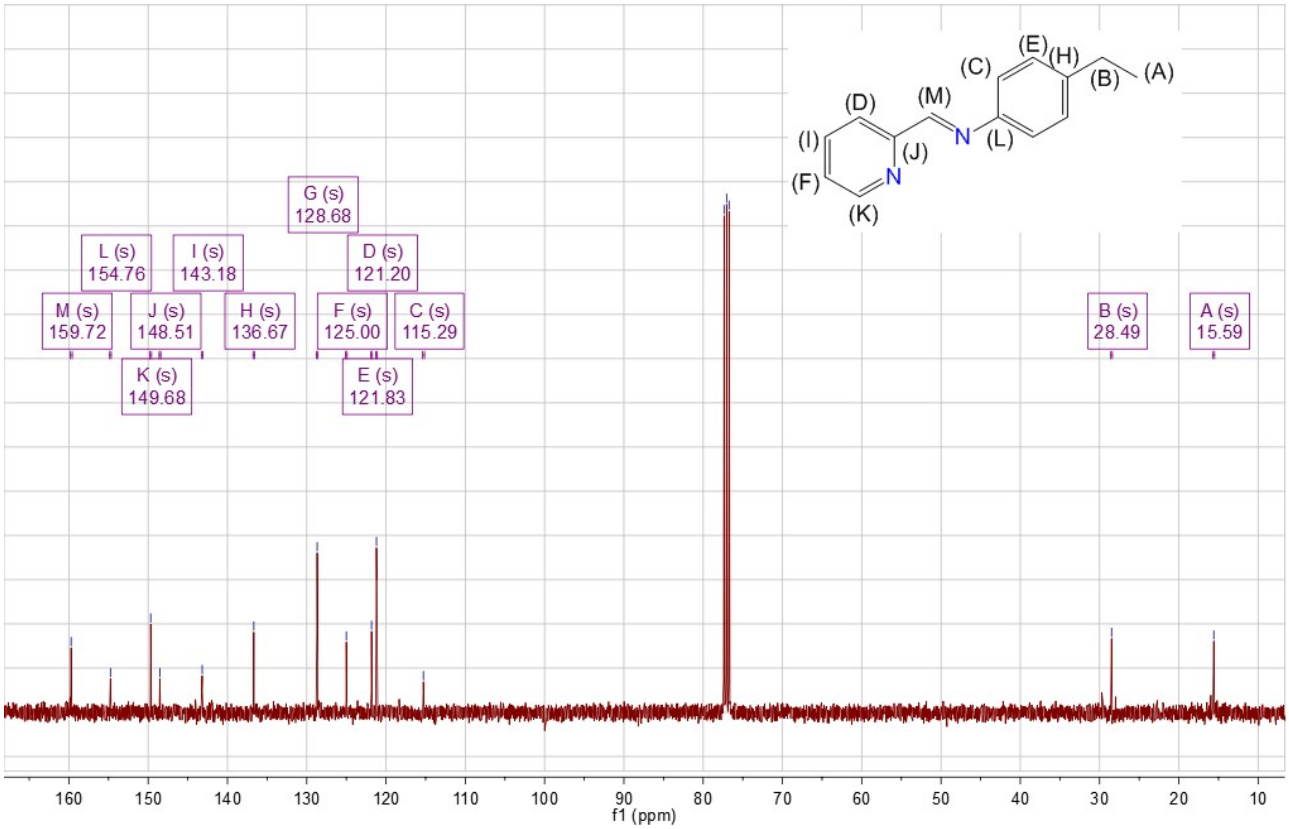
3-methyl-N-(pyridin-2-ylmethylene)aniline



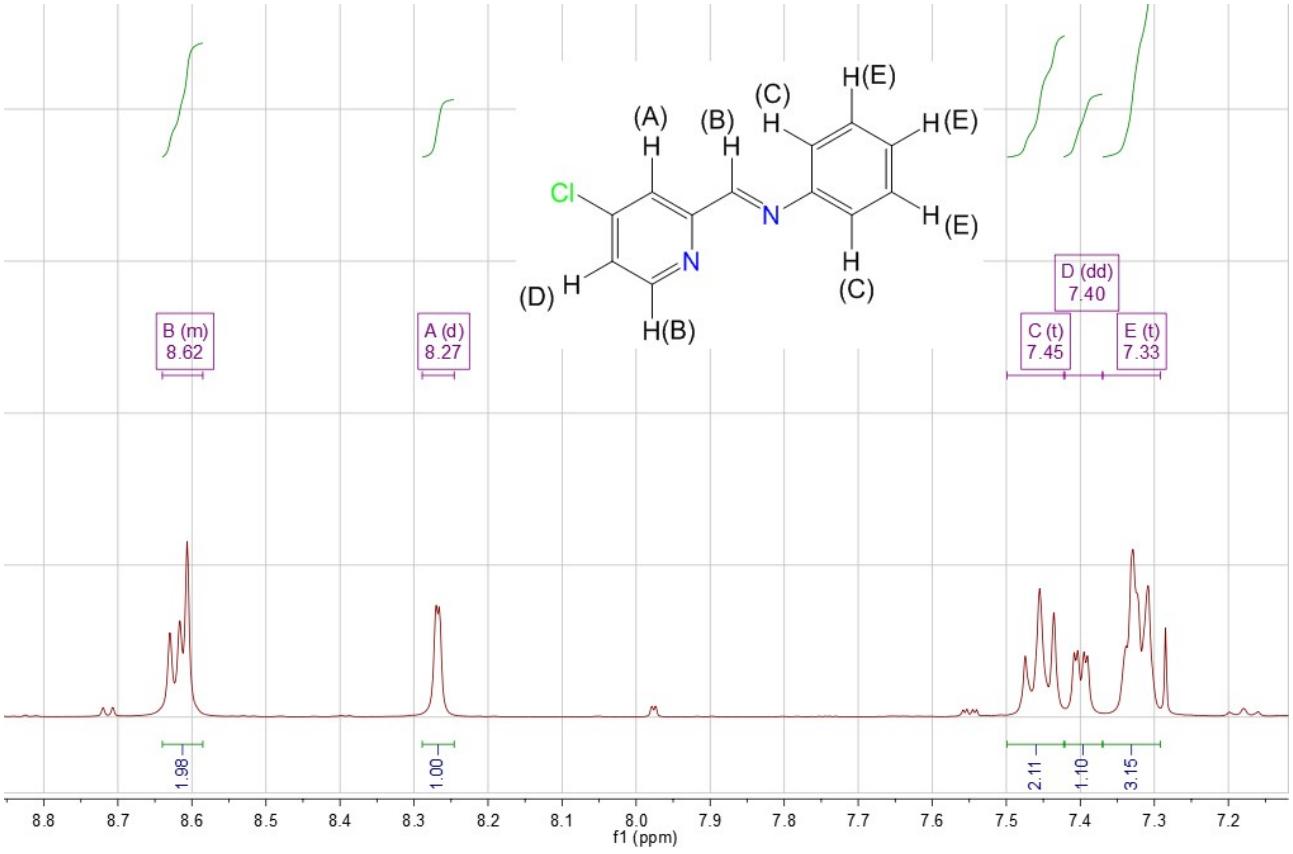


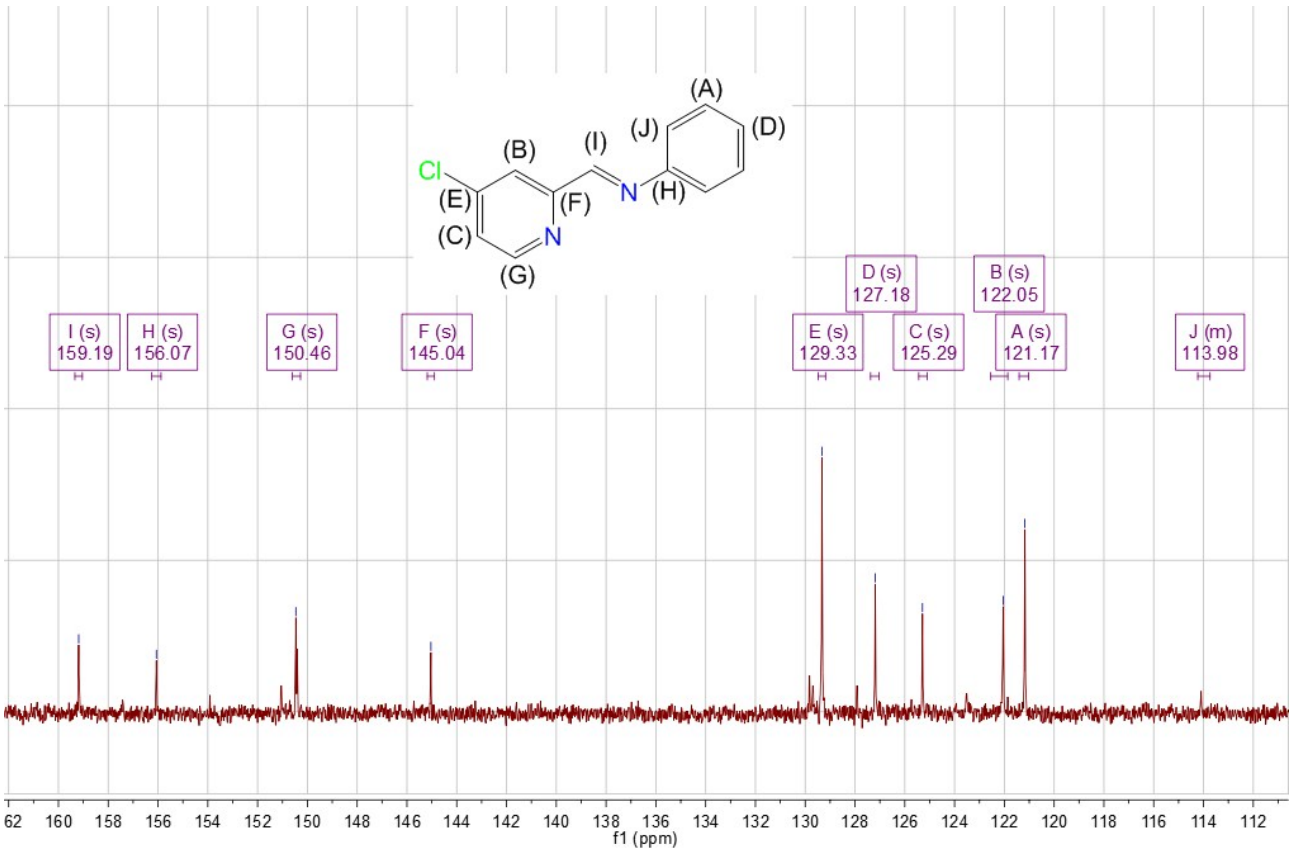
4-ethyl-N-(pyridin-2-ylmethylene)aniline



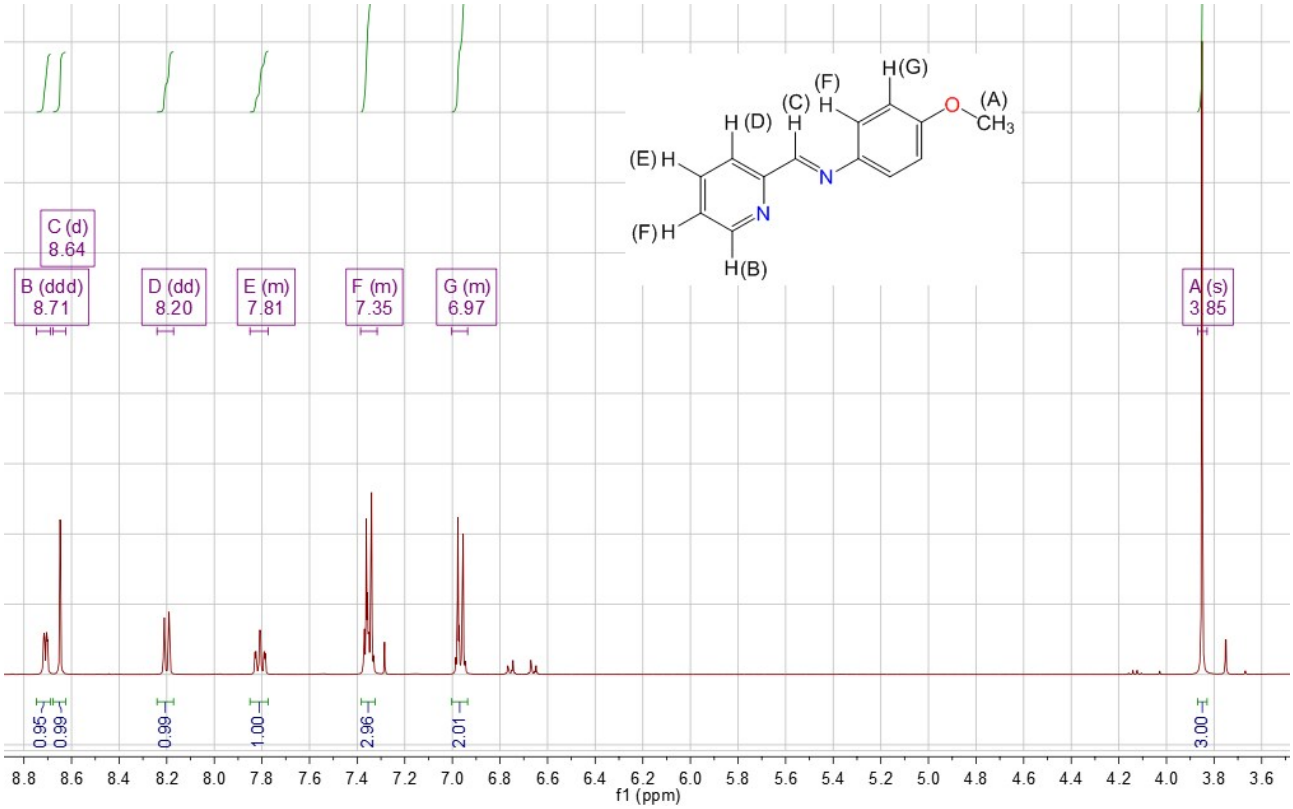


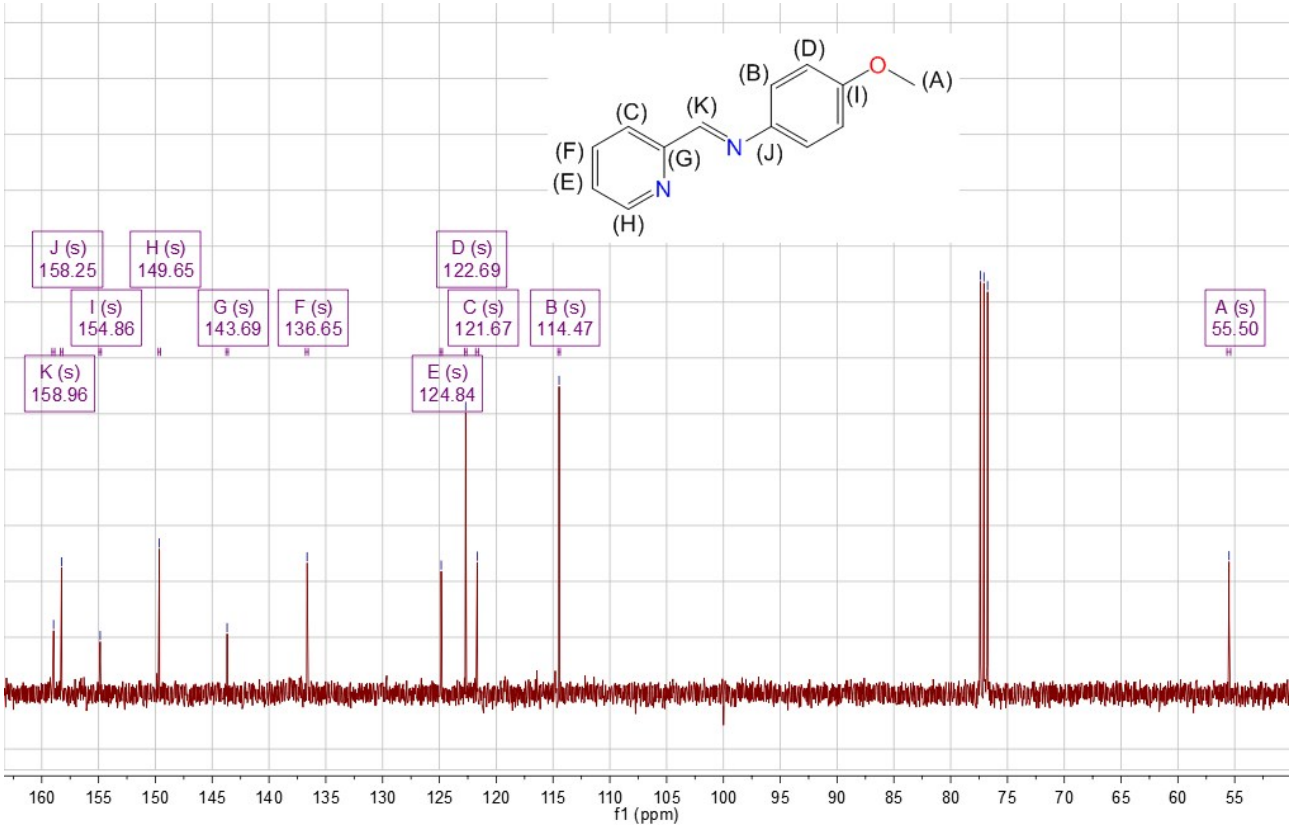
N-((4-chloropyridin-2-yl)methylene)aniline



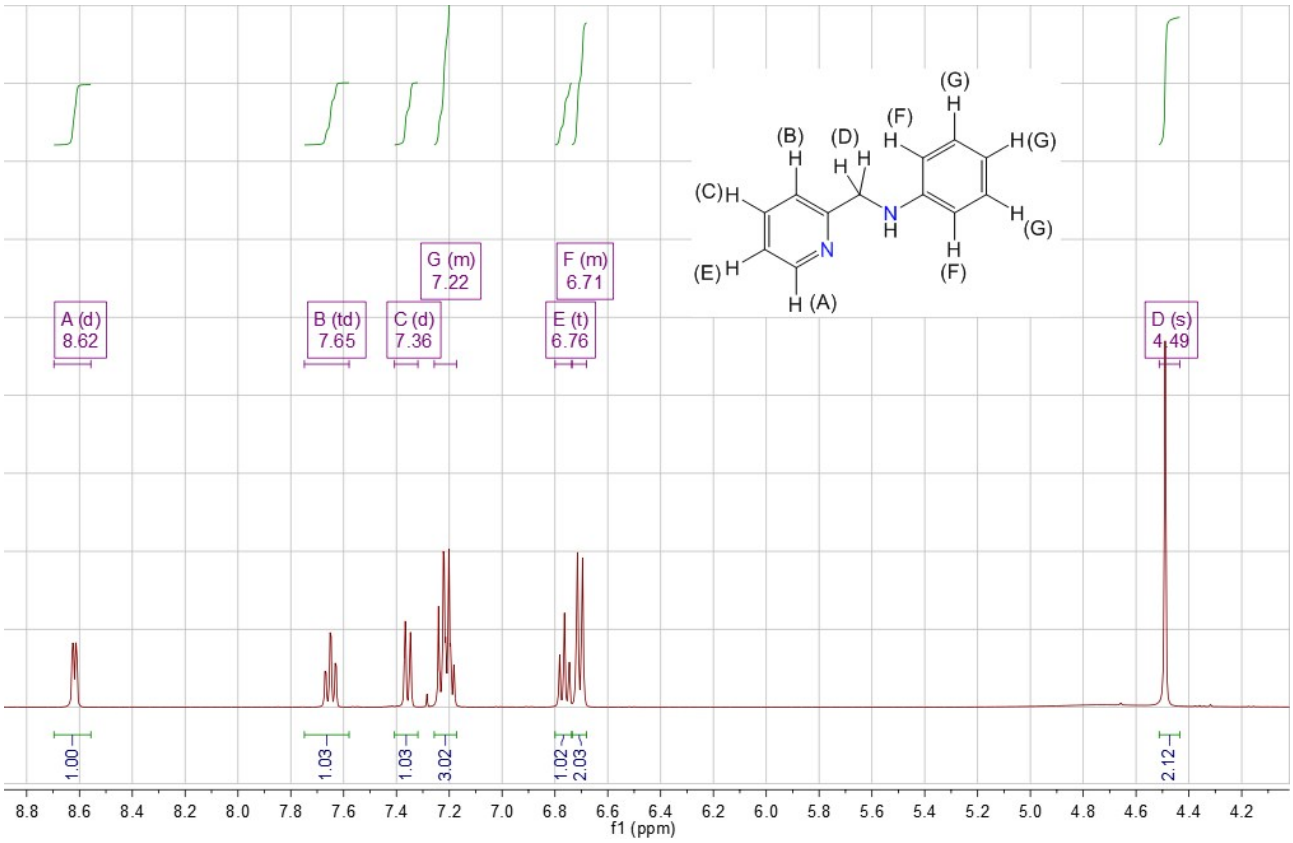


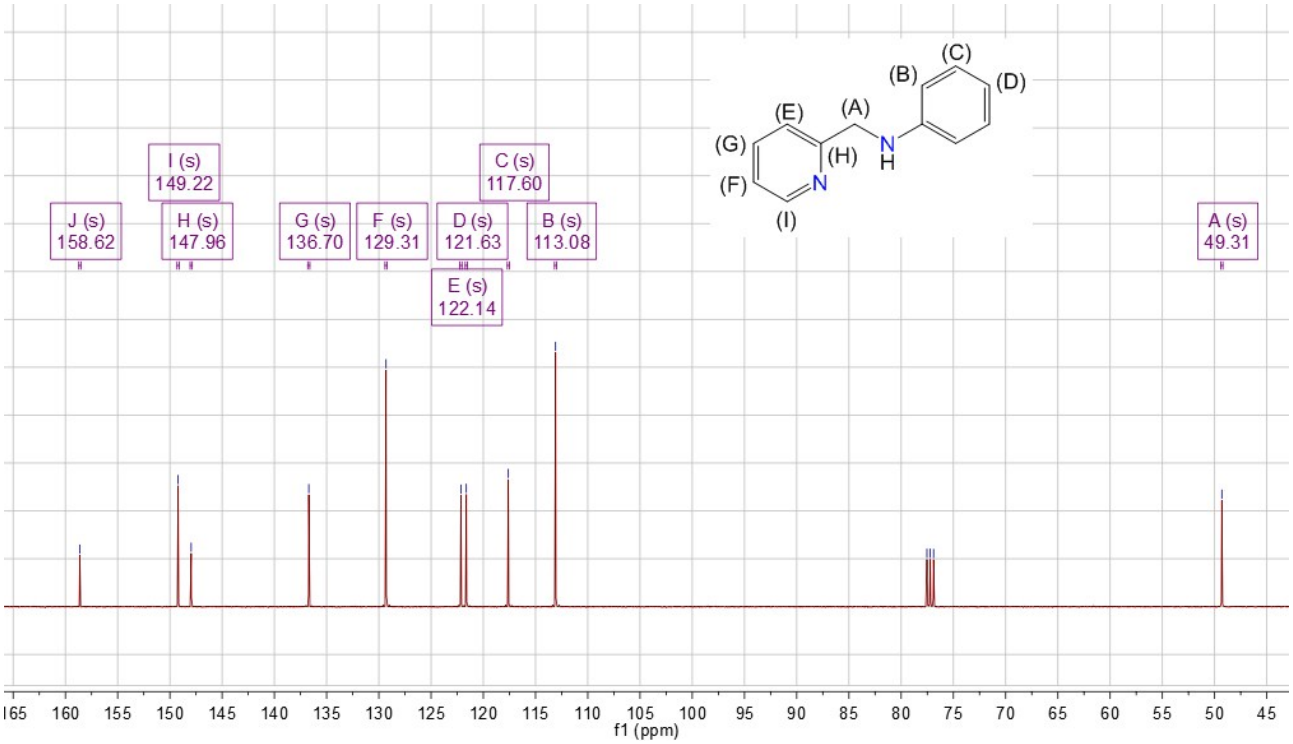
4-methoxy-N-(pyridin-2-ylmethylene)aniline



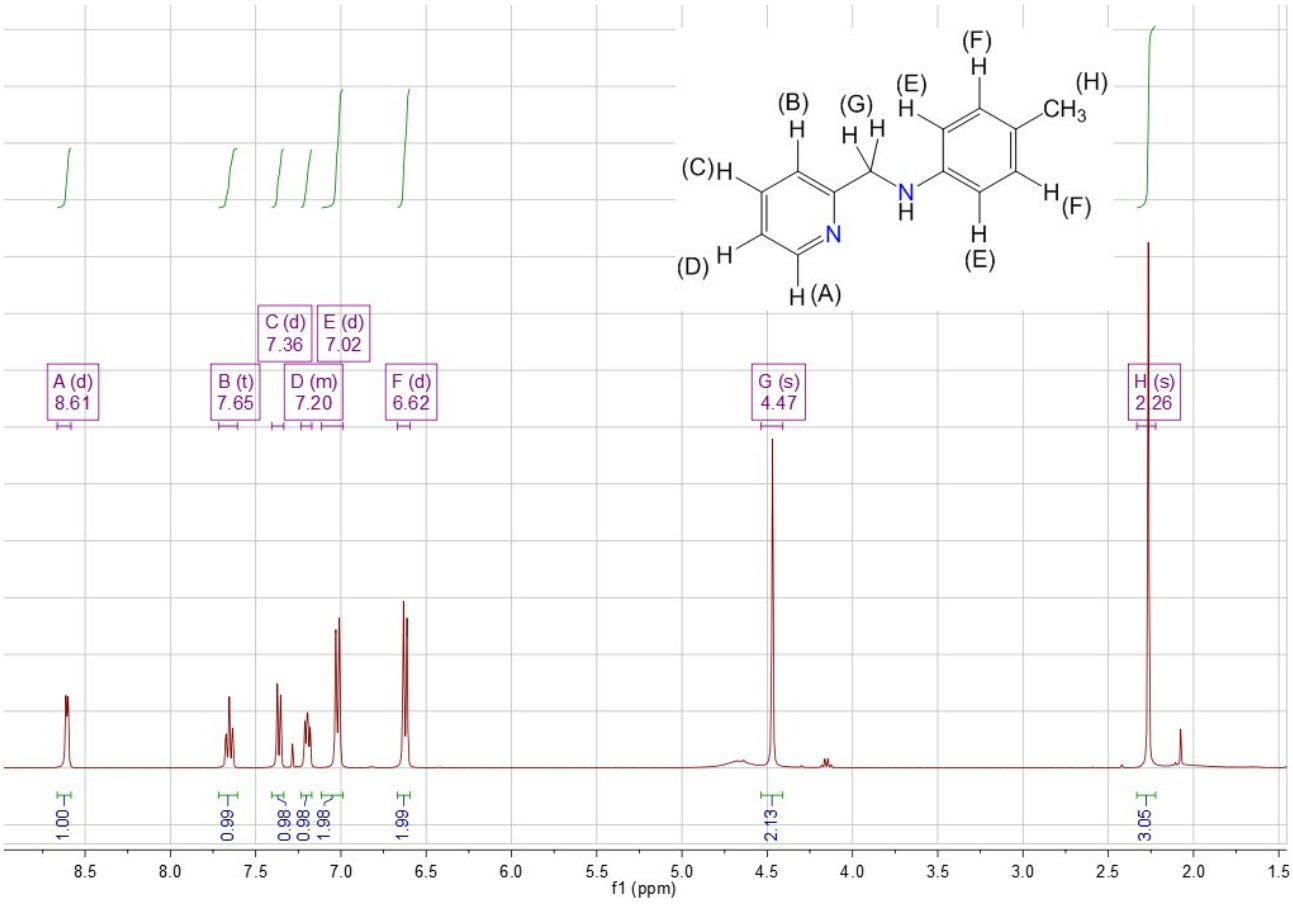


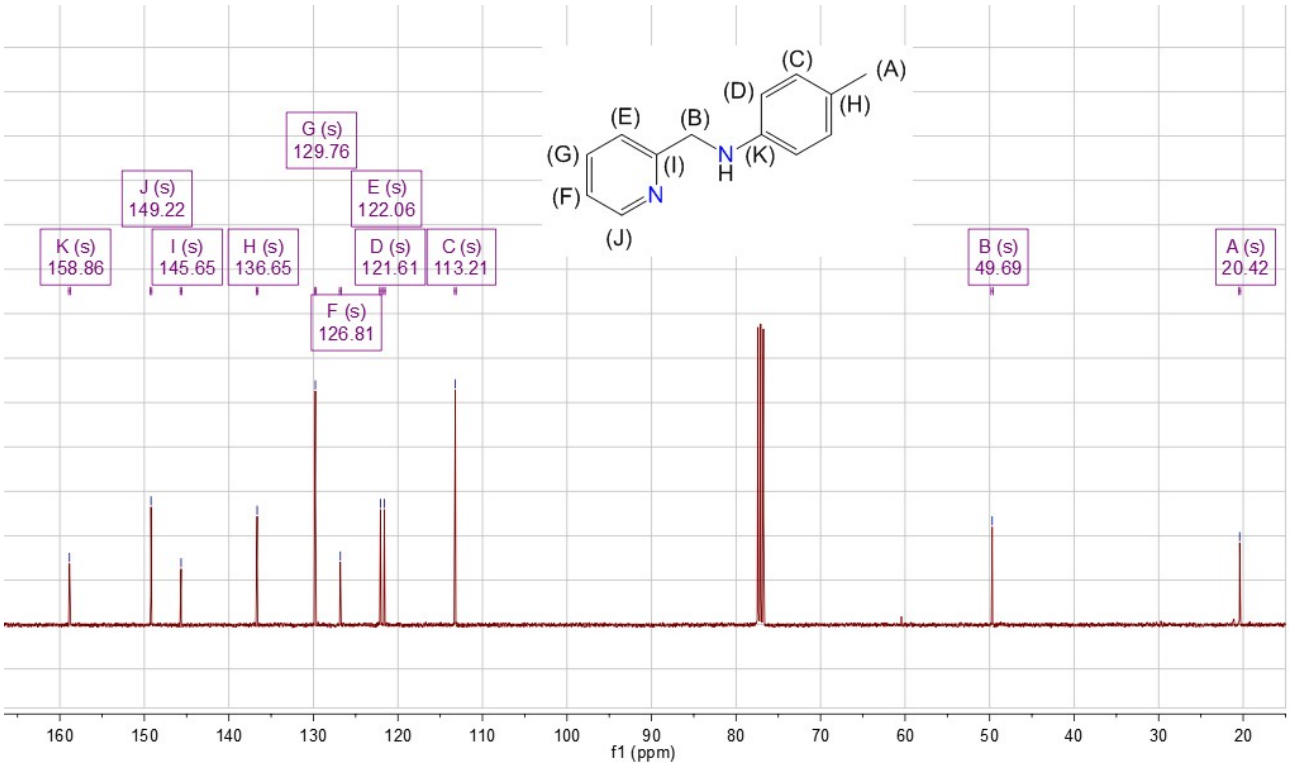
N-(pyridin-2-ylmethyl) aniline



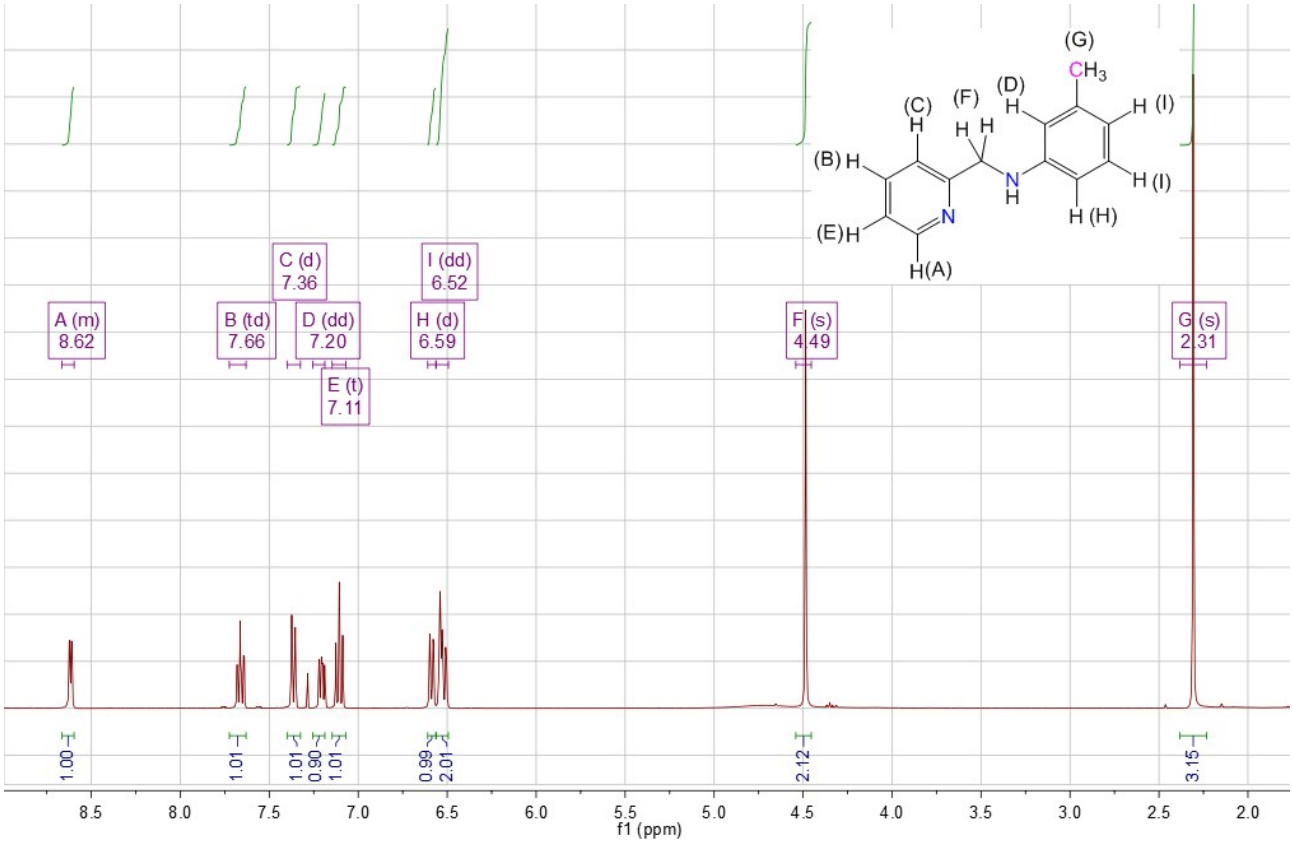


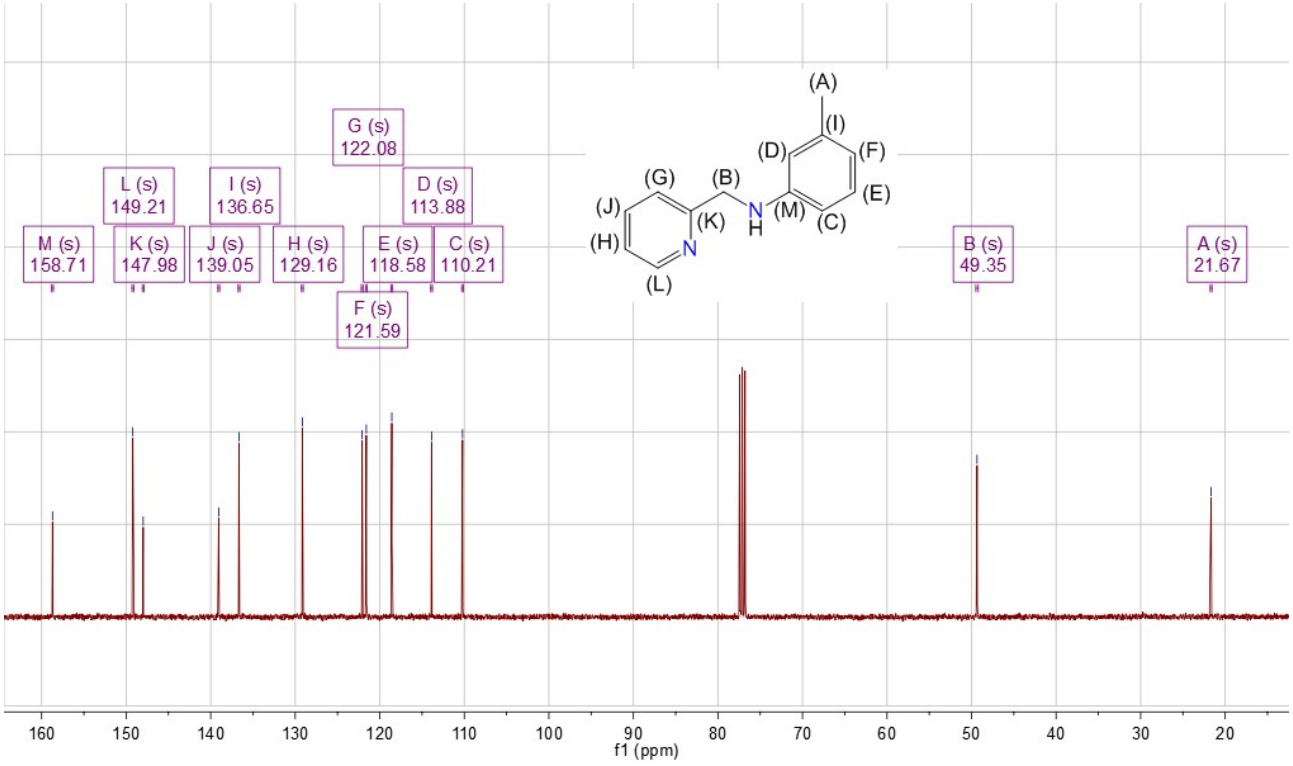
4-methyl-N-(pyridin-2-ylmethyl)aniline



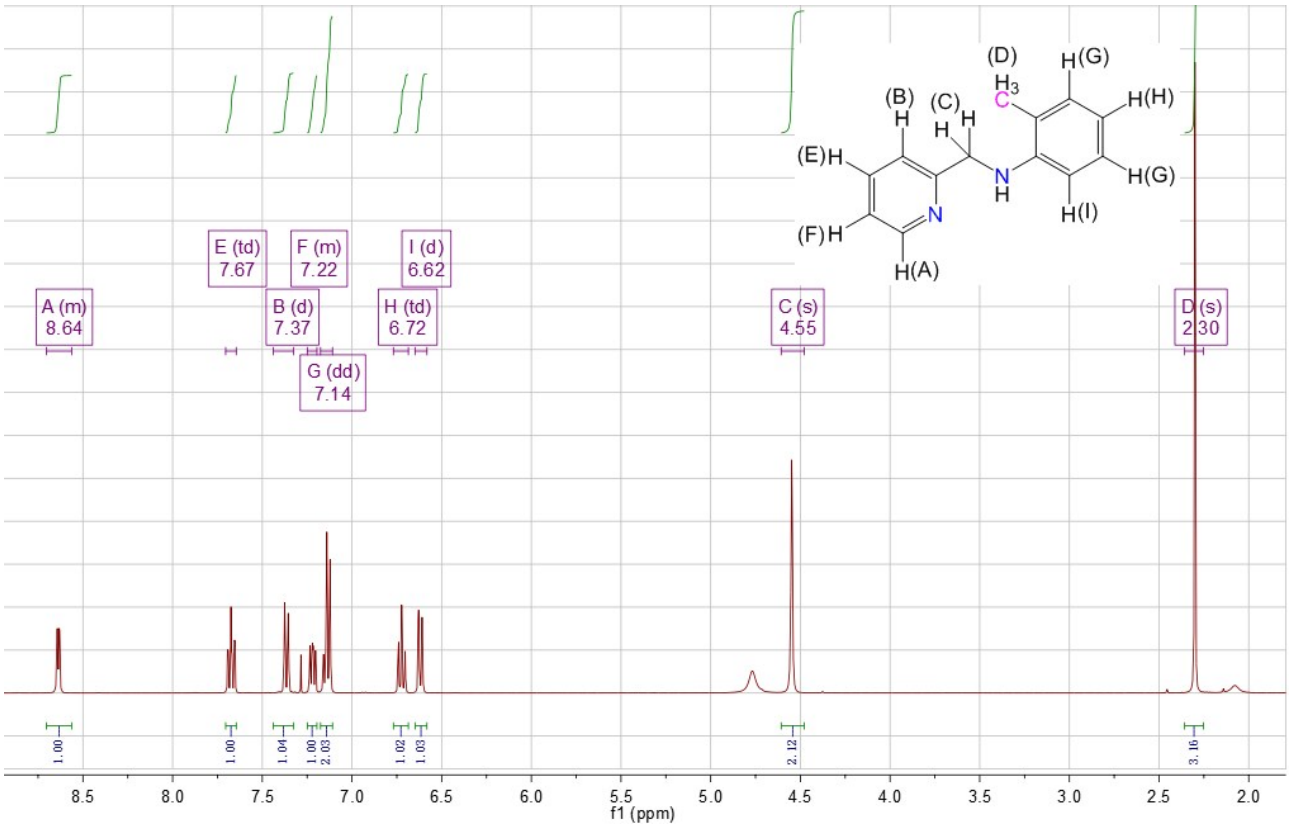


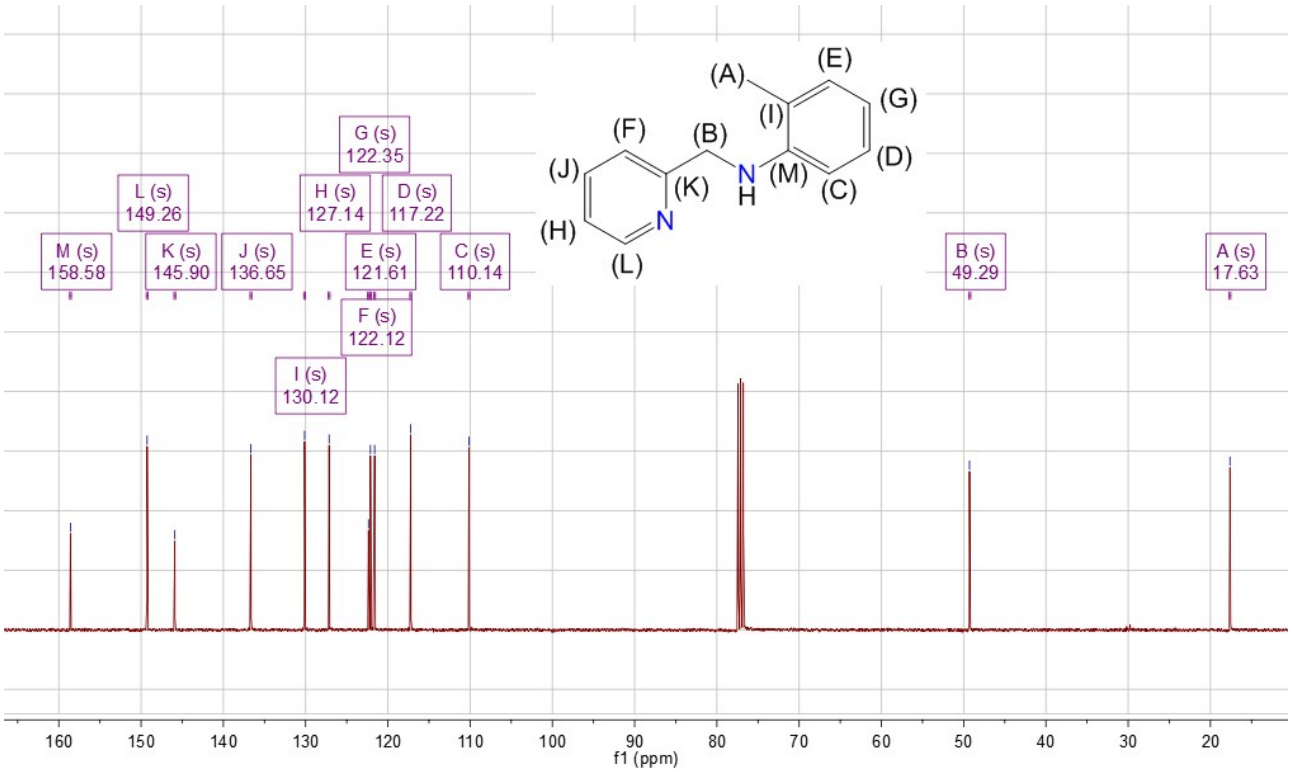
3-methyl-N-(pyridin-2-ylmethyl)aniline



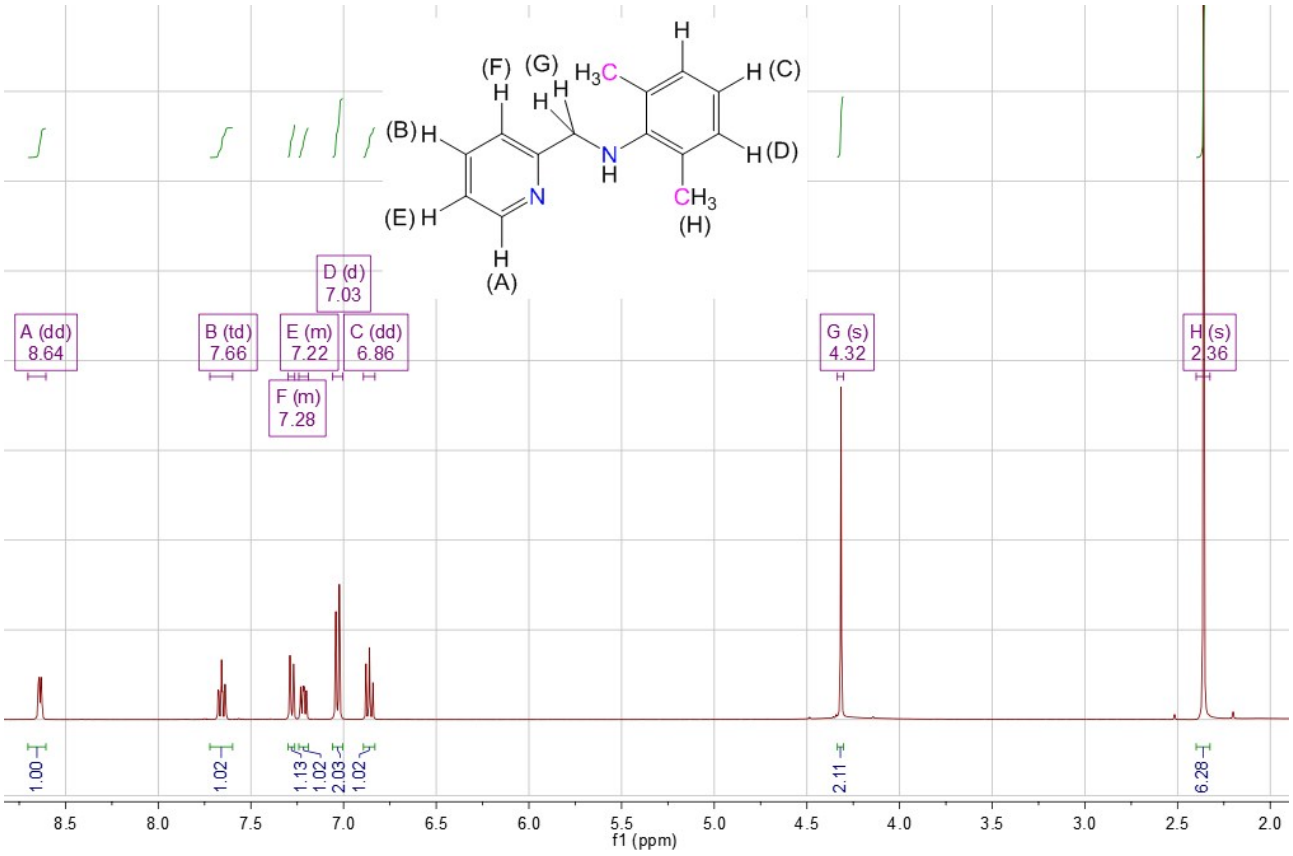


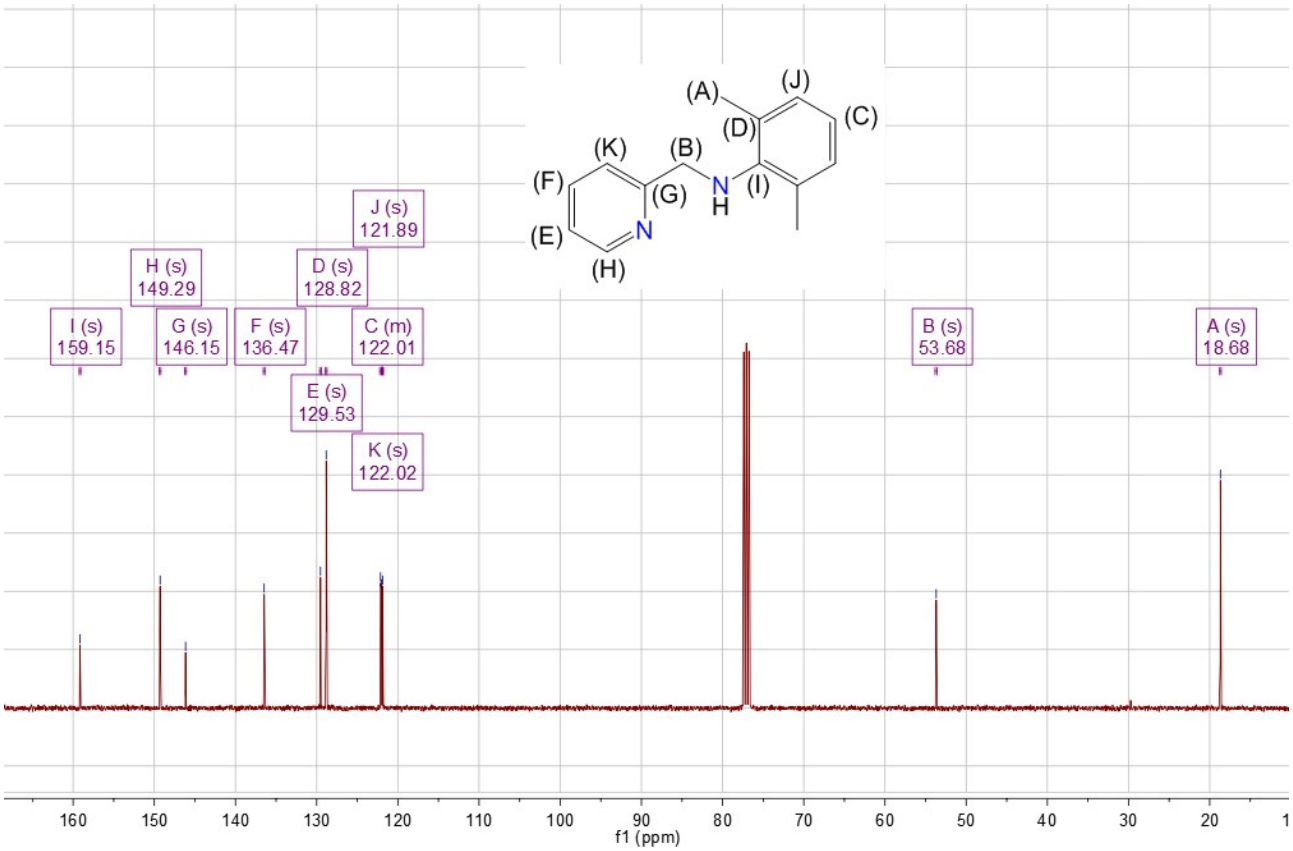
2-methyl-N-(pyridin-2-ylmethyl)aniline



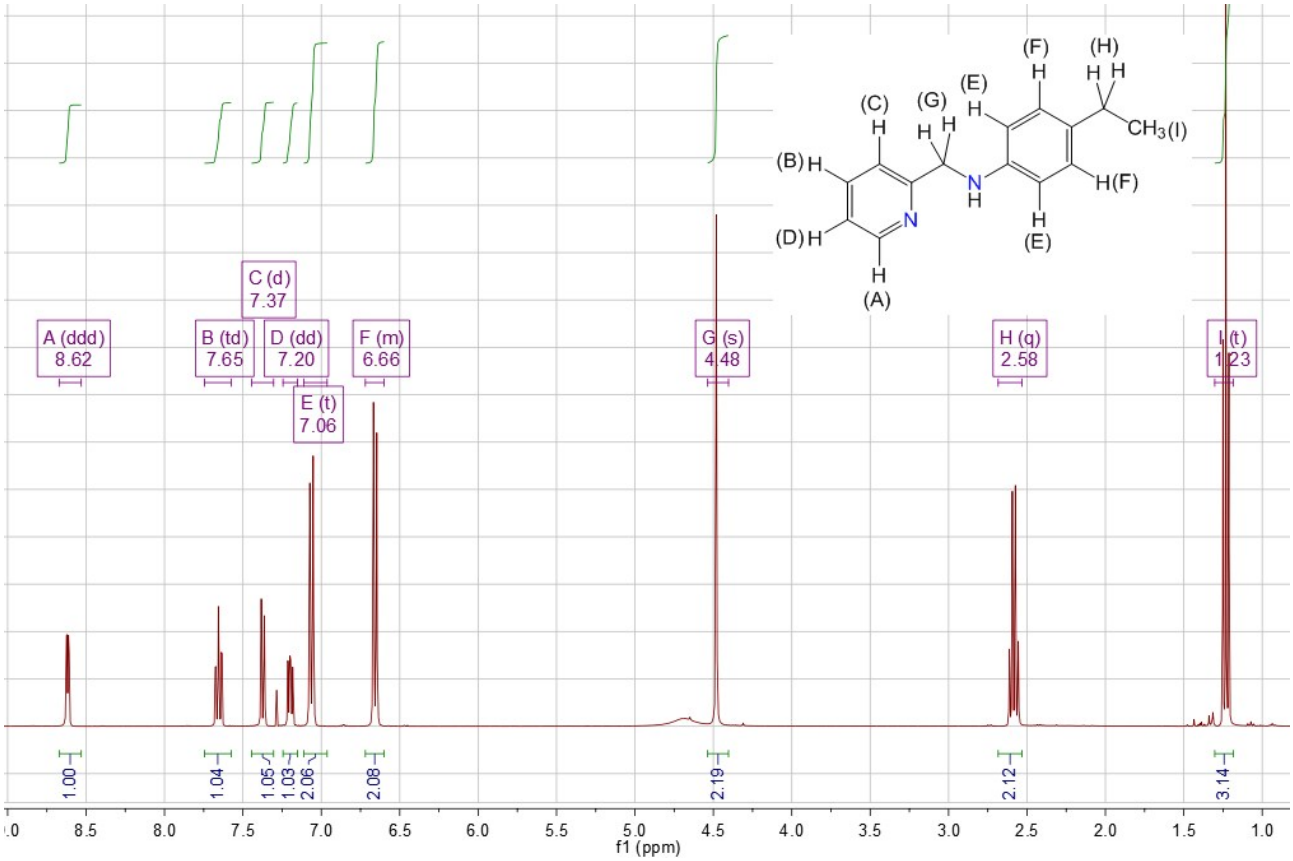


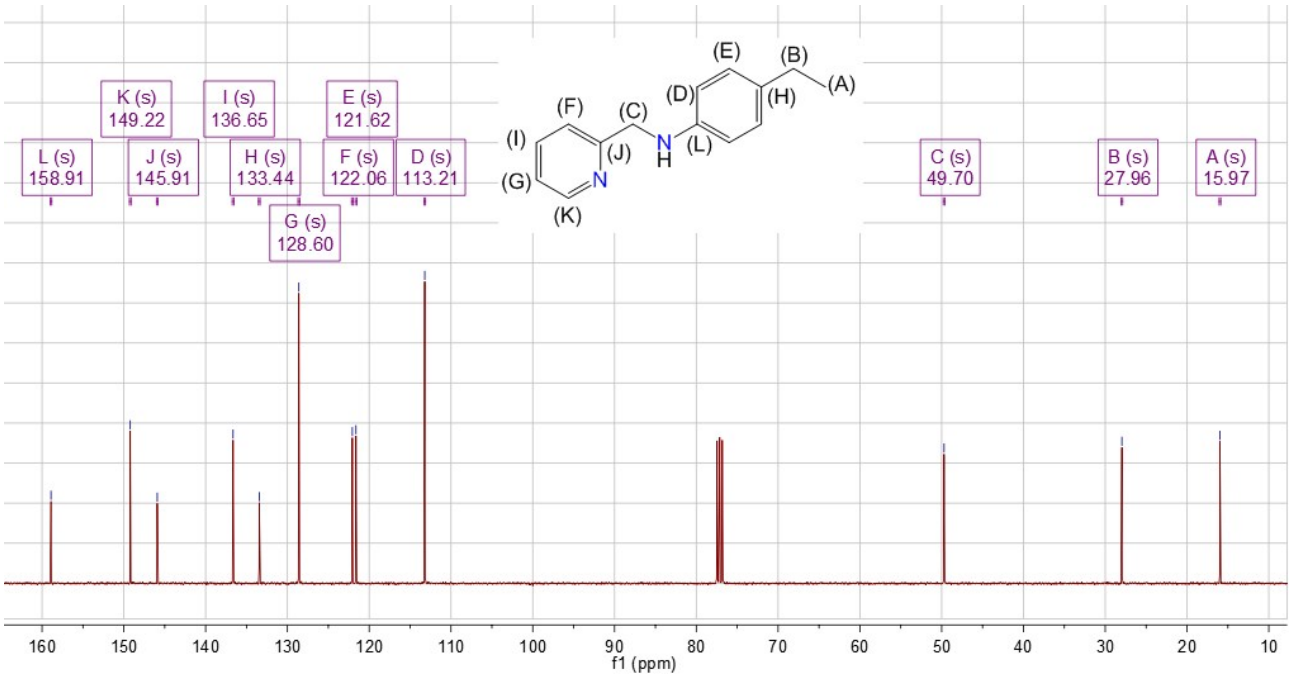
2,6-dimethyl-N-(pyridin-2-ylmethyl)aniline



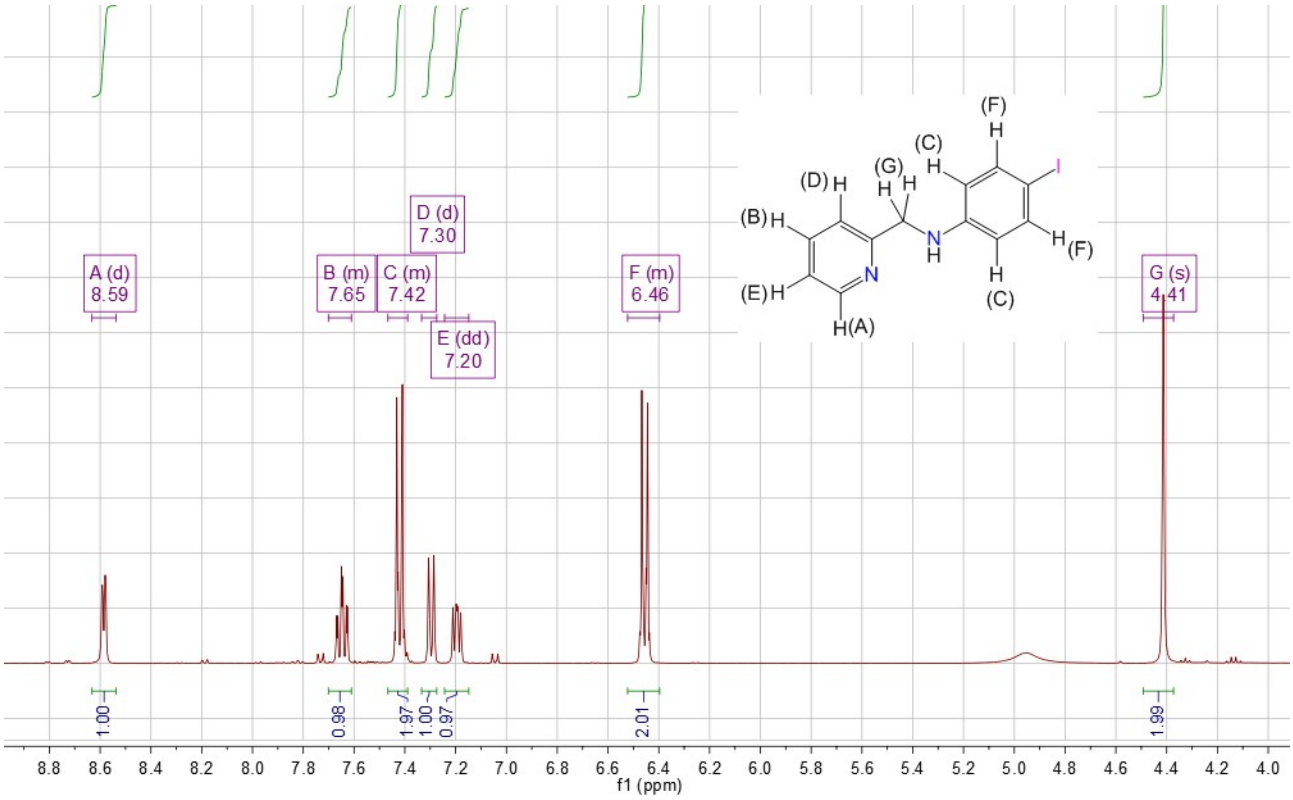


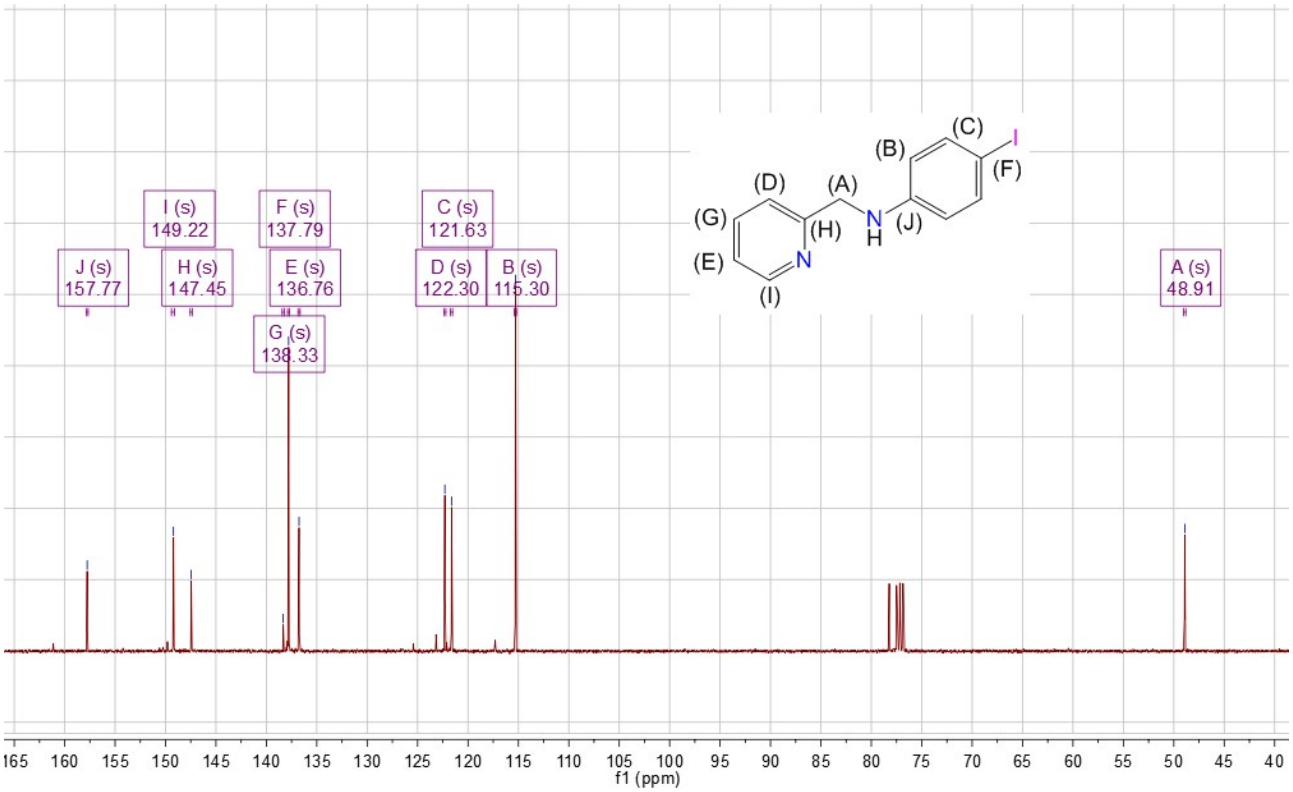
4-ethyl-N-(pyridin-2-ylmethyl)aniline



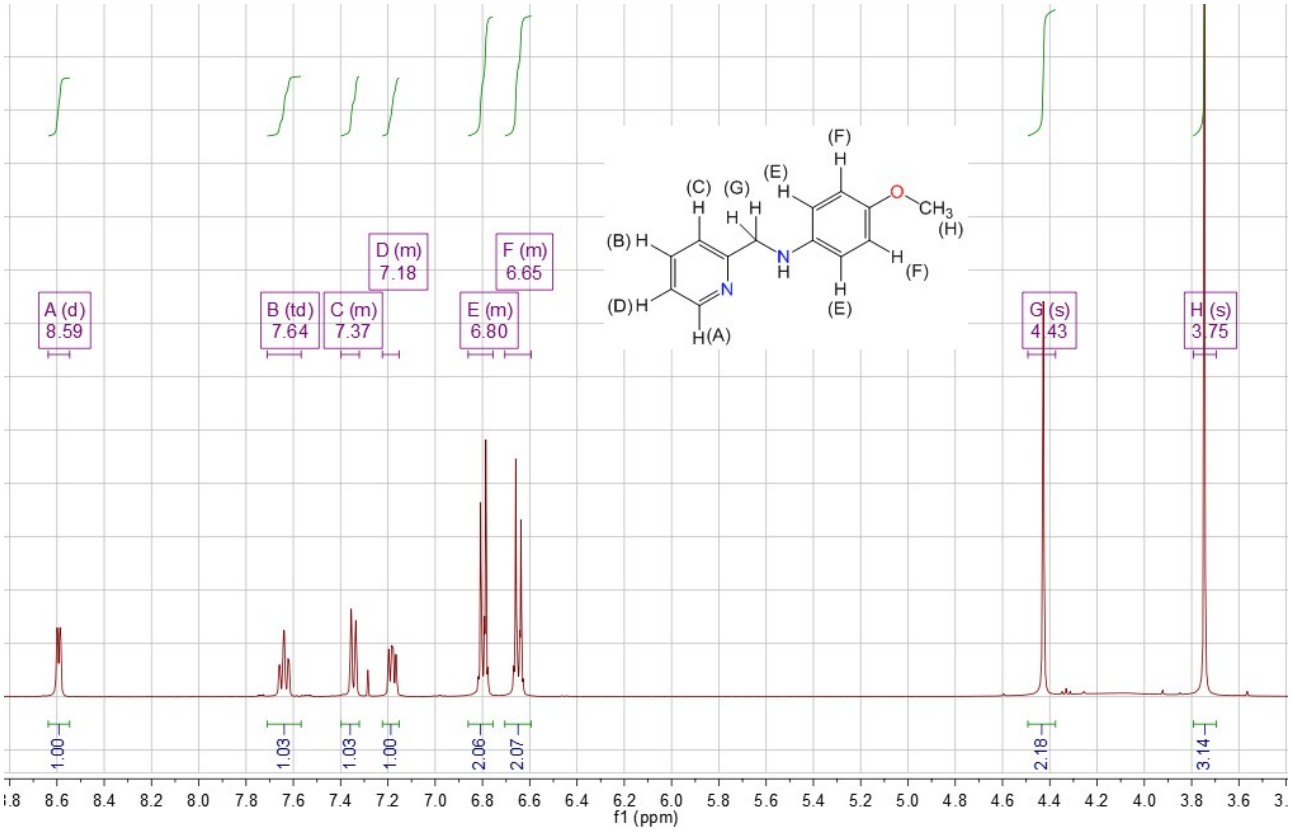


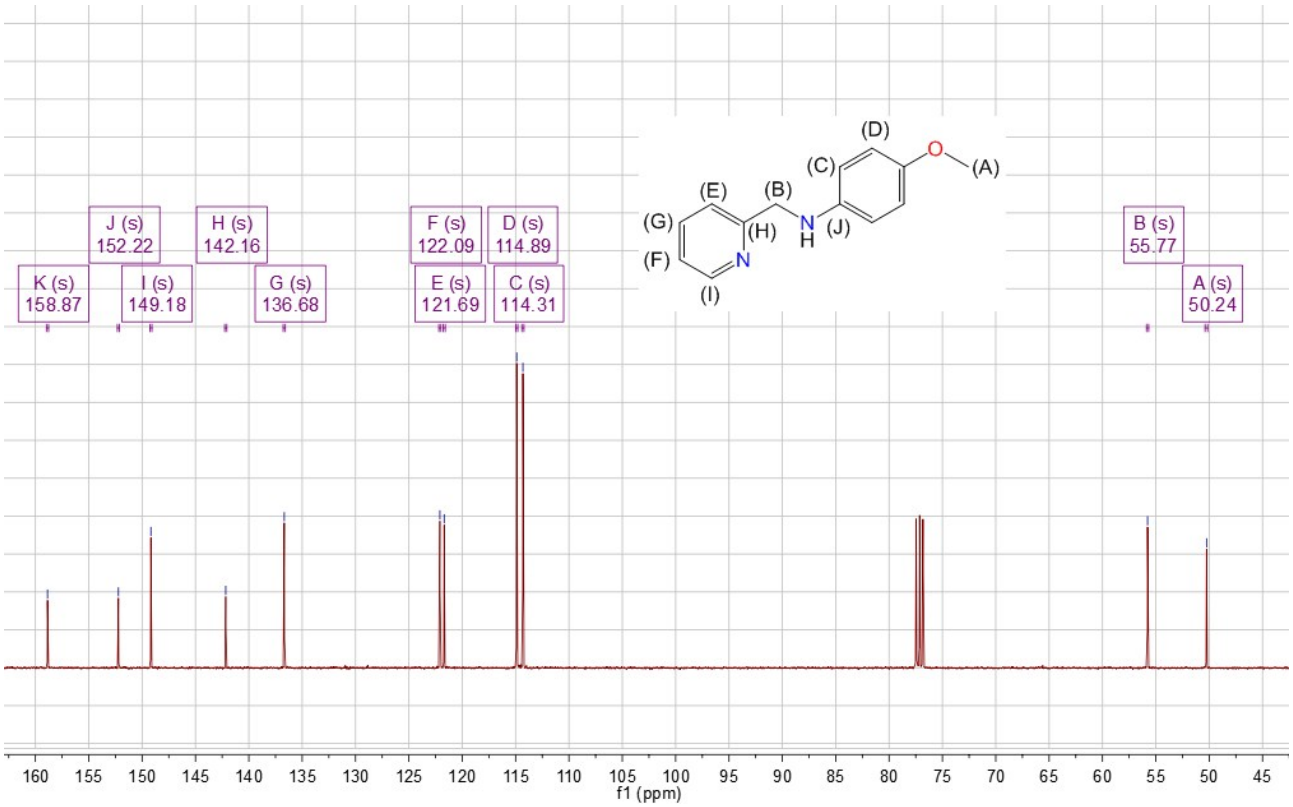
4-iodo-N-(pyridin-2-ylmethyl)aniline



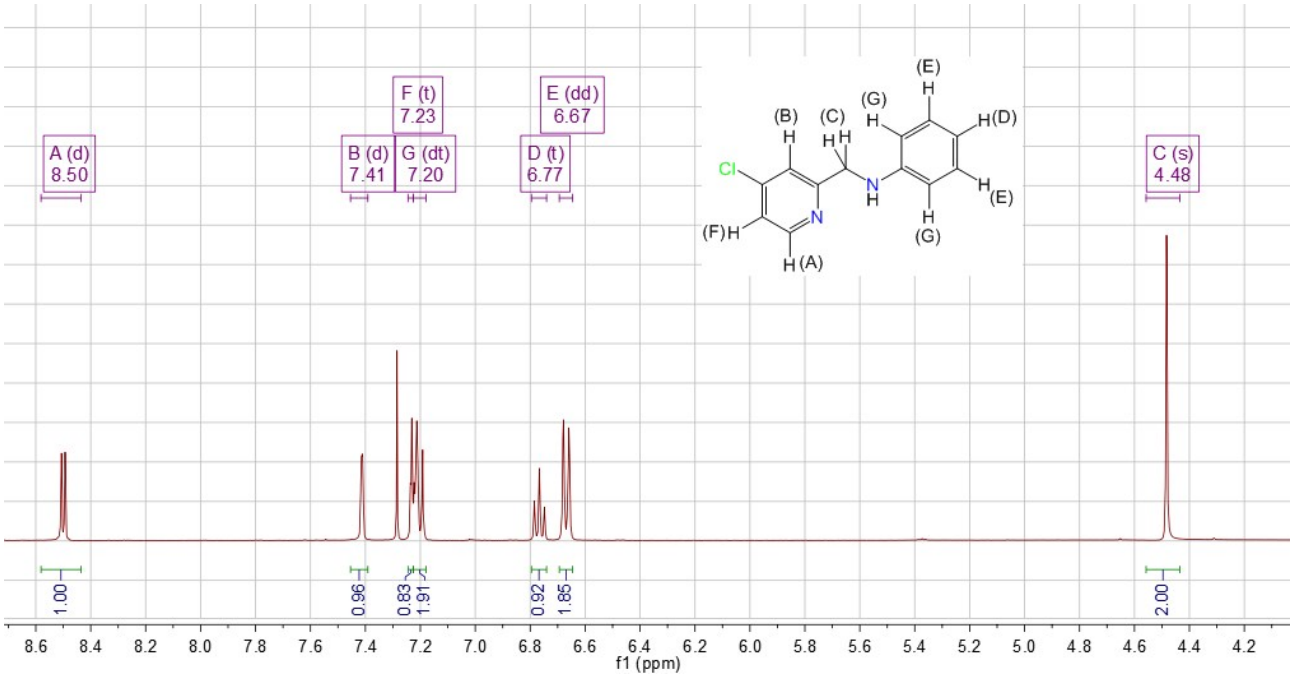


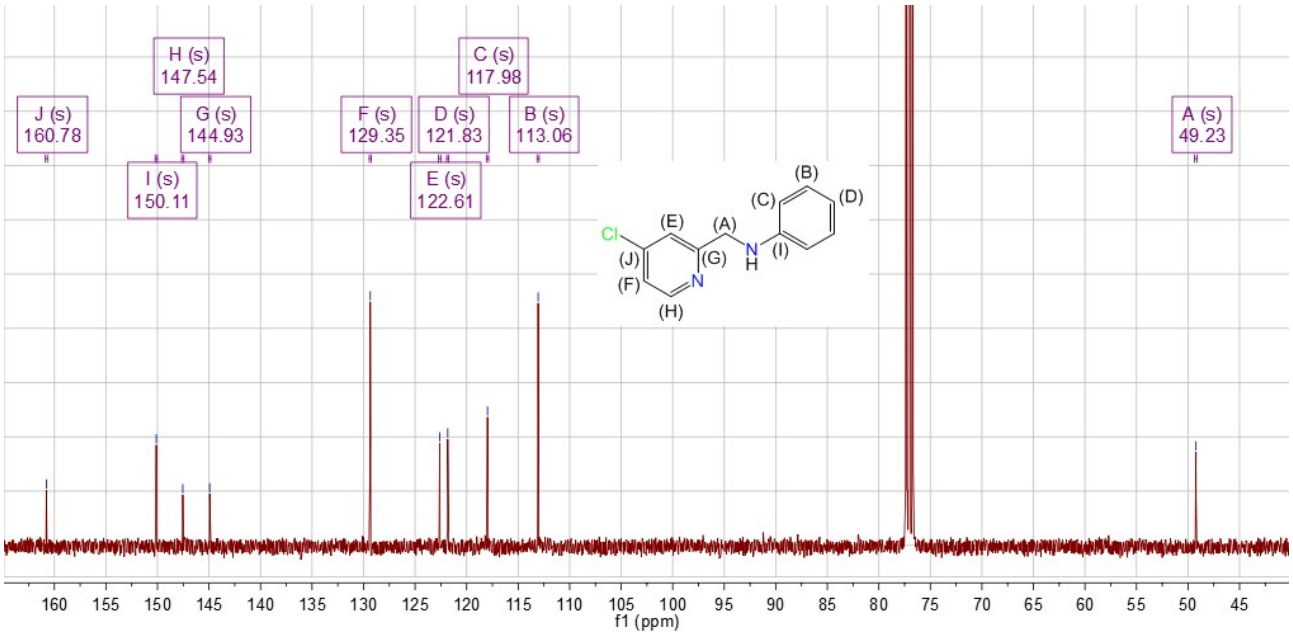
4-methoxy-N-(pyridin-2-ylmethyl)aniline

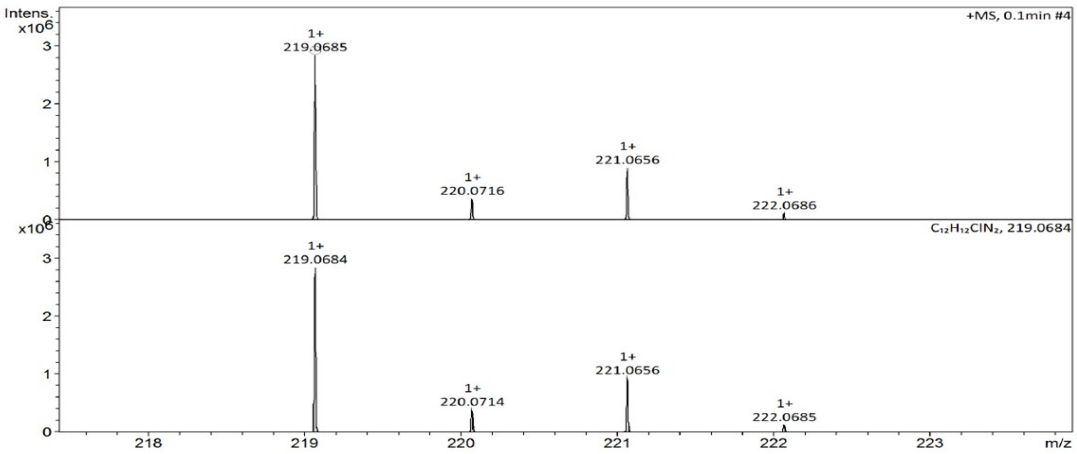




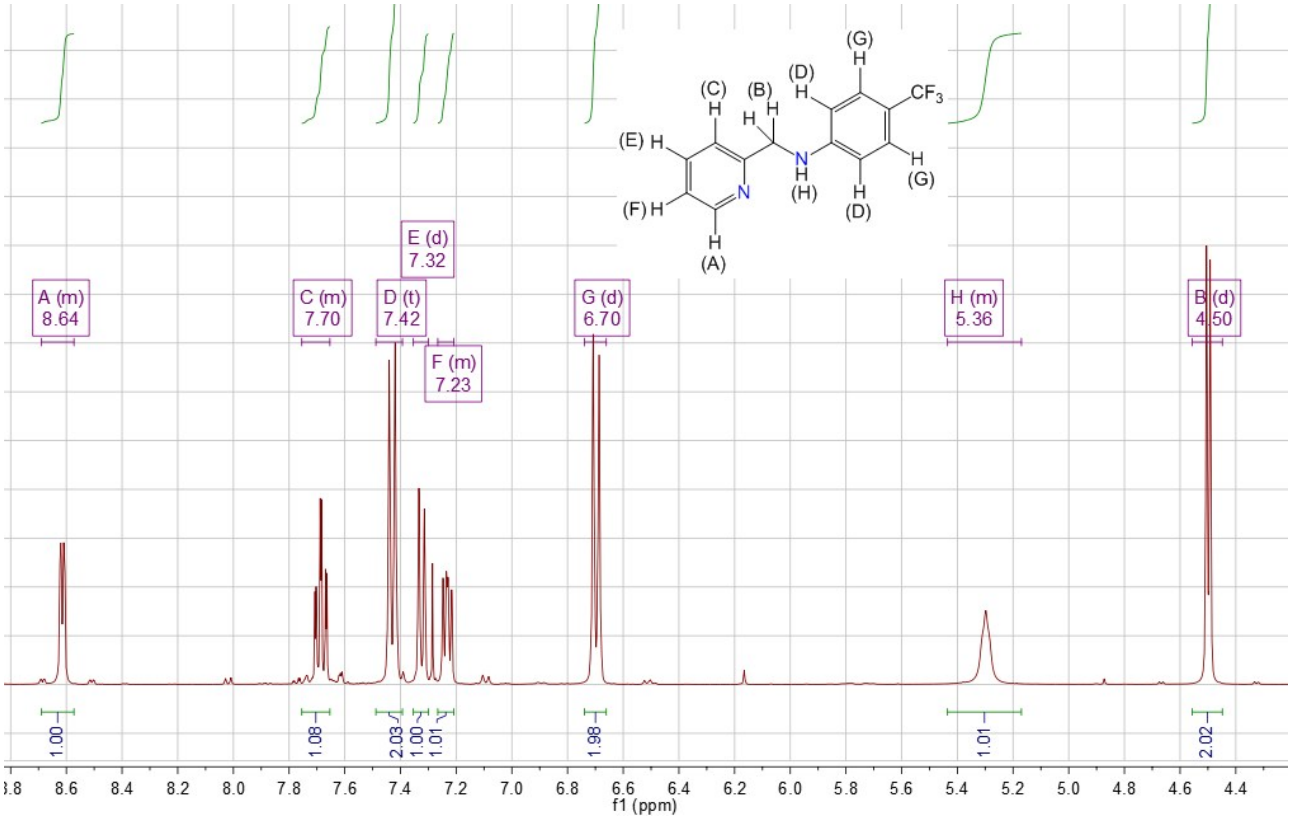
N-((4-chloropyridin-2-yl)methyl)aniline

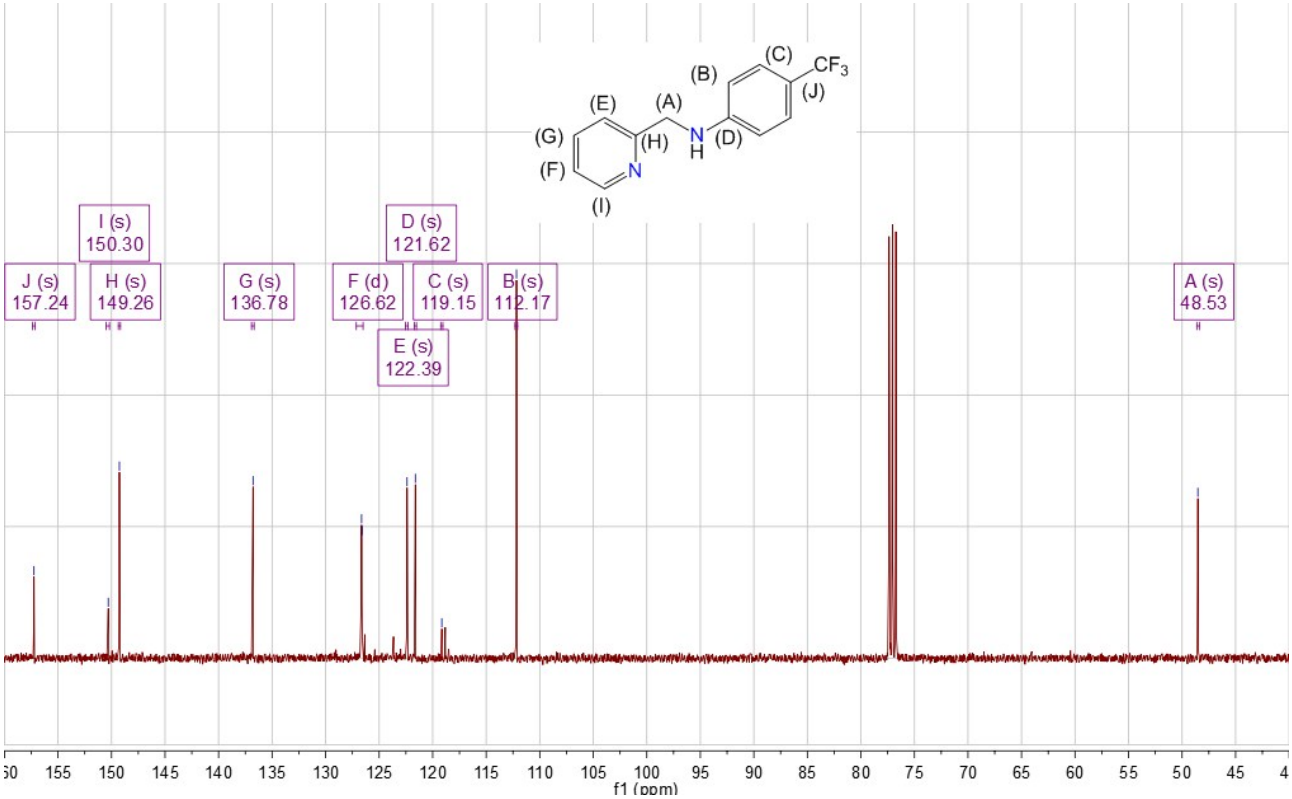




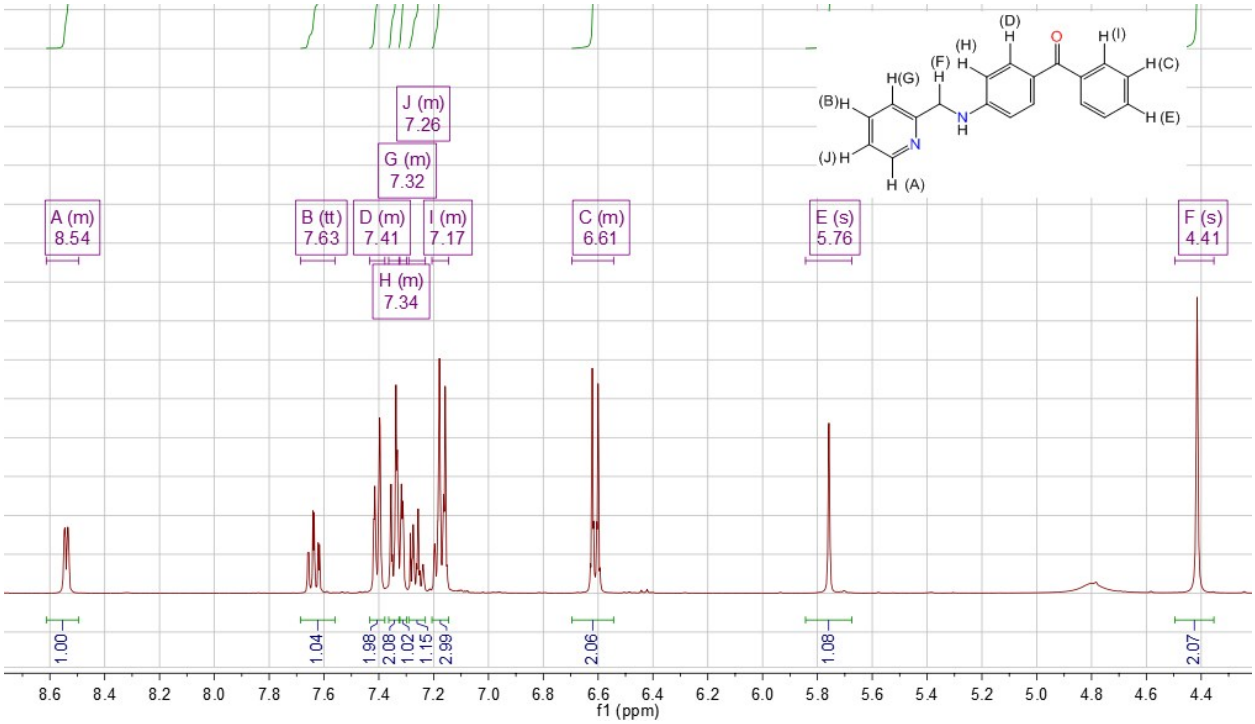


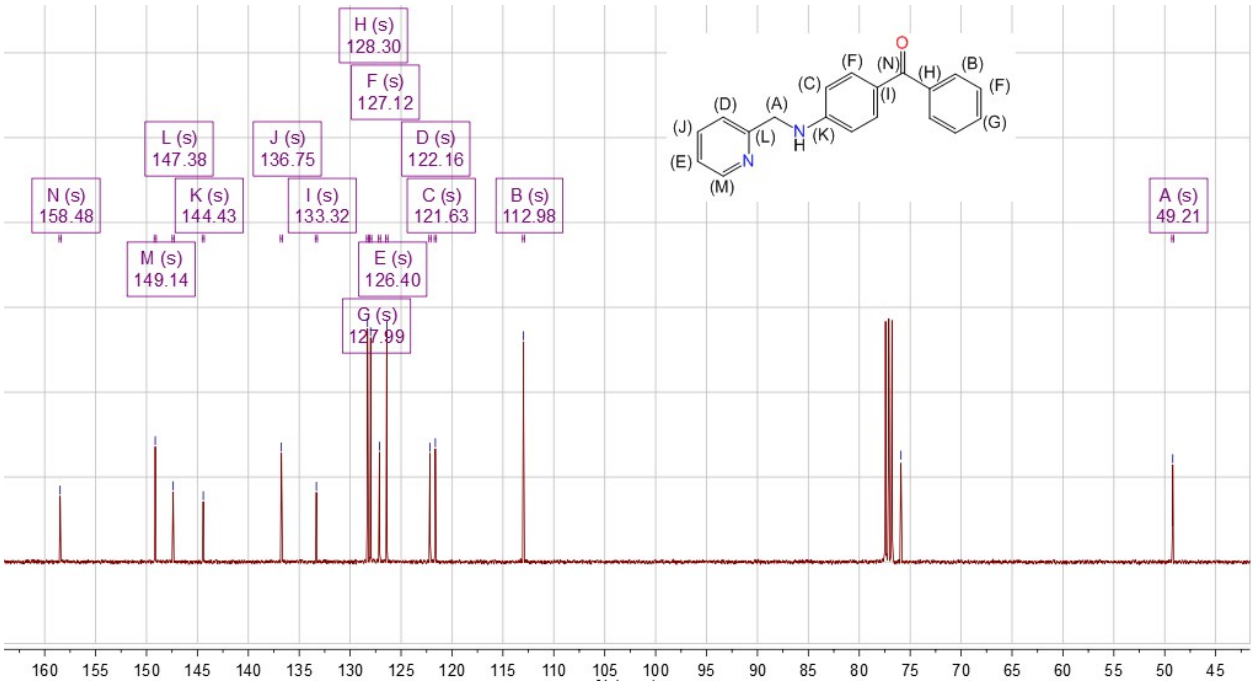
N-(pyridin-2-ylmethyl)-4-(trifluoromethyl)aniline

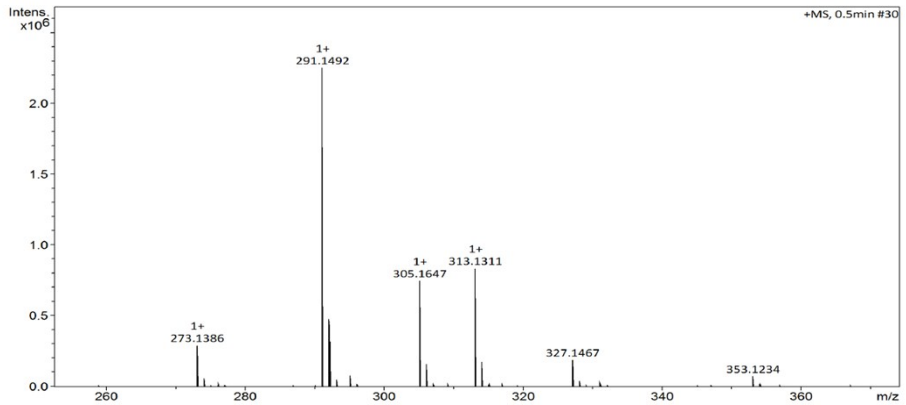




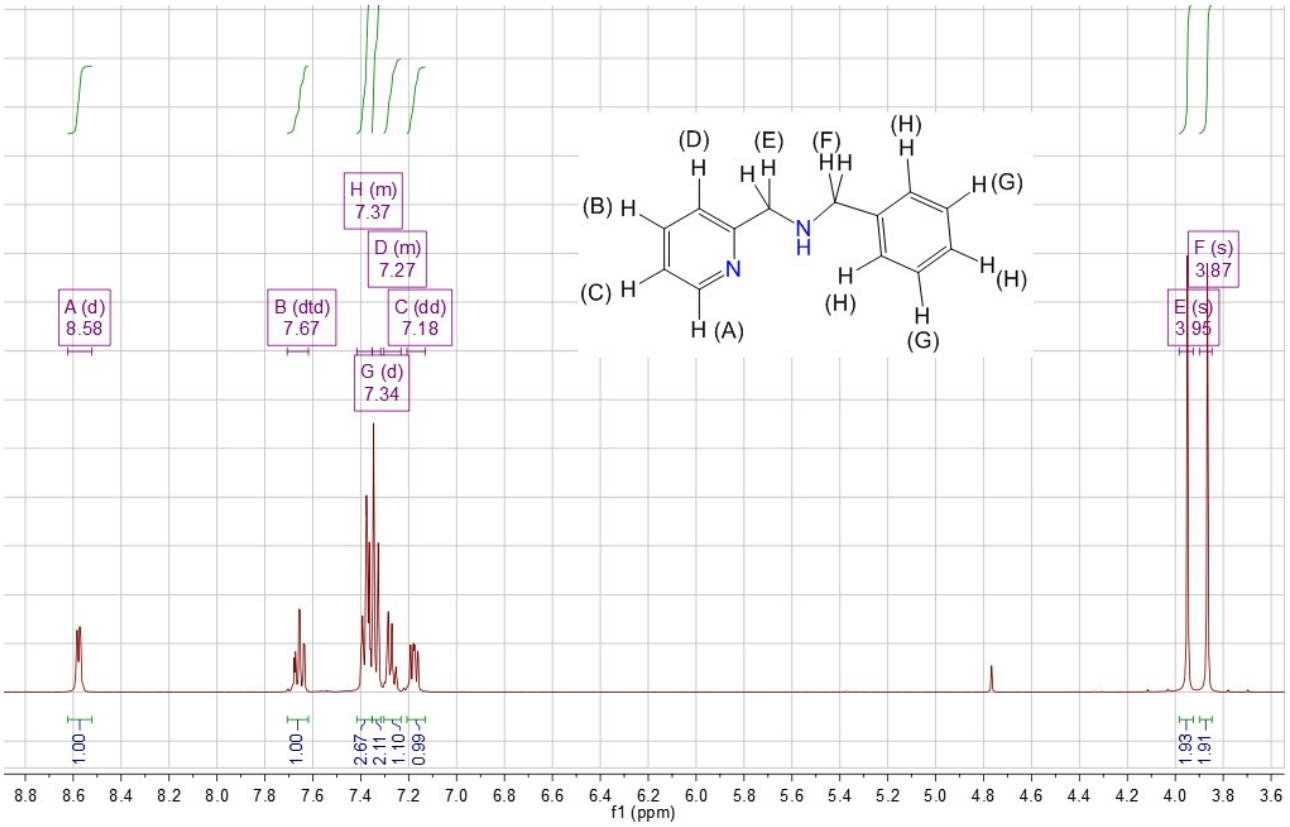
phenyl(4-((pyridin-2-ylmethyl)amino)phenyl)methanone

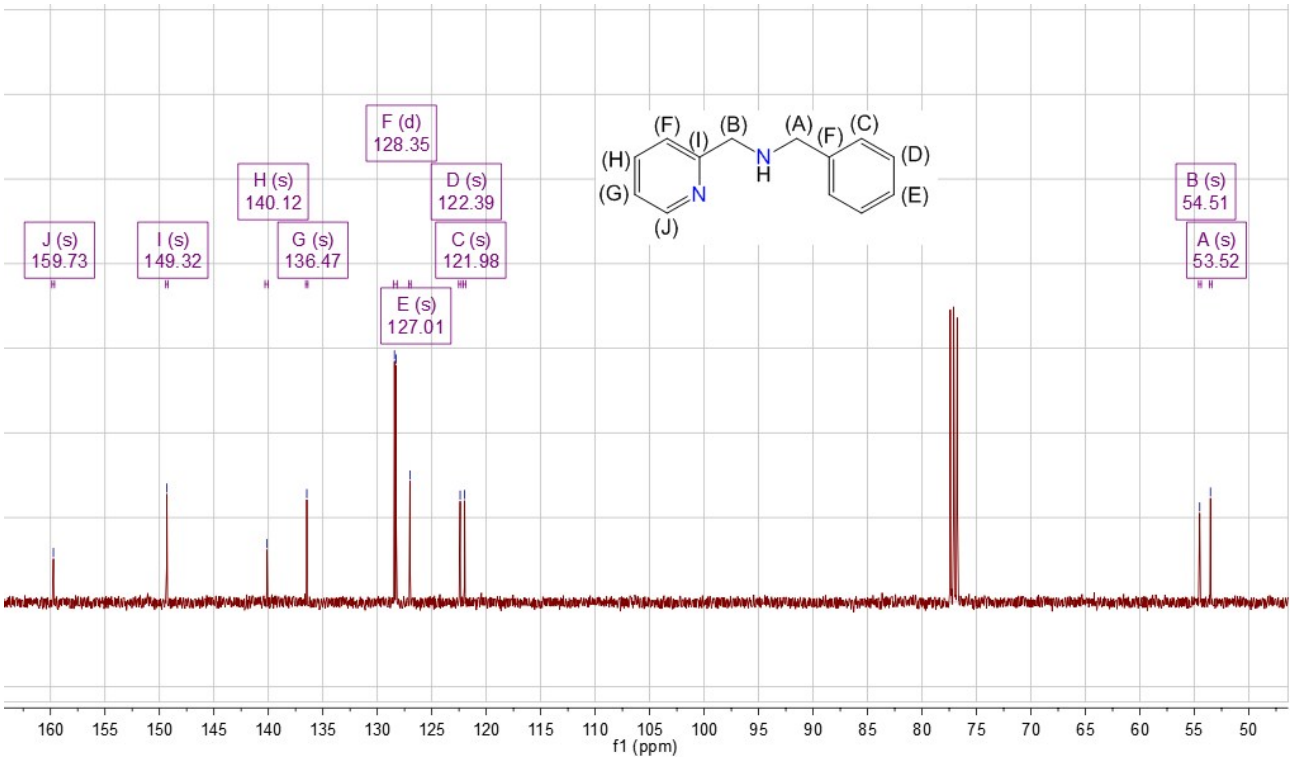




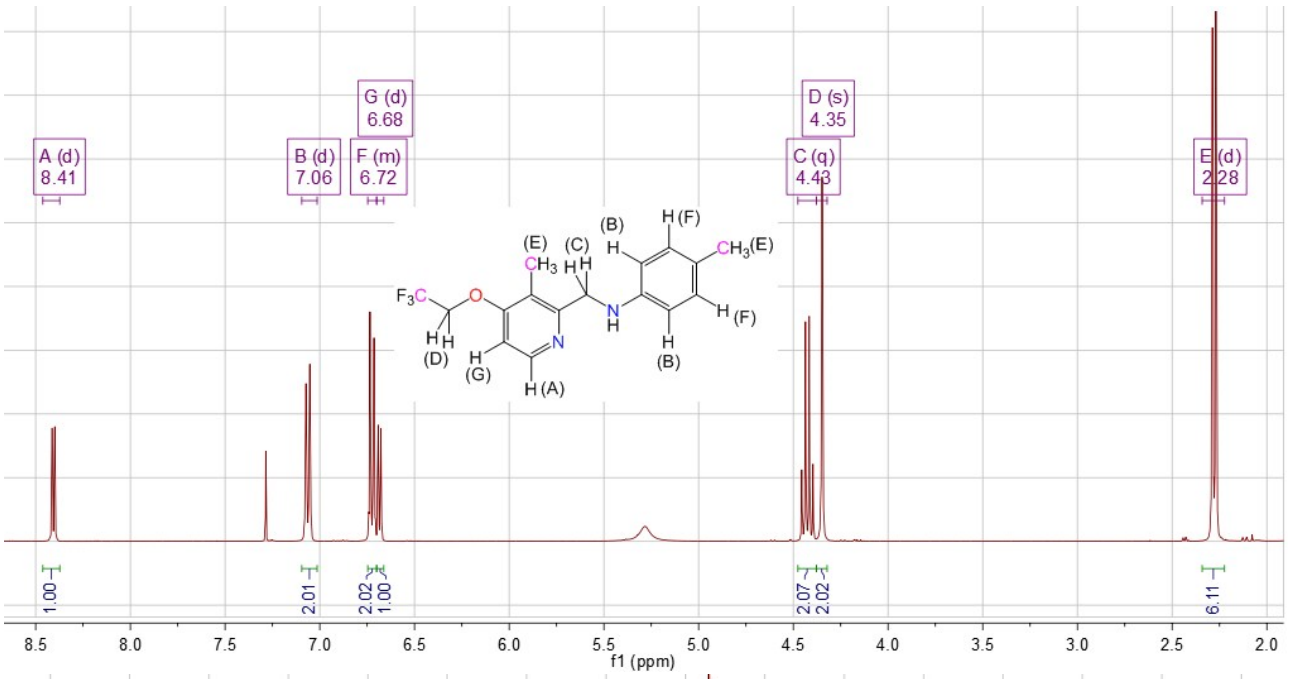


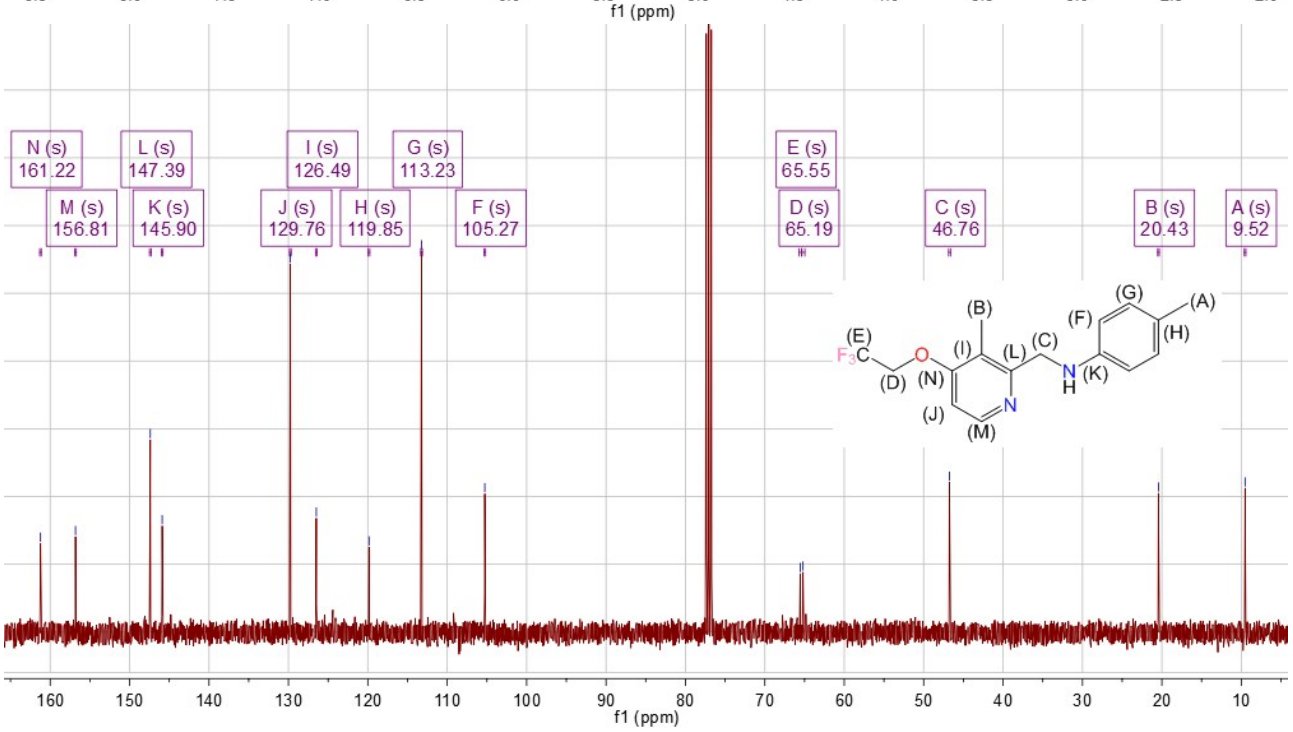
N-benzyl-1-(pyridin-2-yl)methanamine

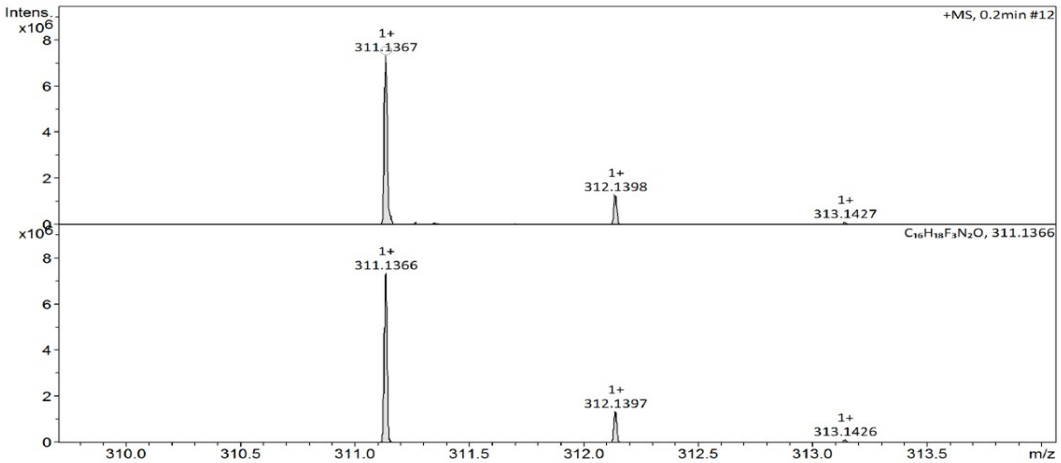




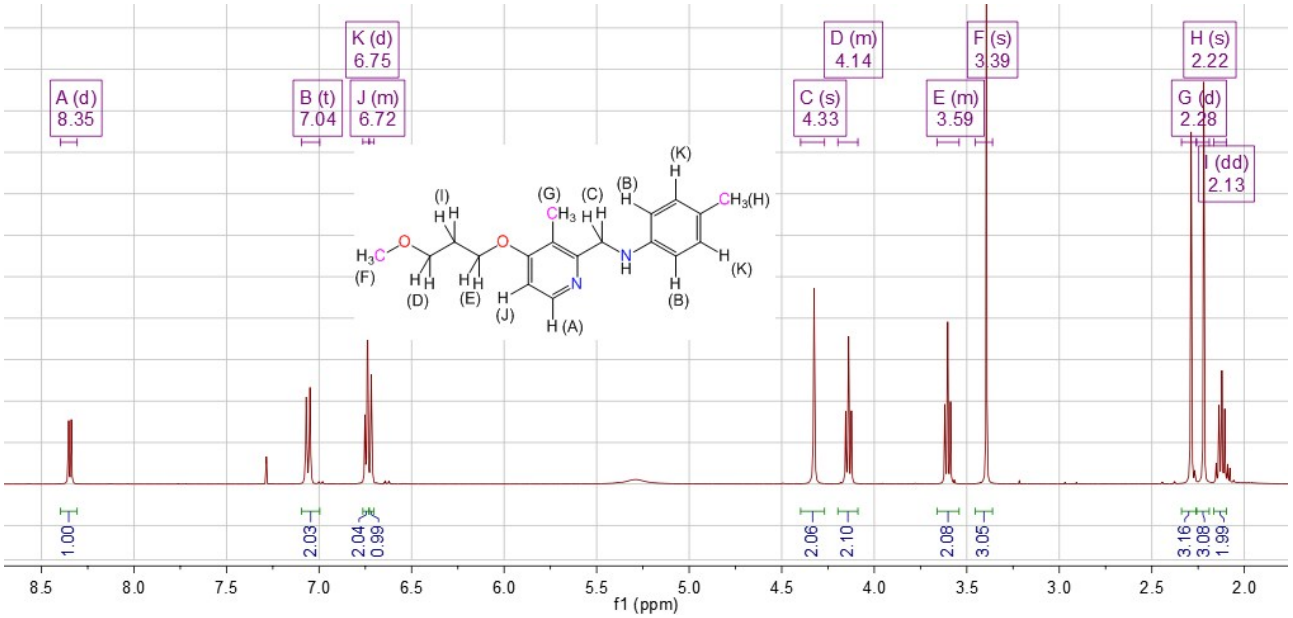
1, 4-methyl-N-((3-methyl-4-(2,2,2-trifluoroethoxy)pyridin-2-yl)methyl)aniline

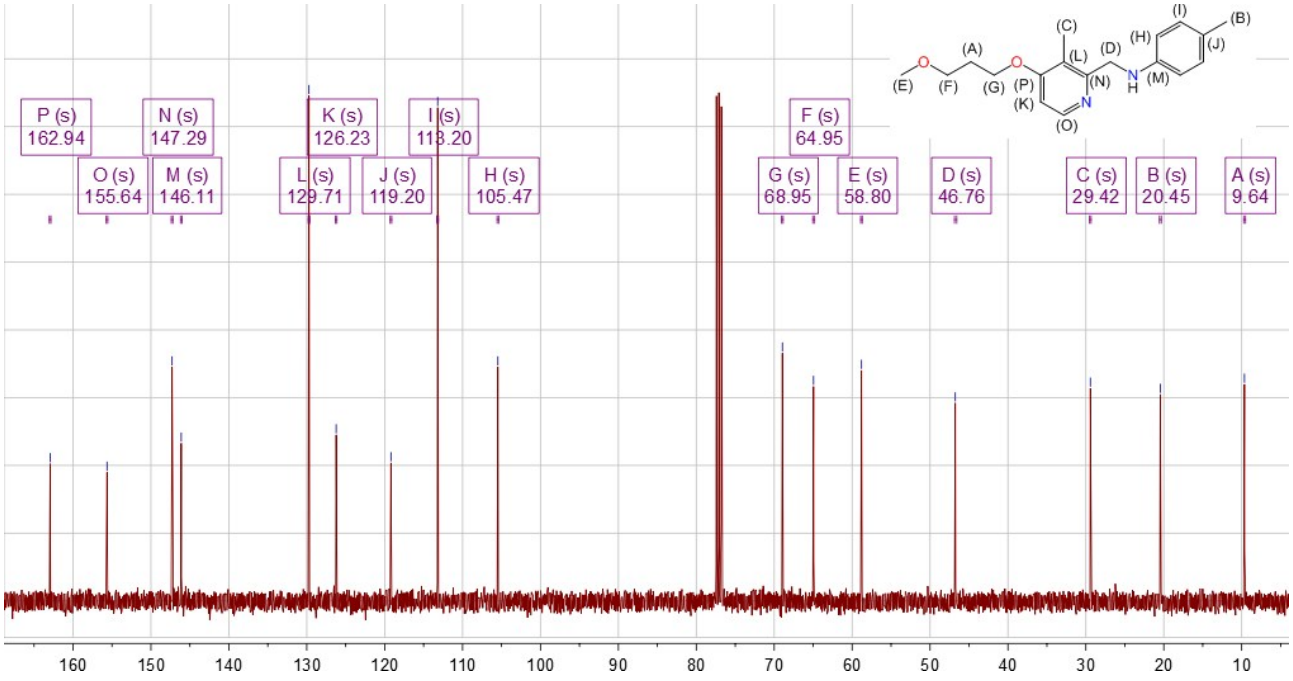


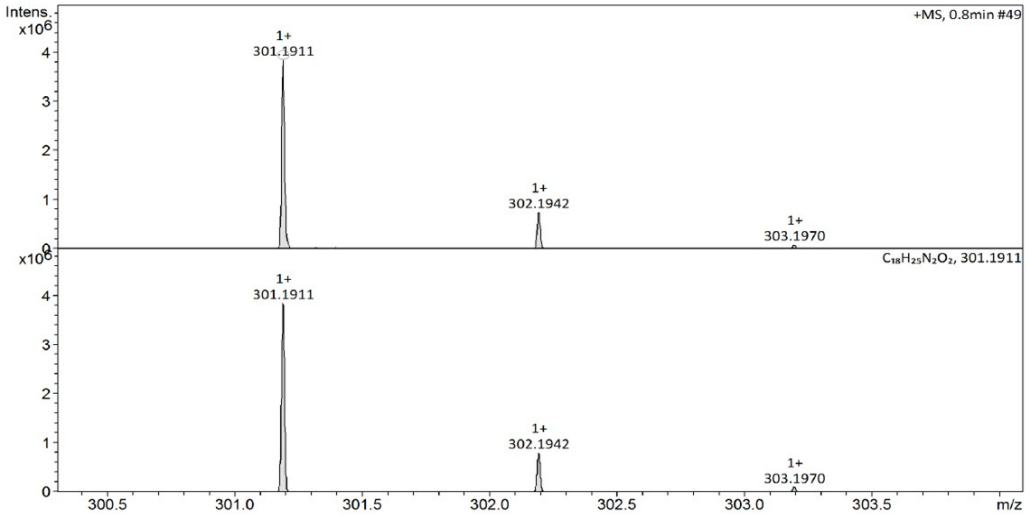




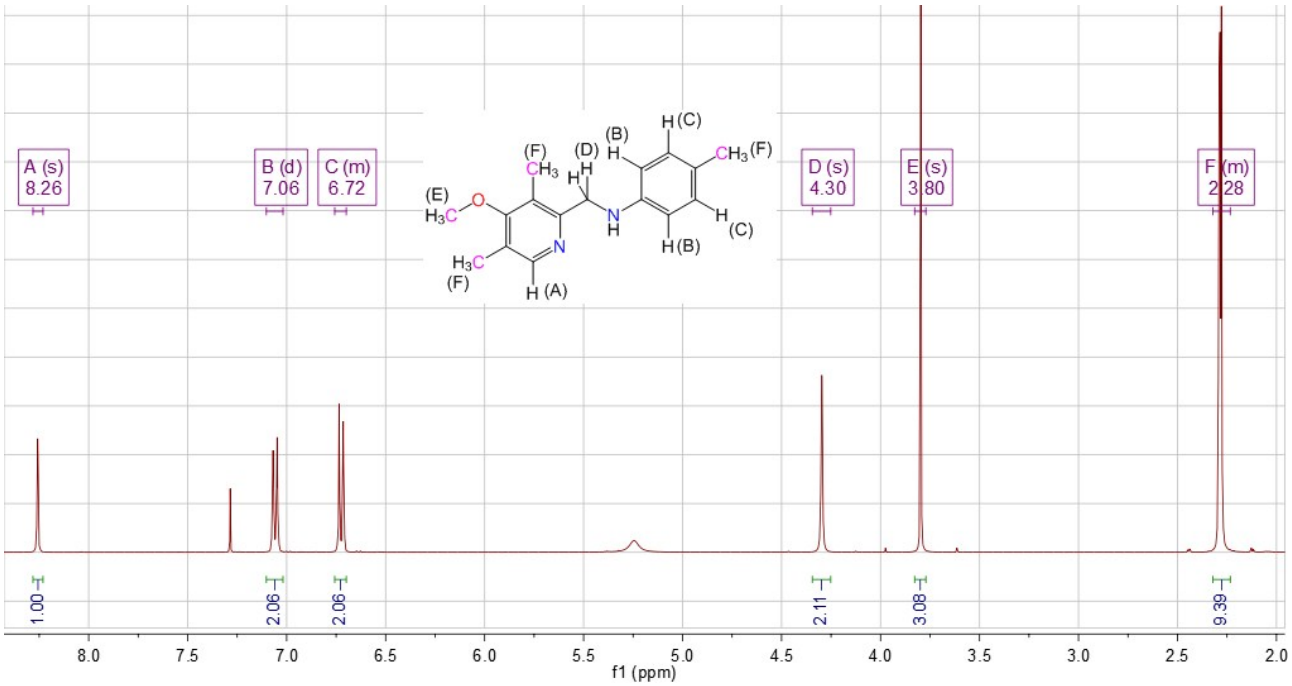
N-((4-(3-methoxypropoxy)-3-methylpyridin-2-yl)methyl)-4-methylaniline

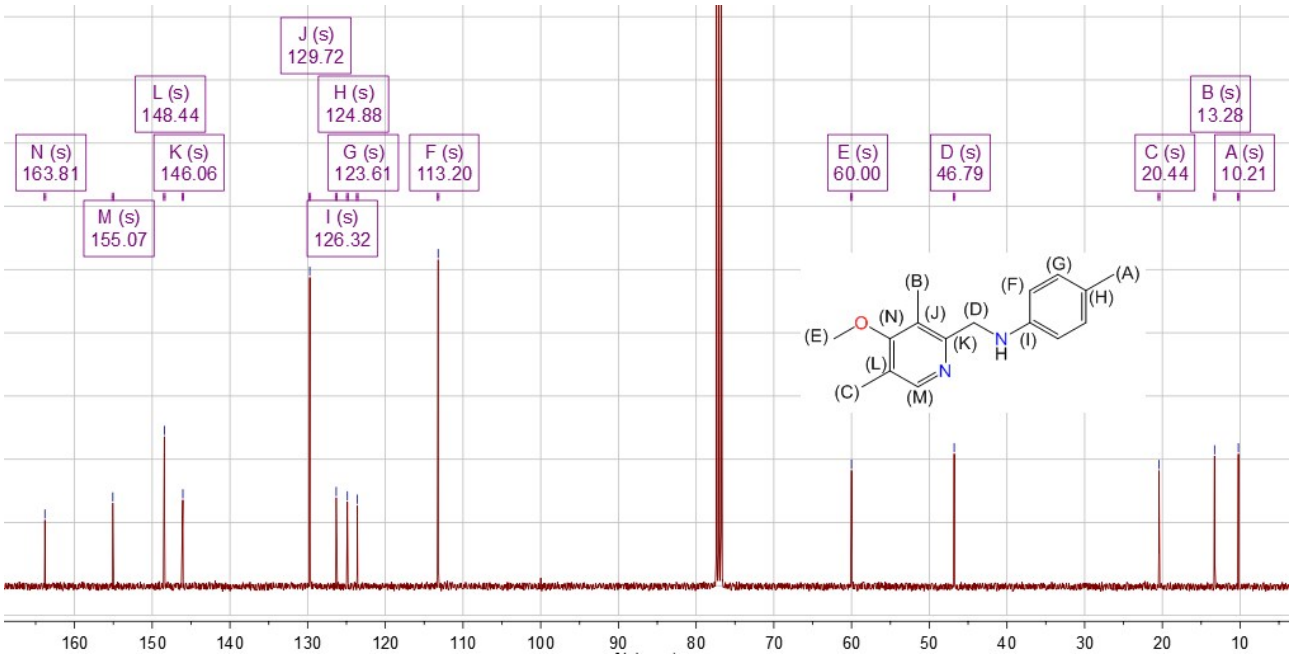


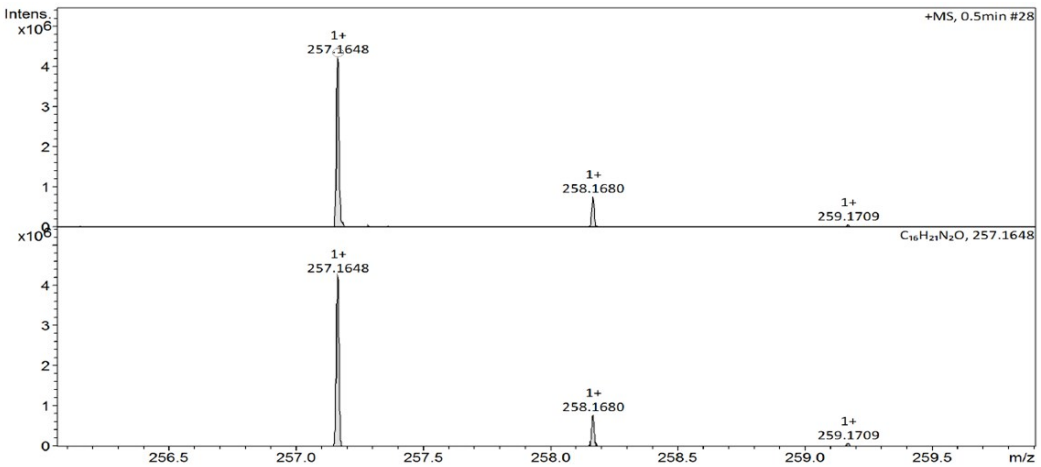




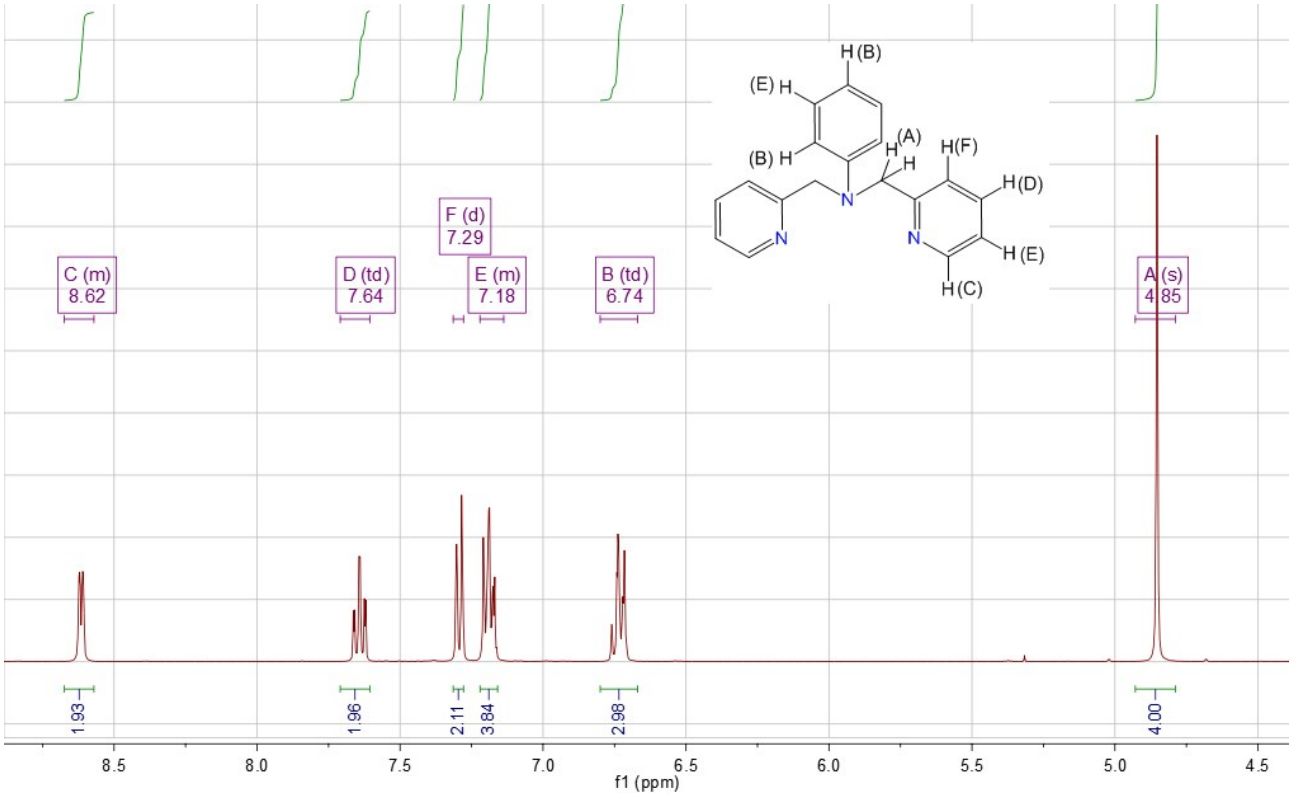
N-((4-methoxy-3,5-dimethylpyridin-2-yl)methyl)-4-methylaniline

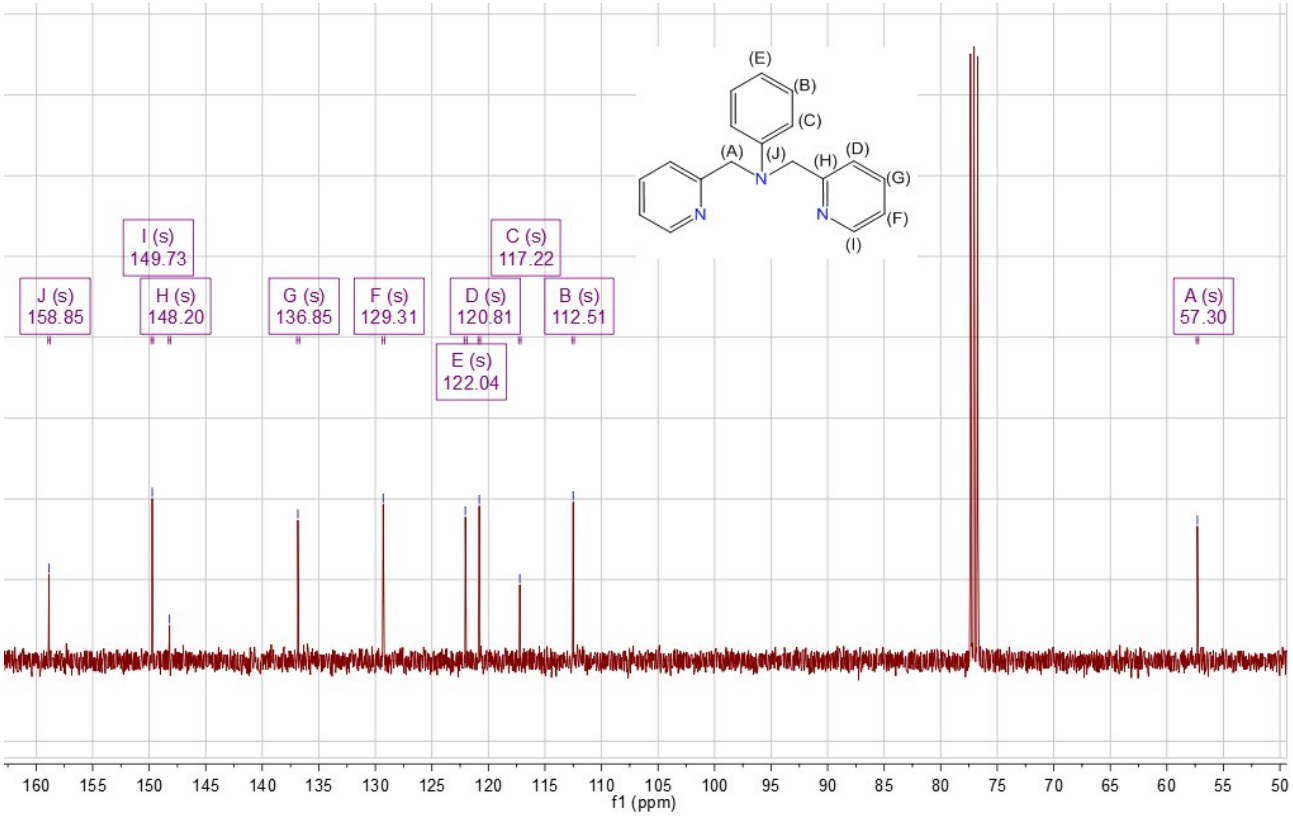




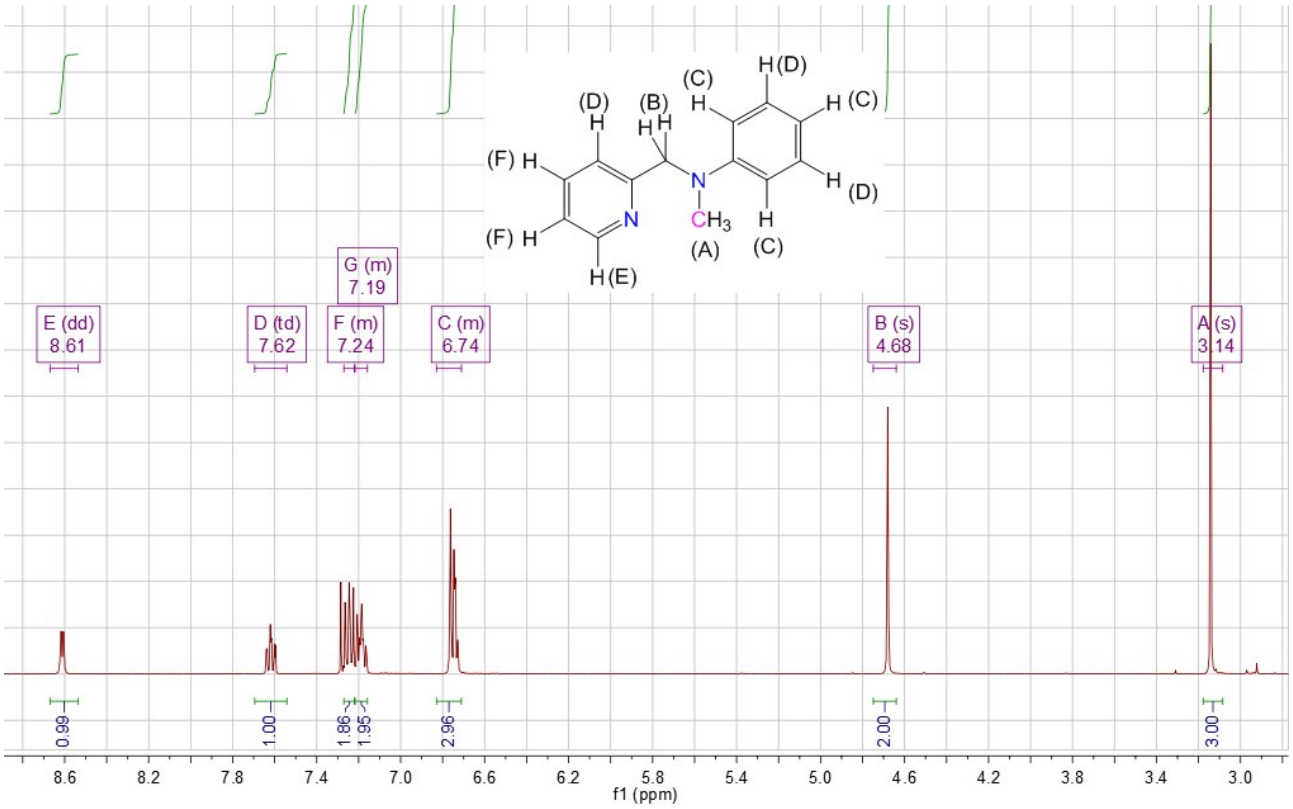


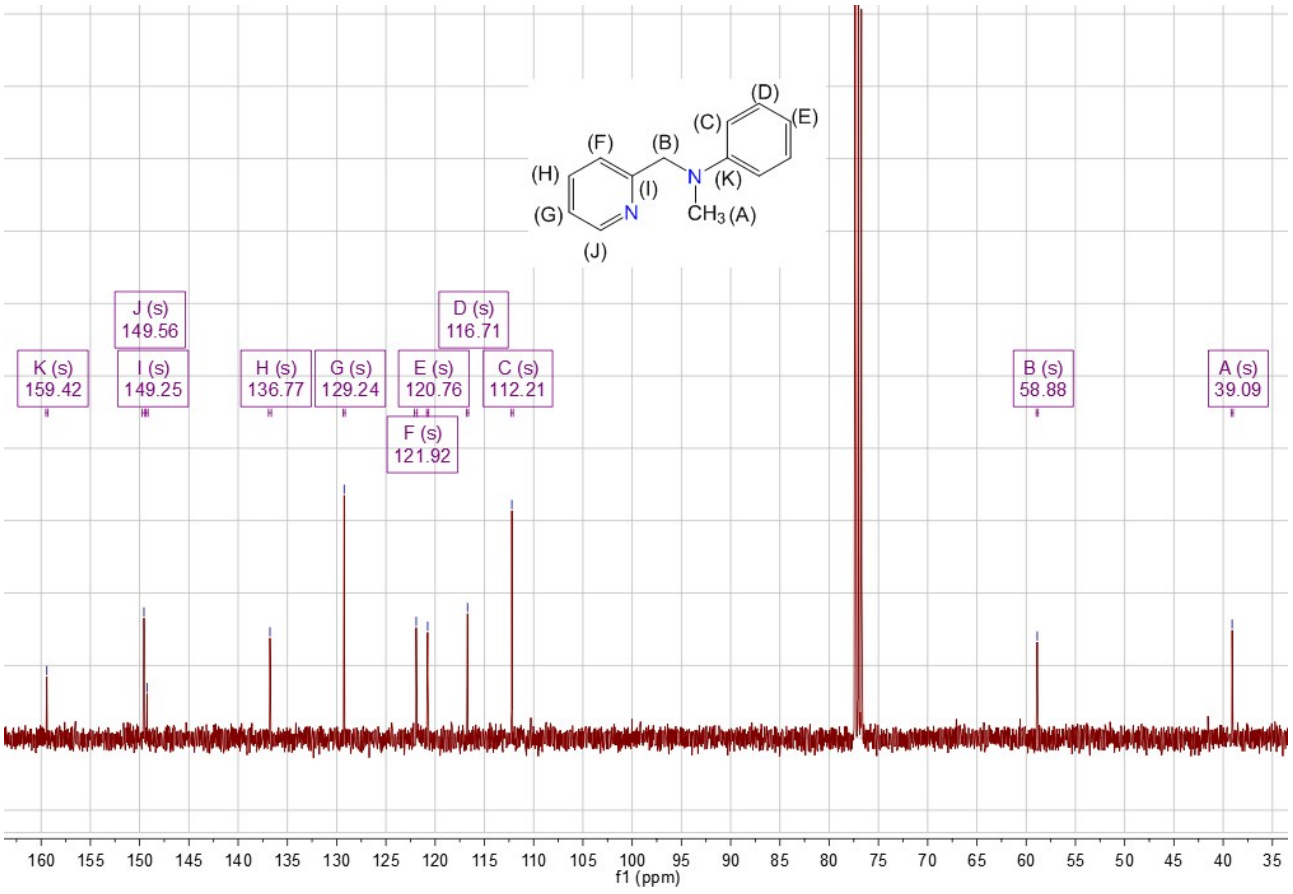
N-benzyl-N-(pyridin-2-ylmethyl)aniline





N-methyl-N-(pyridin-2-ylmethyl)aniline


E (dd)
8.61
D (td)
7.62
G (m)
7.19
F (m)
7.24
C (m)
6.74
B (s)
4.68
A (s)
3.14
0.99
1.00
1.86
1.95
2.96
2.00
3.00
f1 (ppm)


K (s)
159.42
J (s)
149.56
I (s)
149.25
H (s)
136.77
G (s)
129.24
F (s)
121.92
E (s)
120.76
D (s)
116.71
C (s)
112.21
B (s)
58.88
A (s)
39.09
f1 (ppm)