Electronic Supporting Information for

QUATERNARY AMMONIUM SALTS AS ALKYLATING REAGENTS IN C-H ACTIVATION CHEMISTRY

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1. General Methods

In general, unless noted otherwise, chemicals were purchased from commercial suppliers and used without further purification. Cyclooctadiene rhodium chloride dimer $[RhCl(cod)]_2$ was handled in the glovebox under argon. Dry and degassed toluene was stored over molecular sieves in the glovebox under argon. Other dry solvents were obtained by passing pre-dried material through a cartridge containing activated alumina (solvent dispensing system) and stored under nitrogen atmosphere until usage.

^{1}H-NMR, C^{13}-NMR and HSQC spectra were recorded on a Bruker Avance 400, chemical shifts are reported in ppm, using Me_4Si as internal standard. NMR signals were assigned according to Figure 1 with different aromatic systems marked as a, b and c and numbers without labels assigned to the aliphatic molecule part.

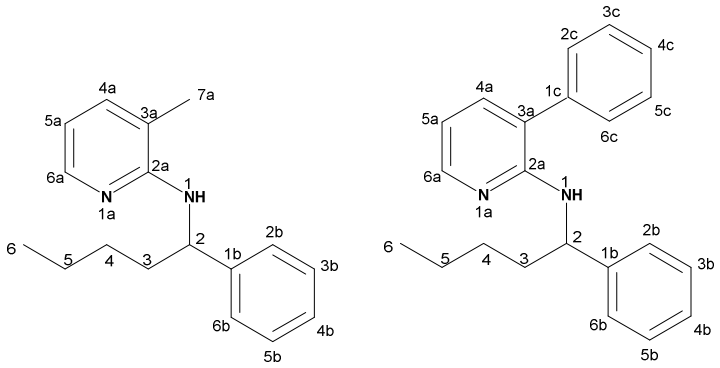


Figure 1: Scheme for assigning NMR Signals

GC-MS was performed on a Thermo Trace 1300 GC/ MS ISQ LT (quadrupole, EI+) with a TR-5 capillary column (7m x 0.32 mm, 0.25µm film, achiral). Temperature program: Start at 100 °C (hold 2 min), 35 °C/min, 300 °C (hold 4 min).

GC spectra were recorded on a Thermo Focus GC using a BGB-5 capillary column (30m x 0.32 mm, 1.0µm film, achiral) with the following oven temperature program: Start at 100 °C (hold 2 min), 35 °C/min, 300°C (hold 4 min).
GC yields were calculated by using the response factor of the corresponding compound relative to dodecane as internal standard, which was determined by calibration.

For TLC aluminum backed silica gel 60 with fluorescence indicator F254 was used. Column chromatography was performed on Silica 60 from Merck (40 µm – 63 µm). Flash chromatography, was carried out on a Büchi Sepacore^{TM} MPLC system.

Melting points were determined on an automated melting point system (Büchi Melting Point B-545) and are uncorrected.

High-resolution mass spectrometry (HRMS) for literature-unknown compounds was performed by liquid chromatography in combination with hybrid ion trap and high-resolution time-of-flight mass spectrometry (LC-IT-TOF-MS) in only positive-ion detection mode with the recording of standard (MS) and tandem (MS/MS) spectra.

2. Experimental Procedures

2.1. General Procedure for C-H activation reactions

Solid starting materials (except the catalyst) were placed in an oven-dried 8 ml glass vial with a septum screw cap and a magnetic stirring bar. The vial was transferred into the glovebox under argon. Catalyst, solvent and dodecane were added in the glovebox. Finally, the vial was closed and the reaction mixture was heated in a heating block for the desired time at the desired temperature

2.2. General work-up procedure for C-H activation reactions

After cooling the reaction mixture to room temperature, the solid material was removed by filtration using a Pasteur pipette with cotton and silica. The residue was washed with CH_2Cl_2. The combined organic filtrate was concentrated under reduced pressure. The resulting crude residue was purified by flash column chromatography (LP/EtOAc) with, unless otherwise noted, one of the following setups: Gradient A: 1% EtOAc isocratic for 5min, then setting up a gradient which varies the solvents from 1% to 10% EtOAc within 1 hour. Gradient B: 1% EtOAc isocratic for 5min, then setting up a gradient which varies the solvents from 1% to 20% EtOAc within 1 hour. Flow rate was set to 30 ml/min for all separations.

2.3. Optimization process for alkylation reactions using quaternary ammonium salts

The experiments were performed on a 0.50 mmol scale with an initial concentration of 0.25 mol/l of benzylamine **1** in toluene.

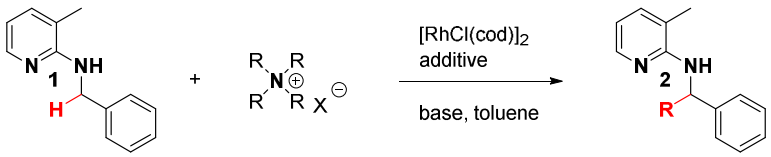


Table 1. Screening results for C-H alkylation using quaternary ammonium salts

Entry	R	Base	Additives	Catalyst (mol%)	Temp [°C][a]	Time [h]	Conversion to 2 [%][b]
1	ethyl	K_2CO_3 (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	80
2	propyl	K_2CO_3 (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	3[c]

3	butyl	K_2CO_3 (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	3
4	pentyl	K_2CO_3 (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	11[d]
5	hexyl	K_2CO_3 (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	3[d]
6	octyl	K_2CO_3 (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	7[d]
7	butyl	K_2CO_3 (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	160	28	4
8	butyl	C_4H_9KO (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	24
9	butyl	NaH (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	traces
10	butyl	NaOH (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	56
11	butyl	KOH (3.5 eq.)	Ag_2CO_3 (5 mol%)	5	140	28	72
12	butyl	KOH (3.5 eq.)	-	5	140	28	71
13	butyl	KOH (0.5 eq.)	-	5	140	3	11
14	butyl	KOH (1 eq.)	-	5	140	3	14
15	butyl	KOH (2 eq.)	-	5	140	3	42
16	butyl	KOH (3 eq.)	-	5	140	3	72
17	butyl	KOH (3 eq.)	-	5	160	3	70
18	butyl	KOH (3 eq.)	-	5 + 5 after 3 h	140	6	73
19	butyl	KOH (3 eq.)	-	7,5	140	3	71
20	butyl	KOH (3 eq.)	-	10	140	3	72

General reaction conditions: benzylic amine **1** (1 equiv.), tetraalkylammonium salt (1 equiv.), additive Ag_2CO_3 (3.5 equiv.), base (3.5 equiv.), catalyst [RhCl(cod)]2 (5 mol%), toluene (2 ml), 140 °C, Ar.

[a] Reaction block temperatures and not inside temperatures of the reaction mixtures. [b] Yields determined by GC-Analysis. [c,d] The conversion is determined relative to dodecane as internal standard assuming the compound has the same conversion factor as the ethylated[c] or butylated[d] product, which have been calibrated.

2.4. Influence of Counterions

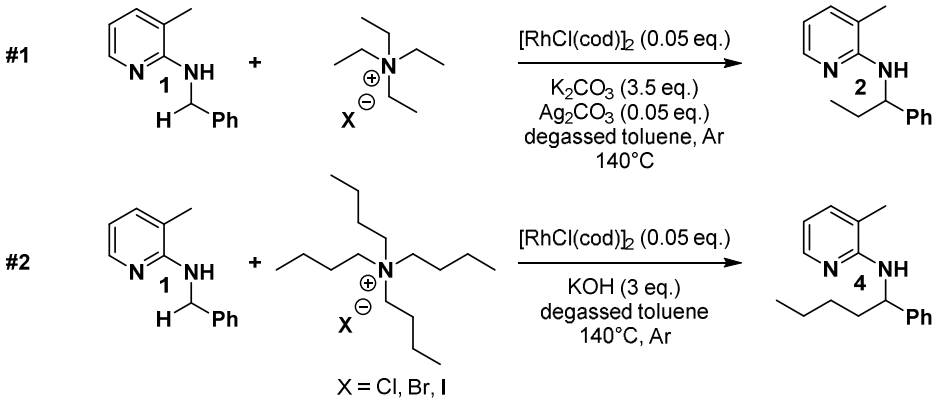


Table 2: Experiments were performed to check the influence of the counterion of the quaternary ammonium salt. At the beginning of the screening with the starting conditions (#1), and after the reaction conditions have been optimized (#2).

Entry	Reaction	X	Conversion to Product [%][a]	Consumption of 1 [%][a]
1	#1	chloride	78.4	89.1
2	#1	bromide	79.0	89.2
3	#1	iodide	78.3	88.7
4	#2	chloride	72.0	86.3
5	#2	bromide	72.1	85.9
6	#2	iodide	70.2	87.0

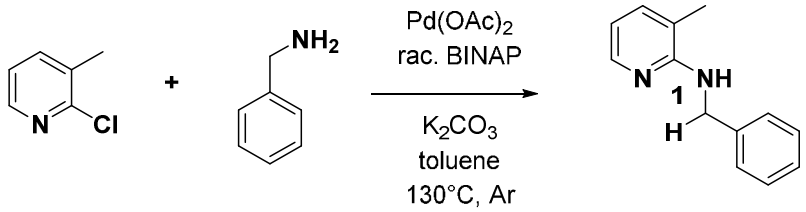
[a] Determined by GC-Analysis. The conversion is determined relative to dodecane as internal standard.

Before (Table 1, entries 1-3) and after the reaction conditions were opimized (Table1, entries 4-6). these different counterions have been tested No significant influence on the reaction outcome could be detected. All 3 counterion showed similar yields and starting material consumption.

3. Synthetic Procedures

3.1. Precursor Synthesis

3.1.1. N-Benzyl-3-methylpiridin-2-amine (1)



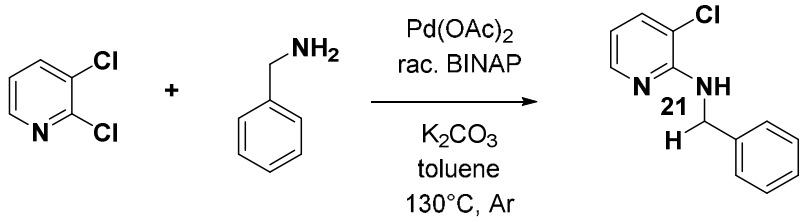
$Pd(OAc)_2$ (67 mg, 0.3 mmol, 0.02 eq.), rac. BINAP (187 mg, 0.3 mmol, 0.02 eq.) and K_2CO_3 (7.256 g, 52.5 mmol, 3.5 eq.) were placed in a 100 ml 3-necked-flask, evacuated, and flushed with argon 3 times. Then 2-chloro-3-methylpyridine (1.64 ml, 15 mmol, 1 eq.), freshly distilled benzylamine (1.97 ml, 18 mmol, 1.2 eq.) and finally toluene (38 ml) were added through the septum with a syringe. The mixture was heated to 130 °C maintaining the argon atmosphere with a balloon. The reaction was stopped after 18 h (TLC). After cooling to r.t. the solid material was removed by filtration and washed with CH_2Cl_2 (150 ml). The combined organic layers were evaporated and the resulting crude product was purified by flash column chromatography (LP/EtOAc) starting with 3 % EtOAc. The pure product was dried under reduced pressure and isolated in 92% yield.
Analytical data is in accordance to literature.[44]

N-Benzyl-3-methylpiridin-2-amine (1) Colorless to beige solid (2.736 g, 92%)
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 2.09 (s, 3H, C[7a]-H_3), 4.37 (s, 1H, N[1]-H), 4.70 (d, J = 5.3 Hz, 2H, C[2]-H_2), 6.57 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 7.23 – 7.44 (m, 6H, C[4a]-H, C[2-6b]-H), 8.06 (dd, J = 5.1, 1.7 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 17.1 (q, C[7a]), 46.0 (t, C[2]), 113.0 (d, C[5a]), 116.7 (s, C[3a]),

127.3 (d, C[4b]), 128.0 (d, C[2b]; C[6b]), 128.7 (d, C[3b]; C[5b]), 137.0 (d, C[4a]), 140.1 (s, C[1b]), 145.5 (d, C[6a]), 156.7 (s, C[2a]).

MP: 48-49 °C
TLC: 0.51 (LP/EtOAc 5:1)

3.1.2. N-Benzyl-3-chloropyridin-2-amine (21)

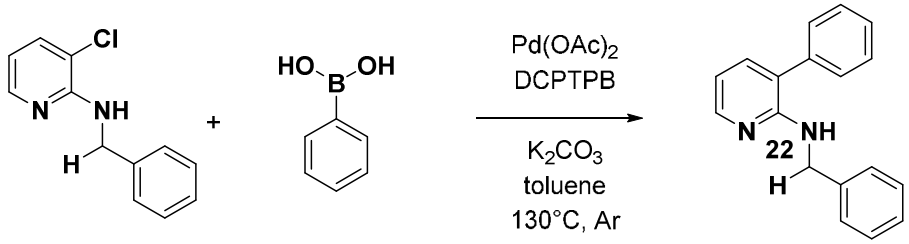


$Pd(OAc)_2$ (67 mg, 0.3 mmol, 0.02 eq.), rac. BINAP (187 mg, 0.3 mmol, 0.02 eq.) and K_2CO_3 (7.256 g, 52.5 mmol, 3.5 eq.) were placed in a 100 ml 3-neck-flask and evacuated and flushed with Argon 3 times. Then 2,3-dichloropyridine (2.22 g, 15 mmol, 1 eq.), freshly distilled benzylamine (1.97 ml, 18 mmol, 1.2 eq.) and finally toluene (38 ml) were added. The mixture was heated to 130 °C maintaining the argon atmosphere with a balloon. The reaction was stopped after 16 h (TLC). After cooling to r.t. the solid material was removed by filtration and washed with CH_2Cl_2 (150 ml). The combined organic layers were evaporated and the resulting crude product was purified by flash column chromatography (LP/EtOAc) starting with 3 % EtOAc. The pure product was dried under reduced pressure and isolated in 90% yield.
Analytical data is in accordance with literature.[45]

N-Benzyl-3-chloropyridin-2-amine (21) Yellow oil (2.95 g, 90 %)
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 4.68 (d, J = 5.6 Hz, 2H, C[2]-H_2), 5.28 (s, 1H, N[1]-H), 6.56 (dd, J = 7.7, 4.9 Hz, 1H, C[5a]-H), 7.26 – 7.41 (m, 5H, C[2-6b]-H), 7.47 (dd, J = 7.6, 1.6 Hz, 1H, C[4a]-H), 8.06 (dd, J = 4.9, 1.6 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 45.6 (t, C[2]), 113.2 (d, C[5a]), 115.5 (s, C[3a]), 127.4 (d, C[4b]), 127.8 (d, C[2b]; C[6b]), 128.8 (d, C[3b]; C[5b]), 136.2 (d, C[4a]), 139.4 (s, C[1b]), 146.2 (d, C[6a]), 154.0 (s, C[2a]).

TLC: 0.65 (LP/EtOAc 5:1)

3.1.3. N-Benzyl-3-phenylpyridin-2-amine (22)



N-Benzyl-3-chloropyridin-2-amine (1.095 g, 5 mmol, 1 eq.), phenylboronic acid (1.830 g, 15 mmol, 3 eq.), K_2CO_3 (1.380 g, 10 mml, 2 eq.), $Pd(OAc)_2$ (20 mg, 0.1 mmol, 0.02 eq.) and DCPTPB (50 mg, 0.1 mmol, 0.02 eq.) were placed in a 100 ml 3-necked-flask. The flask was evacuated and flushed with argon 3 times. The mixture was heated to 130 °C maintaining the argon atmosphere with a balloon. The reaction was stopped after 16 h (TLC). After cooling to r.t. the solid material was removed by filtration and washed with CH_2Cl_2 (100 ml). The combined organic layers were evaporated and the resulting crude product was purified by flash column chromatography (LP/EtOAc) starting with 5 % EtOAc. The pure product was dried under reduced pressure and isolated in 87% yield.
Analytical data is in accordance with literature.[33]

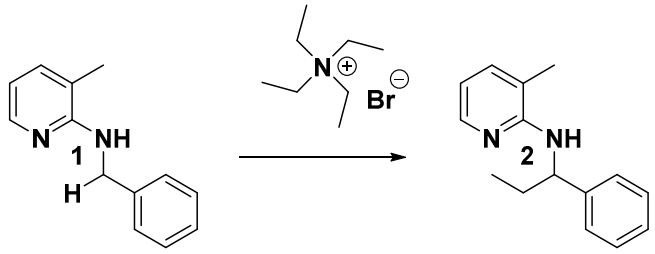
N-Benzyl-3-phenylpyridin-2-amine (22) Colorless to beige solid (1.13 g, 87 %)
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 4.67 (d, J = 5.6 Hz, 2H, C[2]-H_2), 4.91 (s, 1H, N[1]-H), 6.69 (dd, J = 7.2, 5.1 Hz, 1H, C[5a]-H), 7.20 – 7.48 (m, 11H, C[4a]-H; C[2-6b]-H; C[2-6c]-H), 8.16 (dd, J = 5.1, 1.8 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 45.7 (t, C[2]), 113.1 (d, C[5a]), 122.5 (s, C[3a]), 127.1 (d, C[4b]), 127.6 (d, C[2b]; C[6b]), 127.9 (d, C[2c]; C[6c]), 128.6 (d, C[3b]; C[5b]), 129.0 (d, C[4c]), 129.4 (d, C[3c]; C[5c]), 137.4 (d, C[4a]), 137.9 (s, C[1c]), 140.0 (s, C[1b]), 147.0 (d, C[6a]), 155.4 (s, C[2a]).

MP: 58-60 °C
TLC: 0.80 (LP/EtOAc 5:1)

3.2. Substrate Scope – Tetraalkylammonium Salts

Unless otherwise noted, experiments were performed on a 0.50 mmol scale with an initial concentration of 0.25 mol/l of **1** in the reaction mixture.

3.2.1. 3-Methyl-N-(1-phenylpropyl)pyridin-2-amine (2)

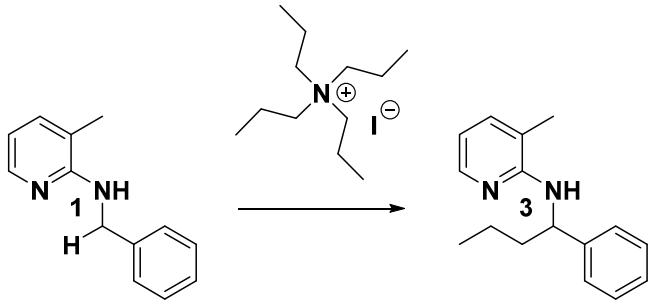


The reaction was carried out according to general procedure A with **1** (100 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **2** was isolated in 68 % yield.

3-Methyl-N-(1-phenylpropyl)pyridin-2-amine (2) Colorless solid (77 mg, 68 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.94 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.82 – 2.04 (m, 2H, C[3]-H_2), 2.12 (s, 3H, C[7a]-H_3), 4.40 (d, J = 7.7 Hz, 1H, N[1]-H), 5.19 (q, J = 7.2 Hz, 1H, C[2]-H), 6.48 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 7.17 – 7.41 (m, 6H, C[4a]-H, C[2-6b]-H), 7.97 (dd, J = 5.1, 1.7 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 17.2 (q, C[7a]), 30.3 (t, C[3]), 56.1 (d, C[2]), 112.7 (d, C[5a]), 116.4 (s, C[3a]), 126.7 (d, C[2b]), 126.9 (d, C[6b]), 127.7 (d, C[4b]), 128.5 (d, C[3b]), 128.6 (d, C[5b]), 136.9 (d, C[4a]), 144.3 (s, C[1b]), 145.6 (d, C[6a]), 156.3 (s, C[2a]).

MP: 41.5-42.5 °C
TLC: 0.54 (LP/EtOAc 5:1)
GCMS: Retention time: 6.55 min. Main fragments: 226 (M^+, 20), 211 (8), 197 (100), 108 (22), 92 (42), 65 (35).
HRMS: calculated for $C_{15}H_{19}N_2$ $[M+H]^+$ 227.1543; found 227.1554; Δ = 5.22 ppm.

3.2.2. 3-Methyl-N-(1-phenylbutyl)pyridin-2-amine (3)

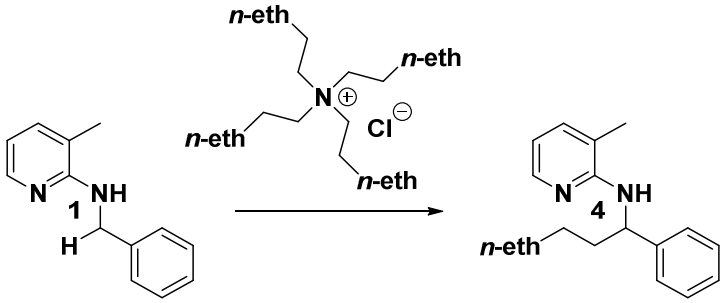


The reaction was carried out according to general procedure A with **1** (100 mg, 0.50 mmol, 1 eq.), tetrapropylammonium iodide (157 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **3** was isolated in 62 % yield.

3-Methyl-N-(1-phenylbutyl)pyridin-2-amine (3) Colorless oil (75 mg, 62 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.85 (t, J = 7.4 Hz, 3H, C[5]-H_3), 1.16 – 1.43 (m, 2H, C[4]-H_2), 1.68 – 1.88 (m, 2H, C[3]-H_2), 2.02 (s, 3H, C[7a]-H_3), 4.29 (d, J = 7.7 Hz, 1H, N[1]-H), 5.18 (q, J = 7.4 Hz, 1H, C[2]-H), 6.37 (dd, J = 7.1, 5.0 Hz, 1H, C[5a]-H), 7.06 – 7.33 (m, 6H, C[4a]-H, C[2-6b]-H), 7.87 (dd, J = 5.2, 1.8 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 14.2 (q, C[5]), 17.2 (q, C[7a]), 19.7 (t, C[4]), 39.9 (t, C[3]), 54.5 (d, C[2]), 112.6 (d, C[5a]), 116.2 (s, C[3a]), 126.6 (d, C[2b; 6b]), 126.8 (d, C[4b]), 128.5 (d, C[3b; 5b]), 136.8 (d, C[4a]), 144.7 (s, C[1b]), 145.7 (d, C[6a]), 156.3 (s, C[2a]).

TLC: 0.57 (LP/EtOAc 5:1)
GCMS: Retention time: 6.77 min. Main fragments: 240 (M^+, 12), 211 (20), 197 (100), 108 (28), 92 (41), 65 (24).
HRMS: calculated for $C_{16}H_{21}N_2$ $[M+H]^+$ 241.1699; found 241.1698; Δ = 0.49 ppm.

3.2.3. 3-Methyl-N-(1-phenylpentyl)pyridin-2-amine (4)

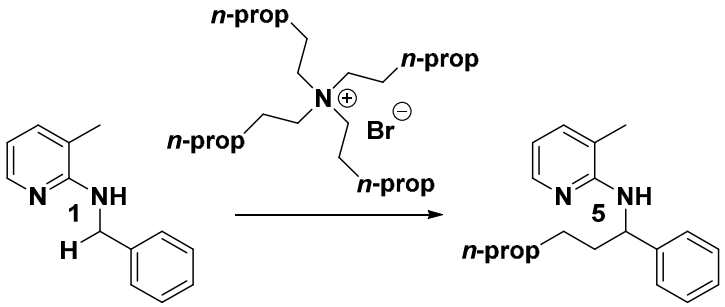


The reaction was carried out according to general procedure A with **1** (100 mg, 0.50 mmol, 1 eq.), tetrabutylammonium chloride (139 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient B. Product **4** was isolated in 60 % yield.

3-Methyl-N-(1-phenylpentyl)pyridin-2-amine (4) Colorless oil (76 mg, 60 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ= 0.88 (t, J = 7.1 Hz, 3H, C[6]-H_3), 1.24 – 1.43 (m, 4H, C[4-5]-H_2), 1.80 – 1.99 (m, 2H, C[3]-H_2), 2.12 (s, 3H, C[7a]-H_3), 4.38 (d, J = 7.7 Hz, 1H, N[1]-H), 5.25 (q, J = 7.3 Hz, 1H, C[2]-H), 6.47 (dd, J = 7.1, 5.0 Hz, 1H, C[5a]-H), 7.16 – 7.40 (m, 6H, C[4a]-H, C[2-6b]-H), 7.96 (dd, J = 5.1, 1.7 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 14.1 (q, C[6]), 17.2 (q, C[7a]), 22.8 (t, C[5]), 28.7 (t, C[4]), 37.4 (t, C[3]), 54.7 (d, C[2]), 112.6 (d, C[5a]), 116.3 (s, C[3a]), 126.6 (d, C[2b; 6b]), 126.8 (d, C[4b]), 128.5 (d, C[3b; 5b]), 136.9 (d, C[4a]), 144.7 (s, C[1b]), 145.7 (d, C[6a]), 156.3 (s, C[2a]).

TLC: 0.60 (LP/EtOAc 5:1)
GCMS: Retention time: 7.01 min. Main fragments: 254 (M^+, 13), 211 (20), 197 (100), 108 (30), 92 (43), 65 (22).

3.2.4. 3-Methyl-N-(1-phenylhexyl)pyridin-2-amine (5)



The reaction was carried out according to general procedure A with **1** (100 mg, 0.50 mmol, 1 eq.), tetrapentylammonium bromide (189 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient B. Product **5** was isolated in 58 % yield.

3-Methyl-N-(1-phenylhexyl)pyridin-2-amine (5) Colorless solid (78 mg, 58 %).

^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.86 (d, J = 6.9 Hz, 3H, C[7]-H_3), 1.24 – 1.45 (m, 6H, C[4-6]-H_2), 1.78 – 1.97 (m, 2H, C[3]-H_2), 2.12 (s, 3H, C[7a]-H_3), 4.38 (d, J = 7.6 Hz, 1H, N[1]-H), 5.25 (q, J = 7.3 Hz, 1H, C[2]-H), 6.47 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 7.17 – 7.40 (m, 6H, C[4a]-H, C[2-6b]-H), 7.96 (dd, J = 5.1, 1.7 Hz, 1H, C[6a]-H).

^{13}C-NMR (101 MHz, $CDCl_3$): δ = 14.2 (q, C[7]), 17.2 (q, C[7a]), 22.7 (t, C[6]), 26.2 (t, C[5]), 31.9 (t, C[4]), 37.6 (t, C[3]), 54.8 (d, C[2]), 112.6 (d, C[5a]), 116.3 (s, C[3a]), 126.6 (d, C[2b; 6b]), 126.8 (d, C[4b]), 128.5 (d, C[3b; 5b]), 136.9 (d, C[4a]), 144.7 (s, C[1b]), 145.7 (d, C[6a]), 156.3 (s, C[2a]).

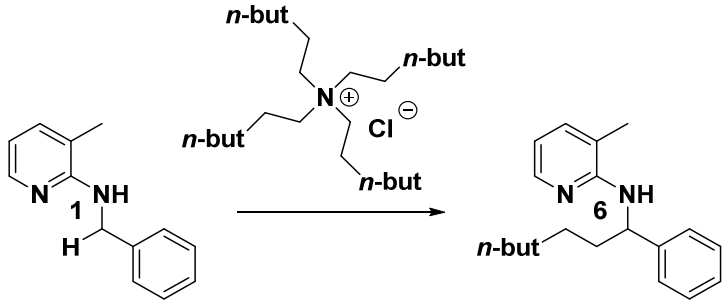
MP: 40-41 °C

TLC: 0.60 (LP/EtOAc 5:1)

GCMS: Retention time: 7.28 min. Main fragments: 268 (M^+, 8), 211 (19), 197 (100), 108 (31), 92 (27), 65 (20).

HRMS: calculated for $C_{18}H_{25}N_2$ $[M+H]^+$ 269.2012; found 269.2033; Δ = 7.79 ppm.

3.2.5. 3-Methyl-N-(1-phenylheptyl)pyridin-2-amine (6)

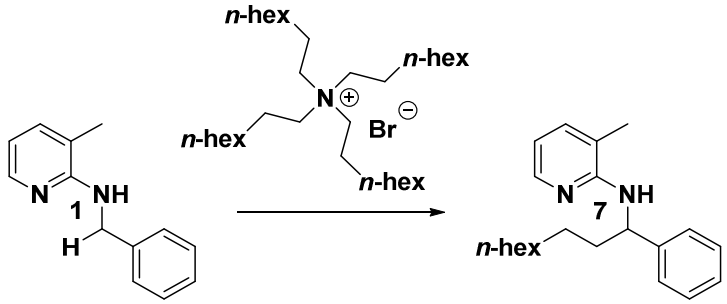


The reaction was carried out according to general procedure A with **1** (100 mg, 0.50 mmol, 1 eq.), tetrahexylammonium chloride (195 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient B. Product **6** was isolated in 61 % yield.

3-Methyl-N-(1-phenylheptyl)pyridin-2-amine (6) Colorless oil (86 mg, 61 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.87 (t, J = 6.7 Hz, 3H, C[8]-H_3), 1.23 – 1.45 (m, 8H, C[4-7]-H_2), 1.80 – 1.99 (m, 2H, C[3]-H_2), 2.13 (s, 3H, C[7a]-H_3), 4.39 (d, J = 7.7 Hz, 1H, N[1]-H), 5.26 (q, J = 7.3 Hz, 1H, C[2]-H), 6.48 (dd, J = 7.1, 5.0 Hz, 1H, C[5a]-H), 7.14 – 7.45 (m, 6H, C[4a]-H, C[2-6b]-H), 7.97 (dd, J = 5.1, 1.8 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 14.2 (q, C[8]), 17.2 (q, C[7a]), 22.7 (t, C[7]), 26.5 (t, C[6]), 29.4 (t, C[5]), 31.9 (t, C[4]), 37.7 (t, C[3]), 54.7 (d, C[2]), 112.6 (d, C[5a]), 116.2 (s, C[3a]), 126.6 (d, C[2b; 6b]), 126.8 (d, C[4b]), 128.5 (d, C[3b; 5b]), 136.8 (d, C[4a]), 144.7 (s, C[1b]), 145.7 (d, C[6a]), 156.3 (s, C[2a]).

TLC: 0.63 (LP/EtOAc 5:1)
GCMS: Retention time: 7.54 min. Main fragments: 282 (M^+, 7), 211 (17), 197 (100), 108 (32), 92 (30), 65 (14).

3.2.6. 3-Methyl-N-(1-phenylnonyl)pyridin-2-amine (7)



The reaction was carried out according to general procedure A with **1** (100 mg, 0.50 mmol, 1 eq.), tetraoctylammonium bromide (273 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 84 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient B. Product **7** was isolated in 40 % yield.

3-Methyl-N-(1-phenylnonyl)pyridin-2-amine (7) Colorless oil (63 mg, 40 %).

^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.87 (t, J = 6.8 Hz, 3H, C[9]-H_3), 1.22 – 1.43 (m, 12H, C[4-8]-H_2), 1.79 – 1.97 (m, 2H, C[3]-H_2), 2.12 (s, 3H, C[7a]-H_3), 4.38 (d, J = 7.7 Hz, 1H, N[1]-H), 5.25 (q, J = 7.3 Hz, 1H, C[2]-H), 6.47 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 7.14 – 7.42 (m, 6H, C[4a]-H, C[2-6b]-H), 7.96 (dd, J = 5.1, 1.7 Hz, 1H, C[6a]-H).

^{13}C-NMR (101 MHz, $CDCl_3$): δ = 14.2 (q, C[9]), 17.2 (q, C[7a]), 22.8 (t, C[8]), 26.5 (t, C[7]), 29.4 (t, C[6]), 29.7 (t, C[5]), 32.0 (t, C[4]), 37.7 (t, C[3]), 54.7 (d, C[2]), 112.6 (d, C[5a]), 116.3 (s, C[3a]), 126.6 (d, C[2b; 6b]), 126.8 (d, C[4b]), 128.5 (d, C[3b; 5b]), 136.9 (d, C[4a]), 144.7 (s, C[1b]), 145.7 (d, C[6a]), 156.3 (s, C[2a]).

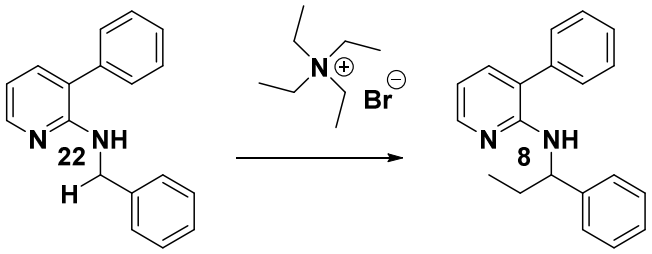
TLC: 0.63 (LP/EtOAc 5:1)

GCMS: Retention time: 8.07 min. Main fragments: 310 (M^+, 5), 211 (17), 197 (100), 108 (33), 92 (28), 65 (10).

HRMS: calculated for $C_{21}H_{31}N_2$ $[M+H]^+$ 311.2482; found 311.2505; Δ = 7.53 ppm.

3.3. Substrate Scope – Target Compound

3.3.1. 3-phenyl-N-(1-phenylpropyl)pyridin-2-amine (8)

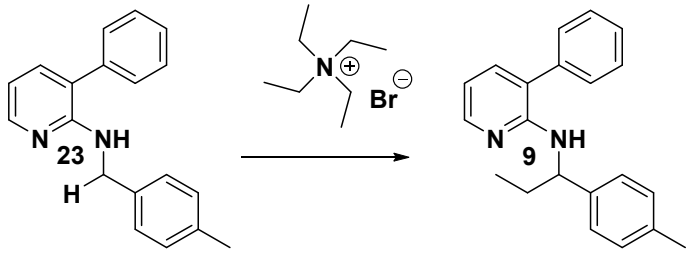


The reaction was carried out according to general procedure A with N-benzyl-3-phenylpyridin-2-amine (**22**) (130 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **8** was isolated in 63 % yield.

3-Phenyl-N-(1-phenylpropyl)pyridin-2-amine (8) Yellowish oil (91 mg, 63 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.85 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.72 – 1.84 (m, 2H, C[3]-H_2), 4.88 (d, J = 8.0 Hz, 1H, N[1]-H), 5.14 (q, J = 7.2 Hz, 1H, C[2]-H), 6.59 (dd, J = 7.2, 5.1 Hz, 1H, C[5a]-H), 7.17 – 7.50 (m, 11H, C[4a]-H, C[2-6b]-H, C[2-6C]-H), 8.05 (dd, J = 5.0, 1.8 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 30.3 (t, C[3]), 56.2 (d, C[2]), 112.7 (d, C[5a]), 122.4 (s, C[3a]), 126.6 (d, C[4b]), 128.0 (d, C[2c; 6c]), 128.4 (d, C[2b; 6b]), 128.6 (d, C[4c]), 129.0 (d, C[3b; 5b]), 129.4 (d, C[3c; 5c]), 137.2 (s, C[4a]), 138.2 (d, C[1c]), 144.1 (s, C[1b]), 147.1 (d, C[6a]), 155.0 (s, C[2a]).

TLC: 0.57 (LP/EtOAc 5:1)
GCMS: Retention time: 7.80 min. Main fragments: 288 (M^+, 11), 259 (100), 181 (26), 154 (21), 129 (27), 127 (36), 115 (12), 91 (28), 77 (11).
HRMS: calculated for $C_{20}H_{21}N_2$ $[M+H]^+$ 289.1699; found 289.1704; Δ = 2.06 ppm.

3.3.2. 3-Phenyl-N-(1-(4-methylphenyl)propyl)pyridin-2-amine (9)

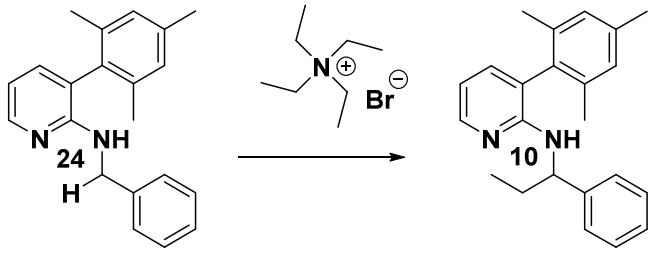


The reaction was carried out according to general procedure A with N-(4-methylbenzyl)-3-phenylpyridin-2-amine (**23**) (137 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **9** was isolated in 65 % yield.

3-Phenyl-N-(1-(4-methylphenyl)propyl)pyridin-2-amine (9) Yellowish oil (98 mg, 65 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.86 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.27 (s, 1H, C[3]-H), 1.68 – 1.88 (m, 2H, C[3]-H_2), 2.31 (s, 3H, C[7b]-H_3), 4.87 (d, J = 7.4 Hz, 1H, N[1]-H), 5.12 (q, J = 7.3 Hz, 1H, C[2]-H), 6.60 (dd, J = 7.2, 5.0 Hz, 1H, C[5a]-H), 7.06 – 7.53 (m, 10H, C[4a]-H, C[2-3b;5-6b]-H, C[2-6C]-H)), 8.07 (dd, J = 5.1, 1.8 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 21.2 (q, C[7b]), 29.9 (t, C[3]), 30.3 (t, C[3]), 56.0 (d, C[2]), 112.7 (d, C[5a]), 122.4 (s, C[3a]), 126.8 (d, C[2b; 6b]), 127.9 (d, C[2c; 6c]), 129.0 (d, C[4c]), 129.1 (d, C[3b; 5b]), 129.4 (d, C[3c; 5c]), 136.3 (d, C[4a]), 137.2 (s, C[4b]), 138.3 (d, C[1c]), 141.1 (s, C[1b]), 147.2 (d, C[6a]), 155.1 (s, C[2a]).

TLC: 0.57 (LP/EtOAc 5:1)
GCMS: Retention time: 8.05 min. Main fragments: 302 (M^+, 12), 273 (100), 181 (30), 154 (24), 129 (27), 127 (32), 115 (12), 106 (28), 91 (13), 77 (10).
HRMS: calculated for $C_{21}H_{23}N_2$ $[M+H]^+$ 303.1856; found 303.1881; Δ = 8.37 ppm.

3.3.3. 3-Mesityl-N-(1-phenylpropyl)pyridin-2-amine (10)

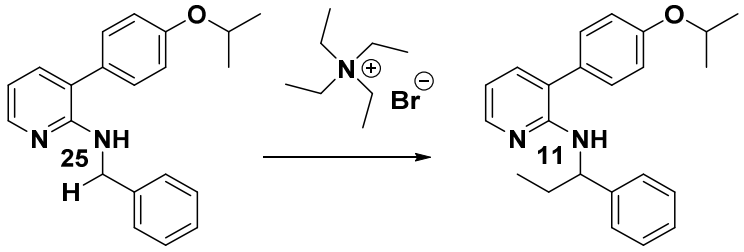


The reaction was carried out according to general procedure A with N-benzyl-3-mesitylpyridin-2-amine (**24**) (151 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **10** was isolated in 64 % yield.

3-Mesityl-N-(1-phenylpropyl)pyridin-2-amine (10) Yellowish oil (106 mg, 64 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.84 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.60 – 1.79 (m, 2H, C[3]-H_2), 1.91 (s, 3H, C[7c]-H_3), 2.06 (s, 3H, C[9c]-H_3), 2.36 (s, 3H, C[8c]-H_3), 4.27 (s, 1H, N[1]-H), 5.15 (d, J = 7.7 Hz, 1H, C[2]-H), 6.61 (dd, J = 7.2, 5.1 Hz, 1H, C[5a]-H), 7.00 (d, J = 6.0 Hz, 2H, C[3c; 5c]), 7.10 (dd, J = 7.2, 1.9 Hz, 1H, C[4a]-H), 7.15 – 7.30 (m, 5H, C[2-6b]-H), 8.08 (dd, J = 5.1, 1.9 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 20.2, (q, C[7c]), 20.2, (q, C[9c]), 21.3 (q, C[8c]), 30.4 (t, C[3]), 55.8 (d, C[2]), 112.7 (d, C[5a]), 116.5 (s, C[3a]), 126.7 (d, C[4b]), 128.4 (d, C[2b; 6b]), 128.9 (d, C[3c; 5c]), 129.0 (d, C[3b; 5b]), 136.2 (d, C[4a]), 137.1 (s, C[1c]), 137.3 (s, C[2c; 6c]), 137.9 (s, C[4c]), 140.7 (s, C[1b]), 146.5 (d, C[6a]), 155.0 (s, C[2a]).

TLC: 0.61 (LP/EtOAc 5:1)
GCMS: Retention time: 7.99 min. Main fragments: 330 (M^+, 15), 301 (100), 209 (29), 197 (13), 181 (25), 143 (14), 91 (39).
HRMS: calculated for $C_{23}H_{27}N_2$ $[M+H]^+$ 331.2169; found 331.2180; Δ = 3.38 ppm.

3.3.4. 3-(4-Isopropoxyphenyl)-N-(1-phenylpropyl)pyridin-2-amine (11)

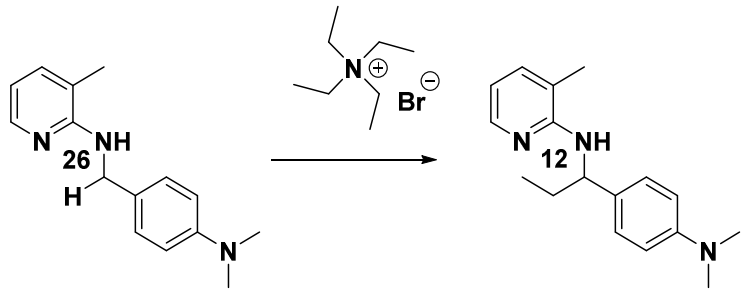


The reaction was carried out according to general procedure A with N-benzyl-3-(4-isopropoxyphenyl)pyridin-2-amine (**25**) (159 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **11** was isolated in 59 % yield.

3-(4-Isopropoxyphenyl)-N-(1-phenylpropyl)pyridin-2-amine (11) Yellow oil (103 mg, 59 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.86 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.38 (d, J = 6.1 Hz, 6H, C[9-10c]-H_3), 1.71 – 1.84 (m, 2H, C[3]-H_2), 4.60 (p, J = 6.0 Hz, 1H, C[8c]-H), 4.90 (d, J = 8.0 Hz, 1H, N[1]-H), 5.14 (q, J = 7.2 Hz, 1H, C[2]-H), 6.56 (dd, J = 7.2, 5.1 Hz, 1H, C[5a]-H), 6.92 – 7.04 (m, 2H, C[3c; 5c]-H), 7.15 – 7.34 (m, 8H, C[4a]-H, C[2-6b]-H, C[2c; 6c]), 8.02 (dd, J = 5.1, 1.8 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 22.2 (q, C[9-10c]), 30.4 (t, C[3]), 56.2 (d, C[2]), 70.1 (d, C[8c]), 112.7 (d, C[5a]), 116.5 (d, C[3c; 5c]), 122.2 (s, C[1c]), 126.6 (d, C[2b; 6b]), 126.7 (d, C[4b]), 128.4 (d, C[3b; 5b]), 130.2 (d, C[2c; 6c]), 137.1 (s, C[4a]), 140.7 (s, C[1b]), 146.7 (d, C[6a]), 155.3 (s, C[4c]), 157.7 (s, C[2a]).

TLC: 0.51 (LP/EtOAc 5:1)
GCMS: Retention time: 8.68 min. Main fragments: 346 (M^+, 19), 317 (100), 275 (32), 197 (25), 185 (26), 170 (11), 115 (21), 91 (45).
HRMS: calculated for $C_{21}H_{31}N_2$ $[M+H]^+$ 347.2118; found 347.2138; Δ = 5.95 ppm.

3.3.5. N-(1-(4-(Dimethylamino)phenyl)propyl)-3-methylpyridin-2-amine (12)



The reaction was carried out according to general procedure A with N-(4-(dimethylamino)benzyl)-3-methylpyridin-2-amine (**26**) (121 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **12** was isolated in 61 % yield.

N-(1-(4-(Dimethylamino)phenyl)propyl)-3-methylpyridin-2-amine (12) Yellow oil (82 mg, 61 %).

^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.91 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.77 – 1.89 (m, 1H, C[3]-H), 1.93 – 2.05 (m, 1H, C[3]-H), 2.07 (s, 3H, C[7a]-H_3), 2.92 (s, 6H, C[8-9b]-H_3), 4.32 (d, J = 7.6 Hz, 1H, N[1]-H), 5.09 (q, J = 7.2 Hz, 1H, C[2]-H), 6.46 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 6.67 – 6.75 (m, 2H, C[3b; 5b]-H), 7.17 (ddt, J = 6.3, 1.8, 0.9 Hz, 1H, C[4a]-H), 7.21 – 7.30 (m, 2H, C[2b; 6b]-H), 7.98 (dd, J = 5.1, 1.8 Hz, 1H, C[6a]-H).

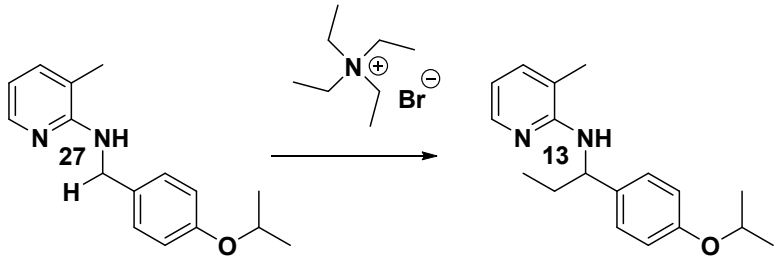
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 11.0 (q, C[4]), 17.2 (q, C[7a]), 29.8 (t, C[3]), 40.8 (q, C[8-9b]), 55.6 (d, C[2]), 112.3 (d, C[5a]), 112.8 (d, C[3b; 5b]), 116.4 (s, C[3a]), 127.6 (d, C[2b; 6b]), 132.0 (s, C[1b]), 136.8 (d, C[4a]), 145.5 (d, C[6a]), 149.7 (s, C[4b]), 156.4 (s, C[2a]).

TLC: 0.29 (LP/EtOAc 5:1)

GCMS: Retention time: 7.82 min. Main fragments: 269 (M^+, 13), 240 (47), 162 (72), 147 (30), 134 (100), 122 (82), 107 (26), 92 (58), 65 (36).

HRMS: calculated for $C_{21}H_{31}N_2$ $[M+H]^+$ 270.1965; found 270.1985; Δ = 7.17 ppm.

3.3.6. N-(4-isopropoxybenzyl)-3-methylpyridin-2-amine (13)

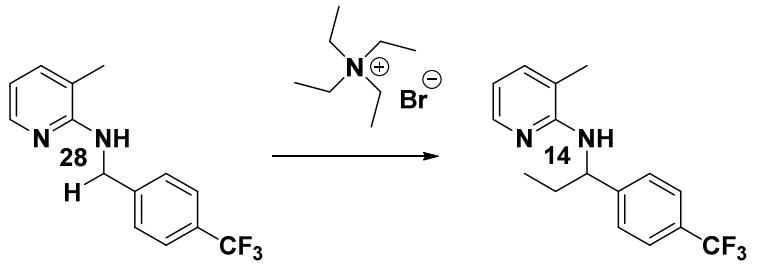


The reaction was carried out according to general procedure A with N-(4-isopropoxybenzyl)-3-methylpyridin-2-amine (**27**) (128 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **13** was isolated in 69 % yield.

N-(1-(4-isopropoxyphenyl)propyl)-3-methylpyridin-2-amine (13) Yellow oil (99 mg, 69 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = δ 0.92 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.32 (d, J = 6.1 Hz, 6H, C[9-10b]-H_3), 1.79 – 1.89 (m, 1H, C[3]-H), 1.91 – 2.03 (m, 1H, C[3]-H), 2.10 (s, 3H, C[7a]-H_3), 4.33 (d, J = 7.7 Hz, 1H, N[1]-H), 4.51 (hept, J = 6.1 Hz, 1H, C[8b]-H), 5.13 (q, J = 7.2 Hz, 1H, C[2]-H), 6.48 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 6.80 – 6.88 (m, 2H, C[3b; 5b]-H), 7.19 (ddt, J = 7.1, 1.9, 1.0 Hz, 1H, C[4a]-H), 7.23 – 7.32 (m, 2H, C[2b; 6b]-H), 7.98 (dd, J = 5.1, 1.8 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 17.2 (q, C[7a]), 22.3 (q, C[9-10b]), 30.1 (t, C[3]), 55.6 (d, C[2]), 69.9 (d, C[8b]), 112.5 (d, C[5a]), 115.8 (d, C[3b; 5b]), 116.4 (s, C[3a]), 127.8 (d, C[2b; 6b]), 136.0 (s, C[1b]), 136.8 (d, C[4a]), 145.6 (d, C[6a]), 156.4 (s, C[4b]), 156.9 (s, C[2a]).

TLC: 0.34 (LP/EtOAc 5:1)
GCMS: Retention time: 7.52 min. Main fragments: 284 (M^+, 19), 255 (74), 213 (66), 177 (10), 135 (69), 119 (38), 107 (100), 92 (86), 77 (13), 65 (29).
HRMS: calculated for $C_{21}H_{31}N_2$ $[M+H]^+$ 285.1961; found 285.1989; Δ = 9.91 ppm.

3.3.7. 3-Methyl-N-(1-(4-(trifluoromethyl)phenyl)propyl)pyridin-2-amine (14)



The reaction was carried out according to general procedure A with 3-methyl-N-(4-(trifluoromethyl)benzyl)pyridin-2-amine (**28**) (133 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **14** was isolated in 53 % yield.

3-Methyl-N-(1-(4-(trifluoromethyl)phenyl)propyl)pyridin-2-amine (14) Yellow oil (78 mg, 53 %).

^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.97 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.85 – 1.96 (m, 2H, C[3]-H_2), 2.15 (s, 3H, C[7a]-H_3), 4.41 (d, J = 7.3 Hz, 1H, N[1]-H), 5.21 (q, J = 7.1 Hz, 1H, C[2]-H), 6.50 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 7.22 (ddd, J = 7.2, 1.9, 0.9 Hz, 1H, C[4a]-H), 7.45 – 7.58 (m, 4H, C[2-3b; 5-6b]-H), 7.92 (dd, J = 5.1, 1.7 Hz, 1H, C[6a]-H)).

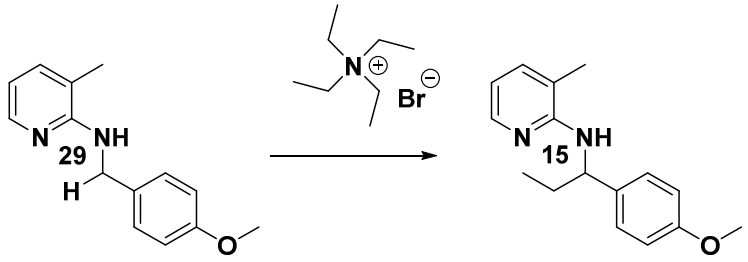
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 17.2 (q, C[7a]), 30.4 (t, C[3]), 56.0 (d, C[2]), 113.1 (d, C[5a]), 116.4 (s, C[3a]), 124.4 (s, J_{CF} = 271.9 Hz, C[7b]), 125.4 (d, J_{CF} = 3.8 Hz, C[3b; 5b]), 127.0 (d, C[2b; 6b]), 129.0 (s, J_{CF} = 32.0 Hz, C[4b]), 137.1 (d, C[4a]), 145.6 (d, C[6a]), 148.7 (s, C[1b]), 156.0 (s, C[2a]).

TLC: 0.48 (LP/EtOAc 5:1)

GCMS: Retention time: 6.45 min. Main fragments: 294 (M^+, 20), 279 (15), 265 (100), 159 (16), 108 (57), 92 (84), 80 (15), 65 (57).

HRMS: calculated for $C_{21}H_{31}N_2$ $[M+H]^+$ 295.1417; found 295.1417; Δ = 0.4 ppm.

3.3.8. N-(1-(4-Methoxyphenyl)propyl)-3-methylpyridin-2-amine (15)

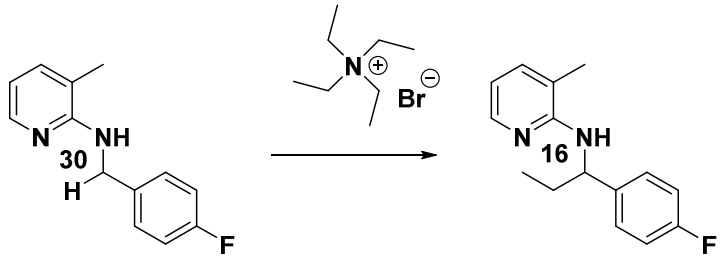


The reaction was carried out according to general procedure A with N-(4-methoxybenzyl)-3-methylpyridin-2-amine (**29**) (114 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **15** was isolated in 71 % yield.

N-(1-(4-Methoxyphenyl)propyl)-3-methylpyridin-2-amine (15) Yellowish oil (92 mg, 71 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.93 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.78 – 1.91 (m, 1H, C[3]-H), 1.92 – 2.04 (m, 1H, C[3]-H), 2.10 (s, 3H, C[7a]-H_3), 3.78 (s, 3H, C[8b]-H_3), 4.34 (d, J = 7.6 Hz, 1H, N[1]-H), 5.13 (q, J = 7.2 Hz, 1H, C[2]-H), 6.47 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 6.84 – 6.89 (m, 2H, C[3b; 5b]-H), 7.19 (ddq, J = 7.1, 1.7, 0.9 Hz, 1H, C[4a]-H), 7.27 – 7.32 (m, 2H, C[2b; 6b]-H), 7.97 (ddd, J = 5.1, 1.8, 0.7 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 17.2 (q, C[7a]), 30.2 (t, C[3]), 55.3 (q, C[8b]), 55.6 (d, C[2]), 112.6 (d, C[5a]), 113.9 (d, C[3b; 5b]), 116.4 (s, C[3a]), 127.8 (d, C[2b; 6b]), 136.3 (s, C[1b]), 136.9 (d, C[4a]), 145.6 (d, C[6a]), 156.3 (s, C[4b]), 158.5 (s, C[2a]).

TLC: 0.41 (LP/EtOAc 5:1)
GCMS: Retention time: 7.31 min. Main fragments: 256 (M^+, 21), 227 (96), 149 (41), 133 (14), 121 (68), 108 (21), 92 (100), 77 (13), 65 (24).
HRMS: calculated for $C_{21}H_{31}N_2$ $[M+H]^+$ 257.1648; found 257.1666; Δ = 6.95 ppm.

3.3.9. N-(1-(4-fluorophenyl)propyl)-3-methylpyridin-2-amine (16)



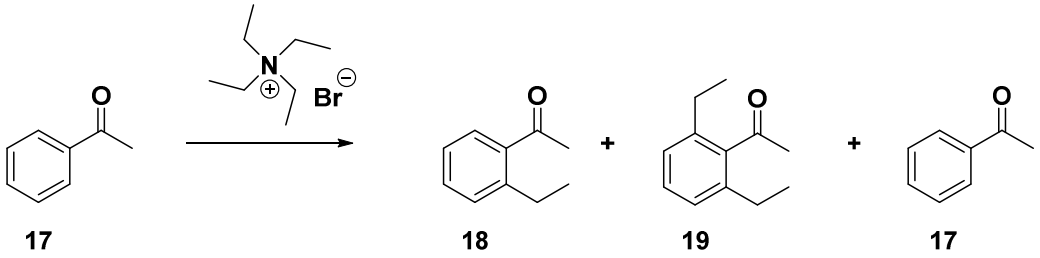
The reaction was carried out according to general procedure A for C-H activation reactions with N-(4-fluorobenzyl)-3-methylpyridin-2-amine (**30**) (108 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (105 mg, 0.50 mmol, 1 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $[RhCl(cod)]_2$ (12 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 16 h at 140 °C. The general work-up procedure B for C-H activation reactions was followed using gradient A. Product **16** was isolated in 50 % yield.

N-(1-(4-fluorophenyl)propyl)-3-methylpyridin-2-amine (16) Yellow oil (61 mg, 50 %).
^{1}H-NMR (400 MHz, $CDCl_3$): δ = 0.94 (t, J = 7.4 Hz, 3H, C[4]-H_3), 1.80 – 2.00 (m, 2H, C[3]-H_2), 2.12 (s, 3H, C[7a]-H_3), 4.35 (d, J = 7.5 Hz, 1H, N[1]-H), 5.15 (q, J = 7.2 Hz, 1H, C[2]-H), 6.49 (dd, J = 7.1, 5.1 Hz, 1H, C[5a]-H), 6.93 – 7.04 (m, 2H, C[3b; 5b]-H), 7.16 – 7.23 (m, 1H, C[4a]-H), 7.29 – 7.39 (m, 2H, C[2b; 6b]-H), 7.95 (dd, J = 5.2, 1.7 Hz, 1H, C[6a]-H).
^{13}C-NMR (101 MHz, $CDCl_3$): δ = 10.9 (q, C[4]), 17.2 (q, C[7a]), 30.4 (t, C[3]), 55.6 (d, C[2]), 112.9 (d, C[5a]), 115.2 (d, J_{CF} = 21.2 Hz, C[3b; 5b]), 116.4 (s, C[3a]), 128.2 (d, J_{CF} = 7.9 Hz, C[2b; 6b]), 137.0 (d, C[4a]), 140.1 (s, J_{CF} = 3.2 Hz, C[1b]), 145.6 (d, C[6a]), 156.1 (s, C[2a]), 161.8 (s, J_{CF} = 244.2 Hz, C[4b]).

TLC: 0.49 (LP/EtOAc 5:1)
GCMS: Retention time: 6.52 min. Main fragments: 244 (M^+, 16), 215 (100), 152 (9), 119 (11), 109 (59), 92 (59), 65 (28).
HRMS: calculated for $C_{21}H_{31}N_2$ $[M+H]^+$ 245.1449; found 245.1463; Δ = 6.21 ppm.

3.4. Alternative Substrates

3.4.1. 1-(2-Ethylphenyl)ethan-1-one (18)



The reaction was carried out according to general procedure A with **17** (60 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (315 mg, 1.50 mmol, 3 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $RuH_2(CO)(PPh_3)_3$ (18 mg, 0.02 mmol, 0.04 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 22 h at 150 °C. The solid material was removed by filtration using a Pasteur pipette with cotton and silica (Silica was conditioned with EtOAc with 1% triethylamine to neutralize the acidic groups). The residue was washed with EtOAc. The combined organic phases were concentrated under reduced pressure. The resulting crude residue was purified by flash column chromatography (LP/EtOAc; 2% EtOAc - both solvents with 1% triethylamine). Product **18** could not be separated from starting material **17** and byproduct **19** by column chromatography. Therefore we isolated a mixture of product, byproduct and starting material, which was quantified with ^{1}H-NMR. 73 mg of a brown liquid was obtained. Ratio of this 73 mg mixture was determined by NMR: product **18** / byproduct **19** / starting material **17** = 1/0.38/0.11. Calculated yields with Ratio: 67.1% product, 25.5% byproduct, 7.3% starting material.

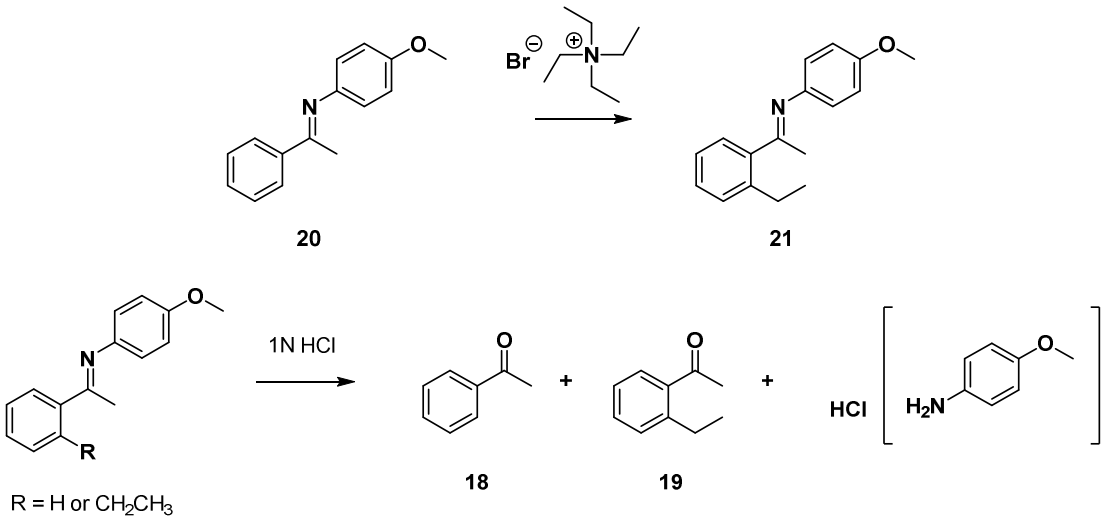
1-(2-Ethylphenyl)ethan-1-one (18)

^{1}H-NMR (400 MHz, $CDCl_3$): δ = 1.21 (td, J = 7.5, 1.7 Hz, 3H, CH_2-*CH_3*), 2.58 (s, 3H, CO-*CH_3*), 2.88 (q, J = 7.5 Hz, 2H, *CH_2*-CH_3), 7.25 – 7.29 (m, 2H, C[3]-H; C[5]-H), 7.40 (td, J = 7.5, 1.5 Hz, 1H, C[4]-H), 7.62 (dd, J = 7.7, 1.4 Hz, 1H, C[6]-H).

^{13}C-NMR (101 MHz, $CDCl_3$): δ = 16.1 (q, CH_2-*CH_3*), 27.2 (t, *CH_2*-CH_3), 30.1 (q, CO-*CH_3*), 125.7 (d, C[3]), 129.1 (d, C[6]), 130.6 (d, C[5]), 131.6 (d, C[4]), 138.6 (s, C[1]), 144.3 (s, C[2]), 202.4 (s, C=O).

GCMS of Compound 18: Retention time: 3.90 min. Main fragments: 148 (M^+, 28), 133 (100), 115 (12), 105 (33), 91 (16), 79 (27).

3.4.2. 1-(2-ethylphenyl)-N-(4-methoxyphenyl)ethan-1-imine (20)



The reaction was carried out according to general procedure A with **20** (113 mg, 0.50 mmol, 1 eq.), tetraethylammonium bromide (315 mg, 1.50 mmol, 3 eq.), KOH (84 mg, 1.50 mmol, 3 eq.) and $RhCl(PPH_3)_3$ (23 mg, 0.025 mmol, 0.05 eq.) in dry and degassed toluene (2 ml). The reaction mixture was heated for 22 h at 150 °C. After cooling to r.t. 5 ml 1N HCl was added and stirred vigorously for 45 min. The hydrolyzed compounds were extracted with Et_2O and the combined organic layers were dried over Na_2SO_4. The solvents were evaporated under reduced pressure. The resulting crude material was purified with column chromatography (LP/EtOAc; 2% EtOAc - both solvents with 1% triethylamine). Product **18** could not be separated from compound **19** by column chromatography. Therefore a mixture was isolated which was quantified with ^{1}H-NMR. 62 mg of a brown liquid was obtained. Ratio of this 62 mg mixture was determined by NMR: product **18** / starting material **19** = 0.65/1. Calculated yields with Ratio: 39.4% product, 60.6% starting material.

1-(2-Ethylphenyl)ethan-1-one (18)

^{1}H-NMR (400 MHz, $CDCl_3$): δ = 1.22 (td, J = 7.5, 1.7 Hz, 3H, CH_2-*CH_3*), 2.58 (s, 3H, CO-*CH_3*), 2.88 (q, J = 7.5 Hz, 2H, *CH_2*-CH_3), 7.26 – 7.30 (m, 2H, C[3]-H; C[5]-H), 7.38 – 7.43 (m, 1H, C[4]-H), 7.62 (dd, J = 7.8, 1.4 Hz, 1H, C[6]-H).

^{13}C-NMR (101 MHz, $CDCl_3$): δ = 16.1 (q, CH_2-*CH_3*), 27.2 (t, *CH_2*-CH_3), 30.1 (q, CO-*CH_3*), 125.7 (d, C[3]), 129.1 (d, C[6]), 130.6 (d, C[5]), 131.6 (d, C[4]), 138.1 (s, C[1]), 144.3 (s, C[2]), 202.4 (s, C=O).

GCMS of Compound 21: Retention time: 7.17 min. Main fragments: 253 (M^+, 31), 238 (16), 146 (21), 131 (75), 123 (100), 108 (48), 91 (31), 77 (49), 64 (23).

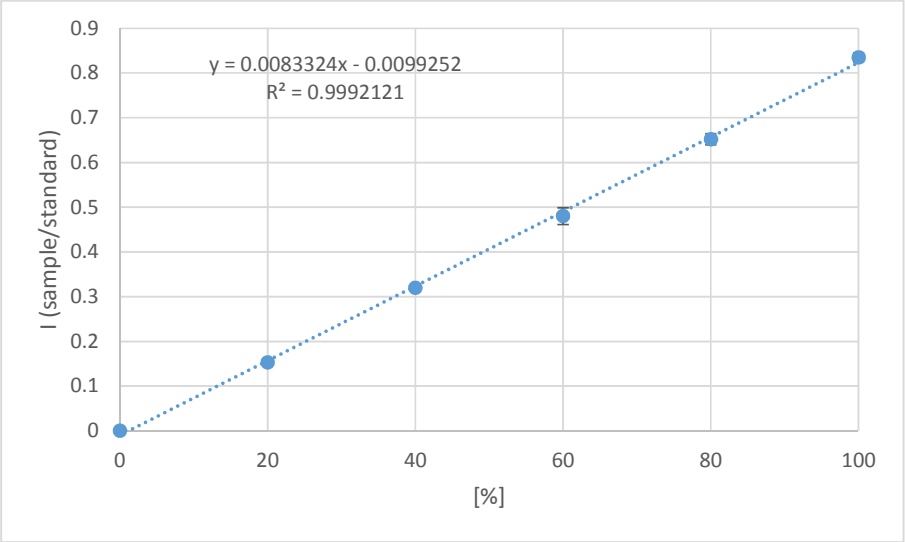
3.5. GC Calibration

3.5.1. General Procedure

The very pure compound was placed in a 10 ml volumetric flask and dissolved in 10 ml EtOAc. This stock solution was diluted 5 times by taking 0.8; 0.6; 0.4; 0.2 ml and backfilling the sample to 1 ml with EtOAc. Also a blank sample containing only 1 ml EtOAc without any compound was measured. At this stage, dodecane was added as internal standard to every 1 ml sample separately. The amount of compound (mol/ml) in the stock solution was calculated, and the same amount of dodecane was added to every sample. Each dilution series was performed twice, and each sample was measured twice by GC to exclude any operational failures in the procedure.

3.5.2. N-Benzyl-3-methylpiridin-2-amine (1)

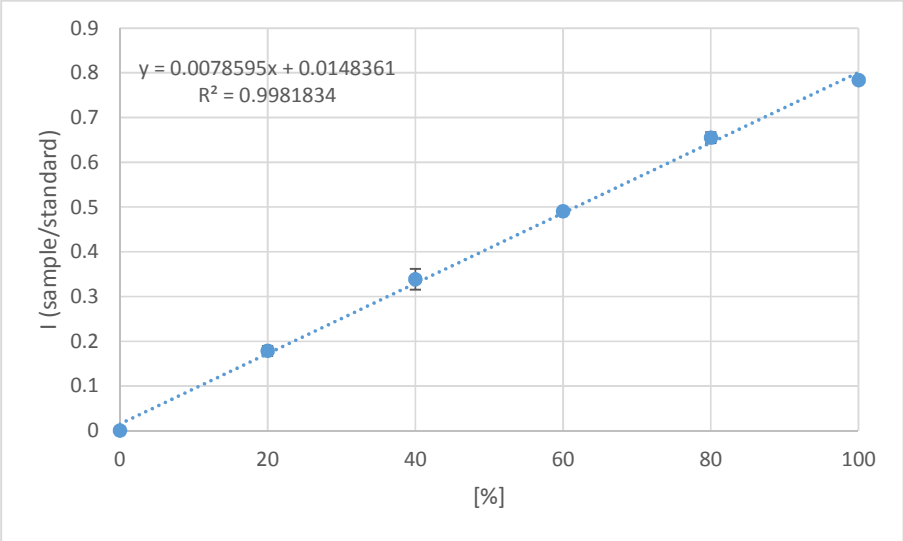
	WP [mg]	Stock sol. [mg/ml]	n [mmol]	[µl]
Compound 1	50.7	5.07	0.0256	
Dodecane			0.0256	5.8



Exp.	Compound	Standard	C/STD	Average	St.deva	Yield [%]
1A	4795378	5772722	0.8307	0.8351	0.0063	100
1B	4968112	5917073	0.8396			
2A	3591105	5629744	0.6379	0.6519	0.0199	80
2B	3954529	5936940	0.6661			
3A	2957209	6169331	0.4793	0.4802	0.0012	60
3B	2760808	5738035	0.4811			
4A	1942723	5979335	0.3249	0.3194	0.0076	40
4B	1781911	5673429	0.3140			
5A	908326	5693157	0.1595	0.1532	0.0088	20
5B	893569	6078104	0.1470			
6A	0	6015655	0	0	0	0
6B	0	6200815	0			

3.5.3. 3-Methyl-N-(1-phenylpropyl)pyridin-2-amine (2)

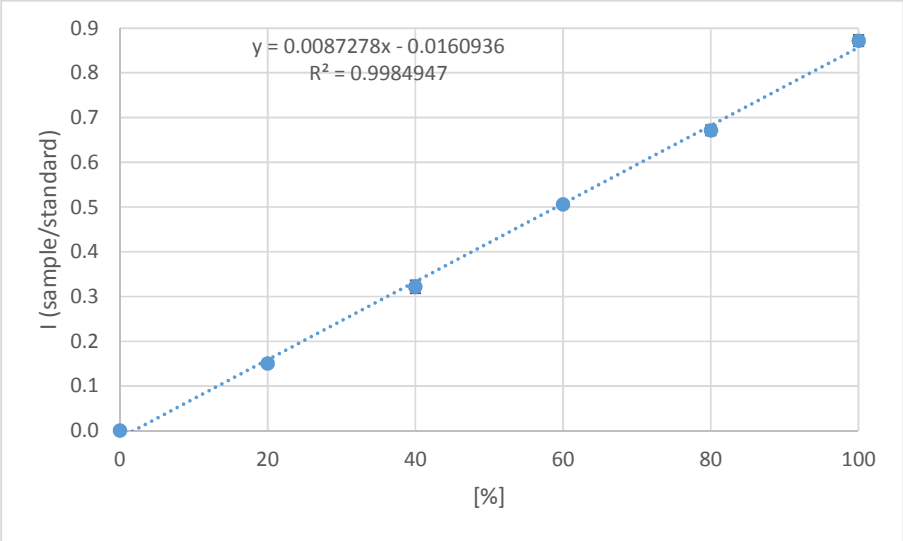
	WP [mg]	Stock sol. [mg/ml]	n [mmol]	[µl]
Compound 2	51.9	5.19	0.0229	
Dodecane			0.0229	5.2



Exp.	Compound	Standard	C/STD	Average	St.deva	Yield [%]
1A	5338061	6838969	0.7805	0.7839	0.0048	100
1B	5368112	6817073	0.7874			
2A	4542839	6838969	0.6642	0.6553	0.0126	80
2B	4354529	6736940	0.6463			
3A	3269098	6684184	0.4890	0.4902	0.0017	60
3B	3360808	6838035	0.4914			
4A	2427078	6833748	0.3551	0.3386	0.0233	40
4B	2181911	6773429	0.3221			
5A	1204454	7049999	0.1708	0.1786	0.0110	20
5B	1263569	6778104	0.1864			
6A	0	6515655	0	0	0	0
6B	0	6700815	0			

3.5.4. 3-Methyl-N-(1-phenylpentyl)pyridin-2-amine (4)

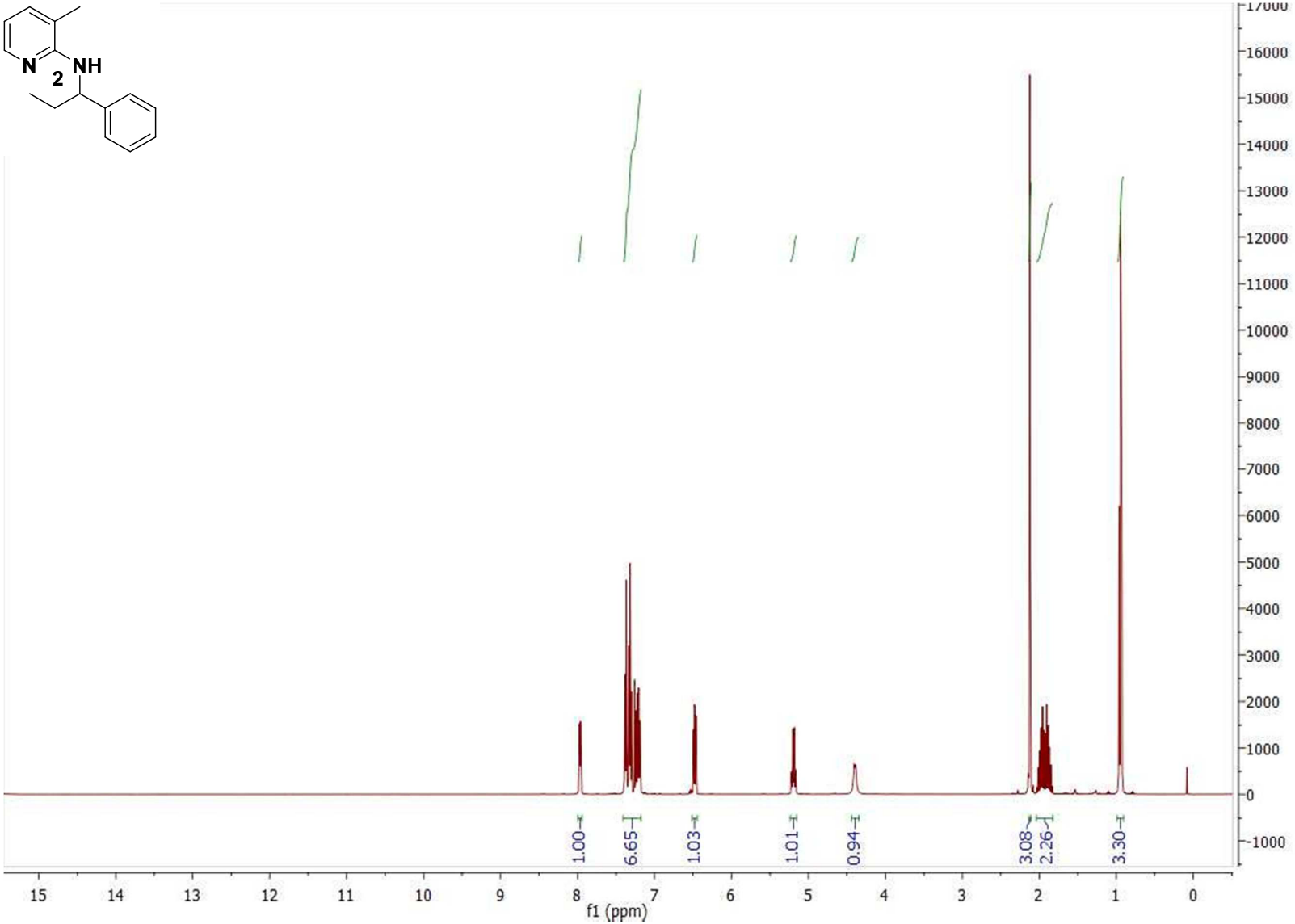
	WP [mg]	Stock sol. [mg/ml]	n [mmol]	[µl]
Compound 4	56.3	5.63	0.0221	
Dodecane			0.0221	5.0



Exp.	Compound	Standard	C/STD	Average	St.deva	Yield [%]
1A	7083177	8206139	0,8632	0.8722	0.0127	100
1B	7125337	8086306	0,8812			
2A	5460570	8226270	0,6638	0.6717	0.0112	80
2B	5452322	8022359	0,6796			
3A	4087478	8112093	0,5039	0.5059	0.0029	60
3B	4148791	8167410	0,5080			
4A	2850068	8587257	0,3319	0.3218	0.0143	40
4B	2647071	8492676	0,3117			
5A	1095848	7244834	0,1513	0.1502	0.0015	20
5B	1167961	7831471	0,1491			
6A	0	8112093	0	0	0	0
6B	0	8167410	0			

4. NMR Spectra of New Compounds

NMR Spectra of new compounds will follow in the next pages.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3.30
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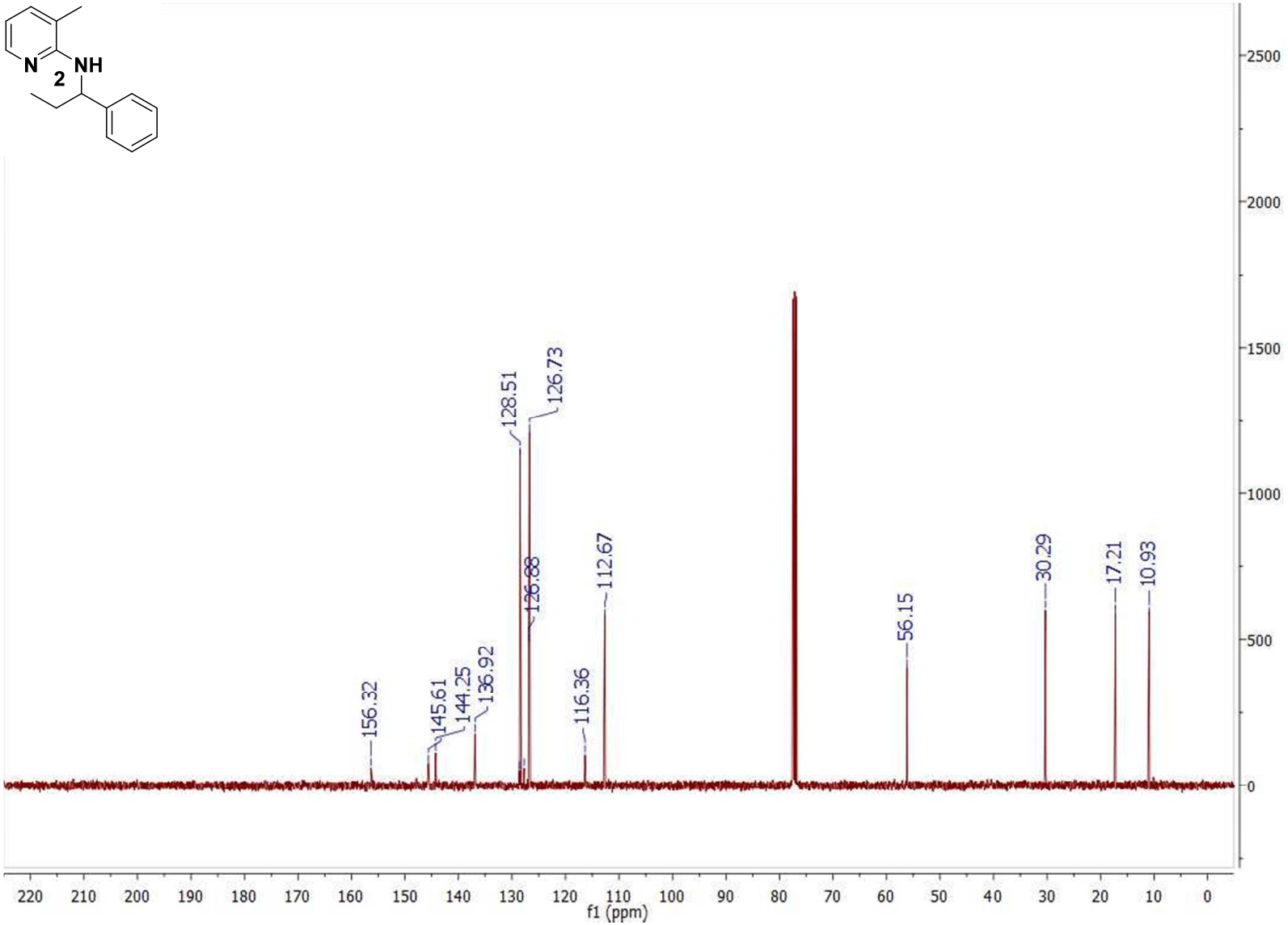
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112.67
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10.93
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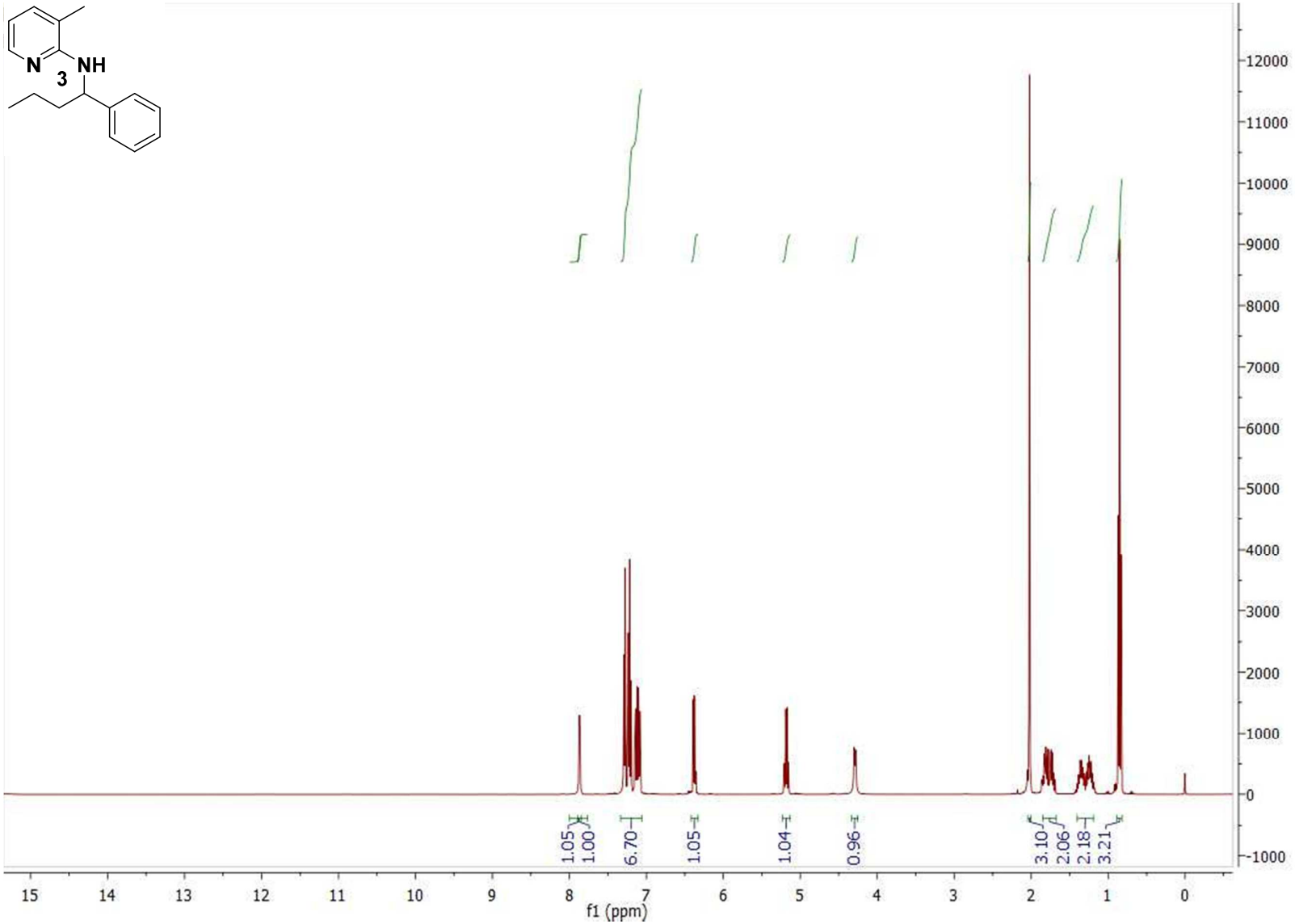
2000
1500
1000
500
0
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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4000
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1000
0
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1.00
6.70
1.05
1.04
0.96
3.10
2.06
2.18
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15
14
13
12
11
10
9
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7
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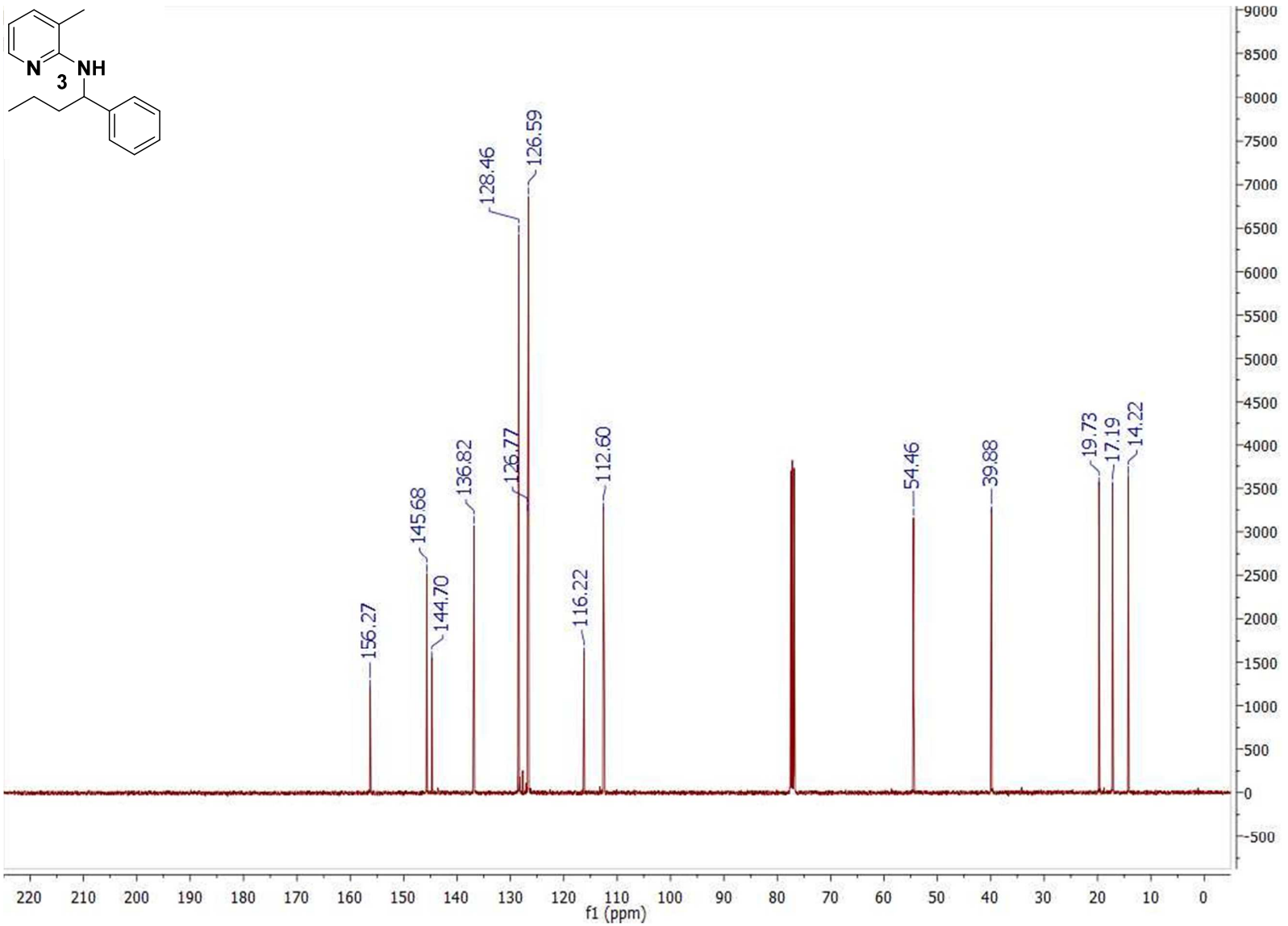
5
4
3
2
1
0
f1 (ppm)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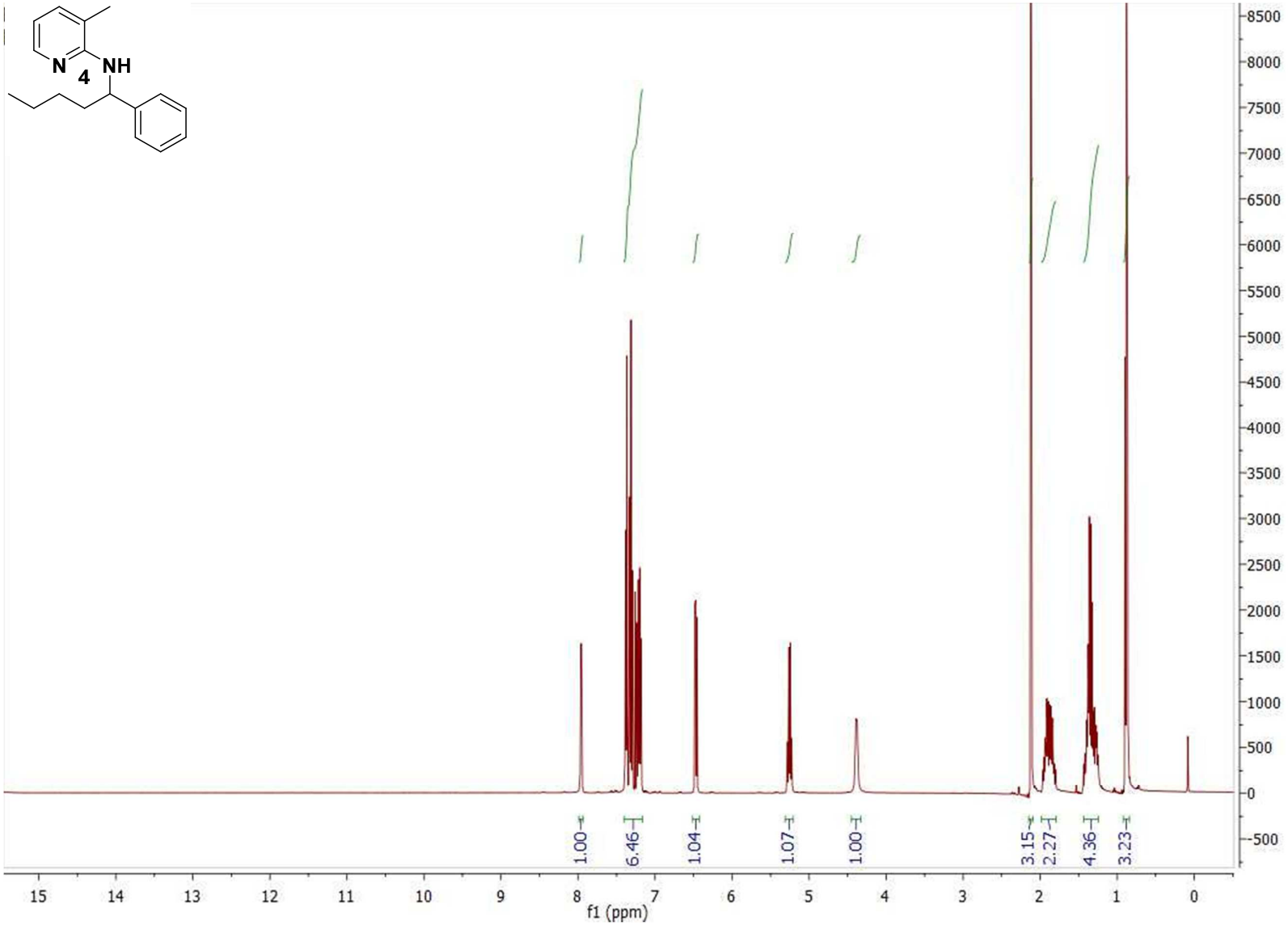
f1 (ppm)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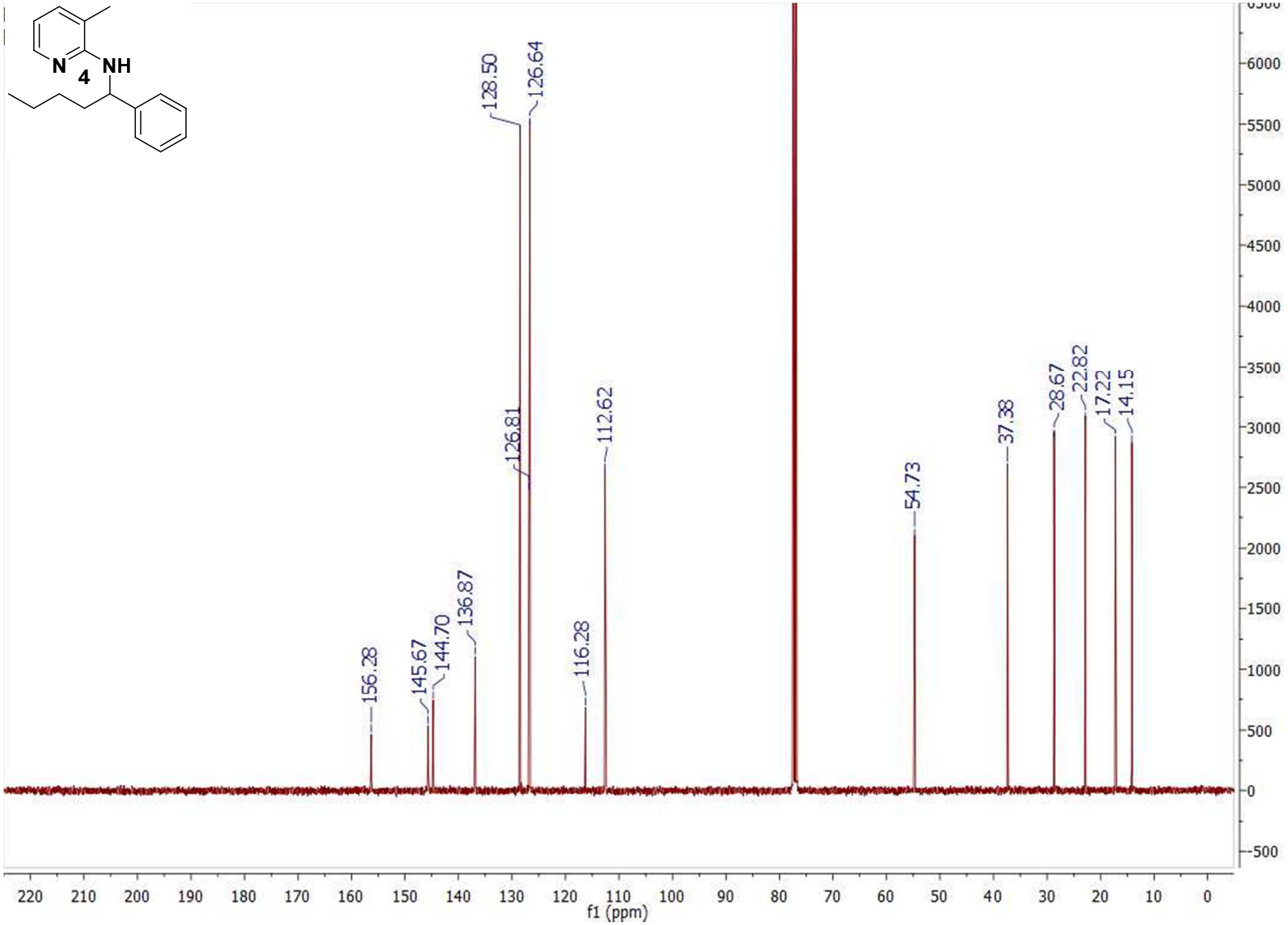
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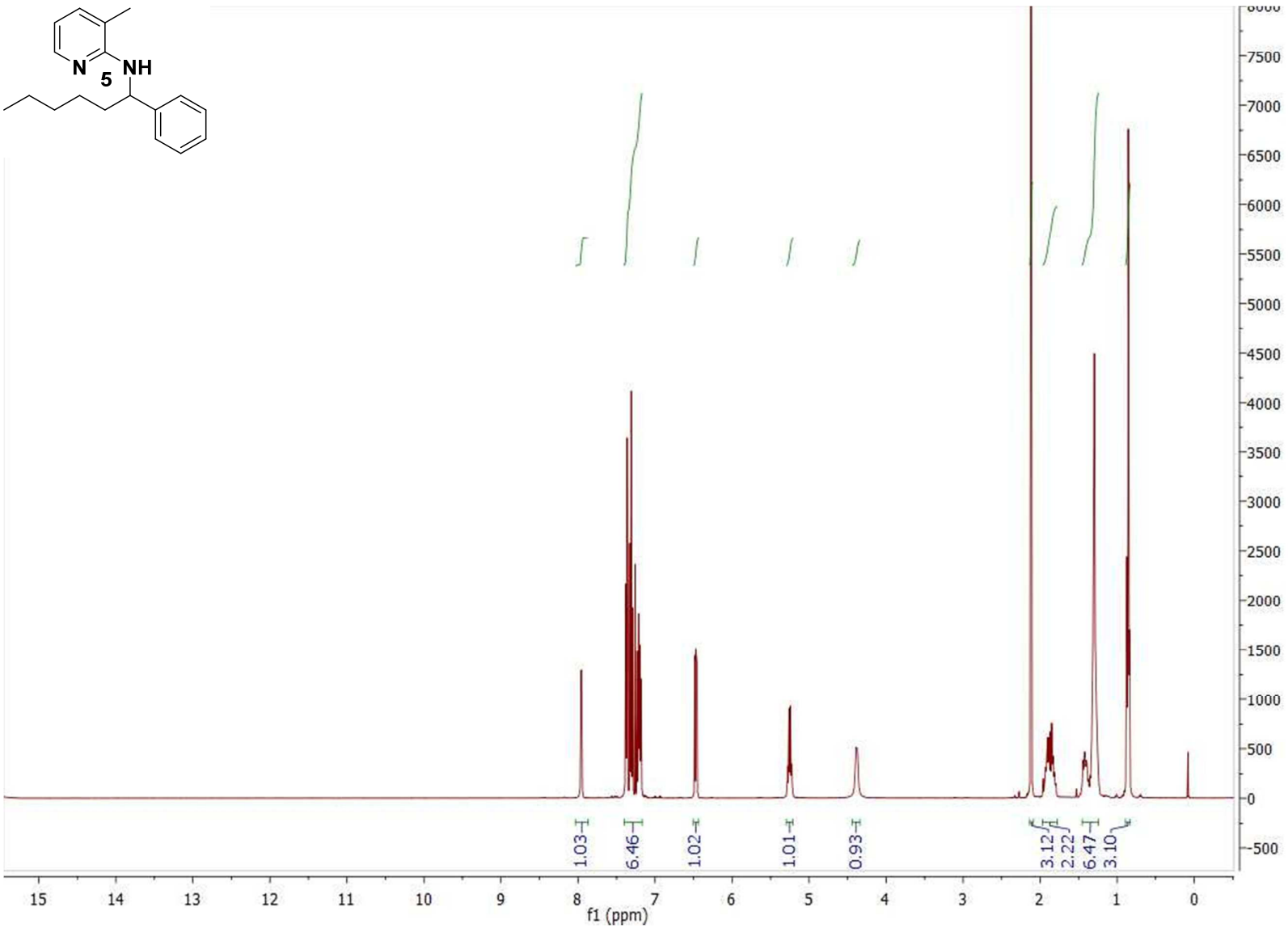
28.67
22.82
17.22
14.15
f1 (ppm)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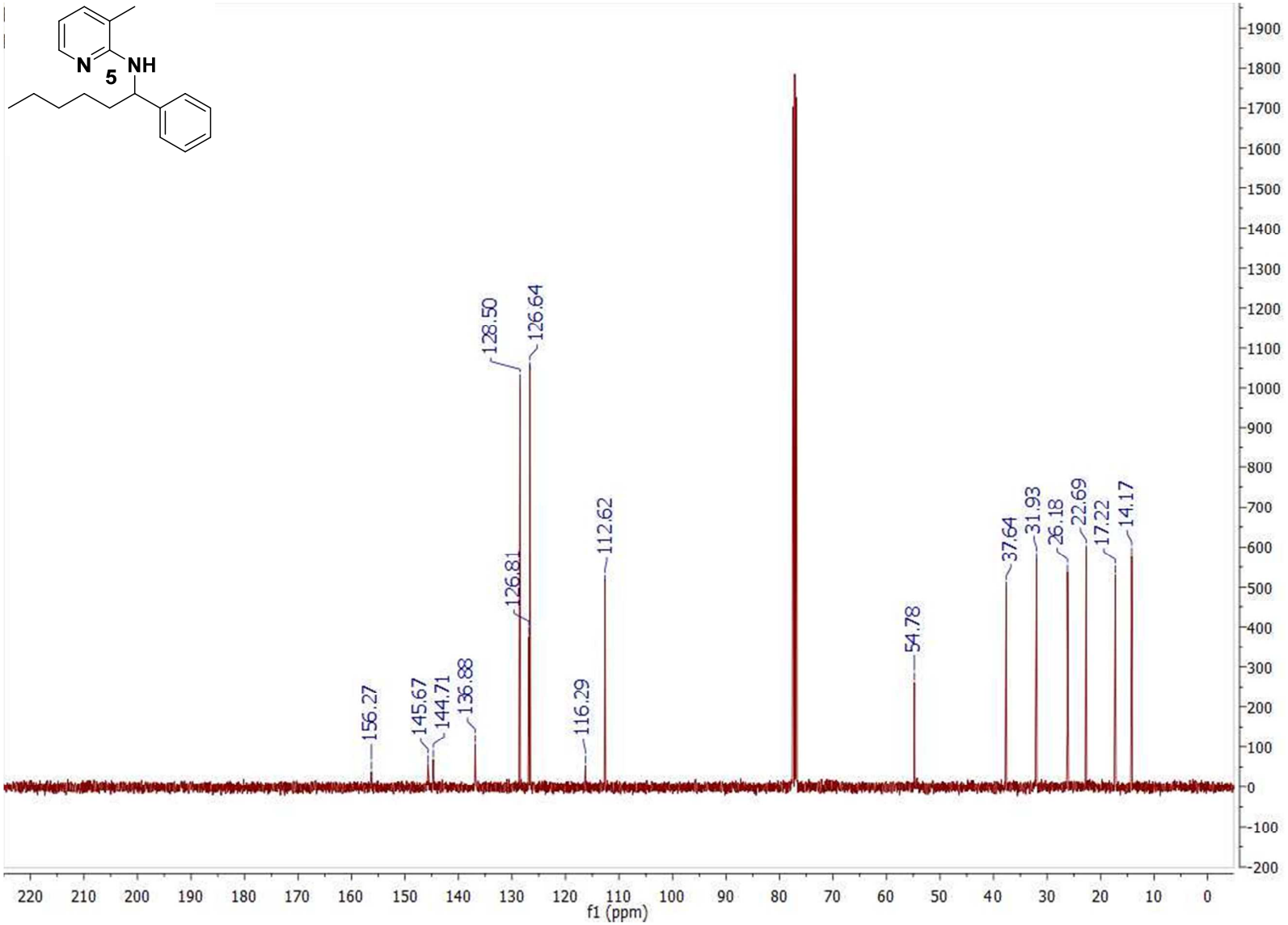
f1 (ppm)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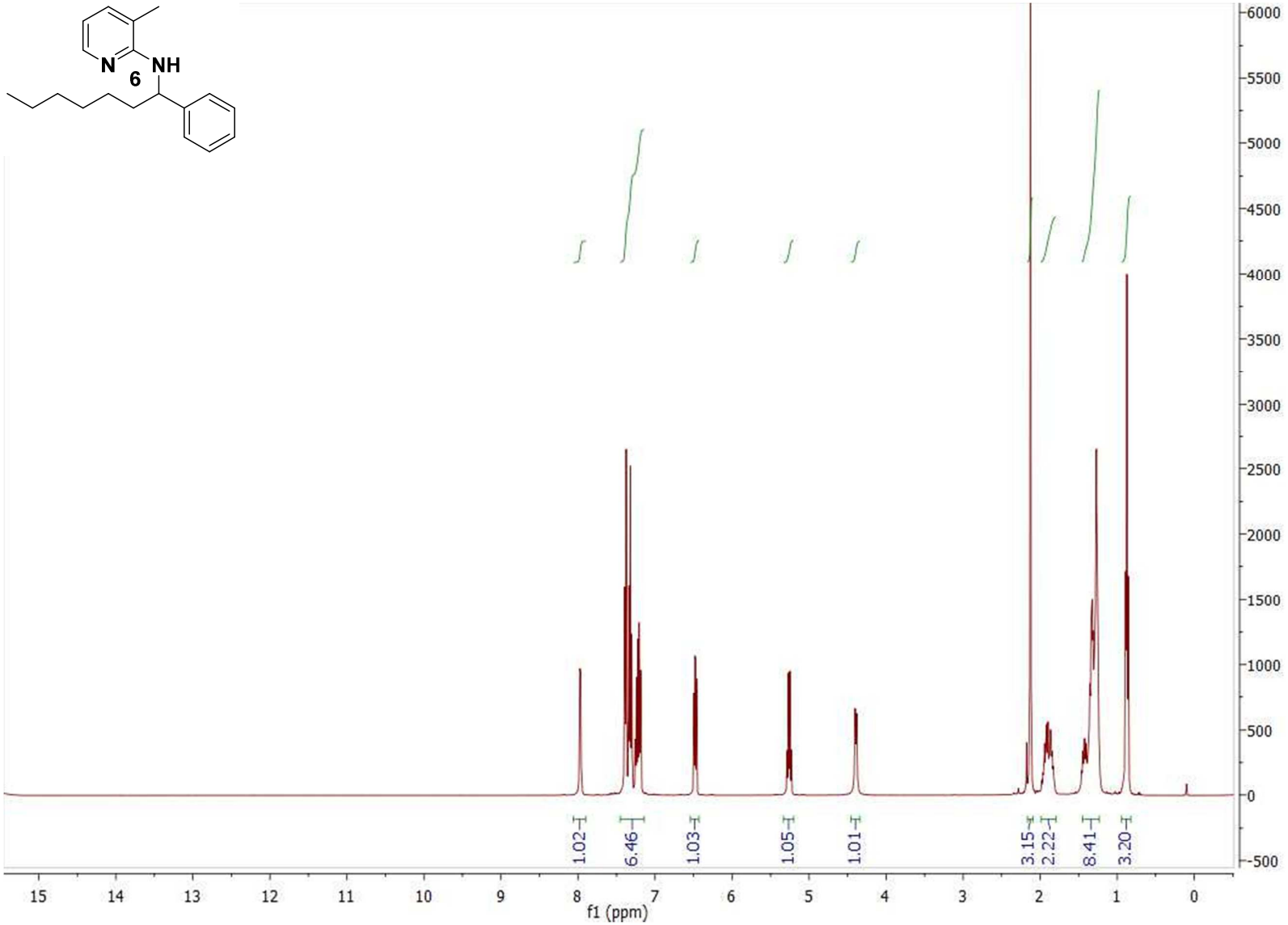
37.64
31.93
26.18
22.69
17.22
14.17
f1 (ppm)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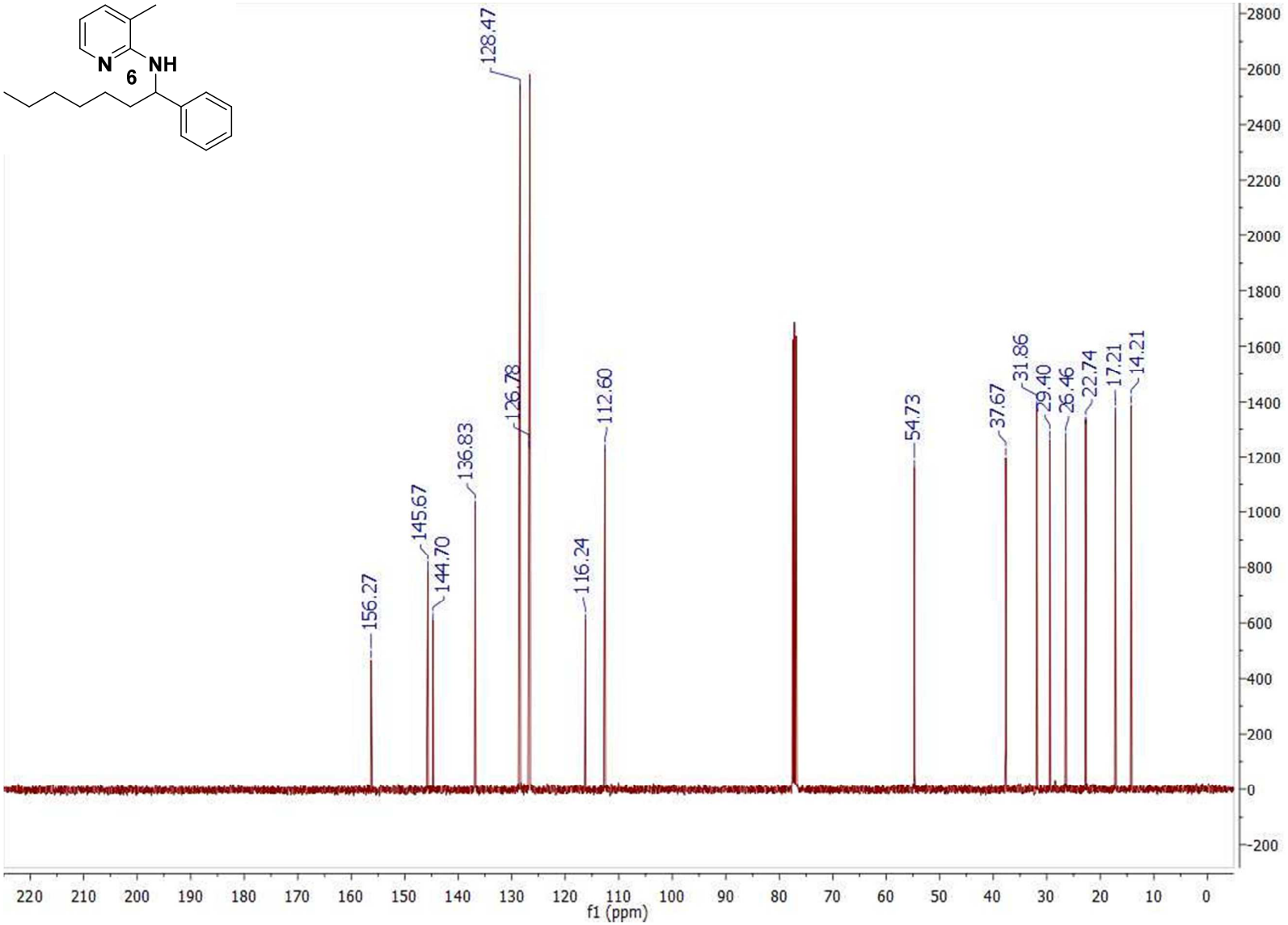
6
NH
1.02
6.46
1.03
1.05
1.01
3.15
2.22
8.41
3.20
f1 (ppm)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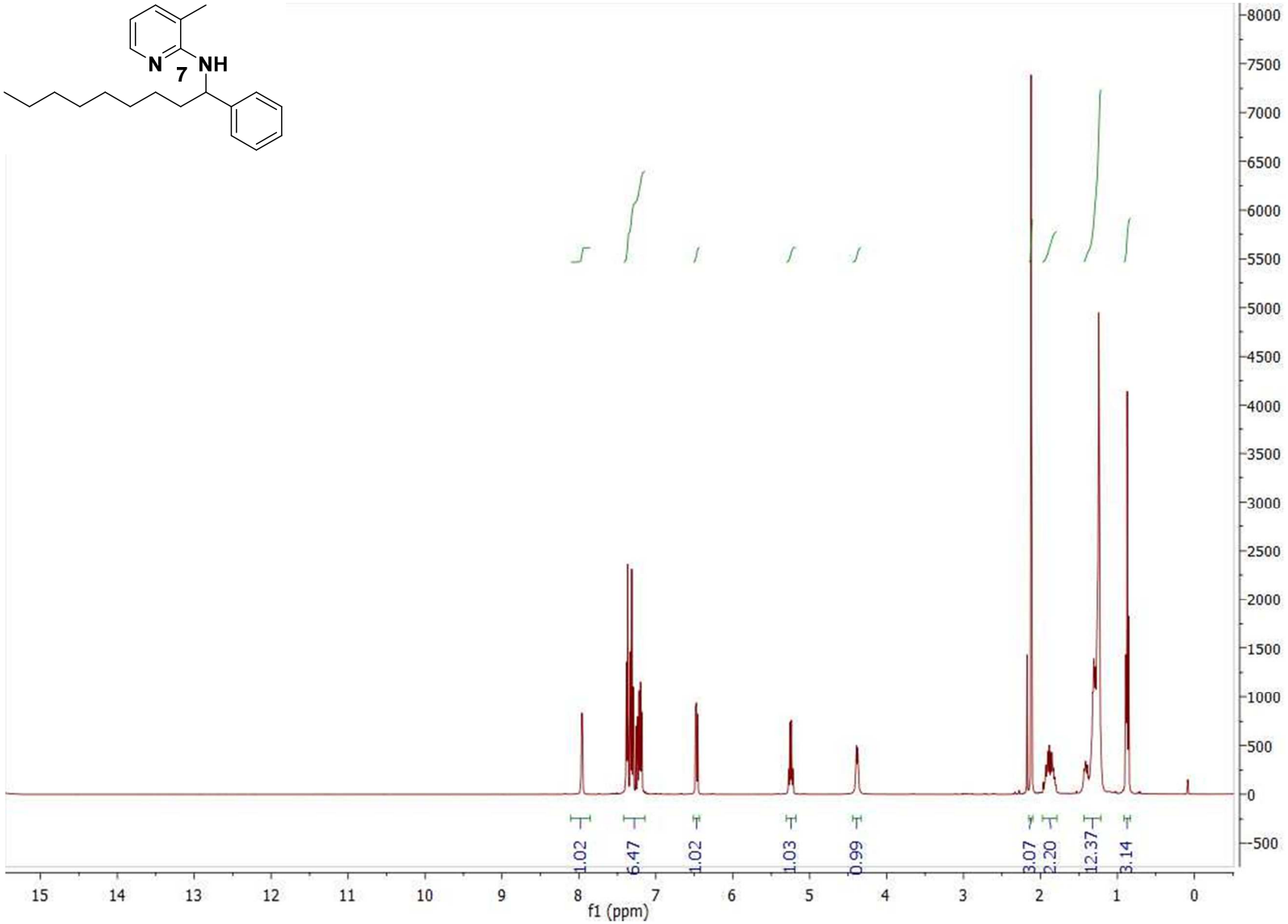
6
NH
128.47
126.78
112.60
136.83
145.67
144.70
156.27
116.24
54.73
37.67
31.86
29.40
26.46
22.74
17.21
14.21
f1 (ppm)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7
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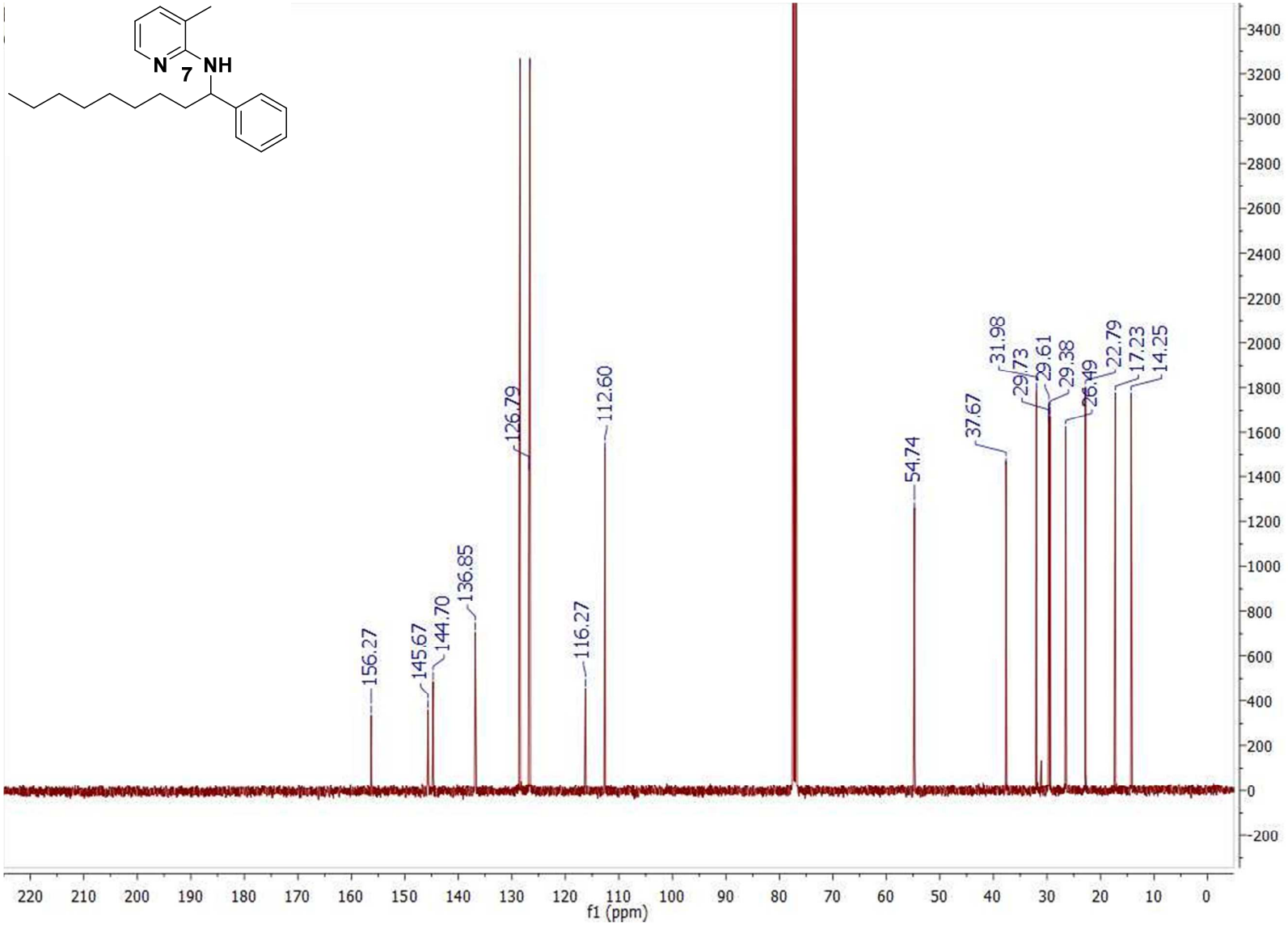
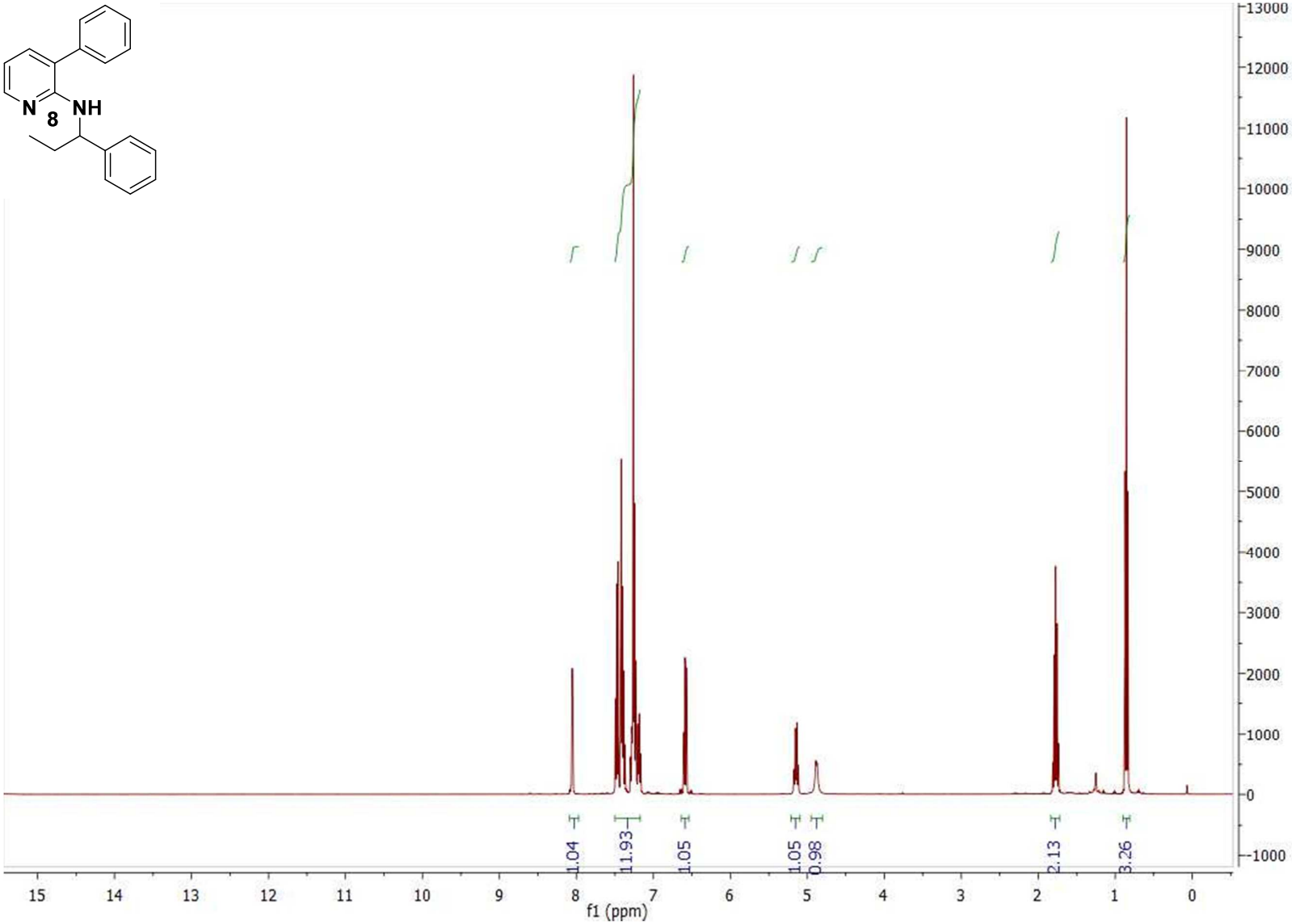
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
1.02
6.47
1.02
1.03
0.99
3.07
2.20
12.37
3.14
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)


N
7
NH
156.27
145.67
144.70
136.85
126.79
116.27
112.60
54.74
37.67
31.98
29.73
29.61
29.38
26.49
22.79
17.23
14.25
f1 (ppm)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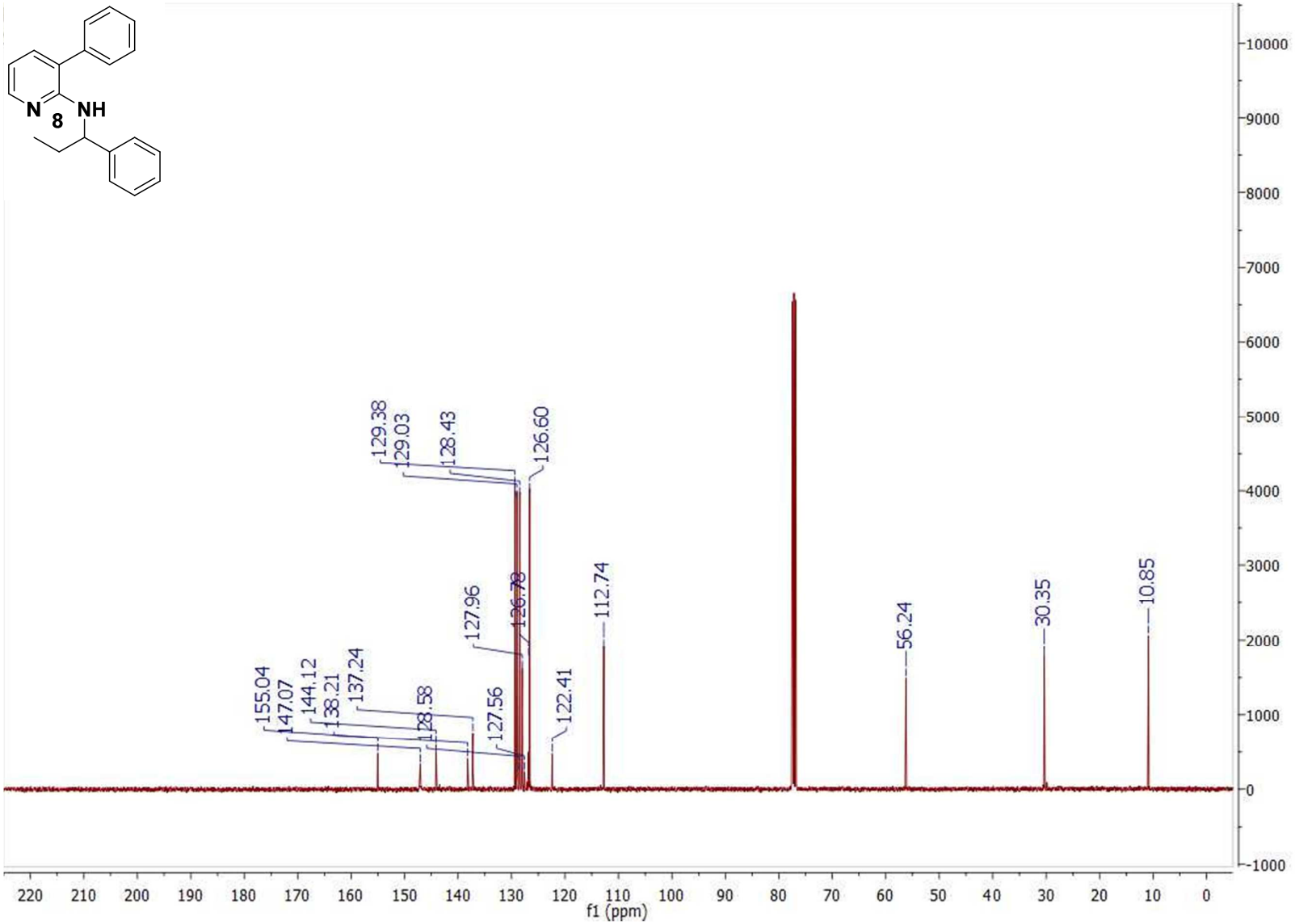
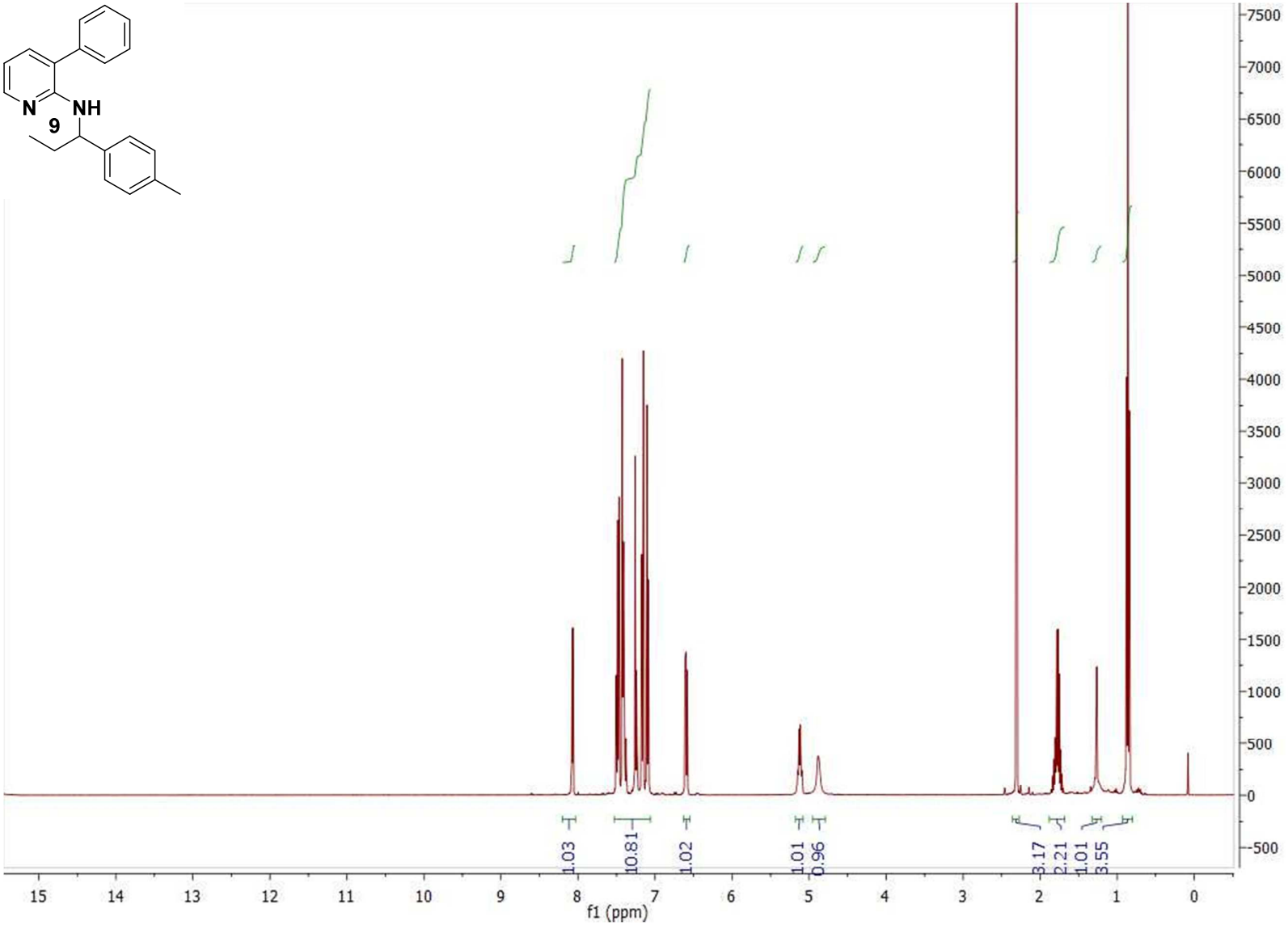
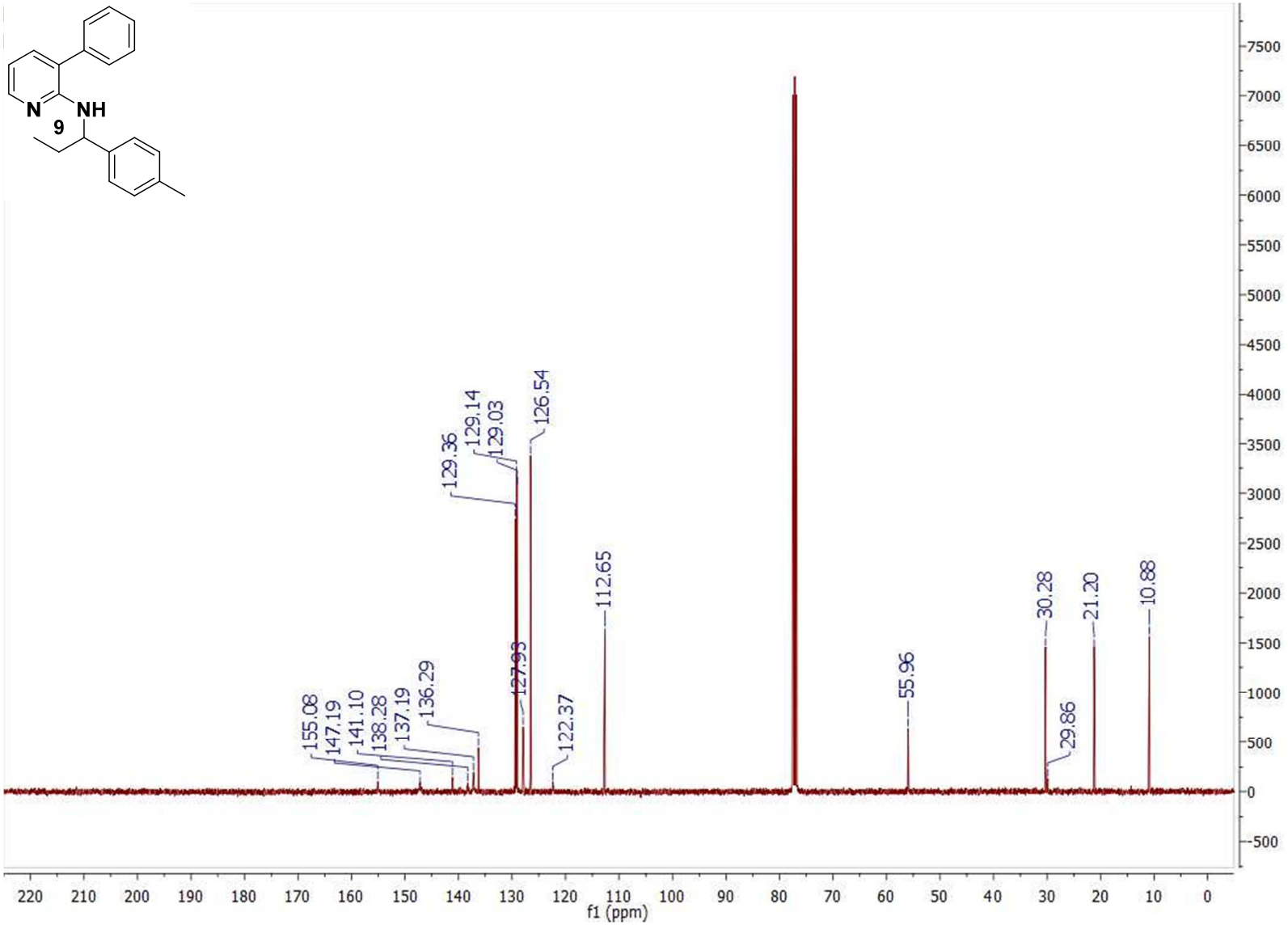
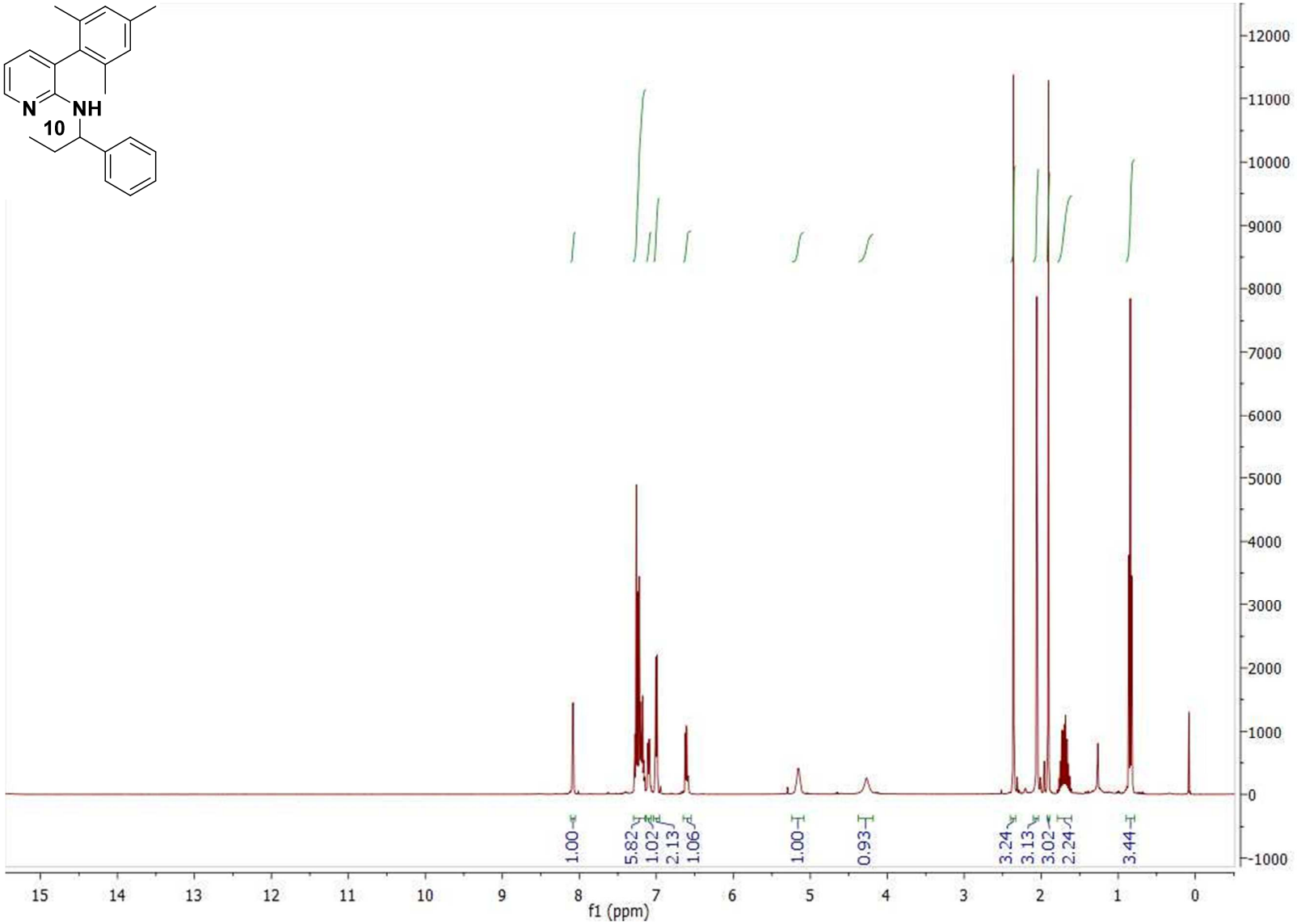
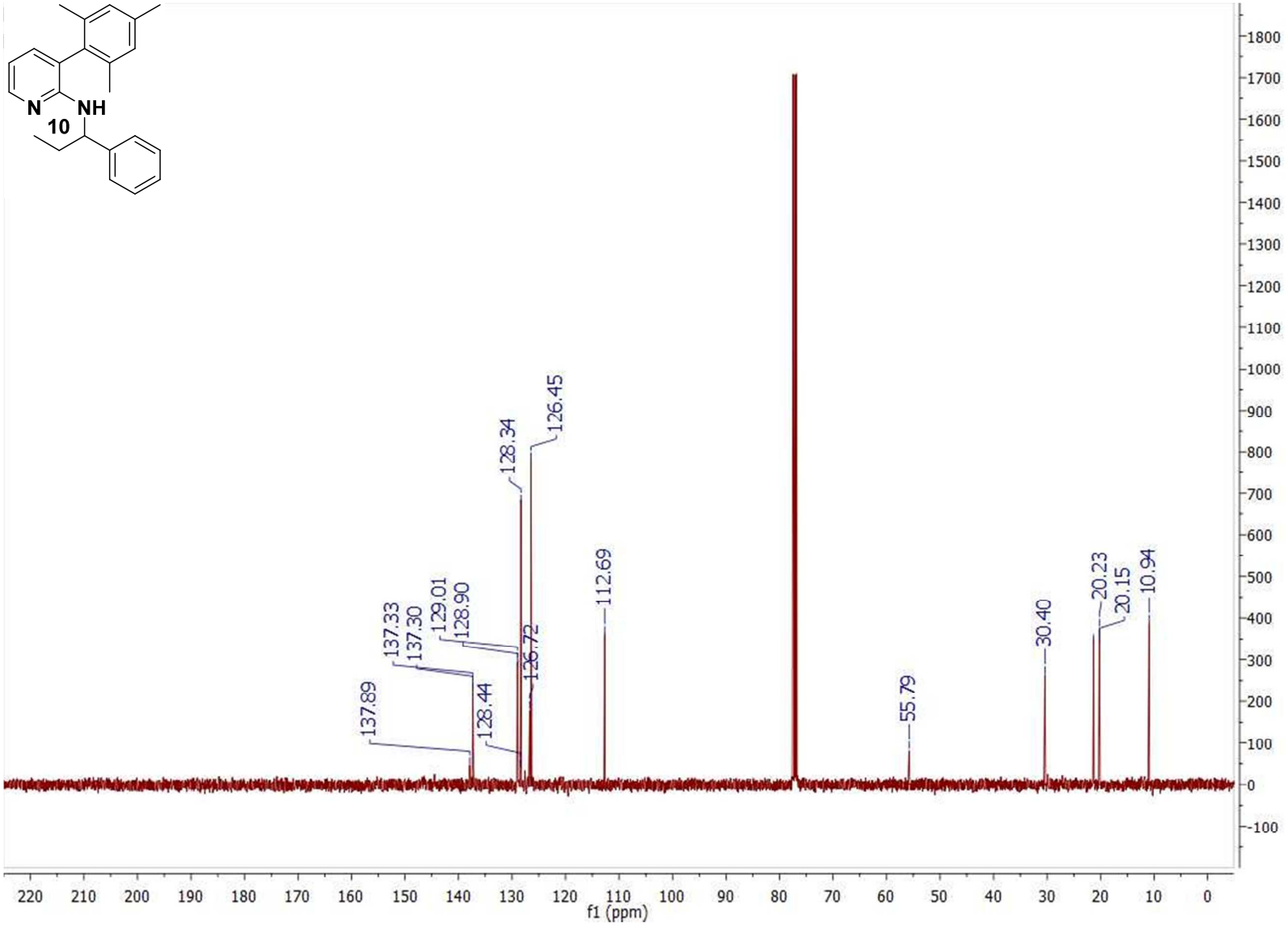
8
NH
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.04
11.93
1.05
1.05
0.98
2.13
3.26
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)

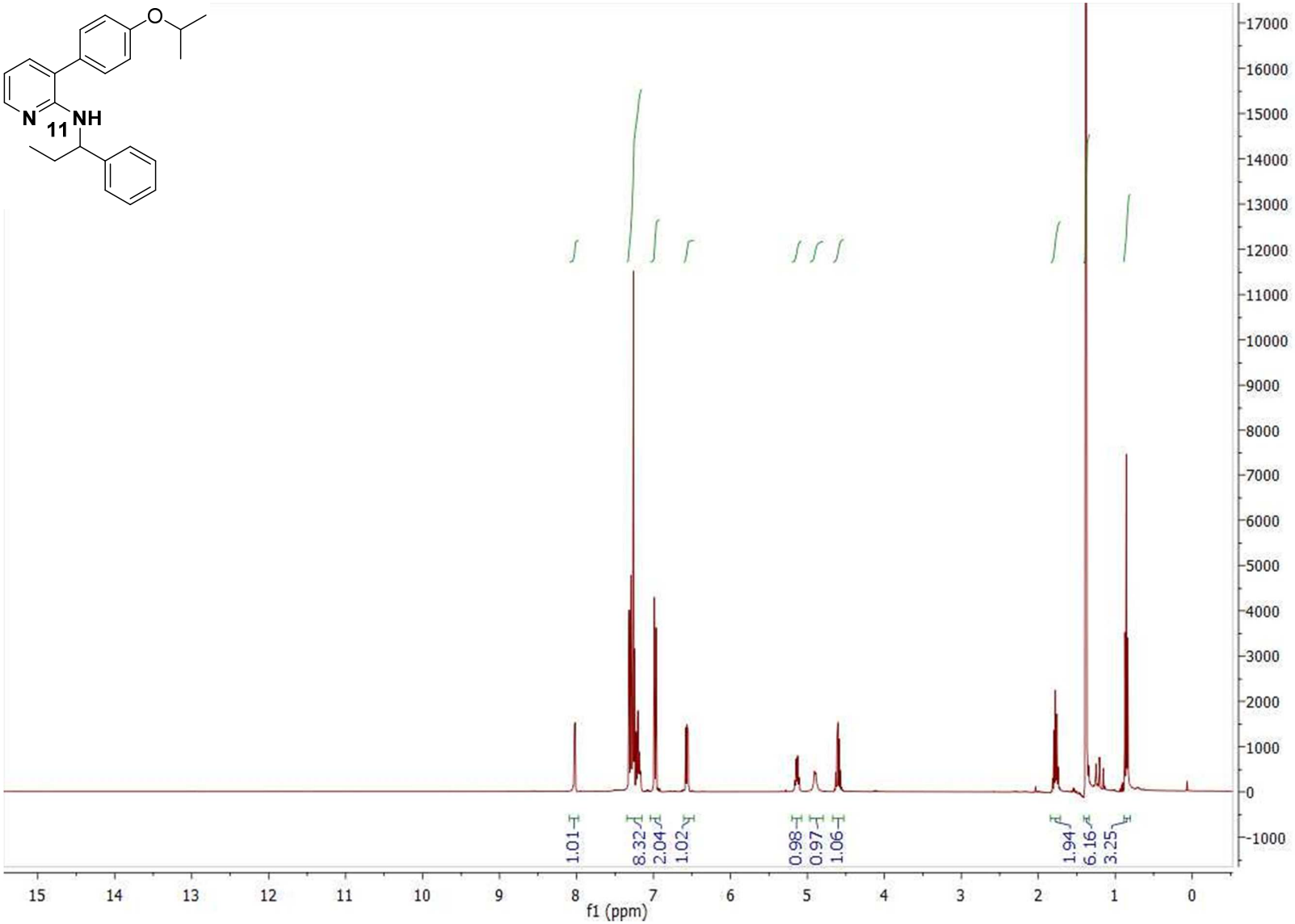

N
8
NH
155.04
147.07
144.12
138.21
137.24
128.58
127.96
127.56
126.78
126.60
129.38
129.03
128.43
122.41
112.74
56.24
30.35
10.85
f1 (ppm)

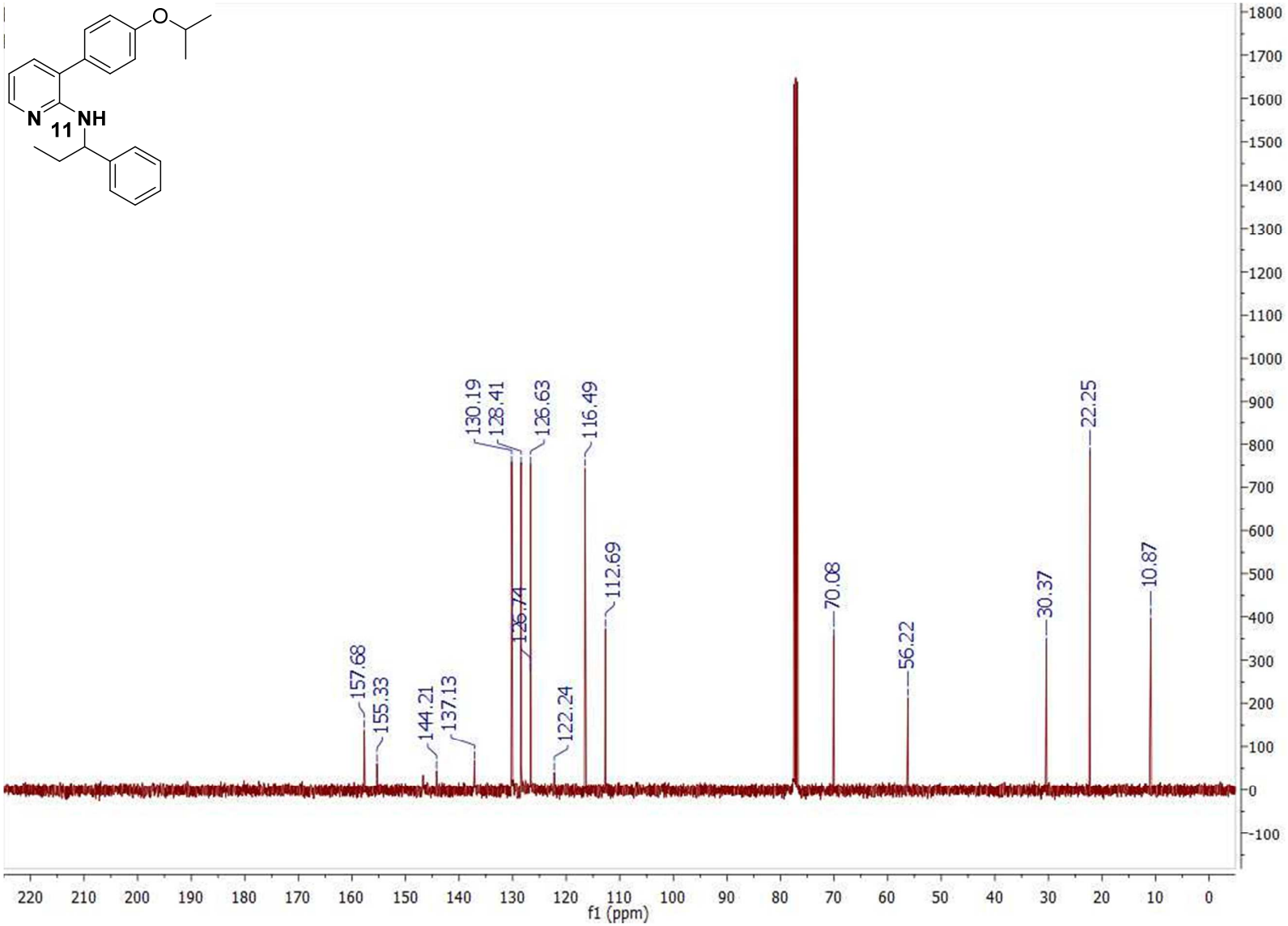

N
NH
9
1.03
10.81
1.02
1.01
0.96
3.17
2.21
1.01
3.55
f1 (ppm)

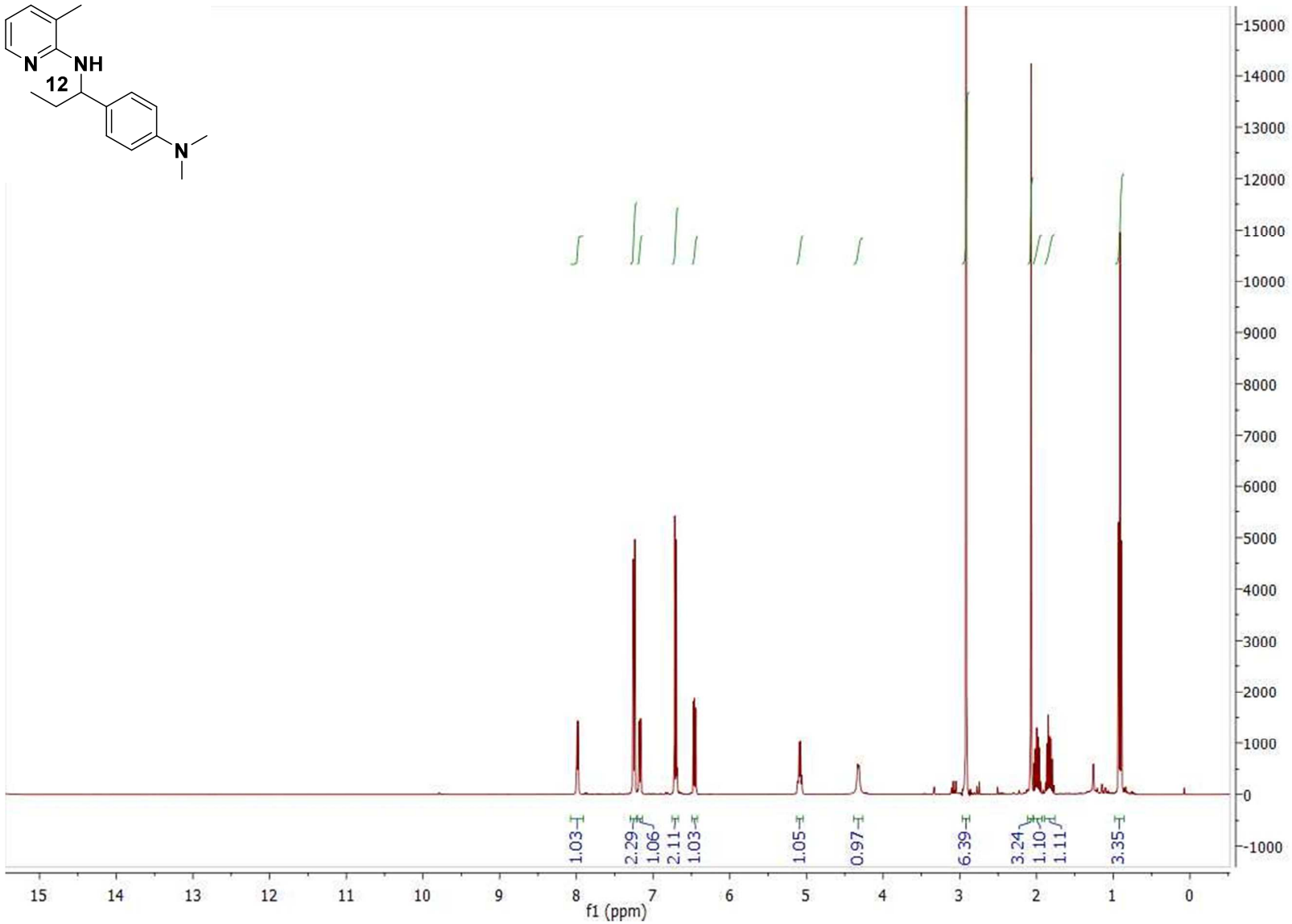

N
NH
9
155.08
147.19
141.10
138.28
137.19
136.29
129.36
129.14
129.03
127.93
126.54
122.37
112.65
55.96
30.28
29.86
21.20
10.88
f1 (ppm)

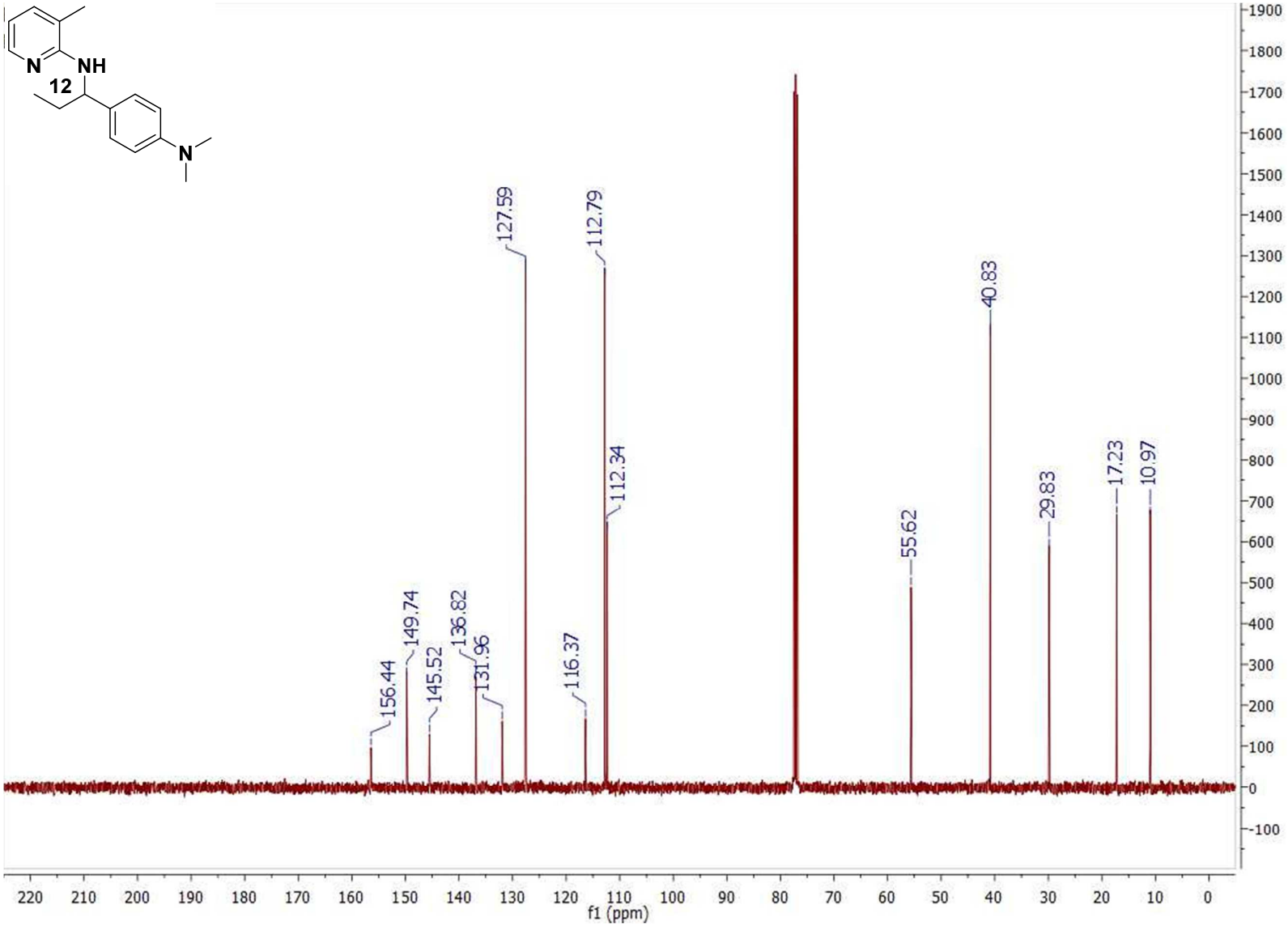

N
NH
10
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.00
5.82
1.02
2.13
1.06
1.00
0.93
3.24
3.13
3.02
2.24
3.44
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)

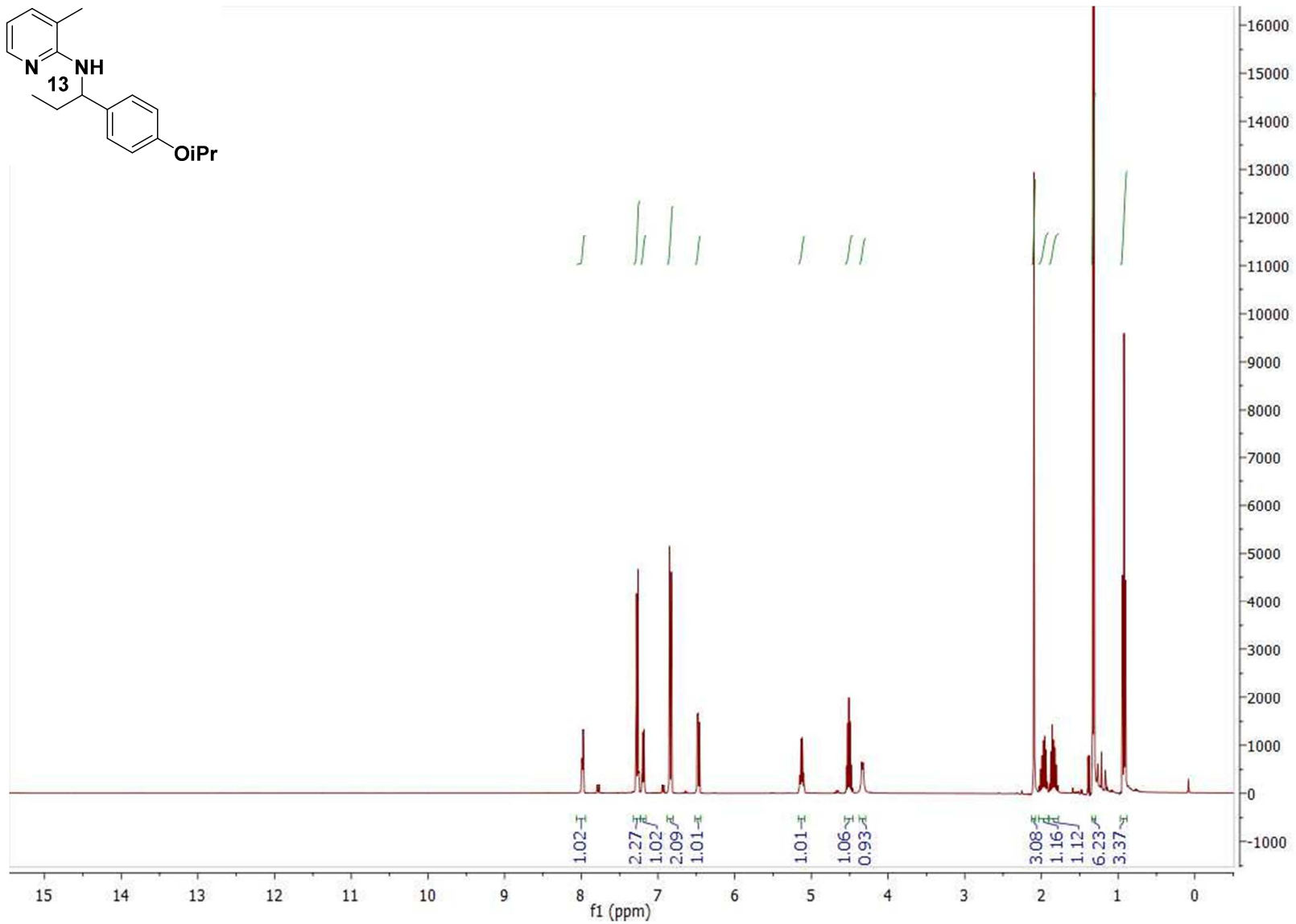

N
NH
10
137.89
137.33
137.30
129.01
128.90
128.44
128.34
126.72
126.45
112.69
55.79
30.40
20.23
20.15
10.94
f1 (ppm)

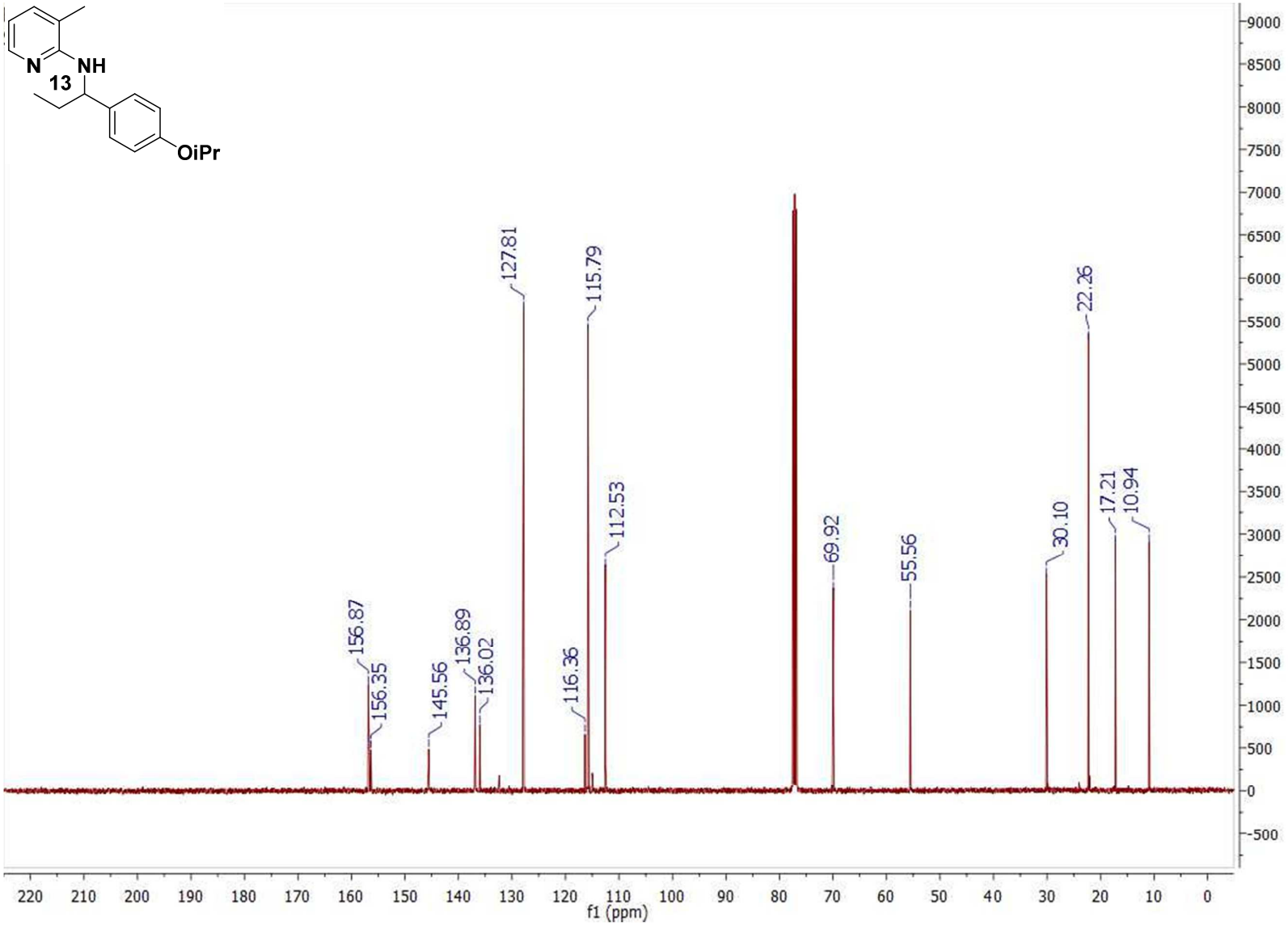

O
N
NH
11
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.01
8.32
2.04
1.02
0.98
0.97
1.06
1.94
6.16
3.25
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)

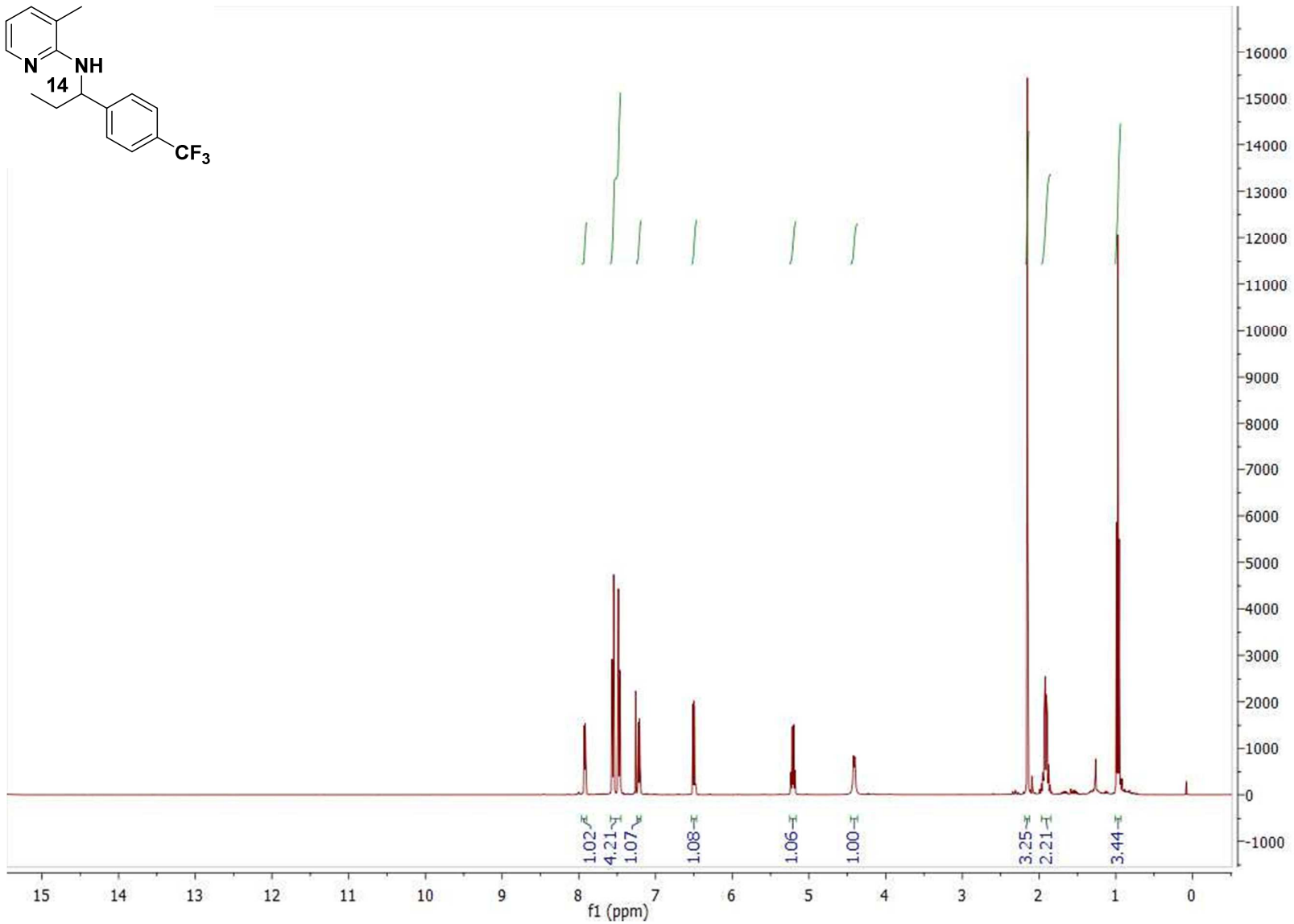

O
N
NH
11
157.68
155.33
144.21
137.13
130.19
128.41
126.74
126.63
122.24
116.49
112.69
70.08
56.22
30.37
22.25
10.87
f1 (ppm)

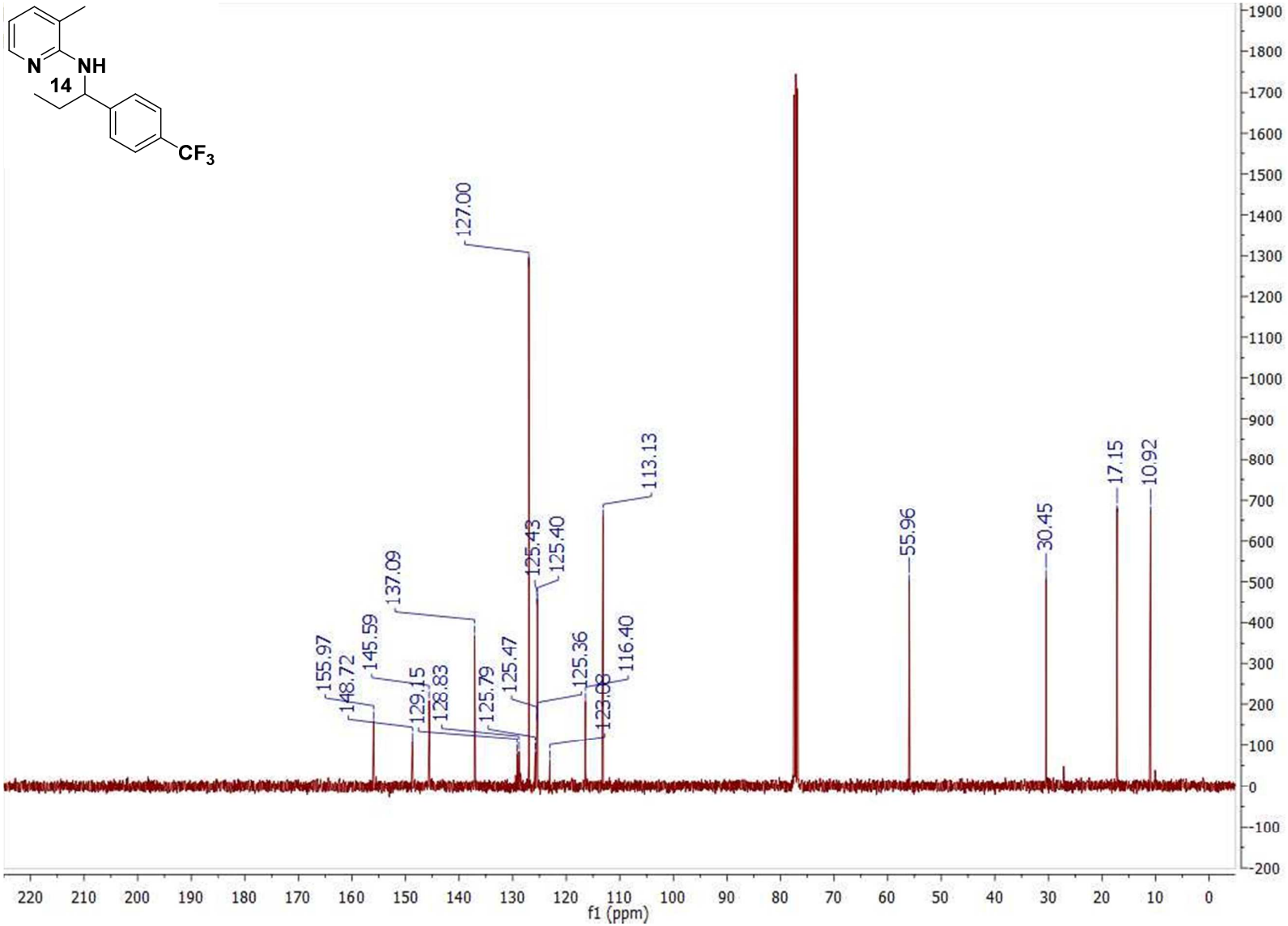

N
NH
12
N
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.03
2.29
1.06
2.11
1.03
1.05
0.97
6.39
3.24
1.10
1.11
3.35
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)

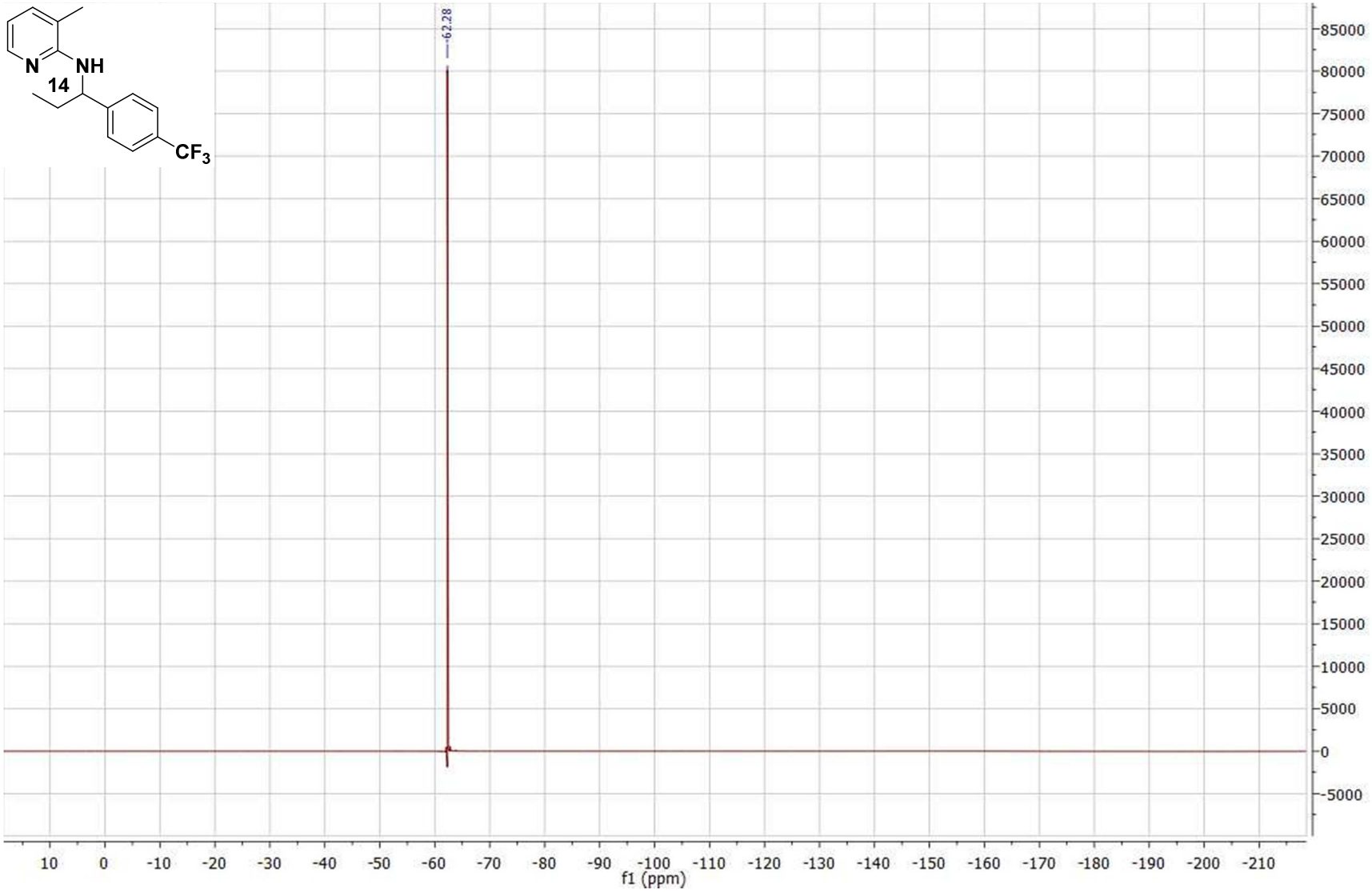

N
NH
12
N
156.44
149.74
145.52
136.82
131.96
127.59
116.37
112.79
112.34
55.62
40.83
29.83
17.23
10.97
f1 (ppm)


N
NH
13
OiPr
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.02
2.27
1.02
2.09
1.01
1.01
1.06
0.93
3.08
1.16
1.12
6.23
3.37
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)


N
NH
13
OiPr
156.87
156.35
145.56
136.89
136.02
127.81
116.36
115.79
112.53
69.92
55.56
30.10
22.36
17.21
10.94
f1 (ppm)


N
NH
14
CF3
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.02
4.21
1.07
1.08
1.06
1.00
3.25
2.21
3.44
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)


N
NH
14
CF3
127.00
113.13
125.43
125.40
137.09
155.97
148.72
145.59
129.15
128.83
125.79
125.47
125.36
123.08
116.40
55.96
30.45
17.15
10.92
f1 (ppm)


N
NH
14
CF3
-62.28
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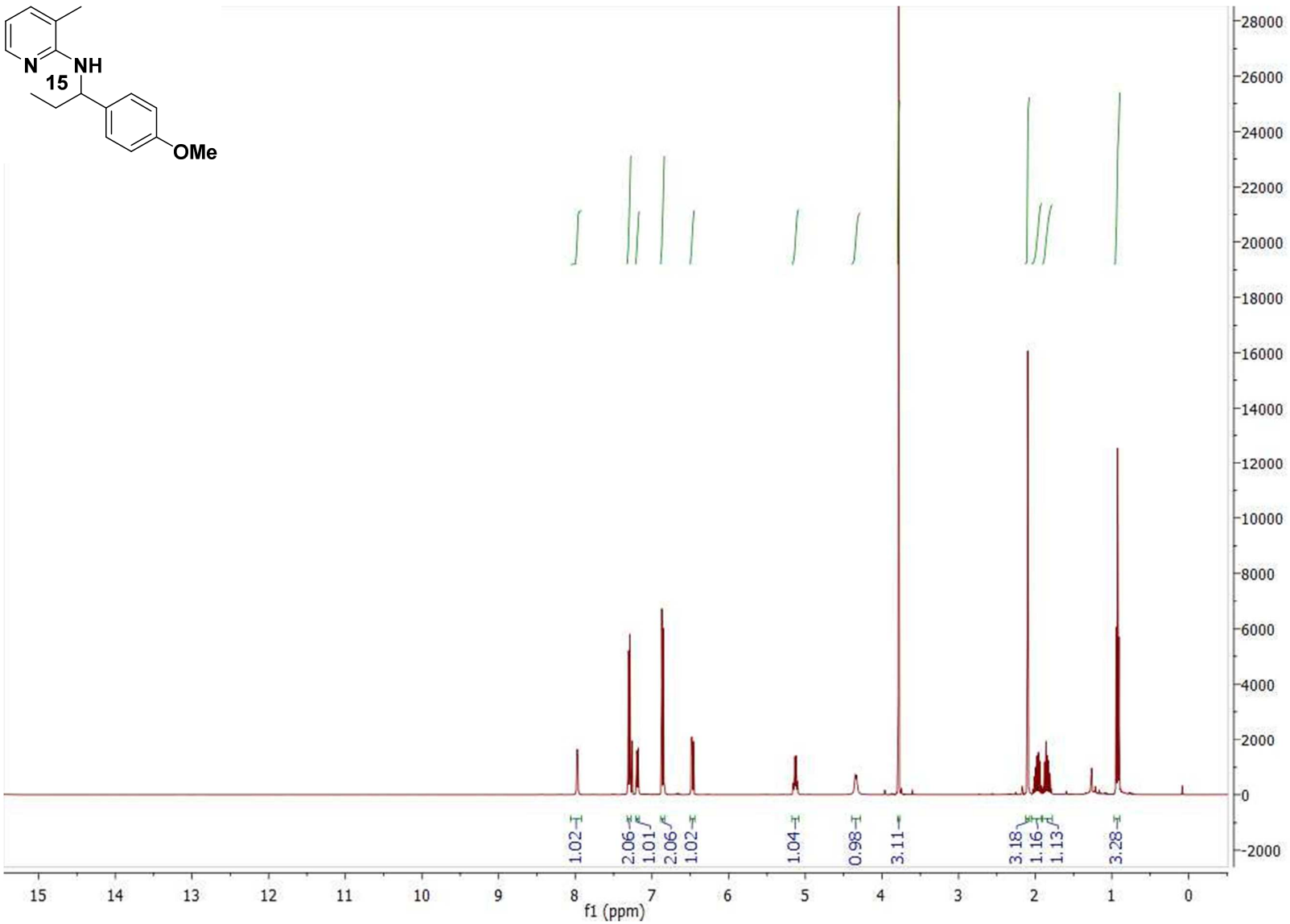
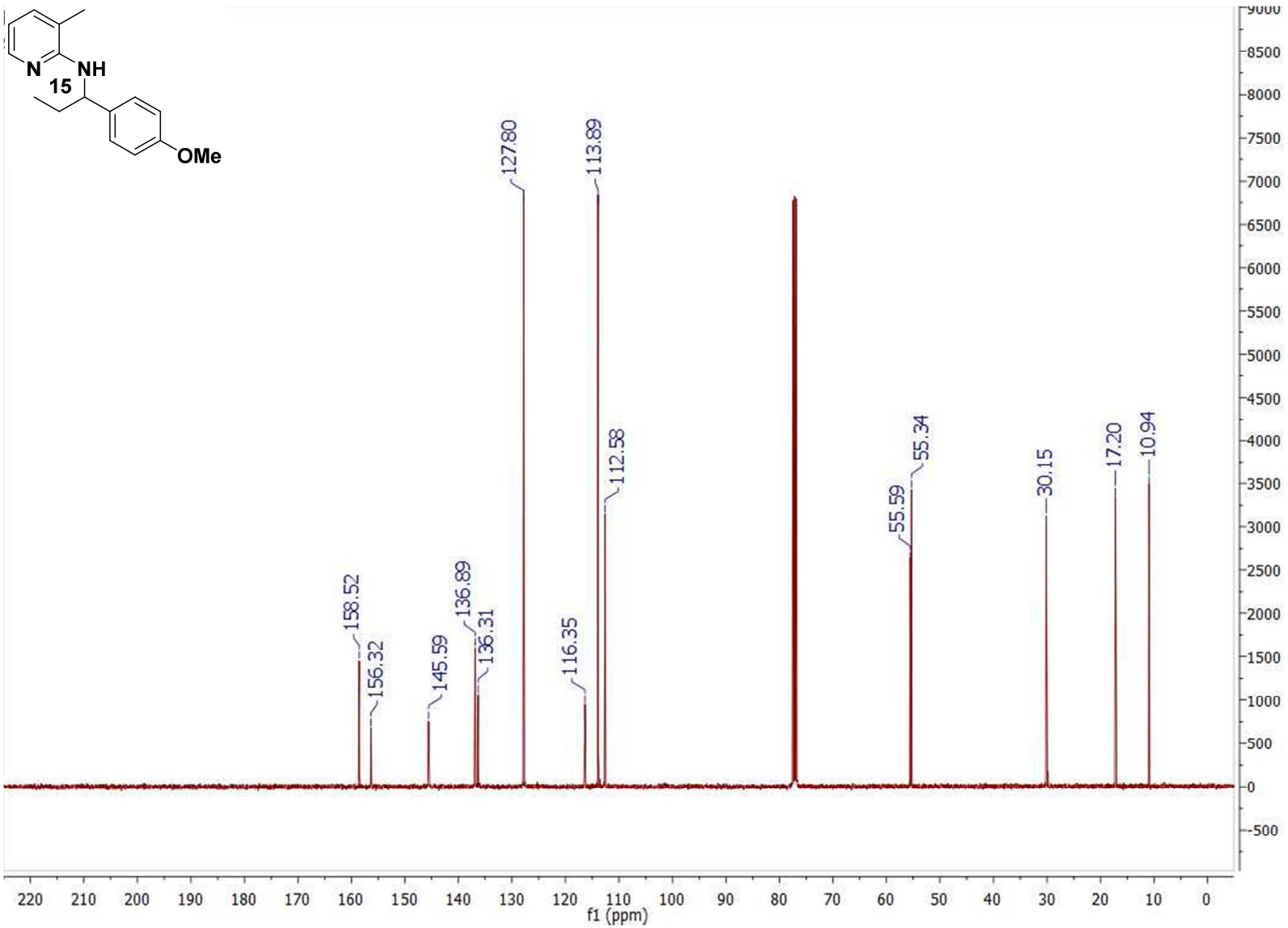
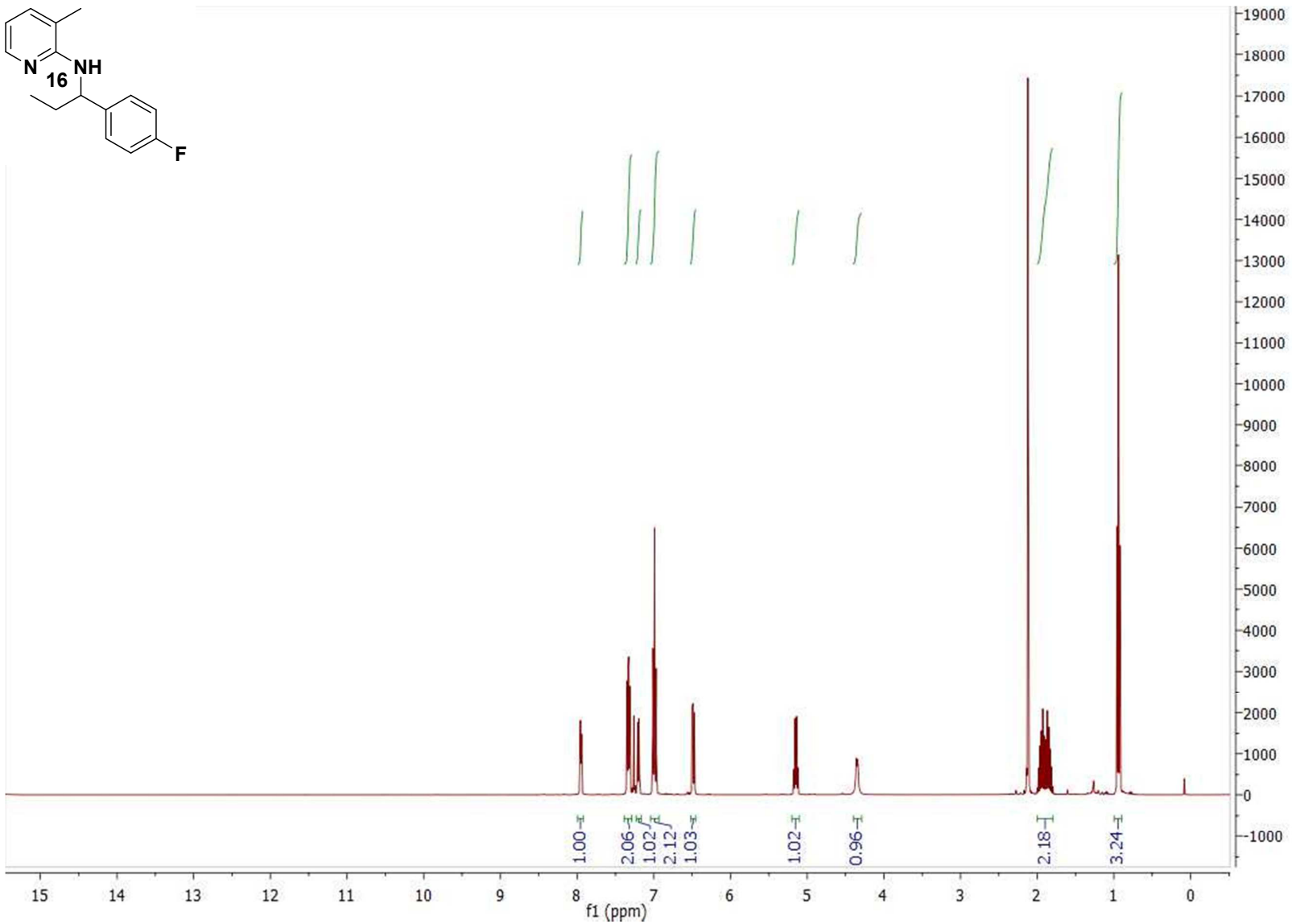
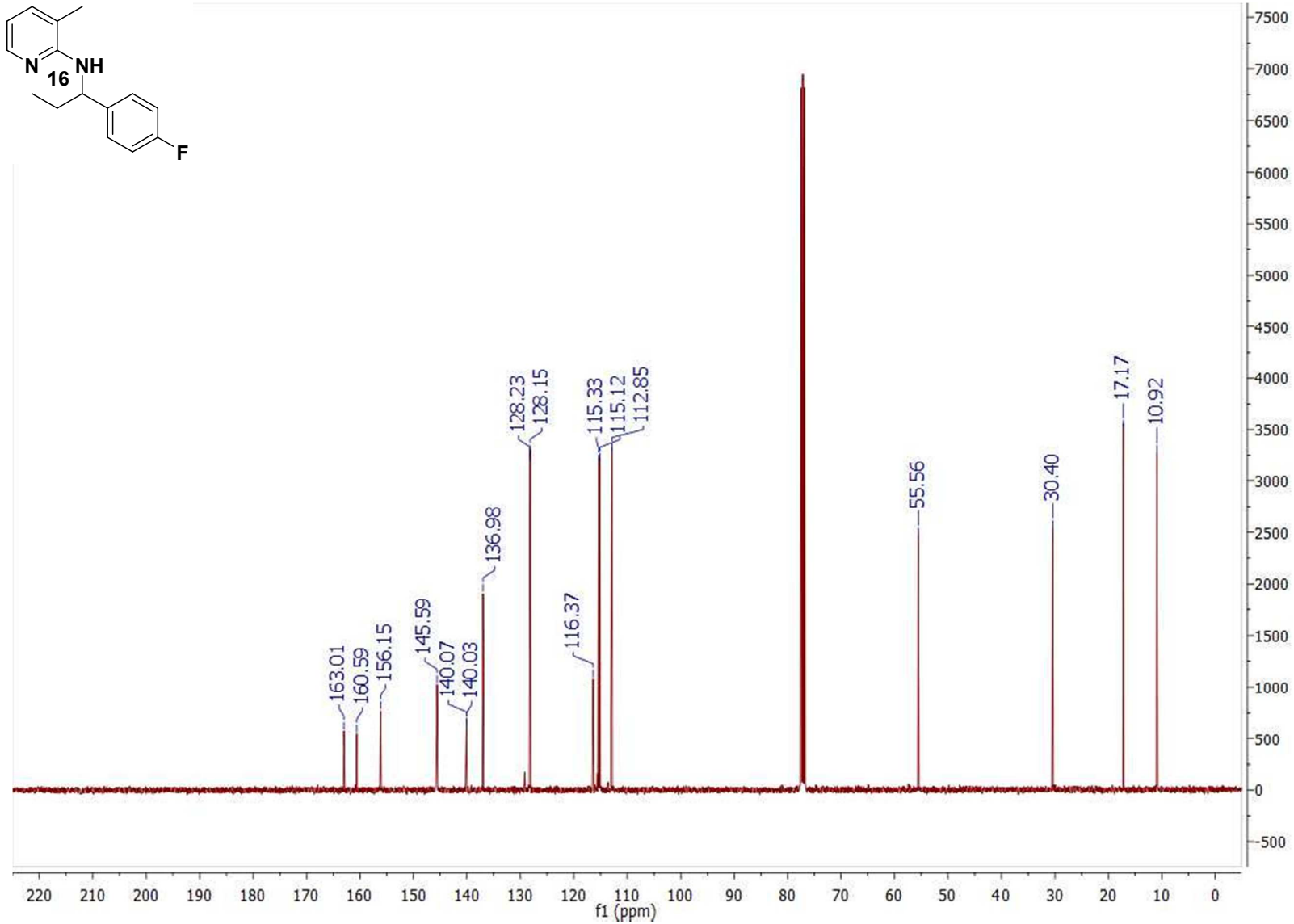
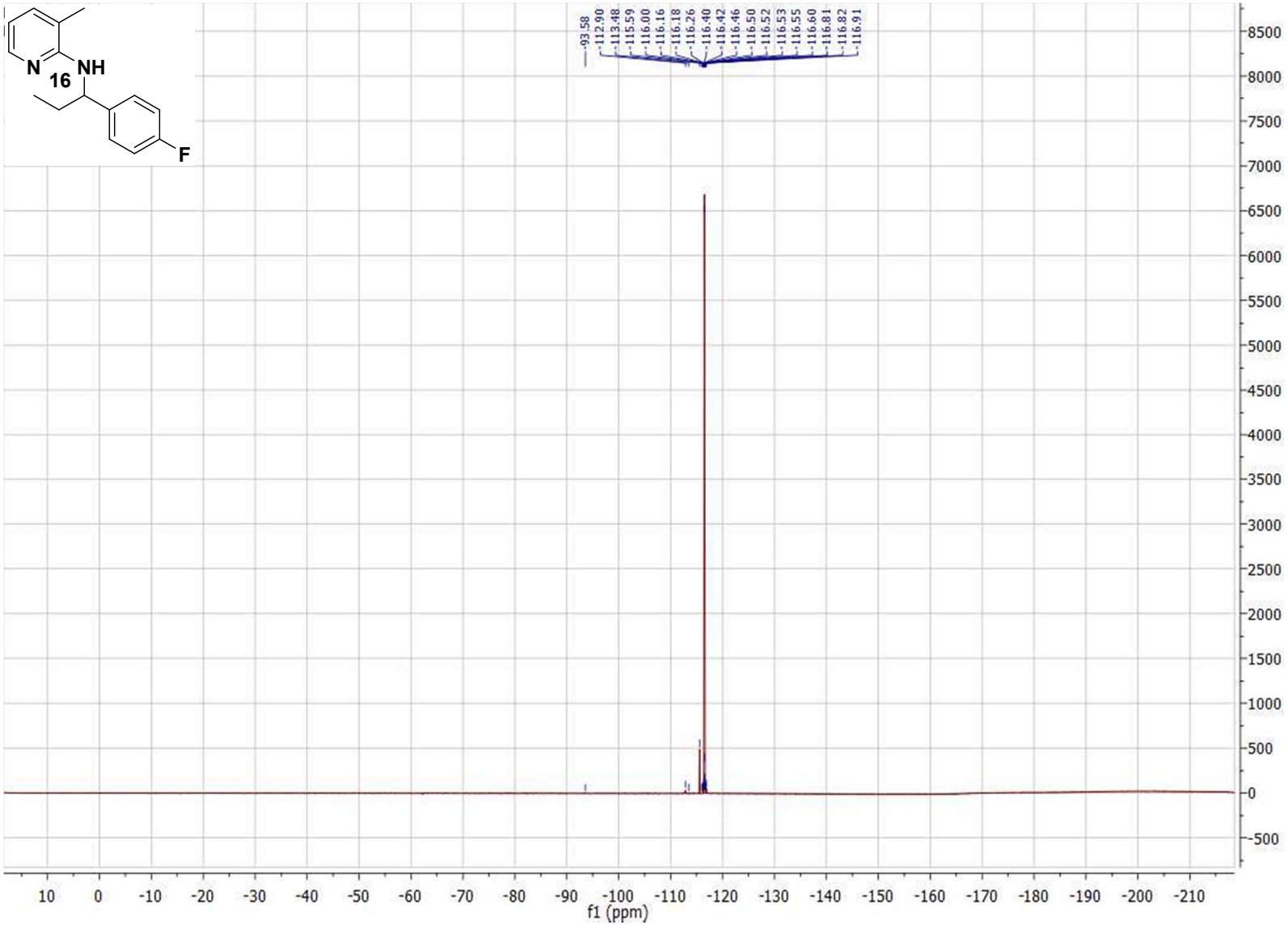
80000
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

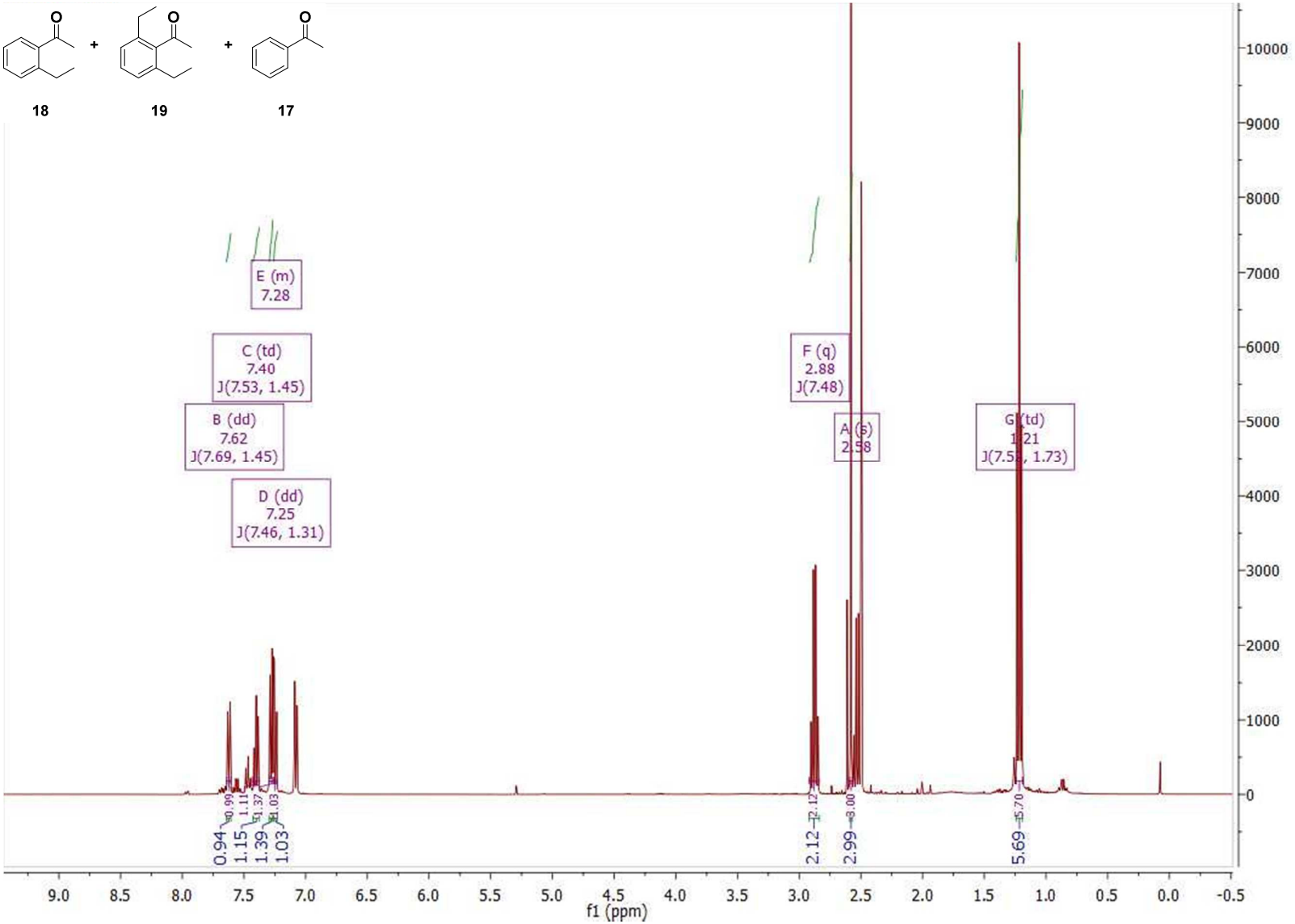

N
NH
15
OMe
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
1.02
2.06
1.01
2.06
1.02
1.04
0.98
3.11
3.18
1.16
1.13
3.28
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)

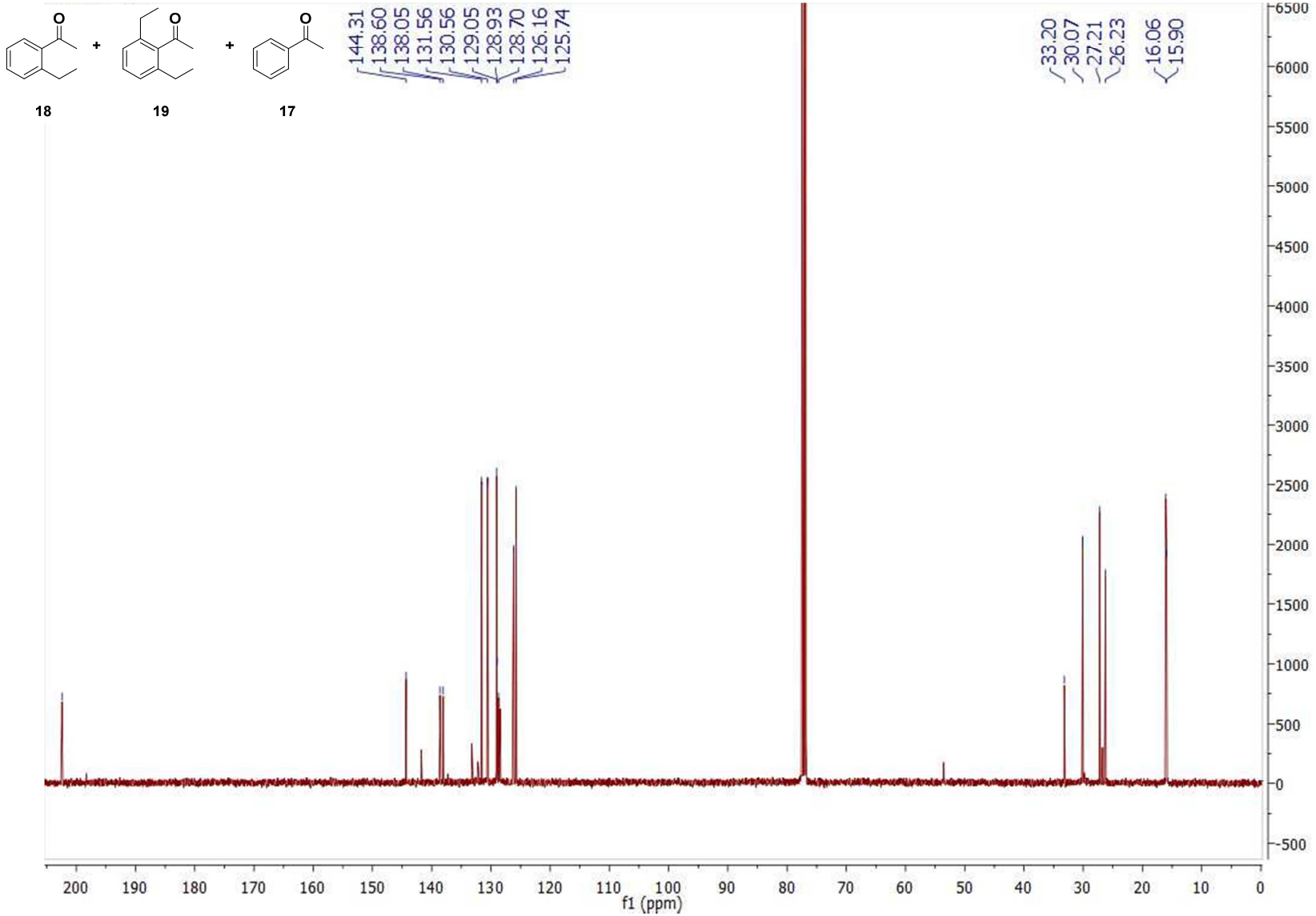

N
NH
15
OMe
158.52
156.32
145.59
136.89
136.31
127.80
116.35
113.89
112.58
55.59
55.34
30.15
17.20
10.94
f1 (ppm)

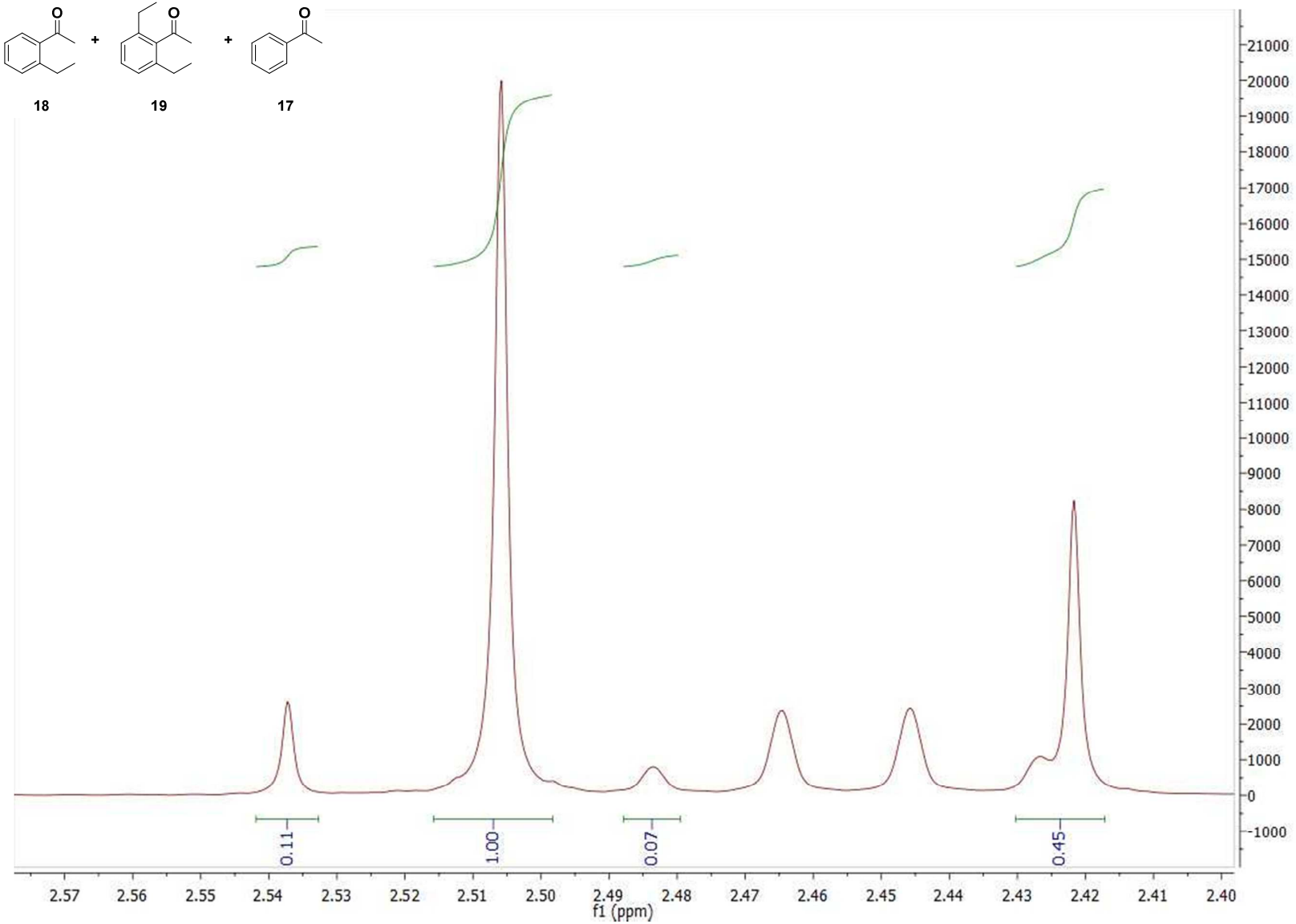

N
16
NH
F
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.00
2.06
1.02
2.12
1.03
1.02
0.96
2.18
3.24
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
f1 (ppm)

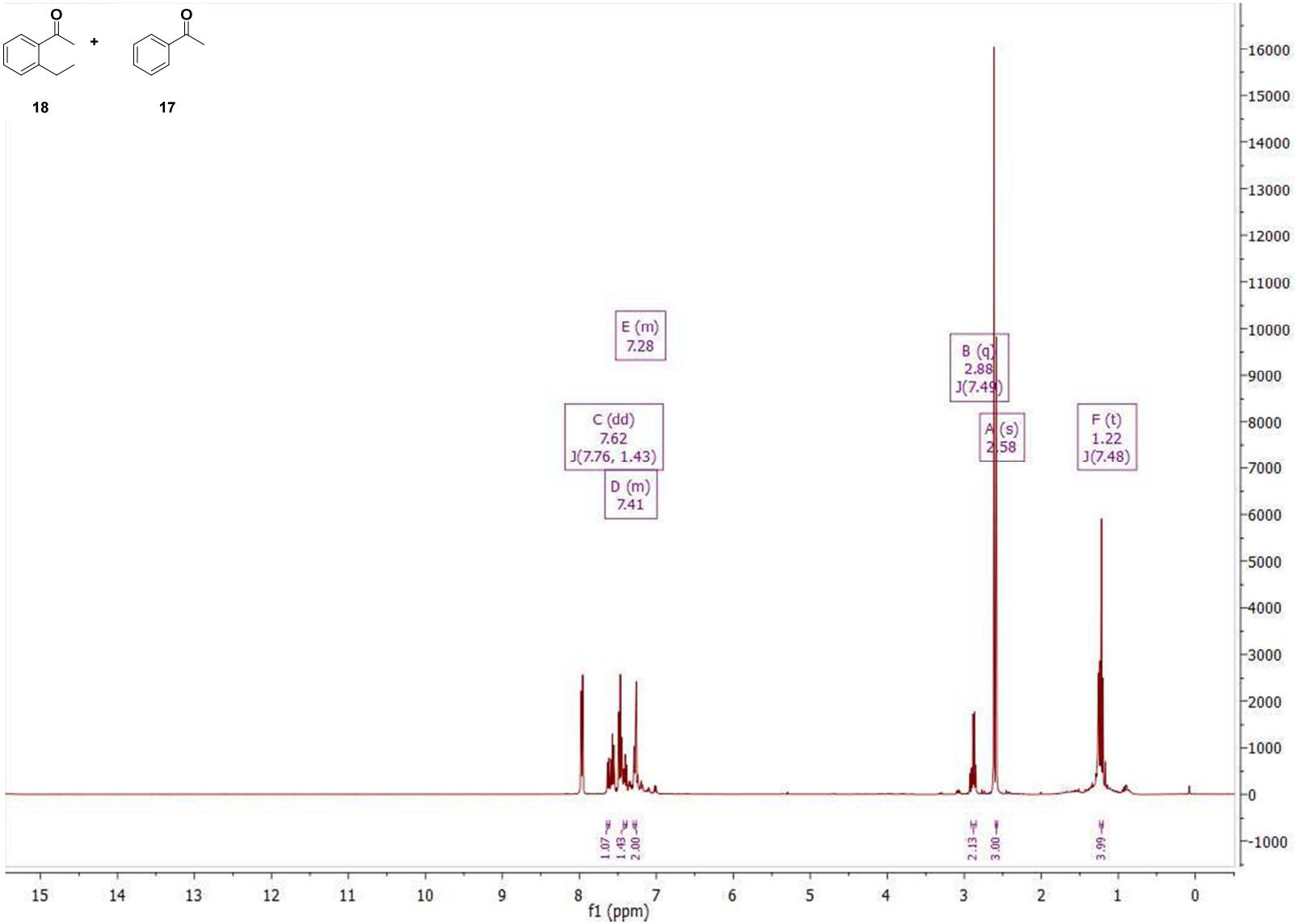

N
16
NH
F
163.01
160.59
156.15
145.59
140.07
140.03
136.98
128.23
128.15
116.37
115.33
115.12
112.85
55.56
30.40
17.17
10.92
f1 (ppm)

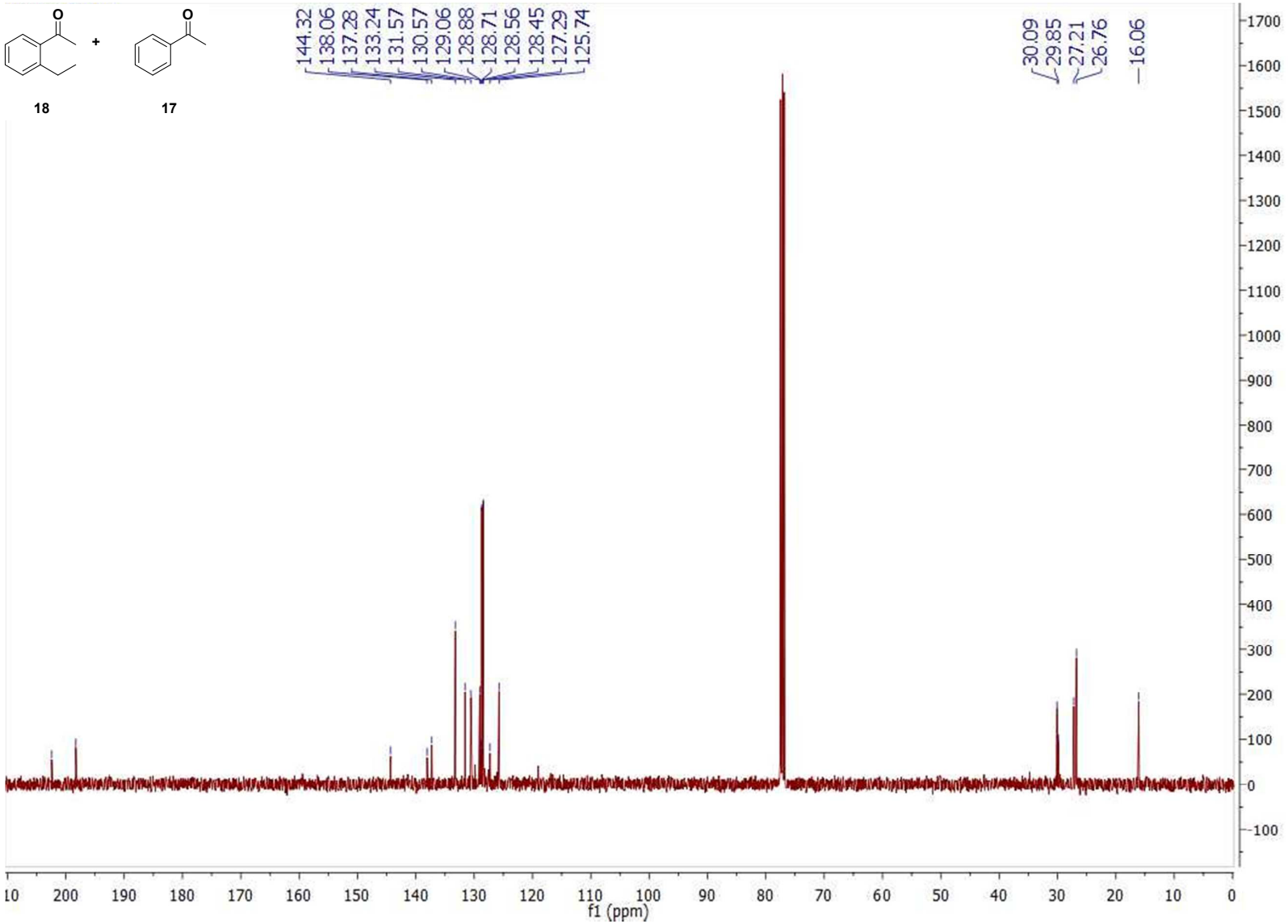

N
16
NH
F
-93.58
-112.90
-113.48
-115.59
-116.00
-116.16
-116.18
-116.26
-116.40
-116.42
-116.46
-116.50
-116.52
-116.53
-116.55
-116.60
-116.81
-116.82
-116.91
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

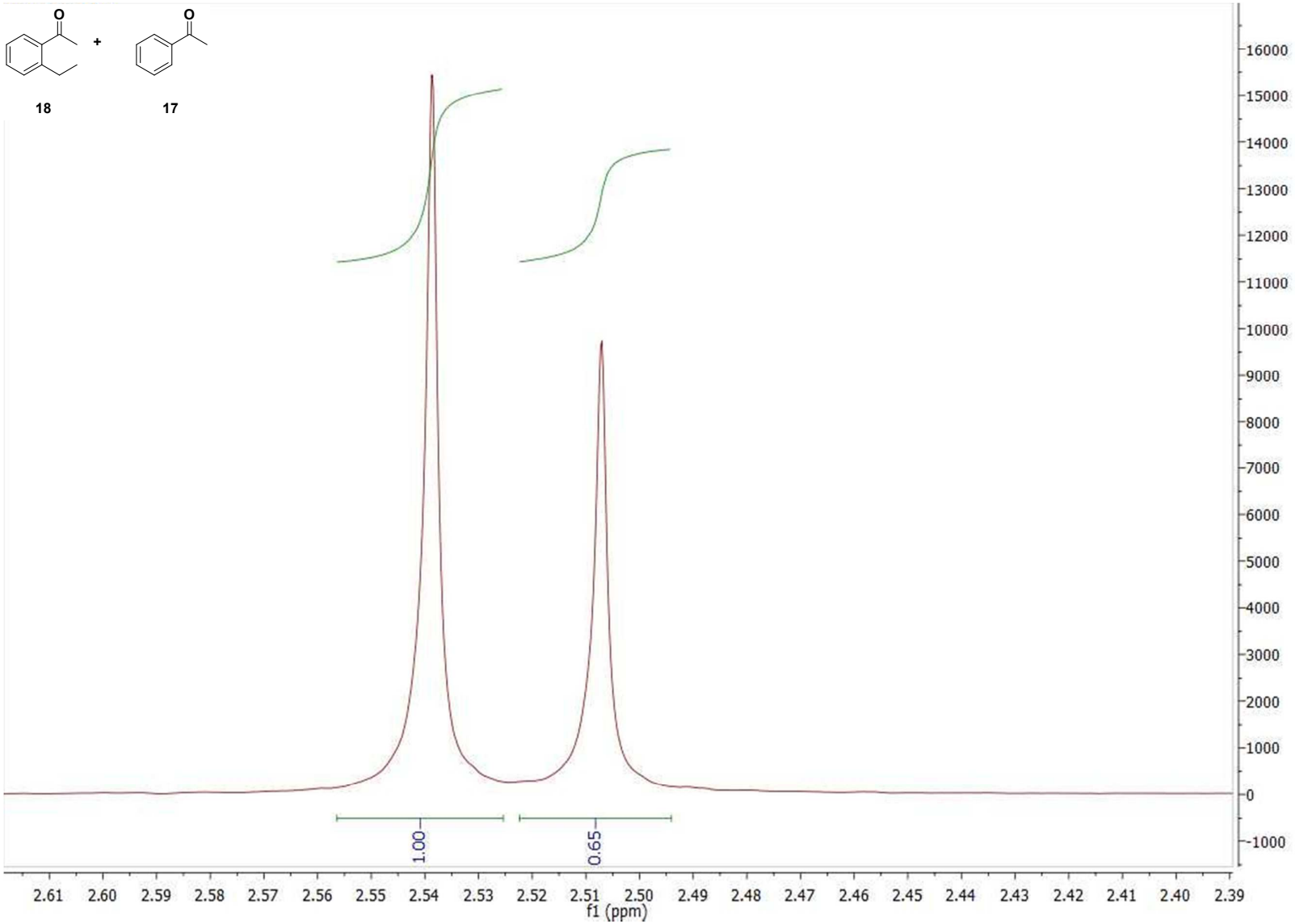

18
19
17
E (m)
7.28
C (td)
7.40
J(7.53, 1.45)
B (dd)
7.62
J(7.69, 1.45)
D (dd)
7.25
J(7.46, 1.31)
F (q)
2.88
J(7.48)
A (s)
2.58
G (td)
1.21
J(7.5, 1.73)
0.94
1.15
1.39
1.03
2.12
2.99
5.69
f1 (ppm)


18
19
17
144.31
138.60
138.05
131.56
130.56
129.05
128.93
128.70
126.16
125.74
33.20
30.07
27.21
26.23
16.06
15.90
f1 (ppm)


18
19
17
0.11
1.00
0.07
0.45
f1 (ppm)


18
17
E (m)
7.28
C (dd)
7.62
J(7.76, 1.43)
D (m)
7.41
B (q)
2.88
J(7.49)
A (s)
2.58
F (t)
1.22
J(7.48)
1.07
1.43
2.00
2.13
3.00
3.99
f1 (ppm)


18
17
144.32
138.06
137.28
133.24
131.57
130.57
129.06
128.88
128.71
128.56
128.45
127.29
125.74
30.09
29.85
27.21
26.76
16.06
f1 (ppm)


18
17
1.00
0.65
f1 (ppm)