

SUPPLEMENTARY INFORMATIONS

N-alkylation of amines through hydrogen borrowing over a heterogeneous Cu catalyst

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Materials:

All the substrates and amines were supplied by Sigma Aldrich and used without any further manipulation. Toluene and xylene were supplied by Sigma Aldrich. Toluene was used without any pretreatment, xylene was dehydrated on molecular sieves before use. The features of the supports and the copper catalysts used are reported in Table S1.

Table S1. Textural properties of supports and copper catalysts.

Support	Supplier	Co-oxide loading (wt%)	Cu loading (wt%)	BET (m ² /g)	PV (mL/g)
SiO ₂	Aldrich	-		480	0.75
Cu/ SiO ₂		-	8.50	363	0.68
Al ₂ O ₃	Sasol	-		210	0.50
Cu/ Al ₂ O ₃		-	7.50		

Catalysts preparation and activation:

Copper catalysts, all with a metal loading of 8-9 wt%, were prepared by chemisorption-hydrolysis method. The support was added to a [Cu(NH₃)₄]²⁺ solution prepared by adding NH₄OH to a Cu(NO₃)₂·3H₂O solution until pH=9. After 20 min under stirring, the slurry, held in an ice bath at 0°C, was slowly diluted in order to allow hydrolysis of the copper complex and deposition of the finely dispersed product to occur. The solid was separated by filtration, washed with water, dried overnight at 120°C, and calcined in air at 350°C for 4 h. The copper loading of the catalyst was determined by ICP analysis (ICAP 6200 Upgrade Thermo Scientific) after microwave HNO₃ digestion. The catalyst was activated into a glass reaction vessel before use by treatment at 270°C in air for 20 min, under reduced pressure at the same temperature for 20 min and then under H₂ at the same temperature by removing the water formed by the reduction under reduced pressure.

Experimental procedure for the Amination reactions of alcohols by borrowing hydrogen:

in a typical reaction a solution of alcohol/amine 1/1 molar ratio were dissolved in the solvent (8 mL), and the solution transferred under N₂ into a glass reaction vessel in which the catalyst (100 mg) had been previously activated. Reactions were carried out under atmospheric pressure of N₂ and constant magnetic stirring (1000 rpm) using Teflon-coated magnetic stir bar at 130°C (bath oil temperature)

Reaction mixtures were analysed by GC-MS (5%-phenyl-methyl polysiloxane capillary column length 30 m, injection T=60°C) with n-dodecane as internal standard, and by ¹HNMR and ¹³CNMR spectroscopy .

Experimental procedure for the Hot filtration test:

for the leaching test, after 10 min the reaction solution was separated from the catalyst by hot filtration and transferred in a new reaction vessel. The solution was stirred (1000 rpm) under N₂ at 130°C for a 12 h.

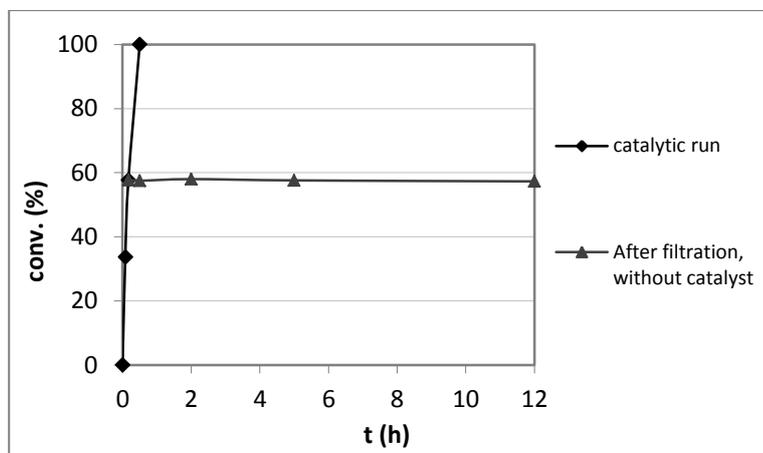


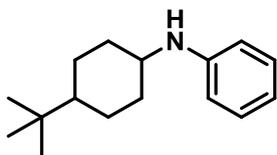
Figure S1. Hot filtration test carried out in the reductive amination of p-methoxy benzyl alcohol with aniline.

Experimental procedure for the Recycling tests:

recycling tests were performed starting from 0.3 g of substrate. The reaction solution was separated from the catalyst after each run by filtration; the recovered catalyst was washed with xylene at RT for 30 min, dried overnight at 100°C and reactivated by hydrogenation following the above procedure. After activation a fresh reaction mixture was charged in the reactor.

Spectral data:

N-(4-tert-butylcyclohexyl)aniline (Table 1, entry 4)¹

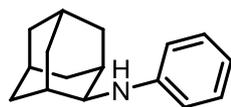


Tab 1-4

White solid, recrystallized from methanol; MP: 107.4°C

¹H NMR (300 MHz, CDCl₃, δ ppm): 7.18 (t, *J* = 7.8 Hz, 2H), 6.75 – 6.54 (m, 3H), 3.51 (s, 1H), 3.19 (s, 1H), 2.21 (d, *J* = 9.4 Hz, 2H), 1.86 (d, *J* = 8.7 Hz, 2H), 1.23 – 1.00 (m, 5H), 0.90 (s, 9H). ¹³C {H} APT NMR (75 MHz, CDCl₃, δ ppm): 147.78, 129.65, 117.38, 113.69, 52.92, 48.10, 34.39, 32.79, 28.02, 26.73. [M]⁺: *m/z* calcd: 231.4; found: 231.2, 132.1, 118.1, 93.1, 77.1.

N-(adamantyl)aniline (Table 1, entry 5)

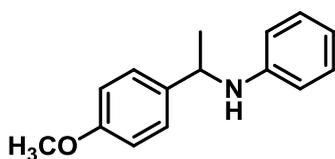


Tab 1-5

White solid, recrystallized from methanol; MP: 56.3°C

¹H NMR (400 MHz, CDCl₃, δ ppm): 1.69-2.06 (m, 14H), 3.57 (s, 1H), 4.24 (brs, 1H), 6.68 (m, 3H), 7.22 (m, 2H). ¹³C{H} APT NMR (75.5 MHz, CDCl₃, δ ppm): 129.67, 117.34, 113.66, 57.23, 38.12, 37.82, 31.99, 27.87, 27.73; [M]⁺: *m/z* calcd: 227.34; found: 227.2, 135.1, 106.1, 93.1, 77.1.

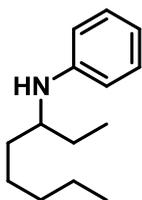
N-[1-(4-Methoxyphenyl)ethyl]aniline (Table 1, entry 10)⁵



Tab 1-10

¹H NMR (300 MHz, CDCl₃, δ ppm): 7.40 – 7.29 (m, 2H), 7.21 – 7.09 (m, 2H), 7.04 – 6.87 (m, 2H), 6.71 (t, *J* = 7.3 Hz, 1H), 6.59 (dd, *J* = 8.6, 1.0 Hz, 2H), 4.51 (q, *J* = 6.6 Hz, 1H), 3.83 (s, 3H), 1.54 (d, *J* = 6.6 Hz, 3H). ¹³C{H} APT NMR (75 MHz, CDCl₃, δ ppm): 158.95, 147.77, 137.68, 129.53, 127.35, 117.66, 114.46, 113.82, 55.66, 53.30, 25.37. [M]⁺: *m/z* calcd: 227.13; found: 227.2, 212.1, 135.1, 120.1, 105.1, 91.1, 77.1.

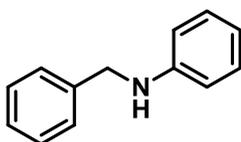
N-(octan-3-yl)aniline (Table 1, entry 11)



Tab 1-11

^1H NMR (300 MHz, CDCl_3 , δ ppm) δ 7.25 – 7.18 (m, 2H), 6.77 – 6.54 (m, 3H), 3.48 (brs, 1H), 3.40 – 3.31 (m, 1H), 1.75 – 1.30 (m, 10H), 0.98 (dt, $J = 10.4, 7.1$ Hz, 6H). ^{13}C NMR (75 MHz, CDCl_3 , δ ppm) 148.65, 129.68, 116.94, 113.36, 54.55, 34.83, 32.46, 27.69, 26.11, 23.09, 14.49, 10.48. $[\text{M}]^+$: m/z calcd: 205.34; found: 205.2, 176.2, 134.1, 120.1, 106.1, 93.1, 77.1.

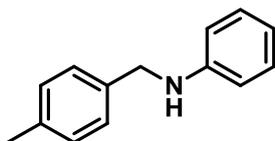
N-benzylaniline (Table 2 entry 1)^{3,4,5,8}



Tab 2-1

^1H NMR (CDCl_3 , 300 MHz, δ ppm): 4.05 (brs, 1H), 4.37 (s, 2H), 6.70 (m, 3H), 7.21-7.41 (m, 7 H).
 $^{13}\text{C}\{\text{H}\}$ APT NMR (75 MHz, CDCl_3 , δ ppm): 148.58, 139.86, 129.67, 129.04, 127.92, 127.64, 117.98, 113.26, 48.75. $[\text{M}]^+$: m/z calcd: 183.25; found: 183.1, 106.1, 91.1, 77.1.

N-(4-methylbenzyl)aniline (Table 2 entry 4)^{4,5}

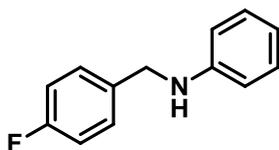


Tab 2-4

White solid, recrystallized from methanol; MP: 44.6°C

^1H NMR (400 MHz, CDCl_3 , δ ppm): 7.30 (t, $J = 6.4$ Hz, 2H), 7.26 – 7.15 (m, 4H), 6.76 (t, $J = 7.3$ Hz, 1H), 6.71 – 6.64 (m, 2H), 4.32 (s, 2H), 4.01 (brs, 1H), 2.39 (s, 3H). $^{13}\text{C}\{\text{H}\}$ APT NMR (75 MHz, CDCl_3 , δ ppm): 148.49, 137.30, 136.67, 129.71, 129.66, 127.96, 118.03, 113.37, 48.59, 21.49. $[\text{M}]^+$: m/z calcd: 197.28 ; found: 197.2, 105.1, 91.1, 77.1

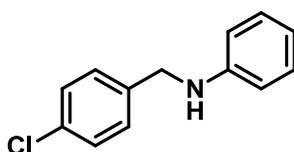
N-(4-fluorobenzyl)aniline (Table 2, entry 7)



Tab 2-7

^1H NMR (300 MHz, CDCl_3 , δ ppm) : 7.41 – 7.33 (m, 2H), 7.25 – 7.18 (m, 2H), 7.12 – 7.01 (m, 2H), 6.81 – 6.62 (m, 3H), 4.33 (s, 2H), 4.03 (brs, 1H). ^{13}C NMR (75 MHz, CDCl_3 , δ ppm) 160.93, 148.37, 135.51, 129.70, 129.35, 121.24, 115.70, 113.29, 48.03. $[\text{M}]^+$: m/z calcd: 201.2; found: 201.1, 109.1, 83.1, 65.1.

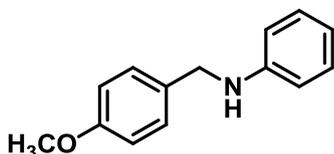
N-(4-chlorobenzyl)aniline (Table 2, entry 9)^{2,3,5}



Tab 2-9

^1H NMR (300 MHz, CDCl_3 , δ ppm) 7.36 (m, 4H), 7.23 (m, 2H), 6.79 (m, 1H), 6.66 (m, 2H), 4.35 (s, 2H), 3.99 (brs, 1H). ^{13}C NMR (75 MHz, CDCl_3 , δ ppm) 148.27, 138.46, 133.30, 129.74, 129.18, 129.14, 118.27, 113.37, 48.05. $[\text{M}]^+$: m/z calcd: 217.7 ; found: 217.1, 182.1, 125.0, 106.1, 89.1.

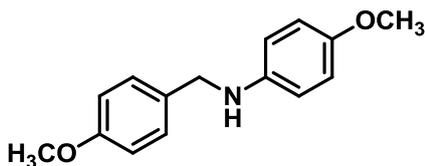
N-(4-methoxybenzyl)aniline (Table 2 entry 2, table 3 entry 1)^{2,3,4,5}



Tab 3-1

^1H NMR (CDCl_3 , 300 MHz, δ ppm): 3.70 (brs, 1H), 3.86 (s, 3H), 4.31 (s, 2H), 6.70 (m, 2H), 6.80 (m, 1H), 6.95 (m, 2H), 7.25 (m, 2H), 7.34 (m, 2H); $^{13}\text{C}\{^1\text{H}\}$ APT NMR (75 MHz, CDCl_3 , δ ppm): 48.25, 55.74, 113.3, 114.5, 117.9, 129.3, 129.7, 131.9, 148.7, 159.3. $[\text{M}]^+$: m/z calcd: 213.28 ; found: 213.1, 121.1, 106.3, 91.1, 77.1

4-methoxy-N-(4-methoxybenzyl)aniline (Table 3, entry 3)^{6,8}

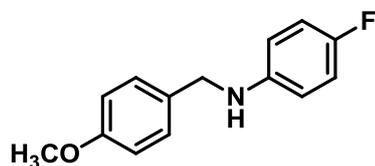


Tab 3-3

White solid, recrystallized from methanol; MP: 96.6°C. ^1H NMR (400 MHz, CDCl_3 , δ ppm): 7.32 (d, J = 8.6 Hz, 2H), 6.91 (d, J = 8.6 Hz, 2H), 6.82 (d, J = 8.9 Hz, 2H), 6.64 (d, J = 8.9 Hz, 2H), 4.24 (s, 2H), 3.84 (s, 3H), 3.78 (s,

3H). ^{13}C NMR (101 MHz, CDCl_3 , δ ppm): 158.85, 152.22, 142.54, 131.70, 128.84, 114.94, 114.16, 114.01, 55.83, 55.29, 48.76. $[\text{M}]^+$: m/z calcd: 243.30 ; found: 243.1, 121.1, 107.0, 91.1, 77.1

4-fluoro-N-(4-methoxybenzyl)aniline (Table 3 entry 4)⁷

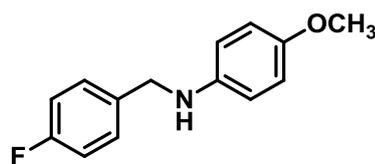


Tab 3-4

White solid, recrystallized from methanol; MP: 72.3°C.

^1H NMR (CDCl_3 , 300 MHz, δ ppm): 3.83 (s, 3H), 4.24 (s, 2H), 6.60 (m, 2H), δ 7.35 – 7.25 (m, 2H), 6.90 (m, 4H). ^{13}C {H} APT NMR (75 MHz, CDCl_3 , δ ppm): 159.36, 157.93, 154.81, 144.76, 131.49, 129.22, 116.19, 115.90, 114.47, 55.69, 48.93. $[\text{M}]^+$: m/z calcd: 231.27 ; found: 231.1, 121.1.

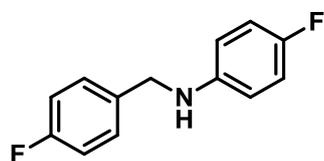
N-(4-fluorobenzyl)-4-methoxyaniline (Table 3, entry 6)⁸



Tab 3-6

$^1\text{H}\{^{19}\text{F}\}$ NMR (300 MHz, CDCl_3 , δ ppm): 7.36 (d, $J = 8.5$ Hz, 2H), 7.05 (d, $J = 8.6$ Hz, 2H), 6.87 – 6.77 (m, 2H), 6.70 – 6.57 (m, 2H), 4.28 (s, 2H), 3.78 (s, 3H), 3.60 (s, 1H). ^{13}C {H} APT NMR (75 MHz, CDCl_3 , δ ppm): 164.07, 152.77, 142.60, 135.80, 129.51, 115.94, 115.36, 114.62, 56.20, 48.97. $[\text{M}]^+$: m/z calcd: 231.27 ; found: 231.1, 214.1, 122.1, 109.1, 96.1, 83.1.

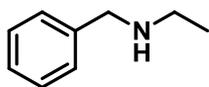
4-fluoro-N-(4-fluorobenzyl)aniline (Table 3, entry 7)



Tab 3-7

^1H NMR (300 MHz, CDCl_3 , δ ppm): 7.41 – 7.30 (m, 2H), 7.13 – 7.00 (m, 2H), 6.99 – 6.83 (m, 2H), 6.64 – 6.52 (m, 2H), 4.29 (s, 2H), 3.90 (s, 1H). ^{13}C {H} APT NMR (75 MHz, CDCl_3 , δ ppm): 164.14, 157.96, 144.69, 135.33, 129.36, 116.26, 115.96, 114.19, 48.64. $[\text{M}]^+$: m/z calcd: 219.23 ; found: 219.1, 109.1, 96.1, 83.1.

N-benzylethanamine (Table 3, entry 8)⁹

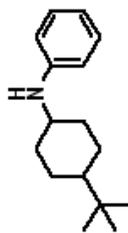


Tab 3-8

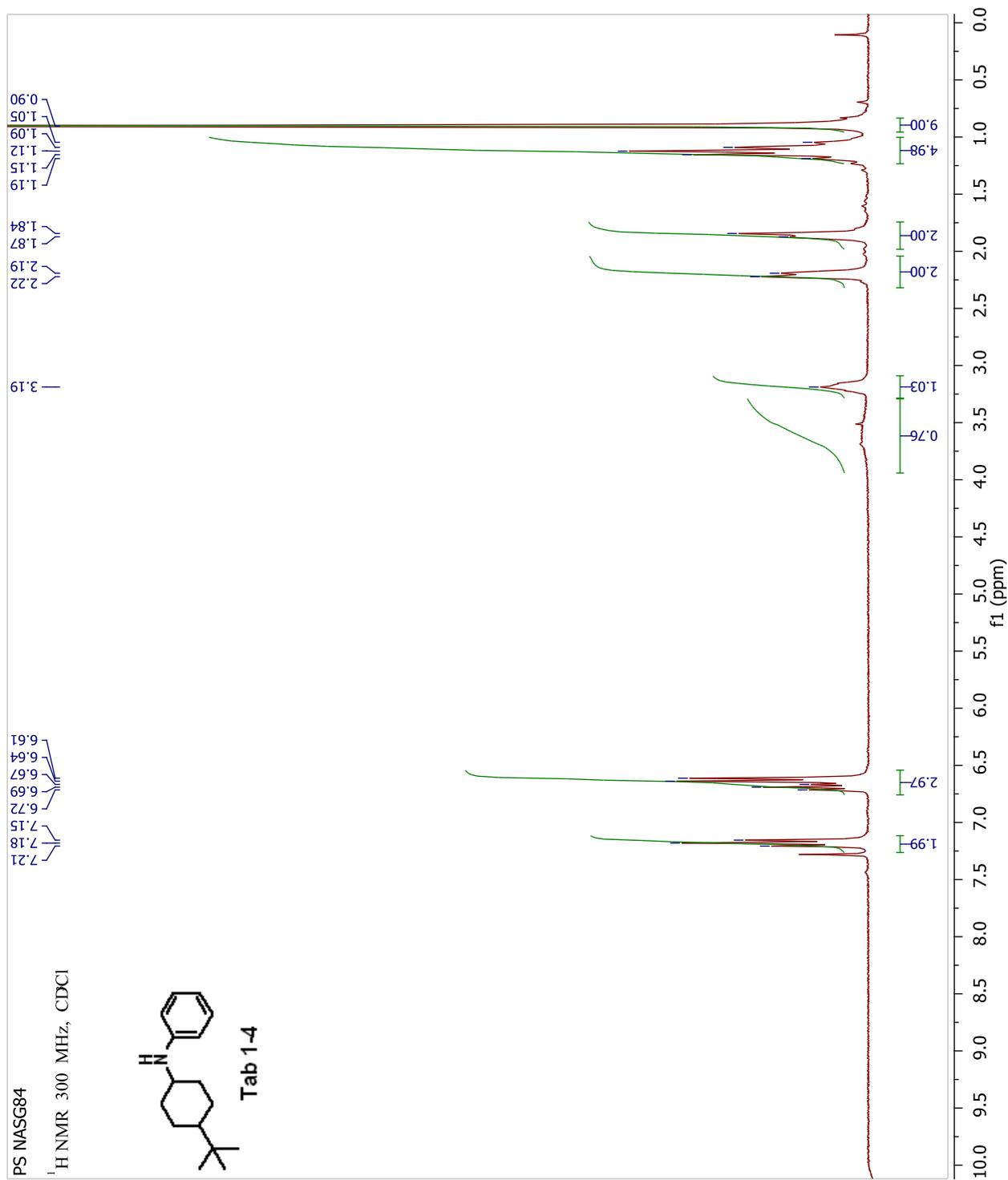
¹H NMR (300 MHz, CDCl₃, δ ppm): 7.36 (m, 5H), 3.82 (s, 2H), 2.71 (q, *J* = 7.0 Hz, 2H), 1.77 (brs, 1H), 1.16 (t, *J* = 7.1 Hz, 3H). ¹³C NMR (75 MHz, CDCl₃, δ ppm) δ 140.83, 128.79, 128.55, 127.30, 54.28, 43.98, 15.60. [M-1]⁺: *m/z* calcd: 134.21; found: 134.1, 120.1, 106.1, 91.1, 78.1, 65.1, 51.1.

PS NASG84

¹H NMR 300 MHz, CDCl₃



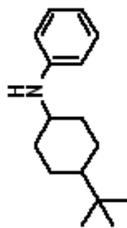
Tab 1-4



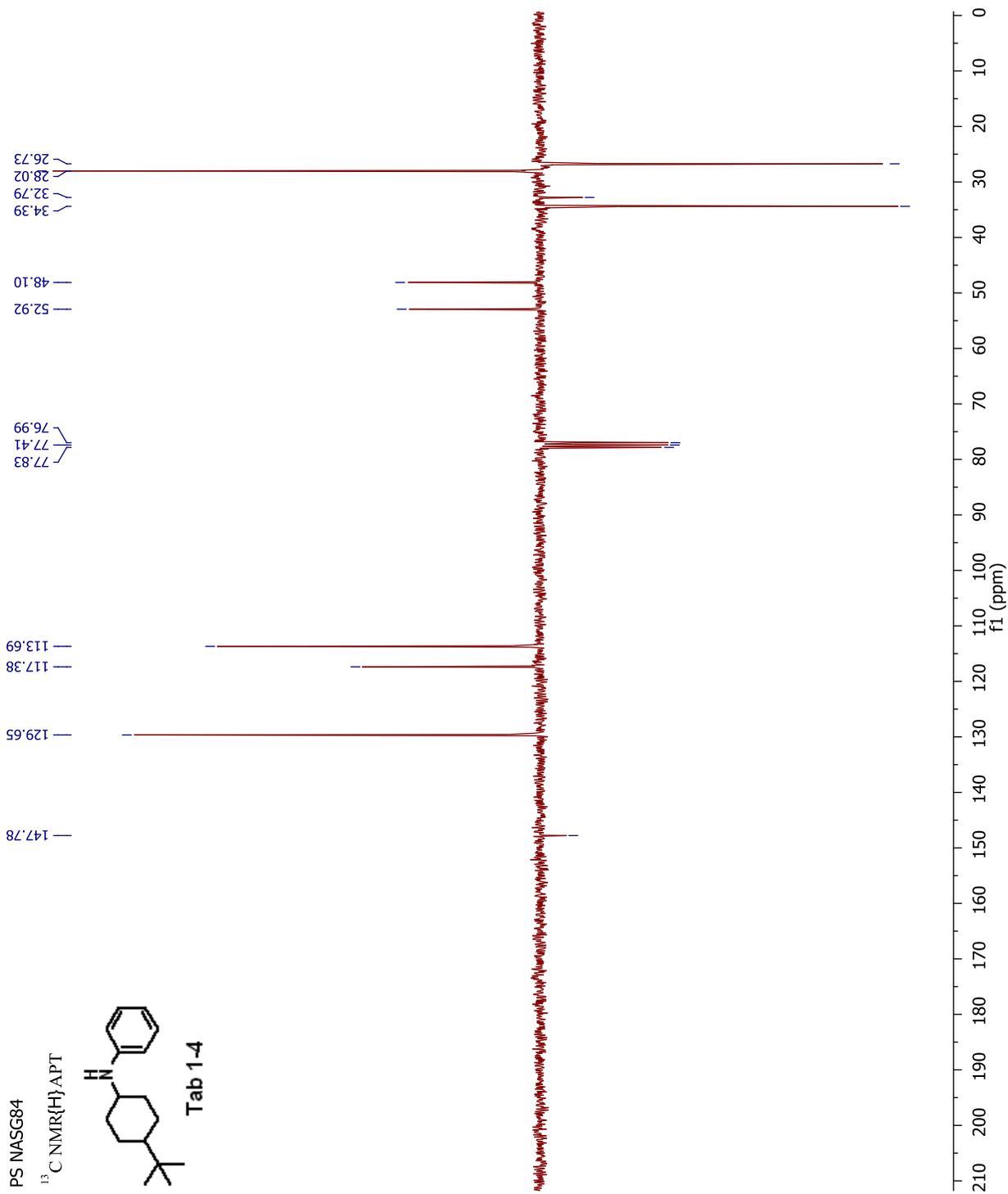
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PS NASG84

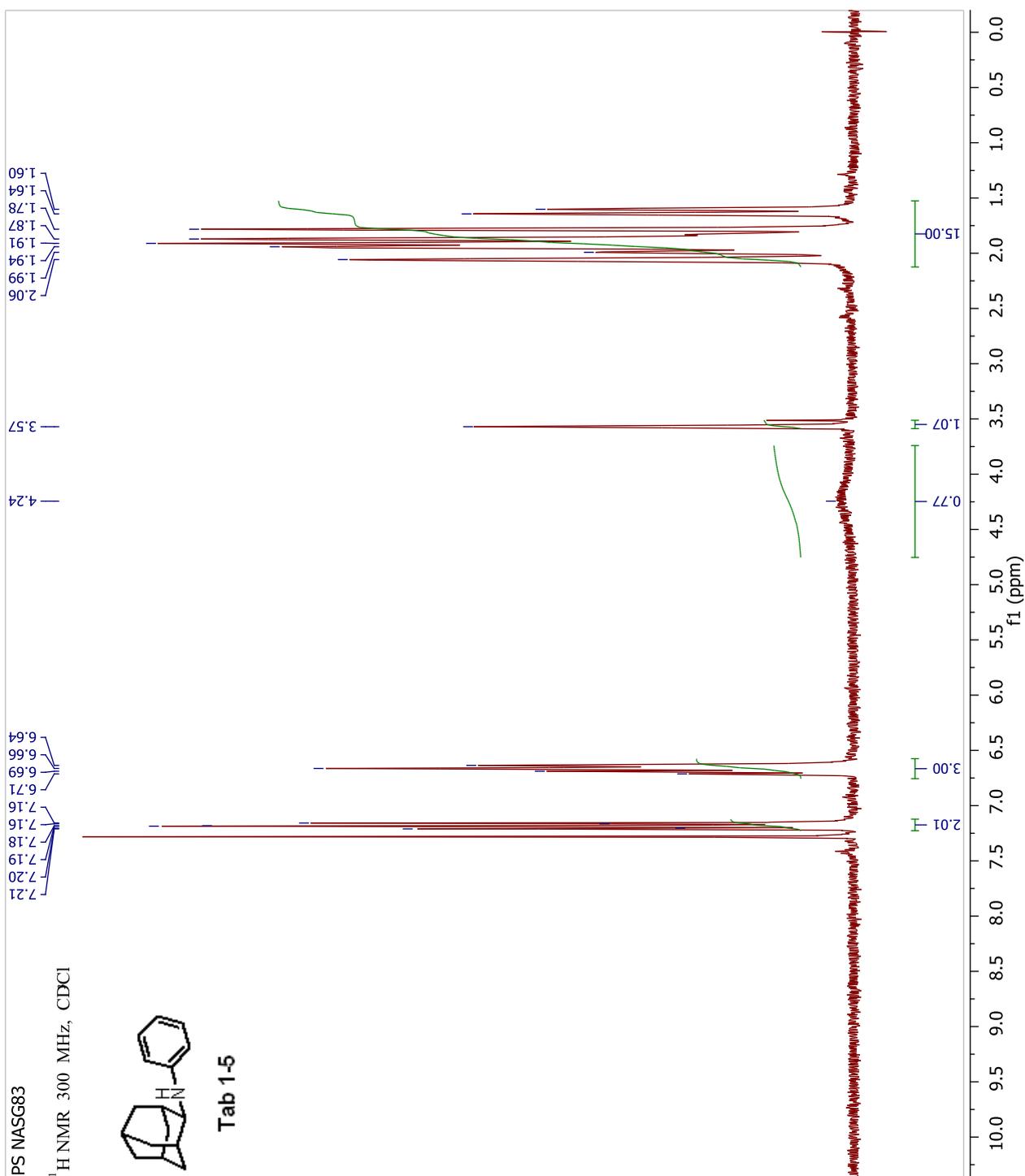
¹³C NMR{H}APT



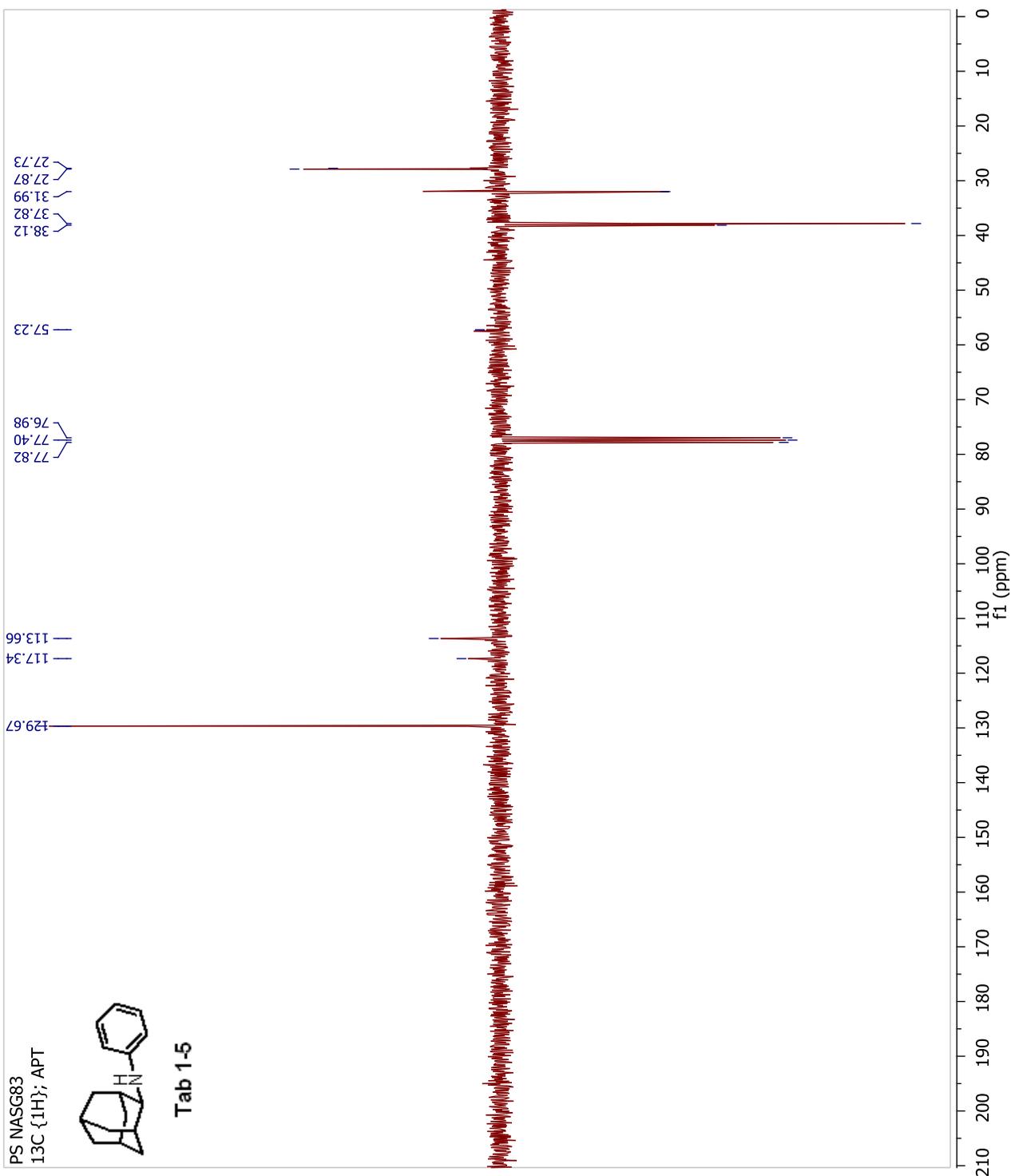
Tab 1-4



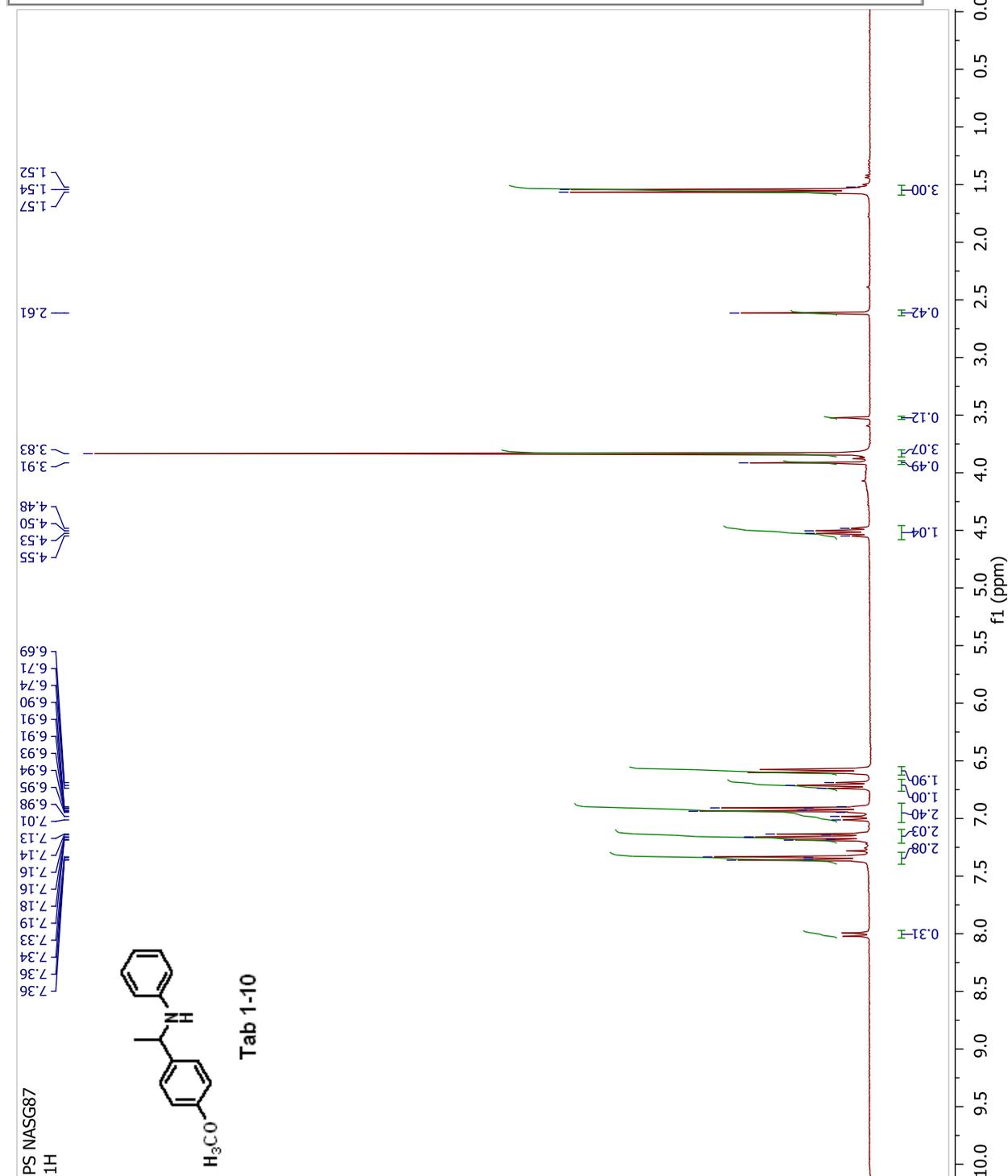
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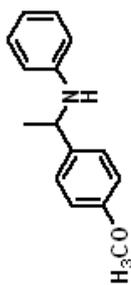


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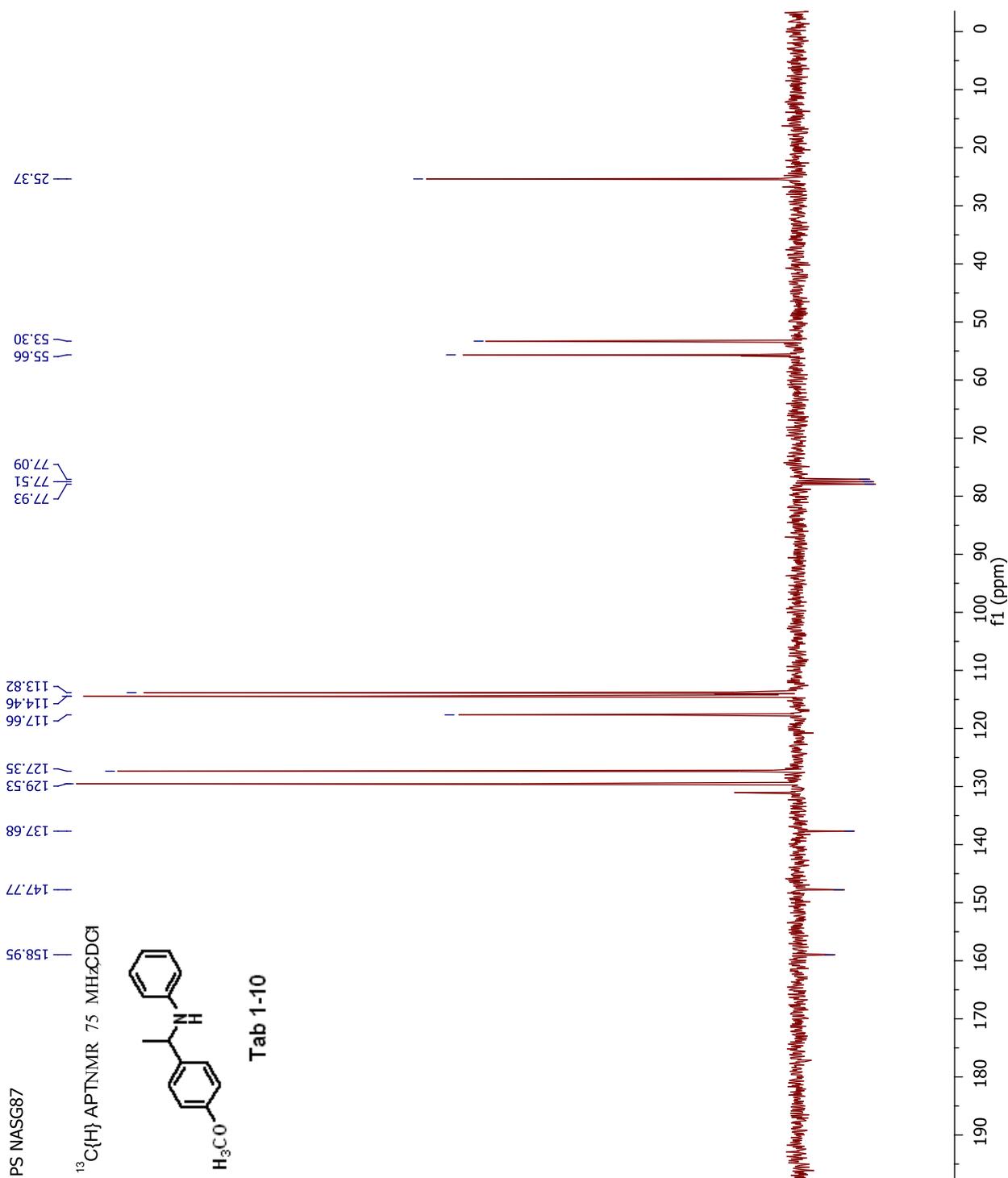


PS NASG87

¹³C{H} APTNMR 75 MHz/CDCl₃

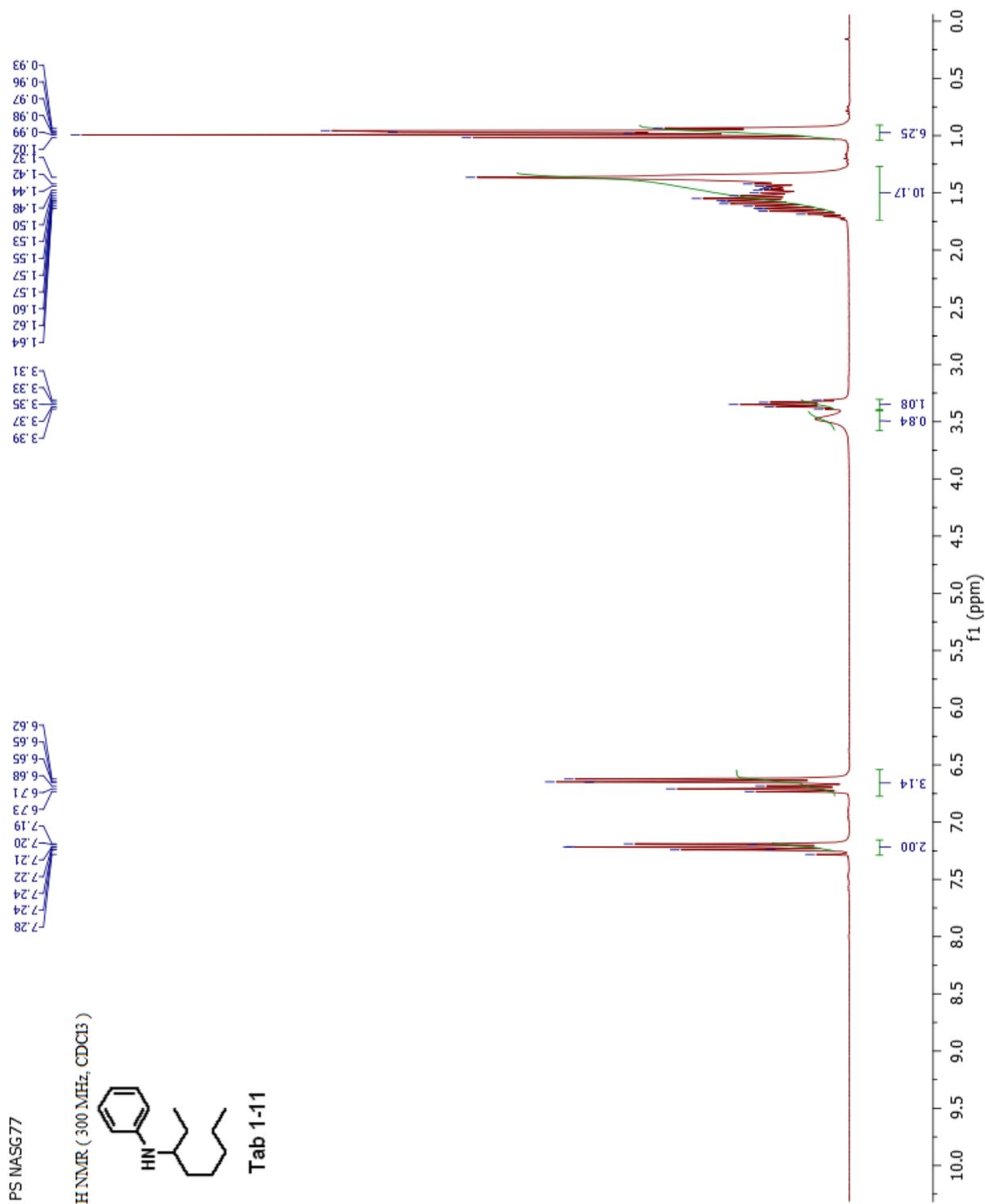


Tab 1-10



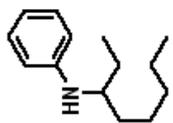
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23 Acquired Size	16384
24 Spectral Size	32768

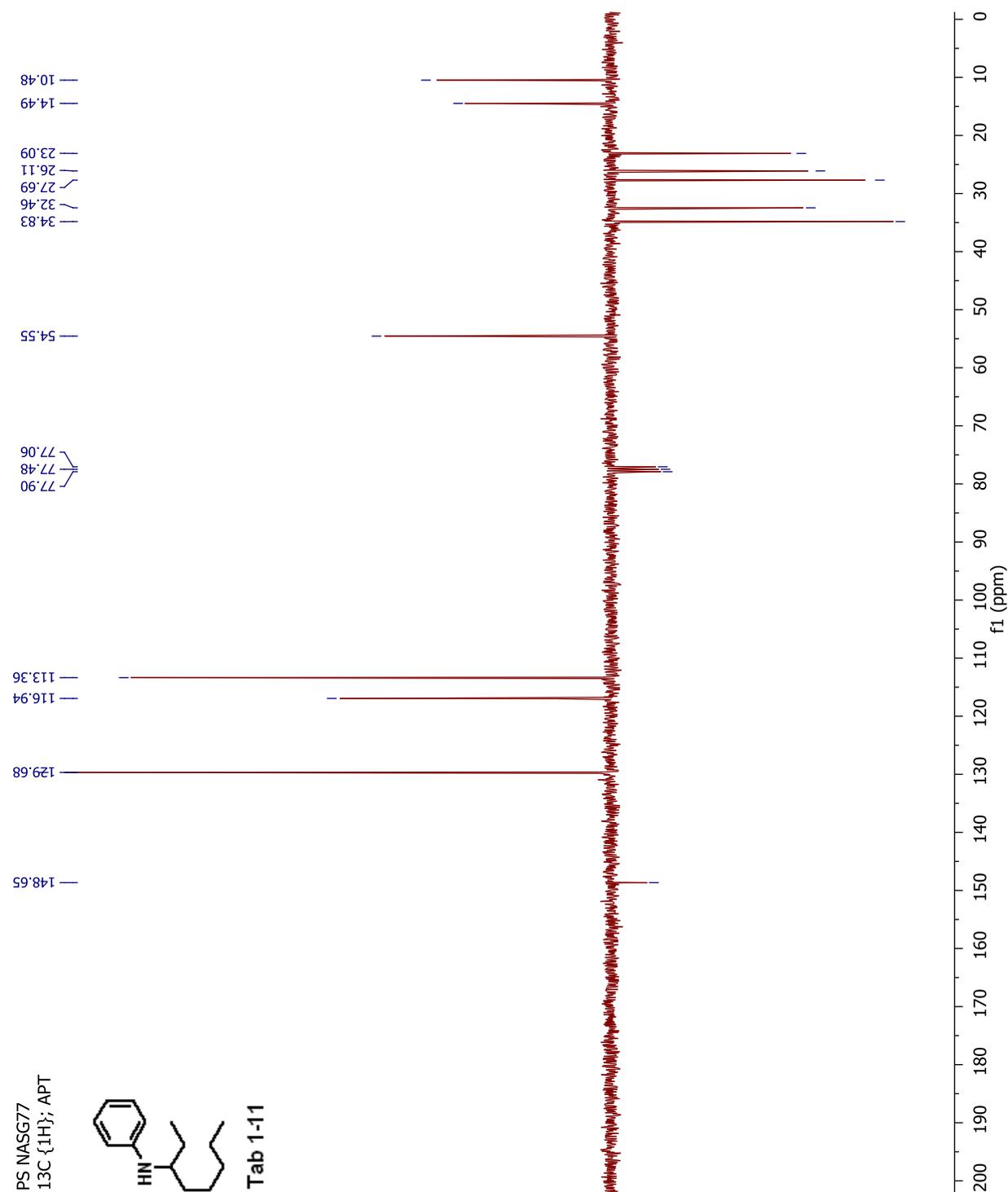


Tab 1-11

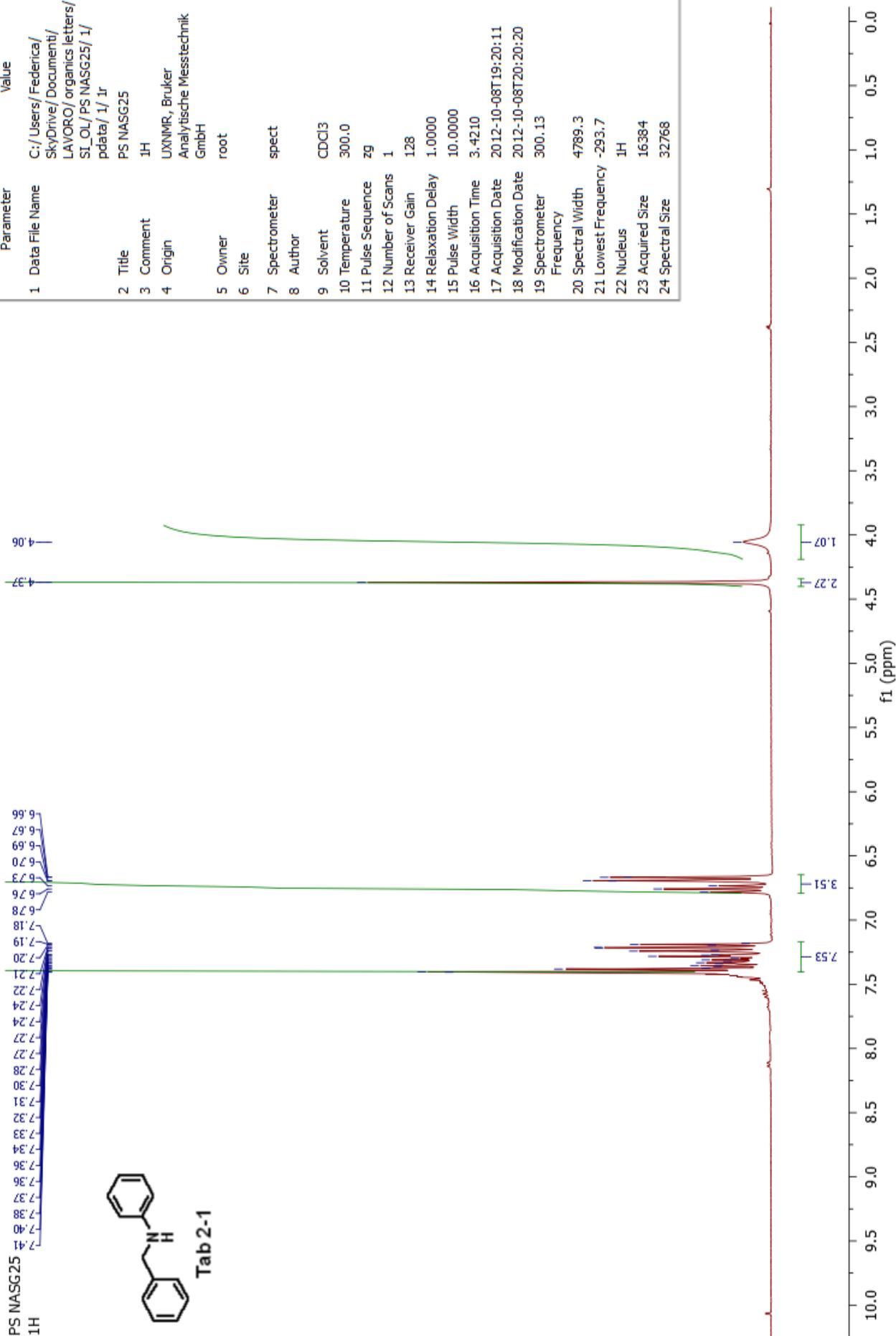
PS NASG77
13C {1H}; APT



Tab 1-11

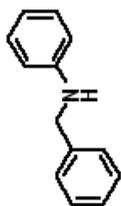


Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics letters/SL_OL/PS NASG25/ 1/pdata/ 1/ 1r
2 Title	PS NASG25
3 Comment	1H
4 Origin	LXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	zg
12 Number of Scans	1
13 Receiver Gain	128
14 Relaxation Delay	1.0000
15 Pulse Width	10.0000
16 Acquisition Time	3.4210
17 Acquisition Date	2012-10-08T19:20:11
18 Modification Date	2012-10-08T20:20:20
19 Spectrometer Frequency	300.13
20 Spectral Width	4789.3
21 Lowest Frequency	-293.7
22 Nucleus	1H
23 Acquired Size	16384
24 Spectral Size	32768

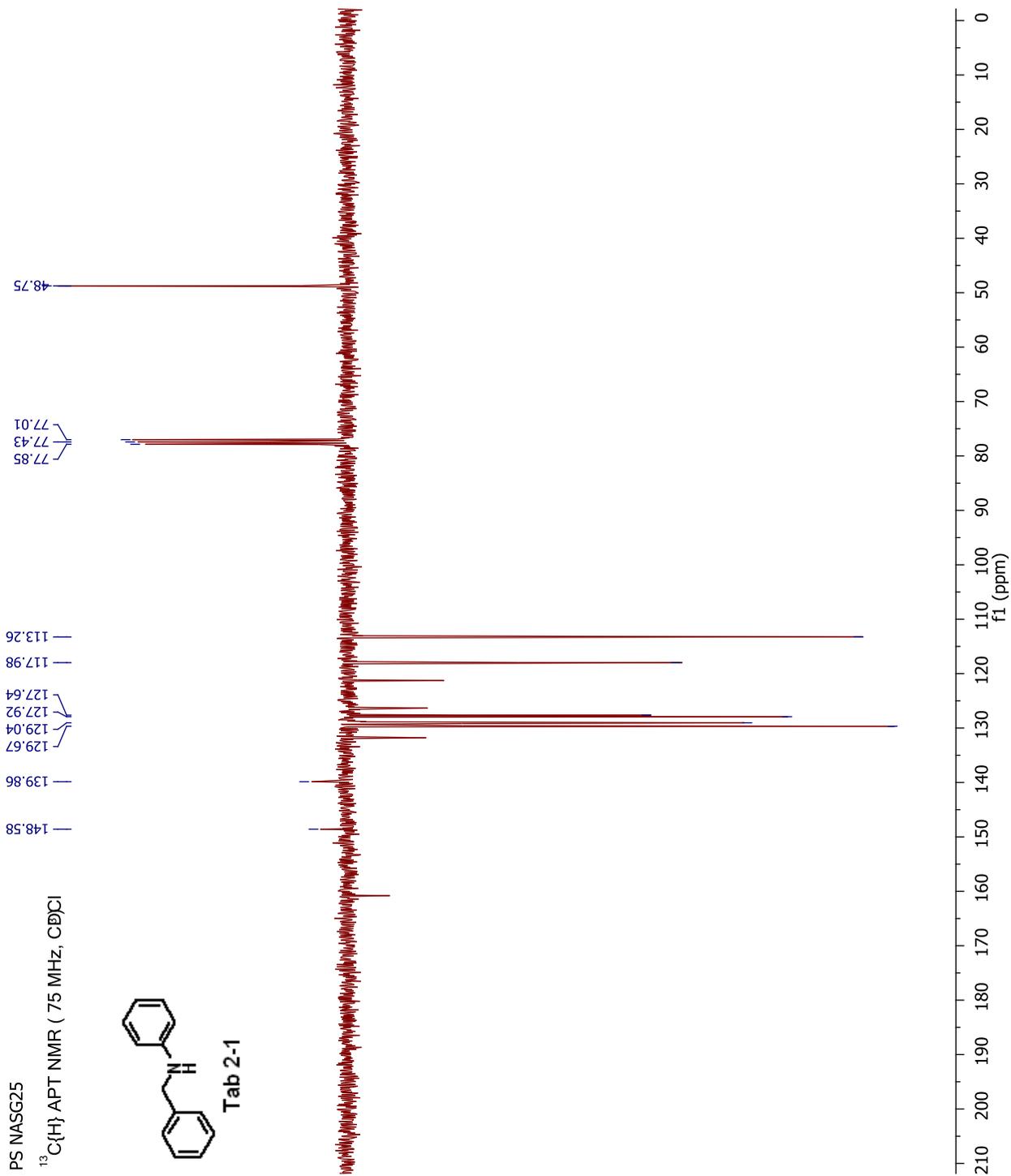


PS NASG25

$^{13}\text{C}\{^1\text{H}\}$ APT NMR (75 MHz, CDCl_3)



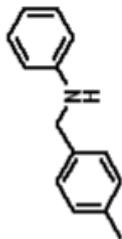
Tab 2-1



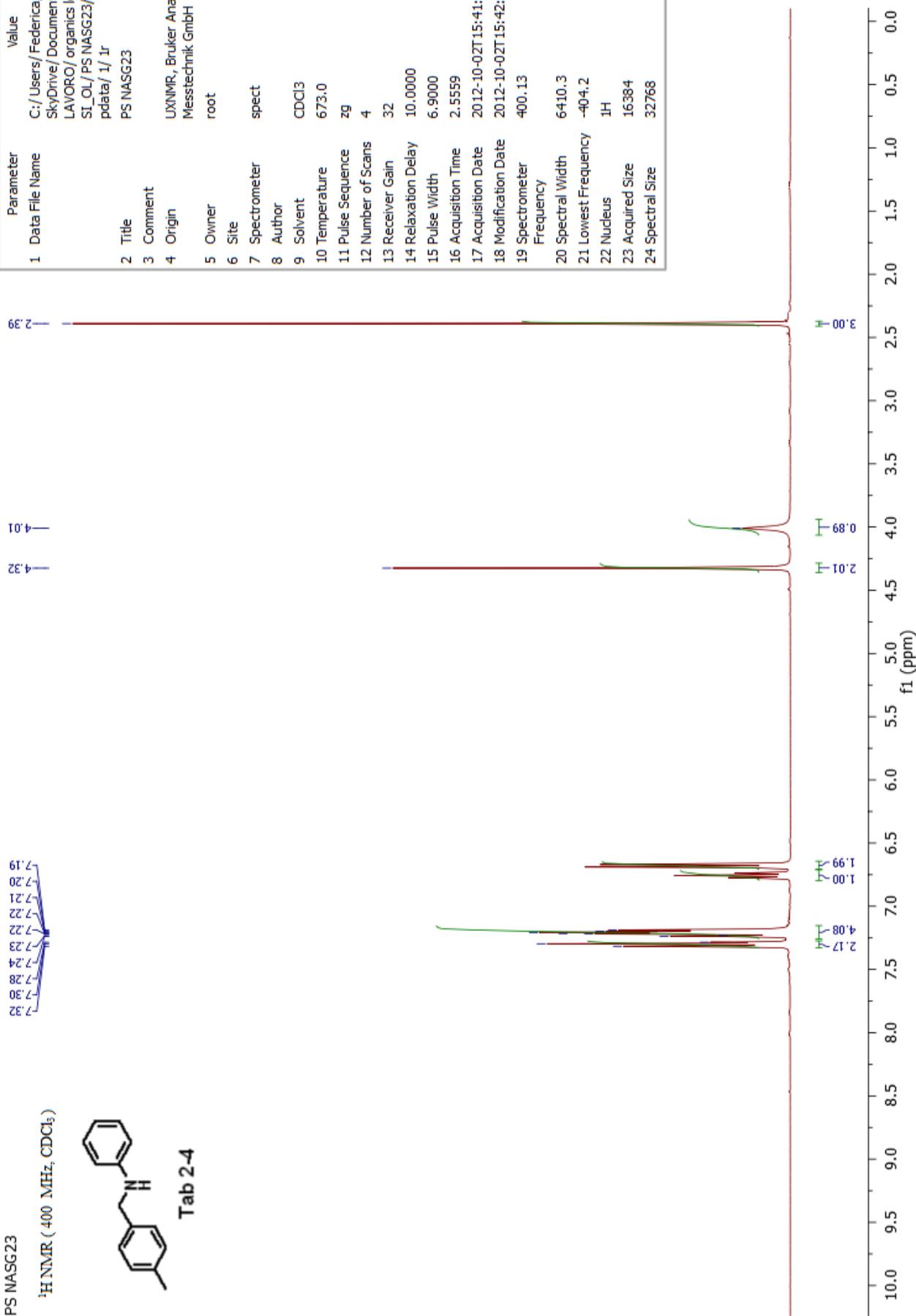
Parameter	Value
1 Data File Name	C:/Users/Federal/SkyDrive/Documents/LAVORO/organics/letters/SI_OL/PS NASG25/2/pdata/1/1r
2 Title	PS NASG25
3 Comment	
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl_3
10 Temperature	300.0
11 Pulse Sequence	apt.save
12 Number of Scans	771
13 Receiver Gain	16384
14 Relaxation Delay	2.0000
15 Pulse Width	7.0000
16 Acquisition Time	0.9044
17 Acquisition Date	2012-10-08T19:21:43
18 Modification Date	2012-10-08T20:59:50
19 Spectrometer Frequency	75.47
20 Spectral Width	18115.9
21 Lowest Frequency	-756.5
22 Nucleus	^{13}C
23 Acquired Size	16384
24 Spectral Size	32768

PS NASG23

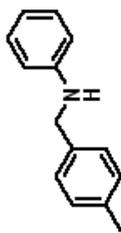
¹H NMR (400 MHz, CDCl₃)



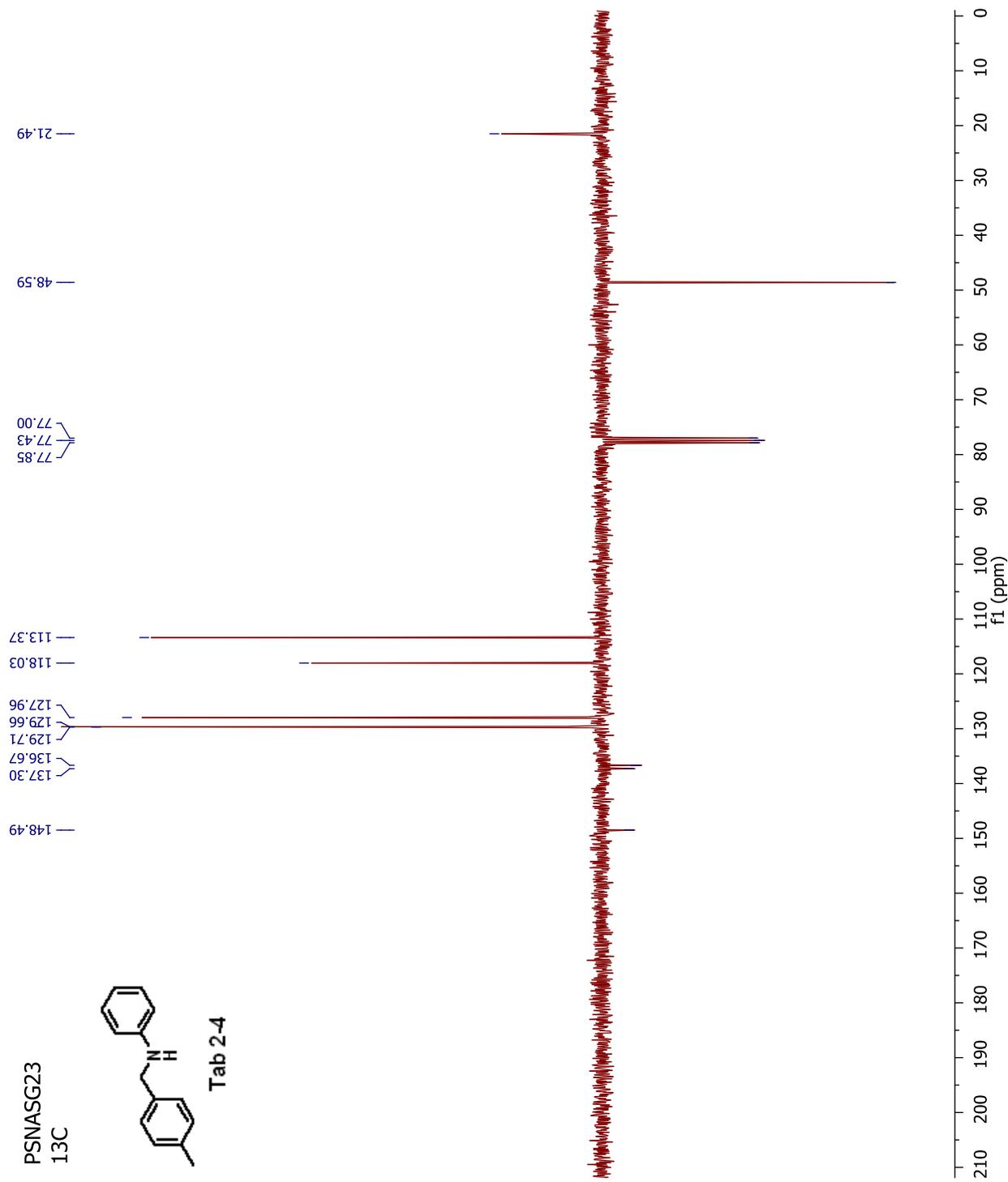
Tab 2-4



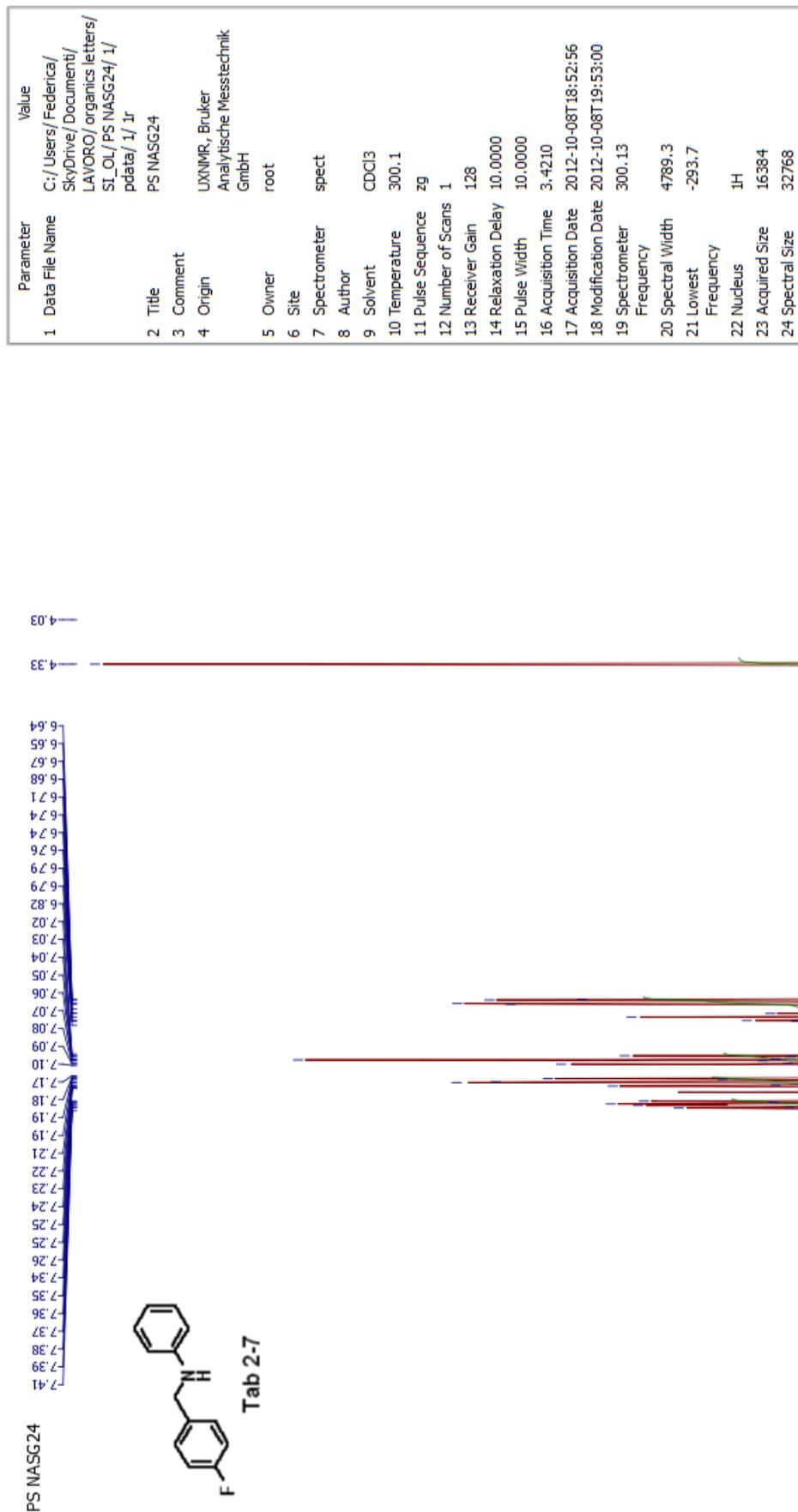
PSNMSG23
13C

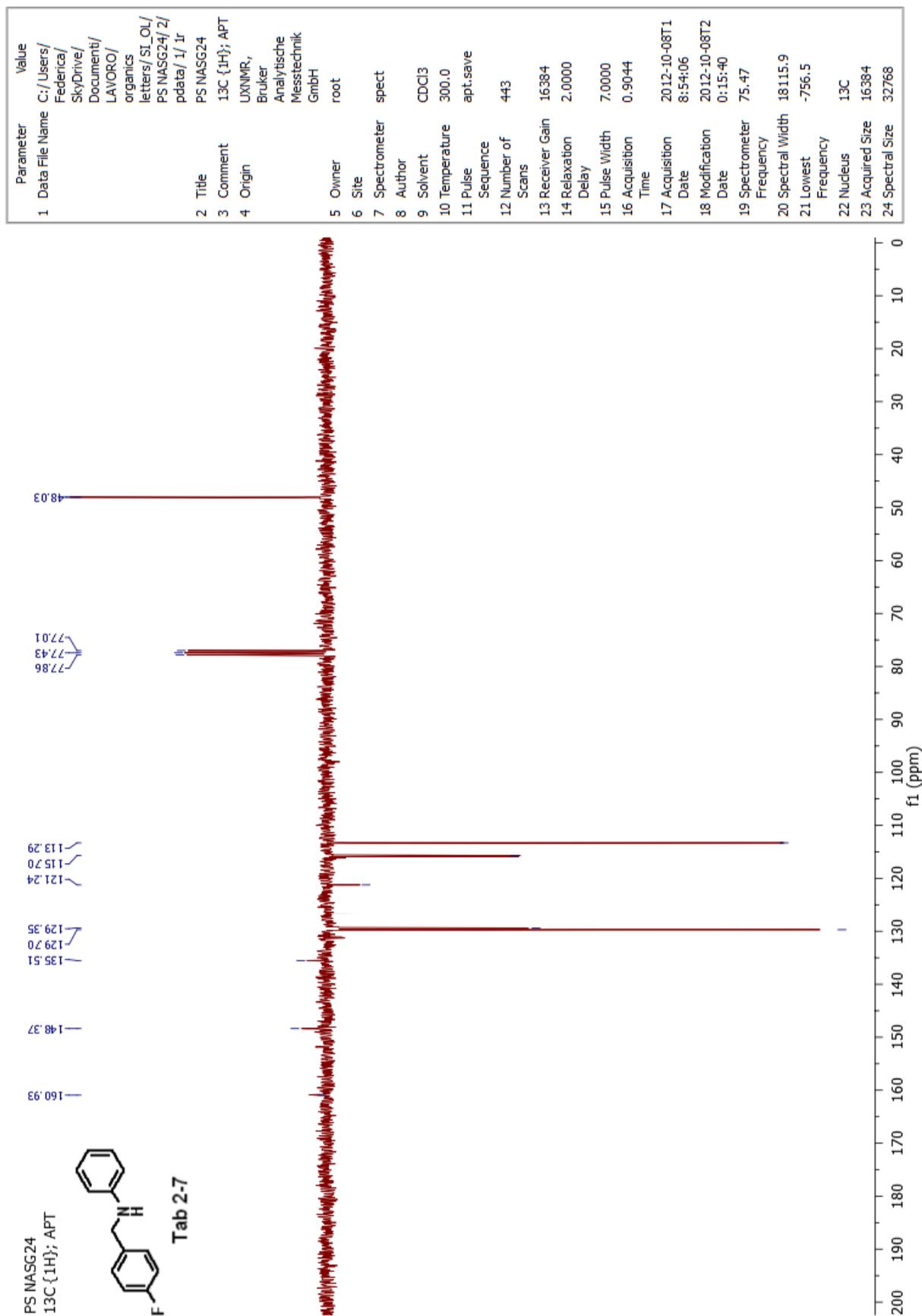


Tab 2-4

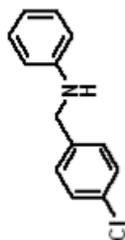


Parameter	Value
1 Data File Name	C:/Users/Federal/SkyDrive/Documents/LAVORO/organics/letters/SI_OL/PS NASG85/2/pdata/1/1r
2 Title	PS NASG85
3 Comment	13C {1H}; APT
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	root
7 Spectrometer	spect
8 Author	
9 Solvent	
10 Temperature	300.0
11 Pulse Sequence	apt.save
12 Number of Scans	491
13 Receiver Gain	16384
14 Relaxation Delay	2.0000
15 Pulse Width	7.0000
16 Acquisition Time	0.9044
17 Acquisition Date	2013-06-21T00:06:43
18 Modification Date	2013-06-21T00:31:50
19 Spectrometer Frequency	75.47
20 Spectral Width	18115.9
21 Lowest Frequency	-756.5
22 Nucleus	13C
23 Acquired Size	16384
24 Spectral Size	32768

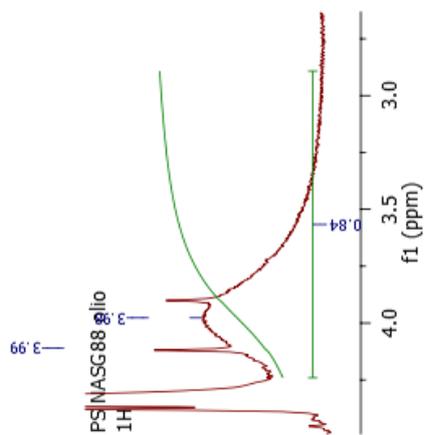




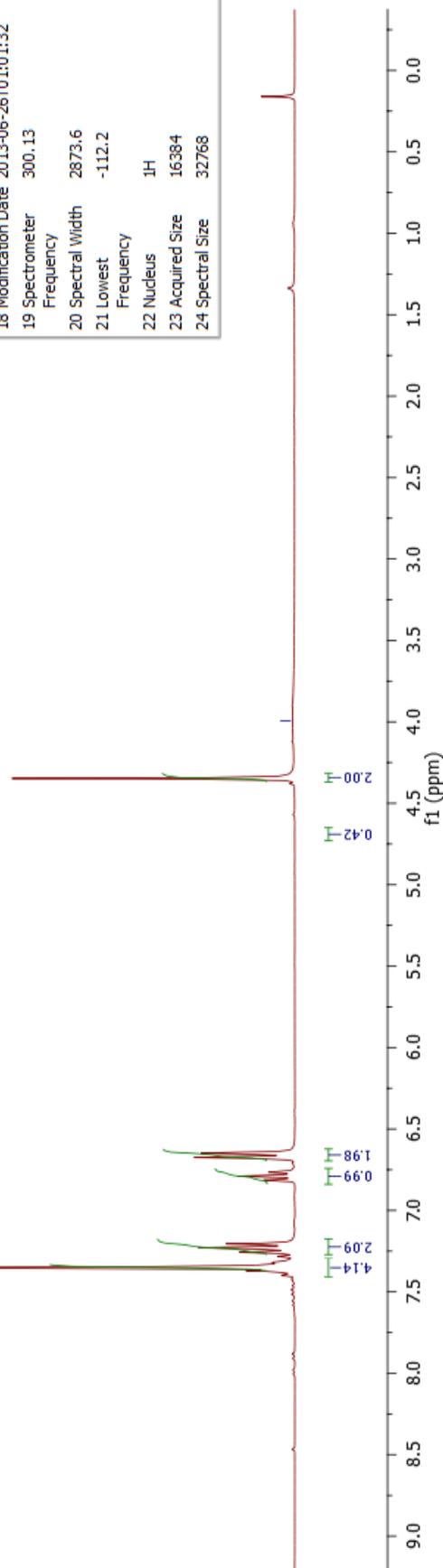
PS NASG88 olio
1H



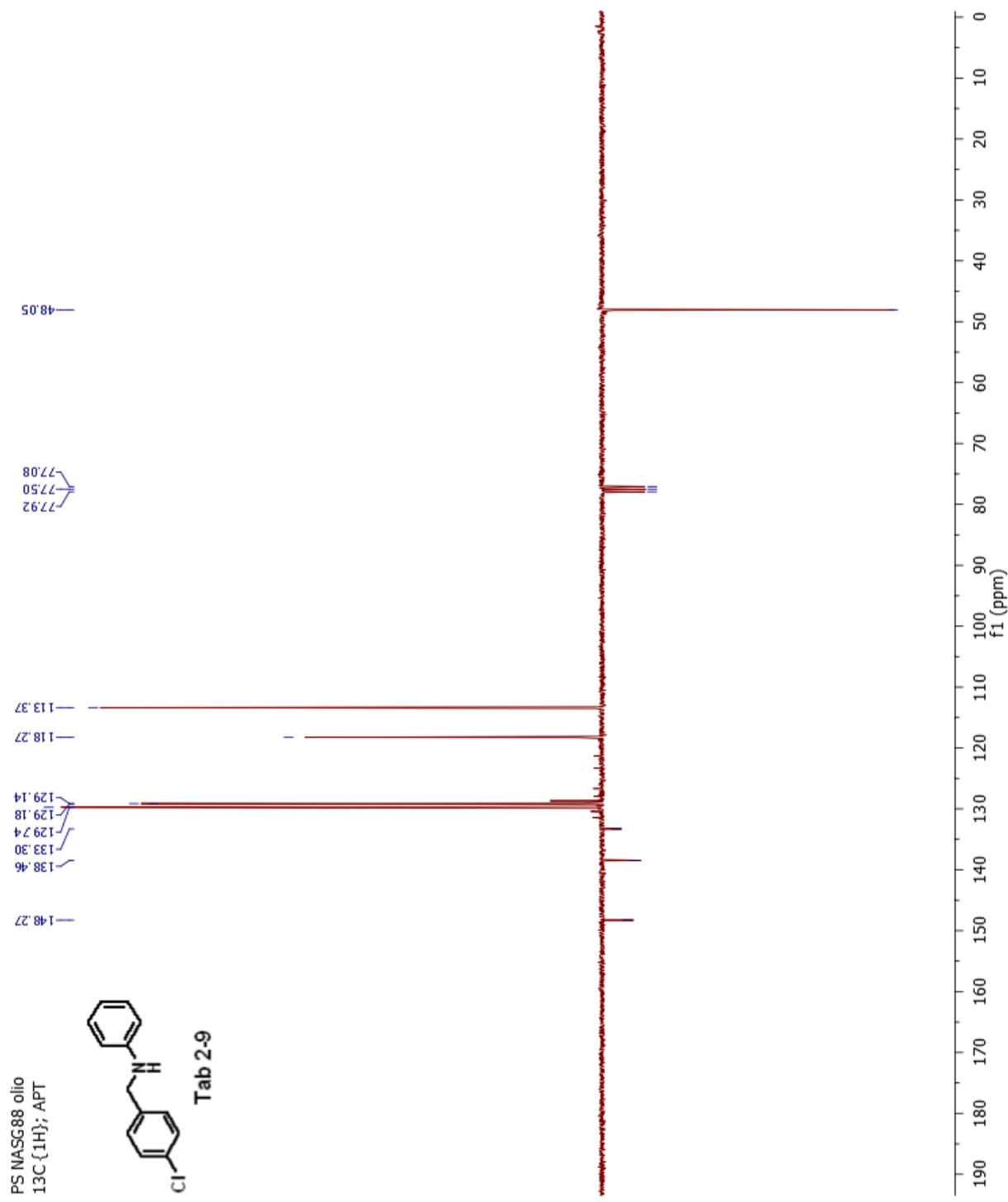
Tab 2-9

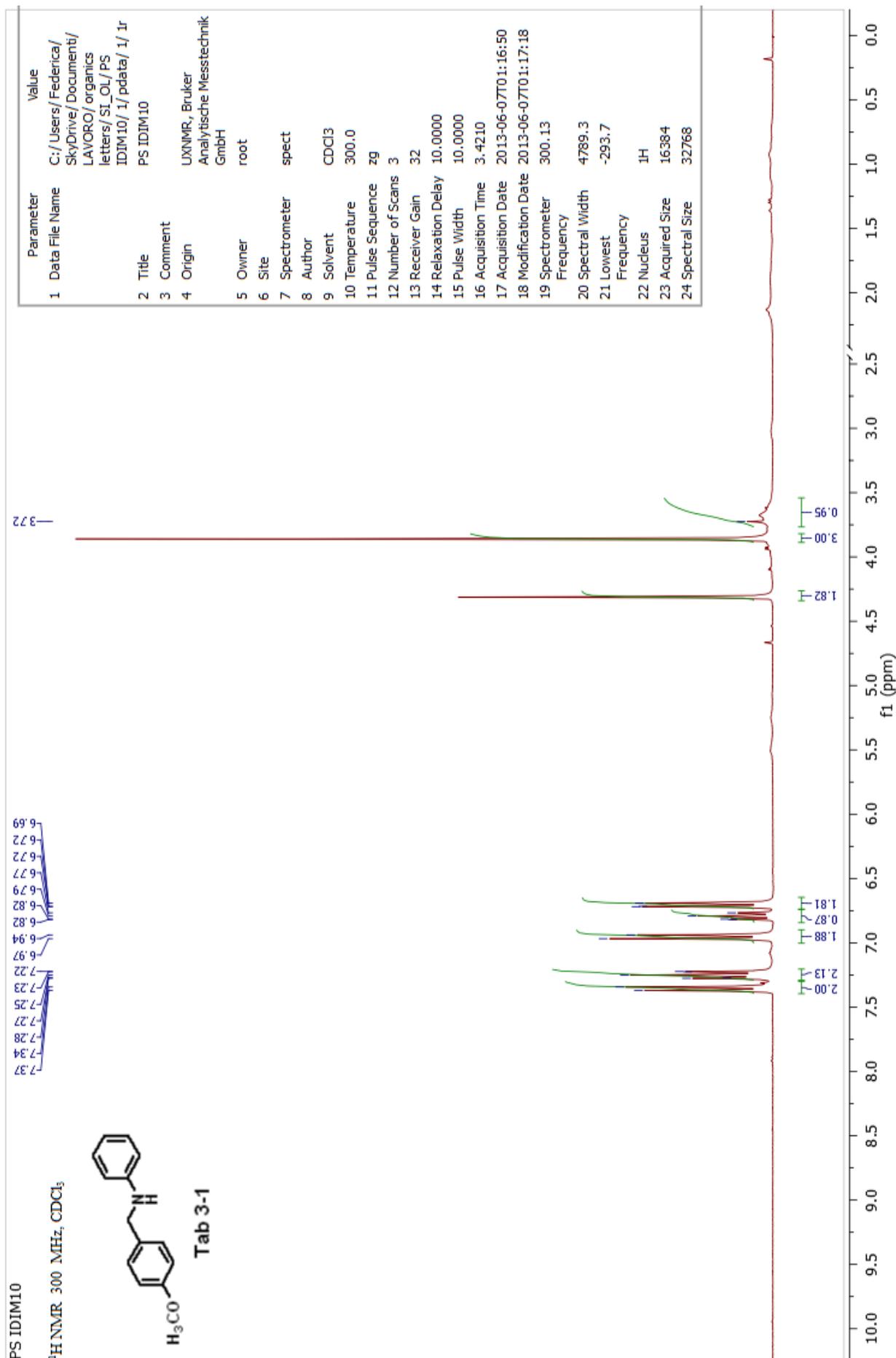


Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics letters/ST_OL/PS NASG88 olio/1/pdata/1/Jr
2 Title	PS NASG88 olio
3 Comment	1H
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	spect
7 Spectrometer	author
8 Author	CDCI3
9 Solvent	300.0
10 Temperature	zg
11 Pulse Sequence	12
12 Number of Scans	128
13 Receiver Gain	10.0000
14 Relaxation Delay	10.0000
15 Pulse Width	5.7016
16 Acquisition Time	2013-06-26T00:58:40
17 Acquisition Date	2013-06-26T01:01:32
18 Modification Date	300.13
19 Spectrometer Frequency	2873.6
20 Spectral Width	-112.2
21 Lowest Frequency	1H
22 Nucleus	16384
23 Acquired Size	32768
24 Spectral Size	

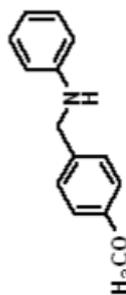


Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics/letters/SI_OL/PS NASG88 olio/ 2/ pdata/ 1/ 1r
2 Title	PS NASG88 olio
3 Comment	13C {1H}; APT
4 Origin	LXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	apt.save
12 Number of Scans	456
13 Receiver Gain	16384
14 Relaxation Delay	2.0000
15 Pulse Width	7.0000
16 Acquisition Time	0.9044
17 Acquisition Date	2013-06-26T01:01:48
18 Modification Date	2013-06-26T01:23:58
19 Spectrometer Frequency	75.47
20 Spectral Width	18115.9
21 Lowest Frequency	-756.5
22 Nucleus	13C
23 Acquired Size	16384
24 Spectral Size	32768

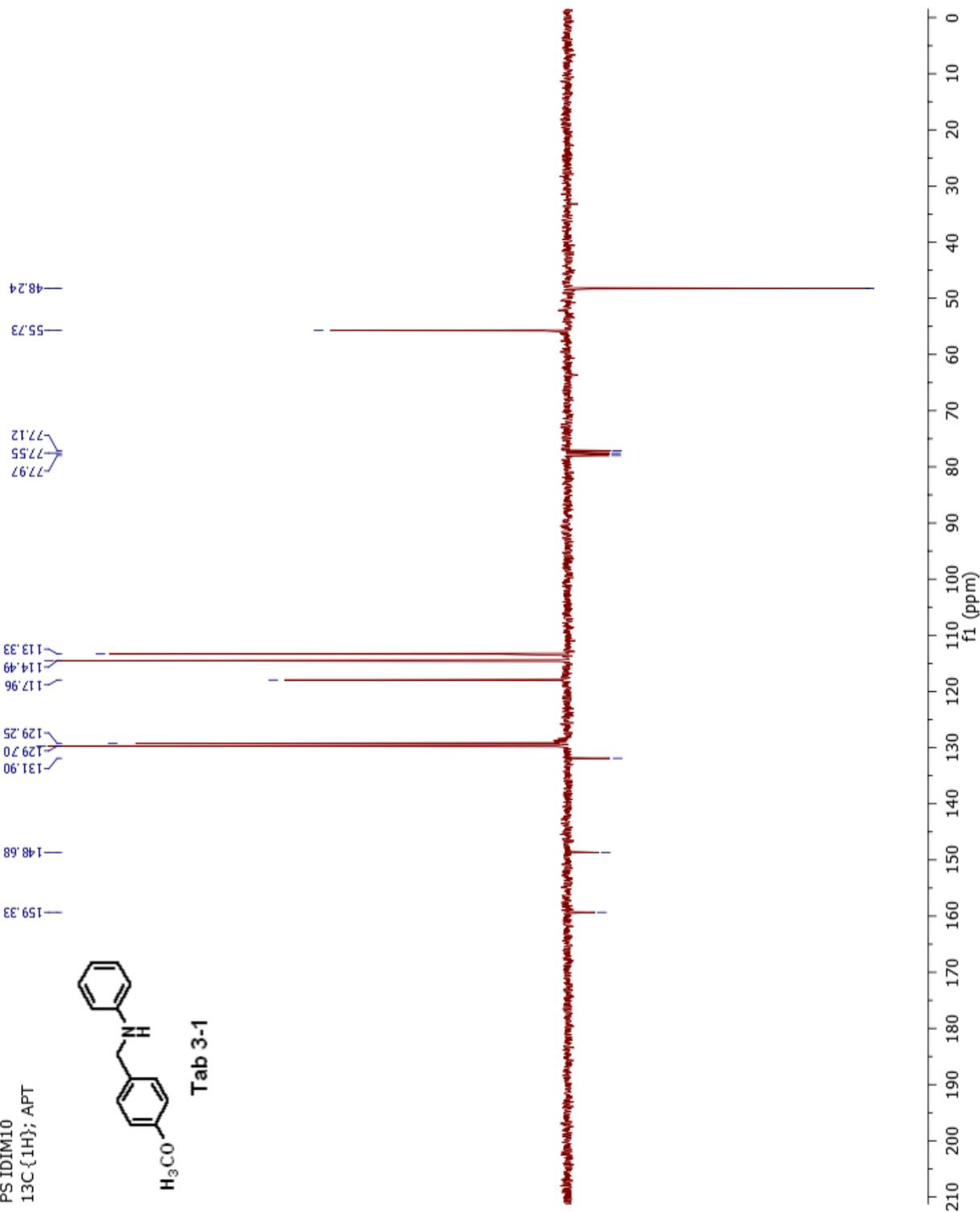




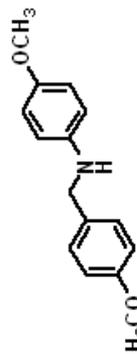
PS IDIM10
13C {1H}; APT



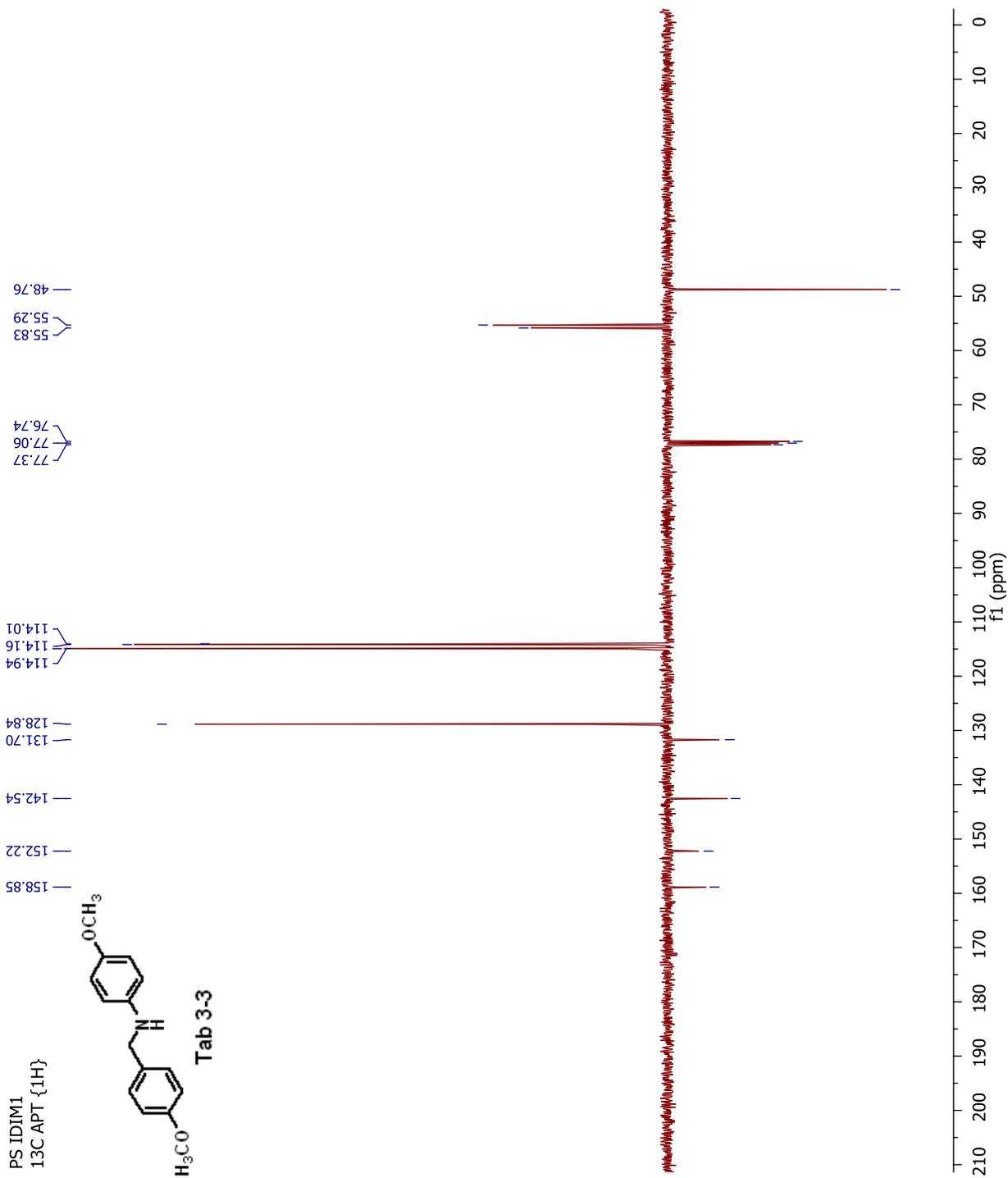
Tab 3-1



PS IDIM1
13C APT {1H}



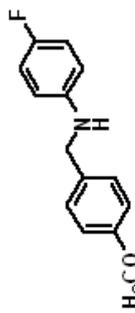
Tab 3-3



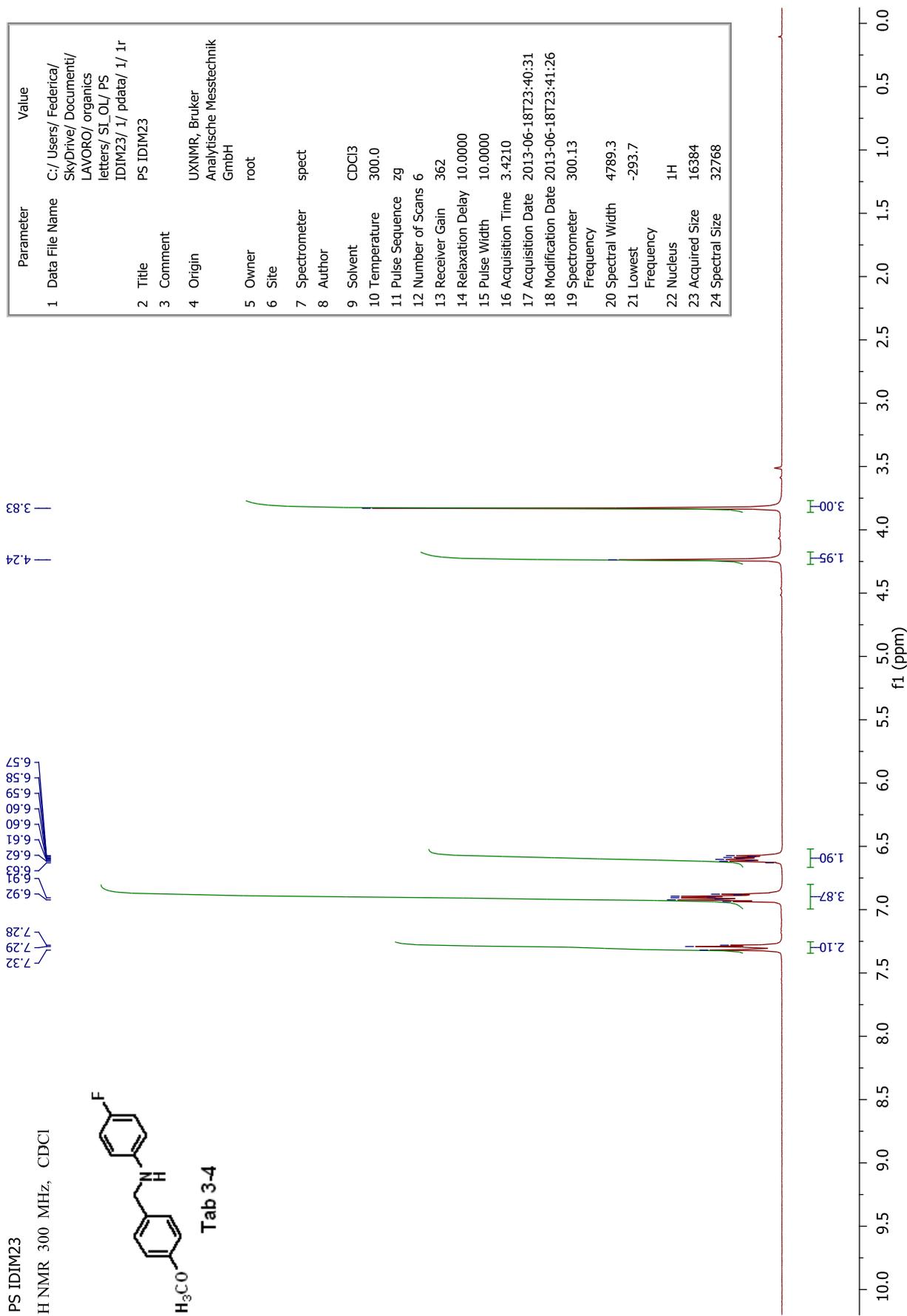
Parameter	Value
1 Data File Name	C:/Users/Federal/SkyDrive/Documents/LAVORO/organics/letters/ SI_OL/PS IDIM1/ 2/ pdata/ 1/ 1r
2 Title	PS IDIM1
3 Comment	13C APT {1H}
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	root
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	apt.save
12 Number of Scans	457
13 Receiver Gain	32768
14 Relaxation Delay	3.0000
15 Pulse Width	9.2500
16 Acquisition Time	0.3408
17 Acquisition Date	2012-12-20T09:00:58
18 Modification Date	2012-12-20T09:26:46
19 Spectrometer Frequency	100.61
20 Spectral Width	24038.5
21 Lowest Frequency	-951.8
22 Nucleus	13C
23 Acquired Size	8192
24 Spectral Size	16384

PS IDJM23

¹H NMR 300 MHz, CDCl₃



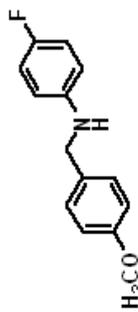
Tab 3-4



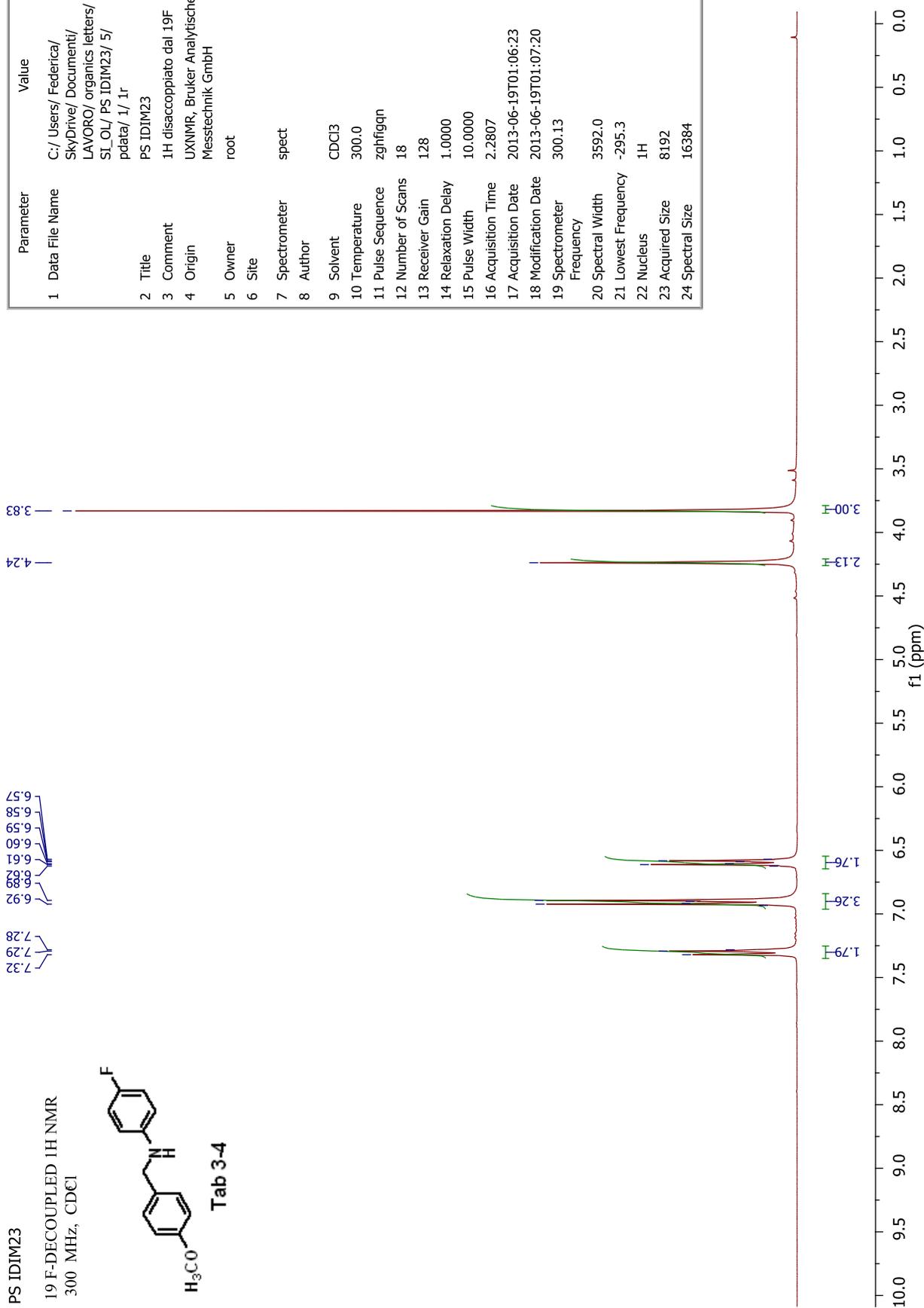
Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics letters/ST_OL/PS IDJM23/1/pdata/1/1r PS IDJM23
2 Title	PS IDJM23
3 Comment	
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	root
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl ₃
10 Temperature	300.0
11 Pulse Sequence	zg
12 Number of Scans	6
13 Receiver Gain	362
14 Relaxation Delay	10.0000
15 Pulse Width	10.0000
16 Acquisition Time	3.4210
17 Acquisition Date	2013-06-18T23:40:31
18 Modification Date	2013-06-18T23:41:26
19 Spectrometer Frequency	300.13
20 Spectral Width	4789.3
21 Lowest Frequency	-293.7
22 Nucleus	¹ H
23 Acquired Size	16384
24 Spectral Size	32768

PS IDIM23

19 F-DECOUPLED 1H NMR
 300 MHz, CDCl₃

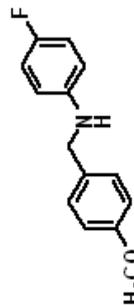


Tab 3-4

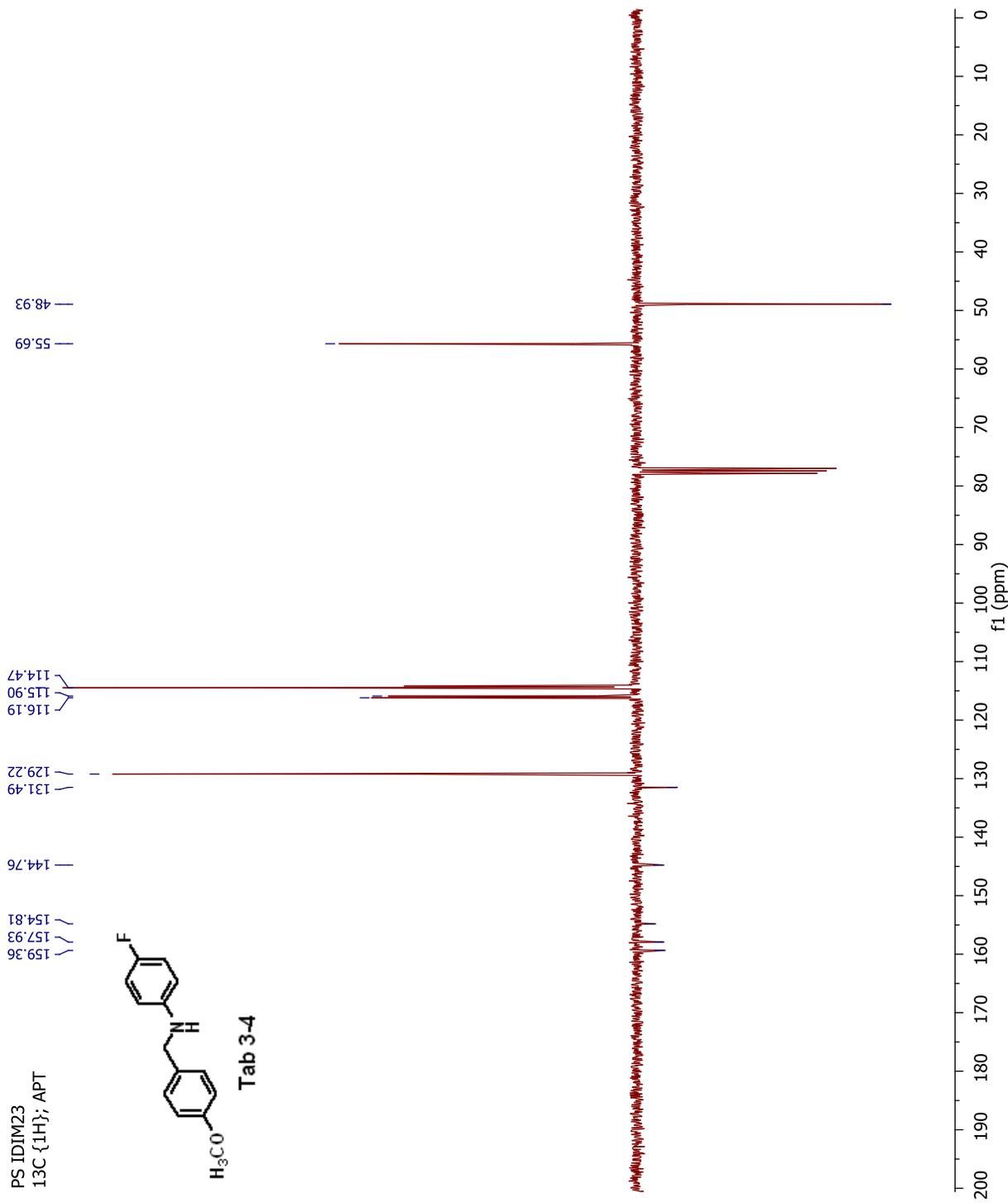


Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics letters/SL_OI/PS IDIM23/ 5/pdata/ 1/ 1r
2 Title	PS IDIM23
3 Comment	1H disaccoppiato dal 19F
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl ₃
10 Temperature	300.0
11 Pulse Sequence	zg30
12 Number of Scans	18
13 Receiver Gain	128
14 Relaxation Delay	1.0000
15 Pulse Width	10.0000
16 Acquisition Time	2.2807
17 Acquisition Date	2013-06-19T01:06:23
18 Modification Date	2013-06-19T01:07:20
19 Spectrometer Frequency	300.13
20 Spectral Width	3592.0
21 Lowest Frequency	-295.3
22 Nucleus	¹ H
23 Acquired Size	8192
24 Spectral Size	16384

PS IDIM23
13C {1H}; APT



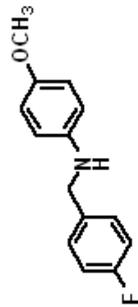
Tab 3-4



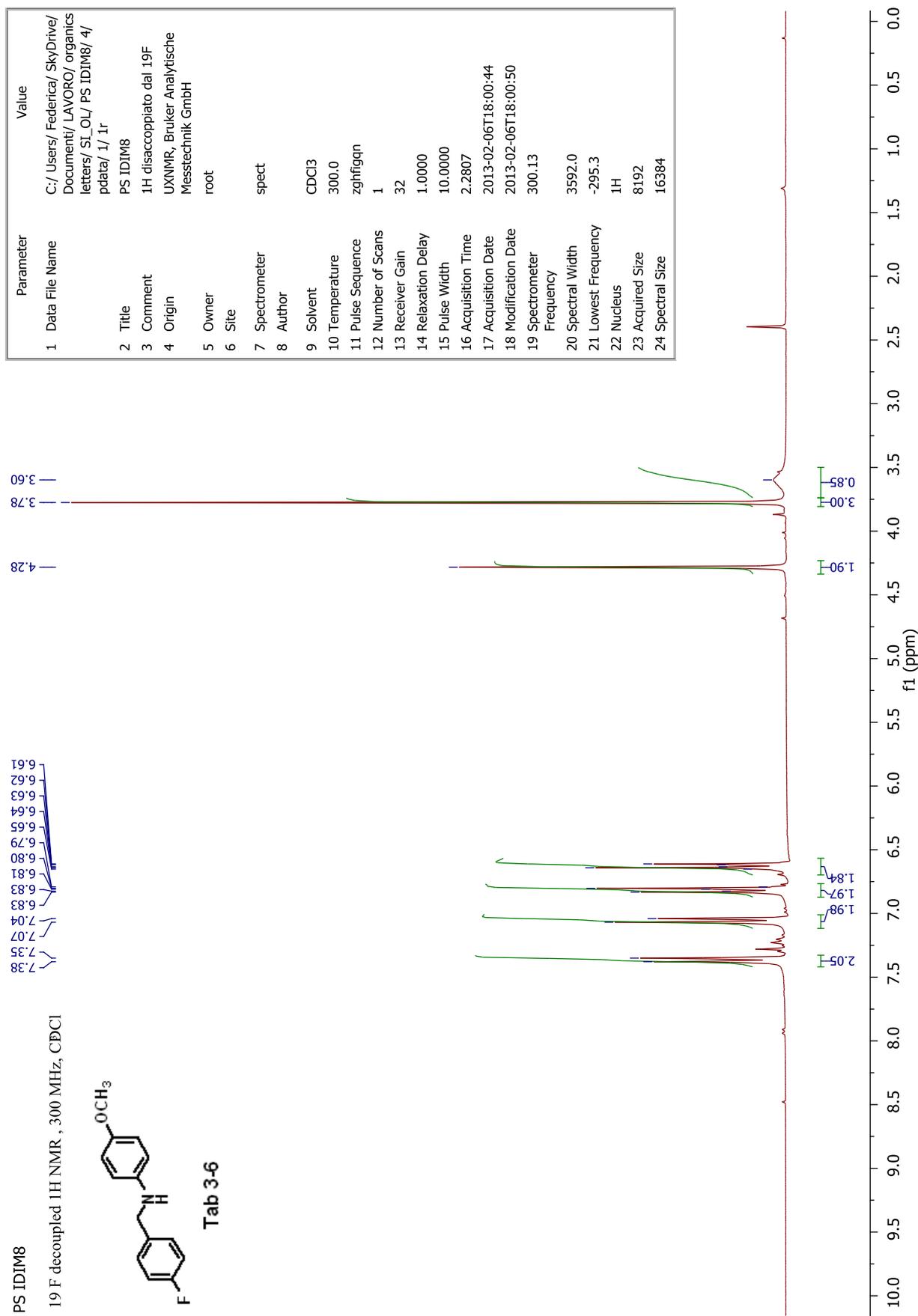
Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics letters/SL_OL/PS IDIM23/2/pdata/1/1r
2 Title	PS IDIM23
3 Comment	13C {1H}; APT
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	root
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	apt.save
12 Number of Scans	1543
13 Receiver Gain	16384
14 Relaxation Delay	2.0000
15 Pulse Width	7.0000
16 Acquisition Time	0.9044
17 Acquisition Date	2013-06-18T23:43:14
18 Modification Date	2013-06-19T00:58:22
19 Spectrometer Frequency	75.47
20 Spectral Width	18115.9
21 Lowest Frequency	-756.5
22 Nucleus	13C
23 Acquired Size	16384
24 Spectral Size	32768

PS IDIM8

¹⁹F decoupled ¹H NMR, 300 MHz, CDCl₃

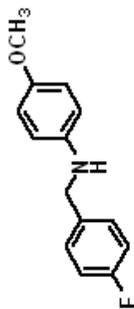


Tab 3-6

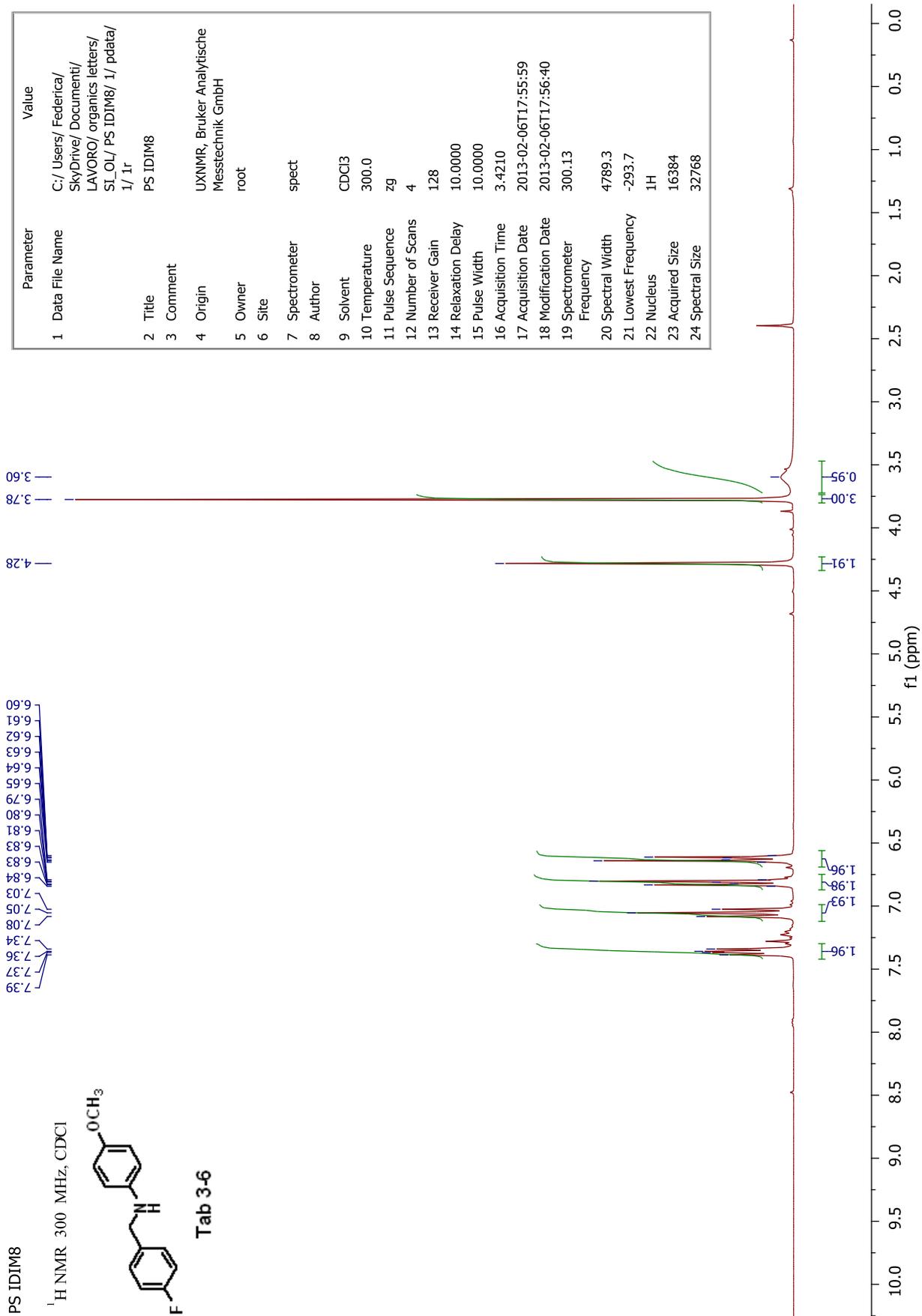


PS IDIM8

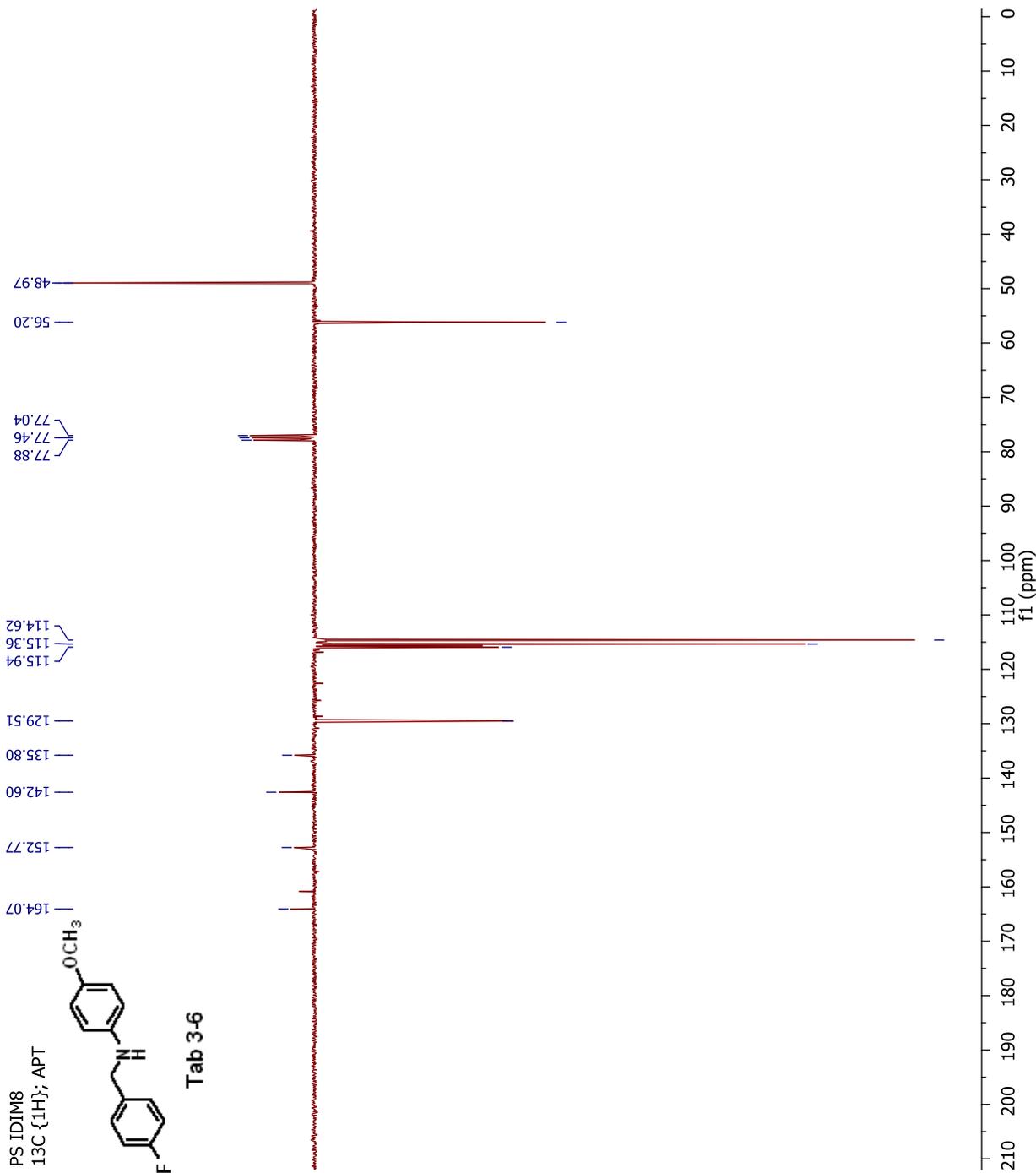
¹H NMR 300 MHz, CDCl₃

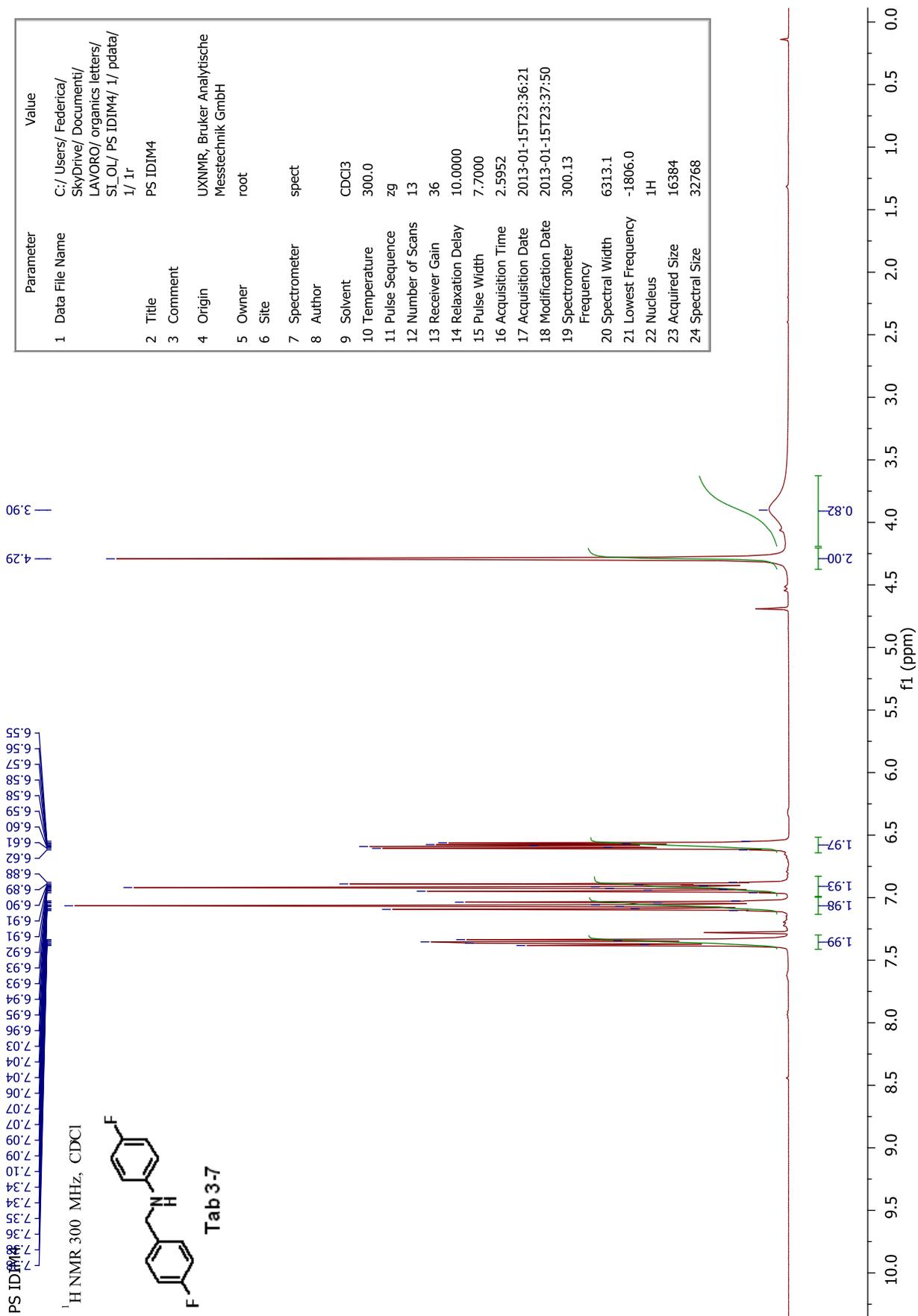


Tab 3-6

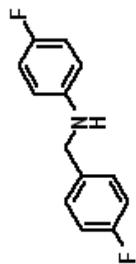


Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics/letters/ SI_OL/ PS IDIM8/ 5/ pdata/ 1/ 1r
2 Title	PS IDIM8
3 Comment	¹³ C {1H}; APT
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl ₃
10 Temperature	300.0
11 Pulse Sequence	apt.save
12 Number of Scans	1762
13 Receiver Gain	16384
14 Relaxation Delay	2.0000
15 Pulse Width	7.0000
16 Acquisition Time	0.9044
17 Acquisition Date	2013-02-06T18:04:14
18 Modification Date	2013-02-06T19:30:00
19 Spectrometer Frequency	75.47
20 Spectral Width	18115.9
21 Lowest Frequency	-756.5
22 Nucleus	¹³ C
23 Acquired Size	16384
24 Spectral Size	32768

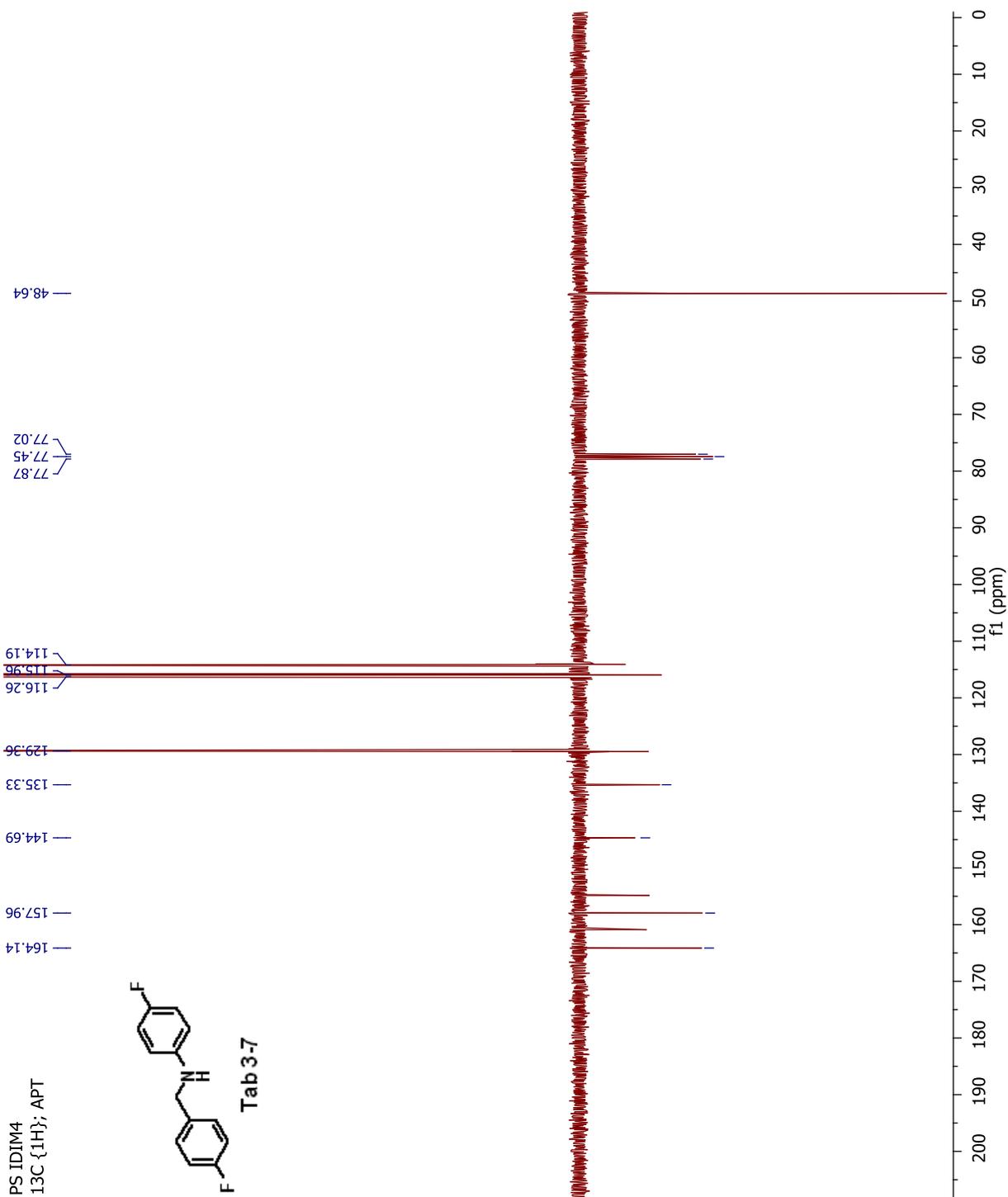




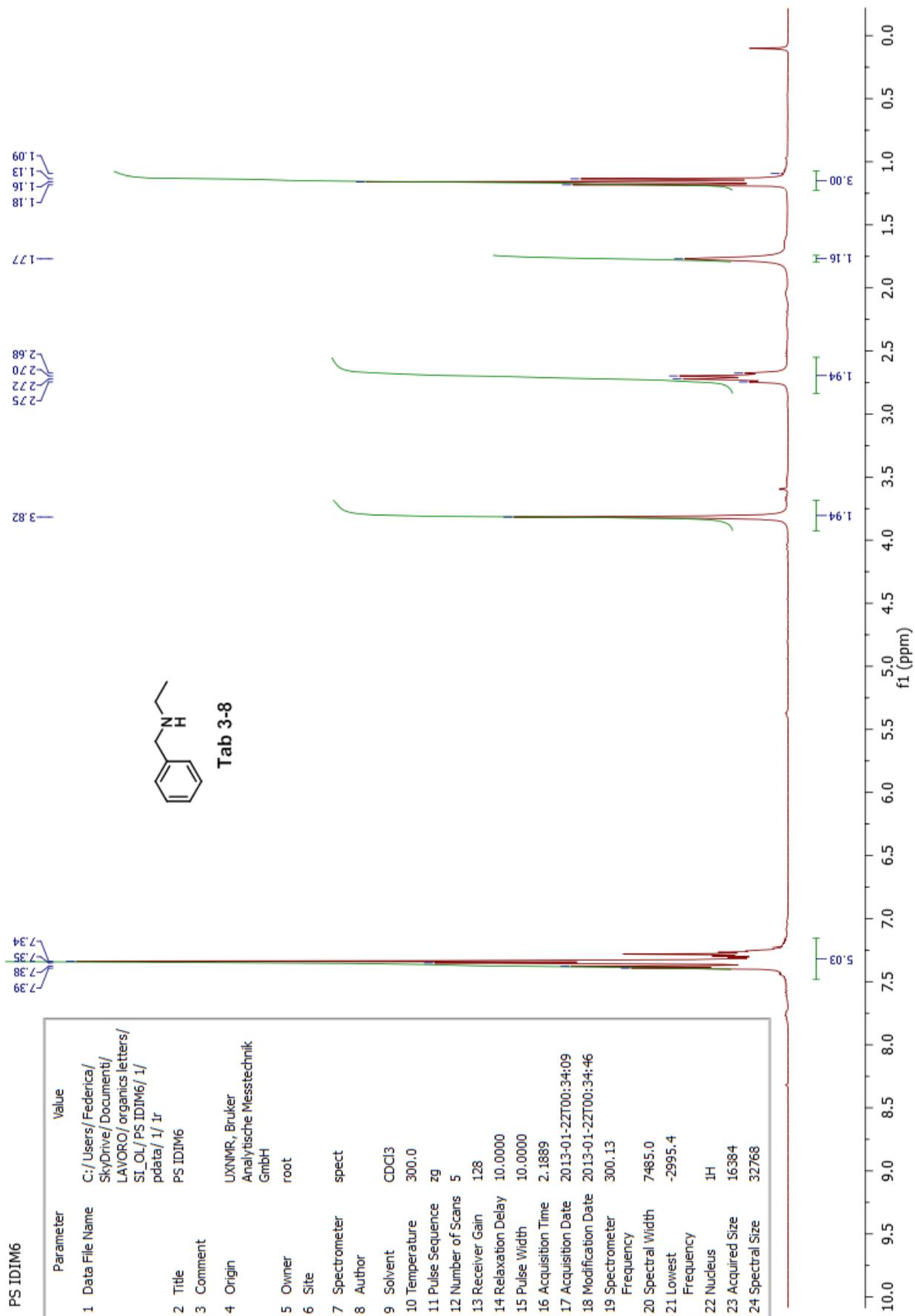
PS IDIM4
13C {1H}; APT



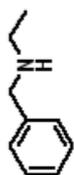
Tab 3-7



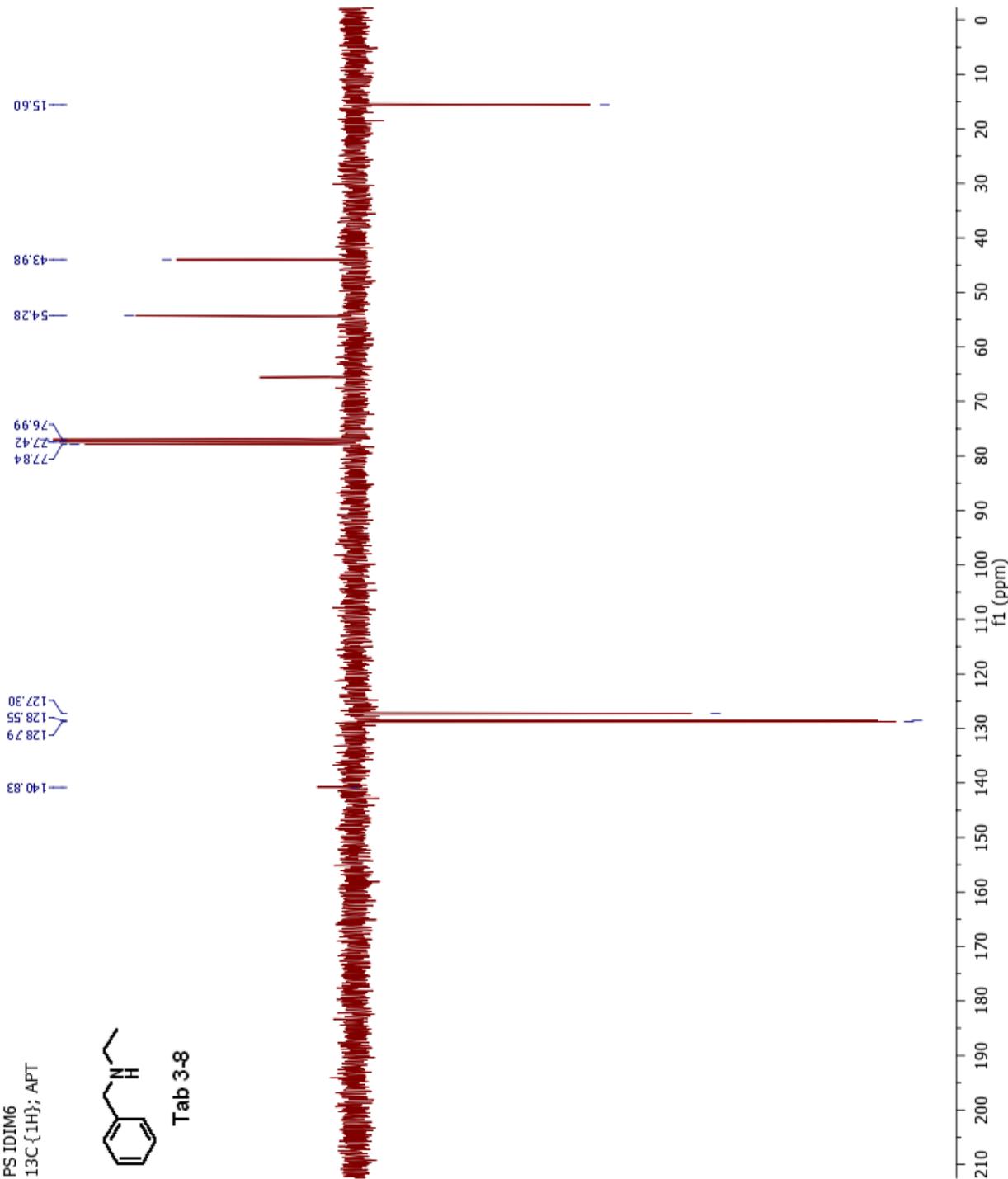
Parameter	Value
1 Data File Name	C:/Users/Federica/SkyDrive/Documents/LAVORO/organics letters/ SI_OL/ PS IDIM4/ 2/ pdata/ 1/ 1r
2 Title	PS IDIM4
3 Comment	13C {1H}; APT
4 Origin	UXNMR, Bruker Analytische Messtechnik GmbH
5 Owner	root
6 Site	root
7 Spectrometer	spect
8 Author	spect
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	apt
12 Number of Scans	2594
13 Receiver Gain	16384
14 Relaxation Delay	2.0000
15 Pulse Width	13.0000
16 Acquisition Time	0.9044
17 Acquisition Date	2013-01-15T23:39:34
18 Modification Date	2013-01-16T01:47:06
19 Spectrometer Frequency	75.47
20 Spectral Width	18115.9
21 Lowest Frequency	-756.5
22 Nucleus	13C
23 Acquired Size	16384
24 Spectral Size	32768

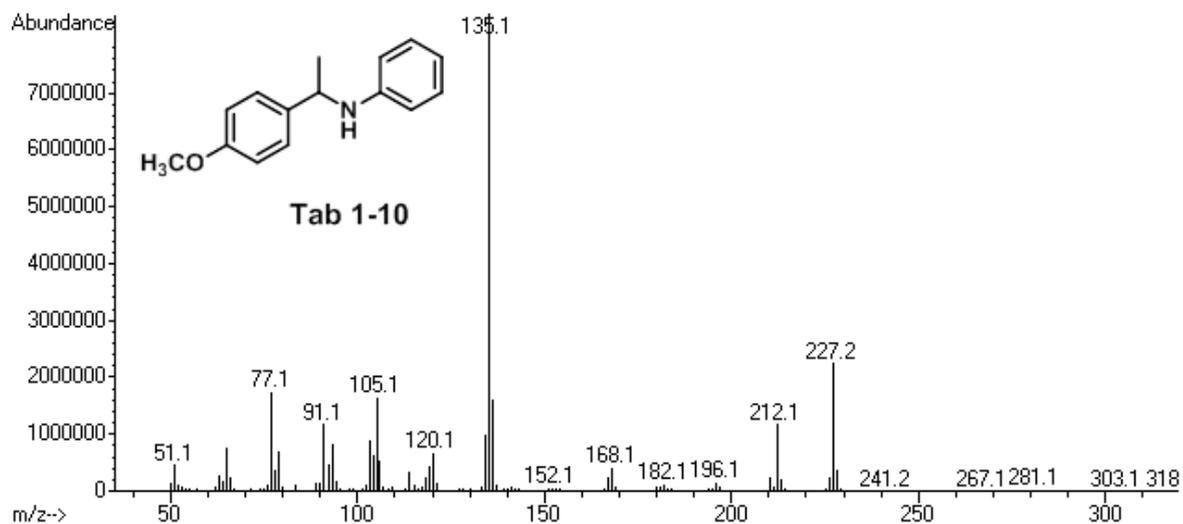
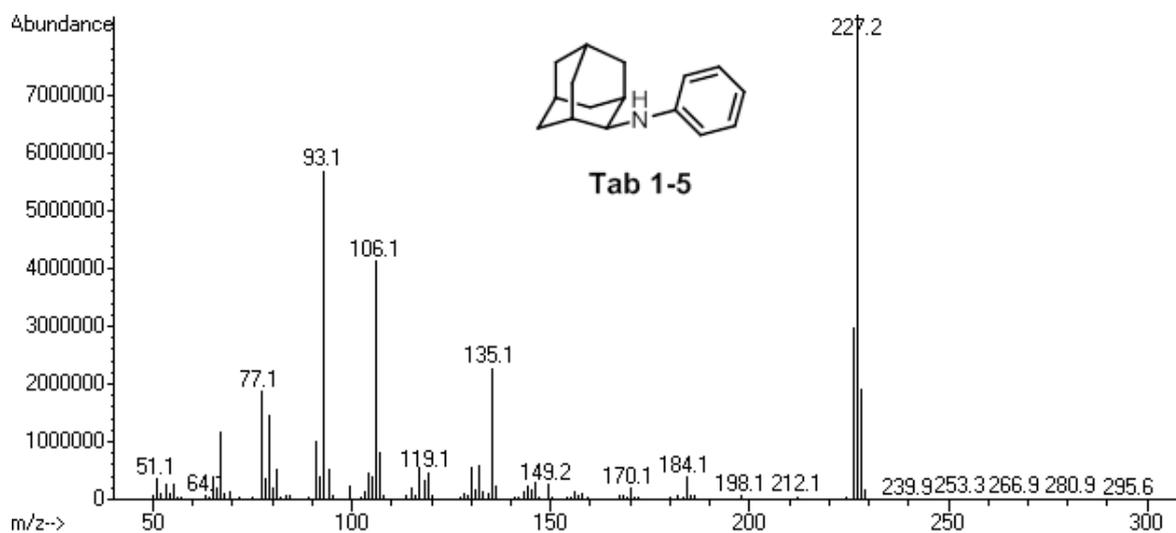
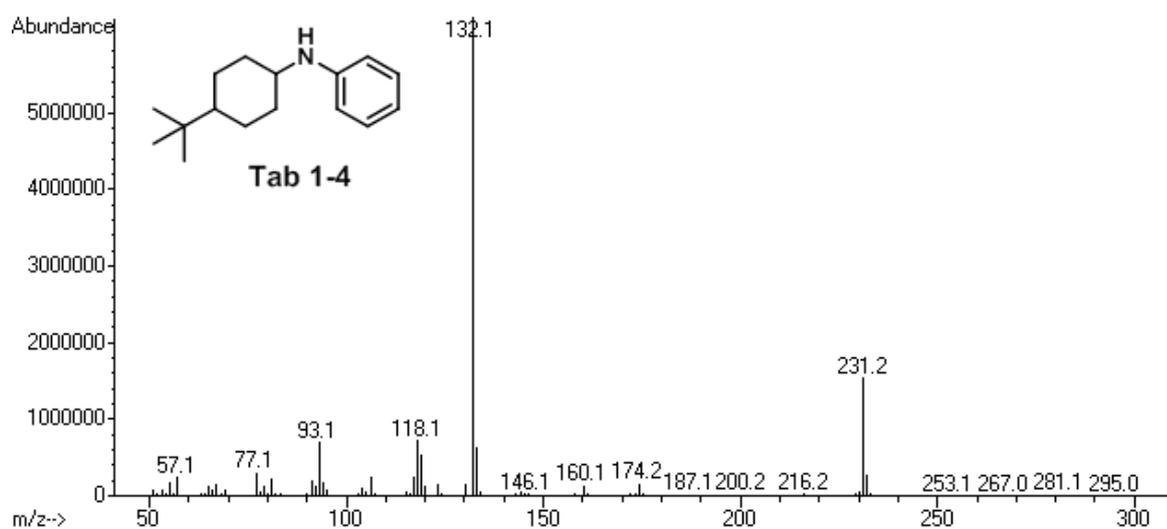


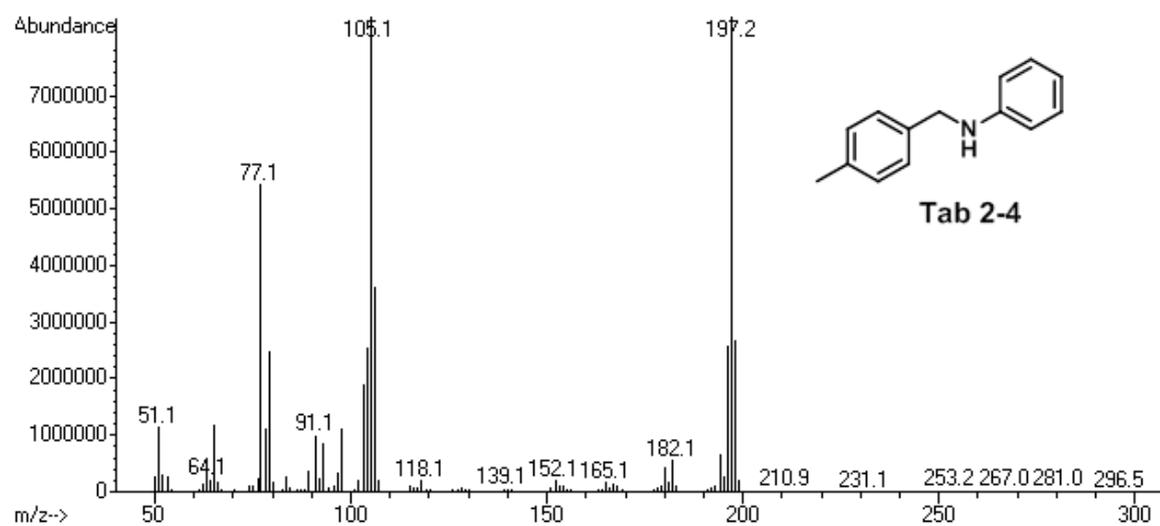
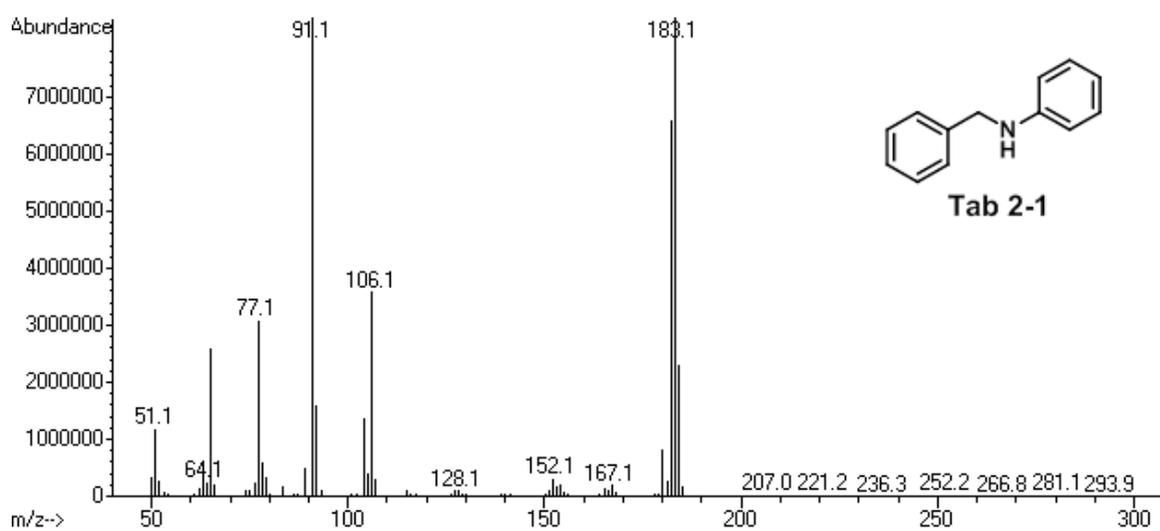
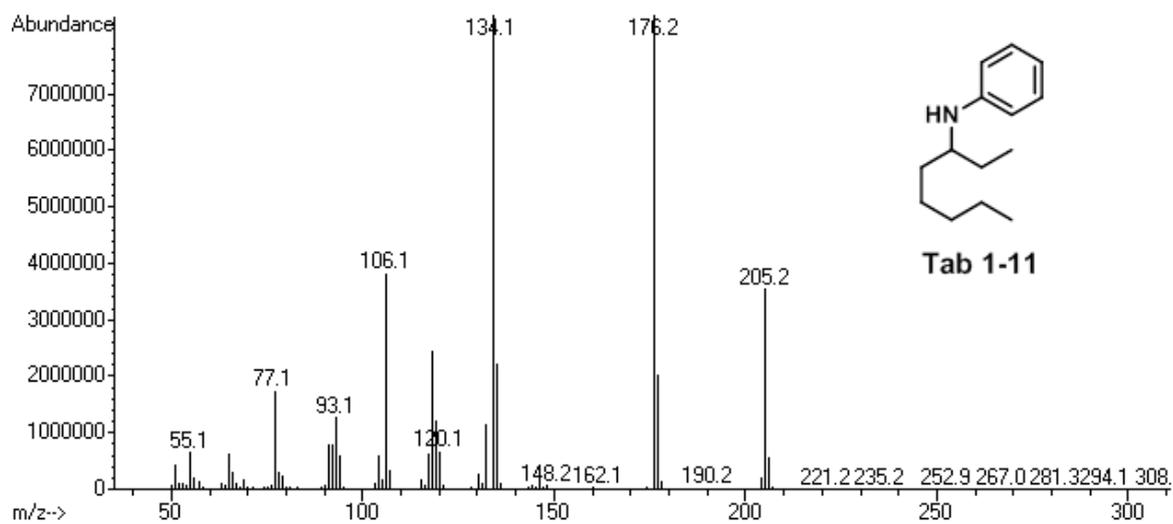
PS IDIM6
13C {1H}; APT

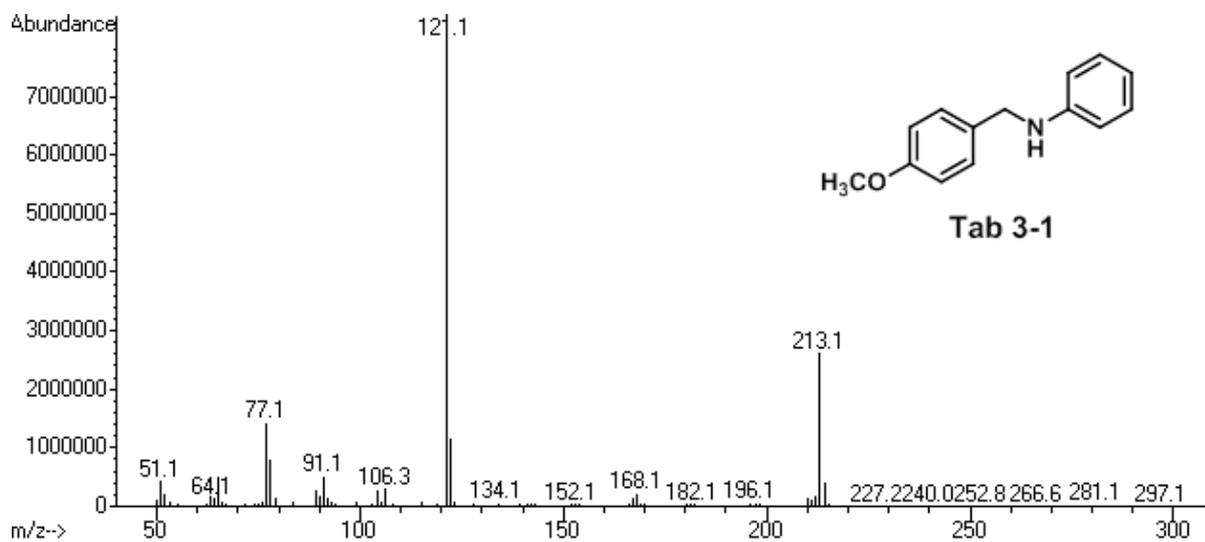
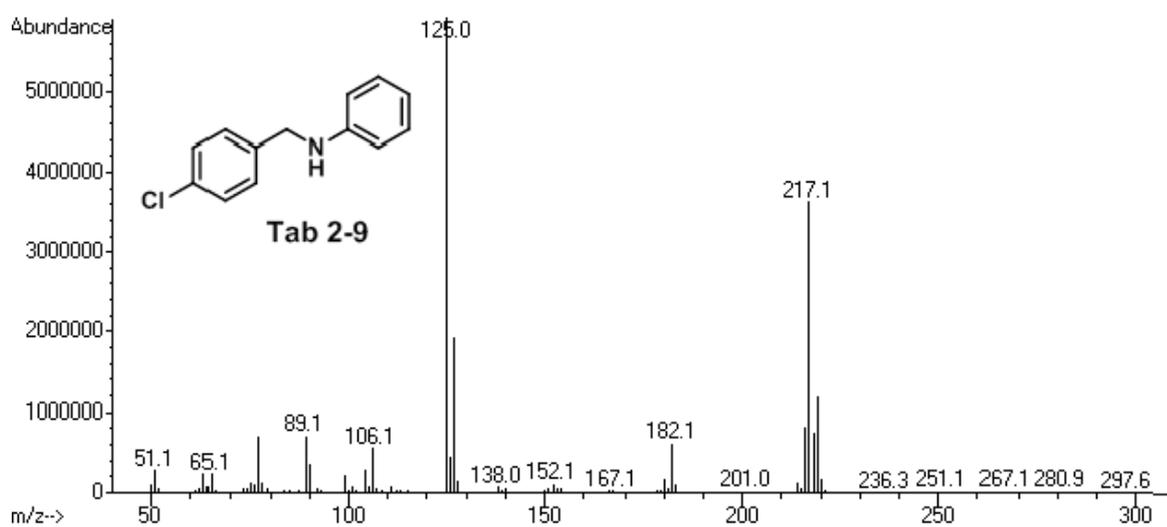
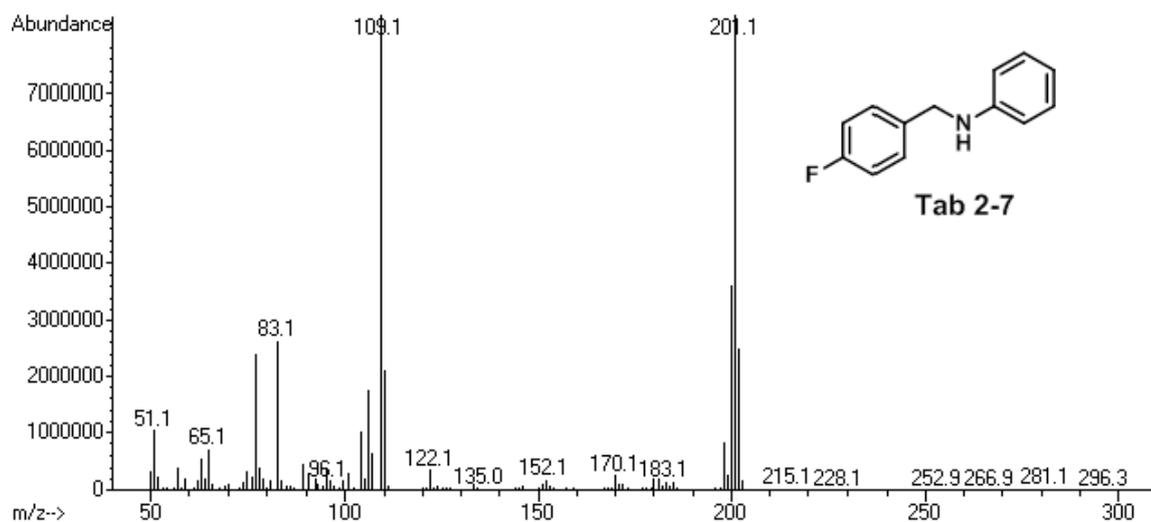


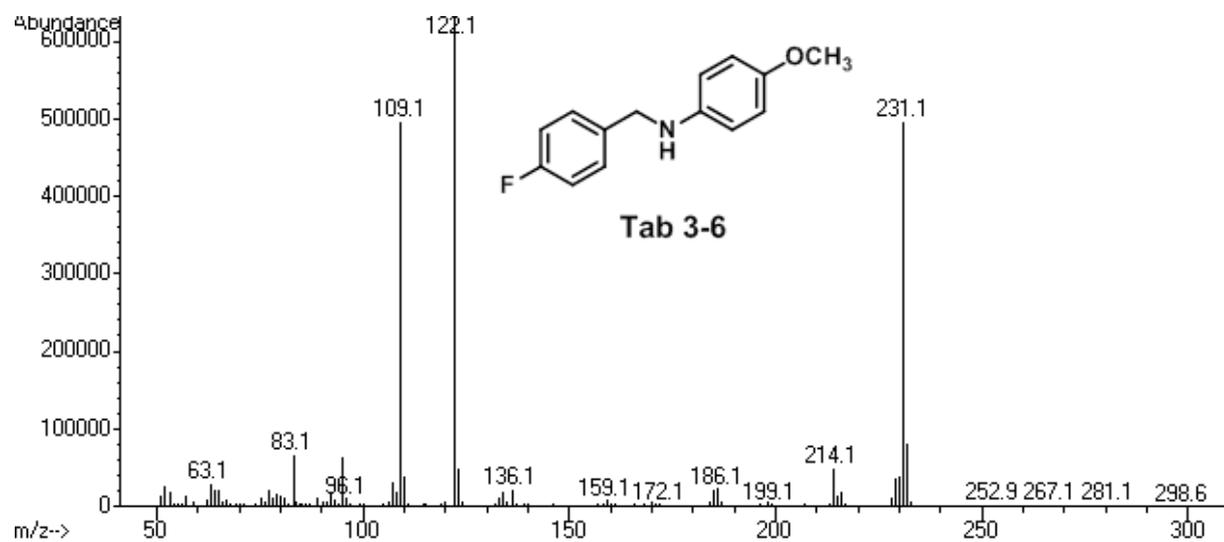
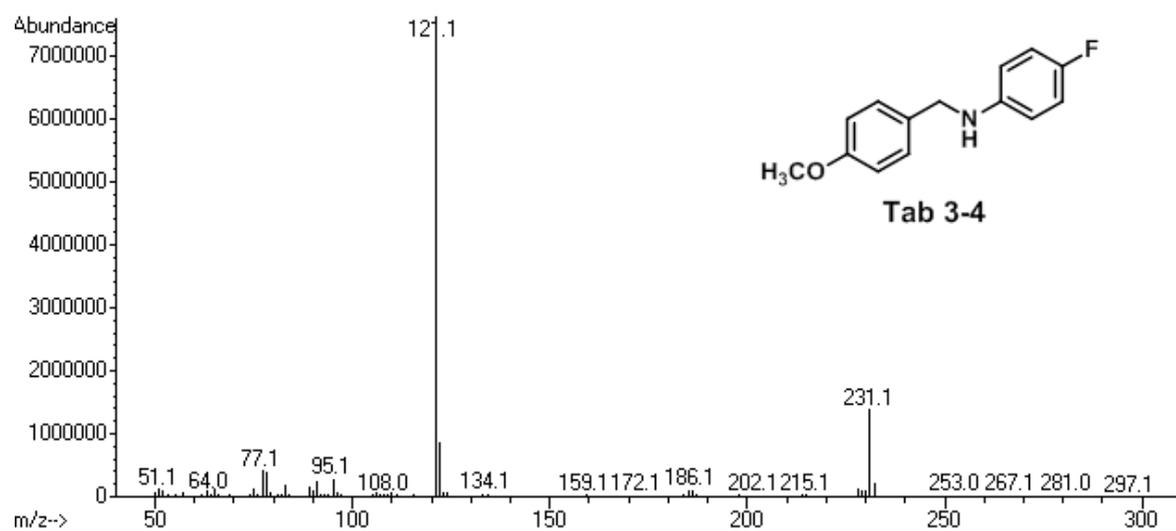
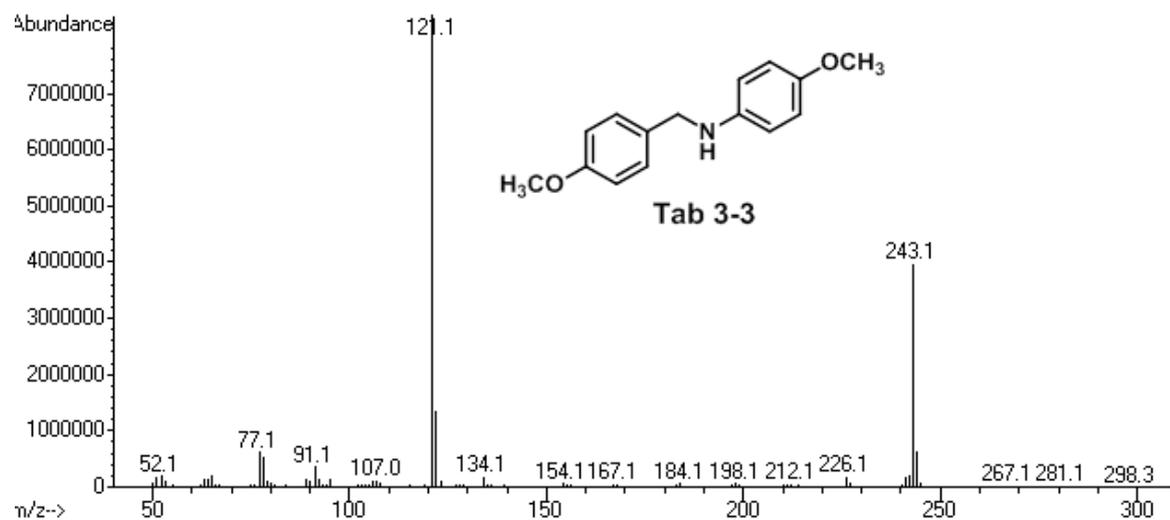
Tab 3-8

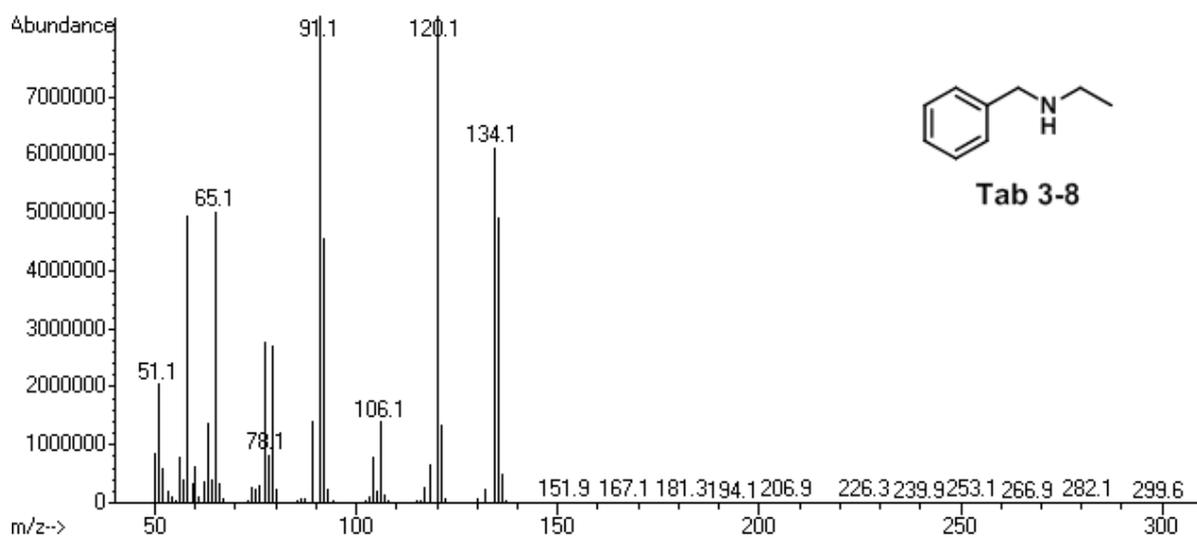
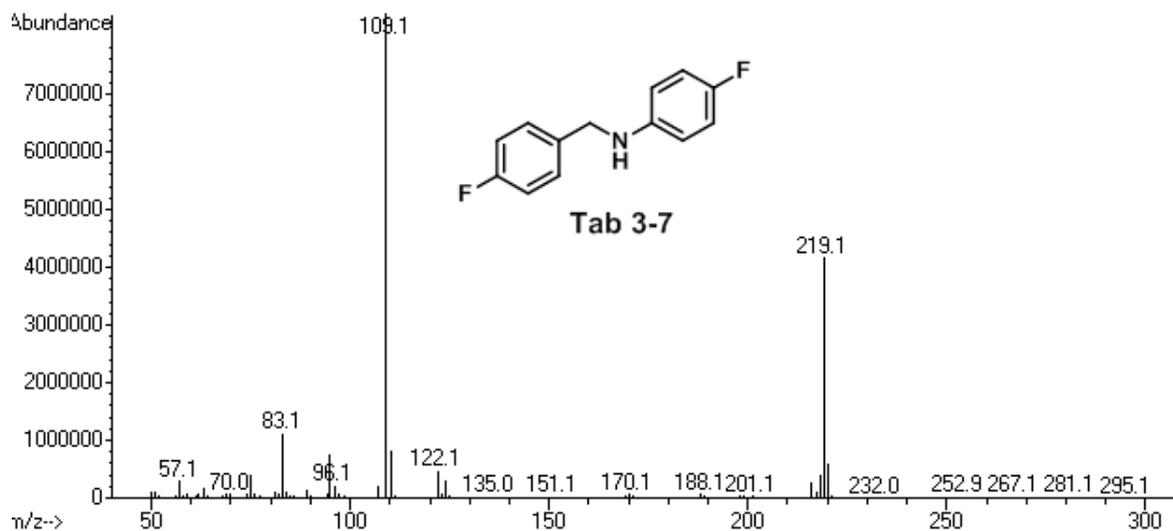












1. Brune, H. A.; Unsin, J.; Hemmer, R.; Reichhardt, M. J. *Organomet. Chem.* 1989, 369, 335
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