Supporting Information for

Highly Enantioselective Hydrogenation of Enamides Catalyzed by Chiral Phosphoric Acids

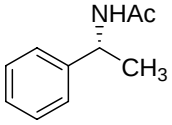
Guilong Li and Jon C. Antilla*
Department of Chemistry, University of South Florida,
4202 East Fowler Avenue CHE205A, Tampa, Florida 33620
jantilla@cas.usf.edu

General Considerations: All reactions were carried out in flame-dried or oven-dried screw-cap test tubes with magnetic stirring. All solvents (toluene, dichloromethane, and THF) were purified by passing through a column of activated alumina under a dry argon atmosphere. Ethyl acetate was purchased from Aldrich and dried with molecular sieves (4Å). Additional solvents (acetonitrile and chloroform) were purchased anhydrous from commercial sources and transferred under an argon atmosphere. VAPOL phosphoric acid was synthesized according to the literature procedure.[1] Chiral BINOL was purchased from commercial sources and used without further purification. Substituted BINOL phosphoric acids (**A3**, and **A4**) were prepared from chiral BINOL according to the known literature procedures.[2] Phenylphosphinic acid was purchased from commercial sources and used without further purification. Thin layer chromatography was performed on Merck TLC plates (silica gel 60 F254). Flash column chromatography was performed with Merck silica gel (230-400 mesh). Enantiomeric excess (ee) was determined using a Varian Prostar HPLC with a 210 binary pump and a 335 diode array detector. Column conditions are reported in the experimental section below. Melting points were determined using a MEL-TEMP 3.0 instrument and are uncorrected. Optical rotations were performed on a Rudolph Research Analytical Autopol IV polarimeter (λ 589) using a 700- L cell with a path length of 1-dm. ^{1}H NMR and ^{13}C NMR were recorded on a Bruker Avance DPX-250 (250 MHz) instrument with chemical shifts reported relative to tetramethylsilane (TMS). Compounds described in the literature were characterized by comparing their ^{1}H NMR, ^{13}C NMR chemical shift and melting points to the reported values.

All enamides were prepared according to the reported procedures except that the purification of the enamides was by flash column chromatography (EtOAc / hexane) and followed by recrystallization from EtOAc/hexane.[3]

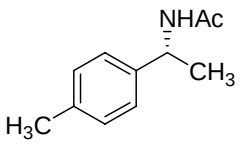
All racemic amide products were prepared by hydrogenation of the corresponding enamide with 10% Pd/C as the catalyst and by using EtOAc as the solvent.

Typical procedure for the asymmetric hydrogenation of enamide catalyzed by a dual-catalytic system of a chiral Brønsted acid and acetic acid (Method B): To a flame-dried reaction tube was added enamide **1** (0.2 mmol), Hanztsch ester **2** (55.7 mg, 0.22 mmol) and catalyst **A4** (1.4 mg, 0.002 mmol). The mixture was purged with argon, then acetic acid (1.0 μL, 0.02 mmol) and toluene (1.2 mL) were added. The suspension was heated to 50℃ with stirring. The crude product was purified by flash column chromatography (EtOAc/hexane) after the reaction was completed (monitored by TLC) to provide pure product amide **3**. ee values were measured on HPLC with a suitable chiral column.



(*R*)-*N*-(1-phenylethyl)acetamide (**3a**)[4]

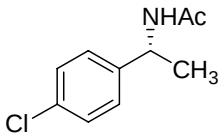
The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 31.4 mg, 97% yield, 91% ee. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 9.12 min, $t_{\text{r-minor}}$ 11.60 min. Melting point: 89-91 ^{o}C. $[\alpha]^{20}_{D}$ = 109.3 (c = 1.49, EtOH). ^{1}H NMR (250MHz, $CDCl_3$): δ 1.46 (d, *J*=6.8 Hz, 3H), 1.94 (s, 3H), 5.04-5.15 (m, 1H), 6.09 (br, 1H), 7.27-7.30 (m, 5H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.8, 23.4, 48.8, 126.2, 127.3, 128.7, 143.3, 169.2.



(*R*)-*N*-(1-*p*-tolylethyl)acetamide (**3b**)[5]

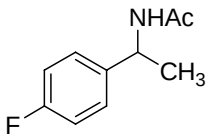
This reaction was performed in 0.1 mmol scale. The product was obtained by flash

chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 16.5 mg, 93% yield, 90% ee. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 9.99 min, $t_{\text{r-minor}}$ 13.03 min. Melting point: 80-82°C. $[\alpha]^{20}_{D}$ = +135.7 (c = 0.715, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.46 (d, *J* = 6.8 Hz, 3H), 1.96 (s, 3H), 2.32(s, 3H), 5.03-5.14 (m, 1H), 5.78 (br, 1H), 7.17(dd, *J* = 7.8, 9.0 Hz, 4H). ^{13}C NMR (62.5MHz, $CDCl_3$): δ 21.1, 21.7, 23.5, 48.6, 126.2, 129.3, 137.1, 140.2, 169.0.



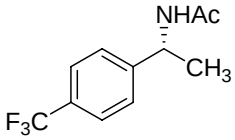
(*R*)-*N*-(1-(4-chlorophenyl)ethyl)acetamide (**3c**)[6]

The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 34.6 mg, 88% yield, 91% ee. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 10.71 min, $t_{\text{r-minor}}$ 14.21 min. Melting point: 97-99 °C. $[\alpha]^{20}_{D}$ = + 122.3 (c = 1.38, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.43 (d, *J* = 6.8 Hz, 3H), 1.95 (s, 3H), 4.99-5.11 (m, 1H), 6.02 (br, 1H), 7.25 (dd, *J* = 8.8, 6.8 Hz, 4H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.7, 23.3, 48.2, 127.6, 128.7, 133.0, 141.9, 169.2.



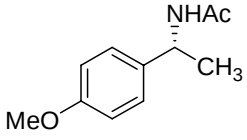
N-(1-(4-fluorophenyl)ethyl)acetamide (**3d**)[7]

The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 34.9 mg, 96% yield, 89% ee. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 9.88 min, $t_{\text{r-minor}}$ 12.65 min. Melting point: 118-120 °C. $[\alpha]^{20}_{D}$ = + 105.2 (c =1.60, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.44 (d, *J* = 7.0 Hz, 3H), 1.95 (s, 3H), 5.01-5.13 (m, 1H), 6.11 (br, 1H), 6.99 (t, *J* = 8.6, 2H), 7.24-7.29 (m, 2H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.8, 23.3, 48.2, 115.3 (d, *J* = 21.3 Hz), 127.8 (d, *J* = 8.0 Hz), 139.2(d, *J* = 3.1 Hz), 161.9 (d, *J* = 243.8 Hz), 169.2.



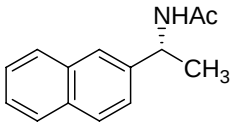
(*R*)-*N*-(1-(4-(trifluoromethyl)phenyl)ethyl)acetamide (**3e**)[5]

The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 44.3 mg, 96% yield, 87% ee. Melting point: 101-102 ^{o}C. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 8.71 min, $t_{\text{r-minor}}$ 11.63 min. $[\alpha]^{20}_{D}$ = + 85.8 (c = 1.62, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.44(d, *J* = 7.0 Hz, 3H), 1.96 (s, 3H), 5.05-5.16 (m, 1H), 6.18 (br, 1H), 7.34 (d, *J* = 8.0, 2H), 7.56(d, *J* = 8.0, 2H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.8, 23.2, 48.6, 124.1 (d, *J* = 270.3 Hz), 125.6 (q, *J* = 4.0 Hz), 126.4, 129.5 (d, *J* = 32.1Hz), 147.5, 169.4.



(*R*)-*N*-(1-(4-methoxyphenyl)ethyl)acetamide (**3f**)[5]

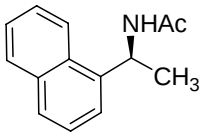
No cocatalyst acetic acid was used in this case. The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 37.1 mg, 96% yield, 95% ee. Melting point: 84-85 ^{o}C. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-minor}}$ 16.48 min, $t_{\text{r-major}}$ 18.64 min. $[\alpha]^{20}_{D}$ = + 140.9 (c = 1.475, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.45(d, *J* = 7.0 Hz, 3H), 1.94 (s, 3H), 3.78(s, 3H), 4.99-5.11(m, 1H), 5.93 (br, 1H), 6.85(d, *J* = 8.8, Hz, 2H), 7.23(d, *J* = 8.8, Hz, 2H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.7, 23.4, 48.2, 114.0, 127.4, 135.4, 158.8, 169.1.



(*R*)-*N*-(1-(naphthalen-2-yl)ethyl)acetamide (**3g**)[8]

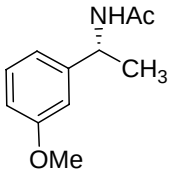
The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 43.0 mg, 99% yield, 92% ee. Melting point: 108-109 ^{o}C. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 13.12 min, $t_{\text{r-minor}}$ 19.56 min. $[\alpha]^{20}_{D}$ = + 102.0 (c = 1.97, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.54(d, *J* = 7.0 Hz, 3H), 1.97 (s, 3H), 5.21-5.32 (m, 1H), 6.21 (d, *J* = 6.5 Hz, 1H),

7.40-7.48 (m, 3H), 7.73-7.81 (m, 4H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.7, 23.4, 48.9, 124.6, 124.8, 125.9, 126.3, 127.6, 127.9, 128.5, 132.7, 133.4, 140.7, 169.3.



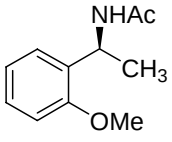
(*S*)-*N*-(1-(naphthalen-1-yl)ethyl)acetamide (**3h**)[5, 9]

The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 18.2 mg, 43% yield, 78% ee. Melting point: 147-149 ^{o}C. HPLC analysis: Chiralcel AS-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 29.43 min, $t_{\text{r-minor}}$ 36.89 min. $[\alpha]^{20}_{D}$ = - 47.9 (c = 0.82, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.66 (d, *J* = 6.5 Hz, 3H), 1.94 (s, 3H), 5.83-5.94 (m, 2H), 7.44-7.55 (m, 4H), 7.78-8.12 (m, 3H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 20.7, 23.4, 44.7, 122.6, 123.5, 125.2, 125.9, 126.6, 128.4, 128.8, 131.2, 134.0, 138.3, 168.9.



(*R*)-*N*-(1-(3-methoxyphenyl)ethyl)acetamide (**3i**)[10]

The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as an oil, 38.0 mg, 98% yield, 71% ee. HPLC analysis: Chiralcel AD-H (hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-major}}$ 13.40 min, $t_{\text{r-minor}}$ 16.69 min. $[\alpha]^{20}_{D}$ = + 93.8 (c =1.58, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.44 (d, *J* = 7.0 Hz, 3H), 1.94 (s, 3H), 3.78 (s, 3H), 5.00-5.11 (m, 1H), 6.09 (br, 1H), 6.76-6.89 (m, 3H), 7.23 (t, *J* = 7.8 Hz, 1H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.8, 23.4, 55.2, 112.3, 112.4, 118.4, 129.7, 145.0, 159.8, 169.2.



(*S*)-*N*-(1-(2-methoxyphenyl)ethyl)acetamide (**3j**)[10b]

The product was obtained by flash chromatography (hexane: EtOAc = 1:1 to EtOAc) as a white solid, 36.9 mg, 96% yield, 41% ee. HPLC analysis: Chiralcel AD-H

(hexane/iPrOH = 95/5, 1.0 mL/min), $t_{\text{r-minor}}$ 11.97 min, $t_{\text{r-major}}$ 16.69 min. Melting point: 142-144 ^{o}C. $[\alpha]^{20}_{D}$ = - 38.3 (c = 1.69, EtOH). ^{1}H NMR (250 MHz, $CDCl_3$): δ 1.41(d, *J* = 7.0 Hz, 3H), 1.95 (s, 3H), 3.86 (s, 3H), 5.20-5.32 (m, 1H), 6.50 (d, *J* = 6.8Hz, 1H), 6.90 (t, *J* = 7.5 Hz, 2H), 7.19-7.25 (m, 2H). ^{13}C NMR (62.5 MHz, $CDCl_3$): δ 21.5, 23.6, 55.4, 111.1, 120.9, 128.0, 128.4, 131.0, 157.0, 168.8.

References:

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2. For procedures, see: (a)Storer, R. I.; Carrera, D. E.; Ni, Y.; MacMillan, D. W. C. *J. Am. Chem. Soc.* **2006**, *128*, 84. For characterization data, see: (b) Inanaga, J. EP 1134209 A1, **2001**, 16 pp. (c) toh, J.; Fuchibe, K.; Akiyama, T. *Angew Chem., Int Ed.* **2006**, *45*, 4796.
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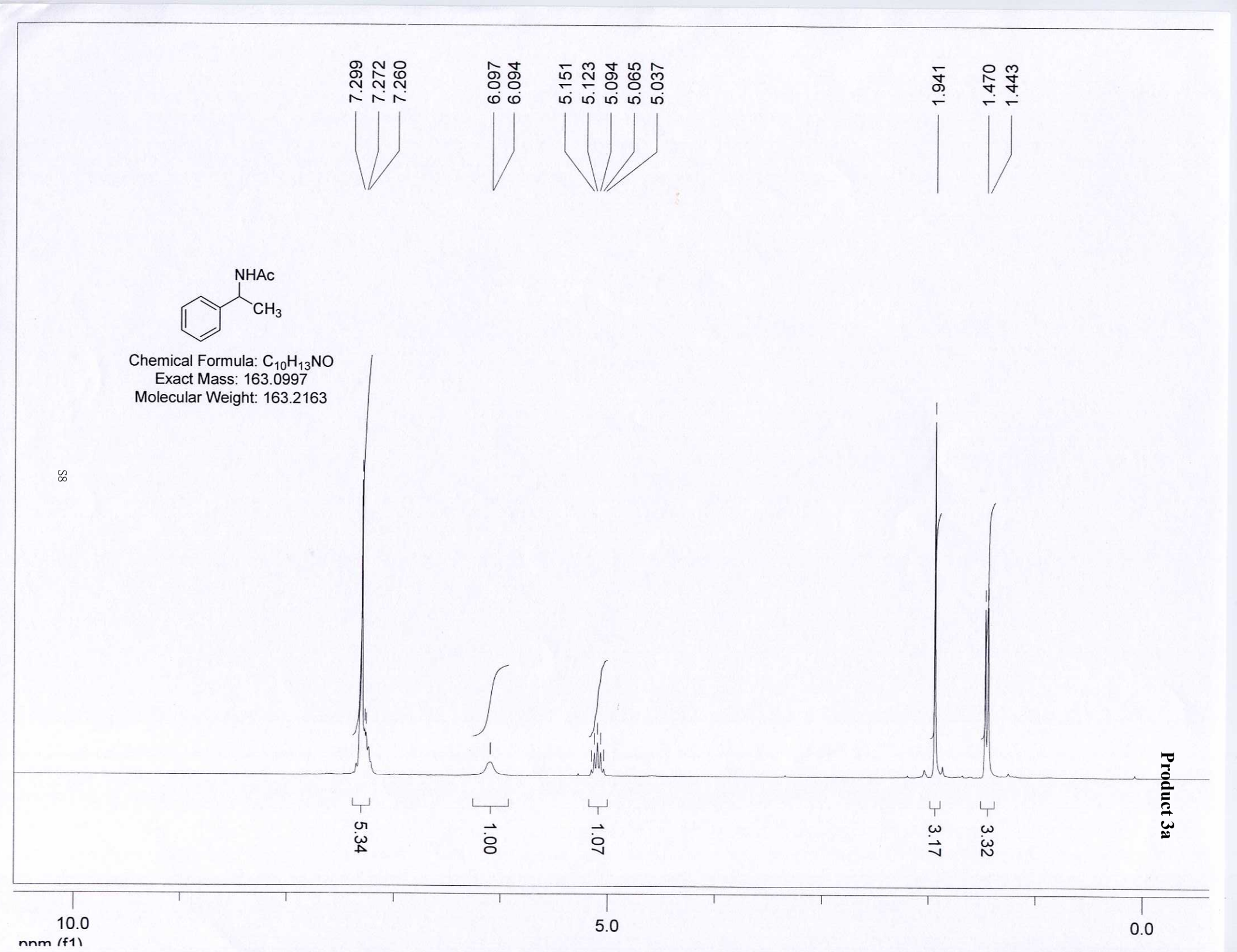
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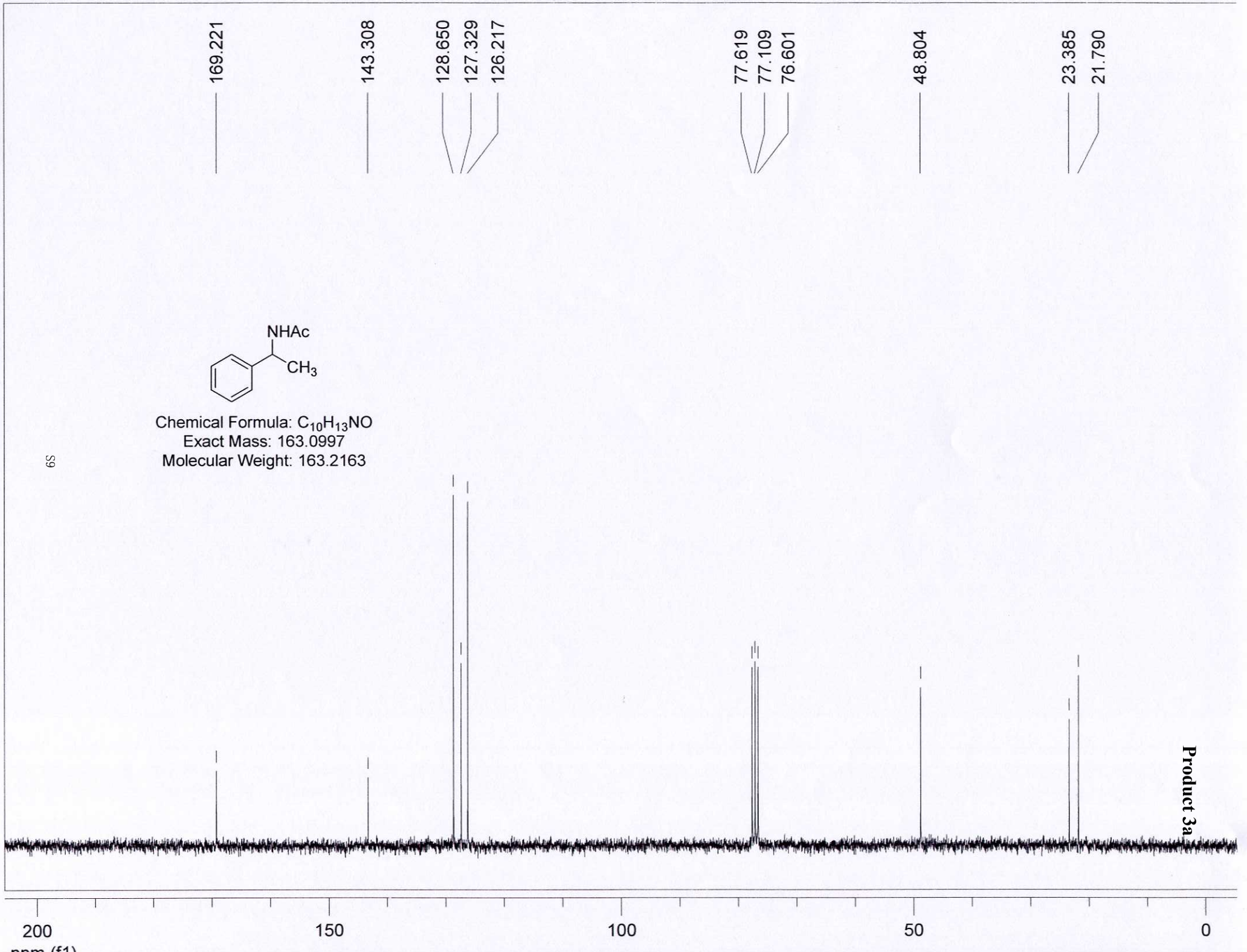
ppm (f1)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Chromatogram : LGL3-150(AD95051)-21_channel1

Product 3a

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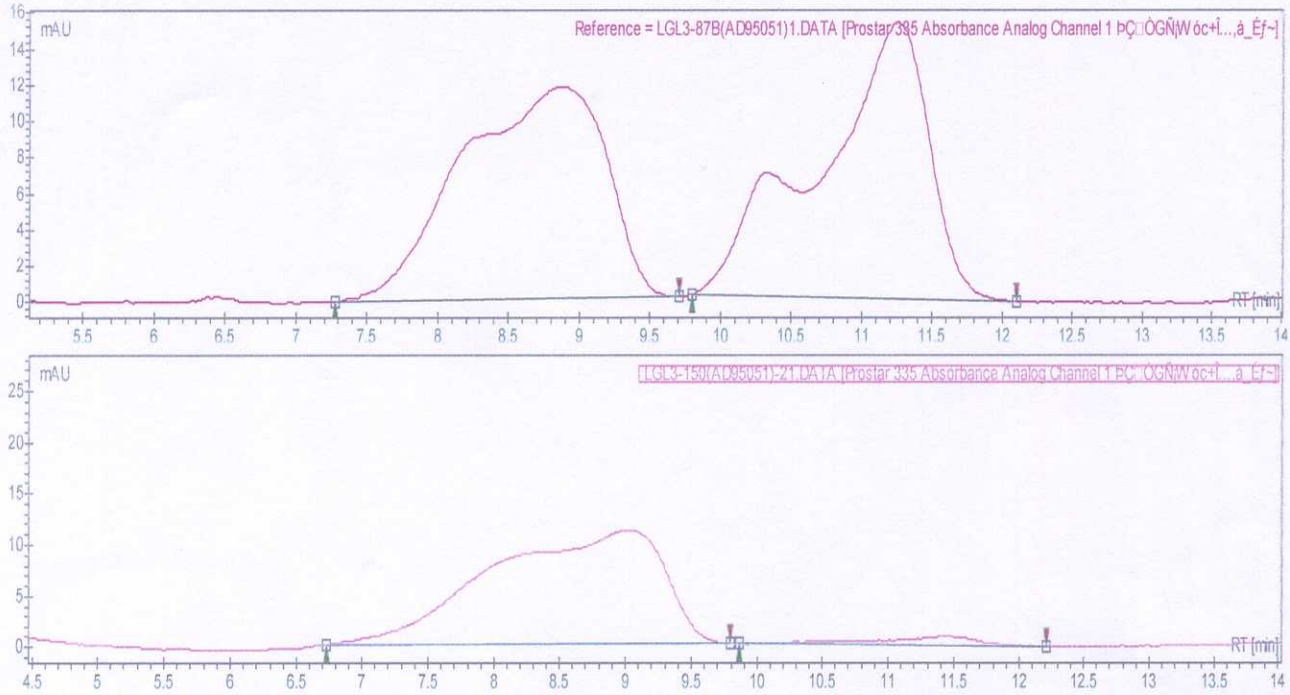

Peak results :

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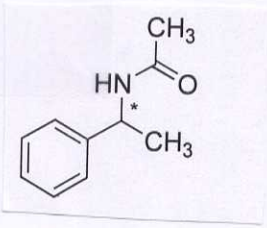

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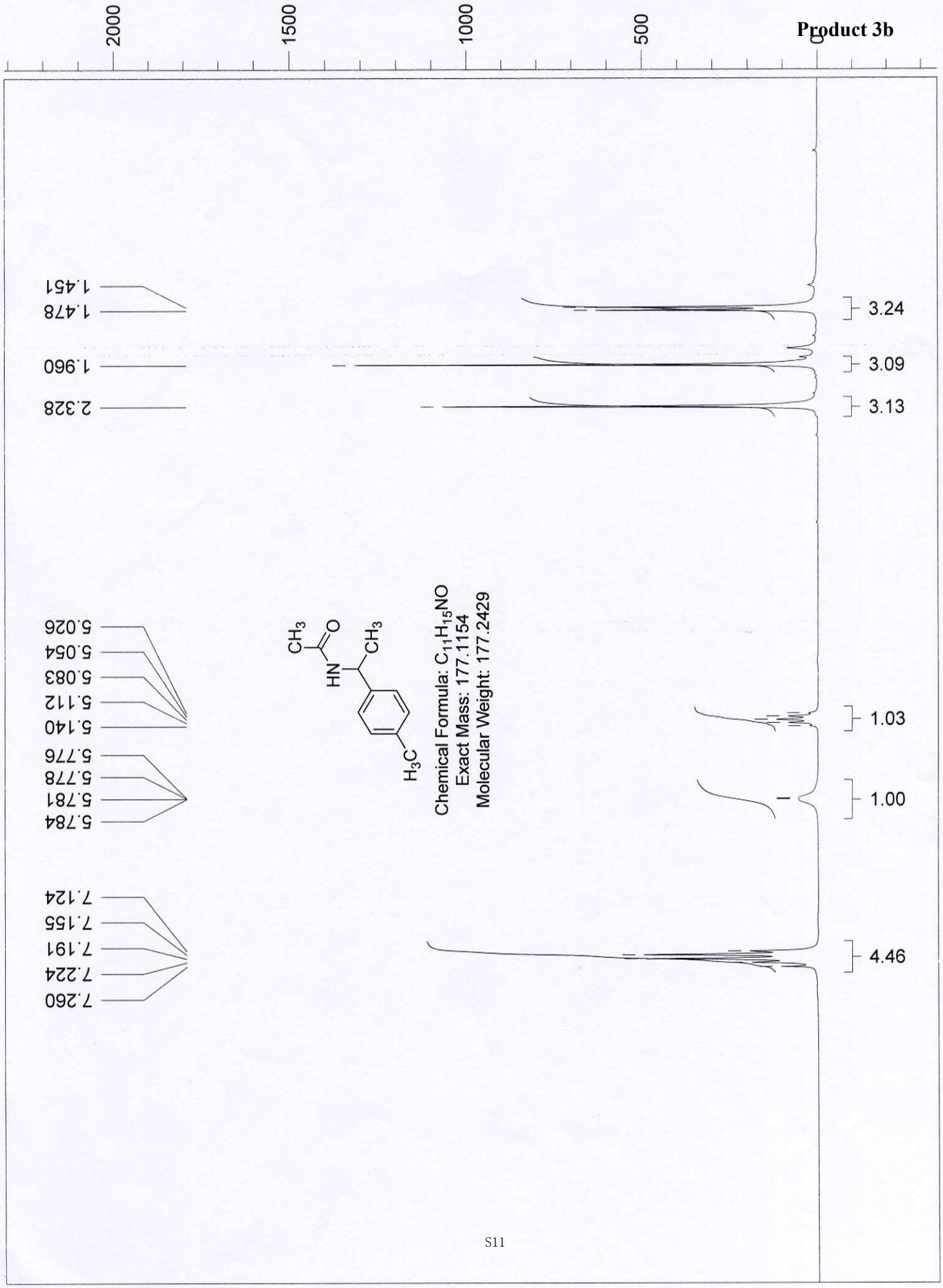
Product 3b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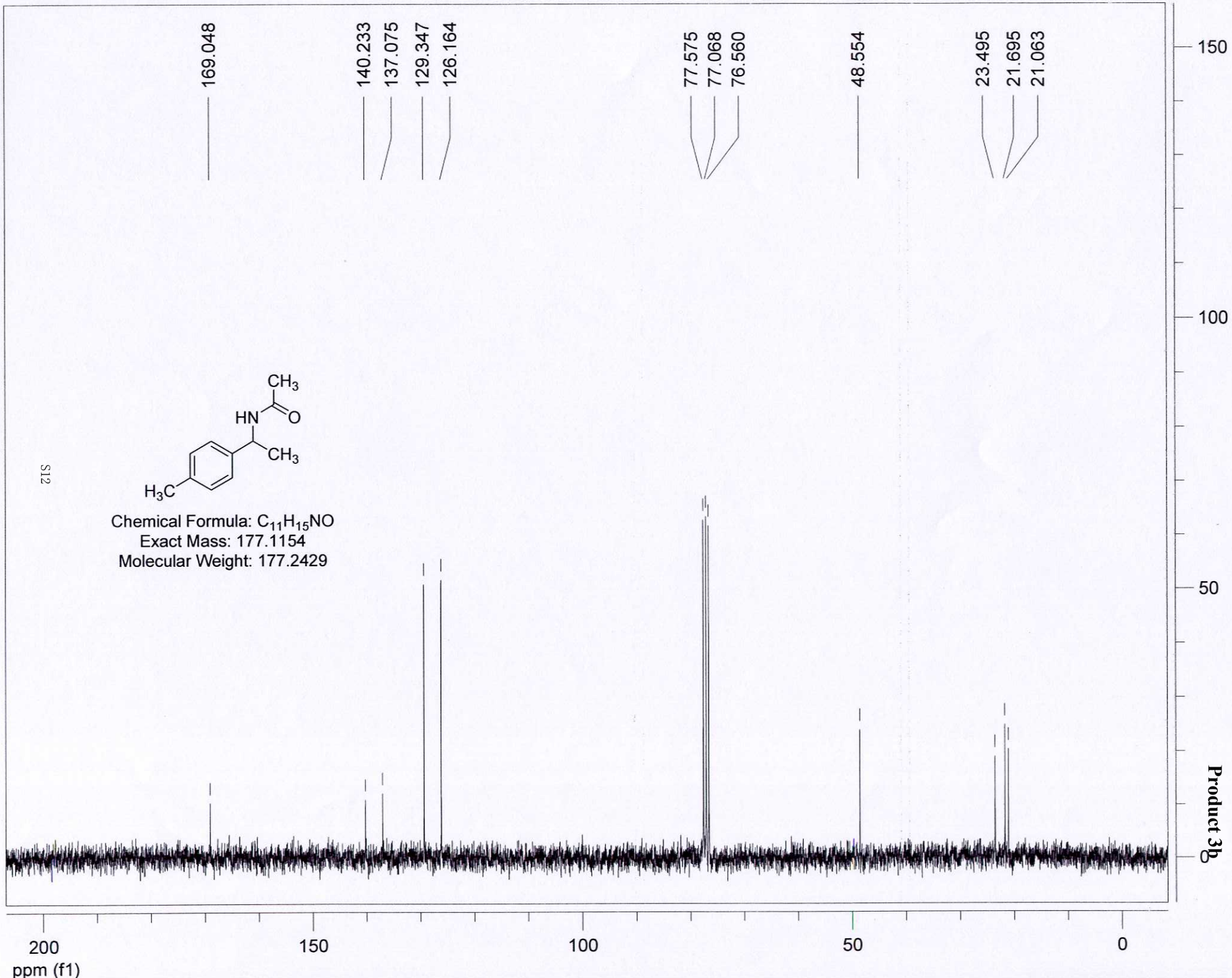
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Product 3b

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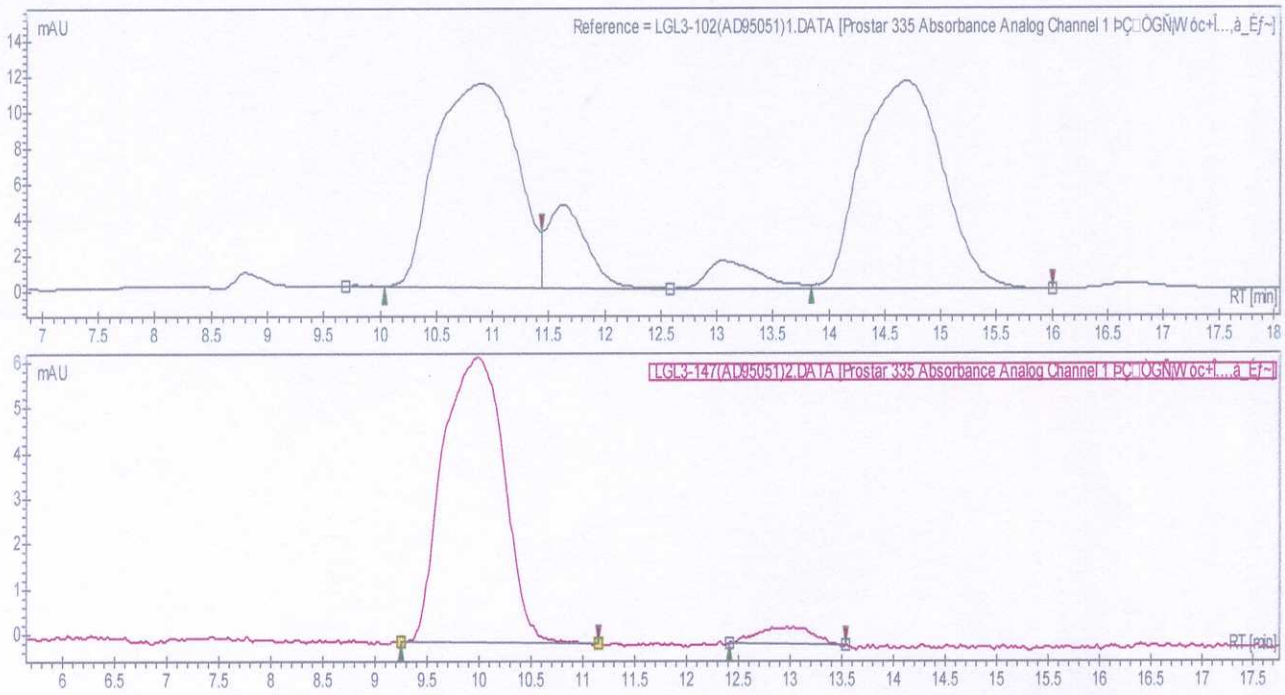

Peak results :

LGL3-102(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

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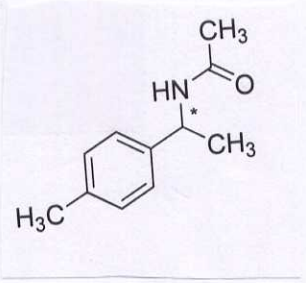
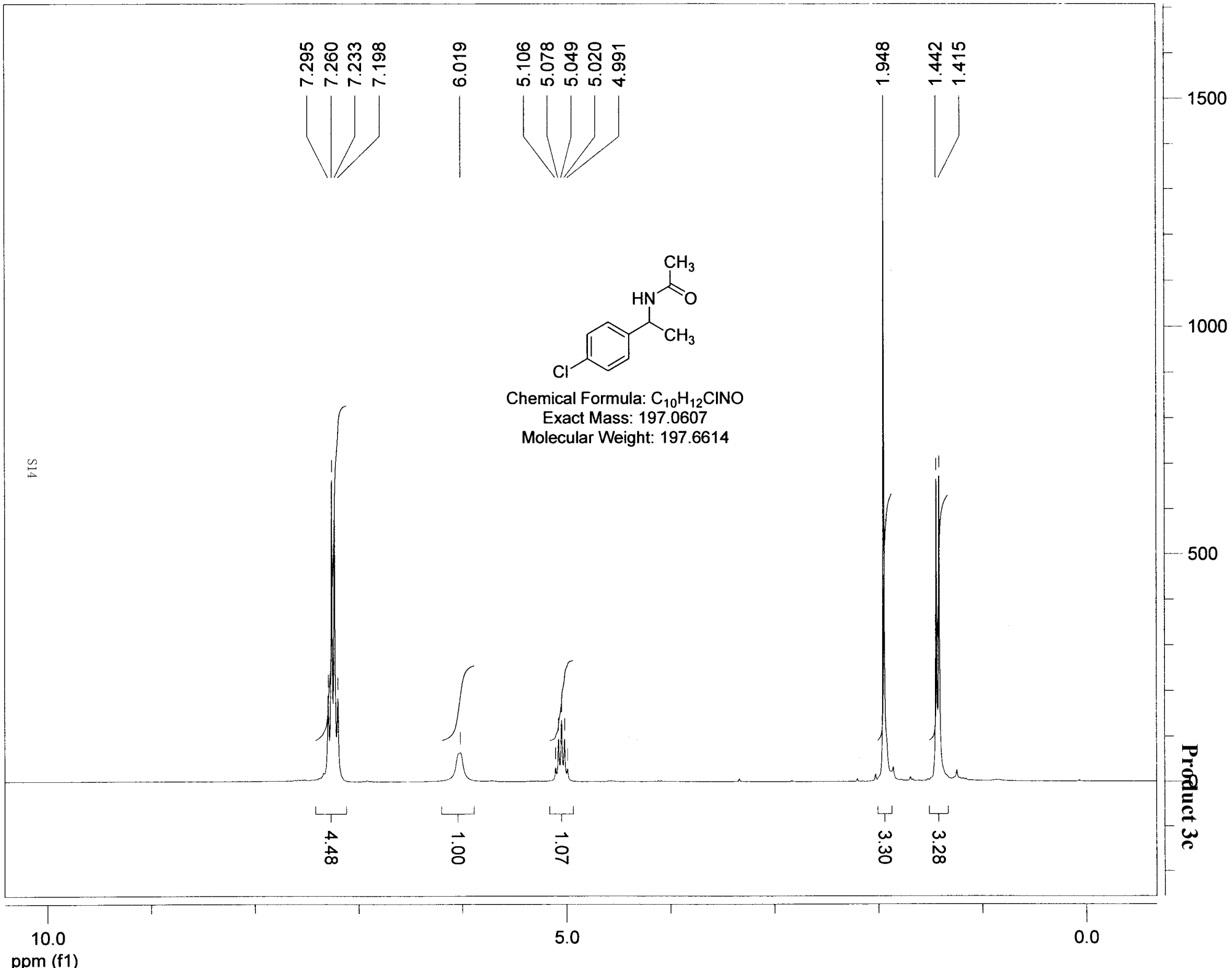
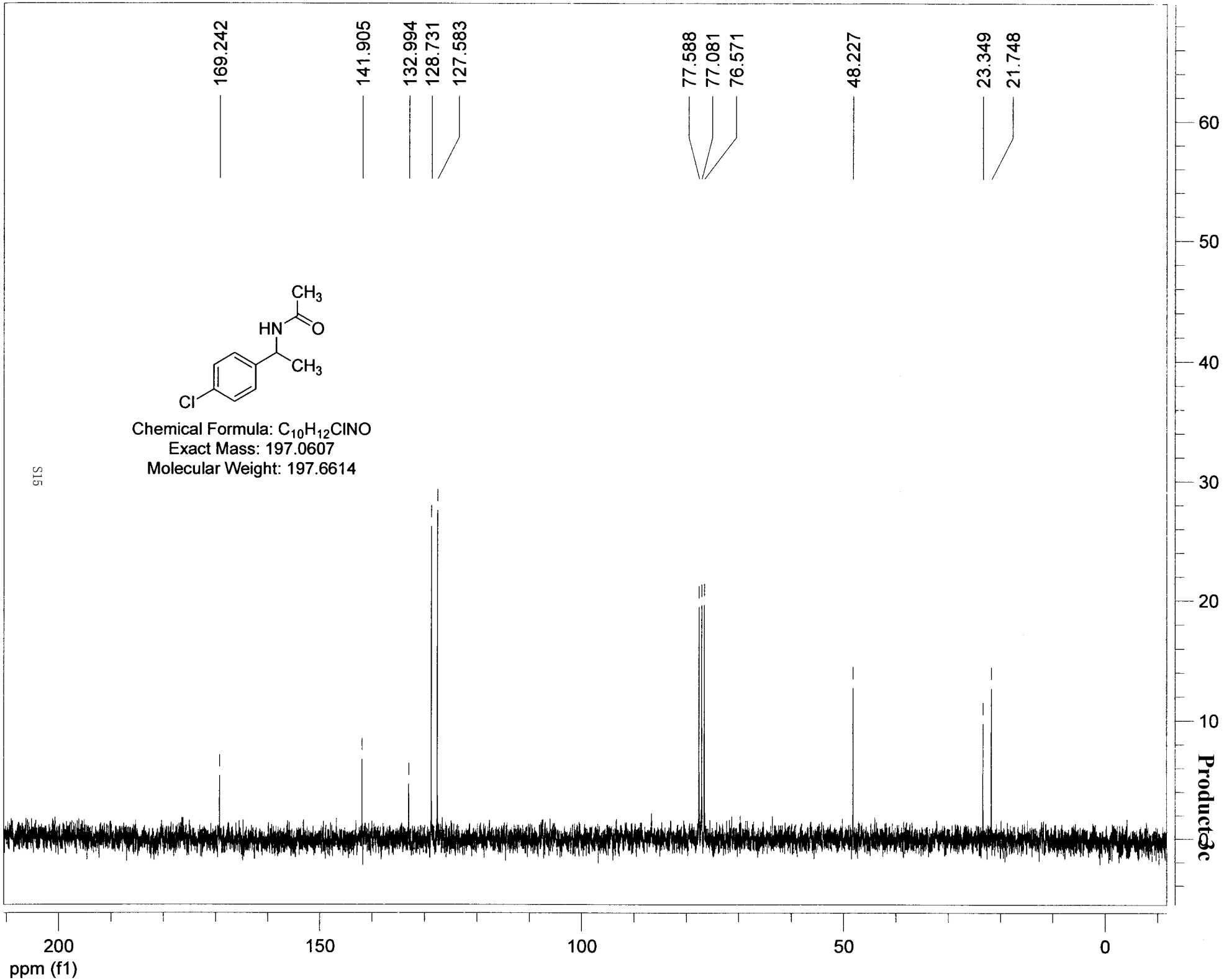
2	UNKNOWN	14.69	50.55	11.6	9.8	50.551
Total			100.00	23.0	19.4	100.000

LGL3-147(AD95051)2.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	9.99	95.02	6.3	4.3	95.023
2	UNKNOWN	13.03	4.98	0.4	0.2	4.977
Total			100.00	6.7	4.5	100.000




7.295
7.260
7.233
7.198
6.019
5.106
5.078
5.049
5.020
4.991
1.948
1.442
1.415
CH3
HN
O
CH3
Cl
Chemical Formula: C10H12ClNO
Exact Mass: 197.0607
Molecular Weight: 197.6614
1500
1000
500
4.48
1.00
1.07
3.30
3.28
10.0
5.0
0.0
ppm (f1)
Product 3c

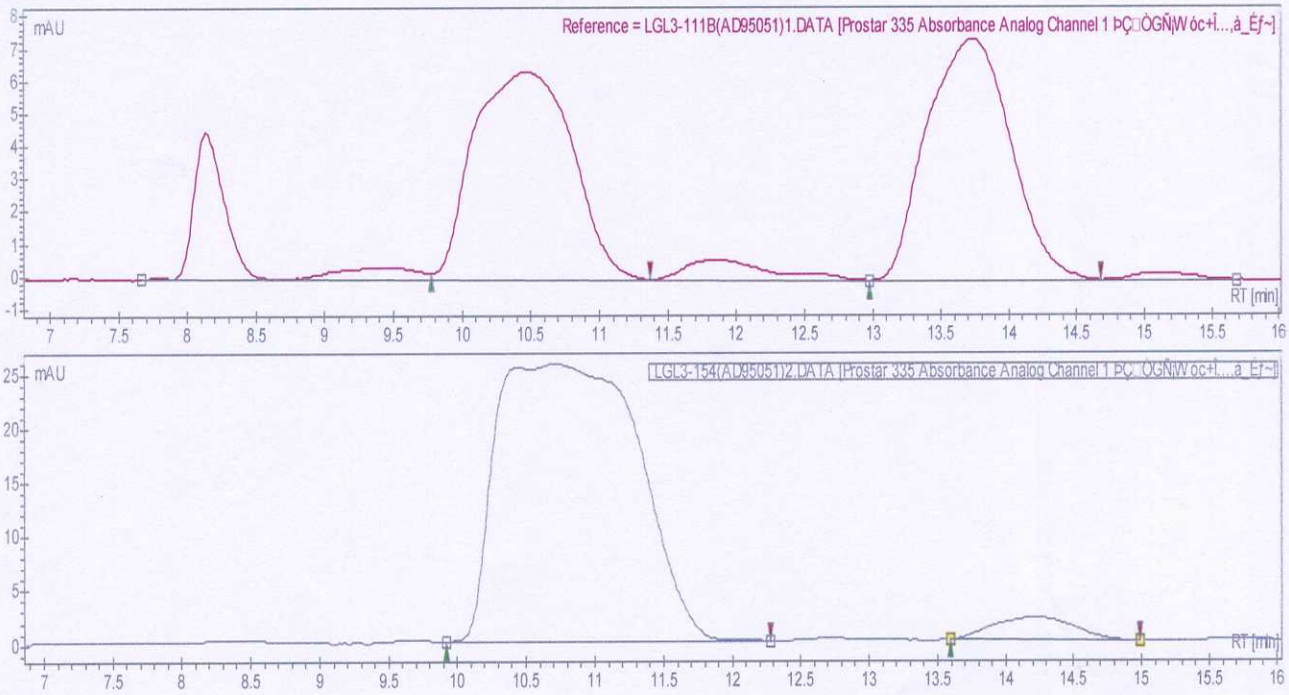

169.242
141.905
132.994
128.731
127.583
77.588
77.081
76.571
48.227
23.349
21.748
CH3
HN
O
CH3
Cl
Chemical Formula: C10H12ClNO
Exact Mass: 197.0607
Molecular Weight: 197.6614
S16
60
50
40
30
20
10
Product3c
200
150
100
50
0
ppm (f1)

Chromatogram : LGL3-154(AD95051)2_channel1

Product 3c

System : HPLC
Method : LGL
User : Gerald Rowland

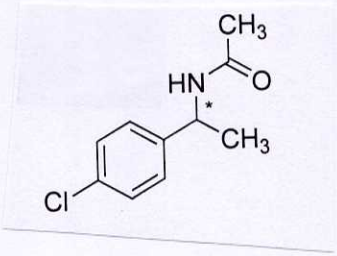
Acquired : 7/15/2008 4:50:18 PM
Processed : 7/15/2008 5:12:32 PM
Printed : 10/29/2008 2:23:08 PM



Peak results :

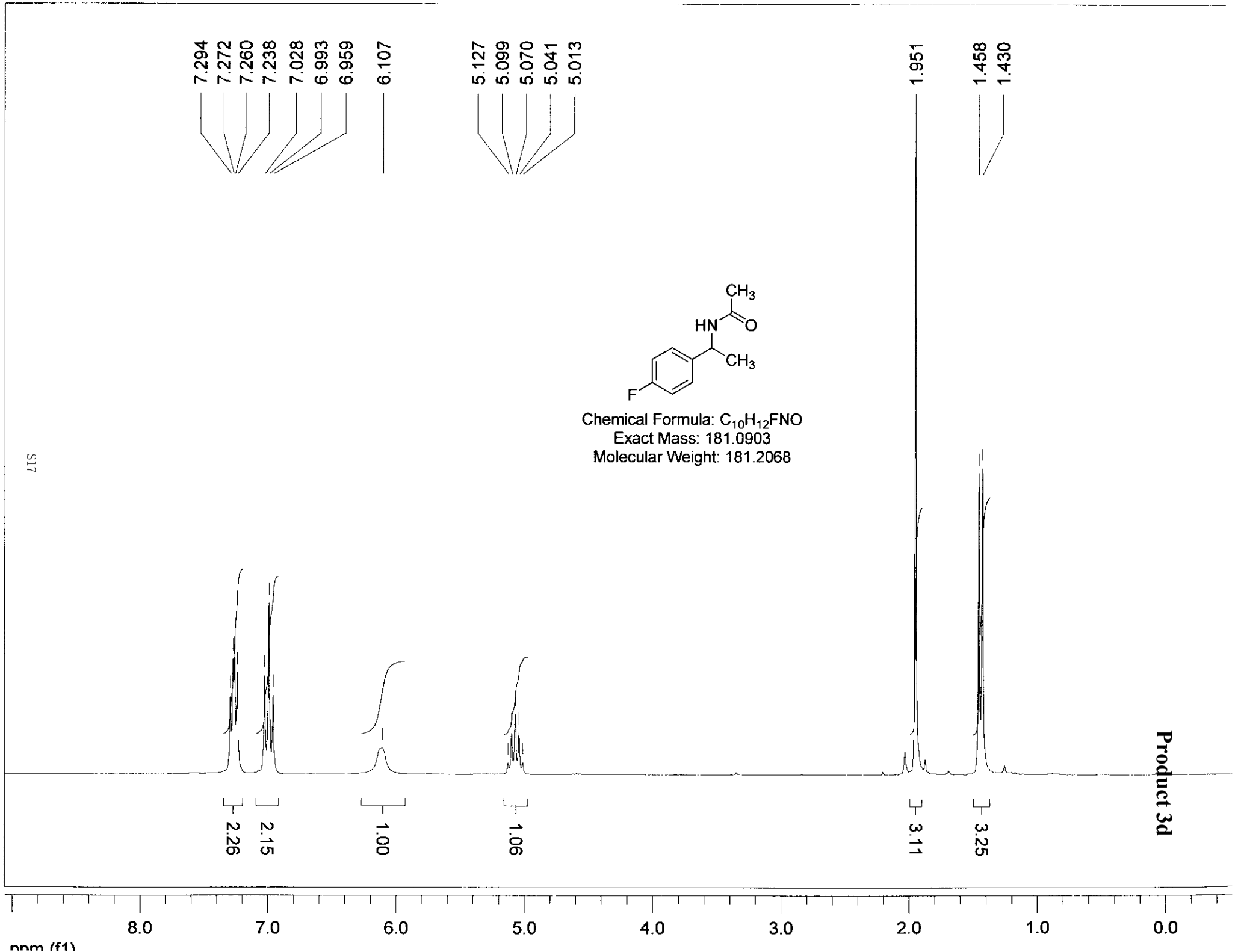
LGL3-111B(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

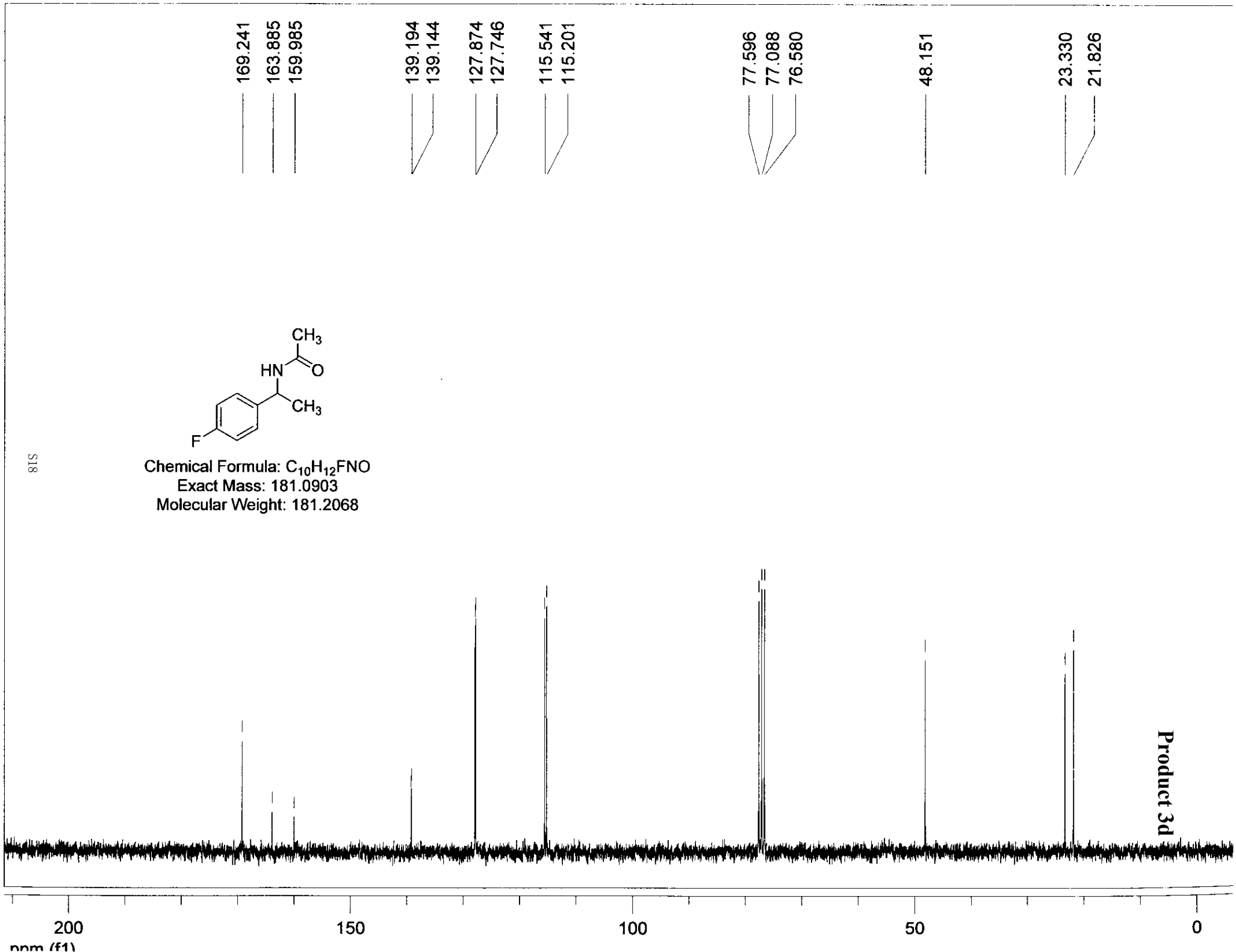
Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.47	50.22	6.4	5.3	50.222
2	UNKNOWN	13.73	49.78	7.4	5.3	49.778
Total			100.00	13.8	10.6	100.000



LGL3-154(AD95051)2.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
2	UNKNOWN	10.71	95.49	25.7	30.8	95.490
1	UNKNOWN	14.21	4.51	2.1	1.5	4.510
Total			100.00	27.8	32.3	100.000


7.294
7.272
7.260
7.238
7.028
6.993
6.959
6.107
5.127
5.099
5.070
5.041
5.013
1.951
1.458
1.430
CH3
HN
O
CH3
F
Chemical Formula: C10H12FNO
Exact Mass: 181.0903
Molecular Weight: 181.2068
S17
2.26
2.15
1.00
1.06
3.11
3.25
Product 3d
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
ppm (f1)

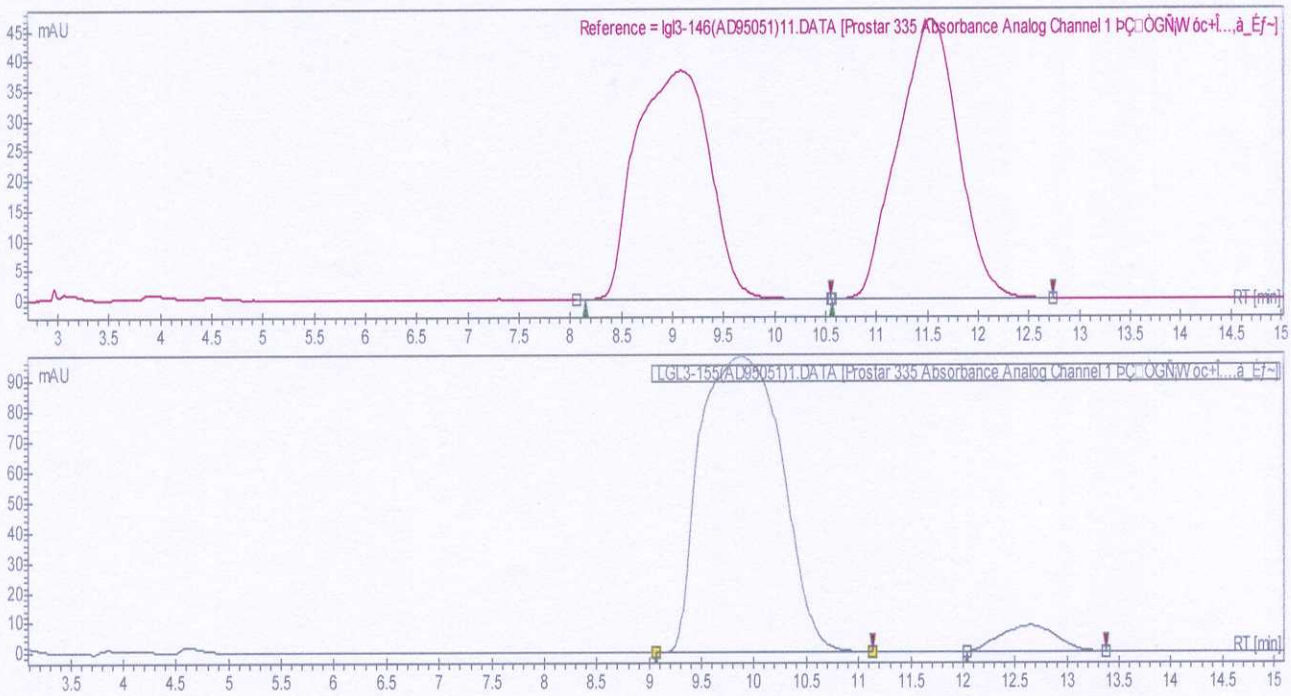

169.241
163.885
159.985
139.194
139.144
127.874
127.746
115.541
115.201
77.596
77.088
76.580
48.151
23.330
21.826
CH3
HN
O
CH3
F
Chemical Formula: C10H12FNO
Exact Mass: 181.0903
Molecular Weight: 181.2068
Product 3d
200
150
100
50
0
ppm (f1)

Chromatogram : LGL3-155(AD95051)1_channel1

Product 3d

System : HPLC
Method : LGL
User : Gerald Rowland

Acquired : 7/15/2008 5:12:23 PM
Processed : 7/15/2008 5:32:59 PM
Printed : 10/29/2008 4:18:57 PM



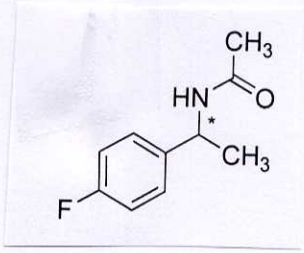
Peak results :

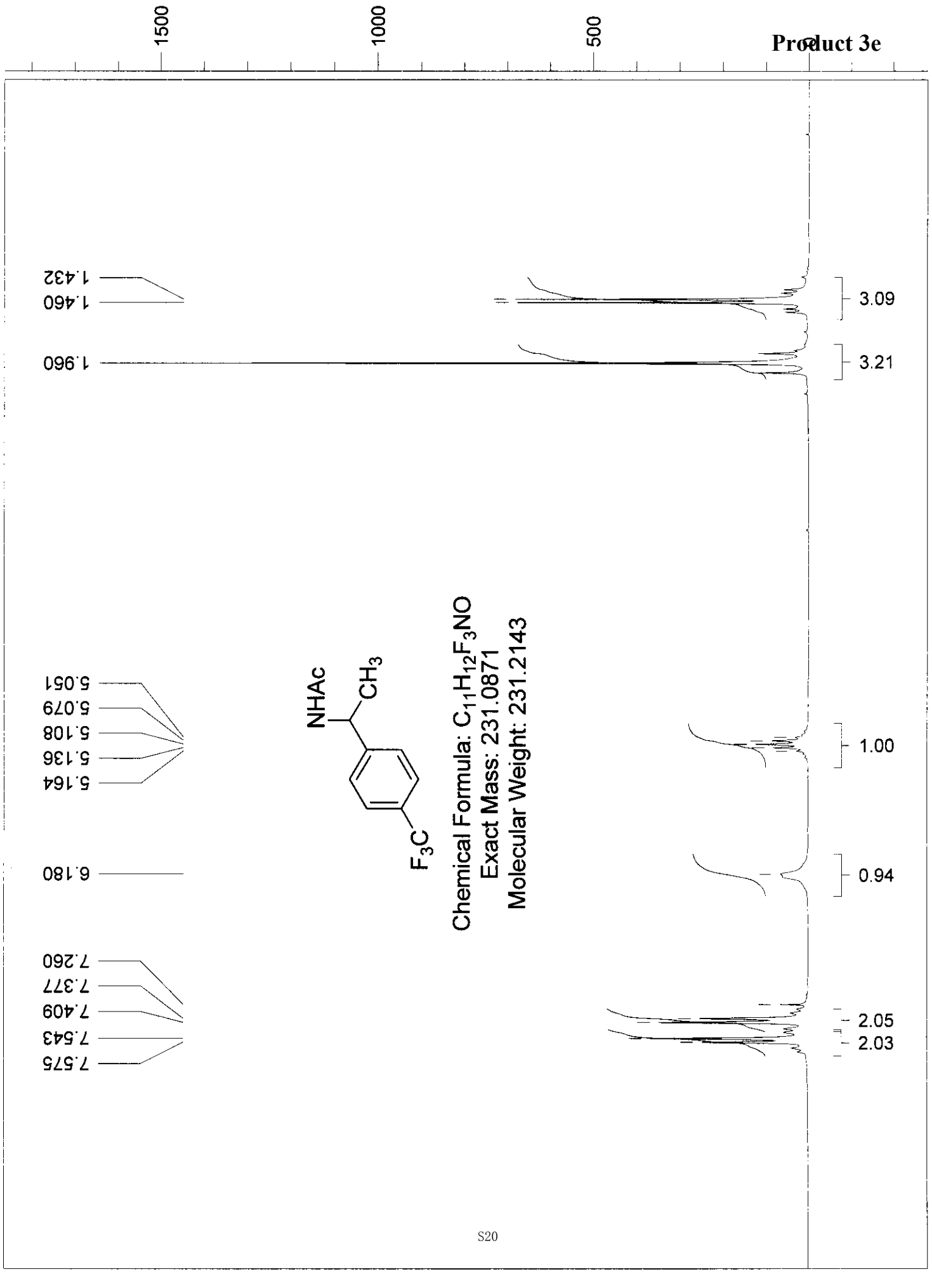
lgl3-146(AD95051)11.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

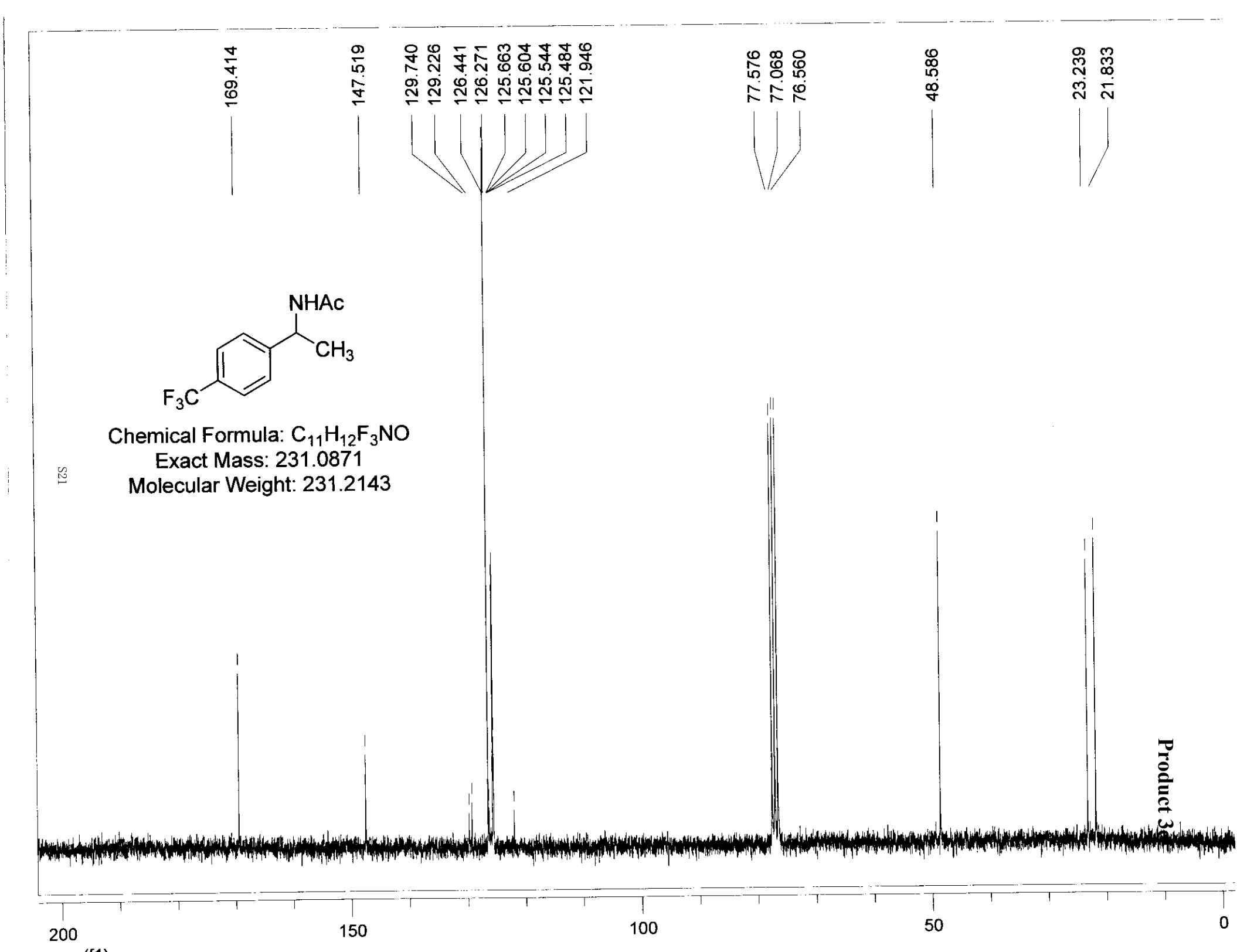
Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	9.08	50.04	38.0	31.9	50.037
2	UNKNOWN	11.55	49.96	46.6	31.9	49.963
Total			100.00	84.7	63.8	100.000

LGL3-155(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	9.88	94.38	97.7	88.5	94.375
2	UNKNOWN	12.65	5.62	8.5	5.3	5.625
Total			100.00	106.2	93.7	100.000




Product 3e
1500
1000
500
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
ppm (f1)
1.432
1.460
1.960
3.09
3.21
5.051
5.079
5.108
5.136
5.164
1.00
6.180
0.94
7.260
7.377
7.409
7.543
7.575
2.05
2.03
NHAc
CH3
F3C
Chemical Formula: C11H12F3NO
Exact Mass: 231.0871
Molecular Weight: 231.2143

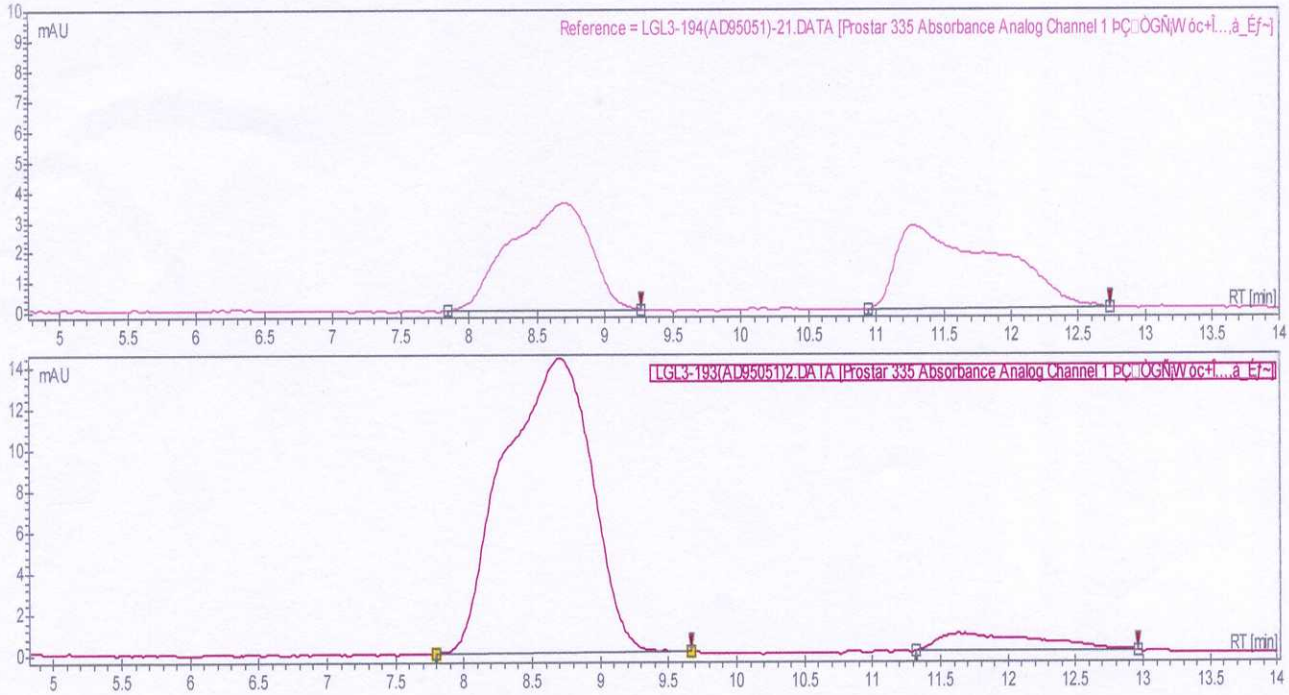

169.414
147.519
129.740
129.226
126.441
126.271
125.663
125.604
125.544
125.484
121.946
77.576
77.068
76.560
48.586
23.239
21.833
NHAc
CH3
F3C
Chemical Formula: C11H12F3NO
Exact Mass: 231.0871
Molecular Weight: 231.2143
S21
Product 3c
200
150
100
50
0
(f1)

Chromatogram : LGL3-193(AD95051)2_channel1

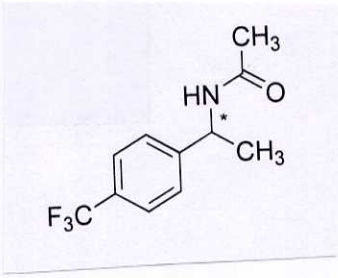
Product 3e

System : HPLC
Method : LGL
User : Gerald Rowland

Acquired : 8/26/2008 4:54:24 PM
Processed : 8/26/2008 5:18:19 PM
Printed : 8/26/2008 6:02:25 PM



Peak results :

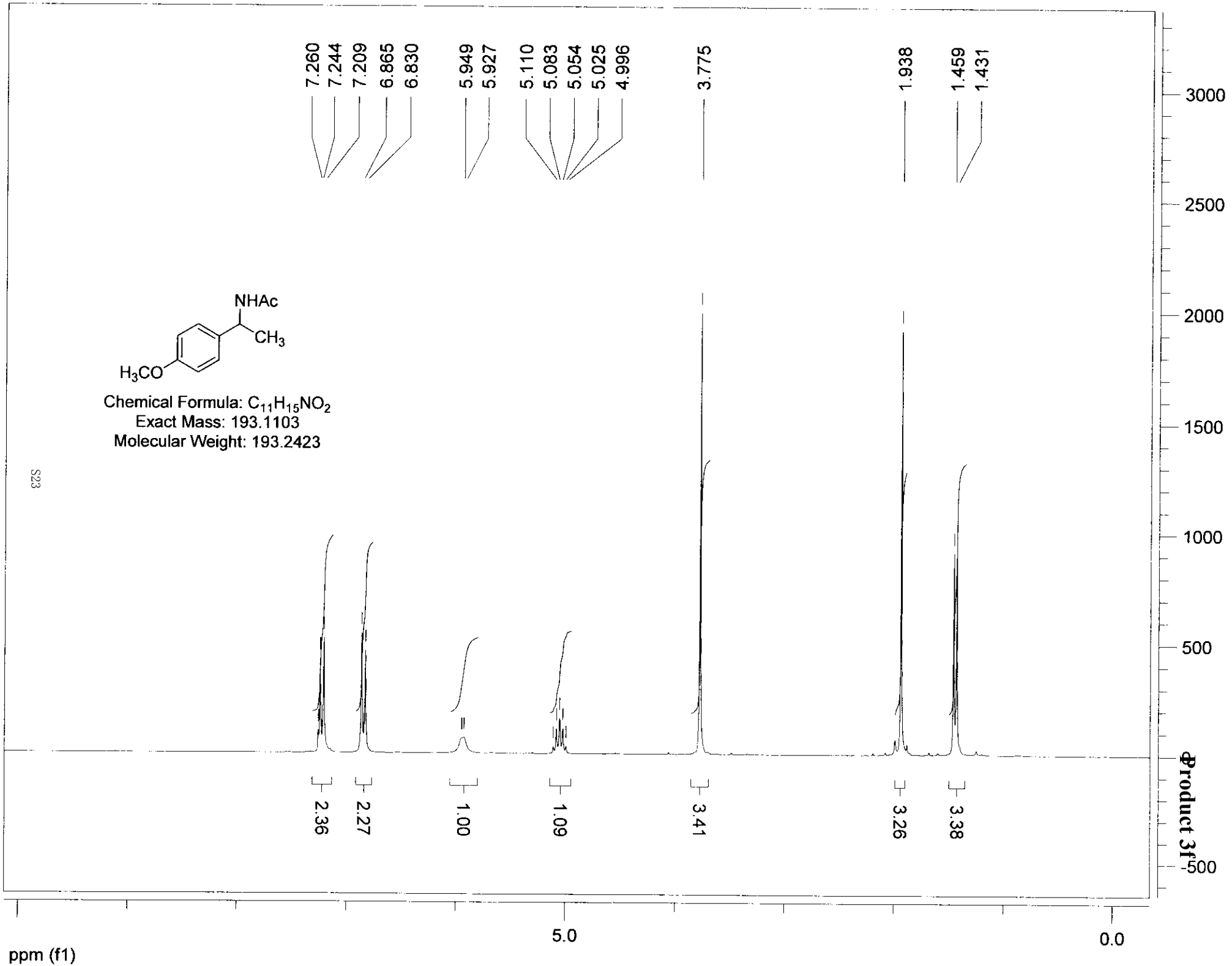


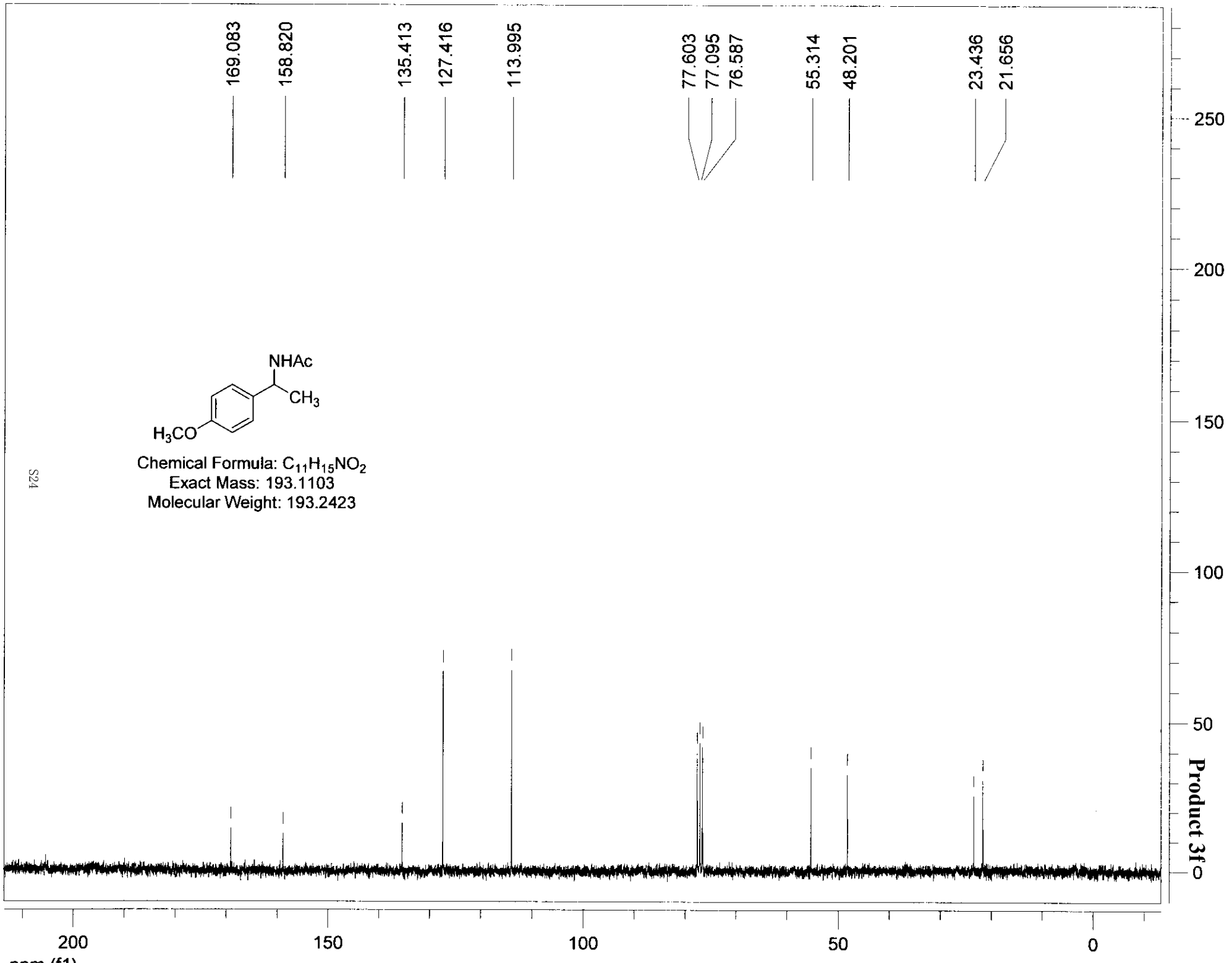
LGL3-194(AD95051)-21.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	8.71	50.12	3.5	2.4	50.123
2	UNKNOWN	11.27	49.88	2.8	2.4	49.877
Total			100.00	6.3	4.8	100.000

LGL3-193(AD95051)2.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	8.71	93.64	14.3	10.7	93.639
2	UNKNOWN	11.63	6.36	0.8	0.7	6.361
Total			100.00	15.1	11.4	100.000


7.260
7.244
7.209
6.865
6.830
5.949
5.927
5.110
5.083
5.054
5.025
4.996
3.775
1.938
1.459
1.431
NHAc
CH3
H3CO
Chemical Formula: C11H15NO2
Exact Mass: 193.1103
Molecular Weight: 193.2423
2.36
2.27
1.00
1.09
3.41
3.26
3.38
3000
2500
2000
1500
1000
500
-500
5.0
0.0
ppm (f1)
Product 3f

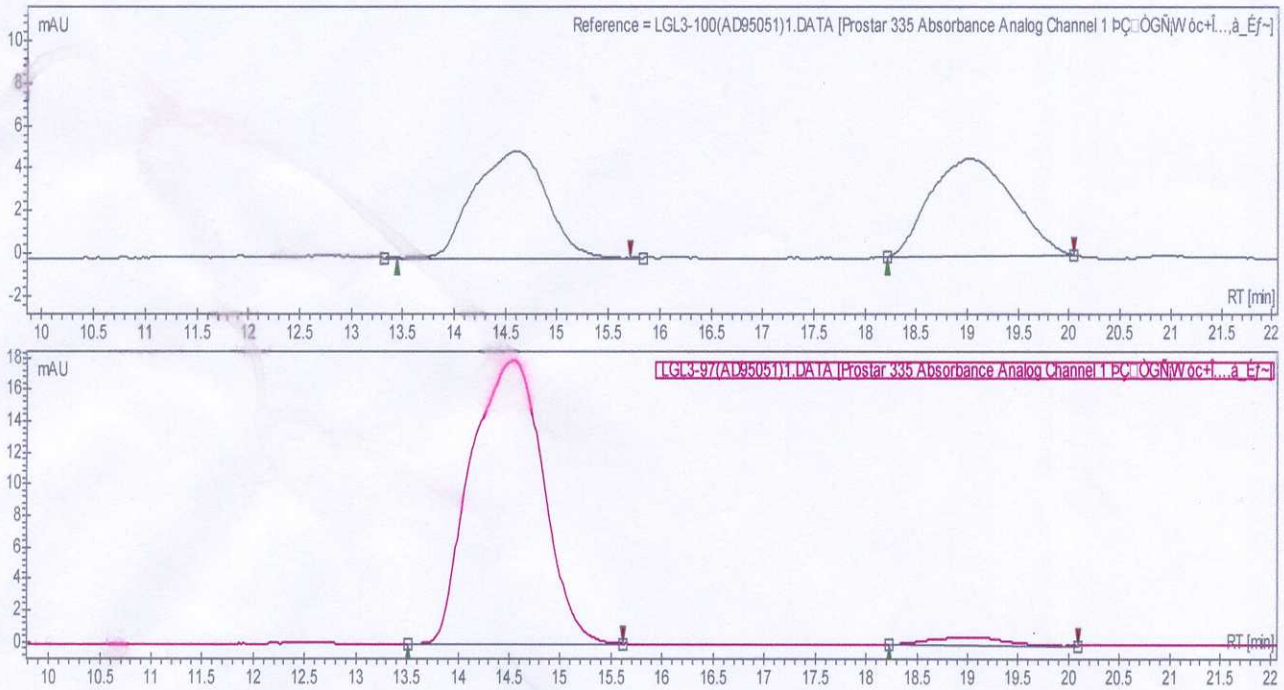

169.083
158.820
135.413
127.416
113.995
77.603
77.095
76.587
55.314
48.201
23.436
21.656
NHAc
CH3
H3CO
Chemical Formula: C11H15NO2
Exact Mass: 193.1103
Molecular Weight: 193.2423
250
200
150
100
50
0
200
150
100
50
0
ppm (f1)
Product 3f

Chromatogram : LGL3-97(AD95051)1_channel1

Product 3f

System : HPLC
Method : LGL
User : Gerald Rowland

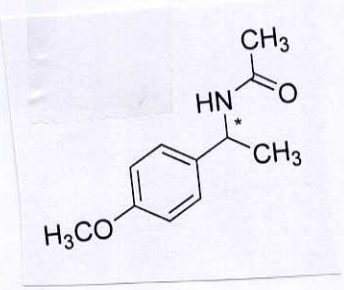
Acquired : 5/30/2008 11:14:04 AM
Processed : 5/30/2008 12:13:47 PM
Printed : 5/30/2008 12:14:52 PM



Peak results :

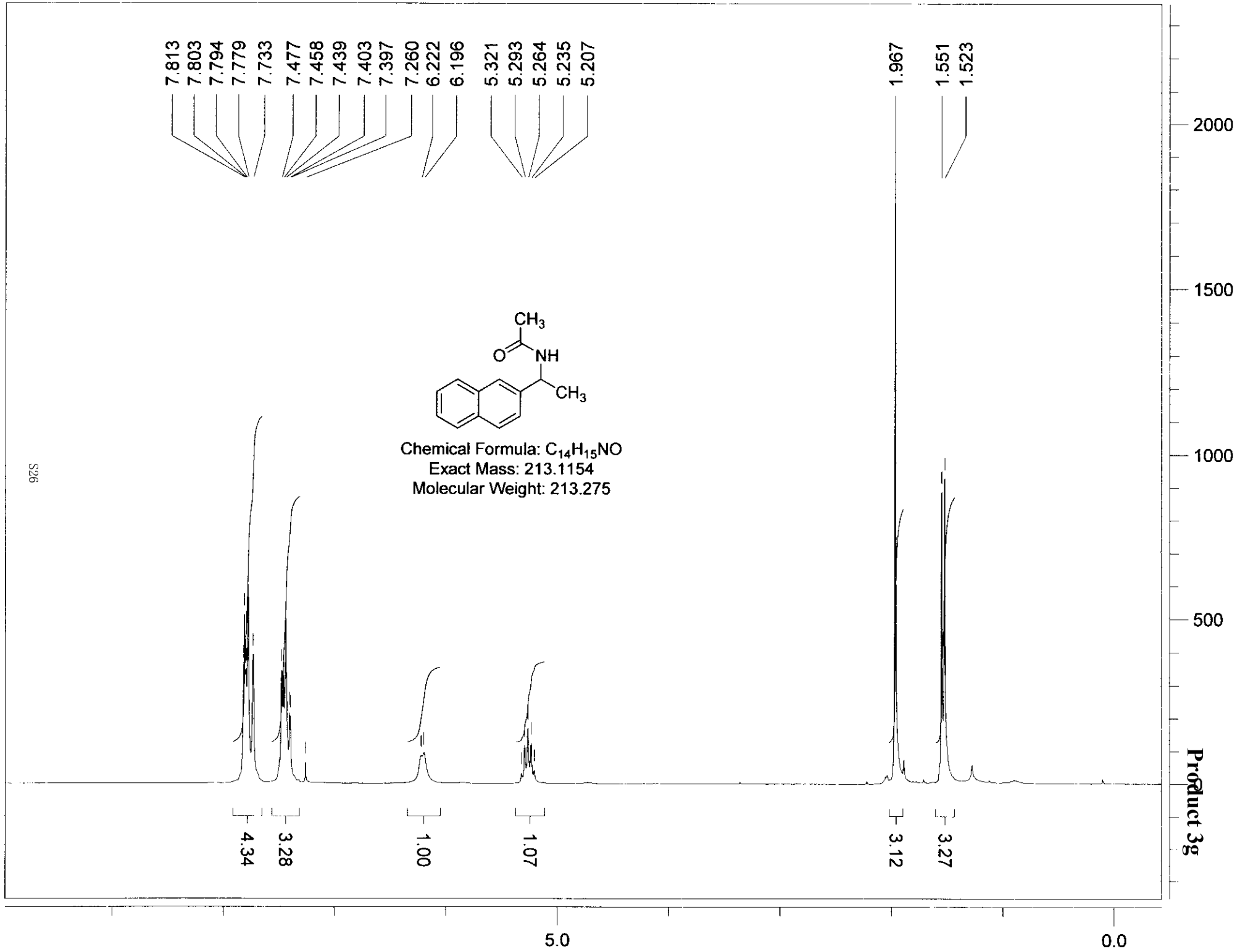
LGL3-100(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

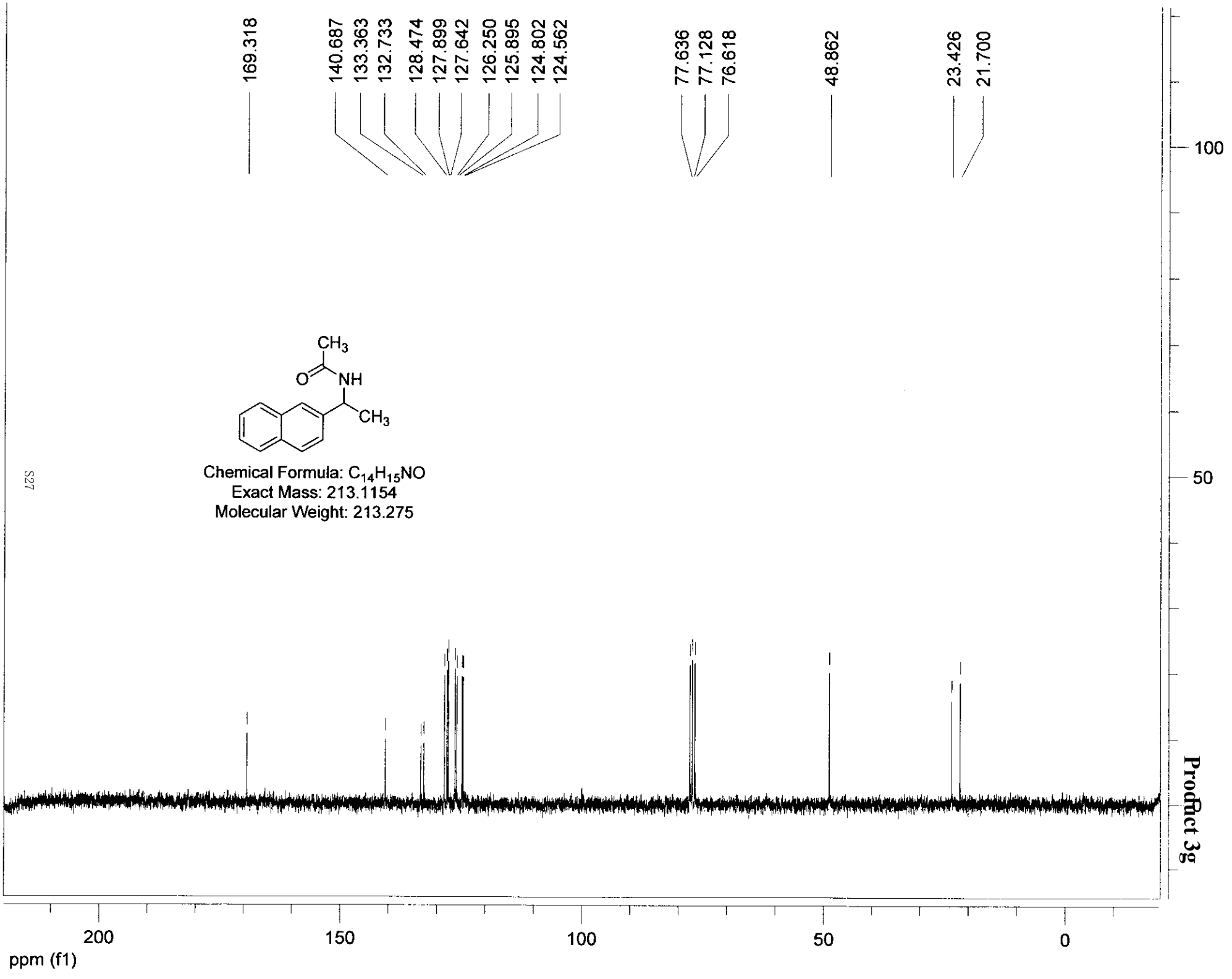
Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	14.61	48.89	5.0	4.1	48.893
2	UNKNOWN	19.04	51.11	4.6	4.3	51.107
Total			100.00	9.6	8.4	100.000



LGL3-97(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	14.53	97.44	18.0	14.7	97.436
2	UNKNOWN	19.00	2.56	0.5	0.4	2.564
Total			100.00	18.4	15.1	100.000


7.813
7.803
7.794
7.779
7.733
7.477
7.458
7.439
7.403
7.397
7.260
6.222
6.196
5.321
5.293
5.264
5.235
5.207
1.967
1.551
1.523
CH3
O
NH
CH3
Chemical Formula: C14H15NO
Exact Mass: 213.1154
Molecular Weight: 213.275
S26
4.34
3.28
1.00
1.07
3.12
3.27
2000
1500
1000
500
5.0
0.0
ppm (f1)
Product 3g

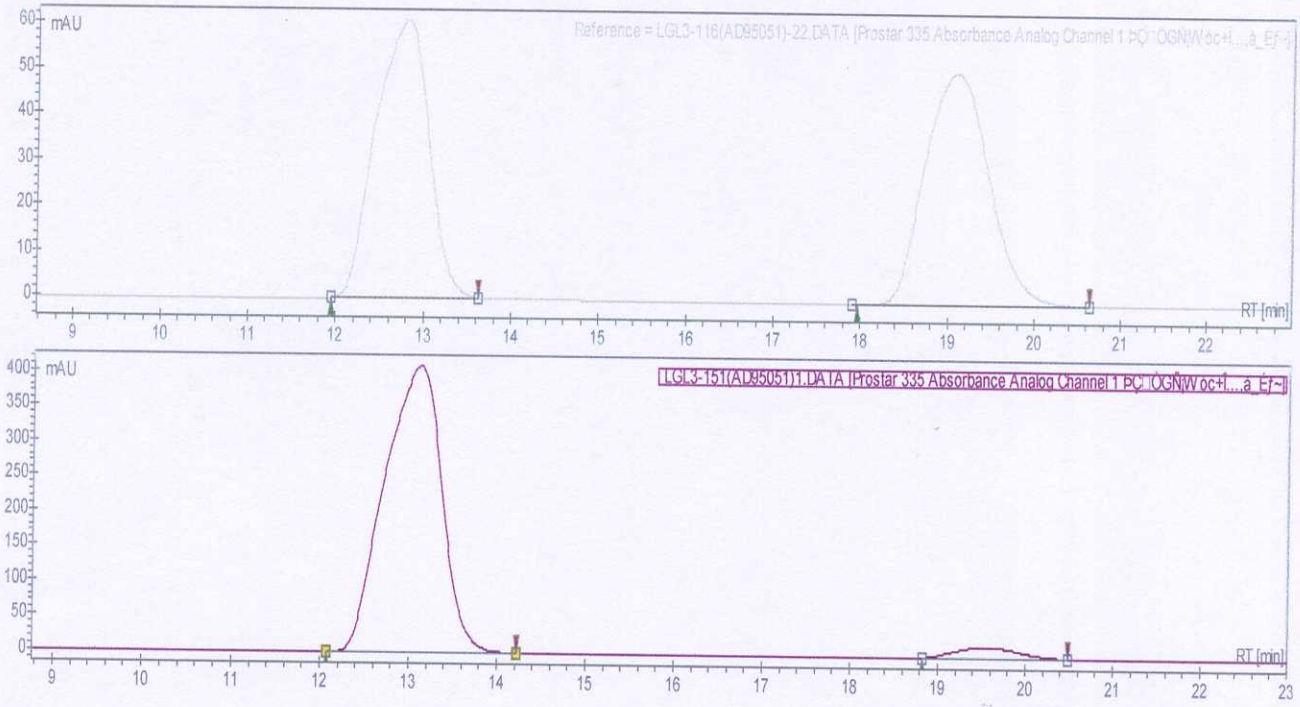

169.318
140.687
133.363
132.733
128.474
127.899
127.642
126.250
125.895
124.802
124.562
77.636
77.128
76.618
48.862
23.426
21.700
CH3
O
NH
CH3
Chemical Formula: C14H15NO
Exact Mass: 213.1154
Molecular Weight: 213.275
100
50
200
150
100
50
0
ppm (f1)
Product 3g

Chromatogram : LGL3-151(AD95051)1_channel1

Product 3g

System : HPLC
Method : LGL
User : Gerald Rowland

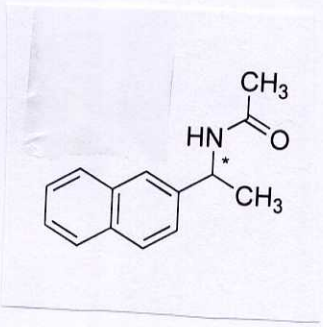
Acquired : 7/11/2008 11:47:20 AM
Processed : 7/11/2008 12:16:32 PM
Printed : 10/30/2008 9:51:23 AM



Peak results :

LGL3-116(AD95051)-22.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

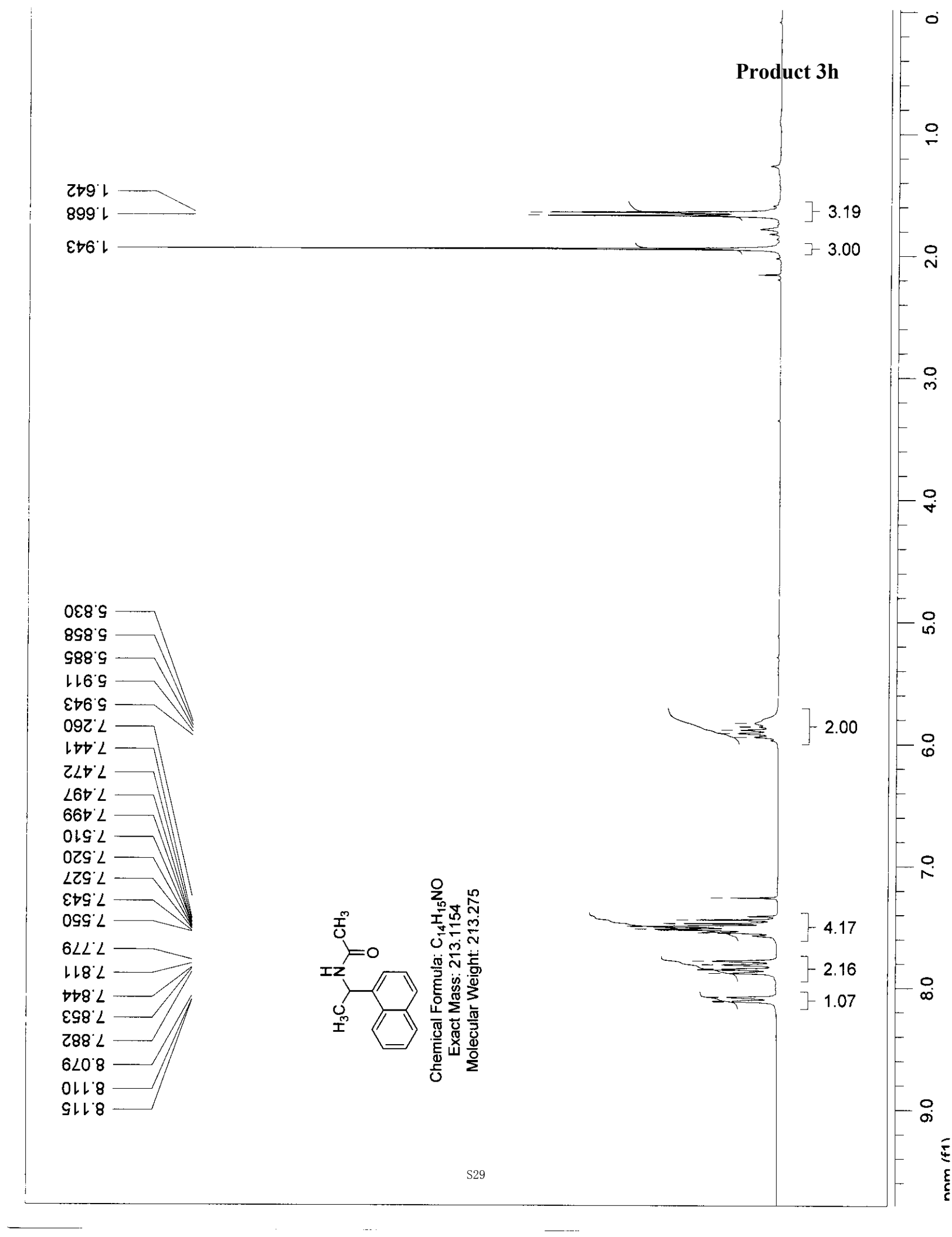
Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
2	UNKNOWN	12.80	49.69	60.8	42.6	49.694
1	UNKNOWN	19.09	50.31	50.5	43.2	50.306
Total			100.00	111.3	85.8	100.000

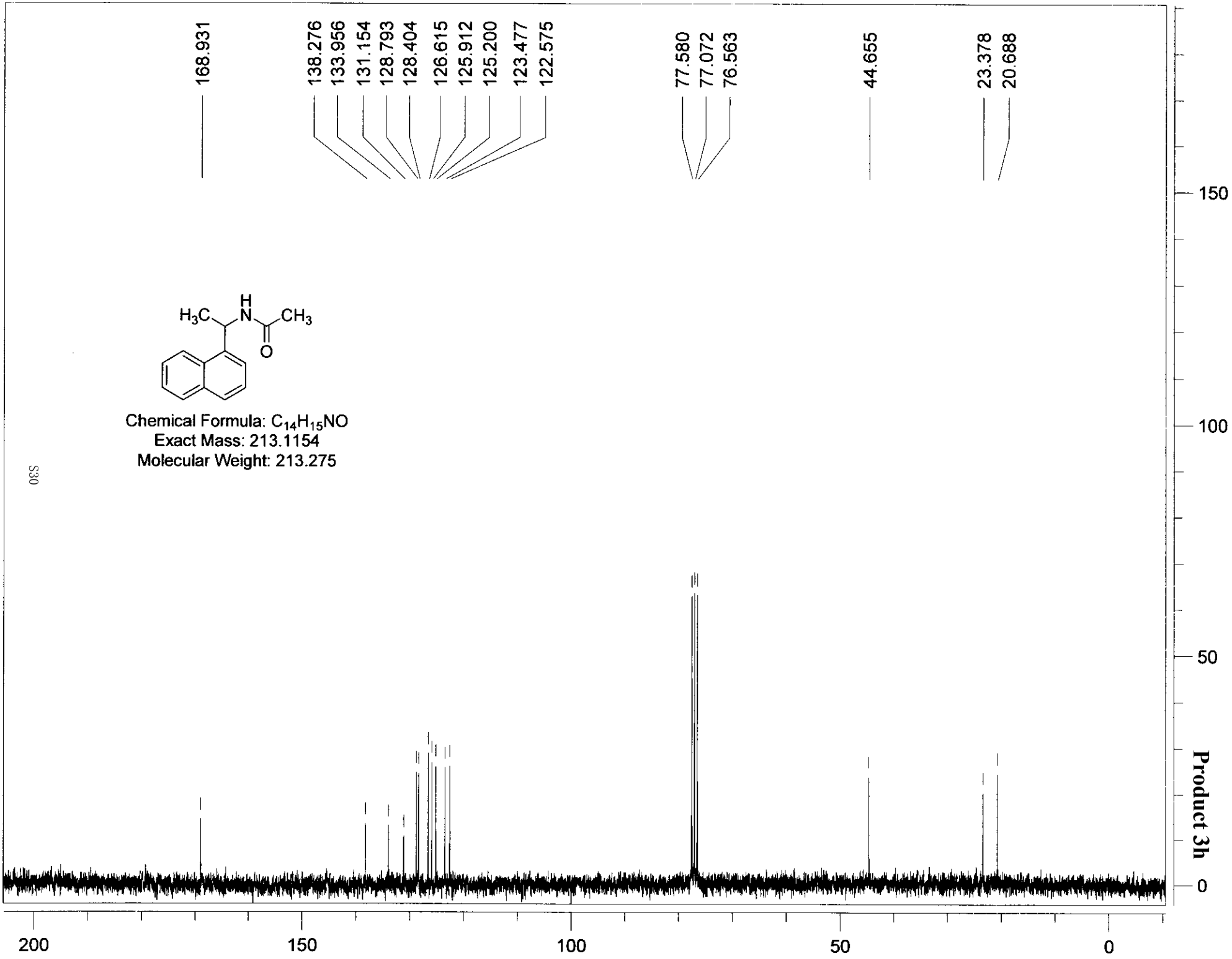


LGL3-151(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	13.12	95.96	410.1	306.2	95.959
2	UNKNOWN	19.56	4.04	15.5	12.9	4.041
Total			100.00	425.6	319.0	100.000

Product 3h


1.642
1.668
1.943
3.19
3.00
5.830
5.858
5.885
5.911
5.943
7.260
7.441
7.472
7.497
7.499
7.510
7.520
7.527
7.543
7.550
7.779
7.811
7.844
7.853
7.882
8.079
8.110
8.115
2.00
4.17
2.16
1.07
Chemical Formula: C14H15NO
Exact Mass: 213.1154
Molecular Weight: 213.275
ppm (f1)

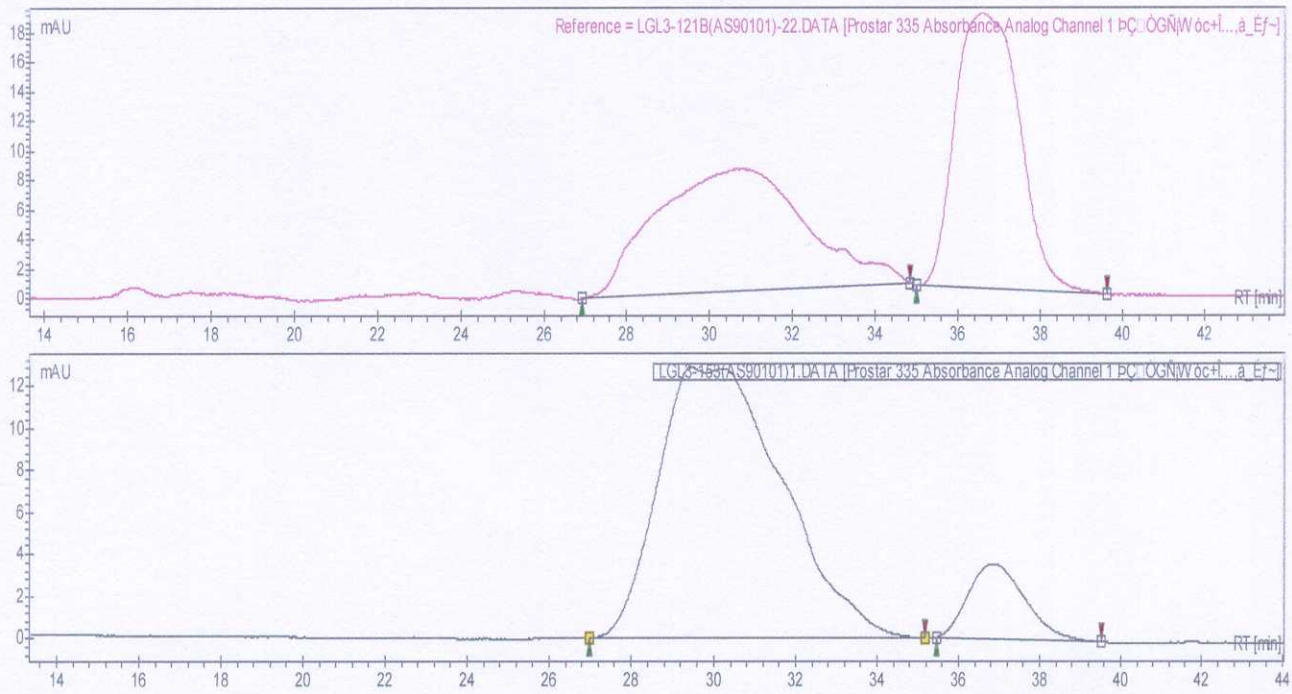

168.931
138.276
133.956
131.154
128.793
128.404
126.615
125.912
125.200
123.477
122.575
77.580
77.072
76.563
44.655
23.378
20.688
H
H3C
N
CH3
O
Chemical Formula: C14H15NO
Exact Mass: 213.1154
Molecular Weight: 213.275
S30
Product 3h
150
100
50
0
200
150
100
50
0
ppm (f1)

Chromatogram : LGL3-153(AS90101)1_channel1

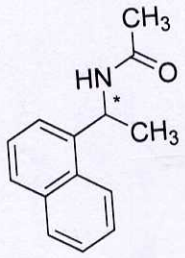
Product 3h

System : HPLC
Method : LGL
User : Gerald Rowland

Acquired : 7/16/2008 10:03:47 AM
Processed : 7/16/2008 12:11:46 PM
Printed : 10/30/2008 11:11:26 AM



Peak results :

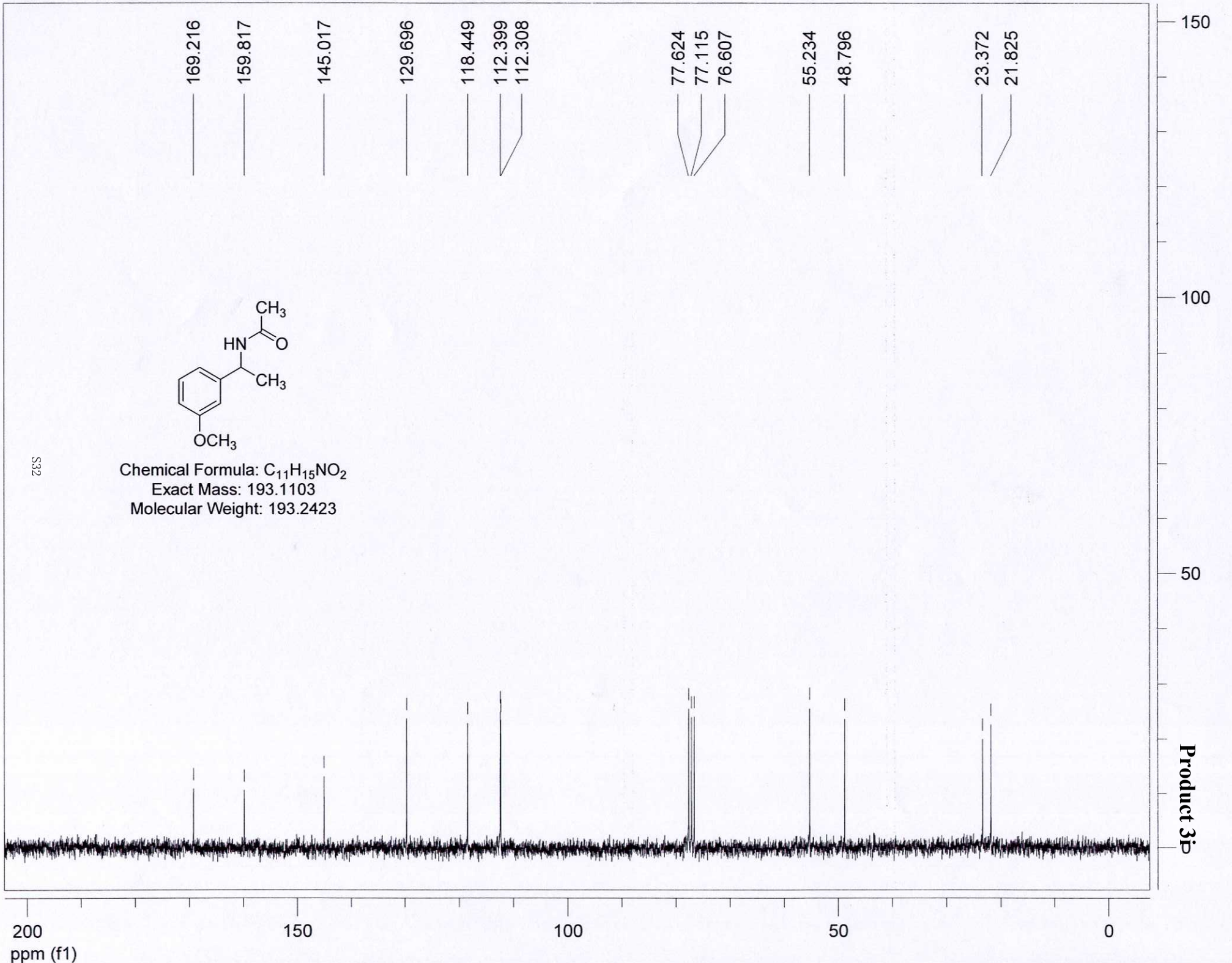


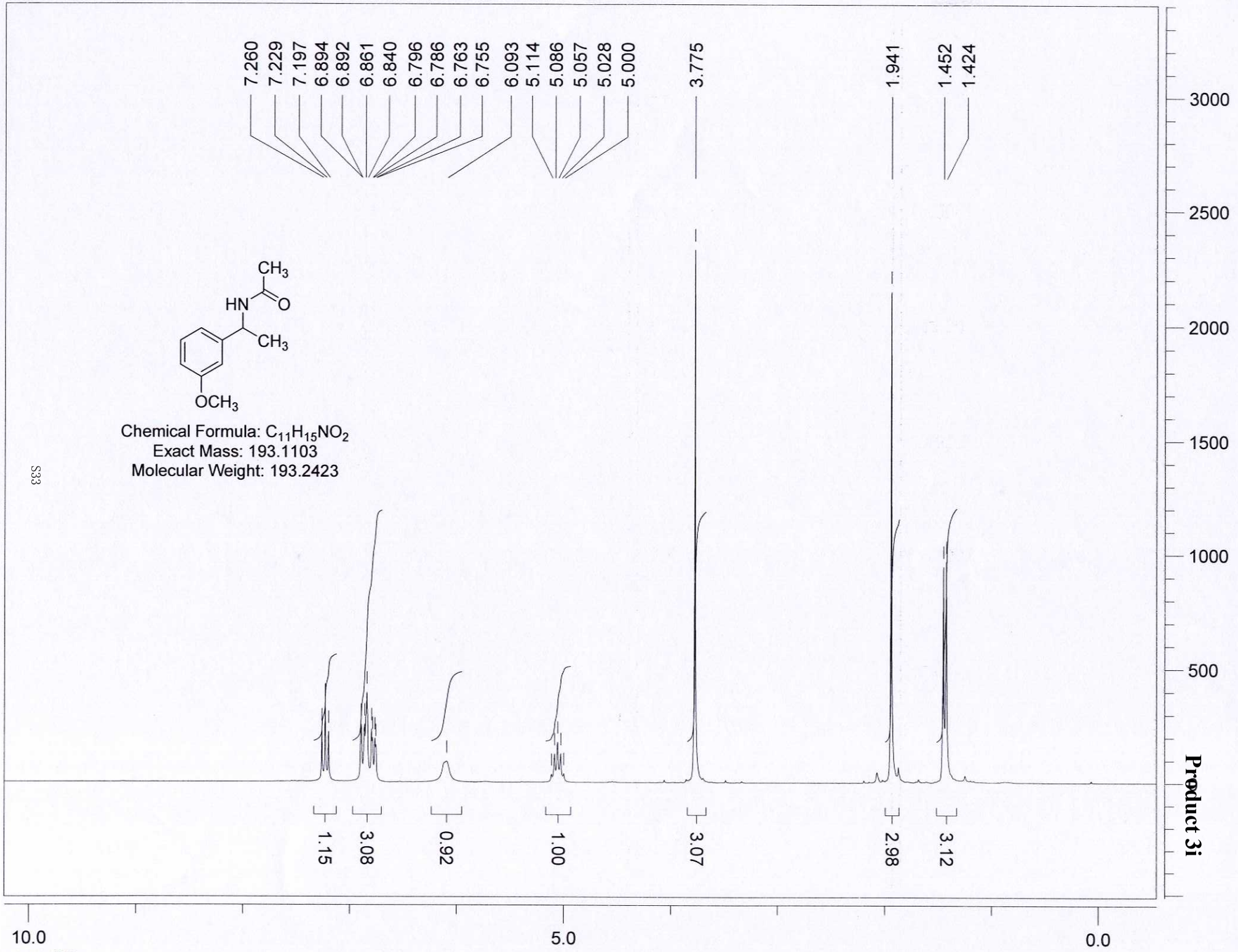
LGL3-121B(AS90101)-22.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
2	UNKNOWN	30.73	50.42	8.2	34.5	50.424
1	UNKNOWN	36.57	49.58	18.7	34.0	49.576
Total			100.00	26.9	68.5	100.000

LGL3-153(AS90101)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	29.43	88.79	12.9	45.2	88.790
2	UNKNOWN	36.89	11.21	3.6	5.7	11.210
Total			100.00	16.4	50.9	100.000


169.216
159.817
145.017
129.696
118.449
112.399
112.308
77.624
77.115
76.607
55.234
48.796
23.372
21.825
150
100
50
0
200
150
100
50
ppm (f1)
CH3
HN
O
CH3
OCH3
Chemical Formula: C11H15NO2
Exact Mass: 193.1103
Molecular Weight: 193.2423
Product 3p

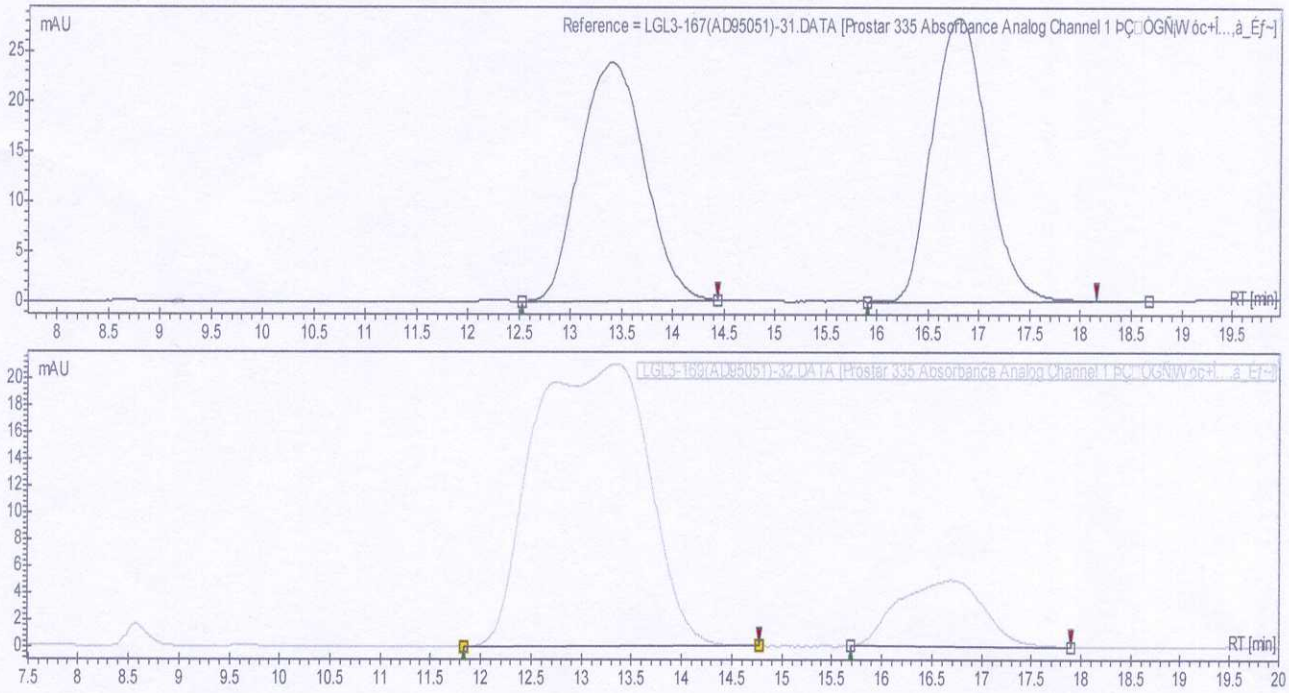

7.260
7.229
7.197
6.894
6.892
6.861
6.840
6.796
6.786
6.763
6.755
6.093
5.114
5.086
5.057
5.028
5.000
3.775
1.941
1.452
1.424
CH3
HN
O
CH3
OCH3
Chemical Formula: C11H15NO2
Exact Mass: 193.1103
Molecular Weight: 193.2423
1.15
3.08
0.92
1.00
3.07
2.98
3.12
3000
2500
2000
1500
1000
500
10.0
5.0
0.0
ppm (f1)
Product 3i

Chromatogram : LGL3-169(AD95051)-32_channel1

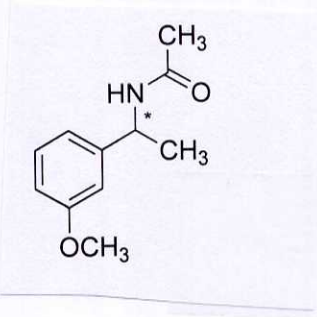
Product 3i

System : HPLC
Method : LGL
User : Gerald Rowland

Acquired : 7/30/2008 2:37:24 PM
Processed : 8/1/2008 11:03:37 AM
Printed : 8/1/2008 11:09:51 AM



Peak results :

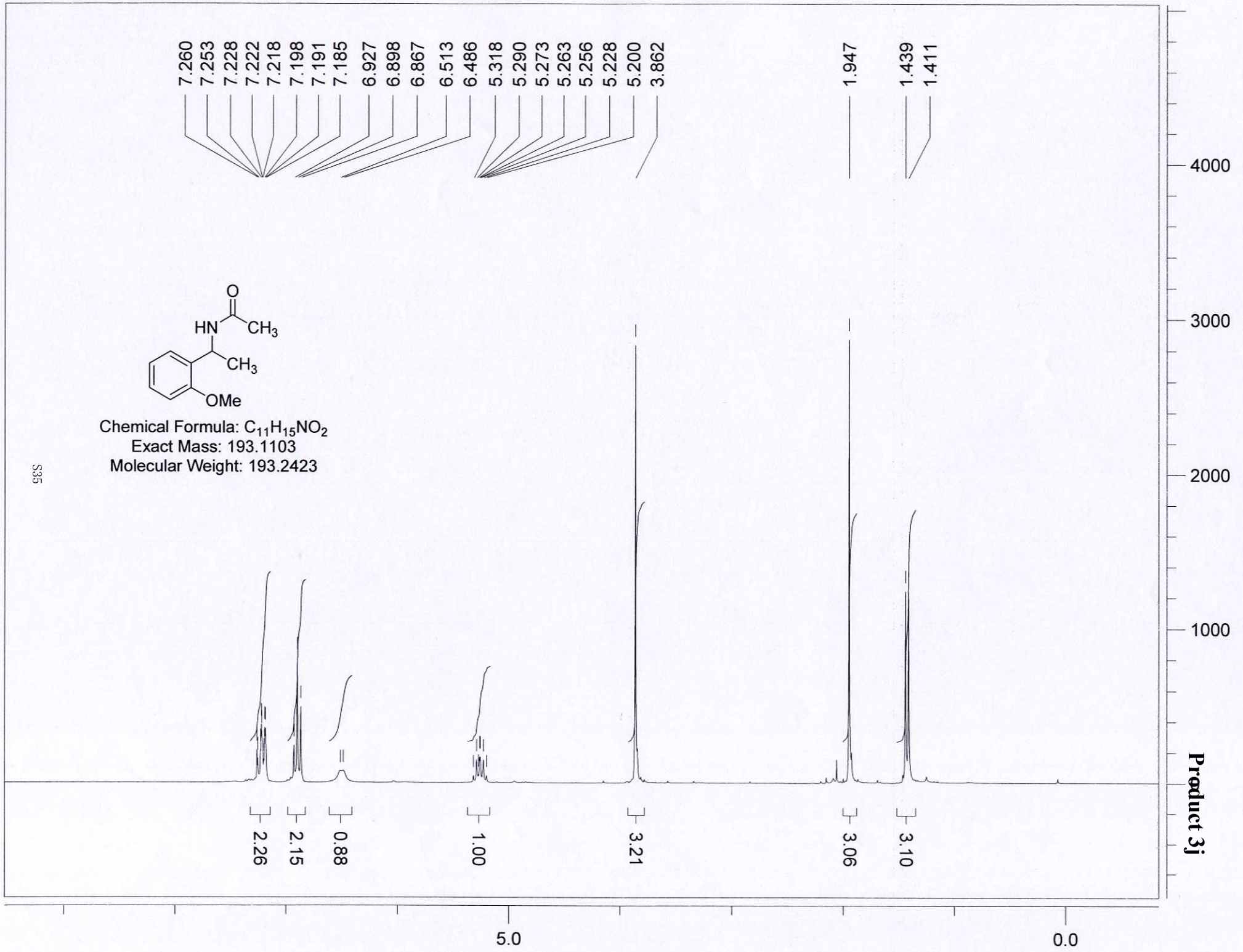


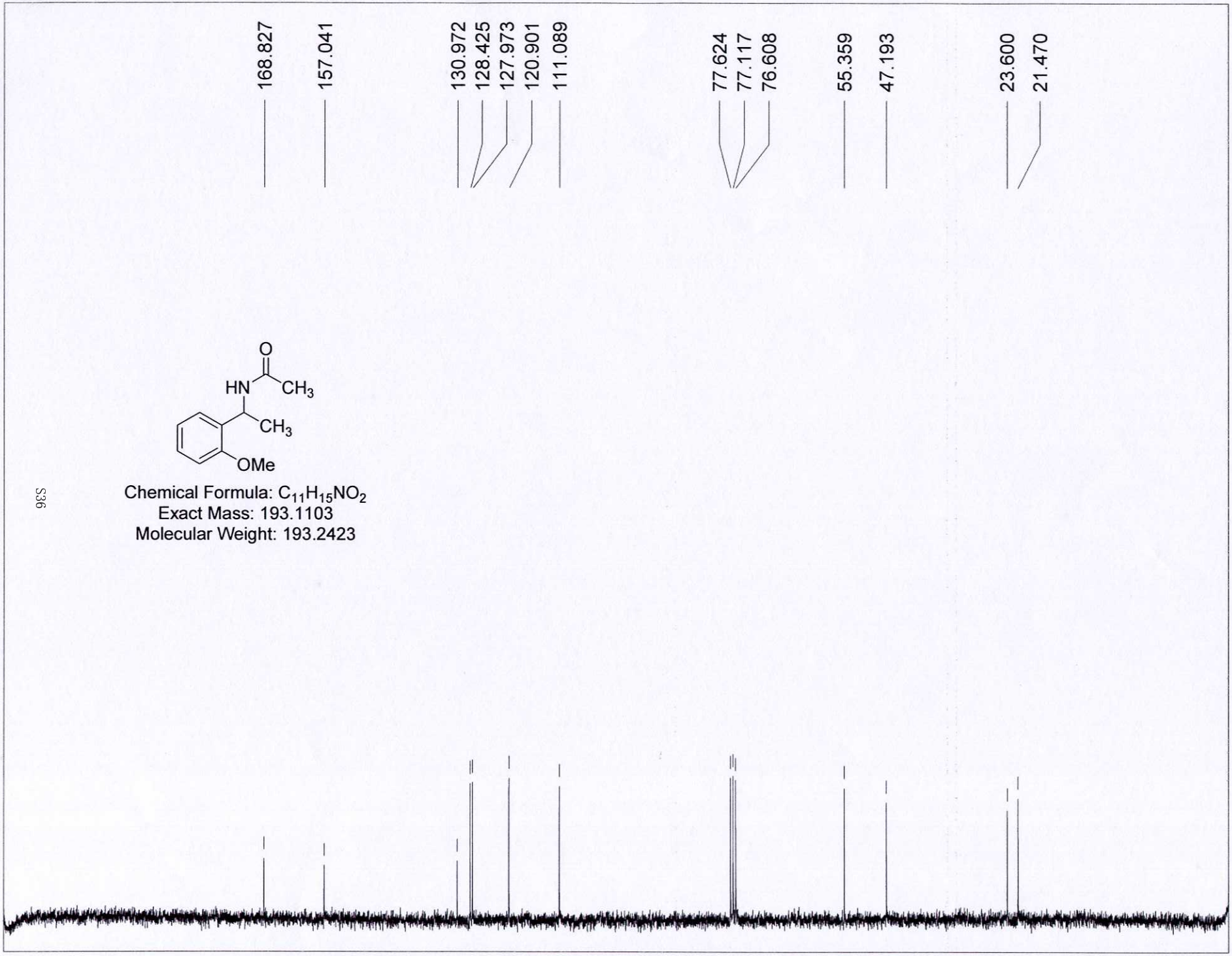
LGL3-167(AD95051)-31.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	13.40	49.74	23.8	17.6	49.739
2	UNKNOWN	16.80	50.26	28.4	17.8	50.261
Total			100.00	52.2	35.4	100.000

LGL3-169(AD95051)-32.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	13.33	85.35	21.0	28.1	85.346
2	UNKNOWN	16.69	14.65	4.9	4.8	14.654
Total			100.00	25.9	32.9	100.000


7.260
7.253
7.228
7.222
7.218
7.198
7.191
7.185
6.927
6.898
6.867
6.513
6.486
5.318
5.290
5.273
5.263
5.256
5.228
5.200
3.862
1.947
1.439
1.411
HN
O
CH3
CH3
OMe
Chemical Formula: C11H15NO2
Exact Mass: 193.1103
Molecular Weight: 193.2423
4000
3000
2000
1000
2.26
2.15
0.88
1.00
3.21
3.06
3.10
5.0
0.0
ppm (f1)
Product 3j


168.827
157.041
130.972
128.425
127.973
120.901
111.089
77.624
77.117
76.608
55.359
47.193
23.600
21.470
O
HN
CH3
CH3
OMe
Chemical Formula: C11H15NO2
Exact Mass: 193.1103
Molecular Weight: 193.2423
100
50
0
200
150
100
50
0
ppm (f1)

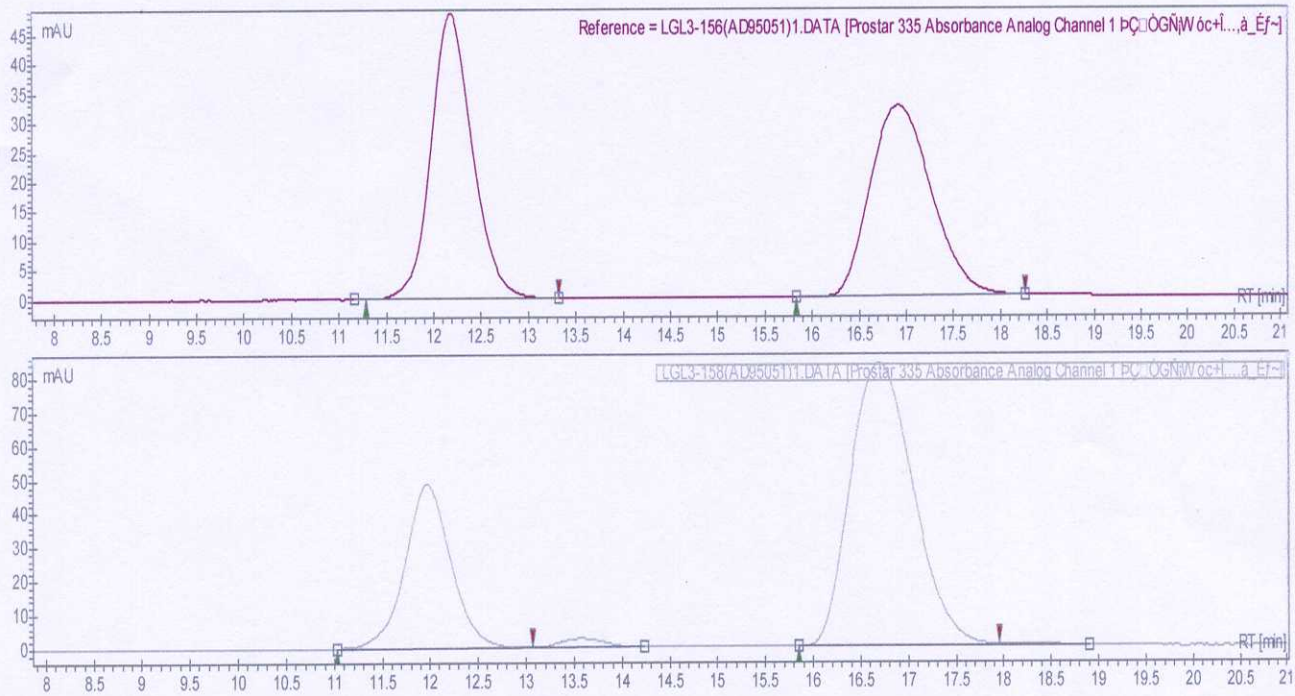
Product 3j

Chromatogram : LGL3-158(AD95051)1_channel1

Product 3j

System : HPLC
Method : LGL
User : Gerald Rowland

Acquired : 7/16/2008 2:39:21 PM
Processed : 7/16/2008 3:01:45 PM
Printed : 10/30/2008 4:20:21 PM



Peak results :

LGL3-156(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	12.17	50.11	48.5	24.5	50.109
2	UNKNOWN	16.92	49.89	32.3	24.4	49.891
Total			100.00	80.8	48.9	100.000

LGL3-158(AD95051)1.DATA [Prostar 335 Absorbance Analog Channel 1 ÞÇ□ÒGÑ¡W óc+Î...,à_Éƒ~]

Index	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	11.97	29.45	48.7	26.9	29.450
2	UNKNOWN	16.69	70.55	84.1	64.5	70.550
Total			100.00	132.8	91.5	100.000