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Supporting Information

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Direct Asymmetric α-Fluorination of Aldehydes [**]

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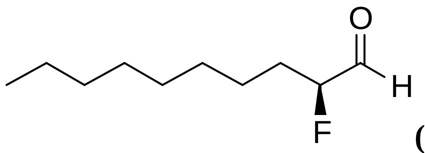
General. Chemicals and solvents were either purchased from commercial suppliers or purified by standard techniques. For thin-layer chromatography (TLC), silica gel plates Merck 60 F254 were used and compounds were visualized by irradiation with UV light and/or by treatment with a solution of phosphomolybdic acid in ethanol followed by heating. Flash column chromatography was performed using silica gel Merck 60 (particle size 0.040-0.063 mm). ^{1}H NMR , ^{13}C NMR and ^{19}F NMR spectra were recorded on Bucker AMX-400 and Brucker DRX-500 instruments. Chemical shifts are given in ***d*** relative to tetramethylsilane (TMS), the coupling constants *J* are given in Hz. The spectra were recorded in $CDCl_3$ (unless otherwise stated) as solvent at RT, TMS served as internal standard (*d* = 0 ppm) for ^{1}H NMR, and $CDCl_3$ was used as internal standard (*d* = 77.0) for ^{13}C NMR. External hexafluorobenzene (*d* = -163 ppm) served as an internal standard for ^{19}F NMR. High-resolution mass spectra were recorded on an Ion Spec Fourier Transform Mass Spectrometer using dihydrobenzoic acid (DHB) as the matrix. Reversed phase HPLC was carried out using an Agilent series 1100 system using . All HRMS run with hydrazone derivative of corresponding aldehyde made with benzoic hydrazide. All chiral GLC were recorded on an Agilent 6980 FID with Helium carrier gas using a (30 m x 0.25

mm) Bodman?γ-TA capillary column.

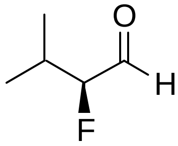
General procedure for the direct fluorination of linear aldehydes, Method A:

To a flask containing a stir bar, 200 μL of DMF was added, followed by 1 equivalent (0.25 mmol) of imidazolidinone **14b** and 1.0 equivalent of linear aldehyde. To this solution 300 μL of a fresh 1M solution of NFSi in DMF (1.2 eq., 0.3 mmol) was added. The resulting solution was stirred at room temperature until complete. The reaction was then diluted with 2 mL of pentane. The pentane was then extracted two times with 1 mL of saturated NH_4CL, dried over $MgSO_4$ and filtered. The organic layer was evaporated carefully and analyzed directly. The enantioselectivity was determined by chiral GLC analysis. Column chromatography with hexane/ethyl acetate resulted in very low yields. Direct derivatization of the aldehyde with benzoic hydrazine proceeds rapidly in methanol to form a stable hydrazone. The resulting α-fluoro hydrazone can then be separated by column chromatography or isolated via recrystallization and is readily ionized on HRMS while the aldehyde is not. Racemic standards were synthesized using same procedure, but substituting pyrrolidine or D+L-proline for chiral catalyst.

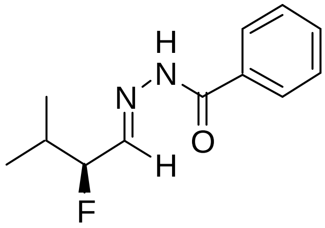


(*S*)-2-Fluoro-decanal (Table 4, entry 2): Prepared according to general procedure, method A, from decyl aldehyde (47.1 μL, 0.25 mmol) catalyzed by imidazolidinone **14b** (54.5 mg, 0.25 mmol) for 3 h to provide as a colorless oil (90% yield by crude ^{1}H NMR, 88%ee). ^{1}H NMR (400 MHz) ***d*** : 0.86 (t, 3H, -CH_3), 1.26 (m, 10H), 1.45 (m, 2H), 1.73 (m, 2H), 4.67 (dddd, *J* = 49.5 Hz, 1H),9.75 (dd, *J* = 6.2 Hz, 1H); ^{13}C NMR (125 MHz) ***d*** = 14.1, 22.6, 24.19 (d, *J* = 3.9 Hz), 29.13, 29.18, 29.26, 30.27 (d, *J* = 20.9 Hz), 31.8, 94.1 (d, *J* = 178.7 Hz), 200.2 (d, *J* = 34.9; ^{19}F NMR ($CDCl_3$) ***d*** = -199.3 ppm; HRMS (ESI) exact mass calculated for ($C_{10}H_{19}FO$) requires [M-H]- 173.1347, found [M-H]- 173.1347. $[\alpha]_D$= -10.55 (c= 1.4, $CHCl_3$). The enantiomeric ratio was determined by GLC using a Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (90 °C isotherm) isomer (*R*) t_r =13.48 min and isomer (*S*)t_r = 13.98

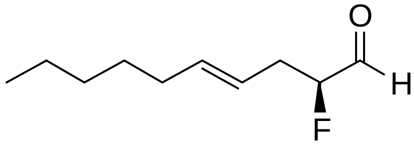
min. Structure was confirmed by comparison to literature values.



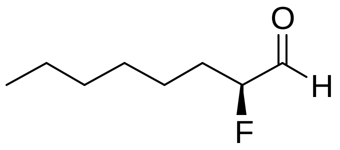
(*S*)-(-)-2-Fluoro-isovaleraldehyde (Table 4, entry 1): Prepared according to general procedure, method A, from isovaleraldehyde (69 μL, 0.25 mmol) catalyzed by imidazolidinone **14b** (54.5 mg, 0.25 mmol) for 2 h. Initial samples were lost upon evaporation of pentane, so 1 equivalent (34 mg, 0.25mmol) benzoic hydrazine was added directly to pentane with 2 mL of MeOH. (74% yield by crude HPLC of hydrazone derivative, 96%ee). ^{1}H NMR of crude reaction in CD_3CN, (400 MHz, CD_3CN) *d* : 0.98 (d, *J* = 6.9 Hz, 3H), 1.032 (d, *J* = 6.9 Hz, 3H), 1.99 (m, 1H), 4.63-4.77 (dd, *J* = 48.7 Hz, 1H), 9.75-9.74(d, *J* = 9.3 Hz, 1H); ^{19}F NMR (CD_3CN) *d* = -203.2 ppm . $[\alpha]_D$= -22.1 (c= 2.2, pentane) unpurified.



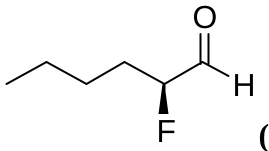
Benzoic acid, [(*S*)--2-fluoro-3-methylbutylidene]hydrazide: Prepared according to general procedure, method A. HRMS (ESI) exact mass calculated for ($C_{12}H_{15}FN_2O$) requires MH+ 223.1241, found MH+ 223.1246. ^{1}H NMR (400 MHz) *d* : 0.97 (d, *J* = 6.8 Hz, 3H), 1.02 (d, *J* = 6.8 Hz, 3H), 2.03 (m, 1H), 4.77-4.89 (d, *J* = 48.6 Hz, 1H), 7.43 (m, 2H), 7.53 (m, 1H), 7.82 (m, 2H), 9.66 (bs, 1H); ^{13}C NMR (125 MHz) *d* = 17.42(d, *J* = 5.2 Hz), 18.04(d, *J* = 4.9 Hz), 32.24(d, *J* = 21.2 Hz), 95.6(d, *J* = 169.9 Hz), 127.80, 129.1, 129.89 (d, *J* = 43.3 Hz), 132.67, 133.00, 164.7; ^{19}F NMR ($CDCl_3$) *d* = -188.4 ppm. $[\alpha]_D$= -3.20 (c= 0.5, $CHCl_3$). The enantiomeric ratio was determined by reverse phase HPLC using a Diacel Chiracel OD-R column (45% acetonitrile/water isocratic) isomer (*S*) t_r =11.94 min and isomer (*R*)t_r = 12.83 min.



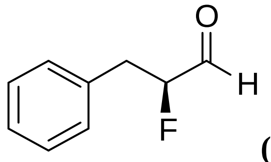
(*S*)-(-)2-Fluoro-4-*trans*-decenal (Table 4, entry 3): Prepared according to general procedure, method A, from 4-*trans*-decenal (45.8 μL, 0.25 mmol) catalyzed by imidazolidinone **14b** (54.5 mg, 0.25 mmol) for 3 h to provide as a colorless oil (59% yield by crude ^{1}H NMR, 93%ee). ^{1}H NMR (400 MHz) ***d*** : 0.86 (t, 3H, -CH_3), 1.26 (m, 8H), 2.46 (m, 2H), 4.68 (dddd, *J* = 49.0 Hz, 1H), 5.41 (m, 1H), 5.58(m, 1H), 9.74 (dd, *J* = 6.6 Hz, 1H); ^{13}C NMR (125 MHz) ***d*** = 14.05, 22.34, 28.08, 31.30, 33.75 (d, *J* = 20.2 Hz), 34.12, 93.53(d, *J* = 183.4 Hz), 121.48 (d, *J* = 3.9 Hz), 32.11, 200.92 (d, *J* = 33.9); ^{19}F NMR ($CDCl_3$) ***d*** = -198.7 ppm; HRMS (ESI) exact mass calculated for hydrazone ($C_{17}H_{23}FN_2O$) requires MH+ 291.1867, found MH+ 291.1868. $[\alpha]_D$= -14.10 (c= 1.0, $CHCl_3$). The enantiomeric ratio was determined by GLC using a Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (80 °C isotherm) isomer (*R*) t_r =18.96 min and isomer (*S*)t_r = 19.69 min.



(*S*)-(-)2-Fluoro octyl aldehyde (Table 4, entry 4): Prepared according to general procedure, method A, from octyl aldehyde (39.0 µL, 0.25 mmol) catalyzed by imidazolidinone **14b** (54.5 mg, 0.25 mmol) for 3 h to provide as a colorless oil (94% yield by crude ^{1}H NMR, 86%ee). ^{1}H NMR (400 MHz) ***d*** : 0.86 (t, 3H, -CH_3), 1.27 (m, 6H), 1.45 (m, 2H), 1.75 (m, 2H), 4.67-4.825 (dddd, *J* = 49.5 Hz, 1H),9.75 (dd, *J* = 6.3 Hz, 1H); ^{13}C NMR (125 MHz) ***d*** = 14.45, 22.89, 24.59 (d, *J* = 3.0 Hz), 29.25, 30.71 (d, *J* = 20.4 Hz), 31.89, 94.76(d, *J* = 178.9 Hz), 200.92 (d, *J* = 34.8); ^{19}F NMR ($CDCl_3$) ***d*** = -199.3 ppm; HRMS (ESI) exact mass calculated for hydrazone ($C_{15}H_{21}FN_2O$) requires MH+ 265.1711, found MH+ 265.1707. $[\alpha]_D$= -12.52 (c= 1.2, $CHCl_3$). The enantiomeric ratio was determined by GLC using a Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (60 °C isotherm) isomer (*R*) t_r =16.35 min and isomer (*S*)t_r = 17.7min. 2-fluoro octyl aldehyde was diluted with MeOH (1.0 mL) and $NaBH_4$ (50mg, 1.3 mmol) at 0 °C and stirred for 2 h. The corresponding (*S*)-2-fluoro-1-octanol was diluted in 2 mL ether, extracted with water and dried over $MgSO_4$. The absolute configuration was determined by optical rotation and compared with literature values.



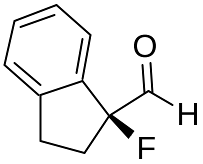
(*S*)-(-)-2-Fluoro-hexanal (Table 4, entry 5): Prepared according to general procedure, method A, from hexanal (30.0 µL, 0.25 mmol) catalyzed by imidazolidinone **14b** (54.5 mg, 0.25 mmol) for 3 h to provide as a colorless oil (40% yield by crude HPLC of hydrazone derivative, 92%ee). ^{1}H NMR (400 MHz) *d* : 0.86 (t, 3H, $-CH_3$), 1.23-1.83(m, 6H), 4.64 (dddd, *J* = 49.4 Hz, 1H), 9.74 (dd, *J* = 6.2 Hz, 1H); ^{19}F NMR ($CDCl_3$) *d* = -199.3 ppm, . $[\alpha]_D$= -26.9 (c= 2.1, pentane) unpurified; HRMS (ESI) exact mass calculated for hydrazone ($C_{13}H_{17}FN_2O$) requires MH+ 237.1398, found MH+ 237.1403. The enantiomeric ratio was determined by reverse phase HPLC using a Diacel Chiracel OD-R column (45% acetonitrile/water isocratic) isomer (*S*) t_r =20.95 min and isomer (*R*)t_r = 21.89 min.



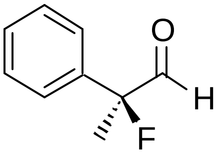
(*S*)-(-)-2-Fluoro-3-phenylproprionaldehyde (Table 4, entry 6): Prepared according to general procedure, method A, from 3-phenylproprionaldehyde aldehyde (33.0 µL, 0.25 mmol) catalyzed by imidazolidinone **14b** (54.5 mg, 0.25 mmol) for 2 h to provide as a colorless oil (97% yield by crude ^{1}H NMR, 88%ee). ^{1}H NMR (400 MHz) *d* : 2.66-2.73 (m, 2H), 4.67-5.03 (dddd, *J* = 48.9 Hz, 1H), 7.21-7.32 (m, 5H), 9.77 (dd, *J* = 5.4 Hz, 1H); ^{13}C NMR (125 MHz) *d* = 37.13 (d, *J* = 20.3 Hz), 94.74(d, *J* = 182.2 Hz), 127.68, 127.94, 129.13, 130.99, 131.06, 200.15 (d, *J* = 37.4); ^{19}F NMR ($CDCl_3$) *d* = -199.3 ppm; HRMS (ESI) exact mass calculated for hydrazone ($C_{16}H_{15}FN_2O$) requires MH+ 271.1241, found MH+ 271.1244. $[\alpha]_D$= -15.4 (c= 0.5, $CHCl_3$). The enantiomeric ratio was determined by GLC using a Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (90 °C isotherm) isomer (*R*) t_r =16.14 min and isomer (*S*)t_r = 18.05 min.

General procedure for the direct fluorination of branched aldehydes, Method B:

To a flask containing a stir bar, 200 µL of THF was added, followed by 0.3 equivalents (0.075 mmol) of catalyst and 1.0 equivalent of branched aldehyde. To this solution 300 µL of a fresh 1M solution of NFSi in THF (1.2 eq., 0.3 mmol) was added. The resulting solution was stirred at room temperature until complete. The reaction was then diluted with 2 mL of Et_2O from which a white precipitate formed. The ET_2O was decanted from the solid and extracted one time with 1 mL of saturated NH4CL, one time with 1 mL of $NaHCO_3$, dried over $MgSO_4$ and filtered. The organic layer was evaporated carefully and analyzed directly. The enantioselectivity was determined by chiral GLC analysis. Column chromatography with hexane/ethyl acetate resulted in very low yield. Derivatization of the aldehyde with benzoic hydrazine proceeds rapidly in methanol to form a stable hydrazone. The resulting α-fluoro hydrazone can then be separated by column chromatography or isolated via recrystallization. Racemic standards were synthesized using same procedure, but substituting pyrrolidine or D+L-proline for chiral catalyst.

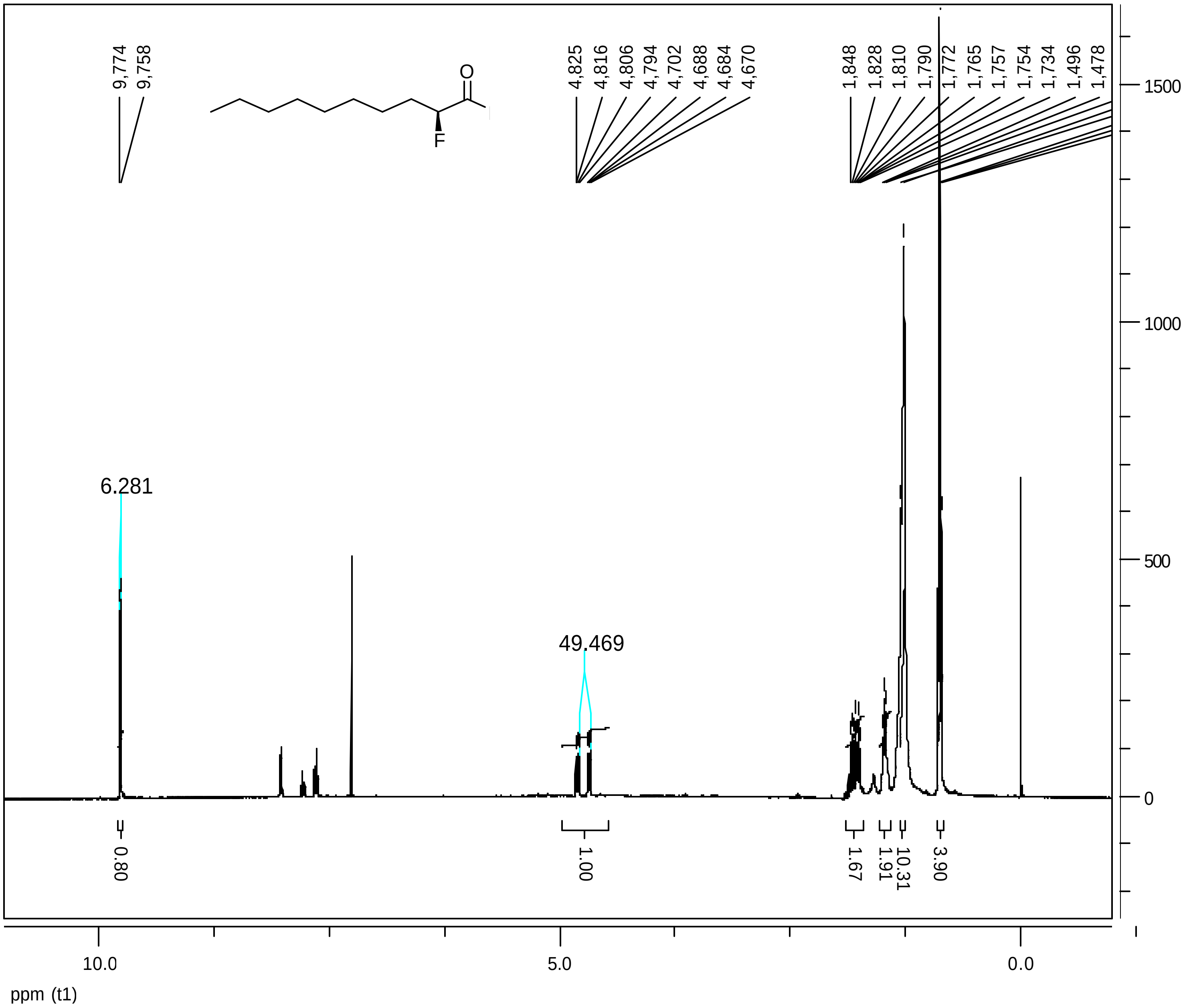


(*S*)-(-)-2-Fluoro-indane aldehyde (Table 4, entry 7): Prepared according to general procedure from indane aldehyde (32.1 μL, 0.25 mmol) catalyzed by TIPS prolinol **9c** (19.3 mg, 0.075 mmol) for 6 h to provide as a colorless oil (40.2 mg, 98% yield, 66 %ee). Material was difficult to monitor by TLC, so yield varied from 75-98 %. ^{1}H NMR (400 MHz) ***d*** : 2.46 (m, 2H), 3.06 (m, 2H), 7.59-8.03 (m, 4H), 9.93 (d, *J* = 5.2 Hz, 1H); ^{13}C NMR (100 MHz) ***d*** = 30.20, 33.36(d, *J* = 22.4 Hz), 106.56(d, *J* = 128.16 Hz), 127.59, 129.69, 130.05, 131.10 (d, *J* = 3.33), 134.81 (d, *J* = 4.74), 136.09, 197.43 (d, *J* = 41.70); ^{19}F NMR ($CDCl_3$) ***d*** = -147.4 ppm; $[\alpha]_D$= -7.1 (c= 1.2, $CHCl_3$); HRMS (ESI) exact mass calculated for hydrazone ($C_{17}H_{15}FN_2O$) requires MH+ 283.1247, found MH+ 283.1249. The enantiomeric ratio was determined by GLC using a Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (110 °C isotherm) isomer t_r =14.17 min and isomer t_r = 15.07 min.



(*S*)-(-)-2-Fluoro-2-phenylpropionaldehyde (Table 4, entry 8): Prepared according to general procedure from 2-phenylpropionaldehyde **1a** (33.2 μL, 0.25 mmol) catalyzed by TIPS prolinol **9c** (19.3 mg, 0.075 mmol) for 6 h to provide as a colorless oil (35.0 mg, 90% yield, 40%ee). ^{1}H NMR (400 MHz) ***d*** : 1.76-1.82 (d, *J* = 22.7 Hz,3H, -CH$_3$), 7.40 (m, 5H), 9.69-9.70 (d, *J* = 4.9 Hz, 1H); ^{19}F NMR (CDCl$_3$) ***d*** = -160.8 ppm; $[\alpha]_D$= -8.2 (c= 5.6, CHCl$_3$); HRMS (ESI) exact mass calculated for hydrazone ($C_{16}H_{15}FN_2O$) requires MH+ 271.1241, found MH+ 271.1237. The enantiomeric ratio was determined by GLC using a Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (90 °C isotherm) isomer t$_r$ =9.45 min and isomer t$_r$ = 11.88 min.

(S)-(+)-2-Fluoro-2-phenylpropionoic acid To a solution of (*S*)-(-)-2-Fluoro-2-phenylpropionaldehyde (112 mg, 0.4 mmol) in tBuOH-H$_2$0 (5:1, 3 mL) at room temperature, NaClO$_2$ (143 mg, 1.6 mmol), NaH$_2$PO$_4$ (95 mg, 0.8 mmol) and 2-methyl-2-butene (1.6 mL of 2M THF solution, 3.2 mmol) was added and stirred for 1 h. The reaction mixture was then extracted with ethyl acetate and washed with brine and water. The organic layer was dried to a white solid. $[\alpha]_D$= +2.6 (c= 0.4, MeOH); HRMS (ESI) exact mass calculated for ($C_9H_9FO_2$) requires [M-H]- 167.0514, found [M-H]- 167.0514.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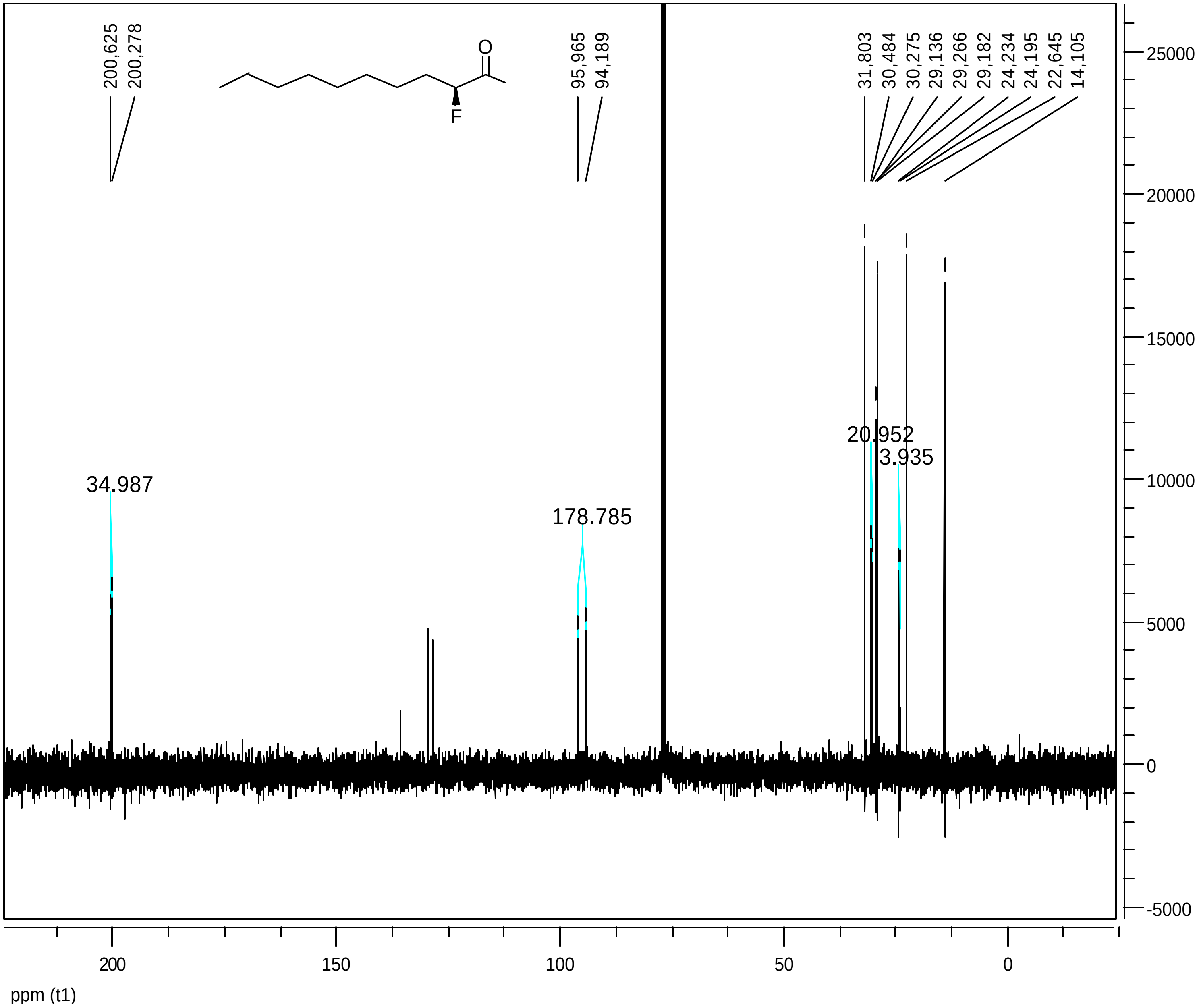
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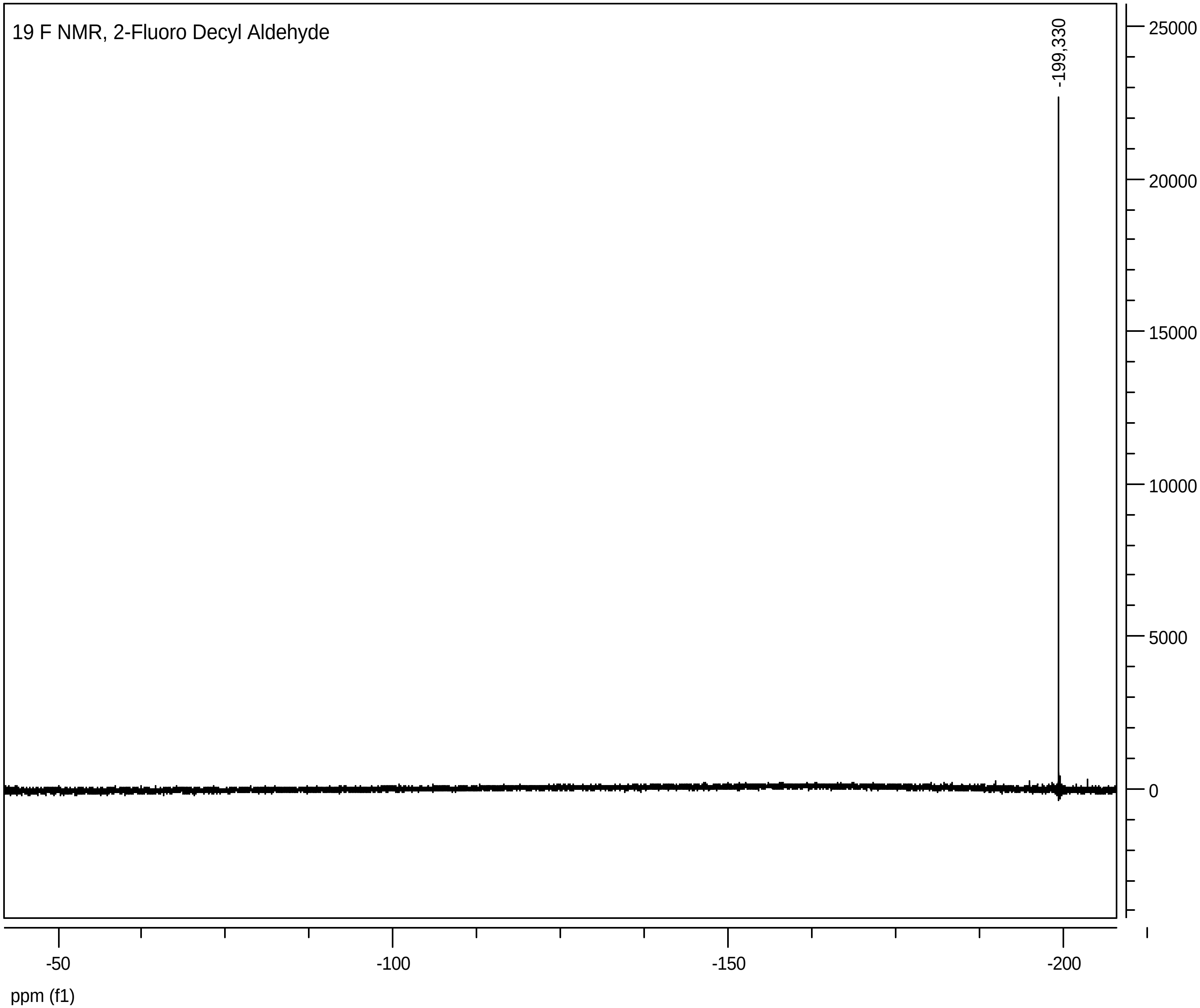
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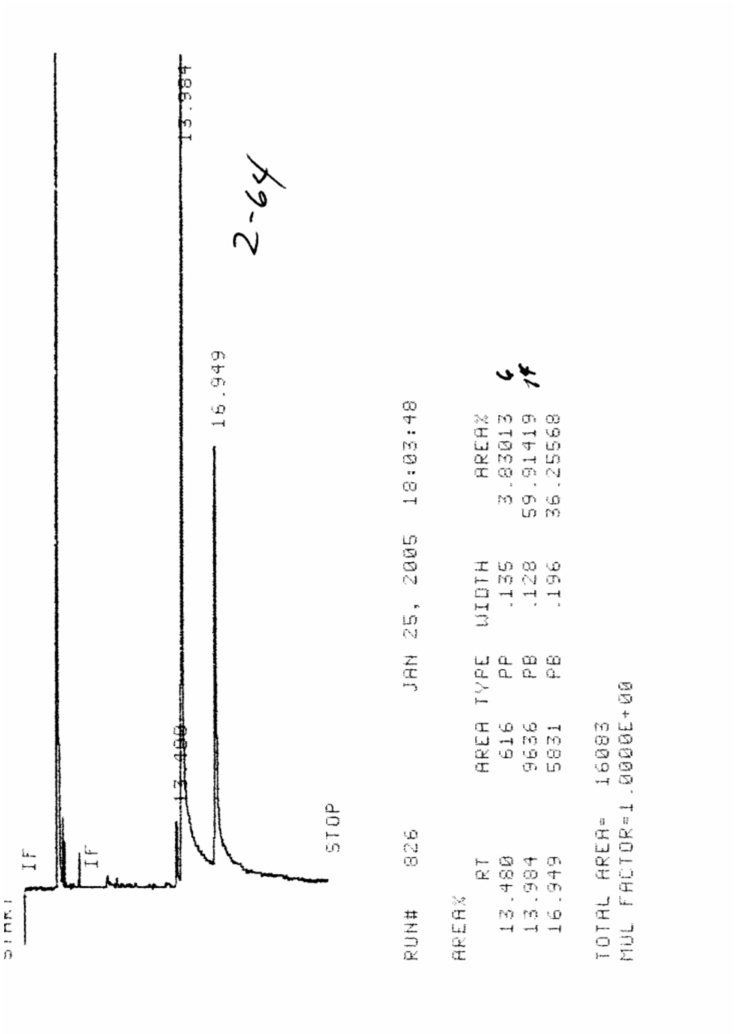
ppm (f1)

2-fluoro-decyl aldehyde: GLC using a Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (90 °C isotherm) isomer (*R*) t_r =13.48 min and isomer (*S*)t_r = 13.98, starting aldehyde t_r= 16.94



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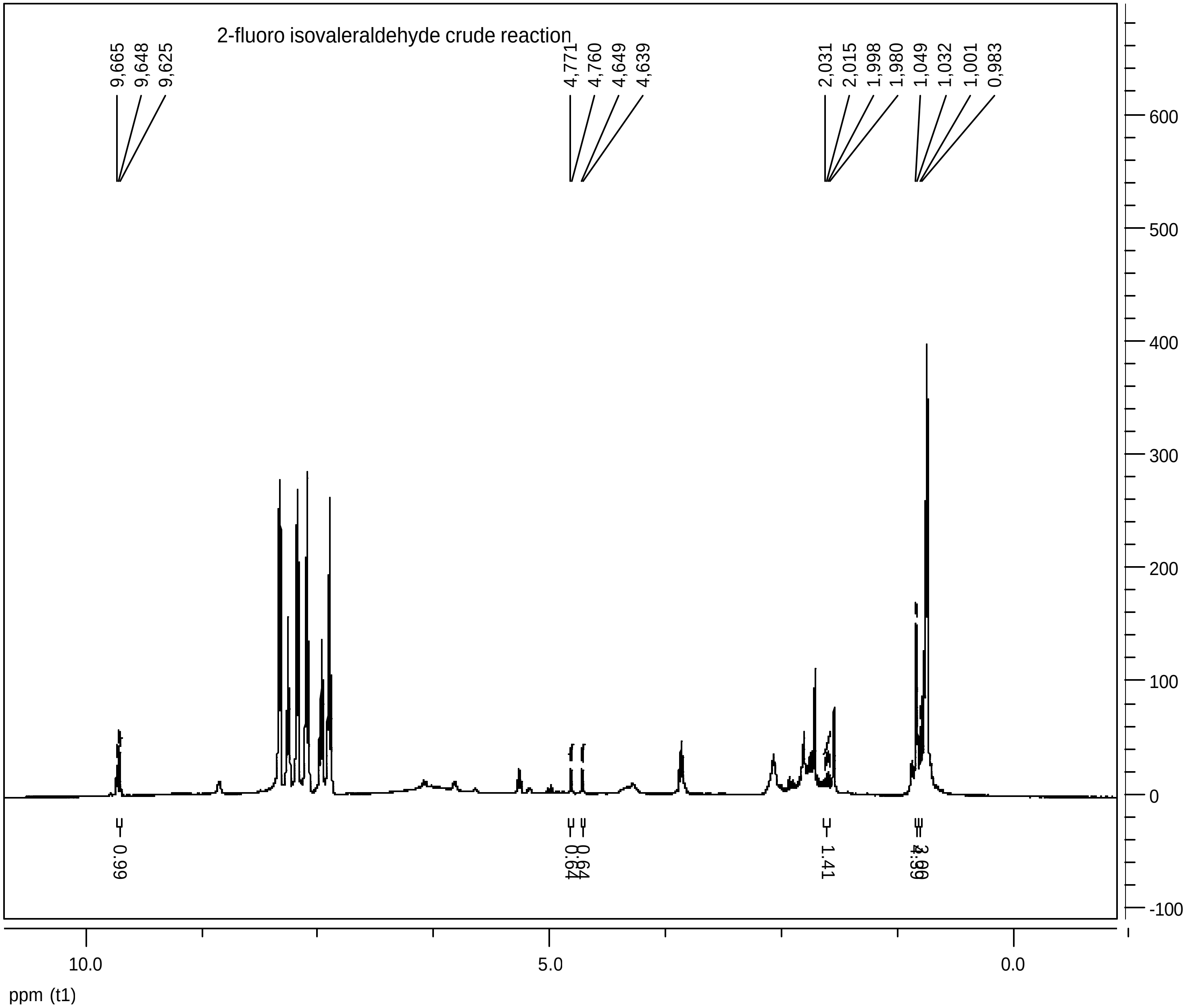
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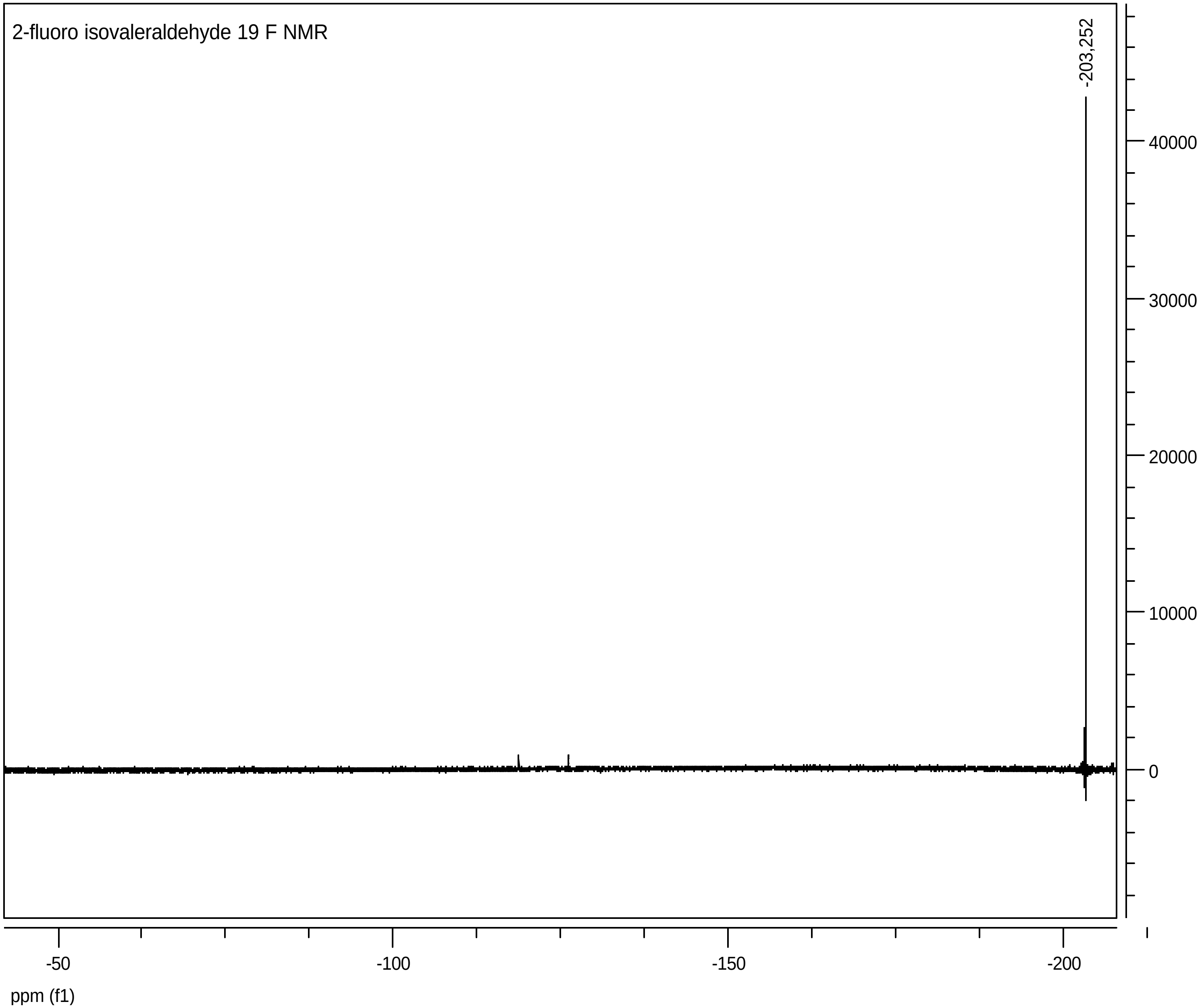
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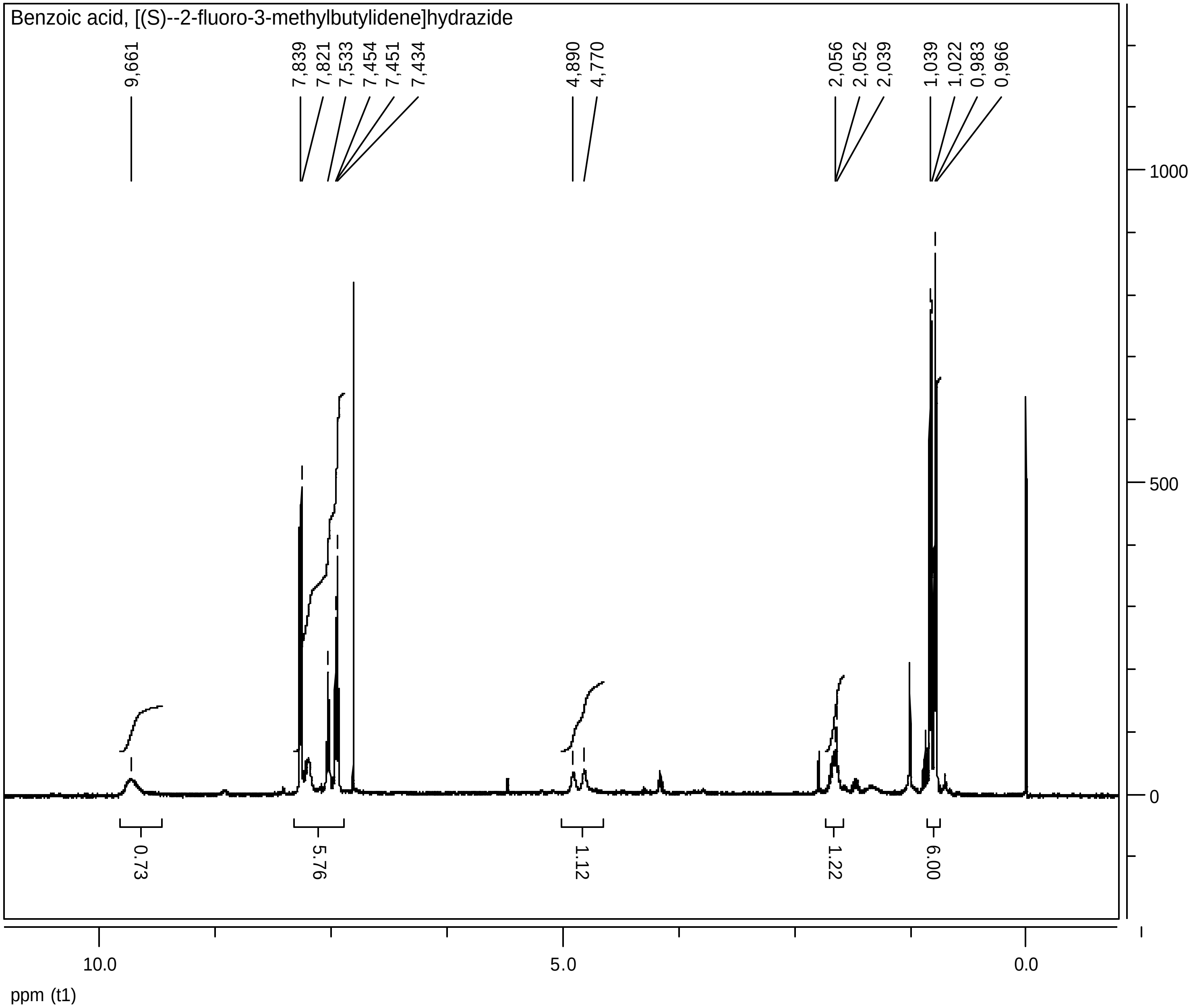
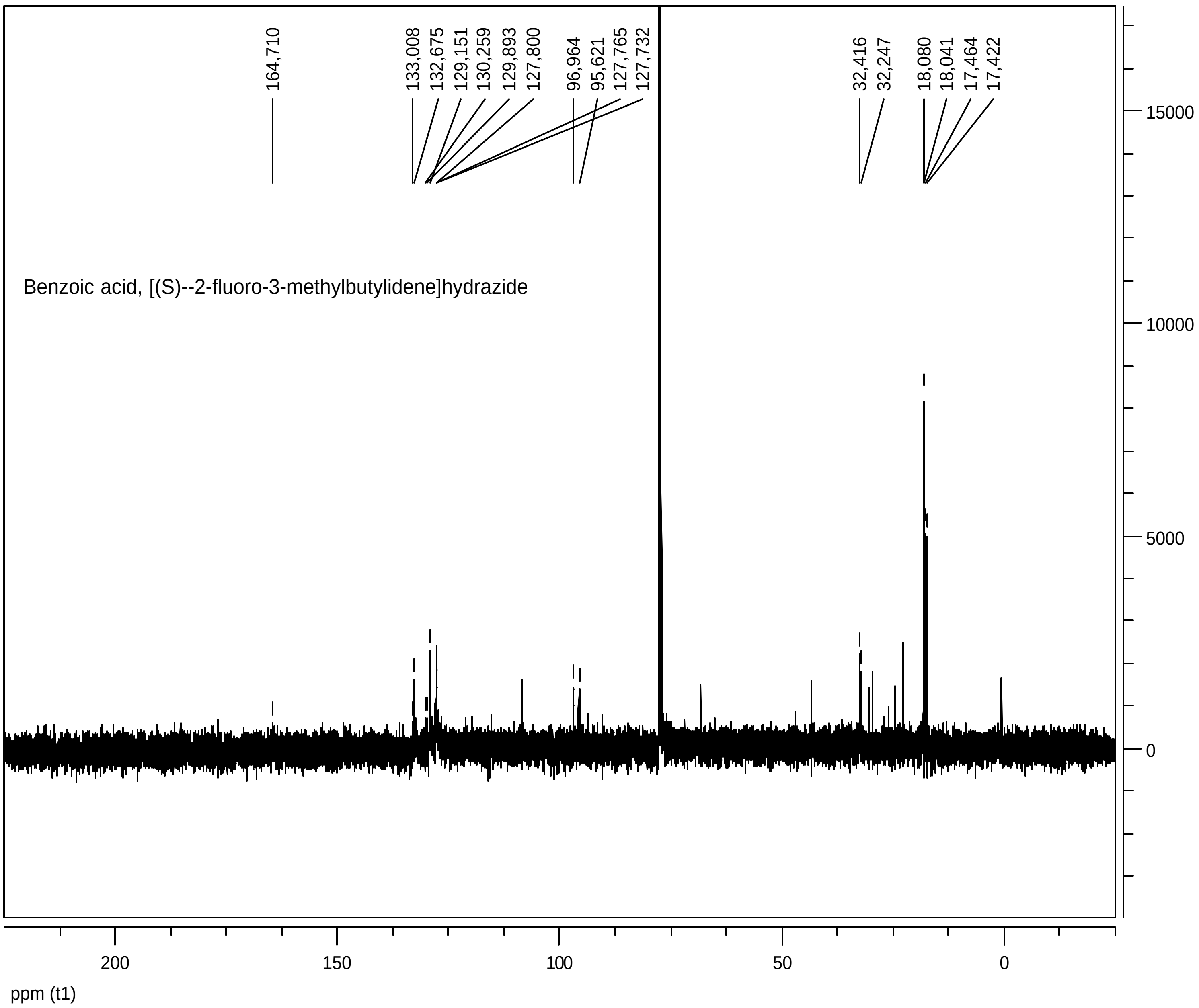


Benzoic acid, [(S)--2-fluoro-3-methylbutylidene]hydrazide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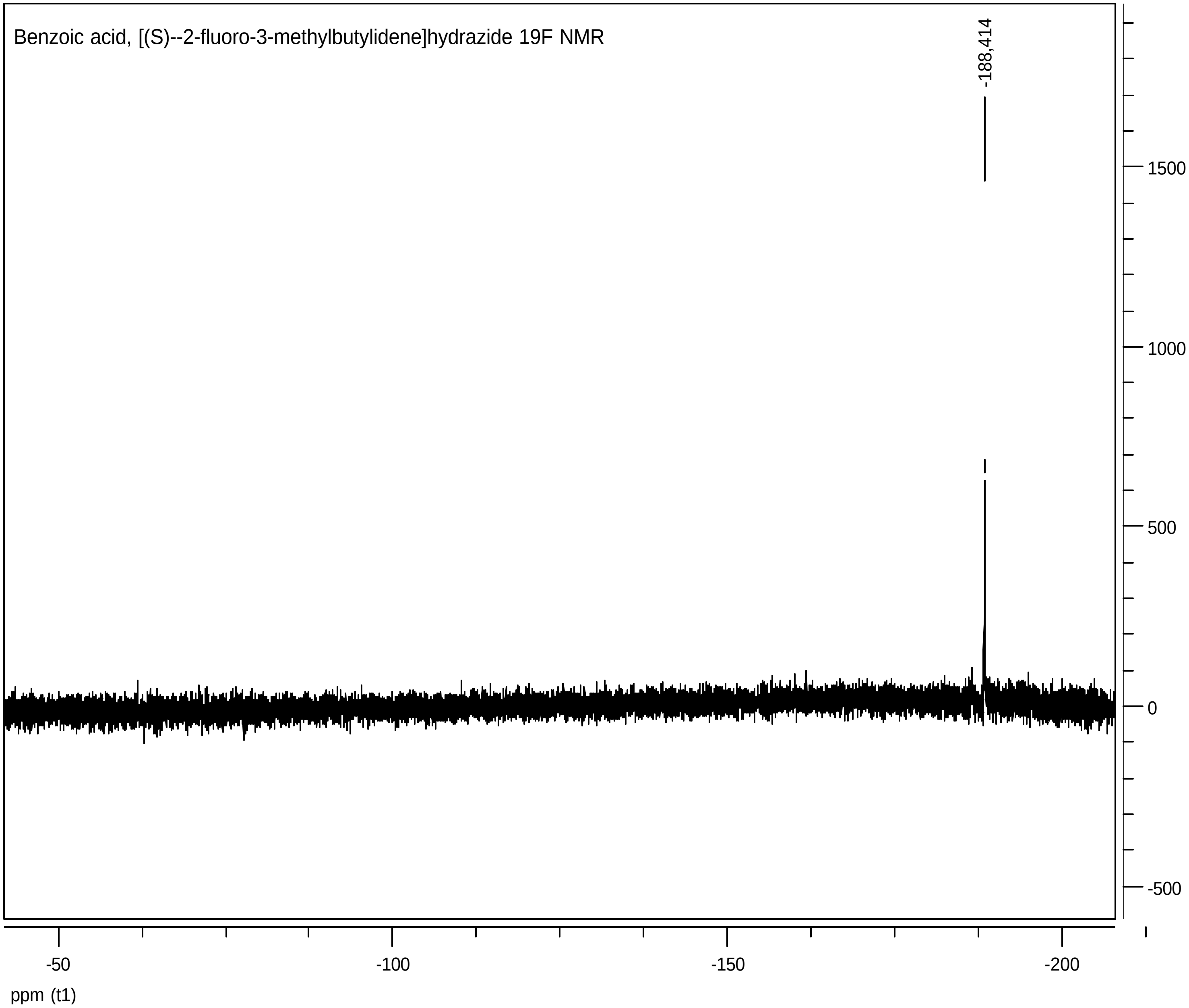
ppm (t1)


Benzoic acid, [(S)--2-fluoro-3-methylbutylidene]hydrazide 19F NMR
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1000
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0
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-200
ppm (t1)

Benzoic acid, [(S)--2-fluoro-3-methylbutylidene]hydrazide: phase HPLC using a Diacel Chiracel OD-R column (45% acetonitrile/water isocratic) isomer (*S*) t_r =11.94 min and isomer (*R*)t_r = 12.83 min.

Figure 1: racemic sample

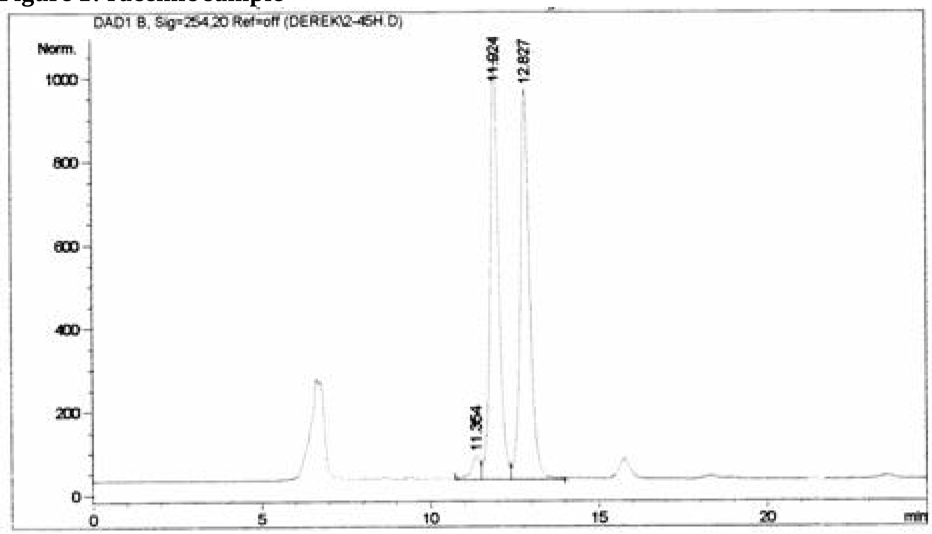
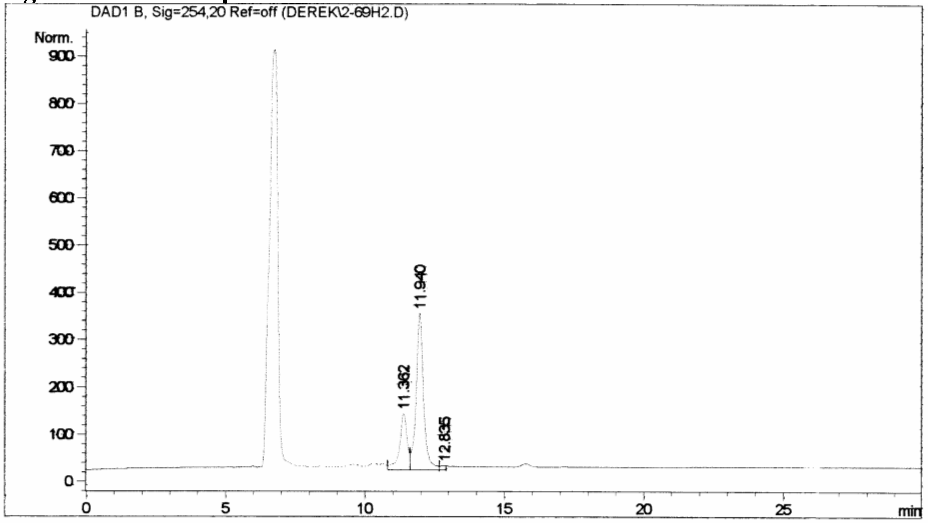
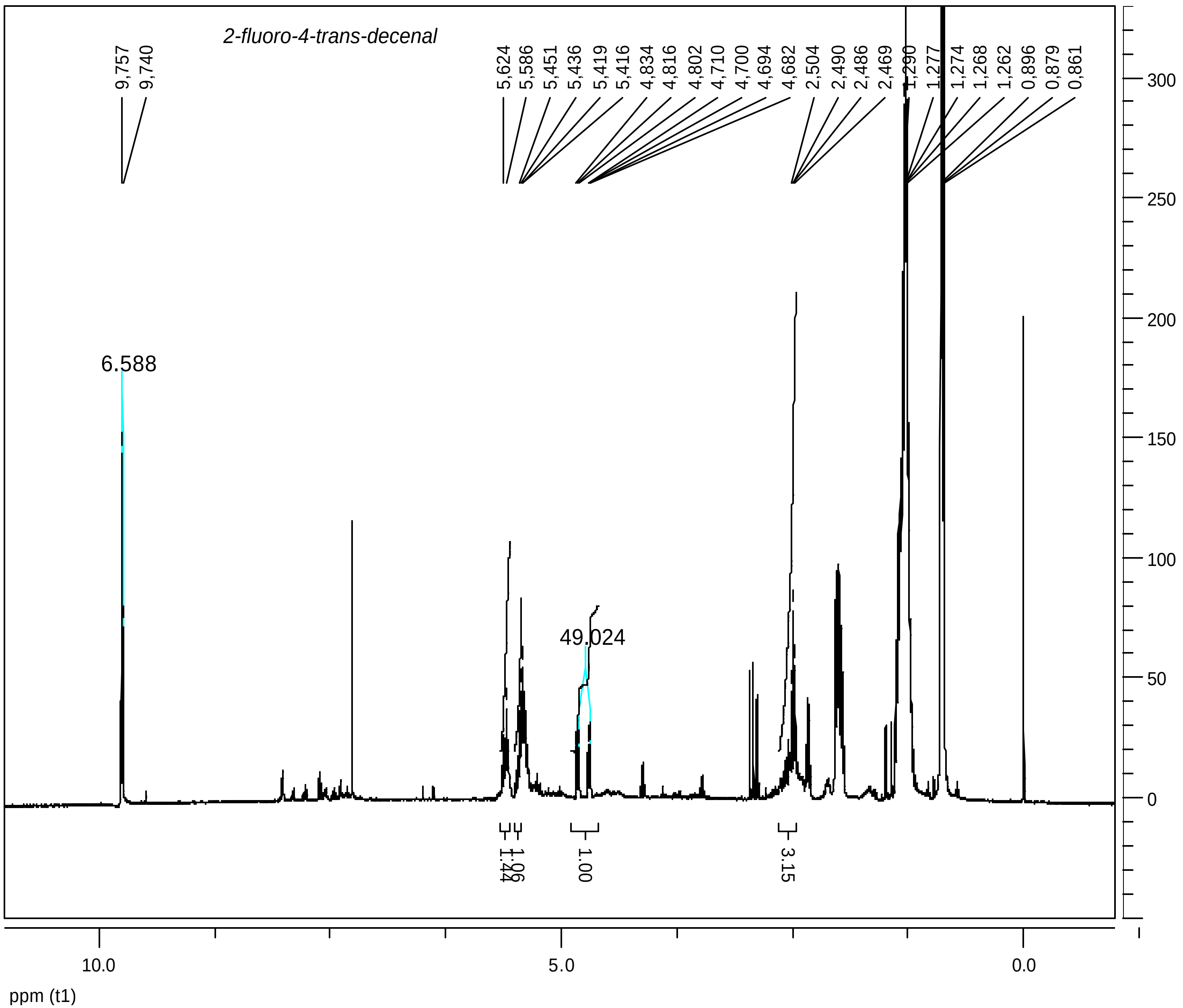
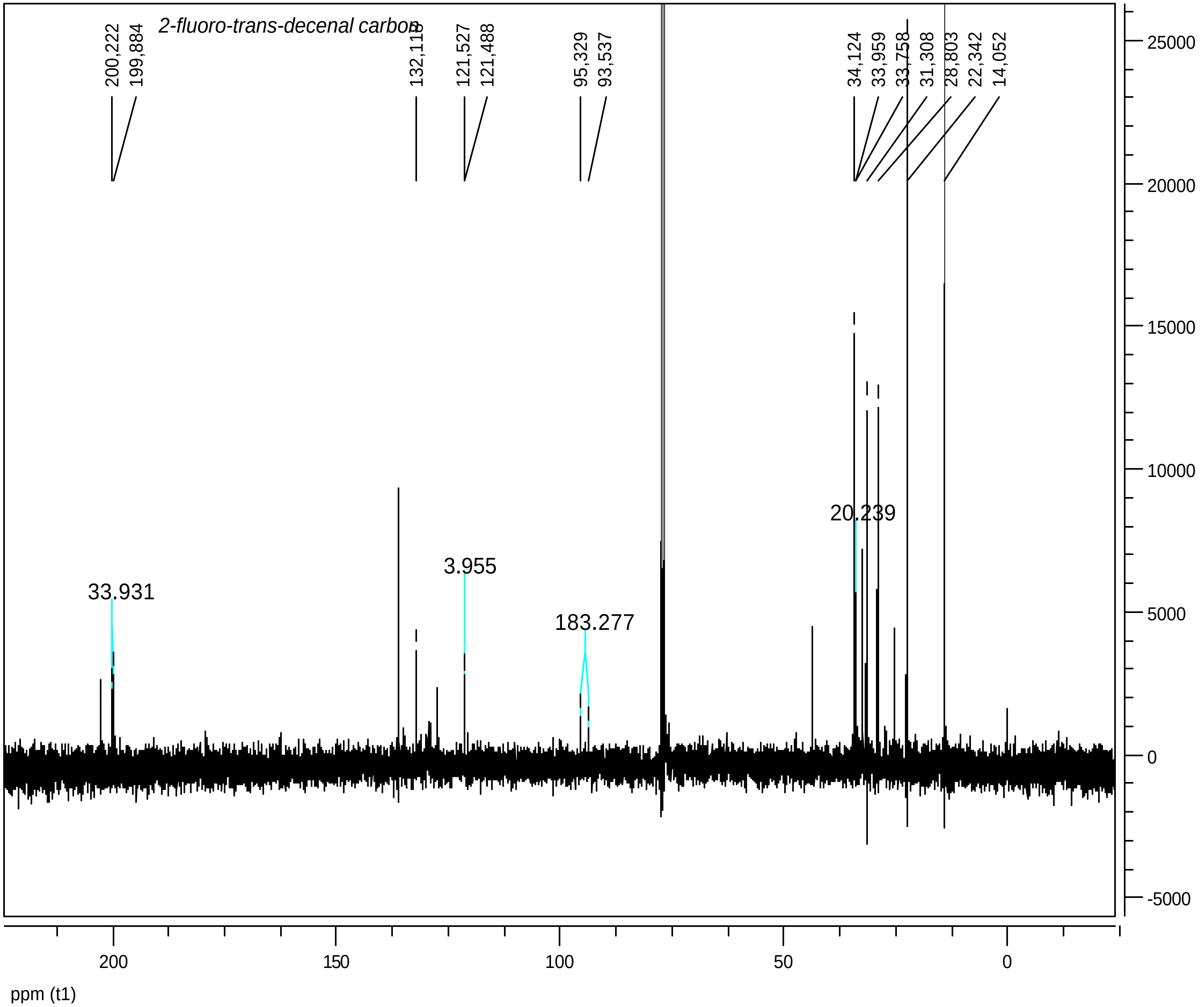
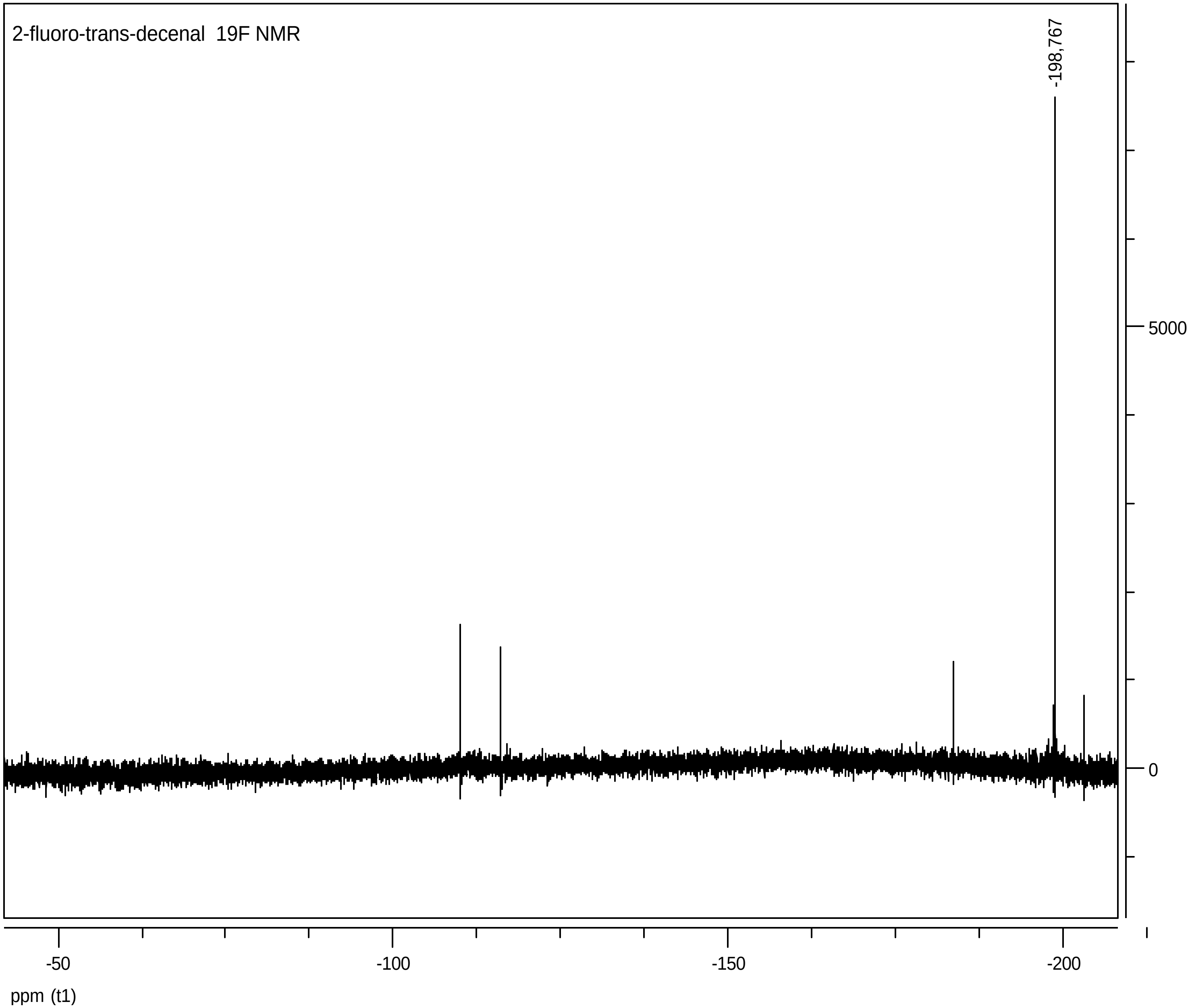


Figure 2:chiral sample

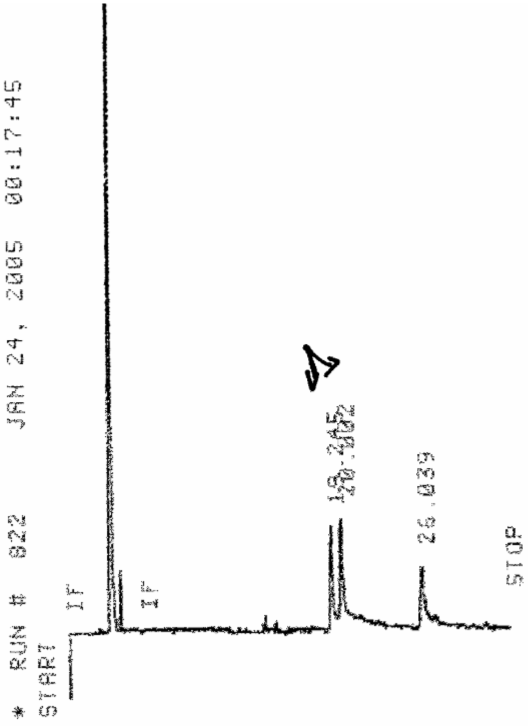


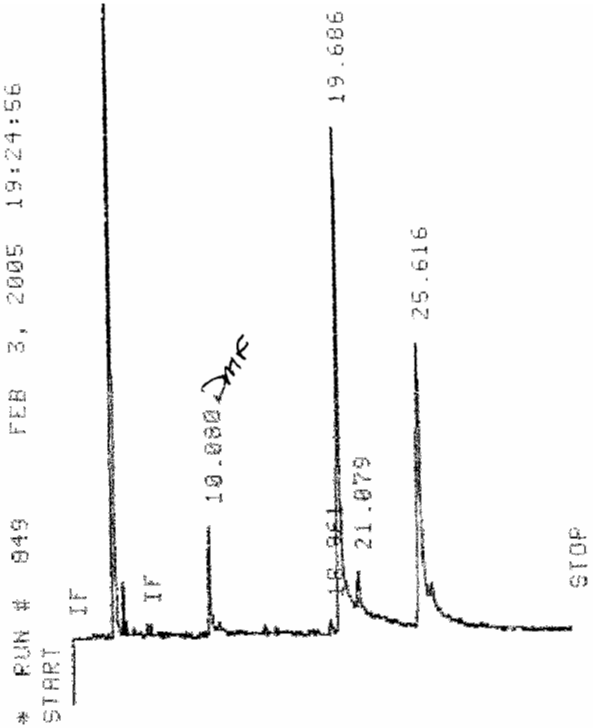

2-fluoro-4-trans-decenal
9,757
9,740
5,624
5,586
5,451
5,436
5,419
5,416
4,834
4,816
4,802
4,710
4,700
4,694
4,682
2,504
2,490
2,486
2,469
1,290
1,277
1,274
1,268
1,262
0,896
0,879
0,861
6.588
49.024
1.44
1.06
1.00
3.15
300
250
200
150
100
50
0
10.0
5.0
0.0
ppm (t1)

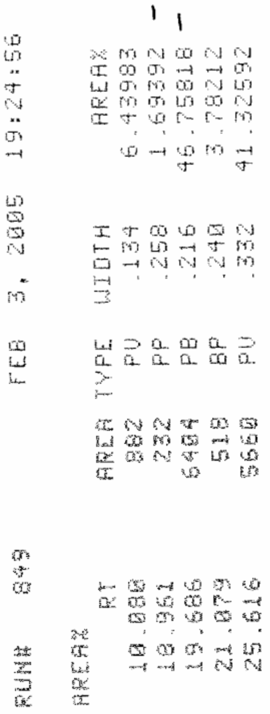

2-fluoro-trans-decenal carbon
200,222
199,884
132,118
121,527
121,488
95,329
93,537
34,124
33,959
33,758
31,308
28,803
22,342
14,052
33.931
3.955
183.277
20.239
25000
20000
15000
10000
5000
0
-5000
200
150
100
50
0
ppm (t1)


2-fluoro-trans-decenal 19F NMR
-198,767
5000
0
-50
-100
-150
-200
ppm (t1)

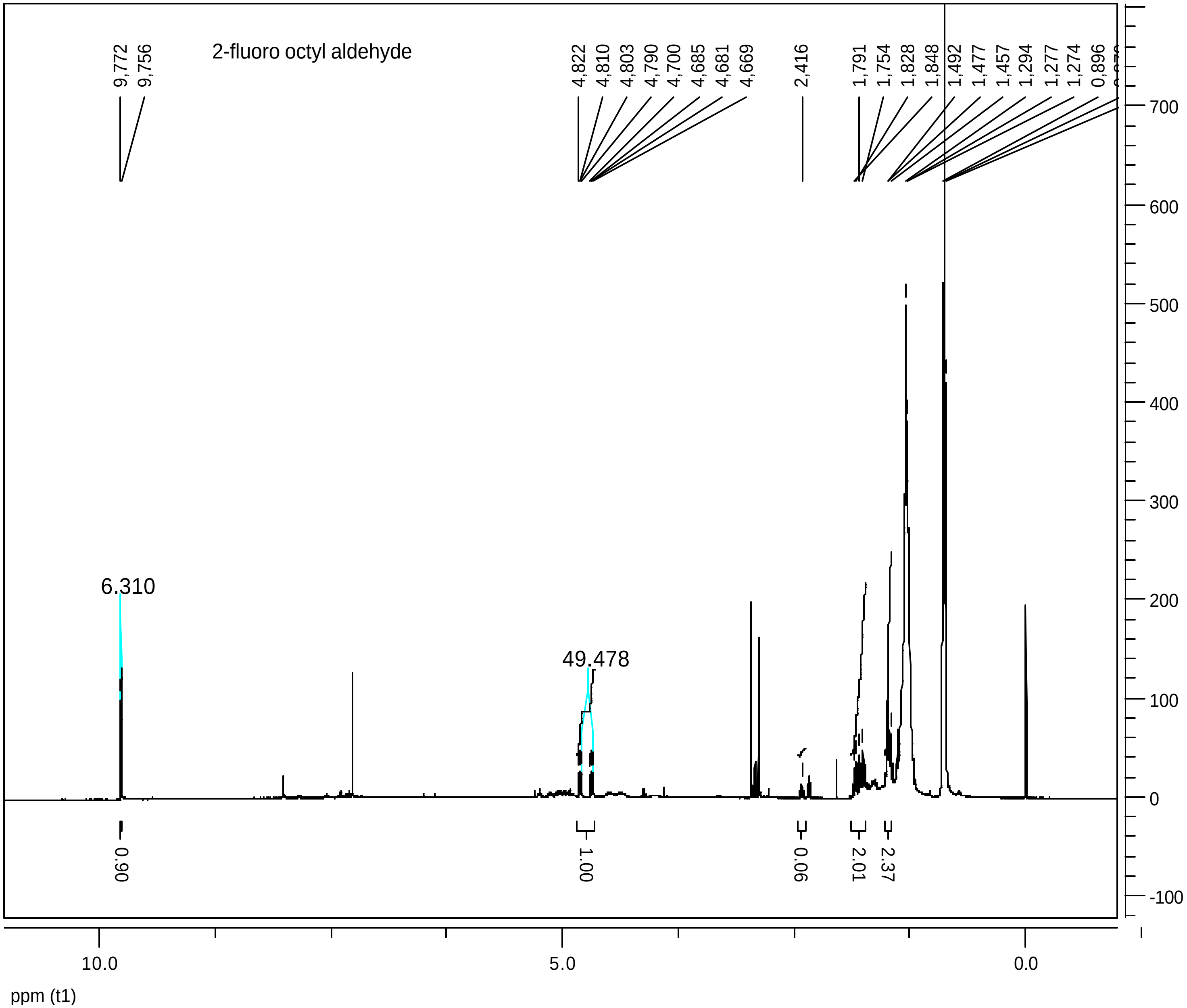
2-Fluoro-4-*trans*-decenal: Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (80 °C isotherm) isomer (*R*) t_r =18.96 min and isomer (*S*)t_r = 19.69 min. 4-*trans*-decenal t_r= 25.6 min.

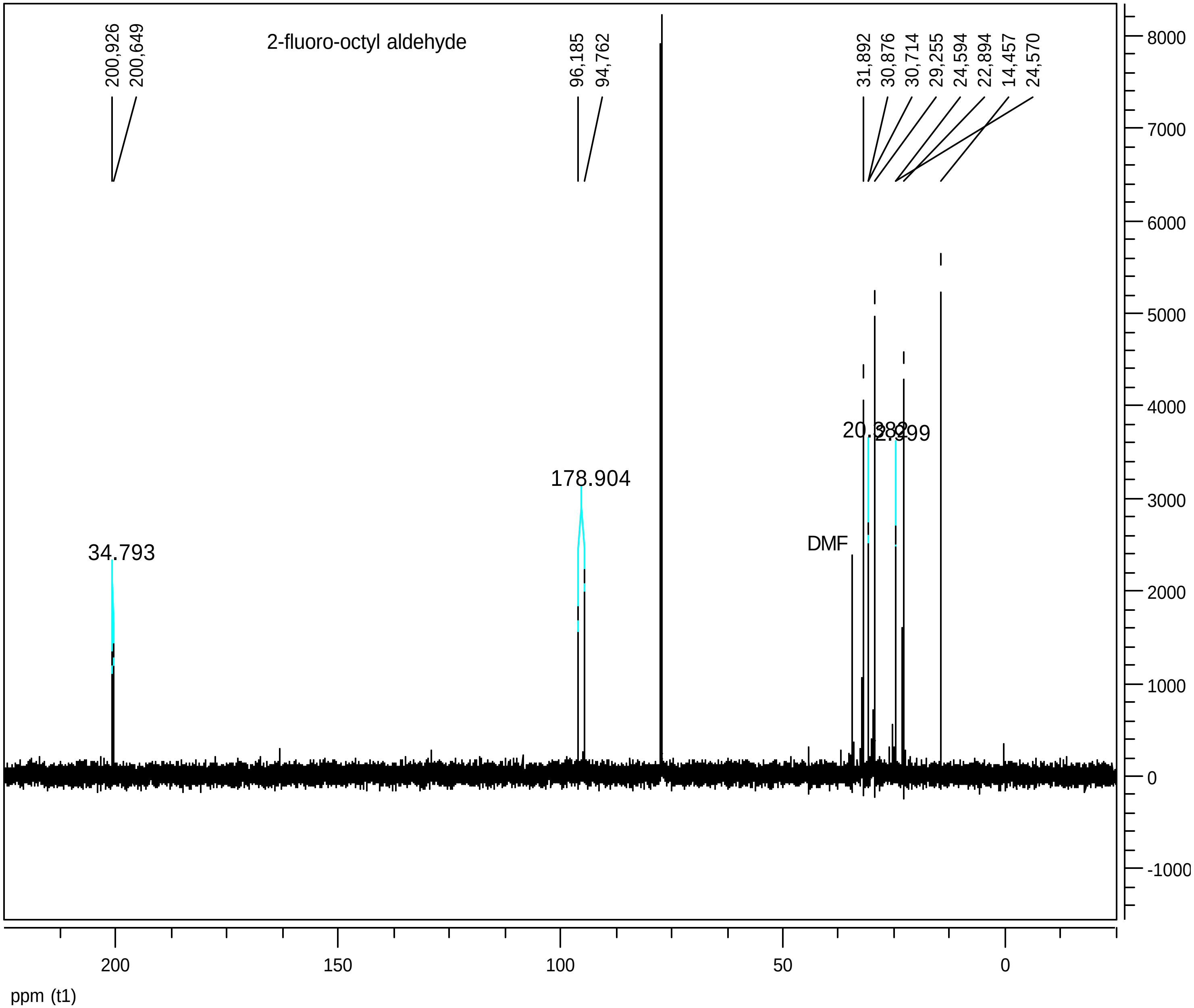


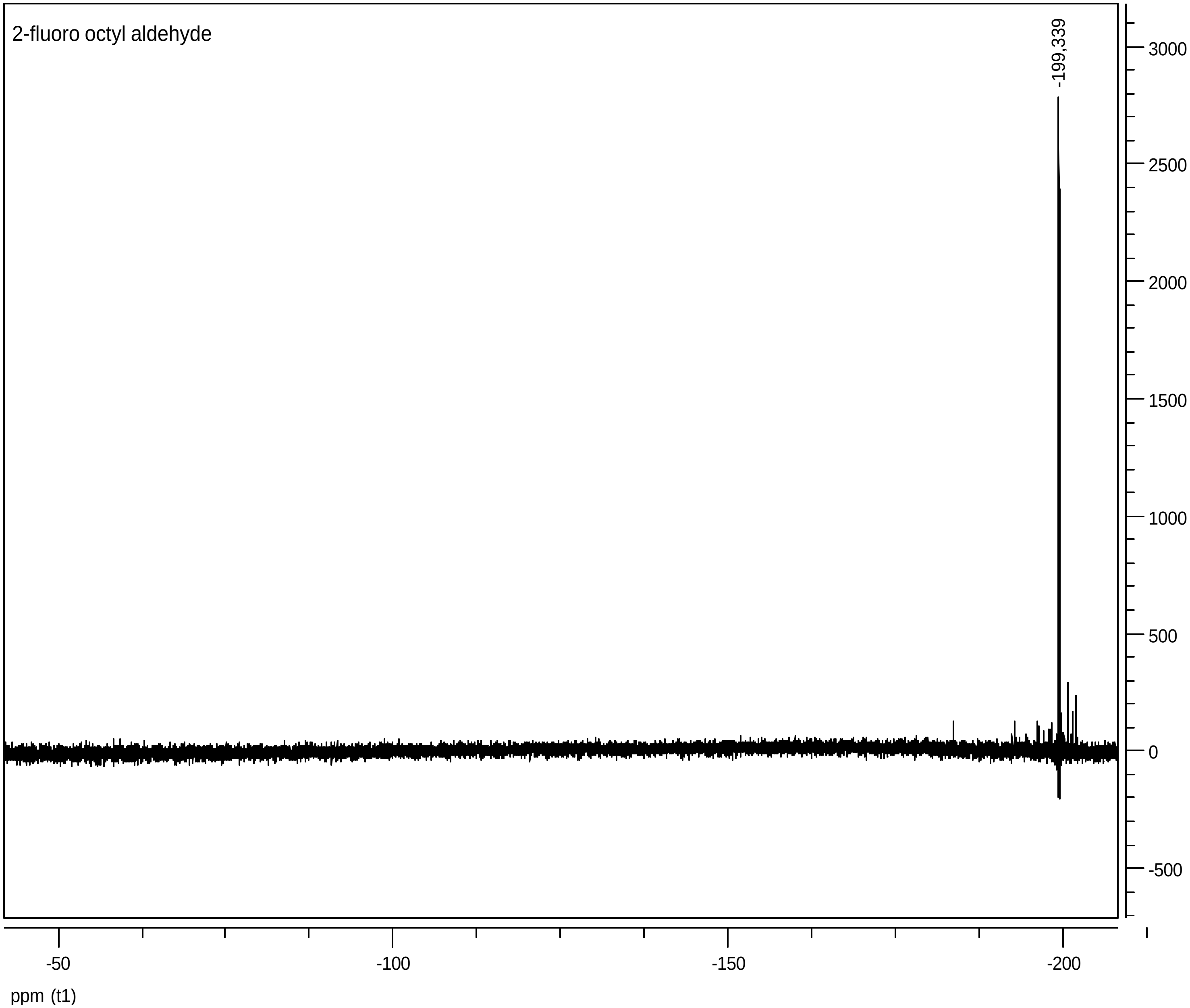




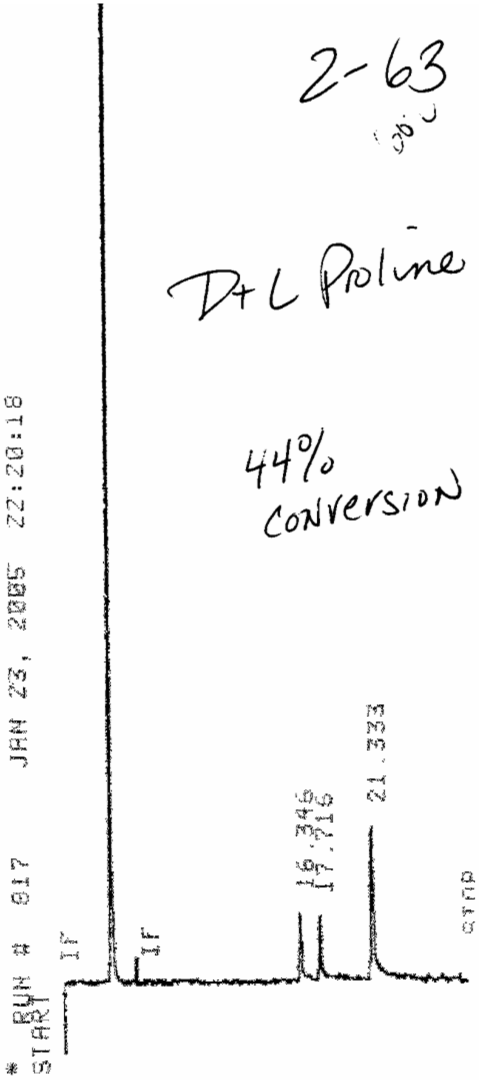
```
RUN#   849          FEB  3, 2005  19:24:56

AREA%
     RT         AREA TYPE   WIDTH       AREA%
  10.080         802   PU    .134     6.43983
  18.961         232   PP    .258     1.69392 -
  19.686        6404   PB    .216    46.75818 -
  21.079         518   BP    .240     3.78212
  25.616        5660   PU    .332    41.32592
```


2-fluoro octyl aldehyde
9,772
9,756
4,822
4,810
4,803
4,790
4,700
4,685
4,681
4,669
2,416
1,791
1,754
1,828
1,848
1,492
1,477
1,457
1,294
1,277
1,274
0,896
6.310
49.478
0.90
1.00
0.06
2.01
2.37
700
600
500
400
300
200
100
0
-100
10.0
5.0
0.0
ppm (t1)


2-fluoro-octyl aldehyde
200,926
200,649
96,185
94,762
31,892
30,876
30,714
29,255
24,594
22,894
14,457
24,570
34.793
178.904
20.382
23.99
DMF
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
200
150
100
50
0
ppm (t1)


2-fluoro octyl aldehyde
-199,339
3000
2500
2000
1500
1000
500
0
-500
-50
-100
-150
-200
ppm (t1)

Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (60 °C isotherm) isomer (*R*) t_r =16.35 min and isomer (*S*)t_r = 17.7min. Octyl aldehyde t_r= 21.34

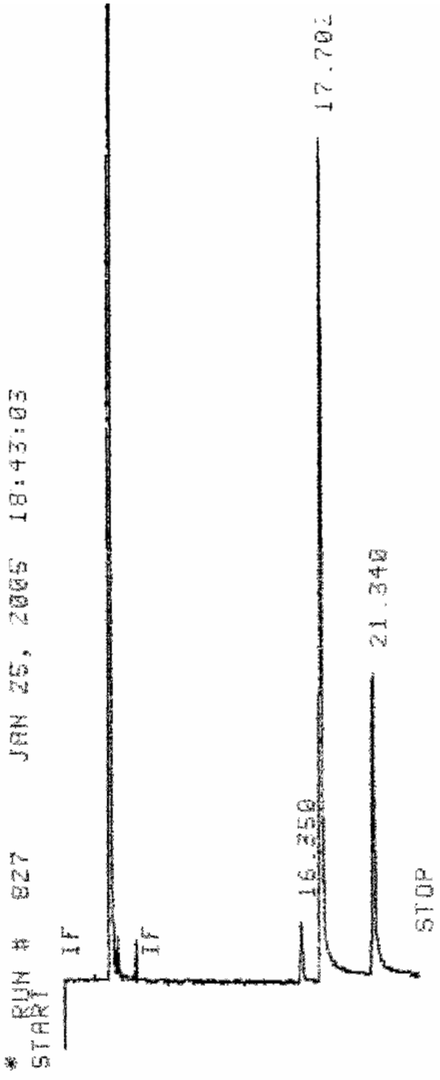


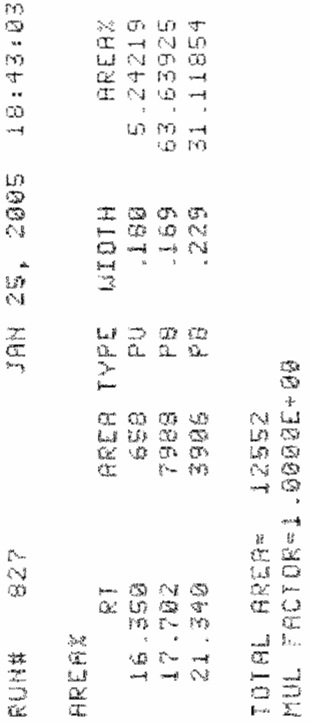
2-63

20 °C

D+L Proline

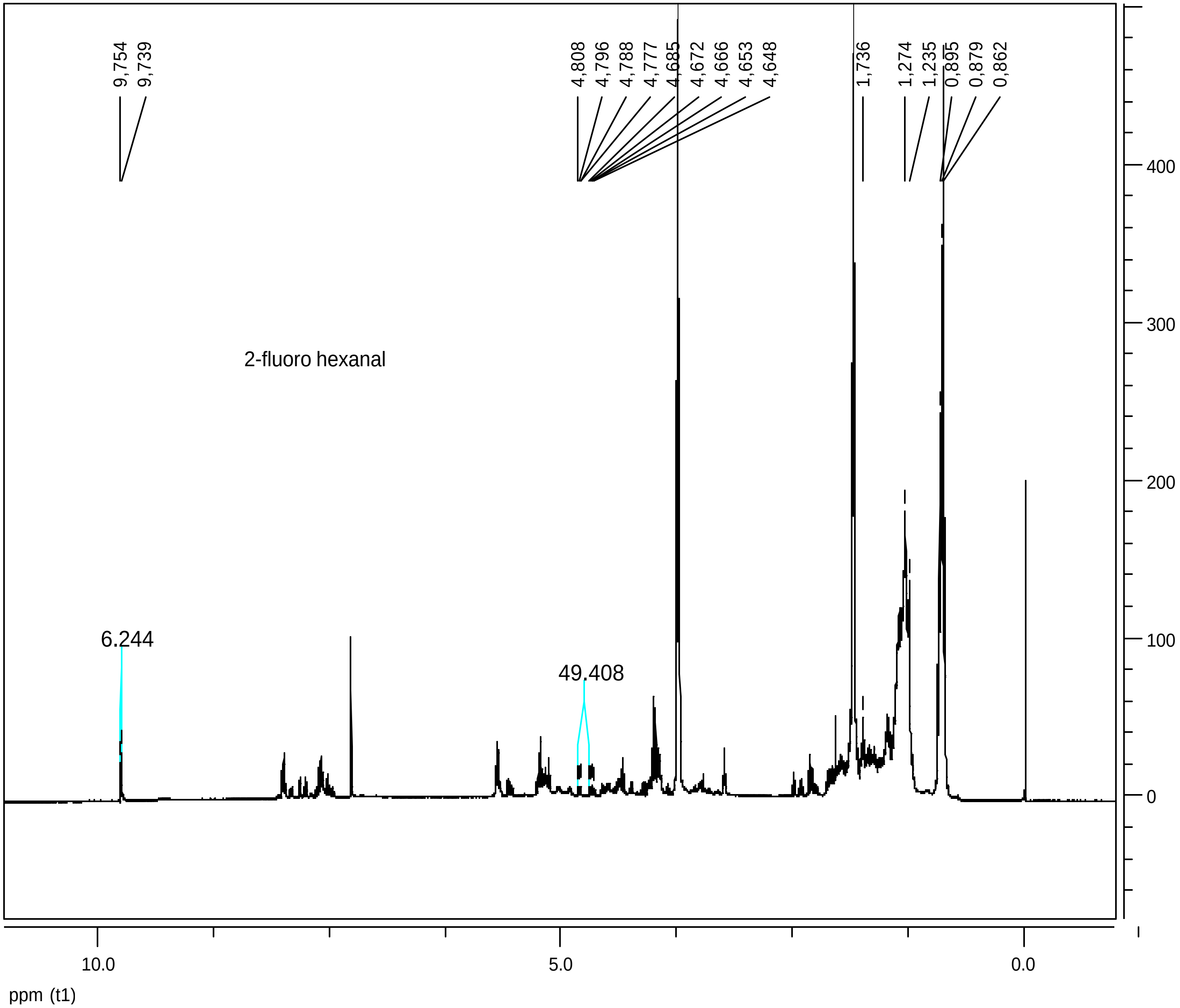
44% conversion

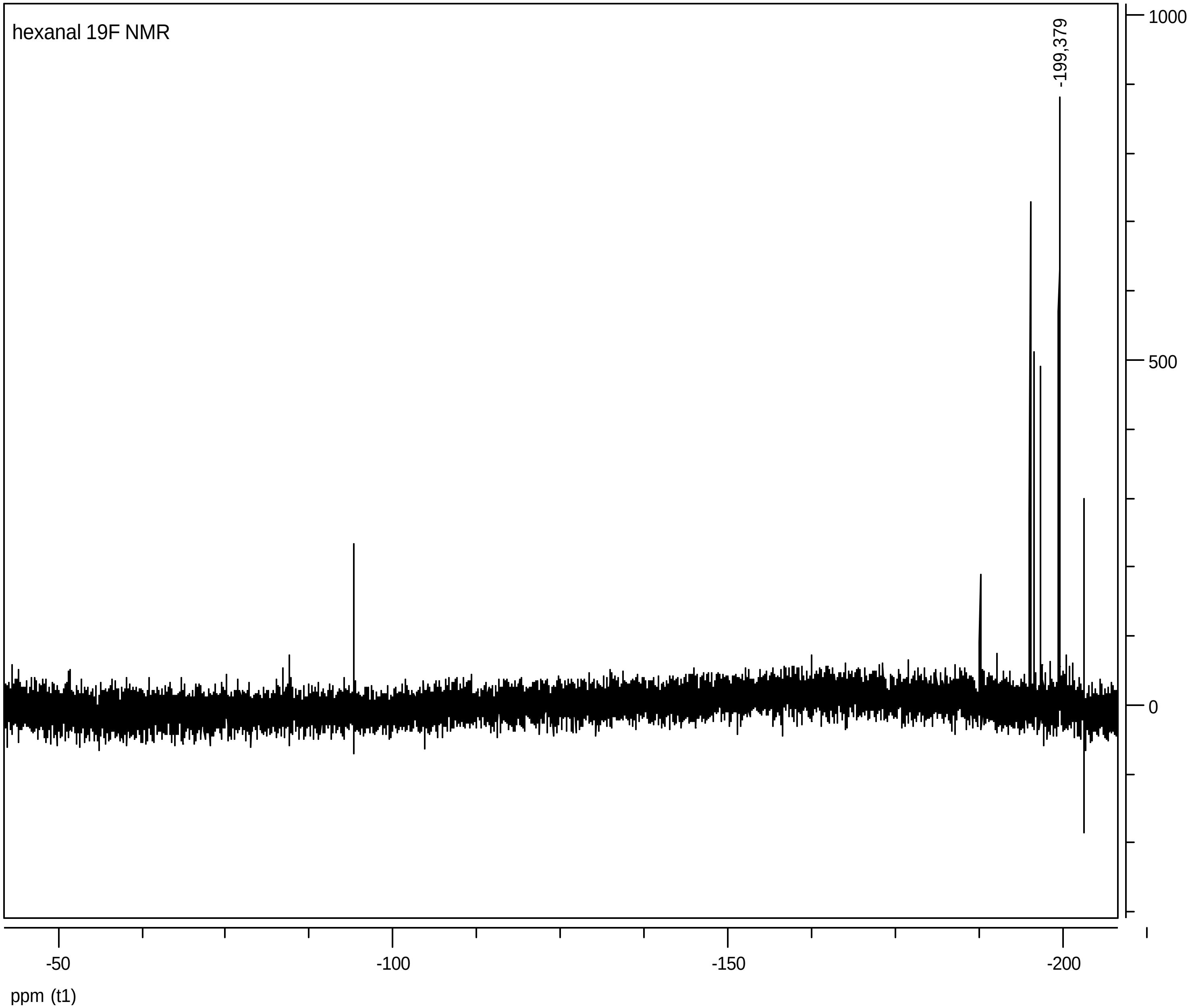




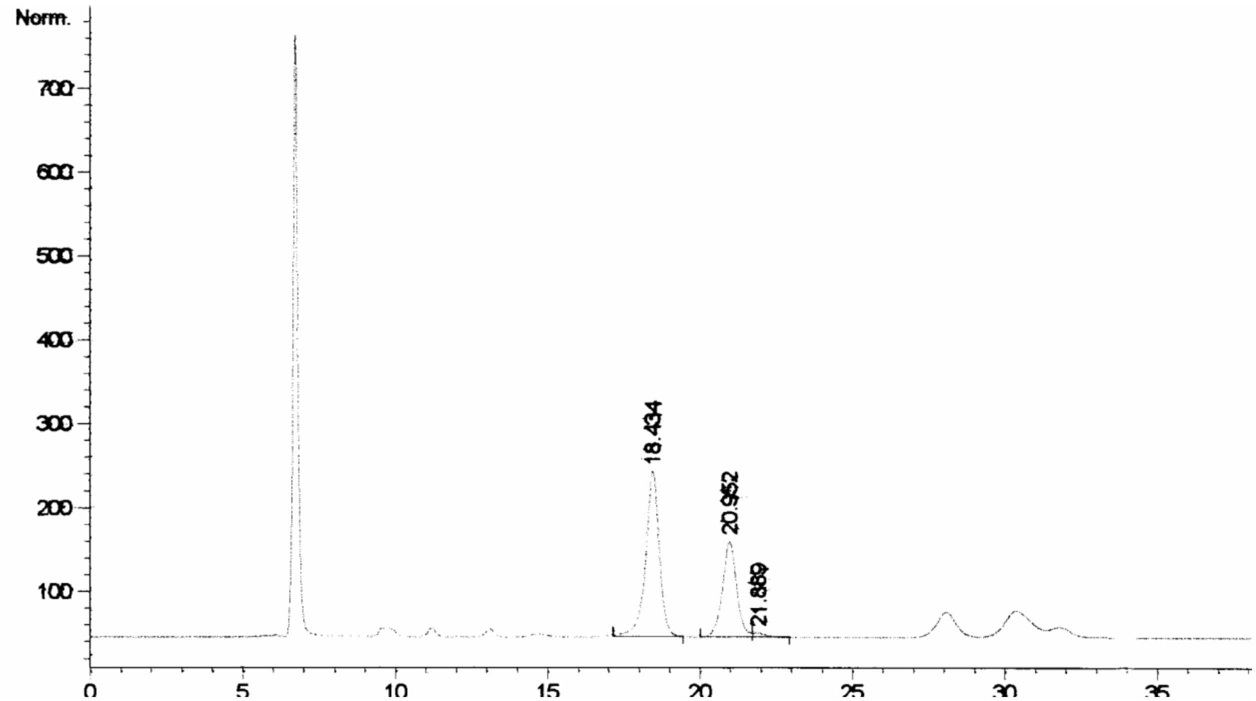
```
RUN#     827        JAN 25, 2005  18:43:03

AREA%
      RT    AREA TYPE  WIDTH      AREA%
  16.350     658   PV   .180    5.24219
  17.702    7988   PB   .169   63.63925
  21.340    3906   PB   .229   31.11854

TOTAL AREA=  12552
MUL FACTOR=1.0000E+00
```

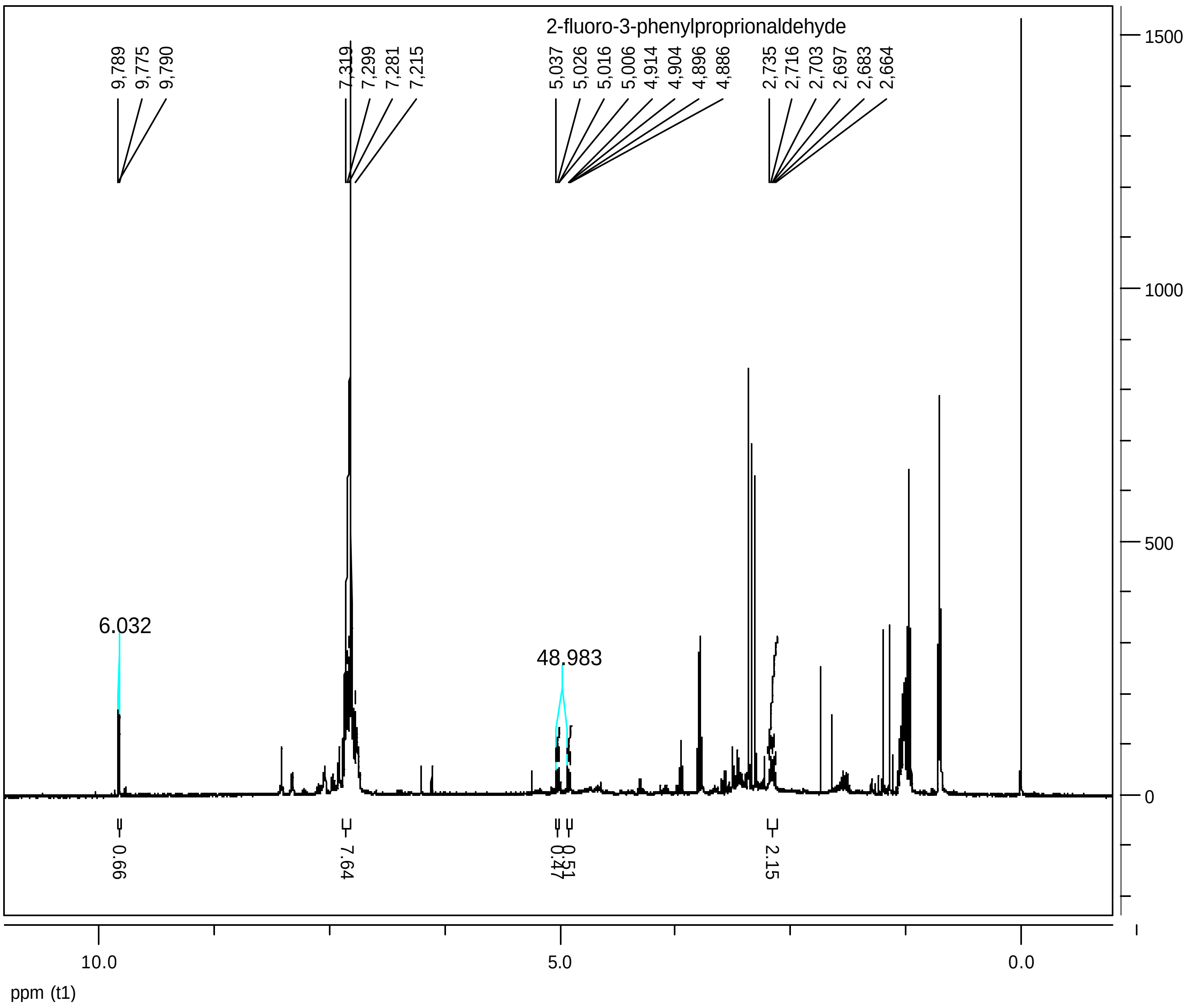
7/93 > 86 %ee

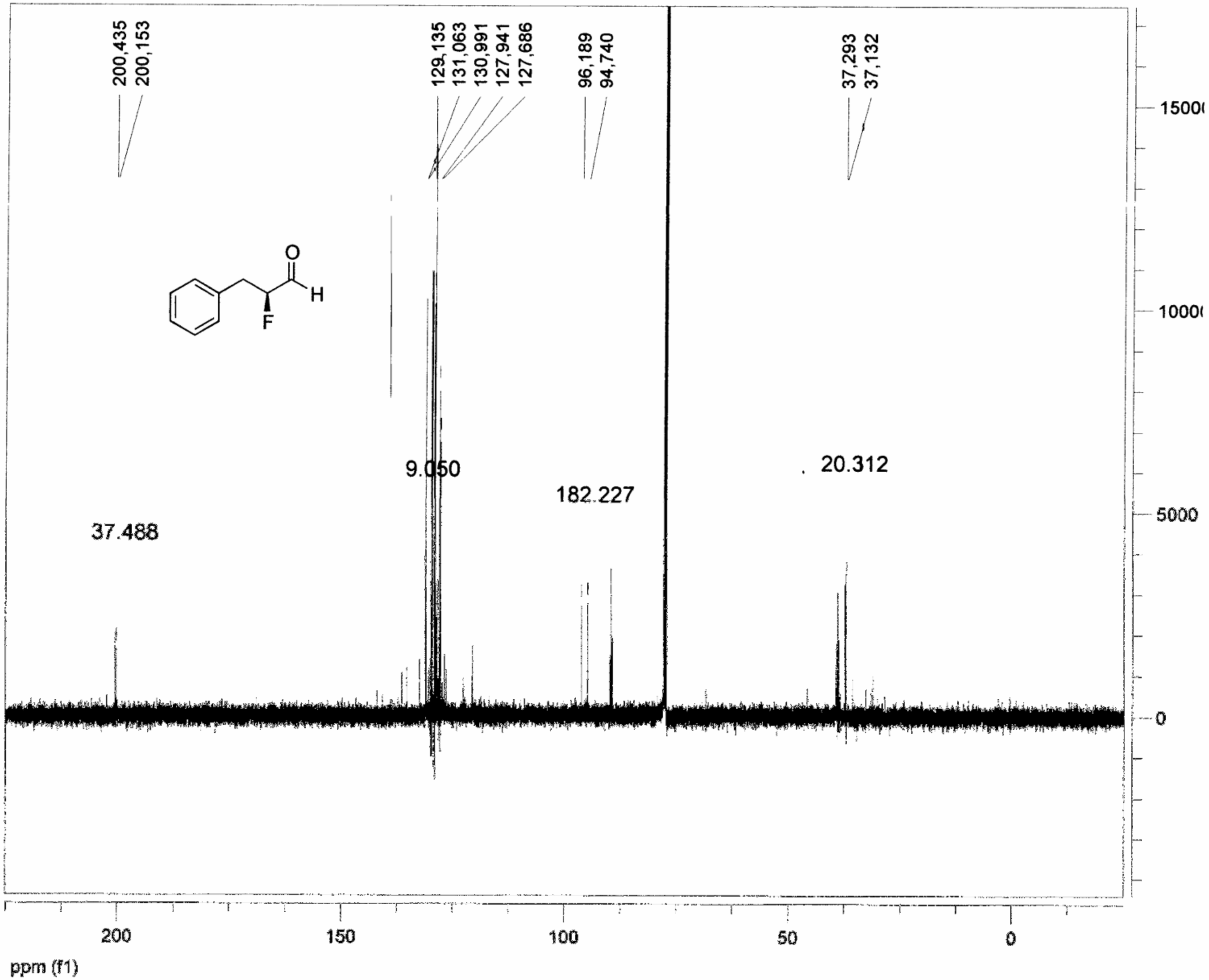

2-fluoro hexanal
9,754
9,739
4,808
4,796
4,788
4,777
4,685
4,672
4,666
4,653
4,648
1,736
1,274
1,235
0,895
0,879
0,862
6.244
49.408
400
300
200
100
0
10.0
5.0
0.0
ppm (t1)

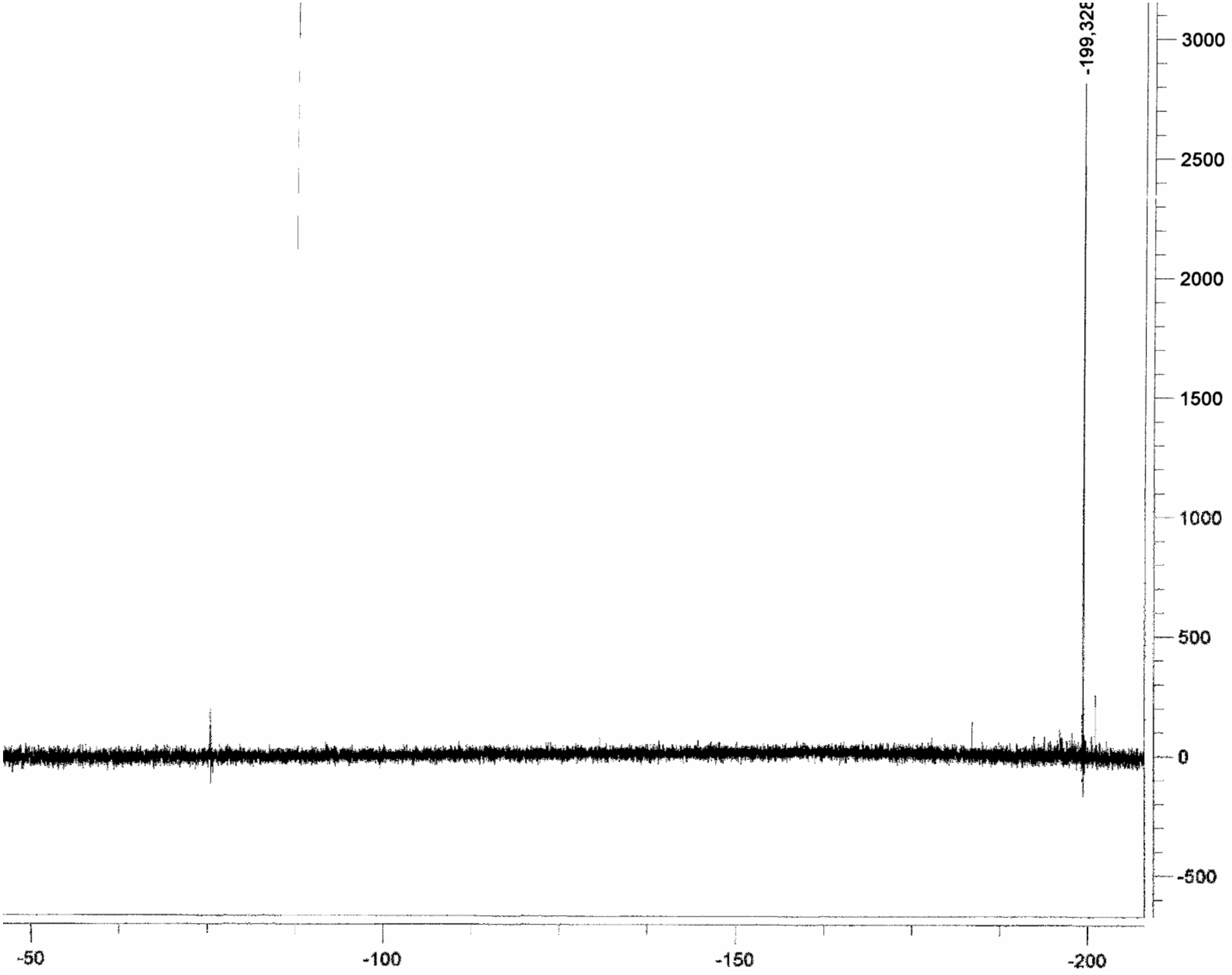

hexanal 19F NMR
-199,379
1000
500
0
-50
-100
-150
-200
ppm (t1)

Diacel Chiracel OD-R column (45% acetonitrile/water isocratic) hydrazone of isomer (*S*) t_r =20.95 min and isomer (*R*)t_r = 21.89 min. hexanal hydrazone t_r =18.43 min



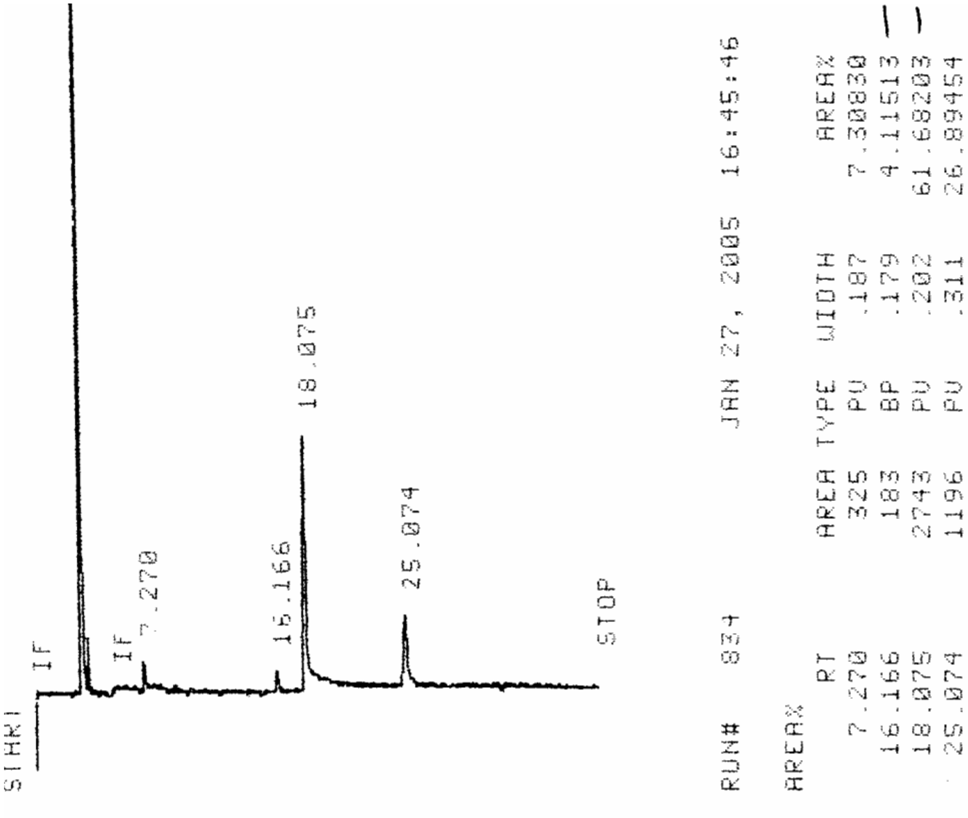

2-fluoro-3-phenylproprionaldehyde
9,789
9,775
9,790
7,319
7,299
7,281
7,215
5,037
5,026
5,016
5,006
4,914
4,904
4,896
4,886
2,735
2,716
2,703
2,697
2,683
2,664
6.032
48.983
0.66
7.64
0.47
0.51
2.15
1500
1000
500
0
10.0
5.0
0.0
ppm (t1)


200,435
200,153
129,135
131,063
130,991
127,941
127,686
96,189
94,740
37,293
37,132
O
H
F
9.050
182.227
20.312
37.488
1500
1000
5000
0
200
150
100
50
0
ppm (f1)

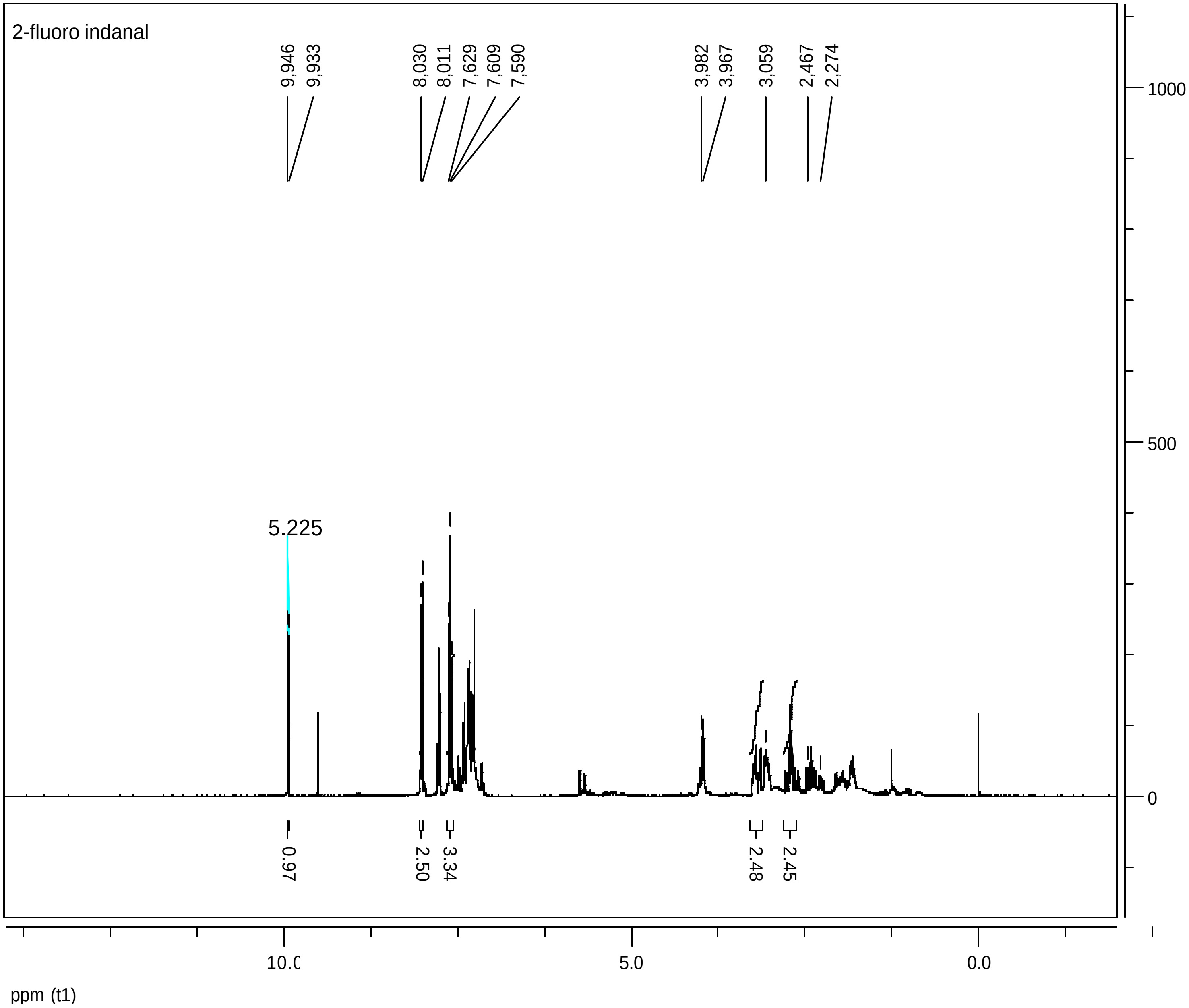


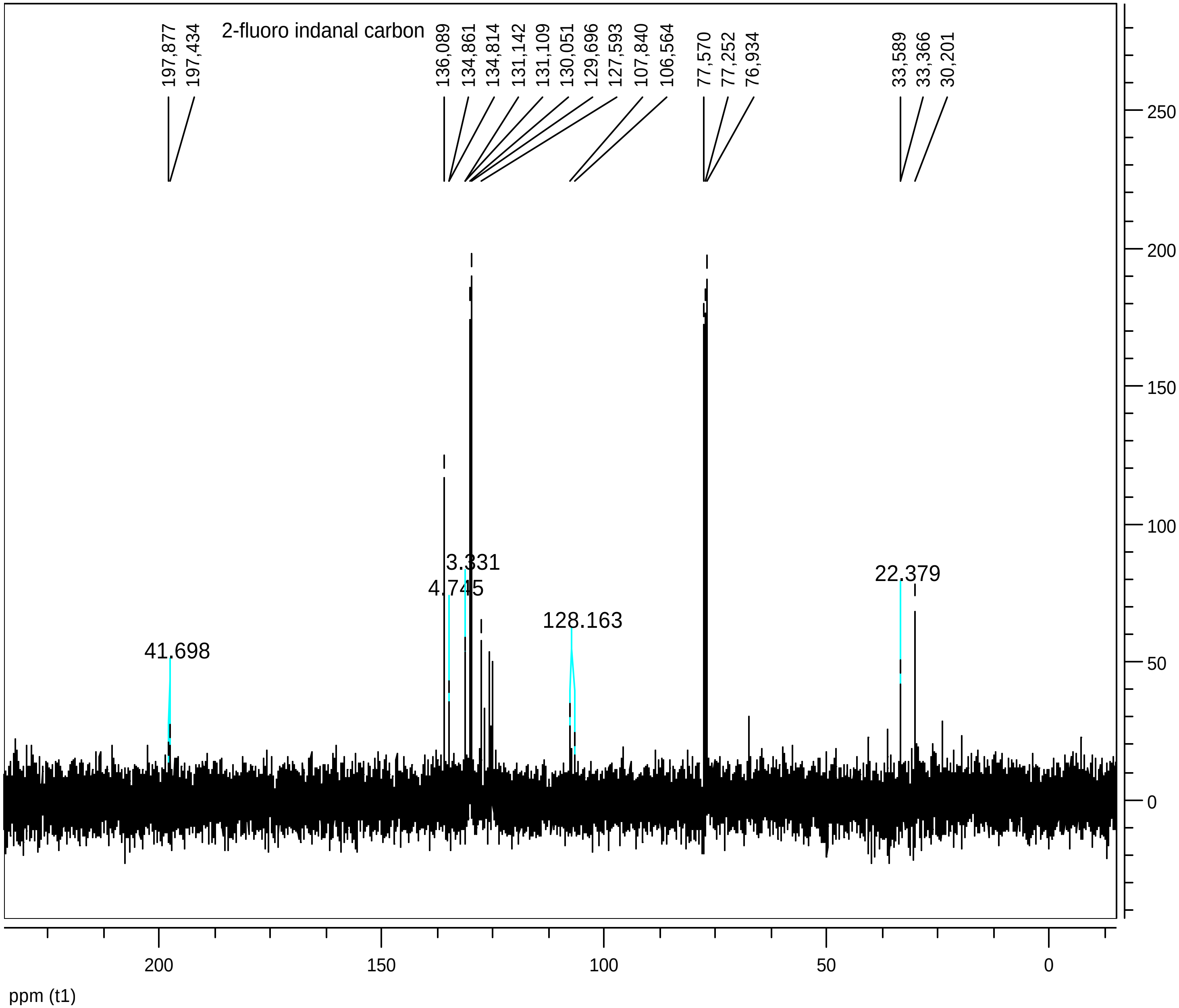
-199,32
3000
2500
2000
1500
1000
500
0
-500
-50
-100
-150
-200

2-fluoro-phenylproprionaldehyde Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (90 °C isotherm) isomer (*R*) t_r =16.14 min and isomer (*S*)t_r = 18.05 min. 2-phenyl proprionaldehyde t_r=26.89 min

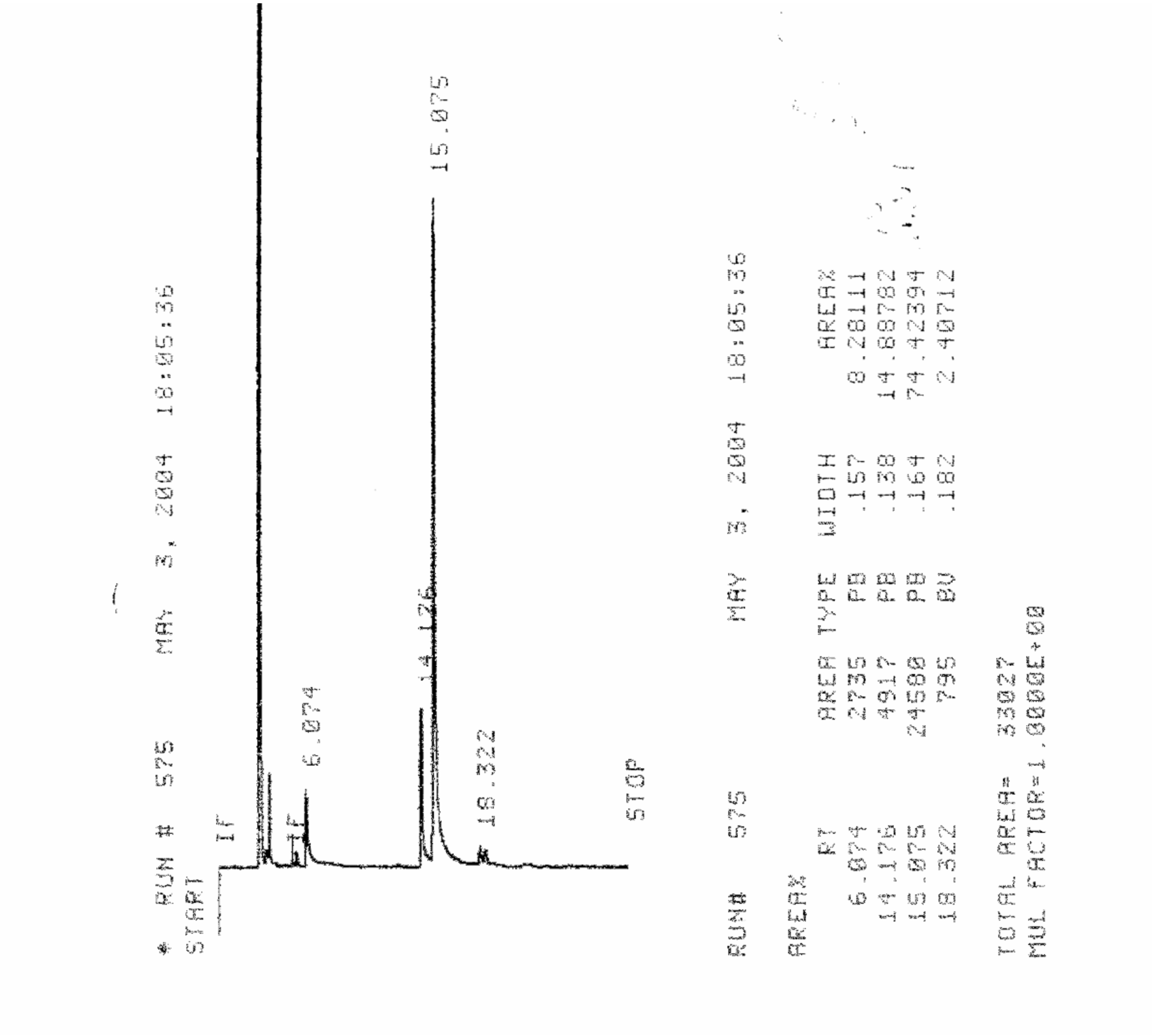


```
RUN#    834          JAN 27, 2005   16:45:46

AREA%
     RT      AREA TYPE   WIDTH       AREA%
   7.270      325  PV     .187     7.30830
  16.166      183  BP     .179     4.11513
  18.075     2743  PV     .202    61.68203
  25.074     1196  PV     .311    26.89454
```

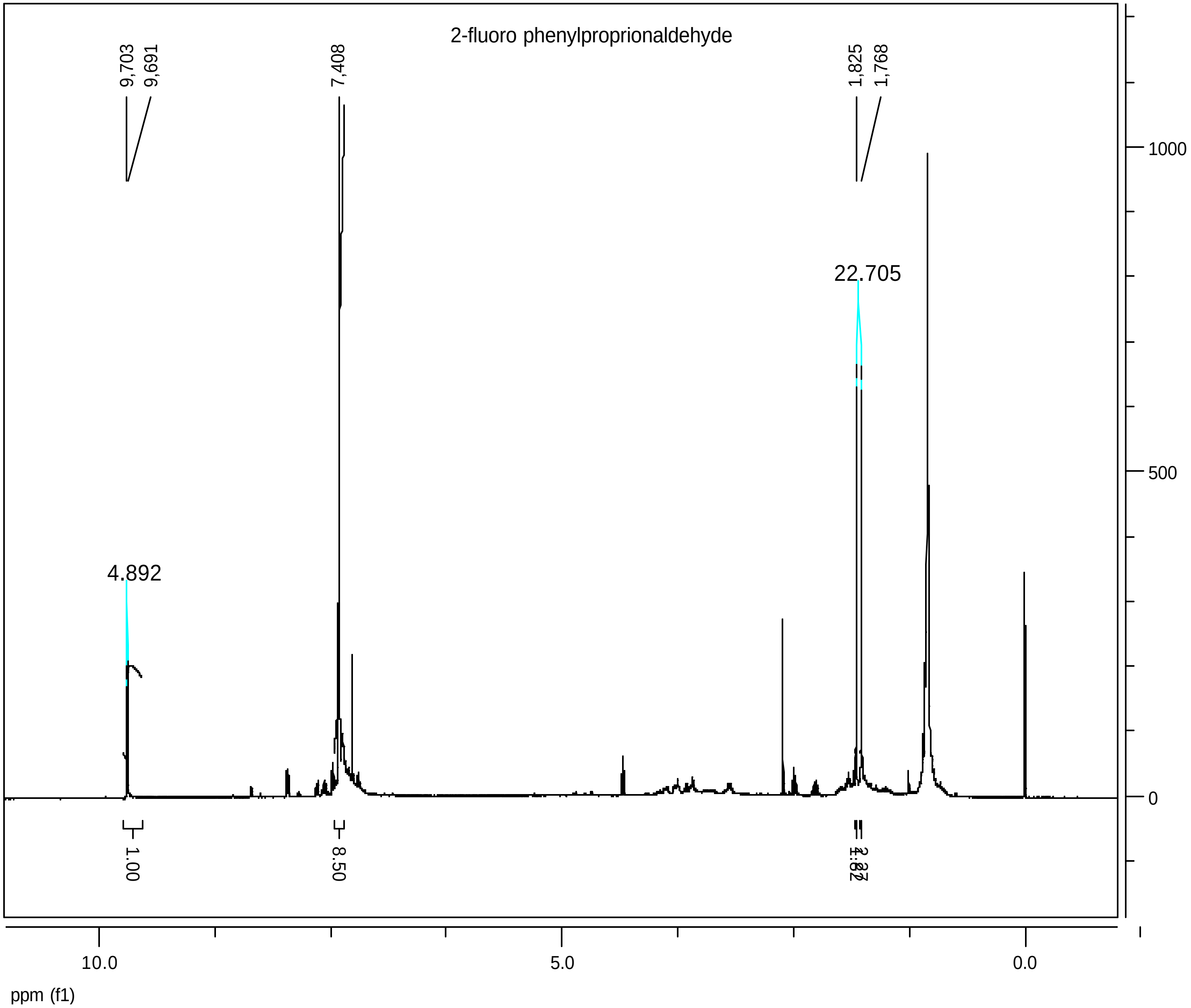

2-fluoro indanal
9,946
9,933
8,030
8,011
7,629
7,609
7,590
3,982
3,967
3,059
2,467
2,274
5.225
0.97
2.50
3.34
2.48
2.45
1000
500
0
10.0
5.0
0.0
ppm (t1)

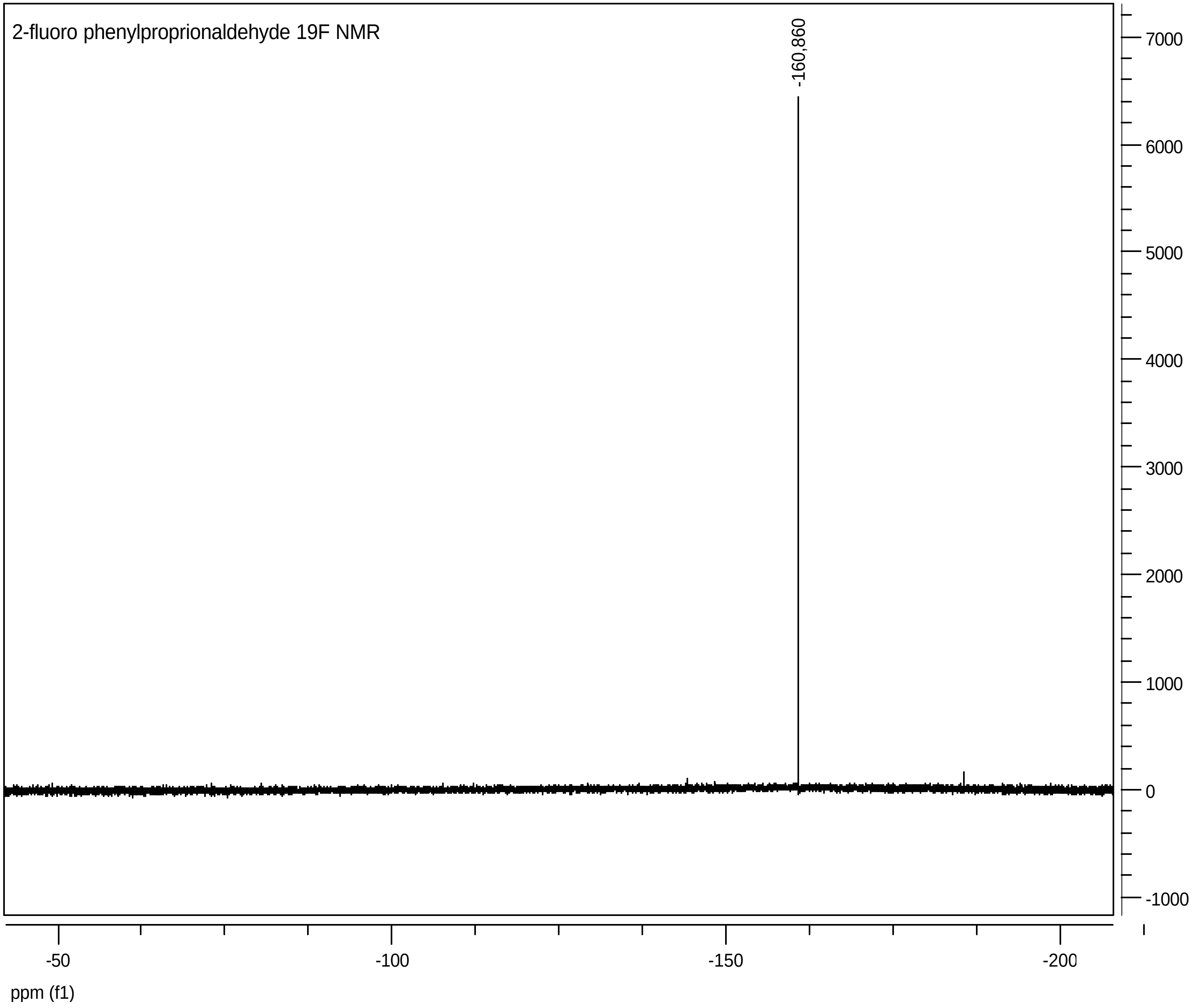

2-fluoro indanal carbon
197,877
197,434
136,089
134,861
134,814
131,142
131,109
130,051
129,696
127,593
107,840
106,564
77,570
77,252
76,934
33,589
33,366
30,201
41.698
4.745
3.331
128.163
22.379
250
200
150
100
50
0
200
150
100
50
0
ppm (t1)

2-fluoro-indanaldehyde: Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (110 °C isotherm) isomer t_r =14.17 min and isomer t_r = 15.07 min. Indanal t_r= 18.32 min.

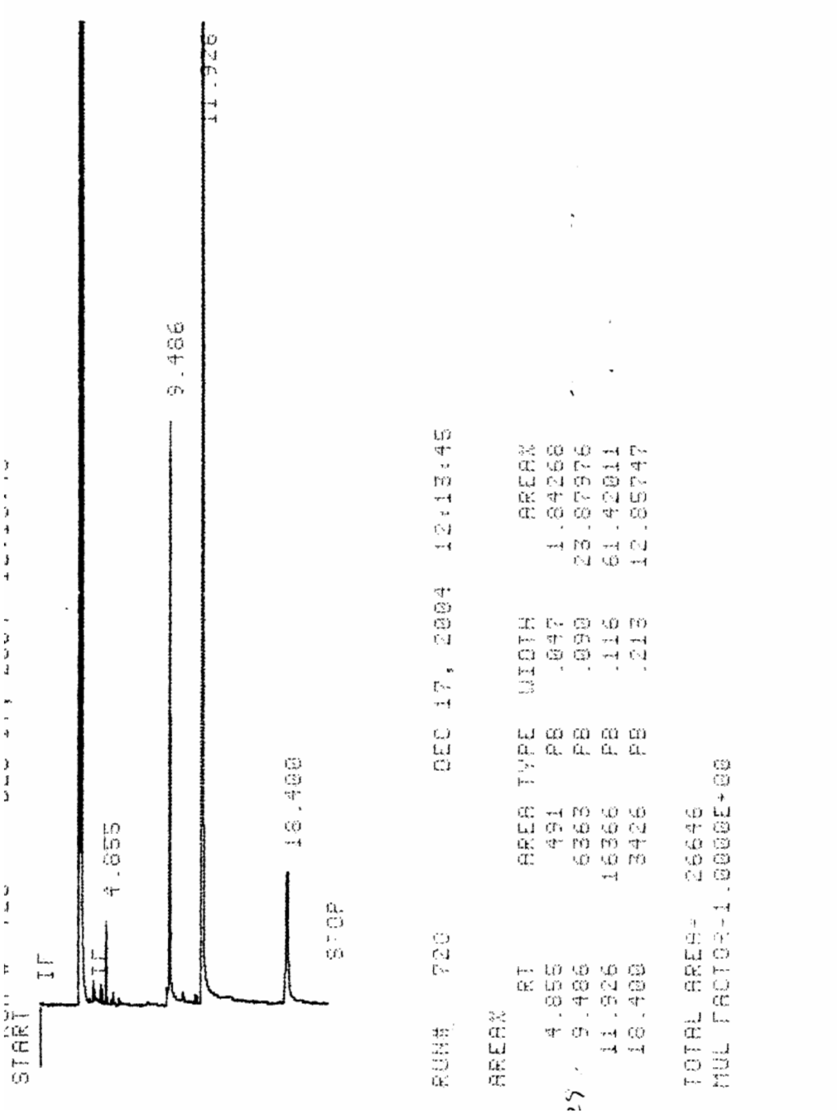


```
* RUN #  575      MAY  3, 2004  18:05:36

RUN#  575         MAY  3, 2004  18:05:36
AREA%
     RT    AREA TYPE  WIDTH      AREA%
  6.074    2735  PB    .157    8.28111
 14.176    4917  PB    .138   14.88782
 15.075   24580  PB    .164   74.42394
 18.322     795  BV    .182    2.40712

TOTAL AREA=  33027
MUL FACTOR=1.0000E+00
```


2-fluoro phenylproprionaldehyde
9,703
9,691
7,408
1,825
1,768
4.892
22.705
1.00
8.50
1.82
2.27
1000
500
0
10.0
5.0
0.0
ppm (f1)


2-fluoro phenylproprionaldehyde 19F NMR
-160,860
7000
6000
5000
4000
3000
2000
1000
0
-1000
-50
-100
-150
-200
ppm (f1)

2-fluoro-phenylproprionaldehyde: Bodman Chiraldex γ-TA (30 m x 0.25 mm) column (90 °C isotherm) isomer t_r =9.45 min and isomer t_r = 11.88 min.



```
RUN#  720          DEC 17, 2004  12:13:45

AREA%
      RT       AREA TYPE  WIDTH      AREA%
   4.855        491   PB   .047    1.84268
   9.486       6363   PB   .090   23.87976
  11.926      16366   PB   .116   61.42011
  18.400       3426   PB   .213   12.85747

TOTAL AREA=  26646
MUL FACTOR=1.0000E+00
```