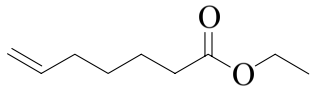
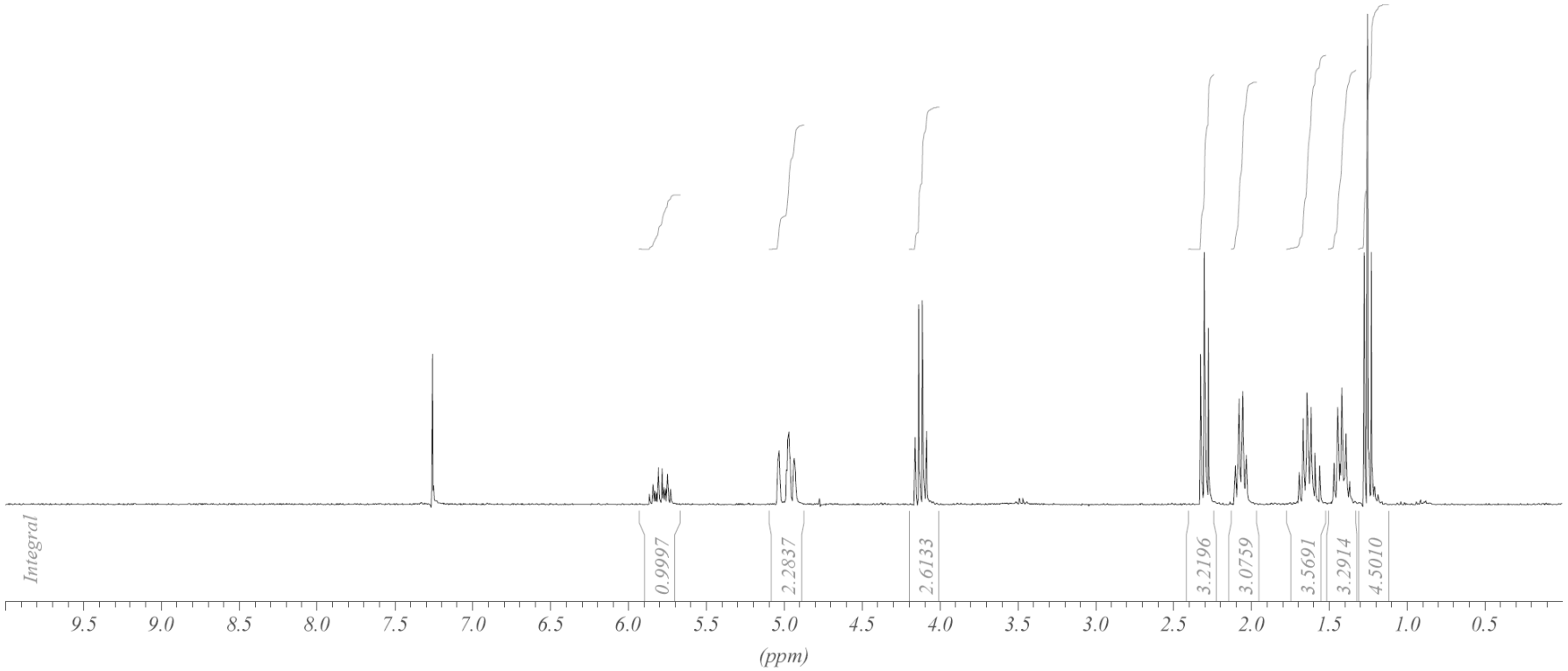
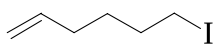
Annexe 1 : Spectres de résonance magnétique nucléaire des protons

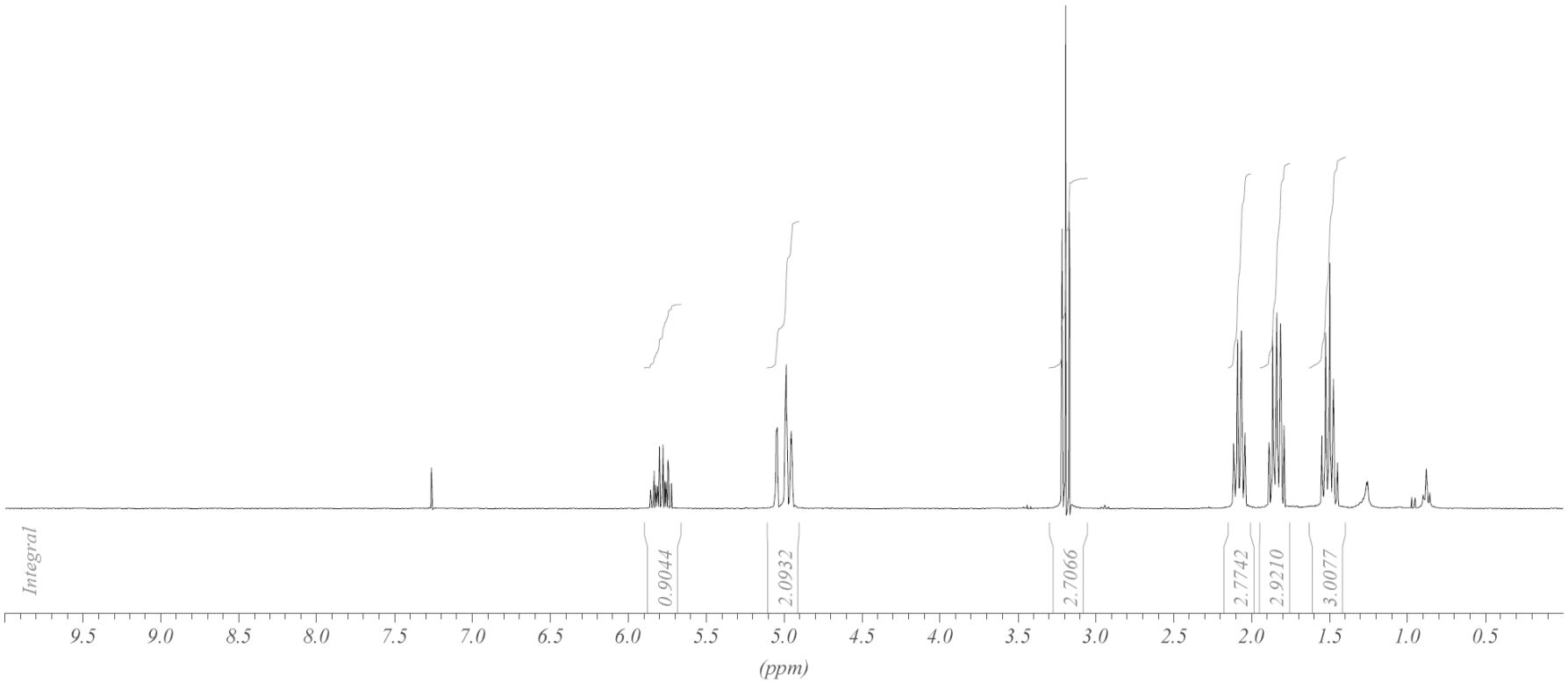


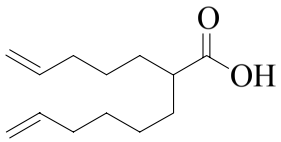
17


Integral
0.9997
2.2837
2.6133
3.2196
3.0759
3.5691
3.2914
4.5010
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
(ppm)

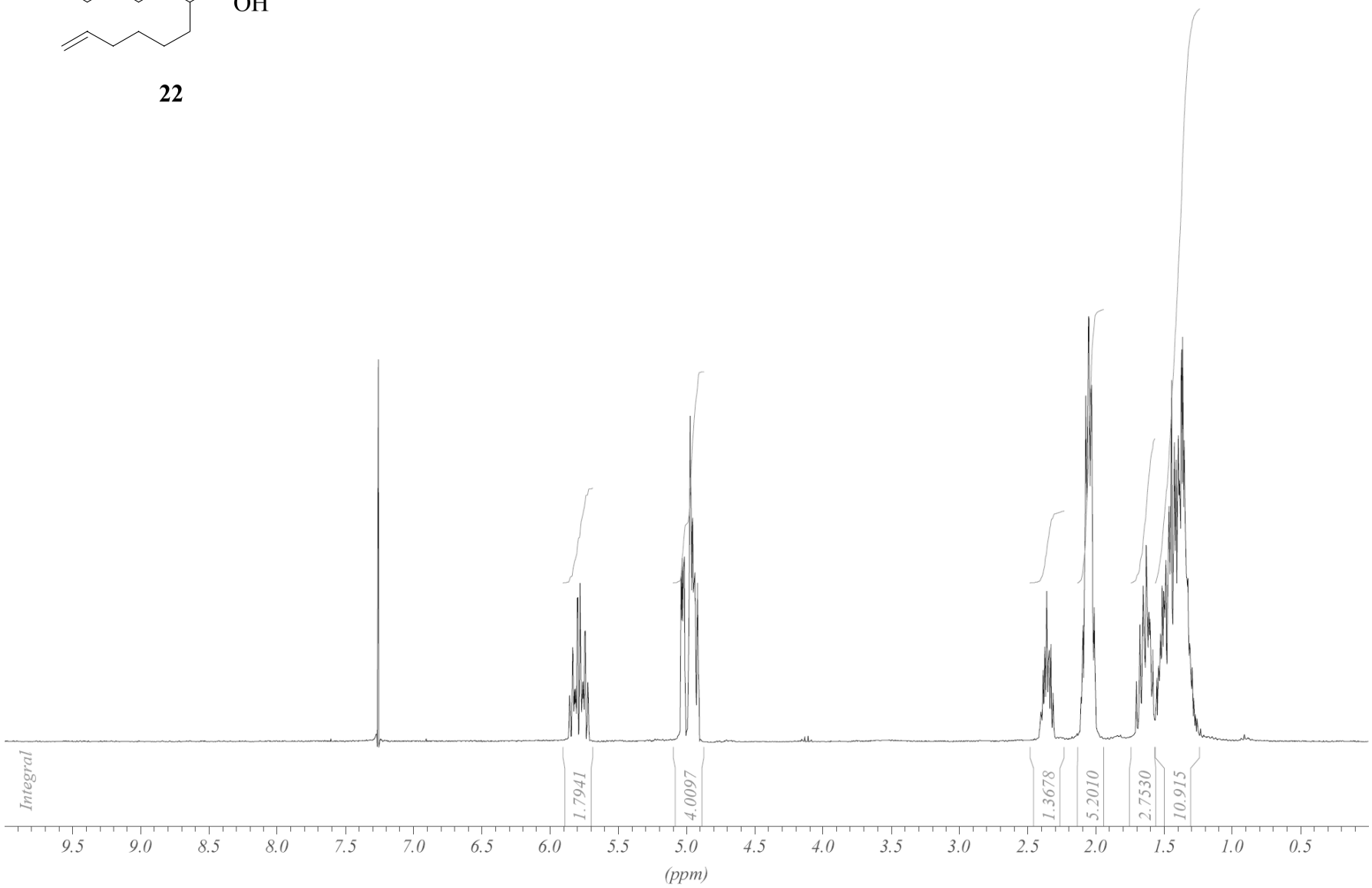

I

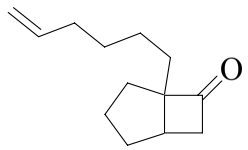
19


Integral
0.9044
2.0932
2.7066
2.7742
2.9210
3.0077
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

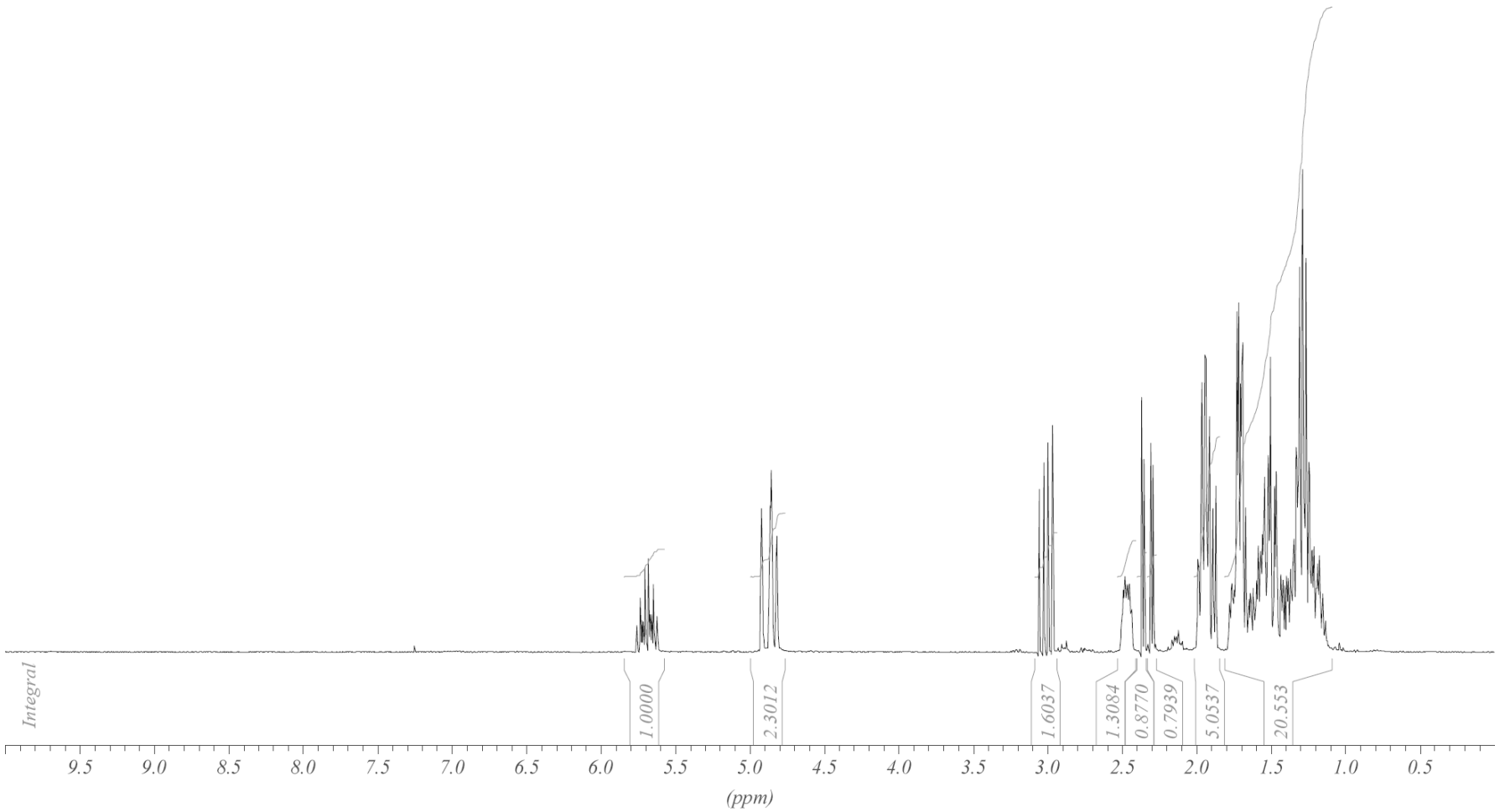

O
OH

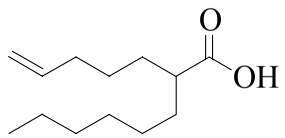
22


Integral
1.7941
4.0097
1.3678
5.2010
2.7530
10.915
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

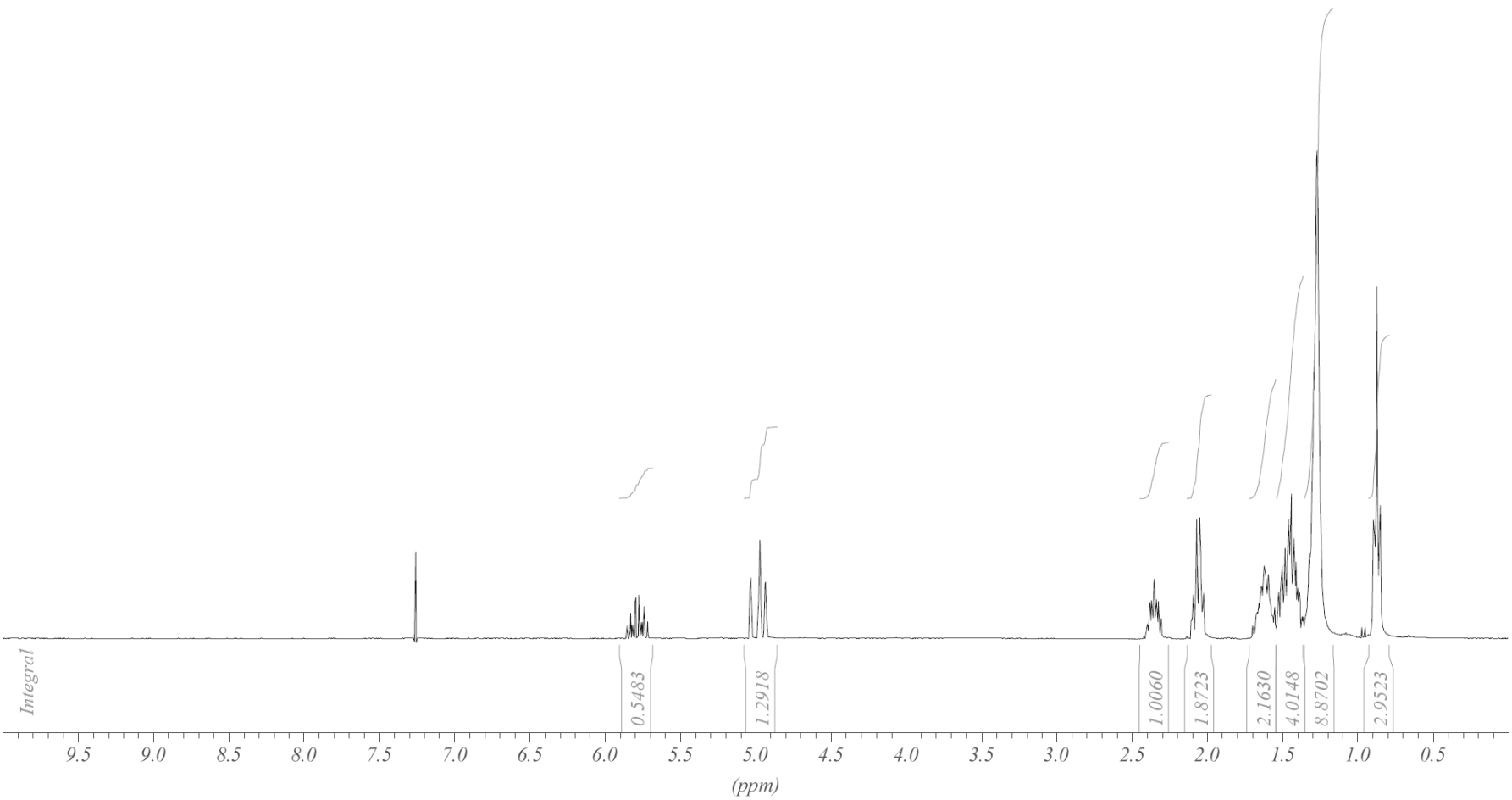

O

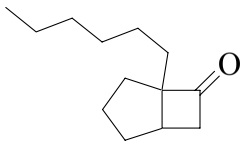
28


Integral
1.0000
2.3012
1.6037
1.3084
0.8770
0.7939
5.0537
20.553
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

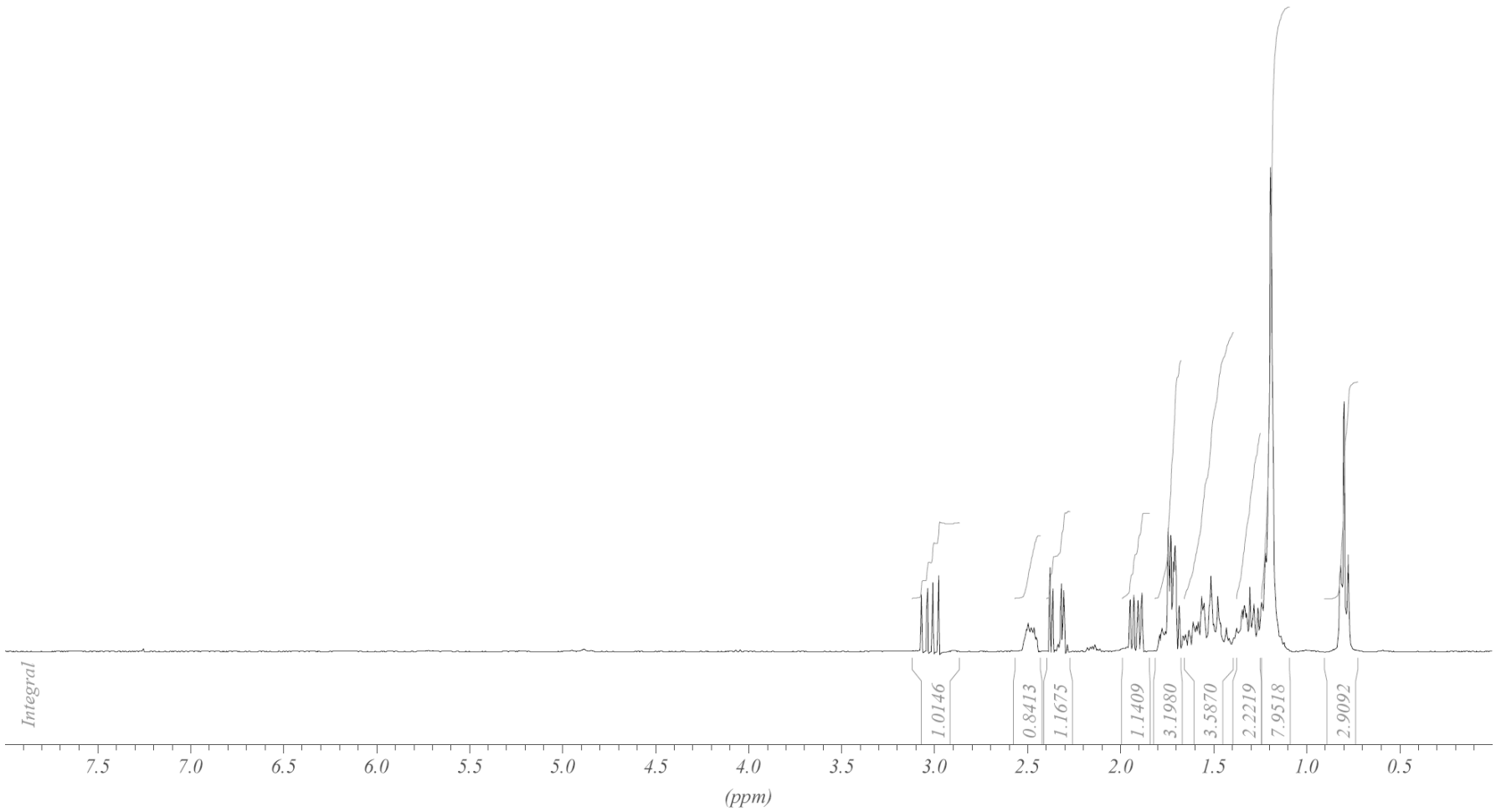

O
OH

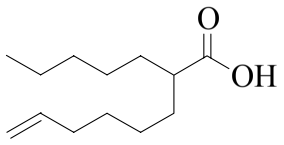
30


Integral
0.5483
1.2918
1.0060
1.8723
2.1630
4.0148
8.8702
2.9523
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

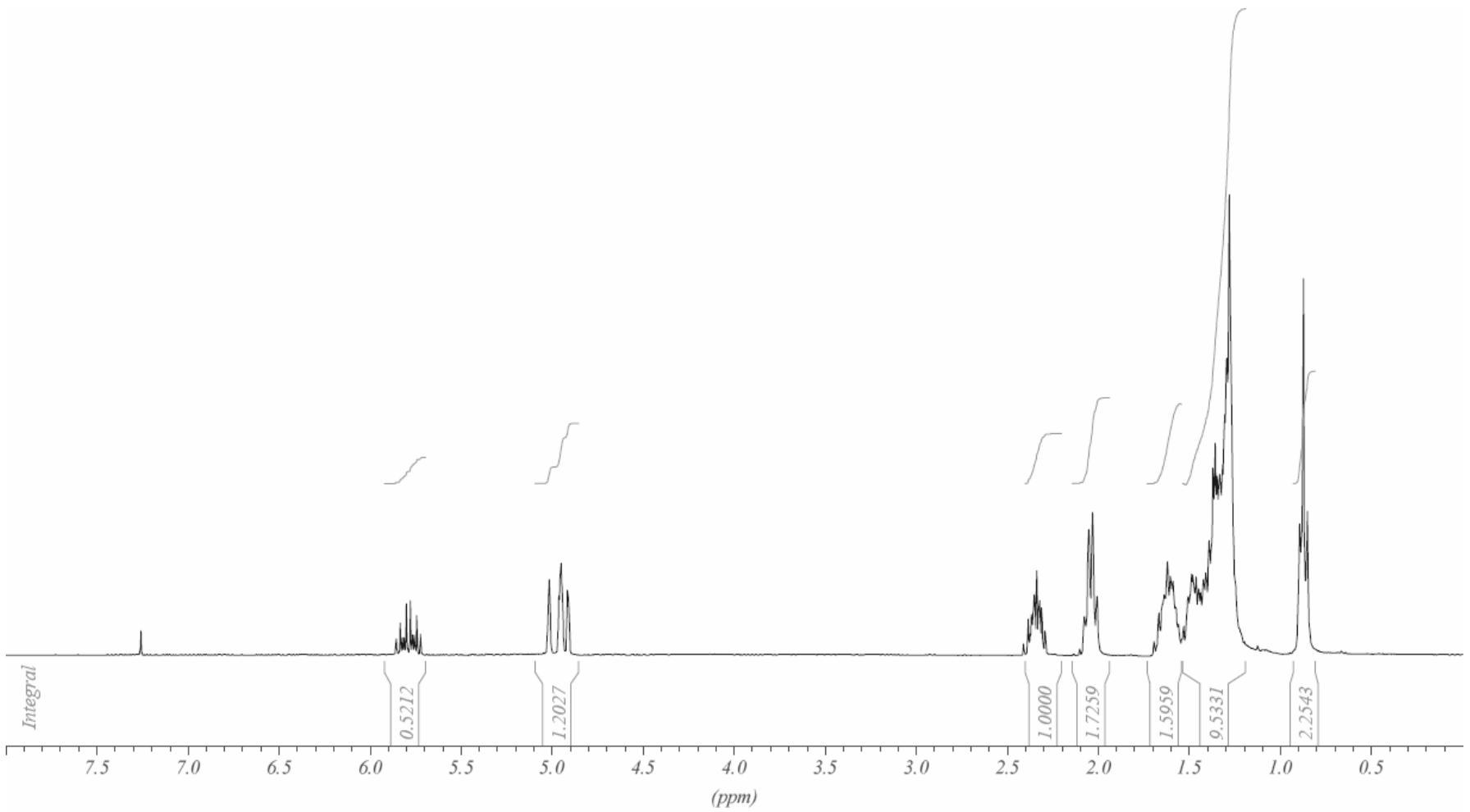

O

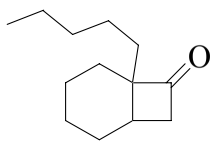
31


Integral
1.0146
0.8413
1.1675
1.1409
3.1980
3.5870
2.2219
7.9518
2.9092
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

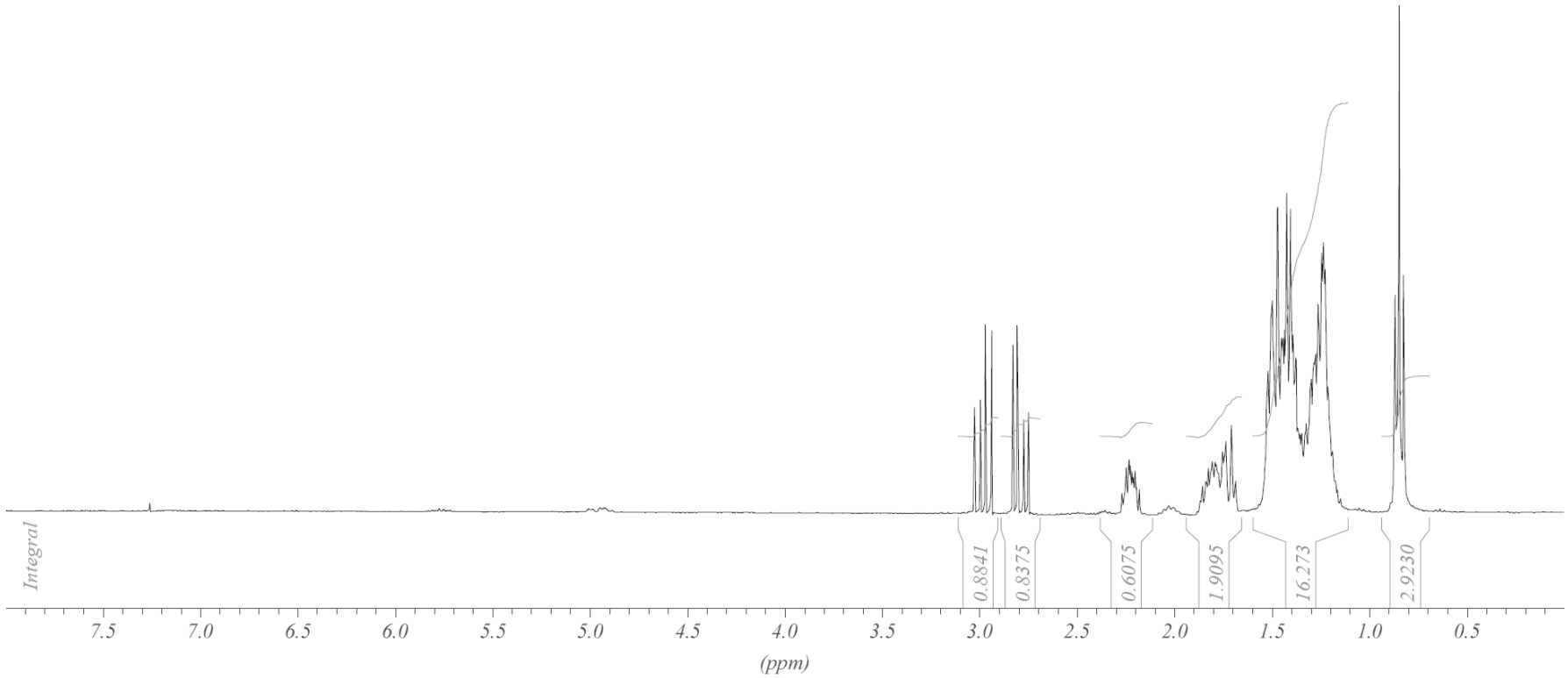

O
OH

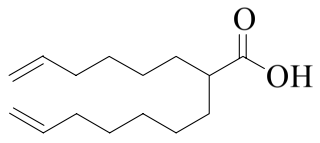
34


Integral
0.5212
1.2027
1.0000
1.7259
1.5959
9.5331
2.2543
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

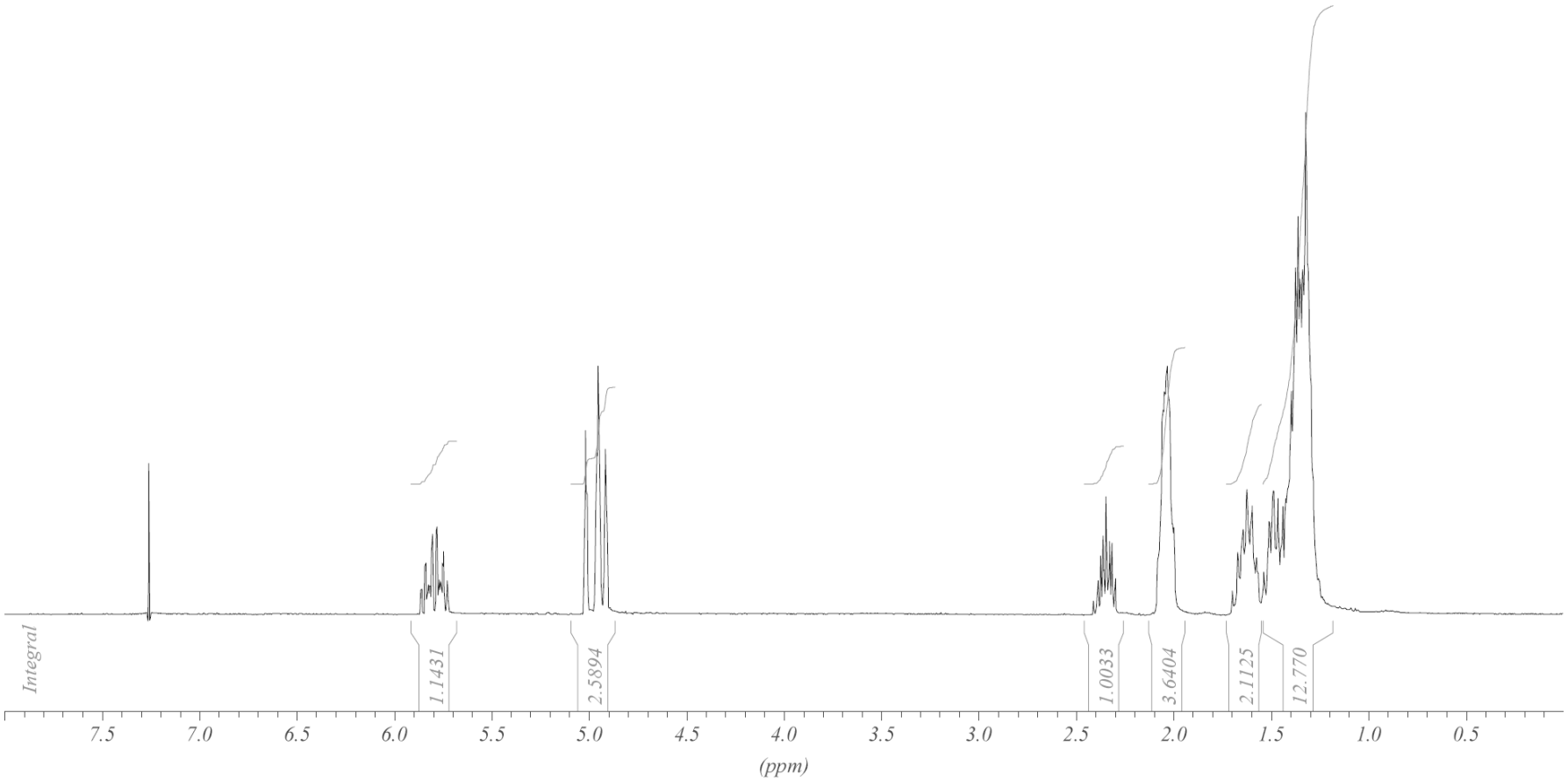

O

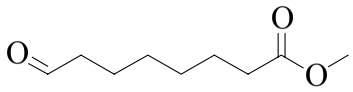
35


Integral
0.8841
0.8375
0.6075
1.9095
16.273
2.9230
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

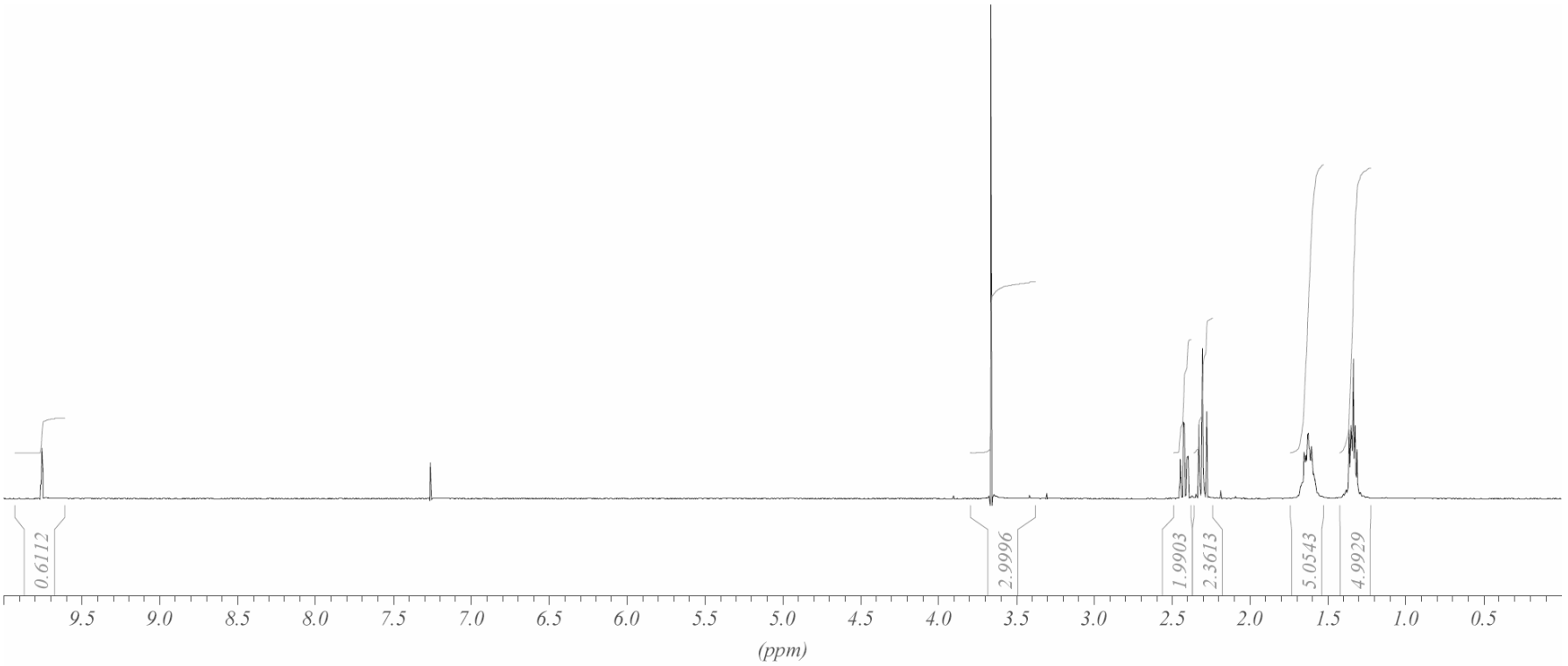

O
OH

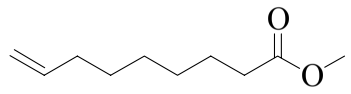
42


Integral
1.1431
2.5894
1.0033
3.6404
2.1125
12.770
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

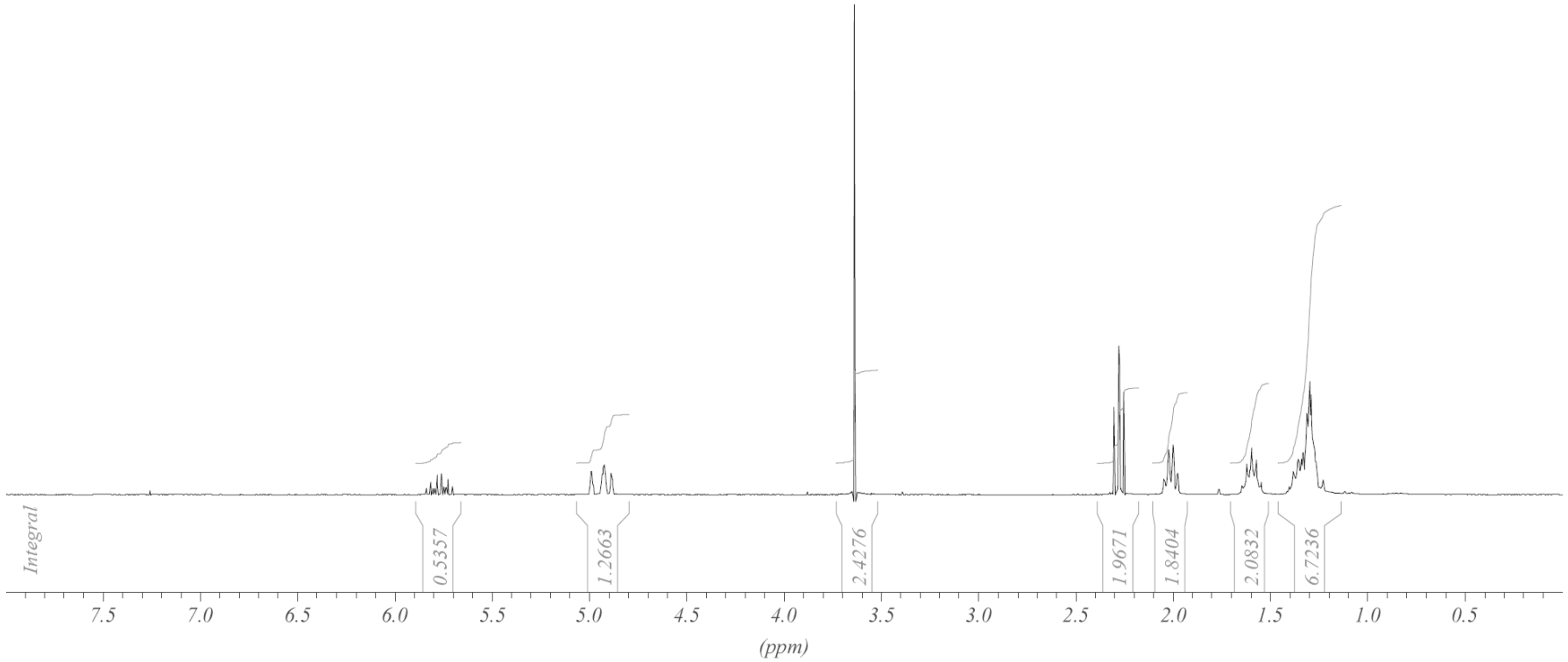


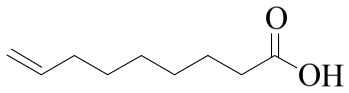
46


0.6112
2.9996
1.9903
2.3613
5.0543
4.9929
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

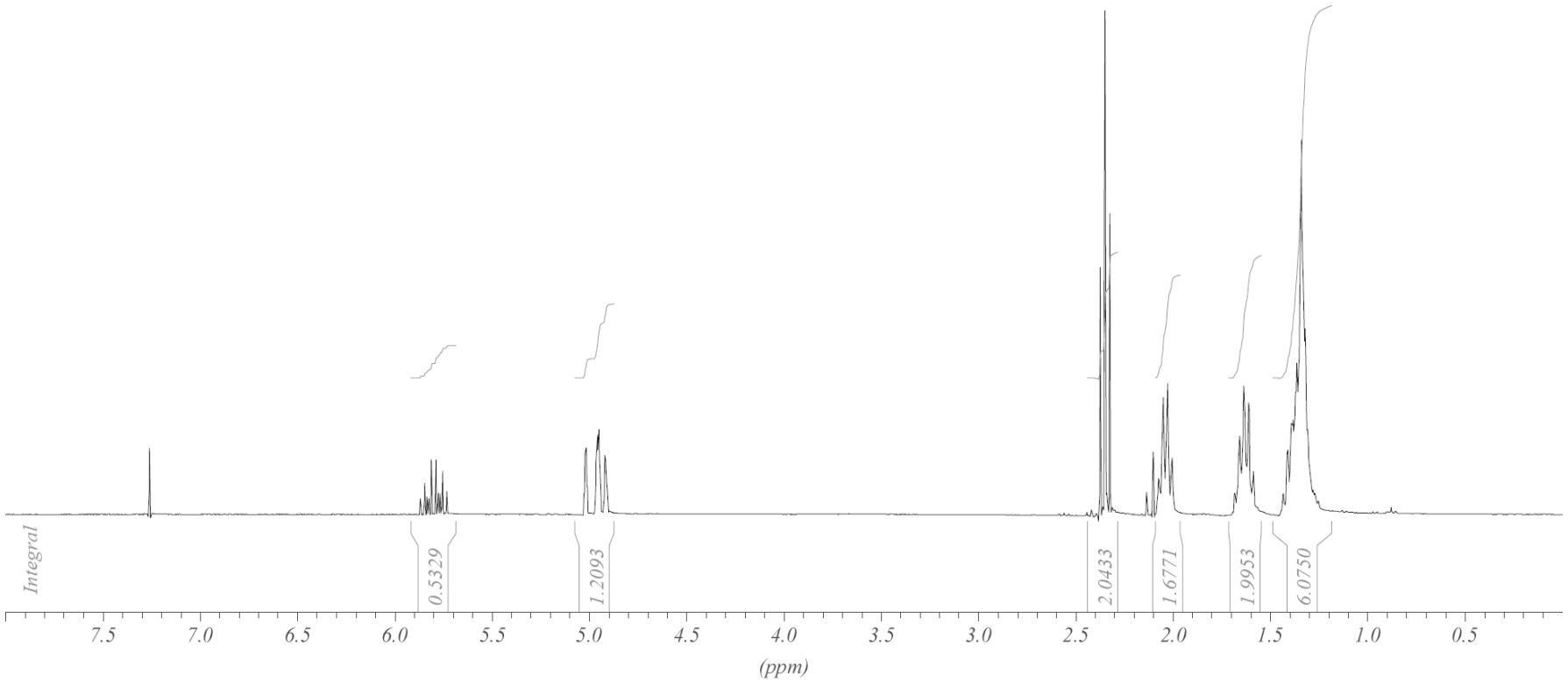


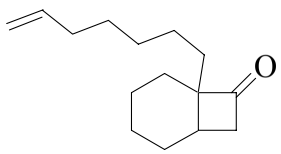
47


Integral
0.5357
1.2663
2.4276
1.9671
1.8404
2.0832
6.7236
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

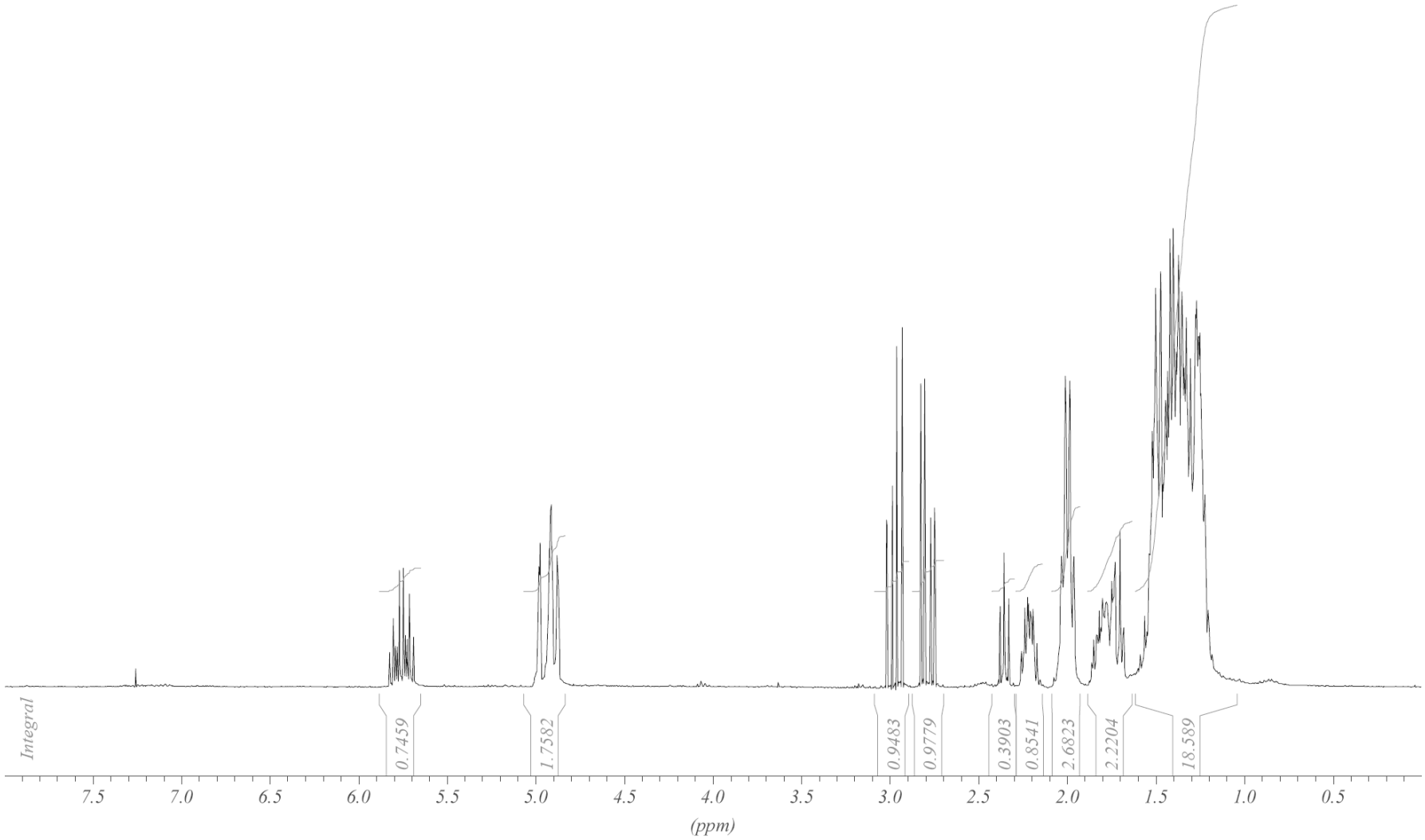

O
OH

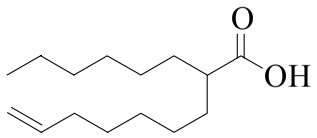
48


Integral
0.5329
1.2093
2.0433
1.6771
1.9953
6.0750
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

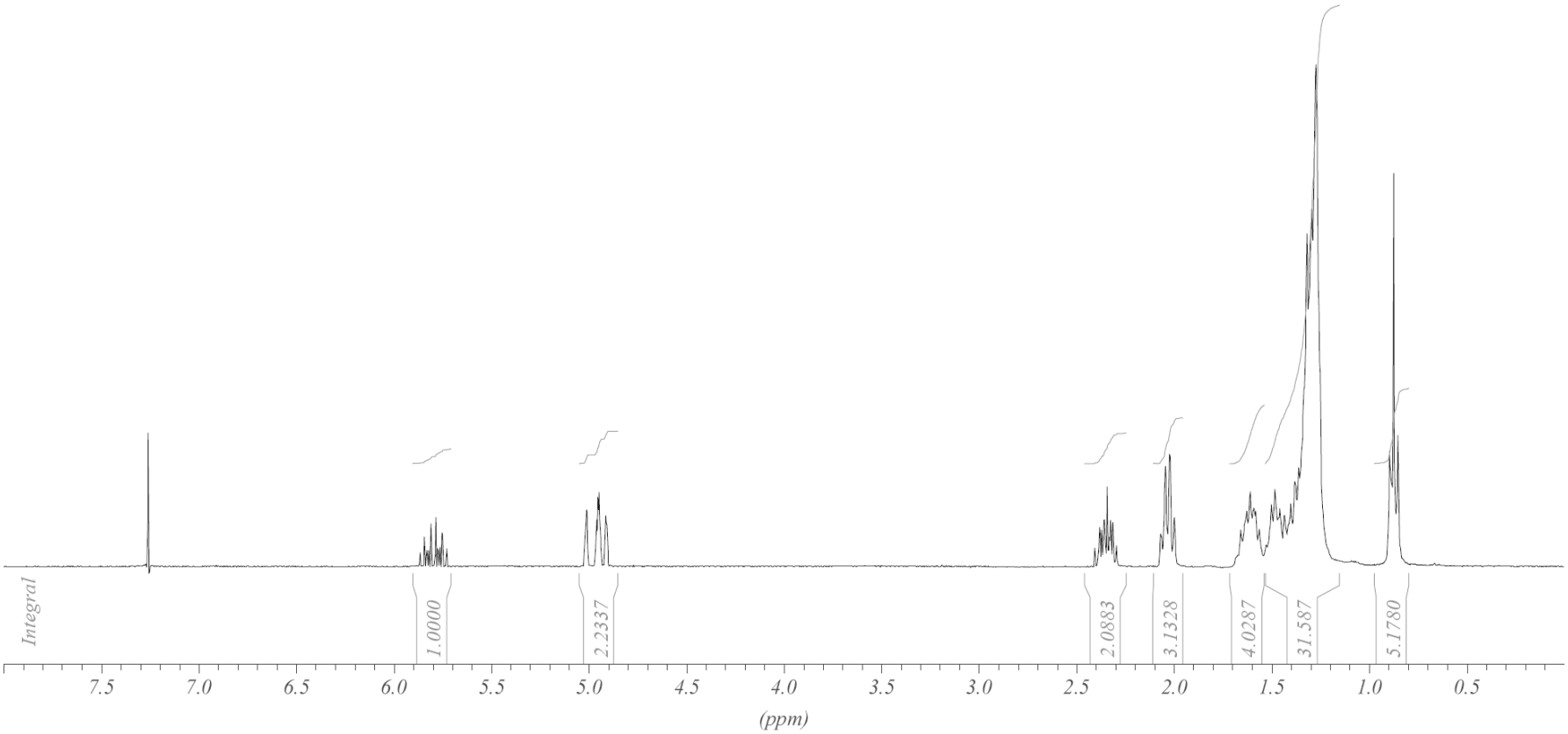

O

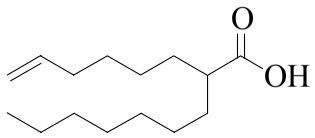
53


Integral
0.7459
1.7582
0.9483
0.9779
0.3903
0.8541
2.6823
2.2204
18.589
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

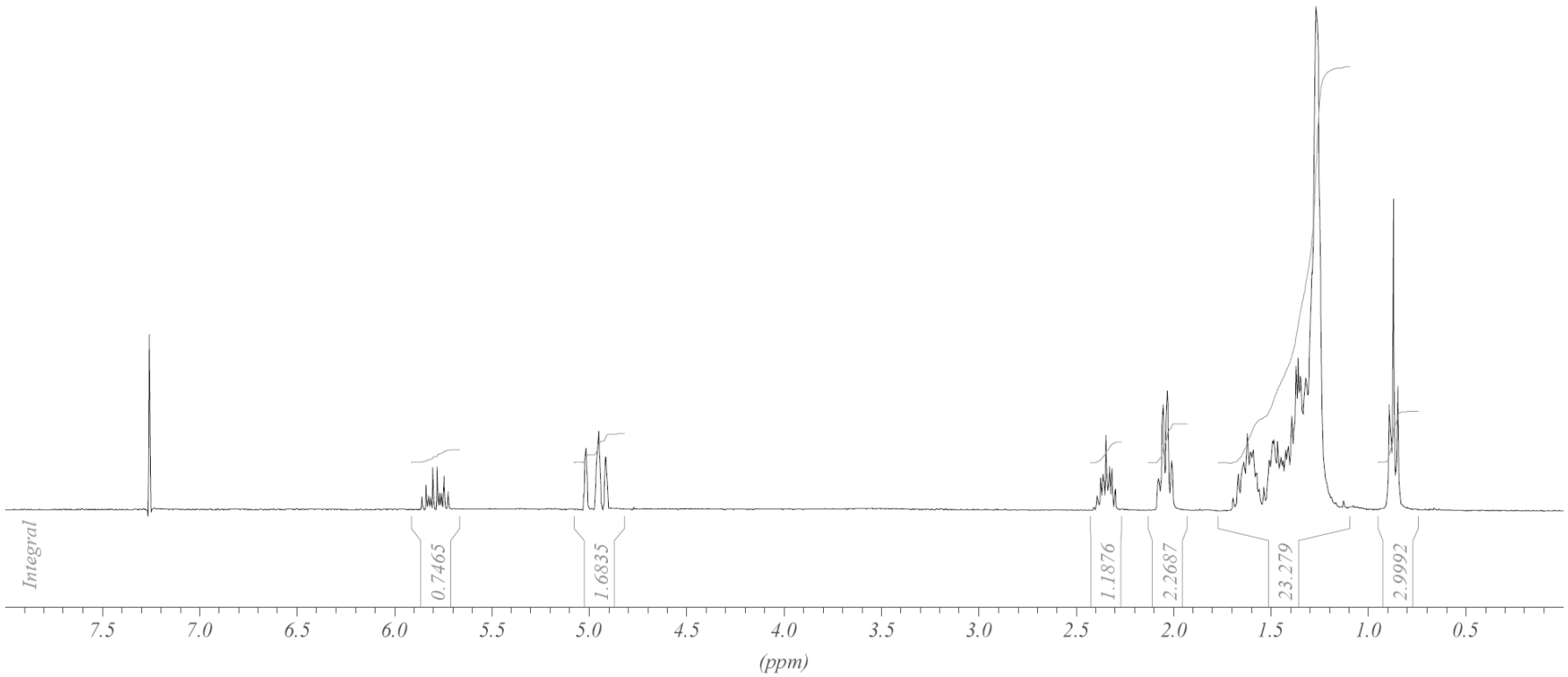

O
OH

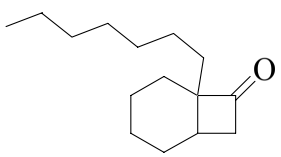
55


Integral
1.0000
2.2337
2.0883
3.1328
4.0287
31.587
5.1780
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

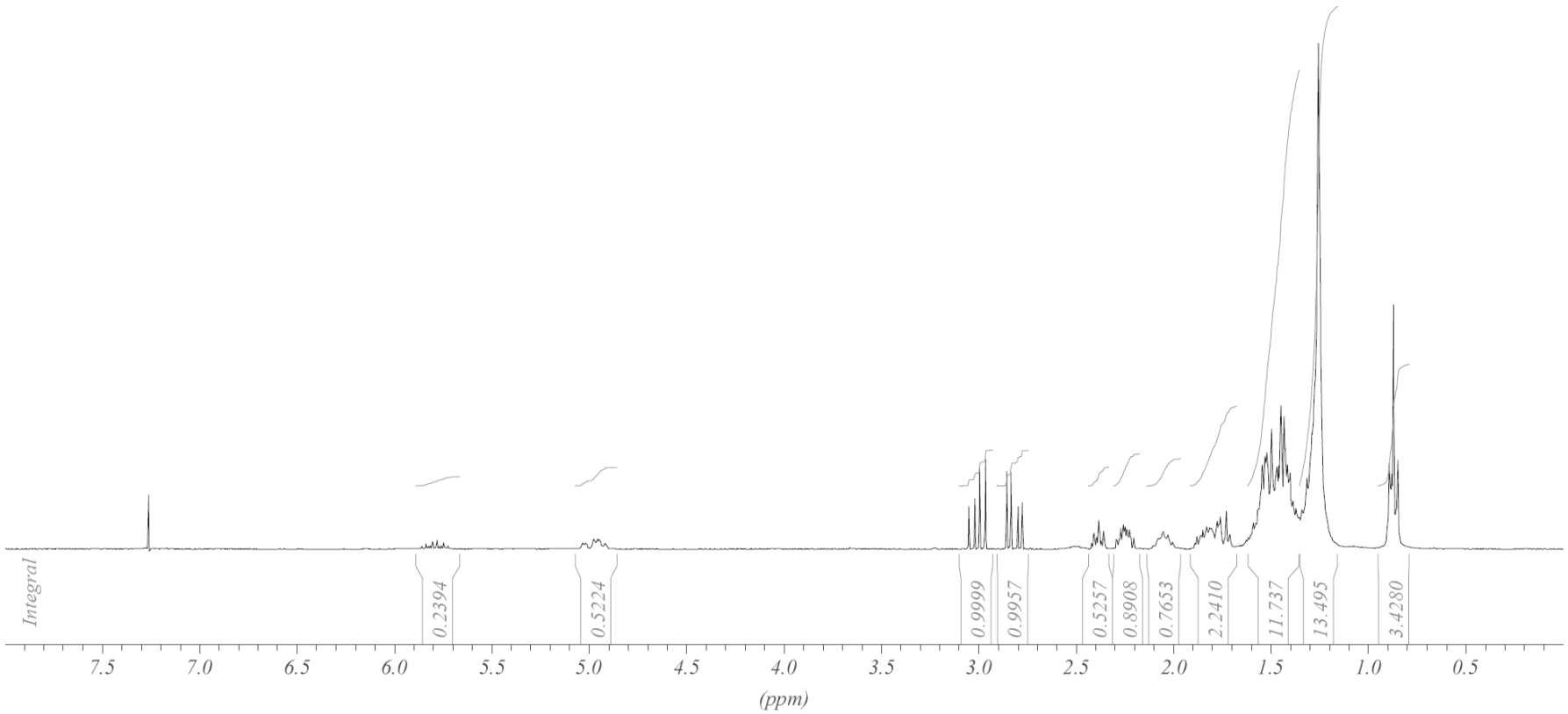

O
OH

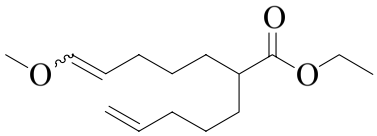
58


Integral
0.7465
1.6835
1.1876
2.2687
23.279
2.9992
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

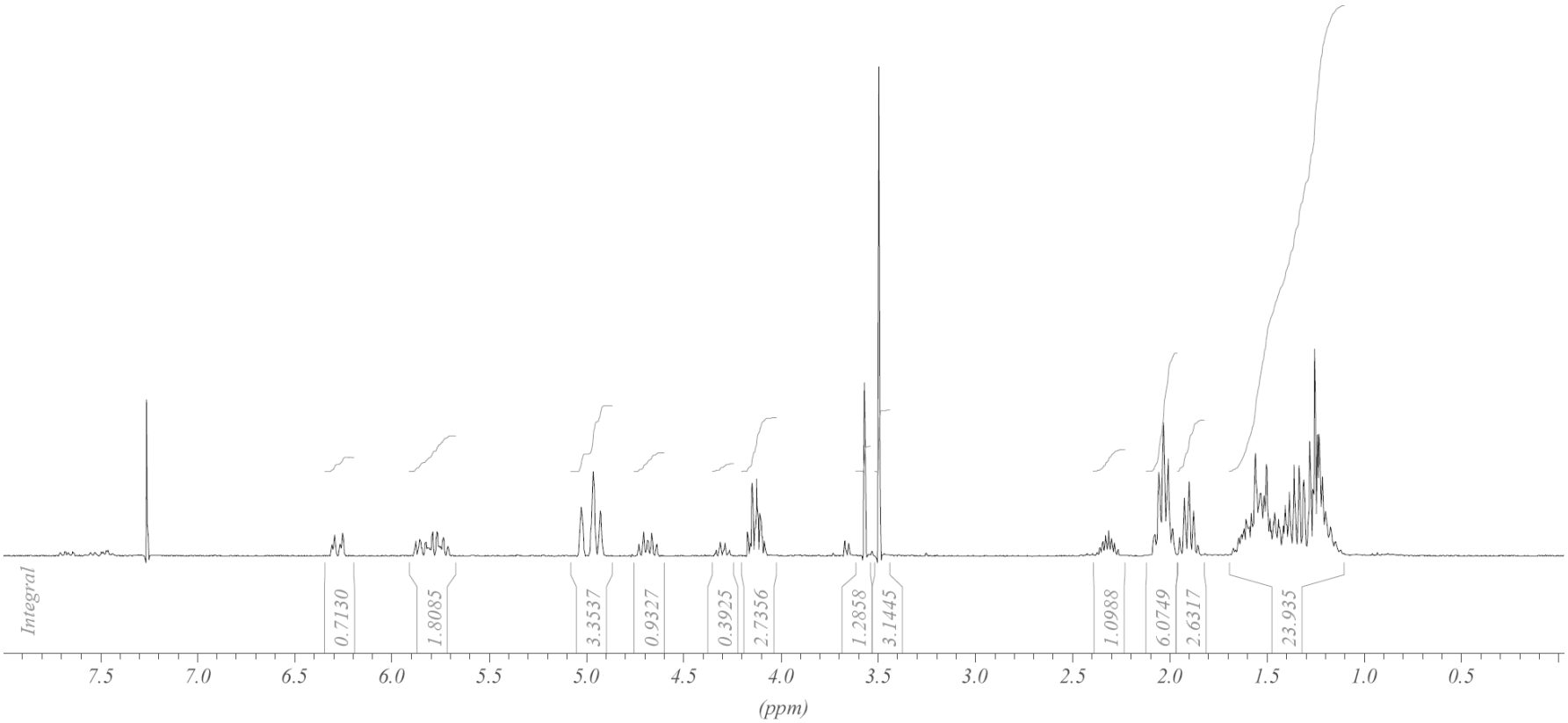

O

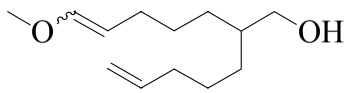
59


Integral
0.2394
0.5224
0.9999
0.9957
0.5257
0.8908
0.7653
2.2410
11.737
13.495
3.4280
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

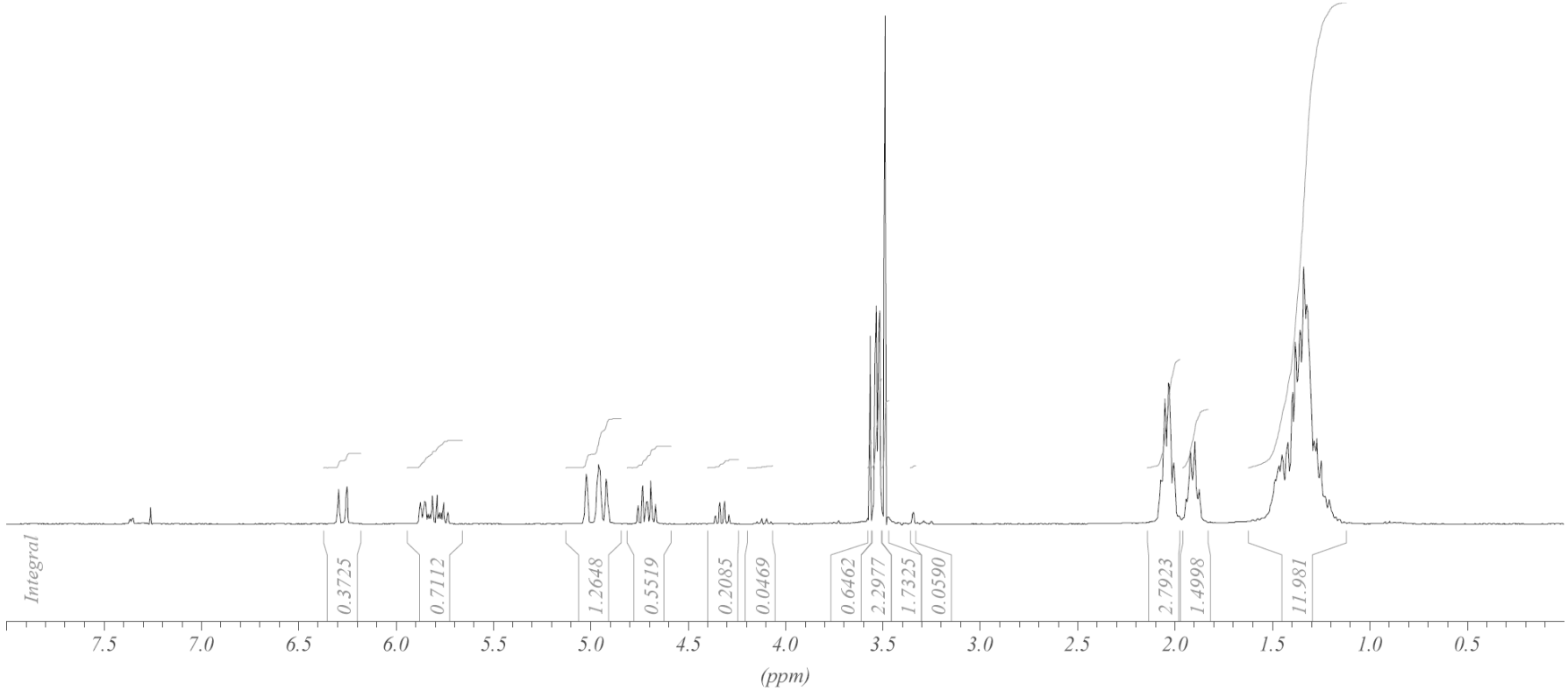


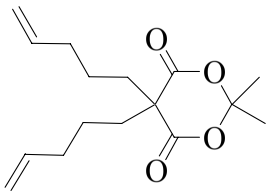
70


Integral
0.7130
1.8085
3.3537
0.9327
0.3925
2.7356
1.2858
3.1445
1.0988
6.0749
2.6317
23.935
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

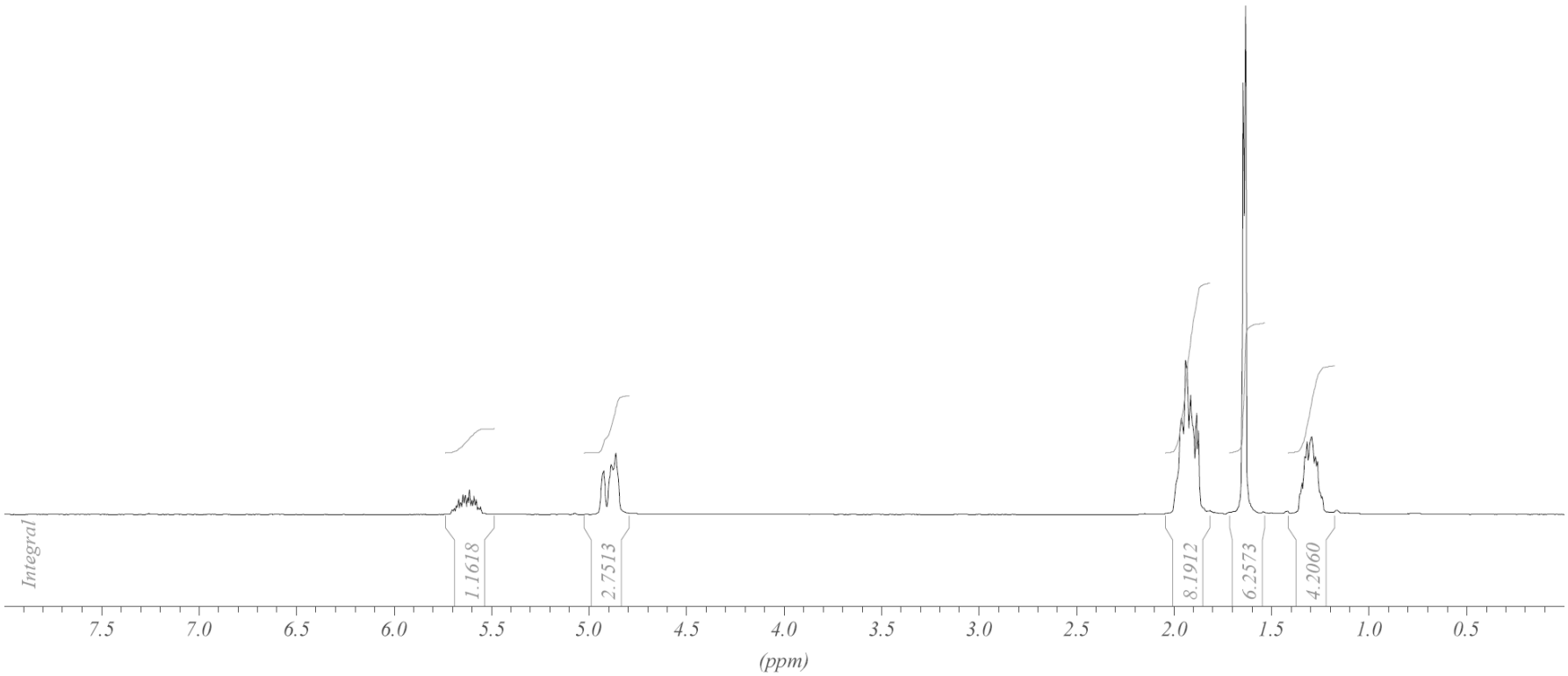

O
OH

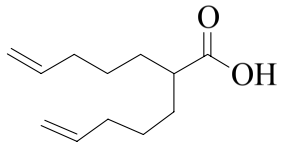
71


Integral
0.3725
0.7112
1.2648
0.5519
0.2085
0.0469
0.6462
2.2977
1.7325
0.0590
2.7923
1.4998
11.981
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

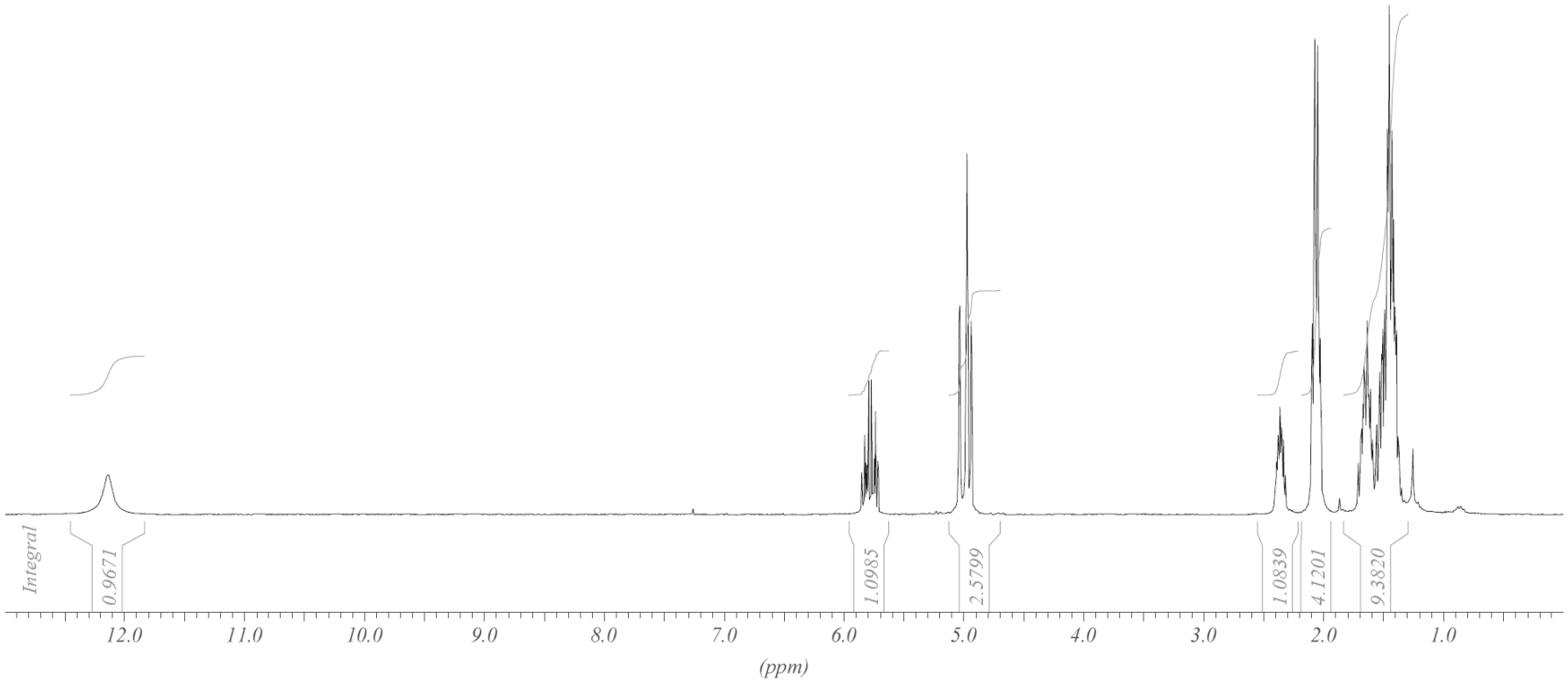


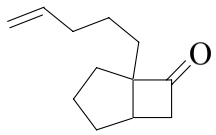
79


Integral
1.1618
2.7513
8.1912
6.2573
4.2060
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

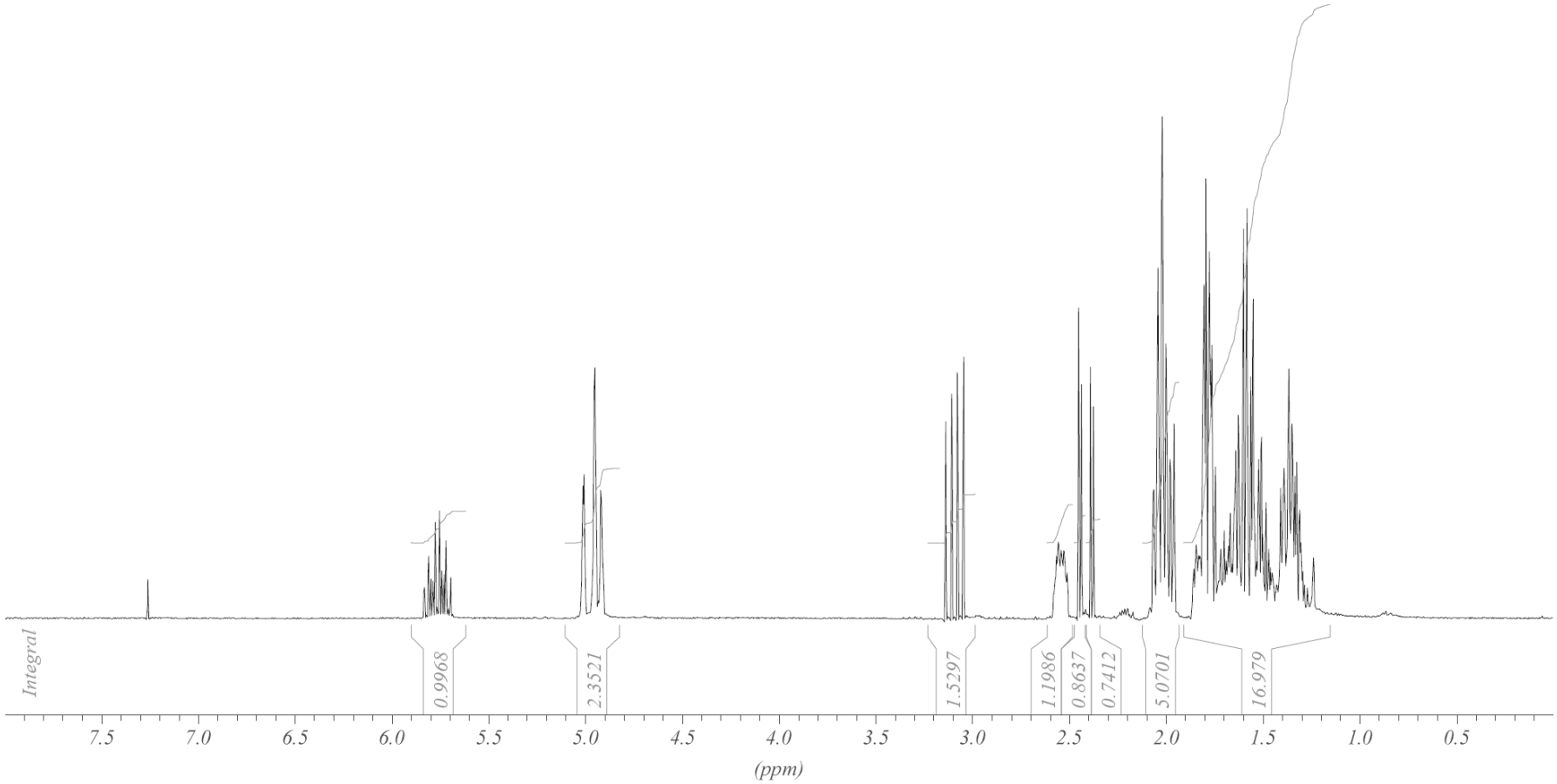

O
OH

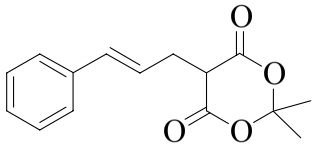
80


Integral
0.9671
1.0985
2.5799
1.0839
4.1201
9.3820
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
(ppm)

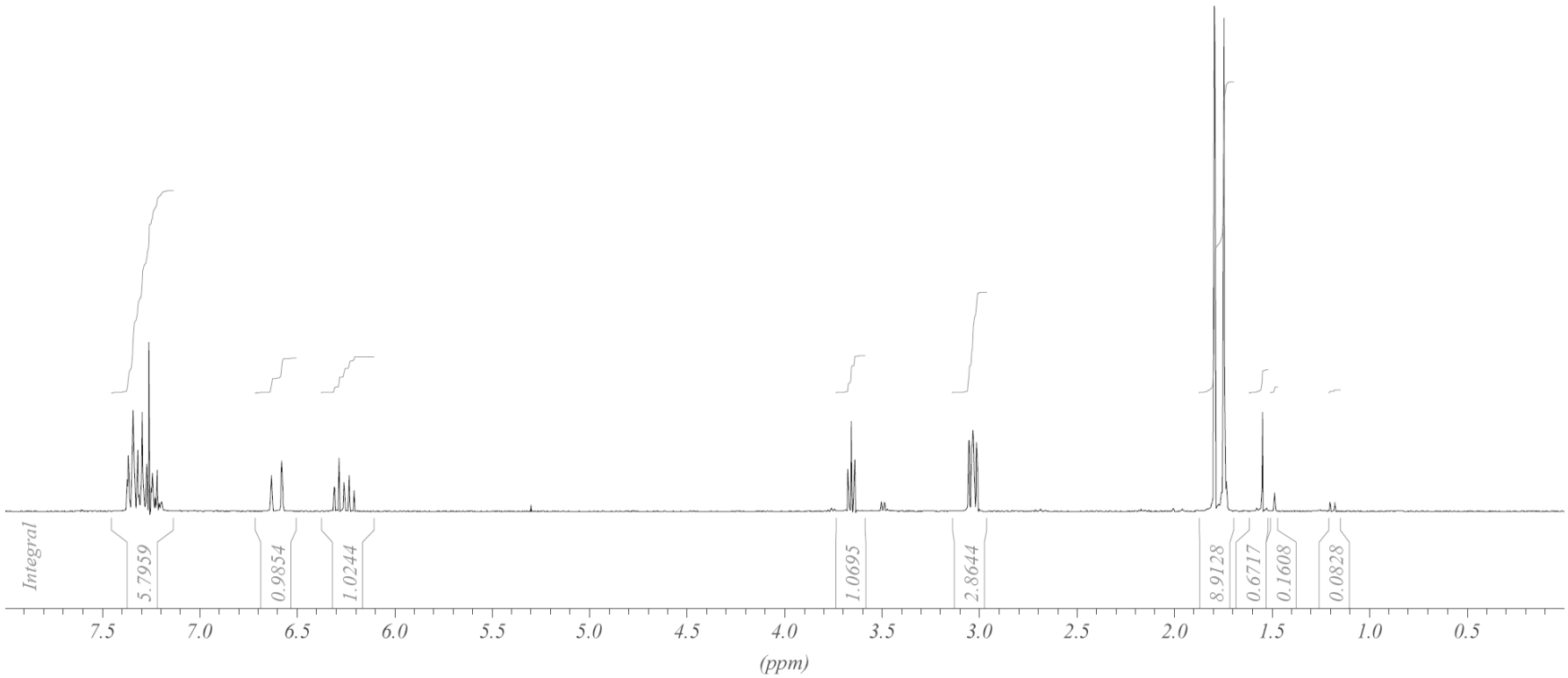

O

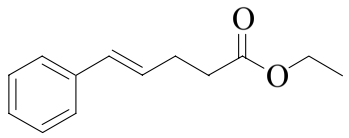
80b


Integral
0.9968
2.3521
1.5297
1.1986
0.8637
0.7412
5.0701
16.979
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

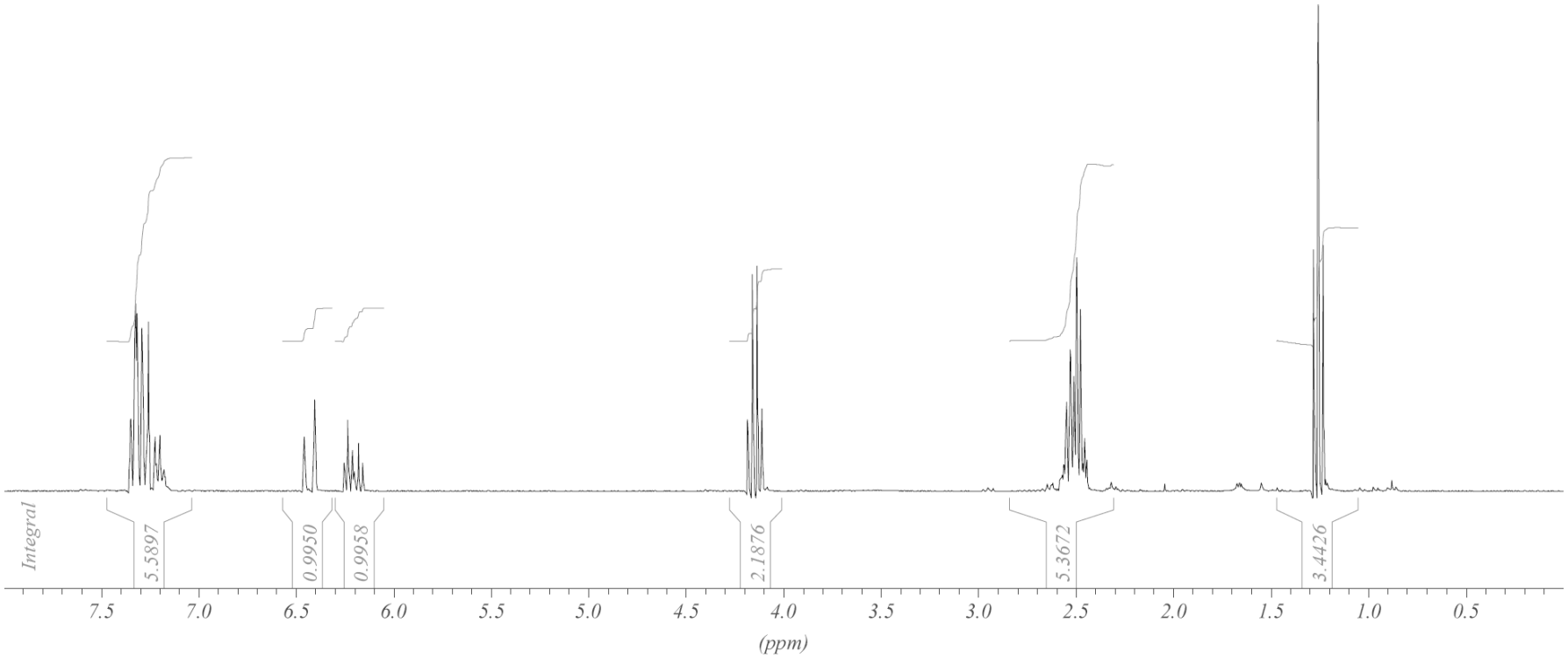


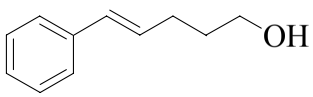
84


Integral
5.7959
0.9854
1.0244
1.0695
2.8644
8.9128
0.6717
0.1608
0.0828
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

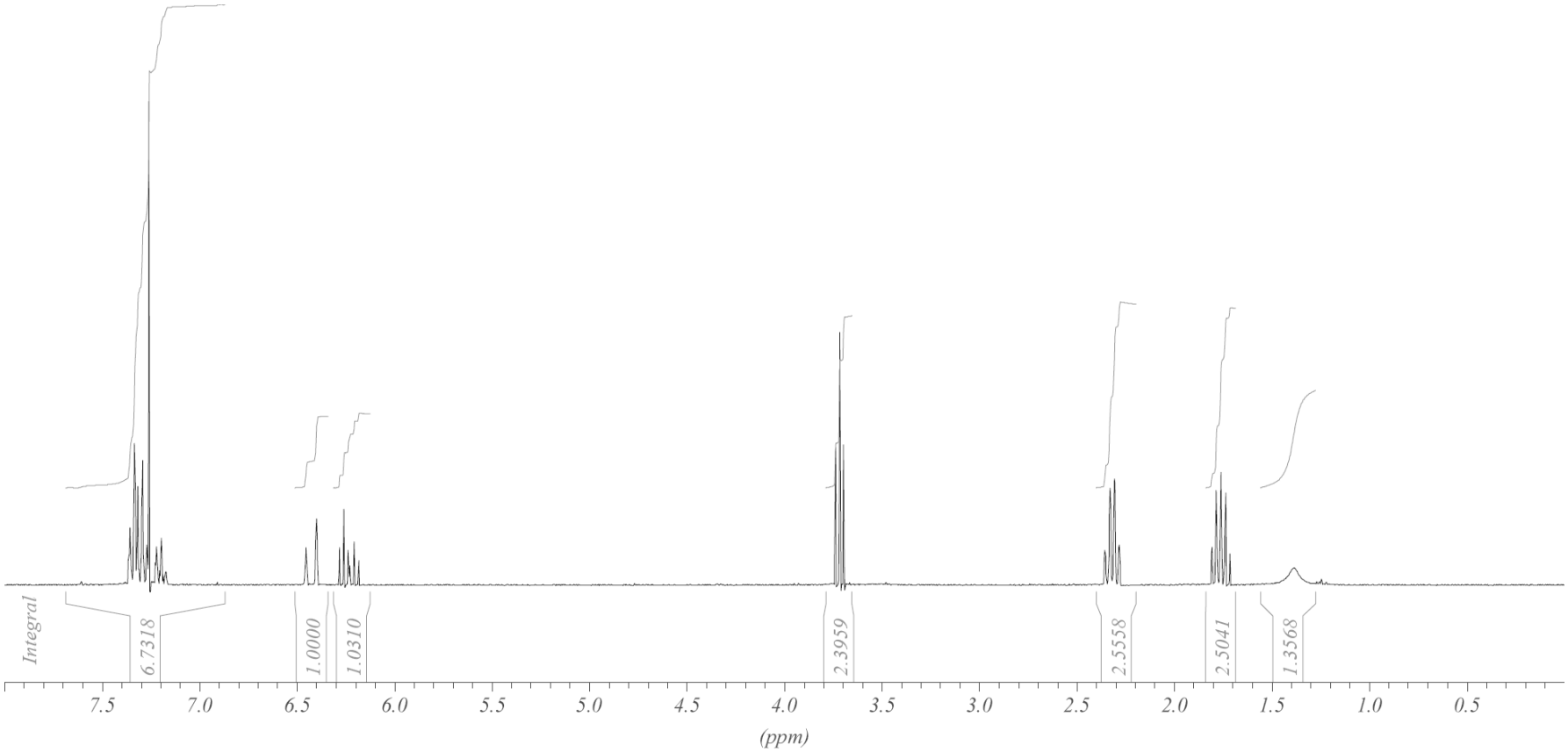


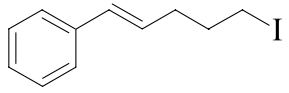
85


Integral
5.5897
0.9950
0.9958
2.1876
5.3672
3.4426
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

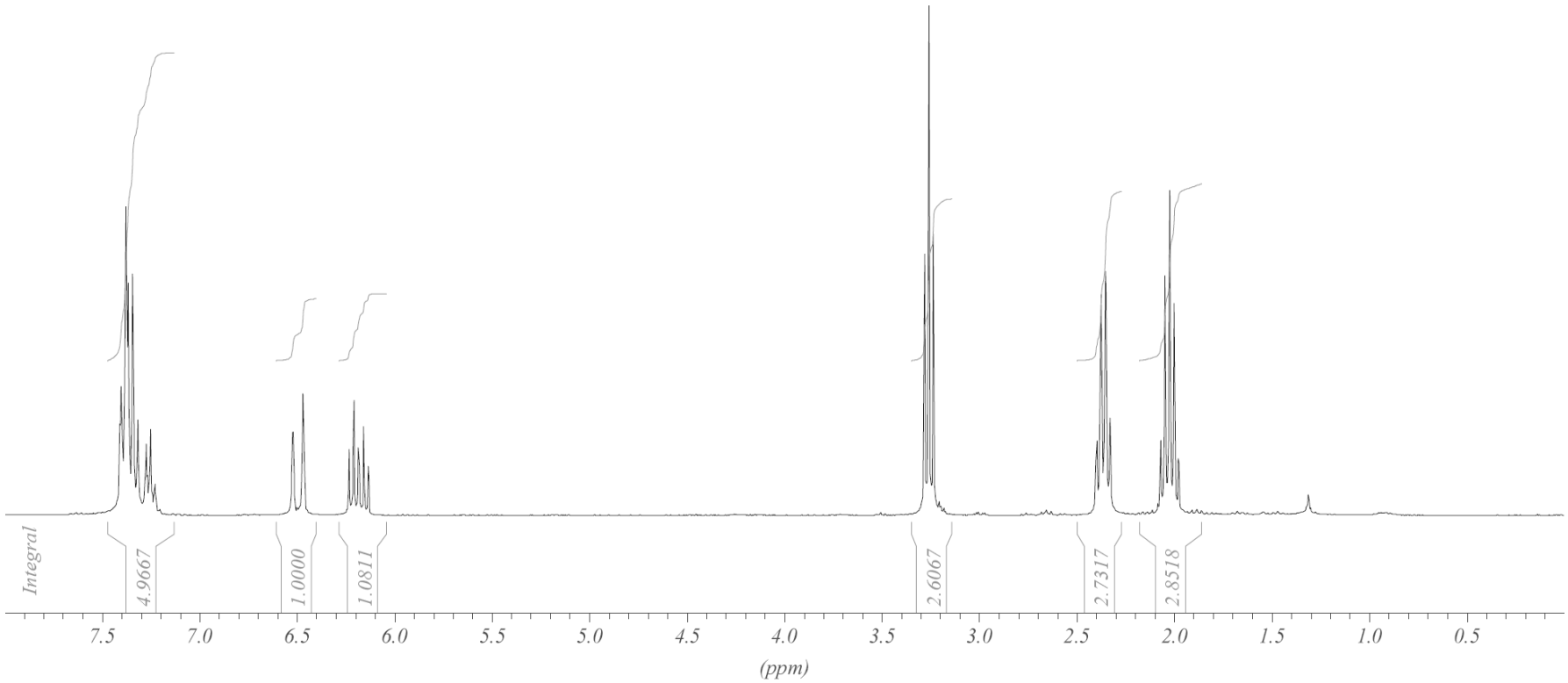

OH

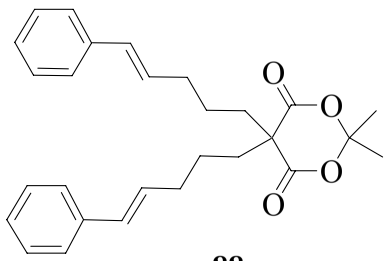
86


Integral
6.7318
1.0000
1.0310
2.3959
2.5558
2.5041
1.3568
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

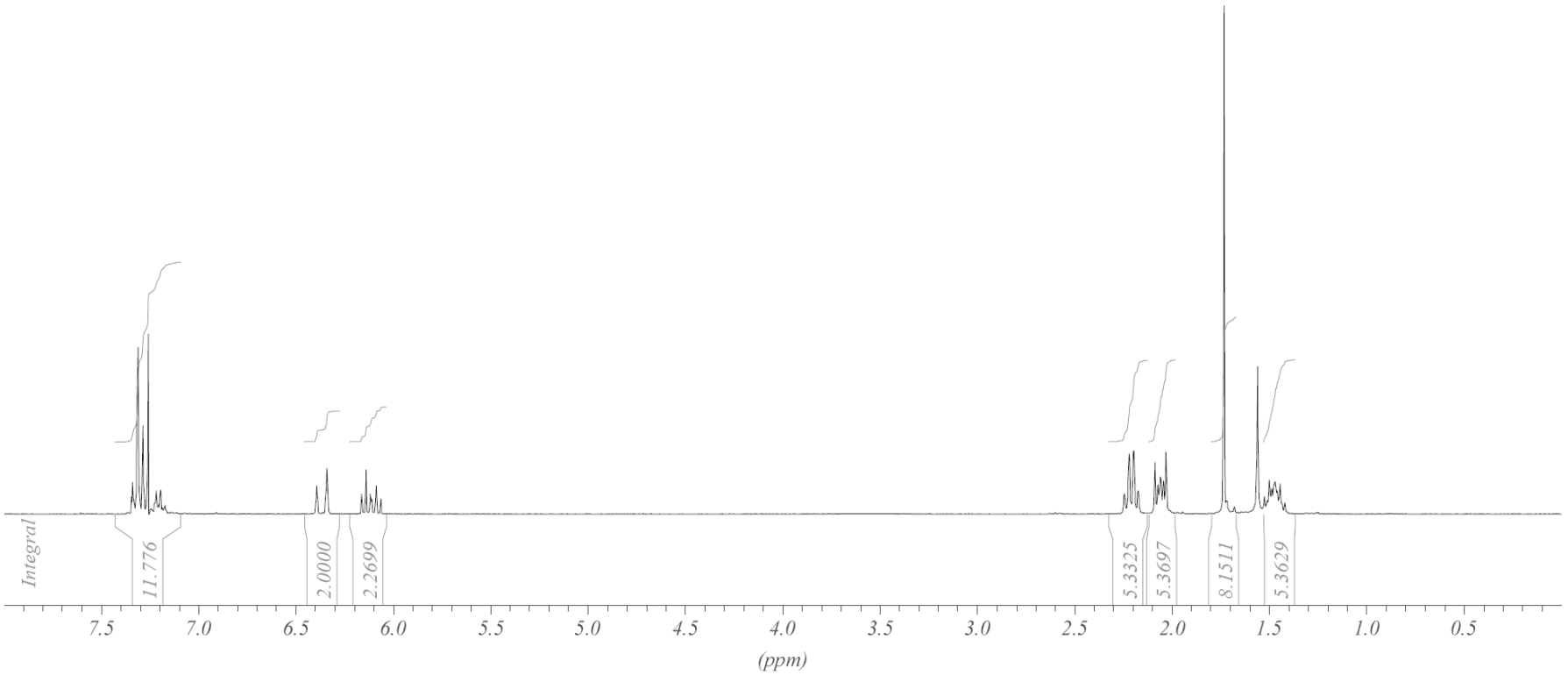

I

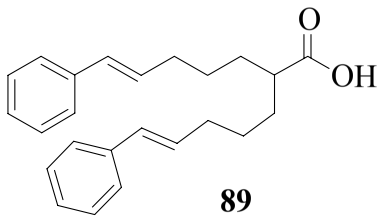
87


Integral
4.9667
1.0000
1.0811
2.6067
2.7317
2.8518
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

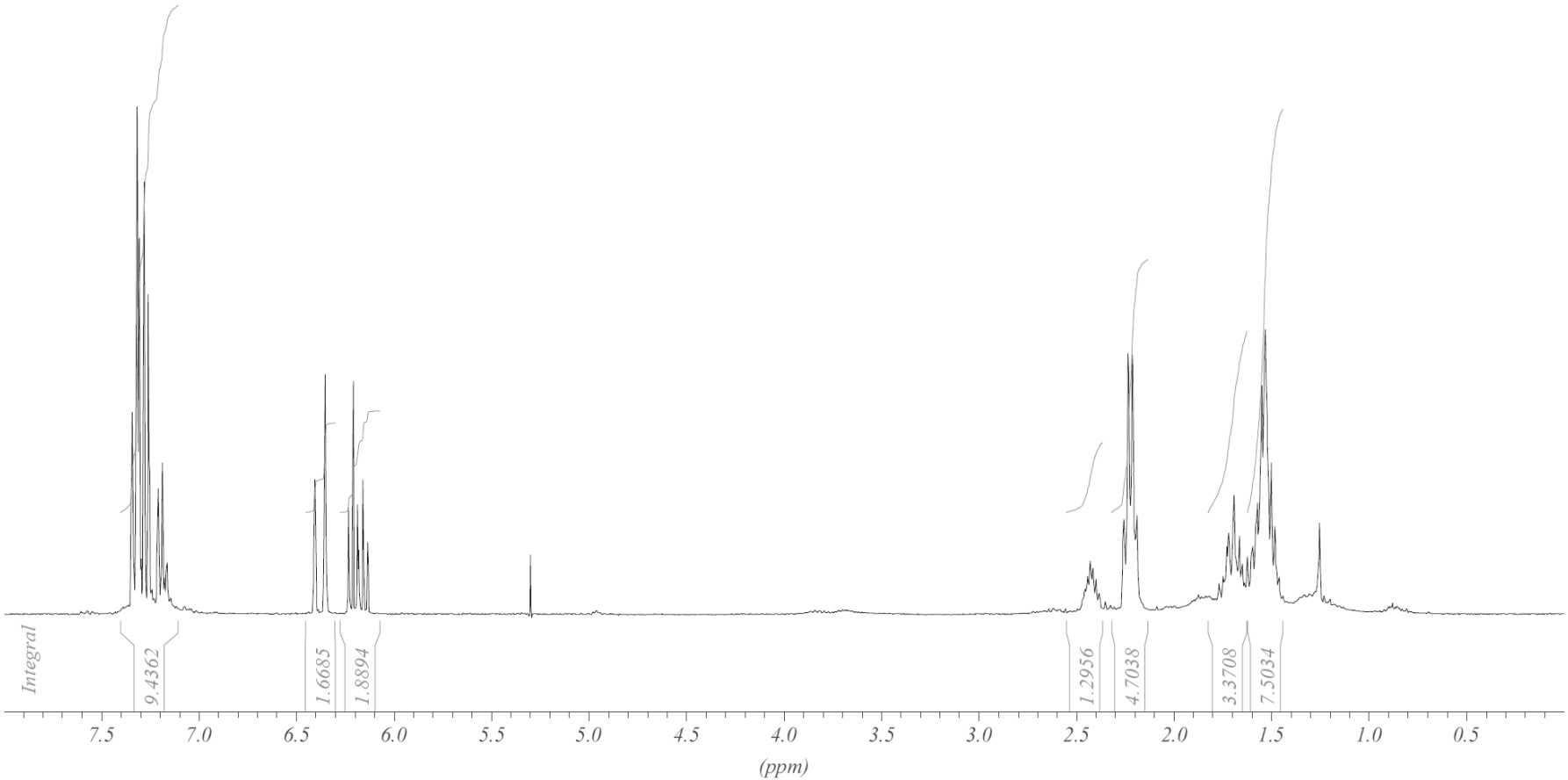


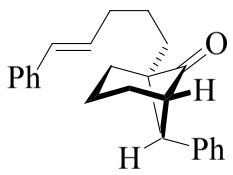
88


Integral
11.776
2.0000
2.2699
5.3325
5.3697
8.1511
5.3629
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

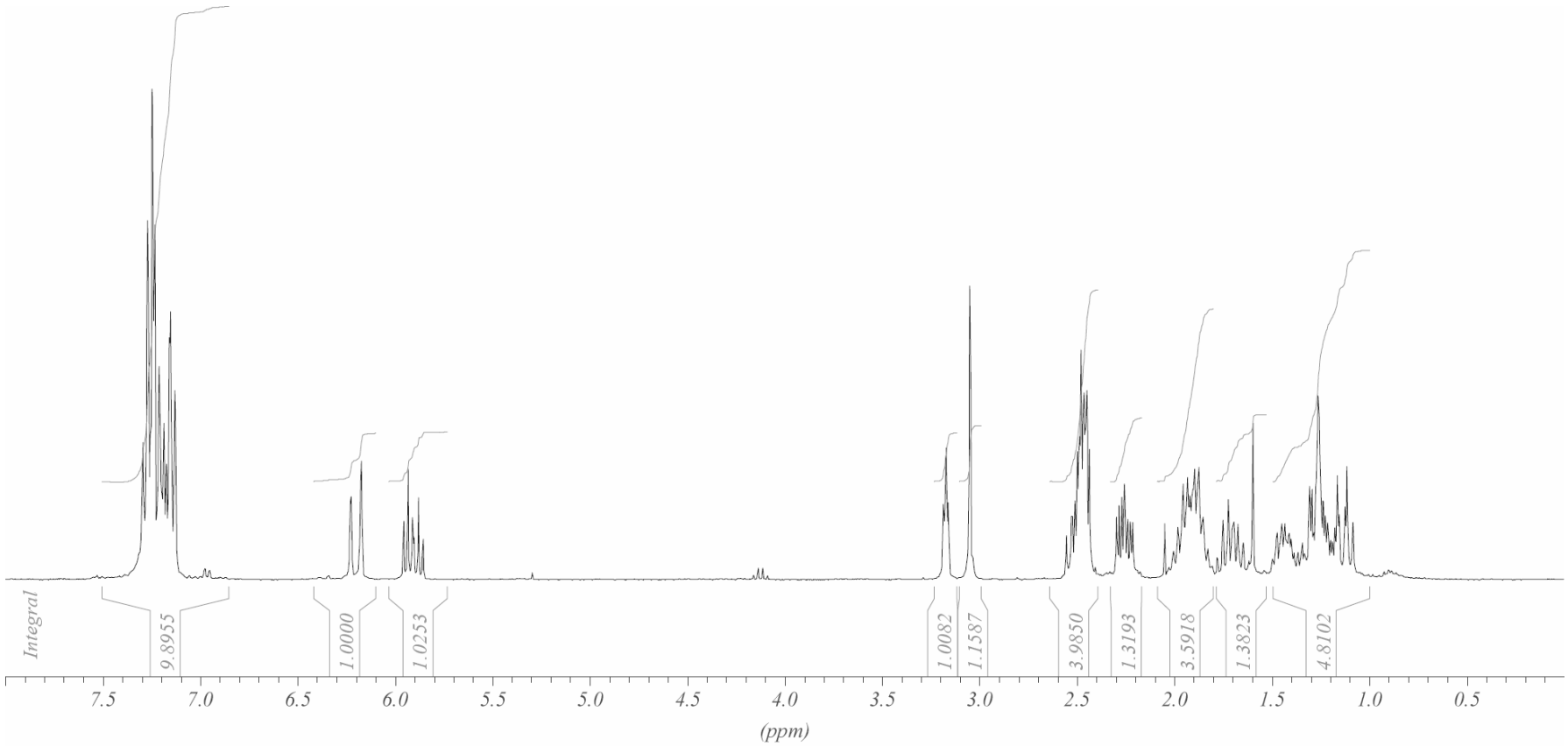

O
OH

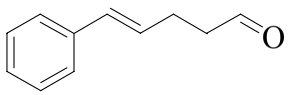
89


Integral
9.4362
1.6685
1.8894
1.2956
4.7038
3.3708
7.5034
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

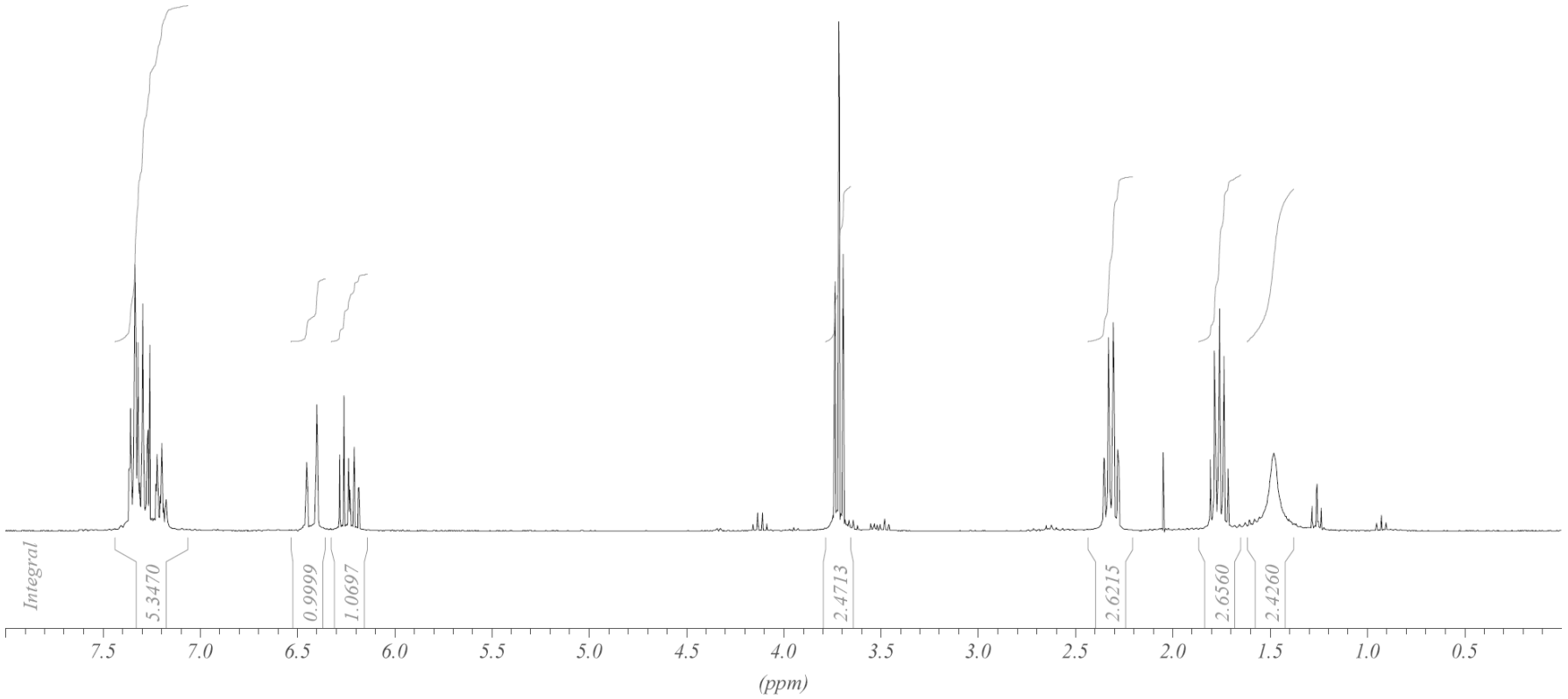

Ph
O
H
H
Ph

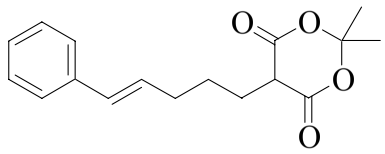
91


Integral
9.8955
1.0000
1.0253
1.0082
1.1587
3.9850
1.3193
3.5918
1.3823
4.8102
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

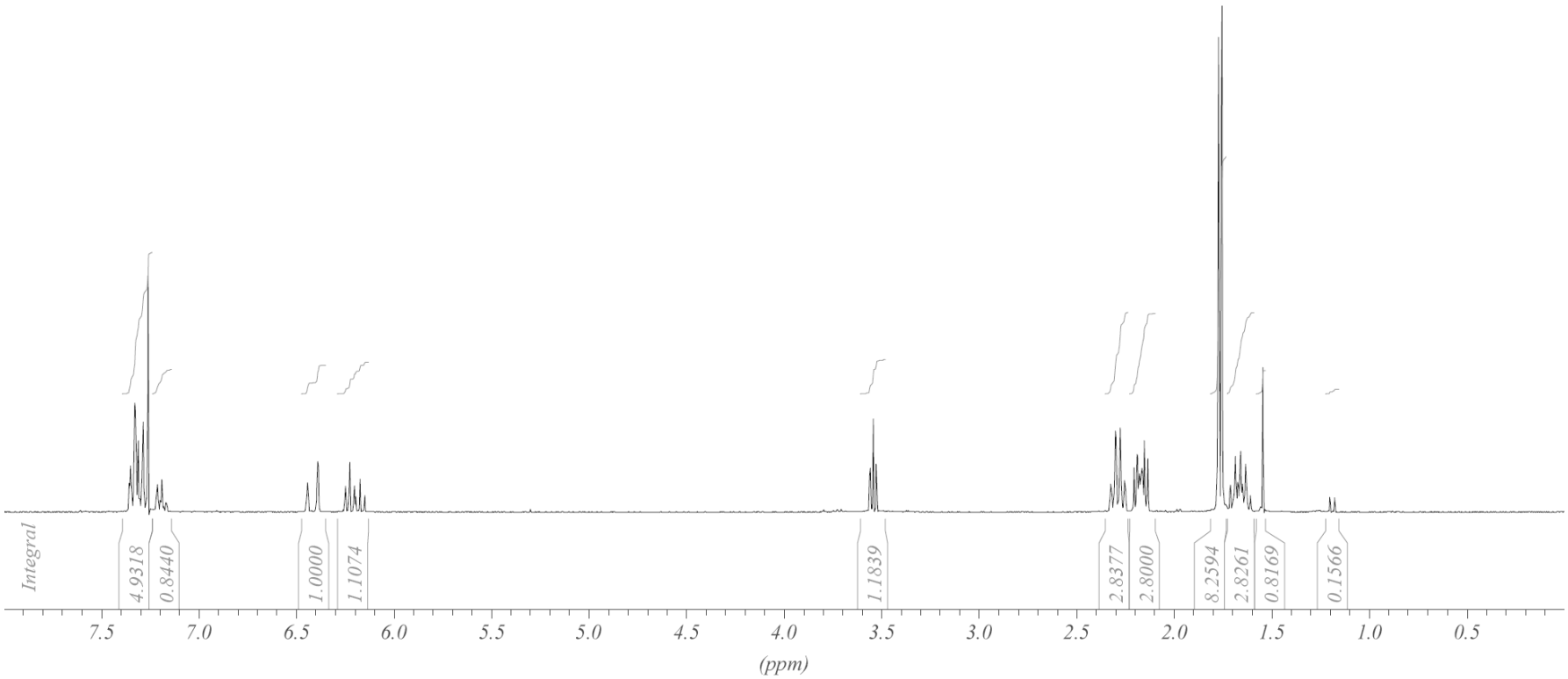

O

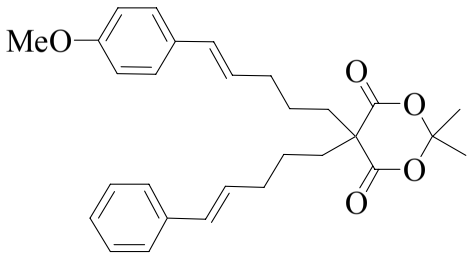
93


Integral
5.3470
0.9999
1.0697
2.4713
2.6215
2.6560
2.4260
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

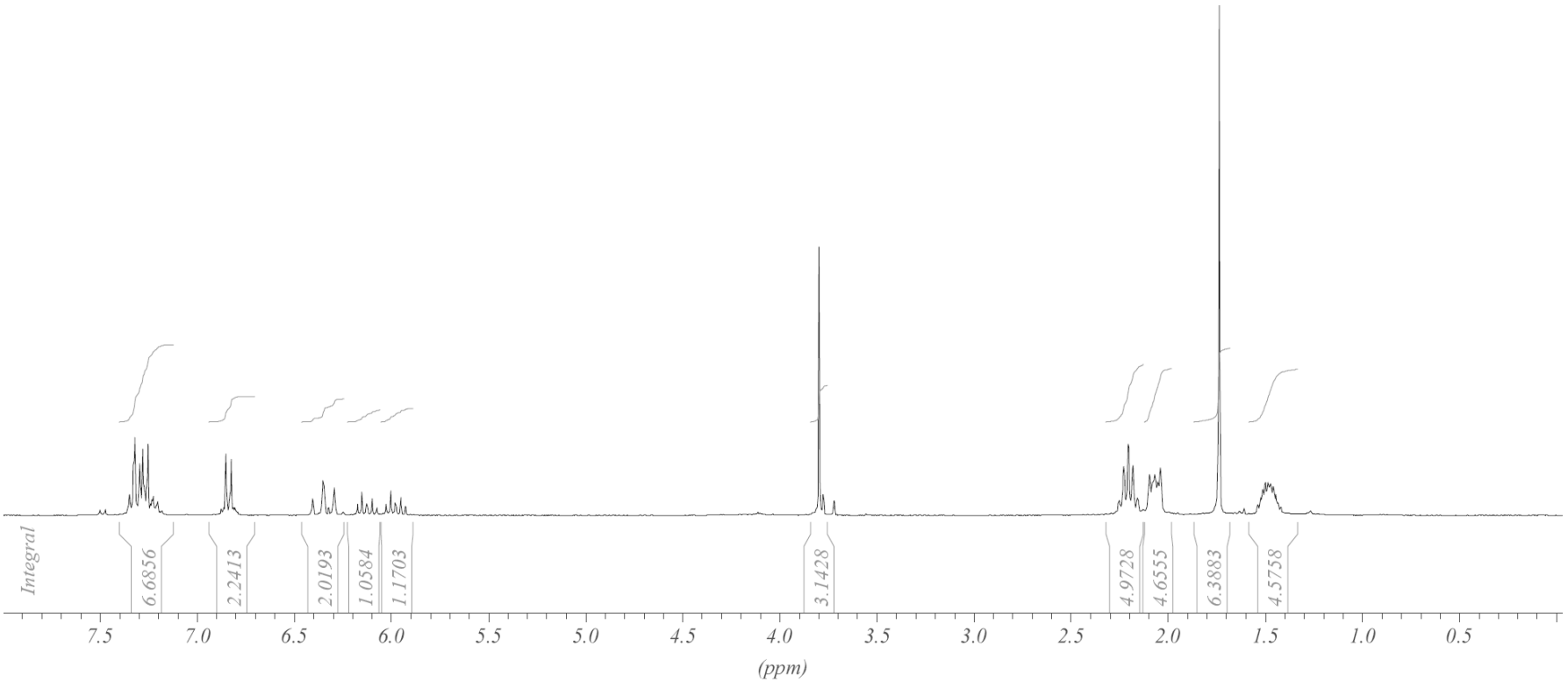


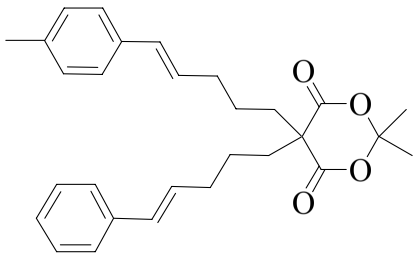
94


Integral
4.9318
0.8440
1.0000
1.1074
1.1839
2.8377
2.8000
8.2594
2.8261
0.8169
0.1566
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

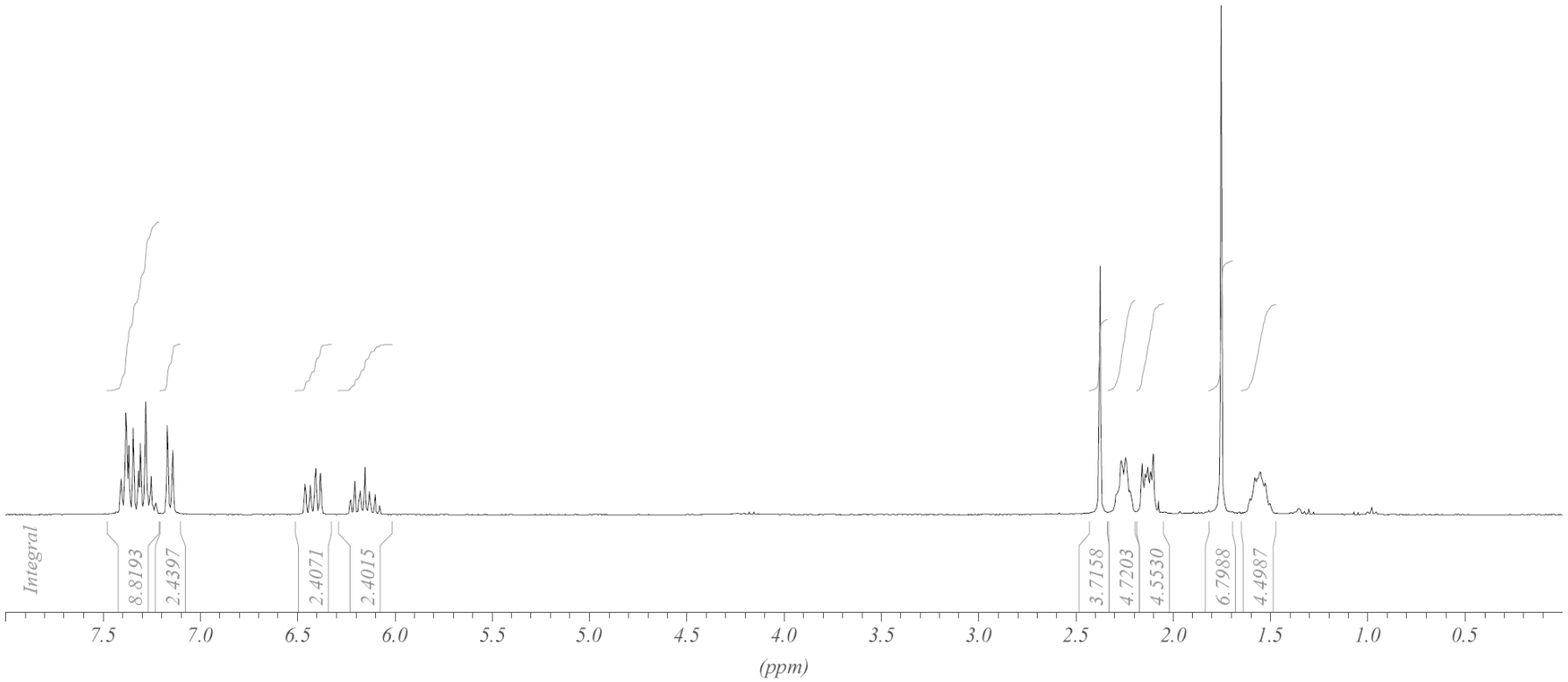

MeO
O
O
O
O
O

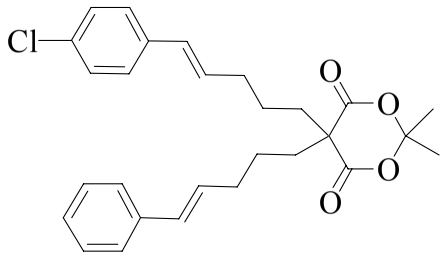
95a


Integral
6.6856
2.2413
2.0193
1.0584
1.1703
3.1428
4.9728
4.6555
6.3883
4.5758
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

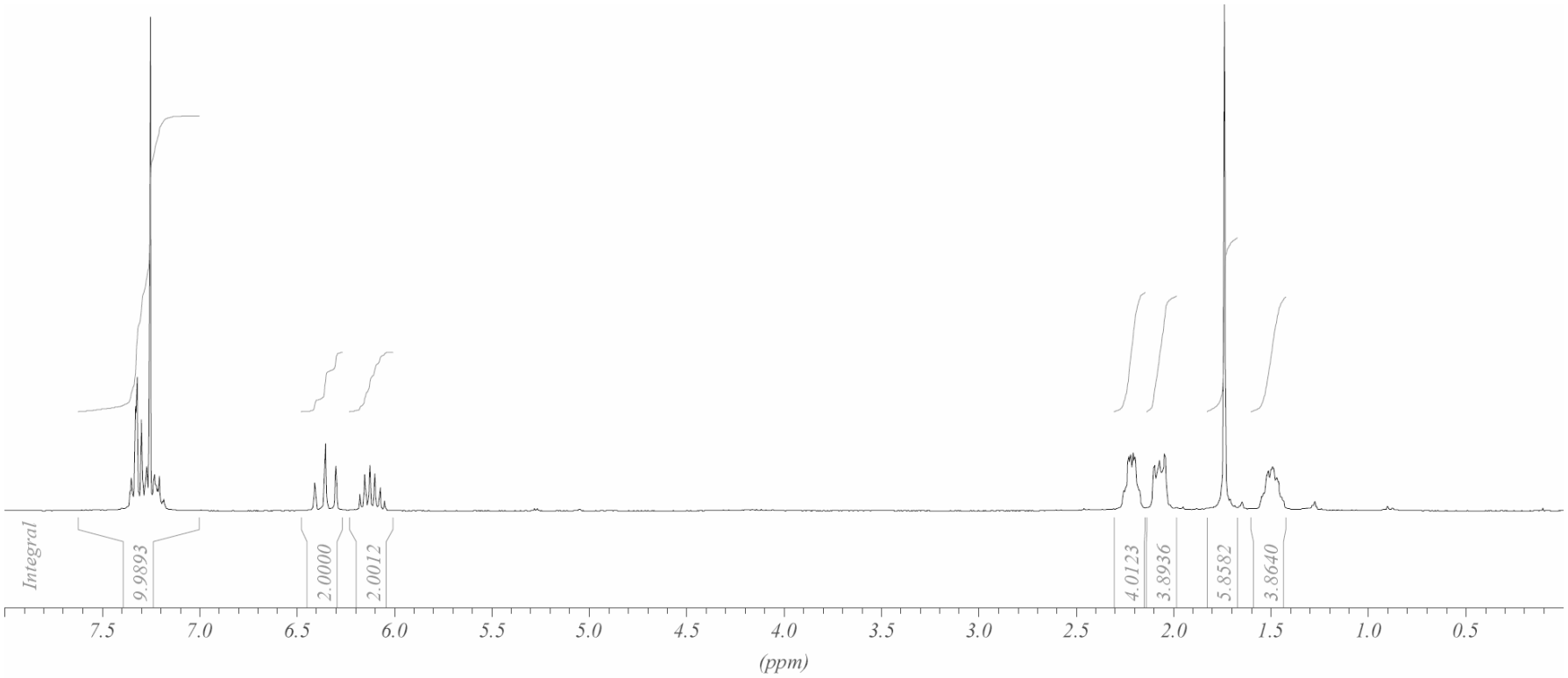


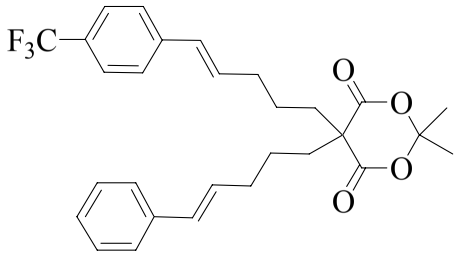
95b


Integral
8.8193
2.4397
2.4071
2.4015
3.7158
4.7203
4.5530
6.7988
4.4987
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

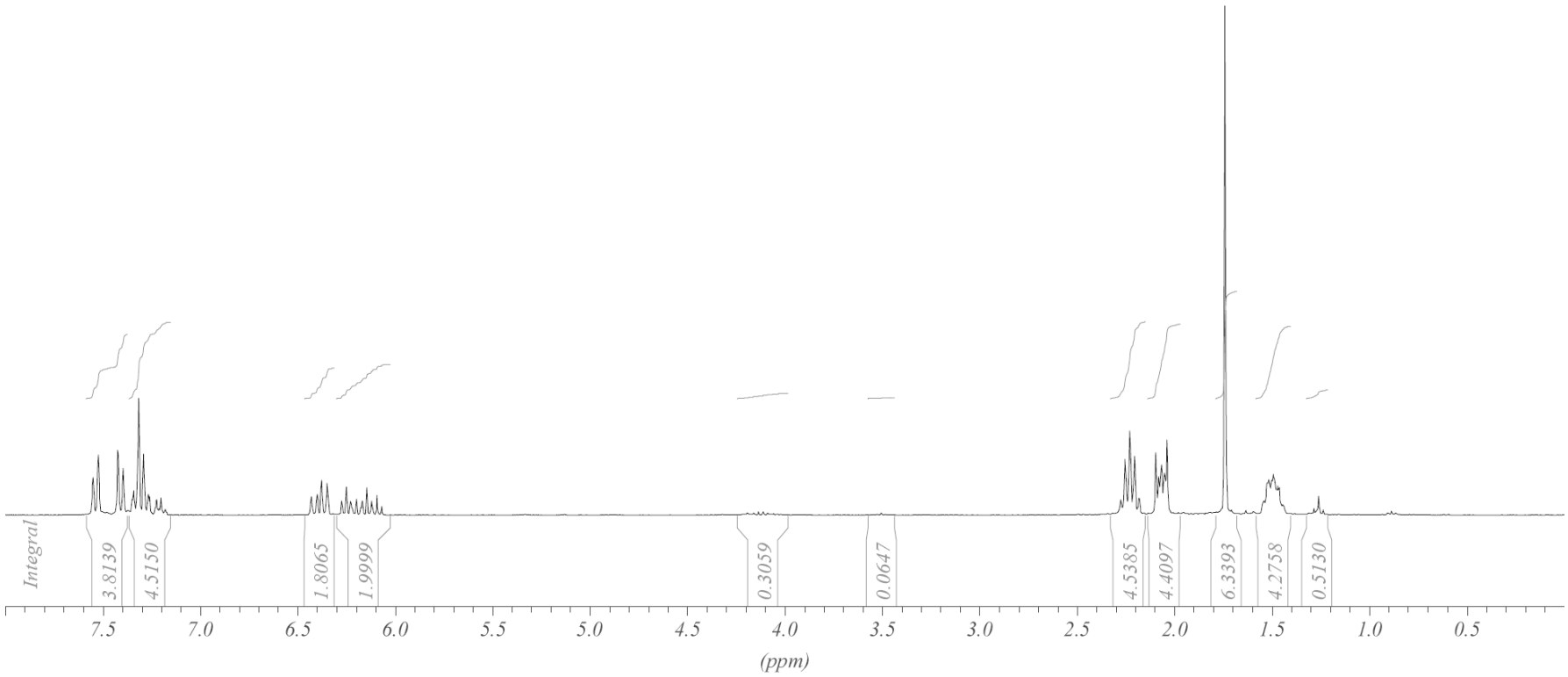

Cl
O
O
O
O

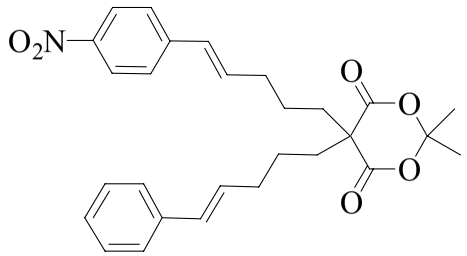
95c


Integral
9.9893
2.0000
2.0012
4.0123
3.8936
5.8582
3.8640
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

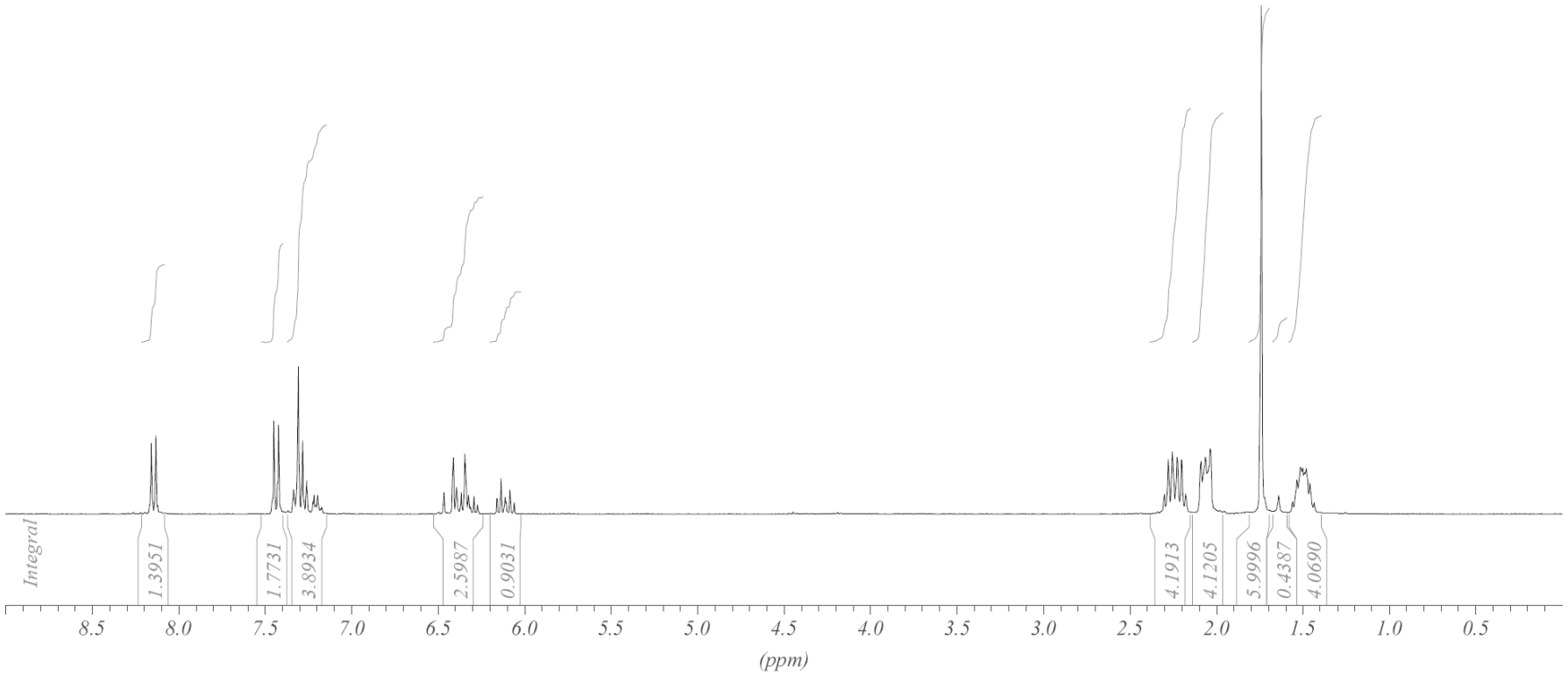

F3C
O
O
O
O

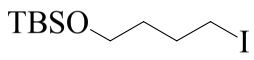
95d


Integral
3.8139
4.5150
1.8065
1.9999
0.3059
0.0647
4.5385
4.4097
6.3393
4.2758
0.5130
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

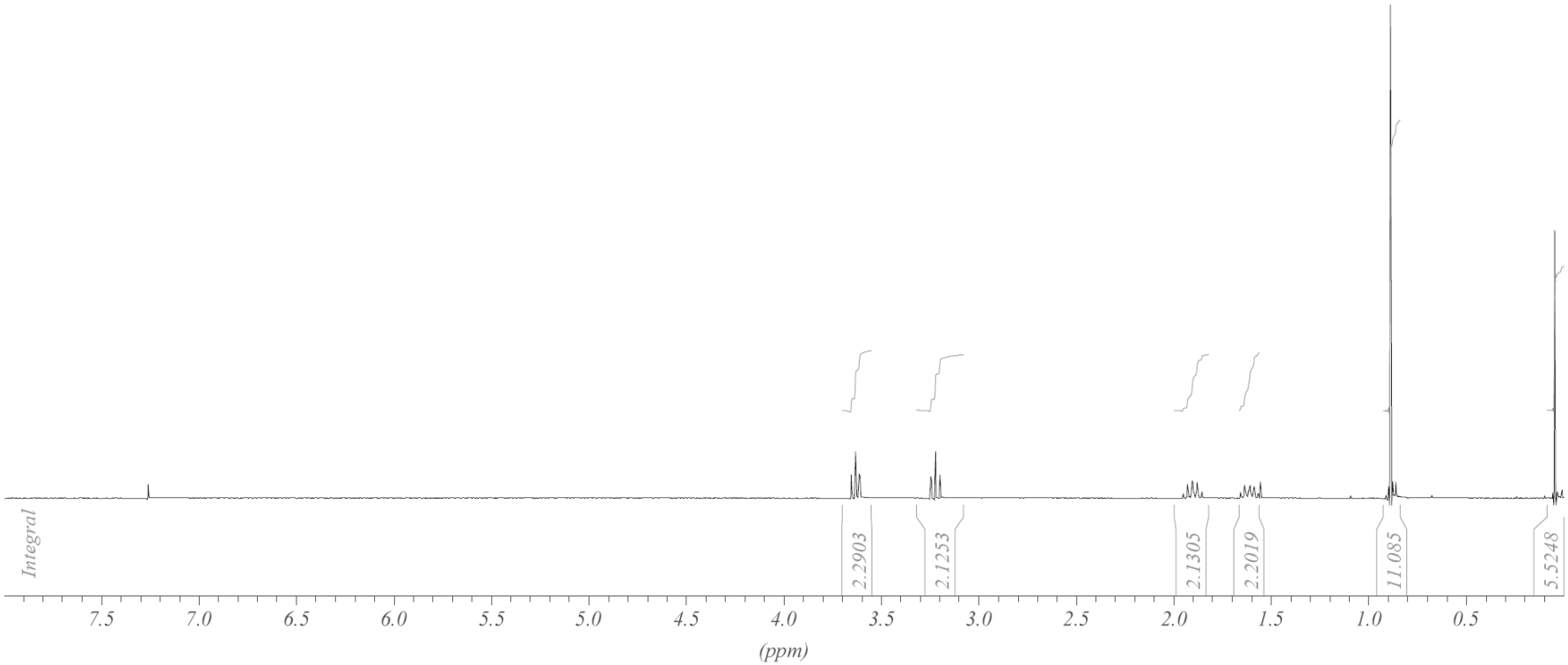


95e


Integral
1.3951
1.7731
3.8934
2.5987
0.9031
4.1913
4.1205
5.9996
0.4387
4.0690
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

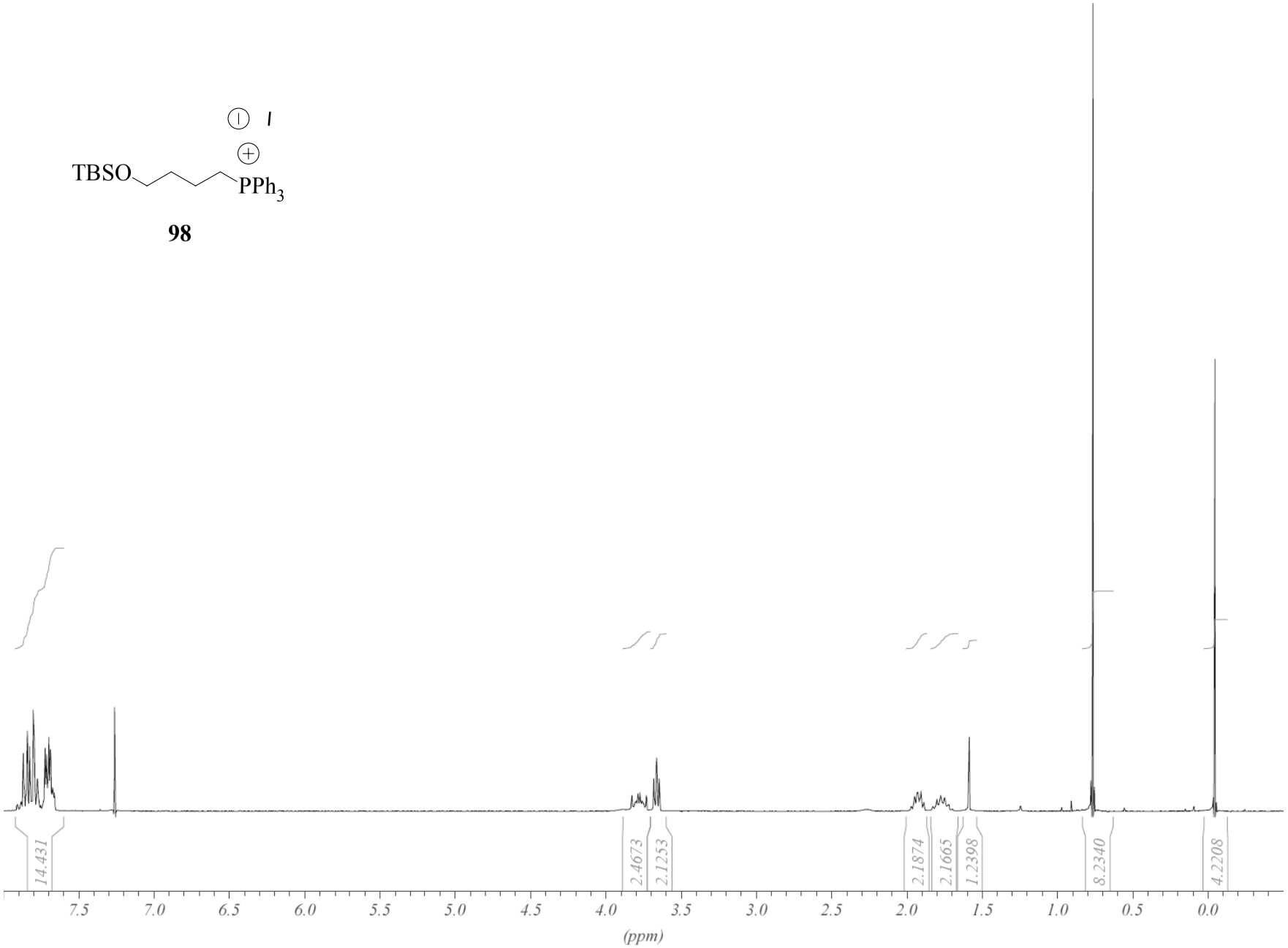

TBSO
I

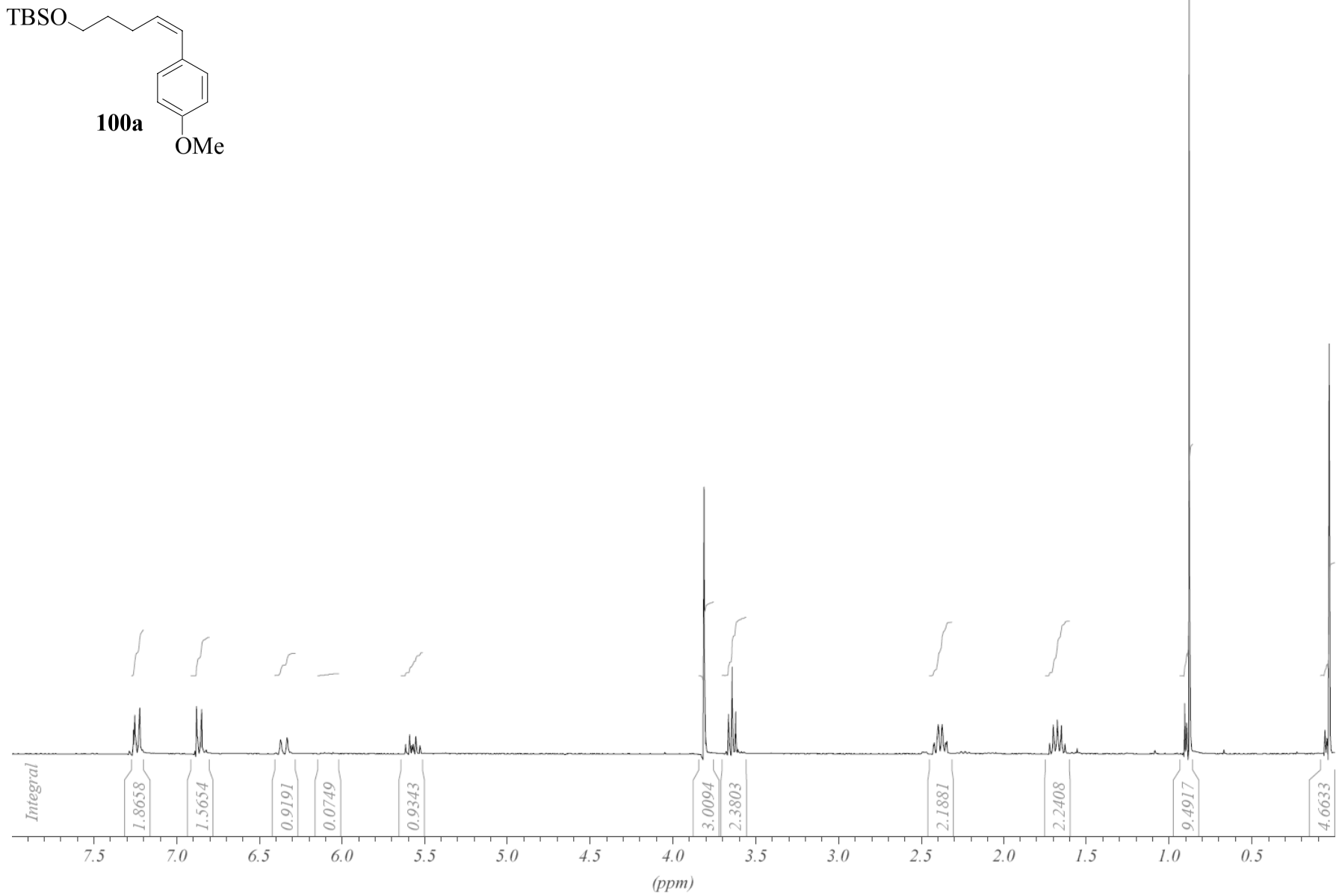
97


Integral
2.2903
2.1253
2.1305
2.2019
11.085
5.5248
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

I
TBSO
PPh3

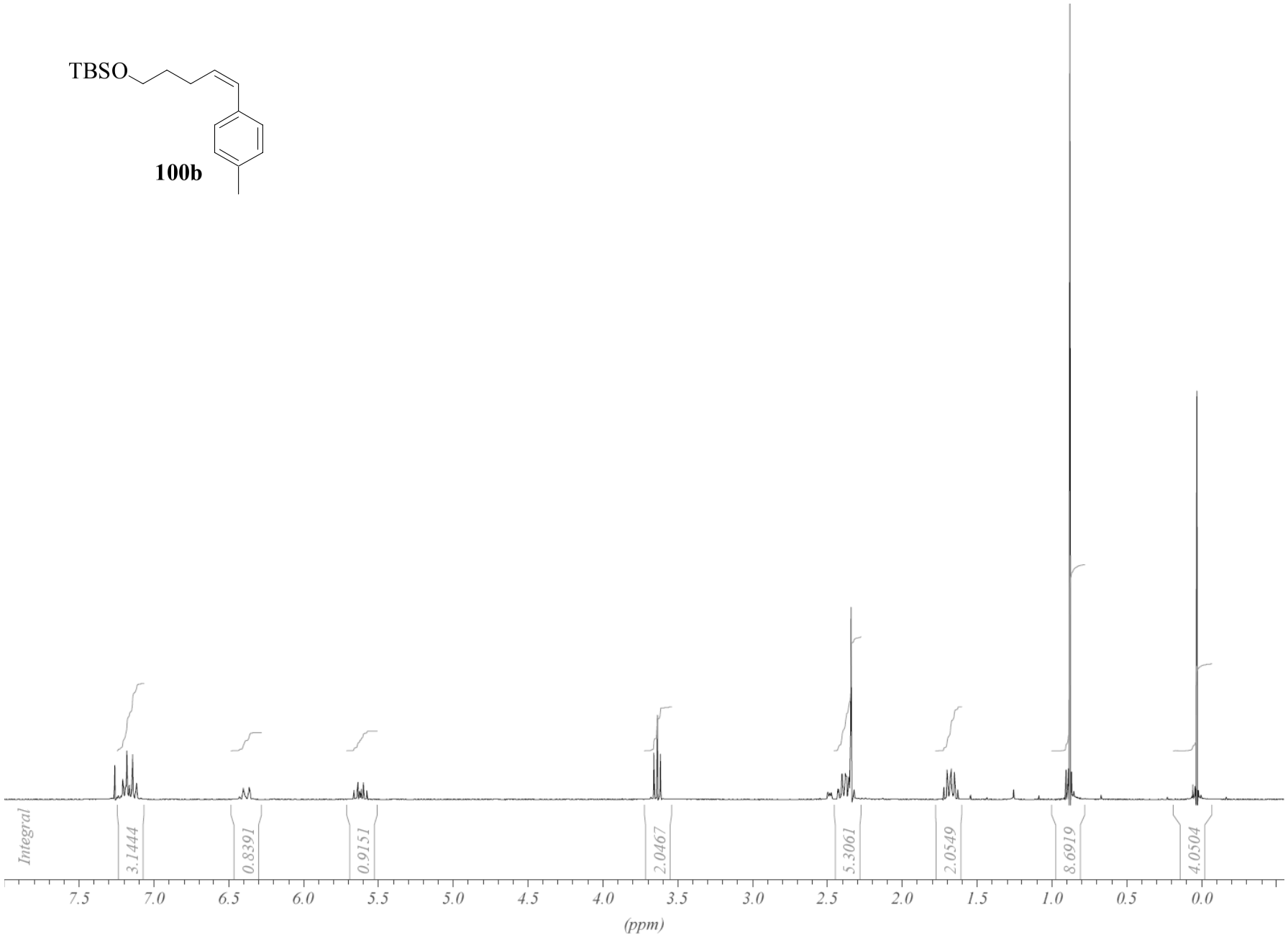
98


14.431
2.4673
2.1253
2.1874
2.1665
1.2398
8.2340
4.2208
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
(ppm)


TBSO
OMe
100a
Integral
1.8658
1.5654
0.9191
0.0749
0.9343
3.0094
2.3803
2.1881
2.2408
9.4917
4.6633
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

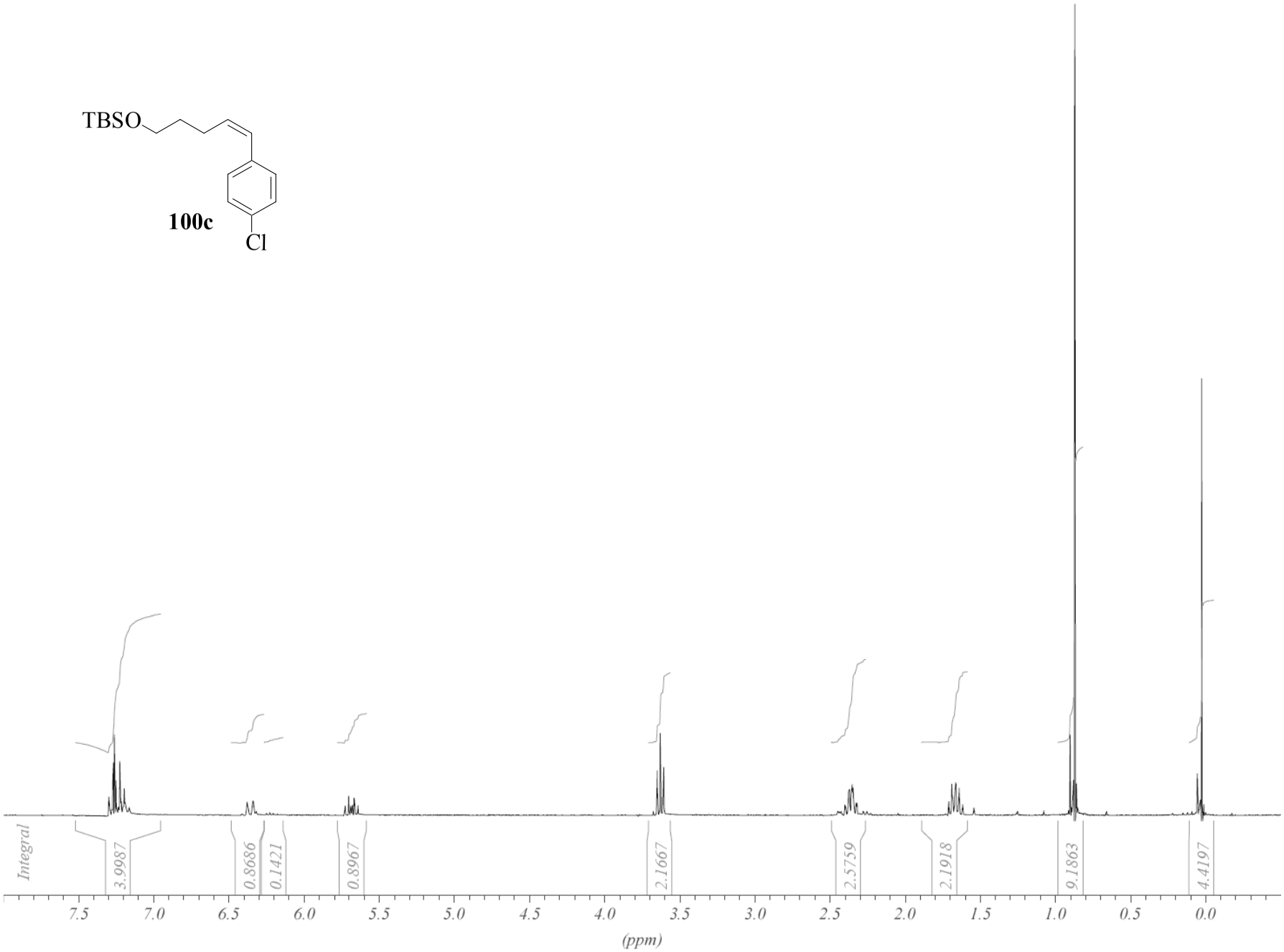
TBSO

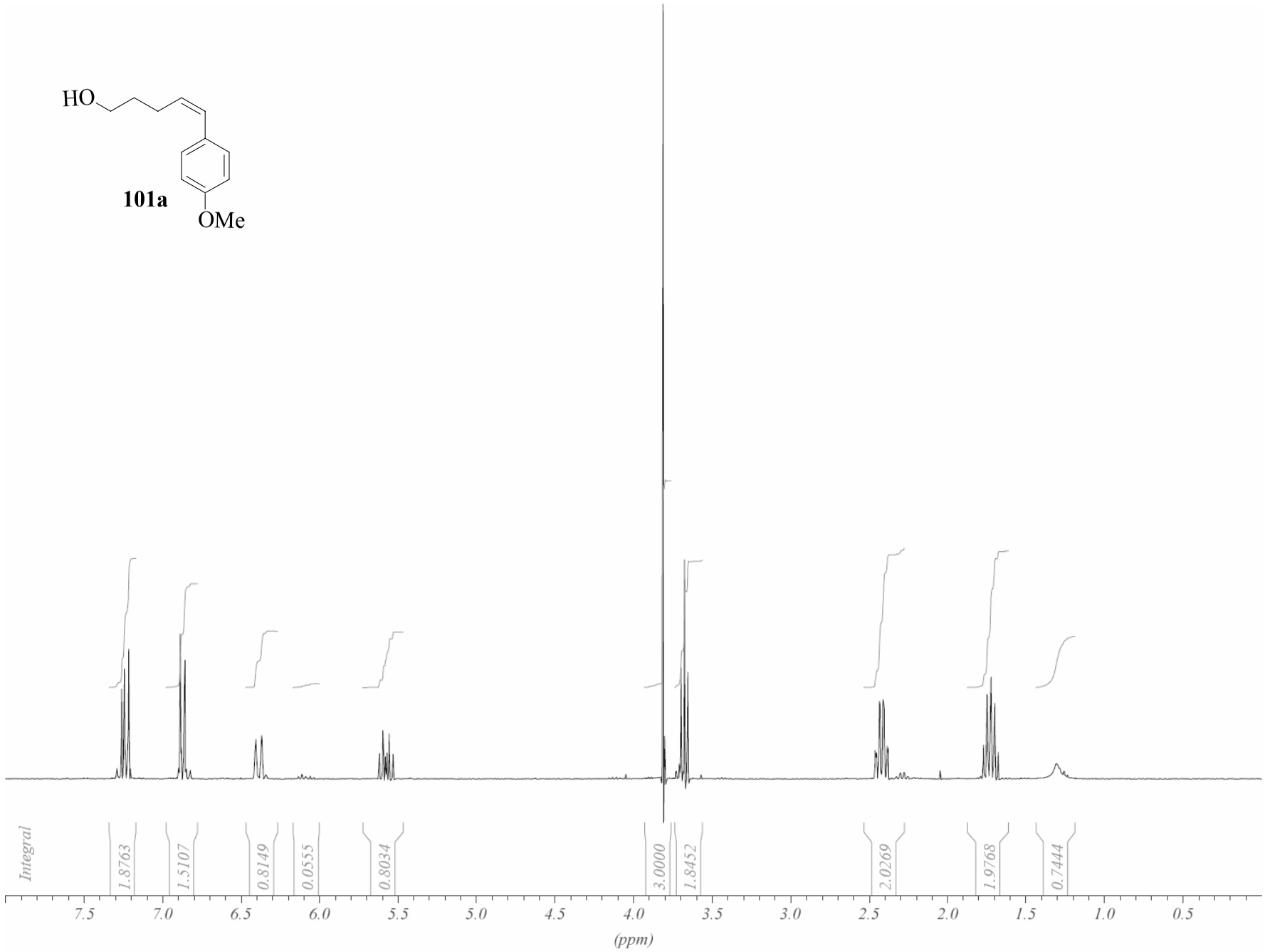
100b

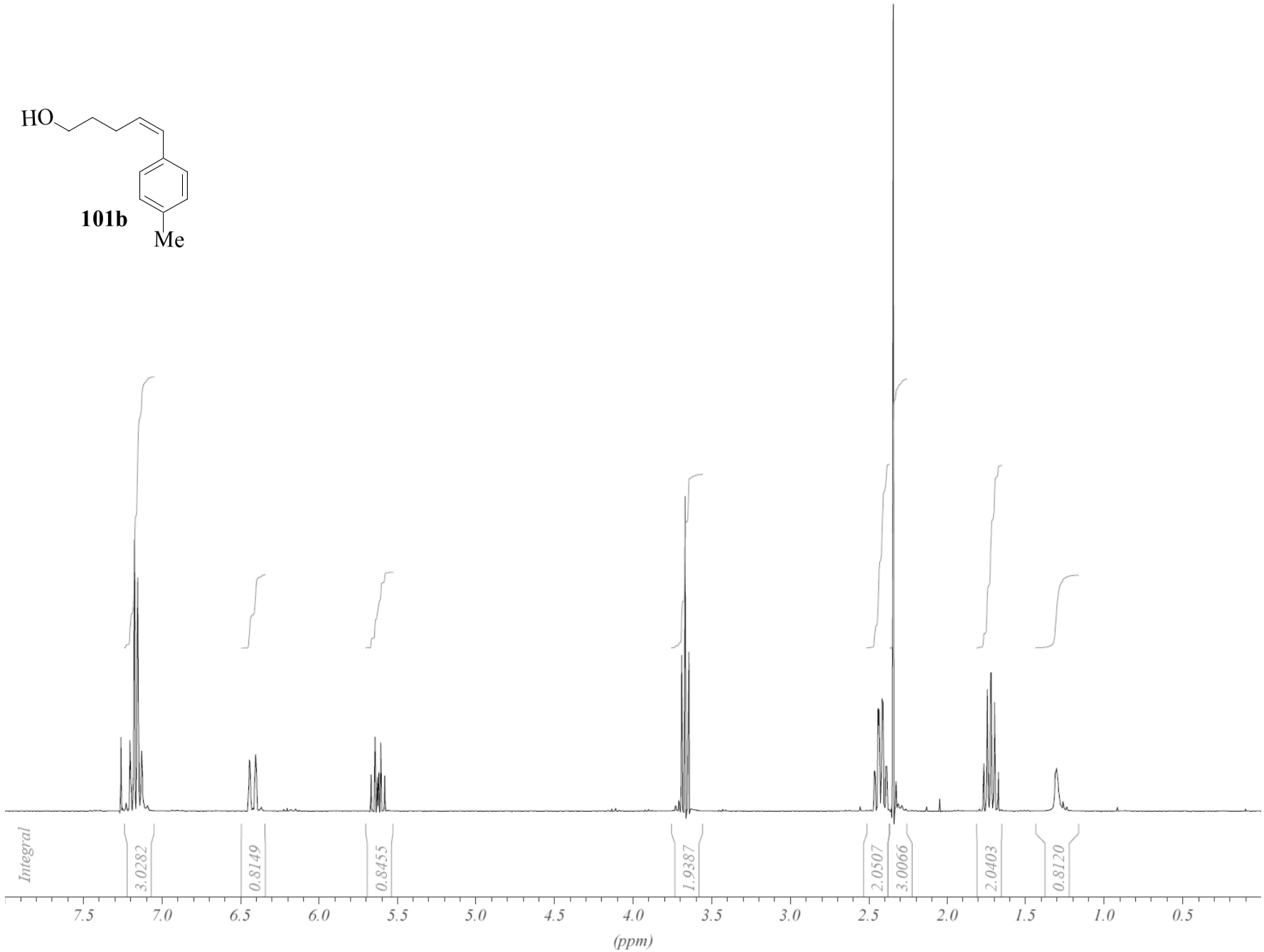

Integral
3.1444
0.8391
0.9151
2.0467
5.3061
2.0549
8.6919
4.0504
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
(ppm)

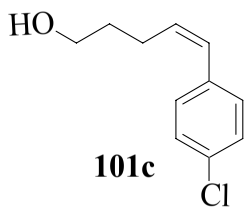
TBSO
Cl

100c

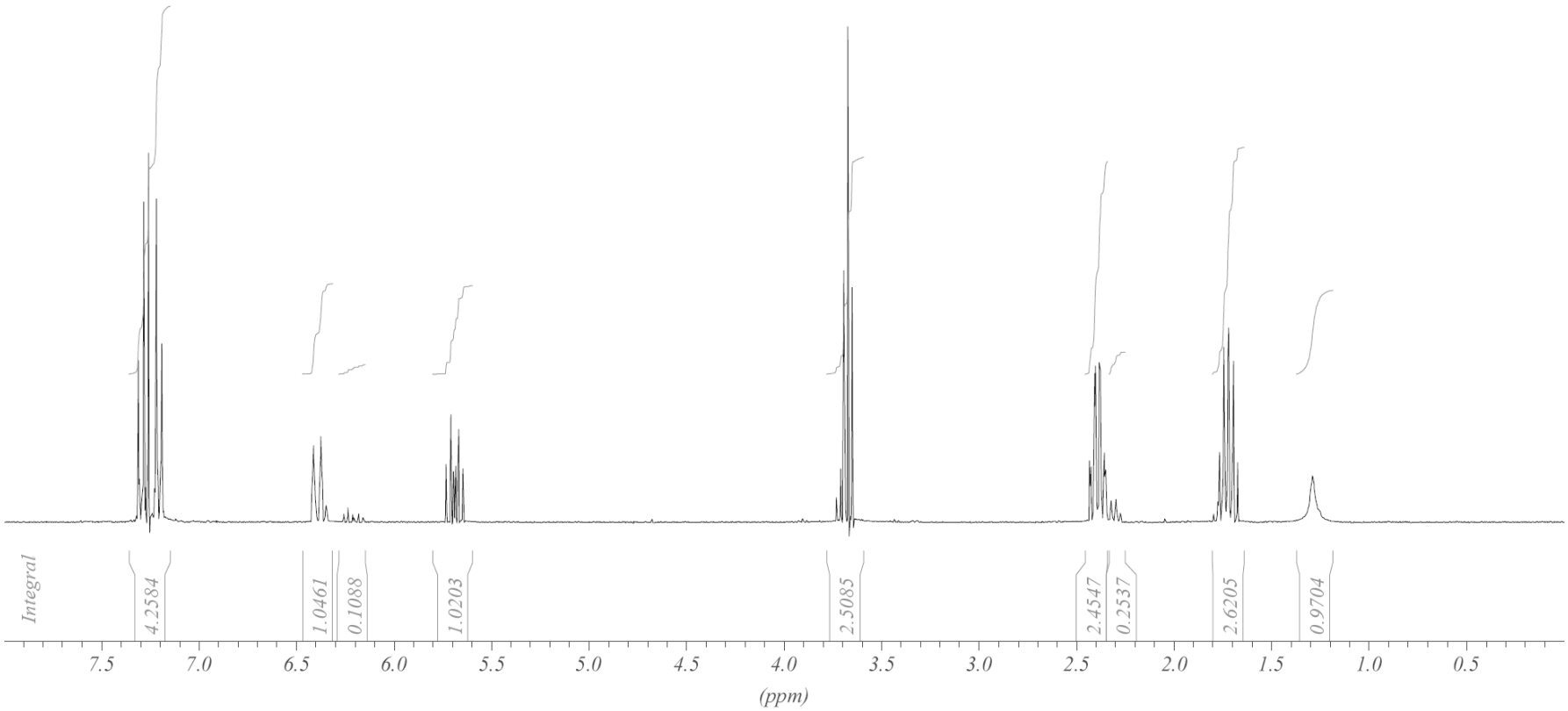

Integral
3.9987
0.8686
0.1421
0.8967
2.1667
2.5759
2.1918
9.1863
4.4197
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
(ppm)


HO
OMe
101a
Integral
1.8763
1.5107
0.8149
0.0555
0.8034
3.0000
1.8452
2.0269
1.9768
0.7444
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


HO
101b
Me
Integral
3.0282
0.8149
0.8455
1.9387
2.0507
3.0066
2.0403
0.8120
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

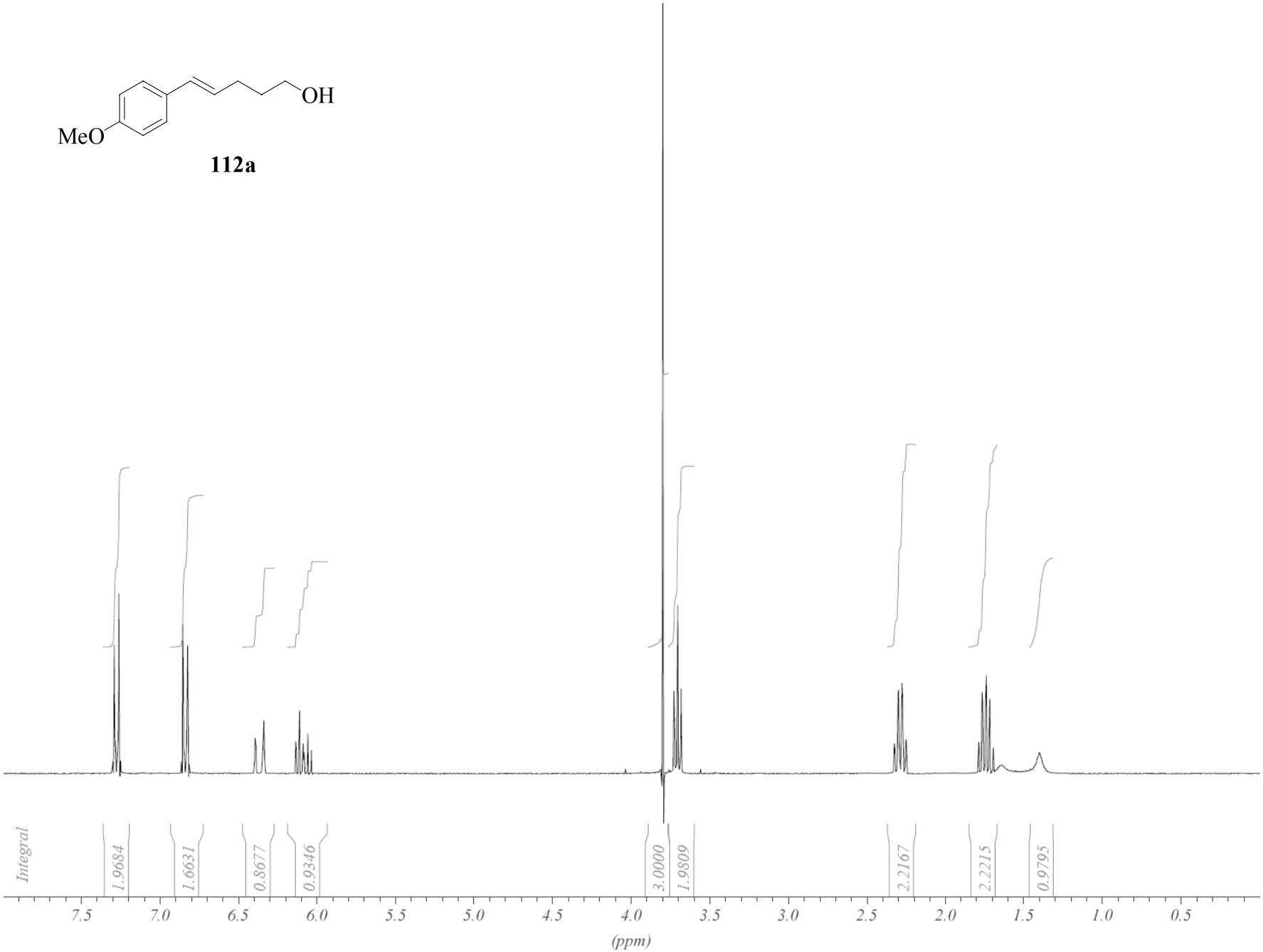

HO
Cl

101c


Integral
4.2584
1.0461
0.1088
1.0203
2.5085
2.4547
0.2537
2.6205
0.9704
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

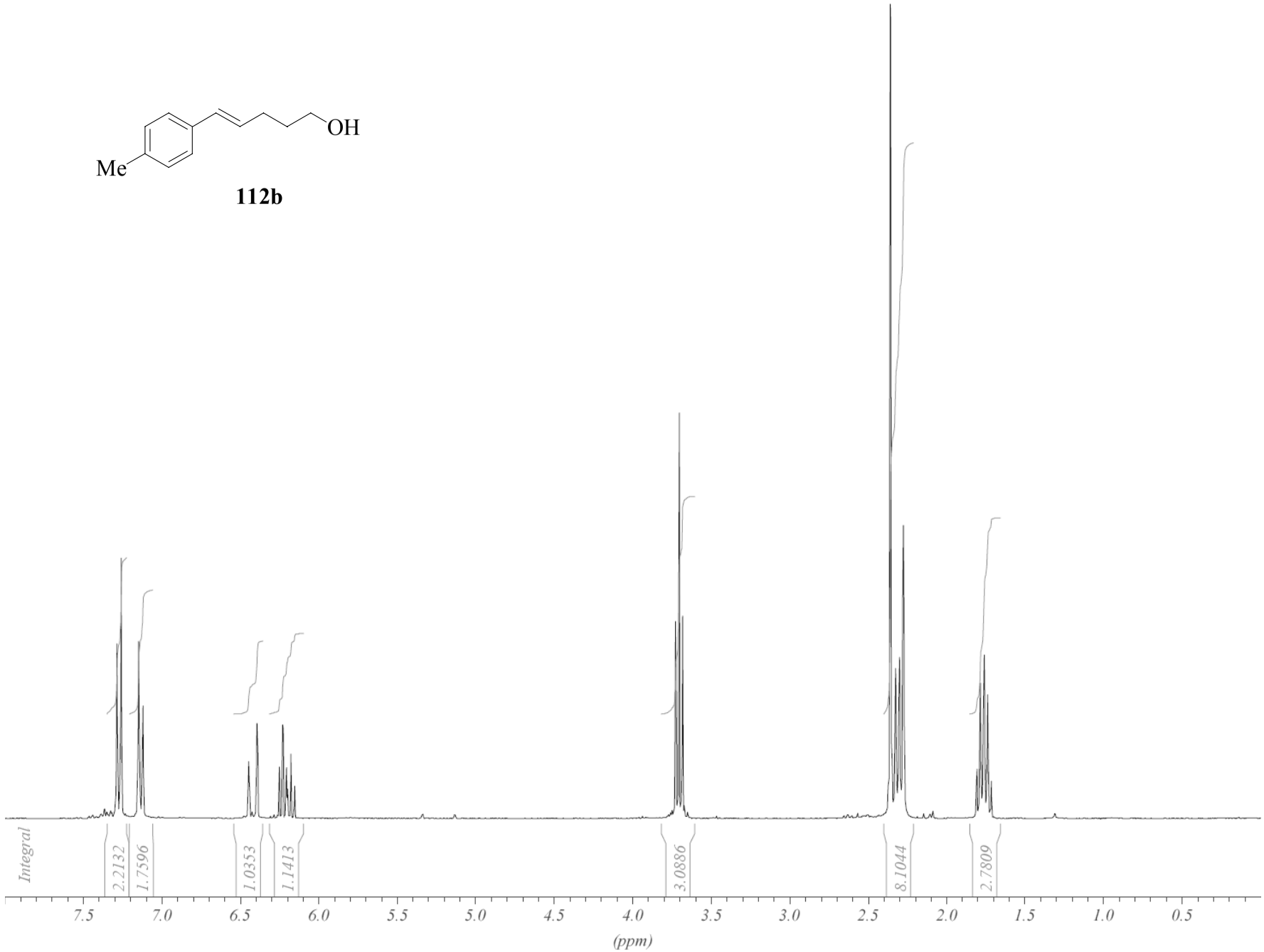
MeO
OH

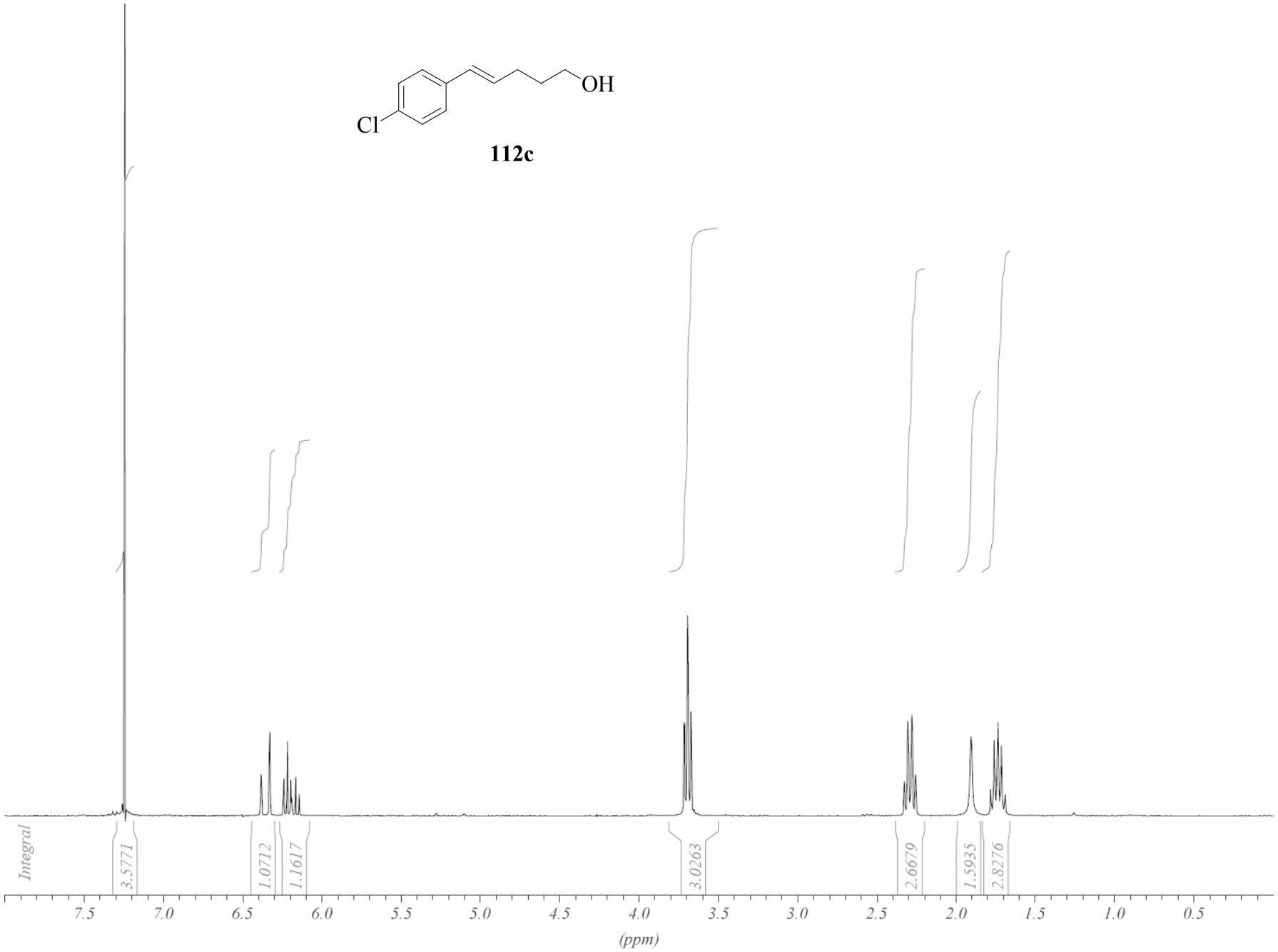
112a

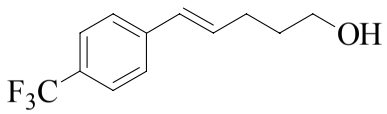

Integral
1.9684
1.6631
0.8677
0.9346
3.0000
1.9809
2.2167
2.2215
0.9795
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

OH
Me

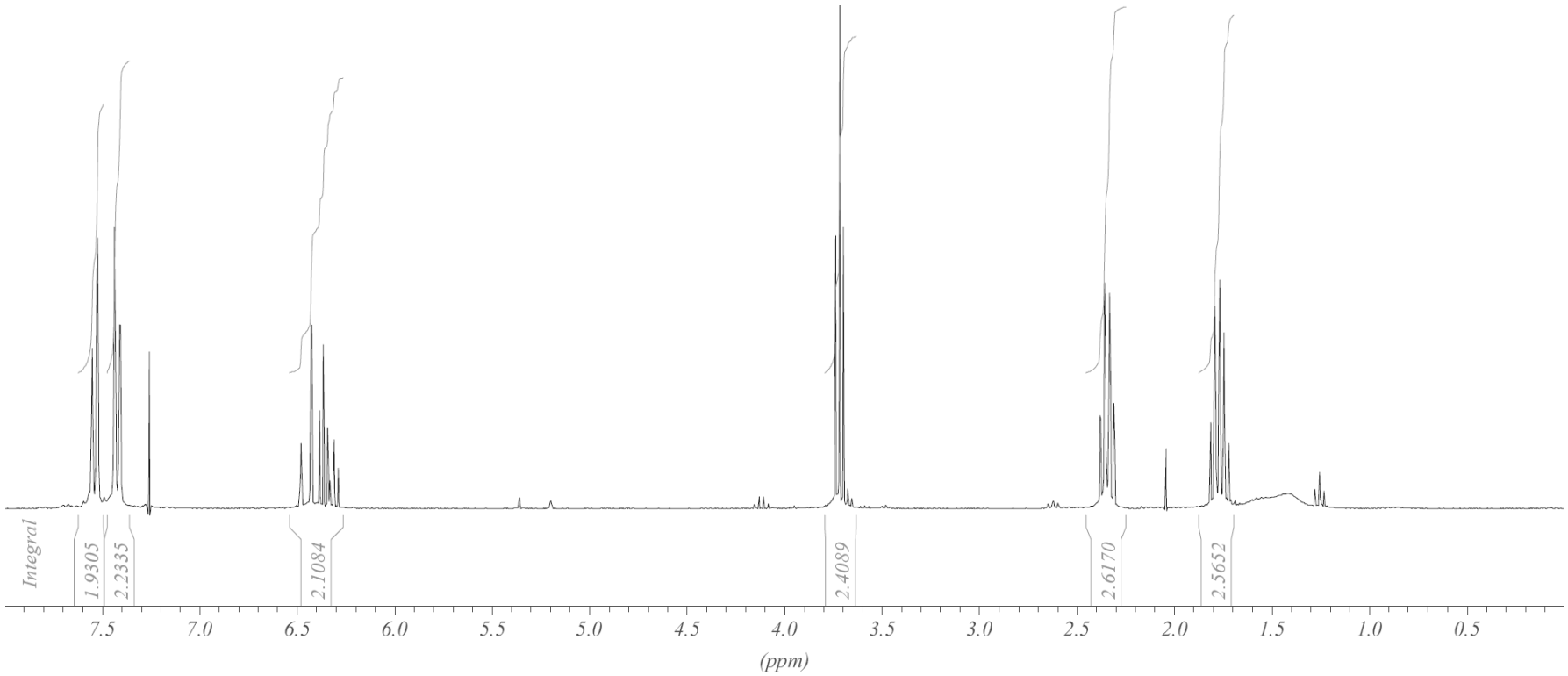
112b

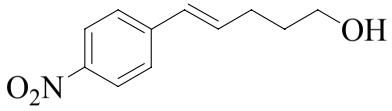

Integral
2.2132
1.7596
1.0353
1.1413
3.0886
8.1044
2.7809
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


OH
Cl
112c
Integral
3.5771
1.0712
1.1617
3.0263
2.6679
1.5935
2.8276
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

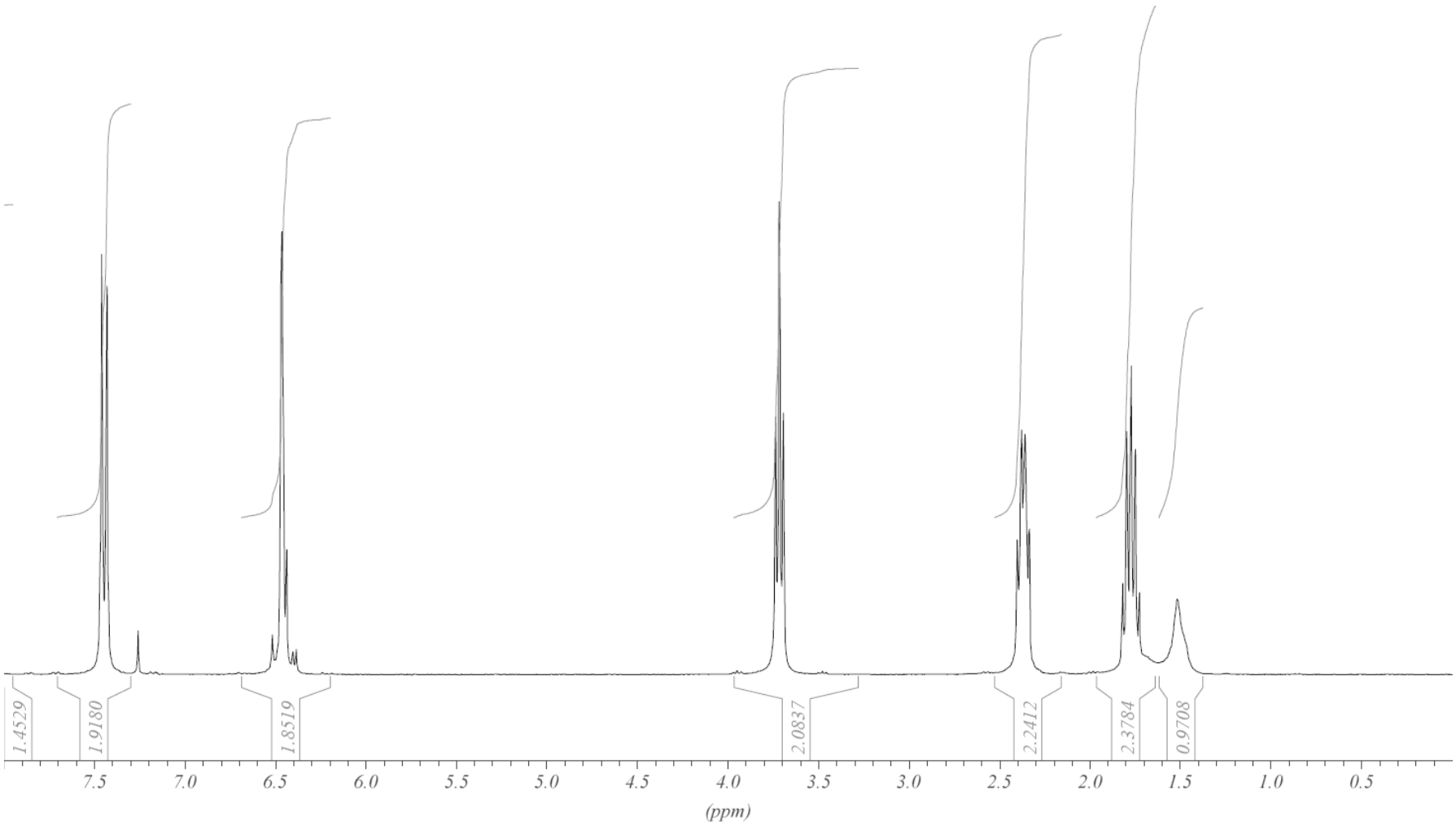

OH
F3C

112d


Integral
1.9305
2.2335
2.1084
2.4089
2.6170
2.5652
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

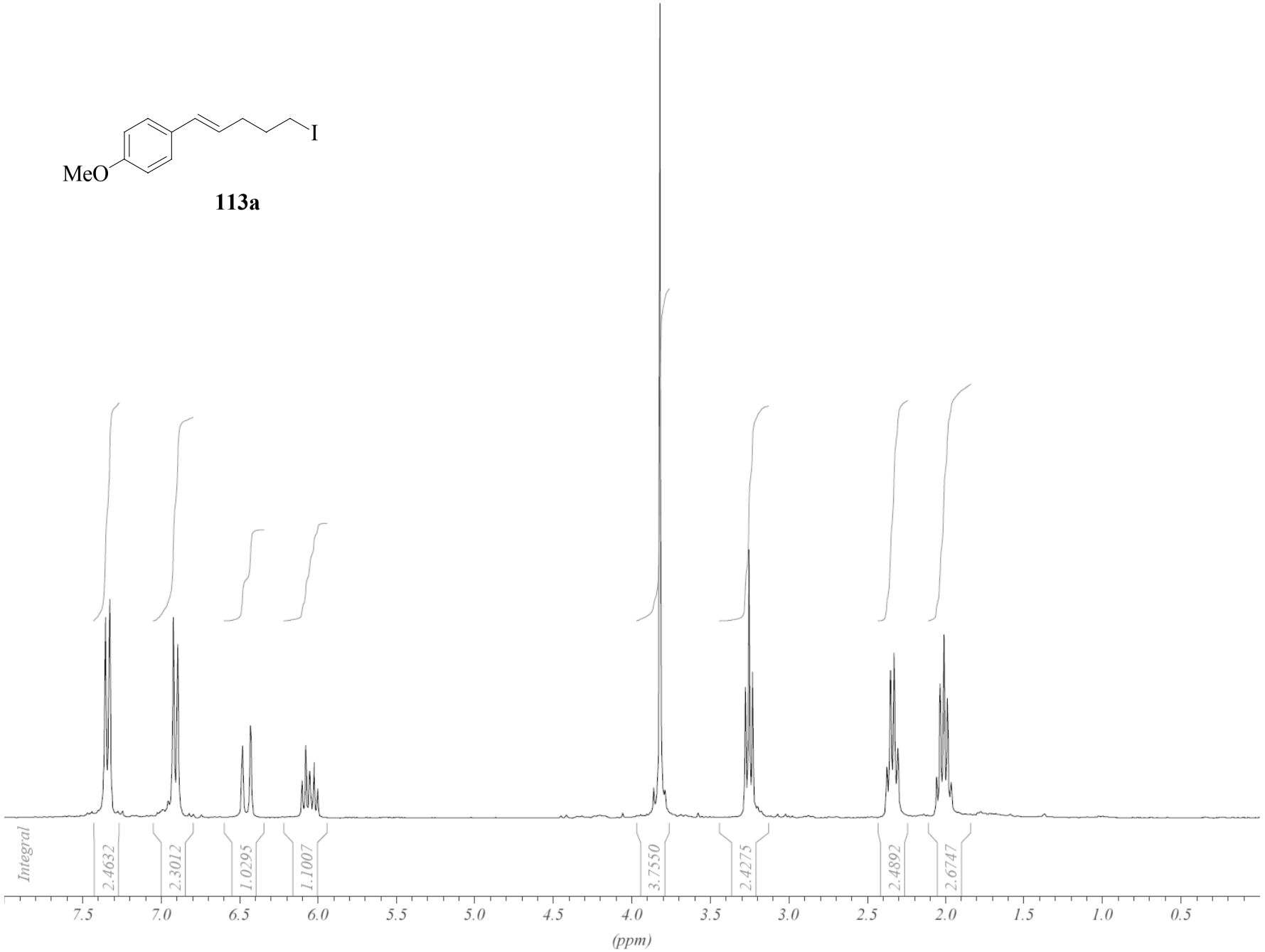

OH
O2N

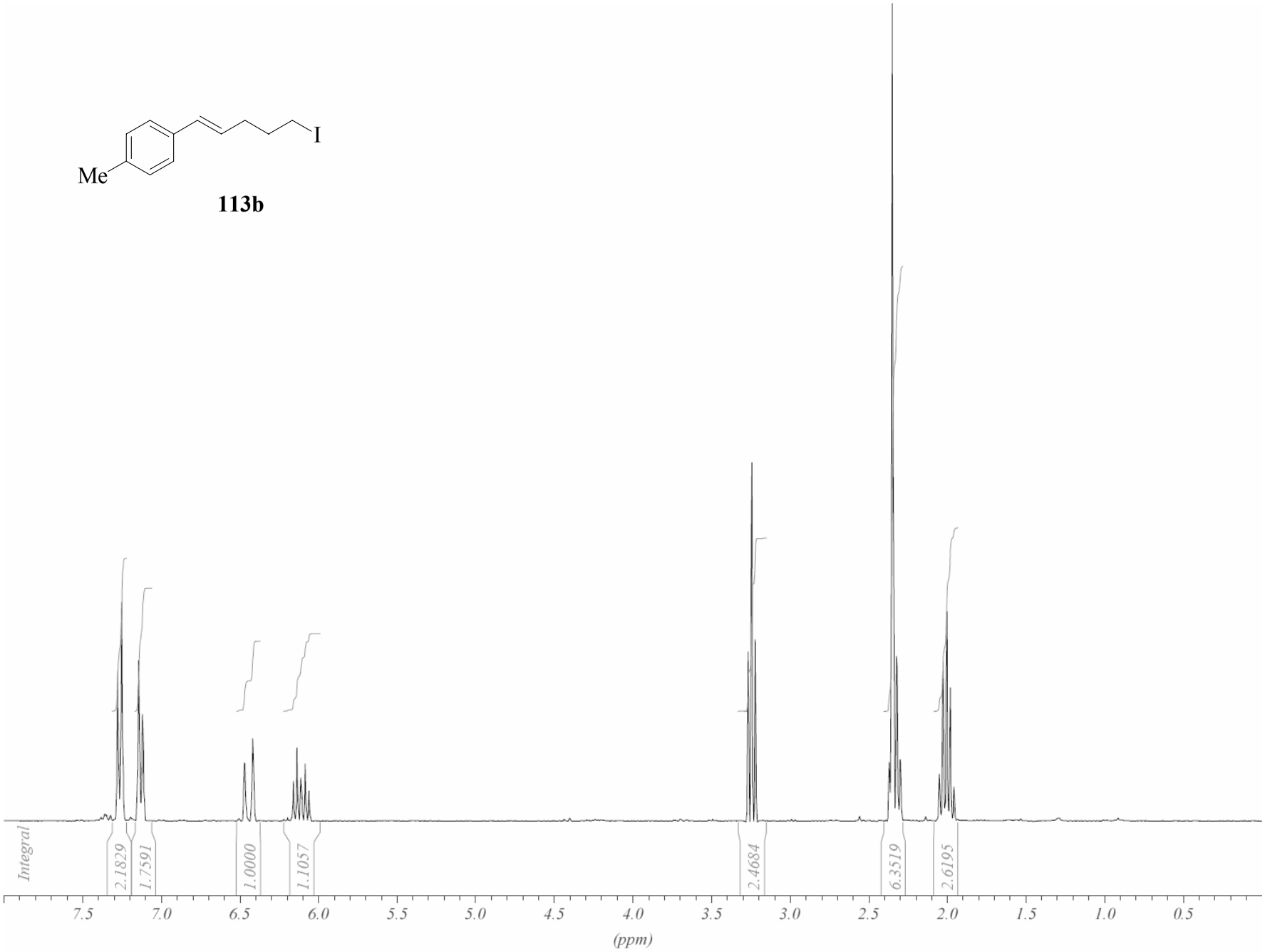
112e


1.4529
1.9180
1.8519
2.0837
2.2412
2.3784
0.9708
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

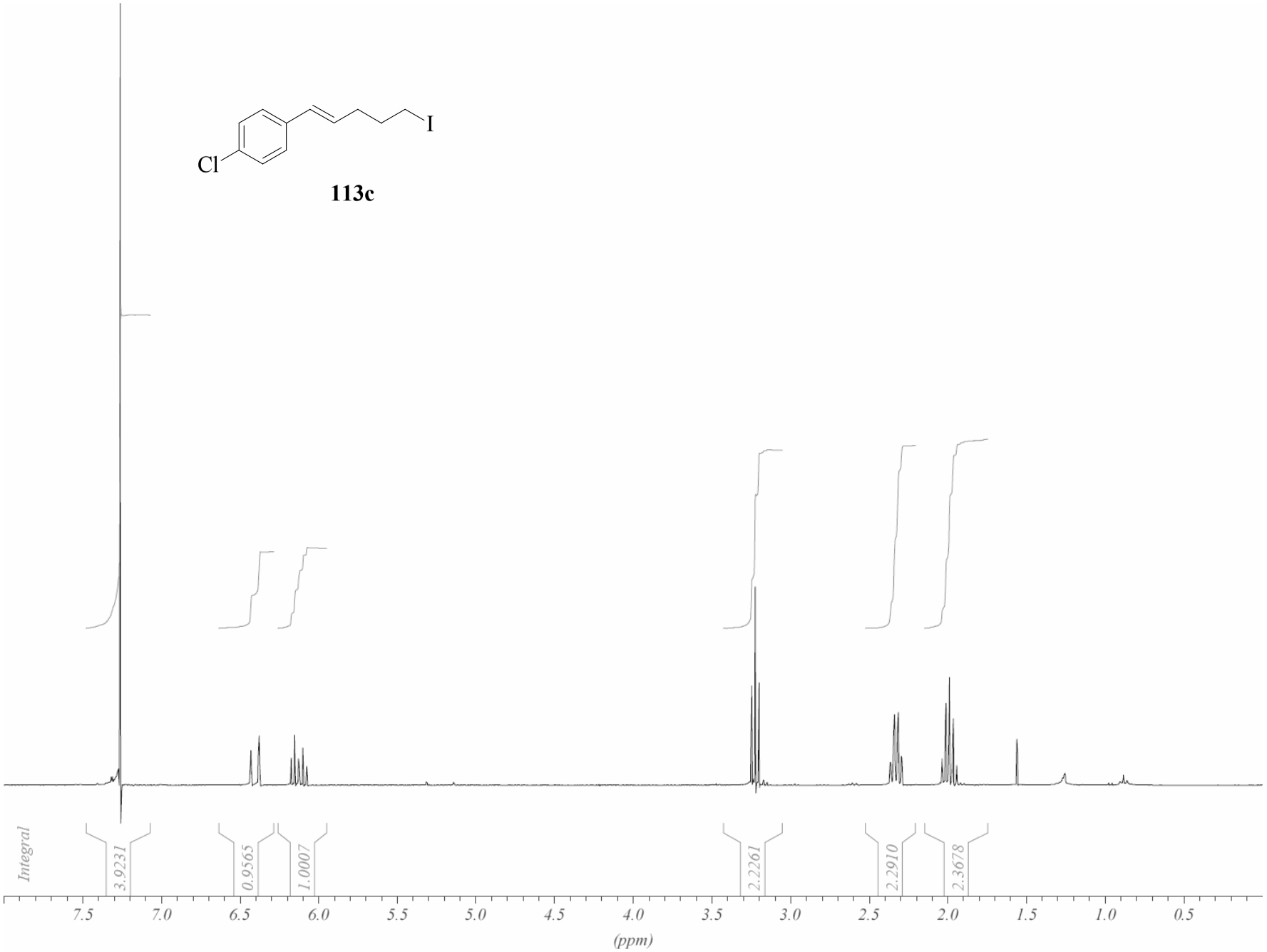
MeO
I

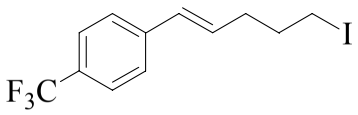
113a


Integral
2.4632
2.3012
1.0295
1.1007
3.7550
2.4275
2.4892
2.6747
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

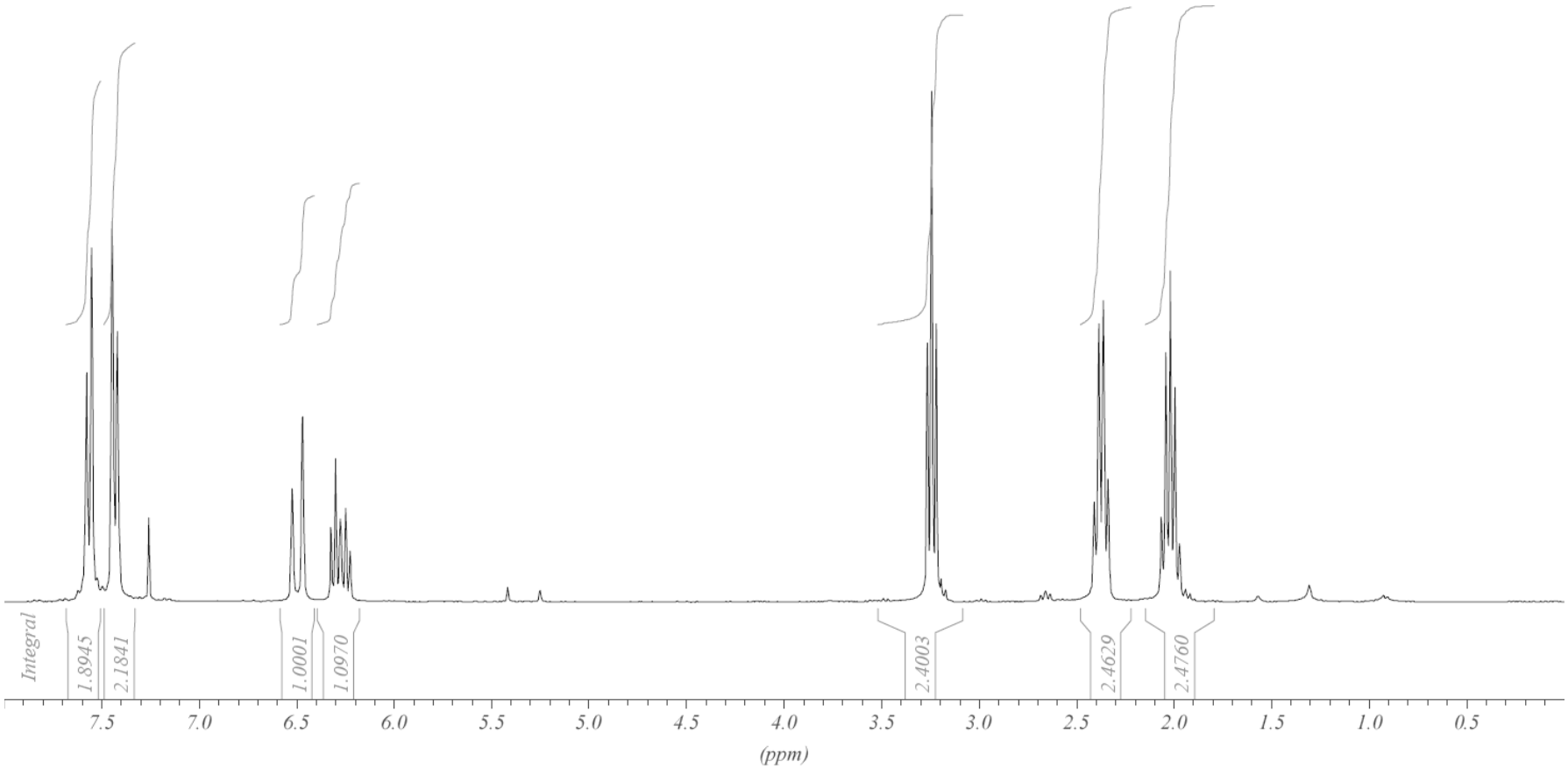

Me
I
Integral
2.1829
1.7591
1.0000
1.1057
2.4684
6.3519
2.6195
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

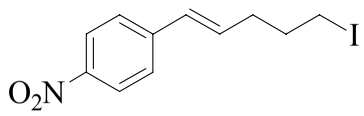
113b


Cl
I
113c
Integral
3.9231
0.9565
1.0007
2.2261
2.2910
2.3678
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

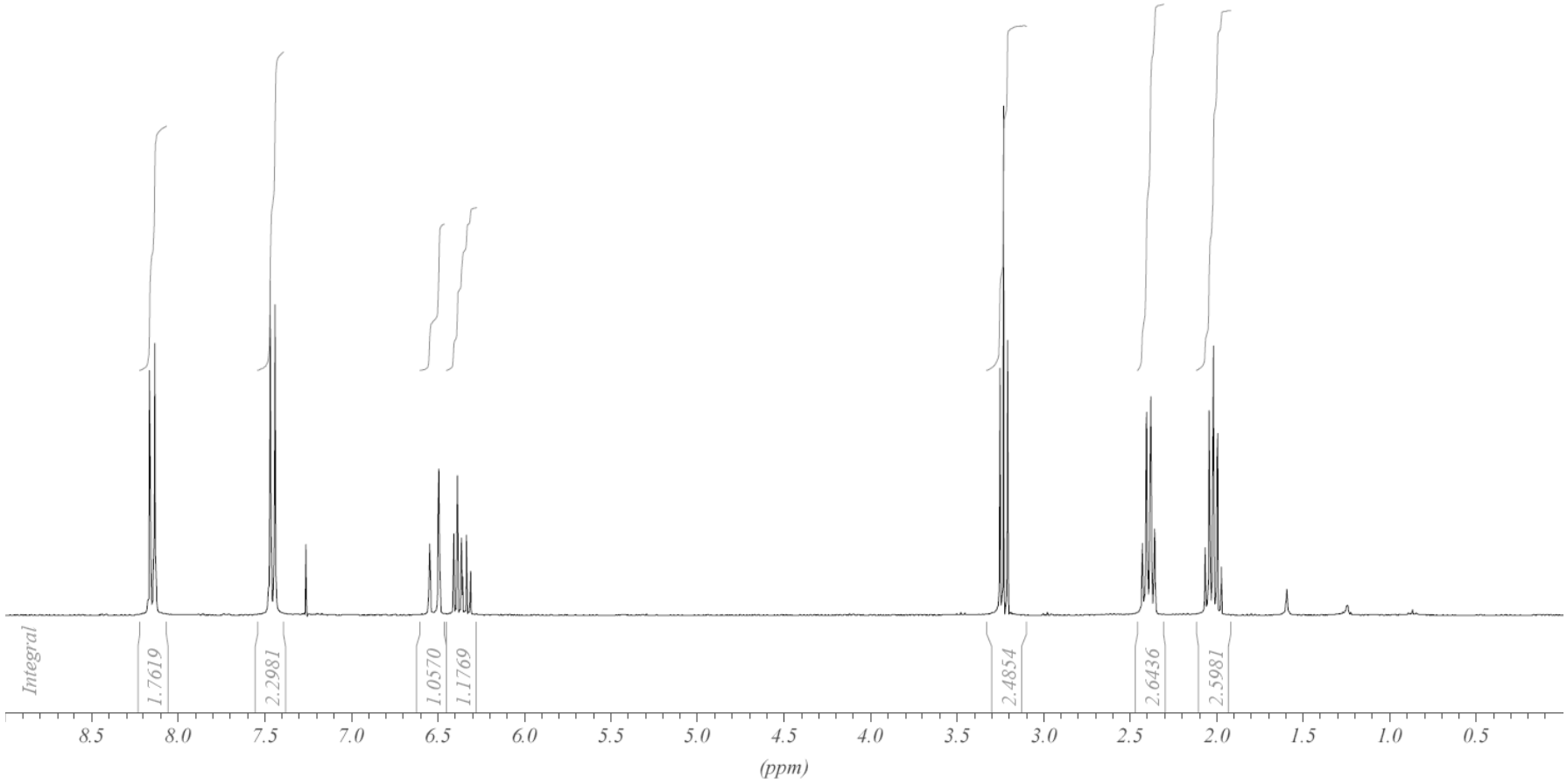

F3C
I

113d


Integral
1.8945
2.1841
1.0001
1.0970
2.4003
2.4629
2.4760
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

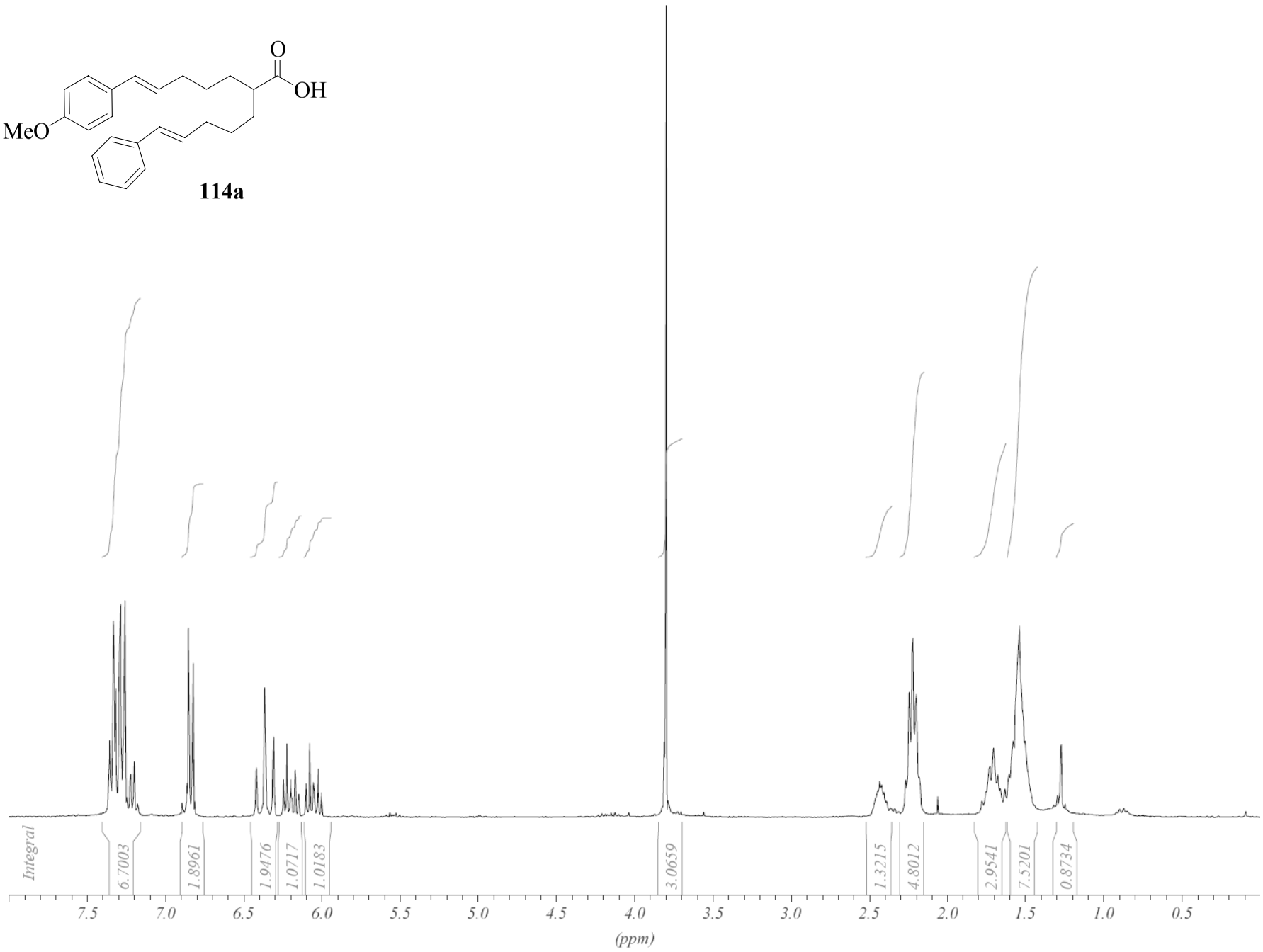

I
O2N

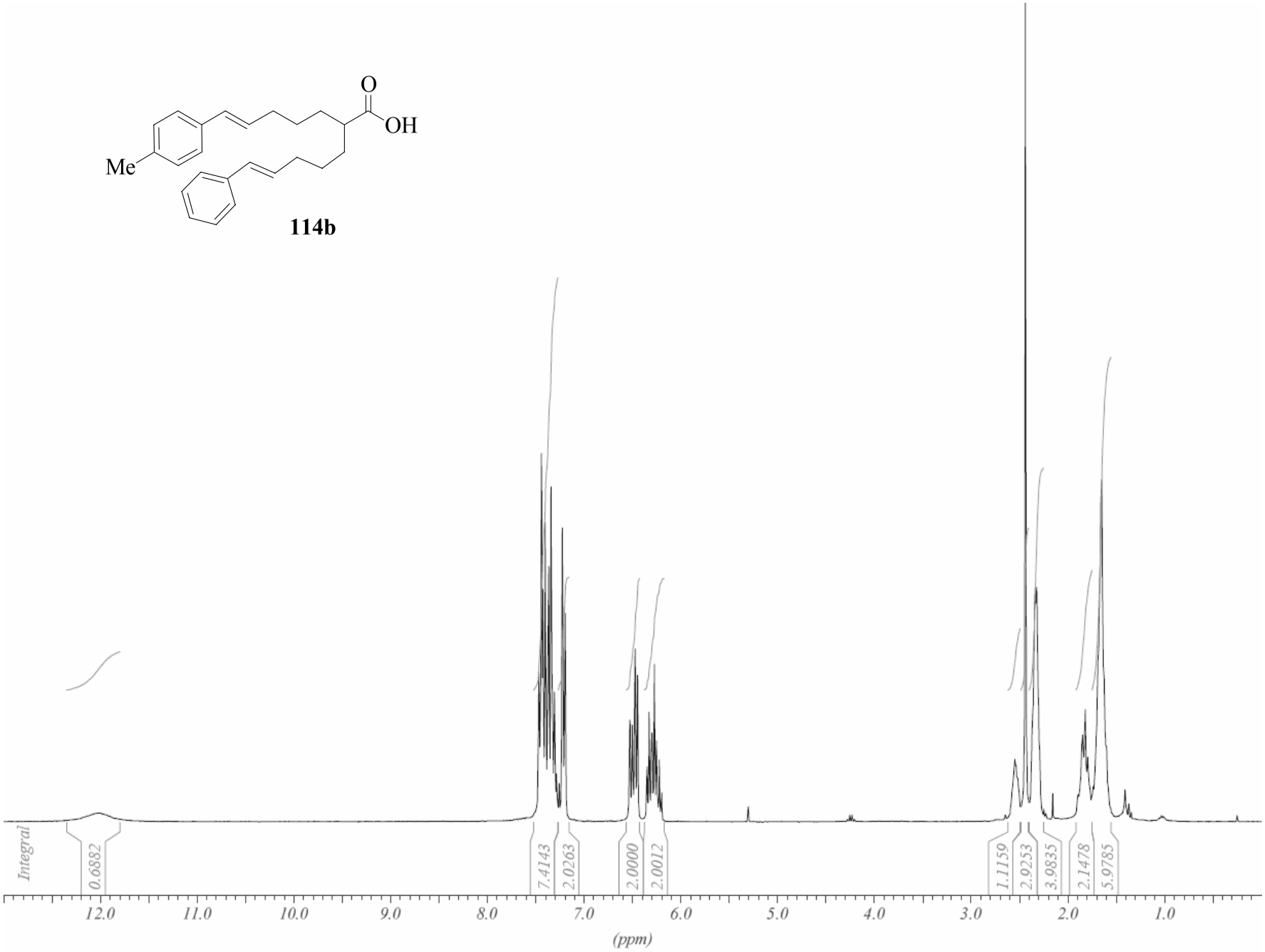
113e


Integral
1.7619
2.2981
1.0570
1.1769
2.4854
2.6436
2.5981
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

O
OH
MeO

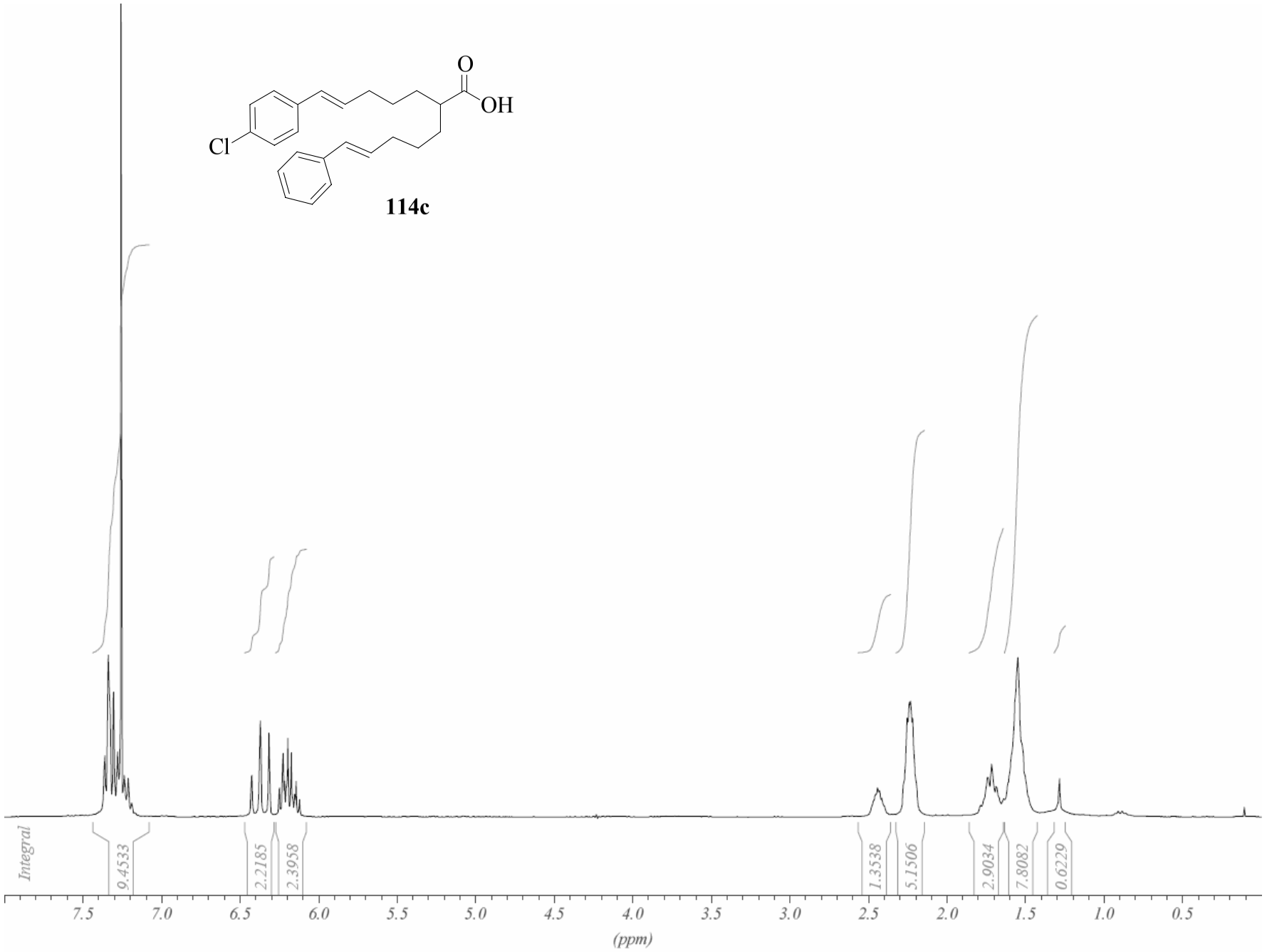
114a

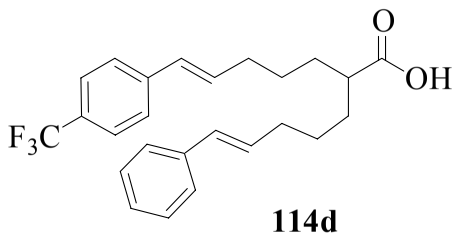

Integral
6.7003
1.8961
1.9476
1.0717
1.0183
3.0659
1.3215
4.8012
2.9541
7.5201
0.8734
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


O
OH
Me
114b
Integral
0.6882
7.4143
2.0263
2.0000
2.0012
1.1159
2.9253
3.9835
2.1478
5.9785
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
(ppm)

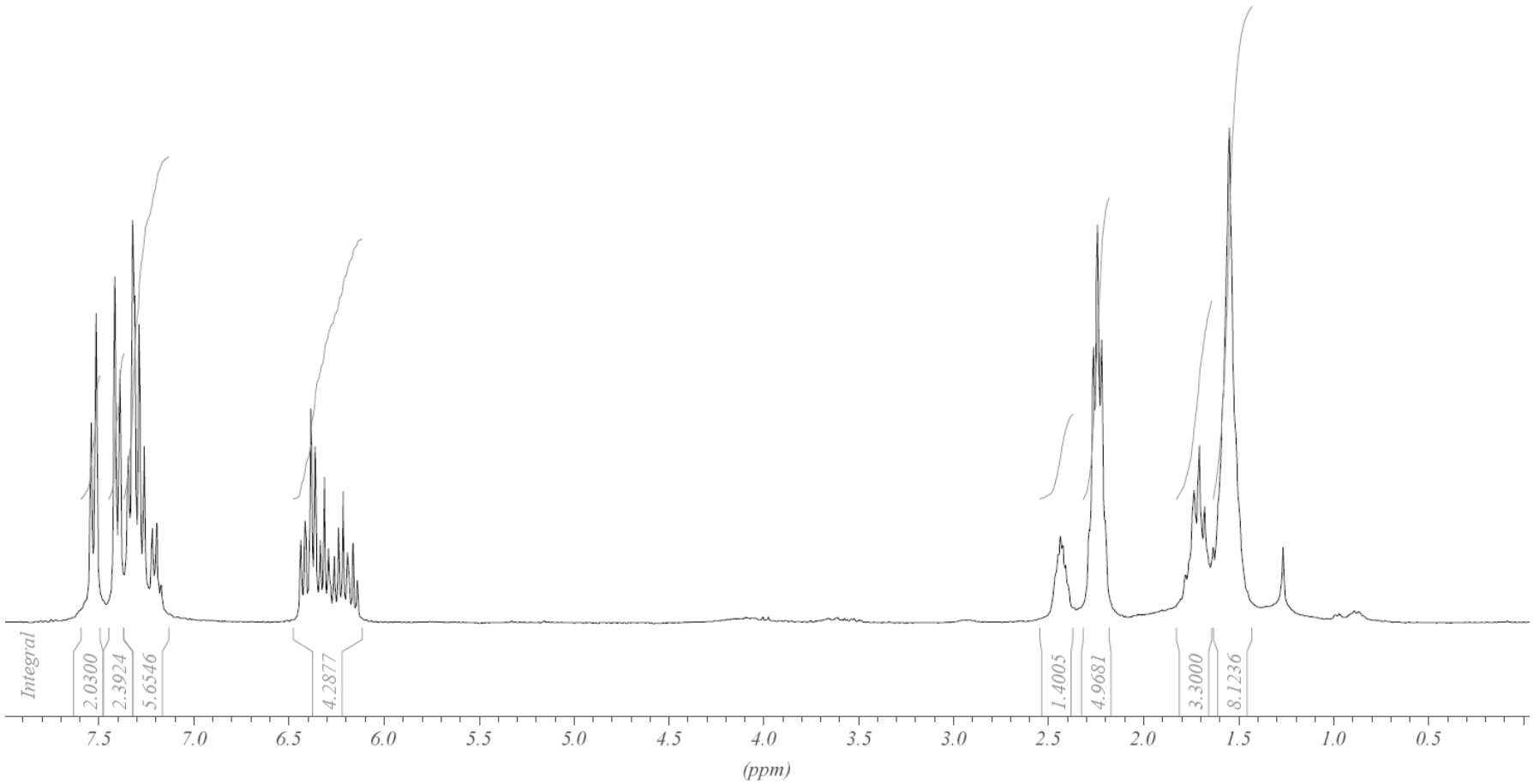
O
OH
Cl

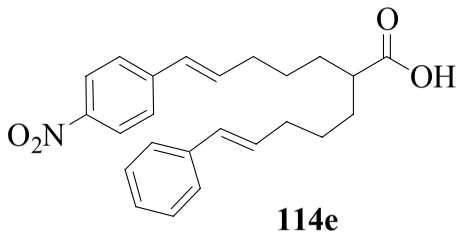
114c


Integral
9.4533
2.2185
2.3958
1.3538
5.1506
2.9034
7.8082
0.6229
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

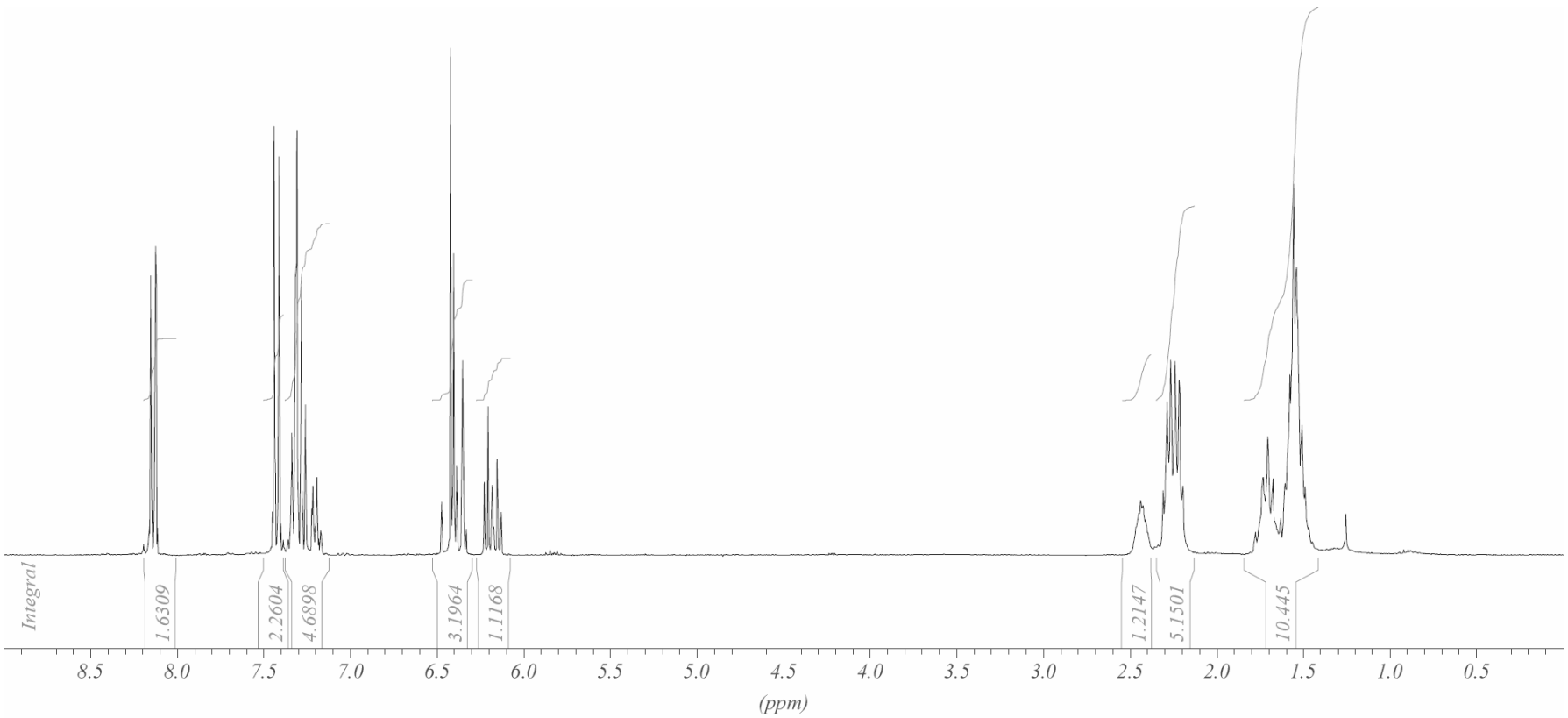

O
OH
F3C

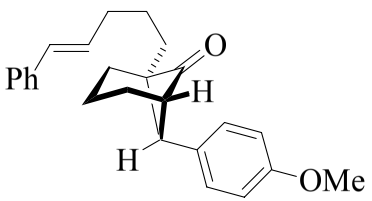
114d


Integral
2.0300
2.3924
5.6546
4.2877
1.4005
4.9681
3.3000
8.1236
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


O
OH
O_2N

114e

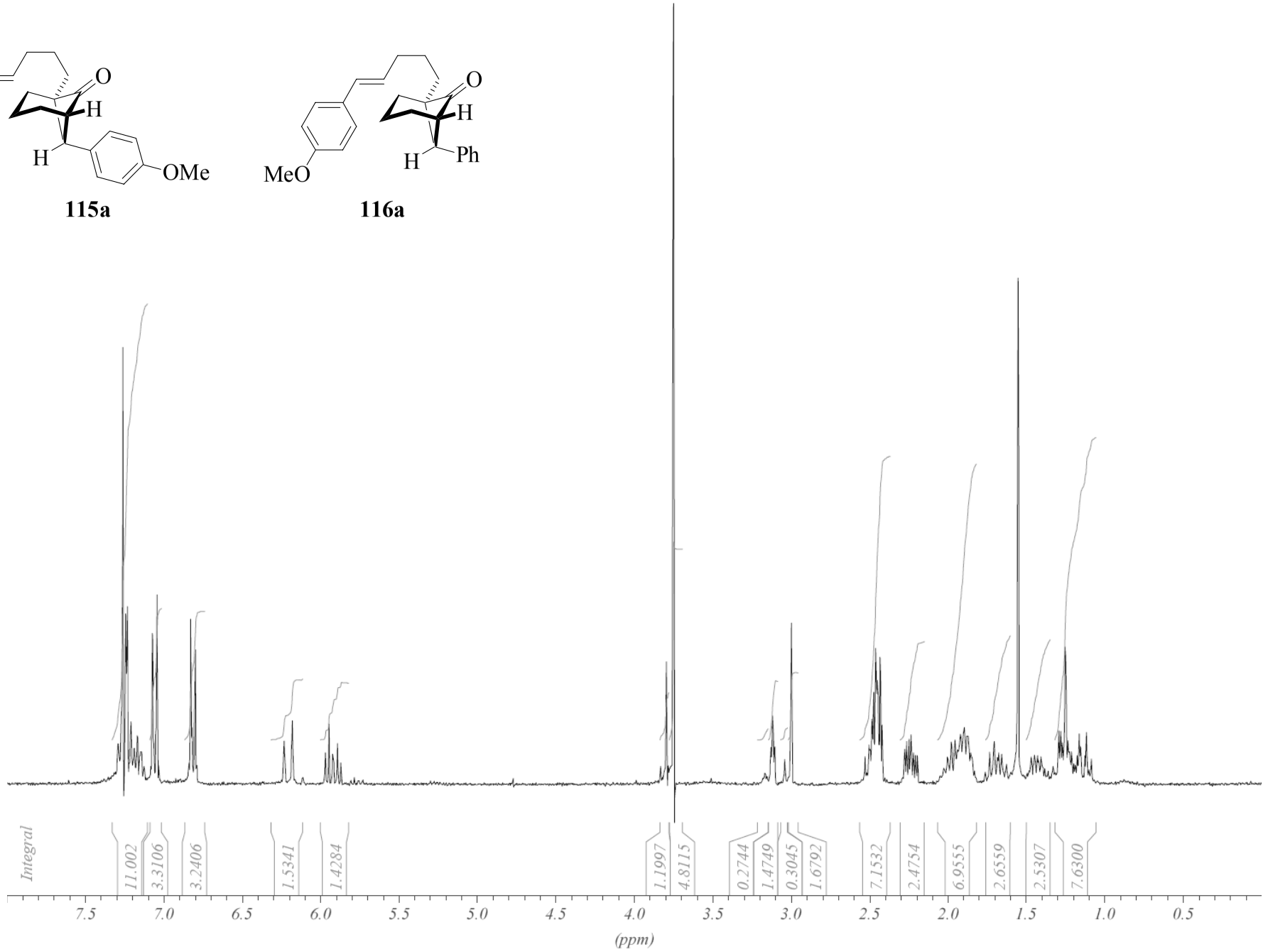

Integral
1.6309
2.2604
4.6898
3.1964
1.1168
1.2147
5.1501
10.445
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

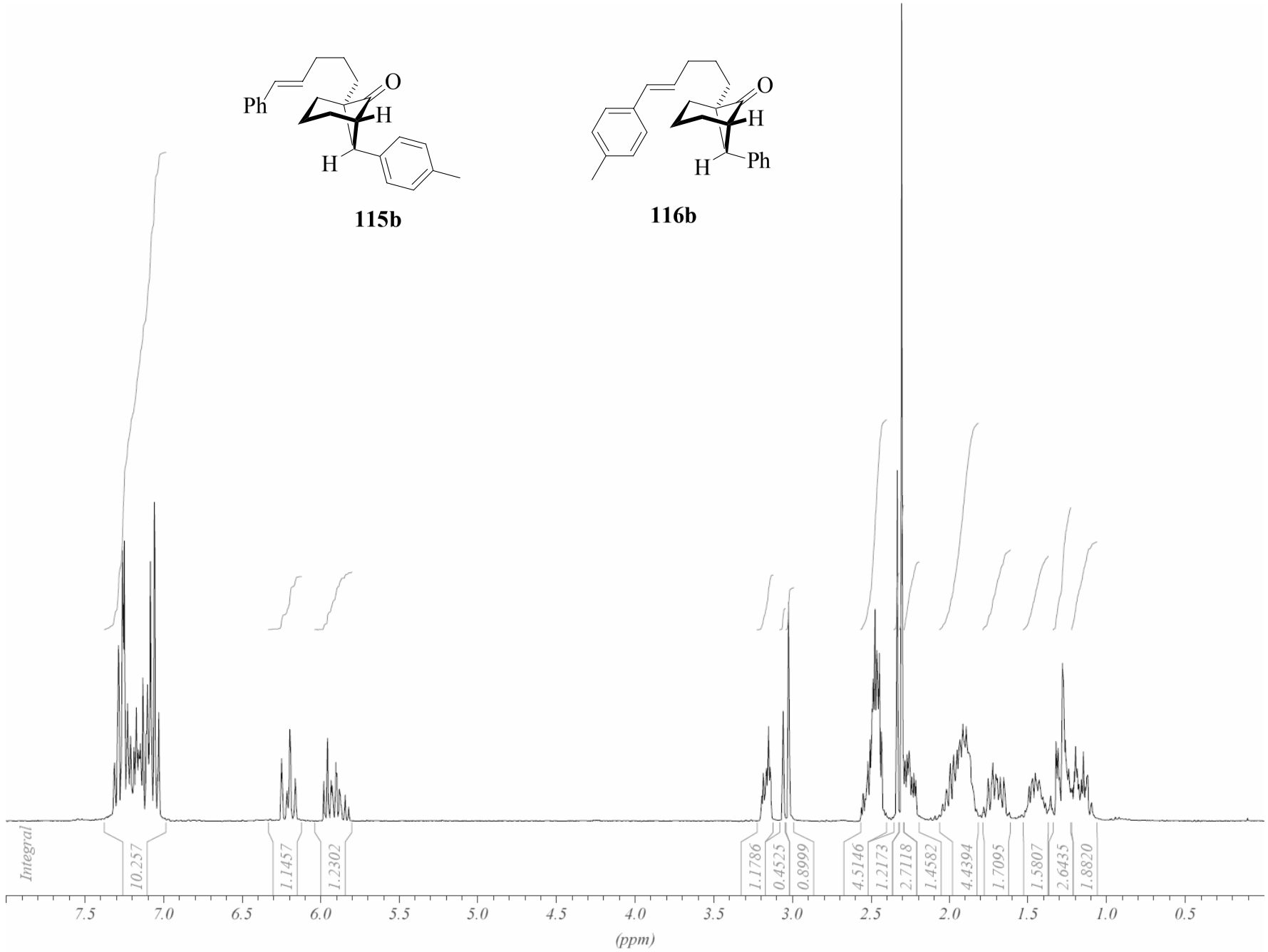

Ph
O
H
H
OMe

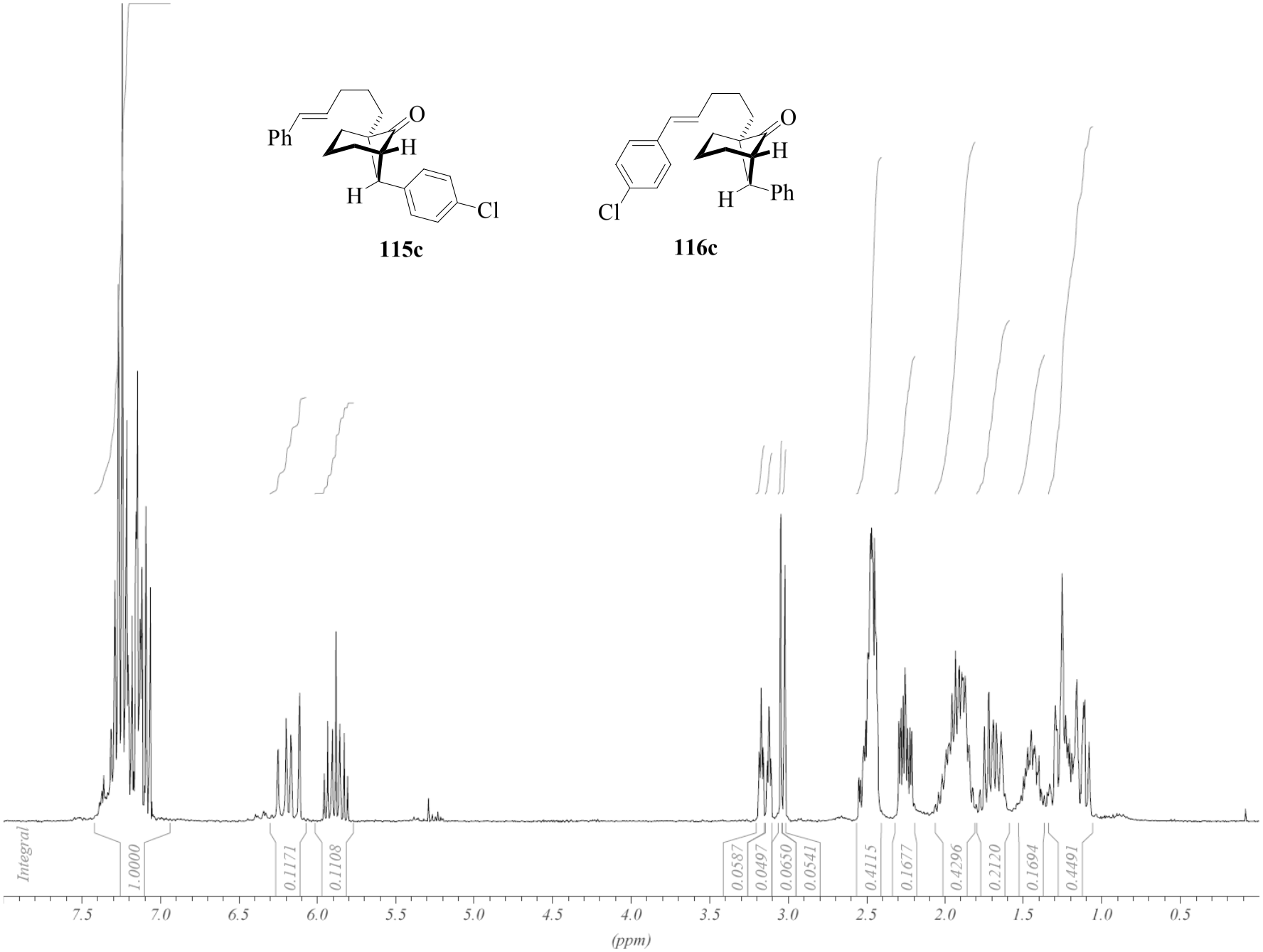
115a

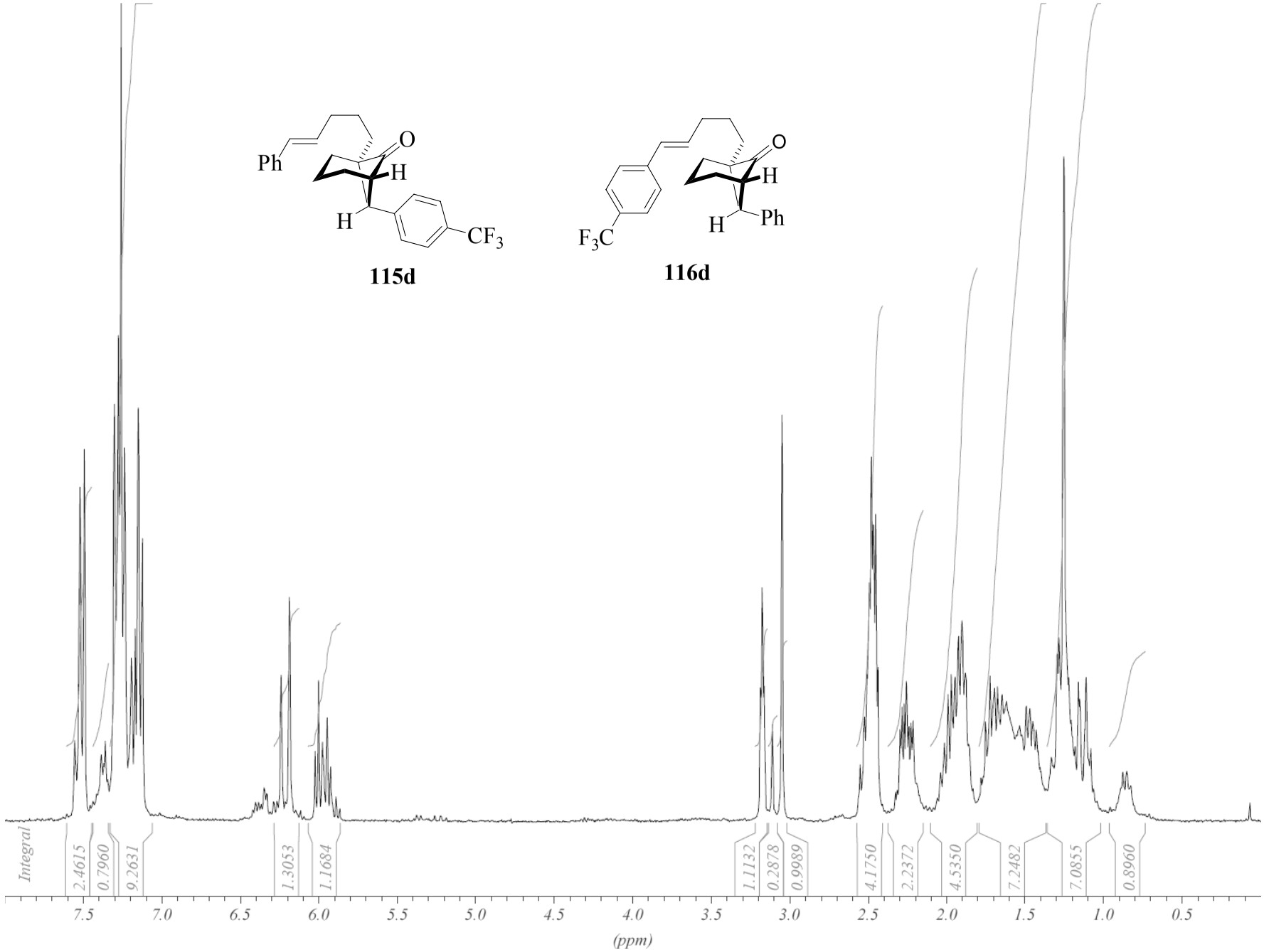
MeO
O
H
H
Ph

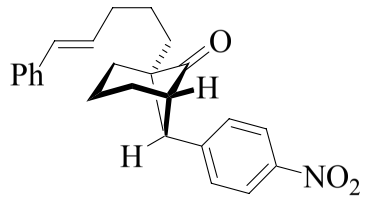
116a


Integral
11.002
3.3106
3.2406
1.5341
1.4284
1.1997
4.8115
0.2744
1.4749
0.3045
1.6792
7.1532
2.4754
6.9555
2.6559
2.5307
7.6300
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

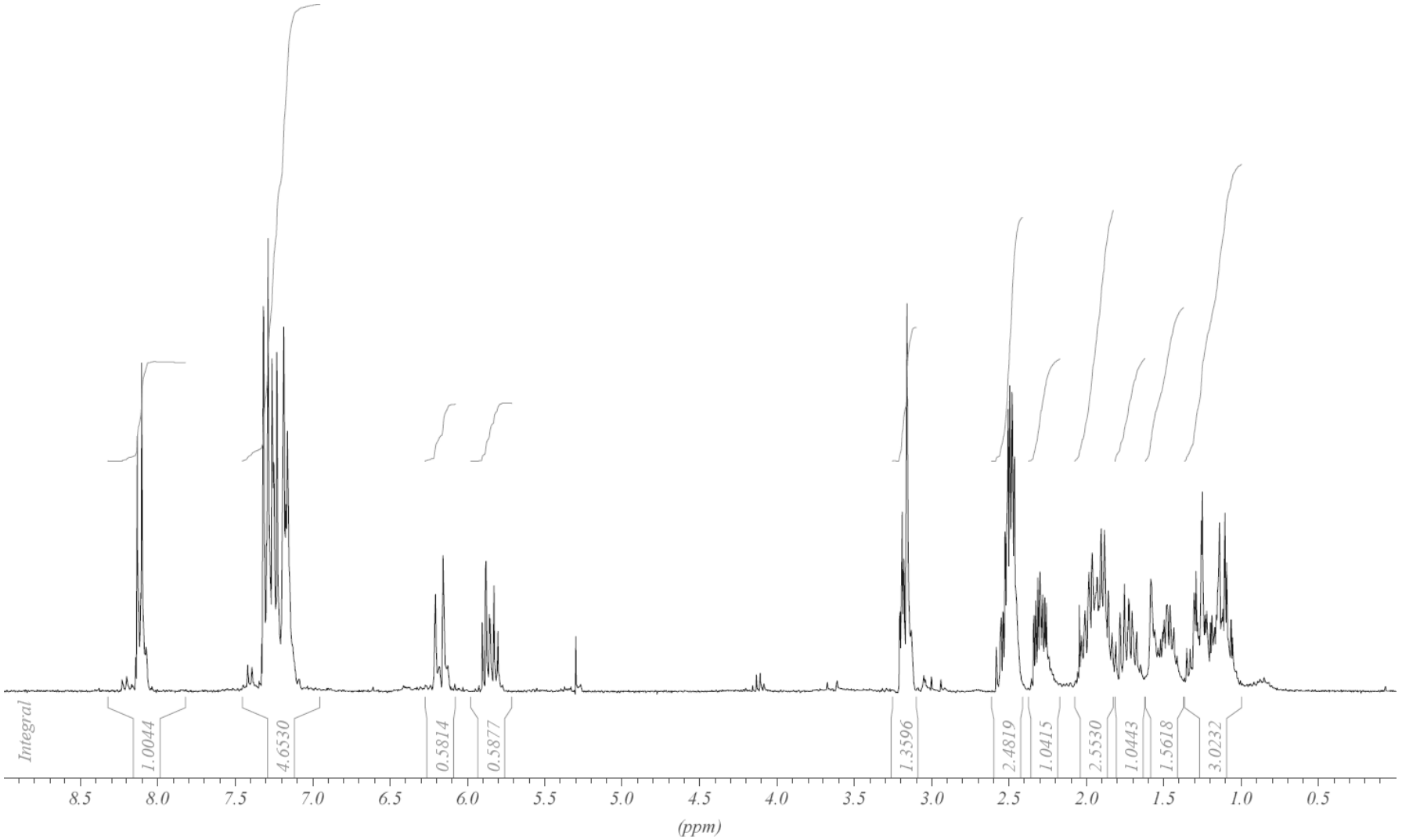

Ph
O
H
H
115b
O
H
H
Ph
116b
Integral
10.257
1.1457
1.2302
1.1786
0.4525
0.8999
4.5146
1.2173
2.7118
1.4582
4.4394
1.7095
1.5807
2.6435
1.8820
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)

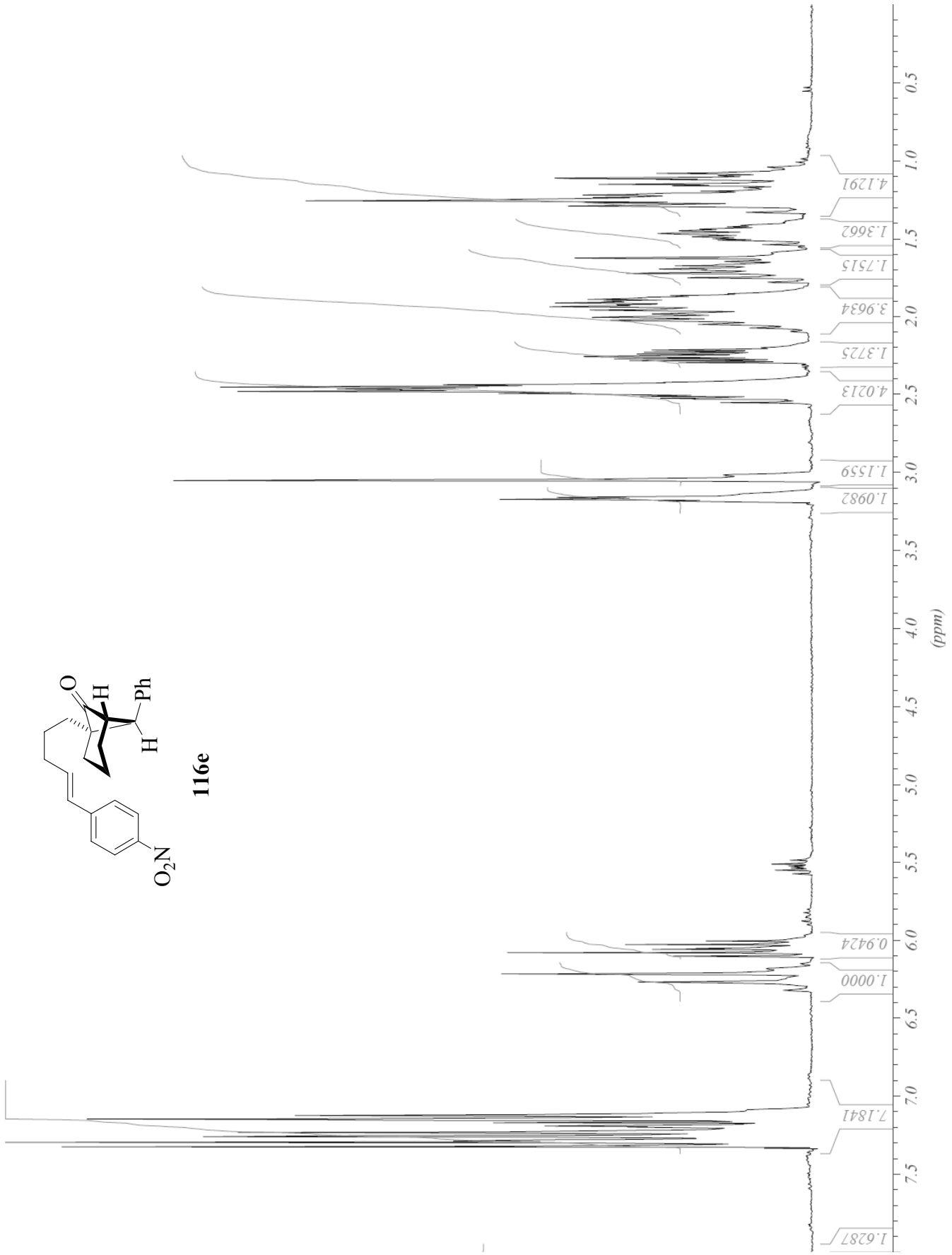

Ph
O
H
H
Cl
115c
Cl
O
H
H
Ph
116c
Integral
1.0000
0.1171
0.1108
0.0587
0.0497
0.0650
0.0541
0.4115
0.1677
0.4296
0.2120
0.1694
0.4491
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


Ph
O
H
H
CF3
115d
F3C
O
H
H
Ph
116d
Integral
2.4615
0.7960
9.2631
1.3053
1.1684
1.1132
0.2878
0.9989
4.1750
2.2372
4.5350
7.2482
7.0855
0.8960
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


Ph
O
H
H
NO2

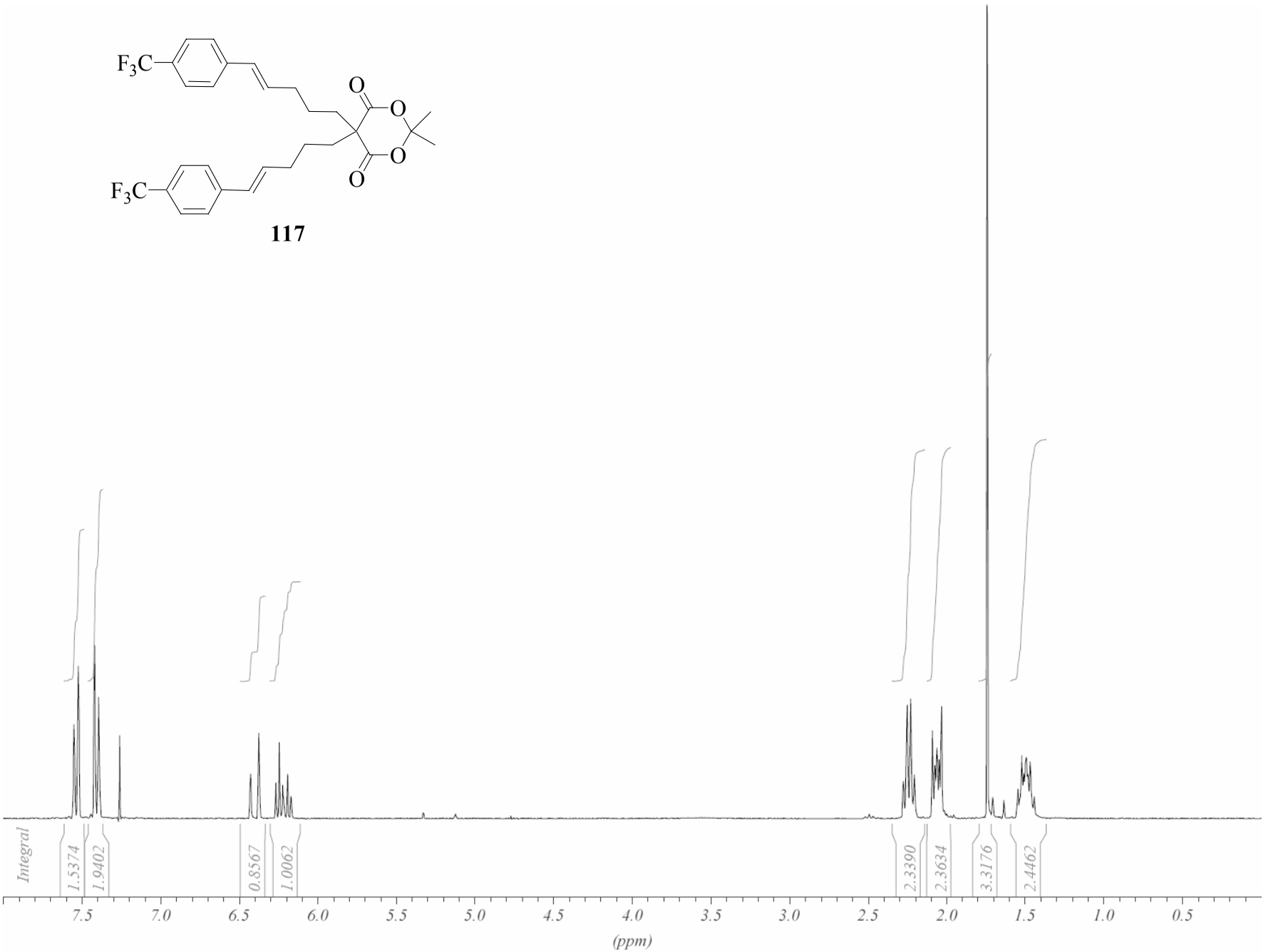
115e

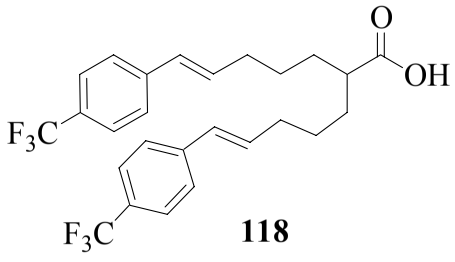

Integral
1.0044
4.6530
0.5814
0.5877
1.3596
2.4819
1.0415
2.5530
1.0443
1.5618
3.0232
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


O
H
Ph
H
O2N
116e
1.6287
7.1841
0.9424
1.0000
1.0982
1.1559
4.0213
1.3725
3.9634
1.7515
1.3662
4.1291
(ppm)

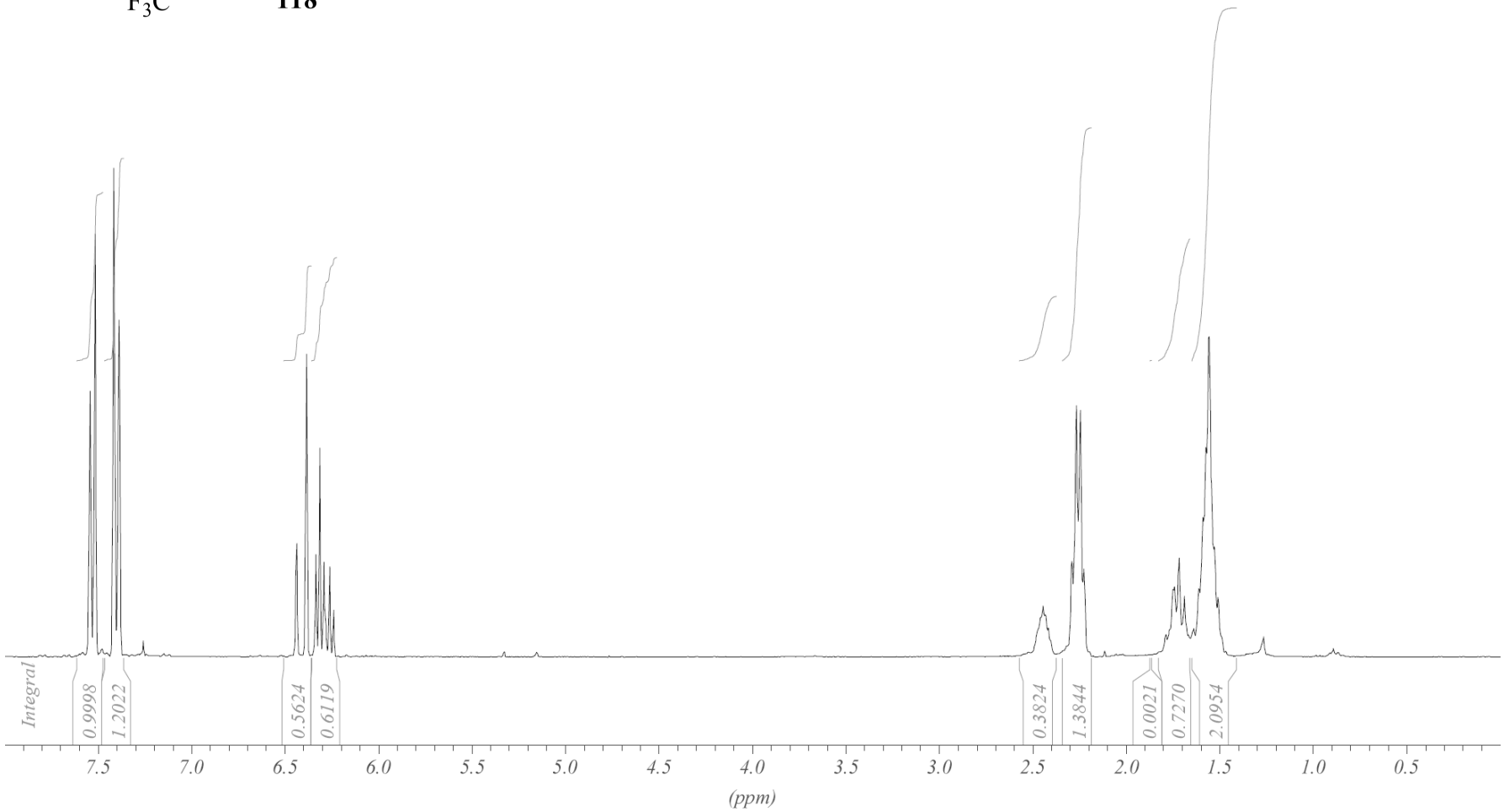
F3C
O
O
O
O
F3C

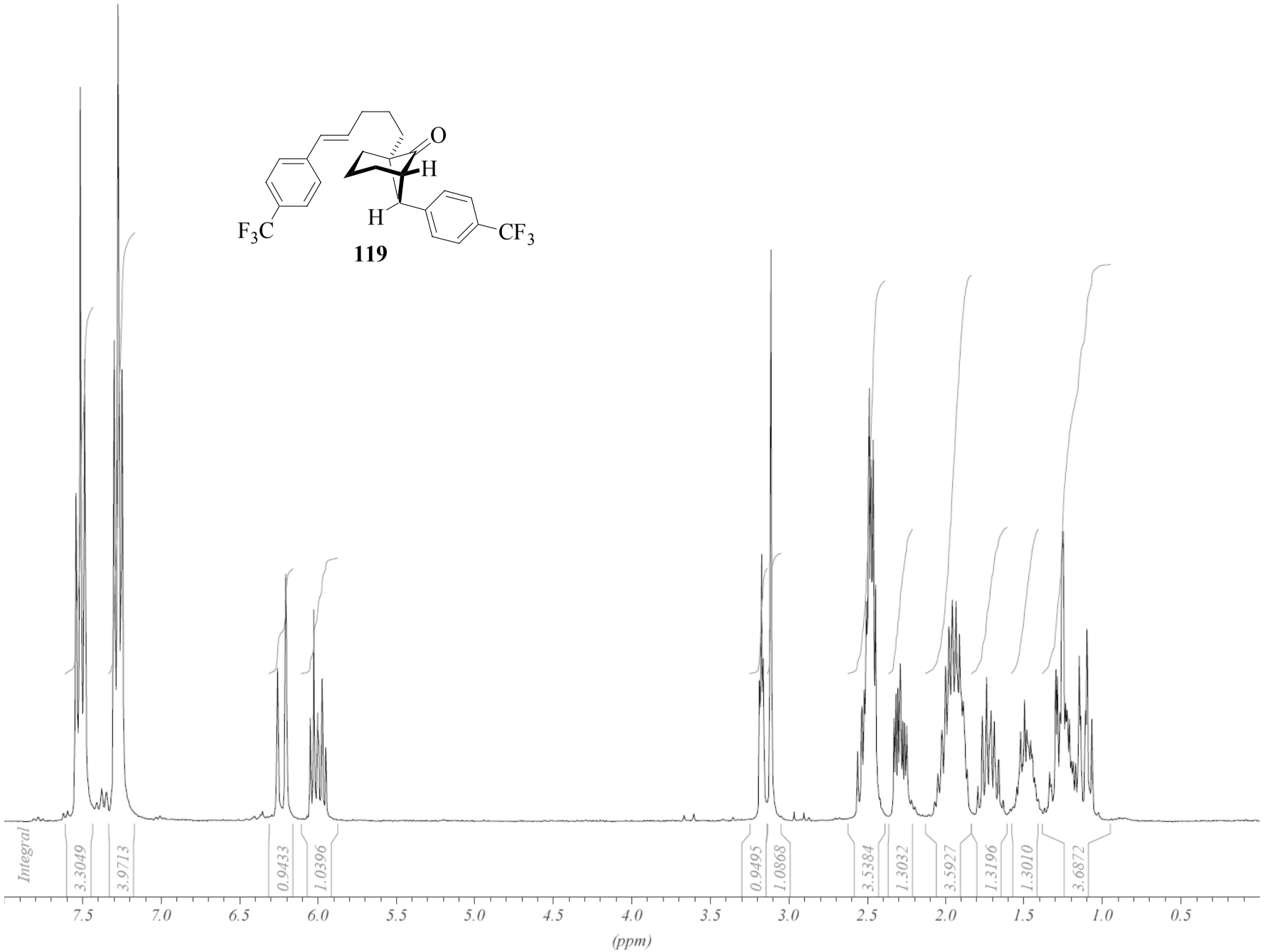
117


Integral
1.5374
1.9402
0.8567
1.0062
2.3390
2.3634
3.3176
2.4462
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


O
OH
F3C
F3C

118


Integral
0.9998
1.2022
0.5624
0.6119
0.3824
1.3844
0.0021
0.7270
2.0954
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)


O
H
H
F3C
CF3
119
Integral
3.3049
3.9713
0.9433
1.0396
0.9495
1.0868
3.5384
1.3032
3.5927
1.3196
1.3010
3.6872
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
(ppm)