

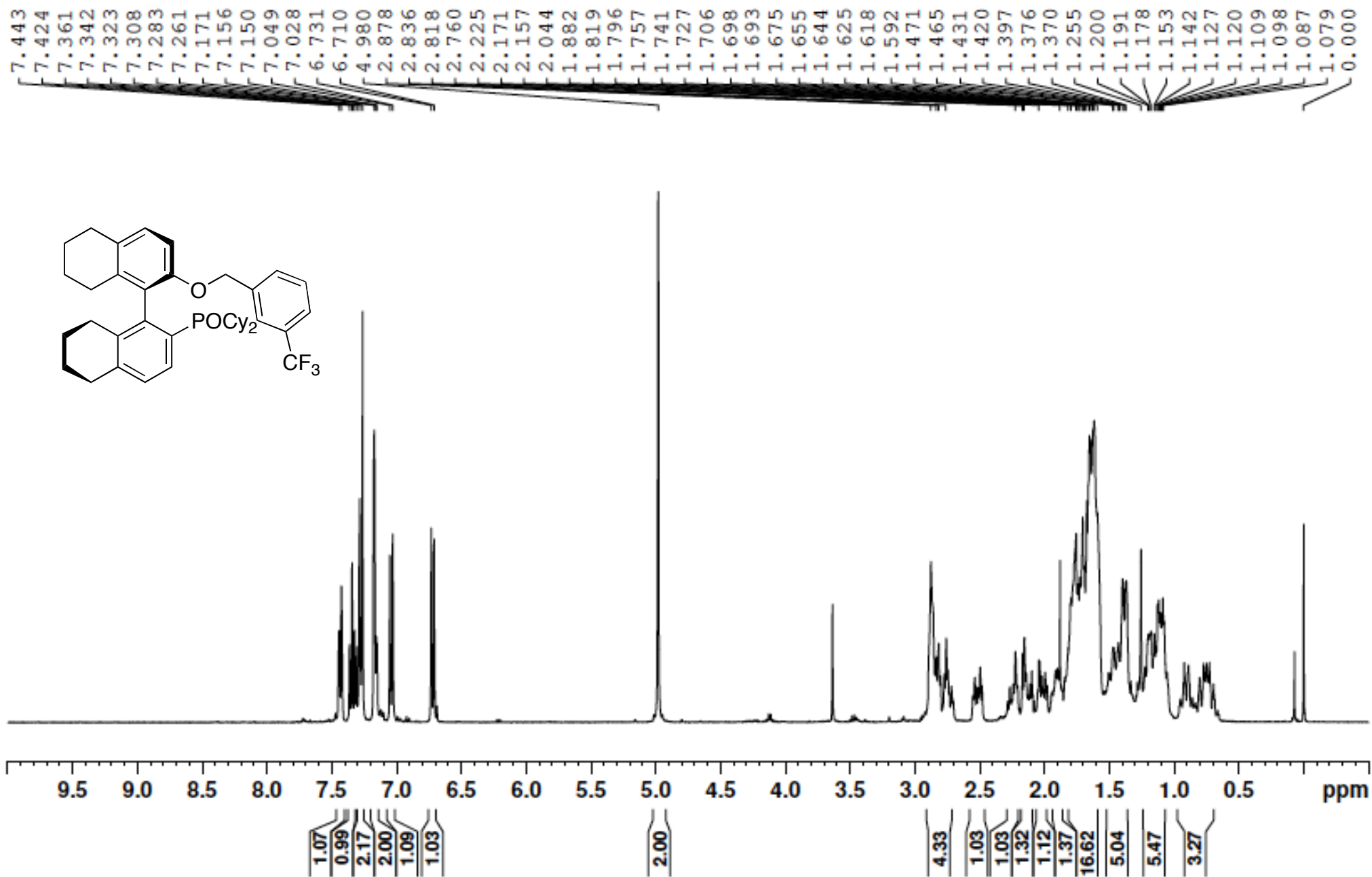
A General Method for Asymmetric Arylation and Vinylation of Silyl Ketene Acetals

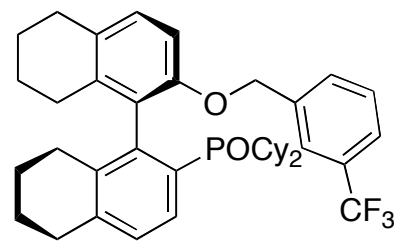
Junfeng Yang and Jianrong (Steve) Zhou*

*Division of Chemistry and Biological Chemistry,
School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore 637371
E-mail: jrzhou@ntu.edu.sg*

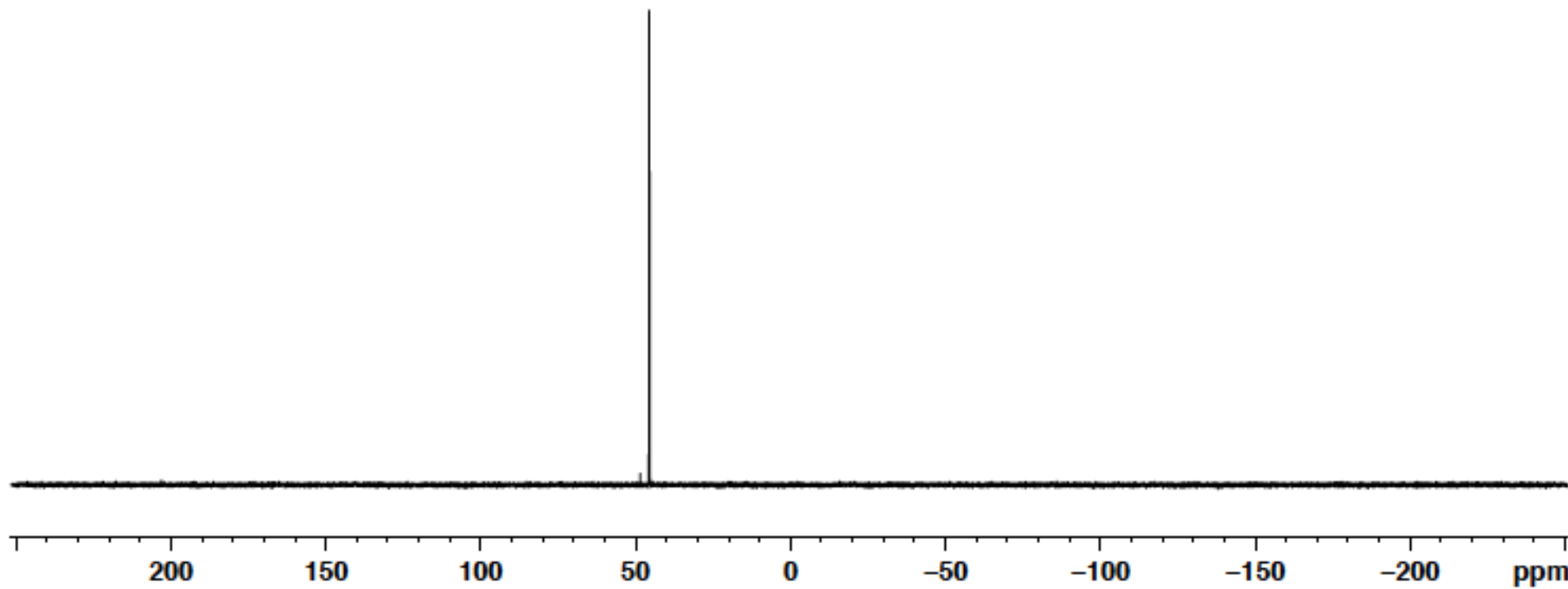
Supporting Information: NMR spectra

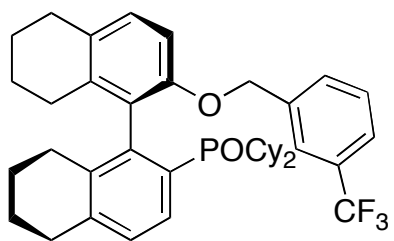
JF11-56-1-redo CDC13 1HNMR BBFO2
2013-08-05



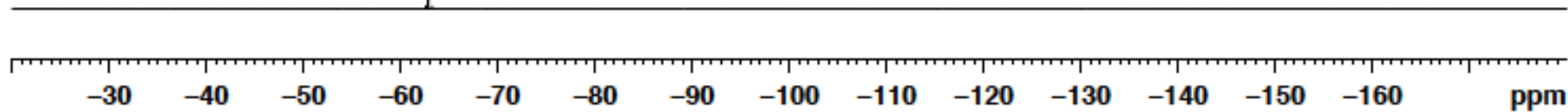


—45.59





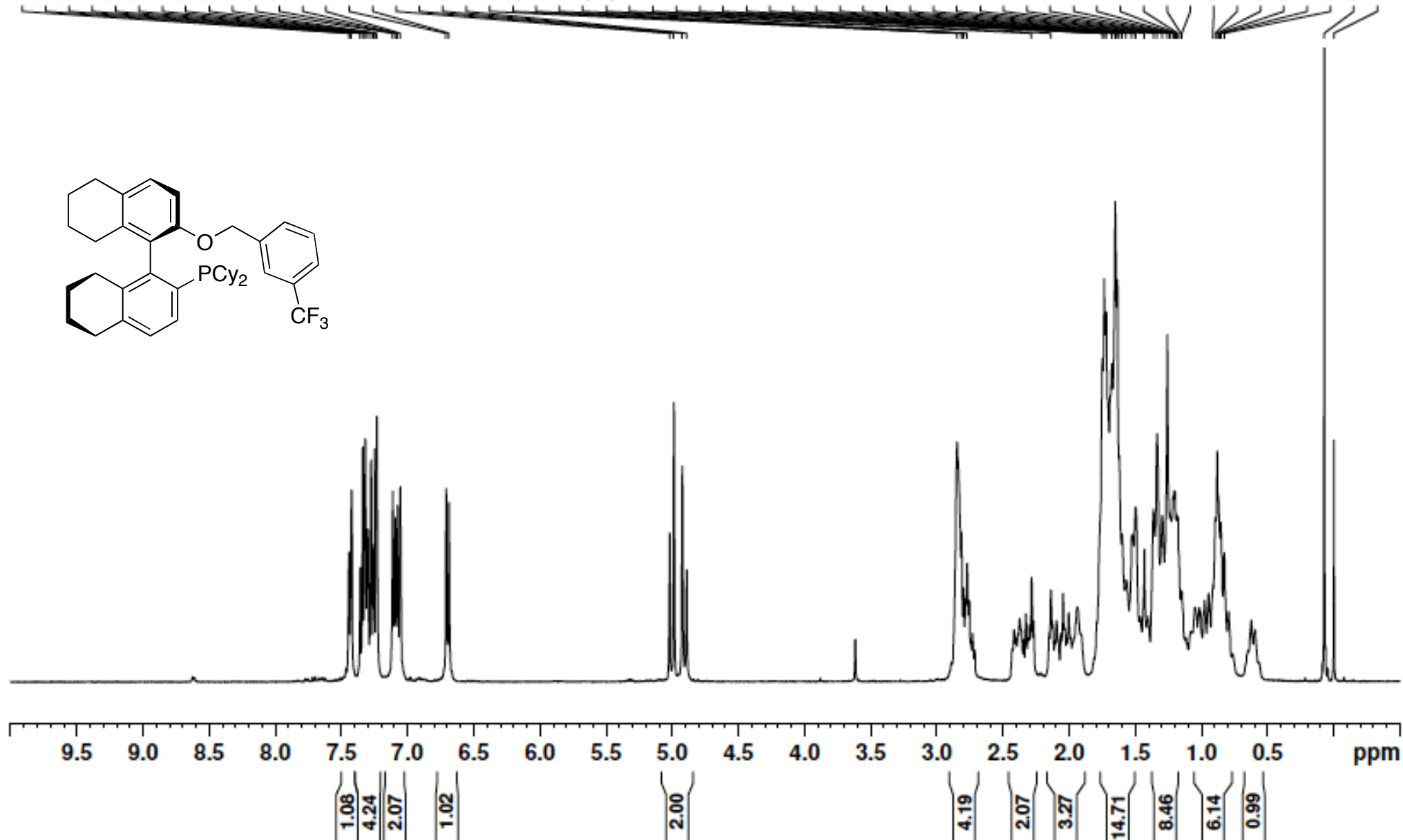
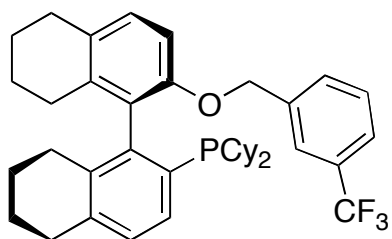
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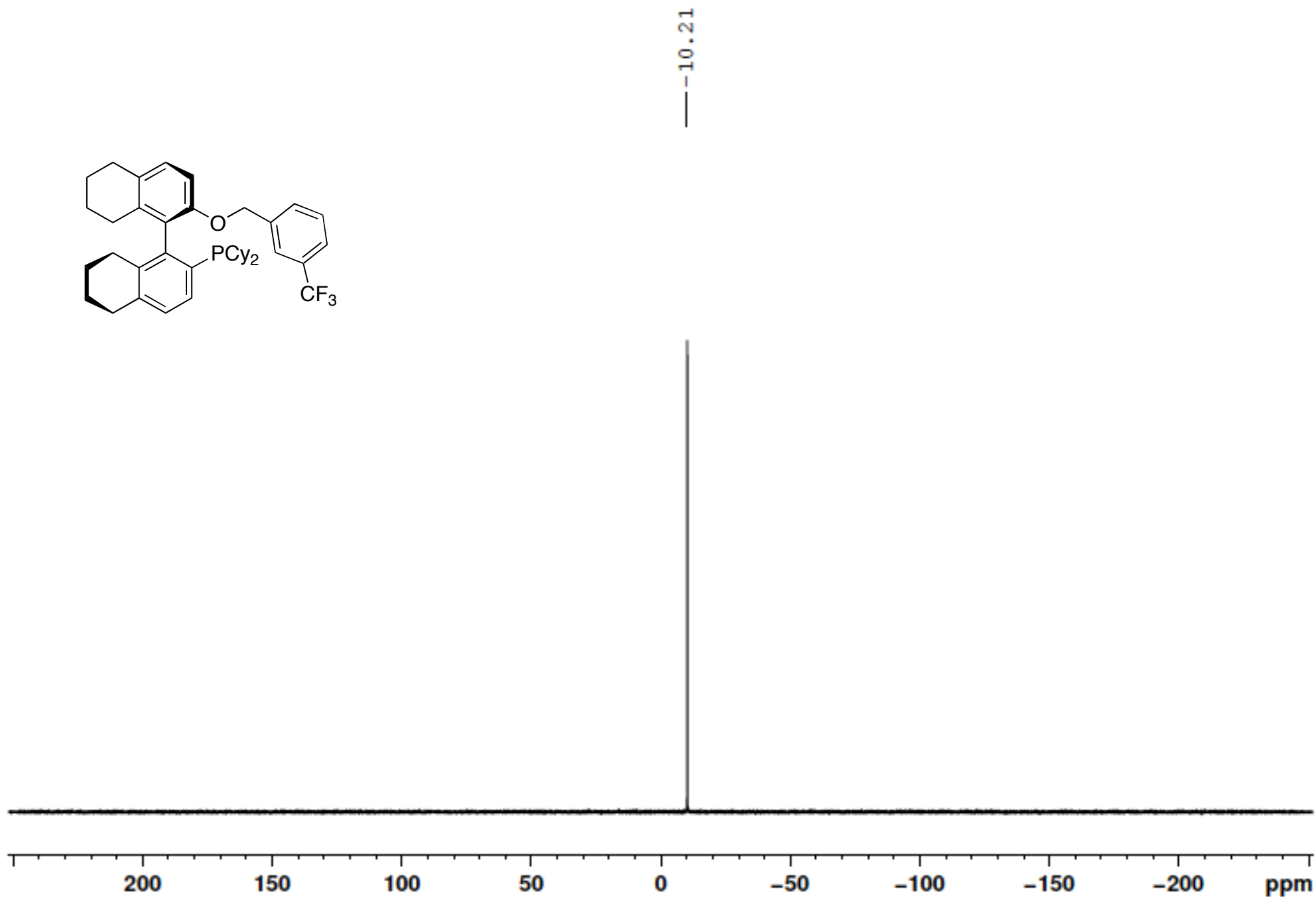
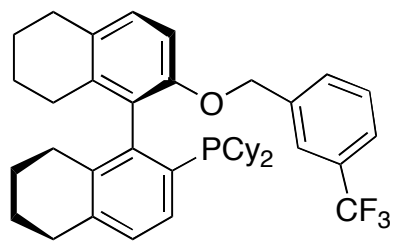


JF9099 1HNMR BBFO1 CDC13

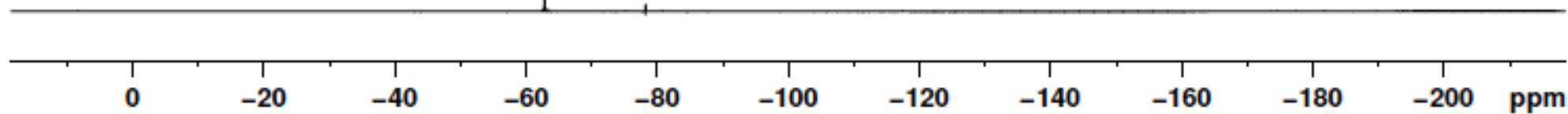
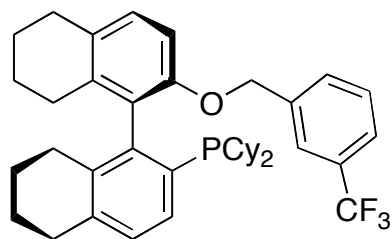
2013-8-4

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7.279
7.259
7.252
7.235
7.114
7.094
7.077
7.056
6.709
6.688
5.020
4.988
4.925
4.892
2.848
2.814
2.798
2.771
2.285
2.139
1.749
1.737
1.721
1.678
1.652
1.637
1.622
1.601
1.570
1.526
1.501
1.497
1.432
1.363
1.335
1.297
1.259
1.239
1.217
1.208
1.202
1.188
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0.881
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0.071
0.000

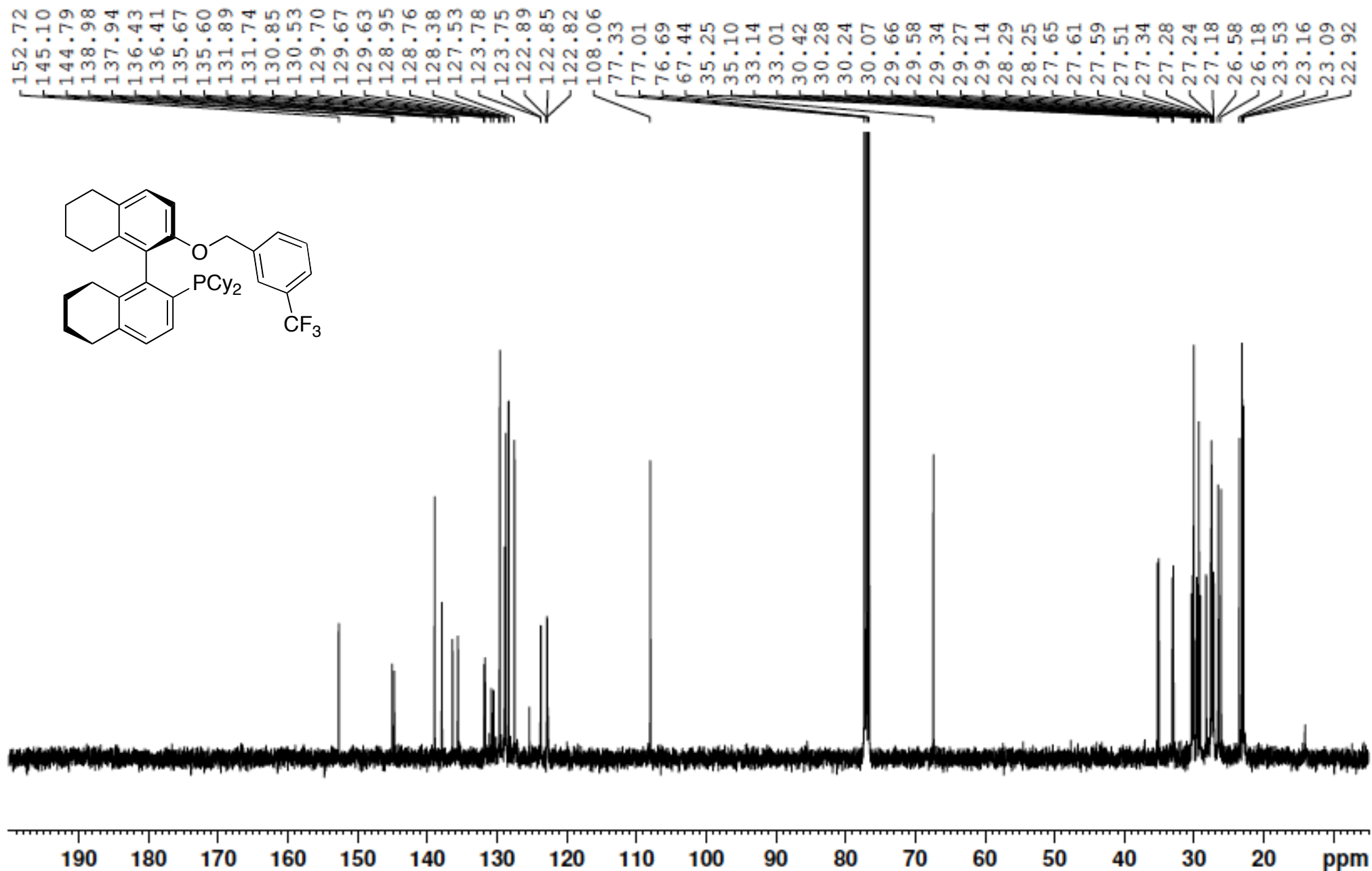




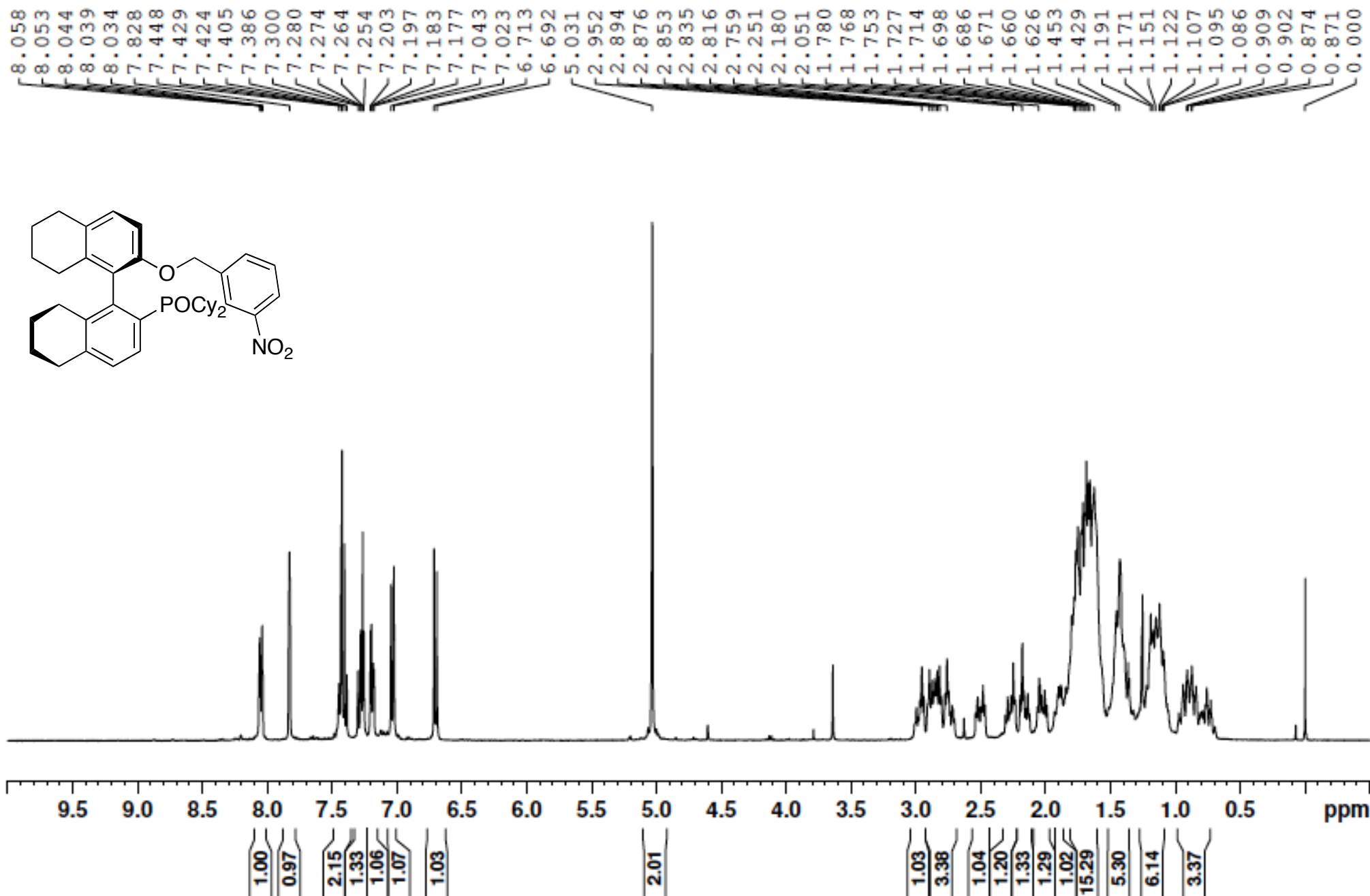
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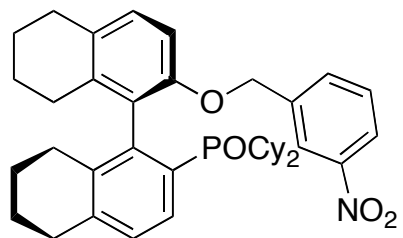


JF-L5 CNMR
BBFO1 400M
2014-01-25

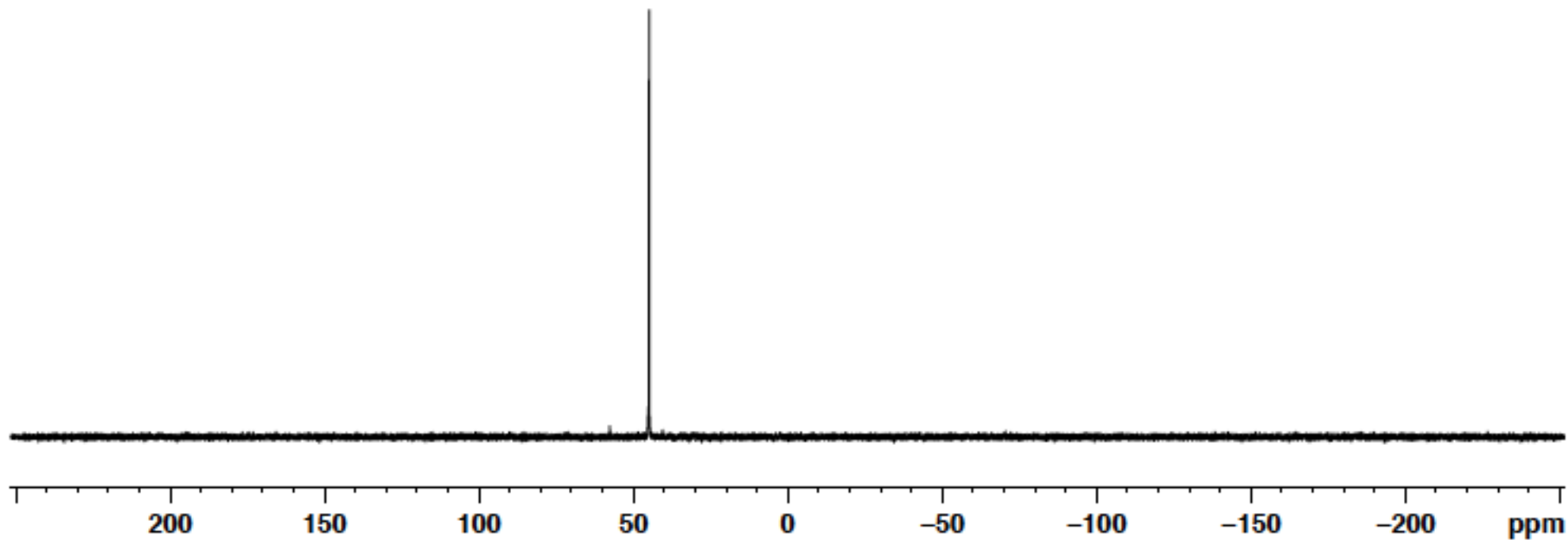


JF11-52-3-oxide CDC13 1HNMR BBFO2
2013-08-02



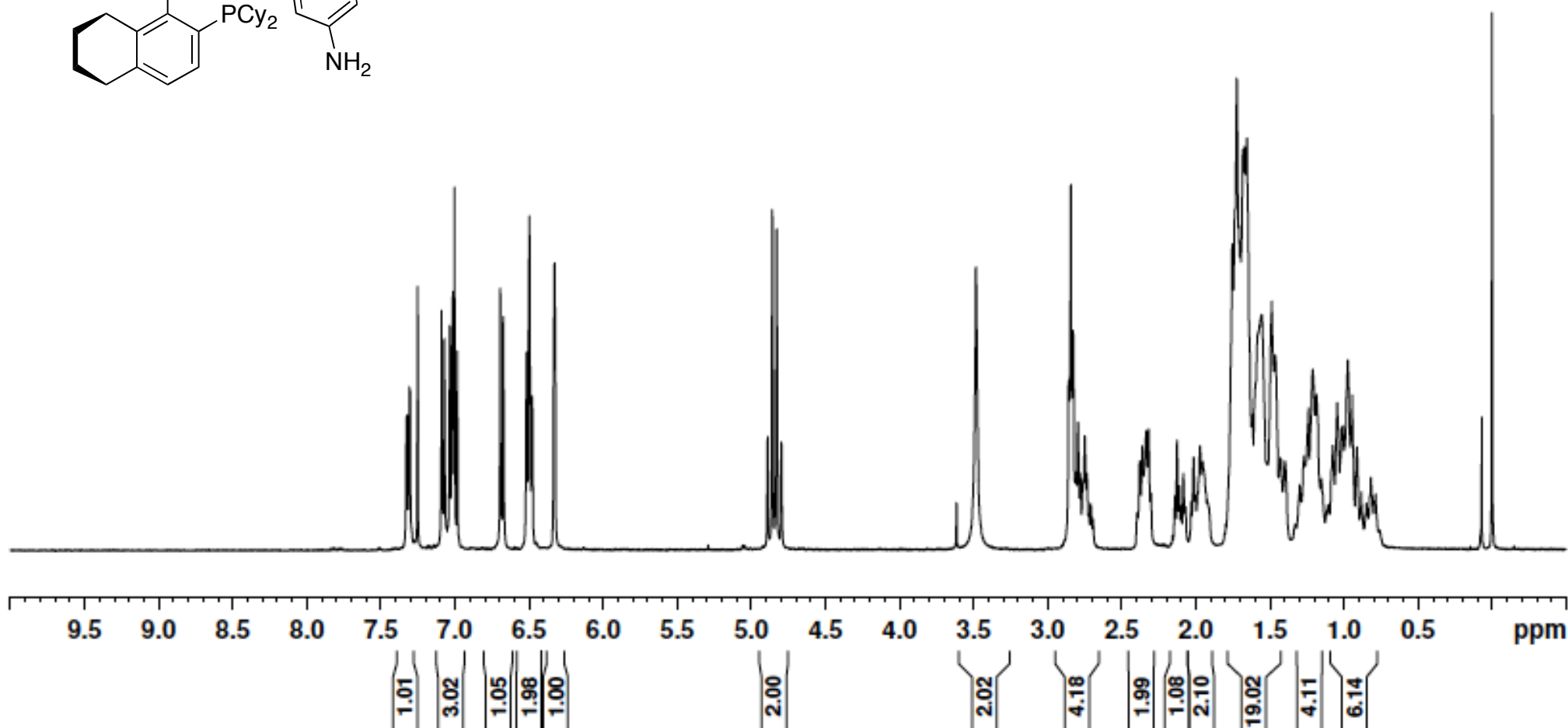
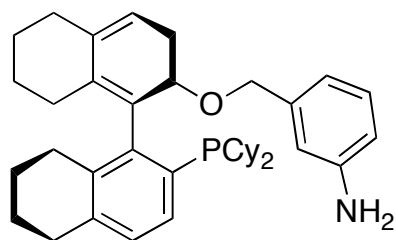


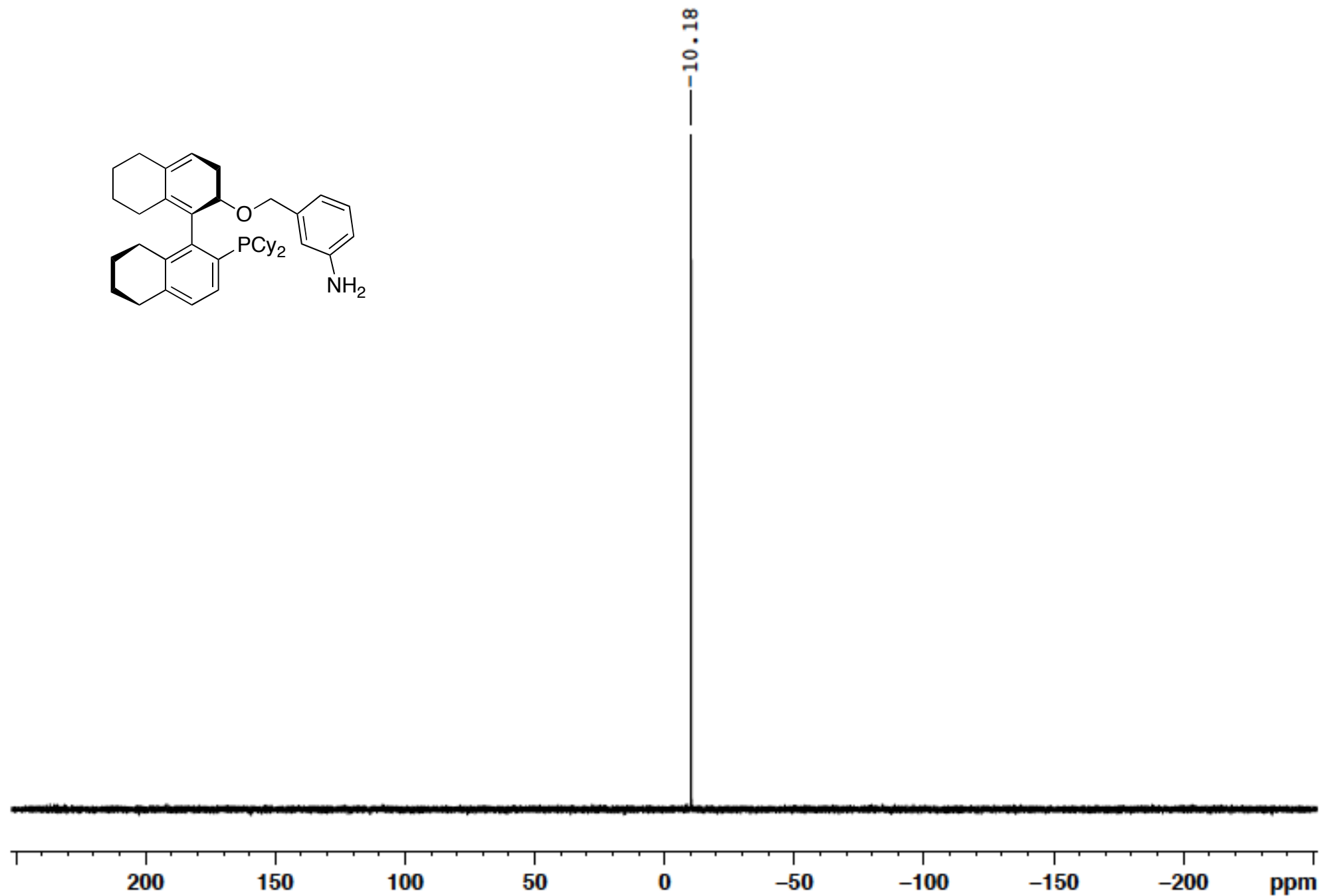
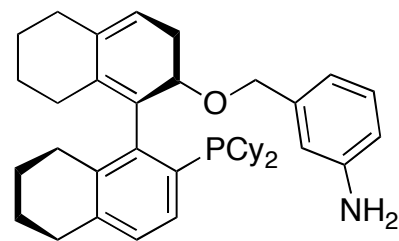
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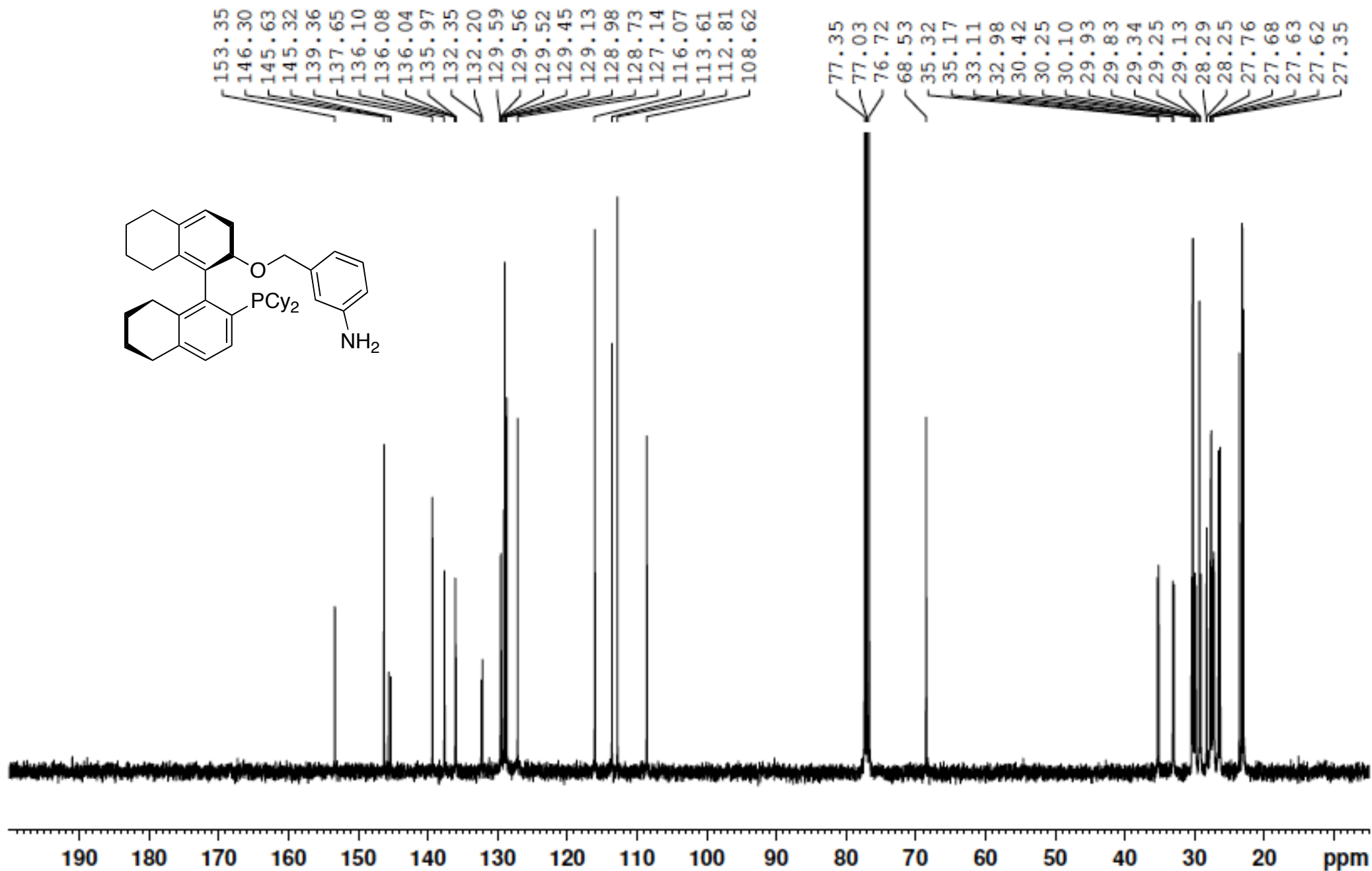
JF11-52-3-redo 1HNMR BBFO1 CDC13
2013-8-4

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7.092
7.072
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7.024
7.016
7.005
6.985
6.696
6.675
6.518
6.500
6.486
6.480
6.330
4.891
4.859
4.830
4.798
3.484
2.858
2.844
2.828
2.795
2.750
2.361
2.335
2.318
2.126
2.016
1.973
1.753
1.724
1.710
1.700
1.683
1.670
1.662
1.655
1.619
1.556
1.488
1.464
1.430
1.268
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1.013
1.006
0.974
0.944
0.912
0.070
0.000





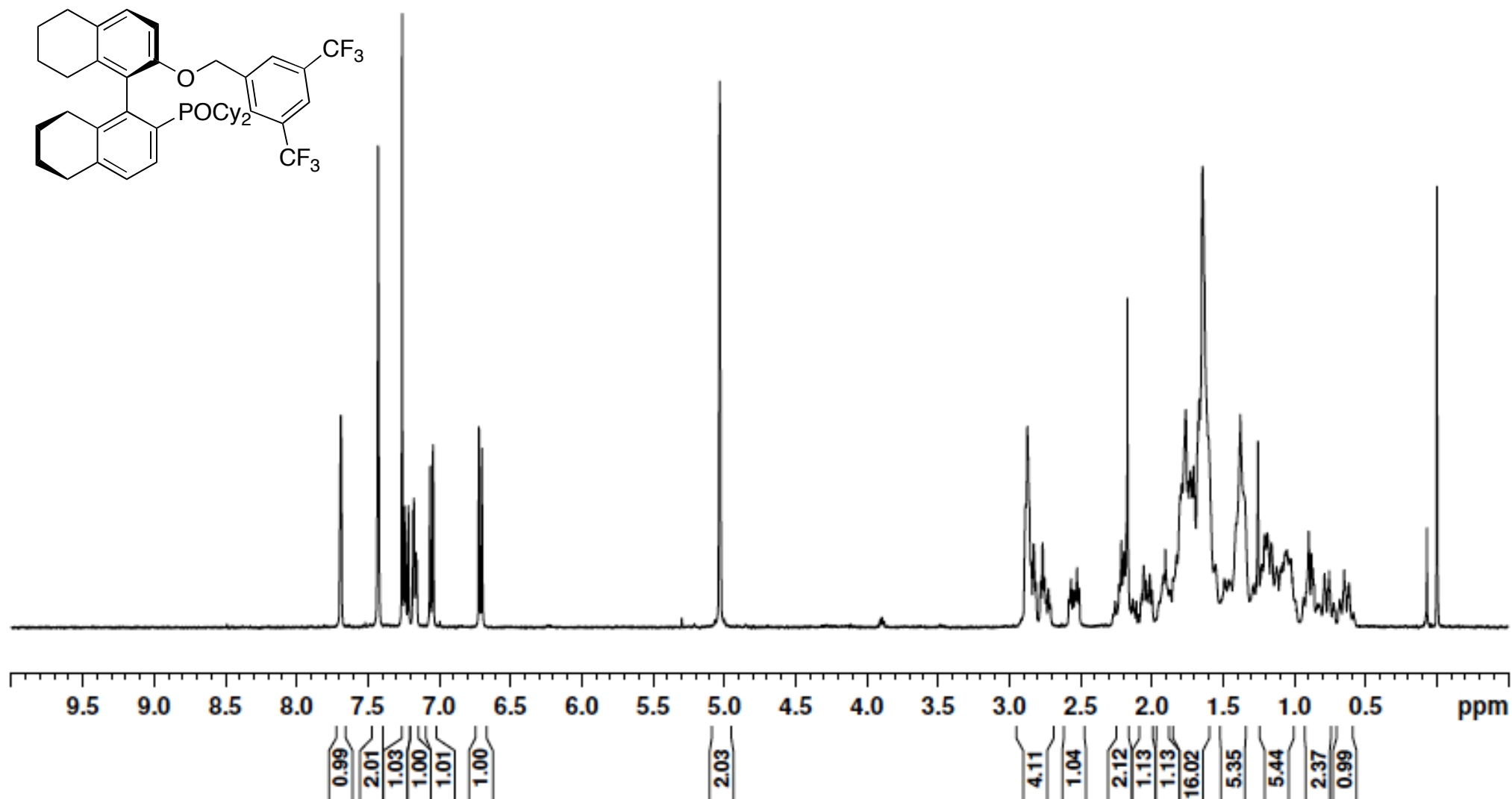
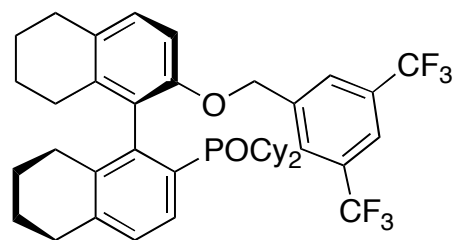
JF-L6-redo CNMR
AV400
2014-01-25

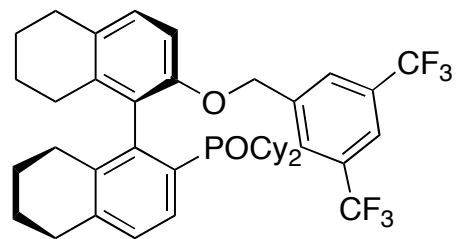


JF11-46-redo CDC13 1HNMR BBFO2

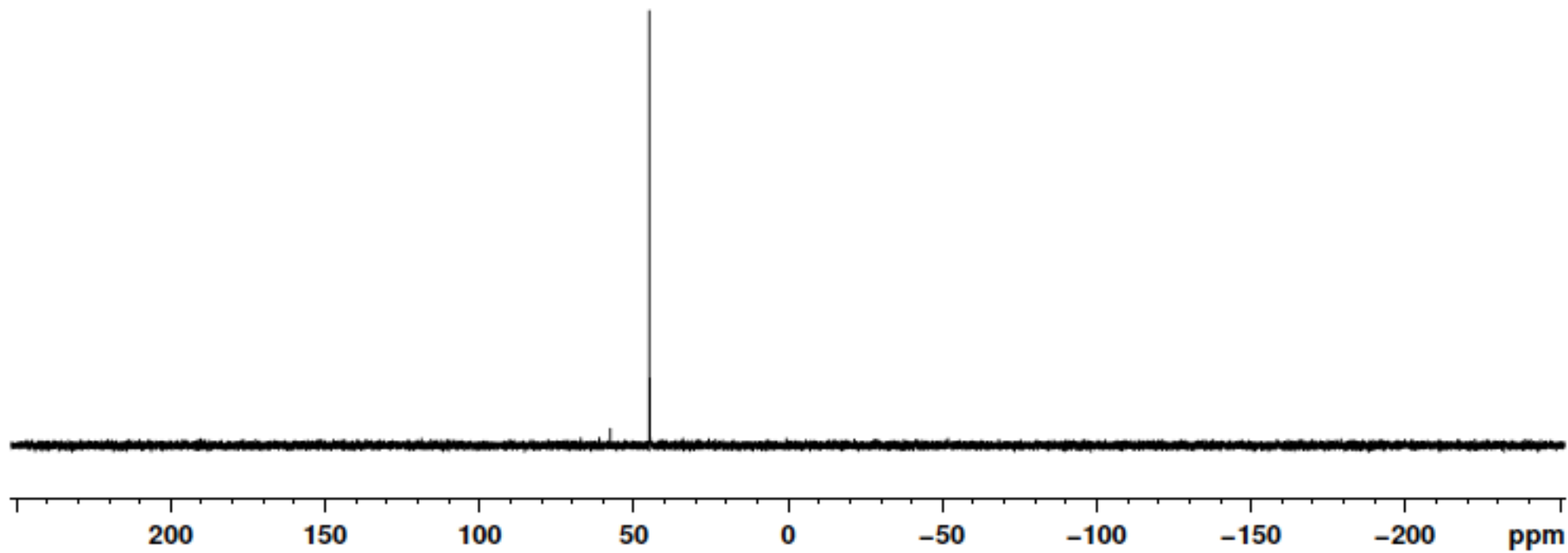
2013-08-05

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7.243
7.218
7.185
7.178
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7.158
7.065
7.045
6.722
6.701
5.032
2.886
2.874
2.847
2.829
2.767
2.525
2.215
2.196
2.178
2.172
2.058
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1.826
1.802
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1.763
1.746
1.730
1.714
1.707
1.700
1.676
1.668
1.644
1.554
1.380
1.255
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1.209
1.190
1.161
1.125
1.093
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1.054
1.045
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0.650
0.071
0.000

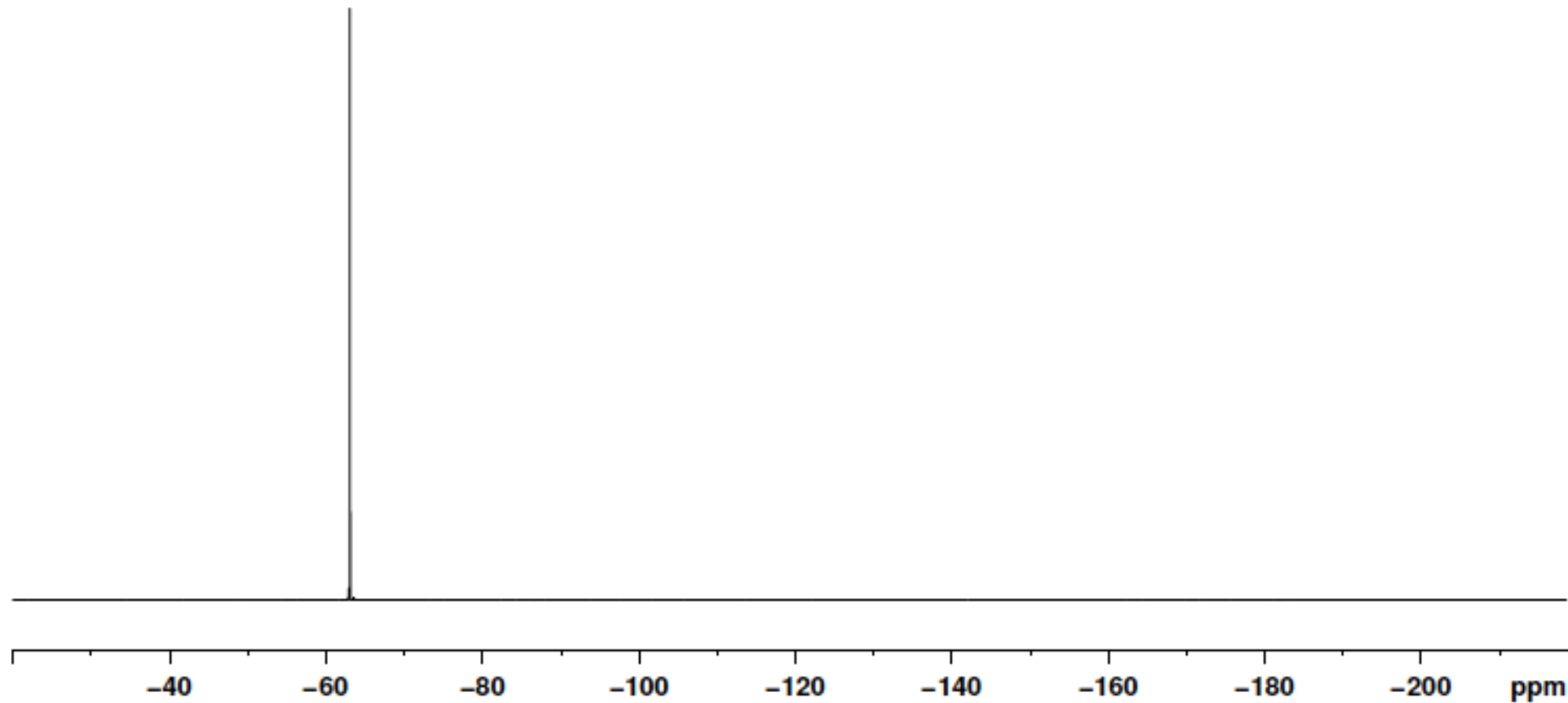
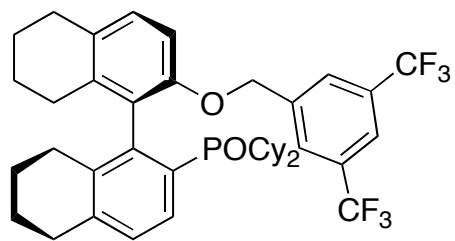




—45.03

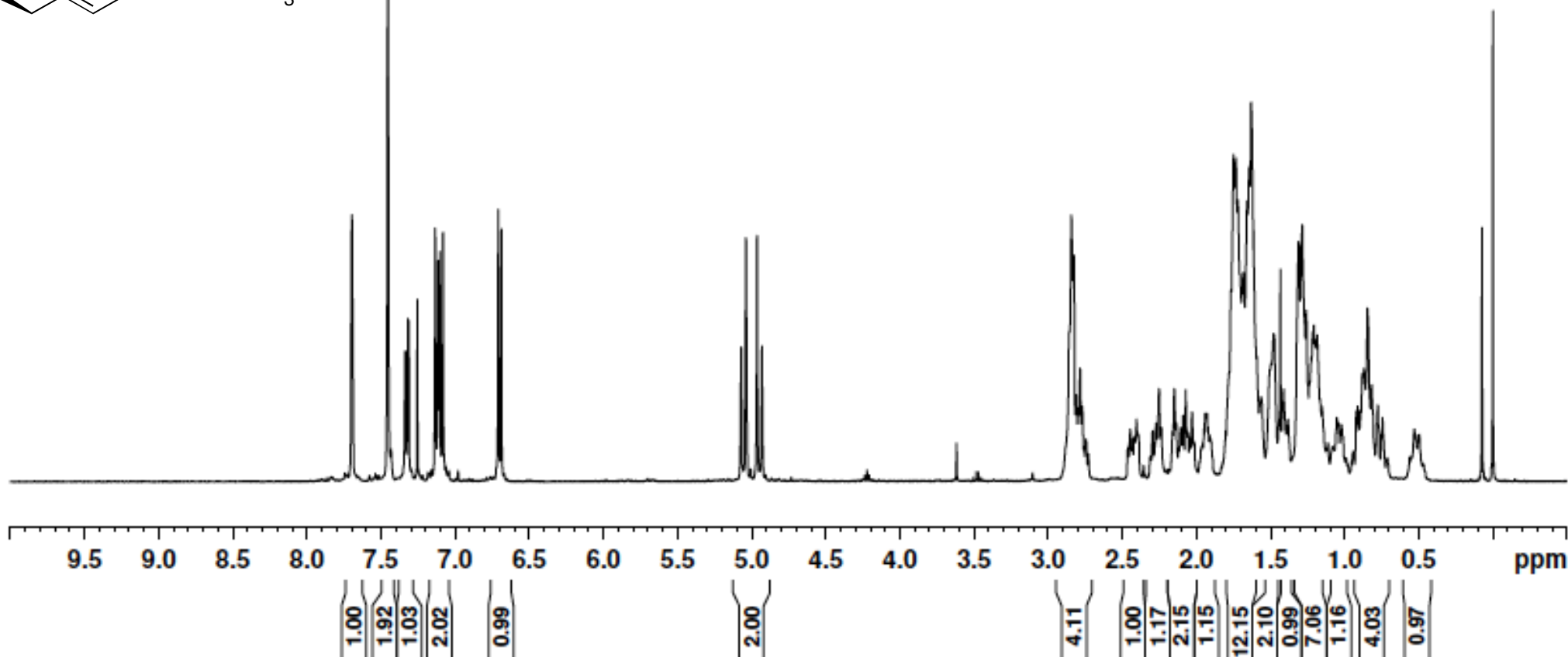
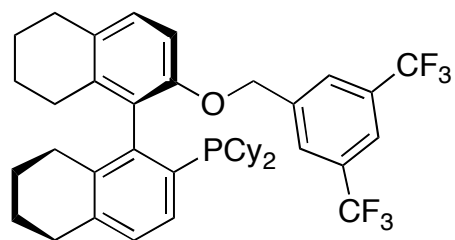


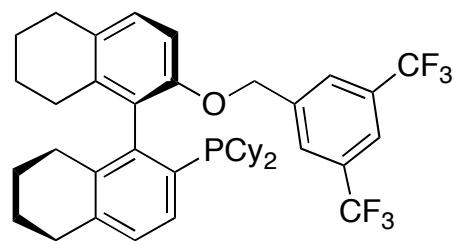
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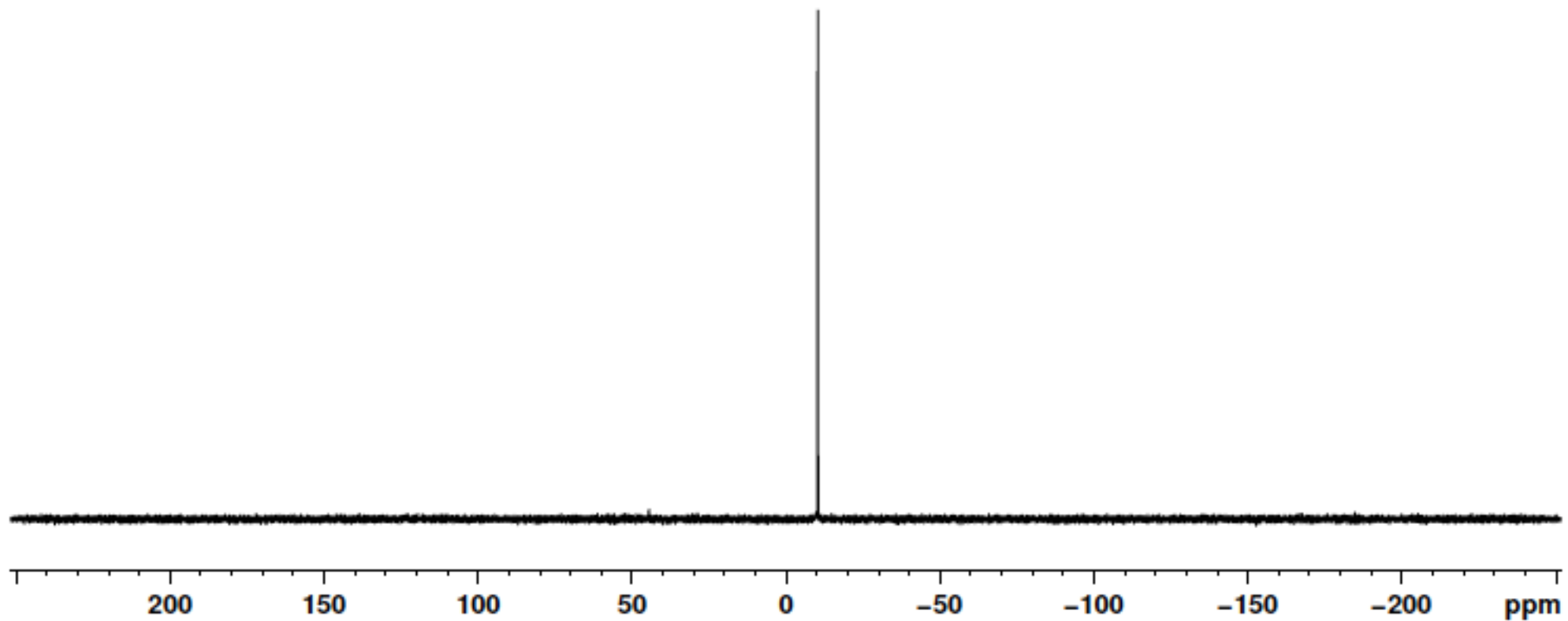
JF10-131 1H NMR, CDC13, BBFO1
2013-07-22

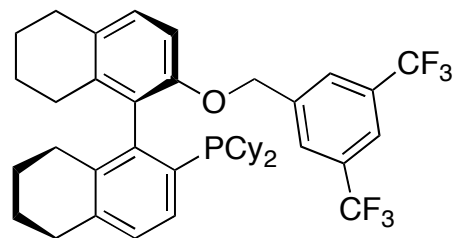
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7.254
7.133
7.113
7.103
7.082
6.709
6.688
5.070
5.037
4.963
4.930
2.842
2.826
2.809
2.784
2.769
2.251
2.148
2.071
1.765
1.748
1.740
1.732
1.720
1.682
1.657
1.644
1.638
1.629
1.614
1.591
1.563
1.477
1.433
1.410
1.310
1.286
1.257
1.237
1.225
1.214
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0.775
0.072
0.000



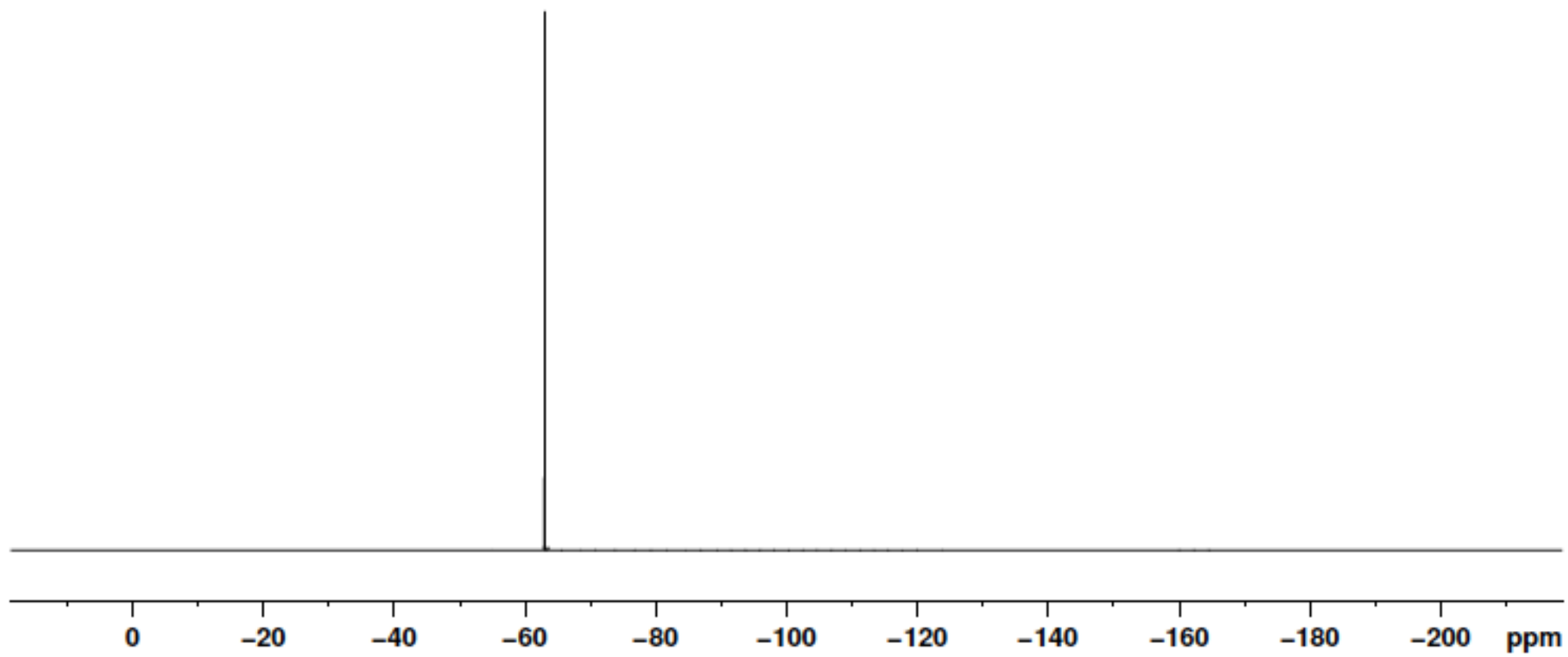


— -10.25

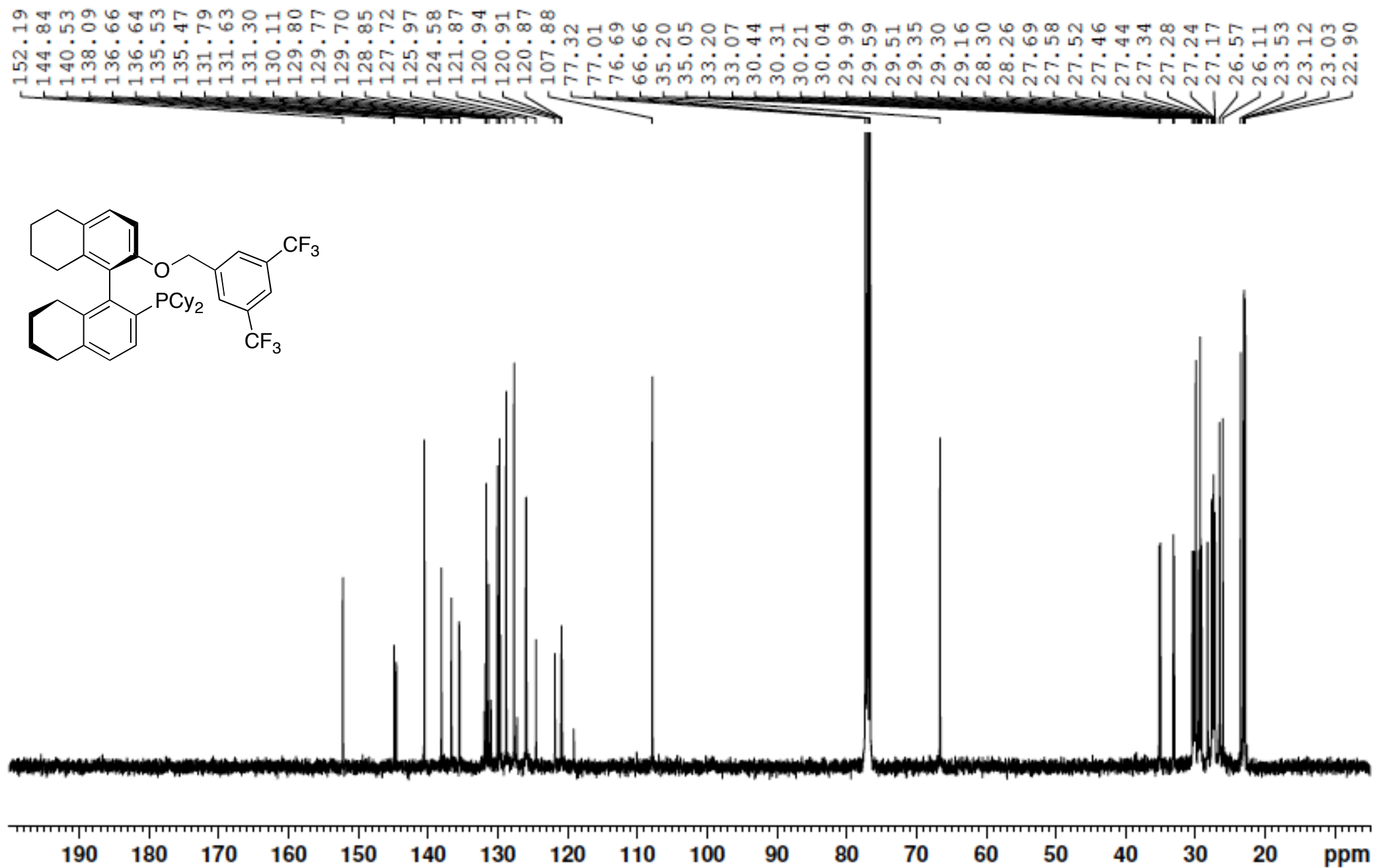




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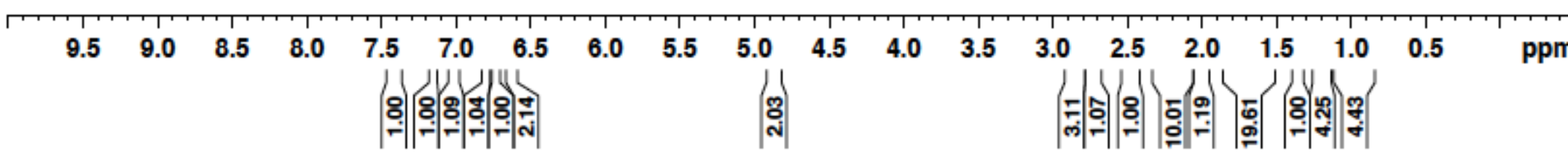
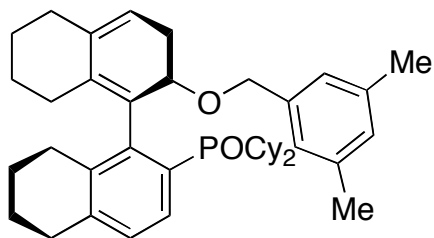
JF-L7 CNMR
BBFO1
2014-01-24

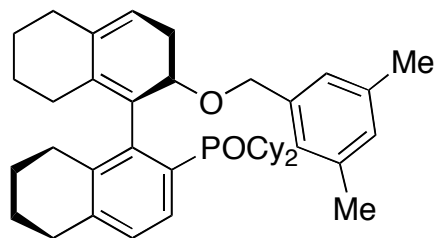


JF11-103 1HMR CDCl3
AV400 2013-Oct-14

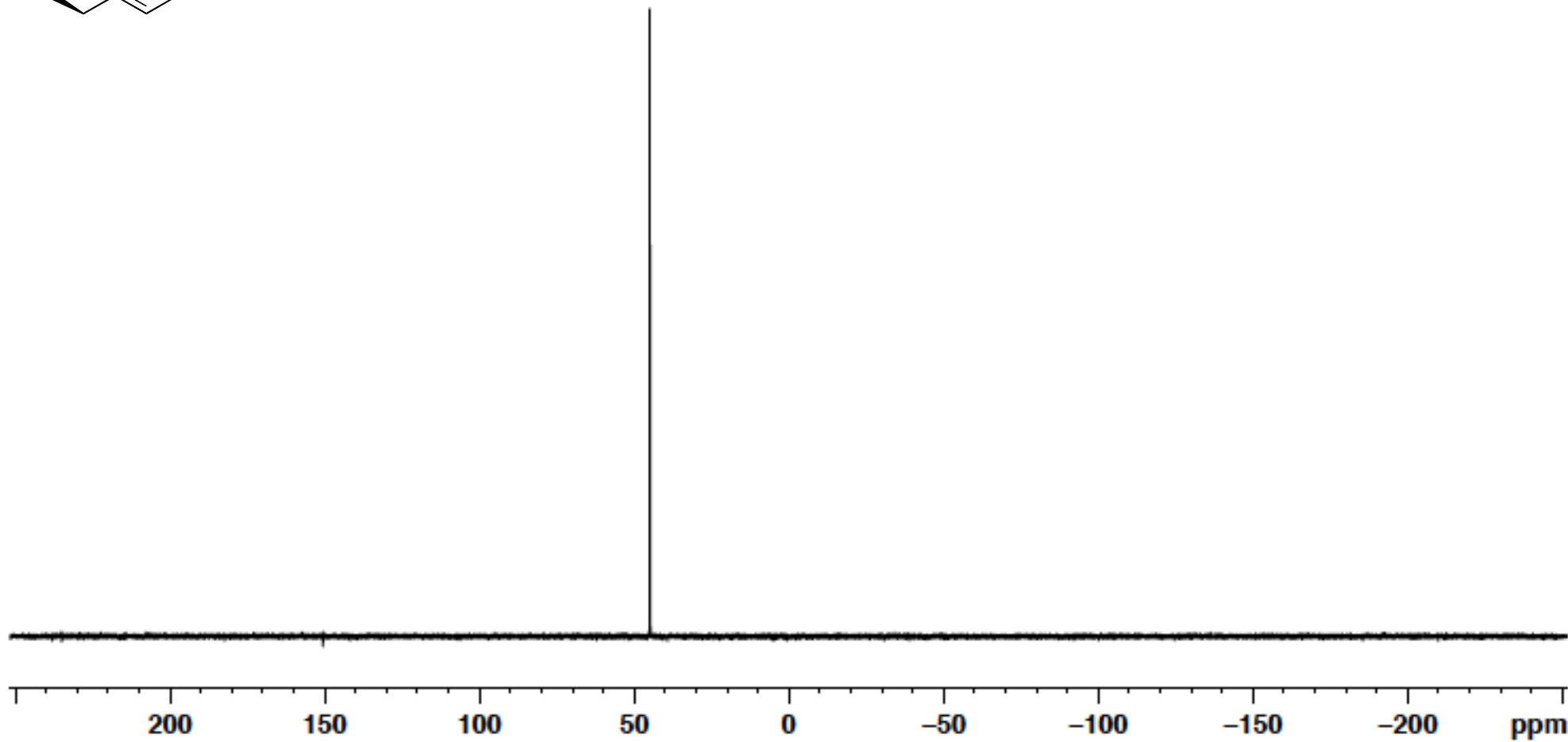
S21

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7.154
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7.031
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6.737
6.717
6.638
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2.810
2.752
2.320
2.244
2.225
2.202
2.189
2.173
2.129
1.841
1.791
1.775
1.761
1.746
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1.720
1.704
1.694
1.688
1.673
1.665
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1.647
1.642
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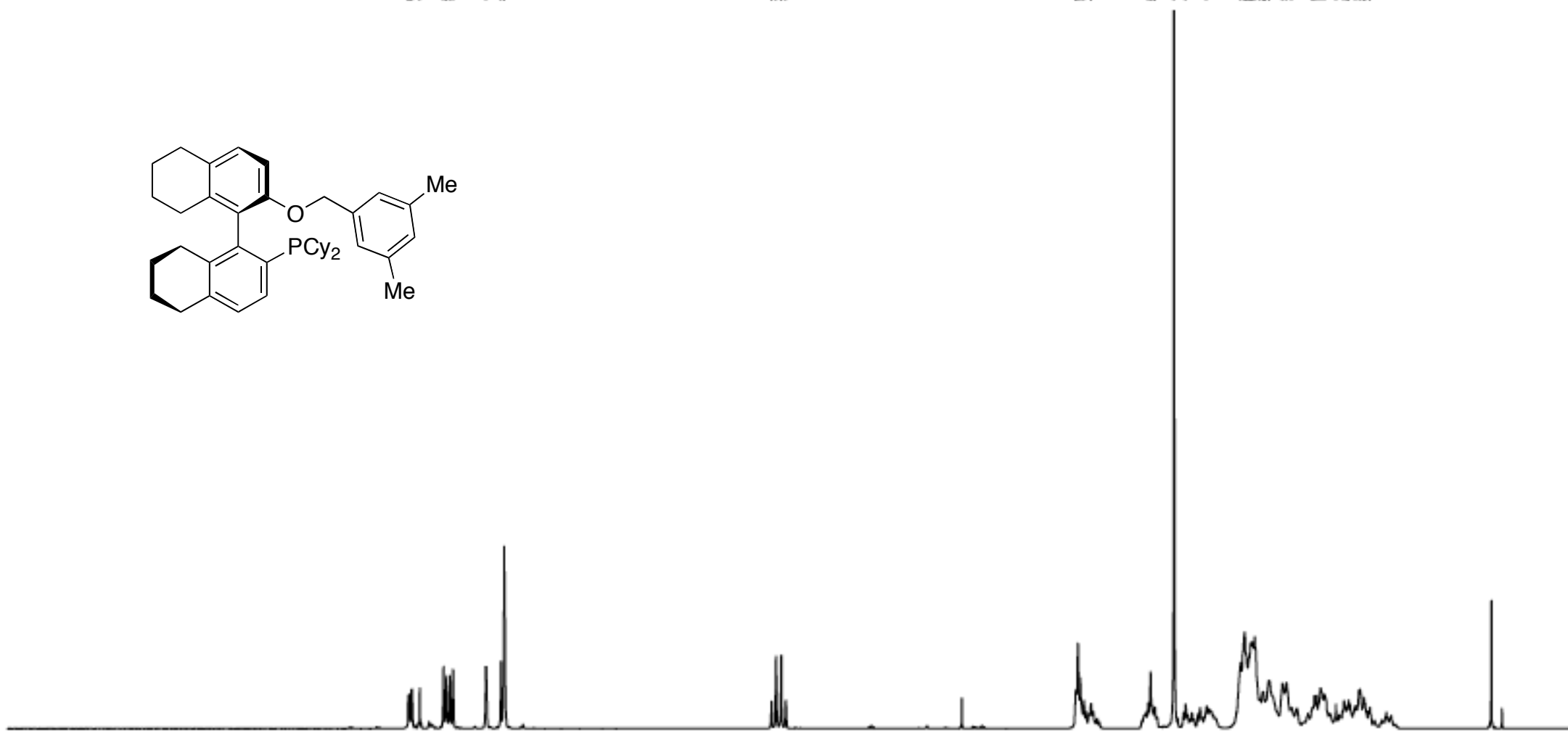
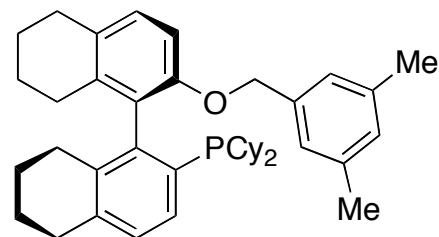




— 45.01

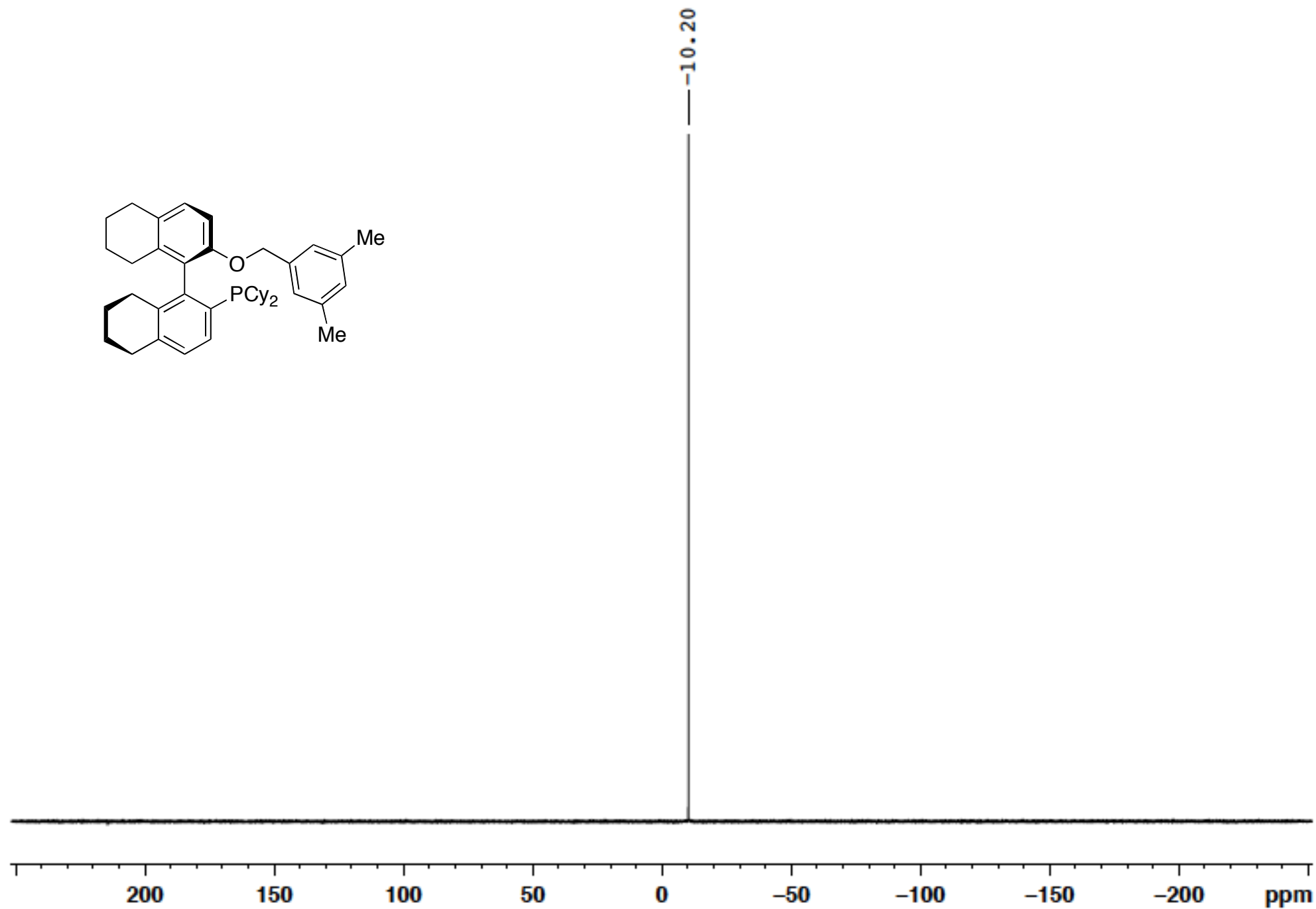
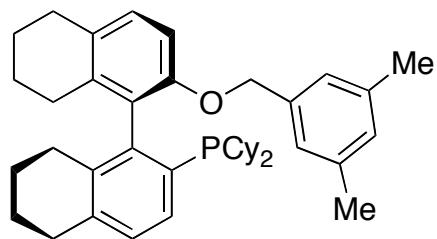


7.318
7.314
7.299
7.295
7.243
7.084
7.064
7.041
7.020
6.799
6.700
6.678
4.889
4.858
4.824
4.793
2.852
2.837
2.822
2.798
2.751
2.367
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2.342
2.324
2.195
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1.748
1.723
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1.691
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1.656
1.619
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1.558
1.470
1.442
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1.255
1.241
1.213
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0.916
0.884

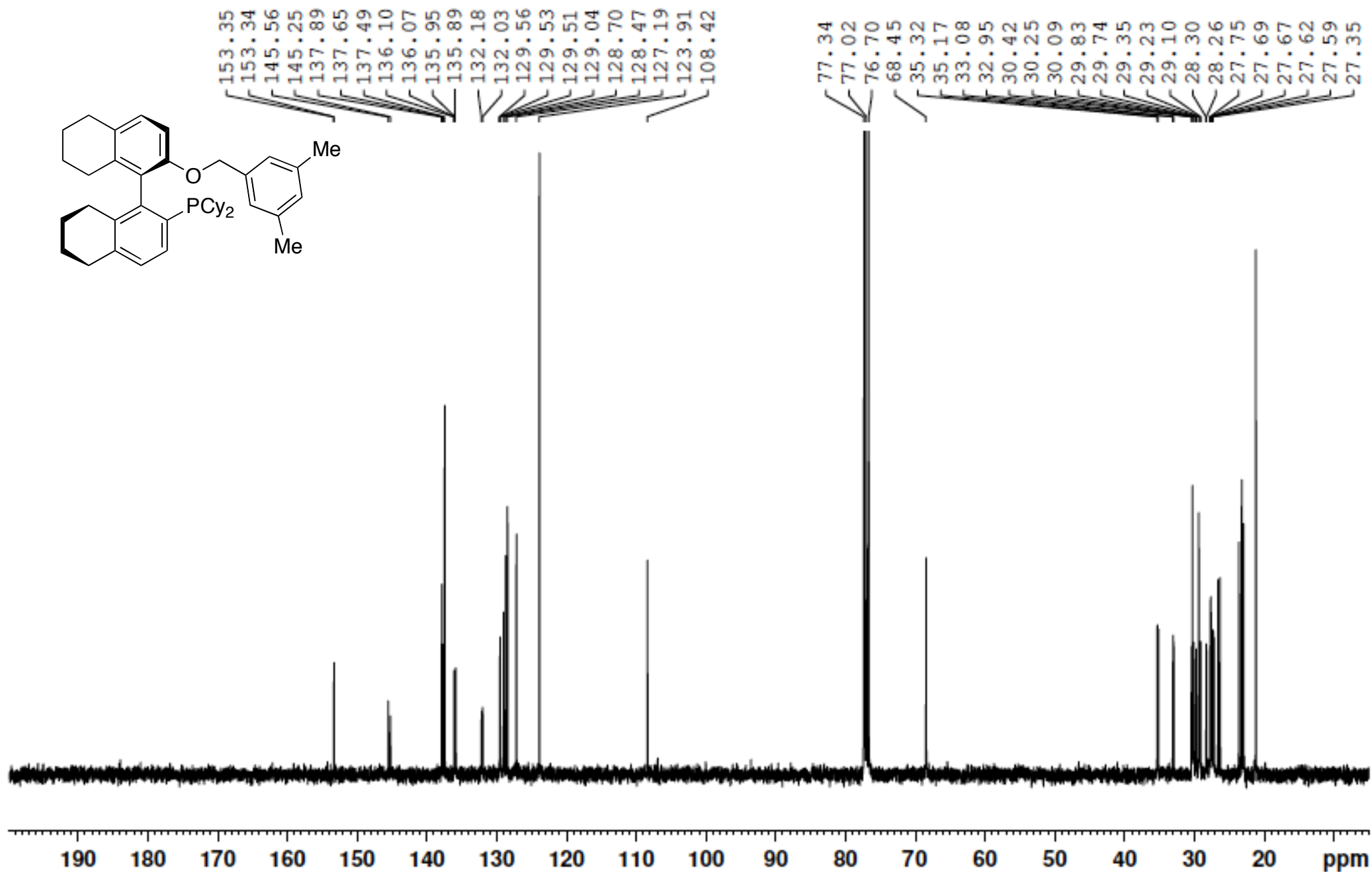


9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm

1.01
2.00
0.90
2.80
1.92
4.13
2.21
5.85
1.14
2.08
19.53
4.38
5.11
0.98

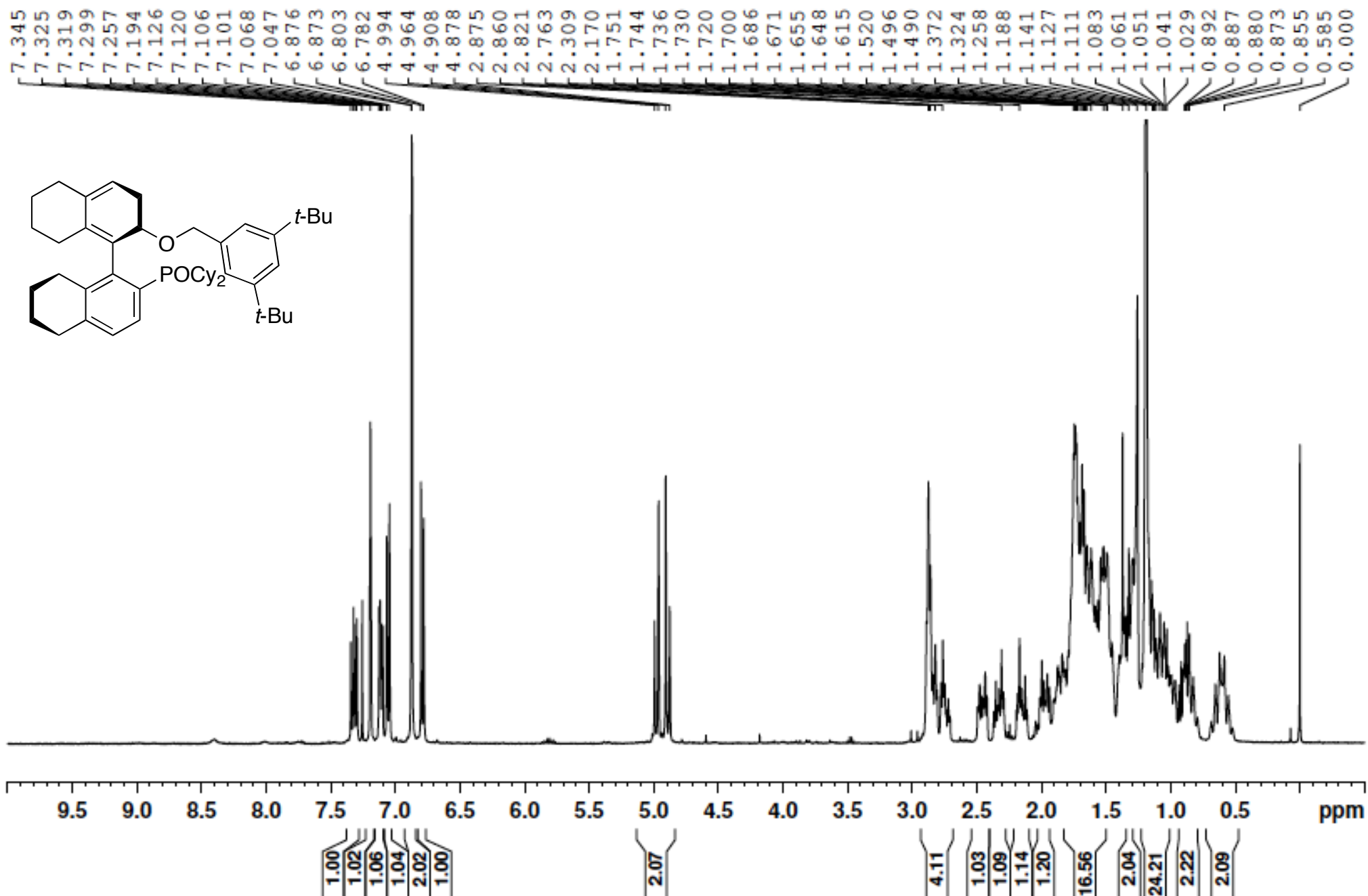


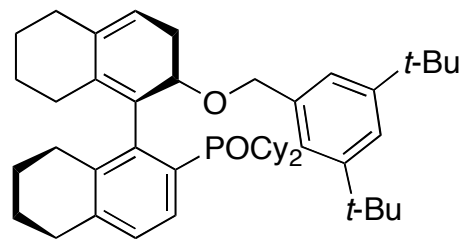
JF-L8 CNMR
BBFO1 400M
2014-01-25



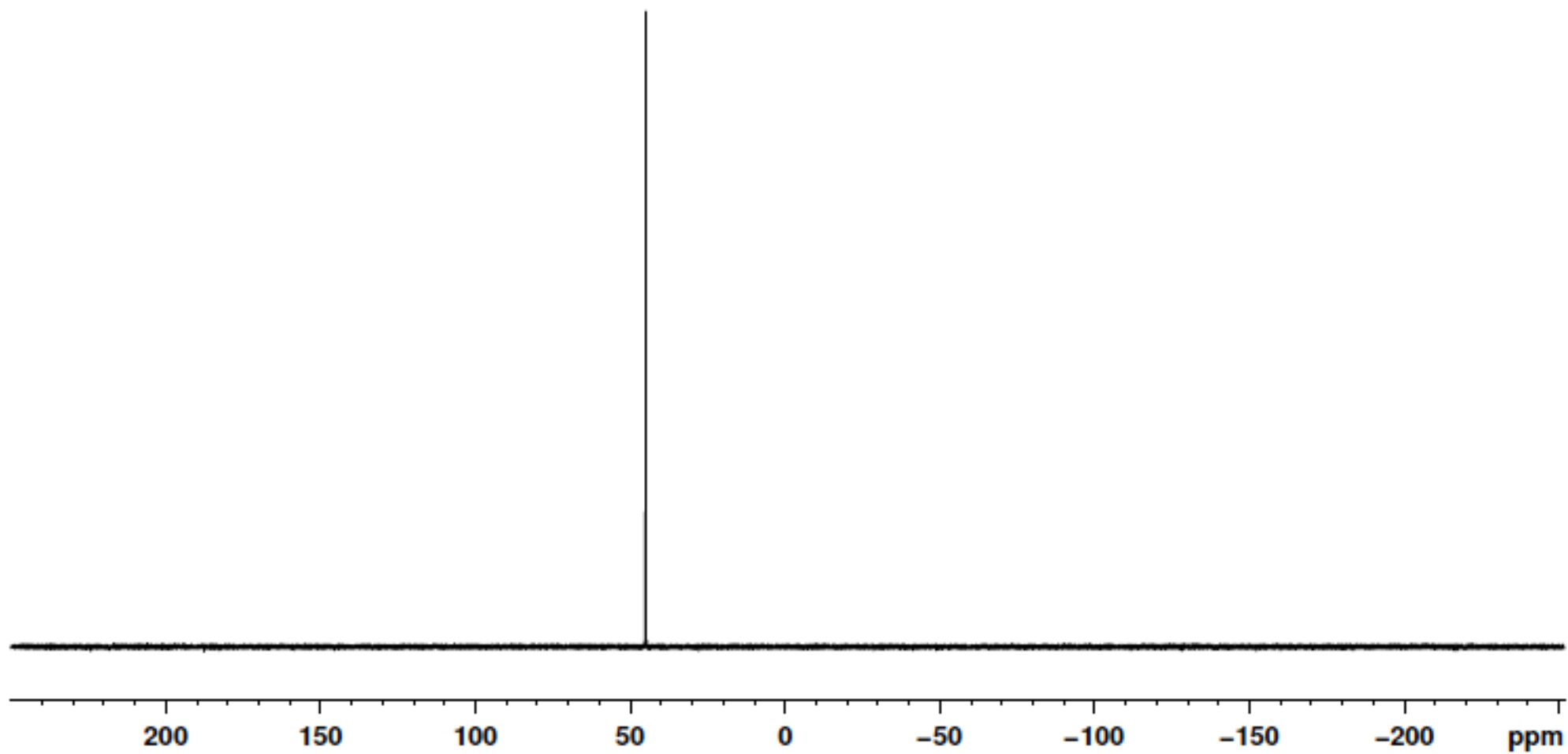
JF11-56-3, ¹HNMR, CDC13 BBFO2

2013-07-27

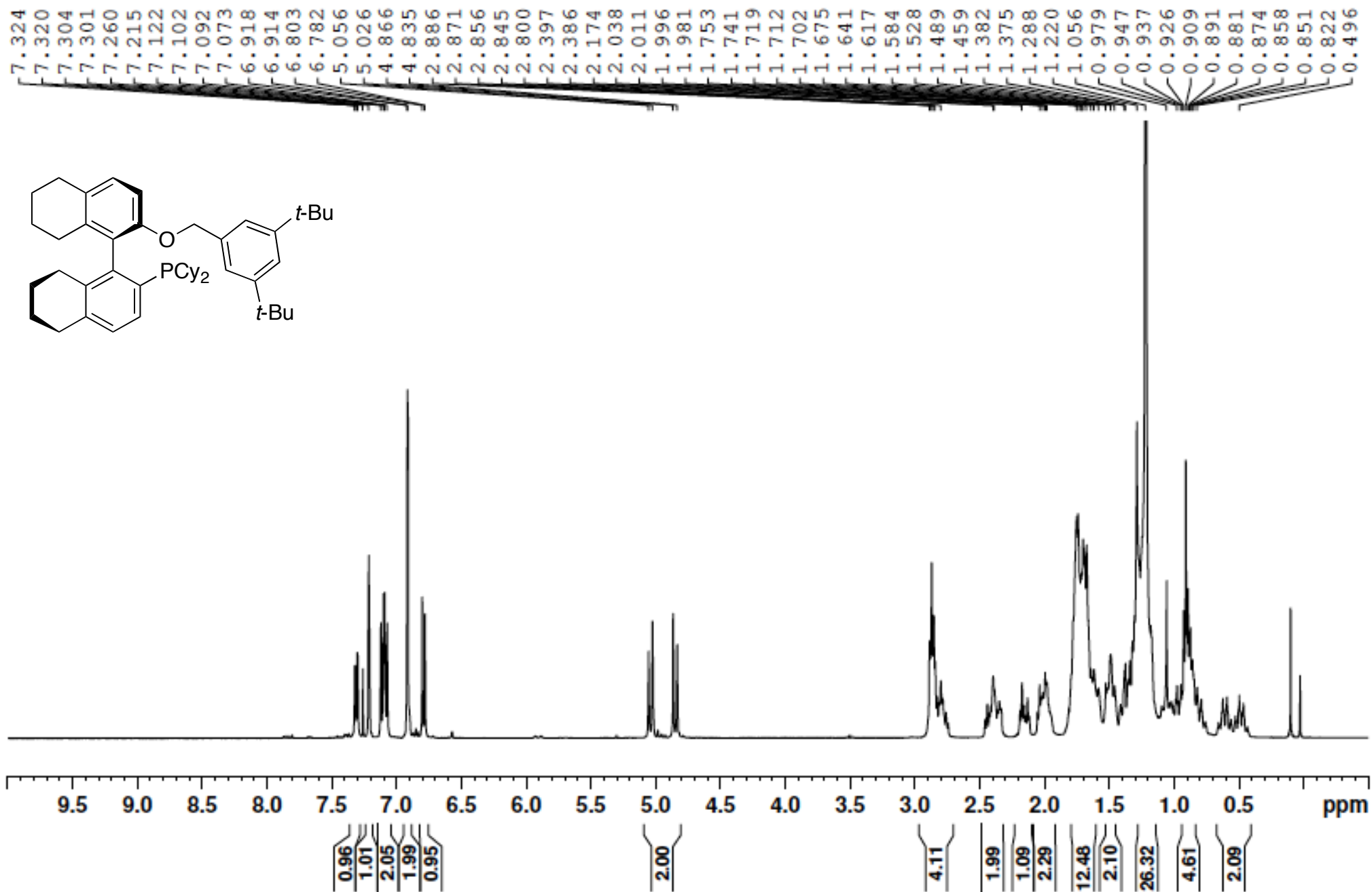


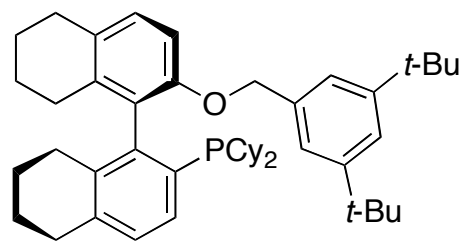


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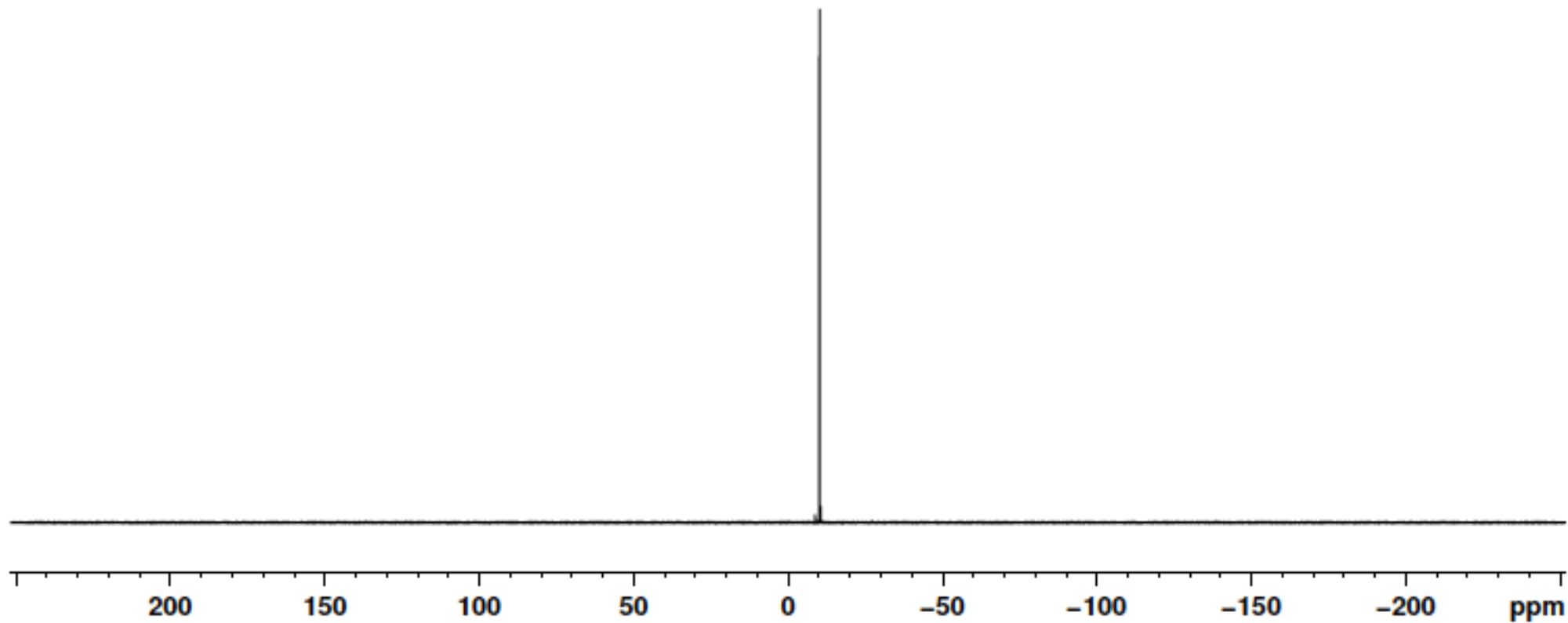


JF11-04-1 1HNMR BBFO1 CDC13
2013-8-4





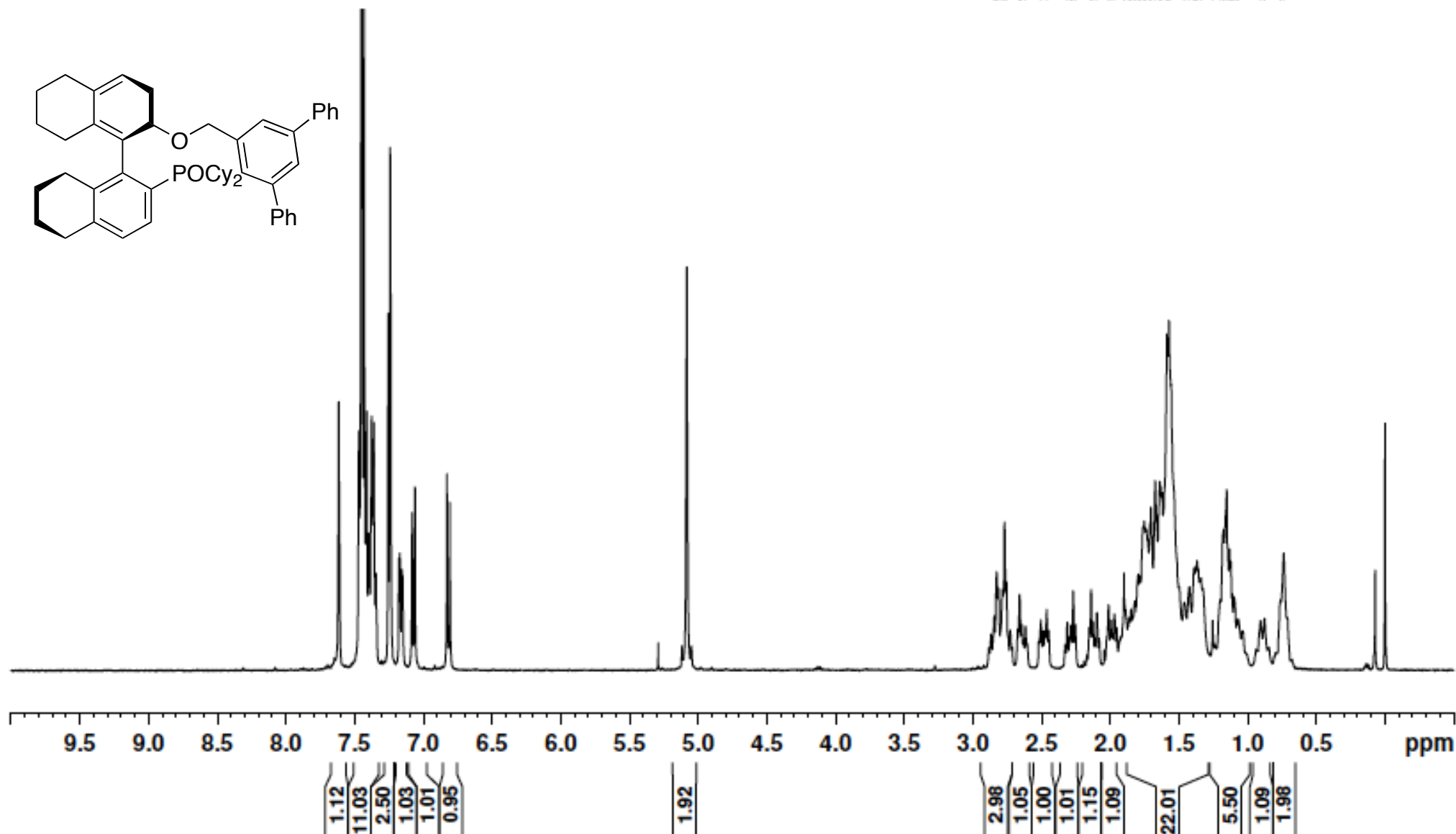
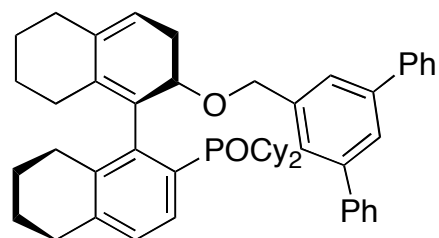
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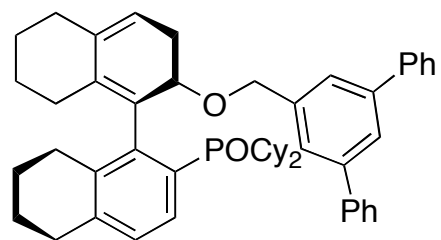


JF11-03-2 CDC13 1HNMR BBFO2

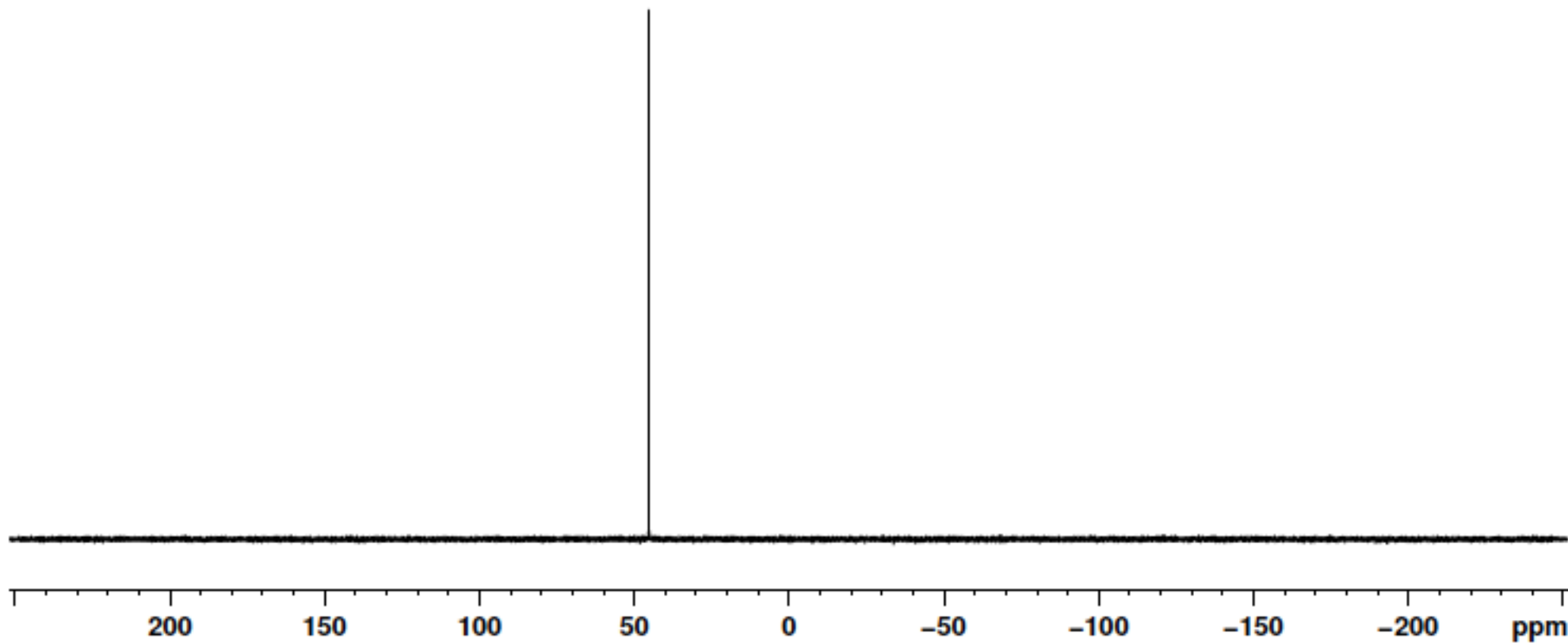
2013-08-02

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2.784
2.770
2.756
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2.646
2.618
2.505
2.463
2.313
2.286
2.270
2.253
2.140
2.125
2.098
2.013
1.996
1.971
1.901
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1.858
1.849
1.821
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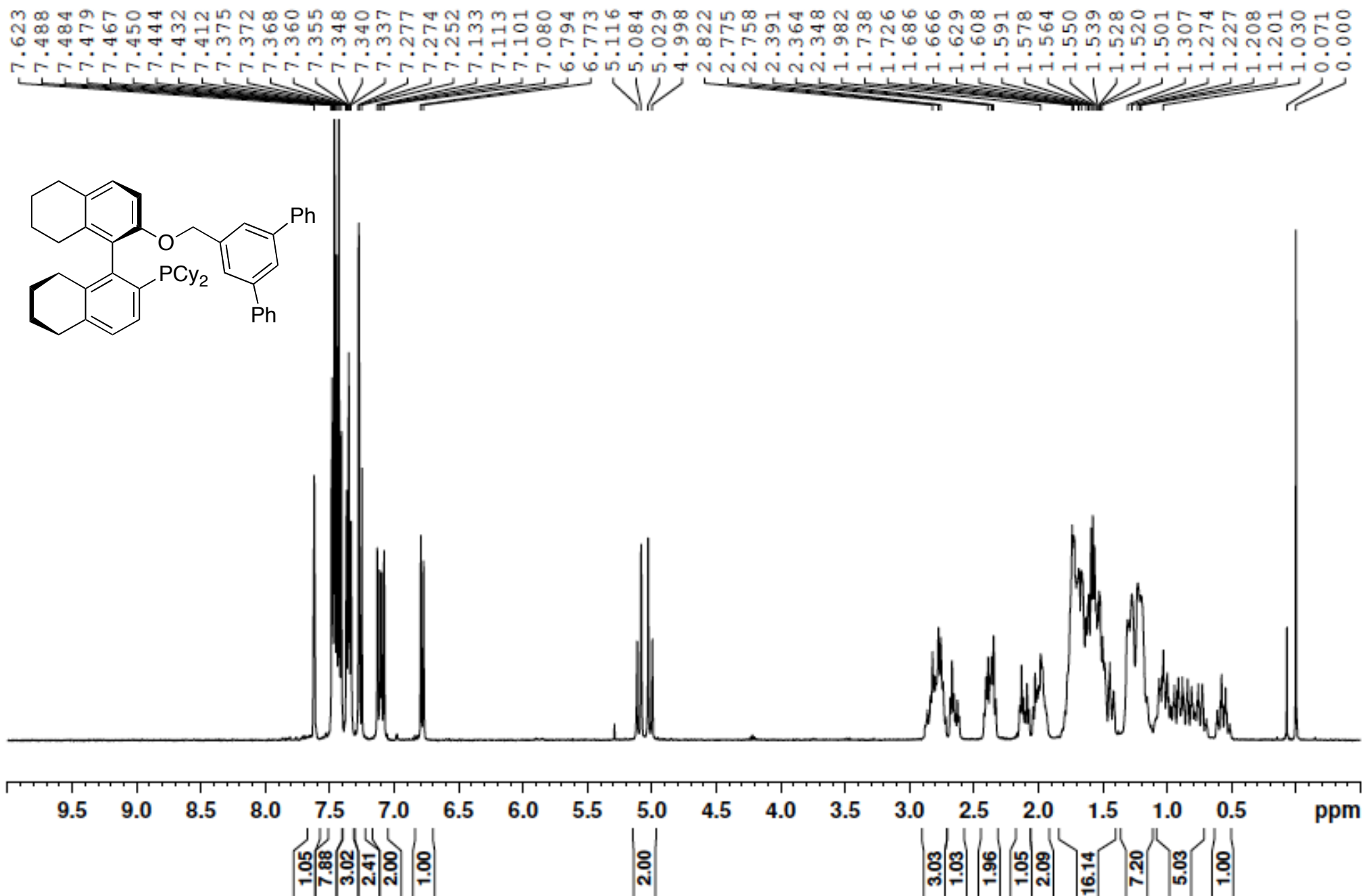


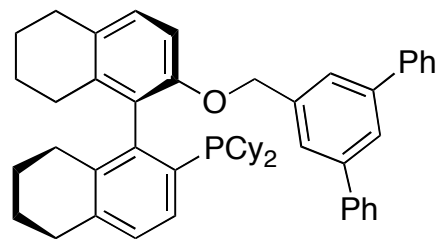


— 45.23

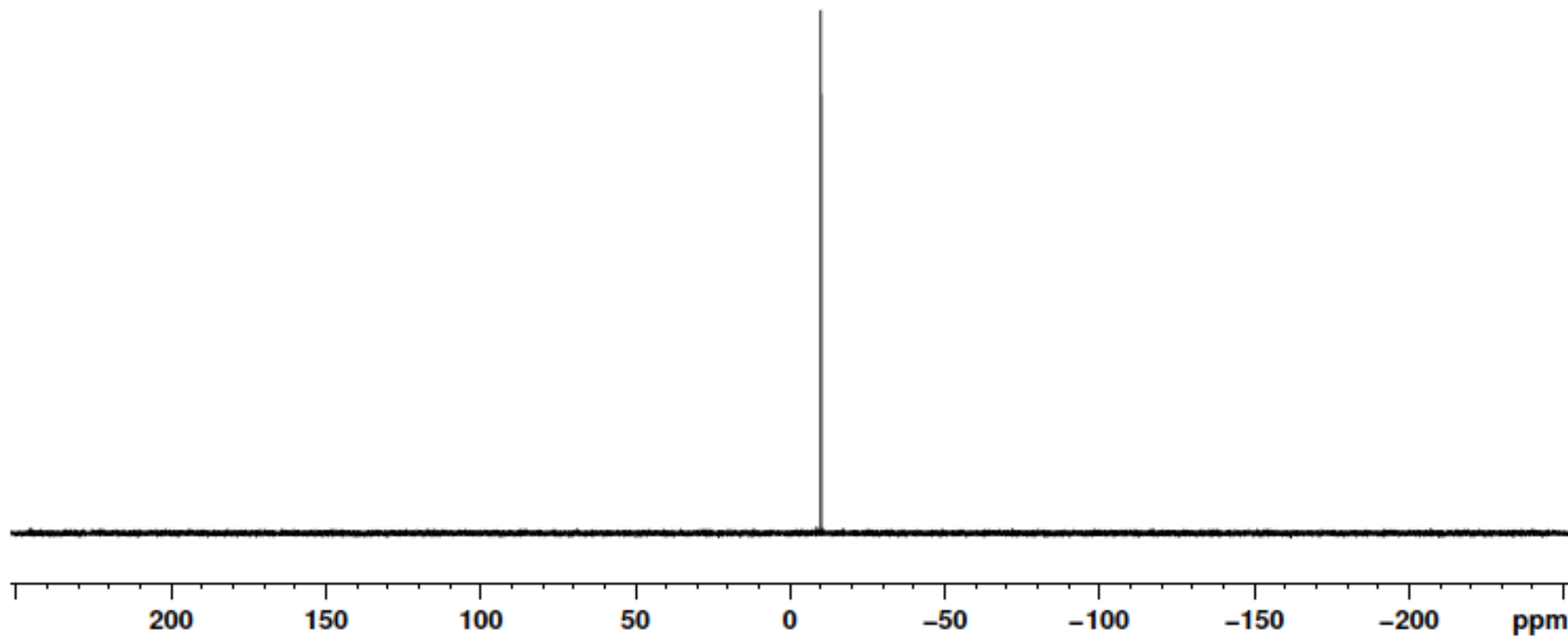


JF11-04-2 1HNMR BBFO1 CDC13
2013-8-4

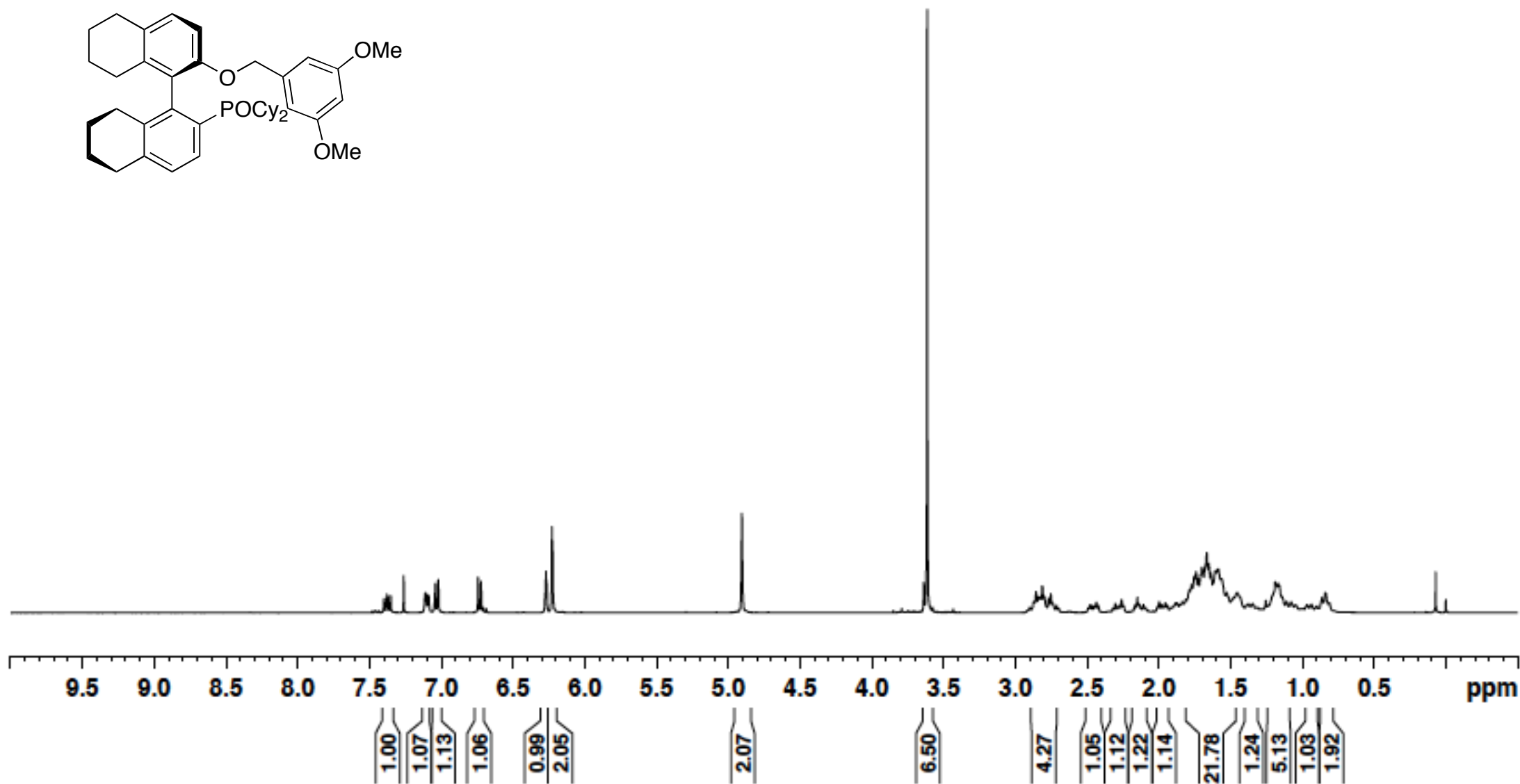
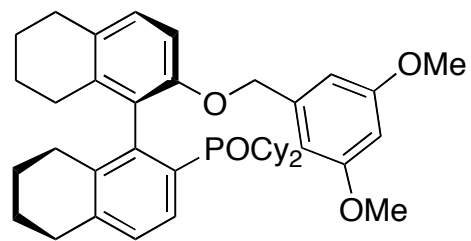


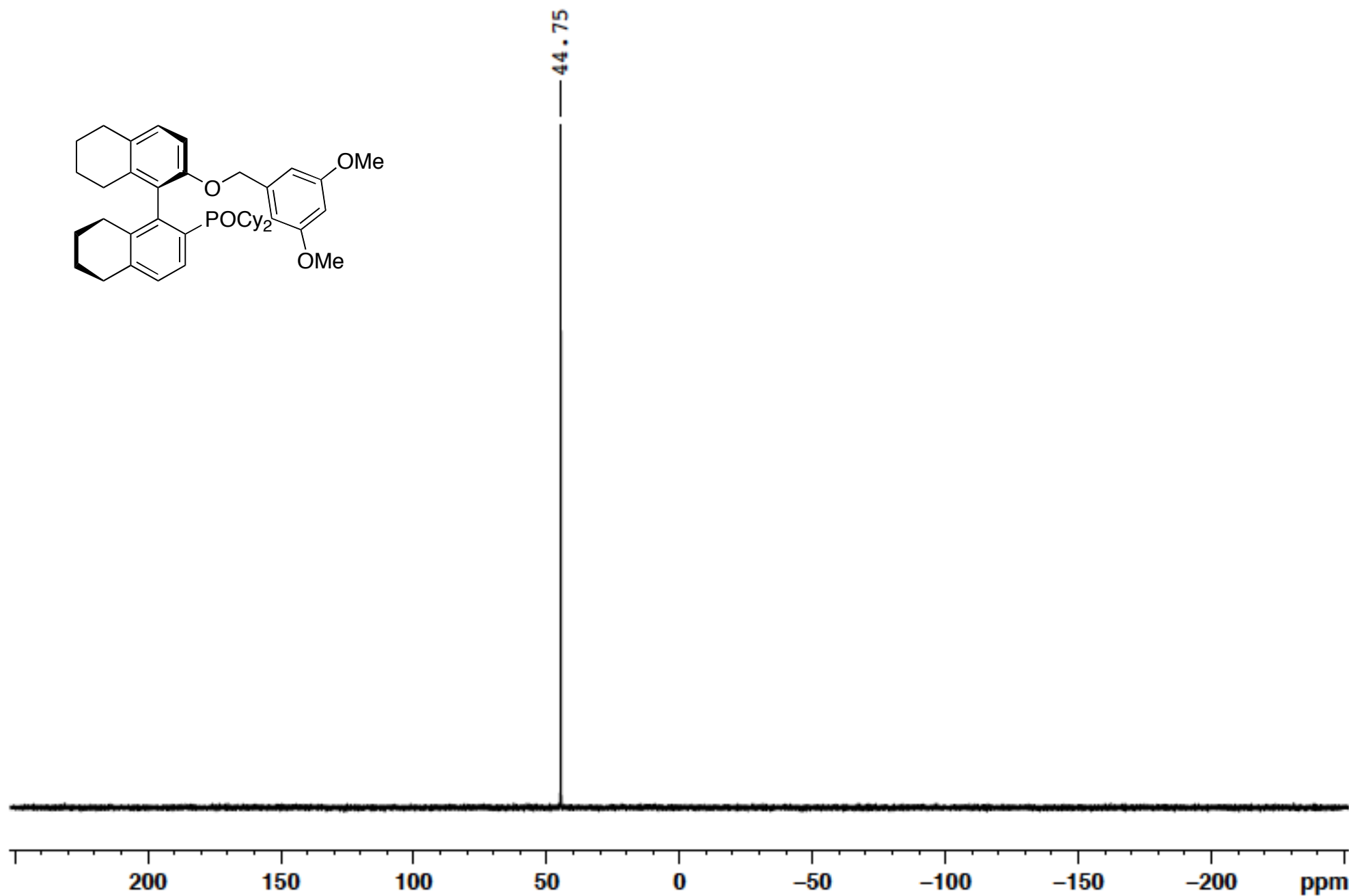
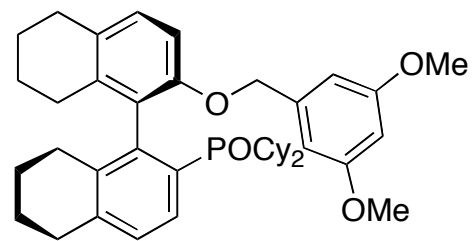


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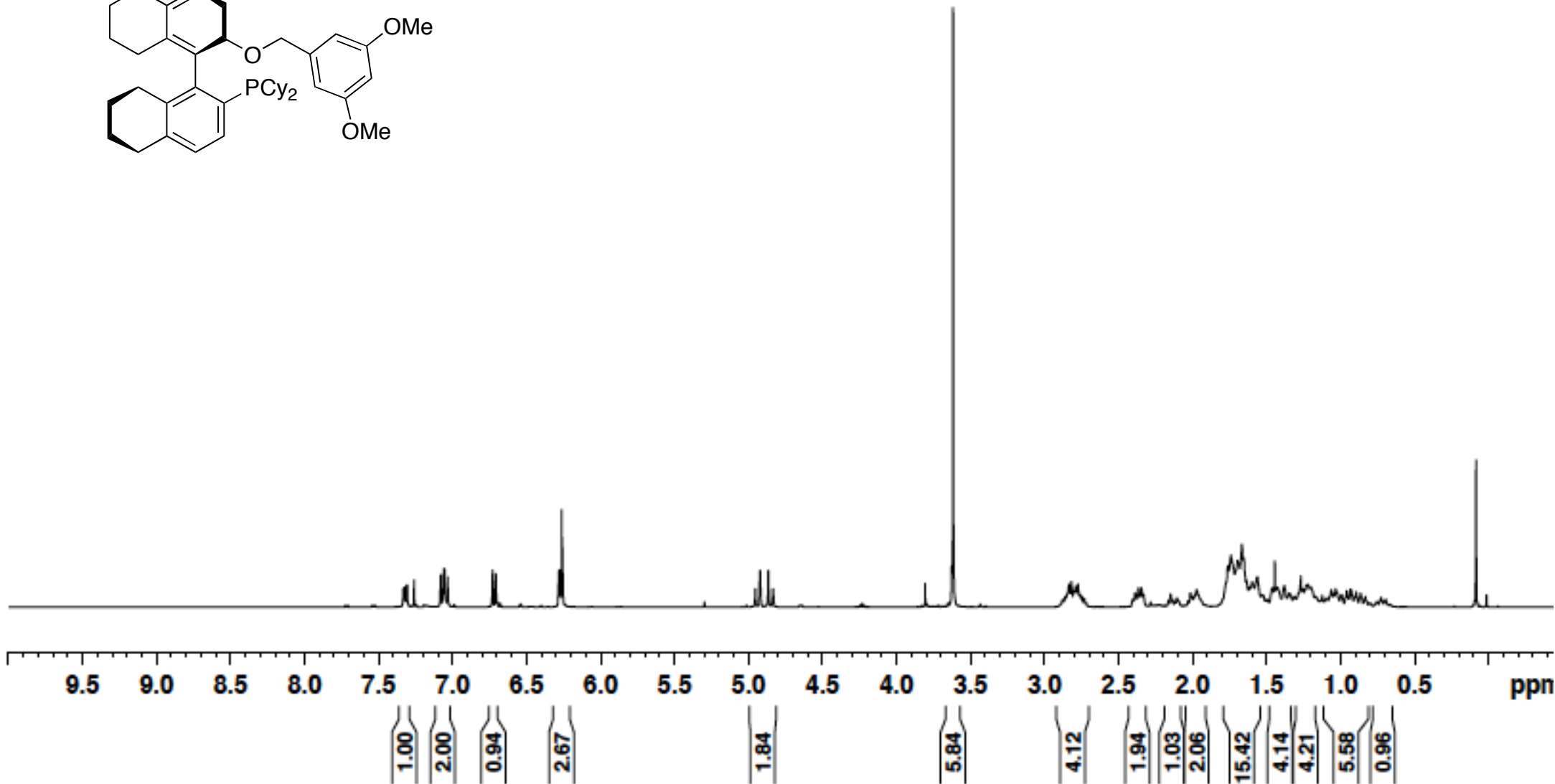
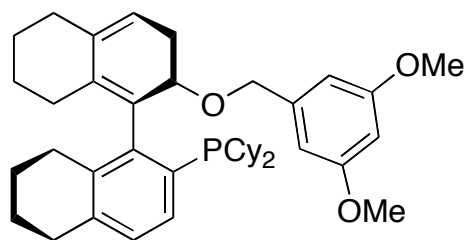
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1.147
1.140
1.109
0.865
0.841
0.071
0.000

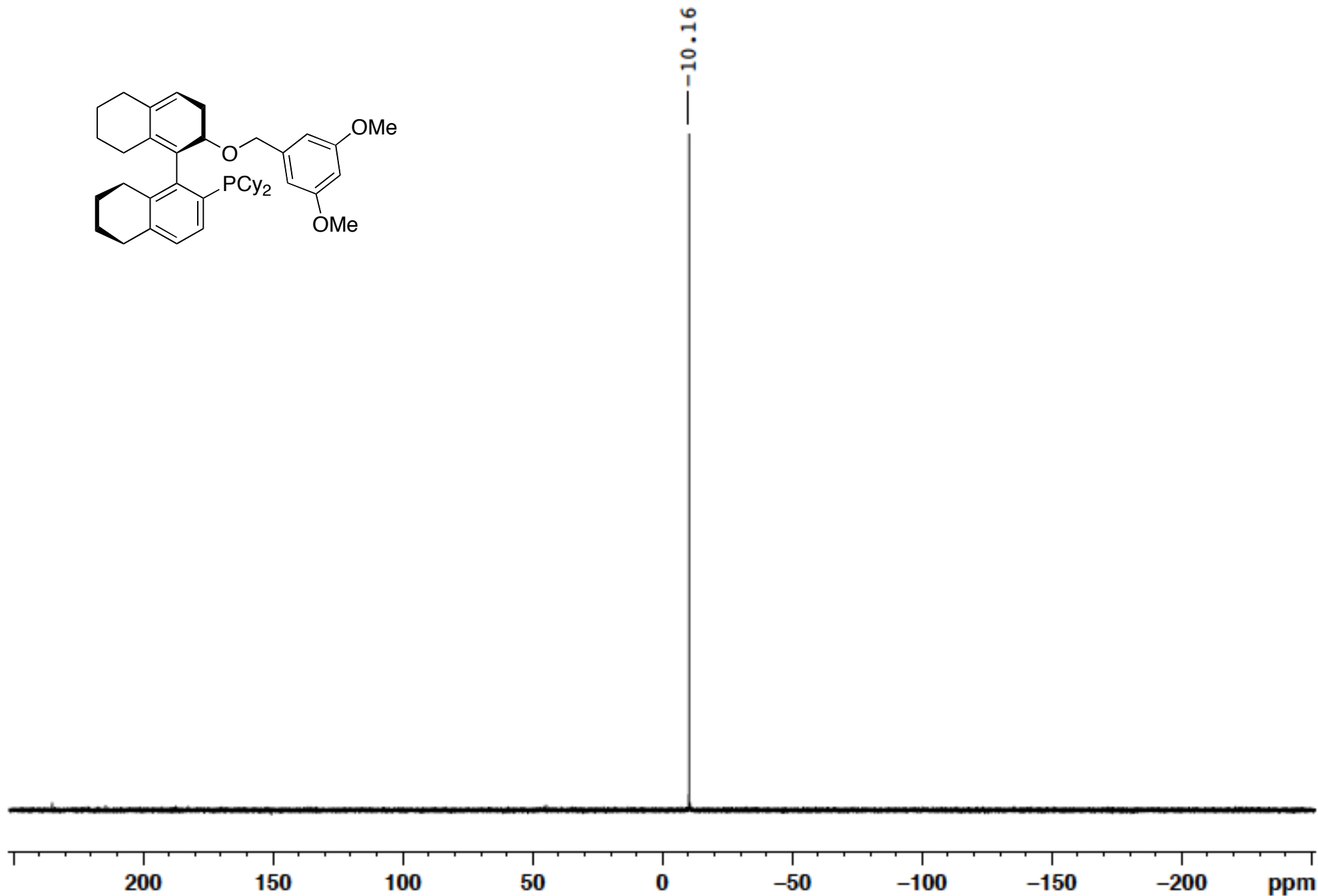
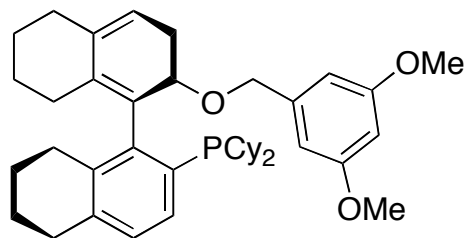




AV400 2013-09-26

7.333
7.329
7.314
7.309
7.260
7.082
7.061
7.053
7.034
6.730
6.709
6.287
6.282
6.276
6.263
6.258
4.955
4.923
4.867
4.835
3.618
2.836
2.819
2.804
2.789
2.775
2.365
2.345
1.972
1.760
1.740
1.695
1.689
1.667
1.653
1.635
1.614
1.598
1.563
1.458
1.444
1.426
1.379
1.268
1.256
1.231
1.219
1.210
1.201
1.063
1.055
1.032
1.023
0.958
0.953
0.934
0.926
0.894
0.084

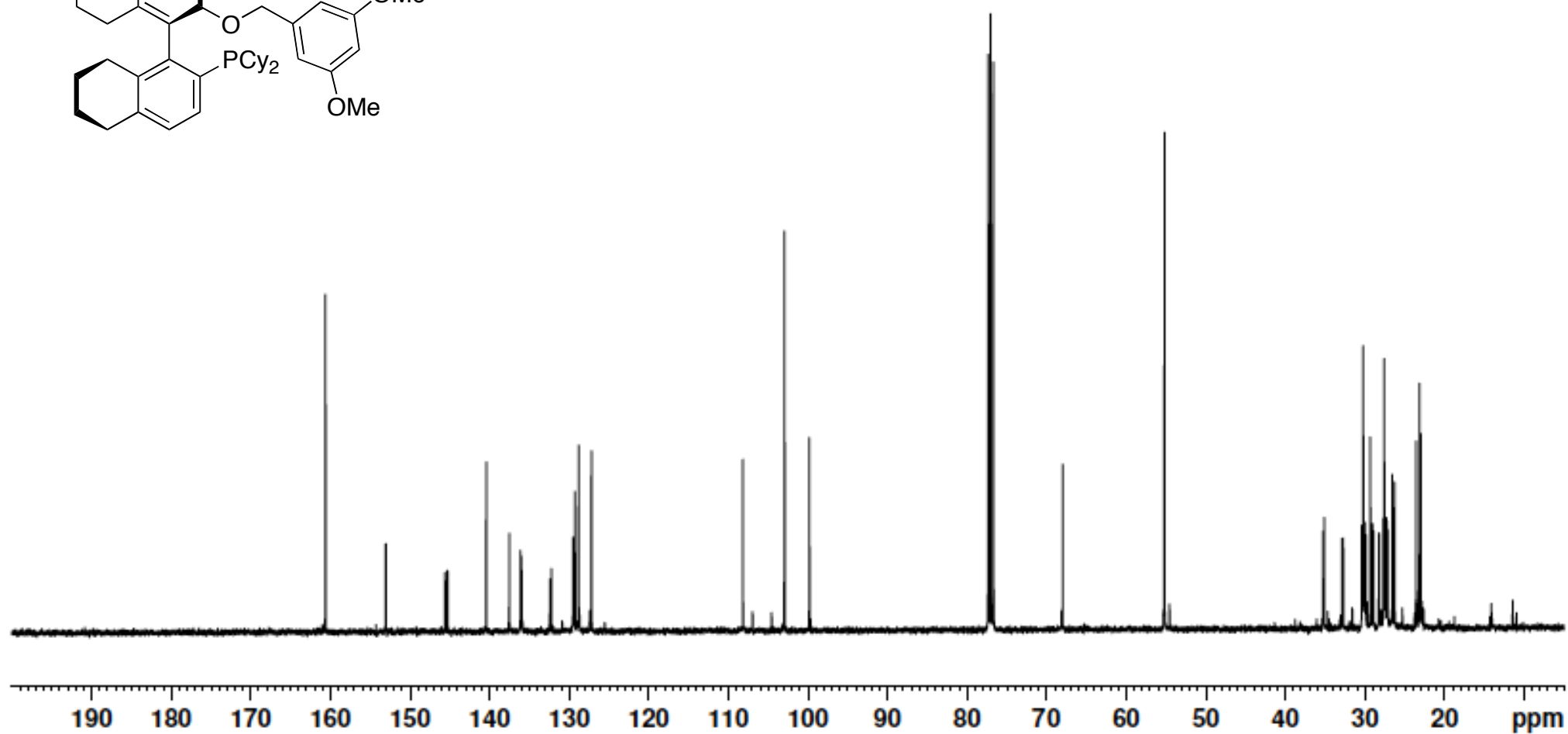
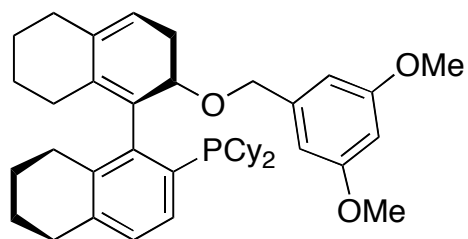




JF-L11-redo CNMR
BBFO1 400M
2014-01-25

160.64
153.09
153.08
145.60
145.30
140.43
137.52
136.16
136.14
136.05
135.99
132.41
132.26
129.54
129.52
129.34
129.28
128.83
128.74
127.43
127.23
108.17
102.97
99.84

77.36
77.04
76.72
68.01
55.19
35.29
35.14
32.88
32.75
30.39
30.25
30.05
30.00
29.91
29.35
29.08
28.96
28.28
28.24
27.69
27.61
27.51
27.31
27.26



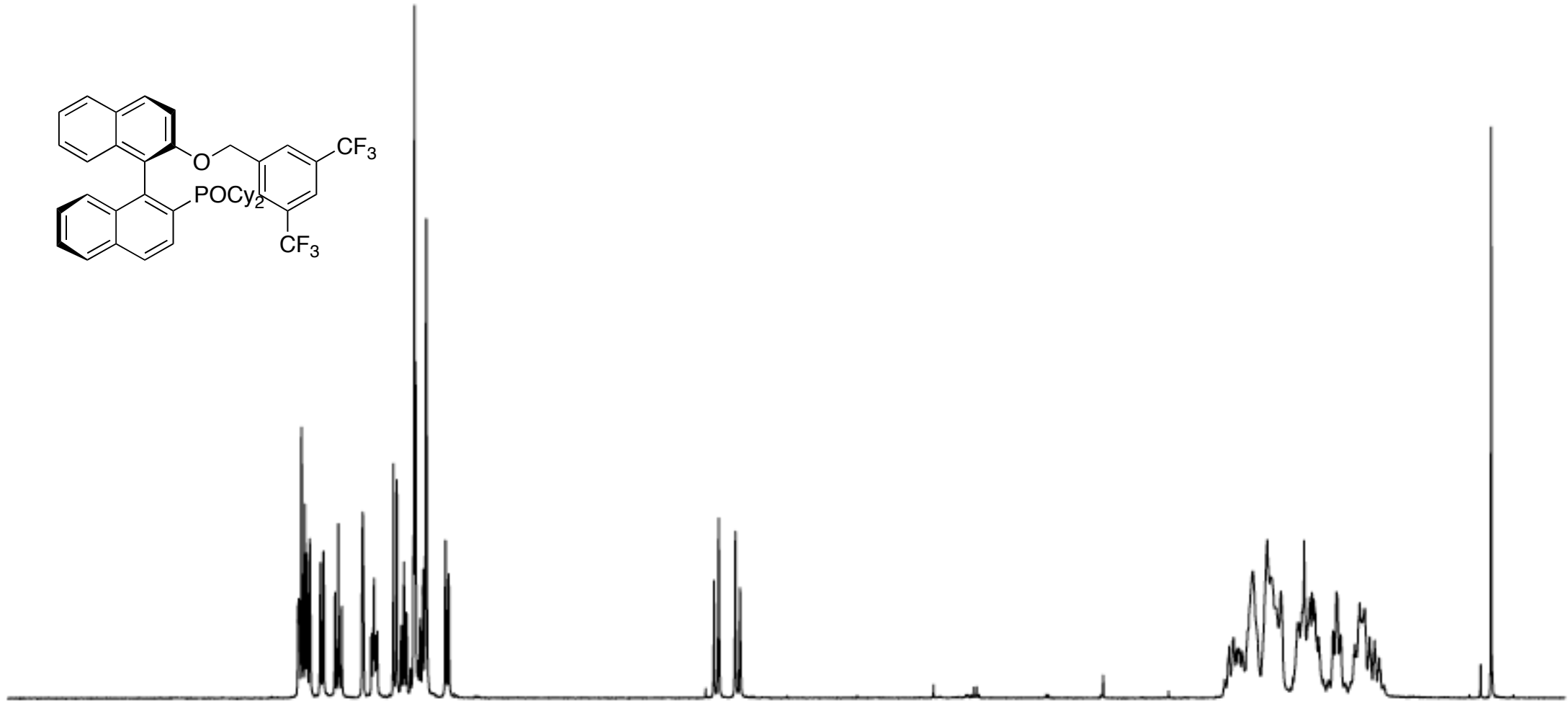
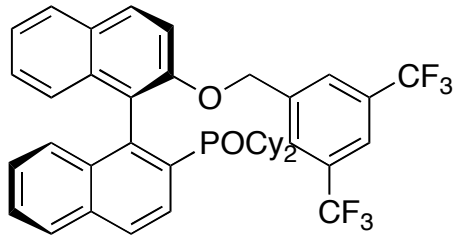
JF12-017, 1H, CDCl3

BBFO1 400MHz,

2013, 06, Dec

S39

8.040
8.035
8.017
7.994
7.980
7.960
7.889
7.869
7.791
7.768
7.746
7.604
7.542
7.533
7.527
7.521
7.513
7.507
7.399
7.377
7.347
7.330
7.312
7.310
7.264
7.258
7.251
7.221
7.218
7.200
7.197
7.180
7.048
7.027
5.239
5.207
5.095
5.063
1.606
1.510
1.485
1.417
1.306
1.294
1.261
1.254
1.226
1.217
1.208
1.195
1.186
1.175
1.066
1.042
1.015
0.886
0.865
0.853
0.000

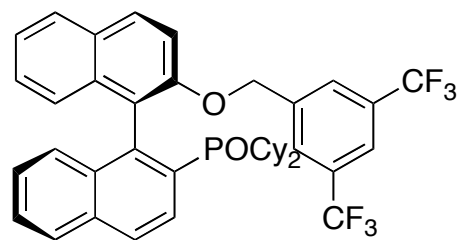


9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm

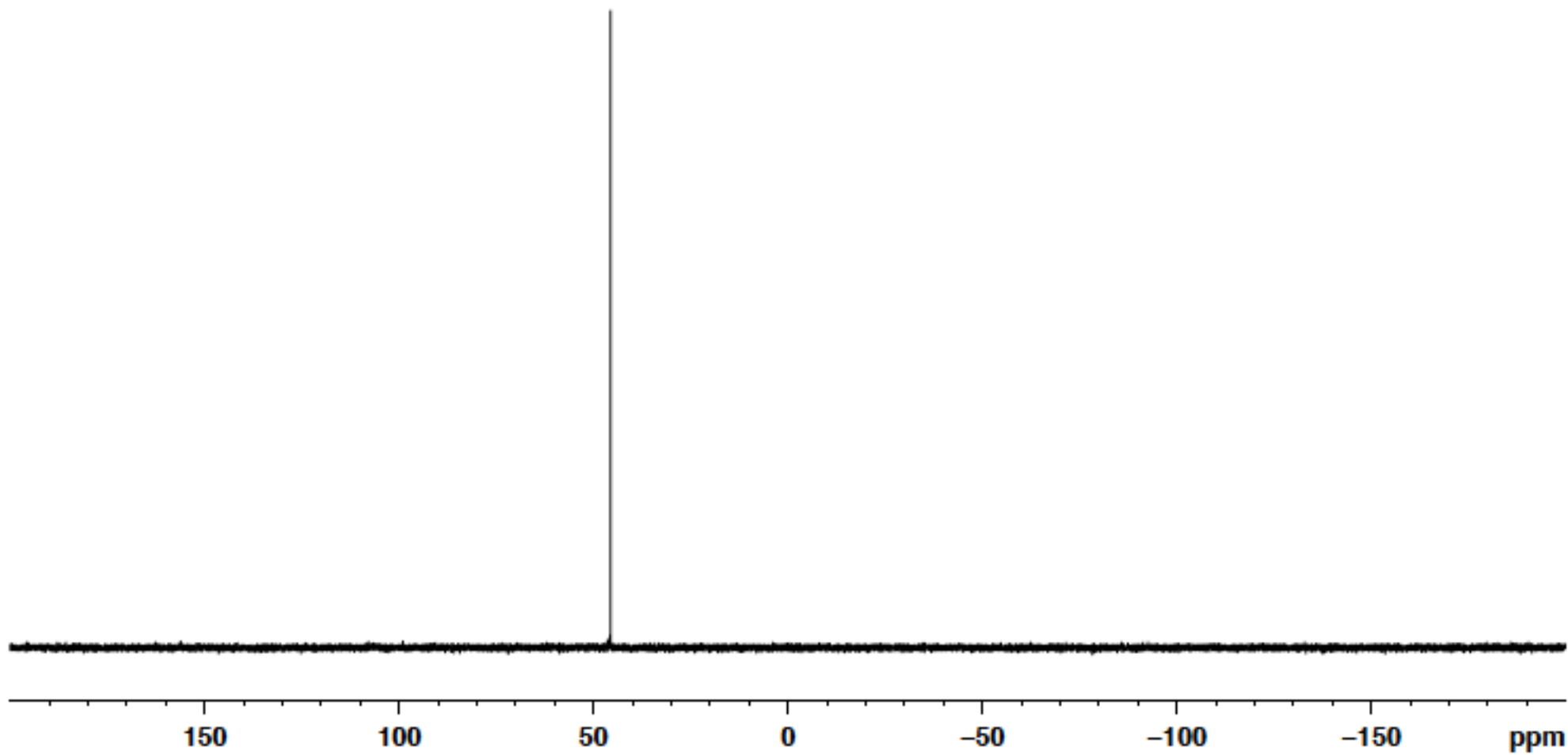
2.90 1.00 1.00 0.95 1.00 0.96 0.99 2.56 3.02 0.98 0.98 0.98 5.16 5.91 5.39 2.09 4.07

JF12-017,31P, CDCl3
BBFO1 400MHz,
2013, 06, Dec

S40

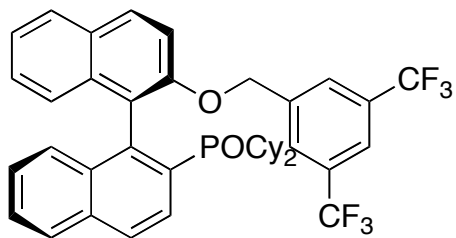


—45.63



JF12-017,19F, CDC13
BBFO1 400MHz,
2013, 010, Dec

S41



—63.04



-20

-40

-60

-80

-100

-120

-140

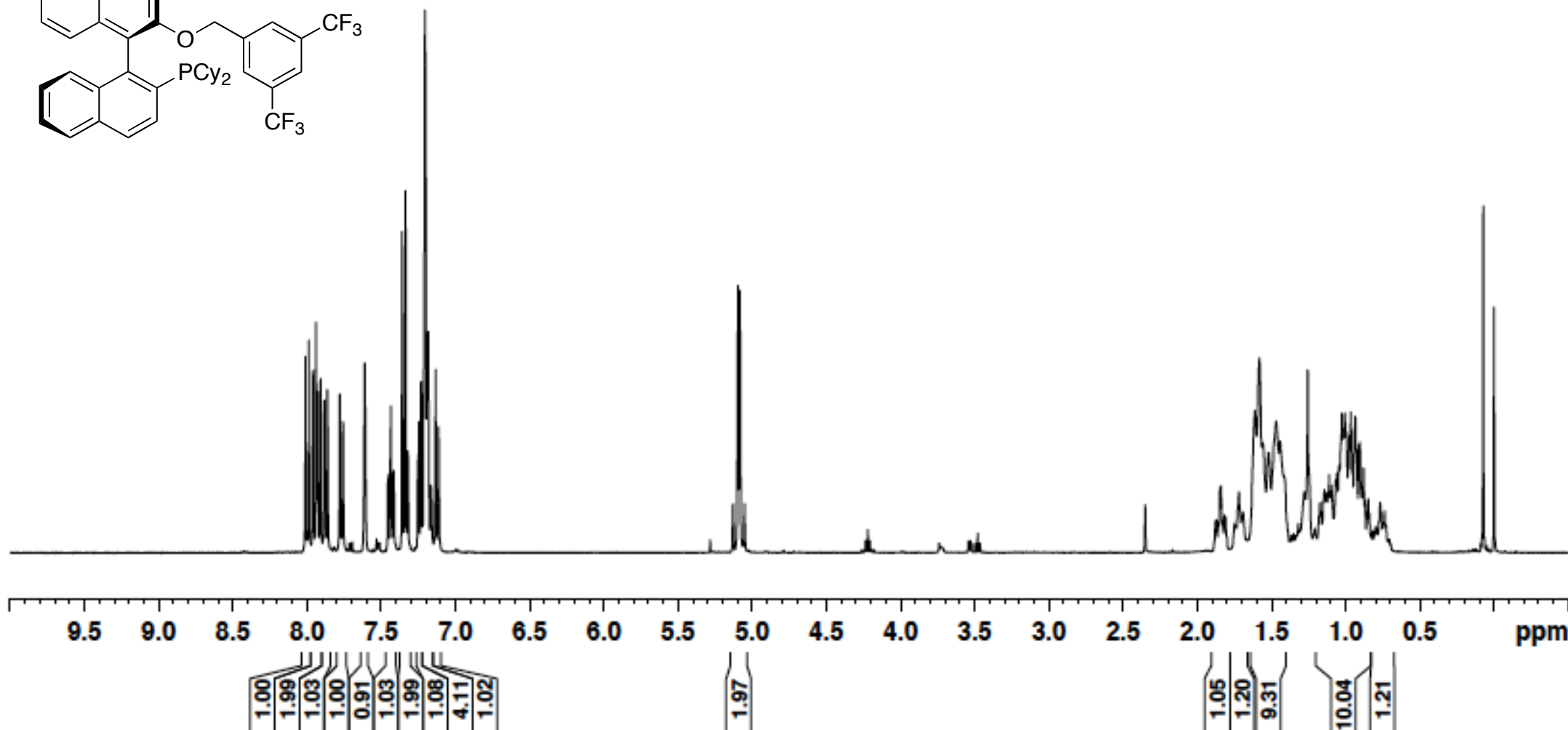
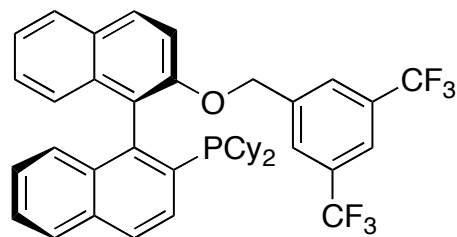
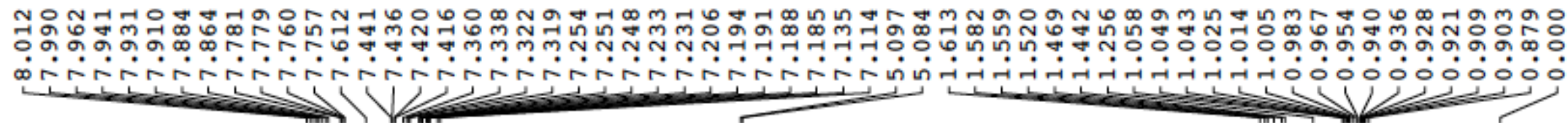
-160

-180

ppm

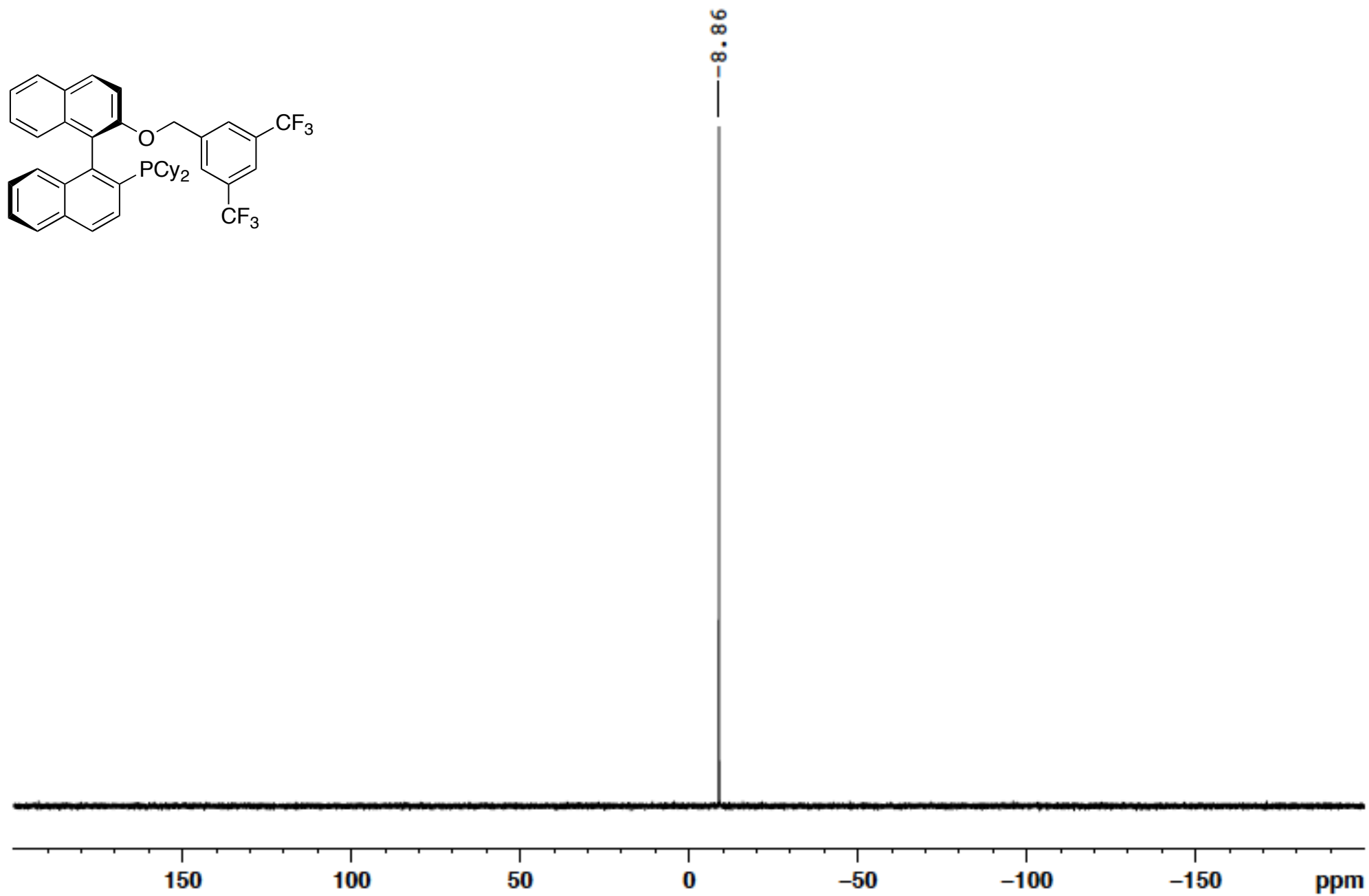
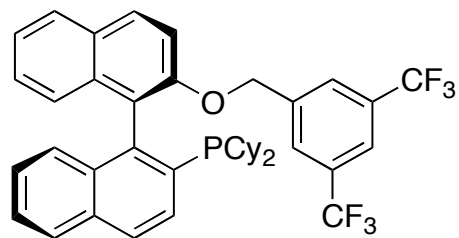
JF12-019, 1H, CDCl3
BBFO1 400MHz,
2013, 08, Dec

S42



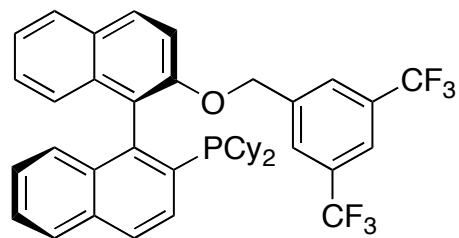
JF12-019,31P, CDCl3
BBFO1 400MHz,
2013, 09, Dec

S43

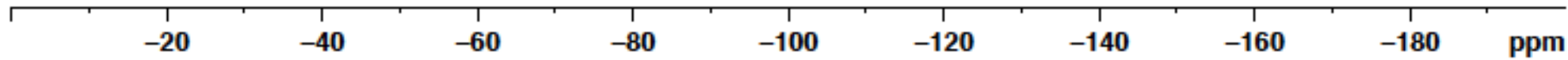


JF12-019,19F, CDCl3
BBFO1 400MHz,
2013, 09, Dec

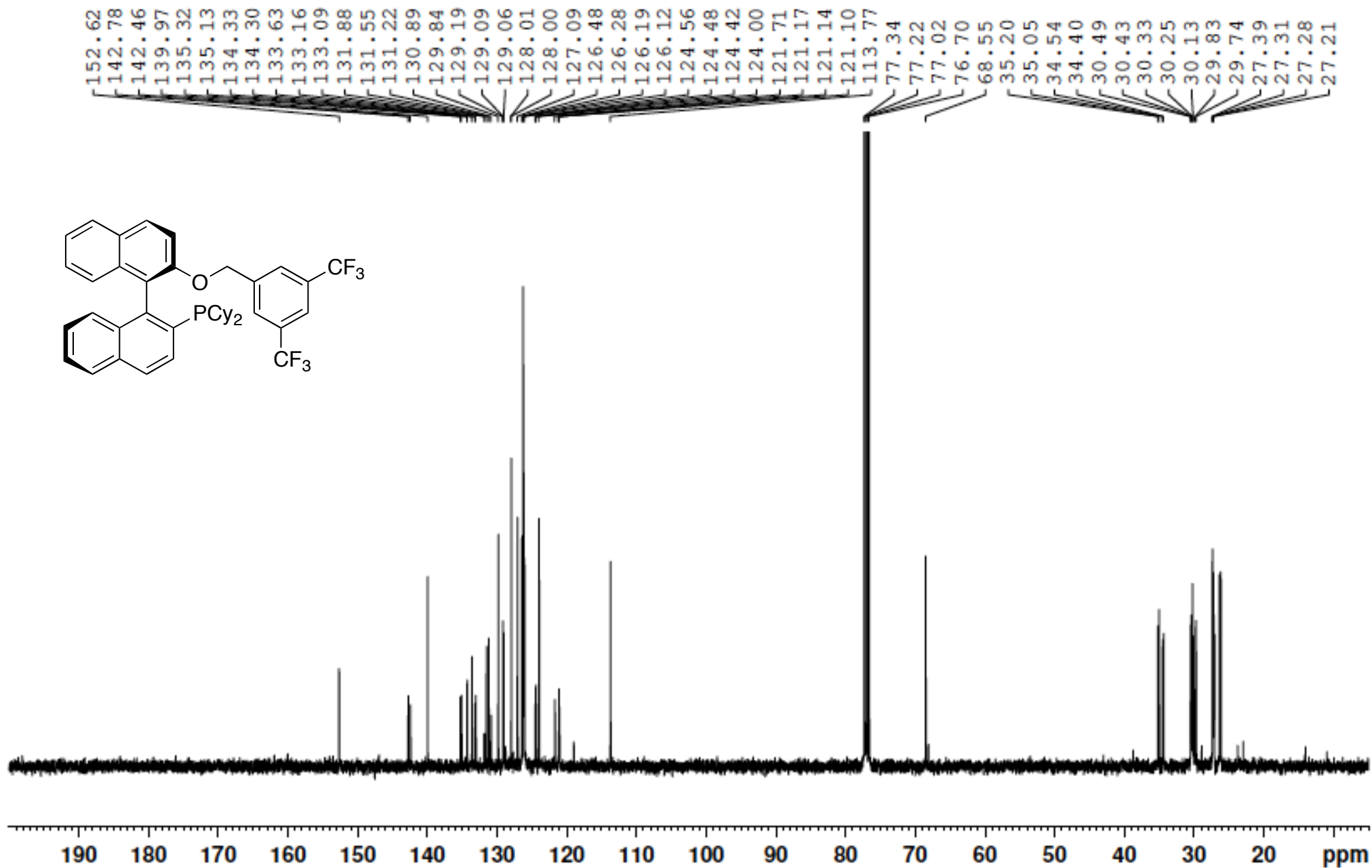
S44



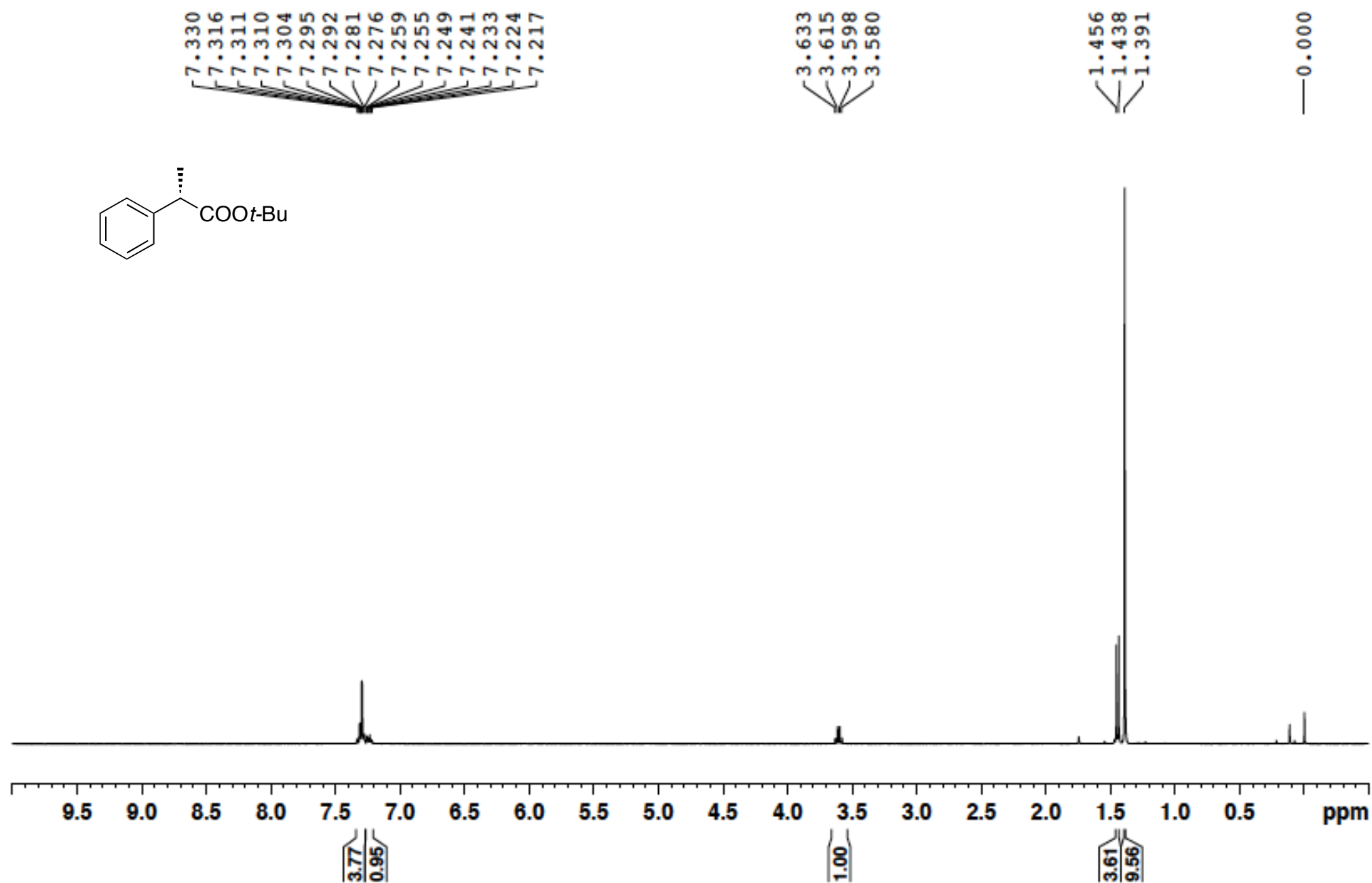
---63.02



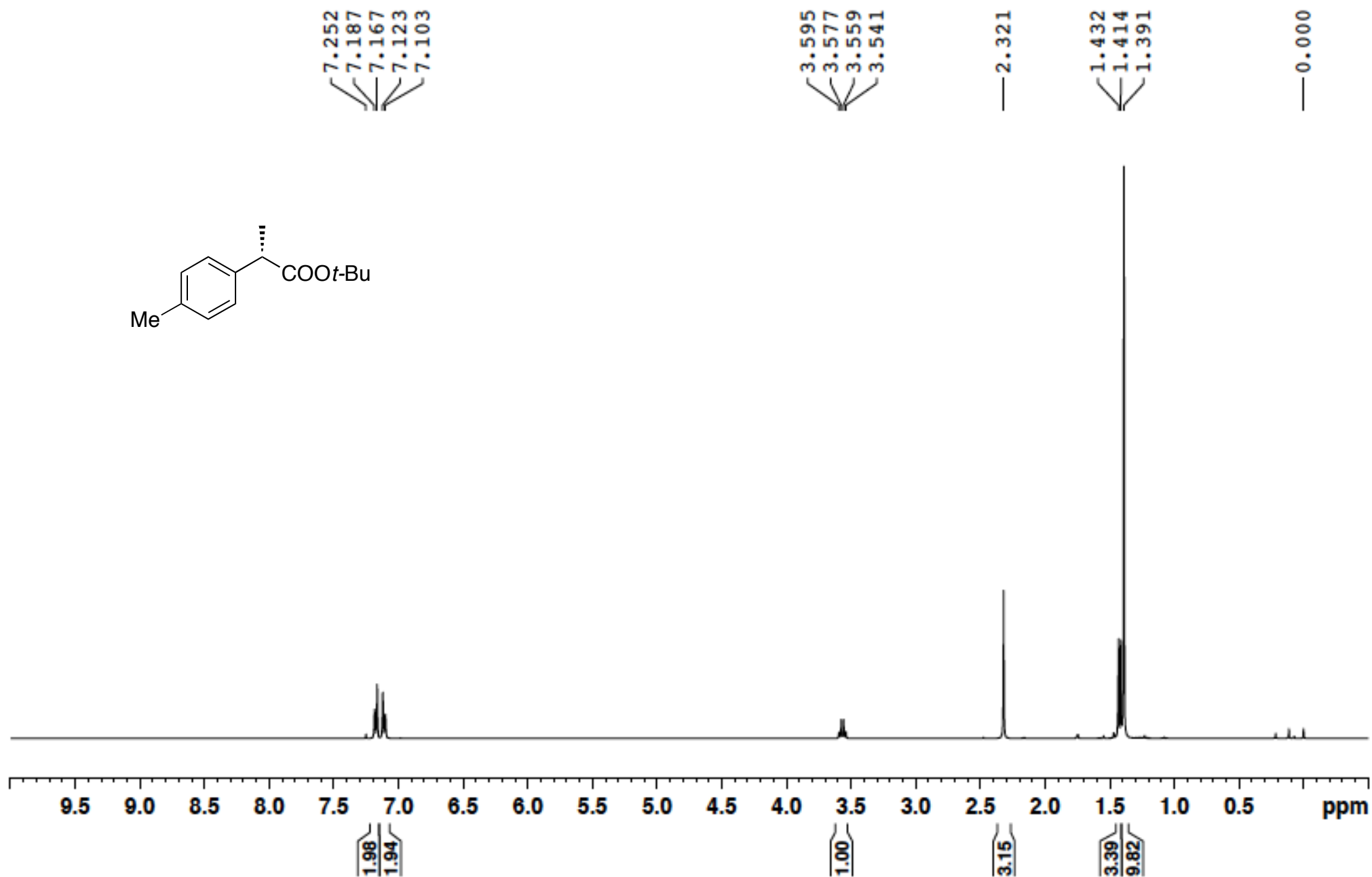
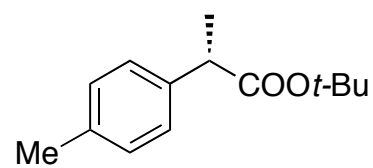
JF-L12 CNMR
BBFO1 400M
2014-01-25



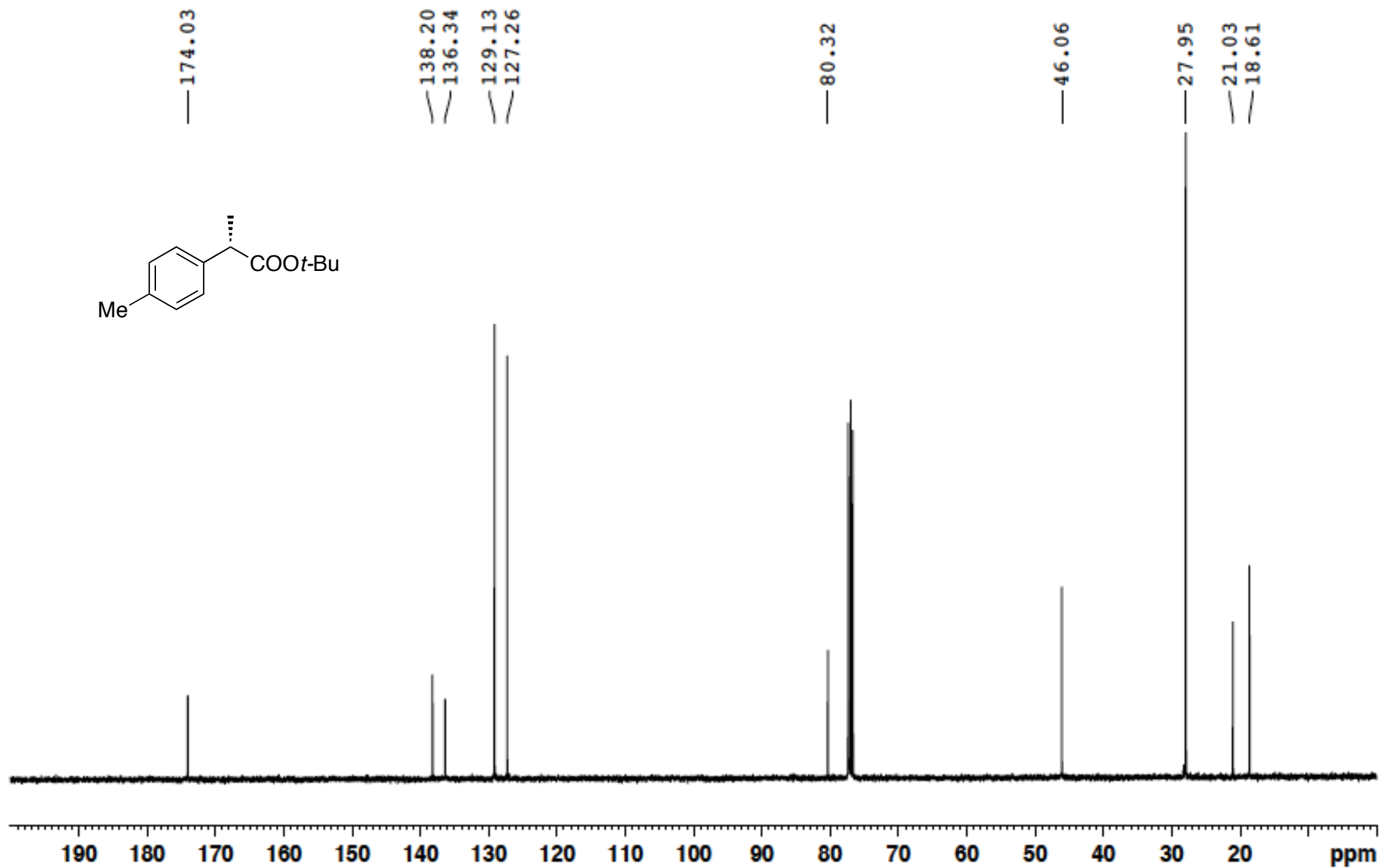
JF11-53-6 CDCl₃ 1HNMR BBFO2
2013-08-02



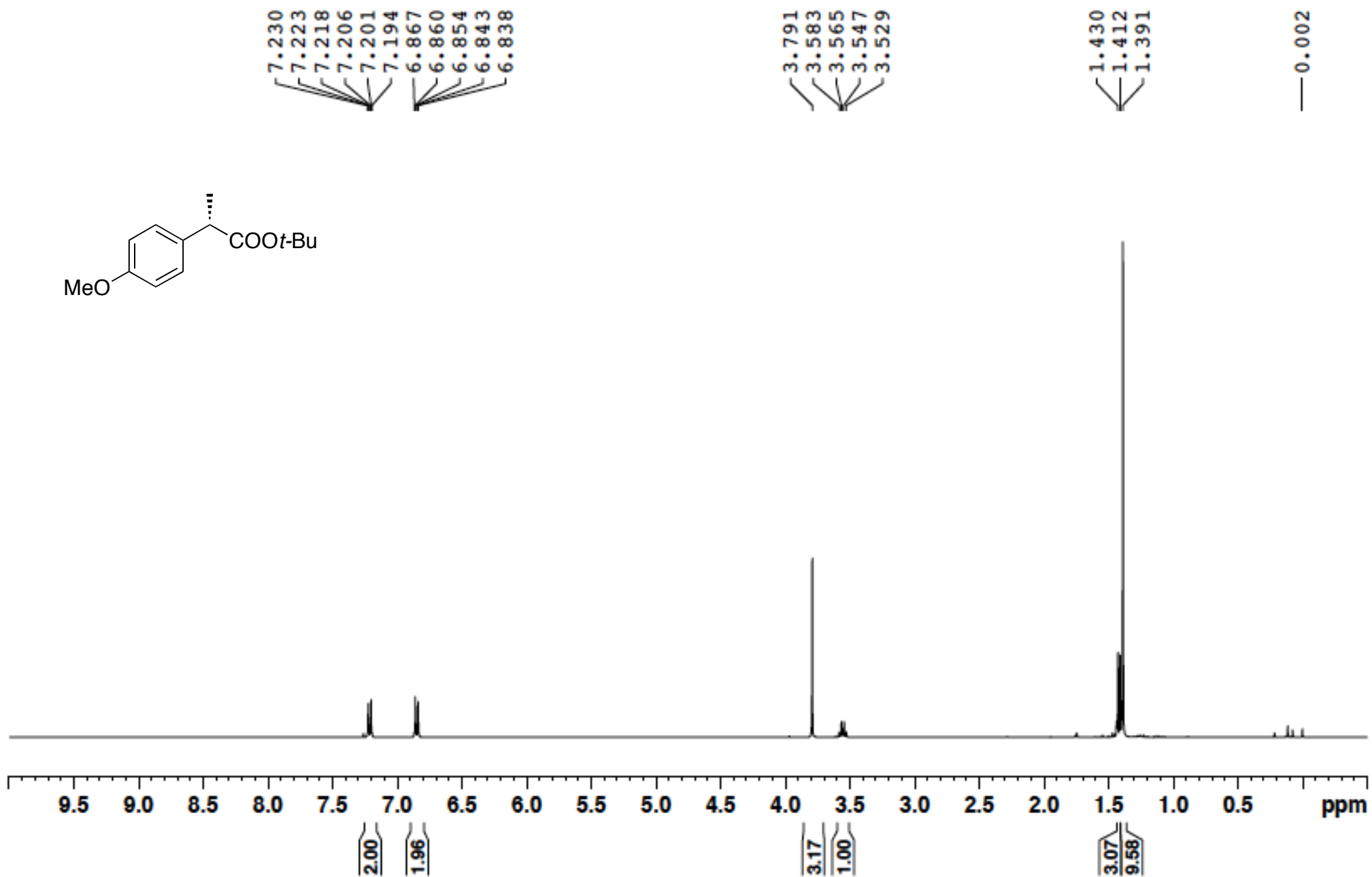
JF11-36-7, HNMR, CDCl₃ BBFO2
2013-07-23



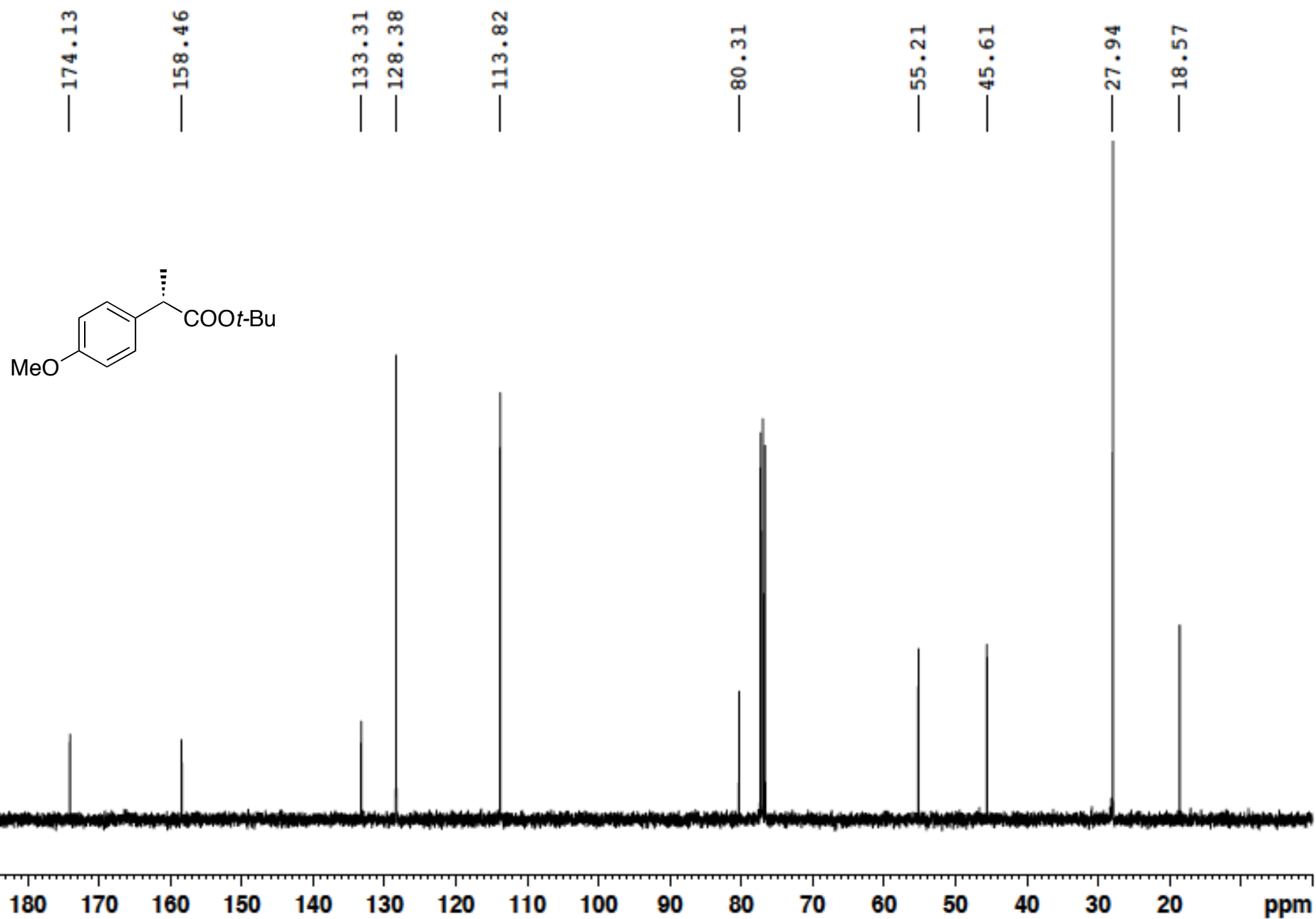
JF11-36-7 ¹³CNMR, CDCl₃, BBF01
2013-07-23



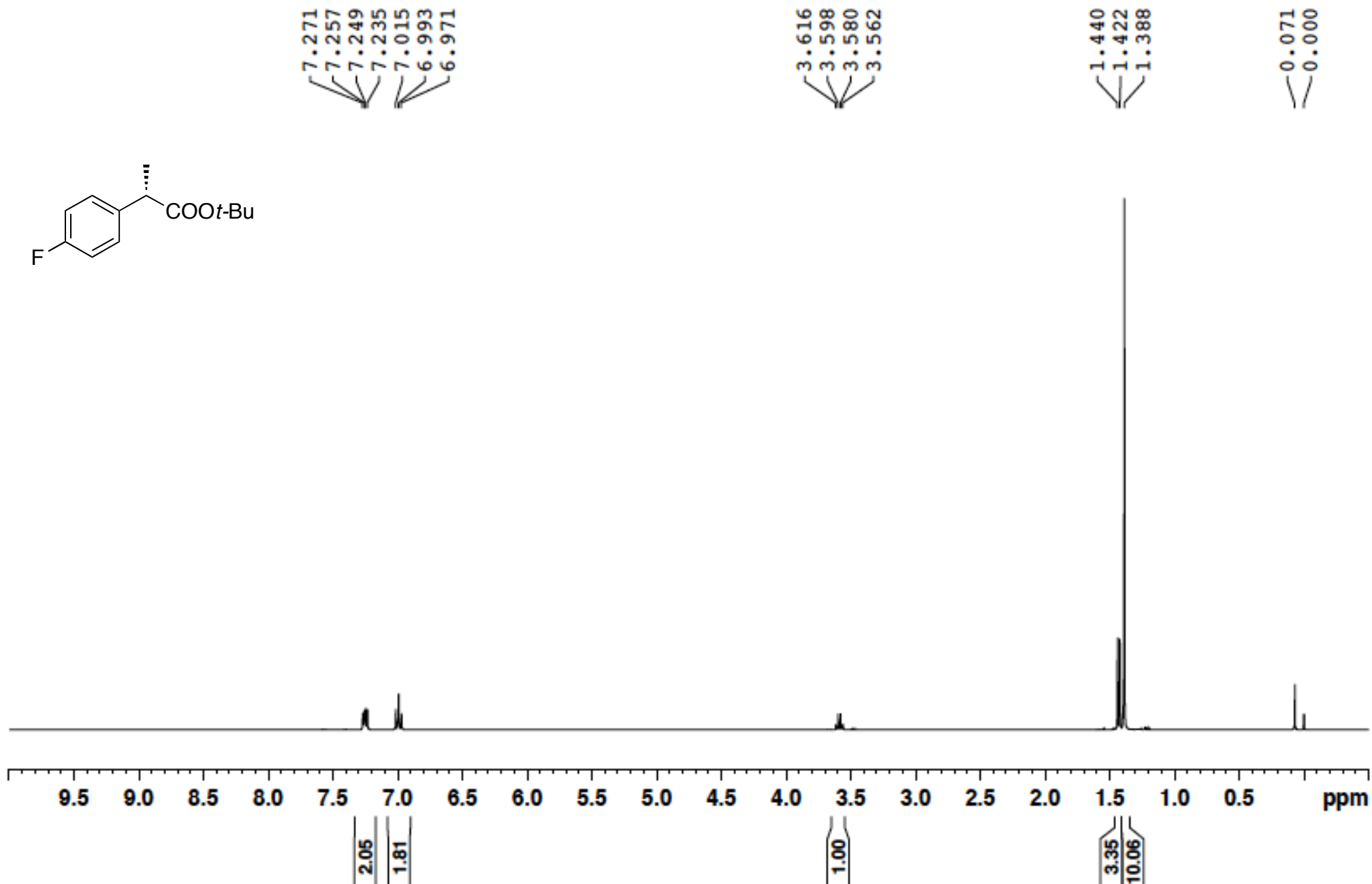
JF11-36-5, HNMR, CDCl₃ BFO2
2013-07-21



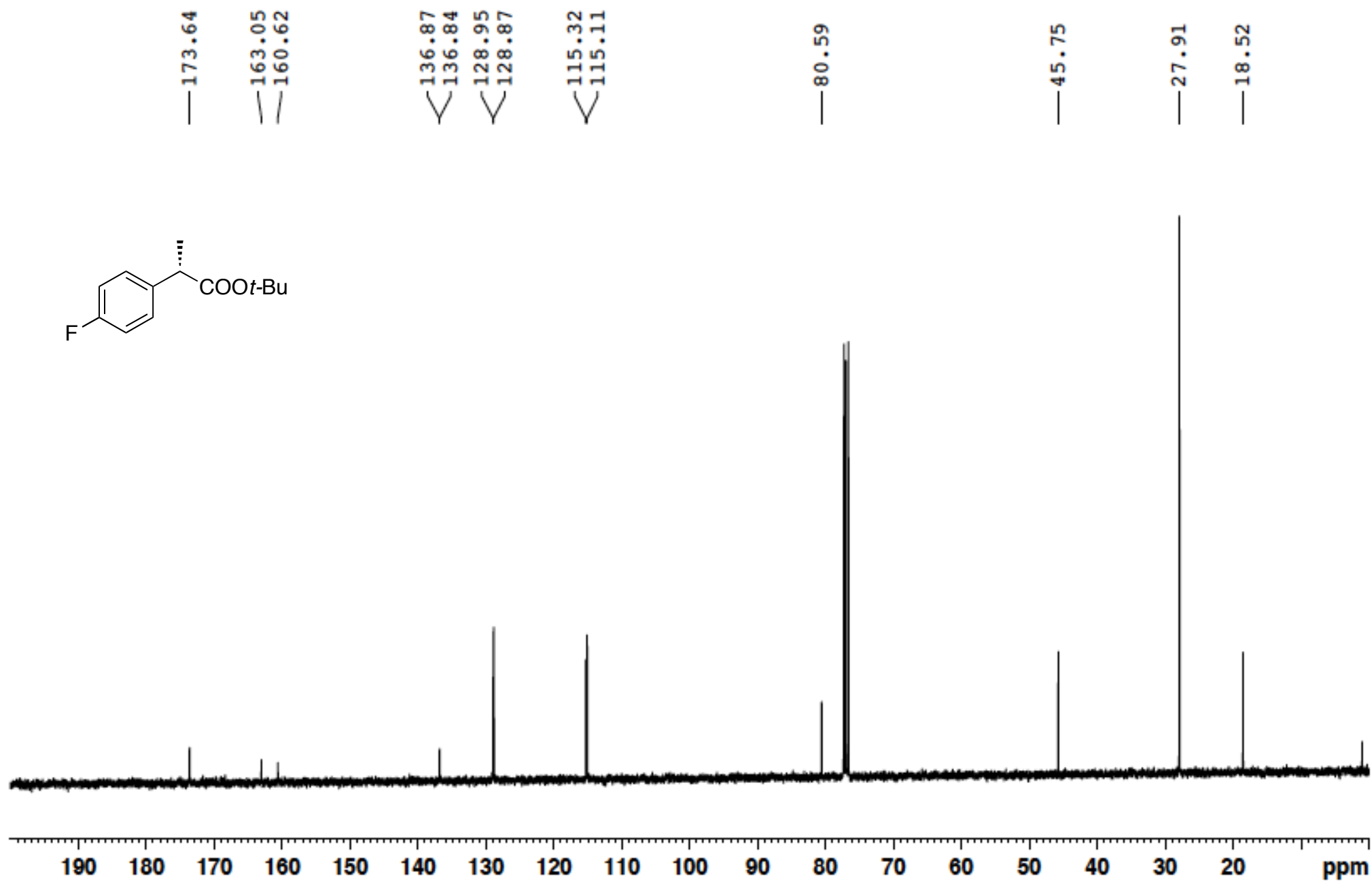
JF11-36-5 ¹³CNMR, CDCl₃, BBFO1
2013-07-22

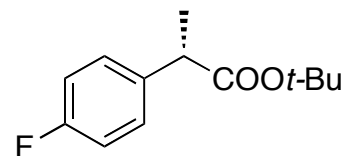


JF11-23-3, HNMR, CDCl₃ BBF02
2013-07-05

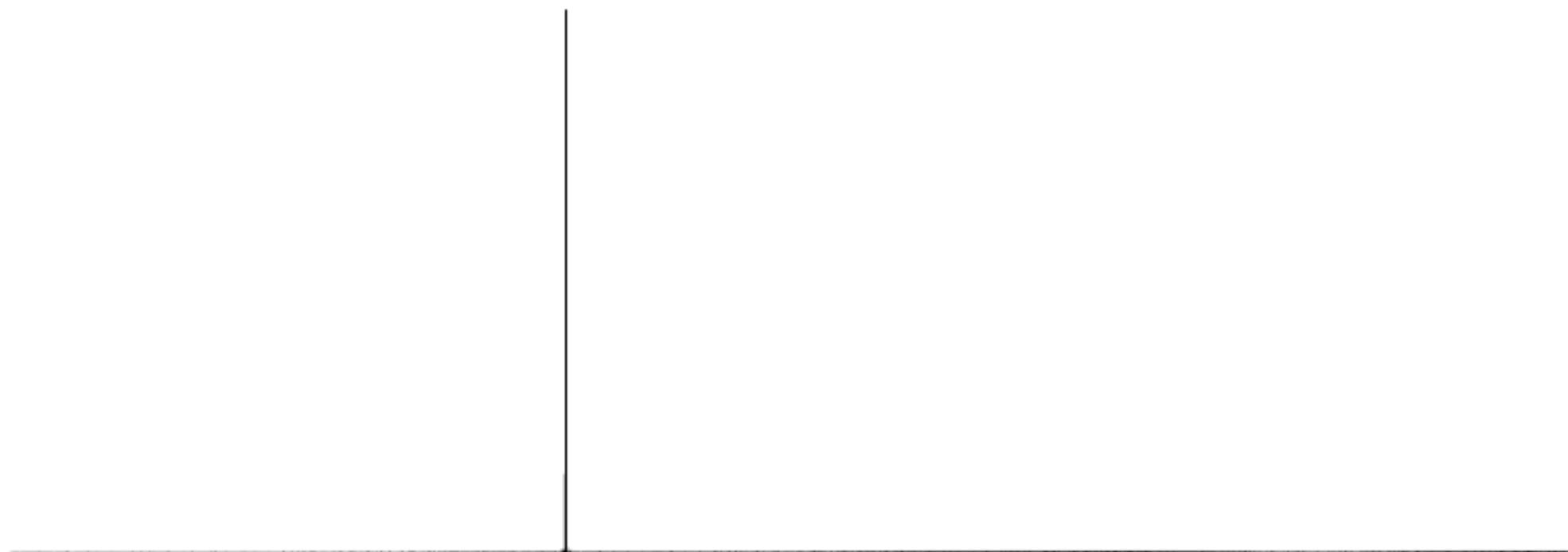


JF11-23-3, ^{13}C NMR, CDCl_3 BBFO2
2013-07-05

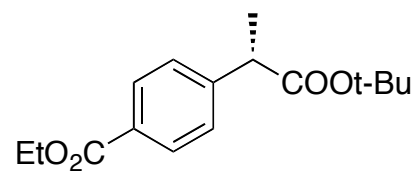




---116.29



-80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 ppm

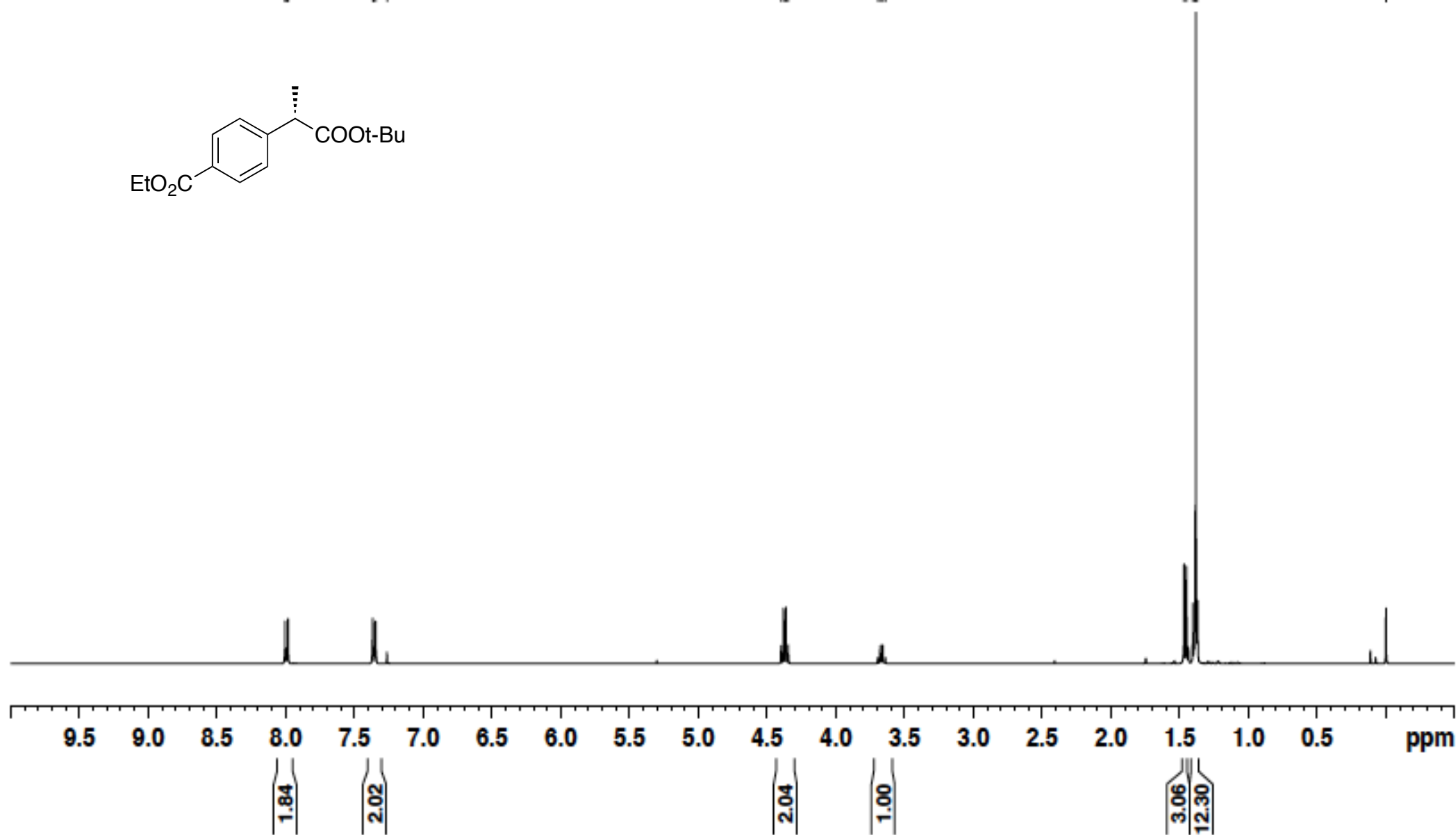


8.003
7.998
7.987
7.982
7.366
7.362
7.345
7.262

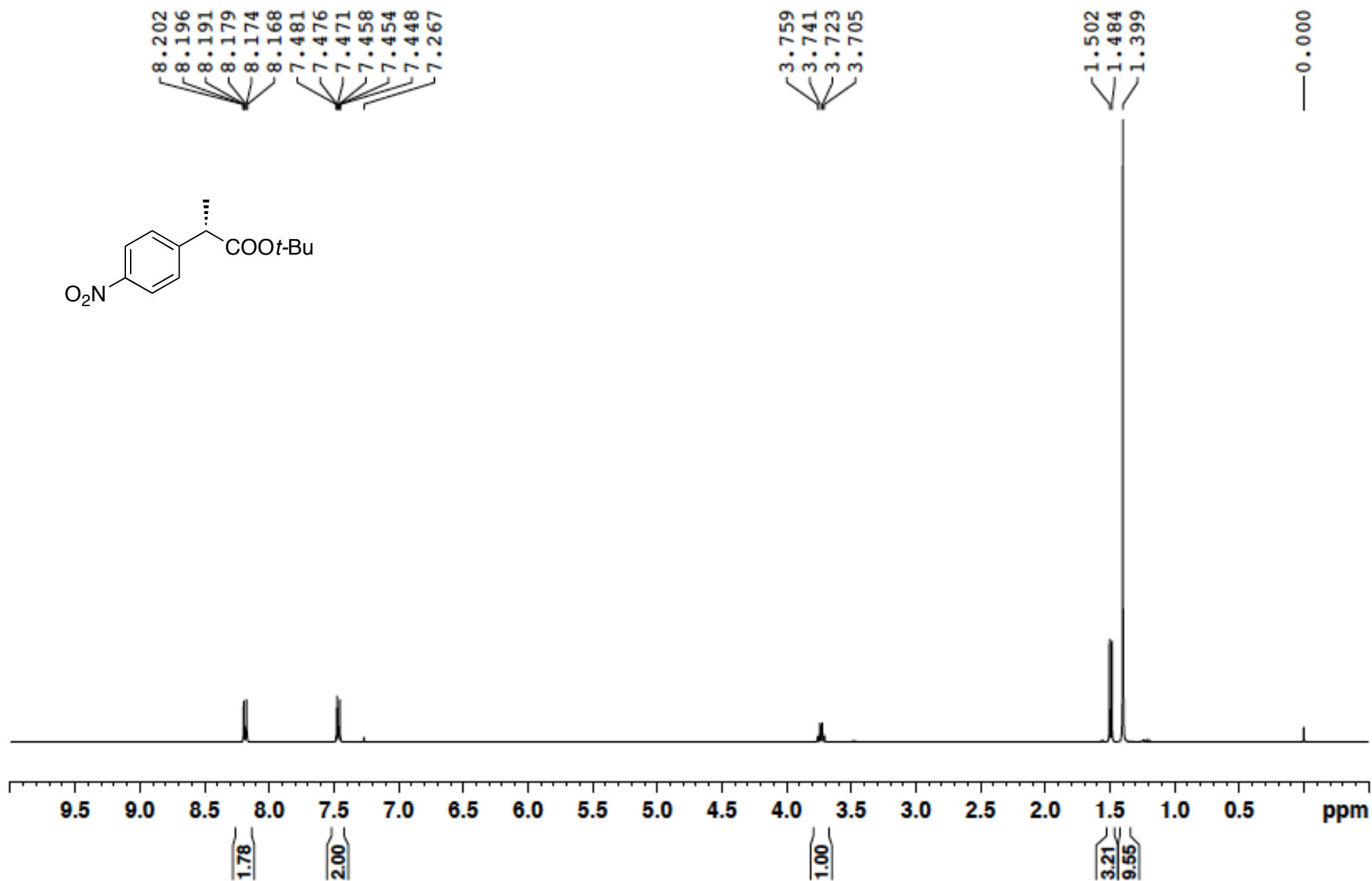
4.396
4.379
4.361
4.343
3.692
3.674
3.656
3.639

1.469
1.451
1.406
1.388
1.383
1.370

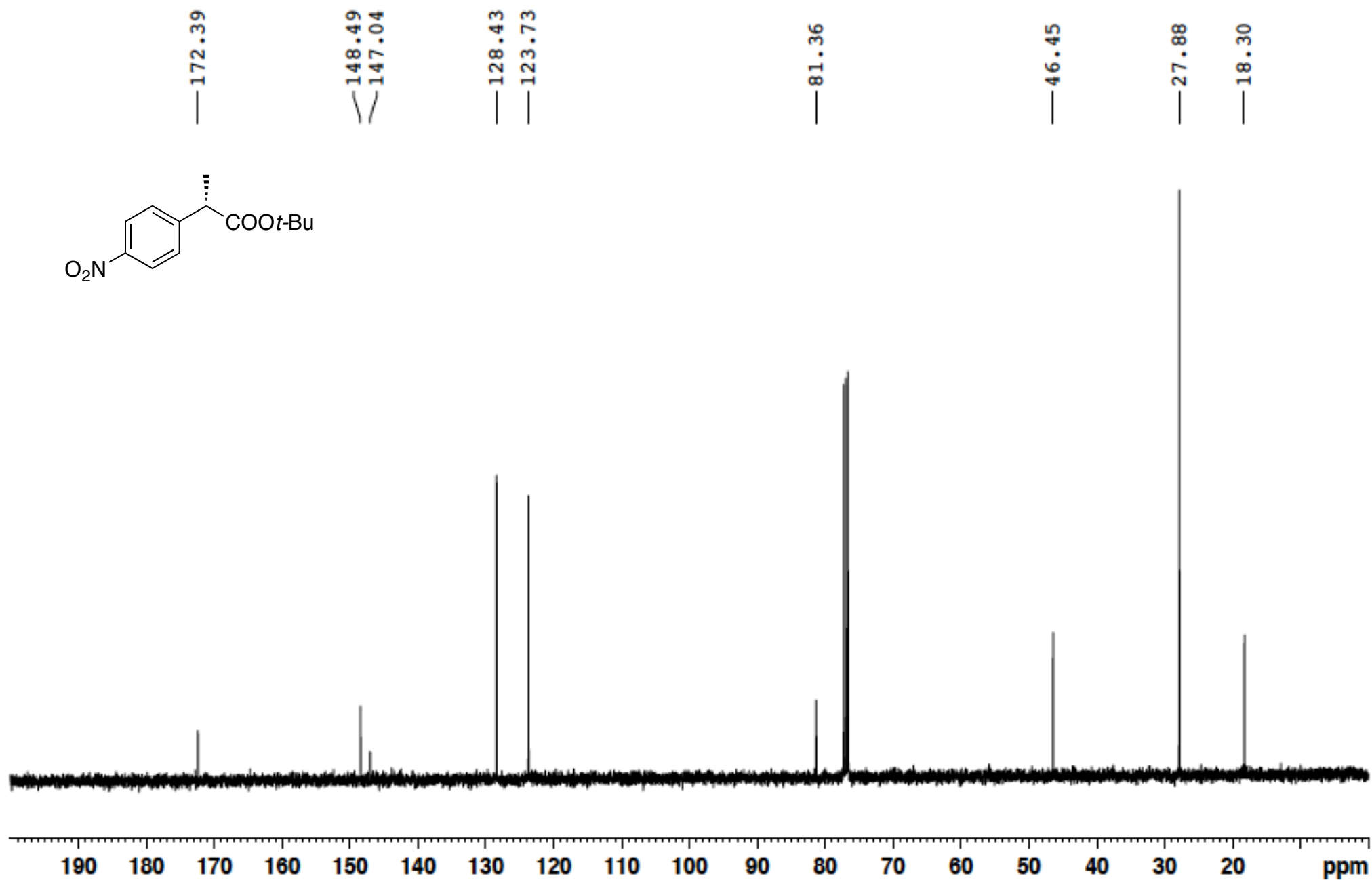
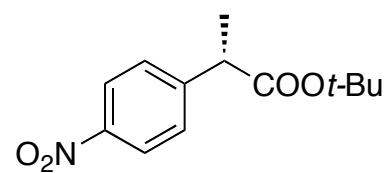
— 0.000



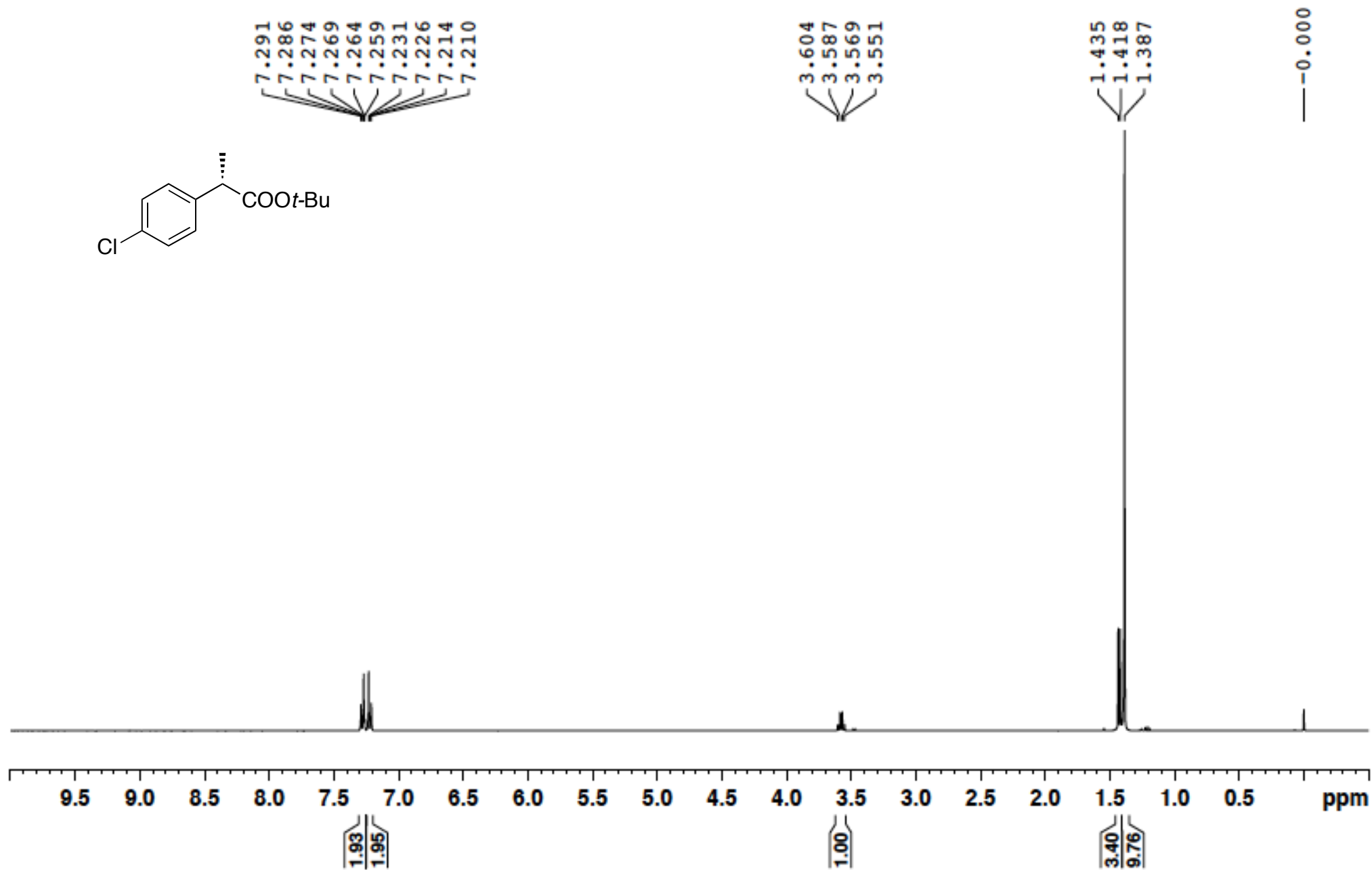
JF11-23-11, HNMR, CDCl3 BBFO2
2013-07-05



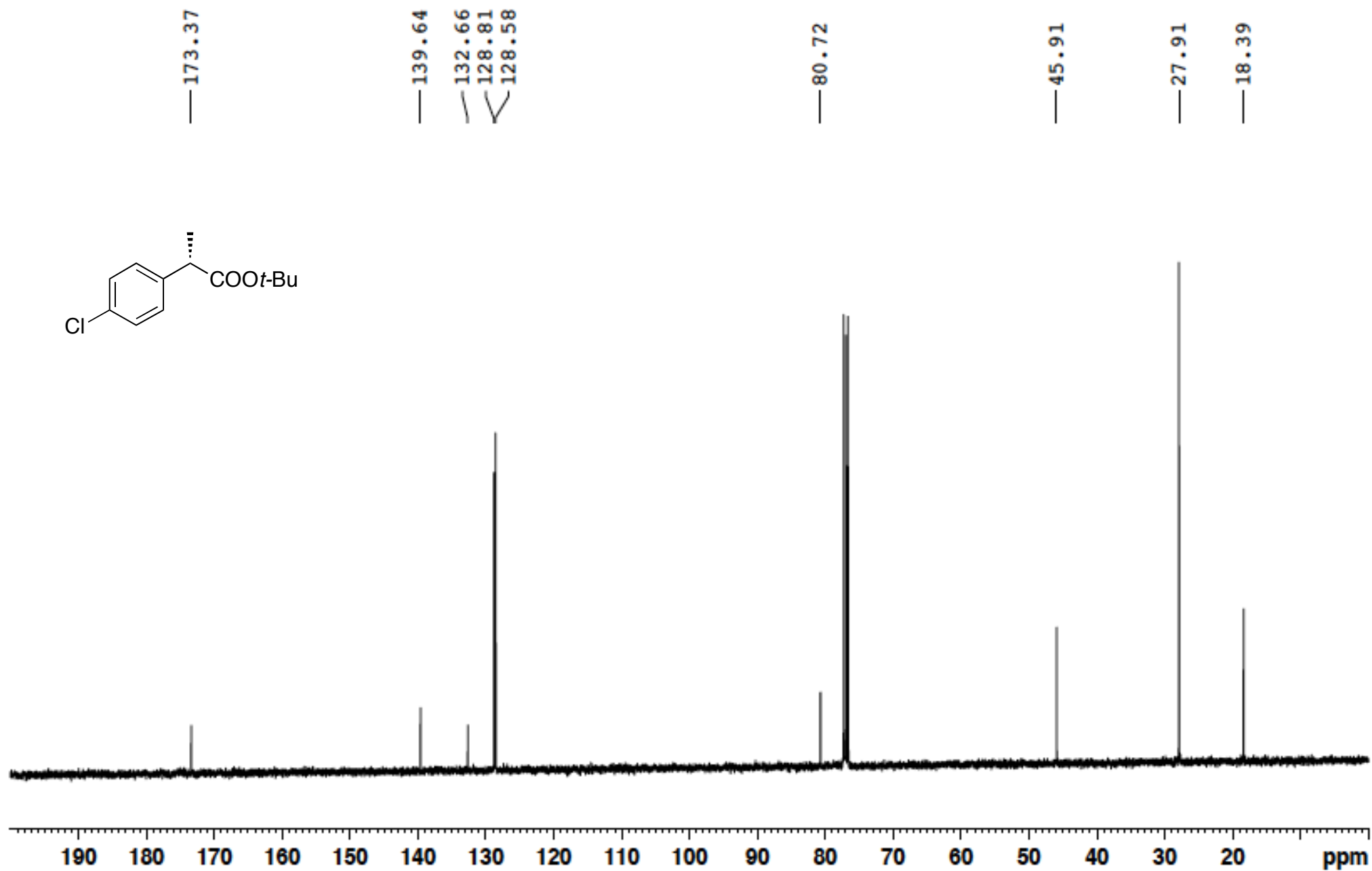
JF11-23-11, ¹³CNMR, CDCl₃ BBFO2
2013-07-05



JF11-23-1, HNMR, CDCl₃ BBF02
2013-07-05



JF11-23-1, ¹³CNMR, CDCl₃ BBFO2
2013-07-05



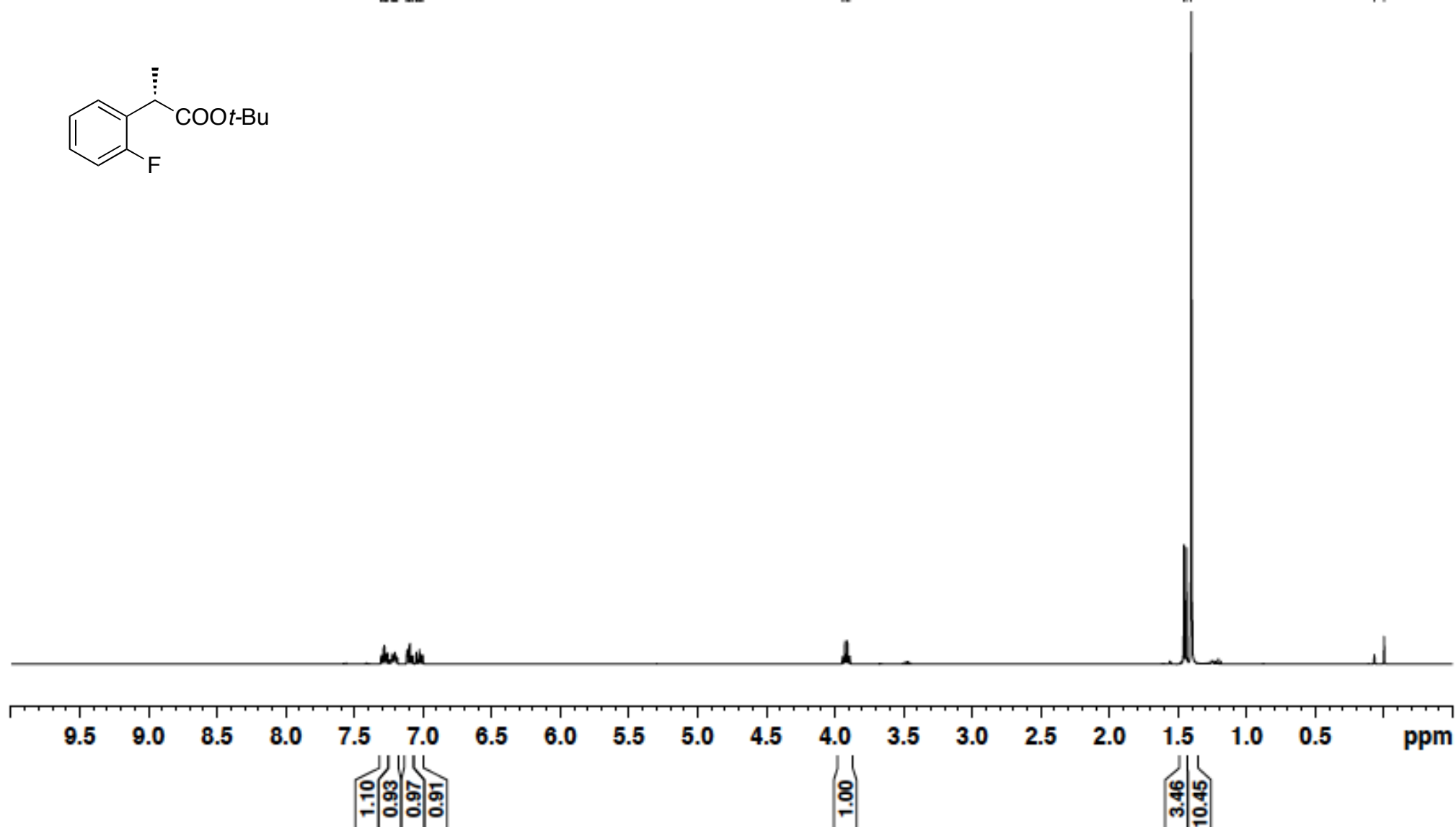
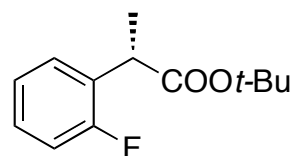
JF11-23-7, HNMR, CDCl₃ BFO2
2013-07-05

7.307
7.303
7.288
7.284
7.269
7.265
7.260
7.226
7.221
7.212
7.206
7.201
7.192
7.188
7.119
7.116
7.100
7.097
7.081
7.078
7.052
7.049
7.031
7.027
7.023
7.005
7.003

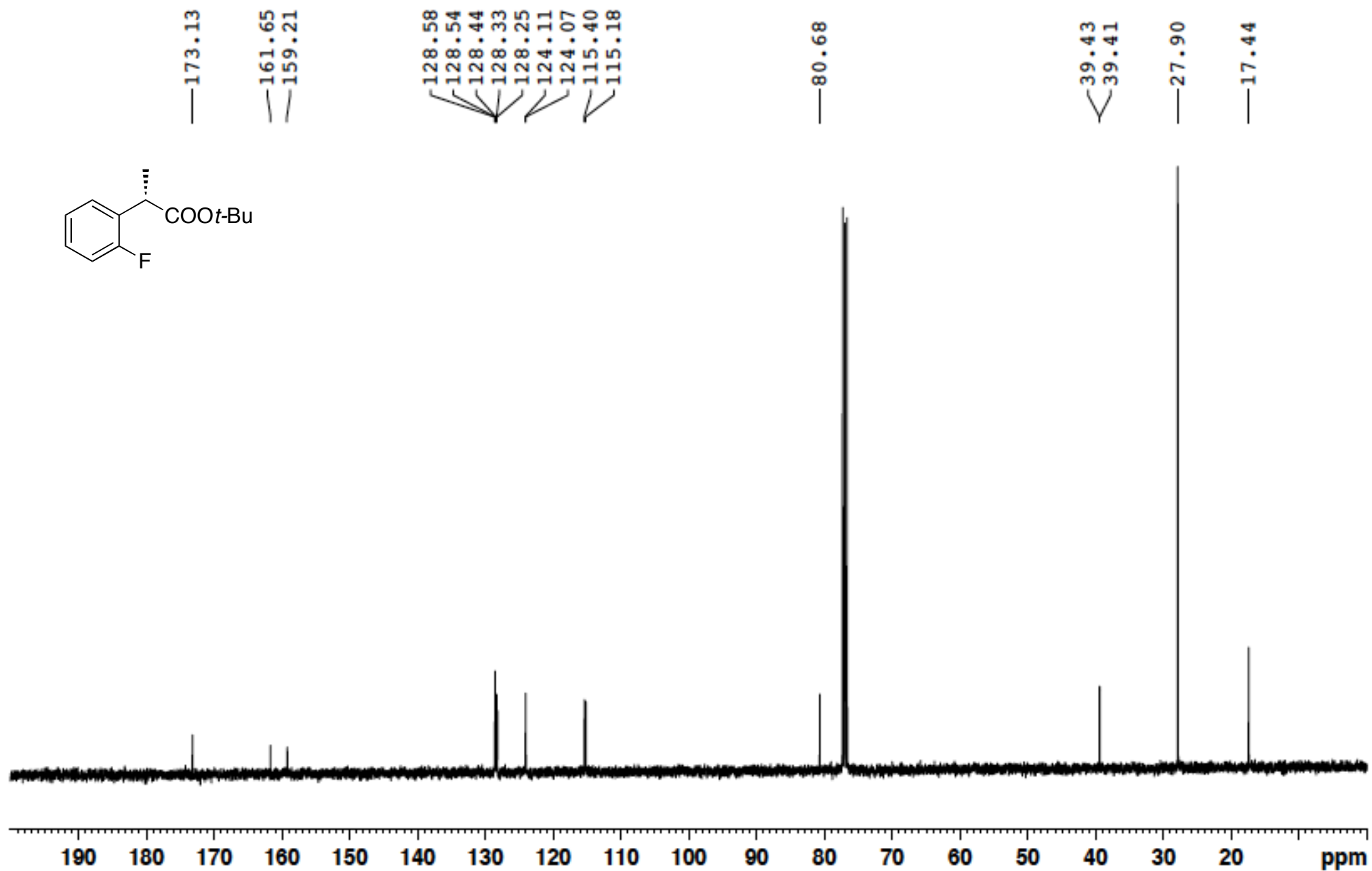
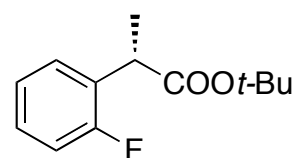
3.946
3.928
3.910
3.892

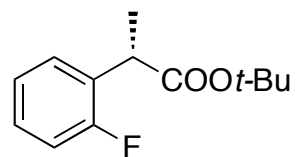
1.458
1.440
1.404

0.070
0.000



JF11-23-7, ^{13}C NMR, CDCl_3 BBFO2
2013-07-05





-118.30



-70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 ppm

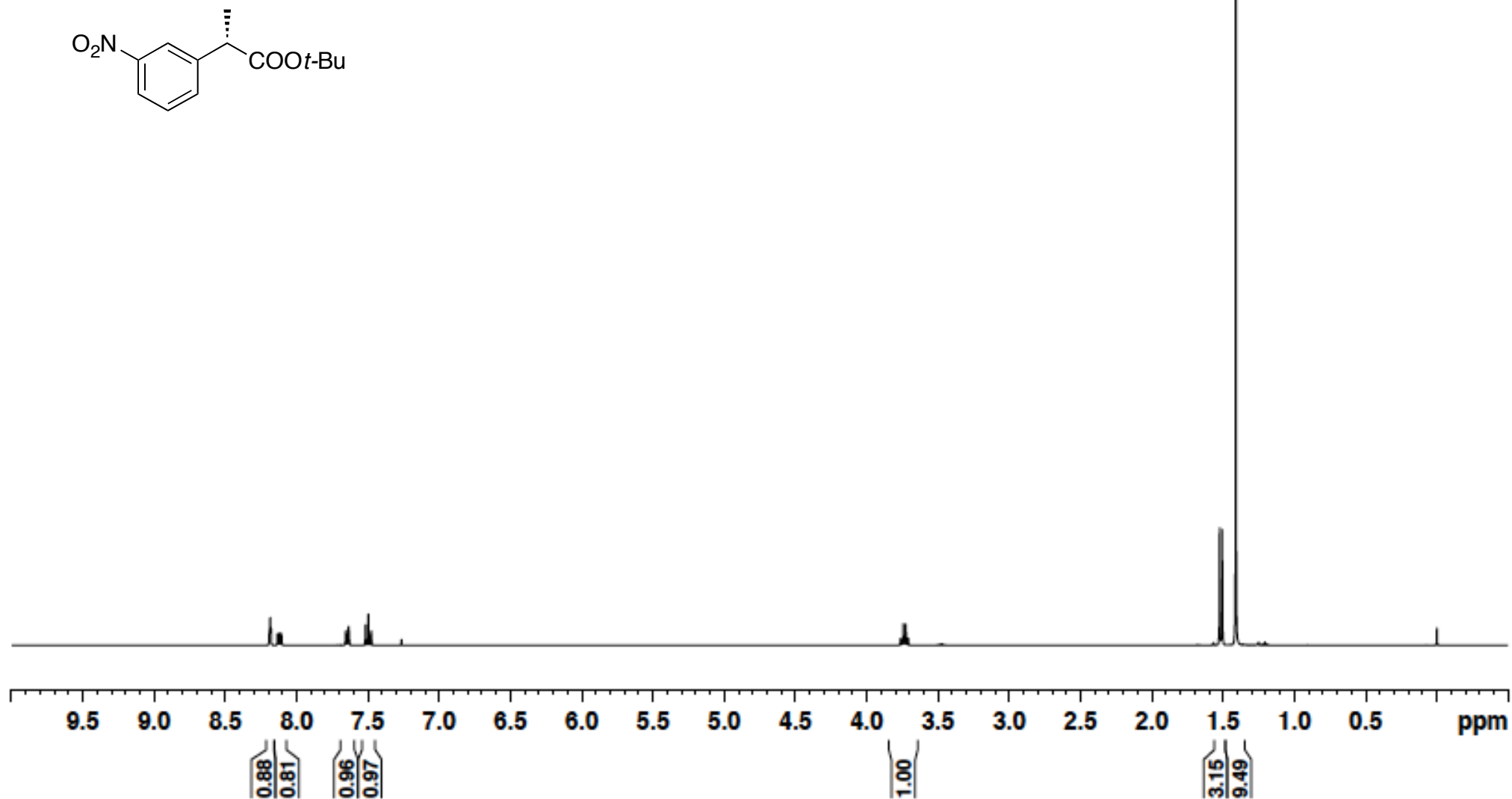
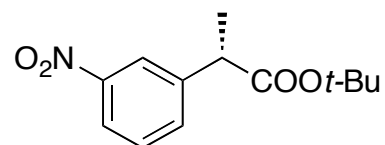
JF11-23-8, HNMR, CDCl3 BBFO2
2013-07-05

8.192
8.187
8.183
8.135
8.133
8.130
8.128
8.115
8.113
8.110
8.107
7.655
7.636
7.518
7.498
7.479
7.266

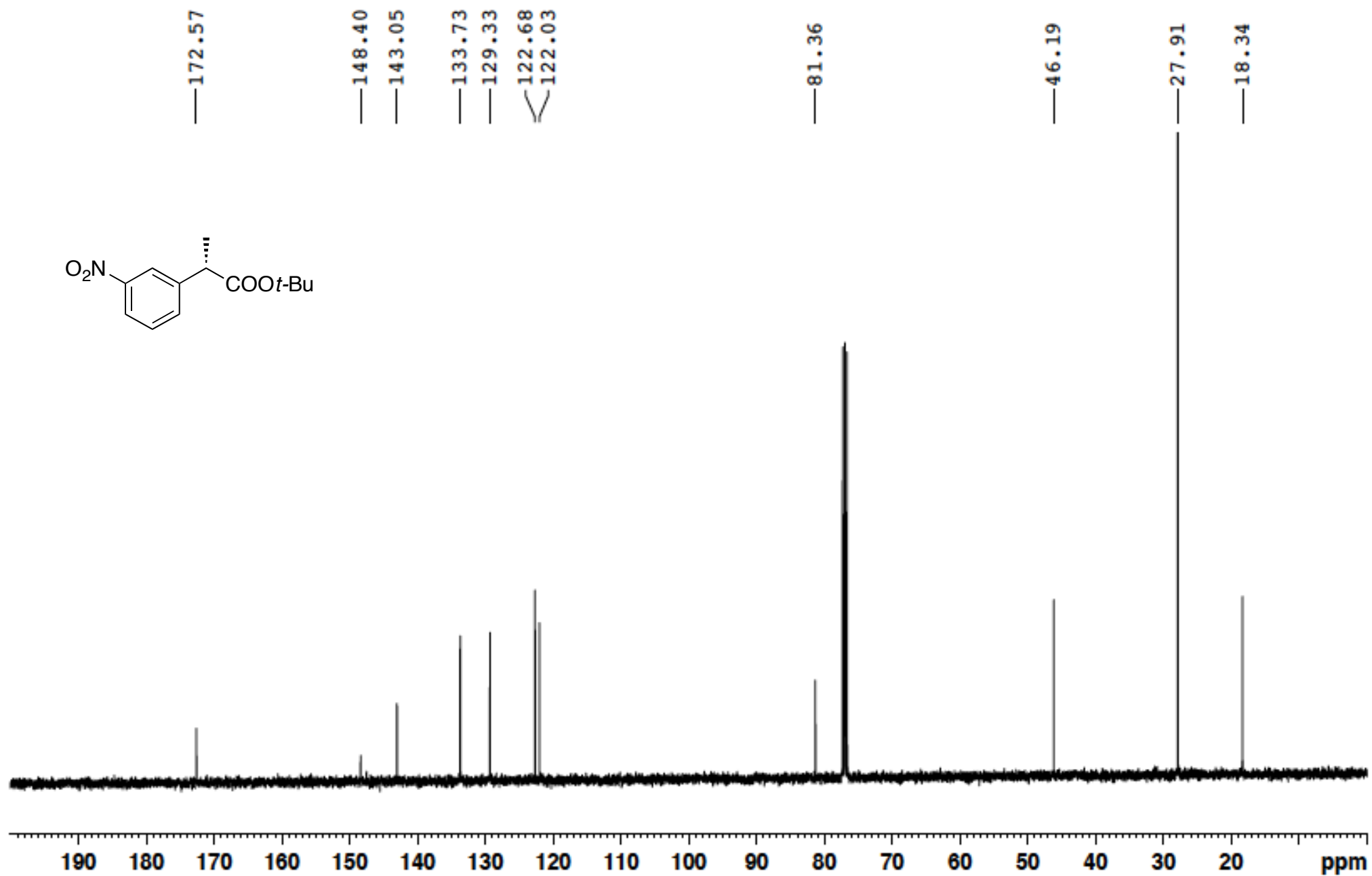
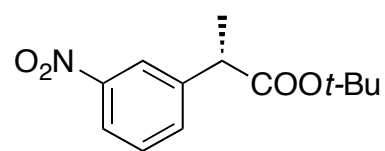
3.764
3.746
3.728
3.710

1.524
1.506
1.411

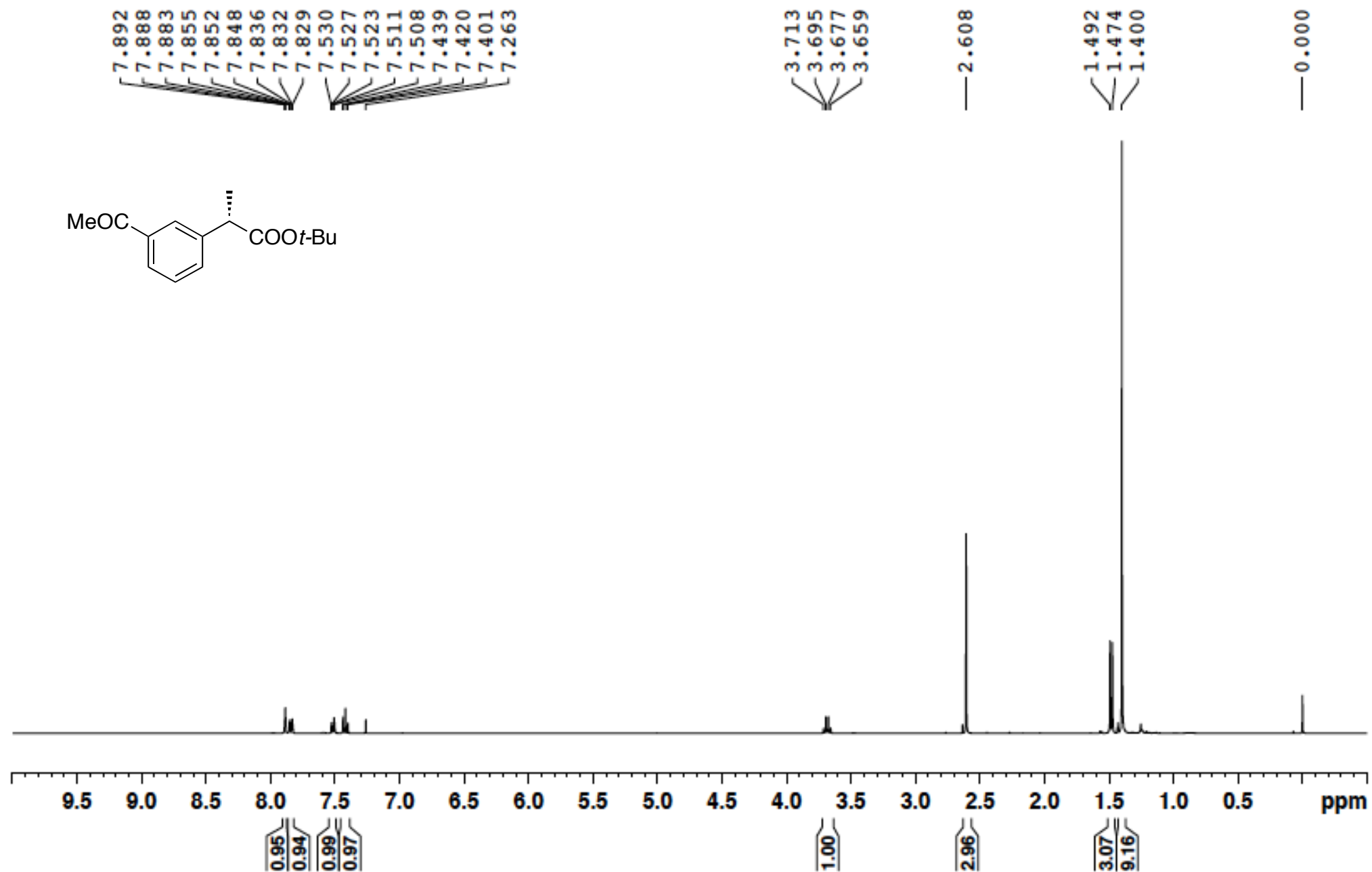
0.000



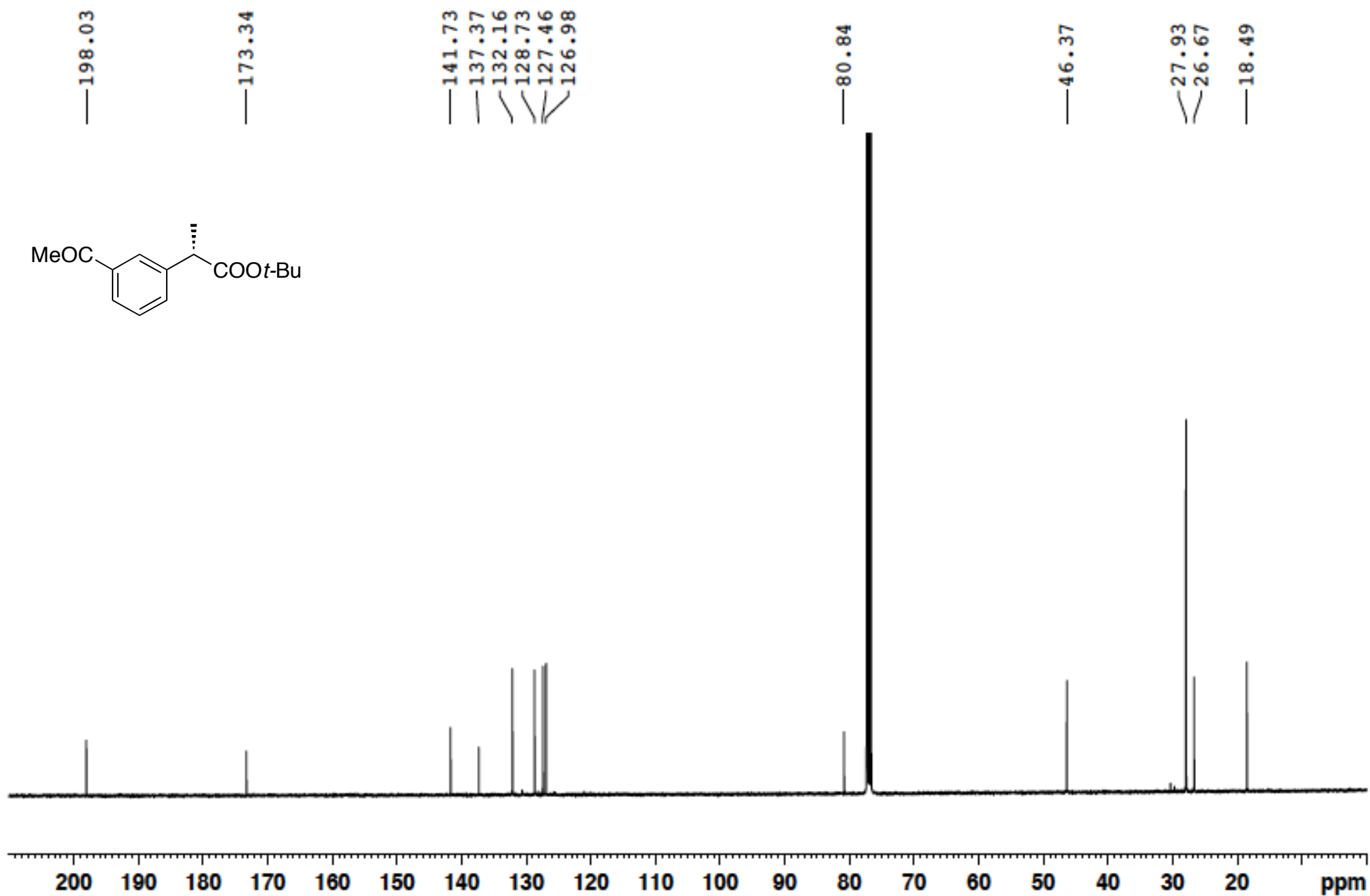
JF11-23-8, ¹³CNMR, CDCl₃ BBFO2
2013-07-05



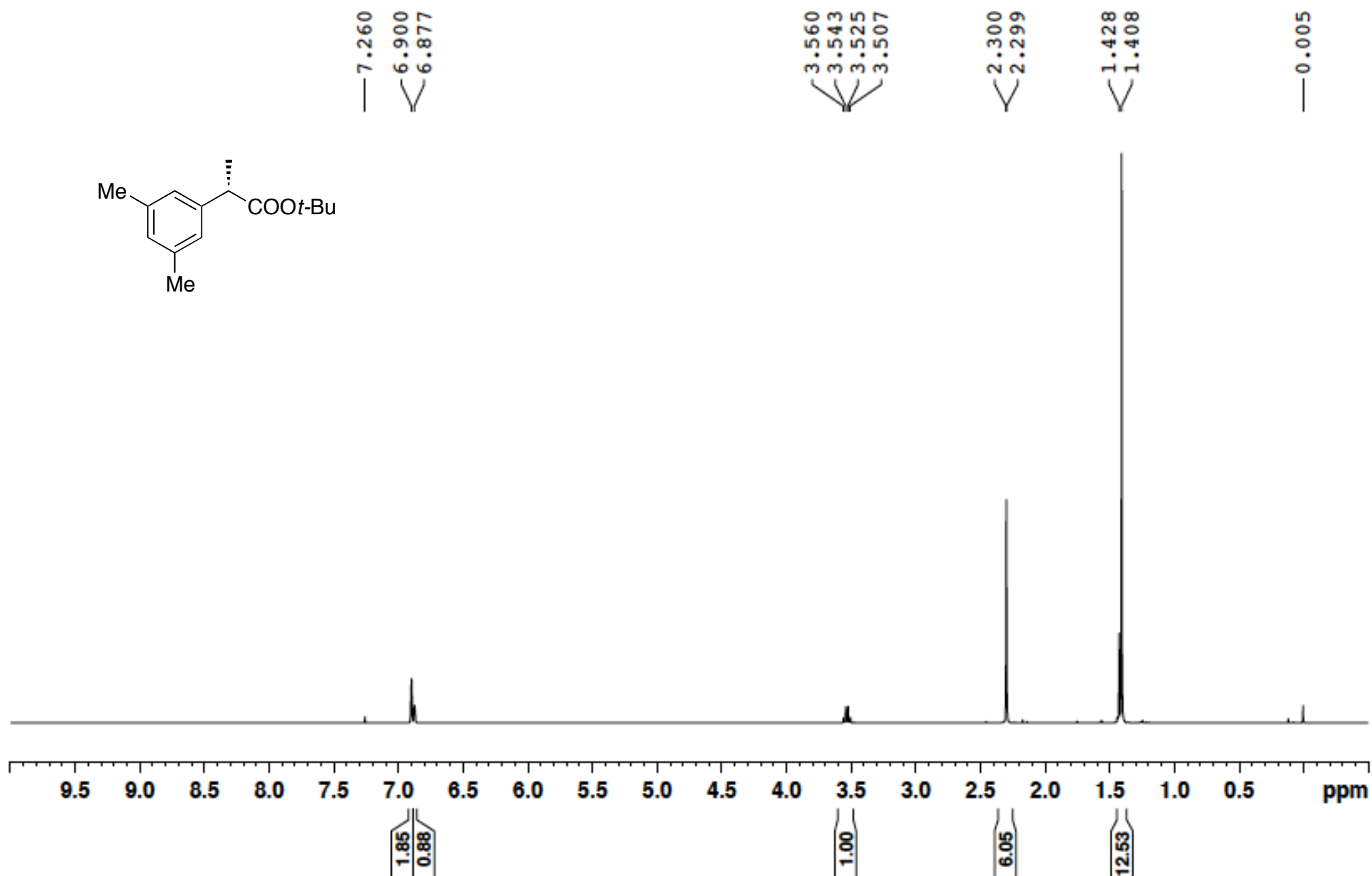
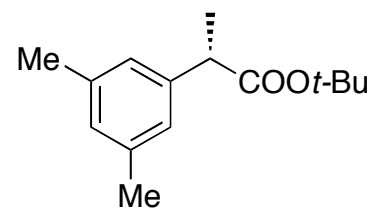
JF11-23-10 1HNMR, CDCl3, BBF01
2013-07-24



JF11-23-10 13CNMR, CDCl3, BBF01
2013-07-24



JF11-29-9, HNMR, CDCl₃ BBF02
2013-07-21



JF11-29-9 ¹³CNMR, CDCl₃, BBF01
2013-07-22

— 174.07

— 141.07

— 137.86

— 128.46

— 125.20

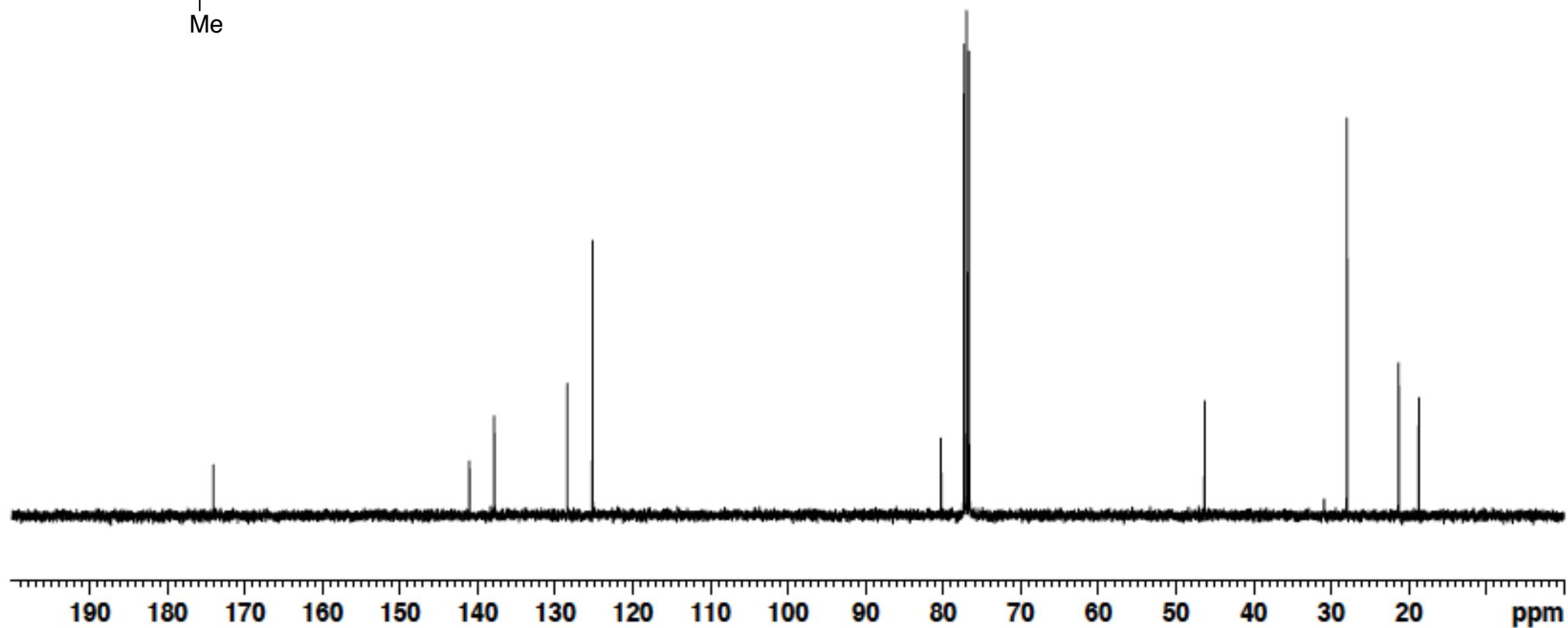
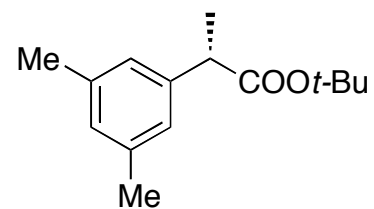
— 80.31

— 46.30

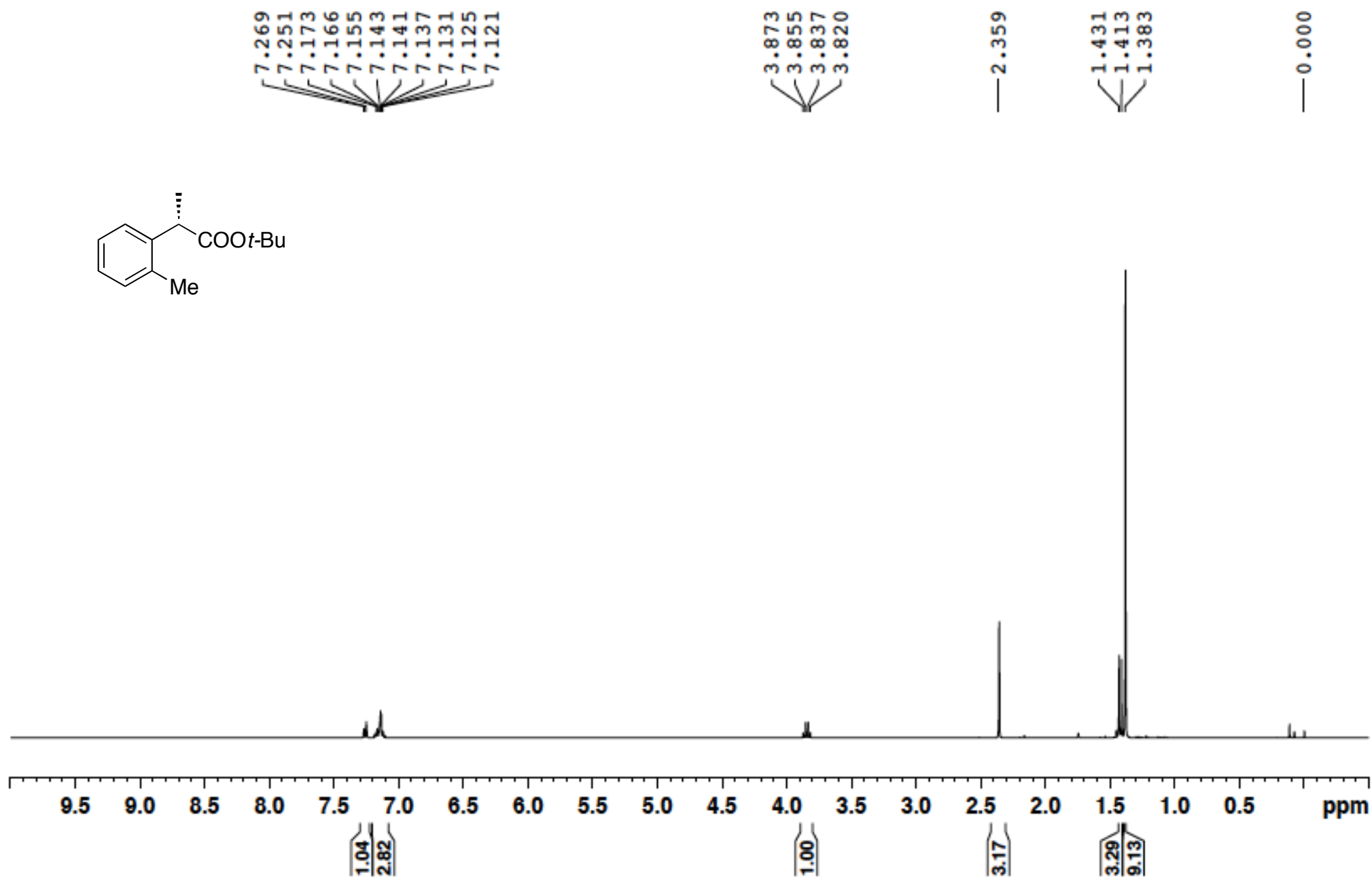
— 27.97

— 21.30

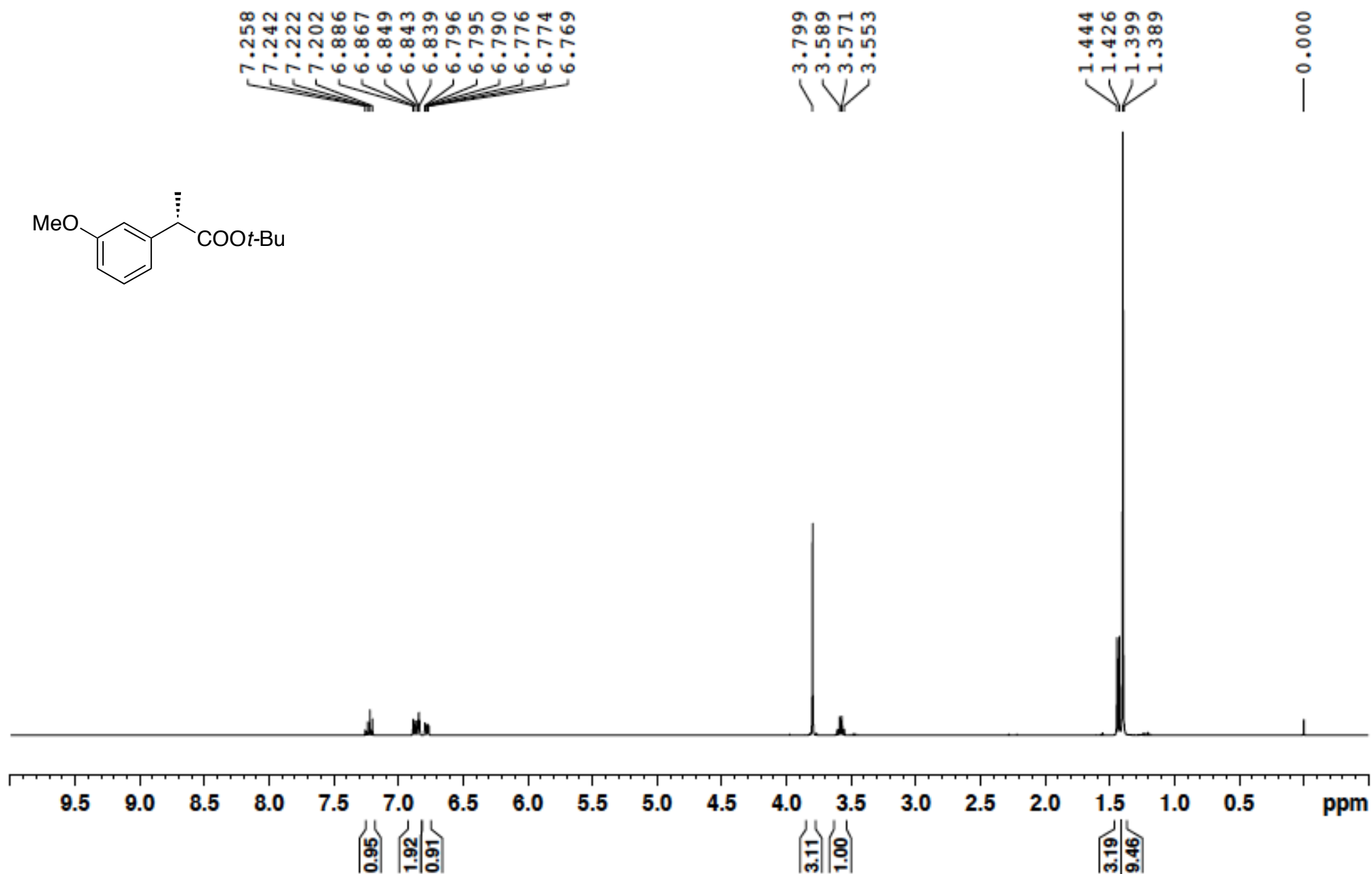
— 18.71



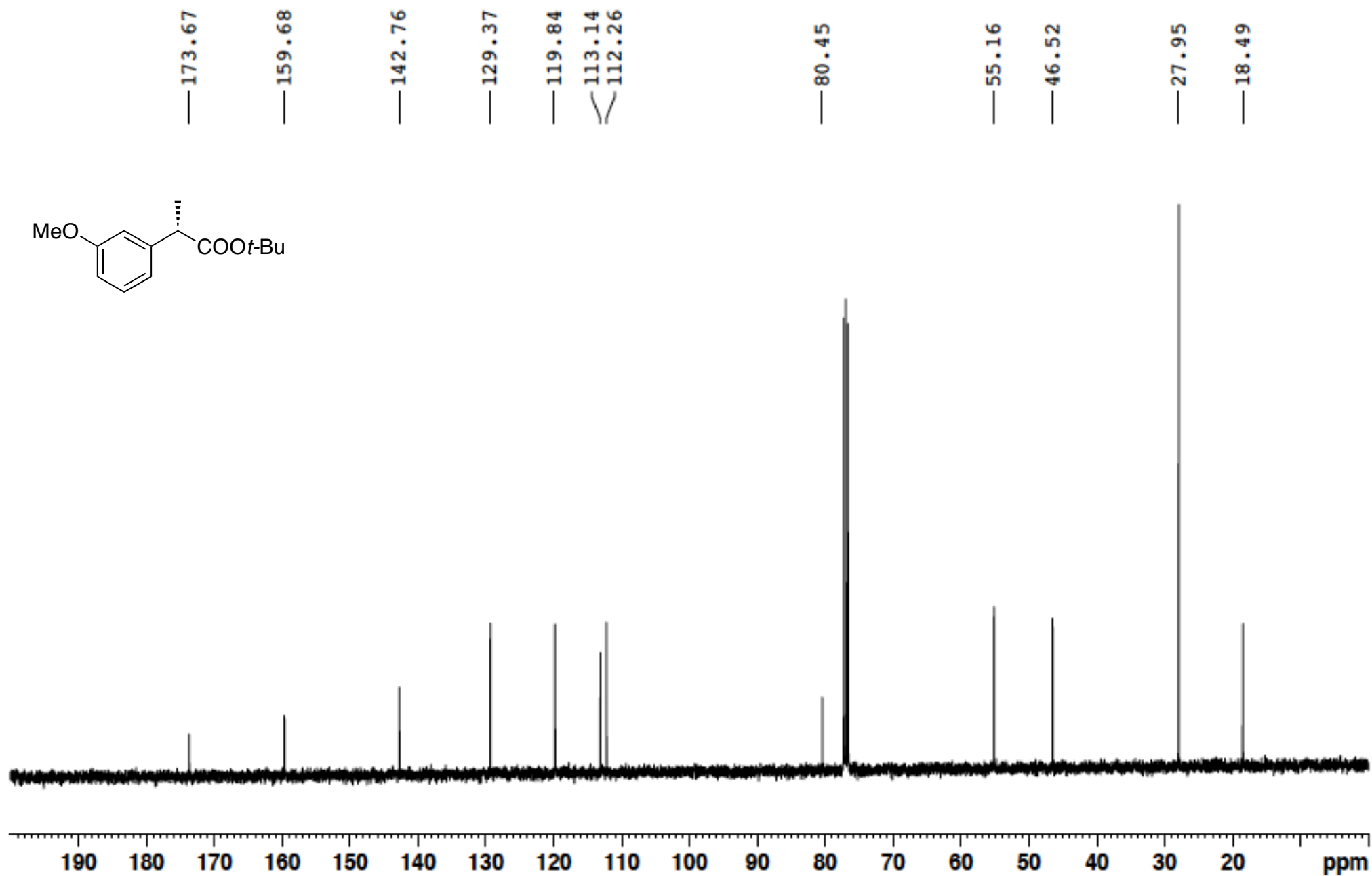
JF11-36-8, HNMR, CDCl₃ BBFO2
2013-07-21

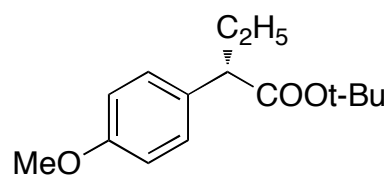


JF11-23-9, HNMR, CDCl₃ BBF02
2013-07-05



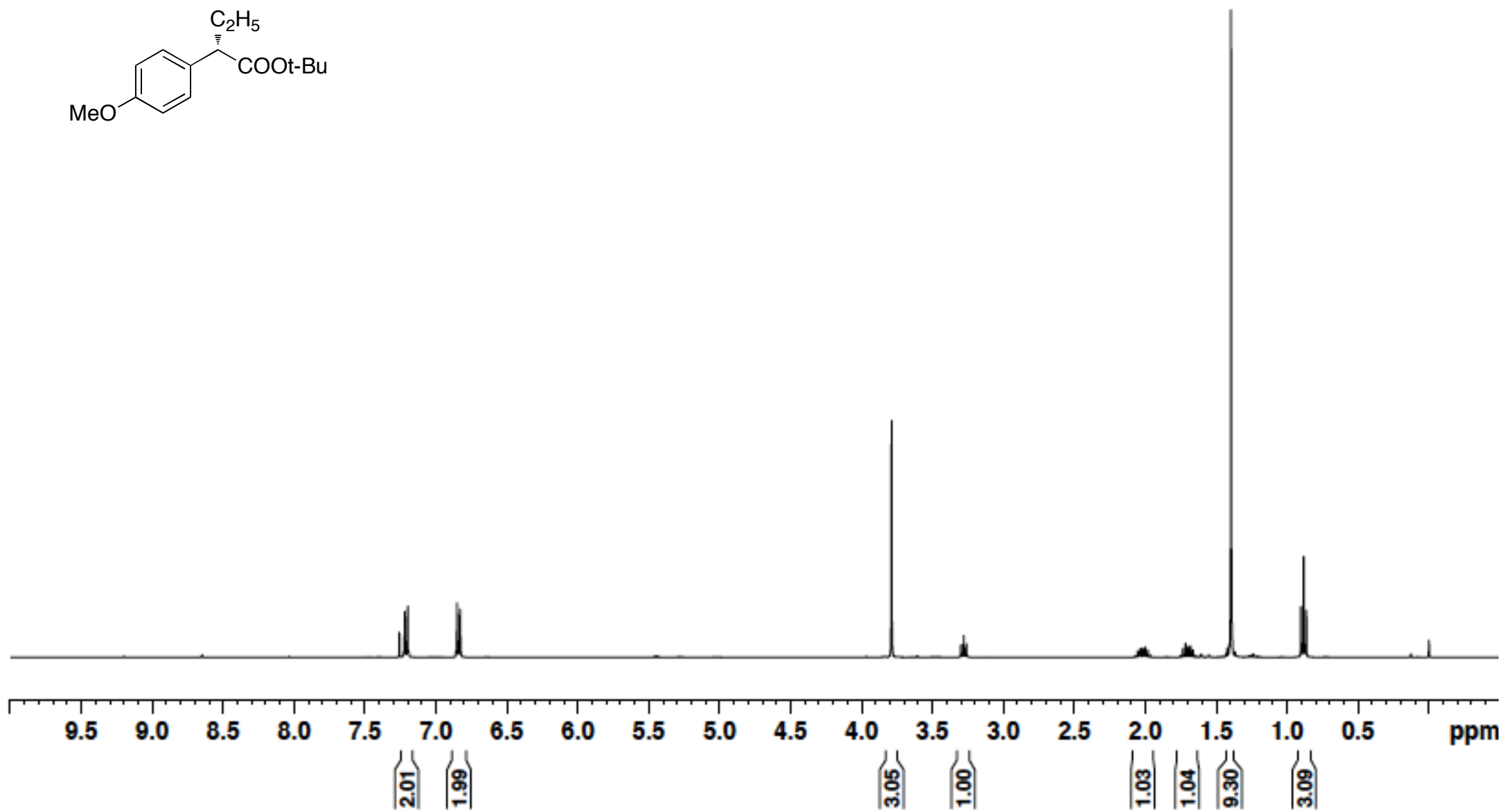
JF11-23-9, ¹³CNMR, CDCl₃ BBFO2
2013-07-05

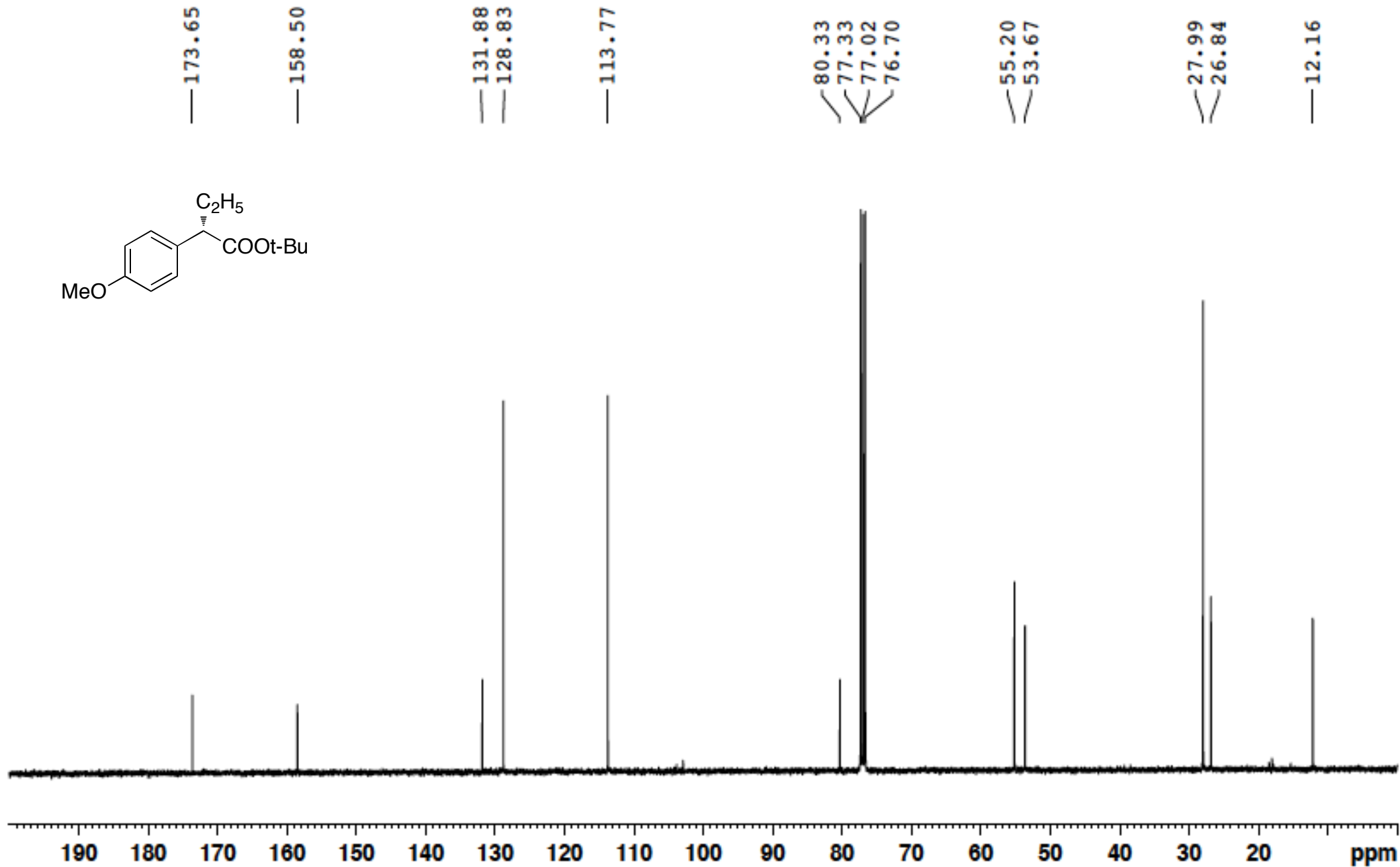
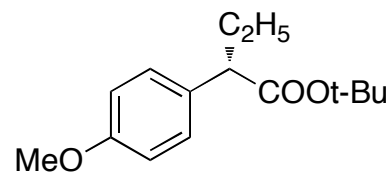




7.259
7.222
7.217
7.206
7.201
6.853
6.848
6.836
6.831

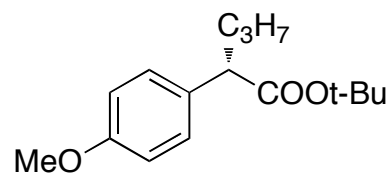
3.789
3.280
2.055
2.036
2.021
2.016
2.002
1.982
1.734
1.716
1.700
1.698
1.682
1.663
1.395
0.902
0.884
0.866
0.000





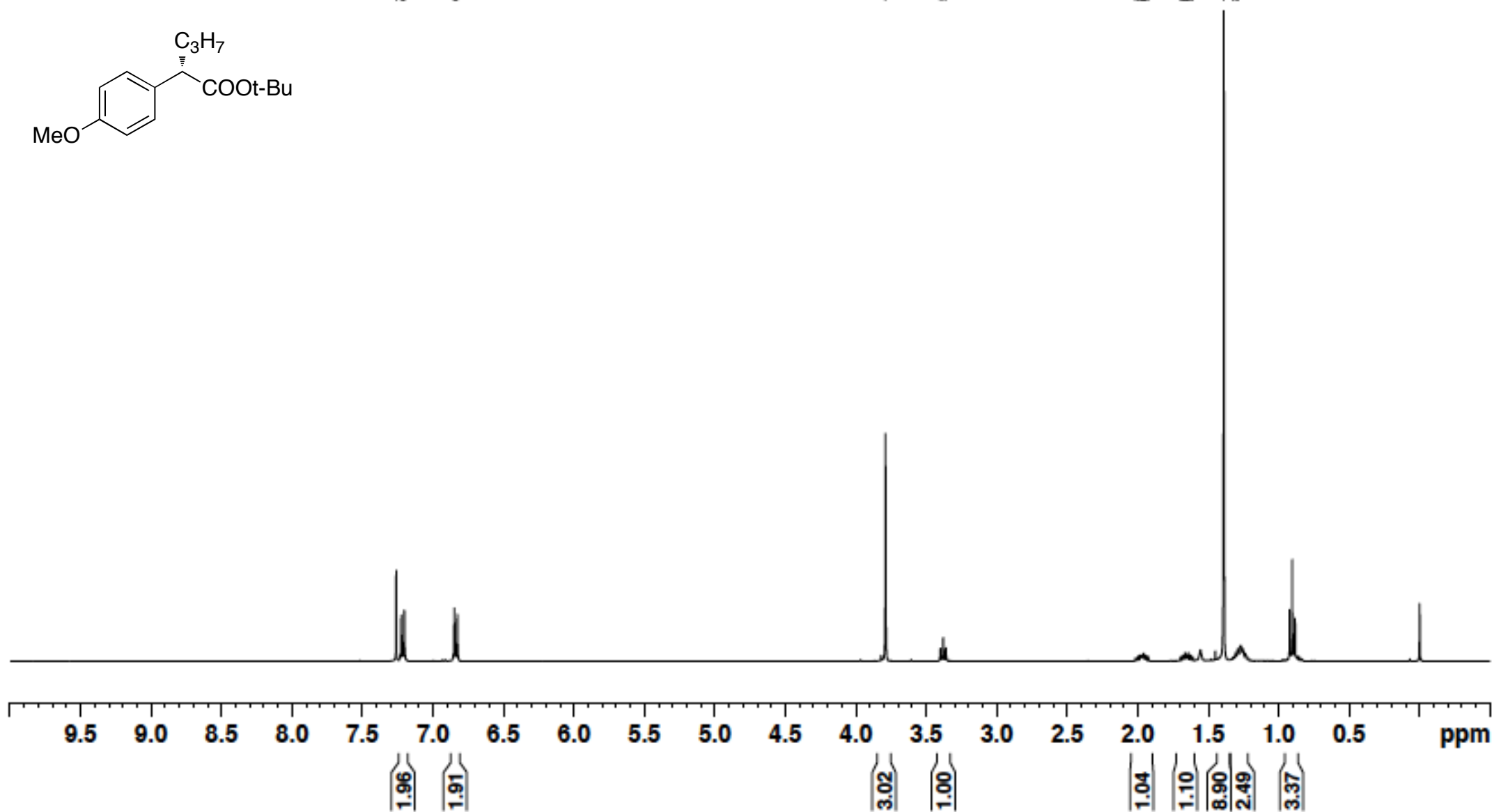
JF12-023 HNMR
BBF01 CDCl3
2014-01-02

S73



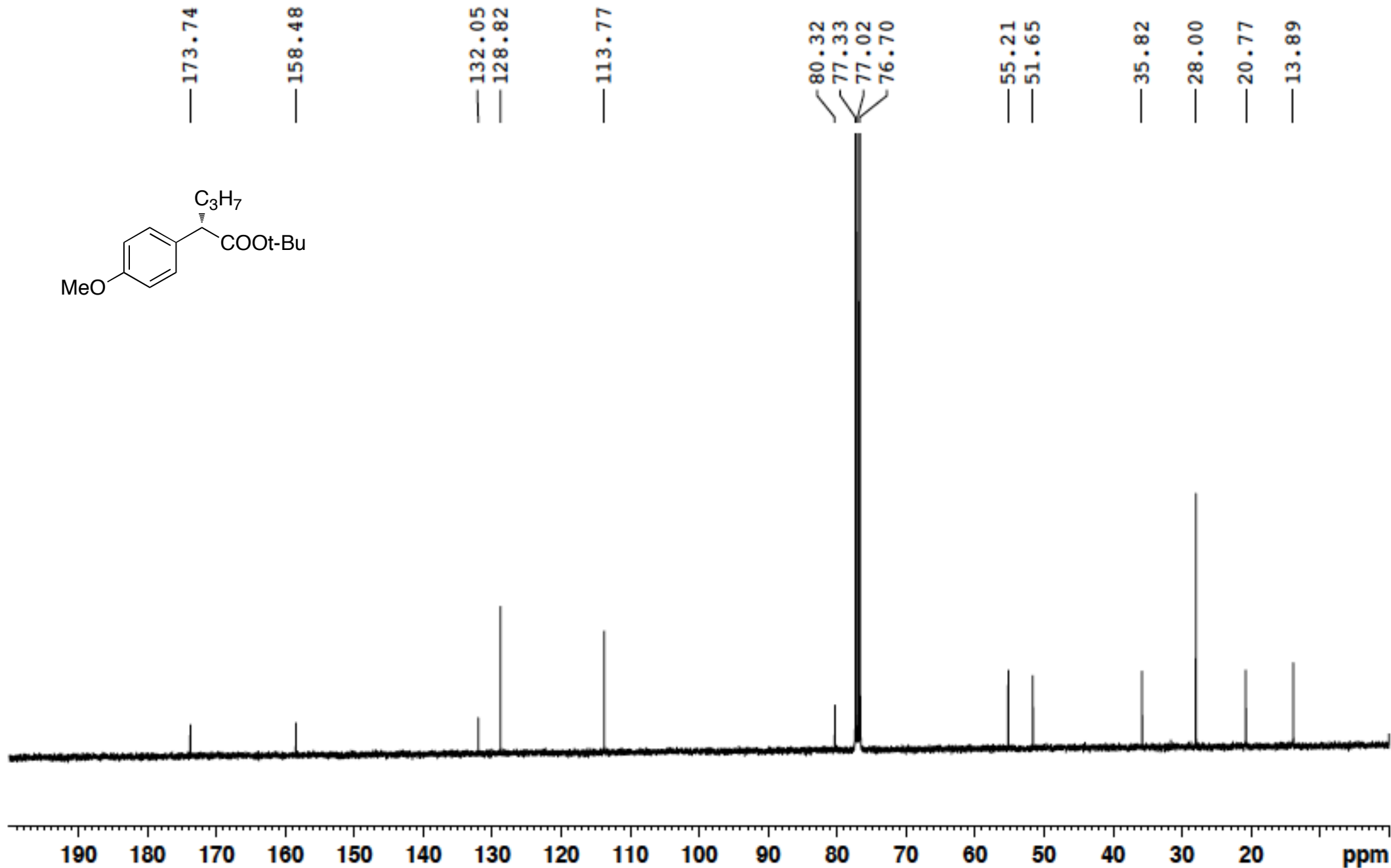
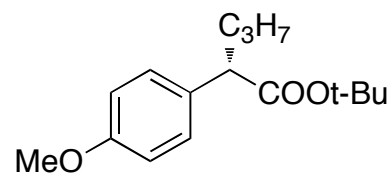
7.260
7.224
7.219
7.207
7.202
6.850
6.845
6.833
6.828

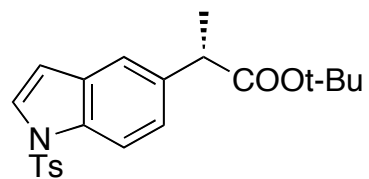
3.790
3.400
3.381
3.361
2.016
2.000
1.994
1.980
1.973
1.968
1.962
1.959
1.947
1.944
1.939
1.924
1.698
1.683
1.680
1.675
1.665
1.659
1.657
1.648
1.642
1.630
1.626
1.608
1.390
1.325
1.306
1.292
1.288



JF12-023 CNMR
BBFO1 CDCl3
2014-01-02

S74





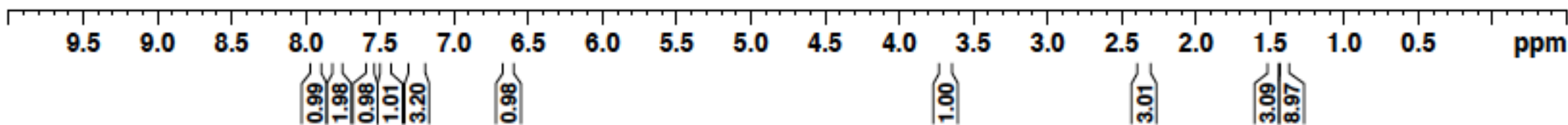
7.918
7.897
7.769
7.748
7.536
7.527
7.440
7.437
7.256
7.252
7.234
7.230
7.221
7.200
6.611
6.601

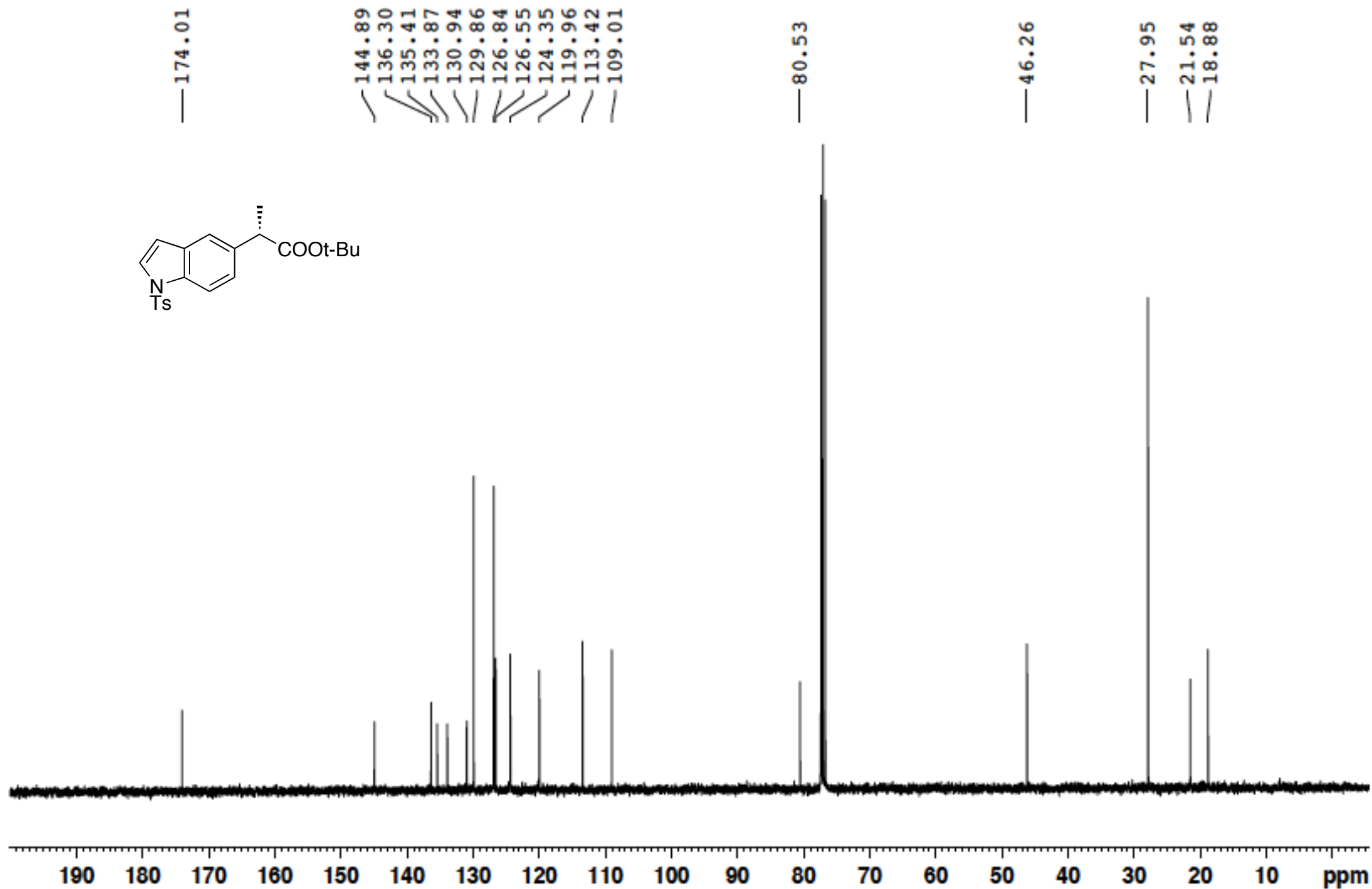
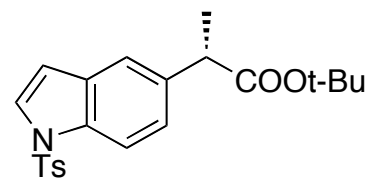
3.688
3.670
3.652
3.635

2.332

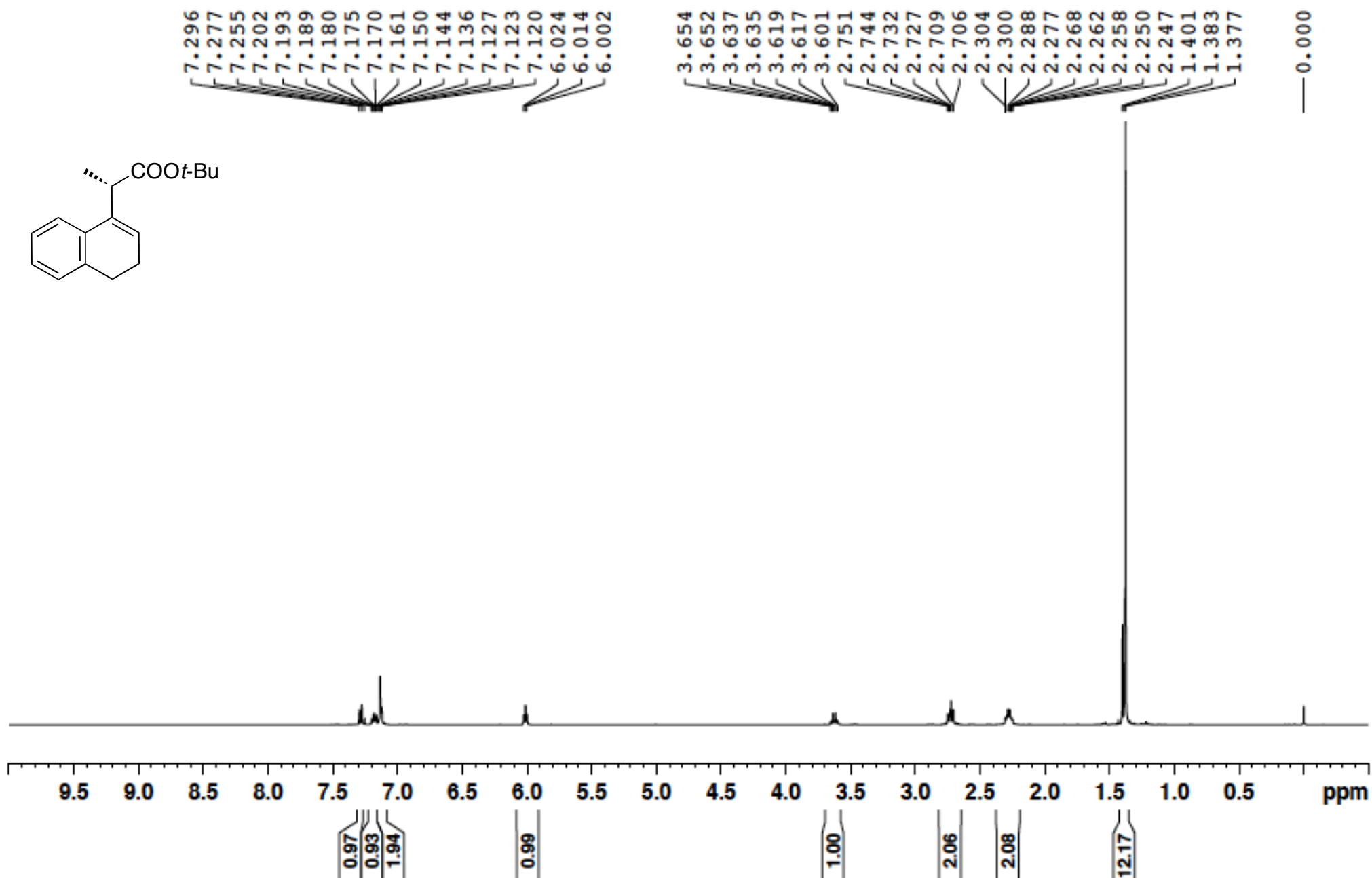
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1.442
1.432
1.373

0.000

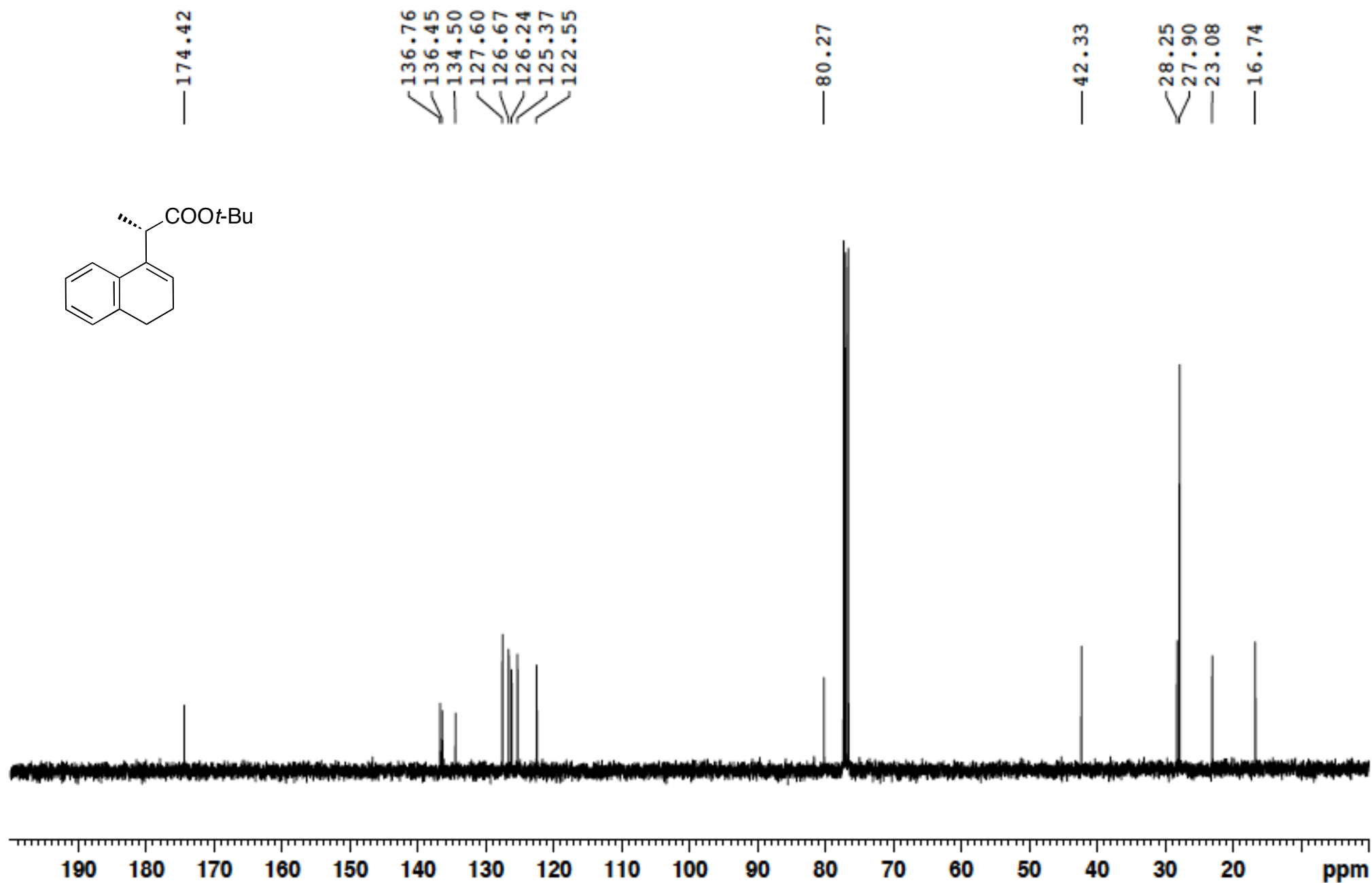




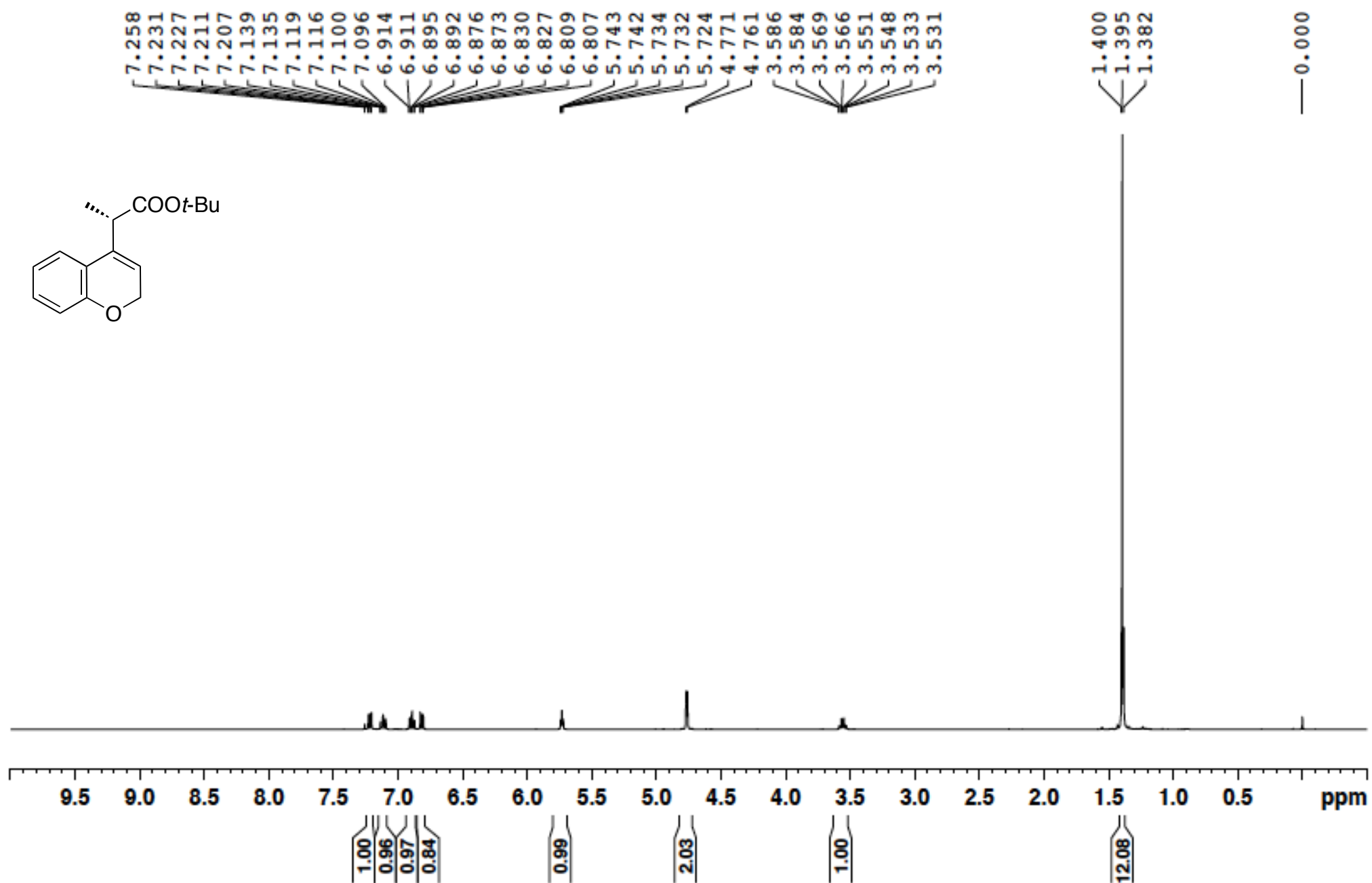
JF11-39-4 ¹HNMR, CDCl₃, BBO1
2013-07-22



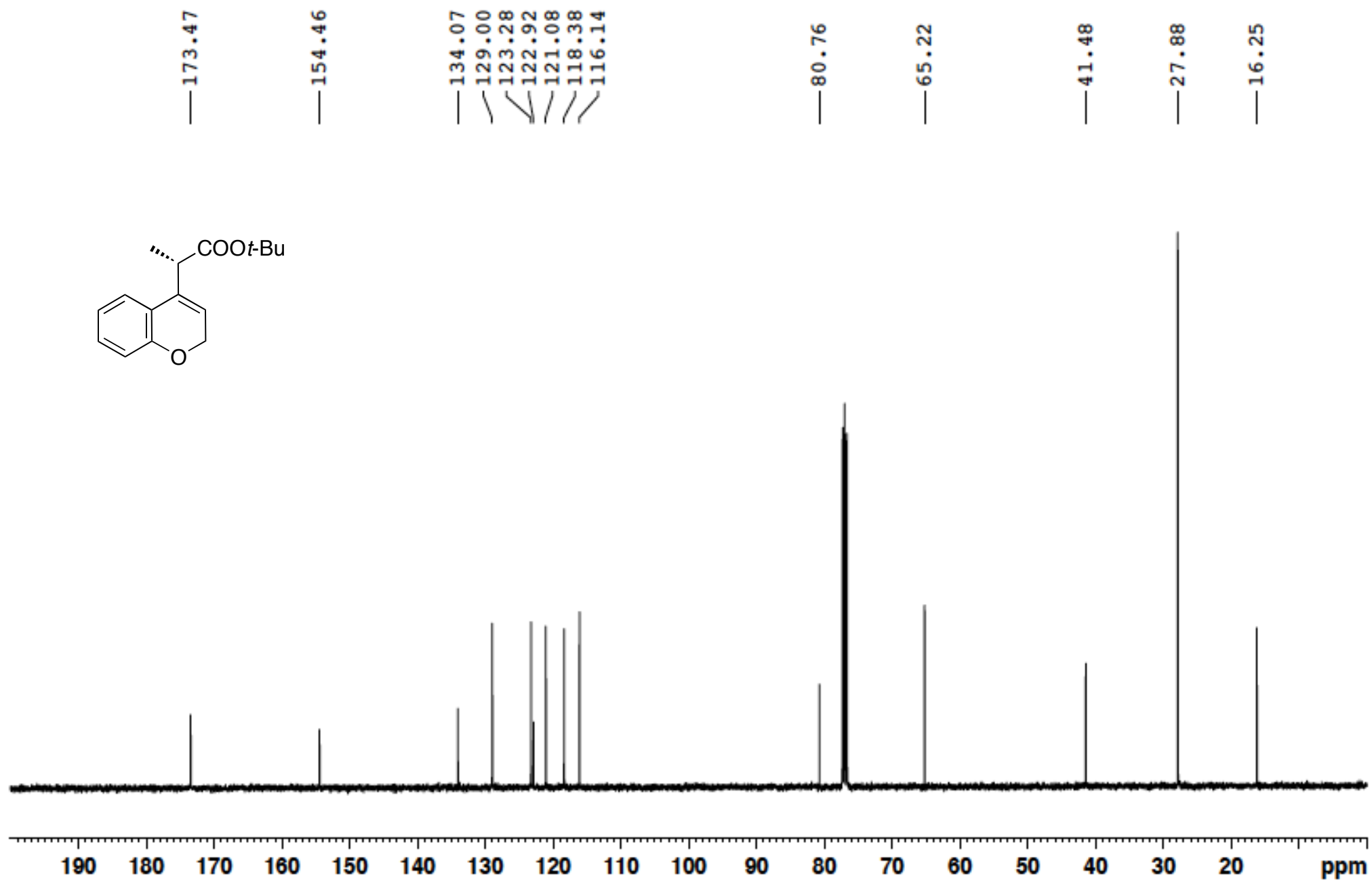
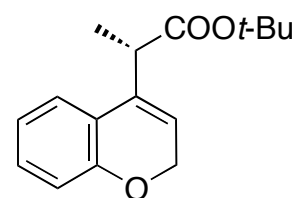
JF11-39-4 ¹³CNMR, CDCl₃, BBF01
2013-07-22



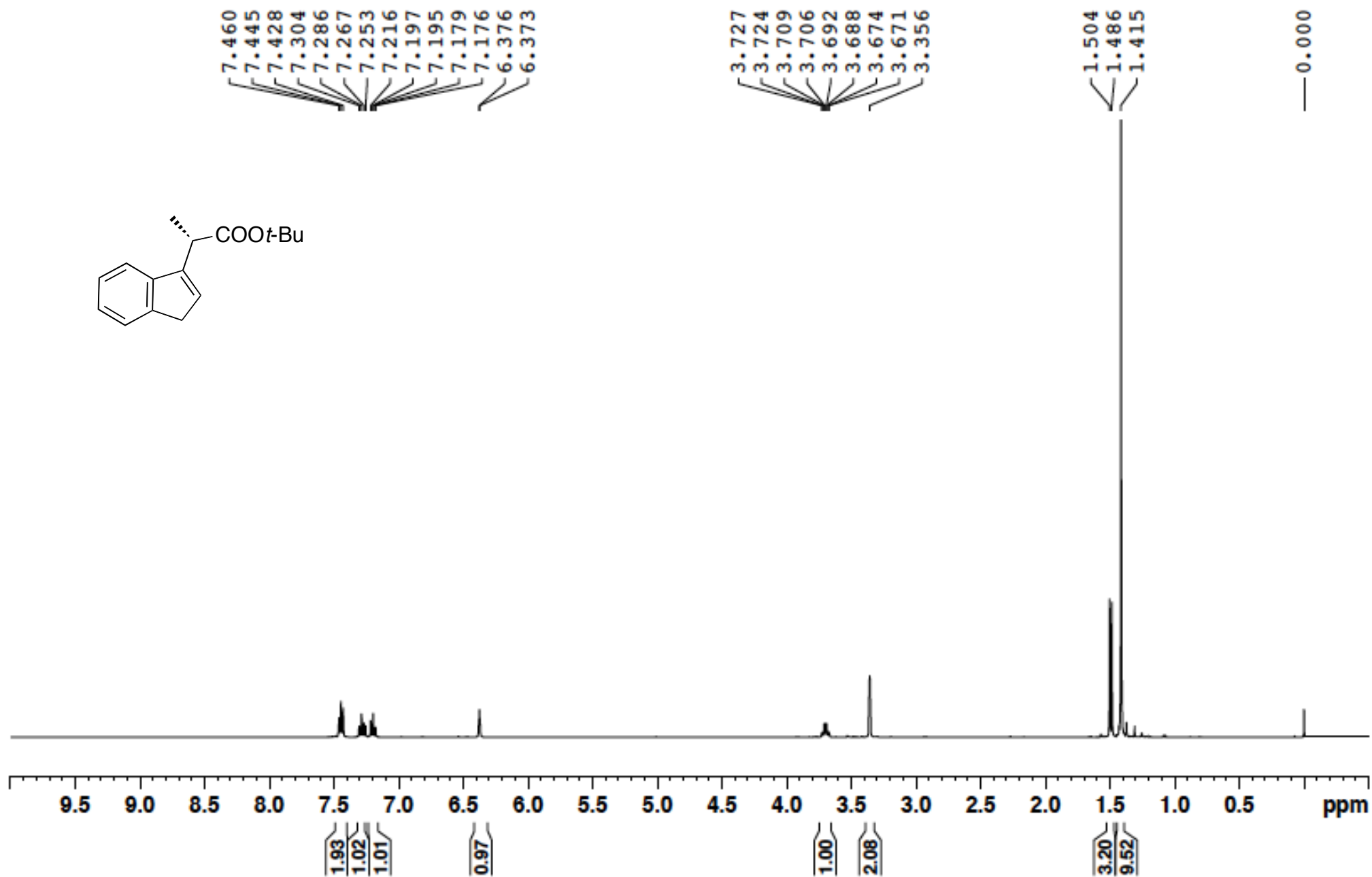
JF11-29-2 1HNMR, CDCl3, BBF01
2013-07-22



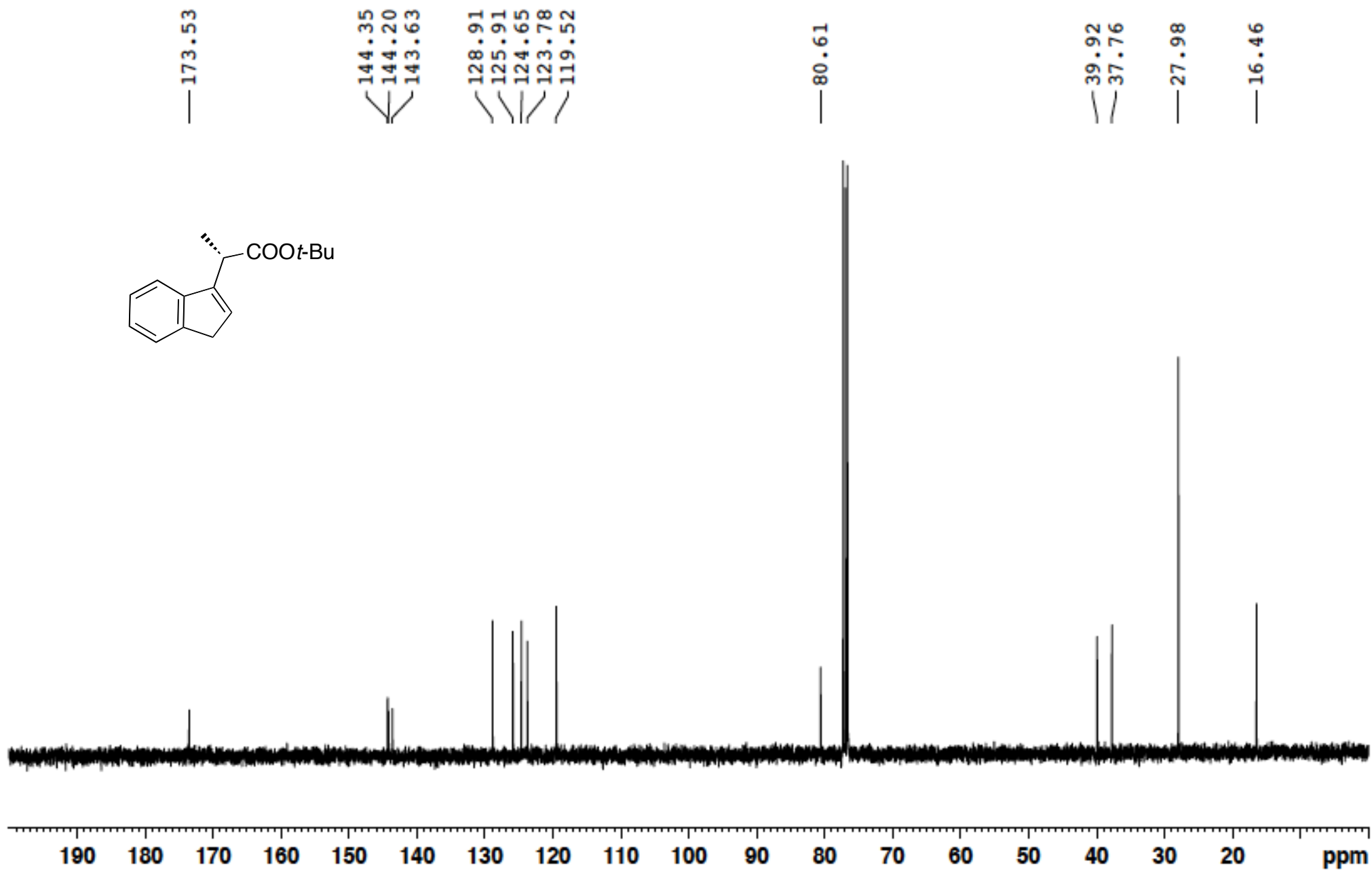
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2013-07-22



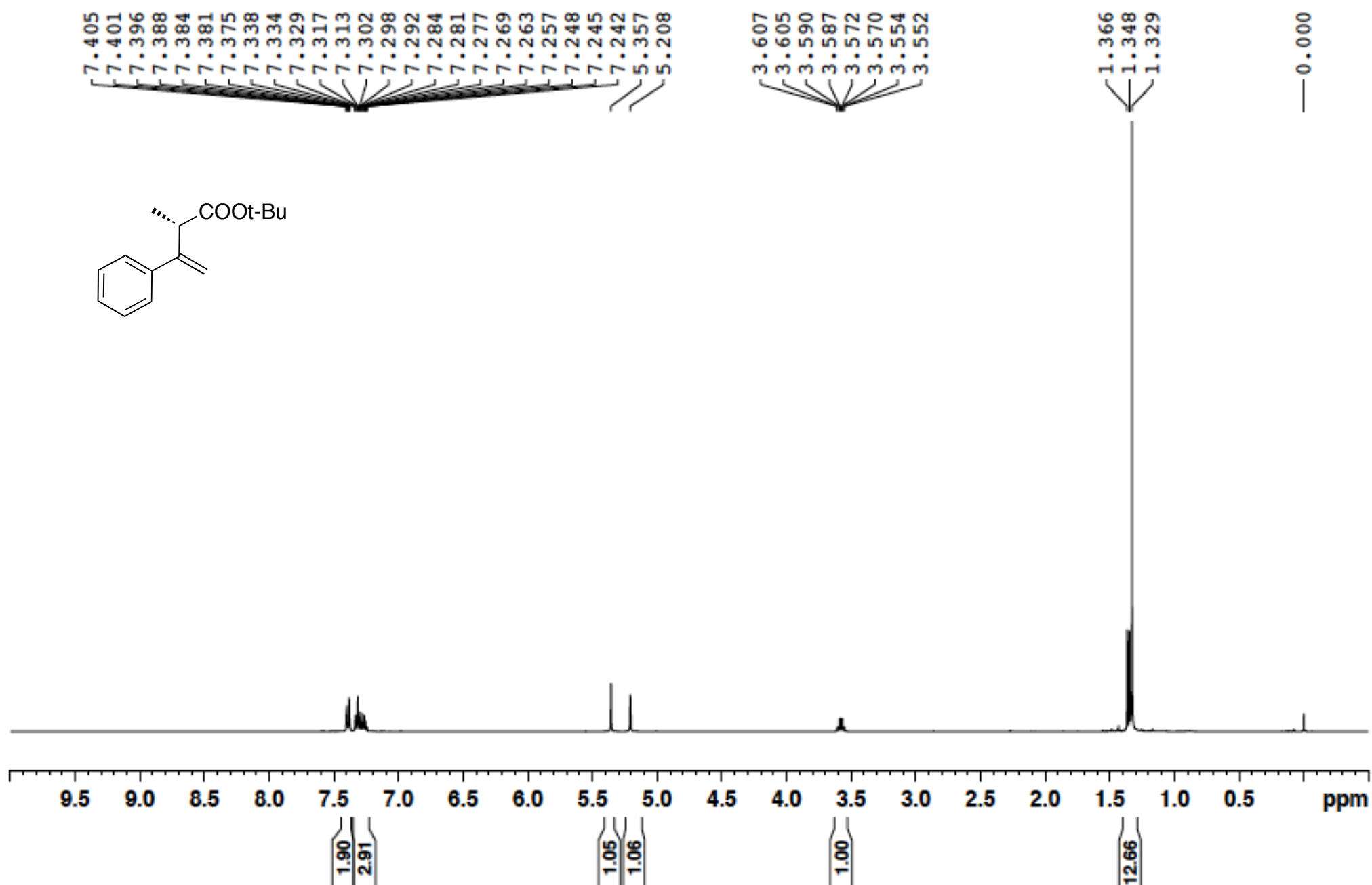
JF11-29-3 ¹HNMR, CDCl₃, BBO1
2013-07-22



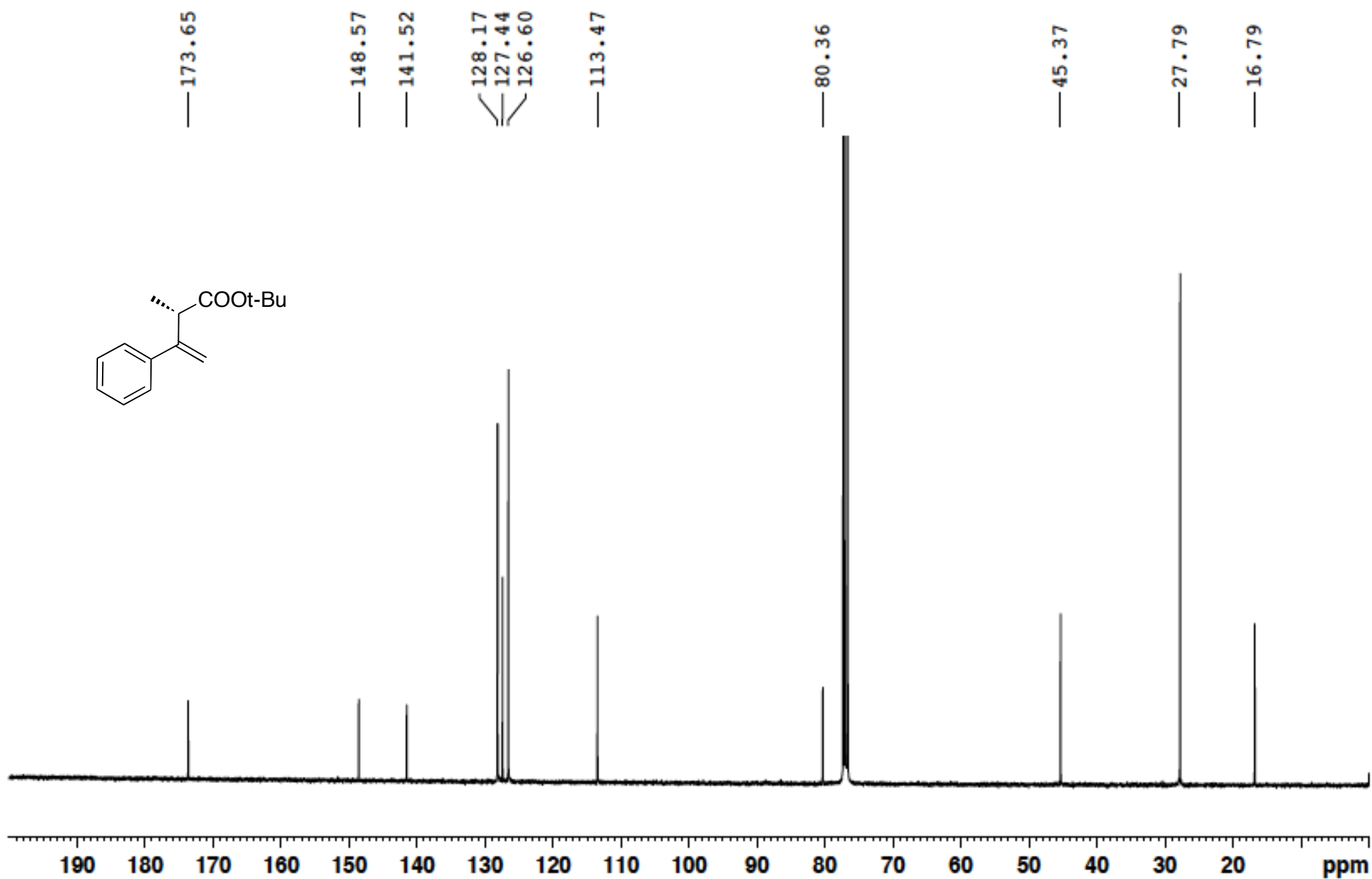
JF11-29-3 ¹³CNMR, CDCl₃, BBF01
2013-07-22



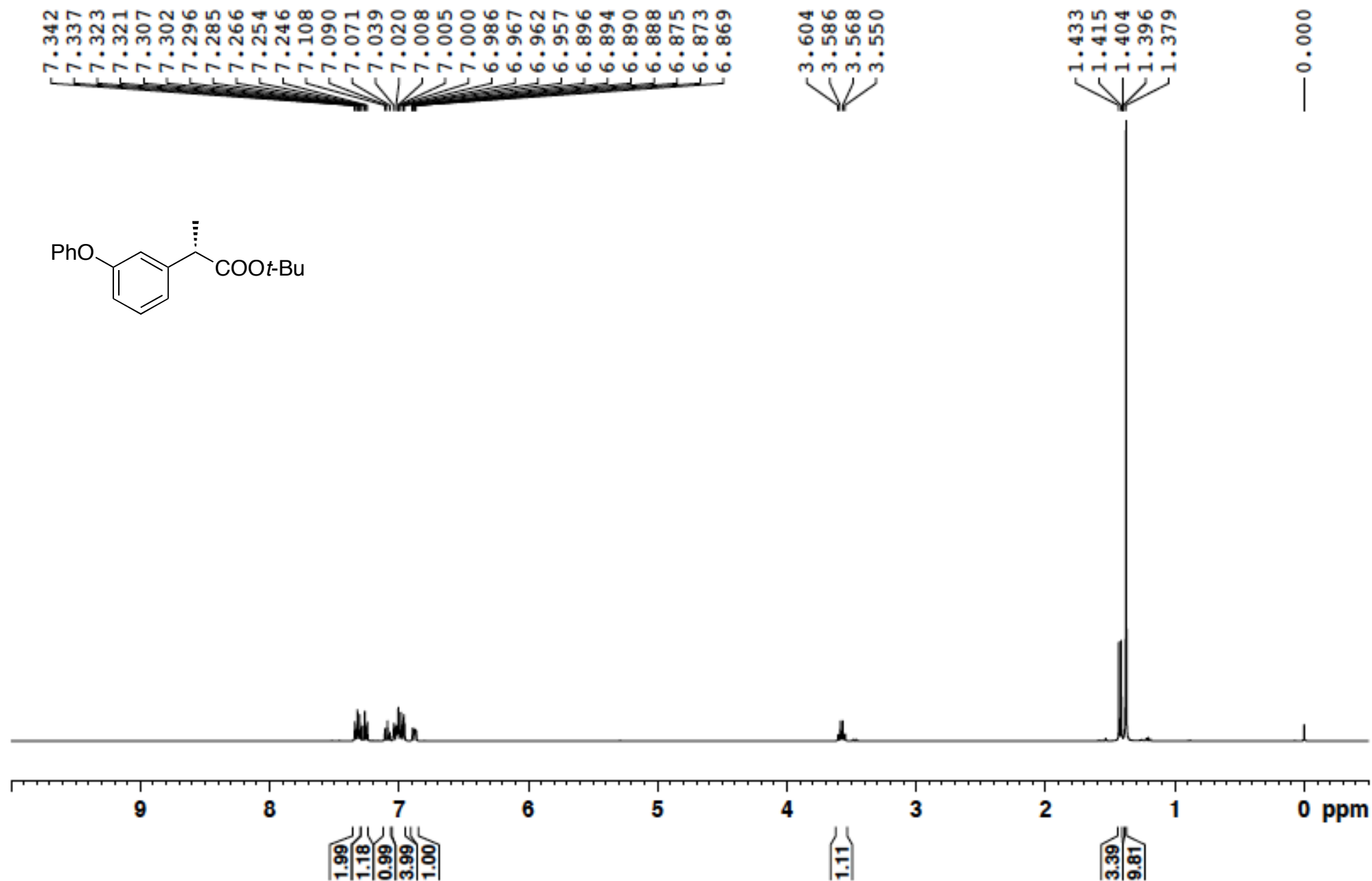
JF11-29-1 1HNMR BBFO1 CDC13
2013-8-9



JF11-29-1 CDCl₃ ¹³CNMR BBF02
2013-08-09

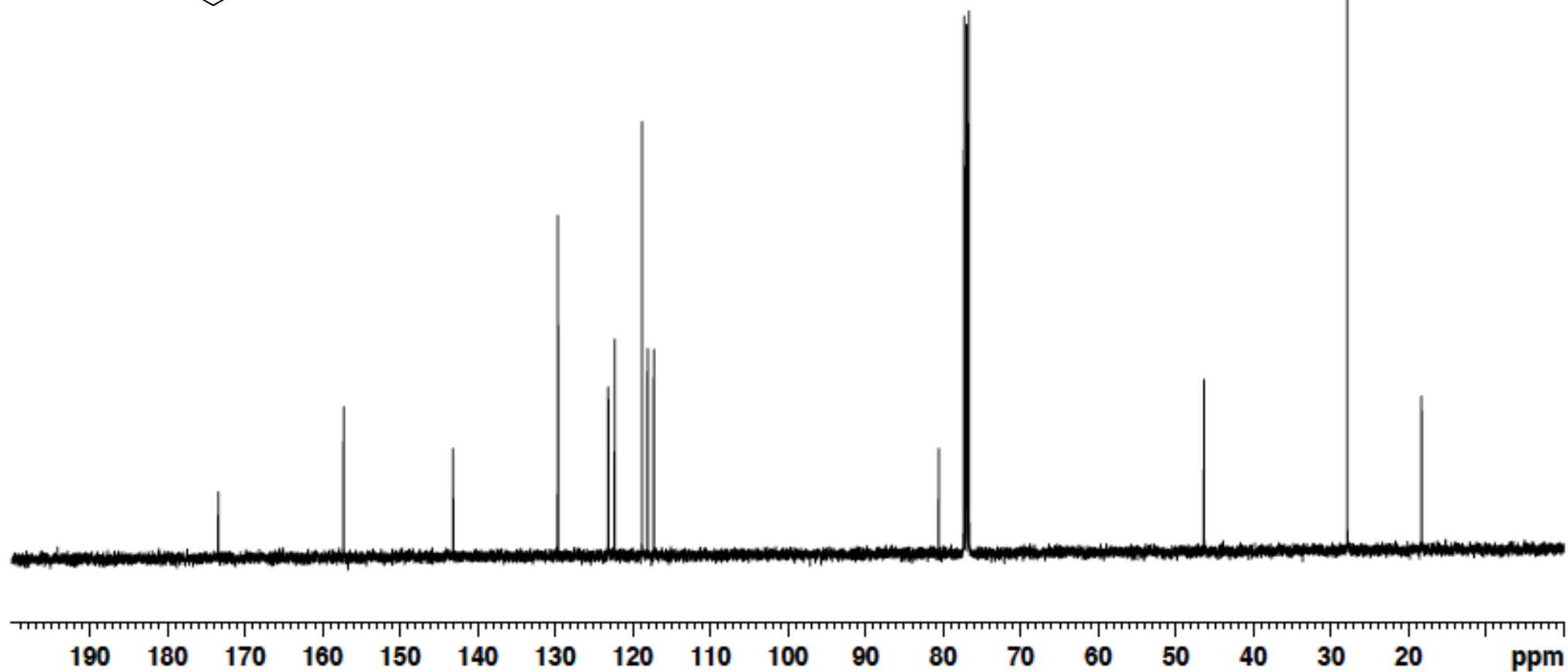
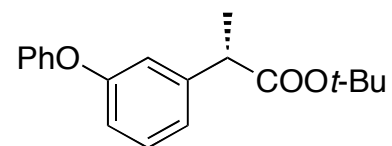


JF11-23-5, HNMR, CDCl₃ BBF02
2013-07-05

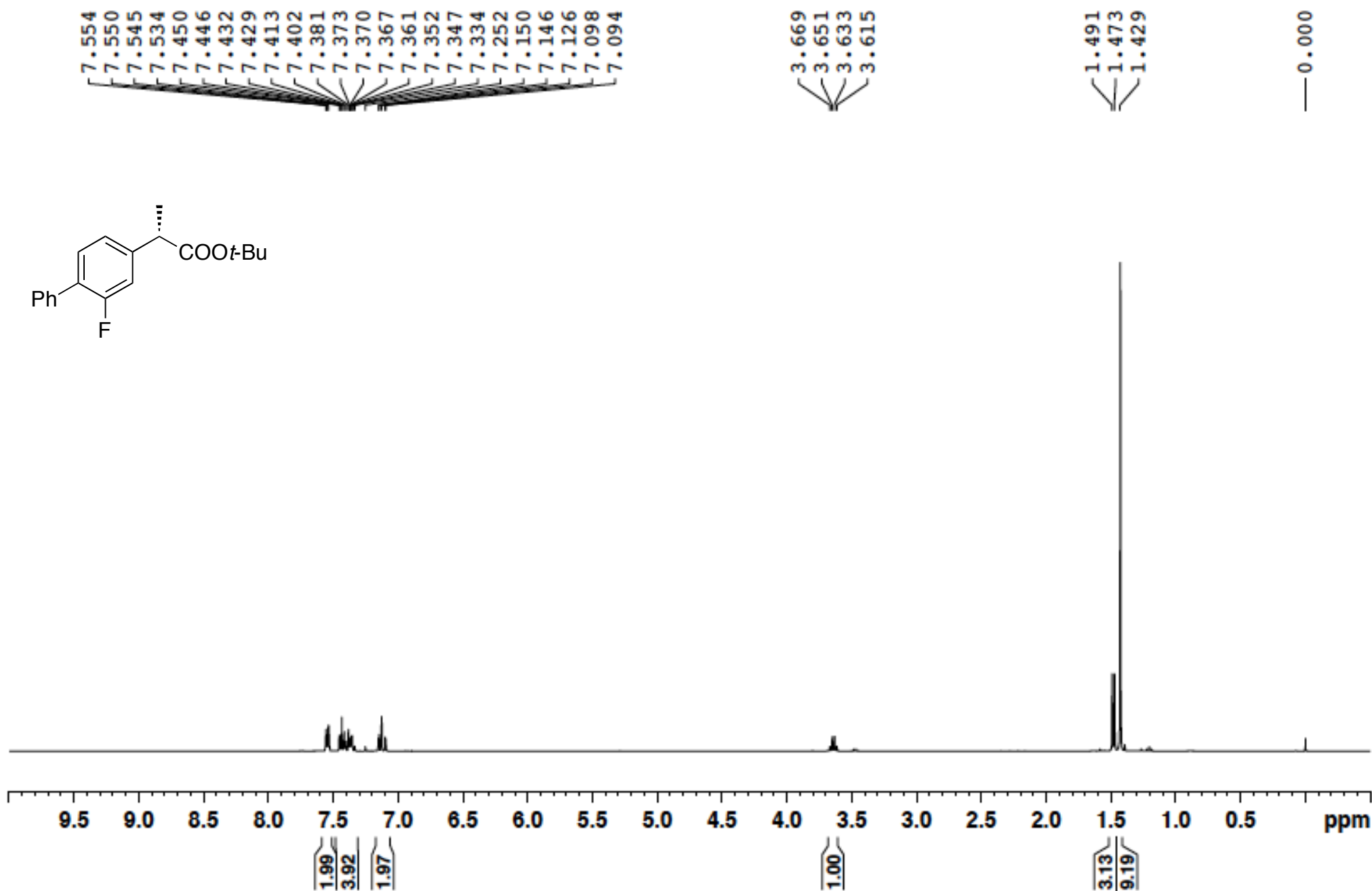


JF11-23-5, ¹³CNMR, CDCl₃ BBFO2
2013-07-05

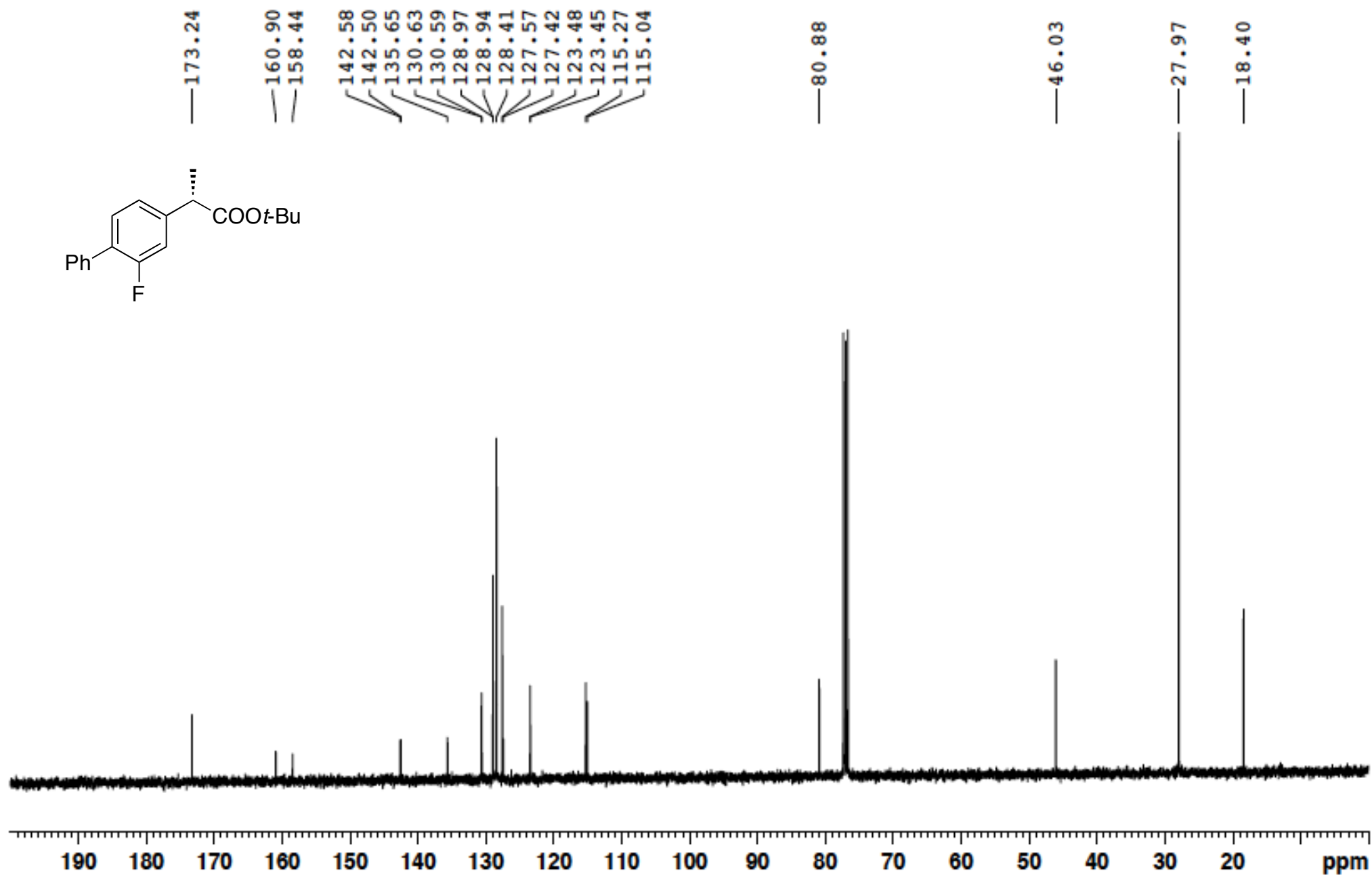
— 173.40
— 157.28
— 143.18
129.70
129.67
123.17
122.35
118.82
118.13
117.32
— 80.58
— 46.39
— 27.93
— 18.32

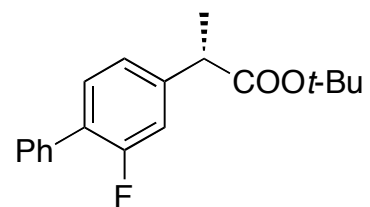


JF11-23-6, HNMR, CDCl₃ BBFO2
2013-07-05

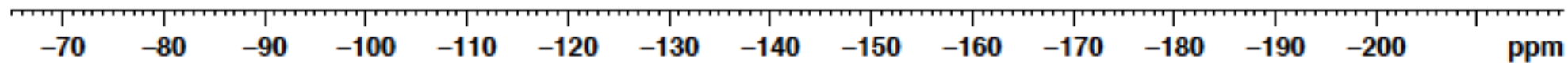


JF11-23-6, ^{13}C NMR, CDCl_3 BBFO2
2013-07-05





— -118.00



JF11-53-4 CDCl3 1HNMR BBFO2

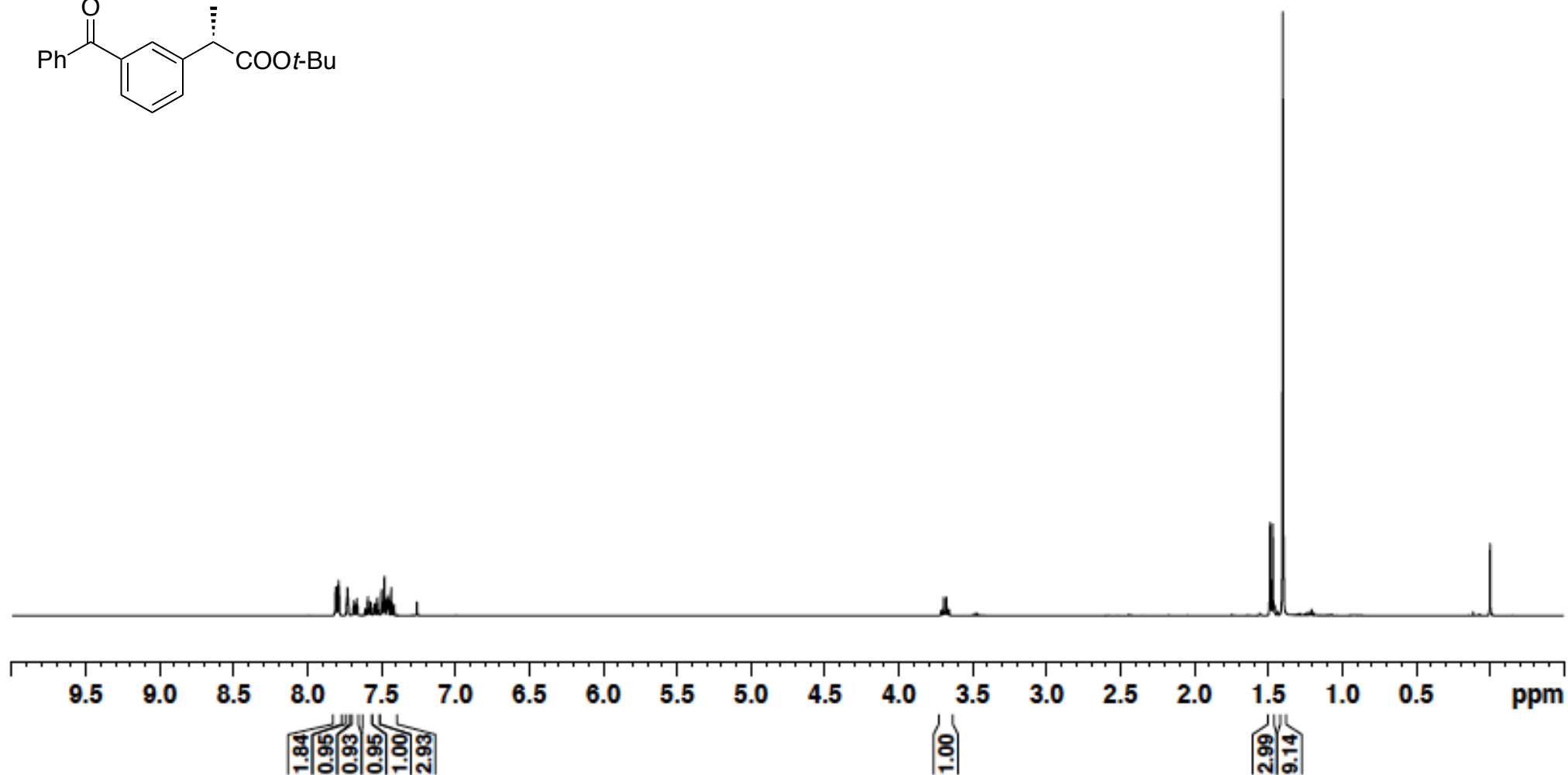
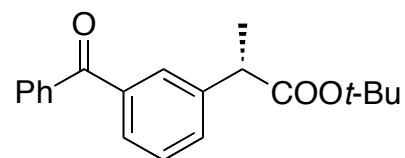
2013-08-02

7.797
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7.788
7.732
7.728
7.691
7.688
7.684
7.672
7.669
7.665
7.612
7.598
7.593
7.589
7.578
7.575
7.572
7.549
7.530
7.501
7.482
7.467
7.463
7.455
7.436
7.417
7.261

3.714
3.696
3.678
3.660

1.488
1.470
1.402

— 0.000



JF11-23-15 CDCl3 1HNMR BBF02
2013-08-02

