Supporting Information

Chemoenzymatic synthesis of Amaryllidaceae constituents and biologoical evaluation of their C-1 analogs. The next generation synthesis of 7-deoxypancratistatin and dihydrolycoricidine.

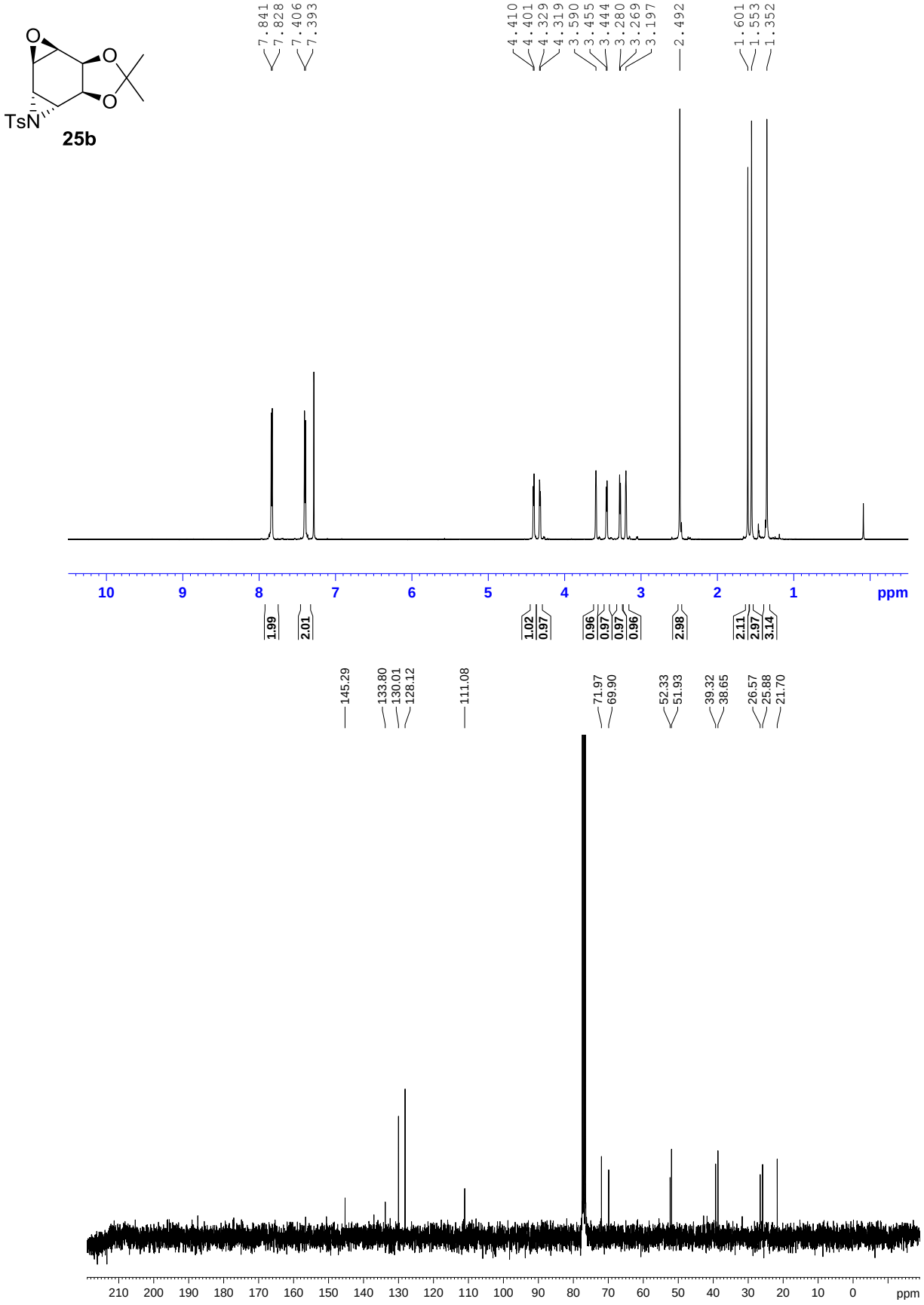
Jonathan Collins, Uwe Rinner, Michael Moser, Tomas Hudlicky*, Ion Ghiviriga, Anntherese E. Romero, Alexander Kornienko, Dennis Ma, Carly Griffin and Siyaram Pandey

Department of Chemistry and Centre for Biotechnology, Brock University, 500 Glenridge Ave., St. Catharines, ON, L2S 3A1, Canada
thudlicky@brocku.ca

Contents of supporting information

General Experimental Details

All non-hydrolytic reactions were carried out under an argon atmosphere. Glassware used for moisture-sensitive reactions was flame-dried under vacuum and subsequently purged with argon. THF, DME, and toluene were distilled from potassium/benzophenone. Methylene chloride and acetonitrile were distilled from calcium hydride. Flash column chromatography was performed using Kieselgel 60 (230-400 mesh). Analytical thin-layer chromatography was performed using silica gel 60-F_{254} plates. Melting points are reported uncorrected. IR spectra were recorded as neat samples or in KBr pellets. ^{1}H and 13C NMR spectra were obtained on either a 300-MHz or 600 MHz instrument. Data are reported as (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad; coupling constants(s) in Hz, integration. Specific rotation measurements are given in deg cm^3 g^{-1} dm^{-1}. Mass spectra and high resolution mass spectra were performed by the analytical division at Brock University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5
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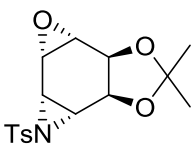
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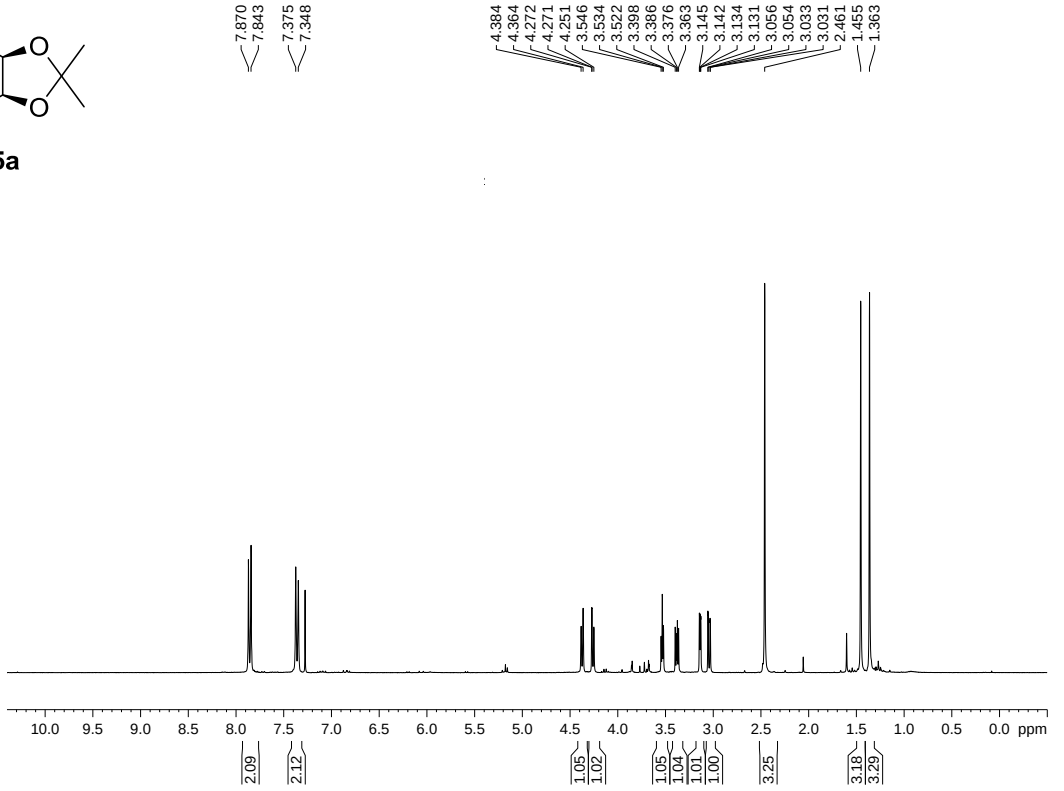
25a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3.376
3.363
3.145
3.142
3.134
3.131
3.056
3.054
3.033
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1.455
1.363
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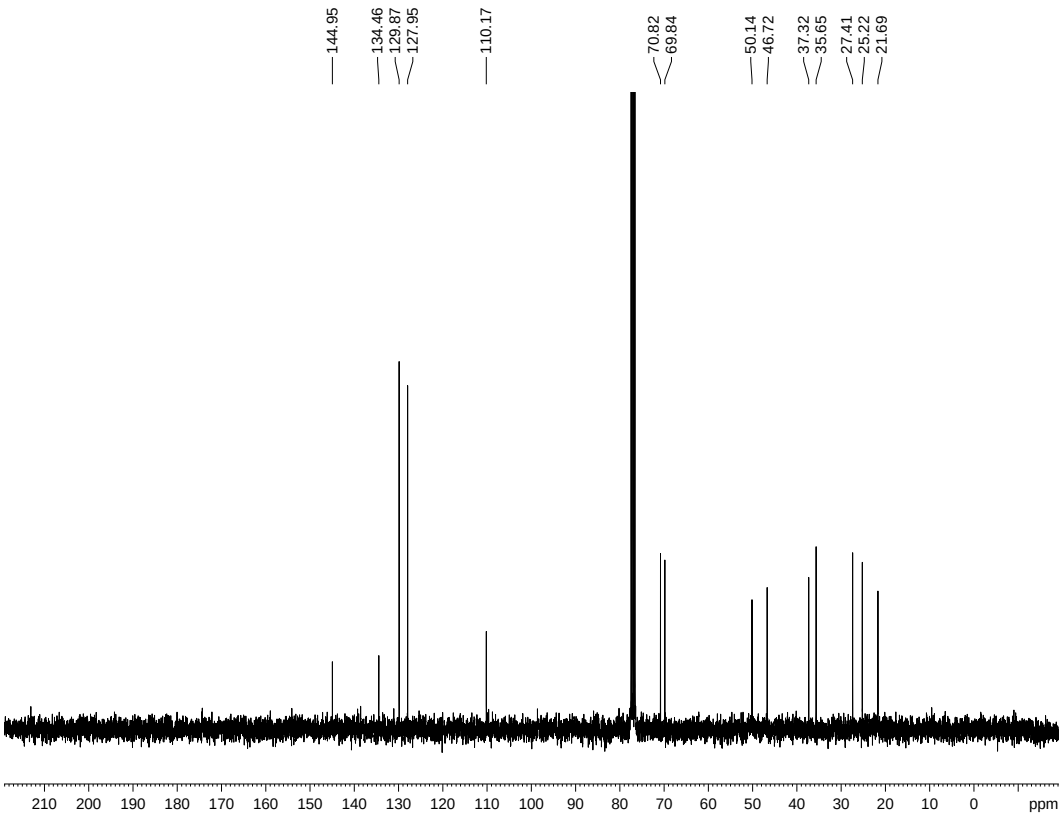
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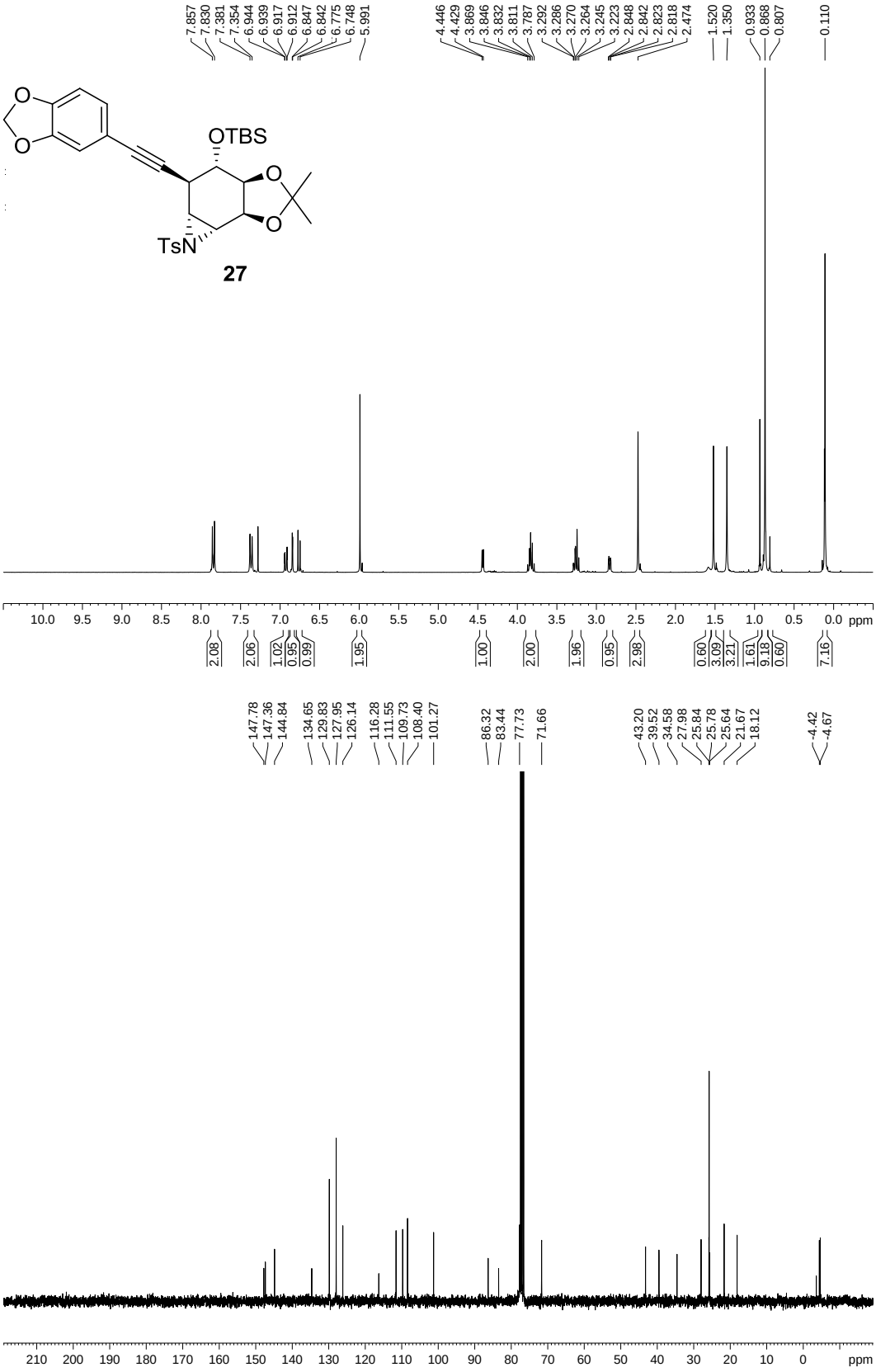
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3.832
3.811
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3.264
3.245
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TsN
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2.06
1.02
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147.36
144.84
134.65
129.83
127.95
126.14
116.28
111.55
109.73
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101.27
86.32
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39.52
34.58
27.98
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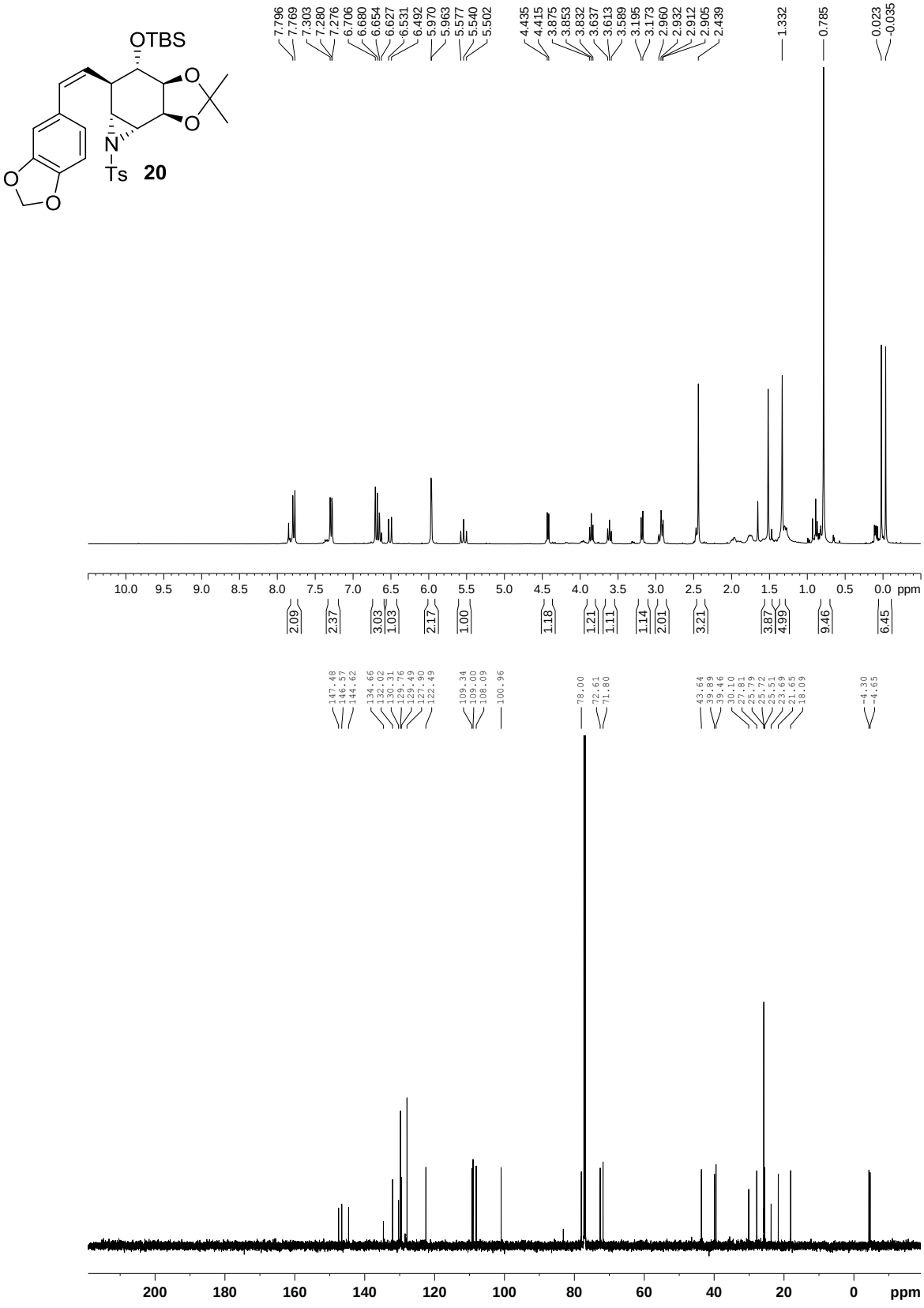
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5.540
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4.415
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3.637
3.613
3.589
3.195
3.173
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2.912
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-0.035
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1.03
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2.01
3.21
3.87
4.99
9.46
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144.62
134.66
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130.31
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122.90
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109.34
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100.96
78.00
72.61
71.80
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39.89
39.46
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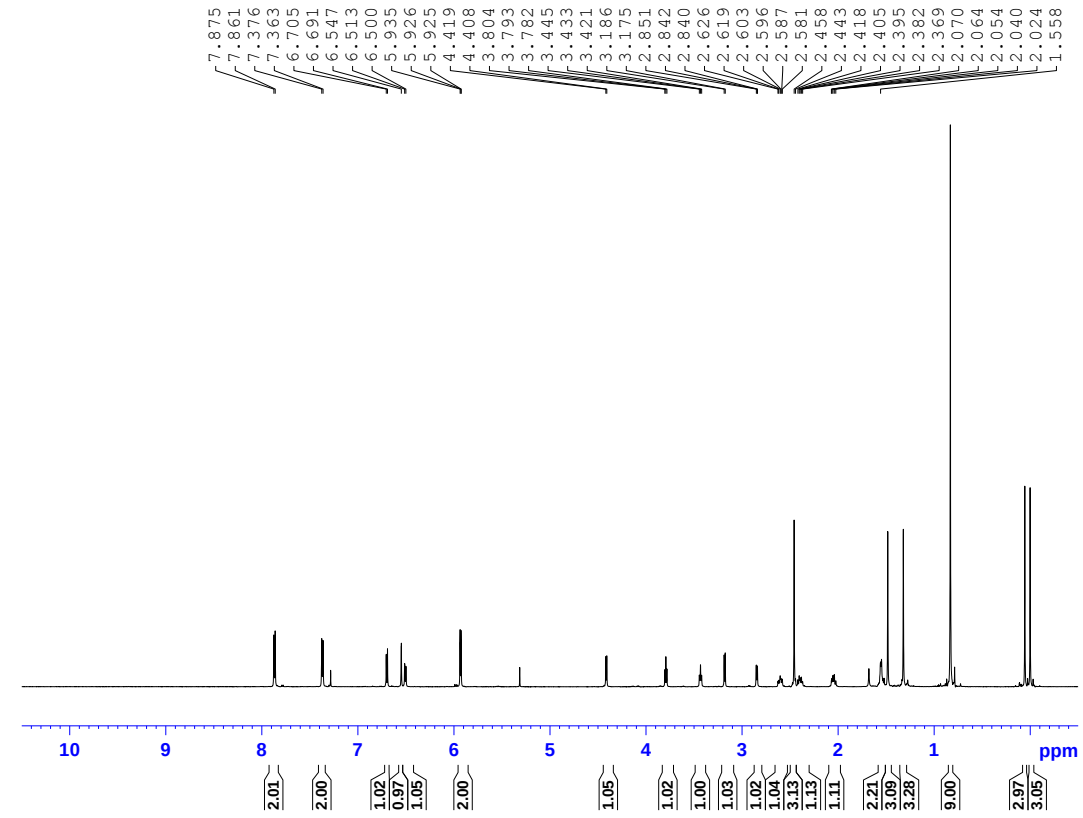
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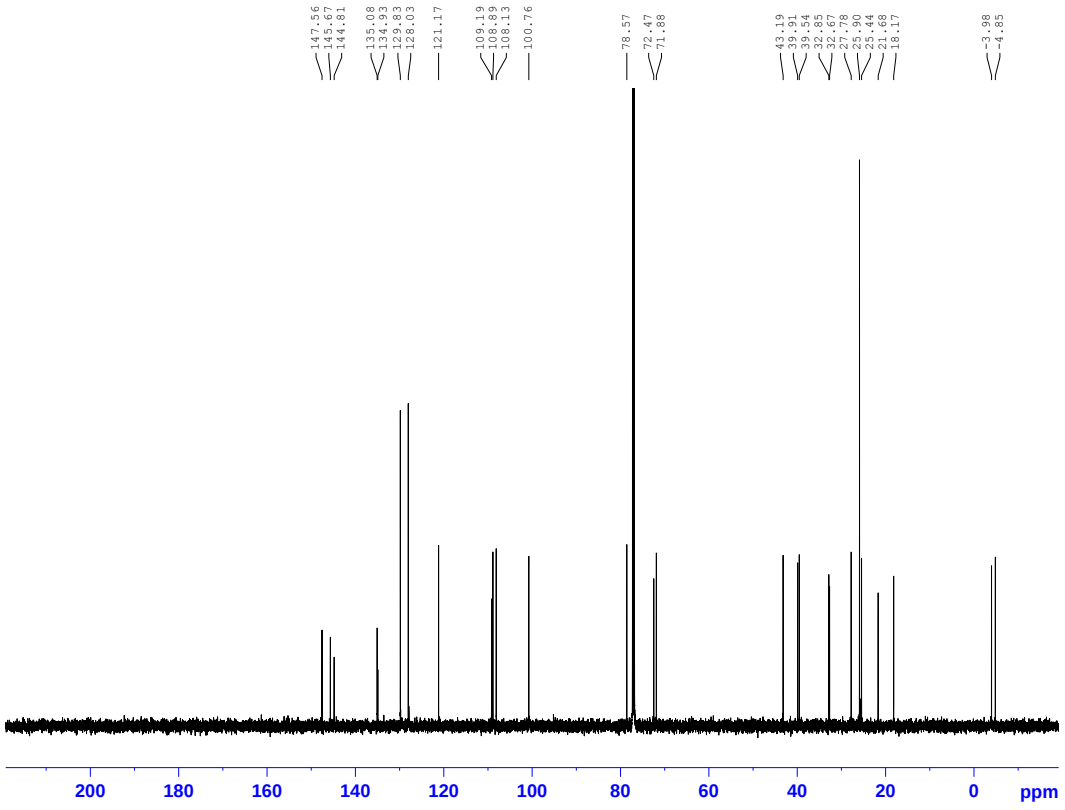
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71.88
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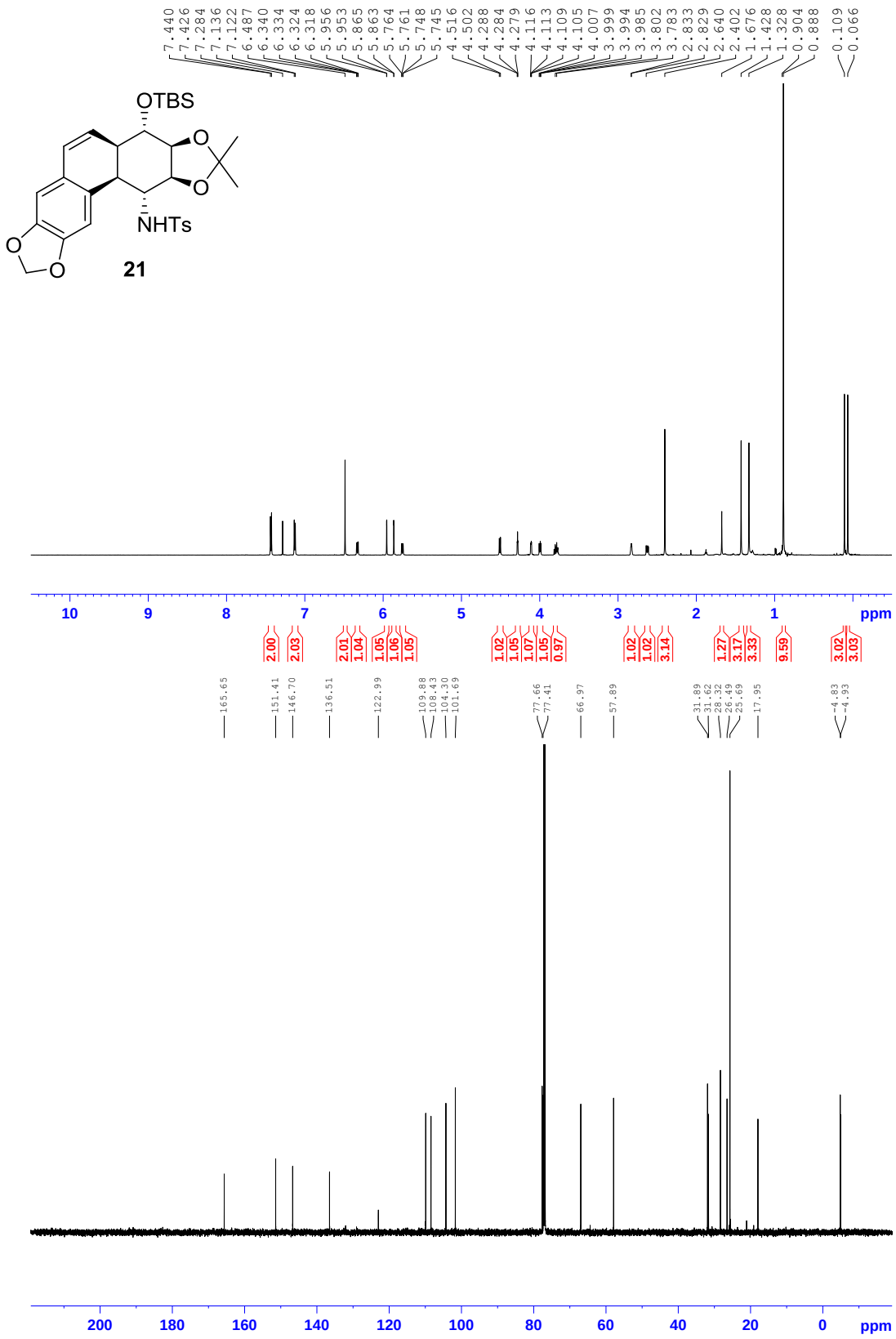
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NHTs
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O
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10
9
8
7
6
5
4
3
2
1
ppm
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2.01
1.04
1.05
1.06
1.05
1.02
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1.07
1.05
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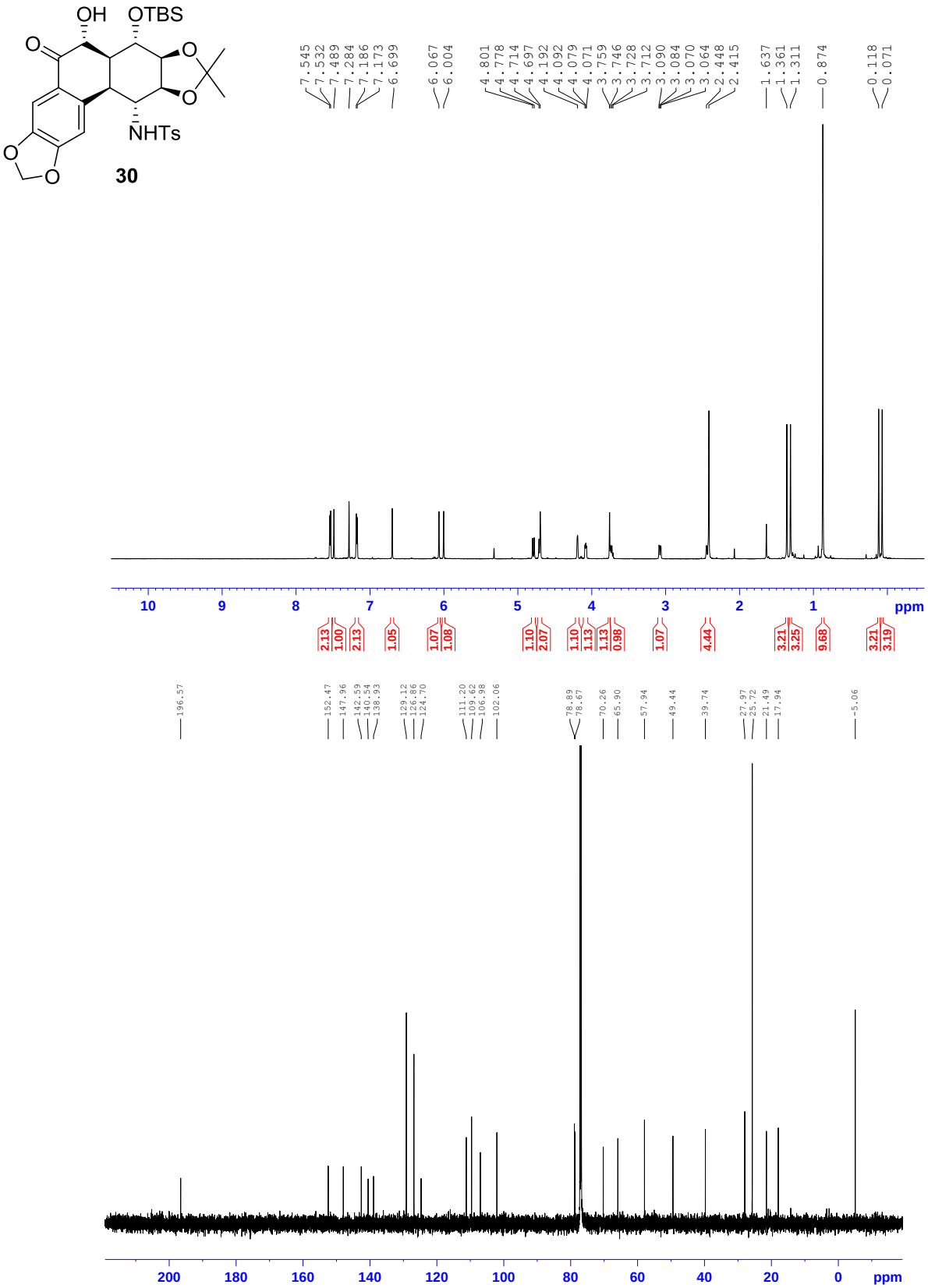
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4.079
4.071
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4
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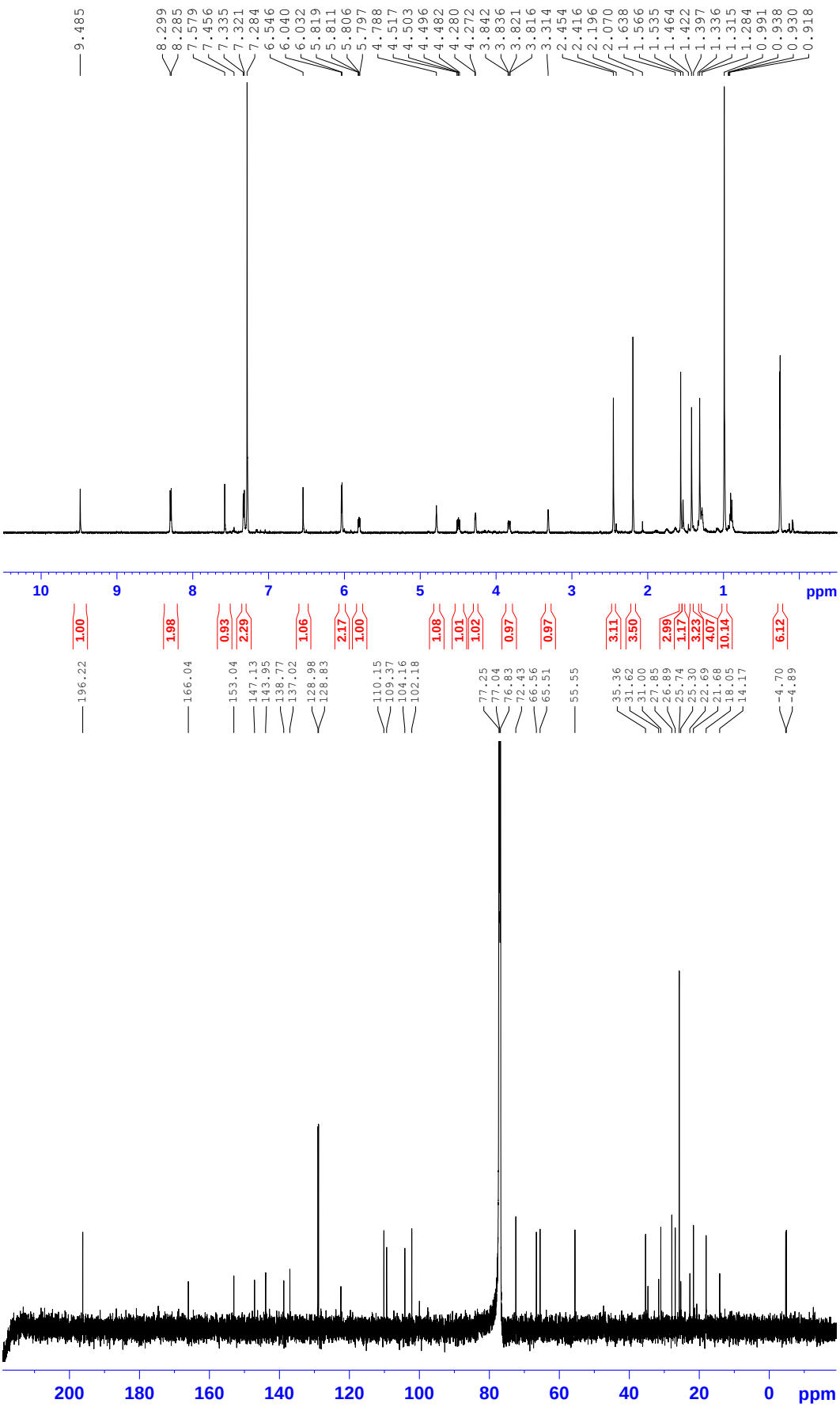
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3.821
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0.918
10 9 8 7 6 5 4 3 2 1 ppm
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166.04
153.04
147.13
143.95
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137.02
128.98
128.83
110.15
109.37
104.16
102.18
77.25
77.04
76.83
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55.55
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27.85
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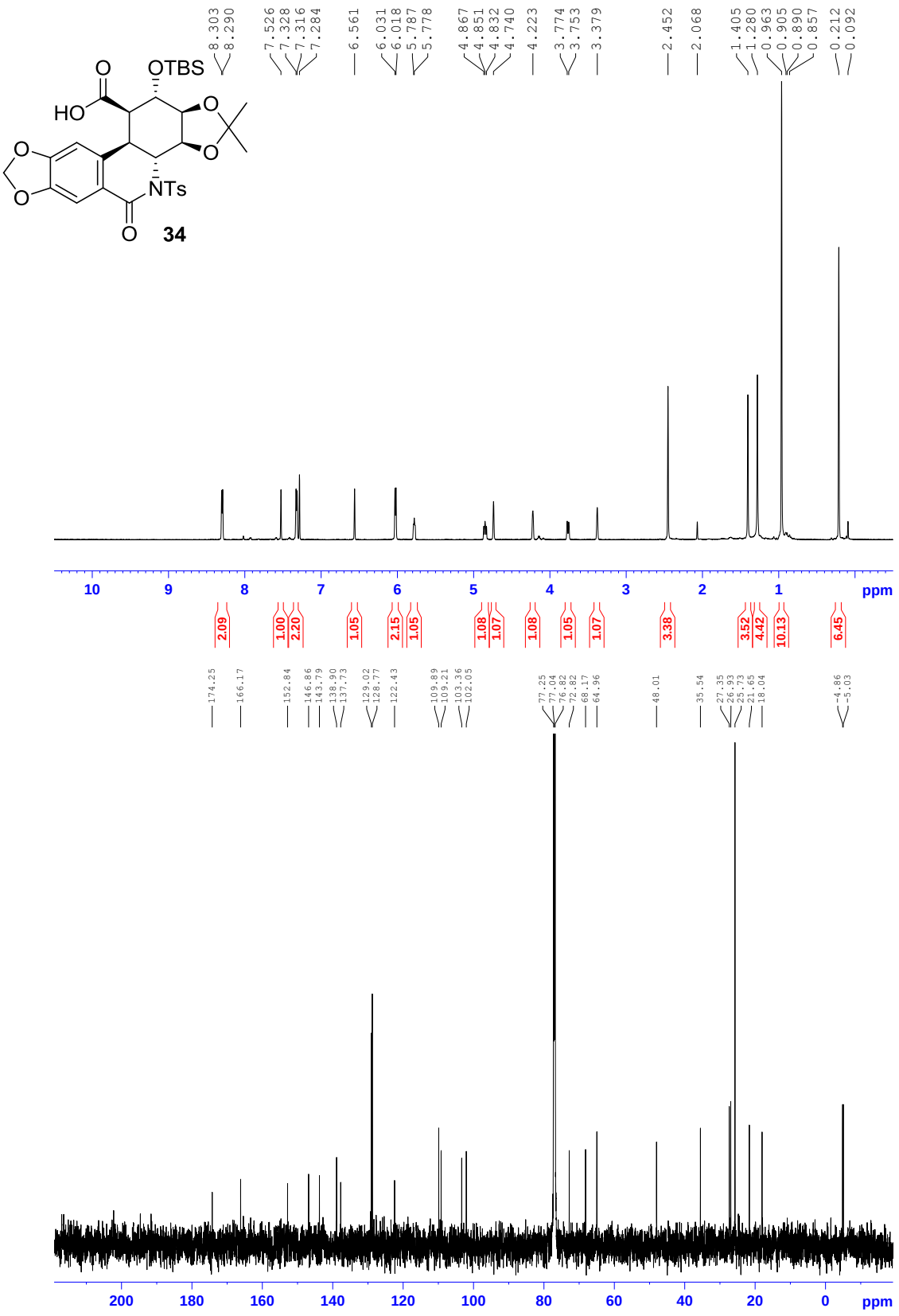
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HO
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O
O
O
O
NTs
O
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1.05
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1.07
1.08
1.05
1.07
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4.42
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146.86
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129.02
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77.04
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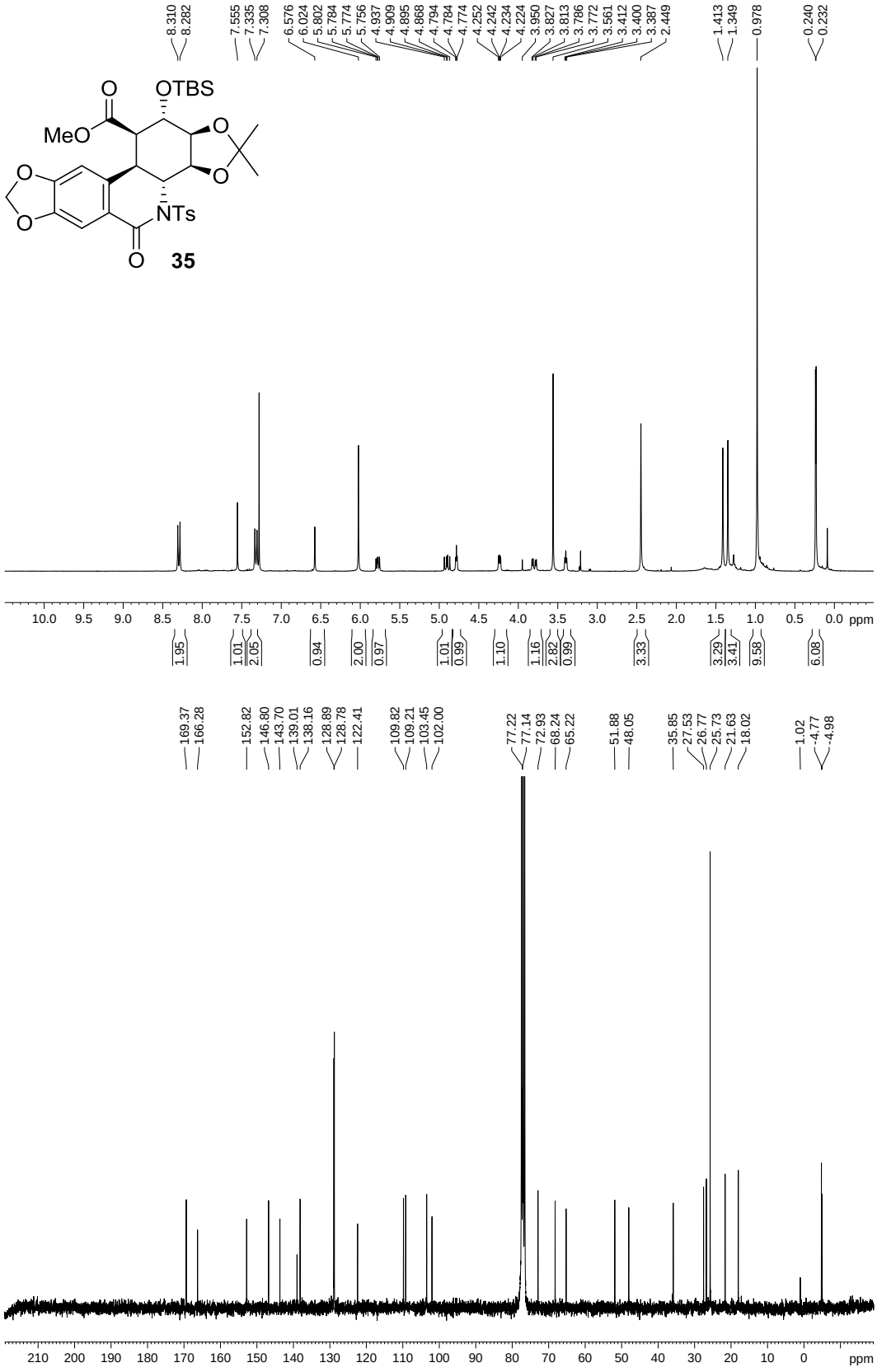
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O
OTBS
MeO
O
O
O
O
NTs
O
35
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
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1.01
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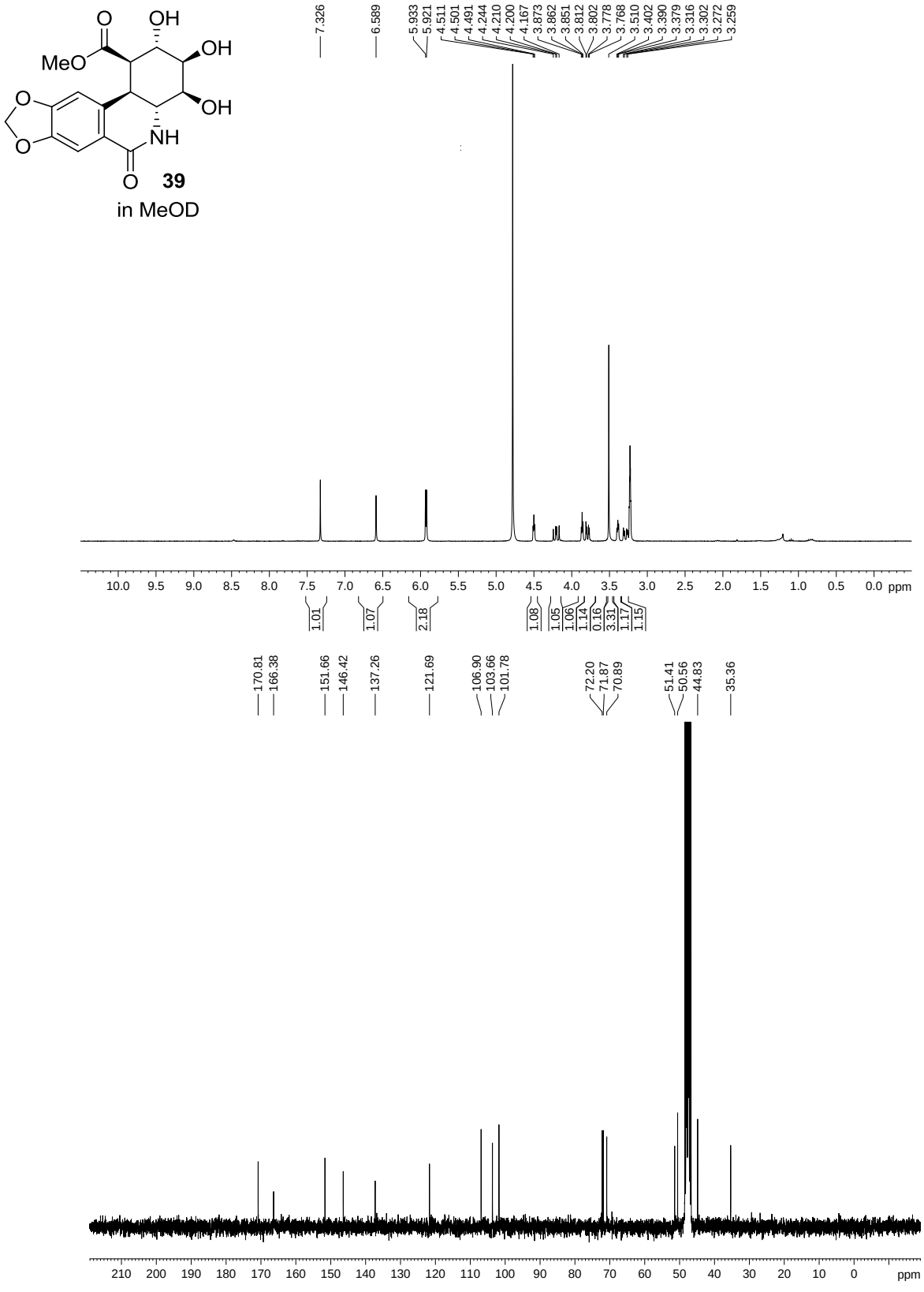
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OH
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O
O
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4.491
4.244
4.210
4.200
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3.812
3.802
3.778
3.768
3.510
3.402
3.390
3.379
3.316
3.302
3.272
3.259
10.0 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 0.0 ppm
1.01
1.07
2.18
1.08
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1.15
170.81
166.38
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137.26
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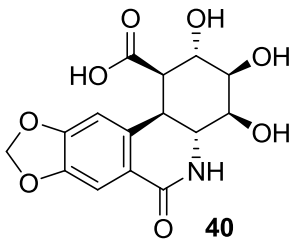
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OH
O
NH
O

40

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4.640
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4.359
4.354
4.338
3.999
3.994
3.989
3.906
3.902
3.890
3.885
3.467
3.461
3.456
3.372
3.367
3.350
3.343
10
9
8
7
6
5
4
3
2
1
ppm
1.15
1.00
2.17
1.09
1.00
1.07
1.10
1.10
1.15
172.15
166.44
151.67
146.38
137.57
121.64
106.83
103.81
101.79
72.35
71.88
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200
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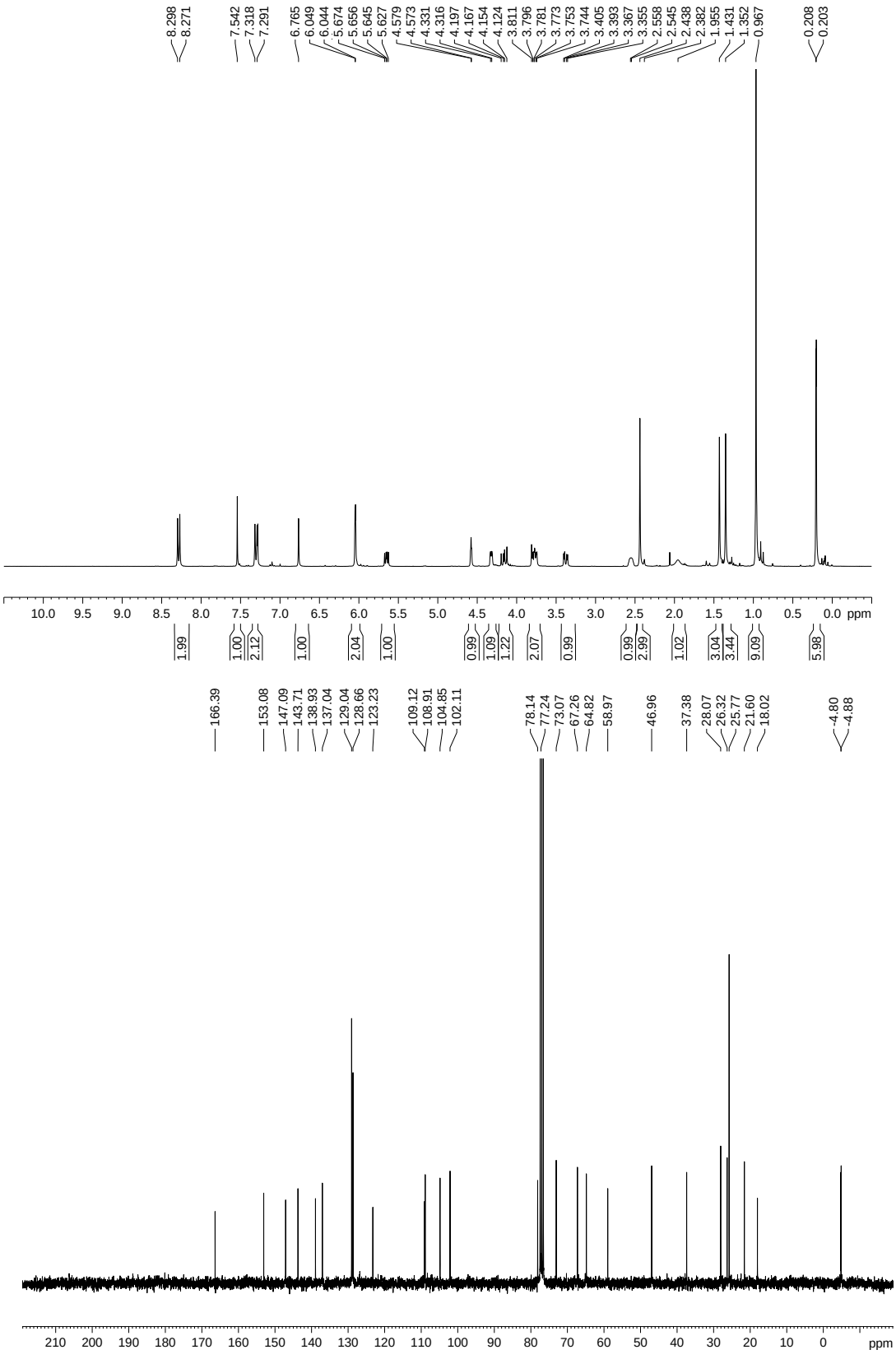
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4.167
4.154
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2.545
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0.203
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
1.99
1.00
2.12
1.00
2.04
1.00
0.99
1.09
1.22
2.07
0.99
0.99
2.99
1.02
3.04
3.44
9.09
5.98
166.39
153.08
147.09
143.71
138.93
137.04
129.04
128.66
123.23
109.12
108.91
104.85
102.11
78.14
77.24
73.07
67.26
64.82
58.97
46.96
37.38
28.07
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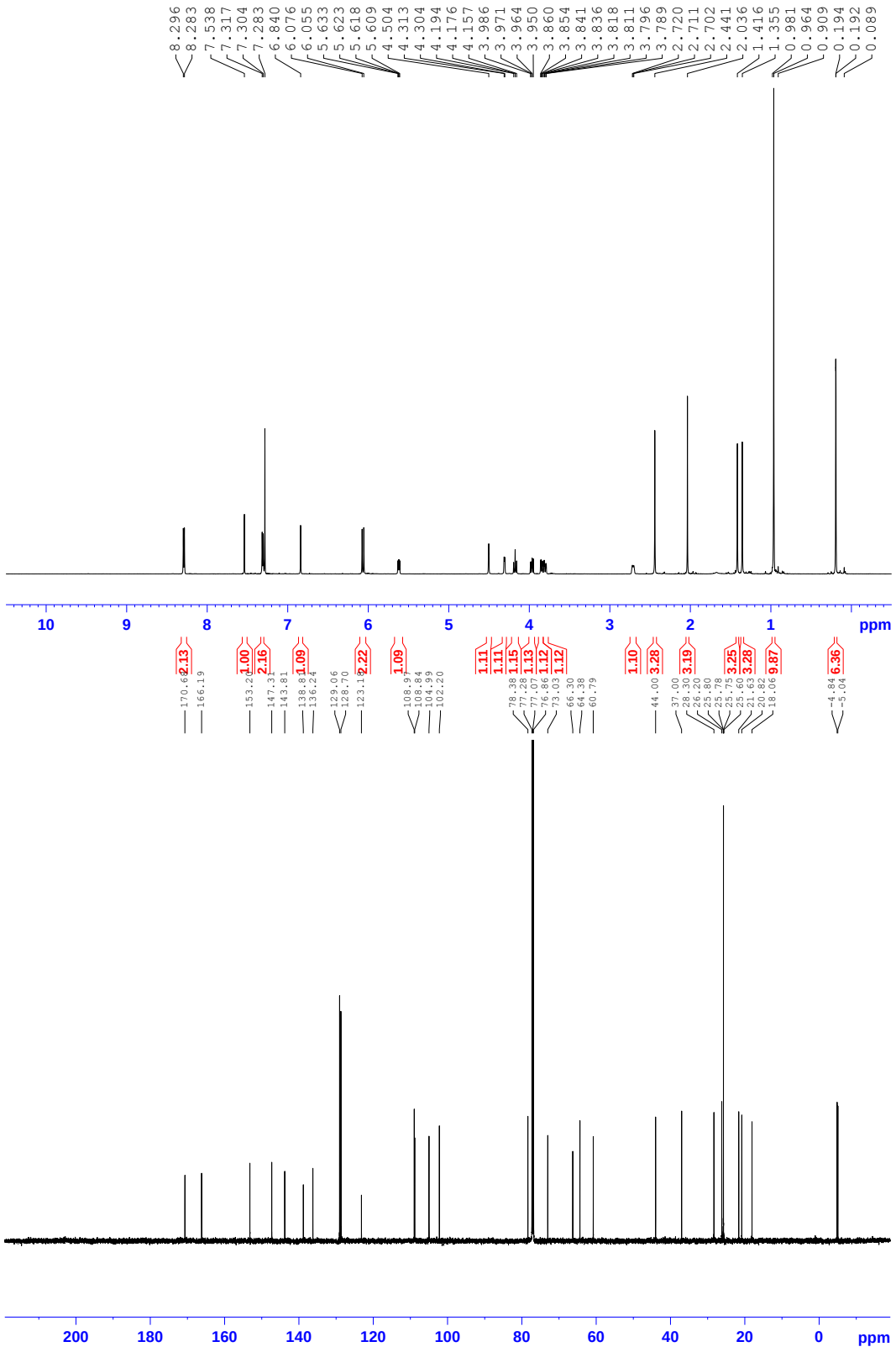
25.77
21.60
18.02
-4.80
-4.88
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm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5.609
4.504
4.313
4.304
4.194
4.176
4.157
3.986
3.971
3.964
3.950
3.860
3.854
3.841
3.836
3.818
3.811
3.796
3.789
2.720
2.711
2.702
2.441
2.036
1.416
1.355
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0.964
0.909
0.194
0.192
0.089
10
9
8
7
6
5
4
3
2
1
ppm
2.13
1.00
2.16
1.09
2.22
1.09
1.11
1.11
1.15
1.13
1.12
1.12
1.10
3.28
3.19
3.25
3.28
9.87
6.36
170.6
166.19
153.2
147.3
143.81
138.8
136.24
129.06
128.70
123.1
108.9
108.84
104.99
102.20
78.38
77.28
77.07
76.86
73.03
66.30
64.38
60.79
44.00
37.00
28.30
26.20
25.90
25.78
25.75
25.60
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200
180
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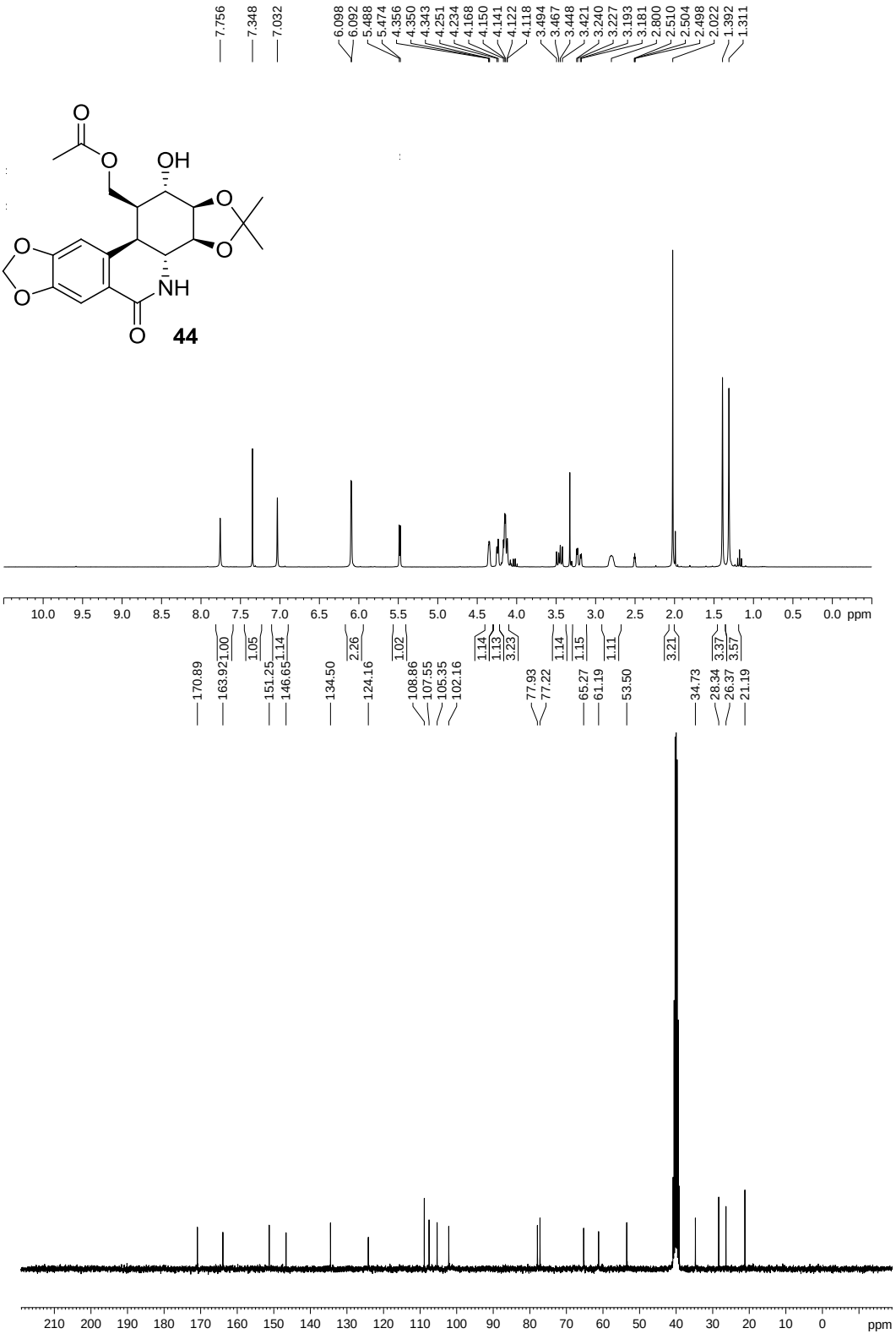
120
100
80
60
40
20
0
ppm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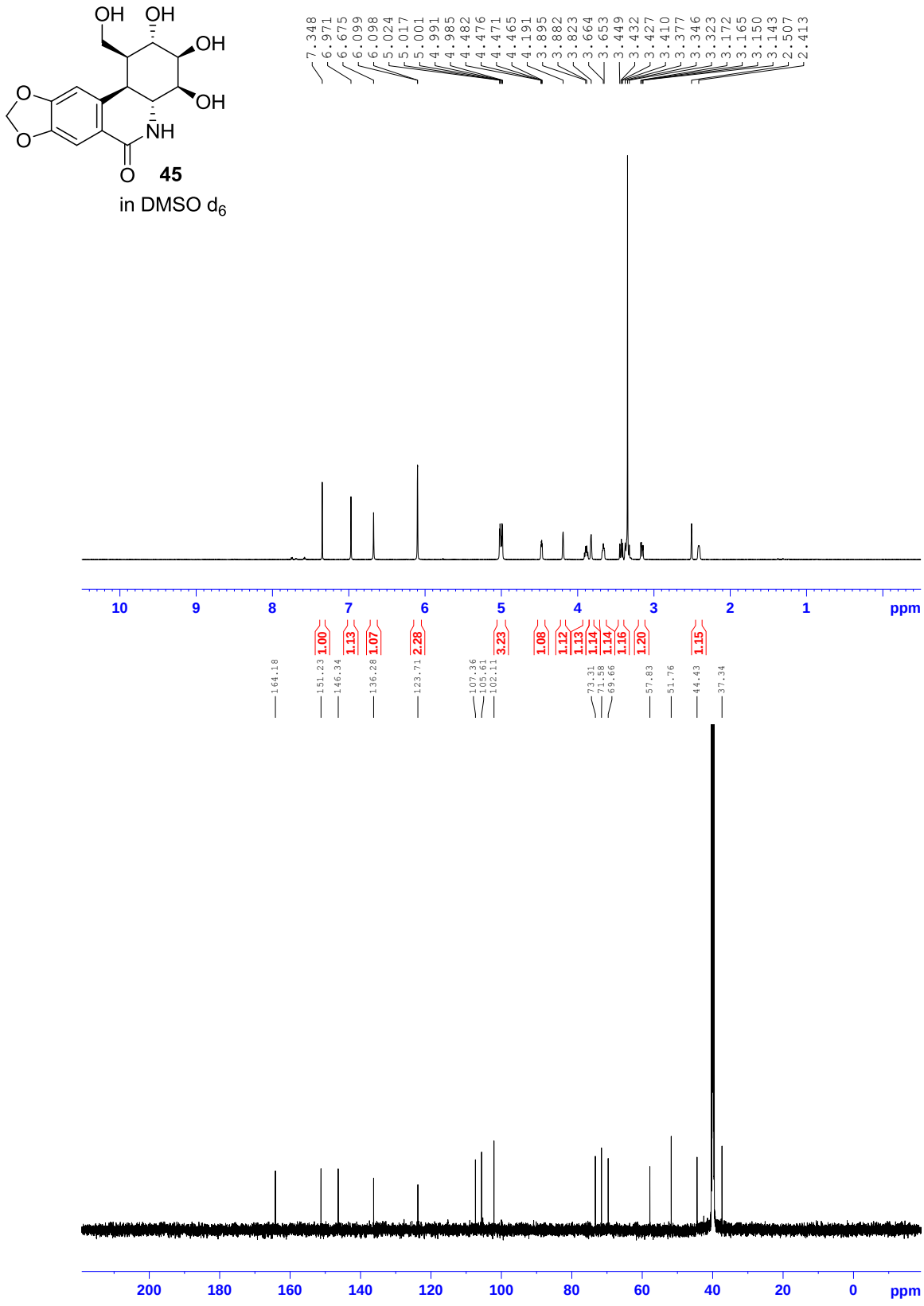
4.150
4.141
4.122
4.118
3.494
3.467
3.448
3.421
3.240
3.227
3.193
3.181
2.800
2.510
2.504
2.498
2.022
1.392
1.311
OH
NH
O
44
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
1.00
1.05
1.14
2.26
1.02
1.14
1.13
3.23
1.14
1.15
1.11
3.21
3.37
3.57
170.89
163.92
151.25
146.65
134.50
124.16
108.86
107.55
105.35
102.16
77.93
77.22
65.27
61.19
53.50
34.73
28.34
26.37
21.19
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm


OH
OH
OH
OH
O
O
NH
O
45
in DMSO d6
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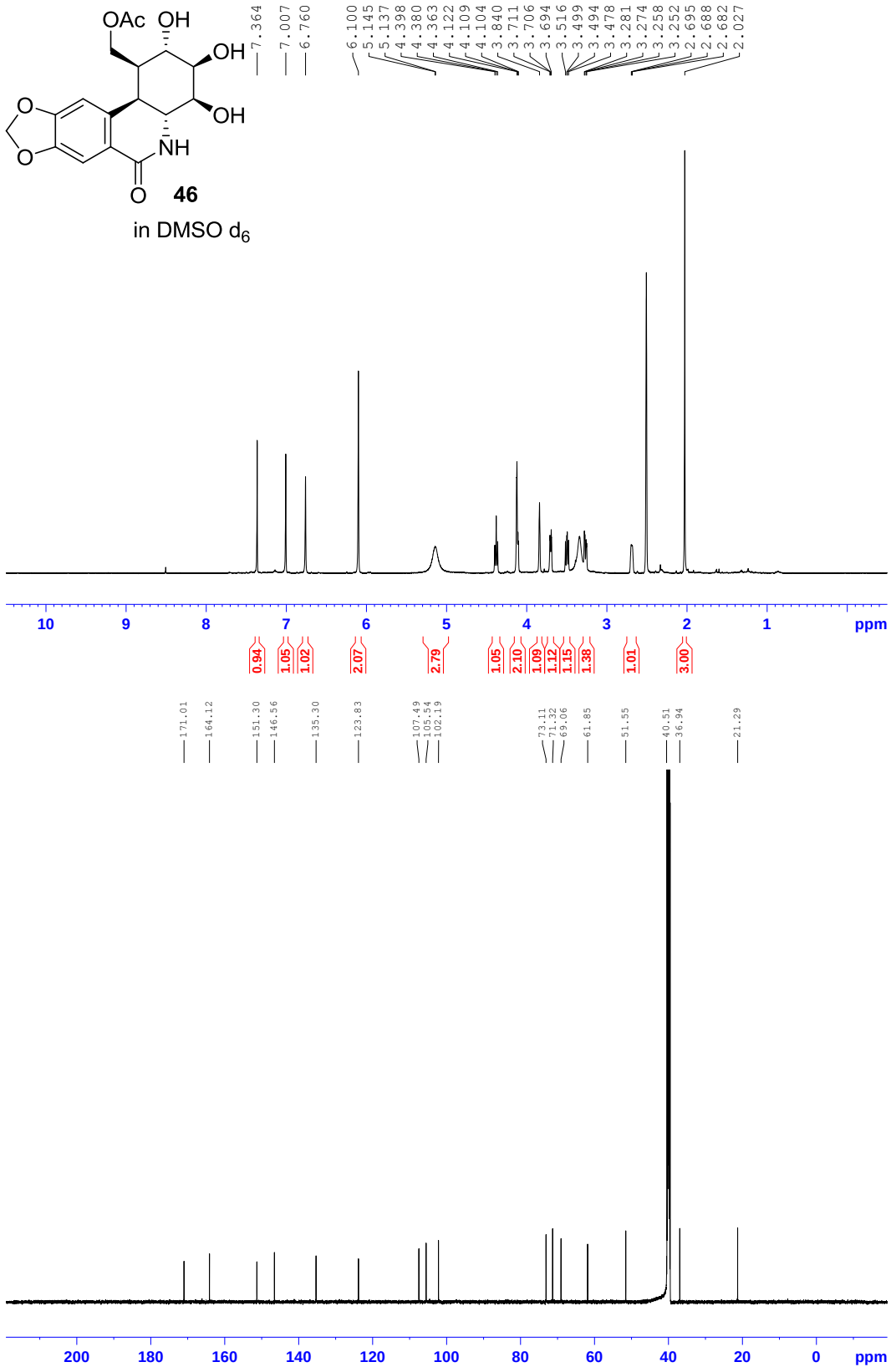
6.971
6.675
6.099
6.098
5.024
5.017
5.001
4.991
4.985
4.482
4.476
4.471
4.465
4.191
3.895
3.882
3.823
3.664
3.653
3.449
3.432
3.427
3.410
3.377
3.346
3.323
3.172
3.165
3.150
3.143
2.507
2.413
10
9
8
7
6
5
4
3
2
1
ppm
1.00
1.13
1.07
2.28
3.23
1.08
1.12
1.13
1.14
1.14
1.16
1.20
1.15
164.18
151.23
146.34
136.28
123.71
107.36
105.46
102.11
73.31
71.58
69.66
57.83
51.76
44.43
37.34
200
180
160
140
120
100
80
60
40
20
0
ppm


OAc
OH
OH
OH
O
O
NH
O
46
in DMSO d6
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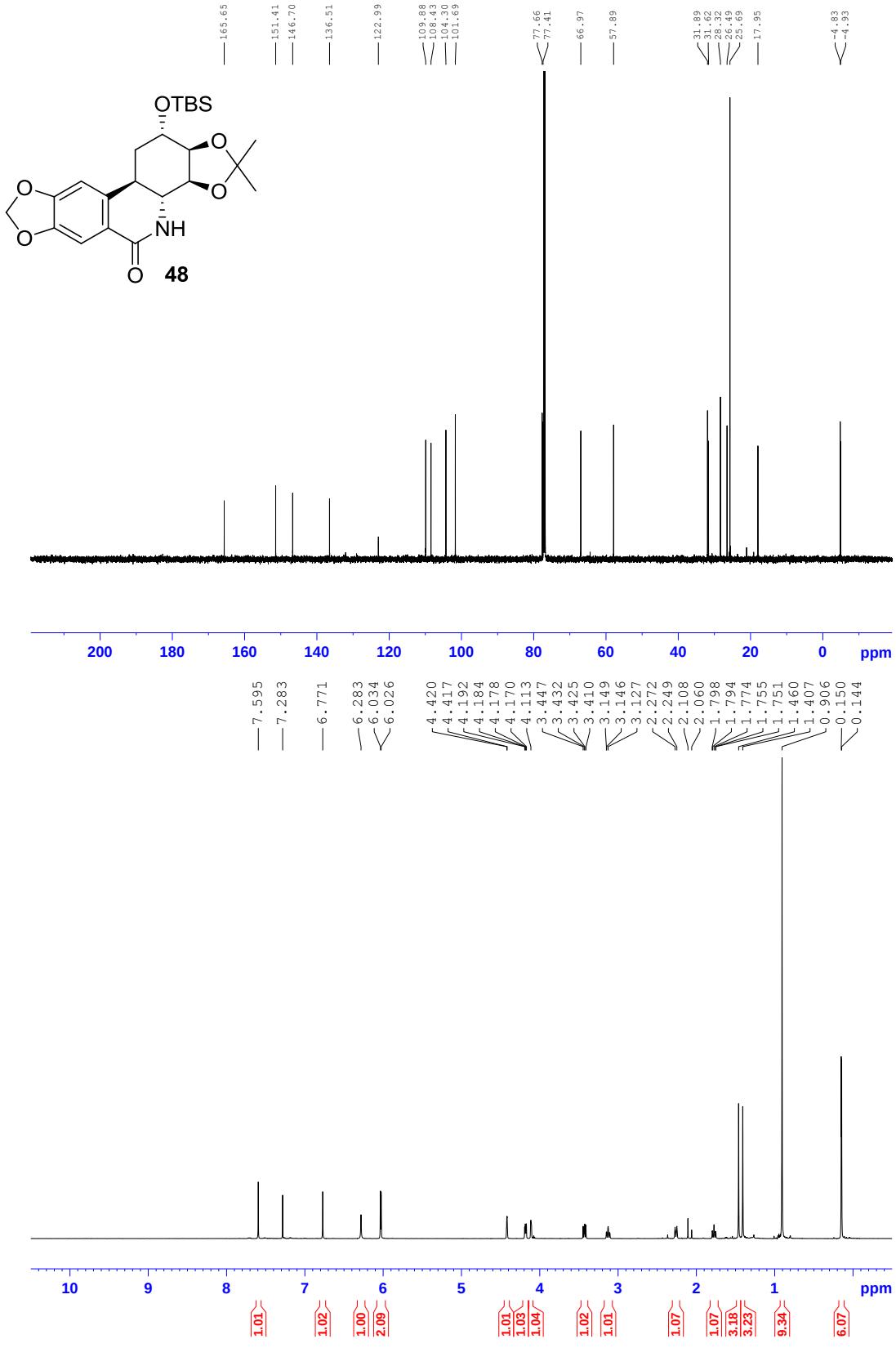
6.760
6.100
5.145
5.137
4.398
4.380
4.363
4.122
4.109
4.104
3.840
3.711
3.706
3.694
3.516
3.499
3.494
3.478
3.281
3.274
3.258
3.252
2.695
2.688
2.682
2.027
10
9
8
7
6
5
4
3
2
1
ppm
0.94
1.05
1.02
2.07
2.79
1.05
2.10
1.09
1.12
1.15
1.38
1.01
3.00
171.01
164.12
151.30
146.56
135.30
123.83
107.49
105.54
102.19
73.11
71.32
69.06
61.85
51.55
40.51
36.94
21.29
200
180
160
140
120
100
80
60
40
20
0
ppm


OTBS
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O
O
O
NH
O
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136.51
122.99
109.88
108.43
104.30
101.69
77.66
77.41
66.97
57.89
31.89
31.62
28.32
26.49
25.69
17.95
-4.83
-4.93
200
180
160
140
120
100
80
60
40
20
0
ppm
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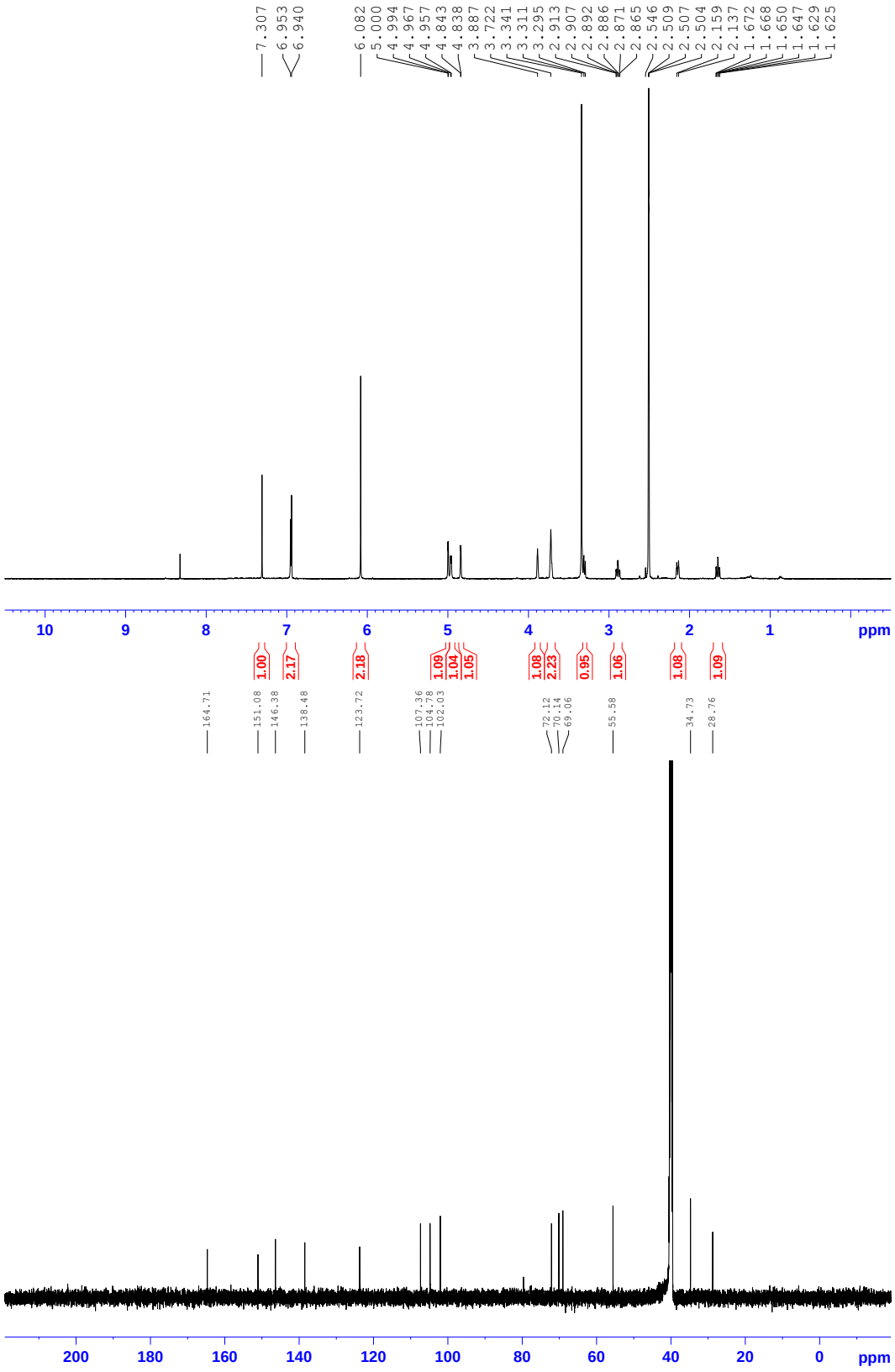
7.283
6.771
6.283
6.034
6.026
4.420
4.417
4.192
4.184
4.178
4.170
4.113
3.447
3.432
3.425
3.410
3.149
3.146
3.127
2.272
2.249
2.108
2.060
1.798
1.794
1.774
1.755
1.751
1.460
1.407
0.906
0.150
0.144
10
9
8
7
6
5
4
3
2
1
ppm
1.01
1.02
1.00
2.09
1.01
1.03
1.04
1.02
1.01
1.07
1.07
3.18
3.23
9.34
6.07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3.341
3.311
3.295
2.913
2.907
2.892
2.886
2.871
2.865
2.546
2.509
2.507
2.504
2.159
2.137
1.672
1.668
1.650
1.647
1.629
1.625
10
9
8
7
6
5
4
3
2
1
ppm
1.00
2.17
2.18
1.09
1.04
1.05
1.08
2.23
0.95
1.06
1.08
1.09
164.71
151.08
146.38
138.48
123.72
107.36
104.78
102.03
72.12
70.14
69.06
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34.73
28.76
200
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140
120
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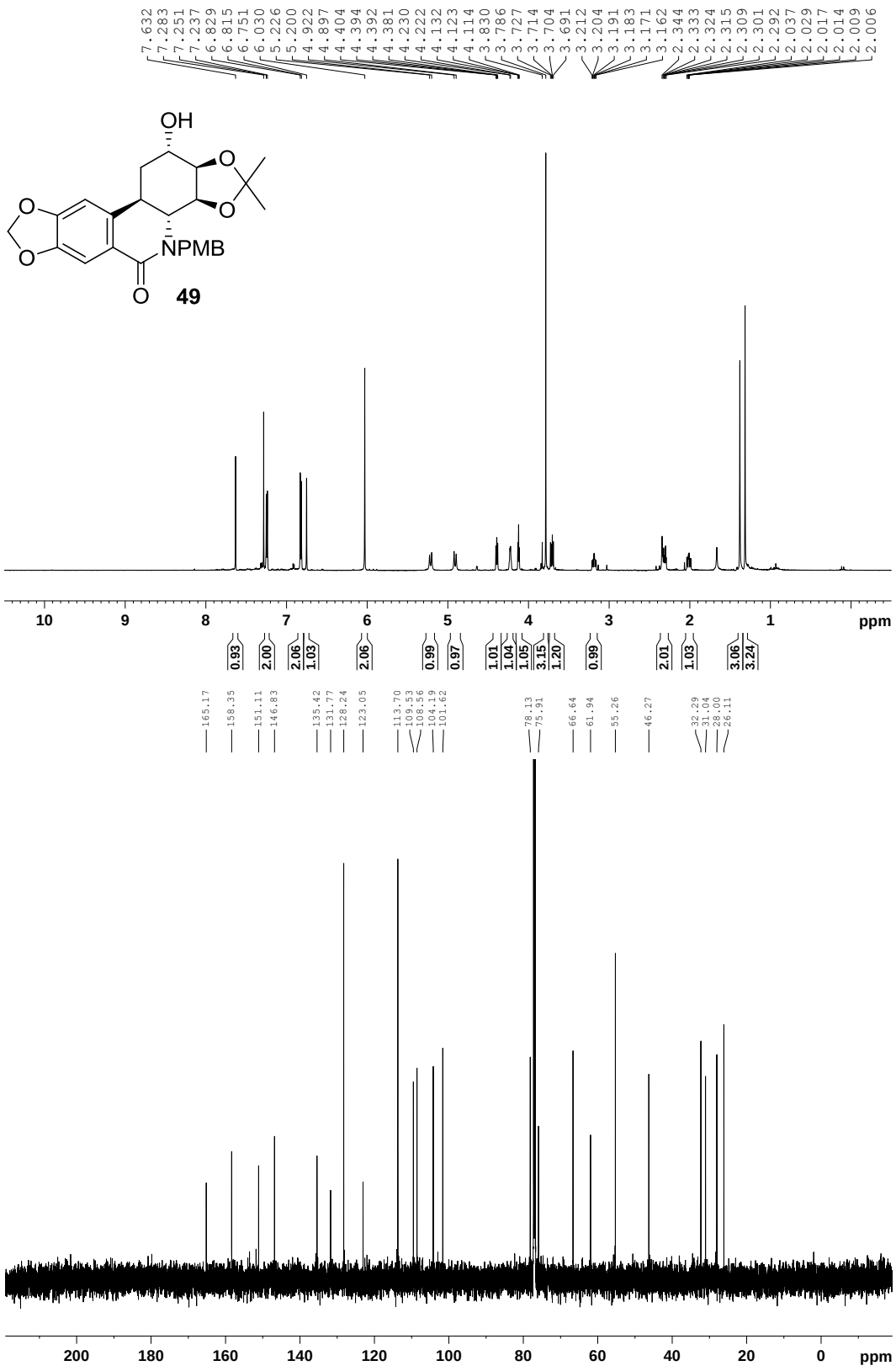
40
20
0
ppm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6.815
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6.030
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5.200
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4.897
4.404
4.394
4.392
4.381
4.230
4.222
4.132
4.123
4.114
3.830
3.786
3.727
3.714
3.704
3.691
3.212
3.204
3.191
3.183
3.171
3.162
2.344
2.333
2.324
2.315
2.309
2.301
2.292
2.037
2.029
2.017
2.014
2.009
2.006
OH
O
O
O
O
NPMB
O
49
10
9
8
7
6
5
4
3
2
1
ppm
0.93
2.00
2.06
1.03
2.06
0.99
0.97
1.01
1.04
1.05
3.15
1.20
0.99
2.01
1.03
3.06
3.24
165.17
158.35
151.11
146.83
135.42
131.77
128.24
123.05
113.70
109.53
108.56
104.19
101.62
78.13
75.91
66.64
61.94
55.26
46.27
32.29
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28.00
26.11
200
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120
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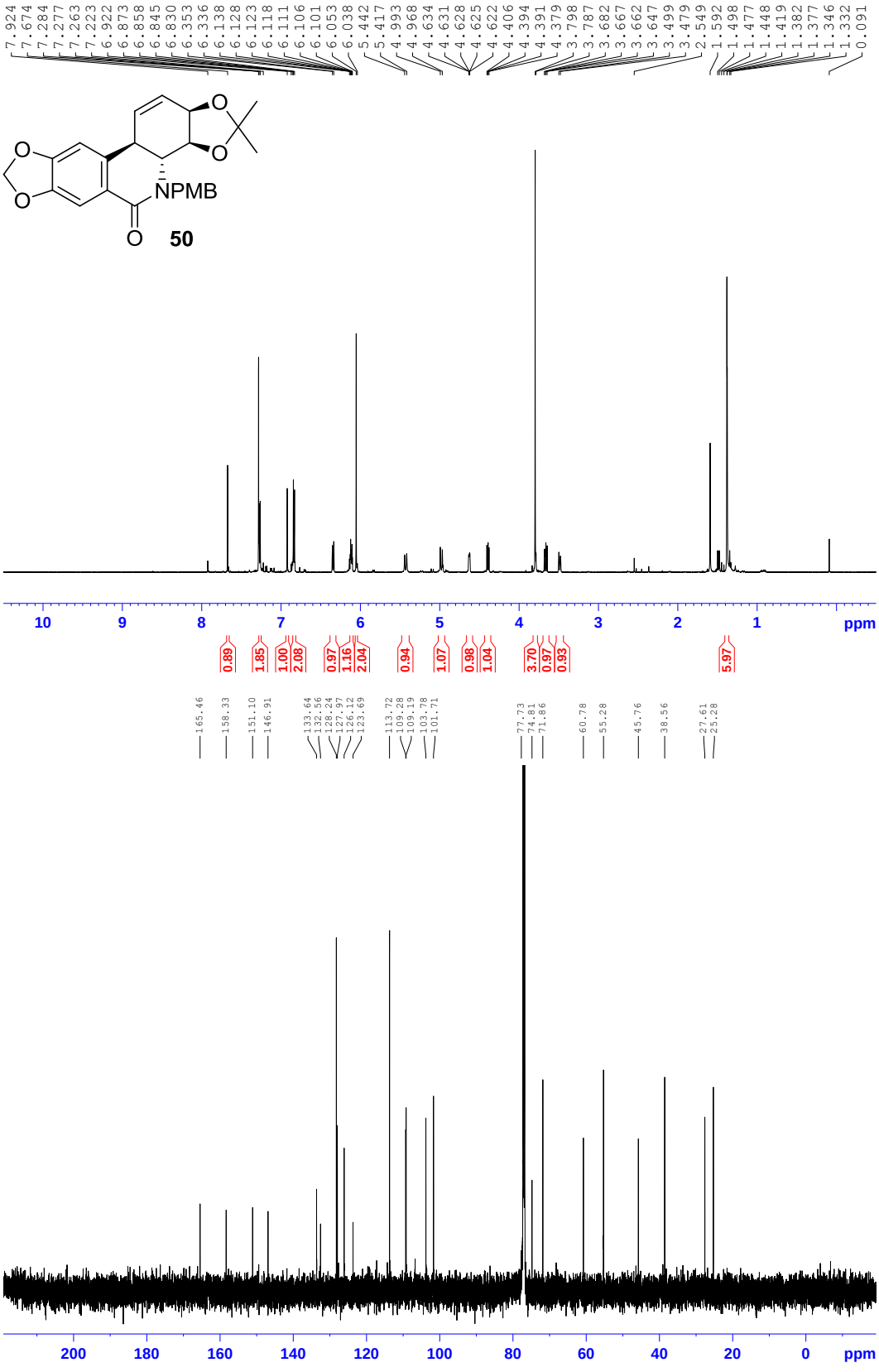
60
40
20
0
ppm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6.138
6.128
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6.118
6.111
6.106
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6.053
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5.442
5.417
4.993
4.968
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4.625
4.622
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4.394
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3.787
3.682
3.667
3.662
3.647
3.499
3.479
2.549
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1.498
1.477
1.448
1.419
1.382
1.377
1.346
1.332
0.091
O
O
O
O
NPMB
O
50
10
9
8
7
6
5
4
3
2
1
ppm
0.89
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1.00
2.08
0.97
1.16
2.04
0.94
1.07
0.98
1.04
3.70
0.97
0.93
5.97
165.46
158.33
151.10
146.91
133.64
132.56
128.24
127.97
126.12
123.69
113.72
109.28
109.19
103.78
101.71
77.73
74.81
71.86
60.78
55.28
45.76
38.56
27.61
25.28
200
180
160
140
120
100
80
60
40
20
0
ppm