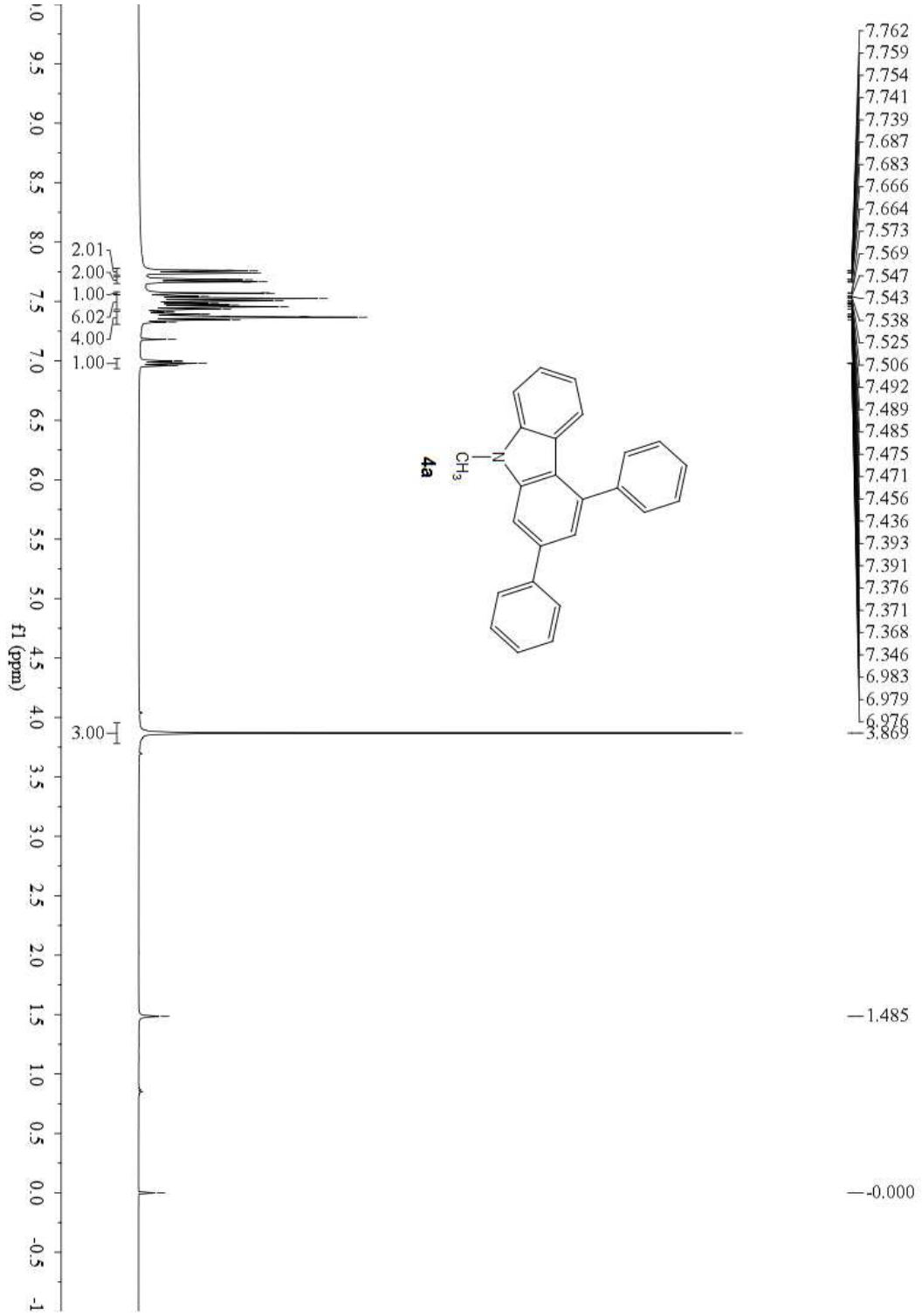
Supporting Information

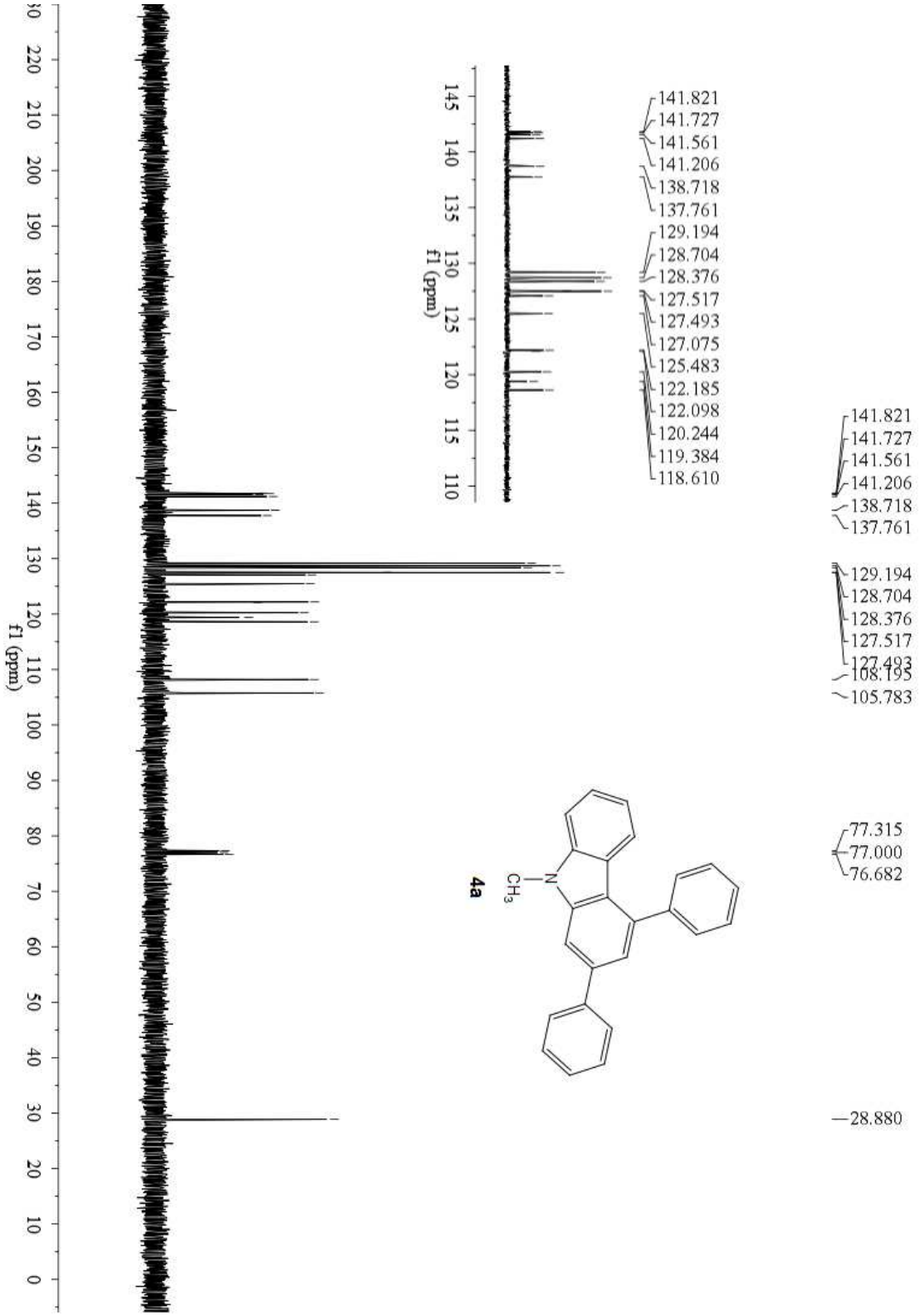
One-pot cascade synthesis of substituted carbazoles from indoles, ketones and alkenes using oxygen as the oxidant

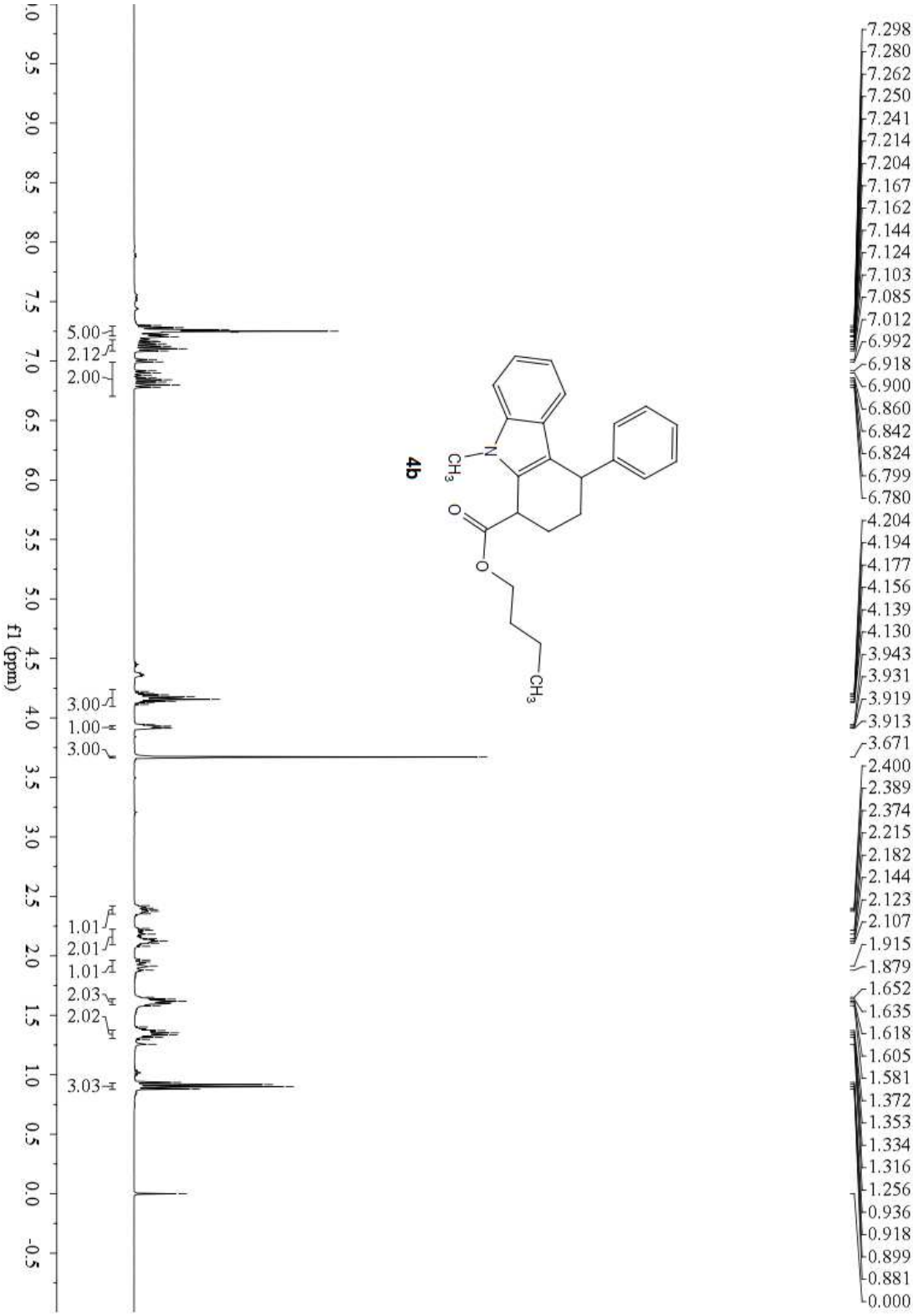
Shanping Chen, Yuxia Li, Penghui Ni, Baichuan Yang, Huawen Huang*, Guo-Jun Deng*

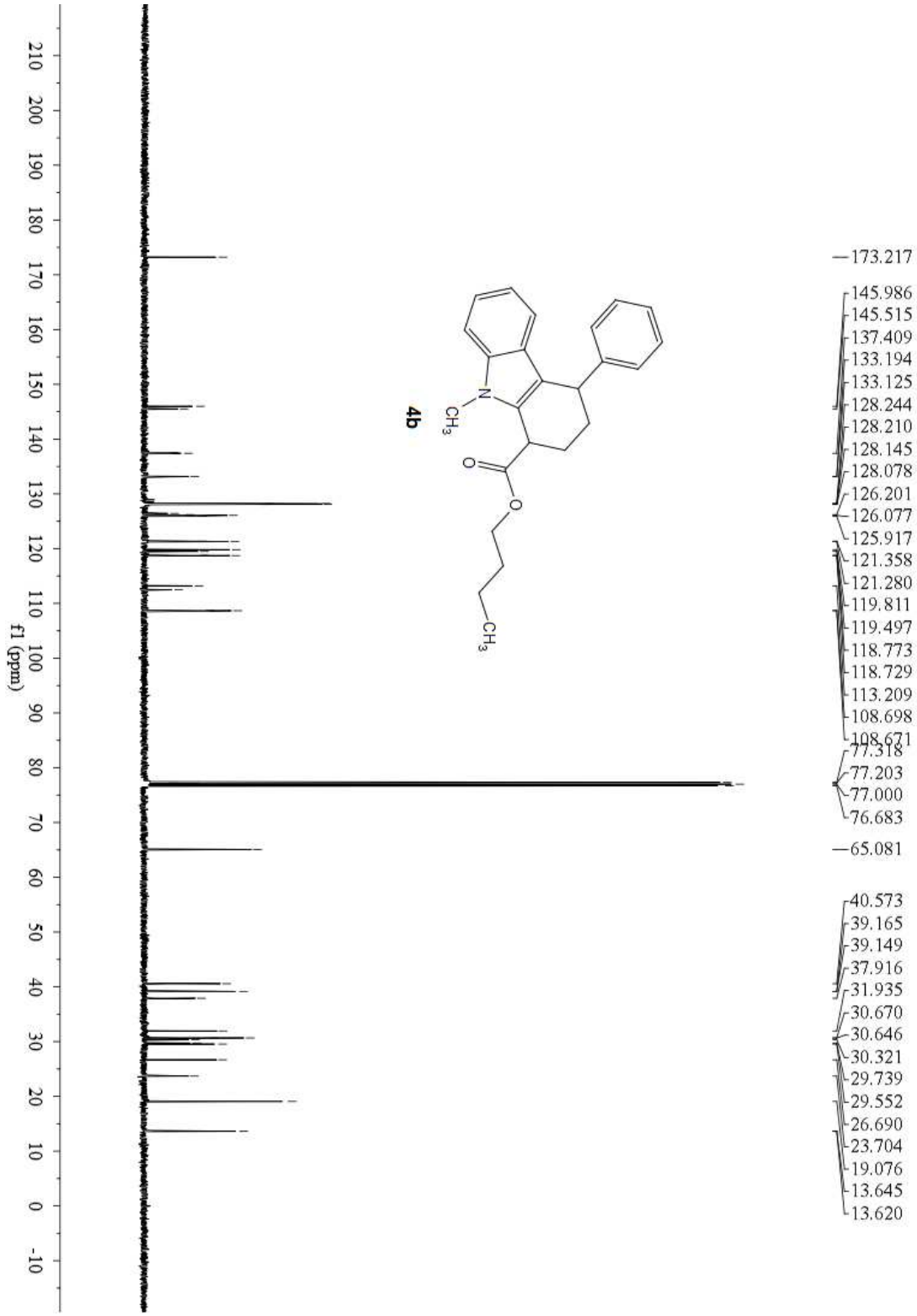
Key Laboratory of Environmentally Friendly Chemistry and Application of Ministry of Education, College of Chemistry, Xiangtan University, Xiangtan 411105, China
E-mail: hwhuang@xtu.edu.cn; gjdeng@xtu.edu.cn

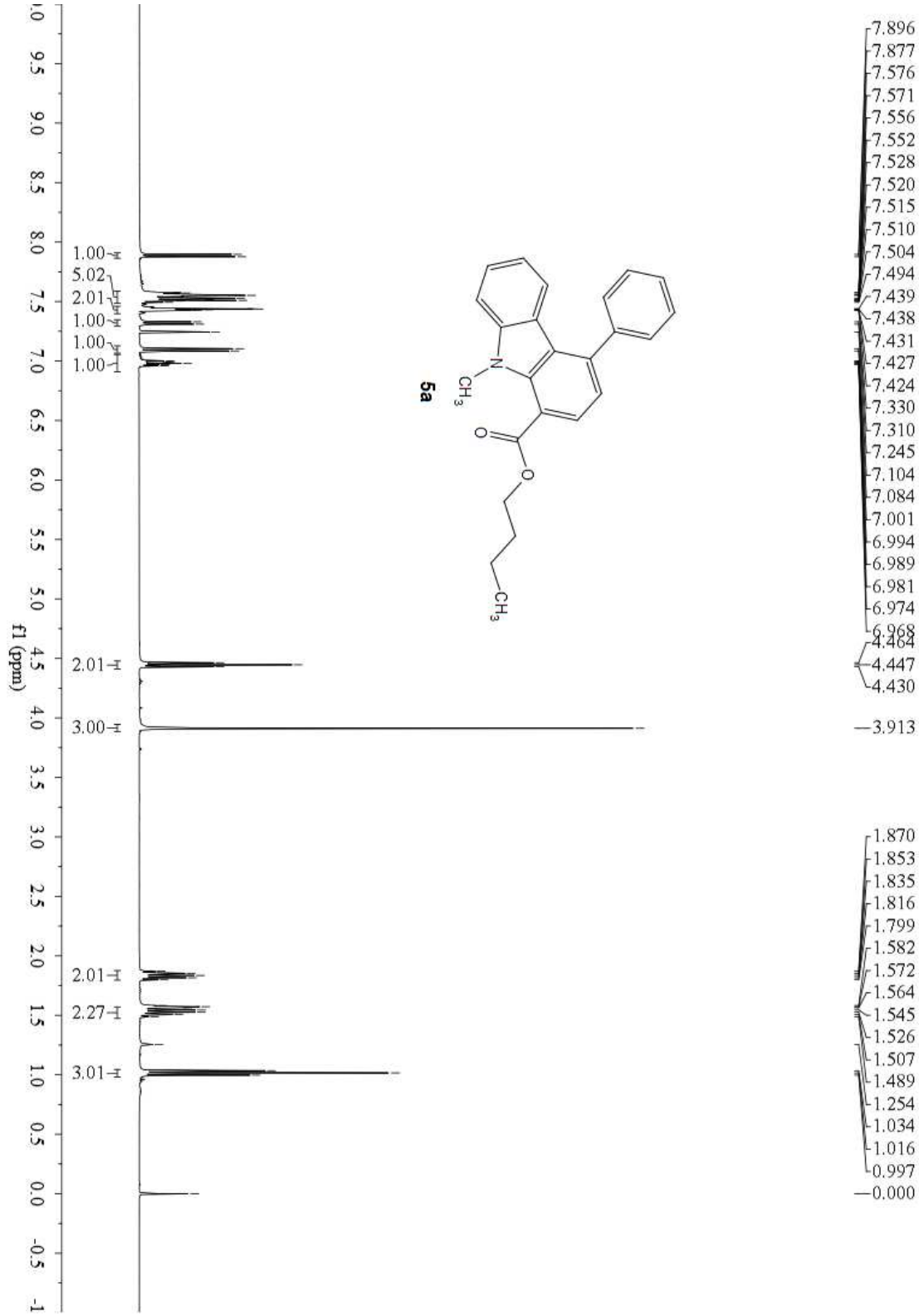
^{1}H NMR and ^{13}C NMR spectra of products

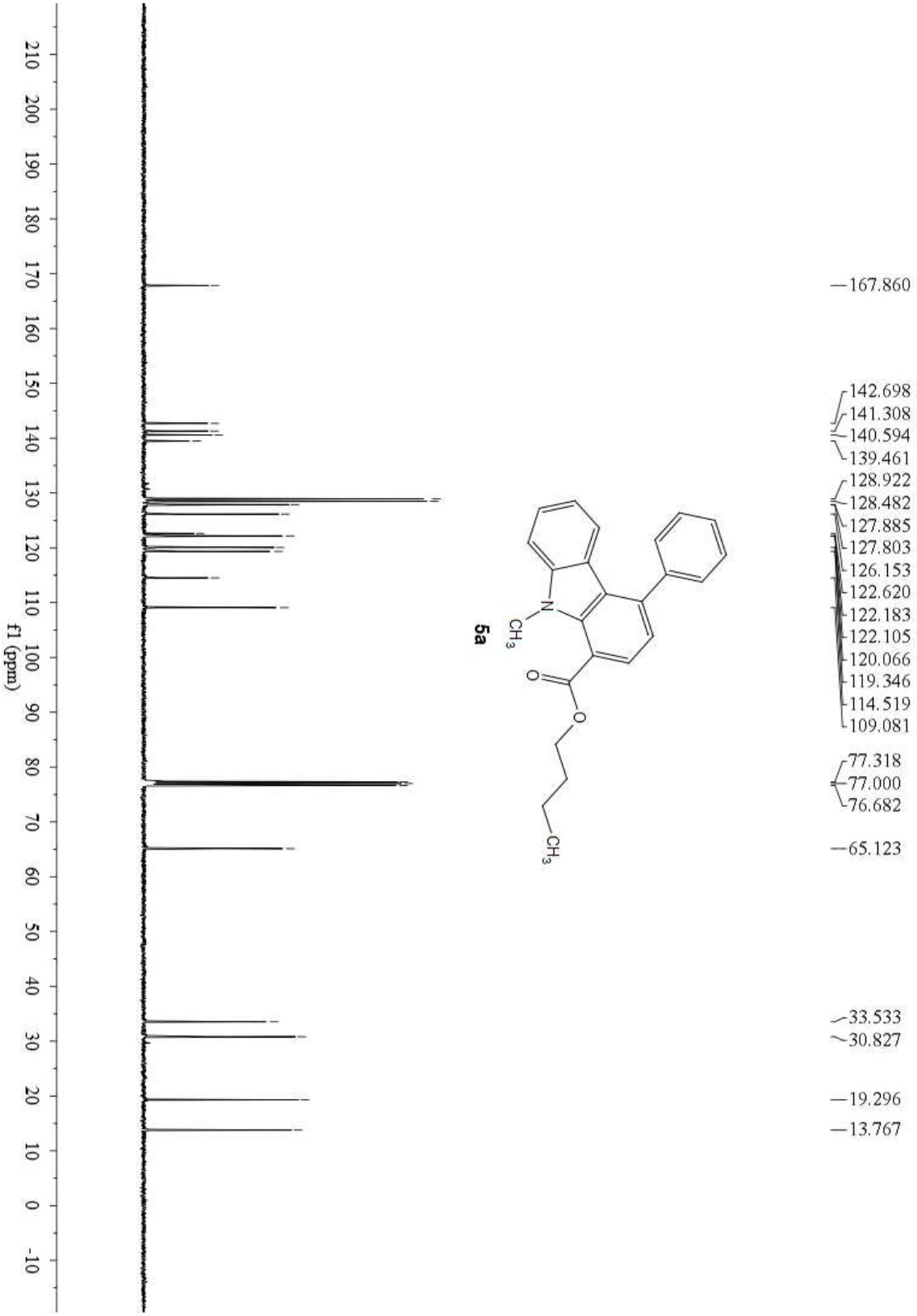


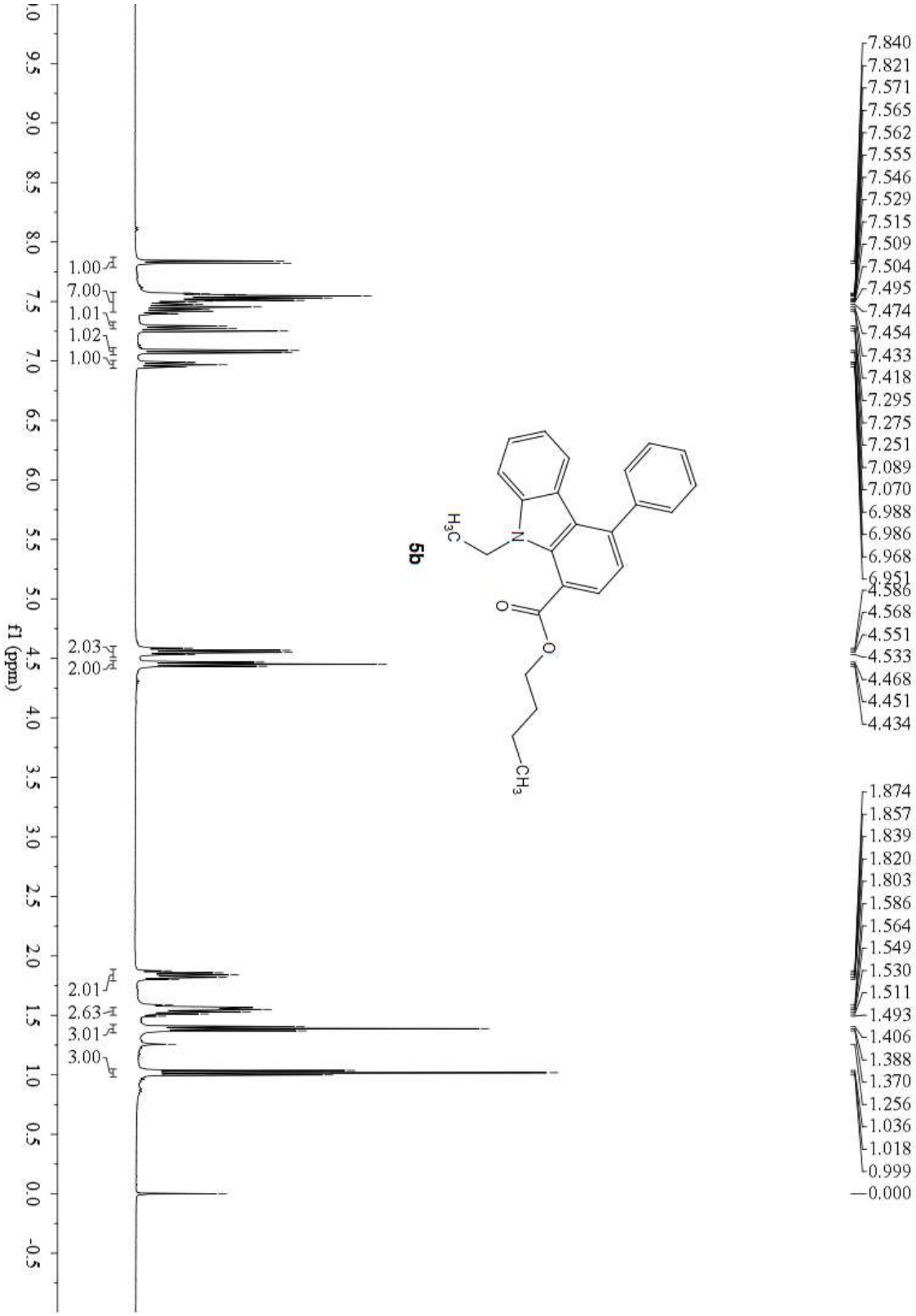

141.821
141.727
141.561
141.206
138.718
137.761
129.194
128.704
128.376
127.517
127.493
127.075
125.483
122.185
122.098
120.244
119.384
118.610
f1 (ppm)
141.821
141.727
141.561
141.206
138.718
137.761
129.194
128.704
128.376
127.517
127.493
108.195
105.783
77.315
77.000
76.682
28.880
f1 (ppm)
4a

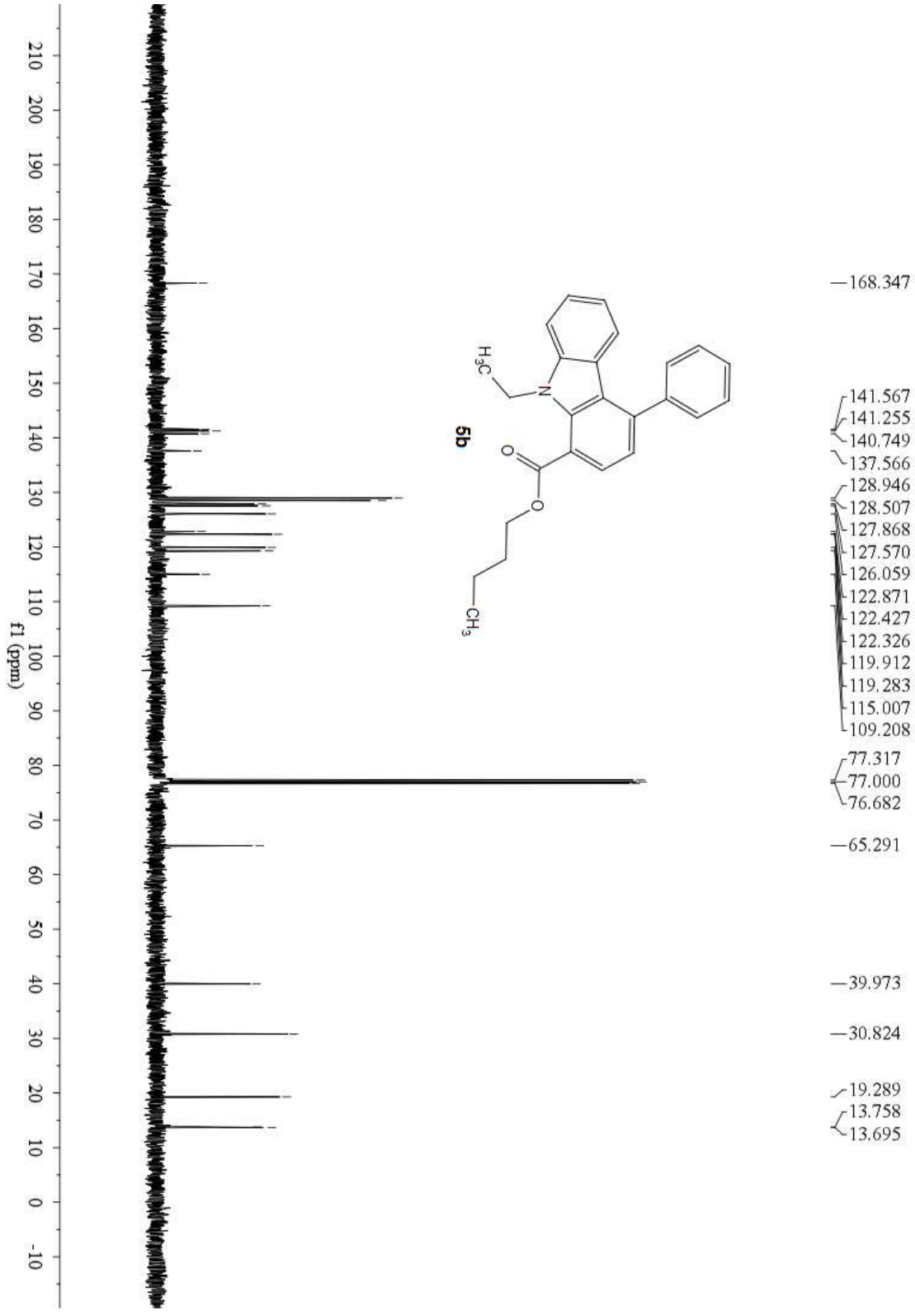

f1 (ppm)
5.00
2.12
2.00
3.00
1.00
3.00
1.01
2.01
1.01
2.03
2.02
3.03
4b
CH3
N
O
O
CH3
7.298
7.280
7.262
7.250
7.241
7.214
7.204
7.167
7.162
7.144
7.124
7.103
7.085
7.012
6.992
6.918
6.900
6.860
6.842
6.824
6.799
6.780
4.204
4.194
4.177
4.156
4.139
4.130
3.943
3.931
3.919
3.913
3.671
2.400
2.389
2.374
2.215
2.182
2.144
2.123
2.107
1.915
1.879
1.652
1.635
1.618
1.605
1.581
1.372
1.353
1.334
1.316
1.256
0.936
0.918
0.899
0.881
0.000

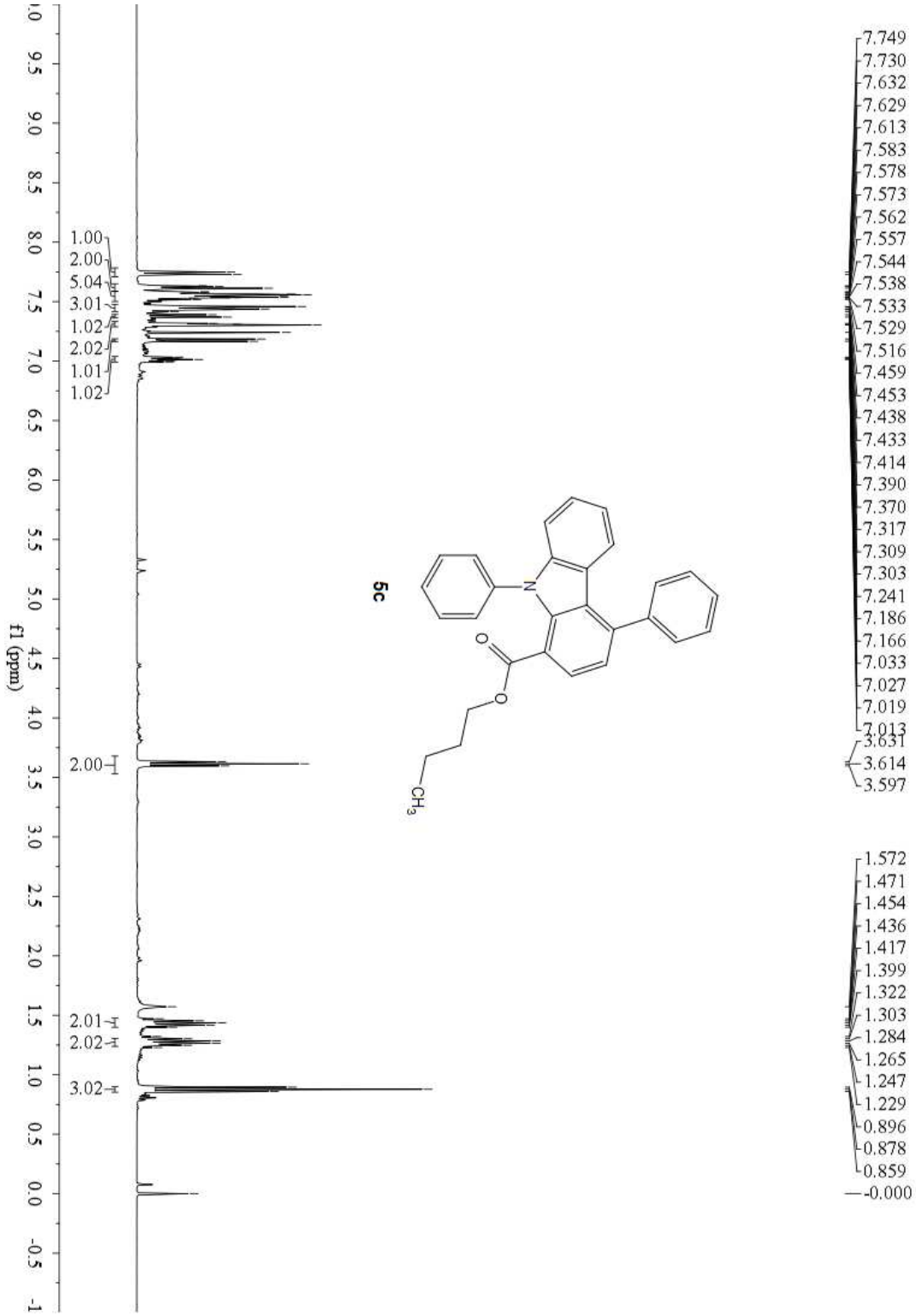

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
4b
N
CH3
O
O
CH3
173.217
145.986
145.515
137.409
133.194
133.125
128.244
128.210
128.145
128.078
126.201
126.077
125.917
121.358
121.280
119.811
119.497
118.773
118.729
113.209
108.698
108.671
77.318
77.203
77.000
76.683
65.081
40.573
39.165
39.149
37.916
31.935
30.670
30.646
30.321
29.739
29.552
26.690
23.704
19.076
13.645
13.620

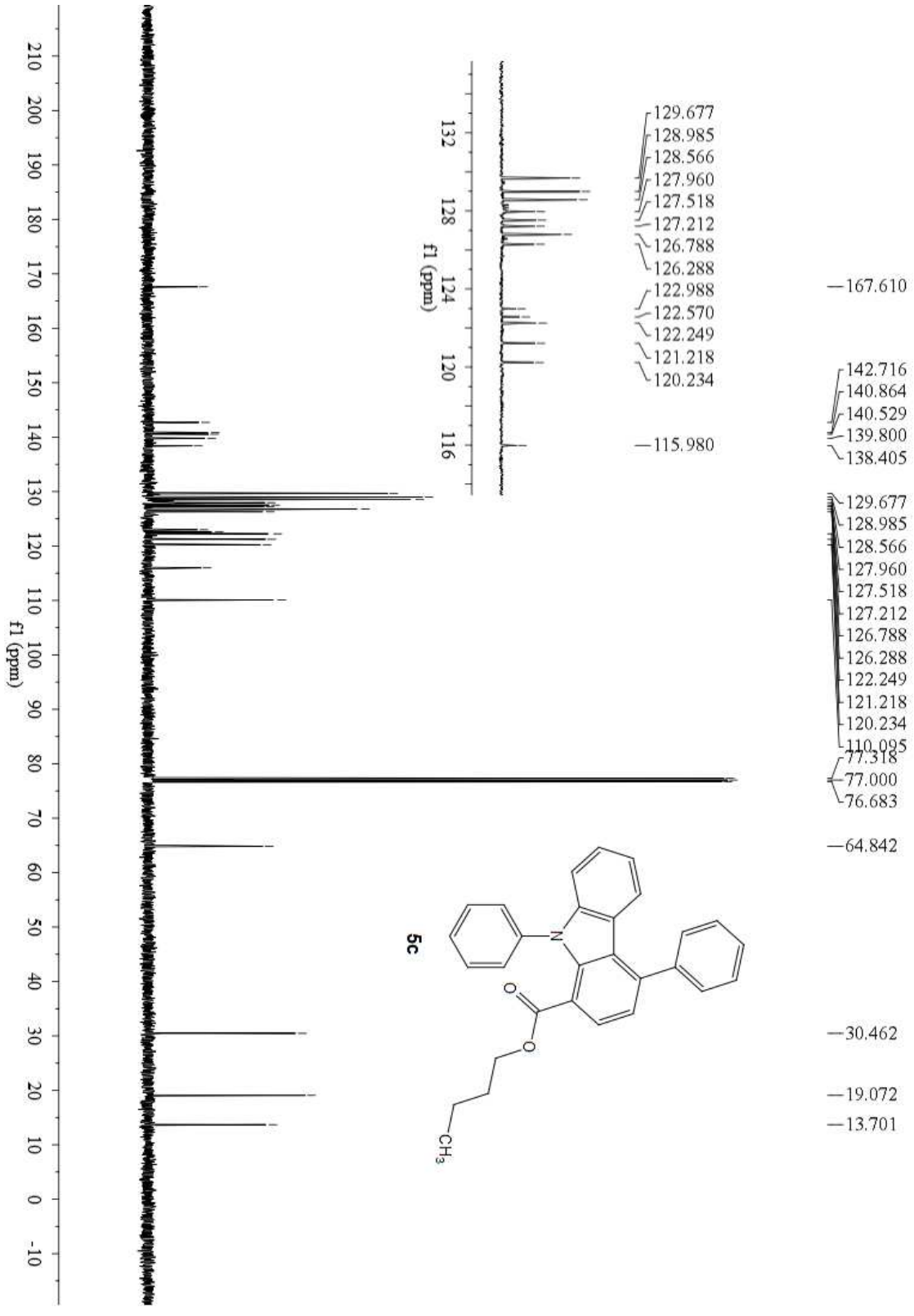

7.896
7.877
7.576
7.571
7.556
7.552
7.528
7.520
7.515
7.510
7.504
7.494
7.439
7.438
7.431
7.427
7.424
7.330
7.310
7.245
7.104
7.084
7.001
6.994
6.989
6.981
6.974
6.968
4.464
4.447
4.430
3.913
1.870
1.853
1.835
1.816
1.799
1.582
1.572
1.564
1.545
1.526
1.507
1.489
1.254
1.034
1.016
0.997
0.000
1.00
5.02
2.01
1.00
1.00
1.00
2.01
3.00
2.01
2.27
3.01
N
CH3
O
O
CH3
5a
f1 (ppm)

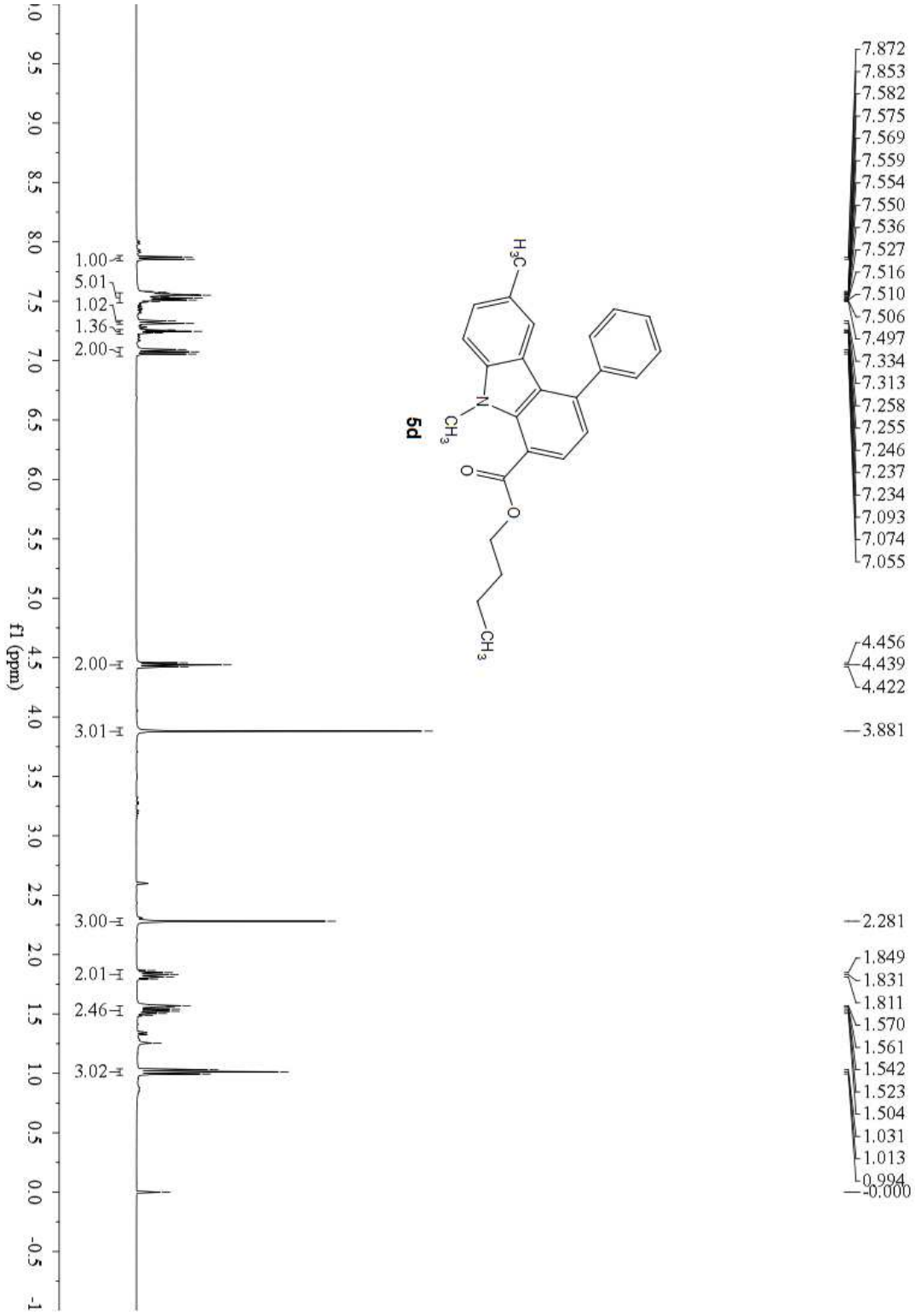

167.860
142.698
141.308
140.594
139.461
128.922
128.482
127.885
127.803
126.153
122.620
122.183
122.105
120.066
119.346
114.519
109.081
77.318
77.000
76.682
65.123
33.533
30.827
19.296
13.767
5a
f1 (ppm)

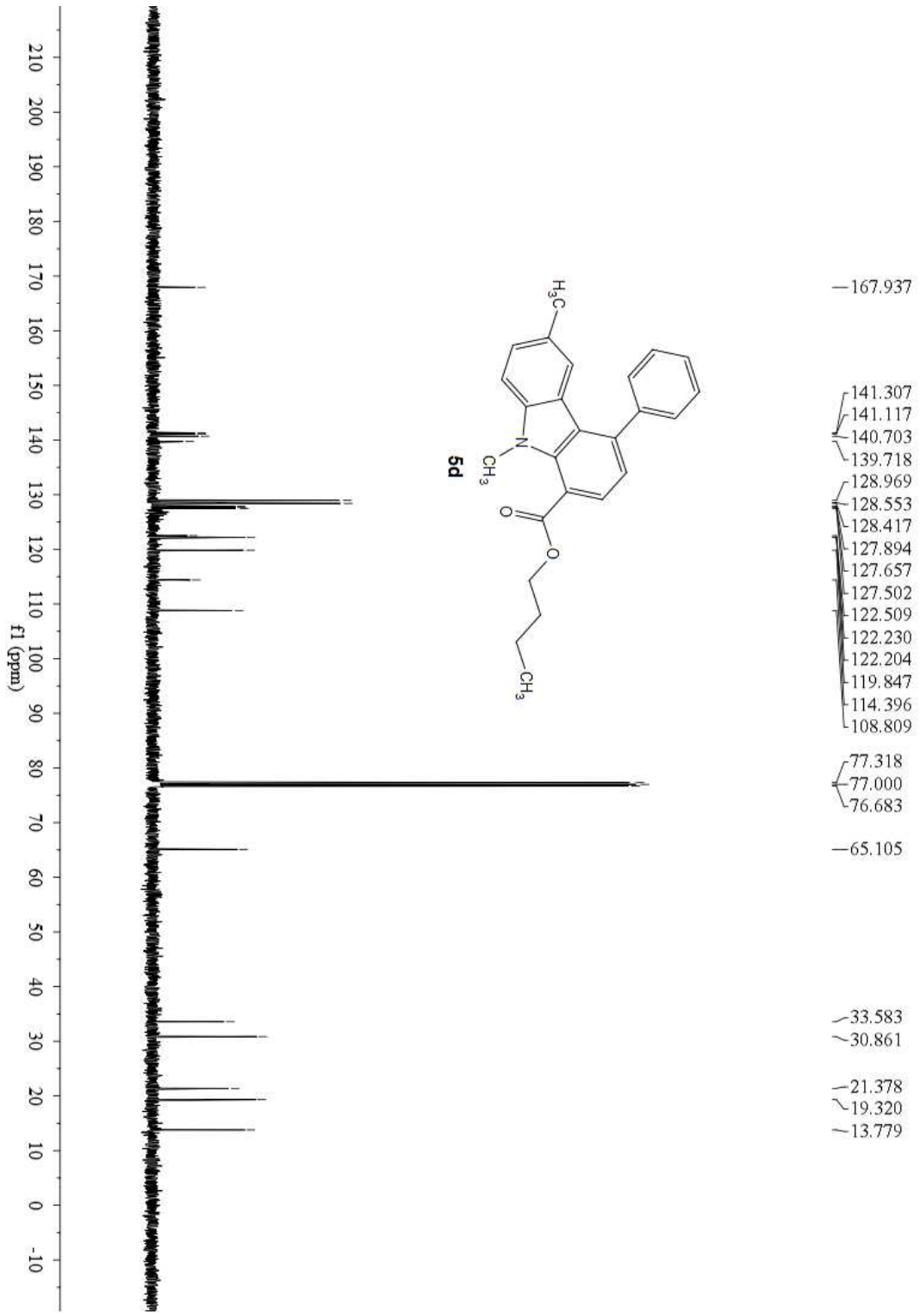

7.840
7.821
7.571
7.565
7.562
7.555
7.546
7.529
7.515
7.509
7.504
7.495
7.474
7.454
7.433
7.418
7.295
7.275
7.251
7.089
7.070
6.988
6.986
6.968
6.951
4.586
4.568
4.551
4.533
4.468
4.451
4.434
1.874
1.857
1.839
1.820
1.803
1.586
1.564
1.549
1.530
1.511
1.493
1.406
1.388
1.370
1.256
1.036
1.018
0.999
0.000
1.00
7.00
1.01
1.02
1.00
2.03
2.00
2.01
2.63
3.01
3.00
f1 (ppm)
5b
H3C
N
O
O
CH3

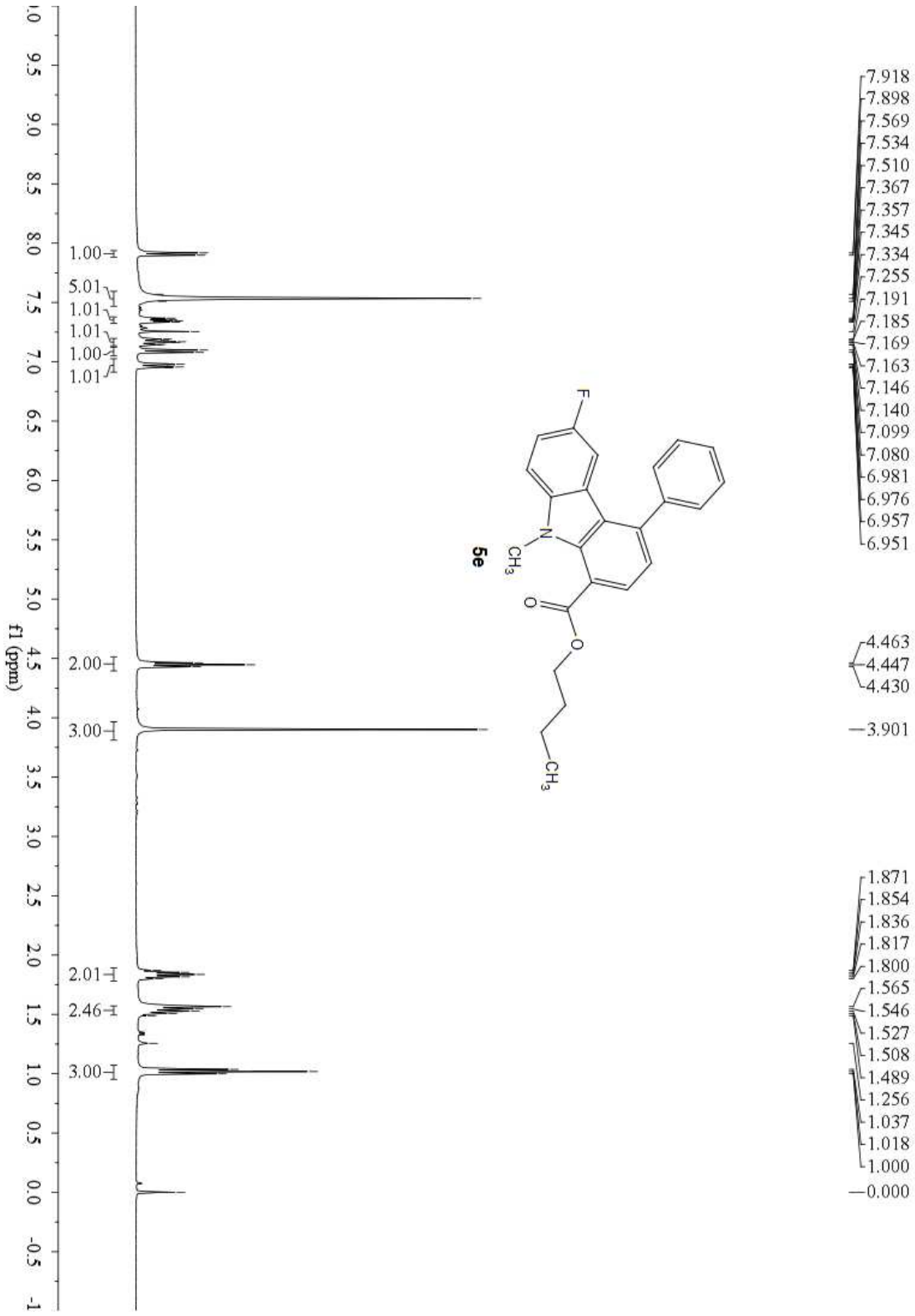

168.347
141.567
141.255
140.749
137.566
128.946
128.507
127.868
127.570
126.059
122.871
122.427
122.326
119.912
119.283
115.007
109.208
77.317
77.000
76.682
65.291
39.973
30.824
19.289
13.758
13.695
5b
f1 (ppm)

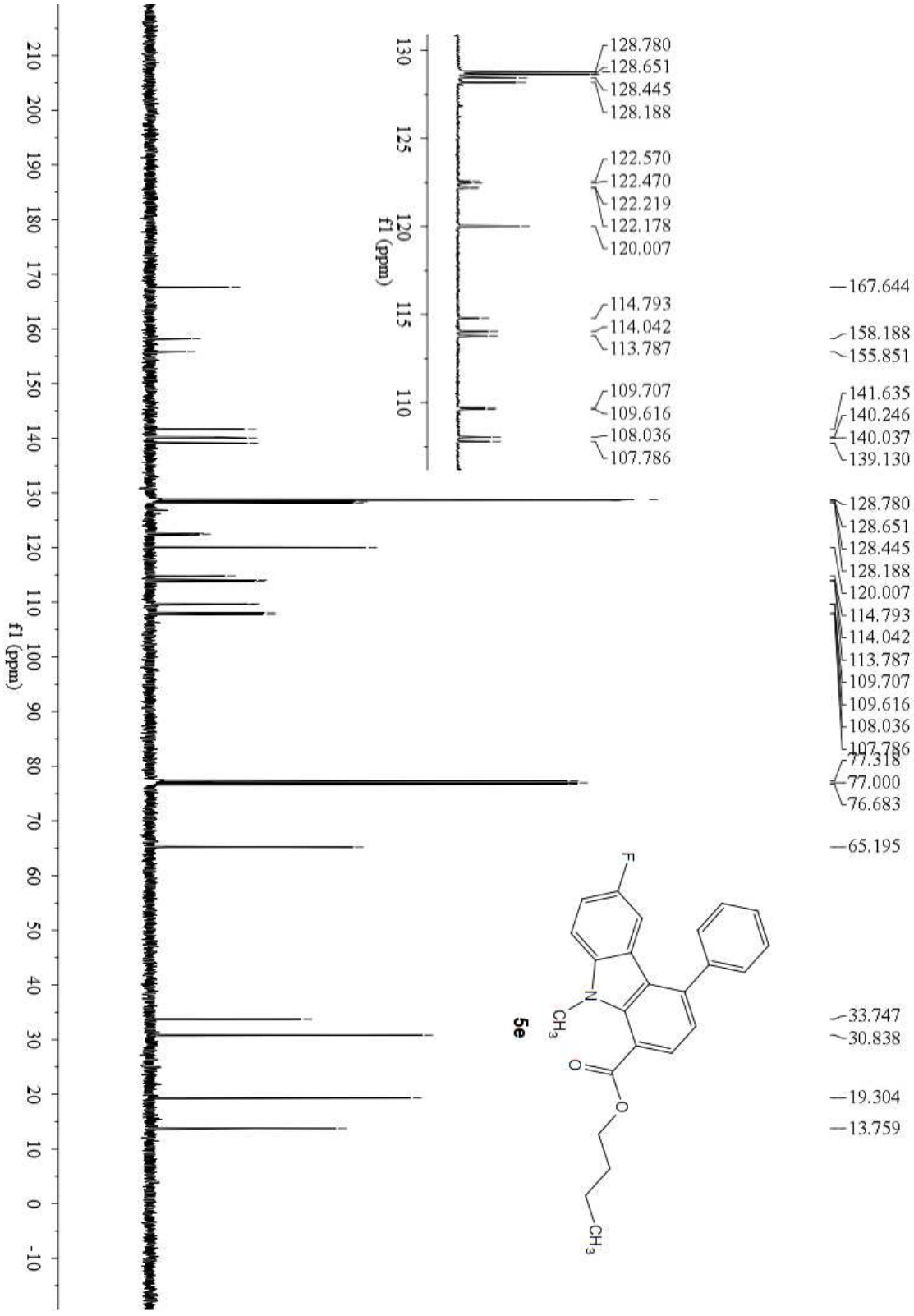

1.00
2.00
5.04
3.01
1.02
2.02
1.01
1.02
2.00
2.01
2.02
3.02
f1 (ppm)
5c
N
O
O
CH3
7.749
7.730
7.632
7.629
7.613
7.583
7.578
7.573
7.562
7.557
7.544
7.538
7.533
7.529
7.516
7.459
7.453
7.438
7.433
7.414
7.390
7.370
7.317
7.309
7.303
7.241
7.186
7.166
7.033
7.027
7.019
7.013
3.631
3.614
3.597
1.572
1.471
1.454
1.436
1.417
1.399
1.322
1.303
1.284
1.265
1.247
1.229
0.896
0.878
0.859
-0.000

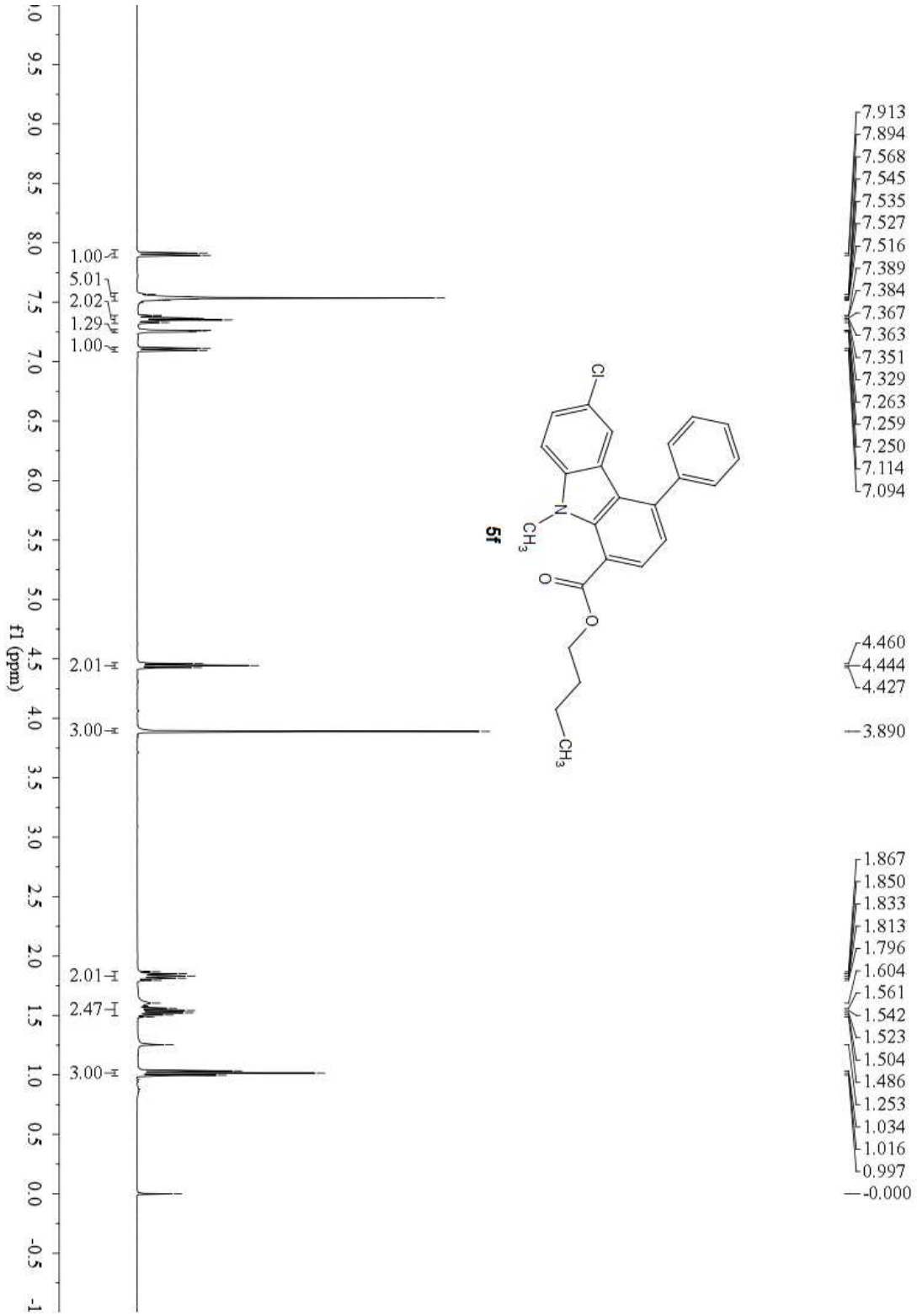

f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)
132 128 124 120 116
129.677
128.985
128.566
127.960
127.518
127.212
126.788
126.288
122.988
122.570
122.249
121.218
120.234
115.980
167.610
142.716
140.864
140.529
139.800
138.405
129.677
128.985
128.566
127.960
127.518
127.212
126.788
126.288
122.249
121.218
120.234
110.095
77.318
77.000
76.683
64.842
30.462
19.072
13.701
5c
N
O
O
CH3

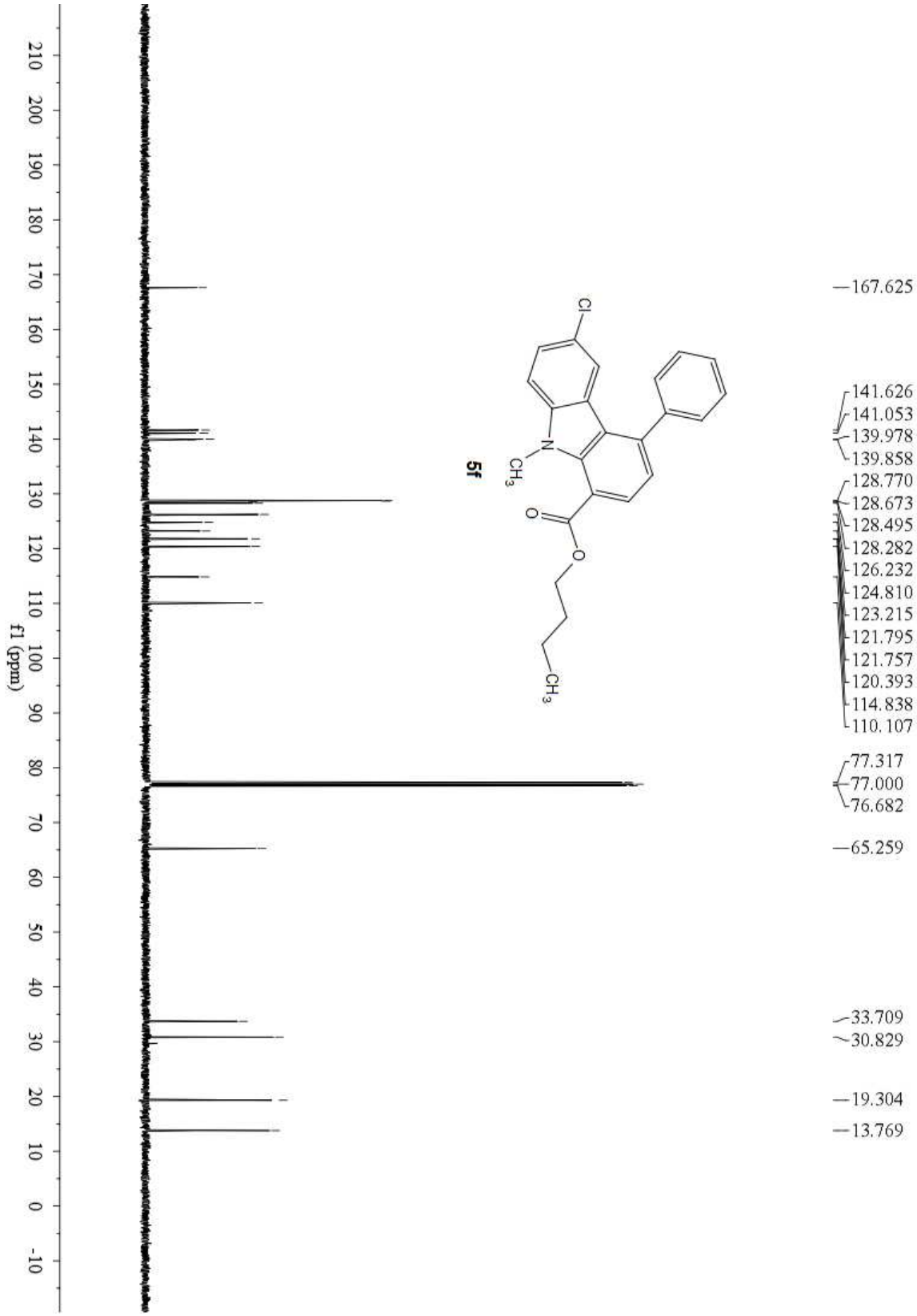

1.00
5.01
1.02
1.36
2.00
2.00
3.01
3.00
2.01
2.46
3.02
f1 (ppm)
5d
7.872
7.853
7.582
7.575
7.569
7.559
7.554
7.550
7.536
7.527
7.516
7.510
7.506
7.497
7.334
7.313
7.258
7.255
7.246
7.237
7.234
7.093
7.074
7.055
4.456
4.439
4.422
3.881
2.281
1.849
1.831
1.811
1.570
1.561
1.542
1.523
1.504
1.031
1.013
0.994
0.000

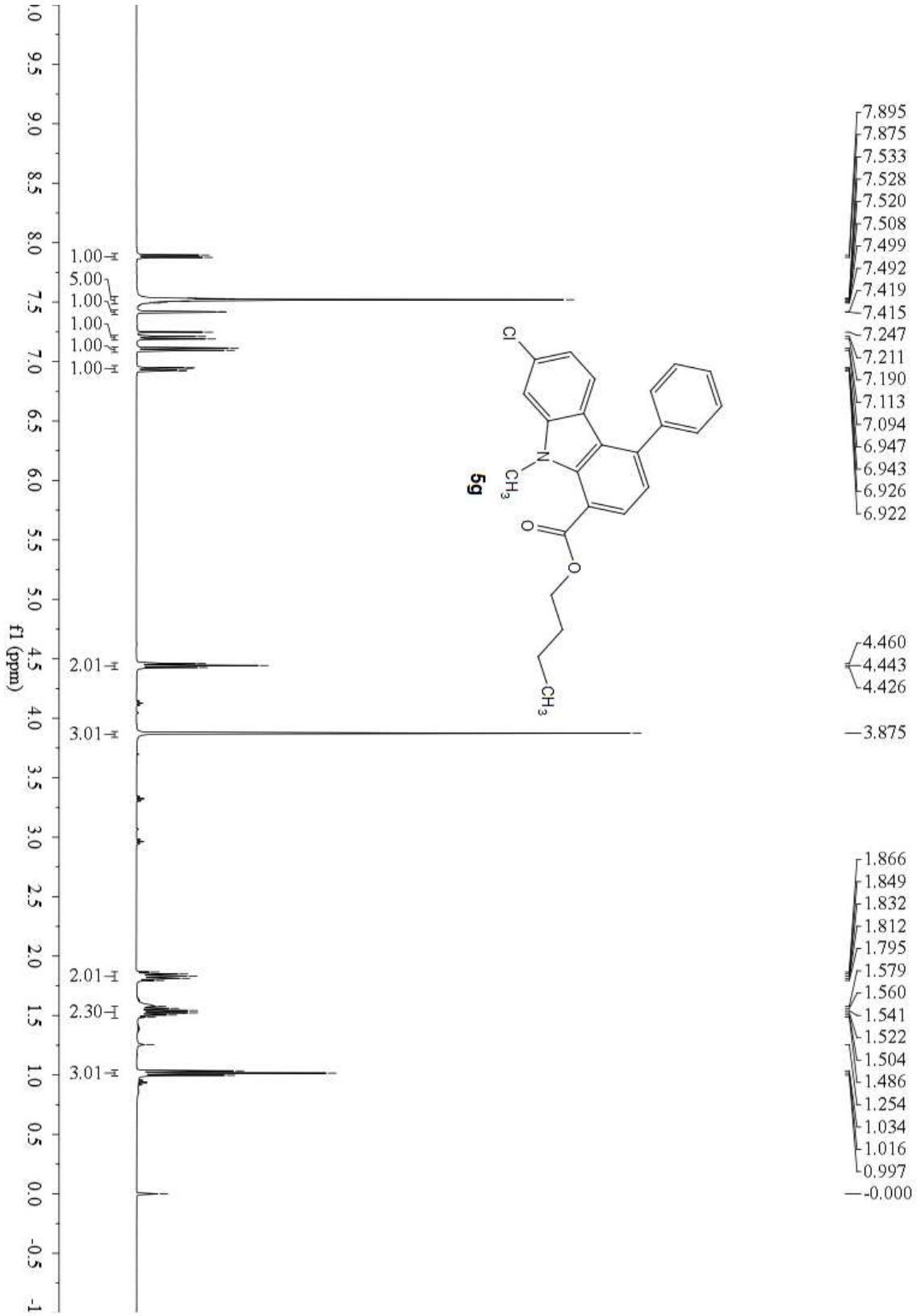

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
H3C
N
CH3
O
O
CH3
5d
167.937
141.307
141.117
140.703
139.718
128.969
128.553
128.417
127.894
127.657
127.502
122.509
122.230
122.204
119.847
114.396
108.809
77.318
77.000
76.683
65.105
33.583
30.861
21.378
19.320
13.779

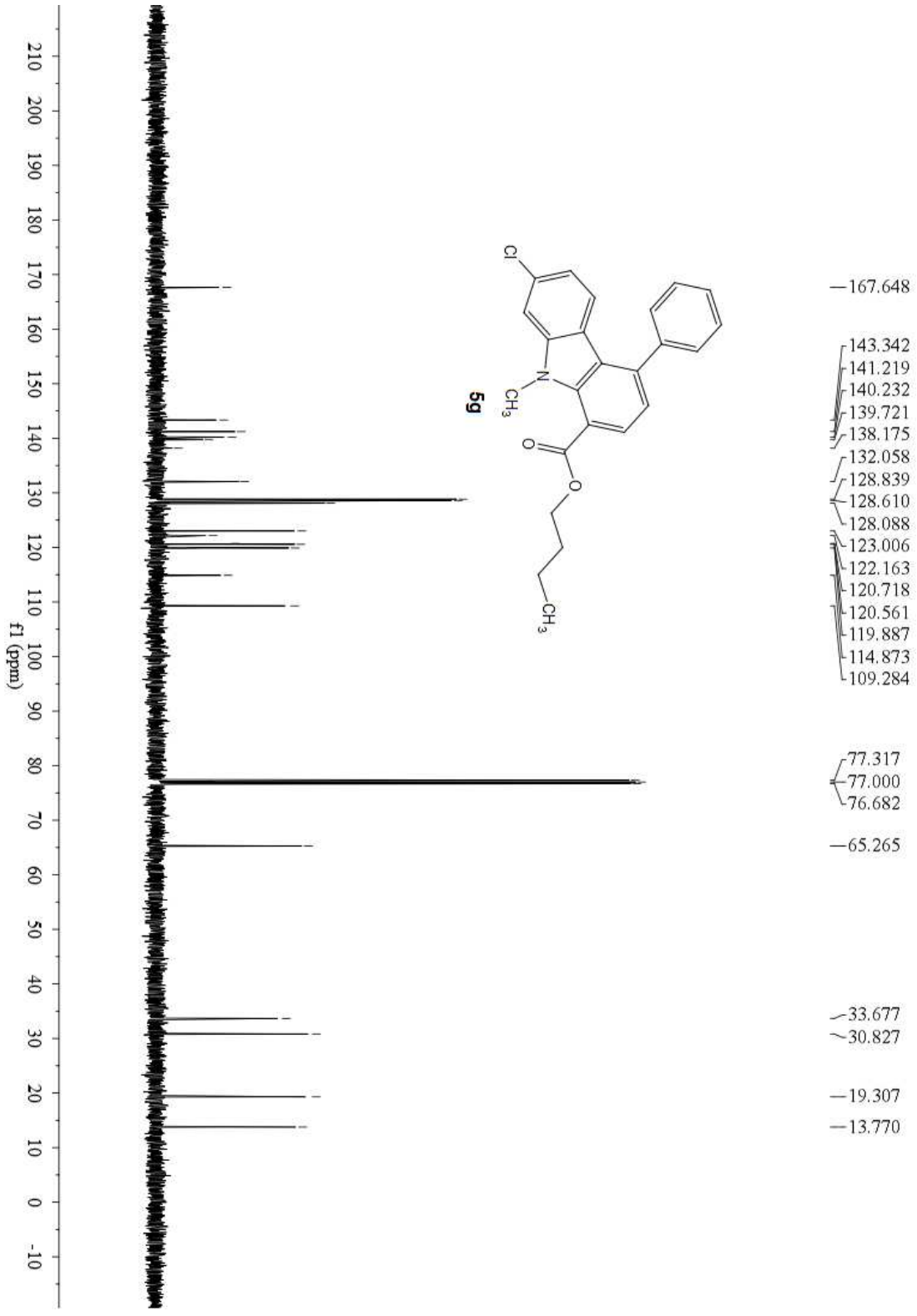

f1 (ppm)
1.00
5.01
1.01
1.01
1.00
1.01
2.00
3.00
2.01
2.46
3.00
5e
F
N
CH3
O
O
CH3
7.918
7.898
7.569
7.534
7.510
7.367
7.357
7.345
7.334
7.255
7.191
7.185
7.169
7.163
7.146
7.140
7.099
7.080
6.981
6.976
6.957
6.951
4.463
4.447
4.430
3.901
1.871
1.854
1.836
1.817
1.800
1.565
1.546
1.527
1.508
1.489
1.256
1.037
1.018
1.000
0.000

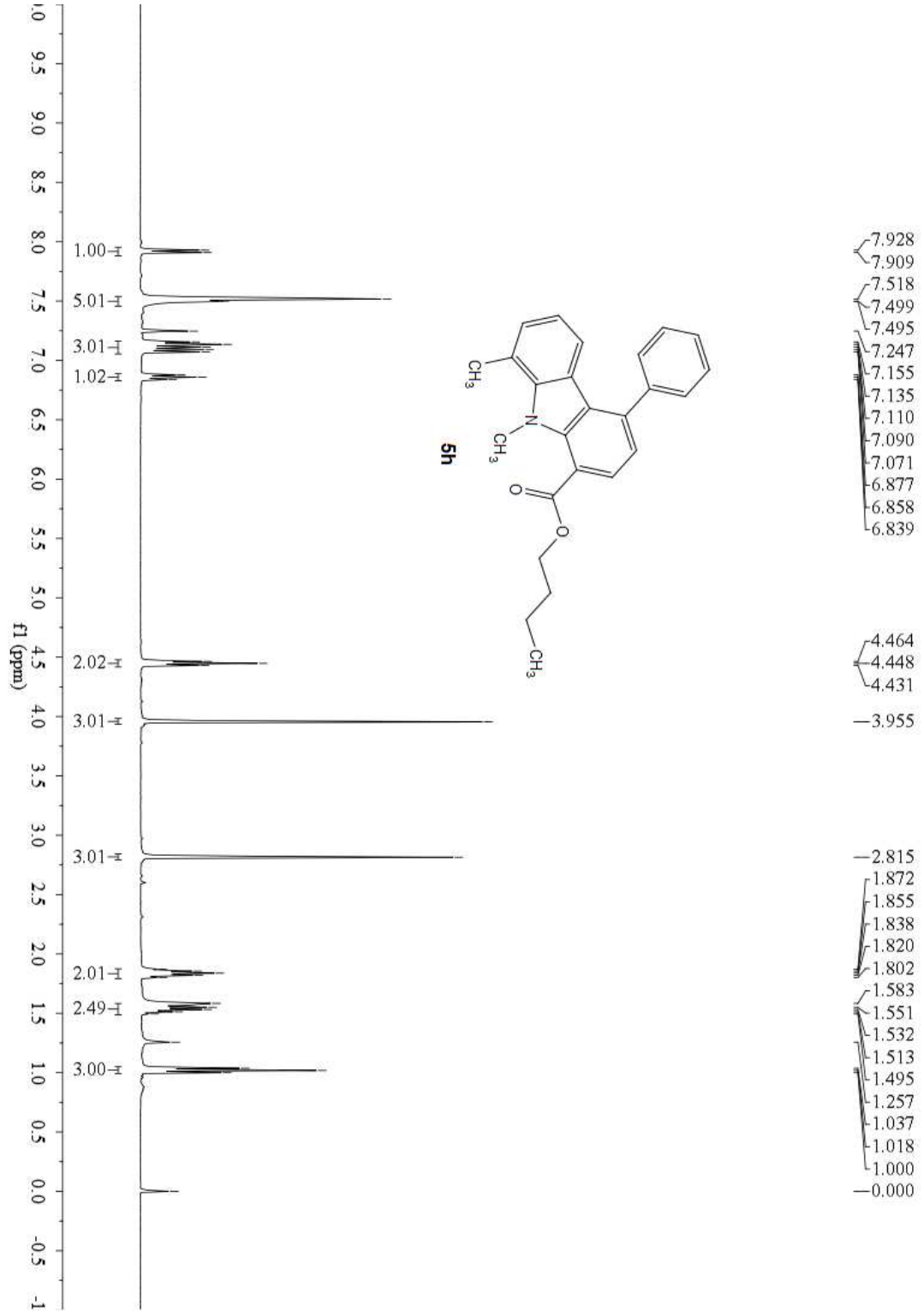

f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
130 125 120 115 110
128.780
128.651
128.445
128.188
122.570
122.470
122.219
122.178
120.007
114.793
114.042
113.787
109.707
109.616
108.036
107.786
167.644
158.188
155.851
141.635
140.246
140.037
139.130
128.780
128.651
128.445
128.188
120.007
114.793
114.042
113.787
109.707
109.616
108.036
107.786
77.318
77.000
76.683
65.195
33.747
30.838
19.304
13.759
F
N
CH3
O
O
CH3
5e

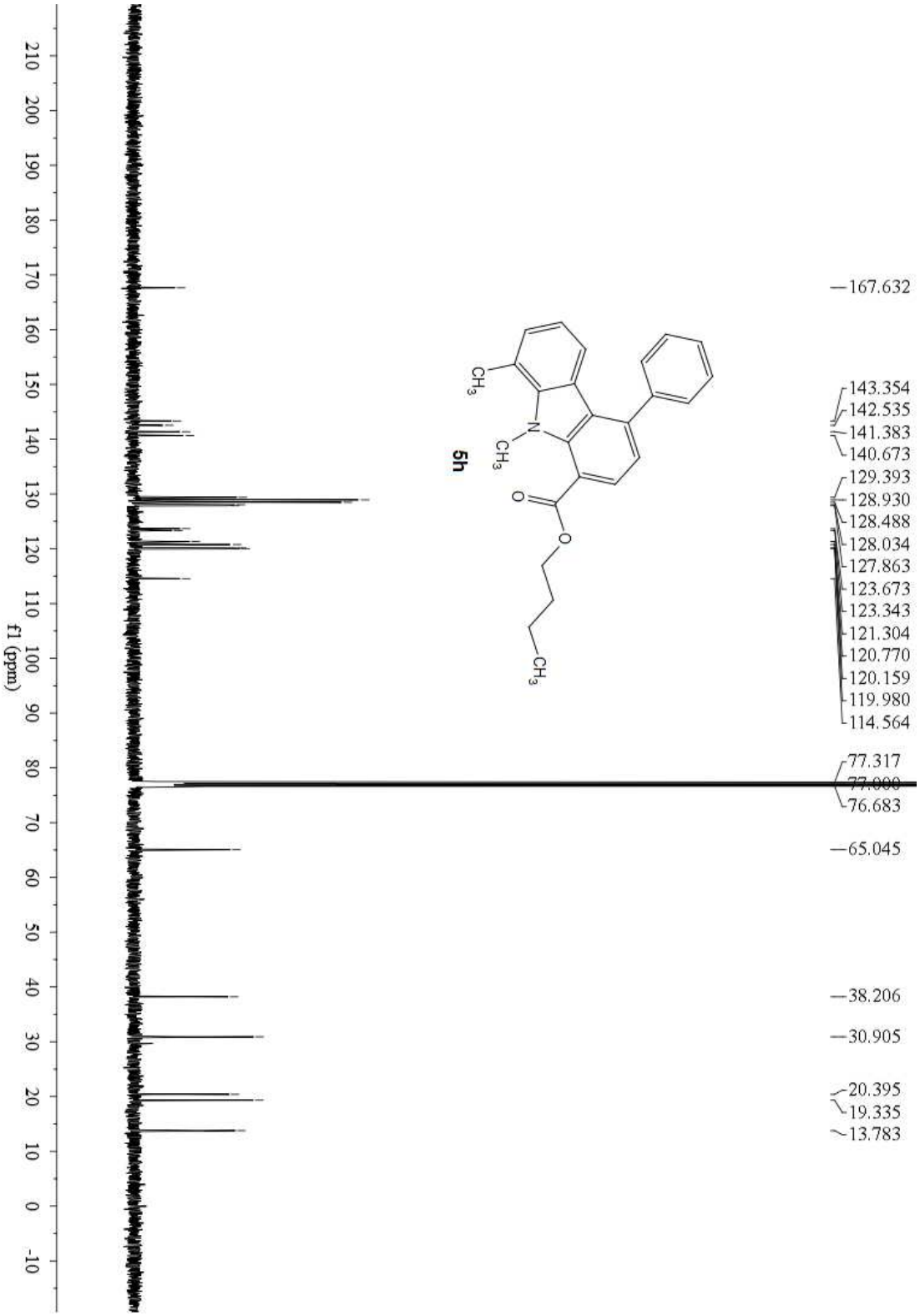

f1 (ppm)
1.00
5.01
2.02
1.29
1.00
2.01
3.00
2.01
2.47
3.00
5f
Cl
N
CH3
O
O
CH3
7.913
7.894
7.568
7.545
7.535
7.527
7.516
7.389
7.384
7.367
7.363
7.351
7.329
7.263
7.259
7.250
7.114
7.094
4.460
4.444
4.427
3.890
1.867
1.850
1.833
1.813
1.796
1.604
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1.016
0.997
-0.000

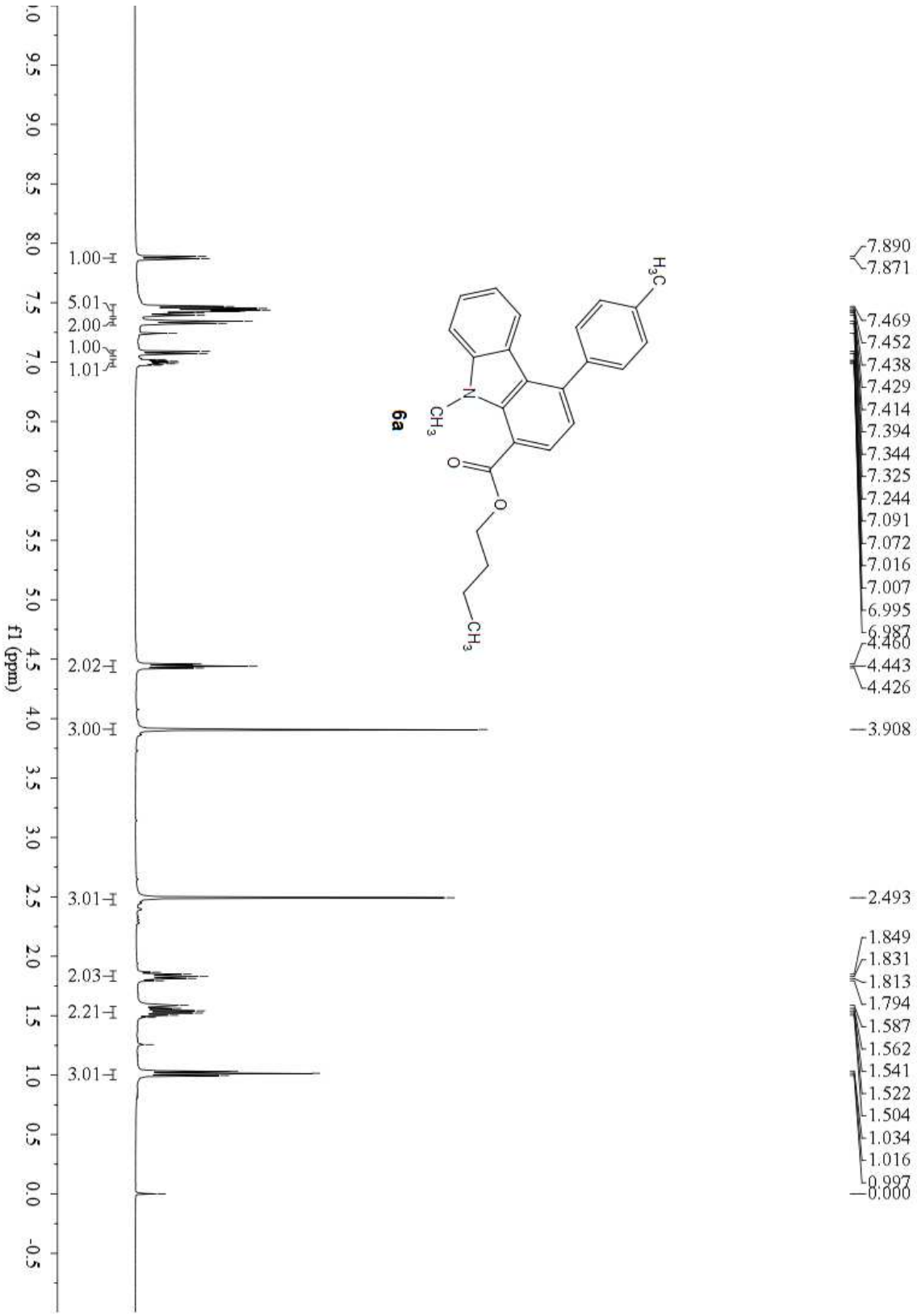

167.625
141.626
141.053
139.978
139.858
128.770
128.673
128.495
128.282
126.232
124.810
123.215
121.795
121.757
120.393
114.838
110.107
77.317
77.000
76.682
65.259
33.709
30.829
19.304
13.769
5f
f1 (ppm)

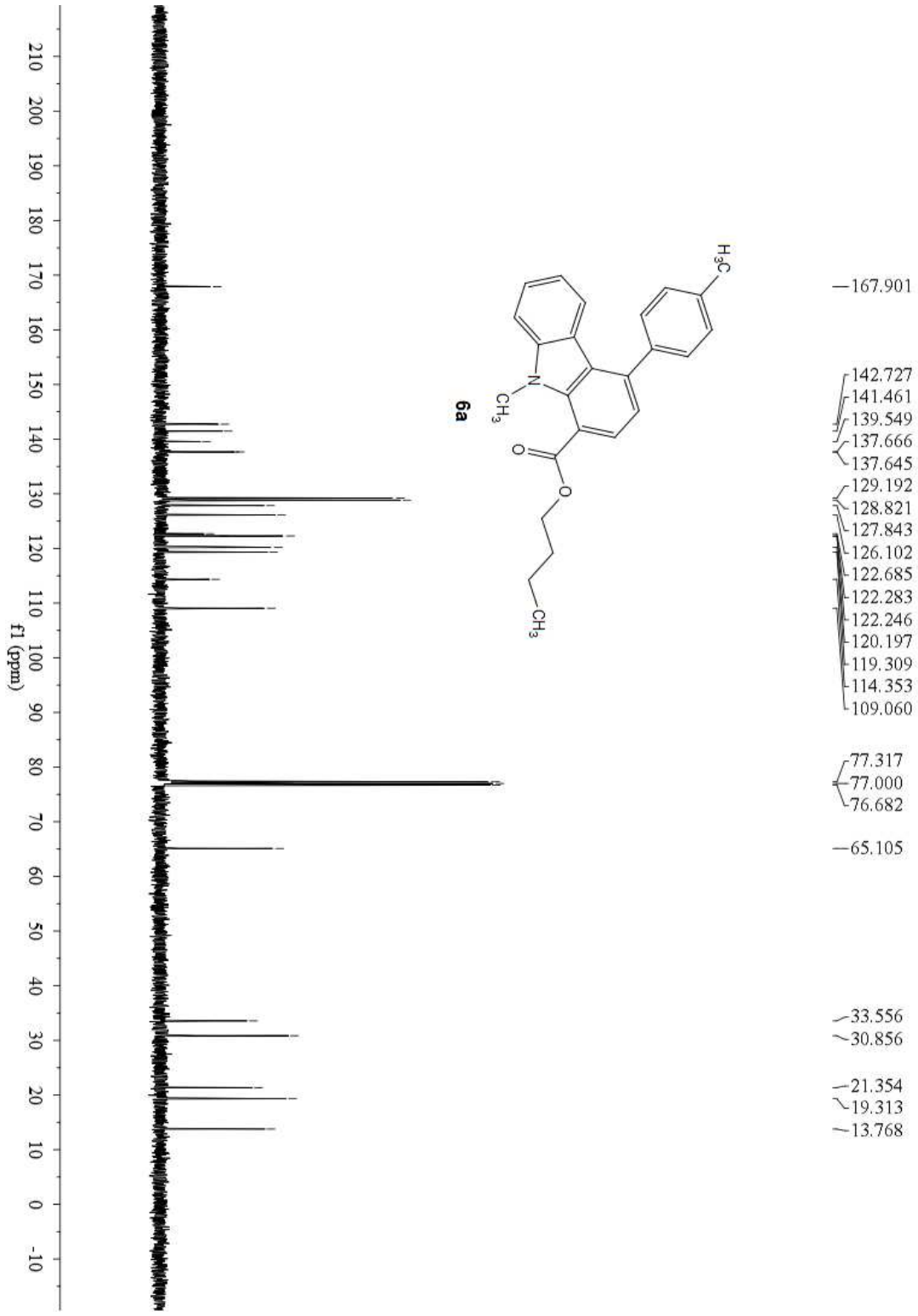

7.895
7.875
7.533
7.528
7.520
7.508
7.499
7.492
7.419
7.415
7.247
7.211
7.190
7.113
7.094
6.947
6.943
6.926
6.922
4.460
4.443
4.426
3.875
1.866
1.849
1.832
1.812
1.795
1.579
1.560
1.541
1.522
1.504
1.486
1.254
1.034
1.016
0.997
0.000
1.00
5.00
1.00
1.00
1.00
1.00
2.01
3.01
2.01
2.30
3.01
f1 (ppm)
Cl
N
CH3
O
O
CH3
6g

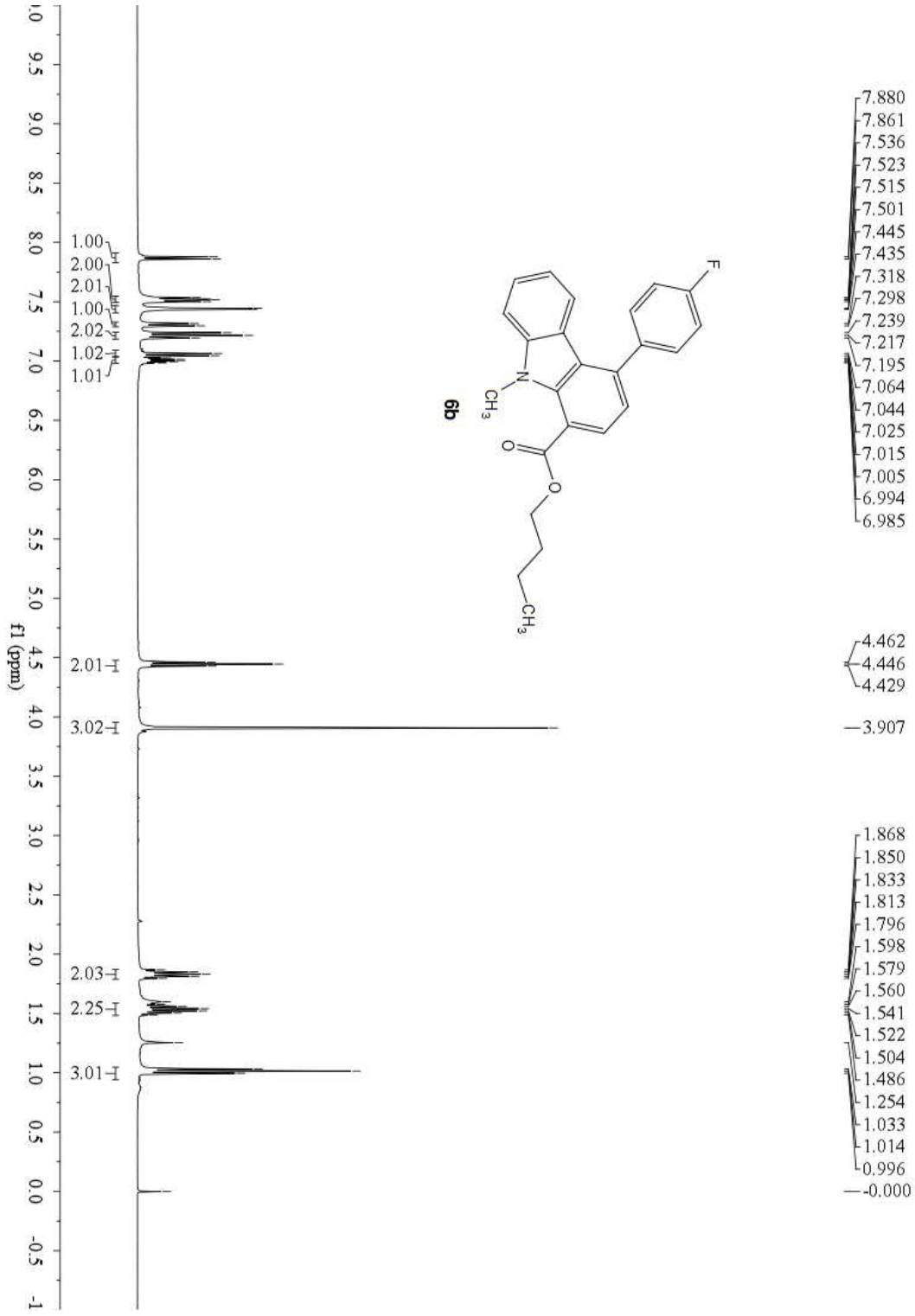

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
Cl
N
CH3
O
O
CH3
5g
167.648
143.342
141.219
140.232
139.721
138.175
132.058
128.839
128.610
128.088
123.006
122.163
120.718
120.561
119.887
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109.284
77.317
77.000
76.682
65.265
33.677
30.827
19.307
13.770

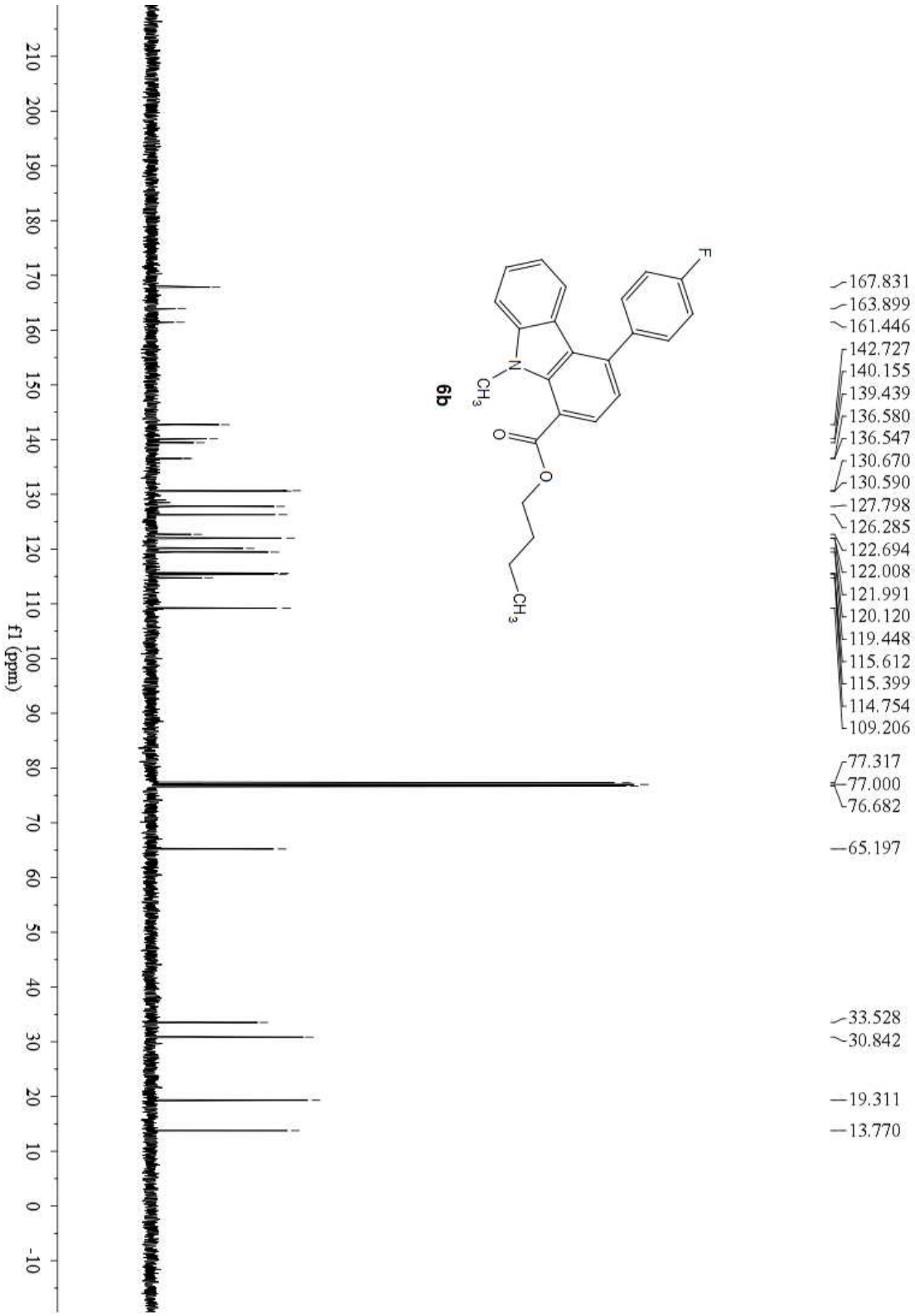

1.00
5.01
3.01
1.02
2.02
3.01
3.01
2.01
2.49
3.00
f1 (ppm)
5h
7.928
7.909
7.518
7.499
7.495
7.247
7.155
7.135
7.110
7.090
7.071
6.877
6.858
6.839
4.464
4.448
4.431
3.955
2.815
1.872
1.855
1.838
1.820
1.802
1.583
1.551
1.532
1.513
1.495
1.257
1.037
1.018
1.000
0.000

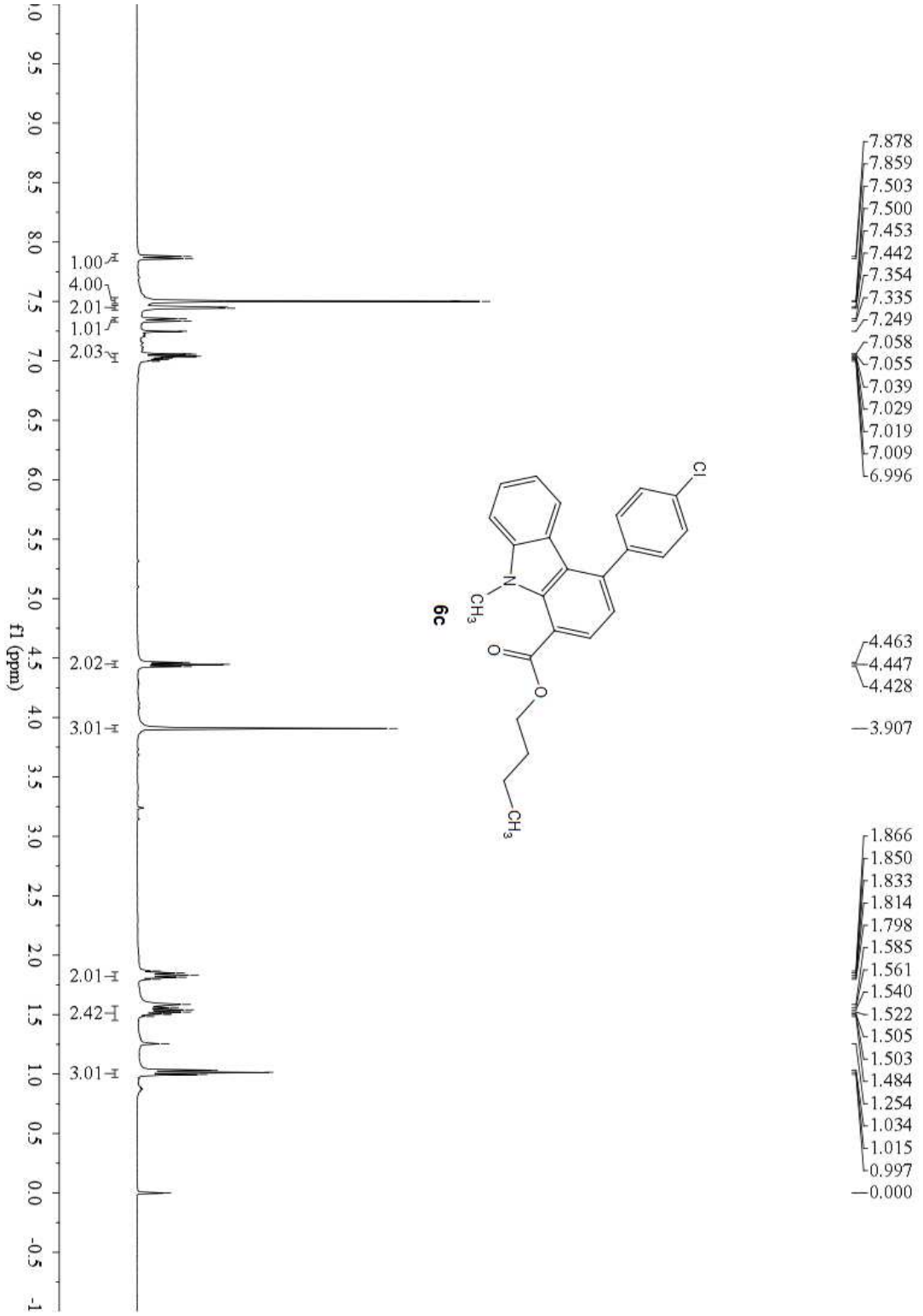

167.632
143.354
142.535
141.383
140.673
129.393
128.930
128.488
128.034
127.863
123.673
123.343
121.304
120.770
120.159
119.980
114.564
77.317
77.000
76.683
65.045
38.206
30.905
20.395
19.335
13.783
5h
f1 (ppm)

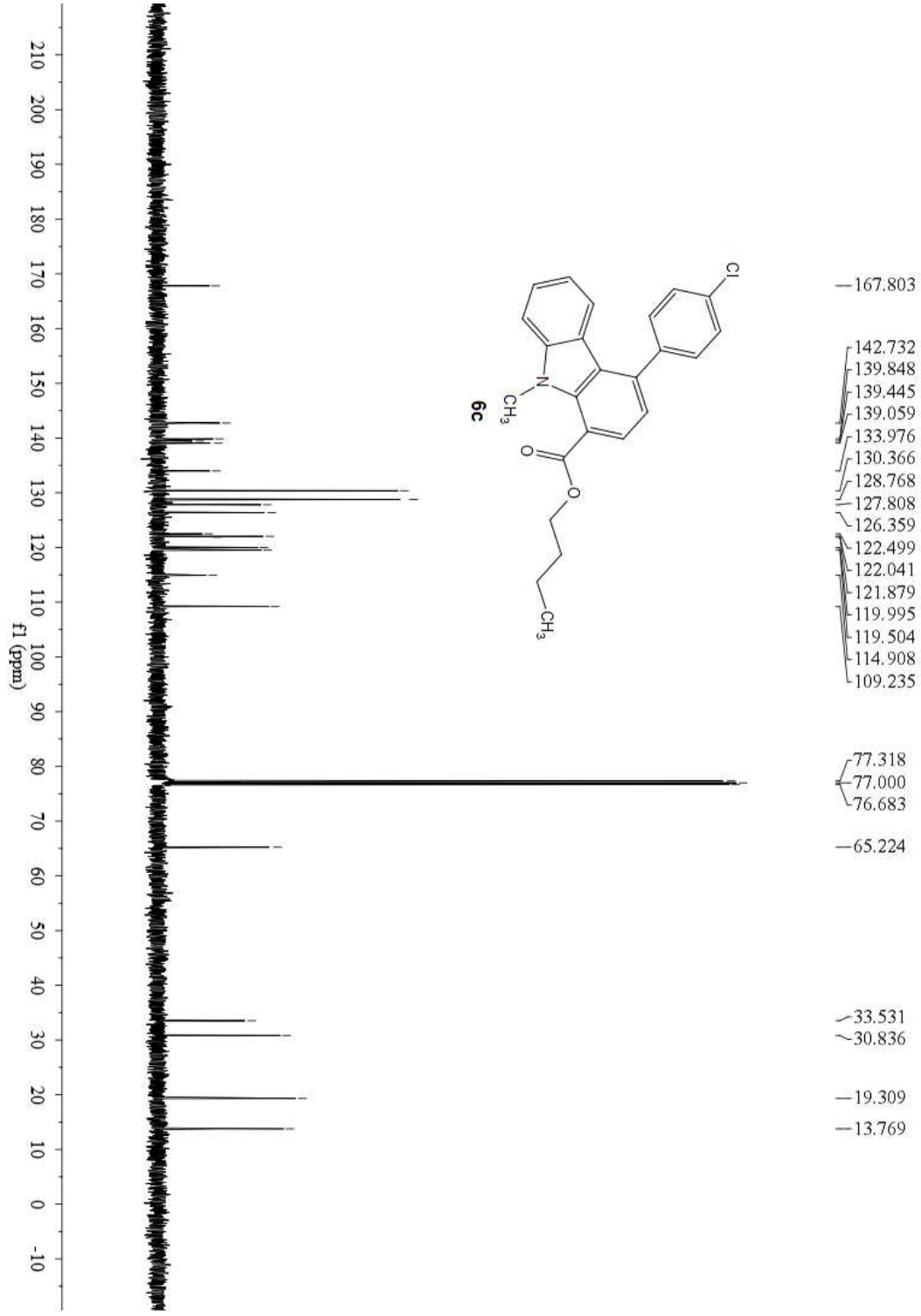

f1 (ppm)
1.00
5.01
2.00
1.00
1.01
2.02
3.00
3.01
2.03
2.21
3.01
6a
7.890
7.871
7.469
7.452
7.438
7.429
7.414
7.394
7.344
7.325
7.244
7.091
7.072
7.016
7.007
6.995
6.987
4.460
4.443
4.426
3.908
2.493
1.849
1.831
1.813
1.794
1.587
1.562
1.541
1.522
1.504
1.034
1.016
0.997
0.000

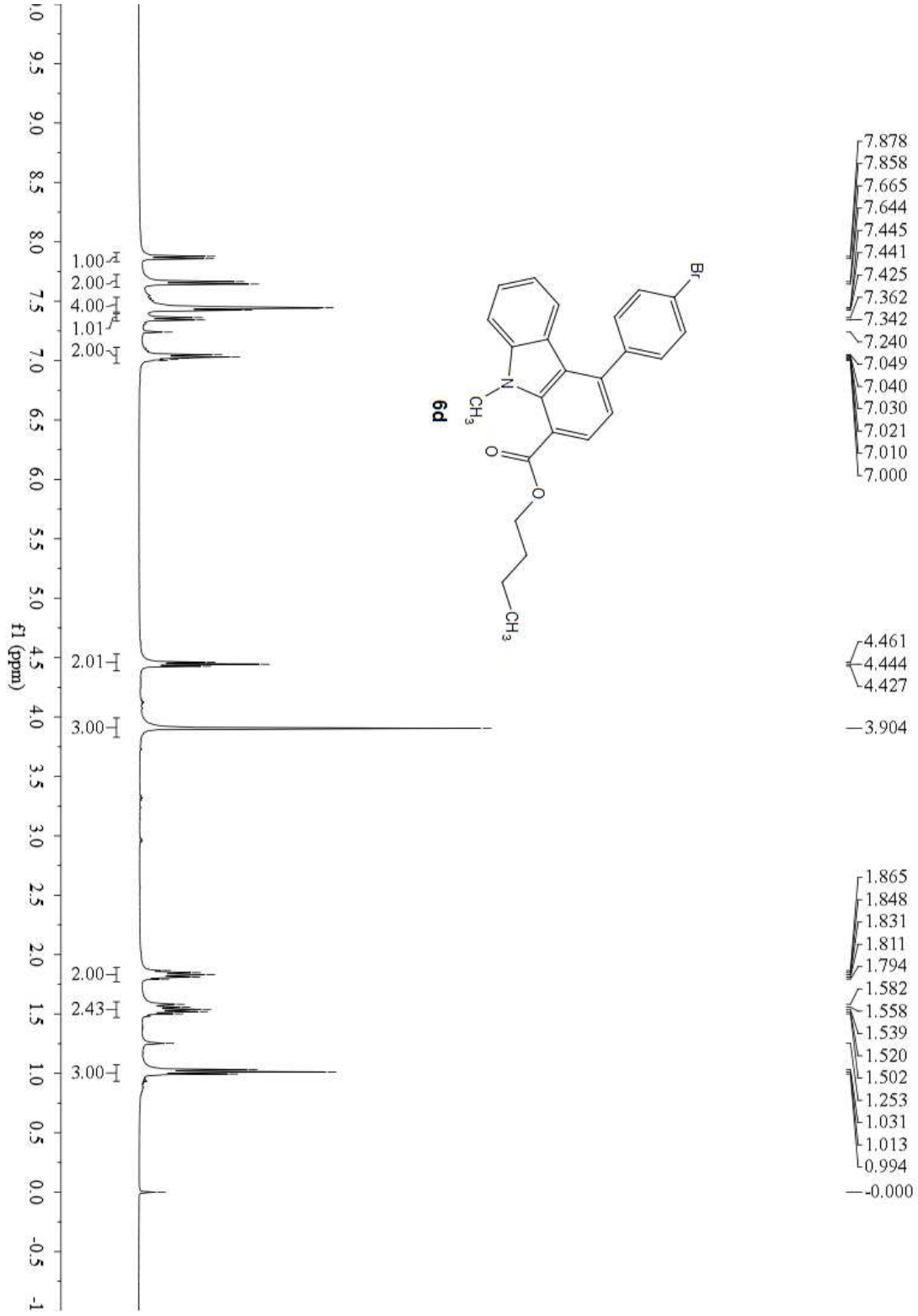

f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
H3C
N
CH3
O
O
CH3
6a
167.901
142.727
141.461
139.549
137.666
137.645
129.192
128.821
127.843
126.102
122.685
122.283
122.246
120.197
119.309
114.353
109.060
77.317
77.000
76.682
65.105
33.556
30.856
21.354
19.313
13.768

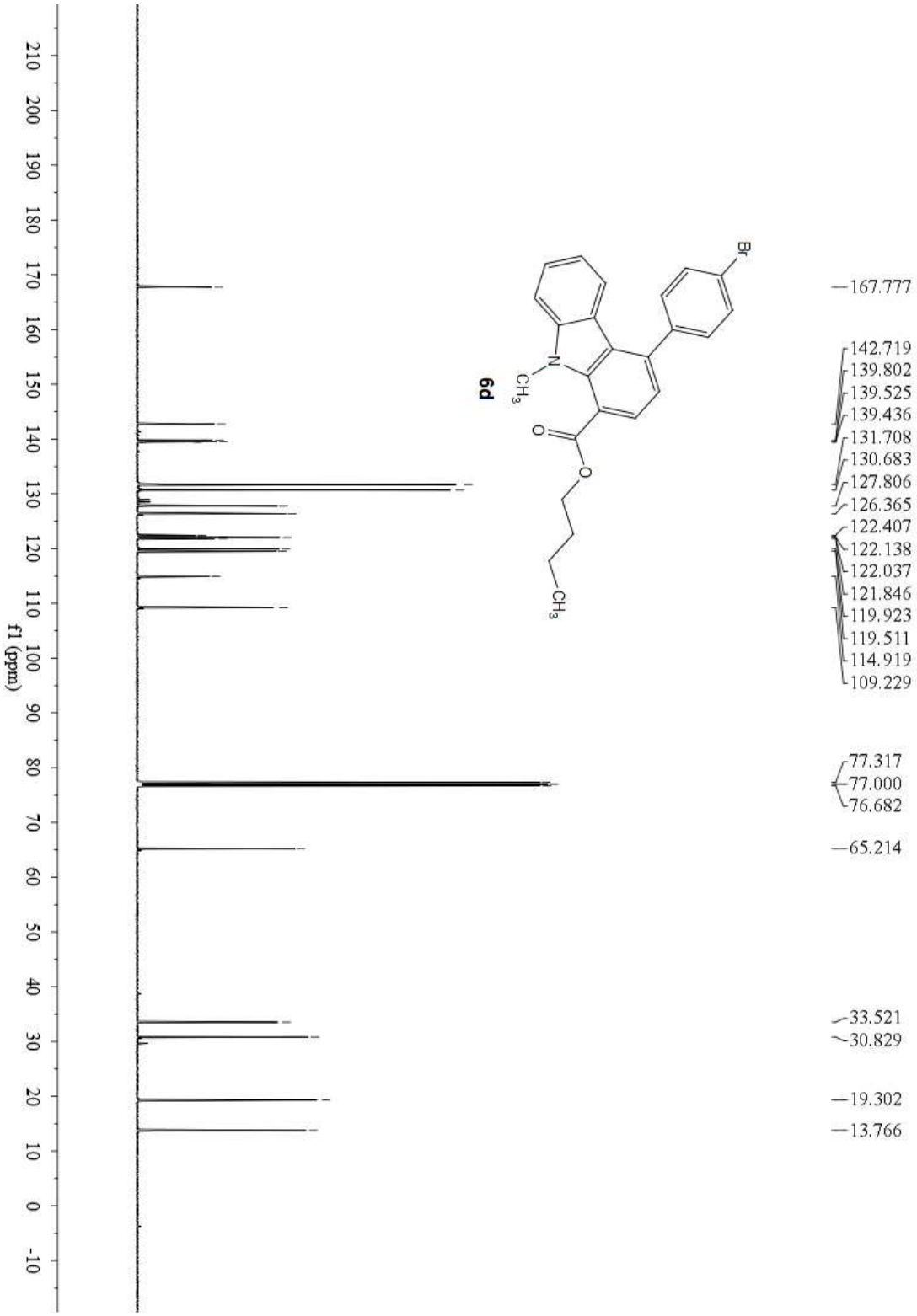

6b
F
N
CH3
O
O
CH3
1.00
2.00
2.01
1.00
2.02
1.02
1.01
2.01
3.02
2.03
2.25
3.01
f1 (ppm)
7.880
7.861
7.536
7.523
7.515
7.501
7.445
7.435
7.318
7.298
7.239
7.217
7.195
7.064
7.044
7.025
7.015
7.005
6.994
6.985
4.462
4.446
4.429
3.907
1.868
1.850
1.833
1.813
1.796
1.598
1.579
1.560
1.541
1.522
1.504
1.486
1.254
1.033
1.014
0.996
-0.000

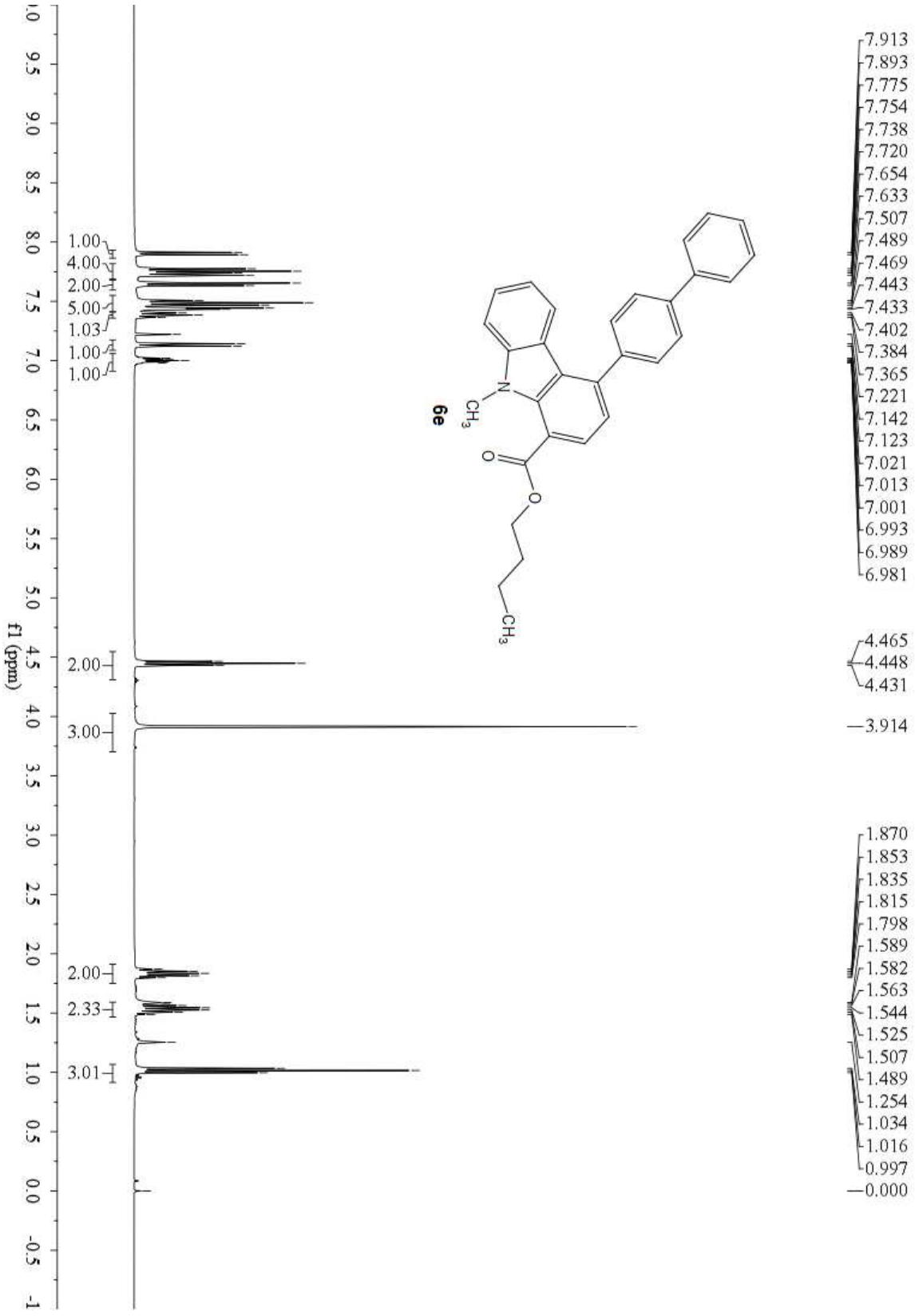

6b
167.831
163.899
161.446
142.727
140.155
139.439
136.580
136.547
130.670
130.590
127.798
126.285
122.694
122.008
121.991
120.120
119.448
115.612
115.399
114.754
109.206
77.317
77.000
76.682
65.197
33.528
30.842
19.311
13.770
f1 (ppm)

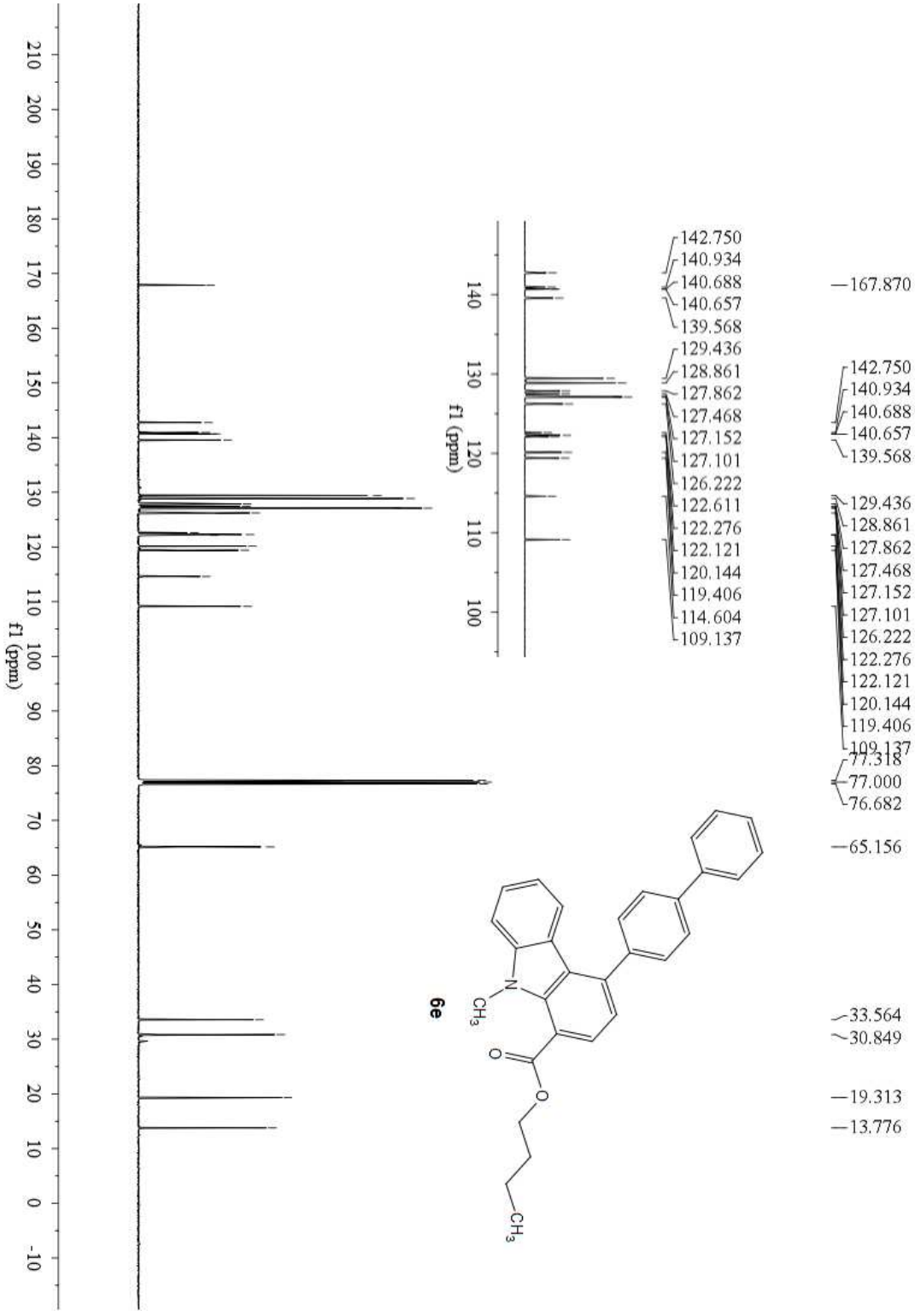

f1 (ppm)
1.00
4.00
2.01
1.01
2.03
2.02
3.01
2.01
2.42
3.01
6c
Cl
N
CH3
O
O
CH3
7.878
7.859
7.503
7.500
7.453
7.442
7.354
7.335
7.249
7.058
7.055
7.039
7.029
7.019
7.009
6.996
4.463
4.447
4.428
3.907
1.866
1.850
1.833
1.814
1.798
1.585
1.561
1.540
1.522
1.505
1.503
1.484
1.254
1.034
1.015
0.997
0.000

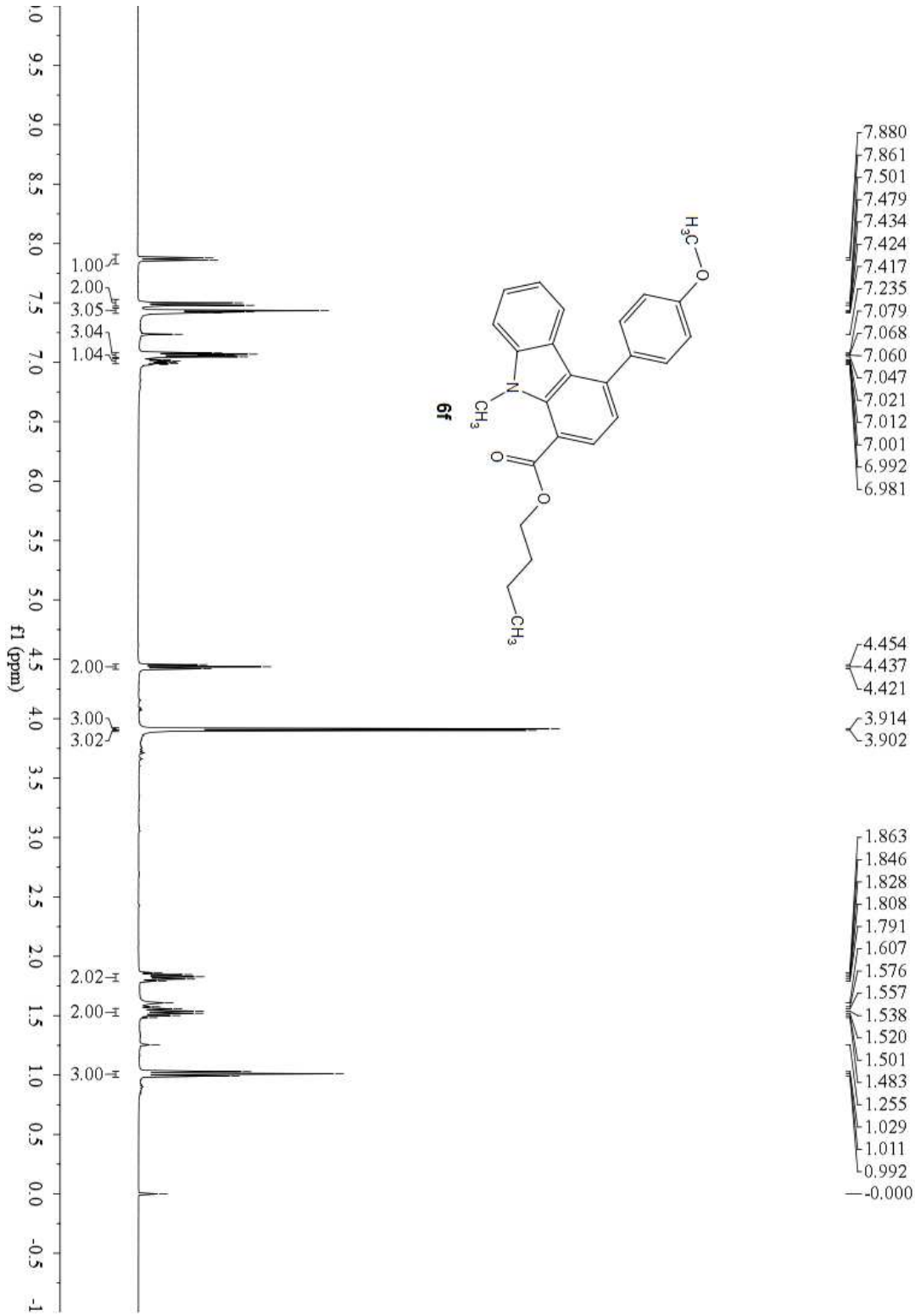

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
6c
Cl
N
CH3
O
O
CH3
167.803
142.732
139.848
139.445
139.059
133.976
130.366
128.768
127.808
126.359
122.499
122.041
121.879
119.995
119.504
114.908
109.235
77.318
77.000
76.683
65.224
33.531
30.836
19.309
13.769

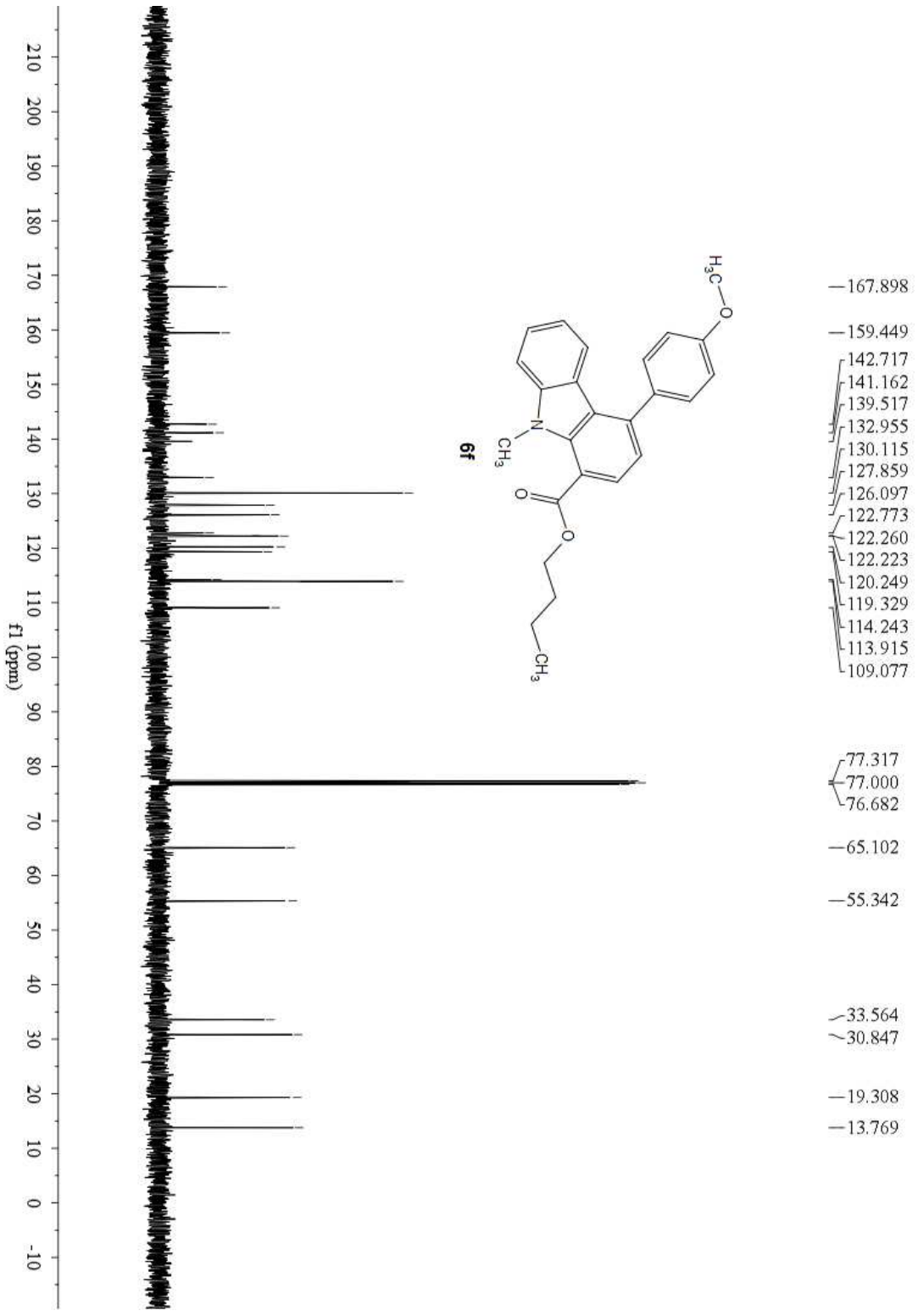

6d
Br
N
CH3
O
O
CH3
1.00
2.00
4.00
1.01
2.00
2.01
3.00
2.00
2.43
3.00
f1 (ppm)
7.878
7.858
7.665
7.644
7.445
7.441
7.425
7.362
7.342
7.240
7.049
7.040
7.030
7.021
7.010
7.000
4.461
4.444
4.427
3.904
1.865
1.848
1.831
1.811
1.794
1.582
1.558
1.539
1.520
1.502
1.253
1.031
1.013
0.994
-0.000

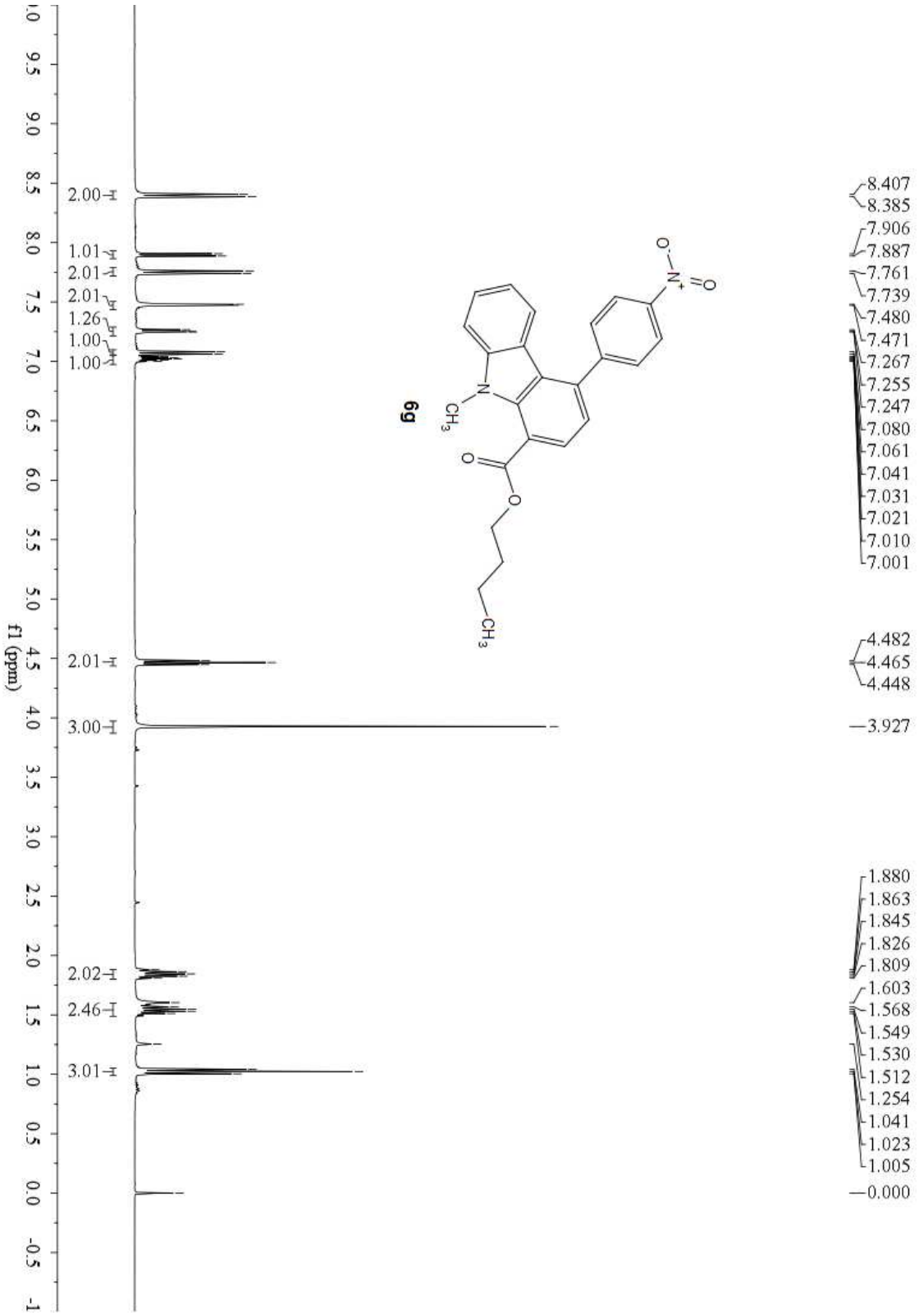

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
6d
Br
N
CH3
O
O
CH3
167.777
142.719
139.802
139.525
139.436
131.708
130.683
127.806
126.365
122.407
122.138
122.037
121.846
119.923
119.511
114.919
109.229
77.317
77.000
76.682
65.214
33.521
30.829
19.302
13.766

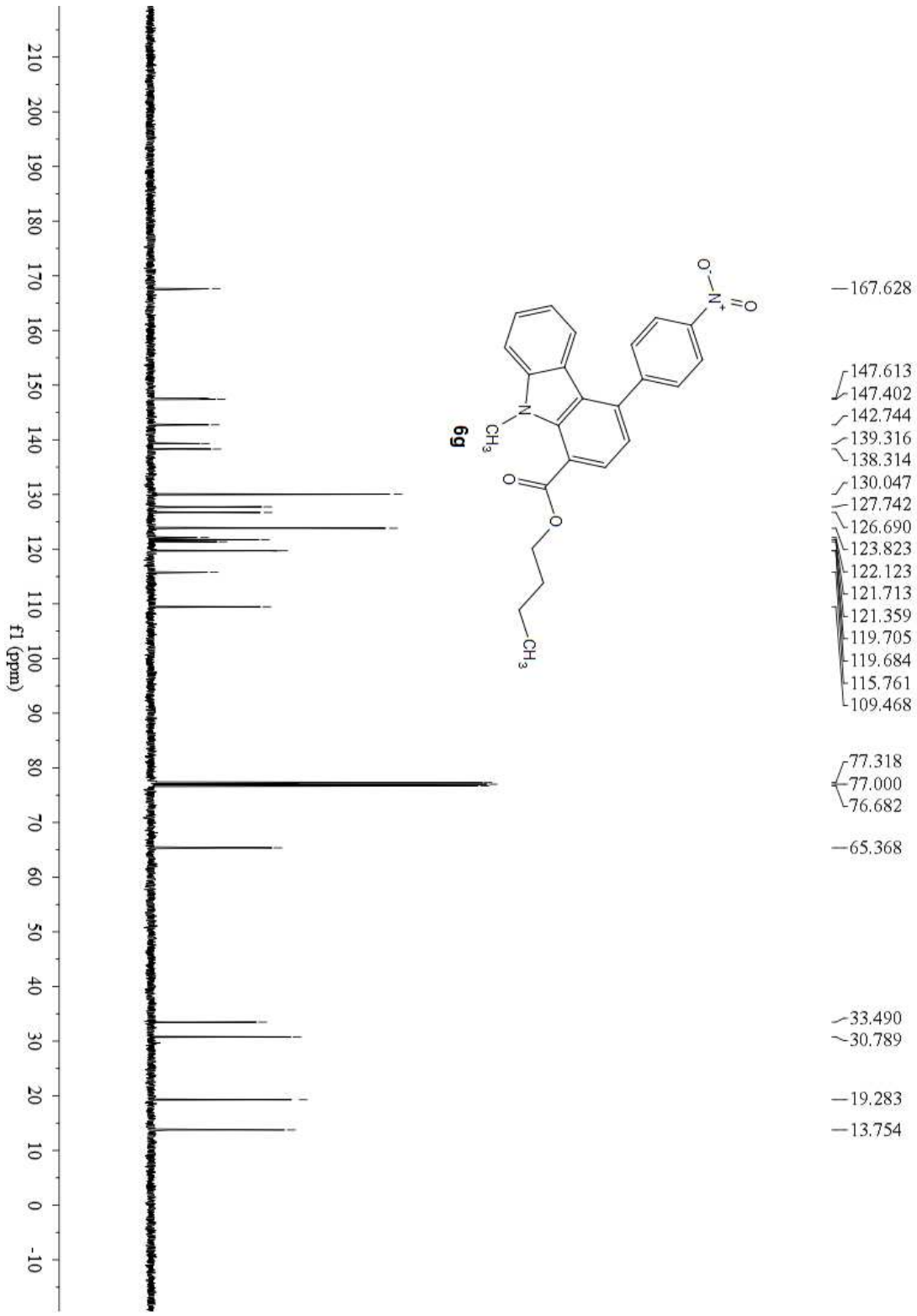

f1 (ppm)
1.00
4.00
2.00
5.00
1.03
1.00
1.00
2.00
3.00
2.00
2.33
3.01
6e
7.913
7.893
7.775
7.754
7.738
7.720
7.654
7.633
7.507
7.489
7.469
7.443
7.433
7.402
7.384
7.365
7.221
7.142
7.123
7.021
7.013
7.001
6.993
6.989
6.981
4.465
4.448
4.431
3.914
1.870
1.853
1.835
1.815
1.798
1.589
1.582
1.563
1.544
1.525
1.507
1.489
1.254
1.034
1.016
0.997
0.000

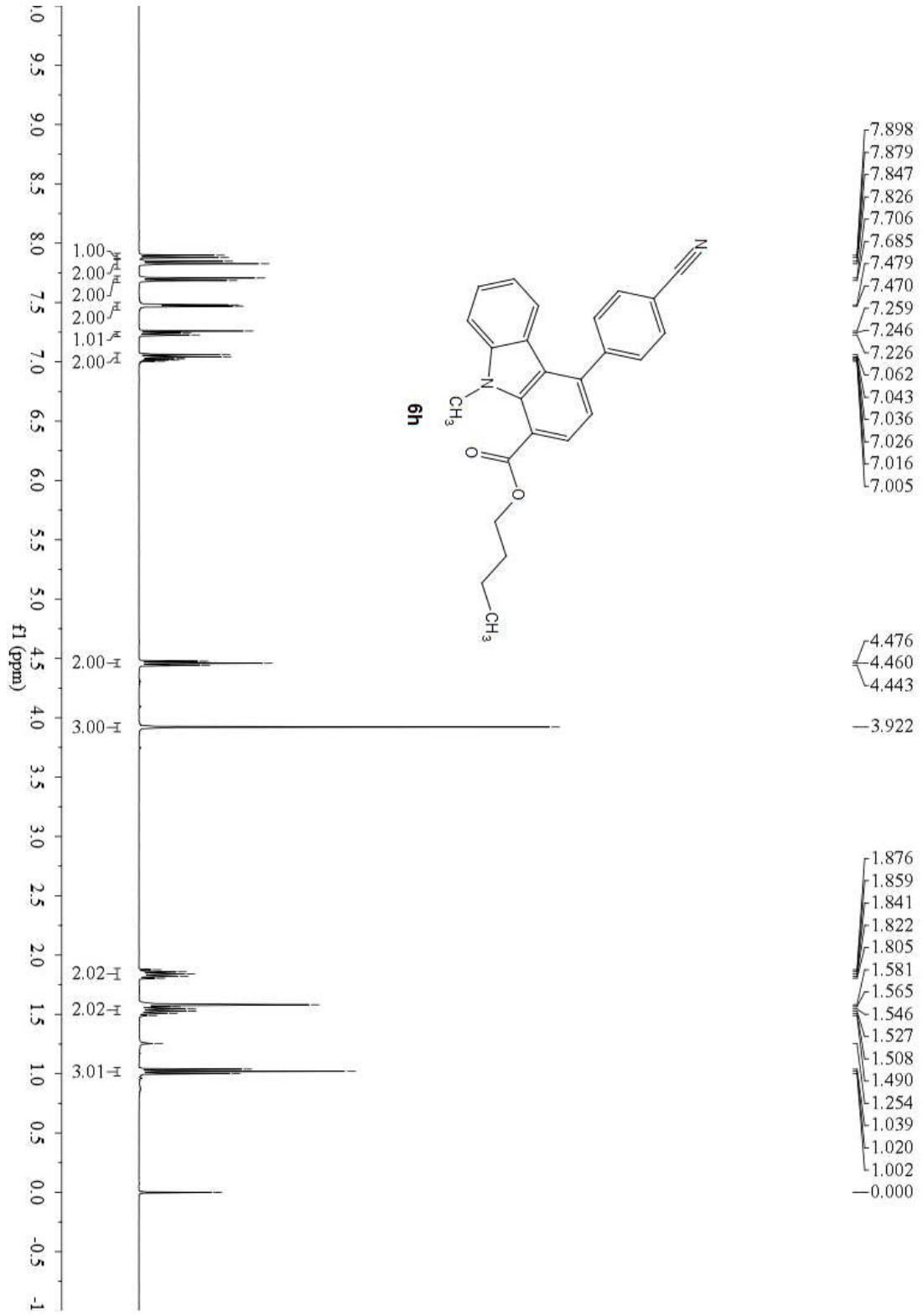

f1 (ppm)
142.750
140.934
140.688
140.657
139.568
129.436
128.861
127.862
127.468
127.152
127.101
126.222
122.611
122.276
122.121
120.144
119.406
114.604
109.137
167.870
77.318
77.000
76.682
65.156
33.564
30.849
19.313
13.776
6e

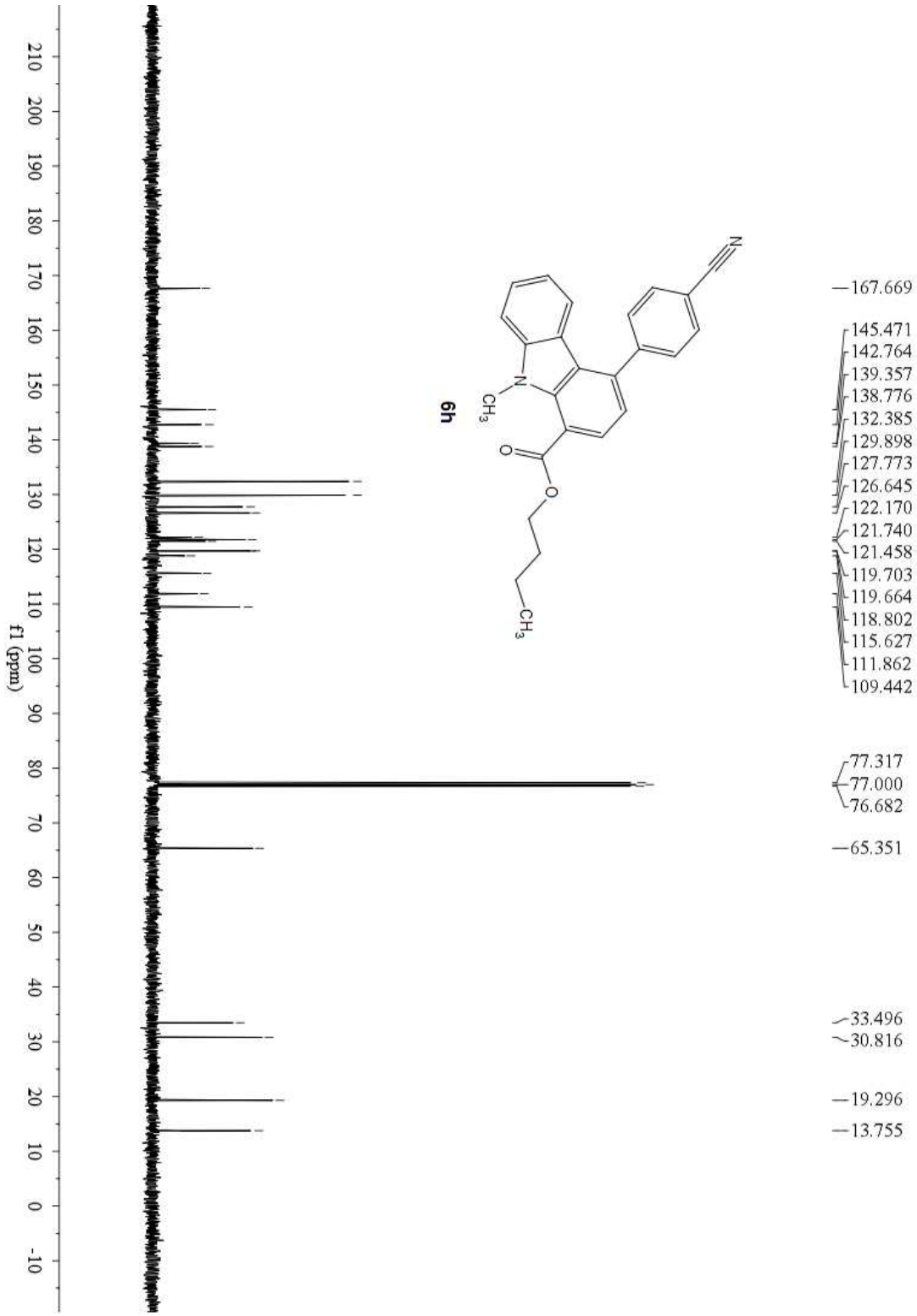

f1 (ppm)
1.00
2.00
3.05
3.04
1.04
2.00
3.00
3.02
2.02
2.00
3.00
6f
7.880
7.861
7.501
7.479
7.434
7.424
7.417
7.235
7.079
7.068
7.060
7.047
7.021
7.012
7.001
6.992
6.981
4.454
4.437
4.421
3.914
3.902
1.863
1.846
1.828
1.808
1.791
1.607
1.576
1.557
1.538
1.520
1.501
1.483
1.255
1.029
1.011
0.992
-0.000

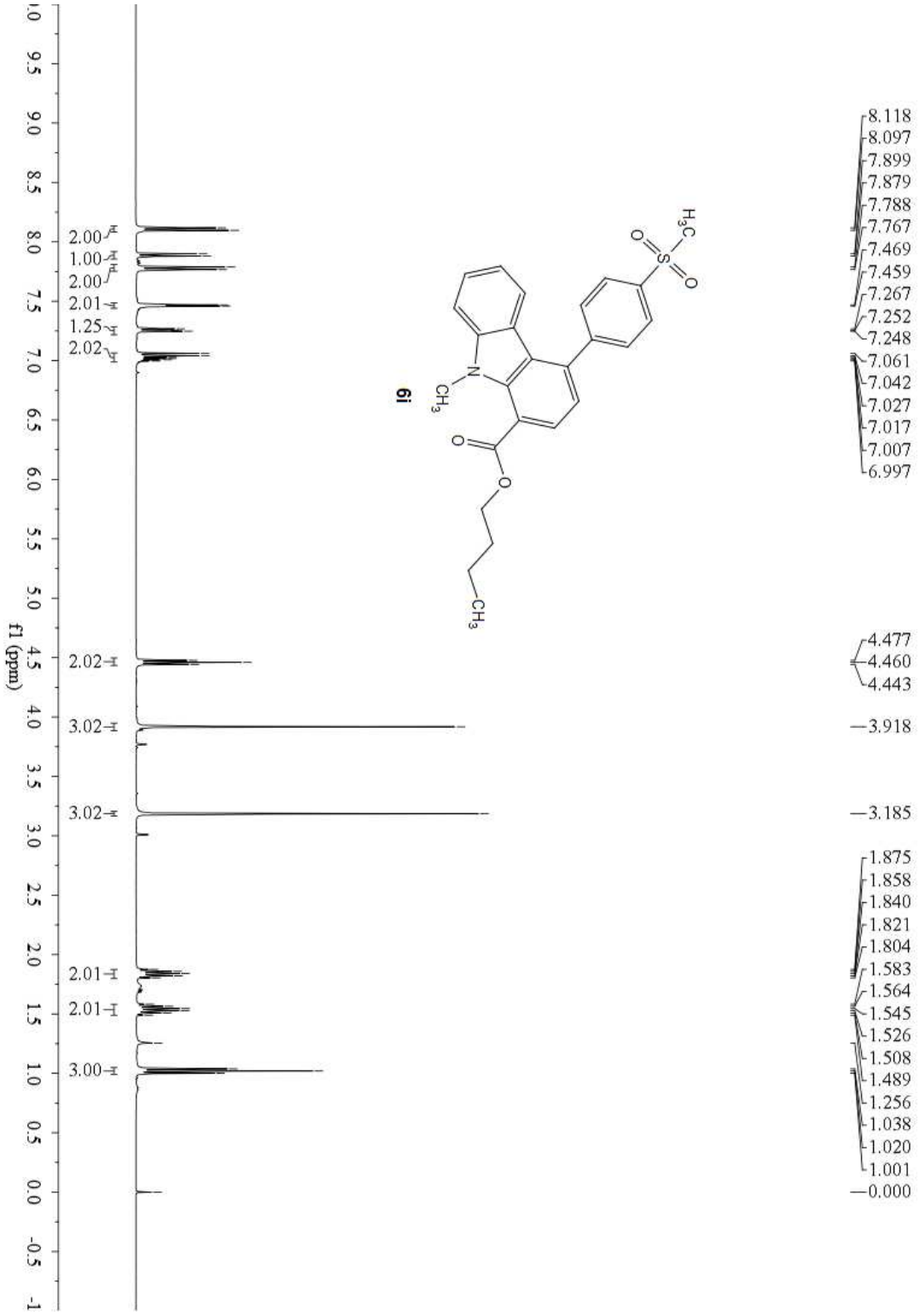

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
6f
H3C
O
N
CH3
O
O
CH3
167.898
159.449
142.717
141.162
139.517
132.955
130.115
127.859
126.097
122.773
122.260
122.223
120.249
119.329
114.243
113.915
109.077
77.317
77.000
76.682
65.102
55.342
33.564
30.847
19.308
13.769

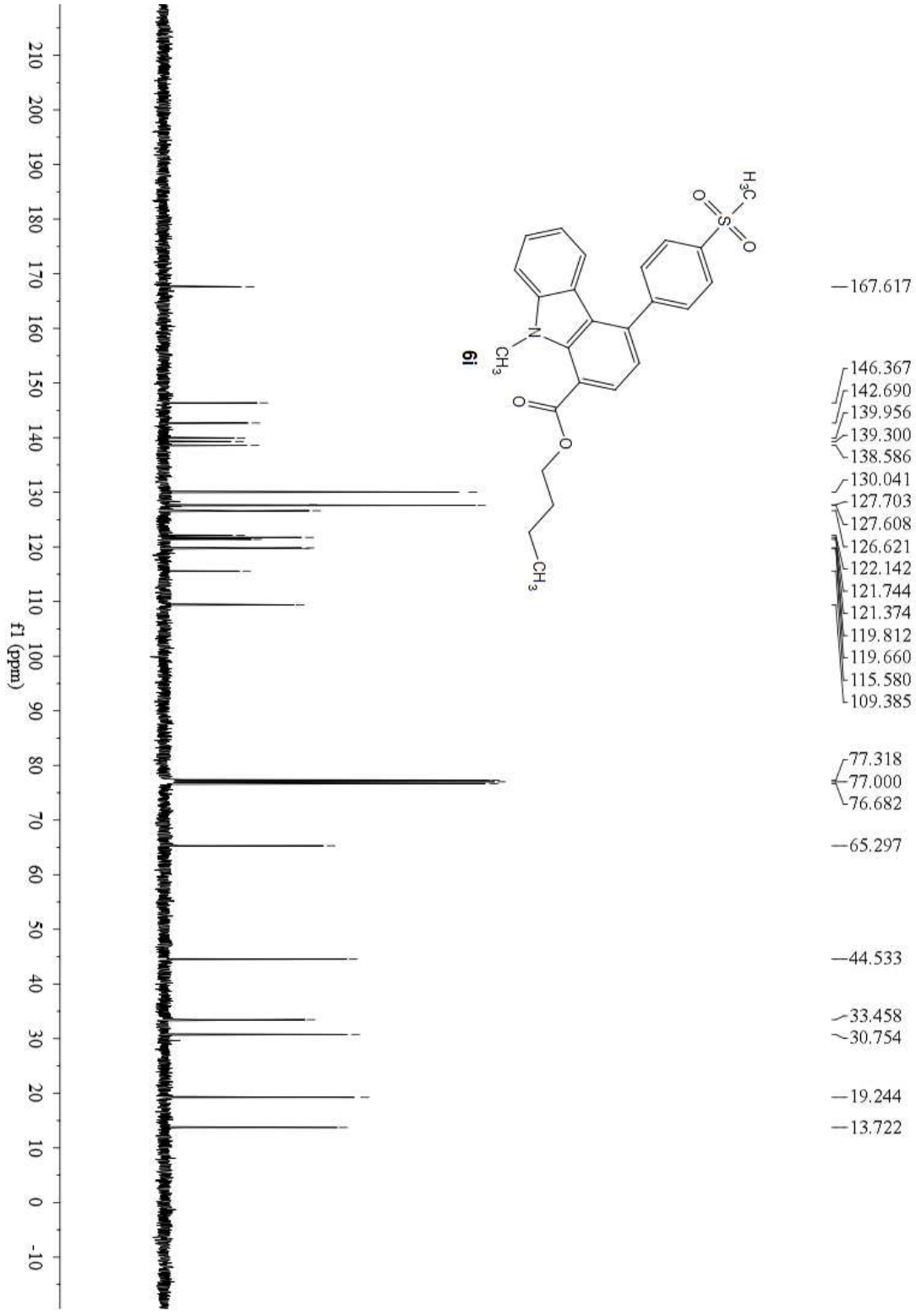

6g
f1 (ppm)
2.00
1.01
2.01
2.01
1.26
1.00
1.00
2.01
3.00
2.02
2.46
3.01
8.407
8.385
7.906
7.887
7.761
7.739
7.480
7.471
7.267
7.255
7.247
7.080
7.061
7.041
7.031
7.021
7.010
7.001
4.482
4.465
4.448
3.927
1.880
1.863
1.845
1.826
1.809
1.603
1.568
1.549
1.530
1.512
1.254
1.041
1.023
1.005
0.000

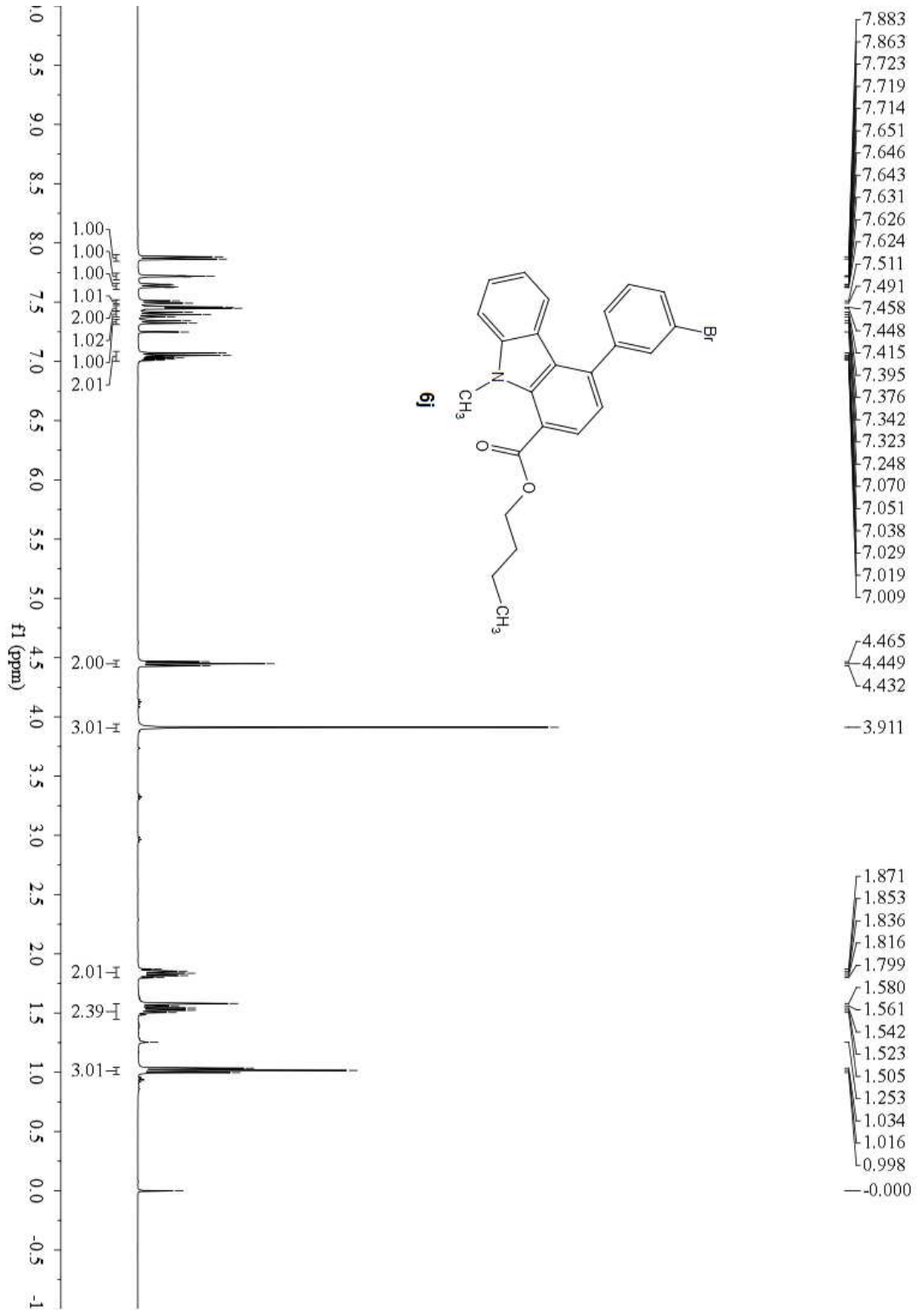

167.628
147.613
147.402
142.744
139.316
138.314
130.047
127.742
126.690
123.823
122.123
121.713
121.359
119.705
119.684
115.761
109.468
77.318
77.000
76.682
65.368
33.490
30.789
19.283
13.754
6g
f1 (ppm)

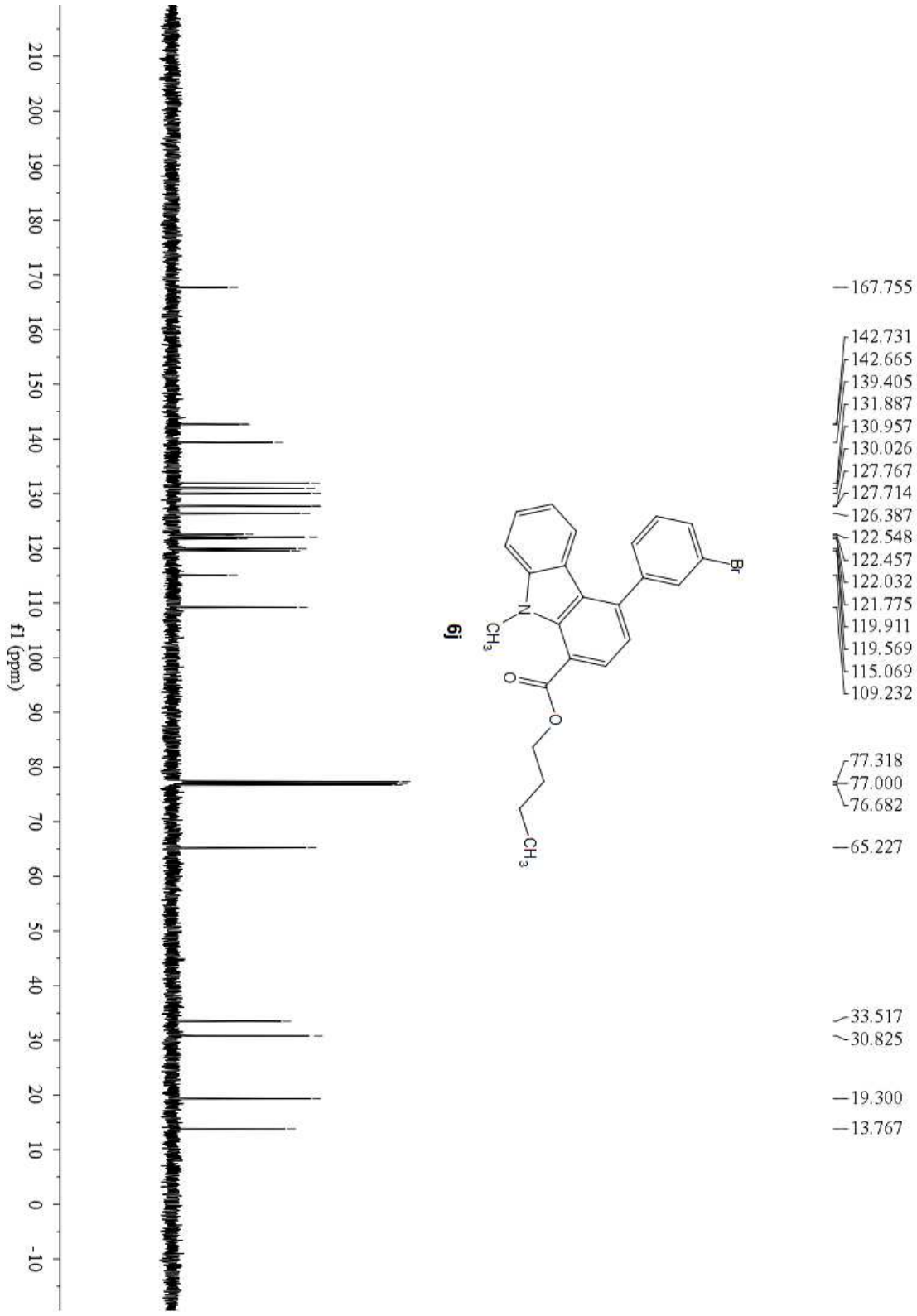

f1 (ppm)
1.00
2.00
2.00
2.00
1.01
2.00
2.00
3.00
2.02
2.02
3.01
6h
7.898
7.879
7.847
7.826
7.706
7.685
7.479
7.470
7.259
7.246
7.226
7.062
7.043
7.036
7.026
7.016
7.005
4.476
4.460
4.443
3.922
1.876
1.859
1.841
1.822
1.805
1.581
1.565
1.546
1.527
1.508
1.490
1.254
1.039
1.020
1.002
0.000

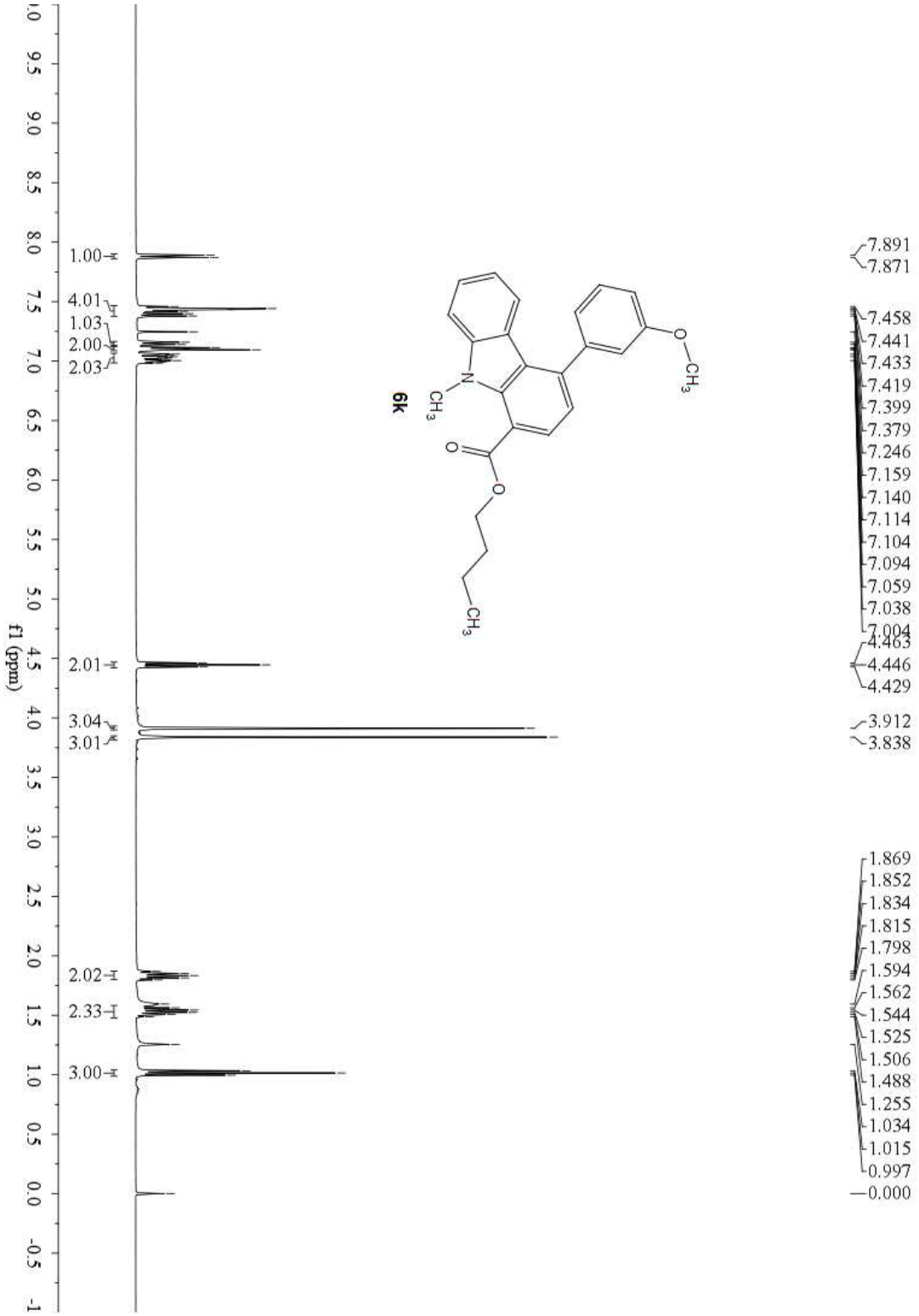

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
6h
N
CH3
O
O
CH3
167.669
145.471
142.764
139.357
138.776
132.385
129.898
127.773
126.645
122.170
121.740
121.458
119.703
119.664
118.802
115.627
111.862
109.442
77.317
77.000
76.682
65.351
33.496
30.816
19.296
13.755

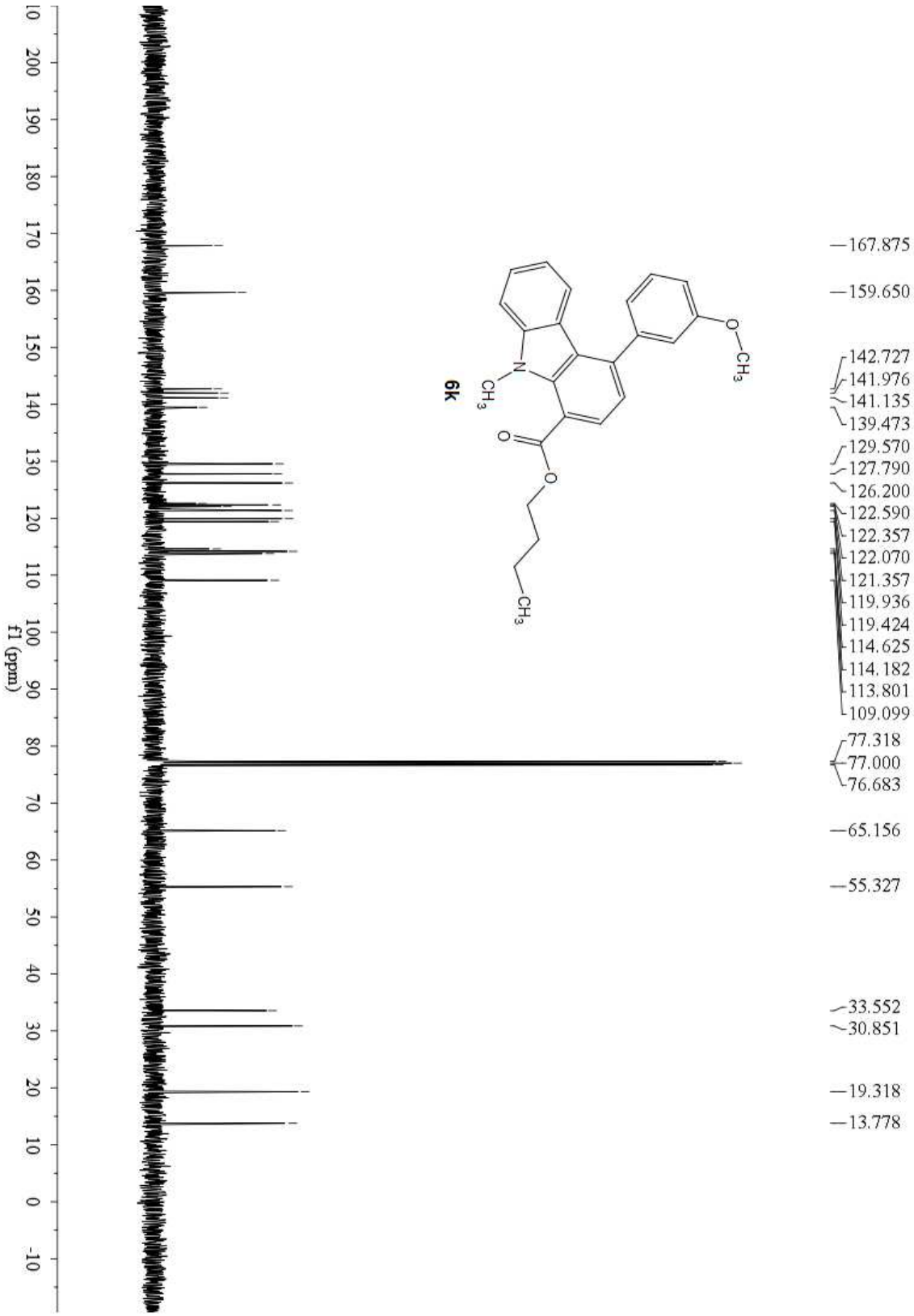

f1 (ppm)
2.00
1.00
2.00
2.01
1.25
2.02
2.02
3.02
3.02
2.01
2.01
3.00
6i
8.118
8.097
7.899
7.879
7.788
7.767
7.469
7.459
7.267
7.252
7.248
7.061
7.042
7.027
7.017
7.007
6.997
4.477
4.460
4.443
3.918
3.185
1.875
1.858
1.840
1.821
1.804
1.583
1.564
1.545
1.526
1.508
1.489
1.256
1.038
1.020
1.001
0.000

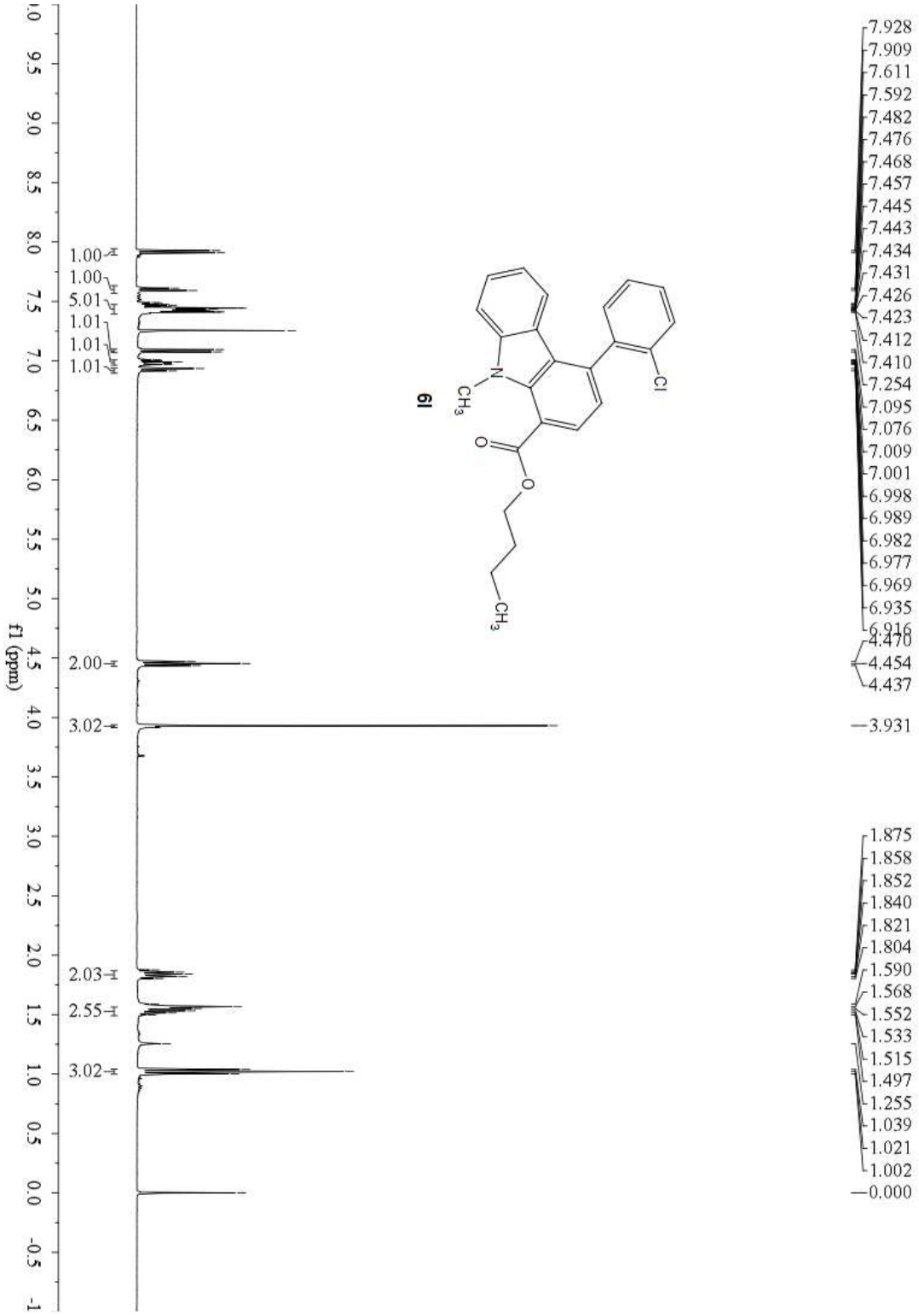

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
6i
H3C
O
S
O
N
CH3
O
O
CH3
167.617
146.367
142.690
139.956
139.300
138.586
130.041
127.703
127.608
126.621
122.142
121.744
121.374
119.812
119.660
115.580
109.385
77.318
77.000
76.682
65.297
44.533
33.458
30.754
19.244
13.722

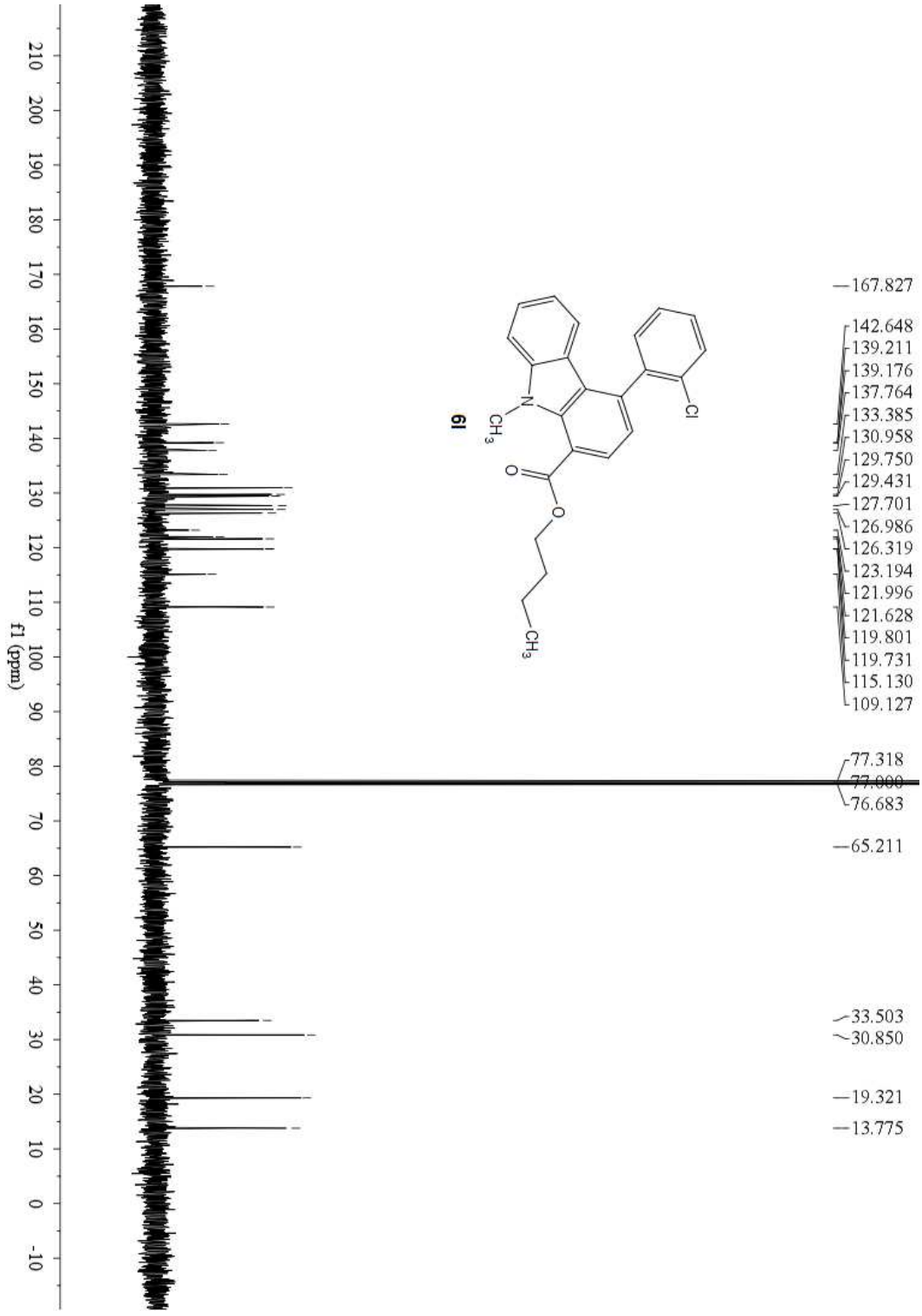

6j
Br
N
CH3
O
O
CH3
f1 (ppm)
1.00
1.00
1.00
1.01
2.00
1.02
1.00
2.01
2.00
3.01
2.01
2.39
3.01
7.883
7.863
7.723
7.719
7.714
7.651
7.646
7.643
7.631
7.626
7.624
7.511
7.491
7.458
7.448
7.415
7.395
7.376
7.342
7.323
7.248
7.070
7.051
7.038
7.029
7.019
7.009
4.465
4.449
4.432
3.911
1.871
1.853
1.836
1.816
1.799
1.580
1.561
1.542
1.523
1.505
1.253
1.034
1.016
0.998
-0.000

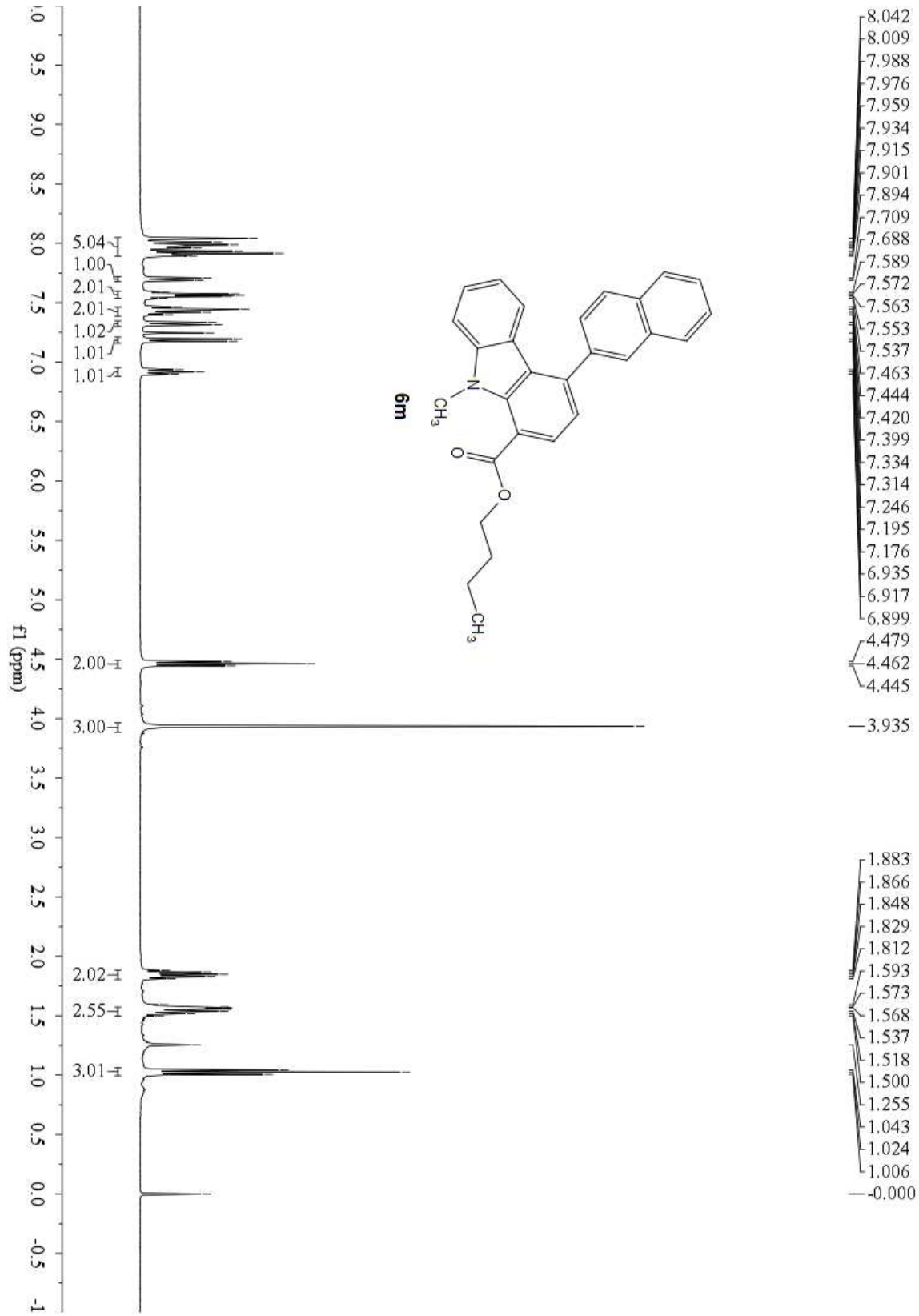

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
6j
Br
N
CH3
O
O
CH3
167.755
142.731
142.665
139.405
131.887
130.957
130.026
127.767
127.714
126.387
122.548
122.457
122.032
121.775
119.911
119.569
115.069
109.232
77.318
77.000
76.682
65.227
33.517
30.825
19.300
13.767

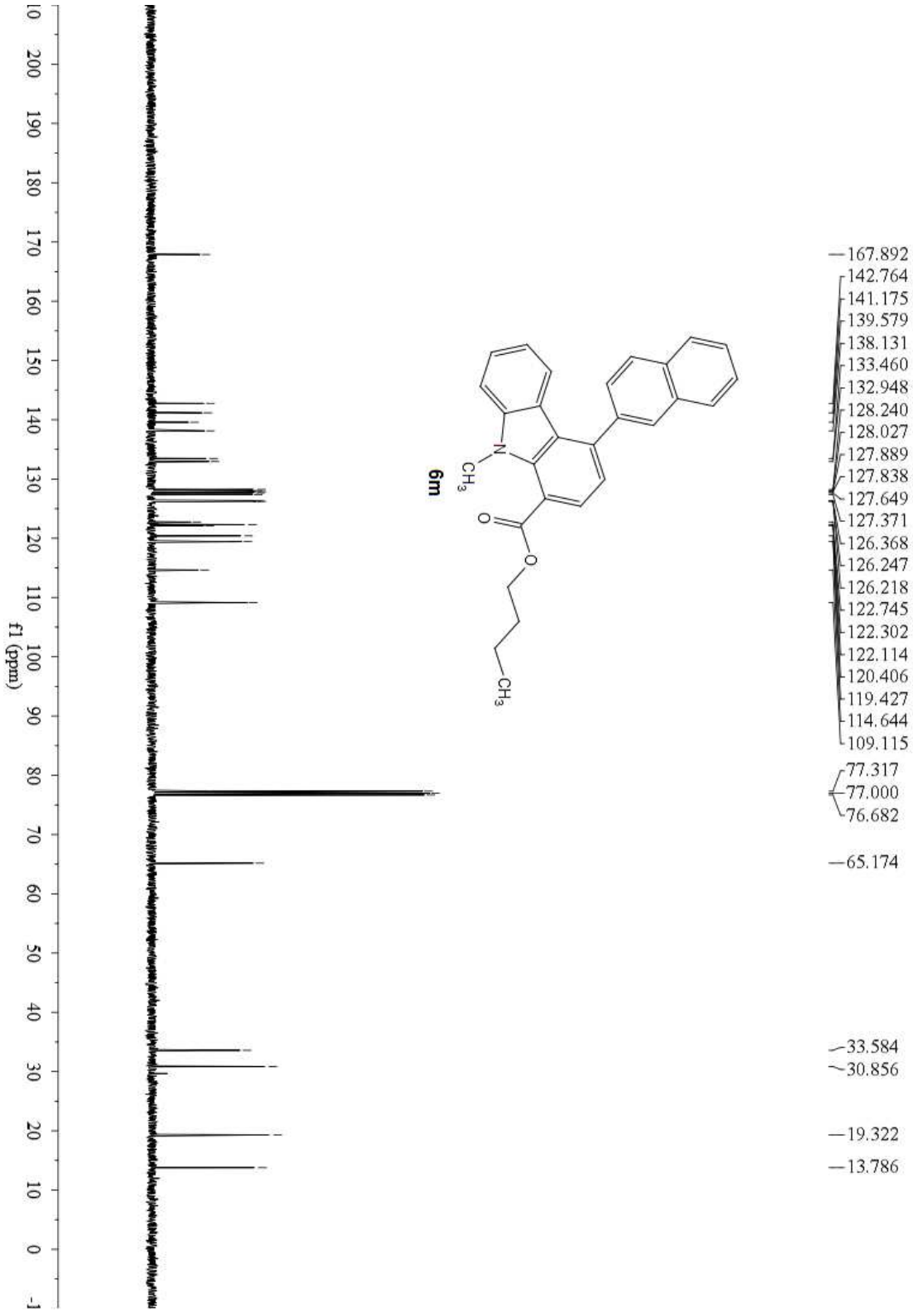

f1 (ppm)
1.00
4.01
1.03
2.00
2.03
2.01
3.04
3.01
2.02
2.33
3.00
6k
7.891
7.871
7.458
7.441
7.433
7.419
7.399
7.379
7.246
7.159
7.140
7.114
7.104
7.094
7.059
7.038
7.004
4.463
4.446
4.429
3.912
3.838
1.869
1.852
1.834
1.815
1.798
1.594
1.562
1.544
1.525
1.506
1.488
1.255
1.034
1.015
0.997
0.000

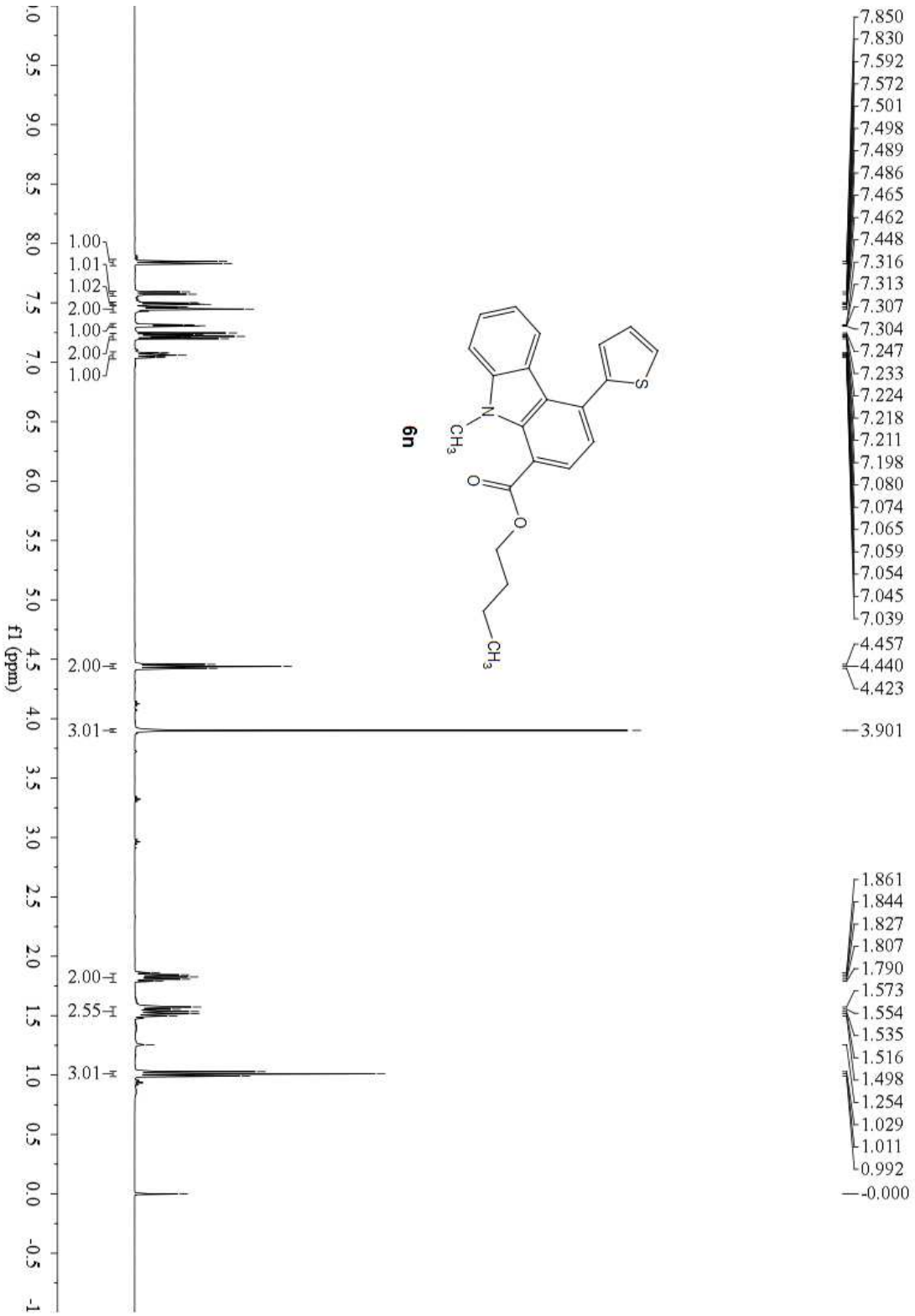

6k
167.875
159.650
142.727
141.976
141.135
139.473
129.570
127.790
126.200
122.590
122.357
122.070
121.357
119.936
119.424
114.625
114.182
113.801
109.099
77.318
77.000
76.683
65.156
55.327
33.552
30.851
19.318
13.778
f1 (ppm)

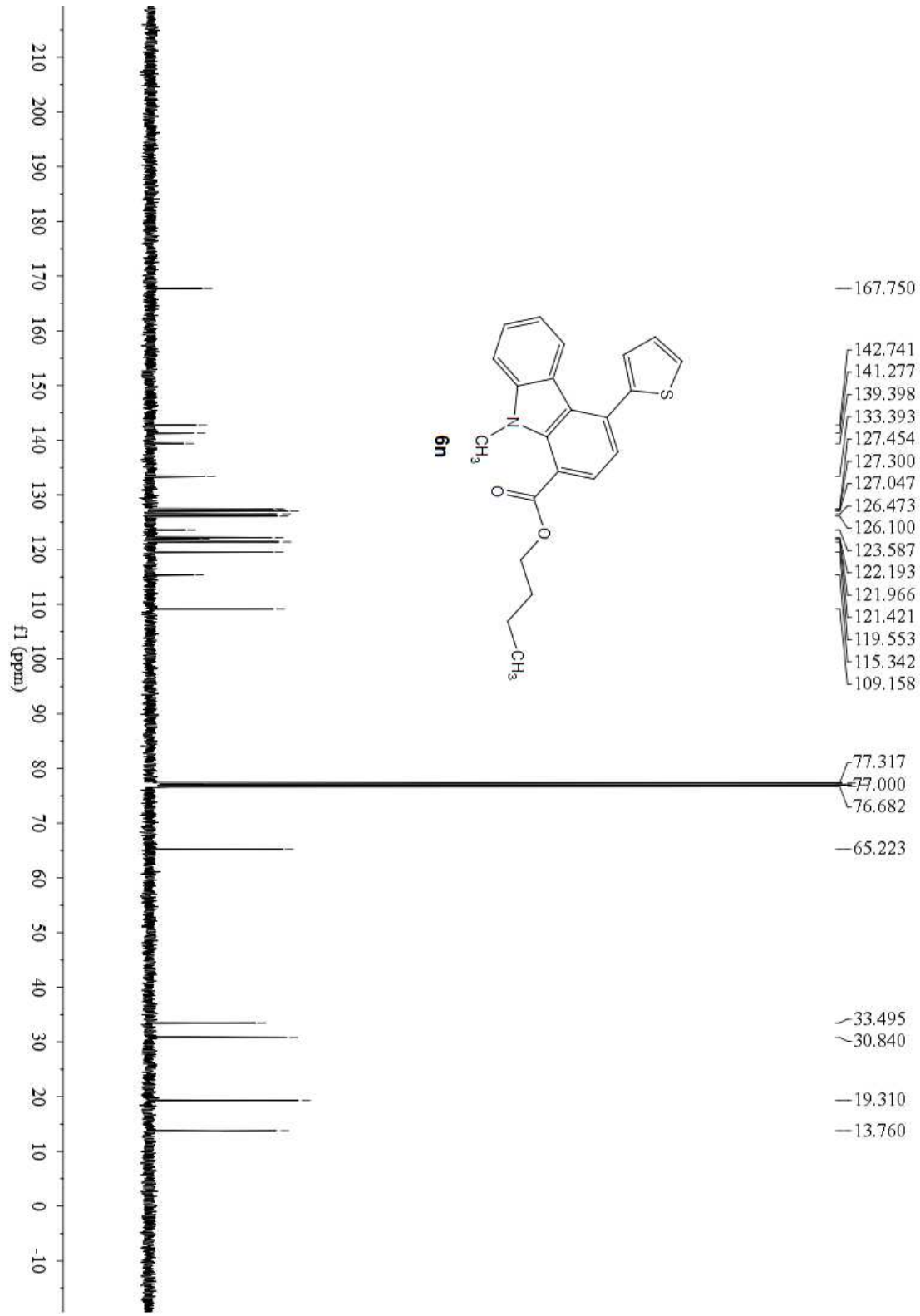

6l
Cl
N
CH3
O
O
CH3
f1 (ppm)
1.00
1.00
5.01
1.01
1.01
1.01
2.00
3.02
2.03
2.55
3.02
7.928
7.909
7.611
7.592
7.482
7.476
7.468
7.457
7.445
7.443
7.434
7.431
7.426
7.423
7.412
7.410
7.254
7.095
7.076
7.009
7.001
6.998
6.989
6.982
6.977
6.969
6.935
6.916
4.470
4.454
4.437
3.931
1.875
1.858
1.852
1.840
1.821
1.804
1.590
1.568
1.552
1.533
1.515
1.497
1.255
1.039
1.021
1.002
0.000

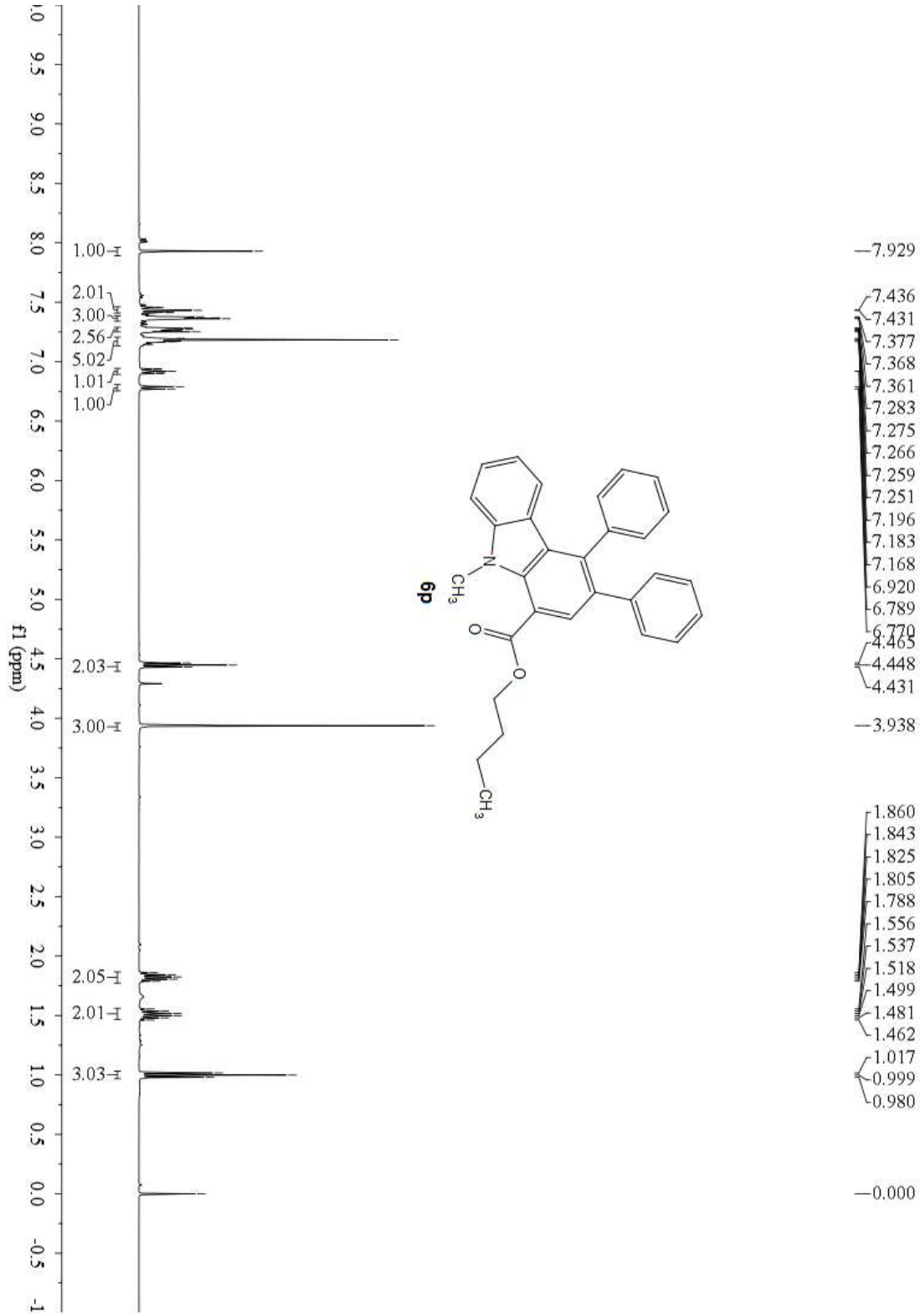

6l
167.827
142.648
139.211
139.176
137.764
133.385
130.958
129.750
129.431
127.701
126.986
126.319
123.194
121.996
121.628
119.801
119.731
115.130
109.127
77.318
77.000
76.683
65.211
33.503
30.850
19.321
13.775
f1 (ppm)

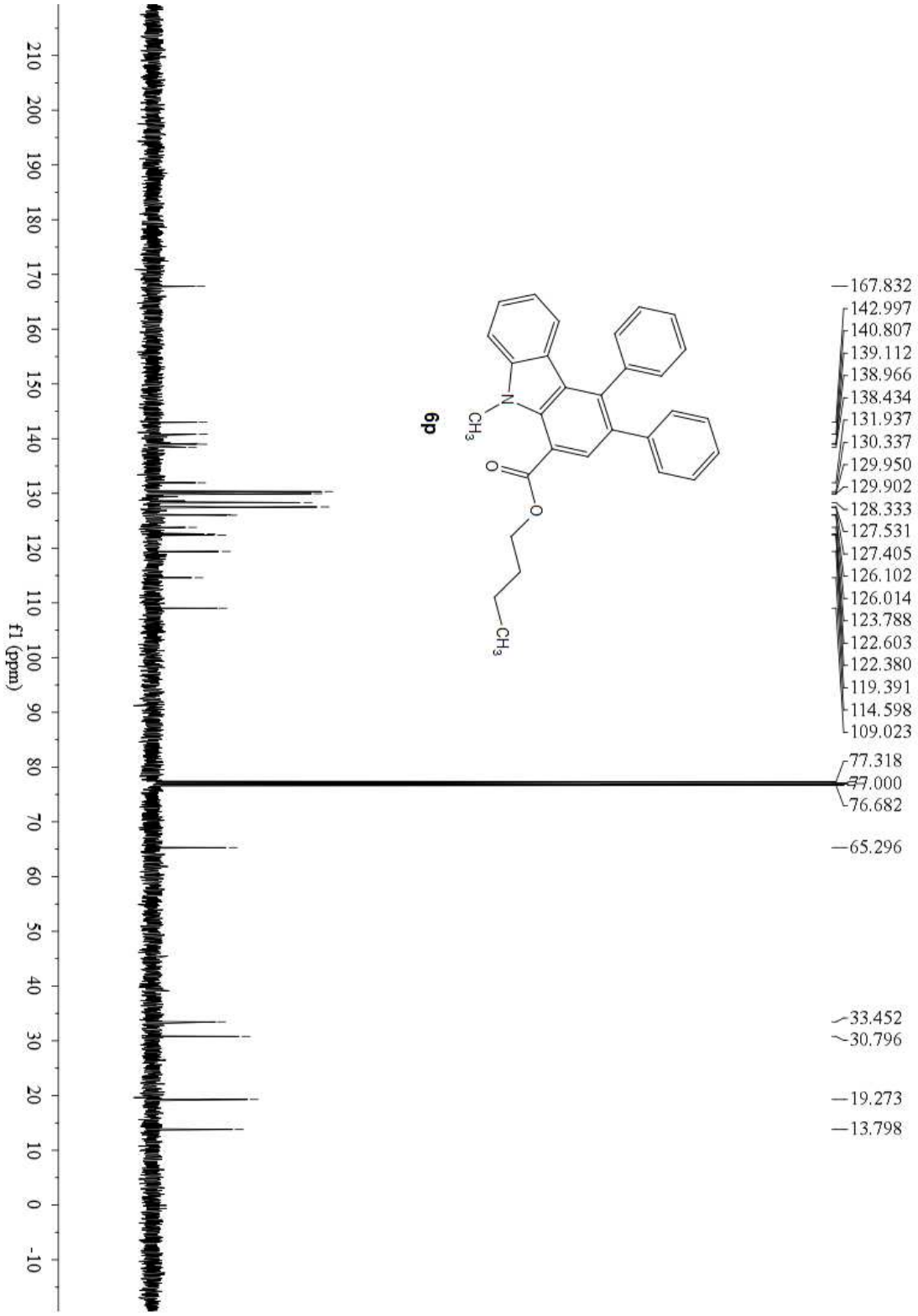

8.042
8.009
7.988
7.976
7.959
7.934
7.915
7.901
7.894
7.709
7.688
7.589
7.572
7.563
7.553
7.537
7.463
7.444
7.420
7.399
7.334
7.314
7.246
7.195
7.176
6.935
6.917
6.899
4.479
4.462
4.445
3.935
1.883
1.866
1.848
1.829
1.812
1.593
1.573
1.568
1.537
1.518
1.500
1.255
1.043
1.024
1.006
-0.000
5.04
1.00
2.01
2.01
1.02
1.01
1.01
2.00
3.00
2.02
2.55
3.01
6m
N
CH3
O
O
CH3
f1 (ppm)

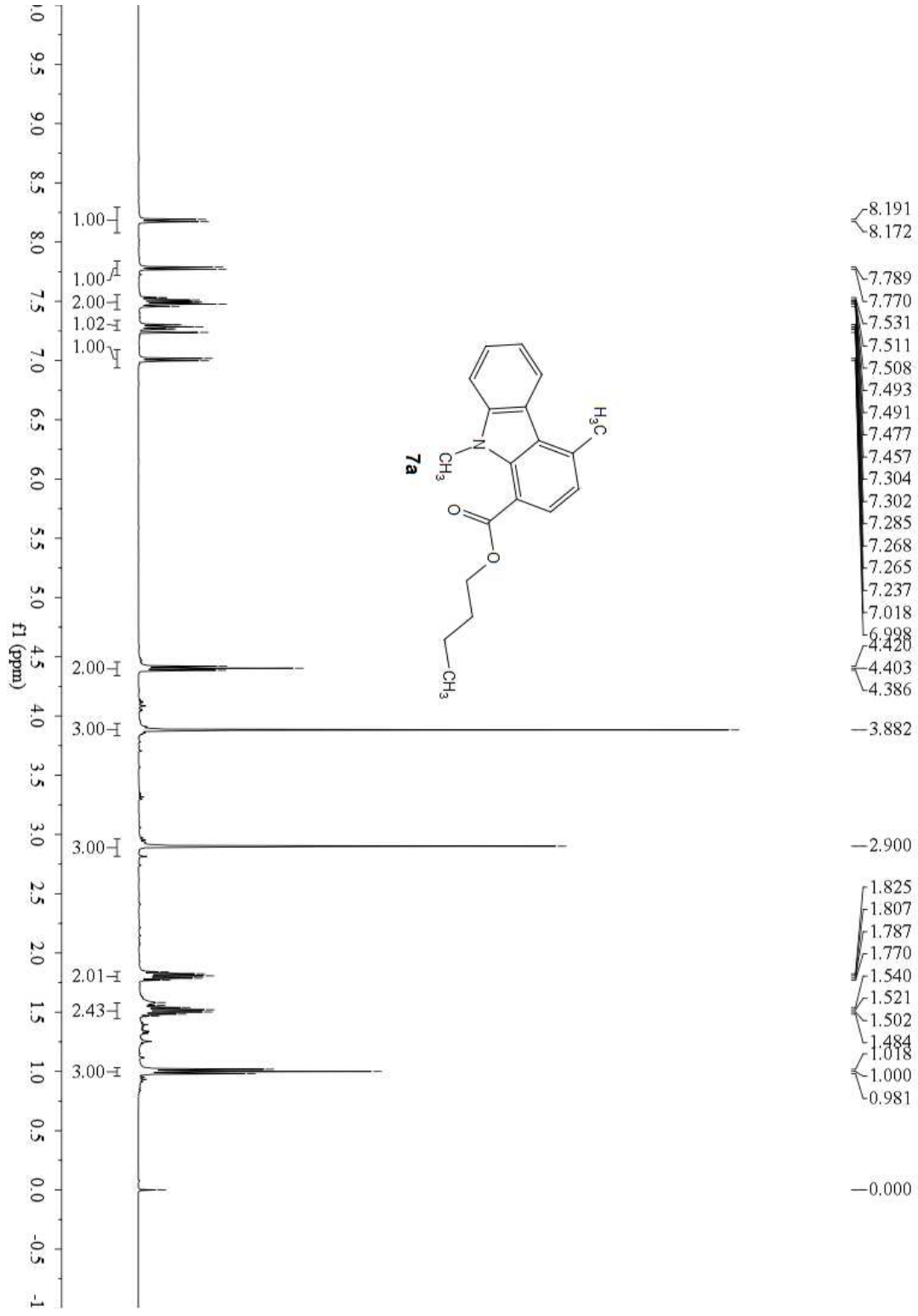

167.892
142.764
141.175
139.579
138.131
133.460
132.948
128.240
128.027
127.889
127.838
127.649
127.371
126.368
126.247
126.218
122.745
122.302
122.114
120.406
119.427
114.644
109.115
77.317
77.000
76.682
65.174
33.584
30.856
19.322
13.786
6m
f1 (ppm)

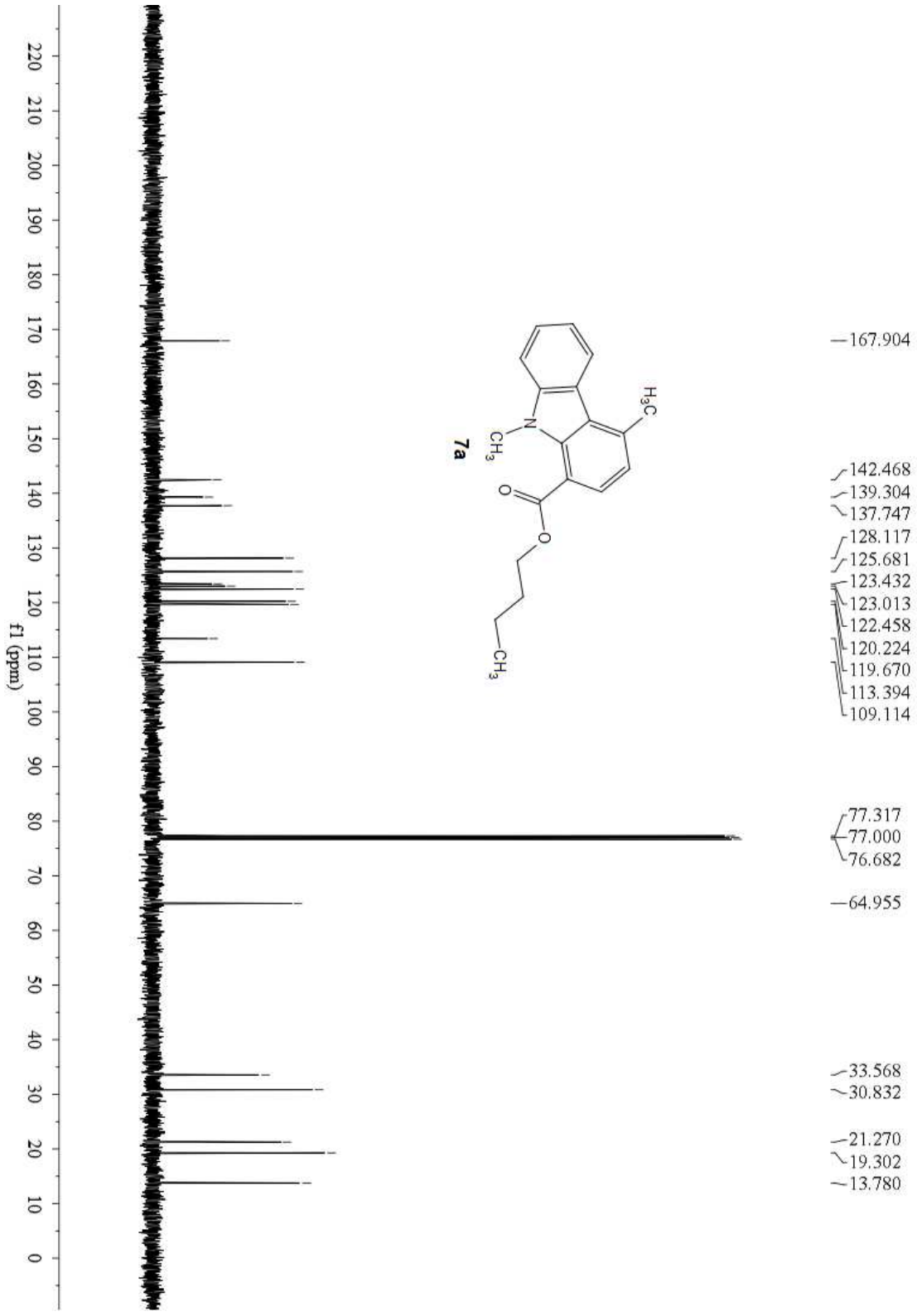

6n
f1 (ppm)
1.00
1.01
1.02
2.00
1.00
2.00
1.00
2.00
3.01
2.00
2.55
3.01
7.850
7.830
7.592
7.572
7.501
7.498
7.489
7.486
7.465
7.462
7.448
7.316
7.313
7.307
7.304
7.247
7.233
7.224
7.218
7.211
7.198
7.080
7.074
7.065
7.059
7.054
7.045
7.039
4.457
4.440
4.423
3.901
1.861
1.844
1.827
1.807
1.790
1.573
1.554
1.535
1.516
1.498
1.254
1.029
1.011
0.992
-0.000

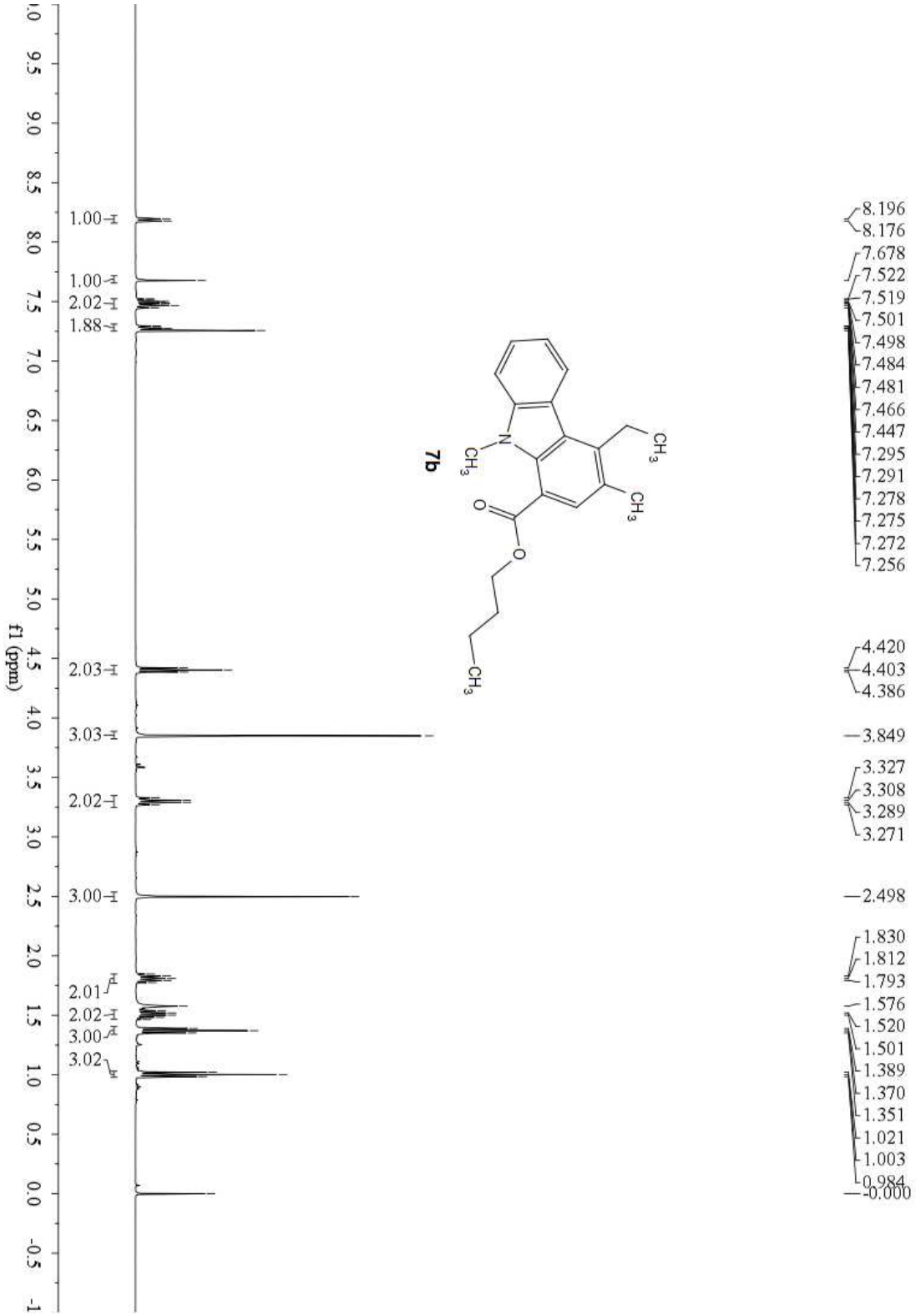

167.750
142.741
141.277
139.398
133.393
127.454
127.300
127.047
126.473
126.100
123.587
122.193
121.966
121.421
119.553
115.342
109.158
77.317
77.000
76.682
65.223
33.495
30.840
19.310
13.760
6n
f1 (ppm)

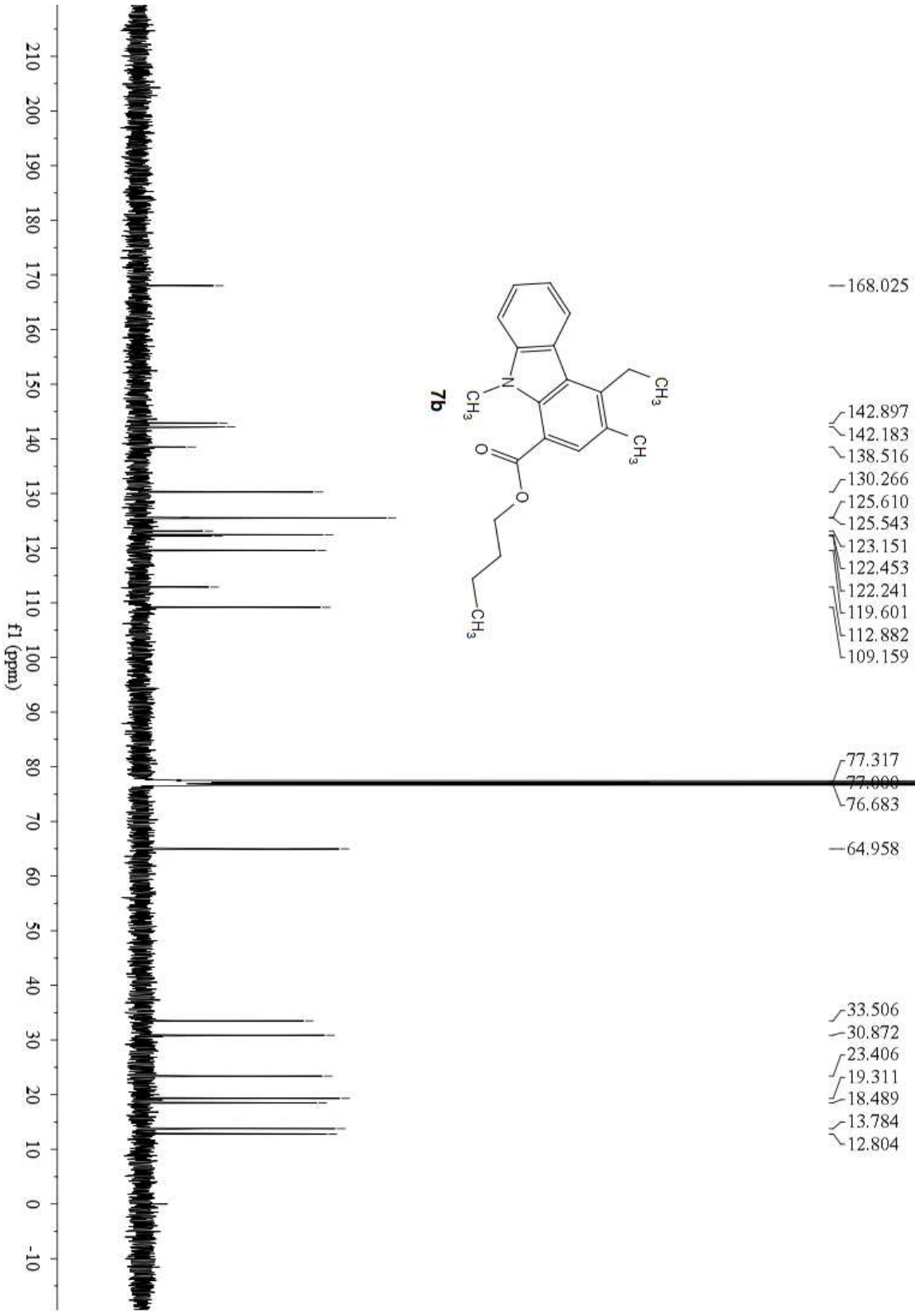

1.00
2.01
3.00
2.56
5.02
1.01
1.00
2.03
3.00
2.05
2.01
3.03
f1 (ppm)
6g
N
CH3
O
O
CH3
7.929
7.436
7.431
7.377
7.368
7.361
7.283
7.275
7.266
7.259
7.251
7.196
7.183
7.168
6.920
6.789
6.770
4.465
4.448
4.431
3.938
1.860
1.843
1.825
1.805
1.788
1.556
1.537
1.518
1.499
1.481
1.462
1.017
0.999
0.980
0.000

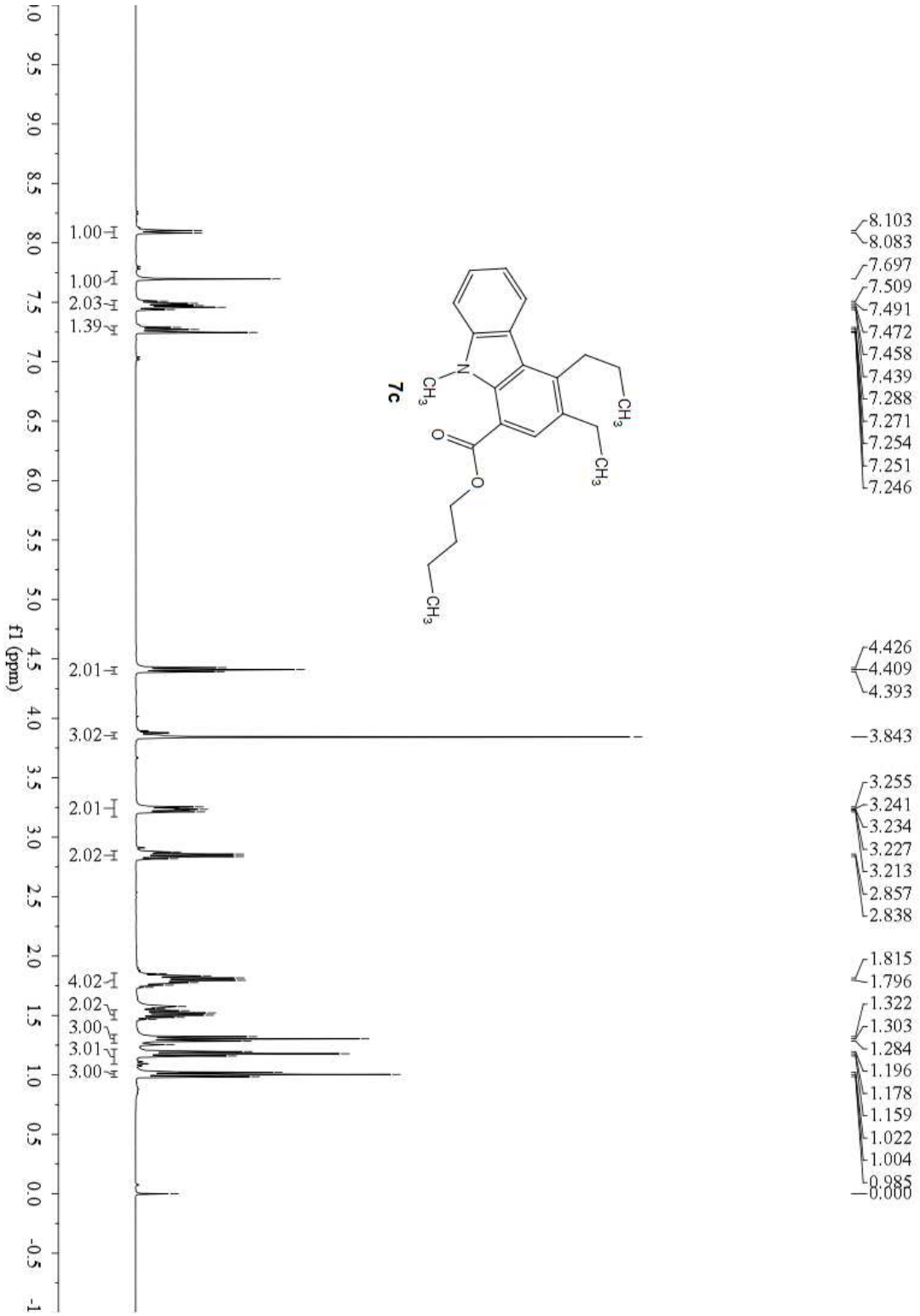

6p
167.832
142.997
140.807
139.112
138.966
138.434
131.937
130.337
129.950
129.902
128.333
127.531
127.405
126.102
126.014
123.788
122.603
122.380
119.391
114.598
109.023
77.318
77.000
76.682
65.296
33.452
30.796
19.273
13.798
f1 (ppm)

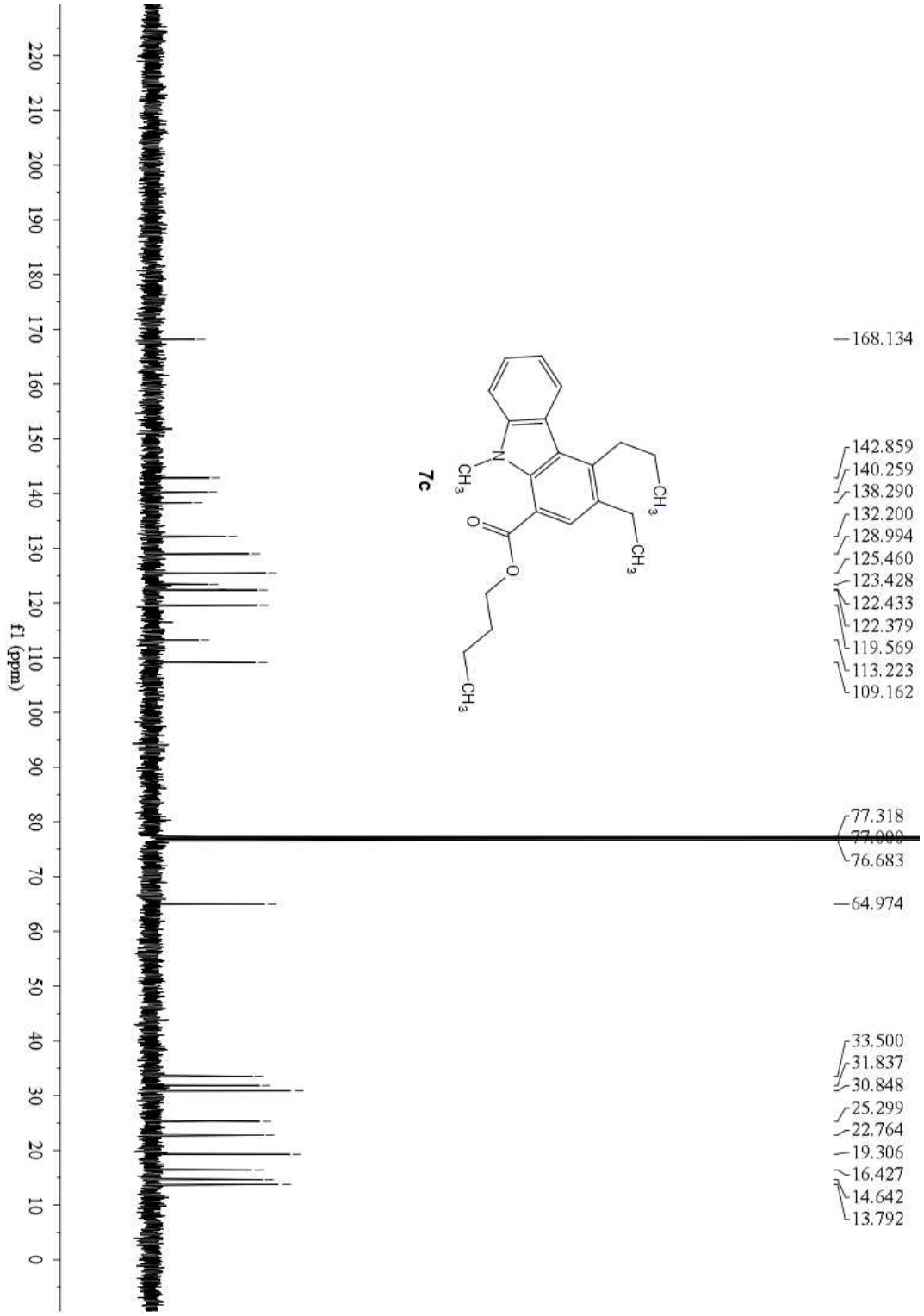

f1 (ppm)
1.00
1.00
2.00
1.02
1.00
2.00
3.00
3.00
2.01
2.43
3.00
8.191
8.172
7.789
7.770
7.531
7.511
7.508
7.493
7.491
7.477
7.457
7.304
7.302
7.285
7.268
7.265
7.237
7.018
6.998
4.420
4.403
4.386
3.882
2.900
1.825
1.807
1.787
1.770
1.540
1.521
1.502
1.484
1.018
1.000
0.981
0.000
7a

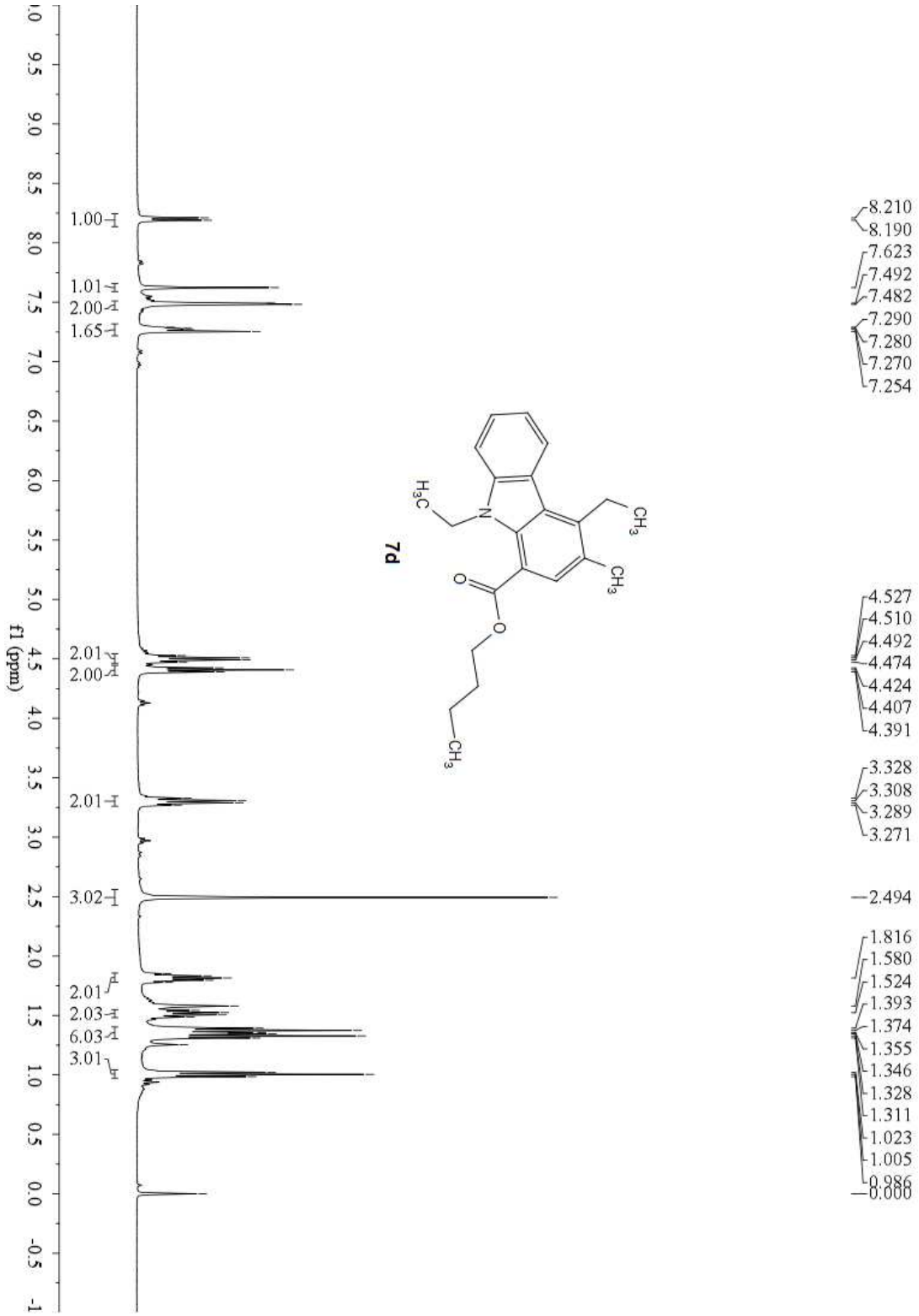

f1 (ppm)
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
7a
H3C
N
CH3
O
O
CH3
167.904
142.468
139.304
137.747
128.117
125.681
123.432
123.013
122.458
120.224
119.670
113.394
109.114
77.317
77.000
76.682
64.955
33.568
30.832
21.270
19.302
13.780

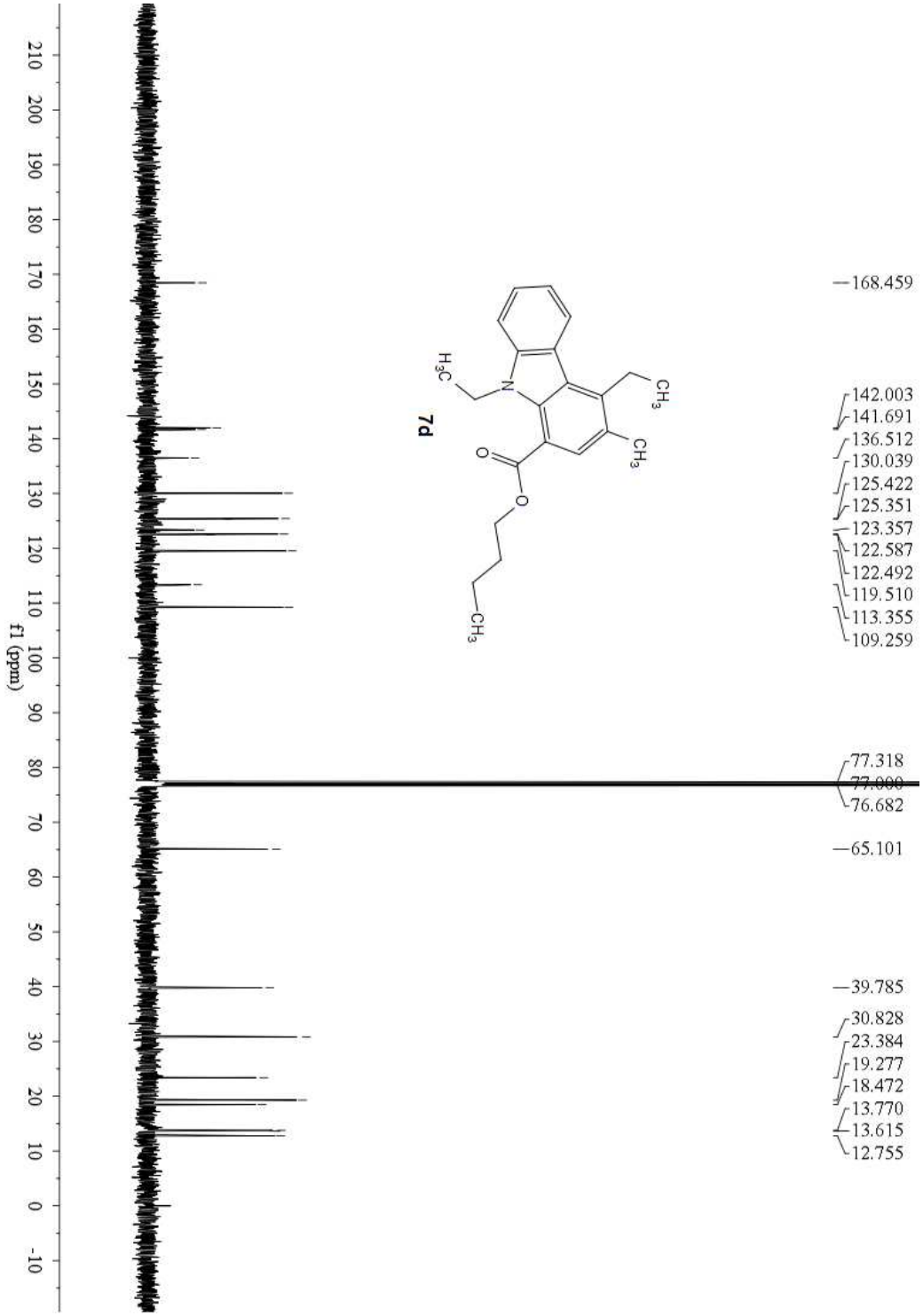

f1 (ppm)
1.00
1.00
2.02
1.88
2.03
3.03
2.02
3.00
2.01
2.02
3.00
3.02
7b
8.196
8.176
7.678
7.522
7.519
7.501
7.498
7.484
7.481
7.466
7.447
7.295
7.291
7.278
7.275
7.272
7.256
4.420
4.403
4.386
3.849
3.327
3.308
3.289
3.271
2.498
1.830
1.812
1.793
1.576
1.520
1.501
1.389
1.370
1.351
1.021
1.003
0.984
0.000

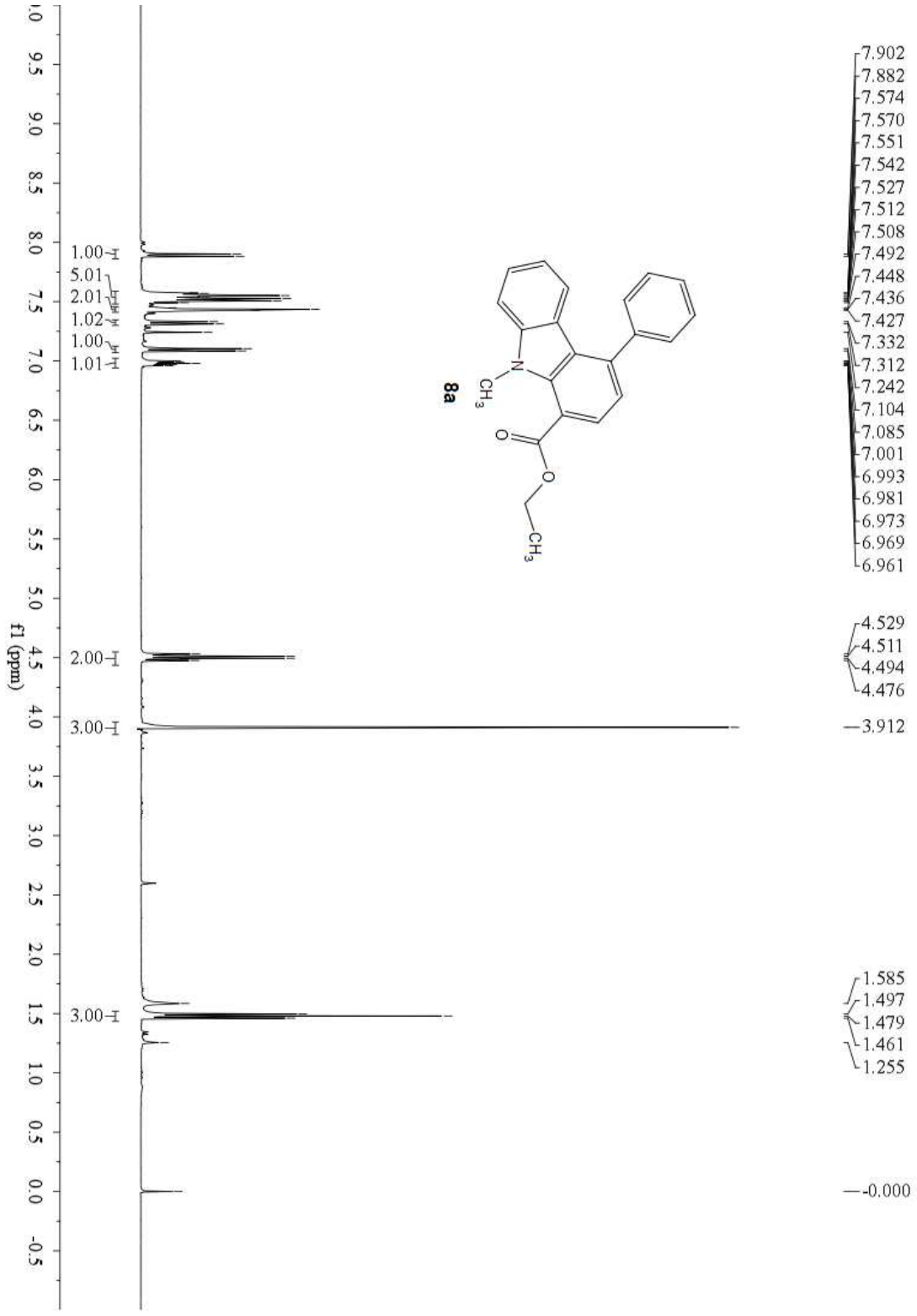

7b
168.025
142.897
142.183
138.516
130.266
125.610
125.543
123.151
122.453
122.241
119.601
112.882
109.159
77.317
77.000
76.683
64.958
33.506
30.872
23.406
19.311
18.489
13.784
12.804
f1 (ppm)

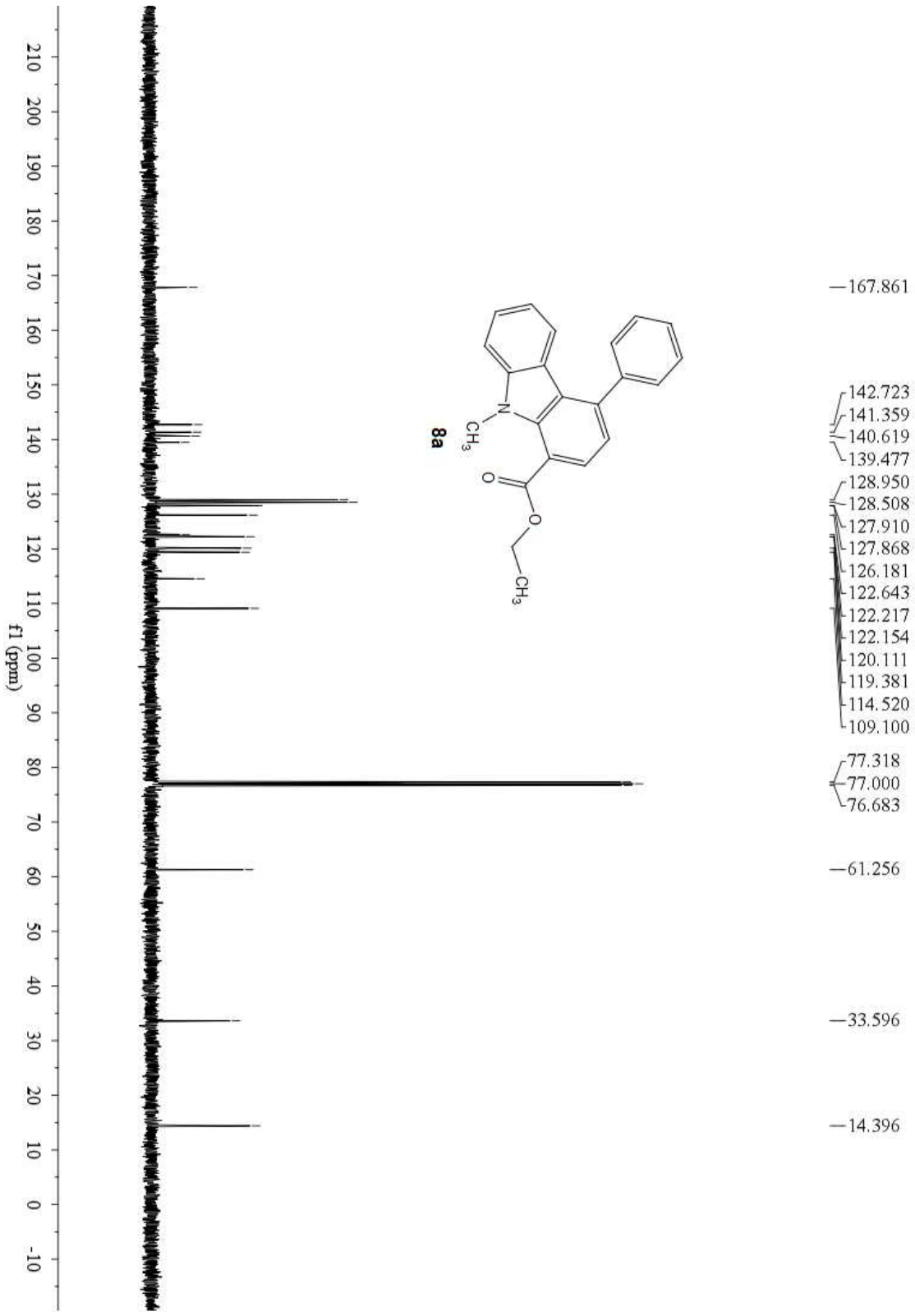

f1 (ppm)
1.00
1.00
2.03
1.39
2.01
3.02
2.01
2.02
4.02
2.02
3.00
3.01
3.00
7c
8.103
8.083
7.697
7.509
7.491
7.472
7.458
7.439
7.288
7.271
7.254
7.251
7.246
4.426
4.409
4.393
3.843
3.255
3.241
3.234
3.227
3.213
2.857
2.838
1.815
1.796
1.322
1.303
1.284
1.196
1.178
1.159
1.022
1.004
0.985
0.000

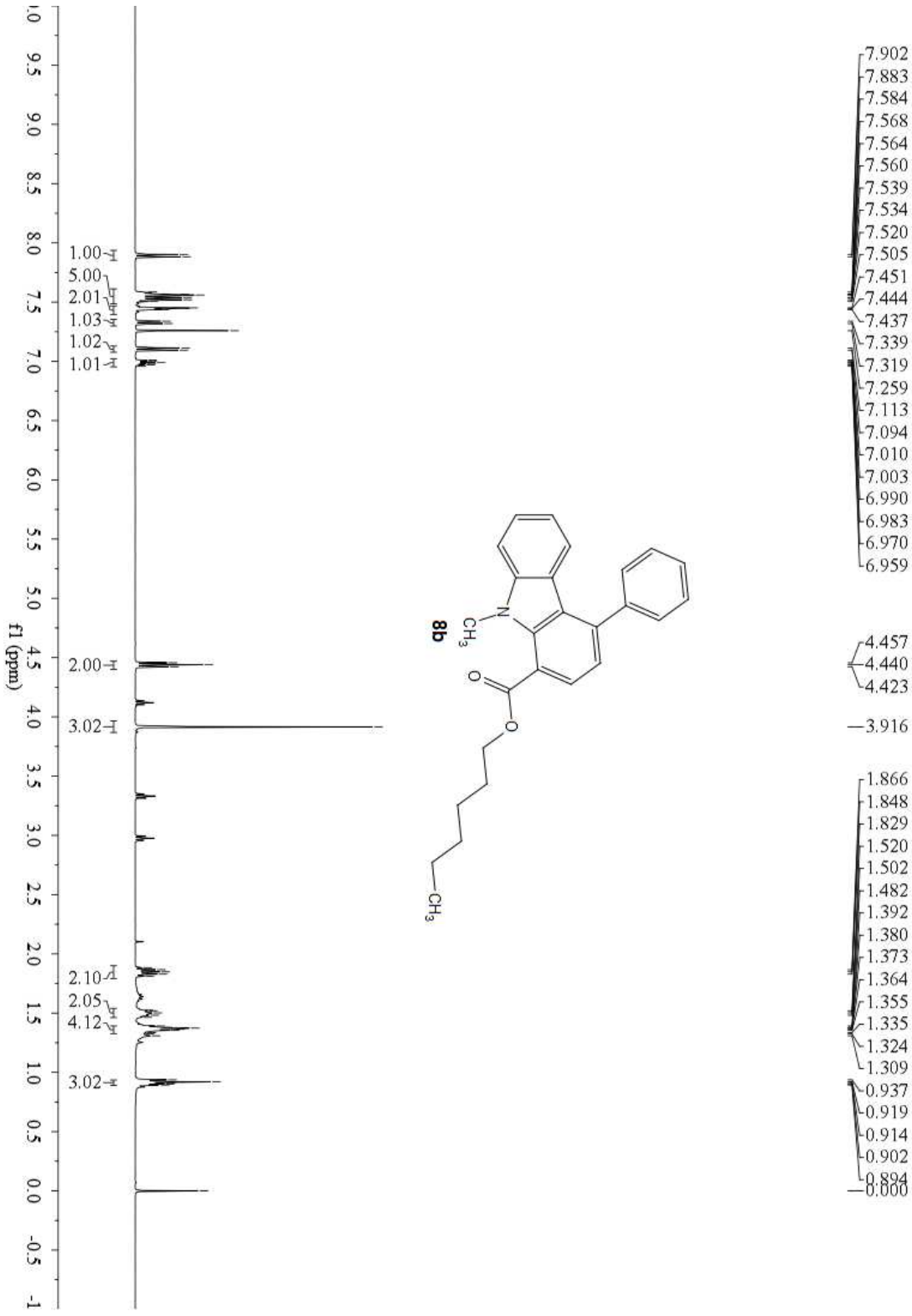

f1 (ppm)
7c
168.134
142.859
140.259
138.290
132.200
128.994
125.460
123.428
122.433
122.379
119.569
113.223
109.162
77.318
77.000
76.683
64.974
33.500
31.837
30.848
25.299
22.764
19.306
16.427
14.642
13.792

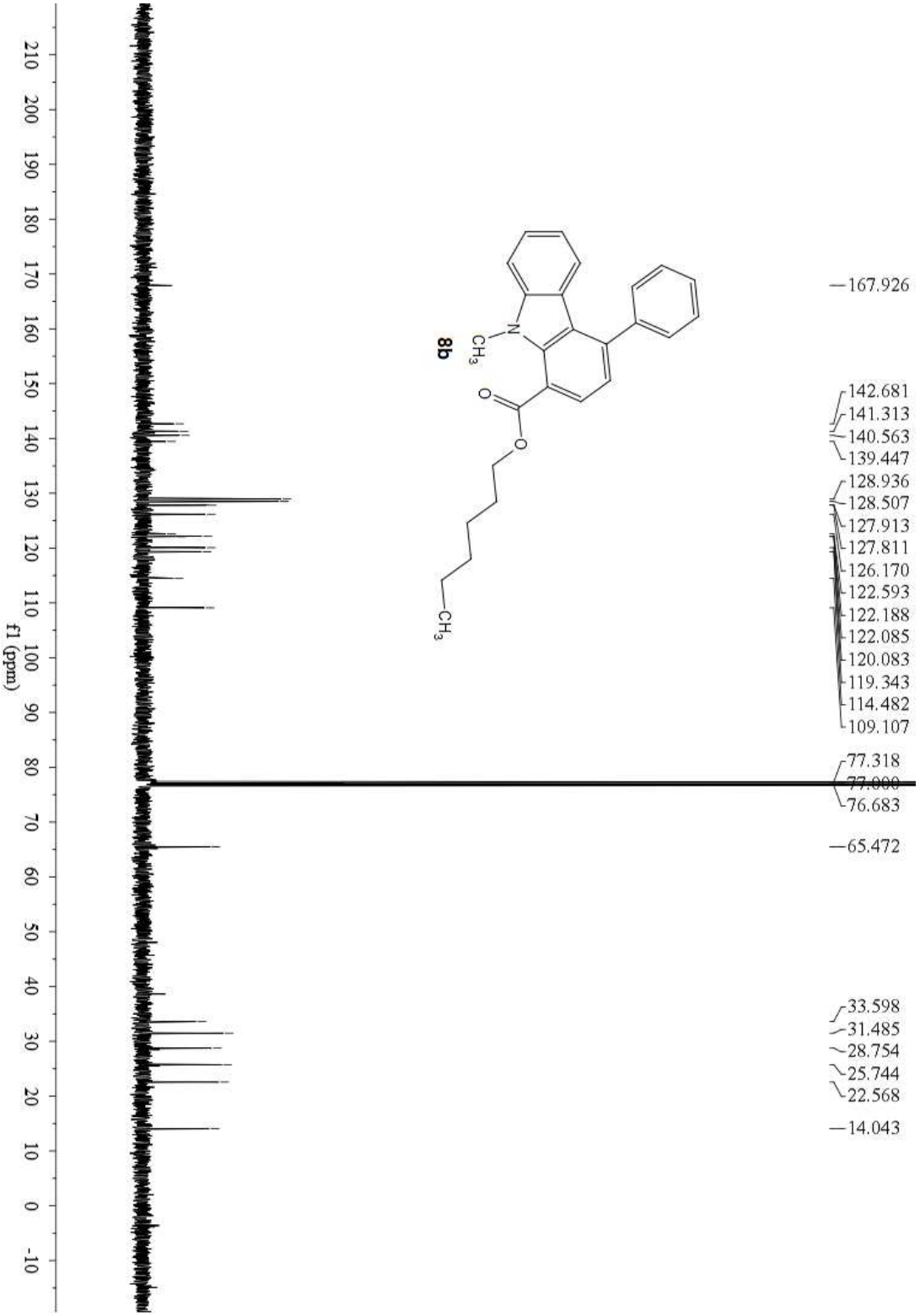

f1 (ppm)
1.00
1.01
2.00
1.65
2.01
2.00
2.01
3.02
2.01
2.03
6.03
3.01
7d
8.210
8.190
7.623
7.492
7.482
7.290
7.280
7.270
7.254
4.527
4.510
4.492
4.474
4.424
4.407
4.391
3.328
3.308
3.289
3.271
2.494
1.816
1.580
1.524
1.393
1.374
1.355
1.346
1.328
1.311
1.023
1.005
0.986
0.000

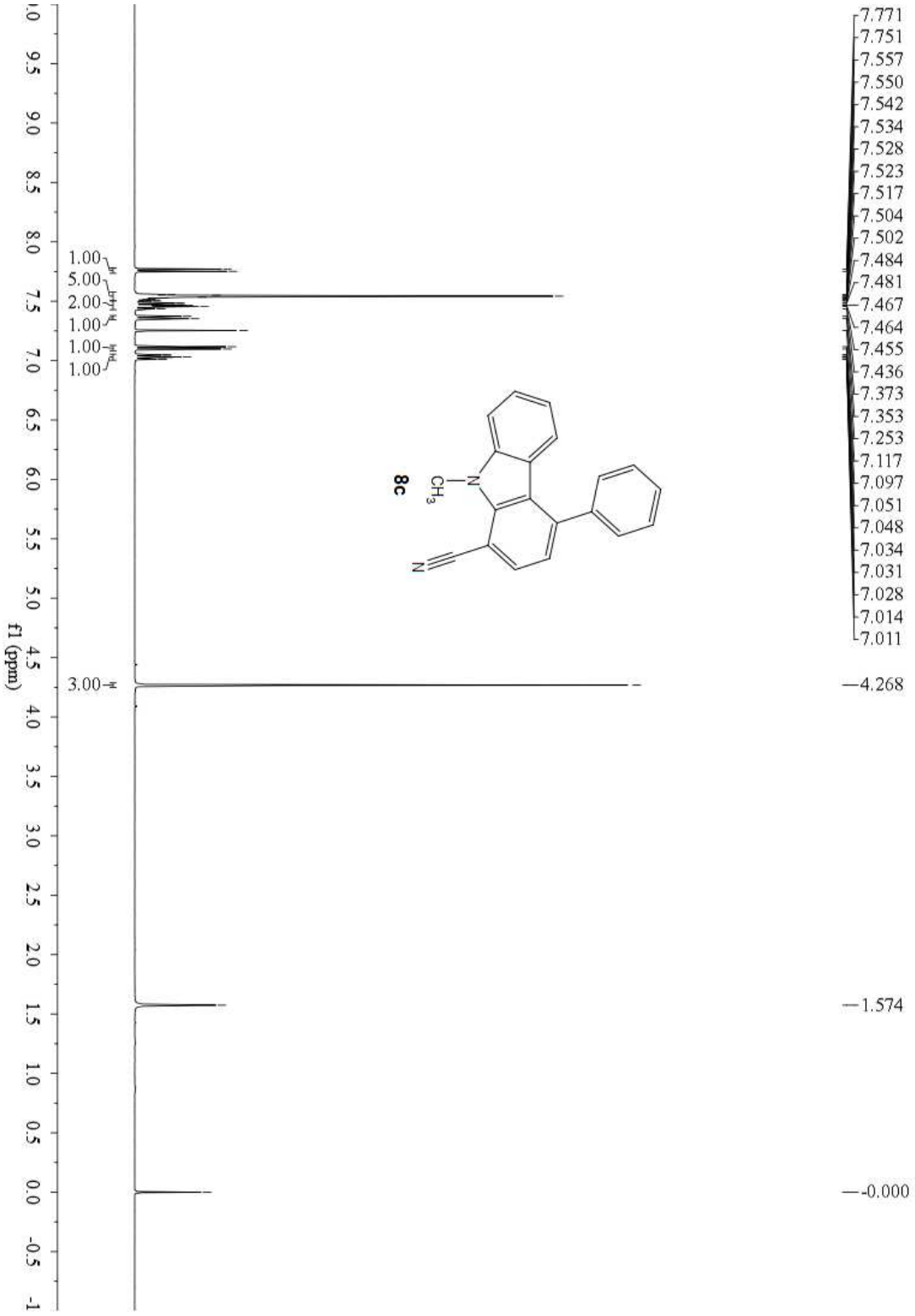

7d
168.459
142.003
141.691
136.512
130.039
125.422
125.351
123.357
122.587
122.492
119.510
113.355
109.259
77.318
77.000
76.682
65.101
39.785
30.828
23.384
19.277
18.472
13.770
13.615
12.755
f1 (ppm)

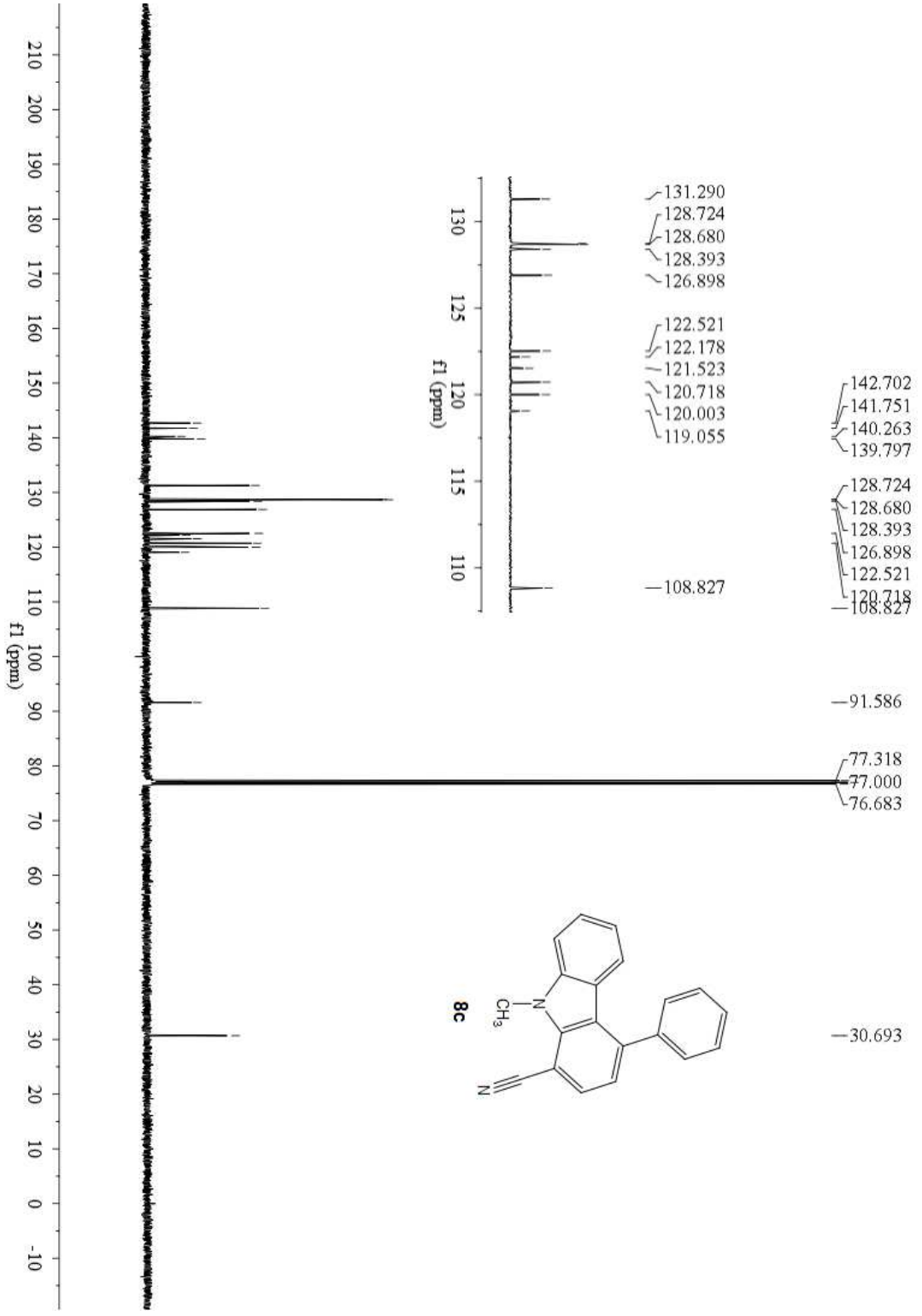

f1 (ppm)
1.00
5.01
2.01
1.02
1.00
1.01
2.00
3.00
3.00
8a
7.902
7.882
7.574
7.570
7.551
7.542
7.527
7.512
7.508
7.492
7.448
7.436
7.427
7.332
7.312
7.242
7.104
7.085
7.001
6.993
6.981
6.973
6.969
6.961
4.529
4.511
4.494
4.476
3.912
1.585
1.497
1.479
1.461
1.255
-0.000

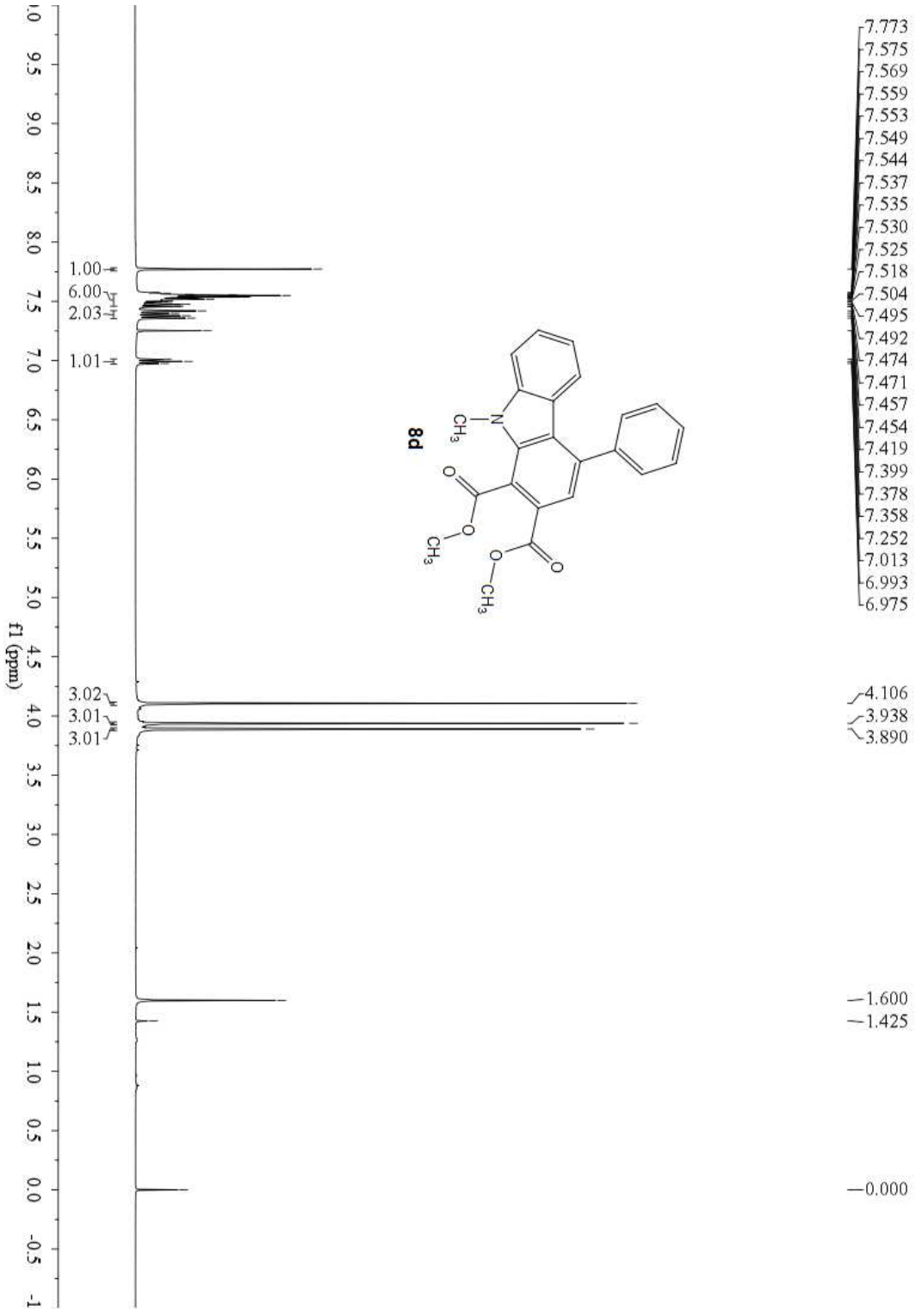

f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
8a
N
CH3
O
O
CH3
167.861
142.723
141.359
140.619
139.477
128.950
128.508
127.910
127.868
126.181
122.643
122.217
122.154
120.111
119.381
114.520
109.100
77.318
77.000
76.683
61.256
33.596
14.396

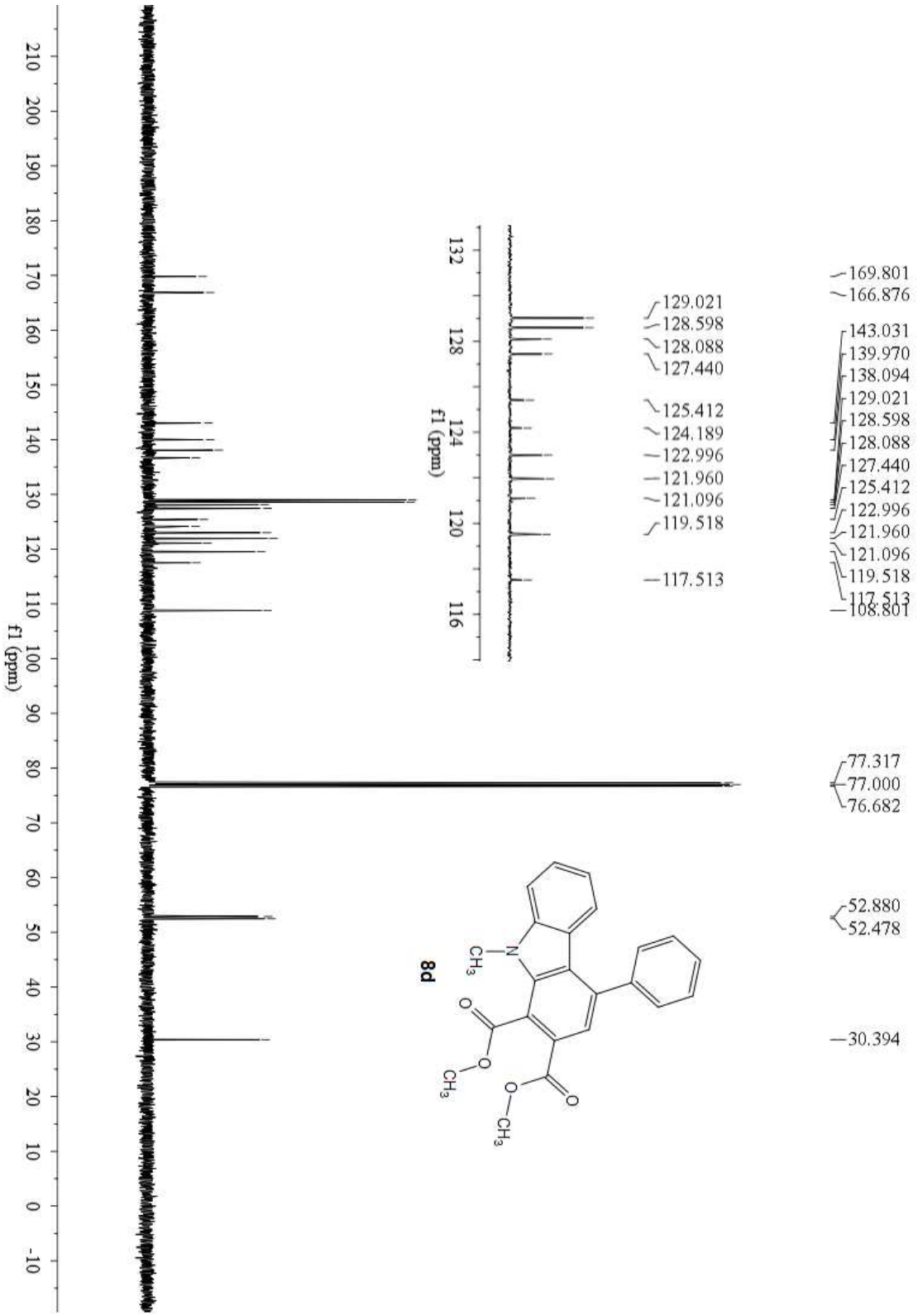

f1 (ppm)
1.00
5.00
2.01
1.03
1.02
1.01
2.00
3.02
2.10
2.05
4.12
3.02
8b
CH3
N
O
O
CH3
7.902
7.883
7.584
7.568
7.564
7.560
7.539
7.534
7.520
7.505
7.451
7.444
7.437
7.339
7.319
7.259
7.113
7.094
7.010
7.003
6.990
6.983
6.970
6.959
4.457
4.440
4.423
3.916
1.866
1.848
1.829
1.520
1.502
1.482
1.392
1.380
1.373
1.364
1.355
1.335
1.324
1.309
0.937
0.919
0.914
0.902
0.894
0.000

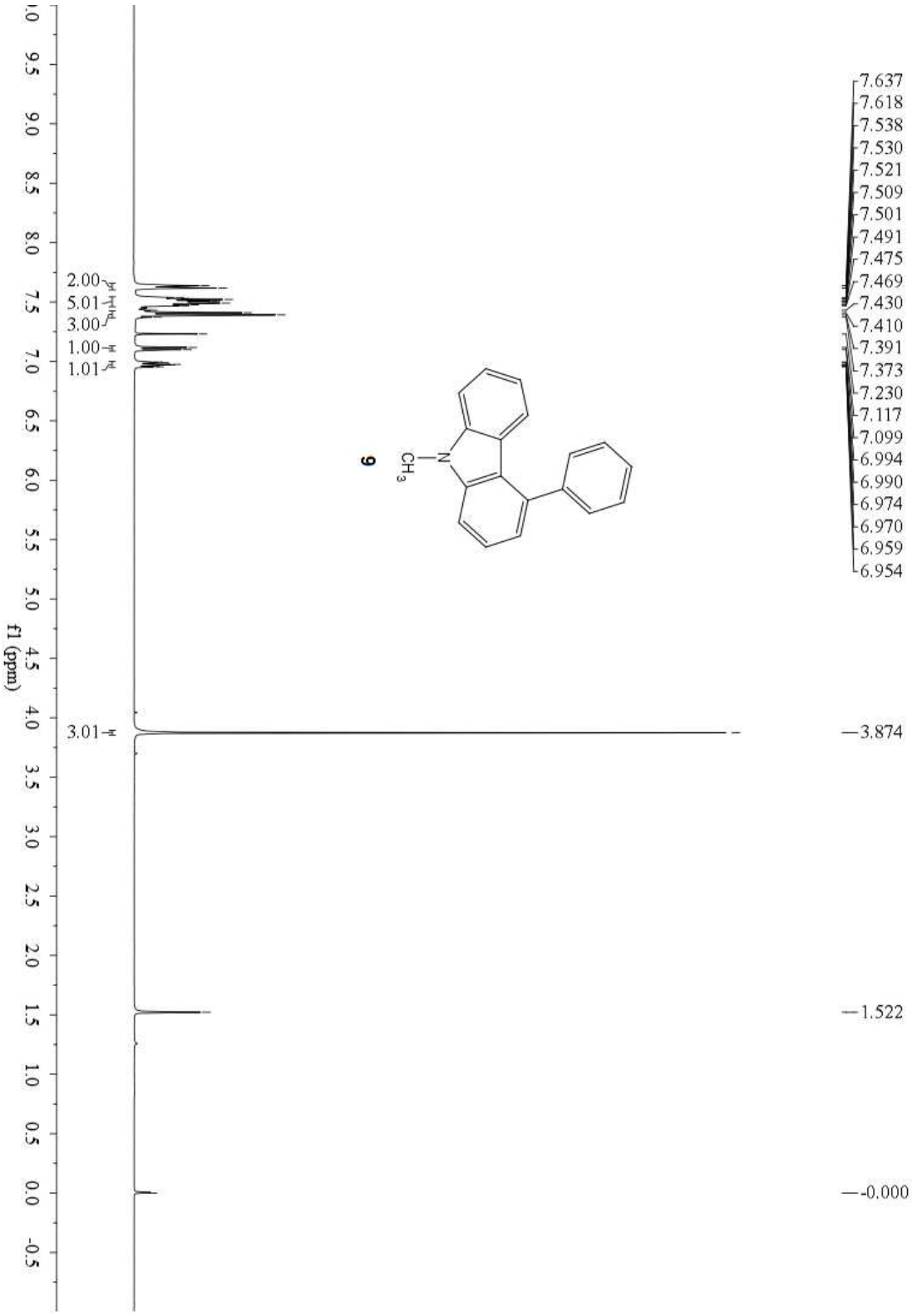

8b
167.926
142.681
141.313
140.563
139.447
128.936
128.507
127.913
127.811
126.170
122.593
122.188
122.085
120.083
119.343
114.482
109.107
77.318
77.000
76.683
65.472
33.598
31.485
28.754
25.744
22.568
14.043
f1 (ppm)

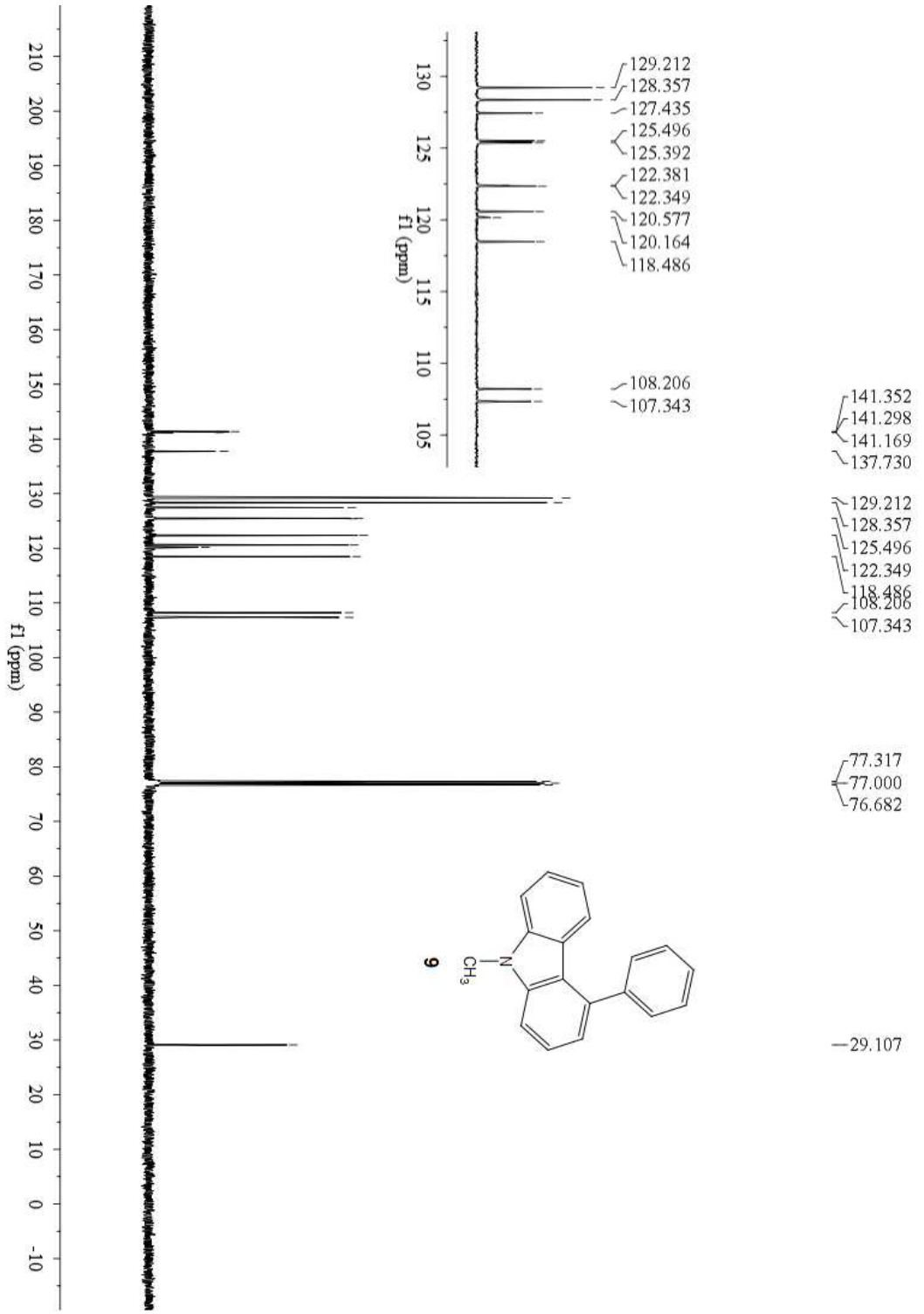

7.771
7.751
7.557
7.550
7.542
7.534
7.528
7.523
7.517
7.504
7.502
7.484
7.481
7.467
7.464
7.455
7.436
7.373
7.353
7.253
7.117
7.097
7.051
7.048
7.034
7.031
7.028
7.014
7.011
4.268
1.574
0.000
1.00
5.00
2.00
1.00
1.00
1.00
3.00
8c
CH3
N
N
f1 (ppm)

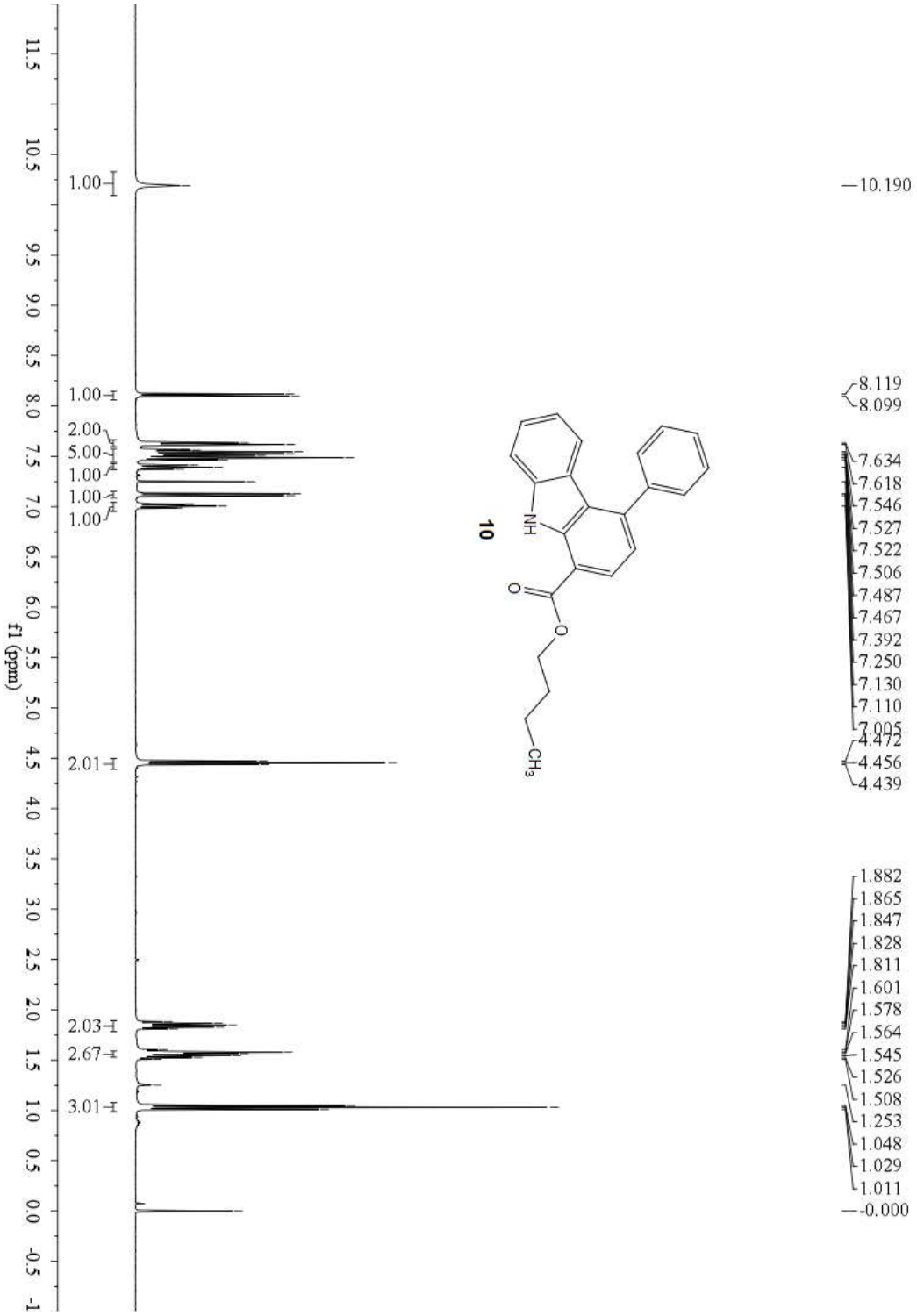

131.290
128.724
128.680
128.393
126.898
122.521
122.178
121.523
120.718
120.003
119.055
108.827
142.702
141.751
140.263
139.797
128.724
128.680
128.393
126.898
122.521
120.718
108.827
91.586
77.318
77.000
76.683
30.693
f1 (ppm)
8c

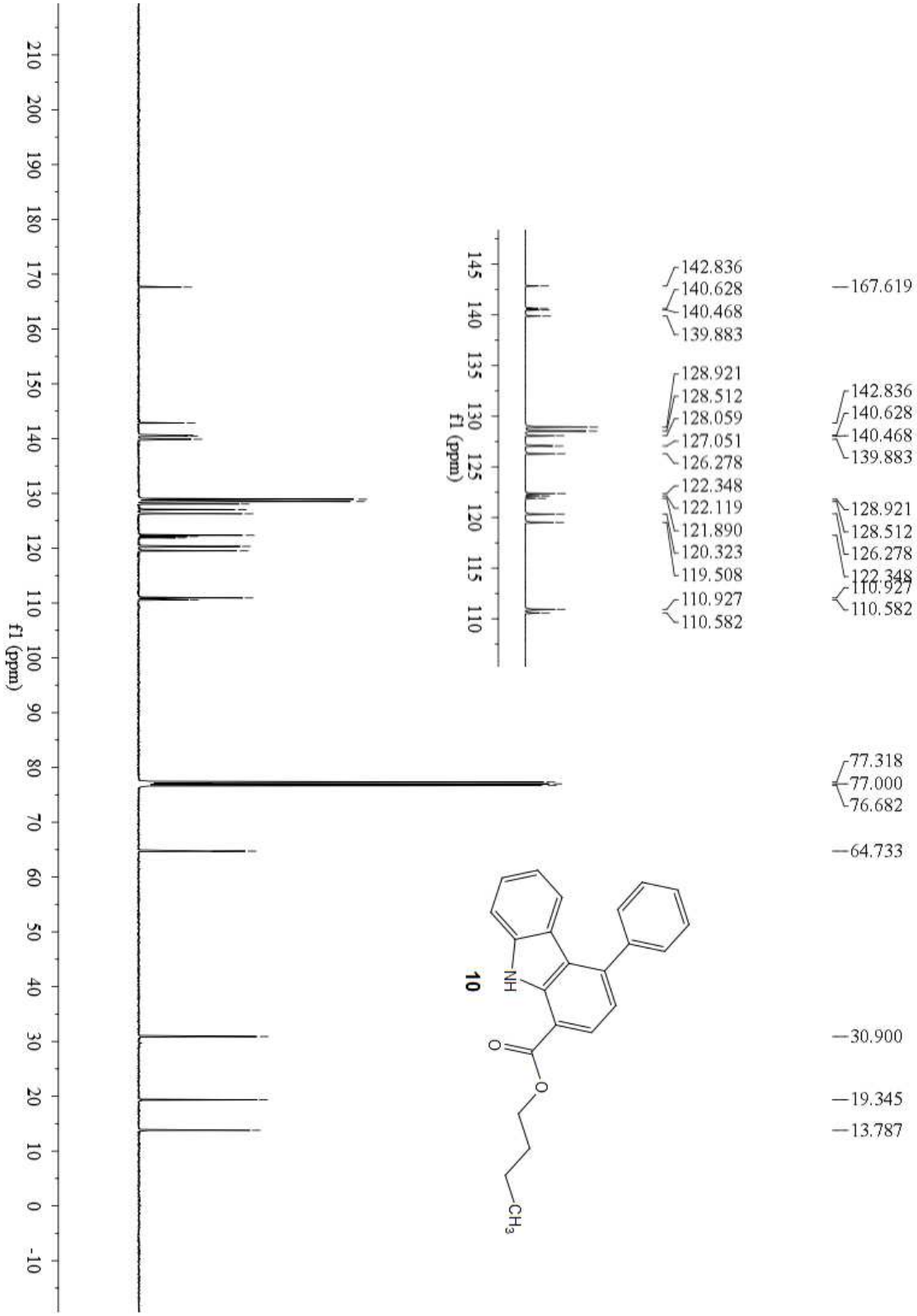

8d
1.00
6.00
2.03
1.01
3.02
3.01
3.01
7.773
7.575
7.569
7.559
7.553
7.549
7.544
7.537
7.535
7.530
7.525
7.518
7.504
7.495
7.492
7.474
7.471
7.457
7.454
7.419
7.399
7.378
7.358
7.252
7.013
6.993
6.975
4.106
3.938
3.890
1.600
1.425
0.000
f1 (ppm)

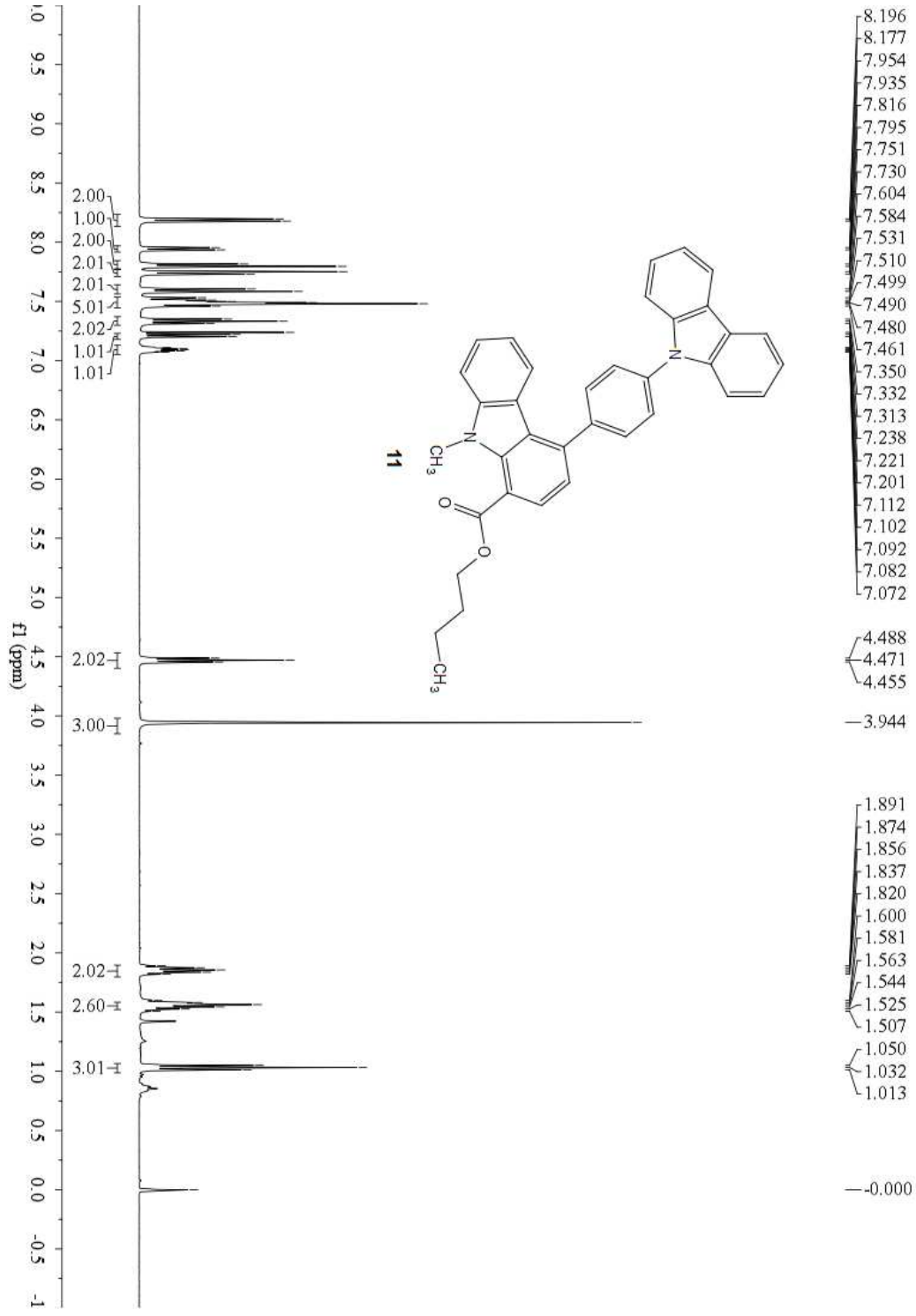

169.801
166.876
143.031
139.970
138.094
129.021
128.598
128.088
127.440
125.412
124.189
122.996
121.960
121.096
119.518
117.513
108.801
77.317
77.000
76.682
52.880
52.478
30.394
f1 (ppm)
8d

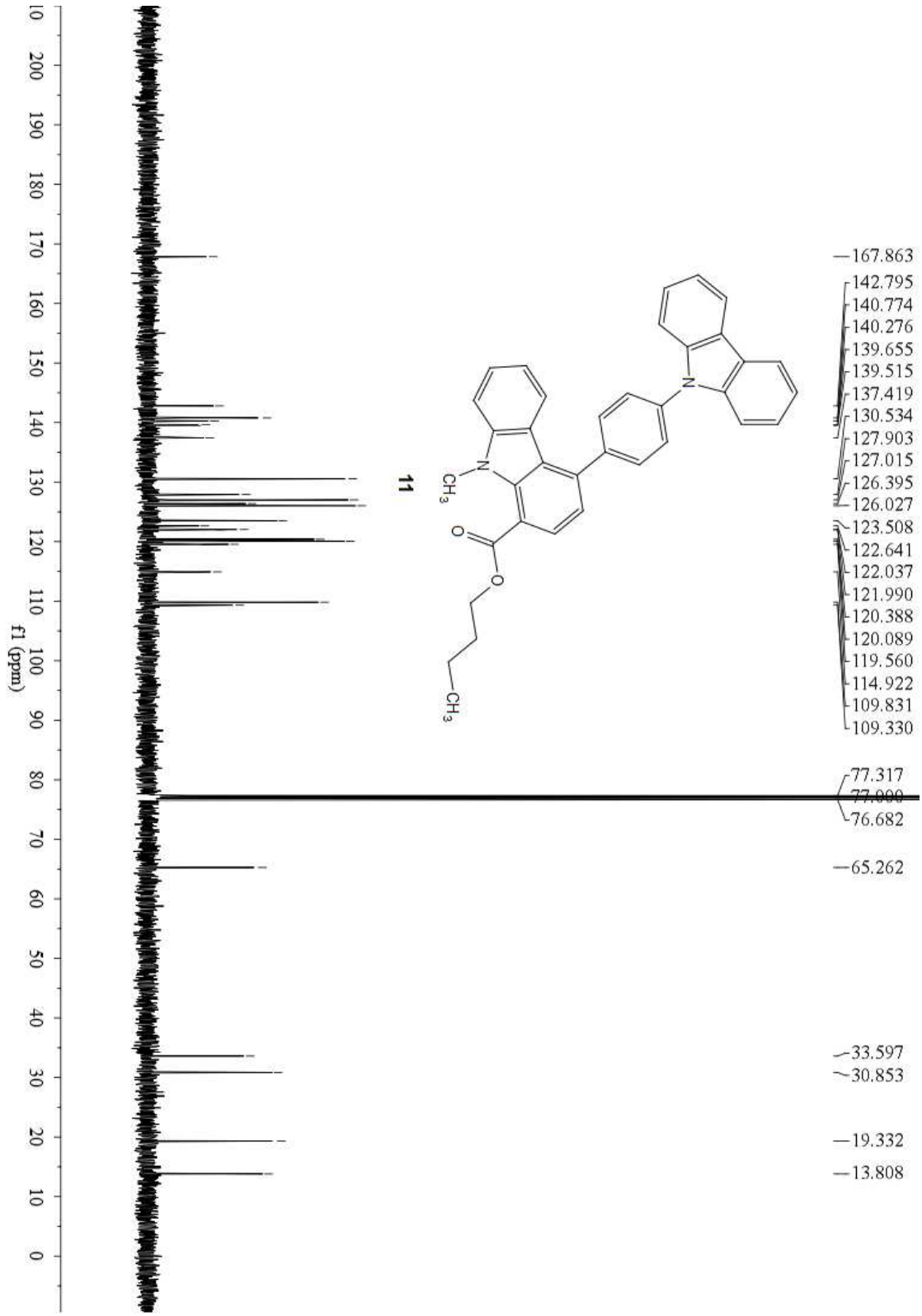

9
CH3
N
7.637
7.618
7.538
7.530
7.521
7.509
7.501
7.491
7.475
7.469
7.430
7.410
7.391
7.373
7.230
7.117
7.099
6.994
6.990
6.974
6.970
6.959
6.954
2.00
5.01
3.00
1.00
1.01
3.01
3.874
1.522
0.000
f1 (ppm)


f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
130 125 120 115 110 105
129.212
128.357
127.435
125.496
125.392
122.381
122.349
120.577
120.164
118.486
108.206
107.343
141.352
141.298
141.169
137.730
129.212
128.357
125.496
122.349
118.486
108.206
107.343
77.317
77.000
76.682
29.107
CH3
N
9


f1 (ppm)
11.5
10.5
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
-0.5
-1
1.00
1.00
2.00
5.00
1.00
1.00
1.00
2.01
2.03
2.67
3.01
10
NH
O
O
CH3
10.190
8.119
8.099
7.634
7.618
7.546
7.527
7.522
7.506
7.487
7.467
7.392
7.250
7.130
7.110
7.005
4.472
4.456
4.439
1.882
1.865
1.847
1.828
1.811
1.601
1.578
1.564
1.545
1.526
1.508
1.253
1.048
1.029
1.011
-0.000


f1 (ppm)
142.836
140.628
140.468
139.883
128.921
128.512
128.059
127.051
126.278
122.348
122.119
121.890
120.323
119.508
110.927
110.582
167.619
142.836
140.628
140.468
139.883
128.921
128.512
126.278
122.348
110.927
110.582
77.318
77.000
76.682
64.733
30.900
19.345
13.787
10
NH
O
O
CH3


f1 (ppm)
11
8.196
8.177
7.954
7.935
7.816
7.795
7.751
7.730
7.604
7.584
7.531
7.510
7.499
7.490
7.480
7.461
7.350
7.332
7.313
7.238
7.221
7.201
7.112
7.102
7.092
7.082
7.072
4.488
4.471
4.455
3.944
1.891
1.874
1.856
1.837
1.820
1.600
1.581
1.563
1.544
1.525
1.507
1.050
1.032
1.013
-0.000
2.00
1.00
2.00
2.01
2.01
5.01
2.02
1.01
1.01
2.02
3.00
2.02
2.60
3.01


167.863
142.795
140.774
140.276
139.655
139.515
137.419
130.534
127.903
127.015
126.395
126.027
123.508
122.641
122.037
121.990
120.388
120.089
119.560
114.922
109.831
109.330
77.317
77.000
76.682
65.262
33.597
30.853
19.332
13.808
11
CH3
CH3
f1 (ppm)