

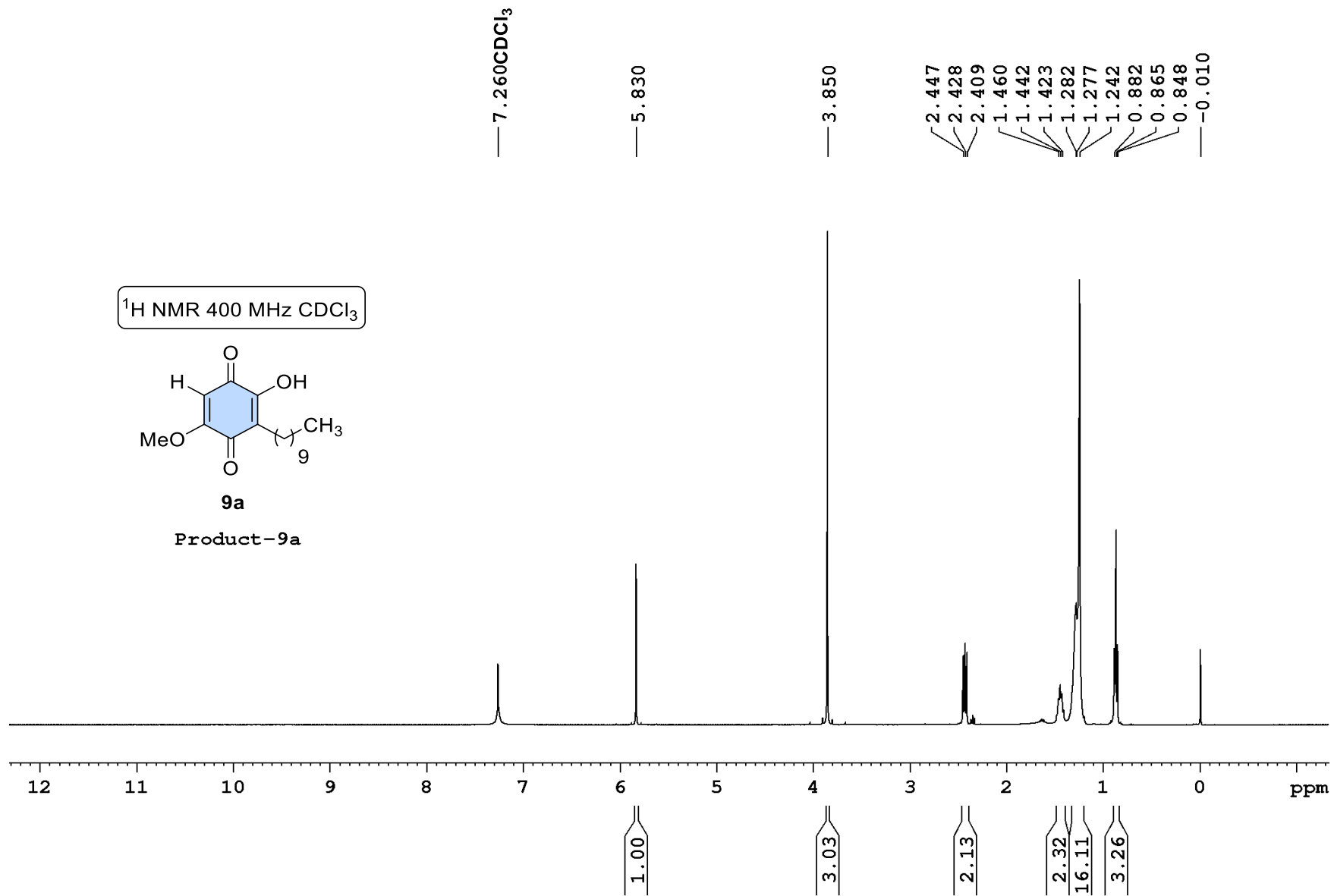
Supporting Information-II

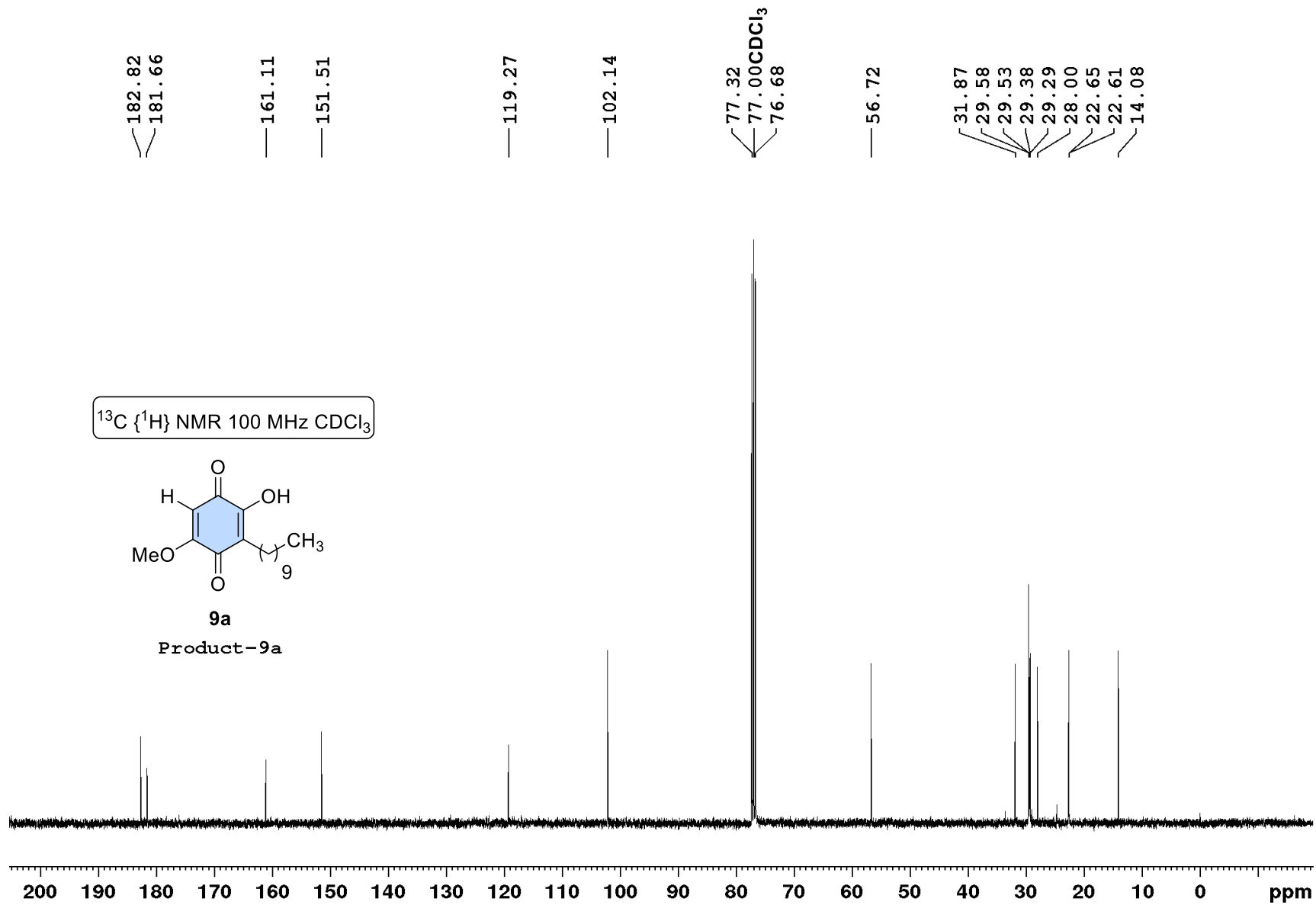
High-yielding Total Synthesis of Embelin, Rapanone, and Irisoquin A, D, F

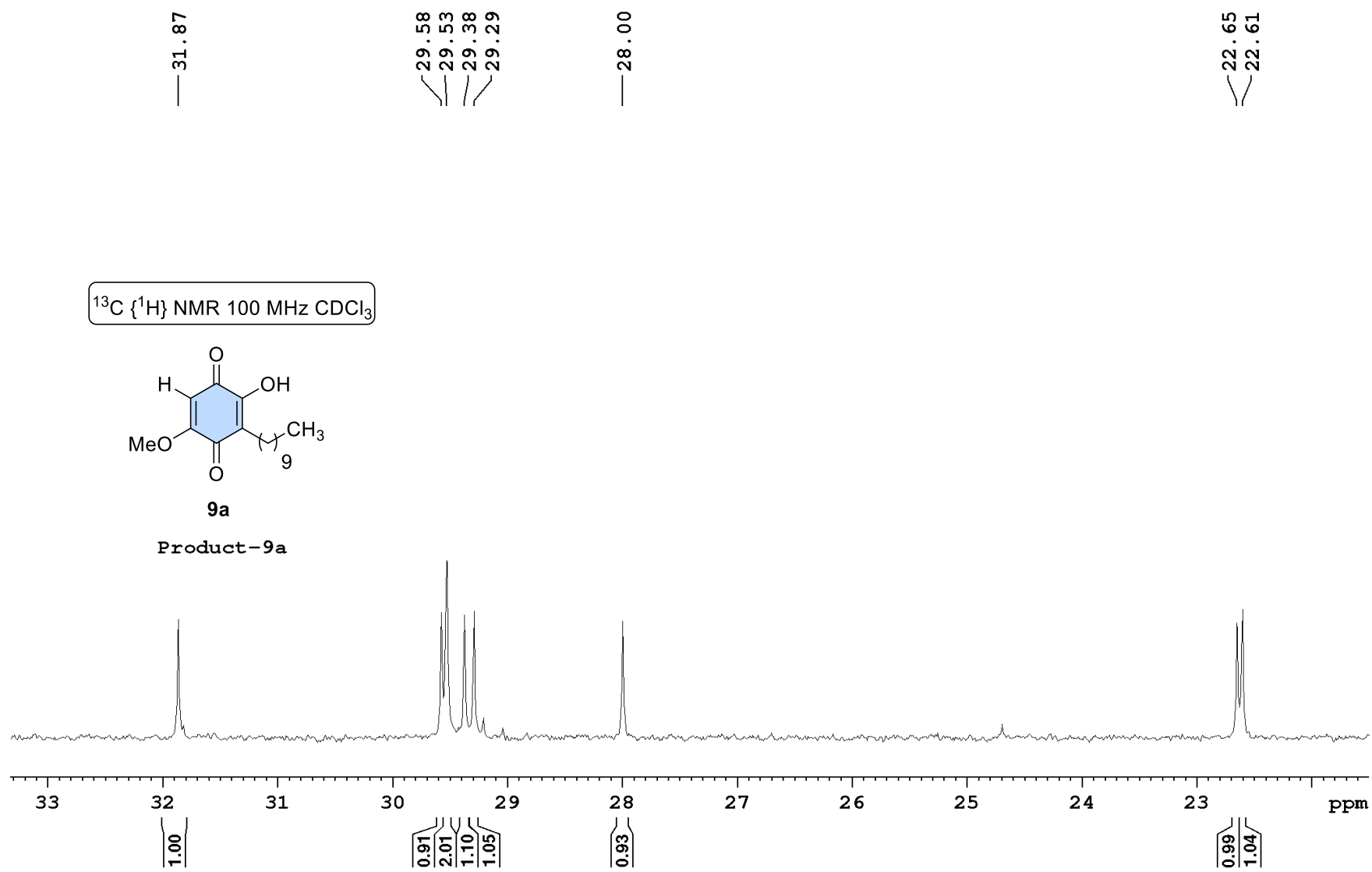
Etikala Ashok, Pandhiti R. Lakshmi, Shyam D. Sanwal, and Dhevalapally B. Ramachary*

Catalysis Laboratory, School of Chemistry, University of Hyderabad, Hyderabad-500 046, India

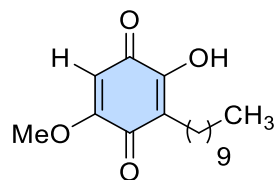
**Correspondence: ramsc@uohyd.ac.in and ramchary.db@gmail.com*





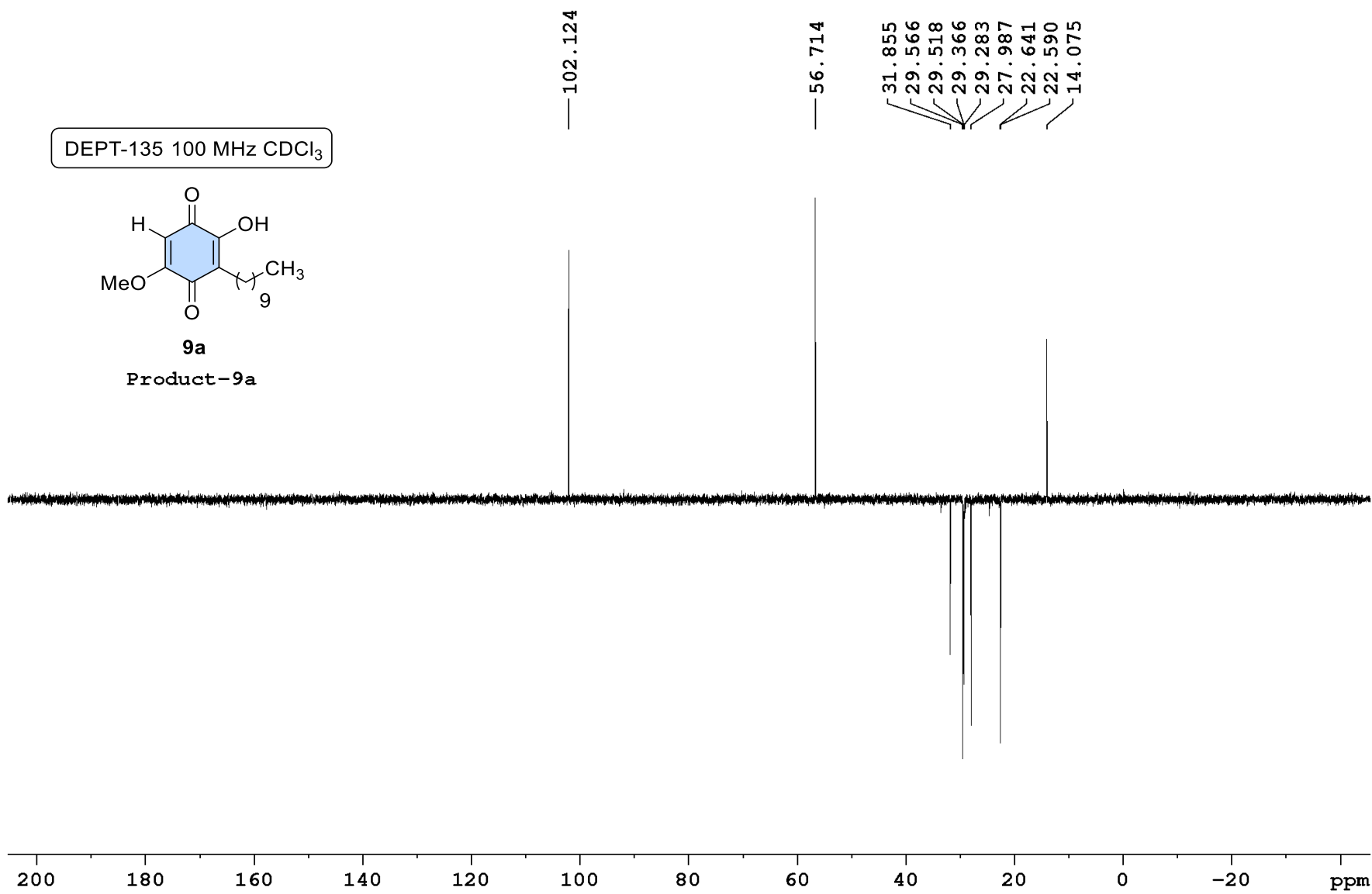


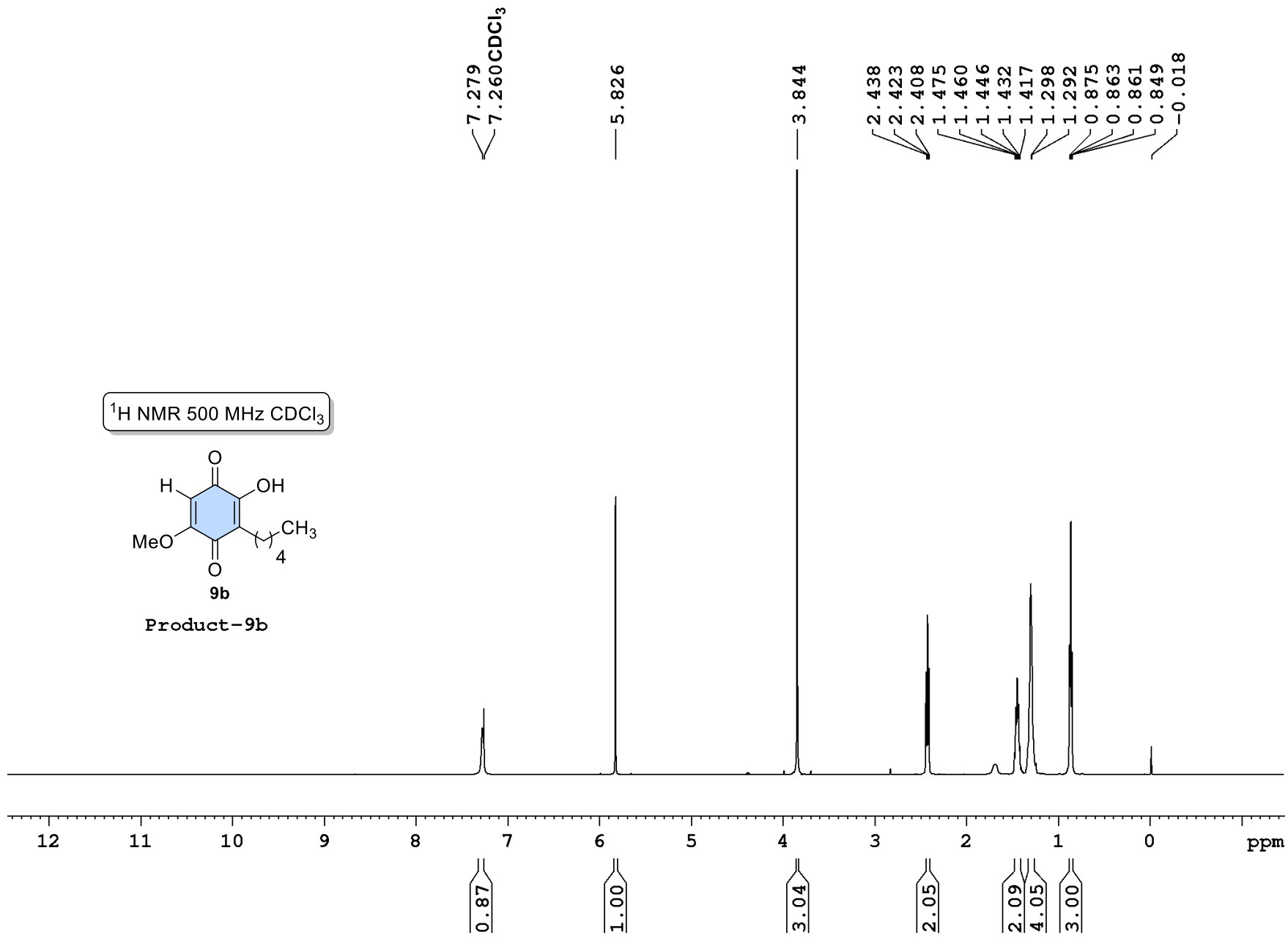
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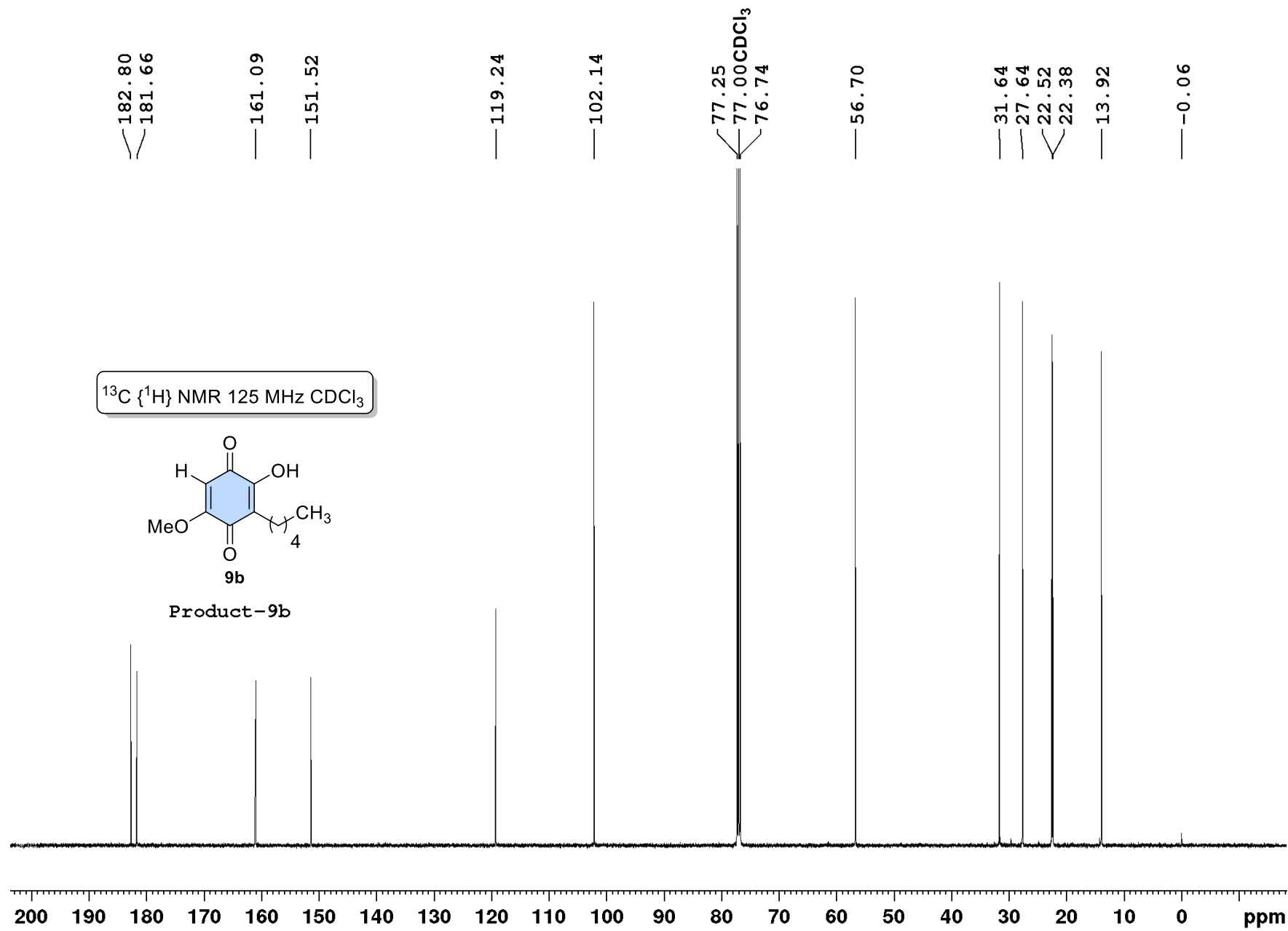


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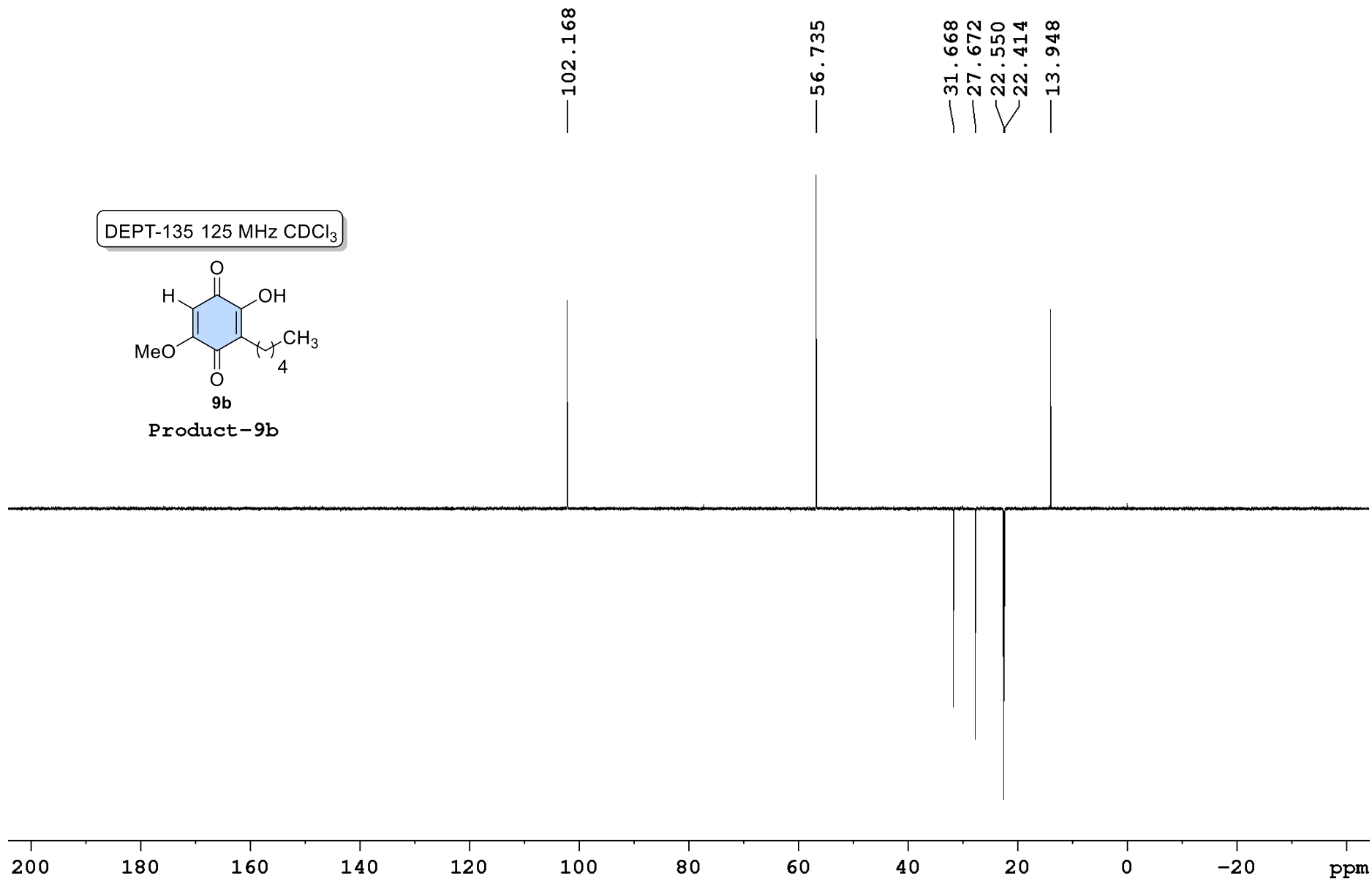
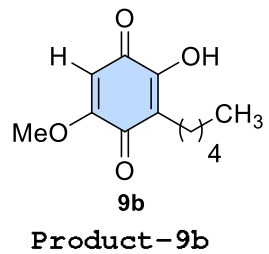
Product-9a

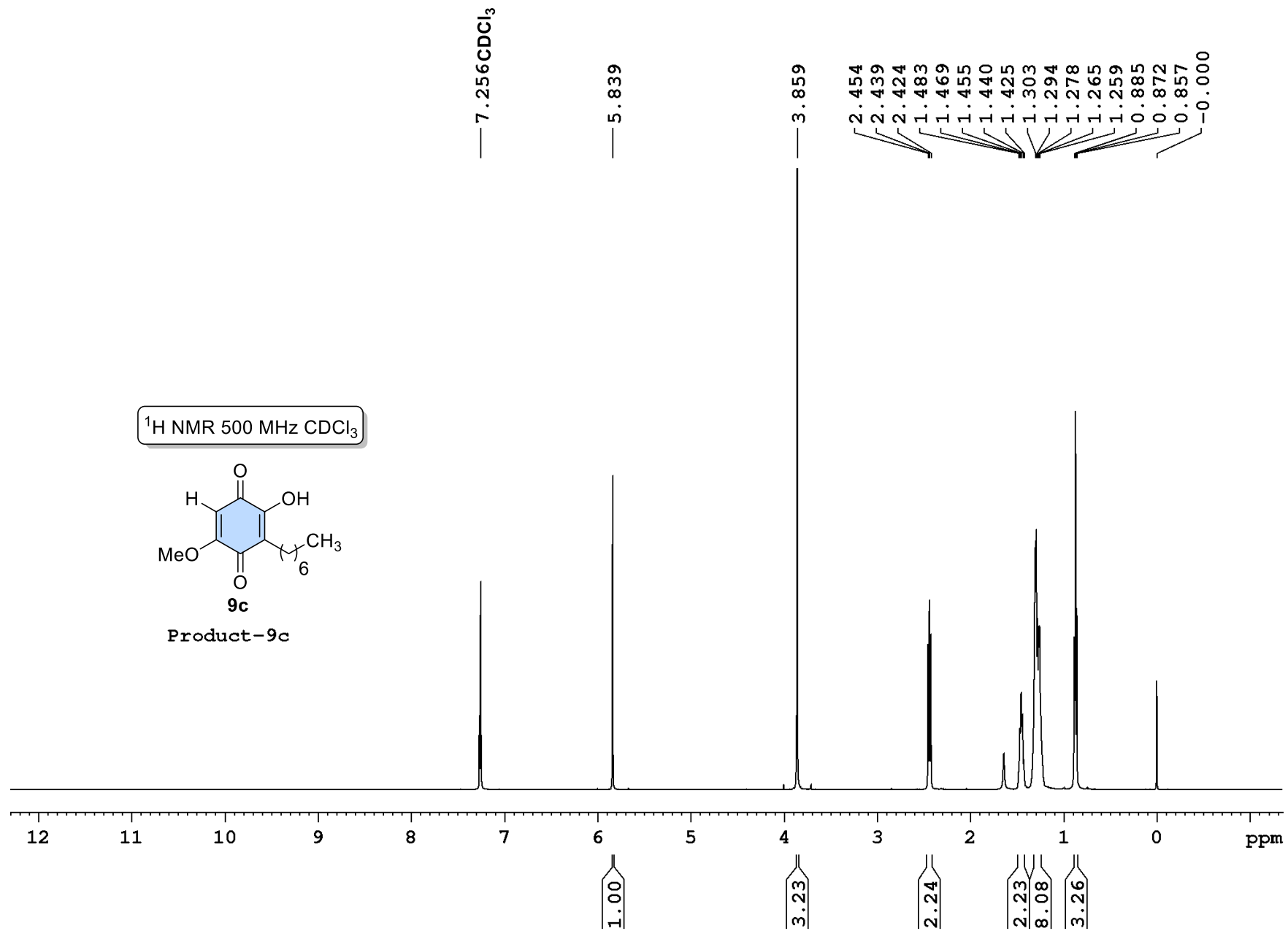


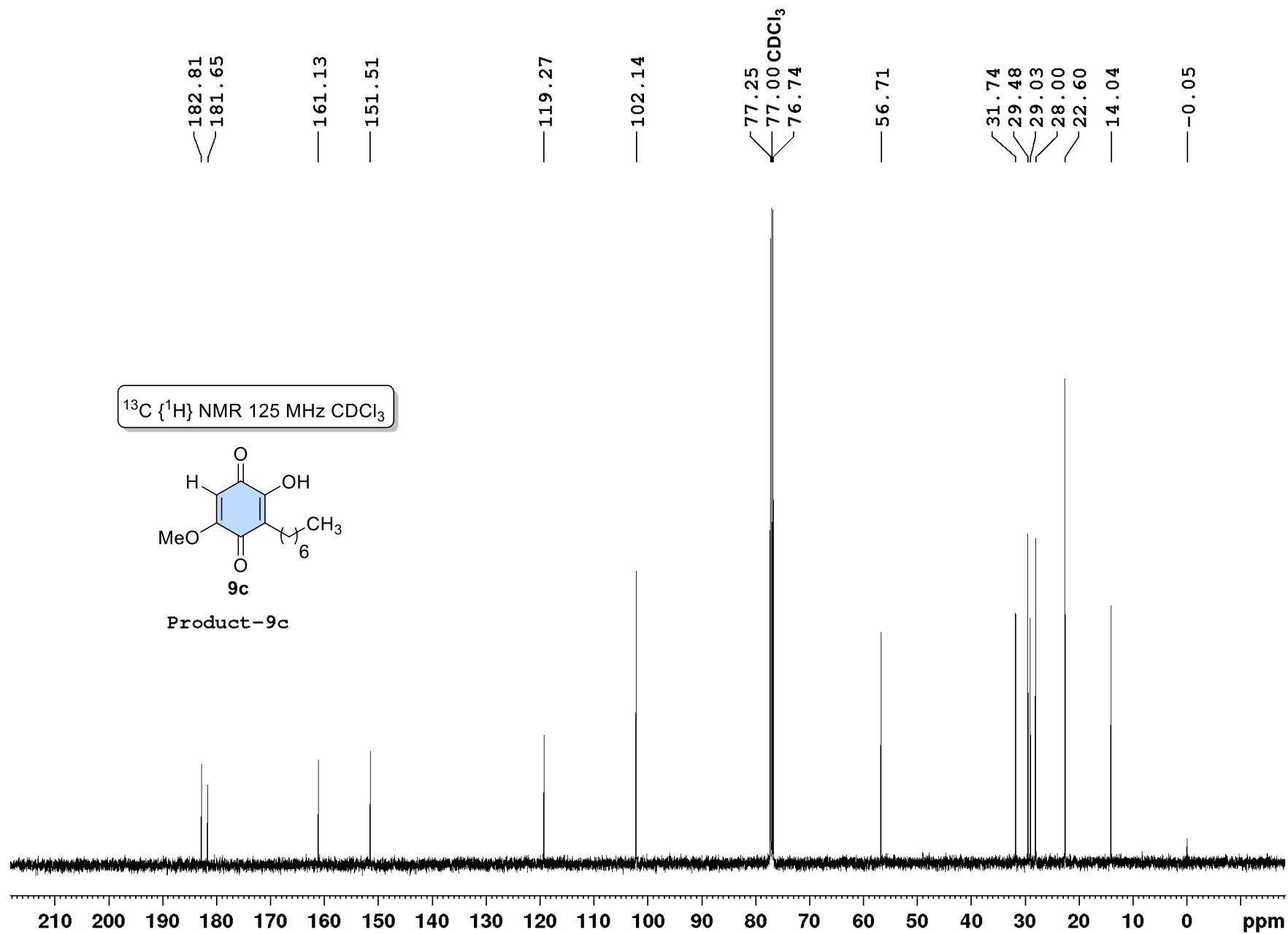


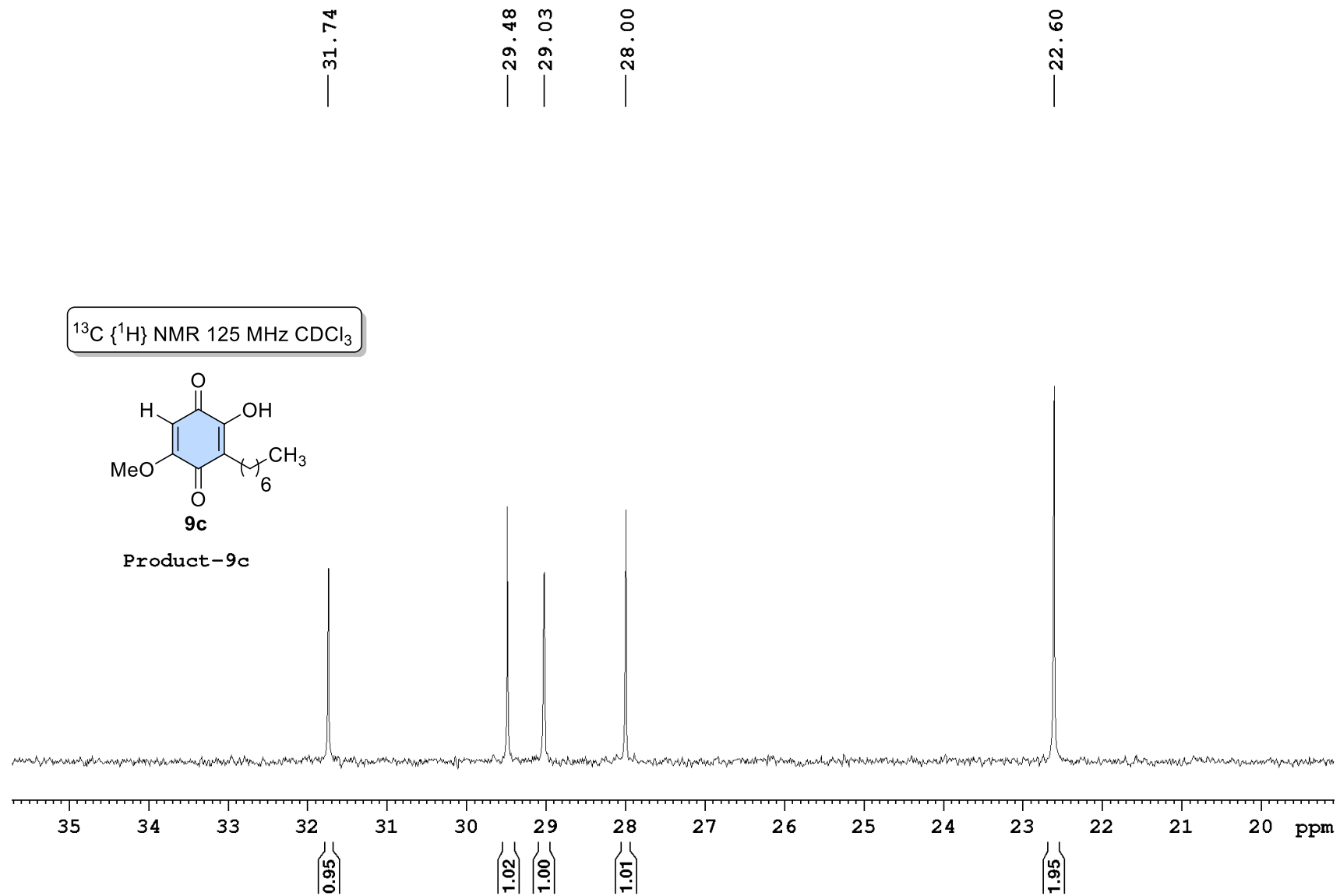


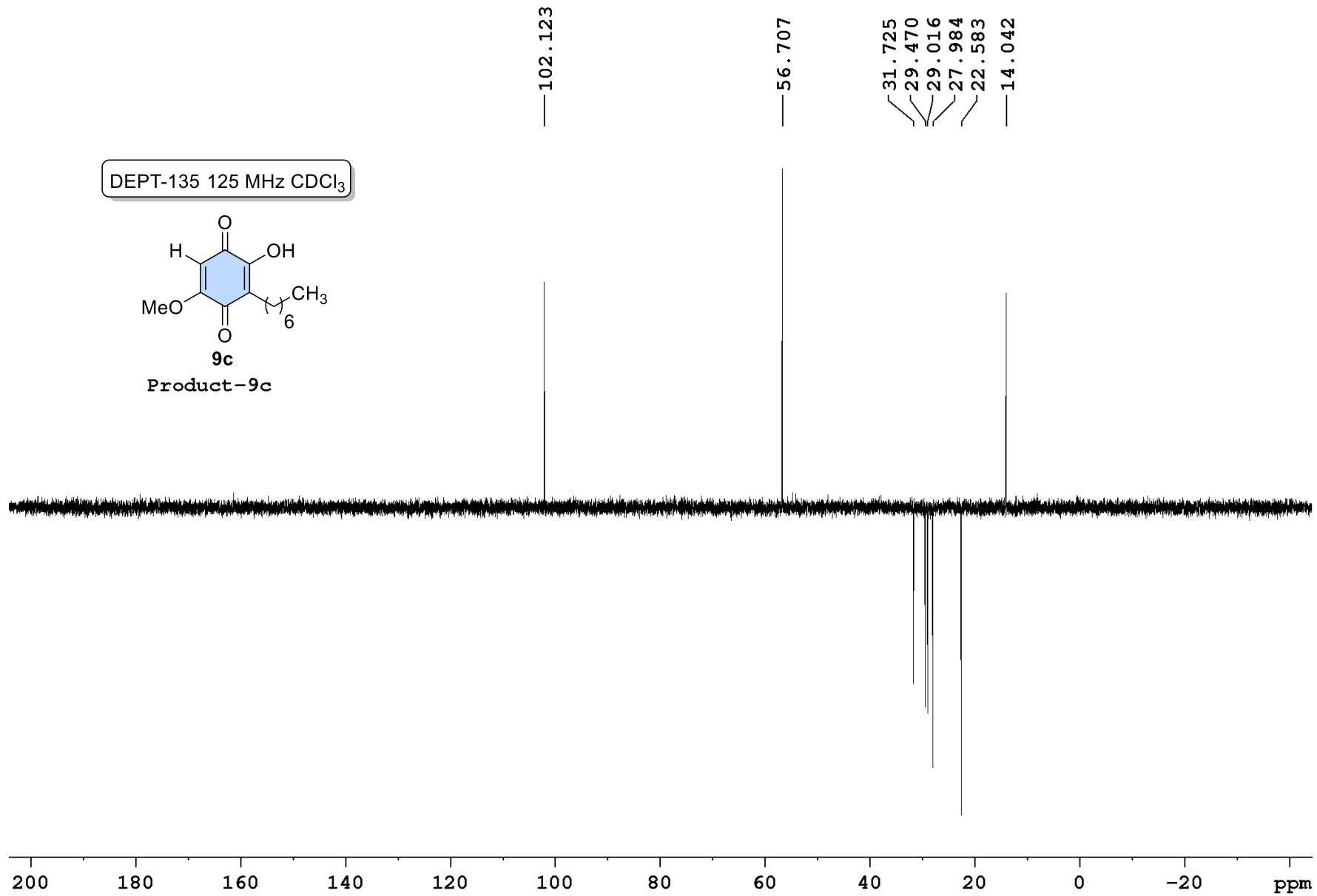
DEPT-135 125 MHz CDCl₃

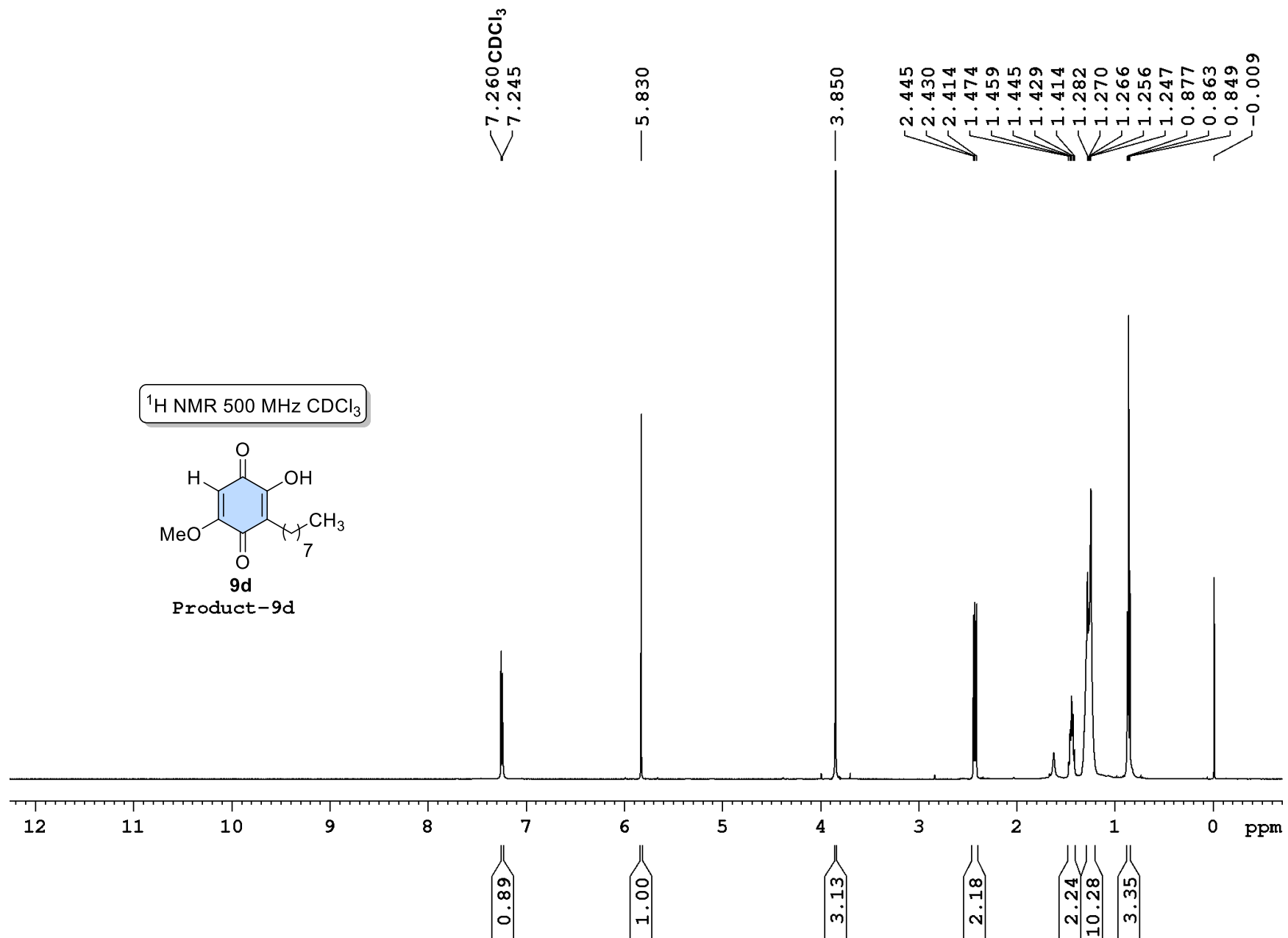


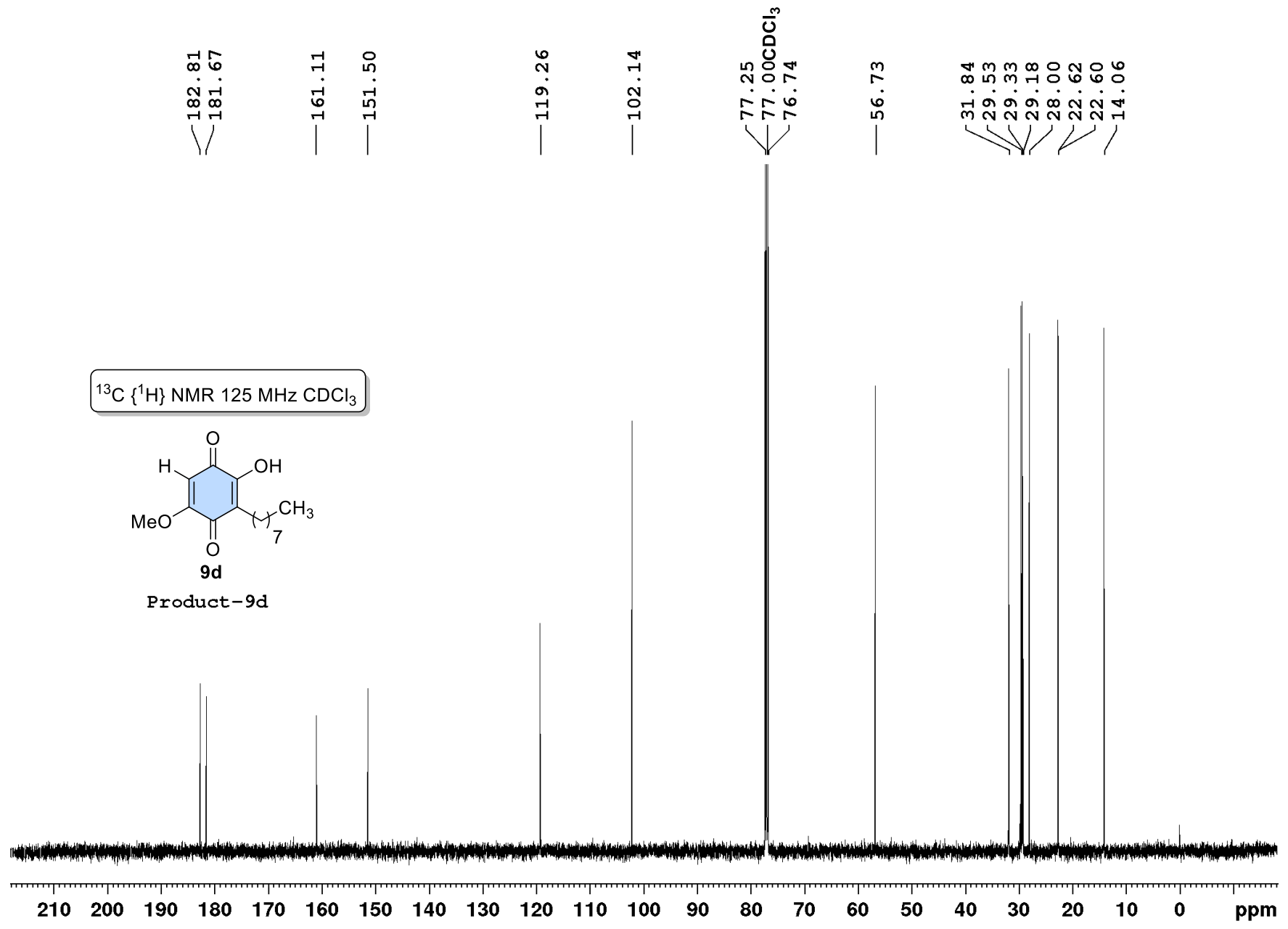




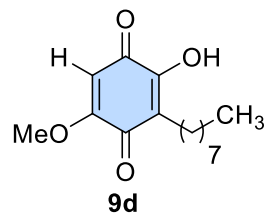




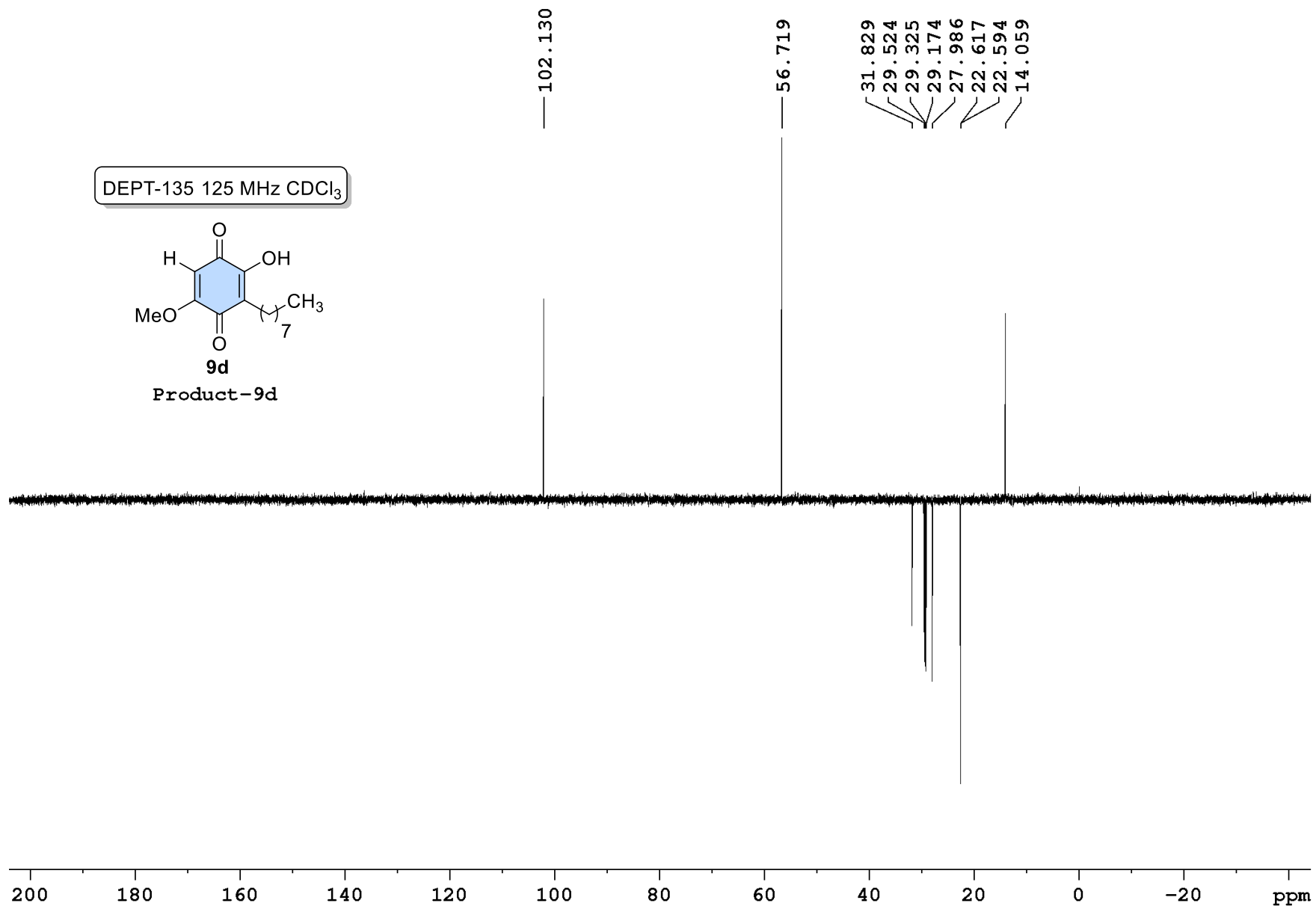


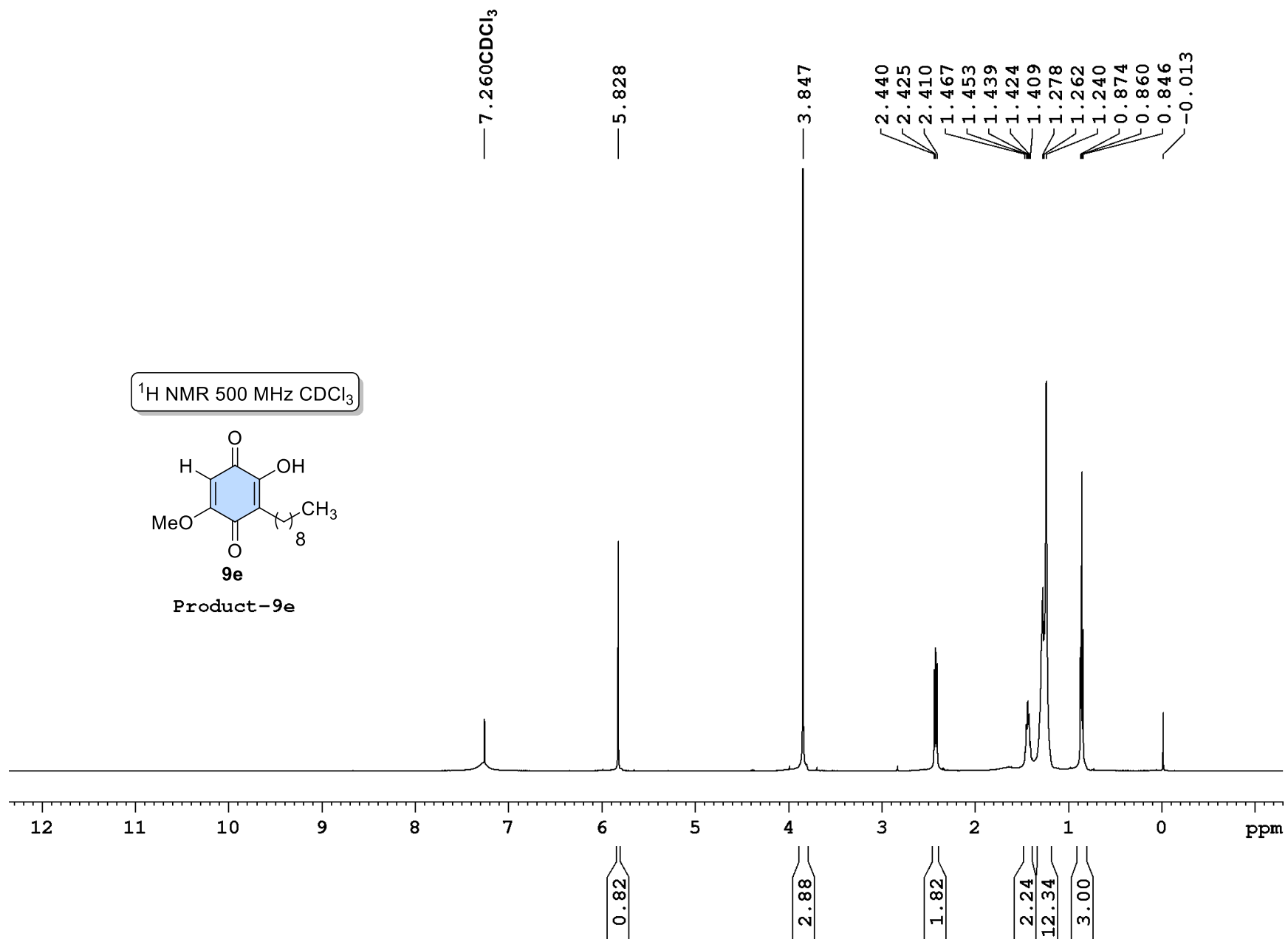


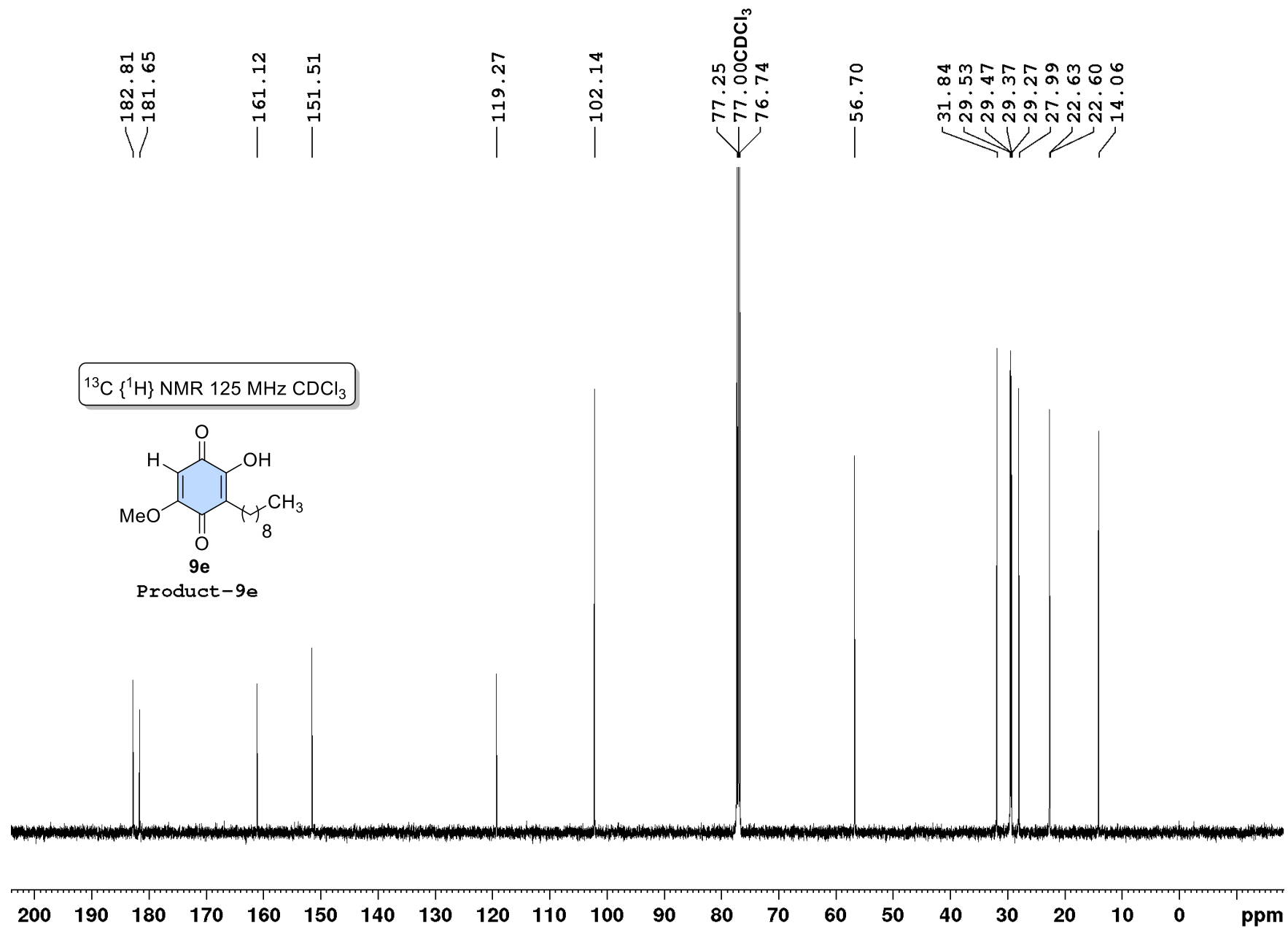
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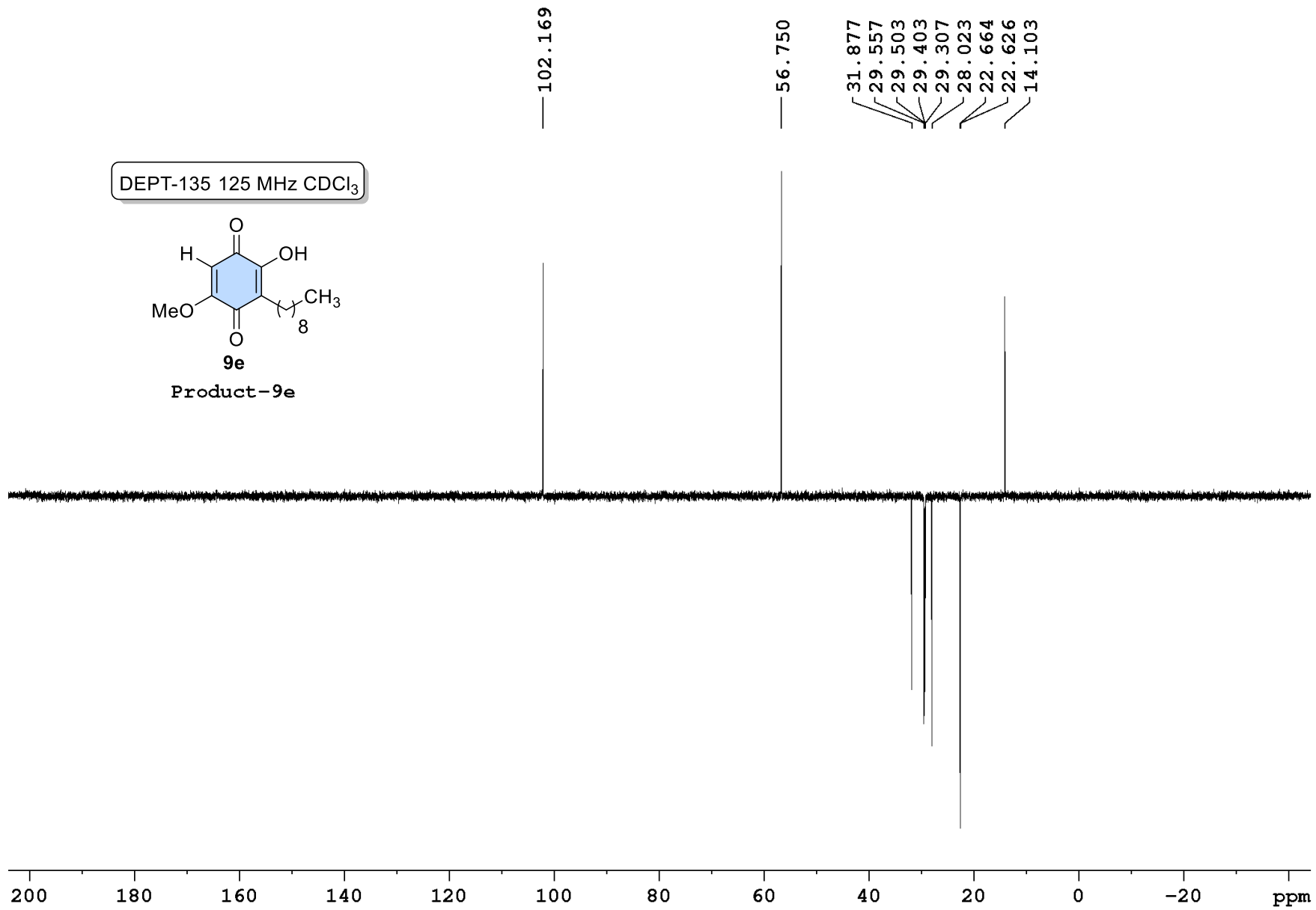


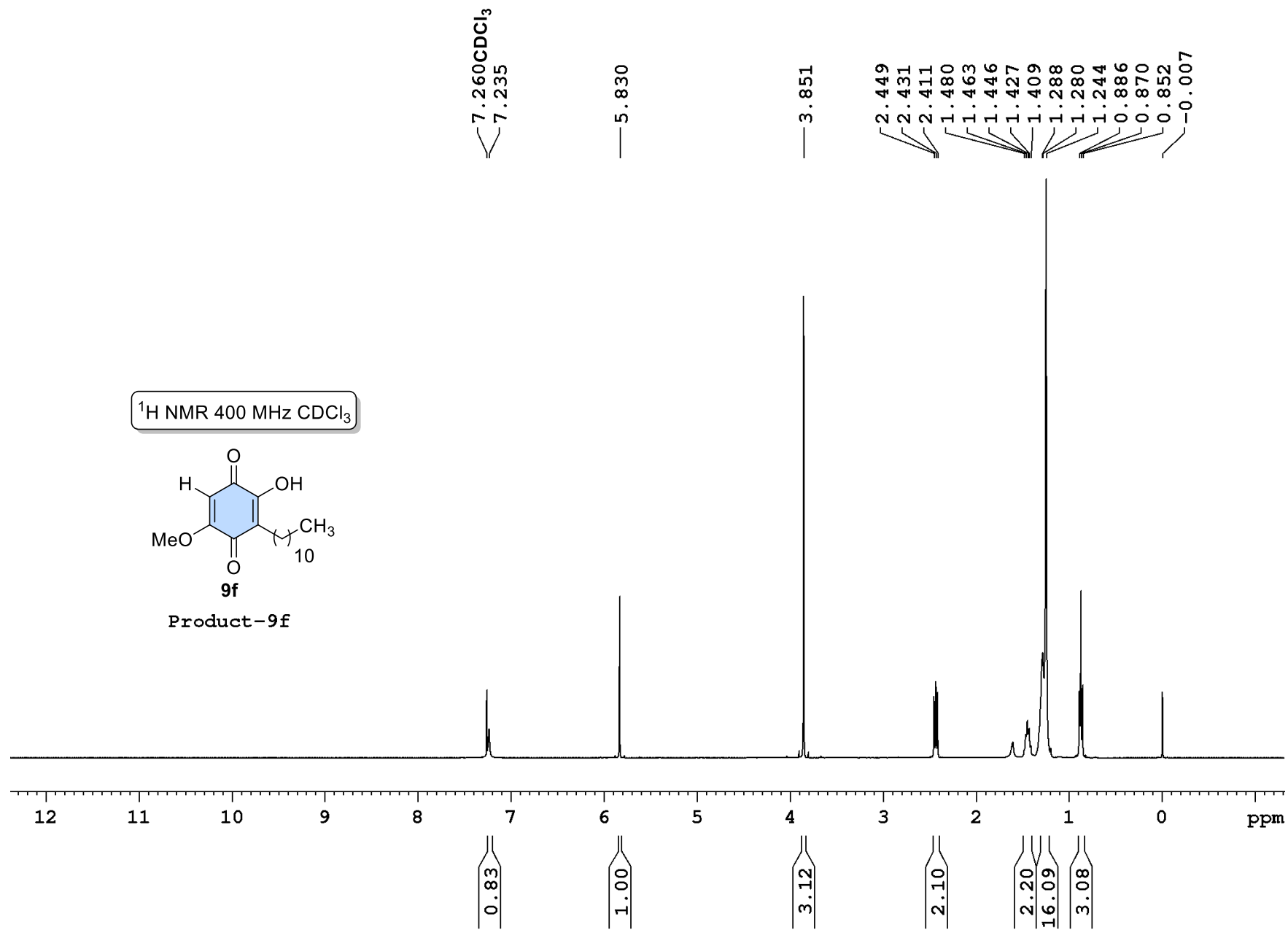
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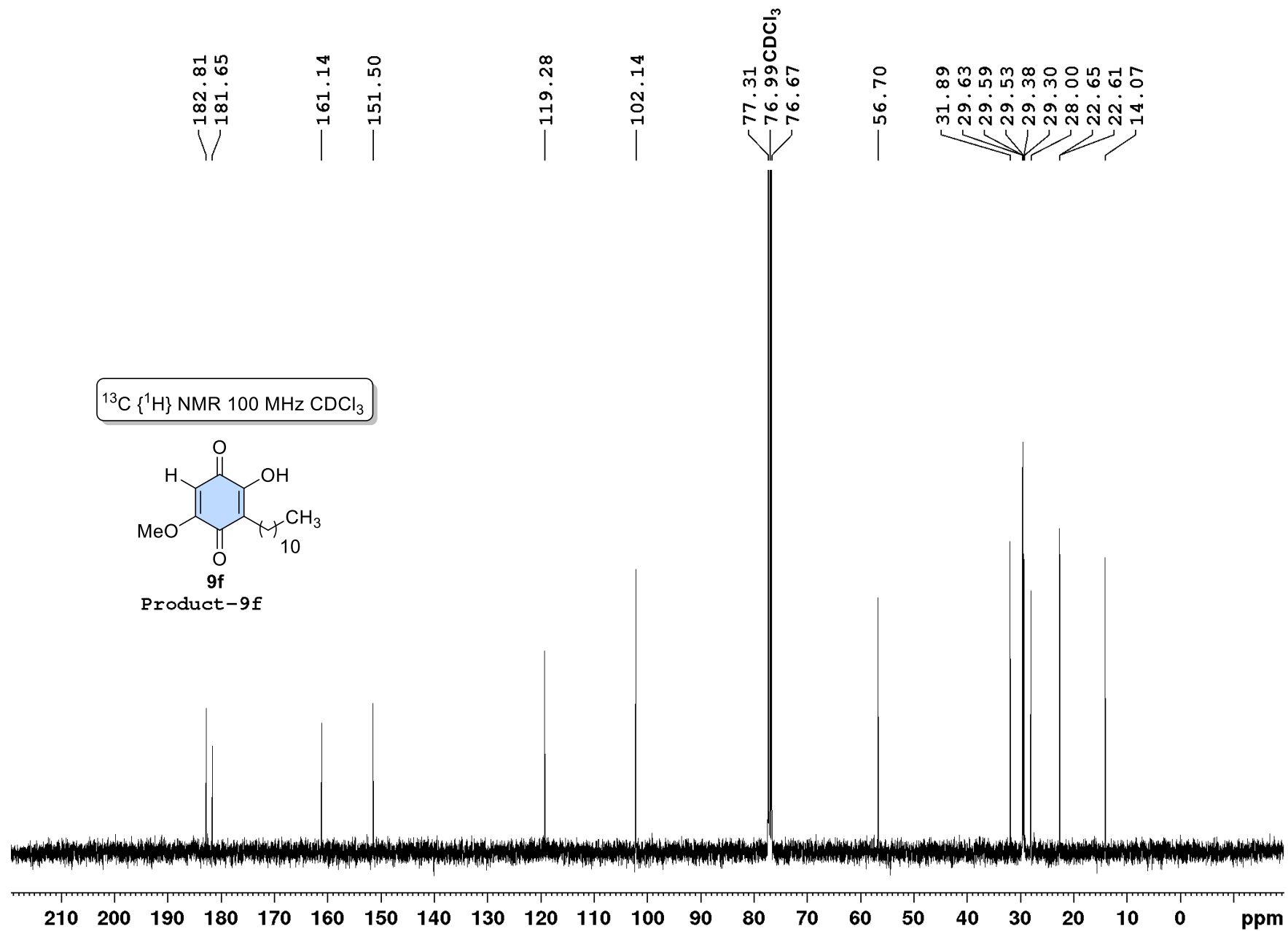


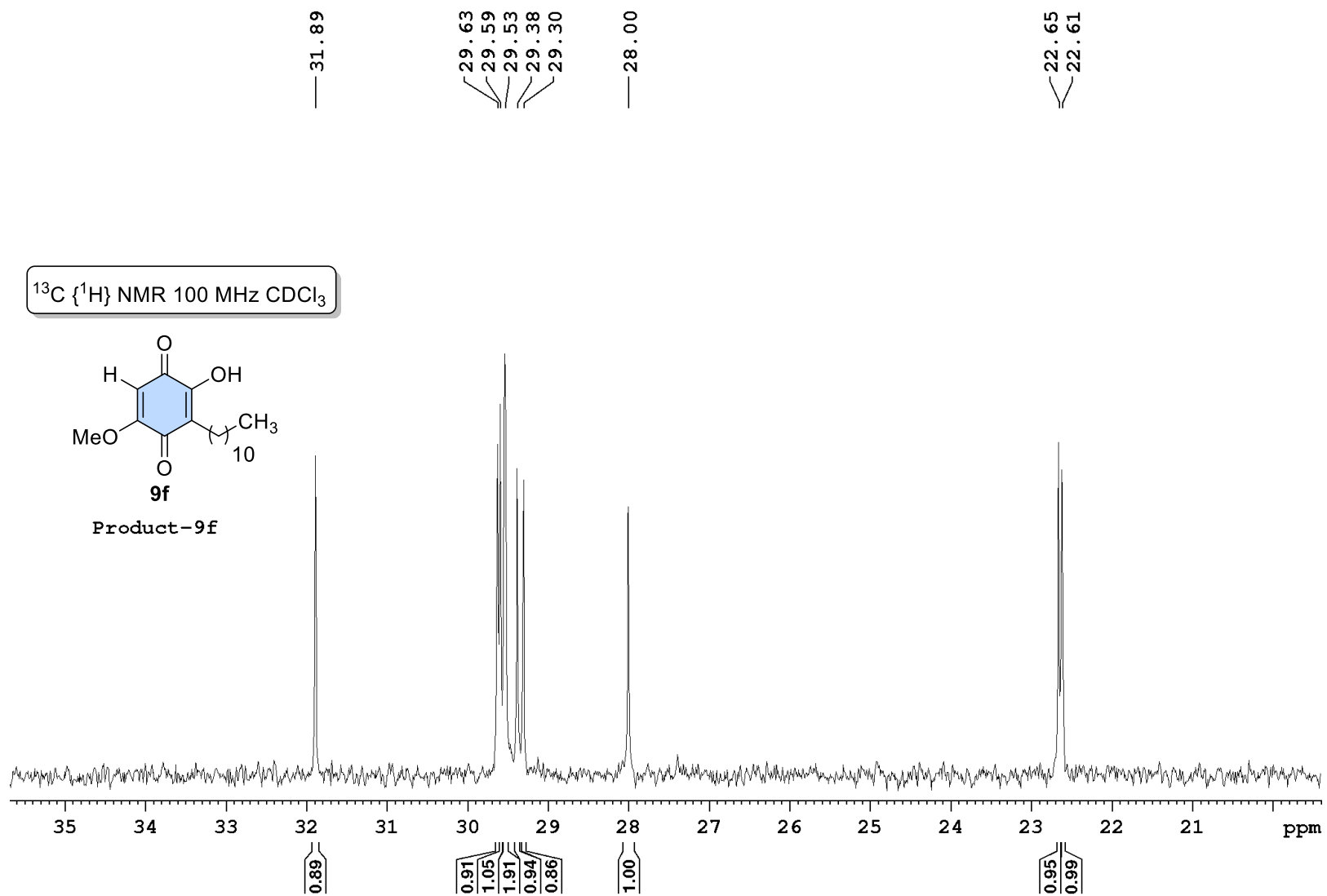




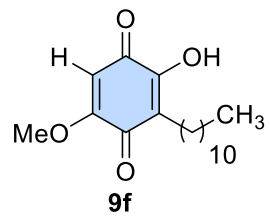




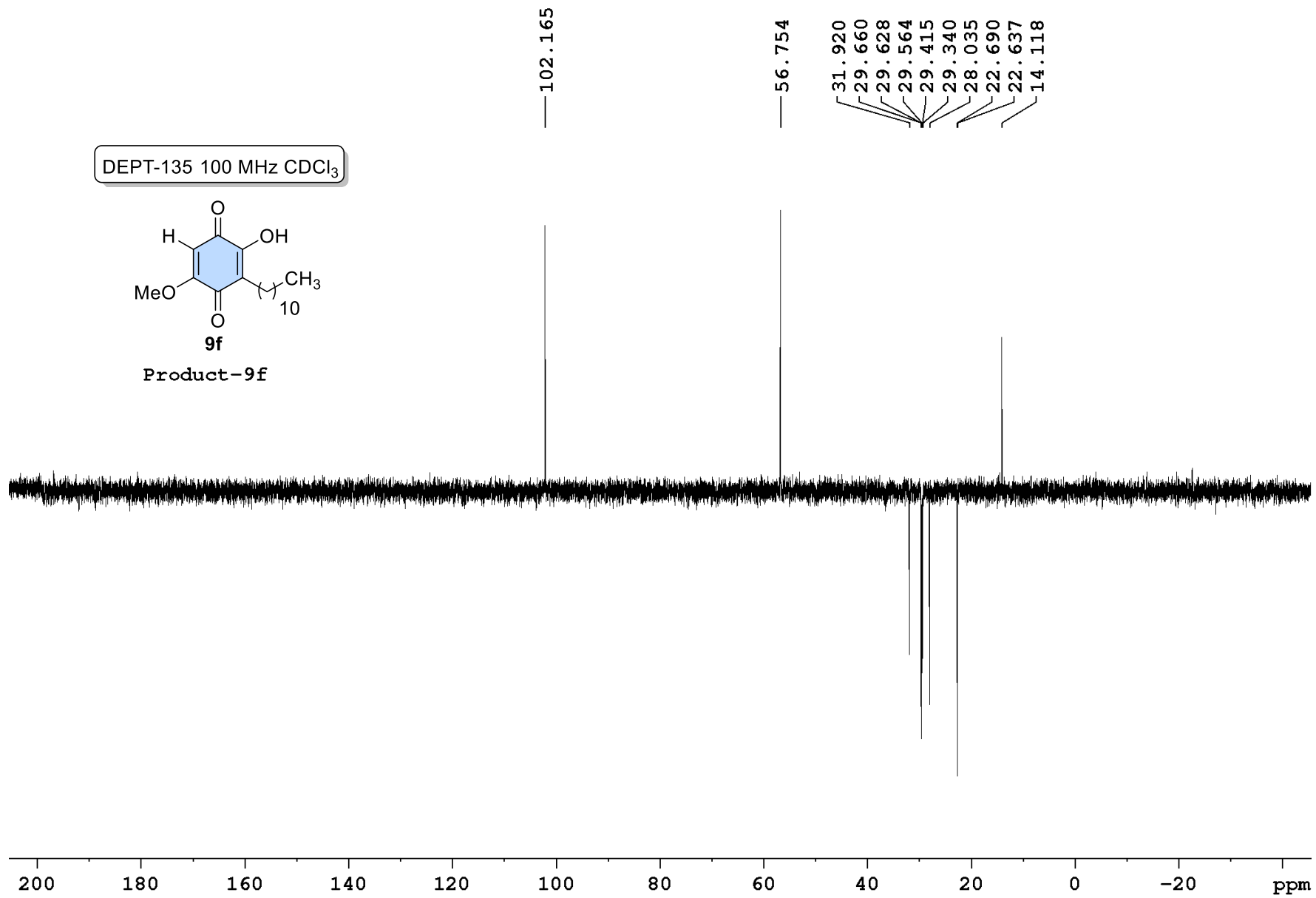


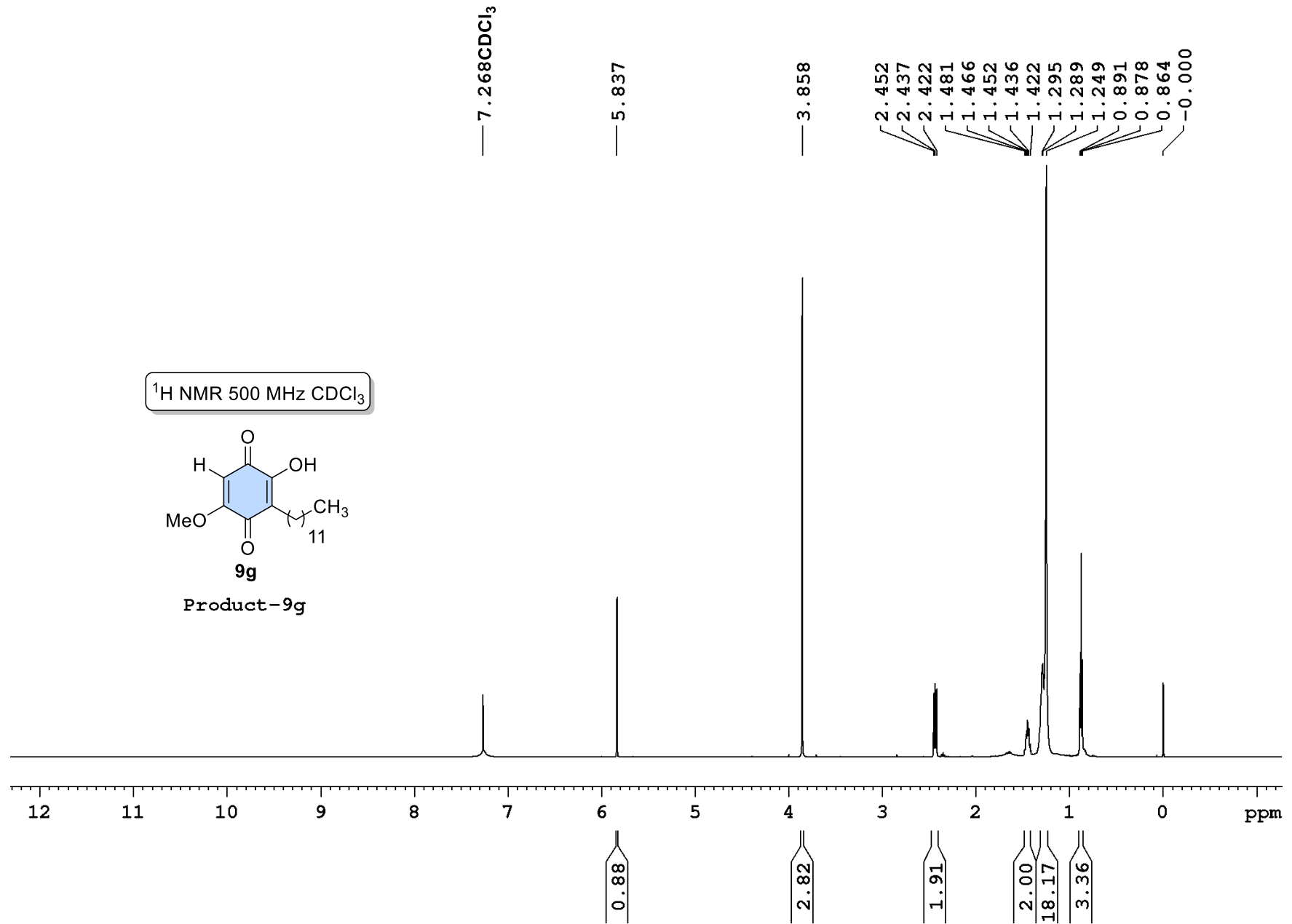


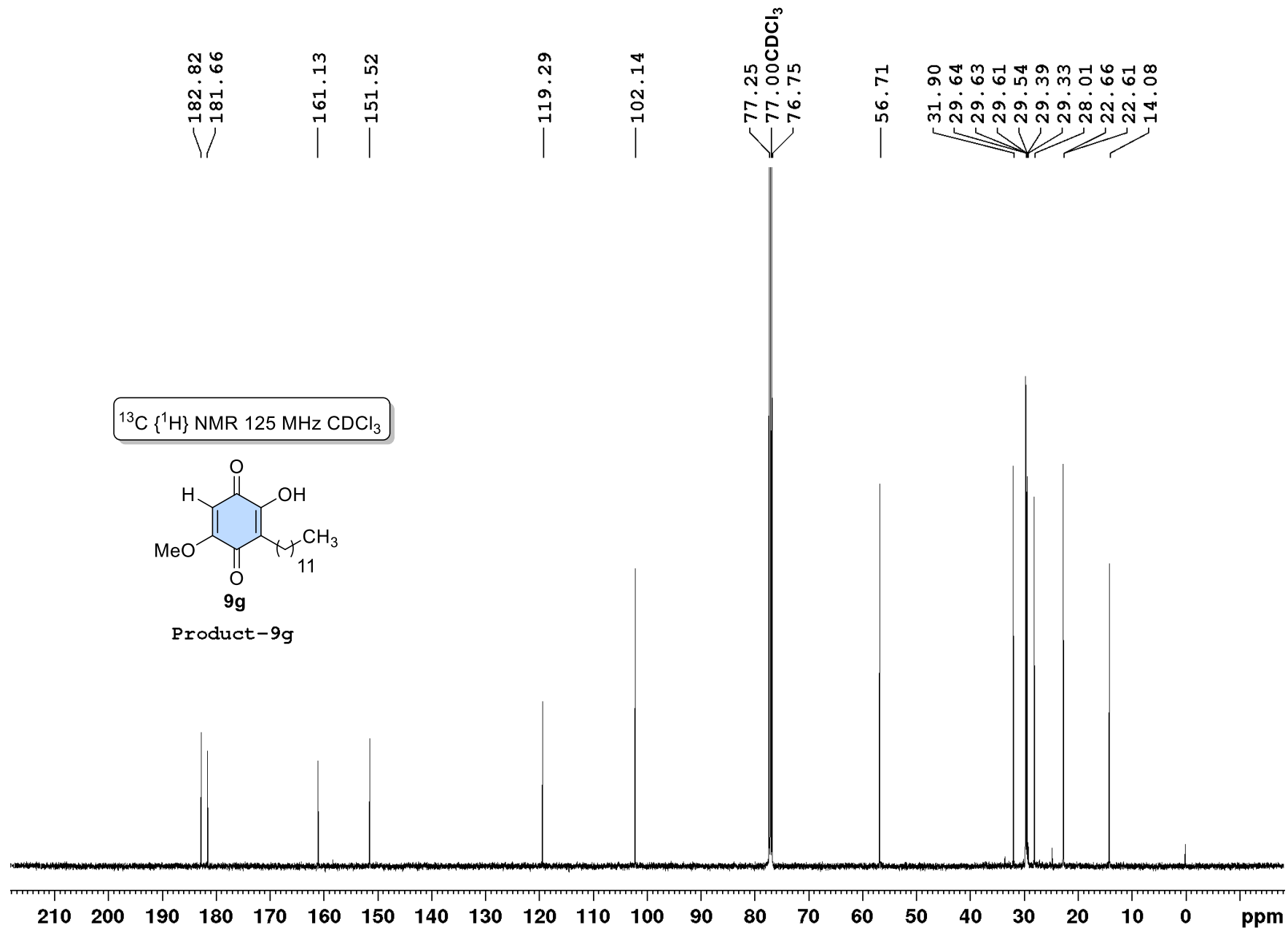
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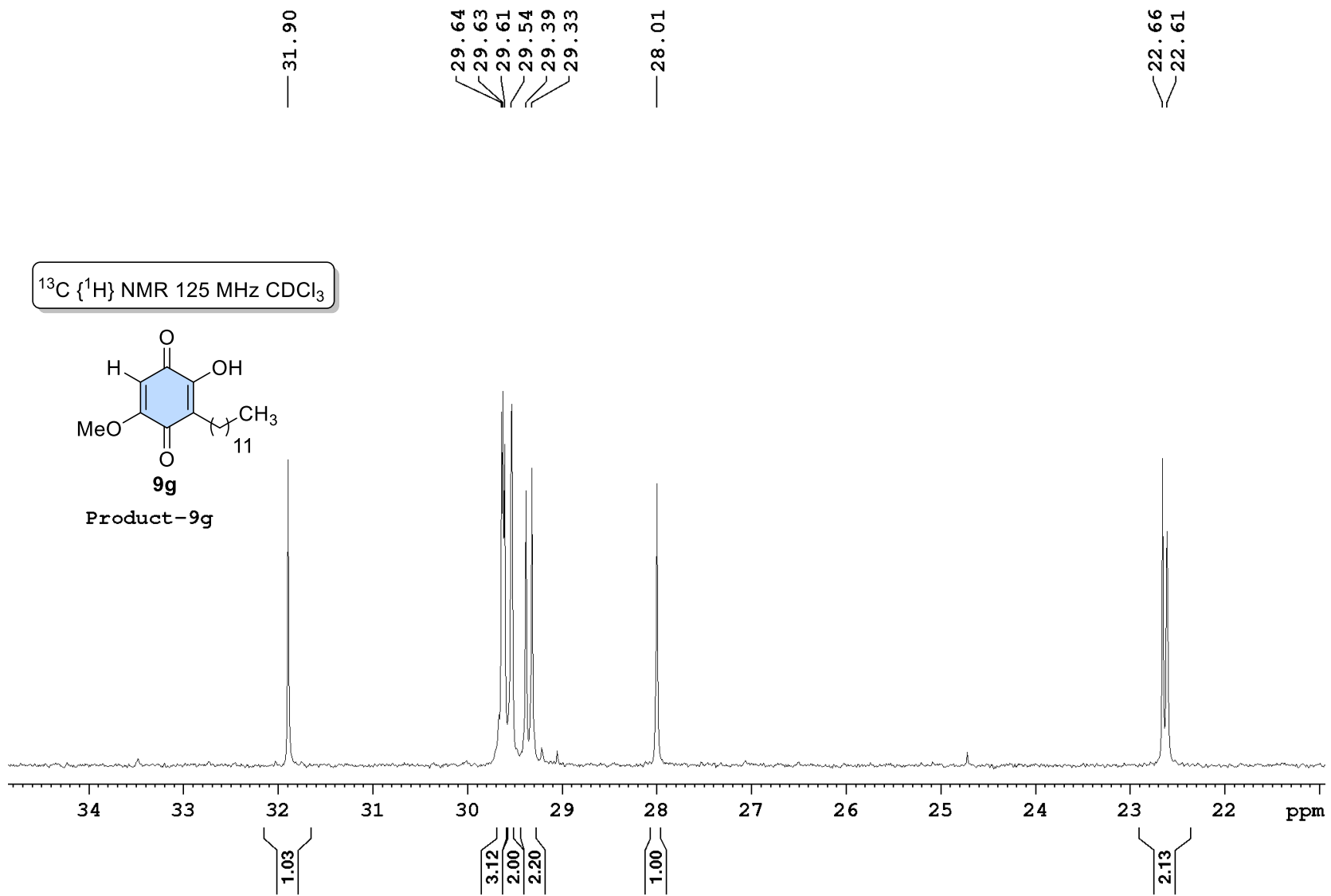


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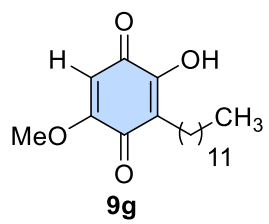




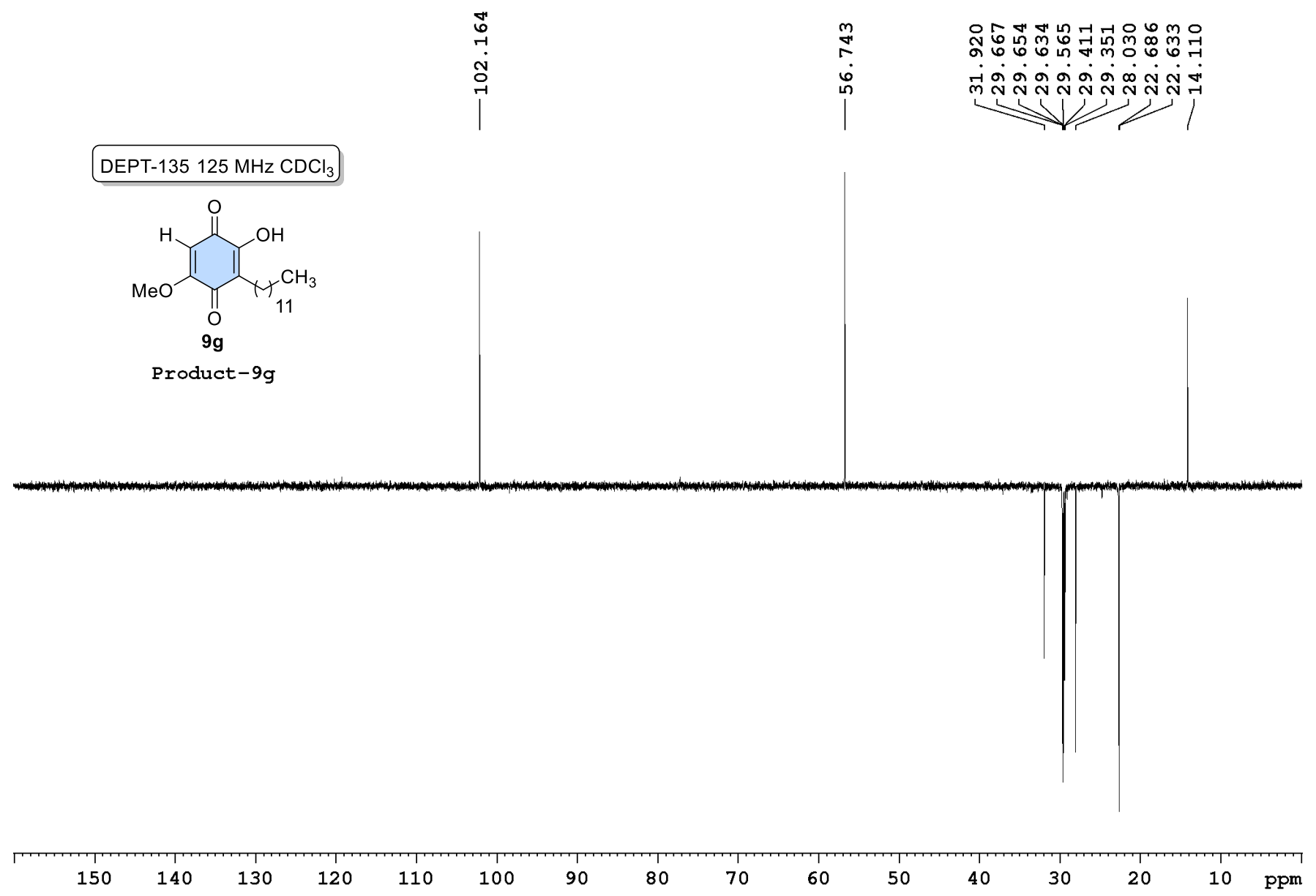




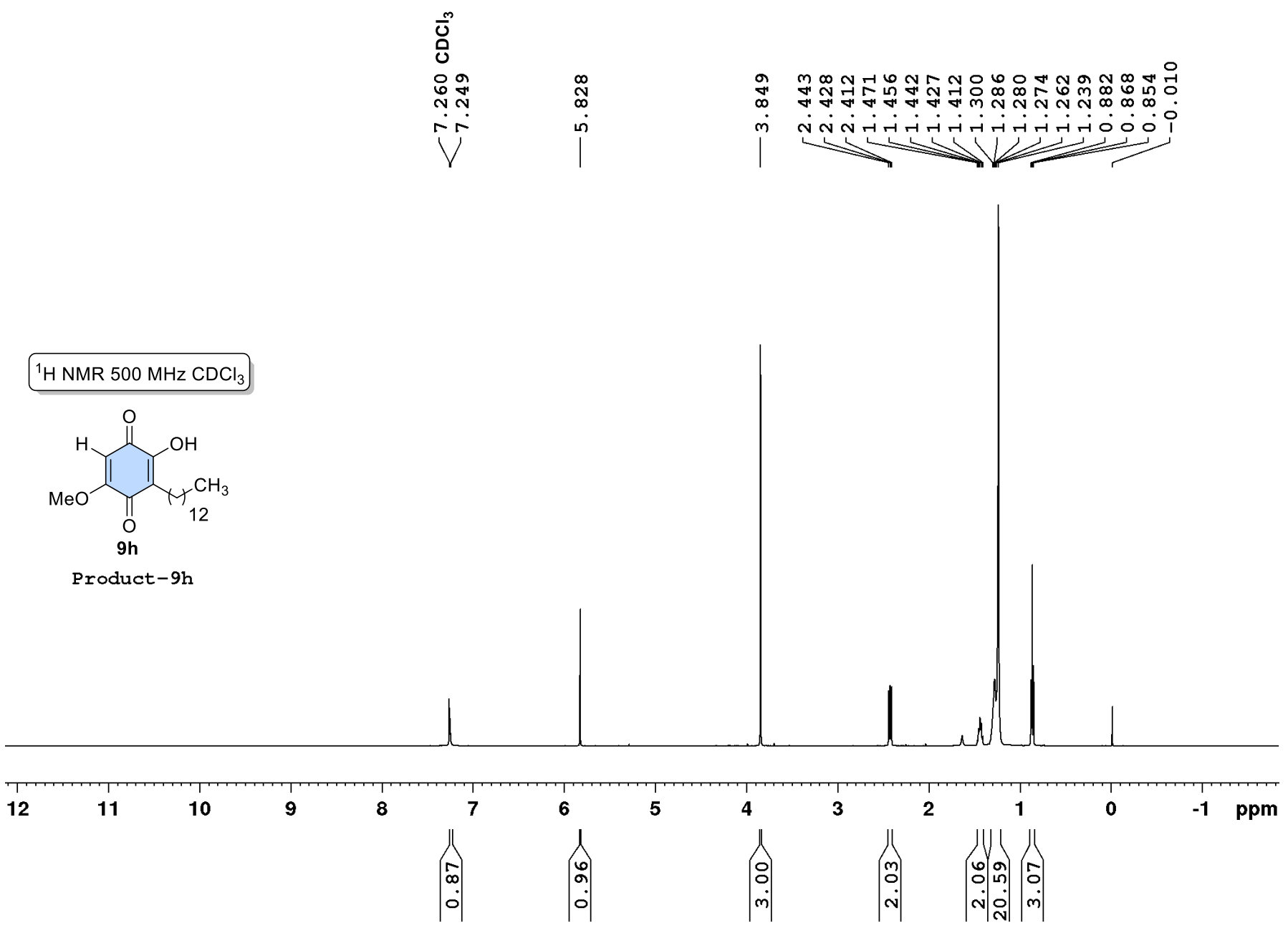
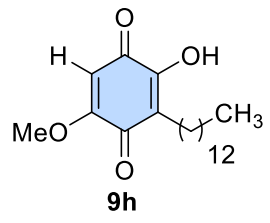
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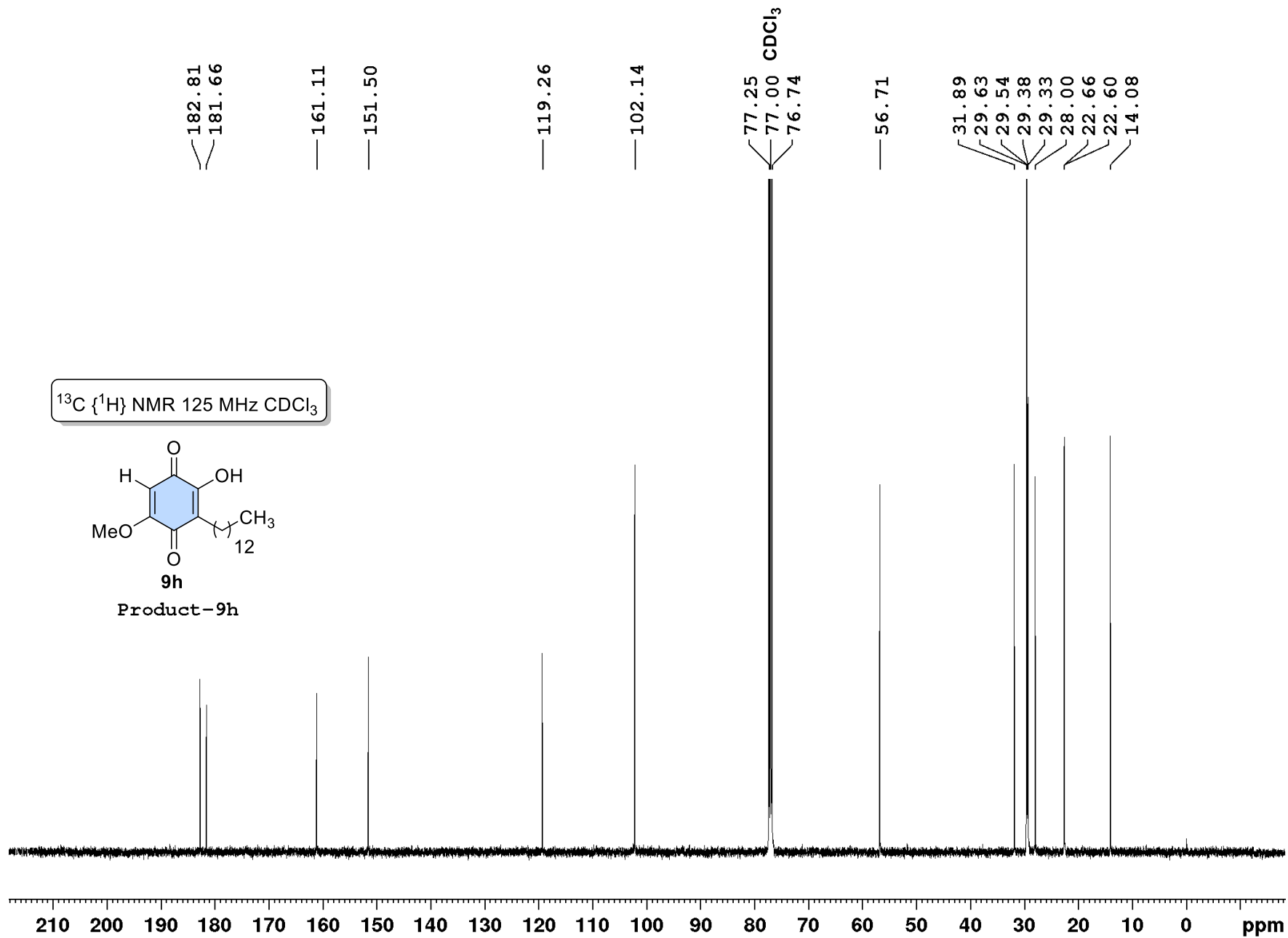


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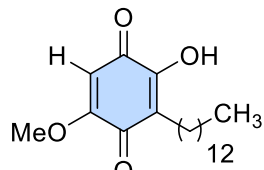


¹H NMR 500 MHz CDCl₃

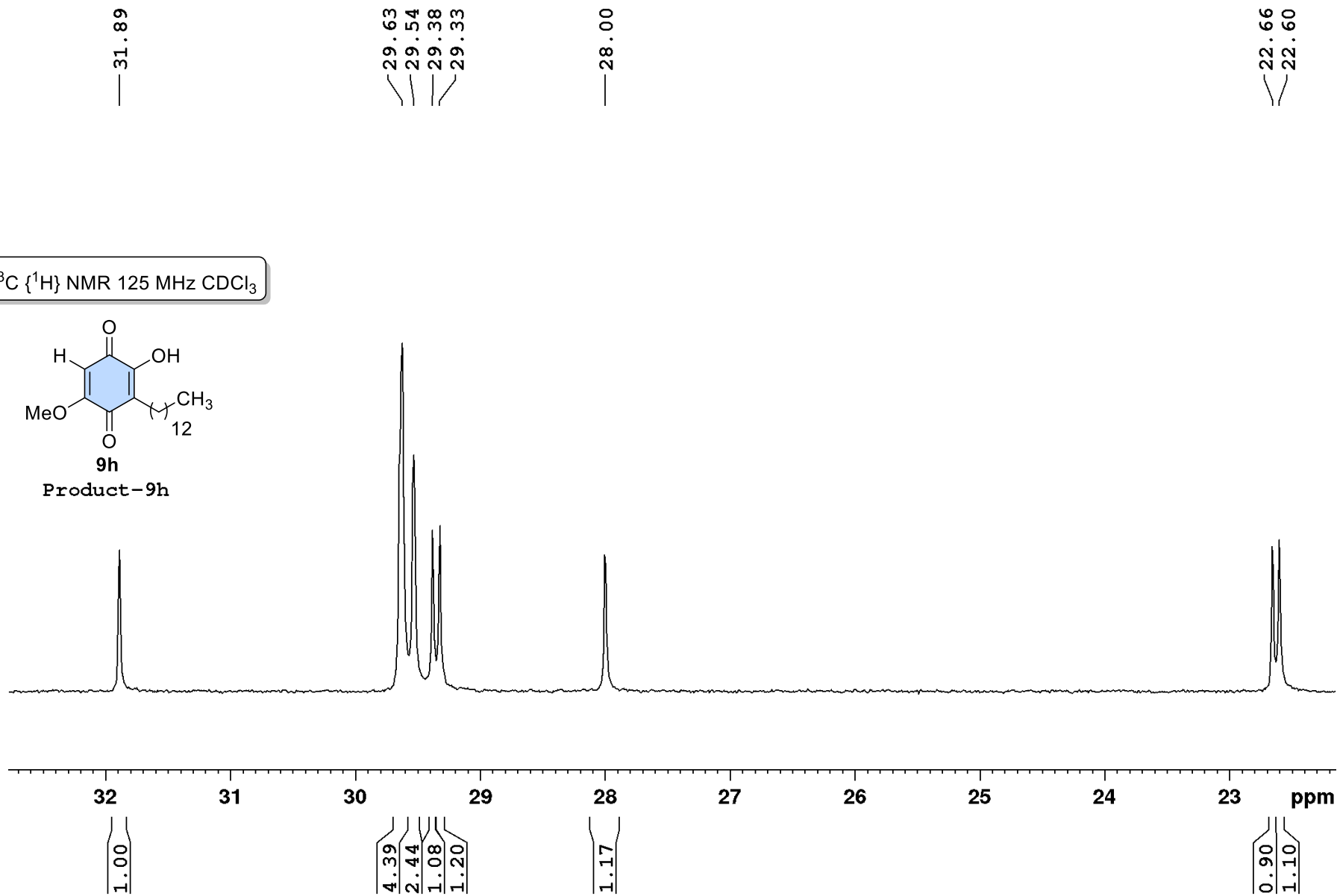




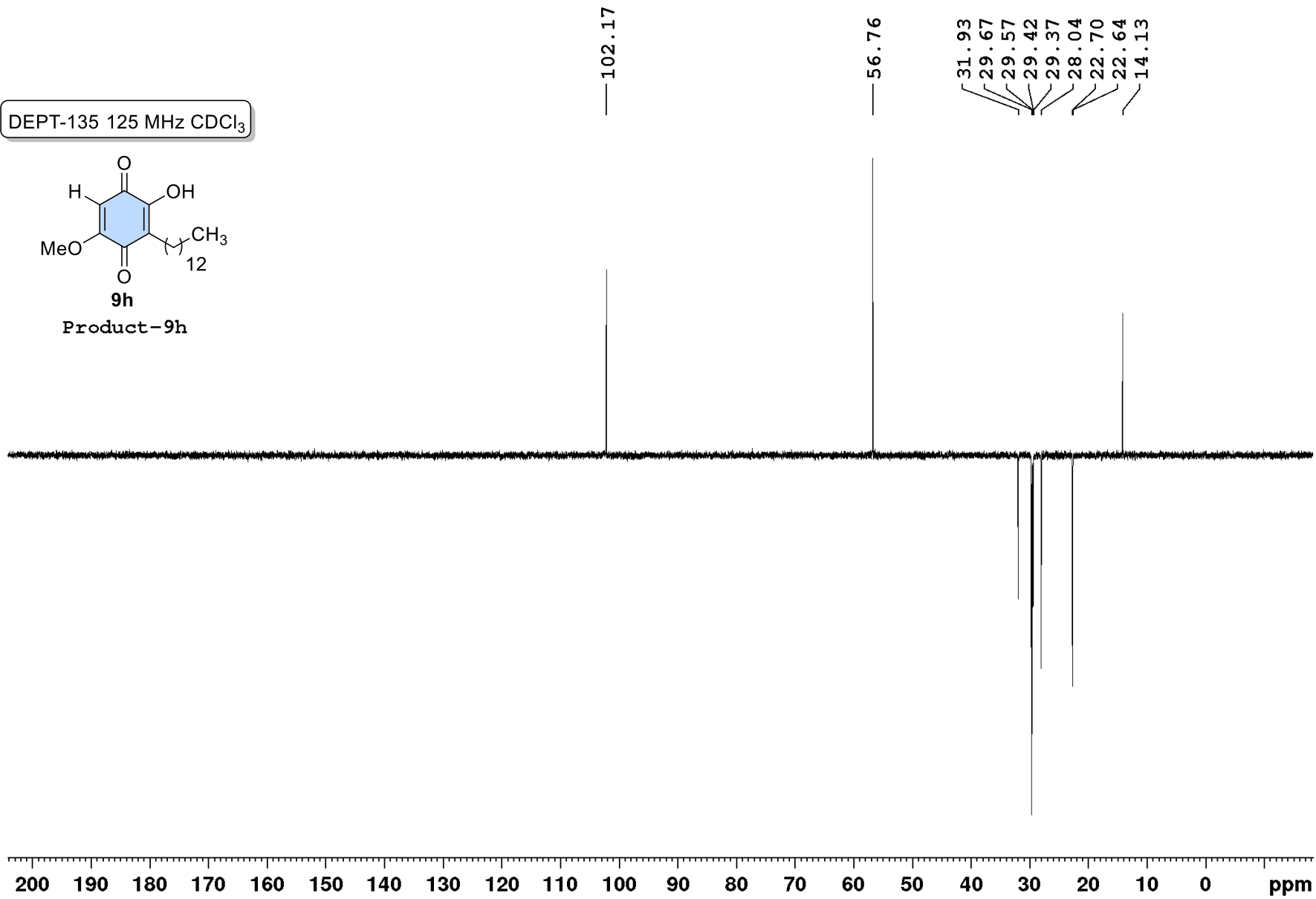
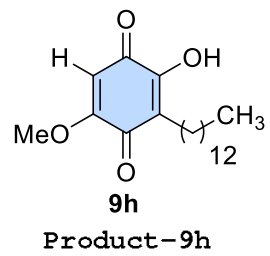
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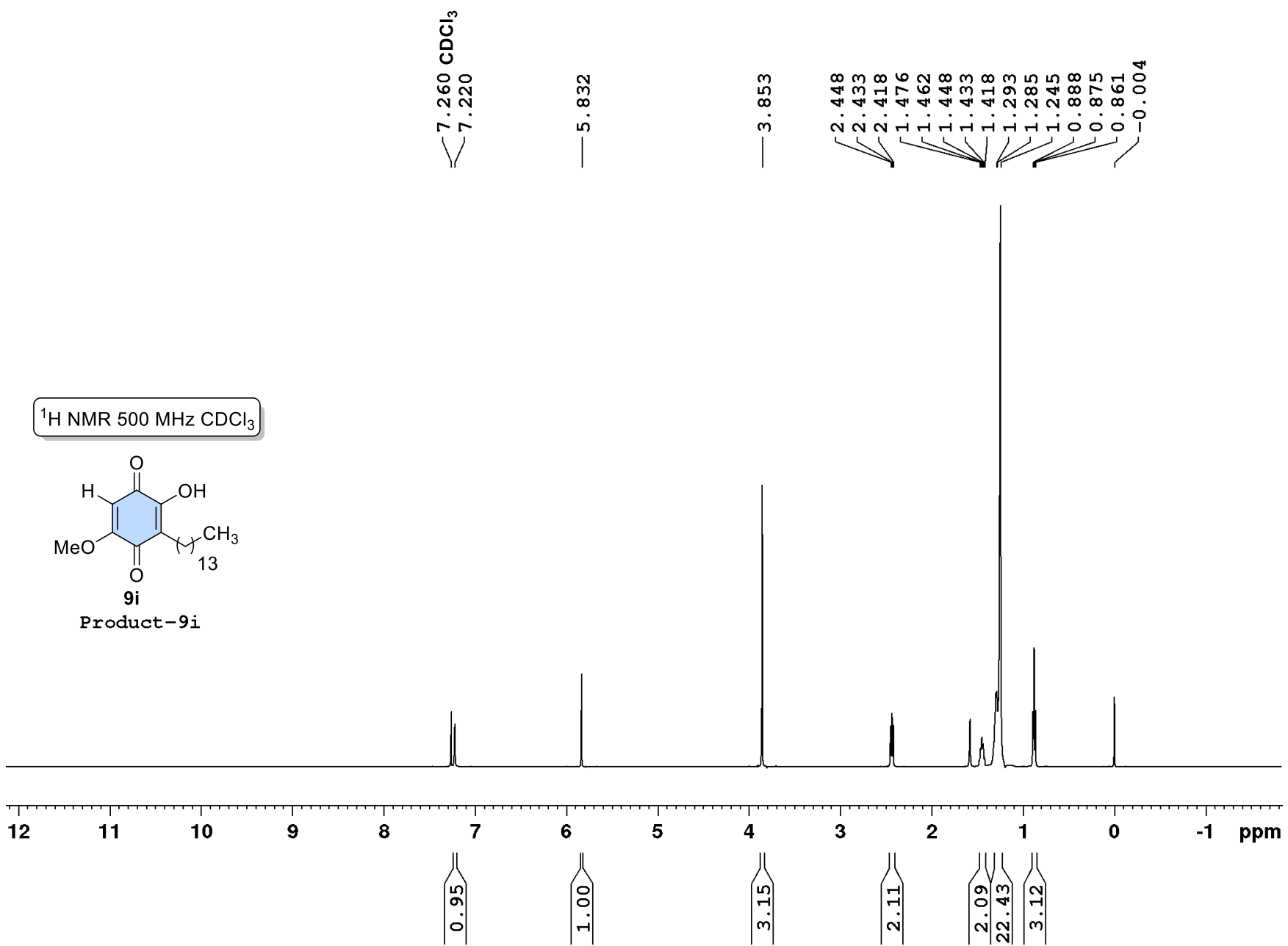


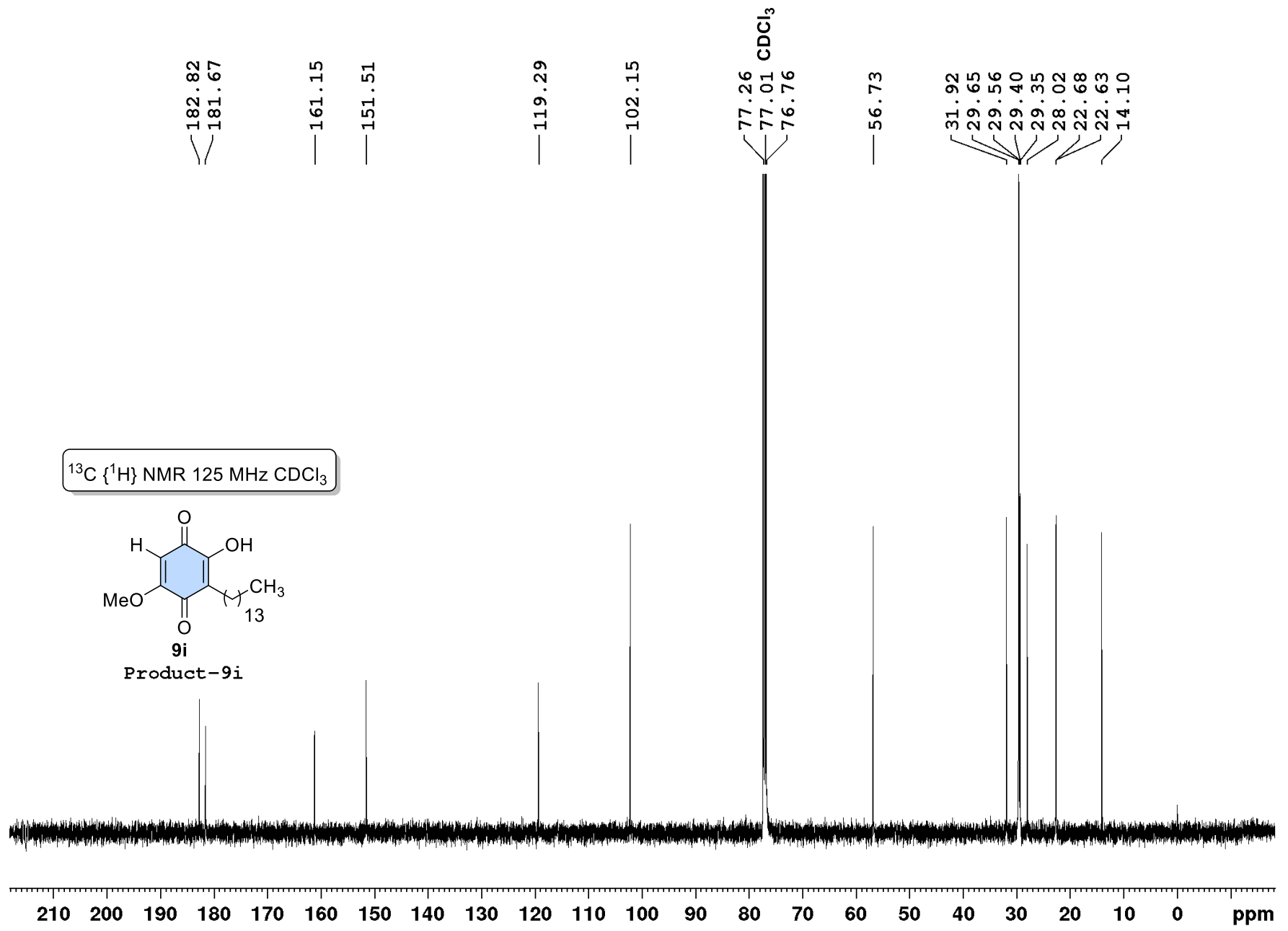
9h
Product-9h



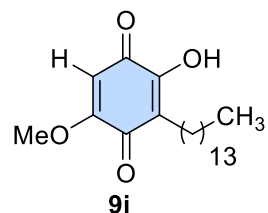
DEPT-135 125 MHz CDCl₃



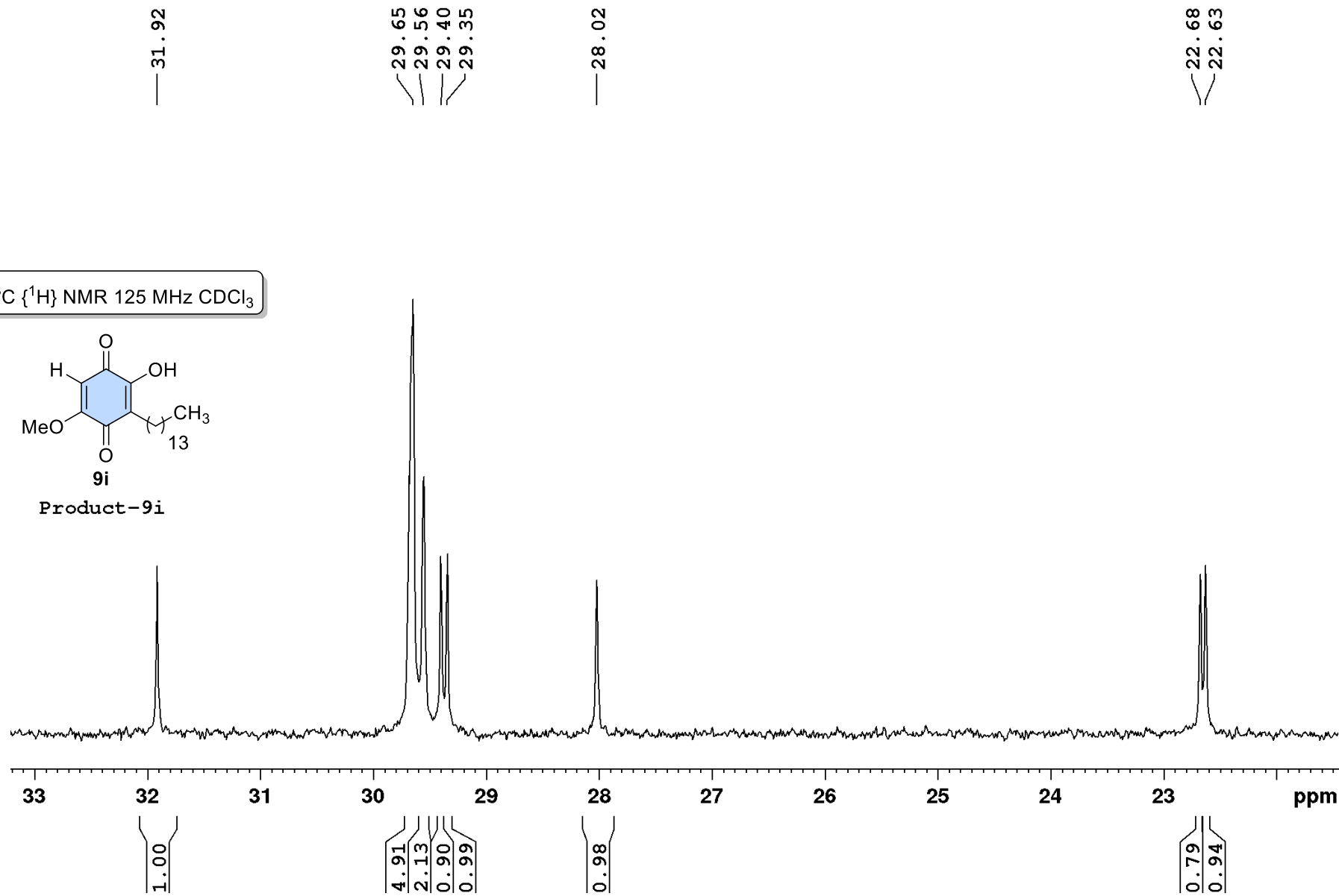




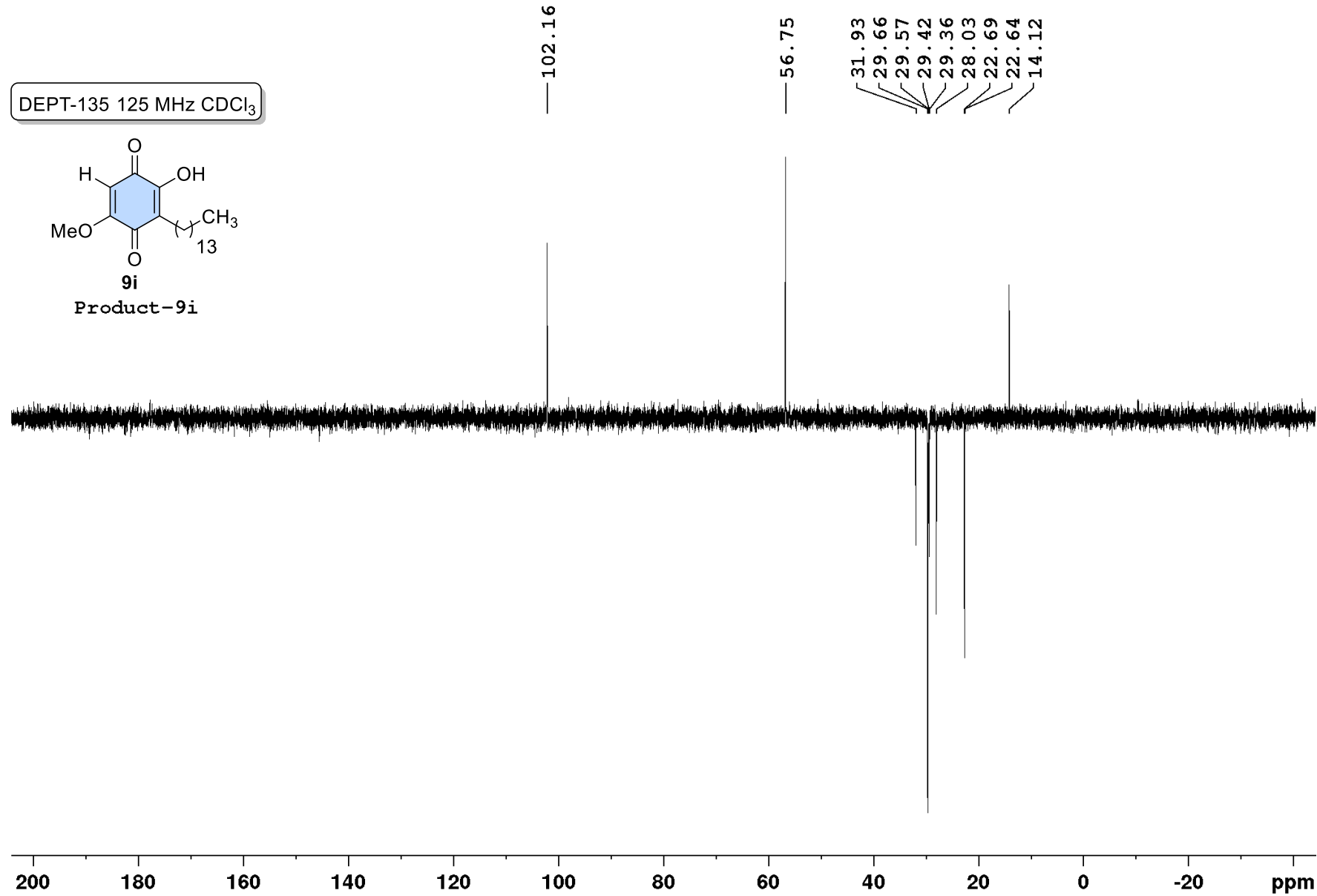
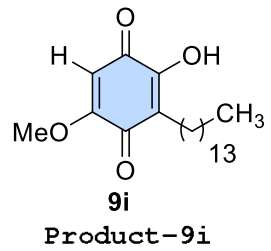
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3

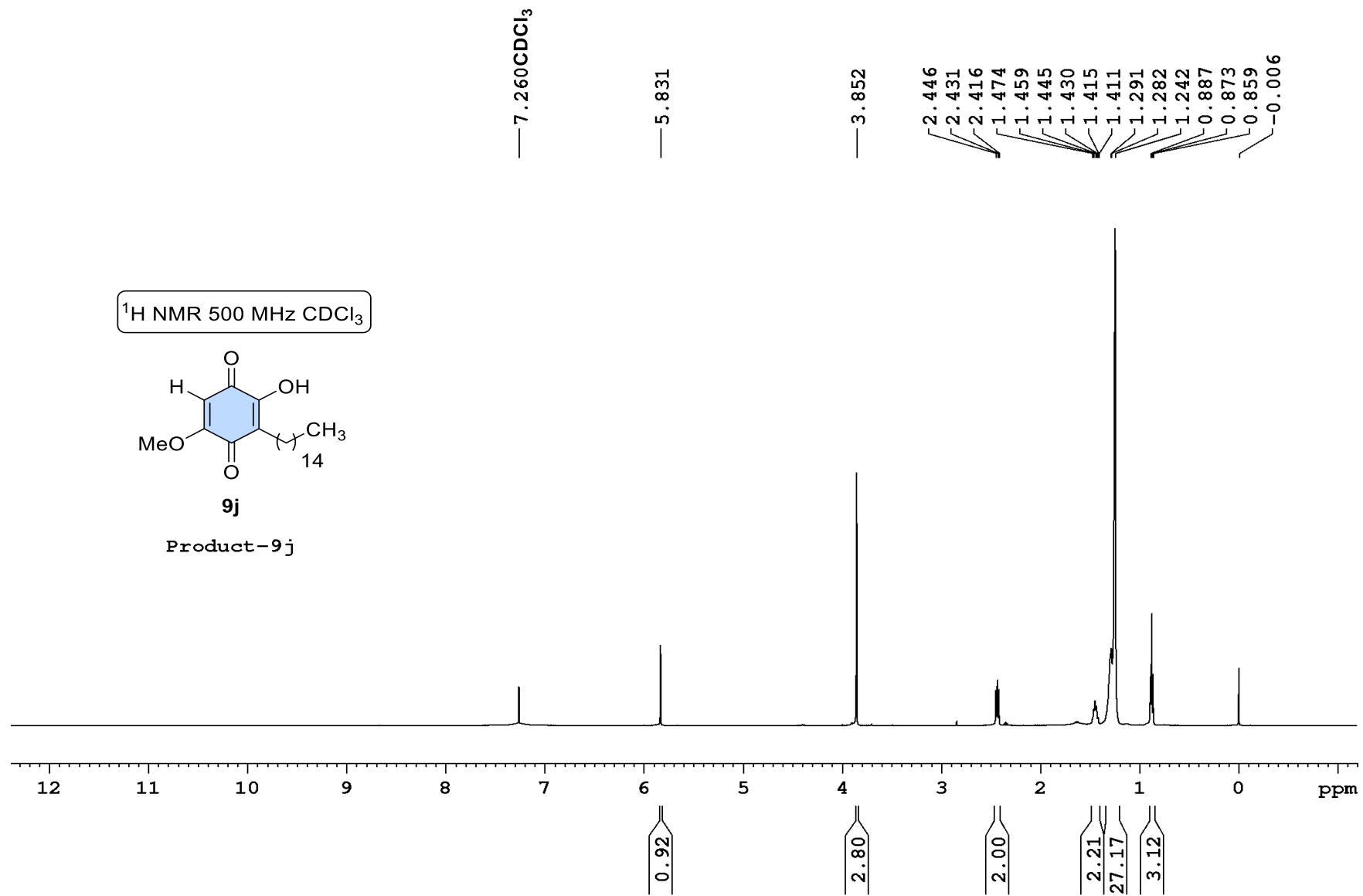


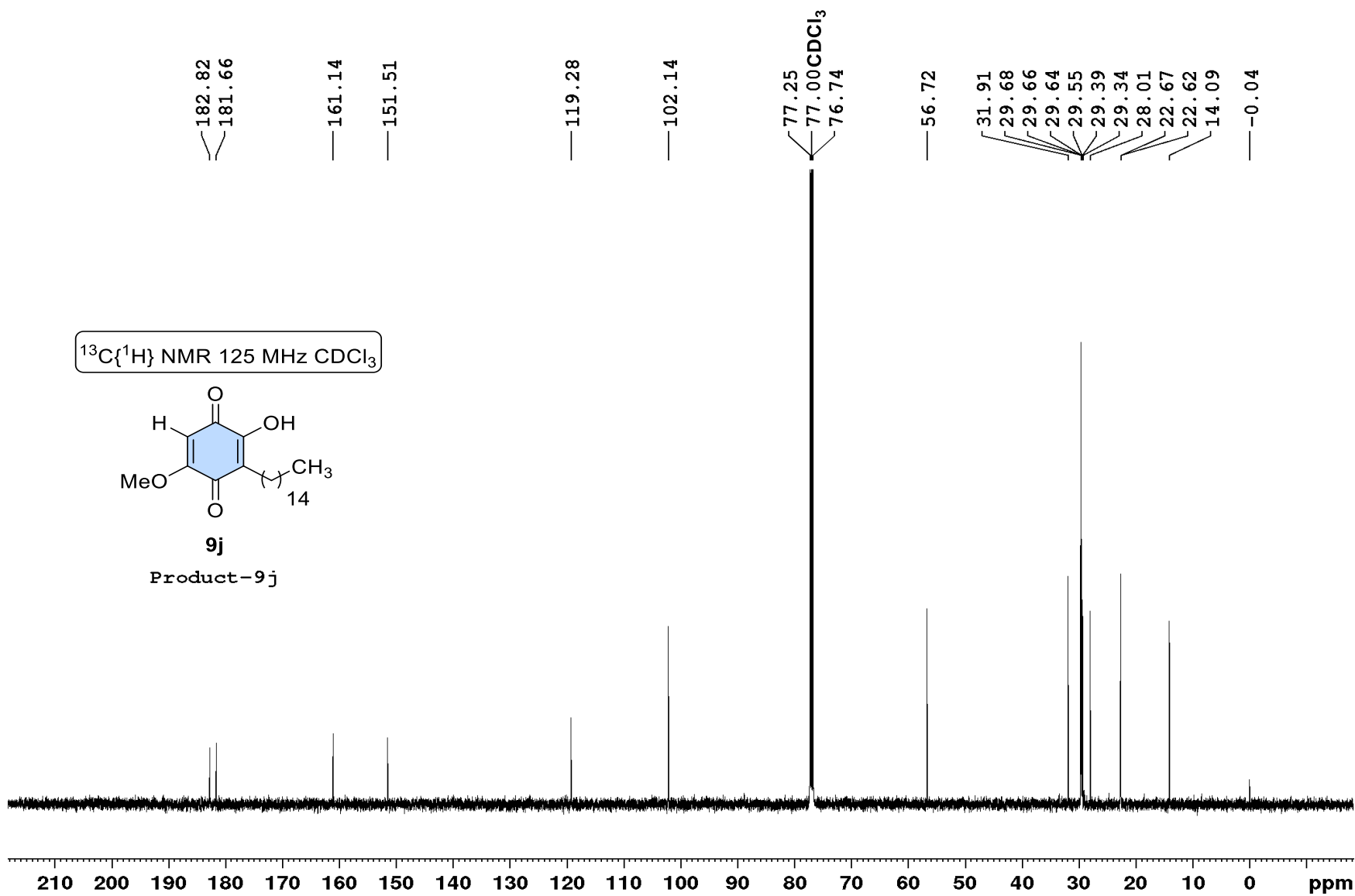
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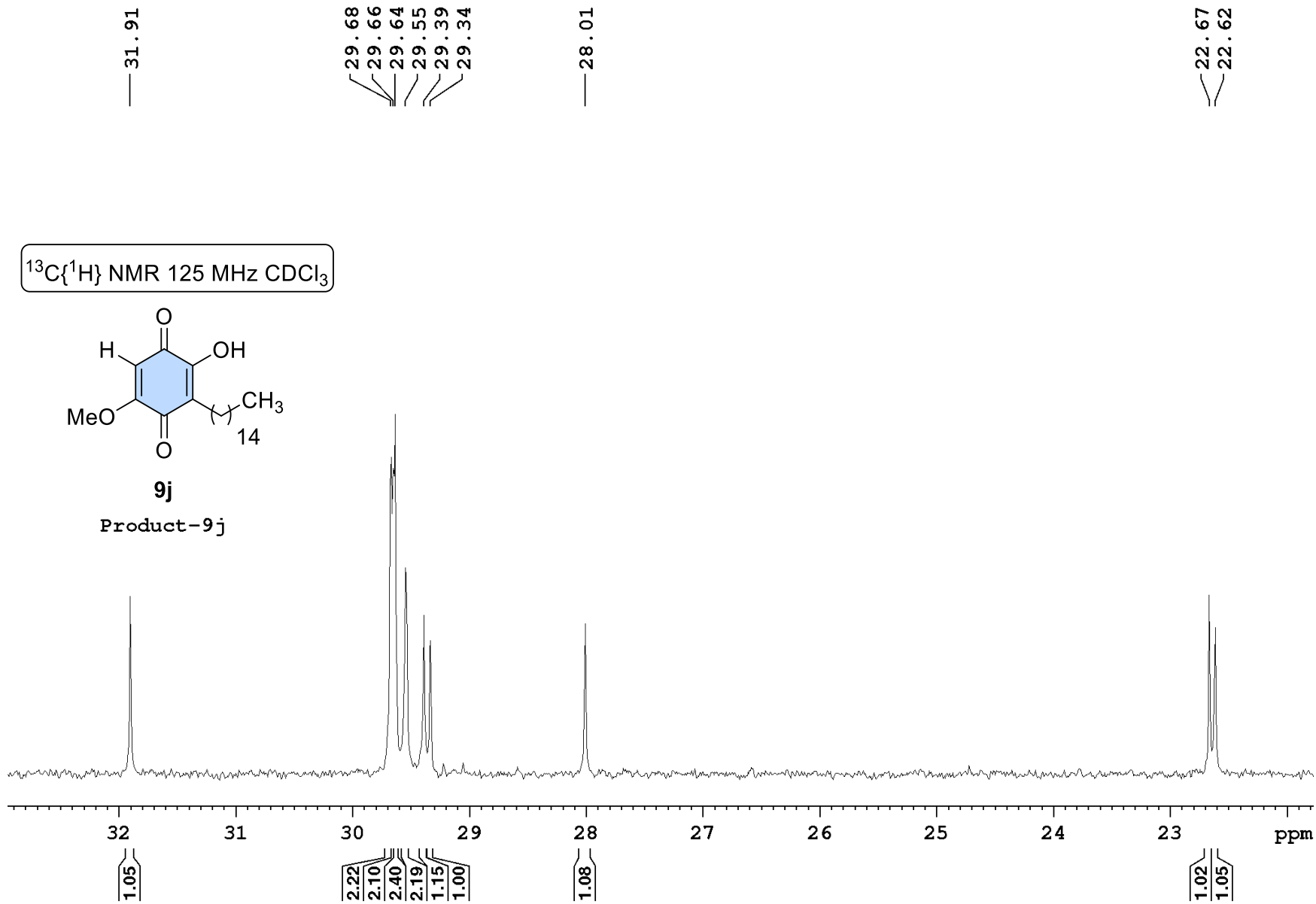


DEPT-135 125 MHz CDCl₃

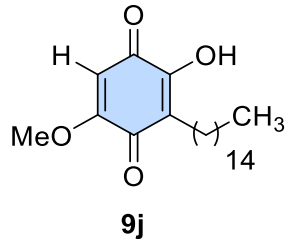




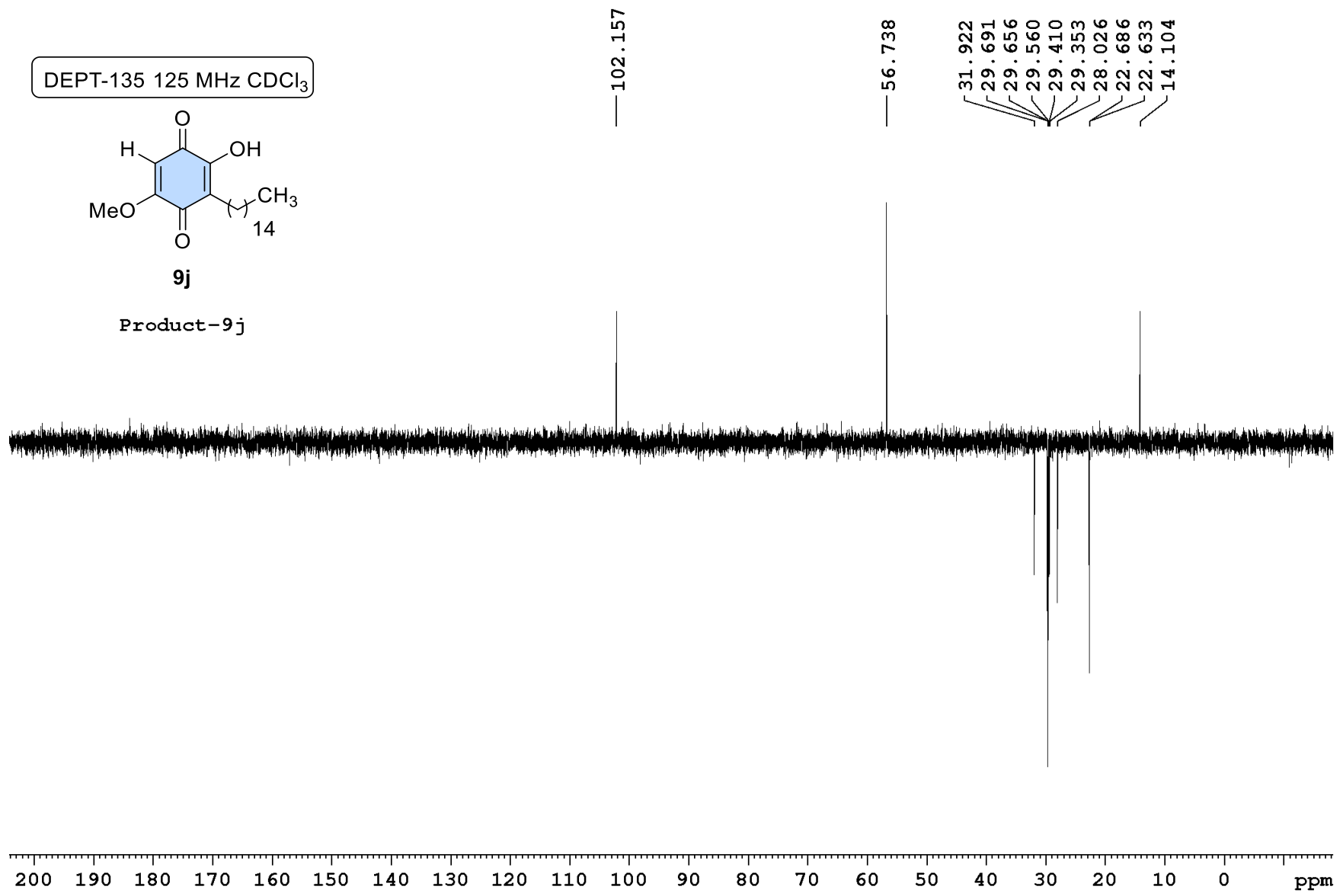


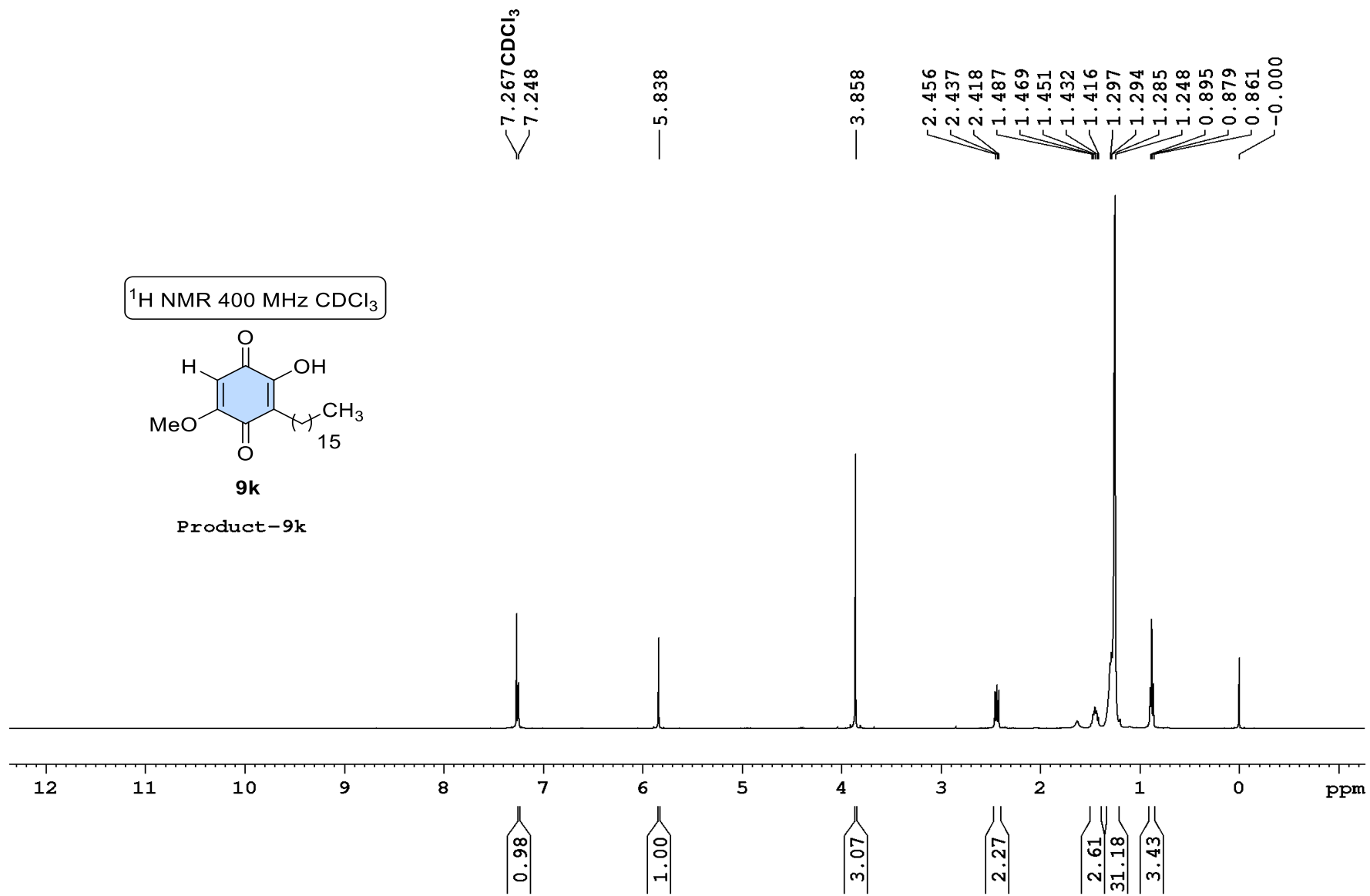


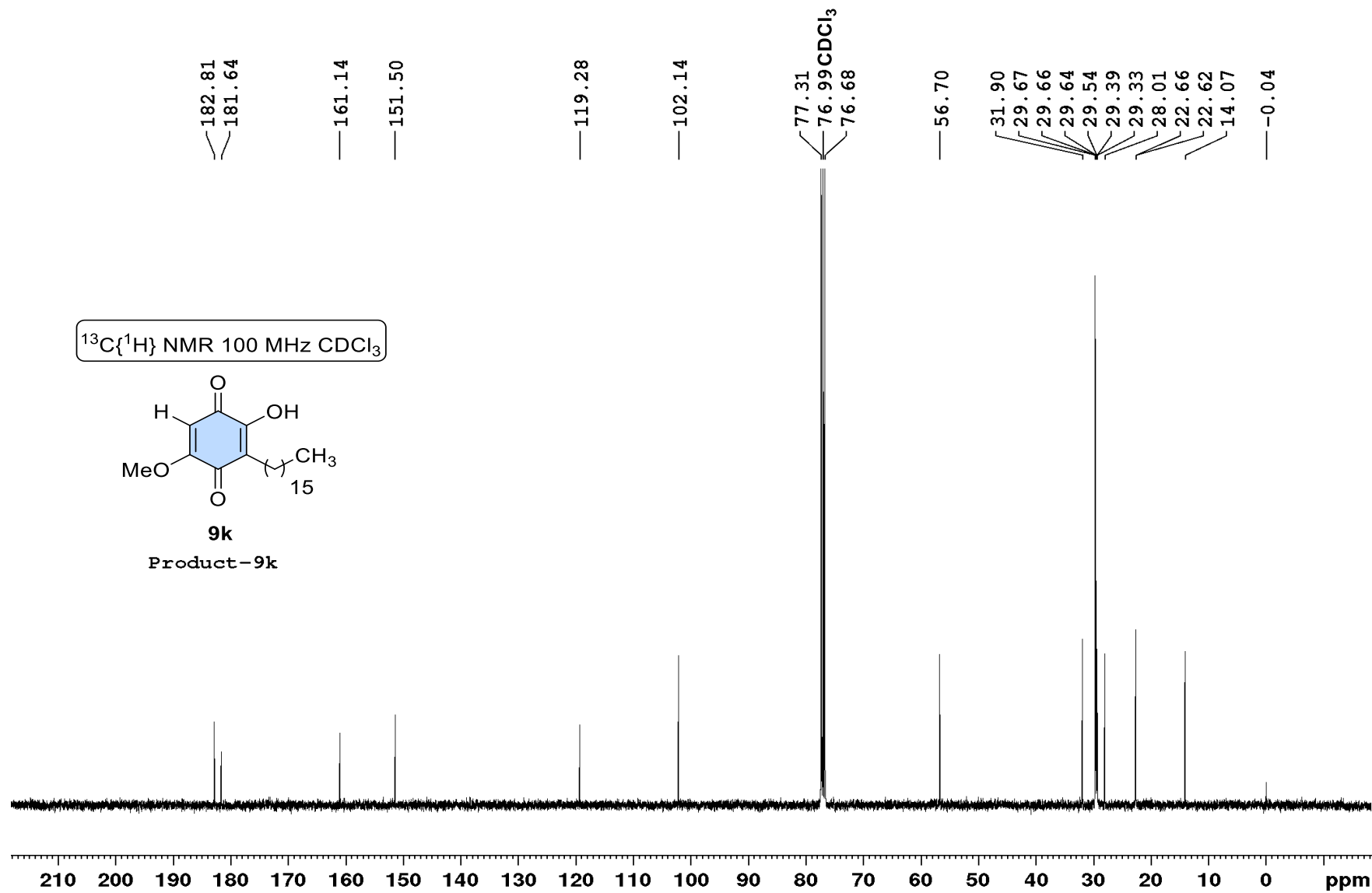
DEPT-135 125 MHz CDCl₃

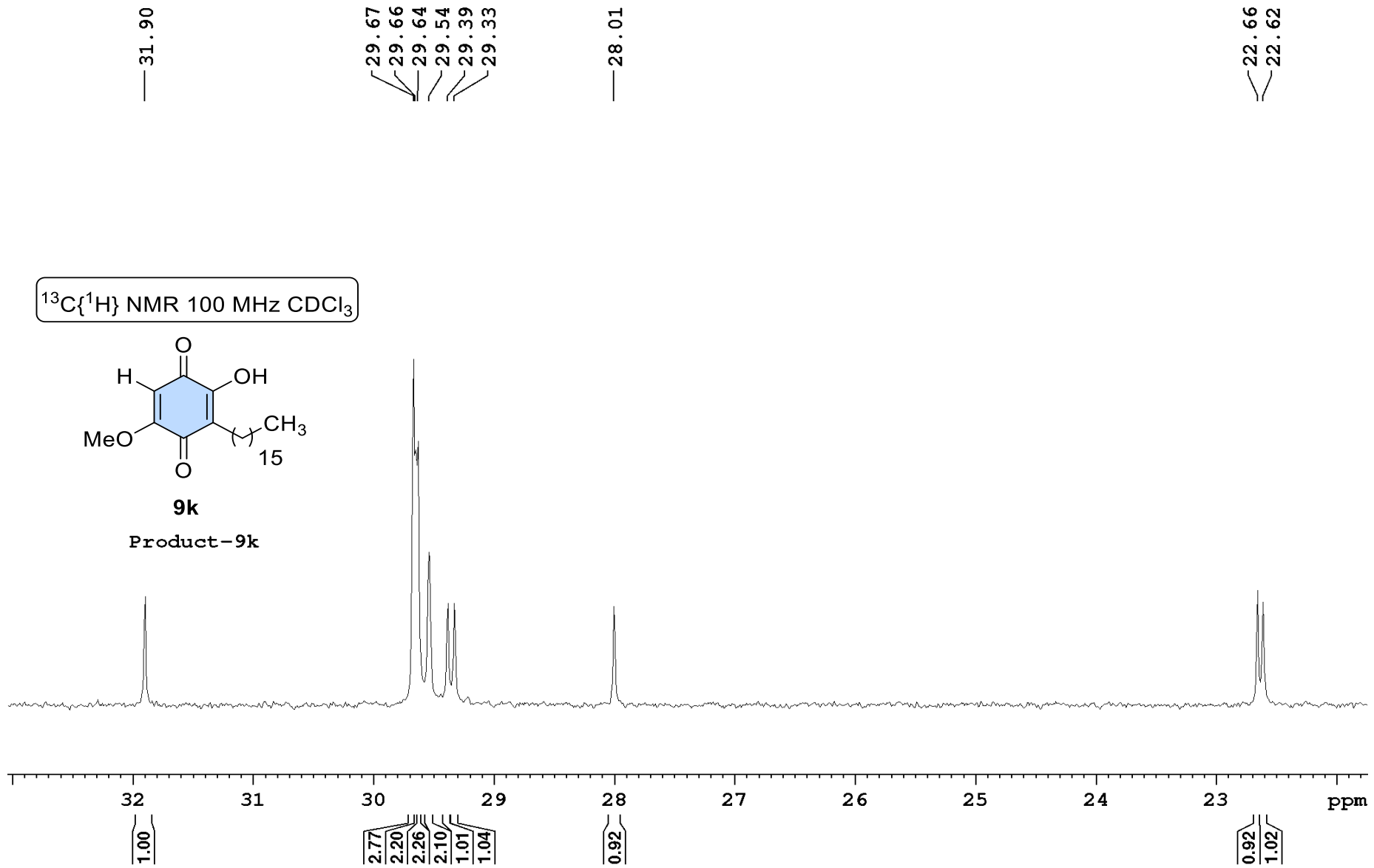


Product-9j

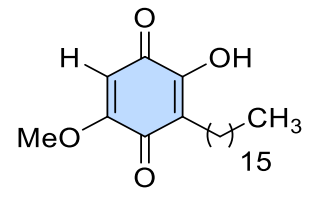








DEPT-135 100 MHz CDCl₃



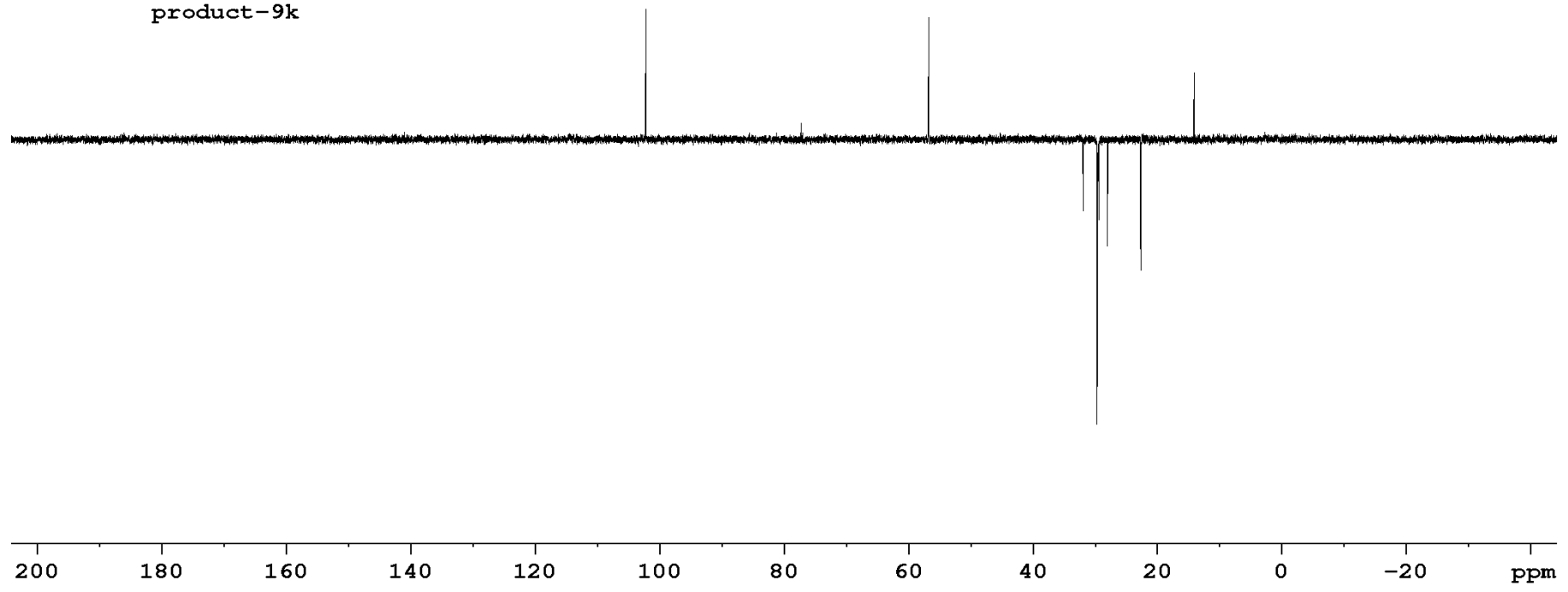
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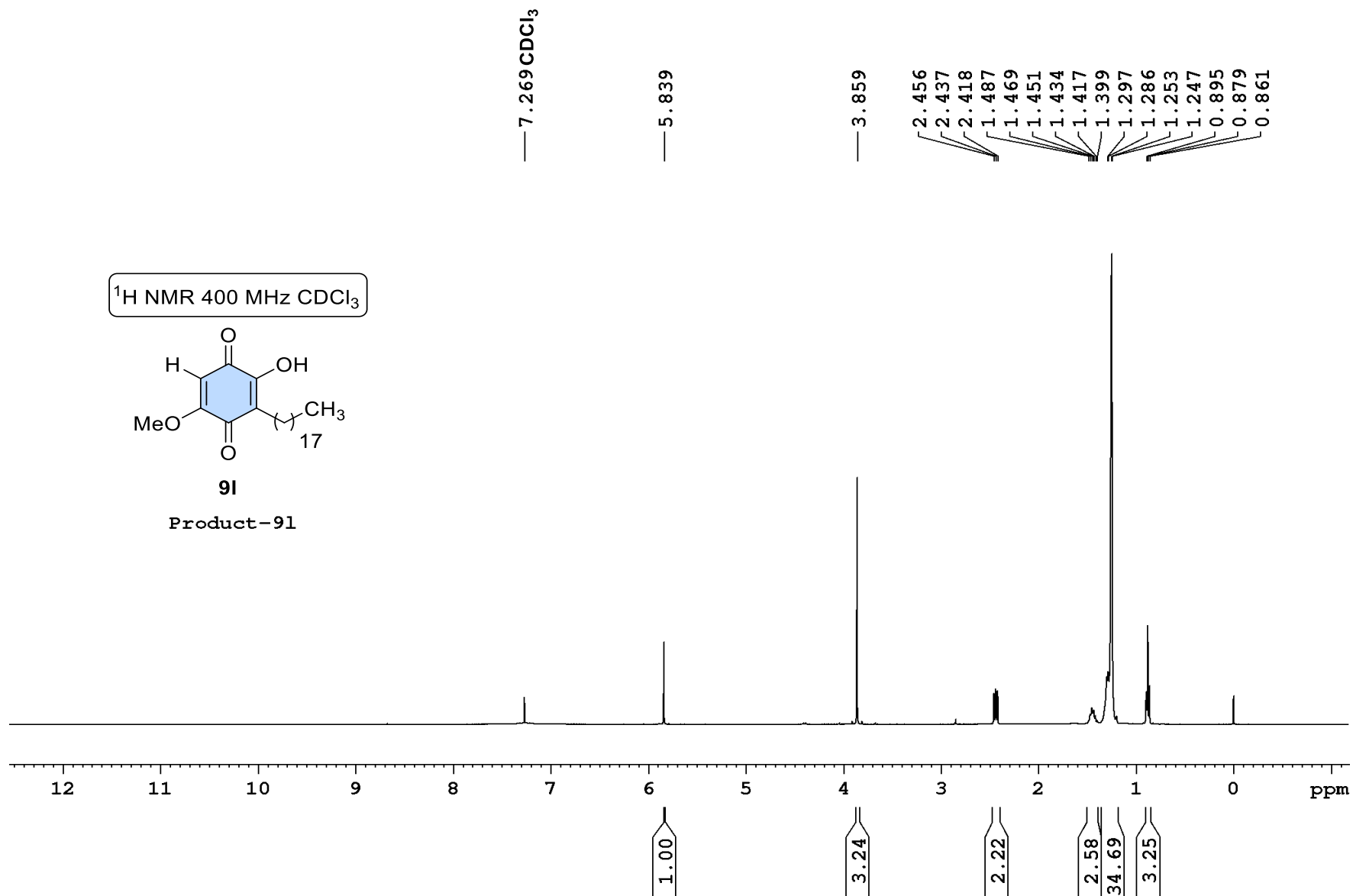
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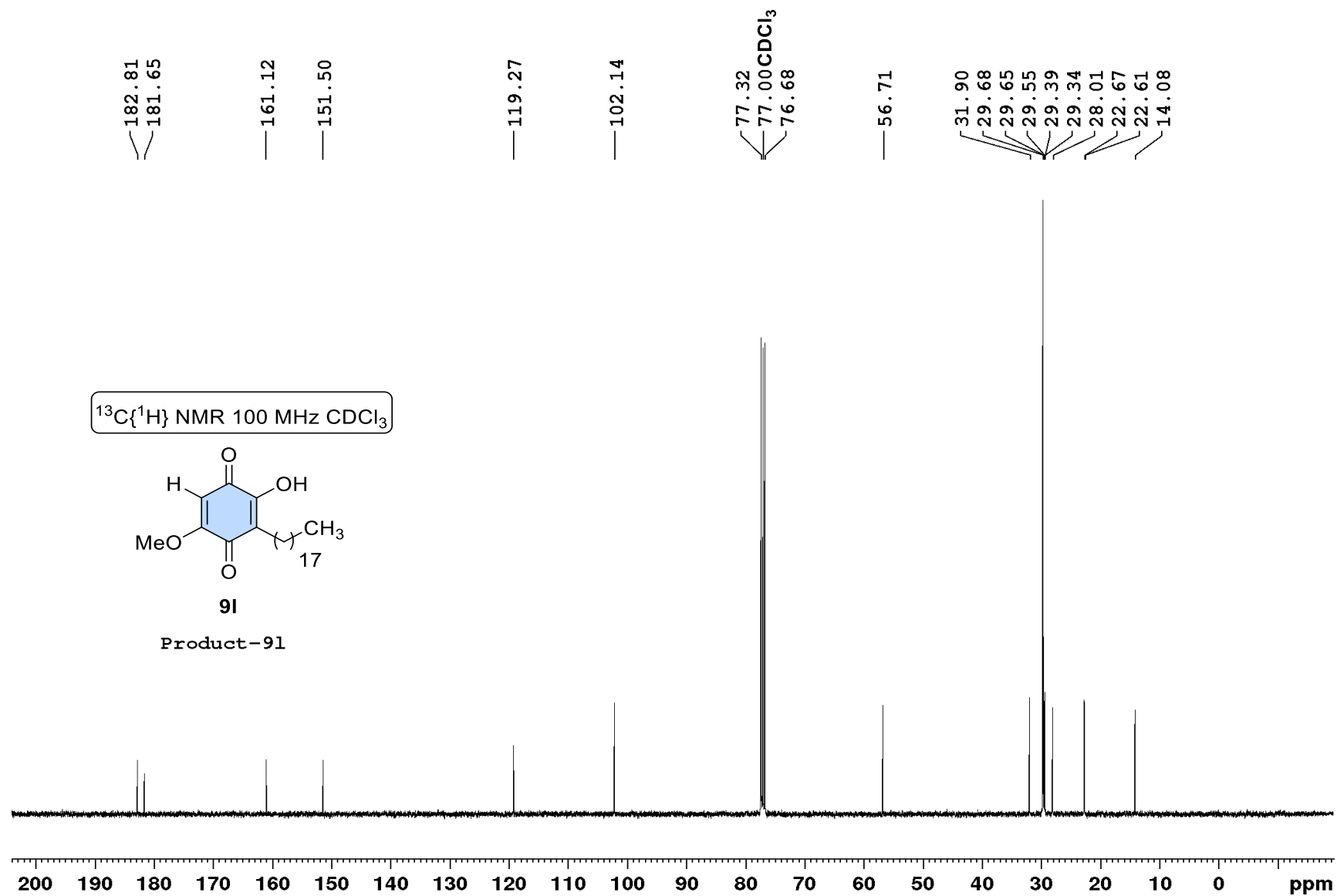
— 102.165

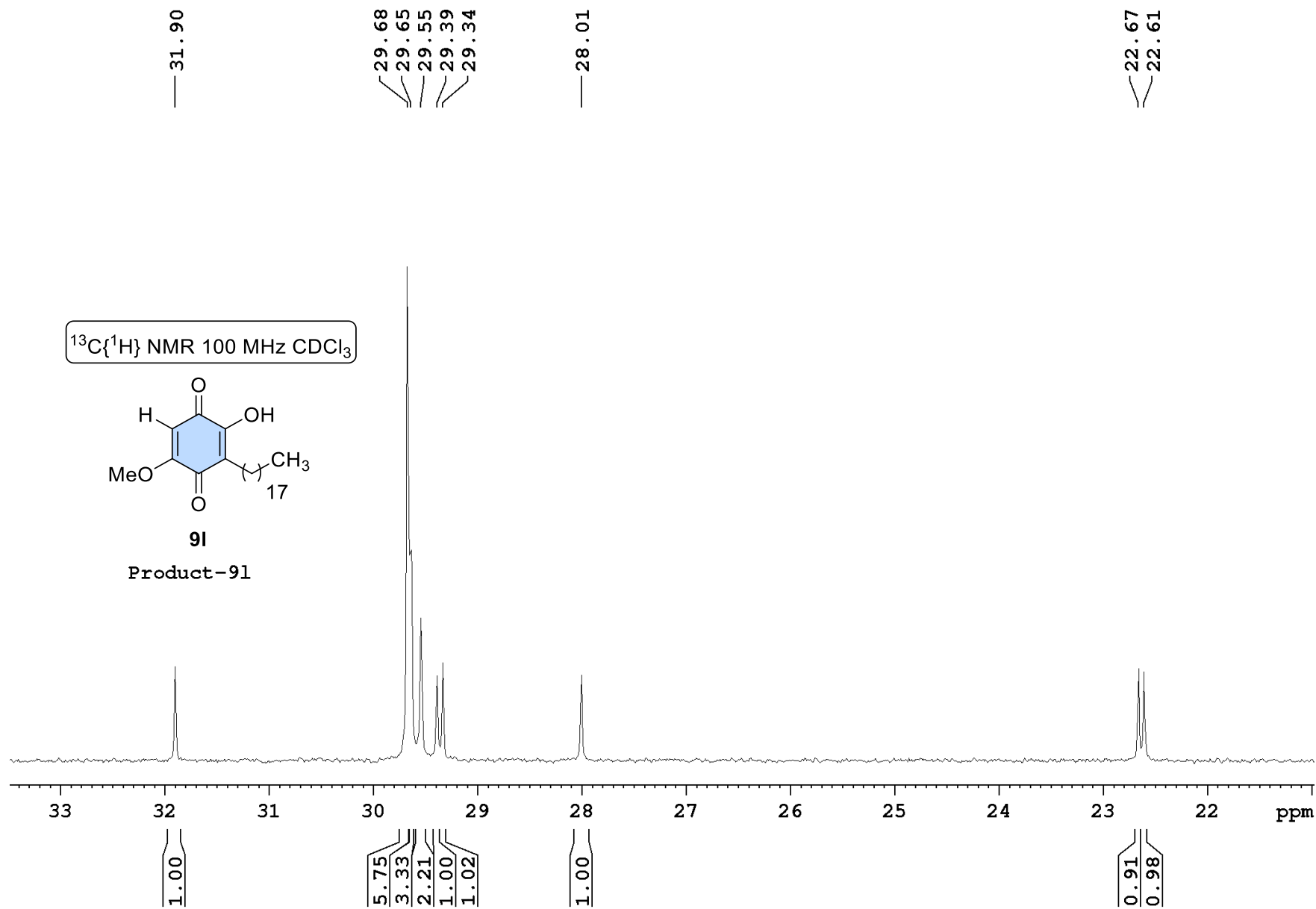
— 56.750

31.934
29.705
29.687
29.670
29.575
29.422
29.368
28.038
22.698
22.640
14.120

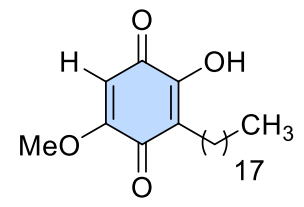






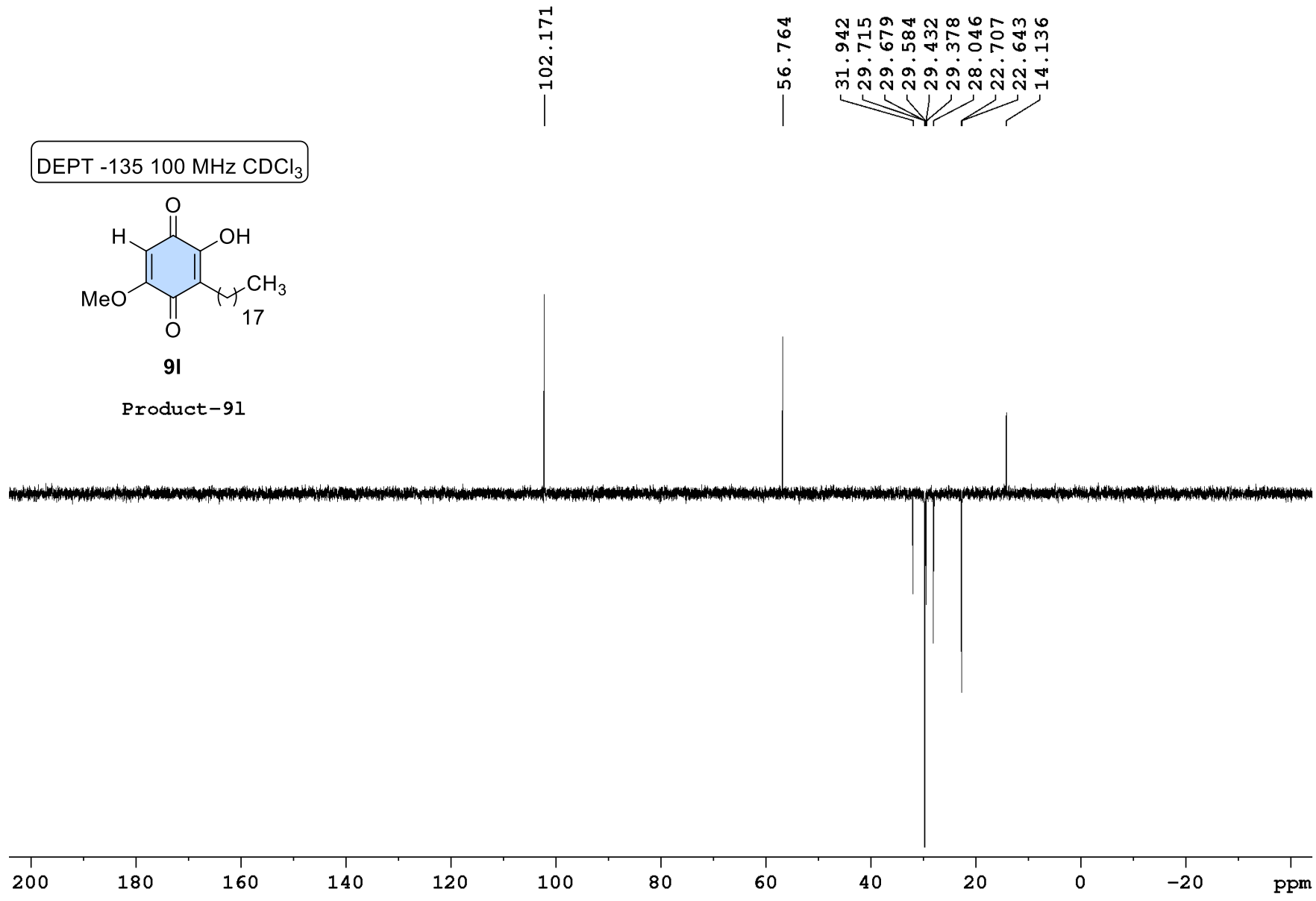


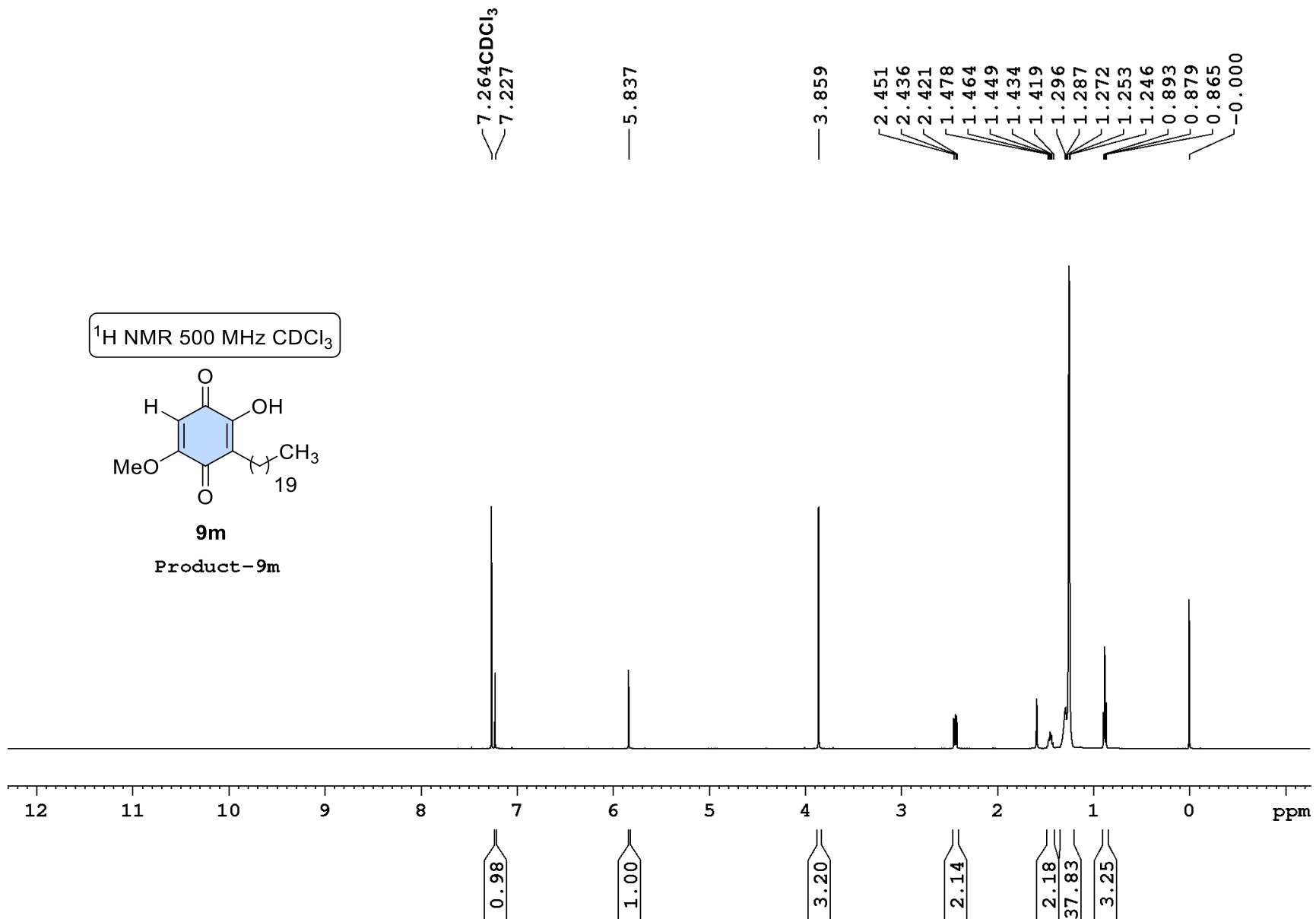
DEPT -135 100 MHz CDCl₃

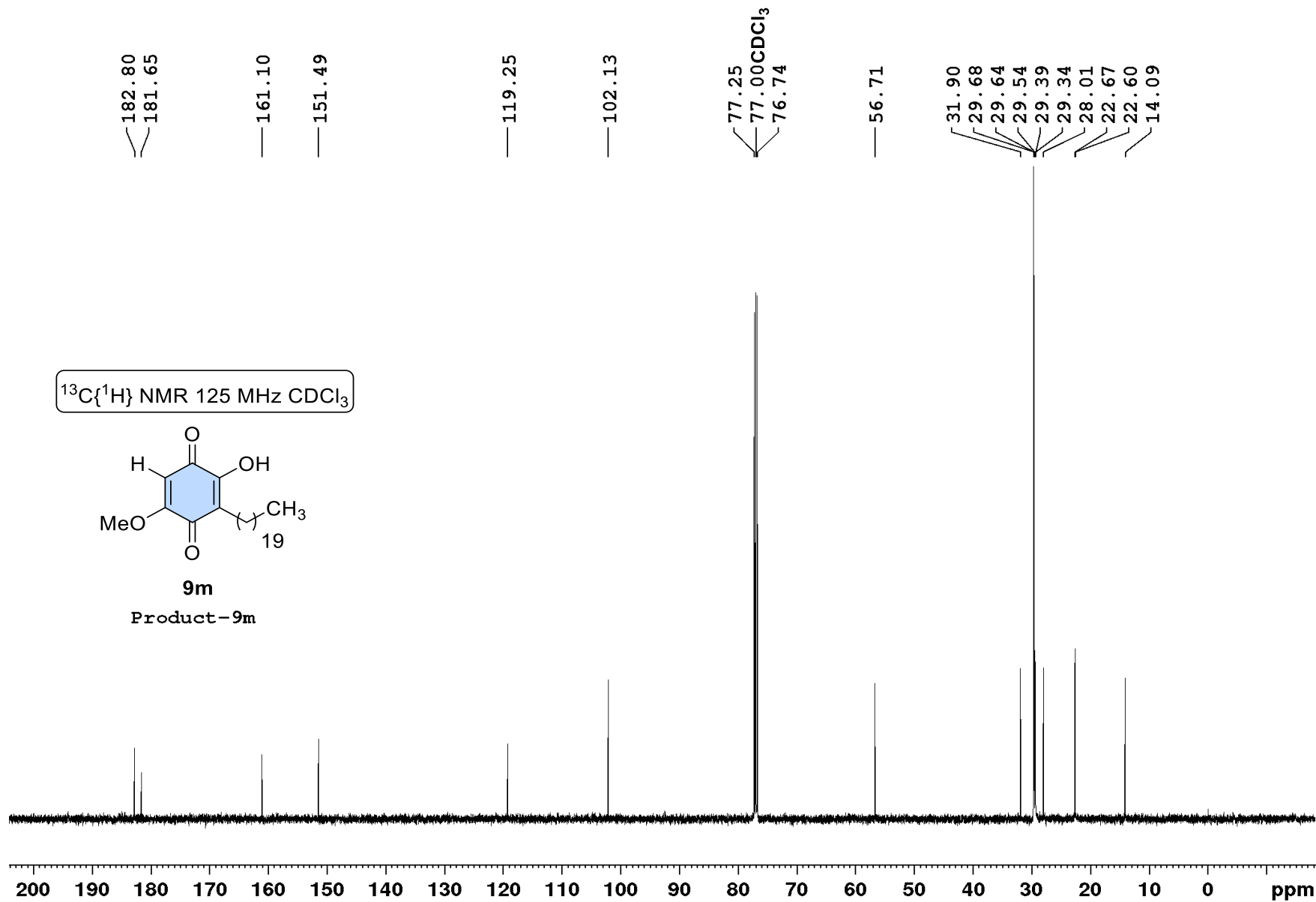


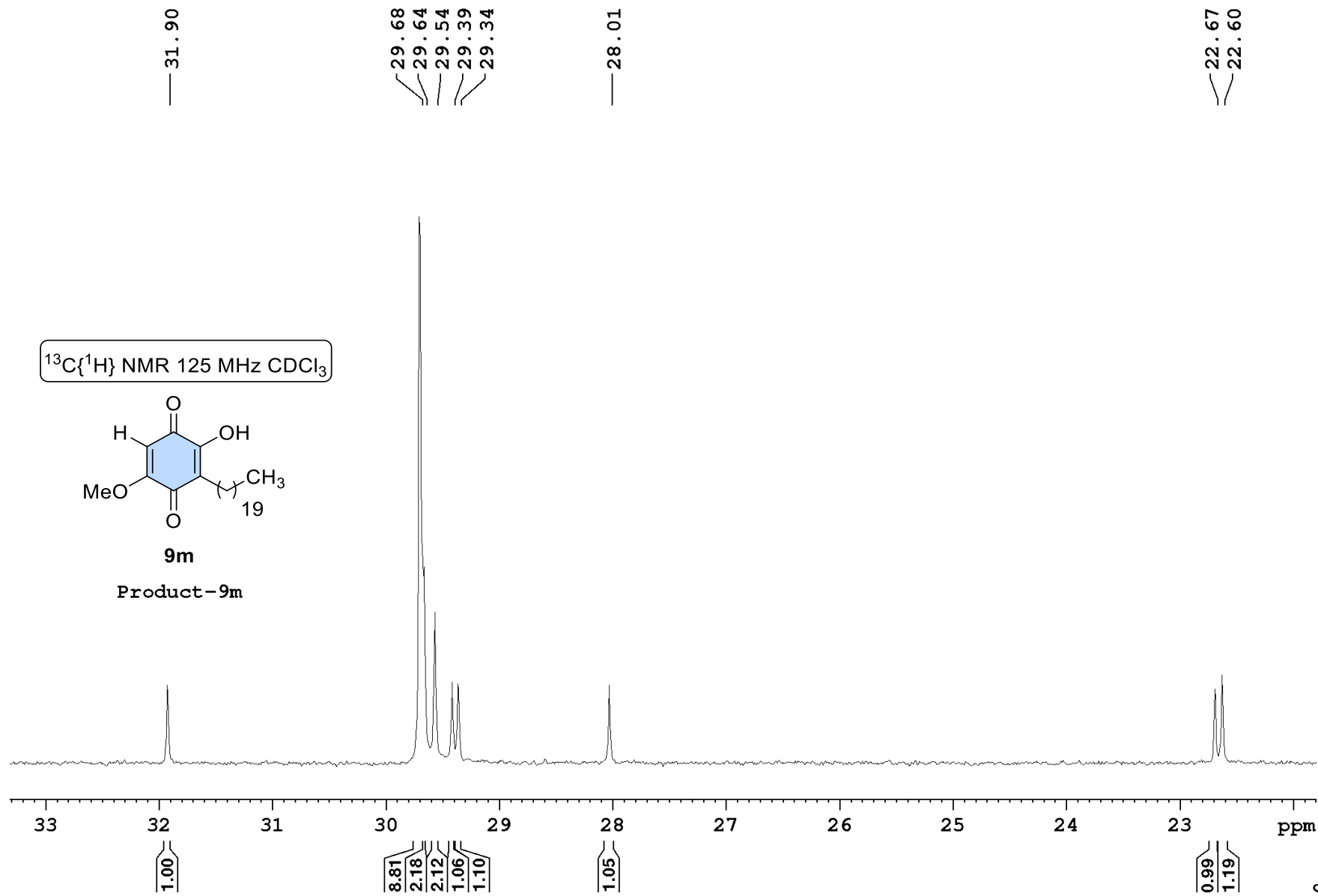
91

Product-91

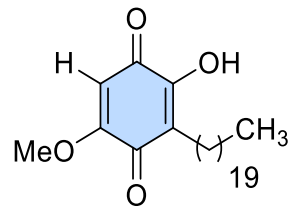






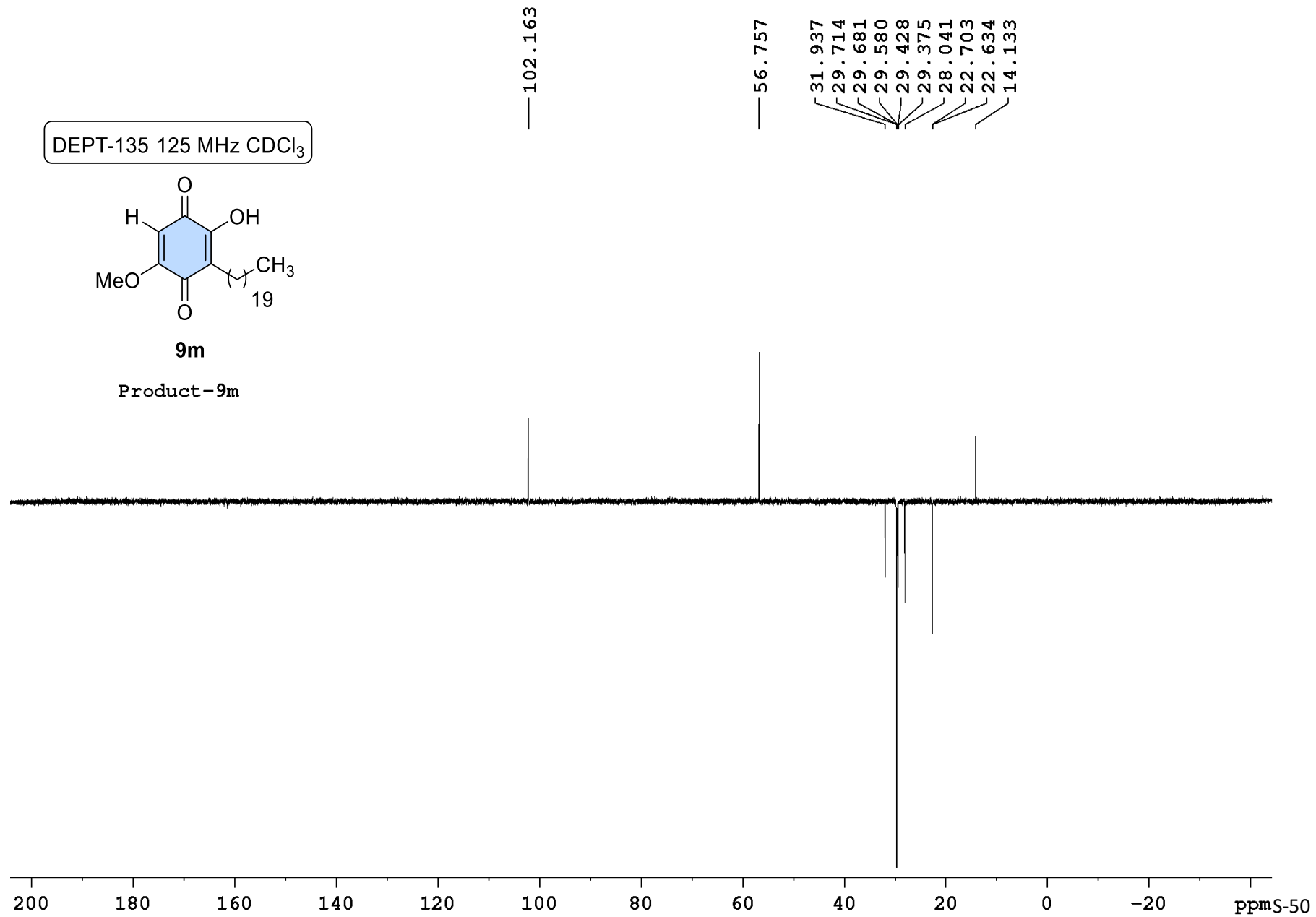


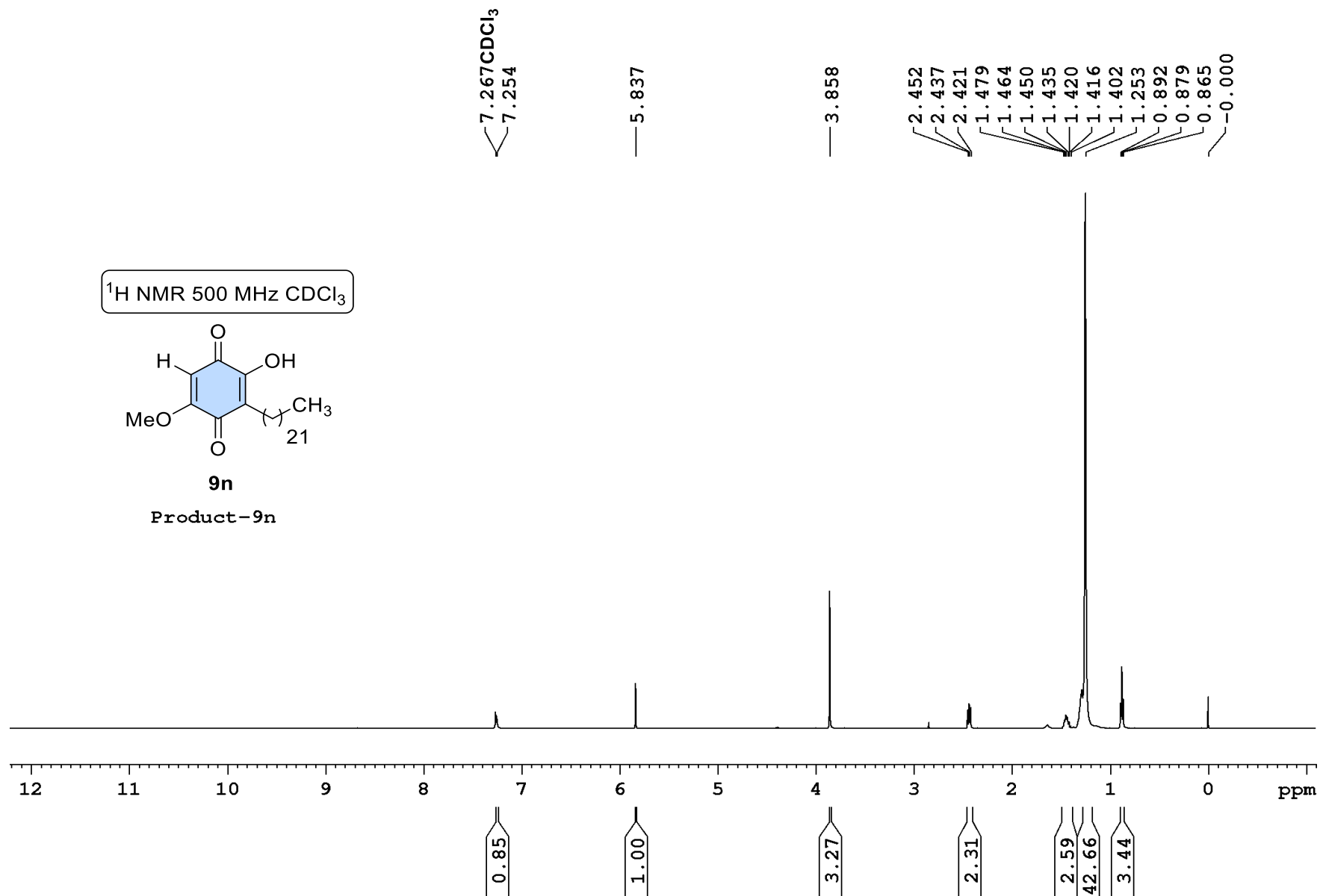
DEPT-135 125 MHz CDCl₃

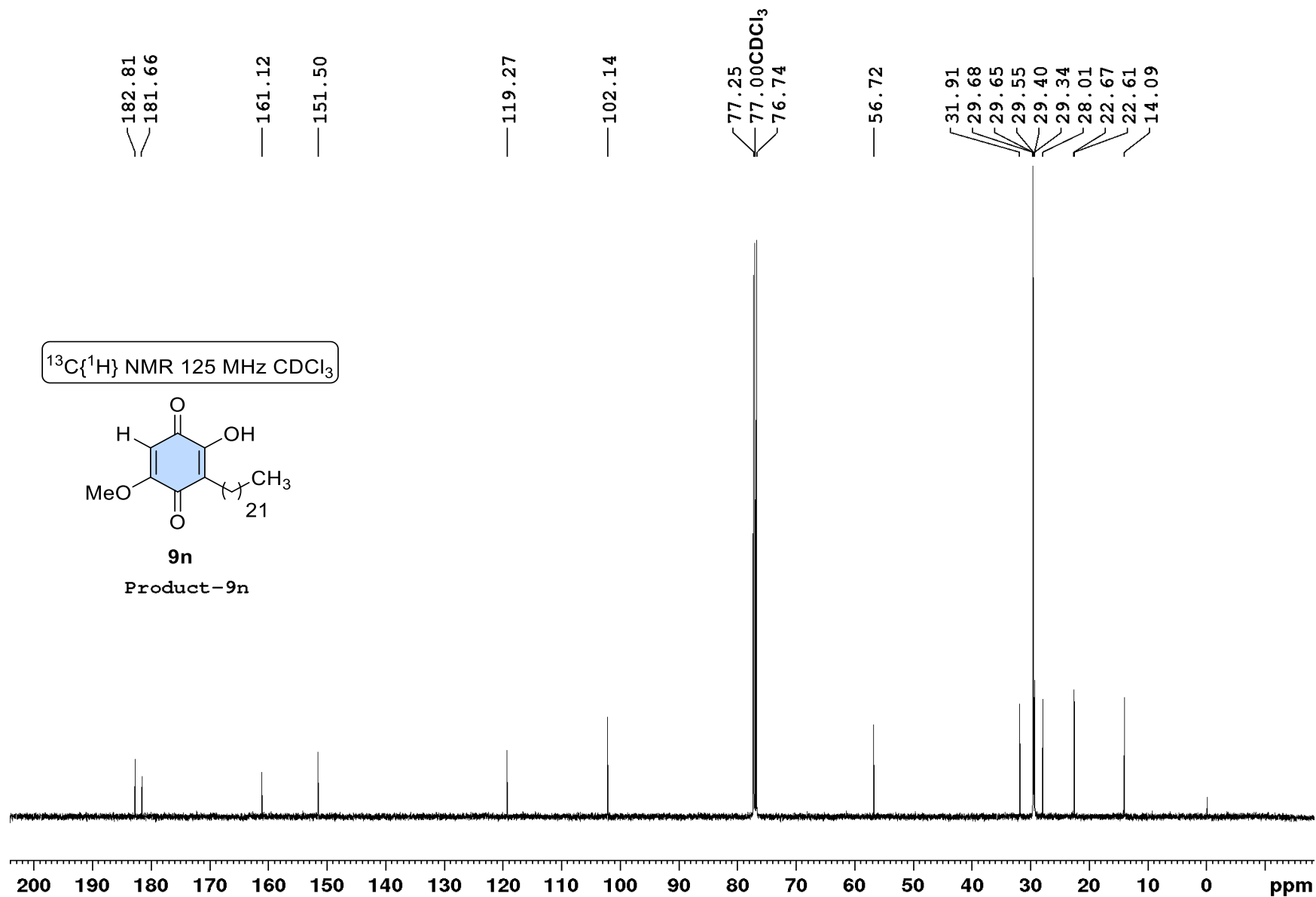


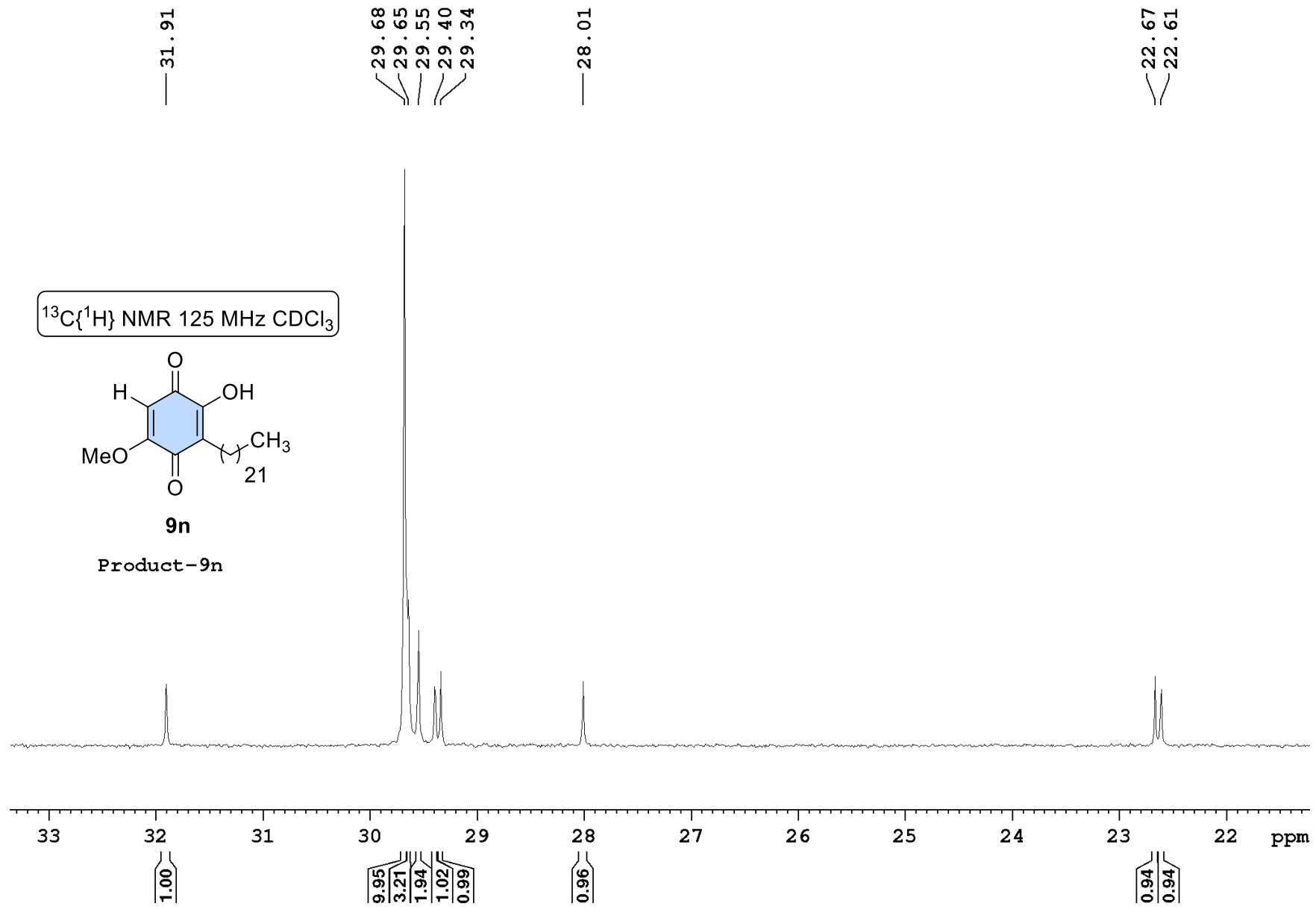
9m

Product-9m

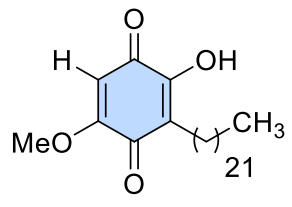






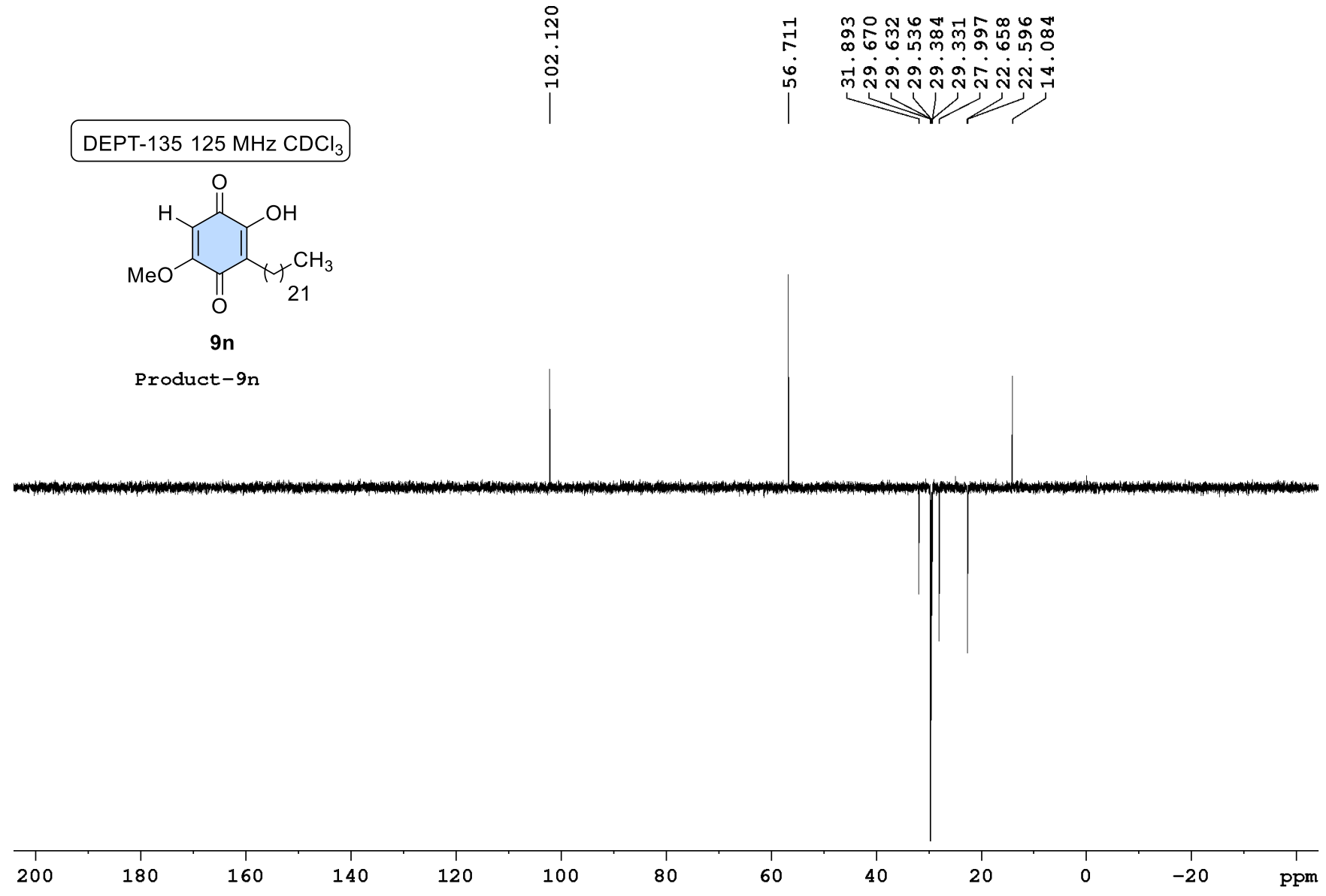


DEPT-135 125 MHz CDCl₃



9n

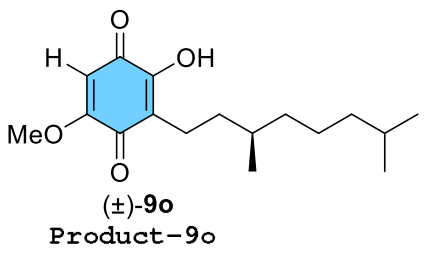
Product-9n



7.310
7.282CDCl₃

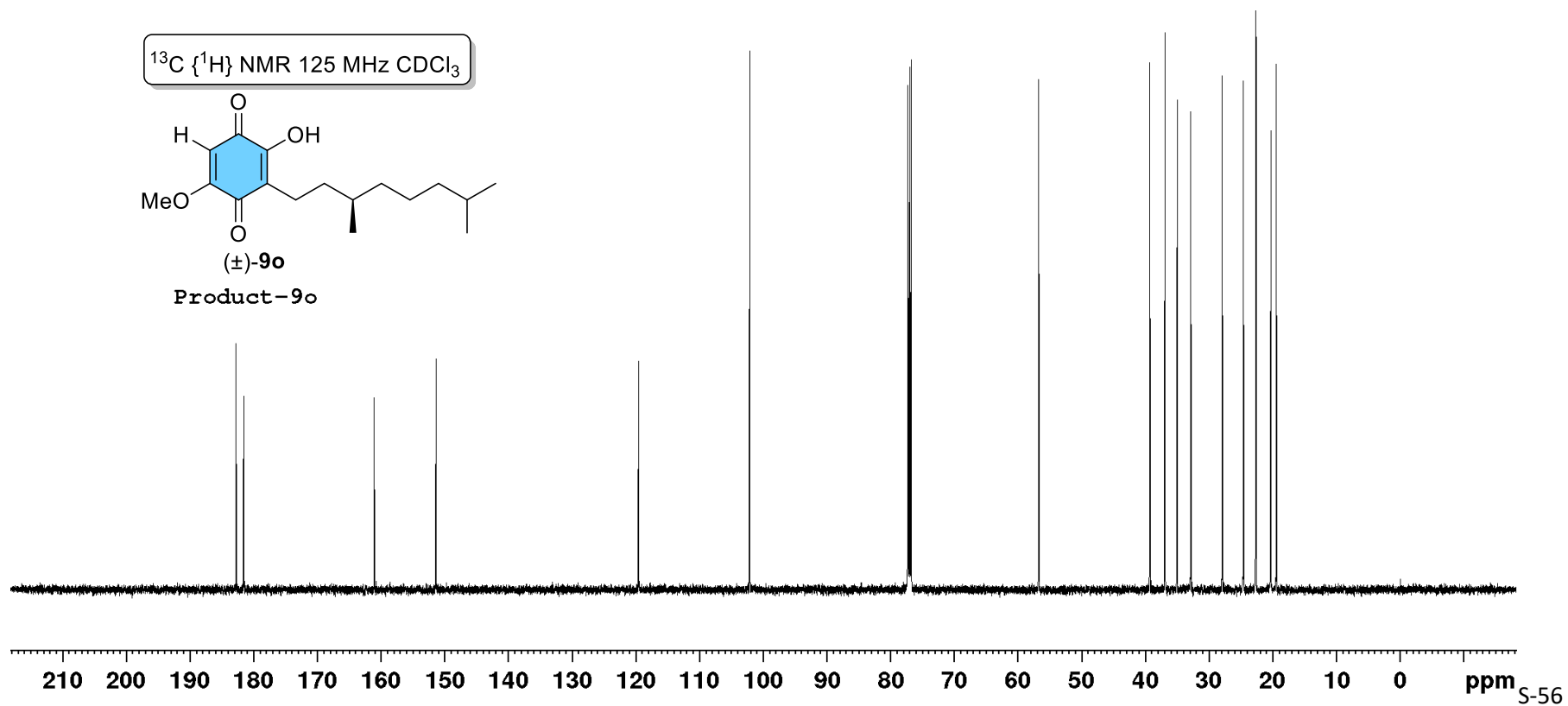
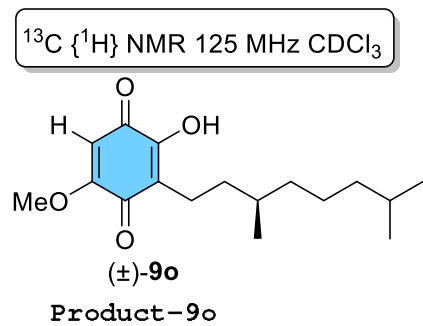
5.843
3.861
2.465
2.459
2.453
2.445
2.433
2.425
2.413
1.544
1.530
1.517
1.504
1.491
1.480
1.470
1.458
1.449
1.445
1.437
1.433
1.426
1.421
1.413
1.400
1.333
1.313
1.300
1.281
1.278
1.272
1.267
1.258
1.256
1.247
1.236
1.231
1.226
1.221
1.213
1.199
1.192
1.152
1.138
1.132
1.129
1.125
1.119
1.106
1.099
1.083
0.927
0.914
0.866
0.852
-0.000

¹H NMR 500 MHz CDCl₃



12 11 10 9 8 7 6 5 4 3 2 1 0 ppm

0.89
0.92
3.00
2.02
3.08
4.24
2.99
2.98
6.10



182.85
181.65

161.13

151.43

119.61

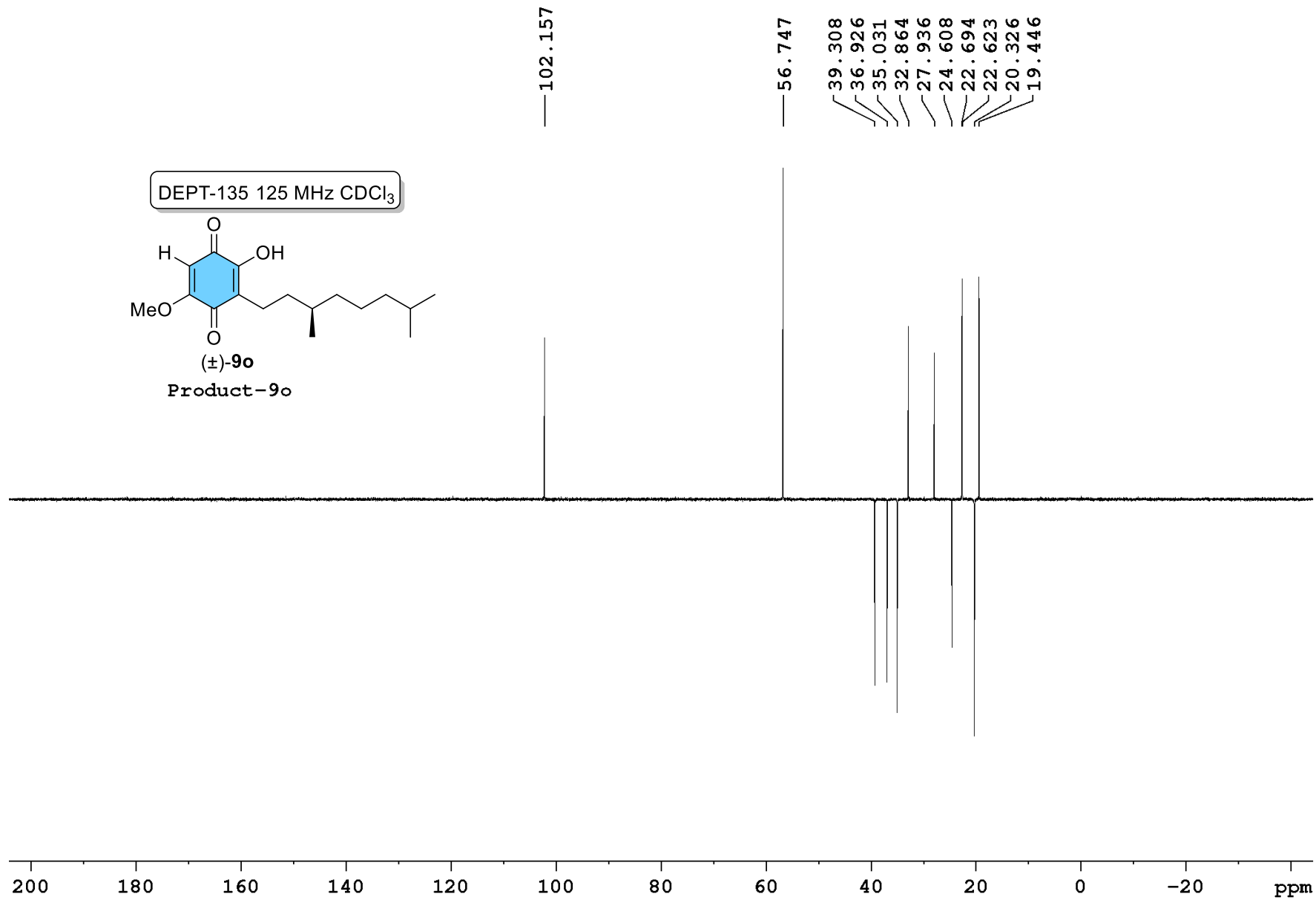
102.16

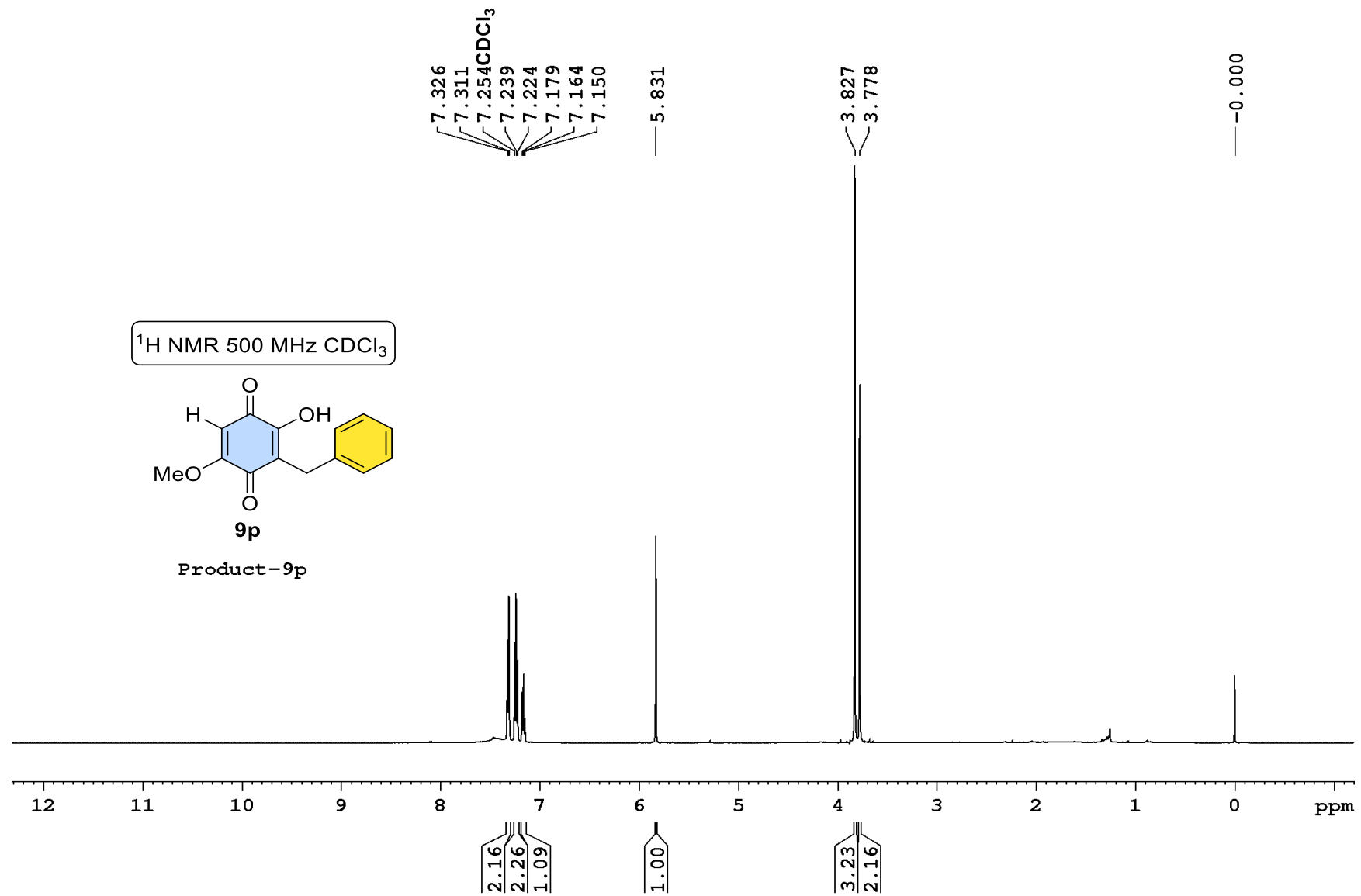
77.30
77.05 CDCl₃
76.80

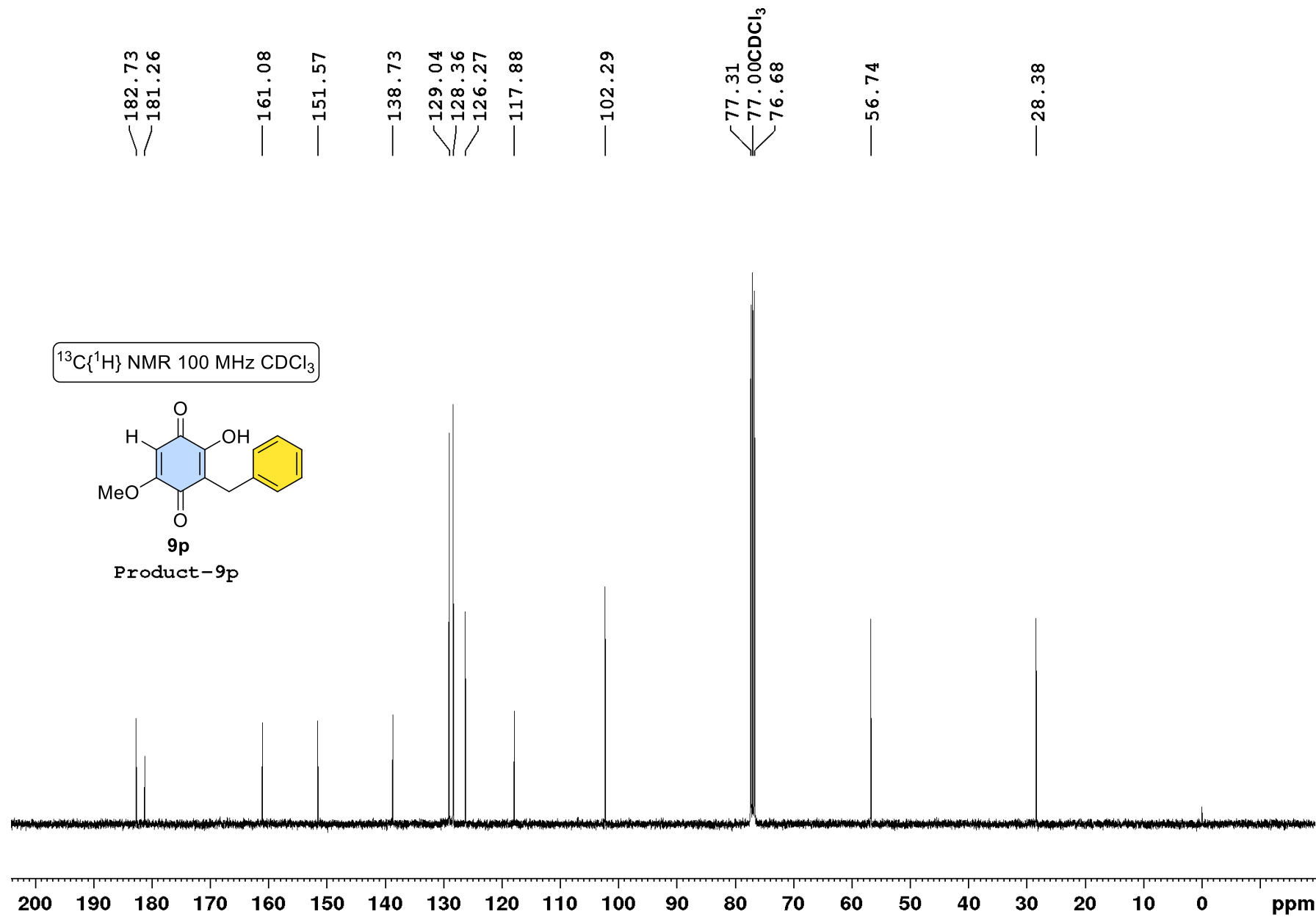
56.75

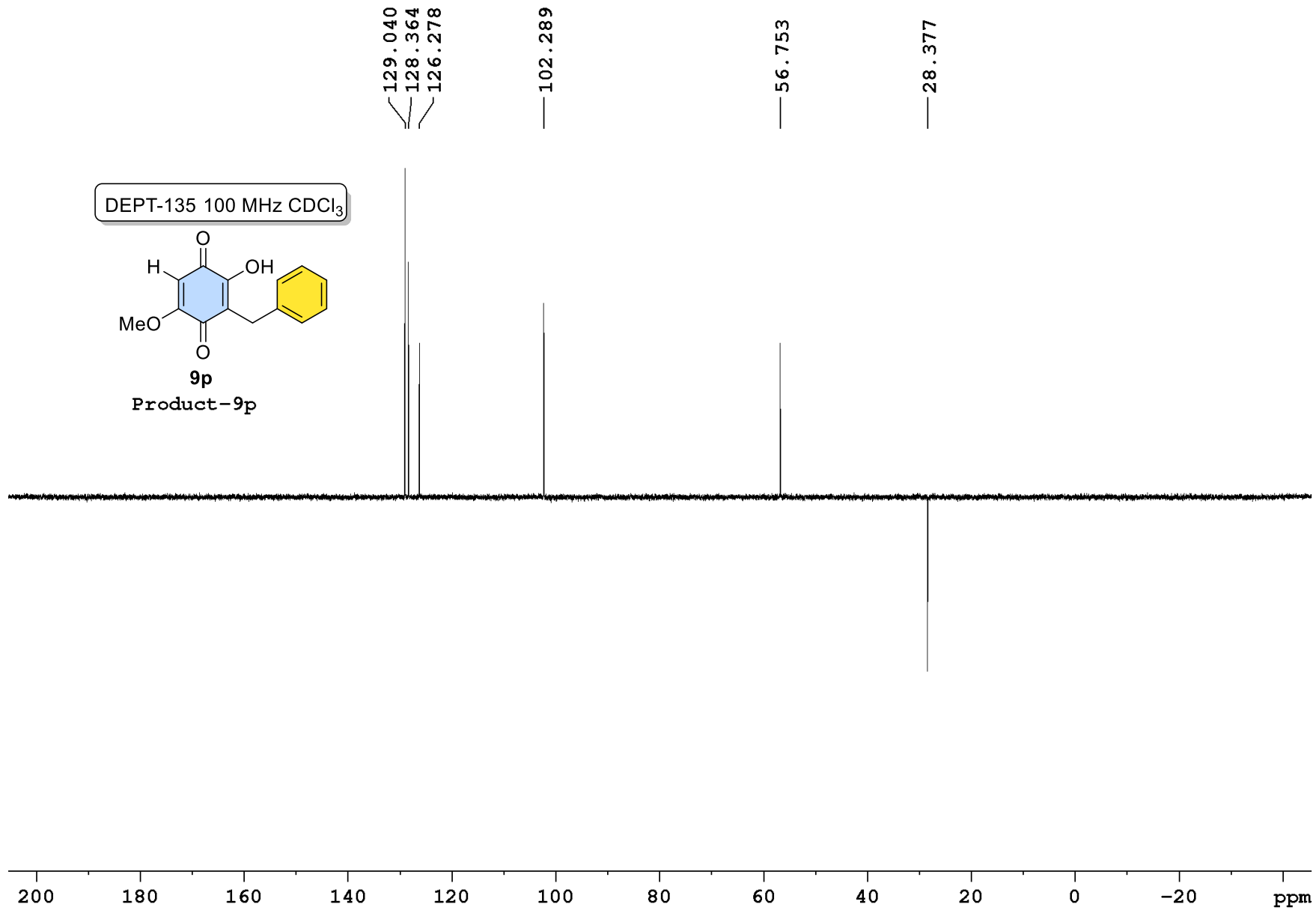
39.31
36.93
35.03
32.86
27.94
24.61
22.70
22.62
20.33
19.45

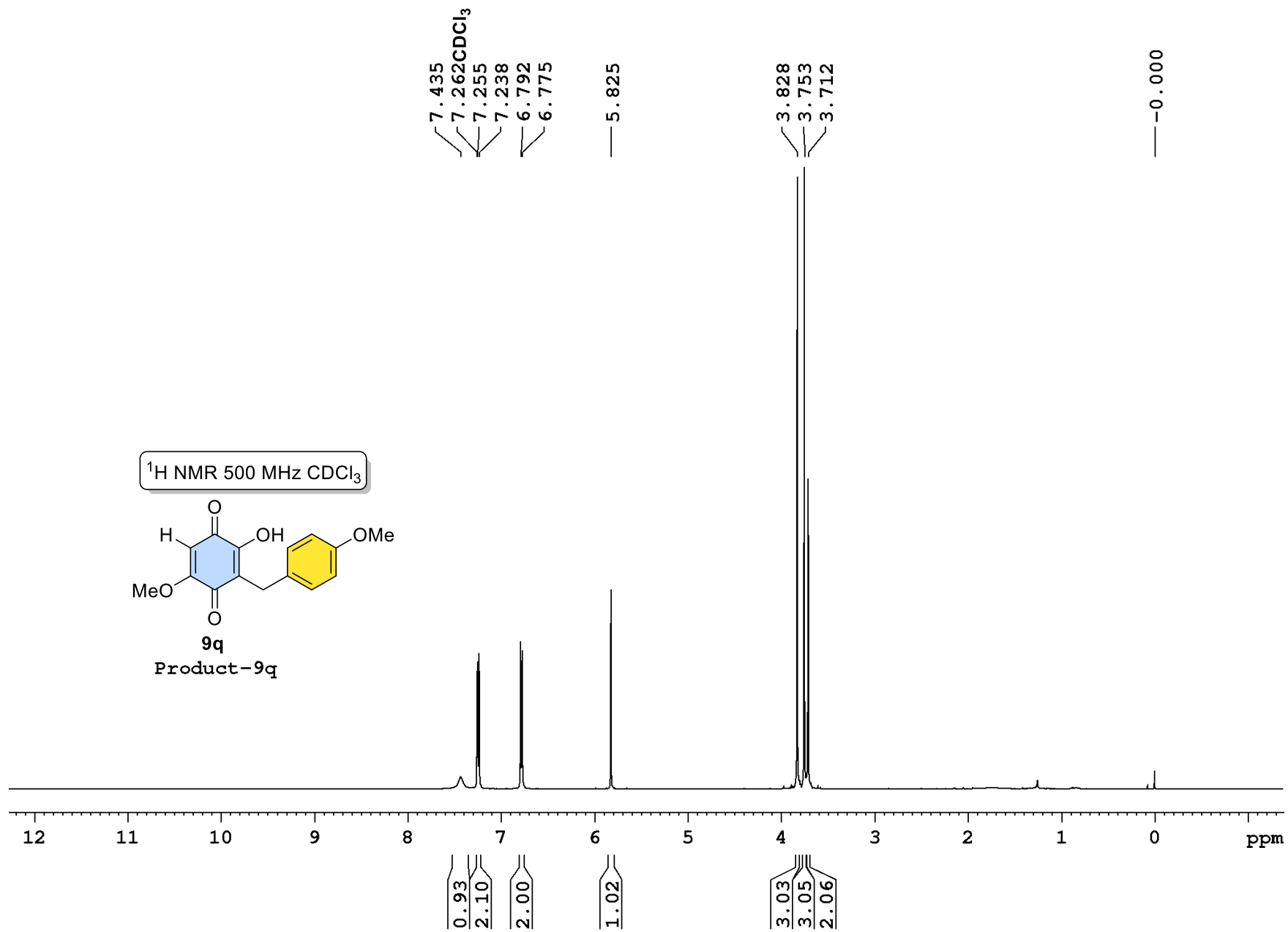
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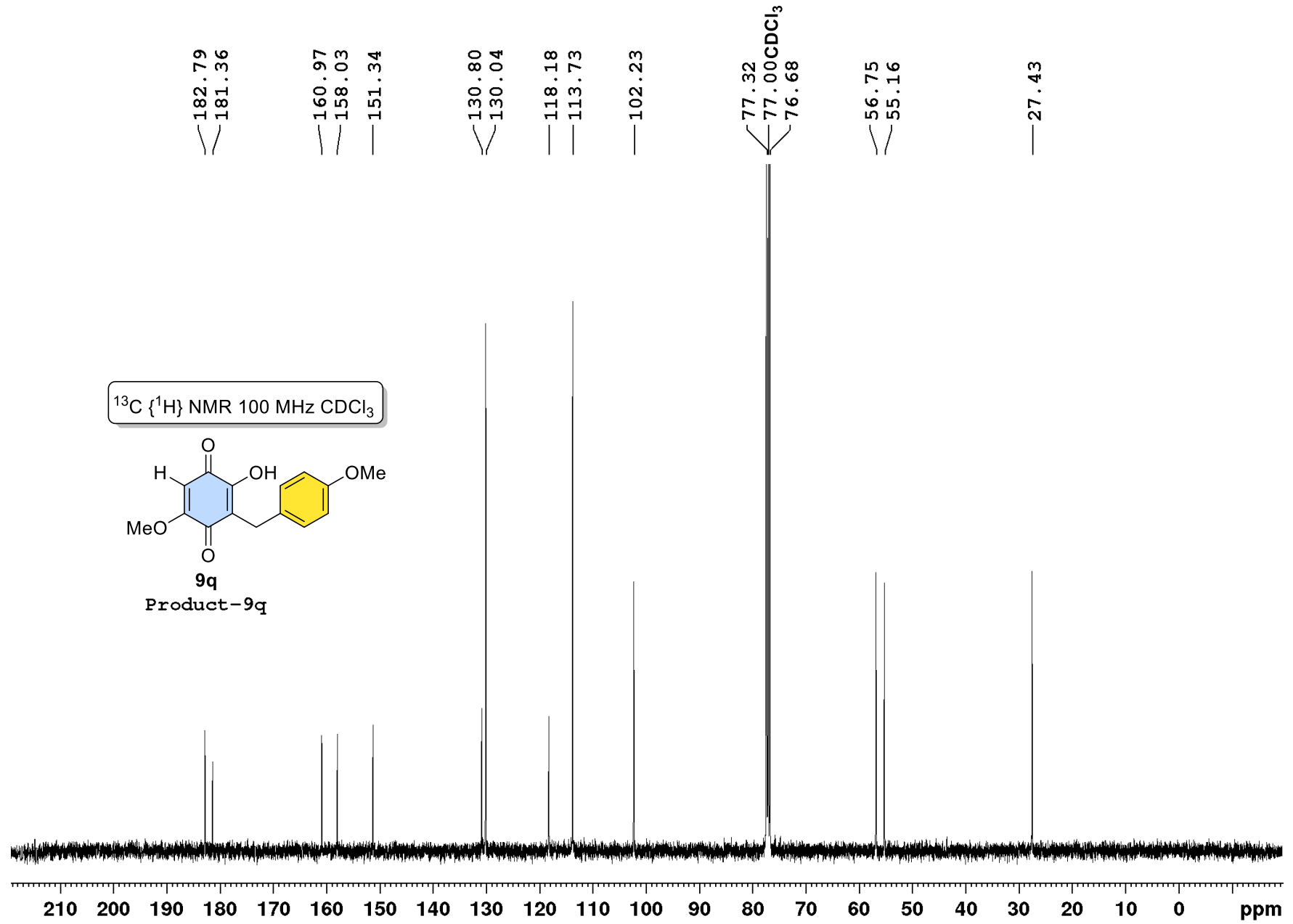


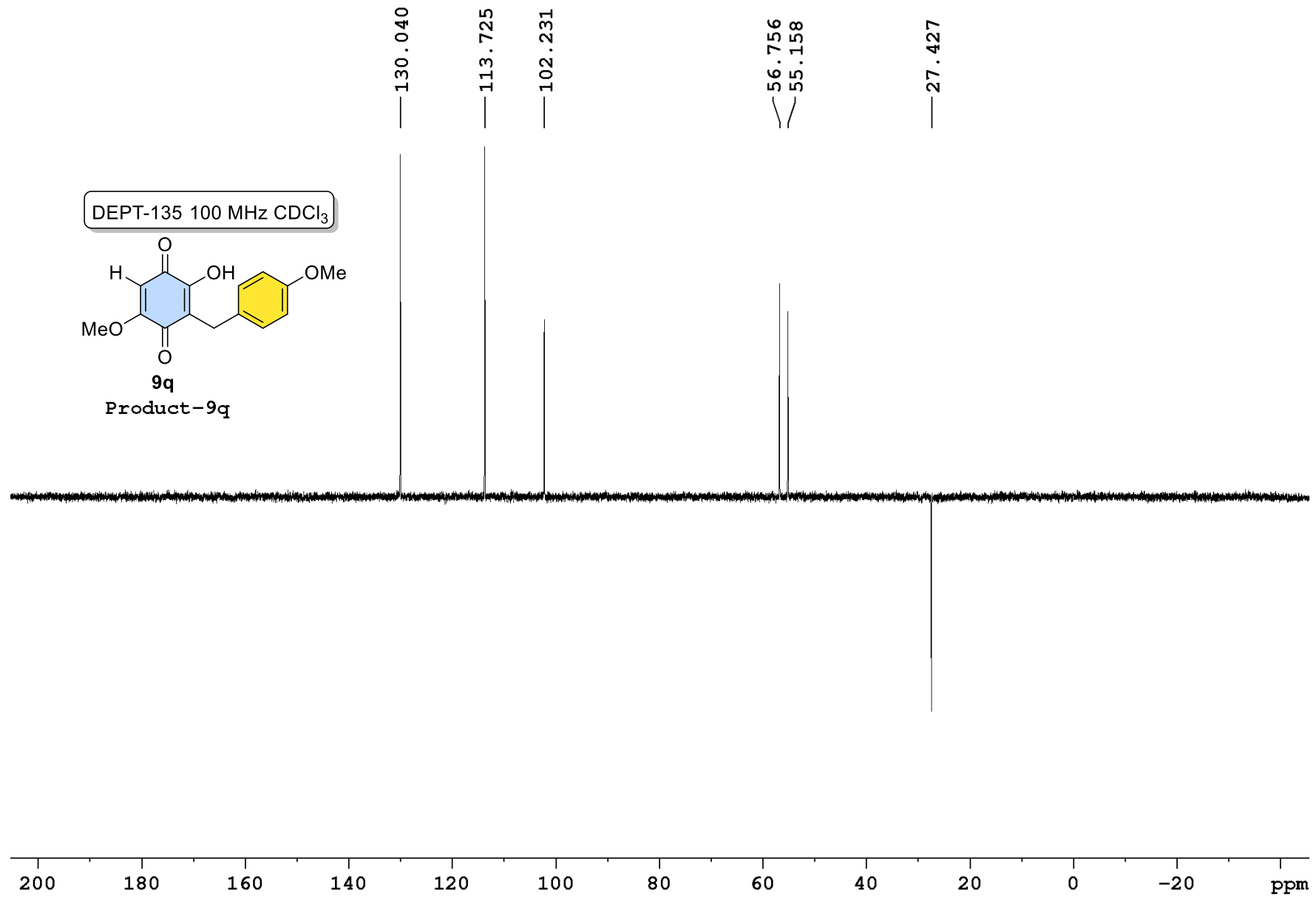


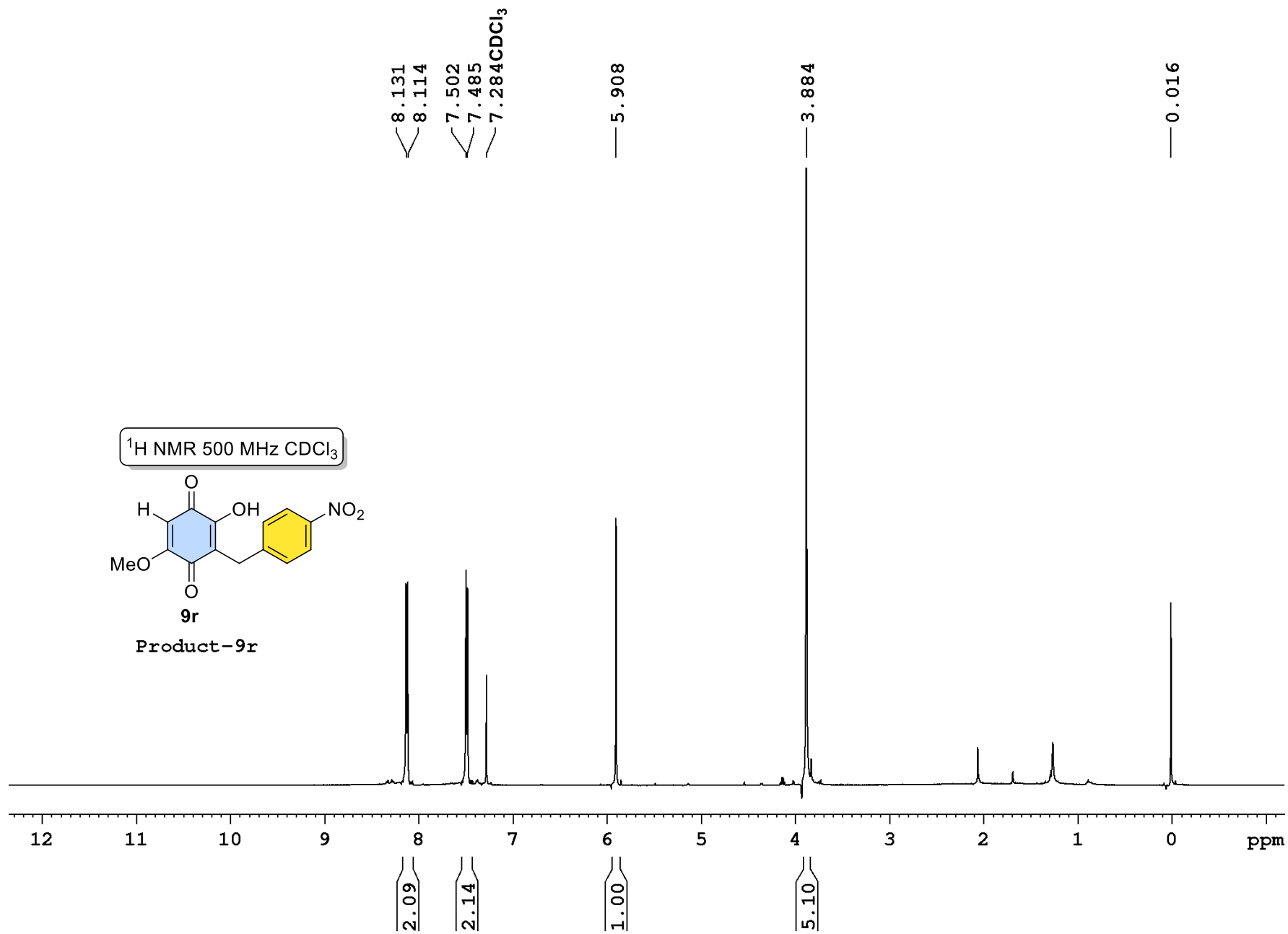


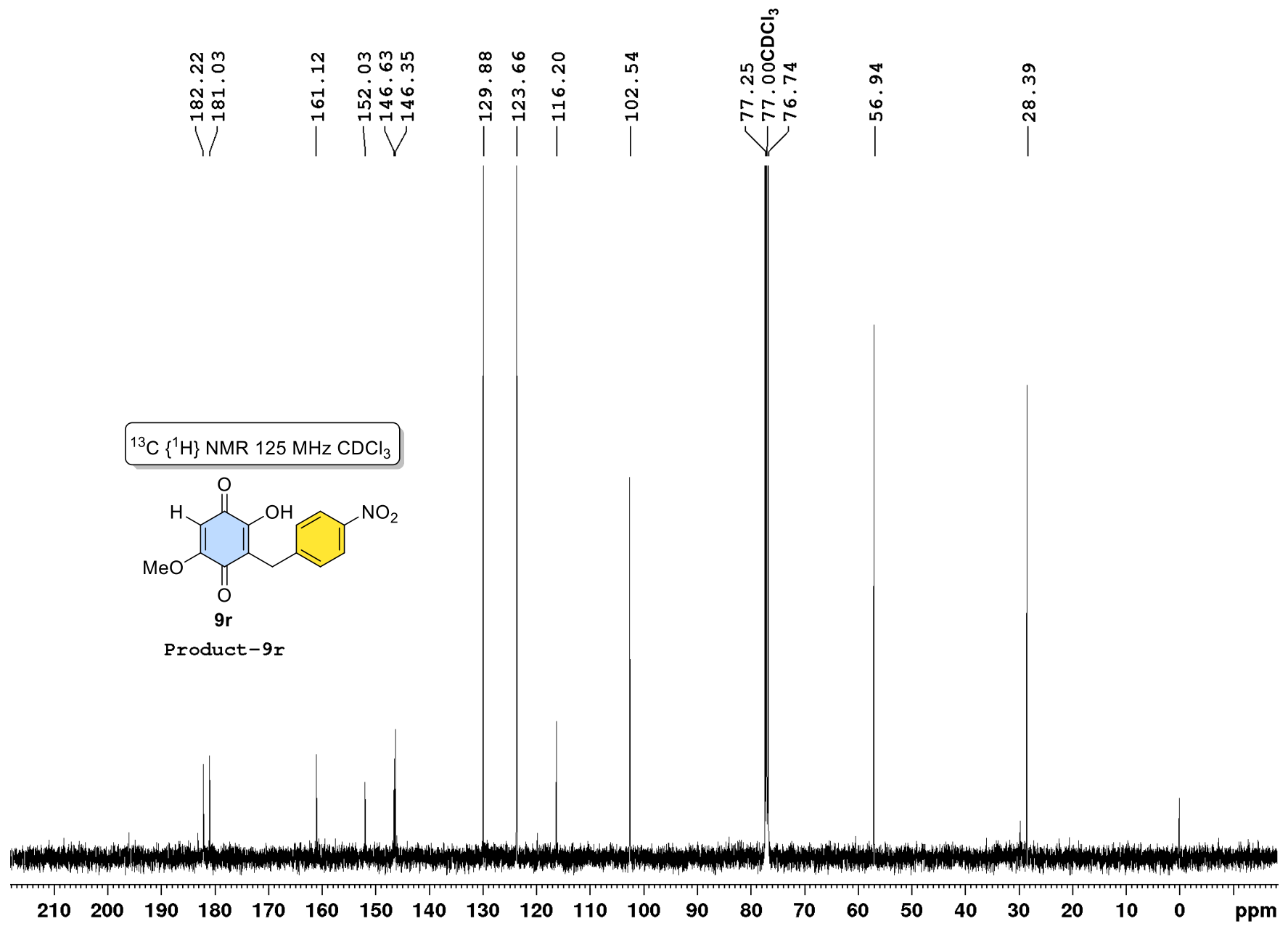




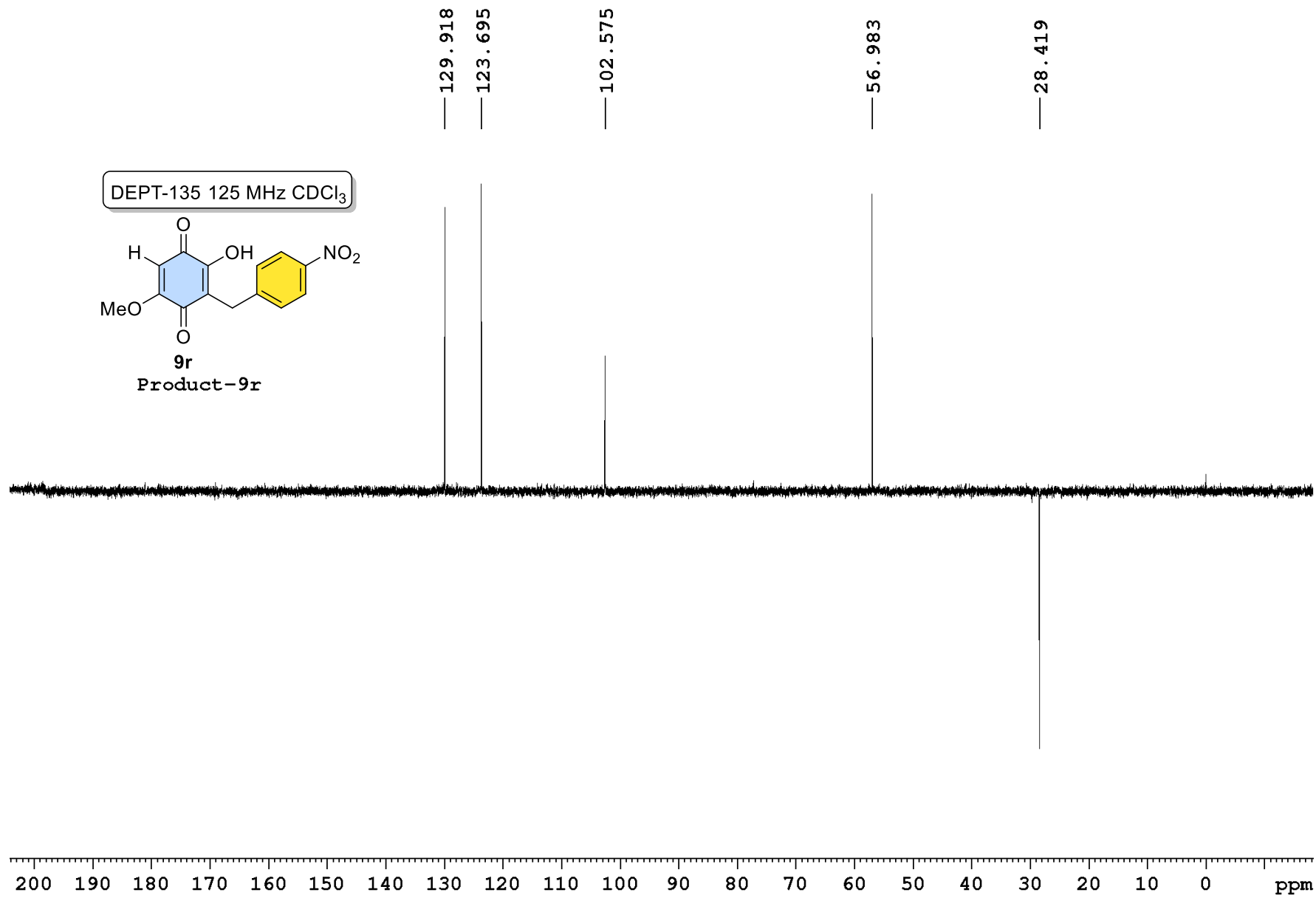
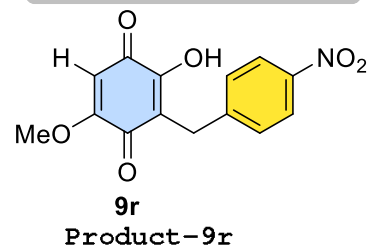


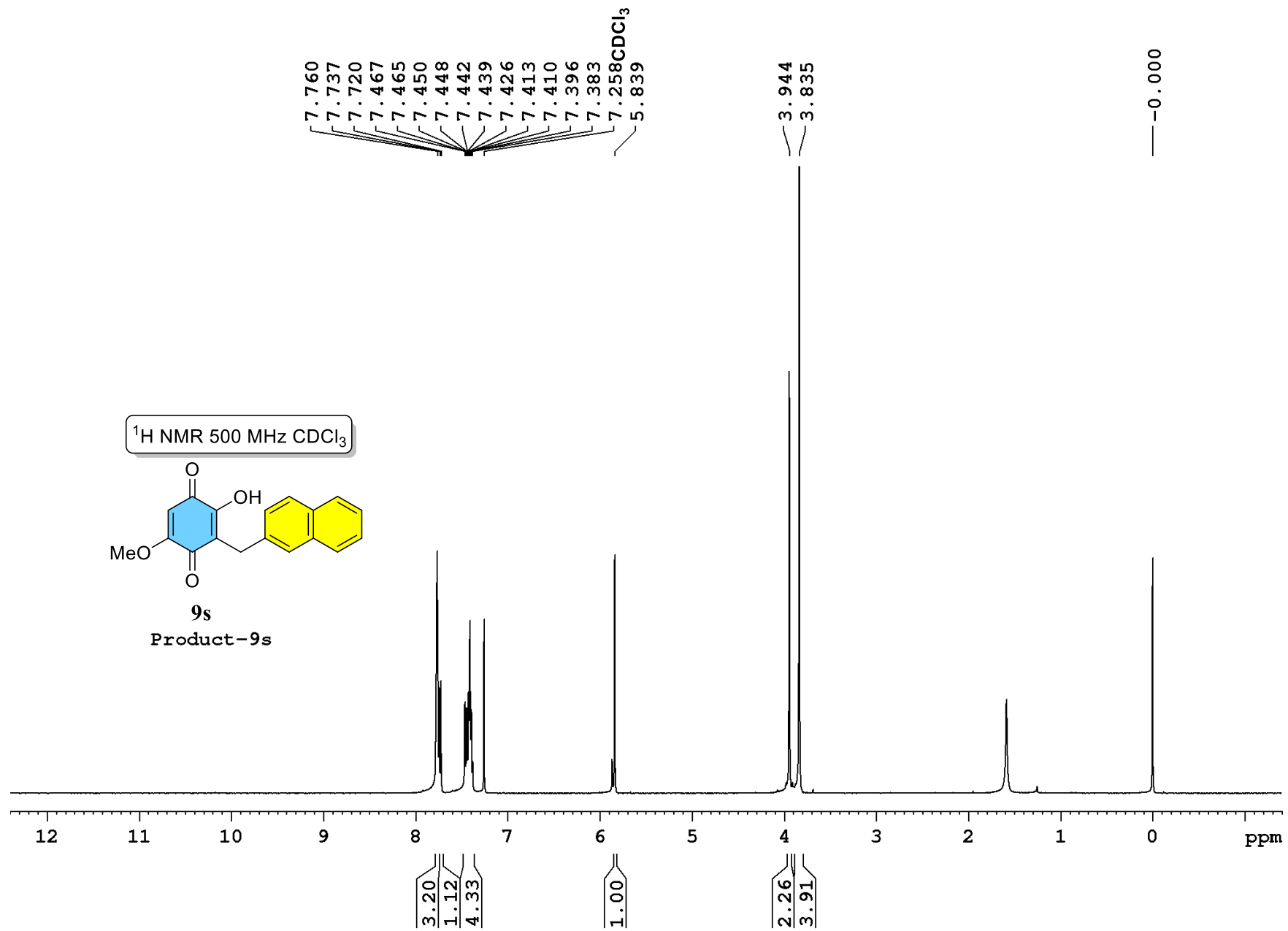


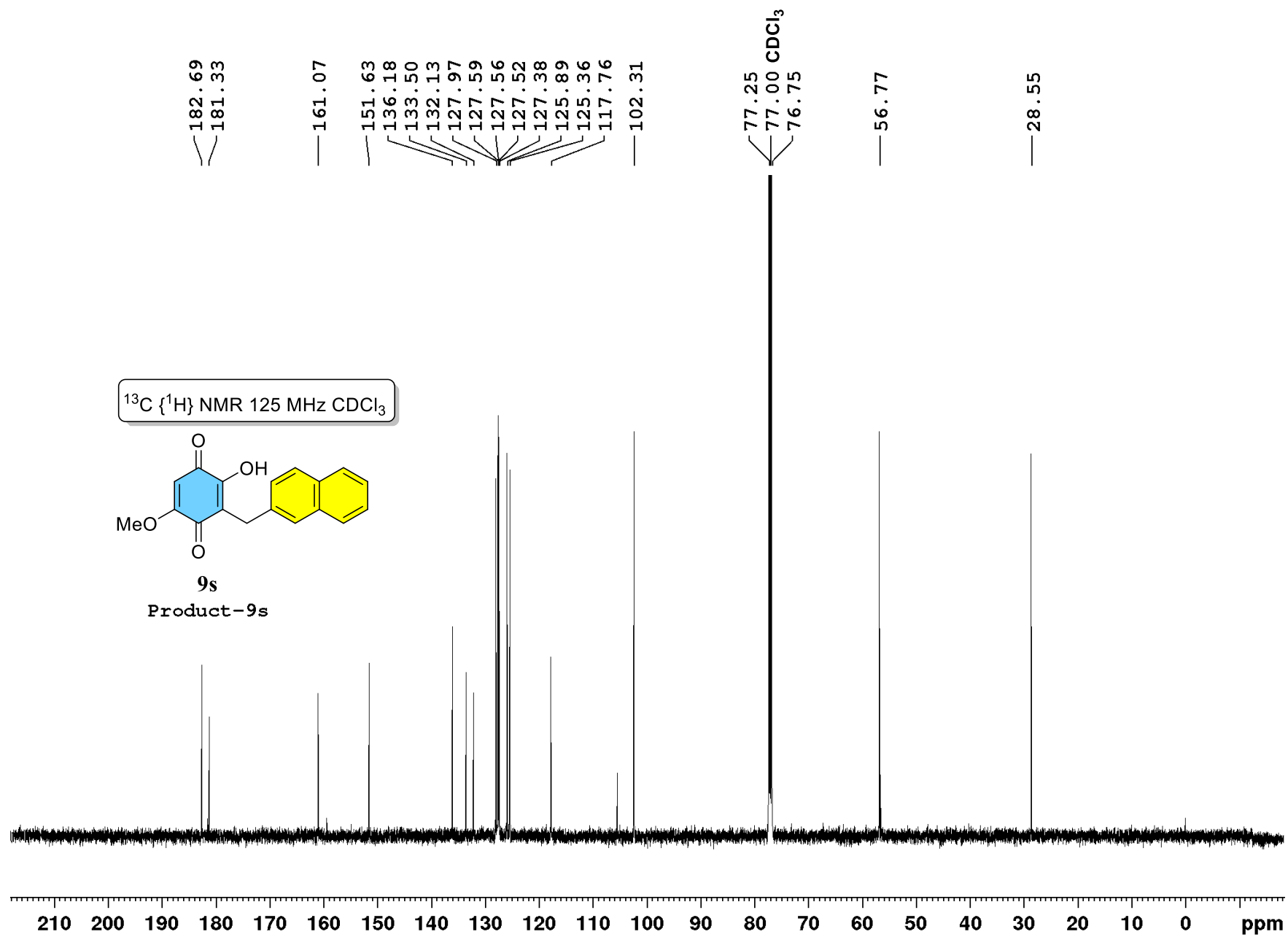


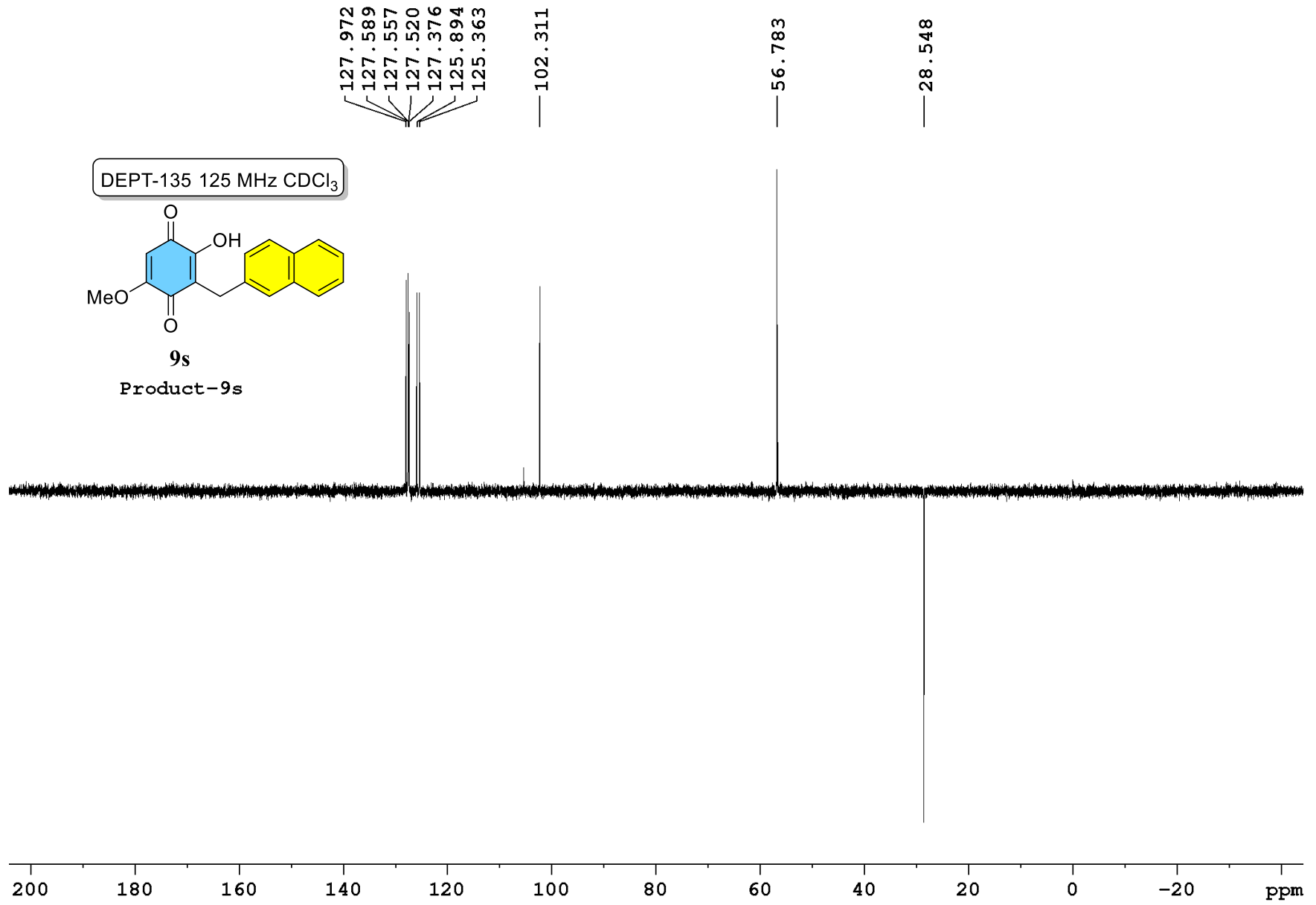


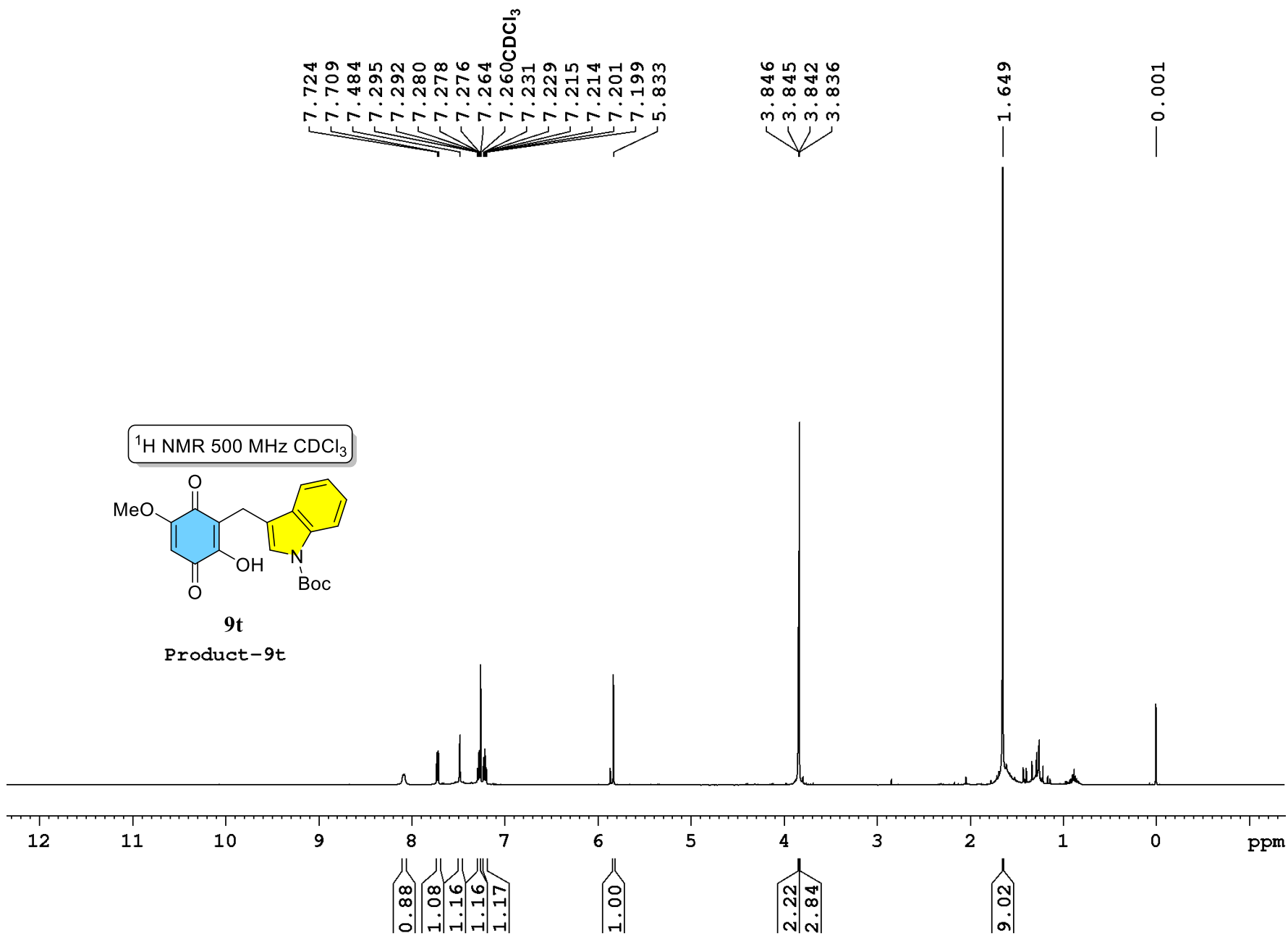
DEPT-135 125 MHz CDCl₃

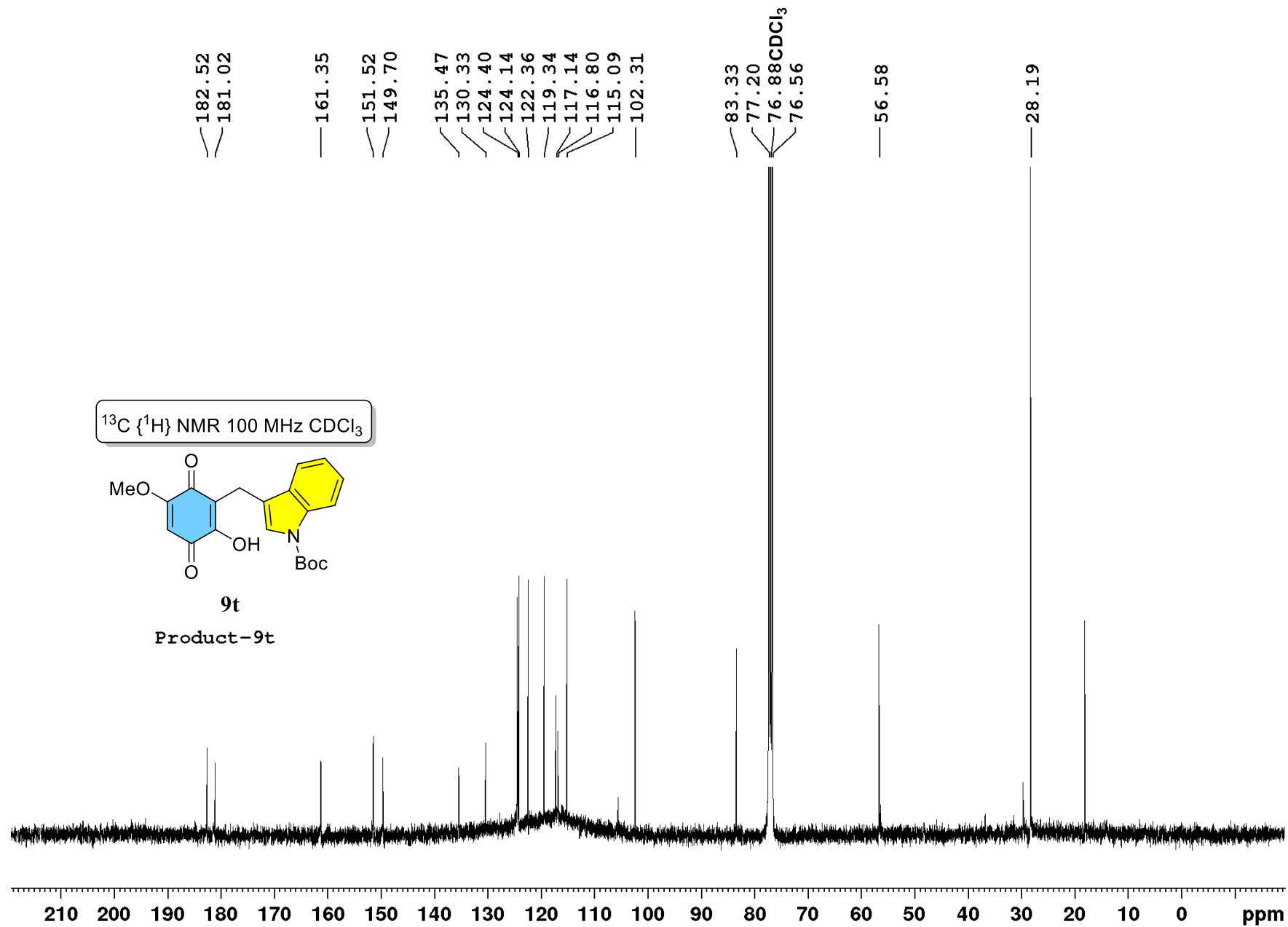


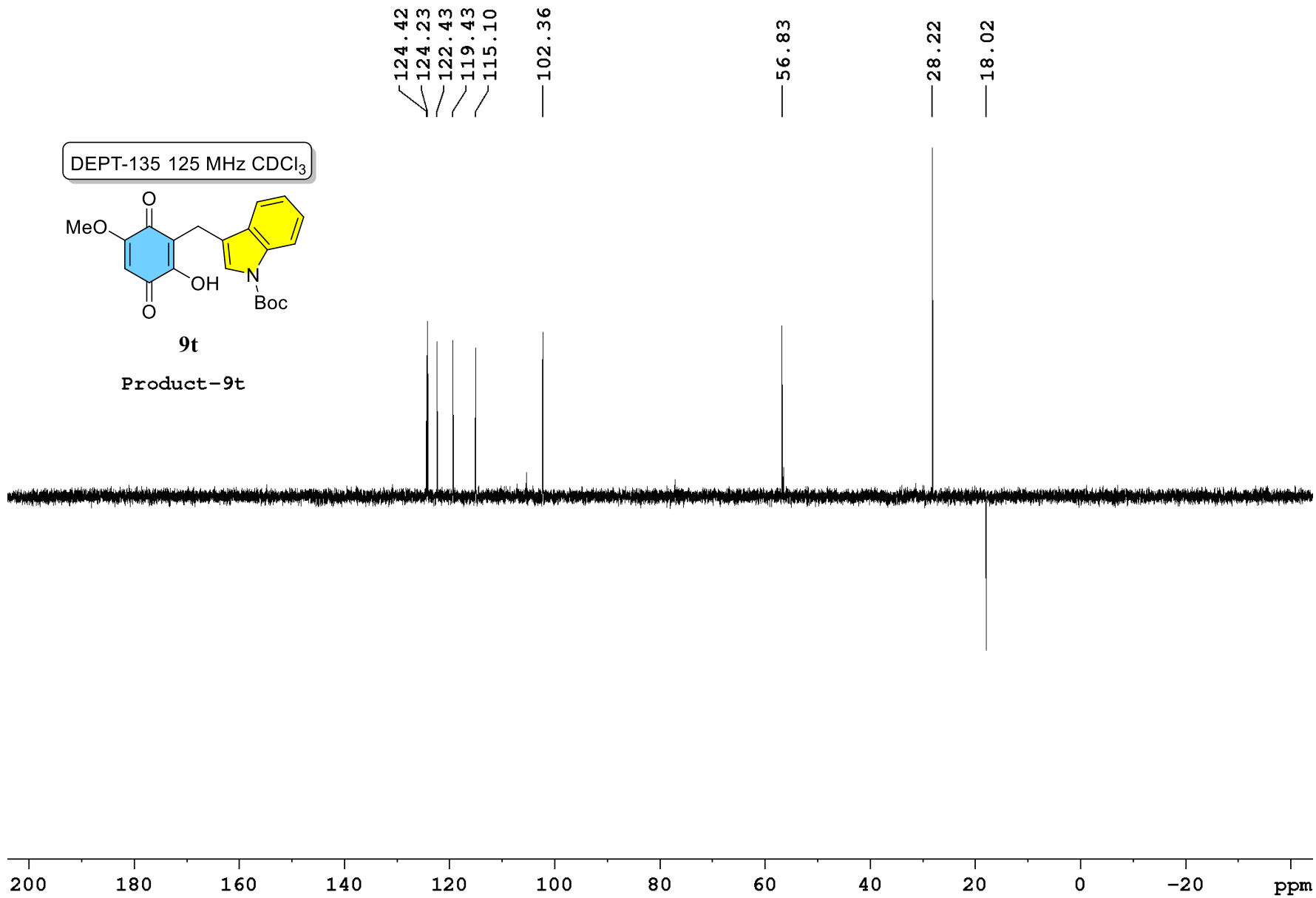


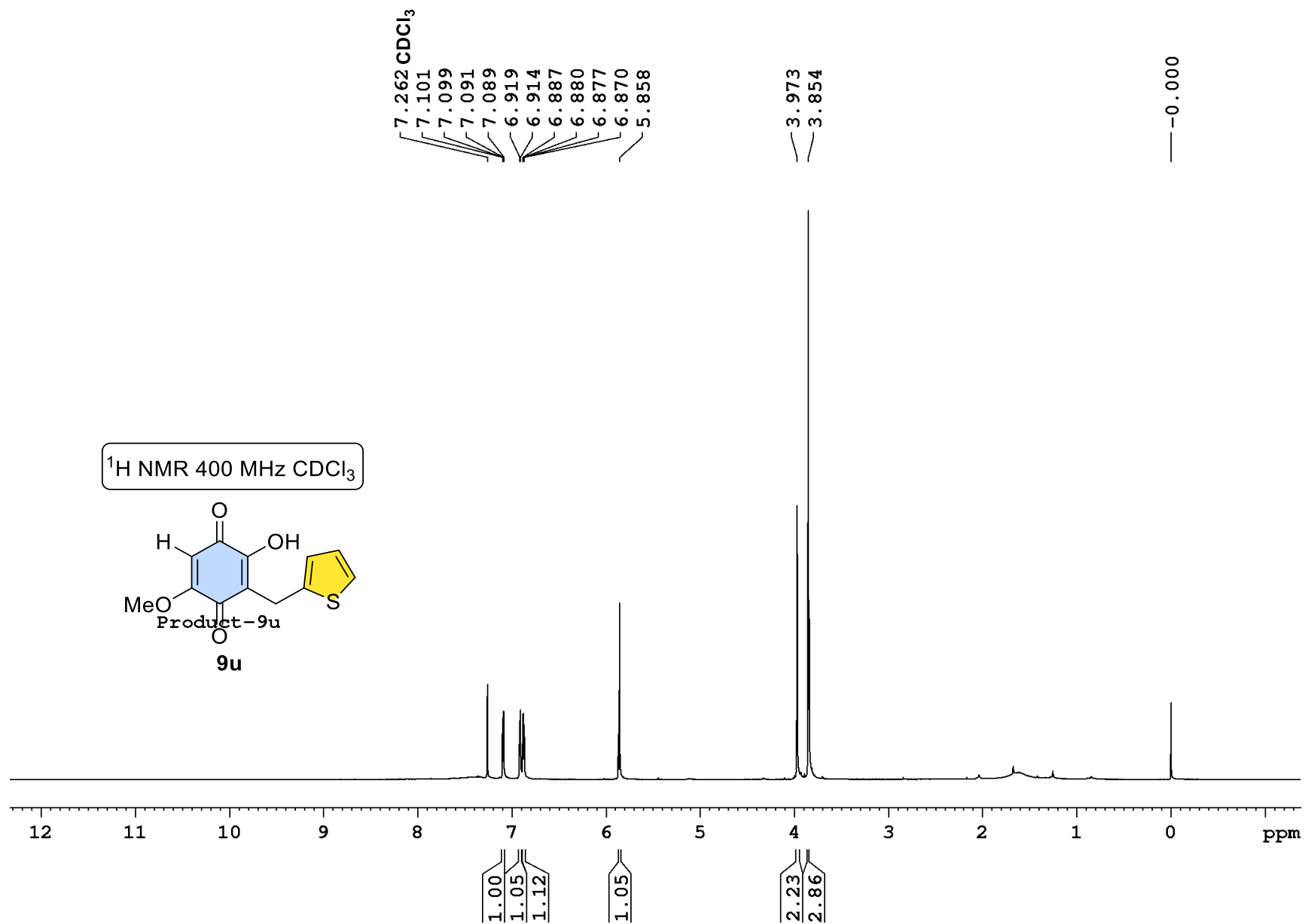


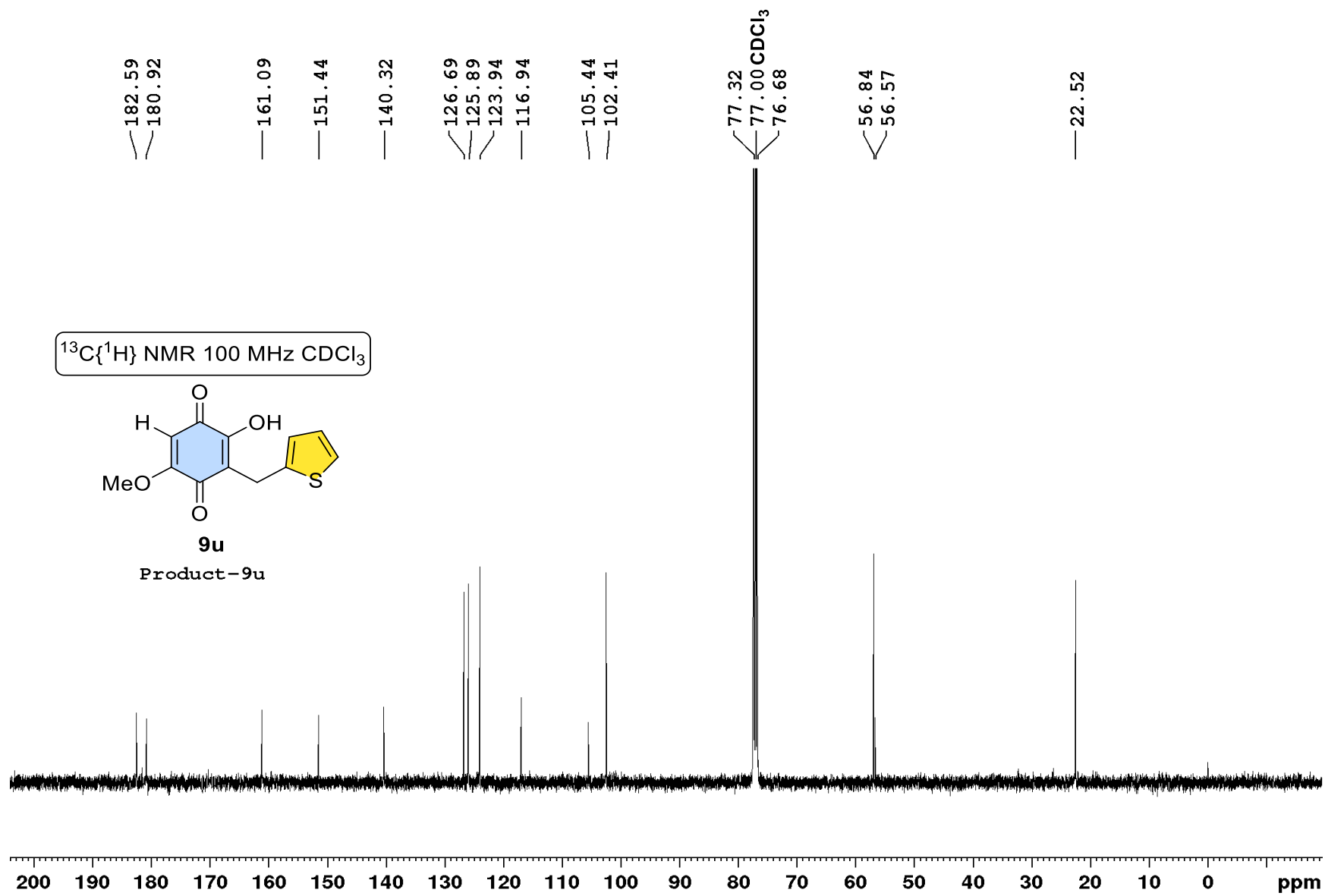


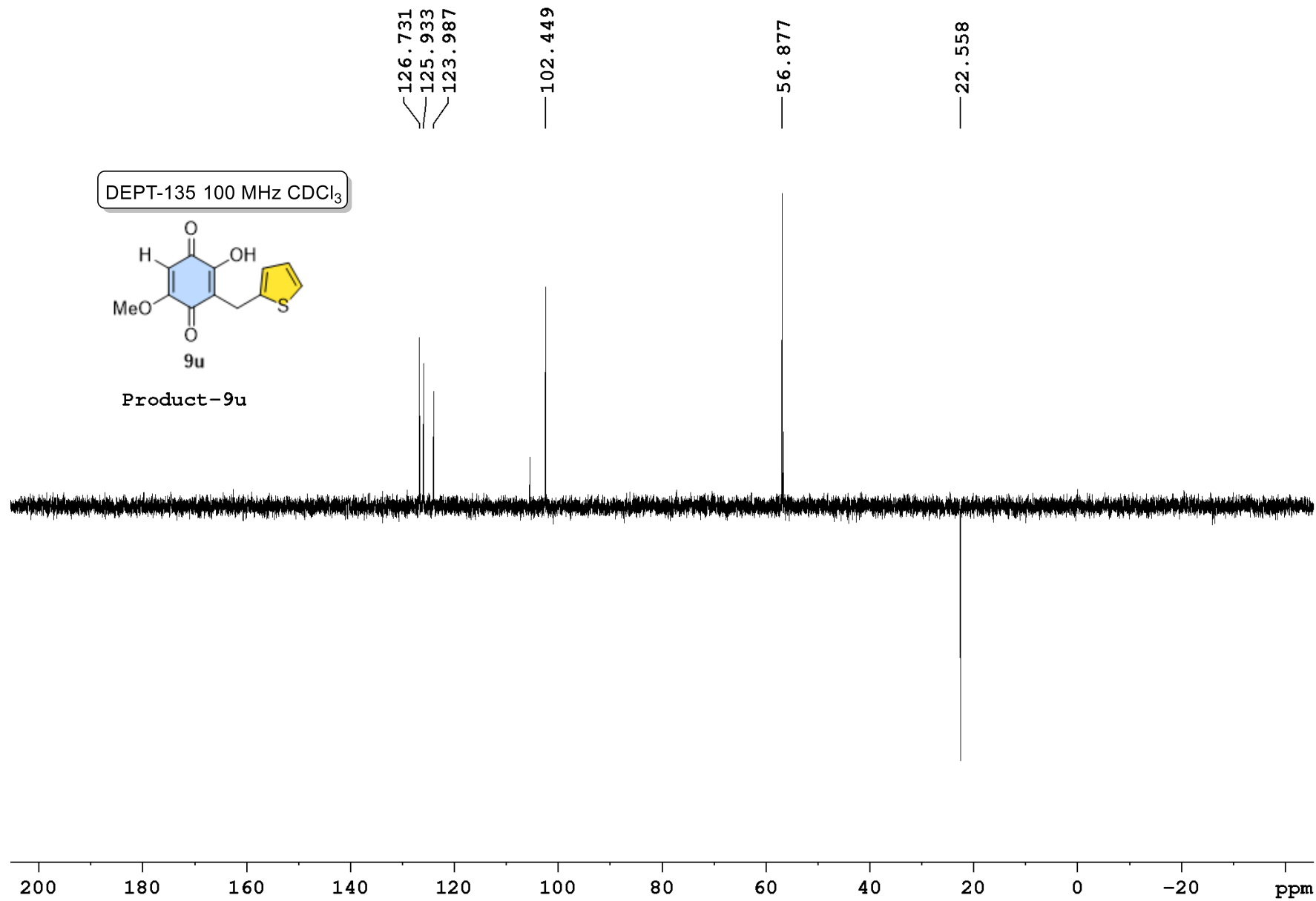


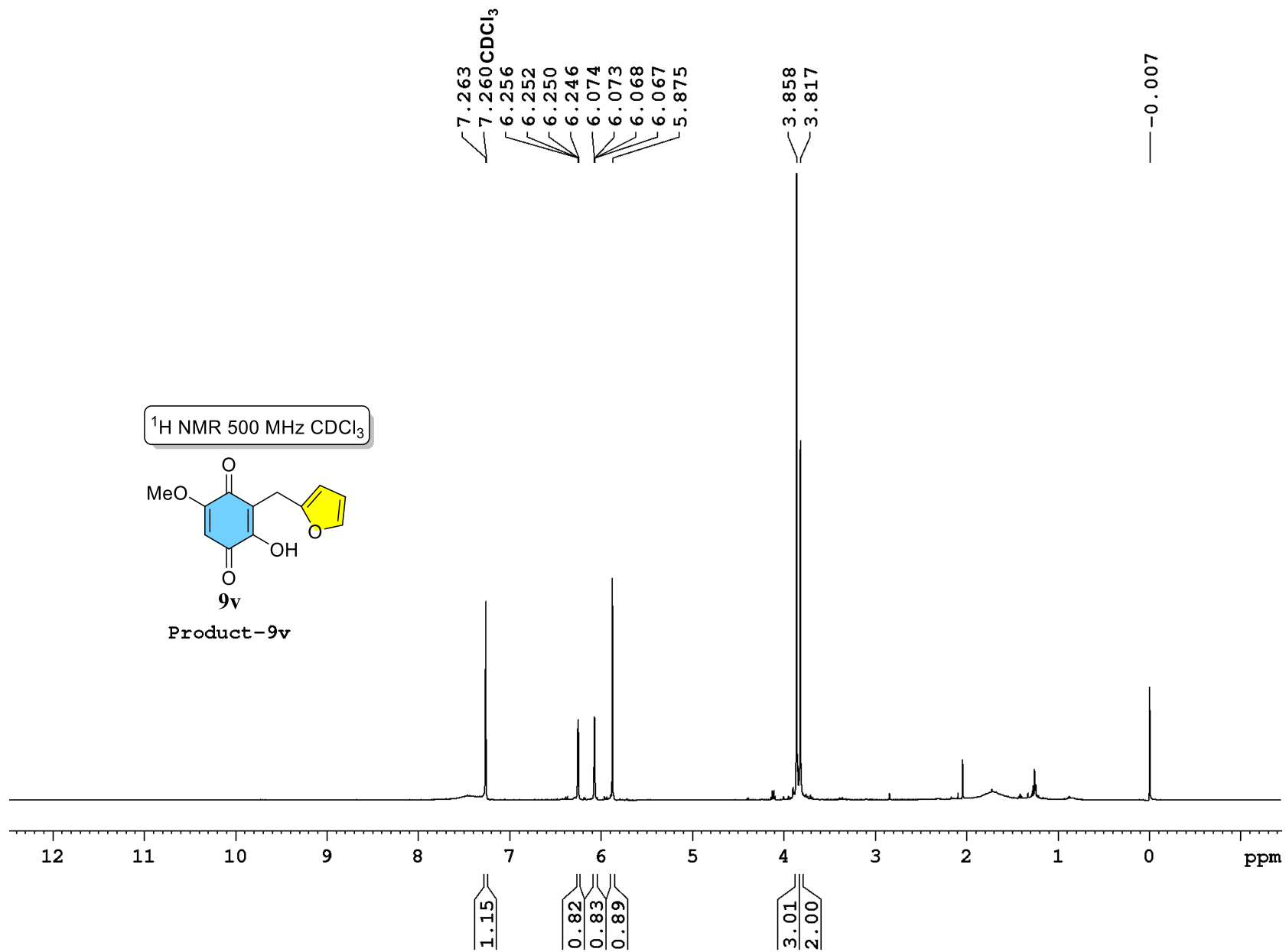


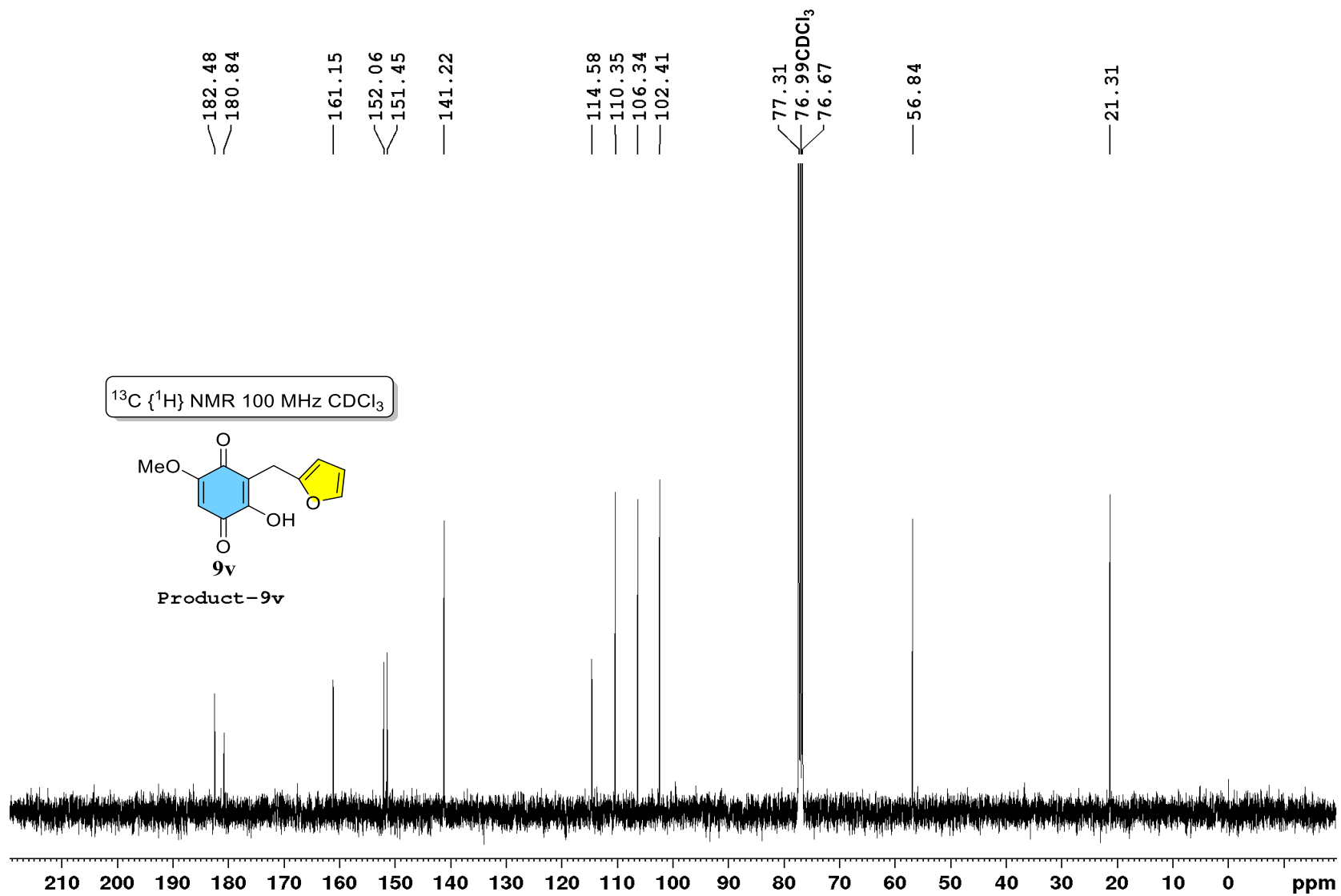


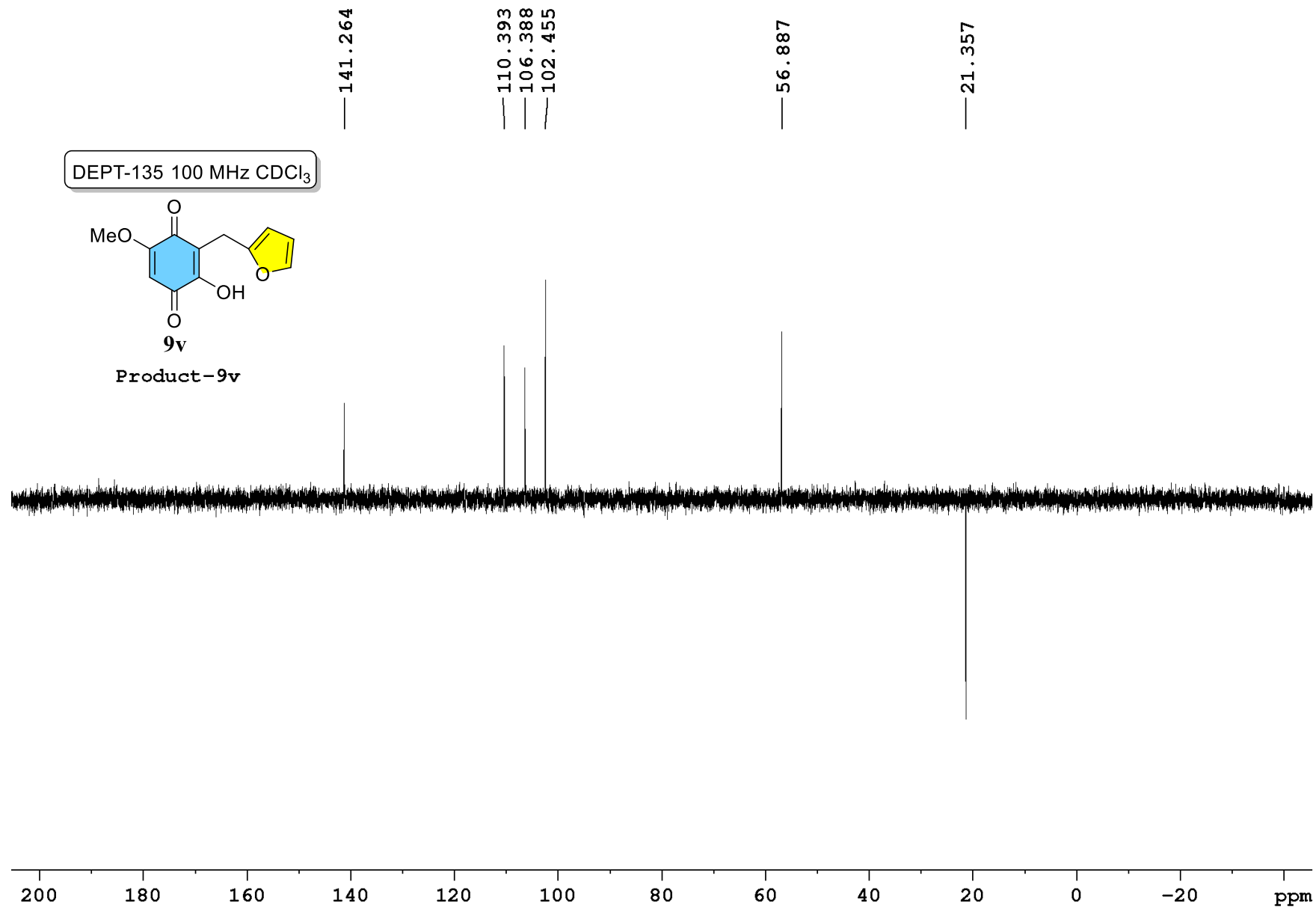


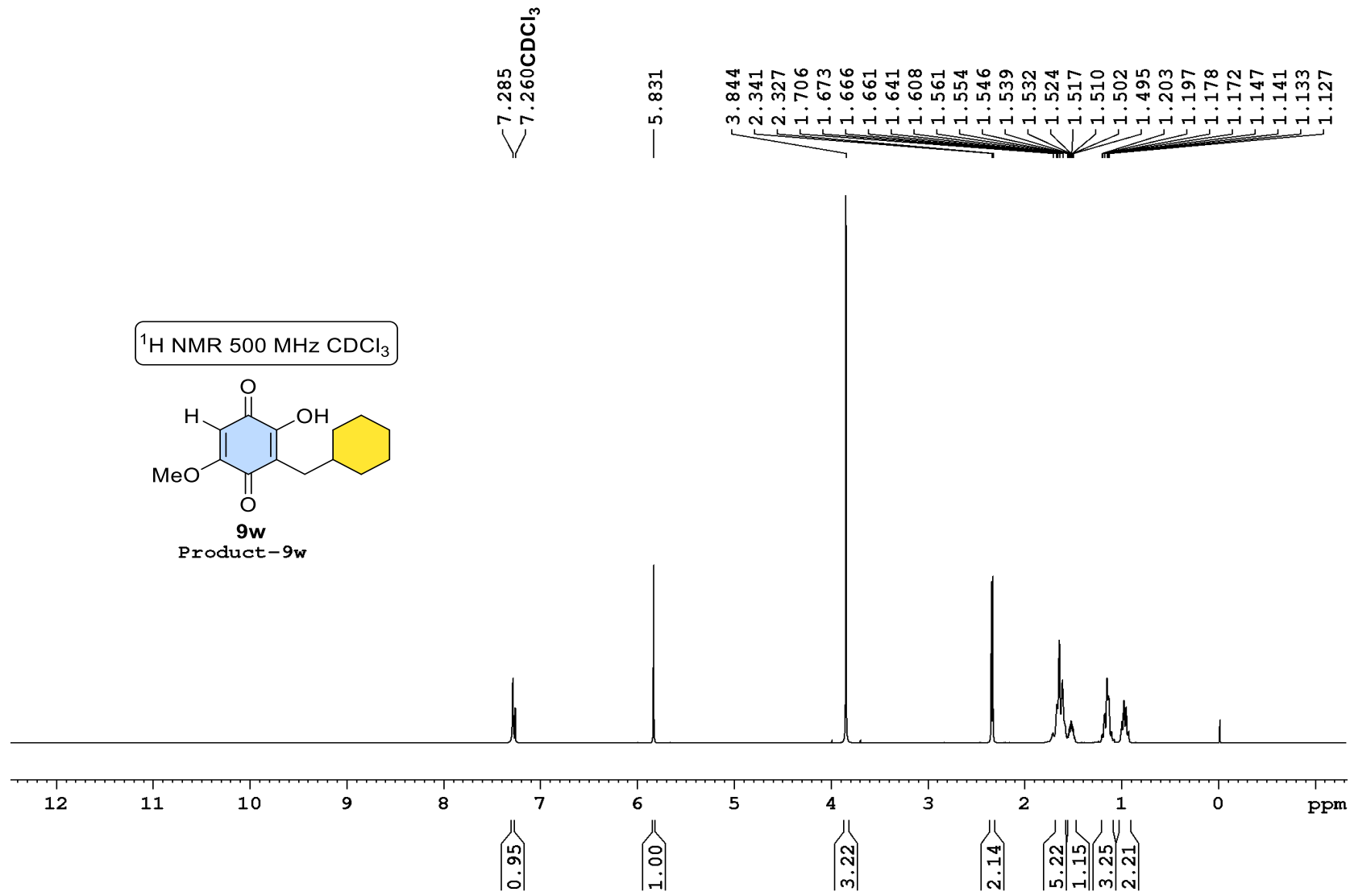


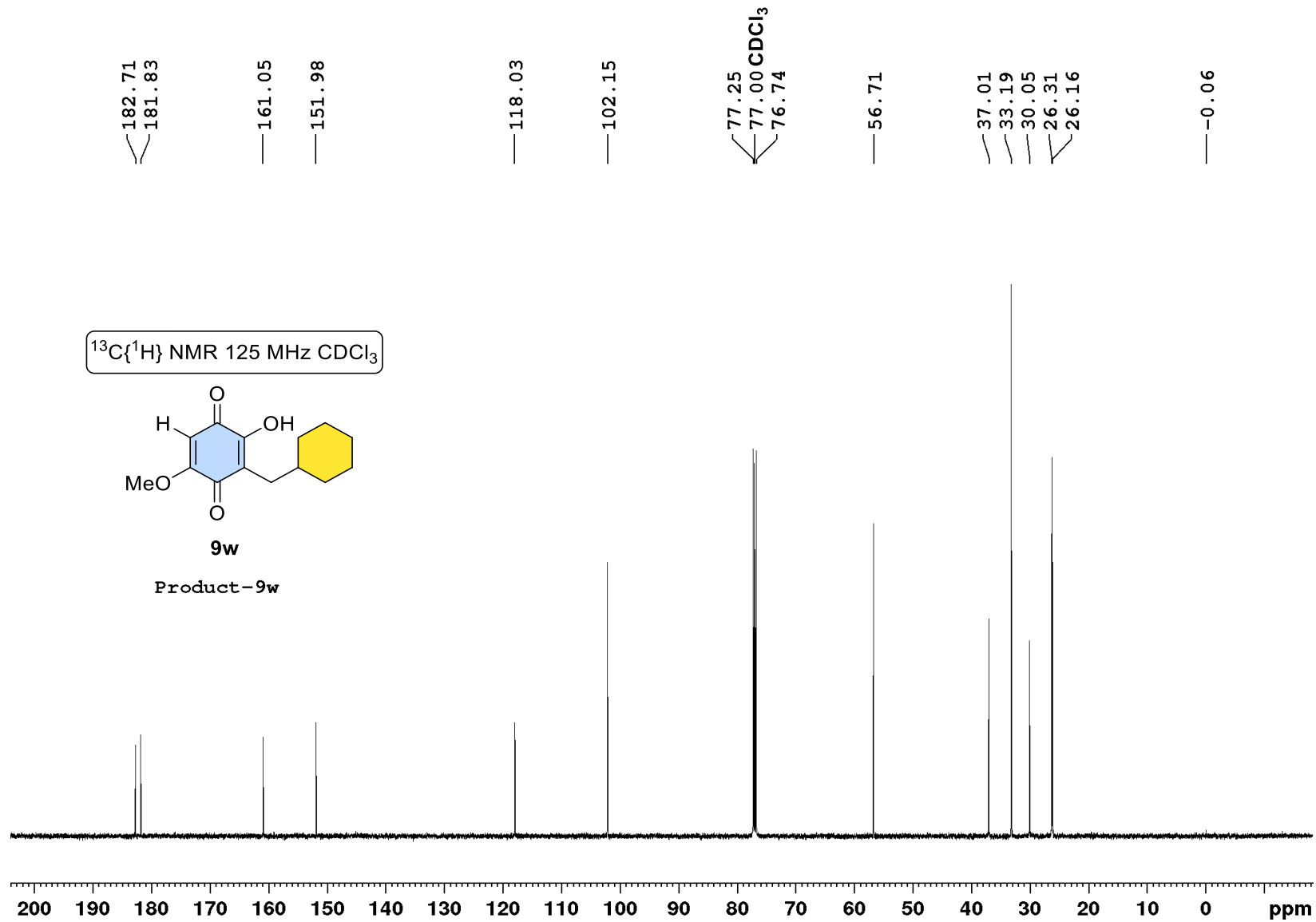




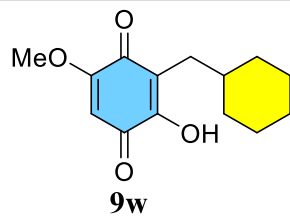




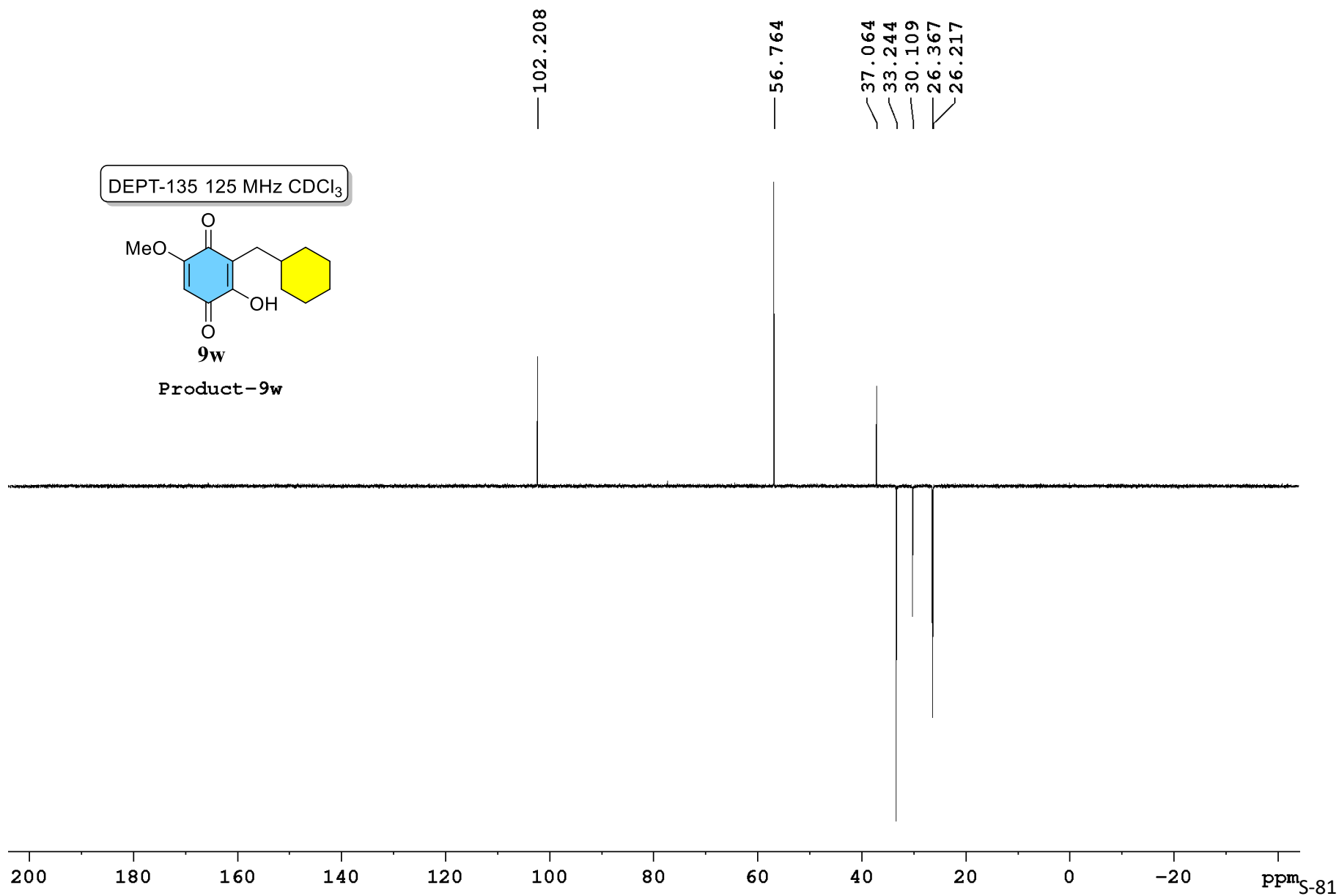


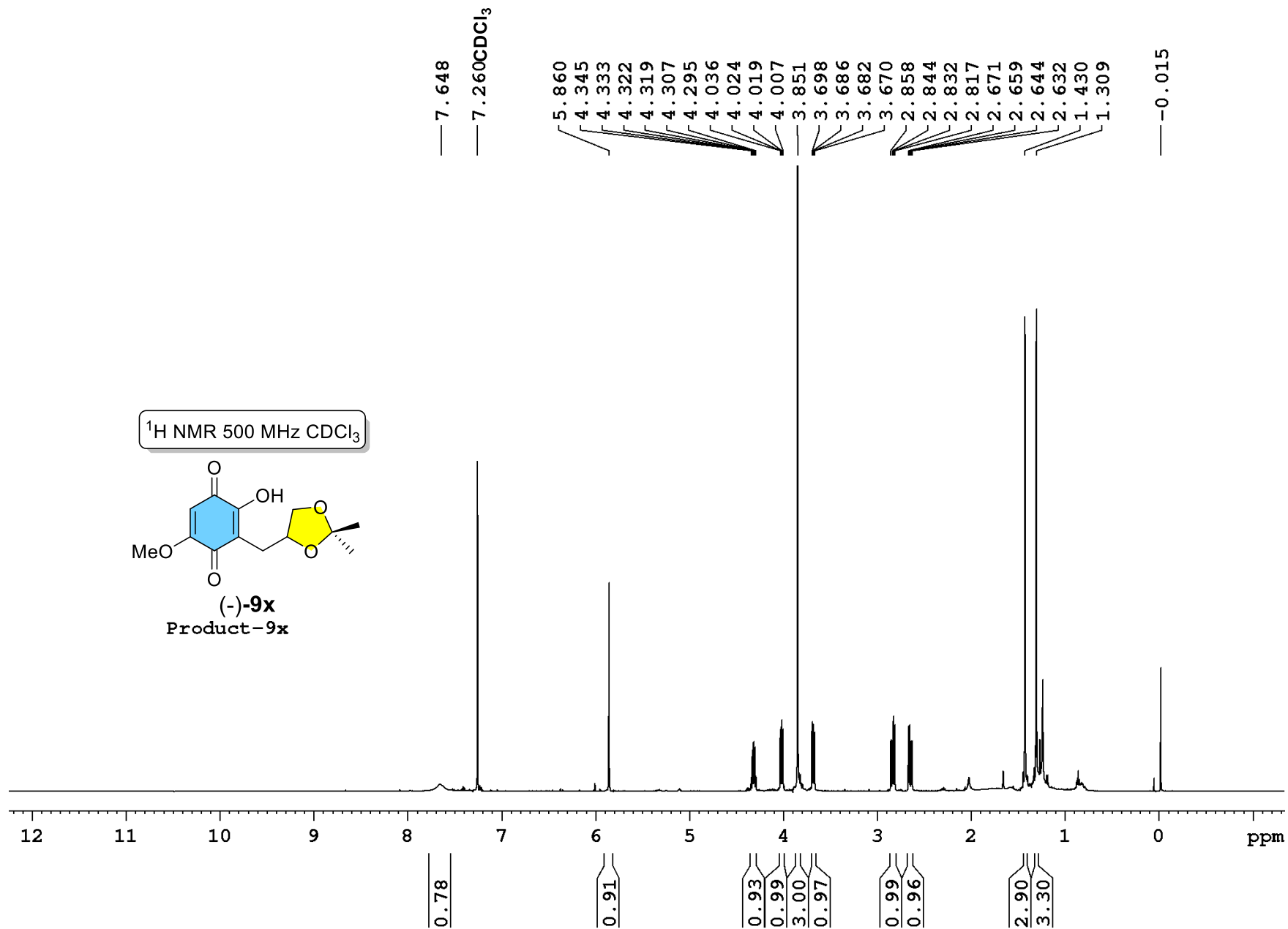
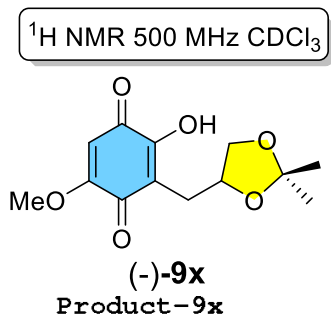


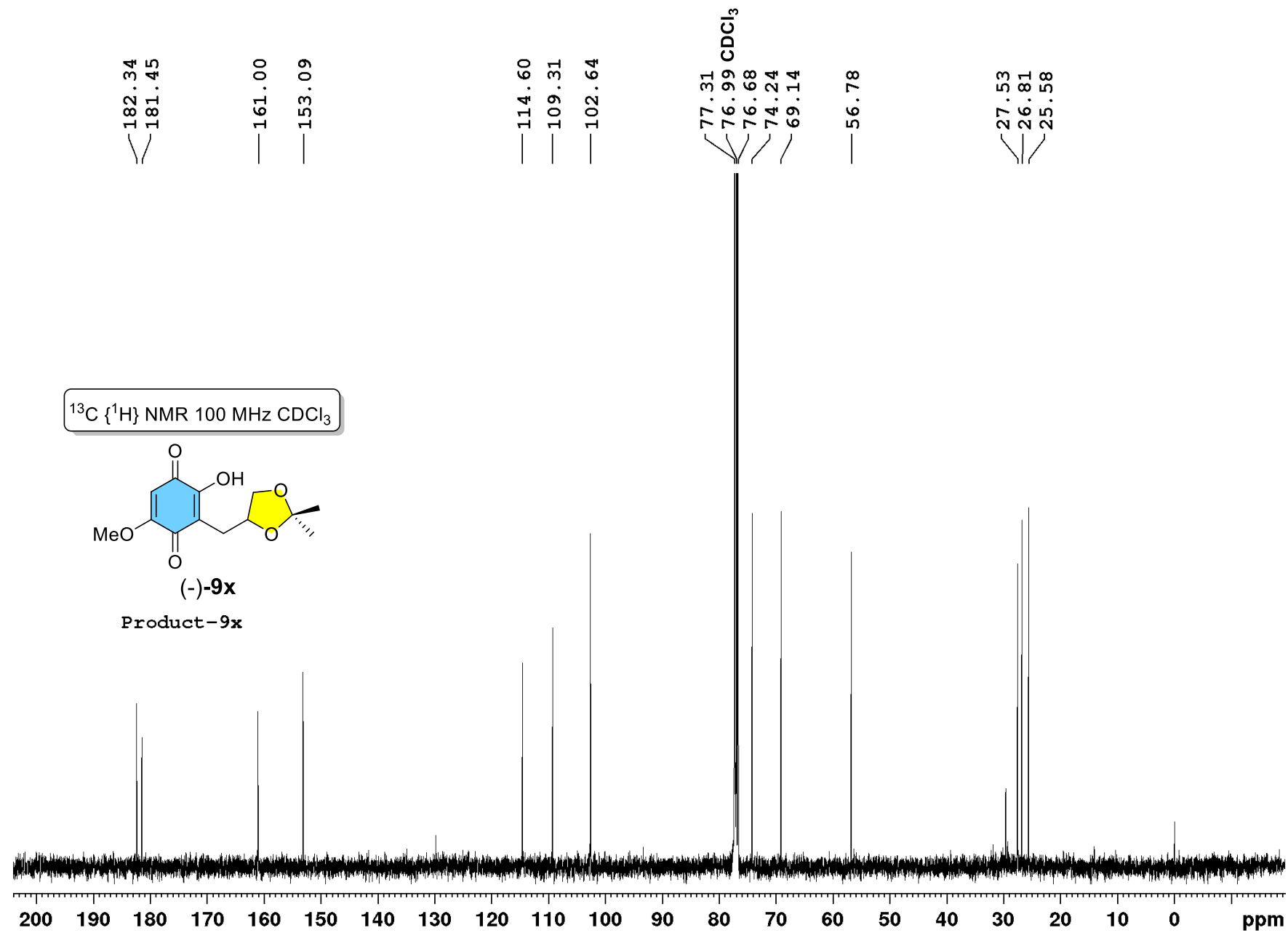
DEPT-135 125 MHz CDCl₃

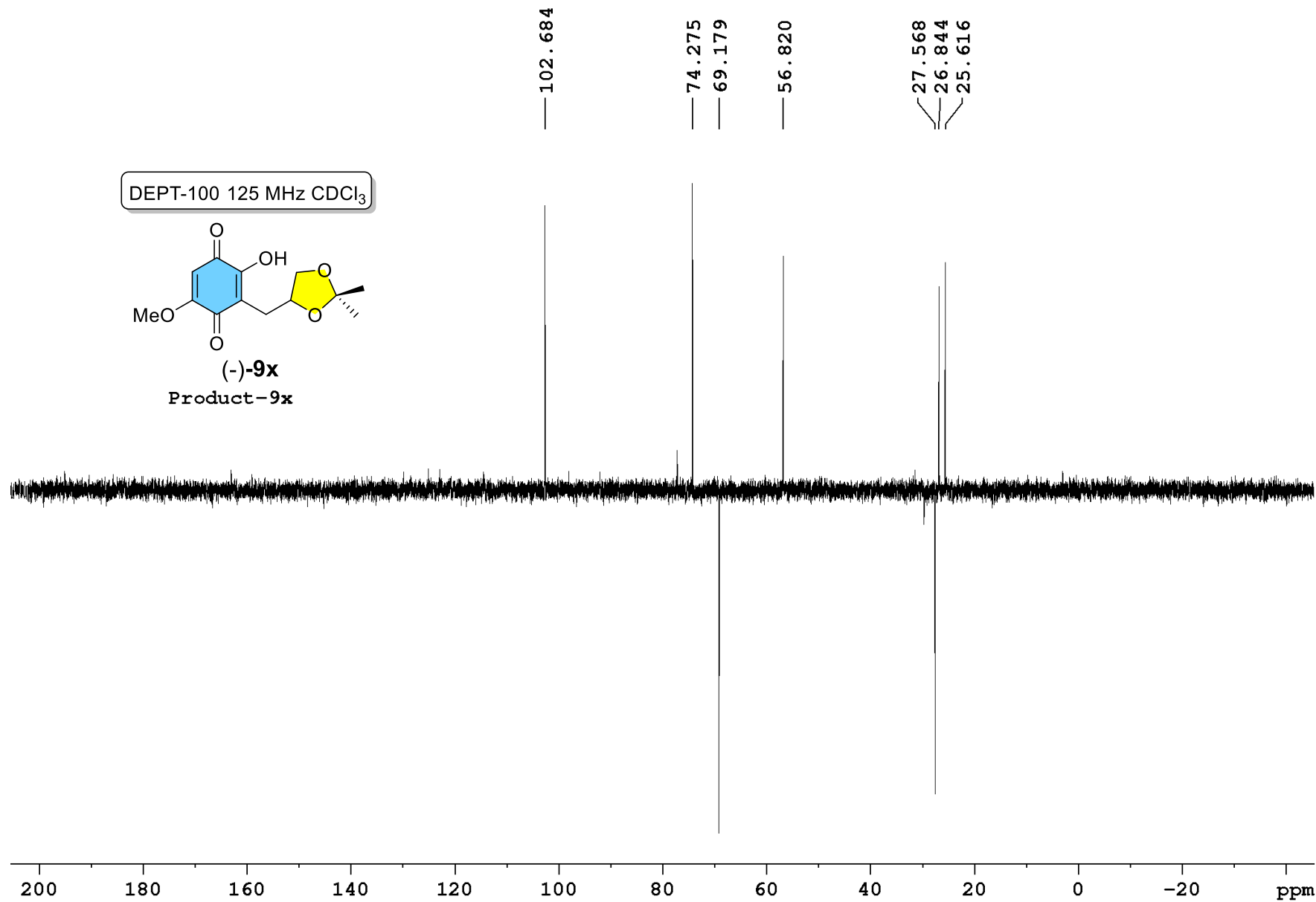


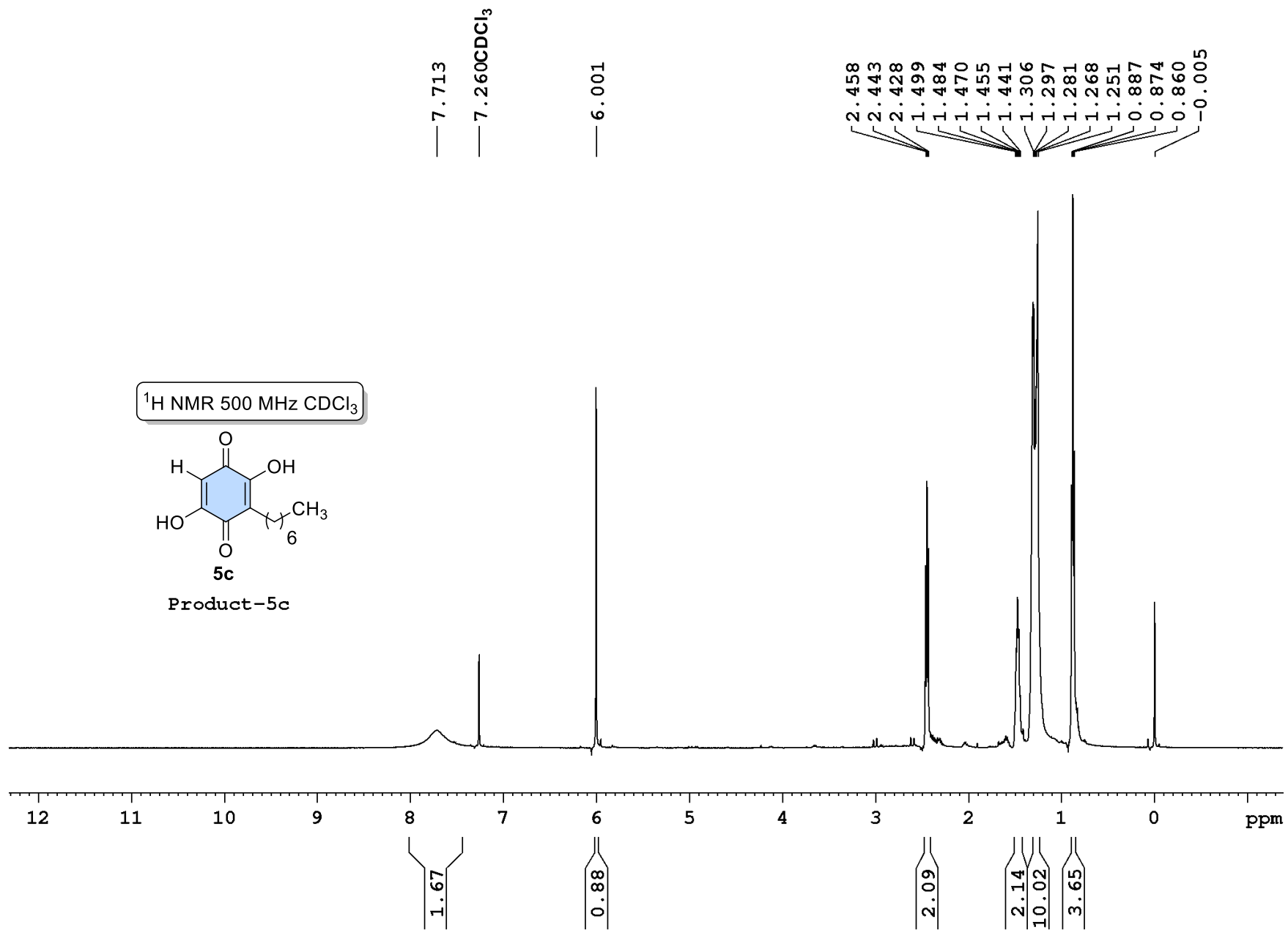
Product-9w

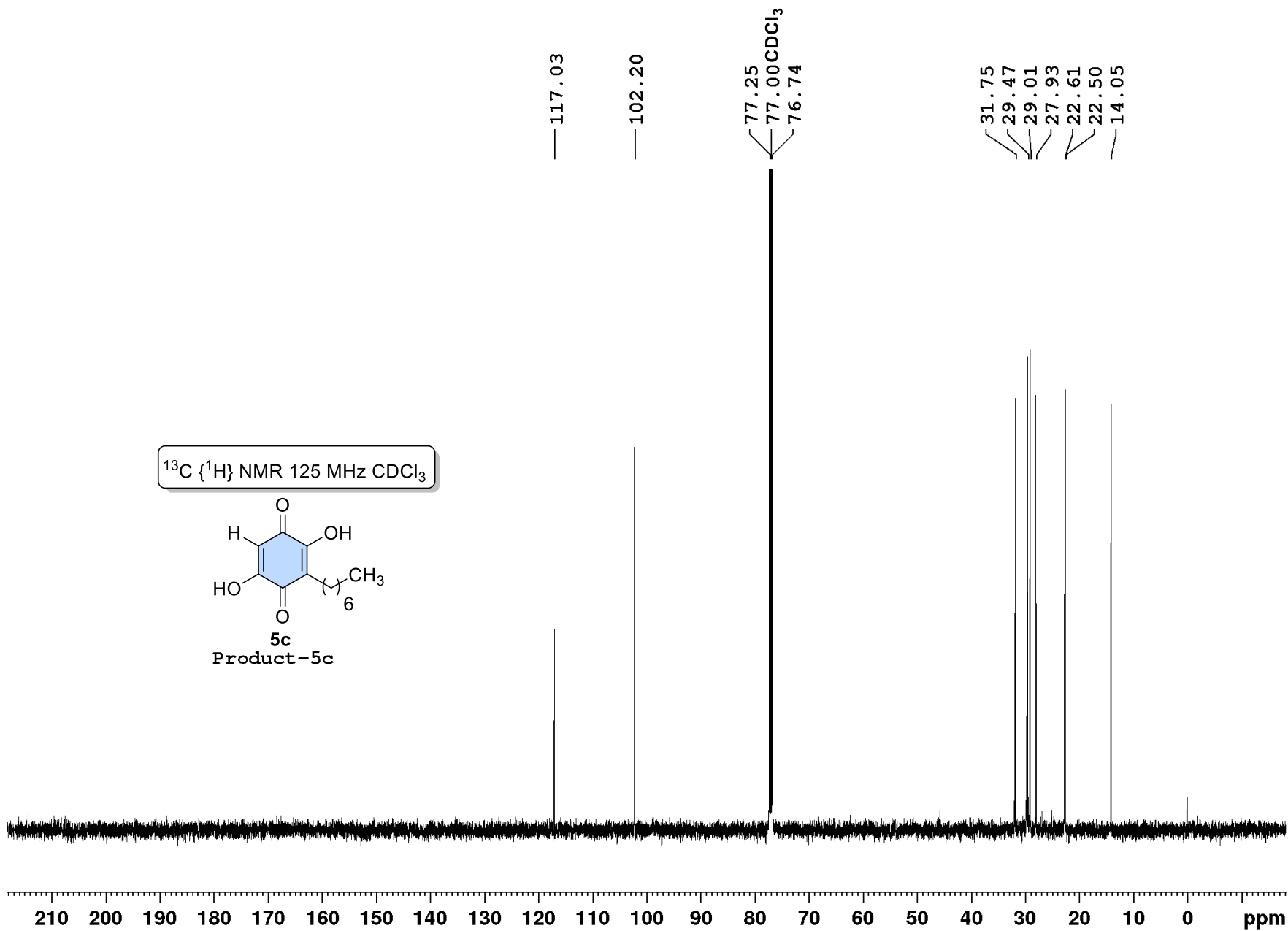




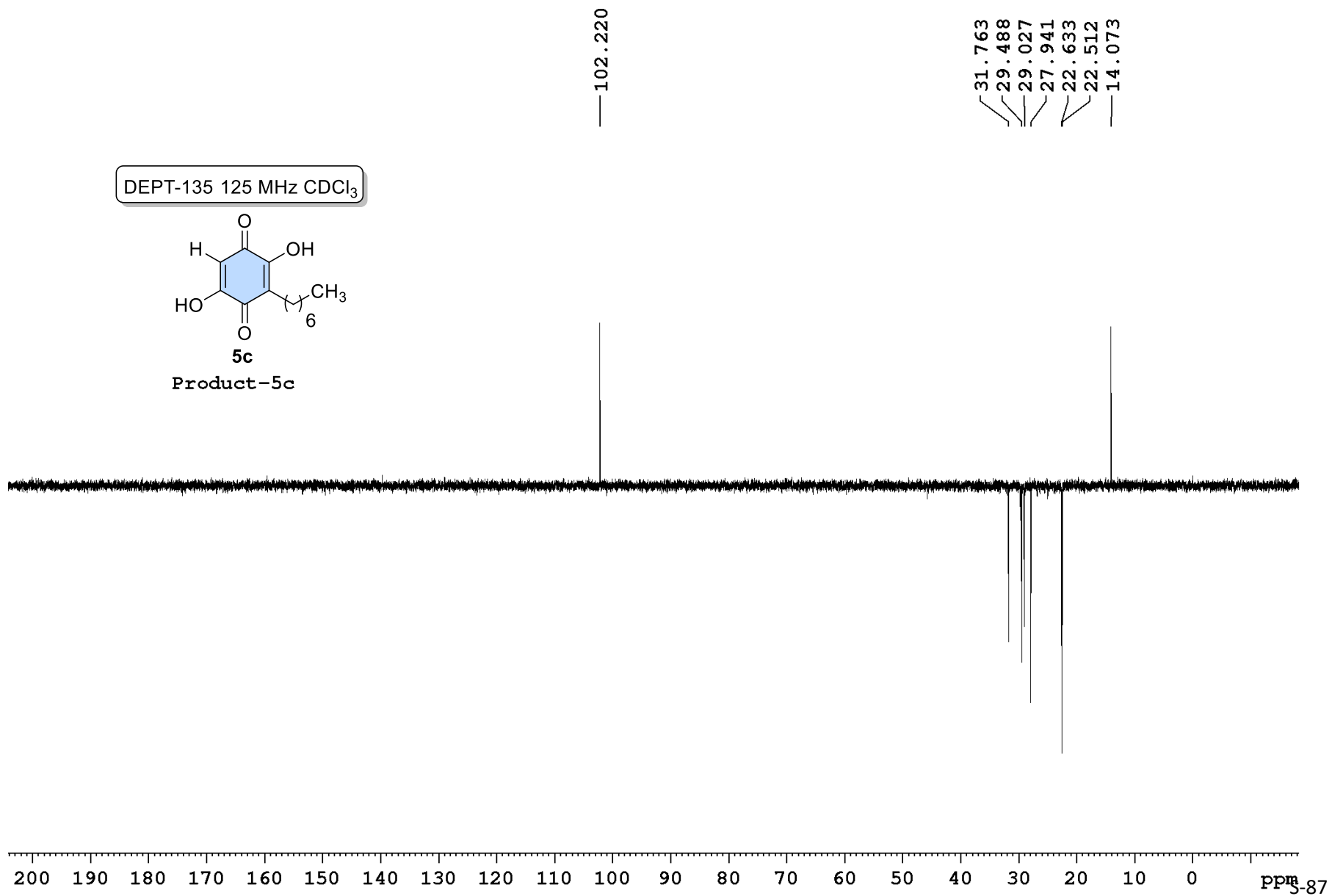
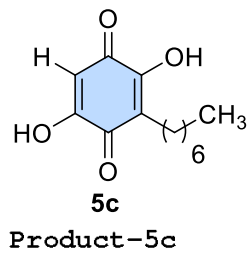


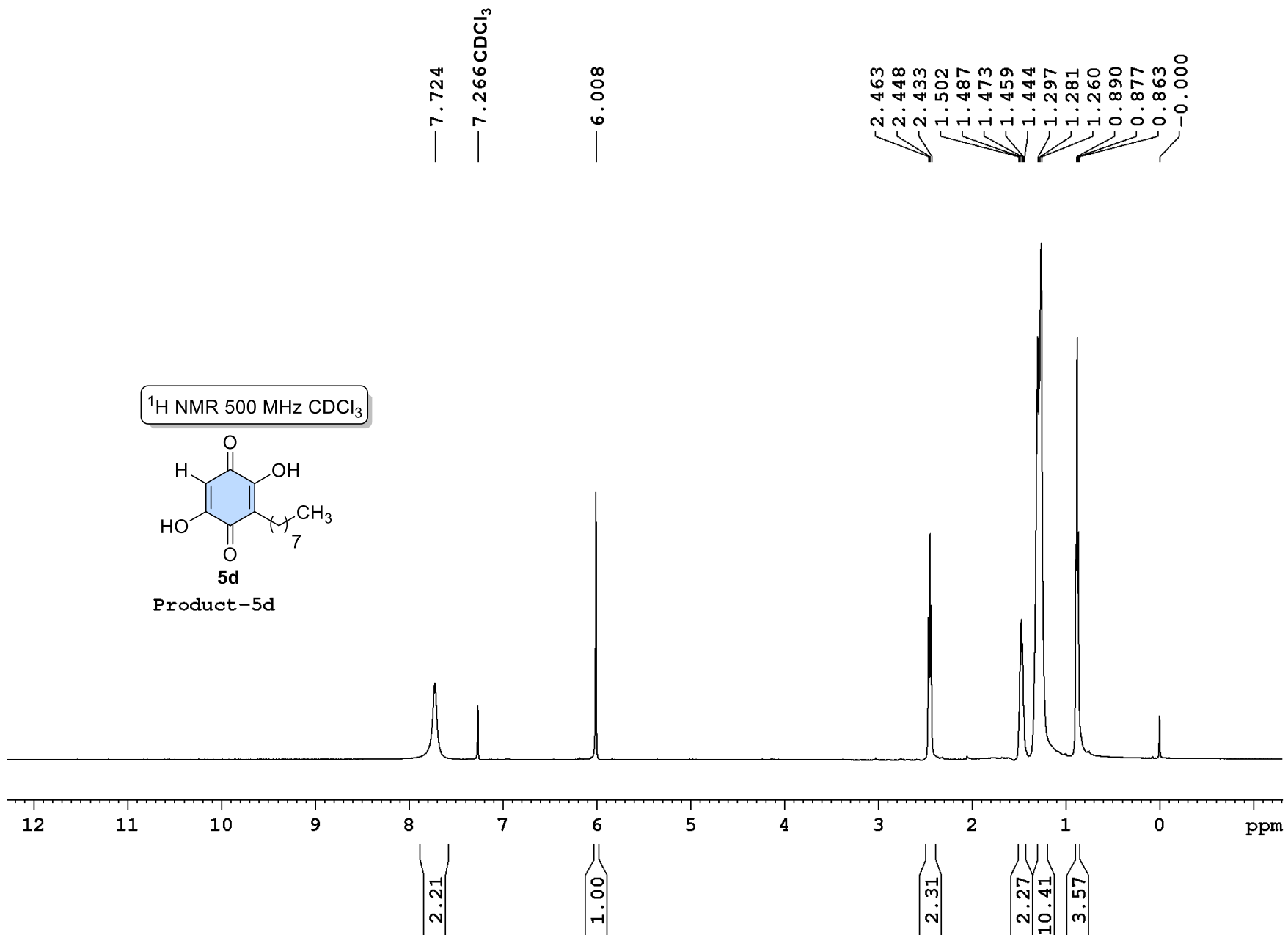




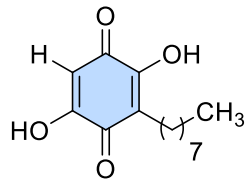


DEPT-135 125 MHz CDCl₃

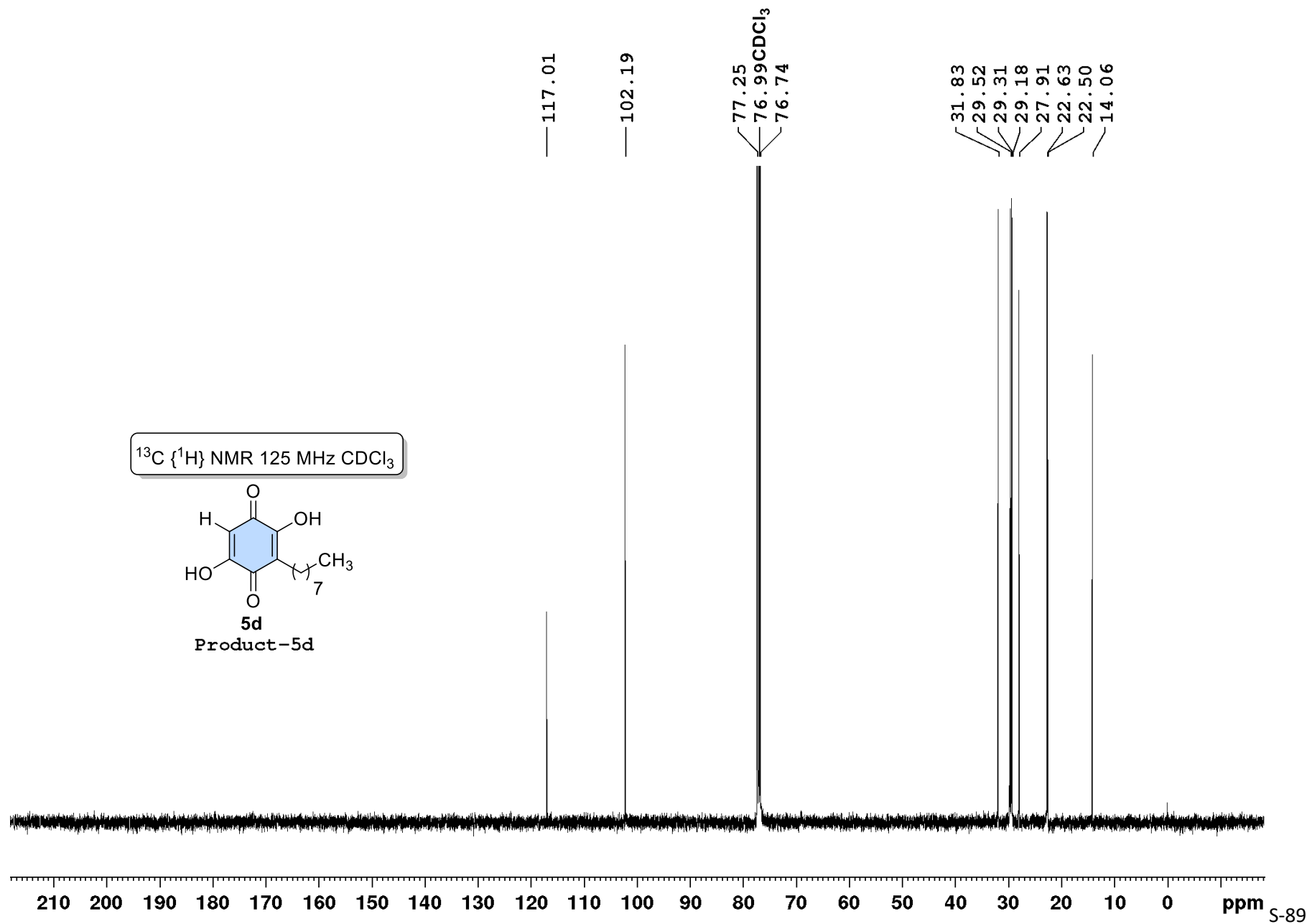




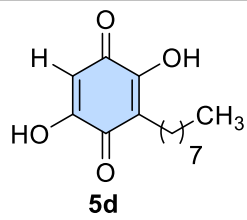
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



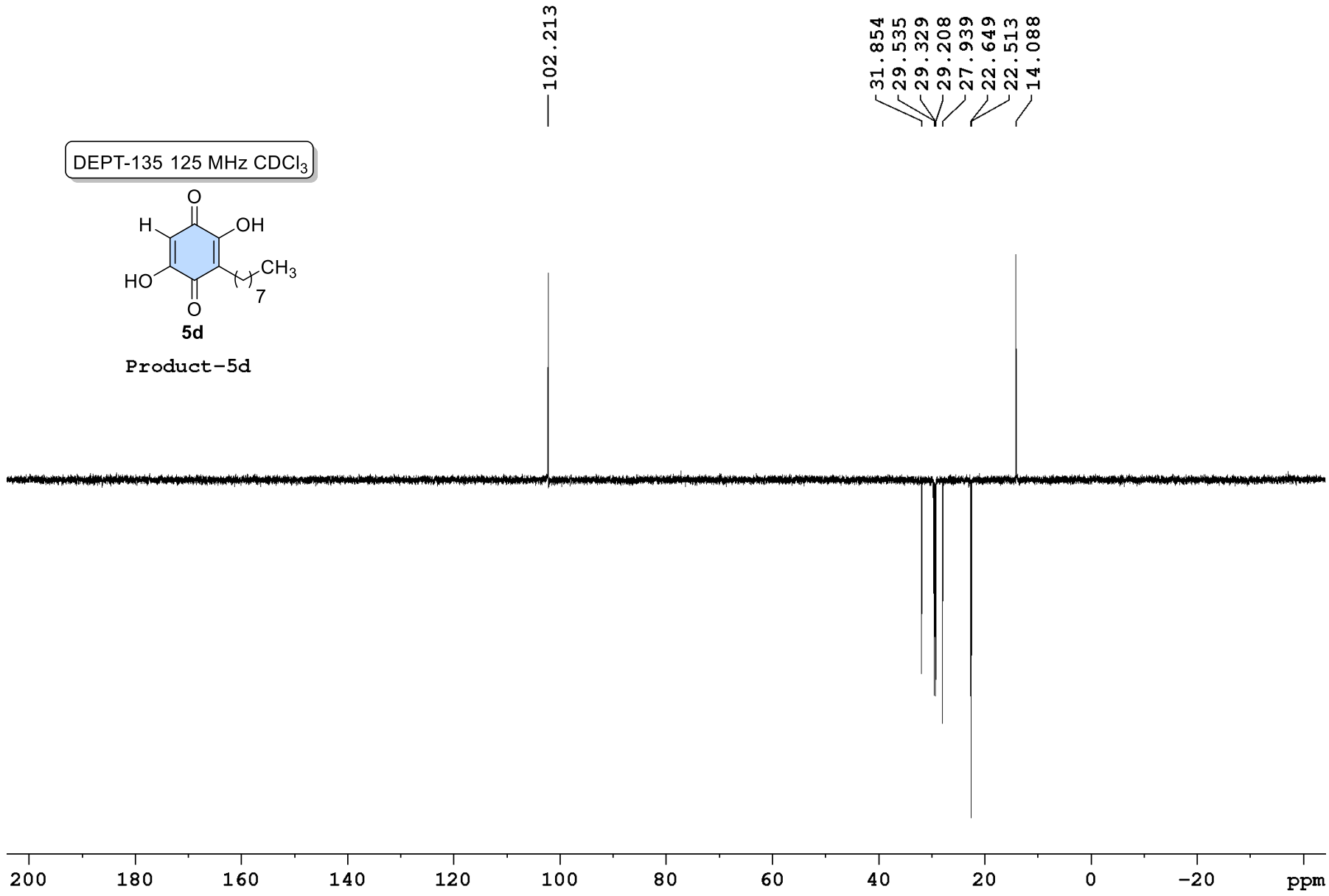
5d
Product-5d

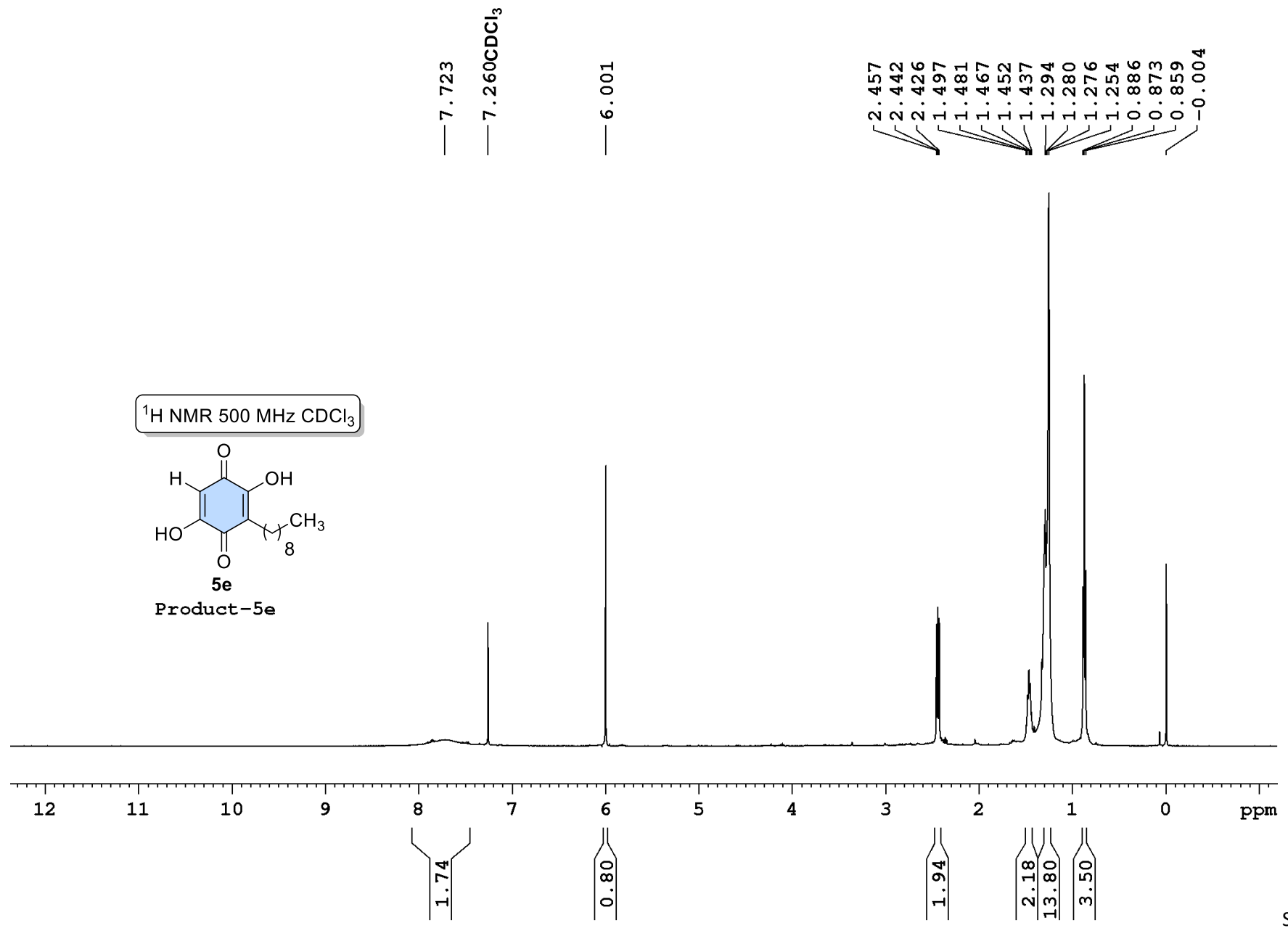


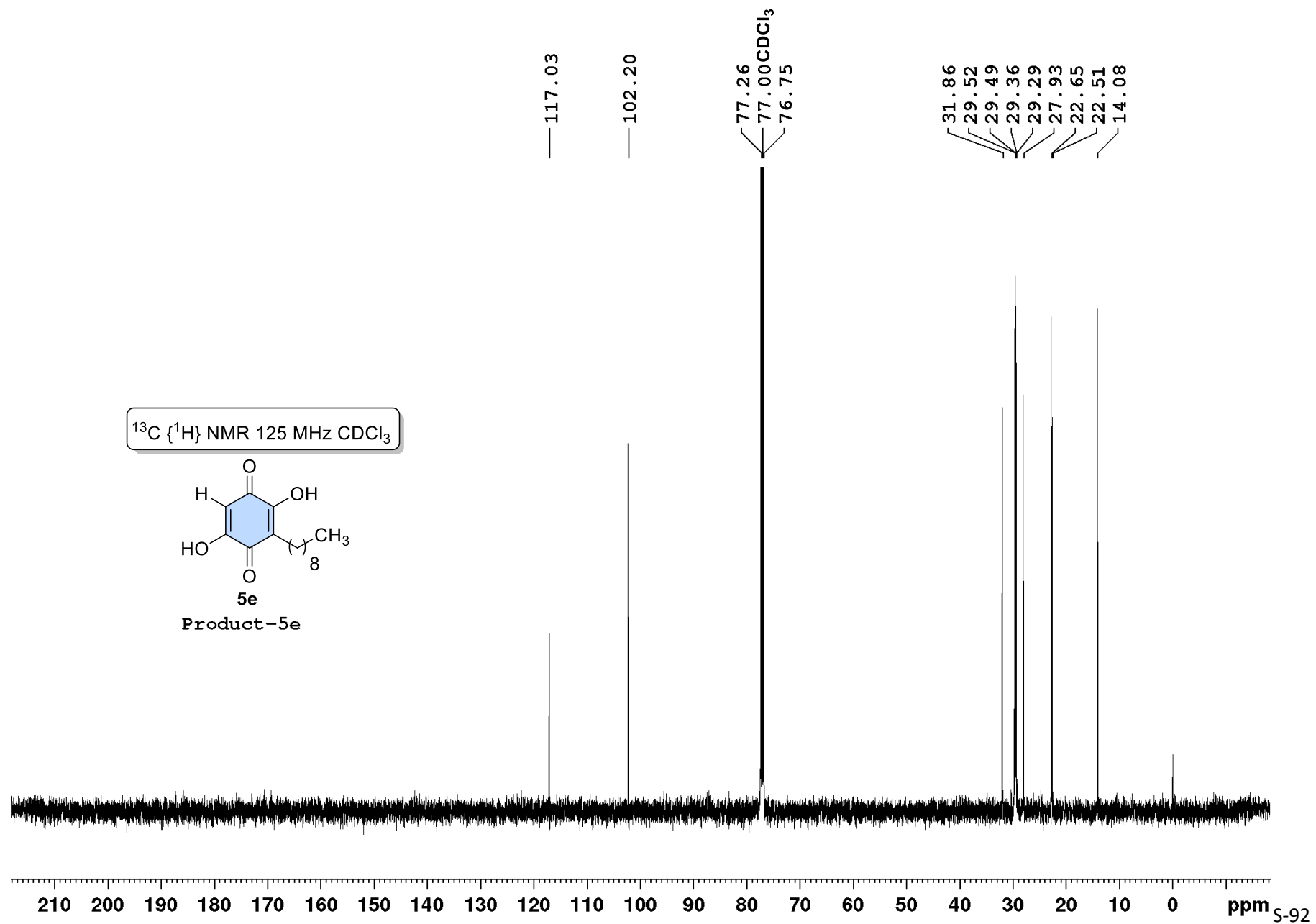
DEPT-135 125 MHz CDCl₃



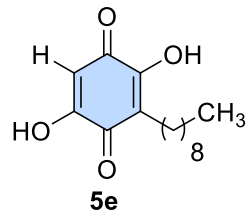
Product-5d



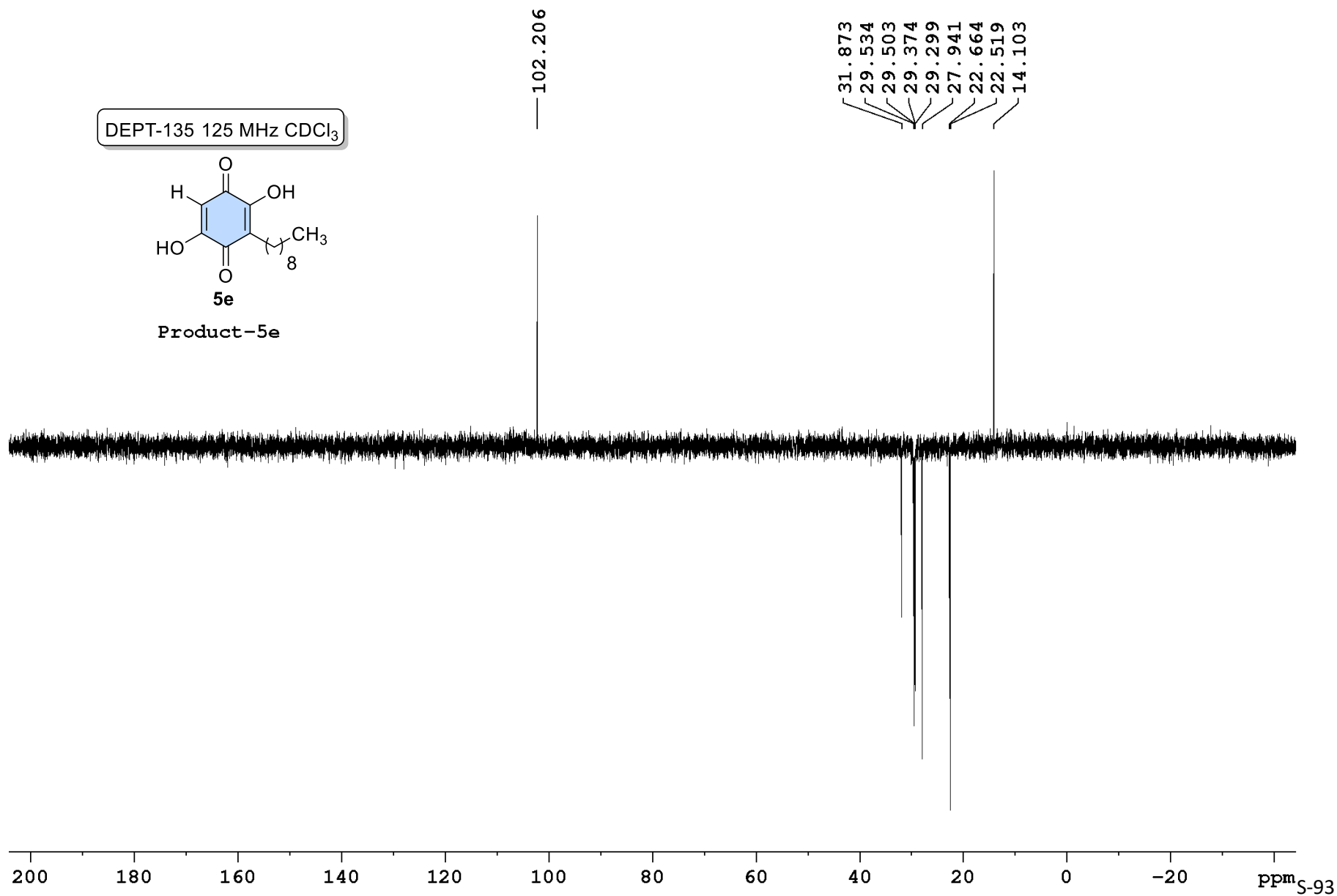


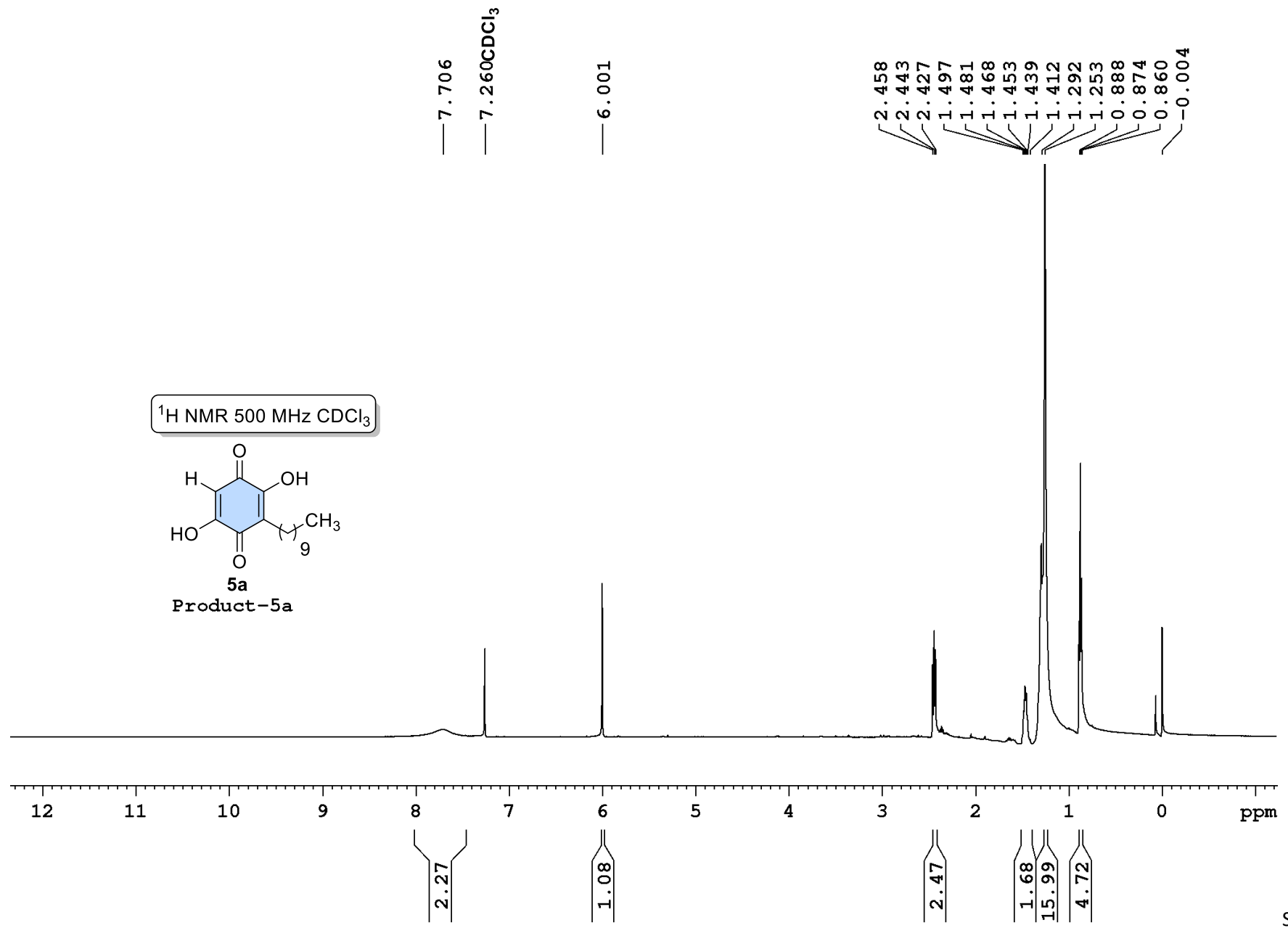


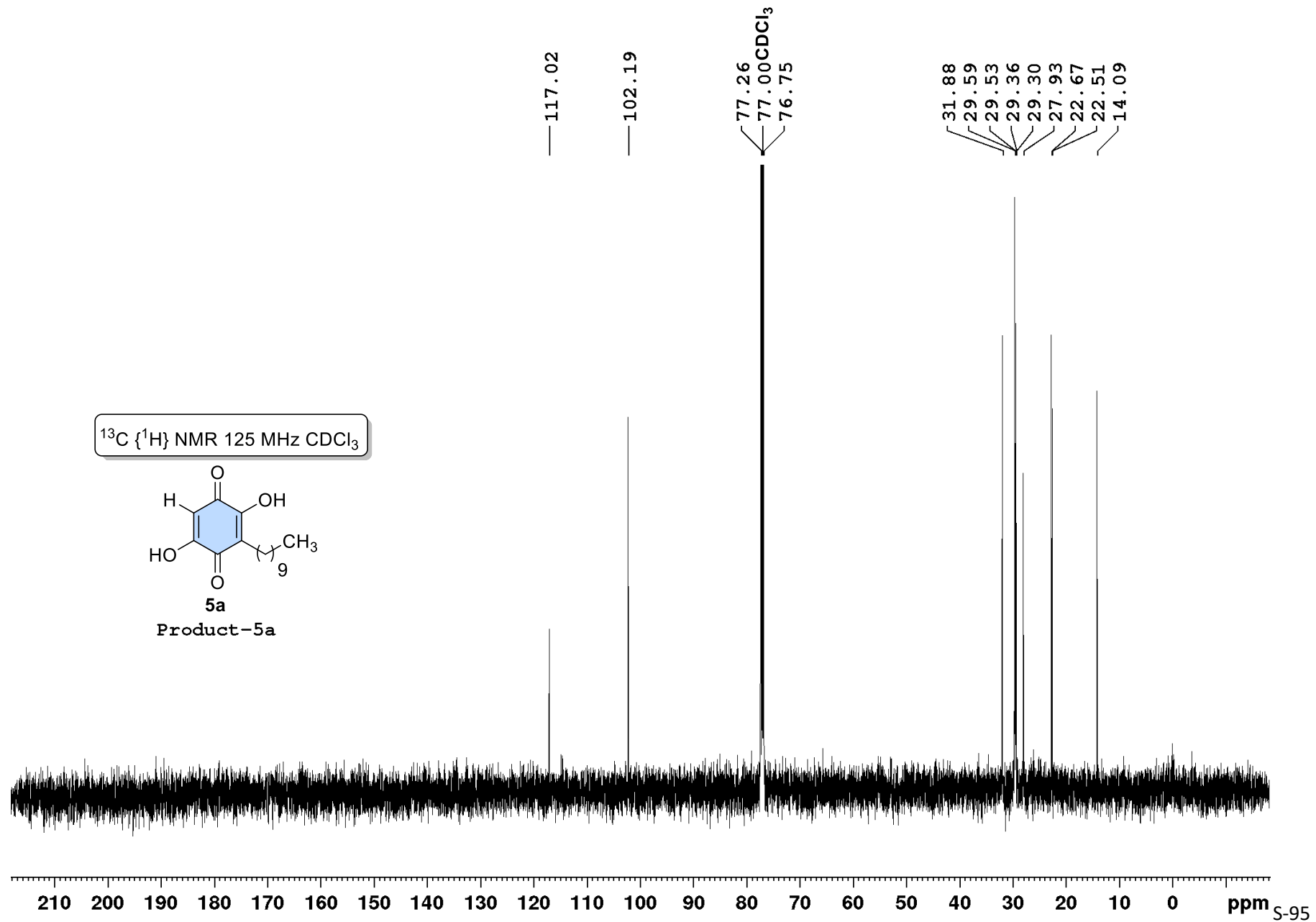
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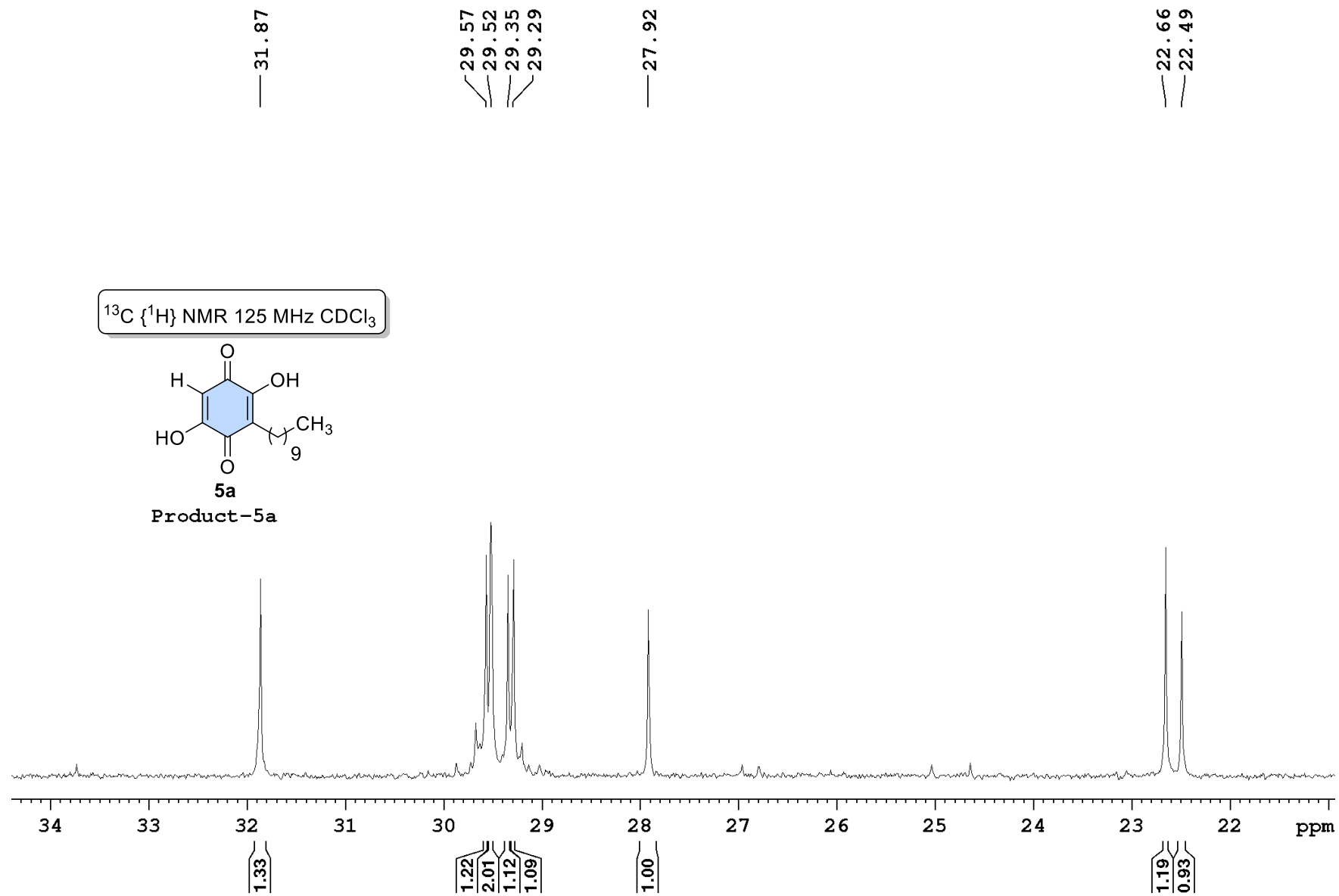


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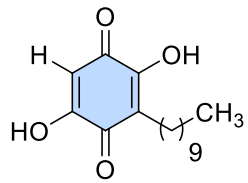








DEPT-135 125 MHz CDCl₃

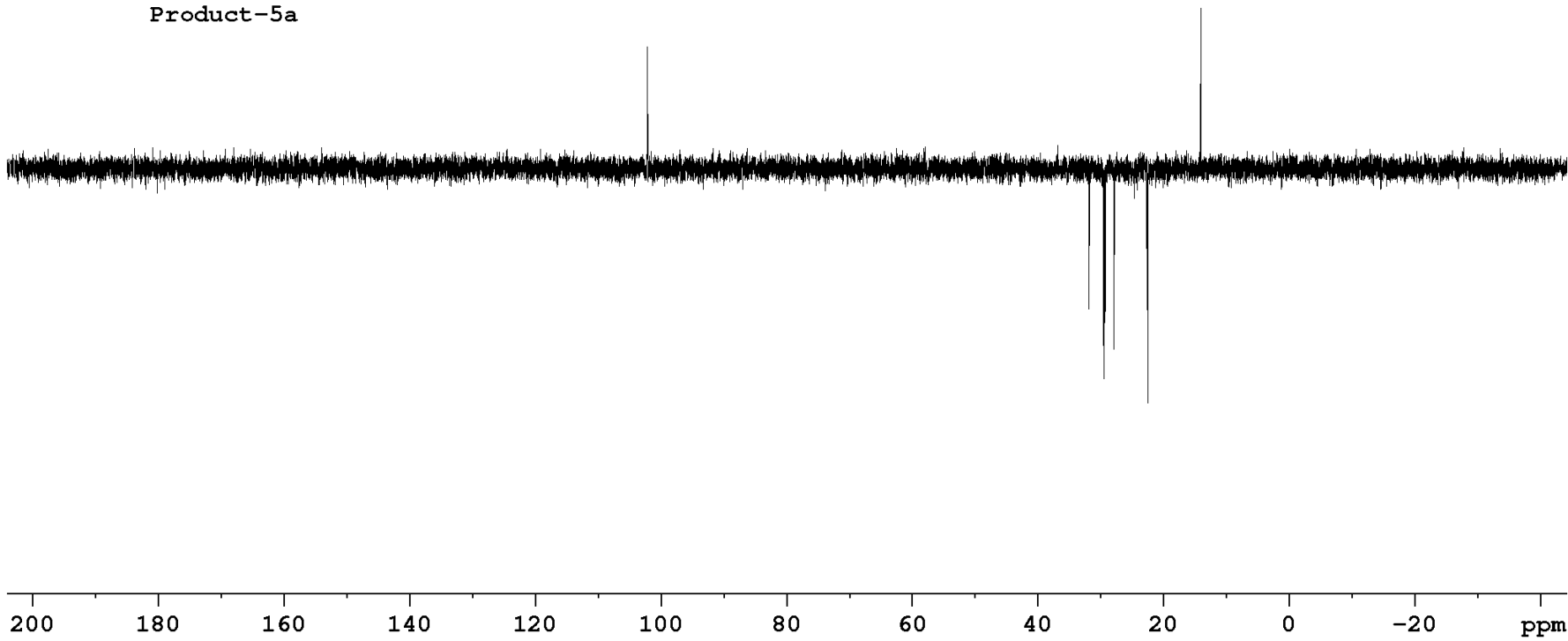


5a

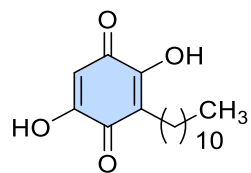
Product-5a

— 102.181

31.867
29.571
29.521
29.349
29.294
27.916
22.659
22.494
14.088

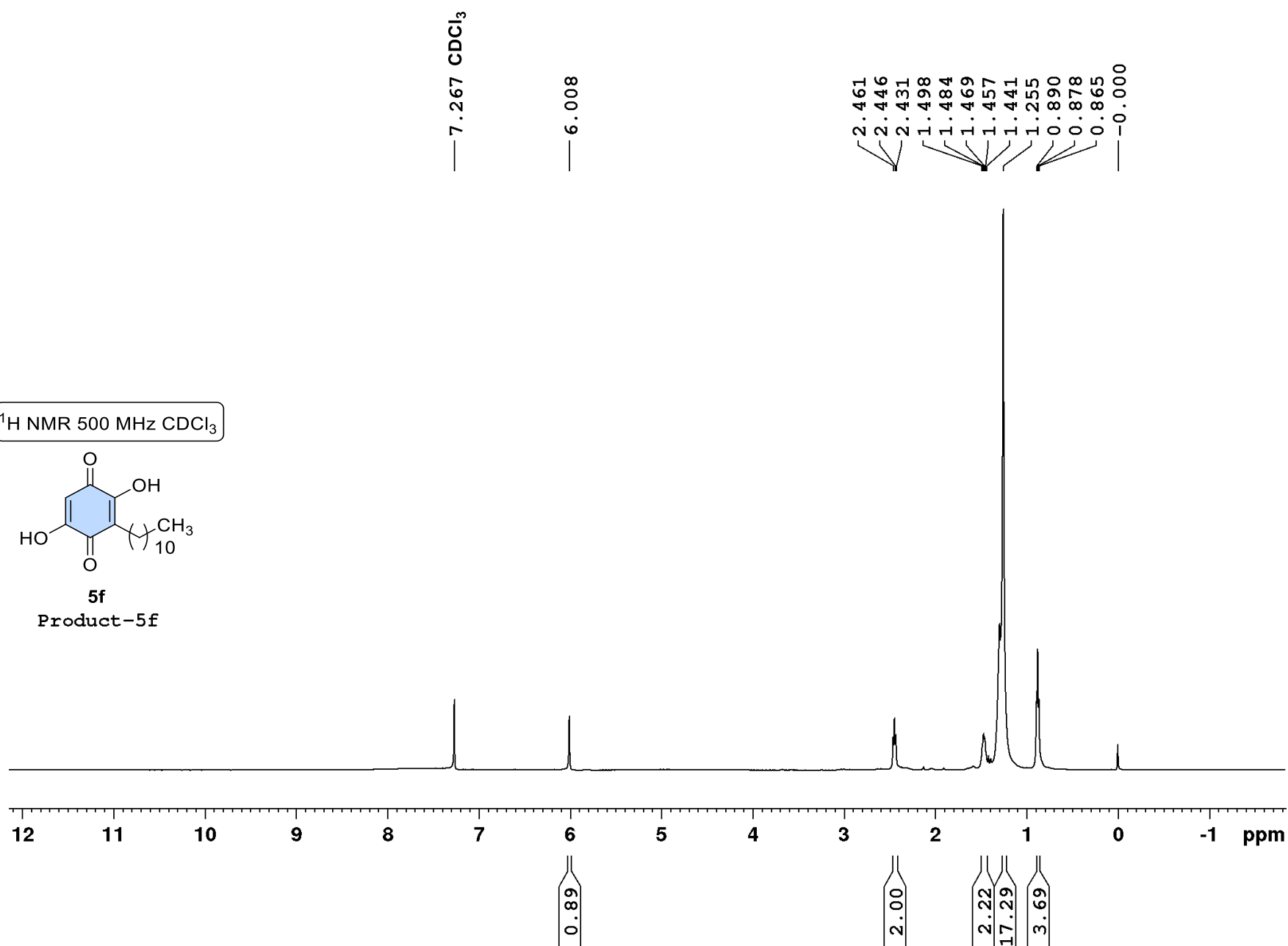


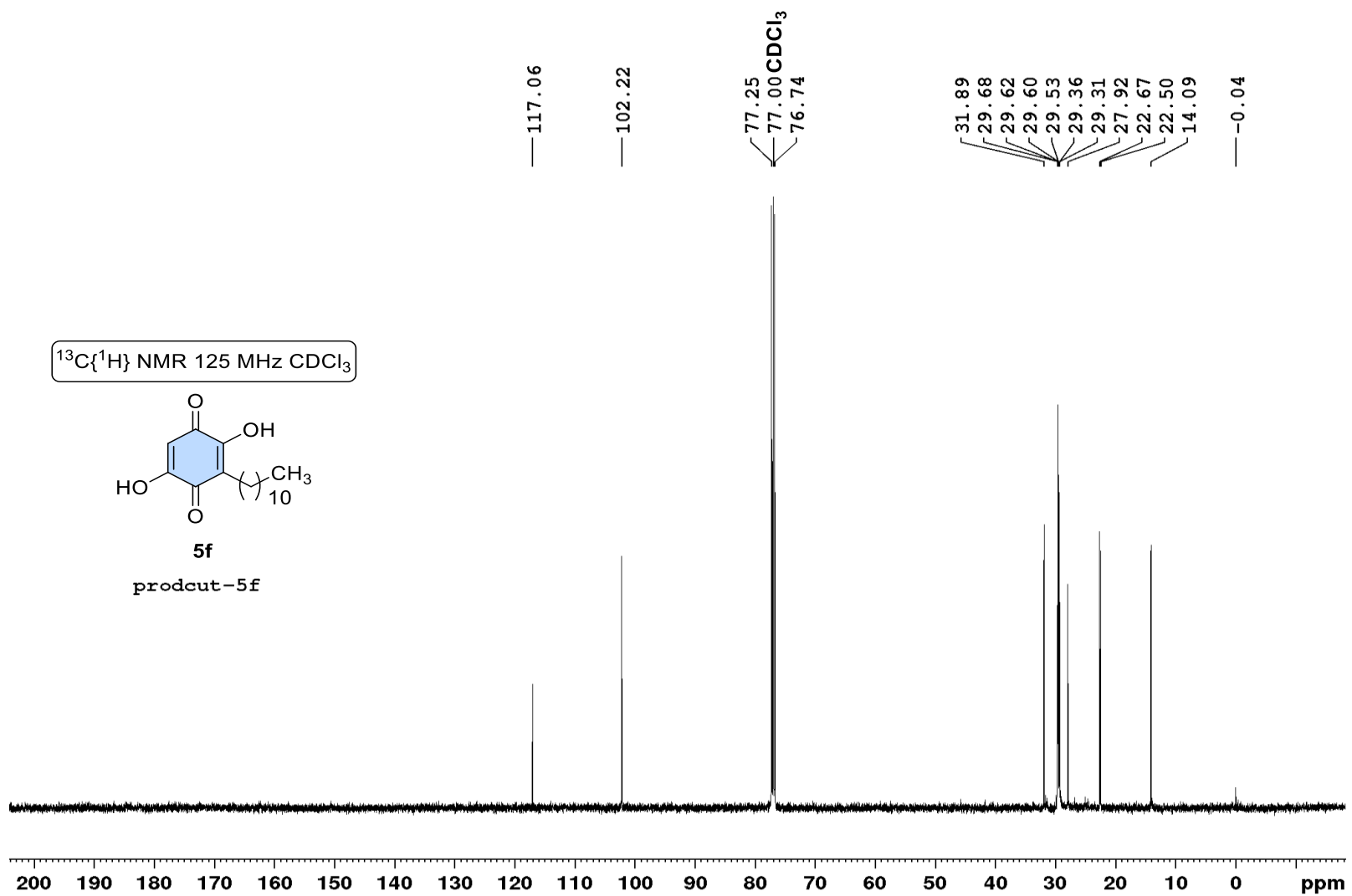
¹H NMR 500 MHz CDCl₃

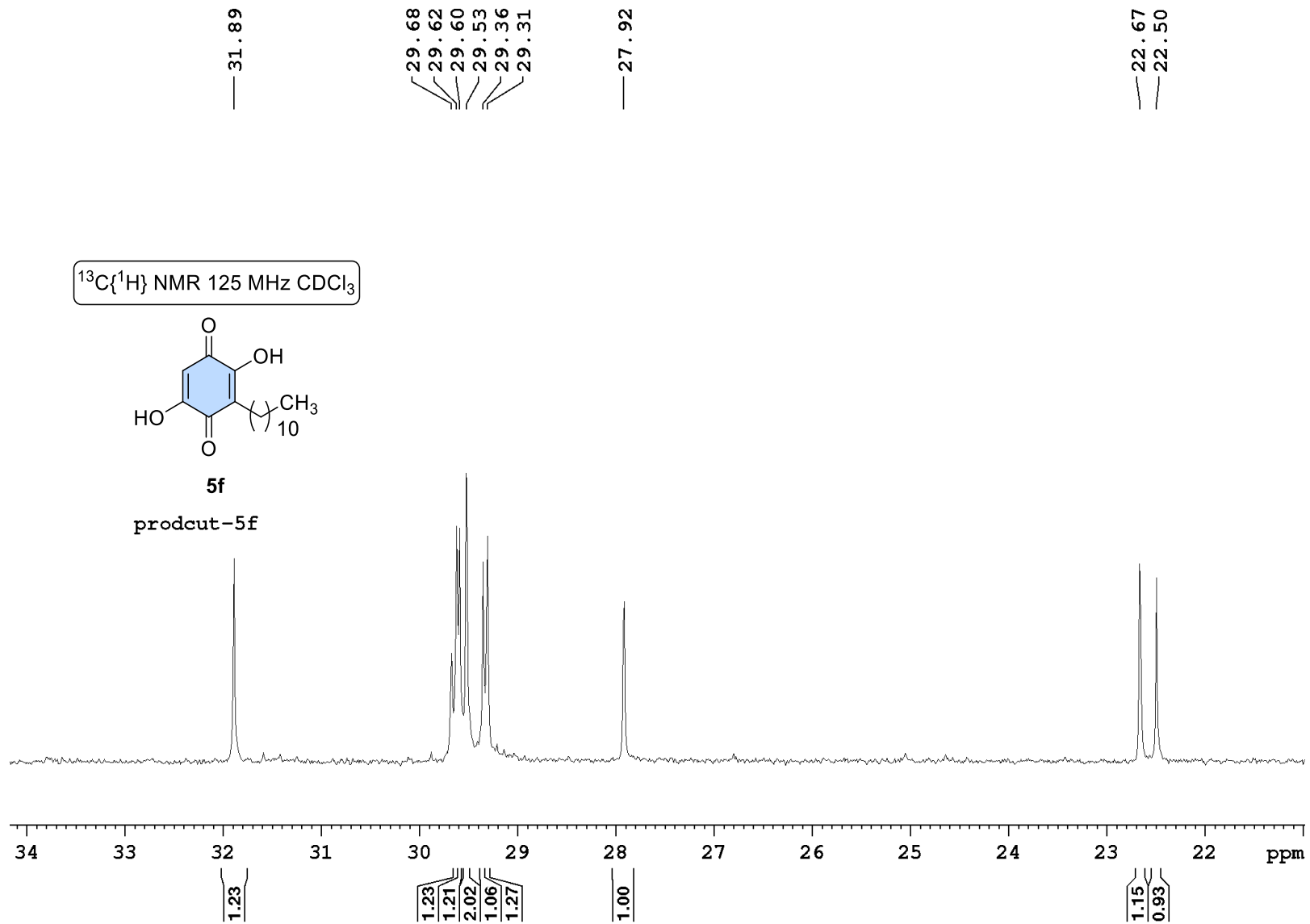


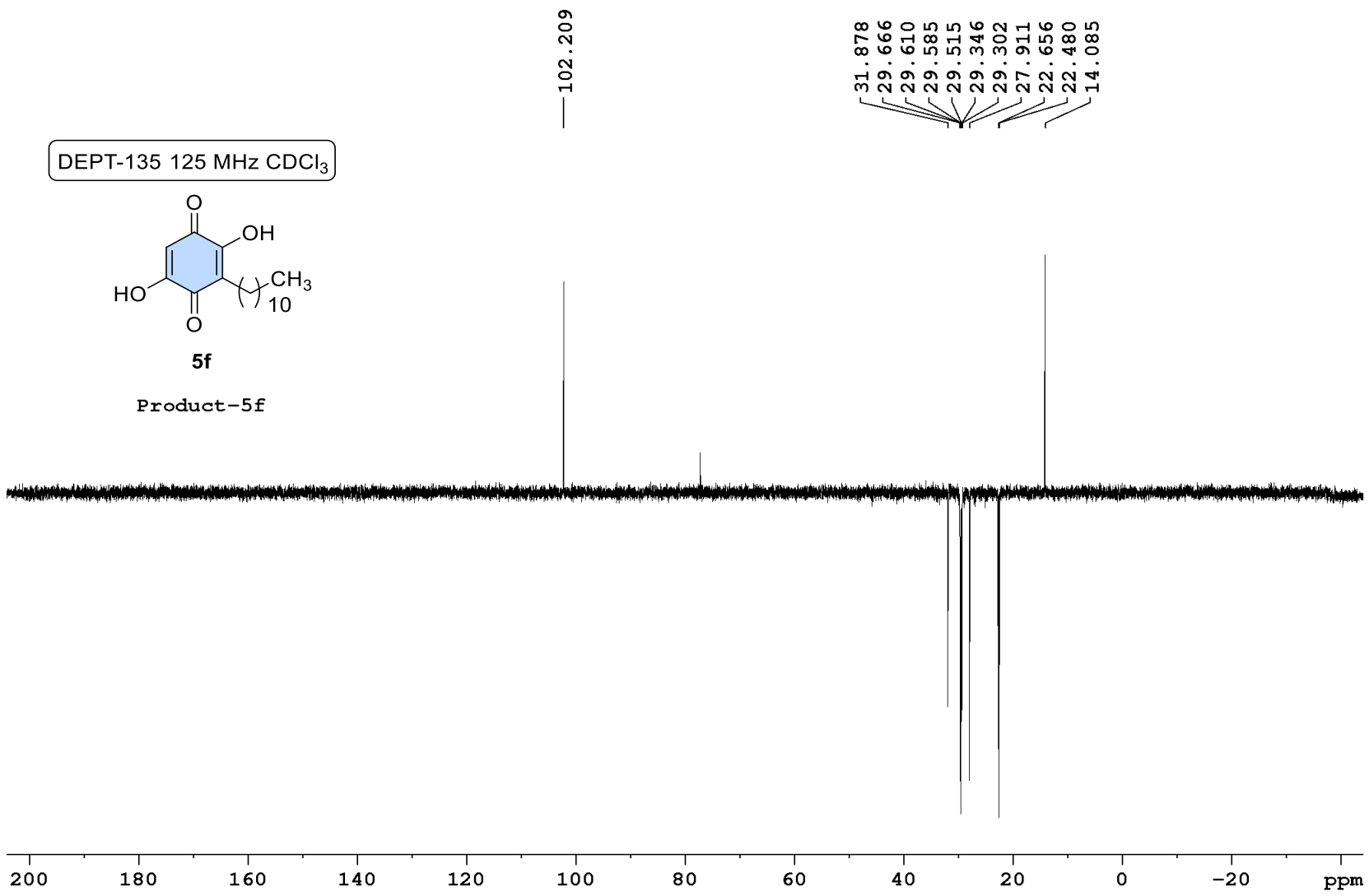
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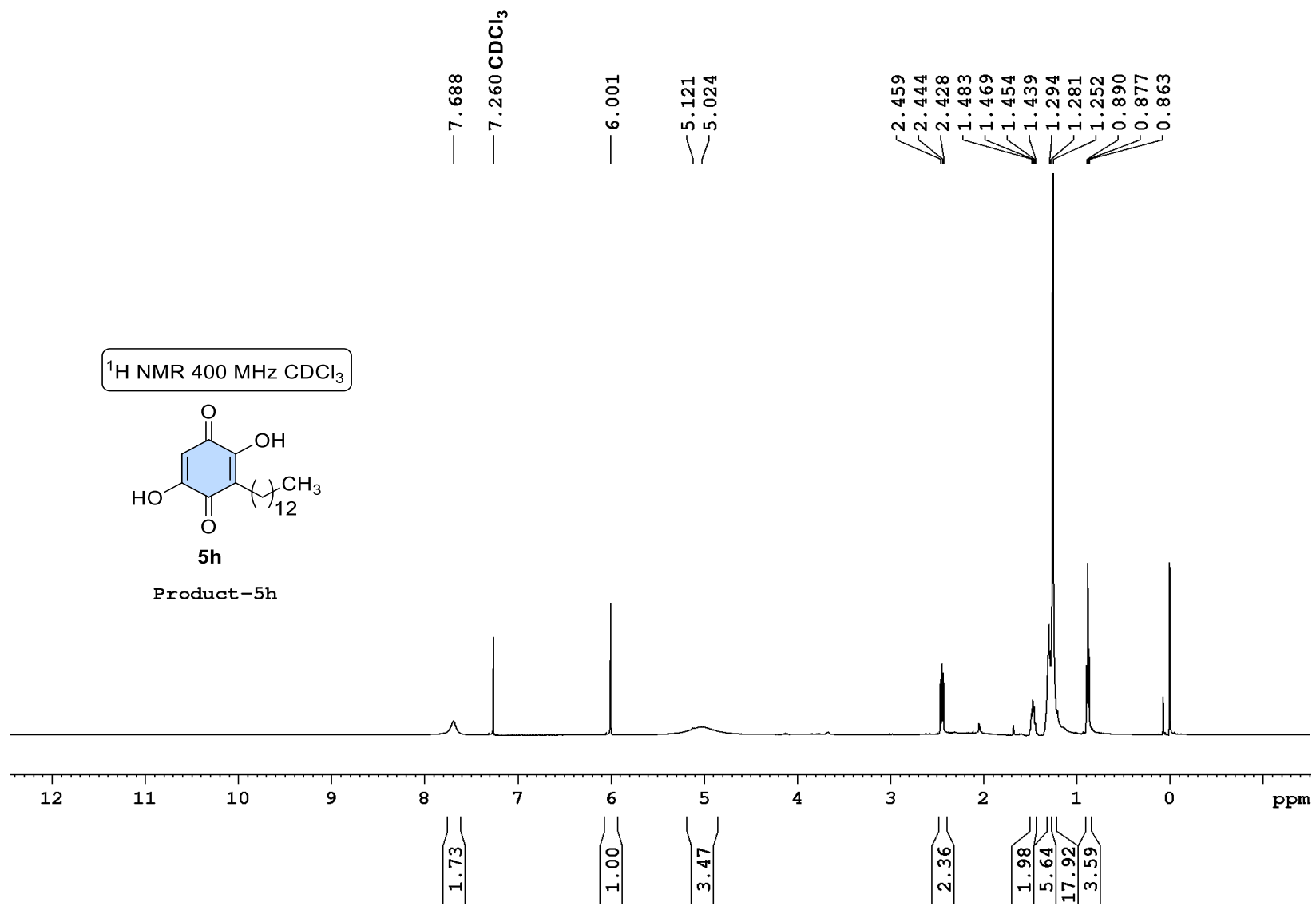
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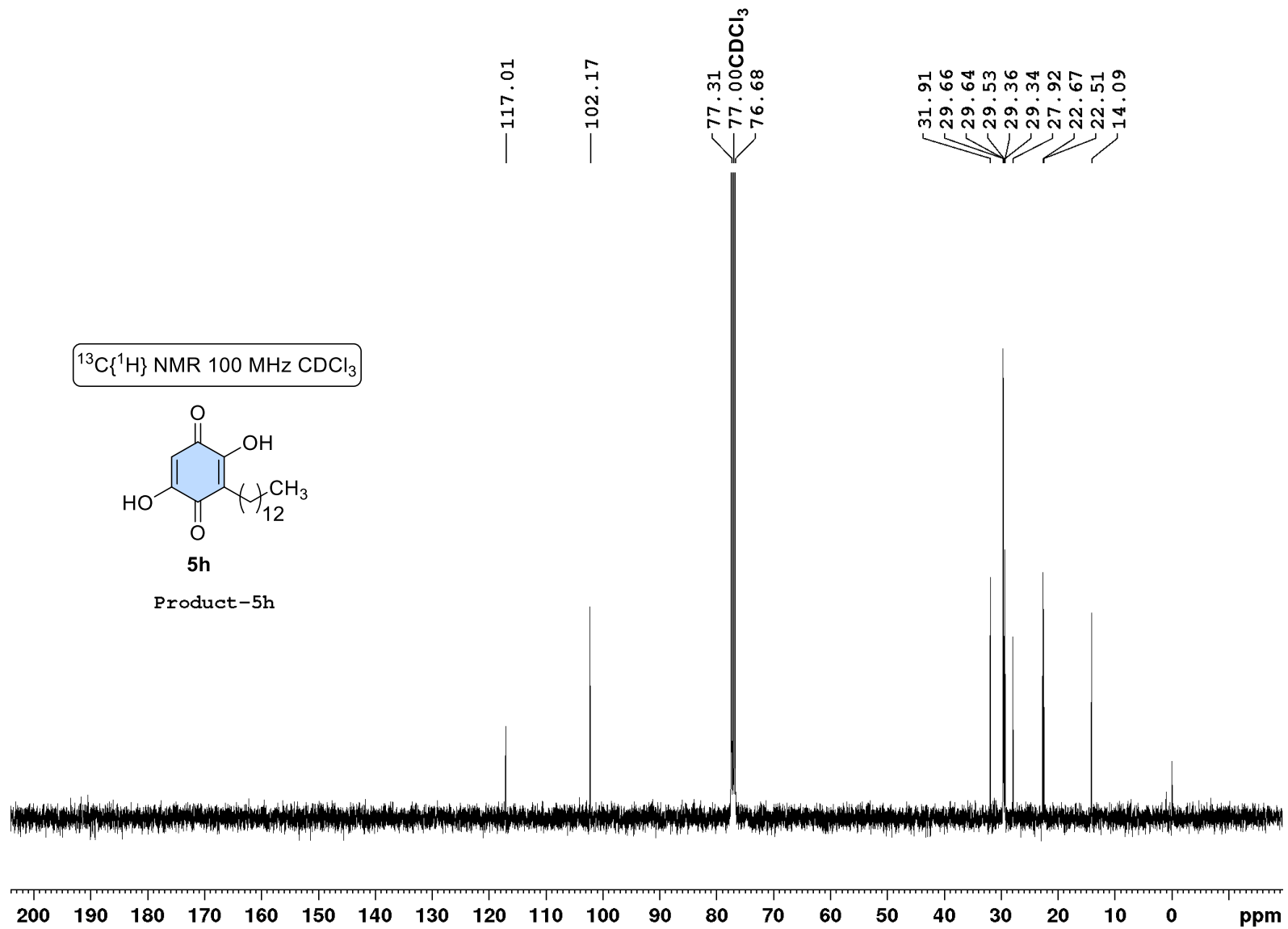


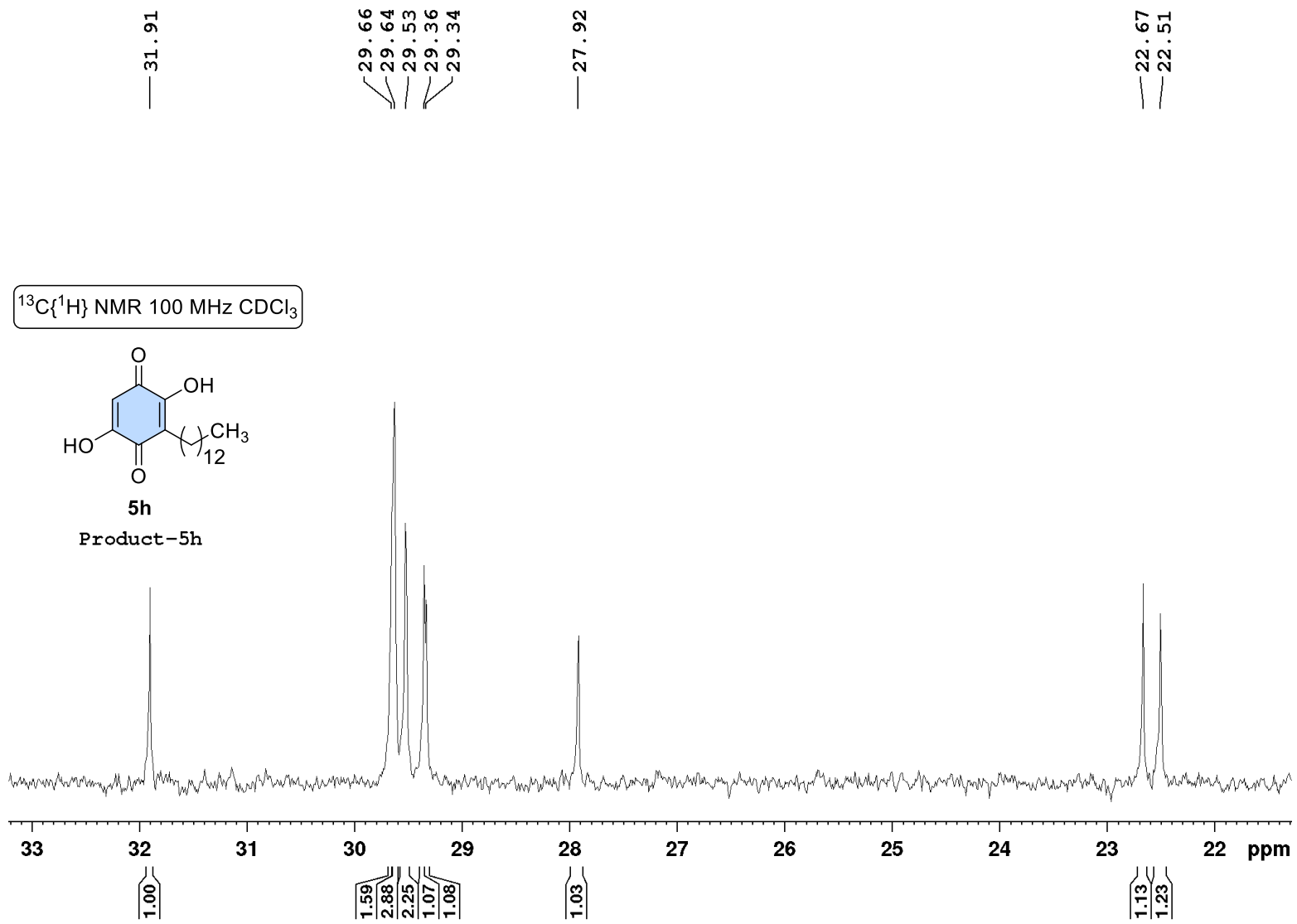


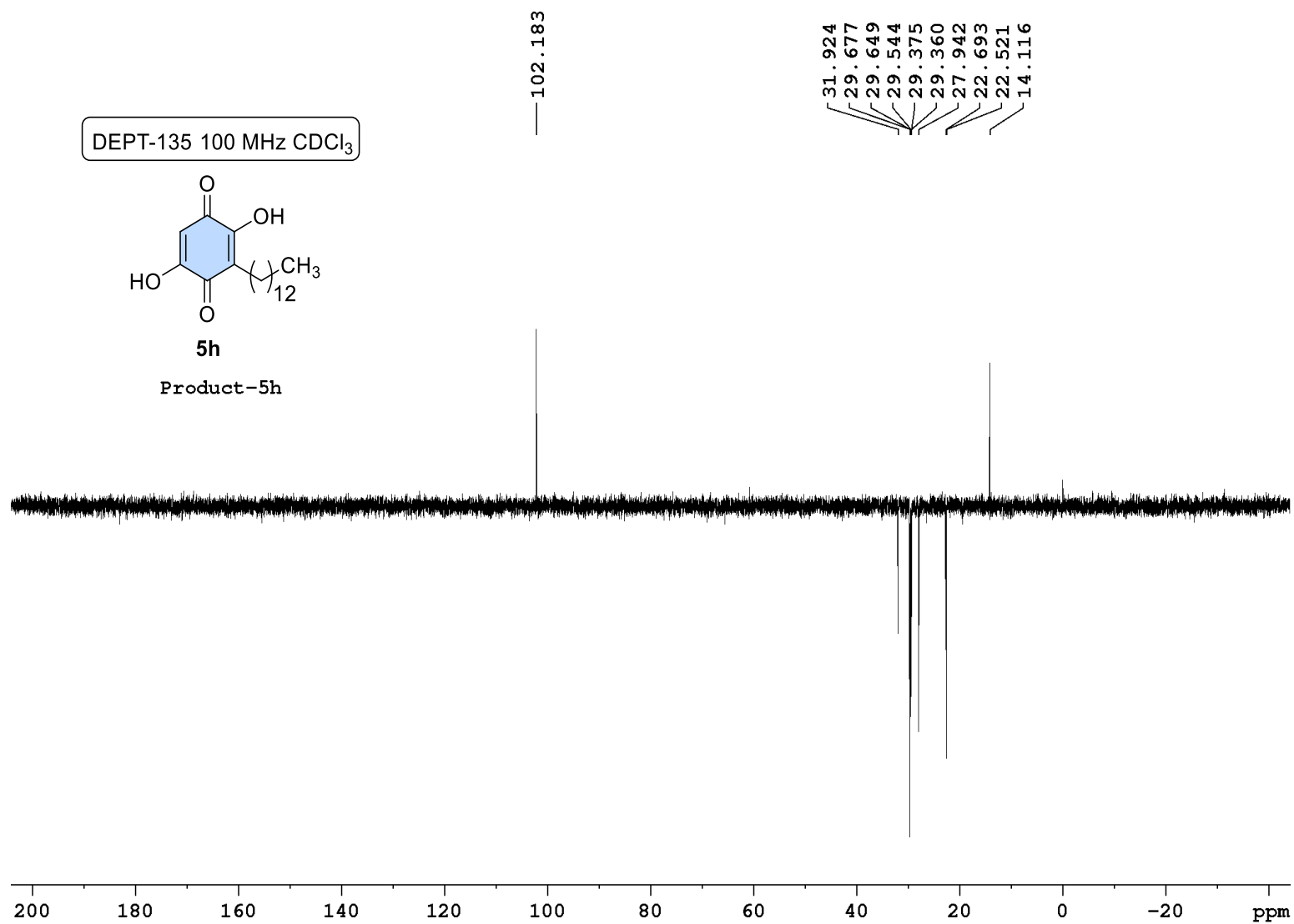


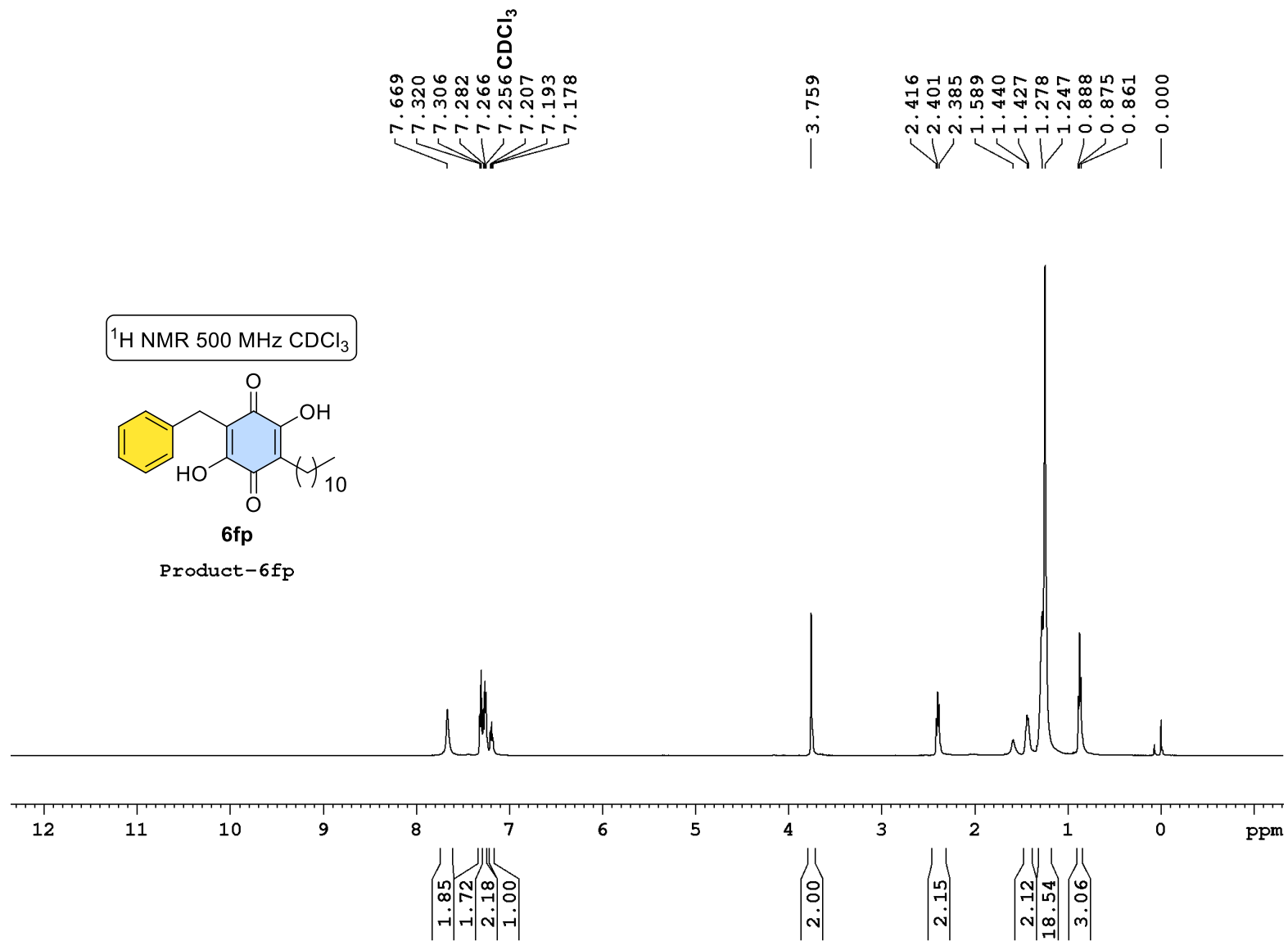


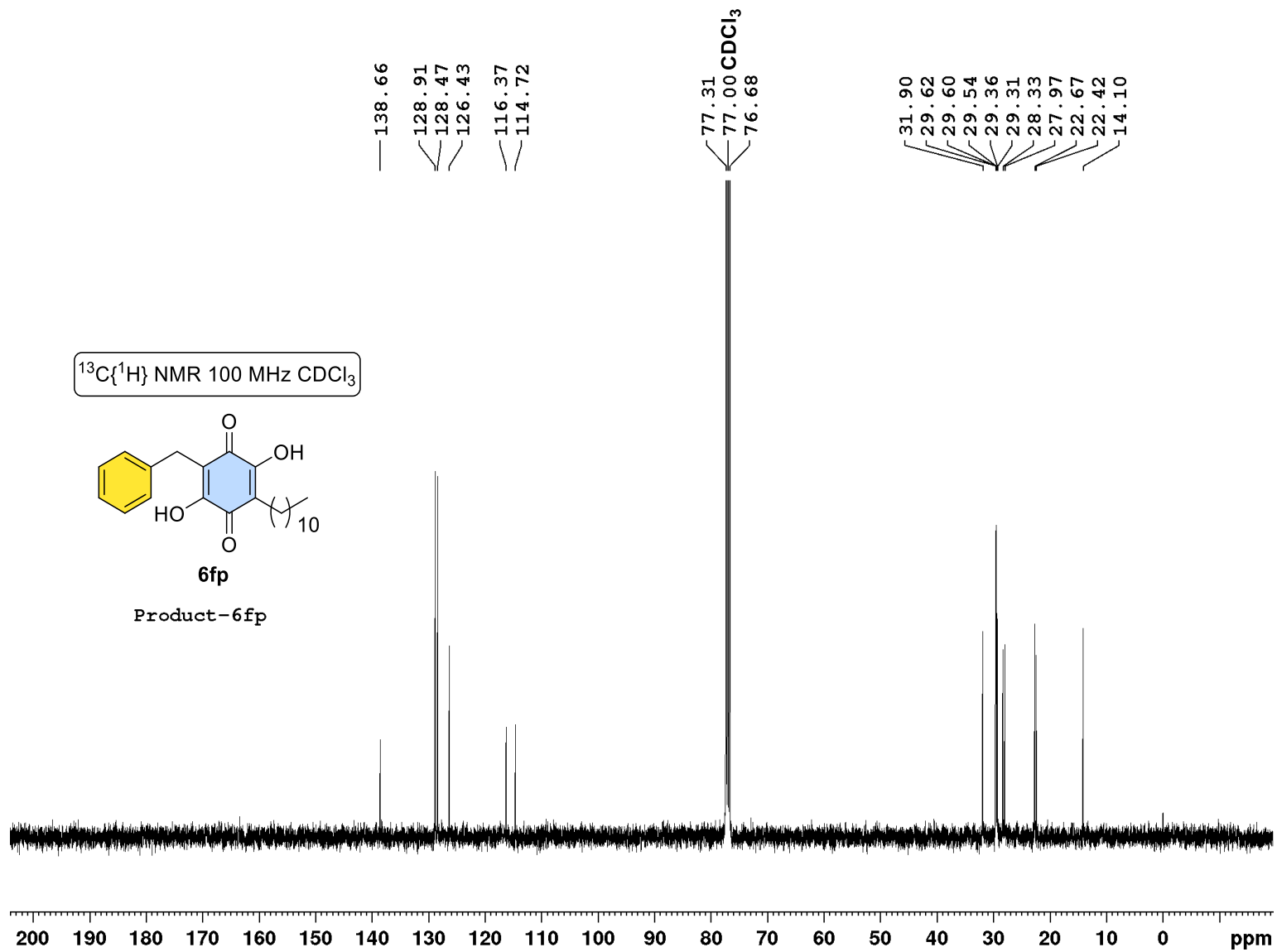


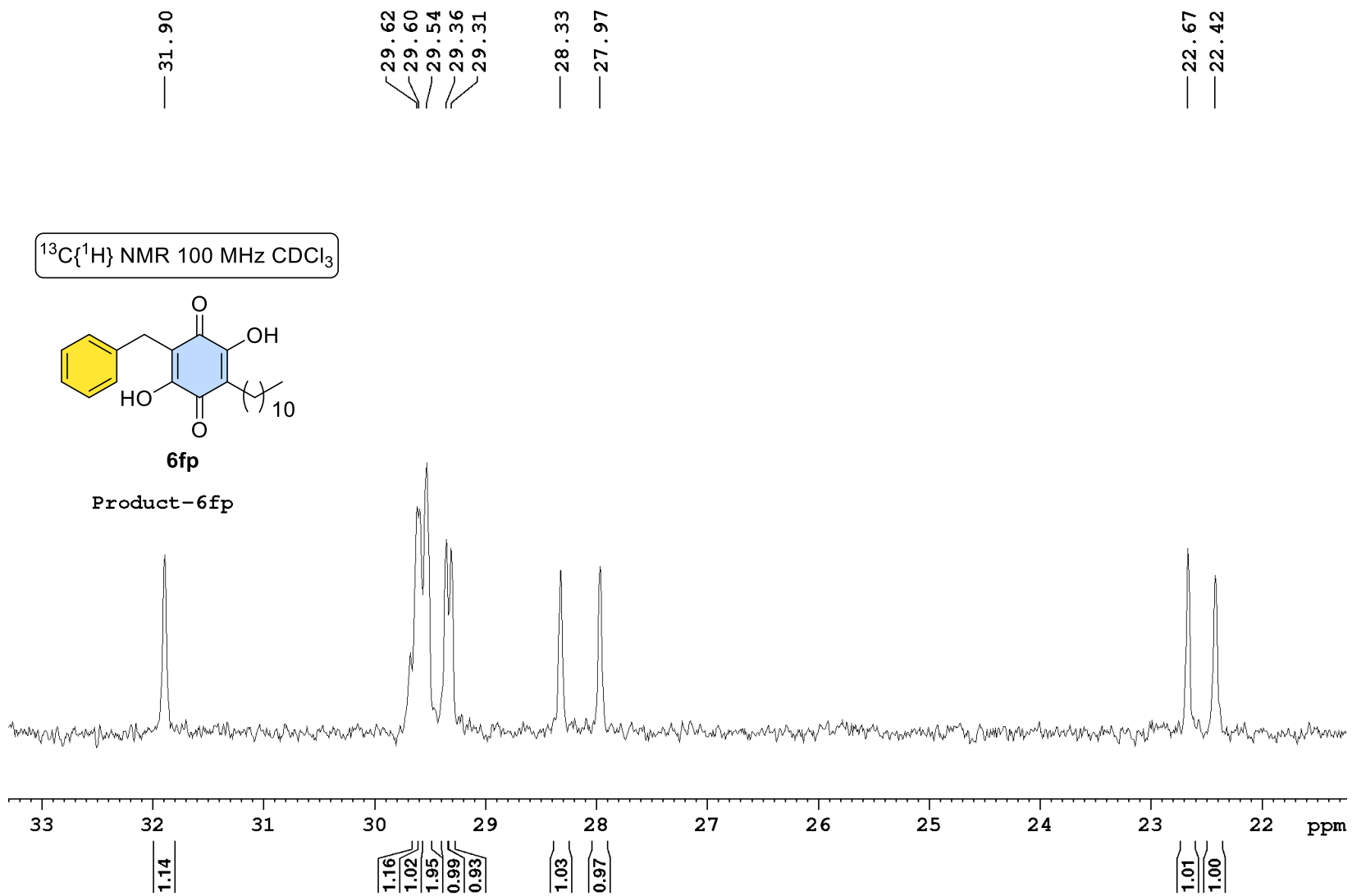


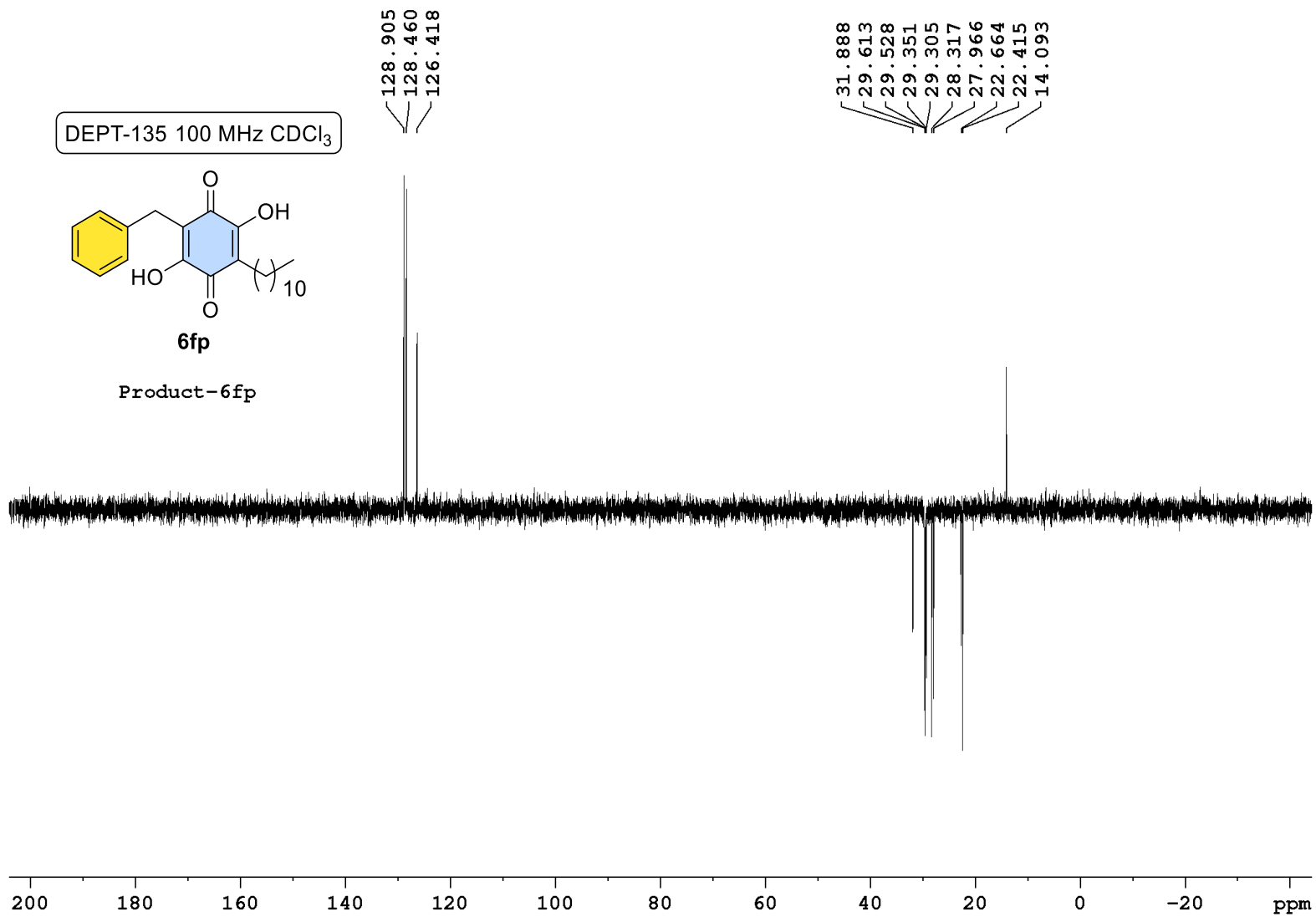




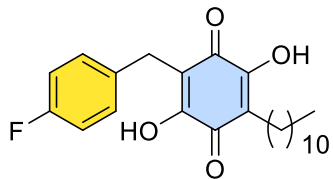




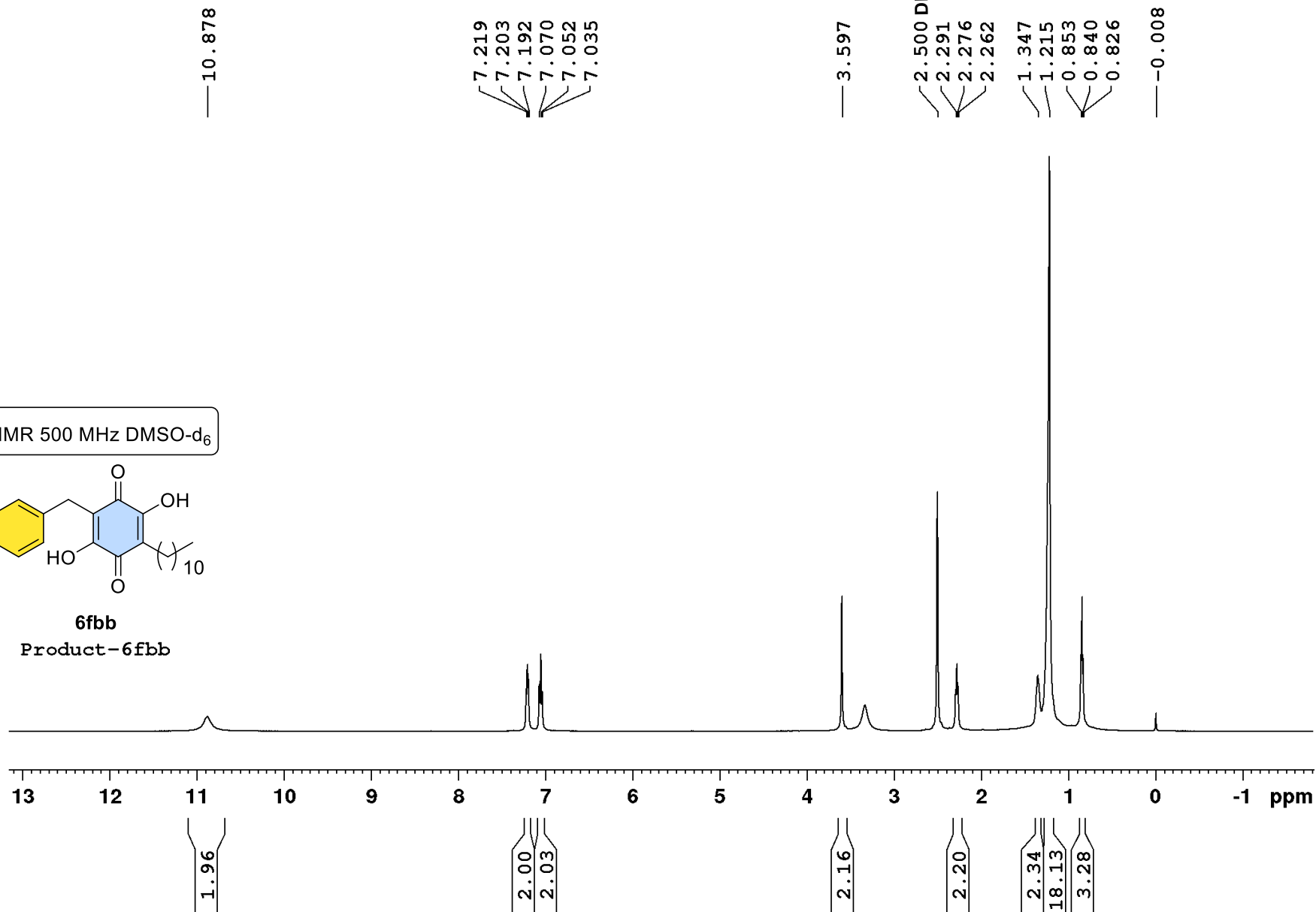




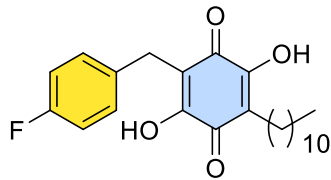
¹H NMR 500 MHz DMSO-d₆



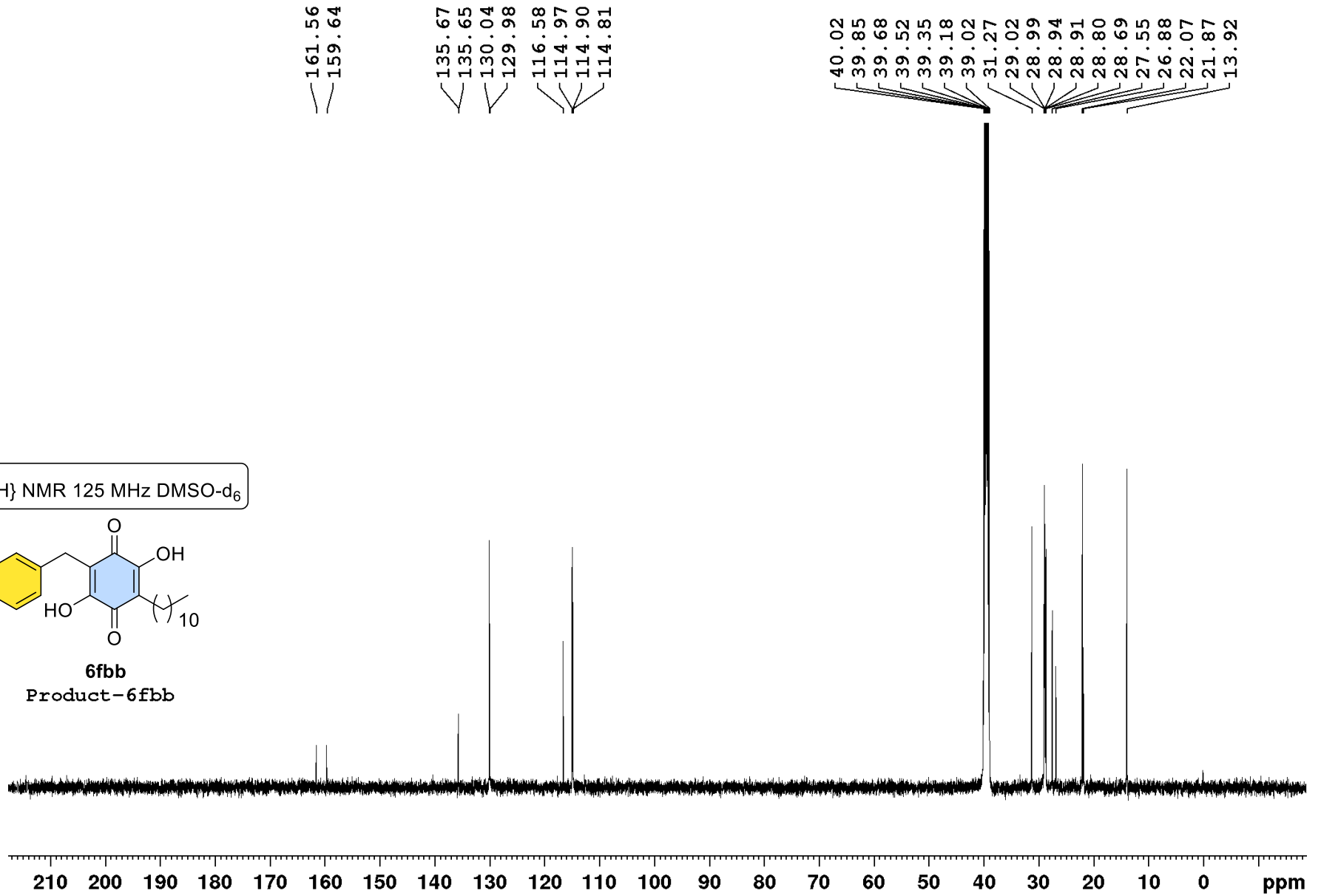
6fbb
Product-6fbb



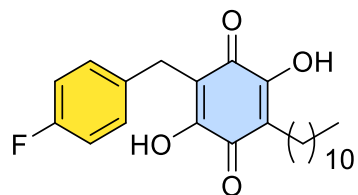
$^{13}\text{C}\{^1\text{H}\}$ NMR 125 MHz DMSO- d_6



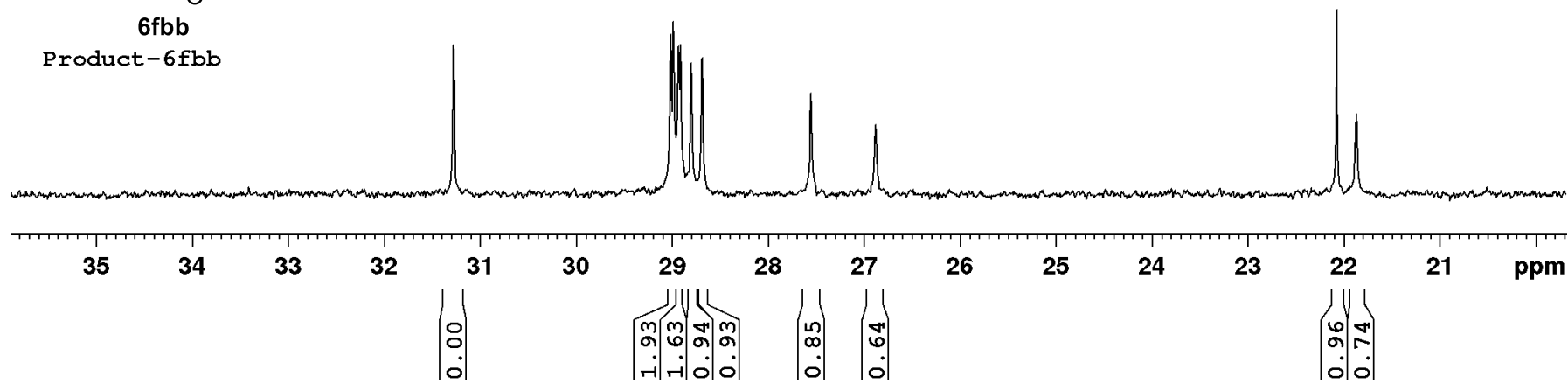
6fbb
Product-6fbb



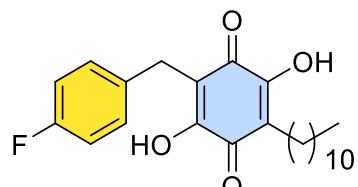
$^{13}\text{C}\{^1\text{H}\}$ NMR 125 MHz DMSO- d_6



6fbb
Product-6fbb

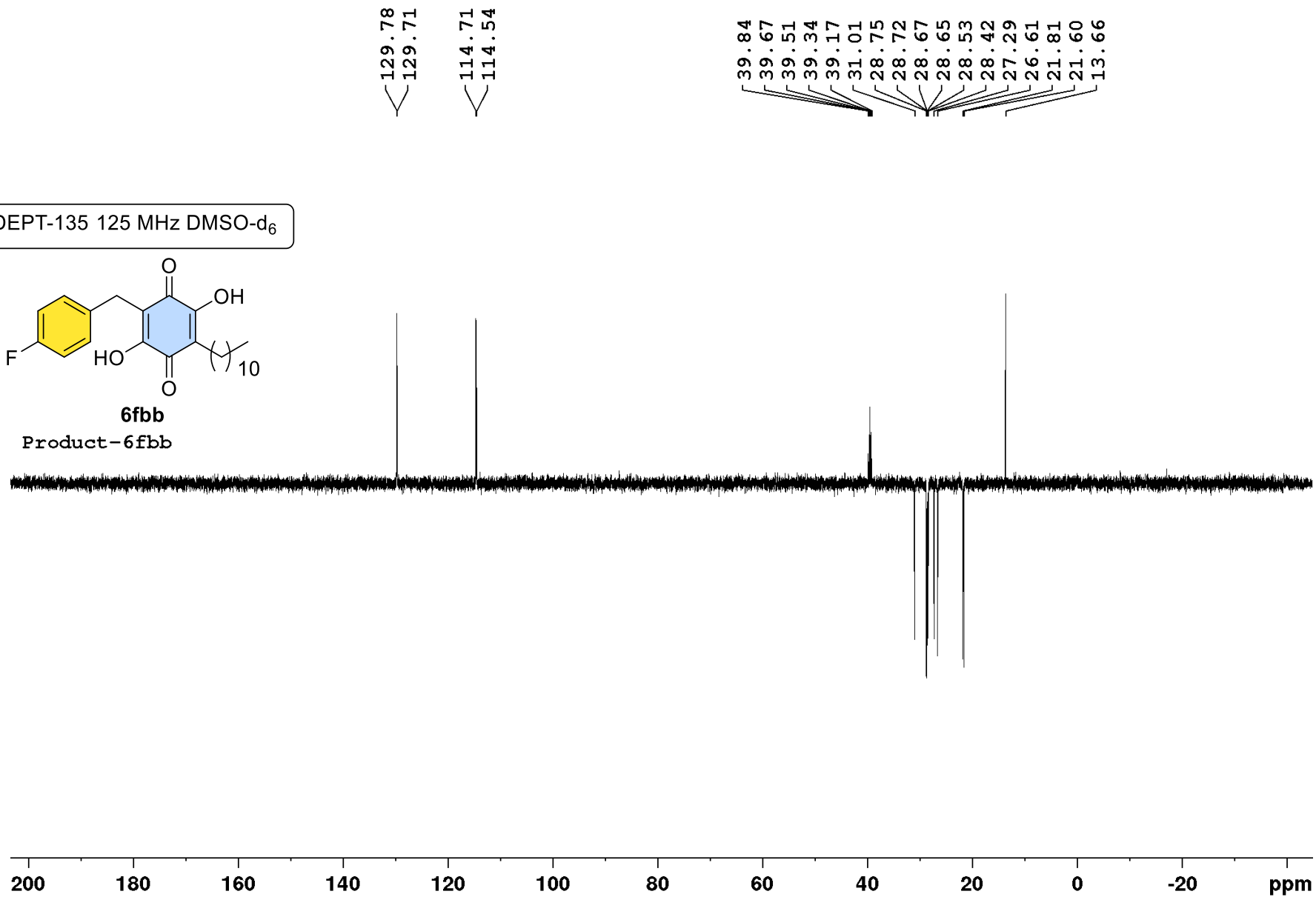


DEPT-135 125 MHz DMSO-d₆

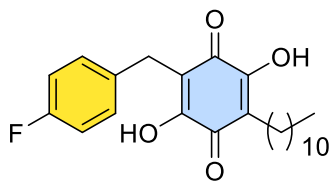


6fbb

Product-6fbb

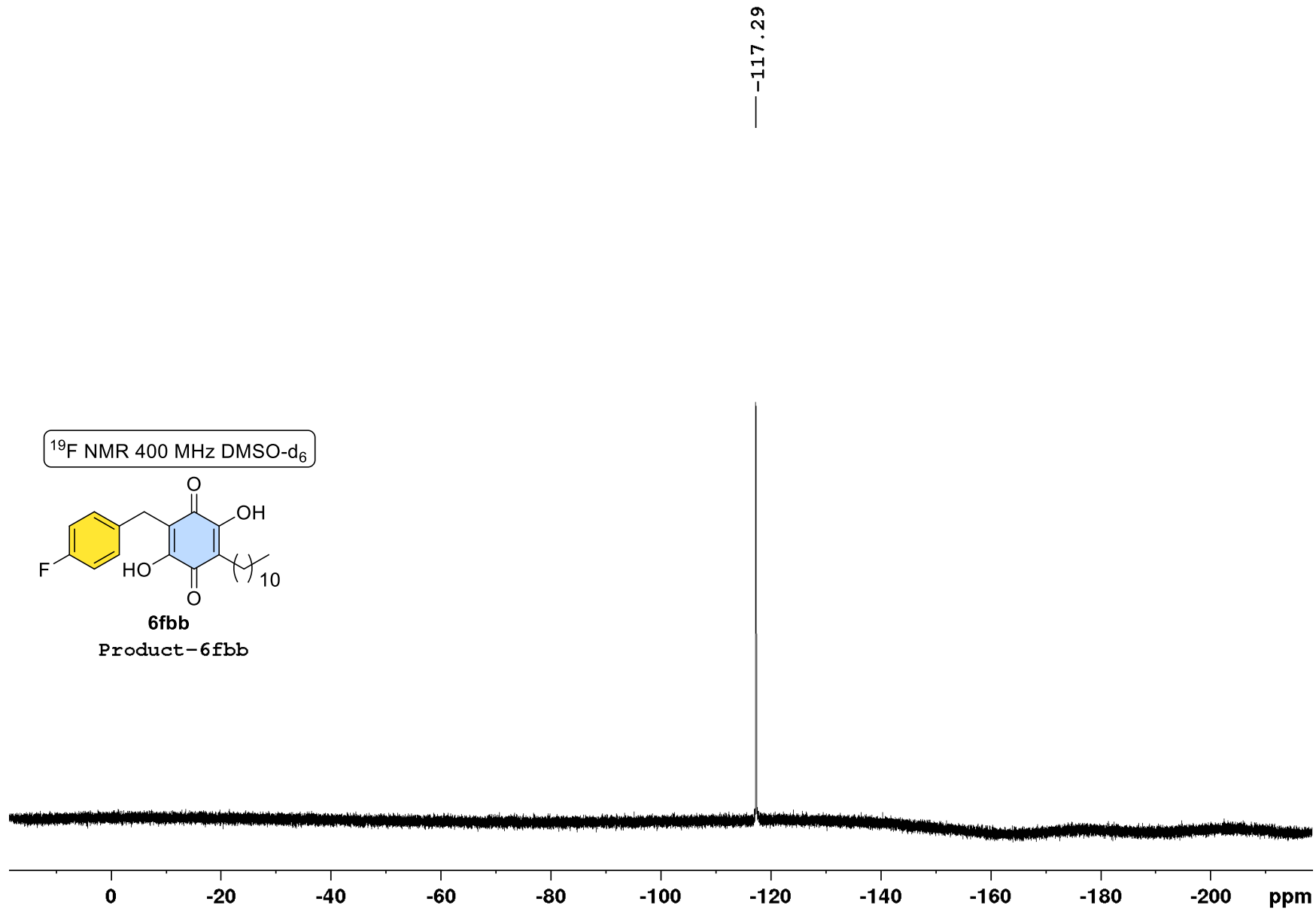


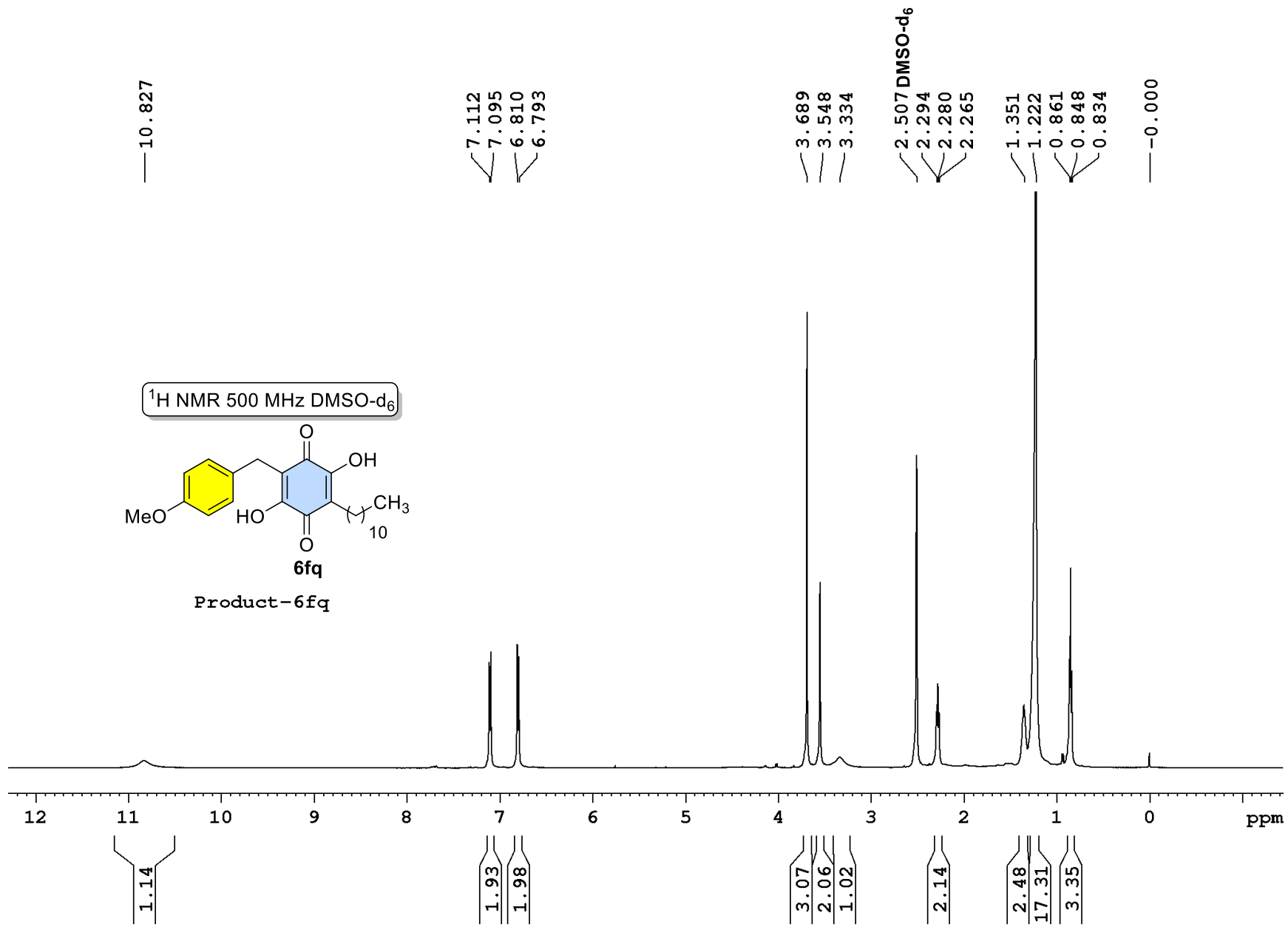
¹⁹F NMR 400 MHz DMSO-d₆

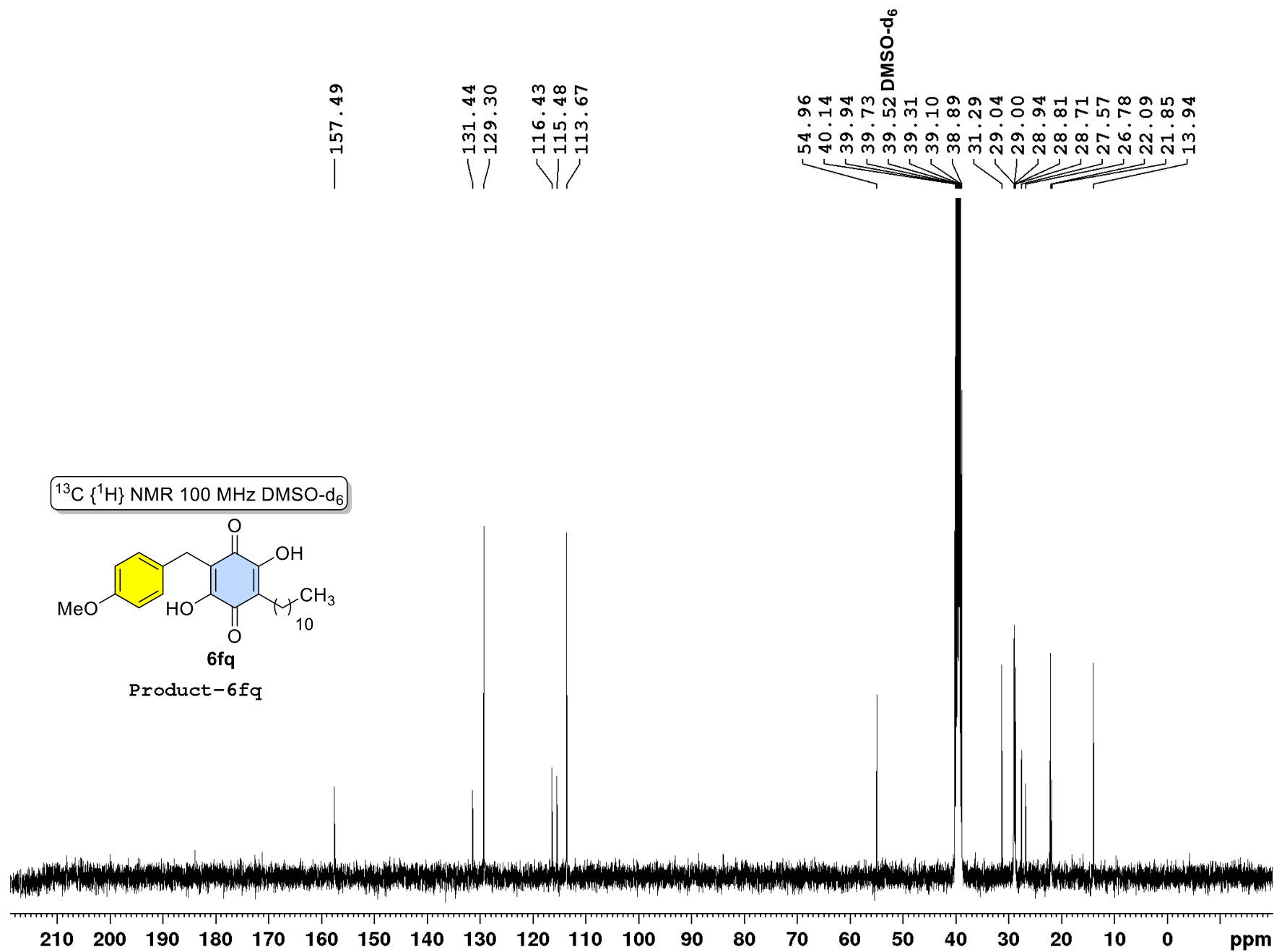


6fbb

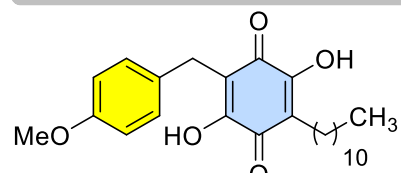
Product-6fbb





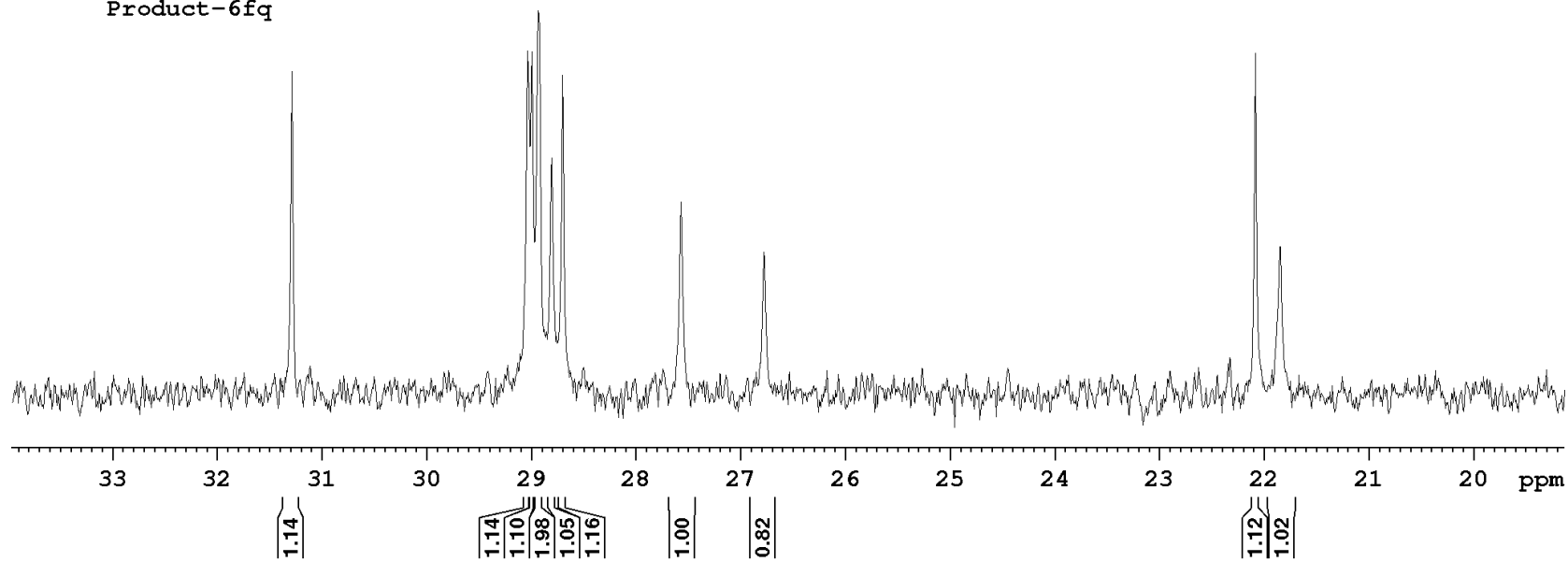


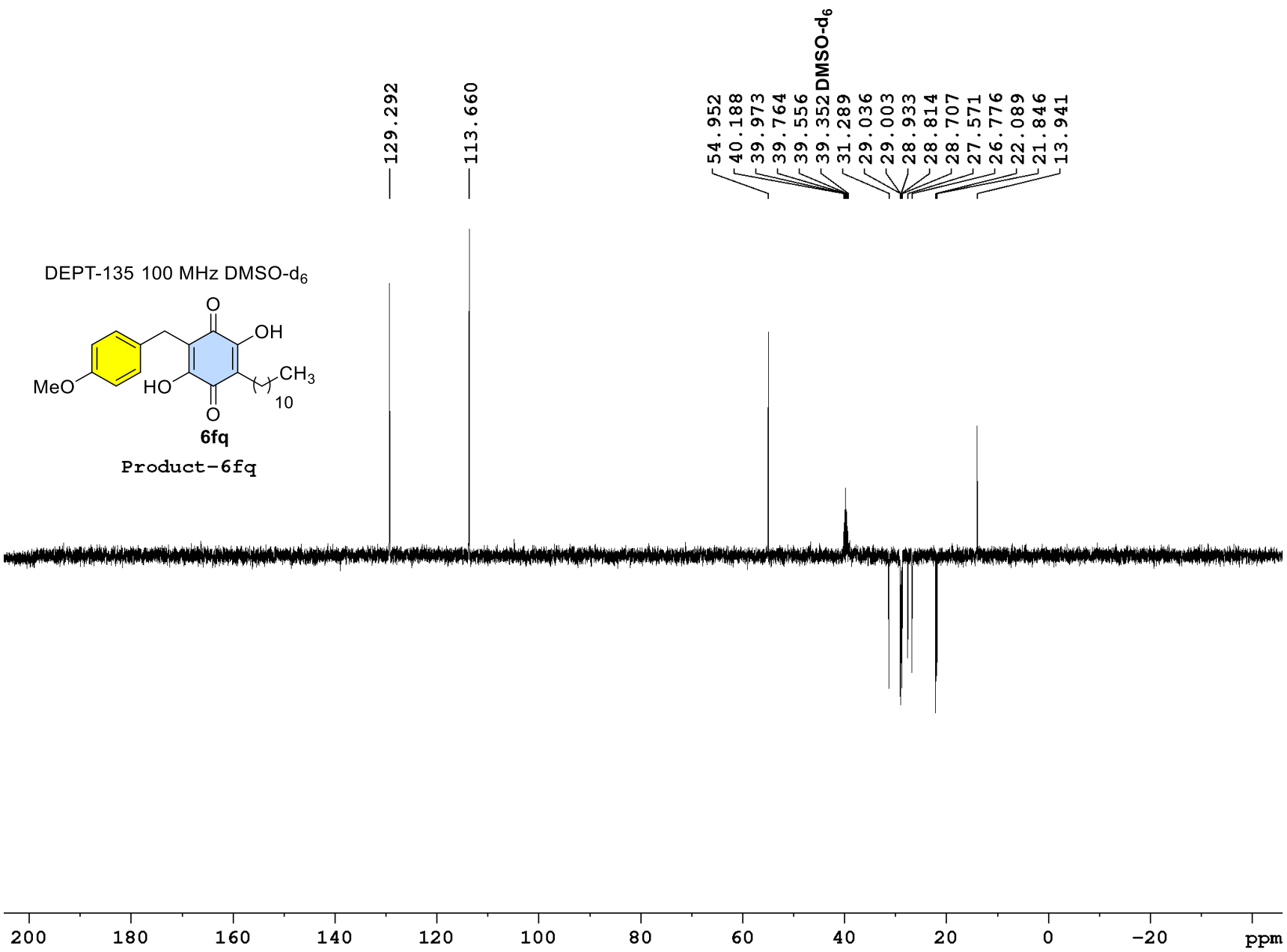
^{13}C $\{^1\text{H}\}$ NMR 100 MHz DMSO- d_6

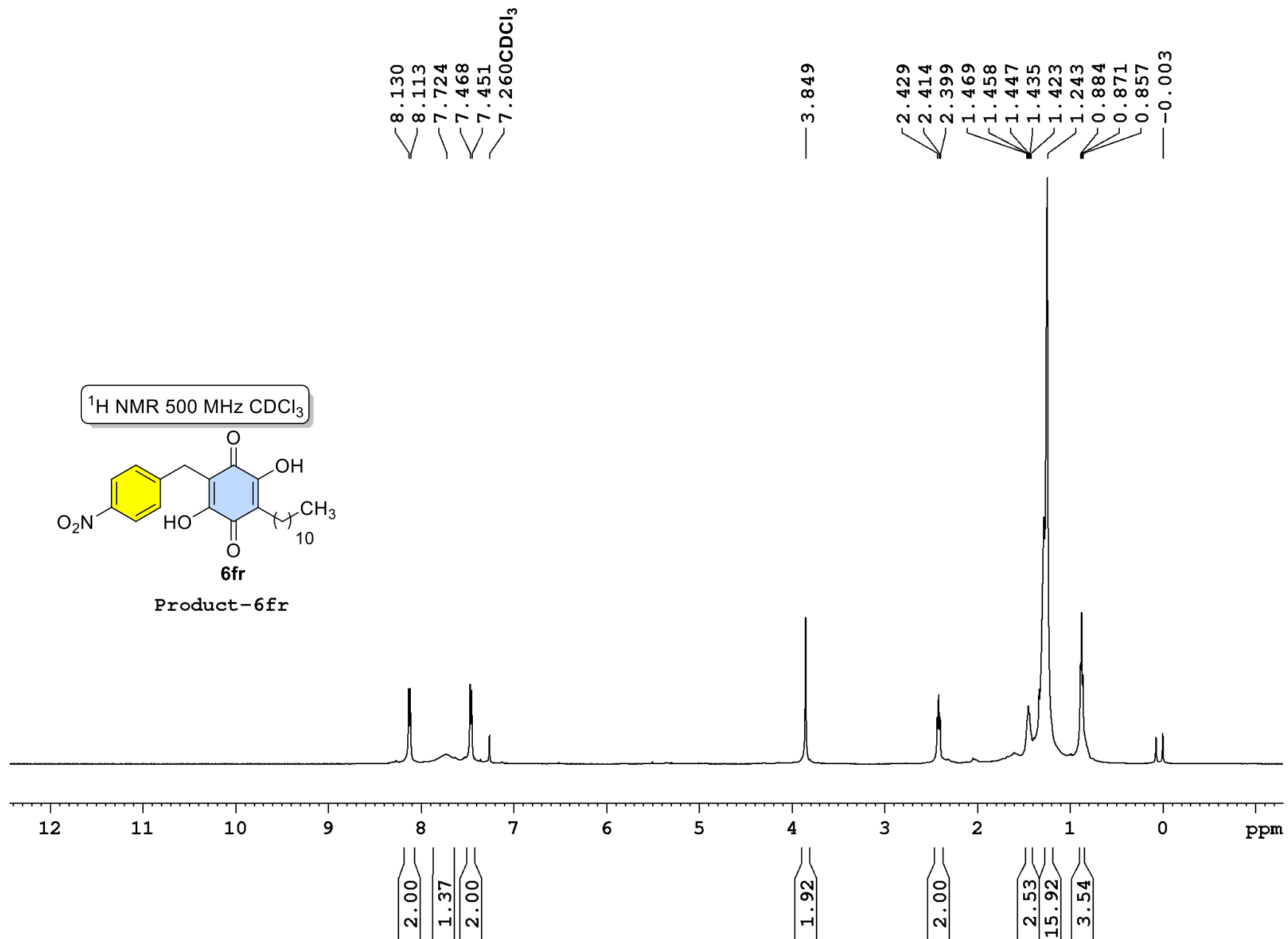


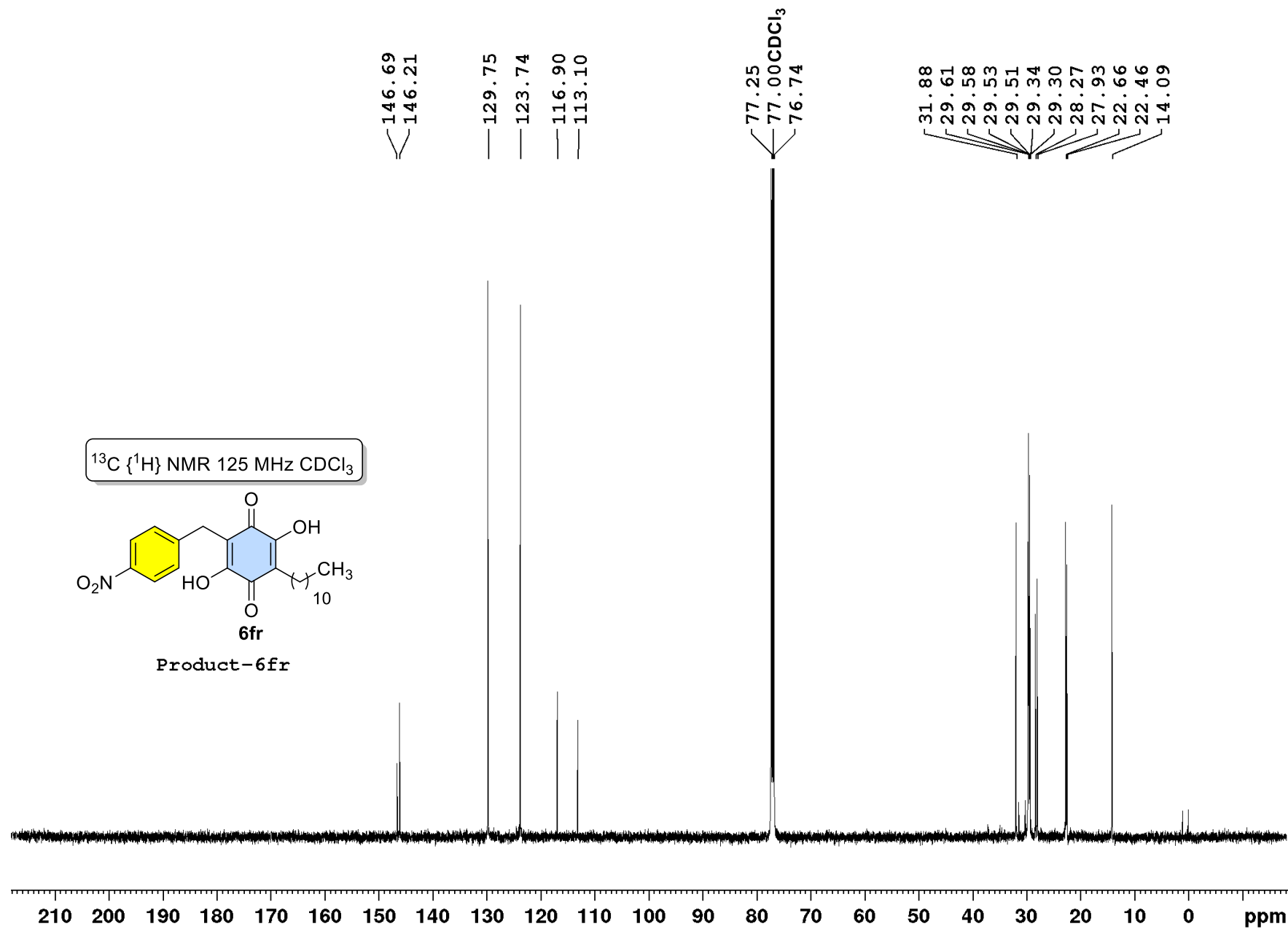
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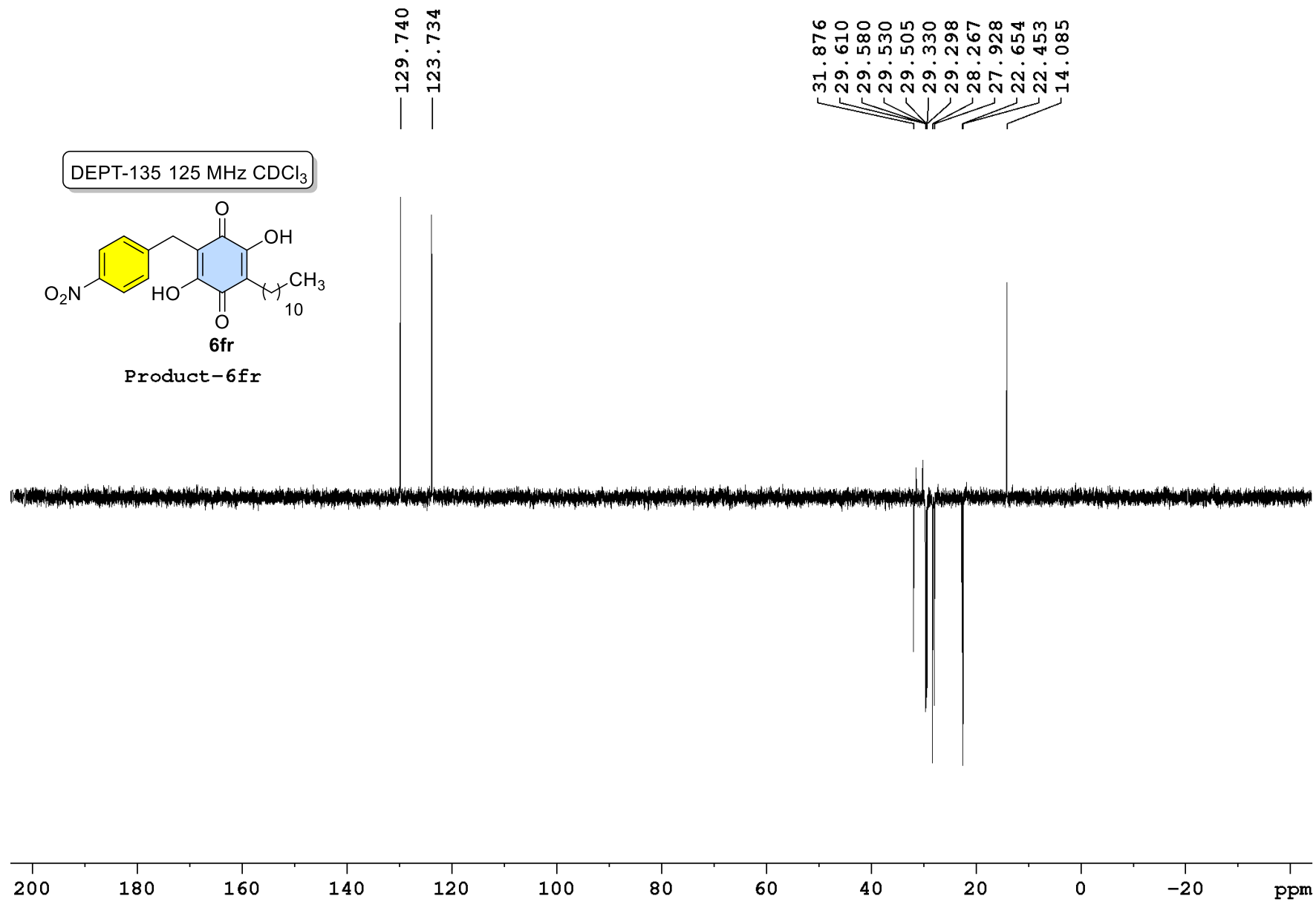
Product-6fq



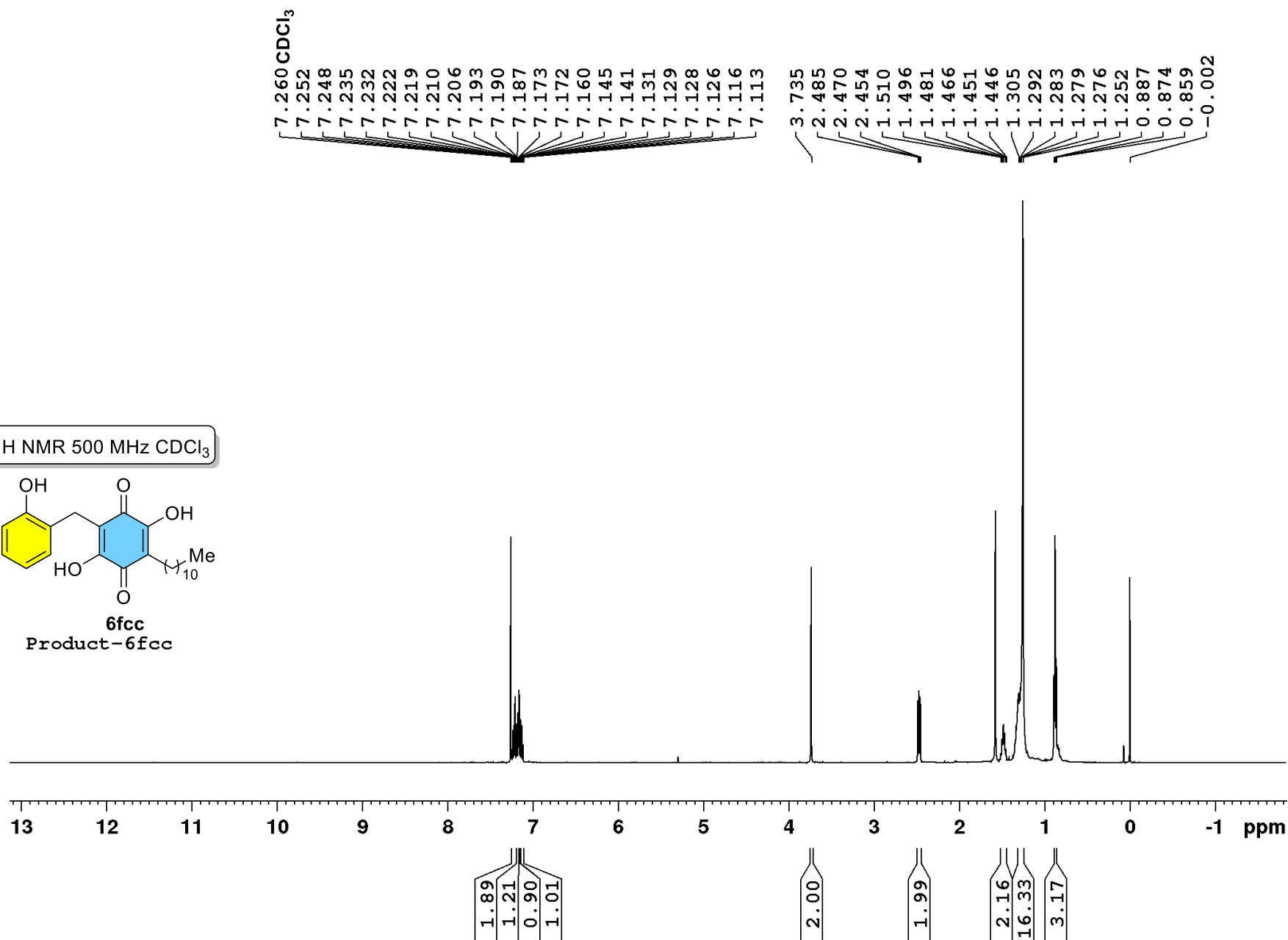
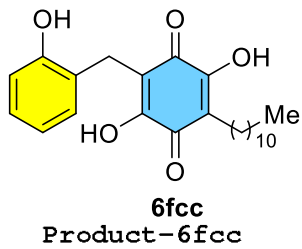




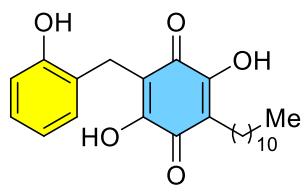




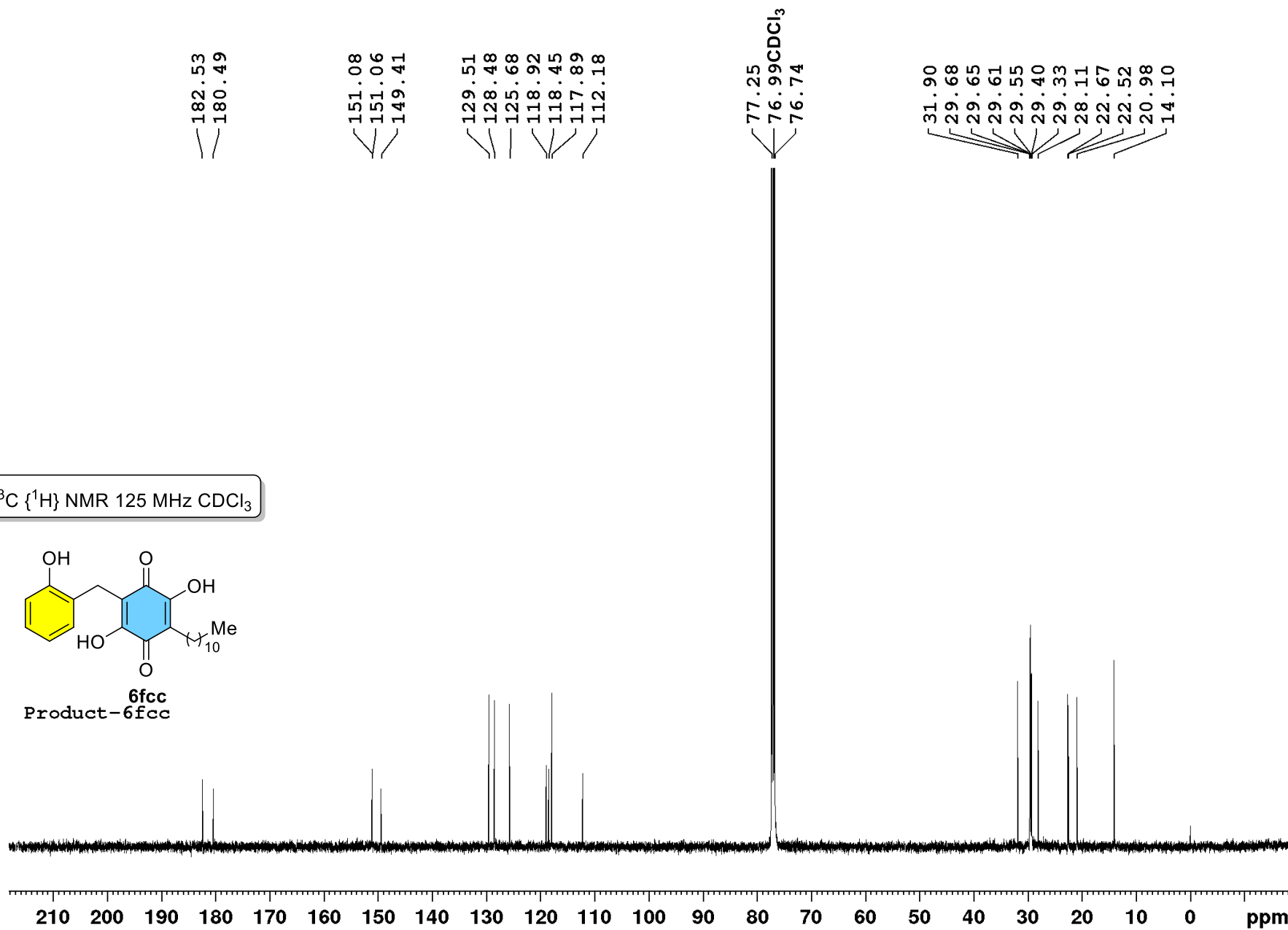
¹H NMR 500 MHz CDCl₃



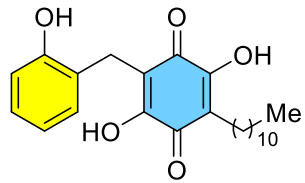
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



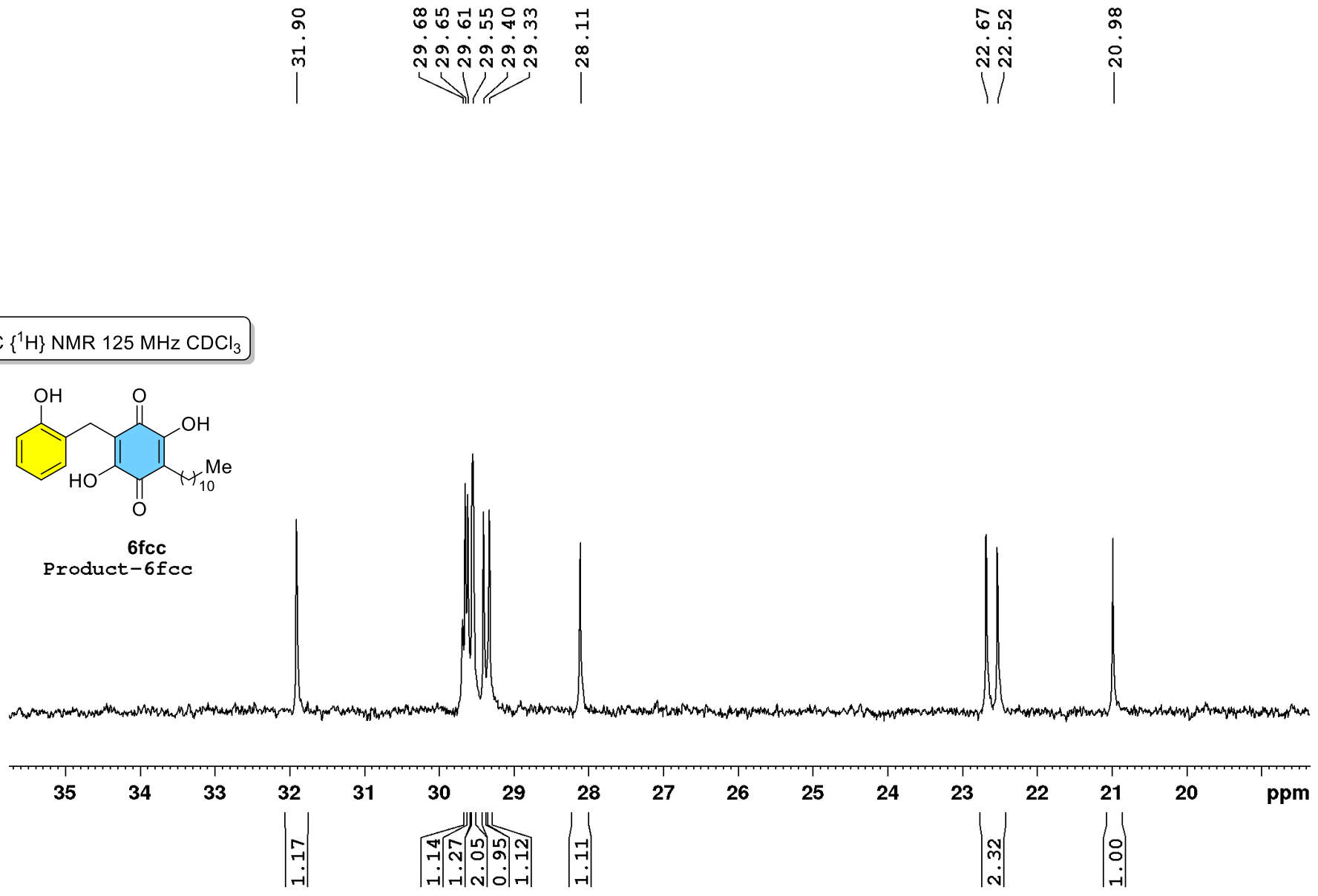
Product-6fcc



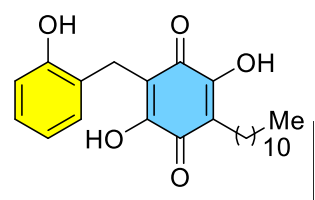
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



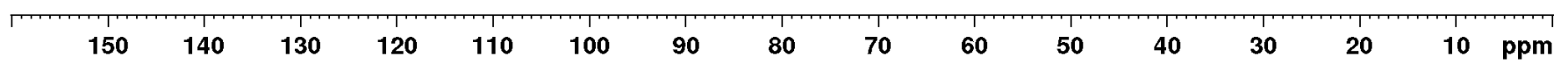
6fcc
Product-6fcc



DEPT-135 125 MHz CDCl₃



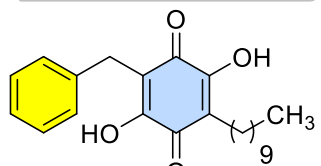
6fca
Product-6fcc



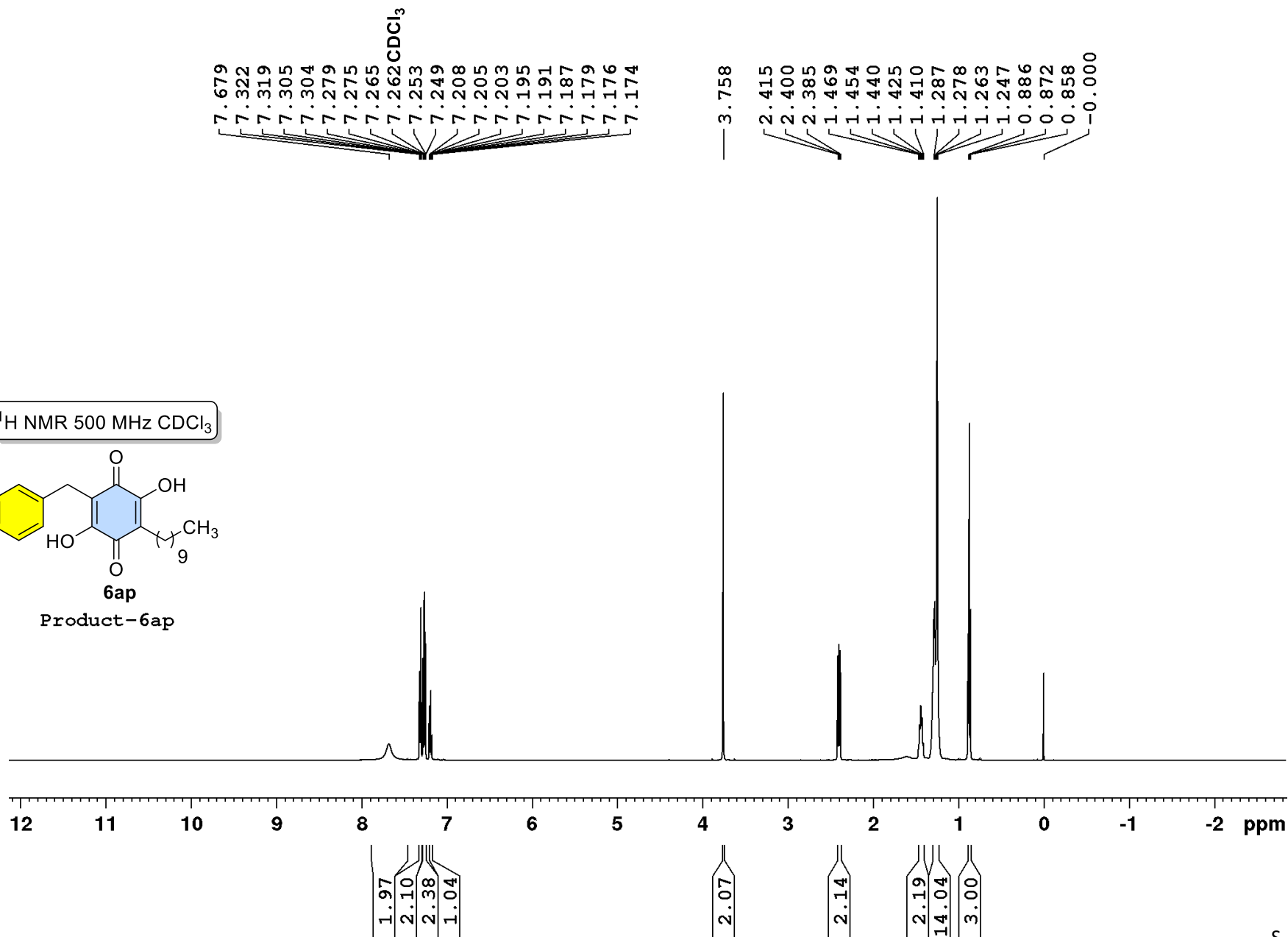
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125.70
117.91

31.93
29.67
29.64
29.57
29.43
29.35
28.14
22.70
22.55
21.00
14.13

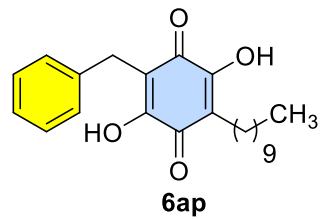
¹H NMR 500 MHz CDCl₃



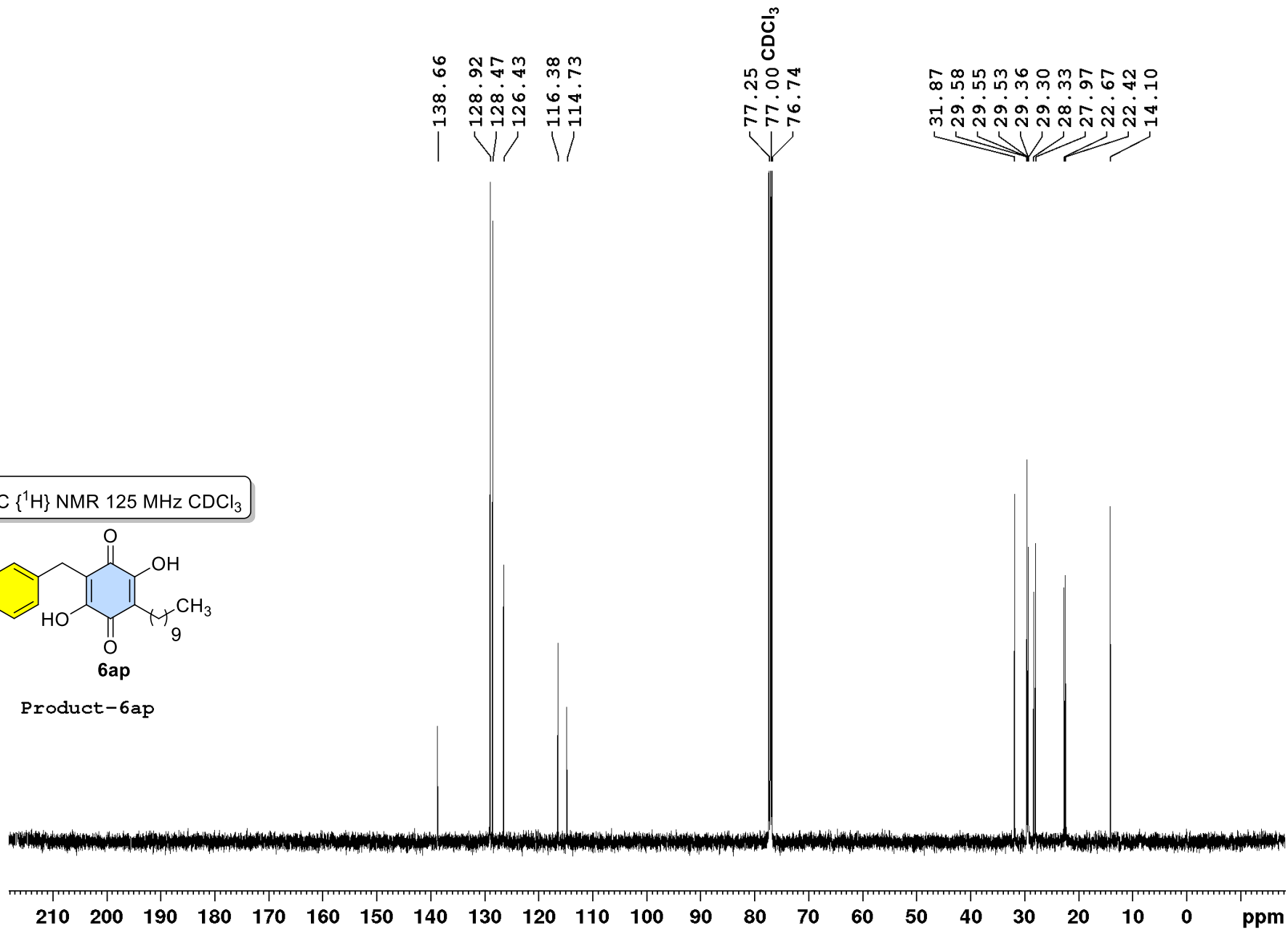
6ap
Product-6ap



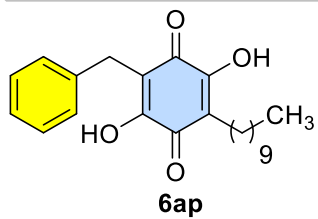
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



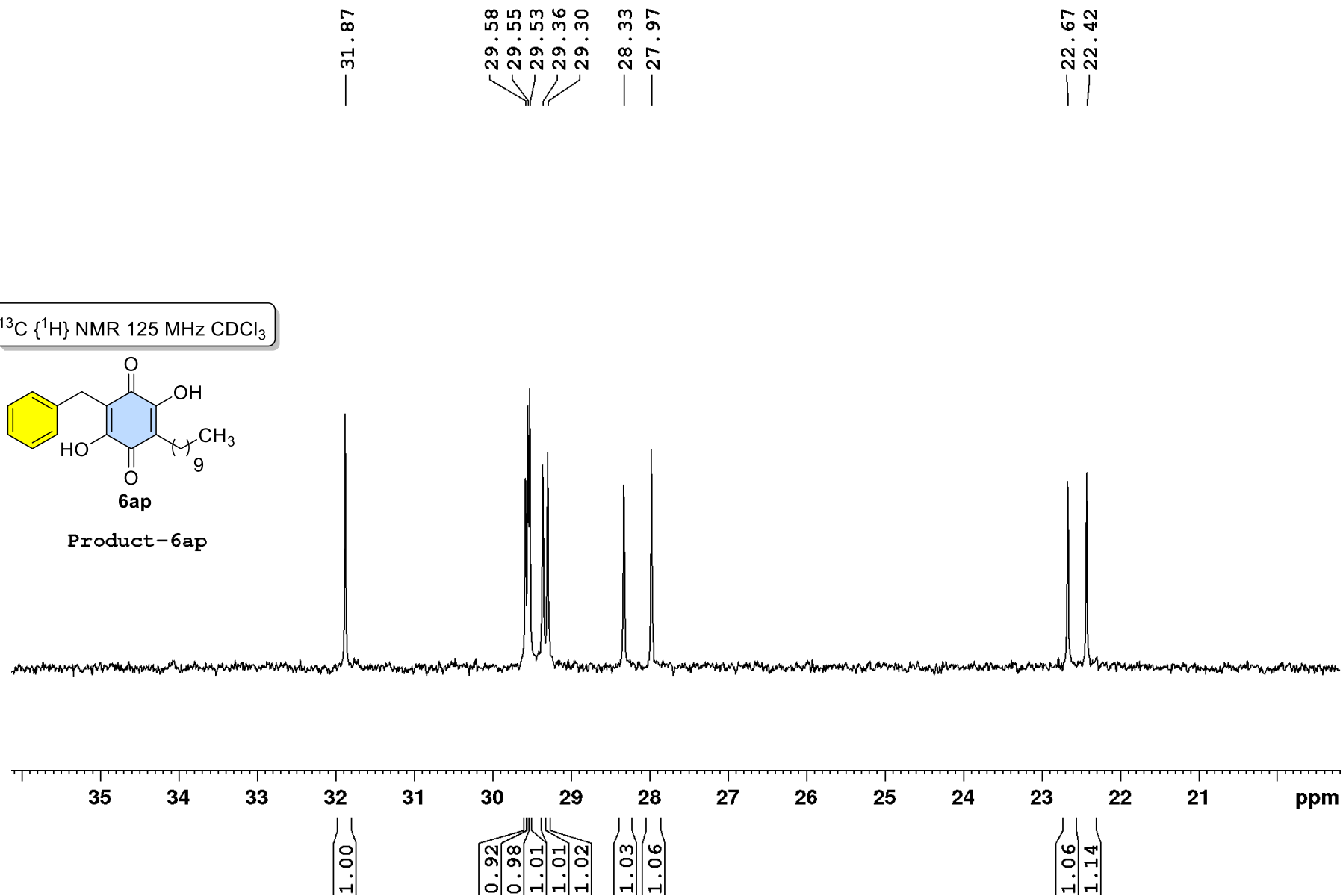
Product-6ap



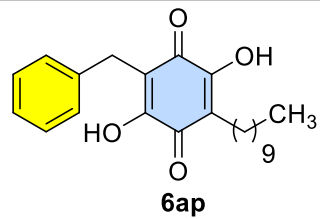
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



Product-6ap



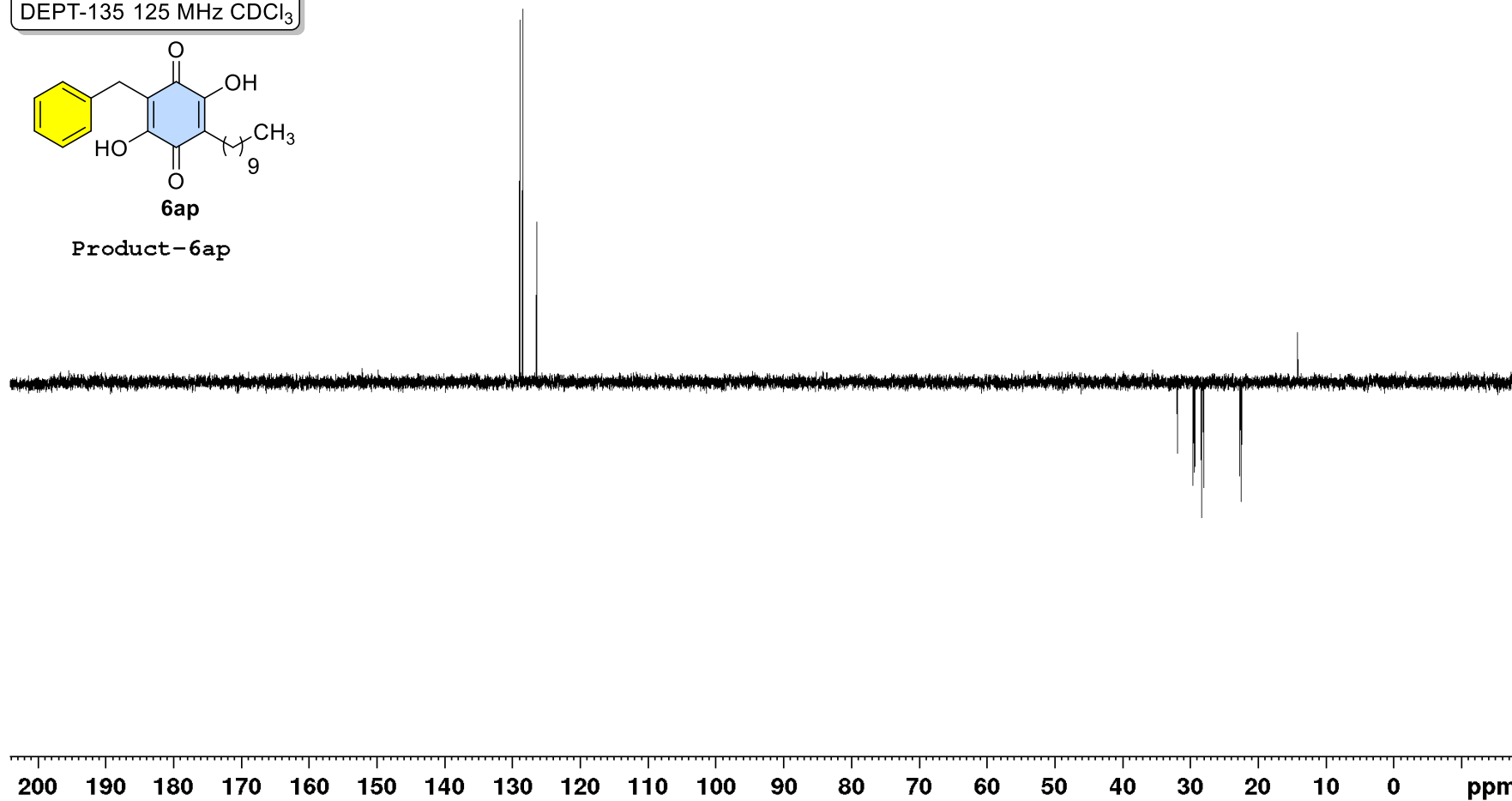
DEPT-135 125 MHz CDCl₃

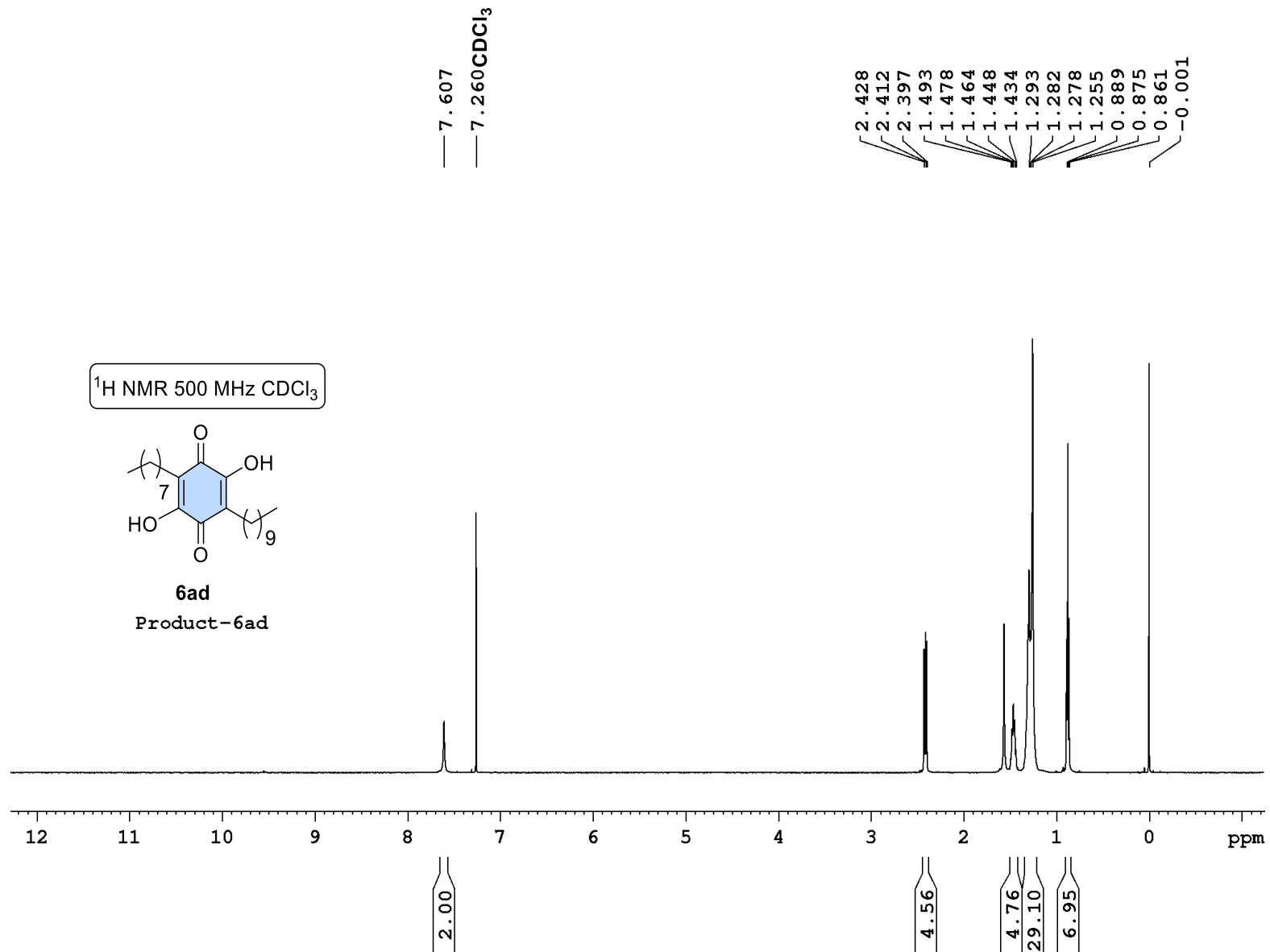


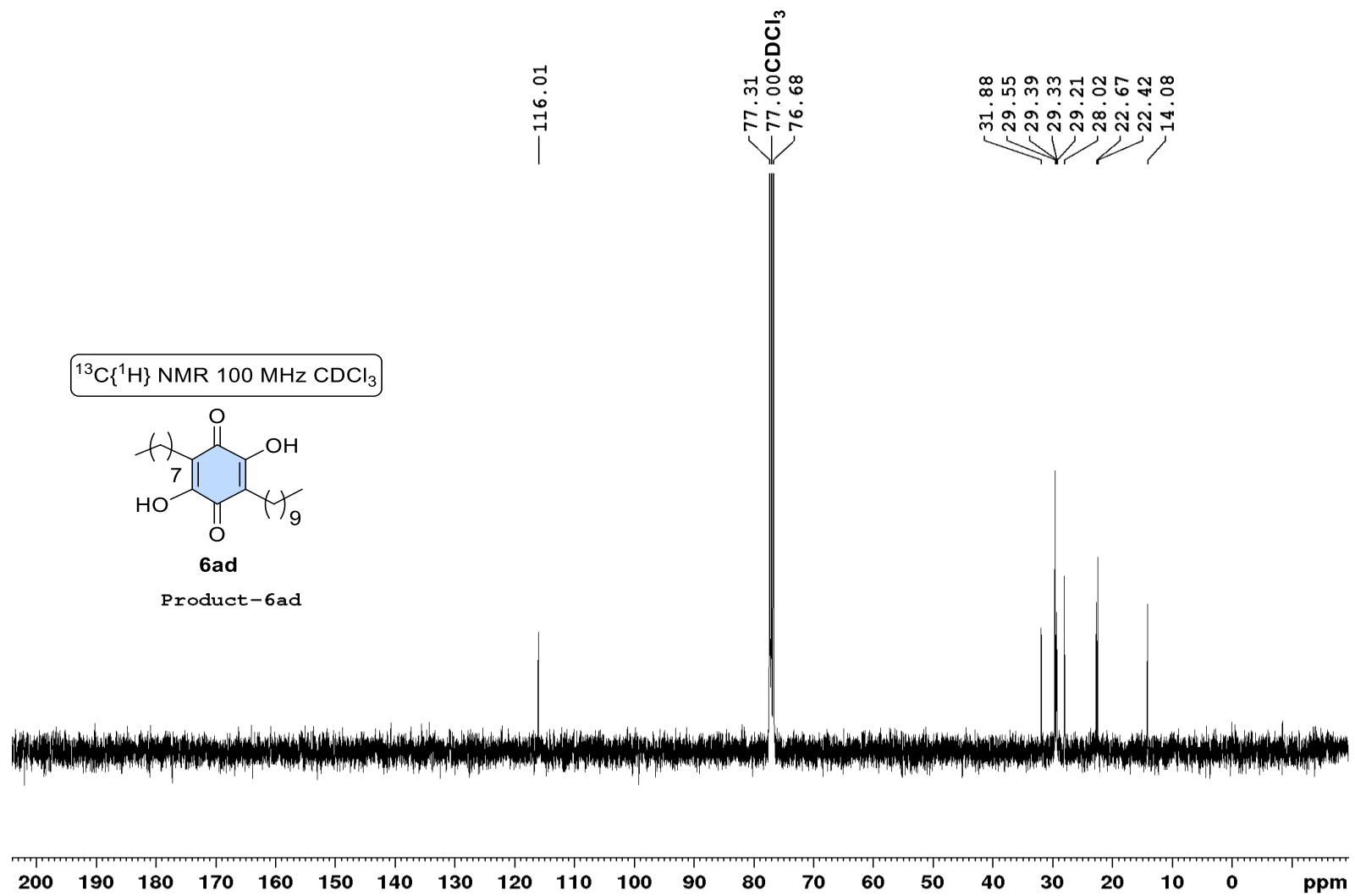
Product-6ap

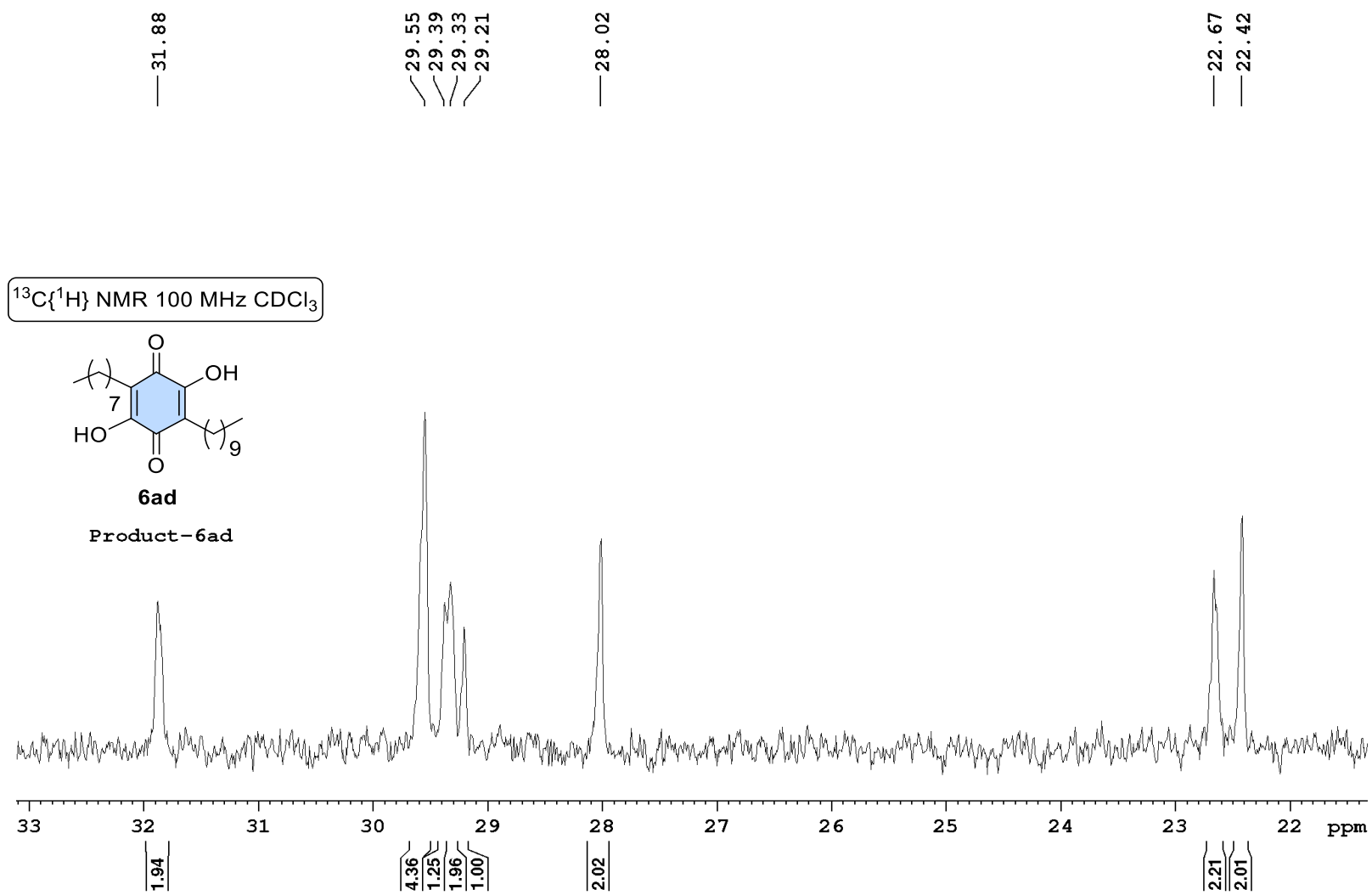
128.95
128.50
126.45

31.90
29.61
29.58
29.55
29.39
29.33
28.35
28.00
22.69
22.45
14.13

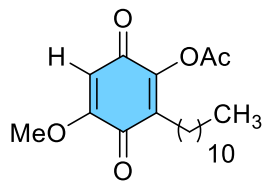




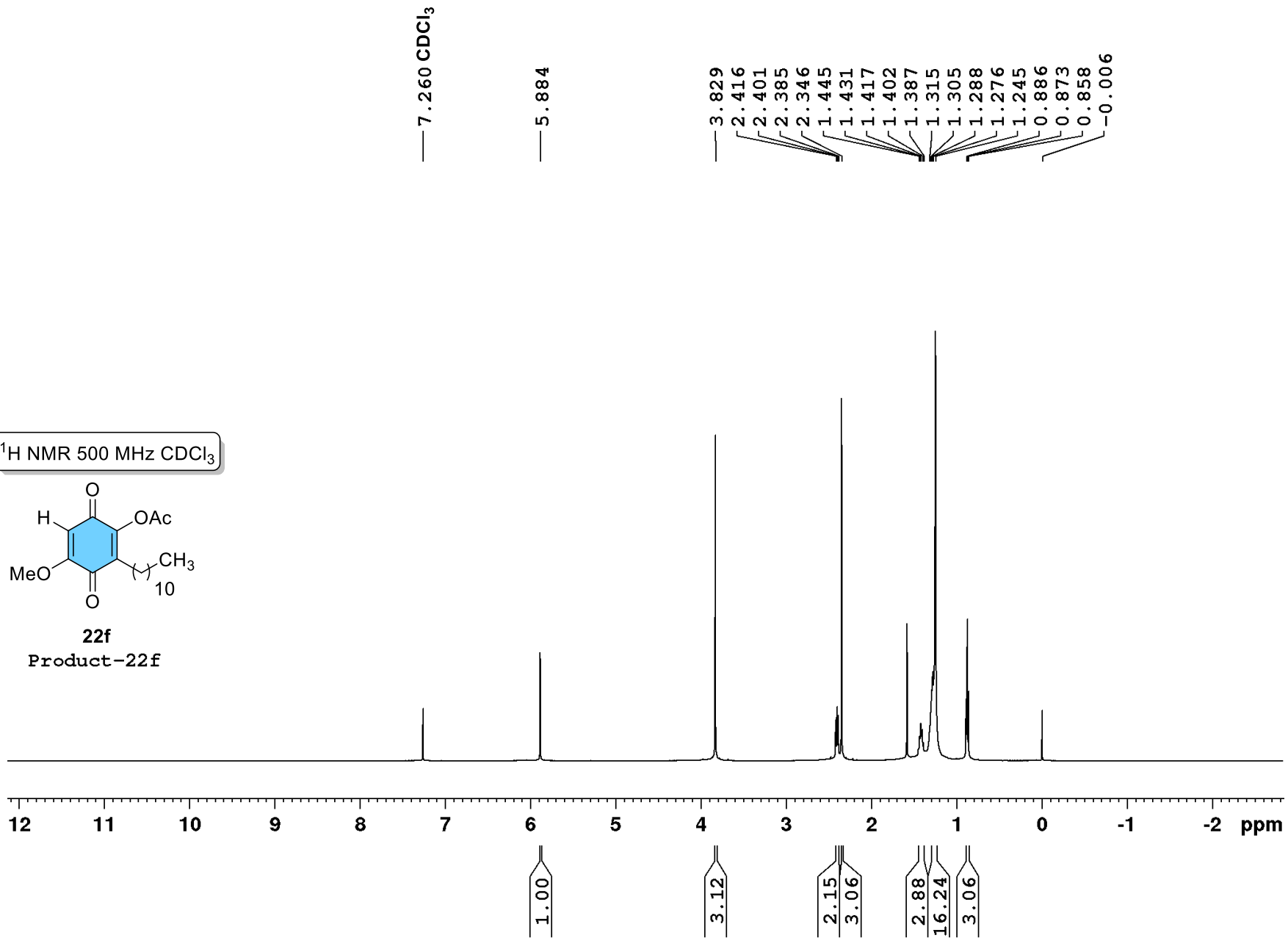




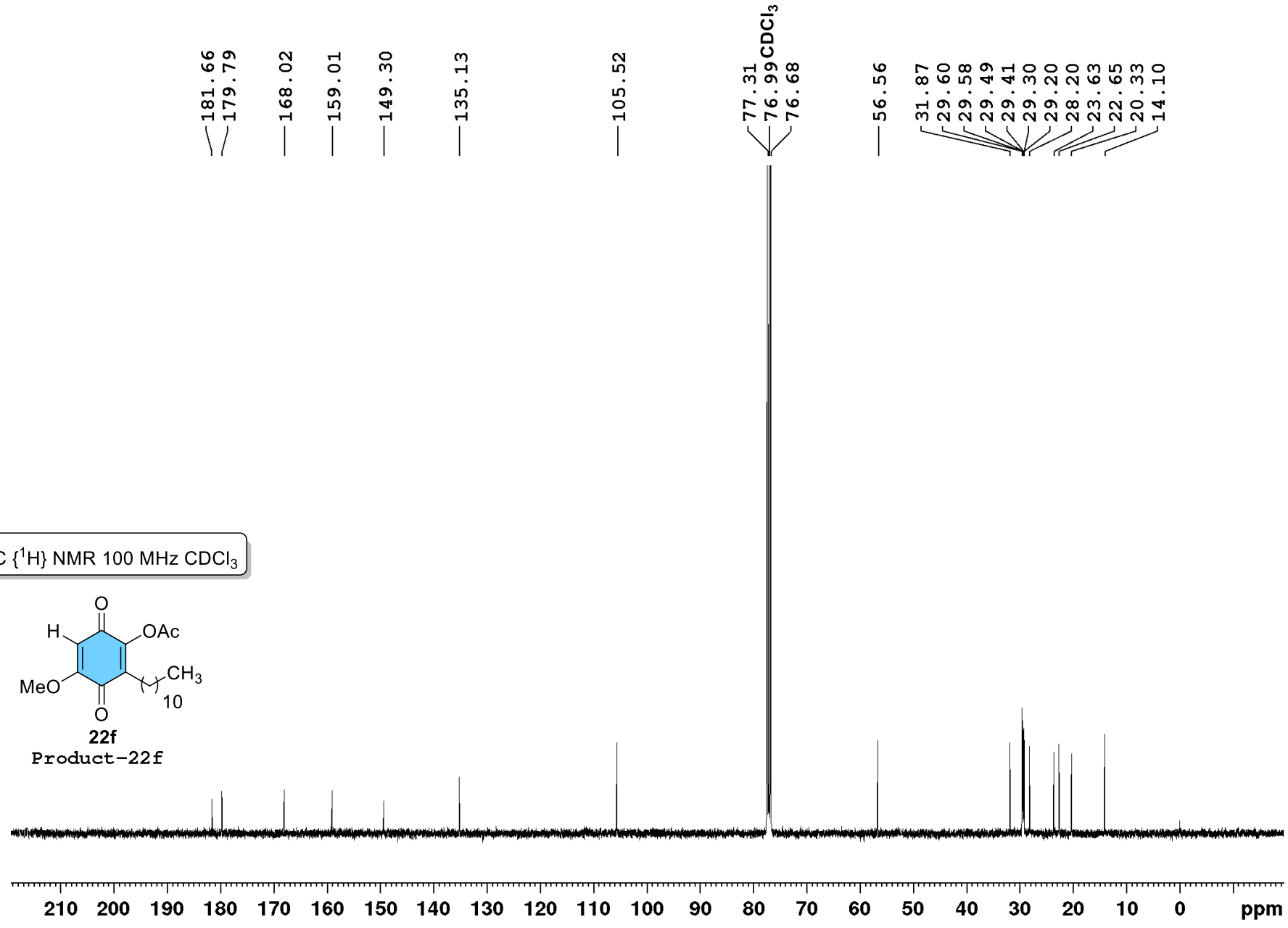
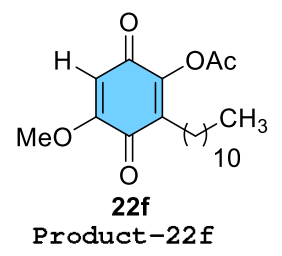
¹H NMR 500 MHz CDCl₃



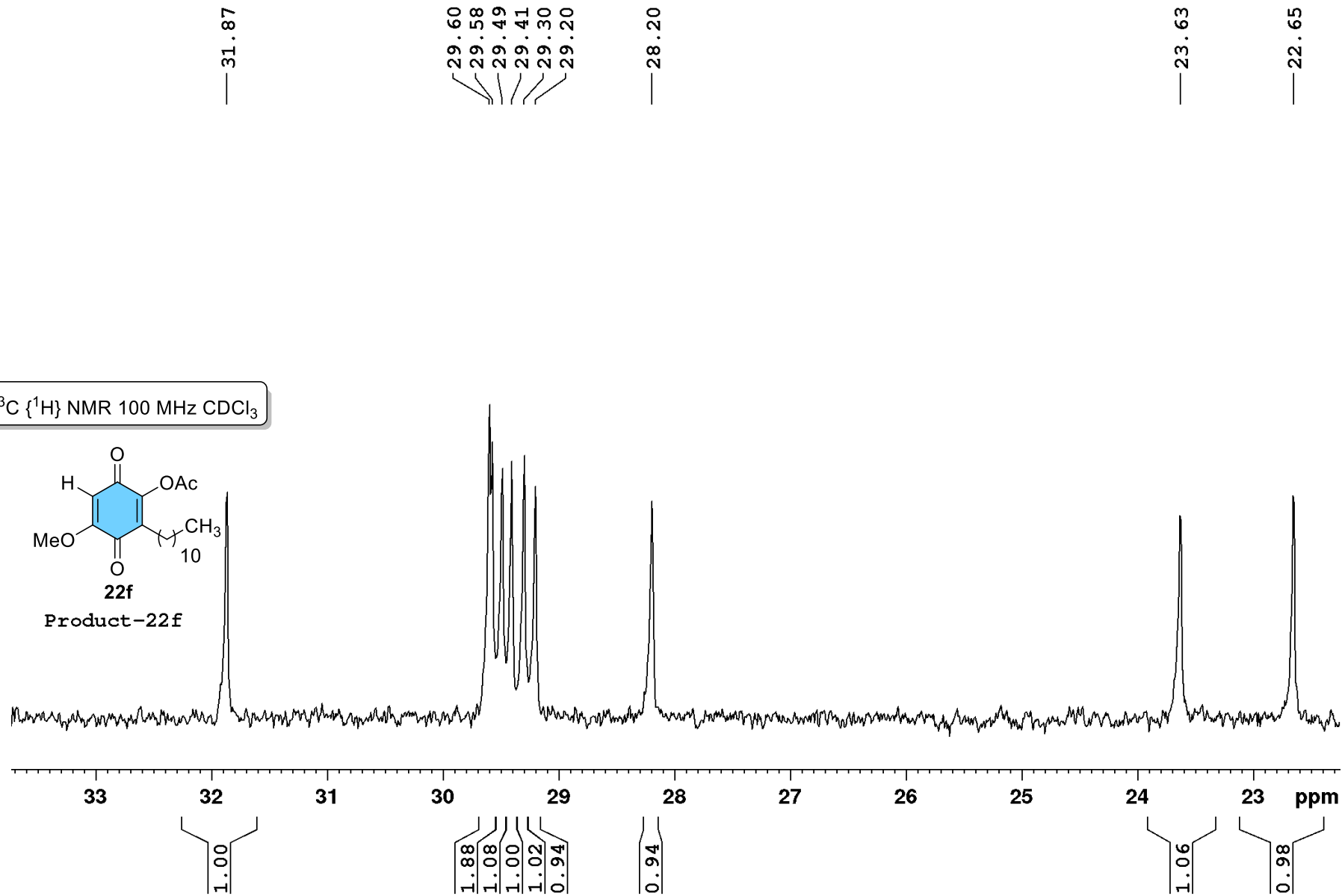
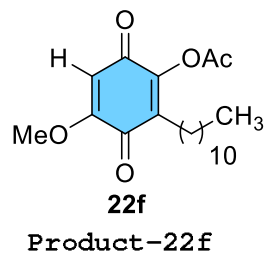
22f
Product-22f



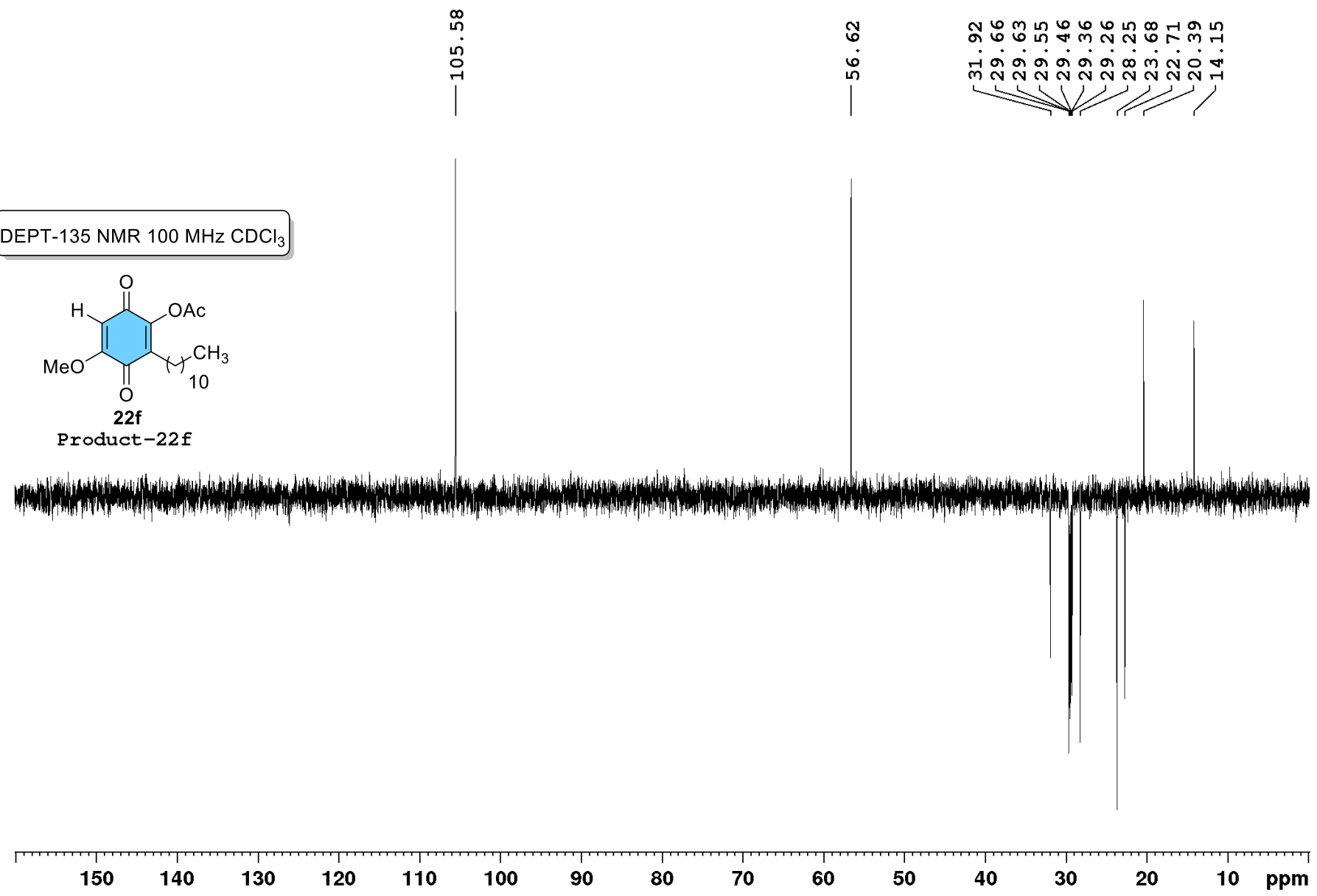
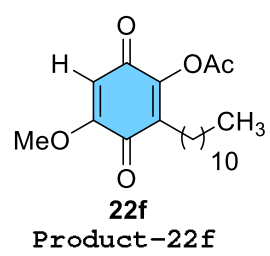
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3

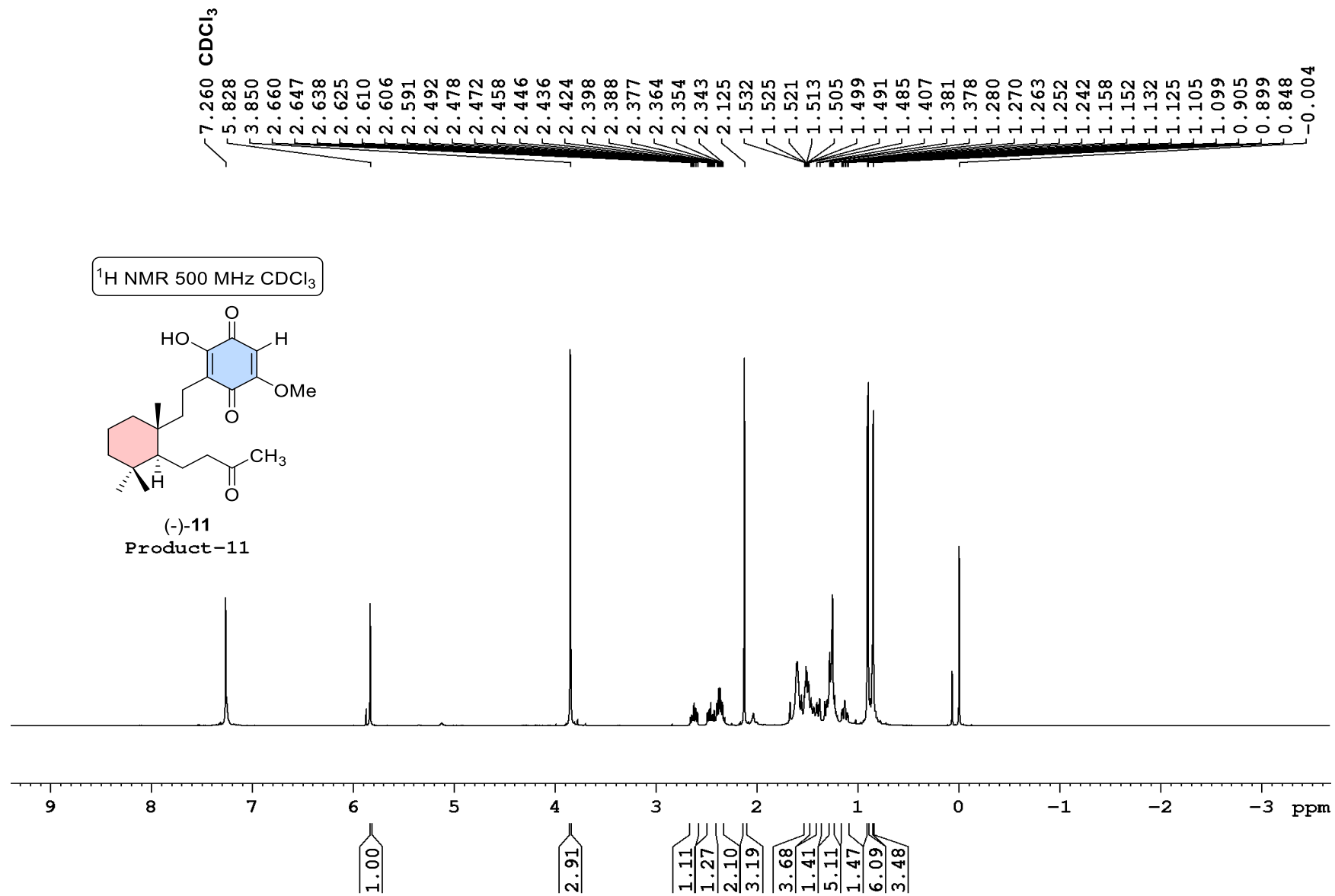


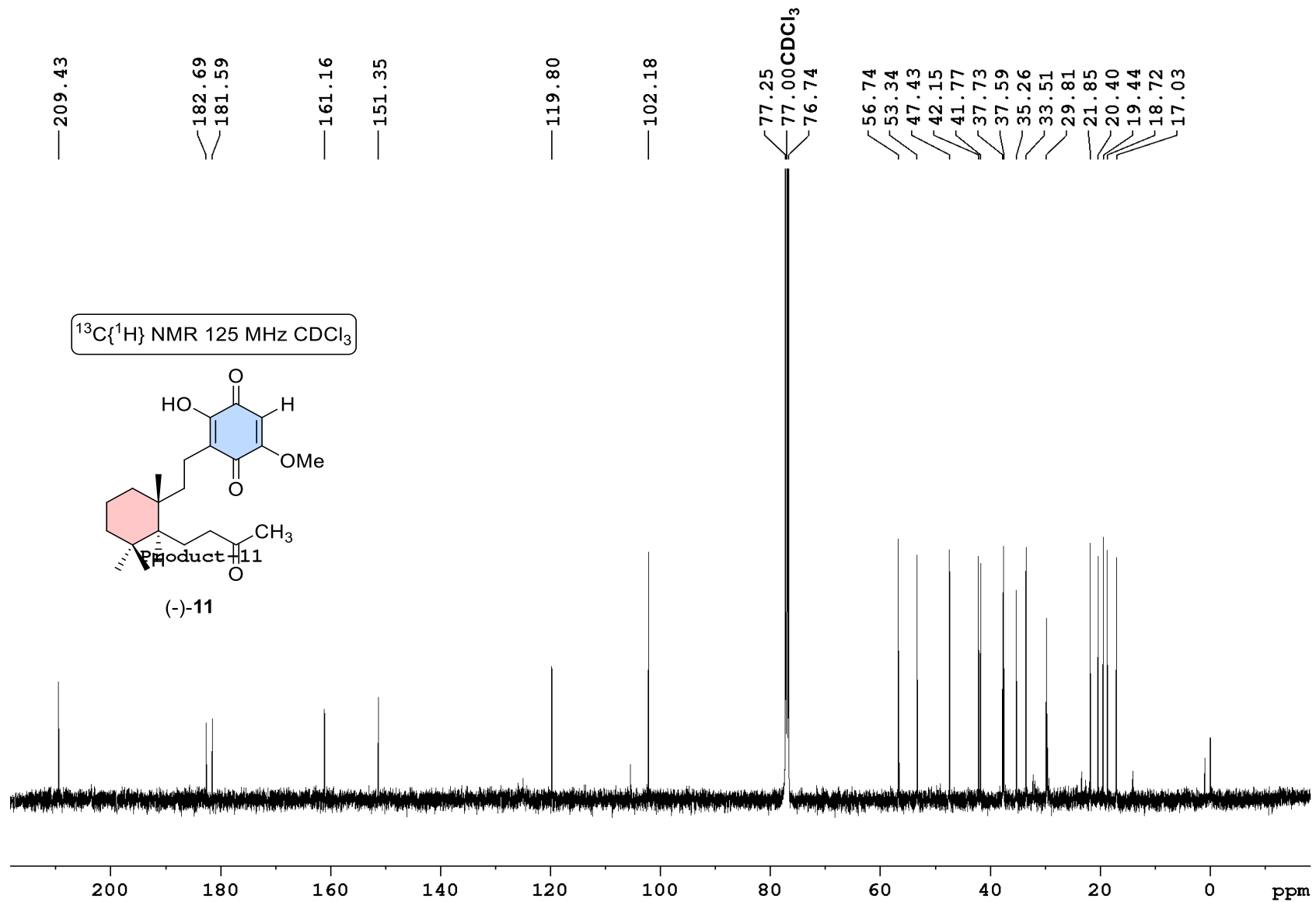
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3

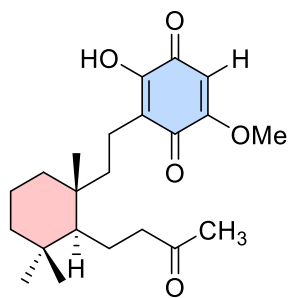


DEPT-135 NMR 100 MHz CDCl₃

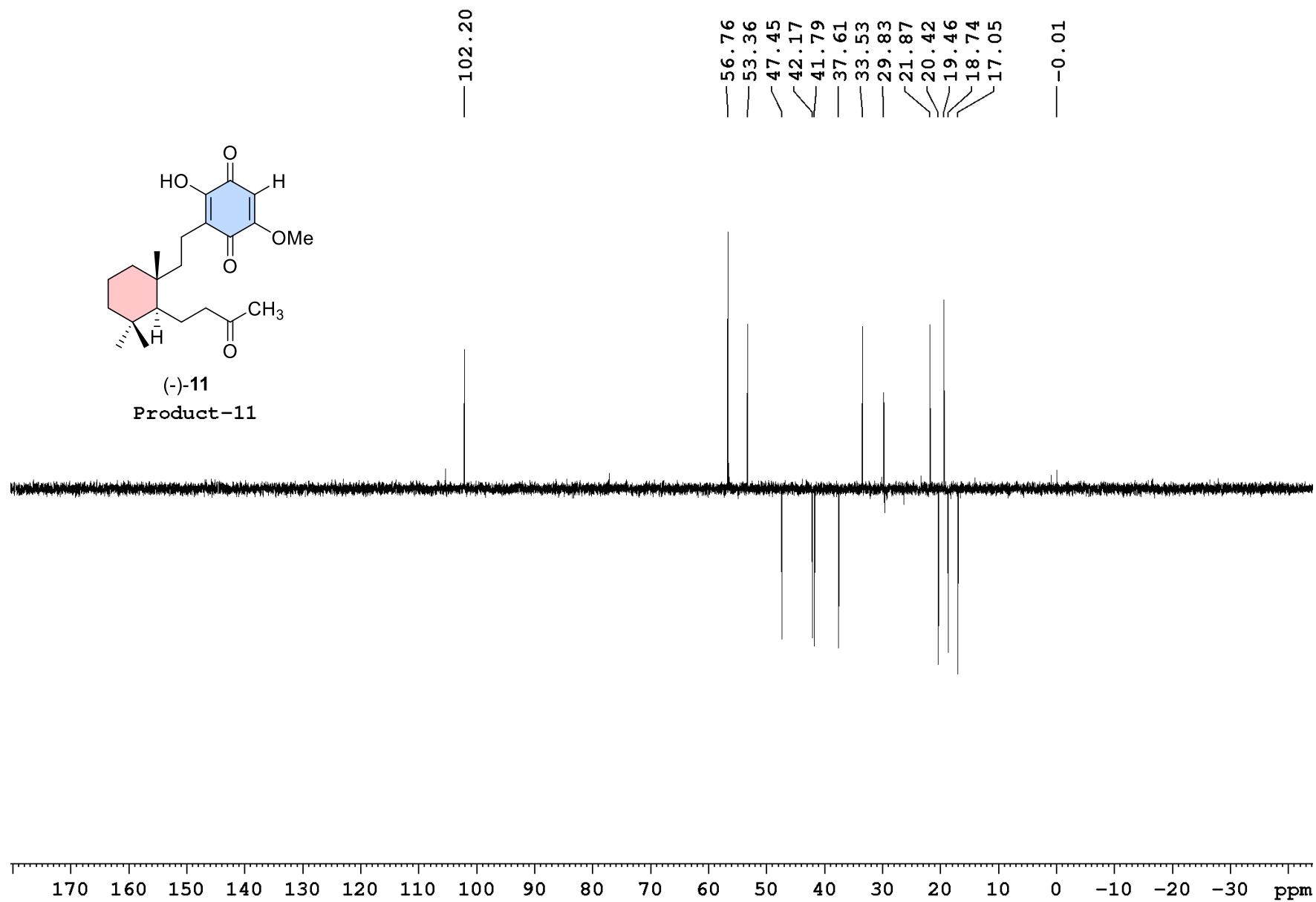


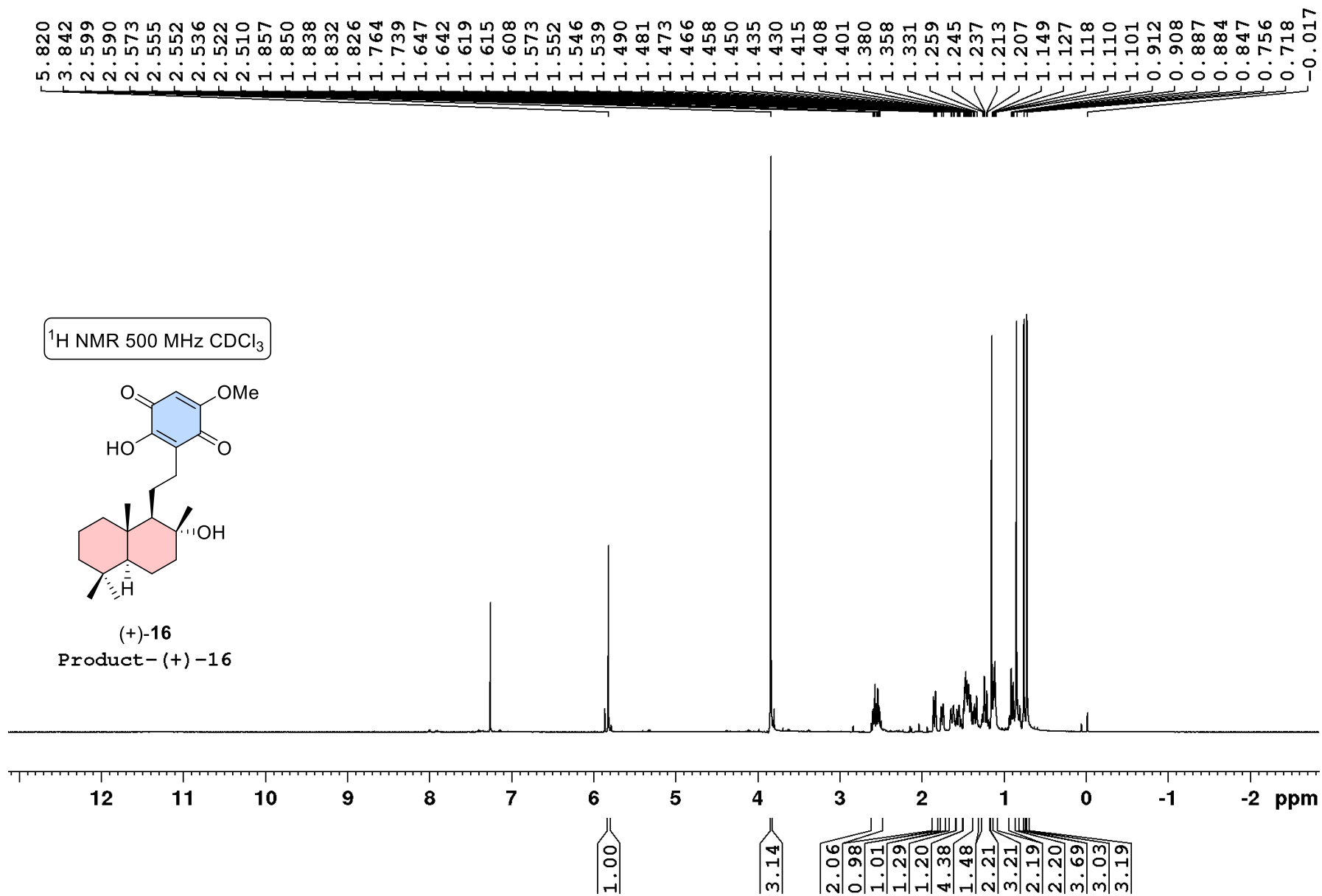




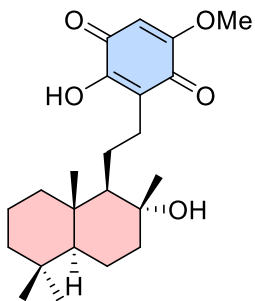


(-)-11
Product-11



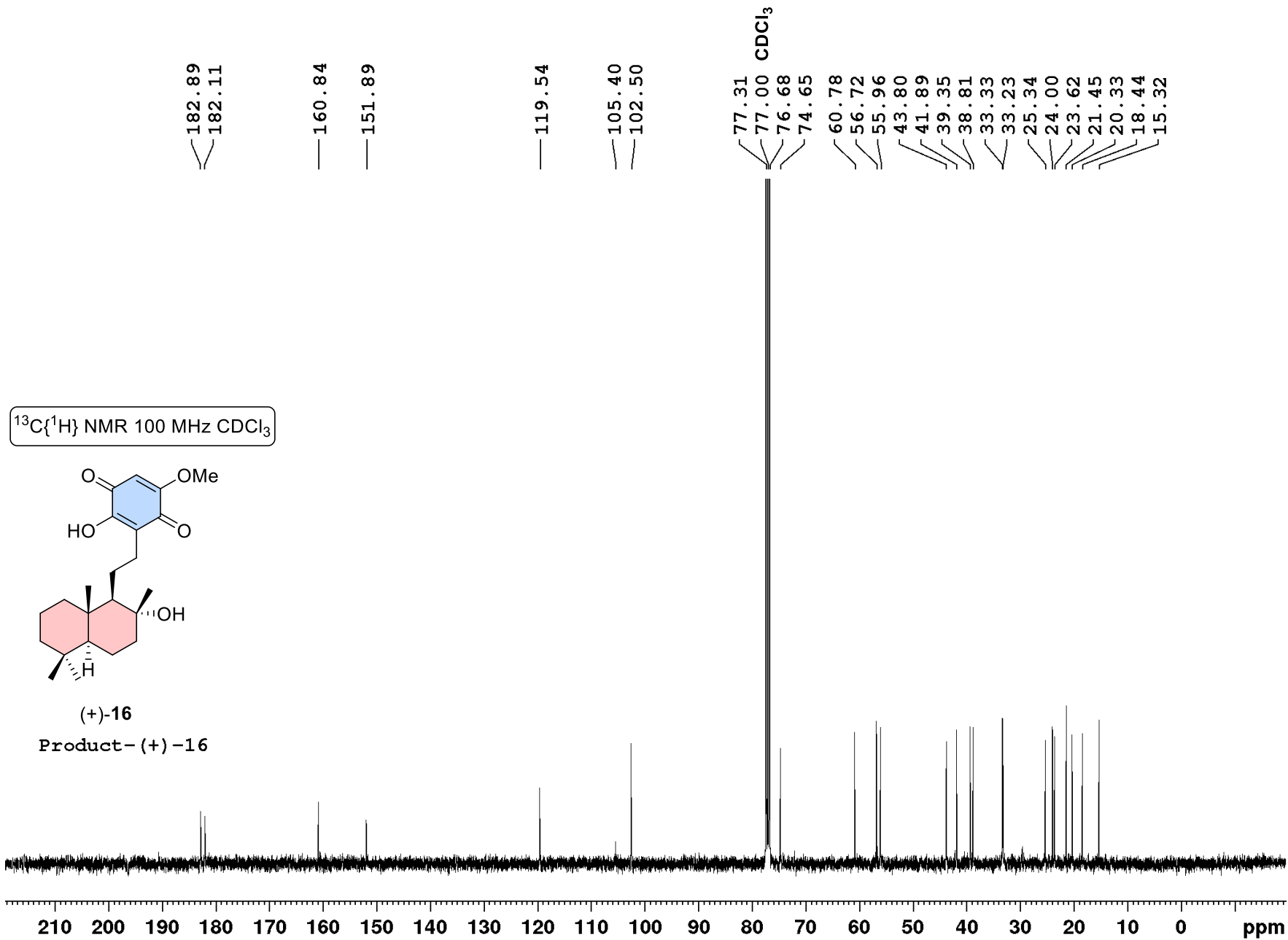


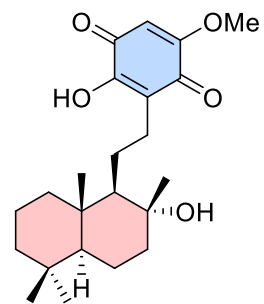
$^{13}\text{C}\{^1\text{H}\}$ NMR 100 MHz CDCl_3



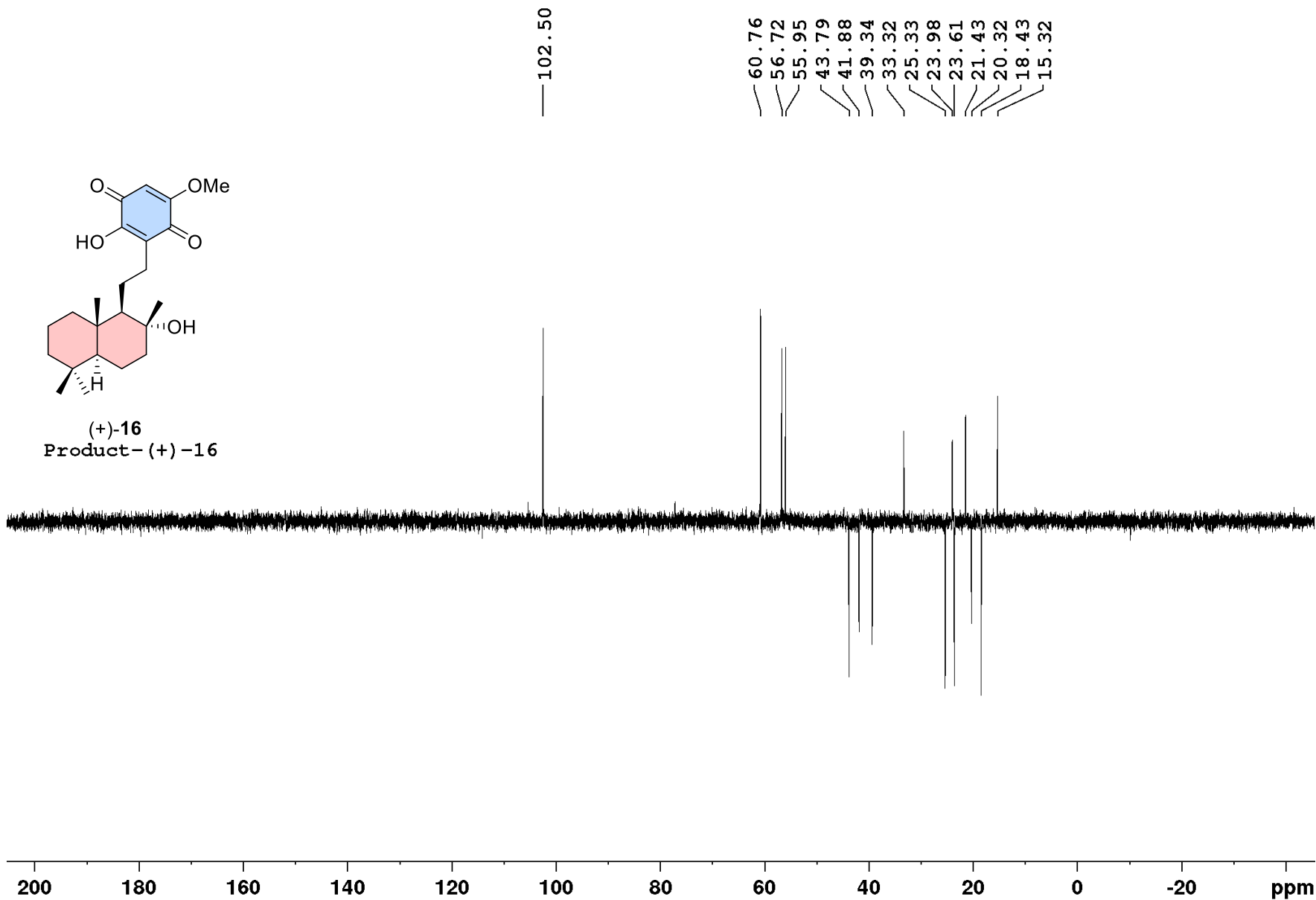
(+)-16

Product- (+) -16

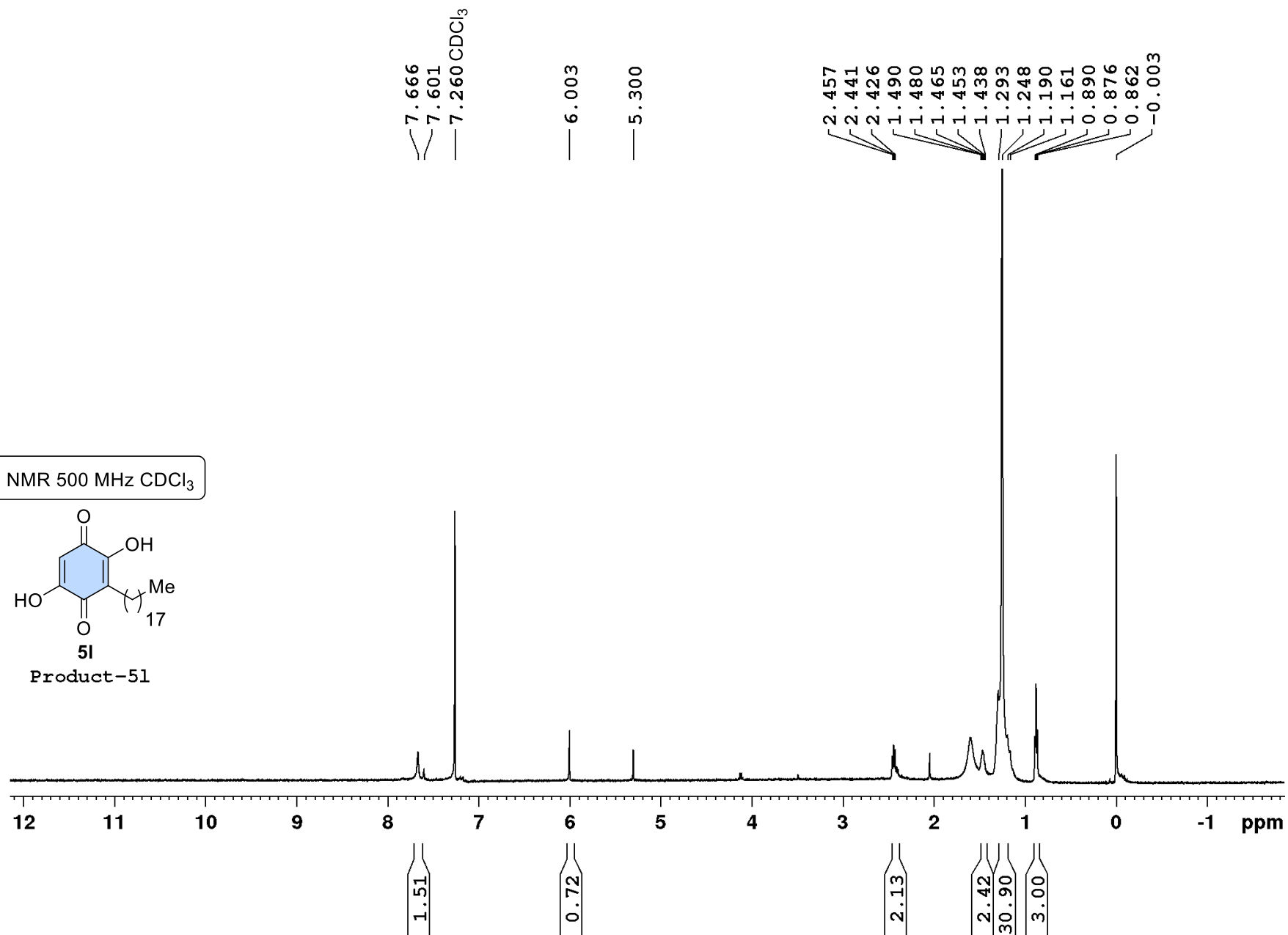
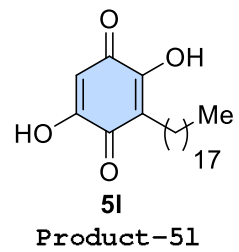




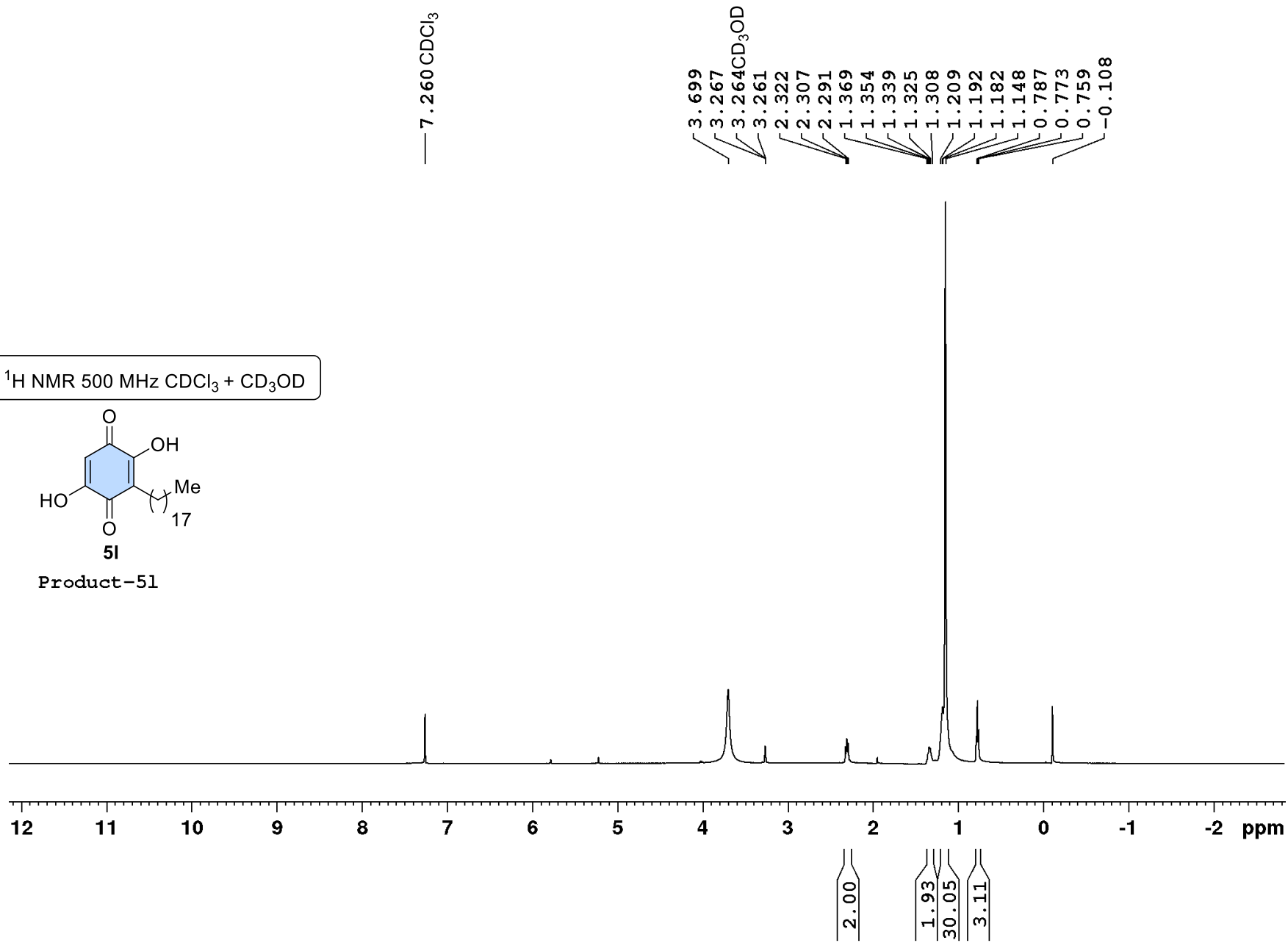
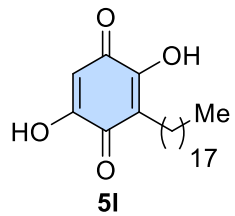
(+)-16
Product-(+)-16



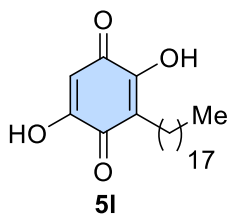
¹H NMR 500 MHz CDCl₃



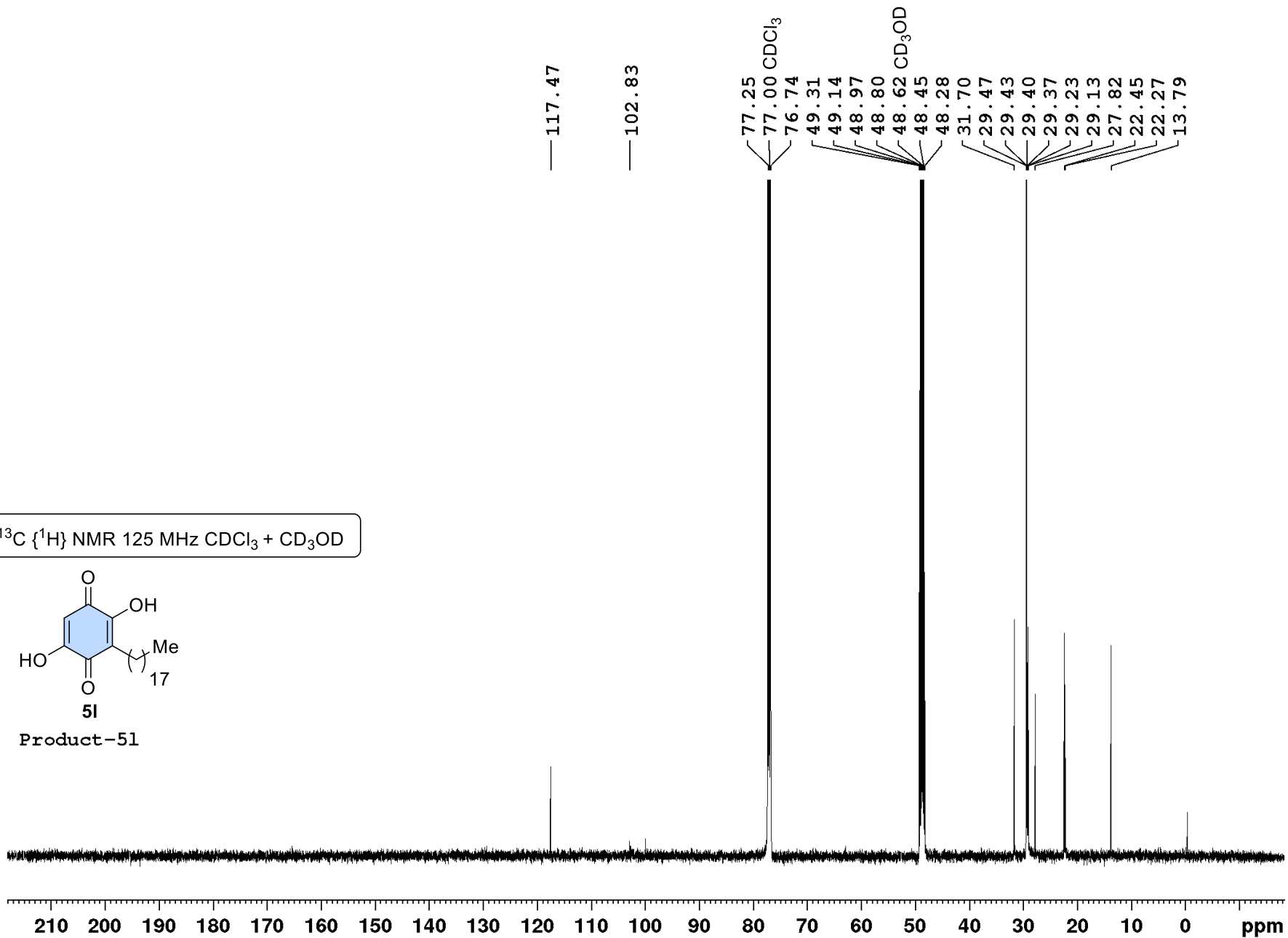
^1H NMR 500 MHz $\text{CDCl}_3 + \text{CD}_3\text{OD}$

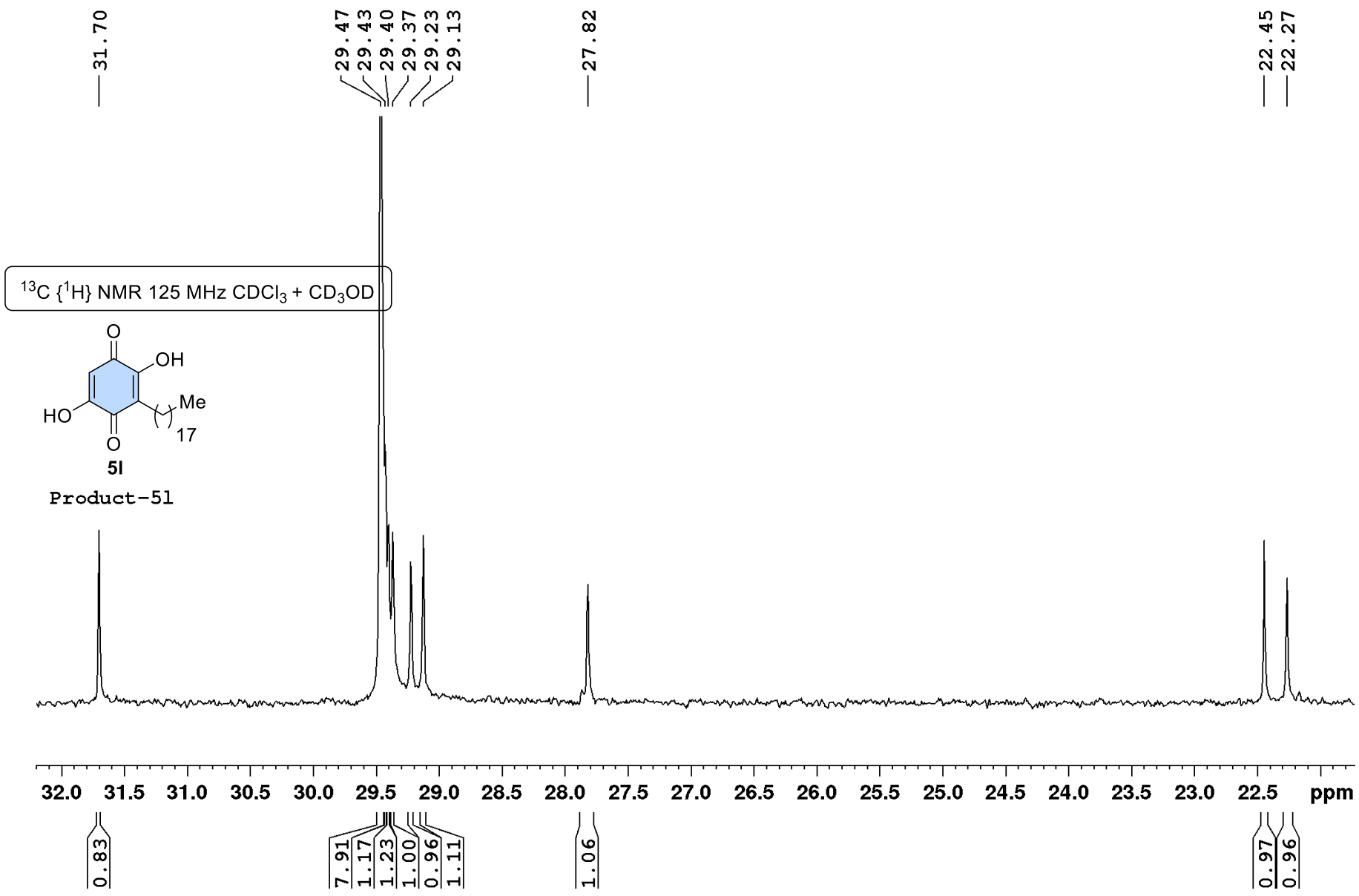


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz $\text{CDCl}_3 + \text{CD}_3\text{OD}$

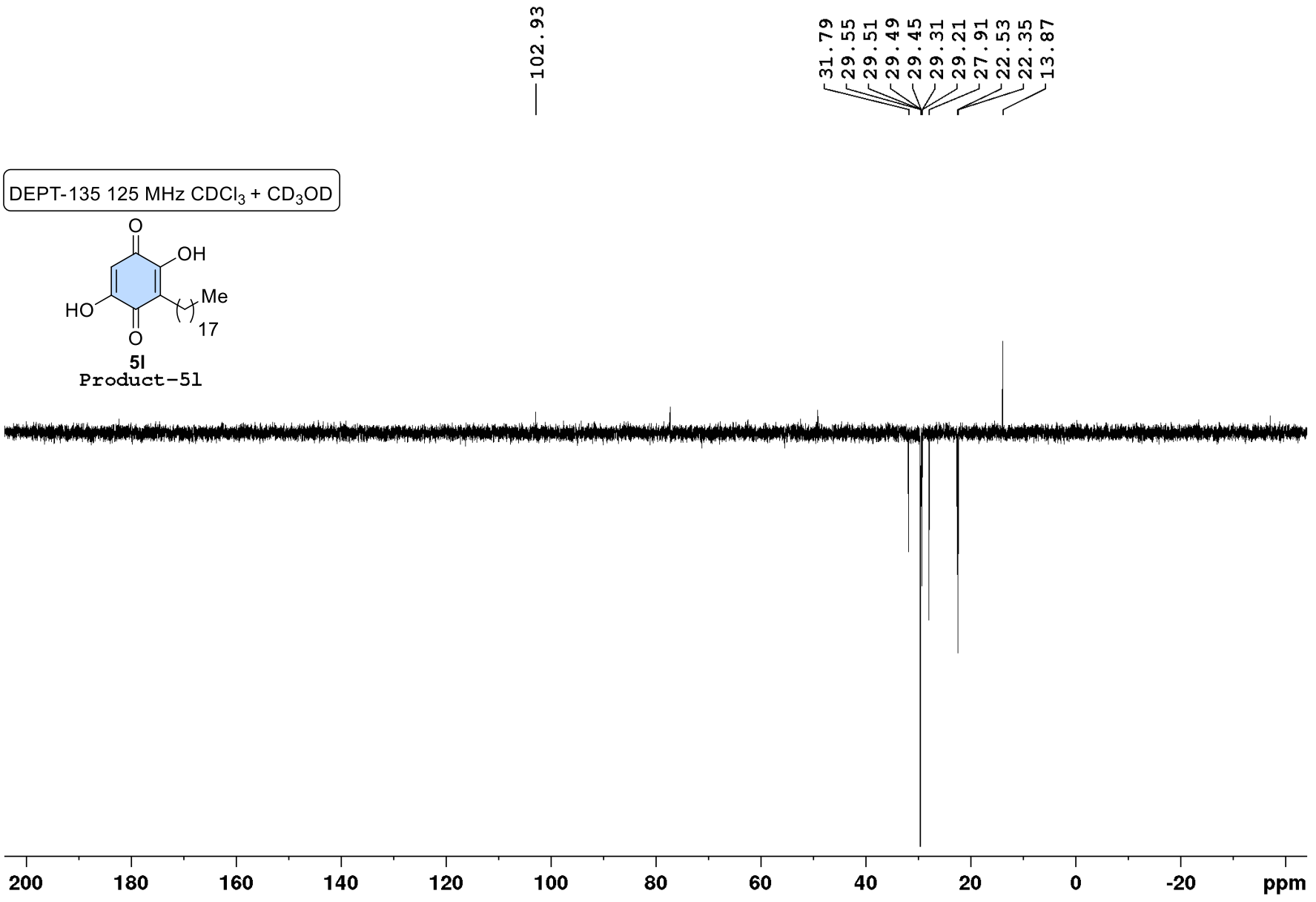
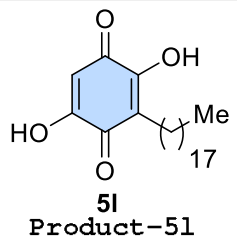


Product-51

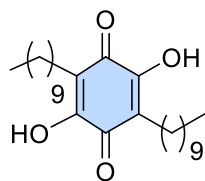




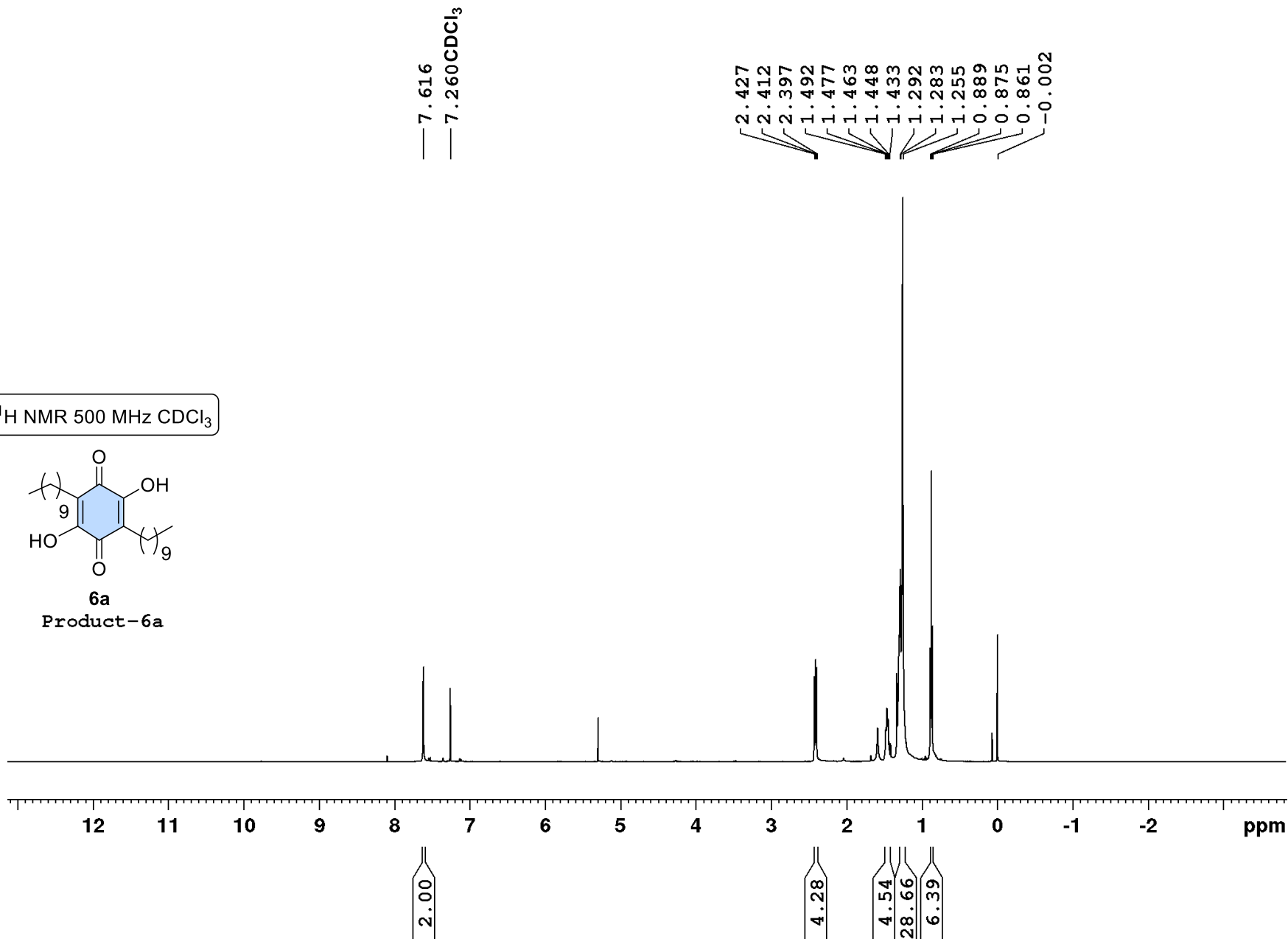
DEPT-135 125 MHz CDCl₃ + CD₃OD



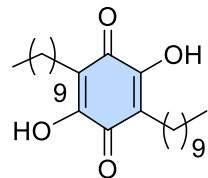
¹H NMR 500 MHz CDCl₃



6a
Product-6a

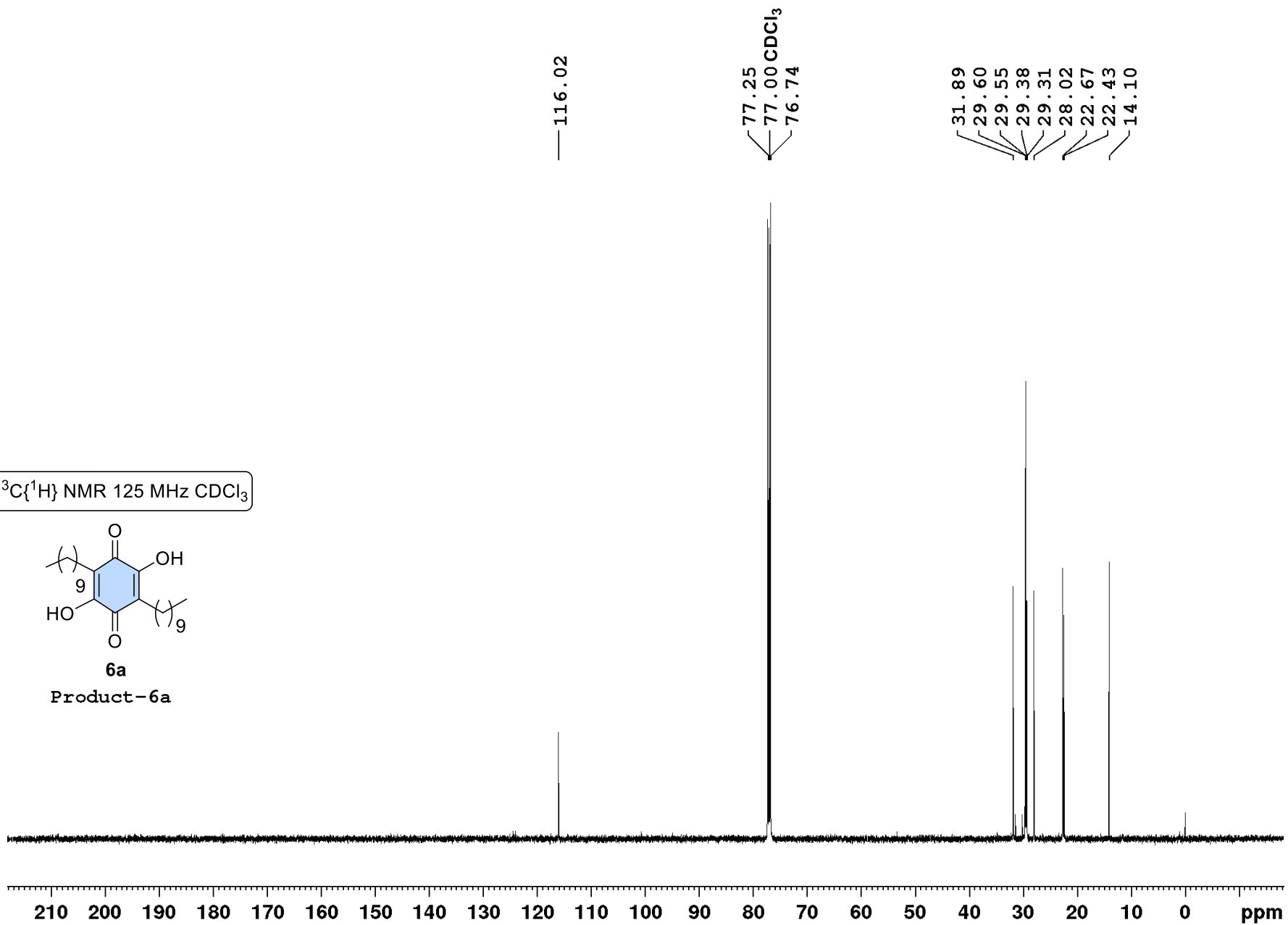


$^{13}\text{C}\{^1\text{H}\}$ NMR 125 MHz CDCl_3

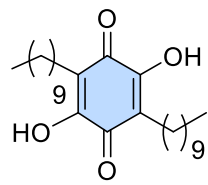


6a

Product-6a

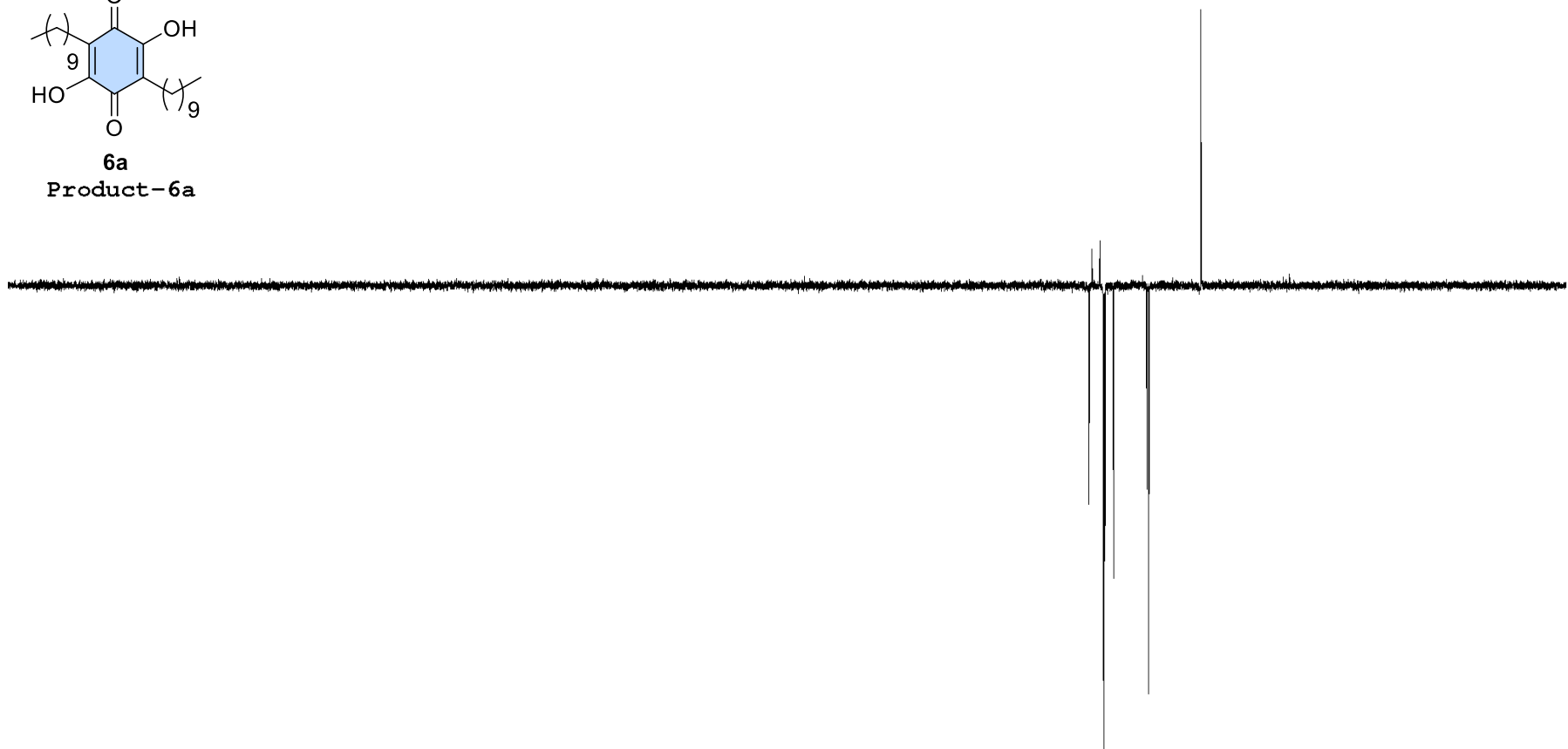


DEPT-135 125 MHz CDCl₃



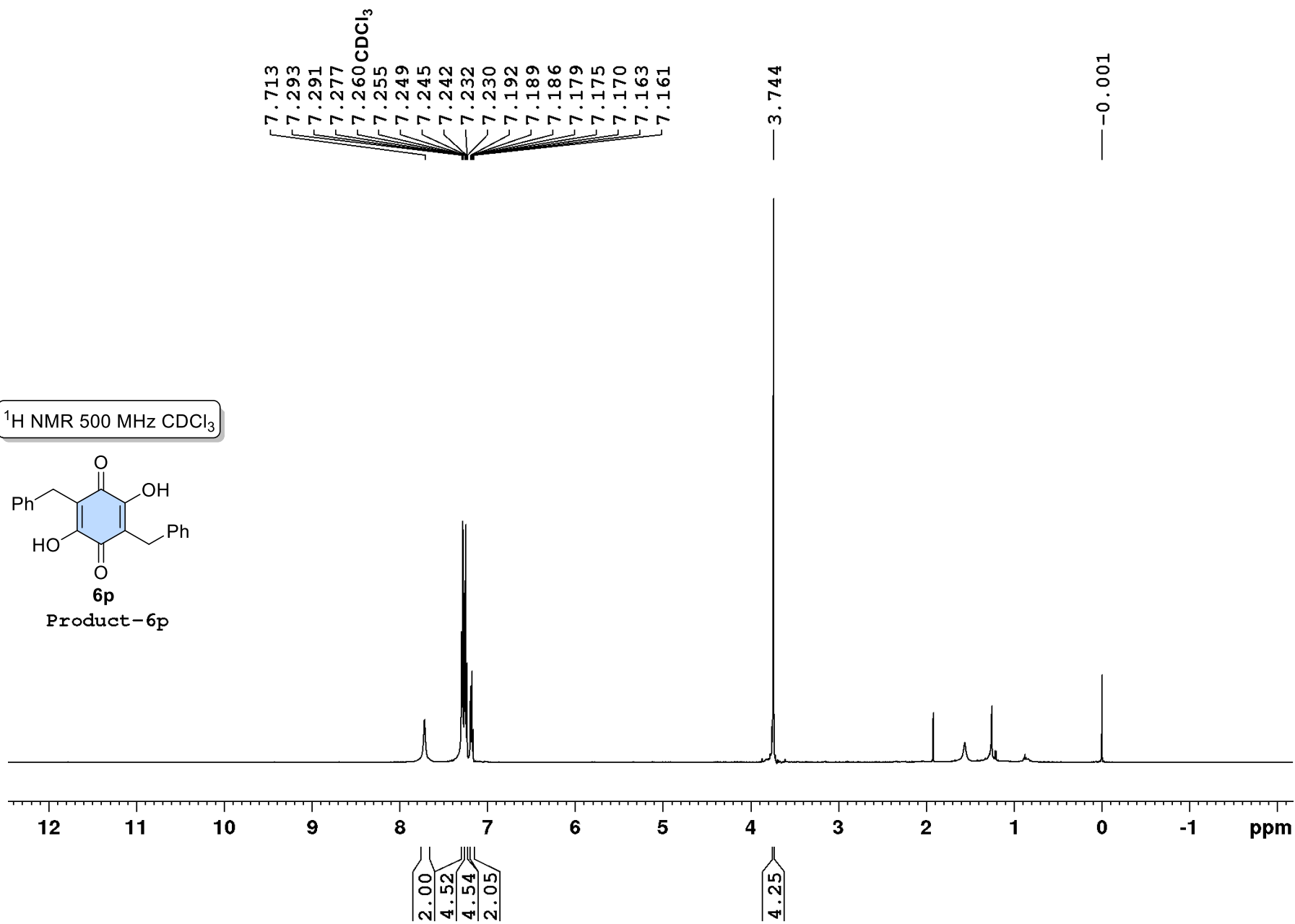
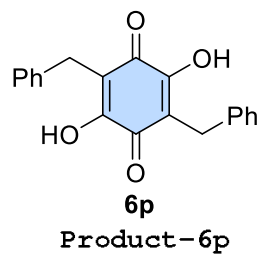
6a
Product-6a

31.89
29.60
29.55
29.38
29.31
28.02
22.67
22.43
14.10

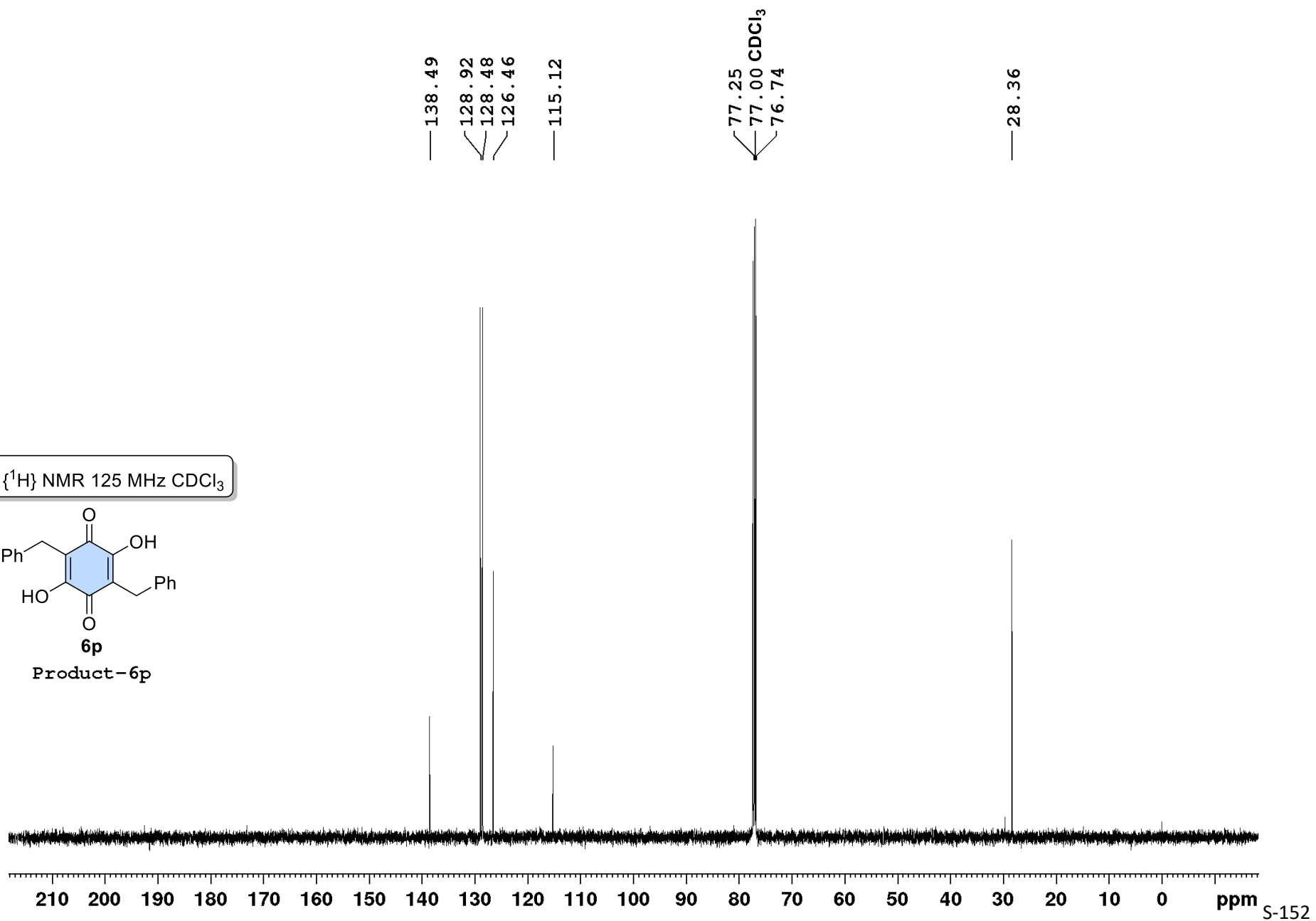
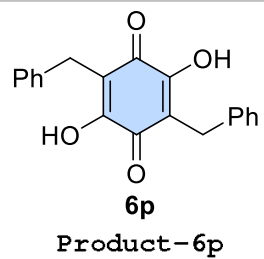


200 180 160 140 120 100 80 60 40 20 0 -20 ppm

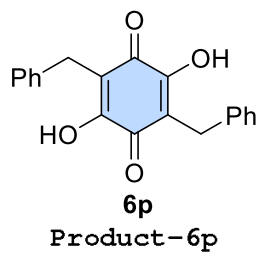
¹H NMR 500 MHz CDCl₃



^{13}C $\{^1\text{H}\}$ NMR 125 MHz CDCl_3

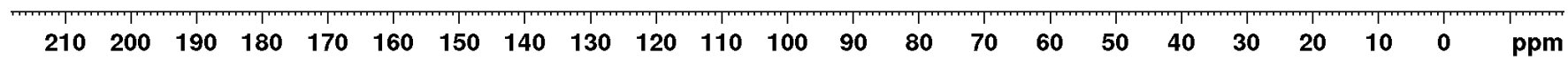


DEPT-135 125 MHz CDCl₃

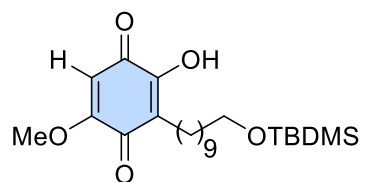


128.92
128.49
126.47

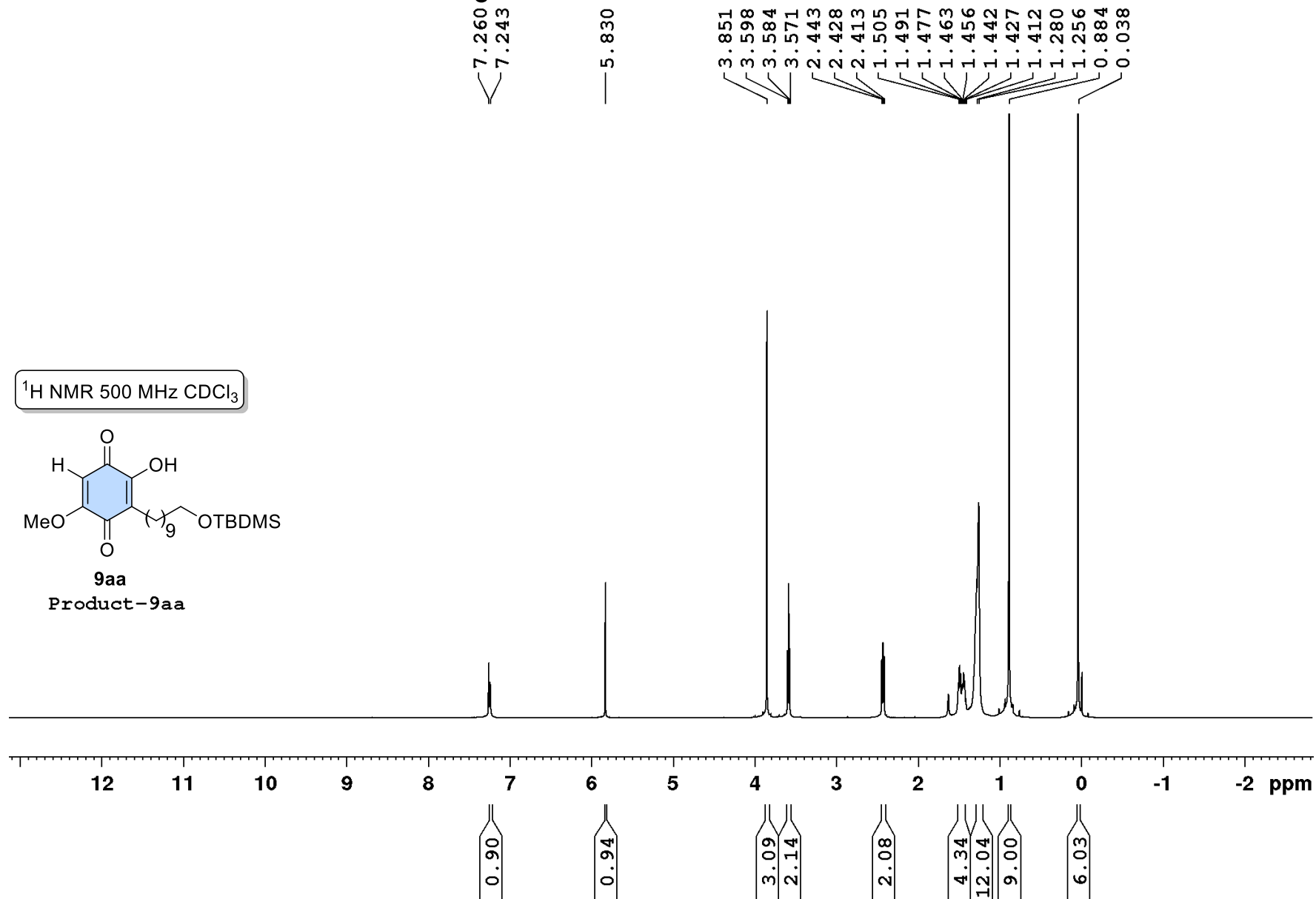
28.36



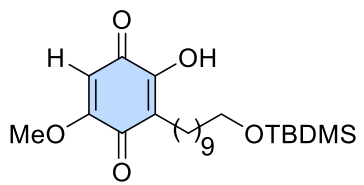
¹H NMR 500 MHz CDCl₃



9aa
Product-9aa

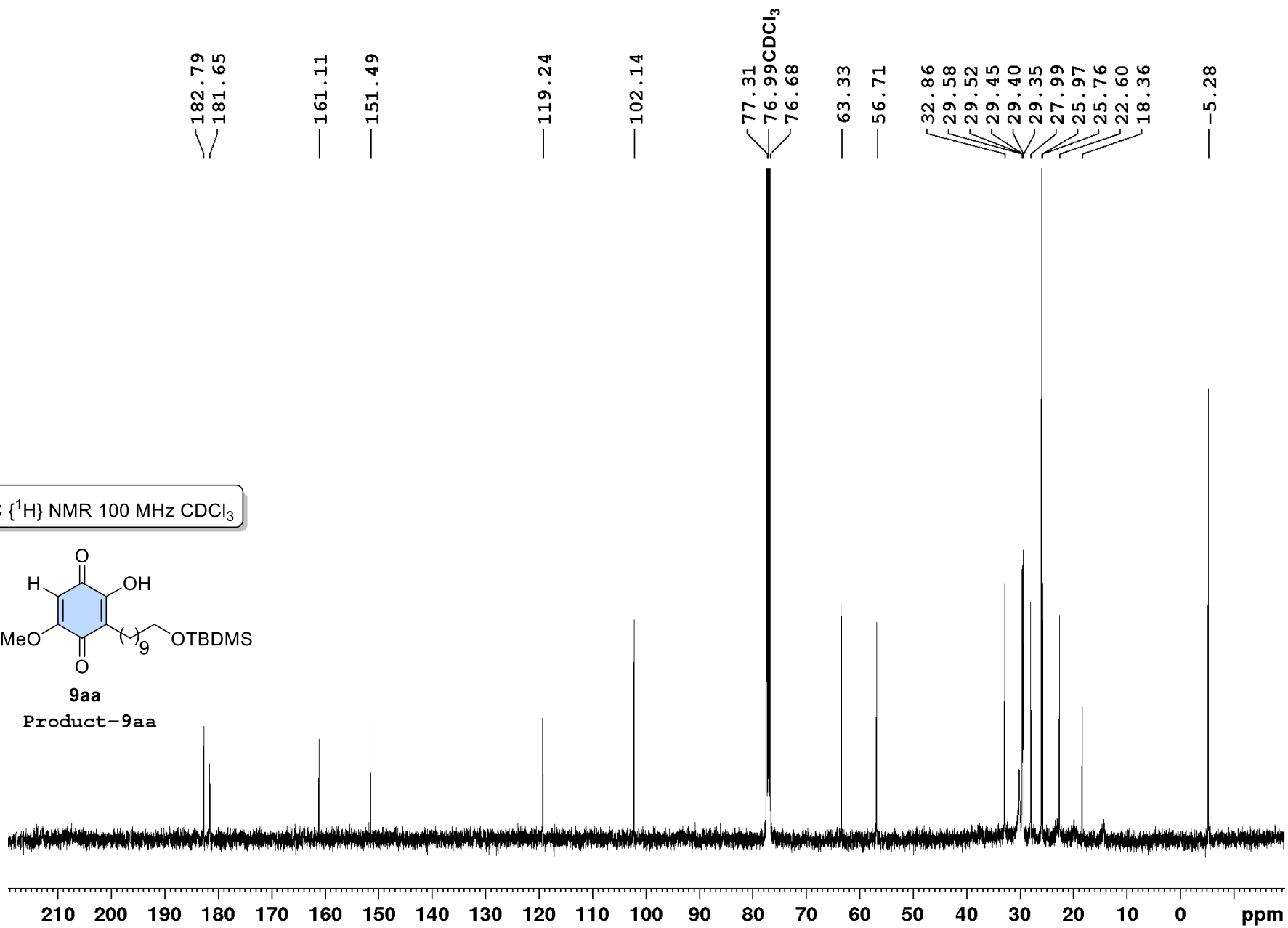


^{13}C { ^1H } NMR 100 MHz CDCl_3

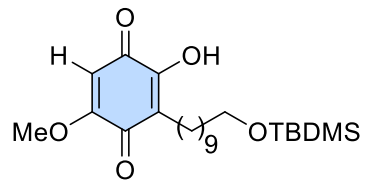


9aa

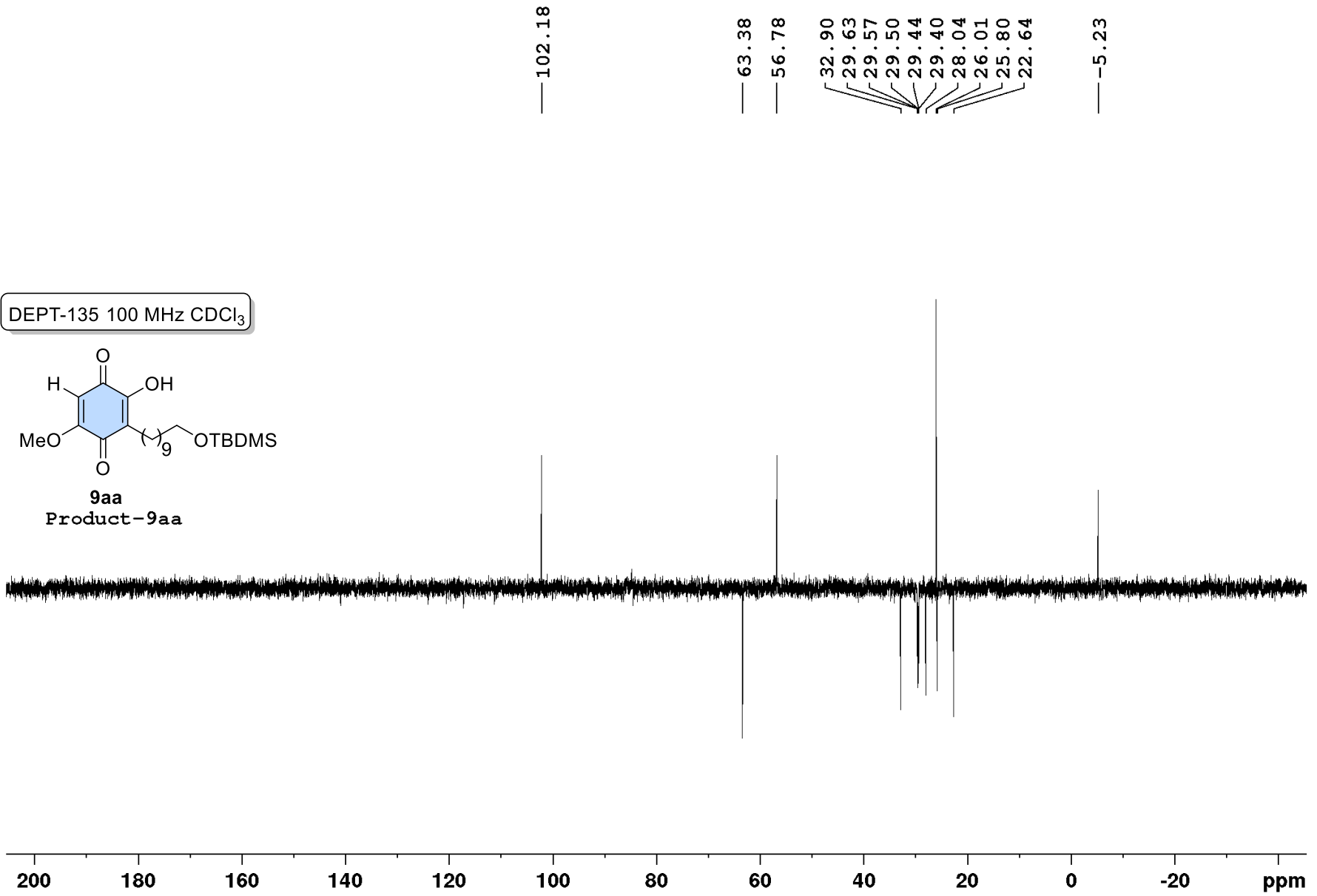
Product-9aa



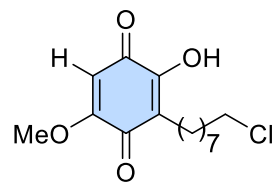
DEPT-135 100 MHz CDCl₃



9aa
Product-9aa

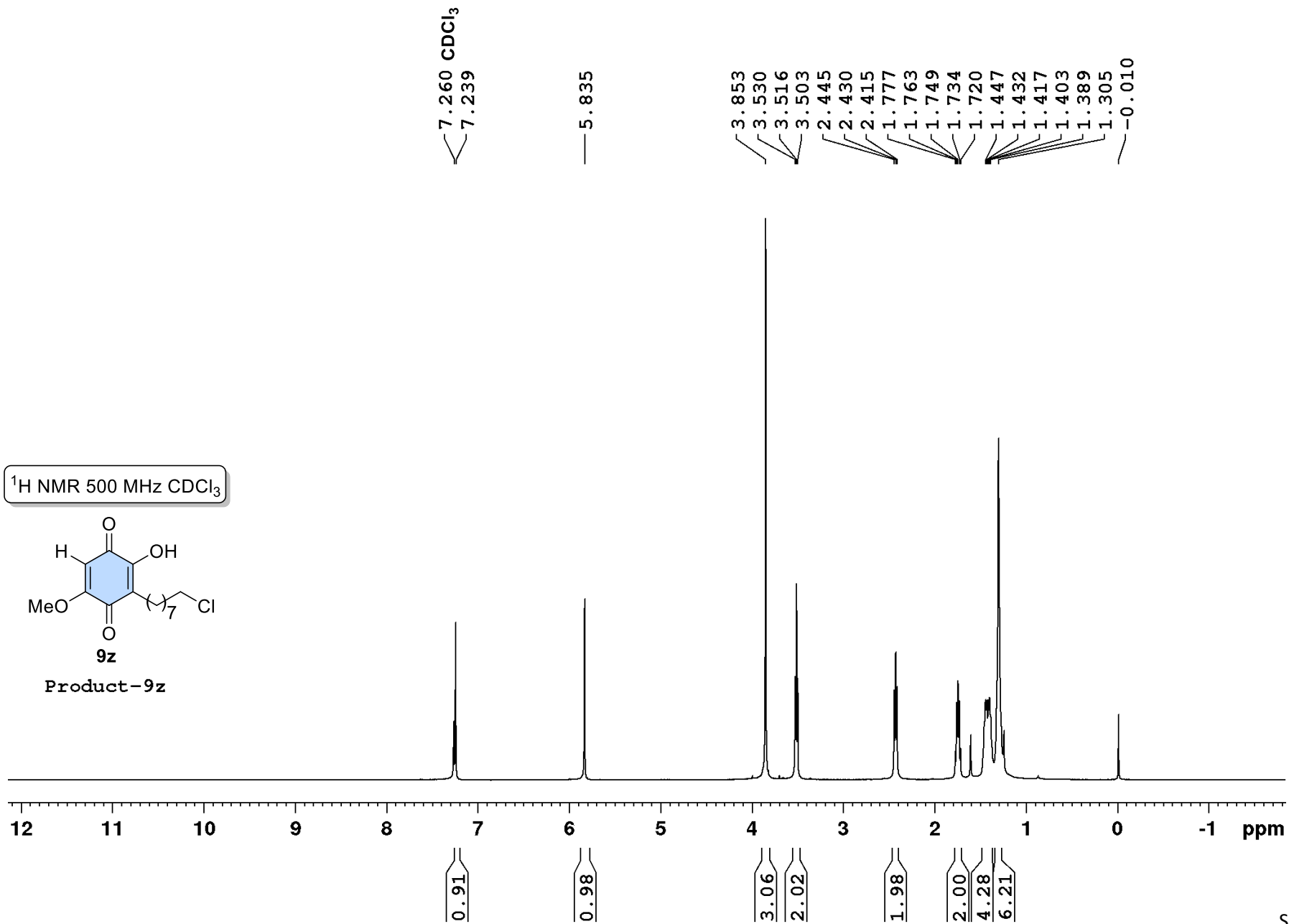


¹H NMR 500 MHz CDCl₃

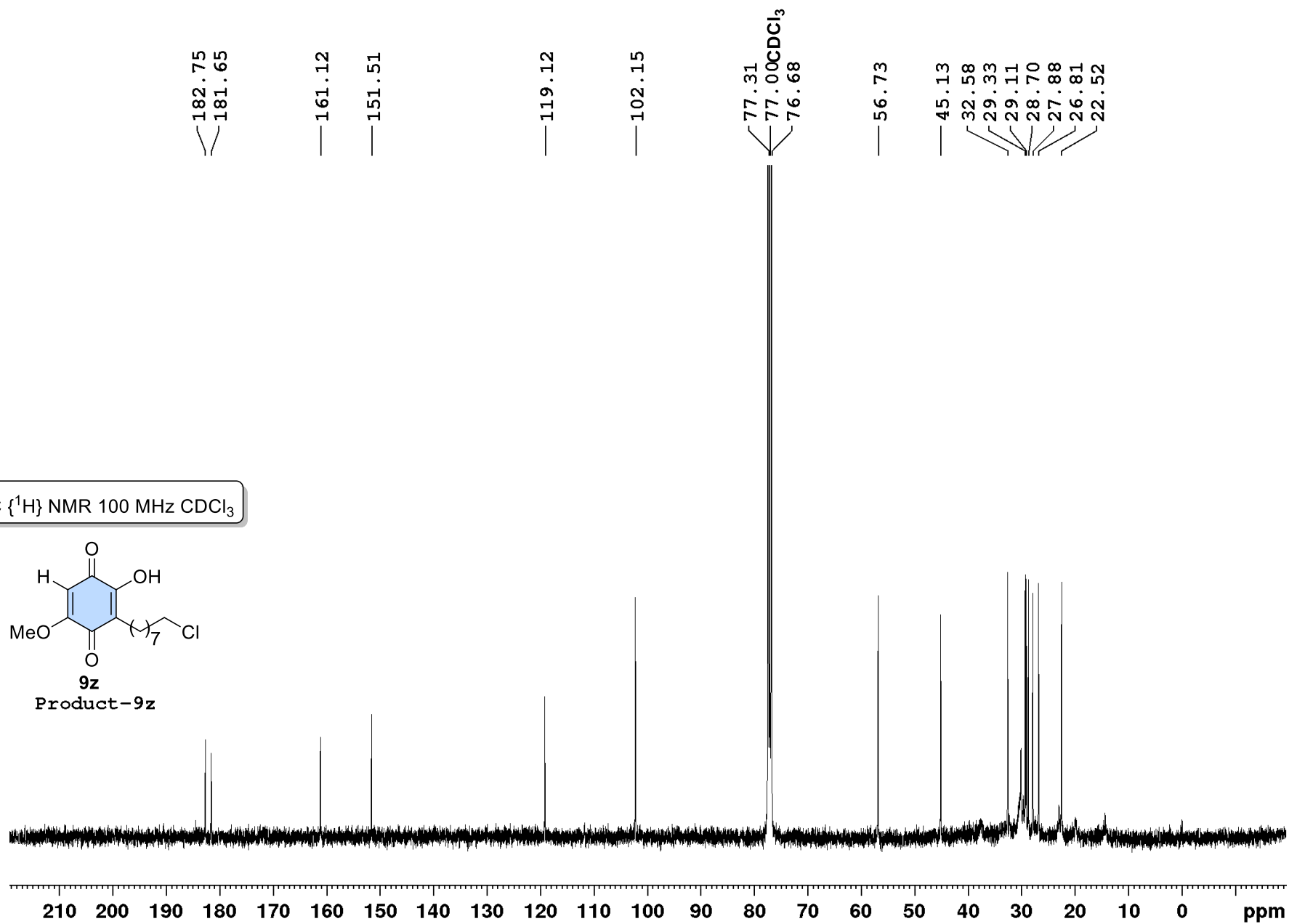
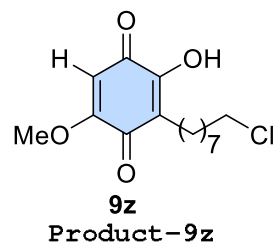


9z

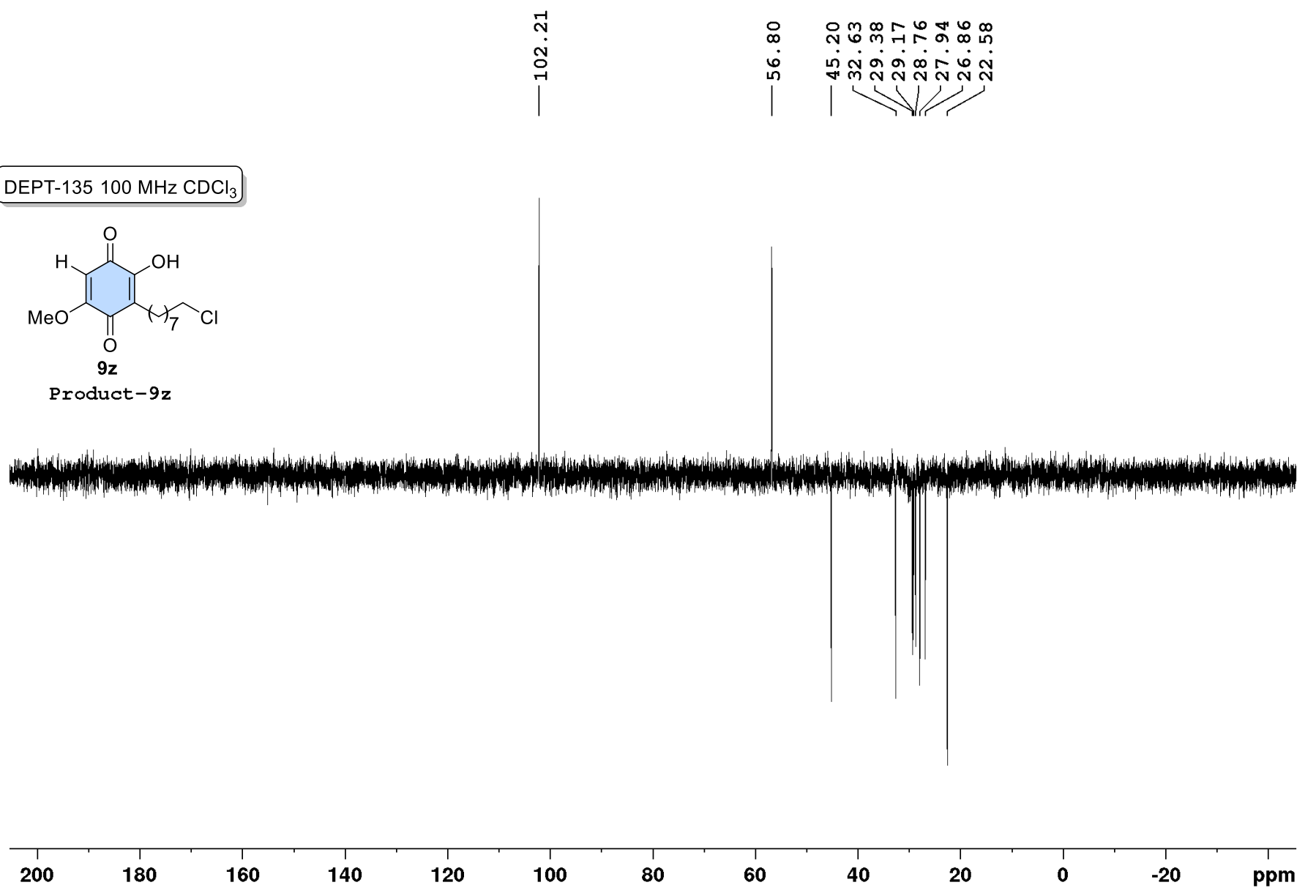
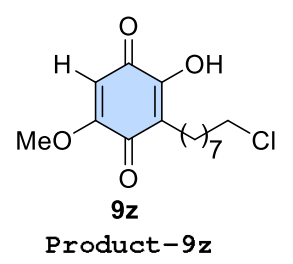
Product-9z



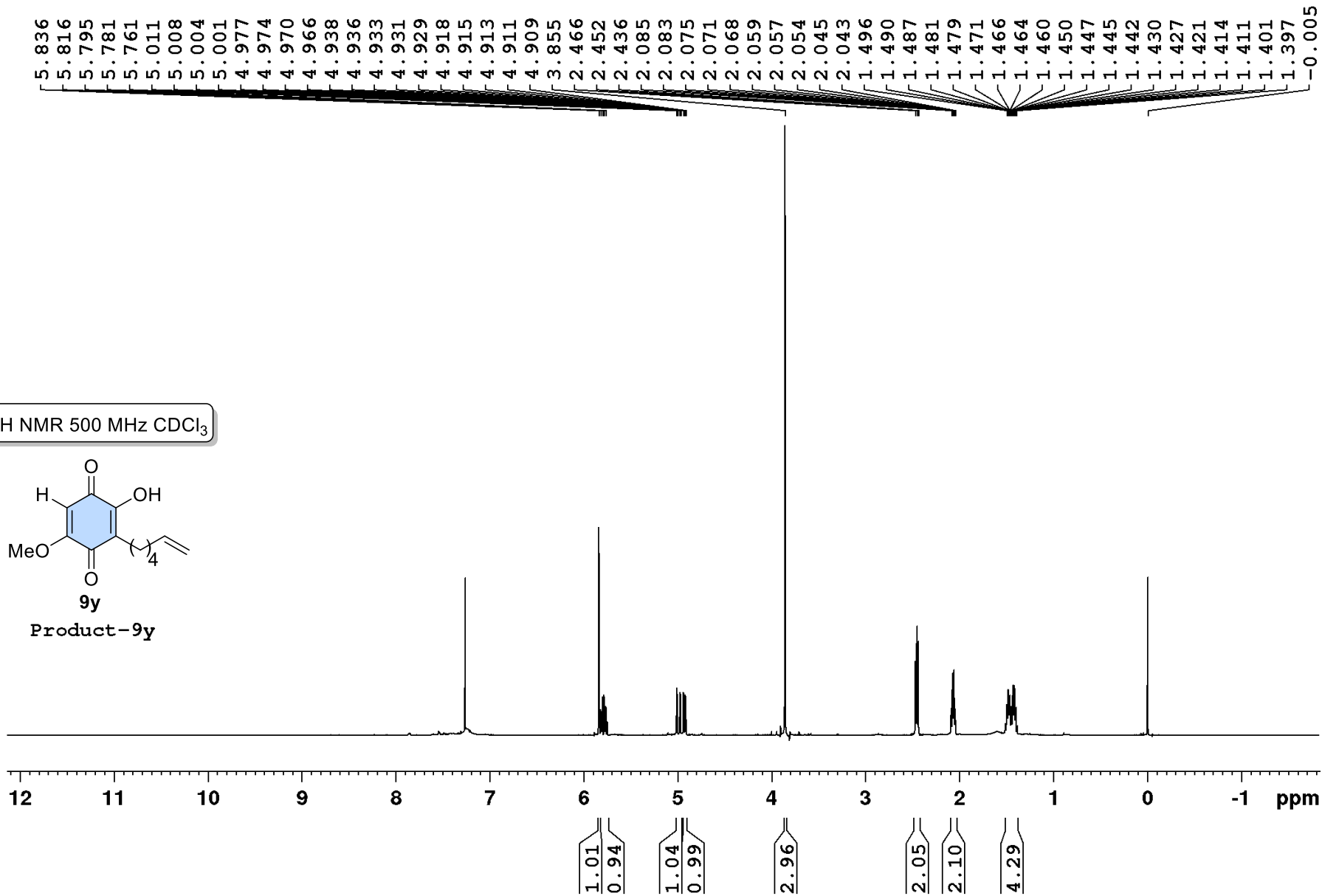
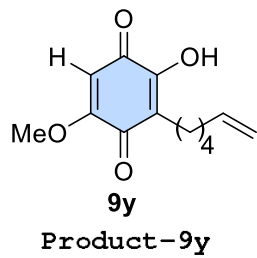
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



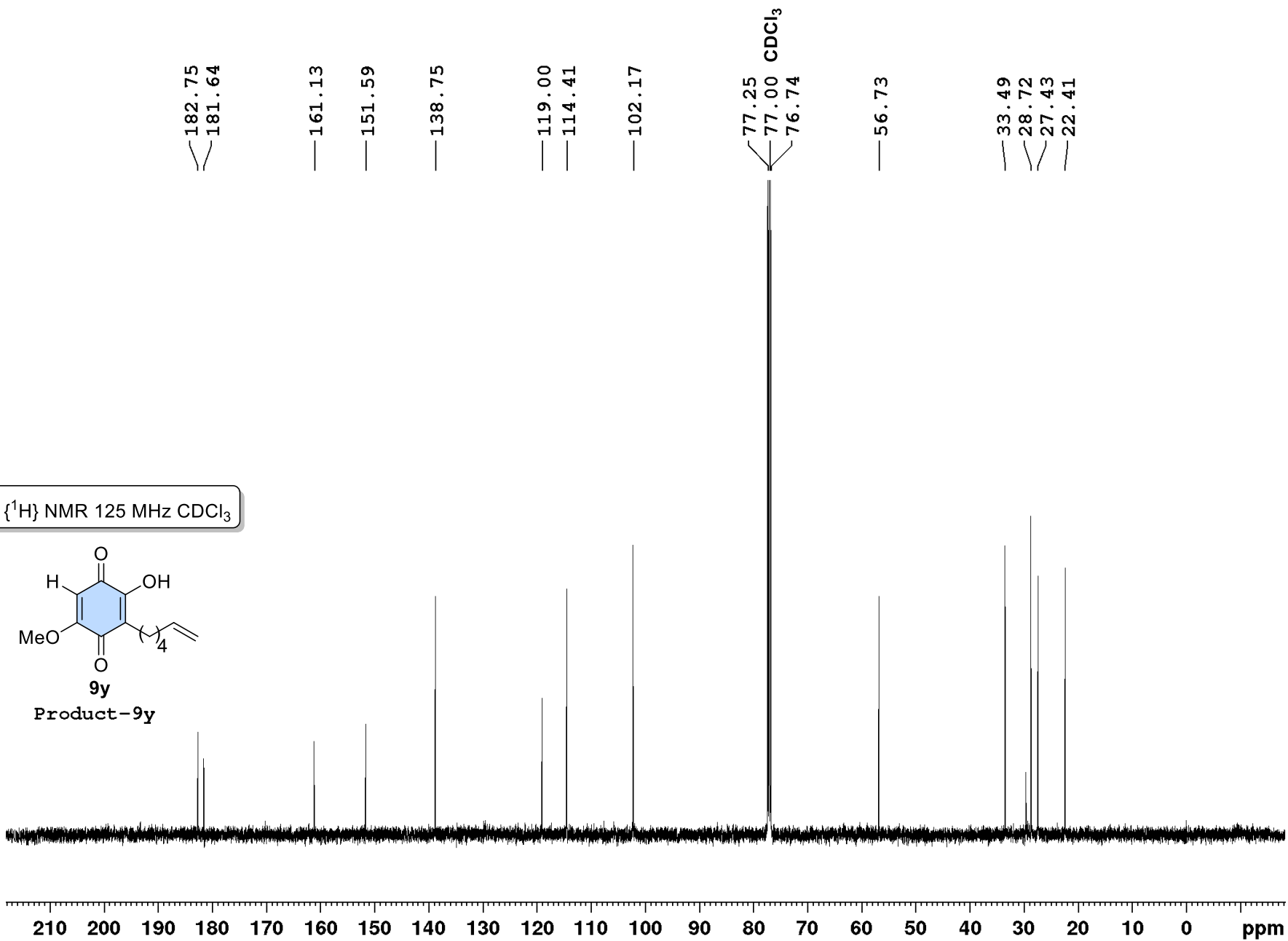
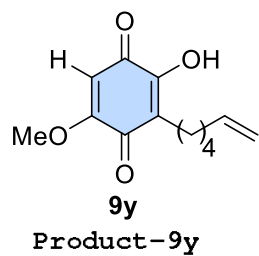
DEPT-135 100 MHz CDCl₃



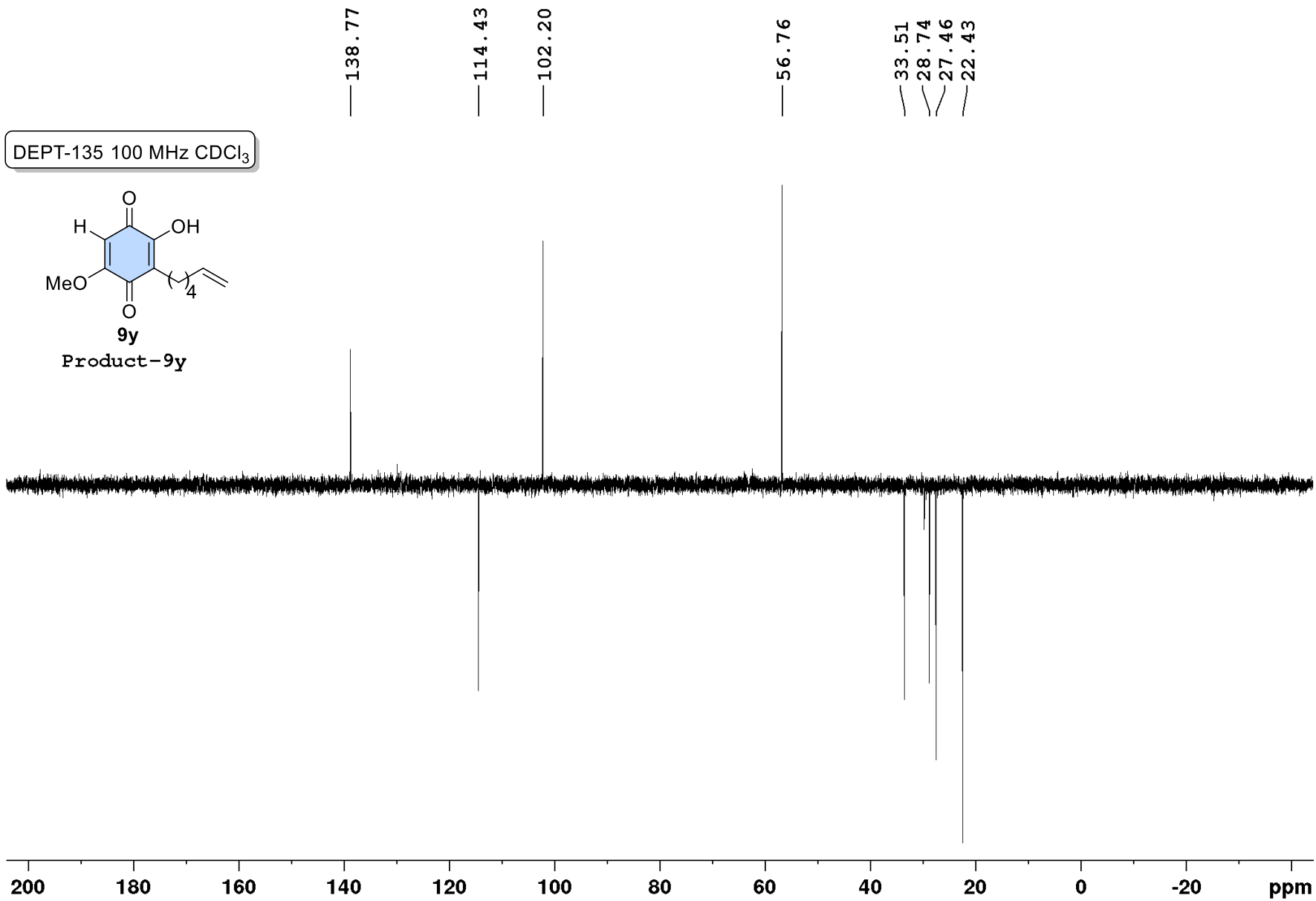
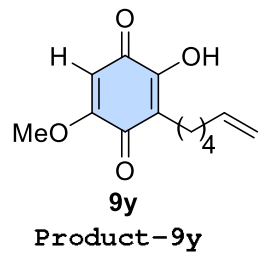
¹H NMR 500 MHz CDCl₃



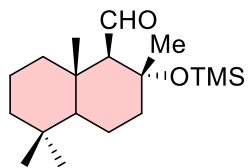
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



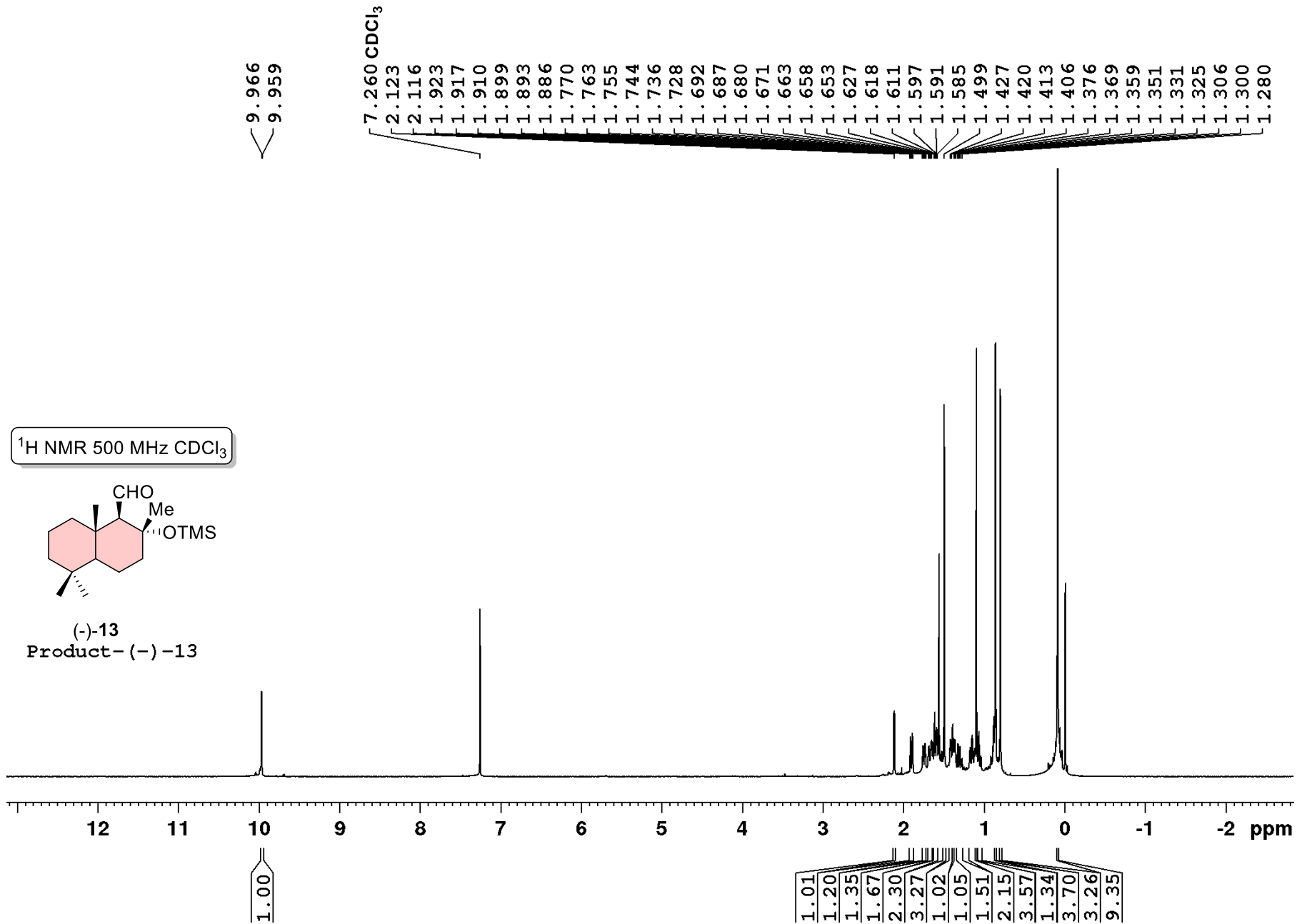
DEPT-135 100 MHz CDCl₃

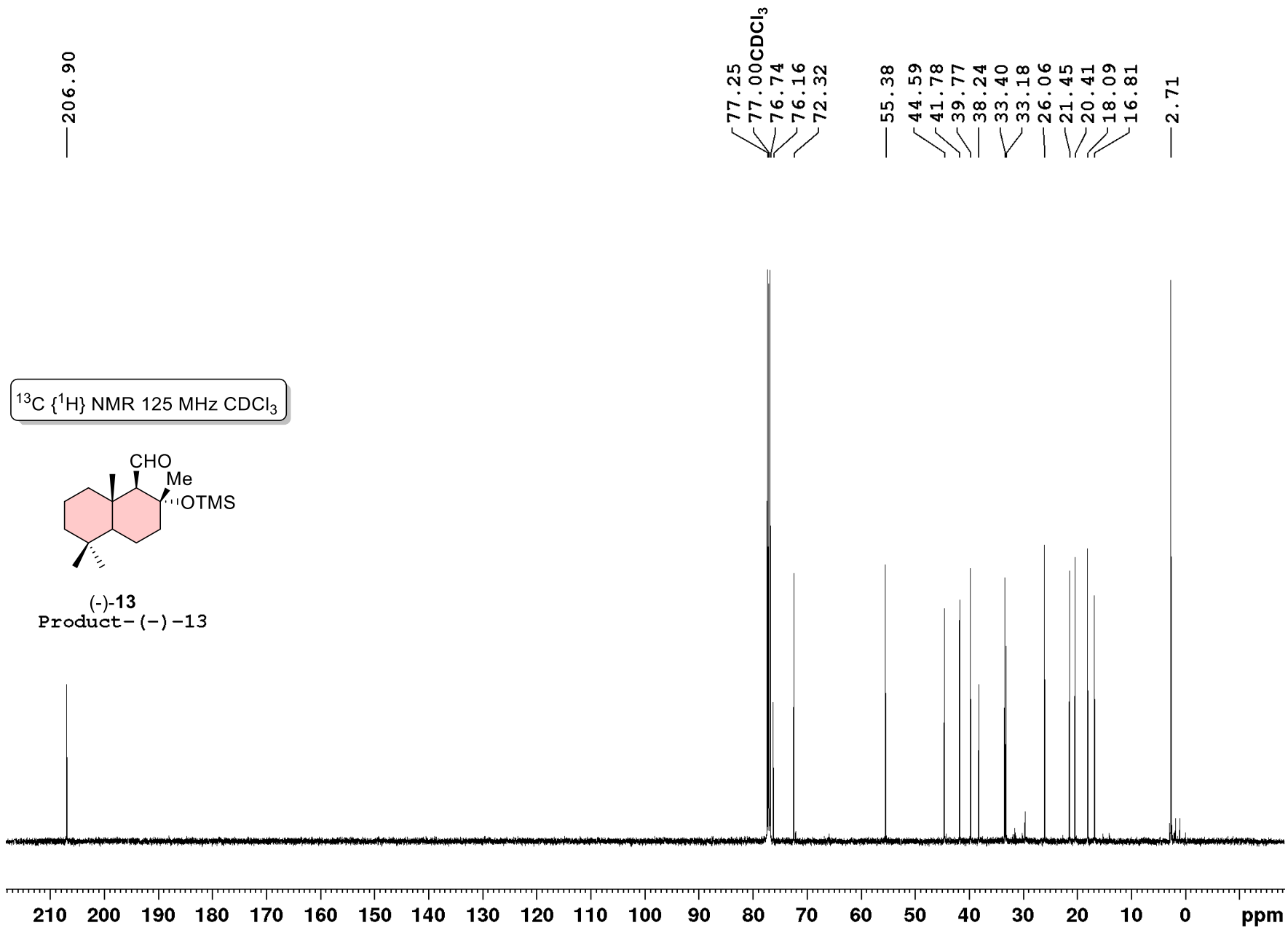


¹H NMR 500 MHz CDCl₃

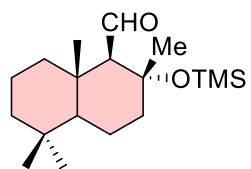


(-)-13
Product - (-)-13

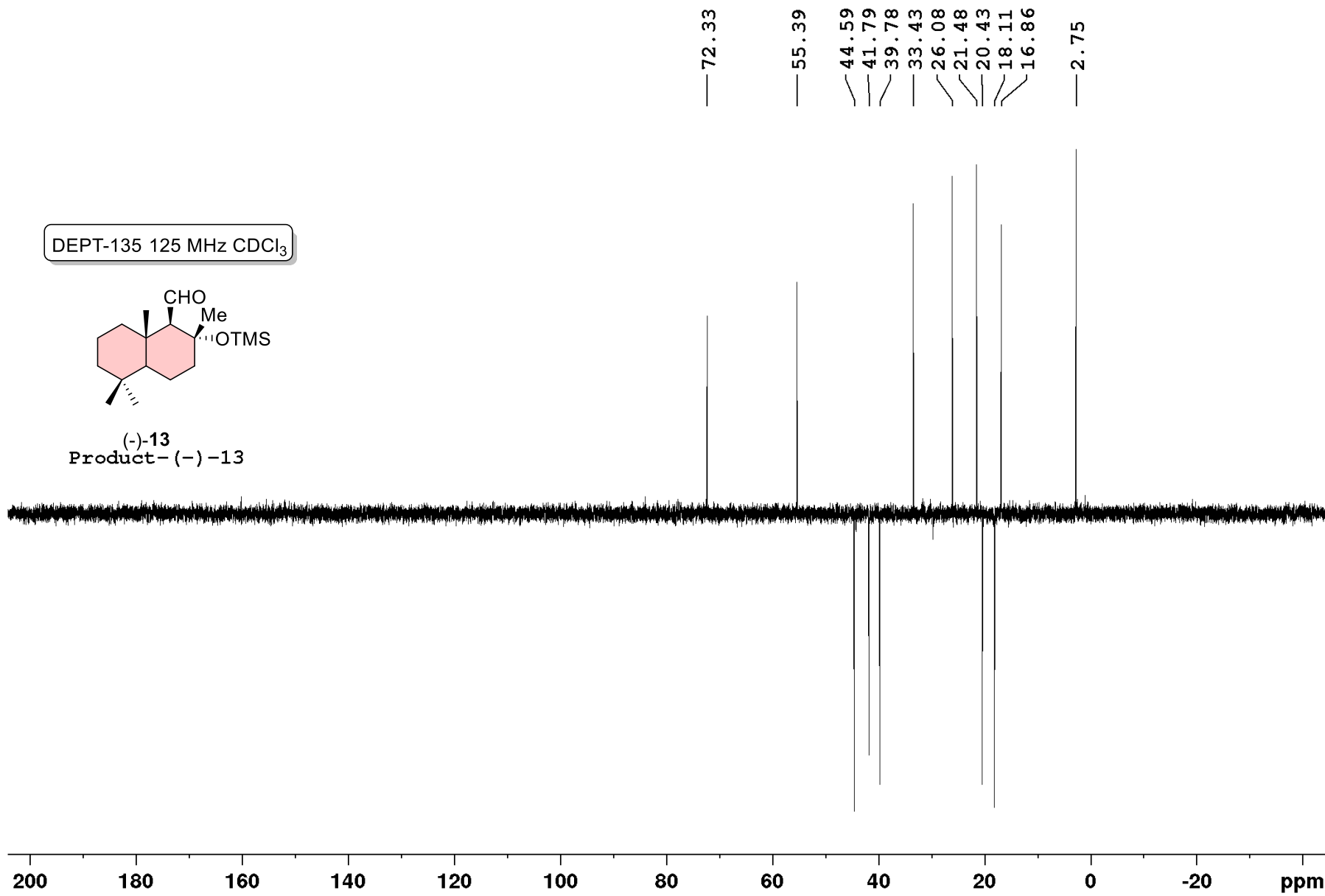


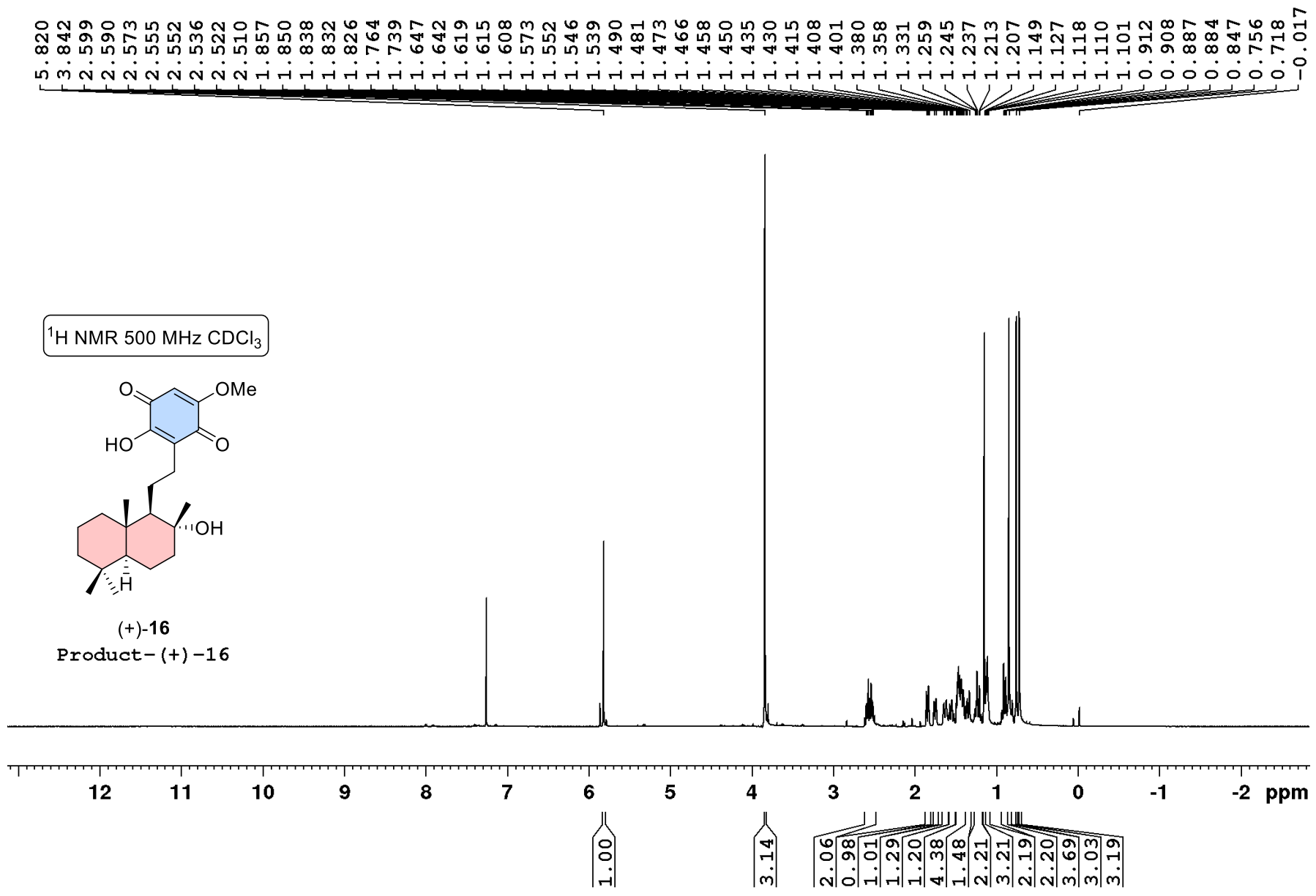


DEPT-135 125 MHz CDCl₃

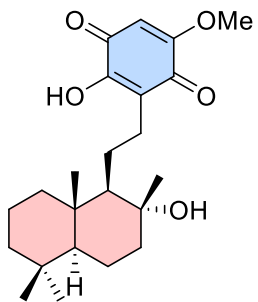


(-)-13
Product-(-)-13



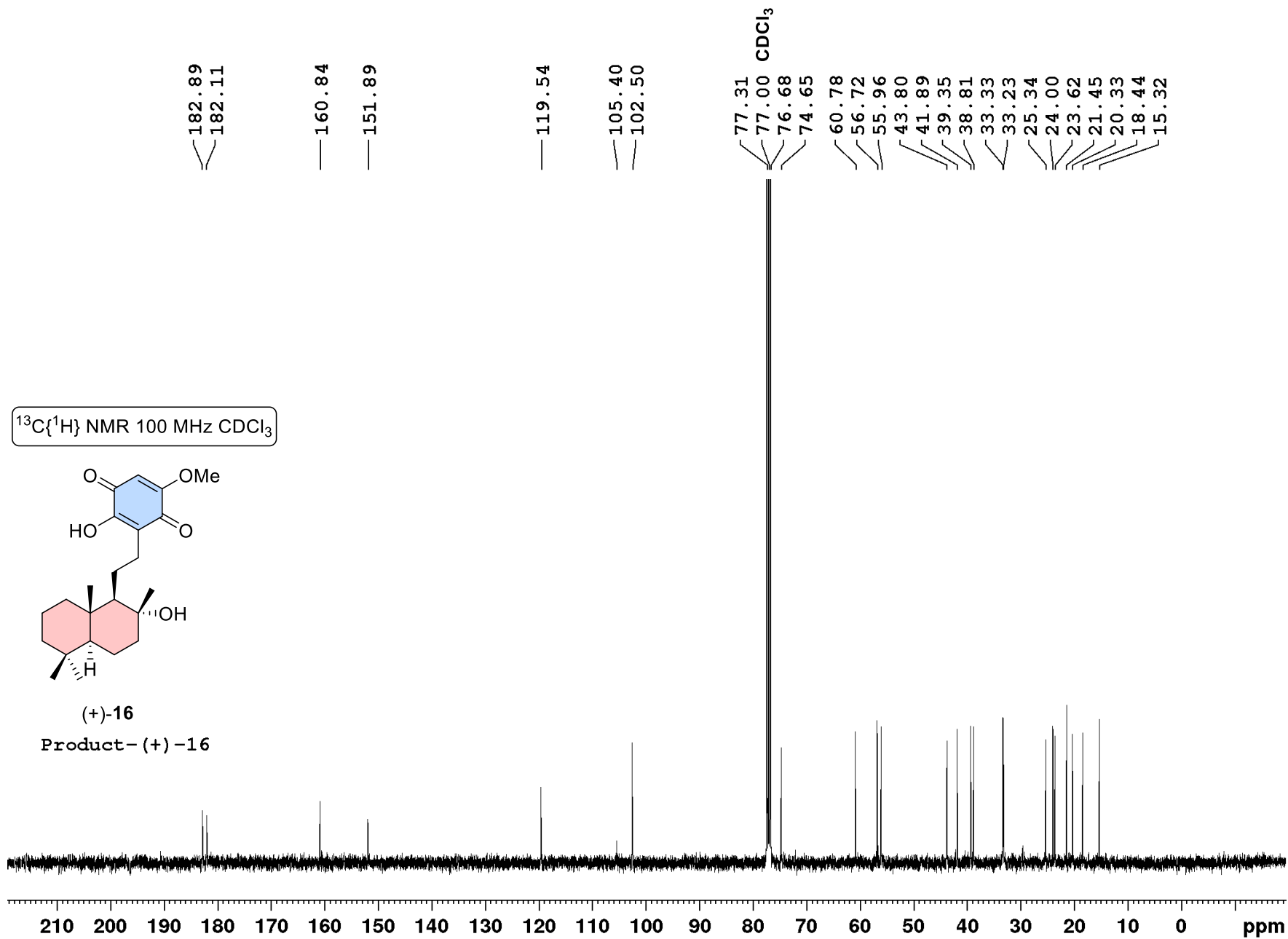


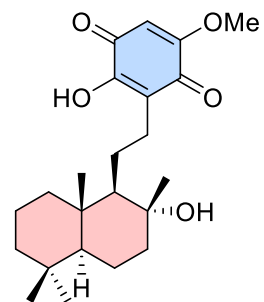
$^{13}\text{C}\{^1\text{H}\}$ NMR 100 MHz CDCl_3



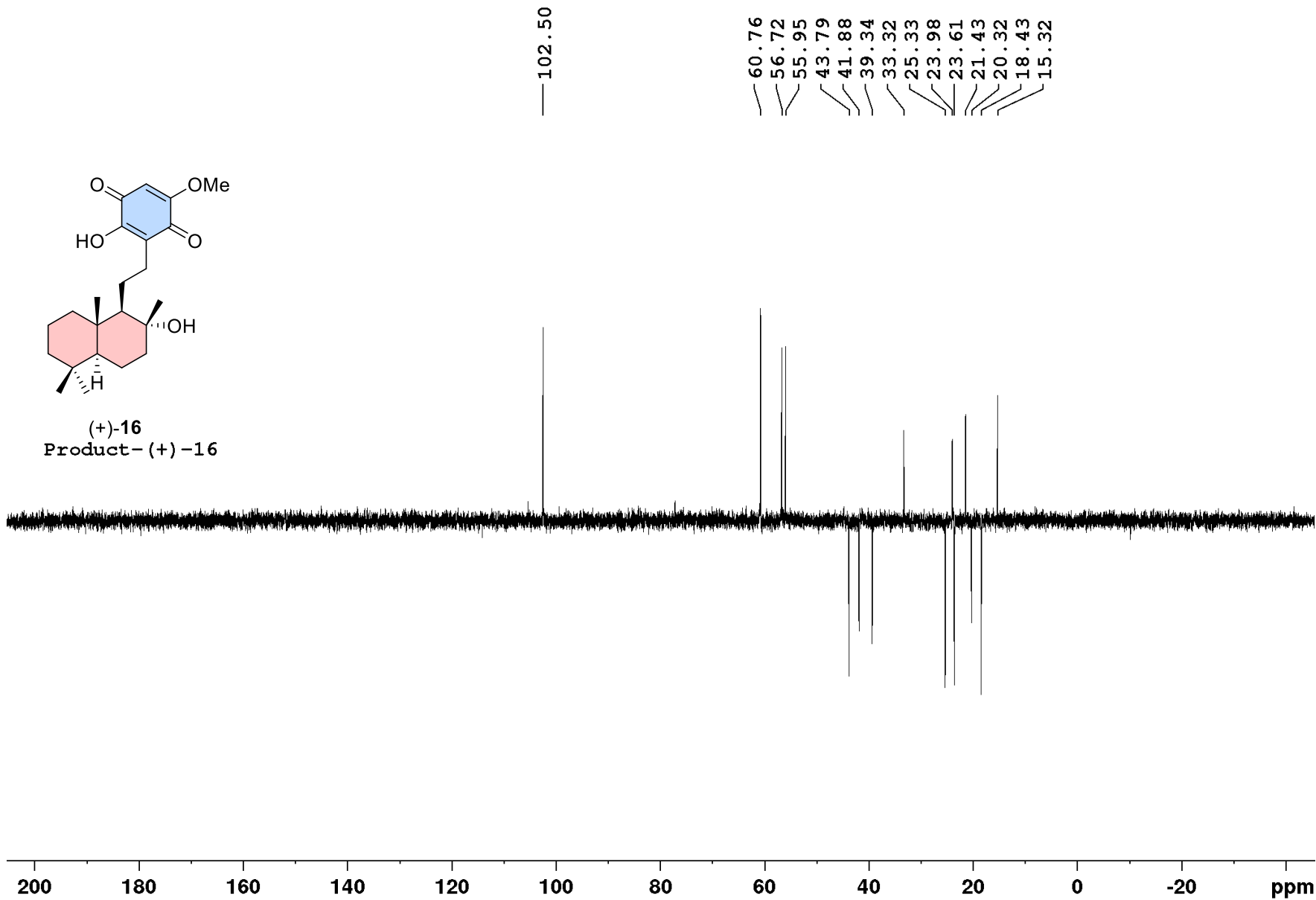
(+)-16

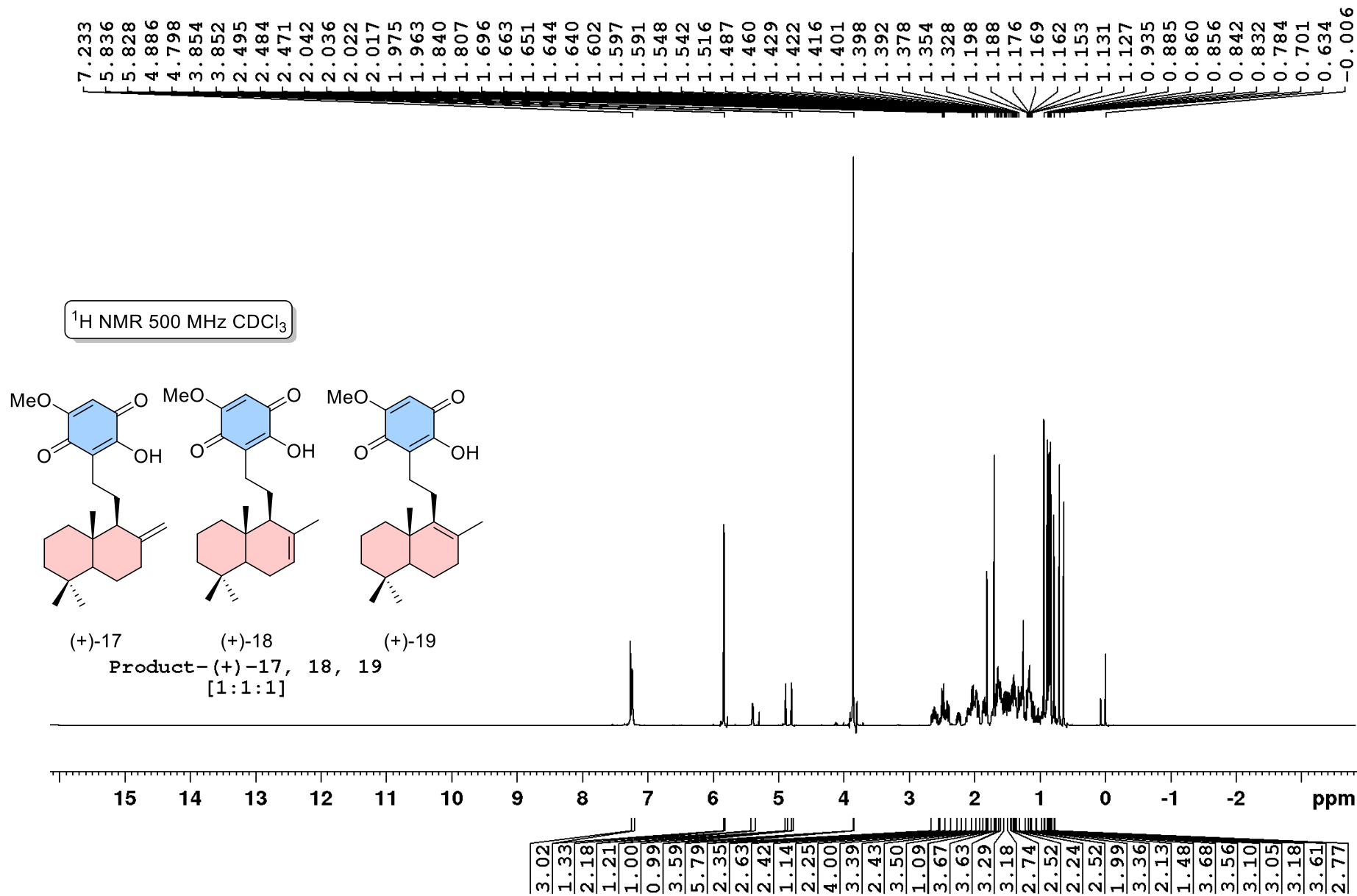
Product- (+) -16

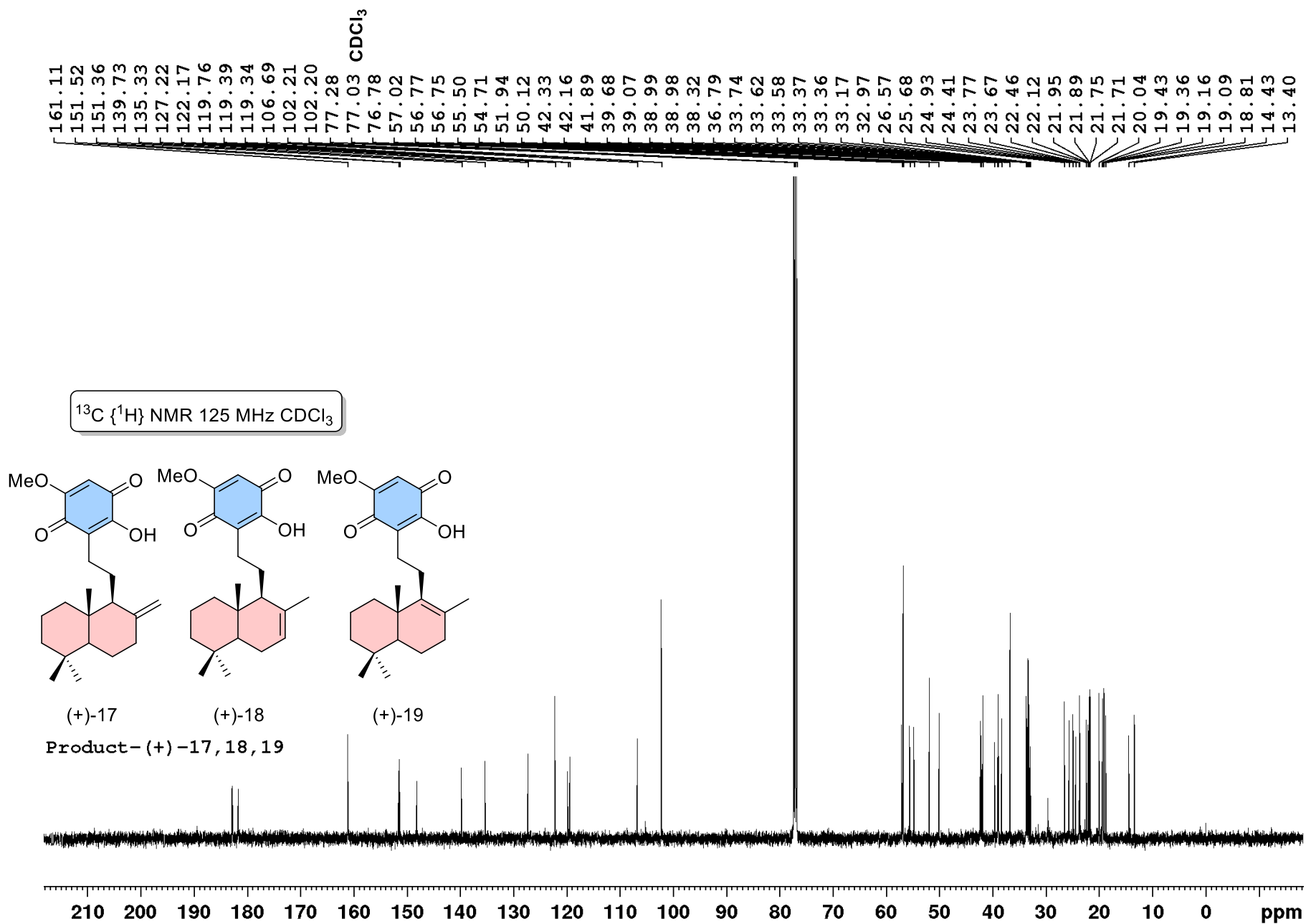


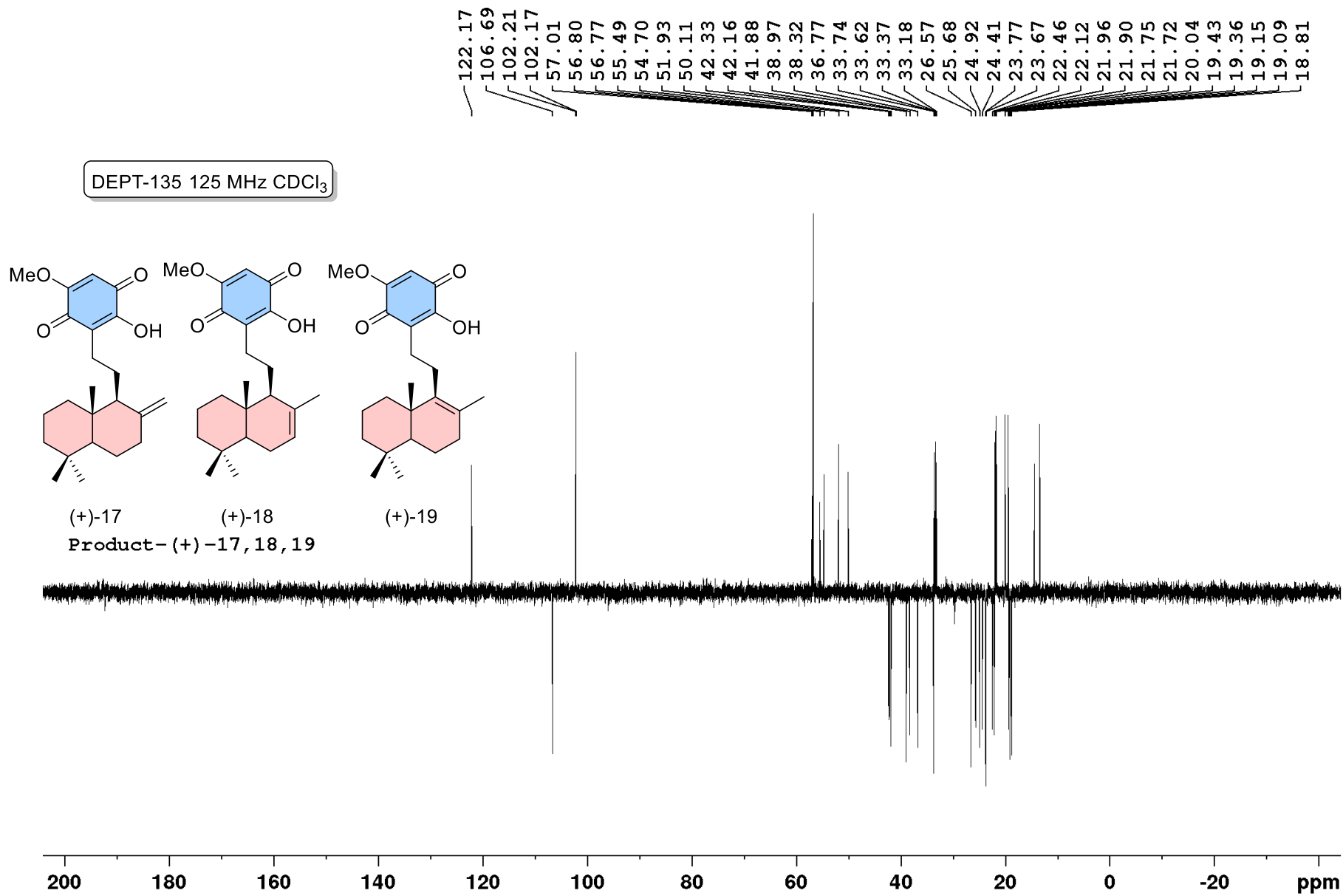


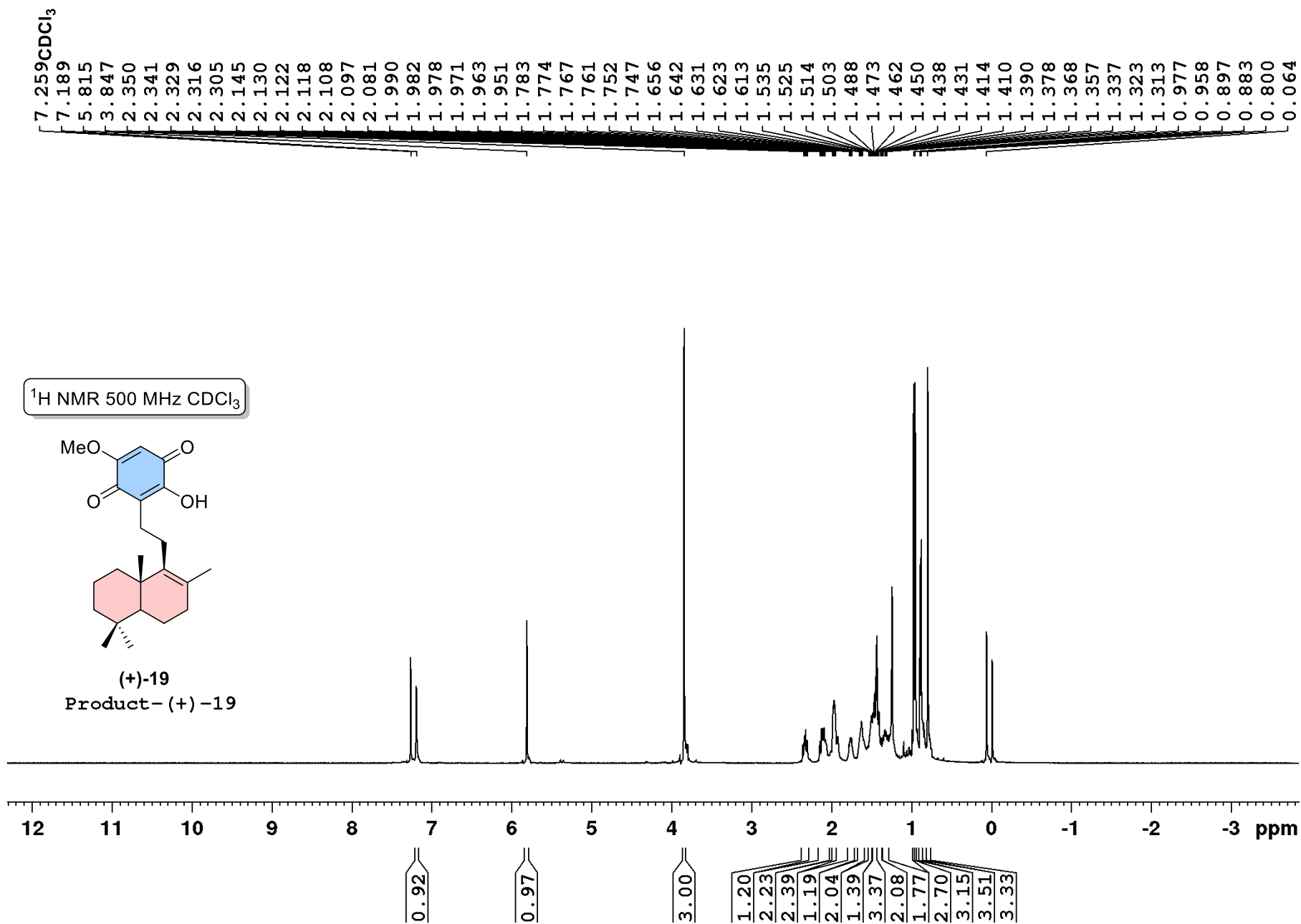
(+)-16
Product-(+)-16



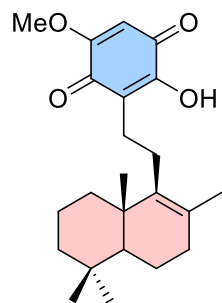




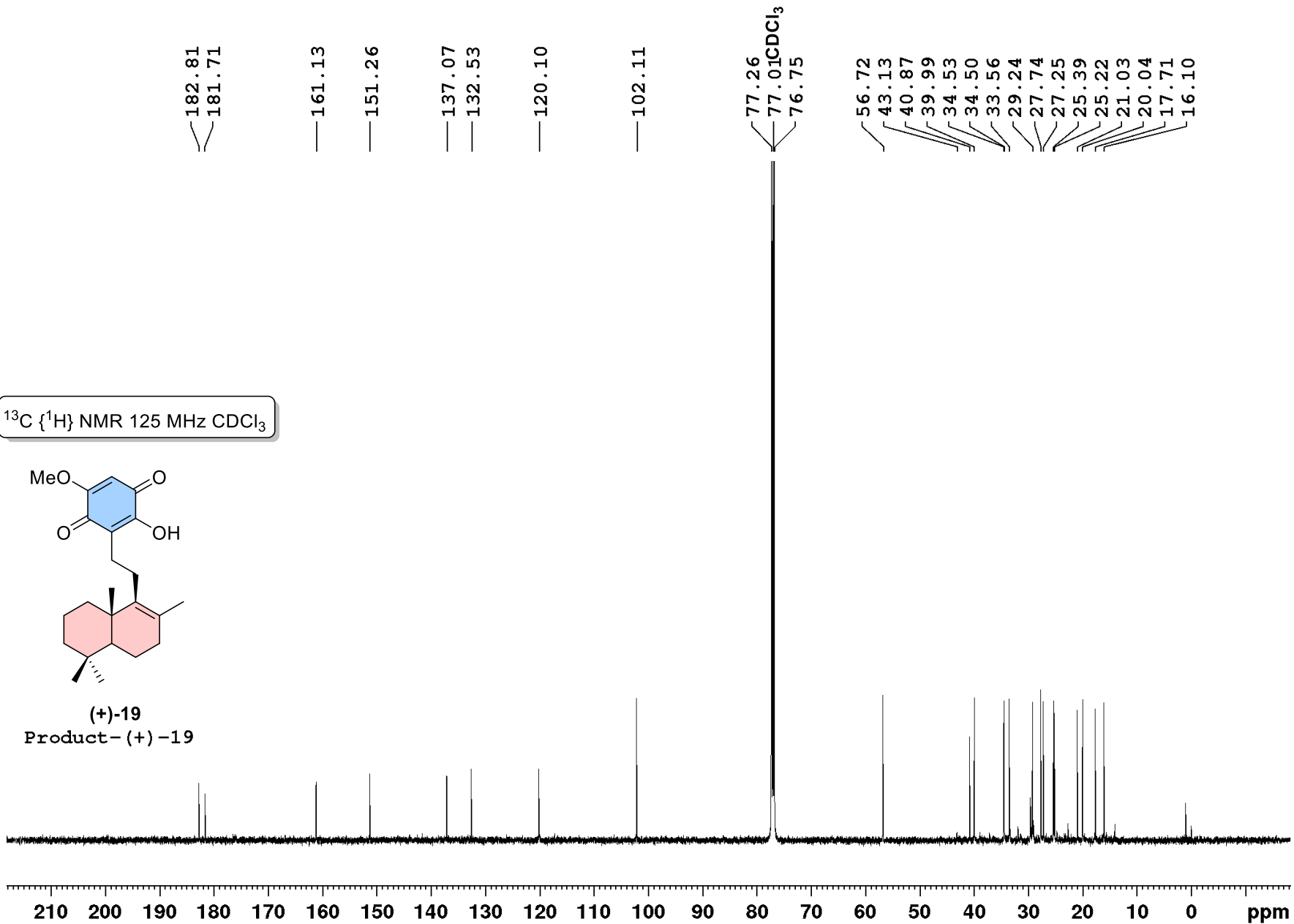




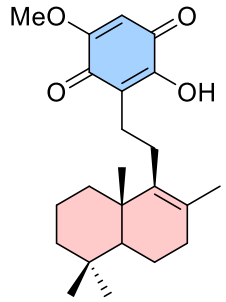
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



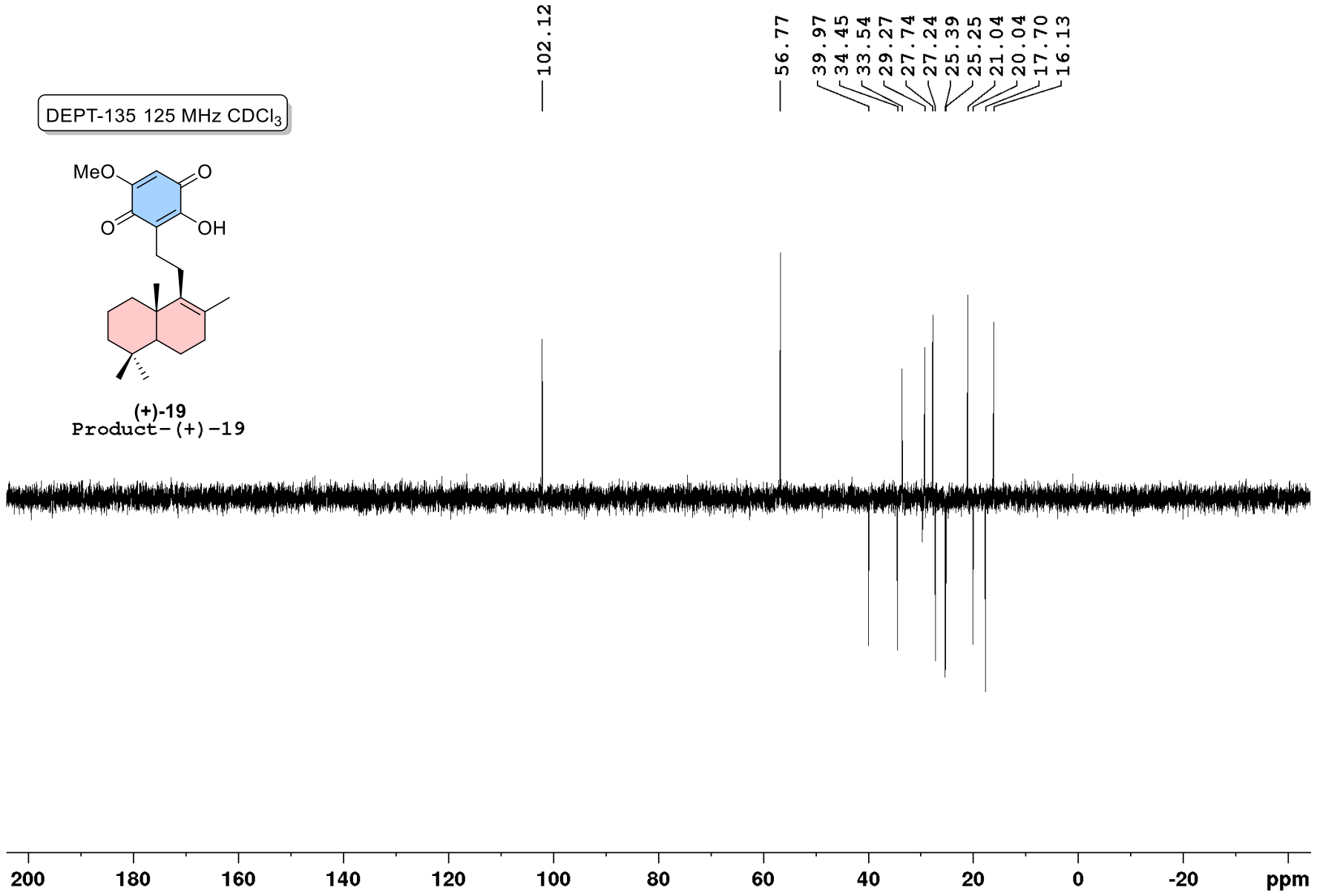
(+)-19
Product- (+)-19

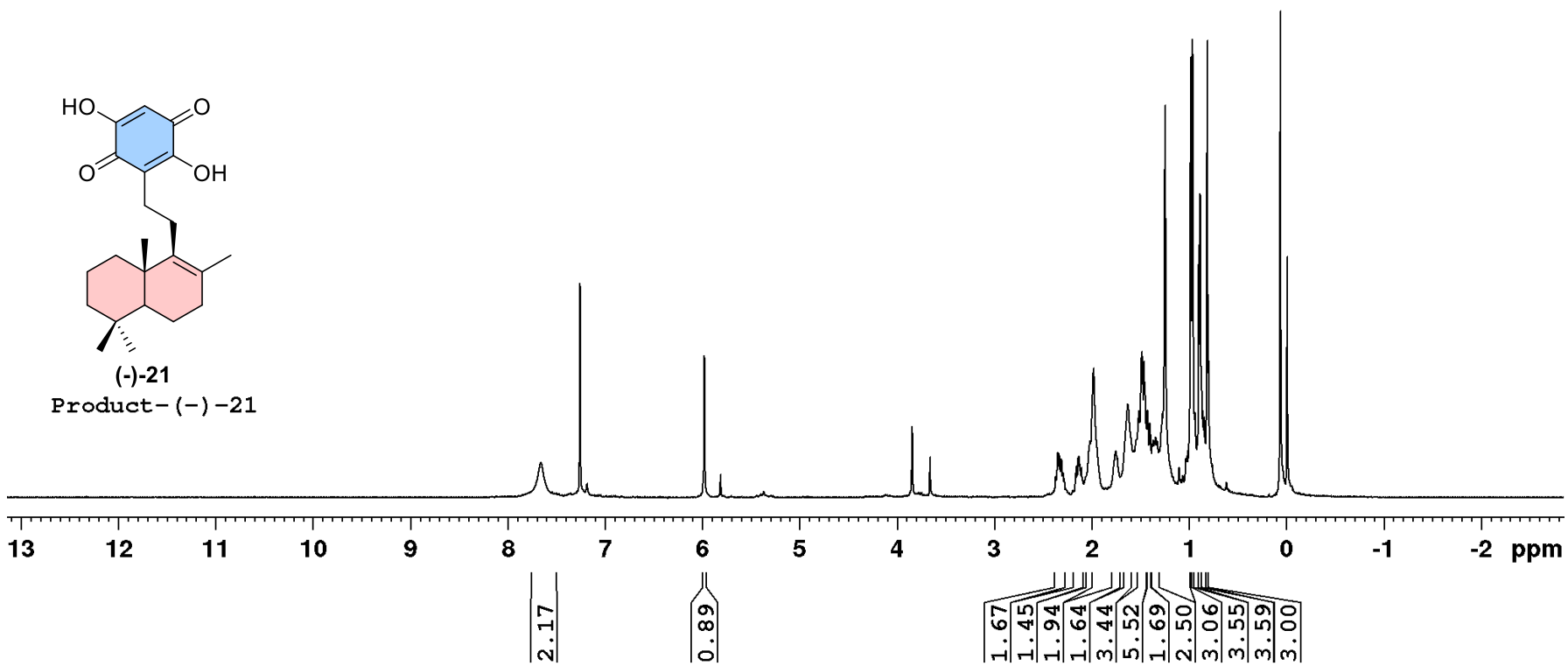


DEPT-135 125 MHz CDCl₃

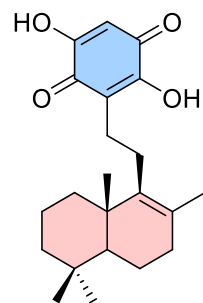


(+)-19
Product- (+)-19

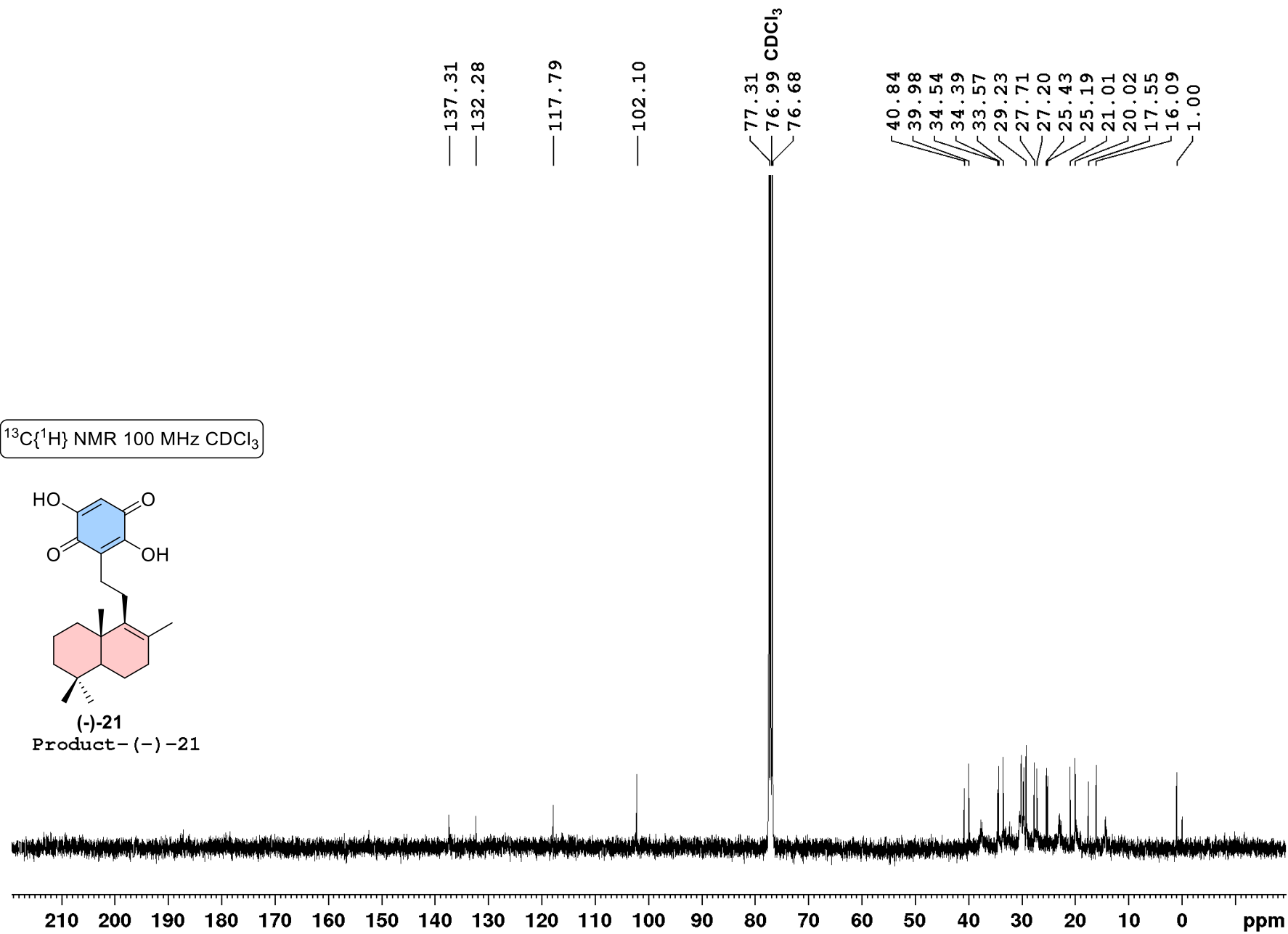


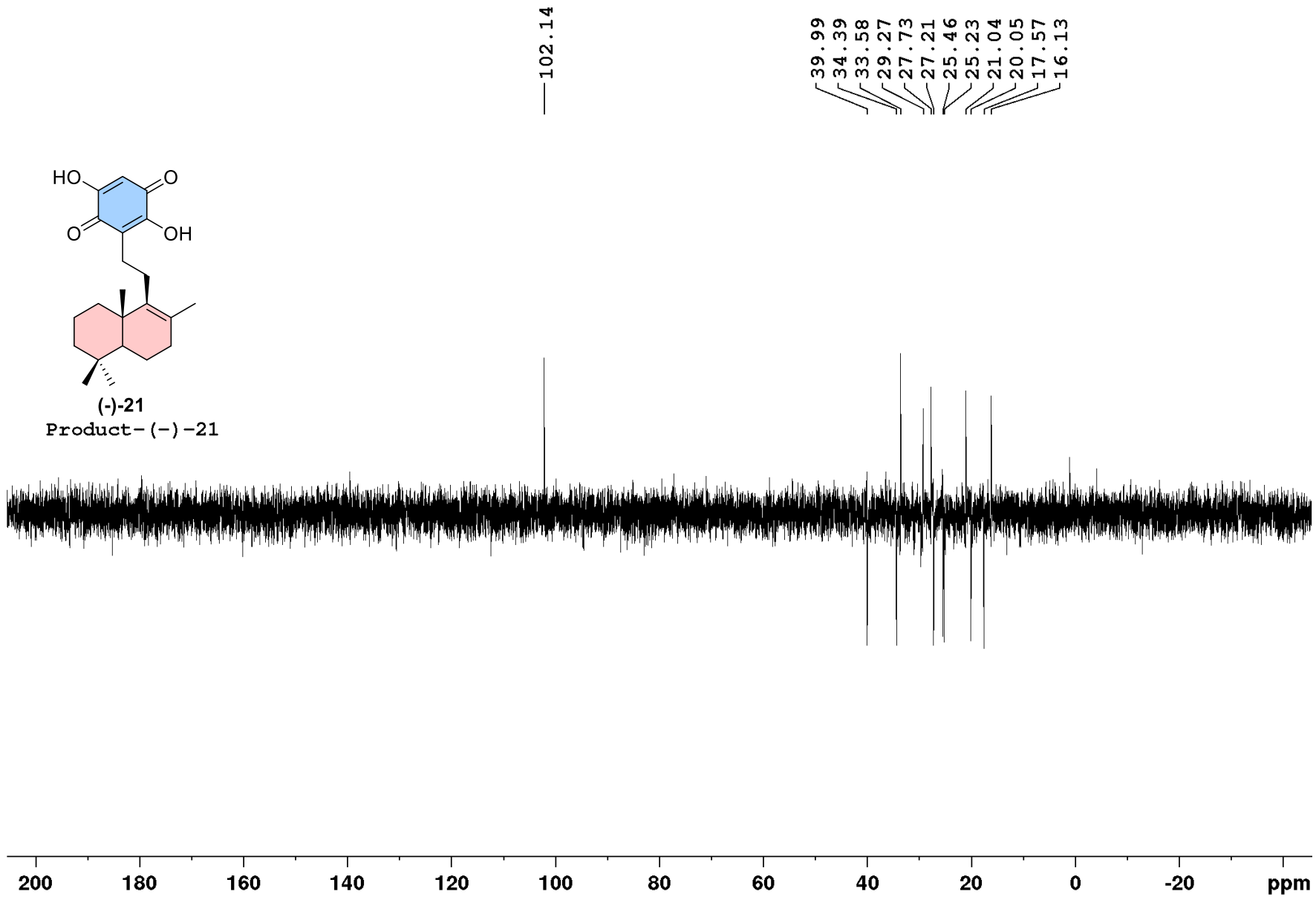


$^{13}\text{C}\{^1\text{H}\}$ NMR 100 MHz CDCl_3

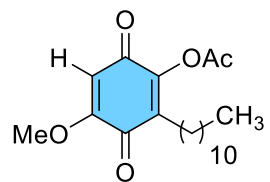


(-)-21
Product - (-) -21

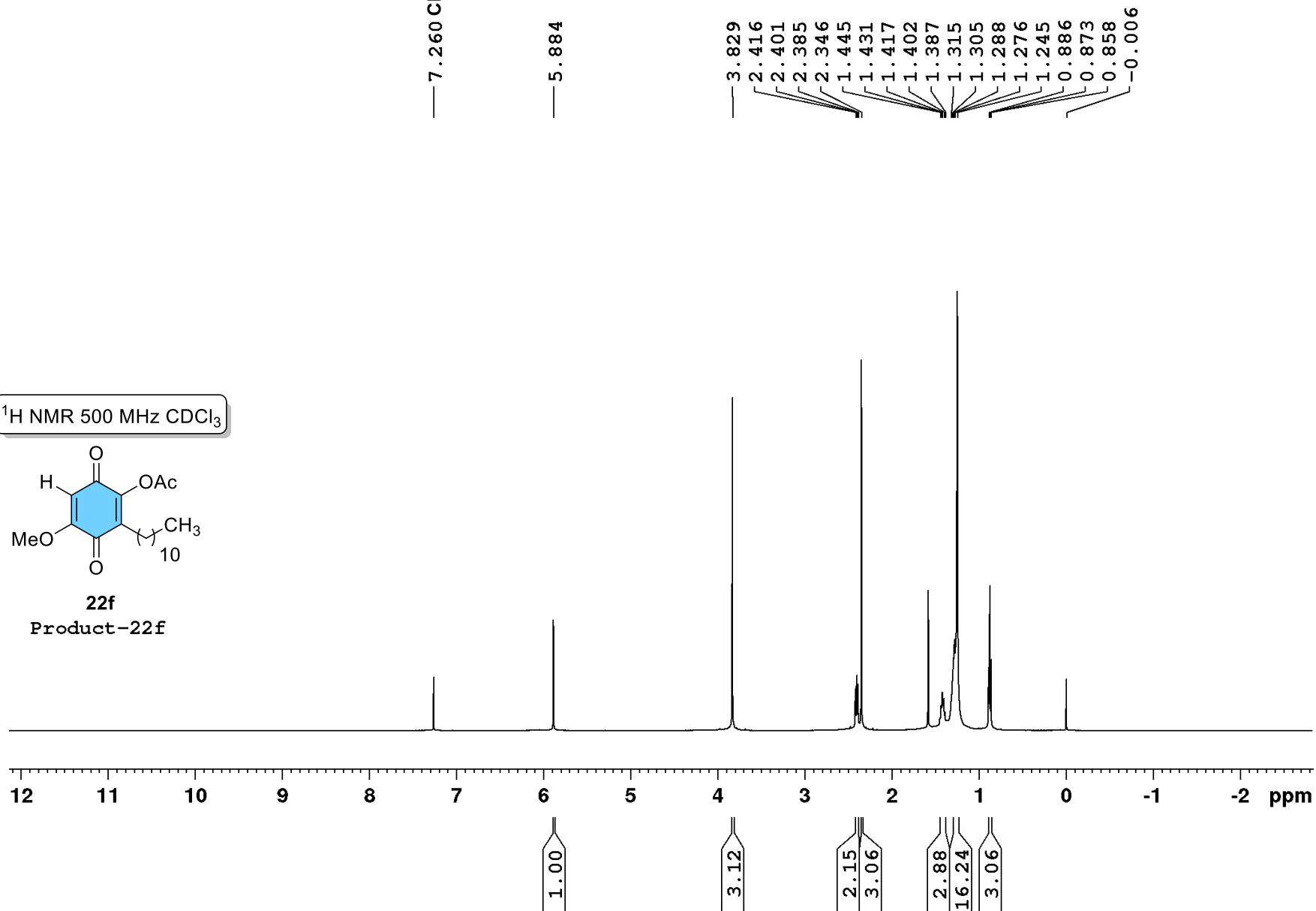




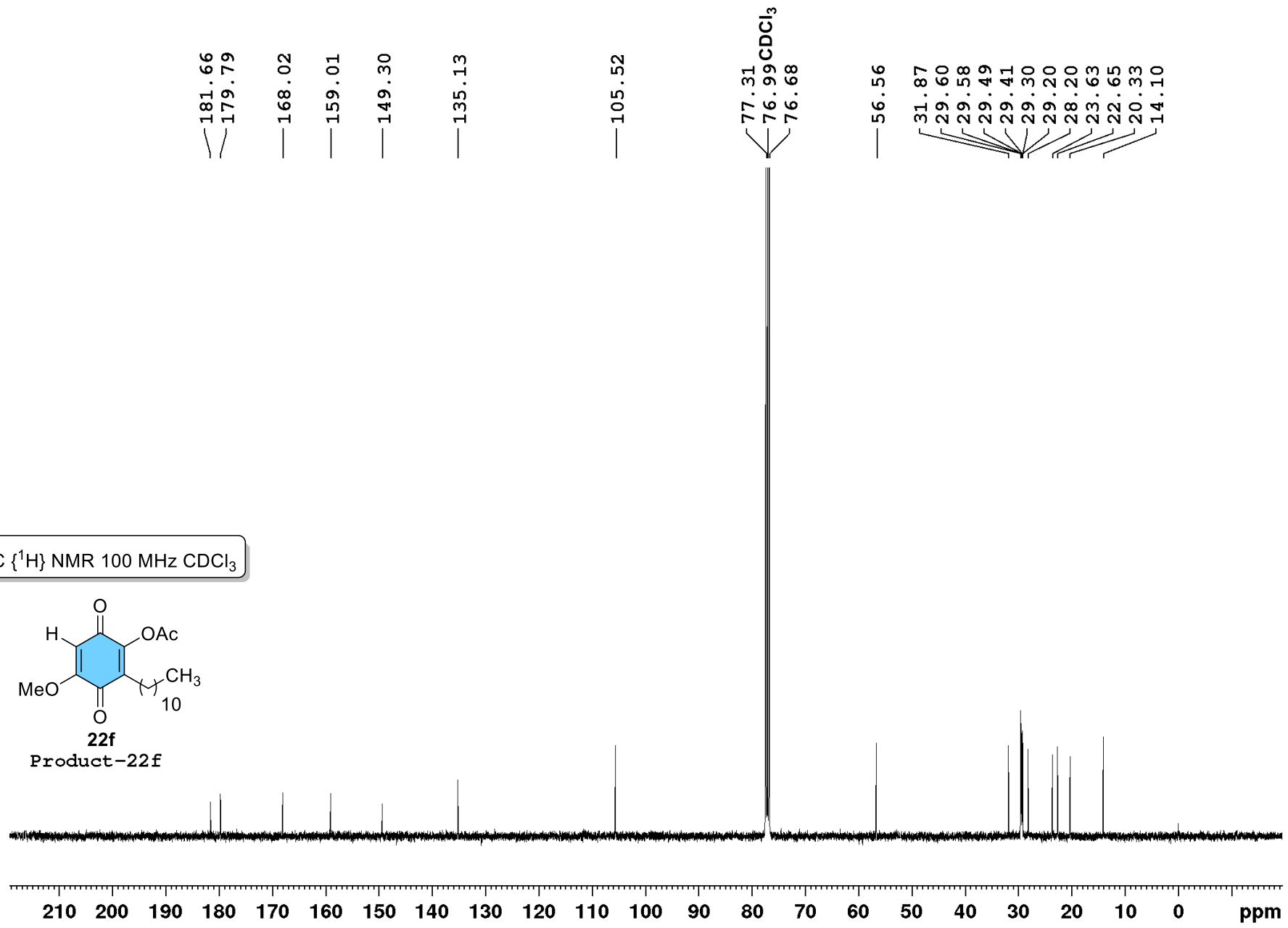
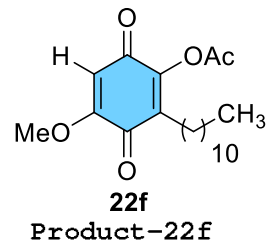
¹H NMR 500 MHz CDCl₃



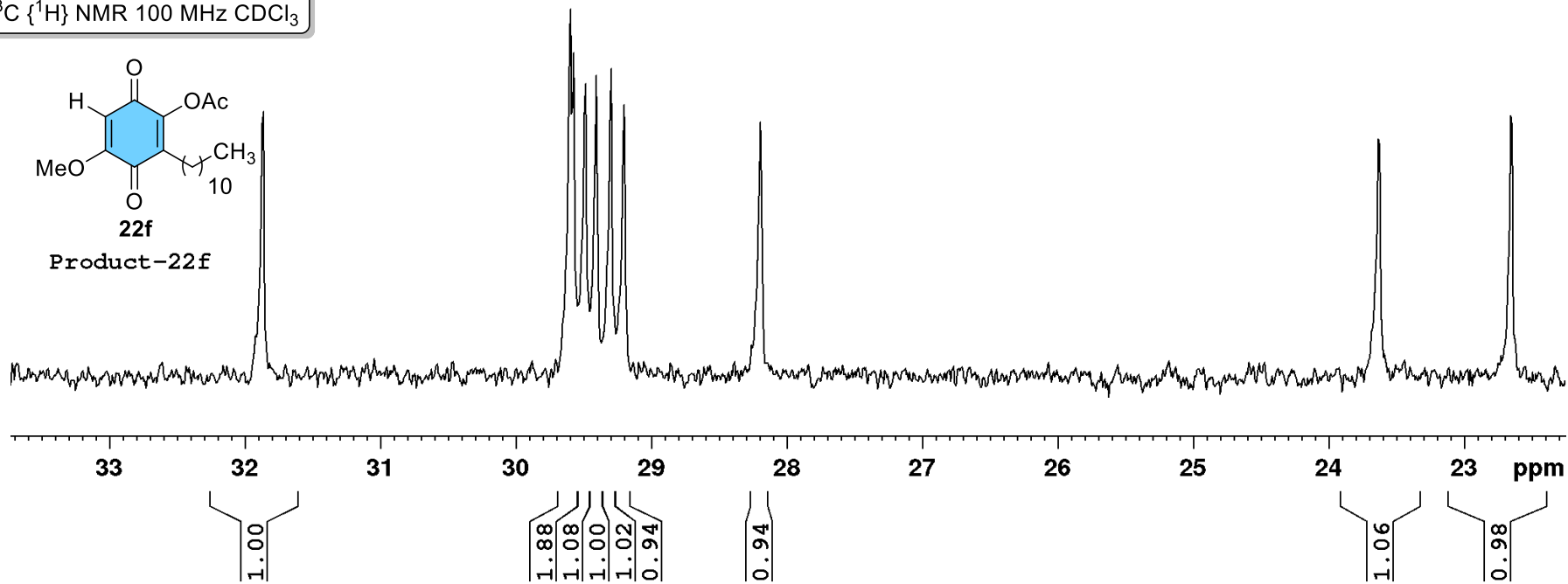
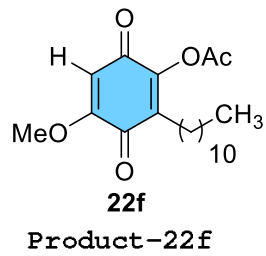
22f
Product-22f



$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



DEPT-135 NMR 100 MHz CDCl₃

