

## Supporting Information-III

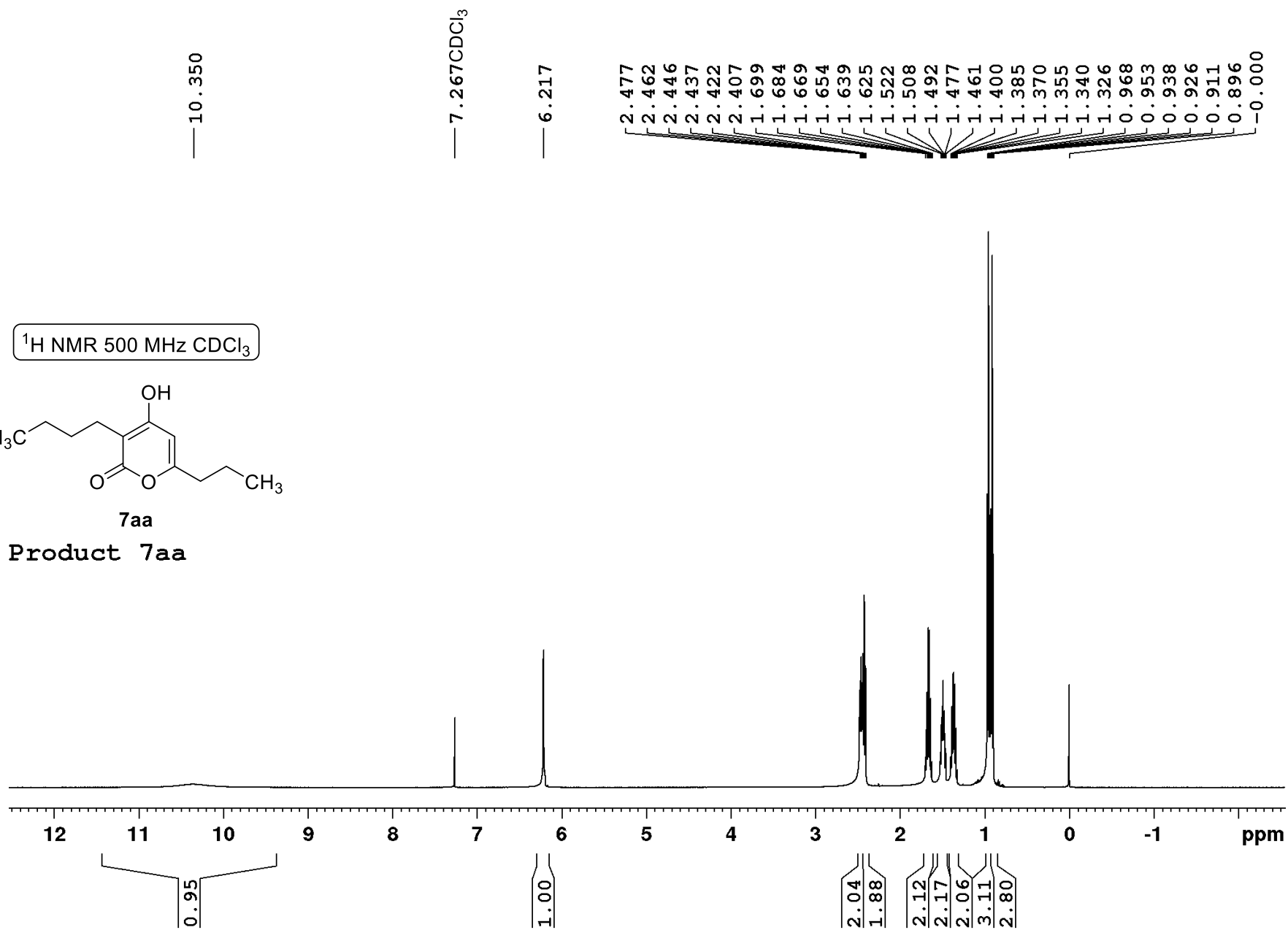
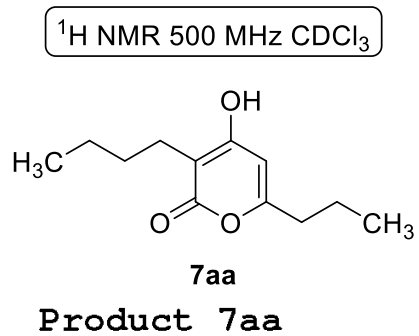
### Two-step, High-yielding Total Synthesis of Antibiotic Pyrones

Akram Hussain,<sup>[a]‡</sup> Revoju Sravanthi,<sup>[a][b]‡</sup> Sunitha Katta,<sup>[b]</sup> and Dhevalapally B. Ramachary\*<sup>[a]</sup>

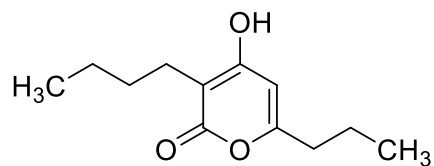
‡These authors contributed equally.

[a] Dr. Akram Hussain, Ms. Revoju Sravanthi, and Prof. Dr. Dhevalapally B. Ramachary  
Catalysis Laboratory, School of Chemistry, University of Hyderabad, Hyderabad-500 046, India;  
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Gitam Deemed to be University, Visakhapatnam, 530 045, Andhra Pradesh, India

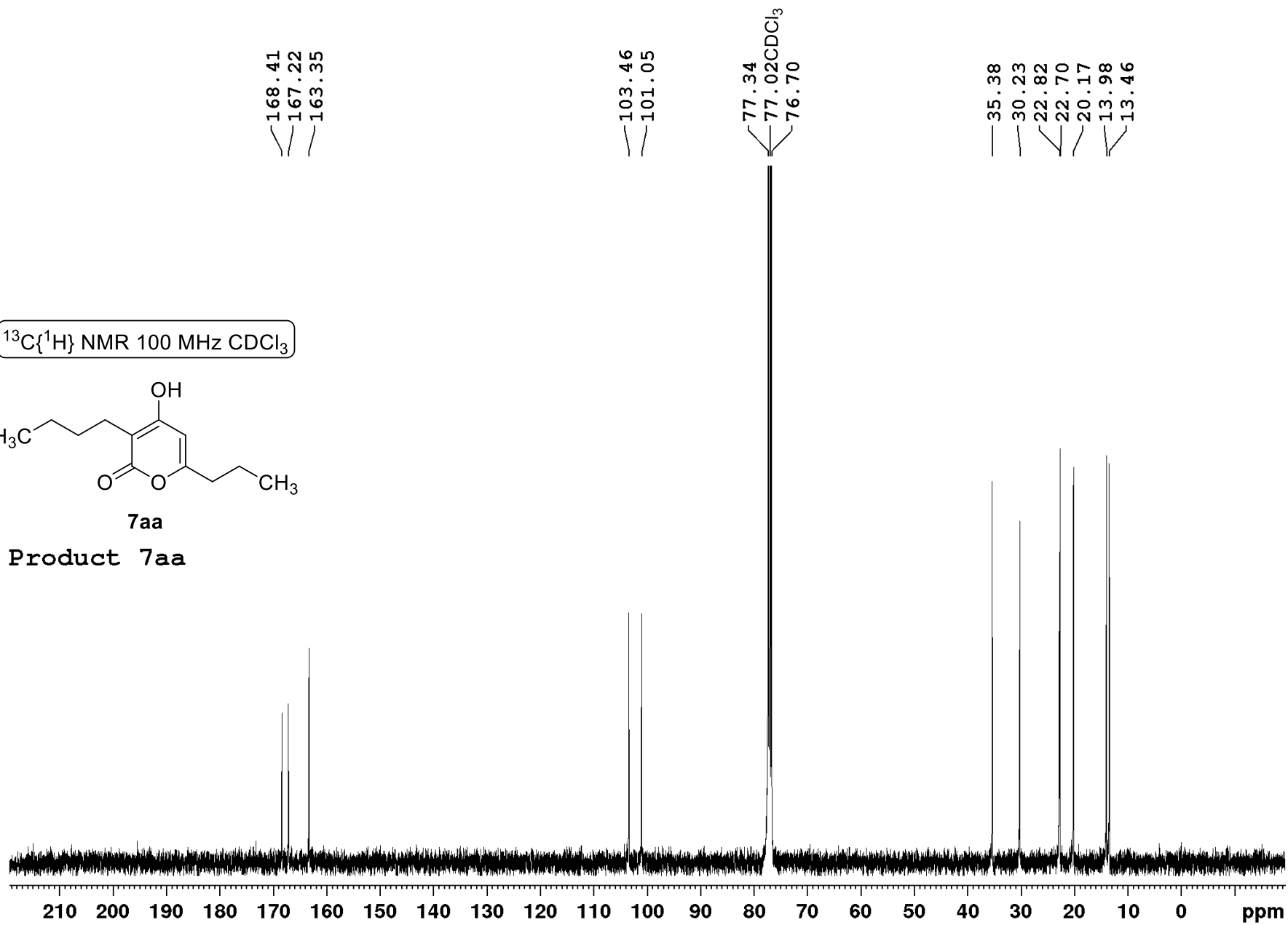


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

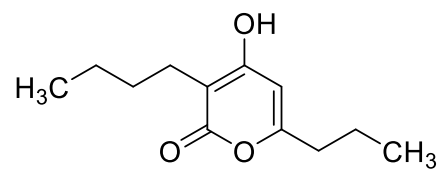


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**Product 7aa**

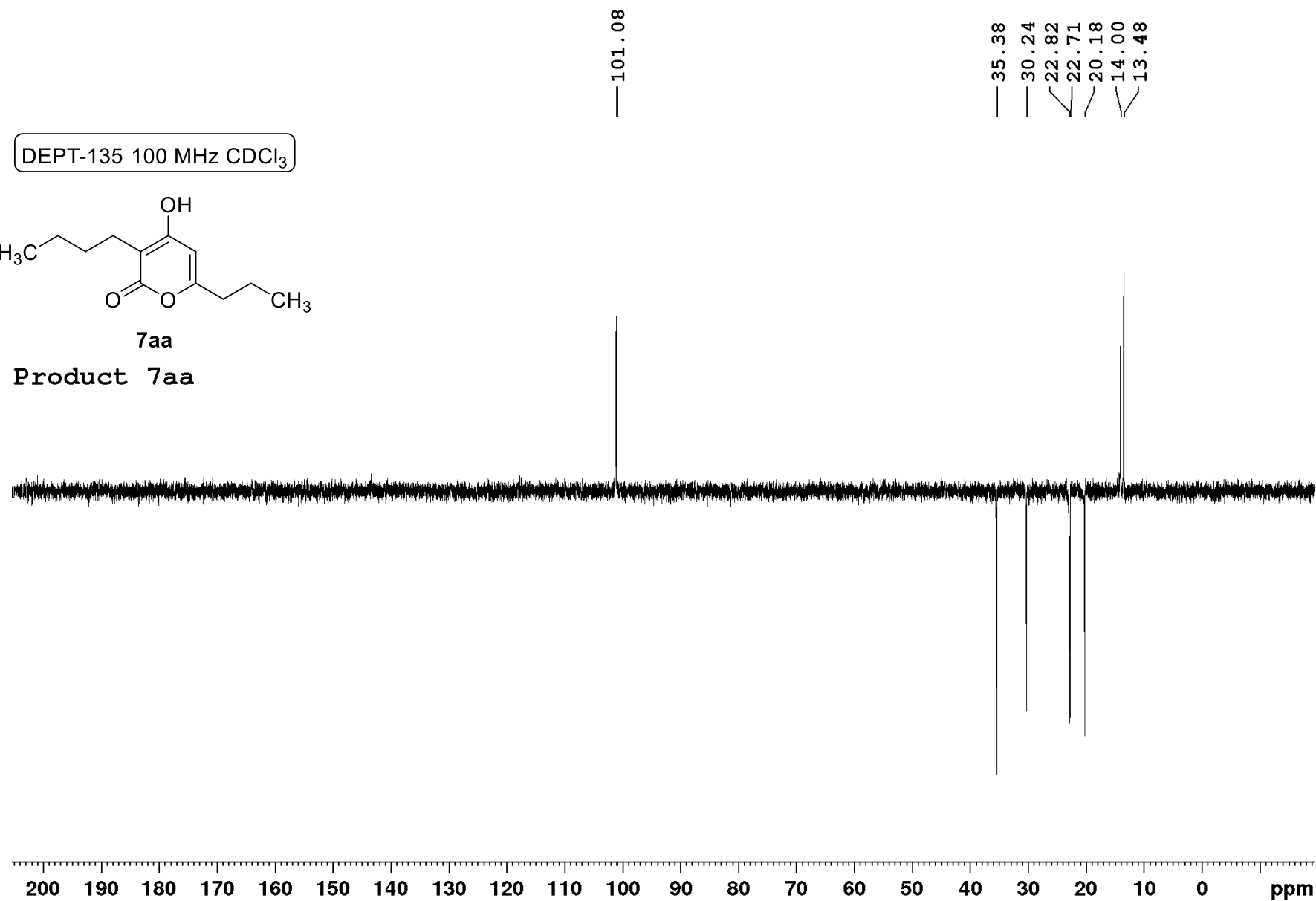


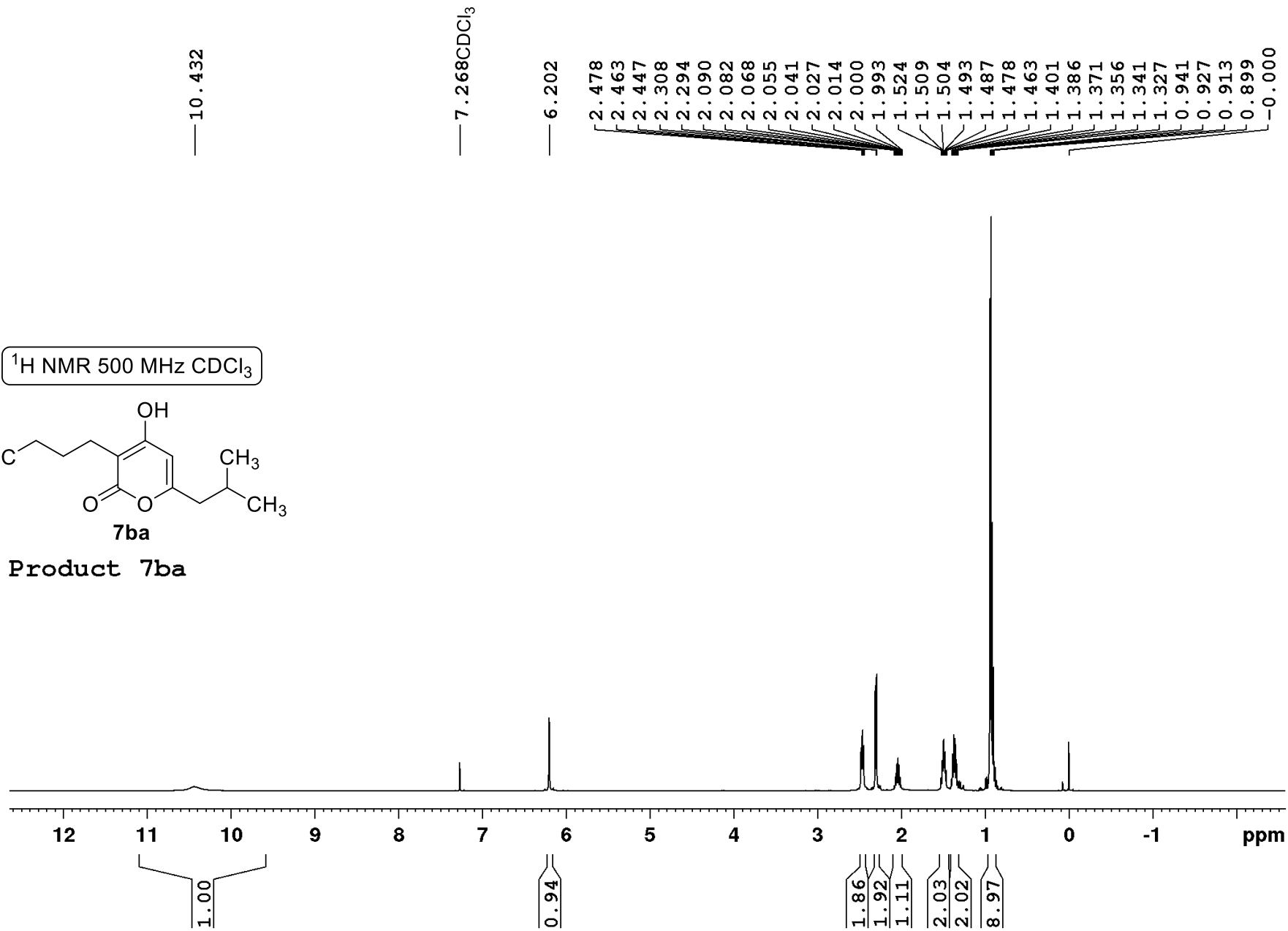
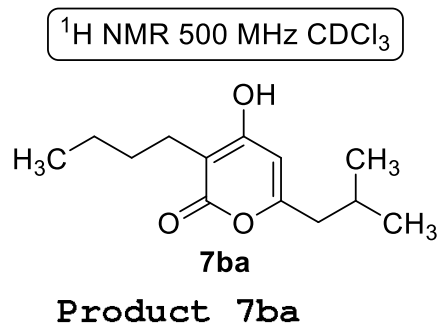
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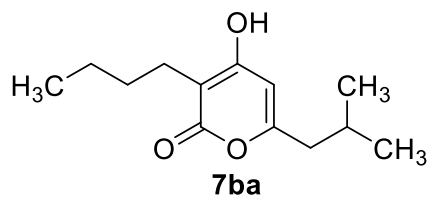
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Product 7aa

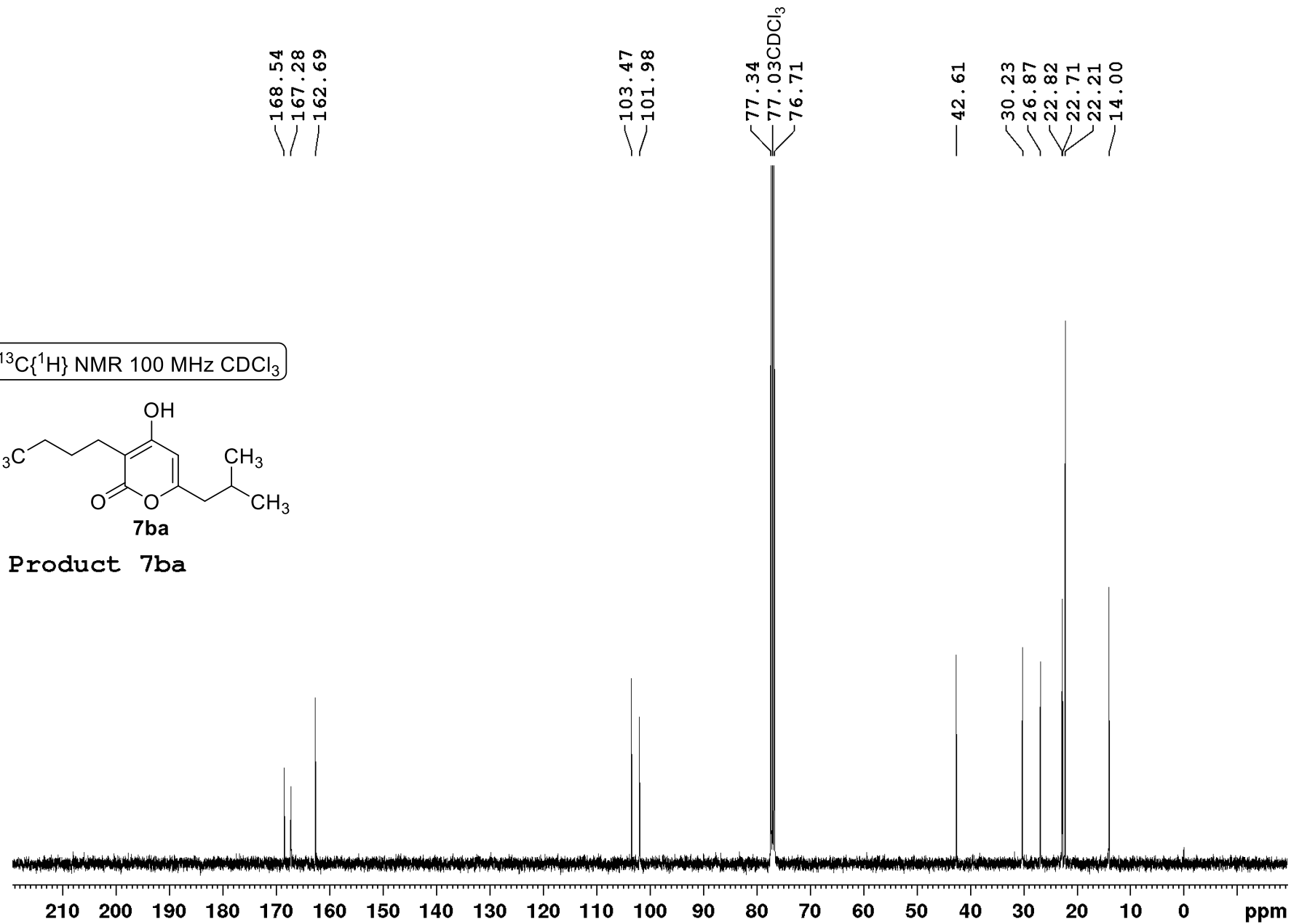




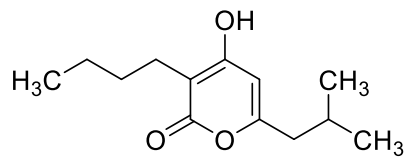
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Product 7ba

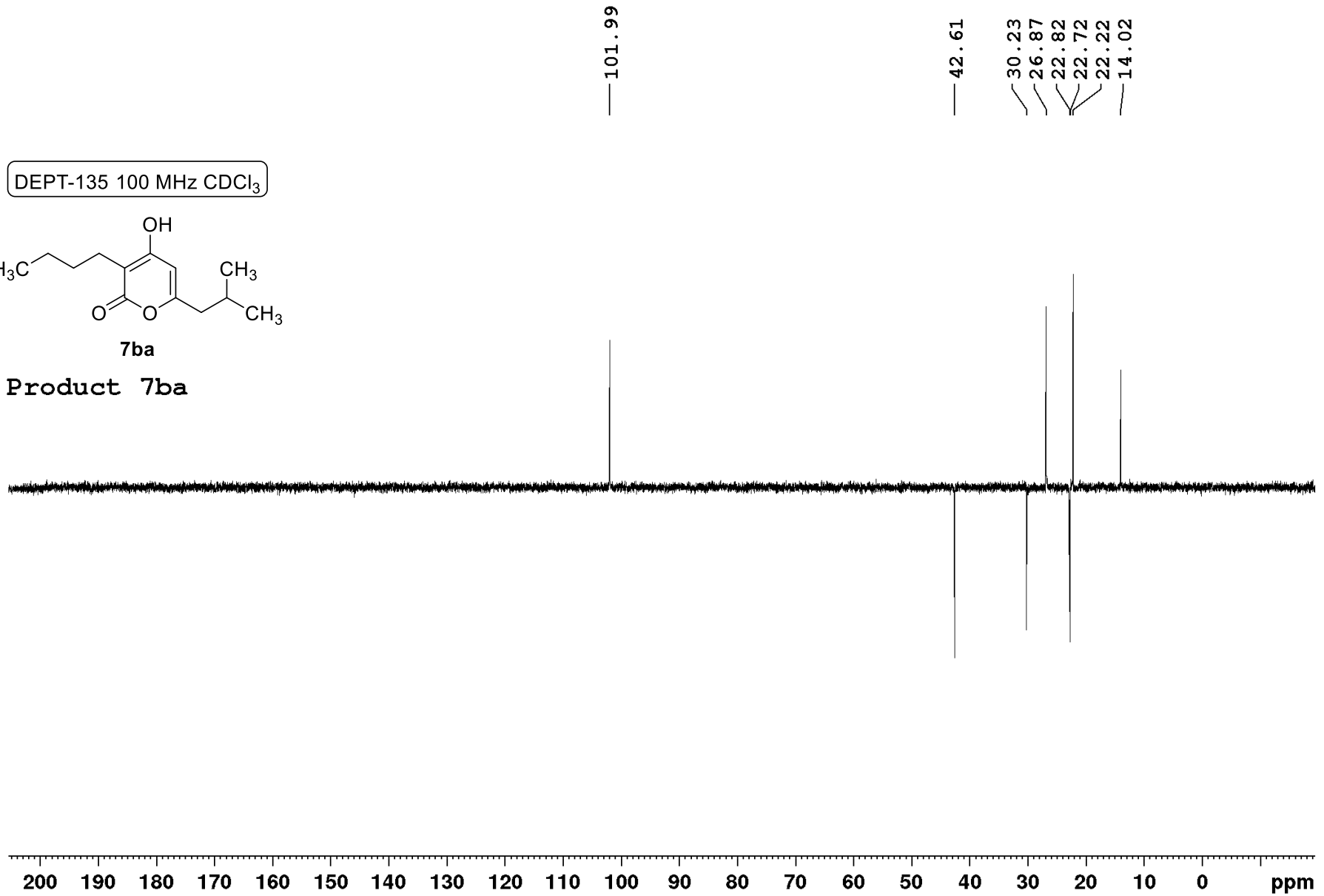


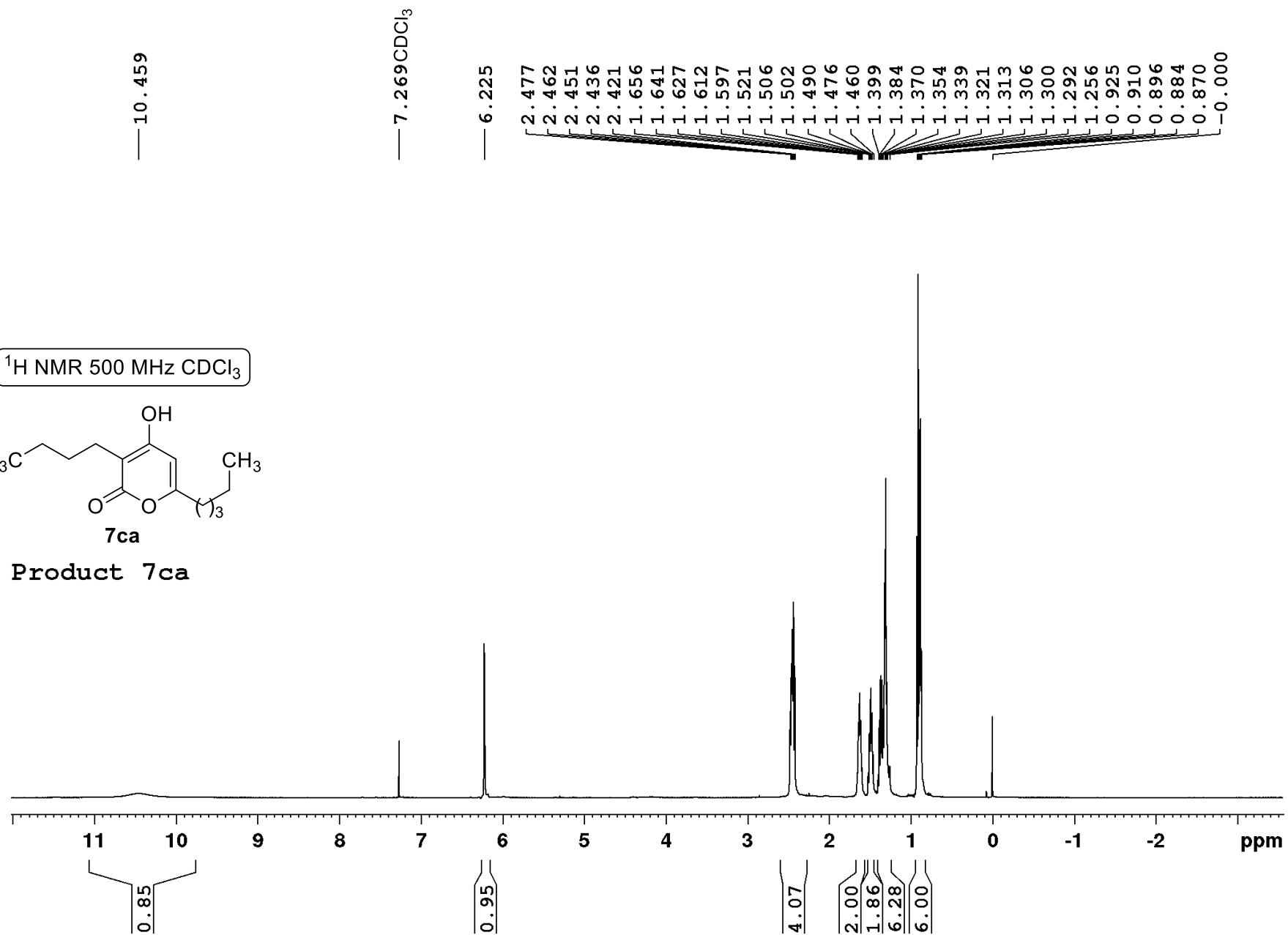
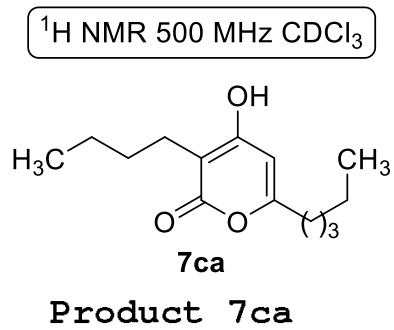
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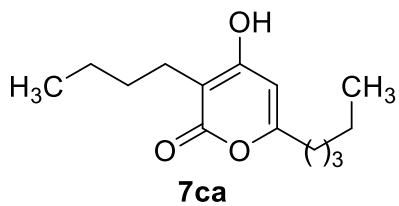
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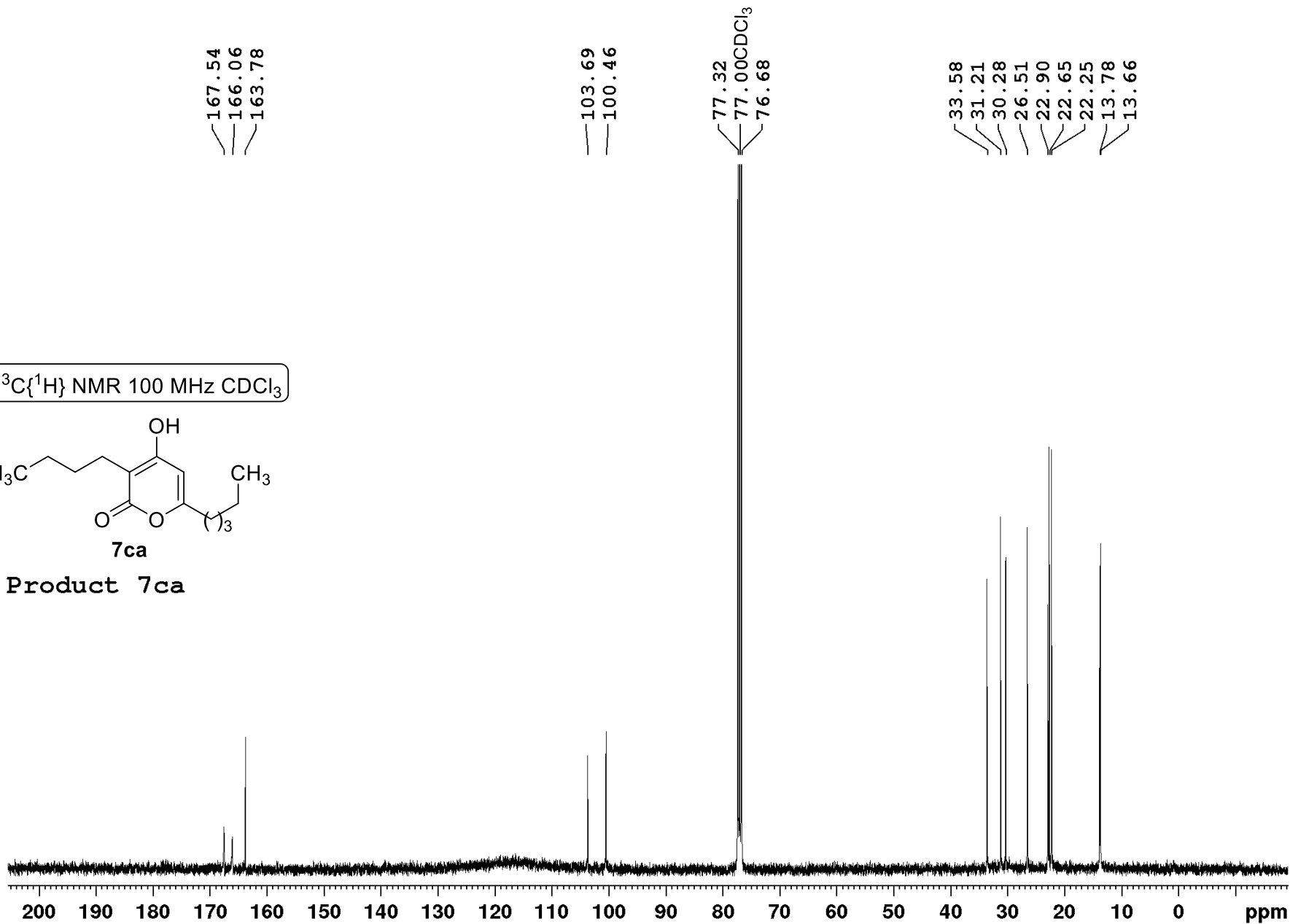




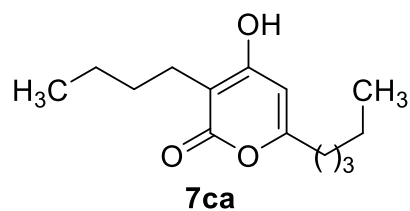
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Product 7ca



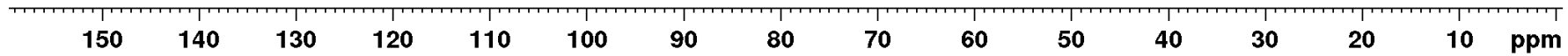
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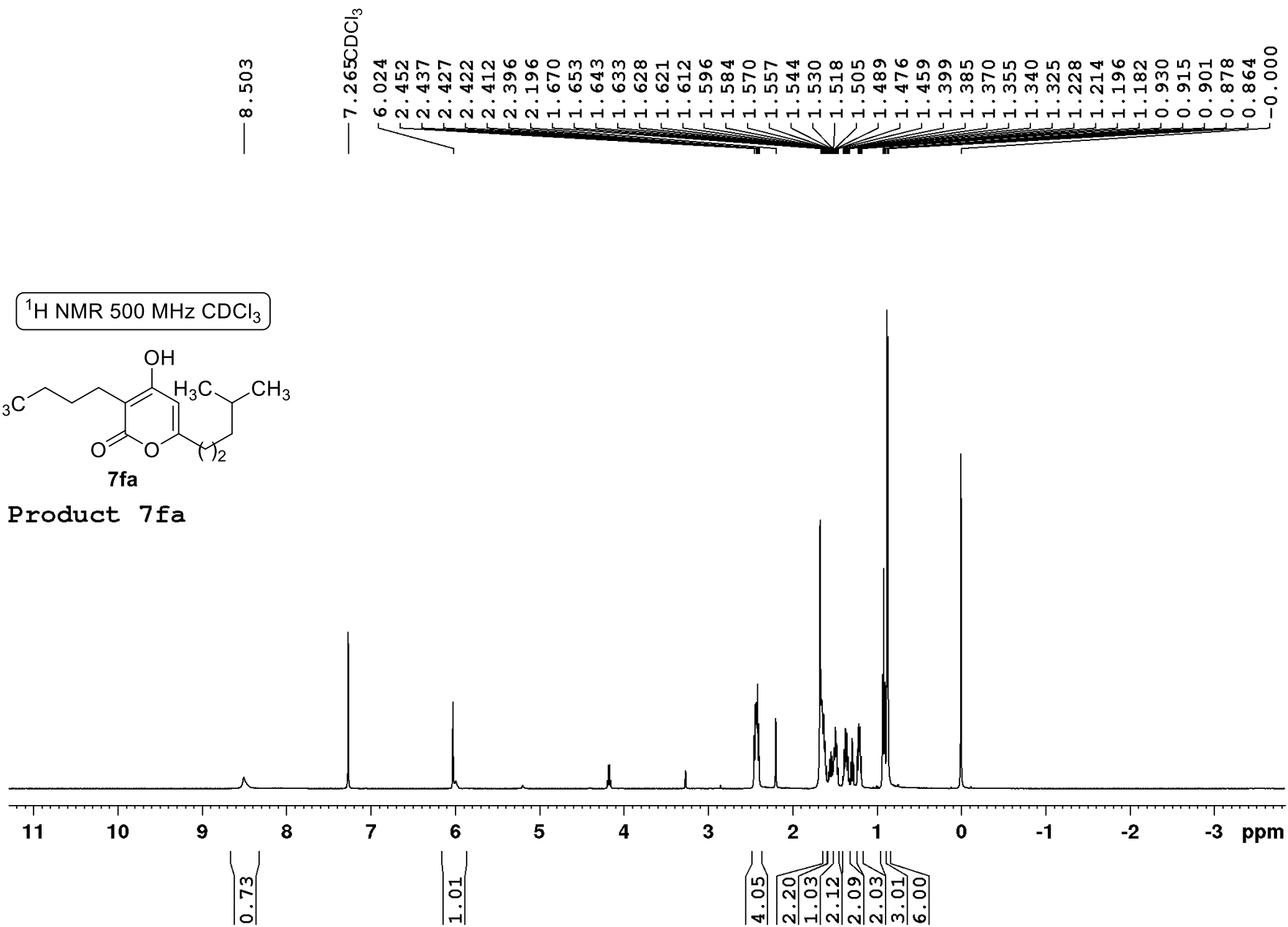
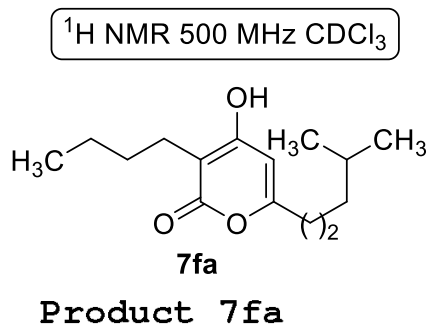


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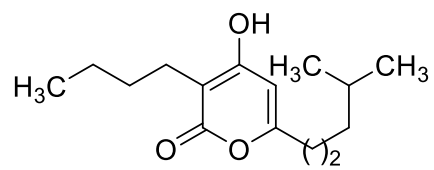
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13.35



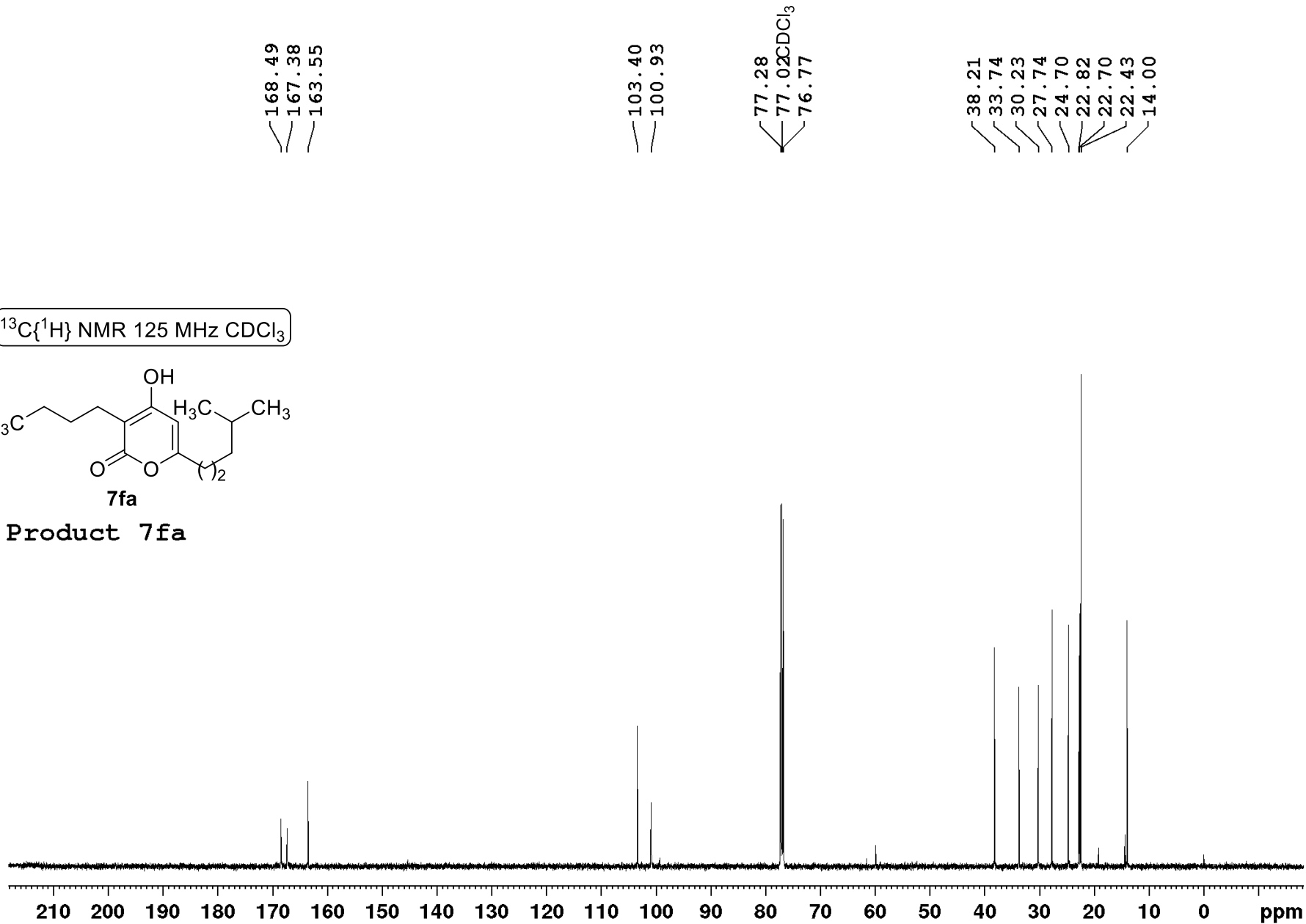


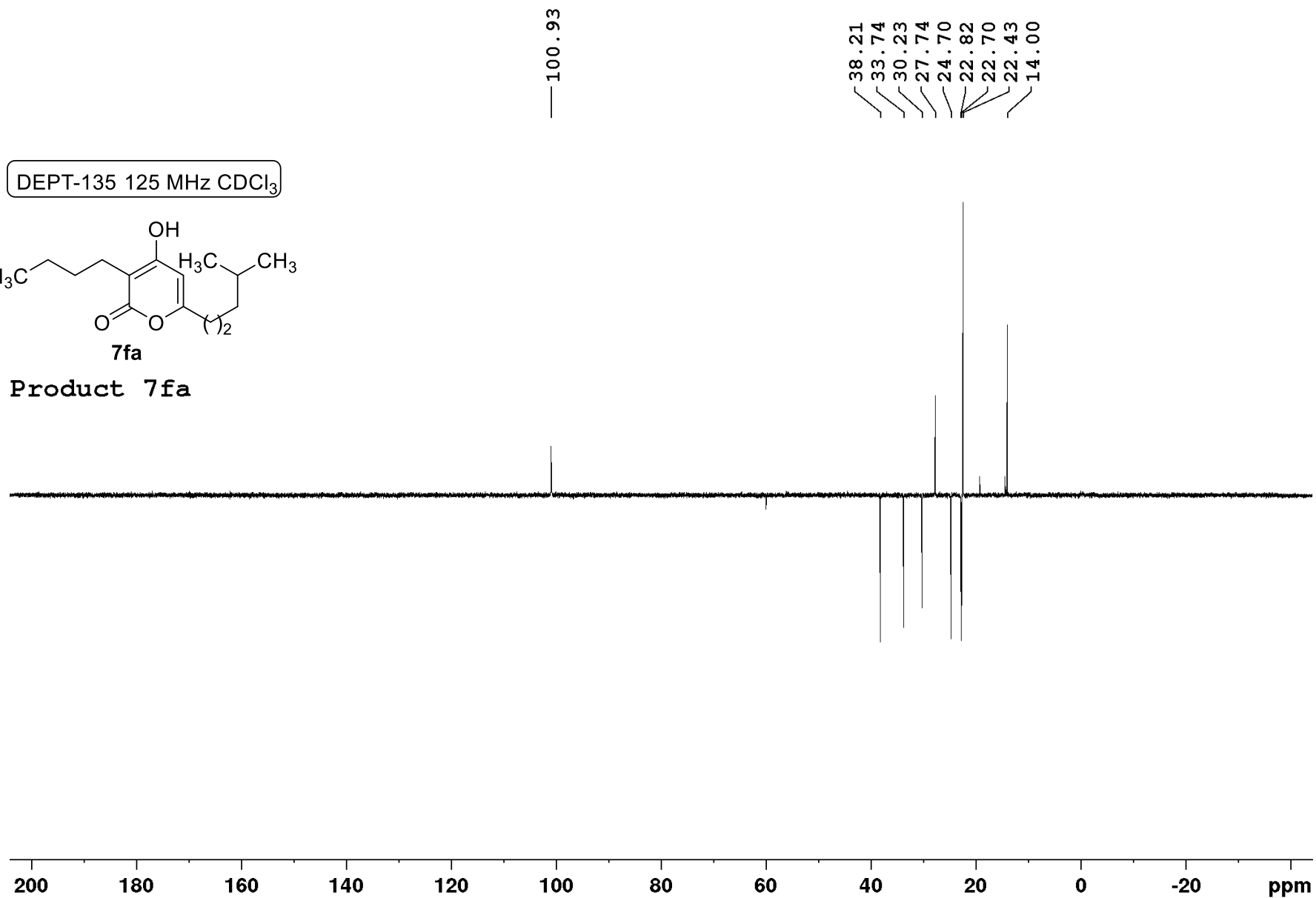
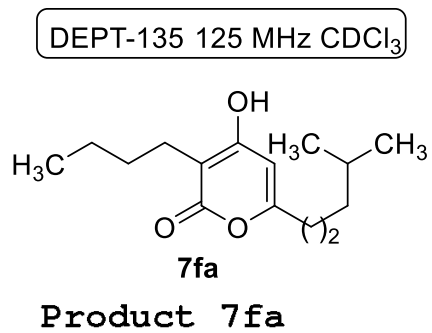
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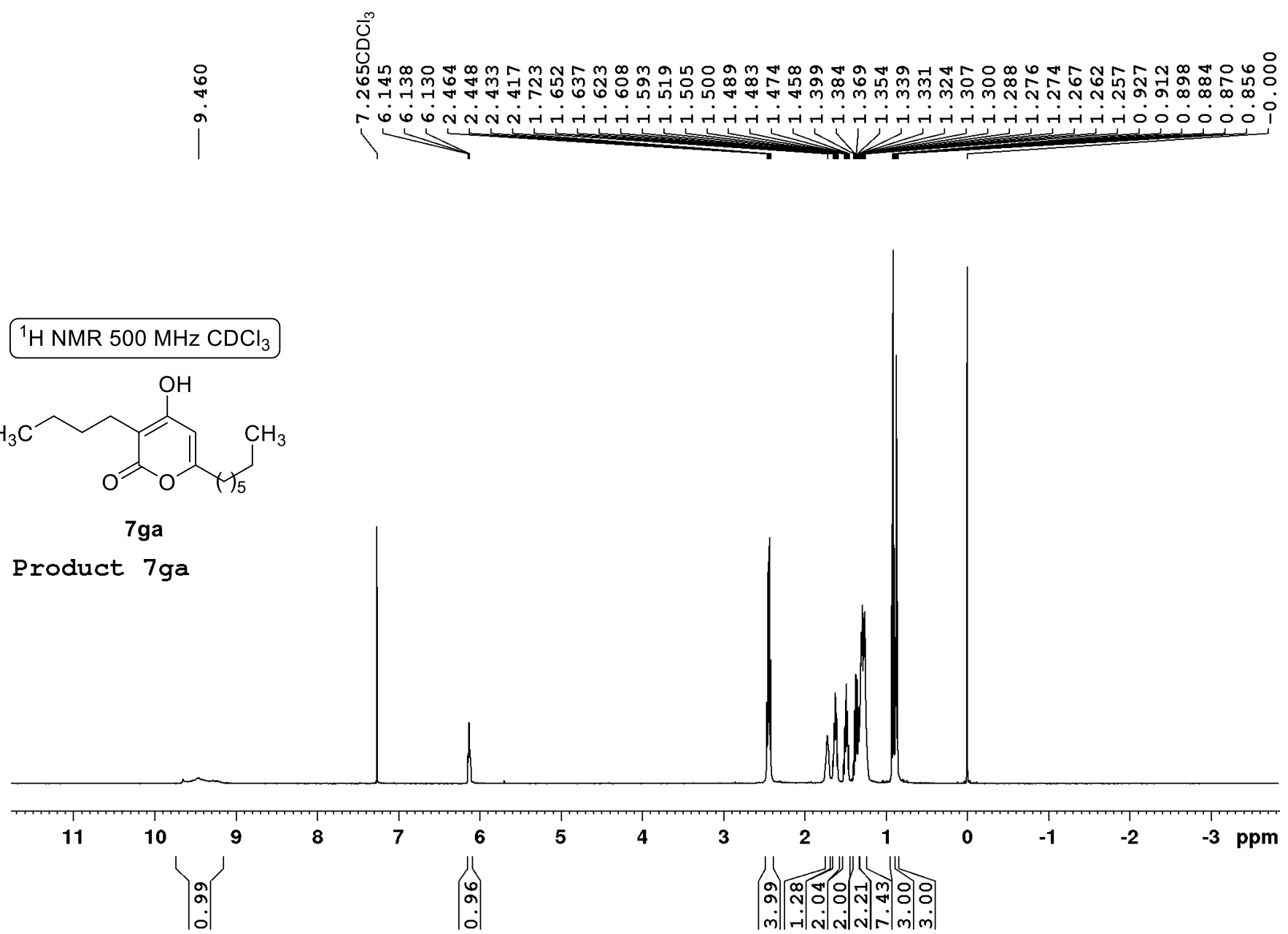
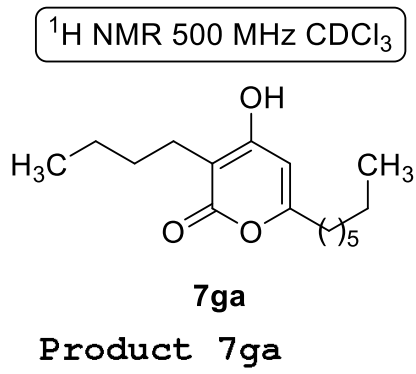


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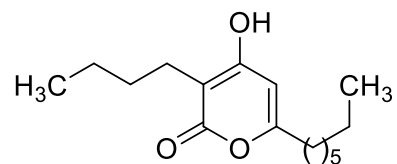
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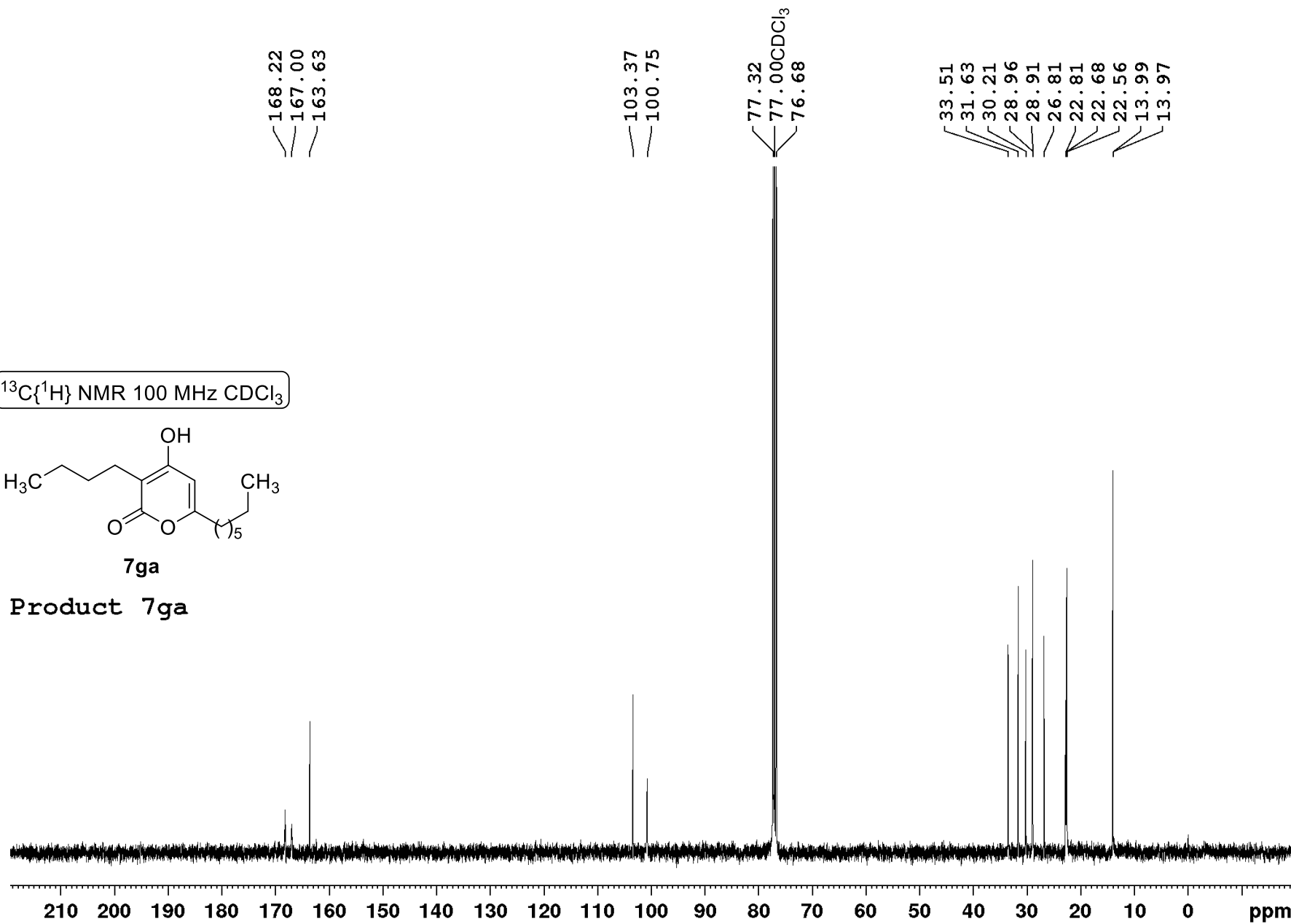


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

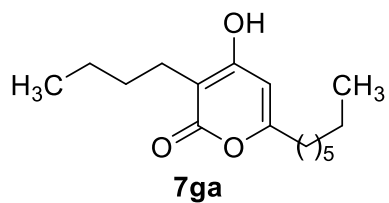


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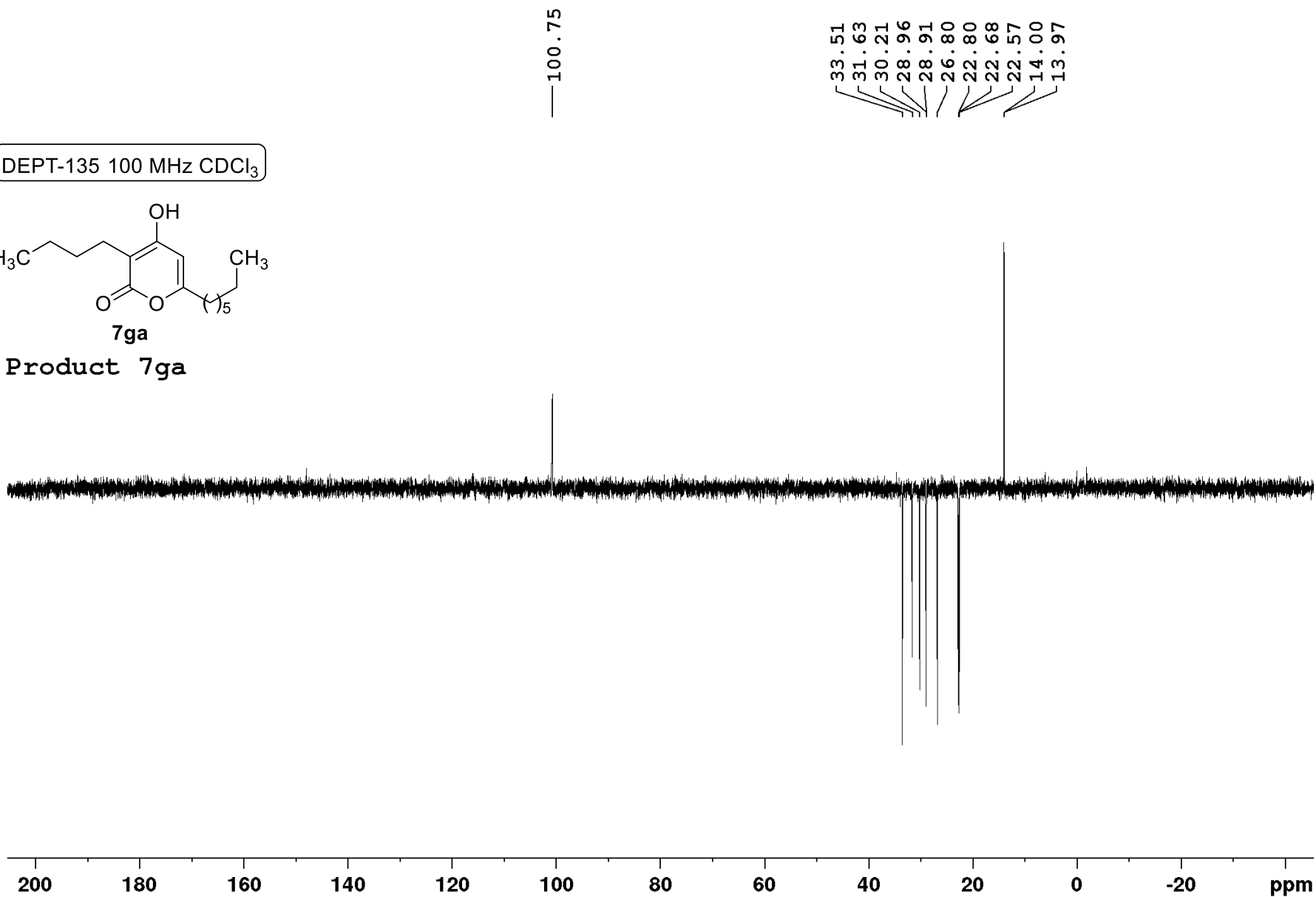
Product 7ga



DEPT-135 100 MHz CDCl<sub>3</sub>

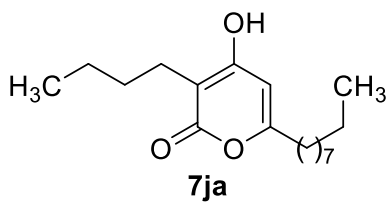


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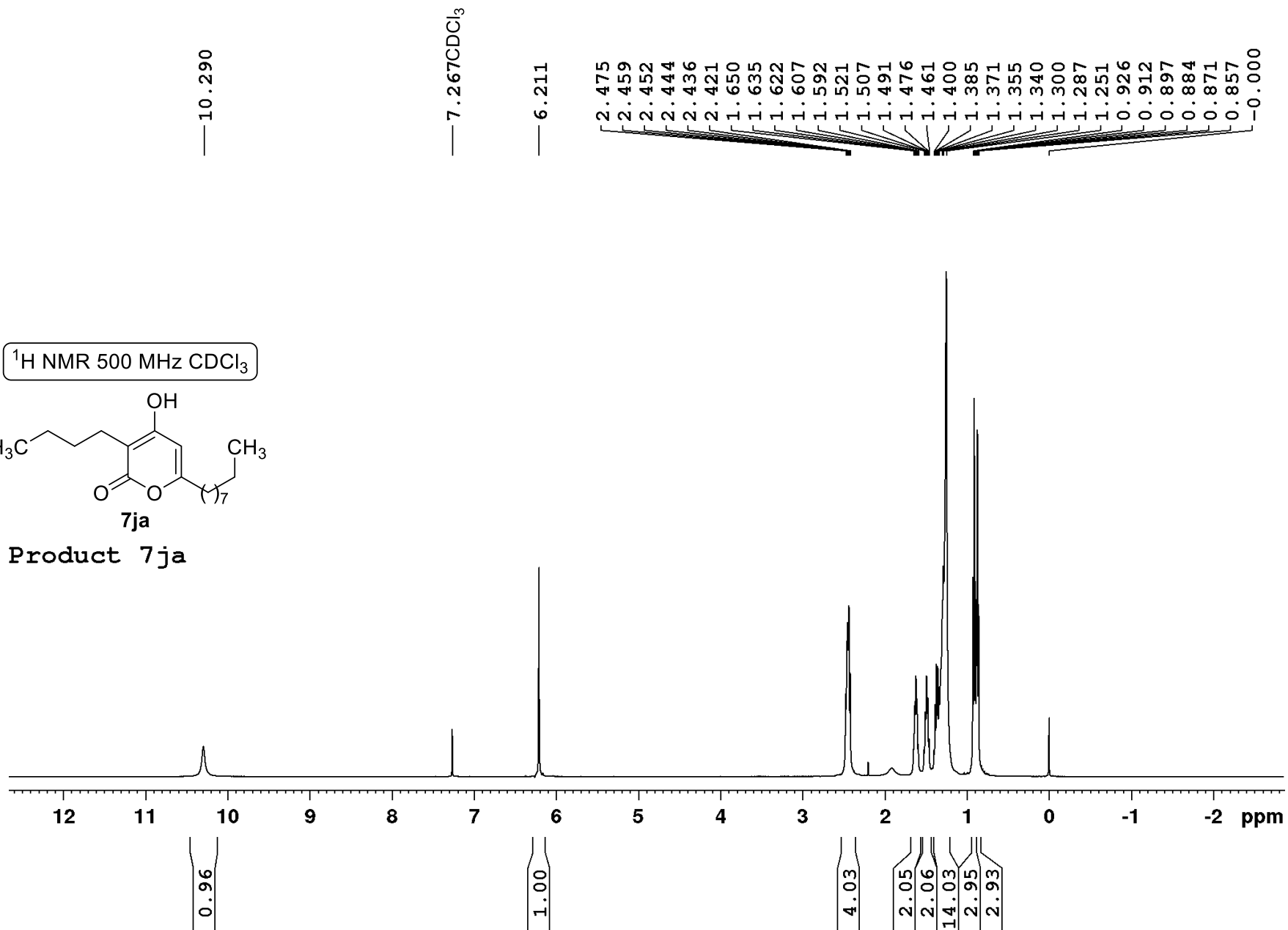




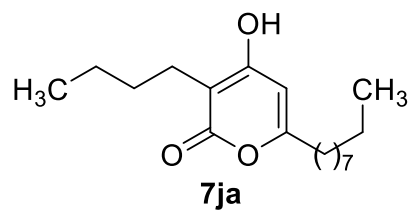
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



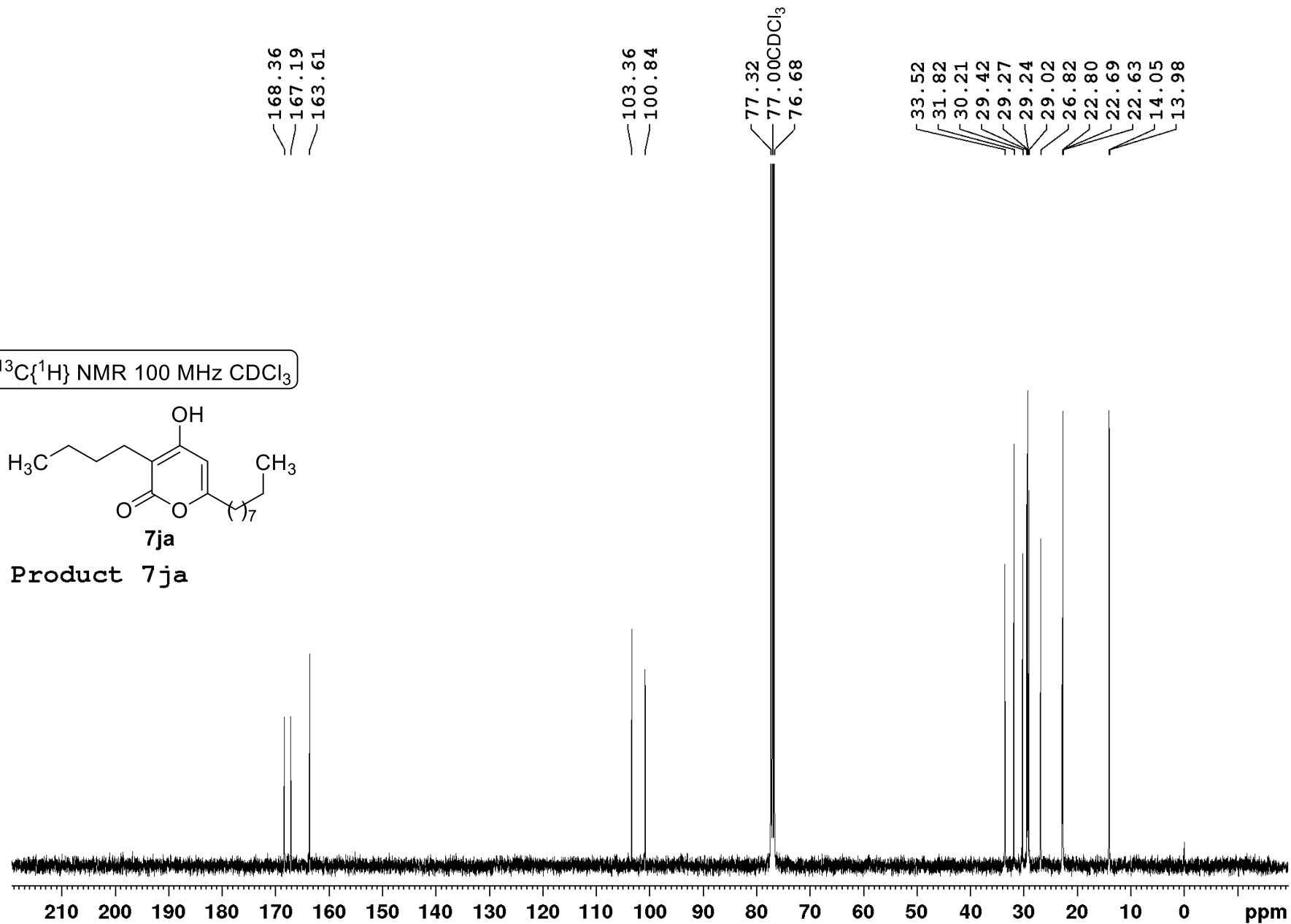
Product 7ja



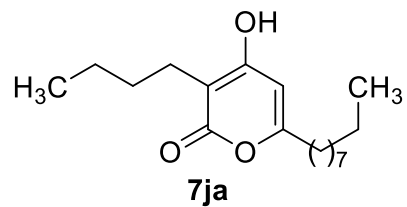
$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



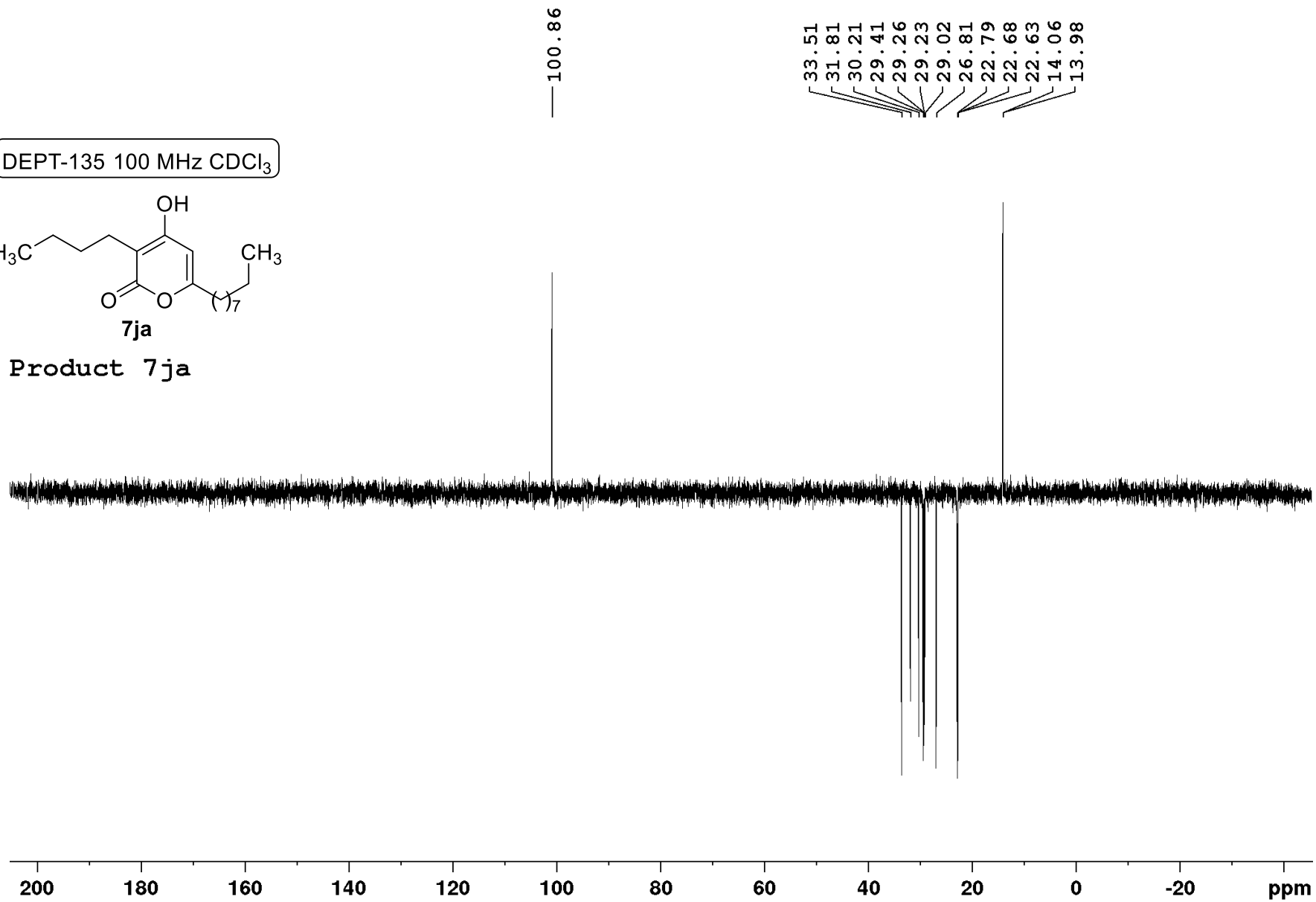
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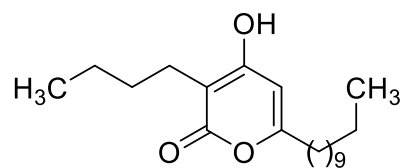
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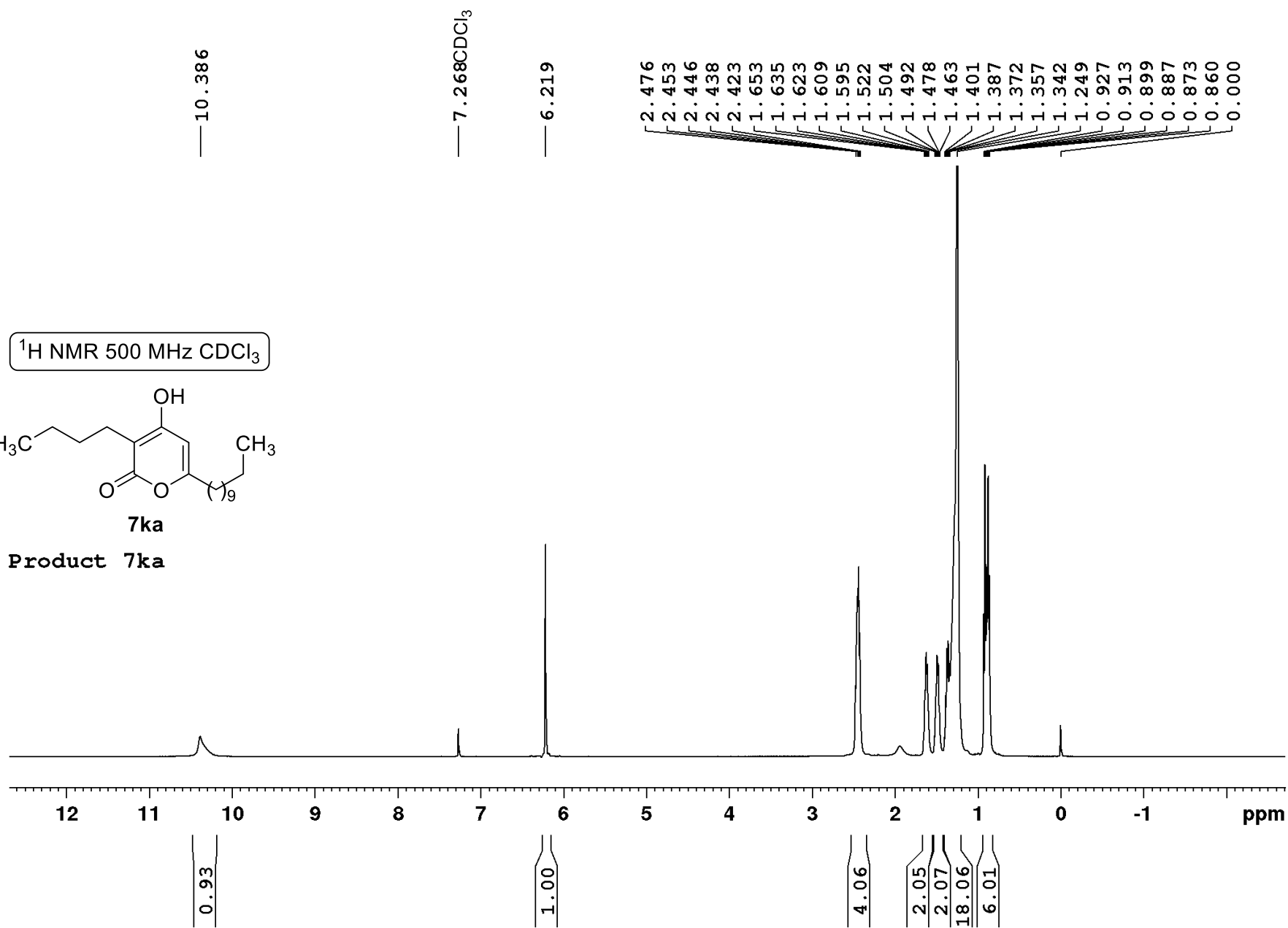


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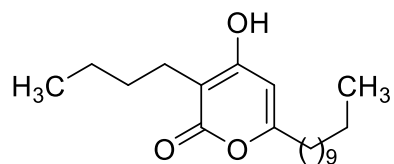


7ka

Product 7ka

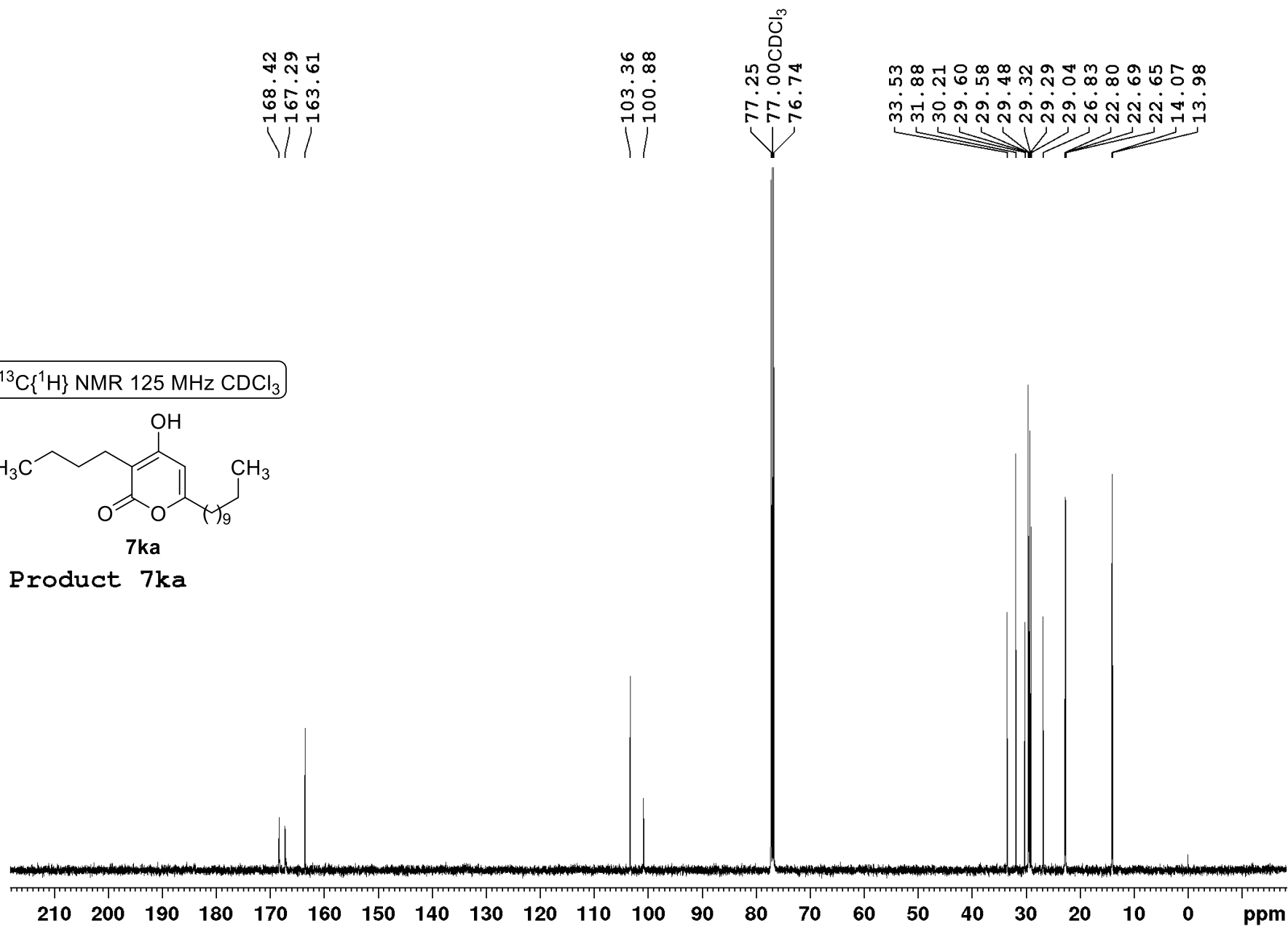


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

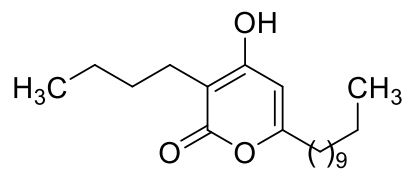


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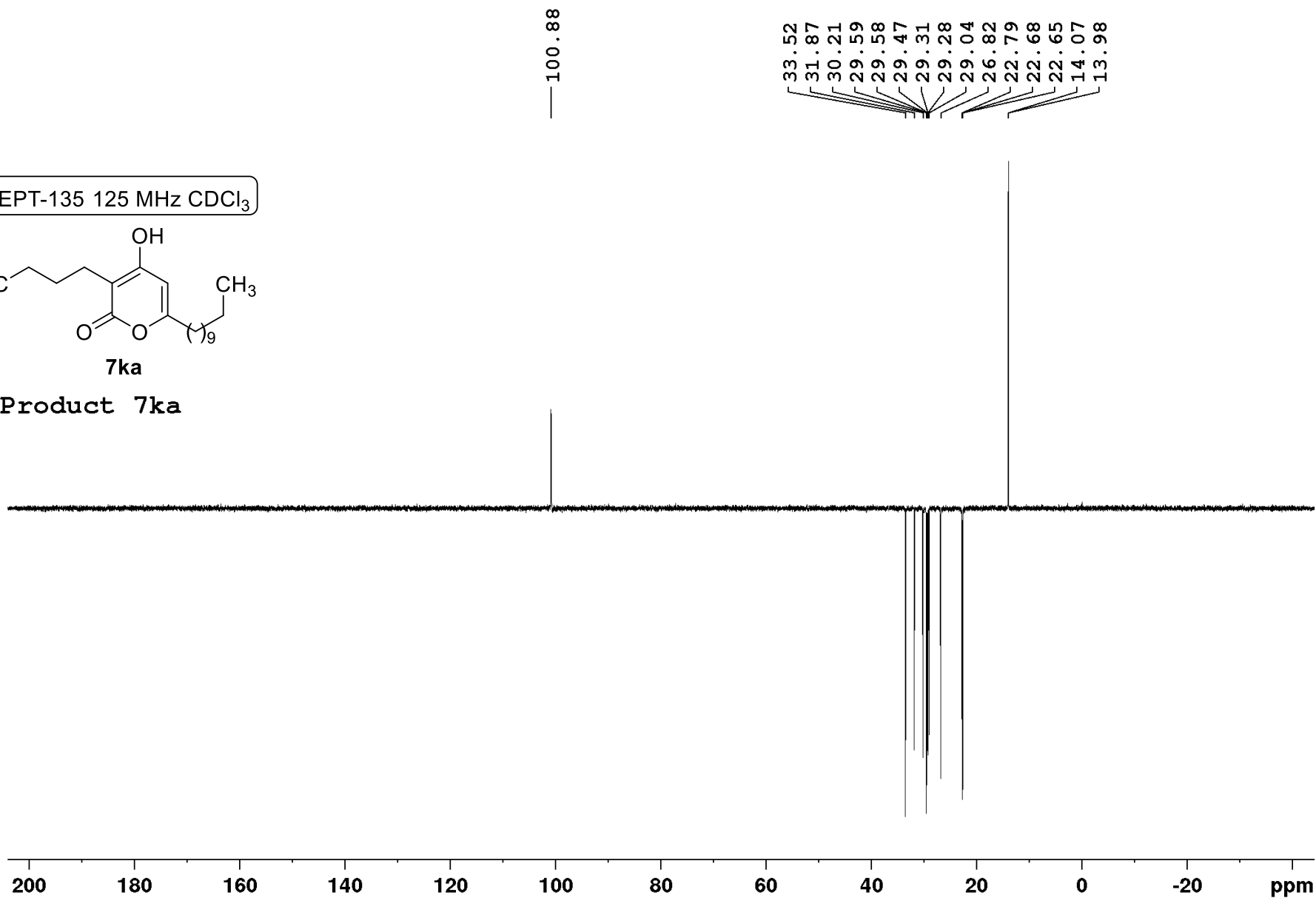


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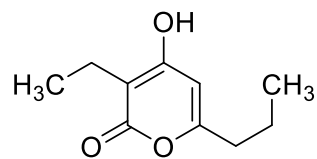


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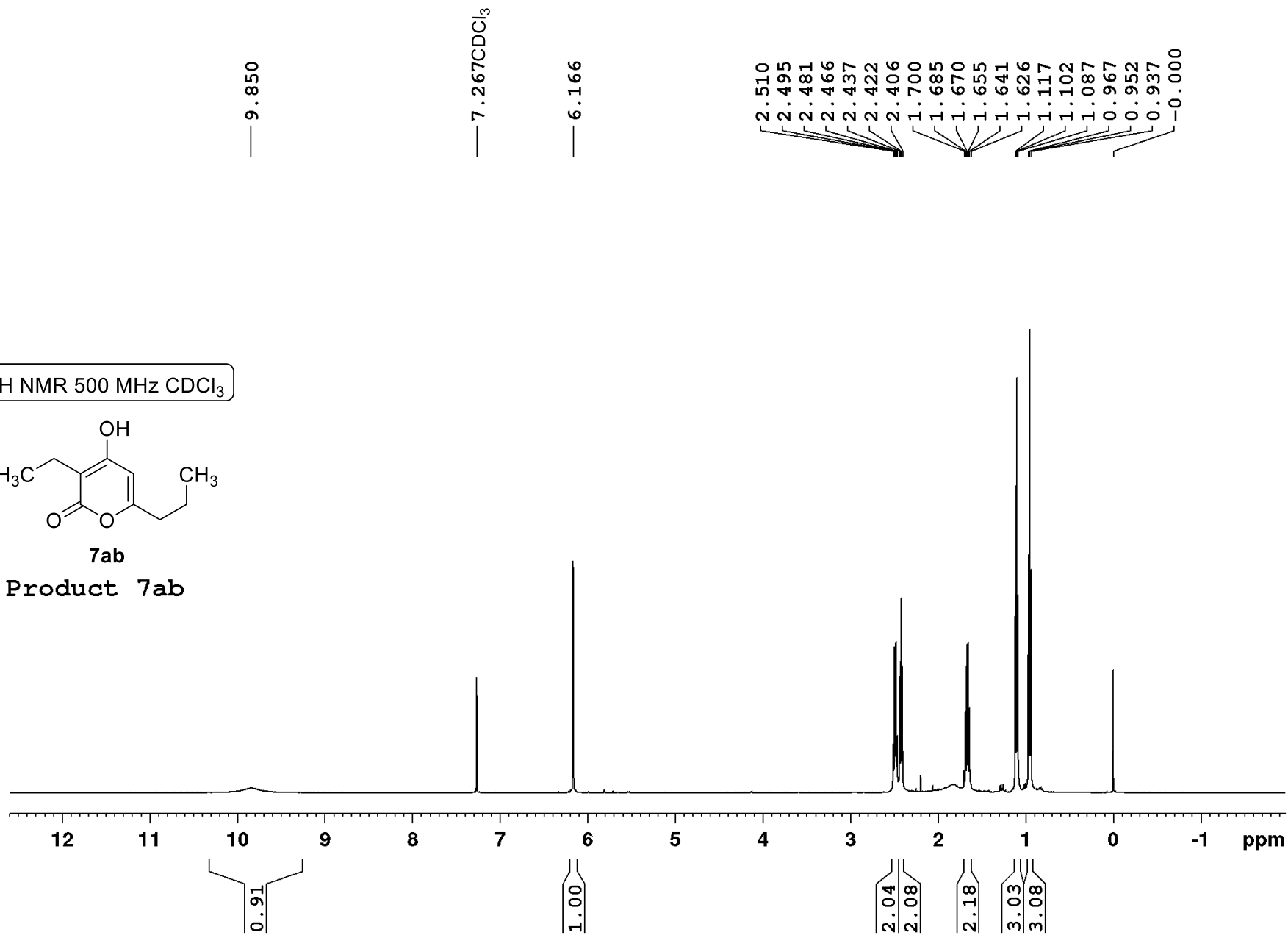


$^1\text{H NMR}$  500 MHz  $\text{CDCl}_3$

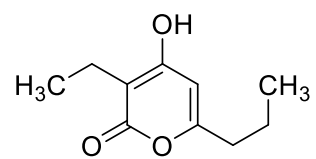


**7ab**

**Product 7ab**

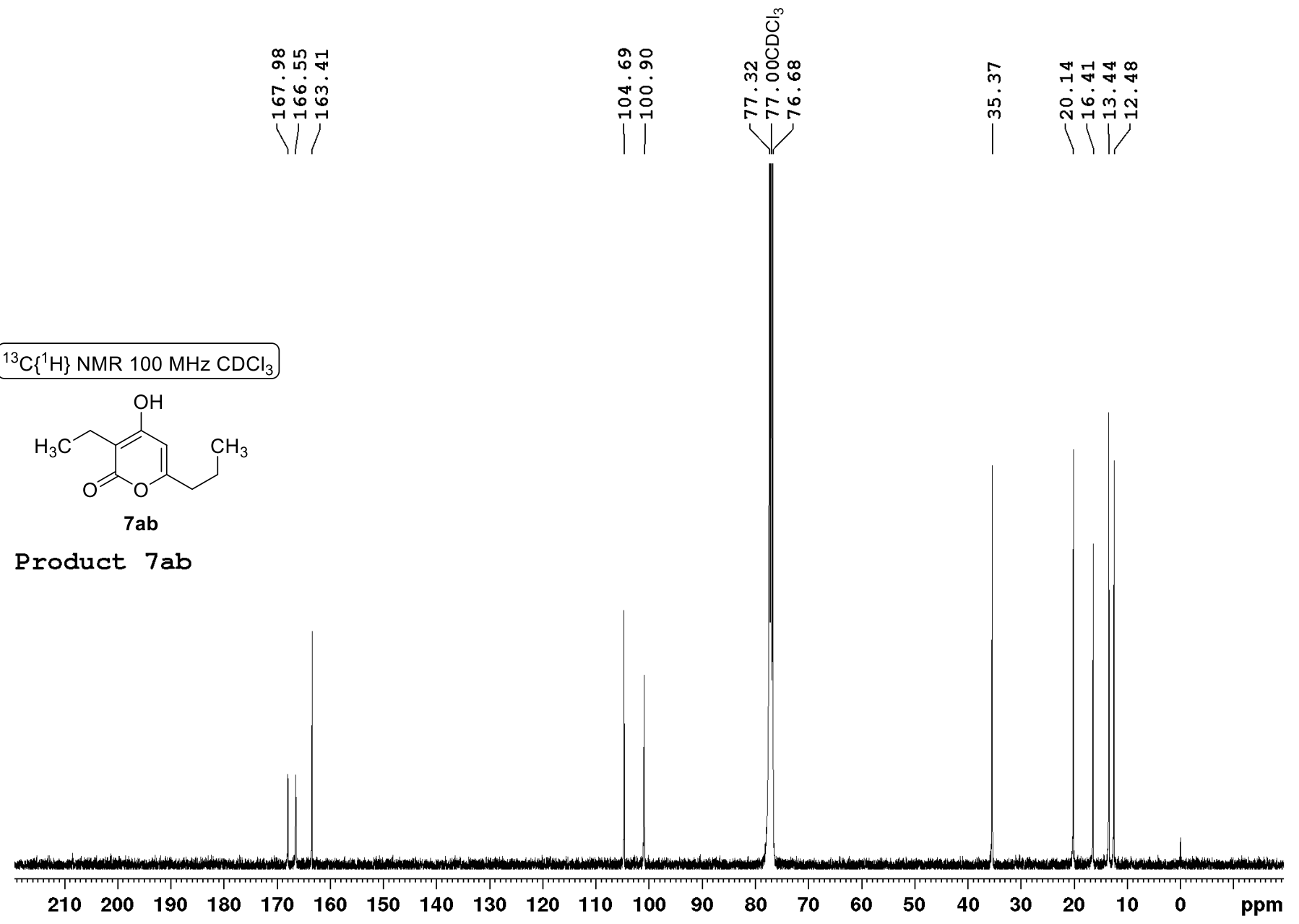


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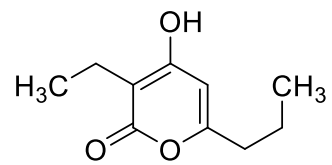
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Product 7ab



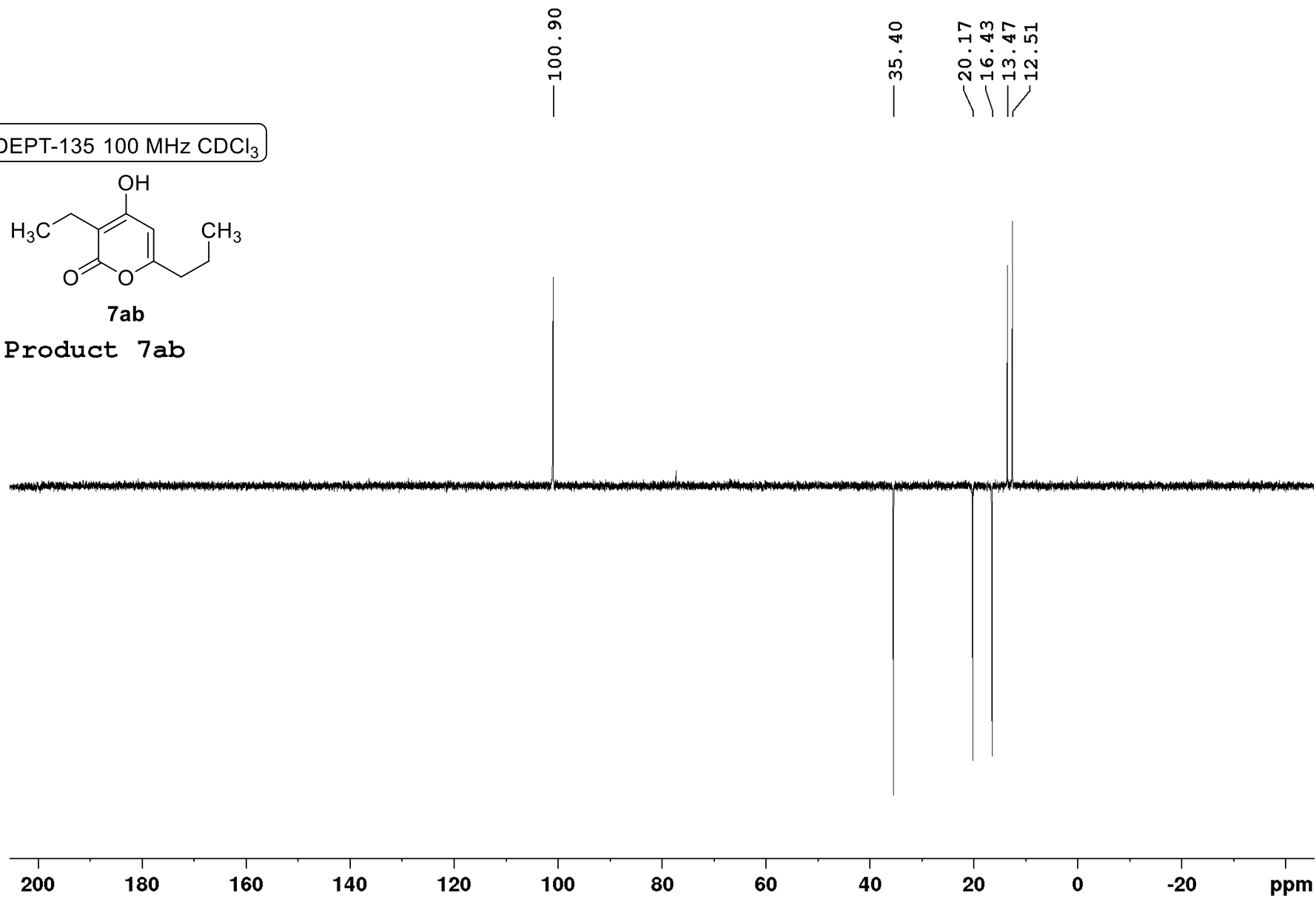


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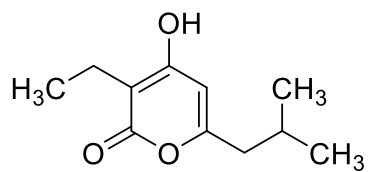


**7ab**

**Product 7ab**

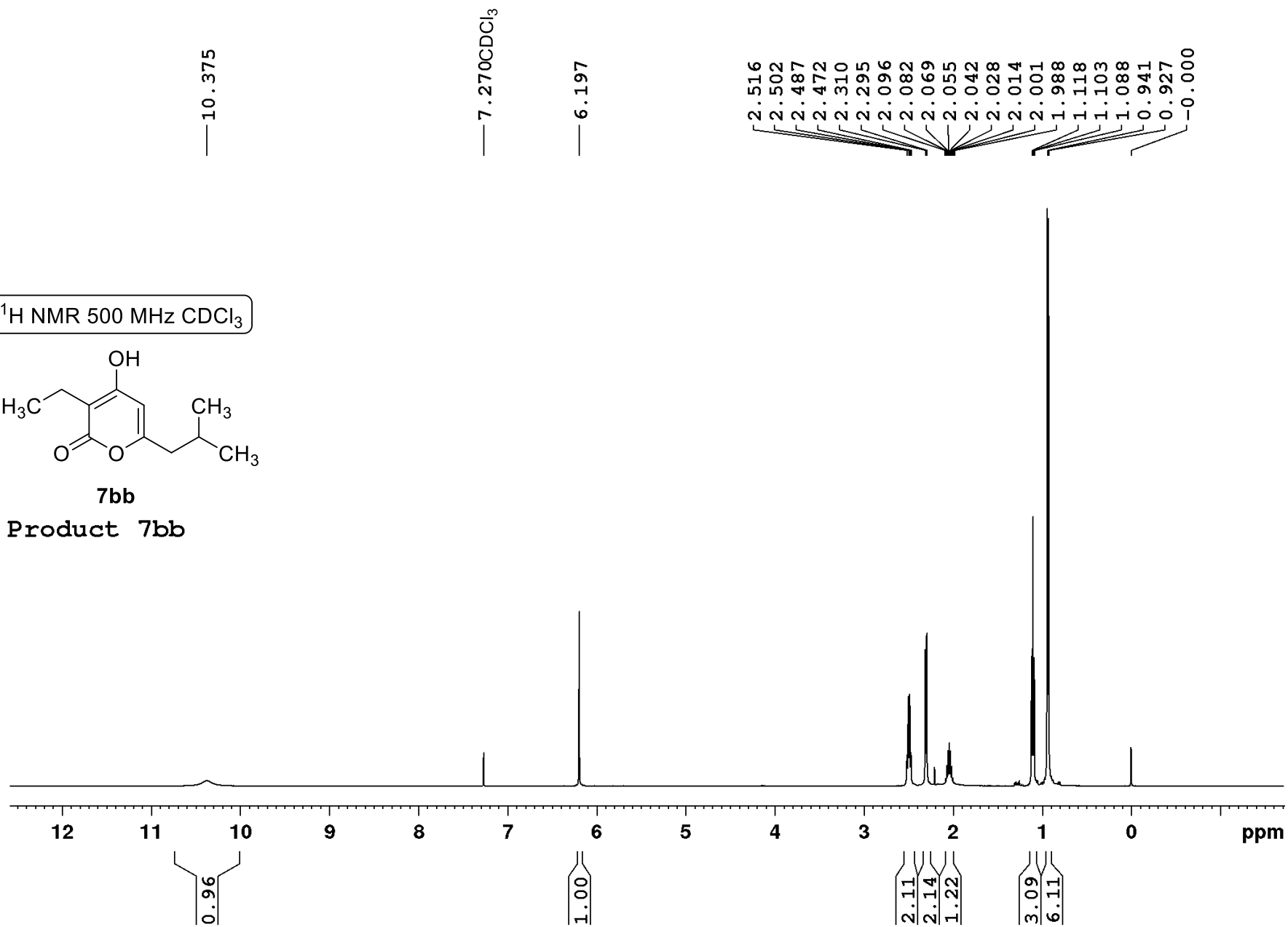


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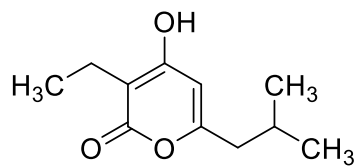


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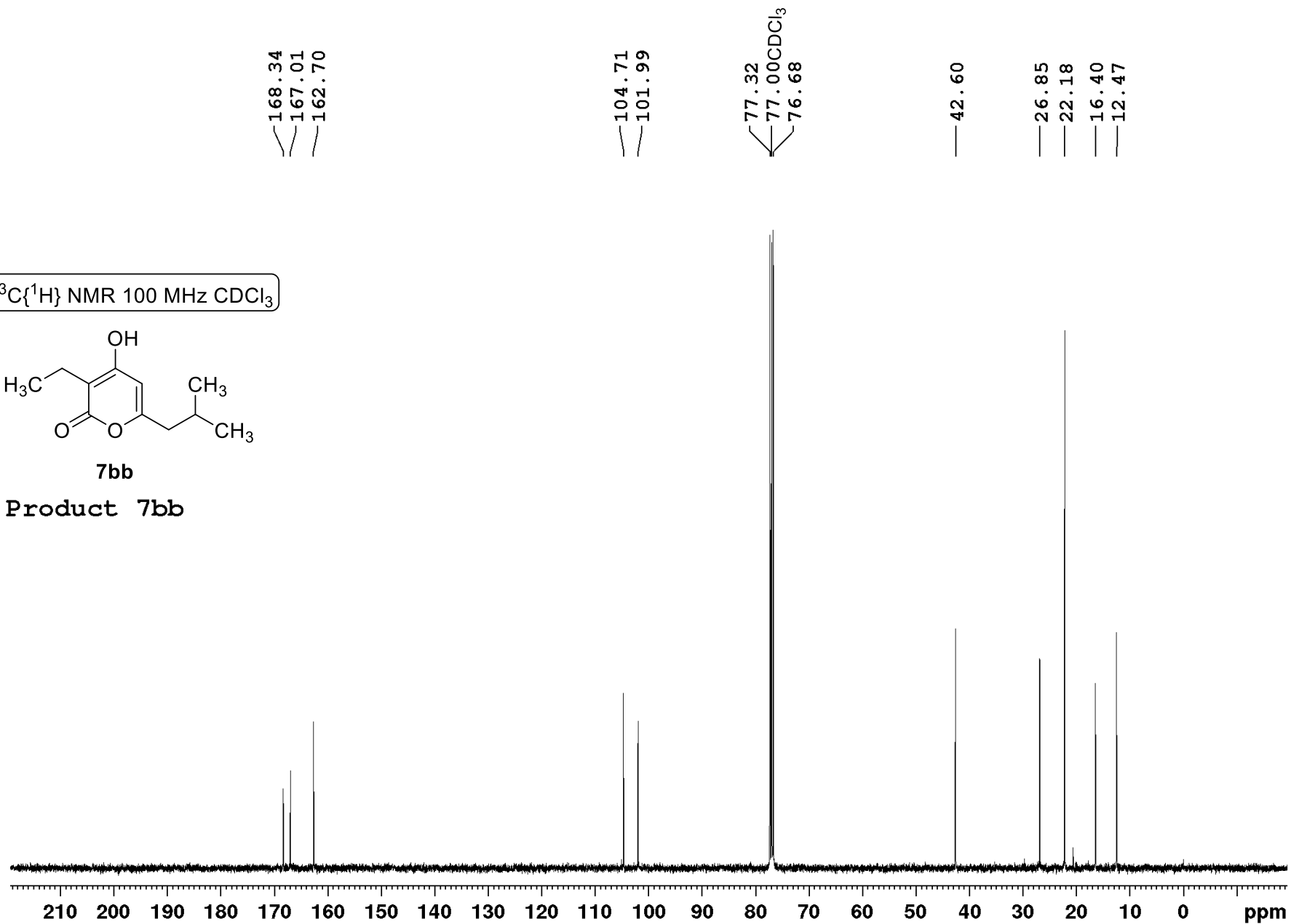


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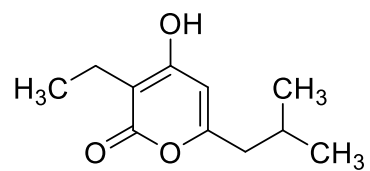


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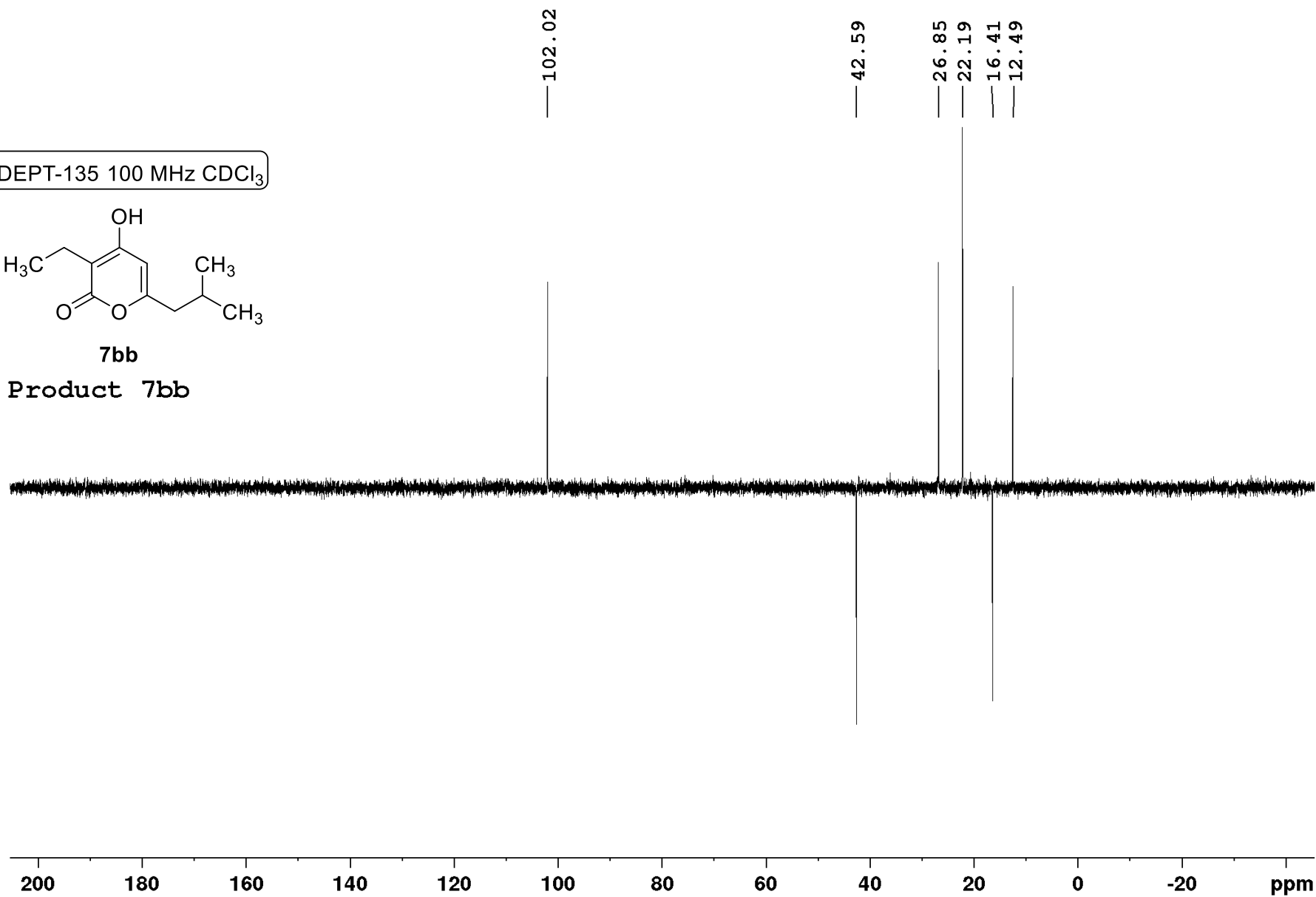


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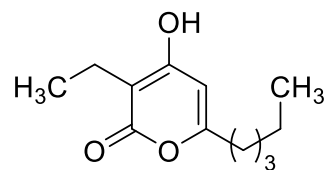


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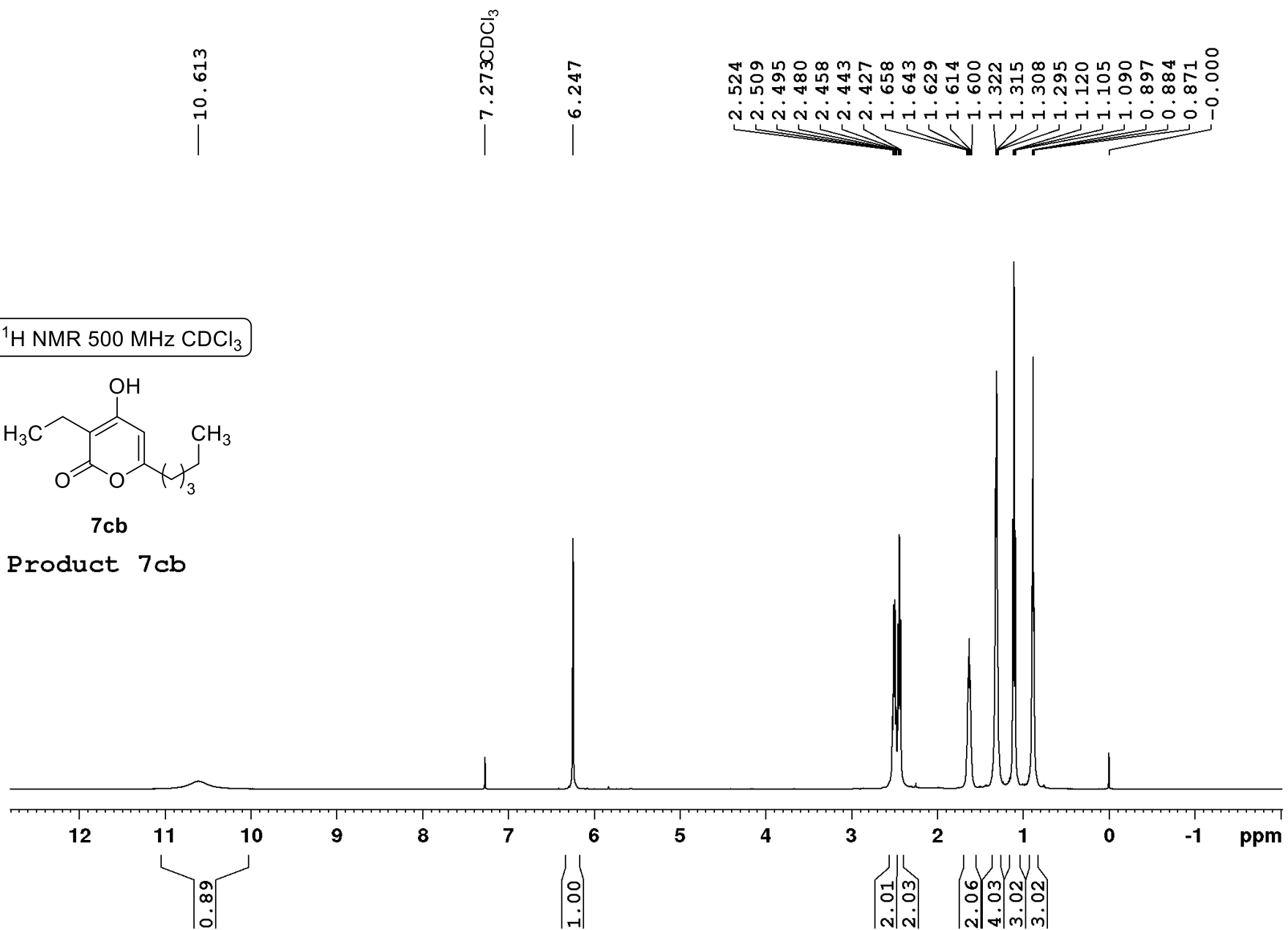


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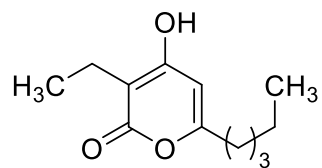


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Product 7cb

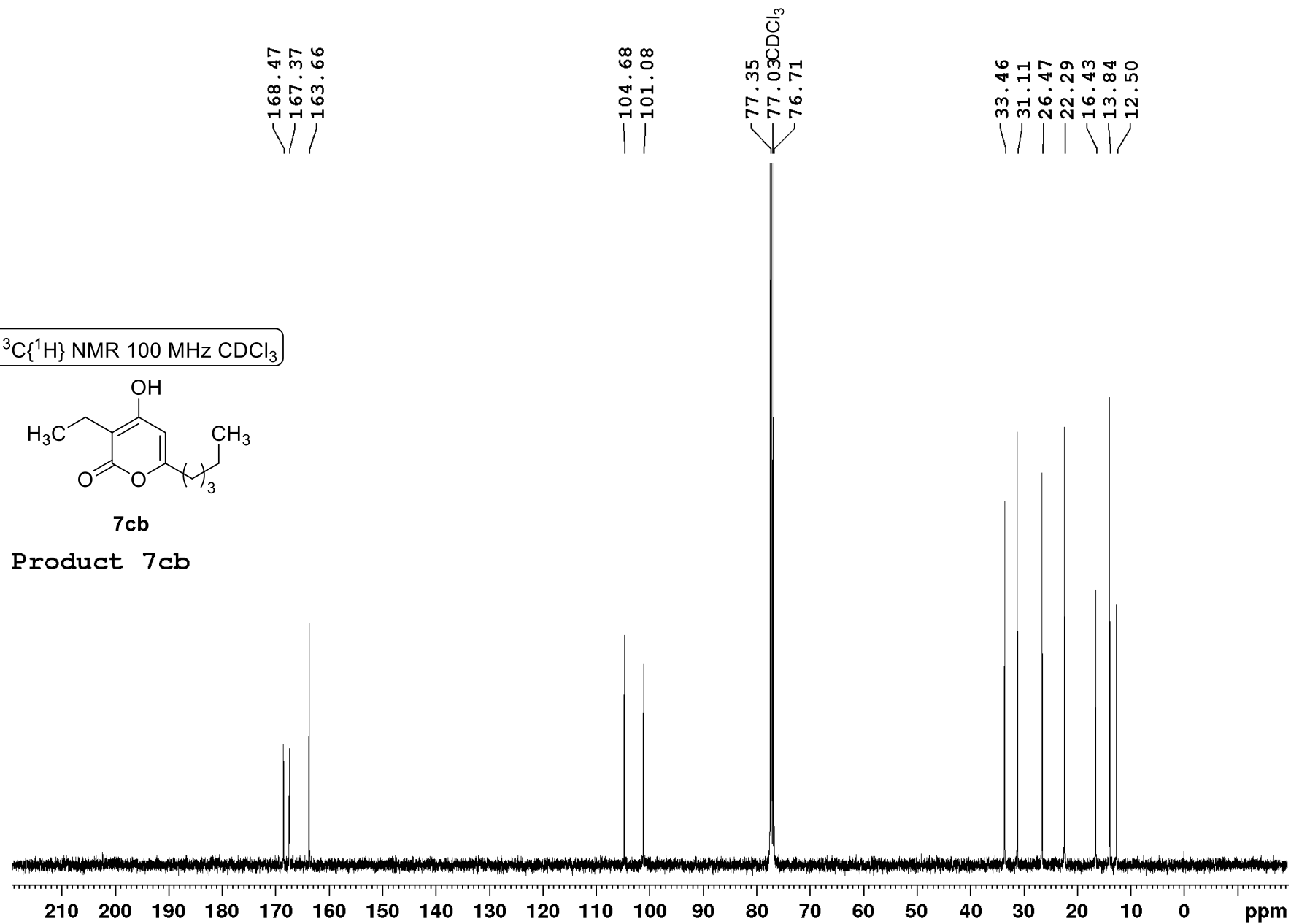


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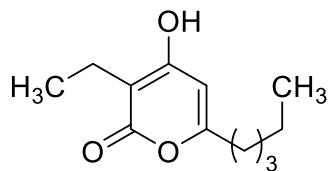


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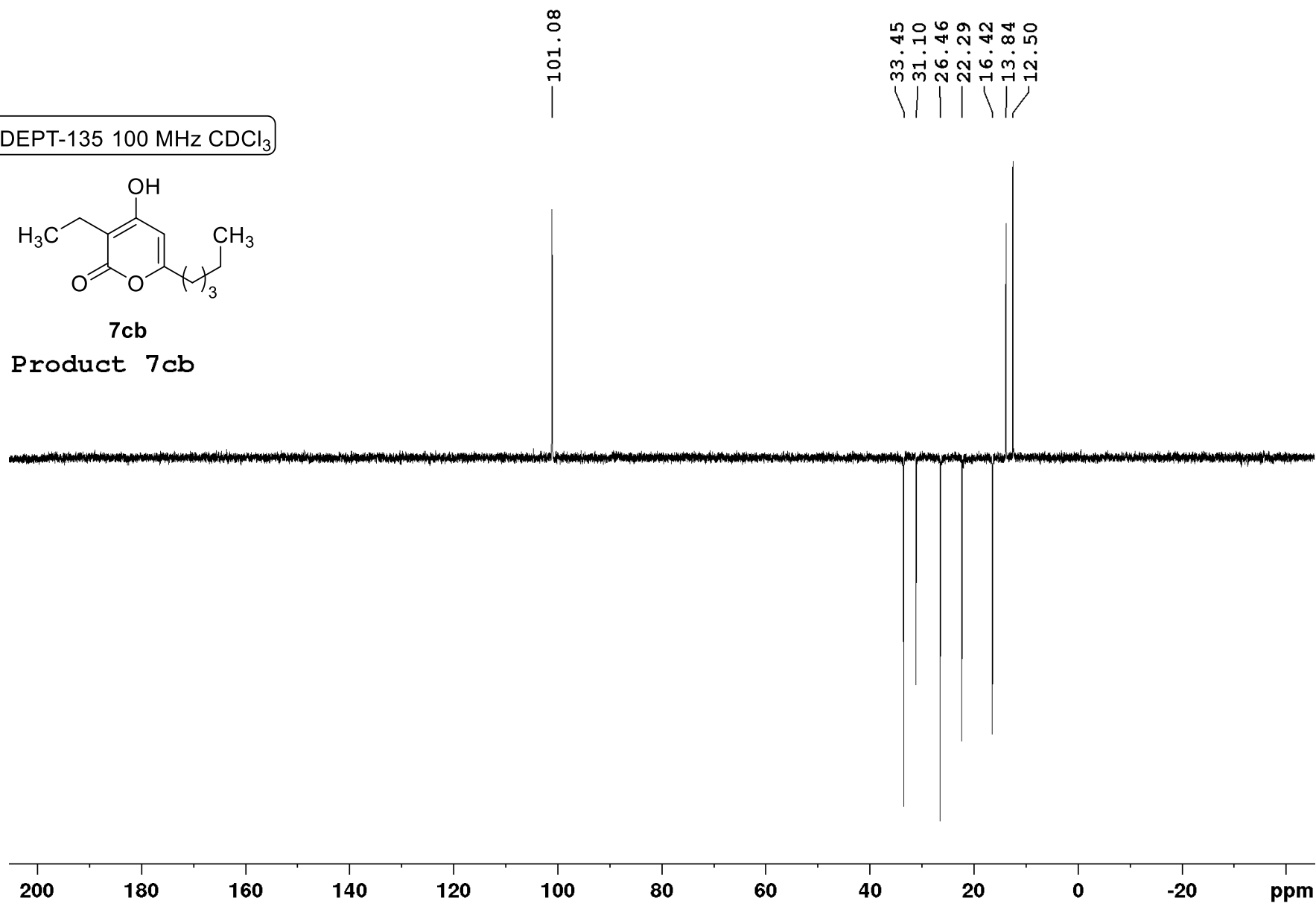


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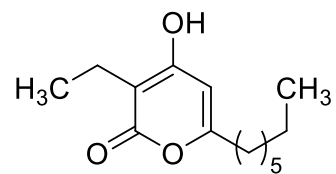


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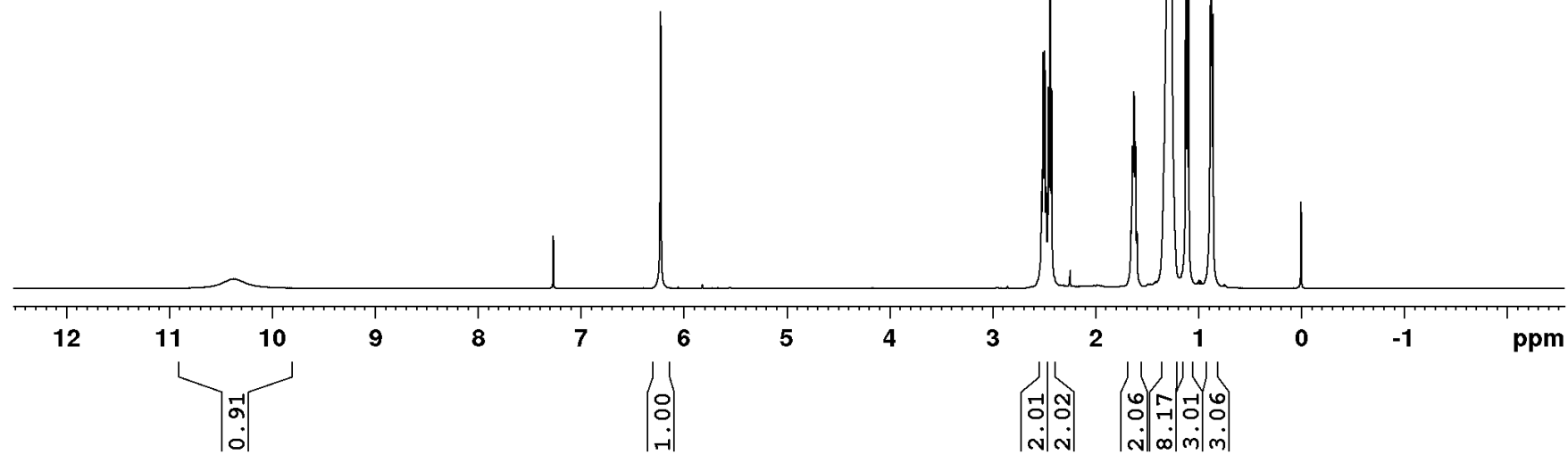


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7gb

Product 7gb



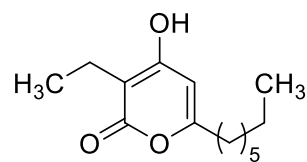
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— 7.267CDCl<sub>3</sub>

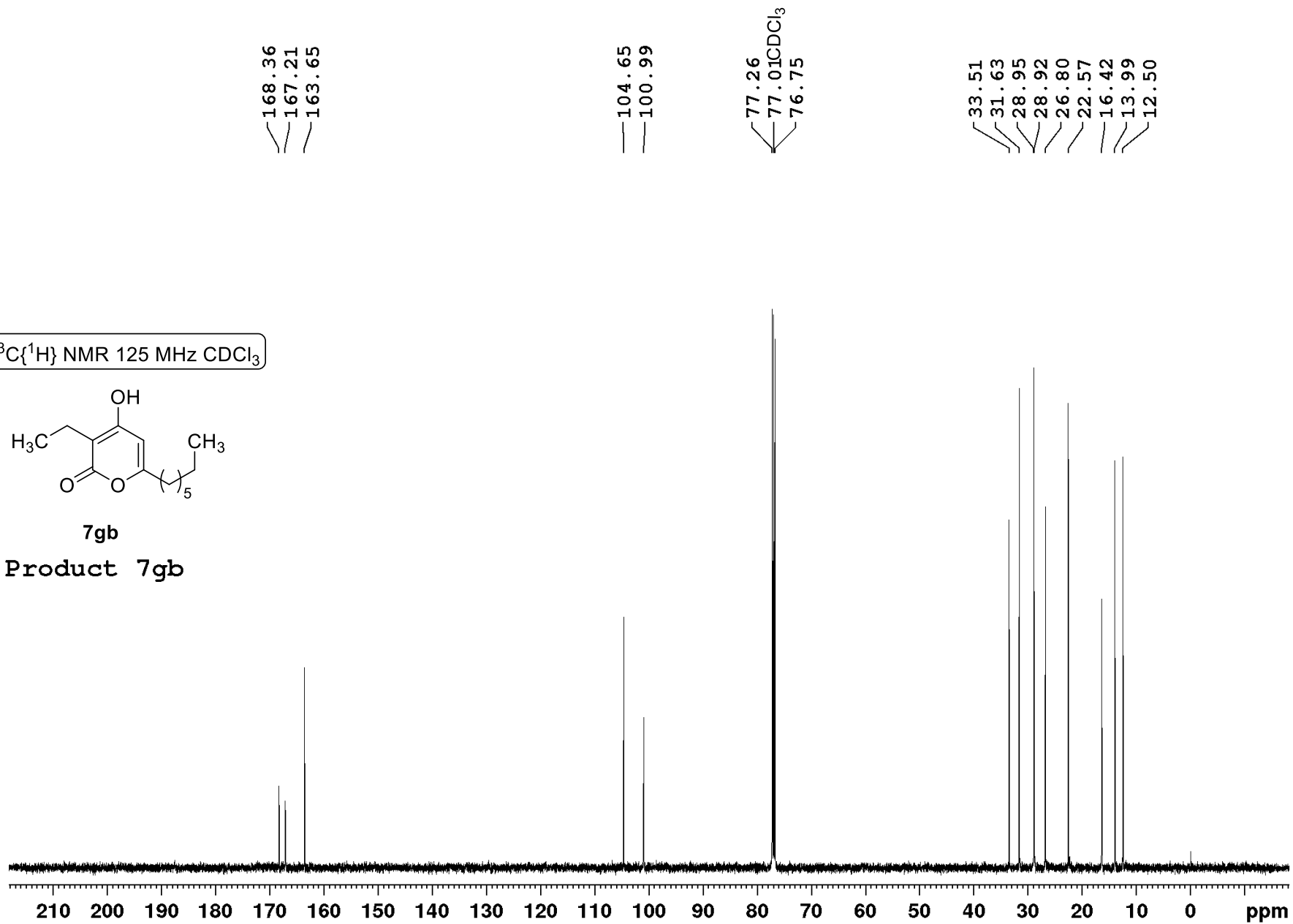
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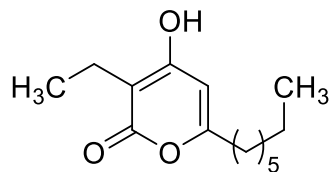
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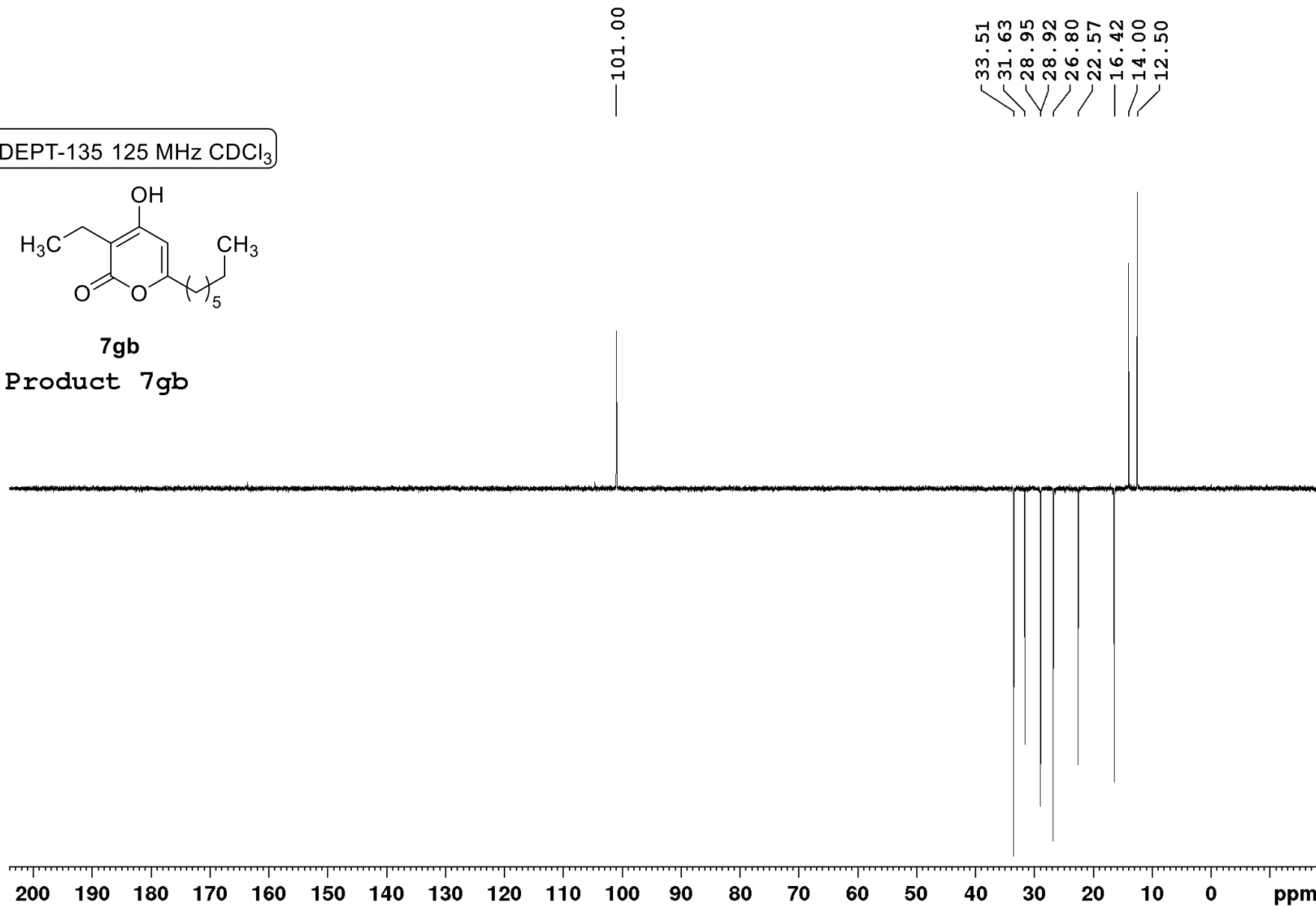
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**Product 7gb**



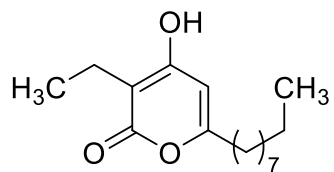
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**7gb**  
Product 7gb

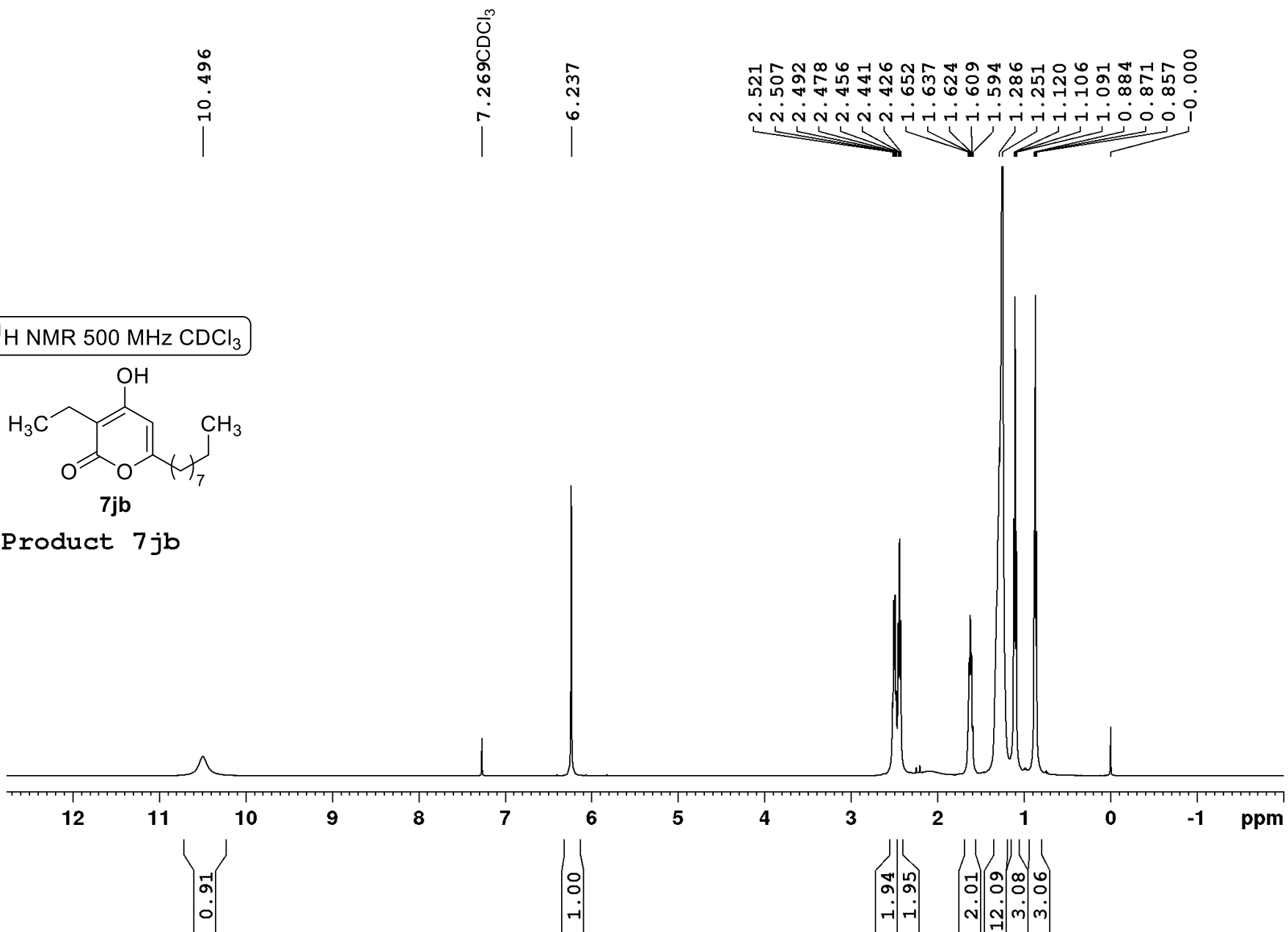


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

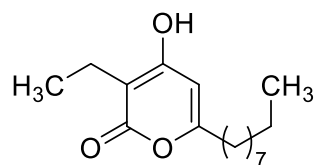


7jb

Product 7jb

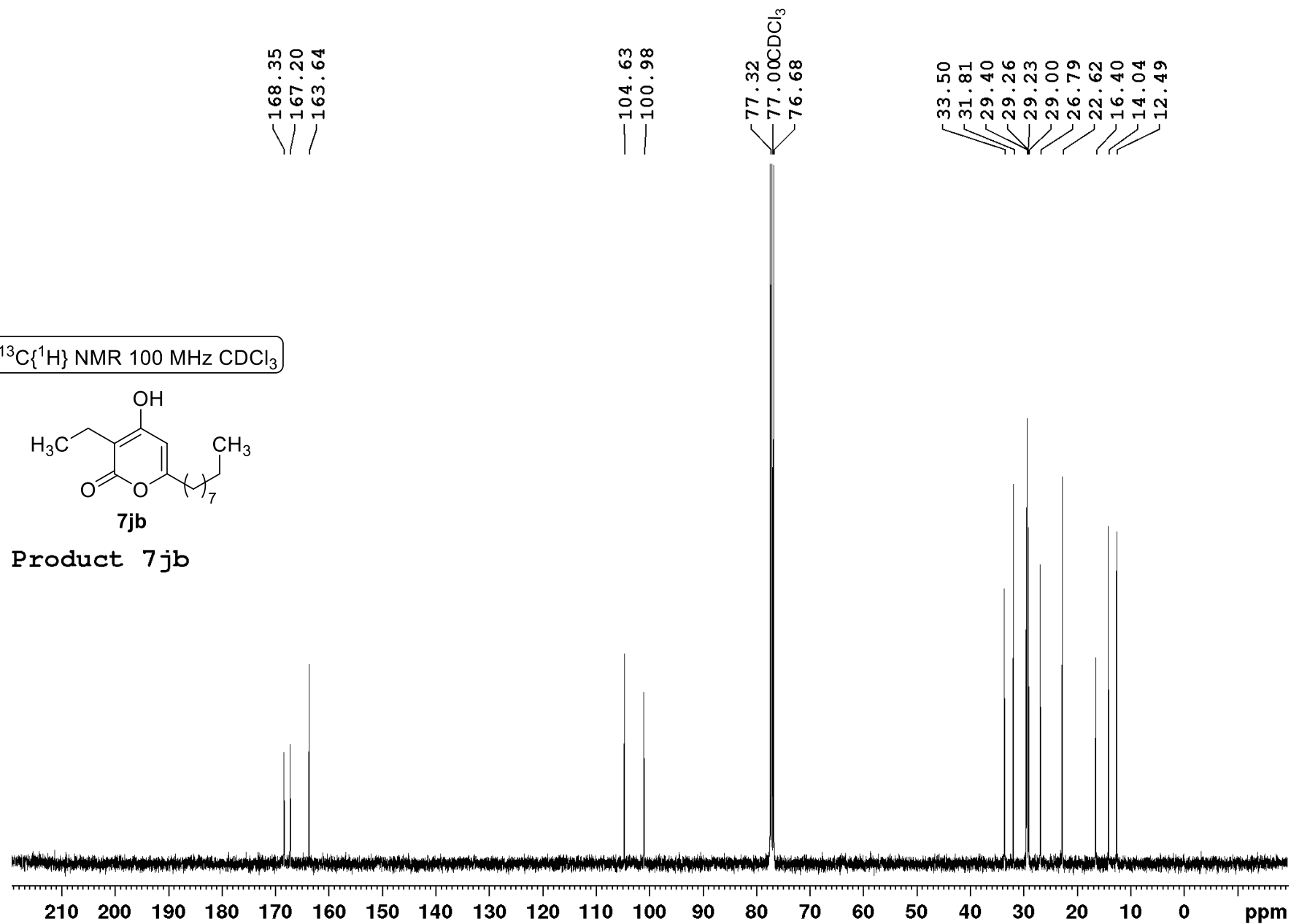


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

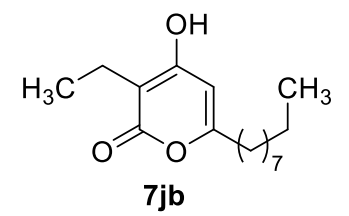


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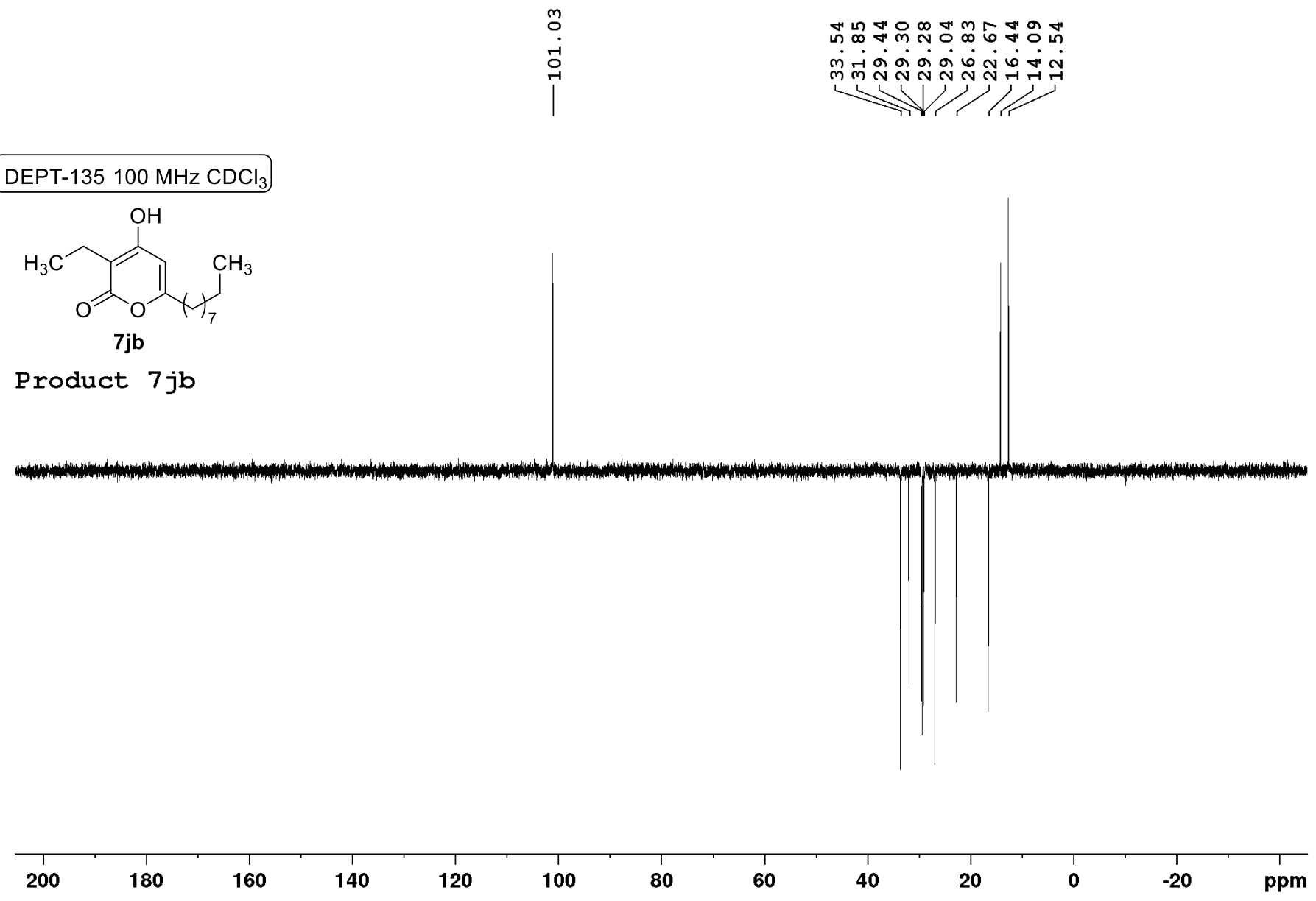
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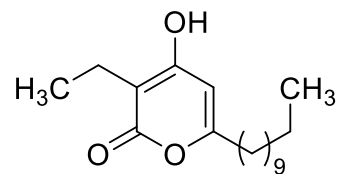
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Product 7jb

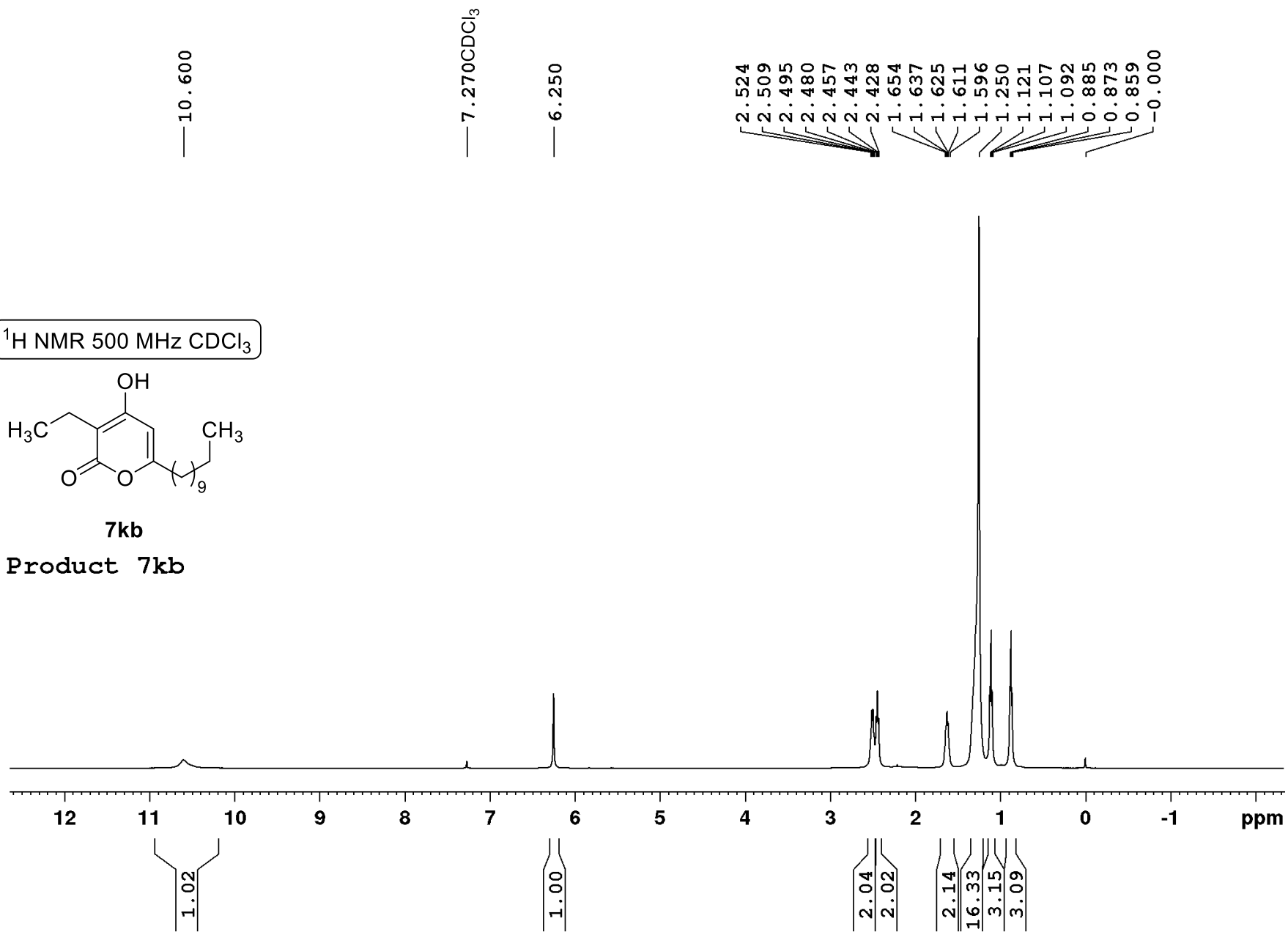


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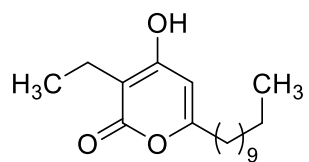


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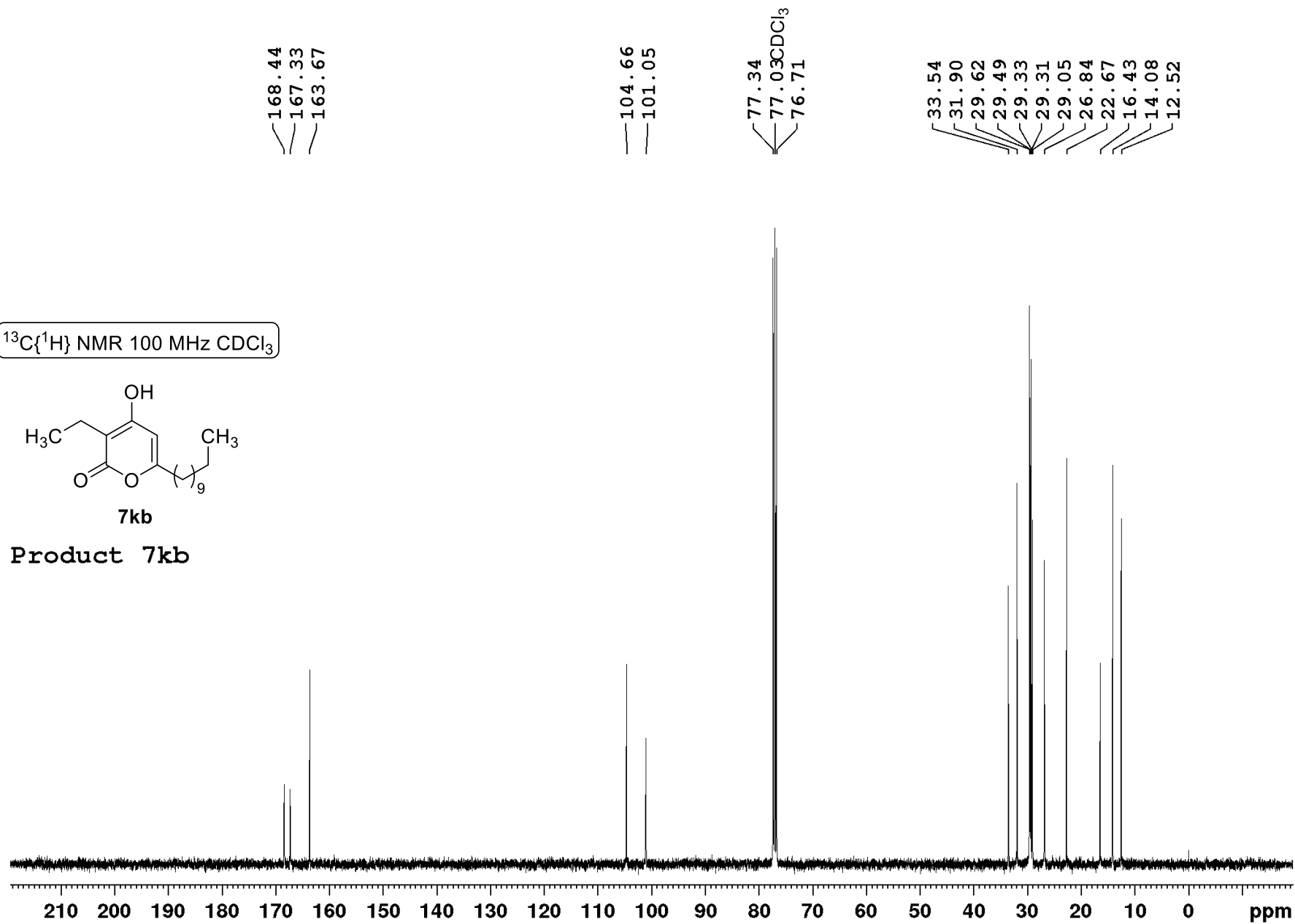


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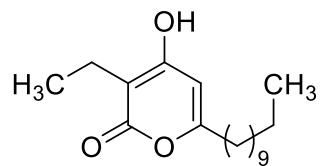


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Product 7kb



DEPT-135 100 MHz CDCl<sub>3</sub>

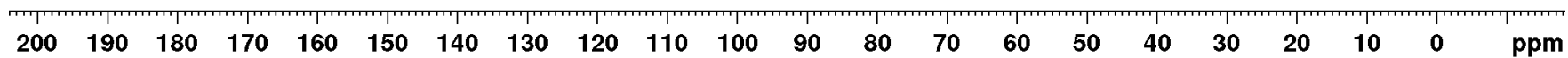


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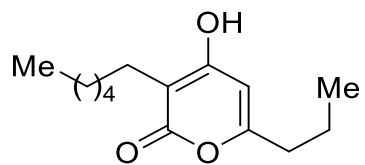
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14.11  
12.54



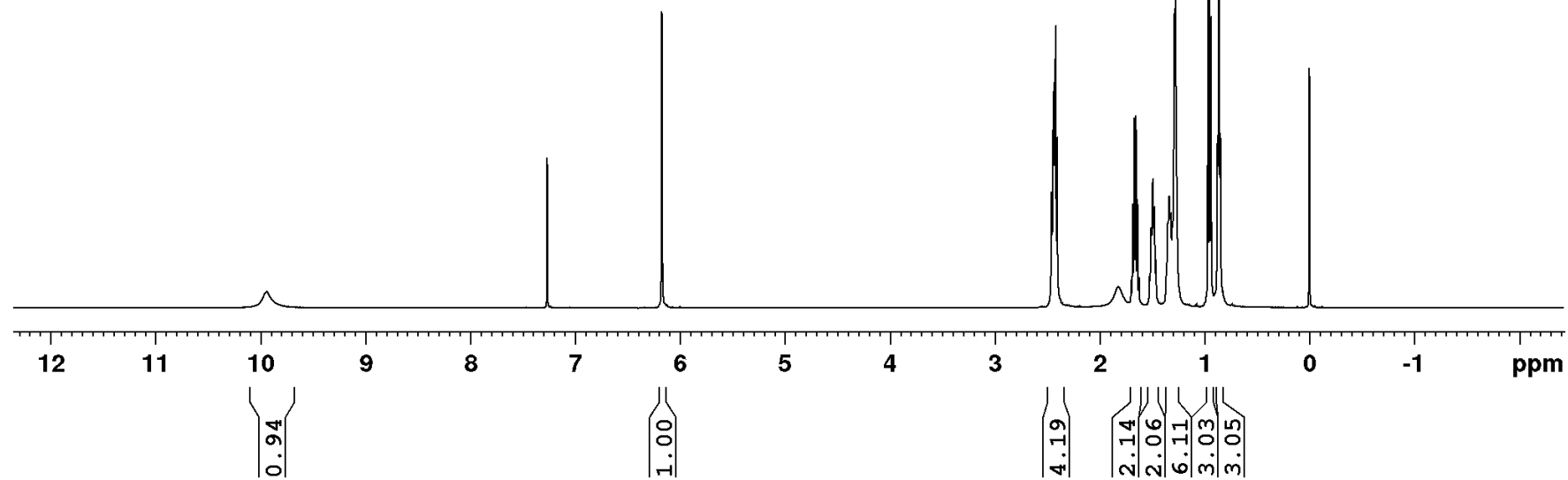


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



7ac

Product 7ac



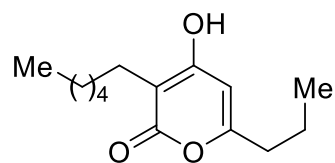
— 9.943

— 7.267CDCl<sub>3</sub>

— 6.174

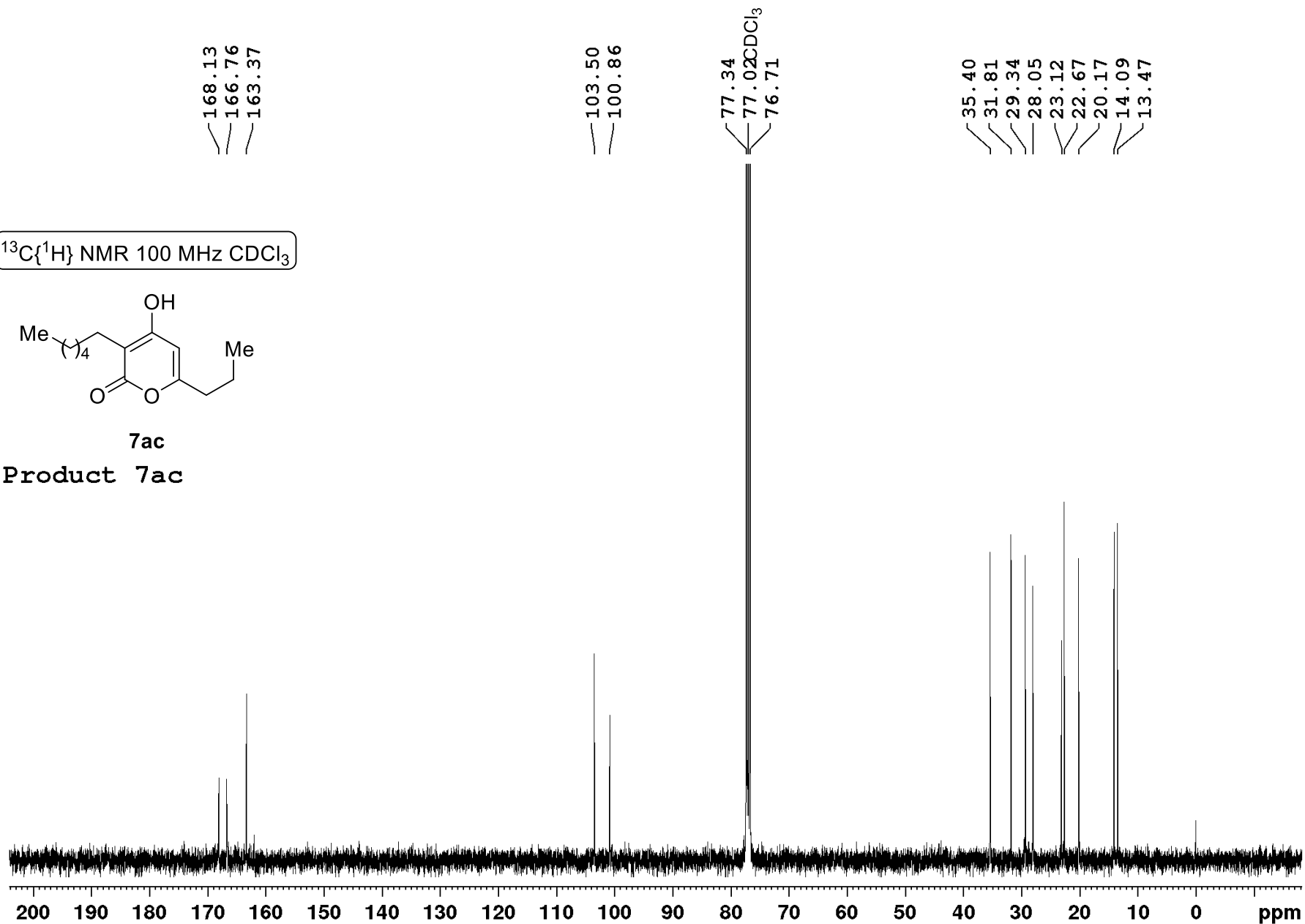
2.458  
2.442  
2.435  
2.427  
2.420  
2.405  
1.699  
1.684  
1.669  
1.654  
1.639  
1.625  
1.523  
1.509  
1.494  
1.479  
1.463  
1.348  
1.337  
1.320  
1.289  
1.281  
1.275  
1.262  
0.967  
0.952  
0.937  
0.875  
0.862  
0.849  
-0.000

$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



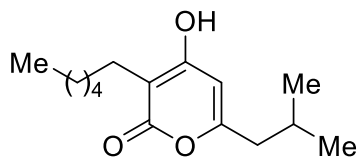
7ac

Product 7ac



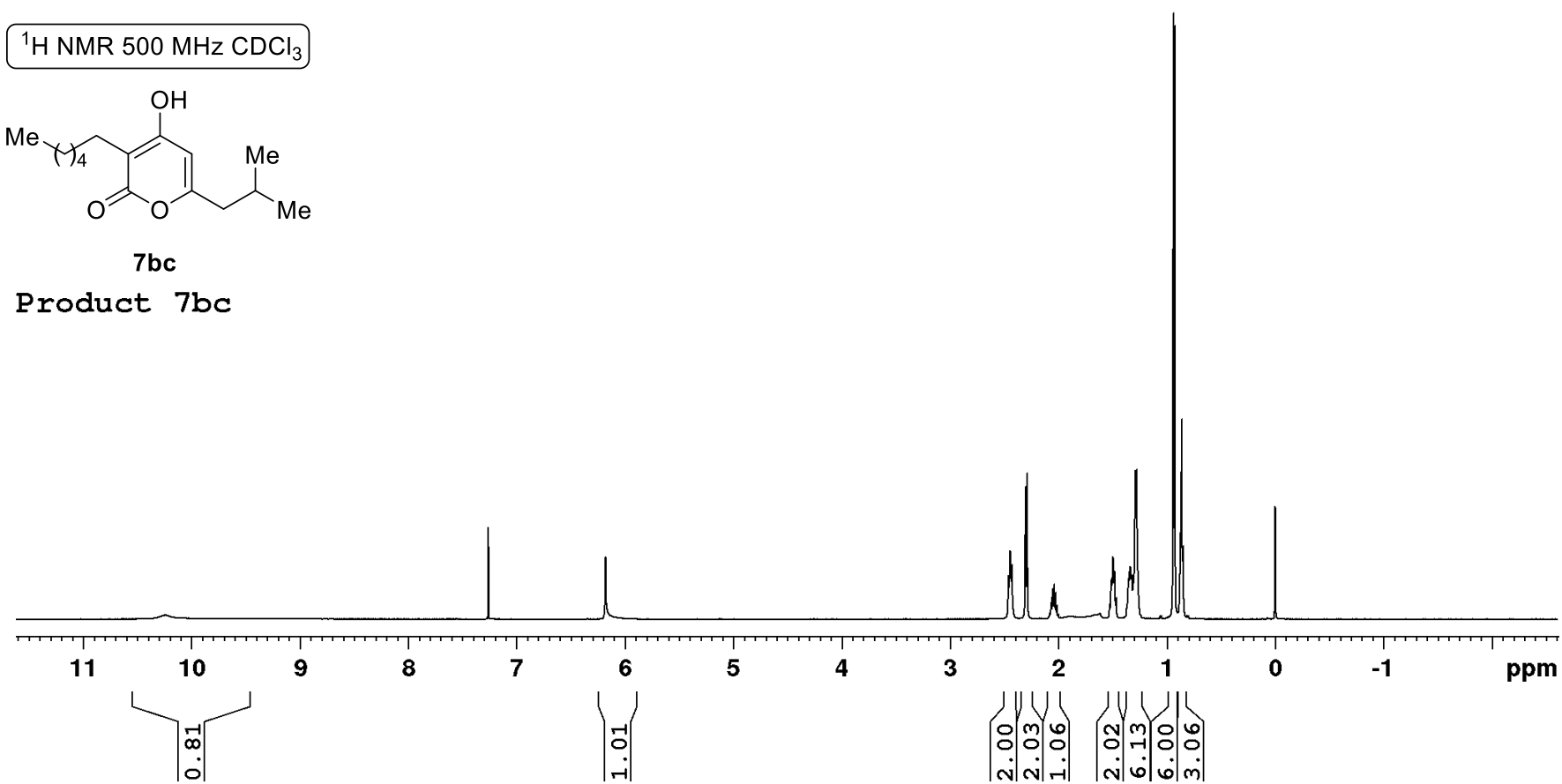


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

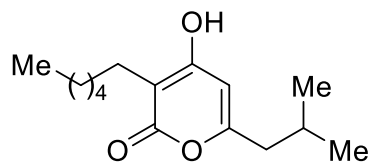


7bc

Product 7bc

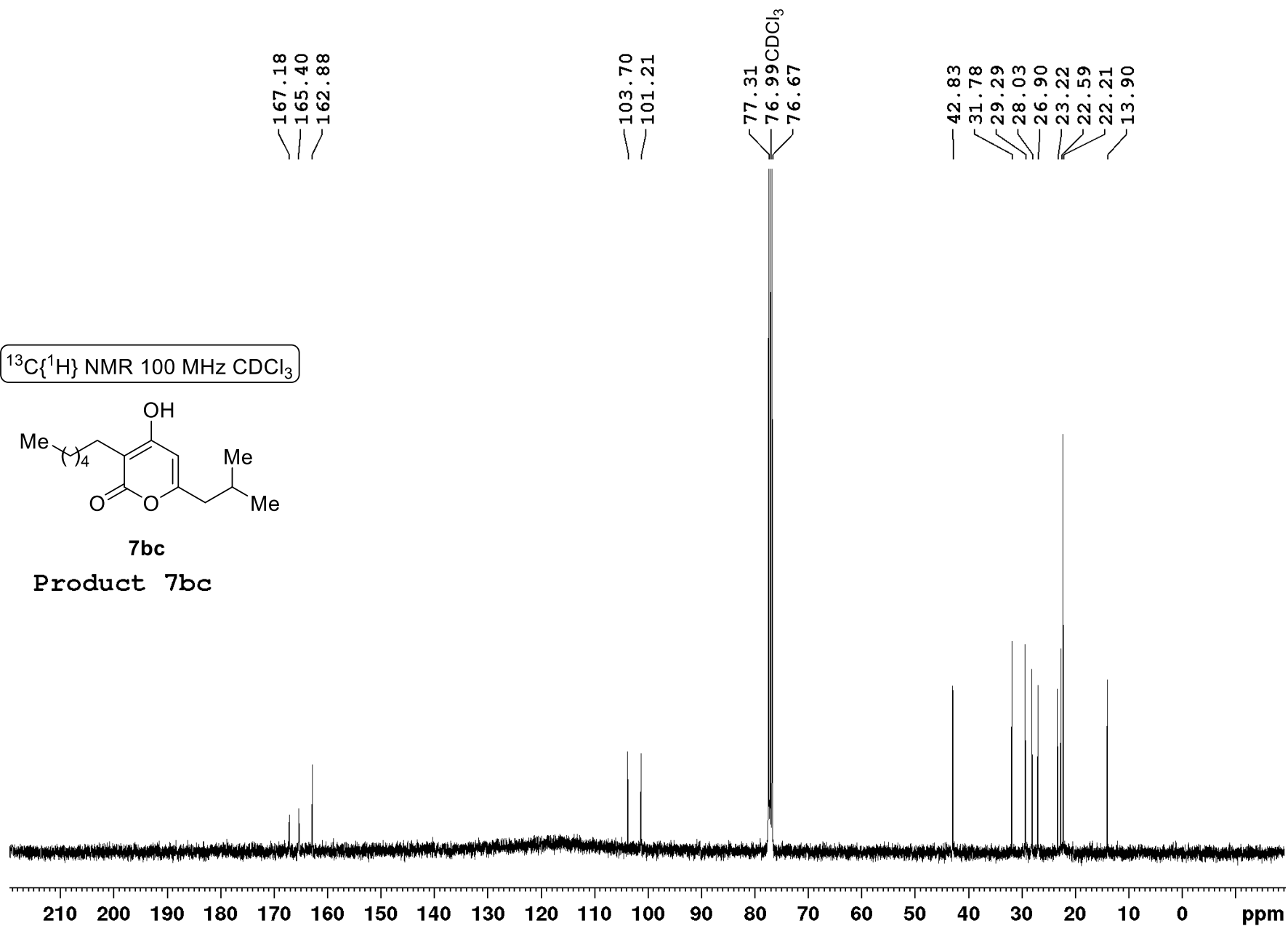


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

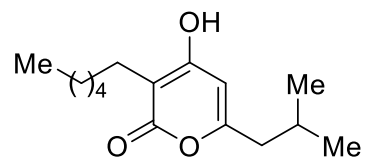


**7bc**

Product 7bc

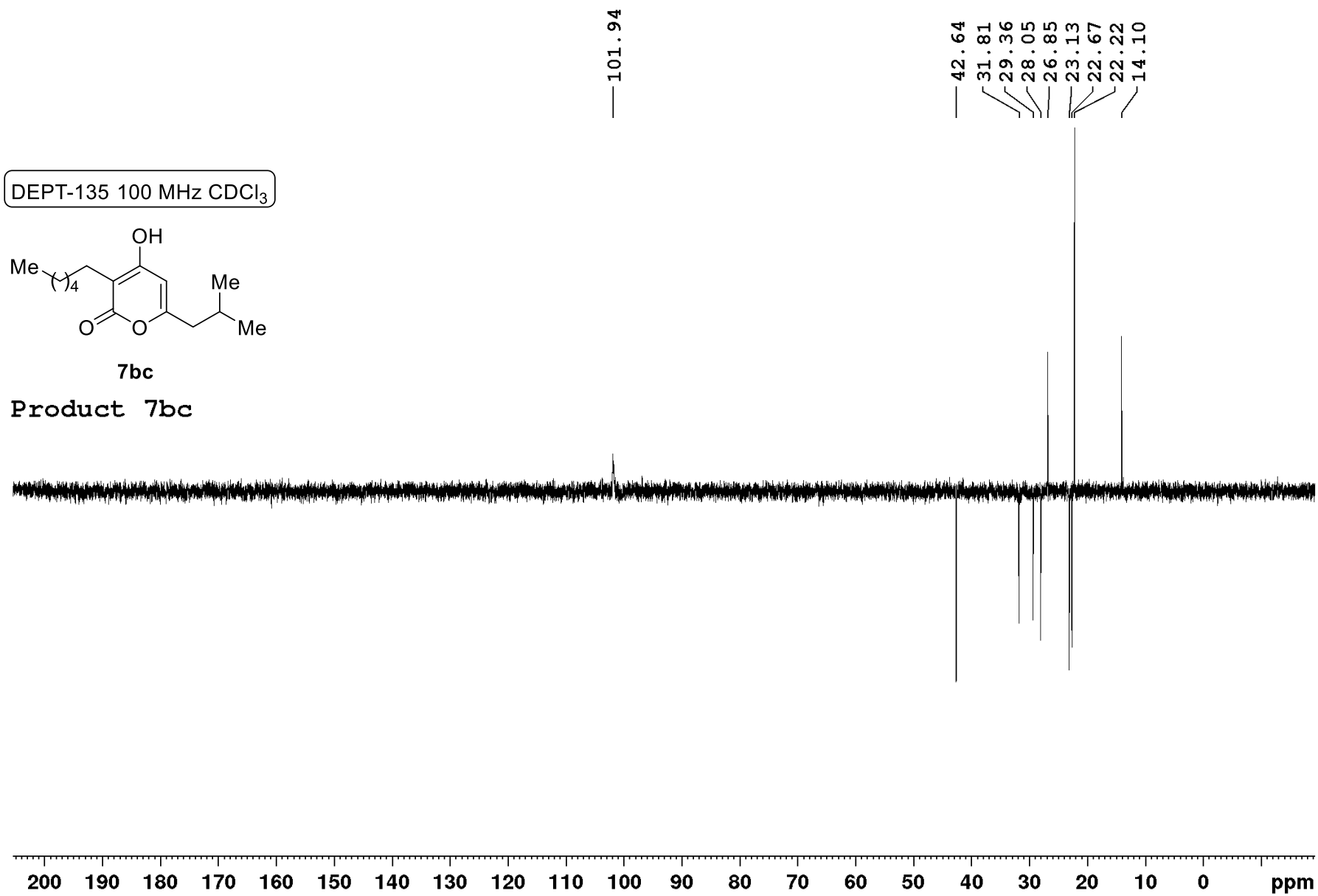


DEPT-135 100 MHz CDCl<sub>3</sub>

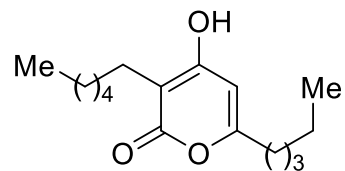


7bc

Product 7bc

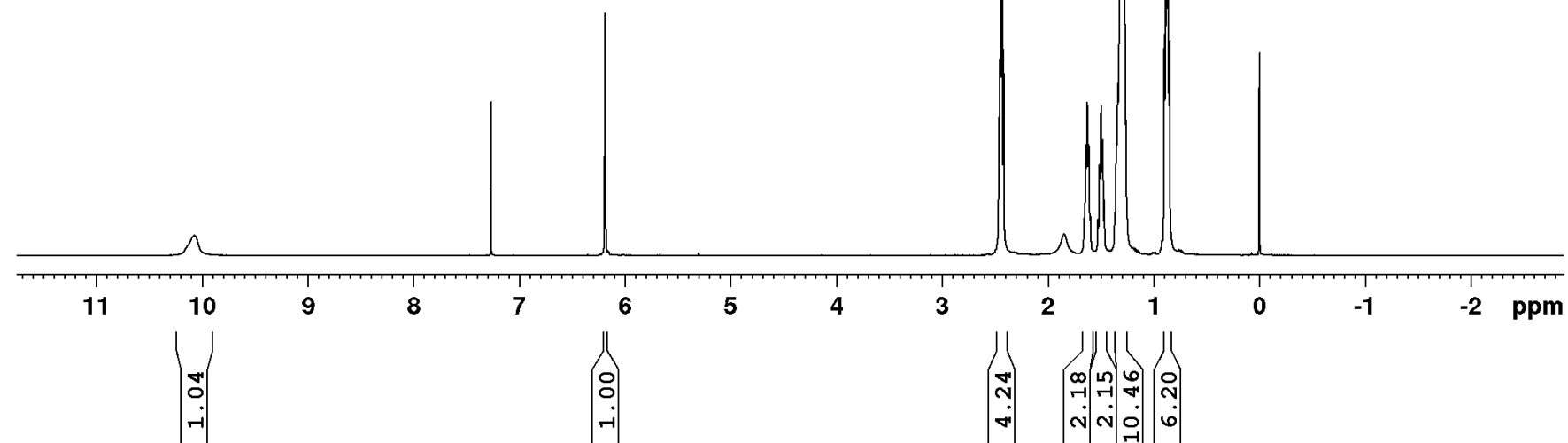


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



7cc

Product 7cc



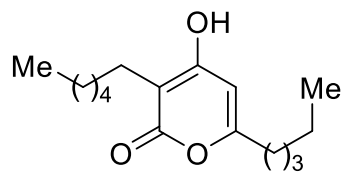
— 10.068

— 7.267CDCl<sub>3</sub>

— 6.186

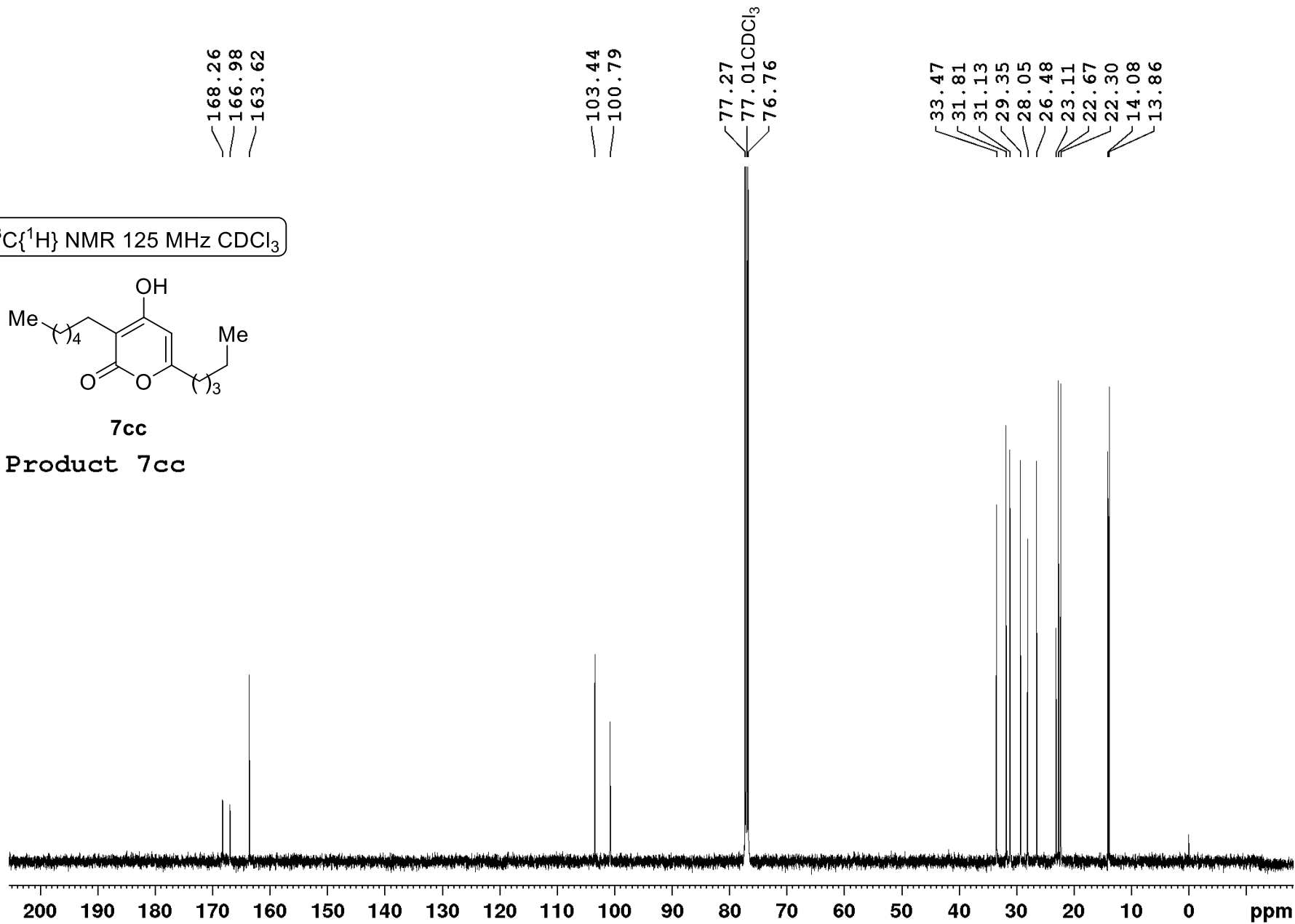
2.461  
2.449  
2.433  
2.418  
1.656  
1.642  
1.627  
1.612  
1.597  
1.525  
1.511  
1.495  
1.481  
1.465  
1.365  
1.348  
1.335  
1.320  
1.313  
1.306  
1.299  
1.289  
1.281  
1.275  
1.261  
0.898  
0.884  
0.875  
0.870  
0.862  
0.848  
-0.000

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



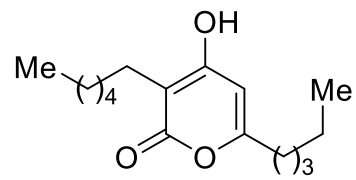
7cc

Product 7cc



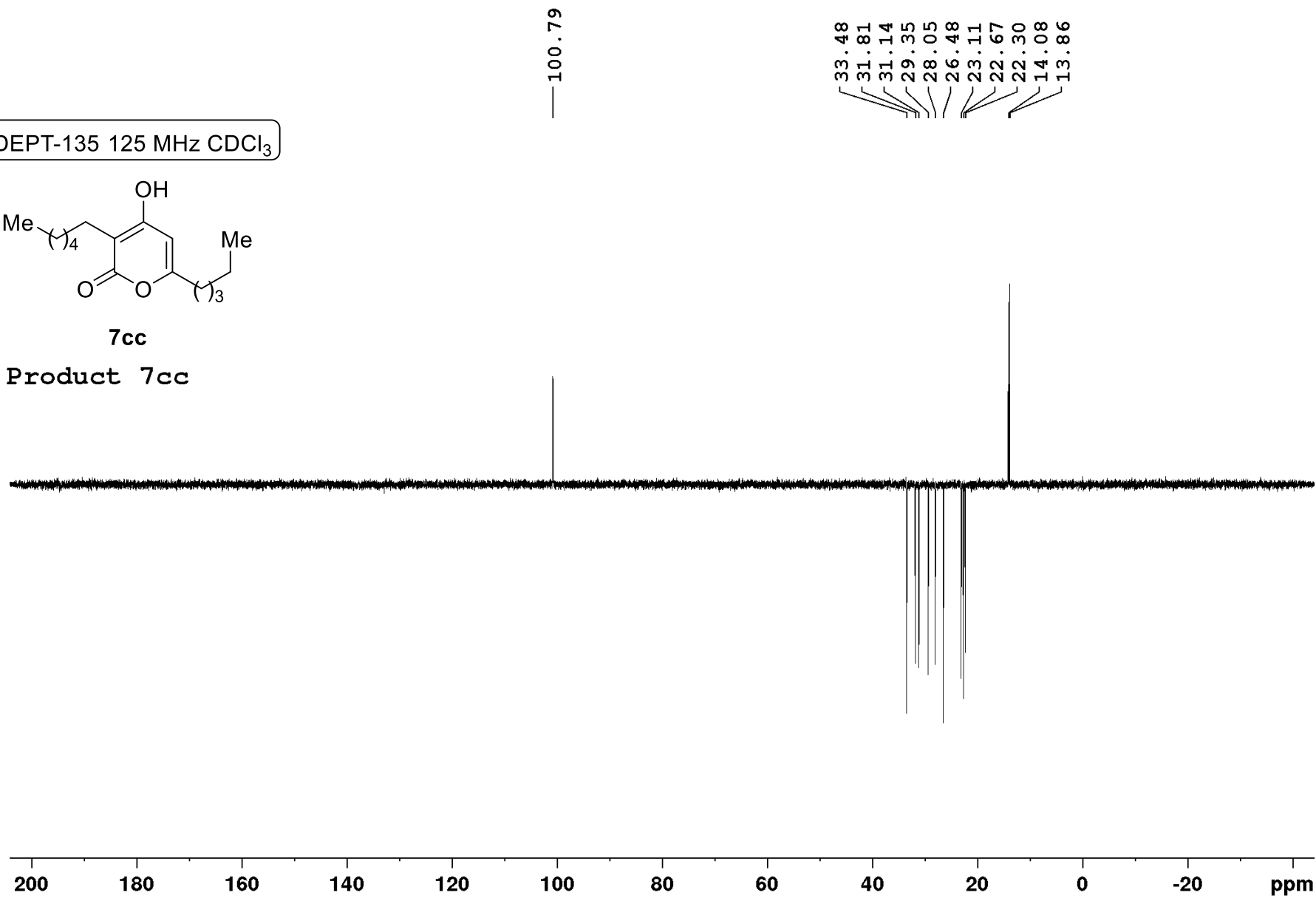


DEPT-135 125 MHz CDCl<sub>3</sub>

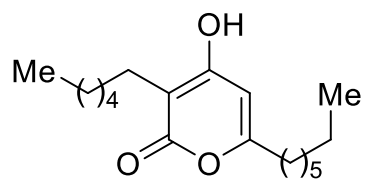


7cc

Product 7cc

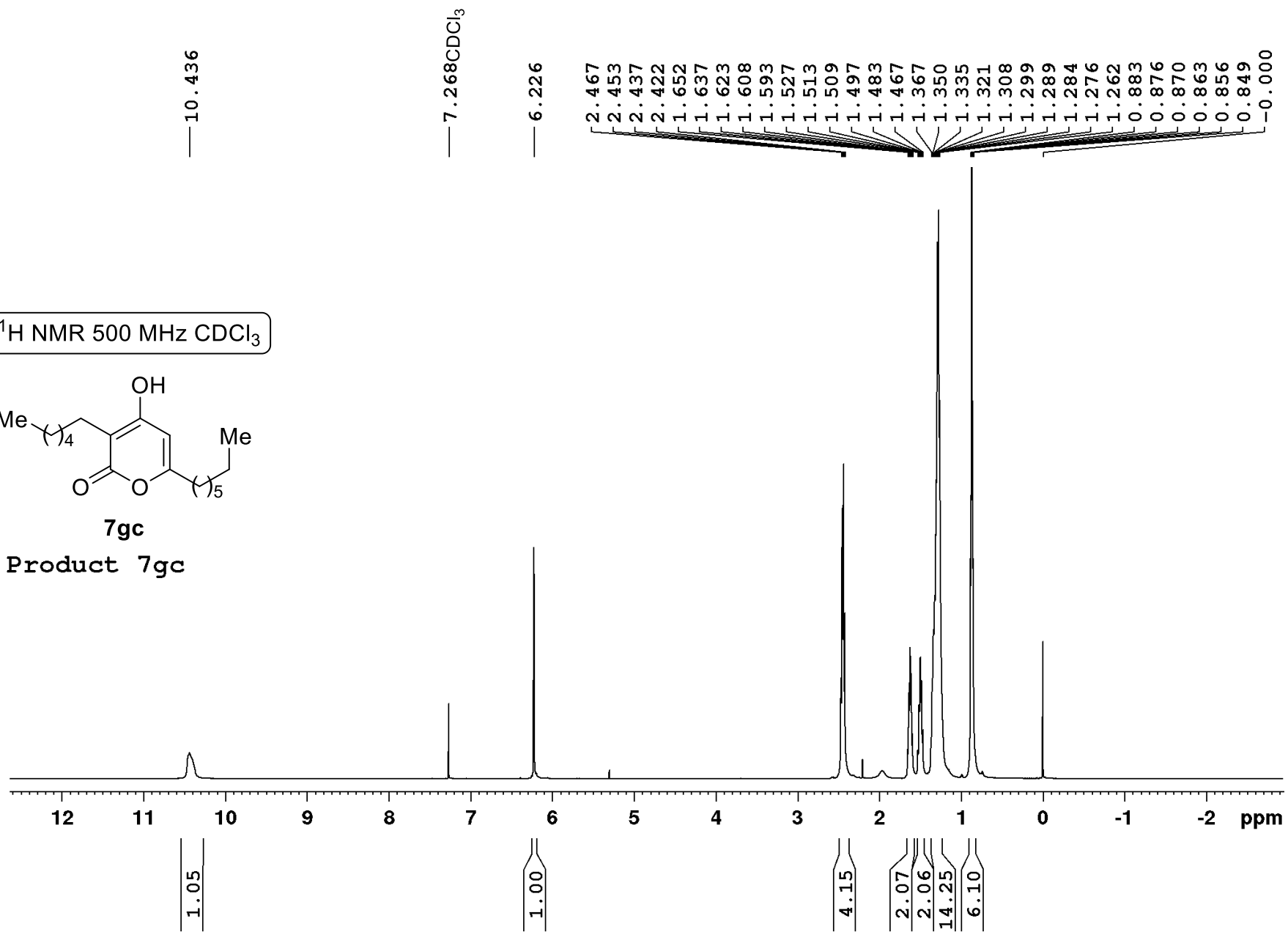


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

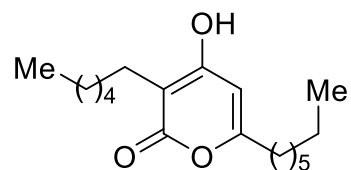


**7gc**

Product 7gc

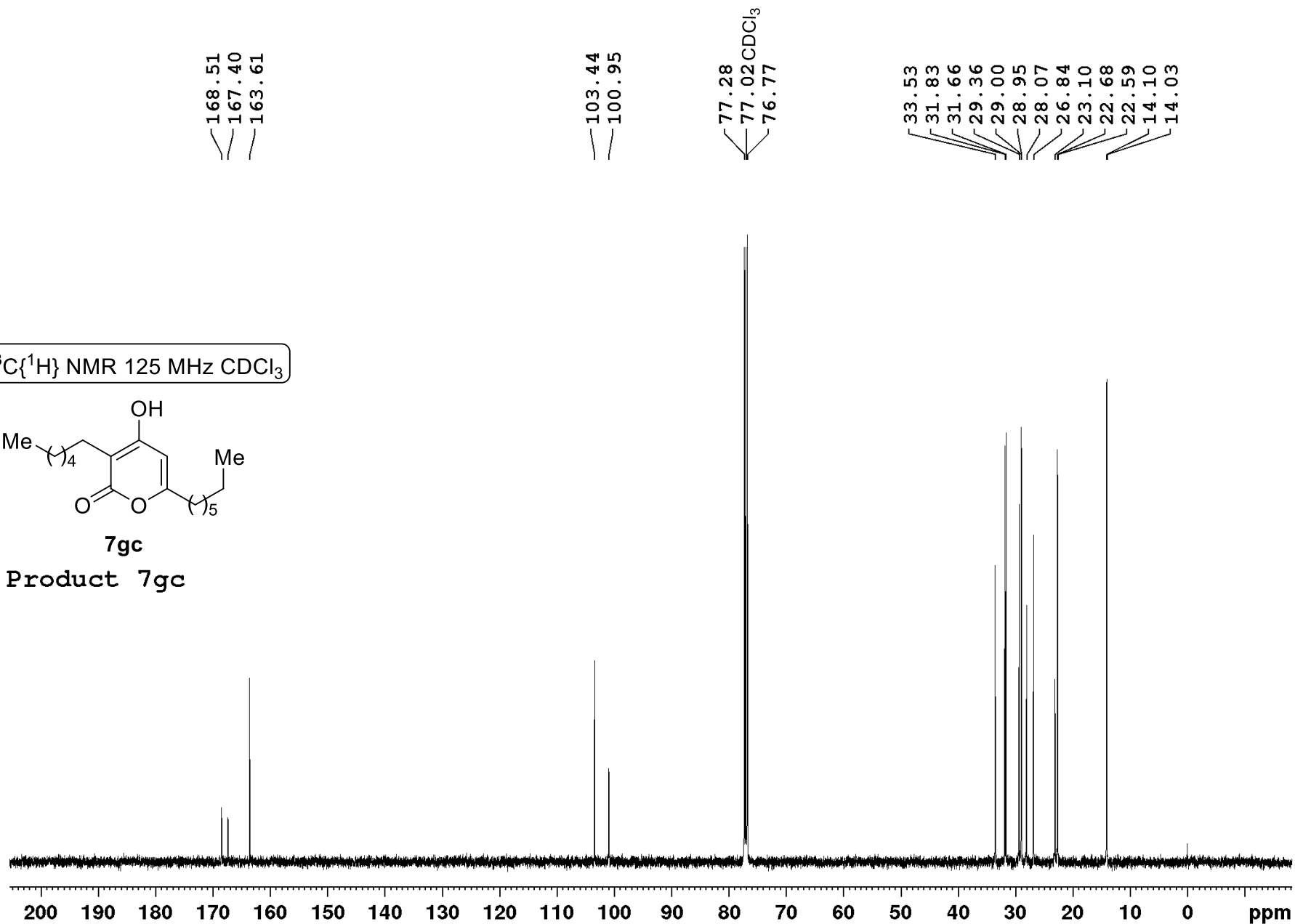


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

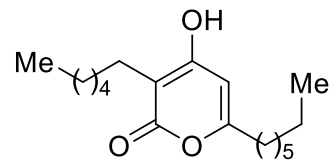


7gc

Product 7gc

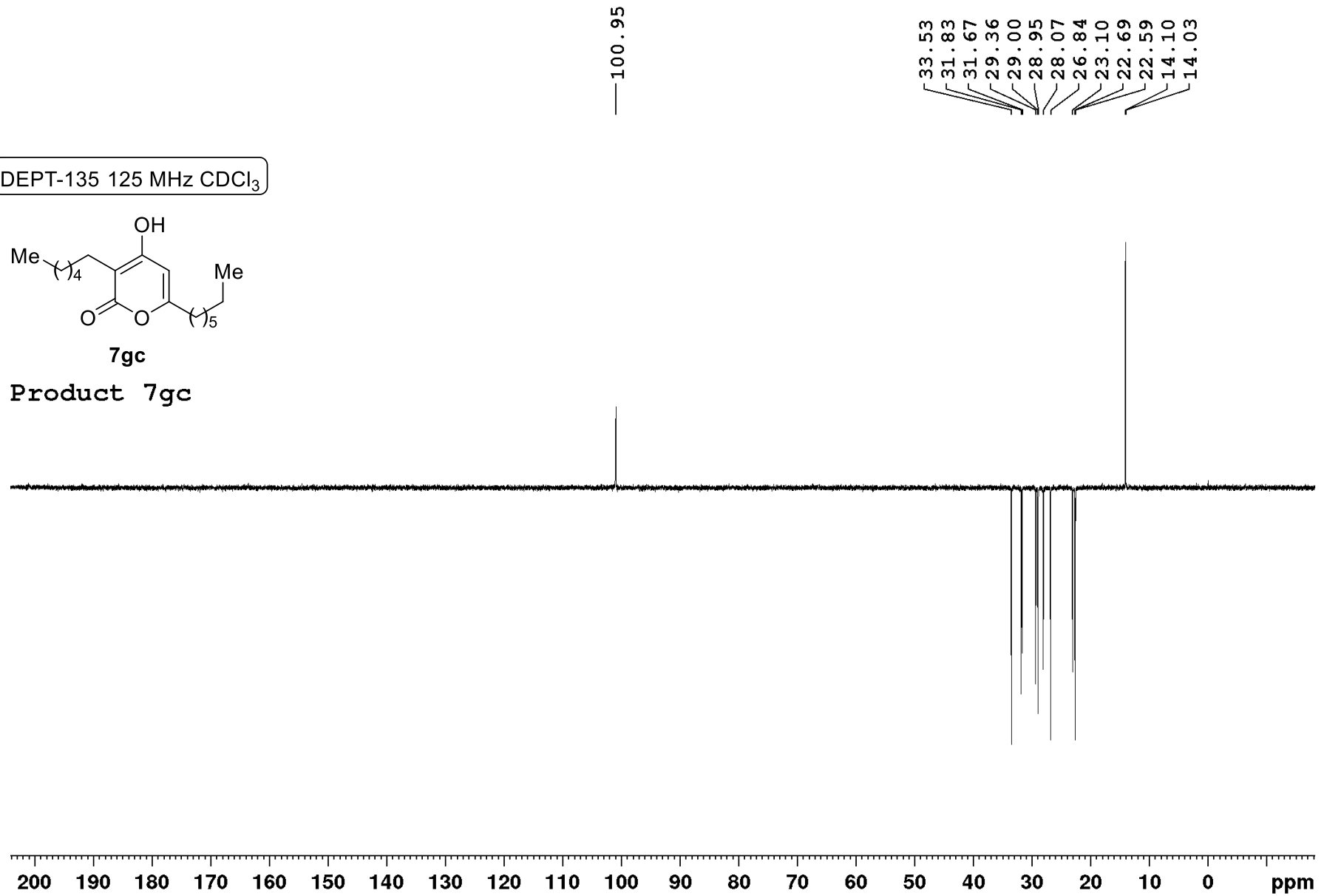


DEPT-135 125 MHz CDCl<sub>3</sub>

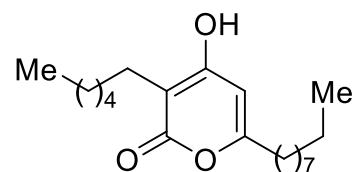


7gc

Product 7gc

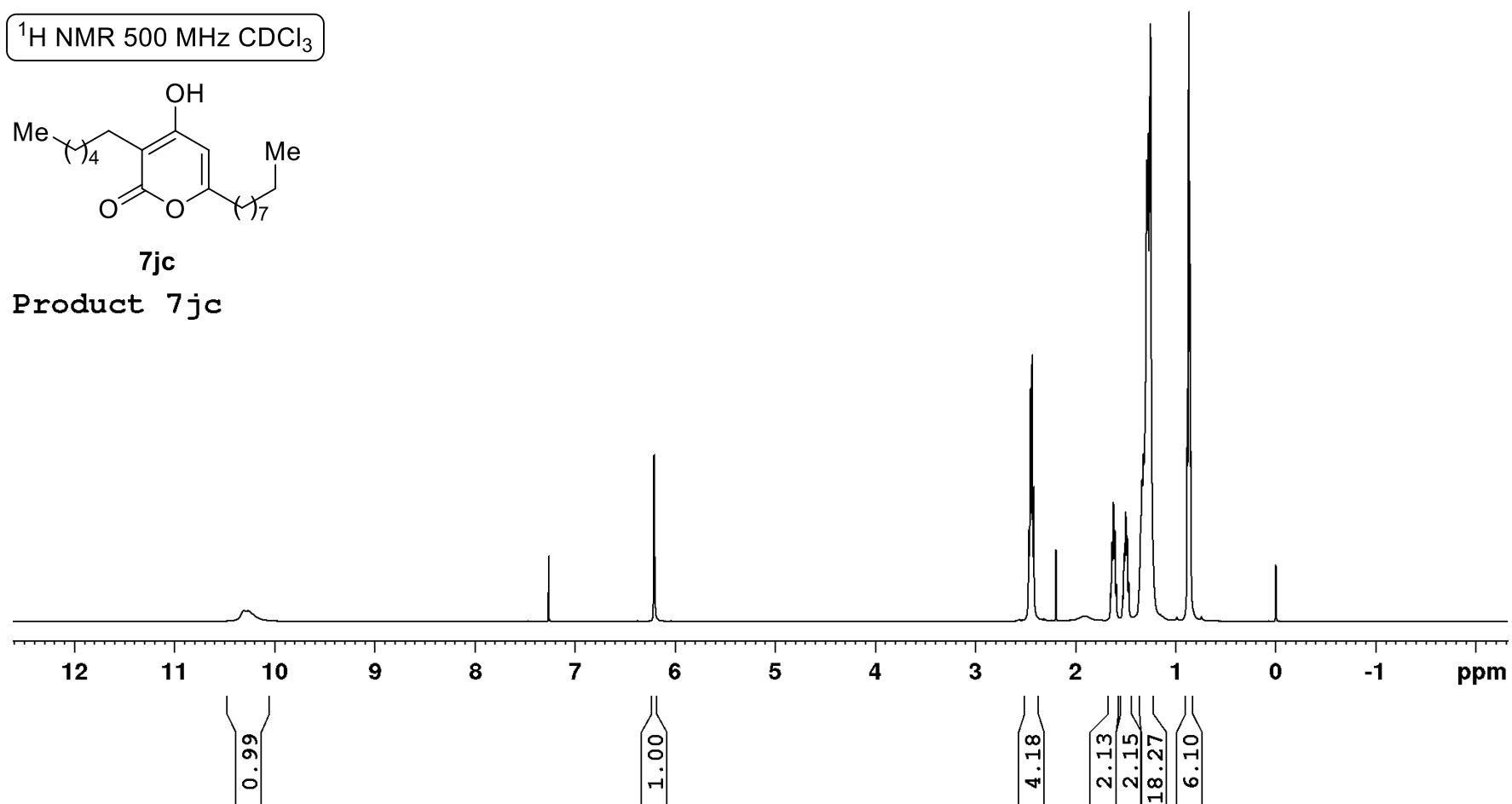


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

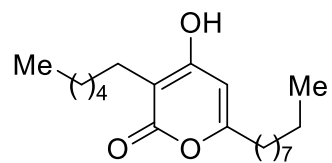


7jc

Product 7jc

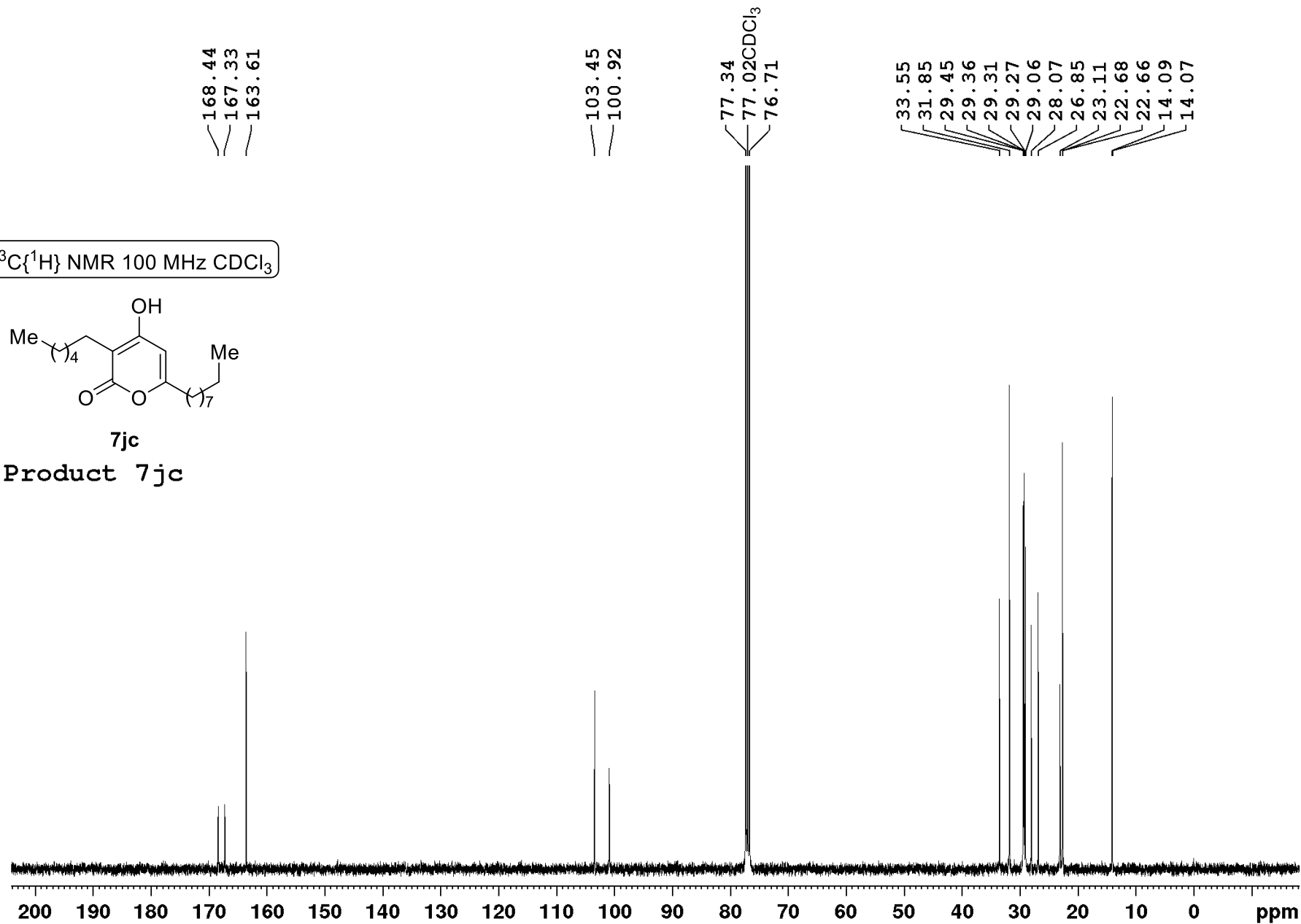


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

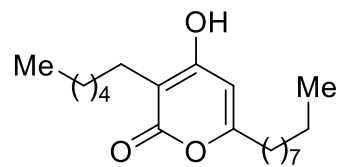


7jc

Product 7jc

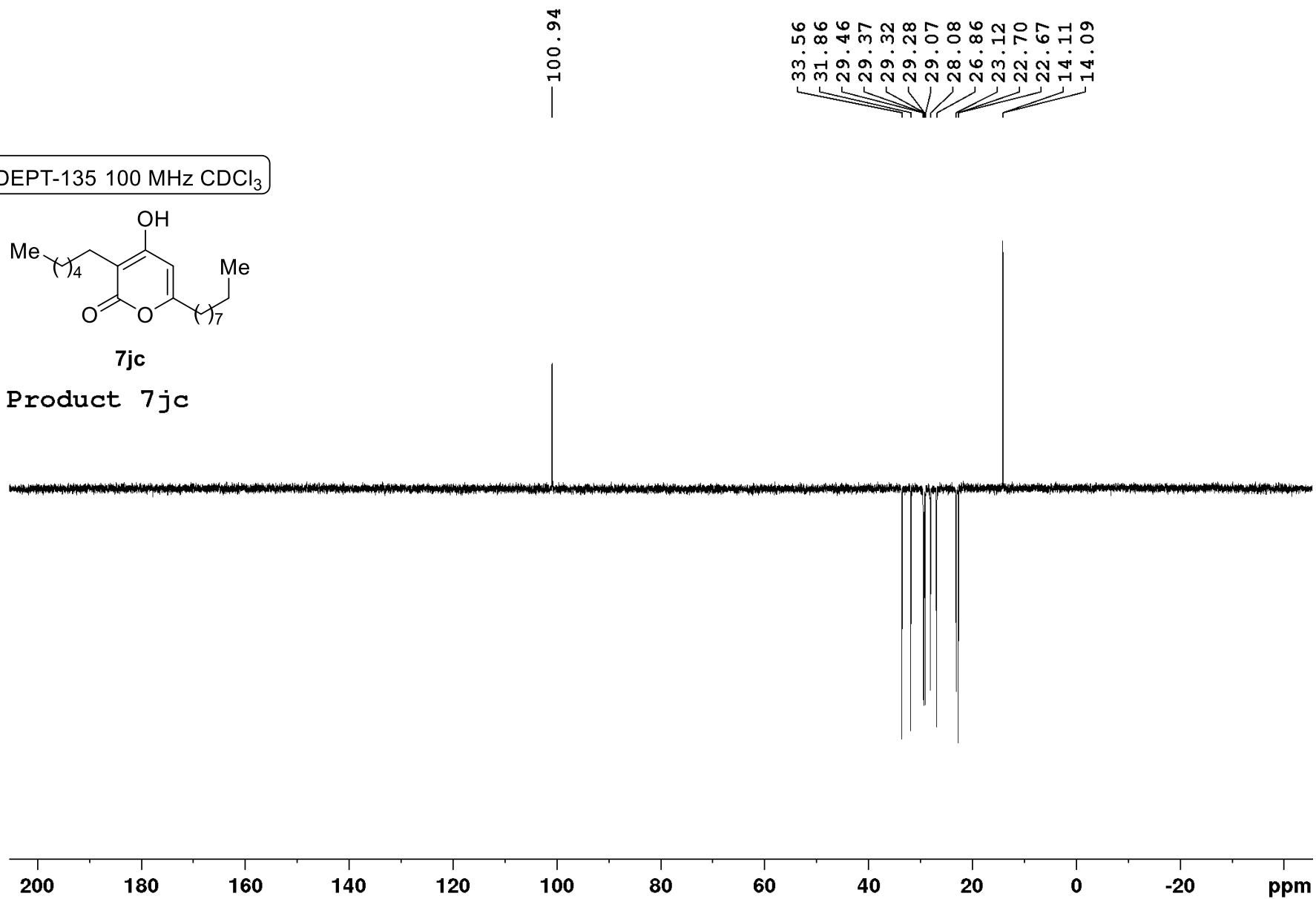


DEPT-135 100 MHz CDCl<sub>3</sub>

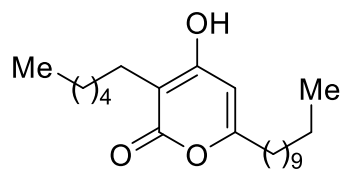


7jc

Product 7jc

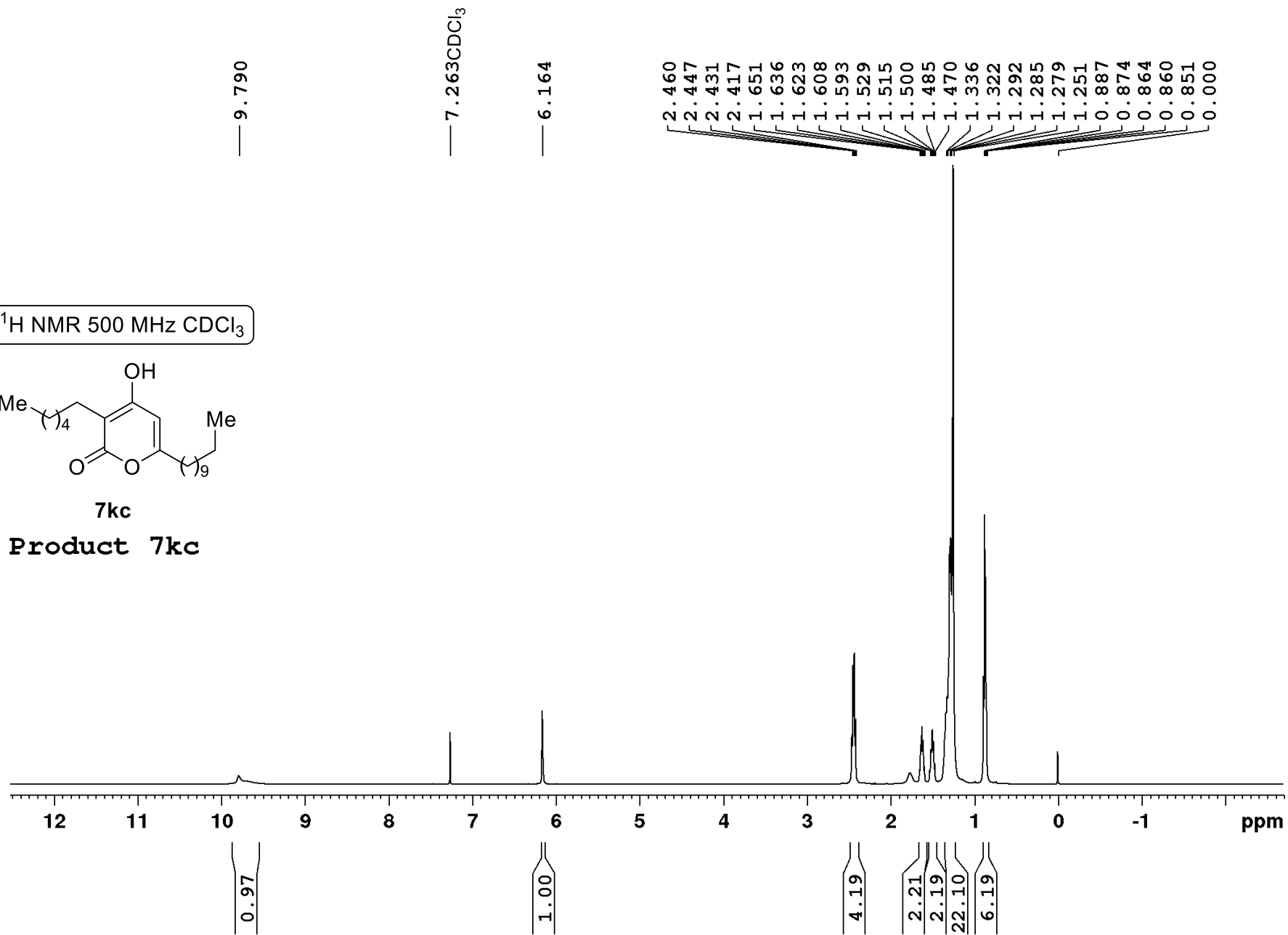


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



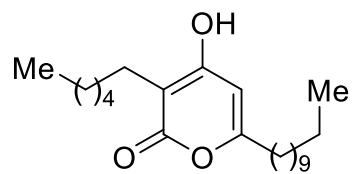
7kc

Product 7kc



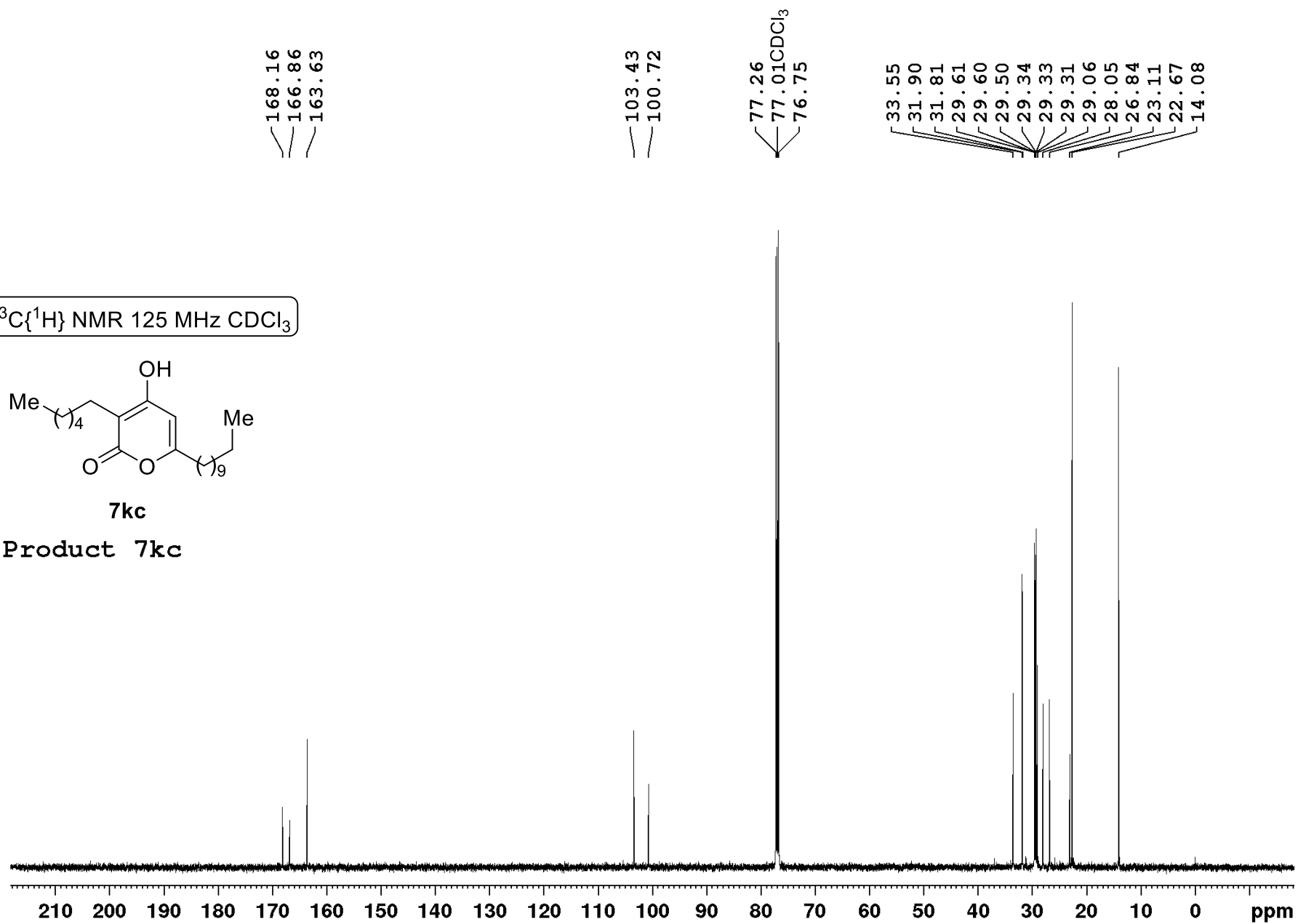


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

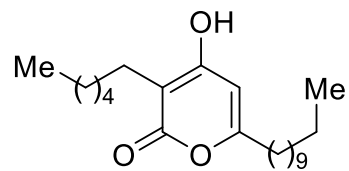


7kc

Product 7kc



DEPT-135 100 MHz CDCl<sub>3</sub>

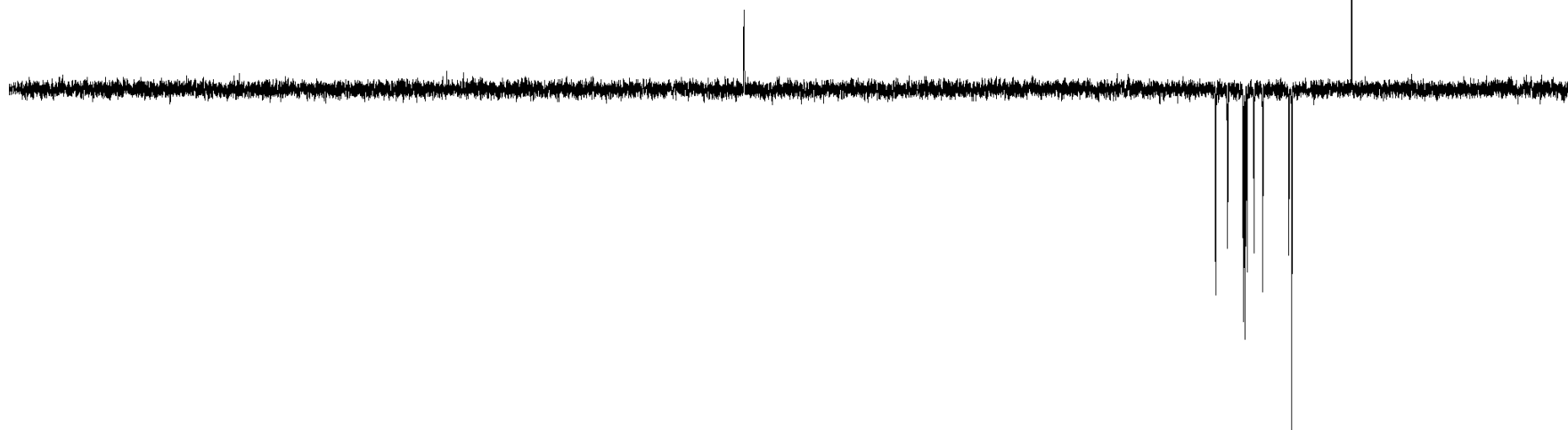


7kc

Product 7kc

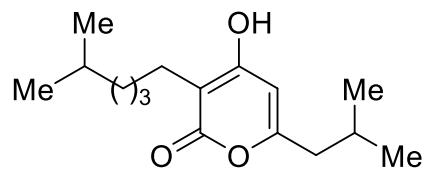
—100.71

33.53  
31.88  
31.80  
29.60  
29.49  
29.32  
29.30  
29.05  
28.04  
26.82  
23.09  
22.66  
14.09



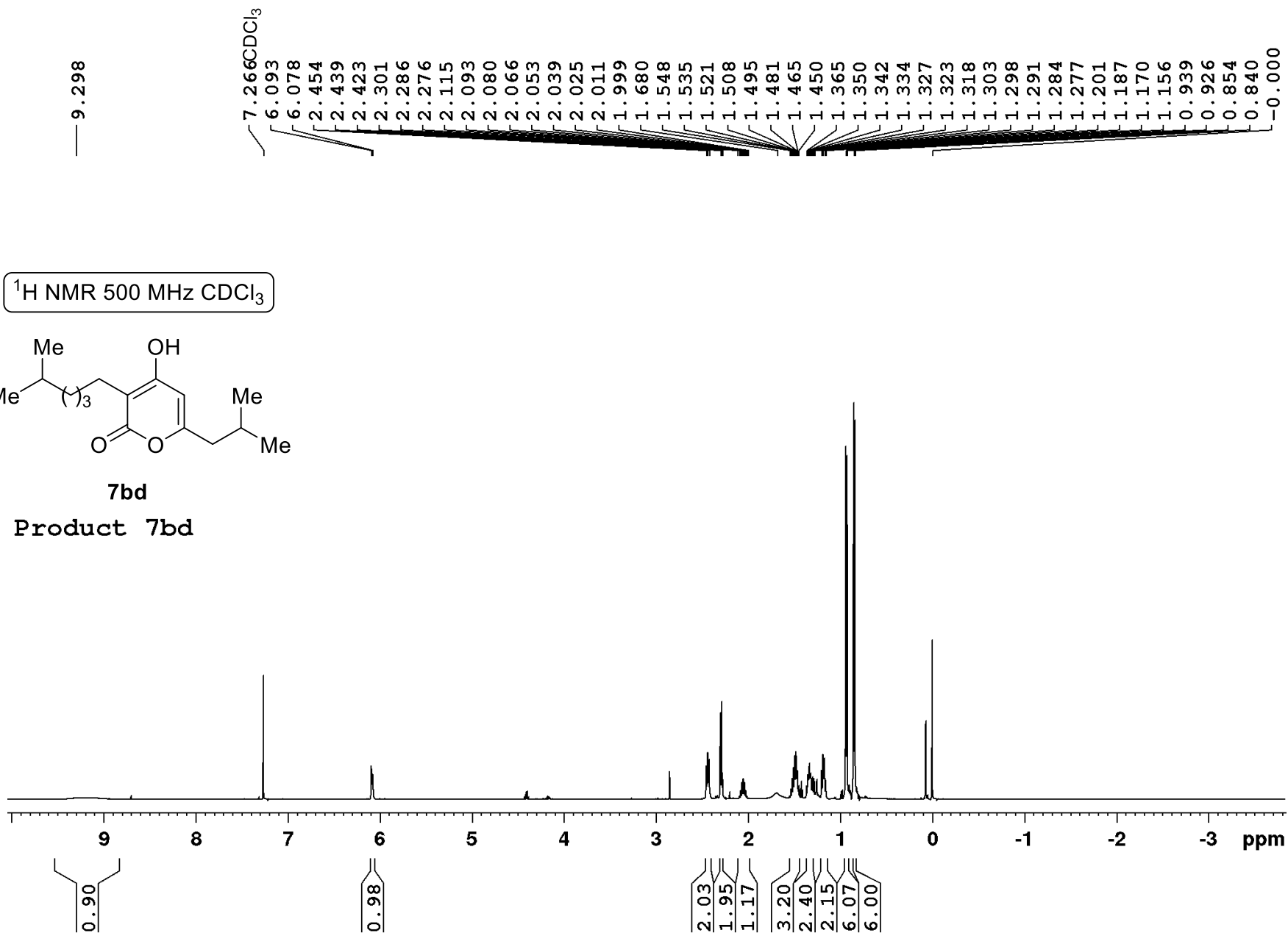
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

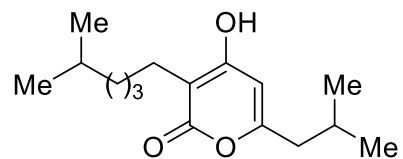


7bd

Product 7bd

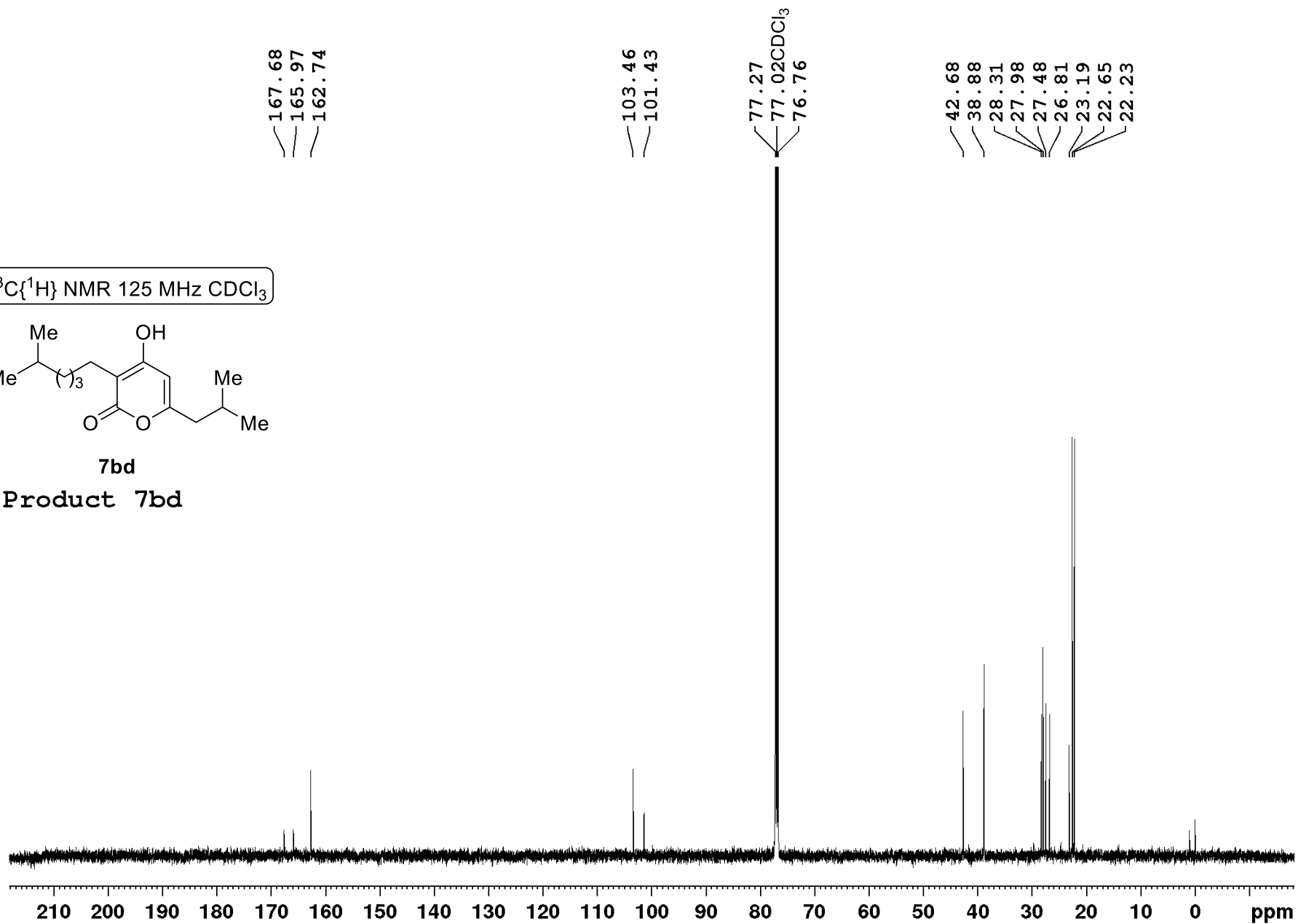


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

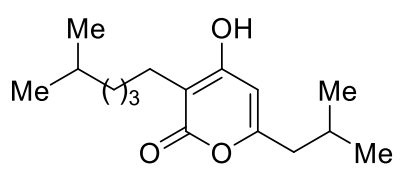


7bd

Product 7bd

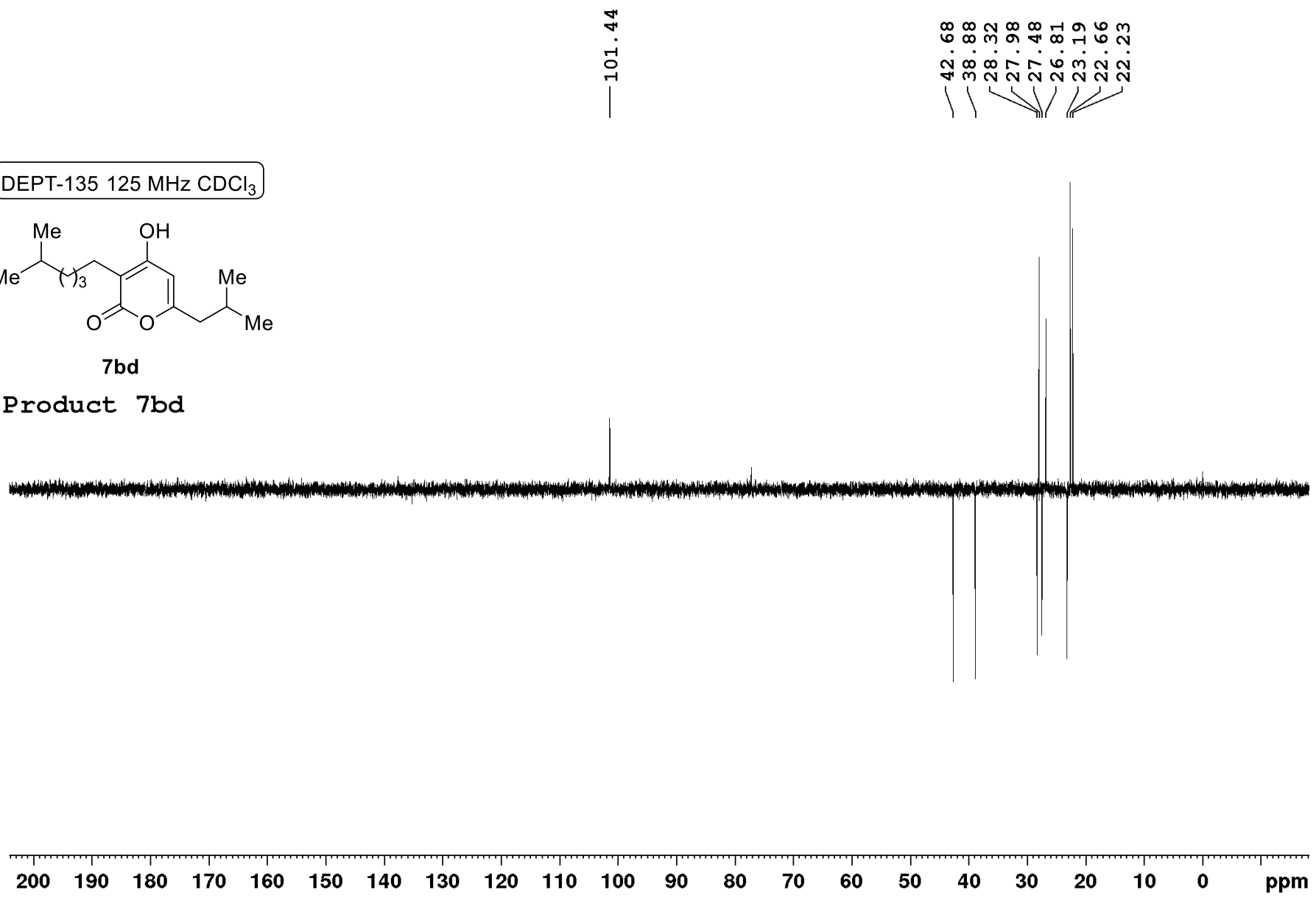


DEPT-135 125 MHz CDCl<sub>3</sub>

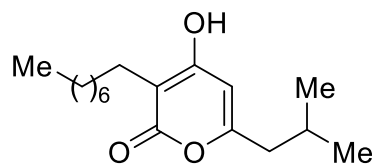


7bd

Product 7bd

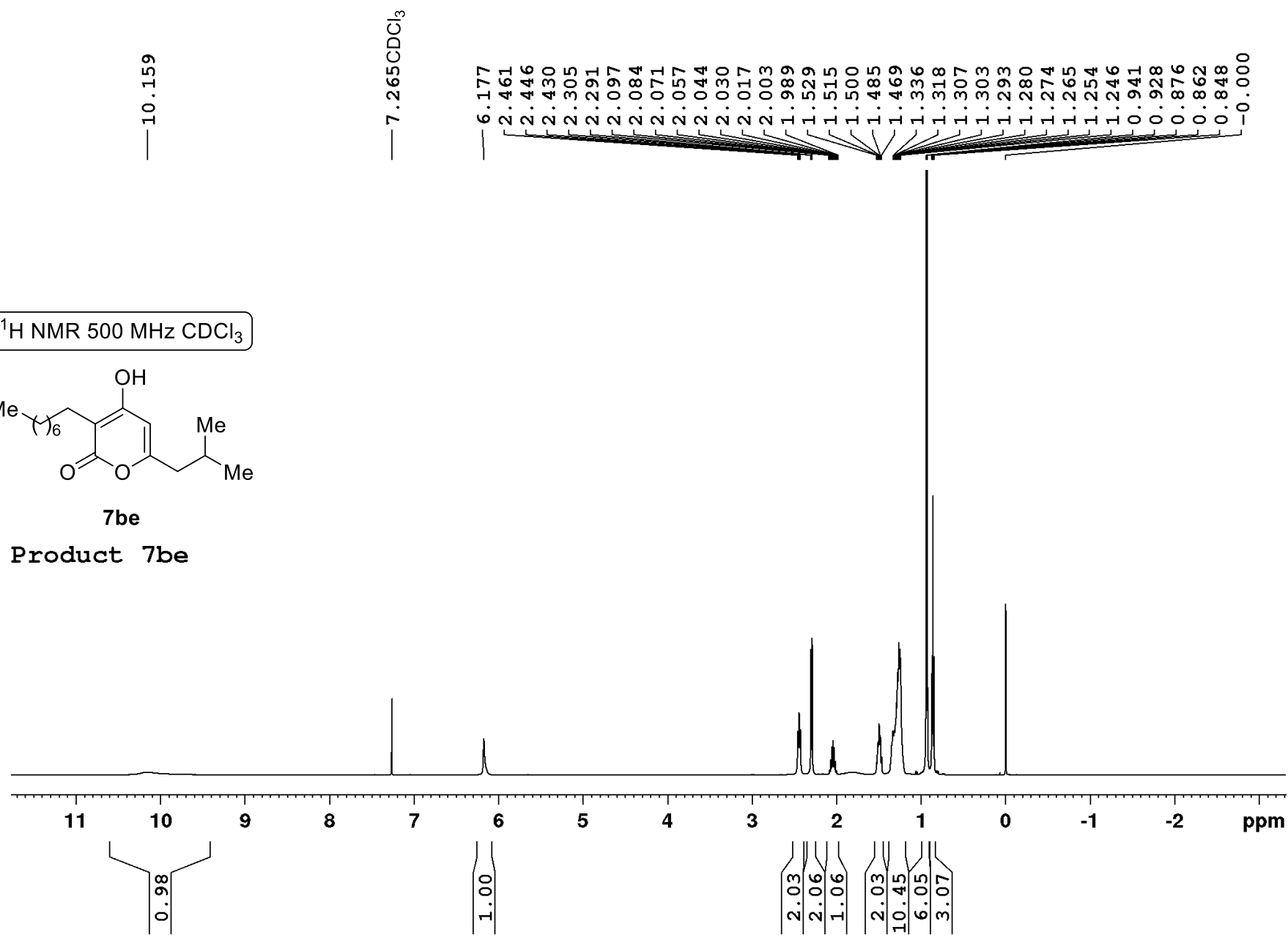


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

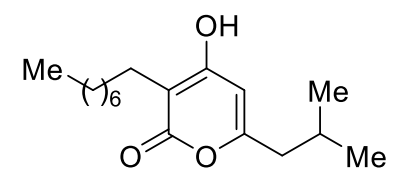


7be

Product 7be



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



7be

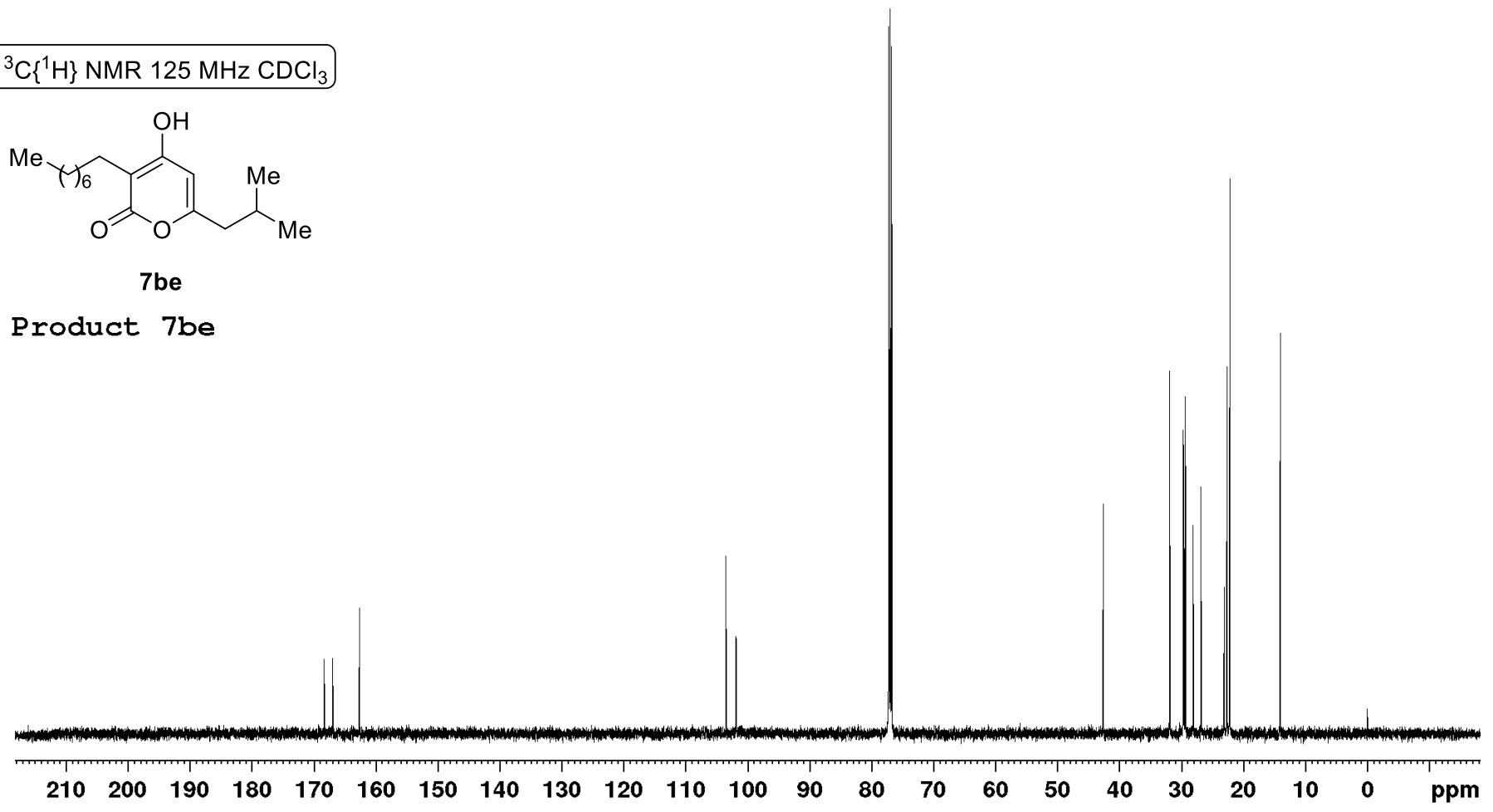
Product 7be

168.37  
167.01  
162.65

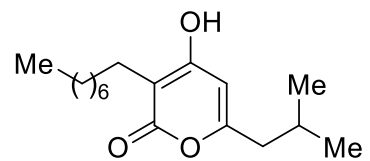
103.49  
101.87

77.25  
77.00  $\text{CDCl}_3$   
76.74

42.61  
31.90  
29.71  
29.58  
29.34  
28.09  
26.83  
23.11  
22.65  
22.20  
14.07  
-0.03

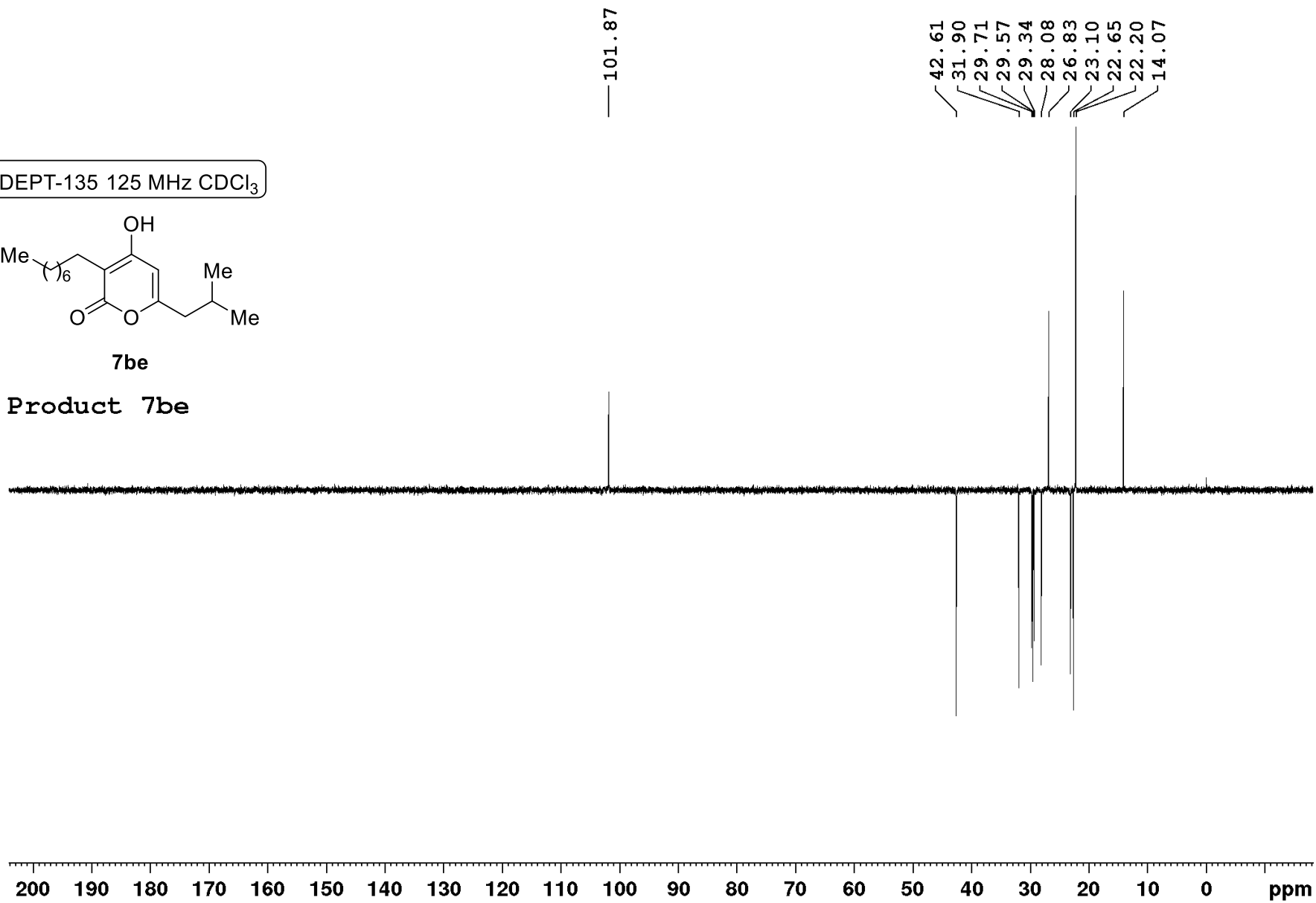


DEPT-135 125 MHz CDCl<sub>3</sub>



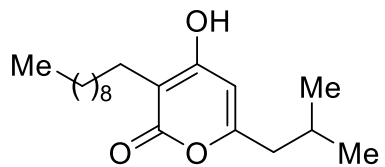
7be

Product 7be



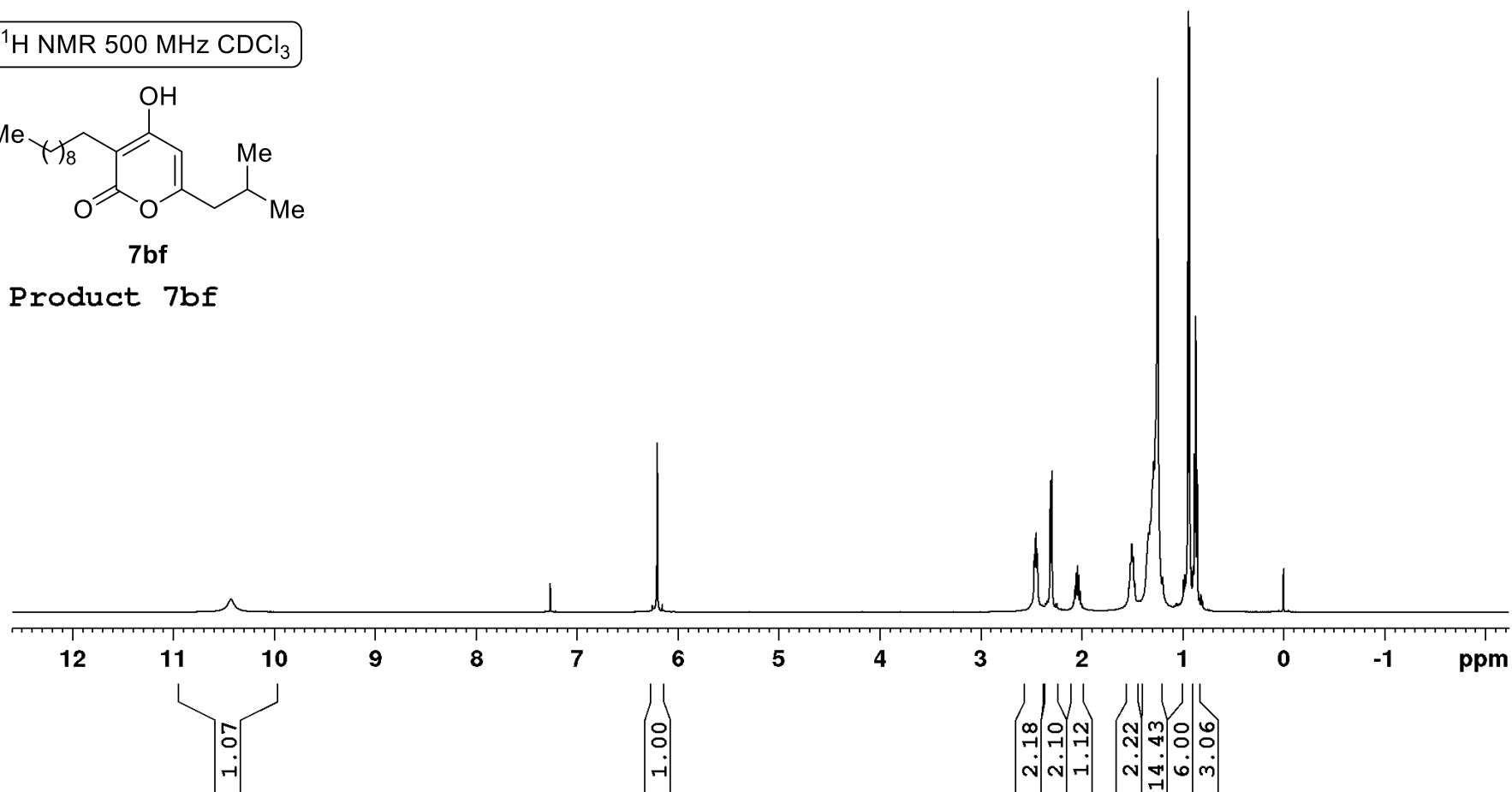


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

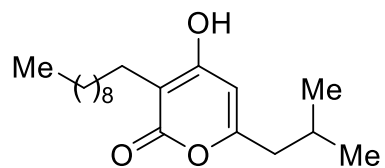


7bf

Product 7bf

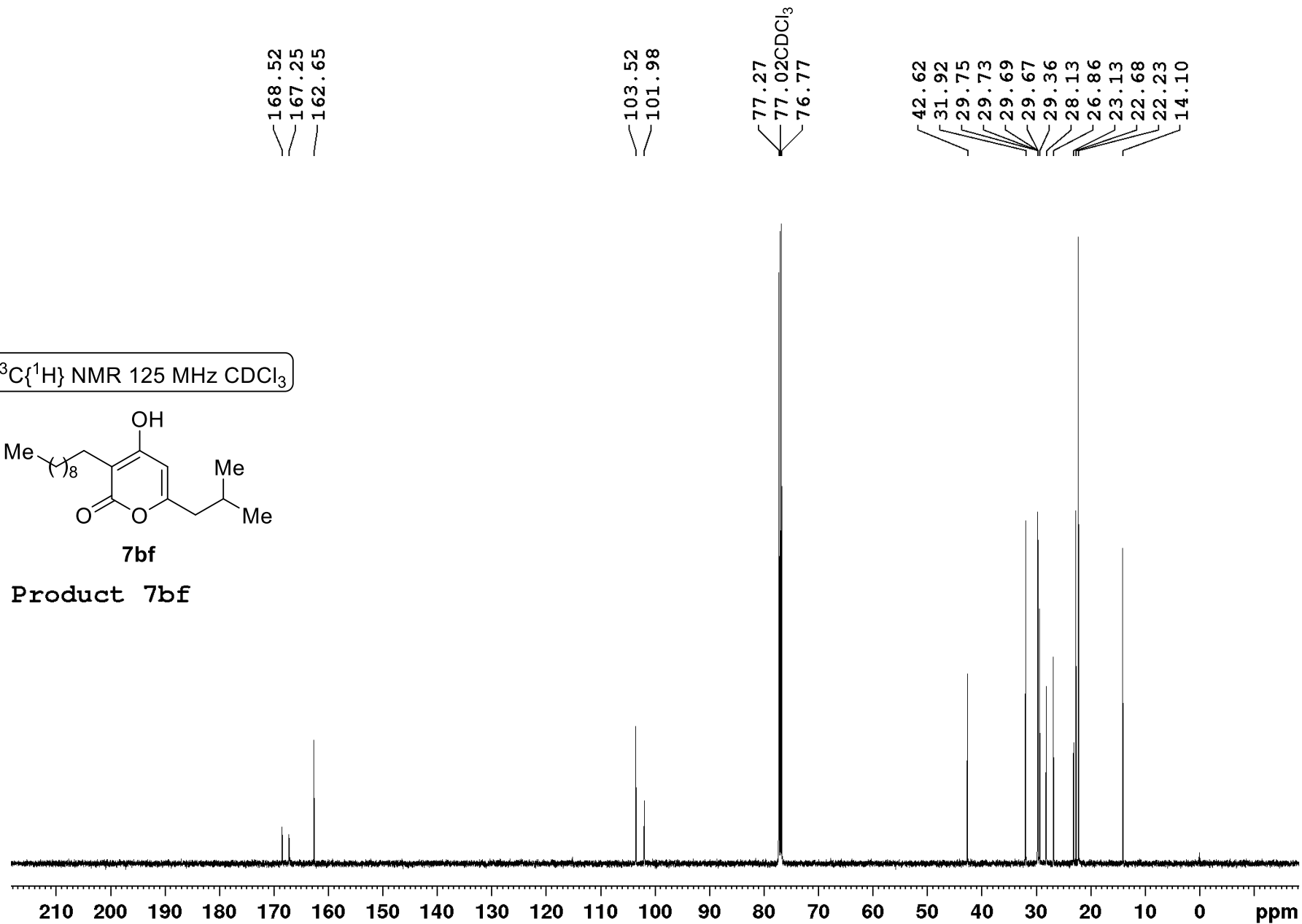


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

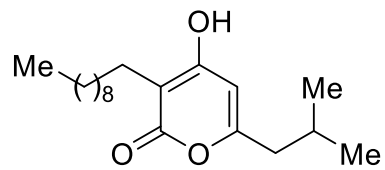


7bf

Product 7bf

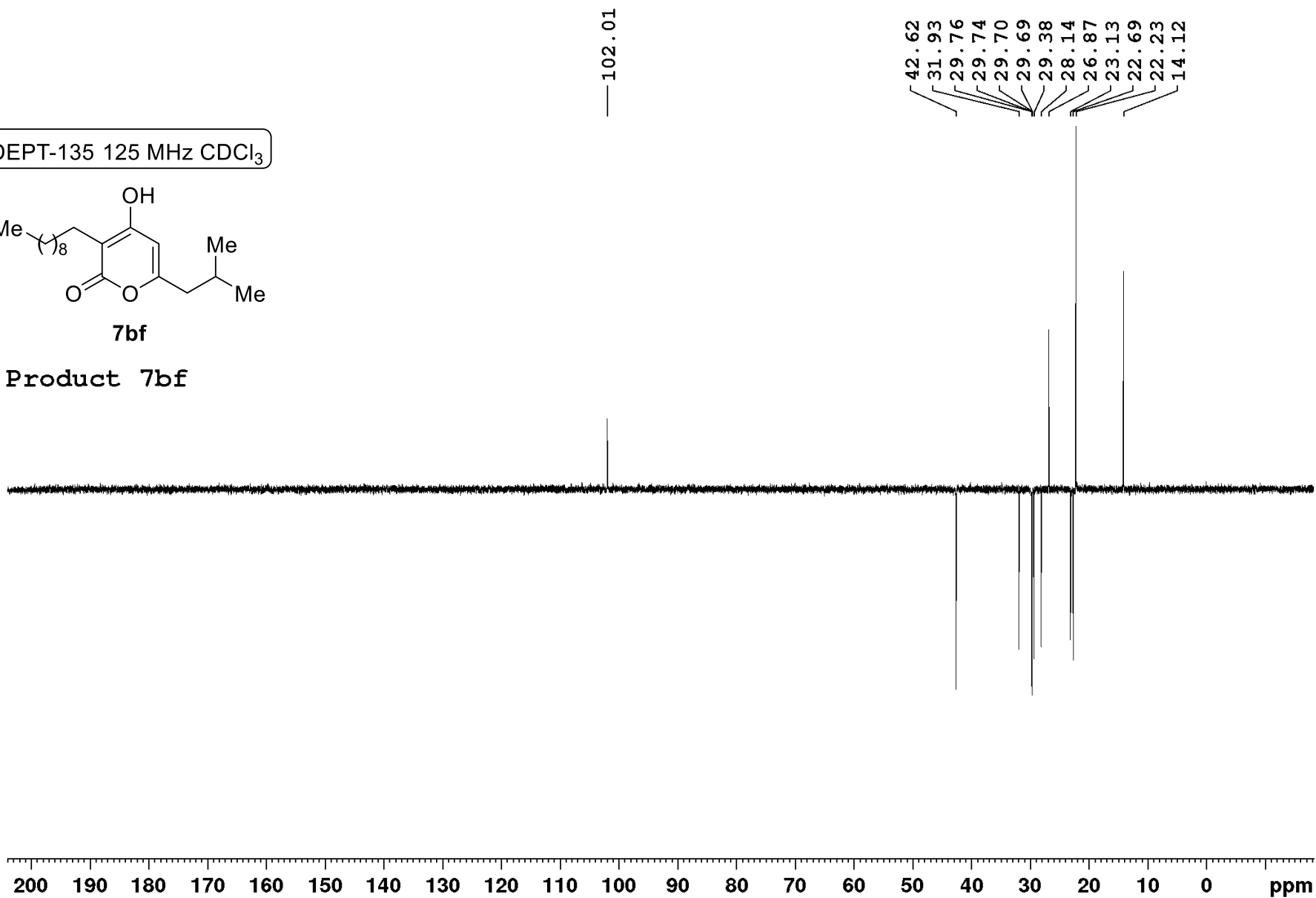


DEPT-135 125 MHz CDCl<sub>3</sub>

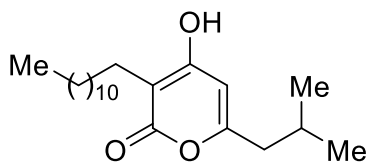


7bf

Product 7bf

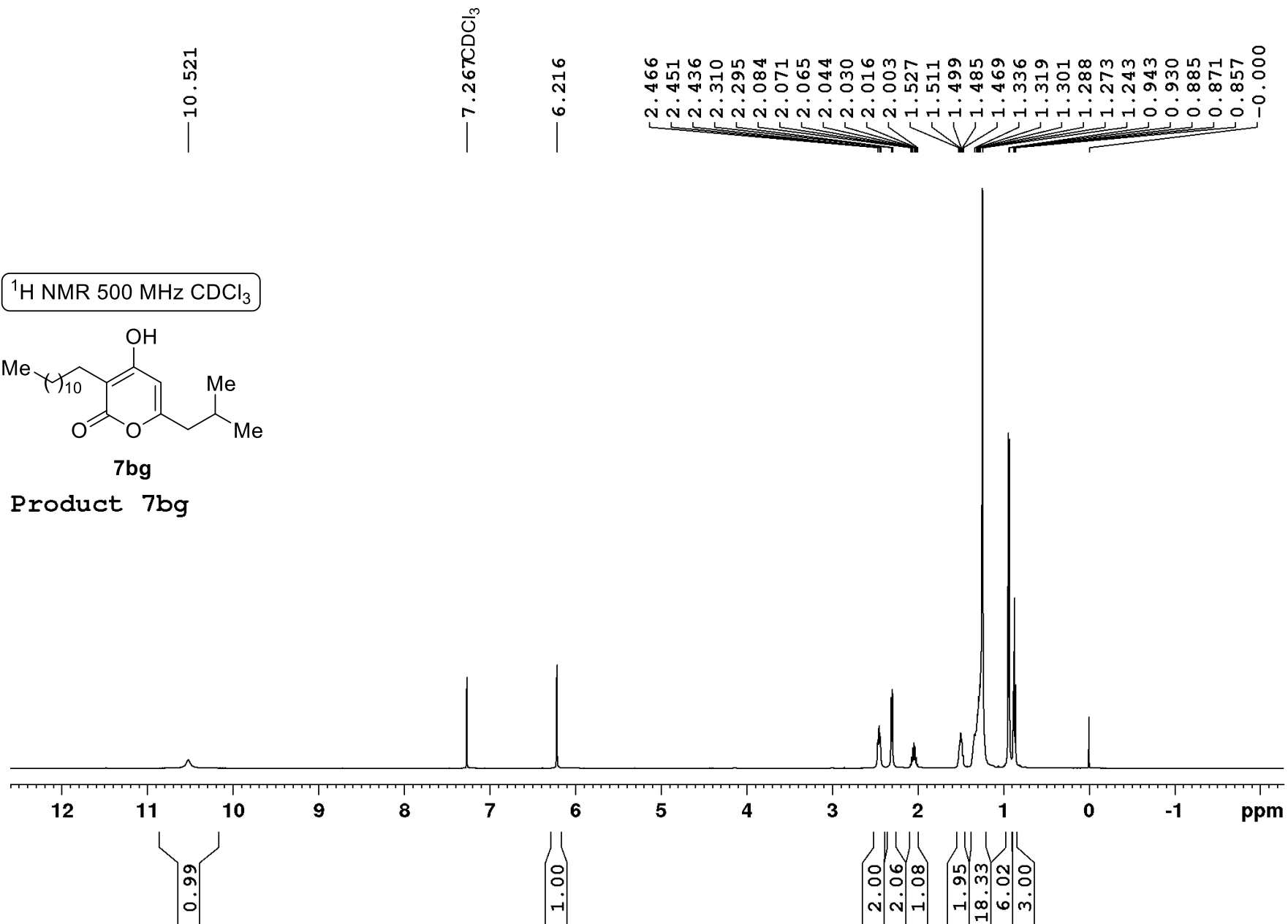


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

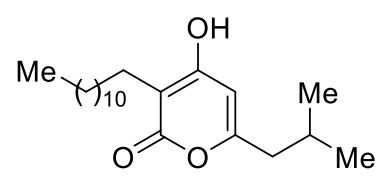


7bg

Product 7bg

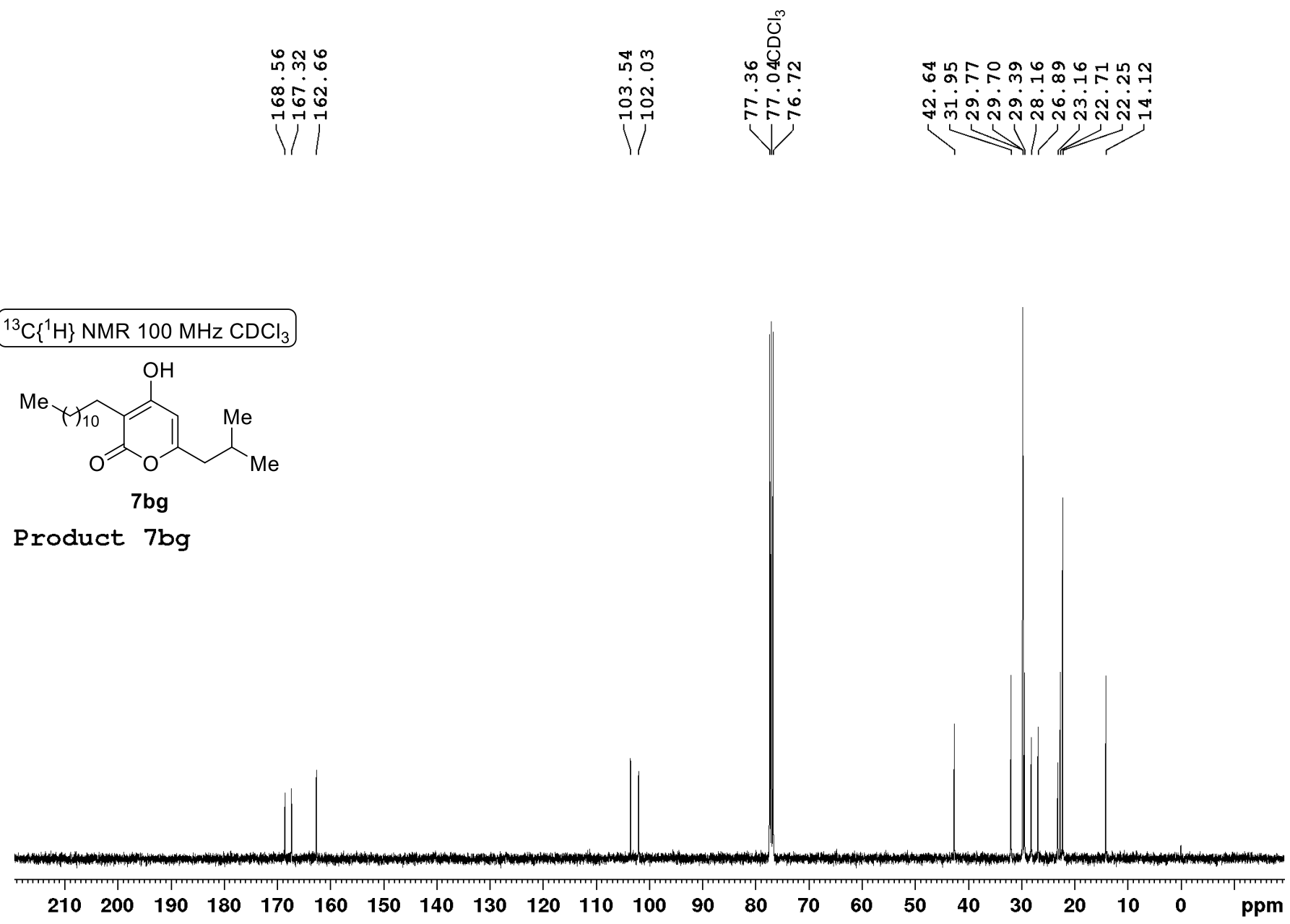


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

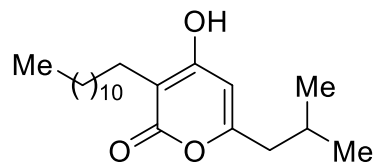


7bg

Product 7bg



DEPT-135 100 MHz CDCl<sub>3</sub>

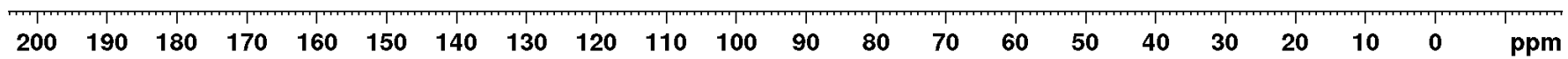


7bg

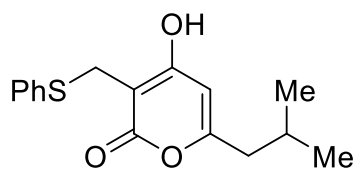
Product 7bg

—102.04

42.64  
31.96  
29.78  
29.71  
29.40  
28.16  
26.89  
23.16  
22.72  
22.26  
14.14

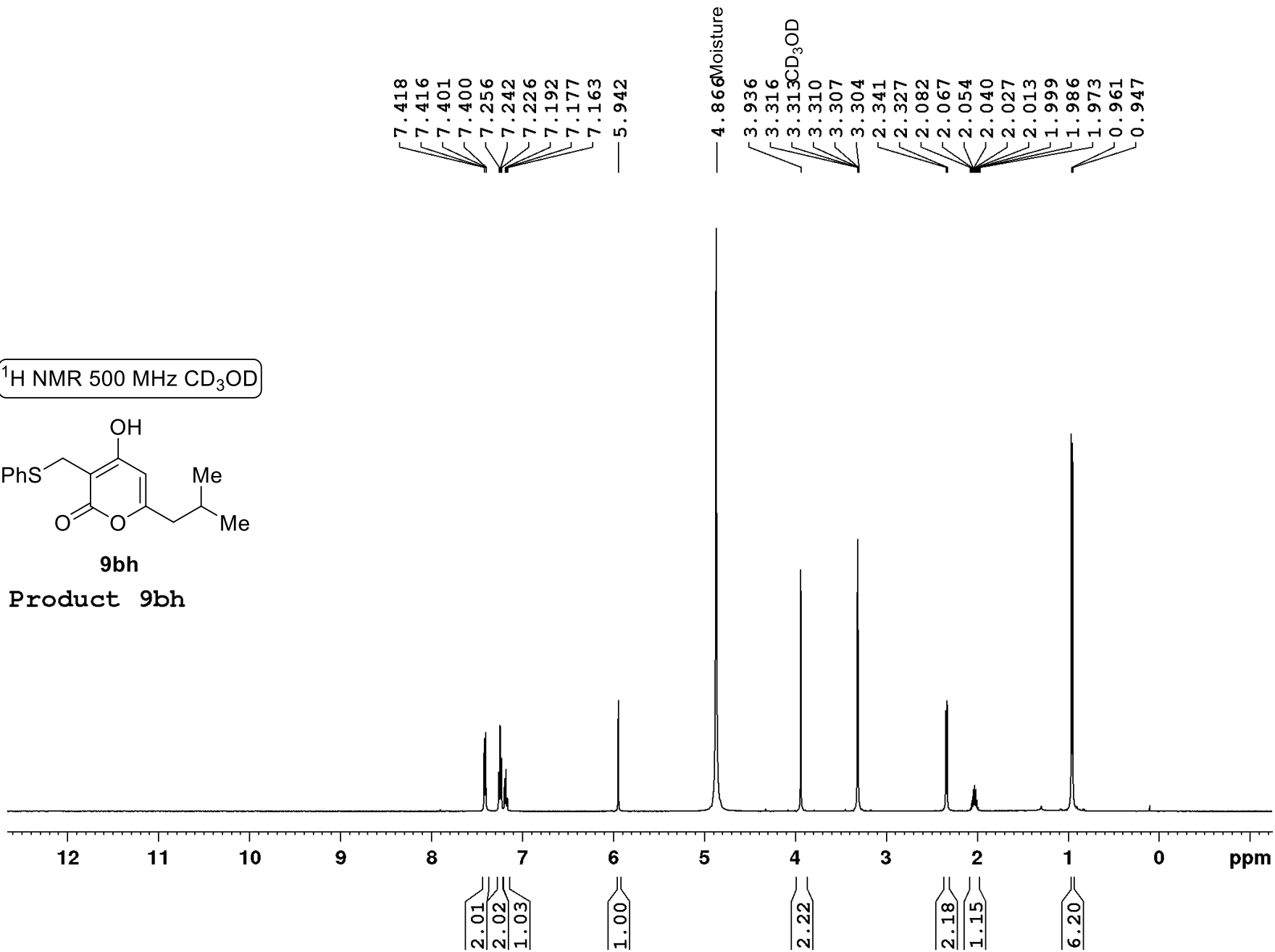


<sup>1</sup>H NMR 500 MHz CD<sub>3</sub>OD

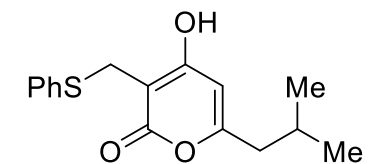


9bh

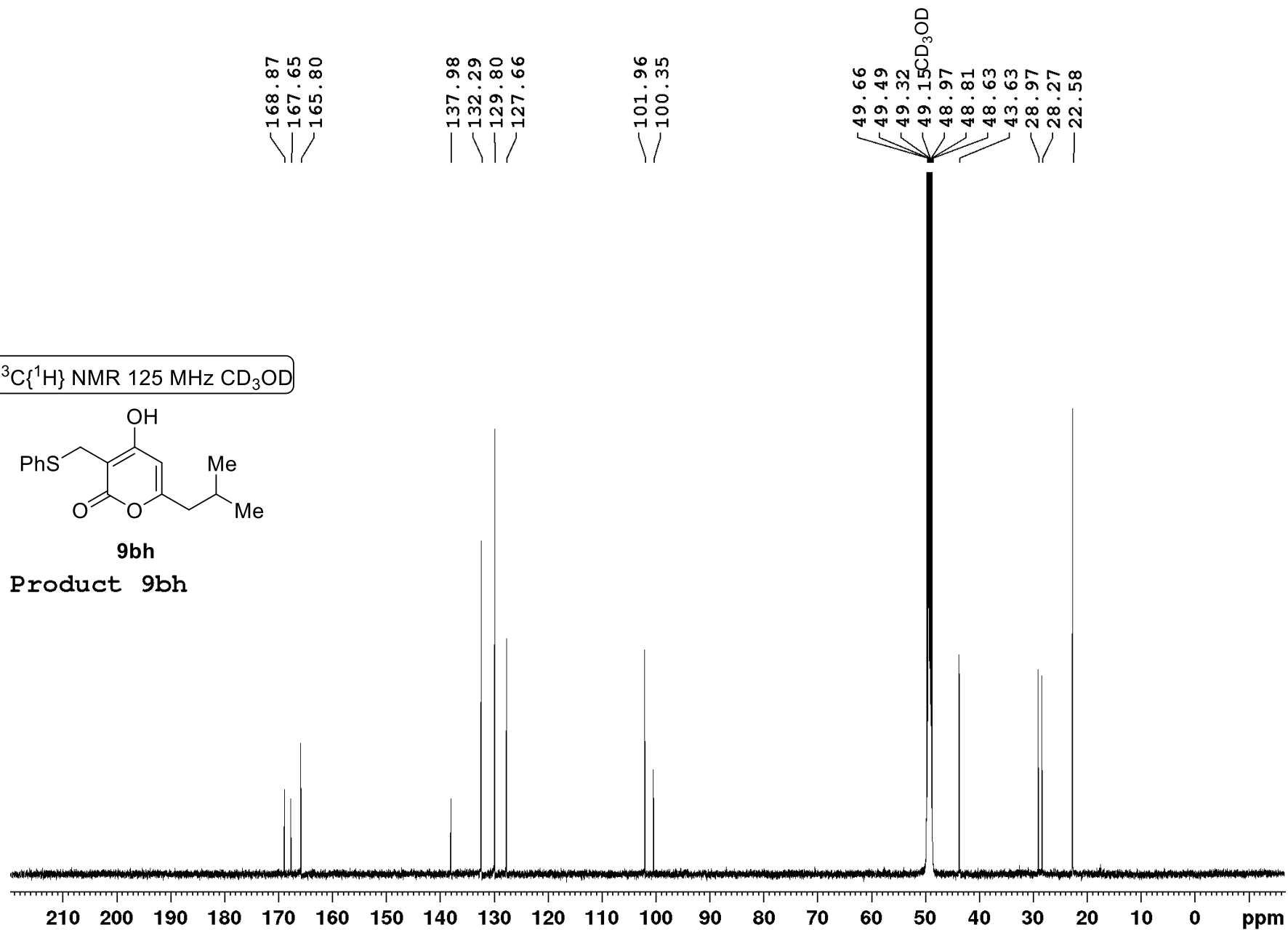
Product 9bh



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

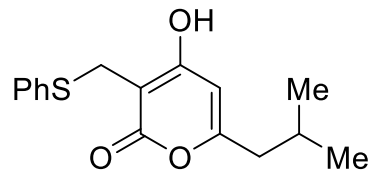


9bh  
Product 9bh



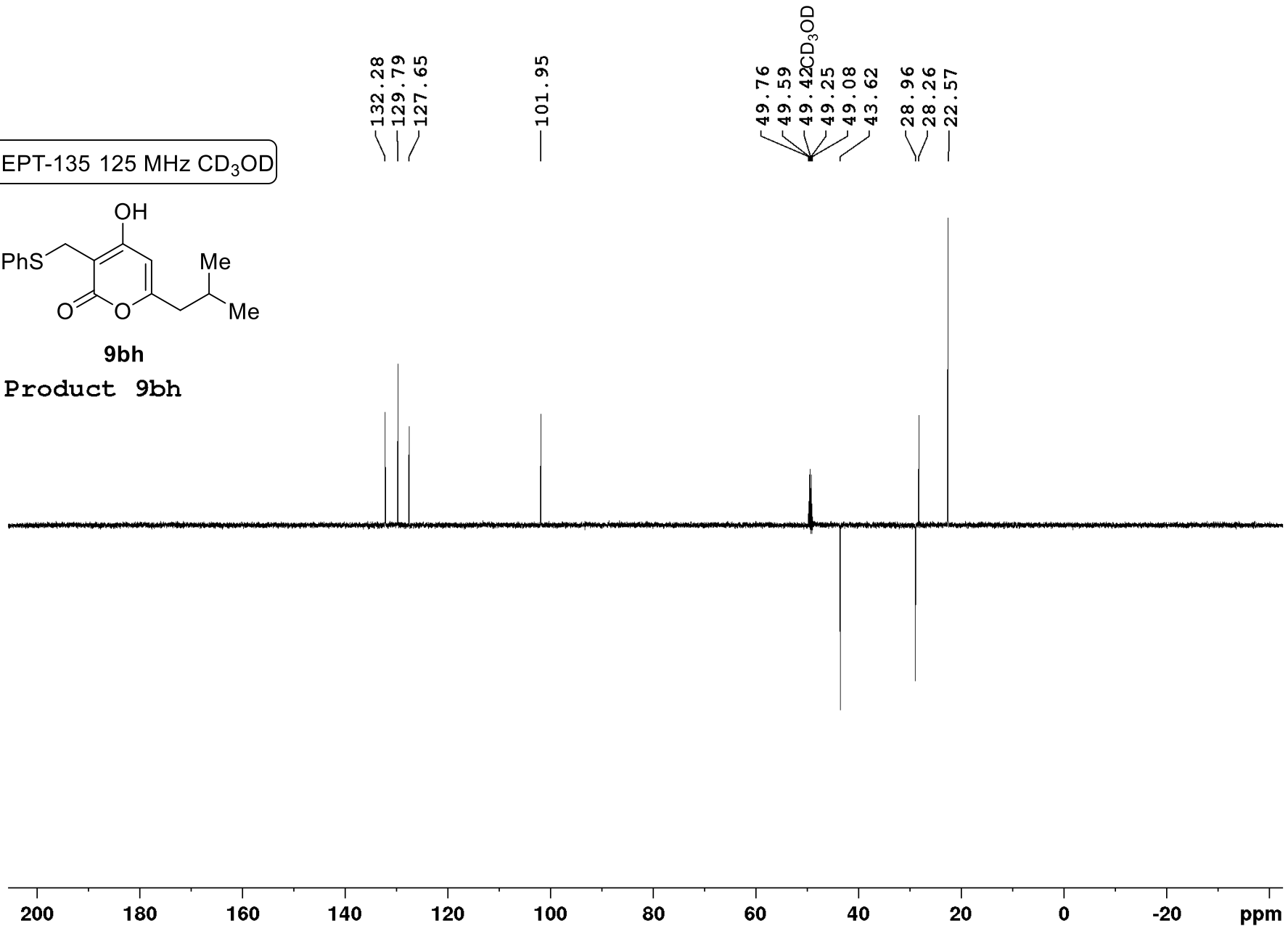


DEPT-135 125 MHz CD<sub>3</sub>OD

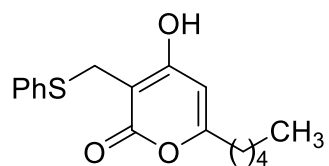


9bh

Product 9bh

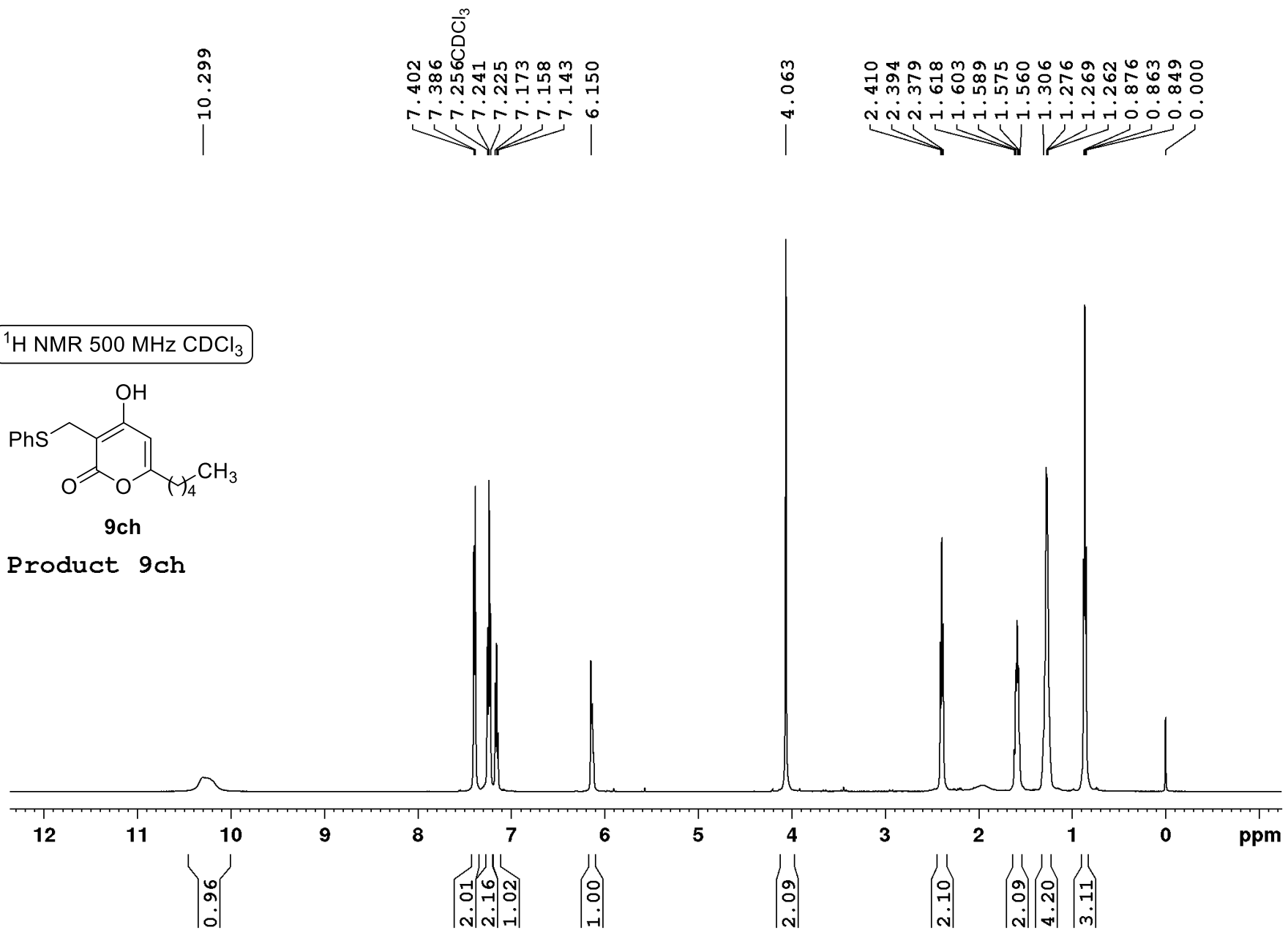


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

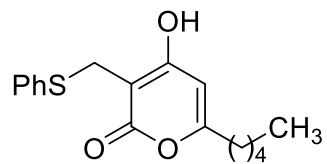


9ch

Product 9ch

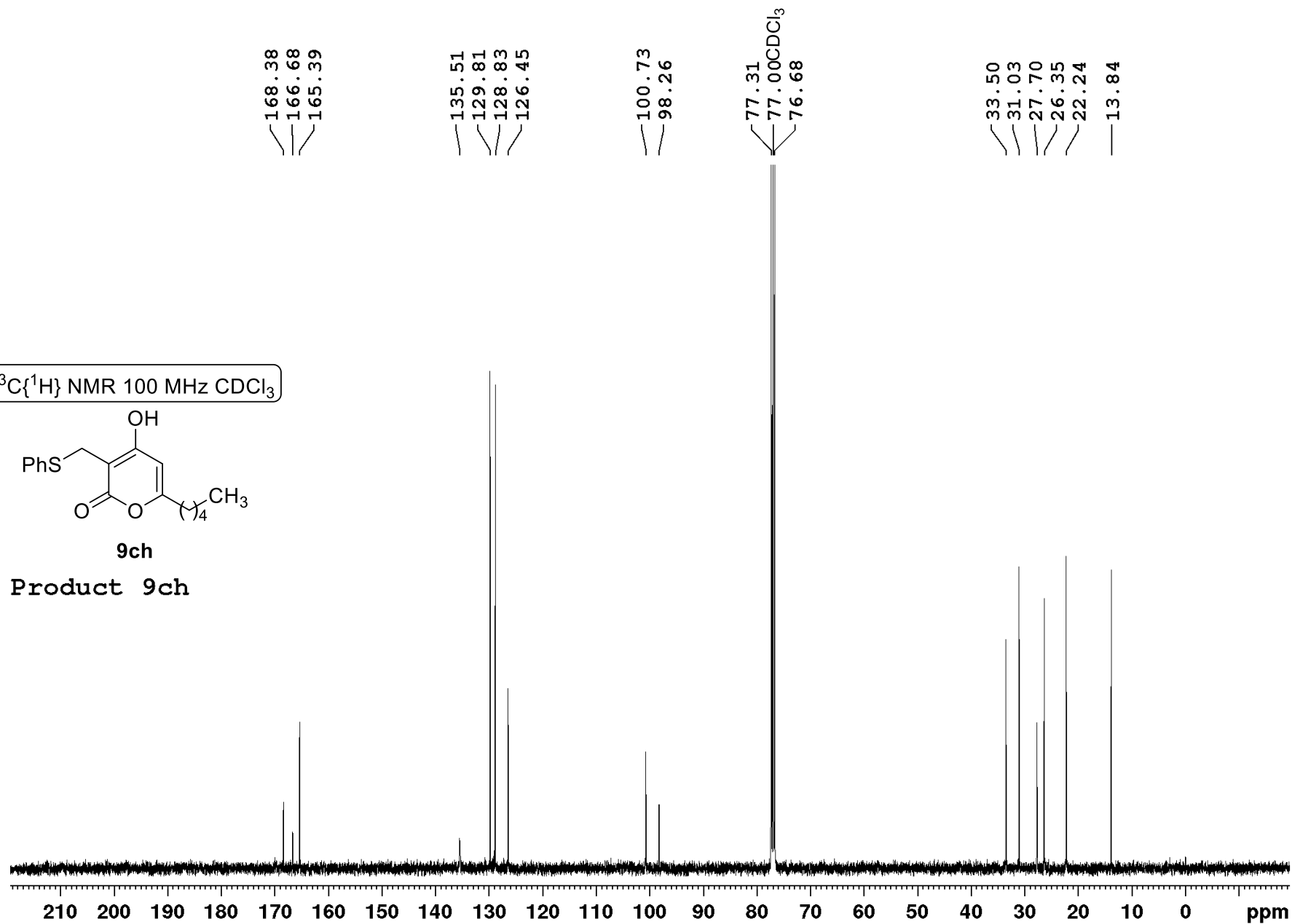


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

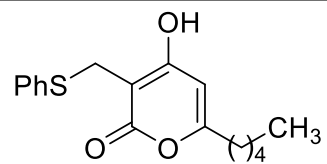


9ch

Product 9ch

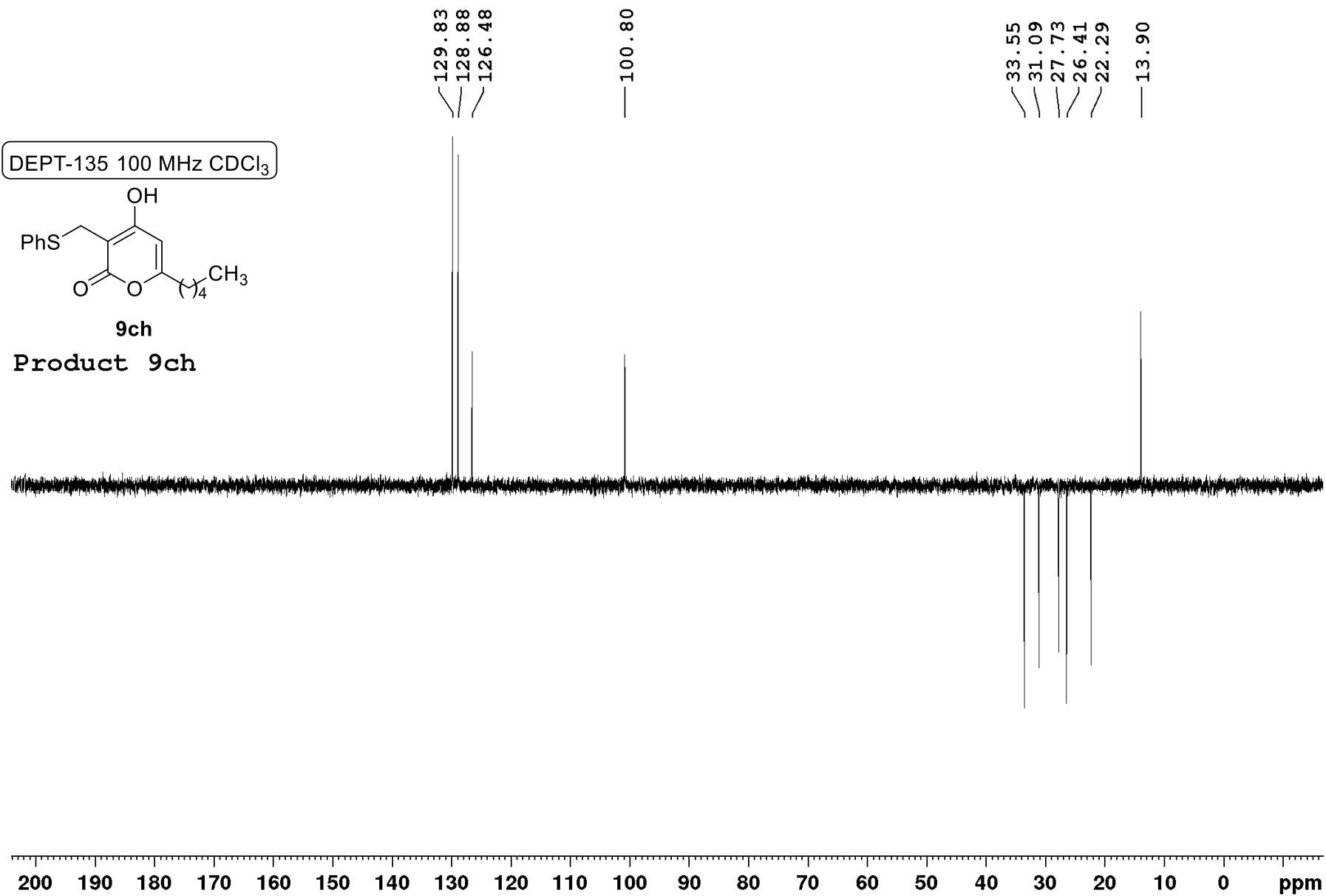


DEPT-135 100 MHz CDCl<sub>3</sub>

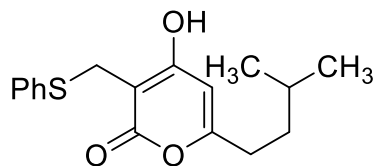


9ch

Product 9ch

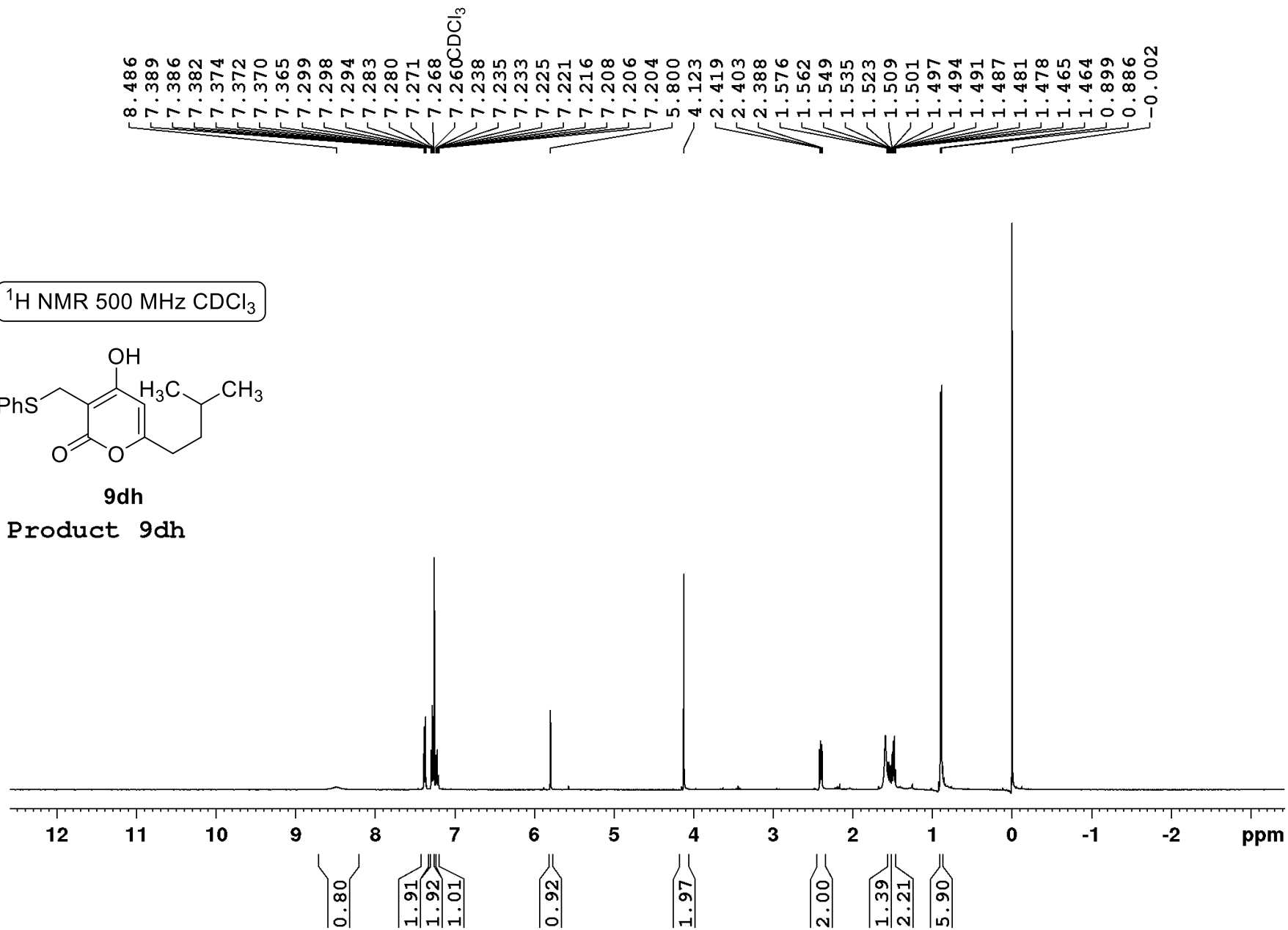


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

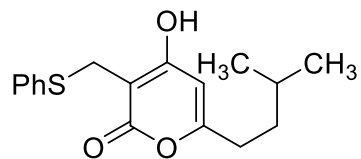


9dh

Product 9dh

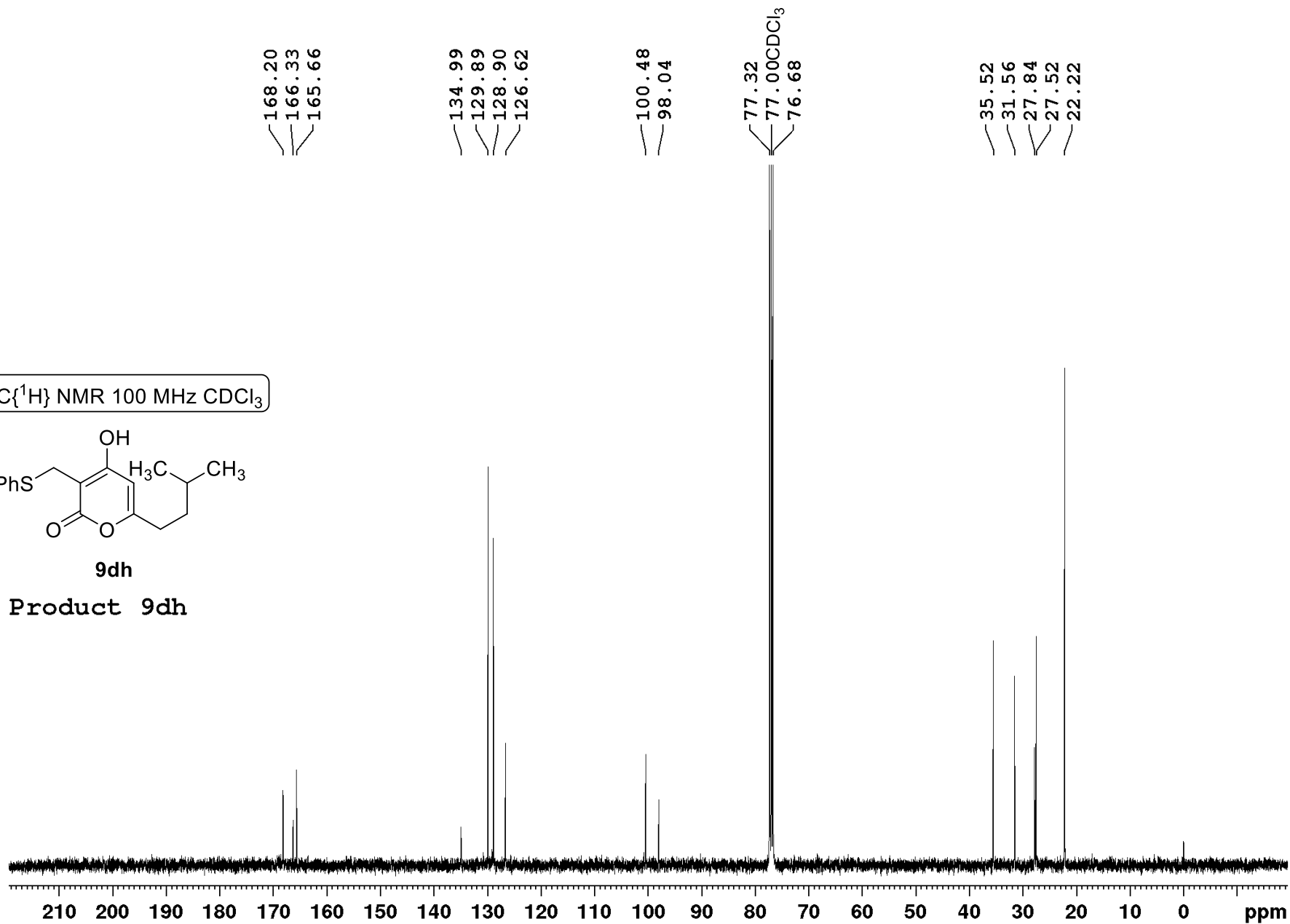


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

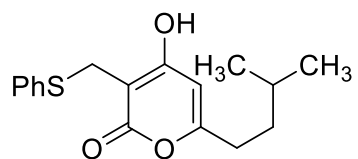


9dh

Product 9dh

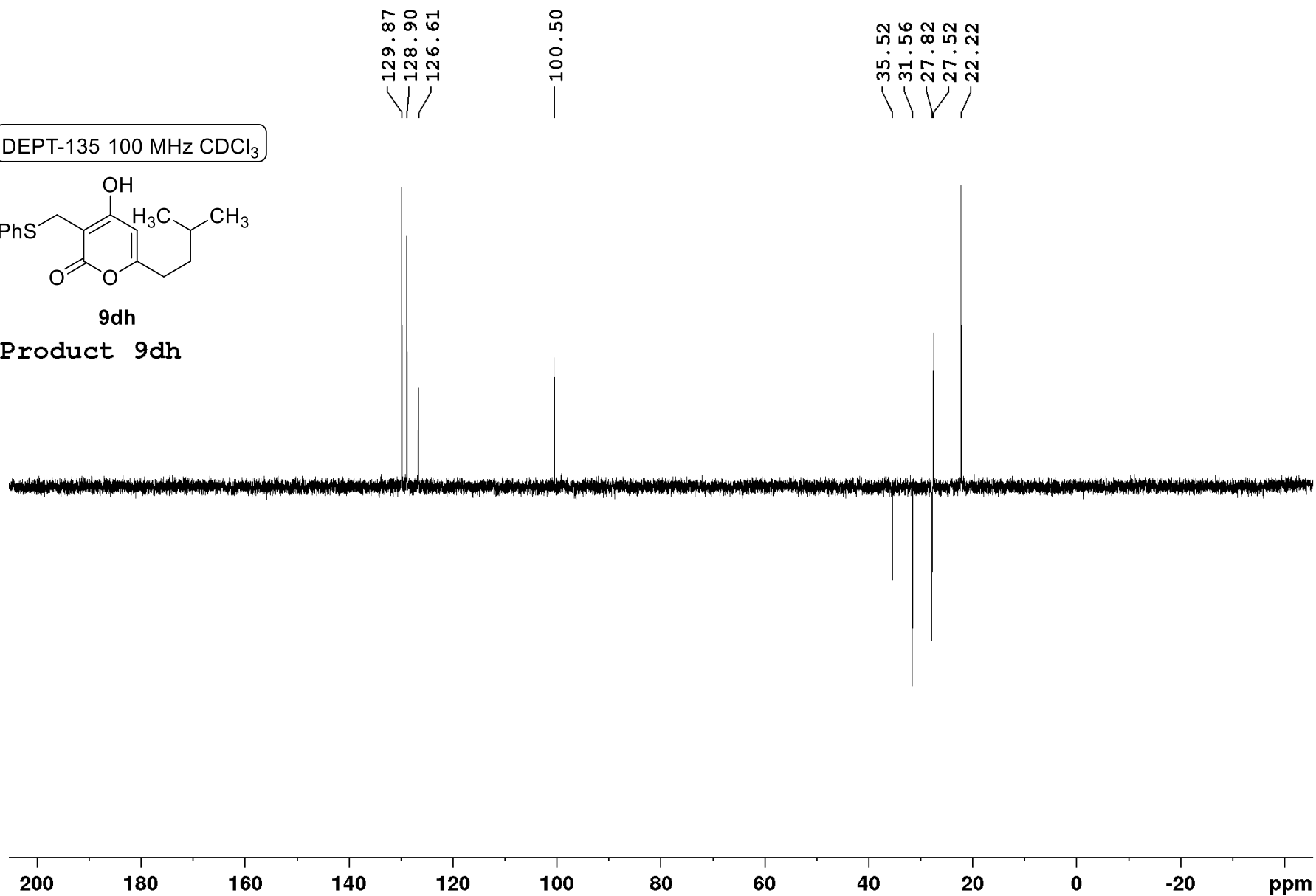


DEPT-135 100 MHz CDCl<sub>3</sub>

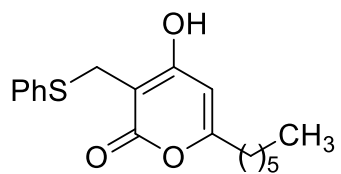


9dh

Product 9dh

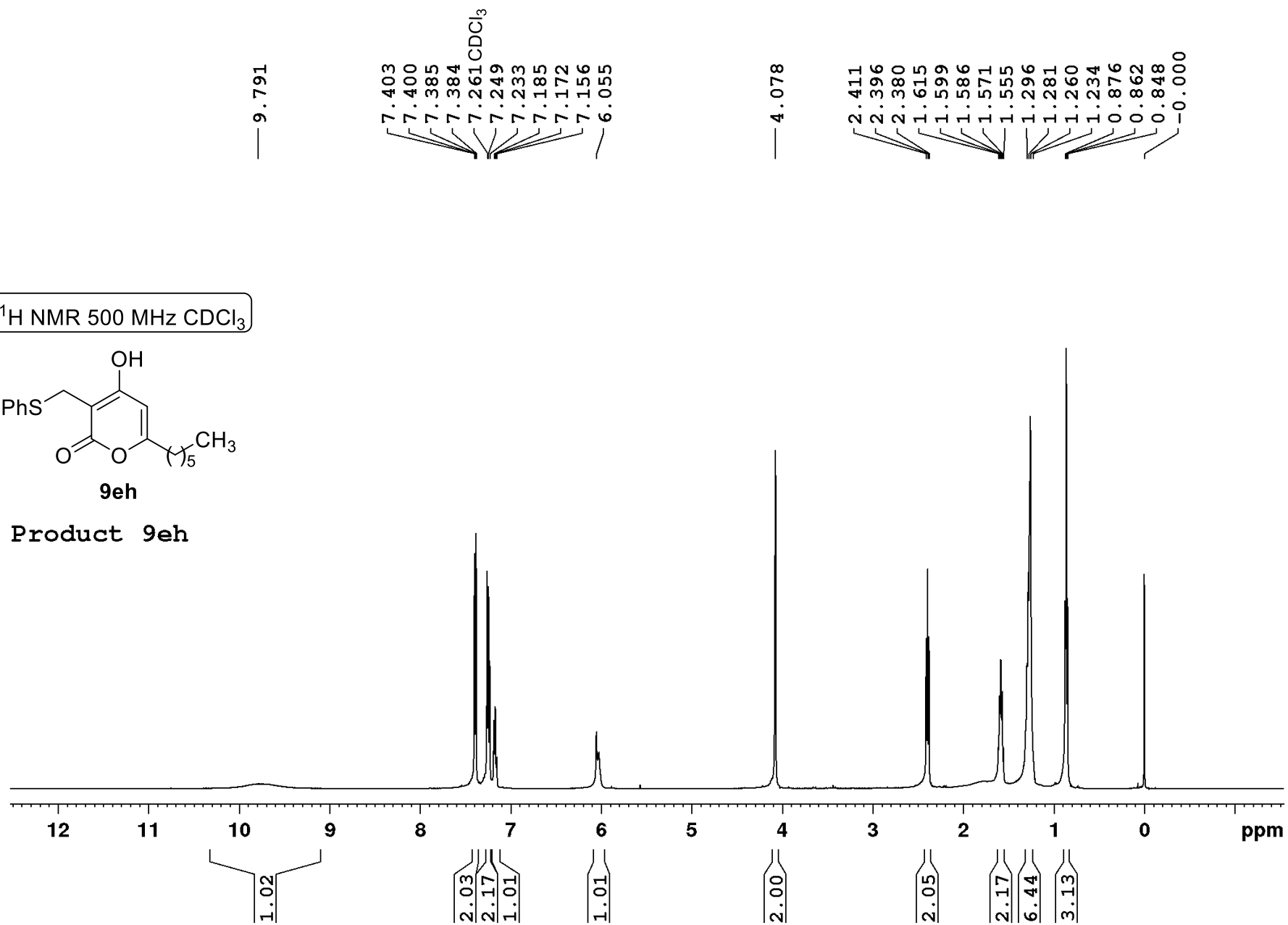


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



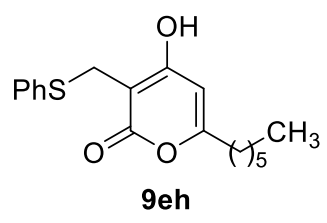
9eh

Product 9eh

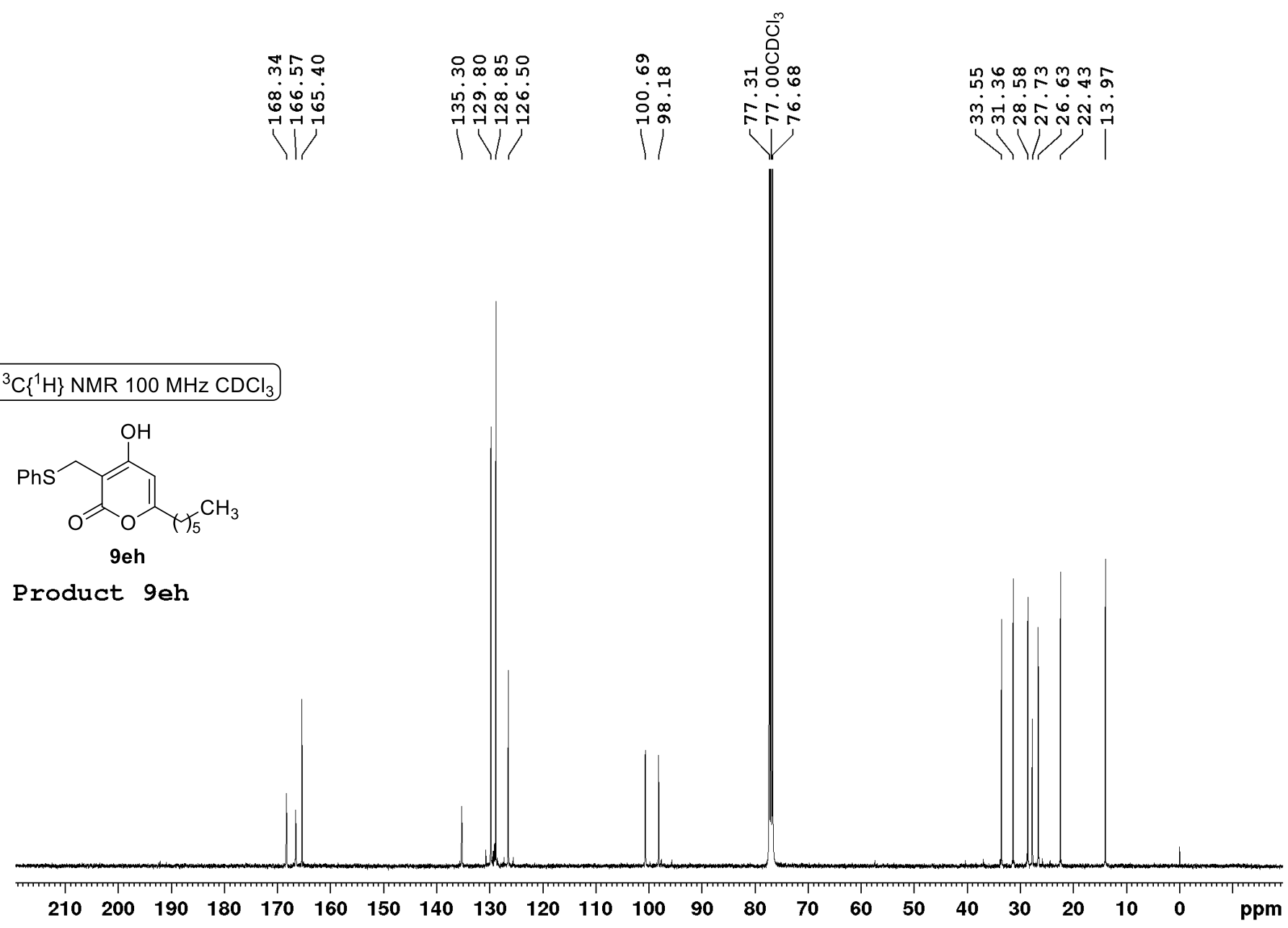




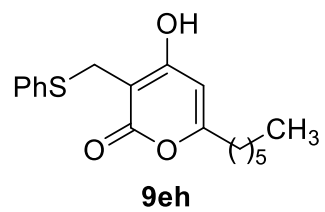
$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



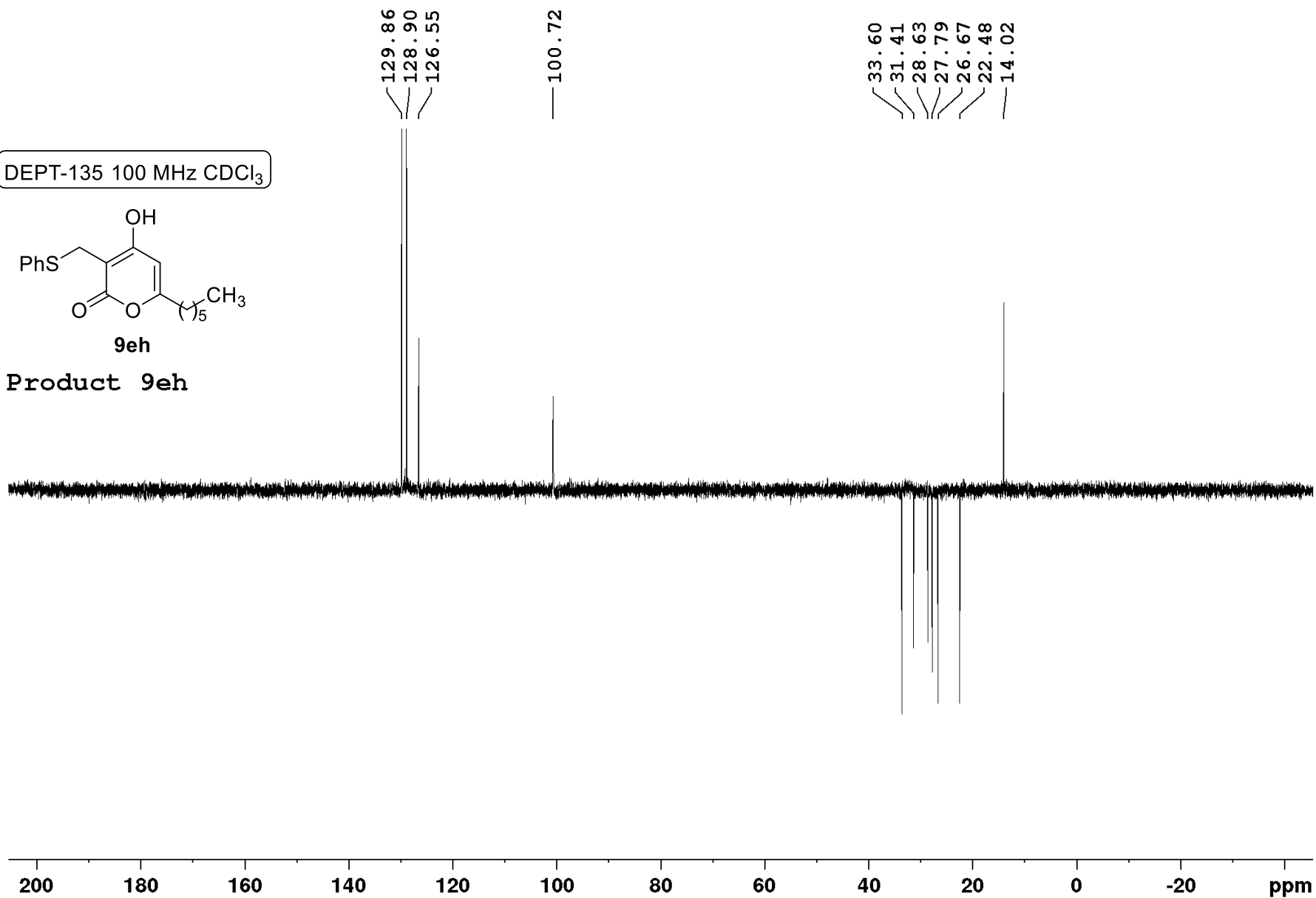
Product 9eh



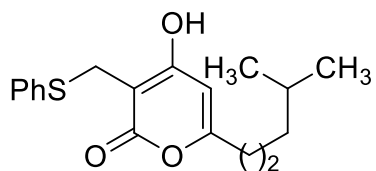
DEPT-135 100 MHz CDCl<sub>3</sub>



Product 9eh

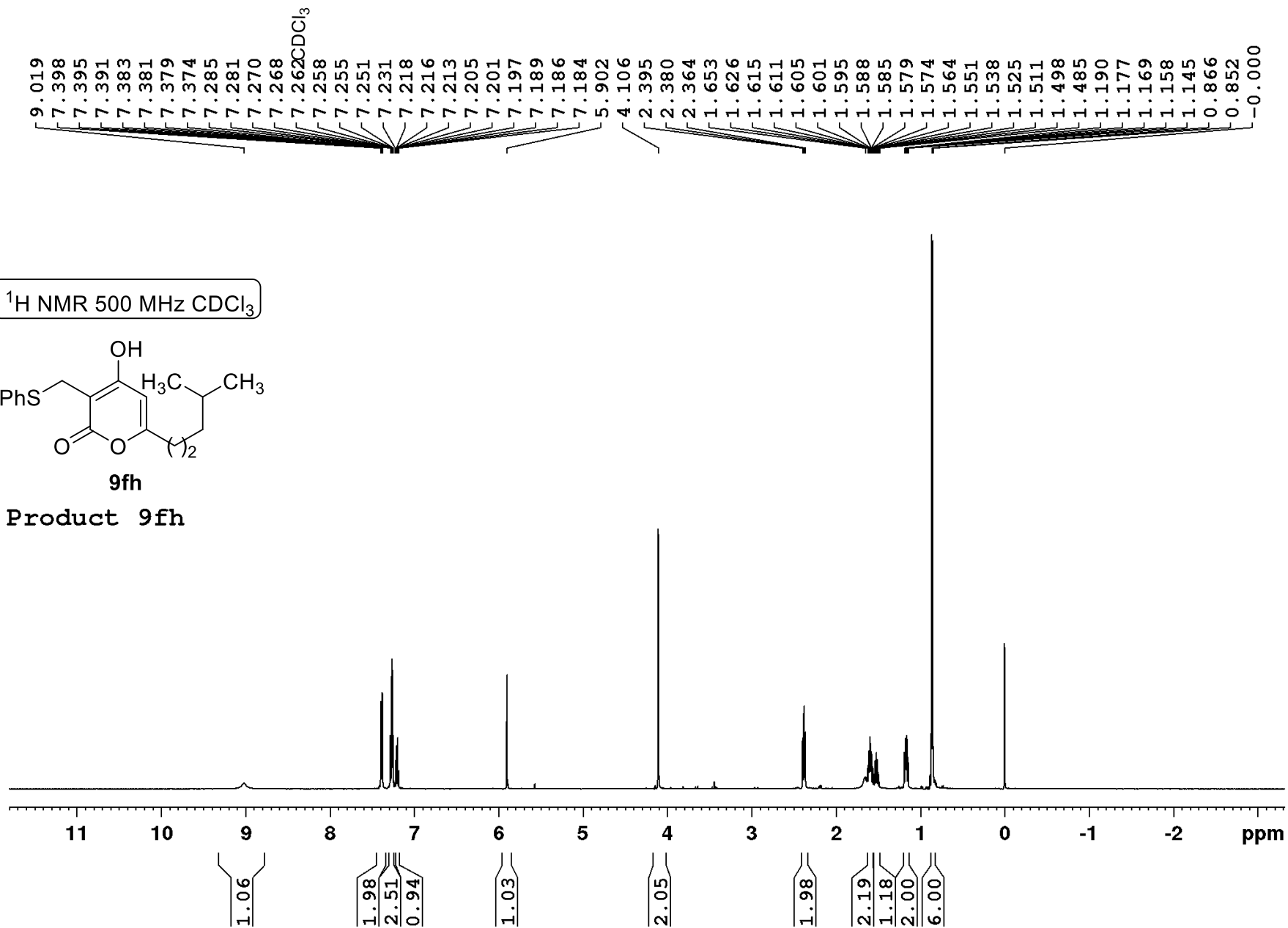


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

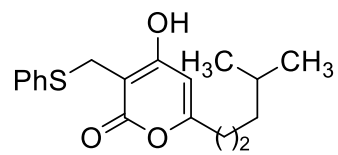


9fh

Product 9fh

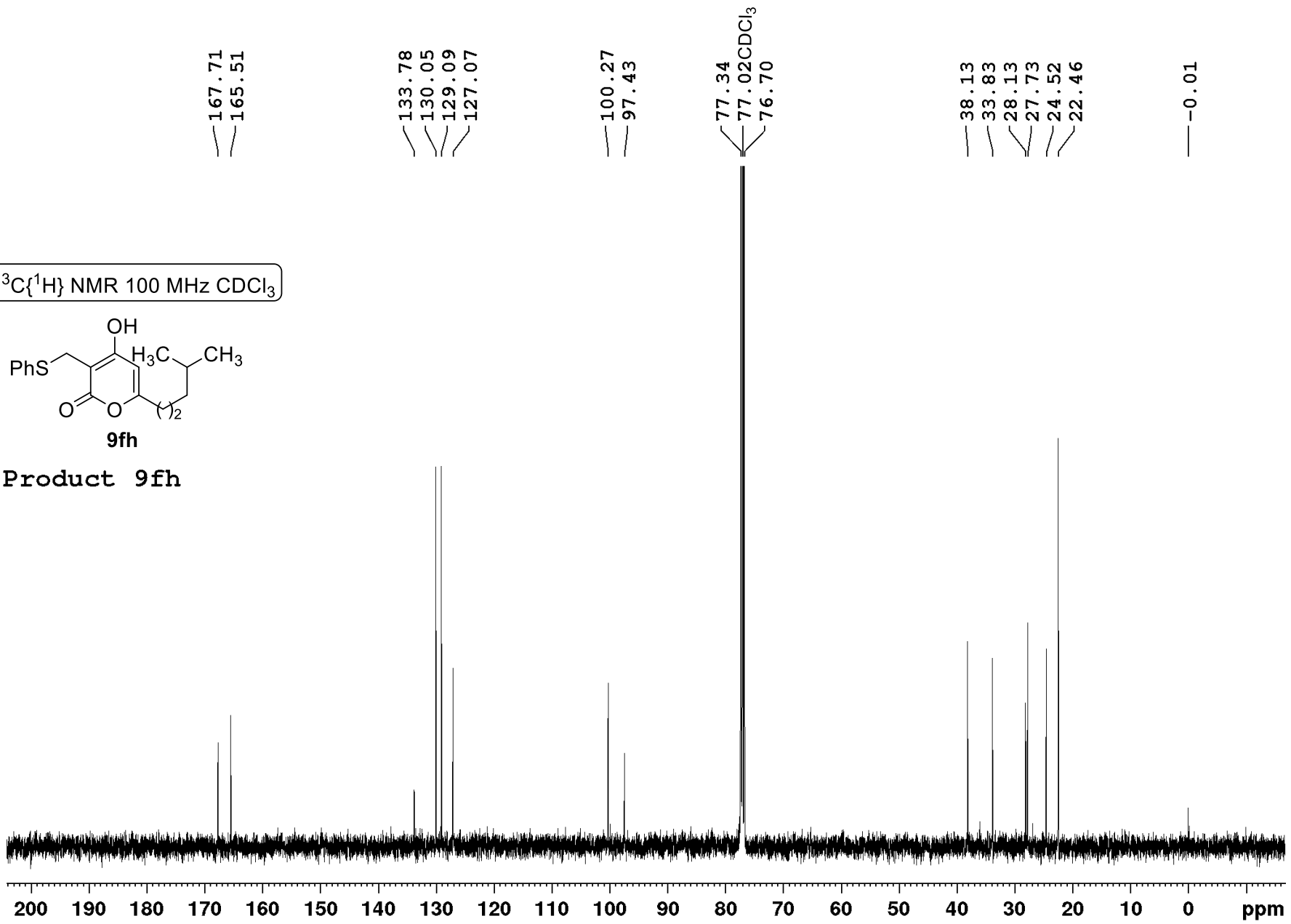


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

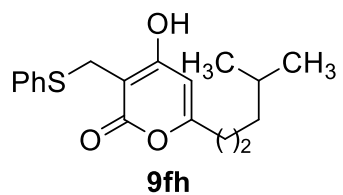


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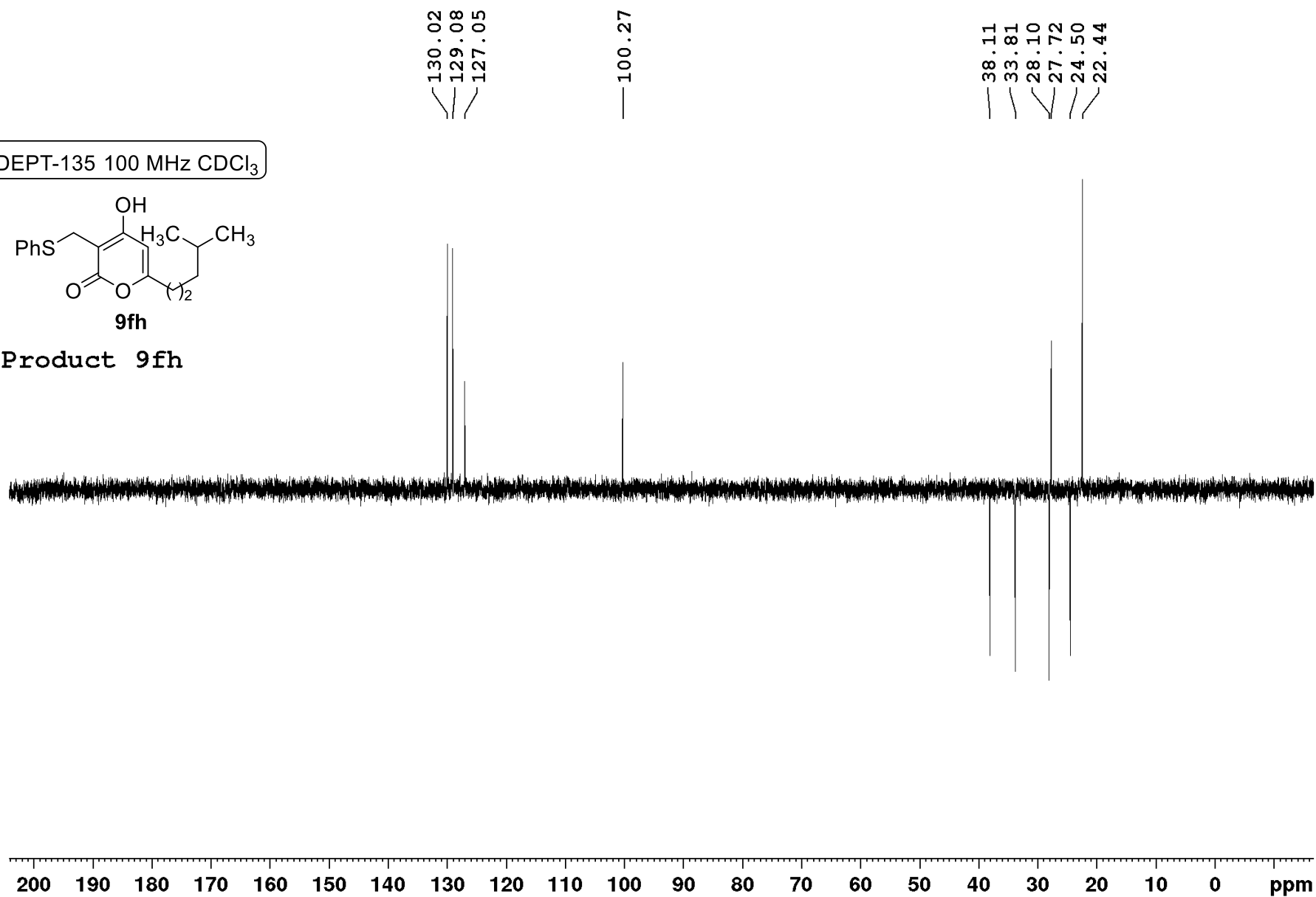
Product 9fh



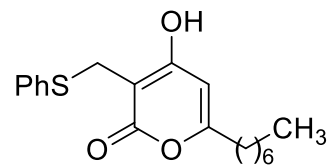
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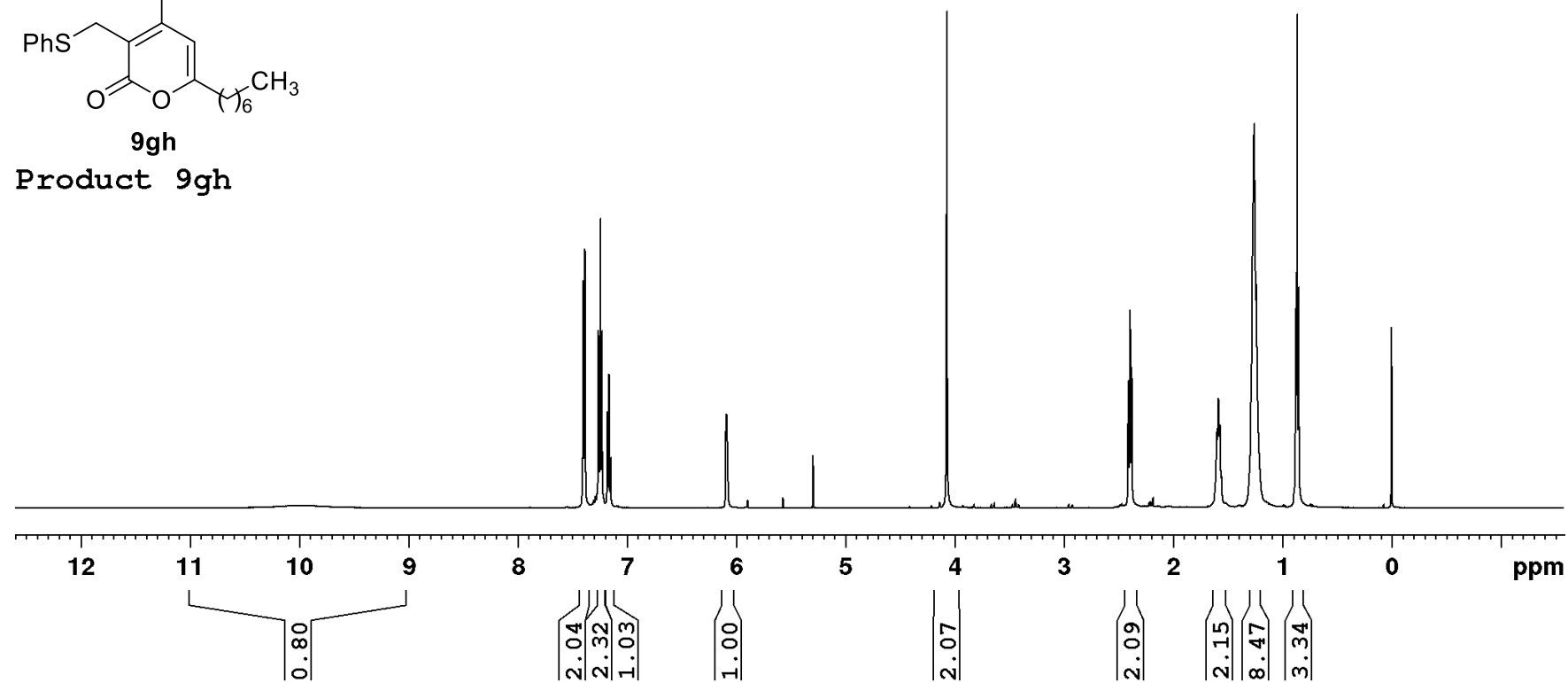
Product 9fh



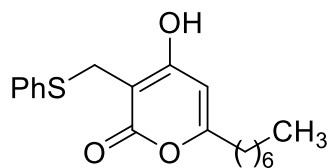
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



9gh  
Product 9gh

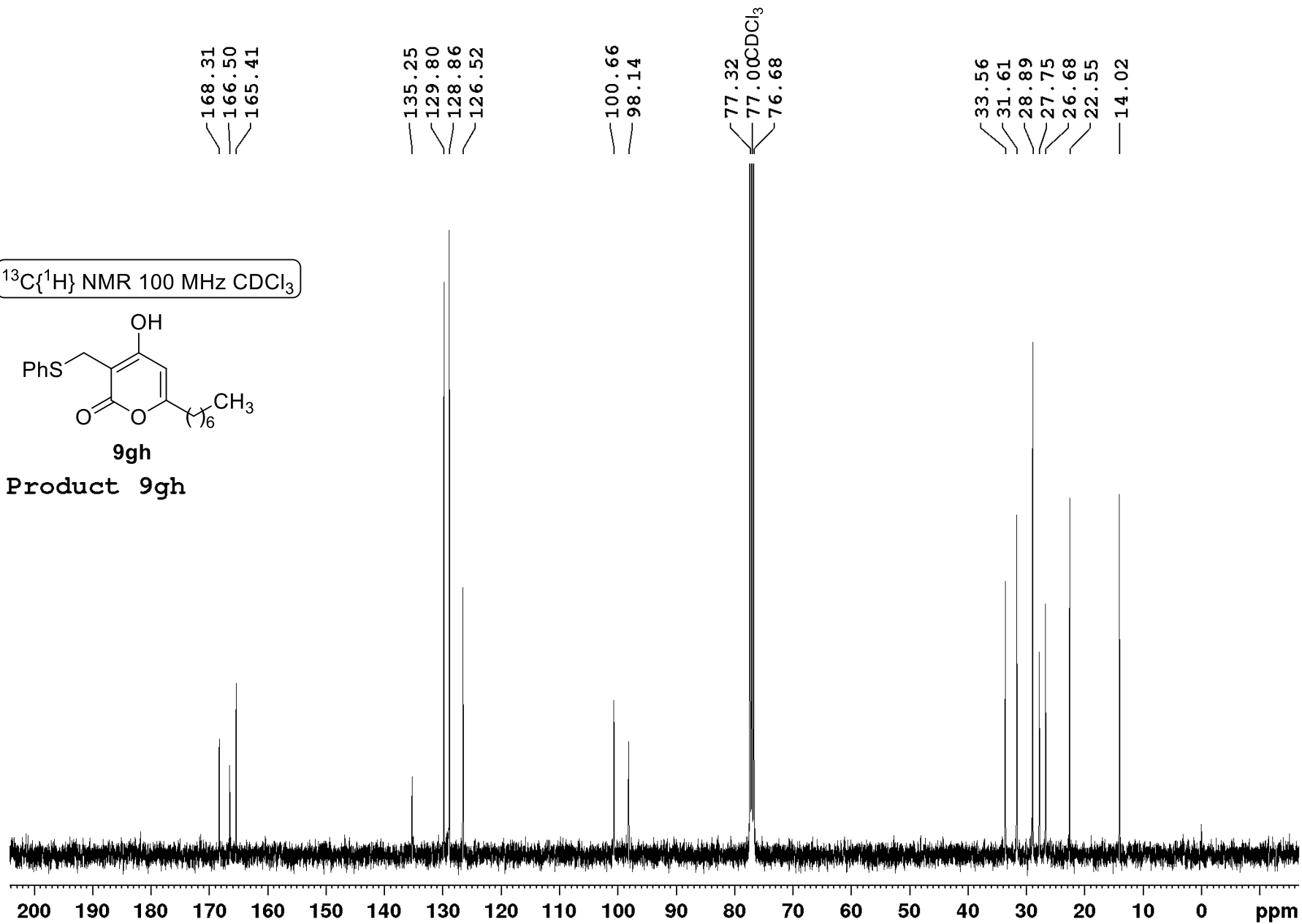


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

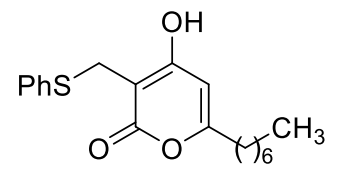


9gh

Product 9gh

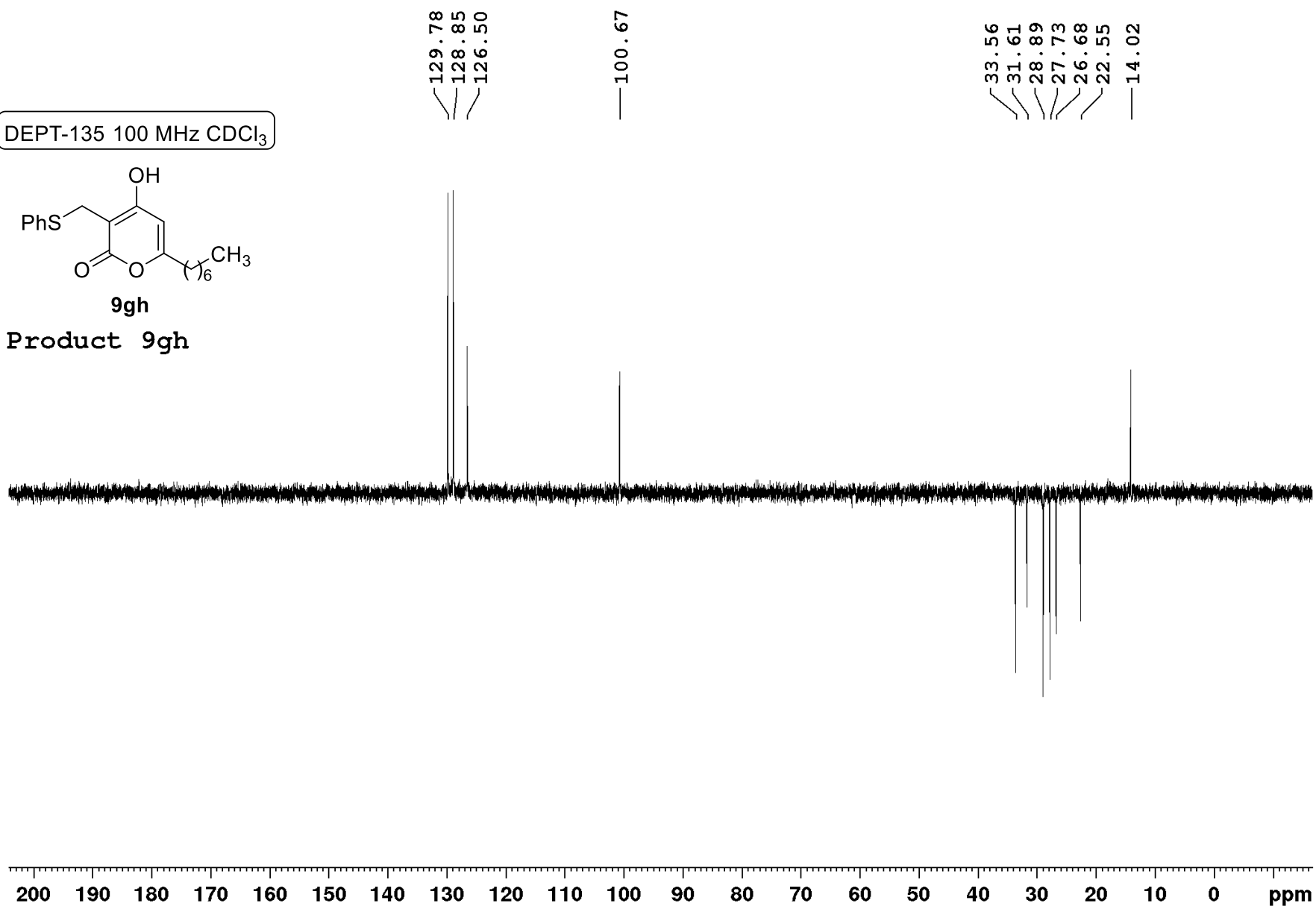


DEPT-135 100 MHz CDCl<sub>3</sub>



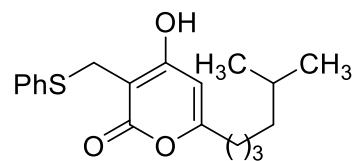
9gh

Product 9gh

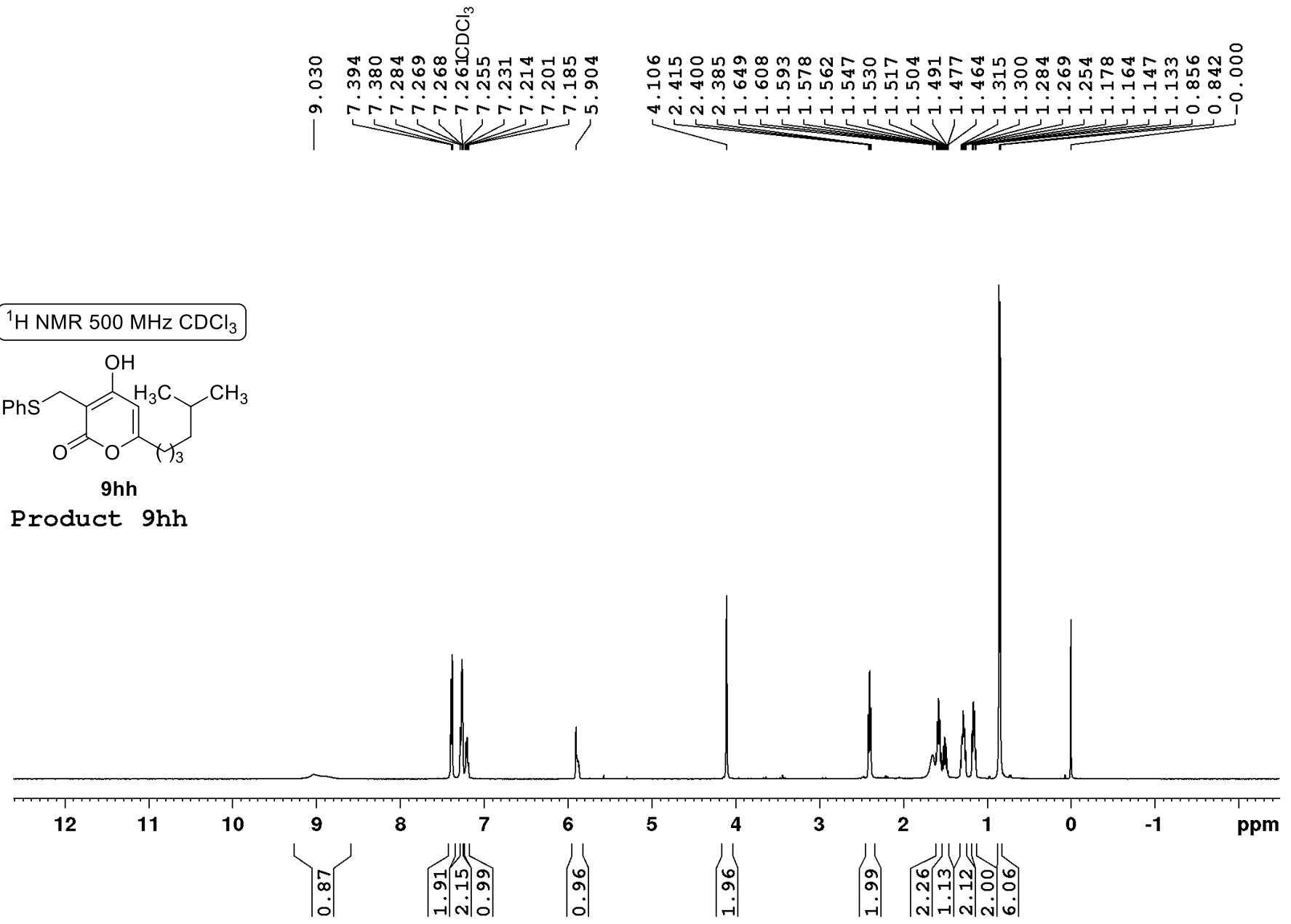




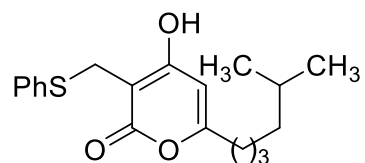
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



9hh  
Product 9hh

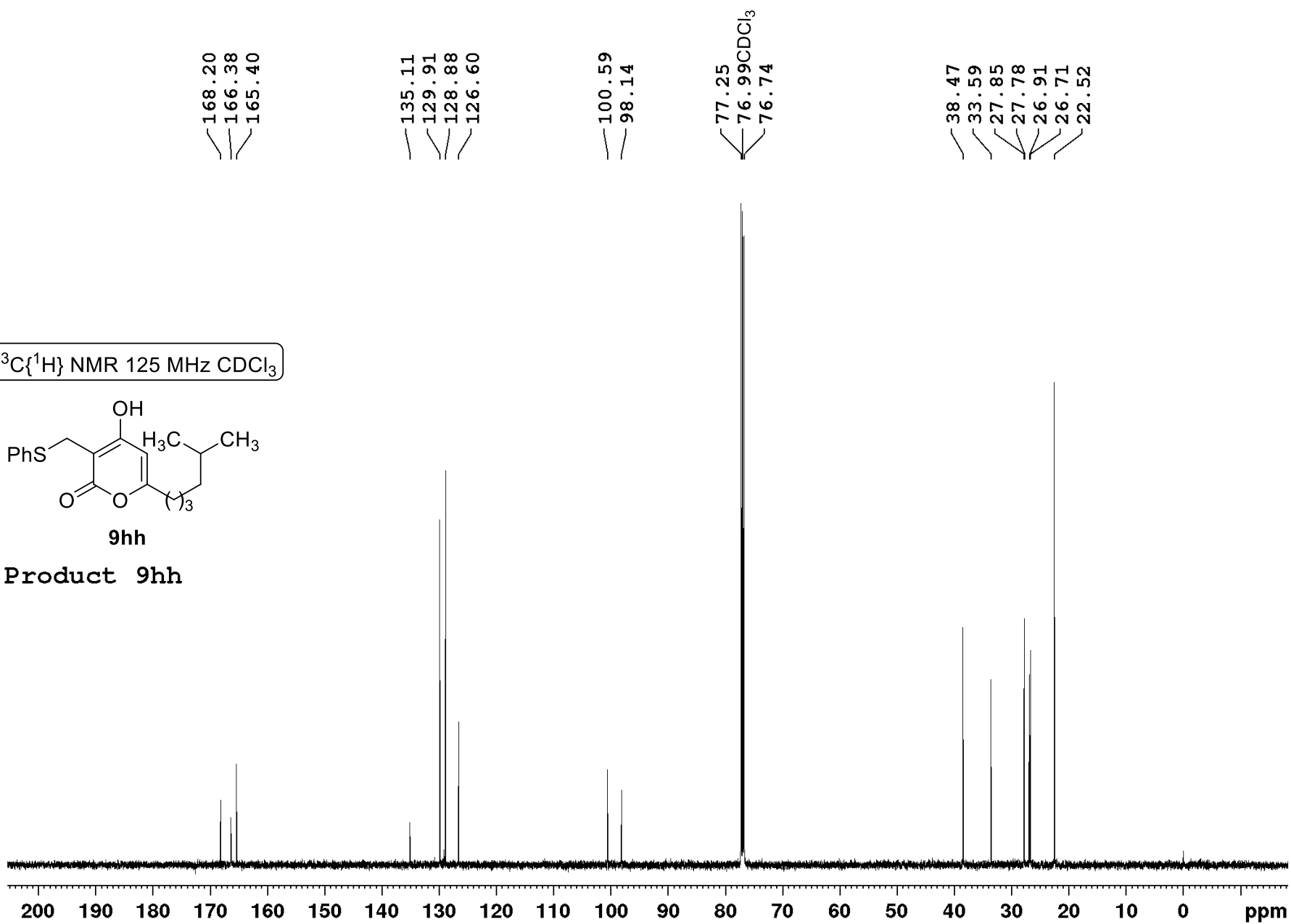


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

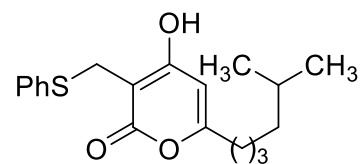


9hh

Product 9hh

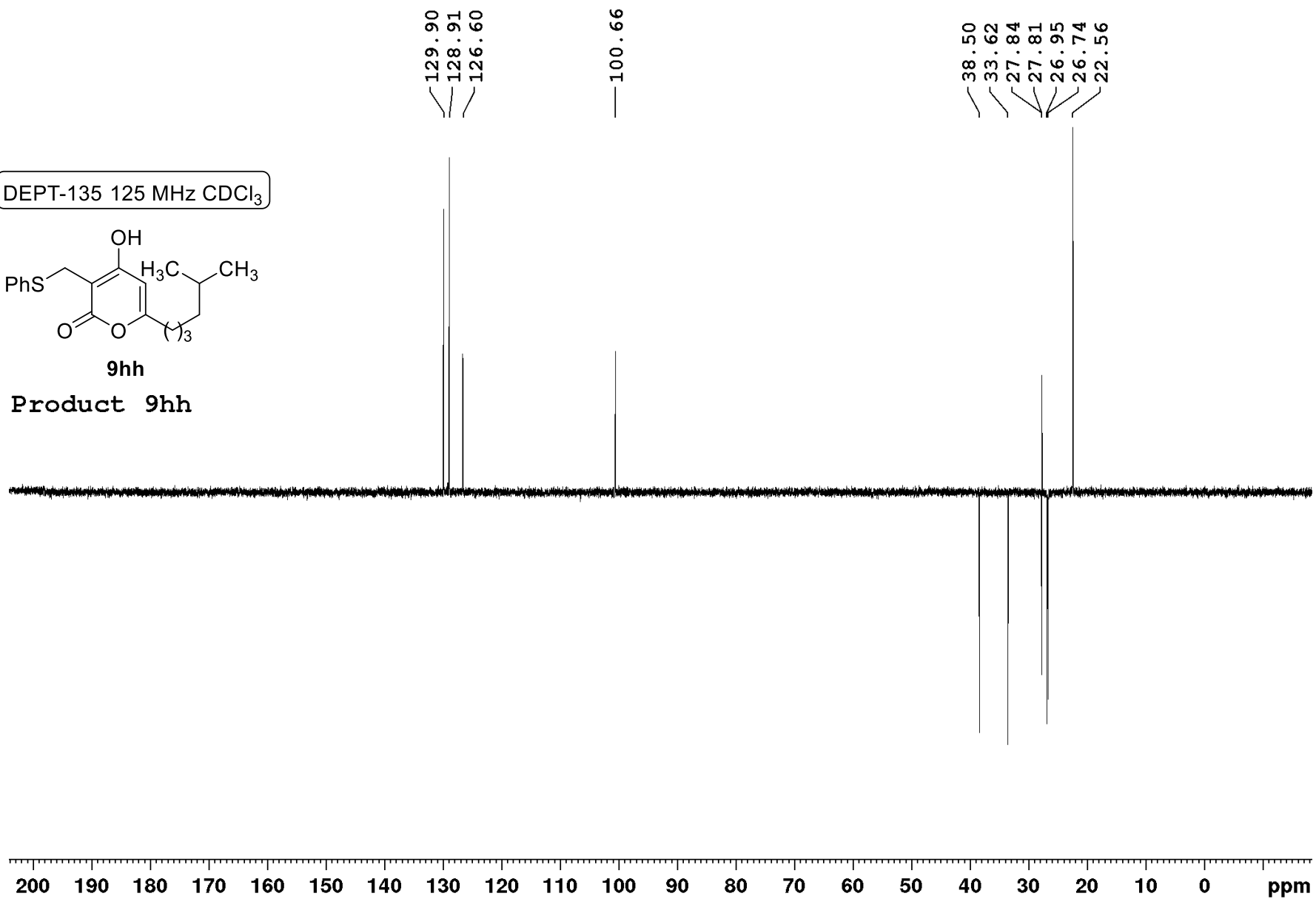


DEPT-135 125 MHz CDCl<sub>3</sub>

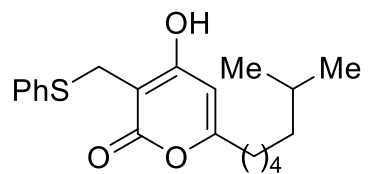


9hh

Product 9hh

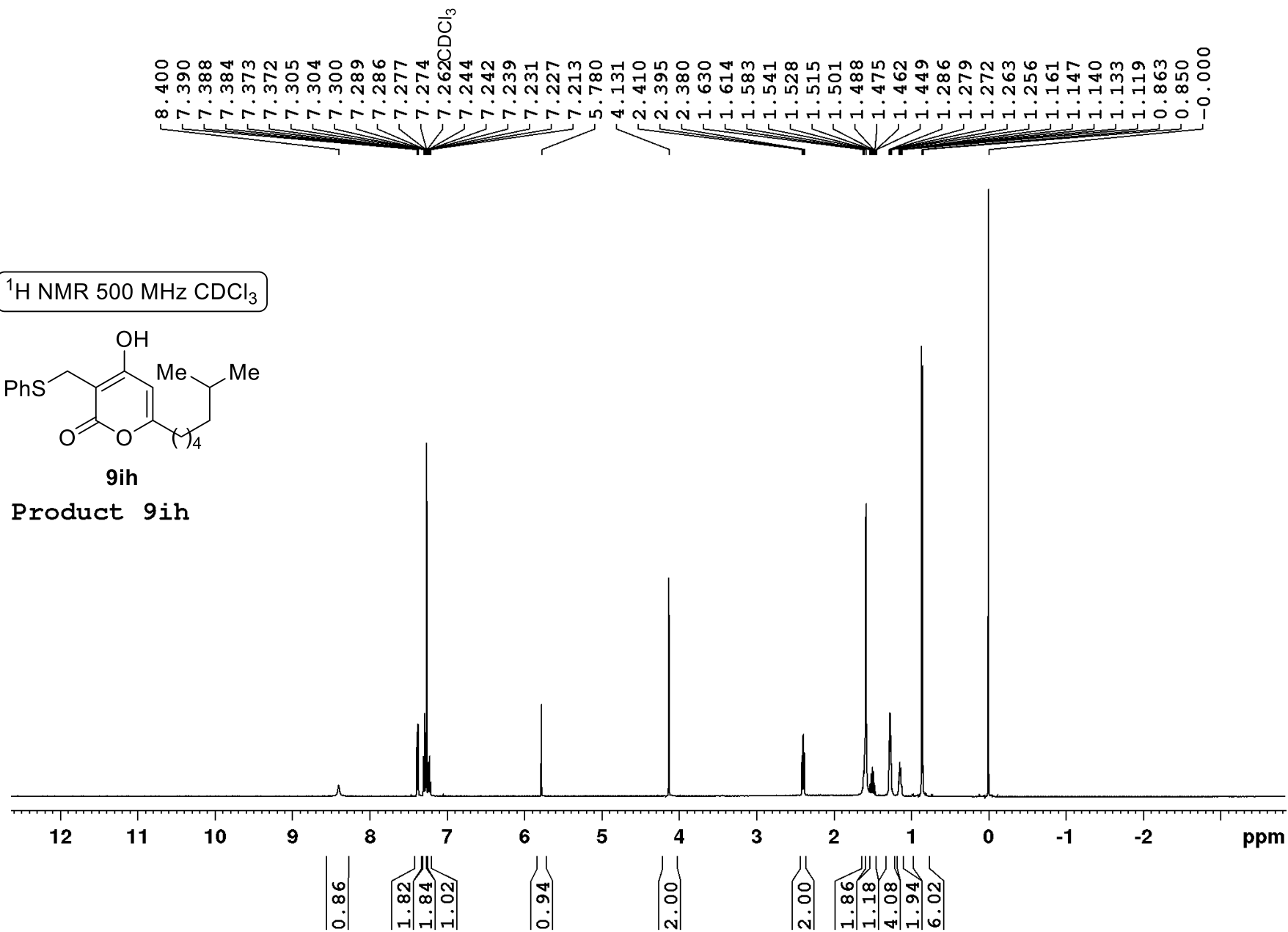


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

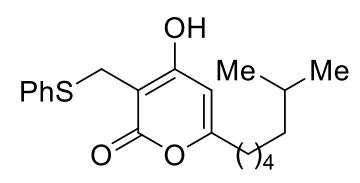


9ih

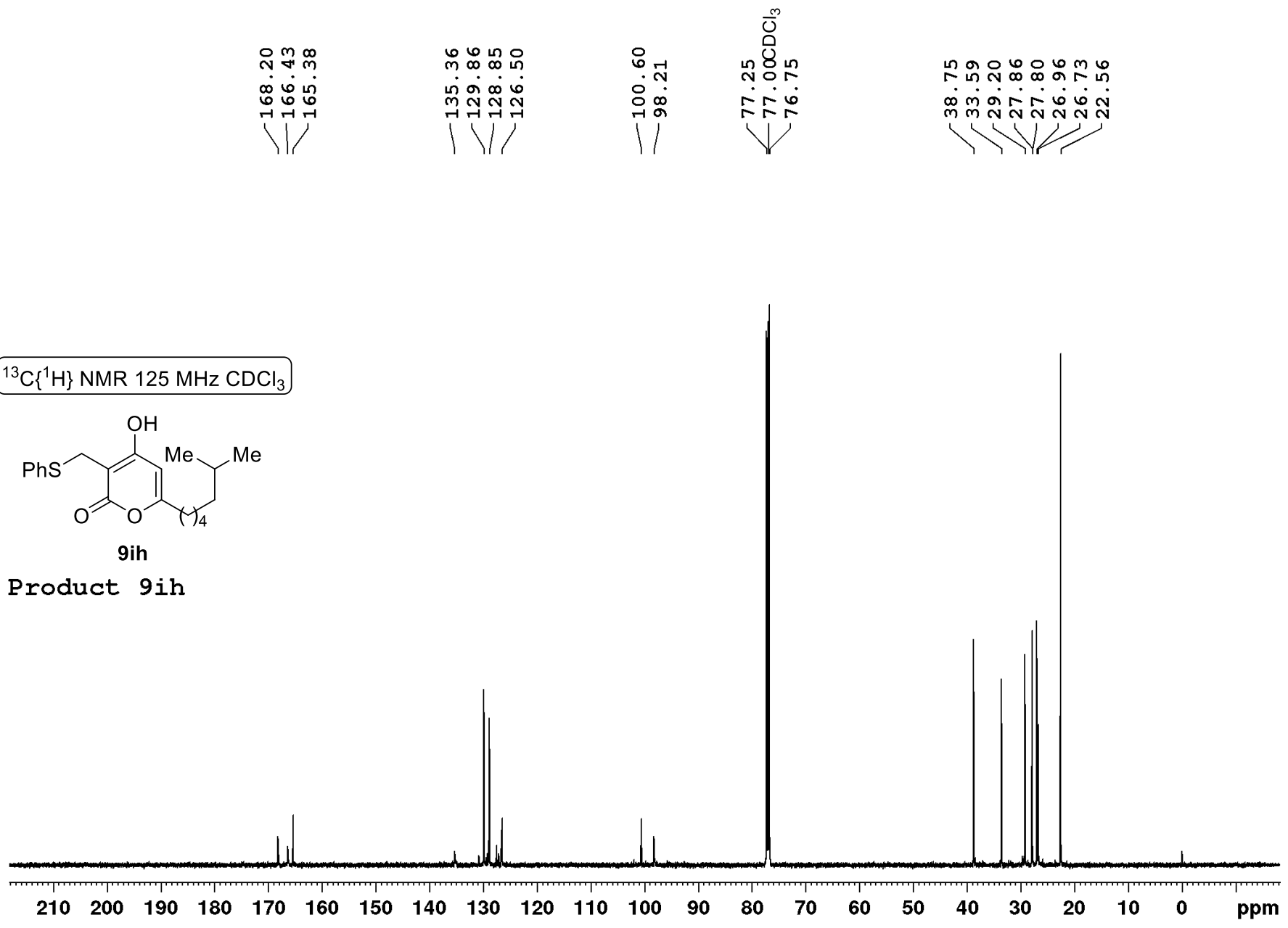
Product 9ih



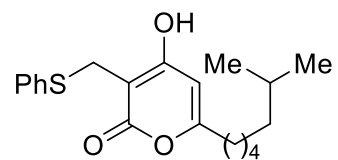
$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



9ih  
Product 9ih

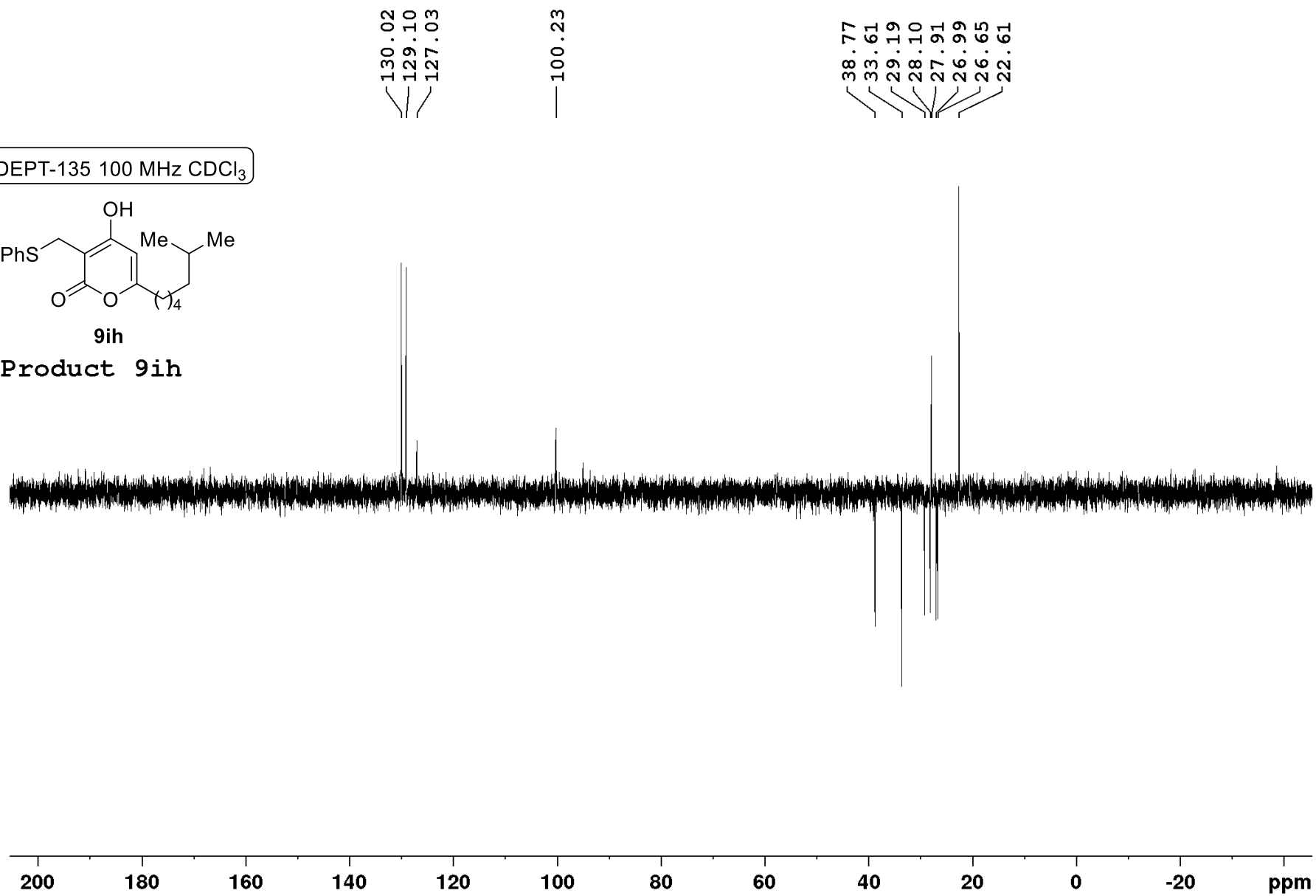


DEPT-135 100 MHz CDCl<sub>3</sub>

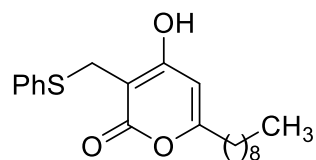


9ih

Product 9ih

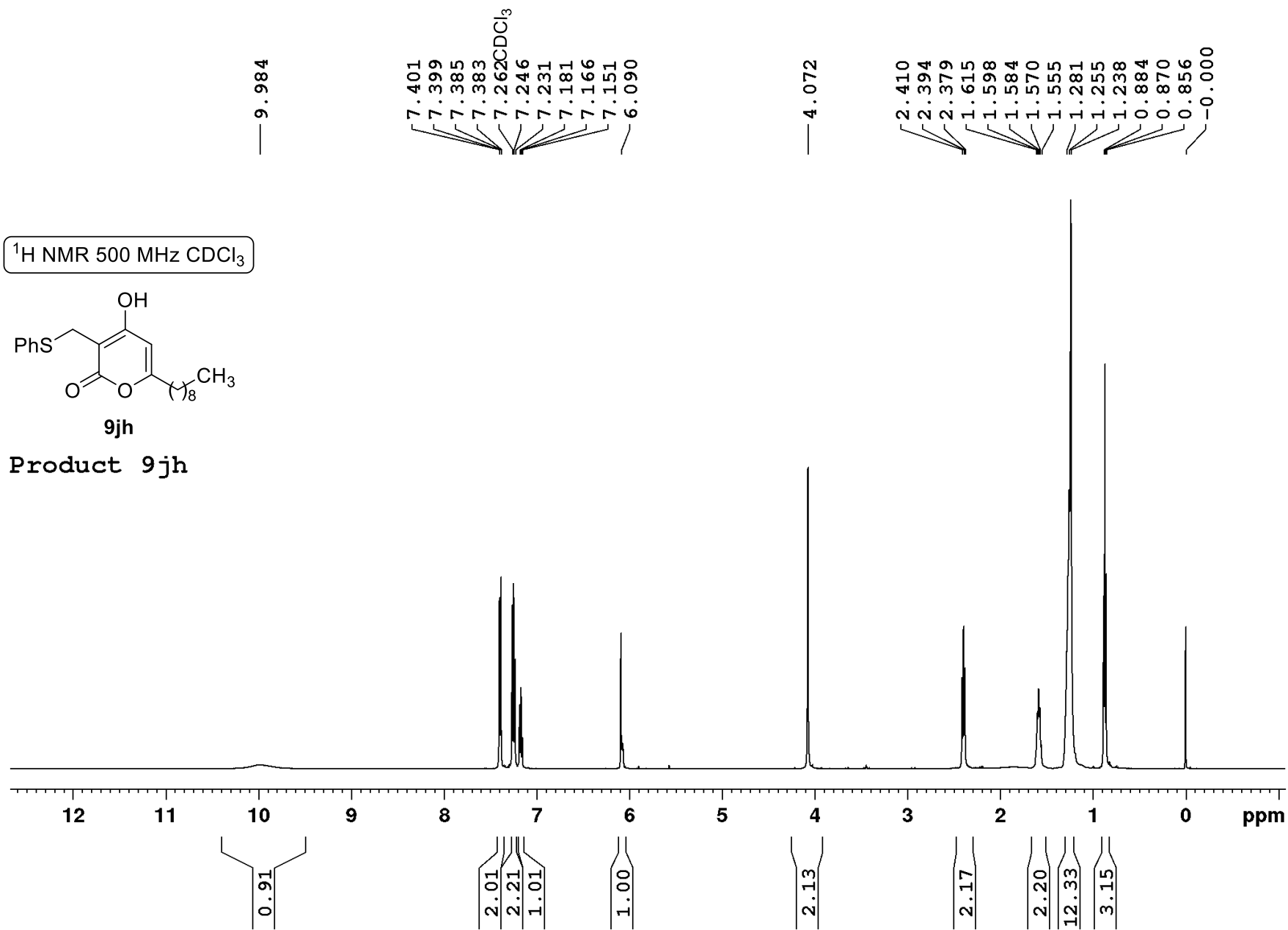


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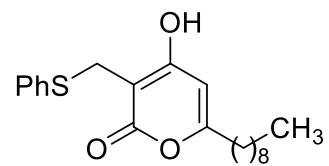


9jh

Product 9jh

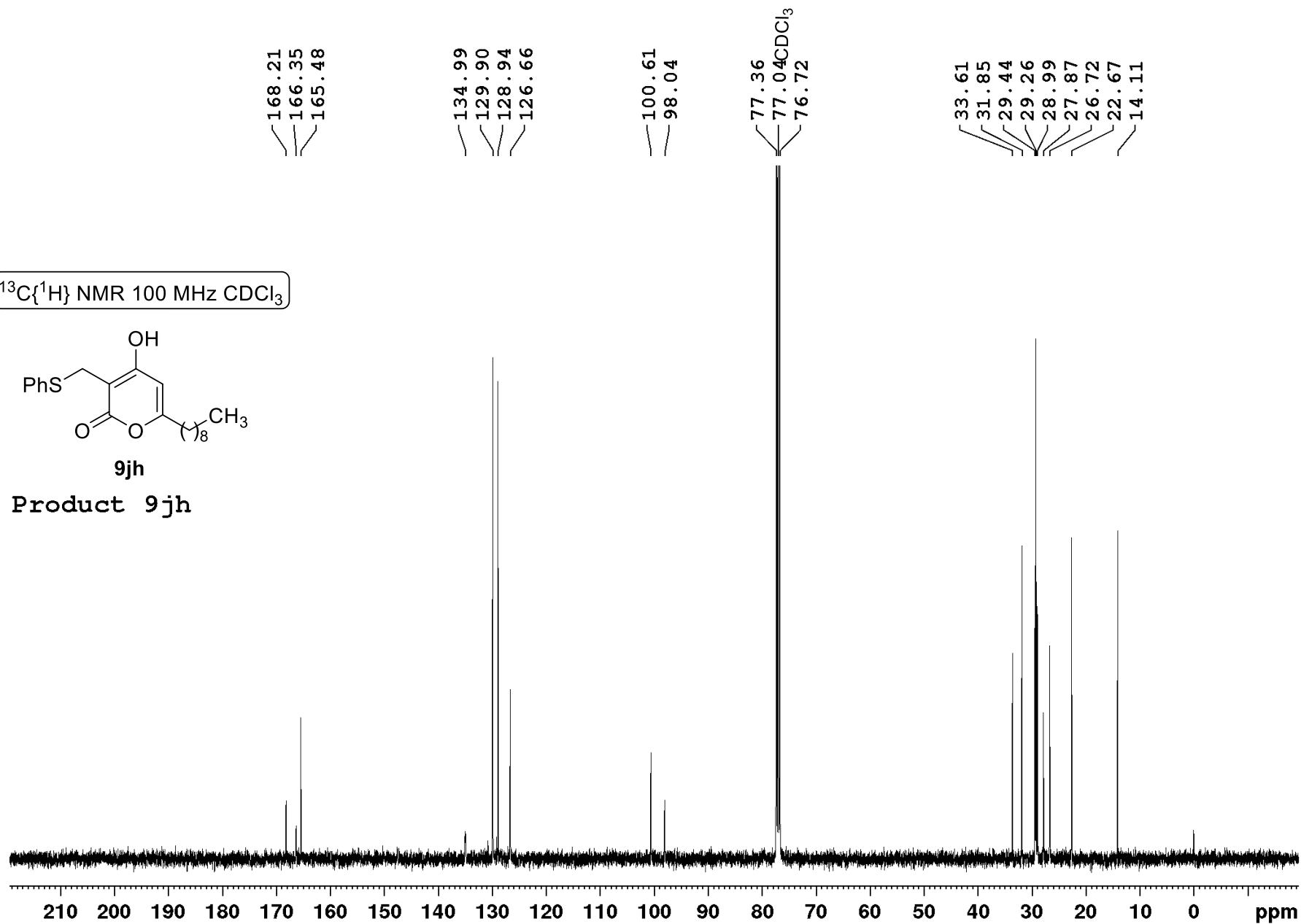


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



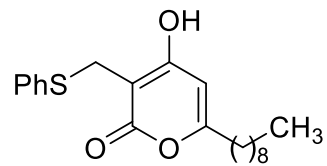
9jh

Product 9jh



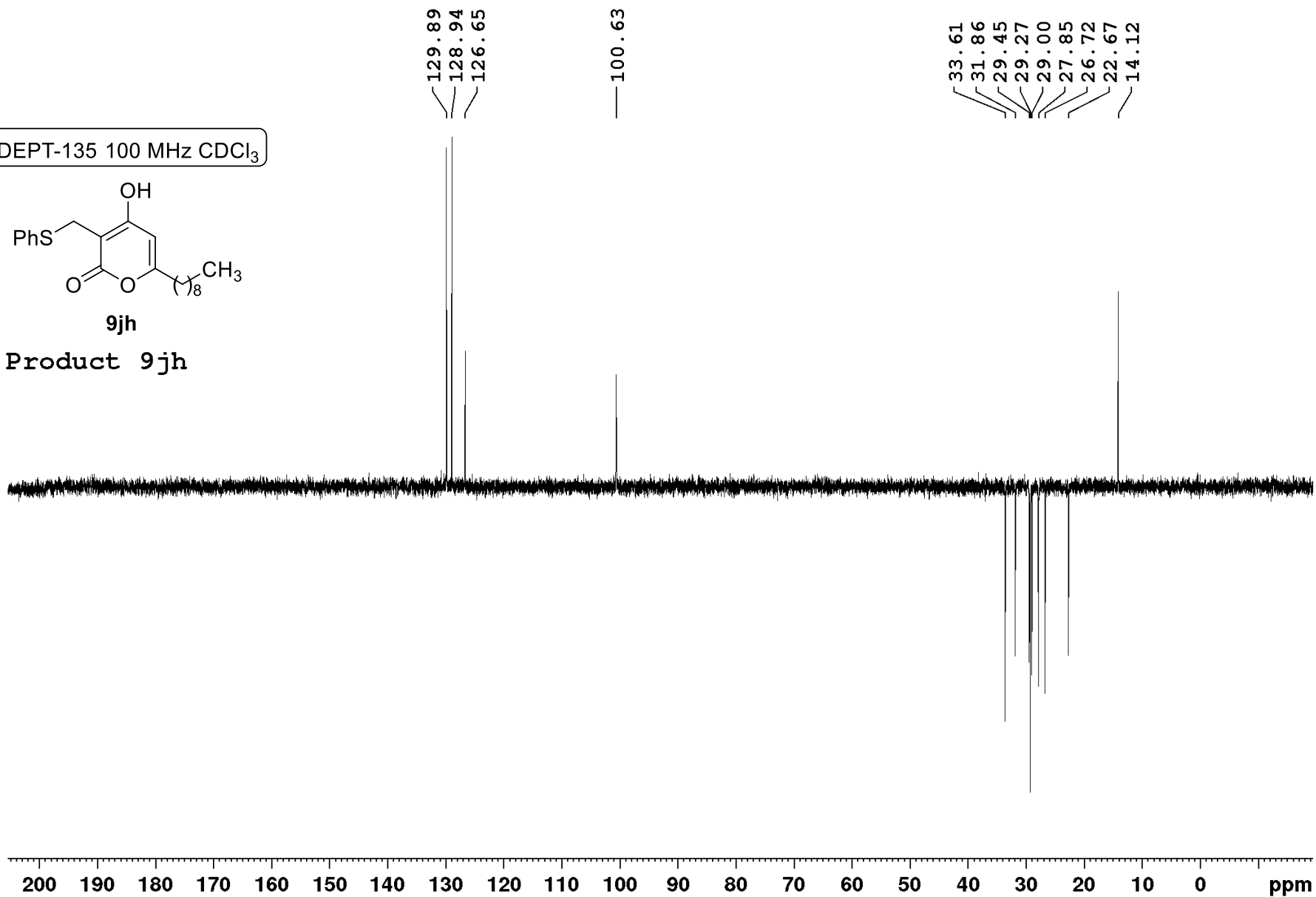


DEPT-135 100 MHz CDCl<sub>3</sub>

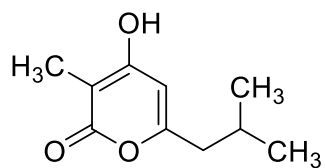


9jh

Product 9jh

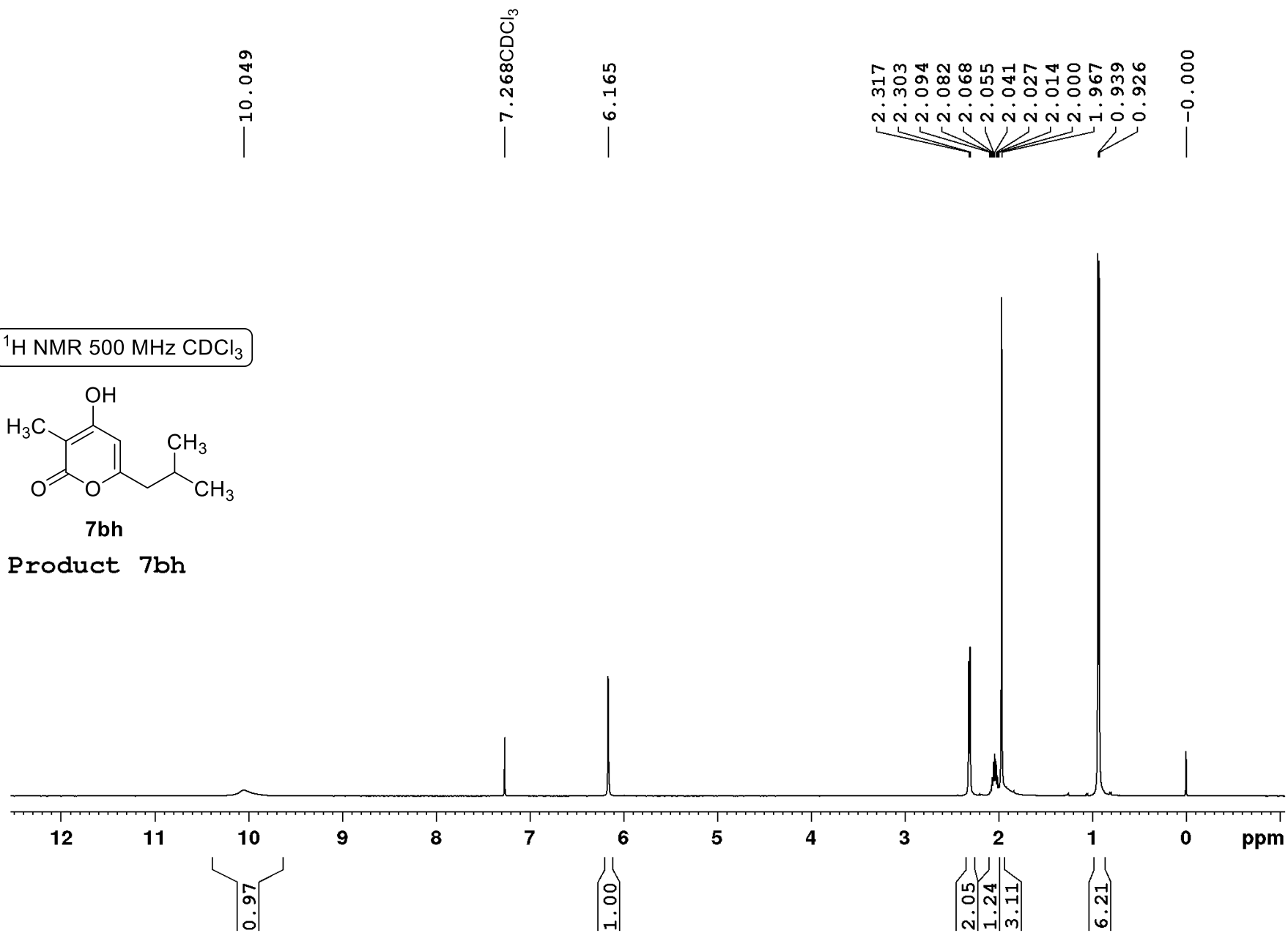


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

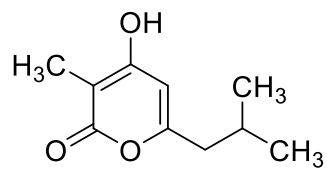


7bh

Product 7bh

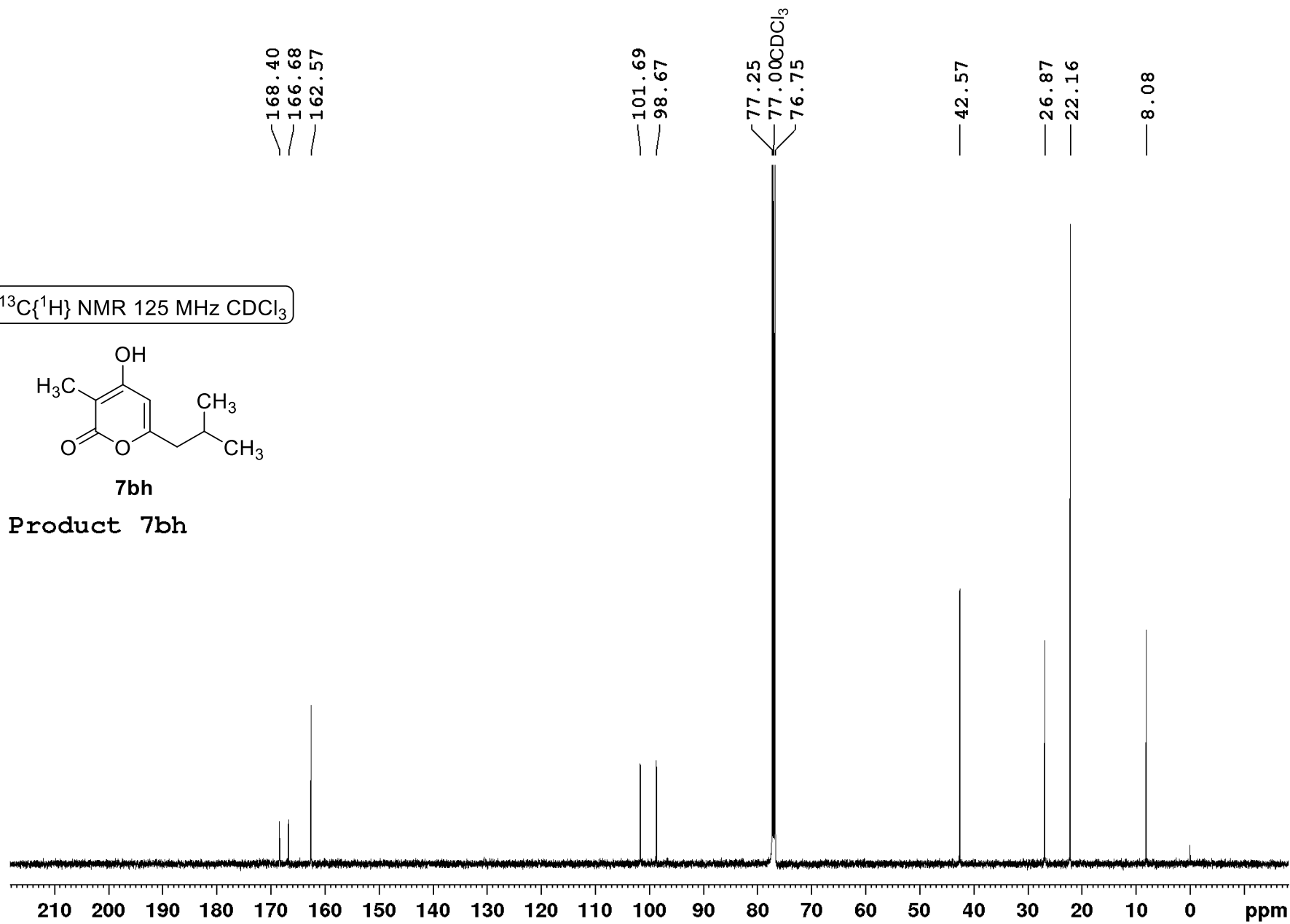


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

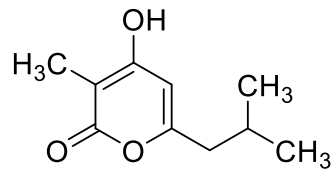


7bh

Product 7bh

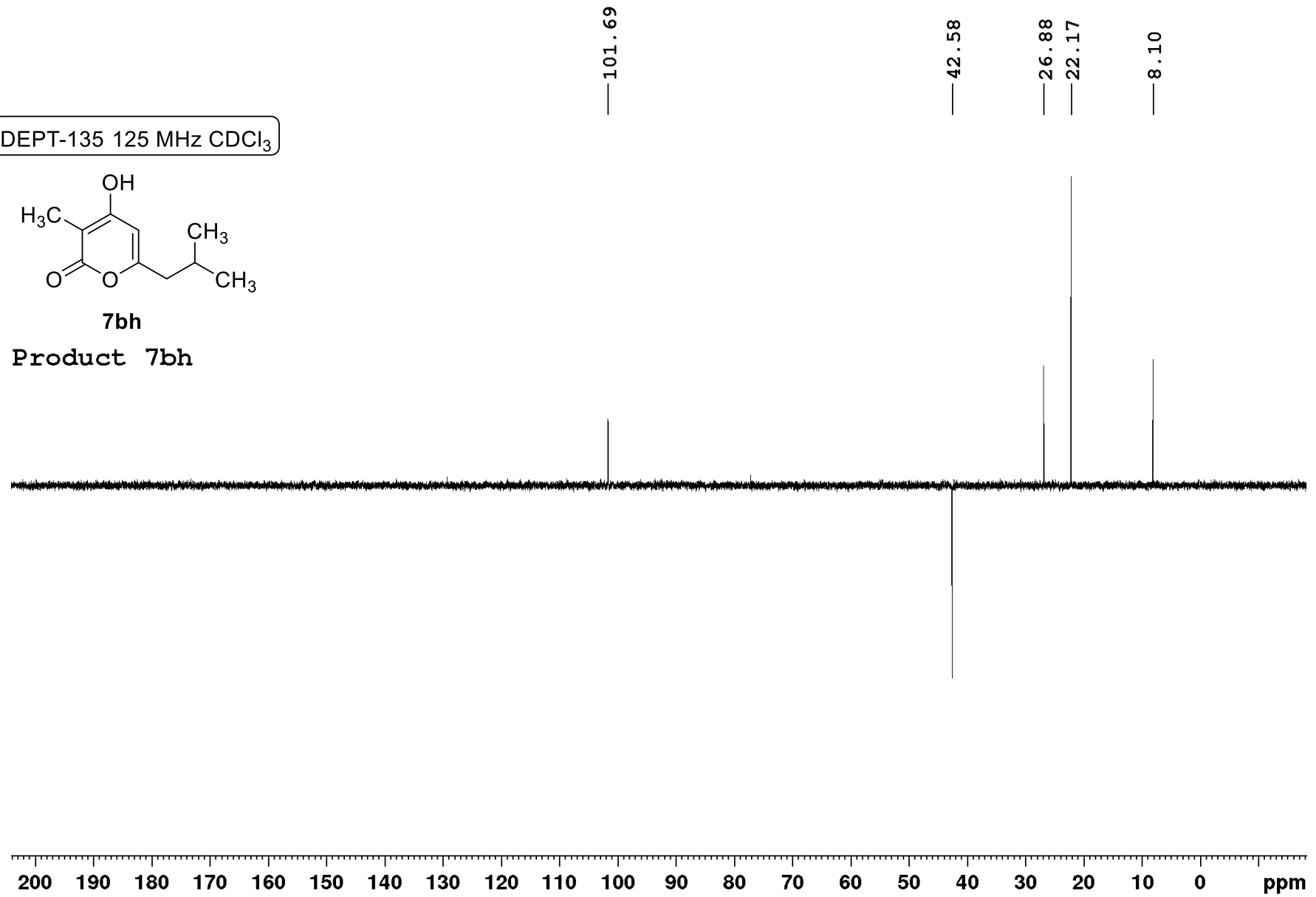


DEPT-135 125 MHz CDCl<sub>3</sub>

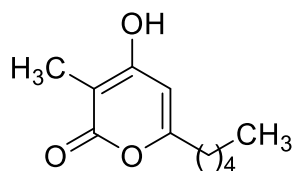


7bh

Product 7bh

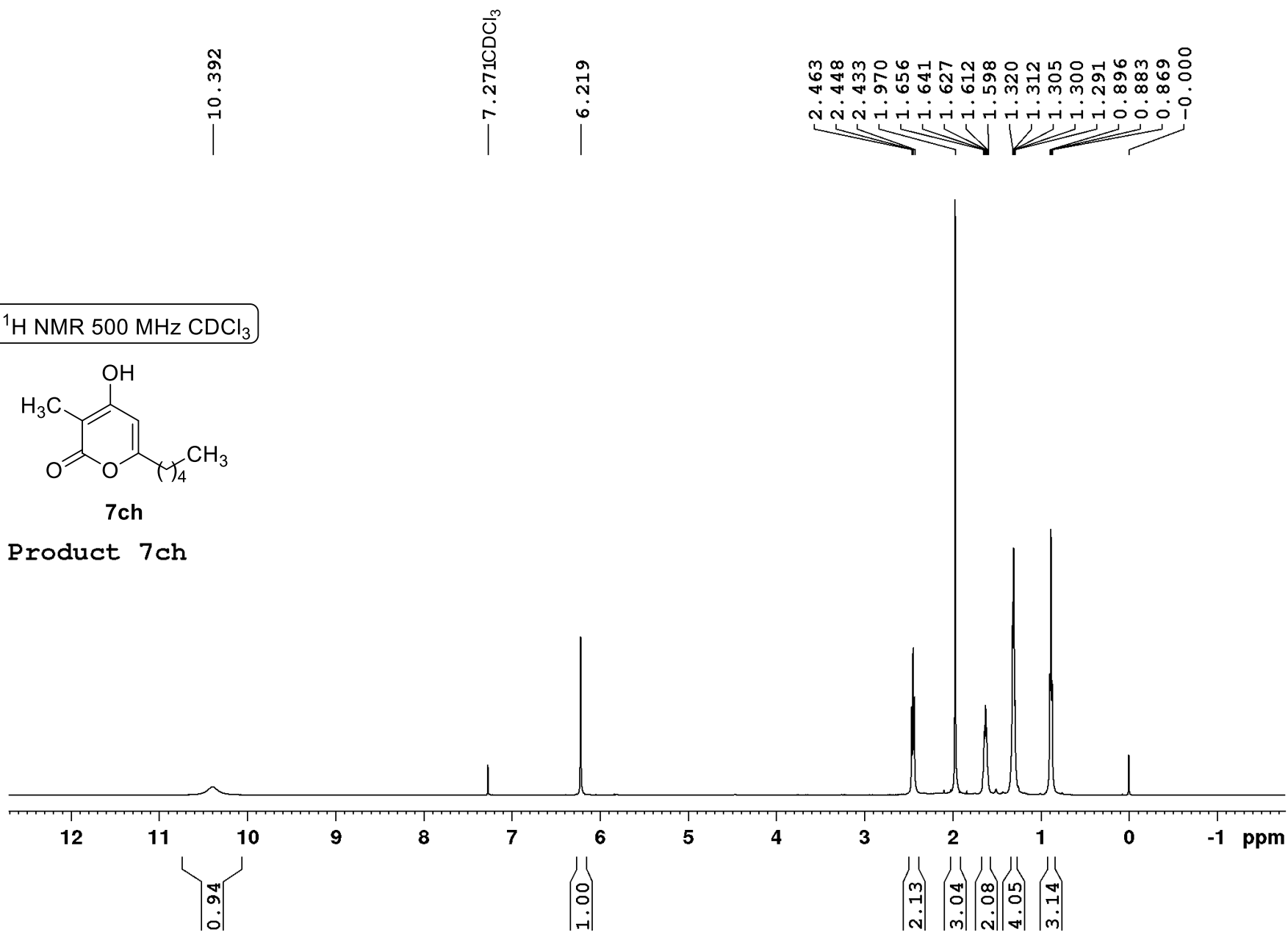


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

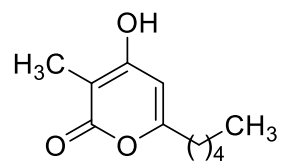


7ch

Product 7ch

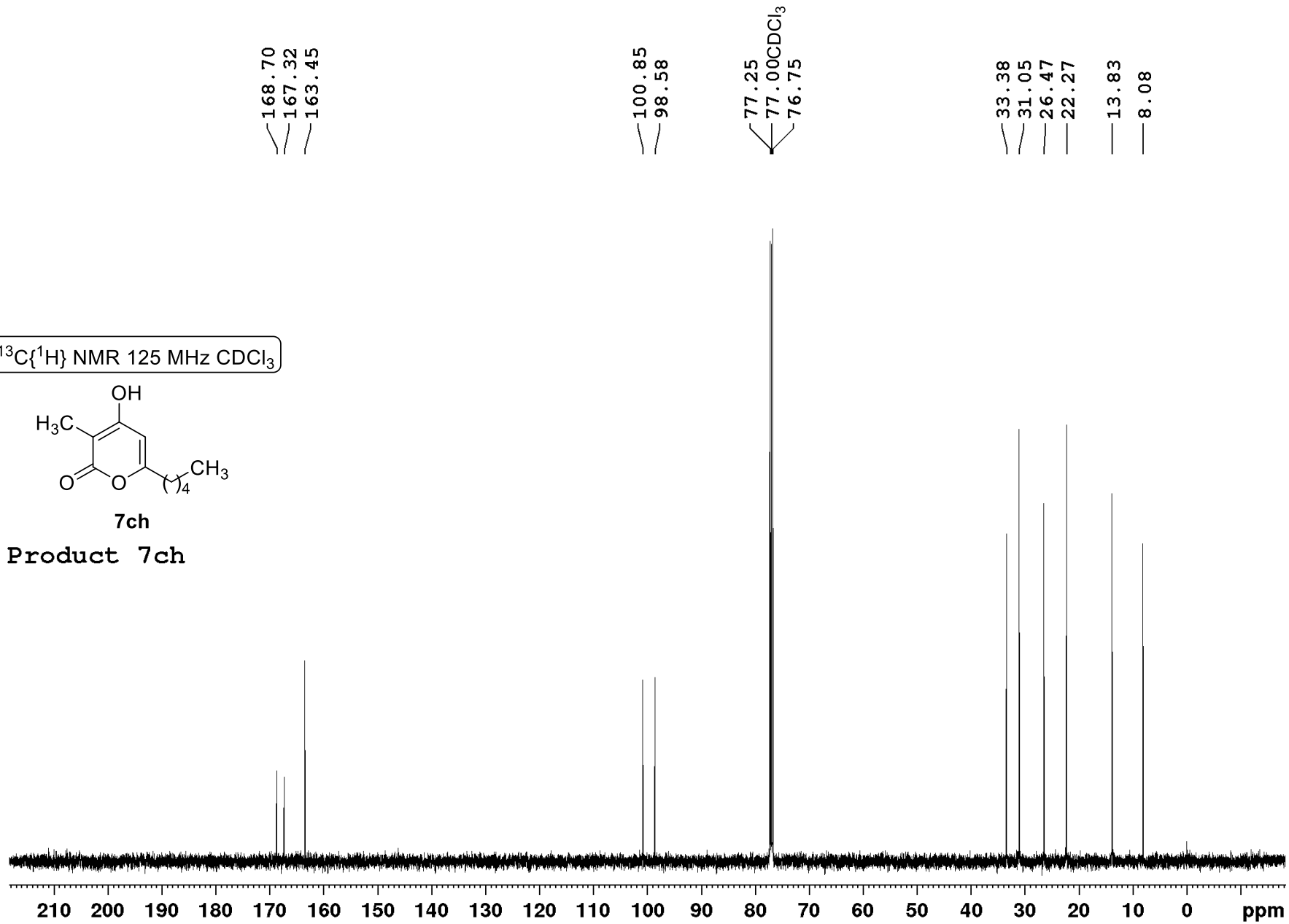


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

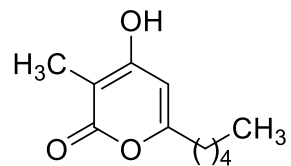


7ch

Product 7ch

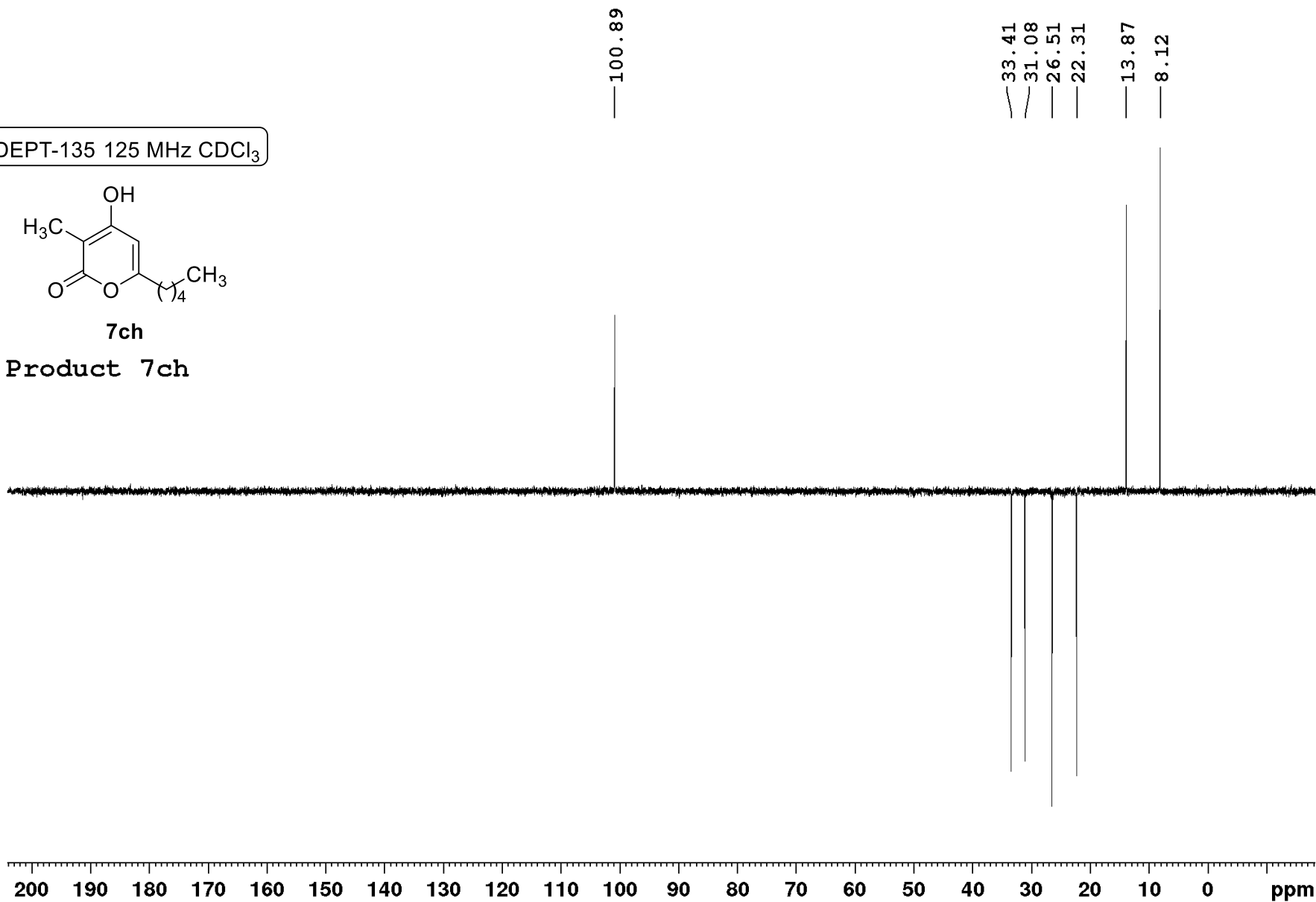


DEPT-135 125 MHz CDCl<sub>3</sub>

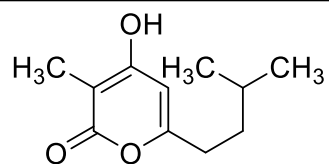


7ch

Product 7ch

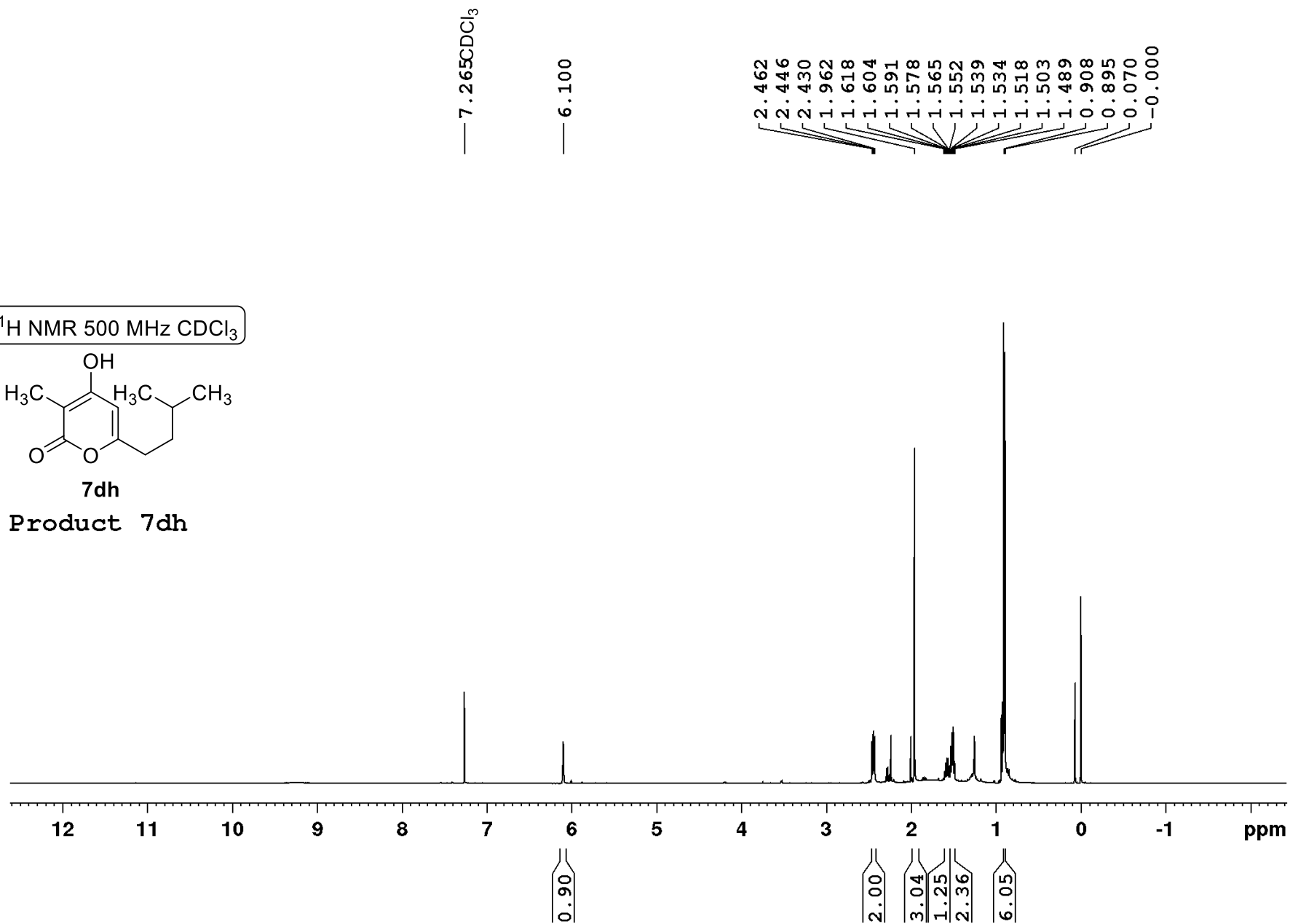


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



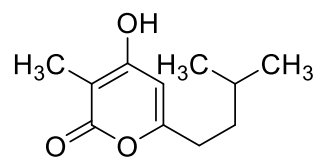
7dh

Product 7dh



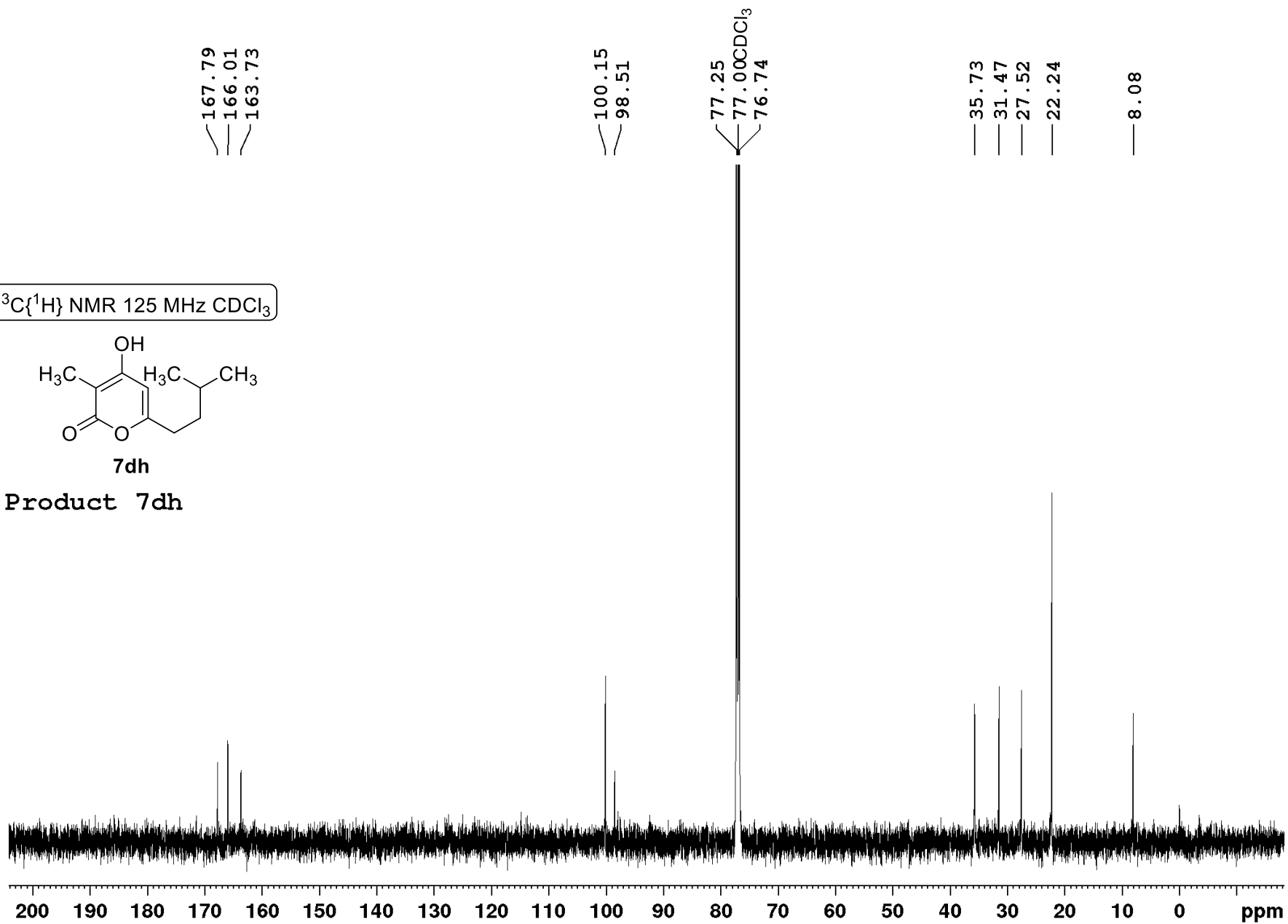


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

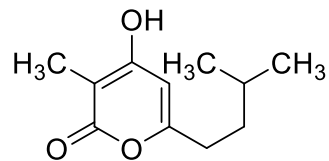


7dh

Product 7dh

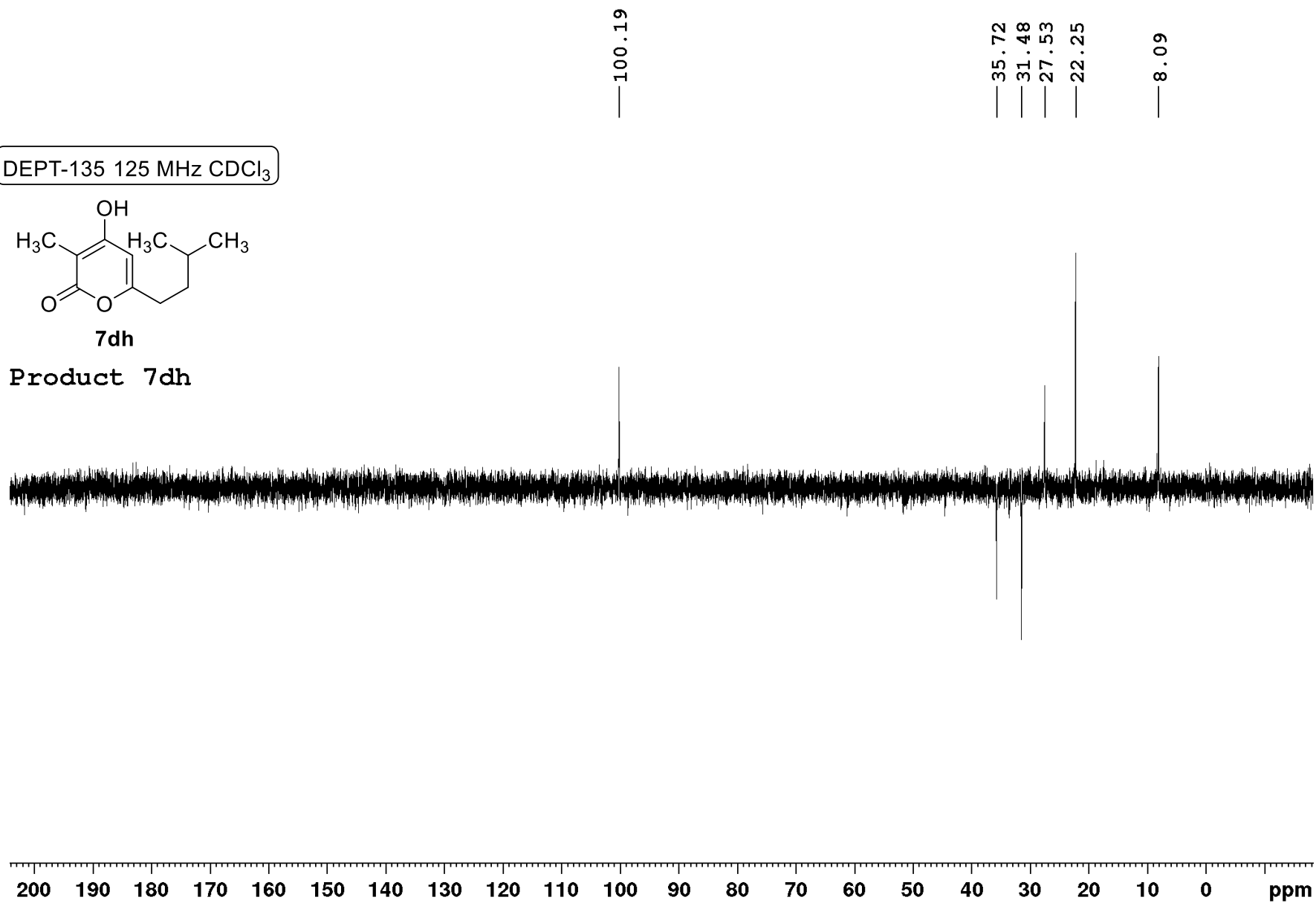


DEPT-135 125 MHz CDCl<sub>3</sub>

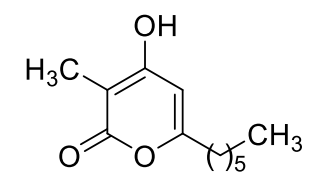


7dh

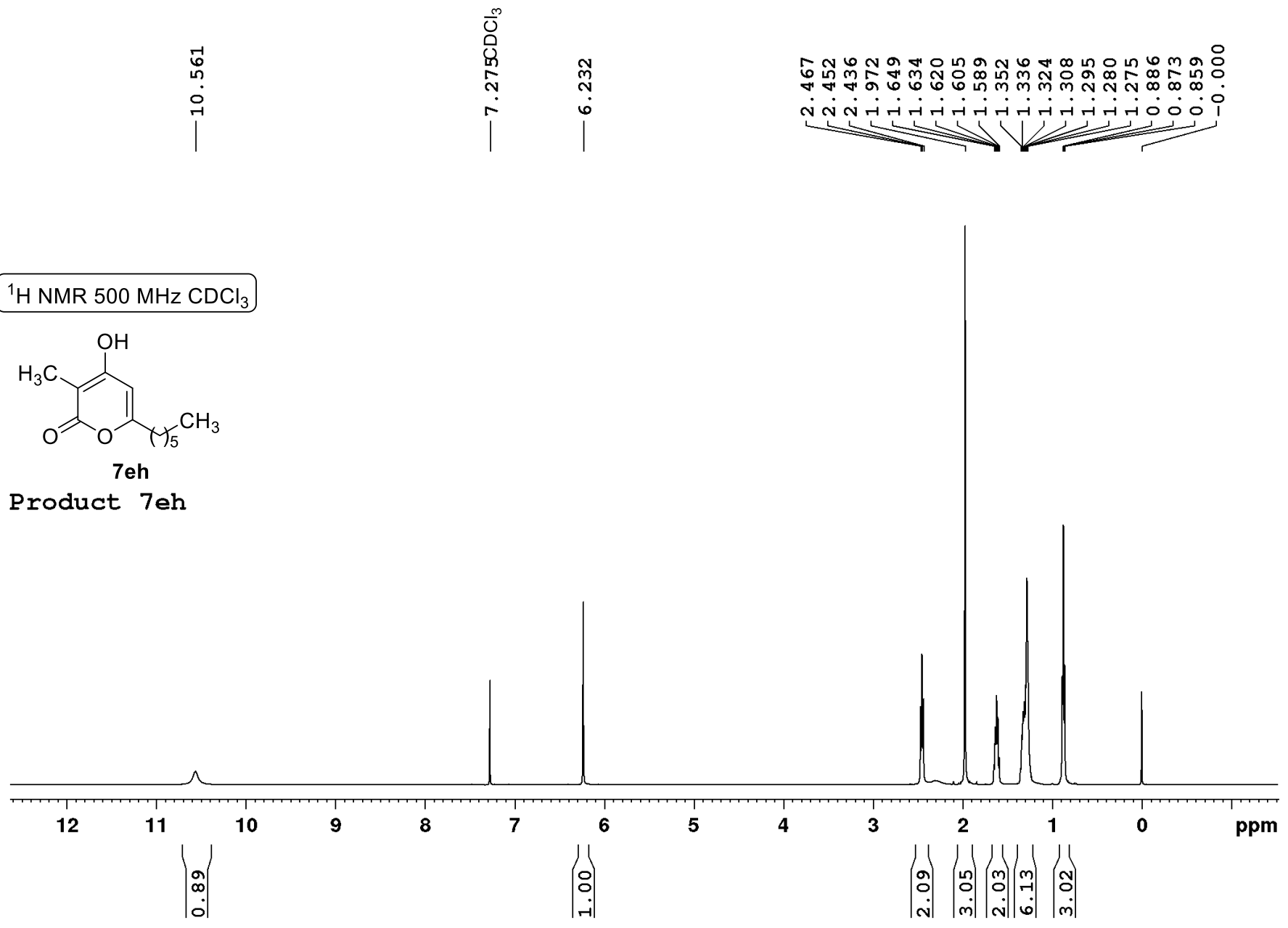
Product 7dh



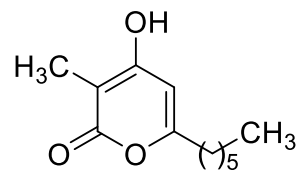
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



**7eh**  
**Product 7eh**

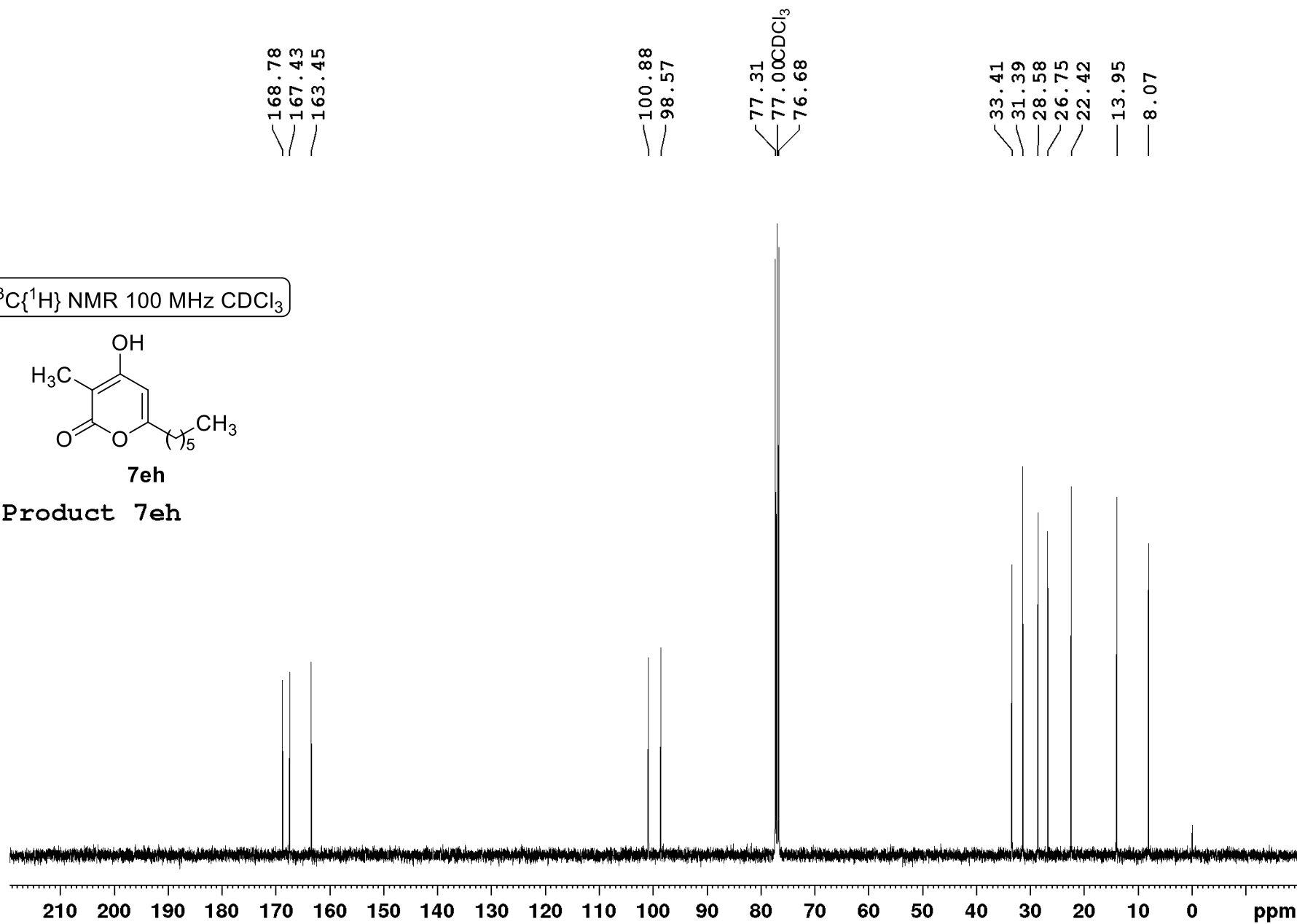


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

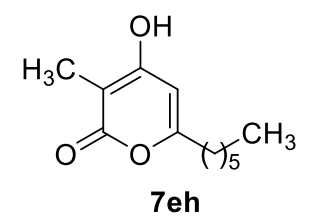


7eh

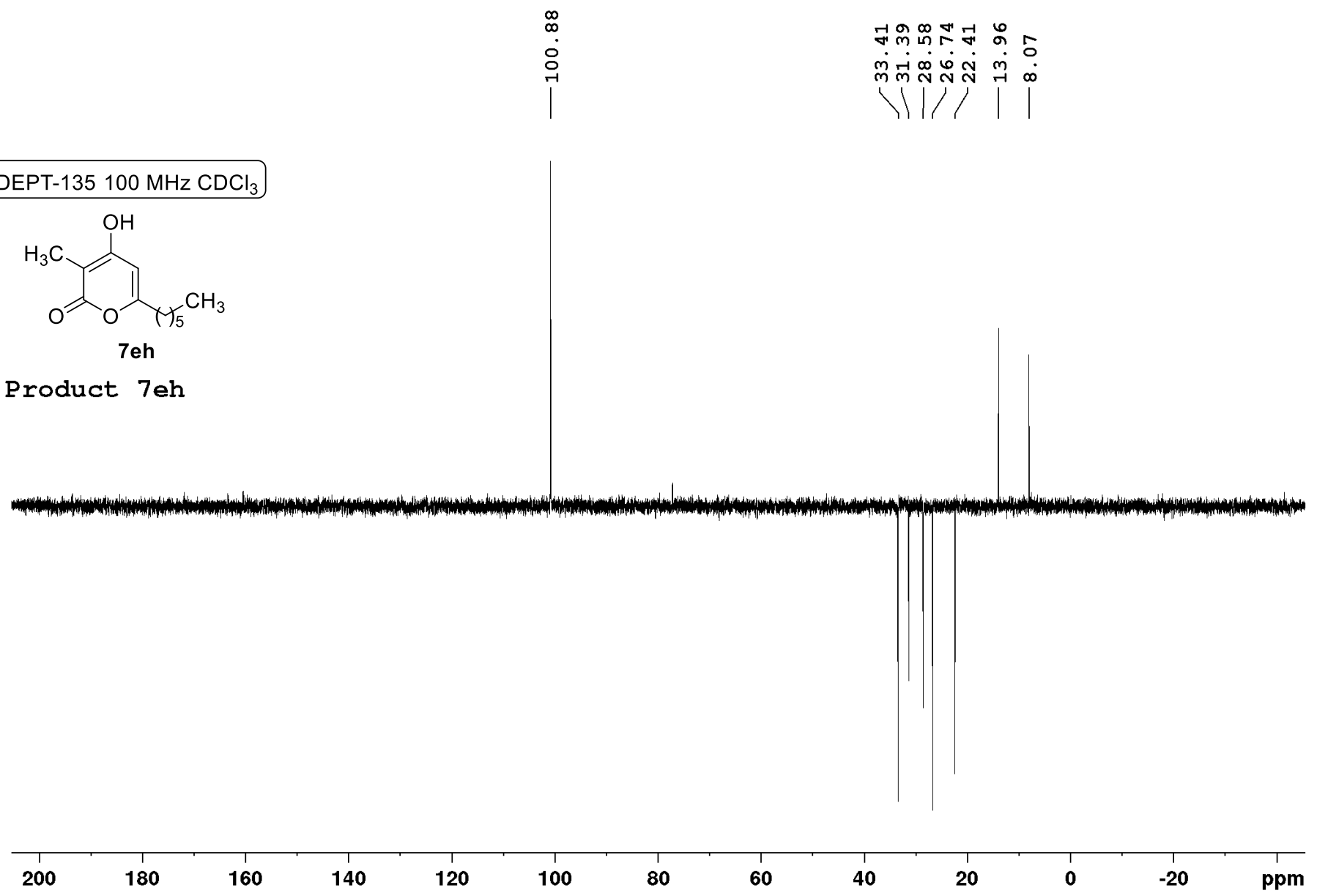
Product 7eh



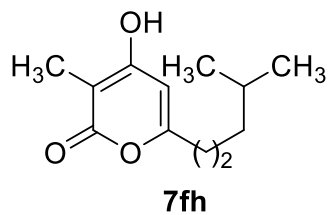
DEPT-135 100 MHz CDCl<sub>3</sub>



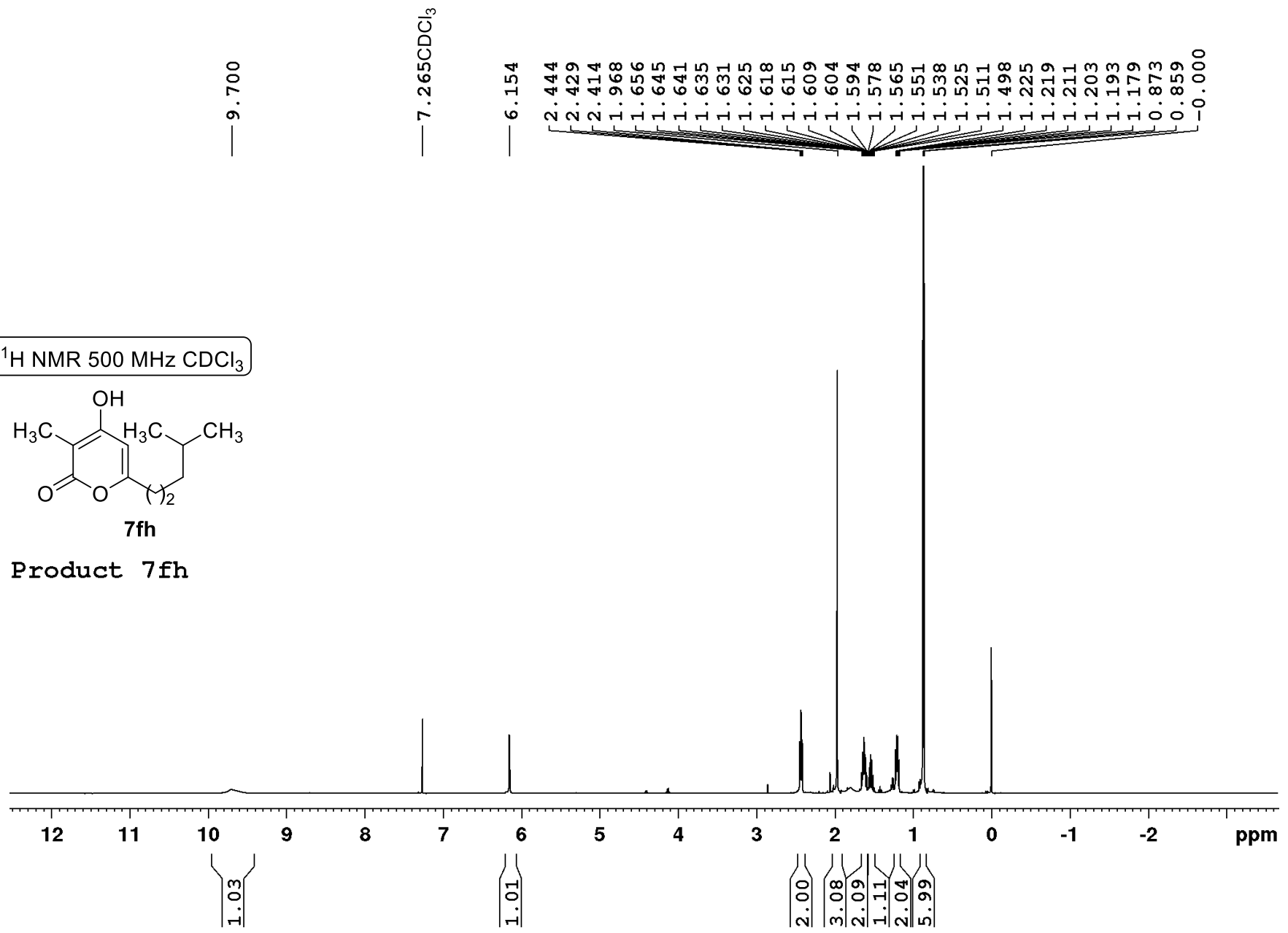
Product 7eh



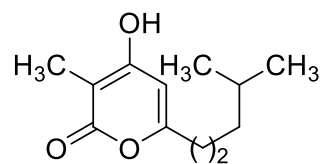
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



Product 7fh

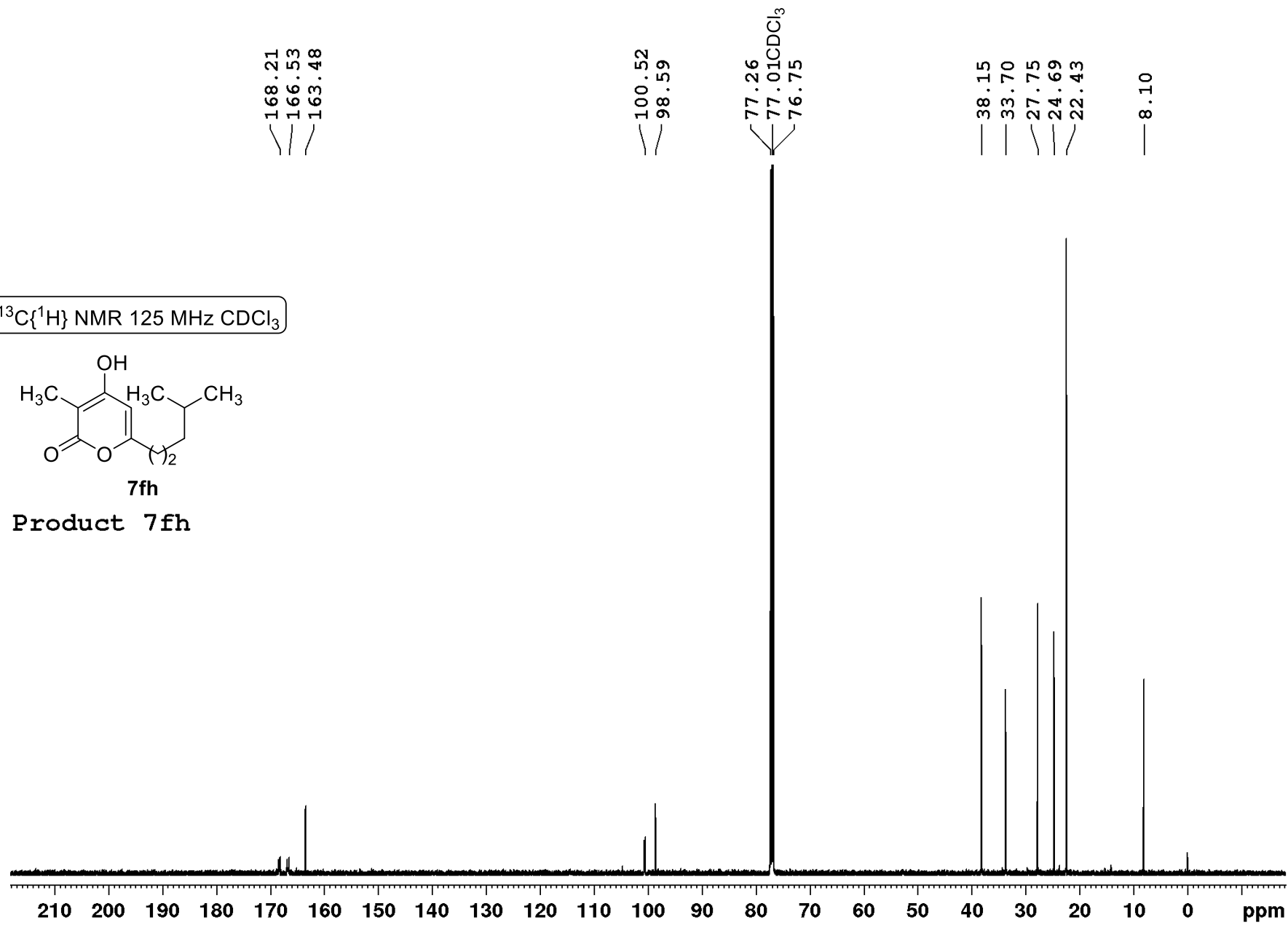


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

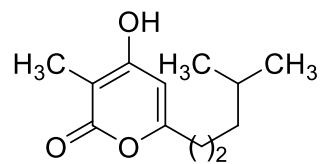


7fh

Product 7fh

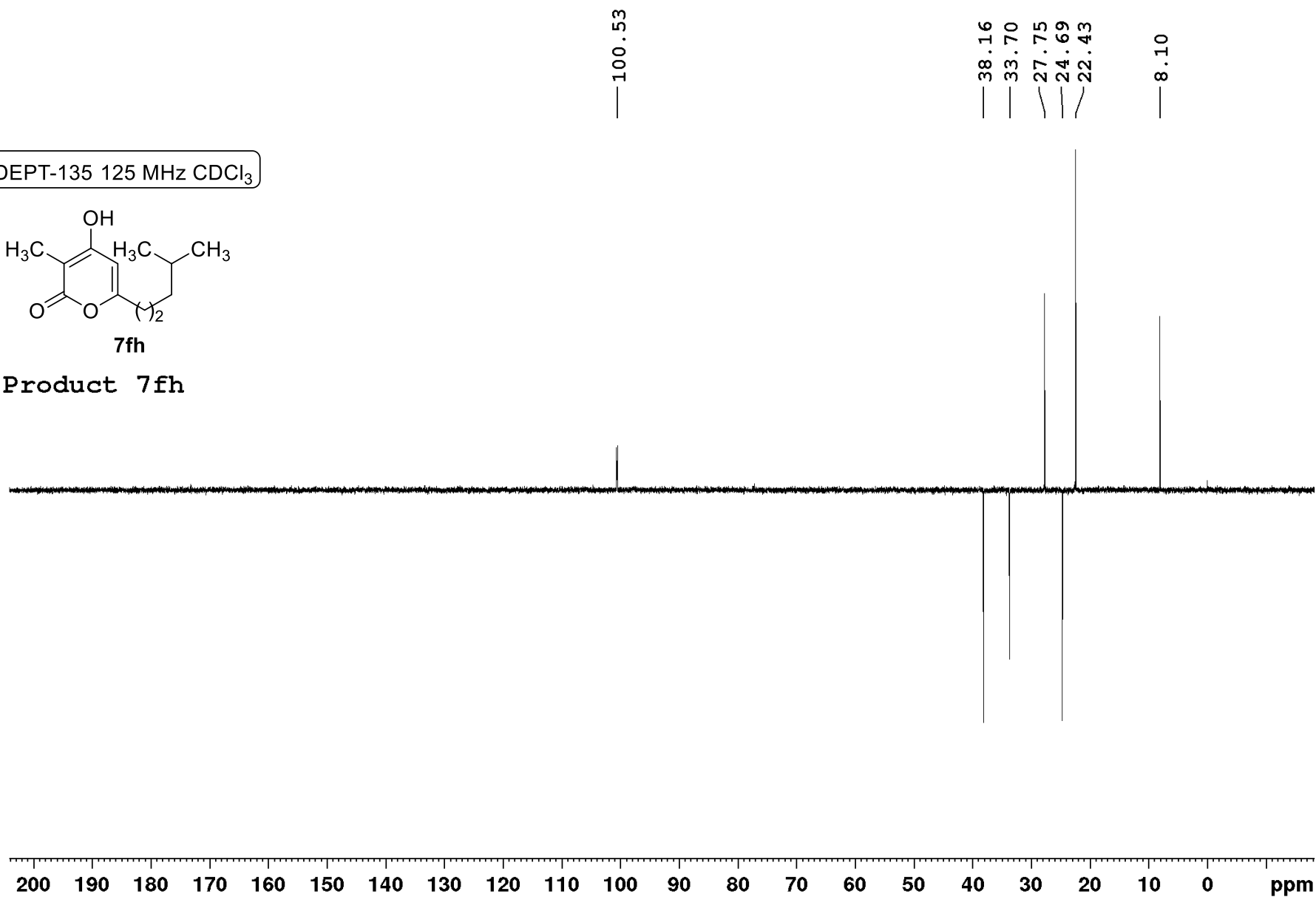


DEPT-135 125 MHz CDCl<sub>3</sub>



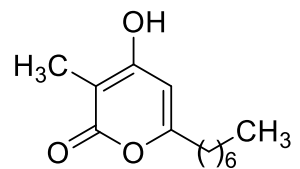
7fh

Product 7fh



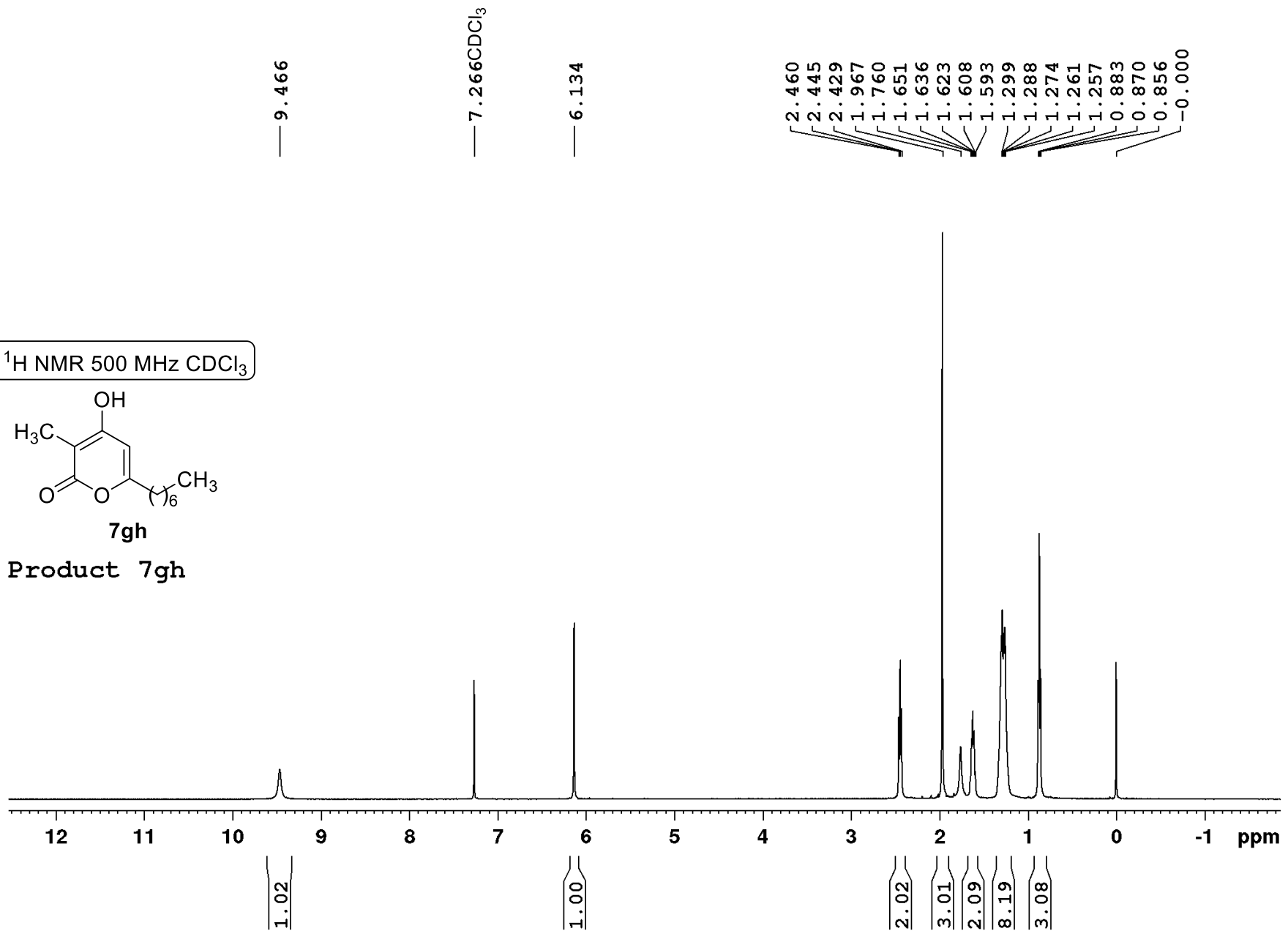


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

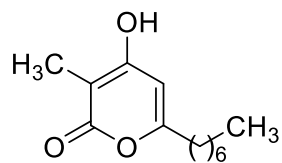


7gh

Product 7gh

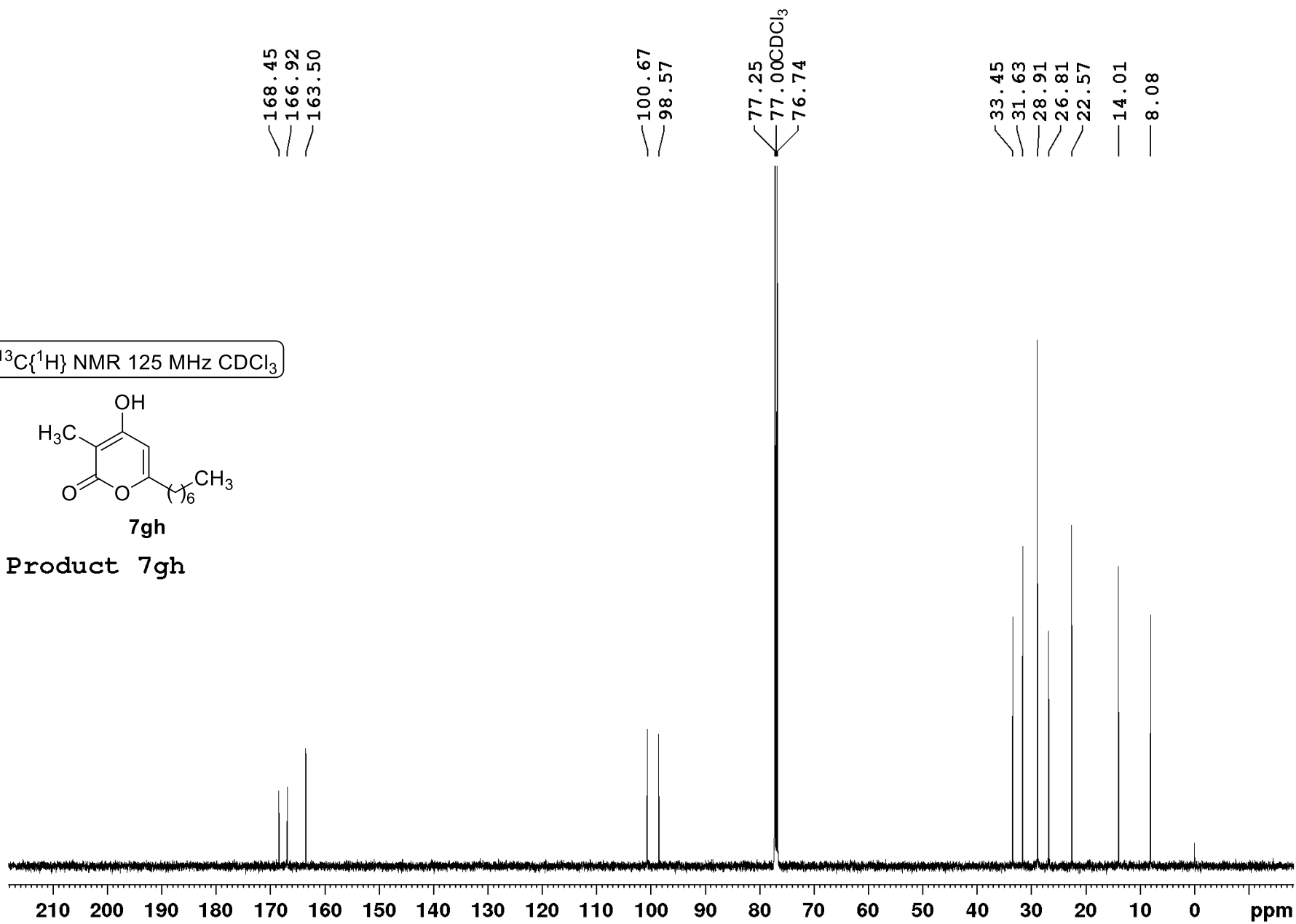


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

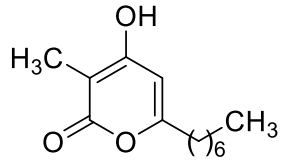


7gh

Product 7gh

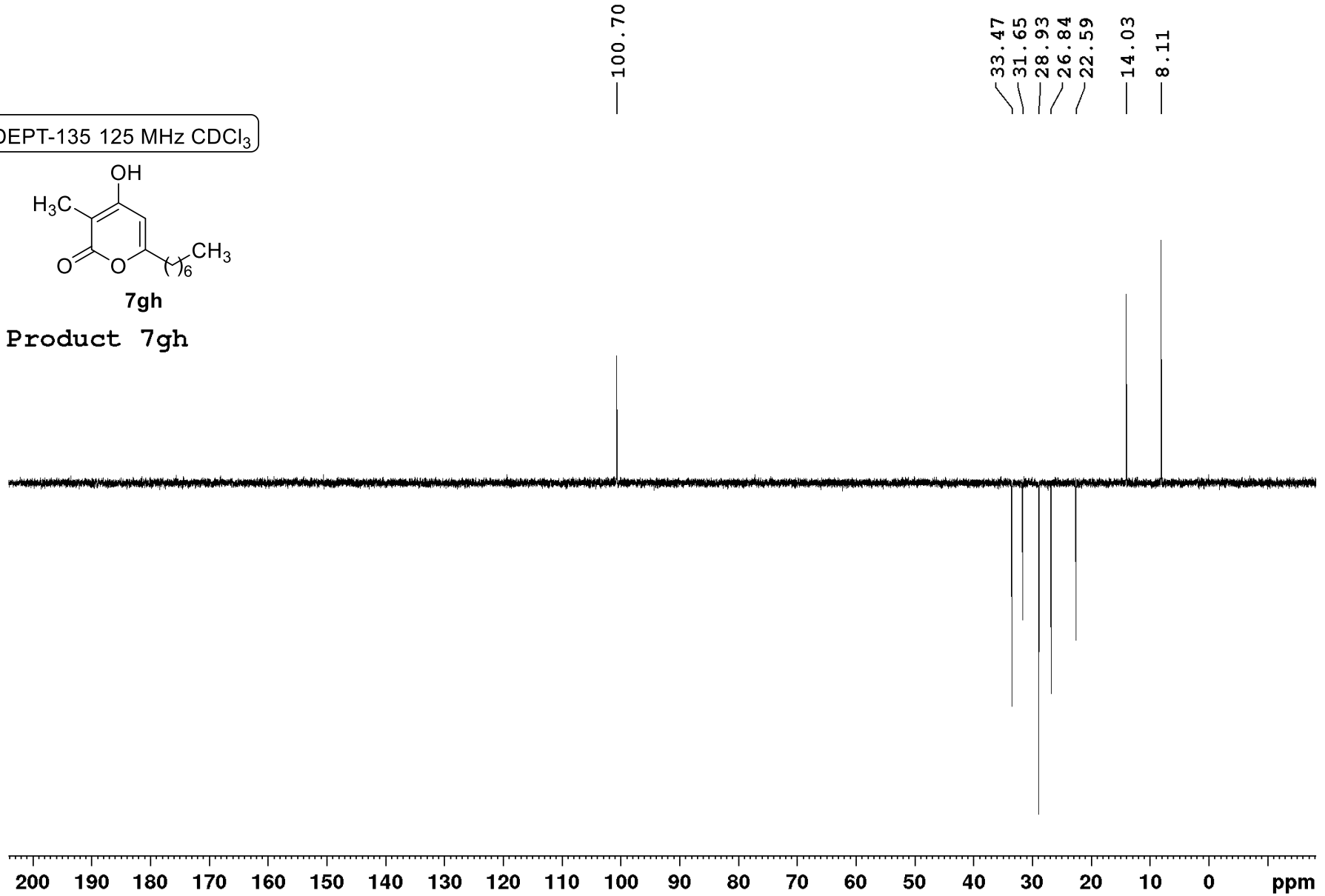


DEPT-135 125 MHz CDCl<sub>3</sub>

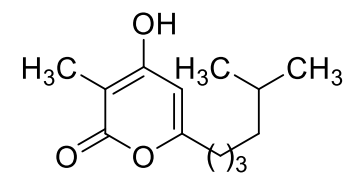


7gh

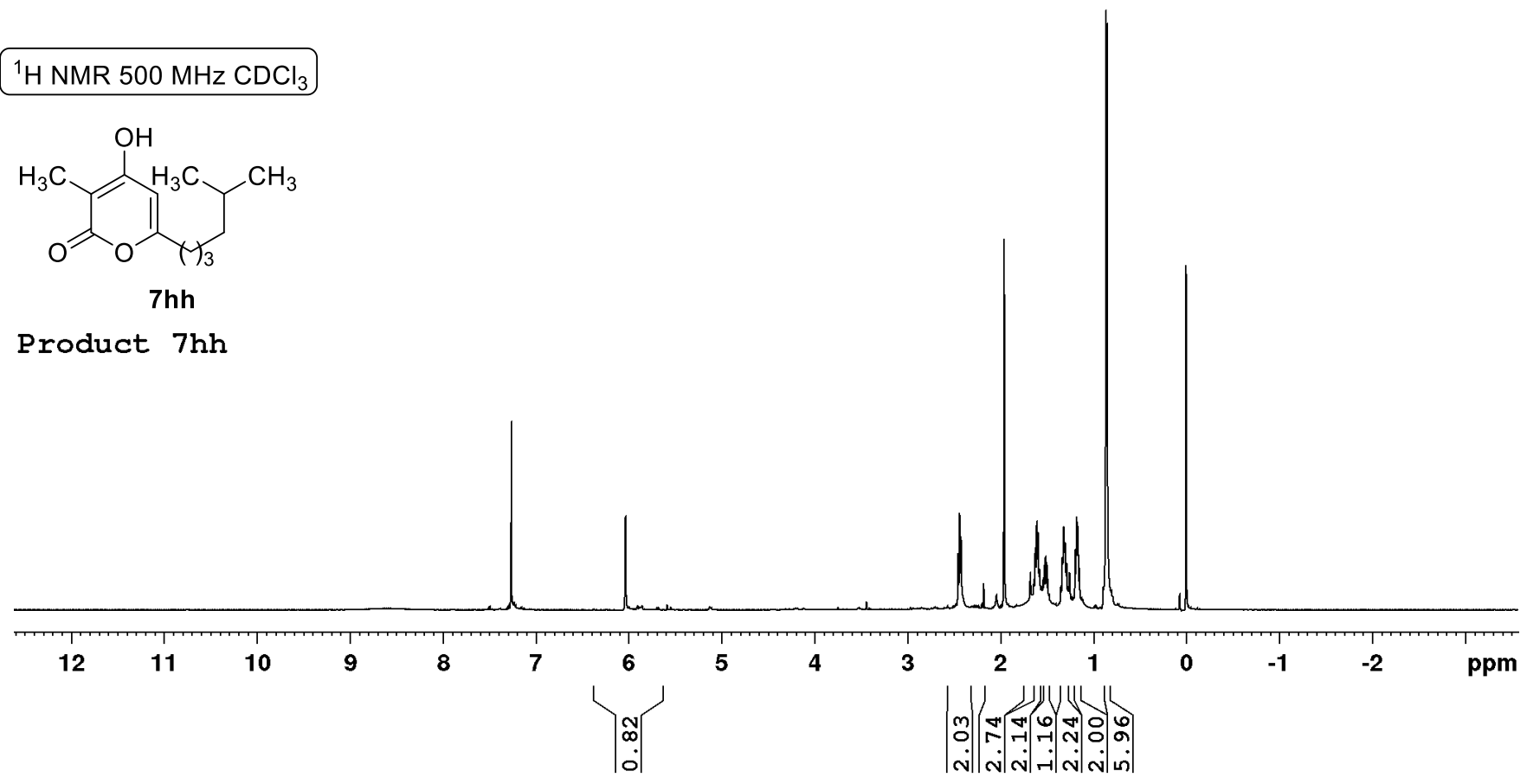
Product 7gh



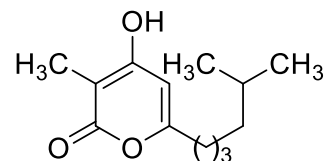
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7hh  
Product 7hh

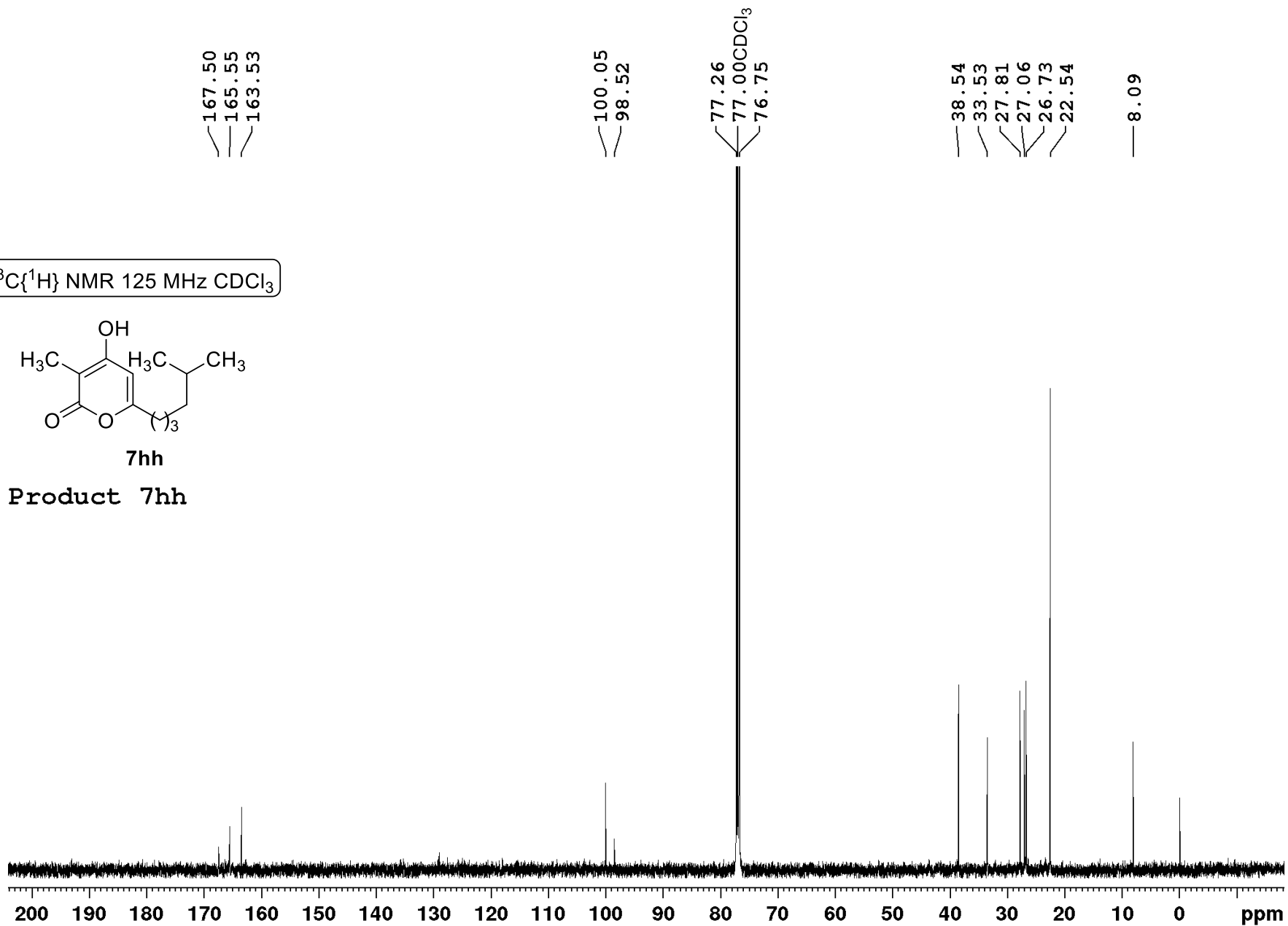


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

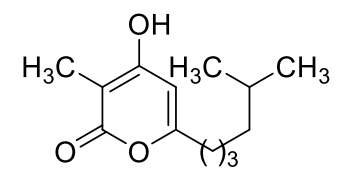


7hh

Product 7hh

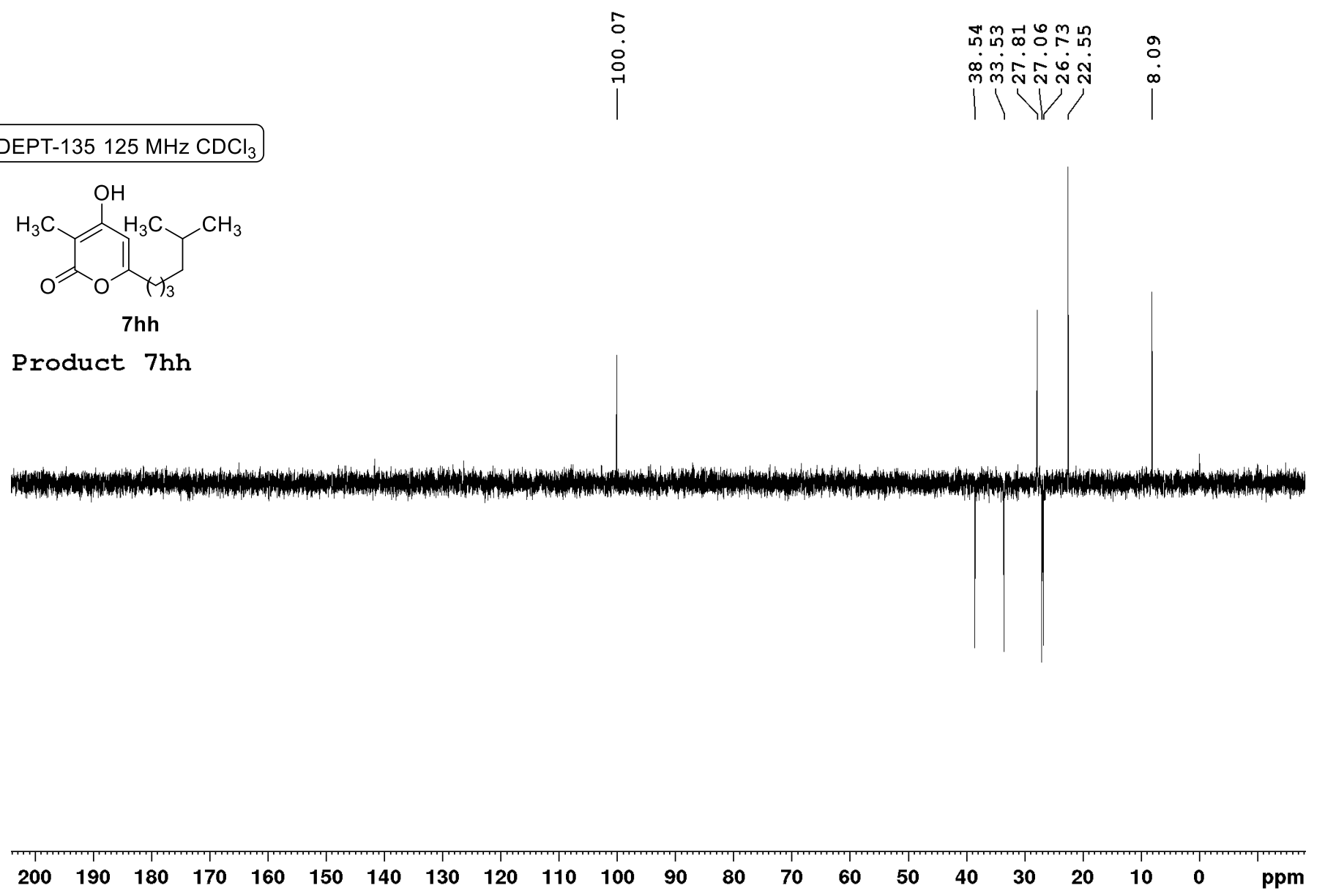


DEPT-135 125 MHz CDCl<sub>3</sub>

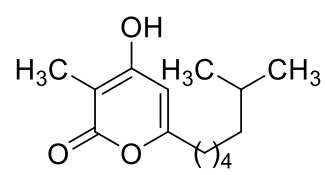


7hh

Product 7hh

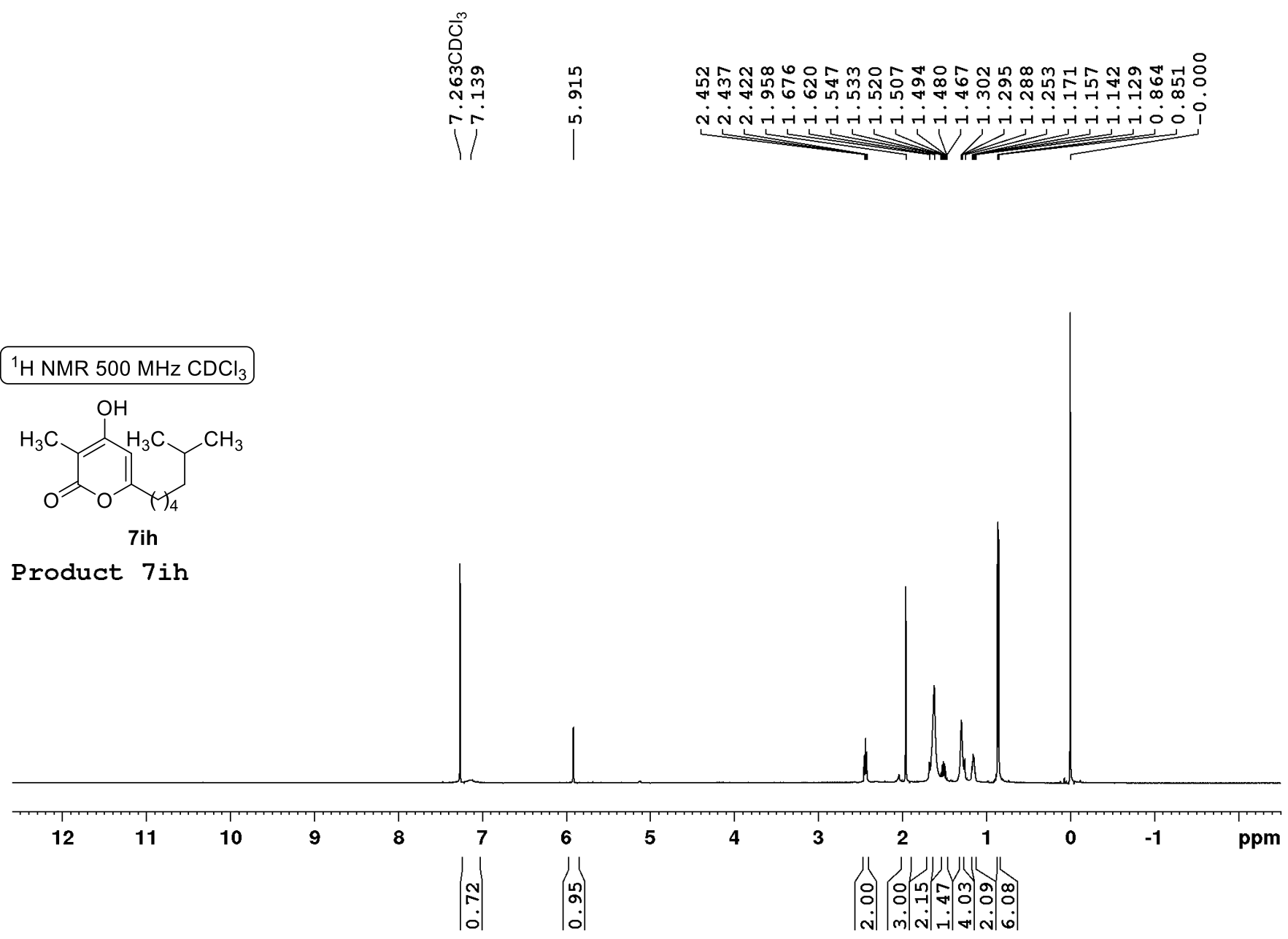


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

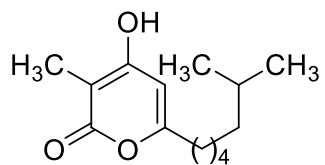


7ih

Product 7ih

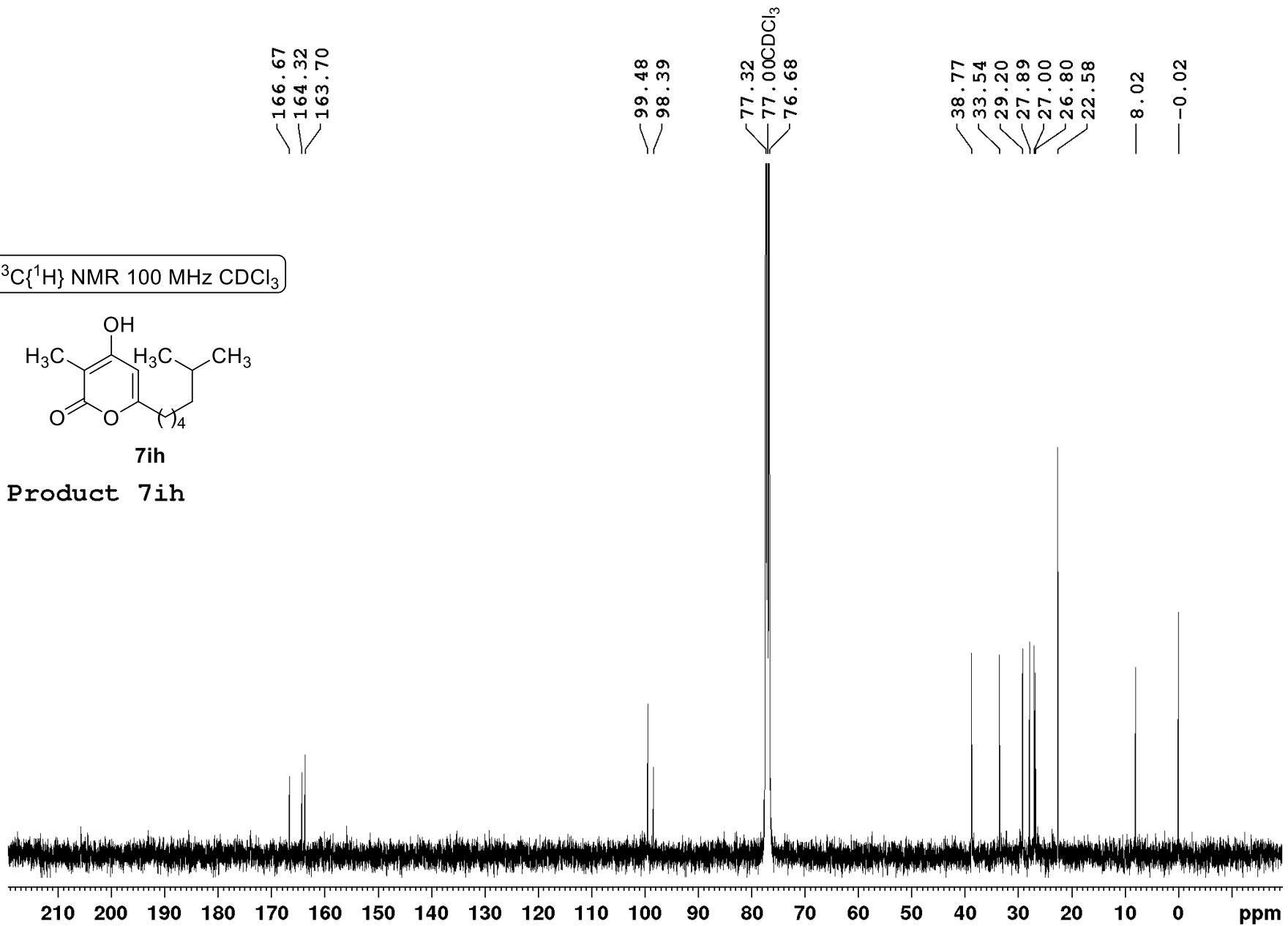


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



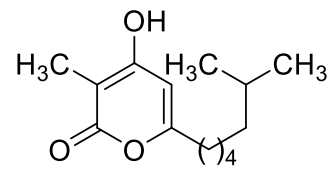
7ih

Product 7ih



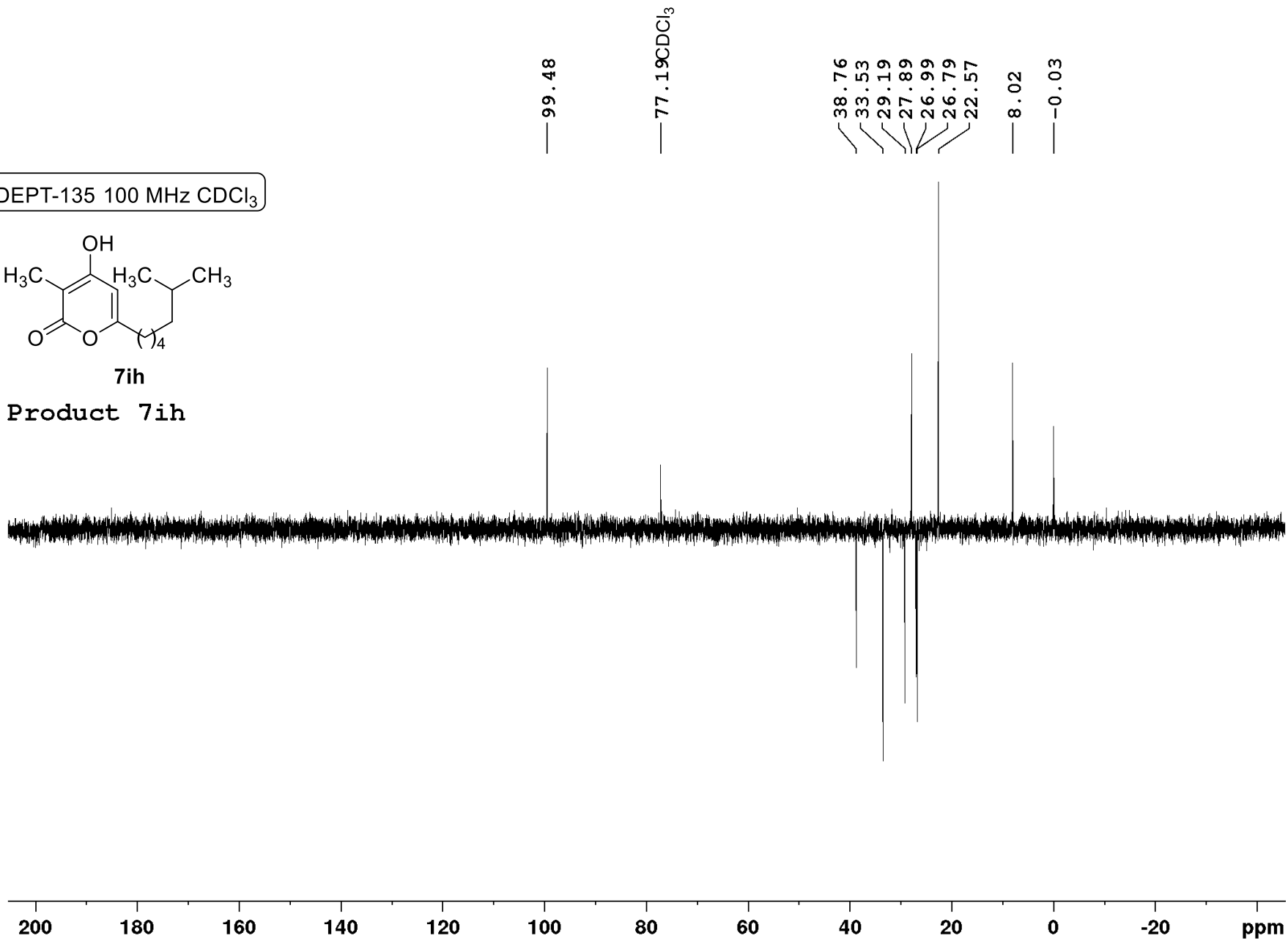


DEPT-135 100 MHz CDCl<sub>3</sub>

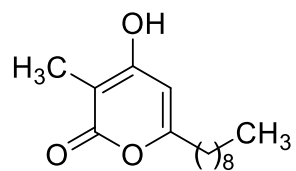


7ih

Product 7ih

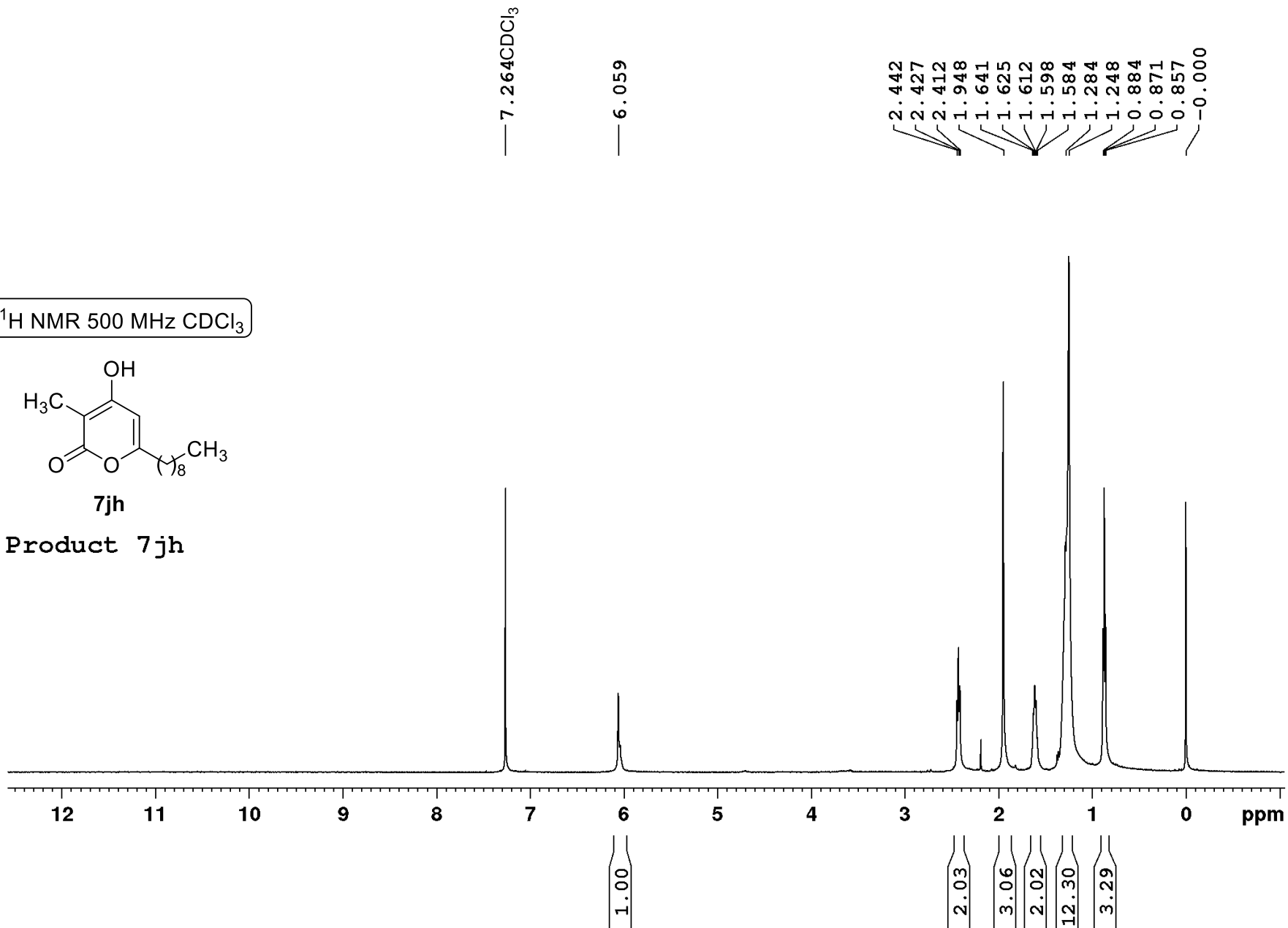


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

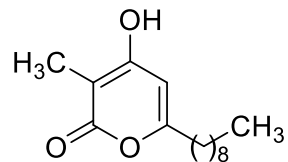


7jh

Product 7jh

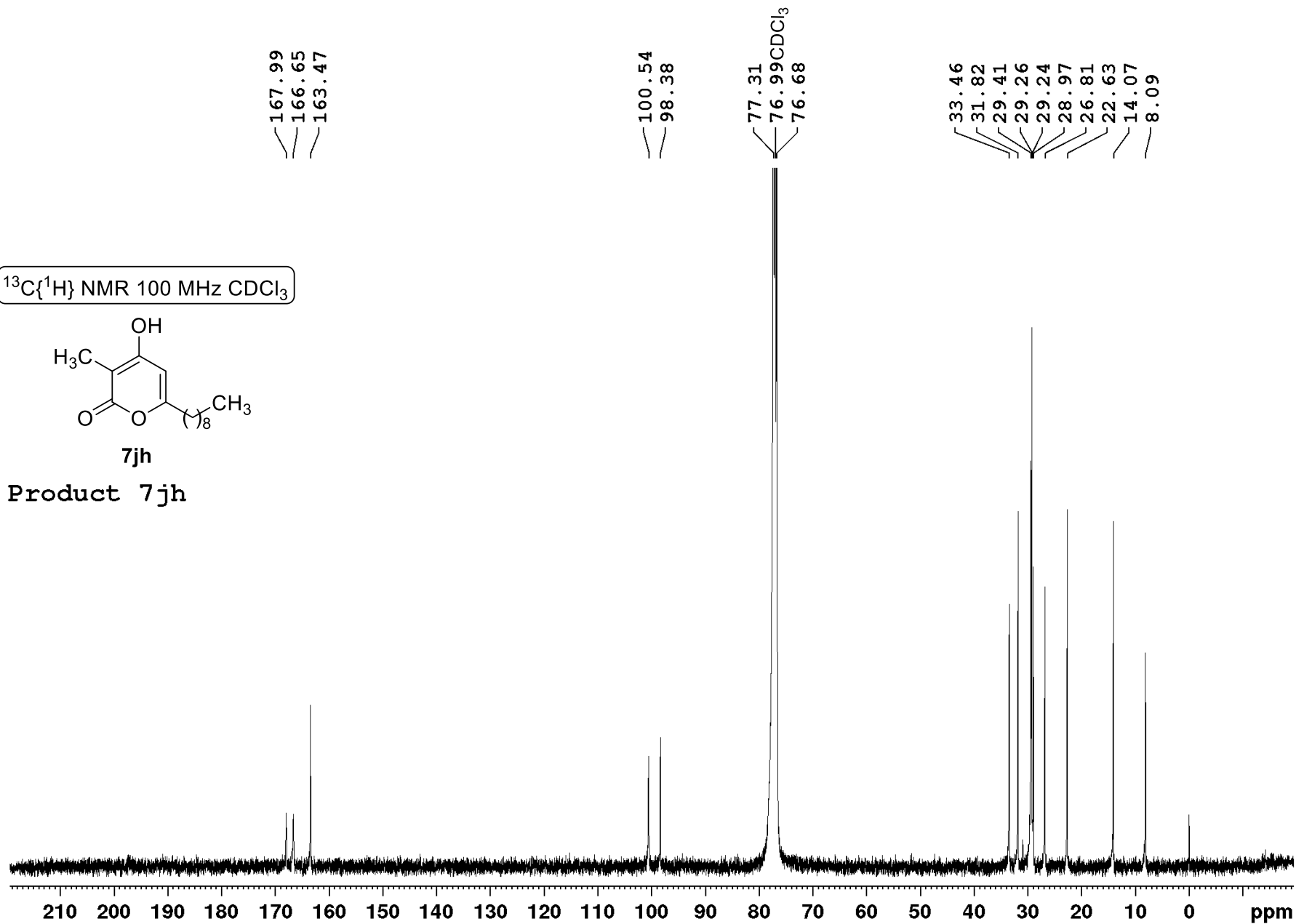


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

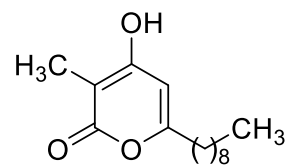


7jh

Product 7jh

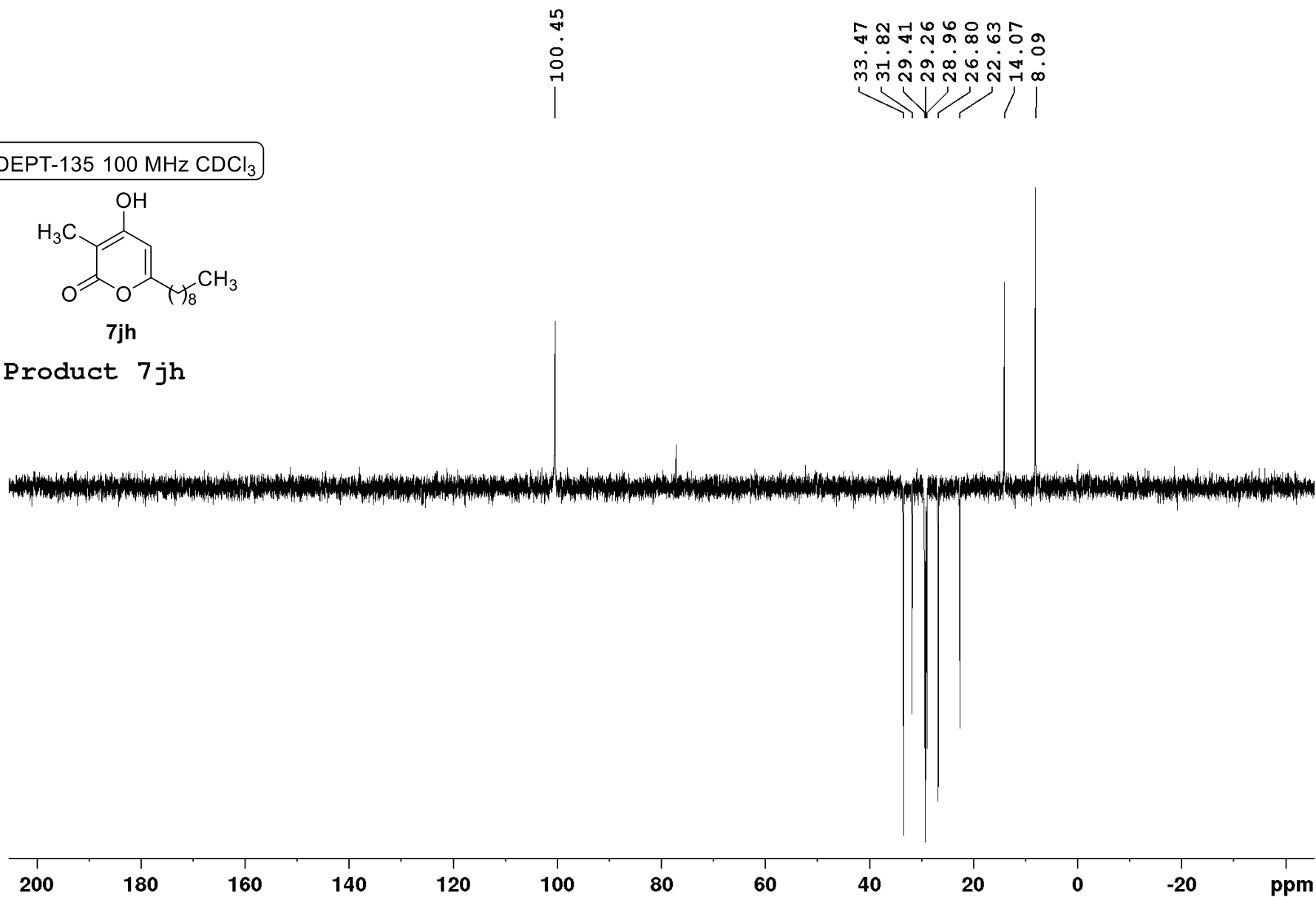


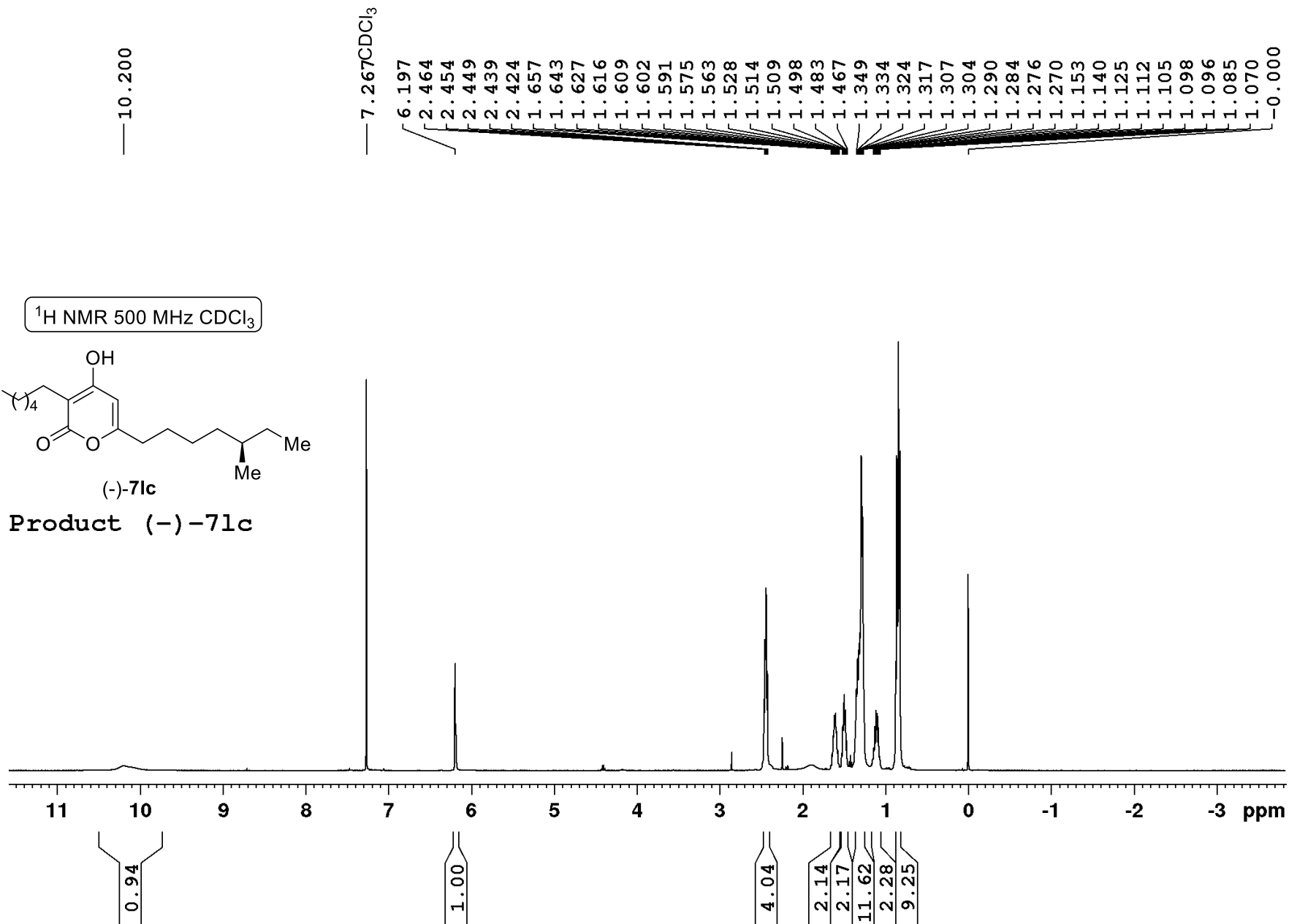
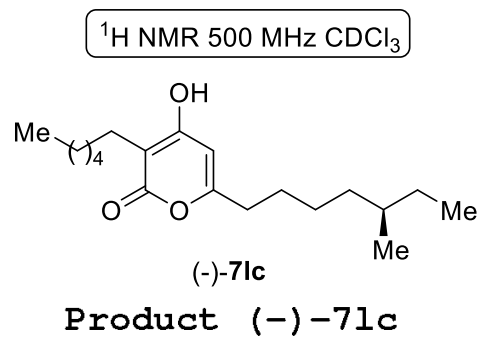
DEPT-135 100 MHz CDCl<sub>3</sub>

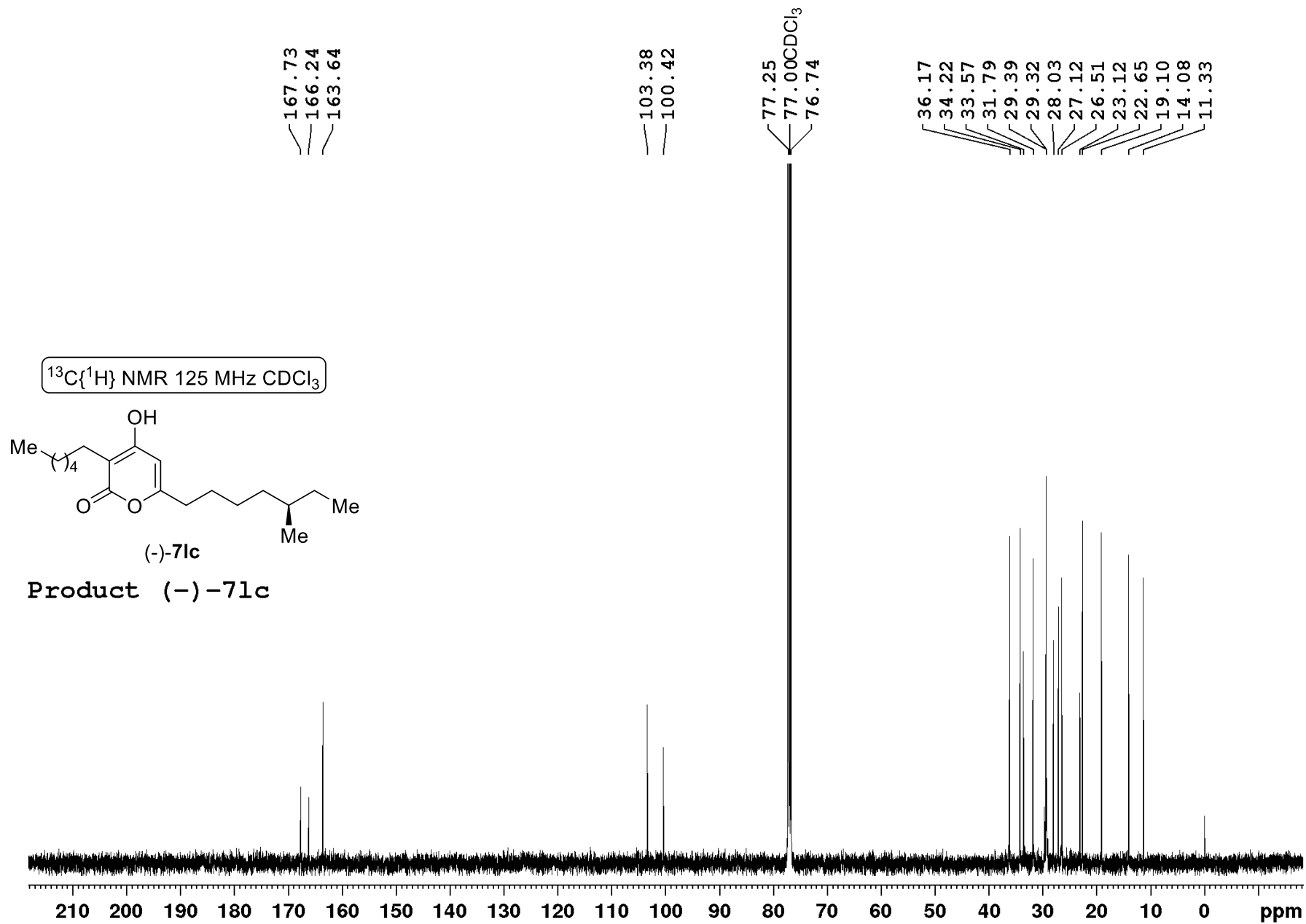


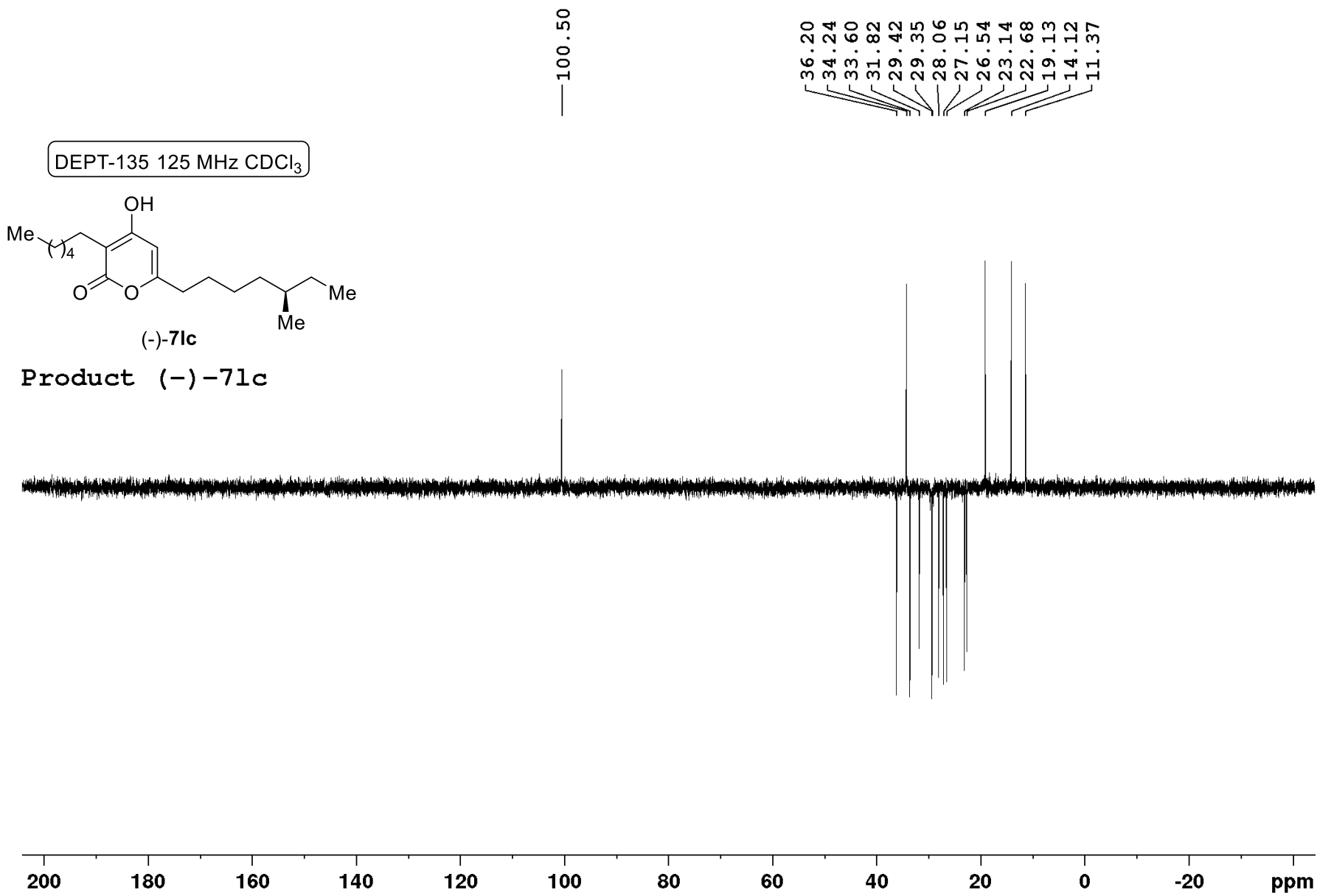
7jh

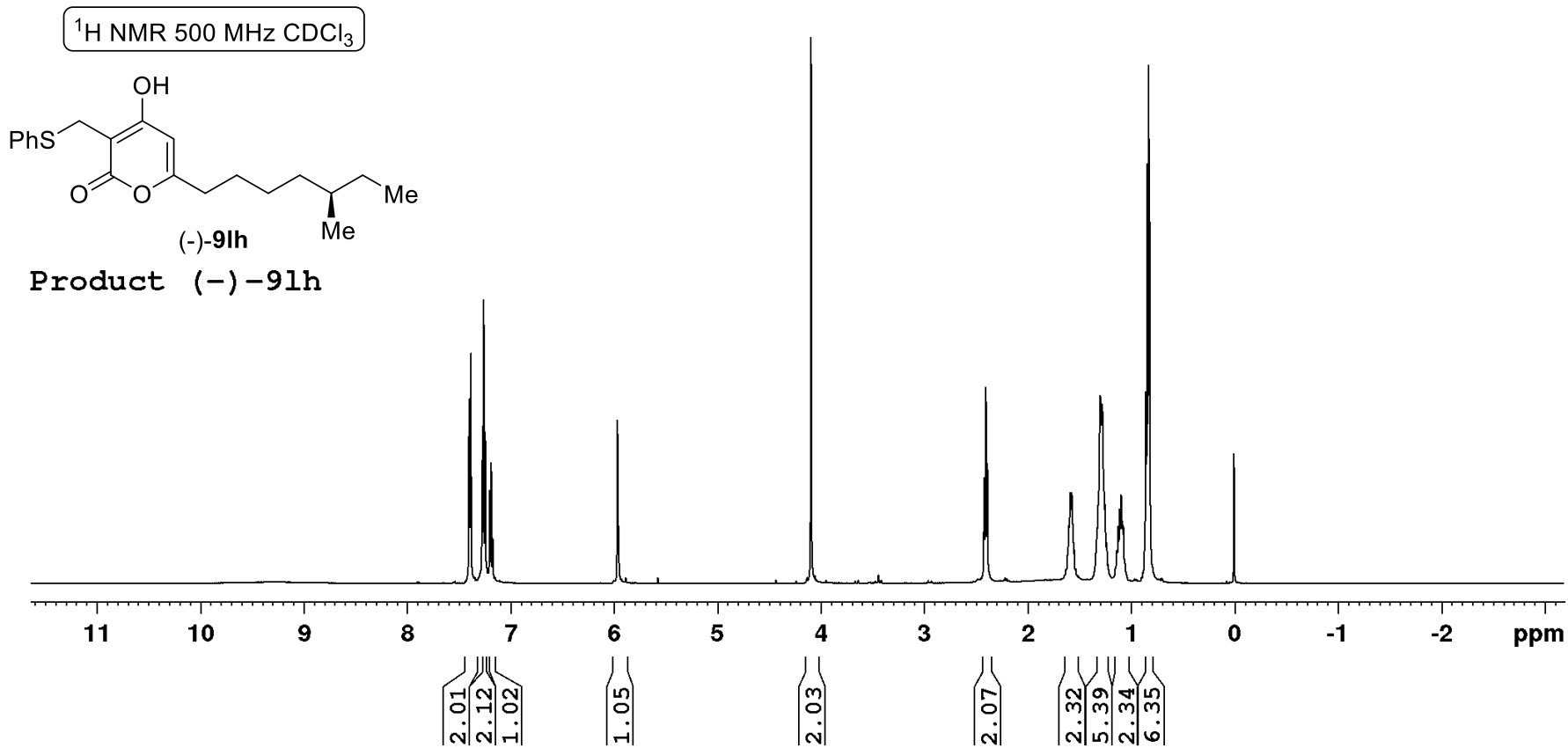
Product 7jh



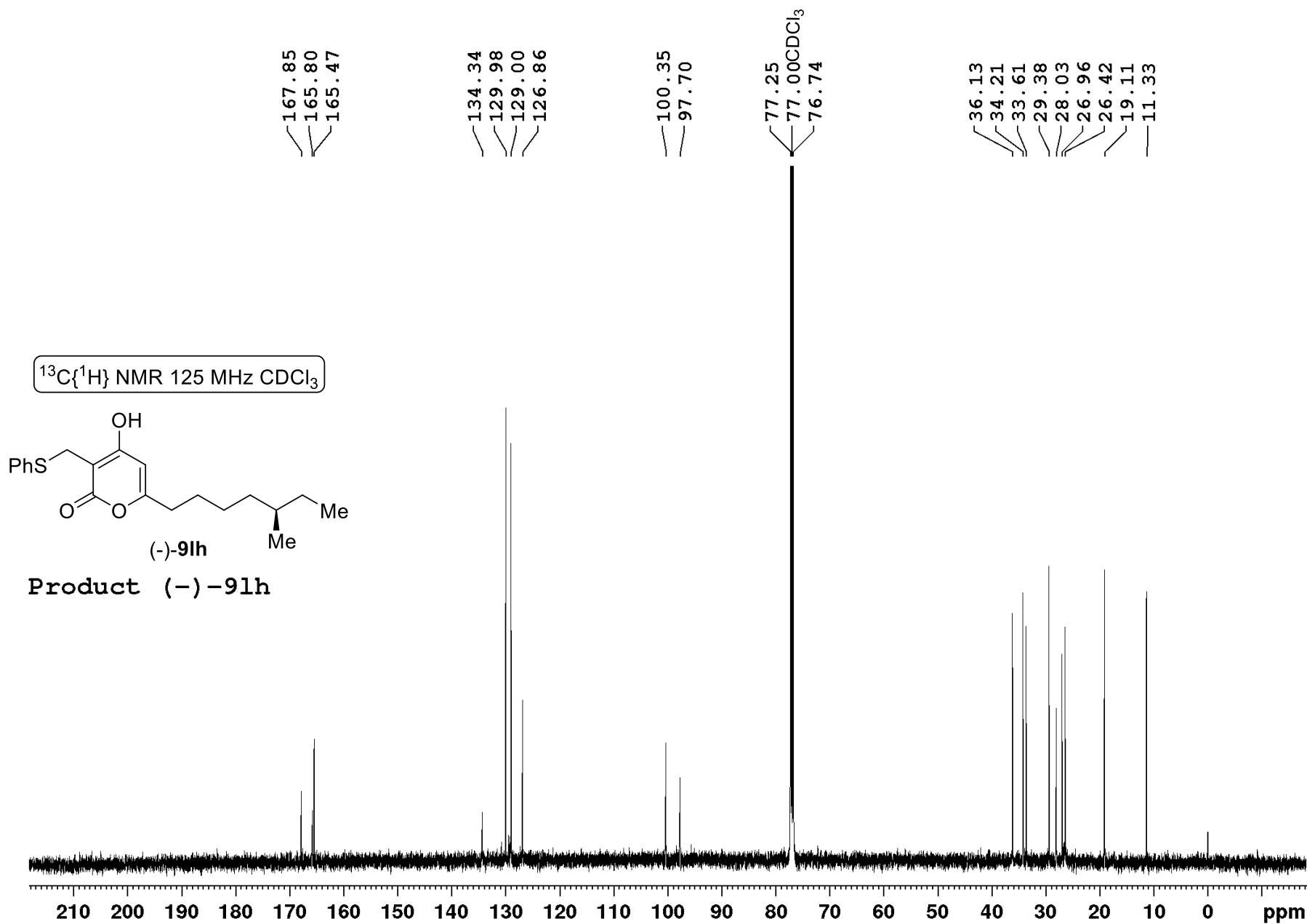


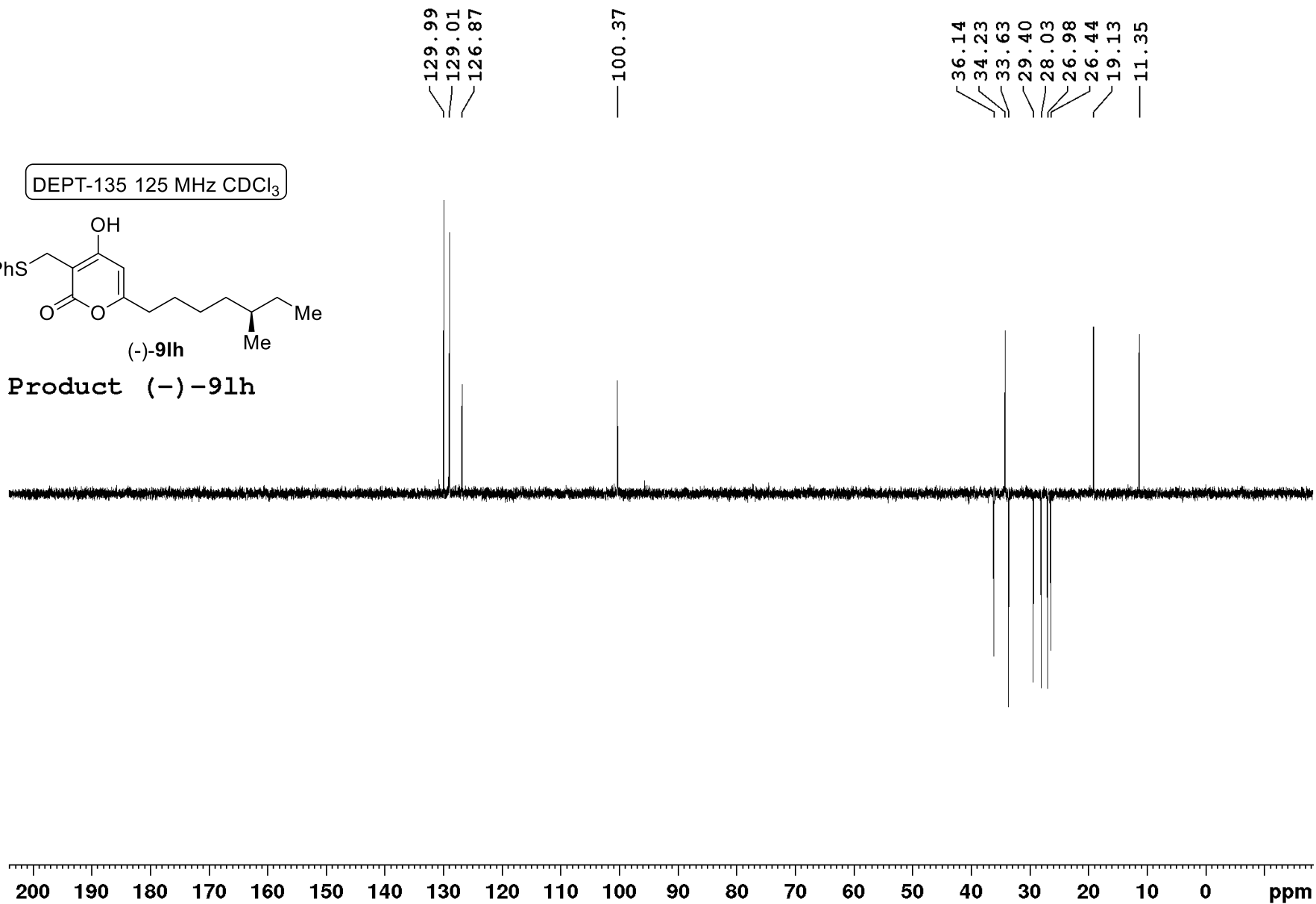
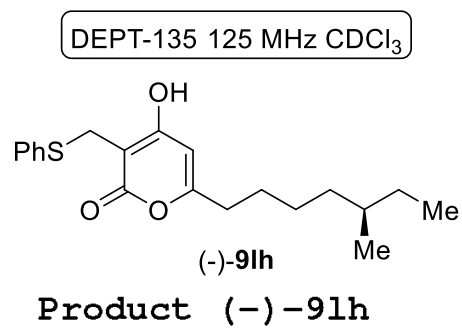


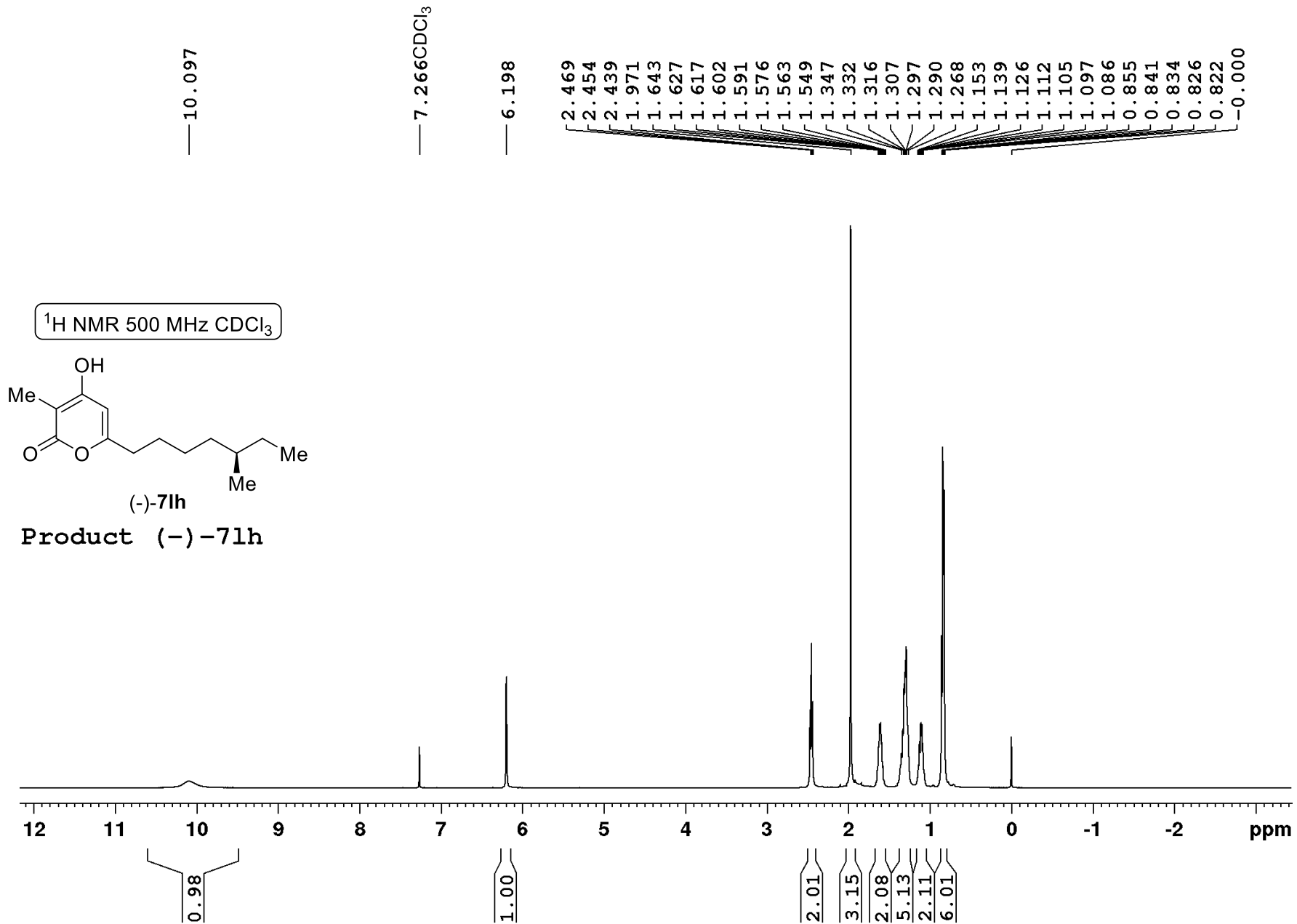




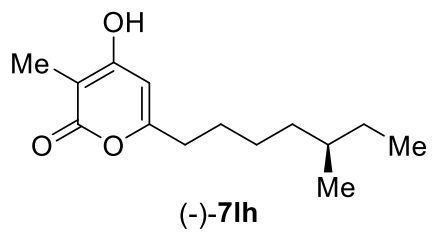




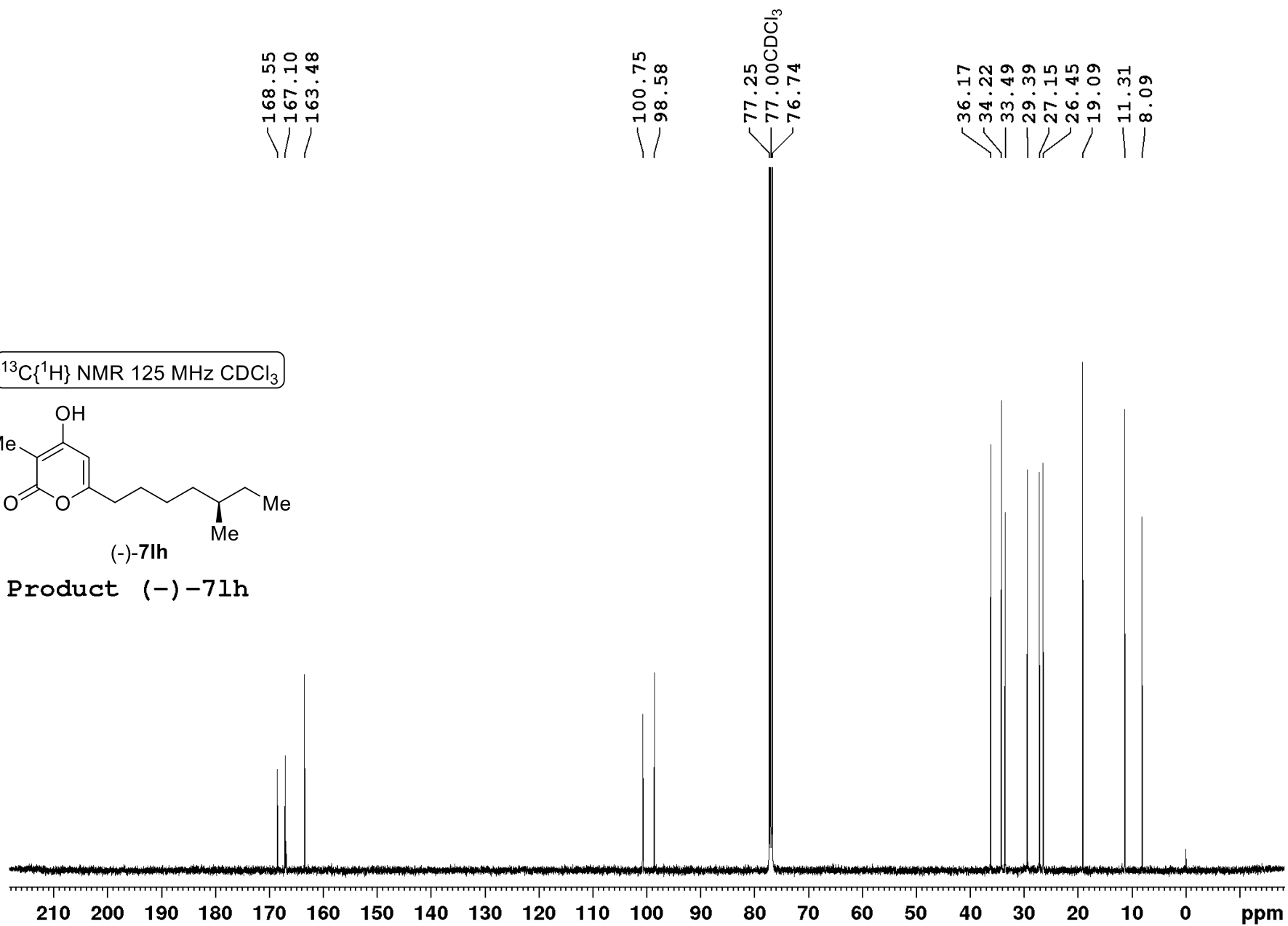




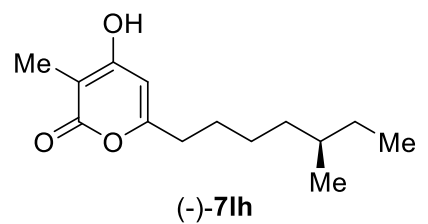
$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



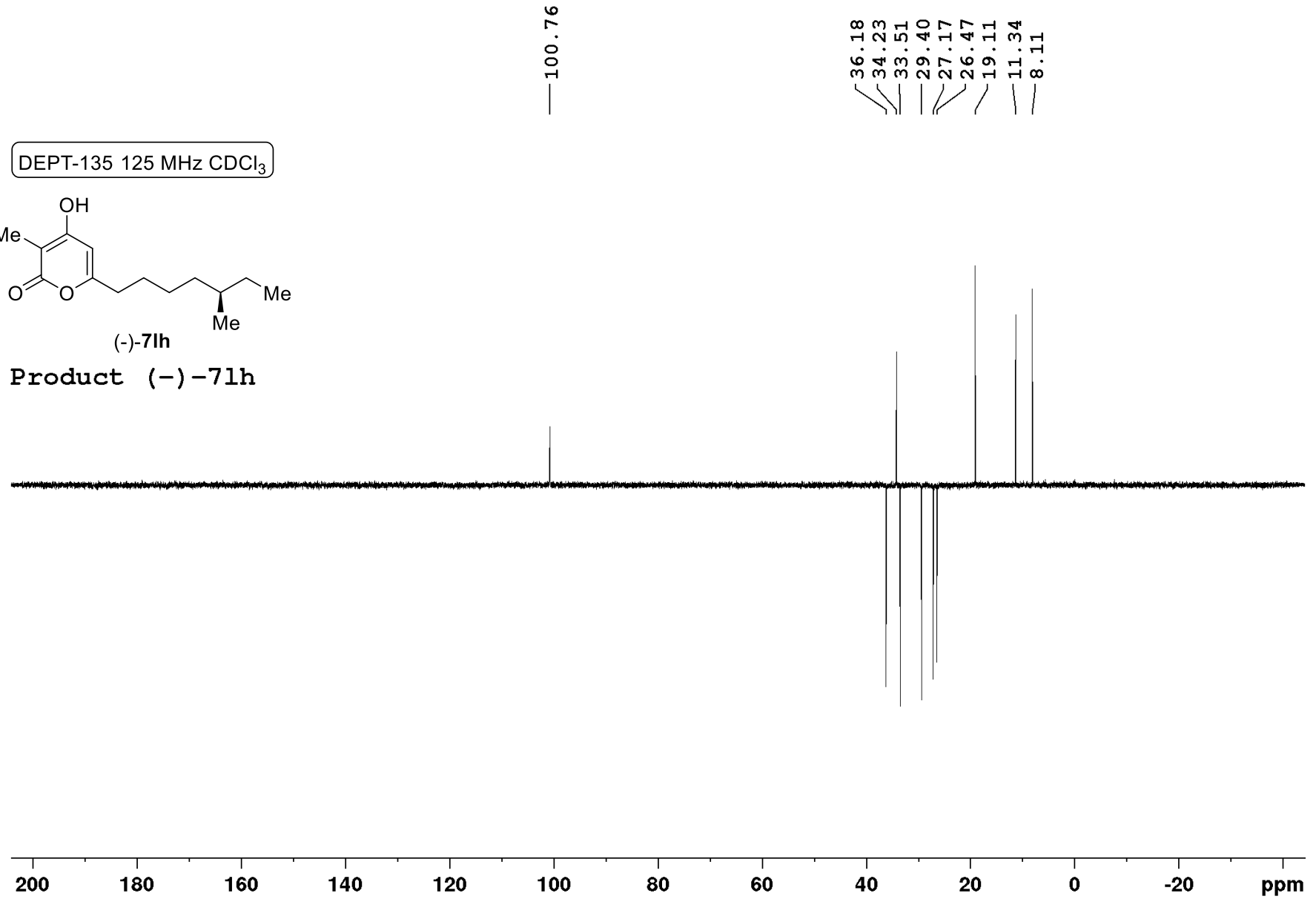
Product (-)-71h

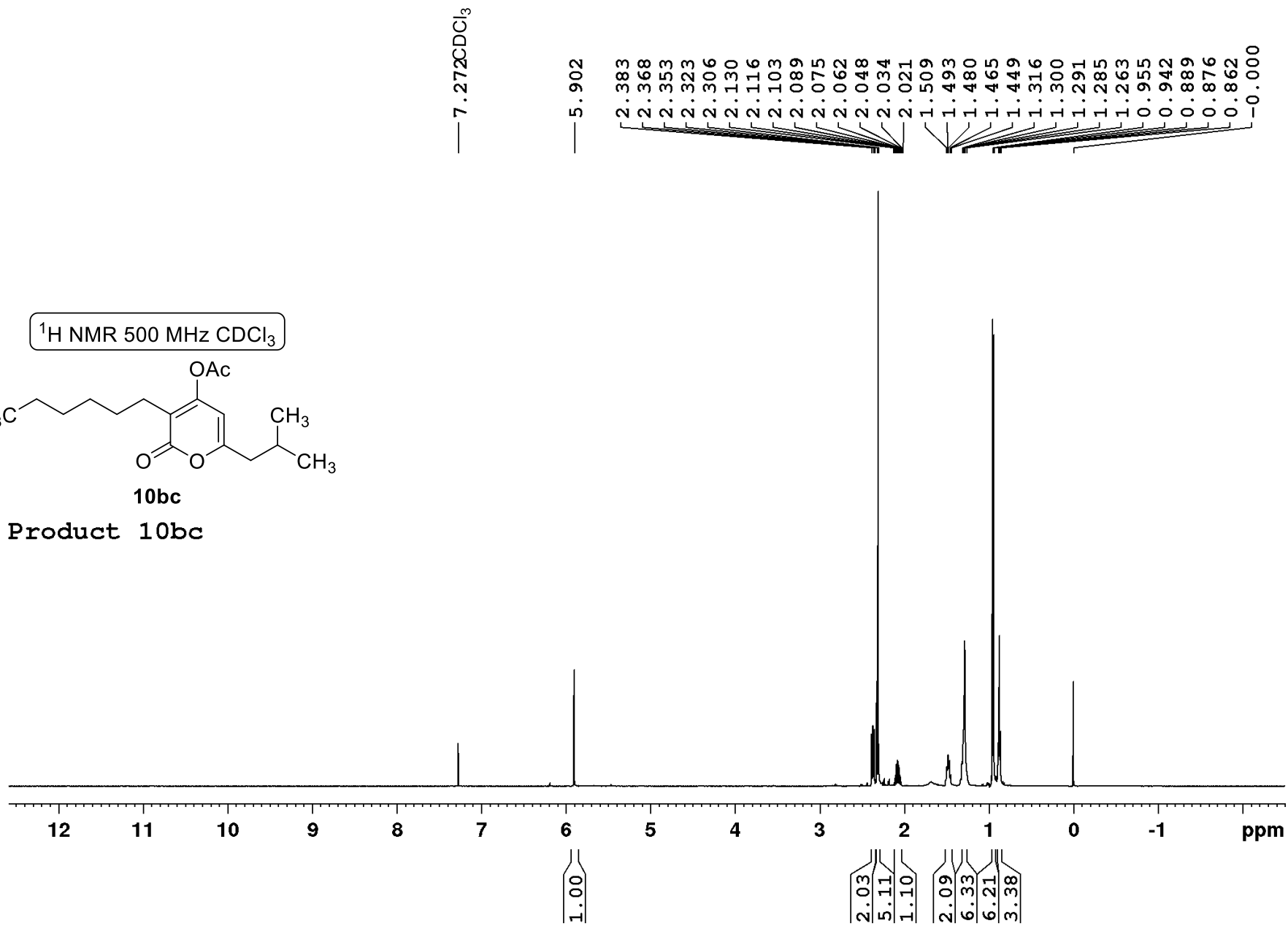
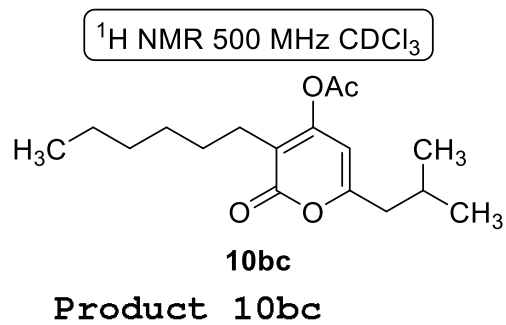


DEPT-135 125 MHz CDCl<sub>3</sub>

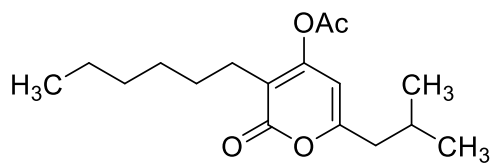


Product (-)-71h



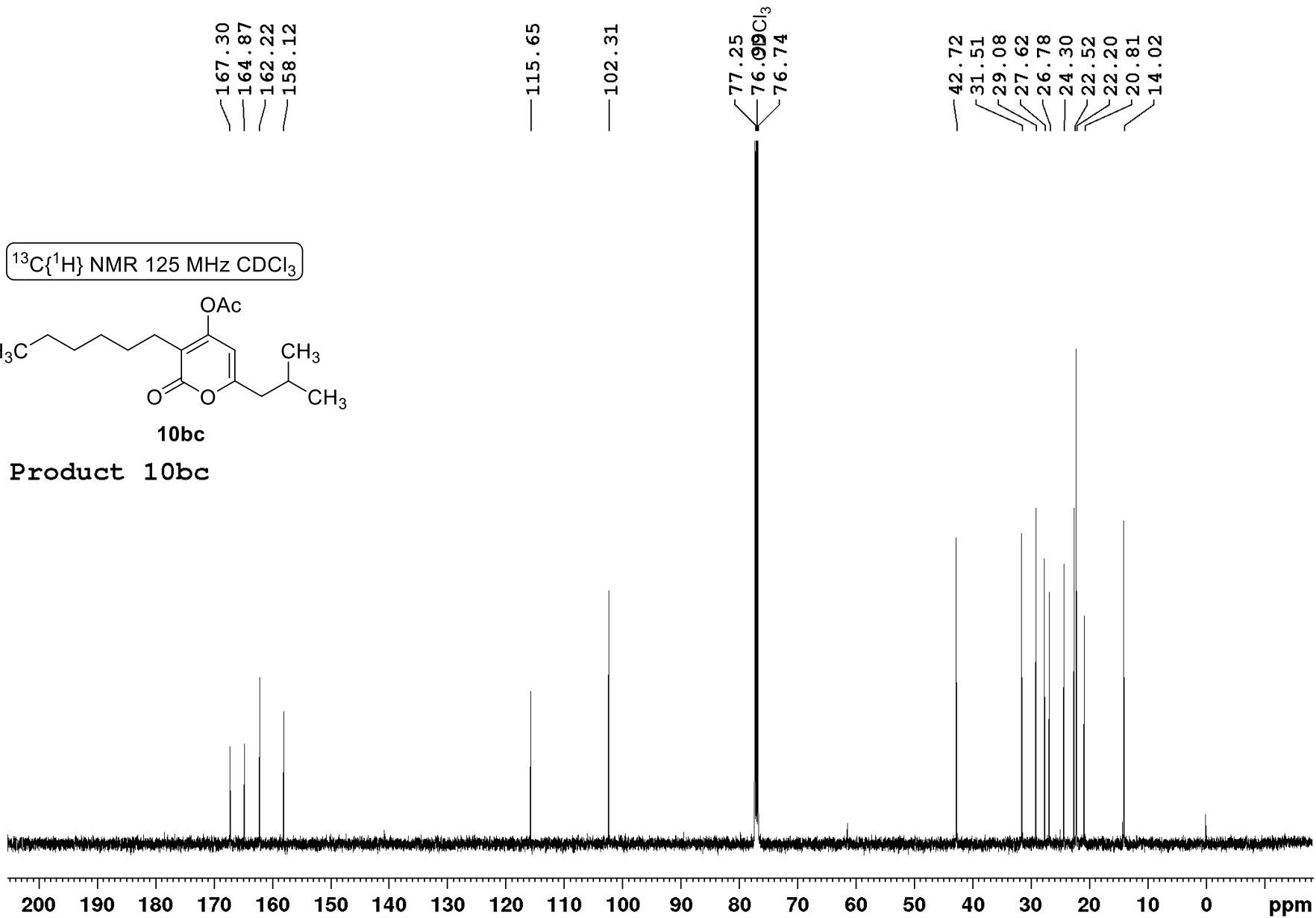


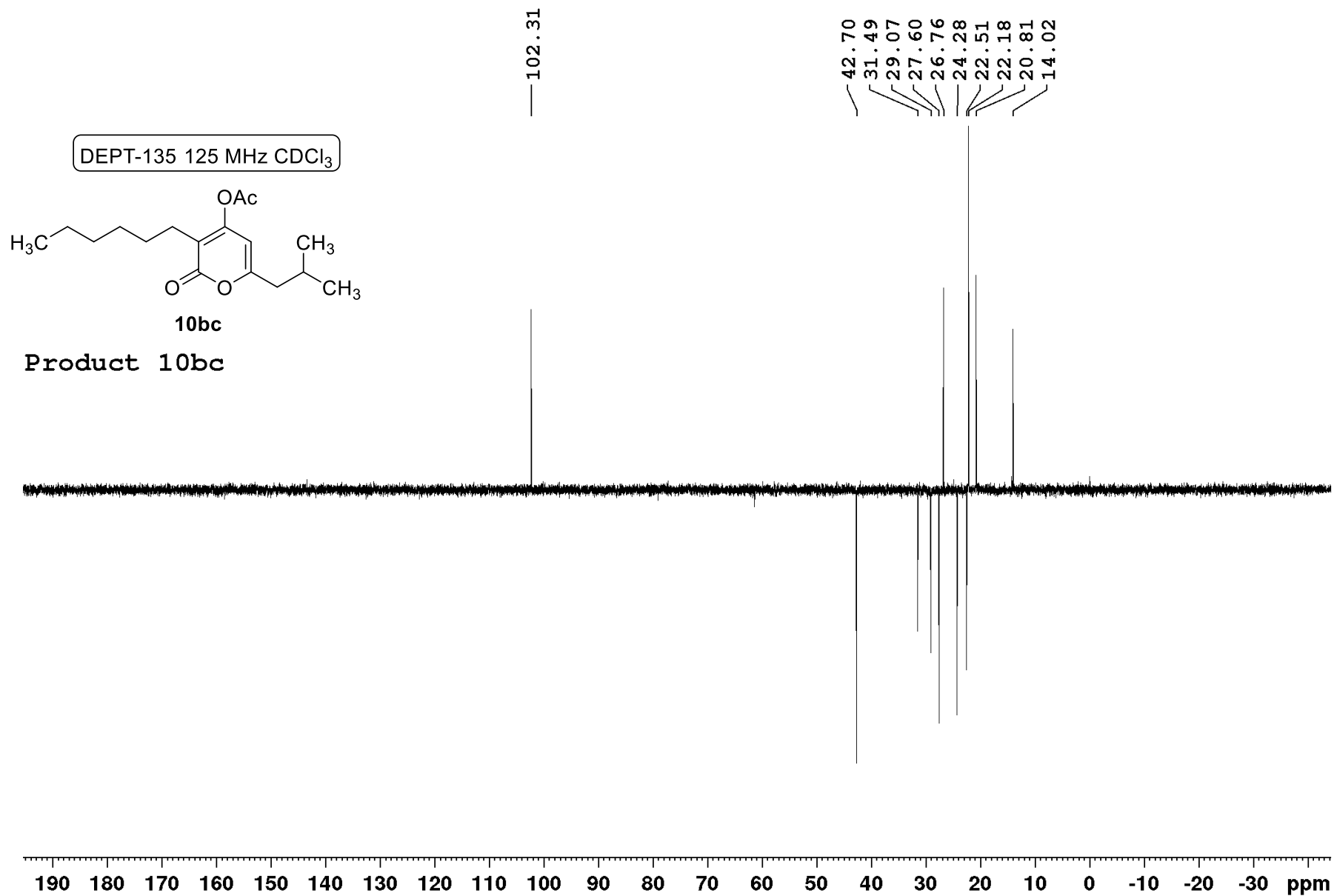
$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



10bc

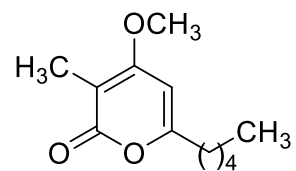
Product 10bc





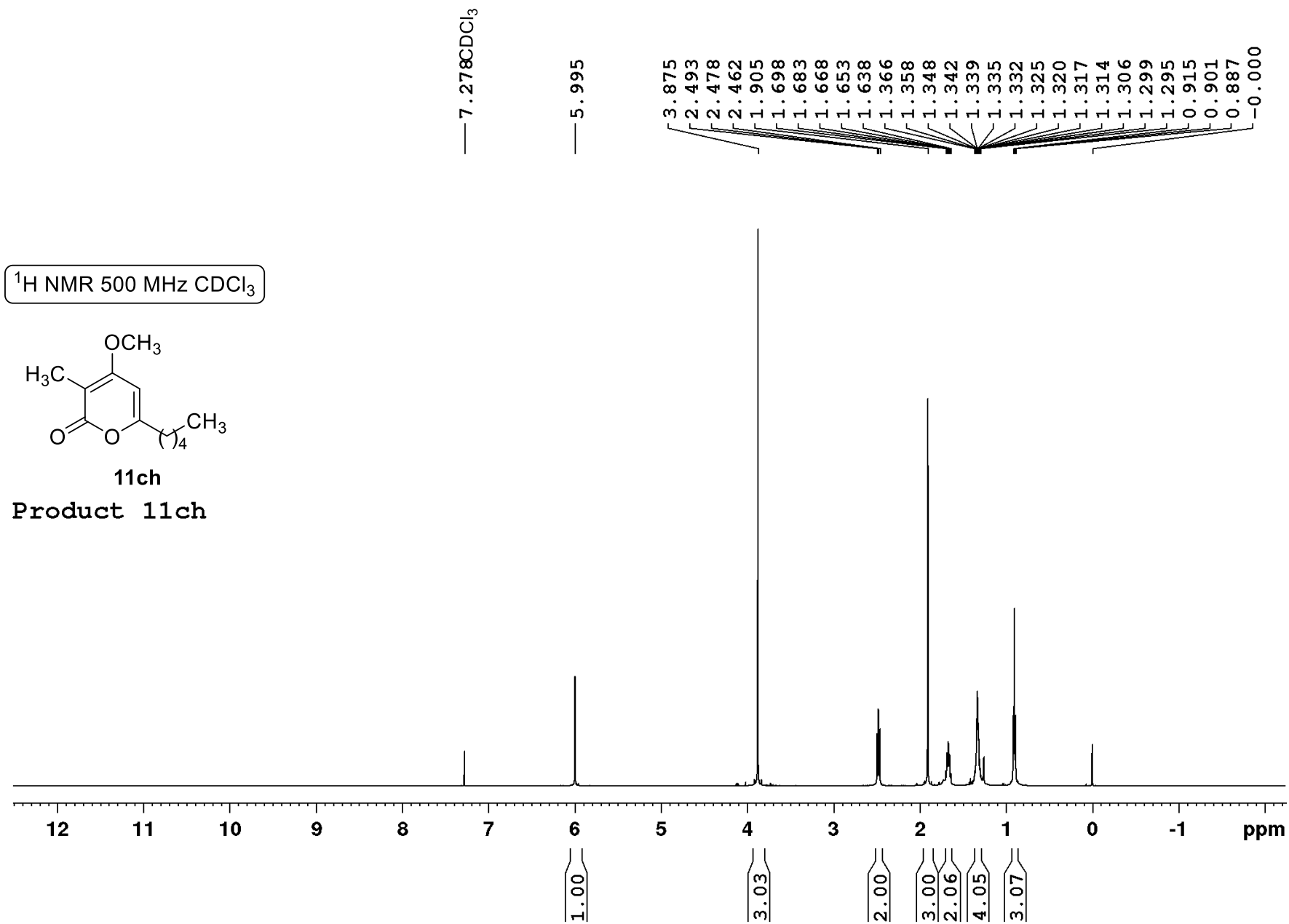


$^1\text{H NMR}$  500 MHz  $\text{CDCl}_3$

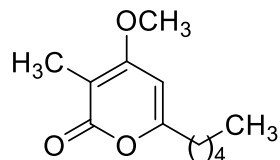


11ch

Product 11ch

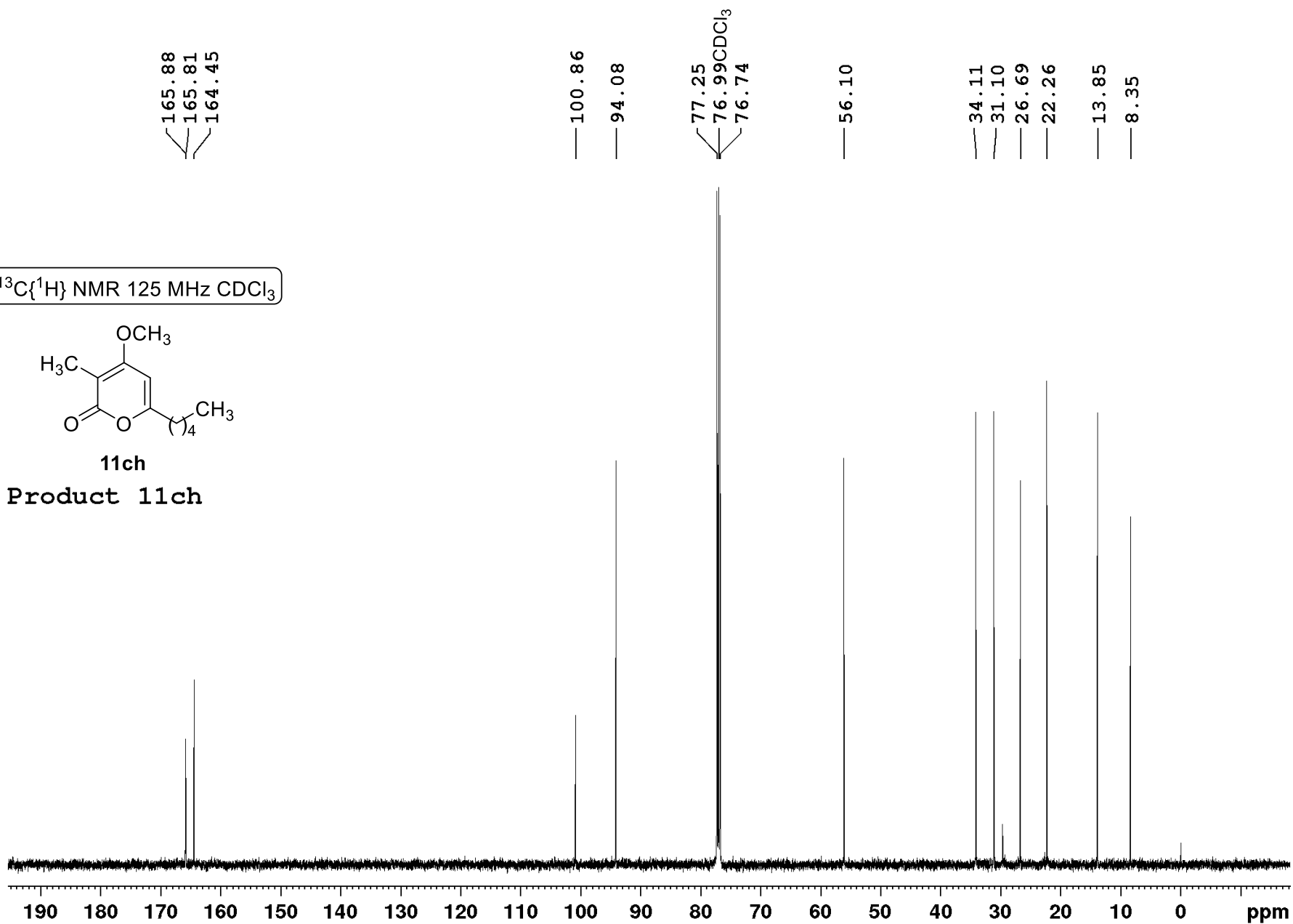


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

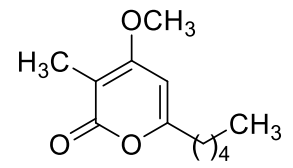


11ch

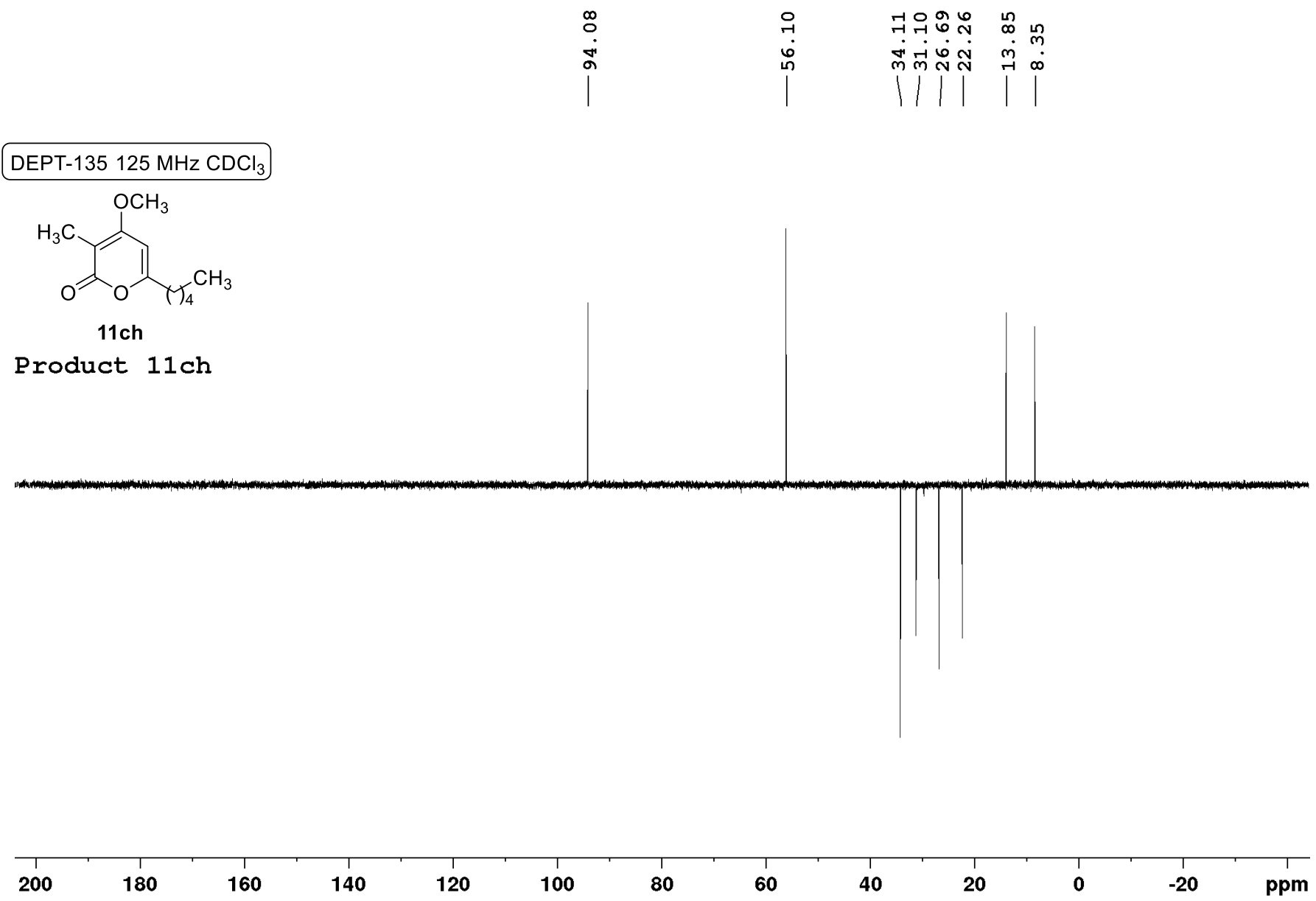
Product 11ch



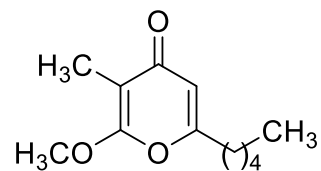
DEPT-135 125 MHz CDCl<sub>3</sub>



**11ch**  
**Product 11ch**

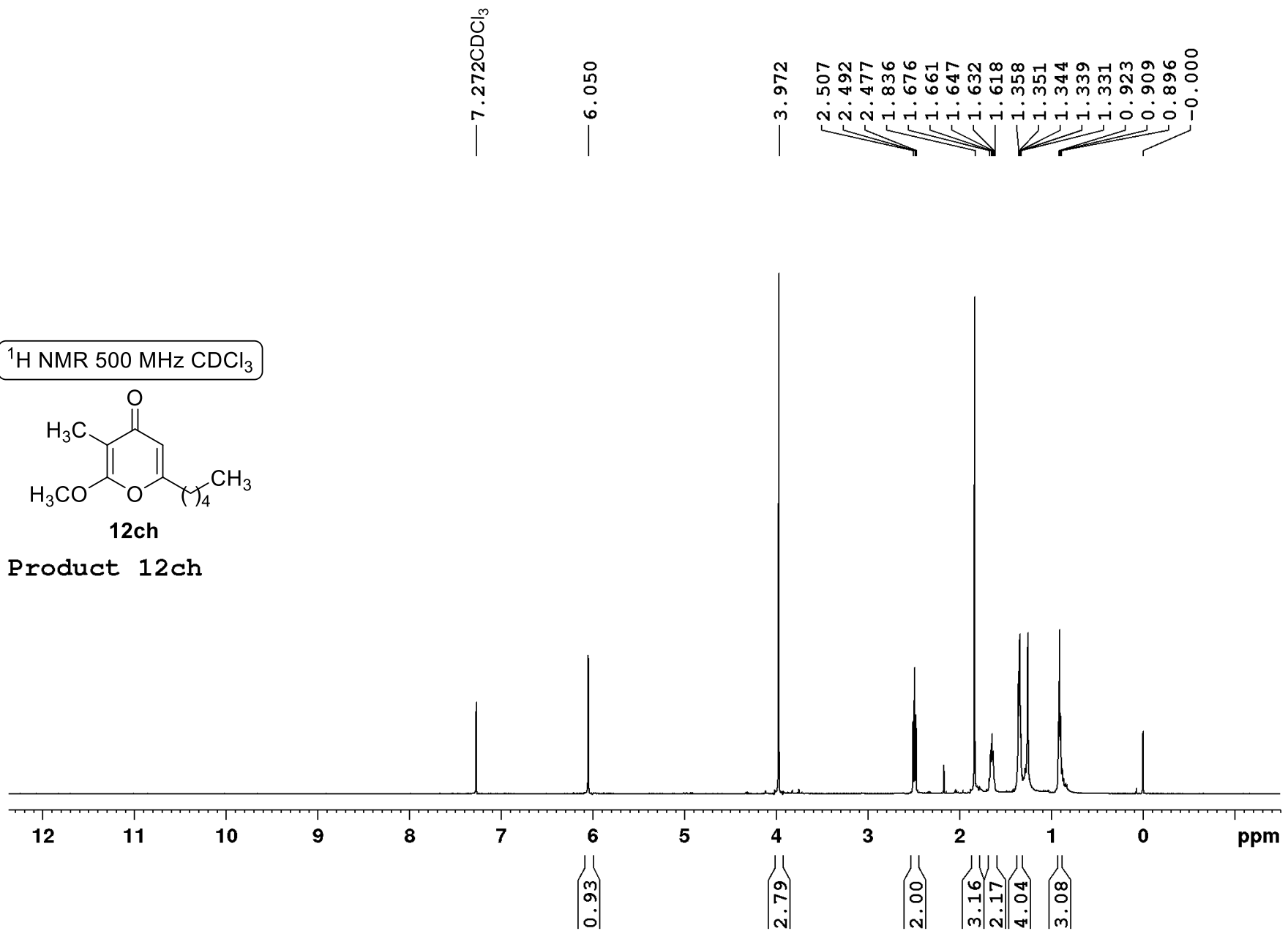


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

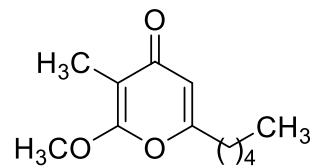


**12ch**

Product 12ch

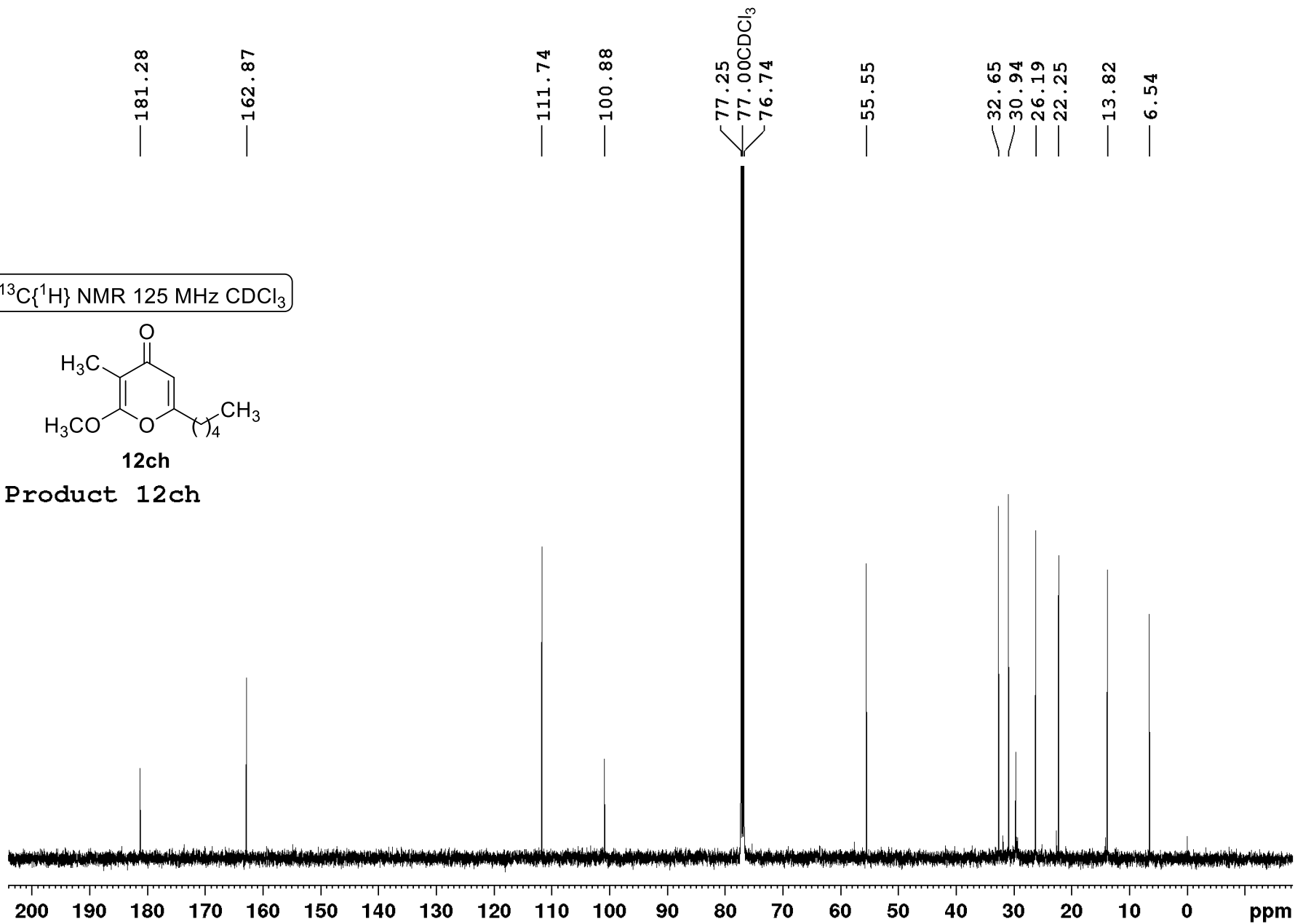


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

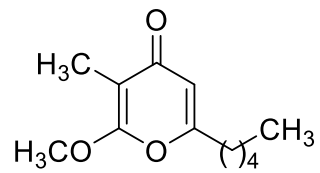


12ch

Product 12ch

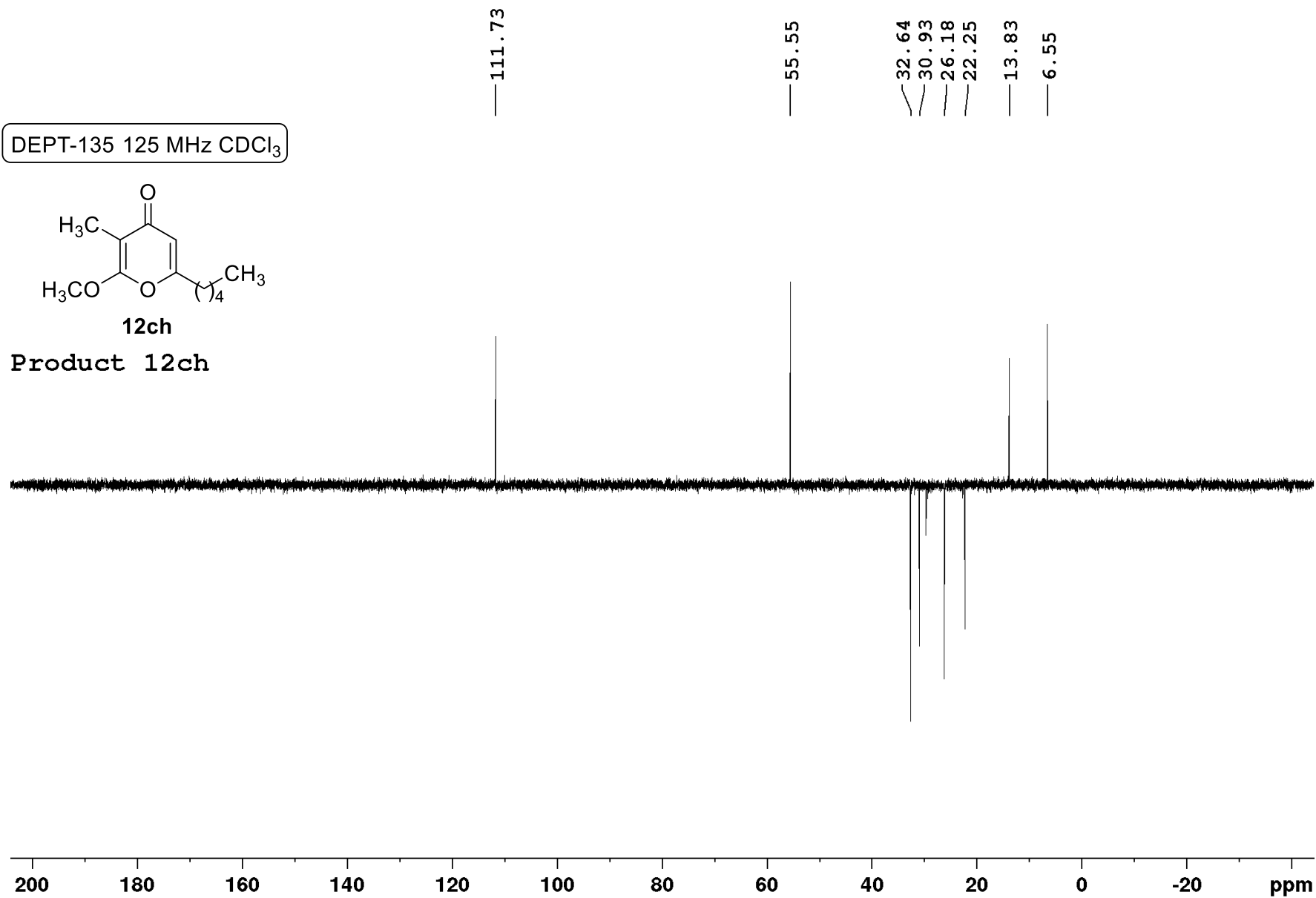


DEPT-135 125 MHz CDCl<sub>3</sub>

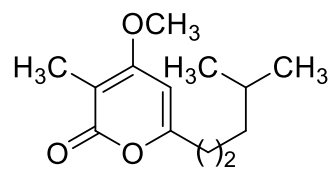


12ch

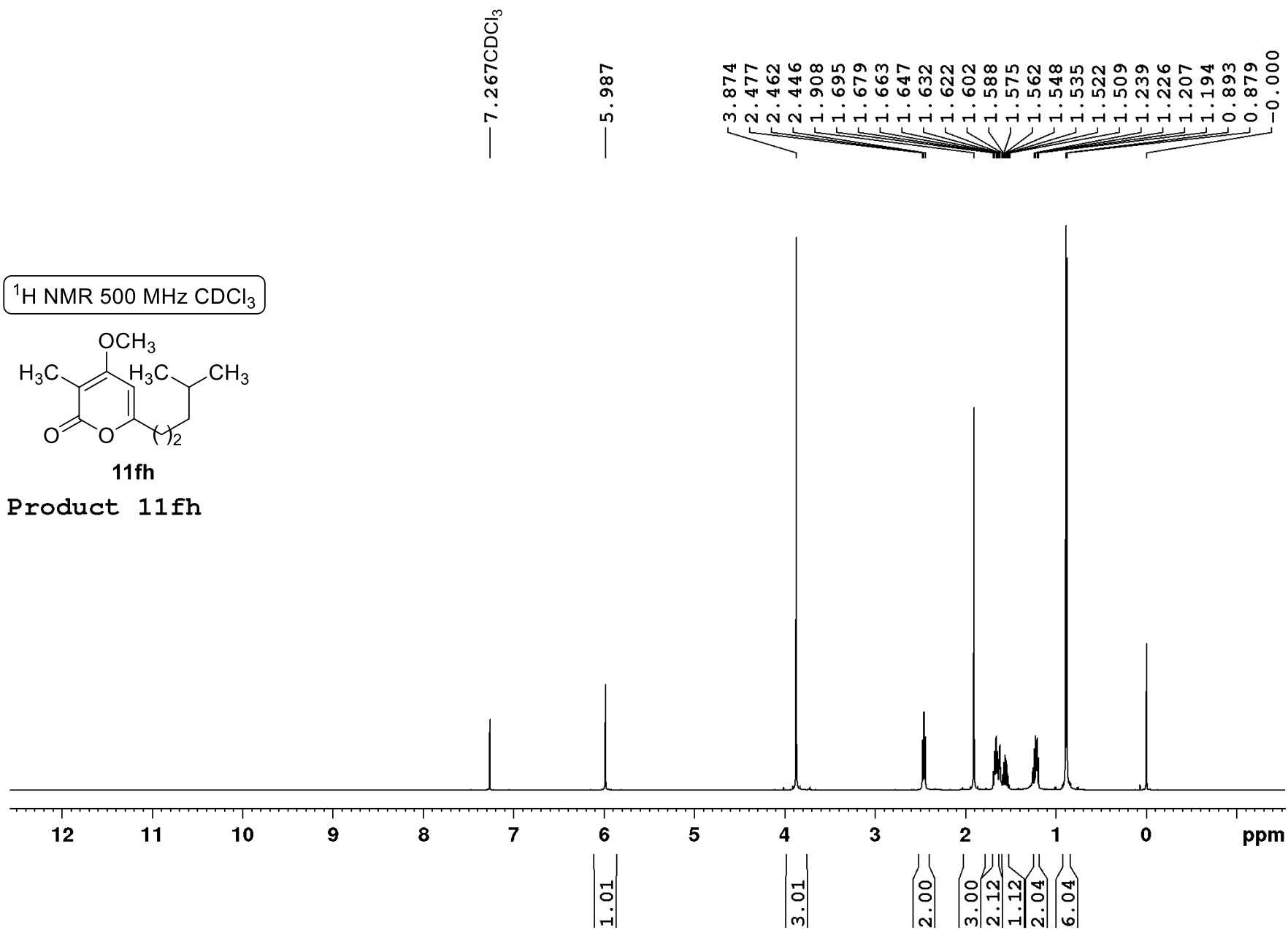
Product 12ch



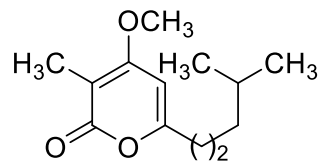
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



**11fh**  
**Product 11fh**

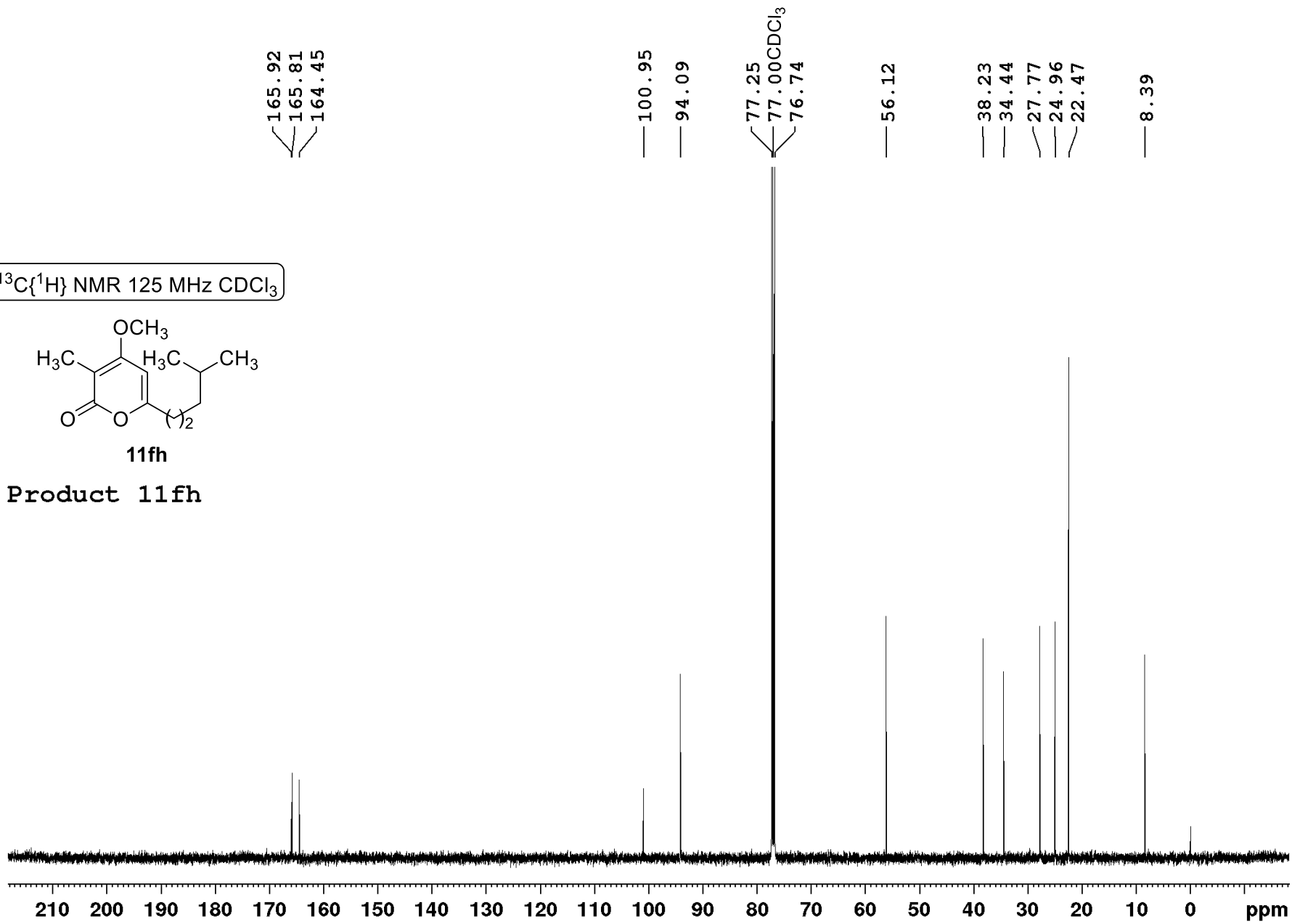


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



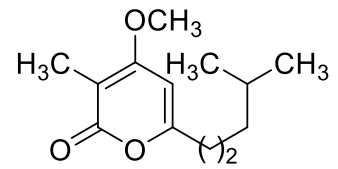
11fh

Product 11fh



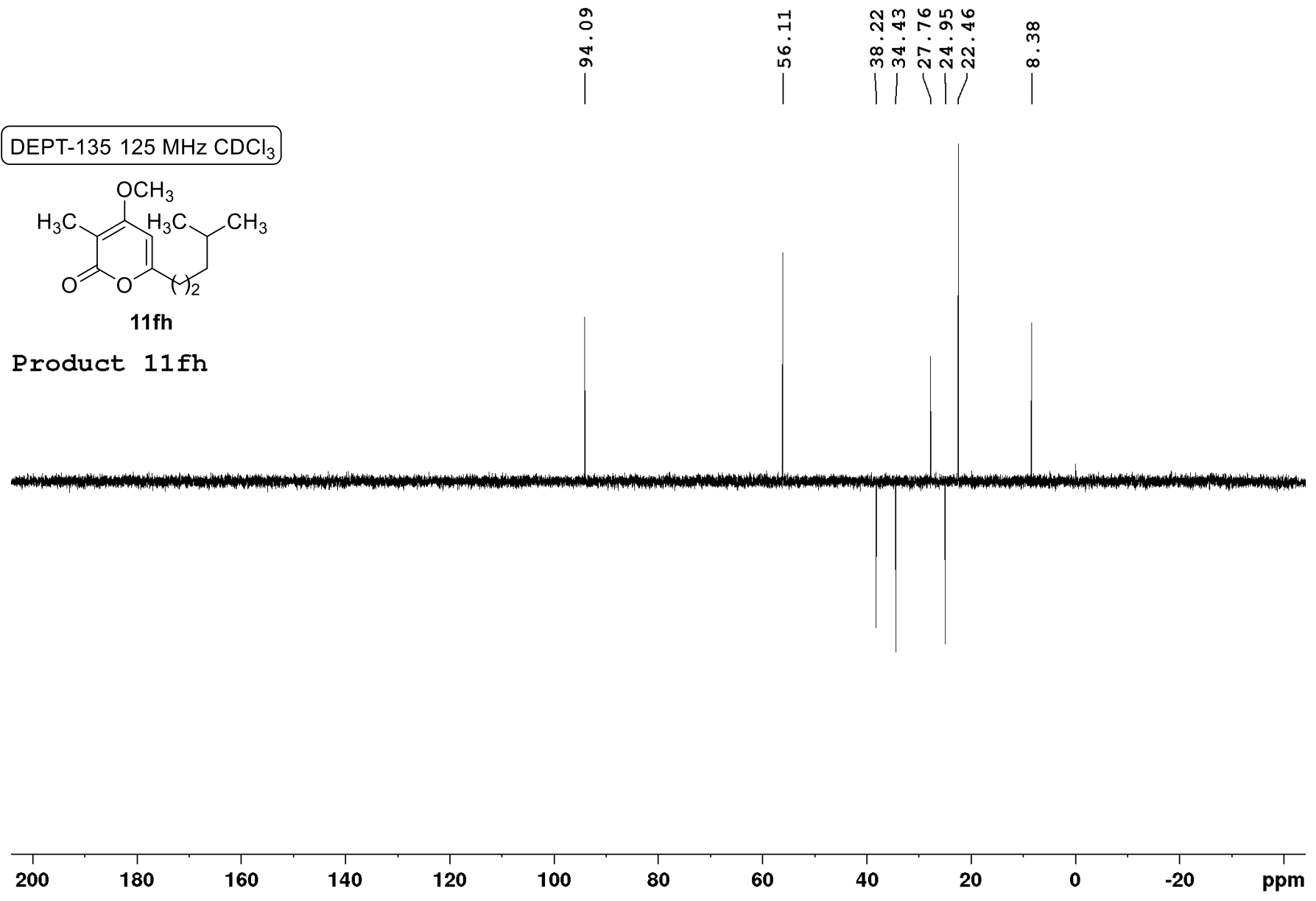


DEPT-135 125 MHz CDCl<sub>3</sub>

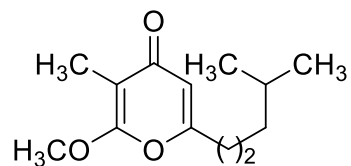


11fh

Product 11fh

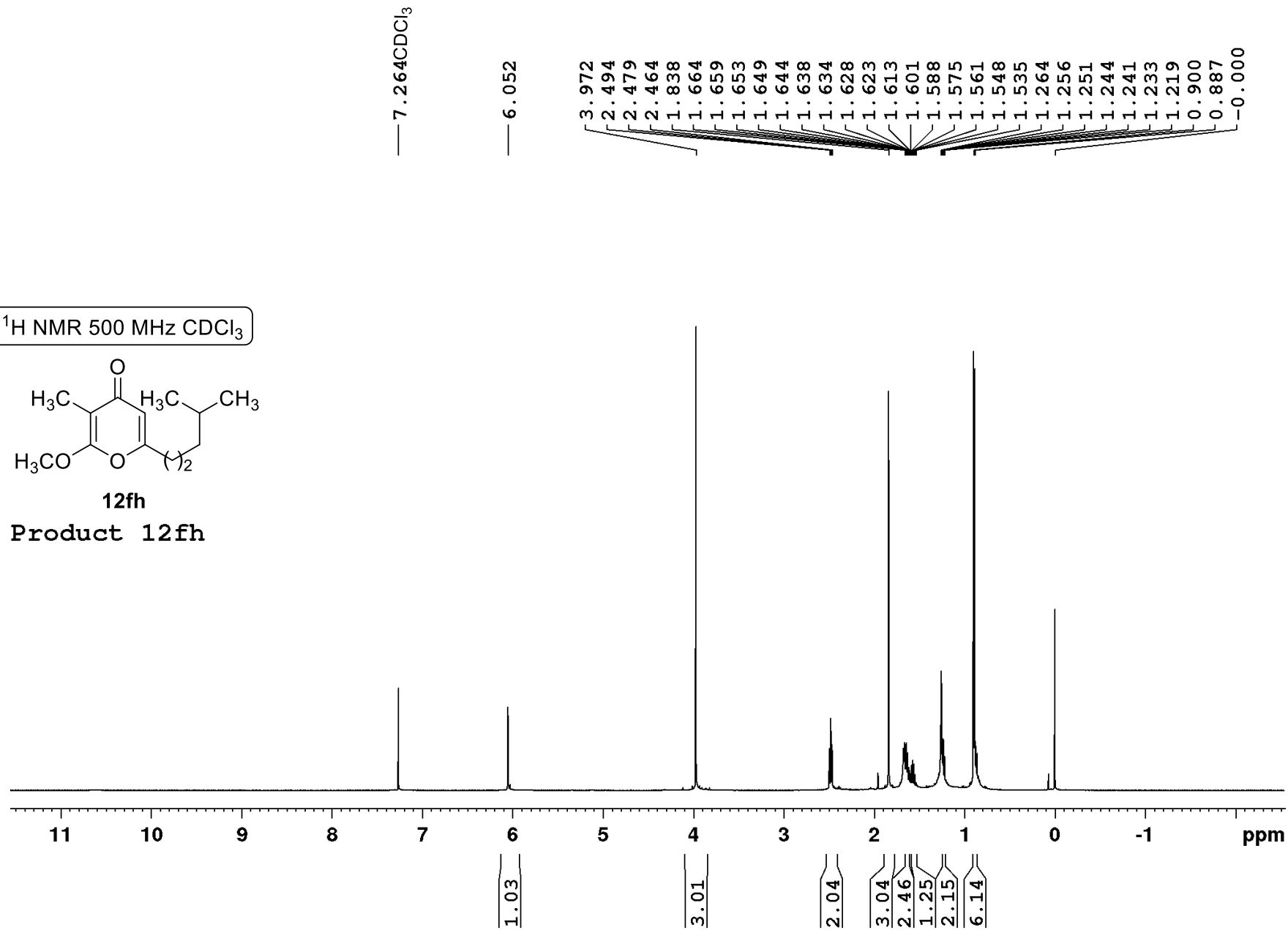


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

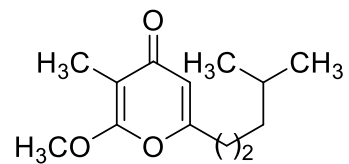


12fh

Product 12fh

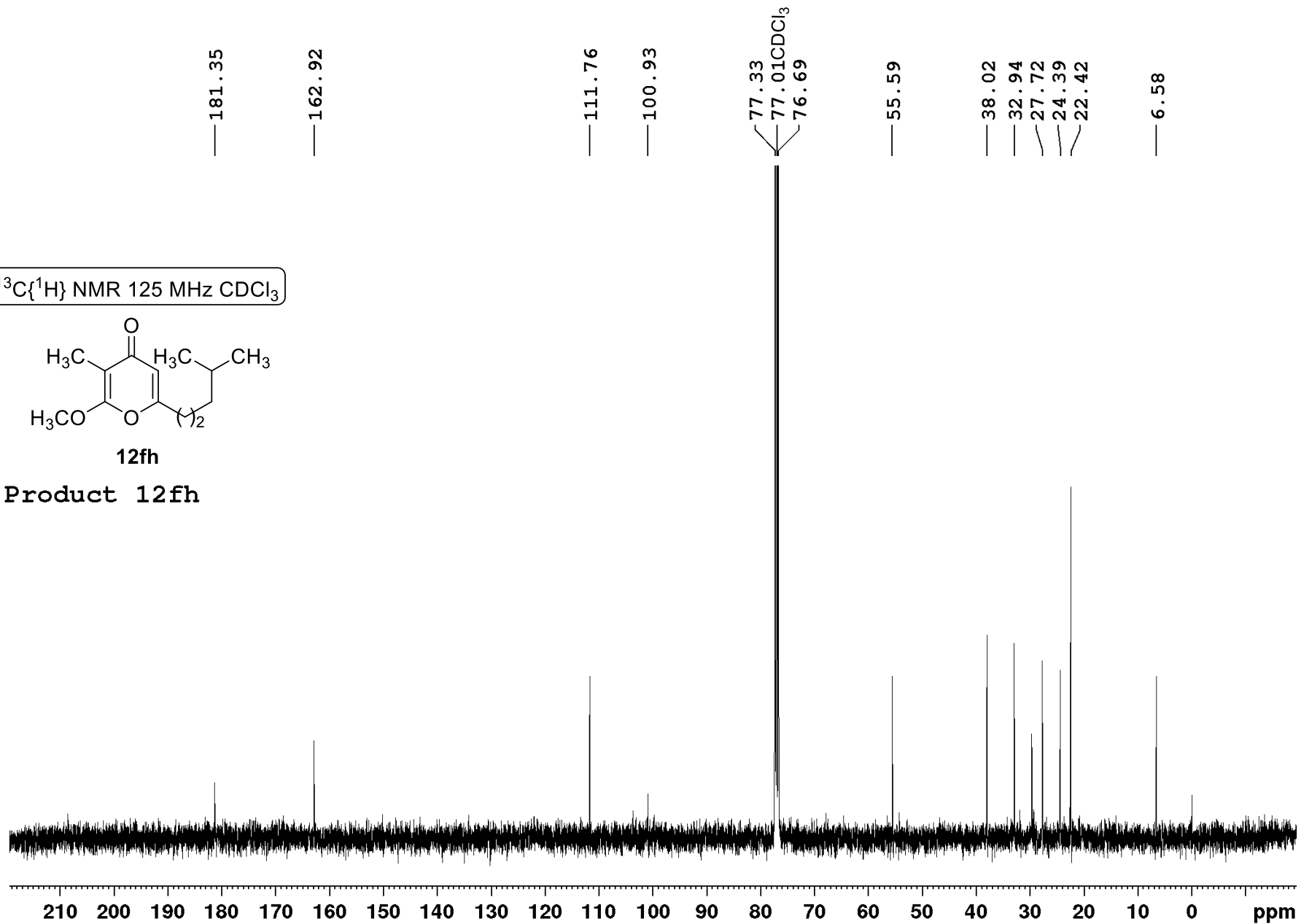


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

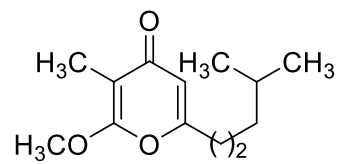


12fh

Product 12fh

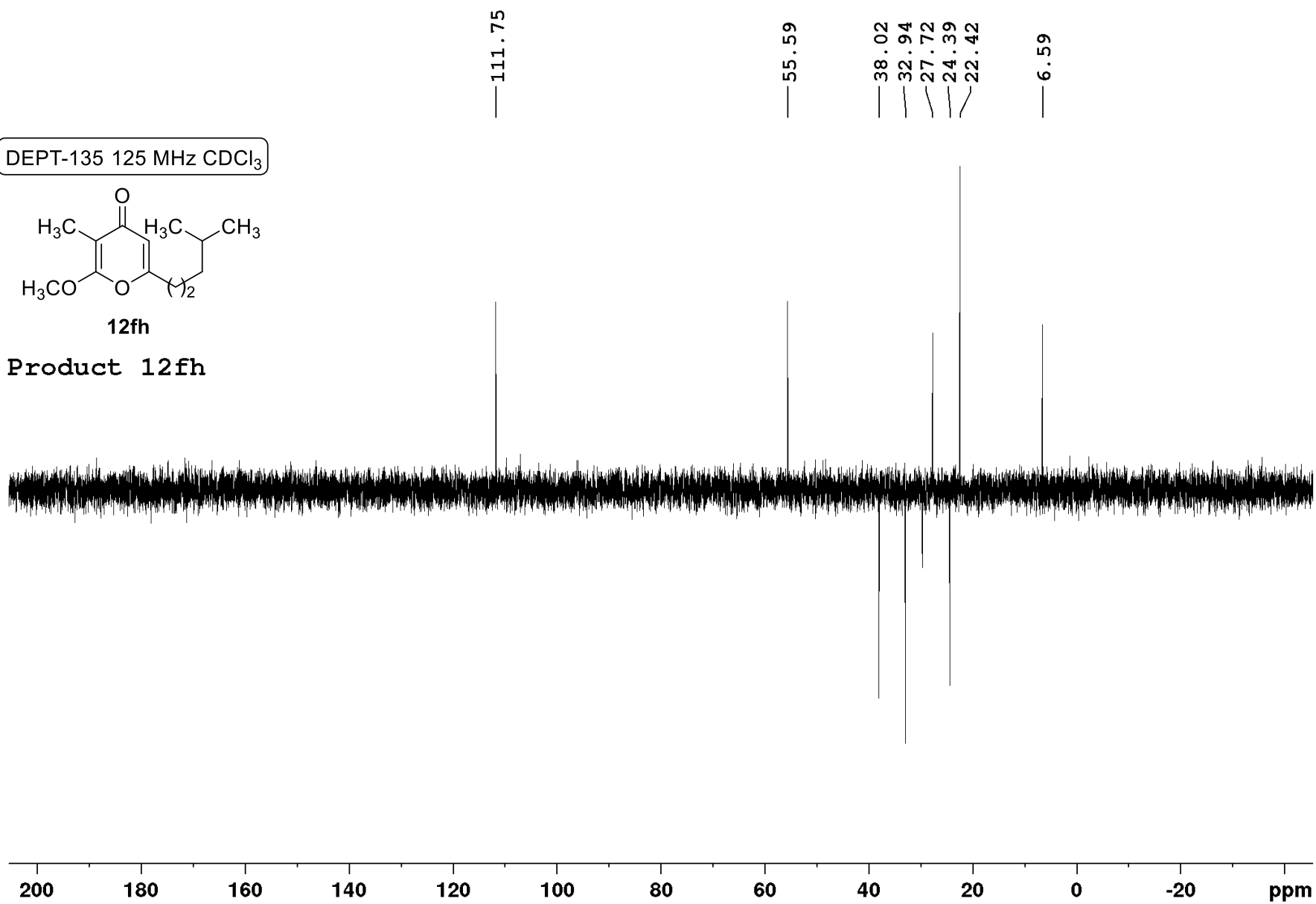


DEPT-135 125 MHz CDCl<sub>3</sub>

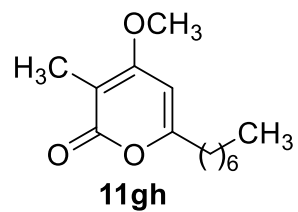


12fh

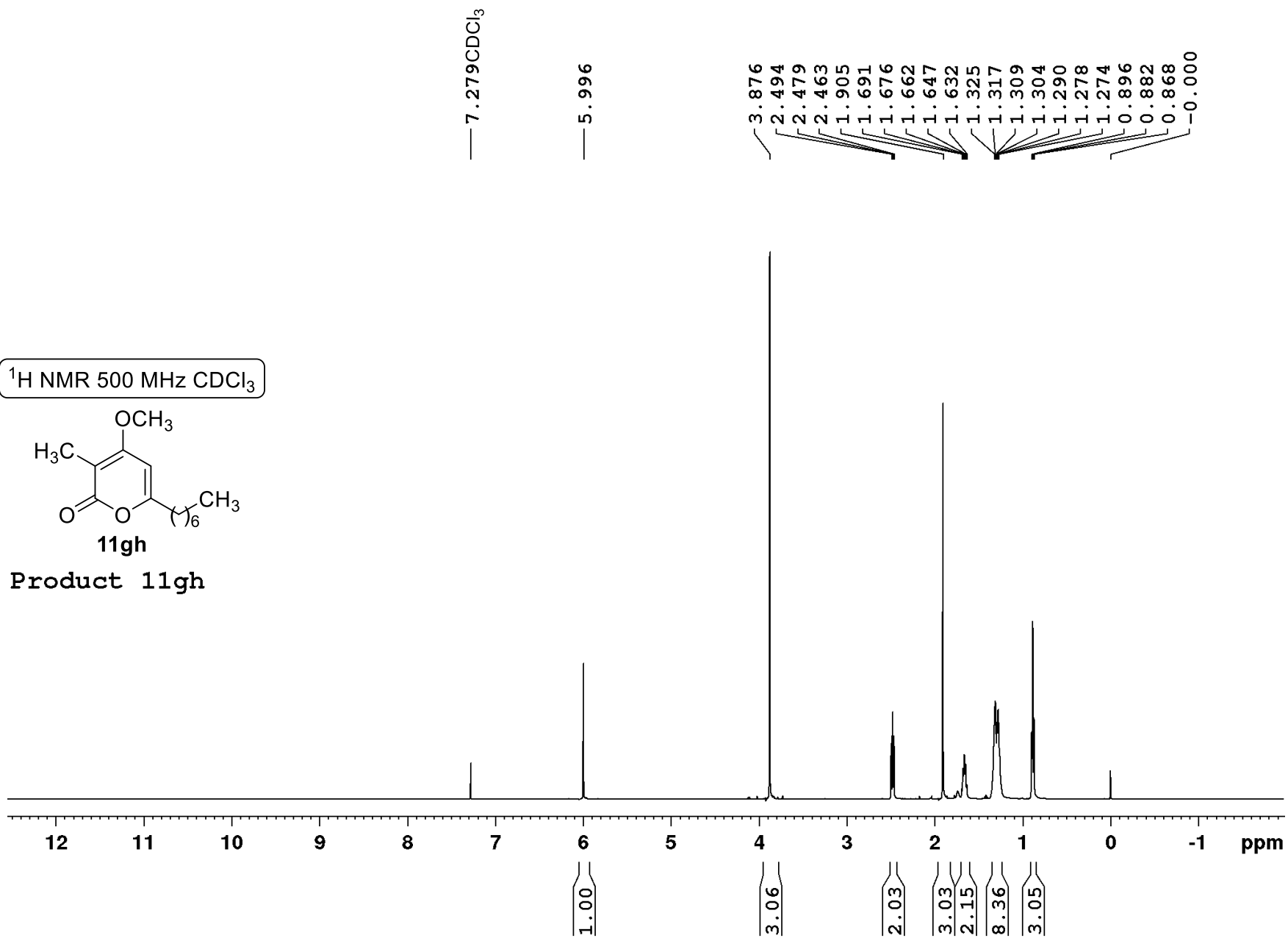
Product 12fh



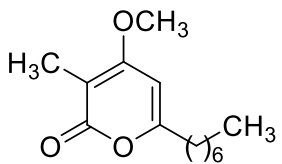
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



Product 11gh

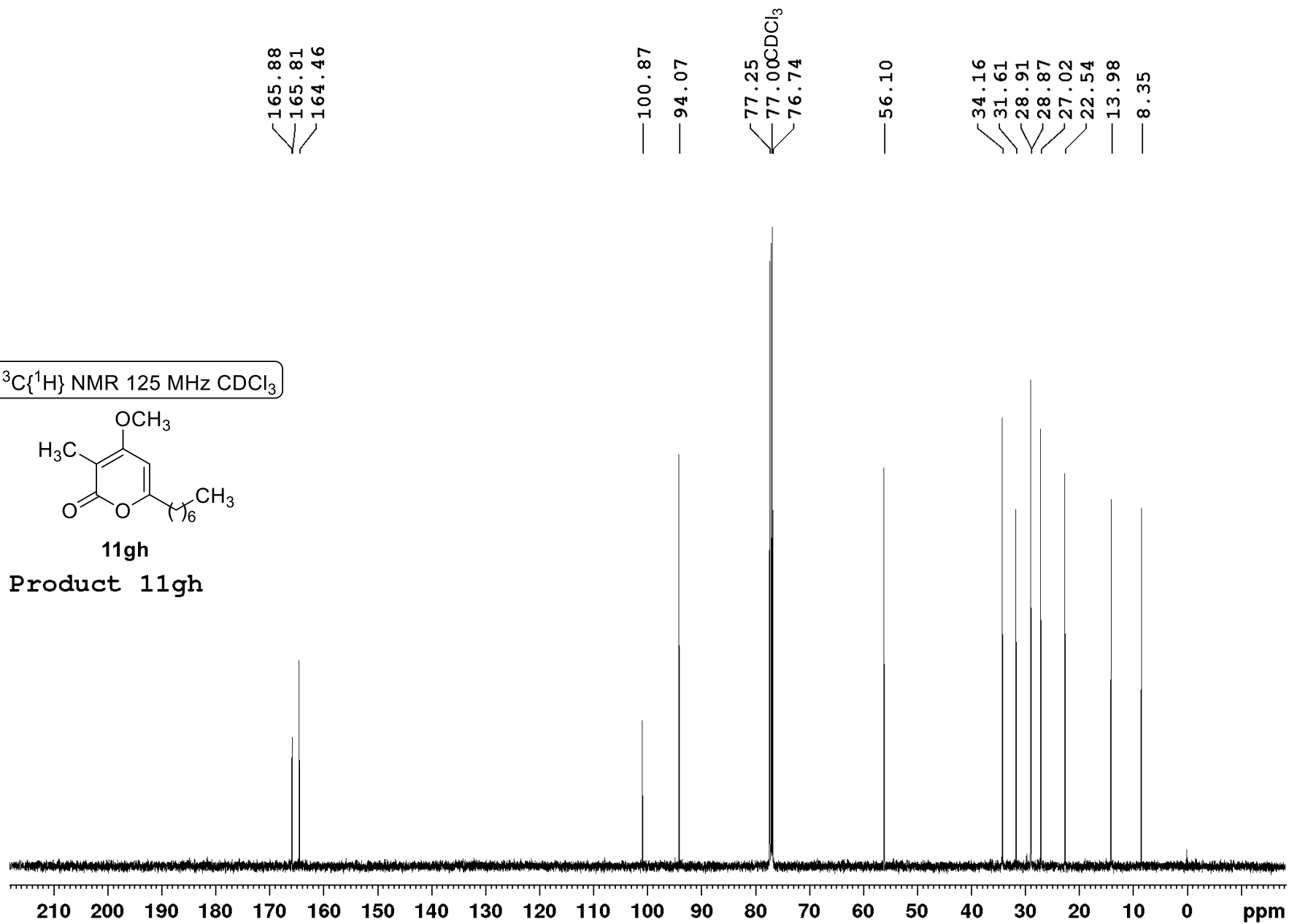


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

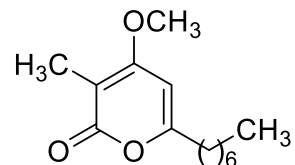


11gh

Product 11gh

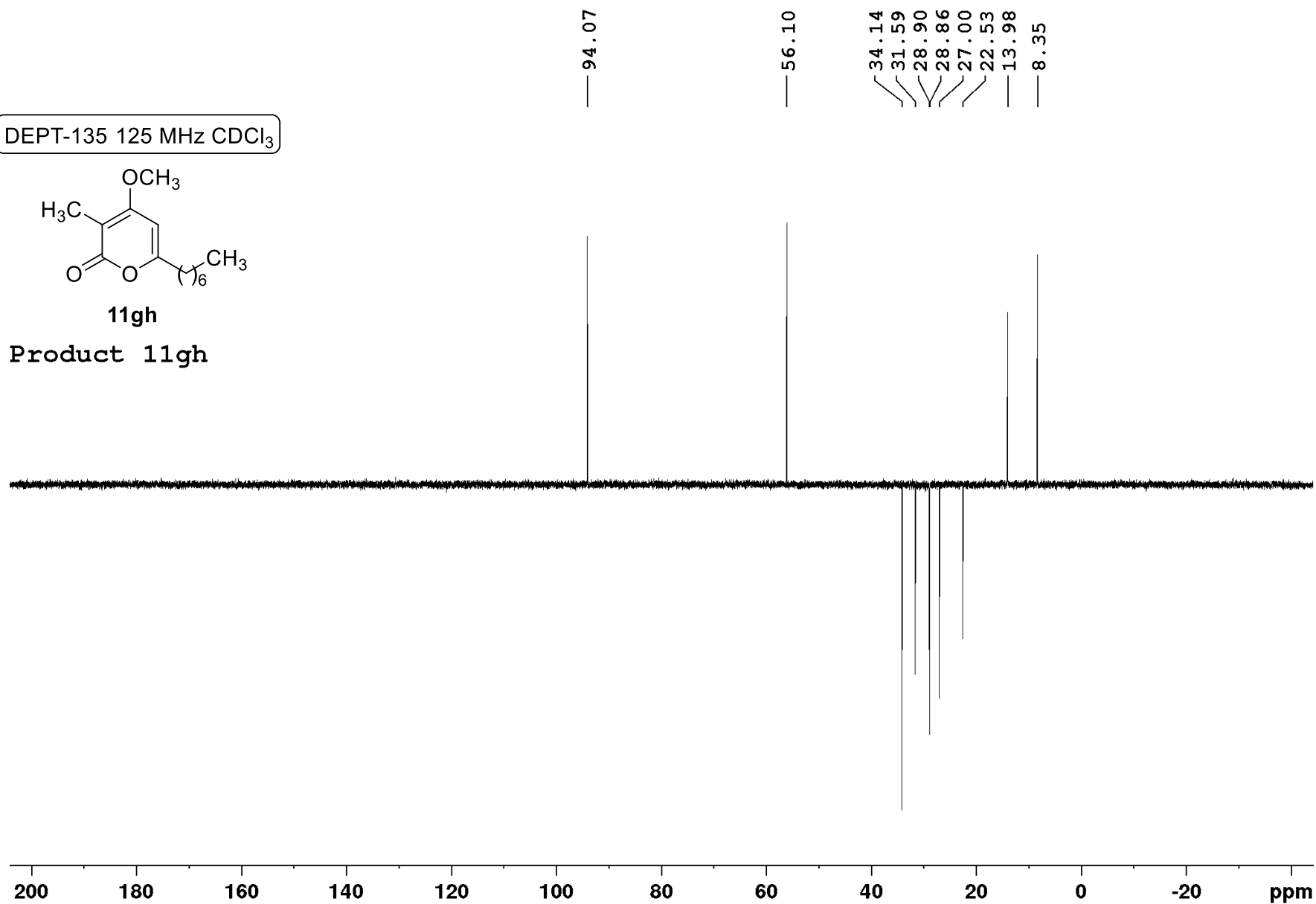


DEPT-135 125 MHz CDCl<sub>3</sub>

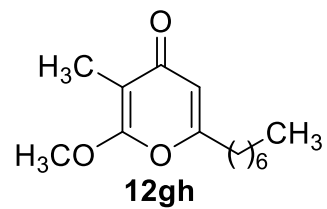


11gh

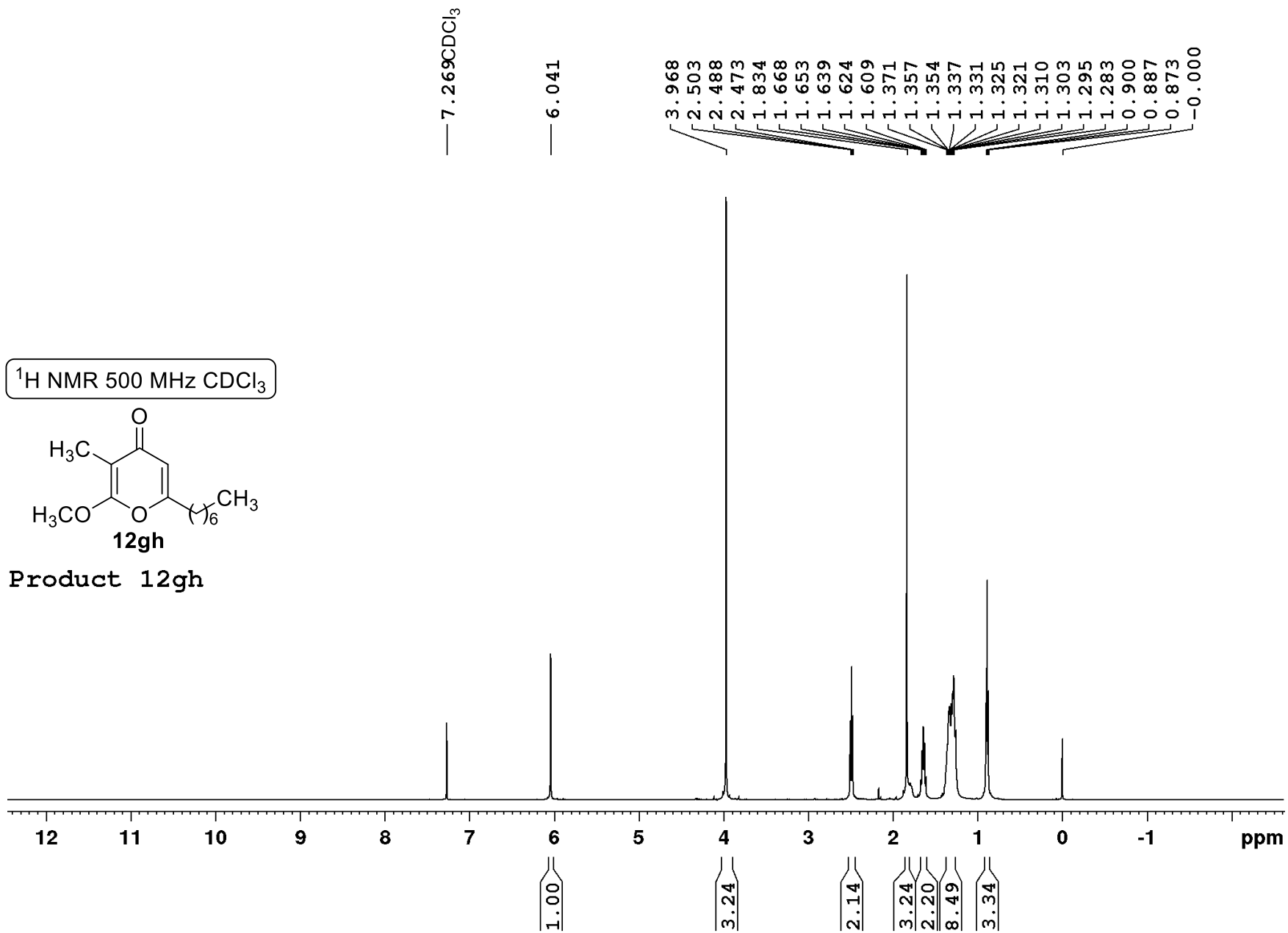
Product 11gh



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

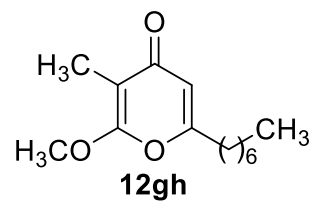


Product 12gh

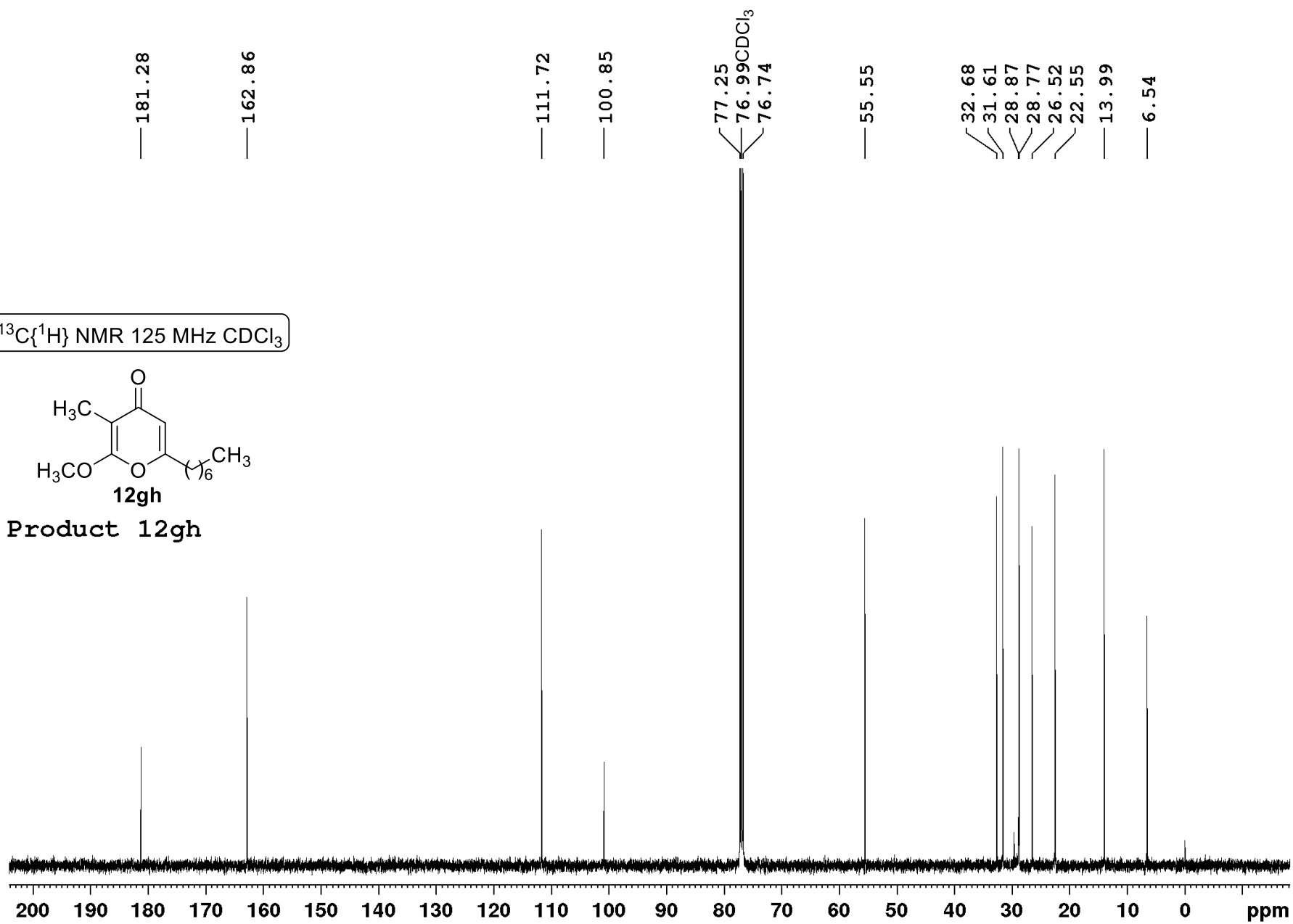




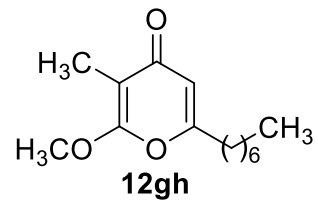
$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



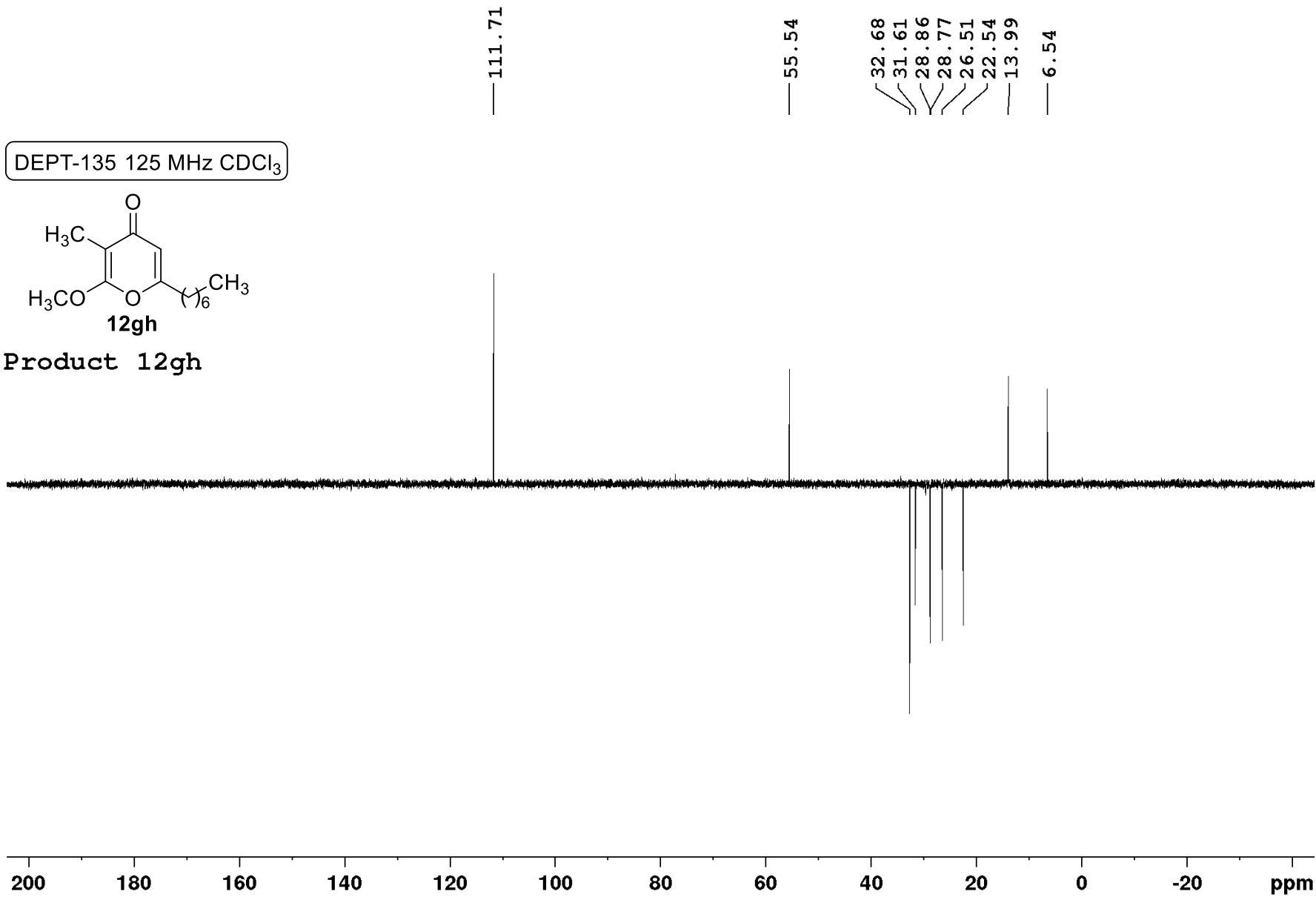
Product 12gh



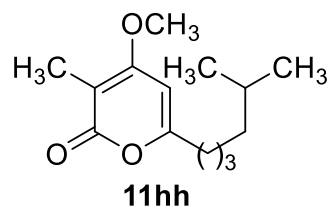
DEPT-135 125 MHz CDCl<sub>3</sub>



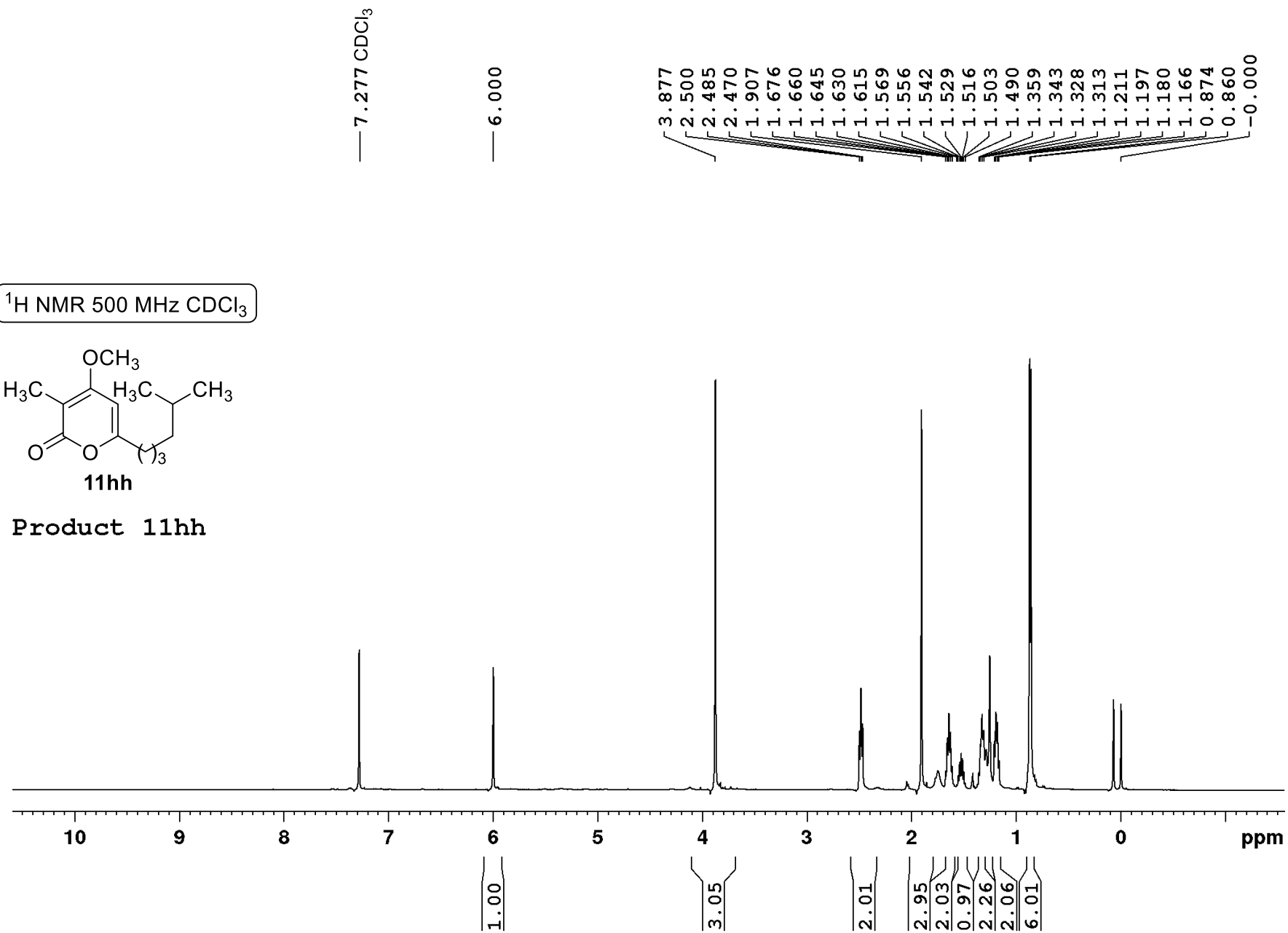
Product 12gh



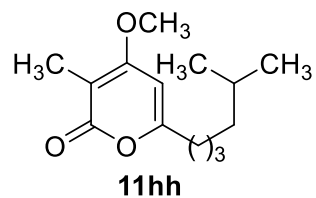
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



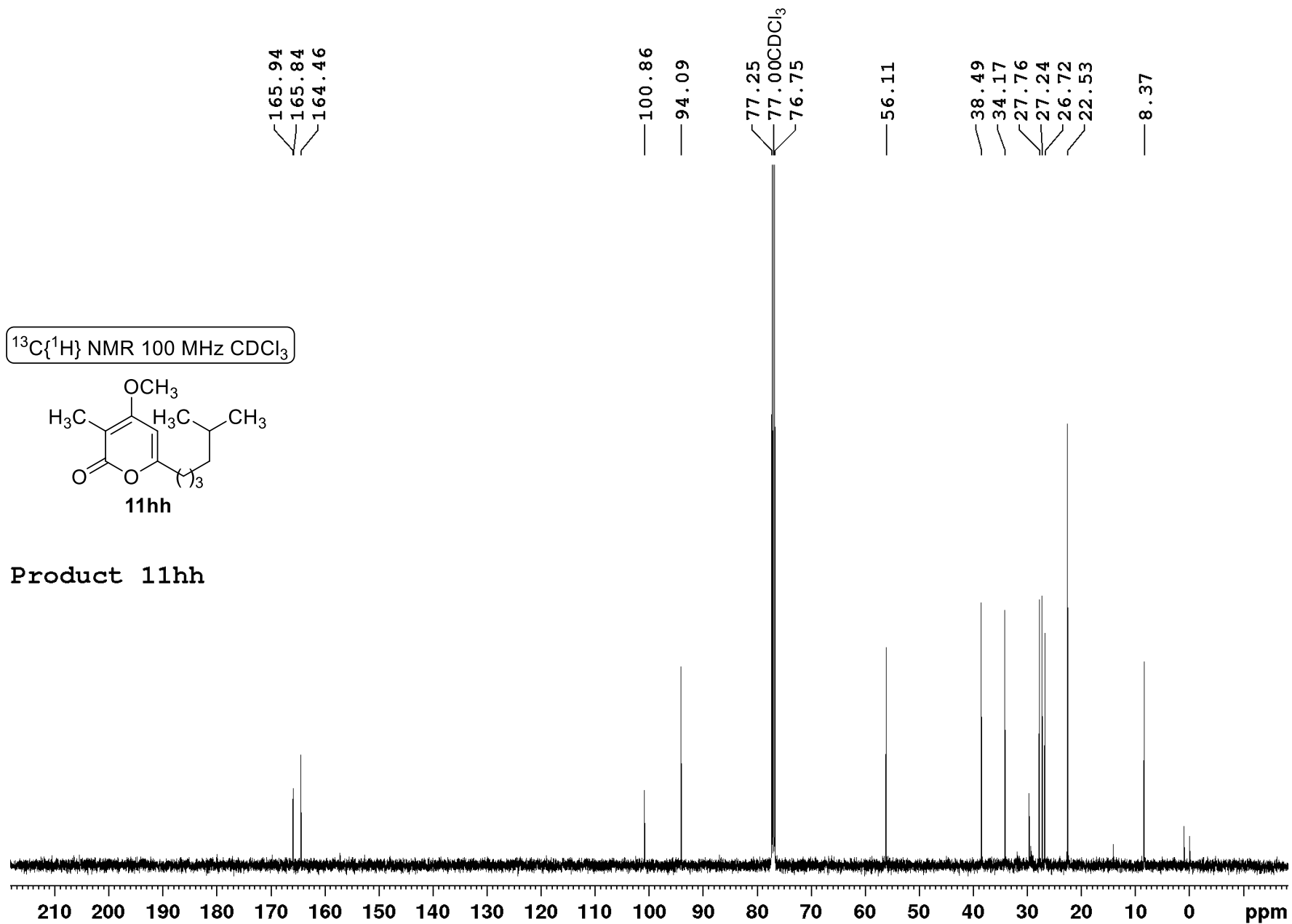
Product 11hh



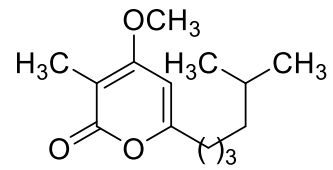
$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



Product 11hh

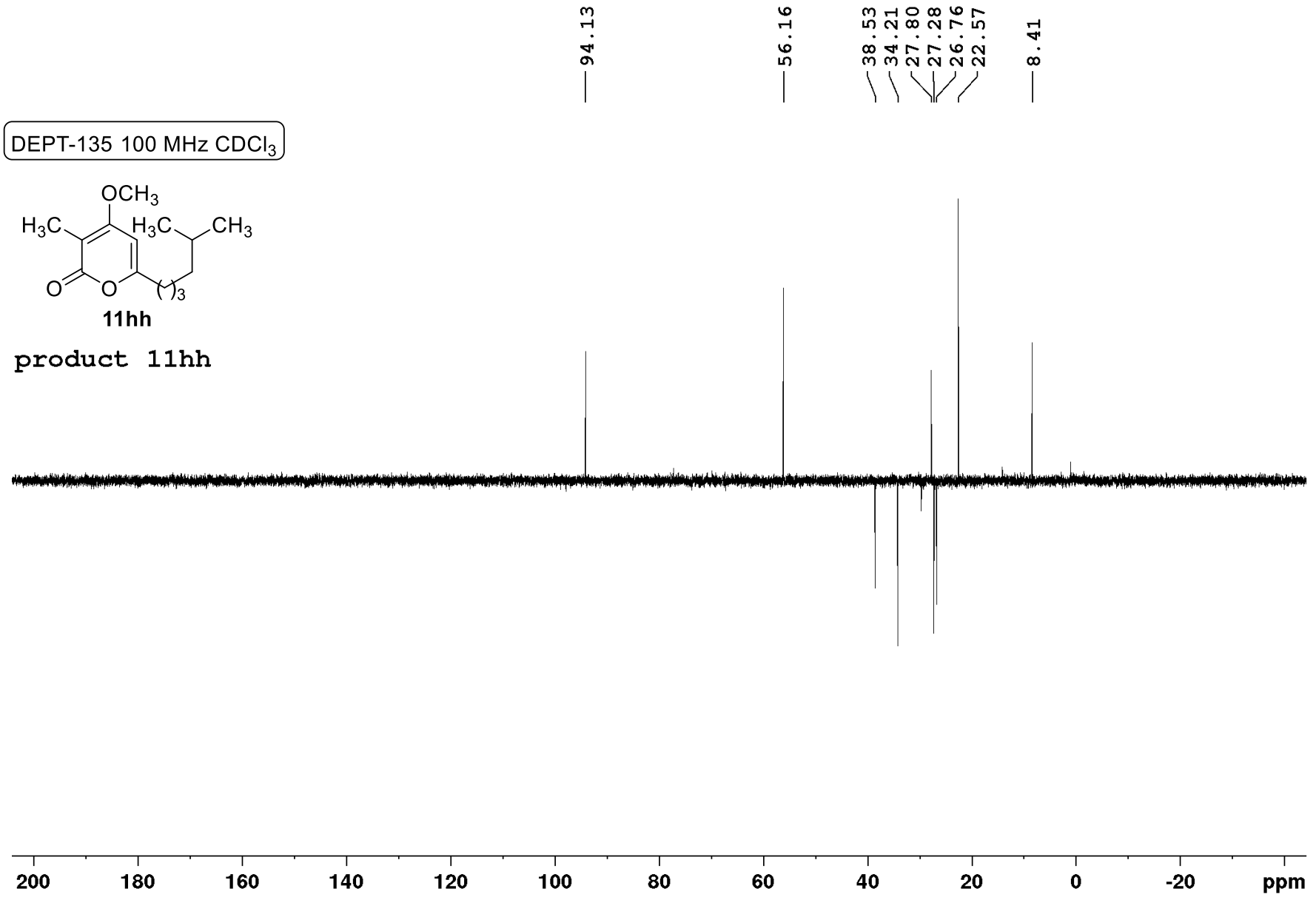


DEPT-135 100 MHz CDCl<sub>3</sub>

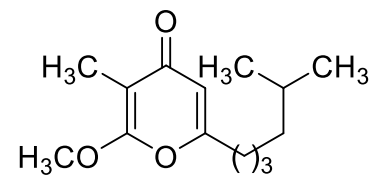


11hh

product 11hh

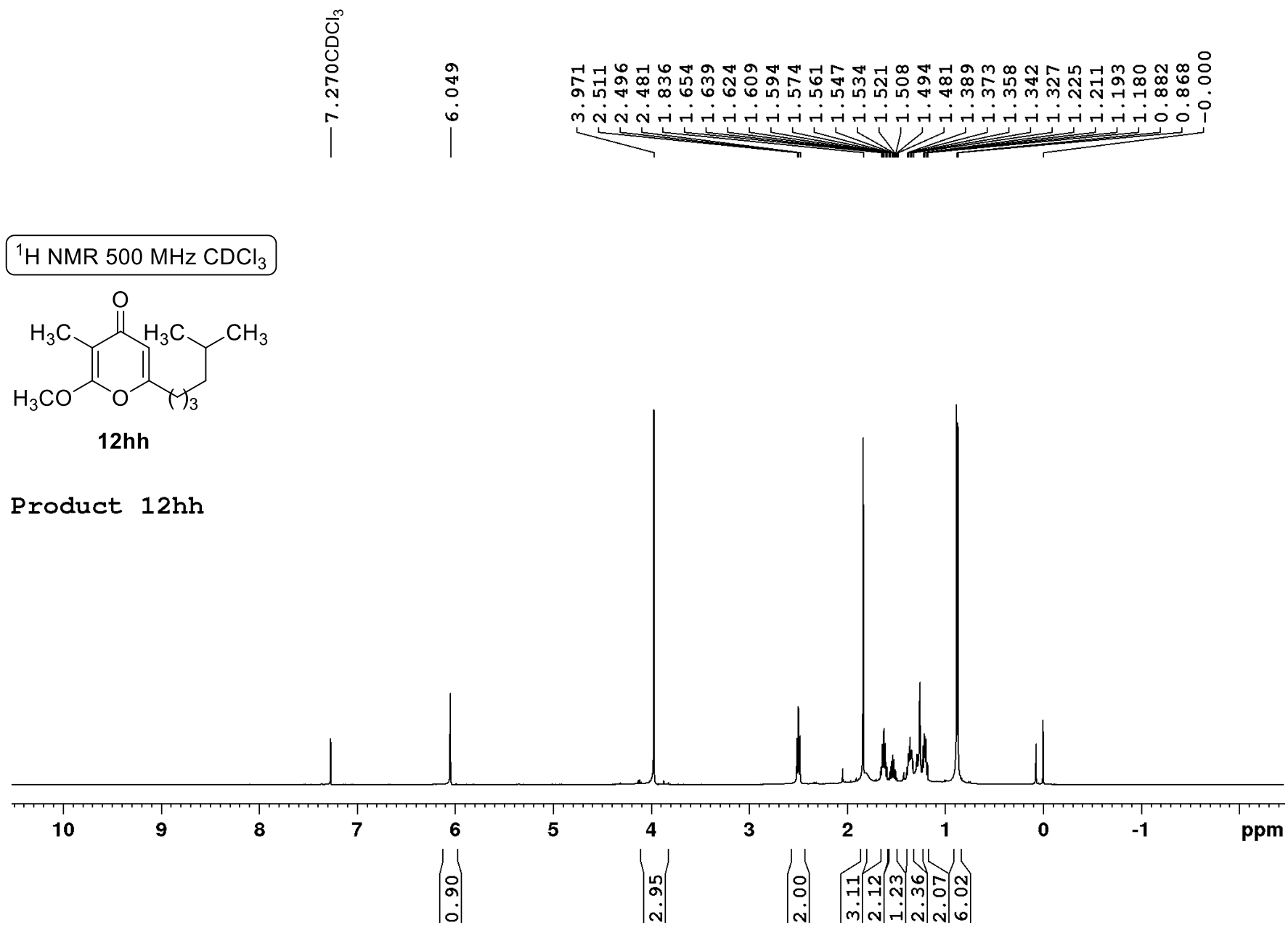


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

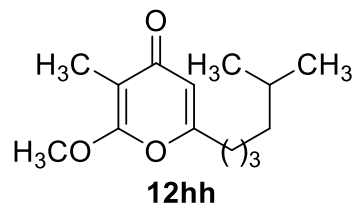


12hh

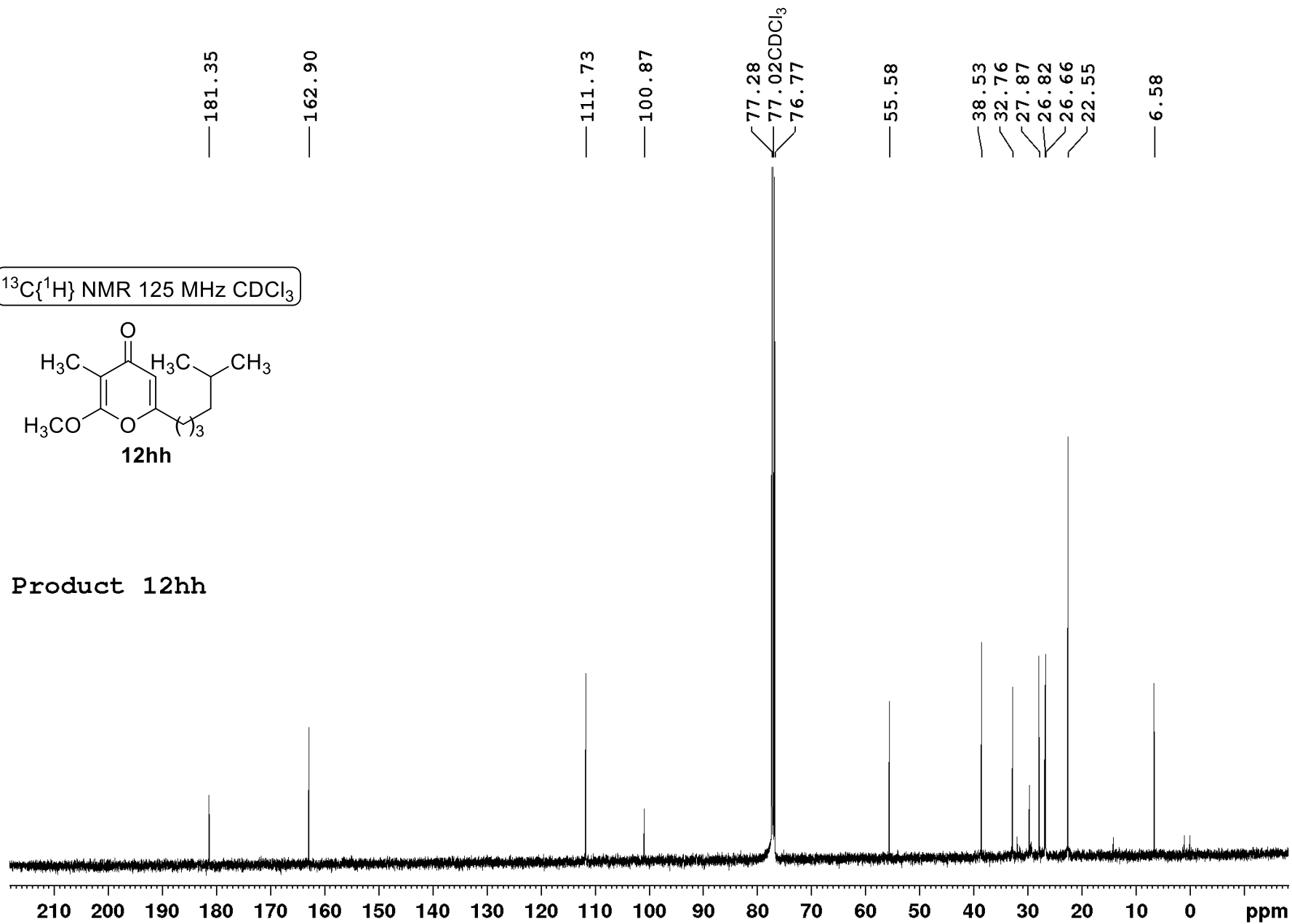
Product 12hh



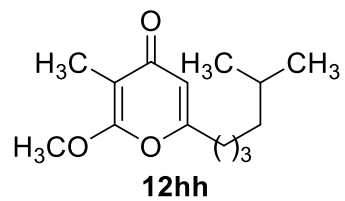
$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



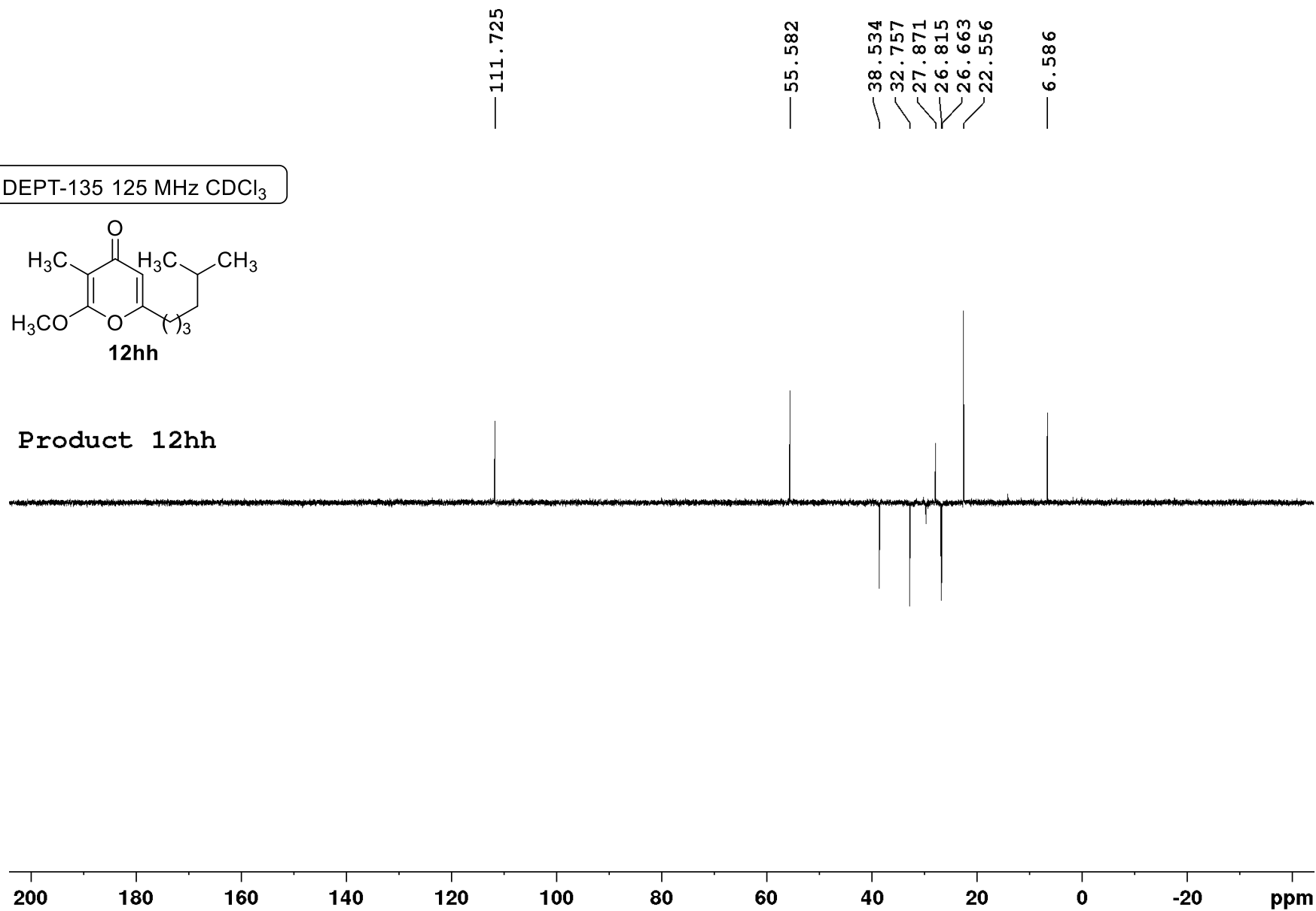
Product 12hh



DEPT-135 125 MHz CDCl<sub>3</sub>

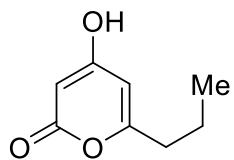


Product 12hh



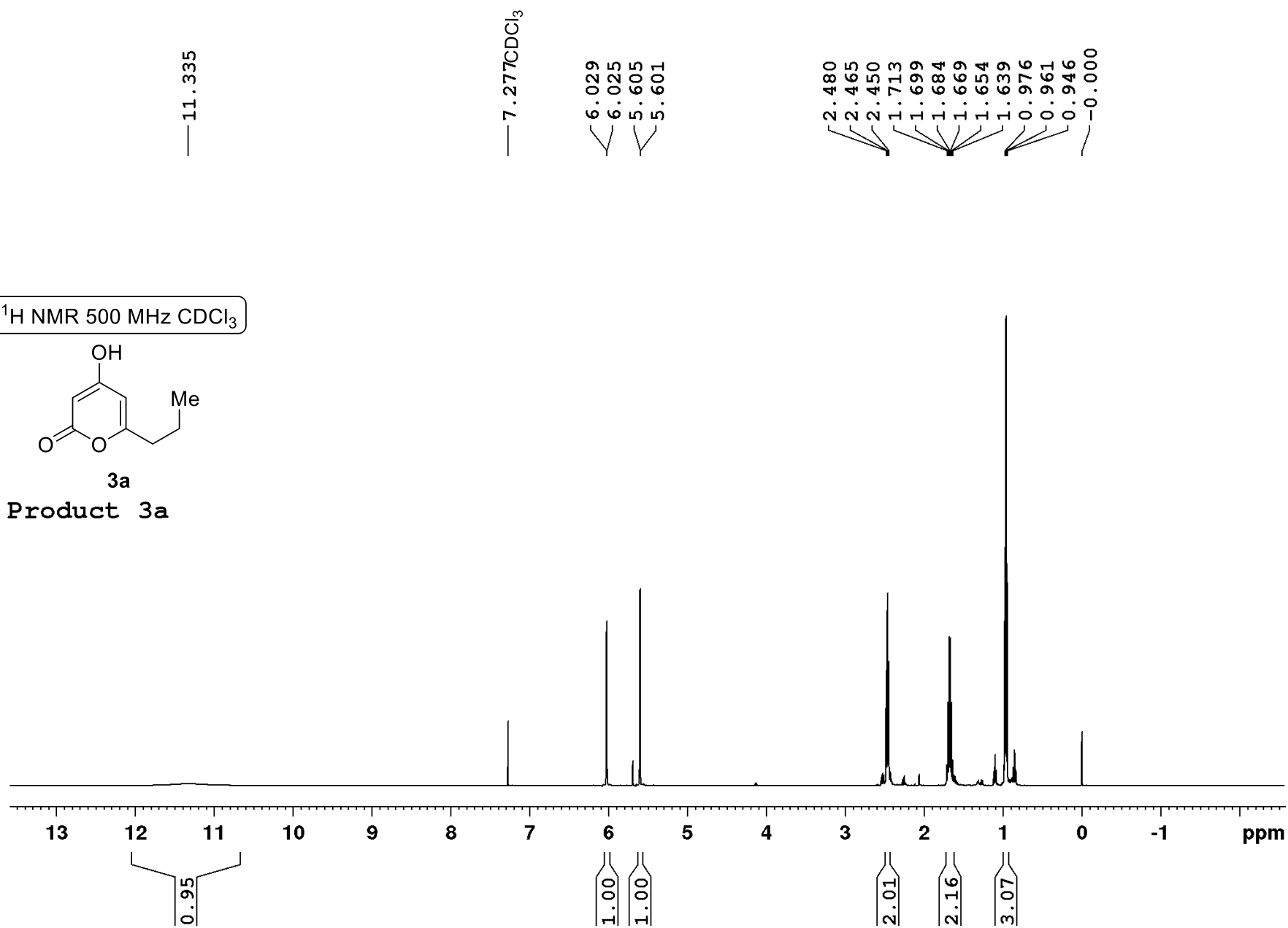


$^1\text{H NMR}$  500 MHz  $\text{CDCl}_3$

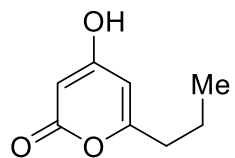


3a

Product 3a

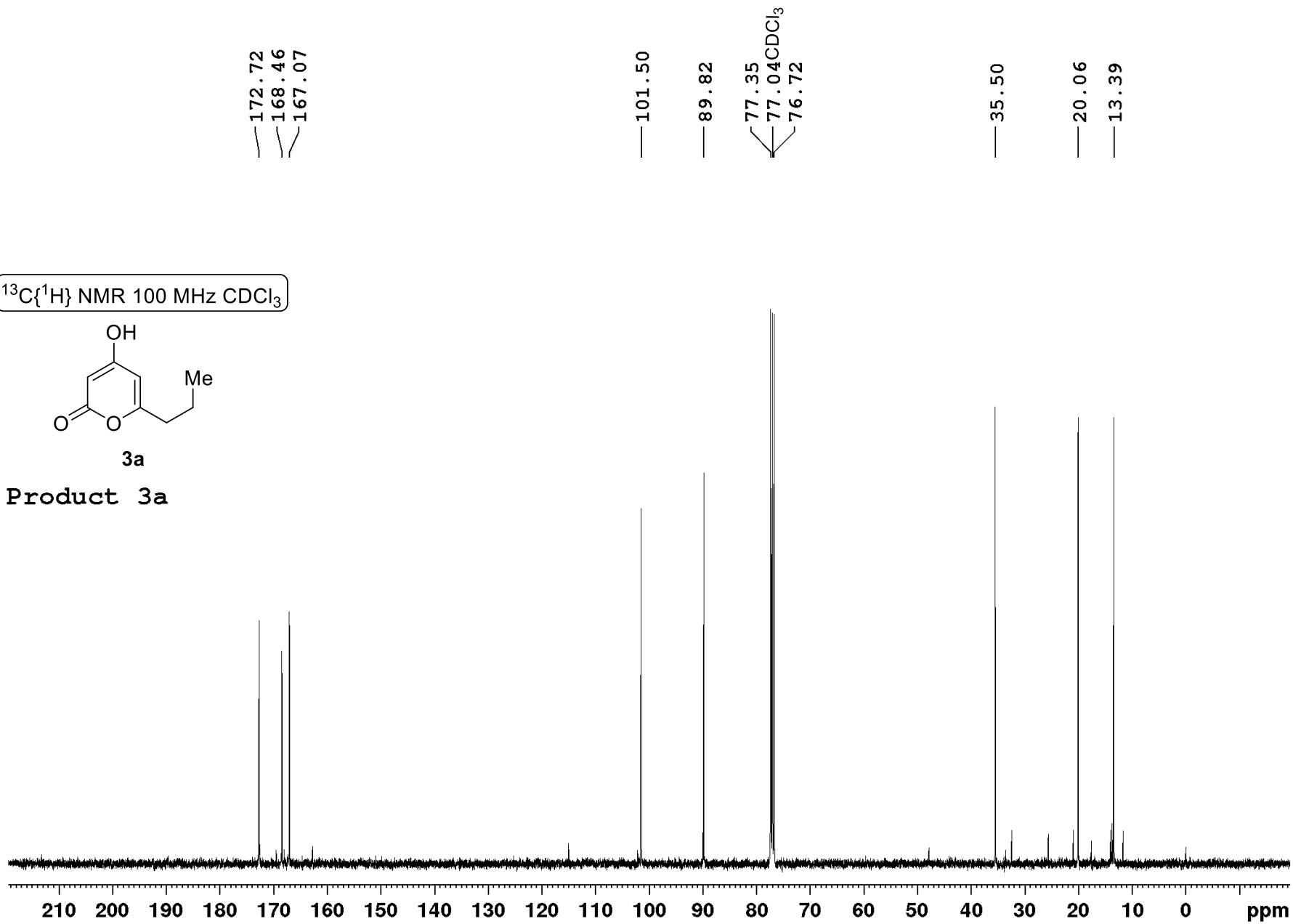


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

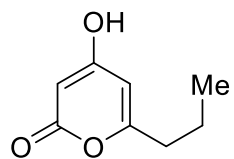


3a

Product 3a

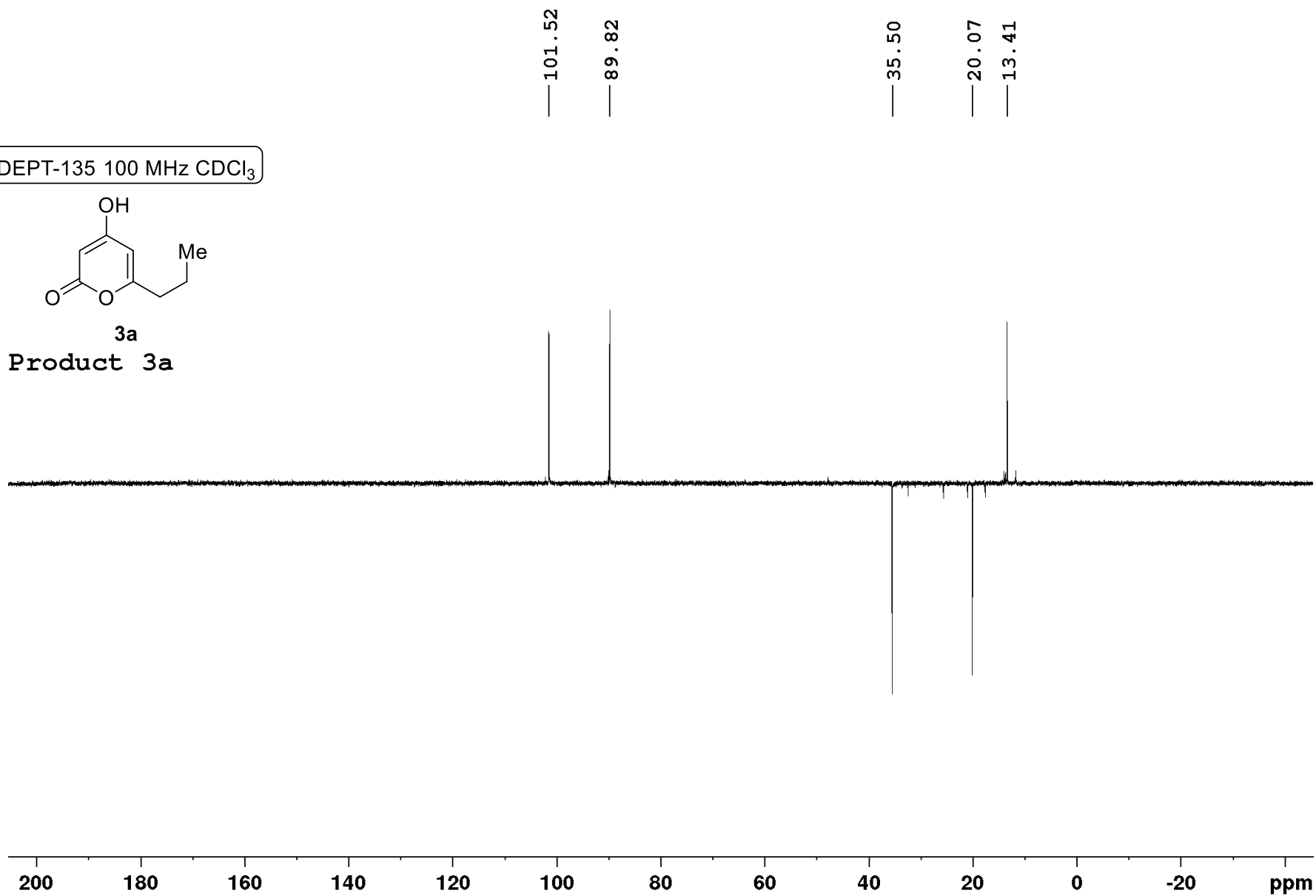


DEPT-135 100 MHz CDCl<sub>3</sub>

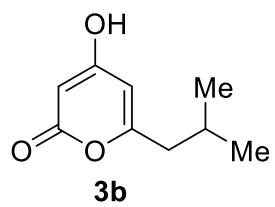


3a

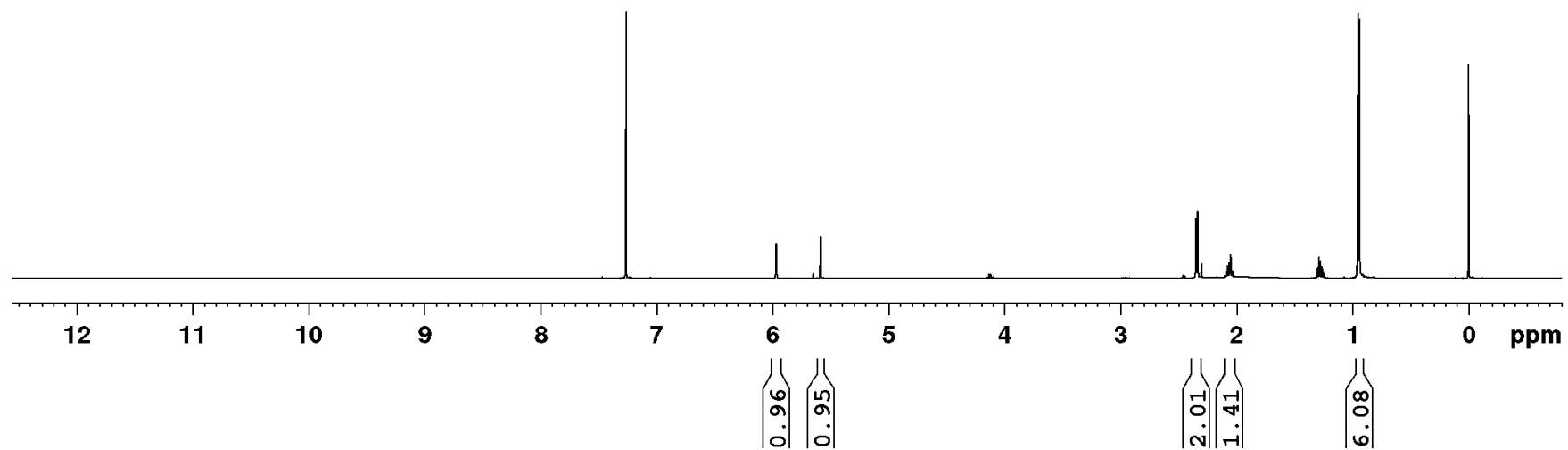
Product 3a



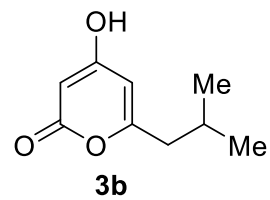
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



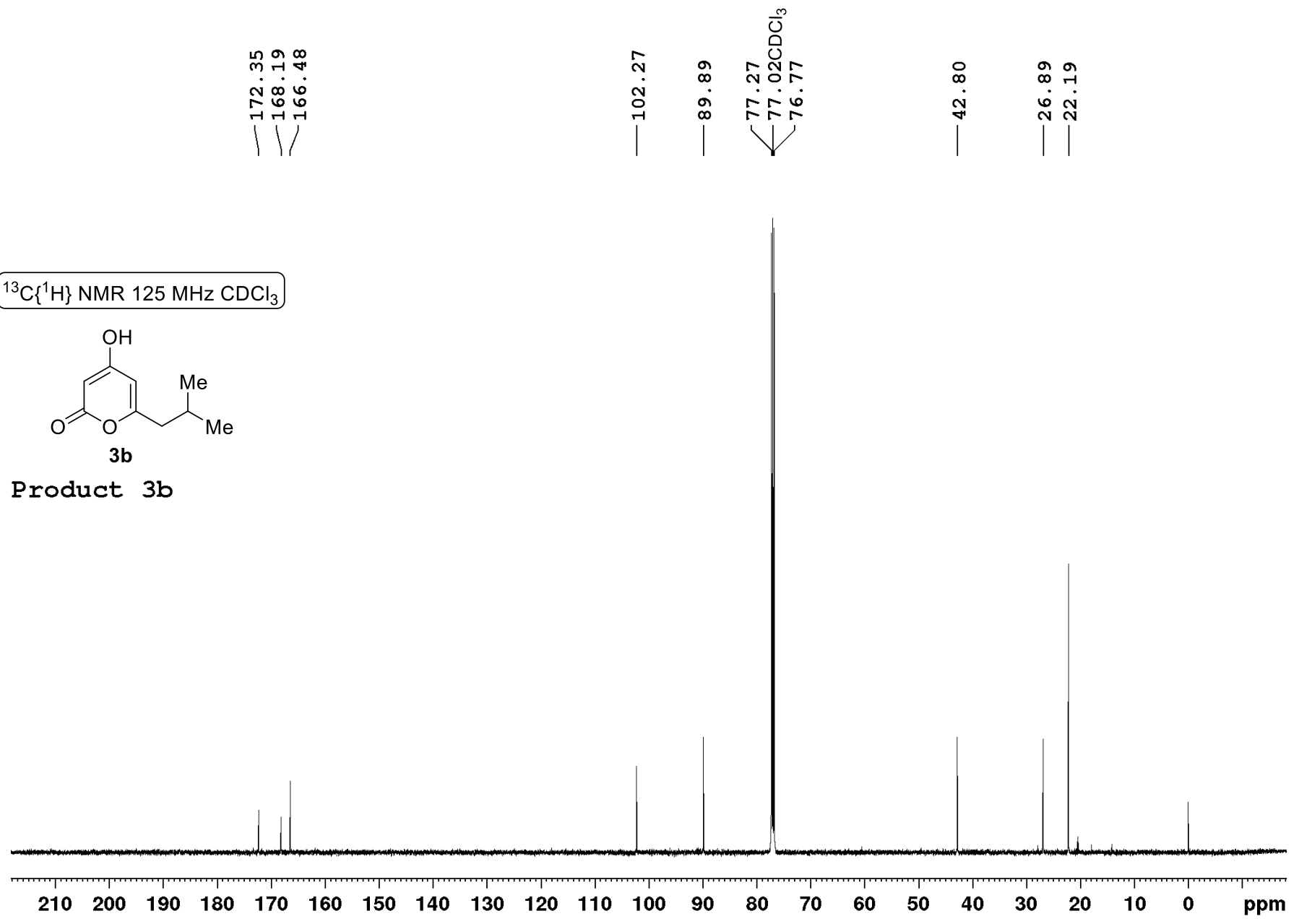
Product 3b



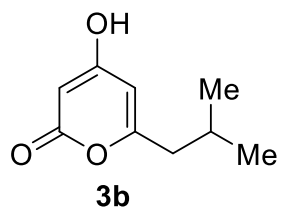
$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



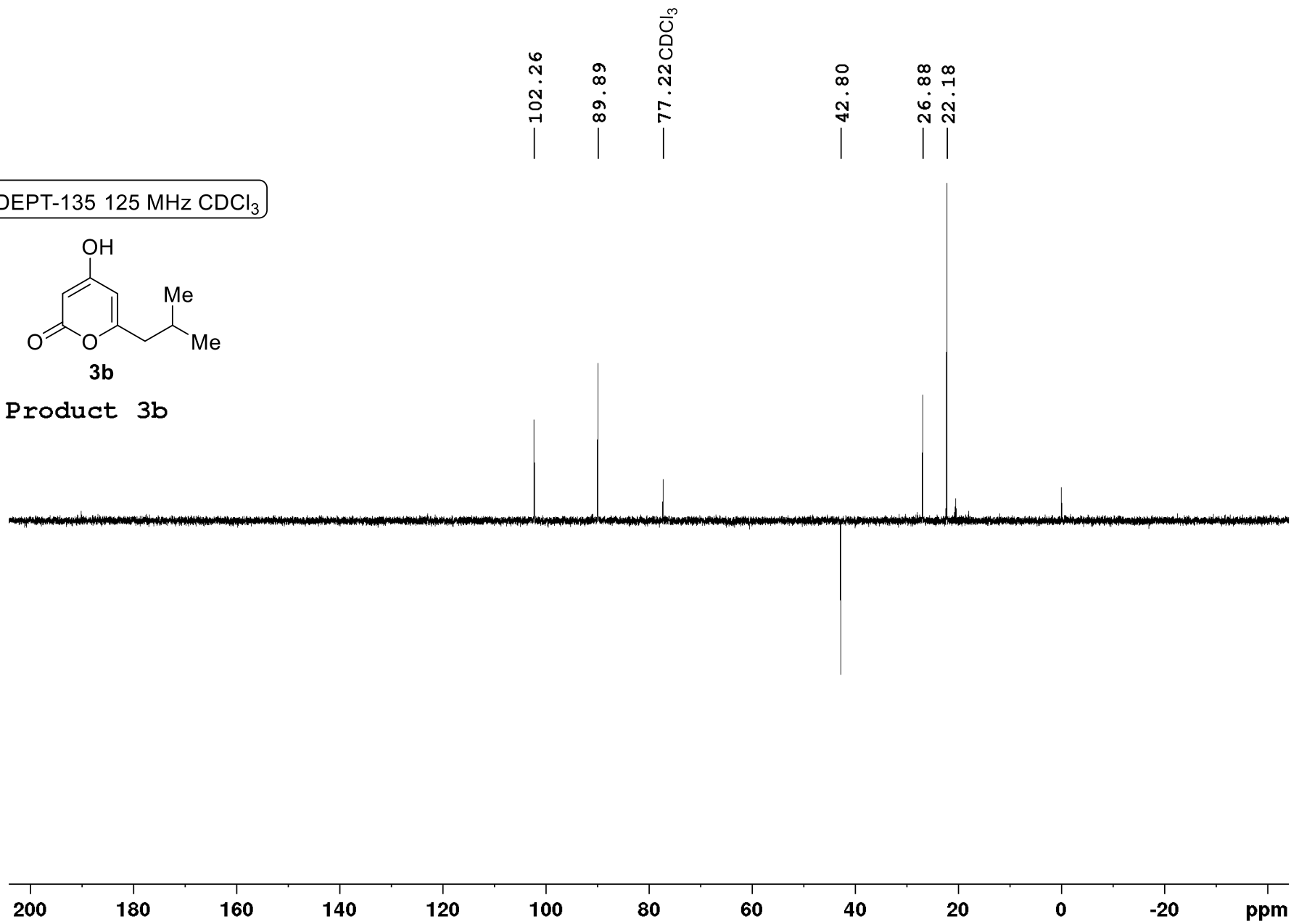
**Product 3b**



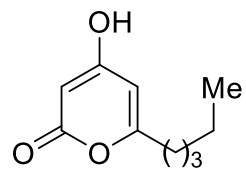
DEPT-135 125 MHz CDCl<sub>3</sub>



Product 3b

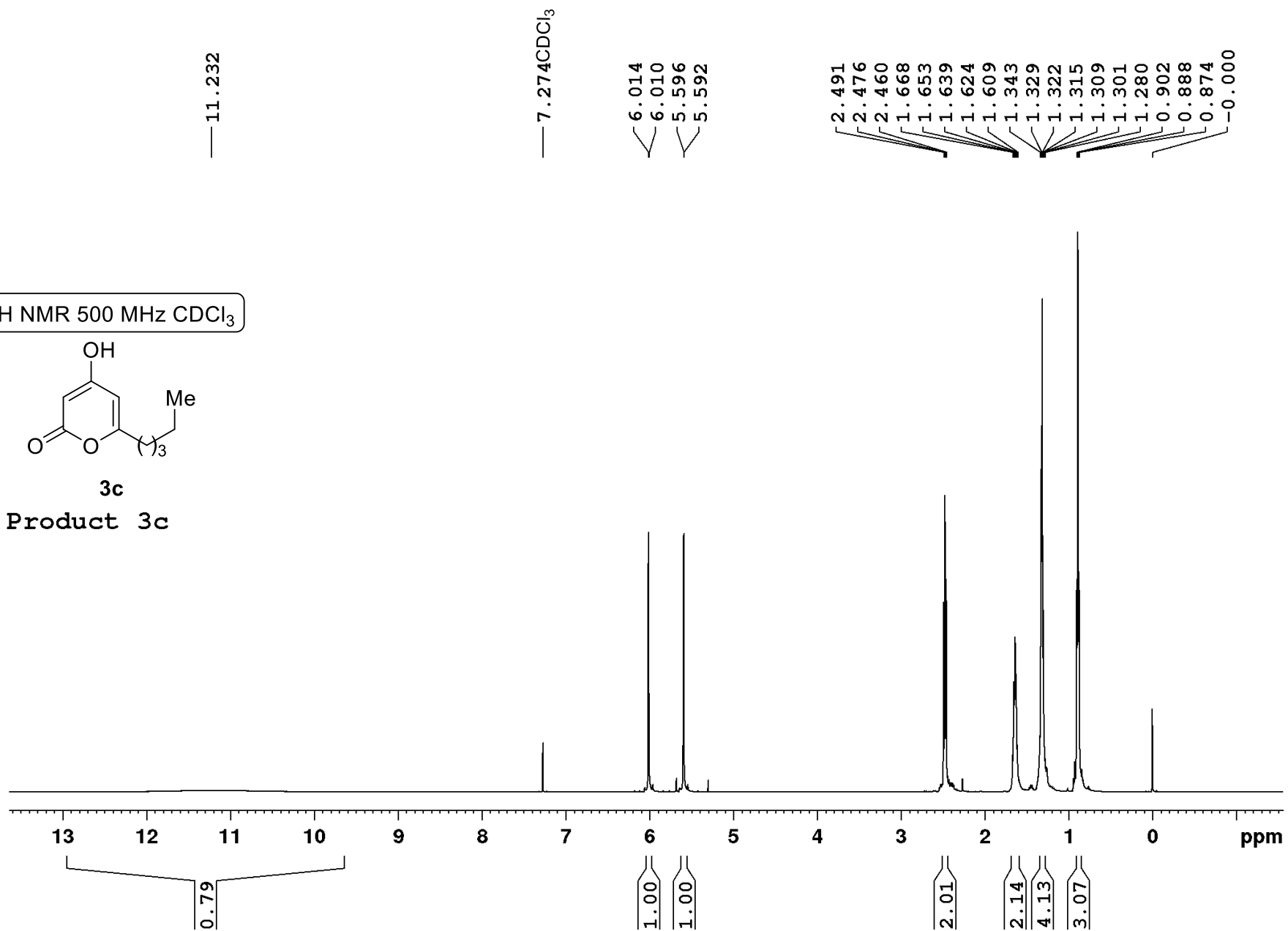


$^1\text{H}$  NMR 500 MHz  $\text{CDCl}_3$

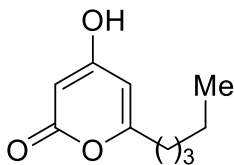


3c

Product 3c

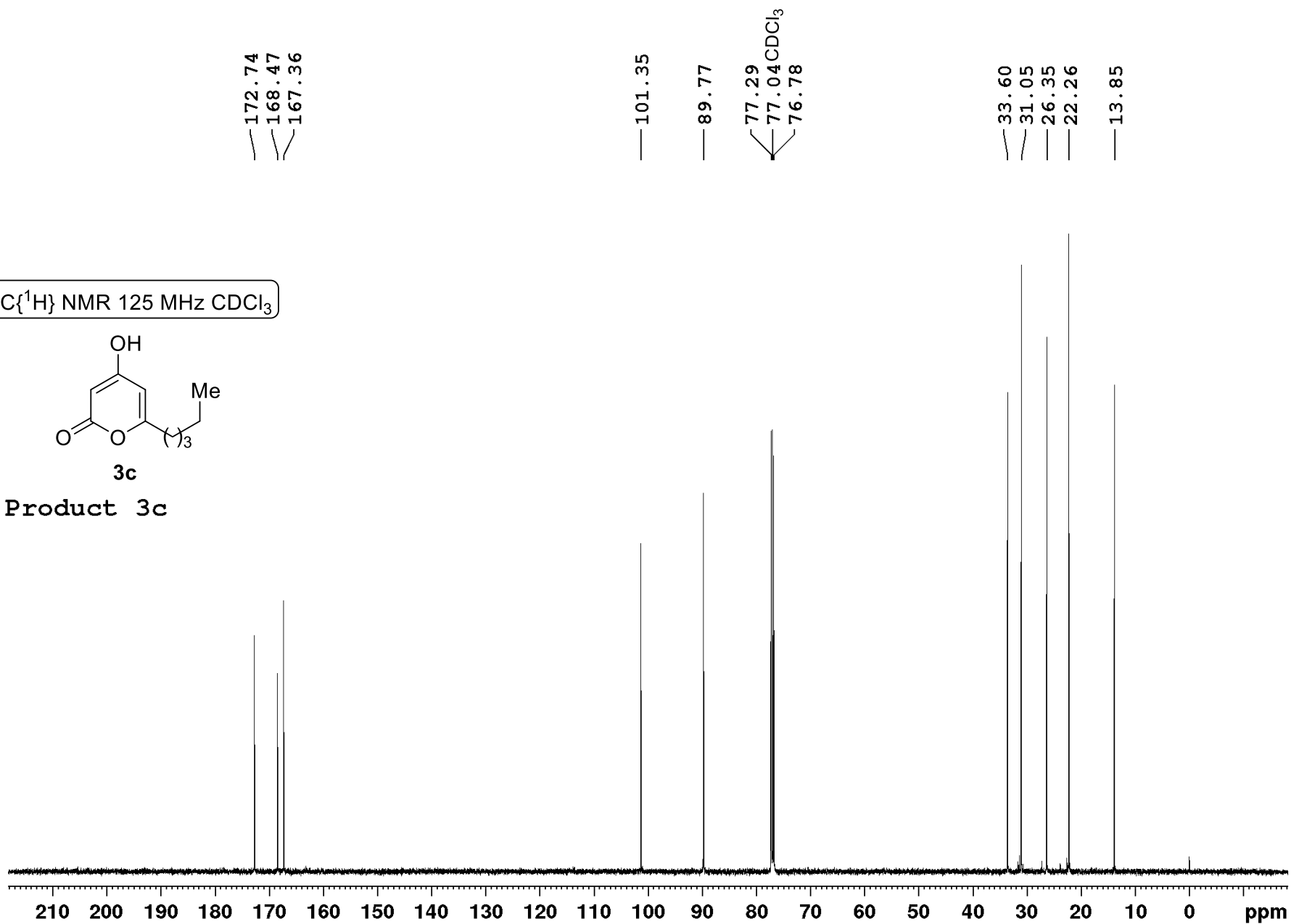


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$



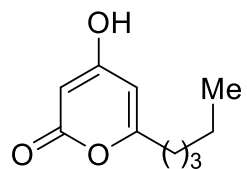
3c

Product 3c



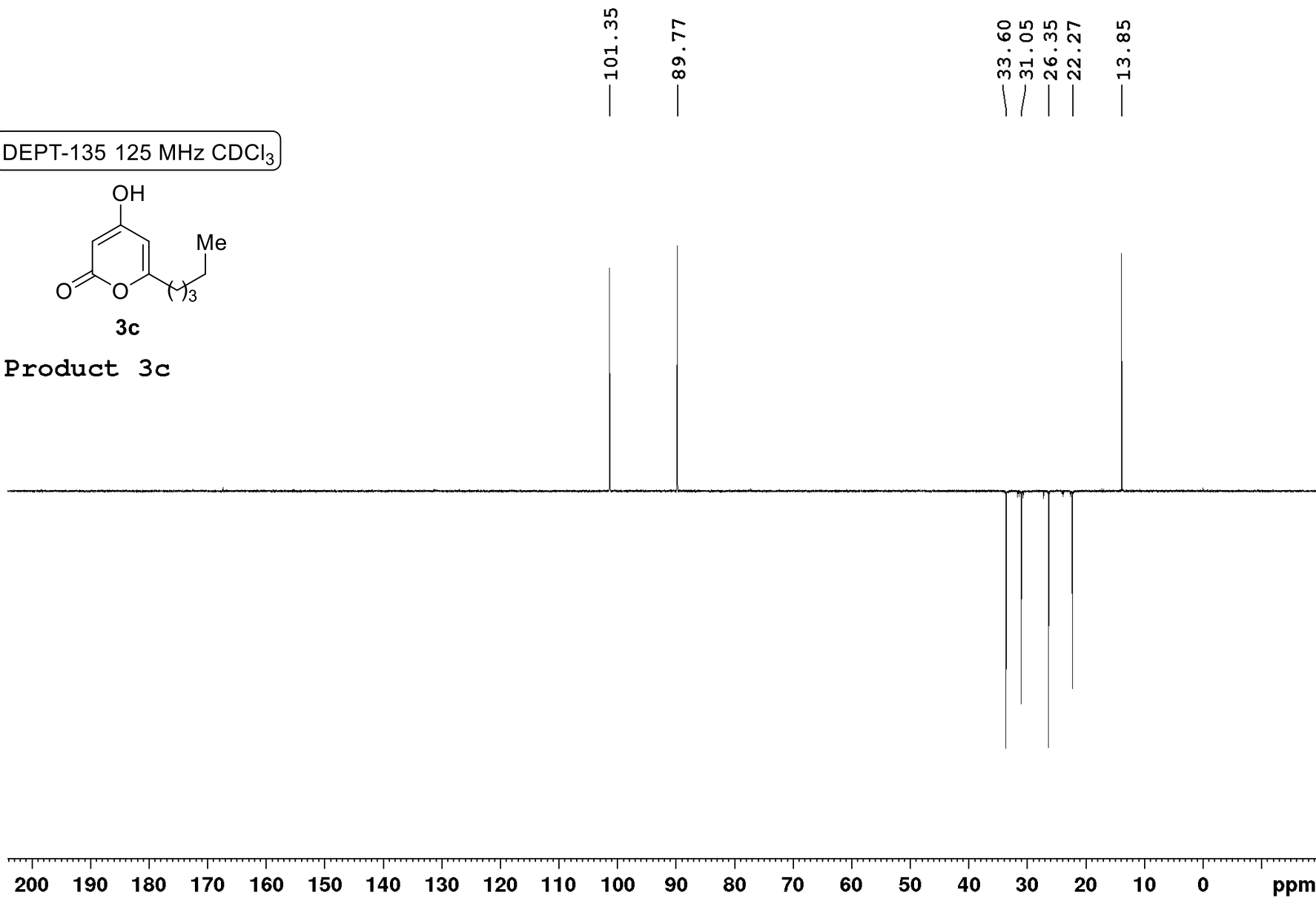


DEPT-135 125 MHz CDCl<sub>3</sub>

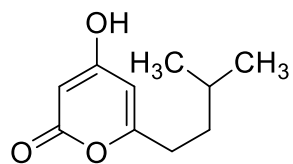


3c

Product 3c

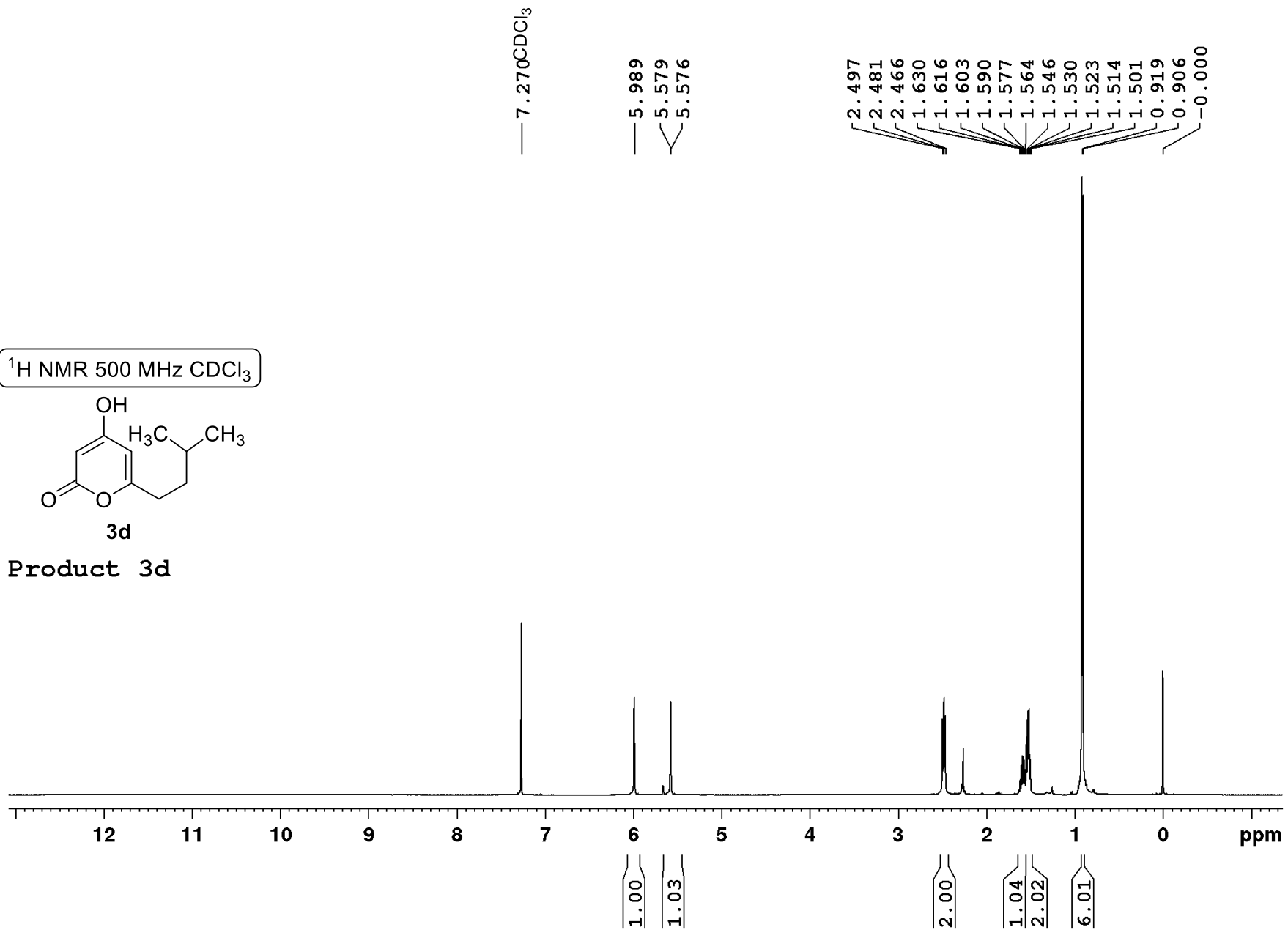


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

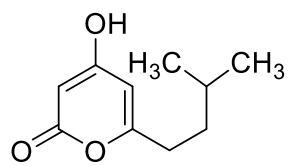


**3d**

Product 3d

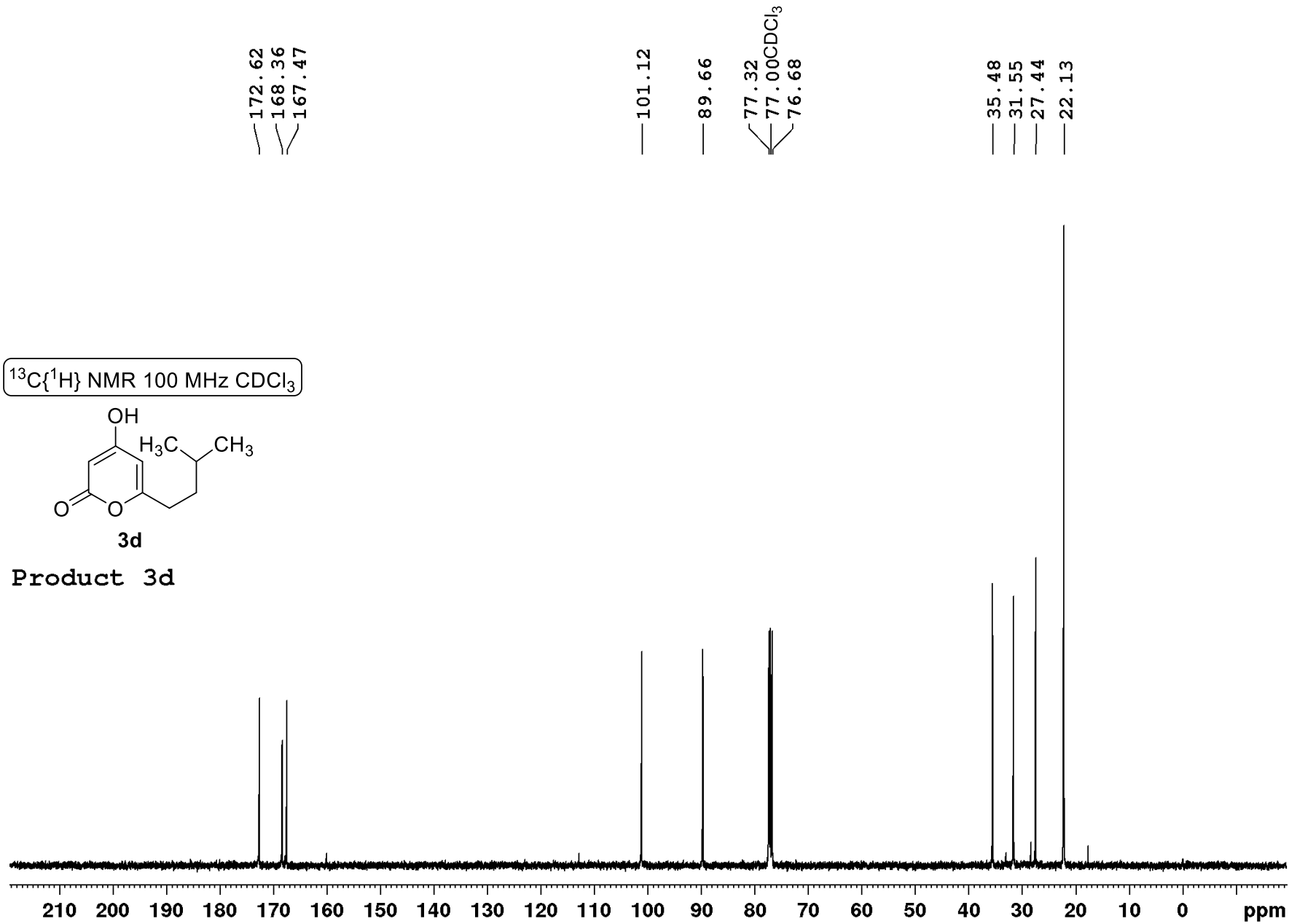


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

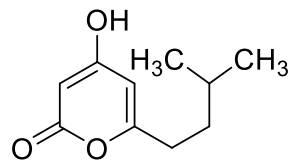


3d

Product 3d

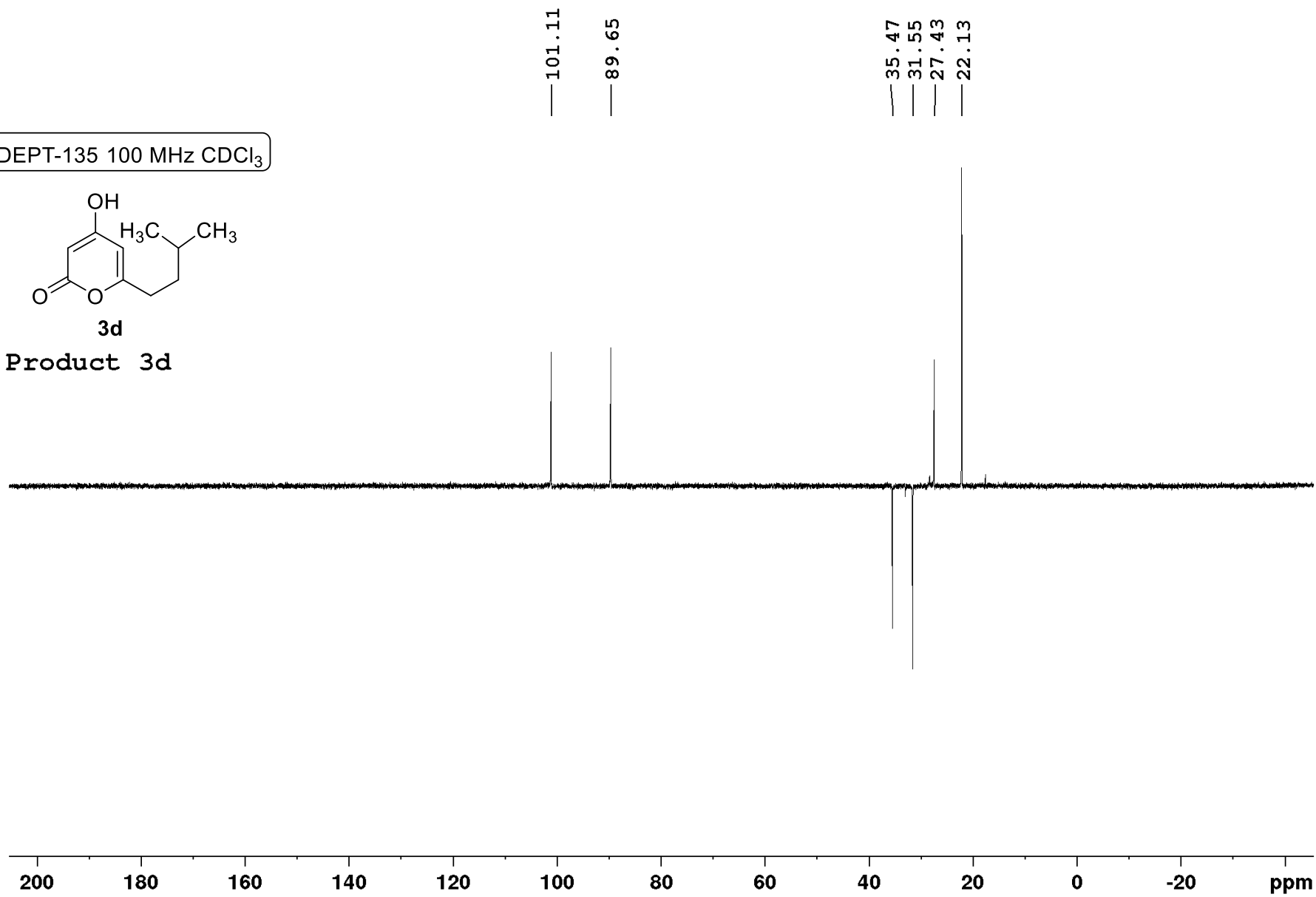


DEPT-135 100 MHz CDCl<sub>3</sub>

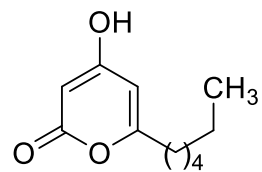


**3d**

**Product 3d**

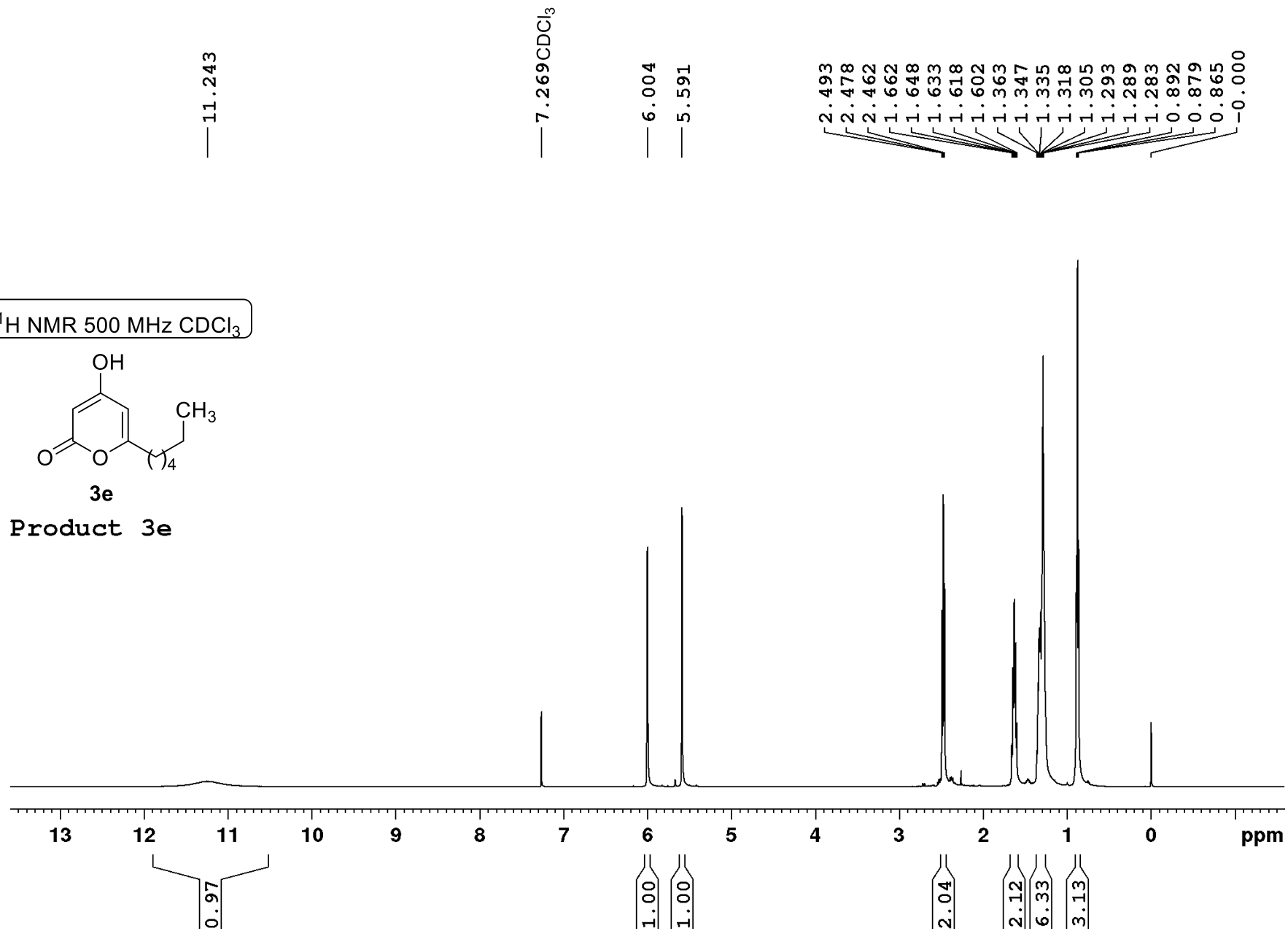


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

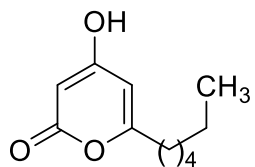


3e

Product 3e



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



3e

Product 3e

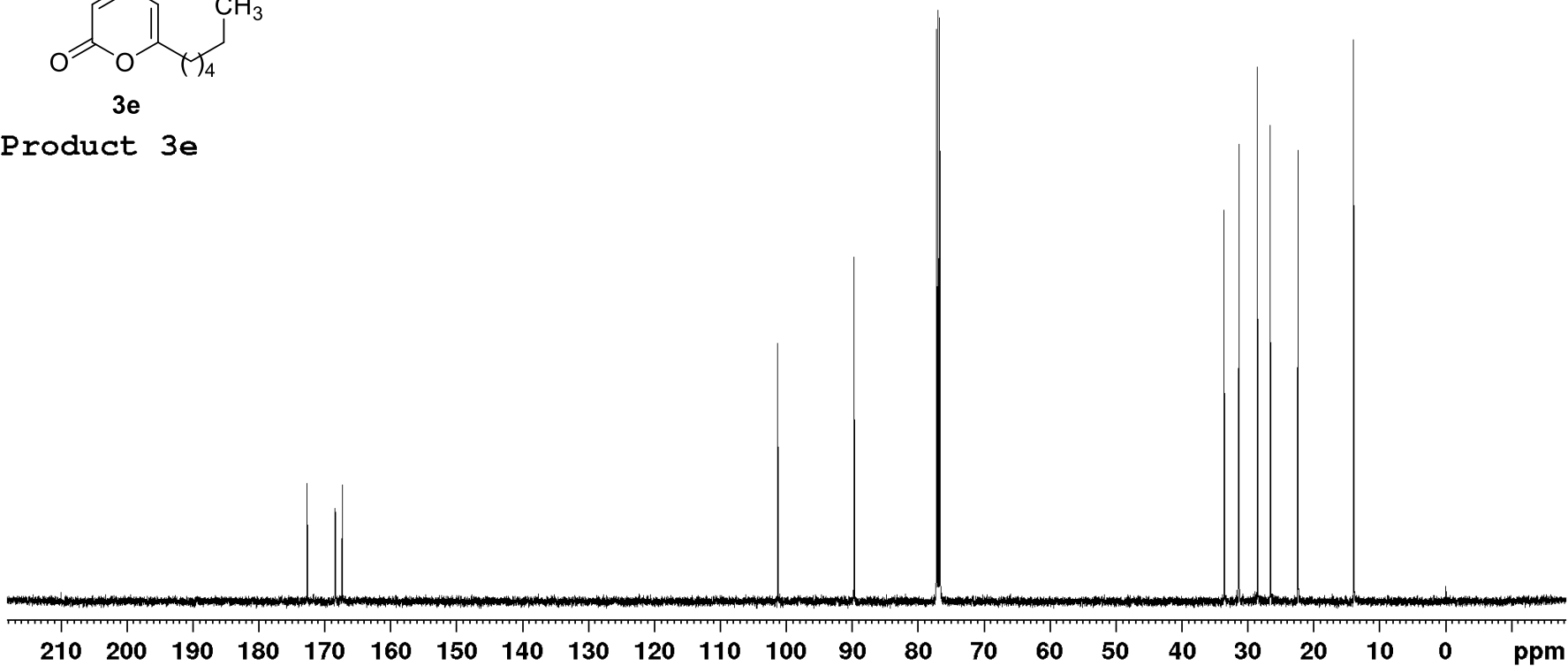
172.72  
168.44  
167.37

101.32

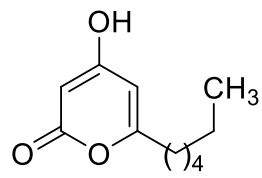
89.75

77.25  
77.00  $\text{CDCl}_3$   
76.74

33.62  
31.36  
28.57  
26.61  
22.42  
13.96

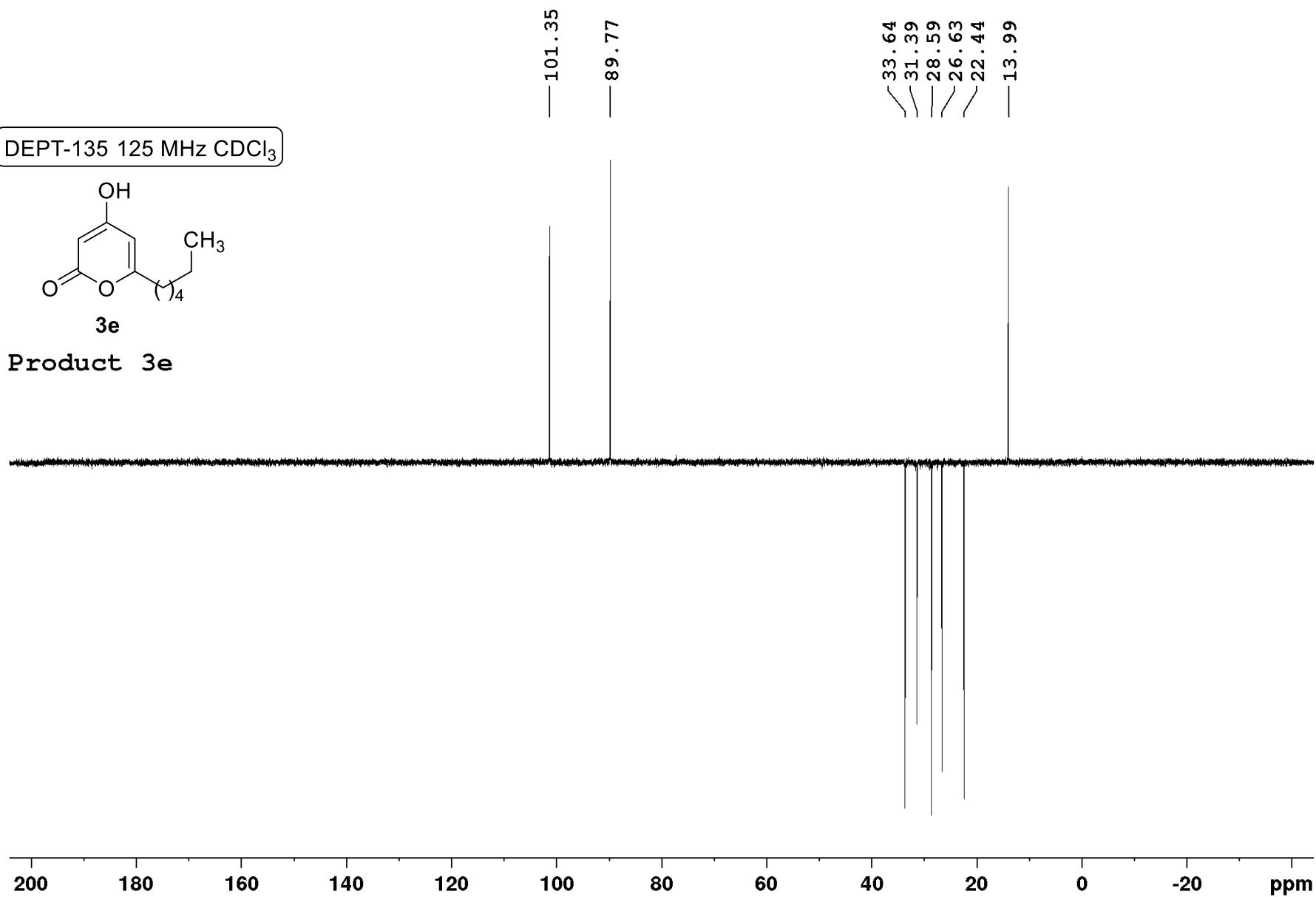


DEPT-135 125 MHz CDCl<sub>3</sub>

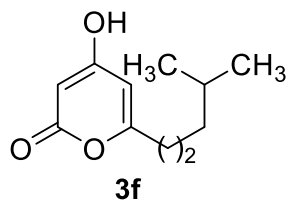


3e

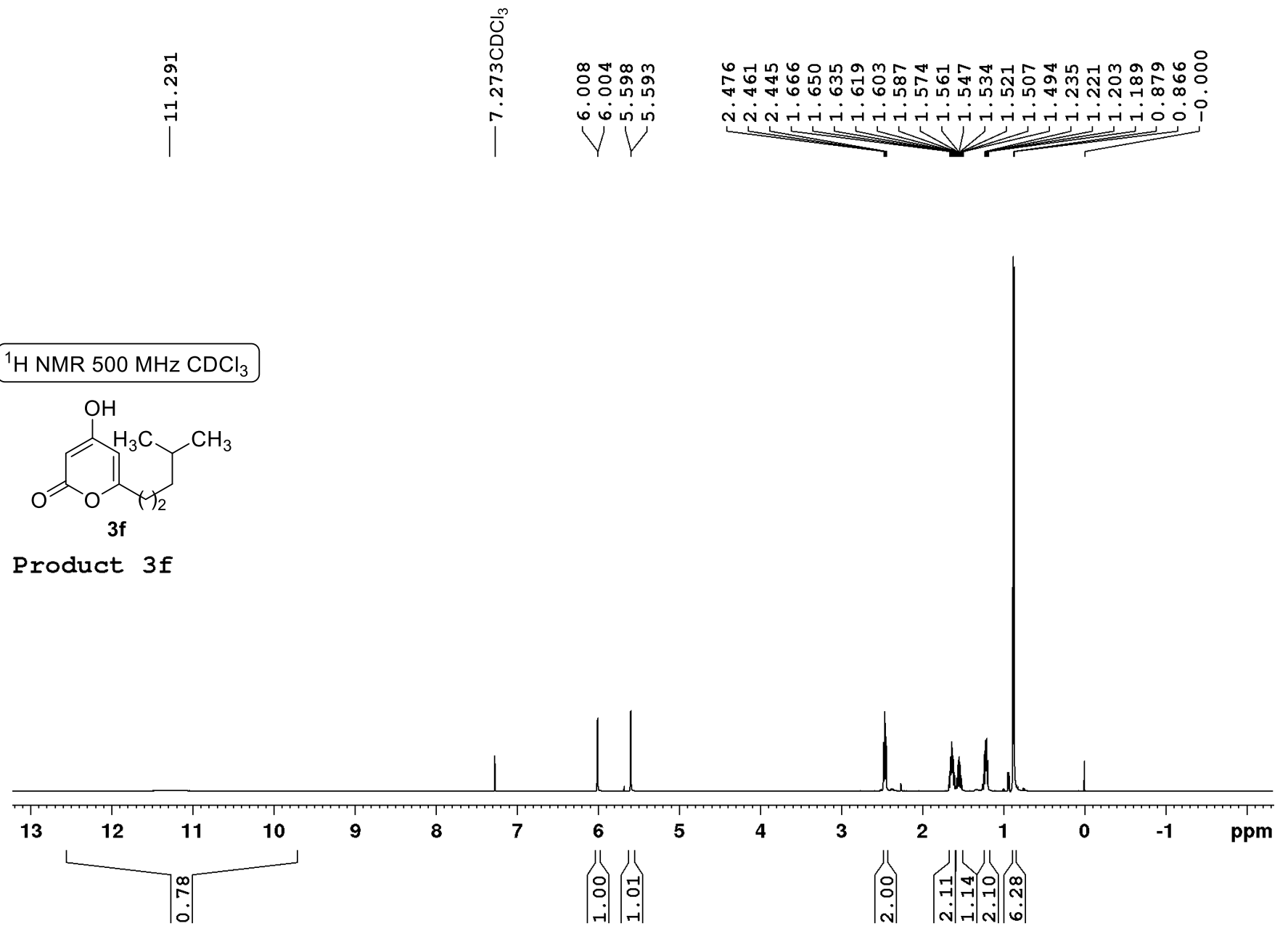
Product 3e



<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

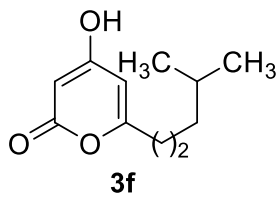


Product 3f





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



Product 3f

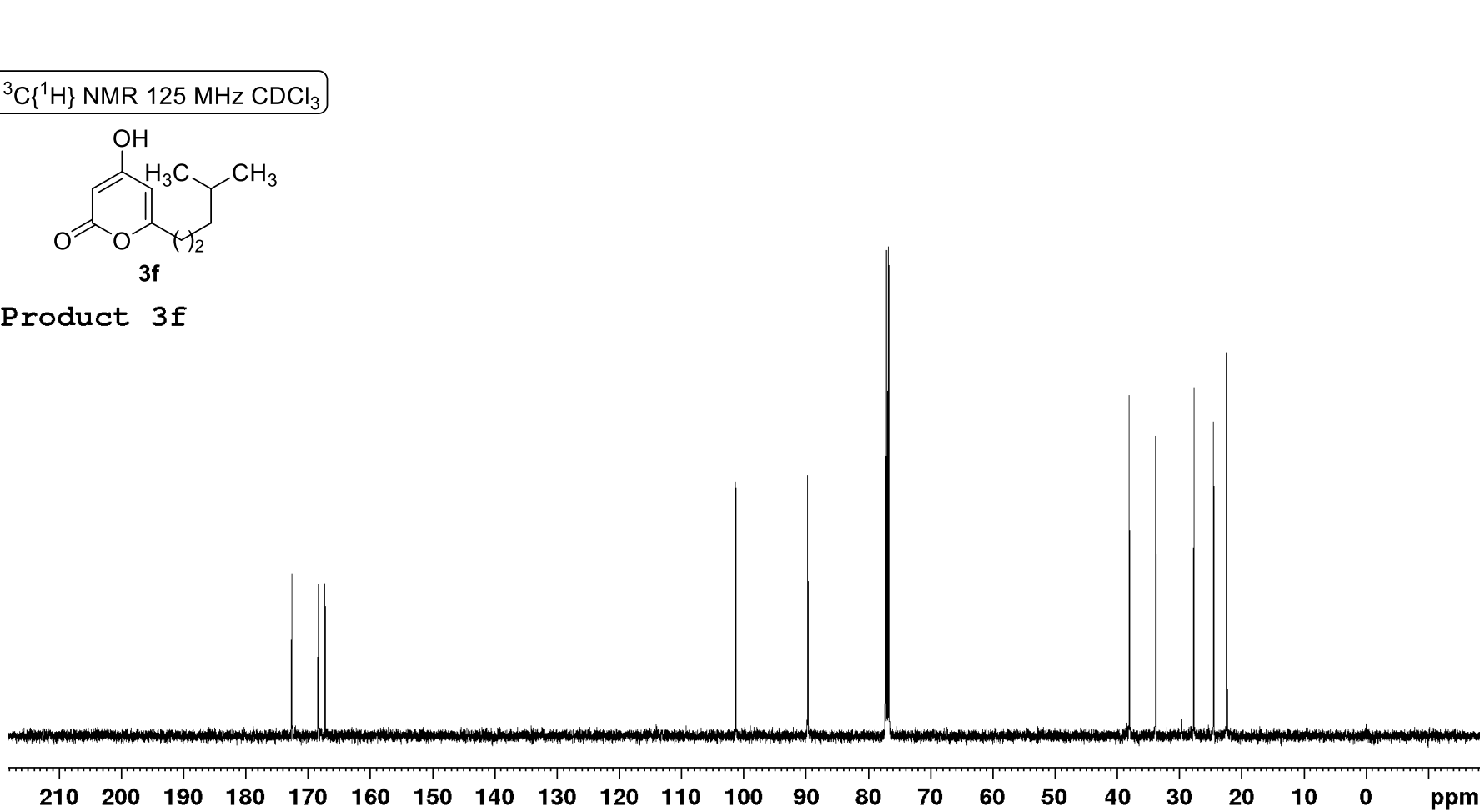
172.66  
168.39  
167.32

101.30

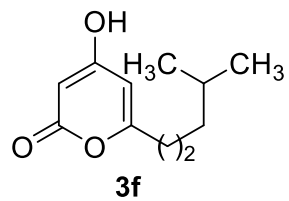
89.74

77.25  
77.00  $\text{CDCl}_3$   
76.74

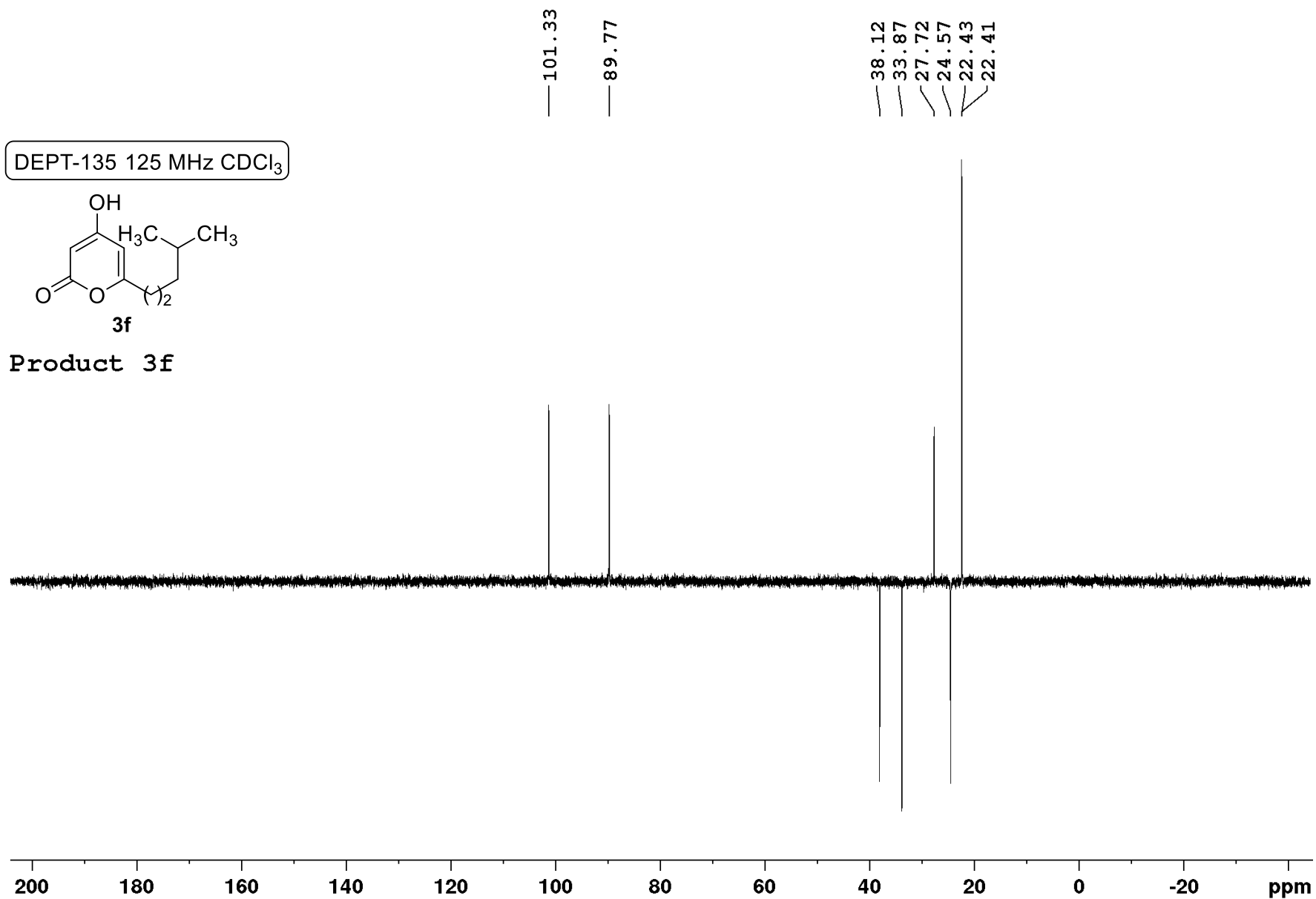
38.09  
33.85  
27.69  
24.54  
22.40  
22.38



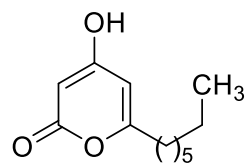
DEPT-135 125 MHz CDCl<sub>3</sub>



Product 3f

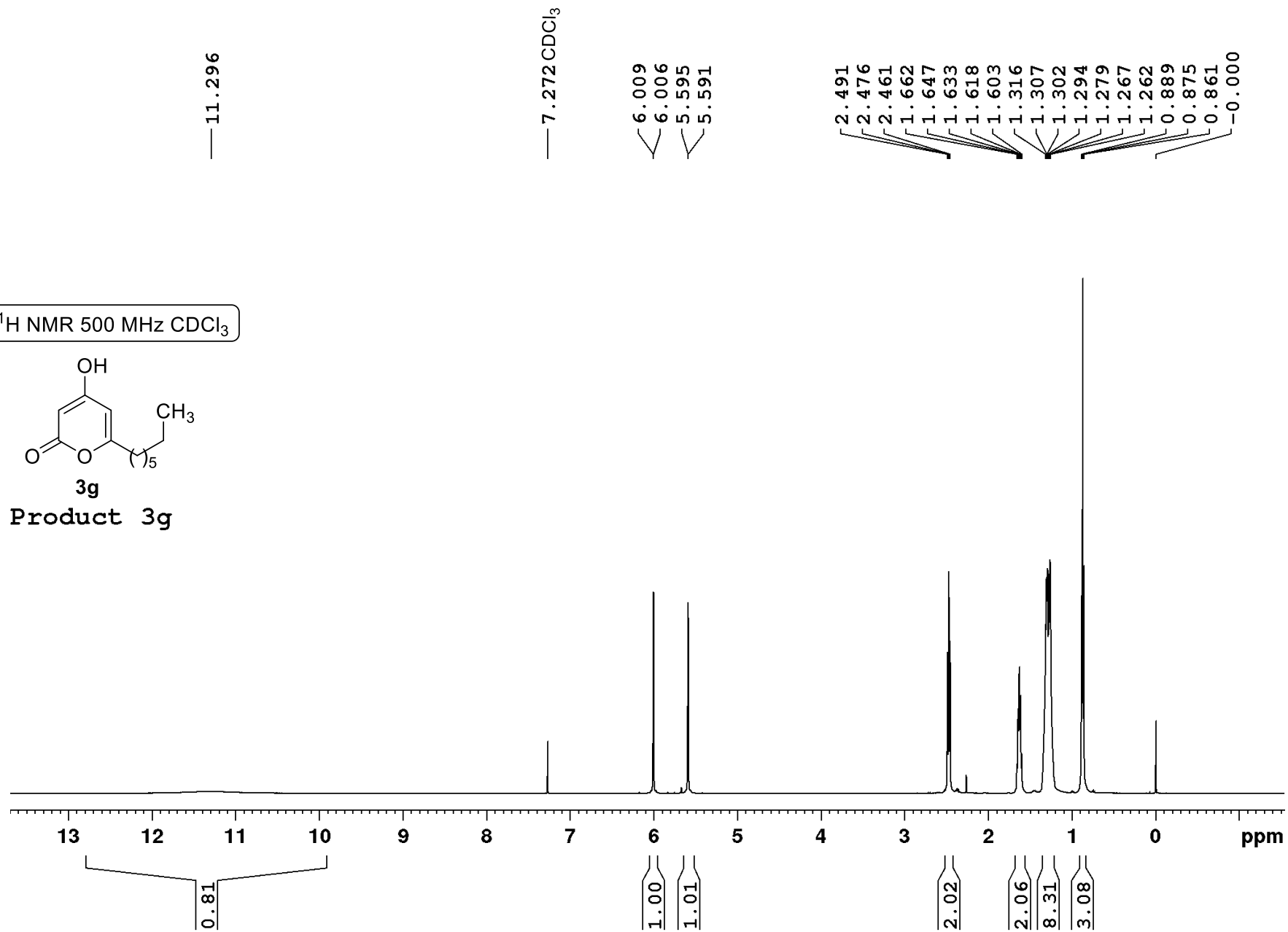


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

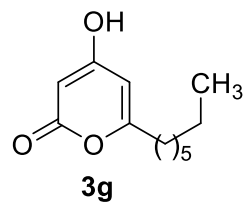


3g

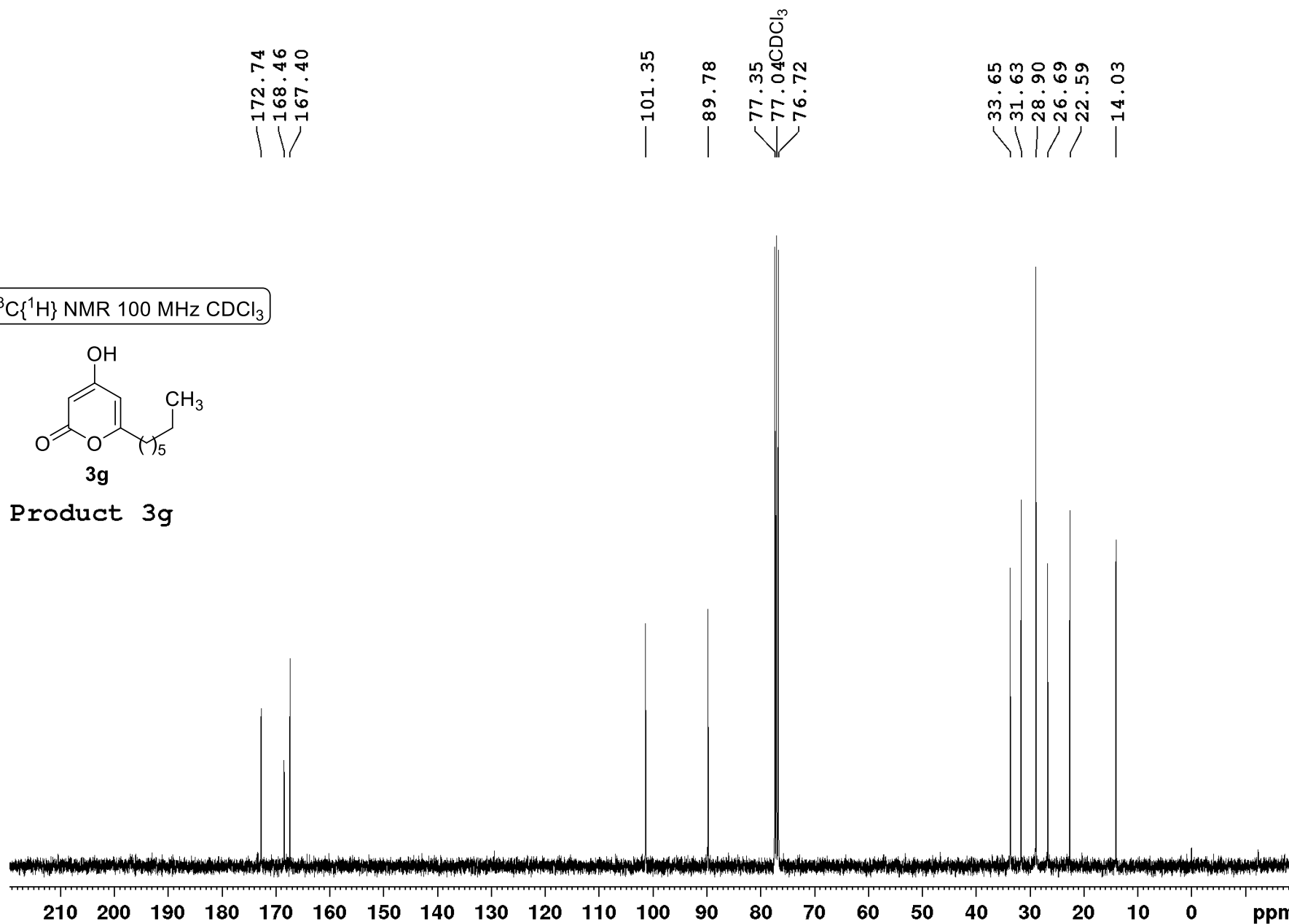
Product 3g



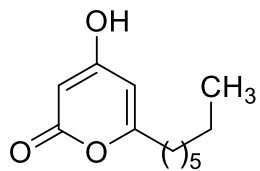
$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



Product 3g

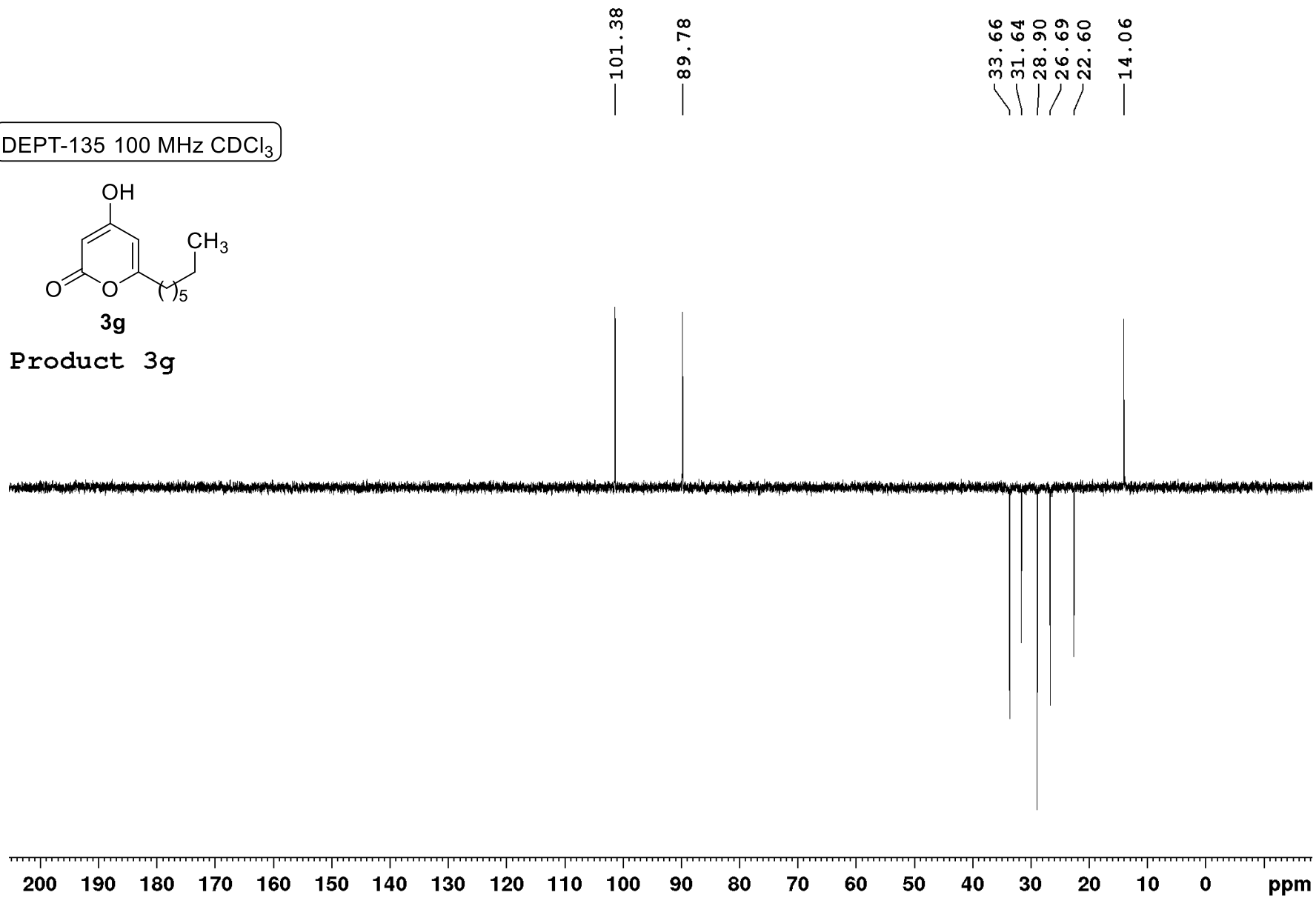


DEPT-135 100 MHz CDCl<sub>3</sub>

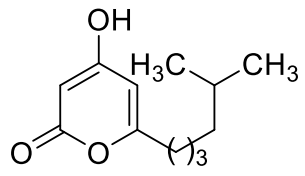


3g

Product 3g

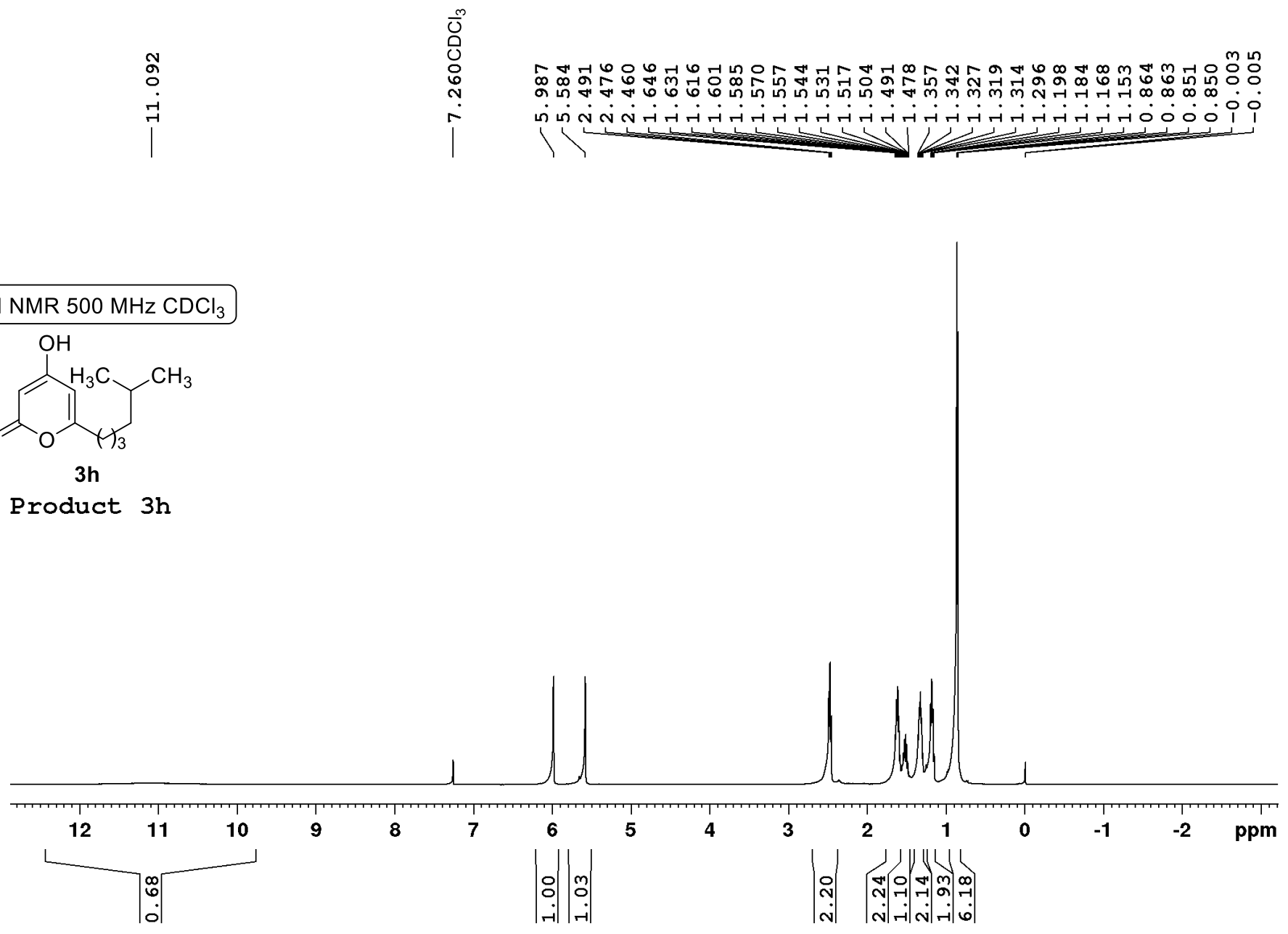


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

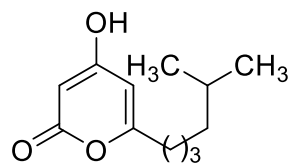


3h

Product 3h

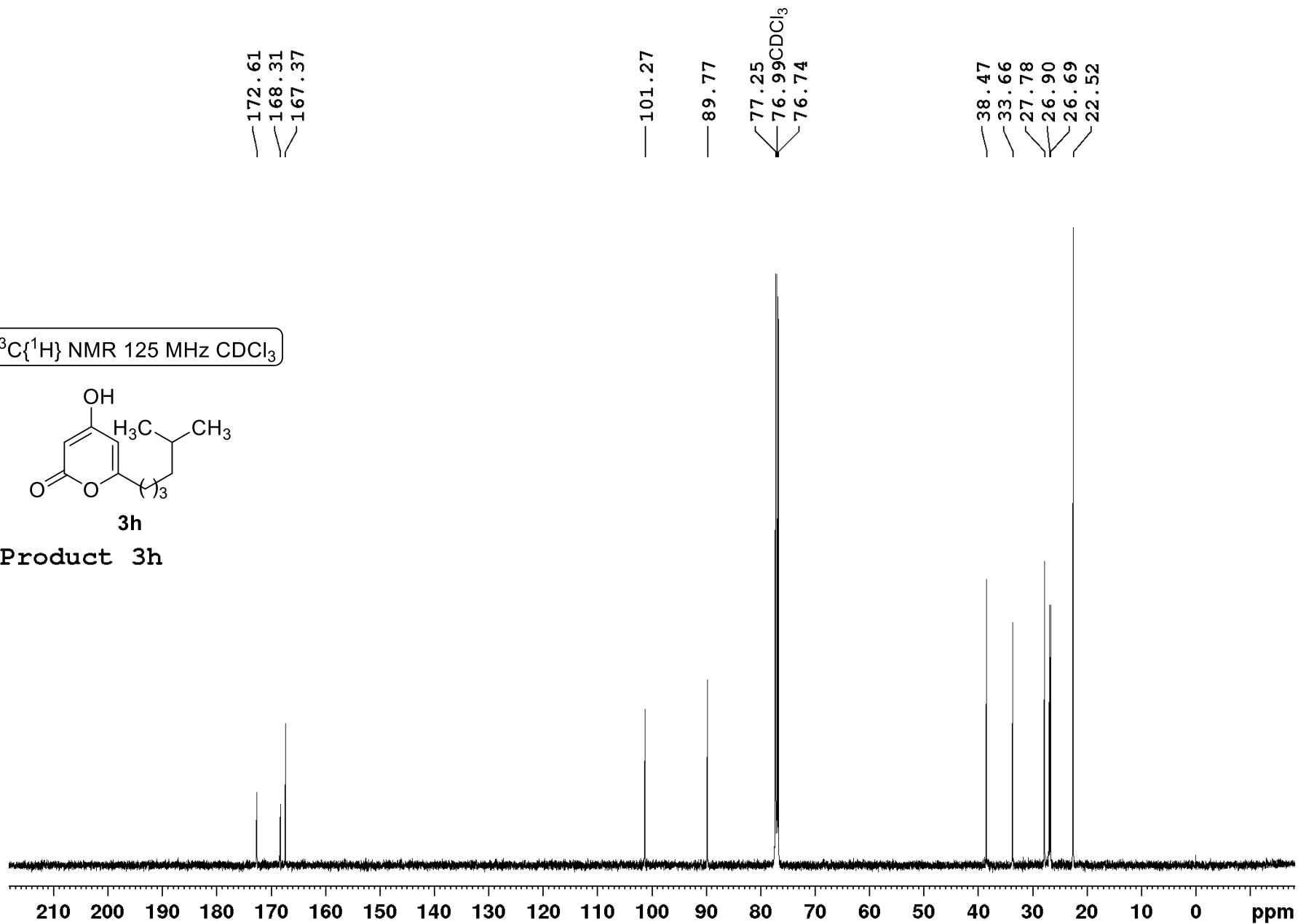


$^{13}\text{C}\{^1\text{H}\}$  NMR 125 MHz  $\text{CDCl}_3$

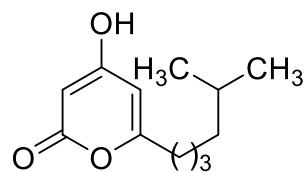


3h

Product 3h

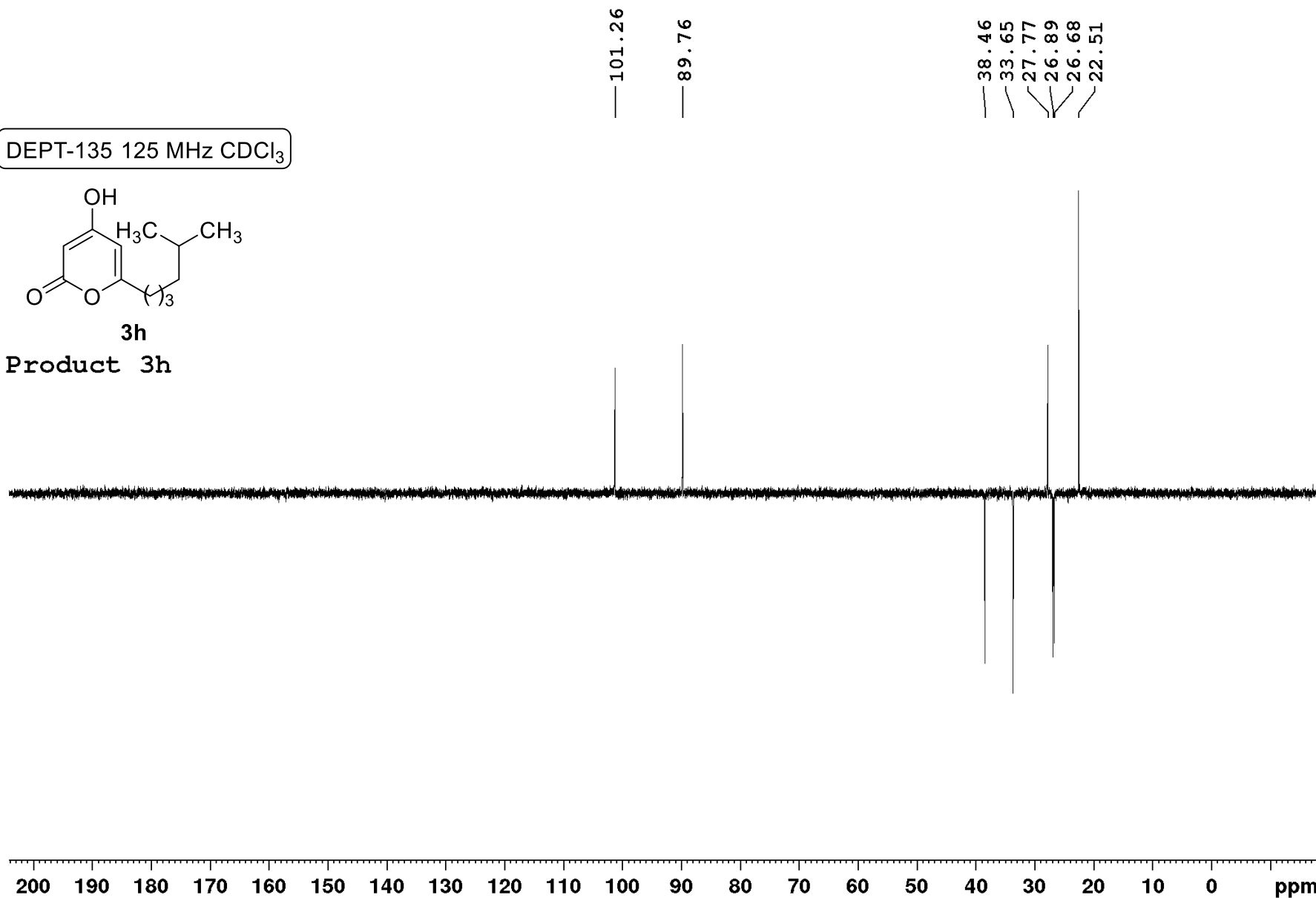


DEPT-135 125 MHz CDCl<sub>3</sub>



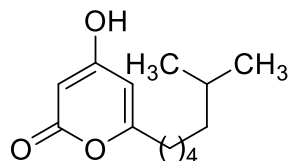
3h

Product 3h



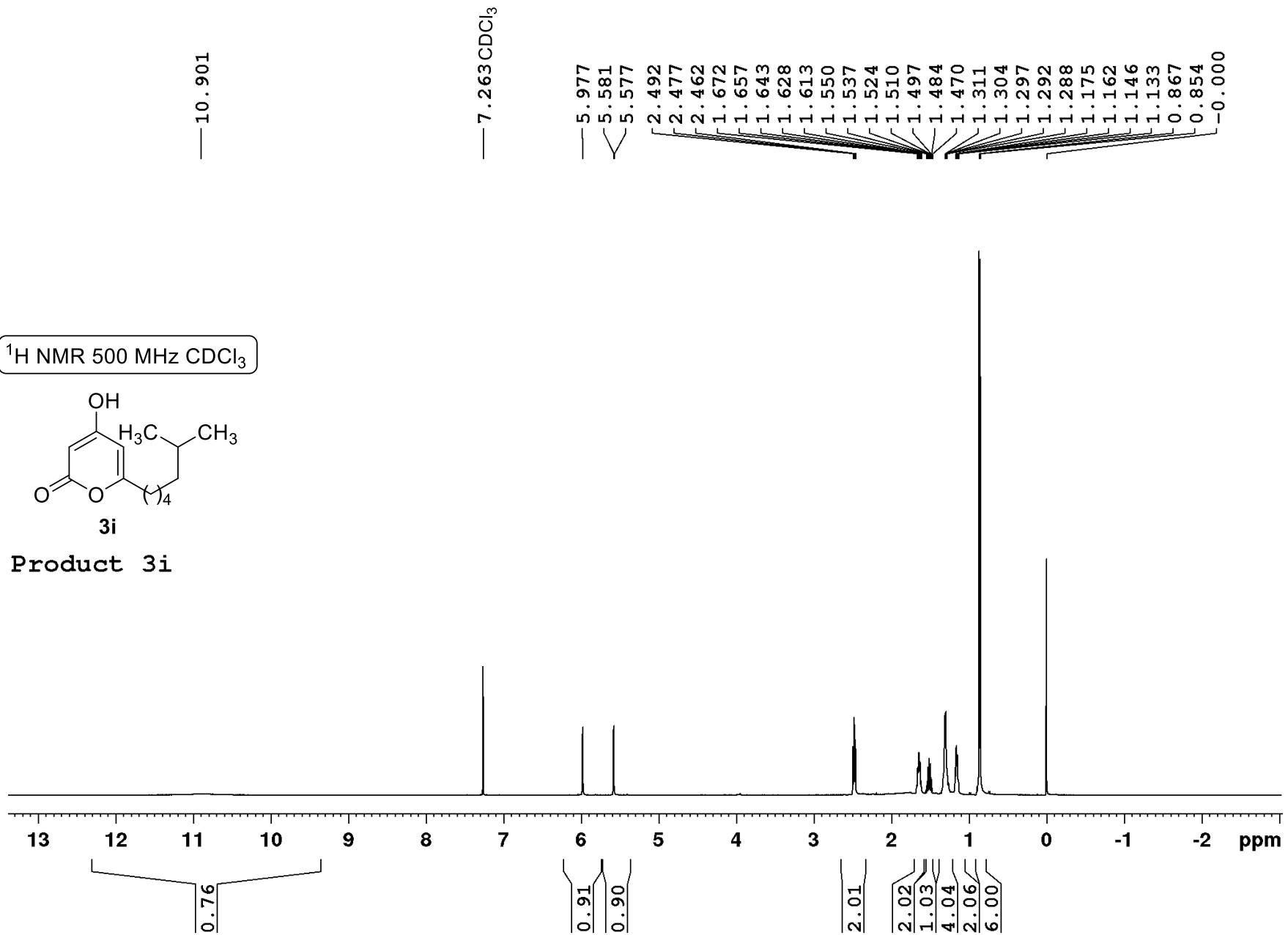


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

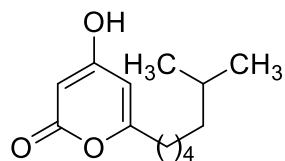


3i

Product 3i

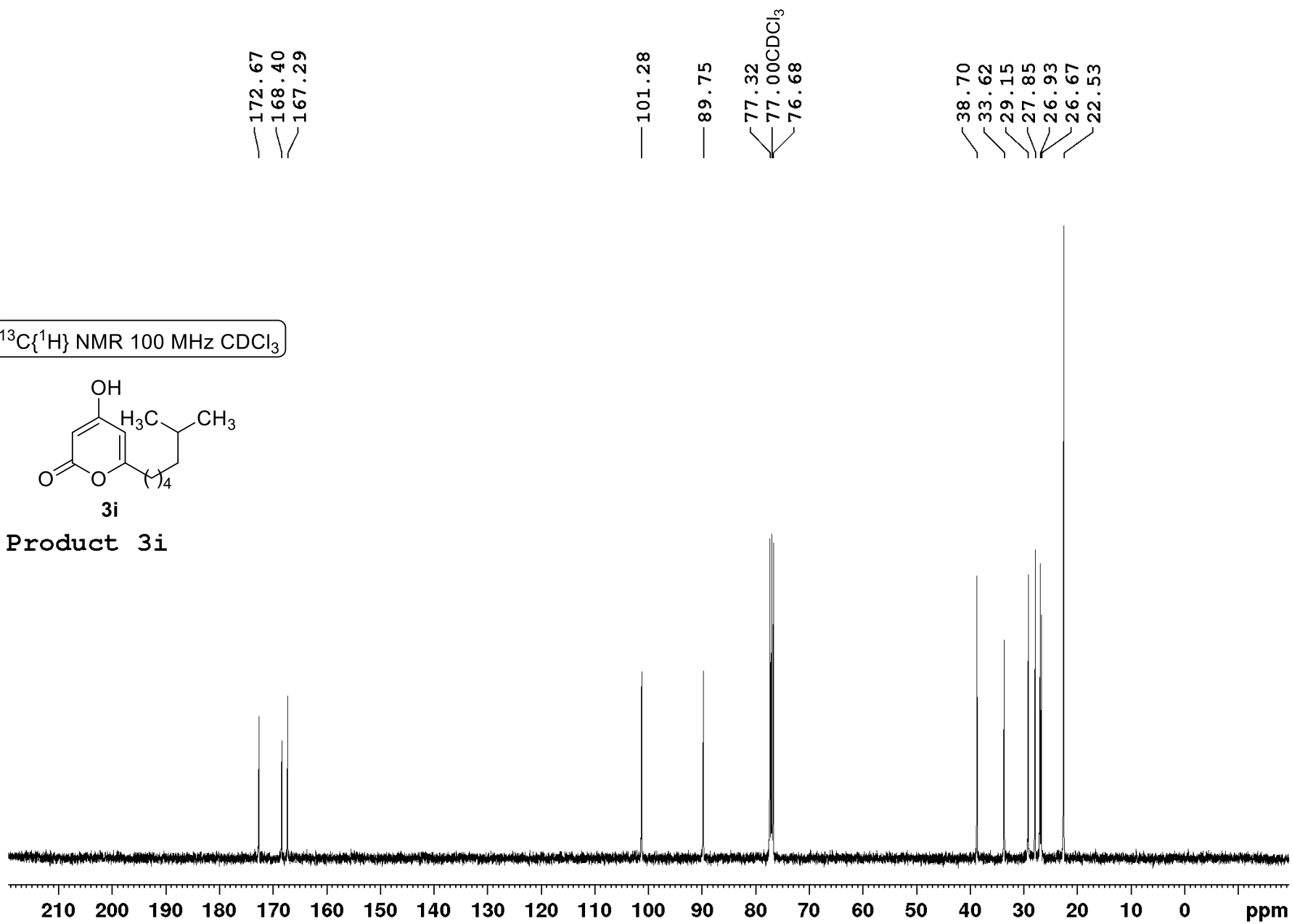


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

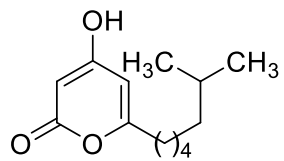


**3i**

**Product 3i**

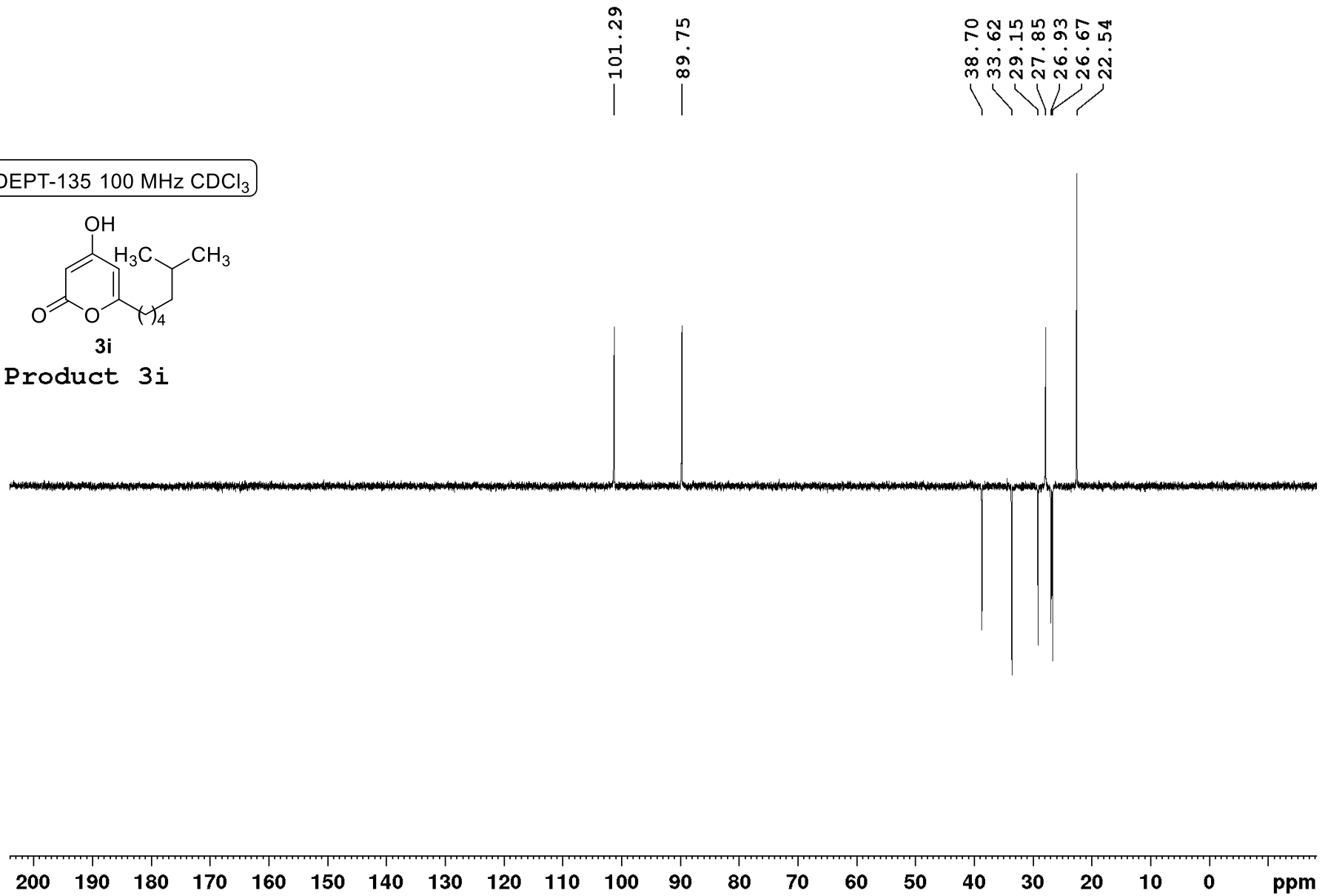


DEPT-135 100 MHz CDCl<sub>3</sub>

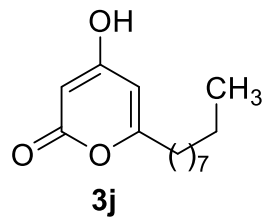


3i

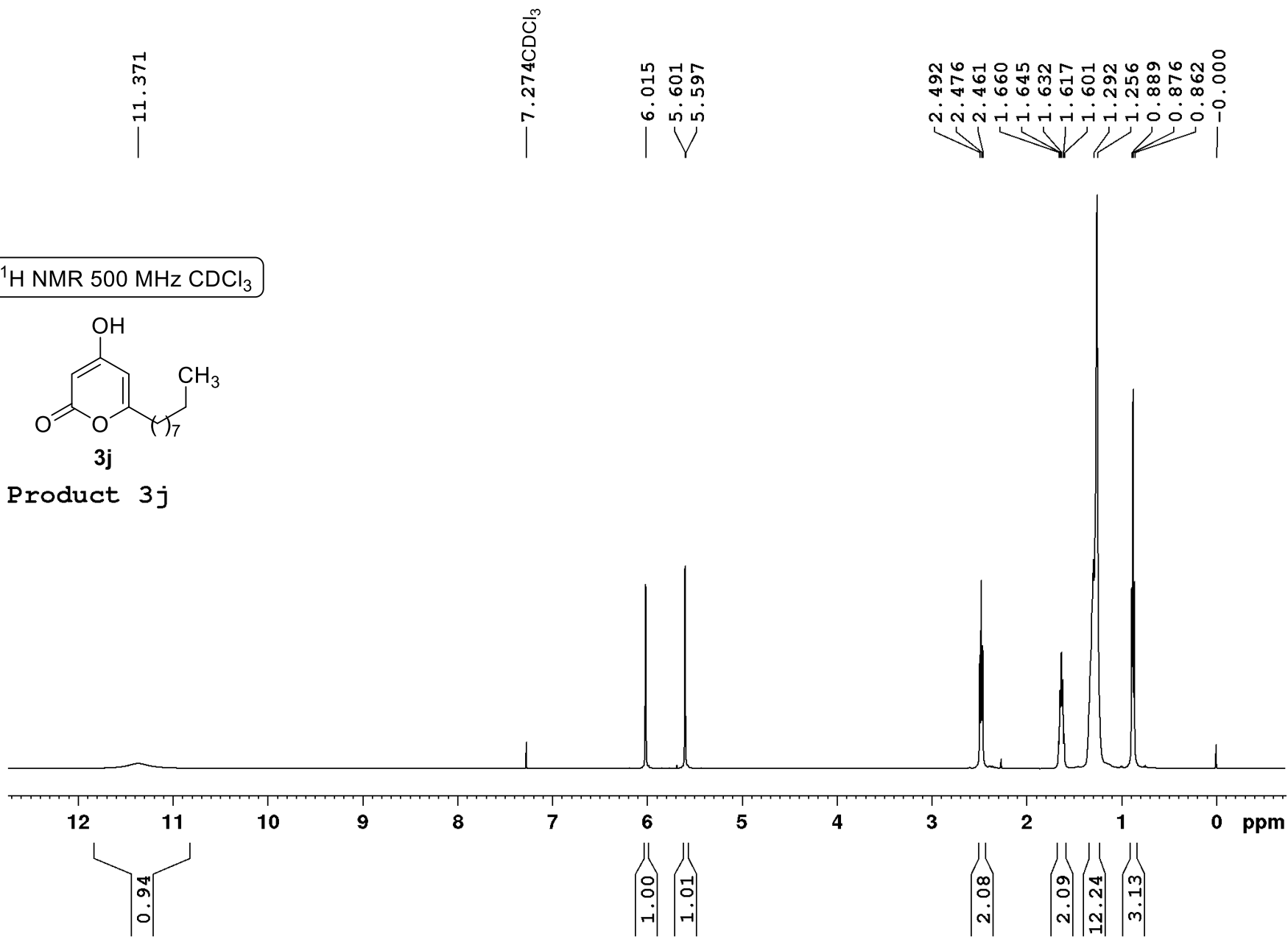
Product 3i



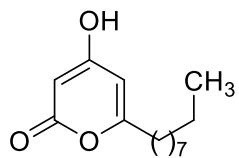
<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>



Product 3j

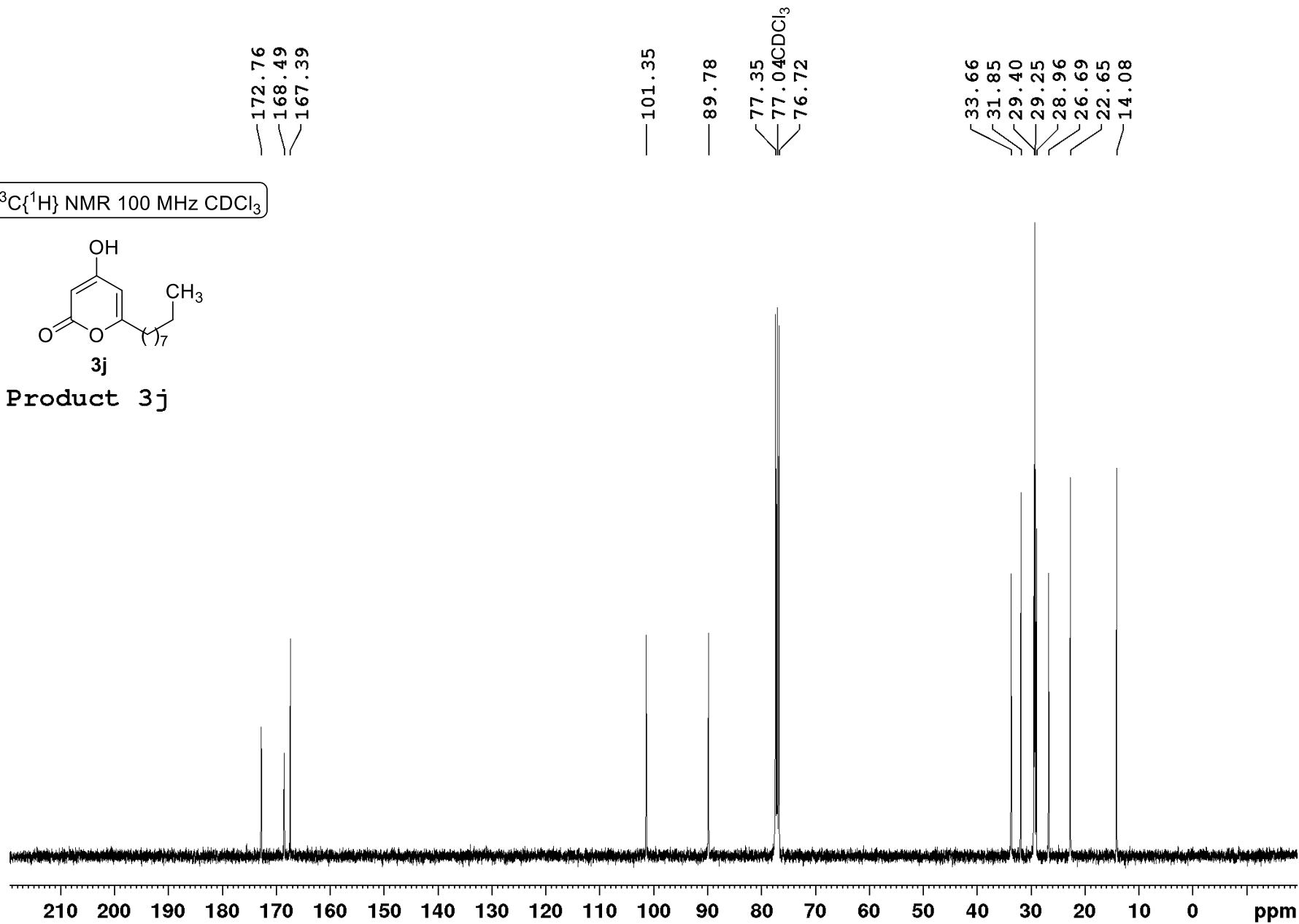


$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

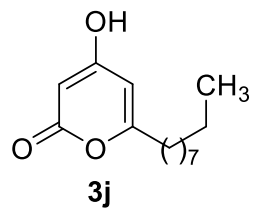


3j

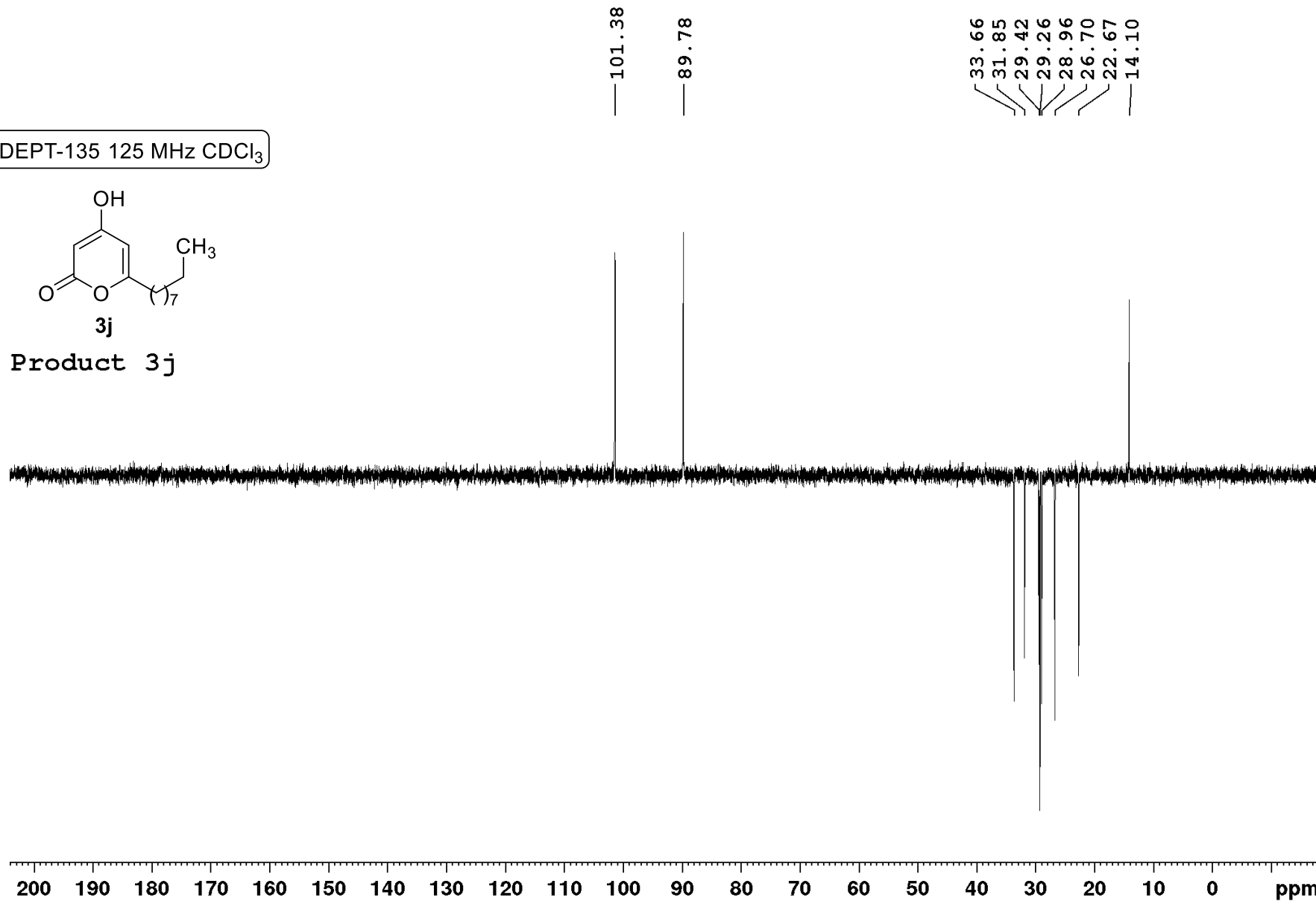
Product 3j



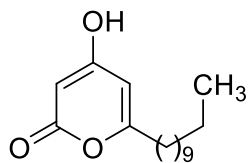
DEPT-135 125 MHz CDCl<sub>3</sub>



Product 3j

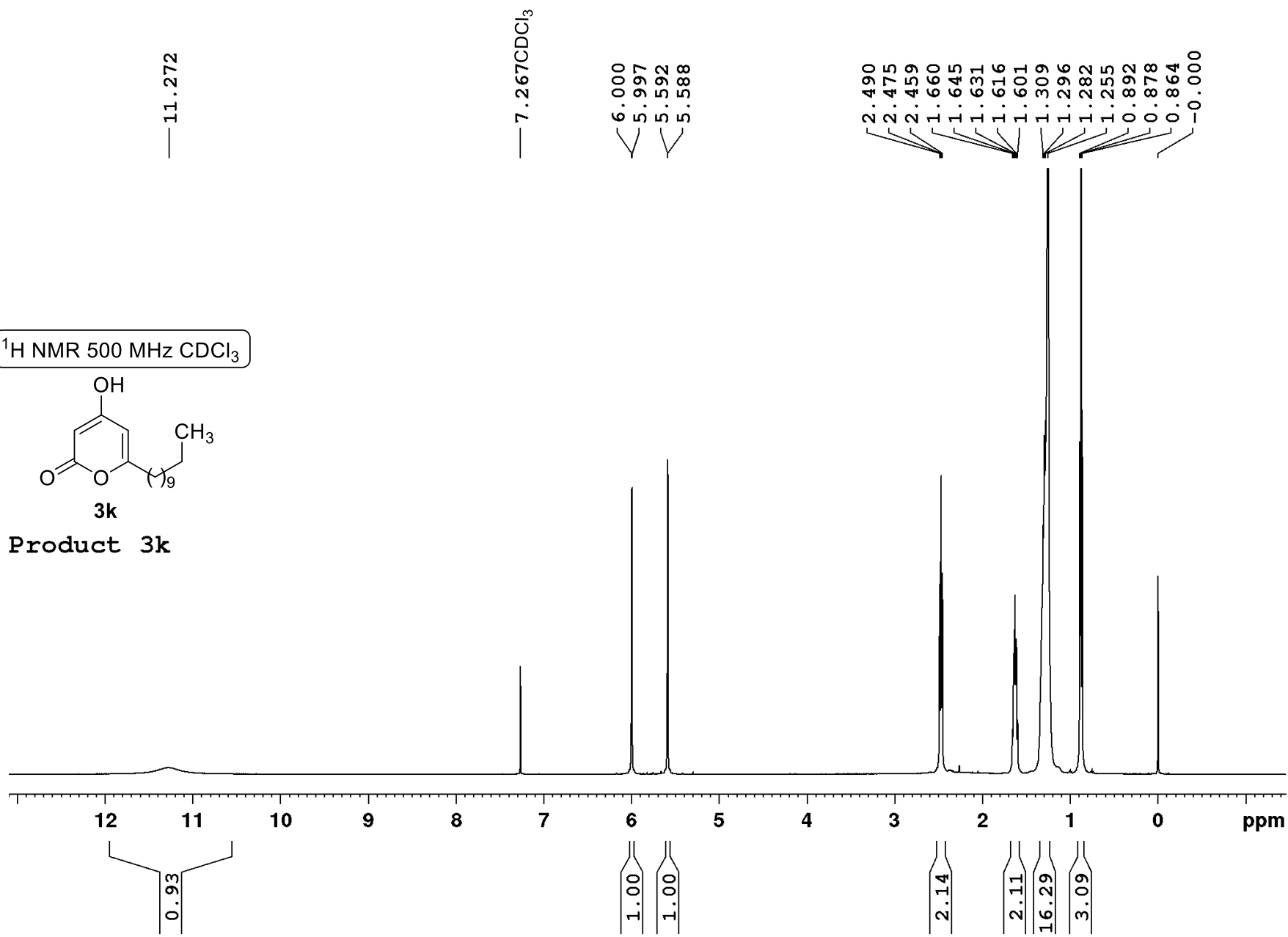


<sup>1</sup>H NMR 500 MHz CDCl<sub>3</sub>

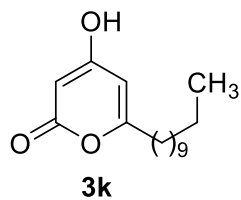


**3k**

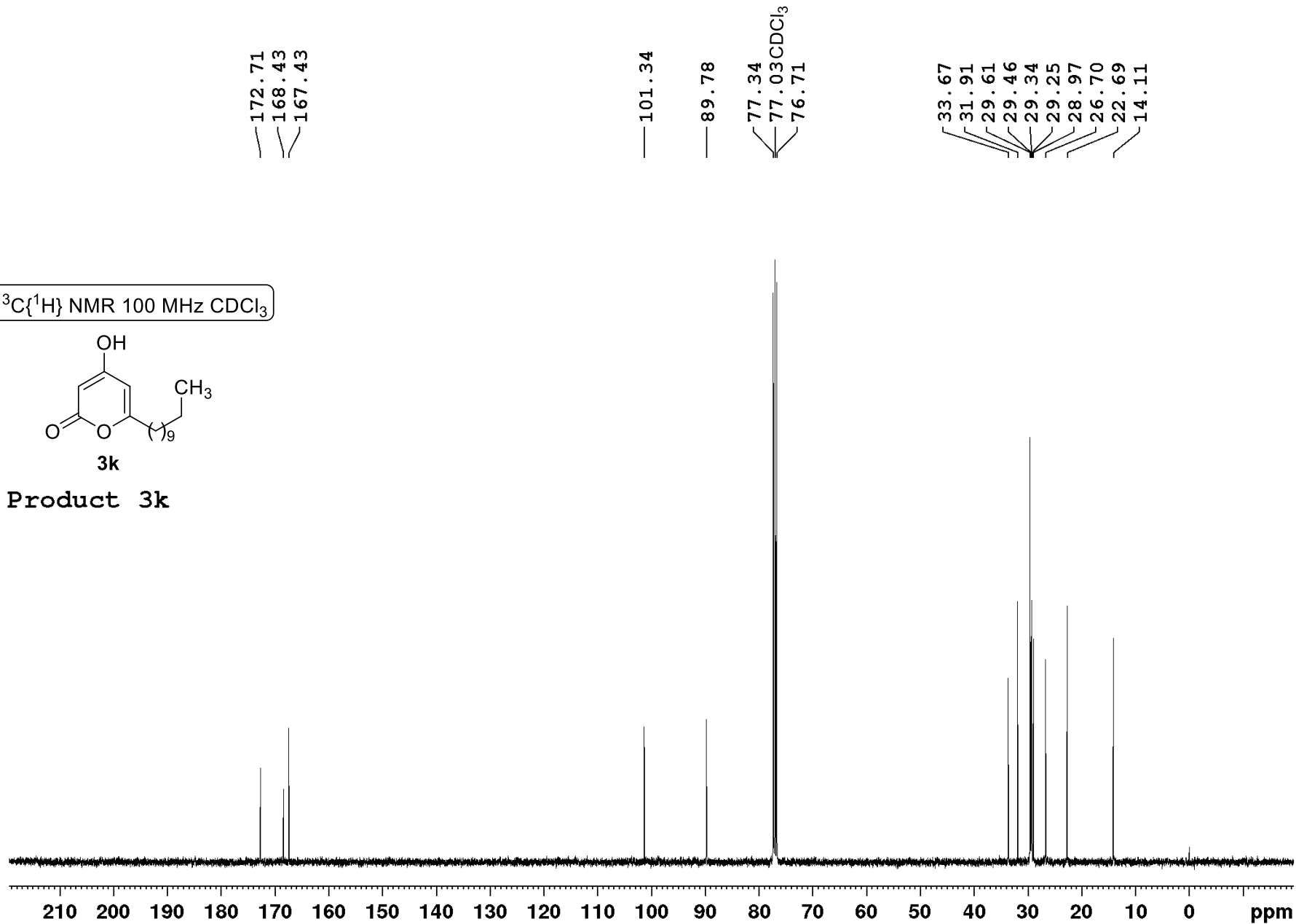
Product 3k



$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$

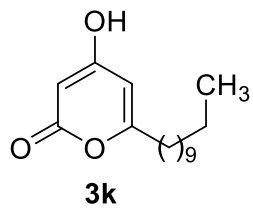


Product 3k

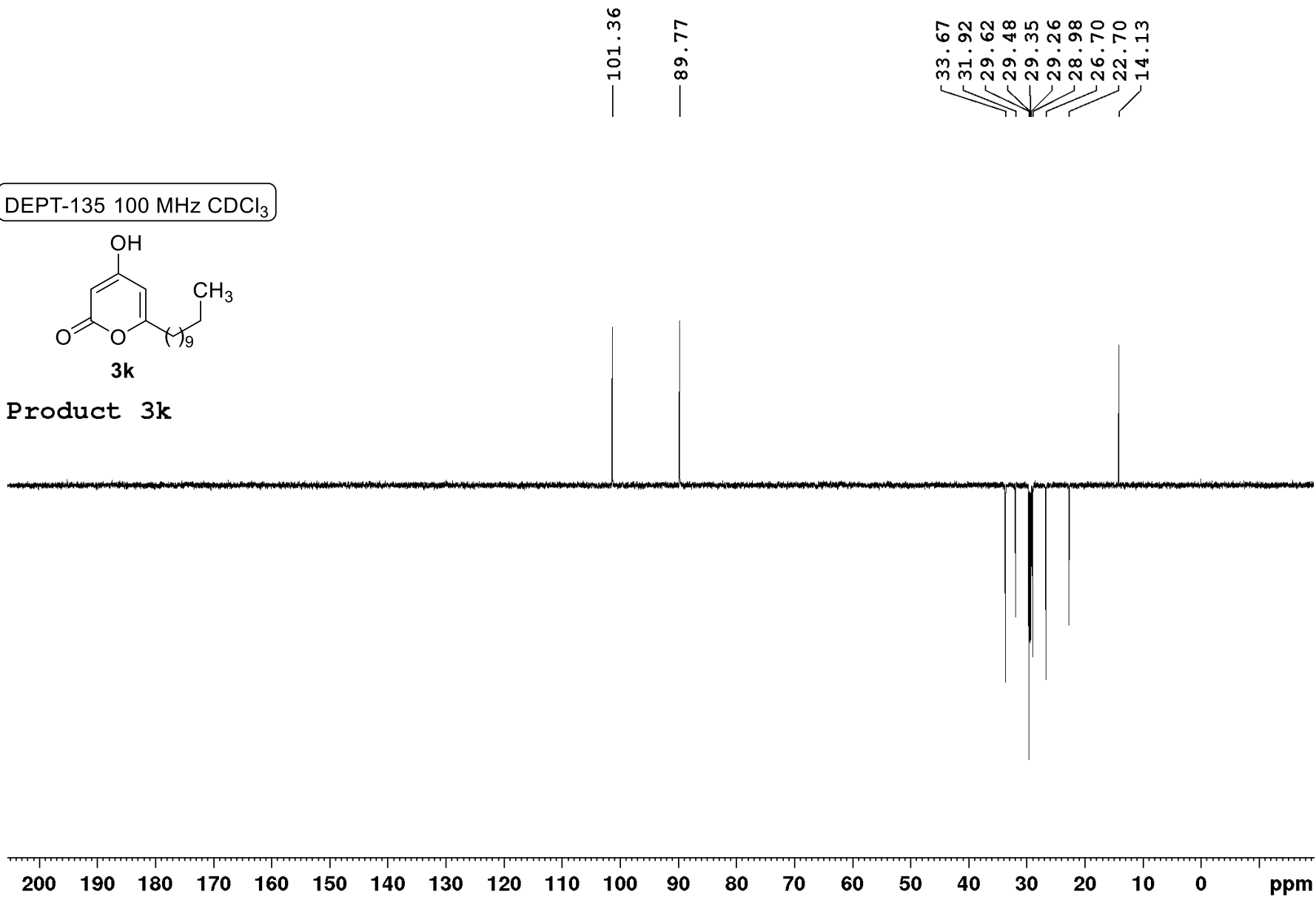


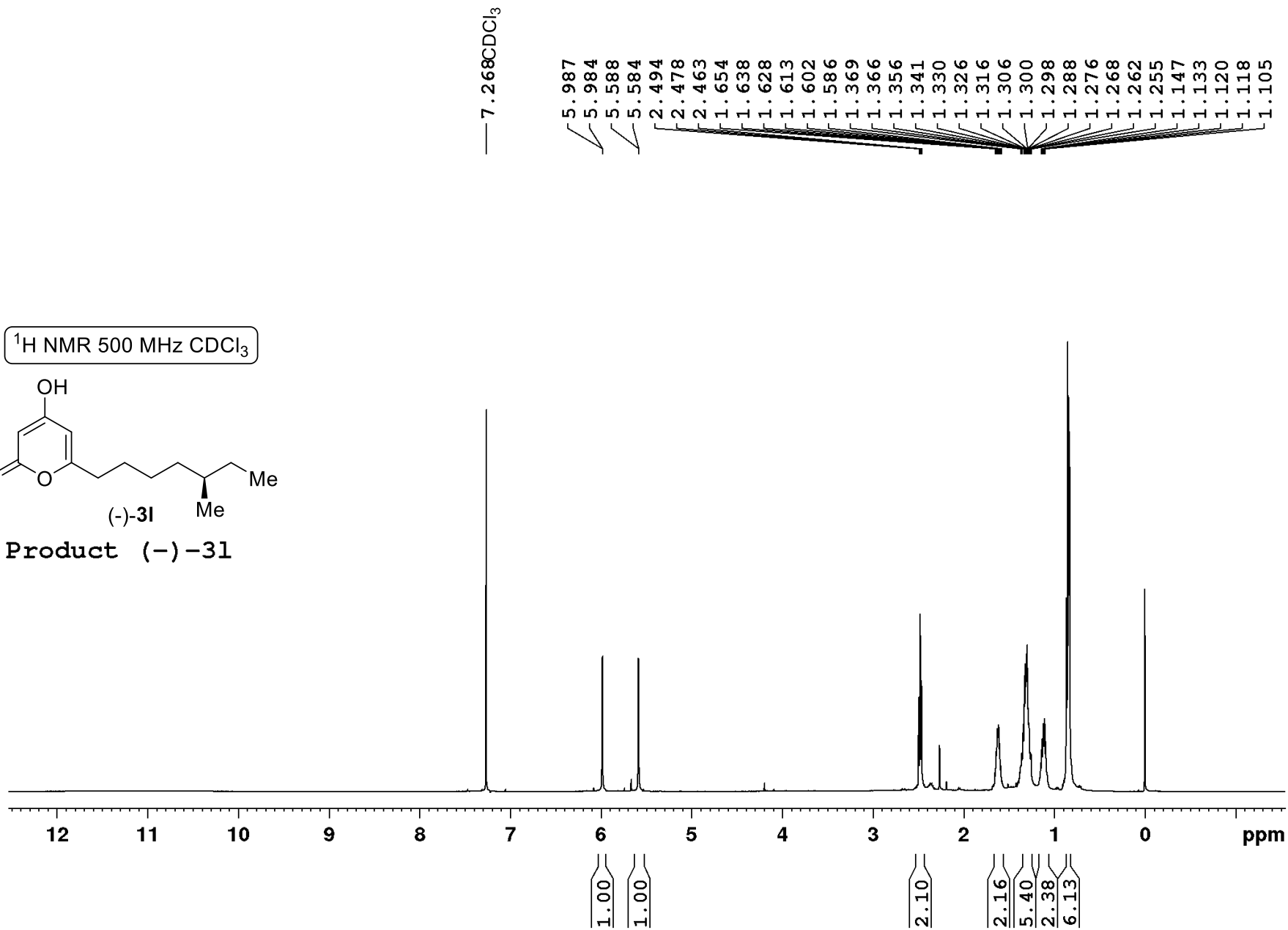
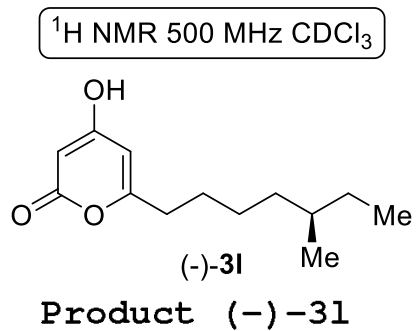


DEPT-135 100 MHz CDCl<sub>3</sub>

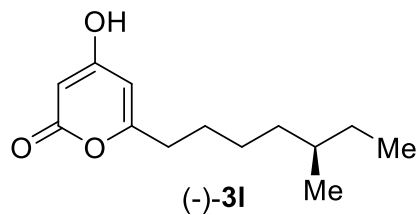


Product 3k

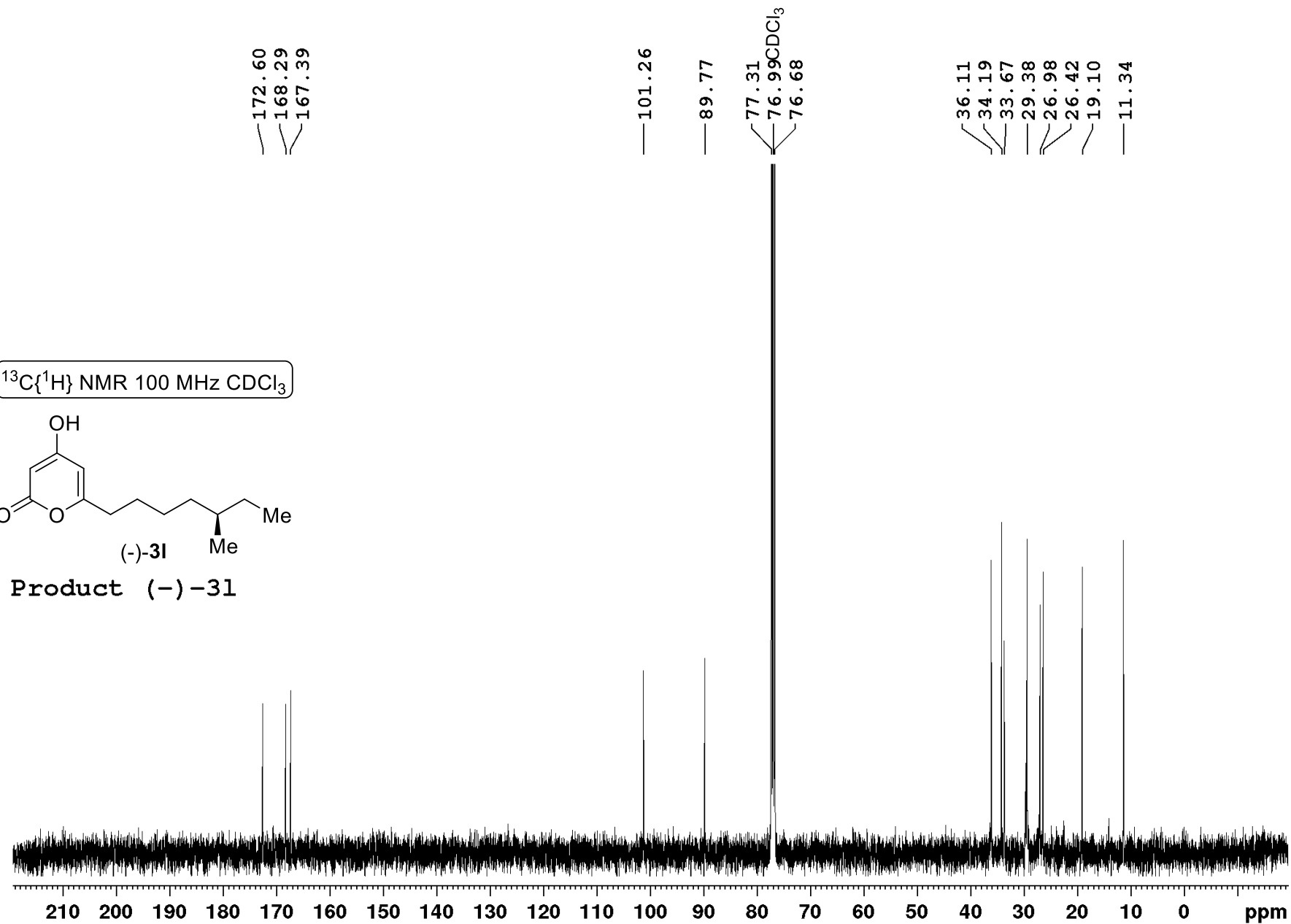




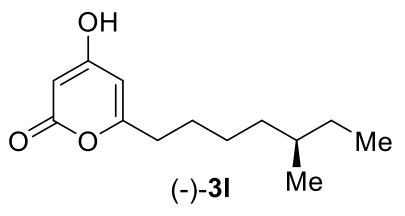
$^{13}\text{C}\{^1\text{H}\}$  NMR 100 MHz  $\text{CDCl}_3$



Product (-)-31



DEPT-135 100 MHz CDCl<sub>3</sub>



Product (-)-31

