

Supporting Information-II

Constructing Chiral Bicyclo[3.2.1]octanes *via* Low-loading Organocatalysis

Etikala Ashok,¹ Pandhiti R. Lakshmi,¹ Revoju Sravanthi,^{1,2} and Dhevalapally B. Ramachary^{1,3,*}

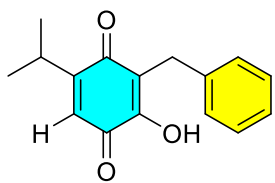
¹Catalysis Laboratory, School of Chemistry, University of Hyderabad, Hyderabad-500 046, India

²Department of Pharmaceutical Chemistry, GITAM School of Pharmacy, GITAM University, Visakhapatnam-530 045, India

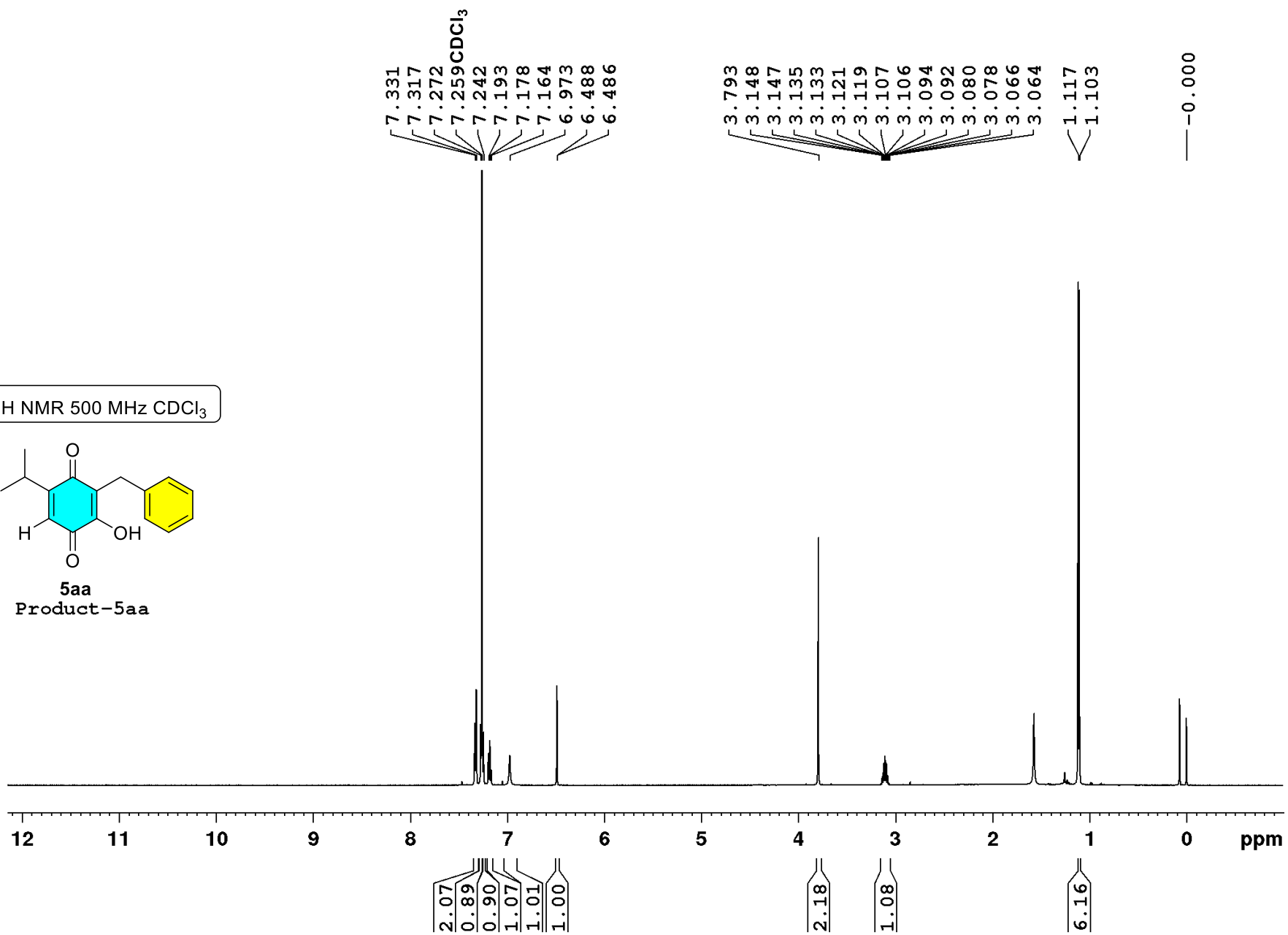
³Lead contact

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

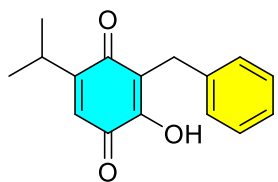
¹H NMR 500 MHz CDCl₃



5aa
Product-5aa

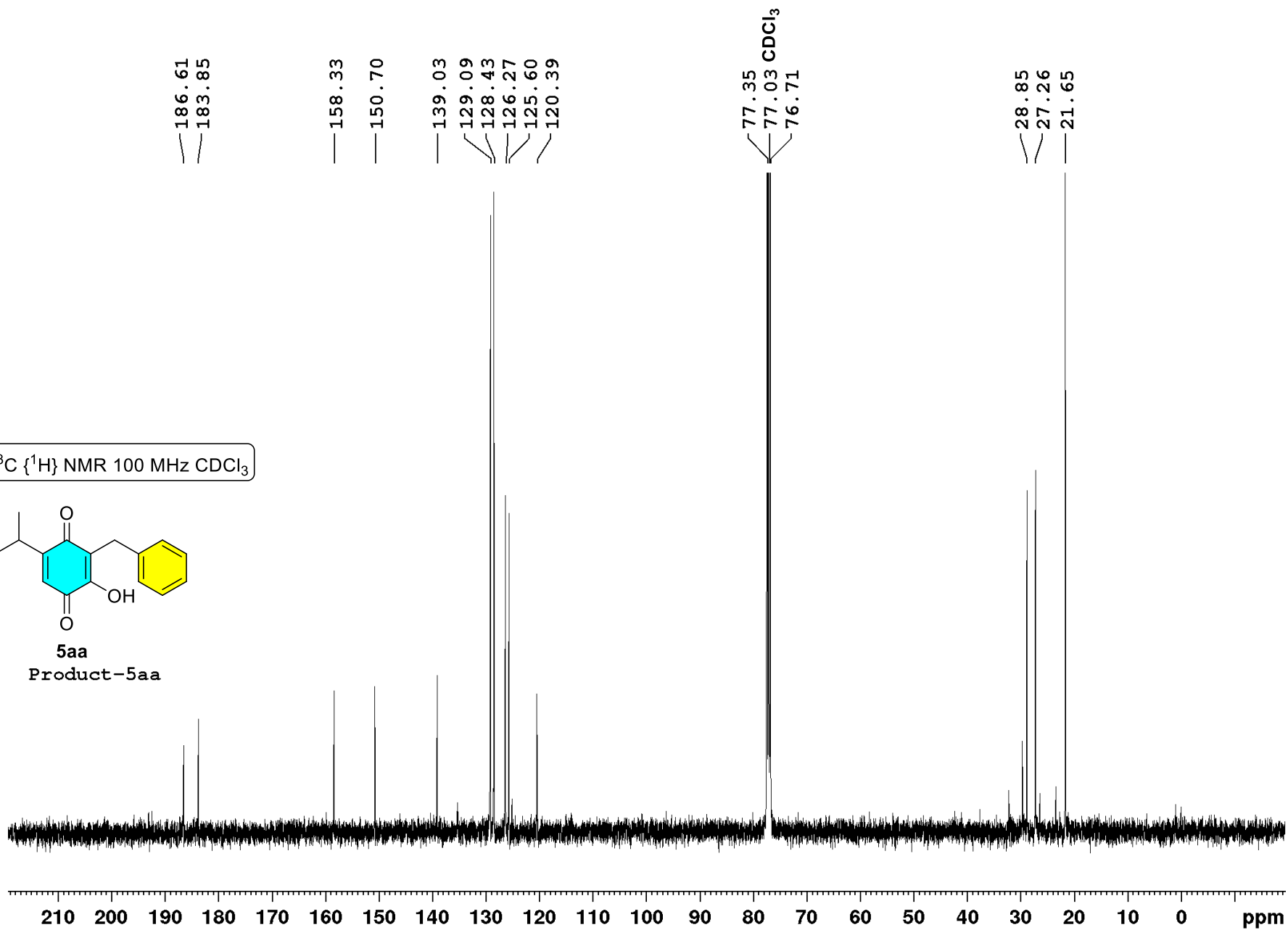


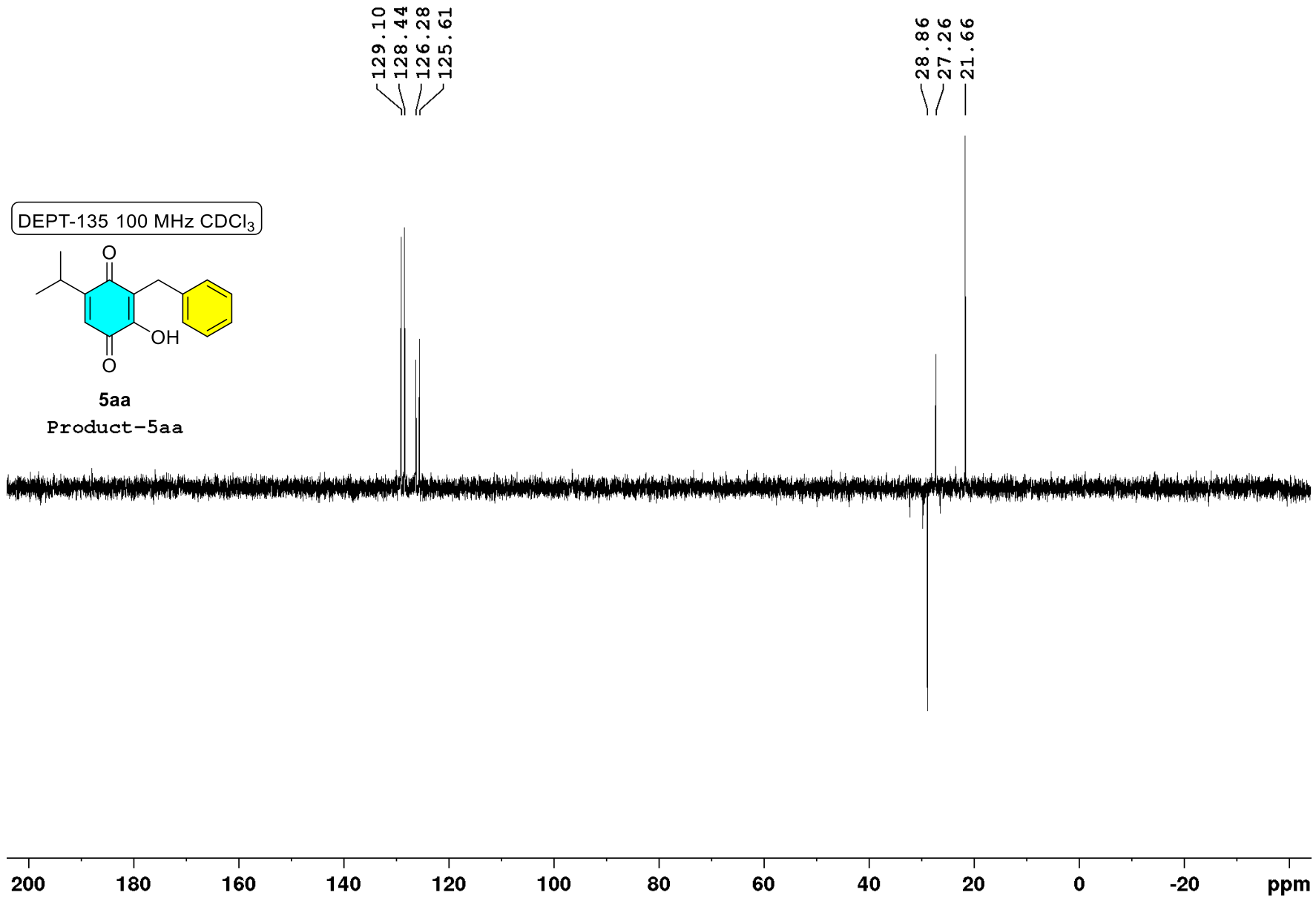
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



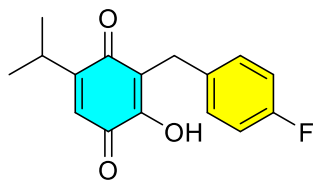
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Product-5aa

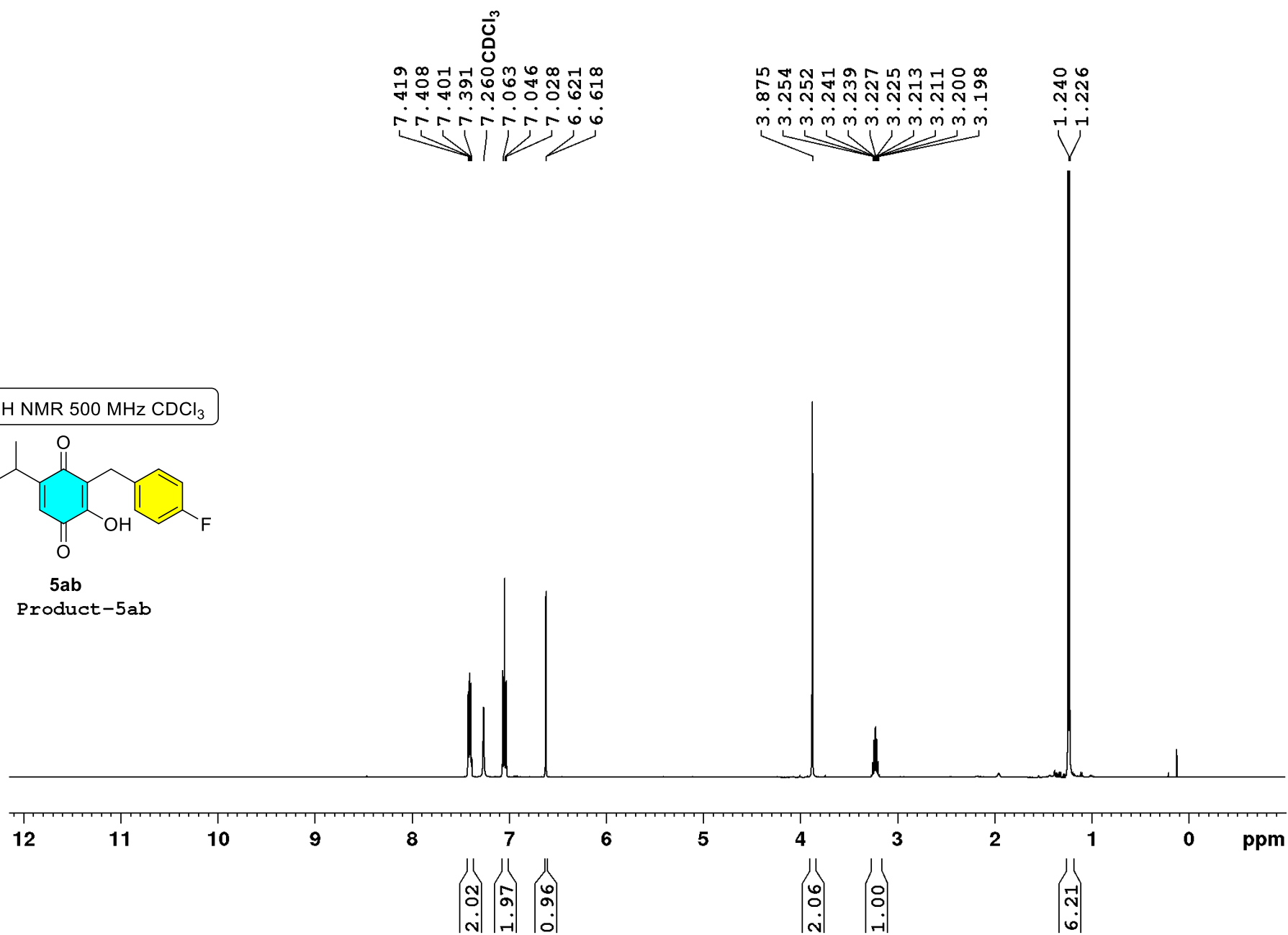




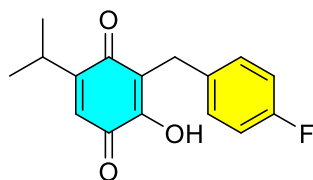
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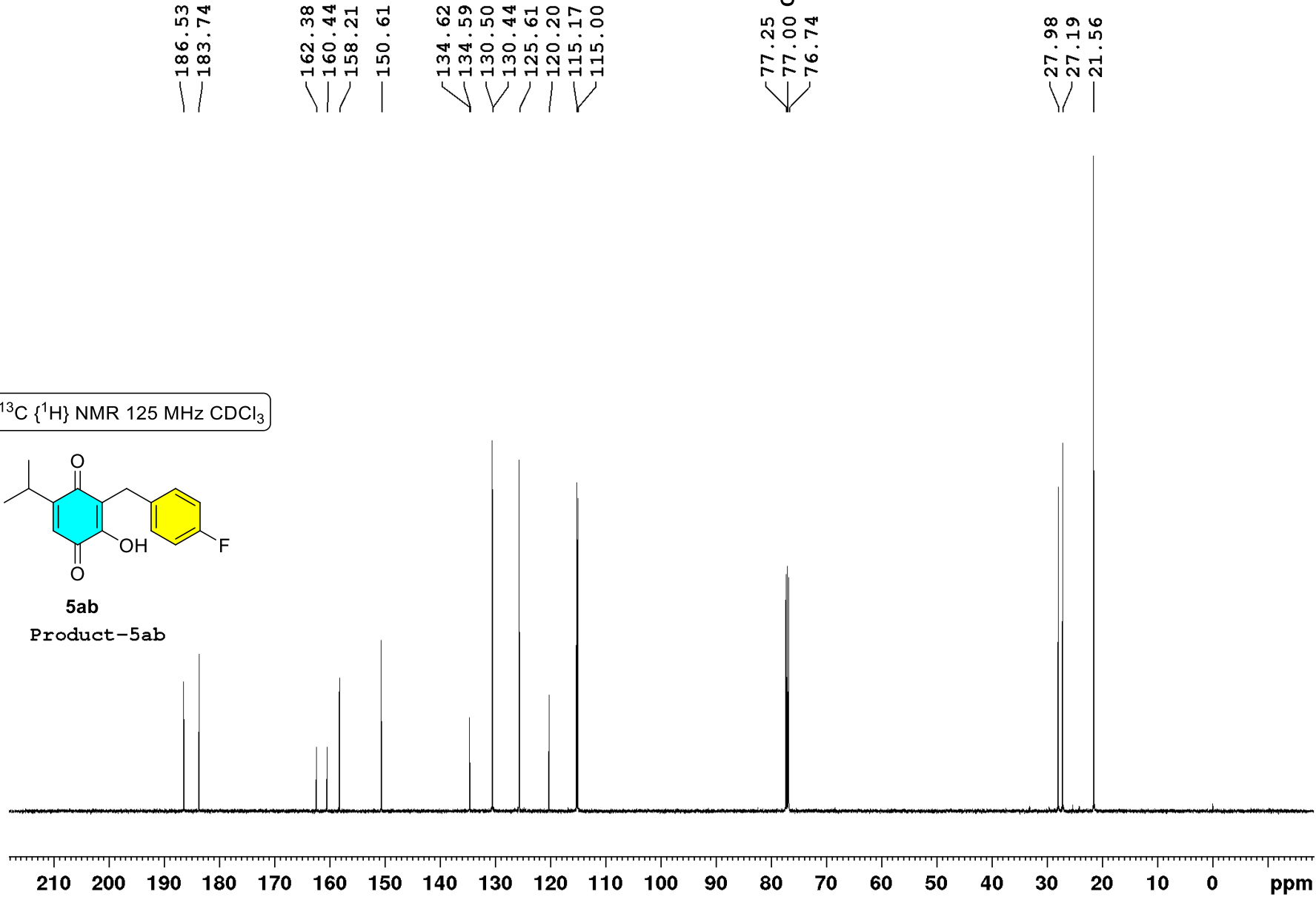
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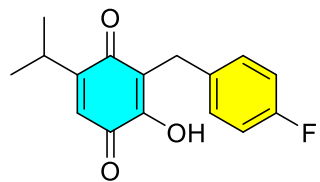
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5ab
Product-5ab



DEPT-135 NMR 125 MHz CDCl₃



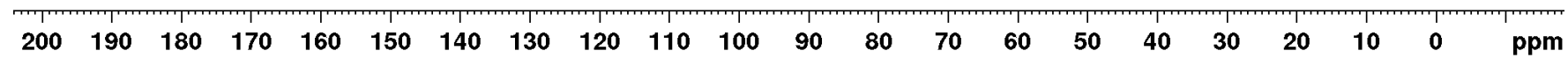
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Product-5ab

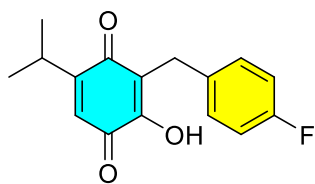
130.50
130.44
125.60

115.16
114.99

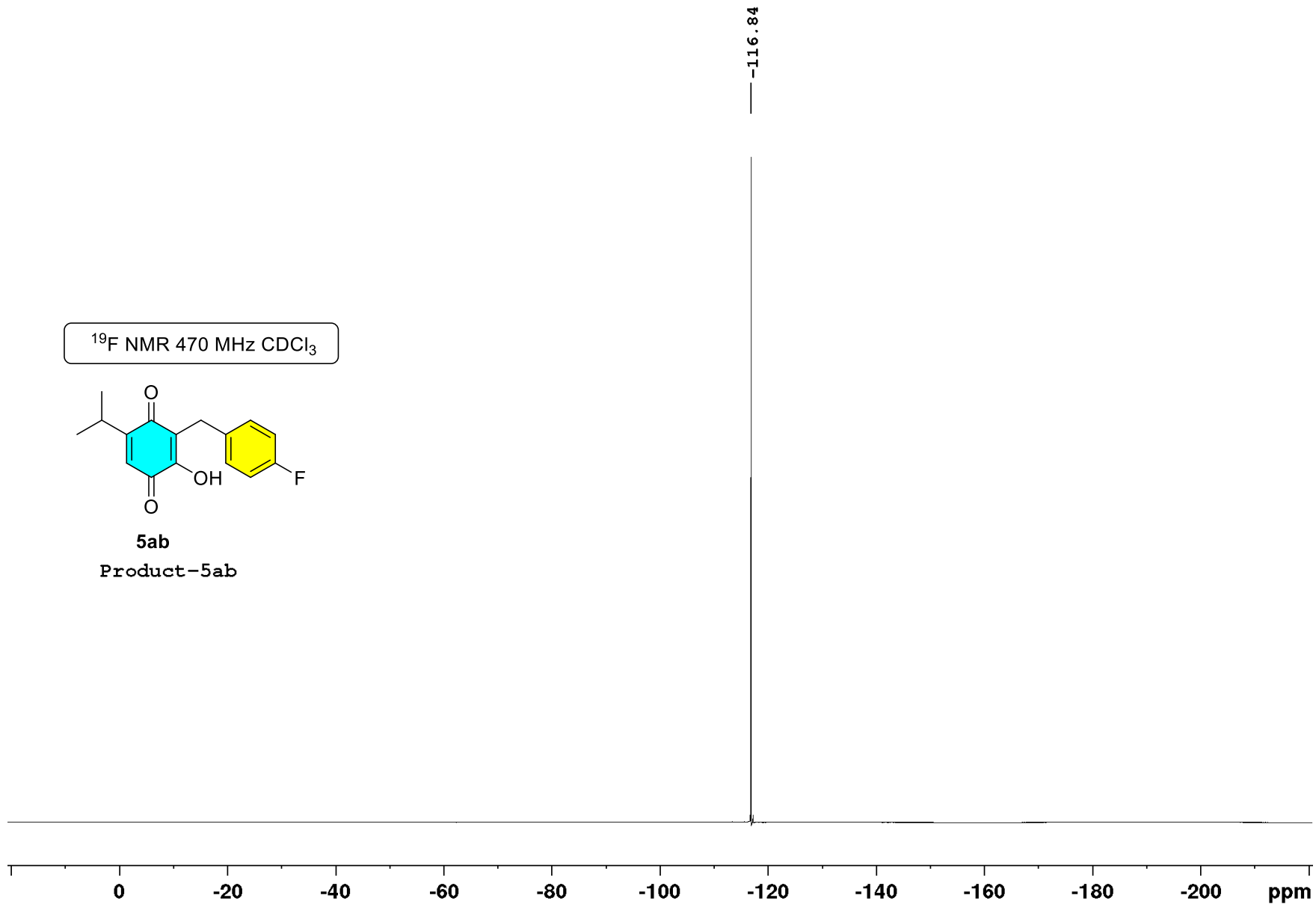
27.97
27.18
21.56



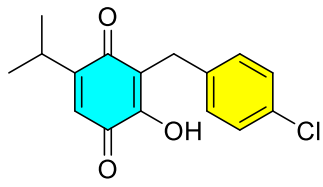
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5ab
Product-5ab

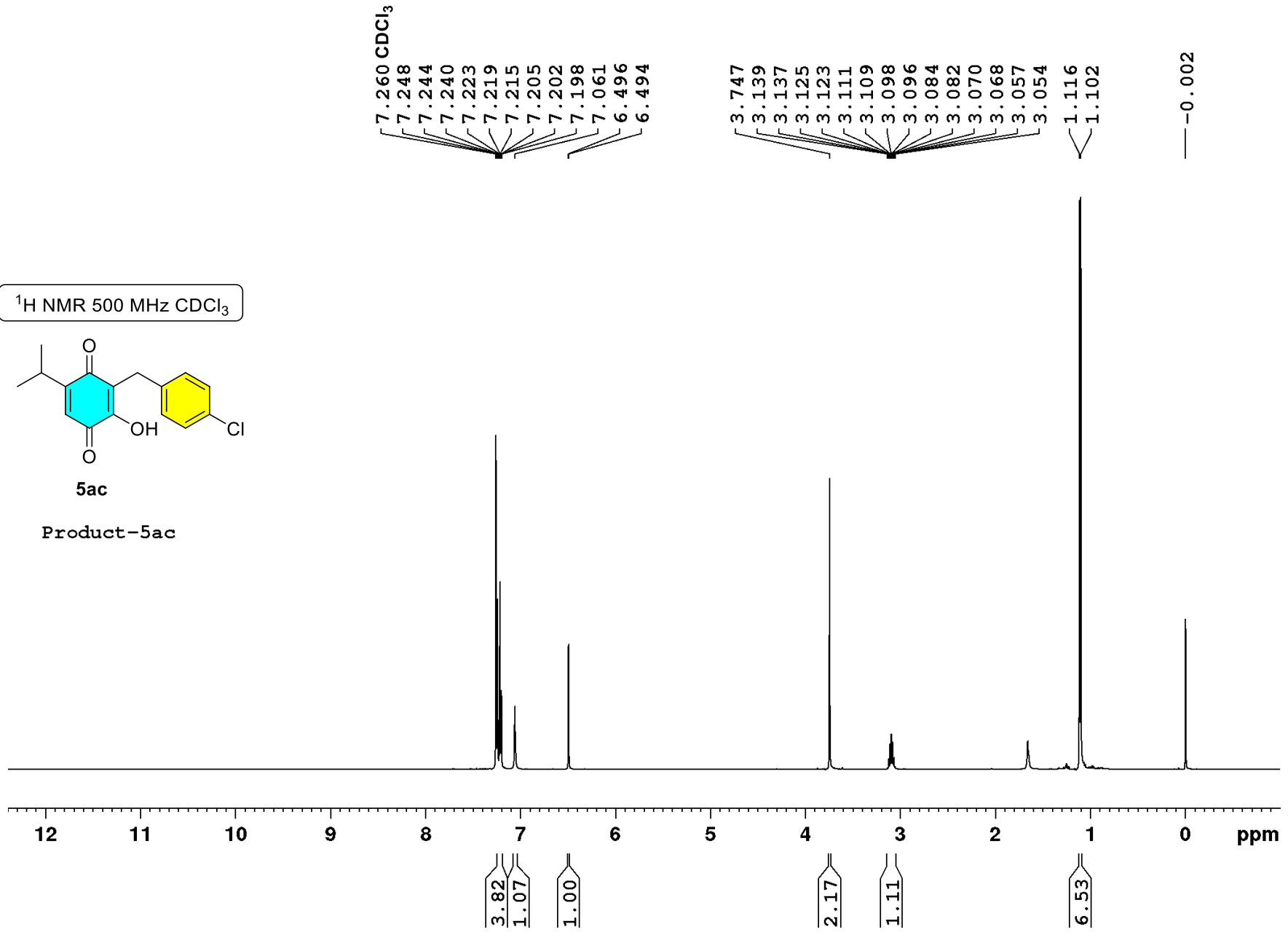


¹H NMR 500 MHz CDCl₃

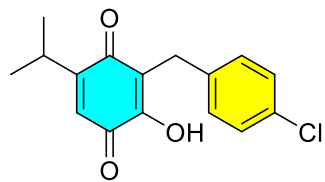


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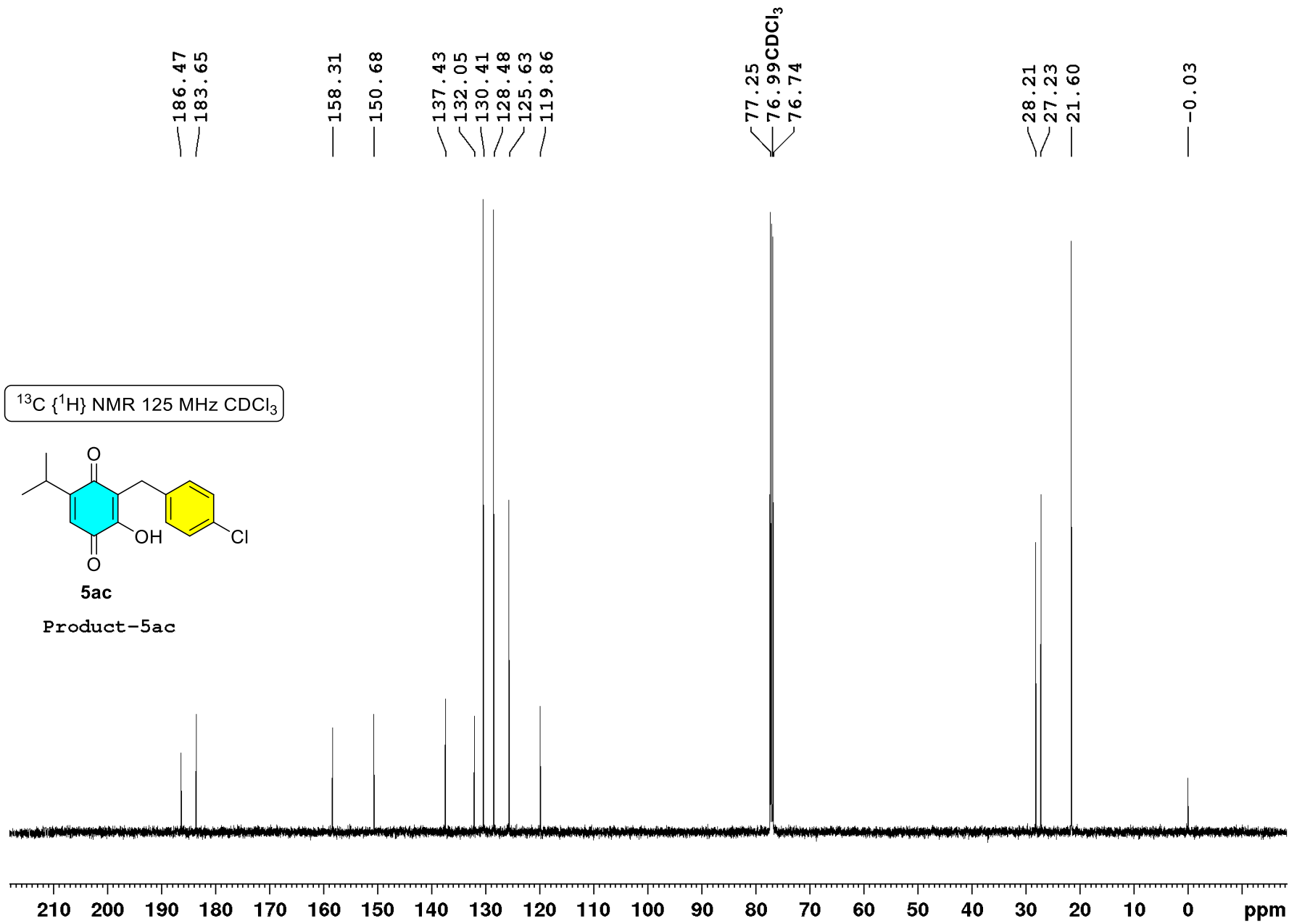
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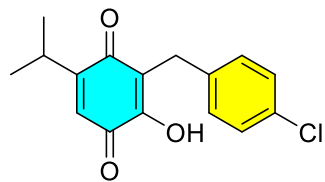
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Product-5ac



DEPT-135 NMR 125 MHz CDCl₃

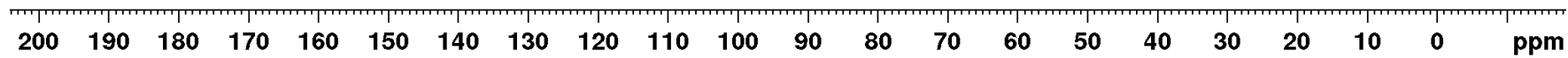


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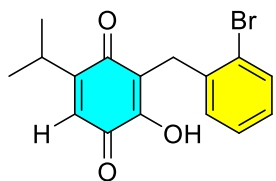
Product-5ac

130.41
128.48
125.63

28.20
27.23
21.60

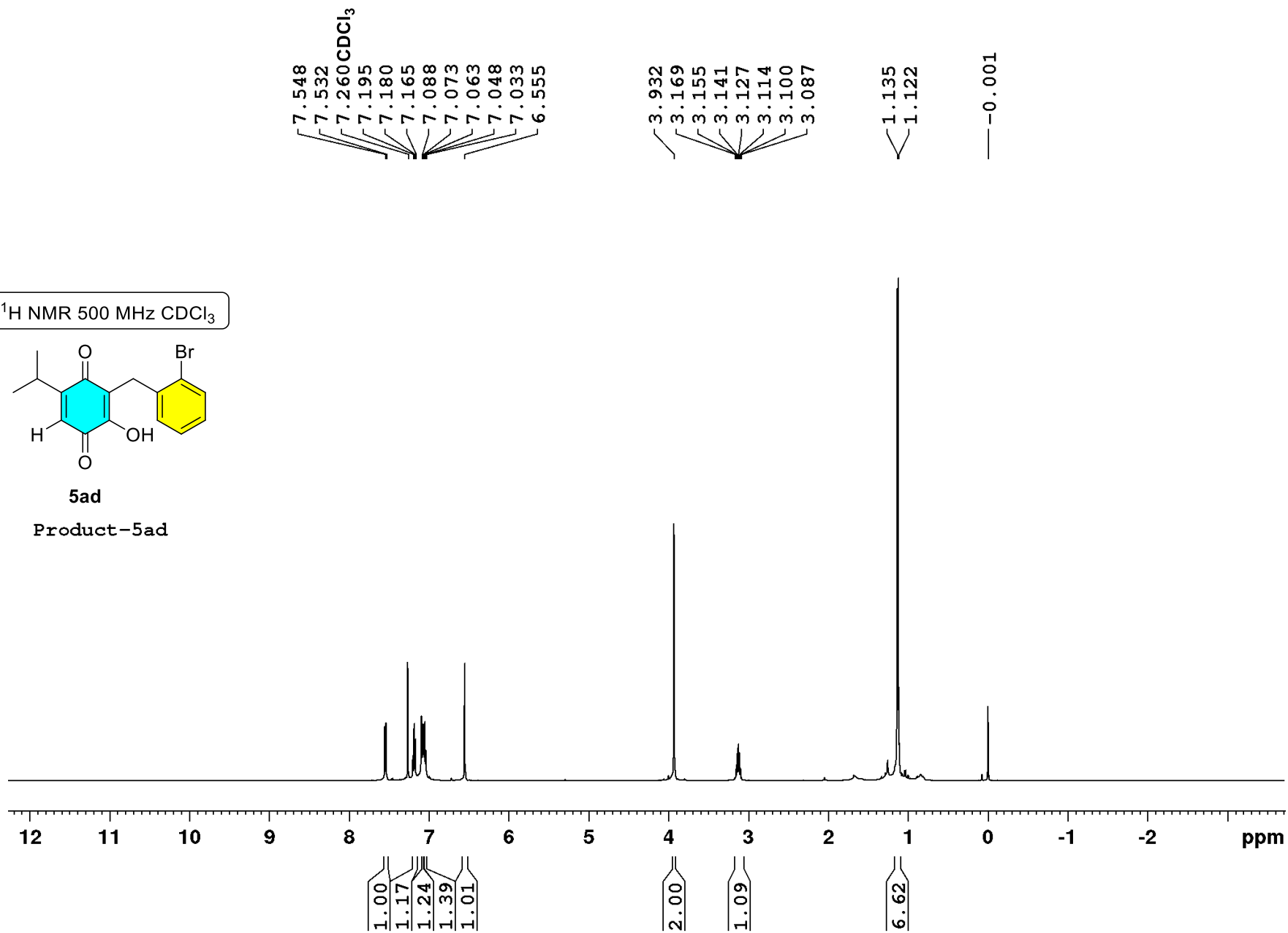


¹H NMR 500 MHz CDCl₃

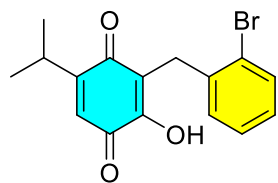


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Product-5ad

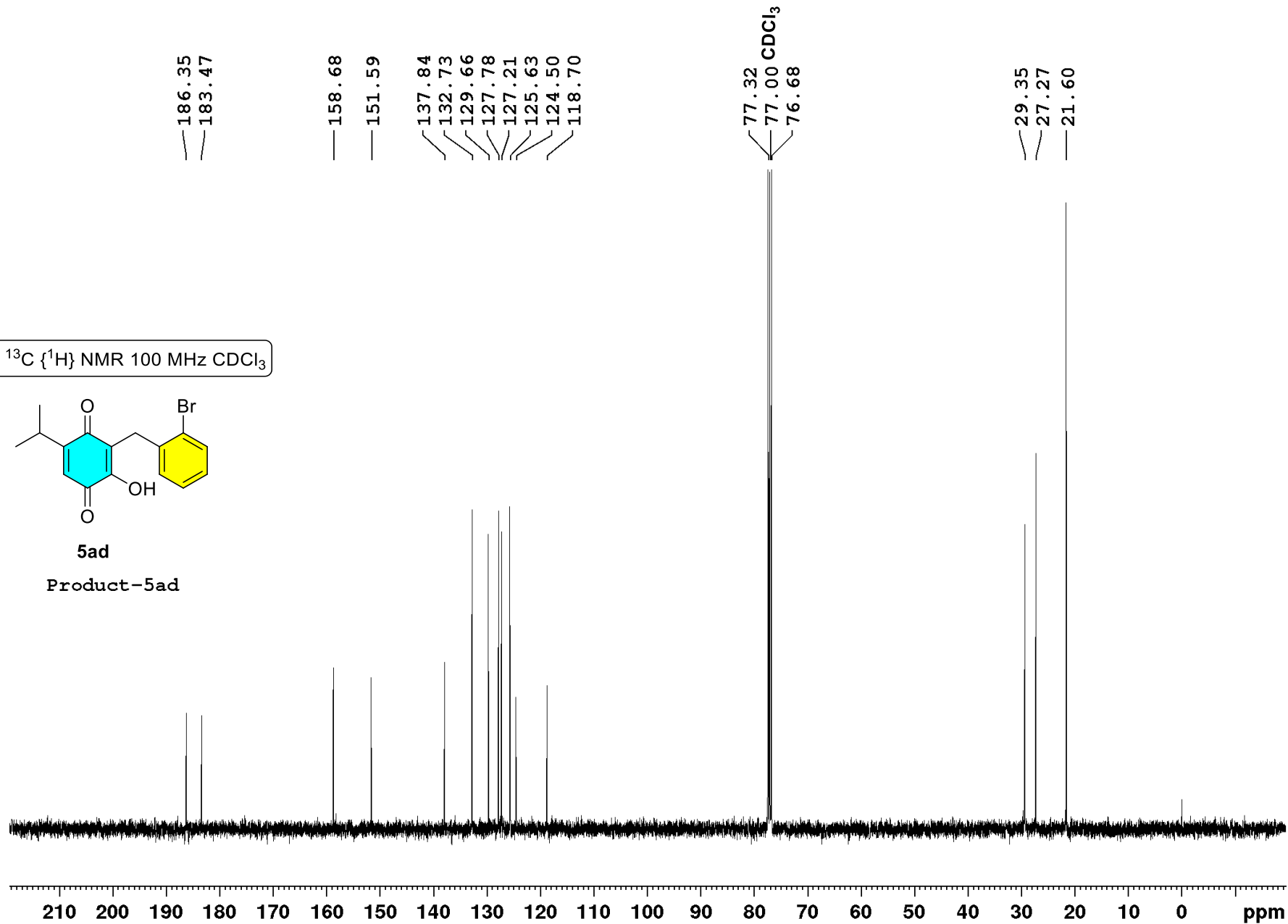


^{13}C { ^1H } NMR 100 MHz CDCl_3

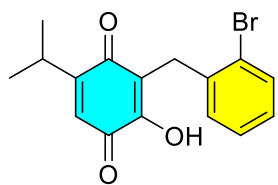


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Product-5ad



DEPT-135 NMR 100 MHz CDCl₃

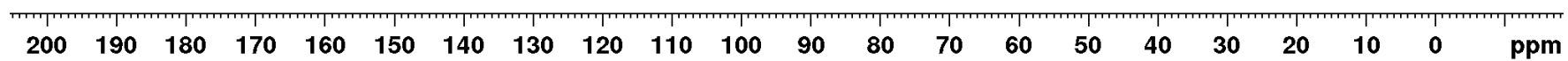


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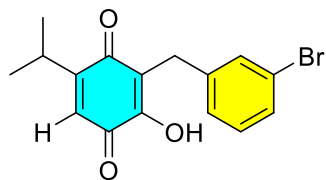
Product-5ad

132.73
129.64
127.78
127.22
125.62

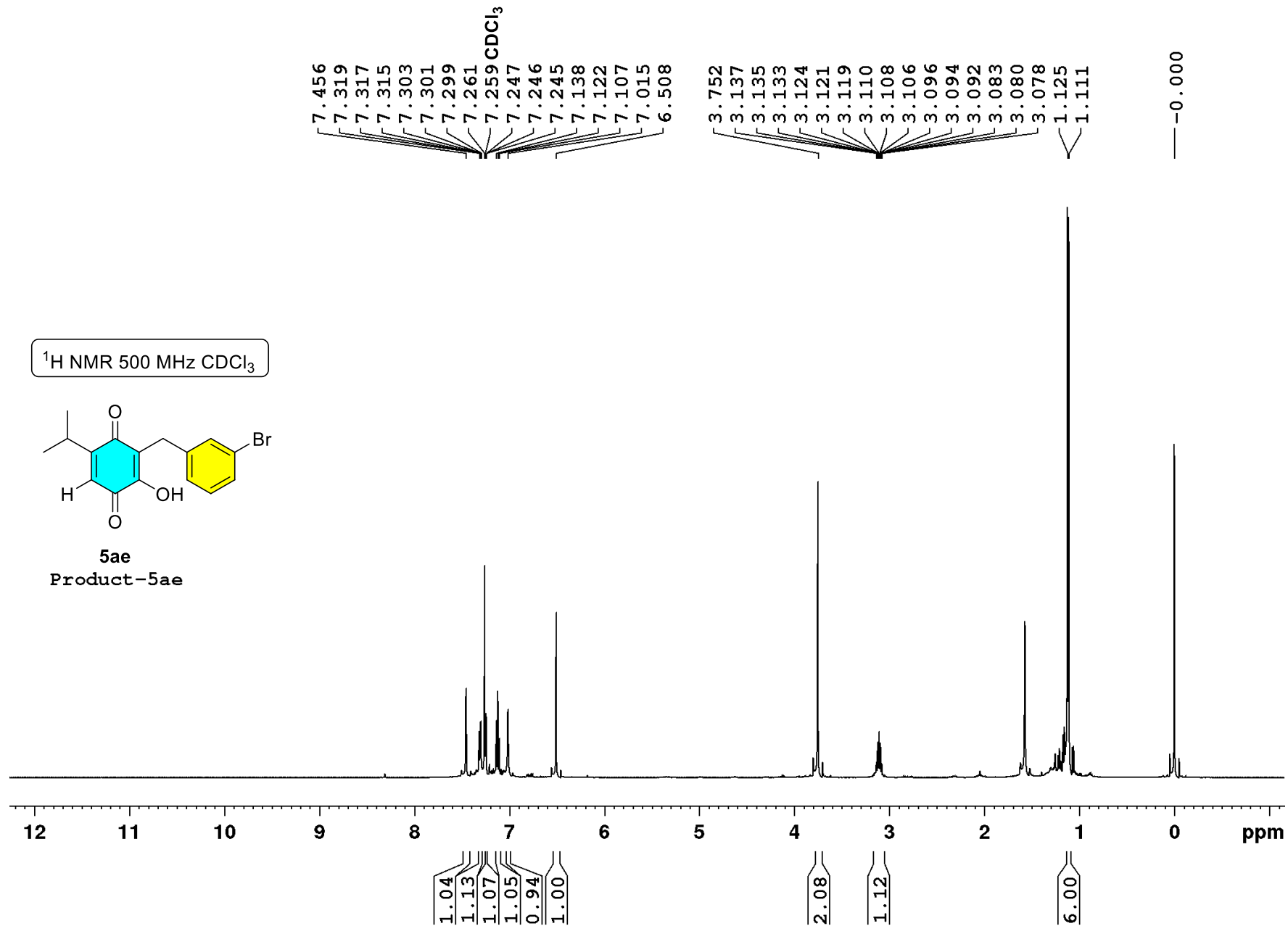
29.34
27.26
21.60



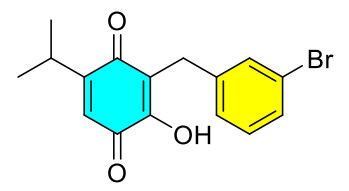
¹H NMR 500 MHz CDCl₃



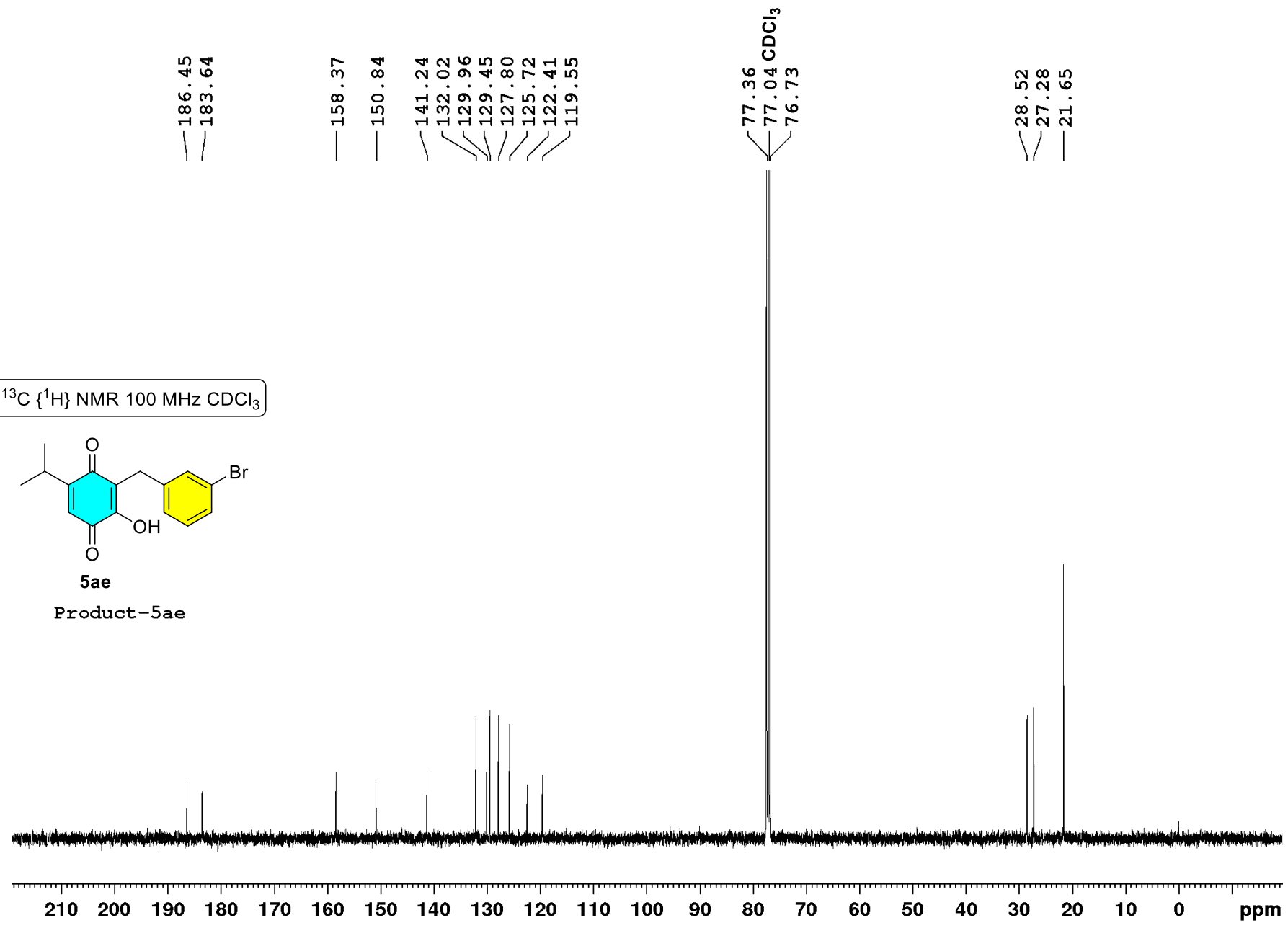
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Product-5ae



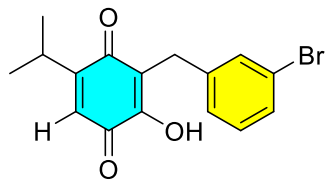
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



5ae
Product-5ae

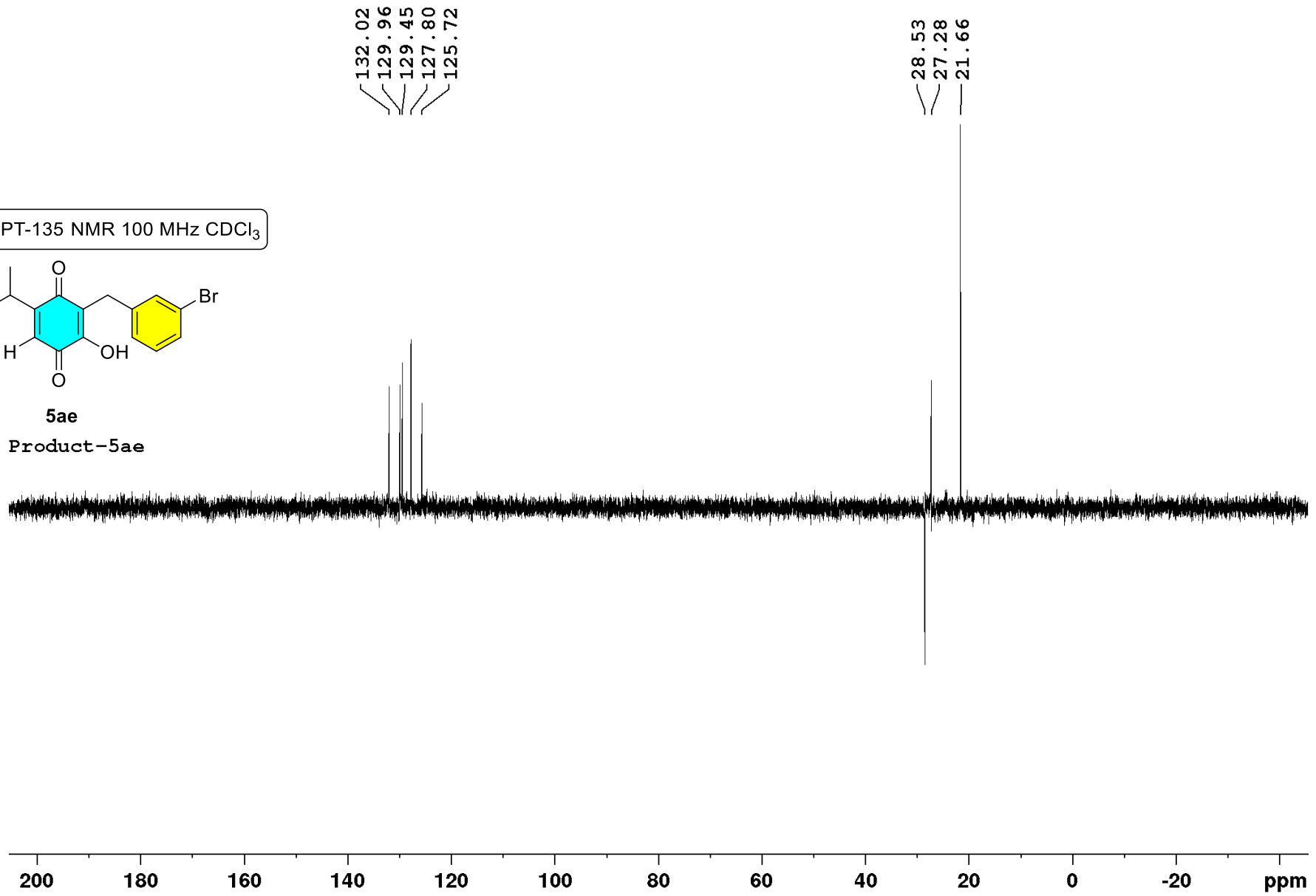


DEPT-135 NMR 100 MHz CDCl₃

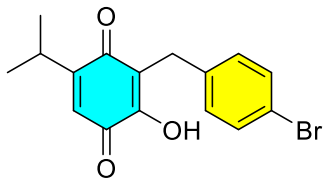


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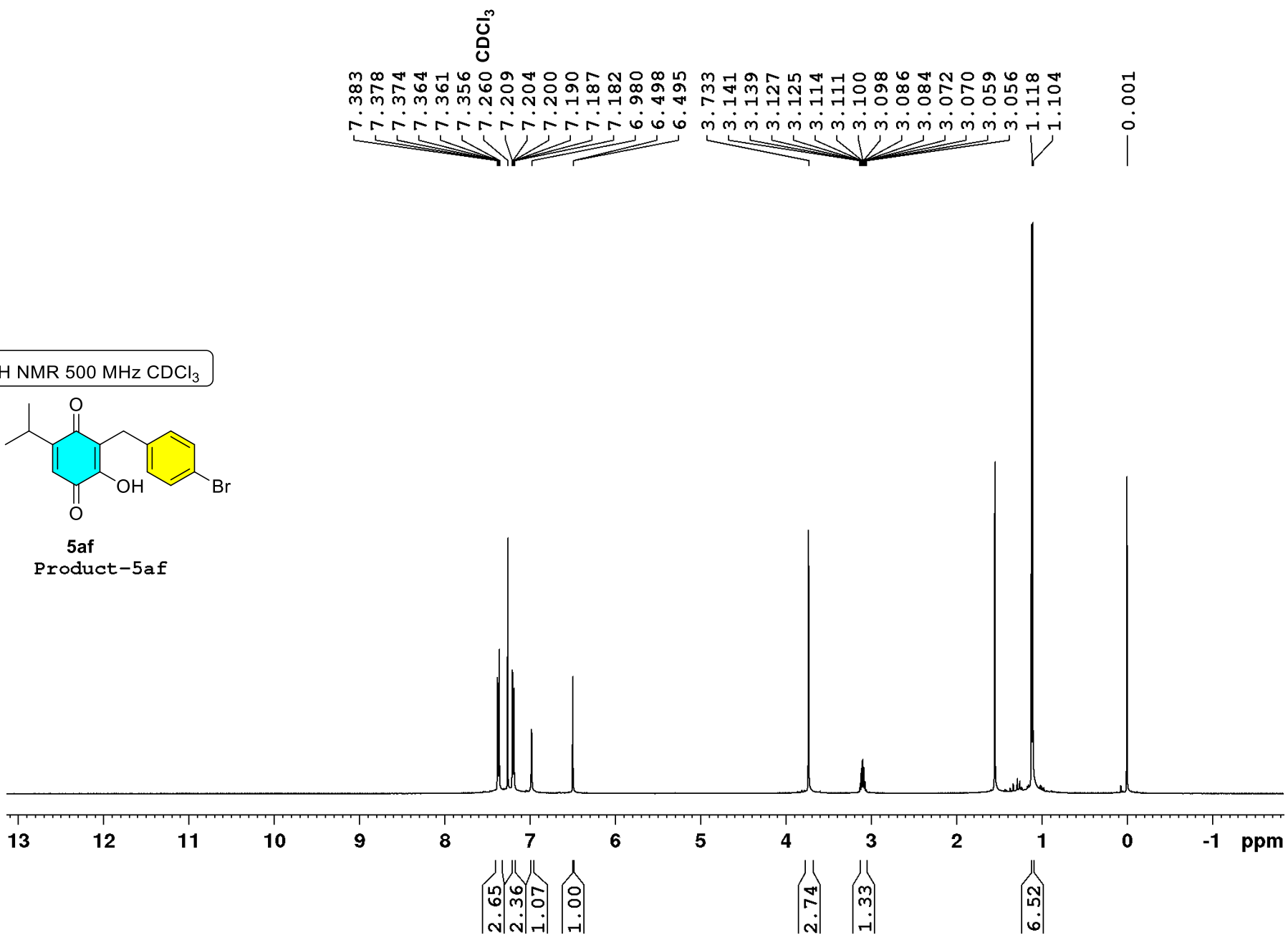
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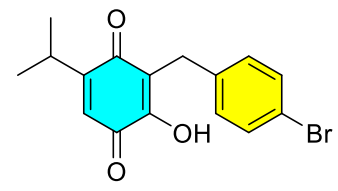
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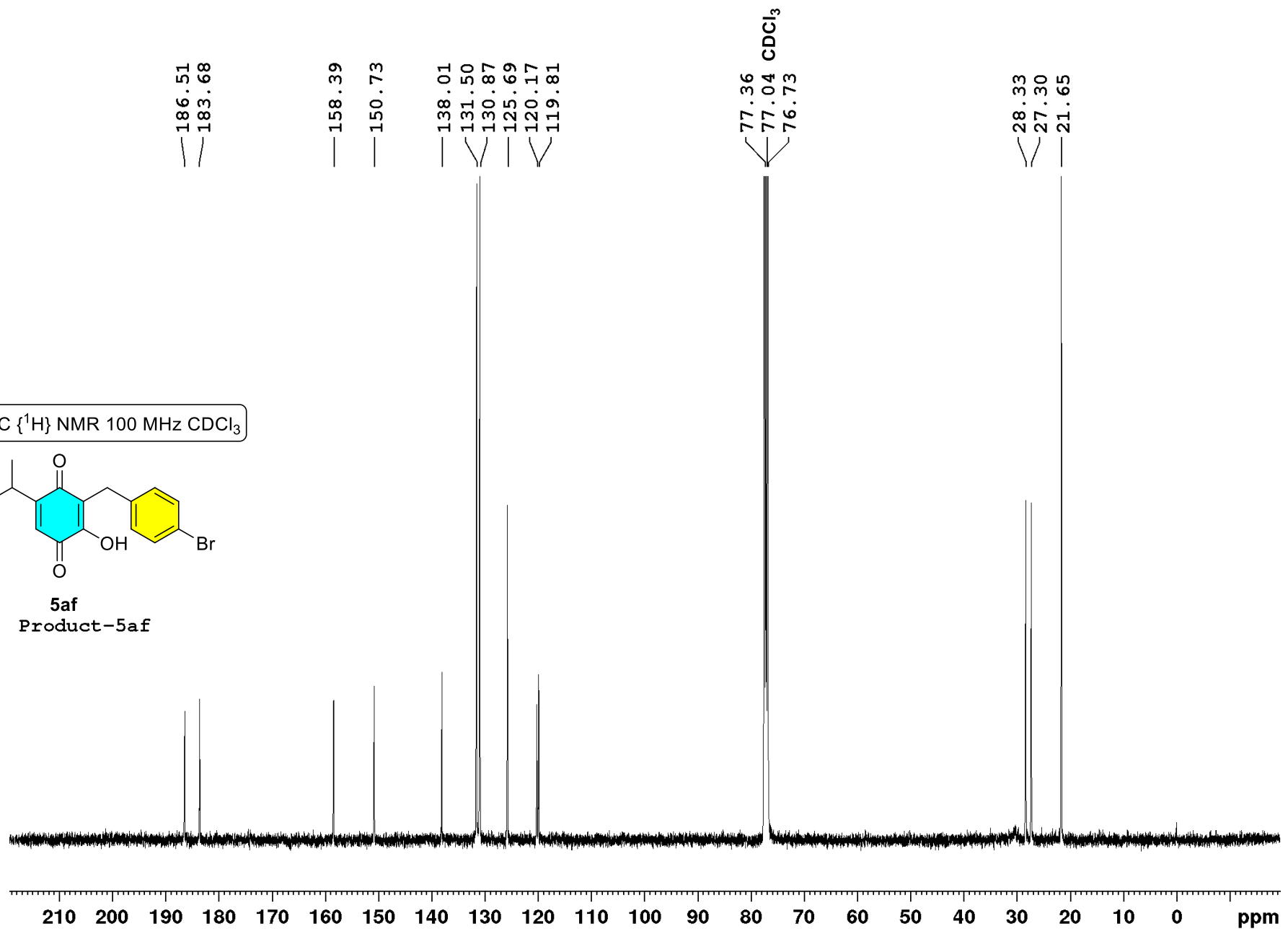
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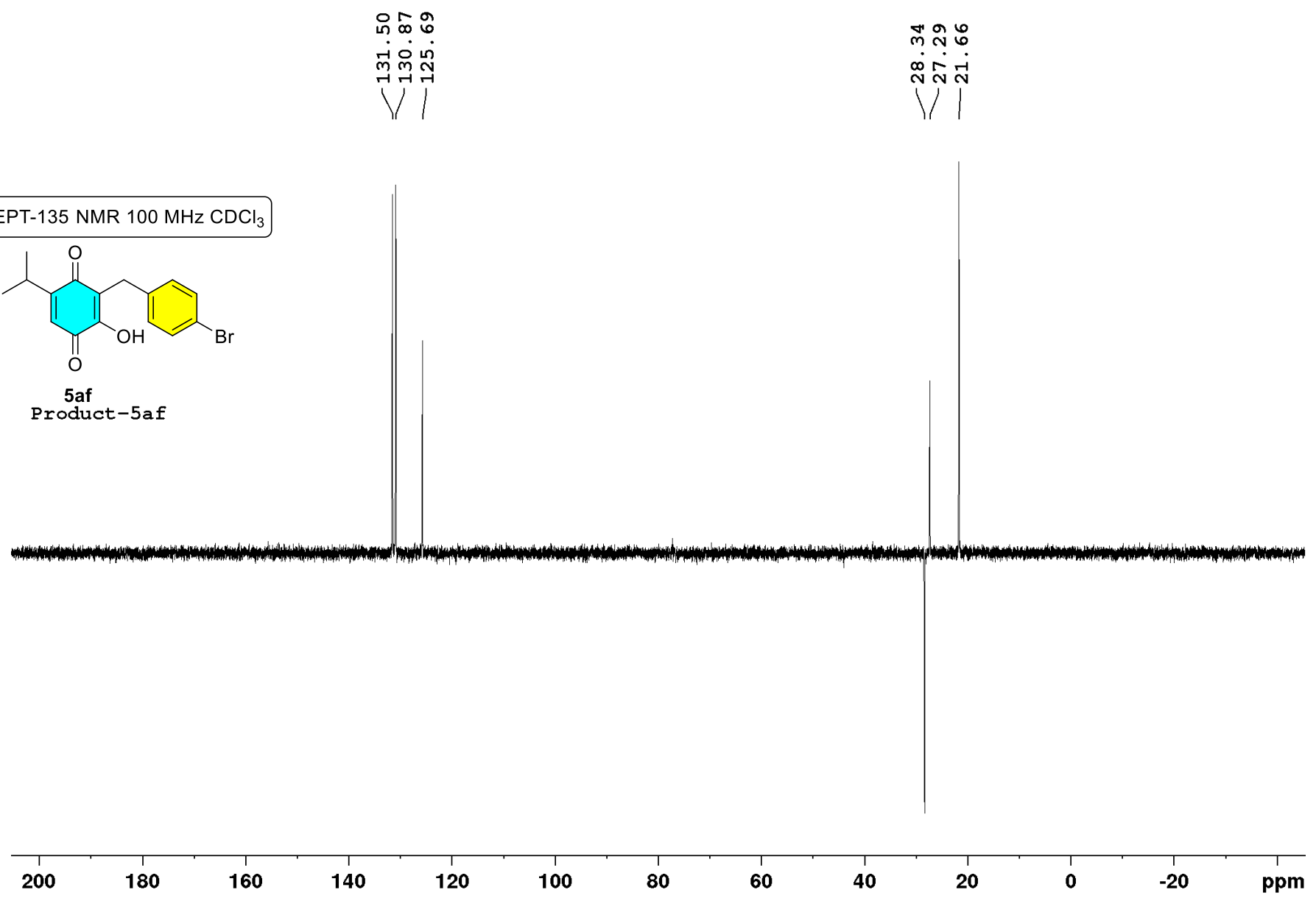
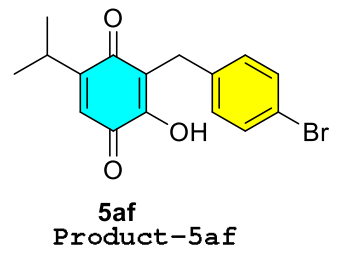
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



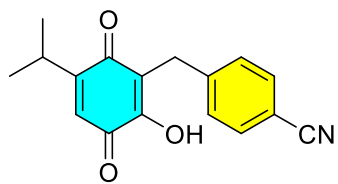
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DEPT-135 NMR 100 MHz CDCl₃

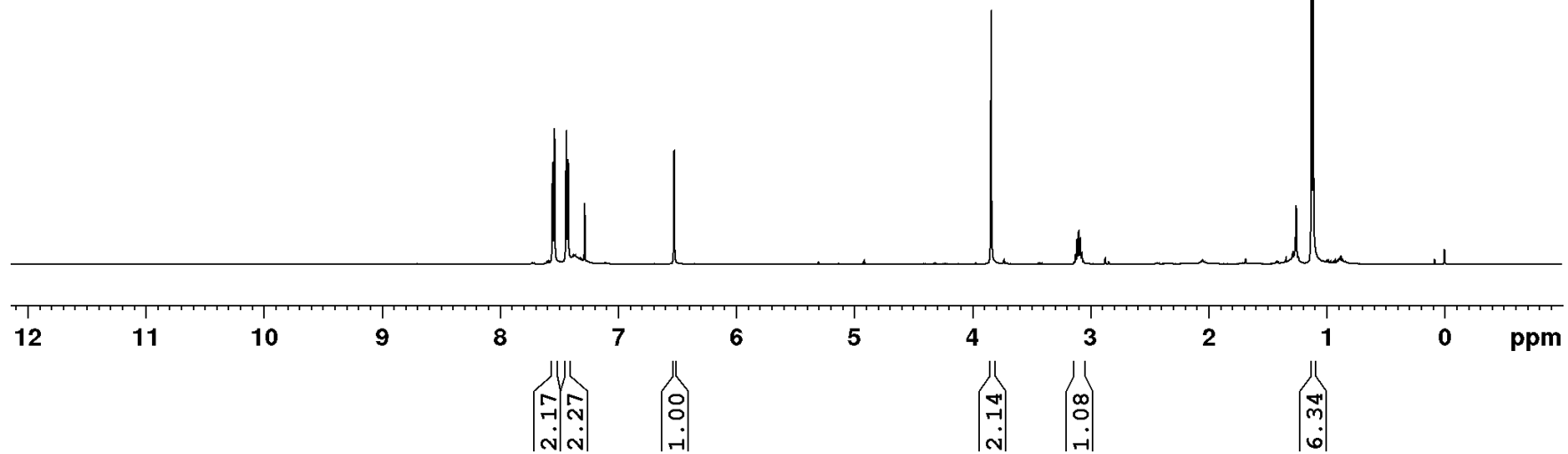


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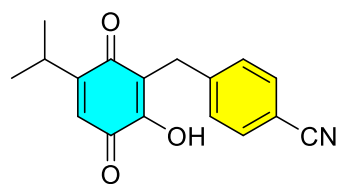


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Product-5ag

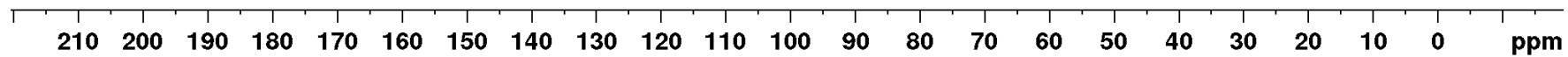


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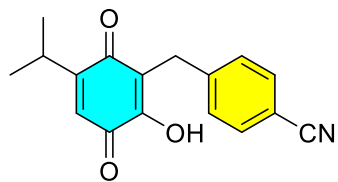


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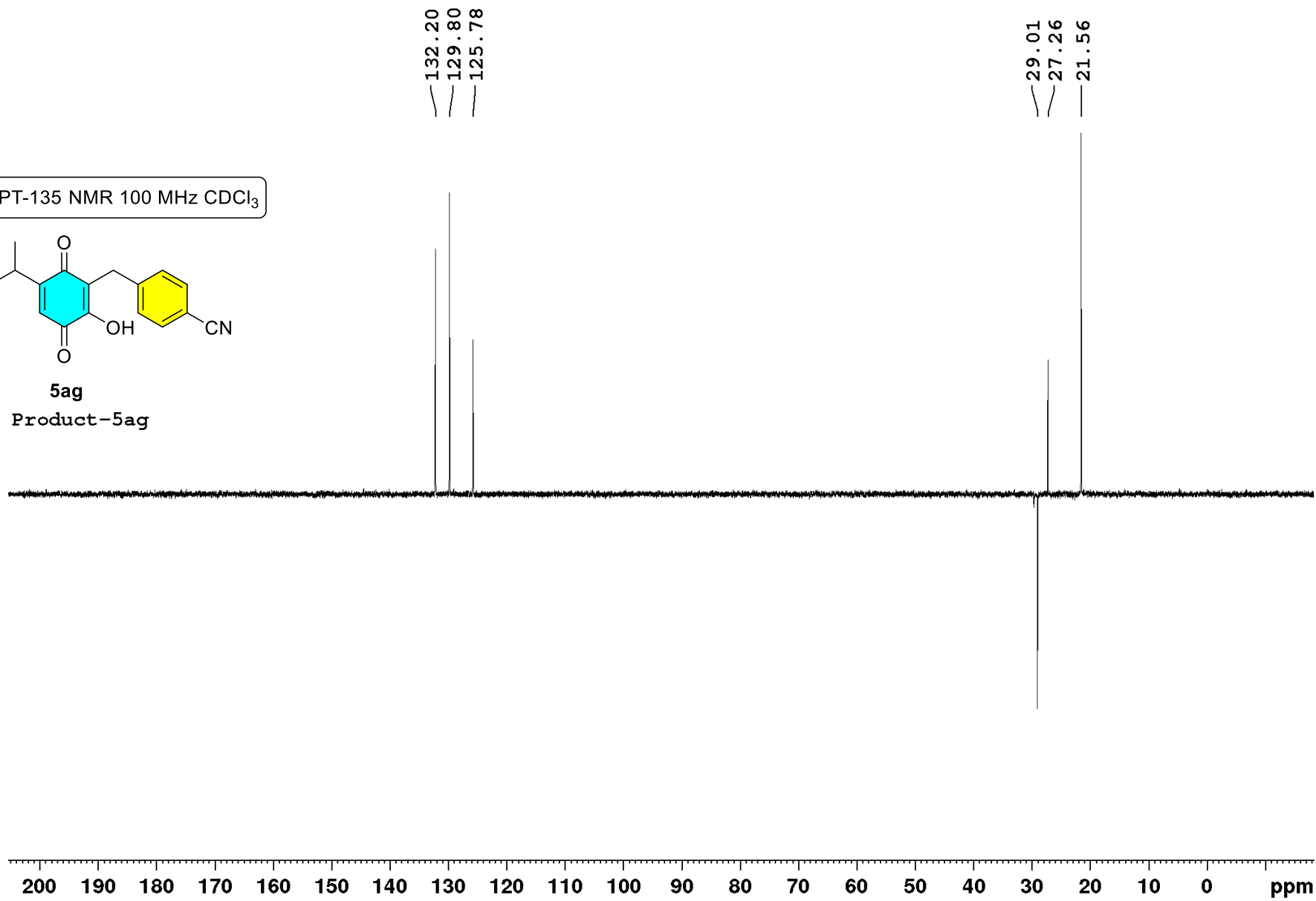


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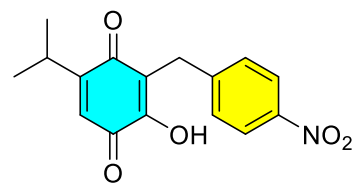


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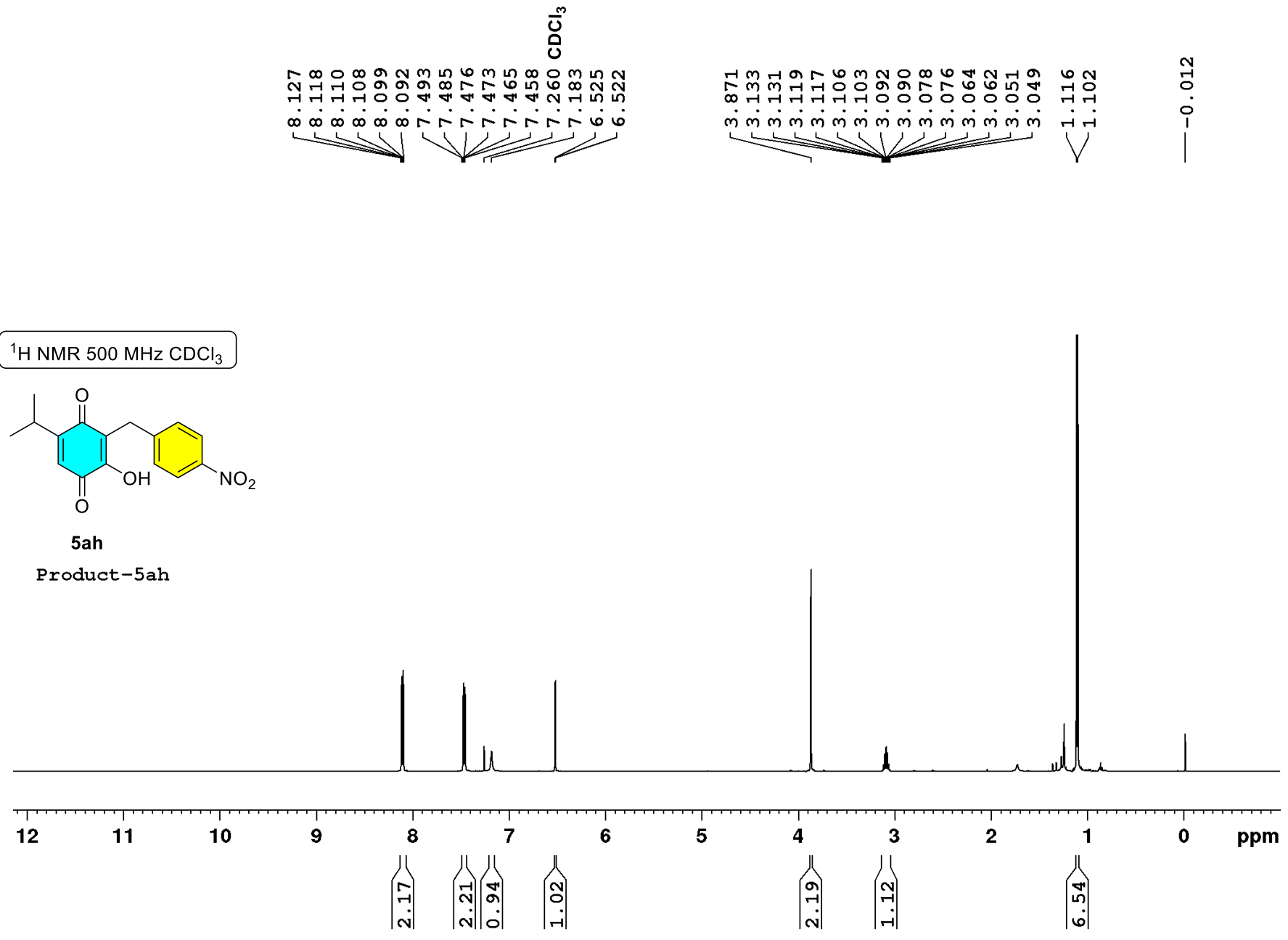
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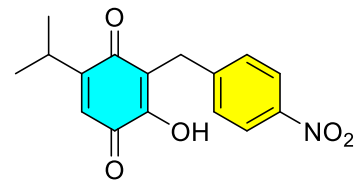
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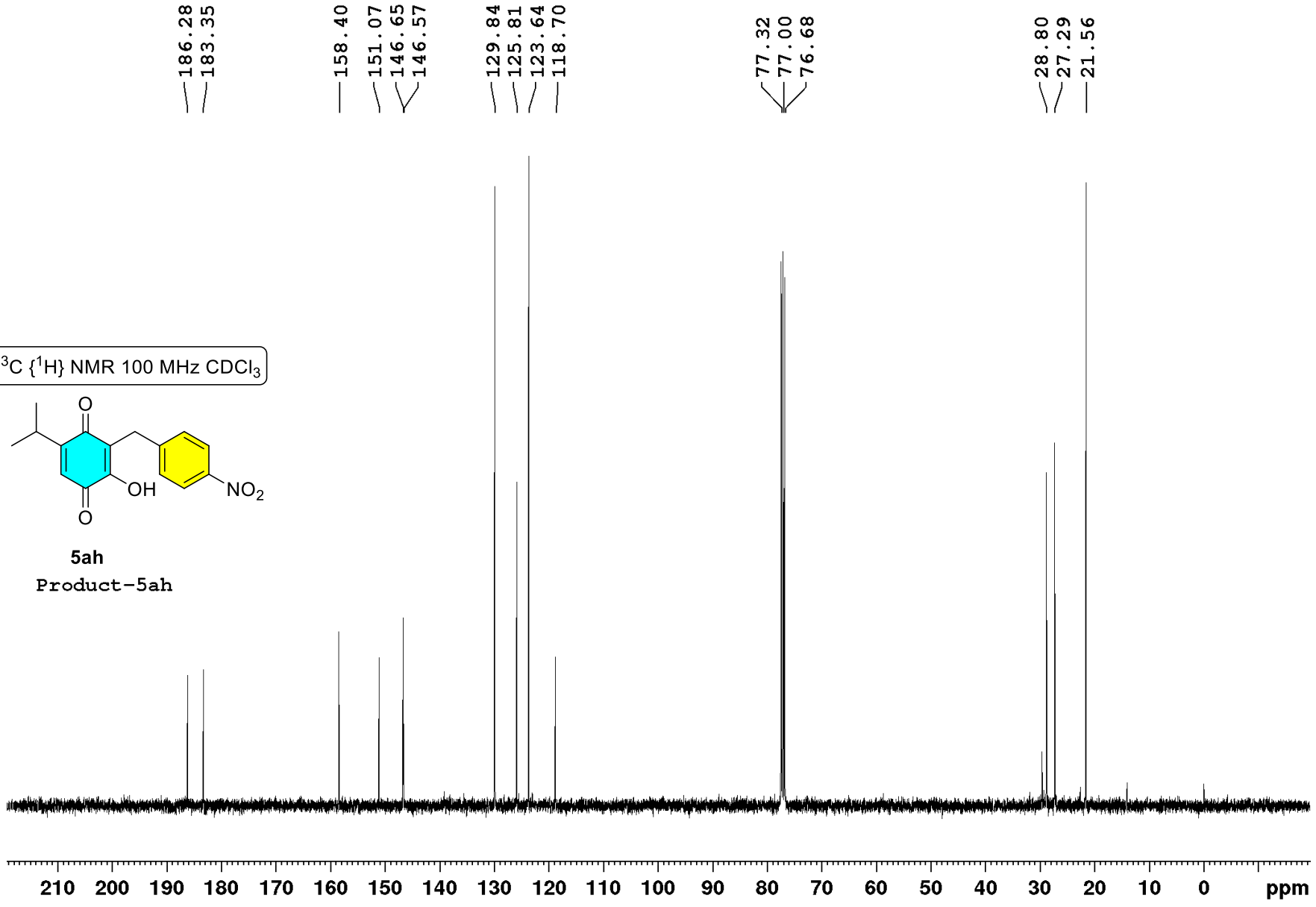
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Product-5ah



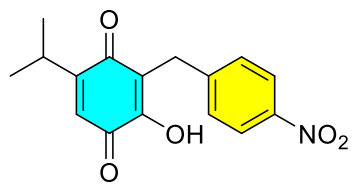
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5ah
Product-5ah



DEPT-135 NMR 100 MHz CDCl₃

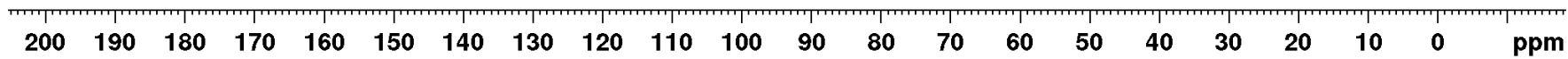


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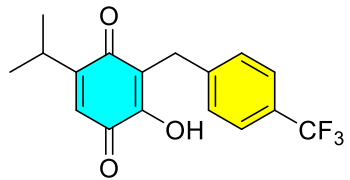
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129.84
125.81
123.64

28.80
27.29
21.56

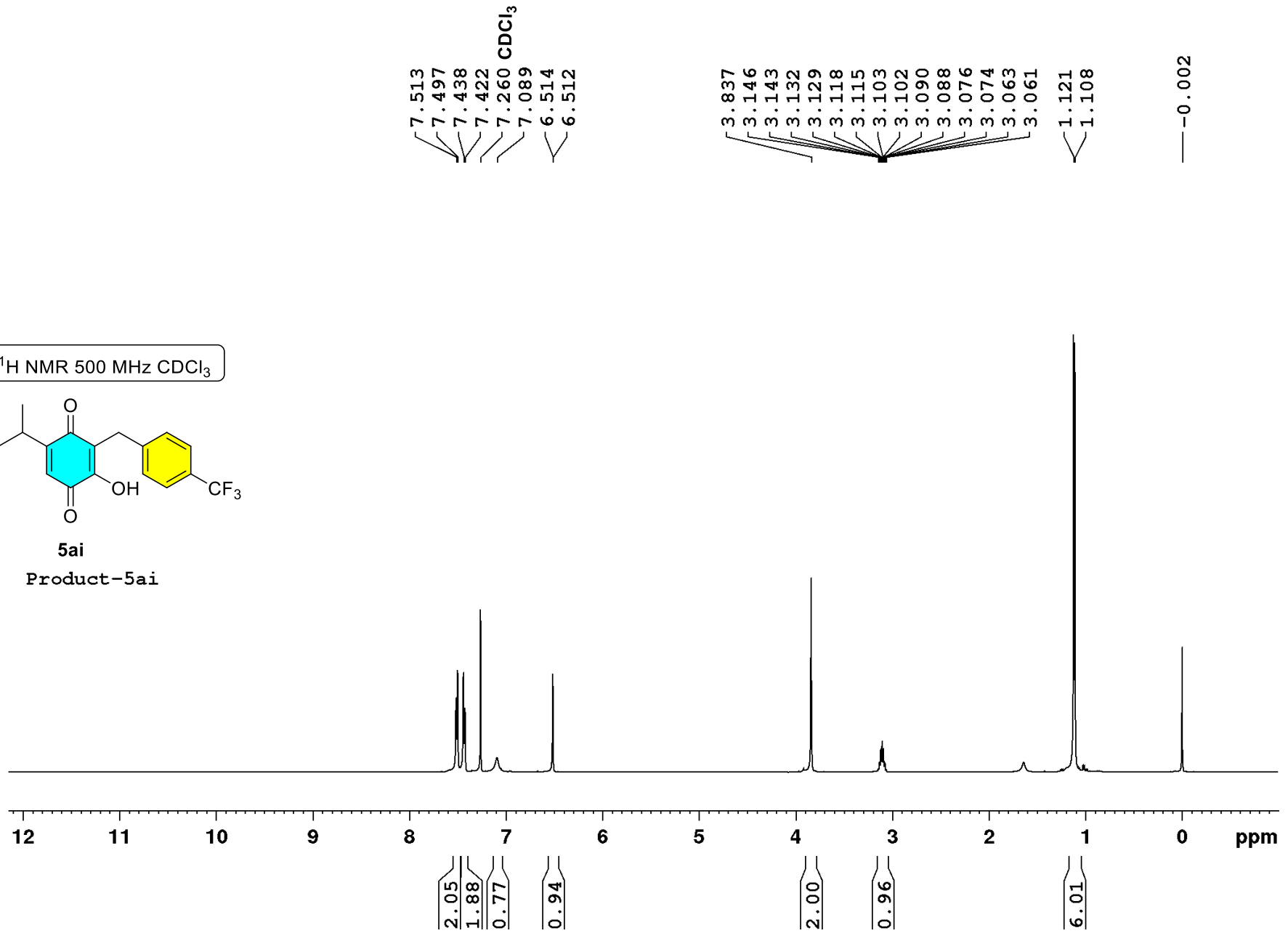


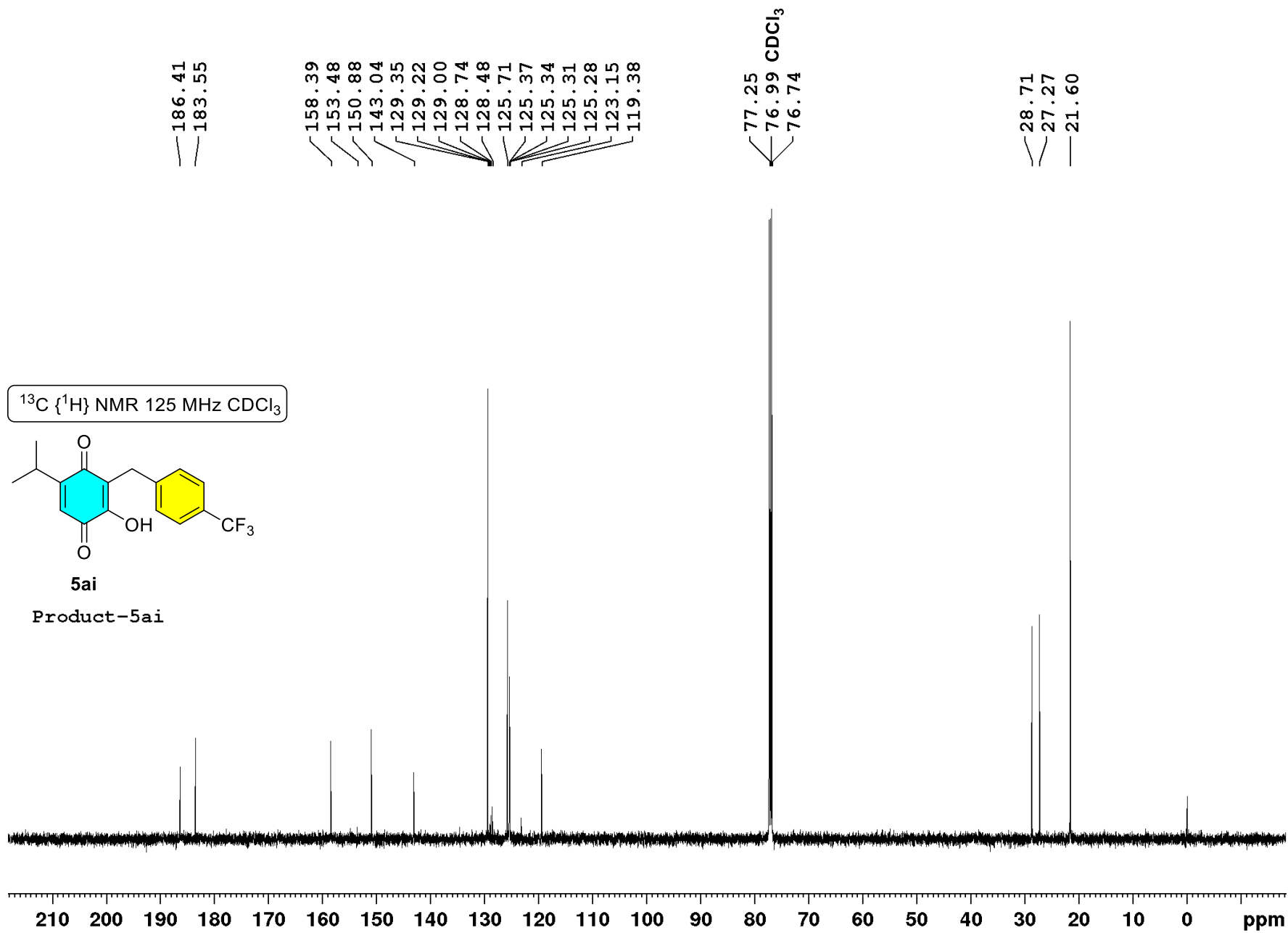
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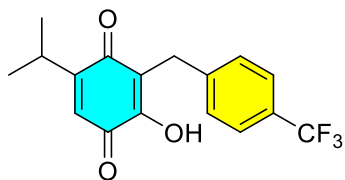
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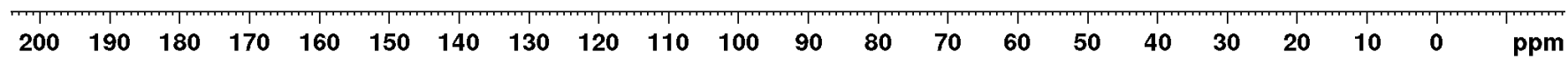




DEPT-135 NMR 125 MHz CDCl₃

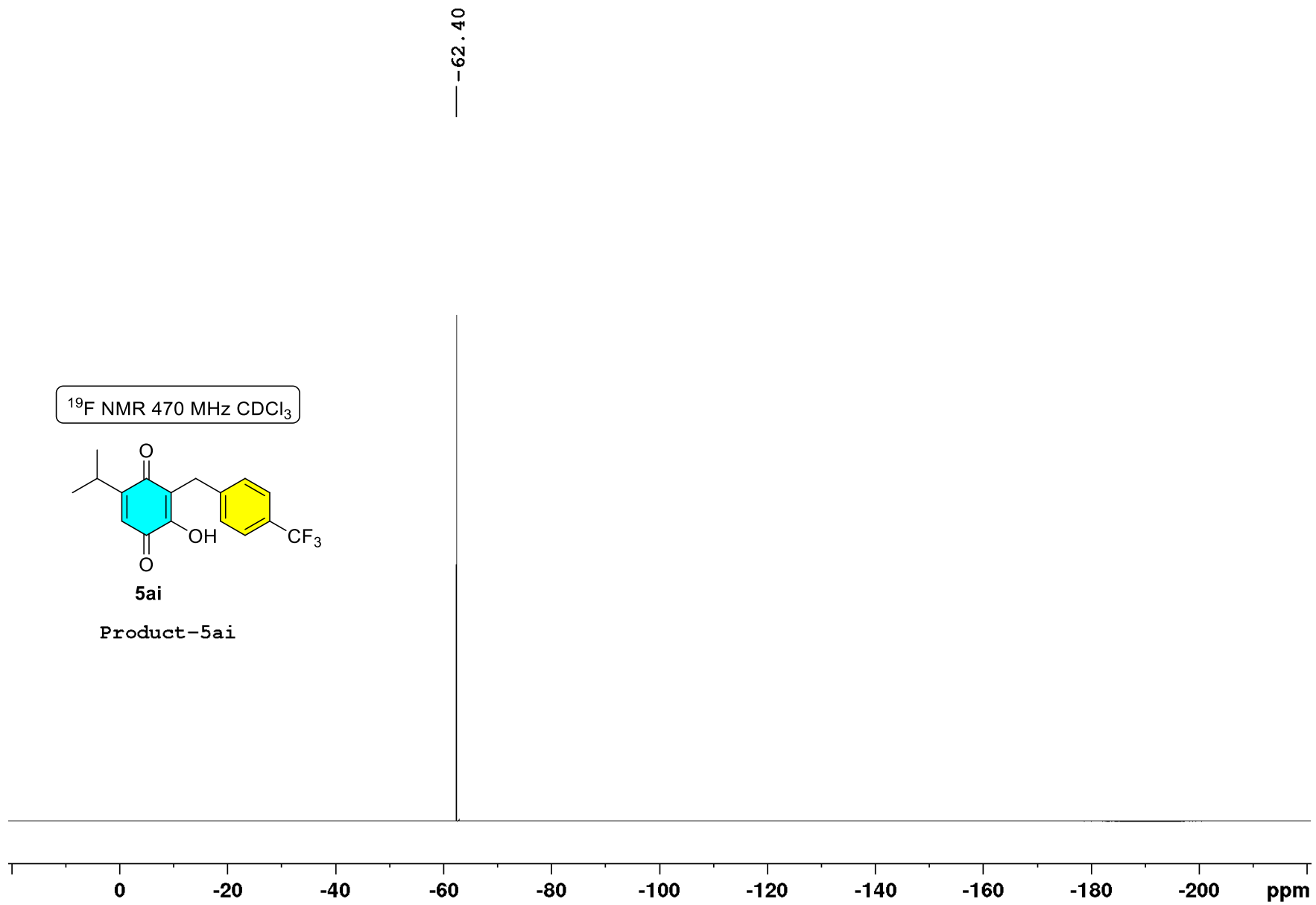


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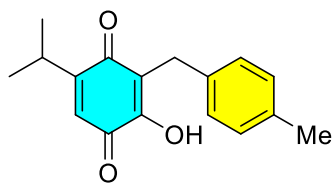


129.37
125.73
125.39
125.36
125.33
125.30

28.73
27.29
21.62

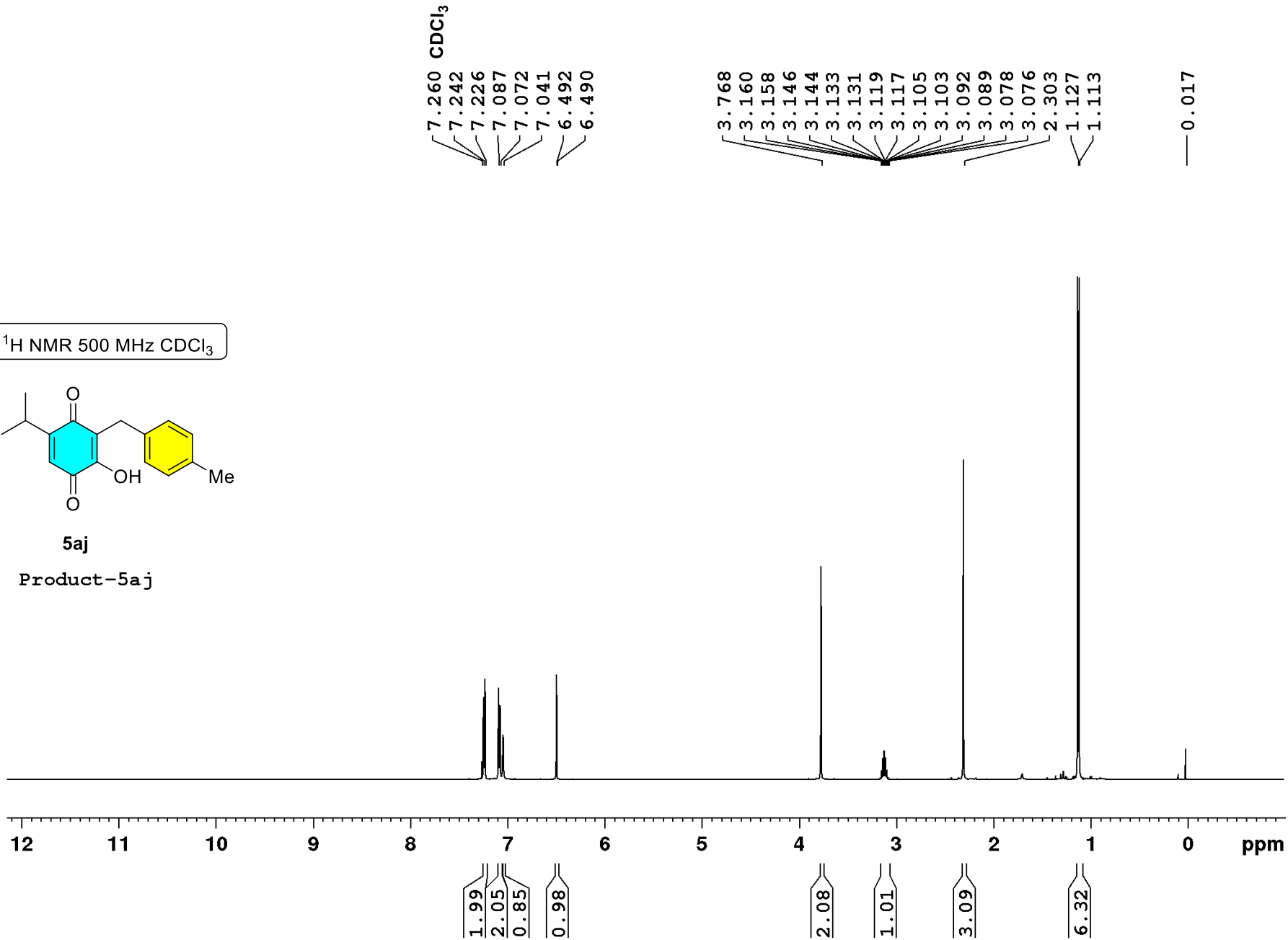


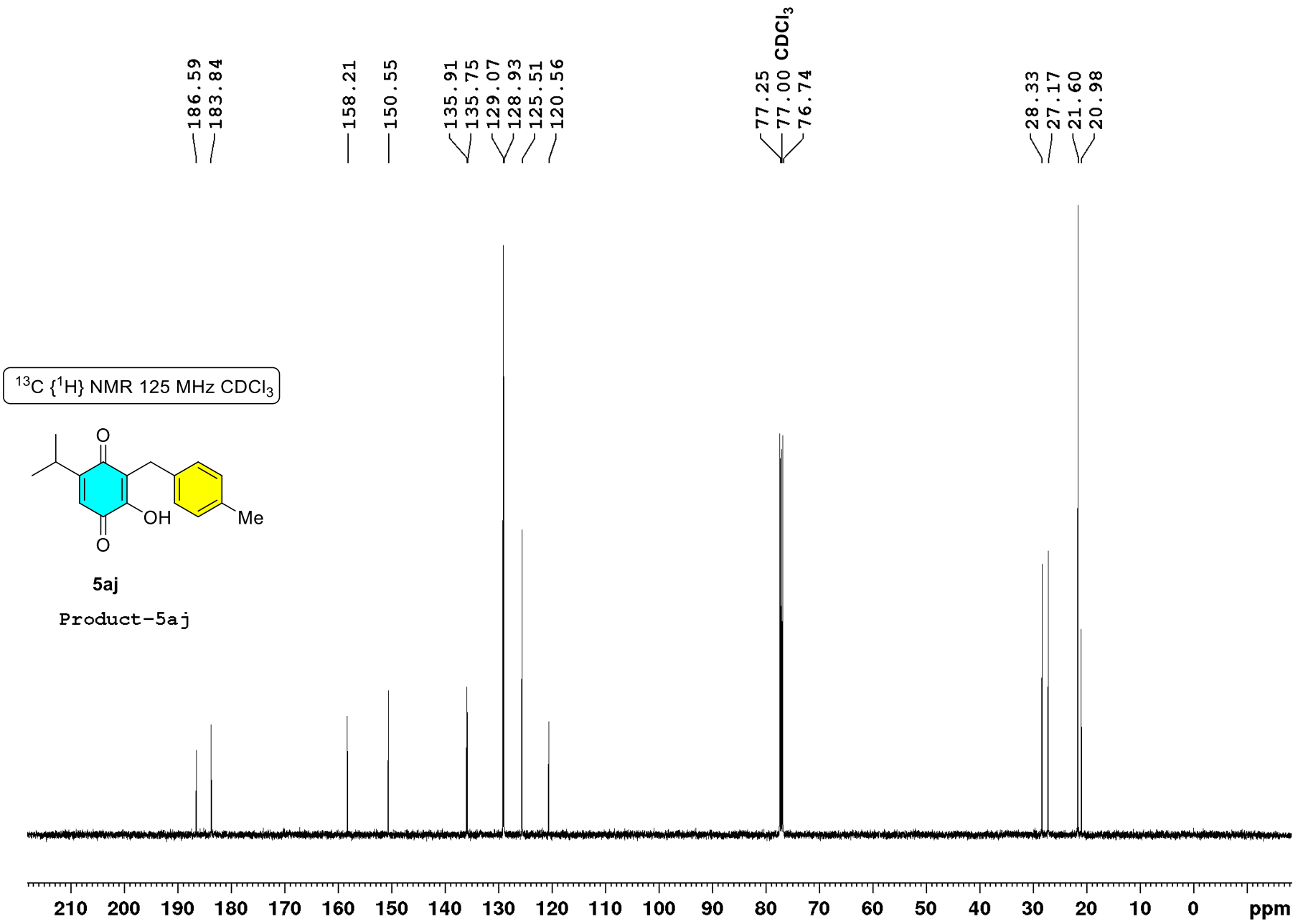
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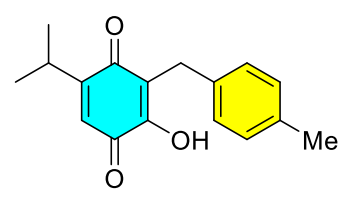
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Product-5aj

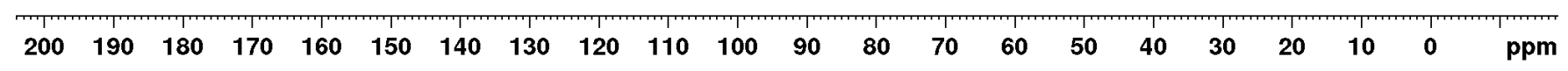




DEPT-135 NMR 125 MHz CDCl₃



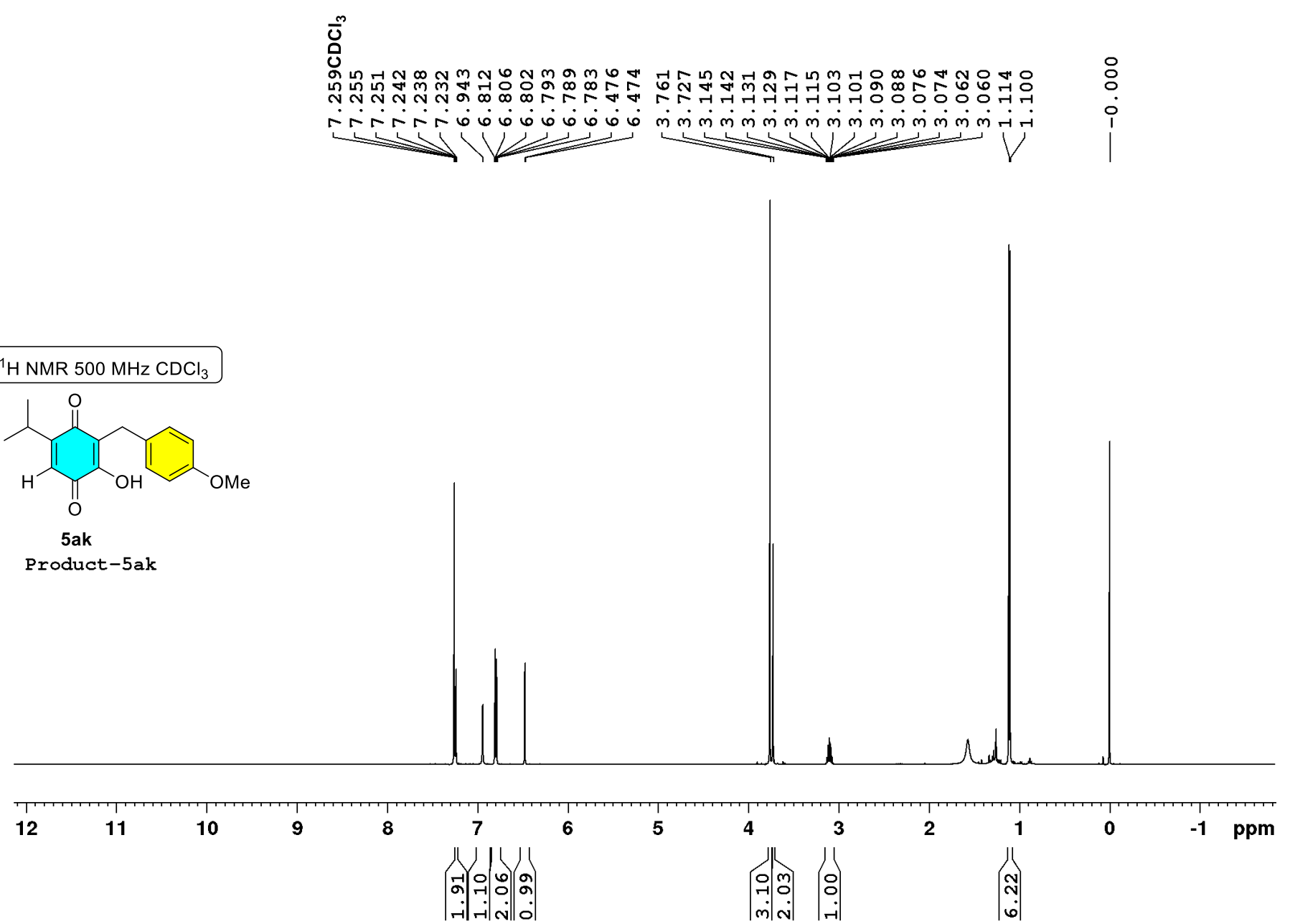
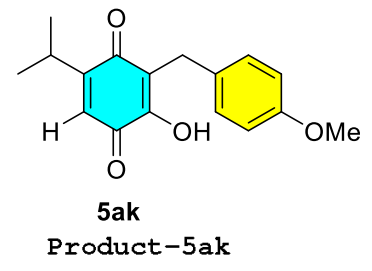
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Product-5aj



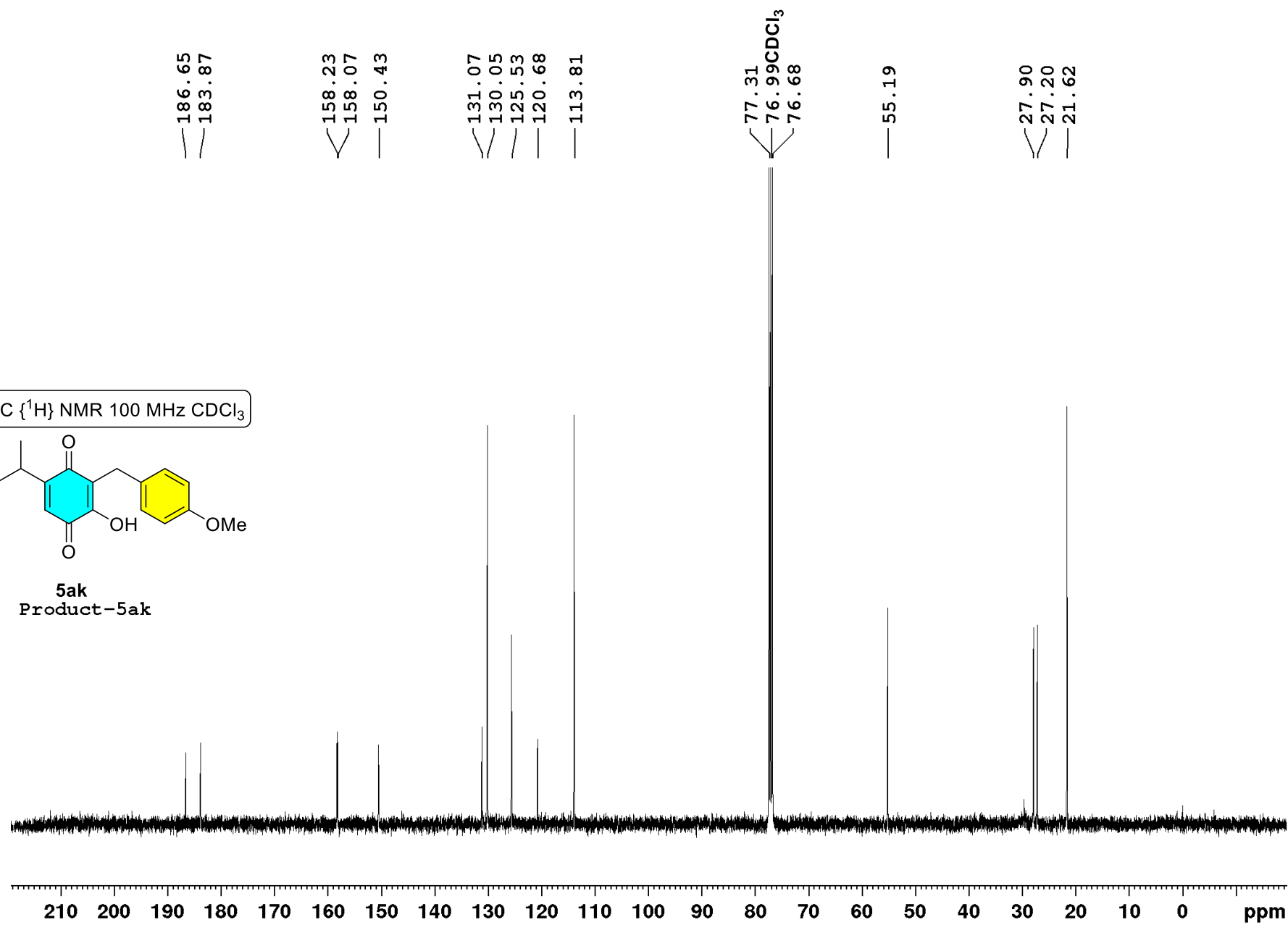
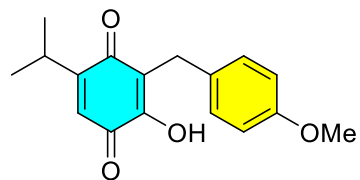
129.07
128.92
125.50

28.32
27.16
21.59
20.97

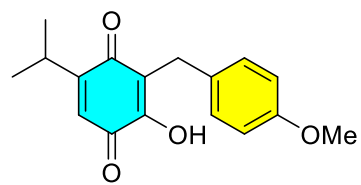
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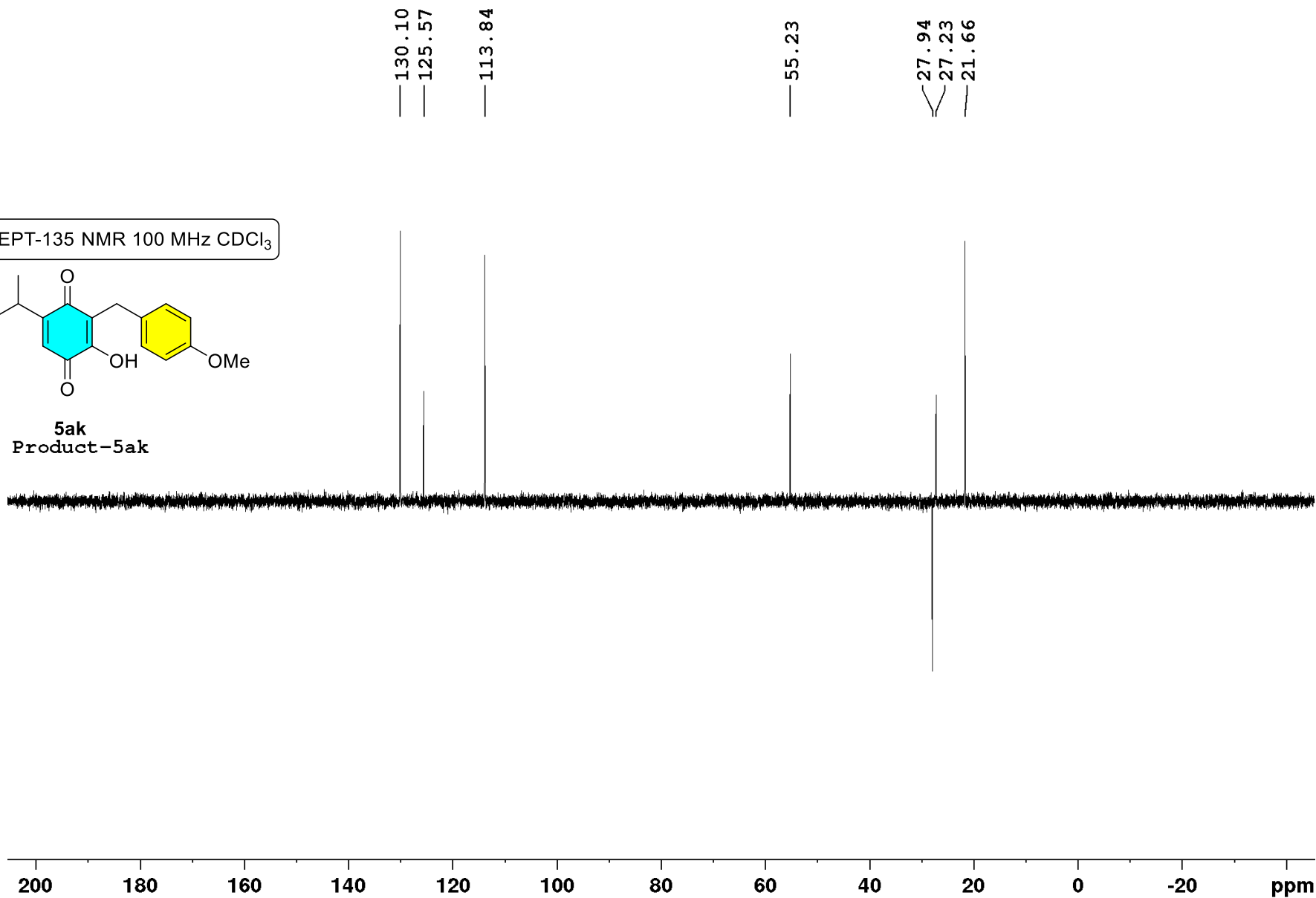
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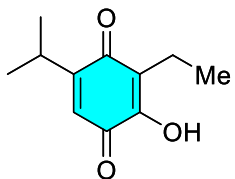
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5ak
Product-5ak

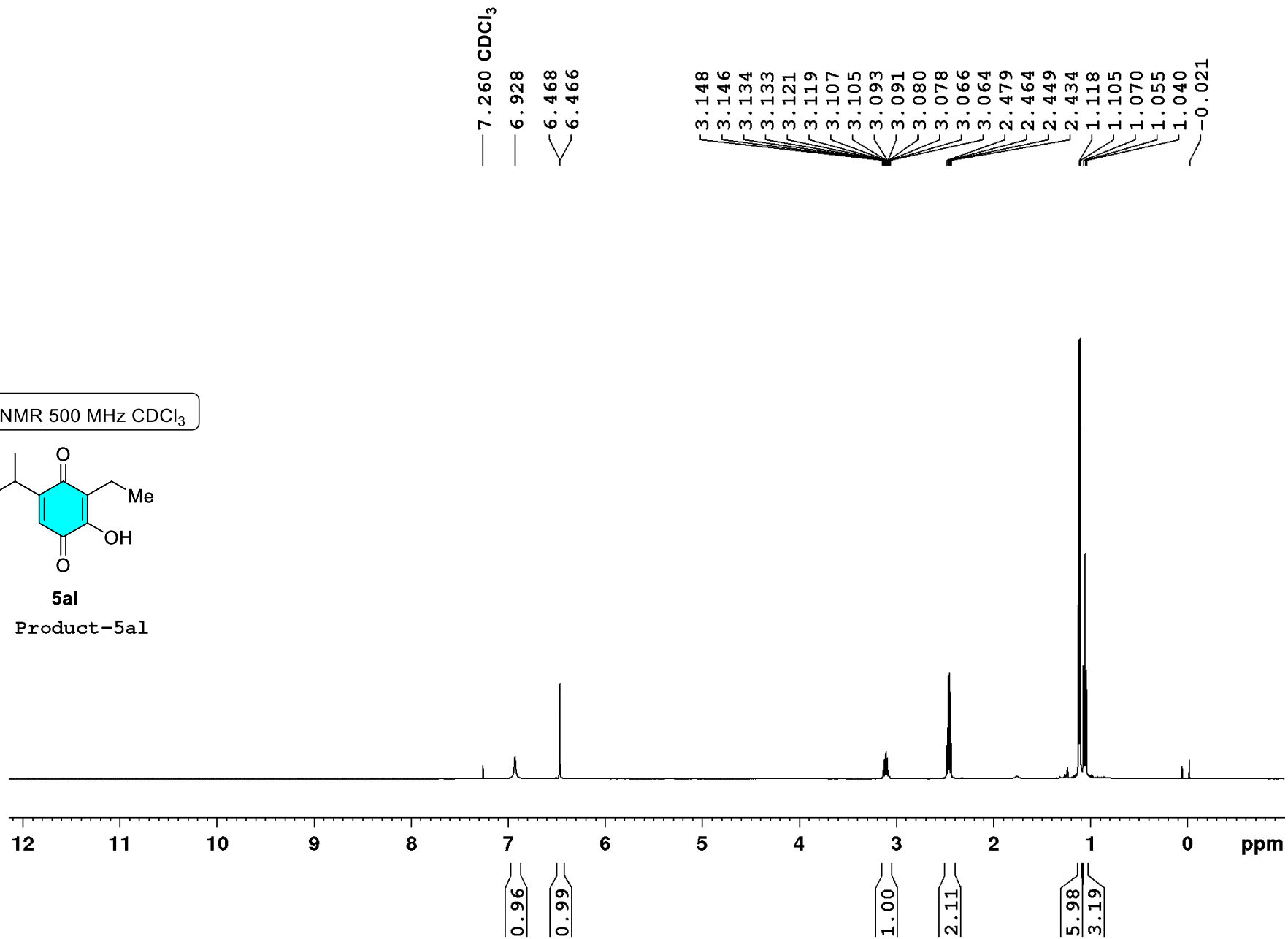


¹H NMR 500 MHz CDCl₃

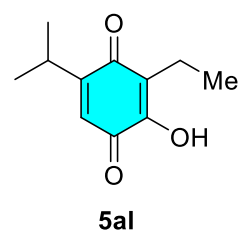


5a1

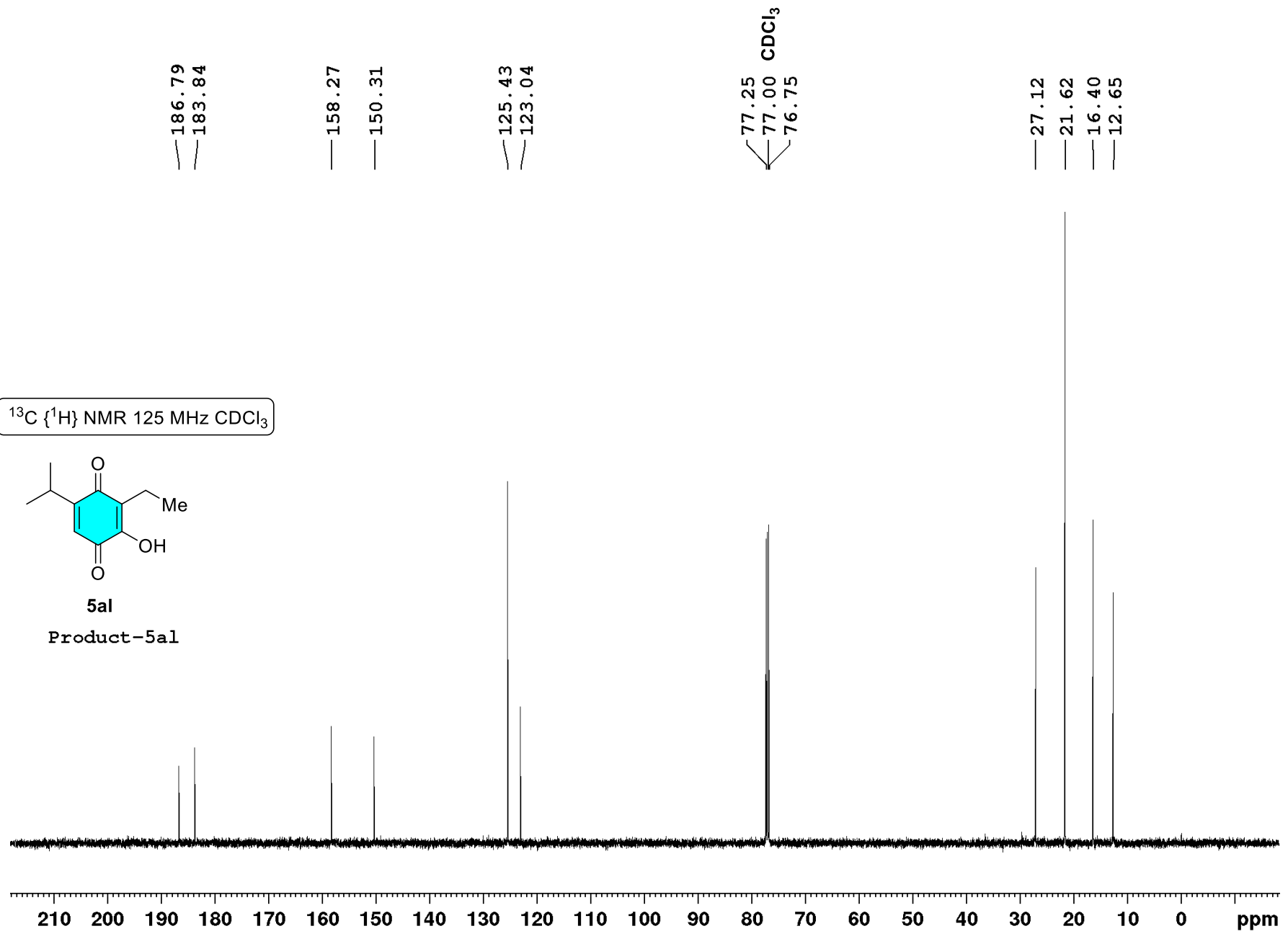
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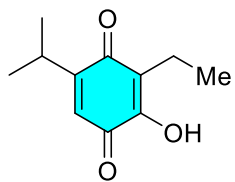
^{13}C $\{^1\text{H}\}$ NMR 125 MHz CDCl_3



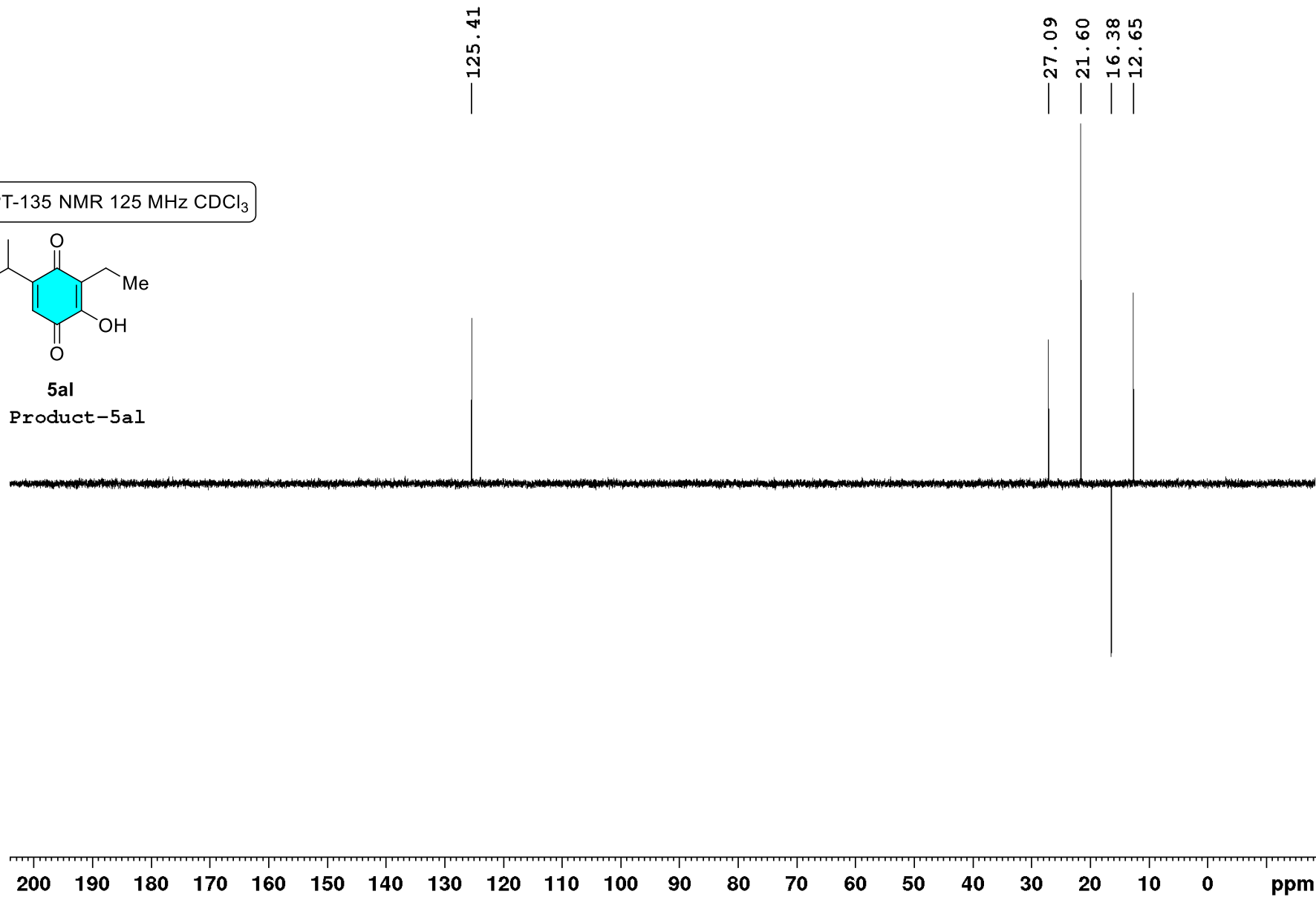
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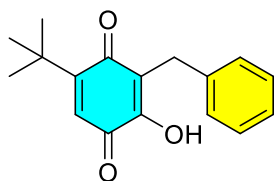
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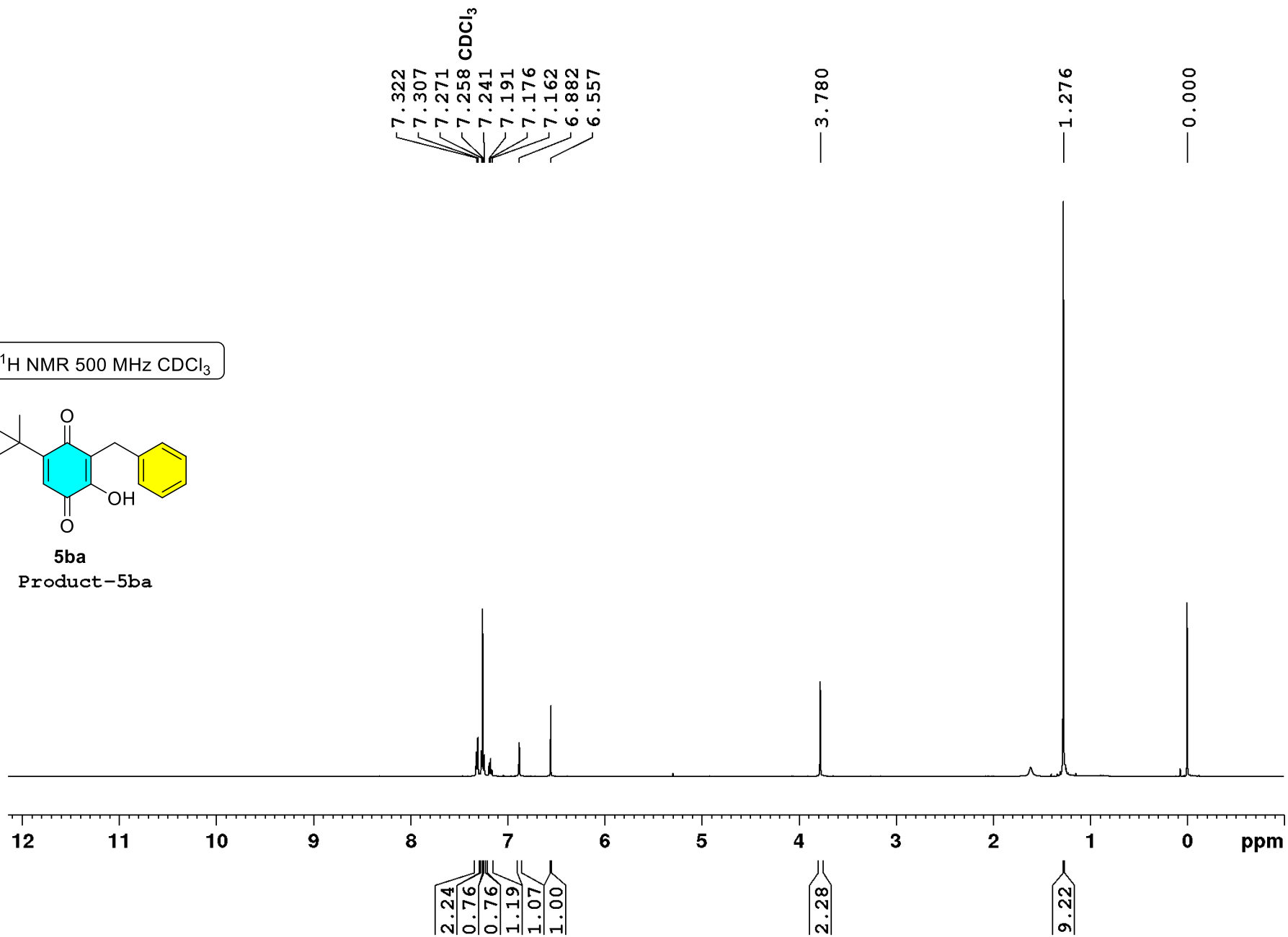
5a1
Product-5a1



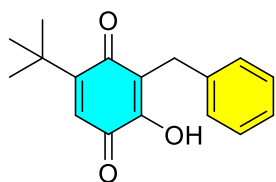
$^1\text{H NMR}$ 500 MHz CDCl_3



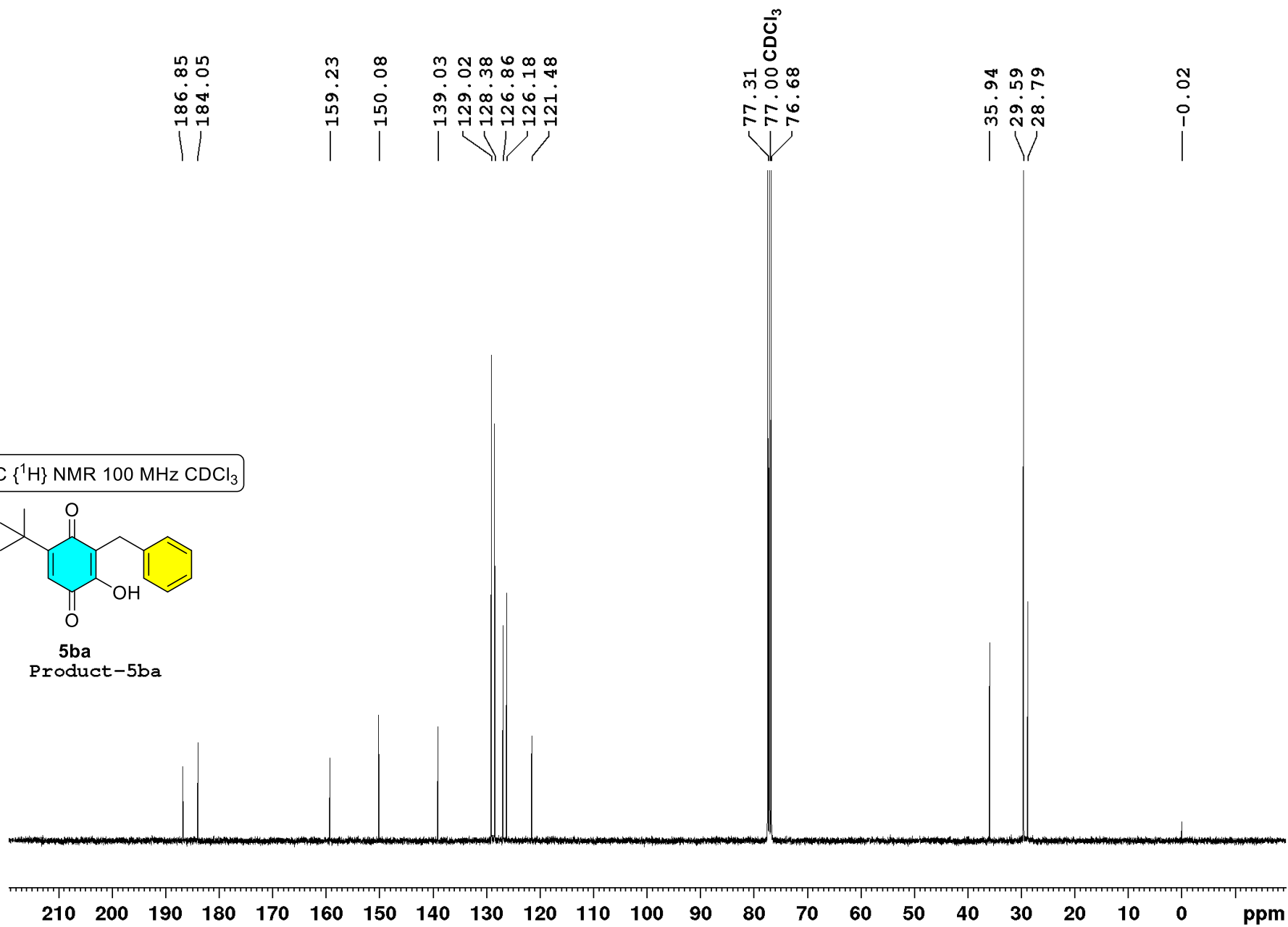
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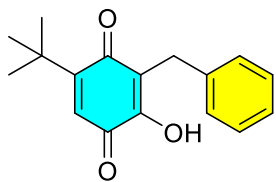
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5ba
Product-5ba



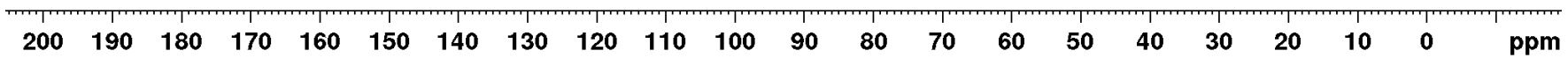
DEPT-135 NMR 100 MHz CDCl₃



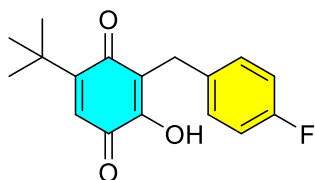
5ba
Product-5ba

129.07
128.43
126.90
126.22

29.63
28.83

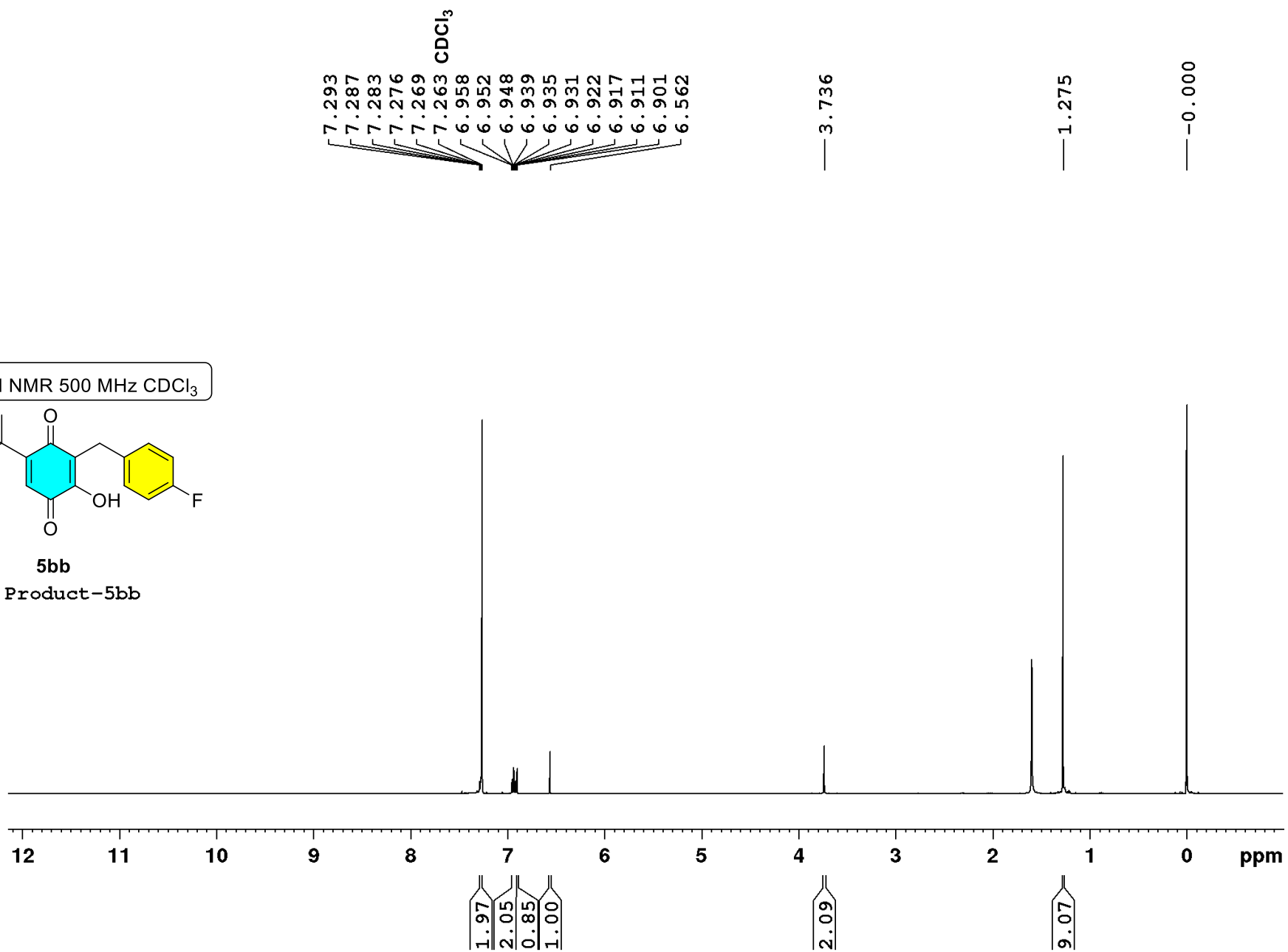


¹H NMR 500 MHz CDCl₃

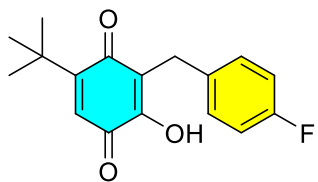


5bb

Product-5bb

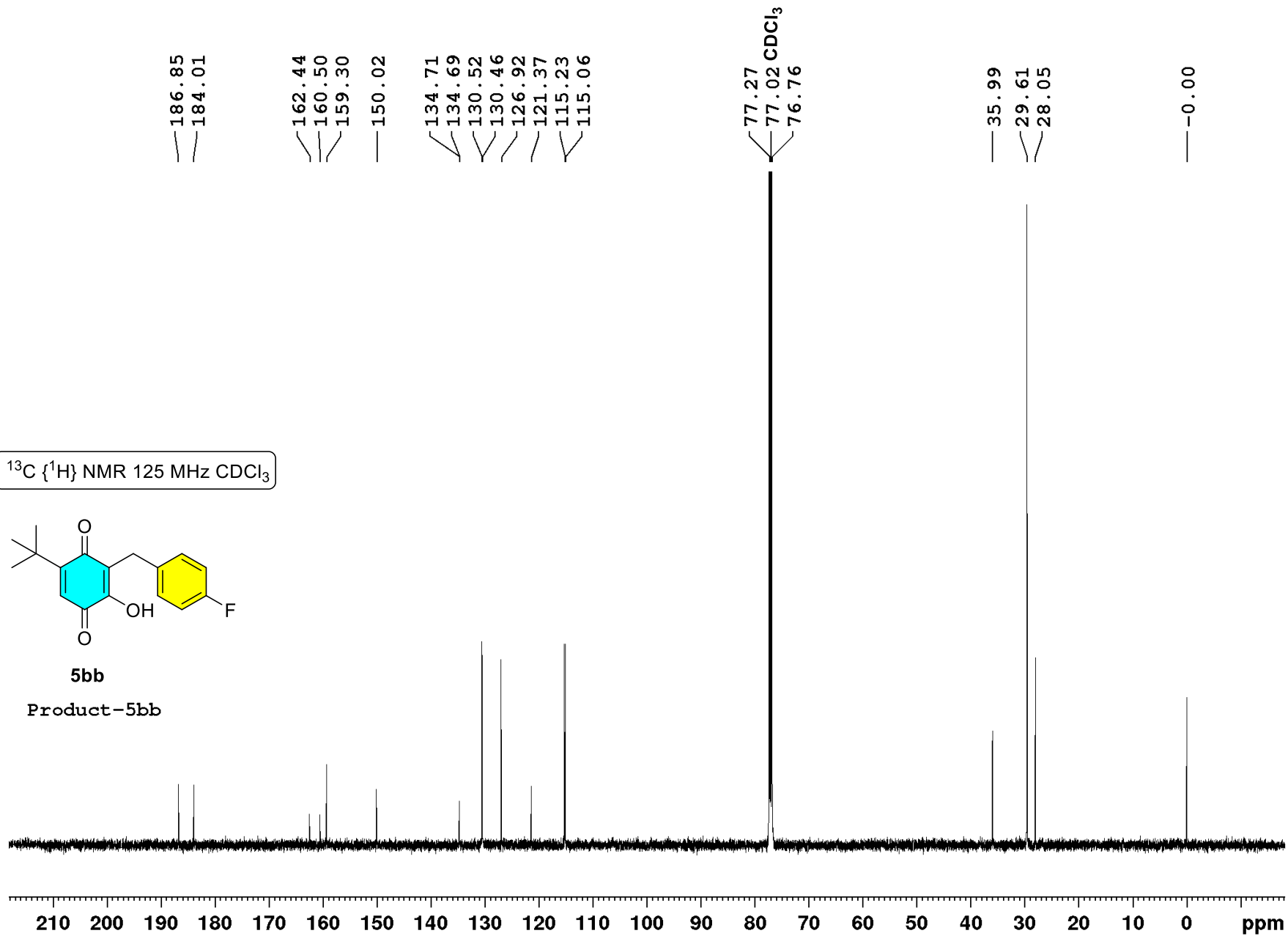


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3

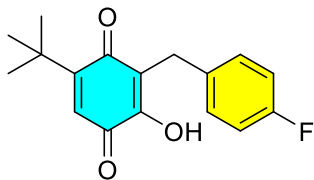


5bb

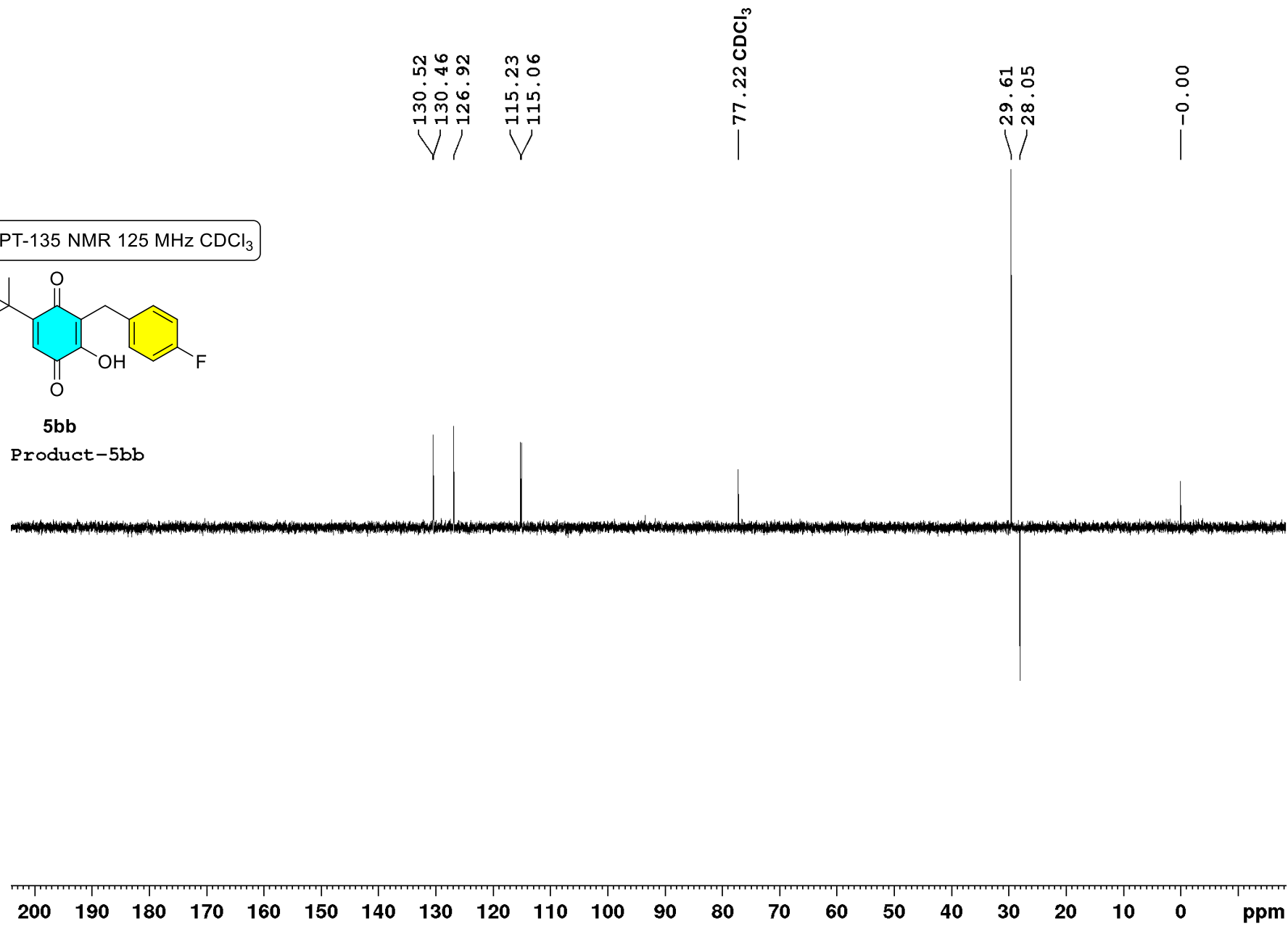
Product-5bb



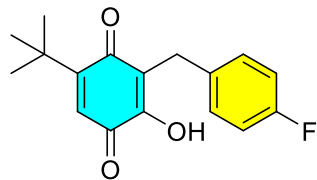
DEPT-135 NMR 125 MHz CDCl₃



5bb
Product-5bb

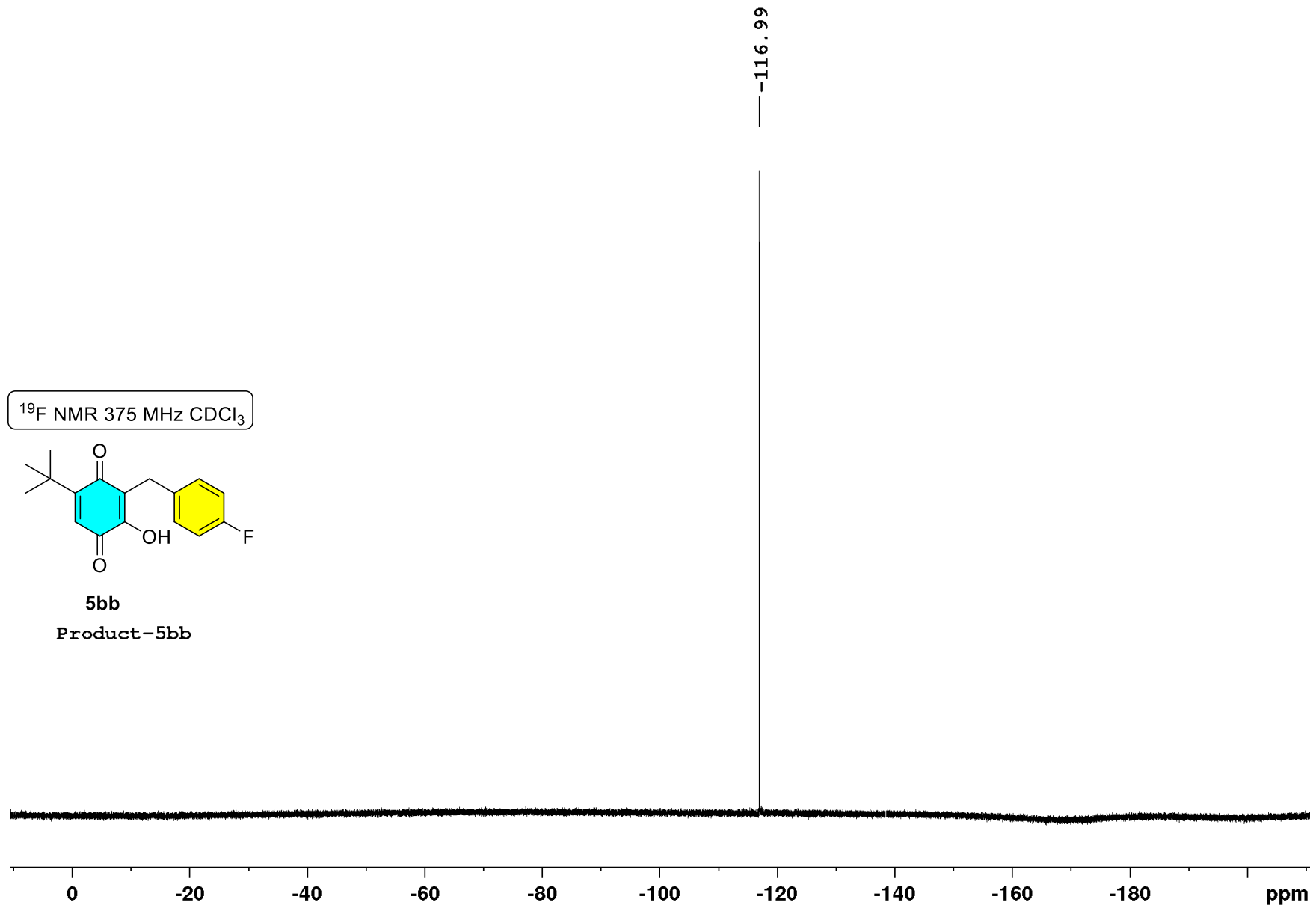


¹⁹F NMR 375 MHz CDCl₃

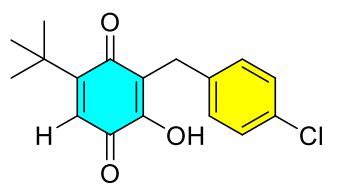


5bb

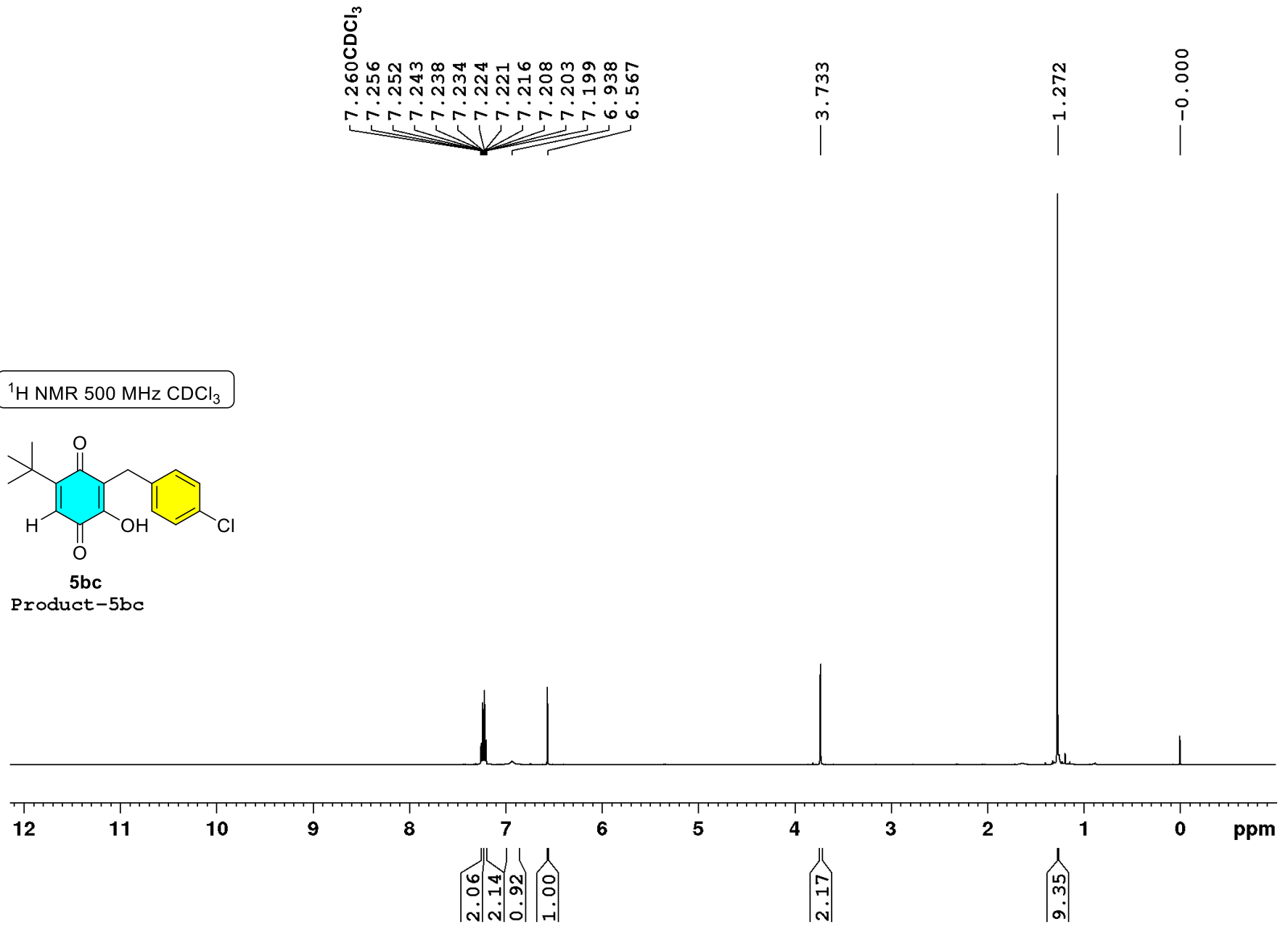
Product-5bb

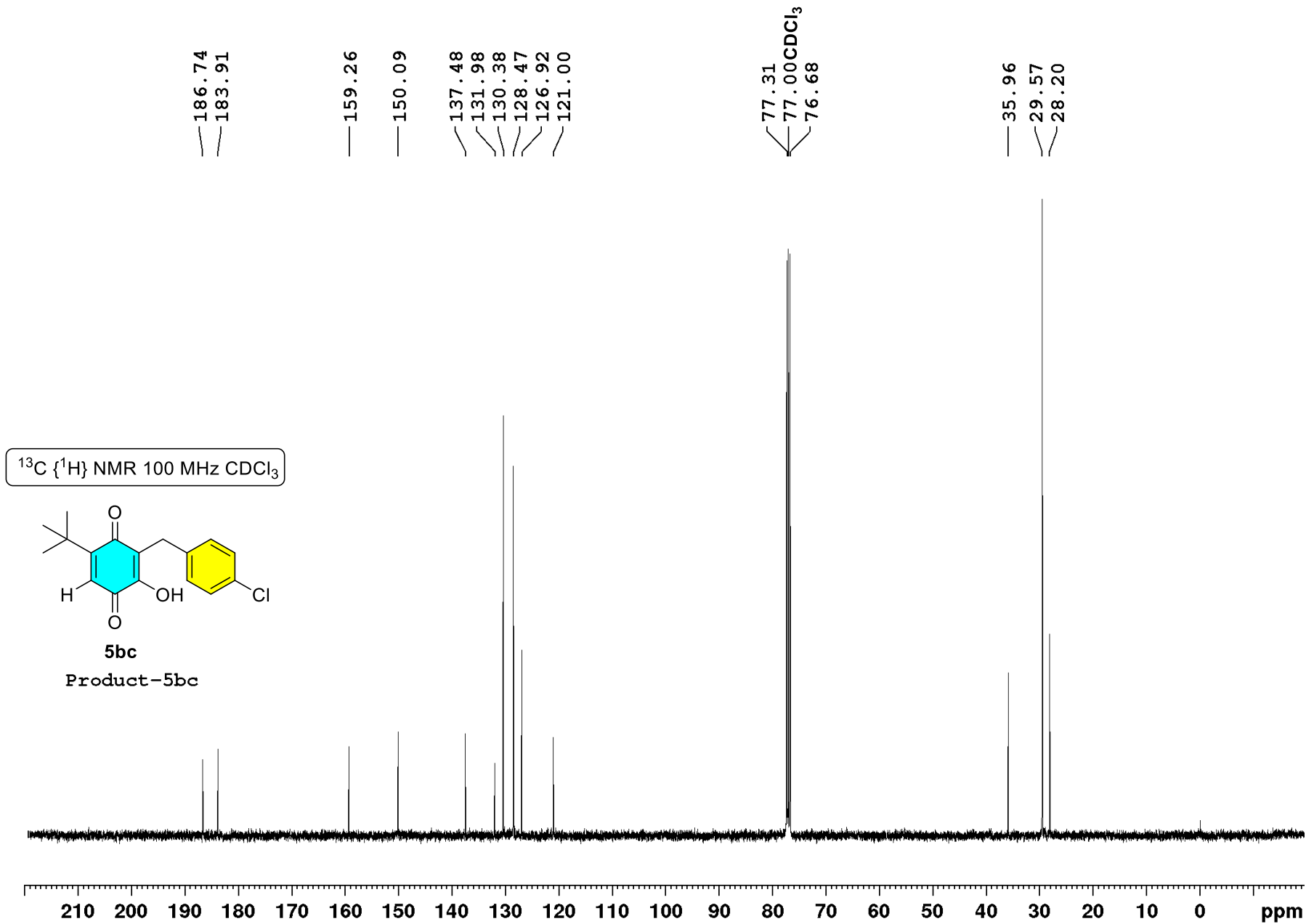


¹H NMR 500 MHz CDCl₃

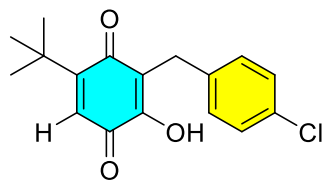


5bc
Product-5bc

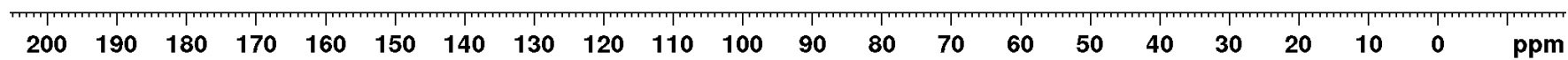




DEPT-135 NMR 100 MHz CDCl₃



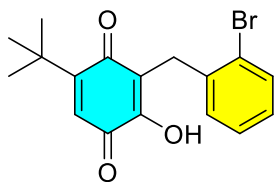
5bc
Product-5bc



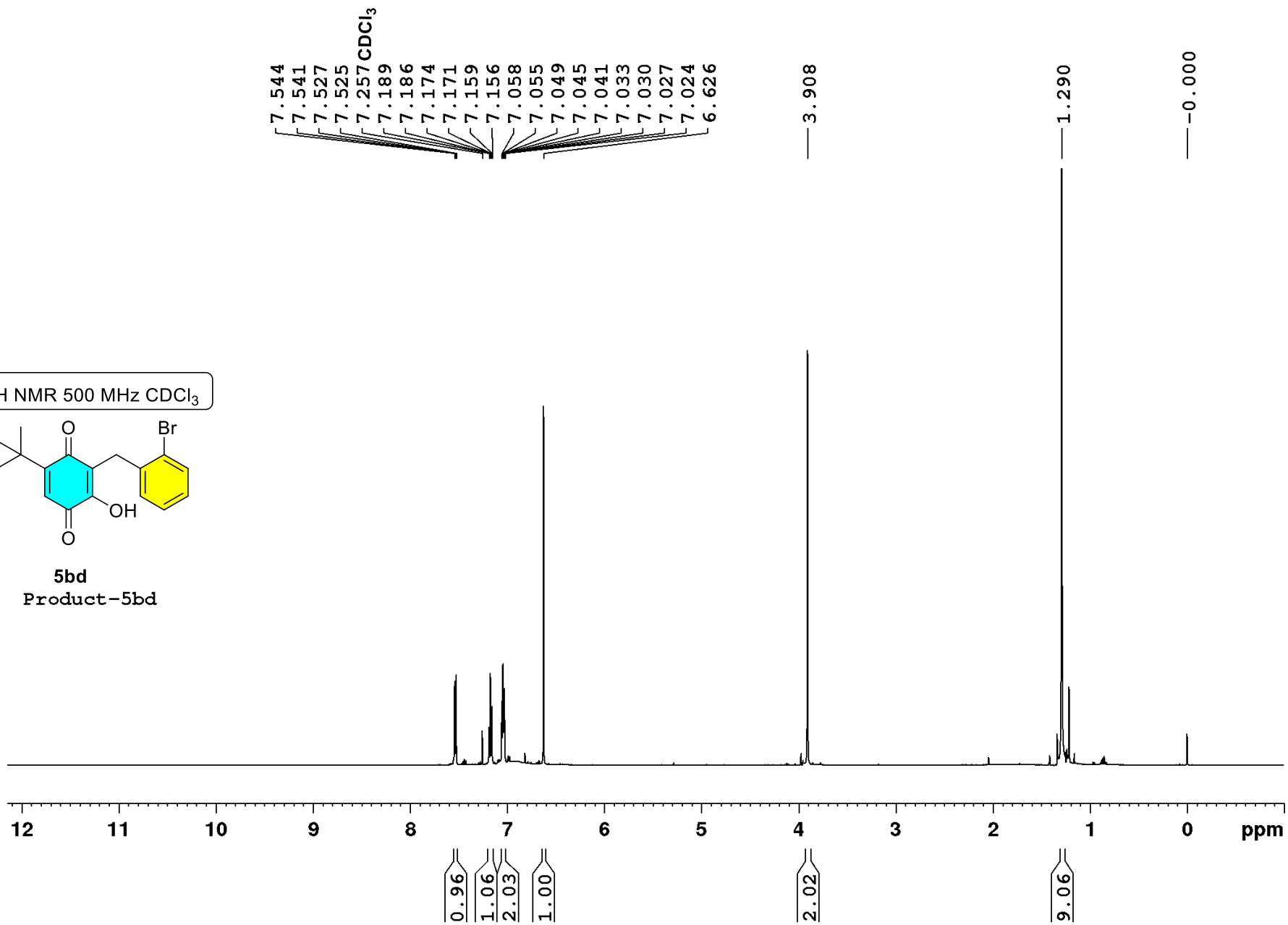
130.39
128.47
126.92

29.57
28.19

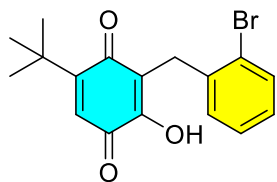
¹H NMR 500 MHz CDCl₃



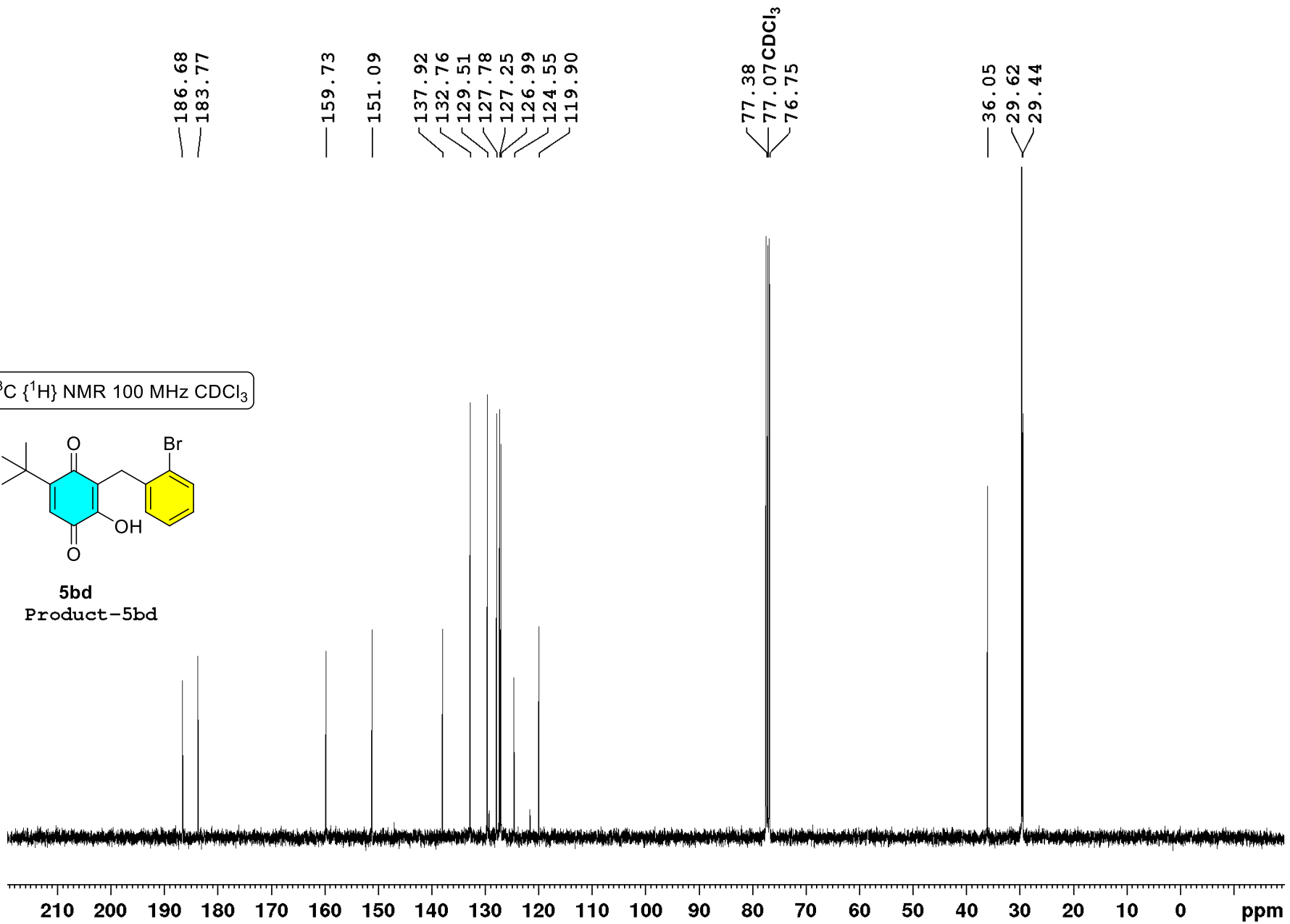
5bd
Product-5bd



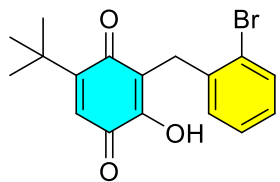
^{13}C $\{^1\text{H}\}$ NMR 100 MHz CDCl_3



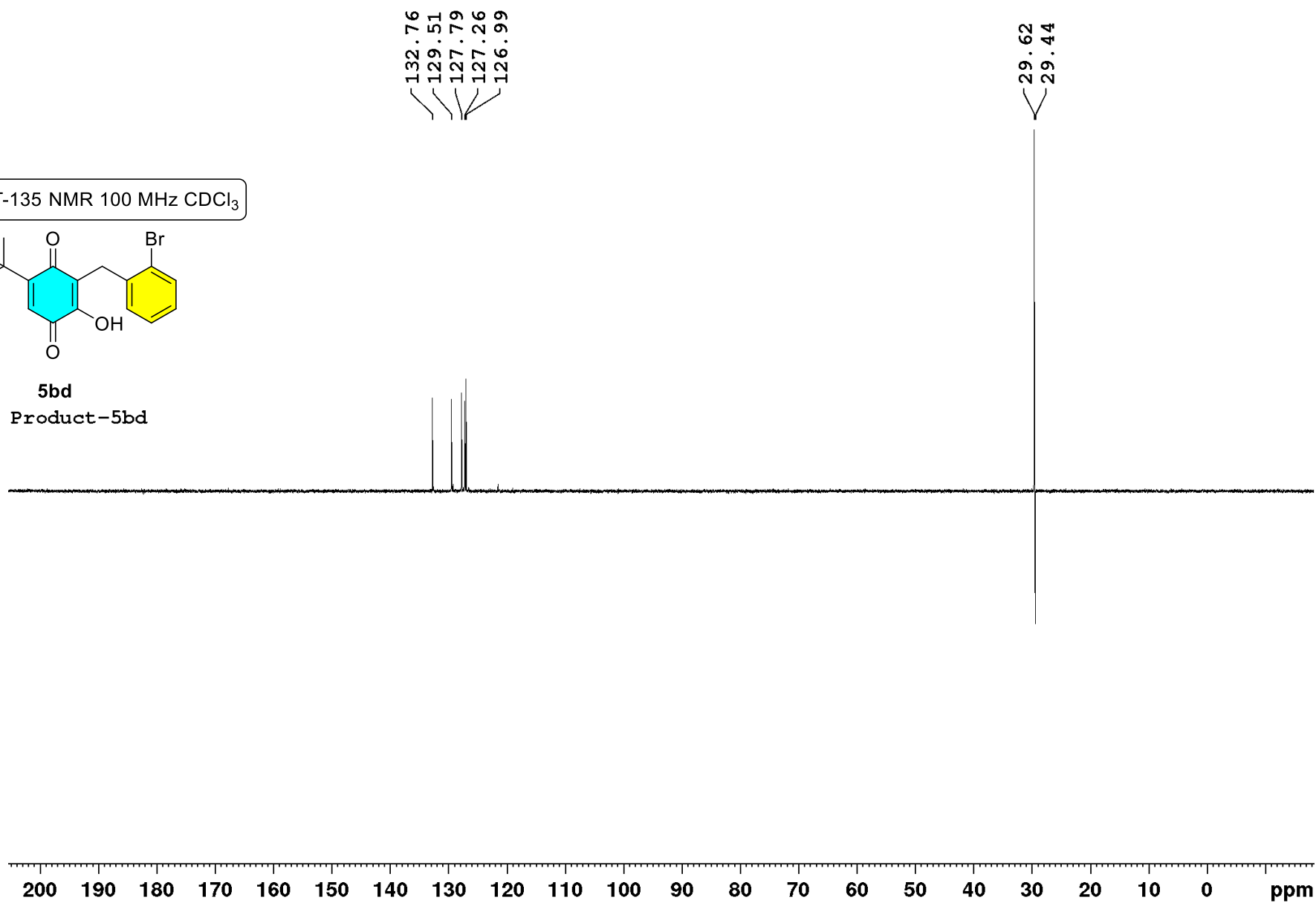
5bd
Product-5bd



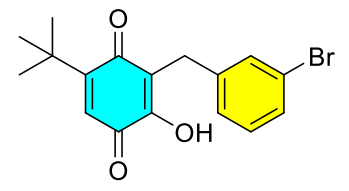
DEPT-135 NMR 100 MHz CDCl₃



5bd
Product-5bd

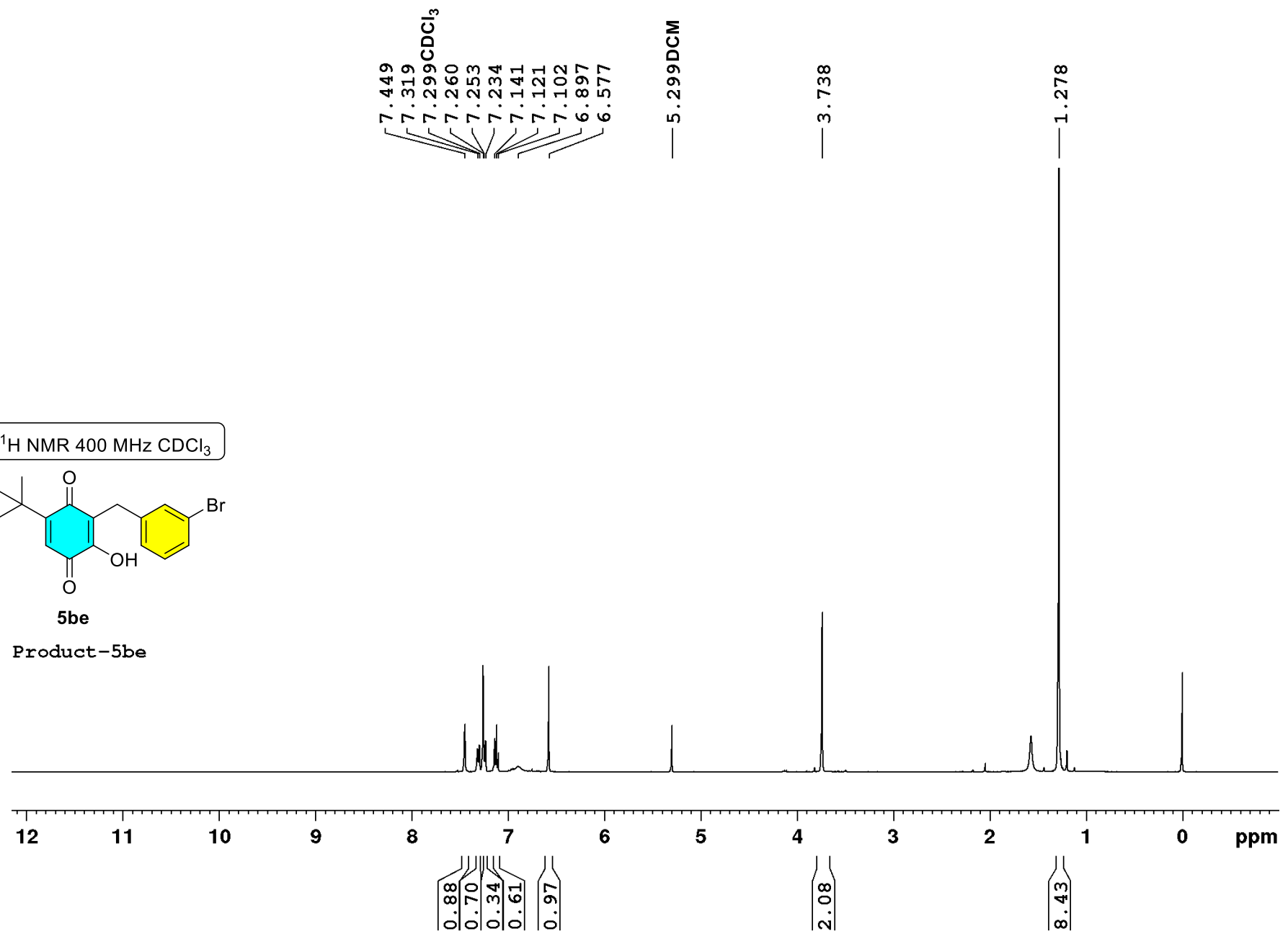


¹H NMR 400 MHz CDCl₃

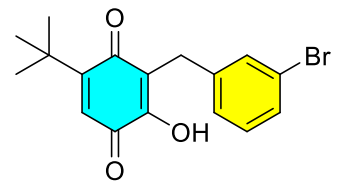


5be

Product-5be



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



5be
Product-5be

186.70
183.87

159.36

150.23

141.29

132.00

129.93

129.39

127.73

126.98

122.40

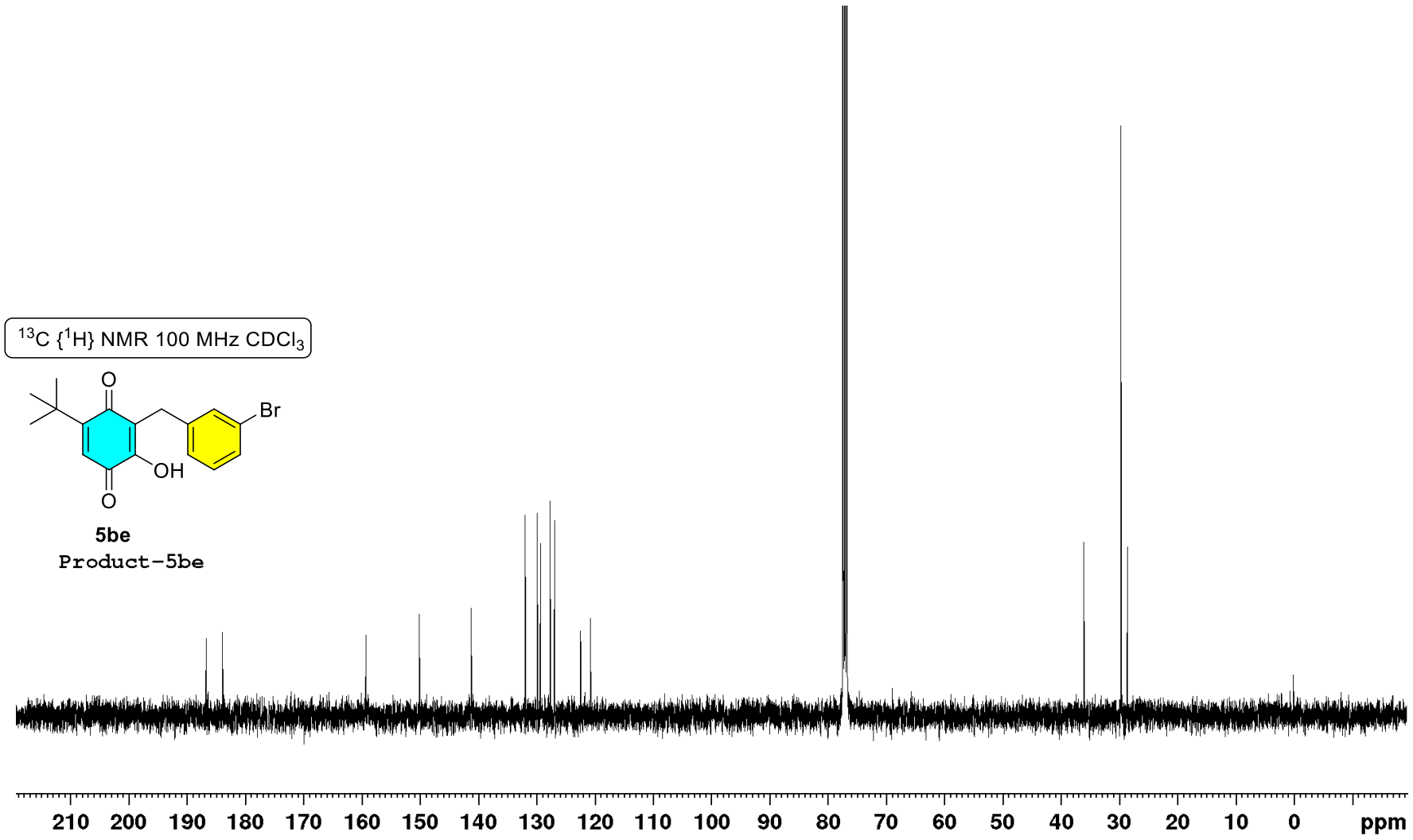
120.68

77.33
77.02 CDCl_3
76.70

36.02

29.61

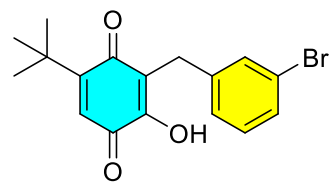
28.51



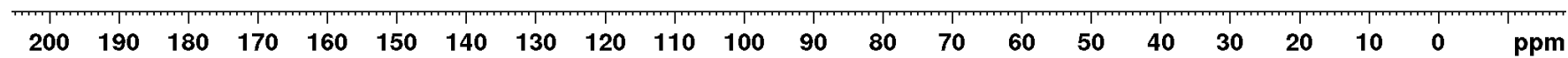
132.00
129.93
129.39
127.73
126.98

29.61
28.51

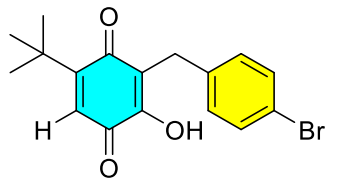
DEPT-135 NMR 100 MHz CDCl₃



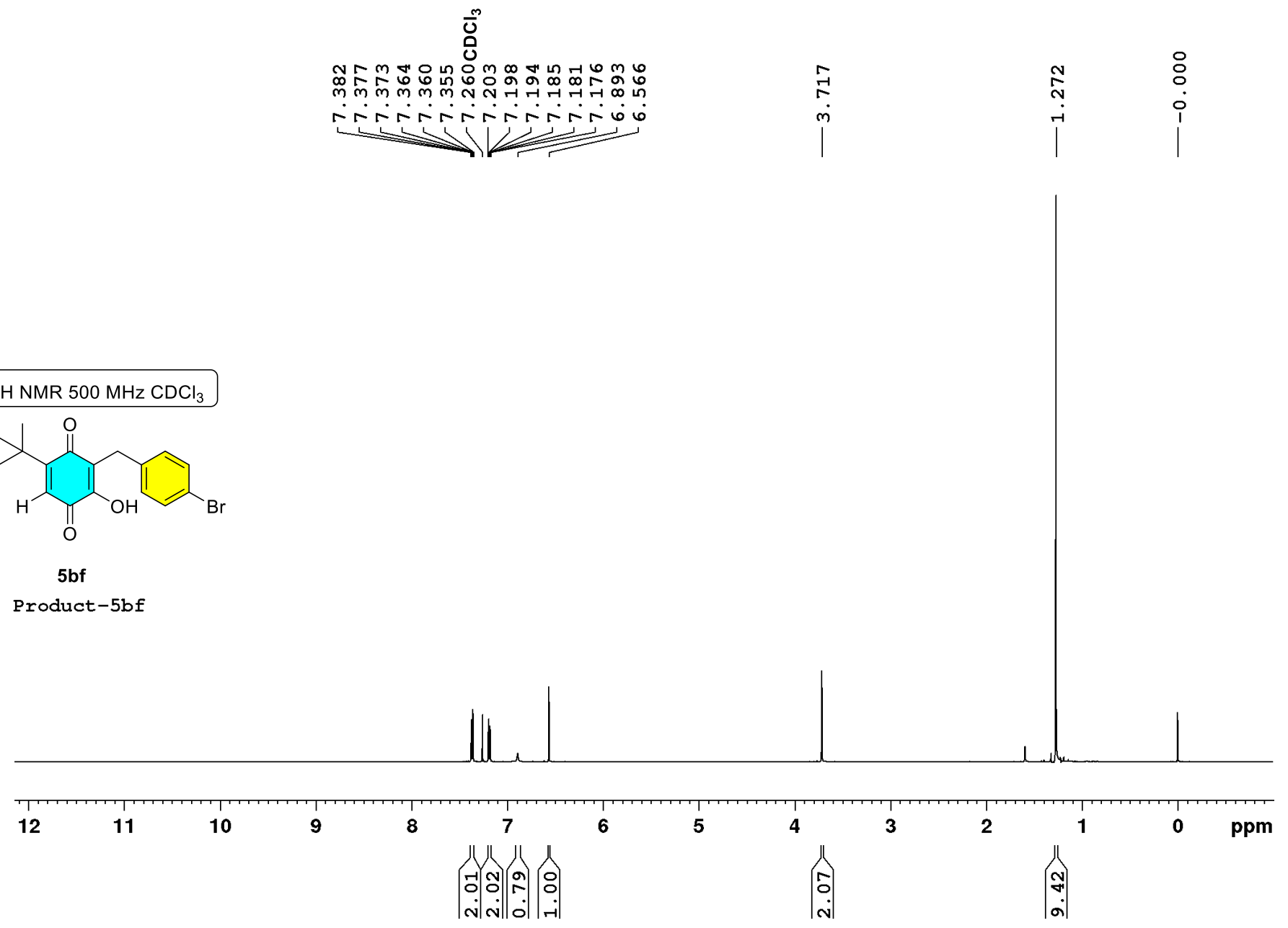
5be
Product-5be



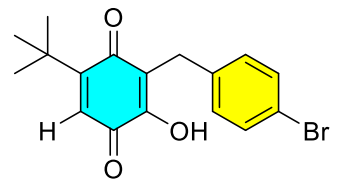
¹H NMR 500 MHz CDCl₃



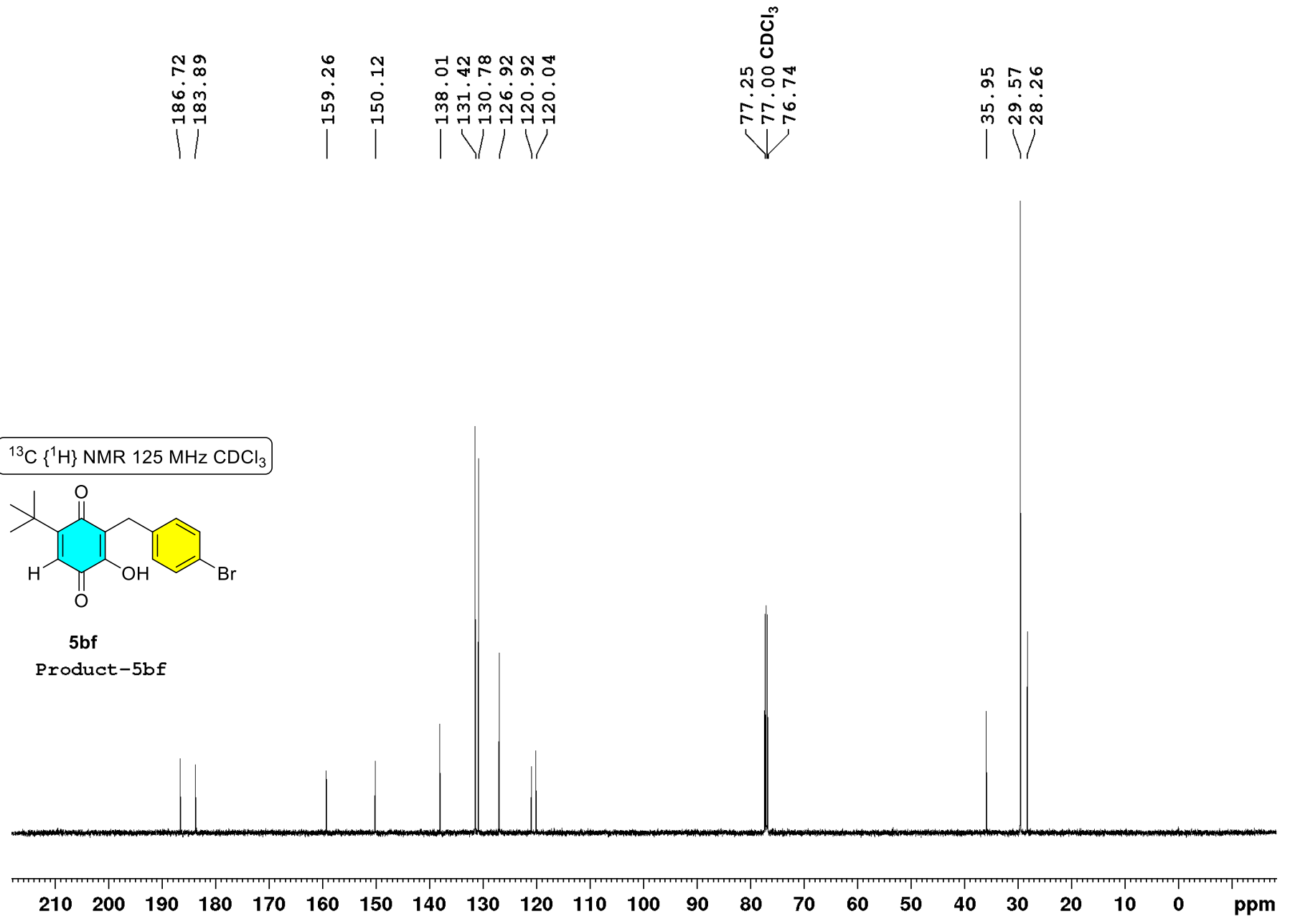
5b
Product-5b



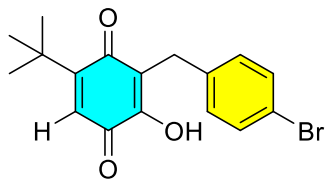
^{13}C $\{^1\text{H}\}$ NMR 125 MHz CDCl_3



5bf
Product-5bf



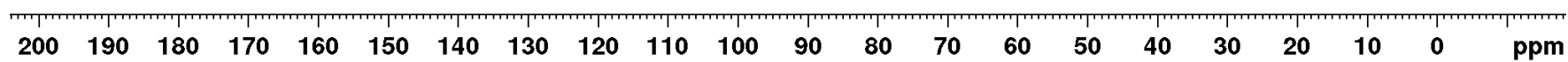
DEPT-135 NMR 125 MHz CDCl₃



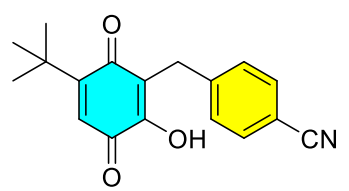
5b
Product-5b

131.42
130.79
126.93

29.56
28.26

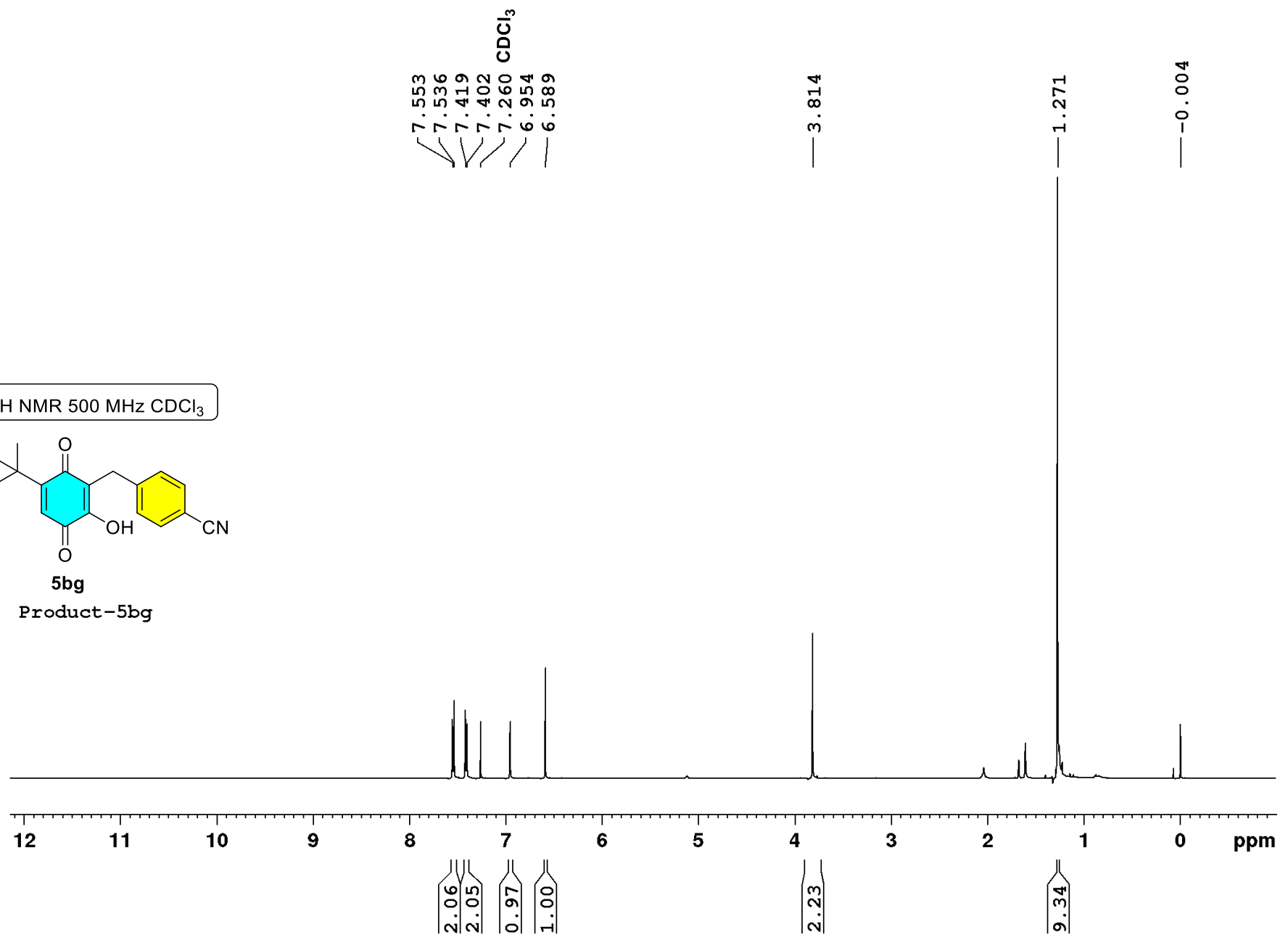


¹H NMR 500 MHz CDCl₃

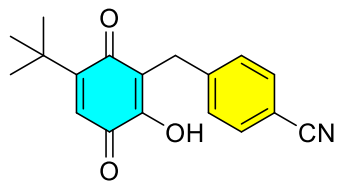


5bg

Product-5bg

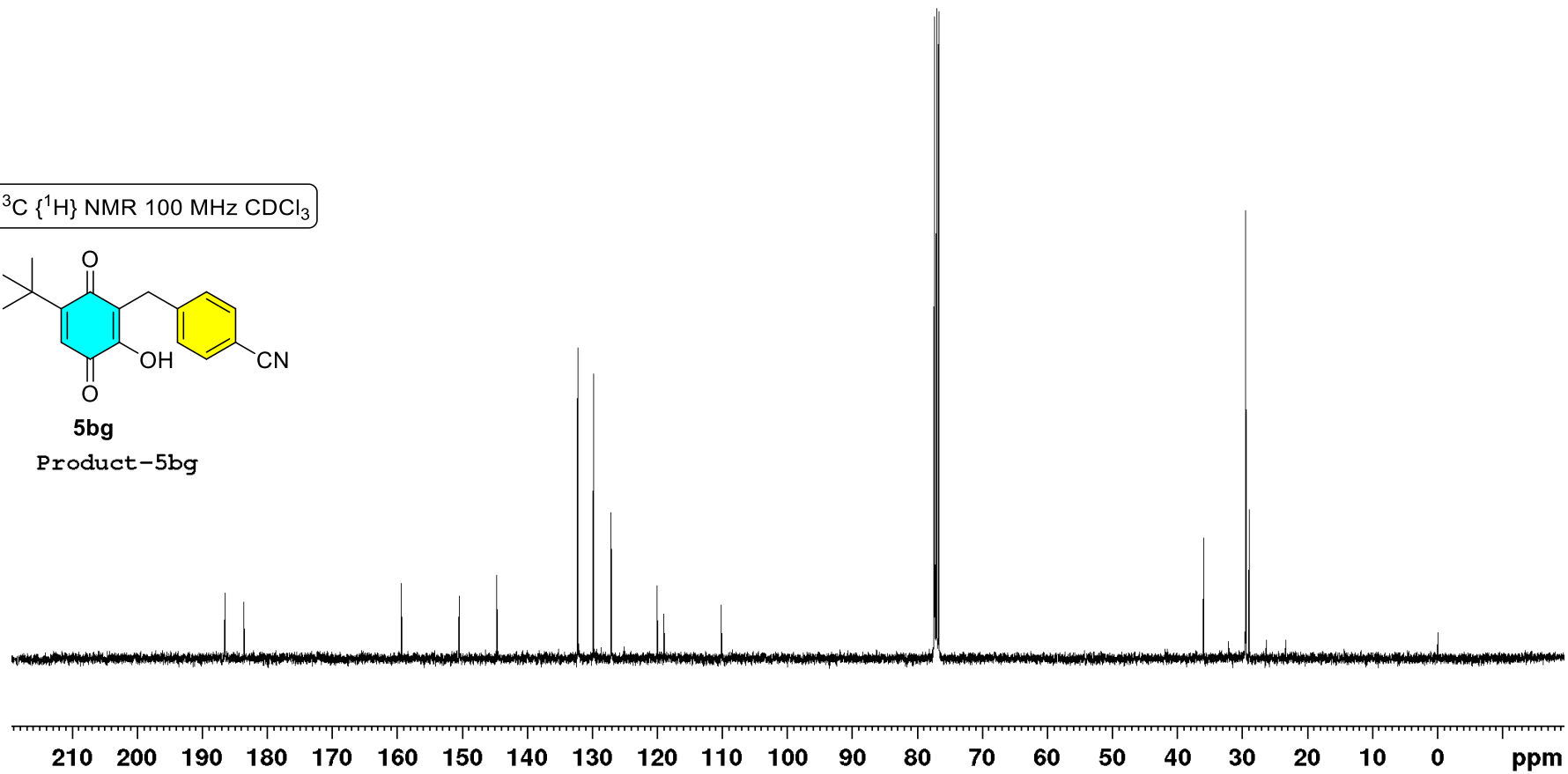


$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3

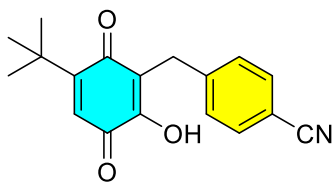


5bg

Product-5bg



DEPT-135 NMR 100 MHz CDCl₃

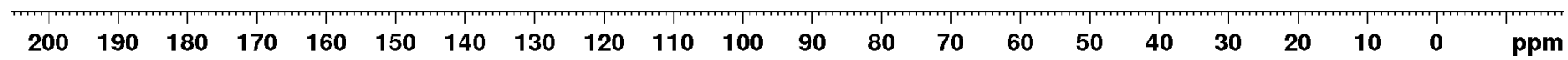


5bg

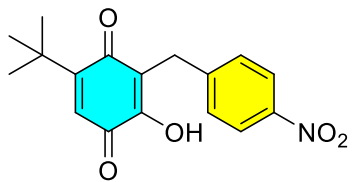
Product-5bg

132.26
129.83
127.11

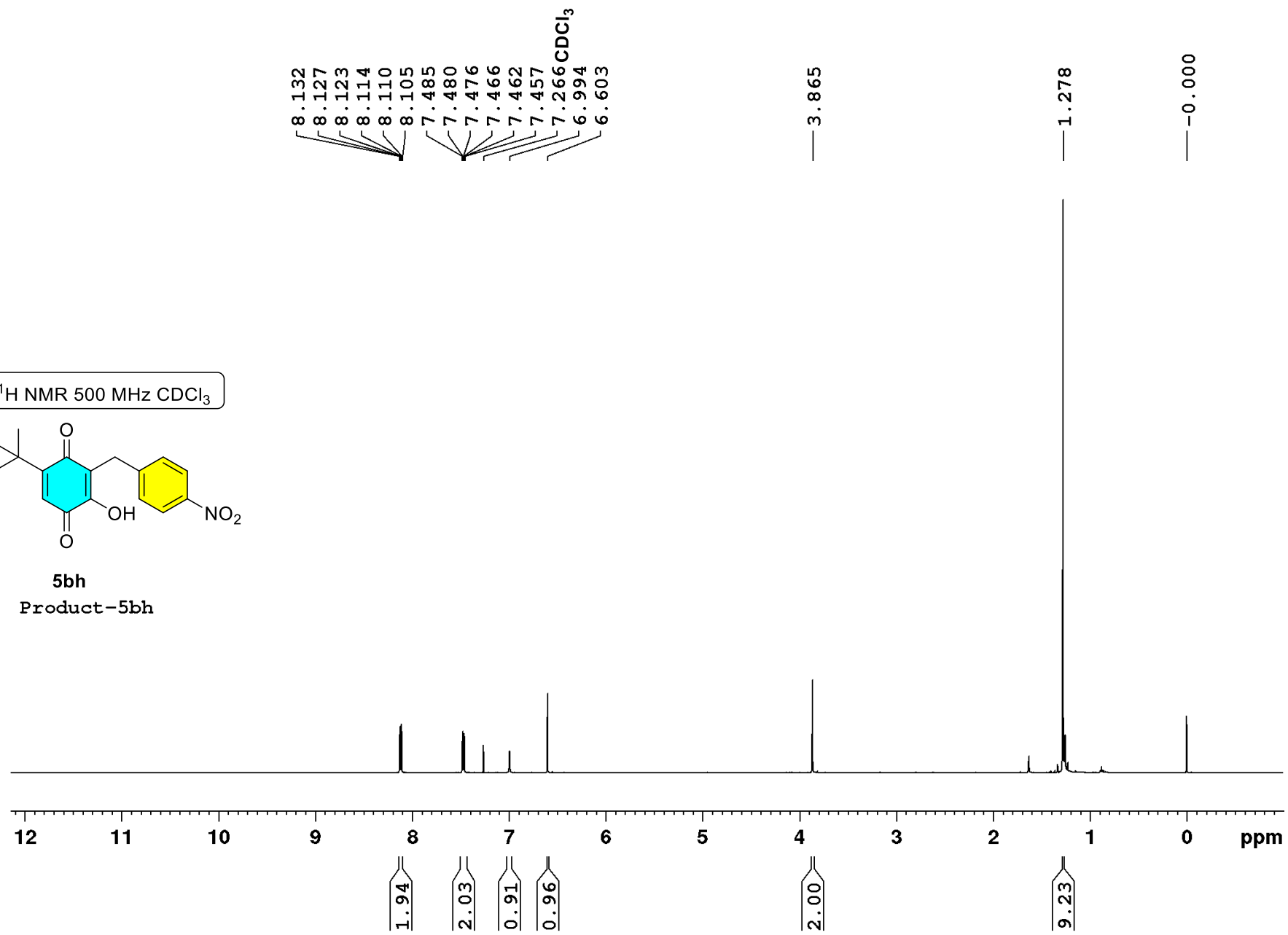
29.07
26.41



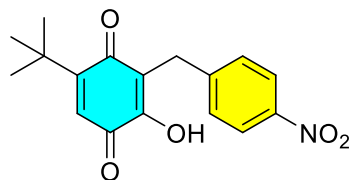
¹H NMR 500 MHz CDCl₃



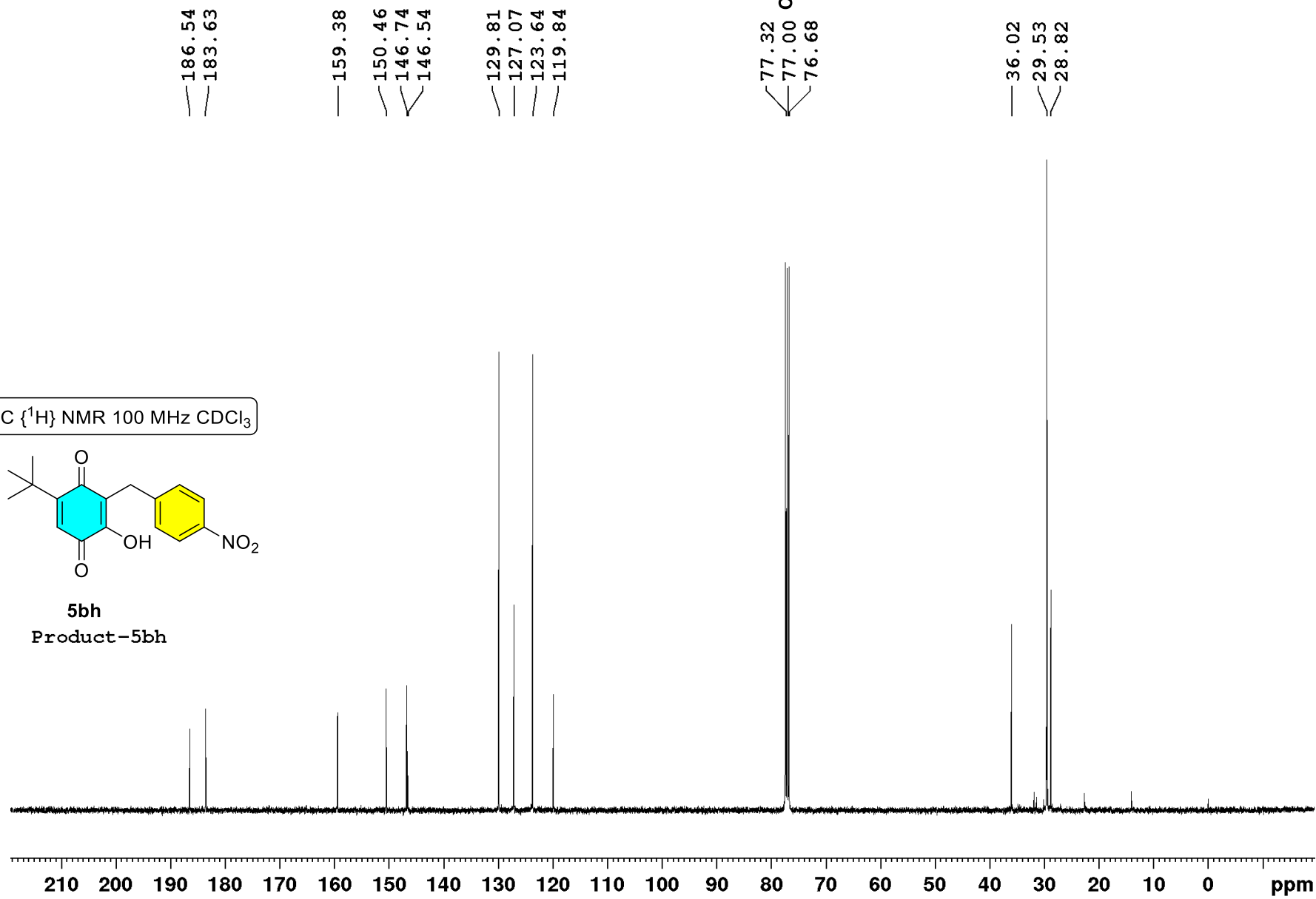
5bh
Product-5bh



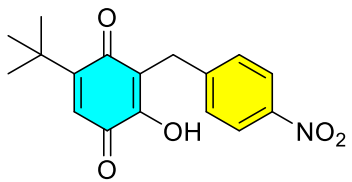
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



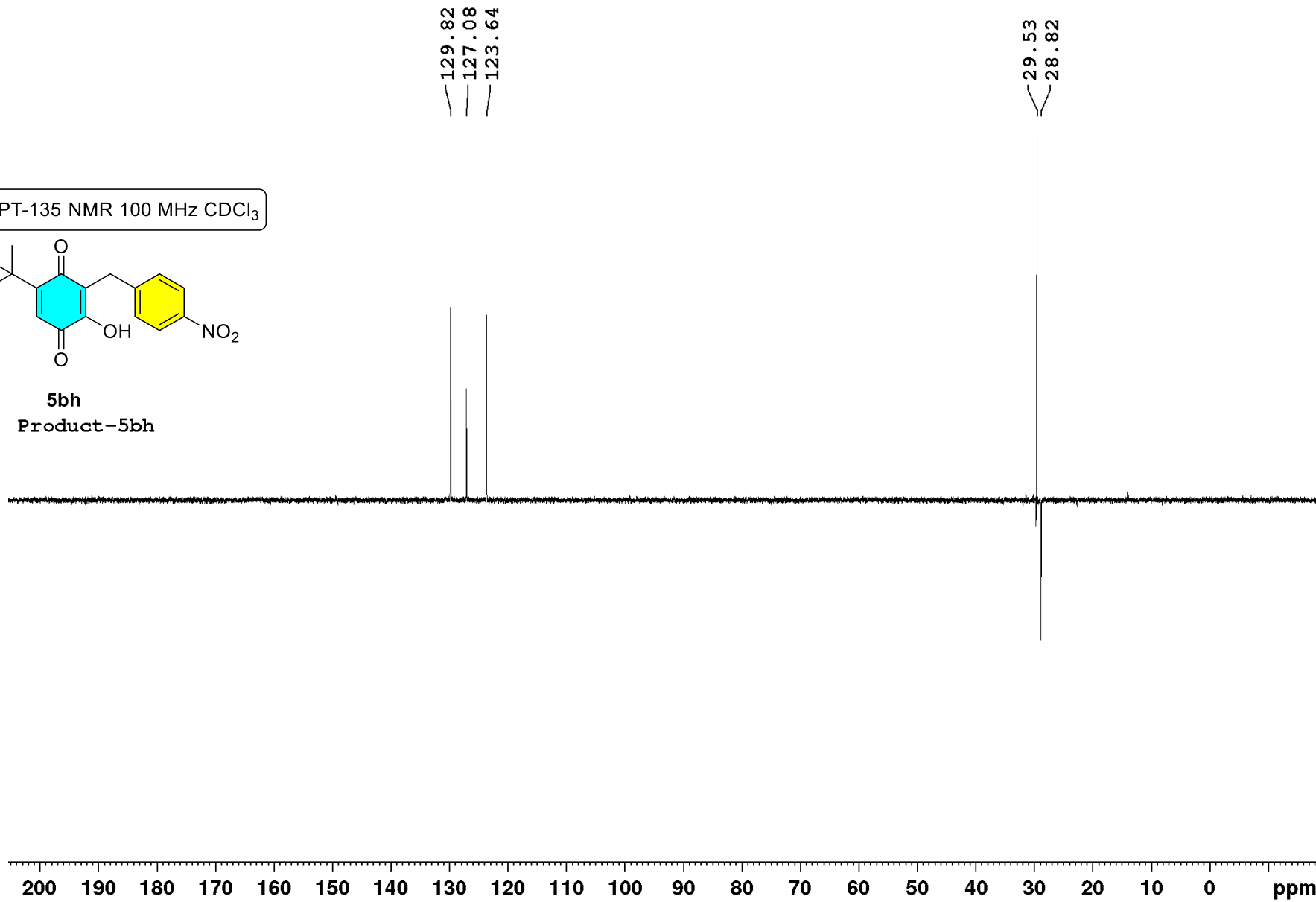
5b
Product-5b

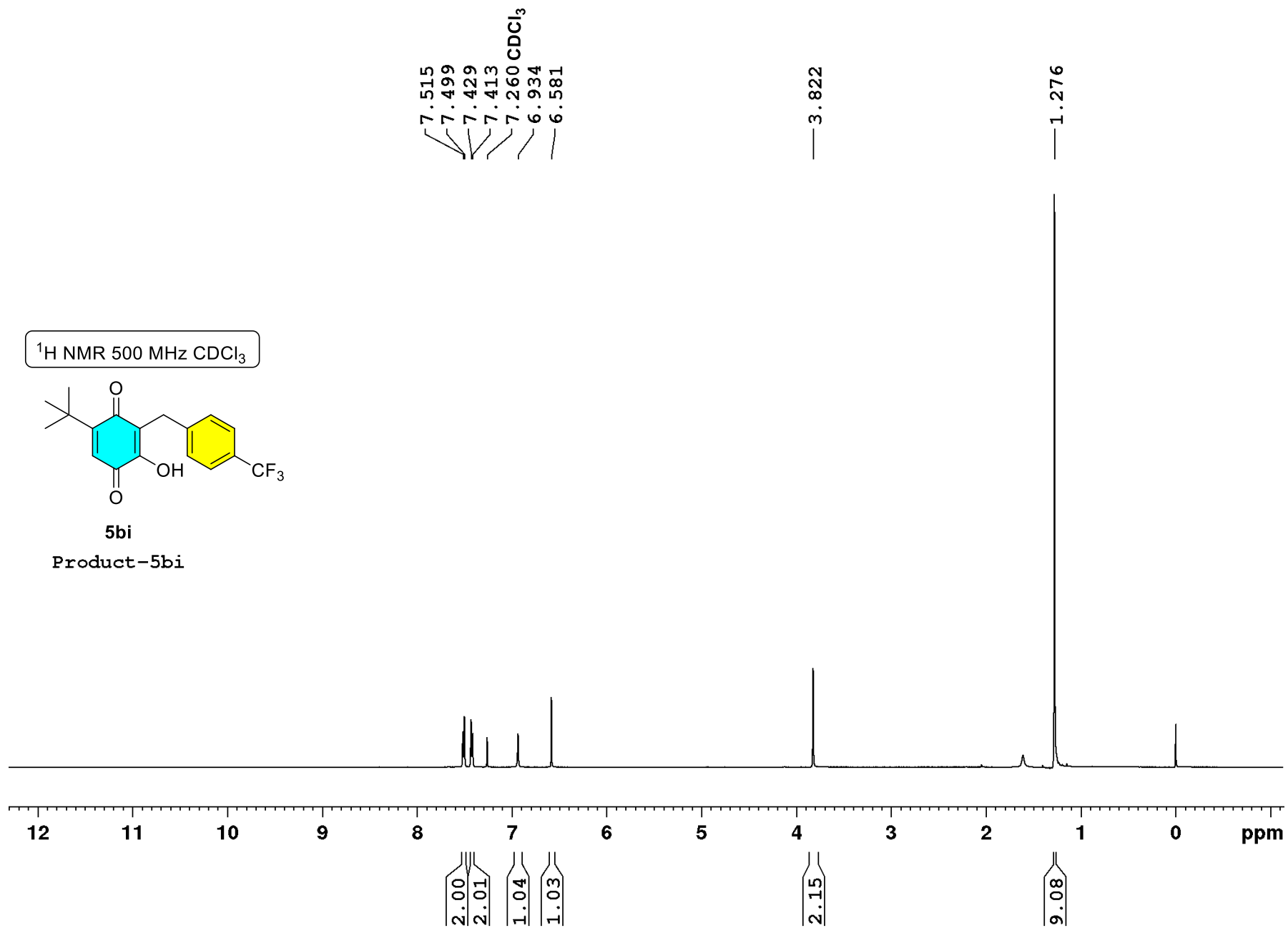


DEPT-135 NMR 100 MHz CDCl₃

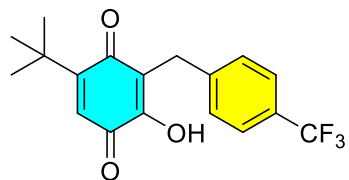


5b
Product-5b



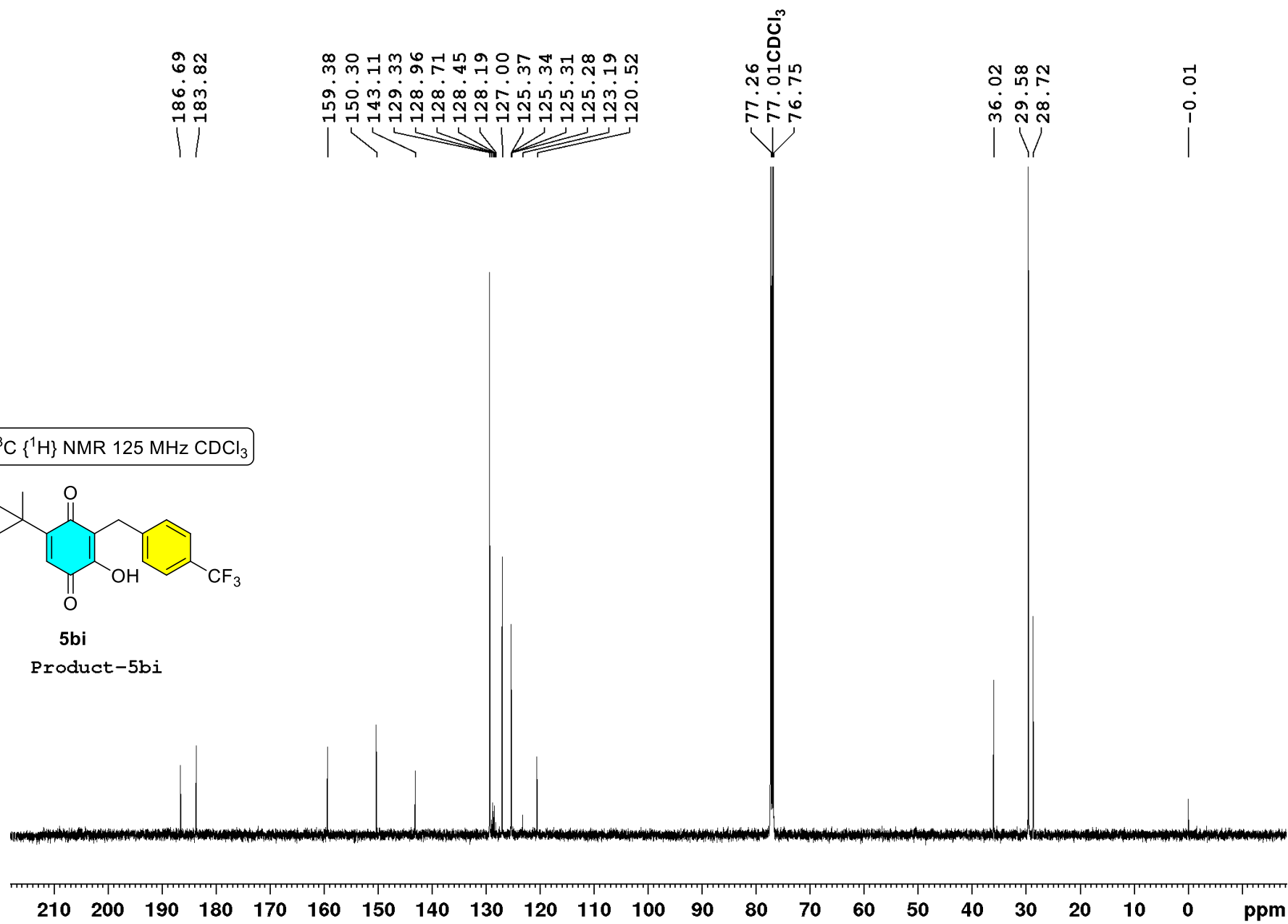


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3

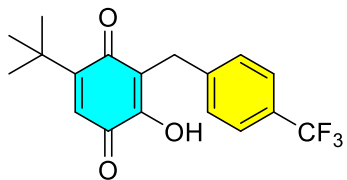


5bi

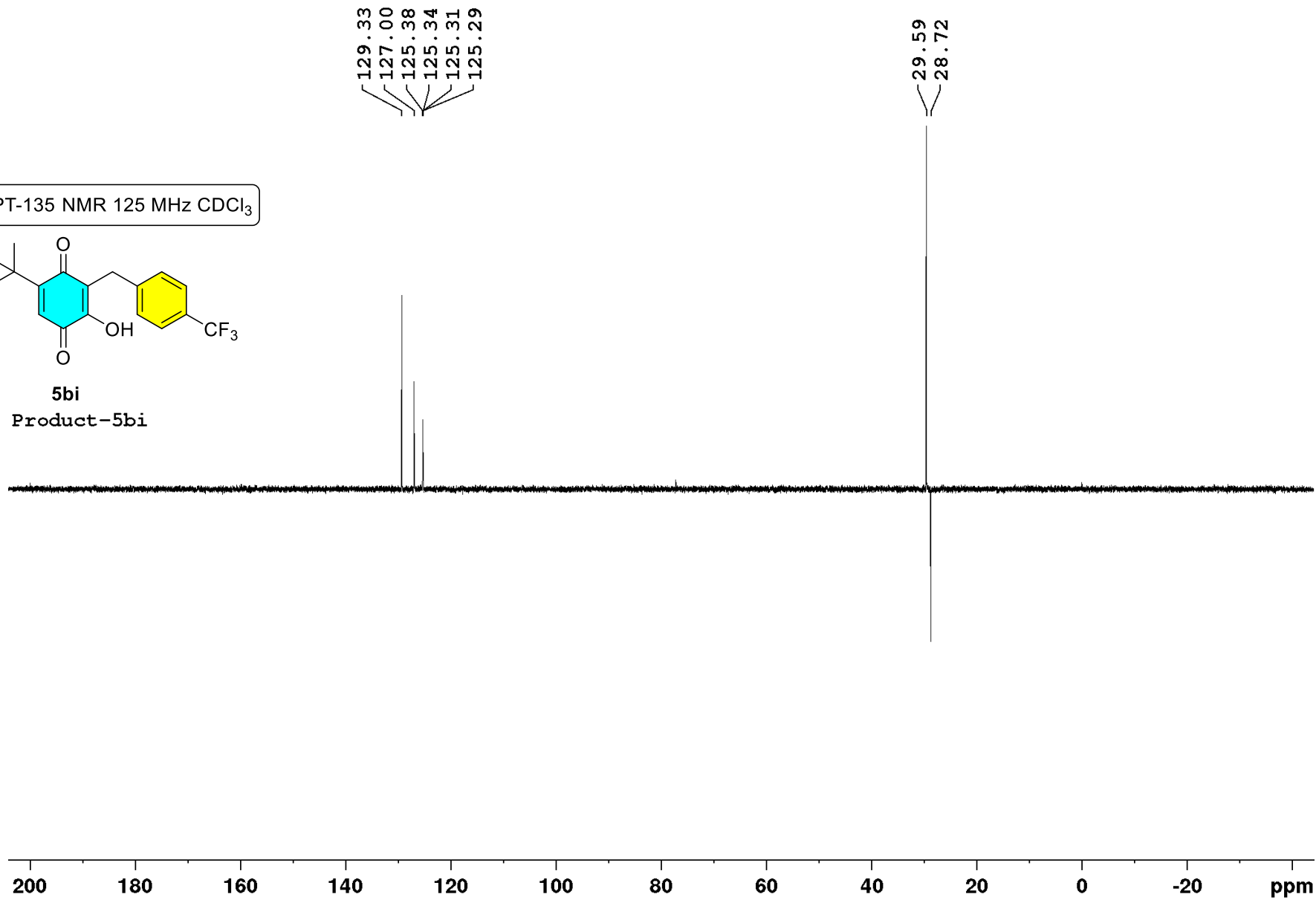
Product-5bi



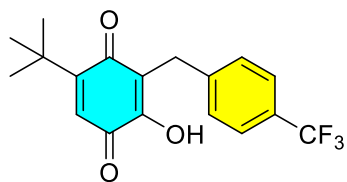
DEPT-135 NMR 125 MHz CDCl₃



5bi
Product-5bi



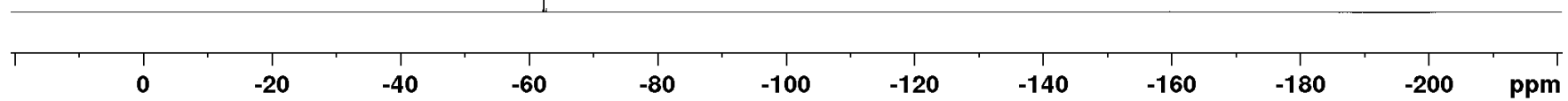
^{19}F NMR 470 MHz CDCl_3



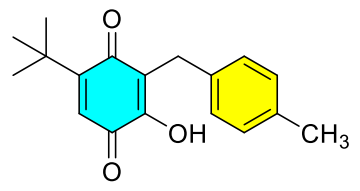
5bi

Product-5bi

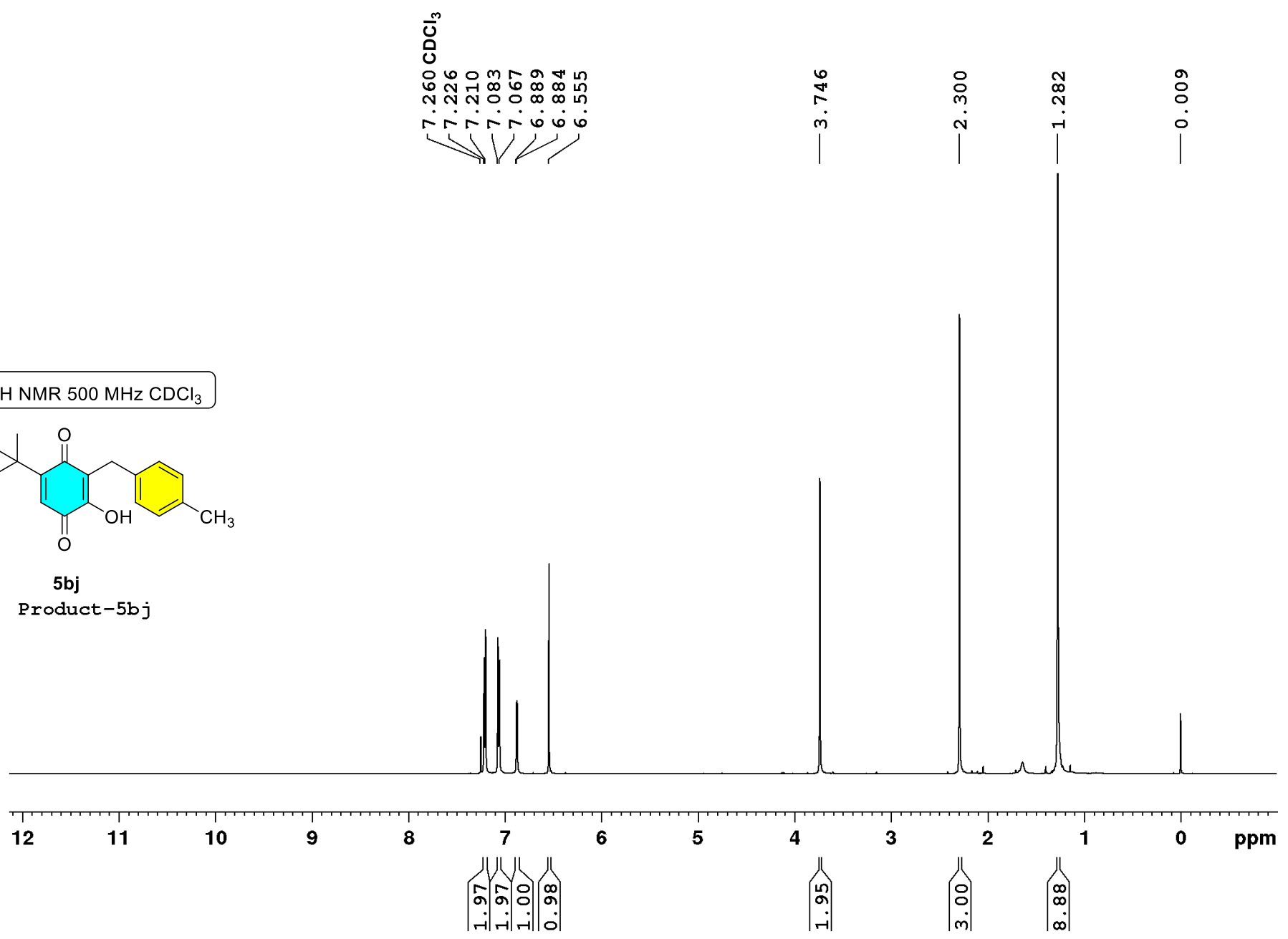
---62.38



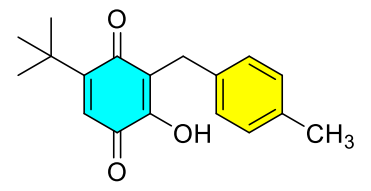
¹H NMR 500 MHz CDCl₃



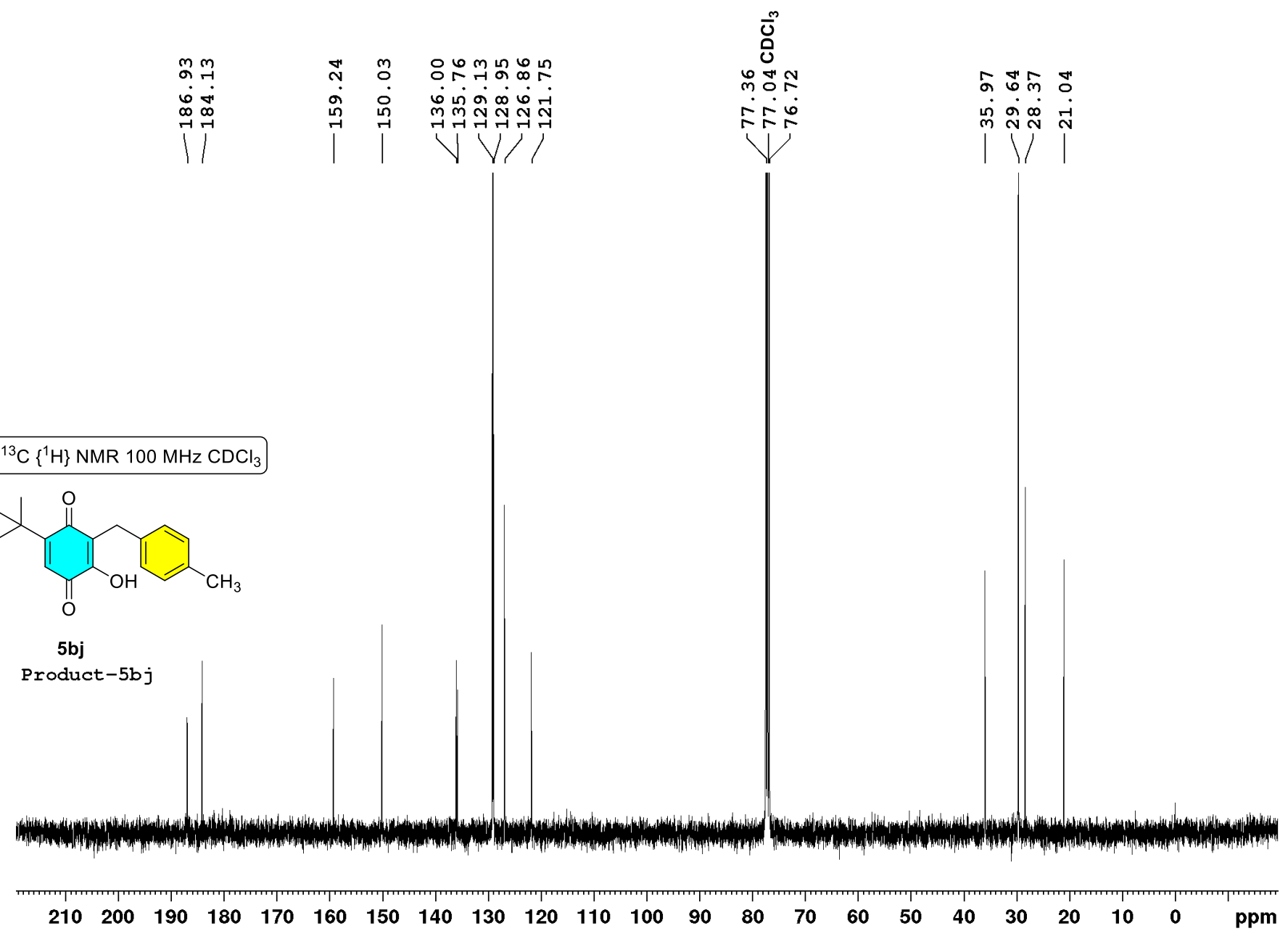
5bj
Product-5bj



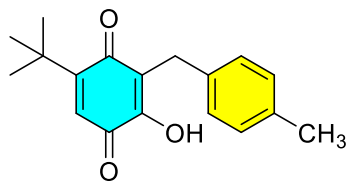
^{13}C $\{^1\text{H}\}$ NMR 100 MHz CDCl_3



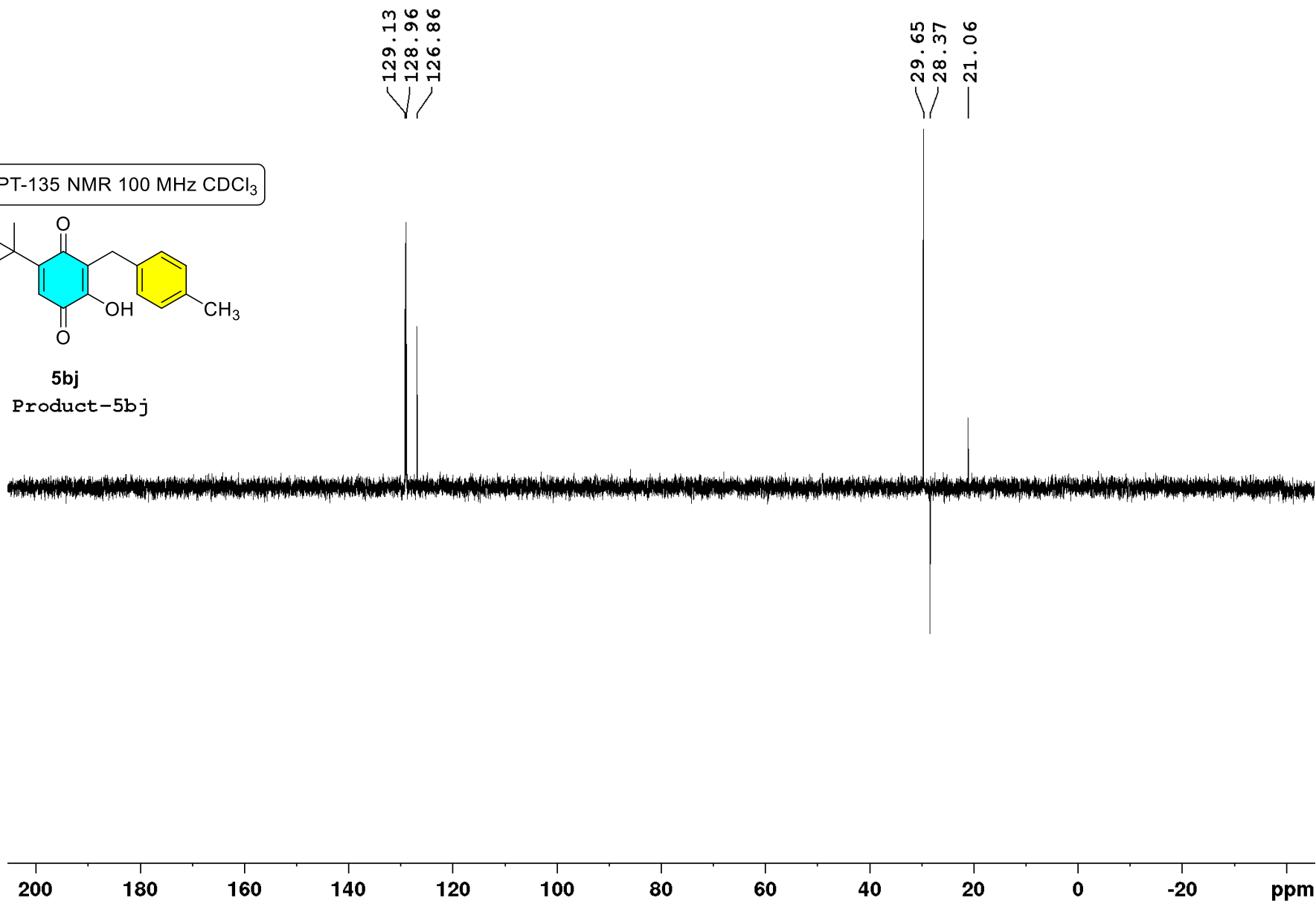
5bj
Product-5bj



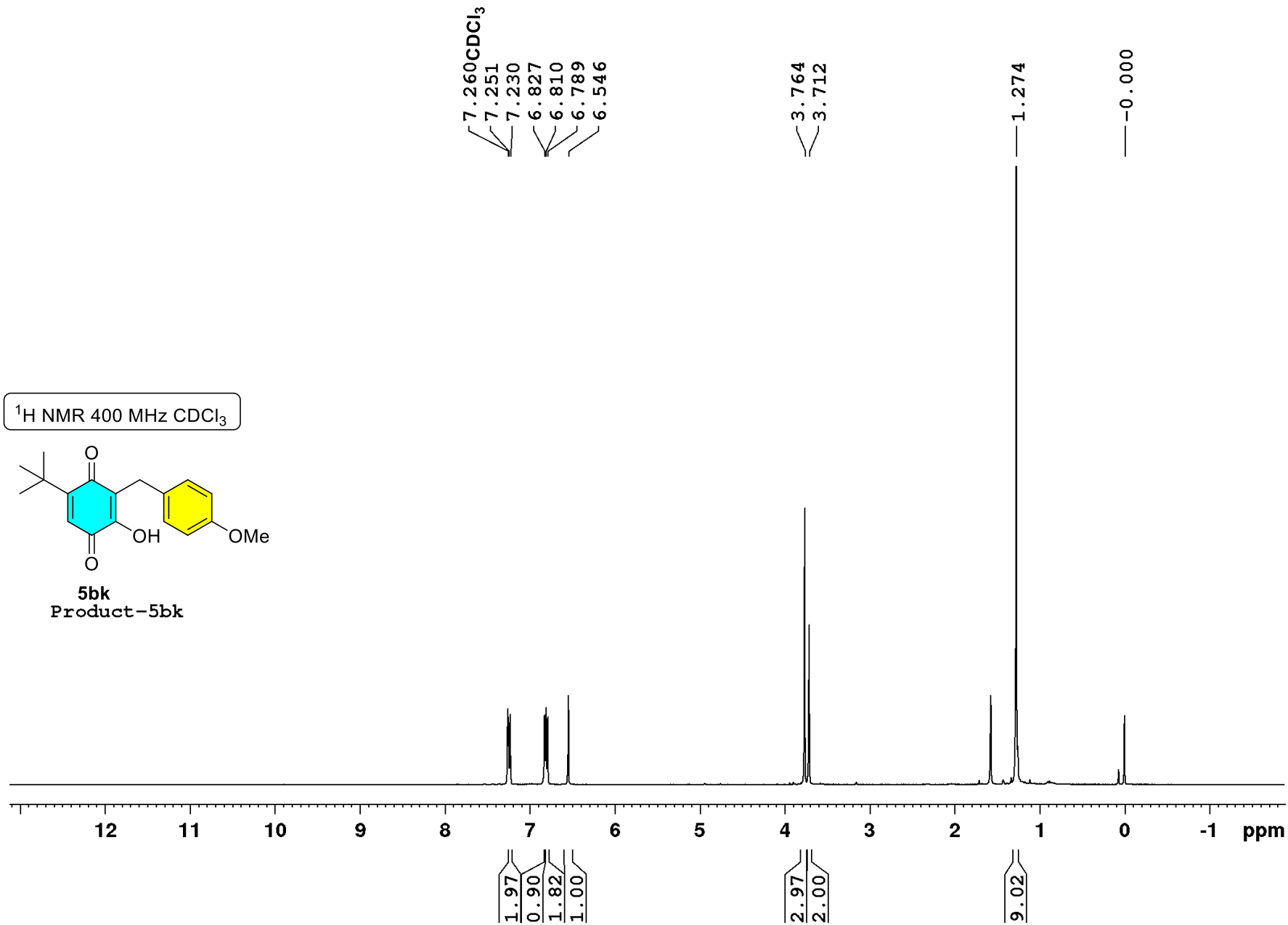
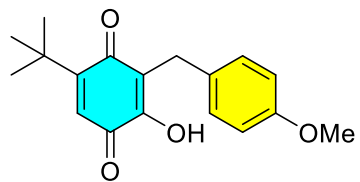
DEPT-135 NMR 100 MHz CDCl₃



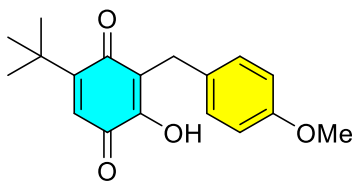
5bj
Product-5bj



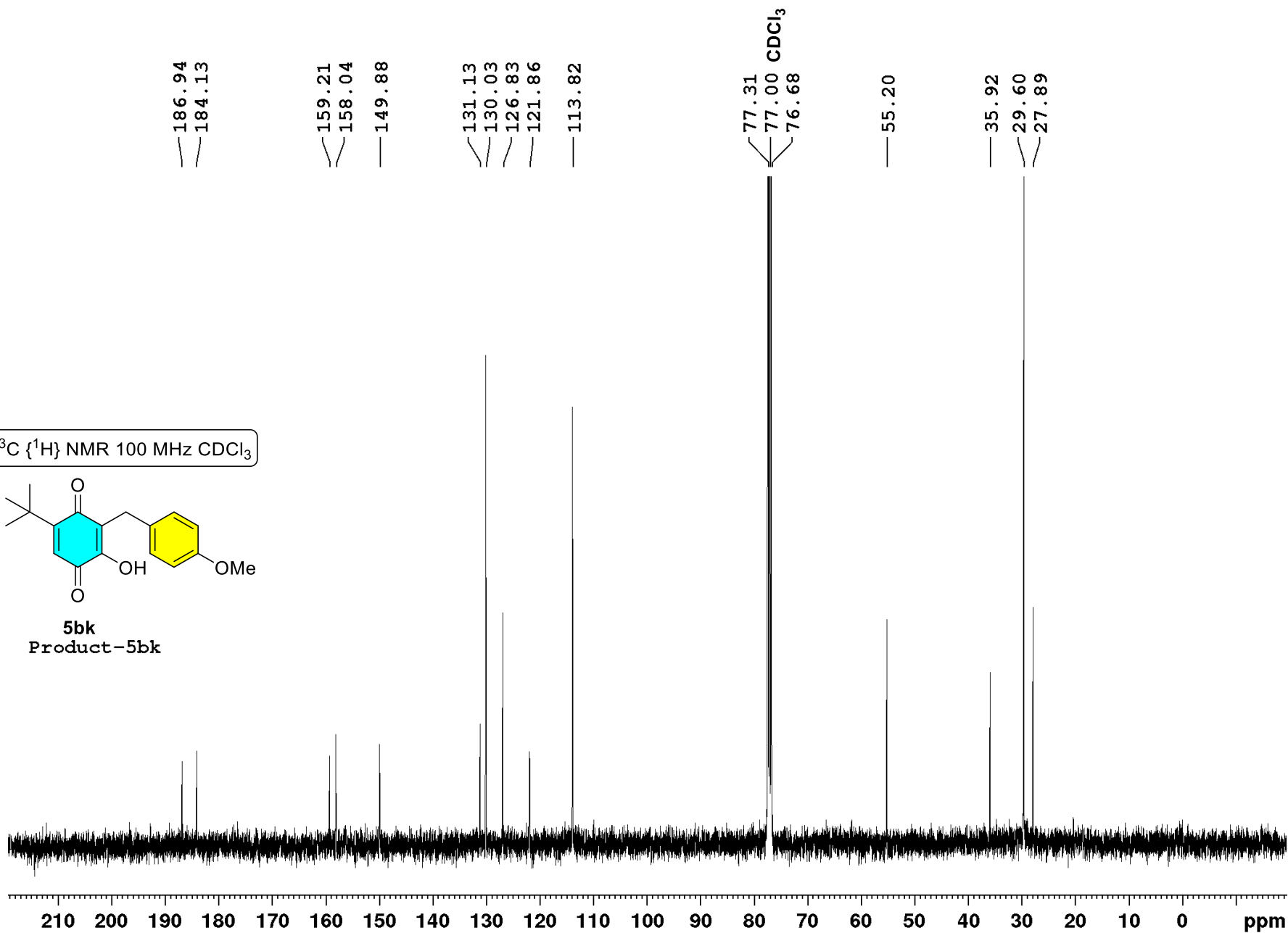
¹H NMR 400 MHz CDCl₃



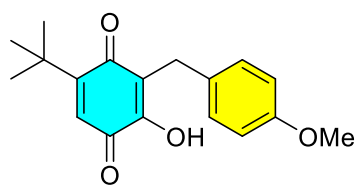
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



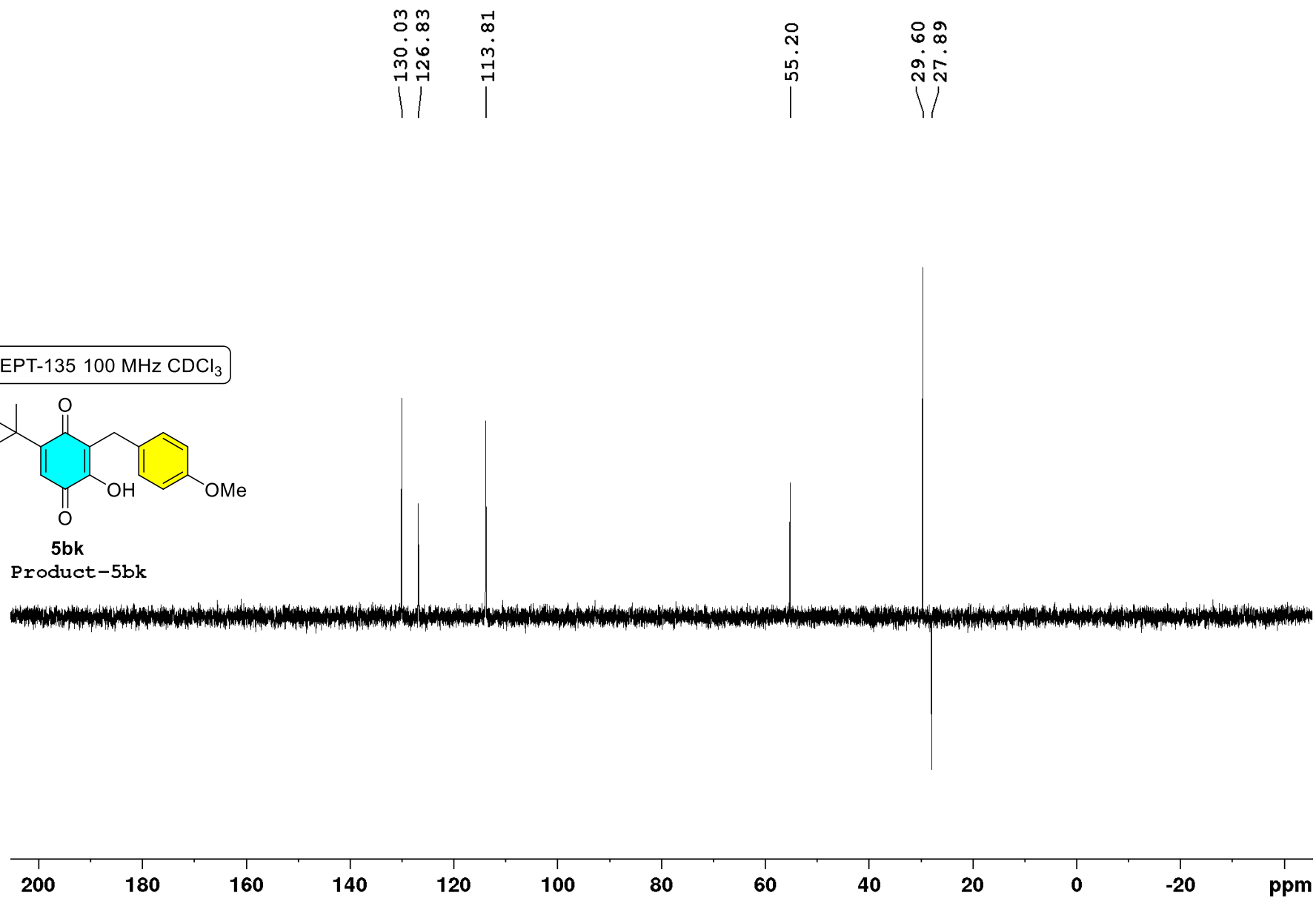
5b
Product-5b



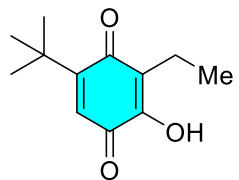
DEPT-135 100 MHz CDCl₃



5bk
Product-5bk

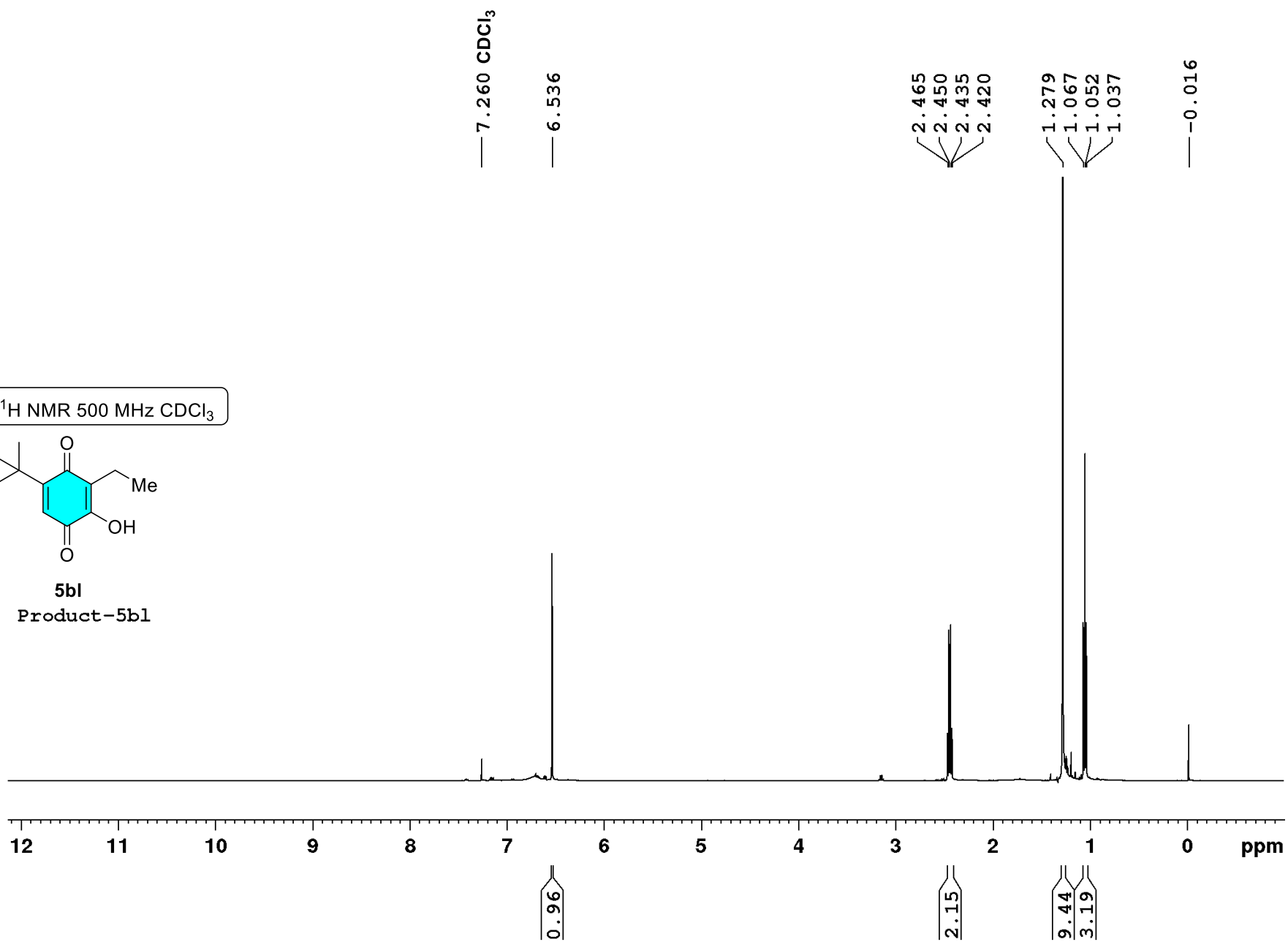


^1H NMR 500 MHz CDCl_3

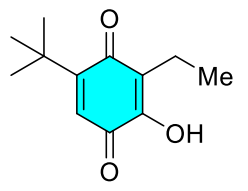


5b1

Product-5b1

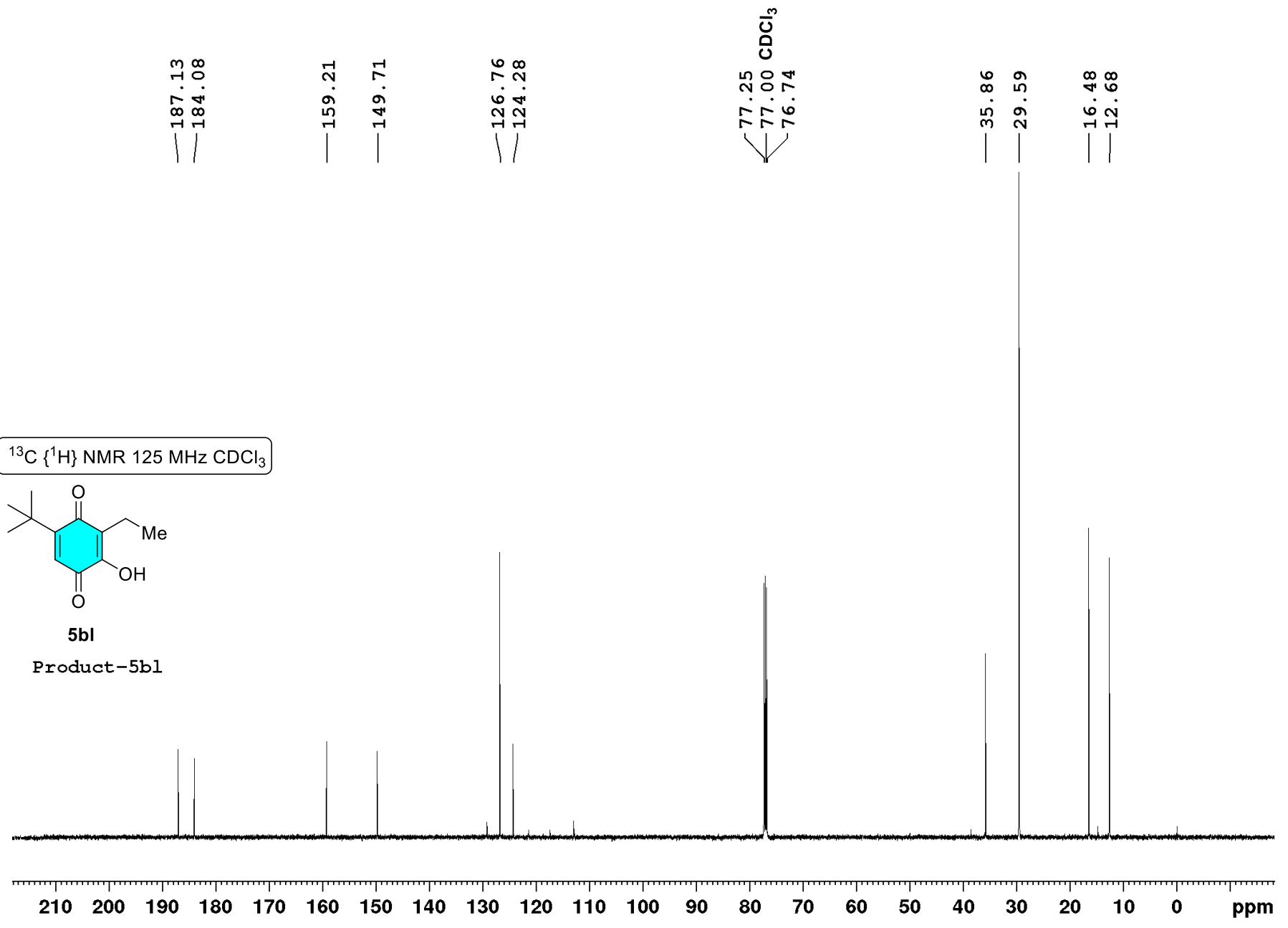


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3

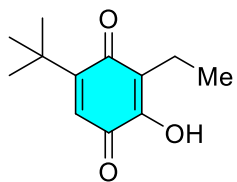


5b1

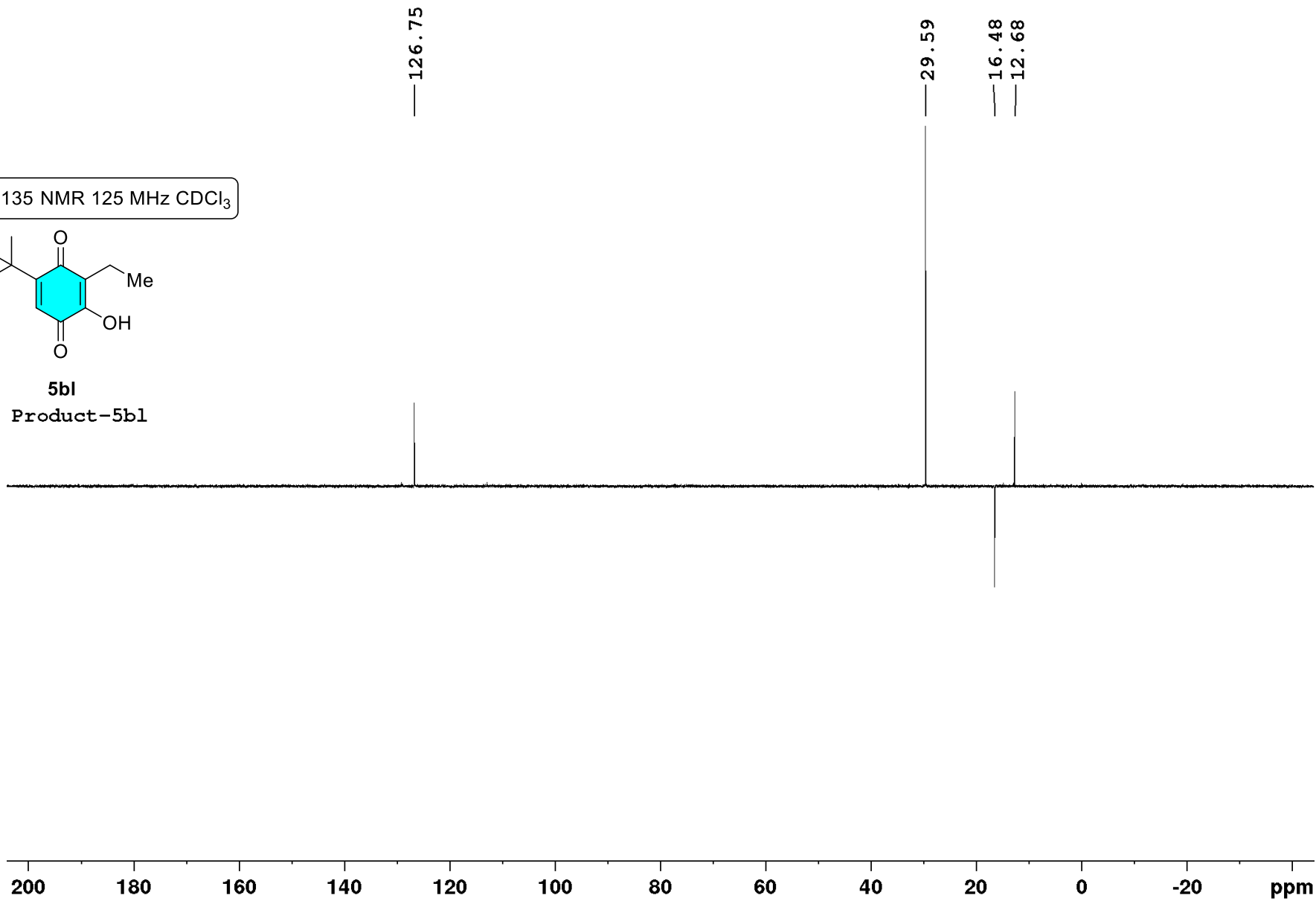
Product-5b1



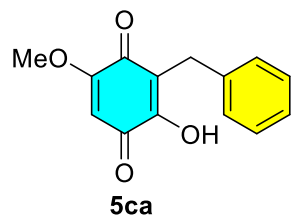
DEPT-135 NMR 125 MHz CDCl₃



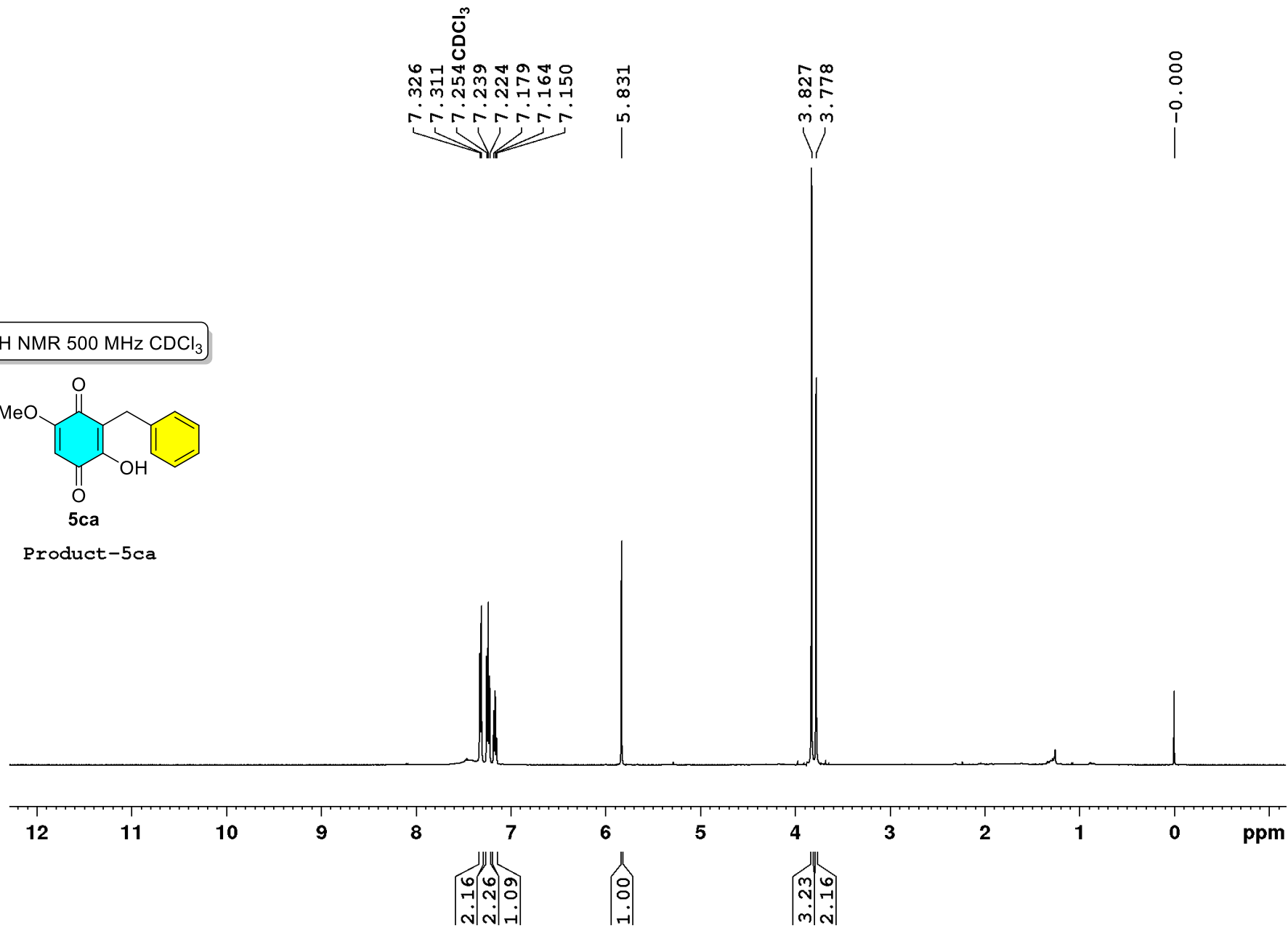
5b1
Product-5b1



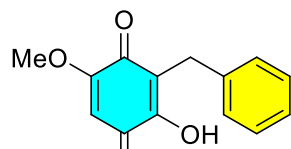
¹H NMR 500 MHz CDCl₃



Product-5ca

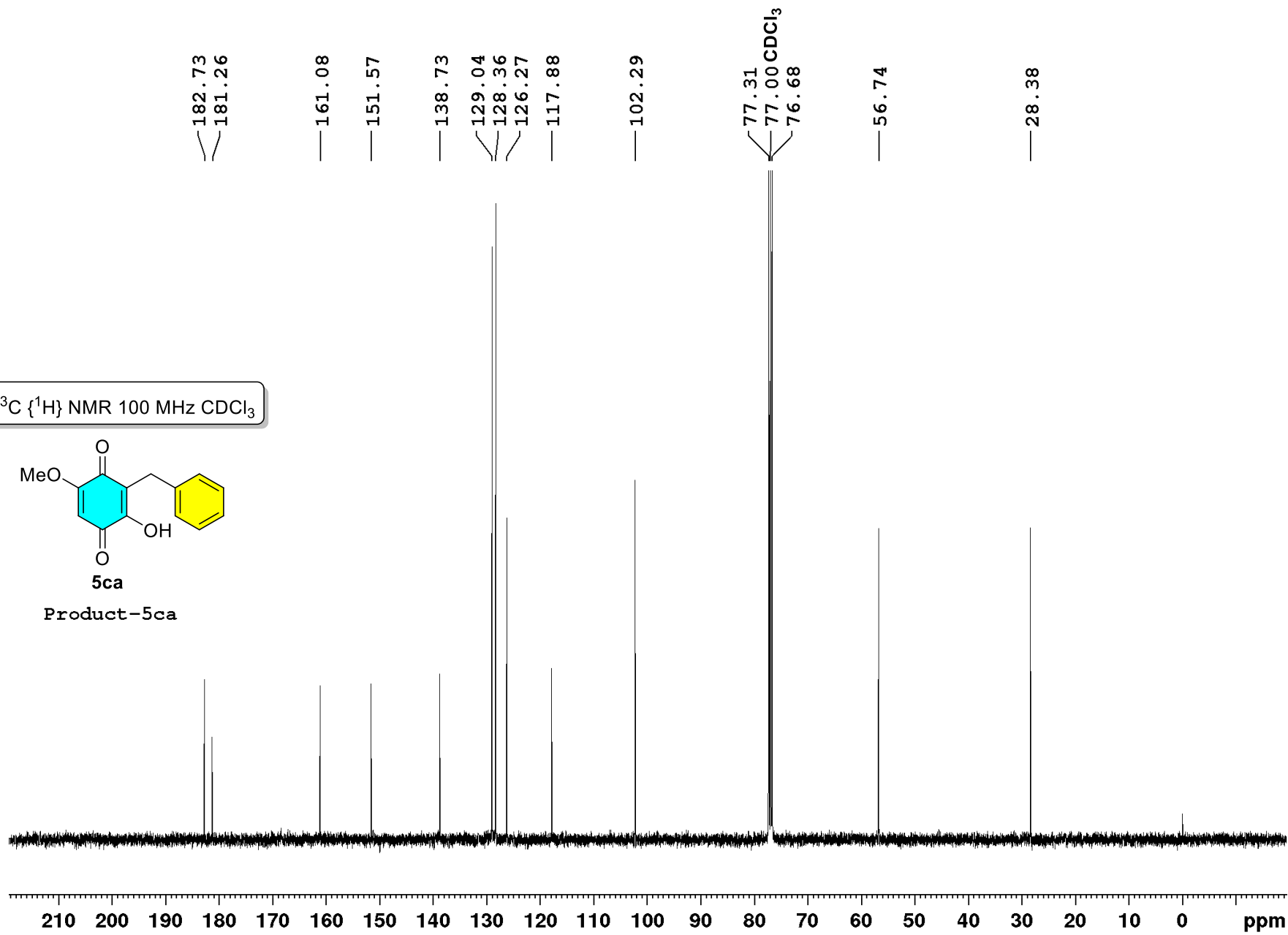


$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3

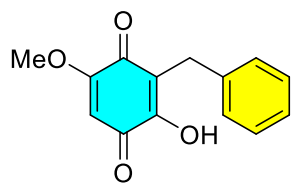


5ca

Product-5ca

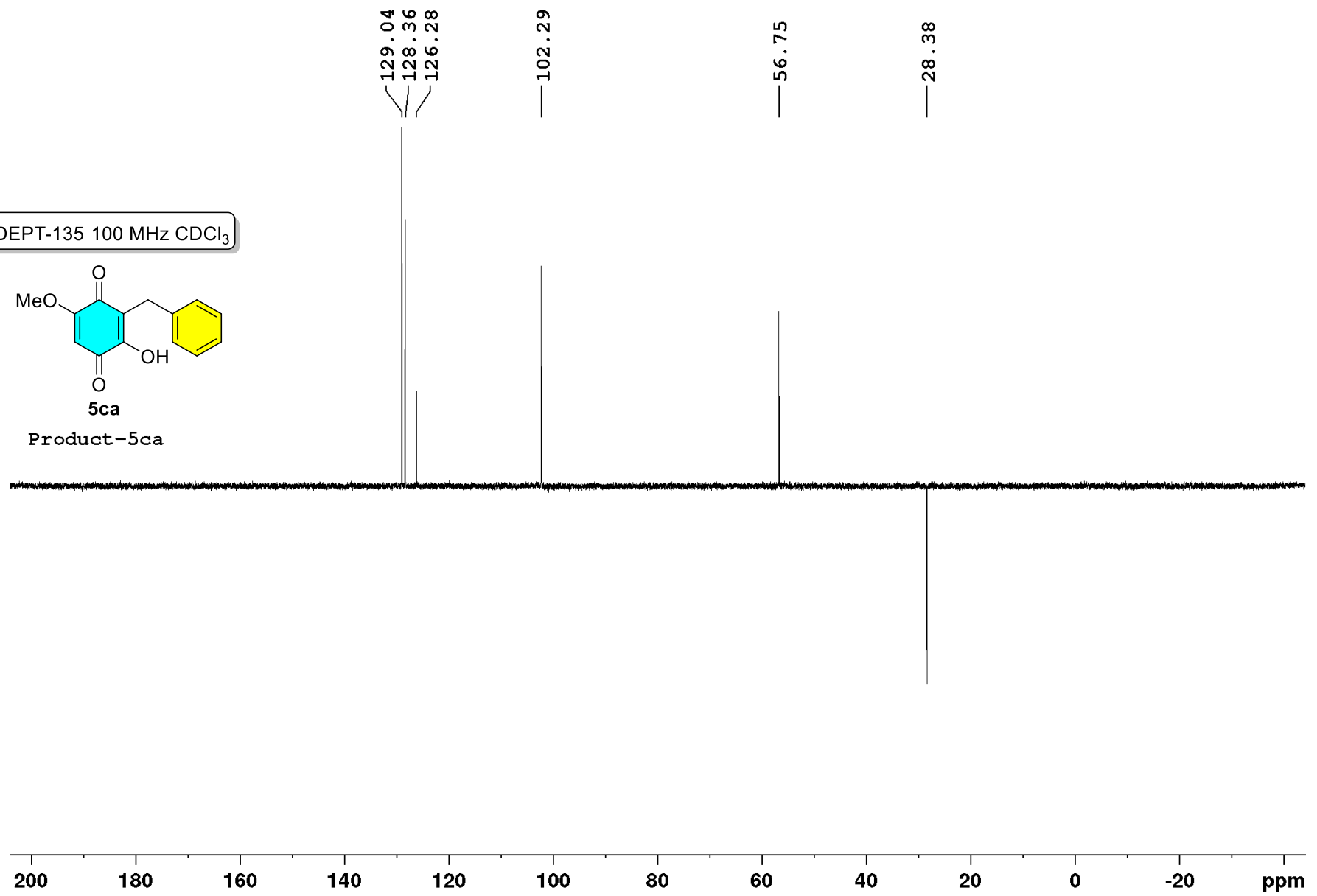


DEPT-135 100 MHz CDCl₃

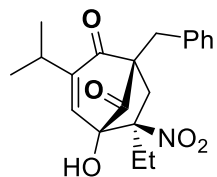


5ca

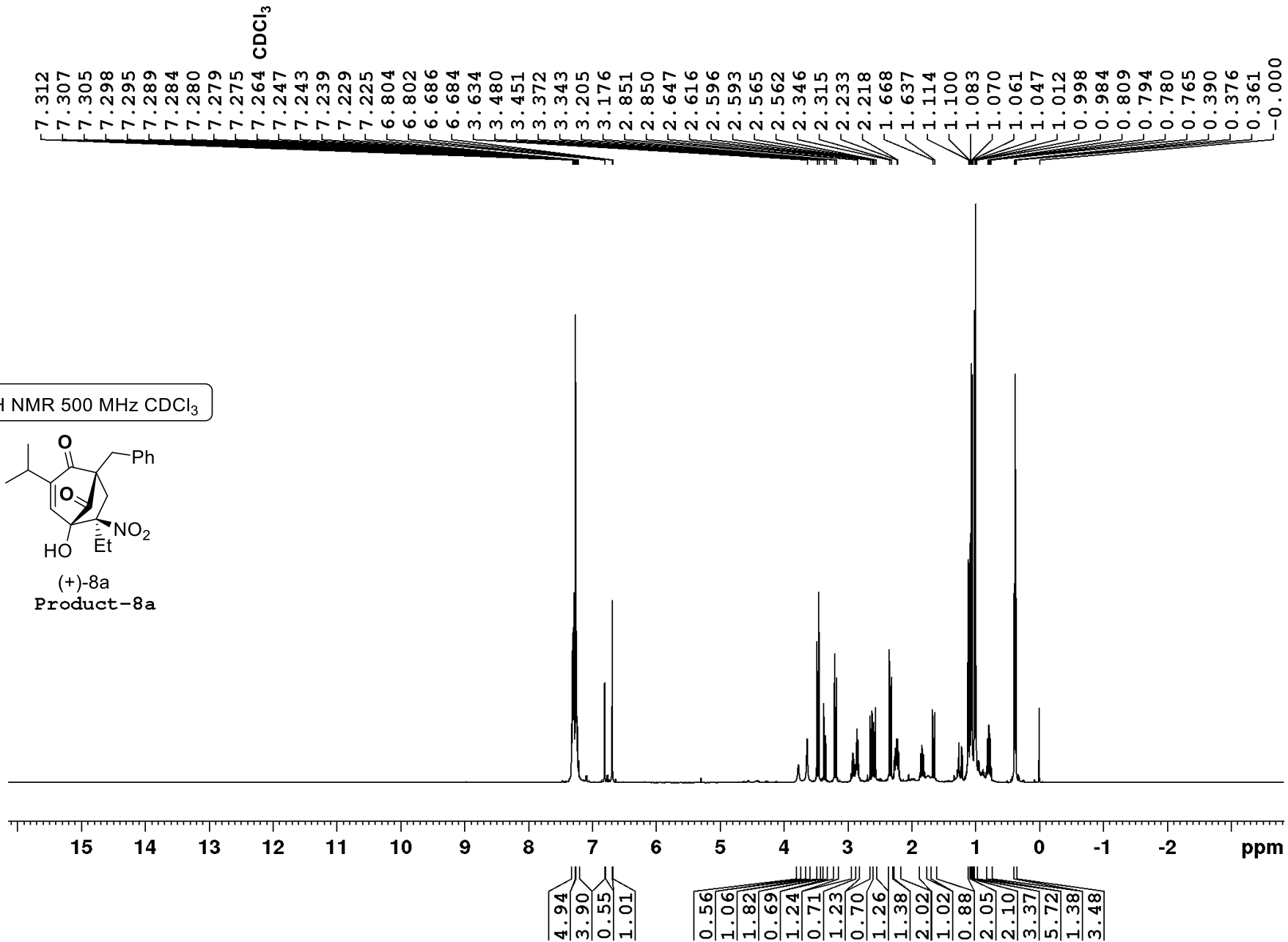
Product-5ca



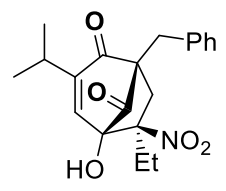
¹H NMR 500 MHz CDCl₃



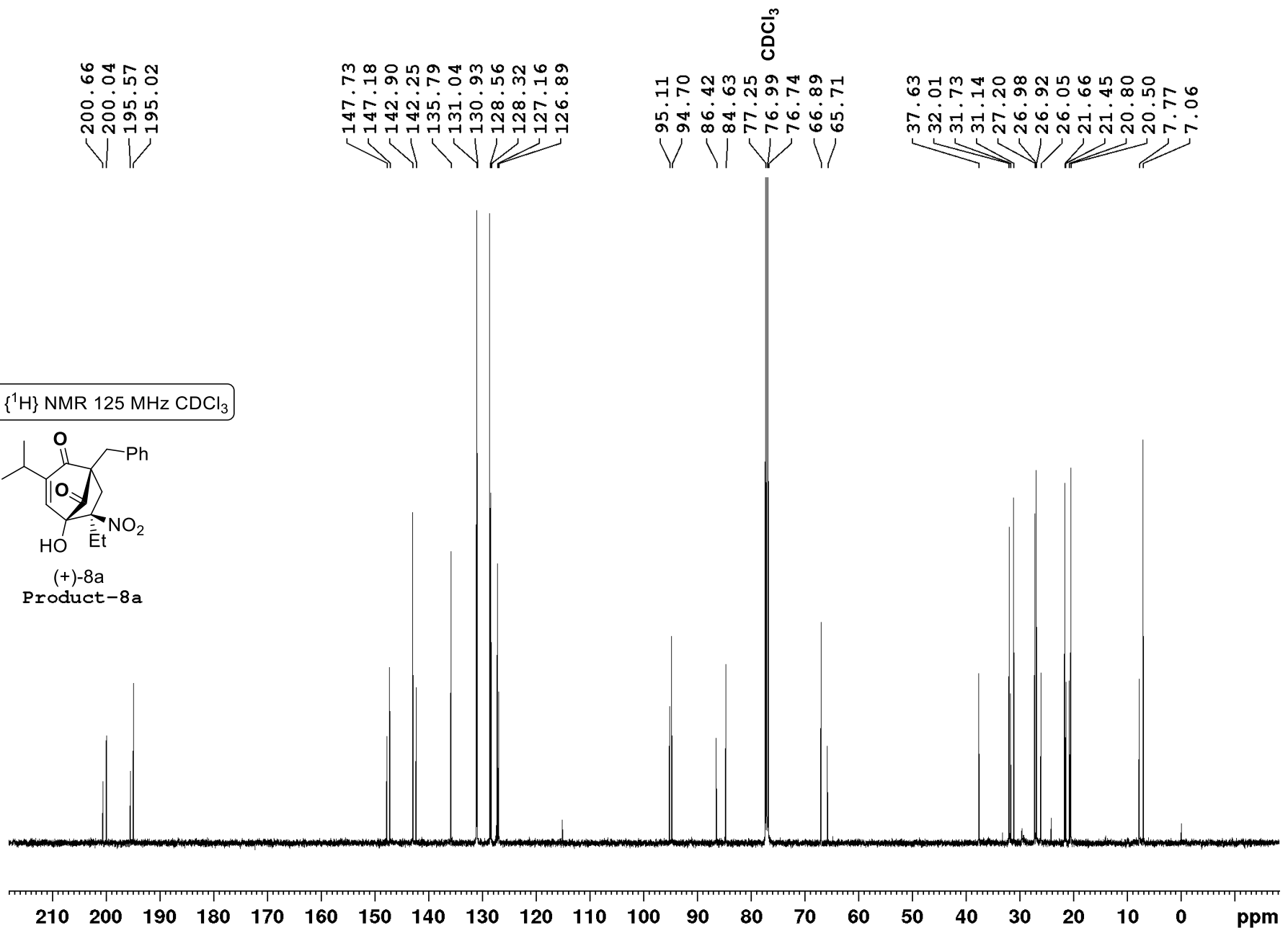
(+)-8a
Product-8a



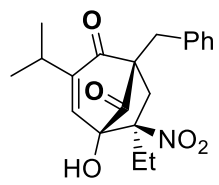
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



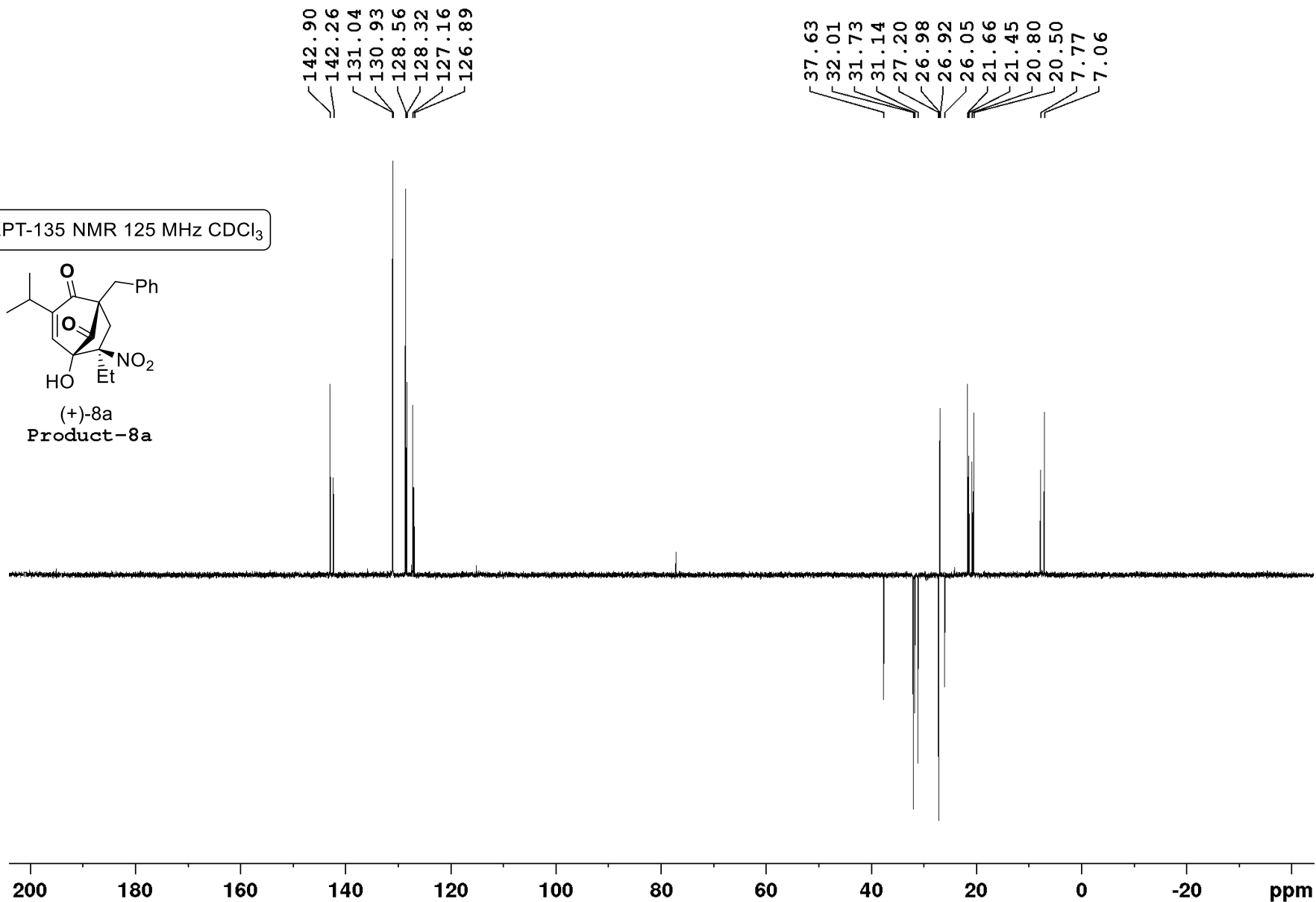
(+)-8a
Product-8a



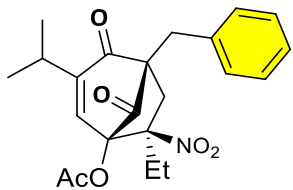
DEPT-135 NMR 125 MHz CDCl₃



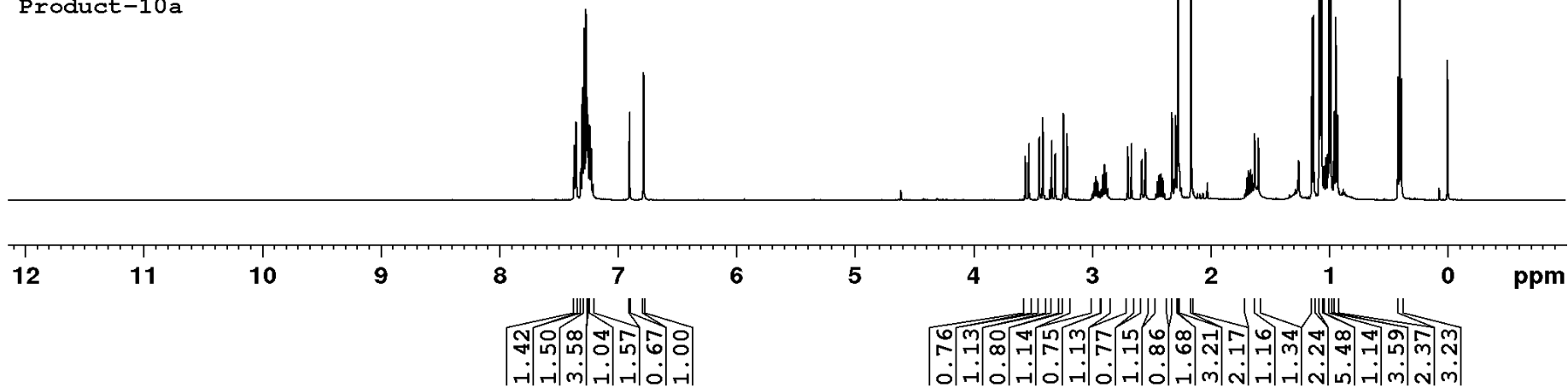
(+)-8a
Product-8a



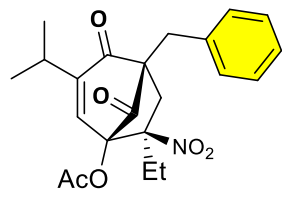
¹H NMR 500 MHz CDCl₃



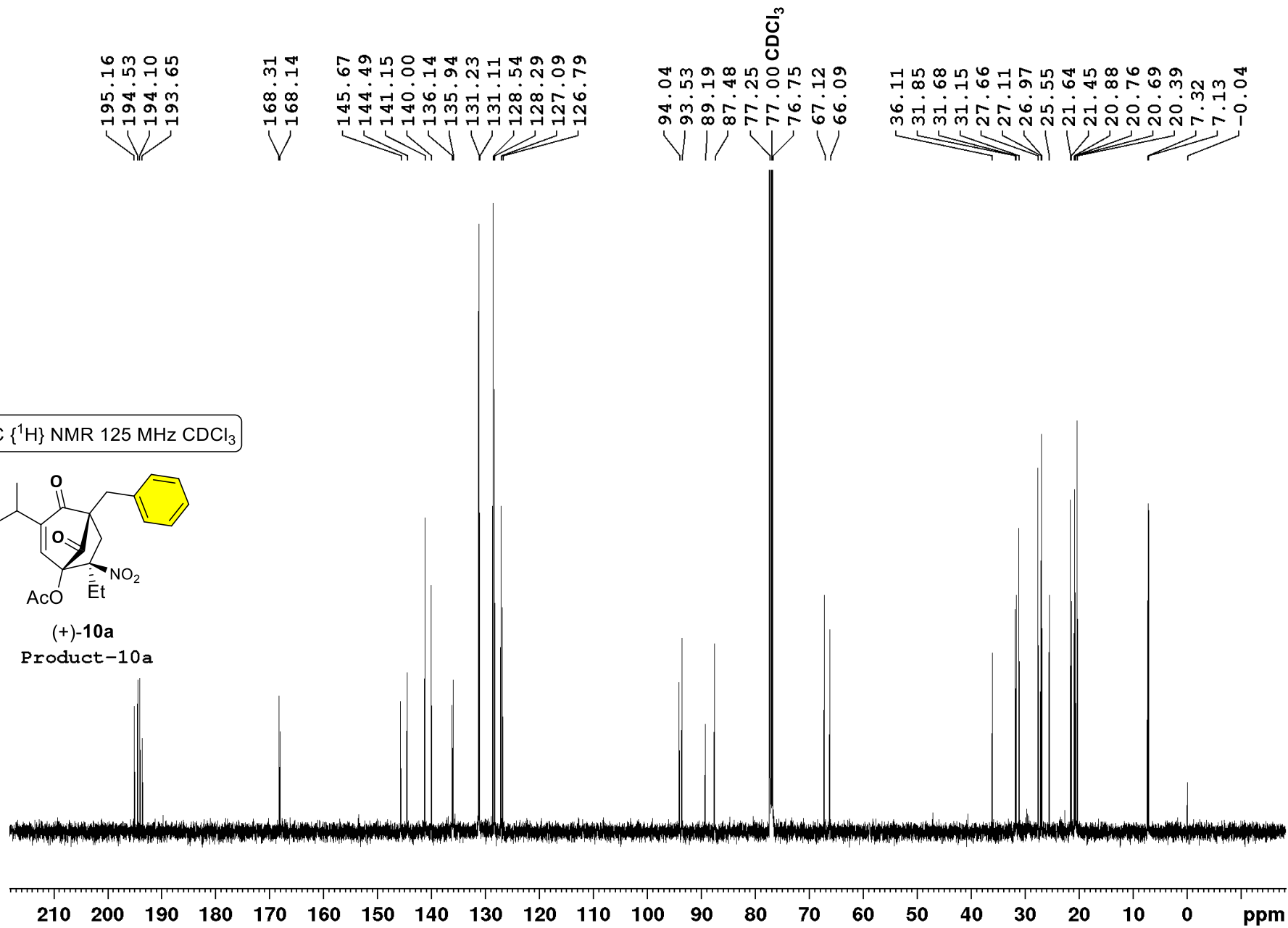
(+)-10a
Product-10a



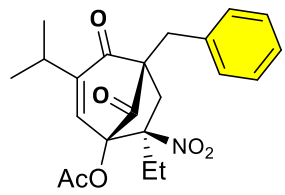
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



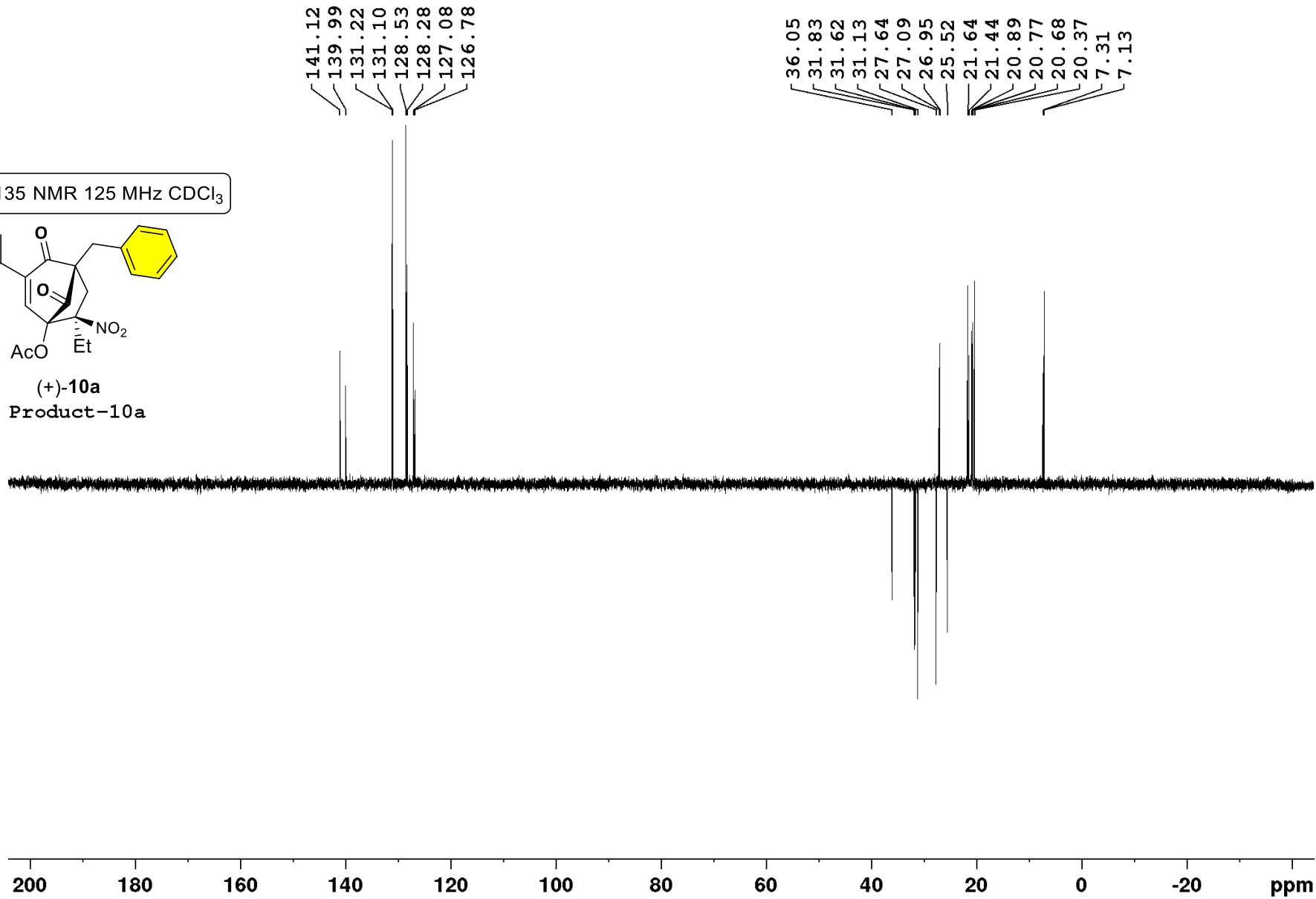
(+)-10a
Product-10a



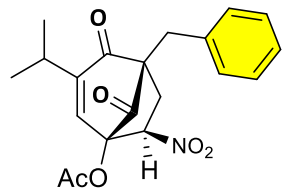
DEPT-135 NMR 125 MHz CDCl₃



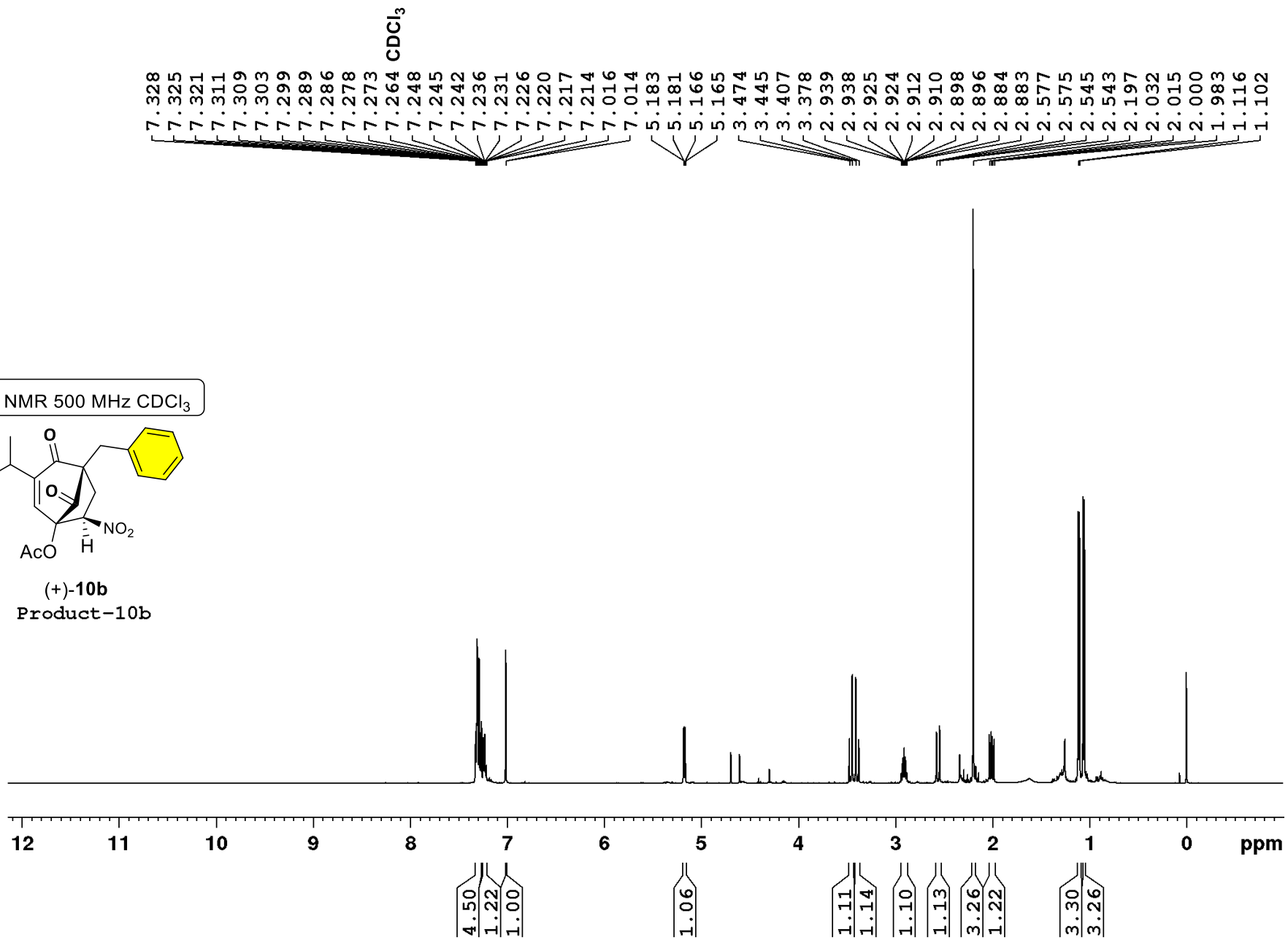
(+)-10a
Product-10a



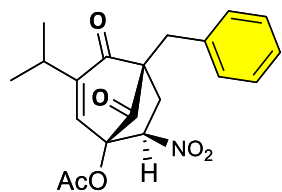
¹H NMR 500 MHz CDCl₃



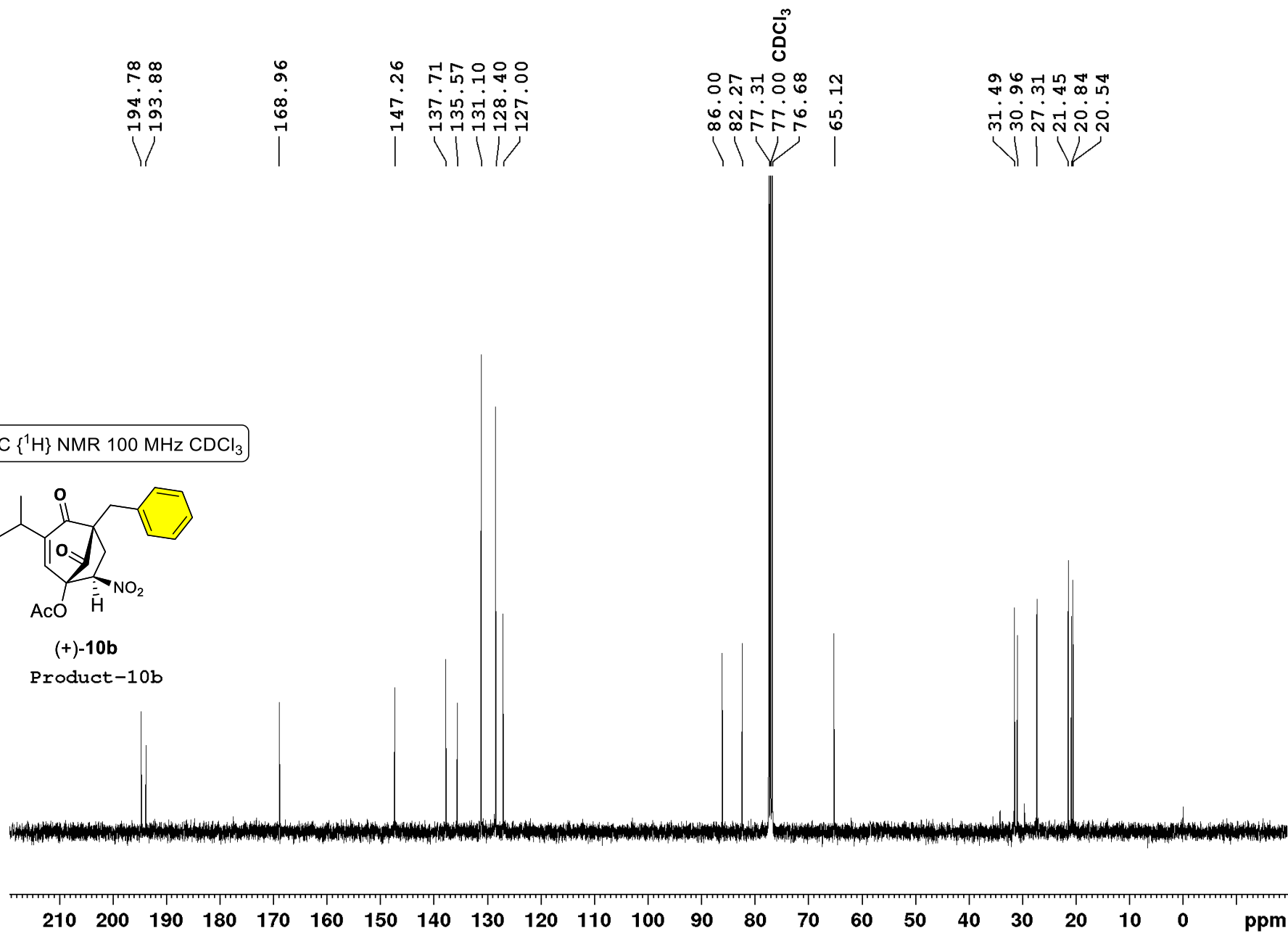
(+)-10b
Product-10b



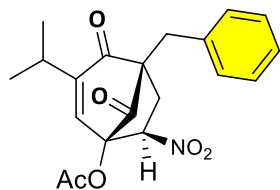
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



(+)-10b
Product-10b



DEPT-135 NMR 100 MHz CDCl₃



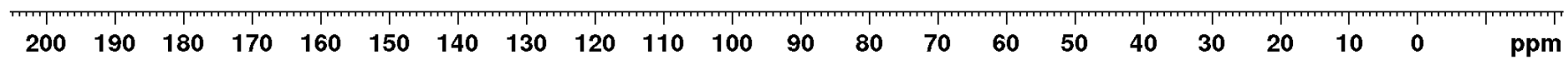
(+)-10b

Product-10b

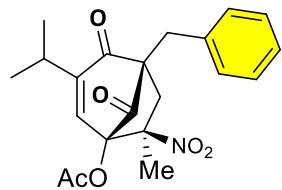
137.71
131.10
128.40
127.00

82.26

31.48
30.95
27.31
21.45
20.84
20.54

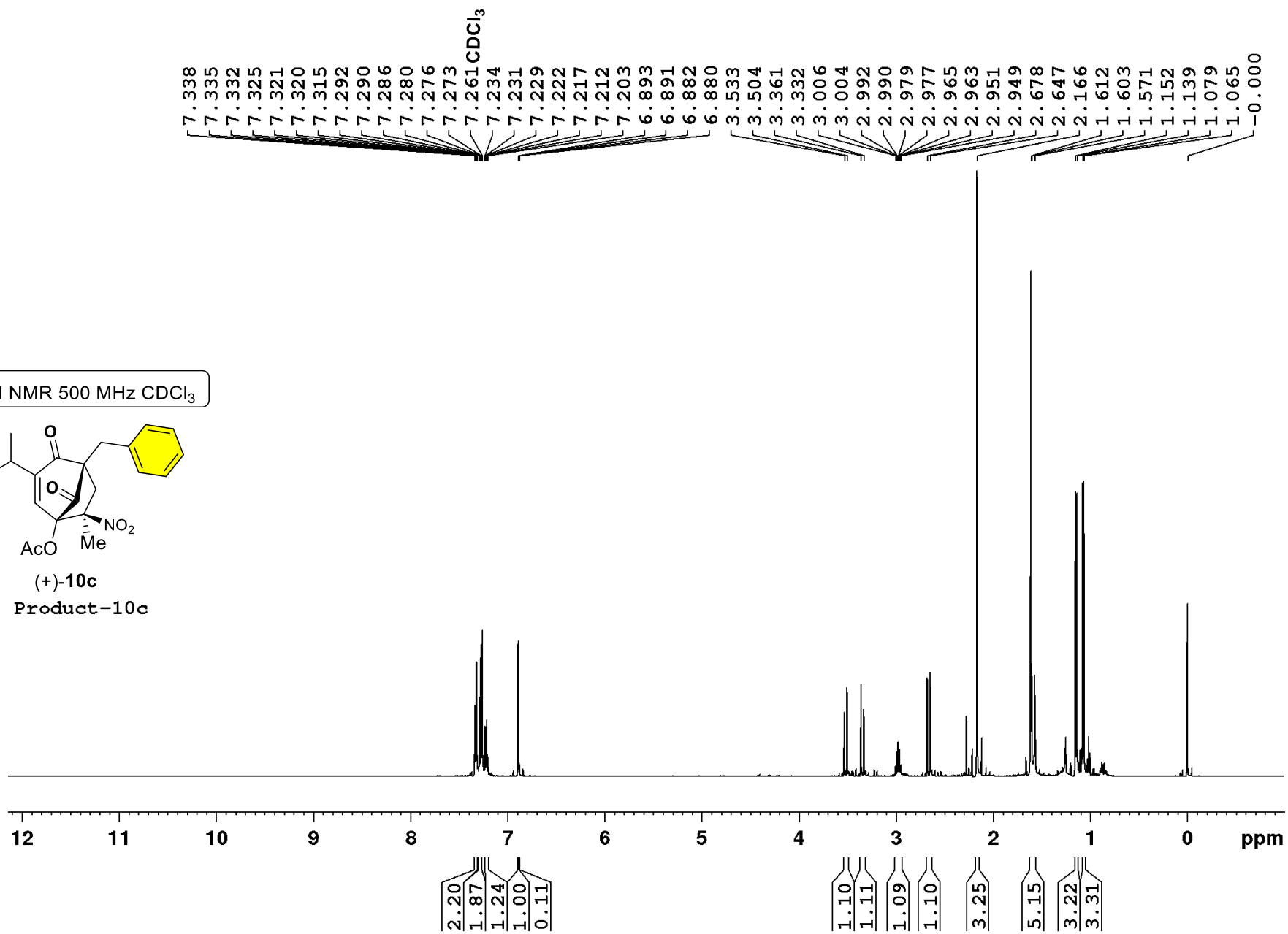


¹H NMR 500 MHz CDCl₃

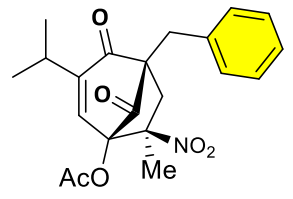


(+)-10c

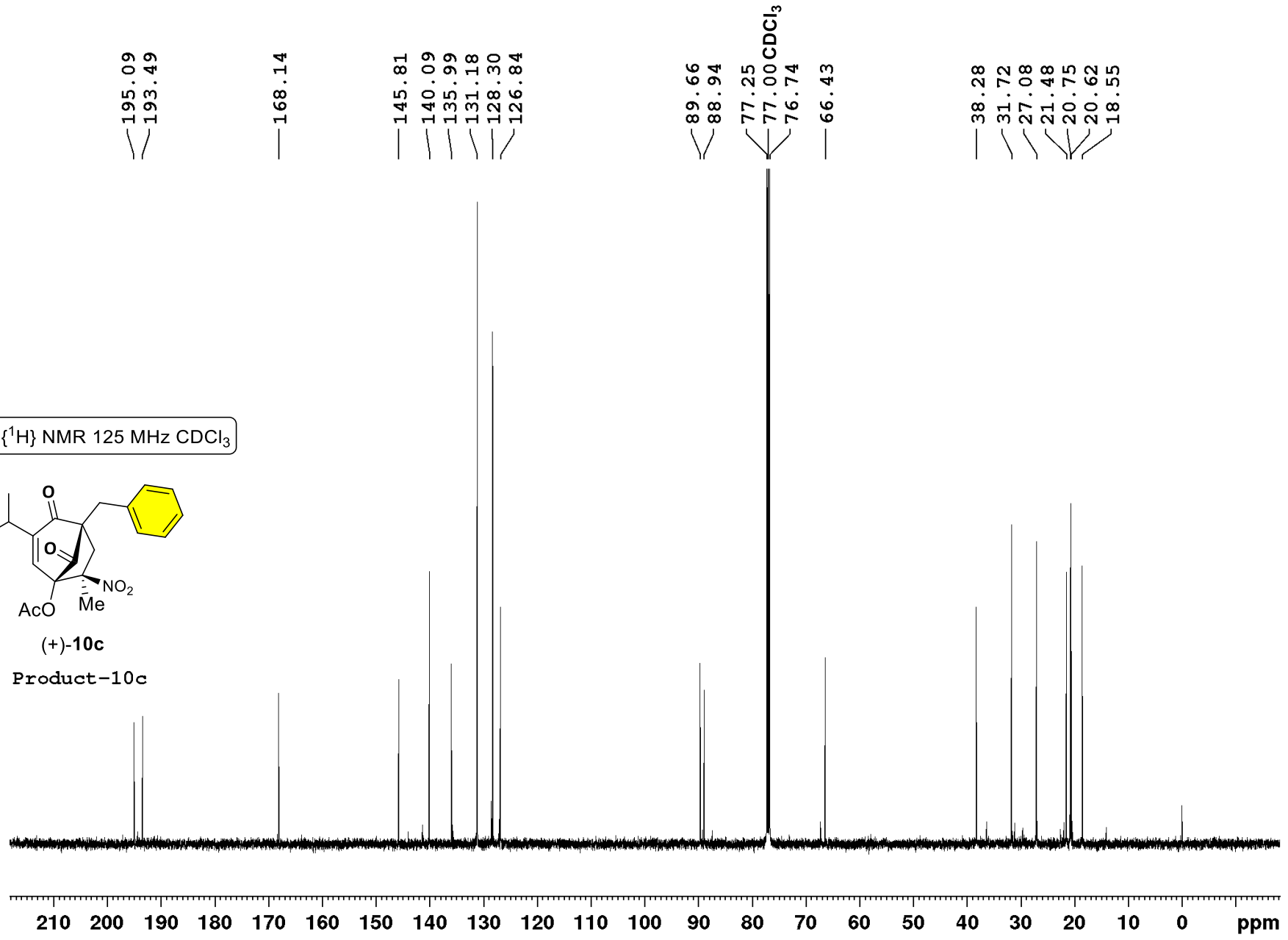
Product-10c



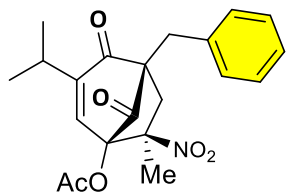
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-10c
Product-10c

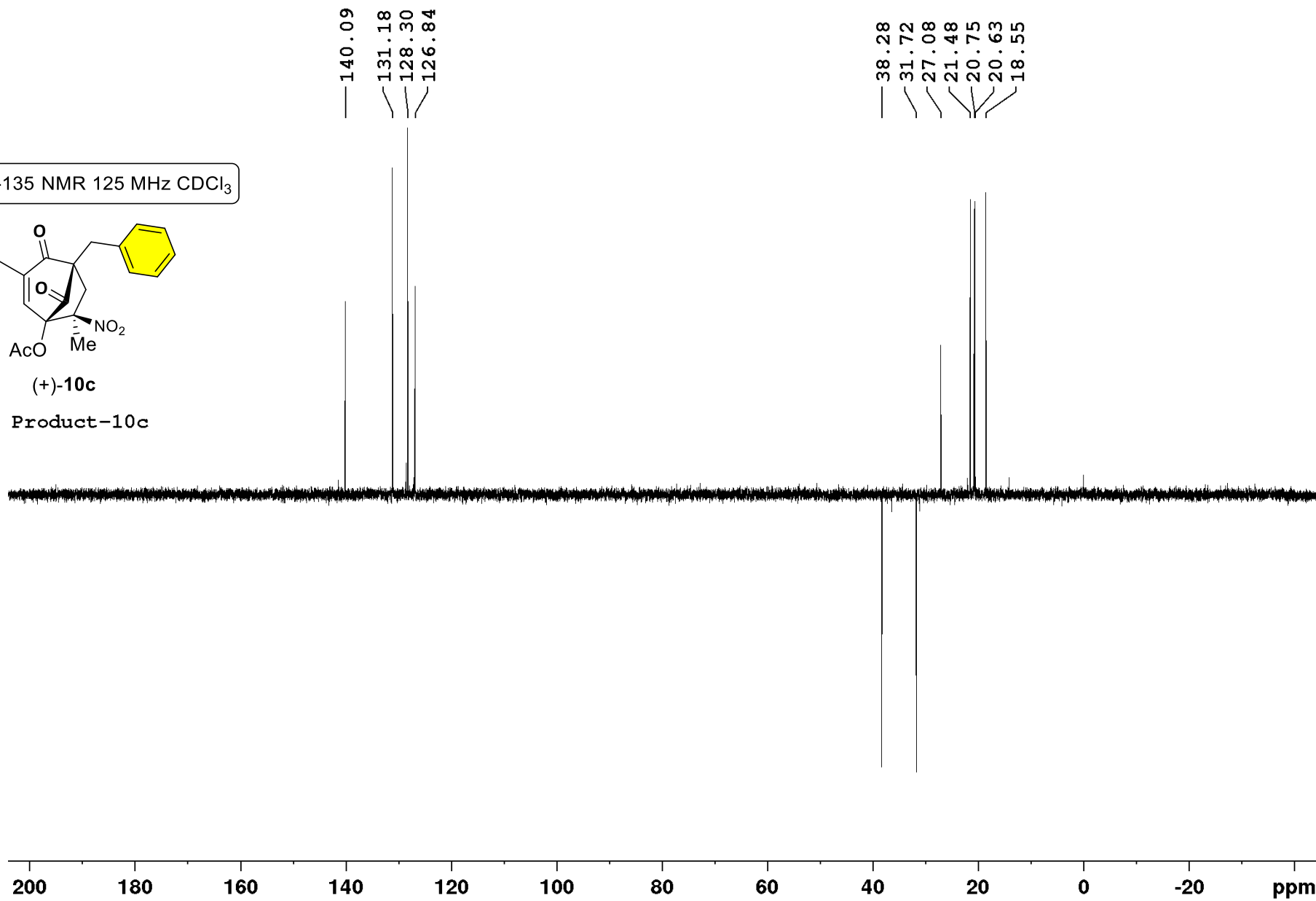


DEPT-135 NMR 125 MHz CDCl₃

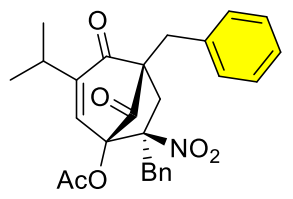


(+)-10c

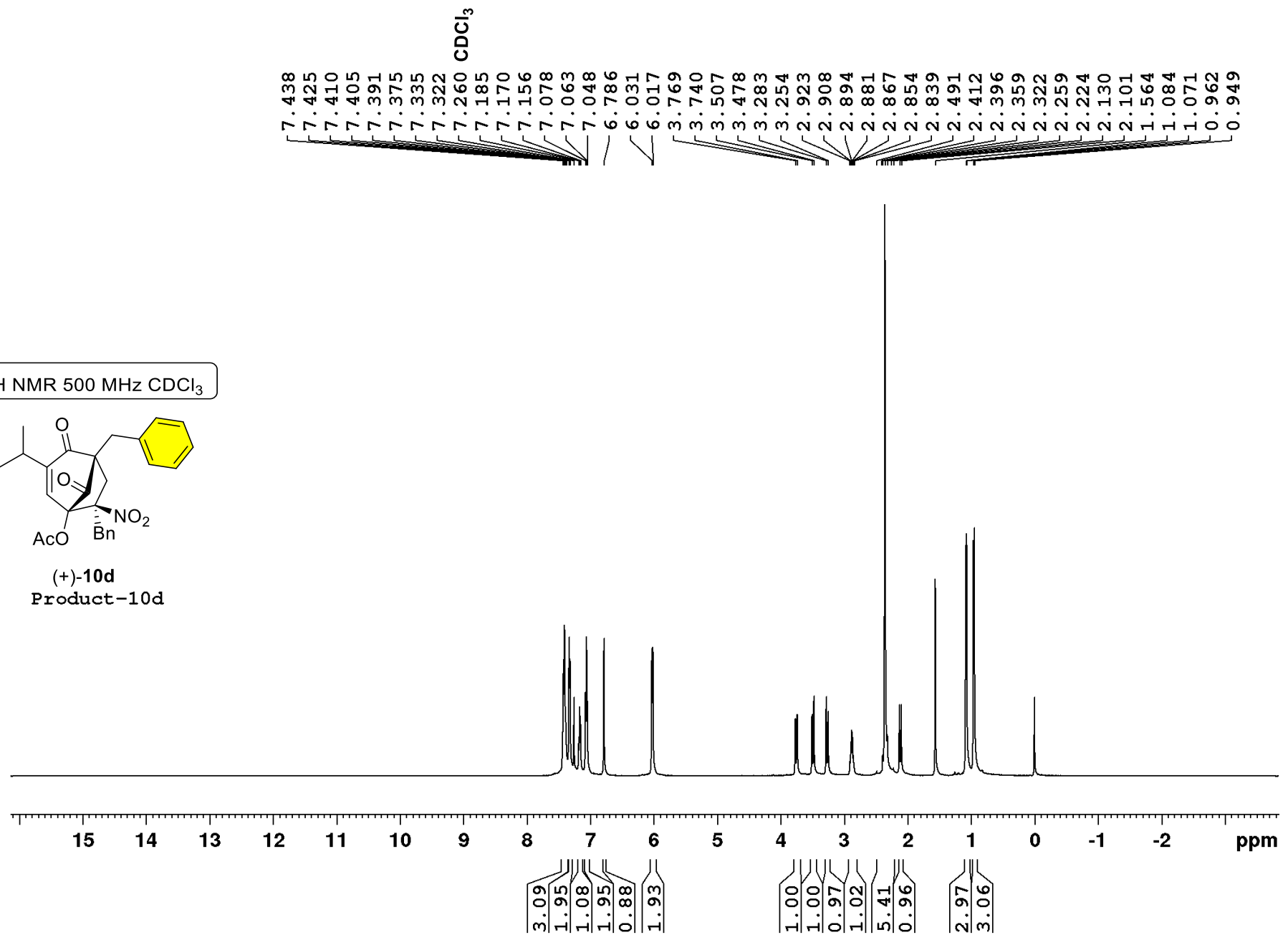
Product-10c



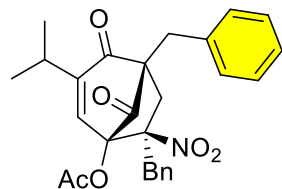
¹H NMR 500 MHz CDCl₃



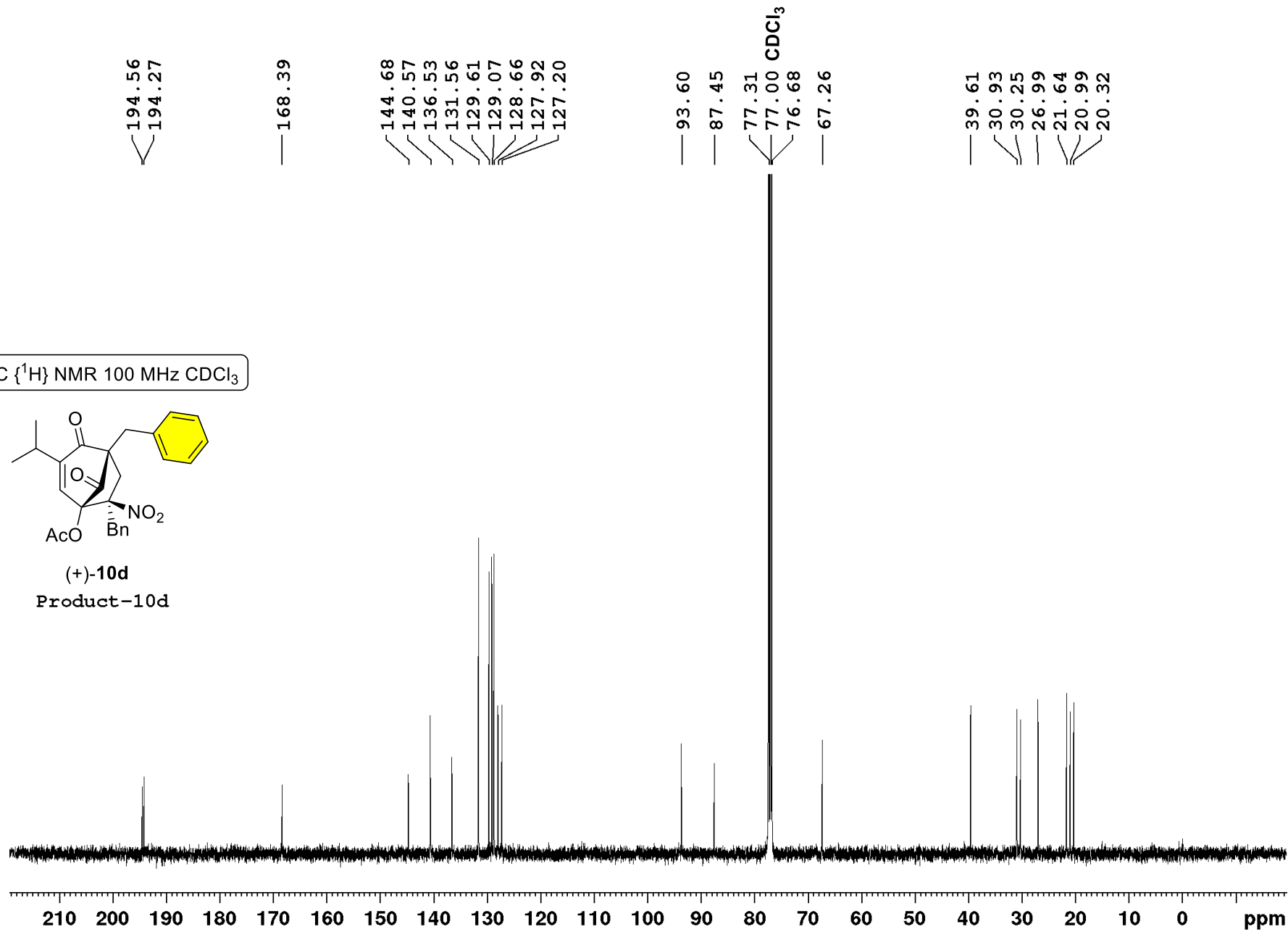
(+)-10d
Product-10d



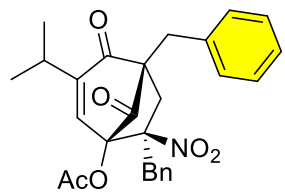
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



(+)-10d
Product-10d



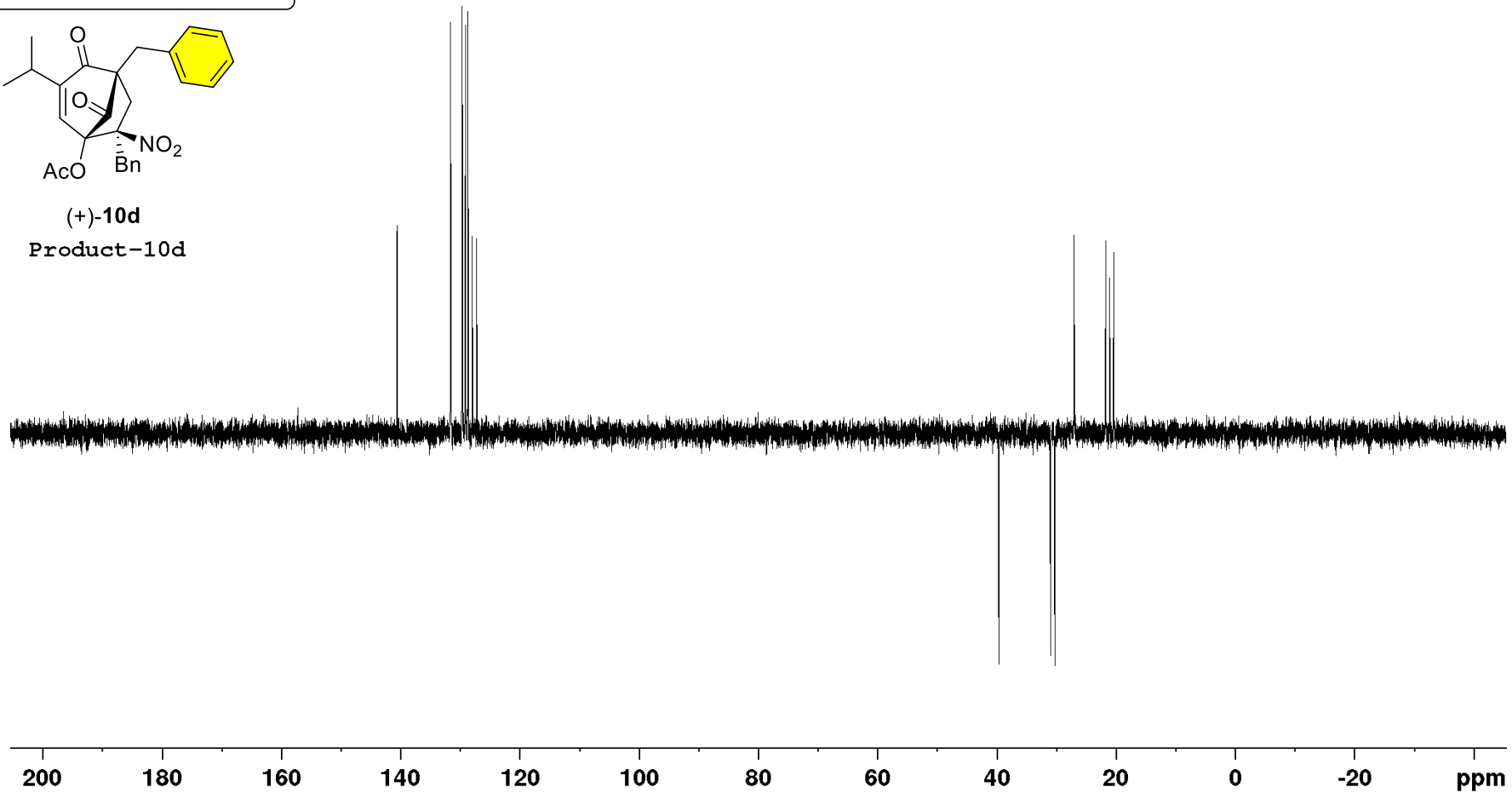
DEPT-135 NMR 100 MHz CDCl₃



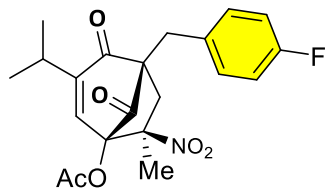
(+)-10d
Product-10d

140.61
131.61
129.66
129.12
128.71
127.96
127.25

39.65
30.97
30.27
27.03
21.70
21.05
20.36

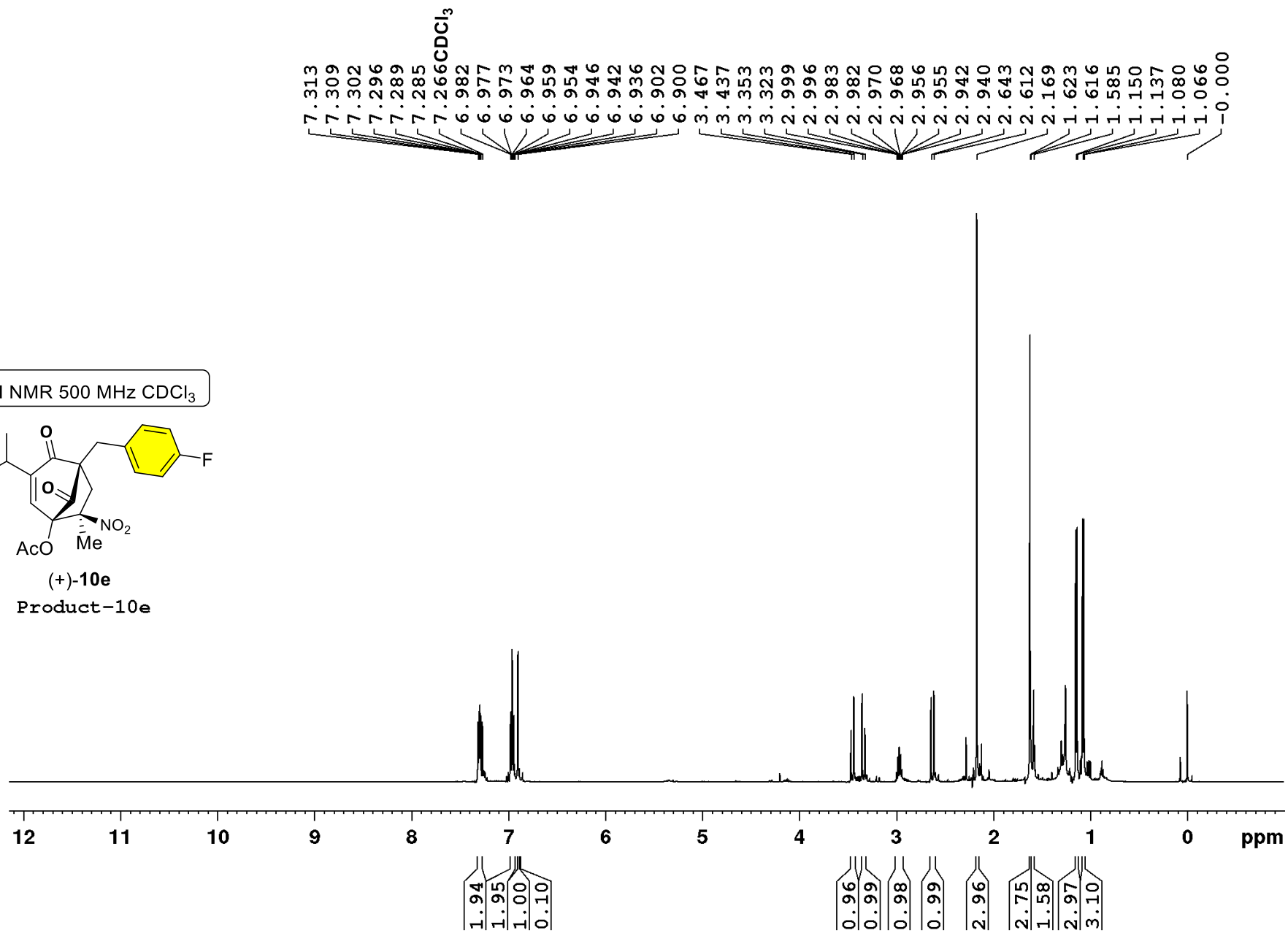


$^1\text{H NMR}$ 500 MHz CDCl_3

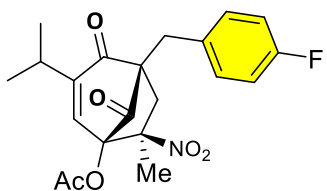


(+)-10e

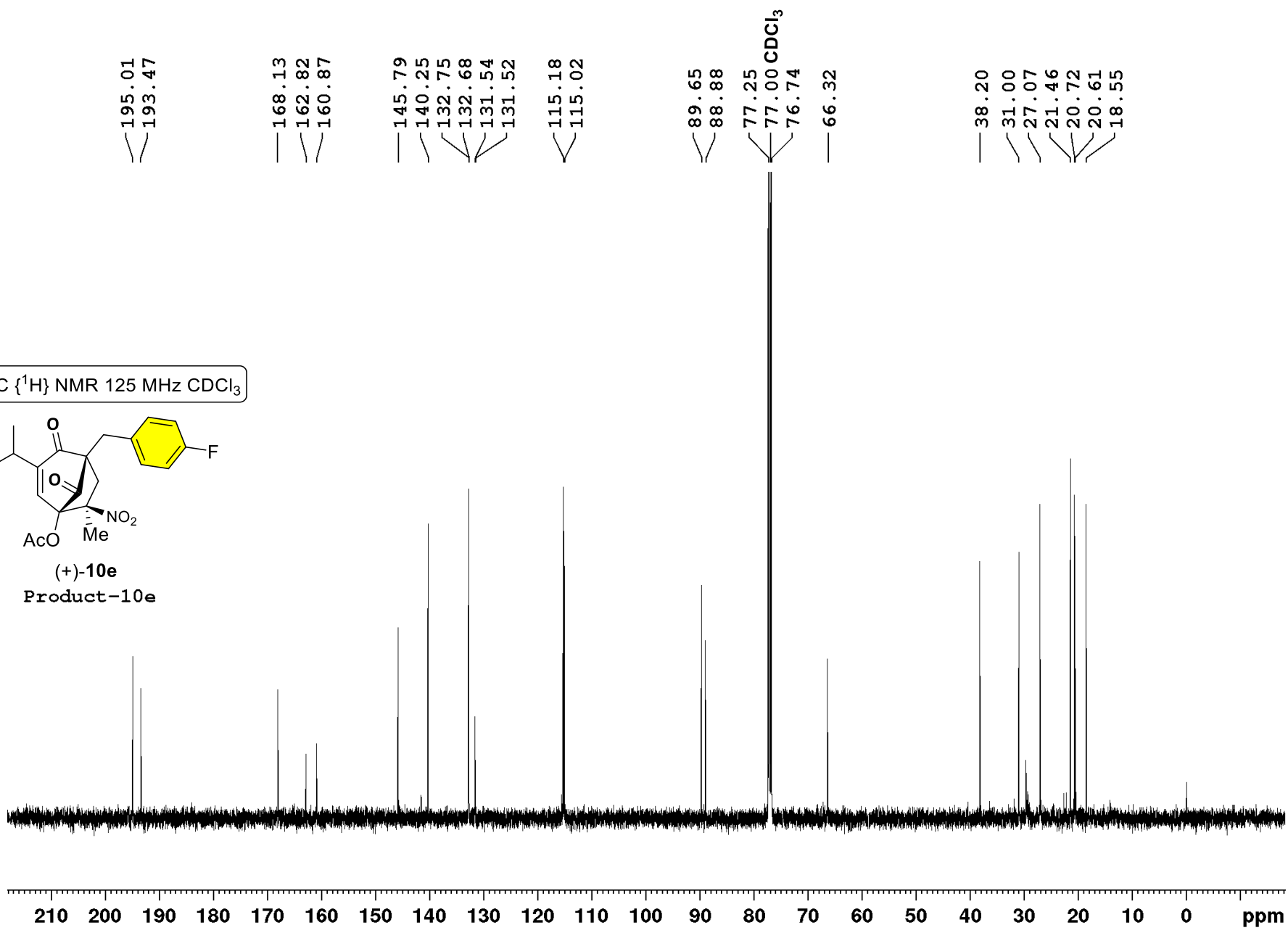
Product-10e



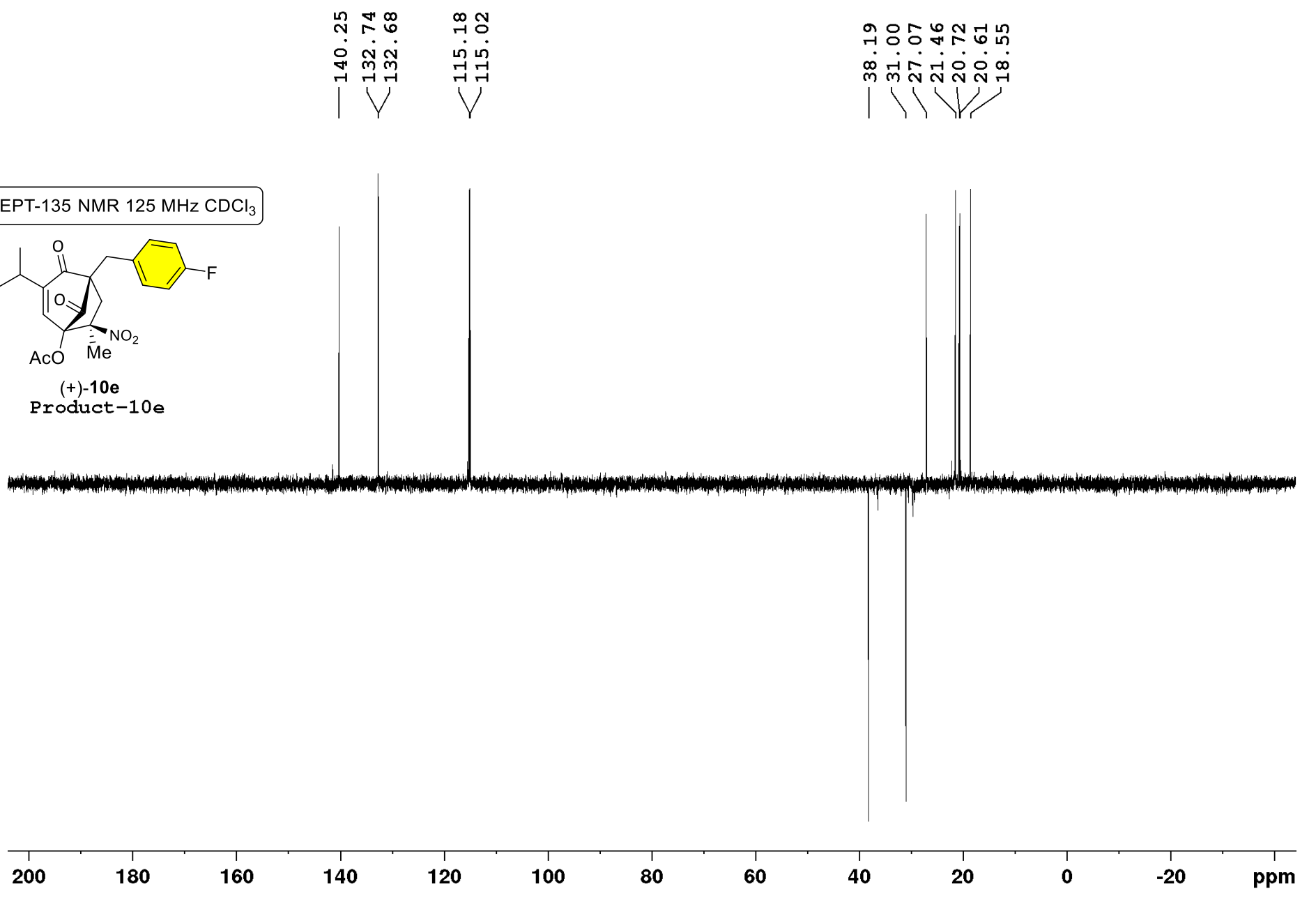
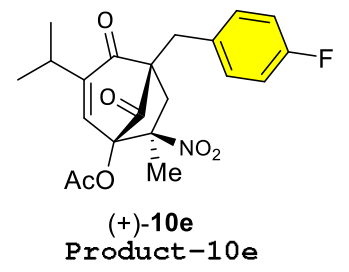
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



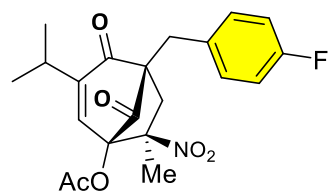
(+)-10e
Product-10e



DEPT-135 NMR 125 MHz CDCl₃



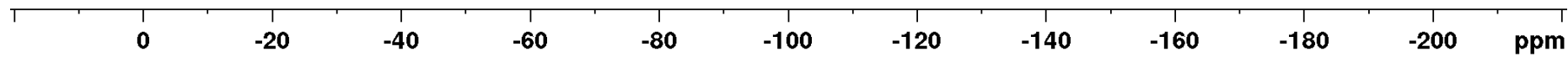
¹⁹F NMR 470 MHz CDCl₃



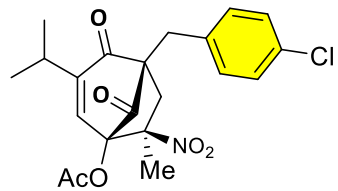
(+)-10e

Product-10e

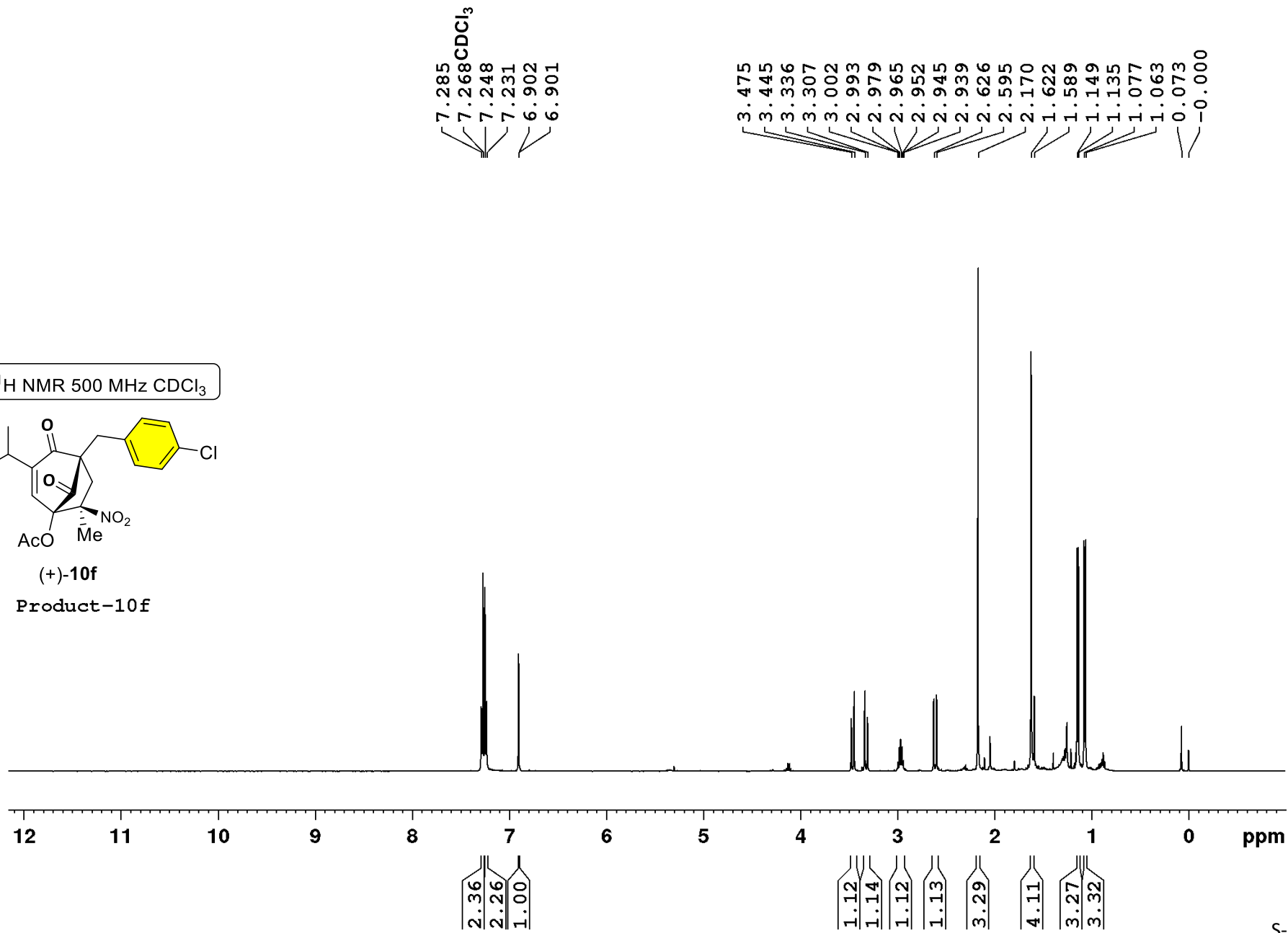
— -115.94



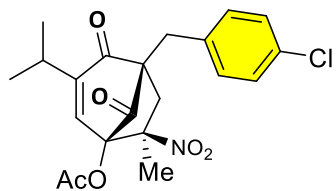
¹H NMR 500 MHz CDCl₃



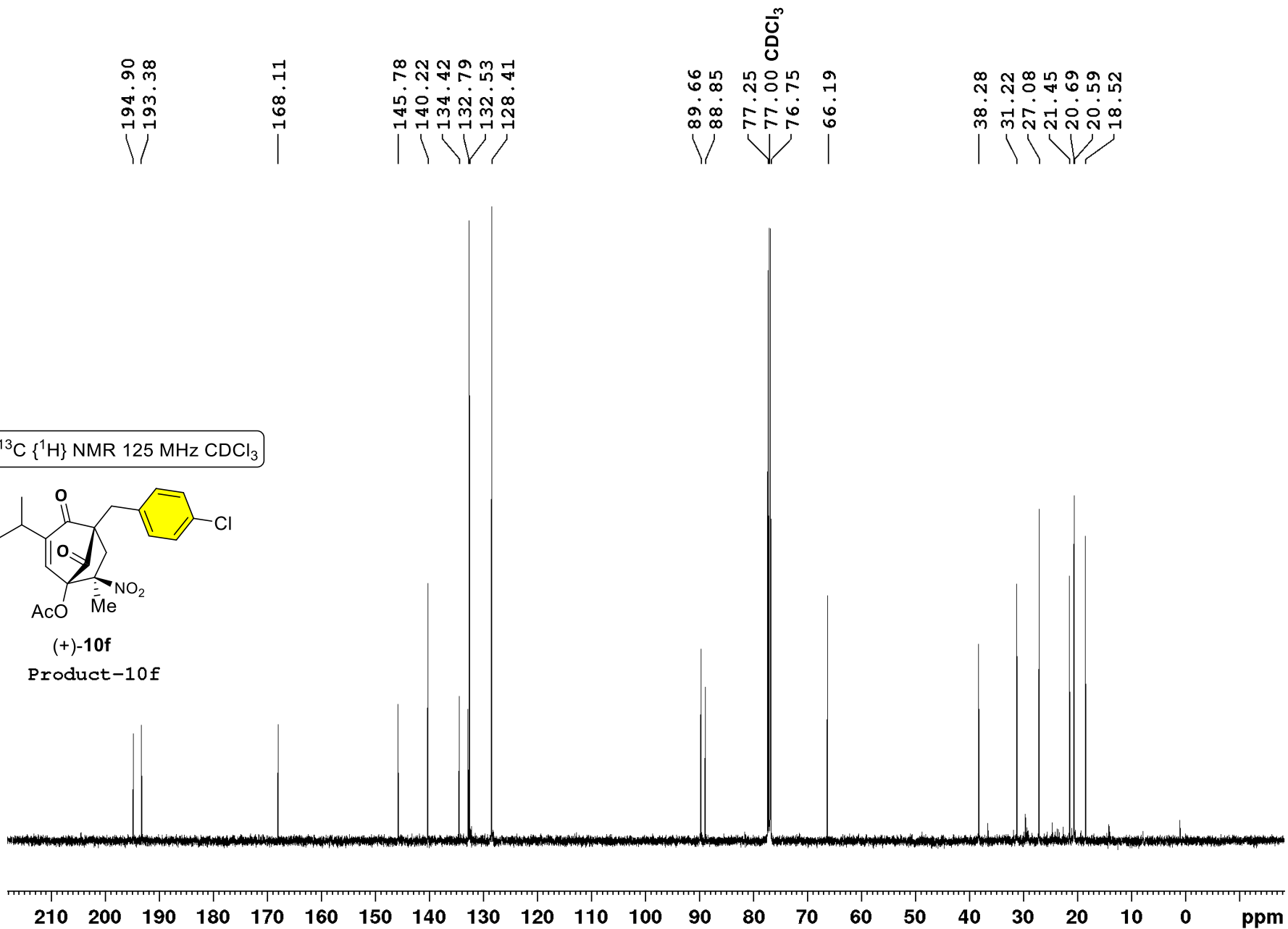
(+)-10f
Product-10f



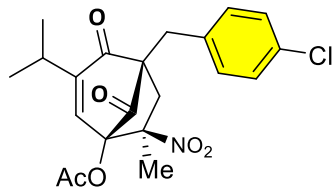
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-10f
Product-10f

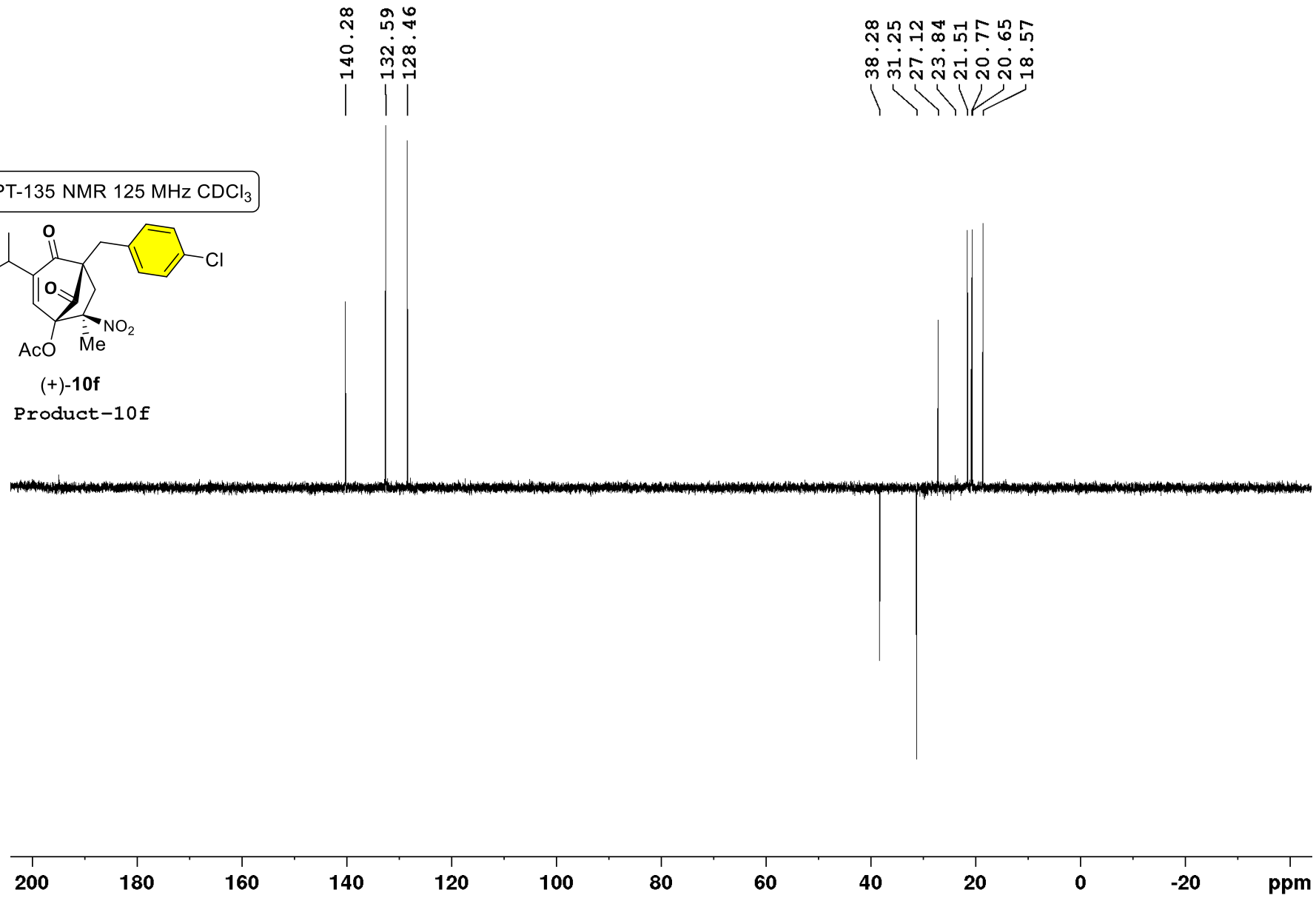


DEPT-135 NMR 125 MHz CDCl₃

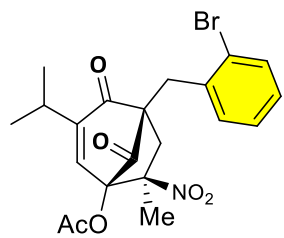


(+)-10f

Product-10f

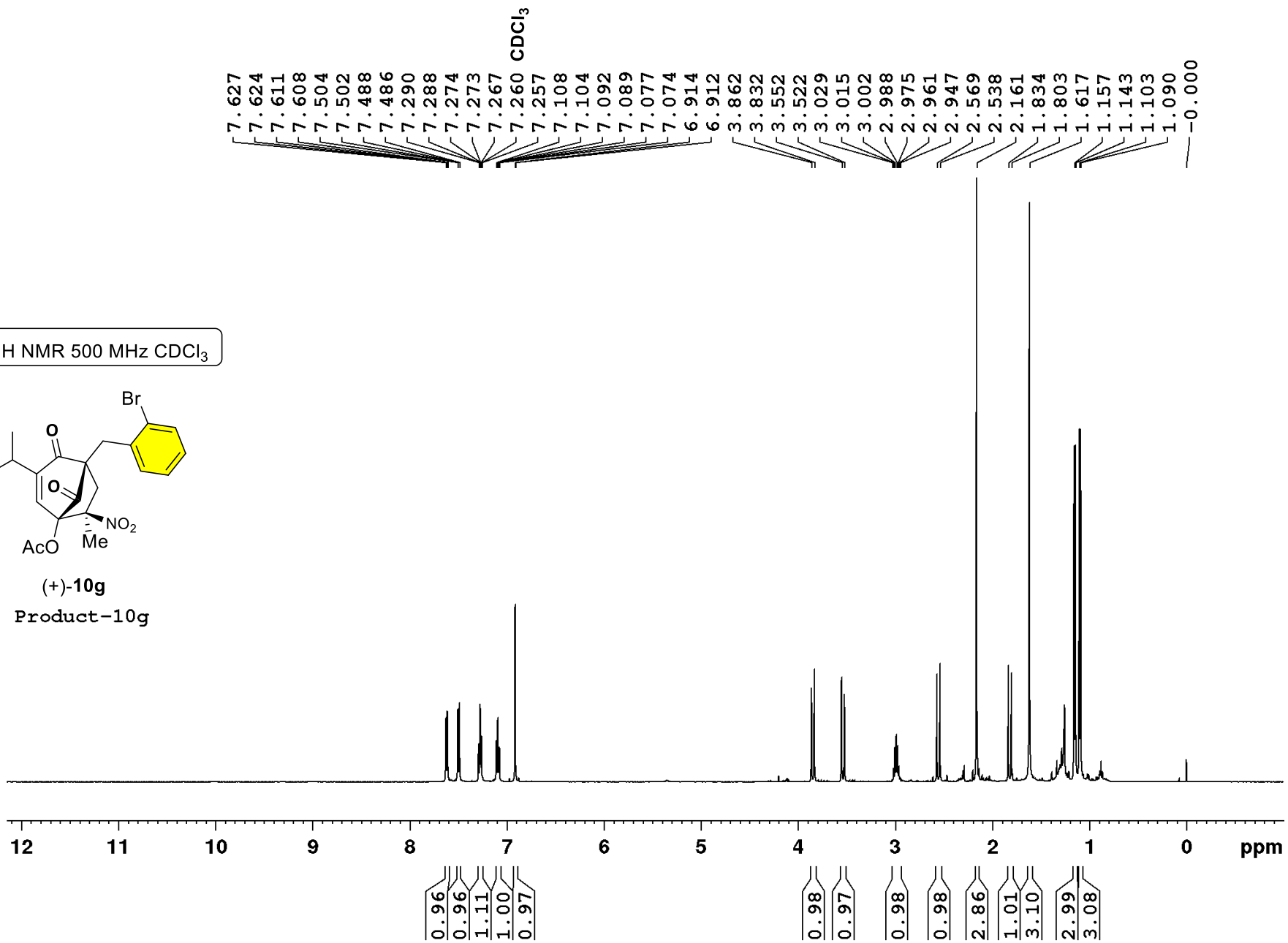


¹H NMR 500 MHz CDCl₃

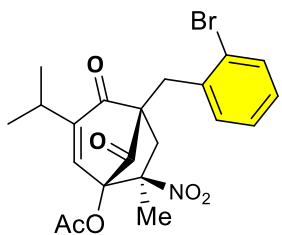


(+)-10g

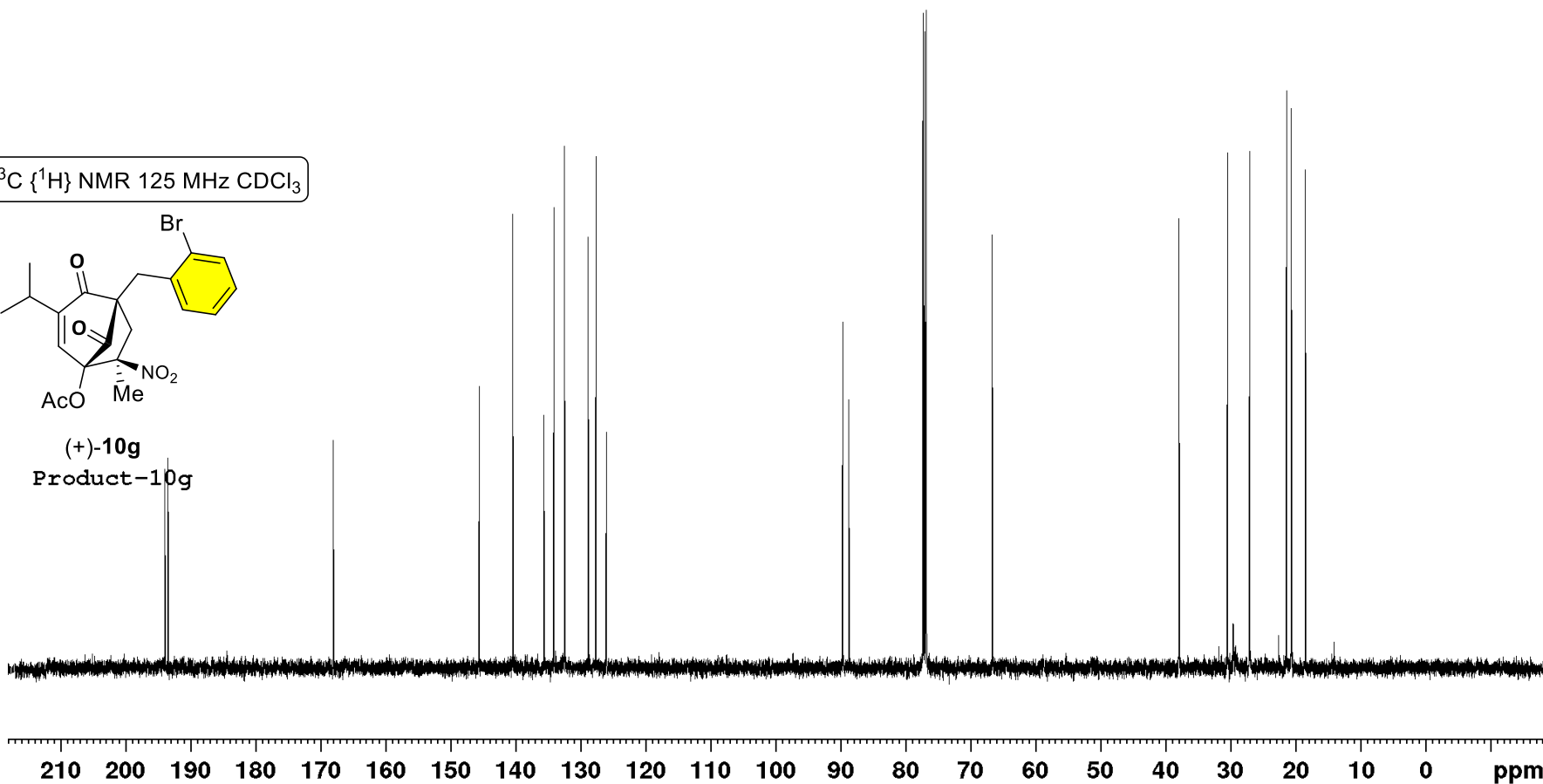
Product-10g



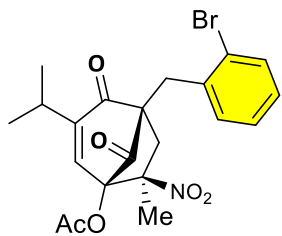
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-10g
Product-10g



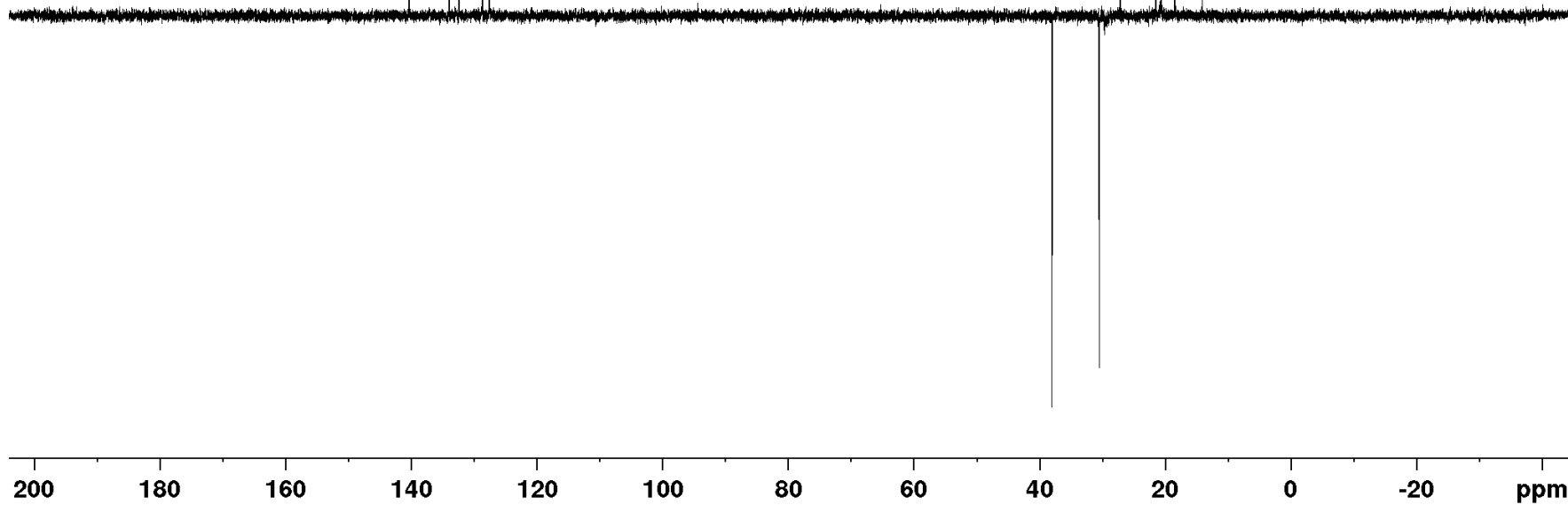
DEPT-135 NMR 125 MHz CDCl₃



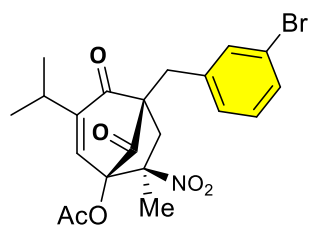
(+)-10g
Product-10g

140.40
134.04
132.44
128.77
127.59

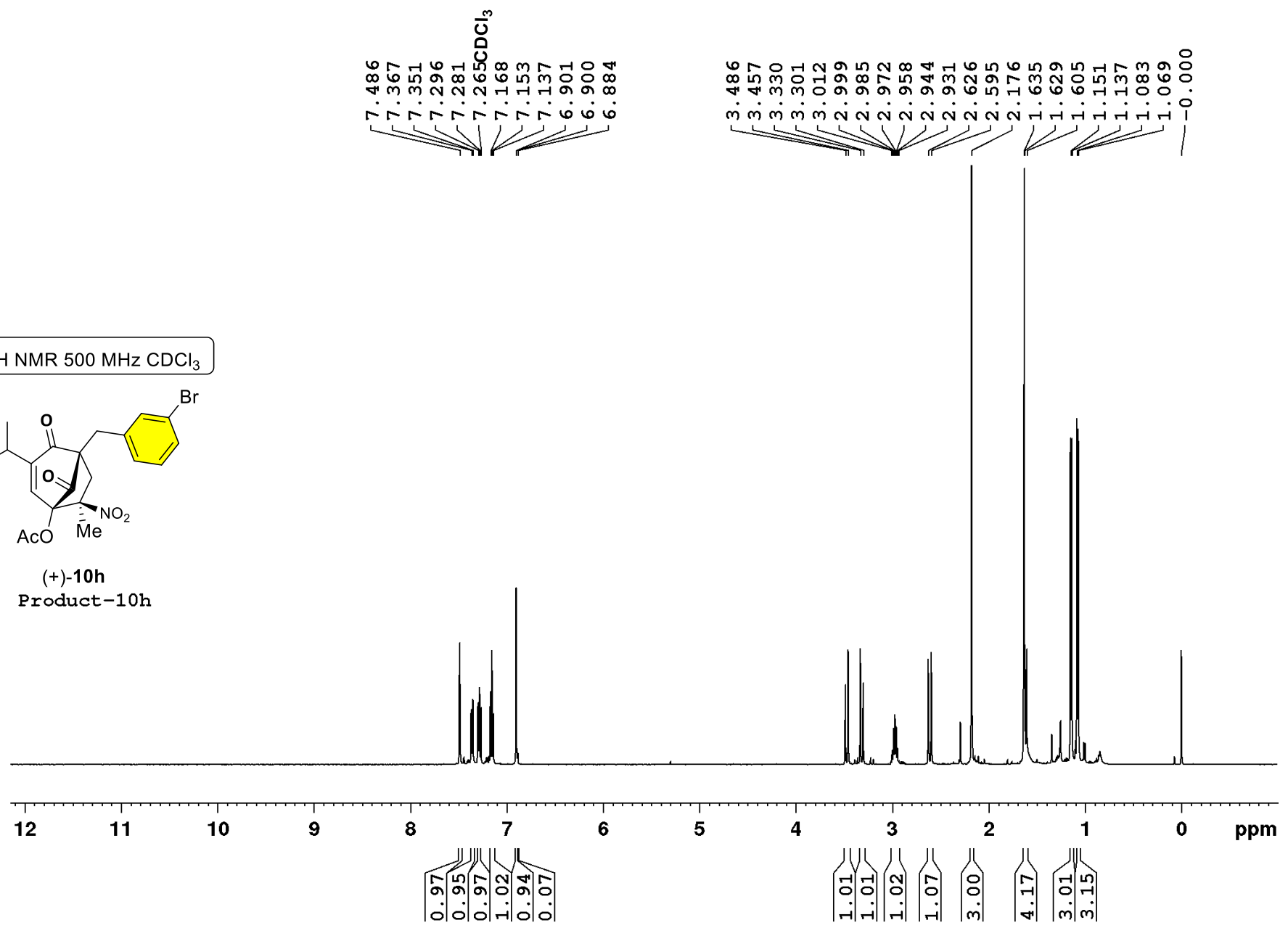
37.98
30.49
27.10
21.44
20.70
20.66
18.50



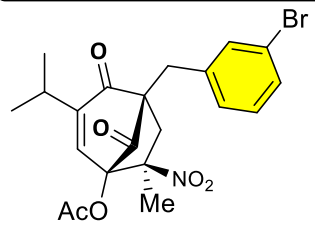
¹H NMR 500 MHz CDCl₃



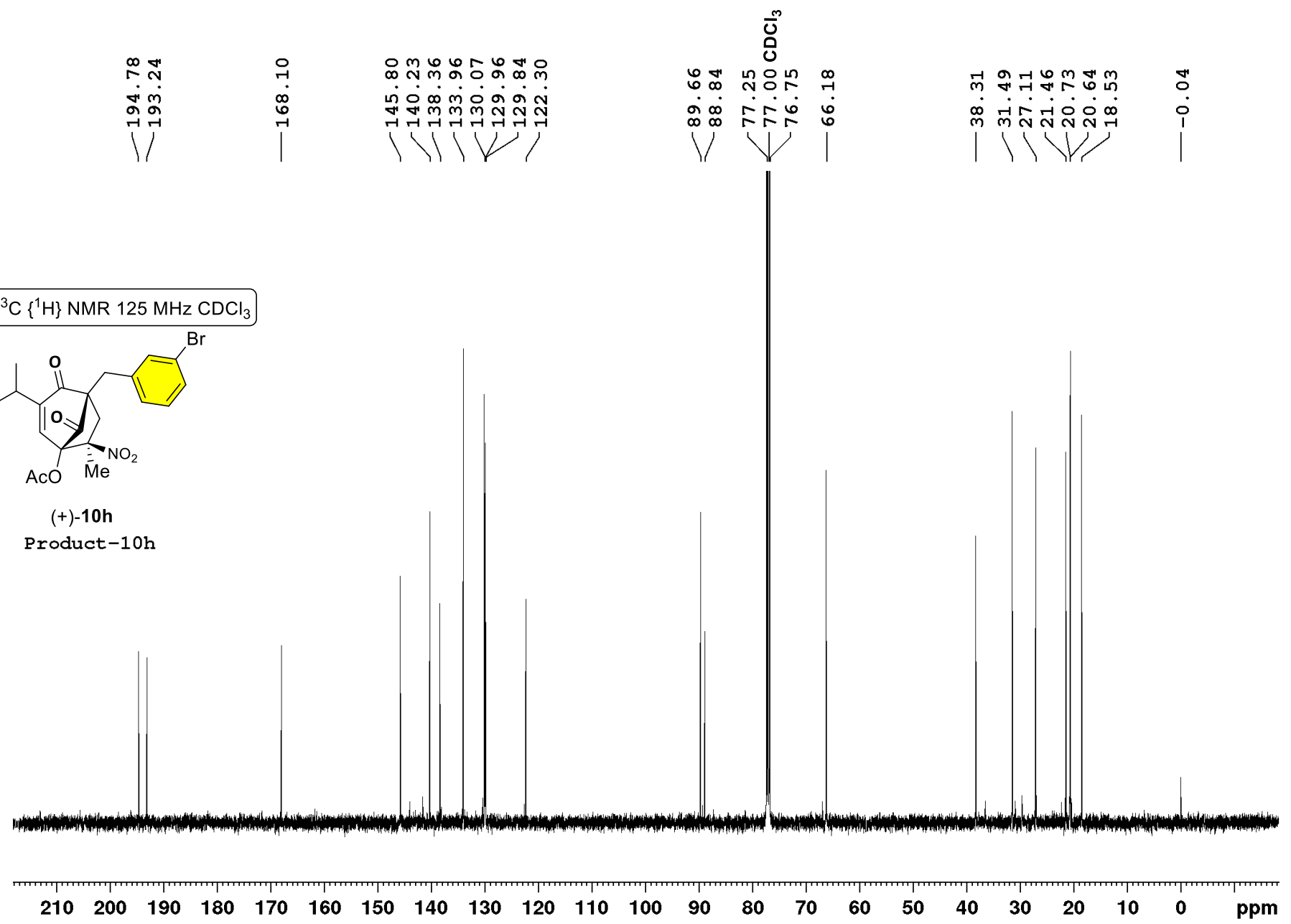
(+)-10h
Product-10h



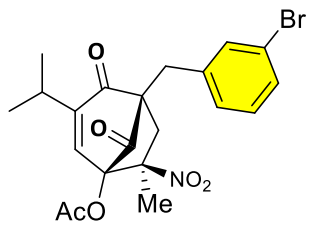
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-10h
Product-10h



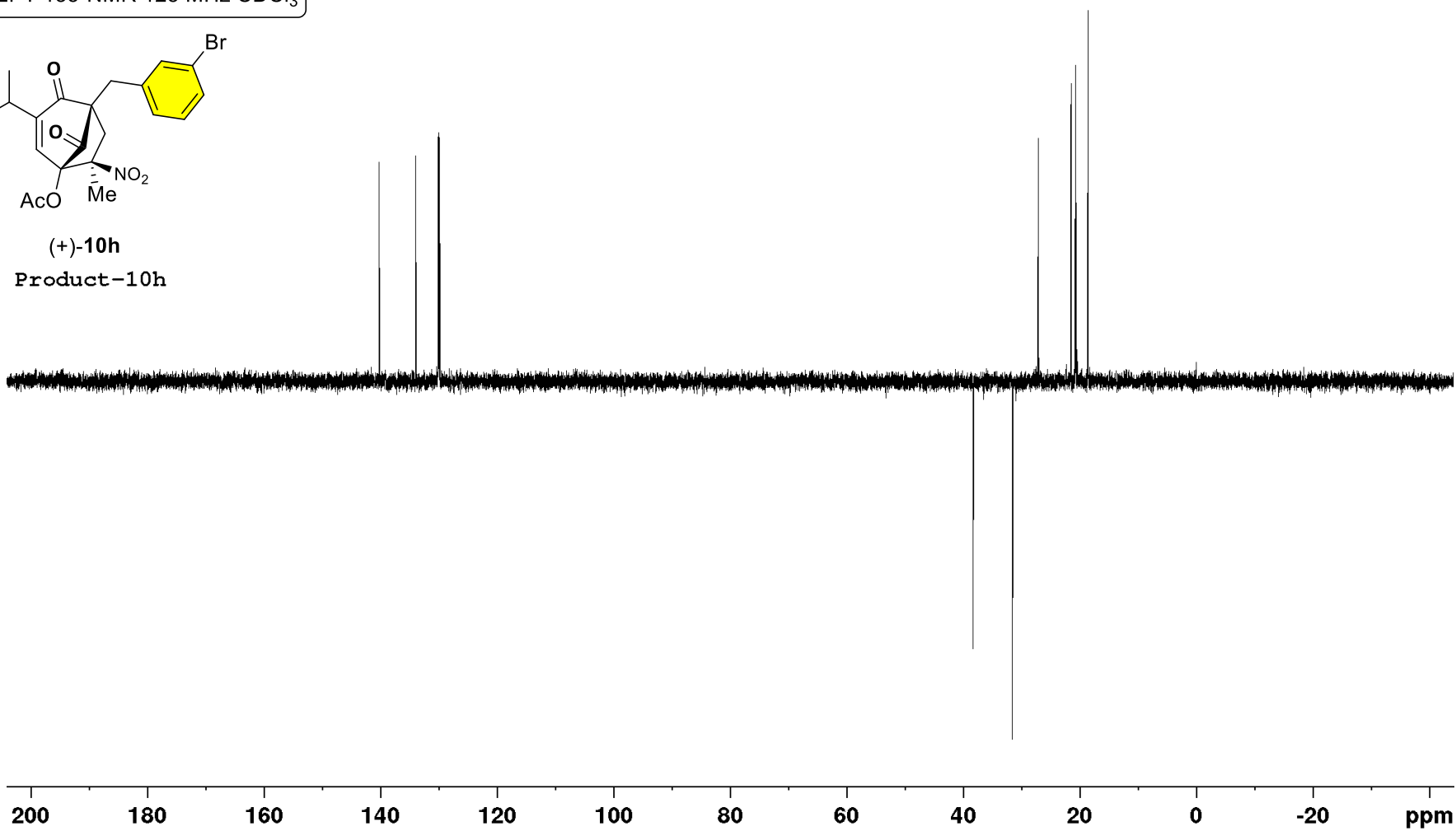
DEPT-135 NMR 125 MHz CDCl₃



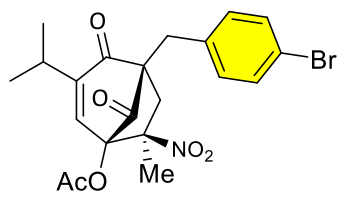
(+)-10h
Product-10h

140.23
133.95
130.07
129.96
129.84

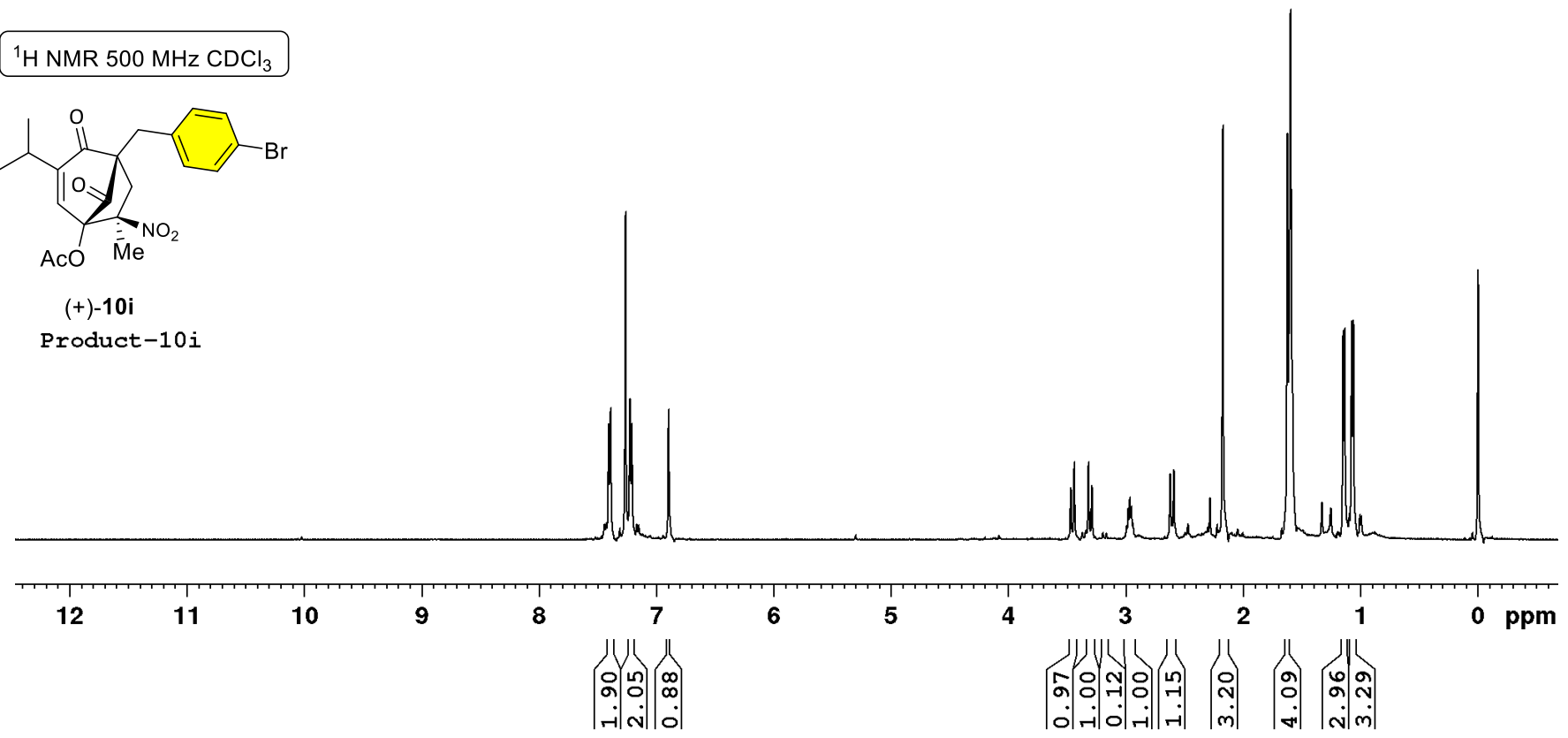
38.26
31.48
27.10
21.46
20.74
20.64
18.53



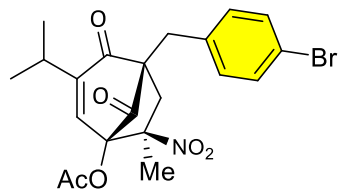
¹H NMR 500 MHz CDCl₃



(+)-10i
Product-10i

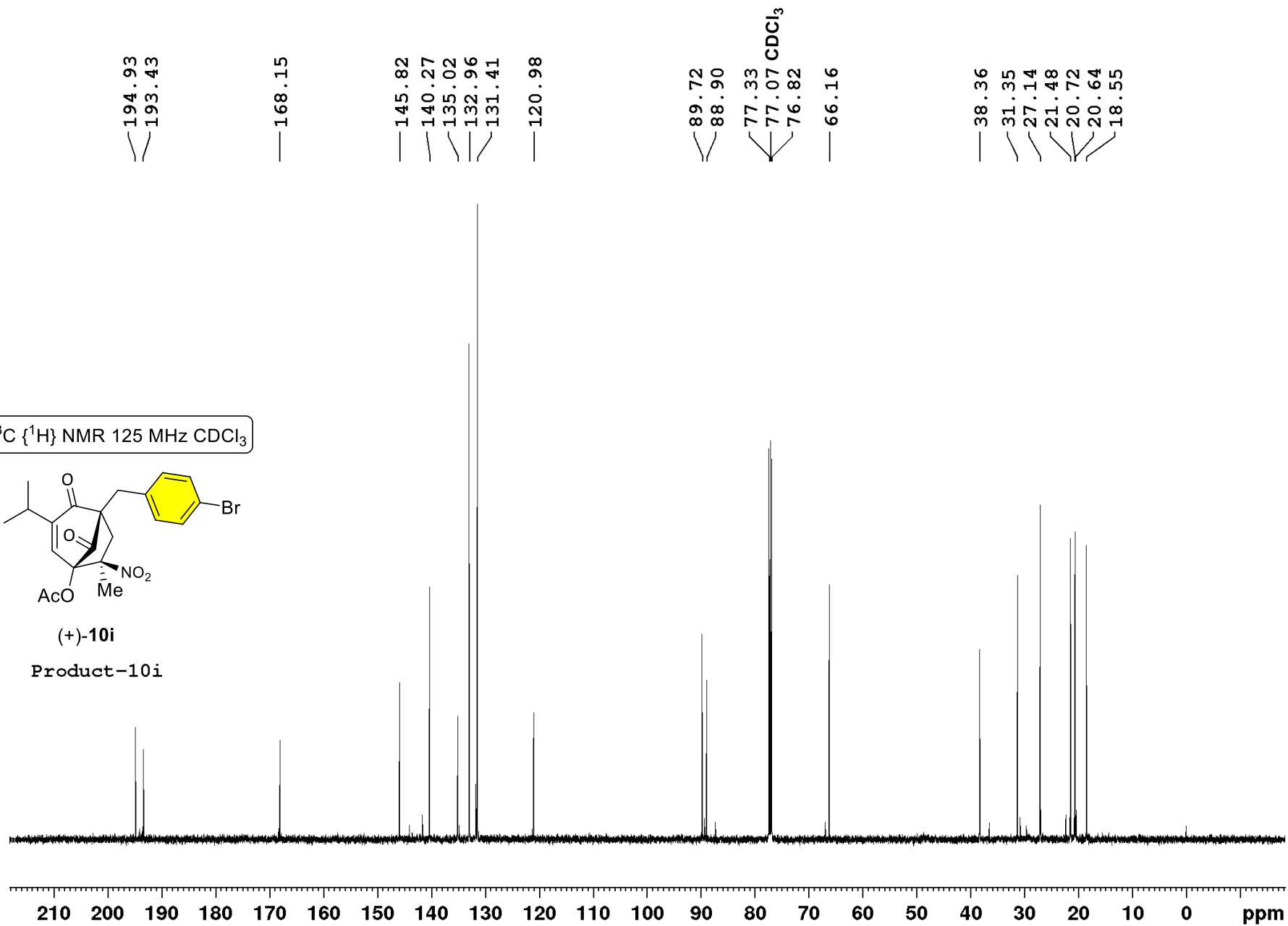


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3

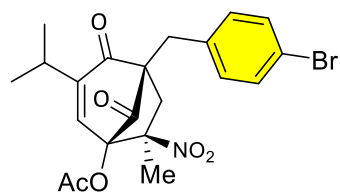


(+)-10i

Product-10i



DEPT-135 NMR 125 MHz CDCl₃

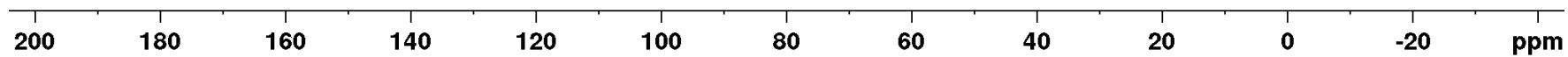


(+)-10i

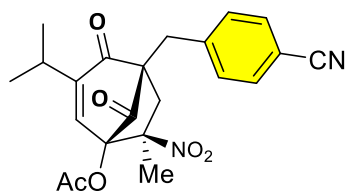
Product-10i

140.28
132.97
131.41

38.33
31.35
27.13
21.50
20.74
20.64
18.55

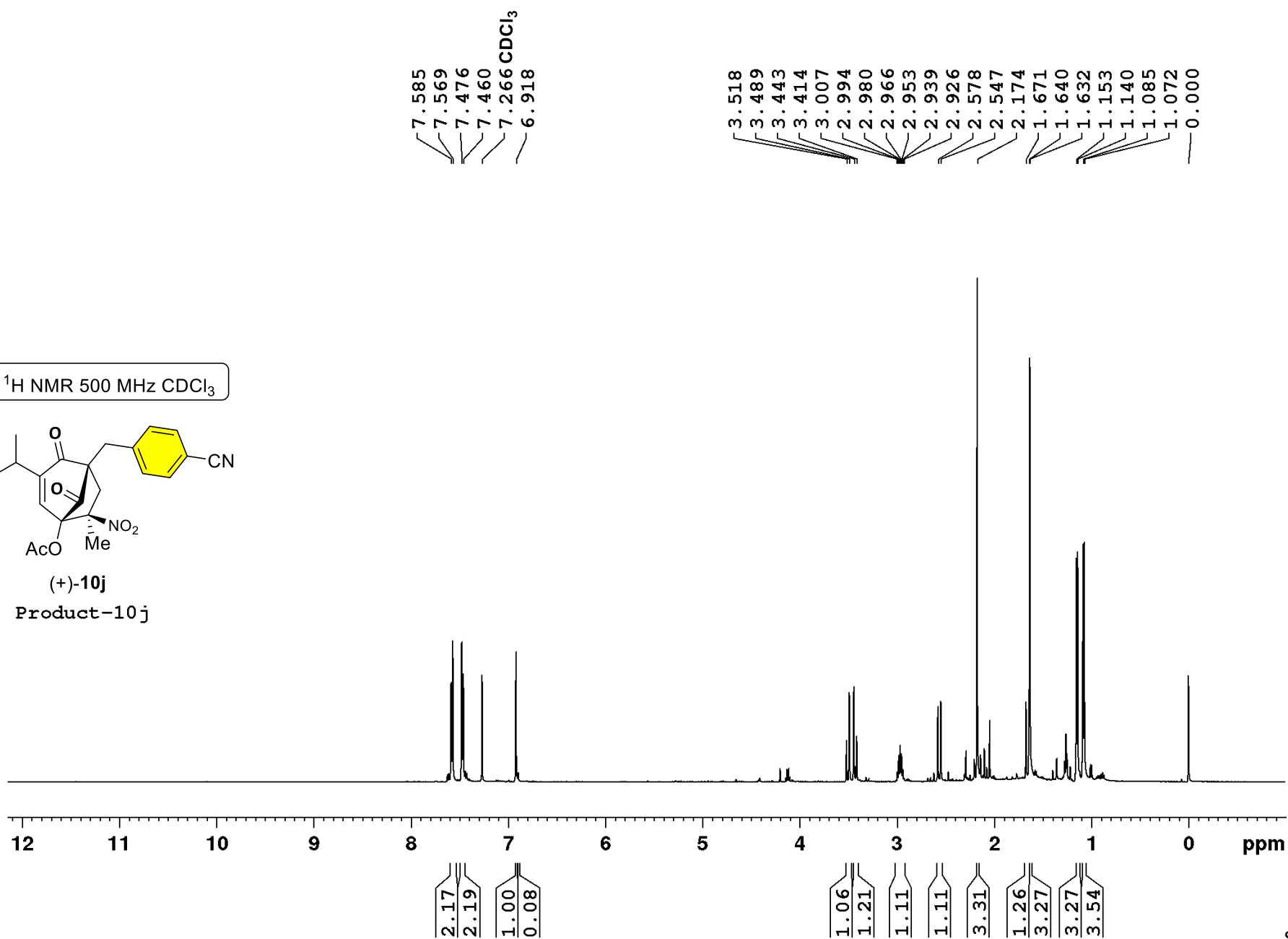


¹H NMR 500 MHz CDCl₃

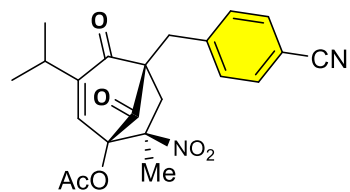


(+)-10j

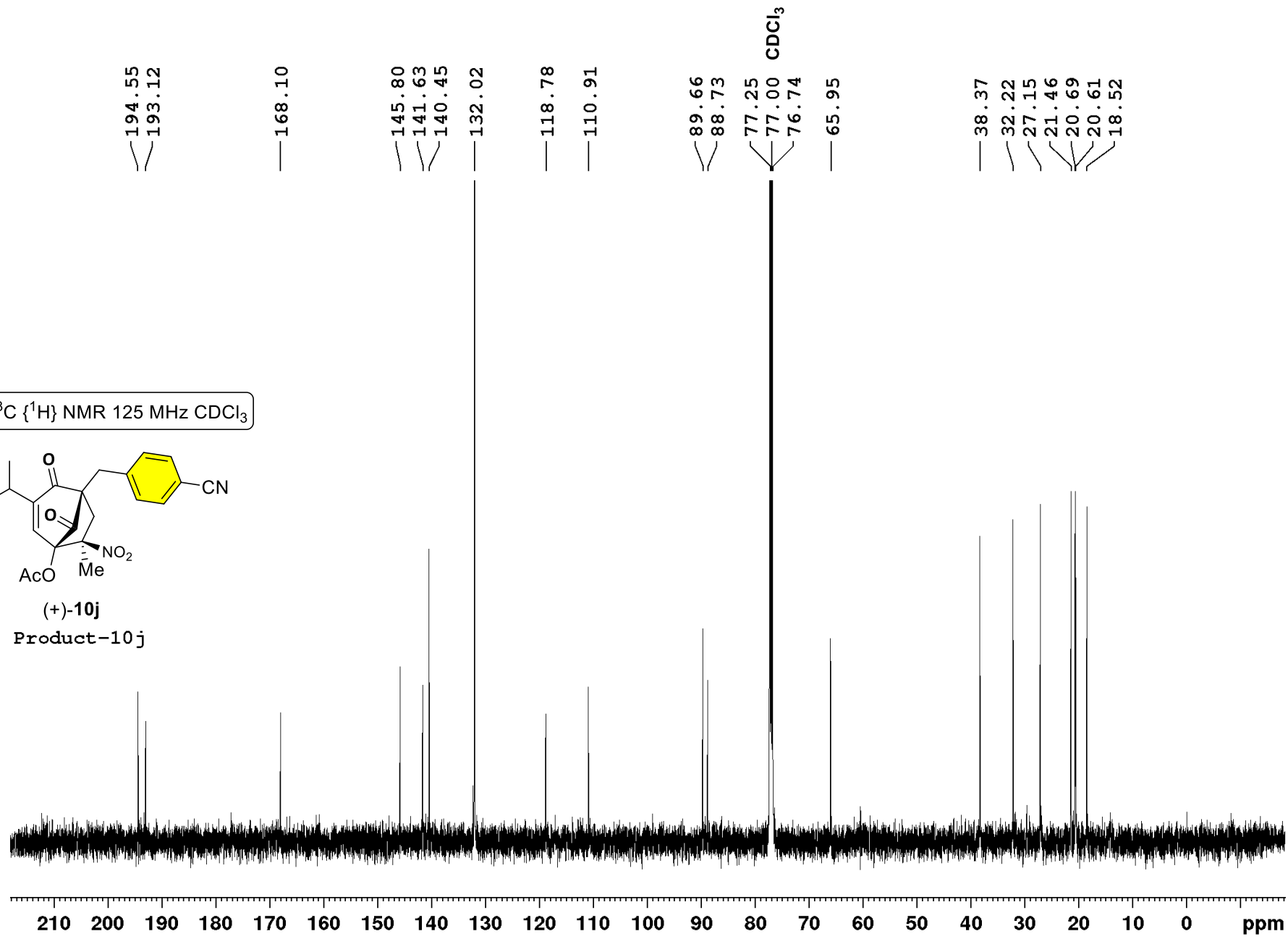
Product-10j



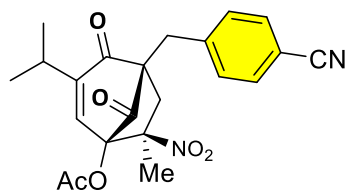
^{13}C $\{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-10j
Product-10j

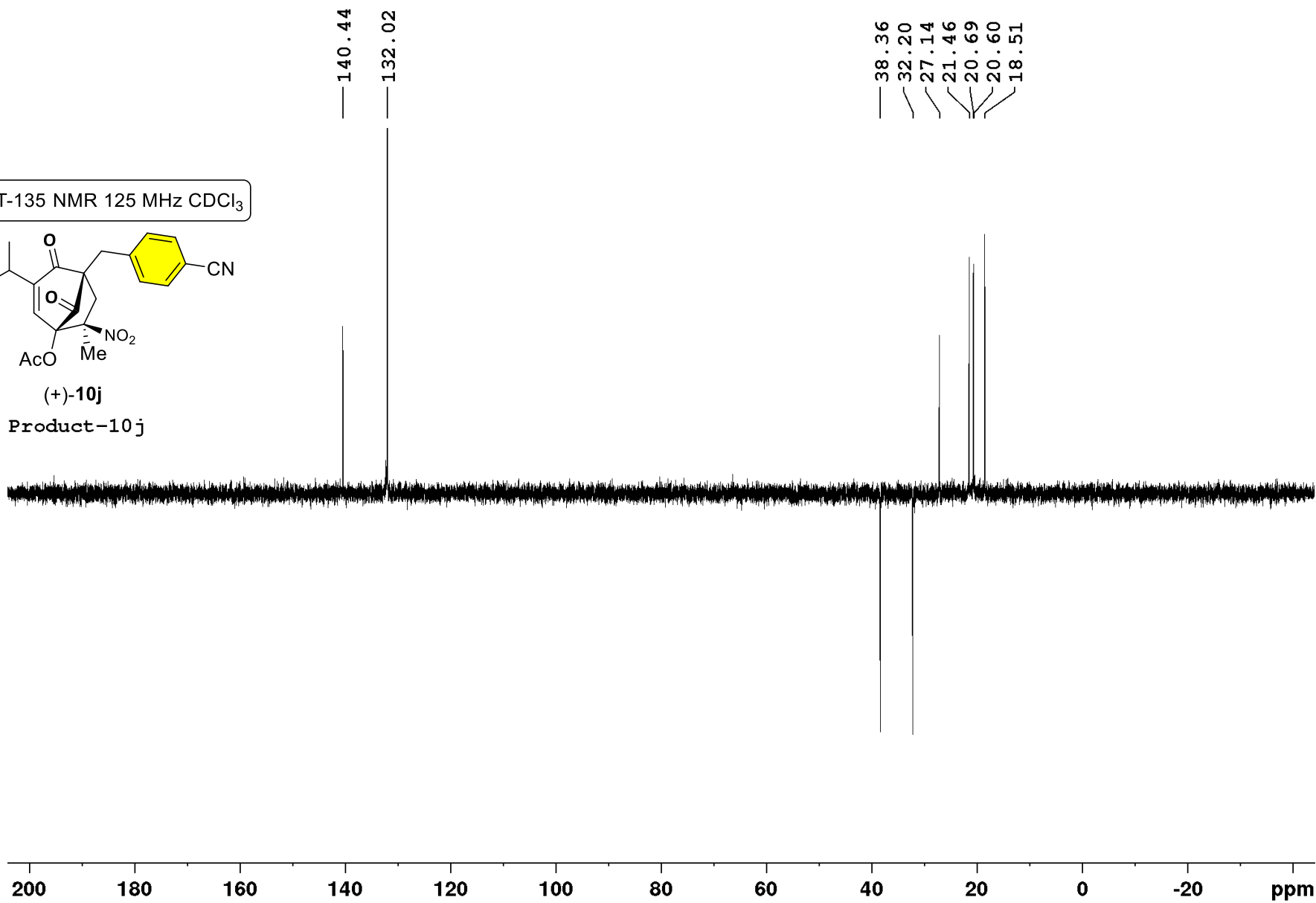


DEPT-135 NMR 125 MHz CDCl₃

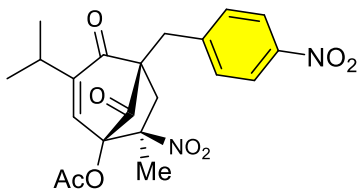


(+)-10j

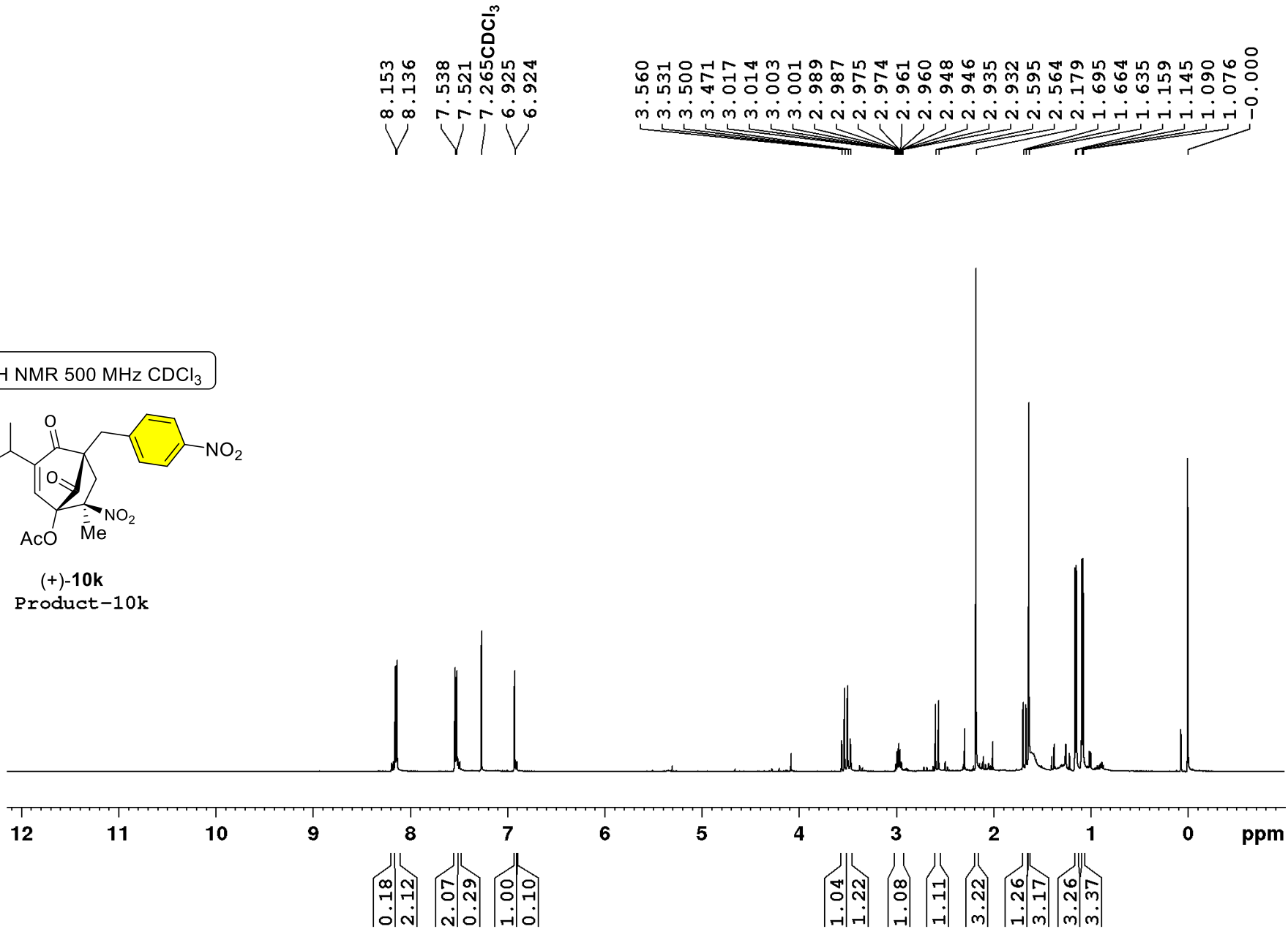
Product-10j



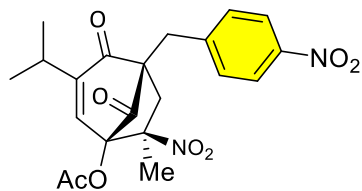
¹H NMR 500 MHz CDCl₃



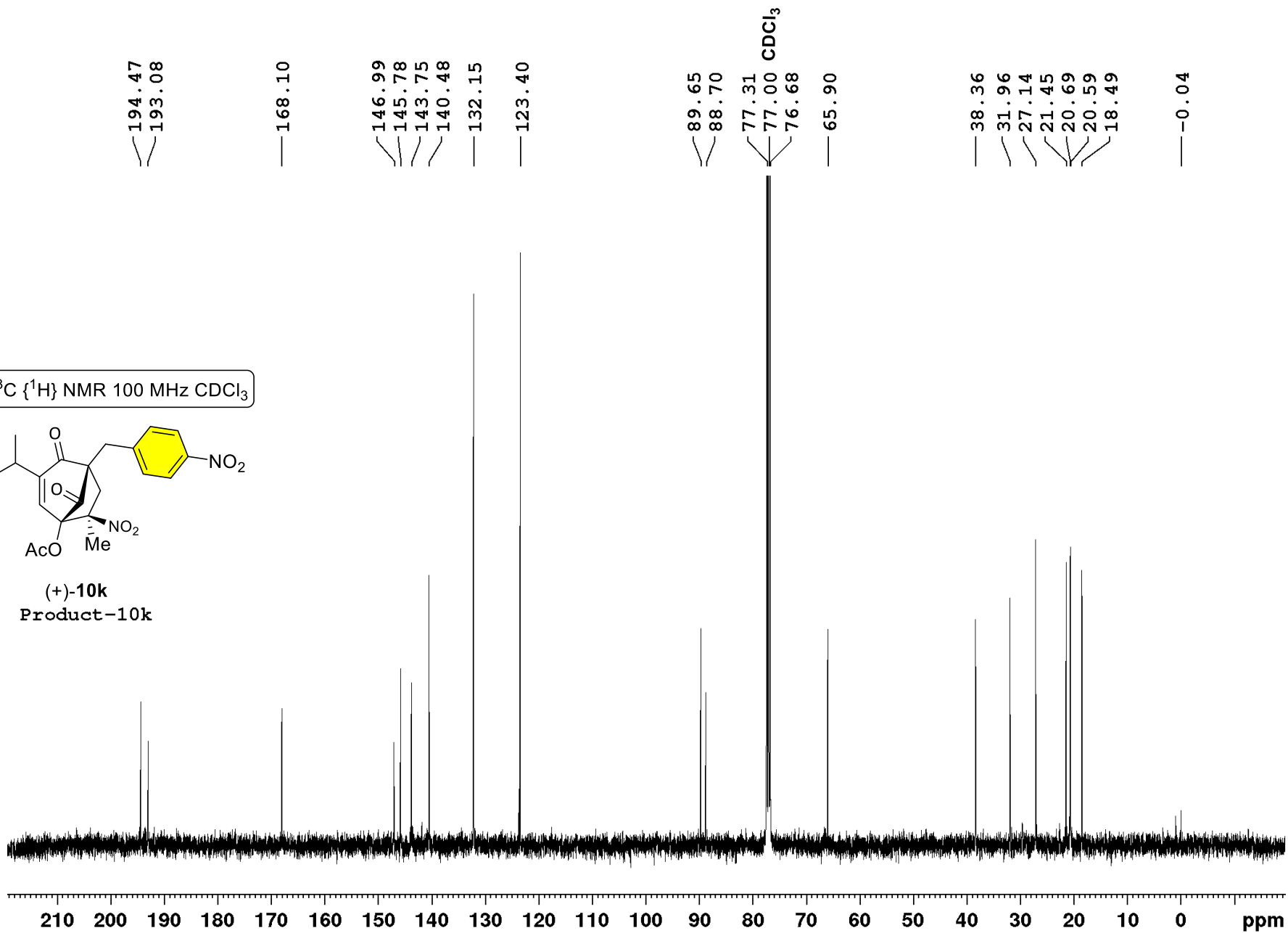
(+)-10k
Product-10k



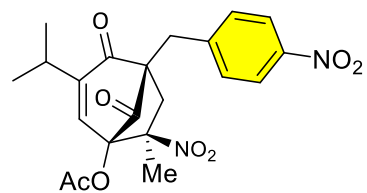
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



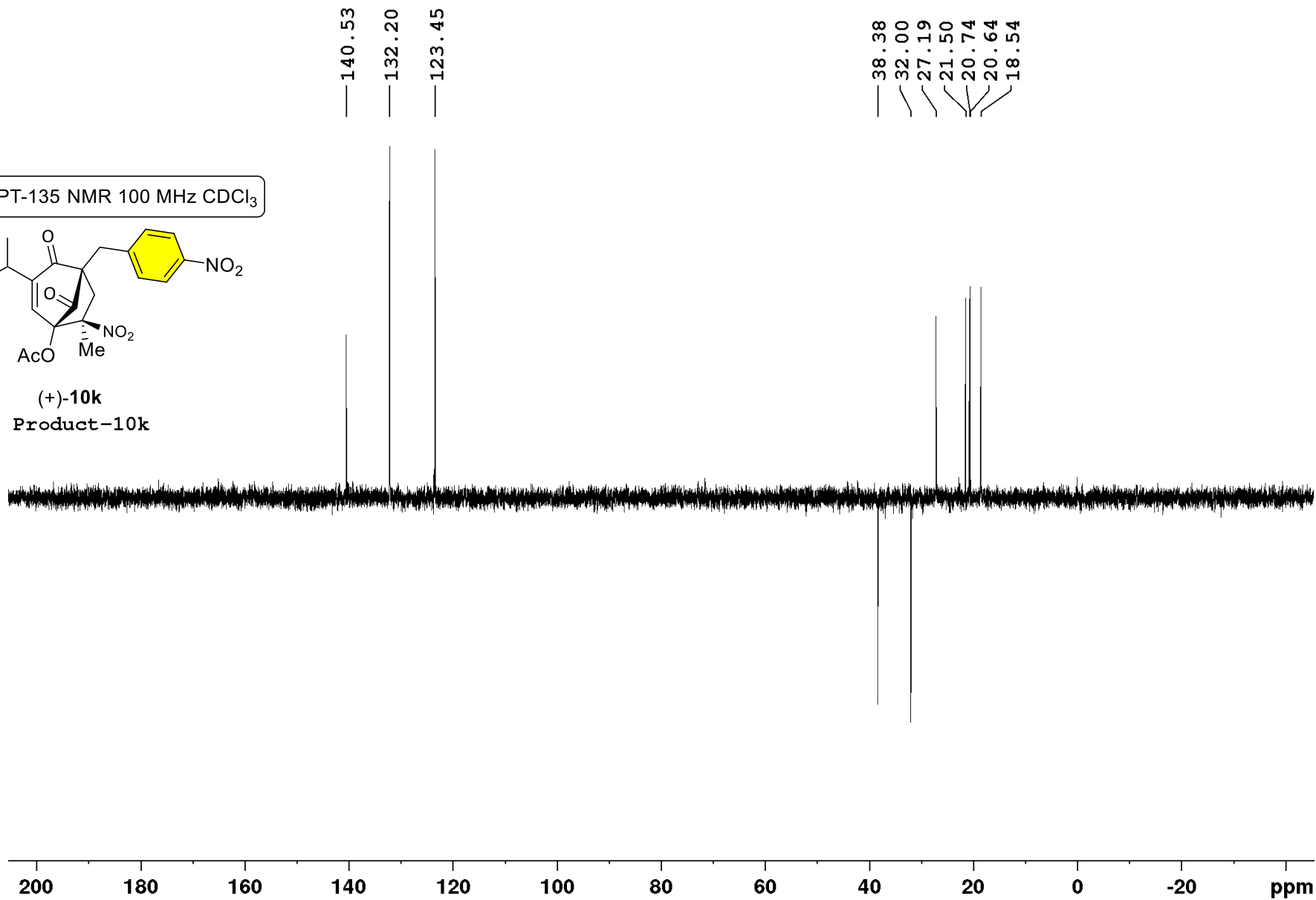
(+)-10k
Product-10k



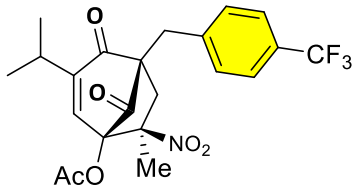
DEPT-135 NMR 100 MHz CDCl₃



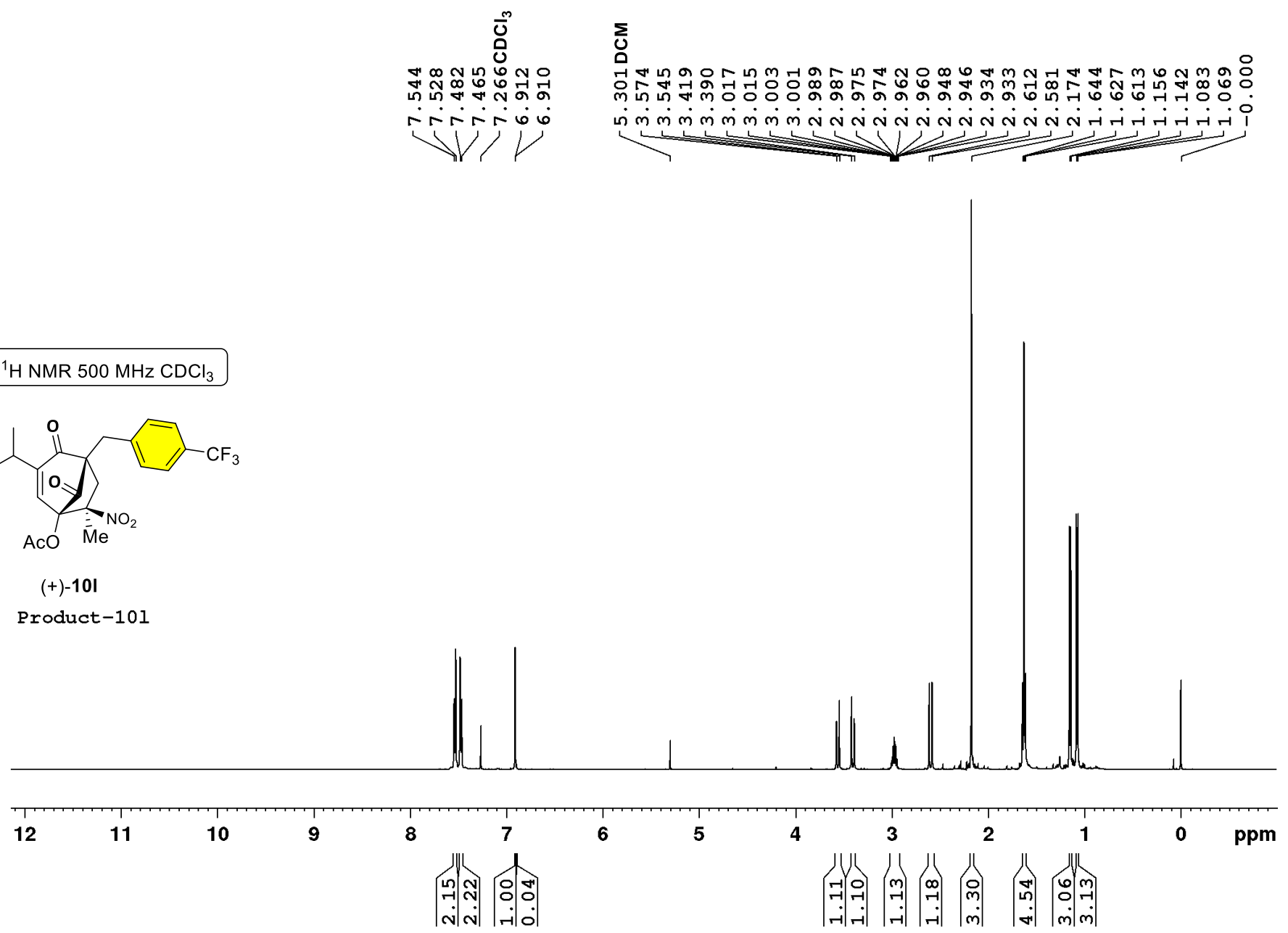
(+)-10k
Product-10k



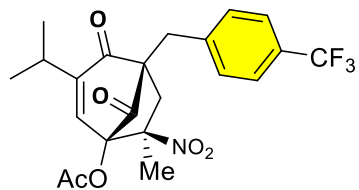
¹H NMR 500 MHz CDCl₃



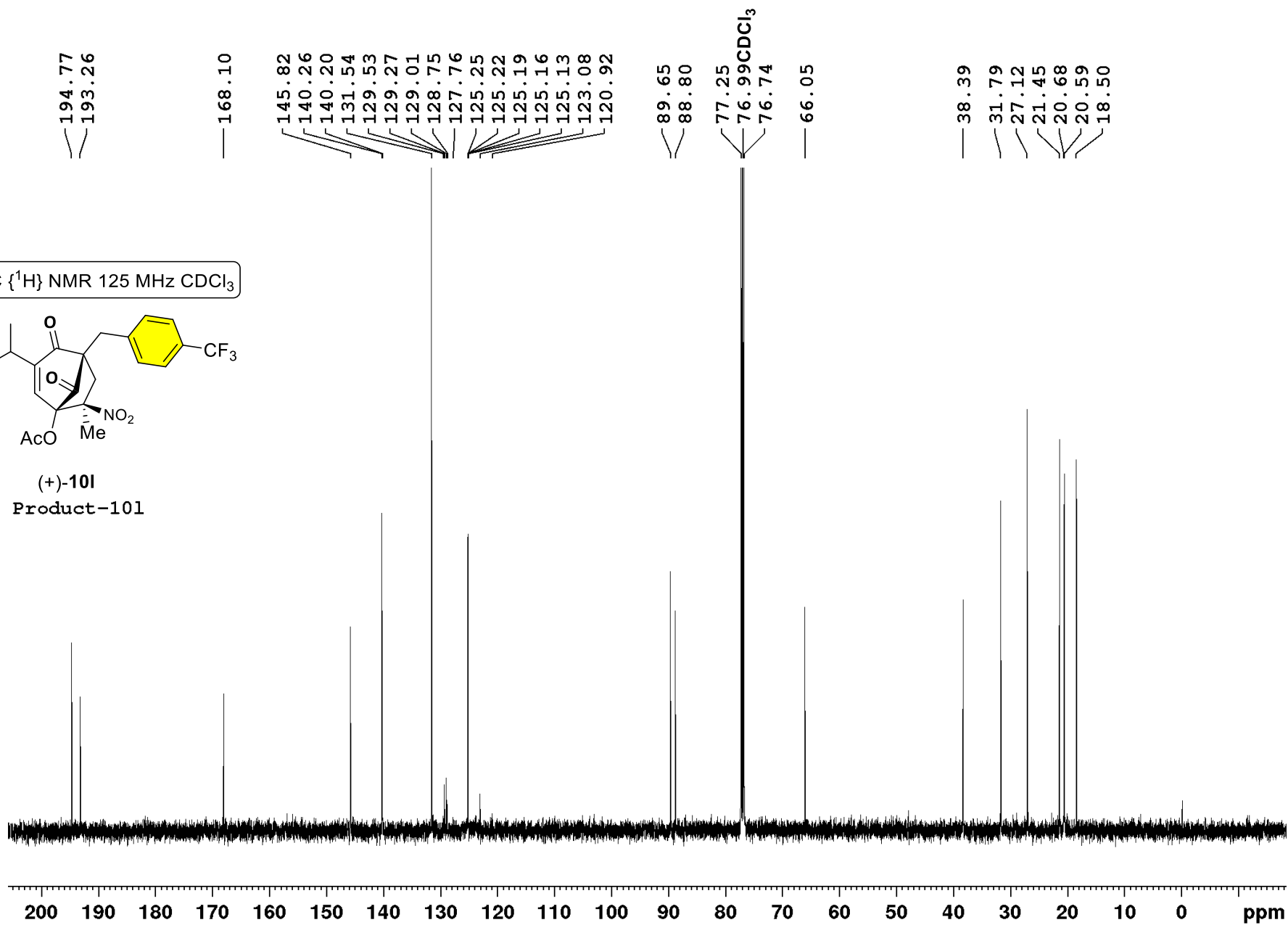
(+)-101
Product-101



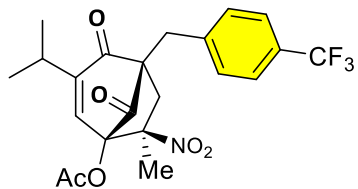
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-101
Product-101

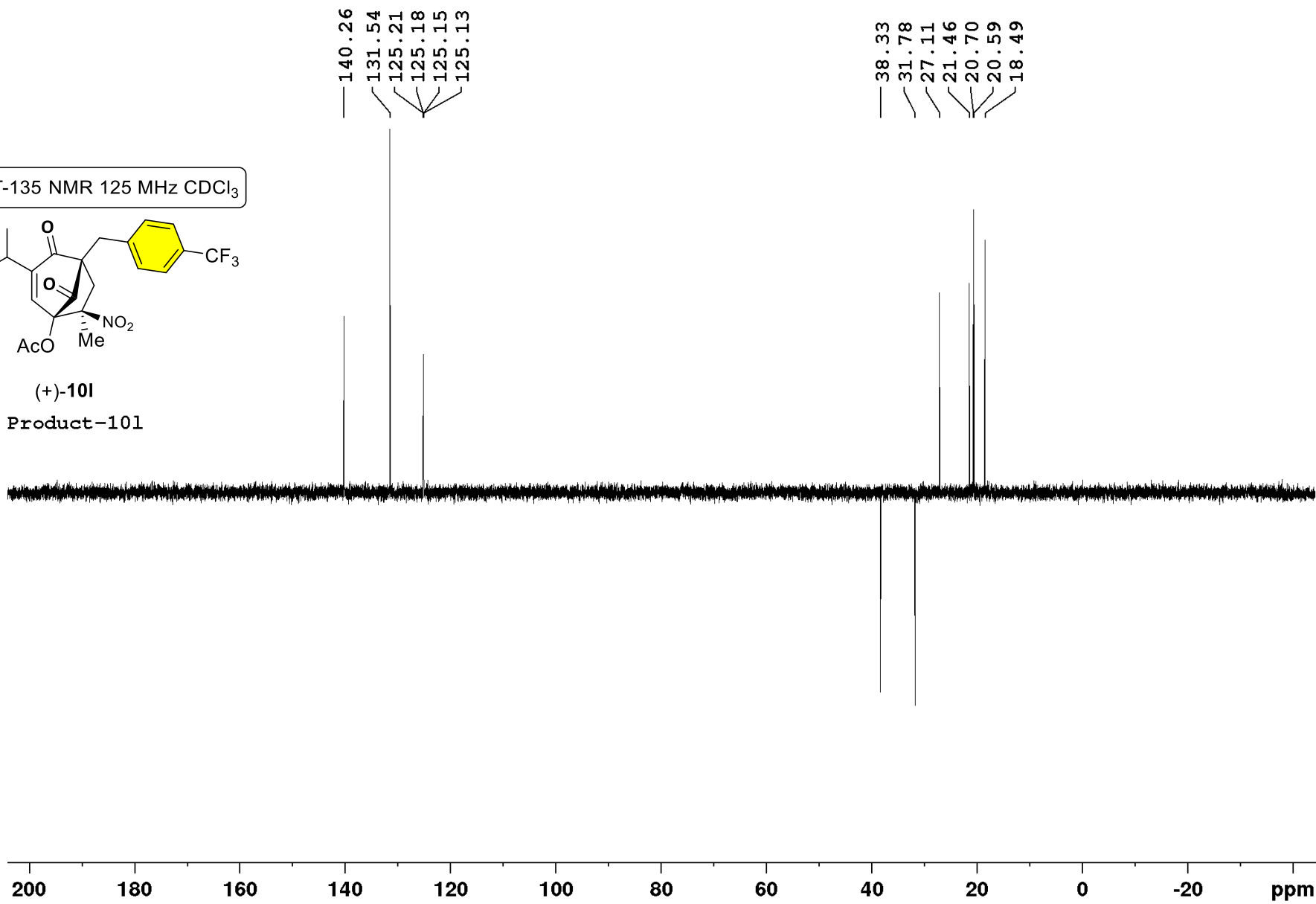


DEPT-135 NMR 125 MHz CDCl₃

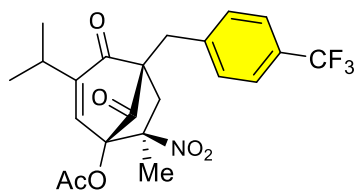


(+)-101

Product-101

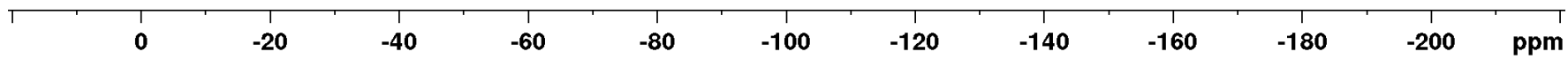


^{19}F NMR 470 MHz CDCl_3

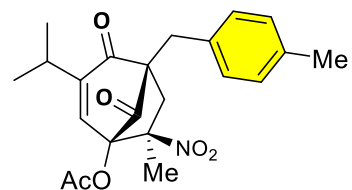


(+)-101
Product-101

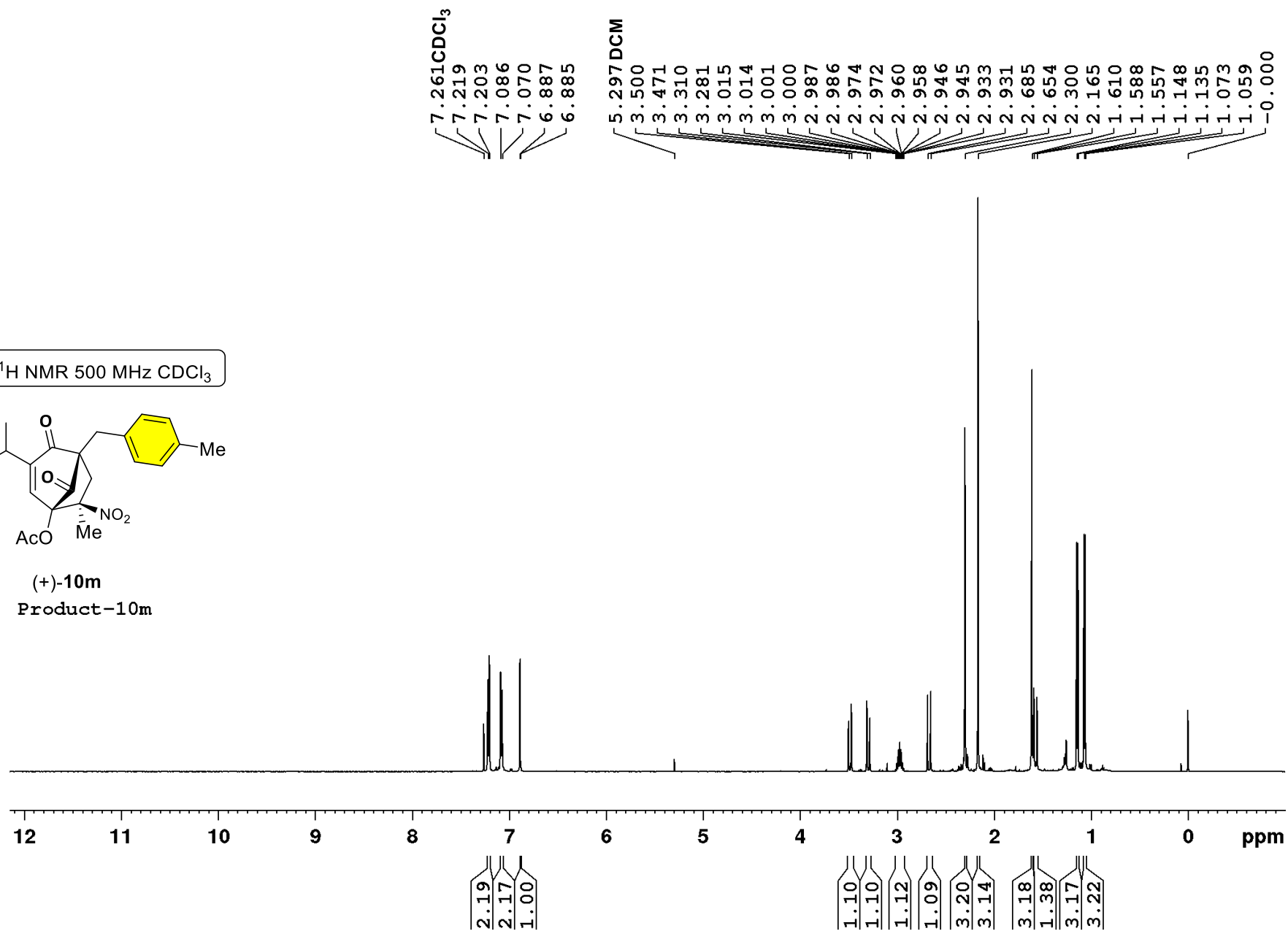
— -62.48



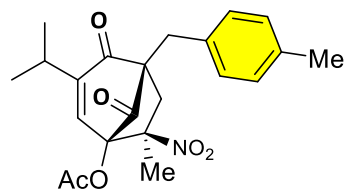
^1H NMR 500 MHz CDCl_3



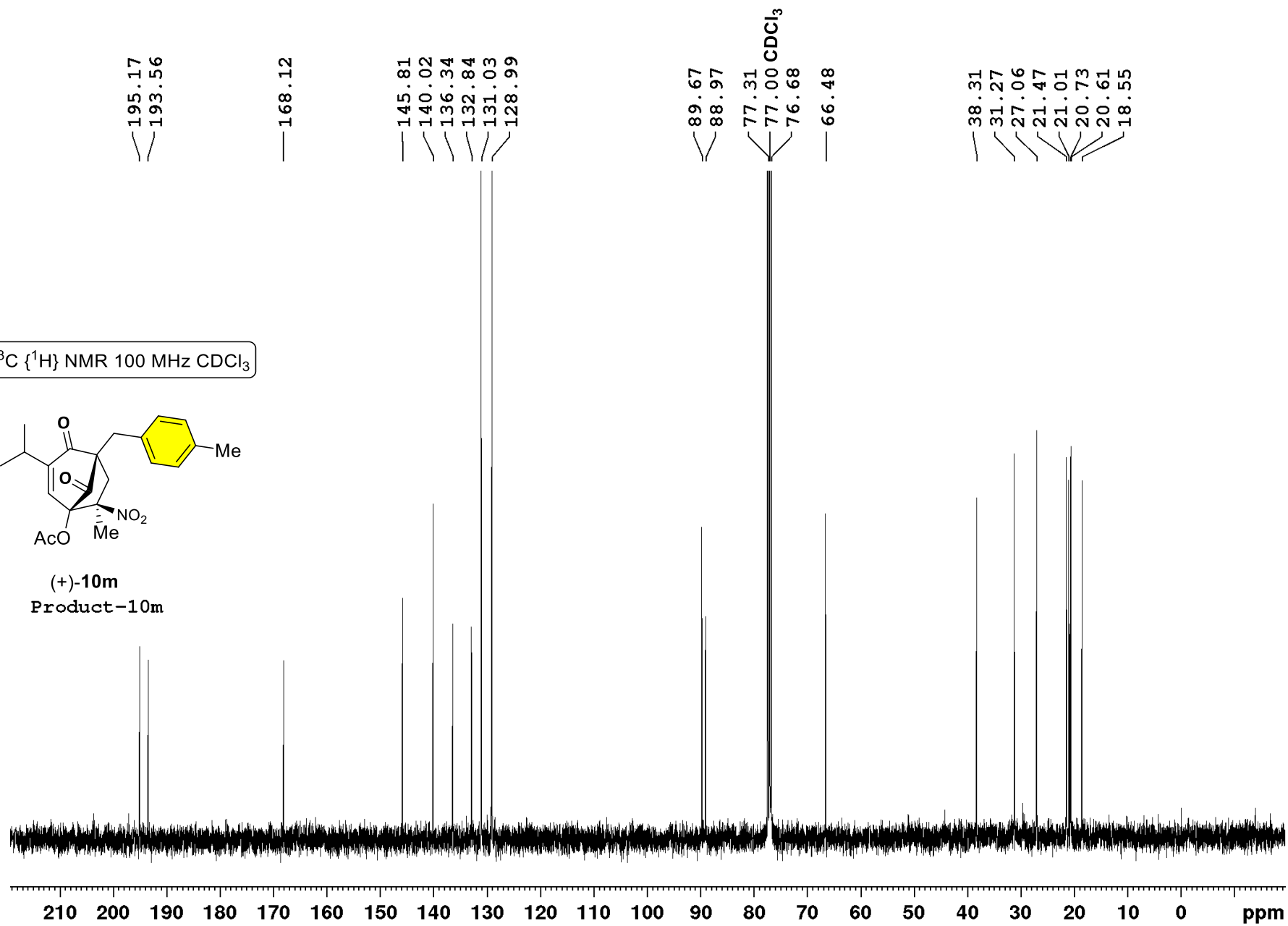
(+)-10m
Product-10m



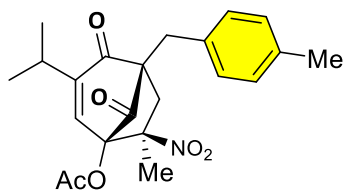
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



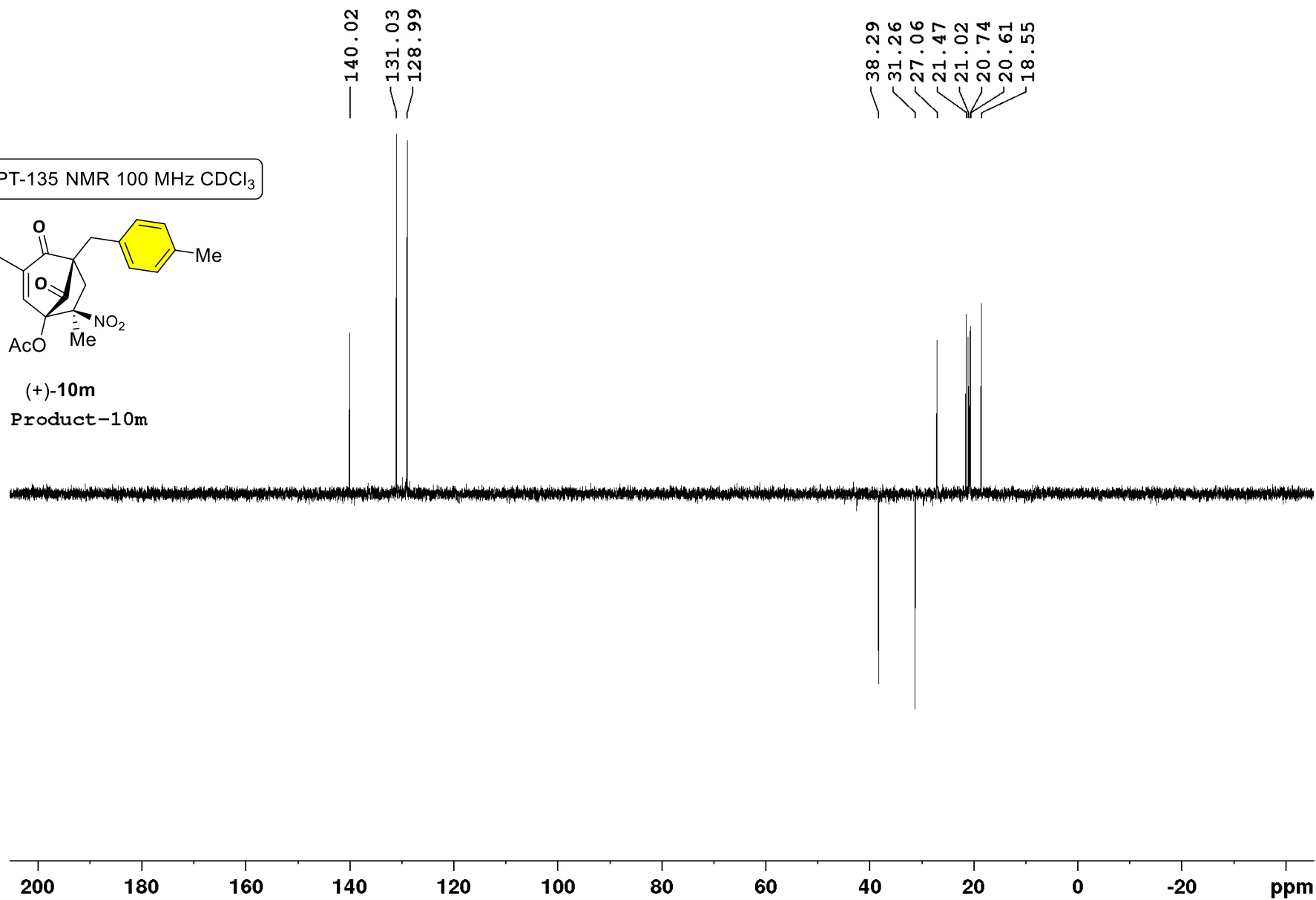
(+)-10m
Product-10m



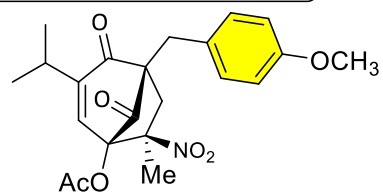
DEPT-135 NMR 100 MHz CDCl₃



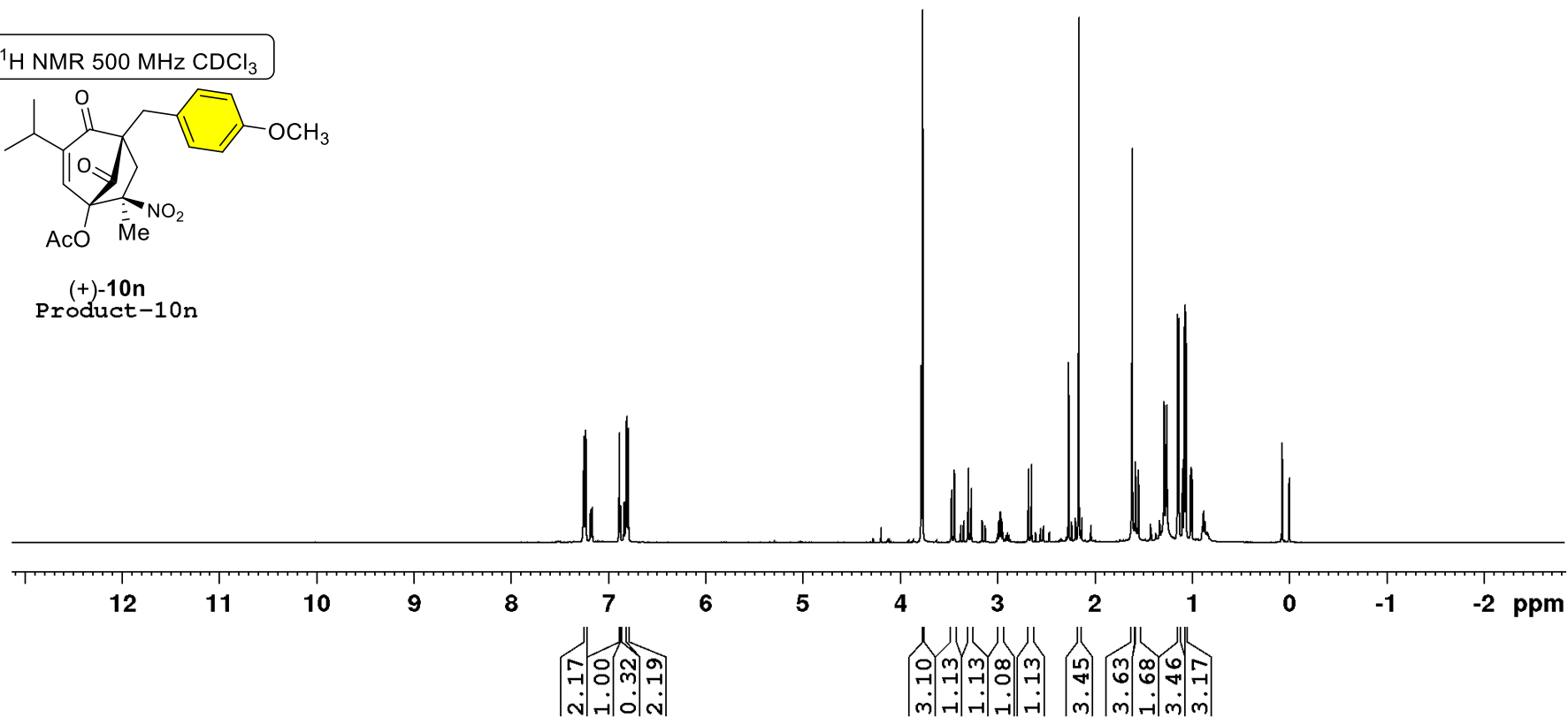
(+)-10m
Product-10m



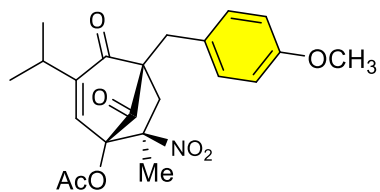
¹H NMR 500 MHz CDCl₃



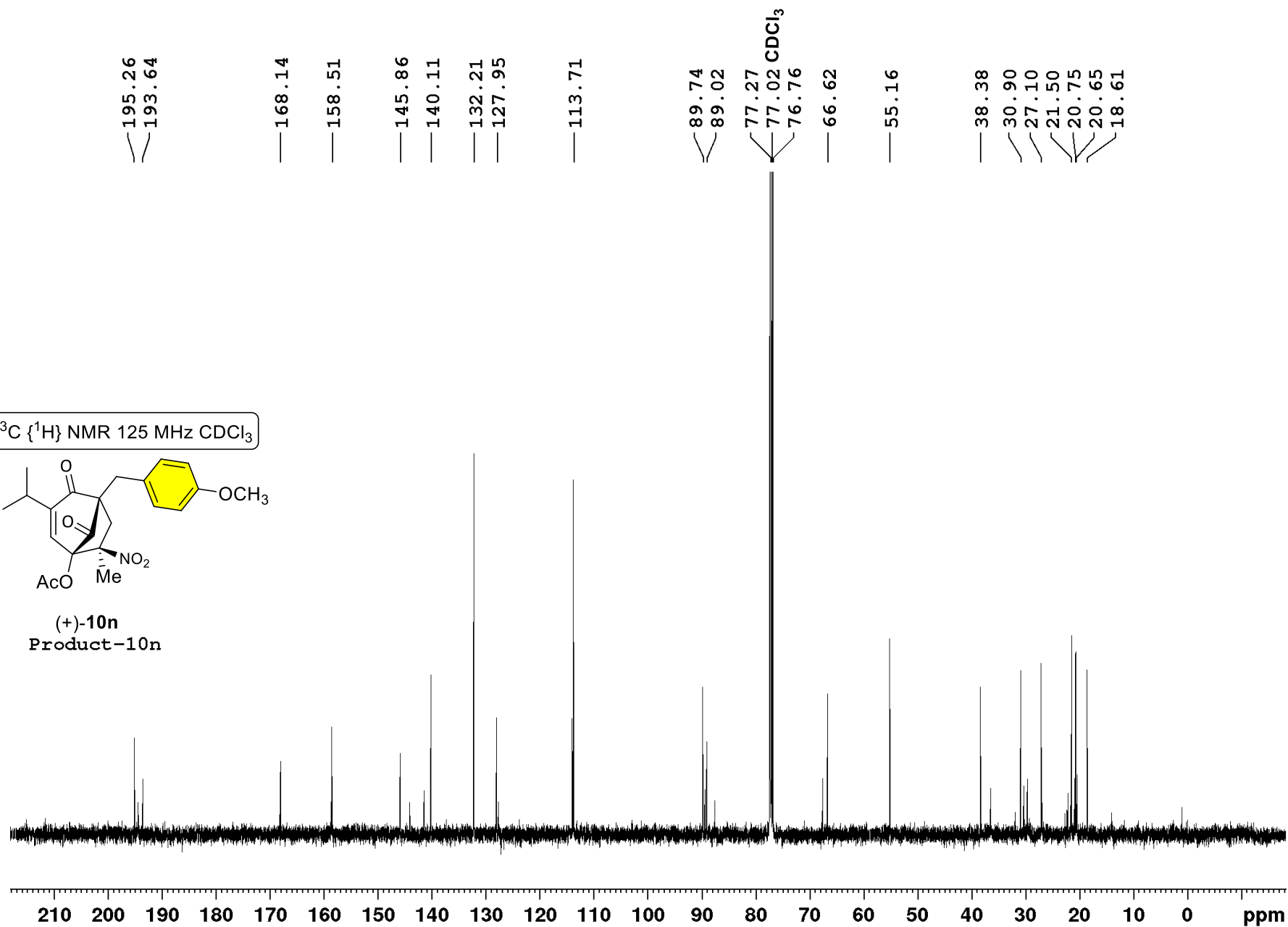
(+)-10n
Product-10n



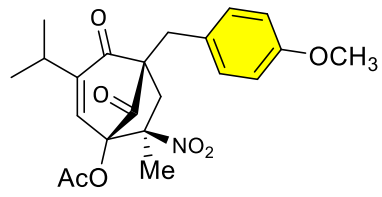
^{13}C { ^1H } NMR 125 MHz CDCl_3



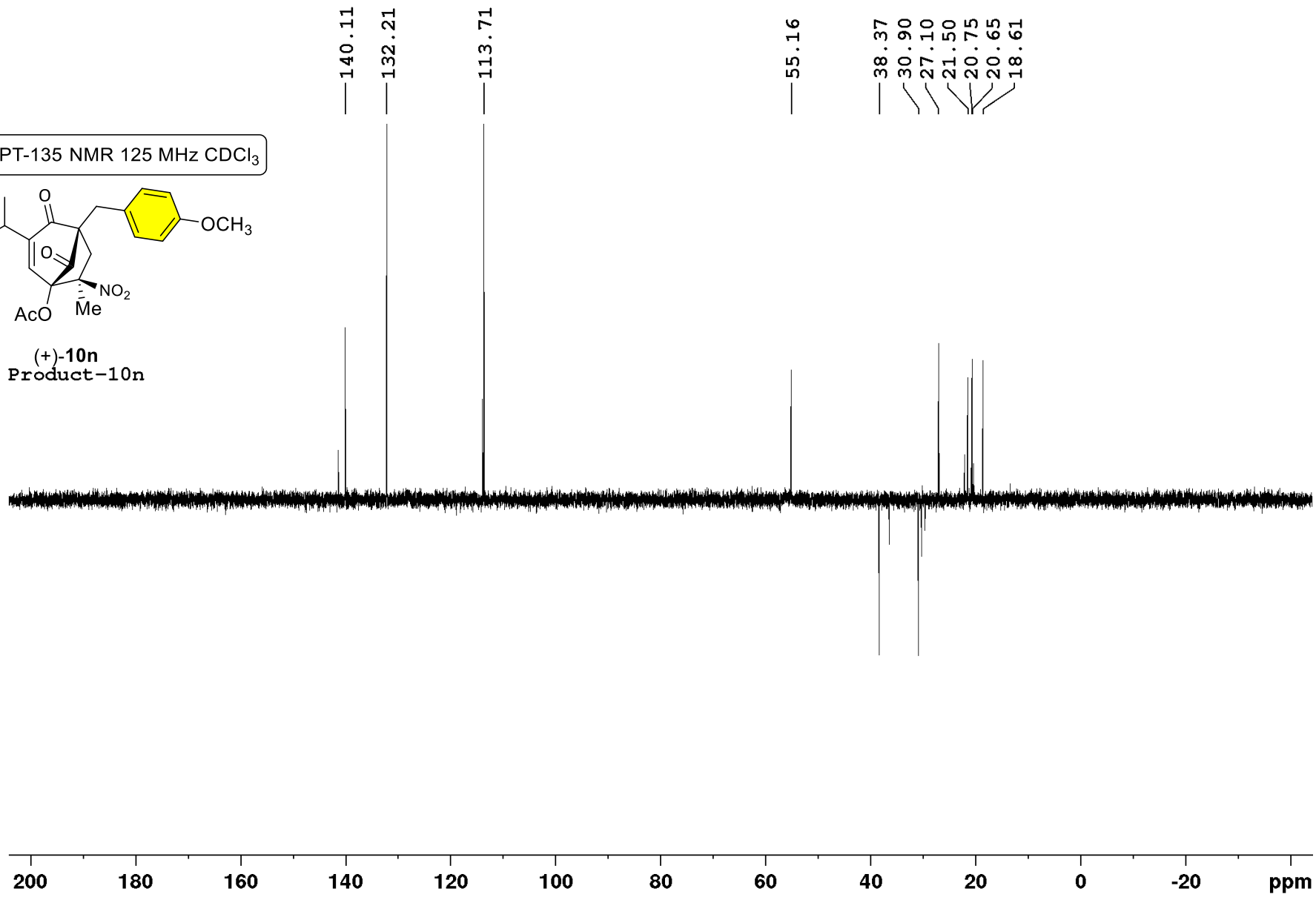
(+)-10n
Product-10n



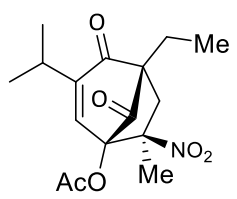
DEPT-135 NMR 125 MHz CDCl₃



(+)-10n
Product-10n

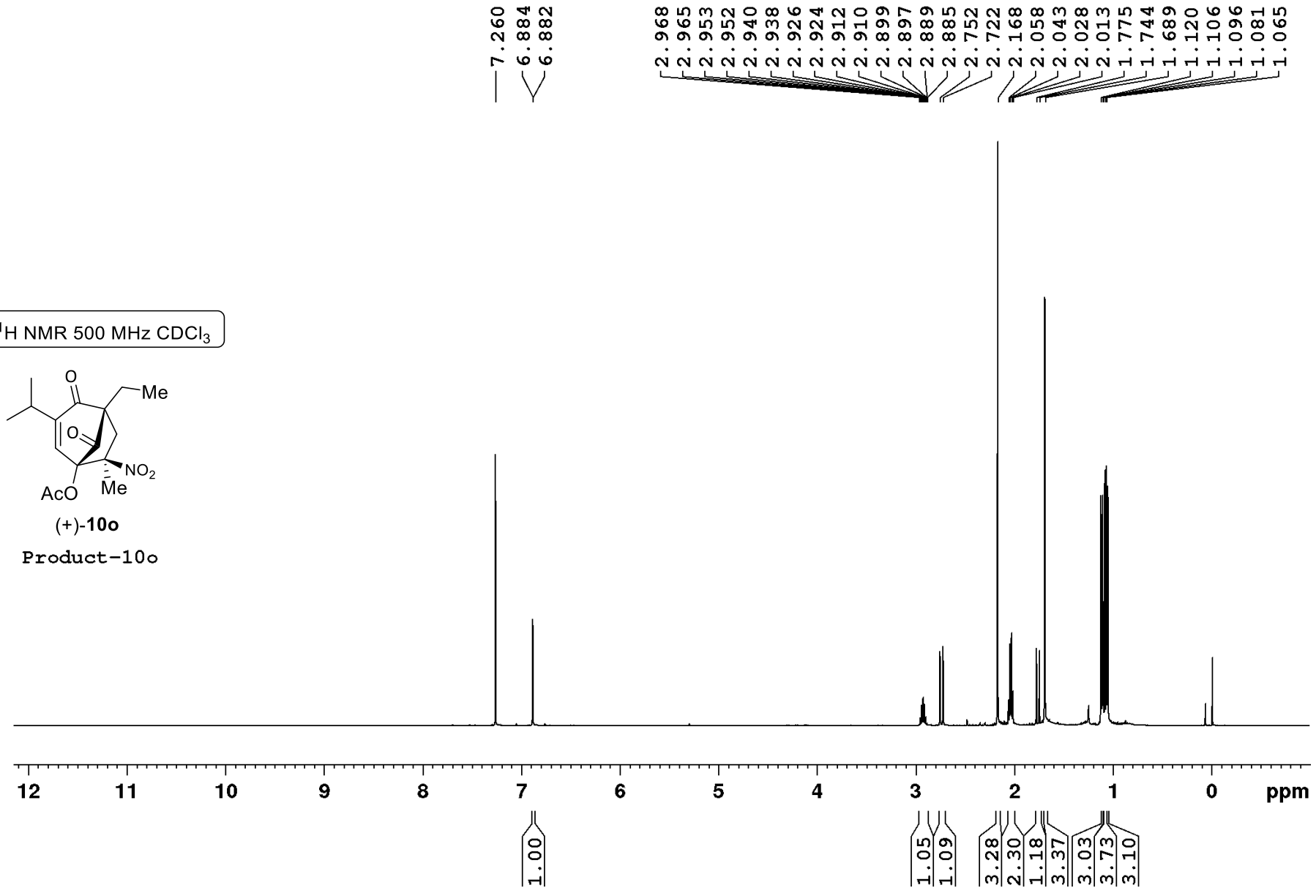


¹H NMR 500 MHz CDCl₃

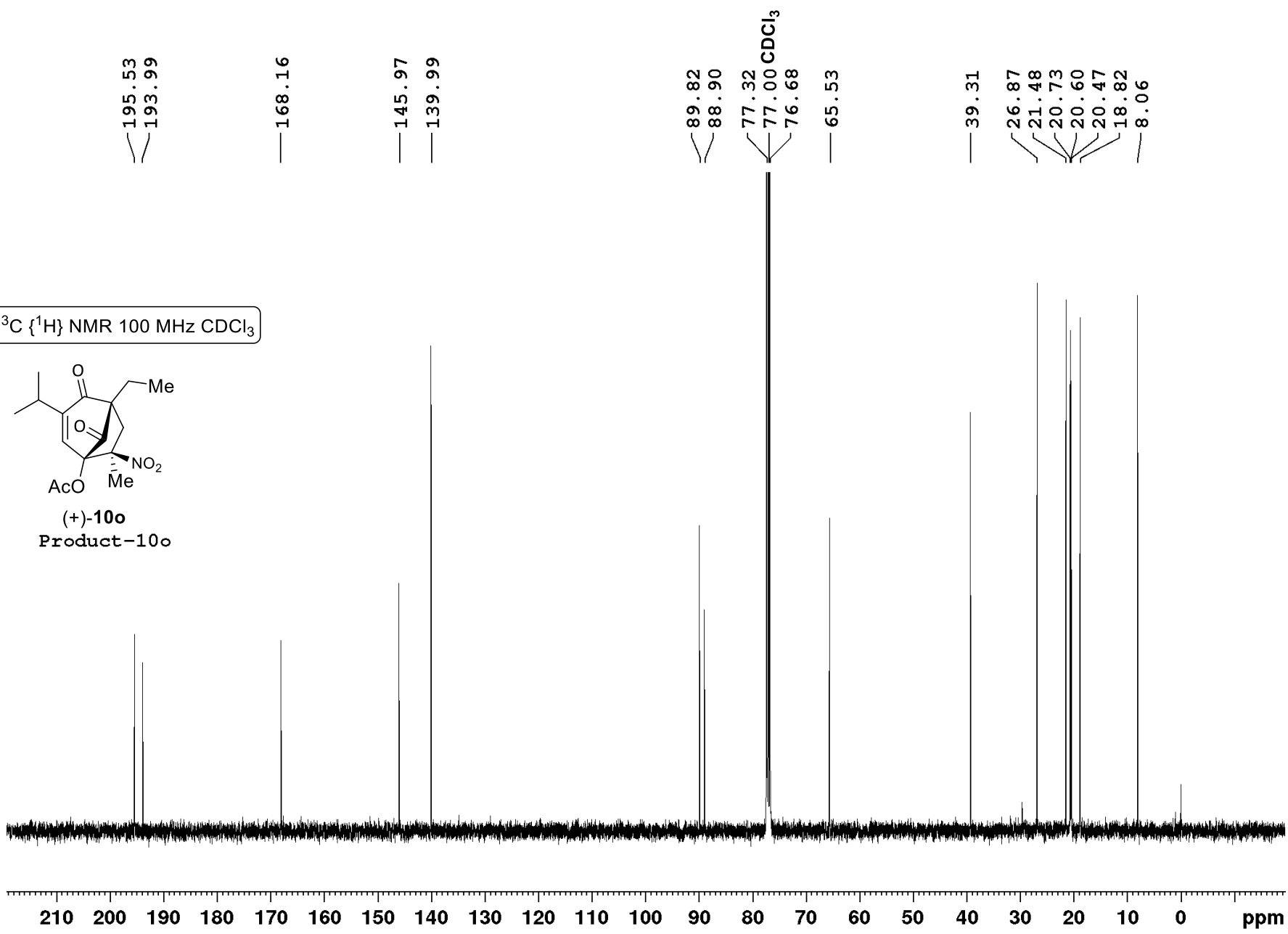
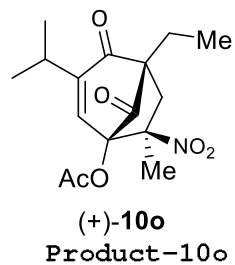


(+)-10o

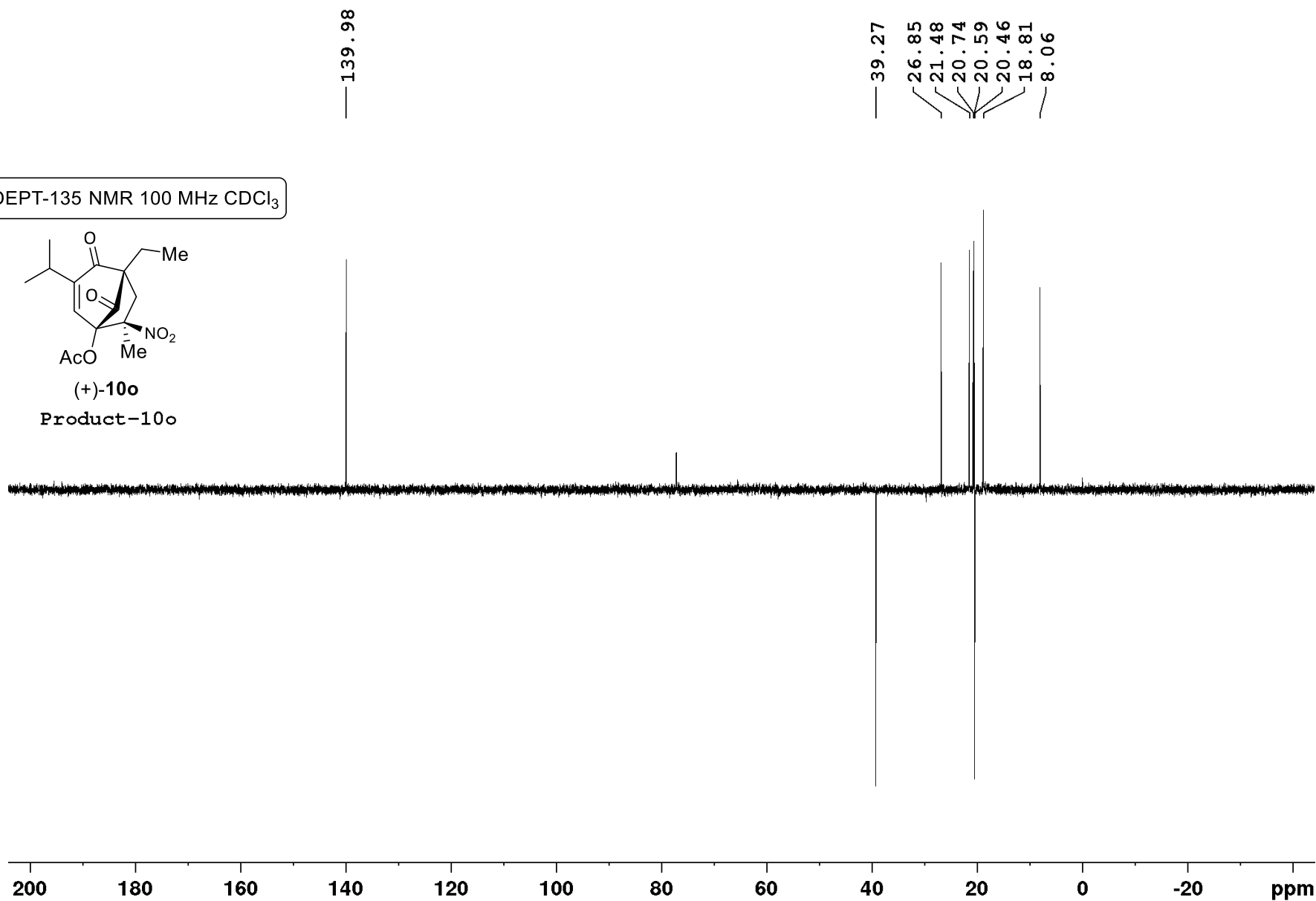
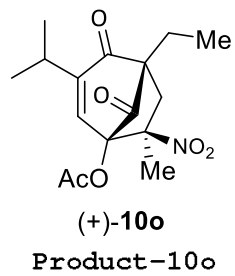
Product-10o



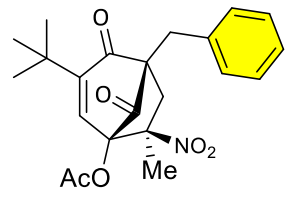
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



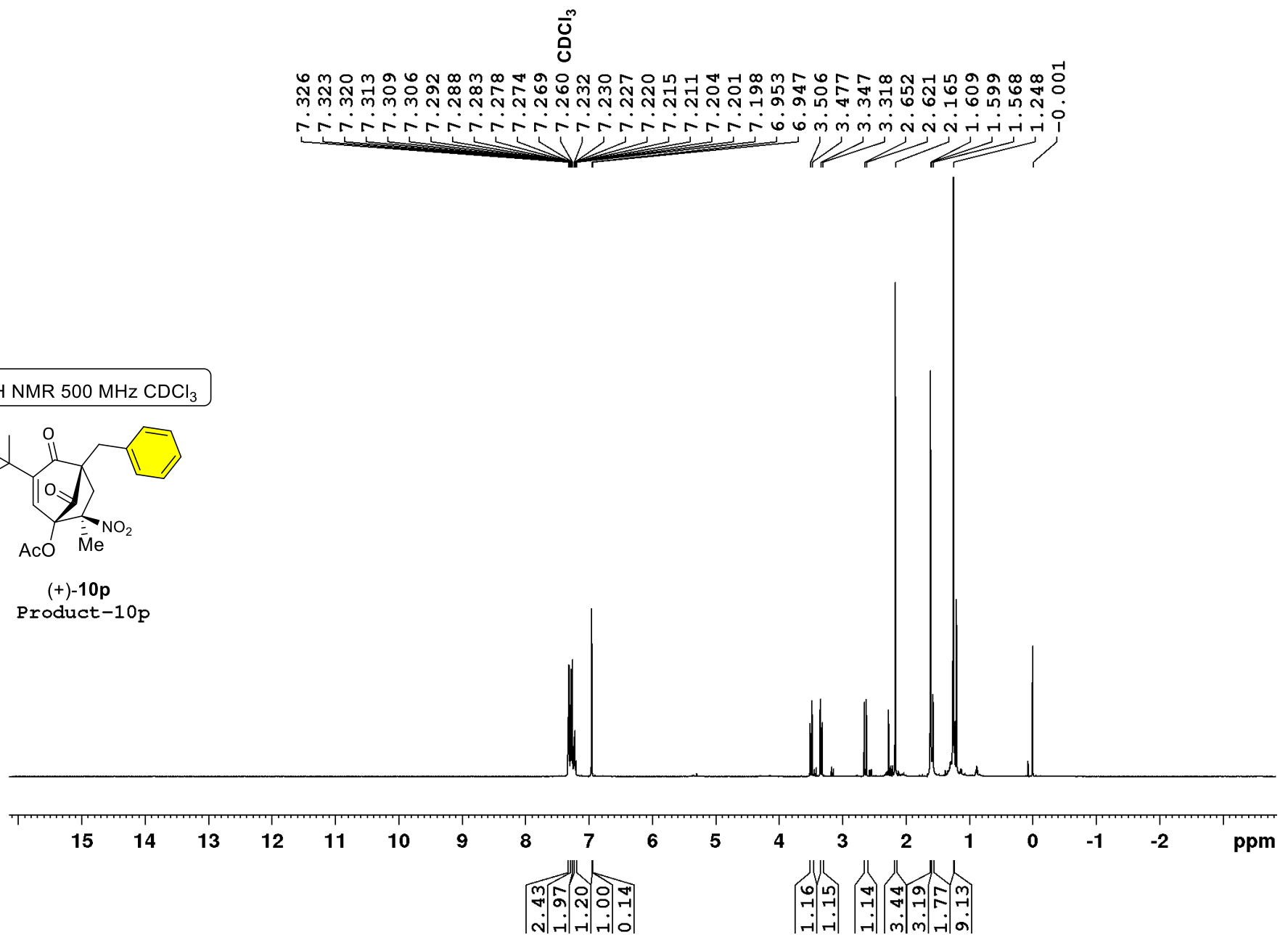
DEPT-135 NMR 100 MHz CDCl₃



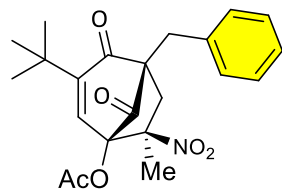
¹H NMR 500 MHz CDCl₃



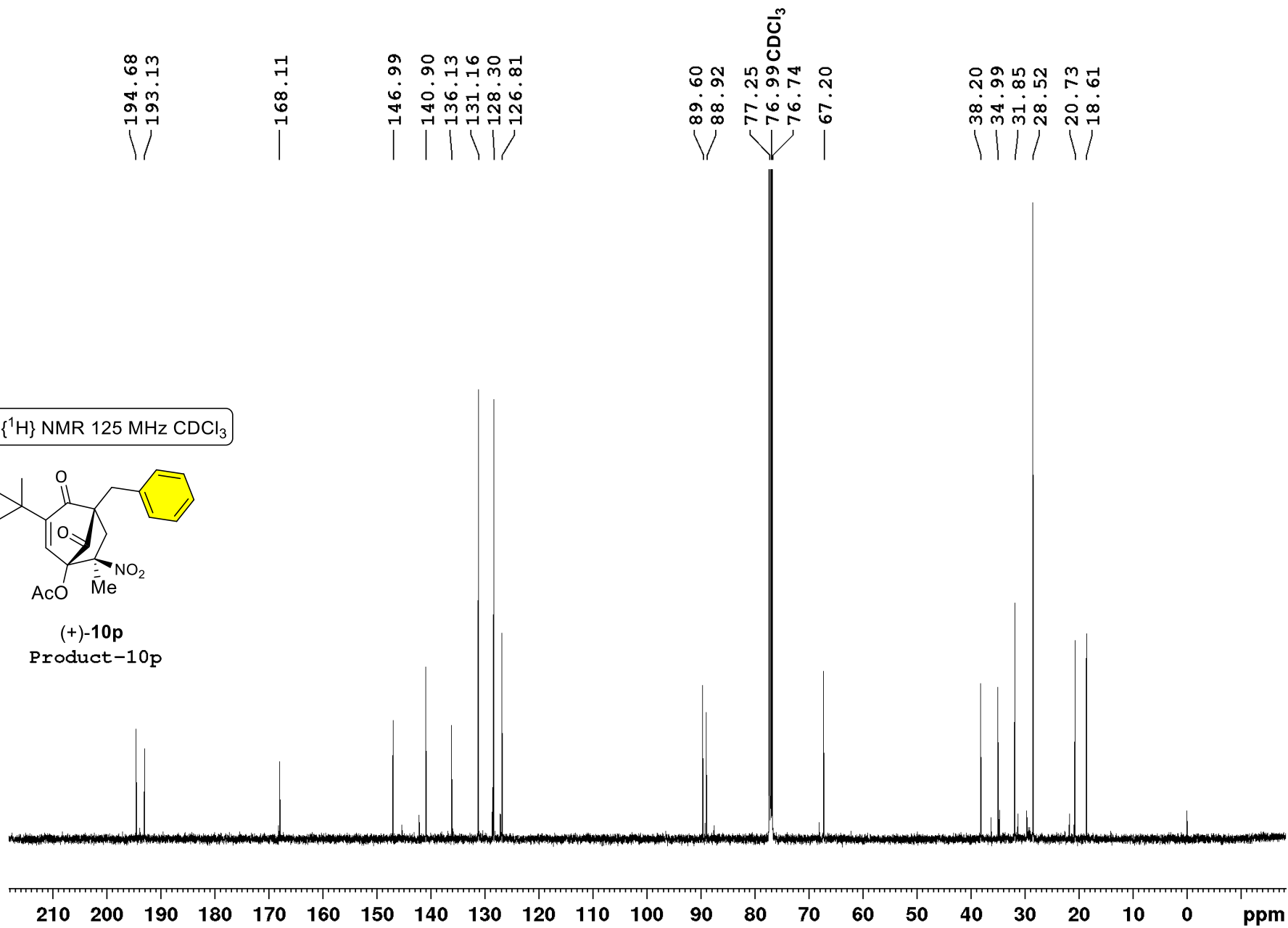
(+)-10p
Product-10p



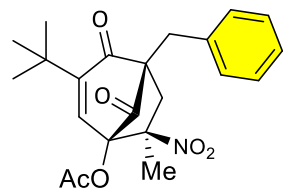
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



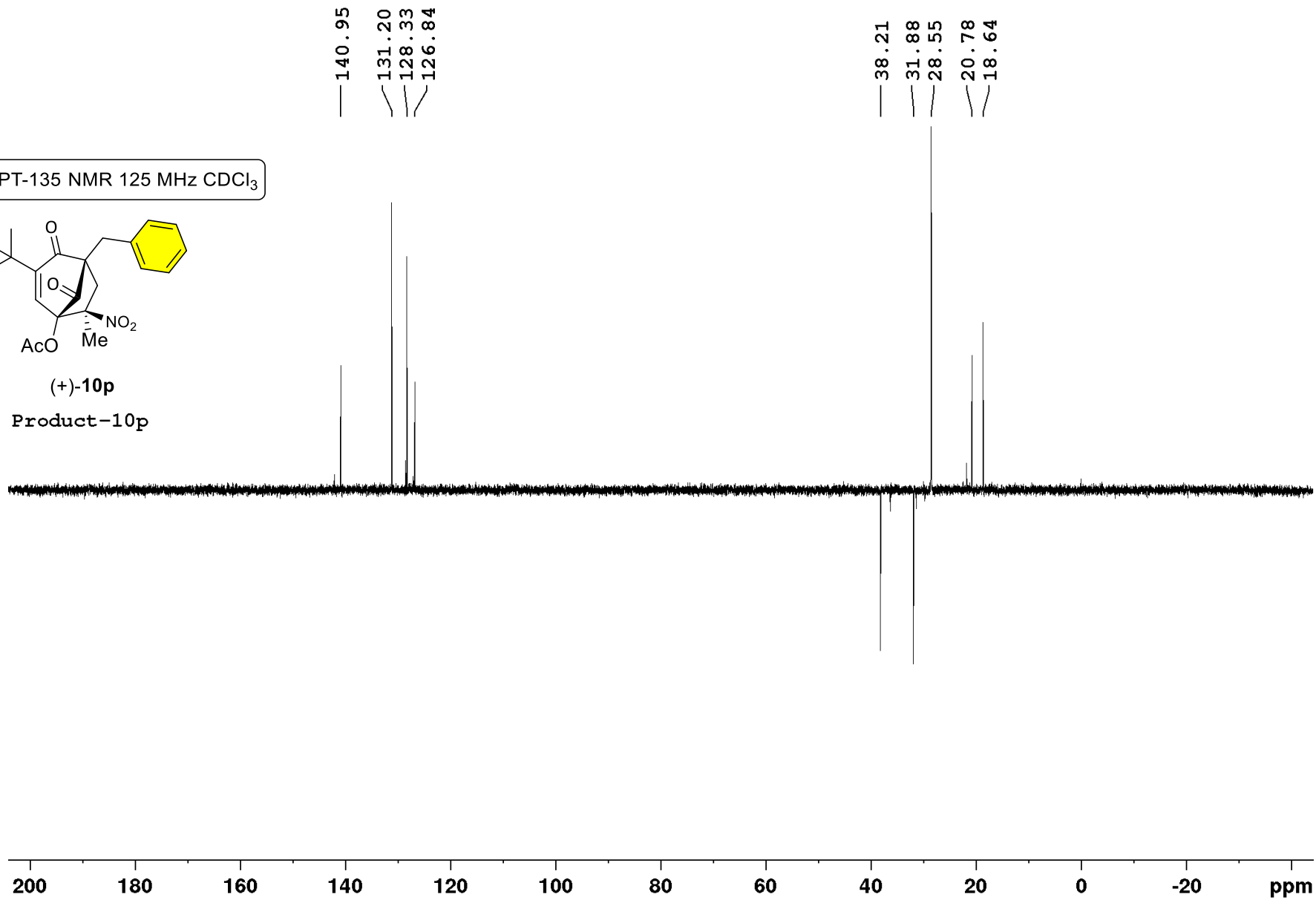
(+)-10p
Product-10p



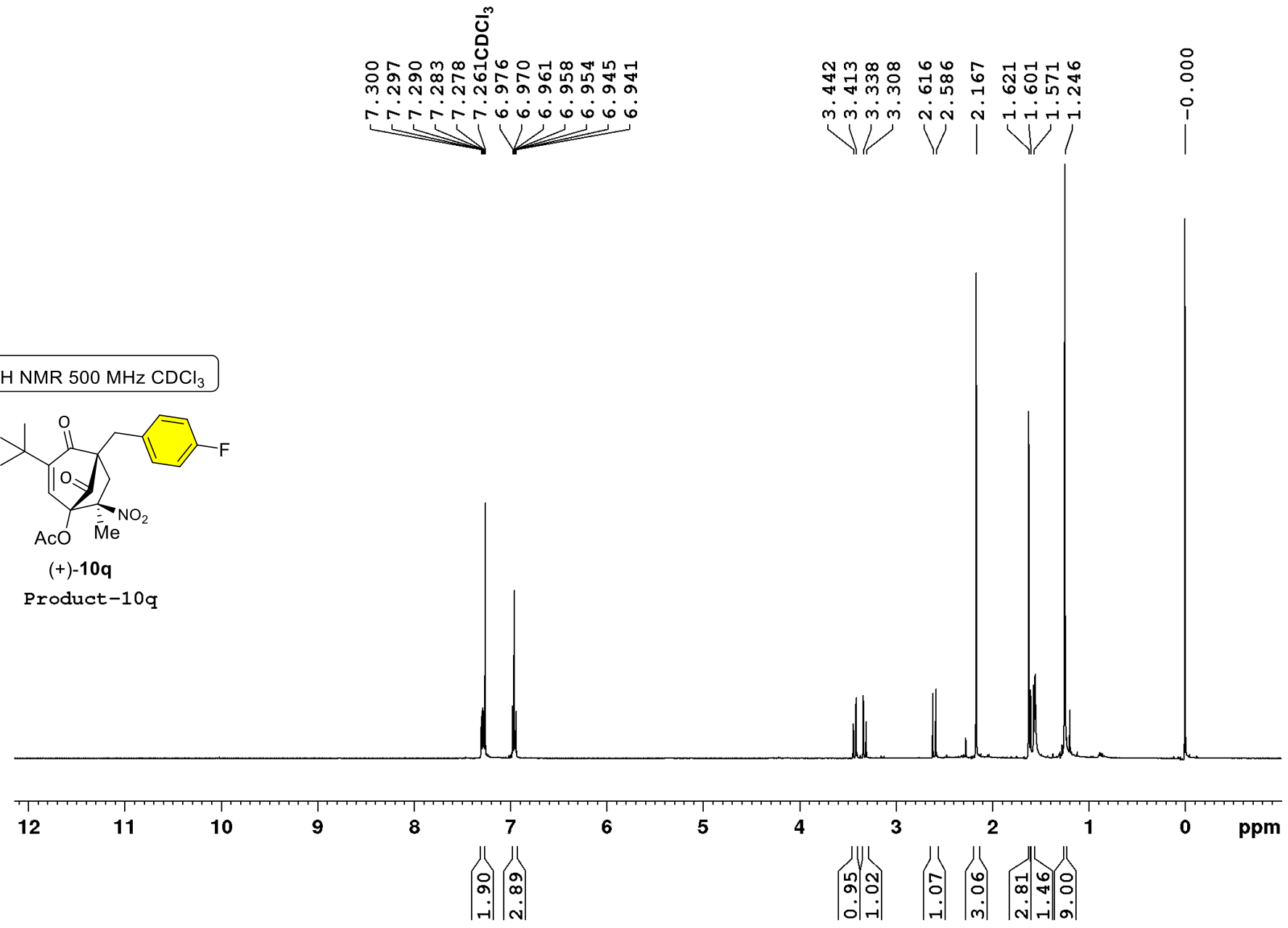
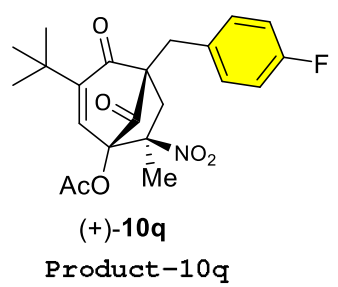
DEPT-135 NMR 125 MHz CDCl₃



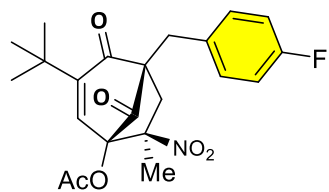
(+)-10p
Product-10p



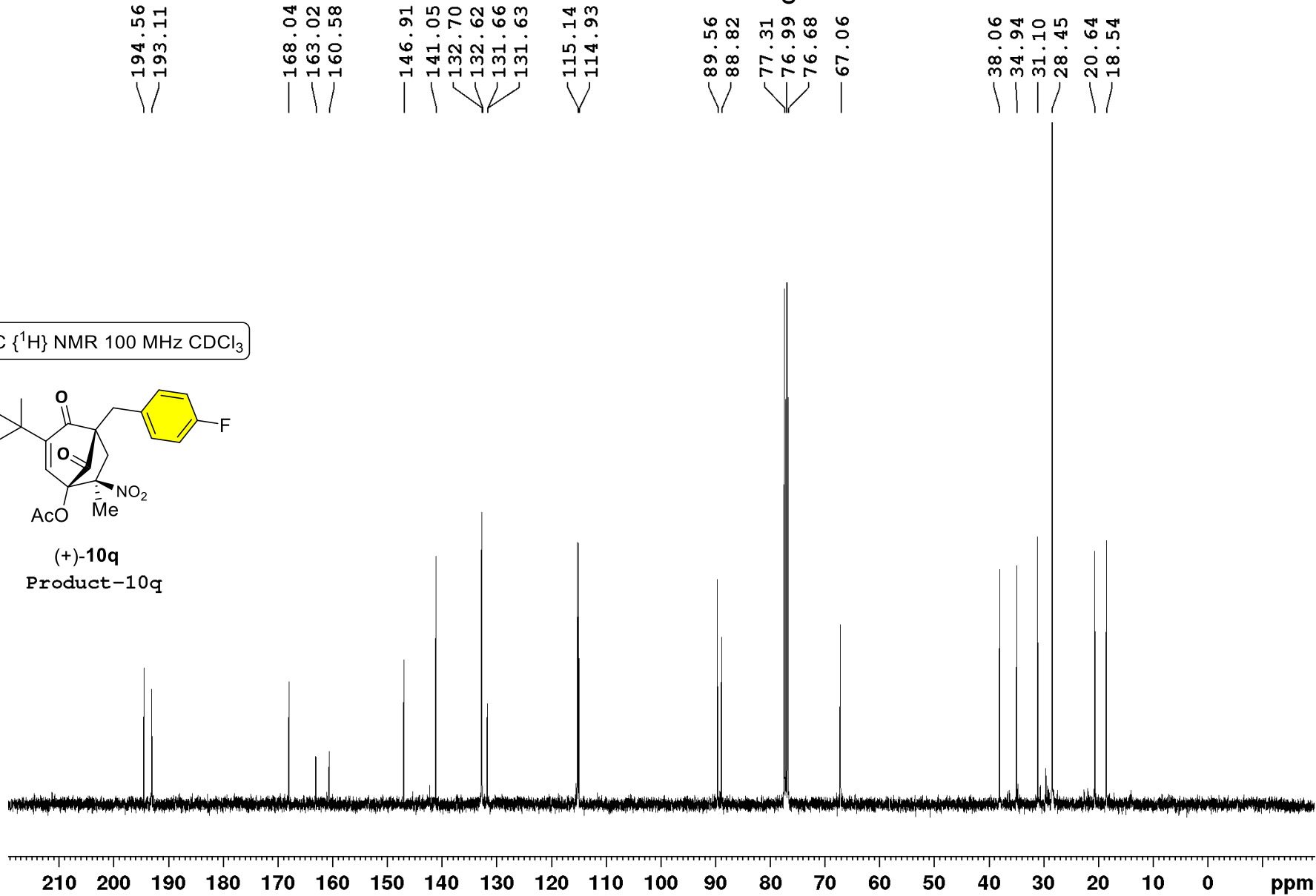
¹H NMR 500 MHz CDCl₃



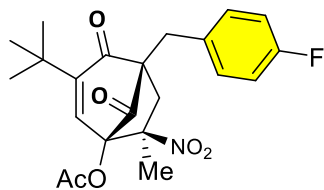
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



(+)-10q
Product-10q

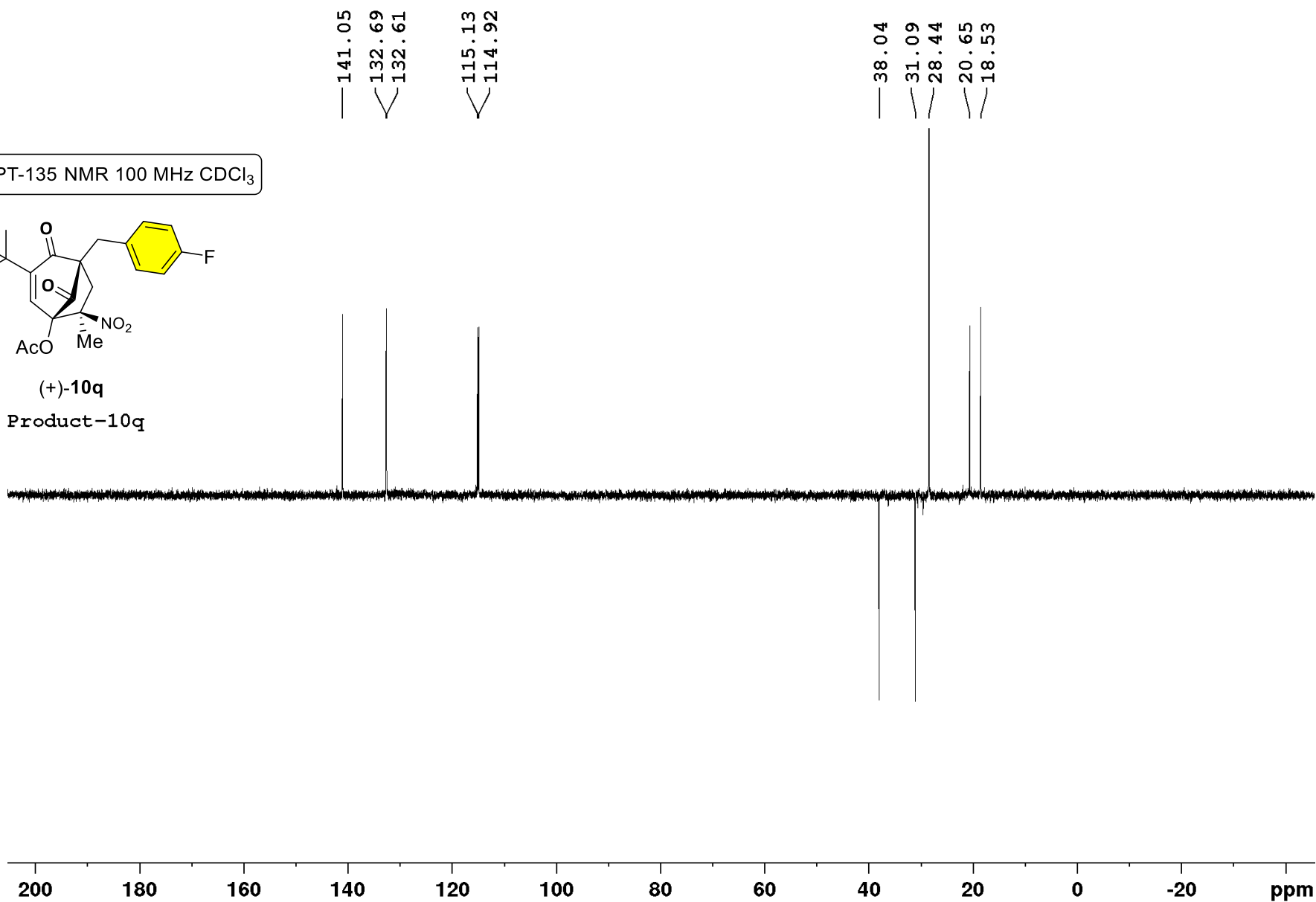


DEPT-135 NMR 100 MHz CDCl₃

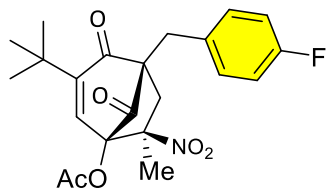


(+)-10q

Product-10q

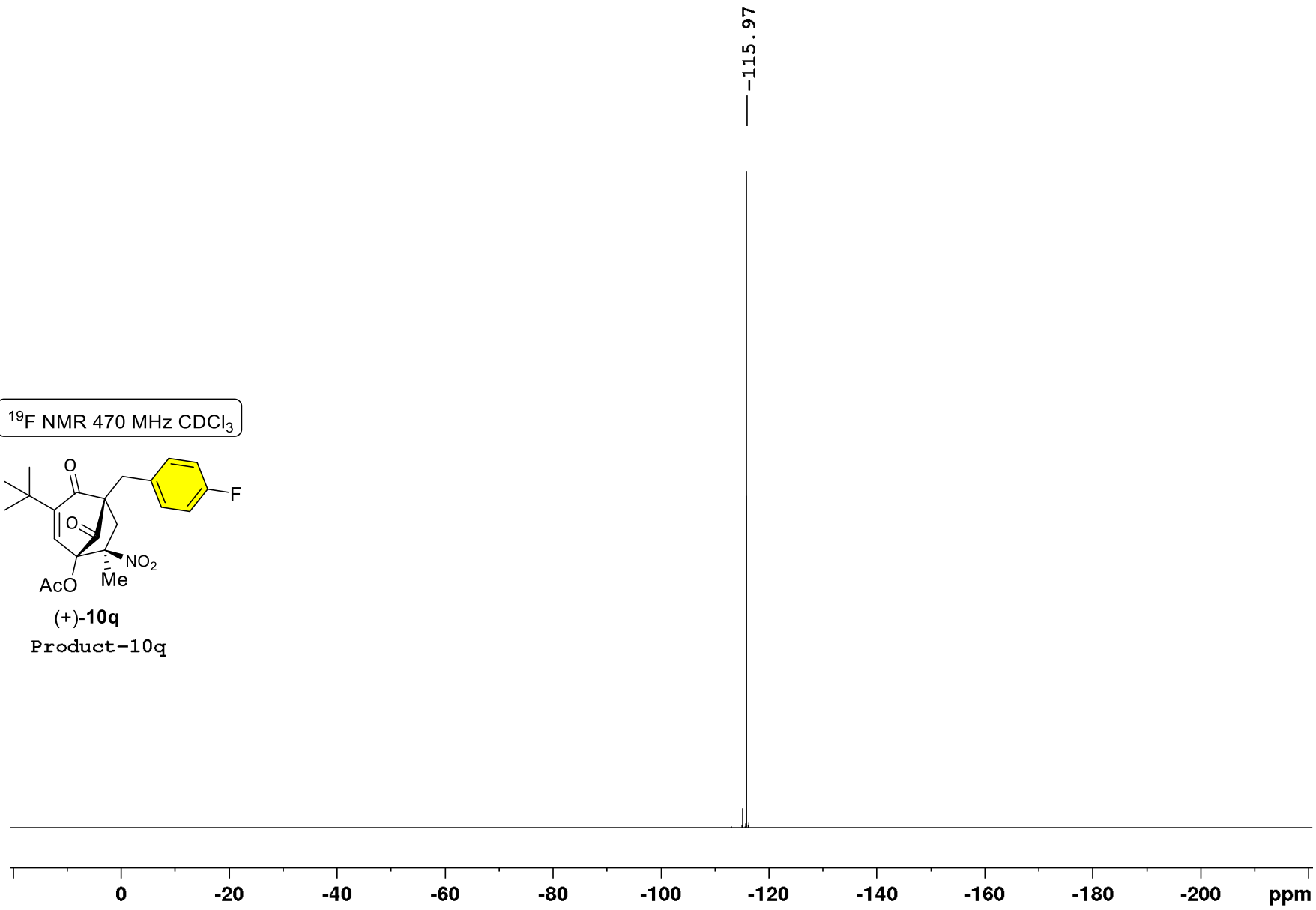


¹⁹F NMR 470 MHz CDCl₃

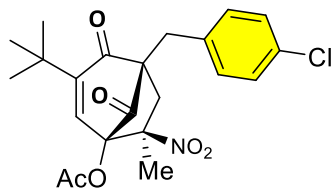


(+)-10q

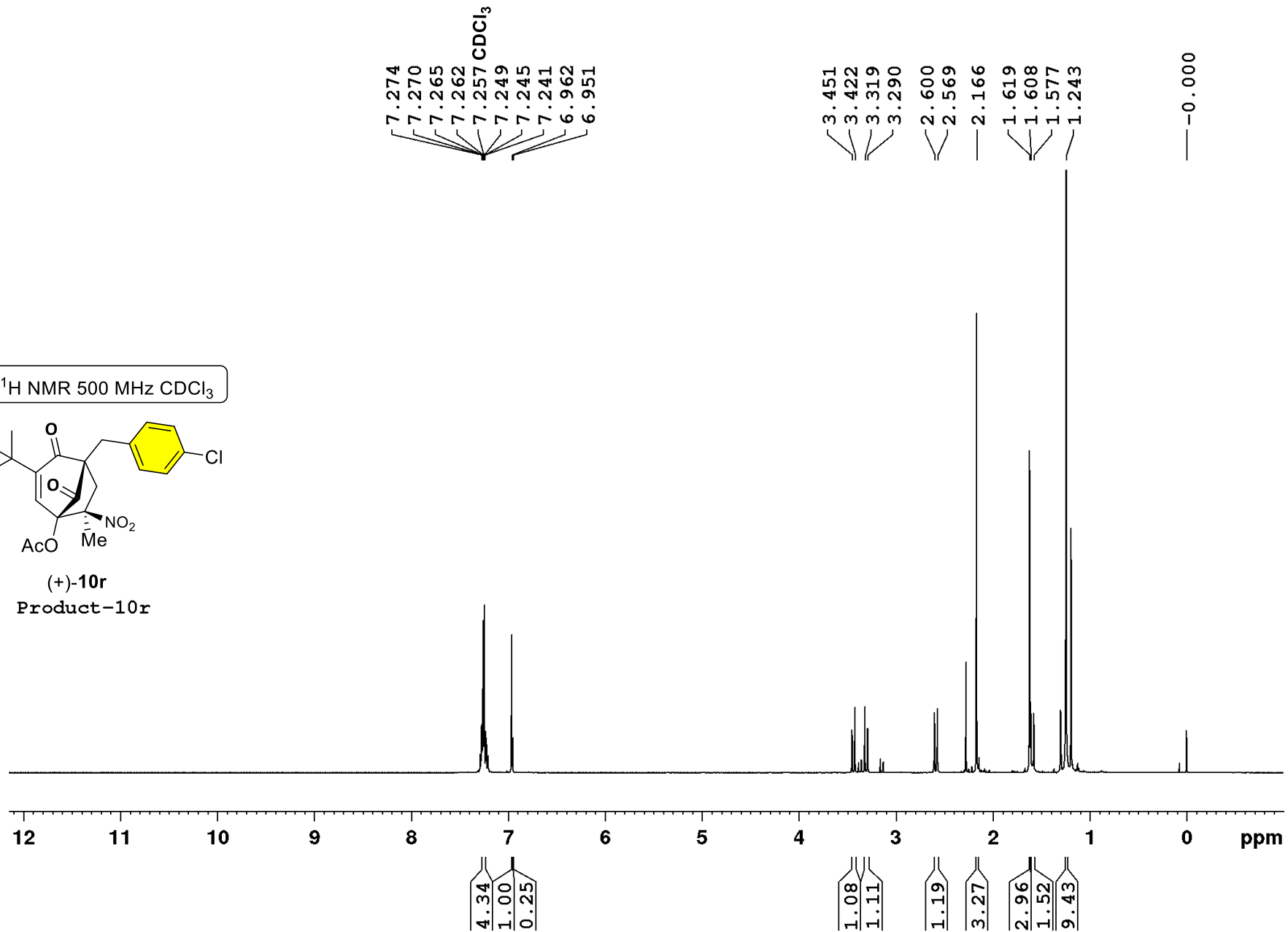
Product-10q



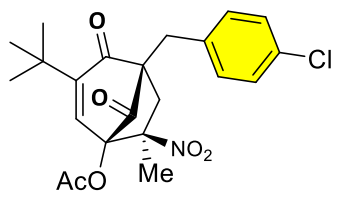
¹H NMR 500 MHz CDCl₃



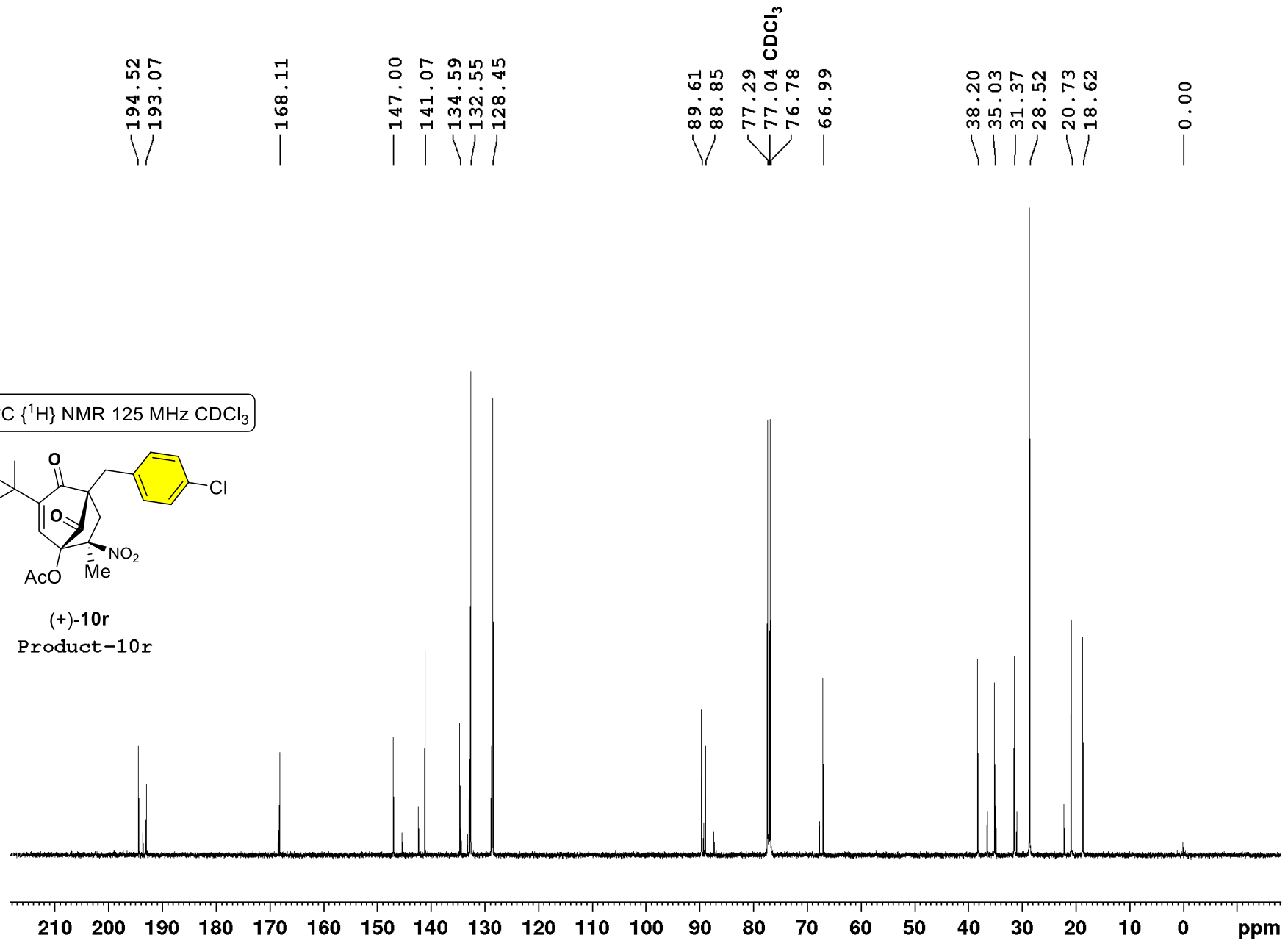
(+)-10r
Product-10r



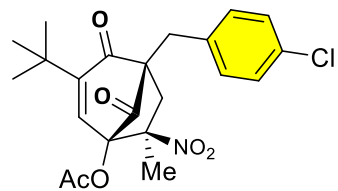
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



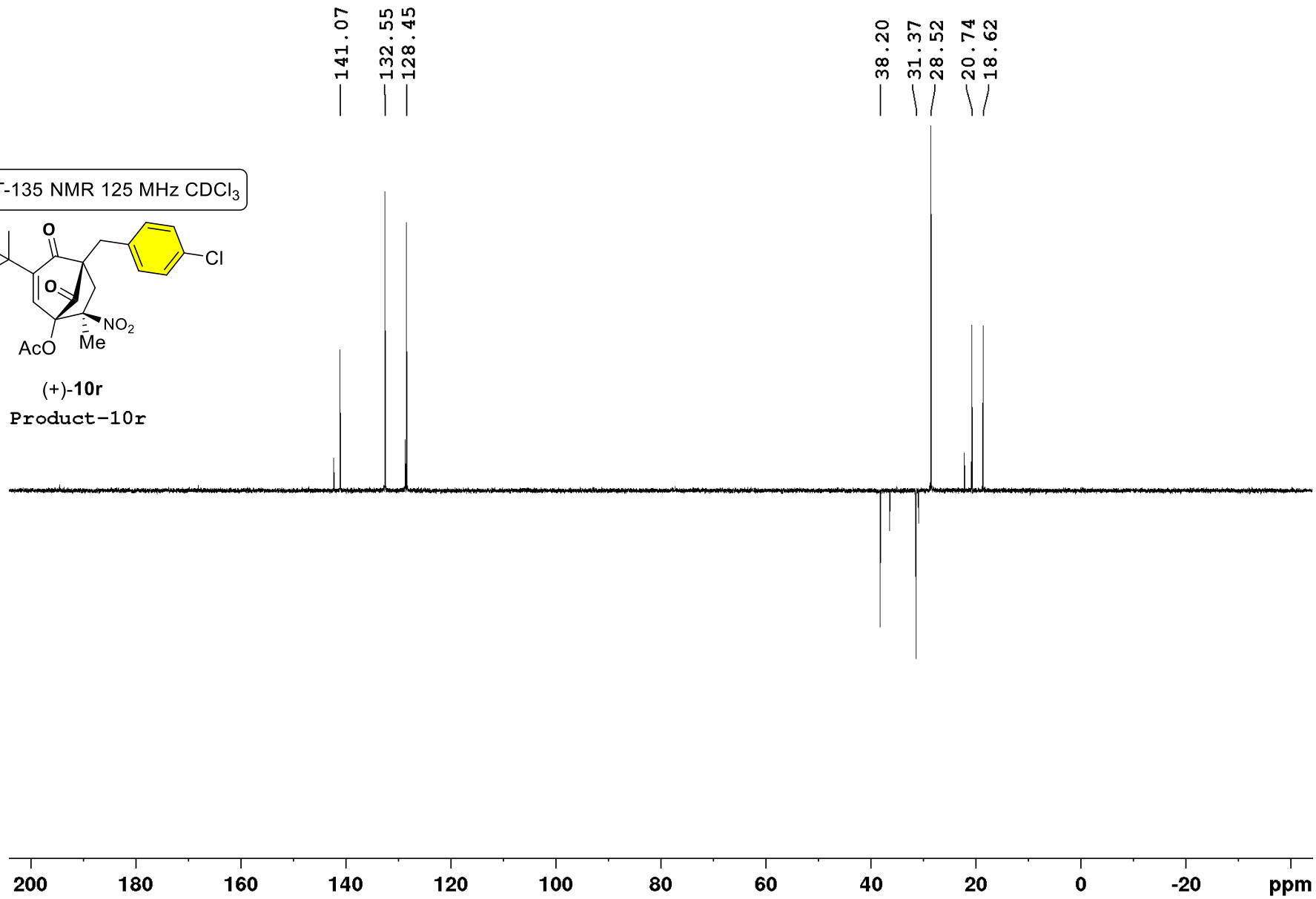
(+)-10r
Product-10r



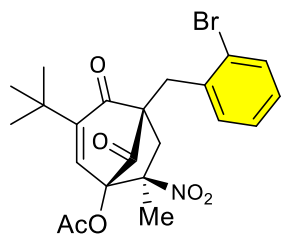
DEPT-135 NMR 125 MHz CDCl₃



(+)-10r
Product-10r

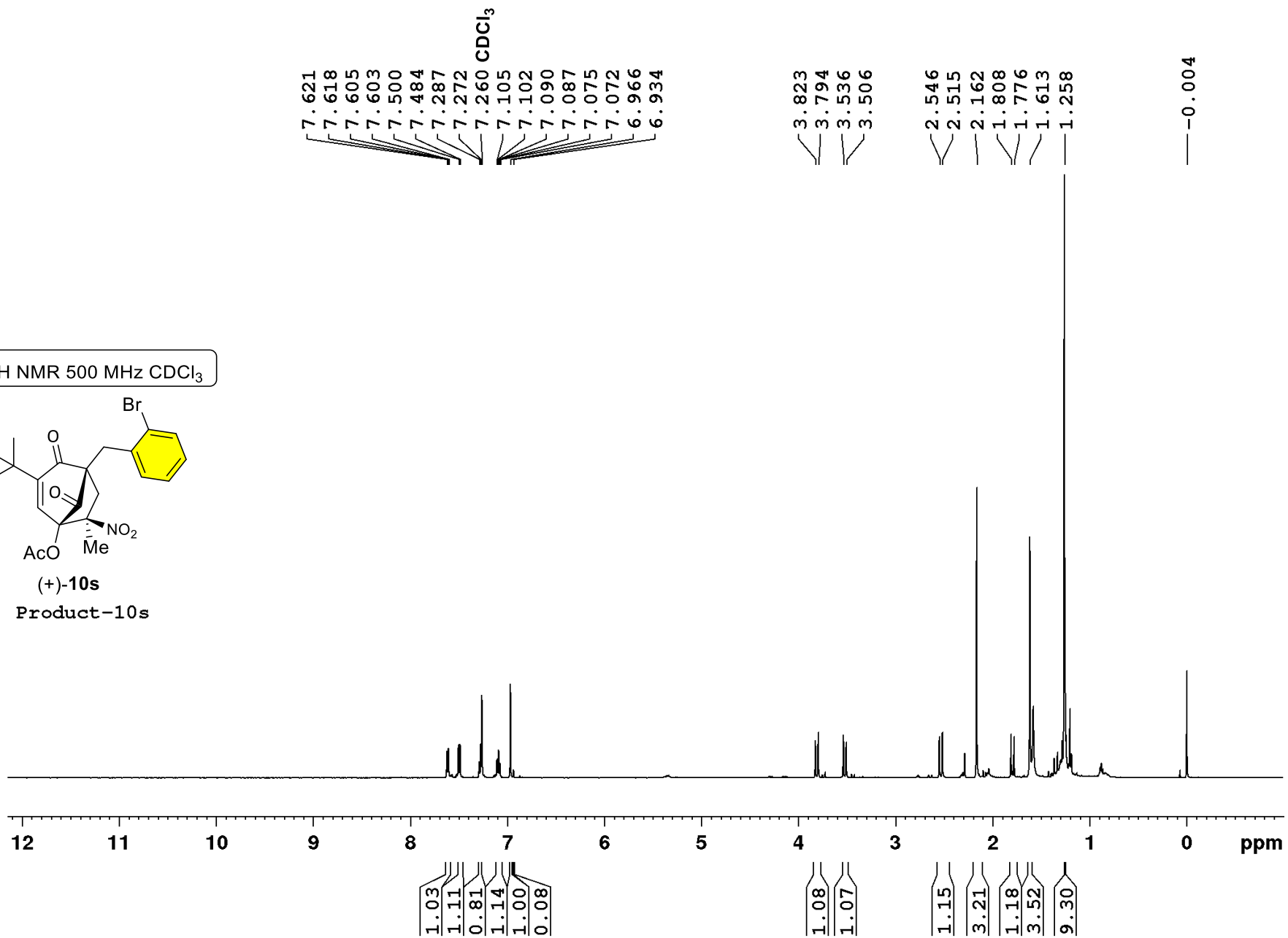


^1H NMR 500 MHz CDCl_3

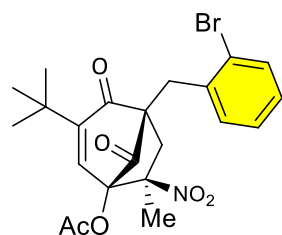


(+)-10s

Product-10s

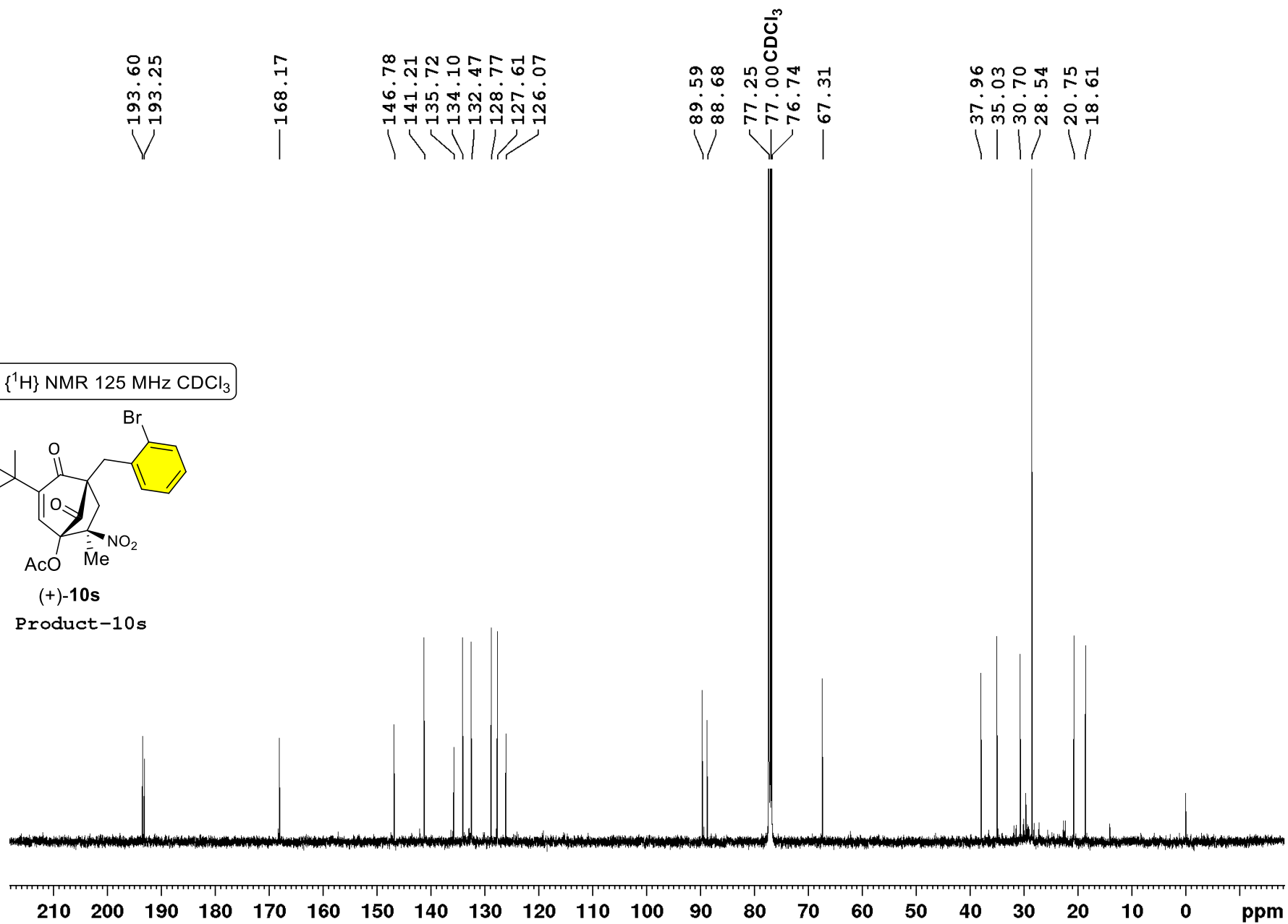


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3

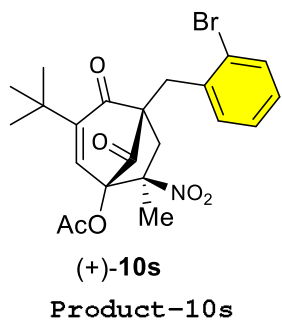


(+)-10s

Product-10s

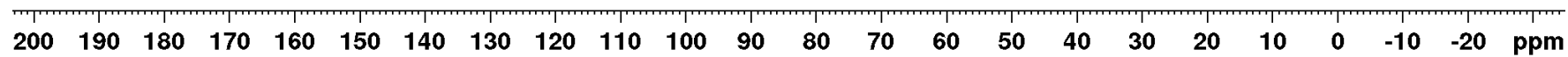


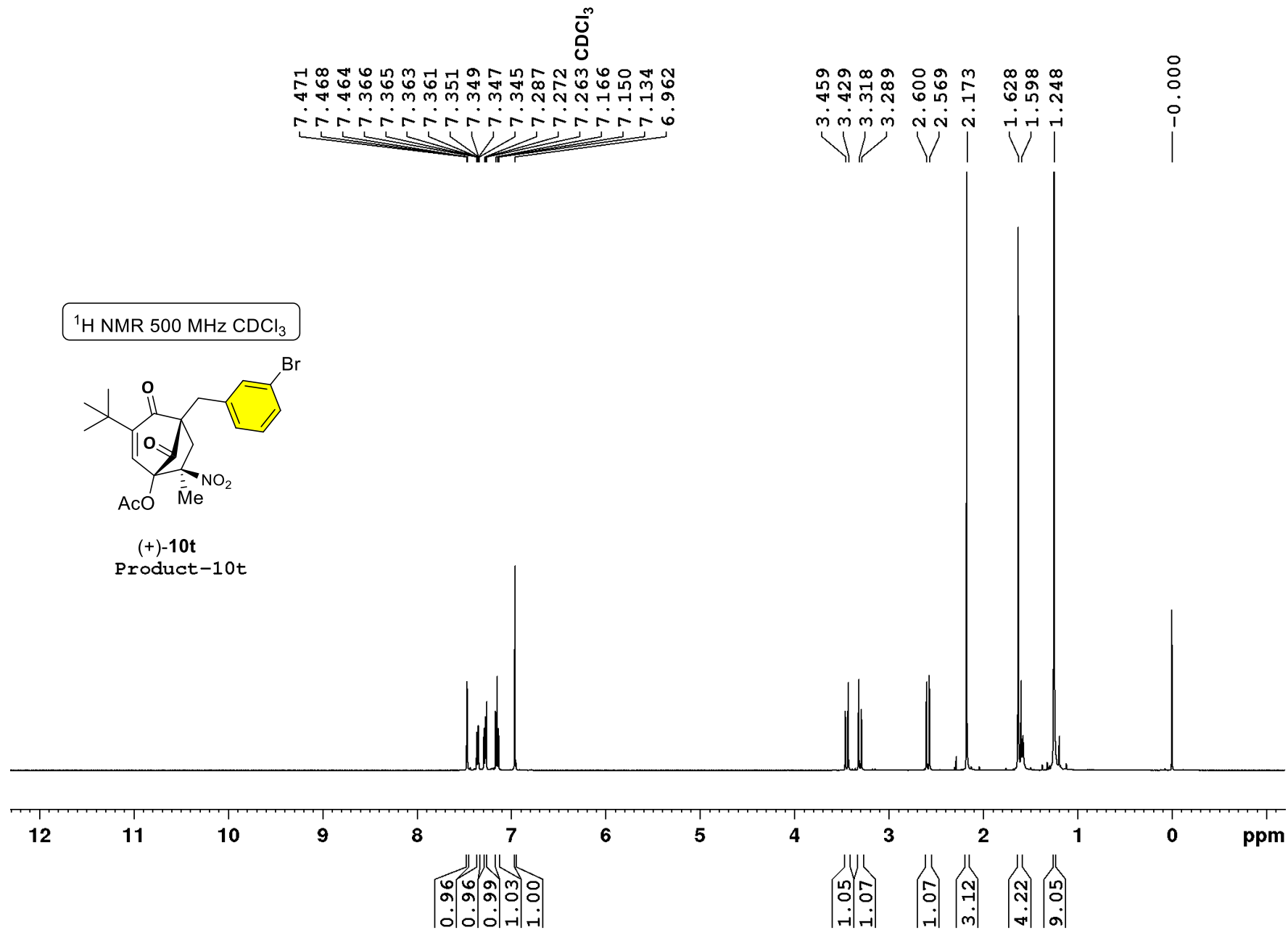
DEPT-135 NMR 125 MHz CDCl₃



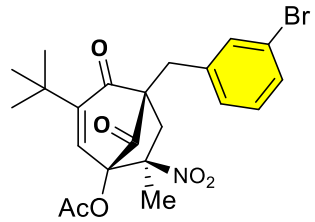
141.25
134.13
132.50
128.81
127.64

37.95
30.71
28.56
20.80
18.64

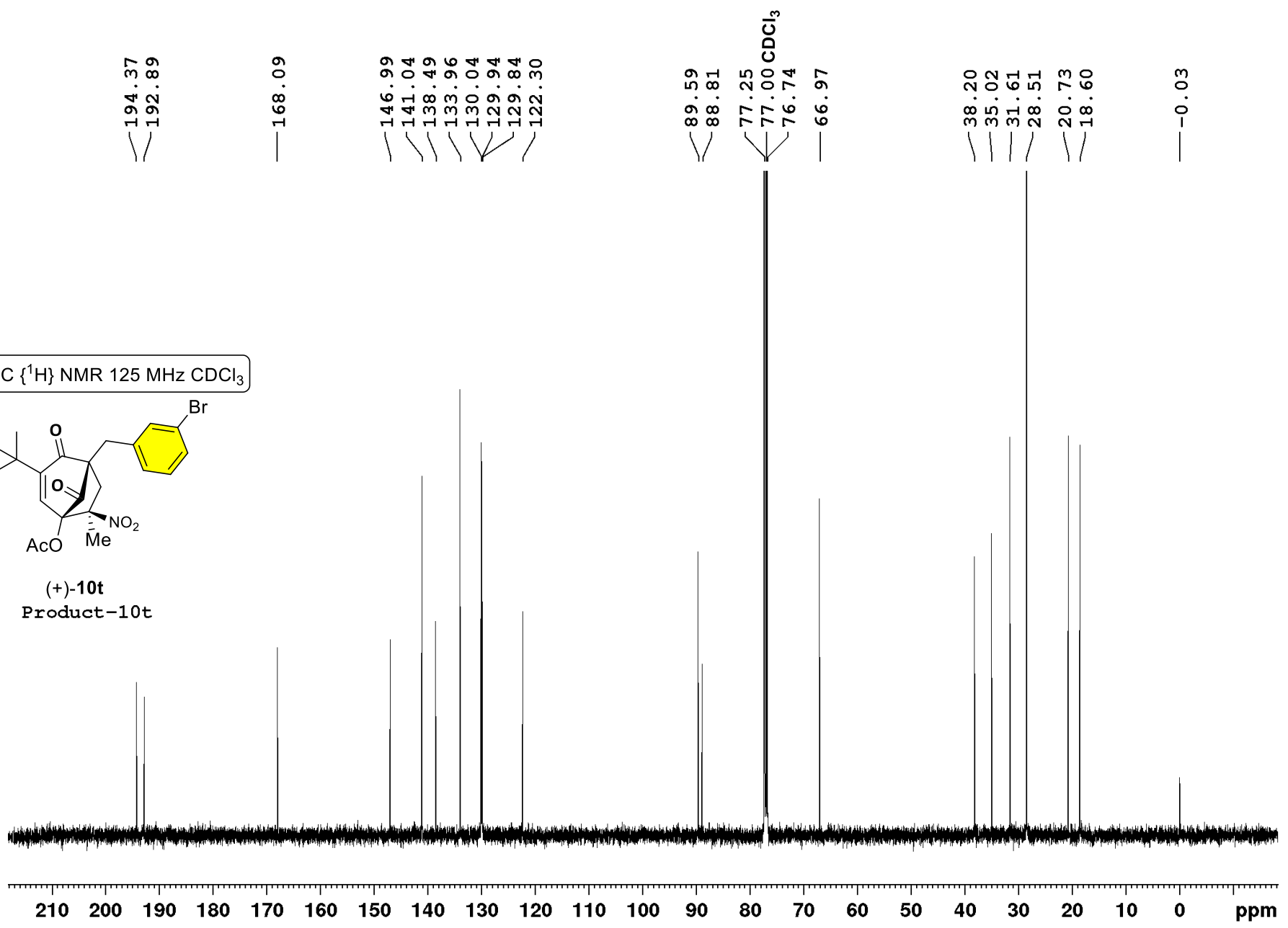




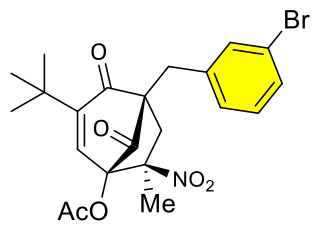
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-10t
Product-10t



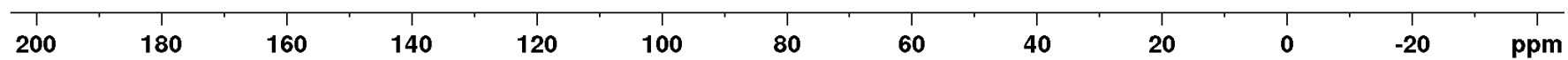
DEPT-135 NMR 125 MHz CDCl₃



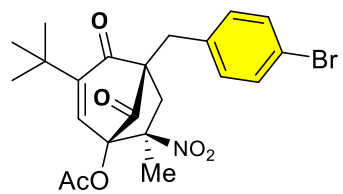
(+)-10t
Product-10t

141.05
133.96
130.04
129.94
129.84

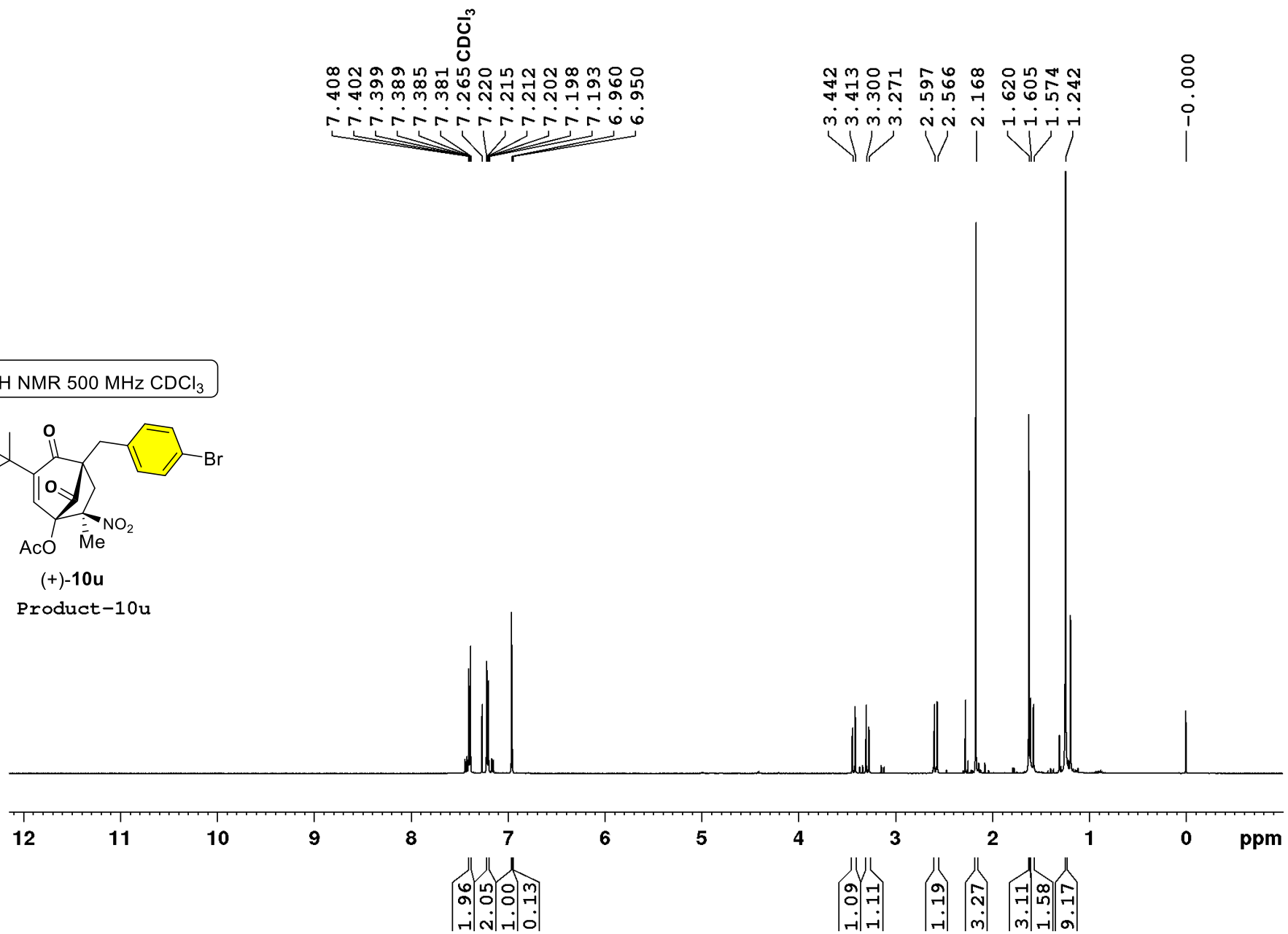
38.15
31.59
28.51
20.75
18.60



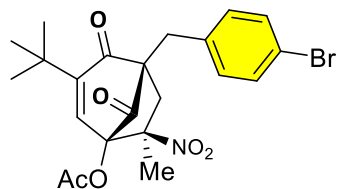
$^1\text{H NMR}$ 500 MHz CDCl_3



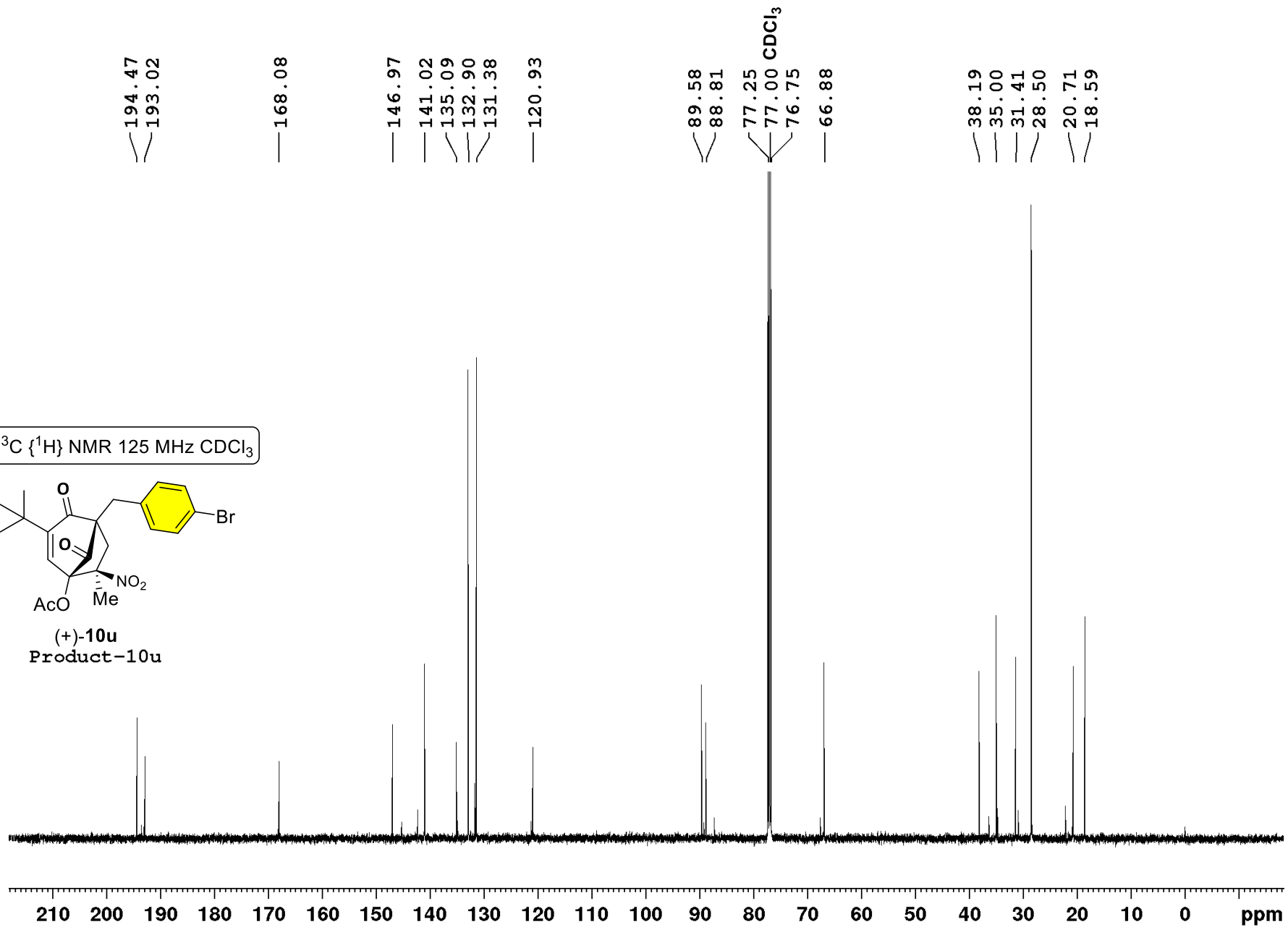
(+)-10u
Product-10u



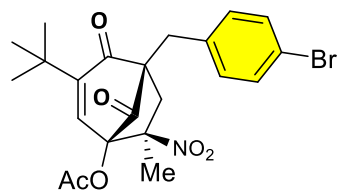
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



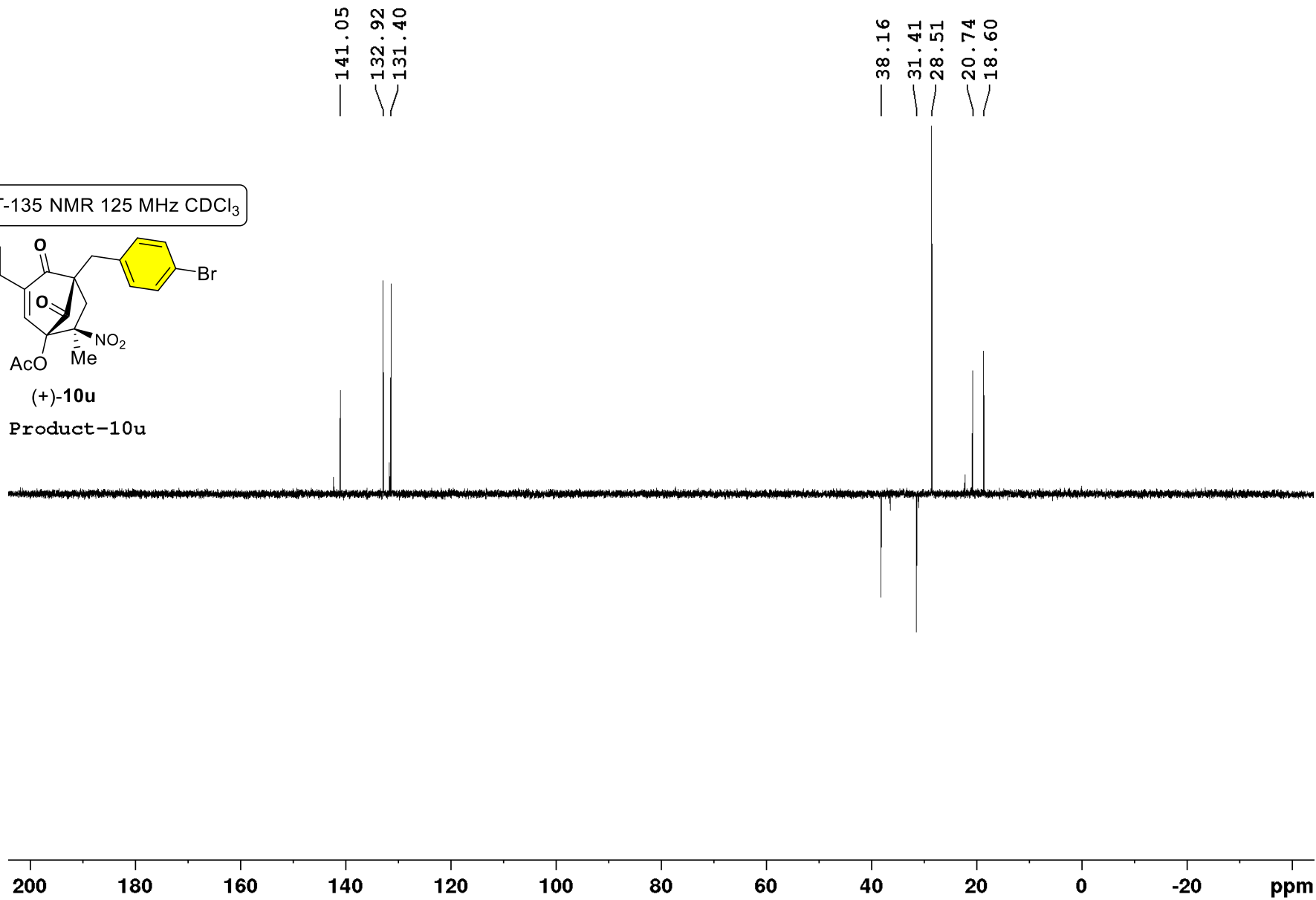
(+)-10u
Product-10u



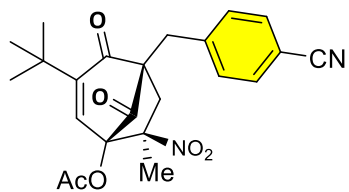
DEPT-135 NMR 125 MHz CDCl₃



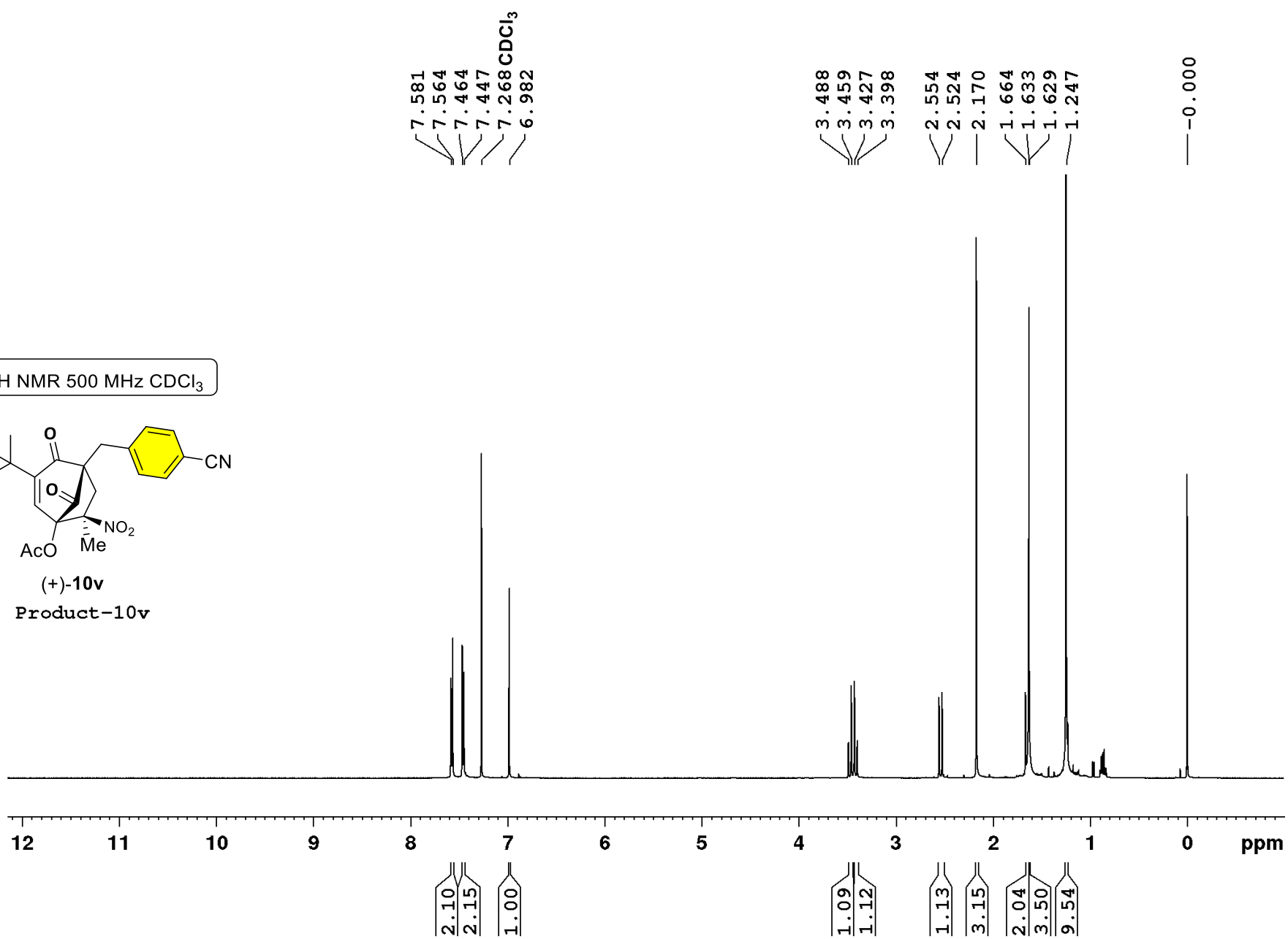
(+)-10u
Product-10u



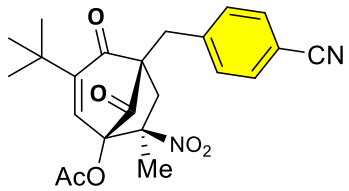
^1H NMR 500 MHz CDCl_3



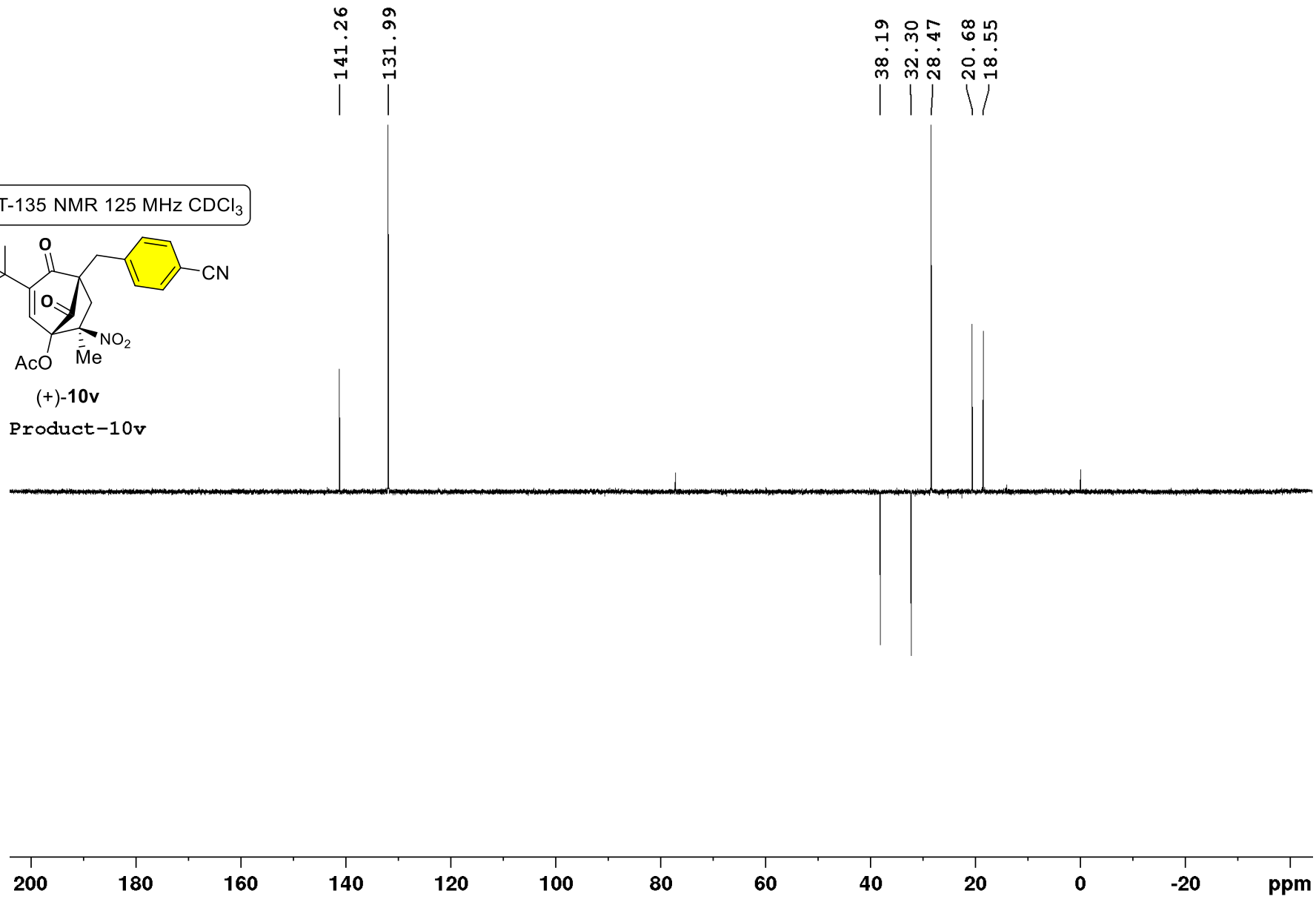
(+)-10v
Product-10v



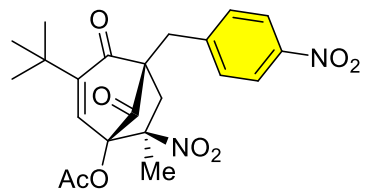
DEPT-135 NMR 125 MHz CDCl₃



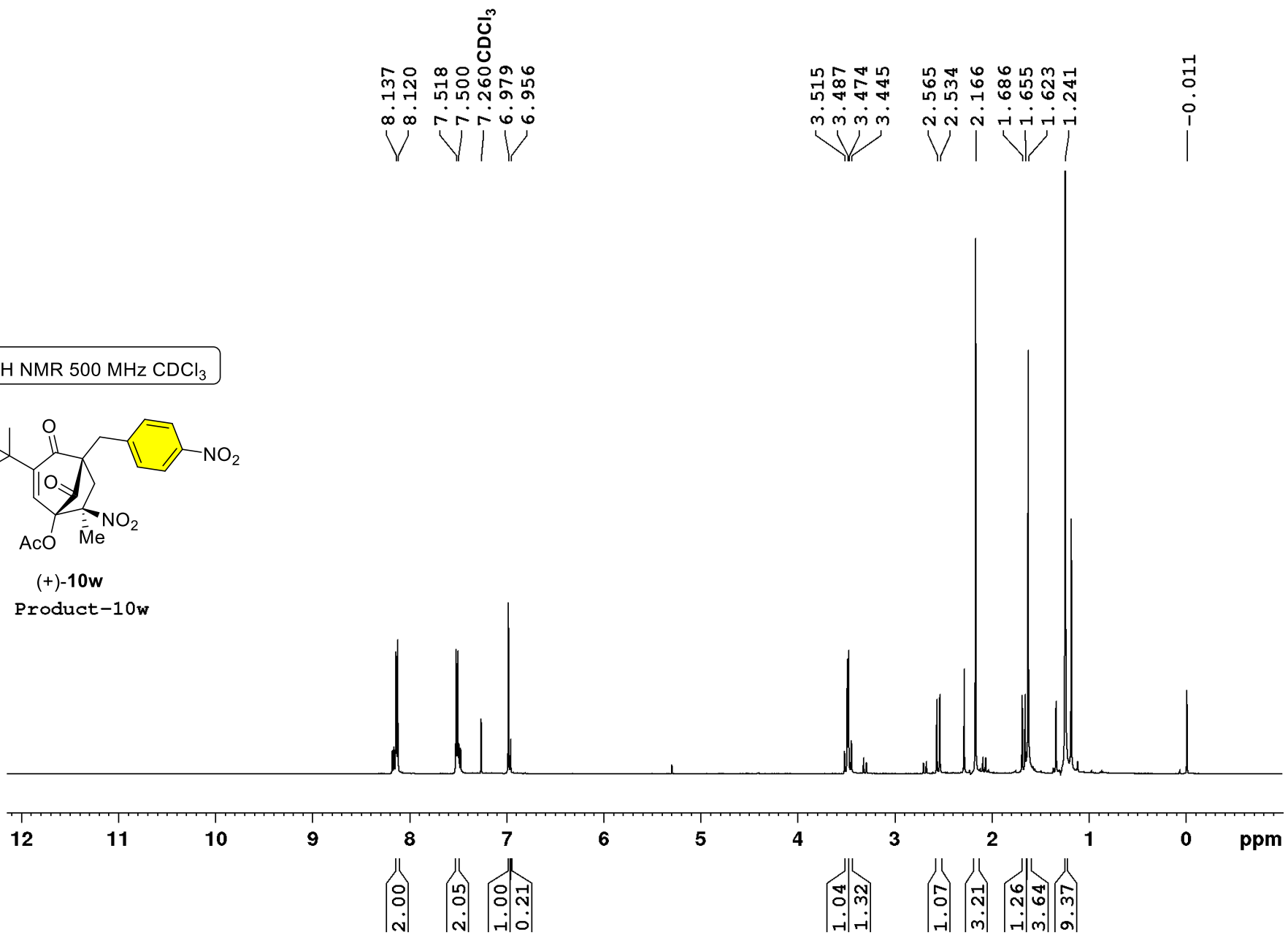
(+)-10v
Product-10v



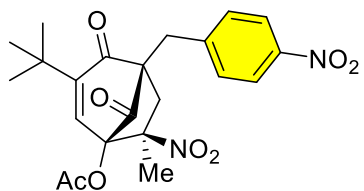
¹H NMR 500 MHz CDCl₃



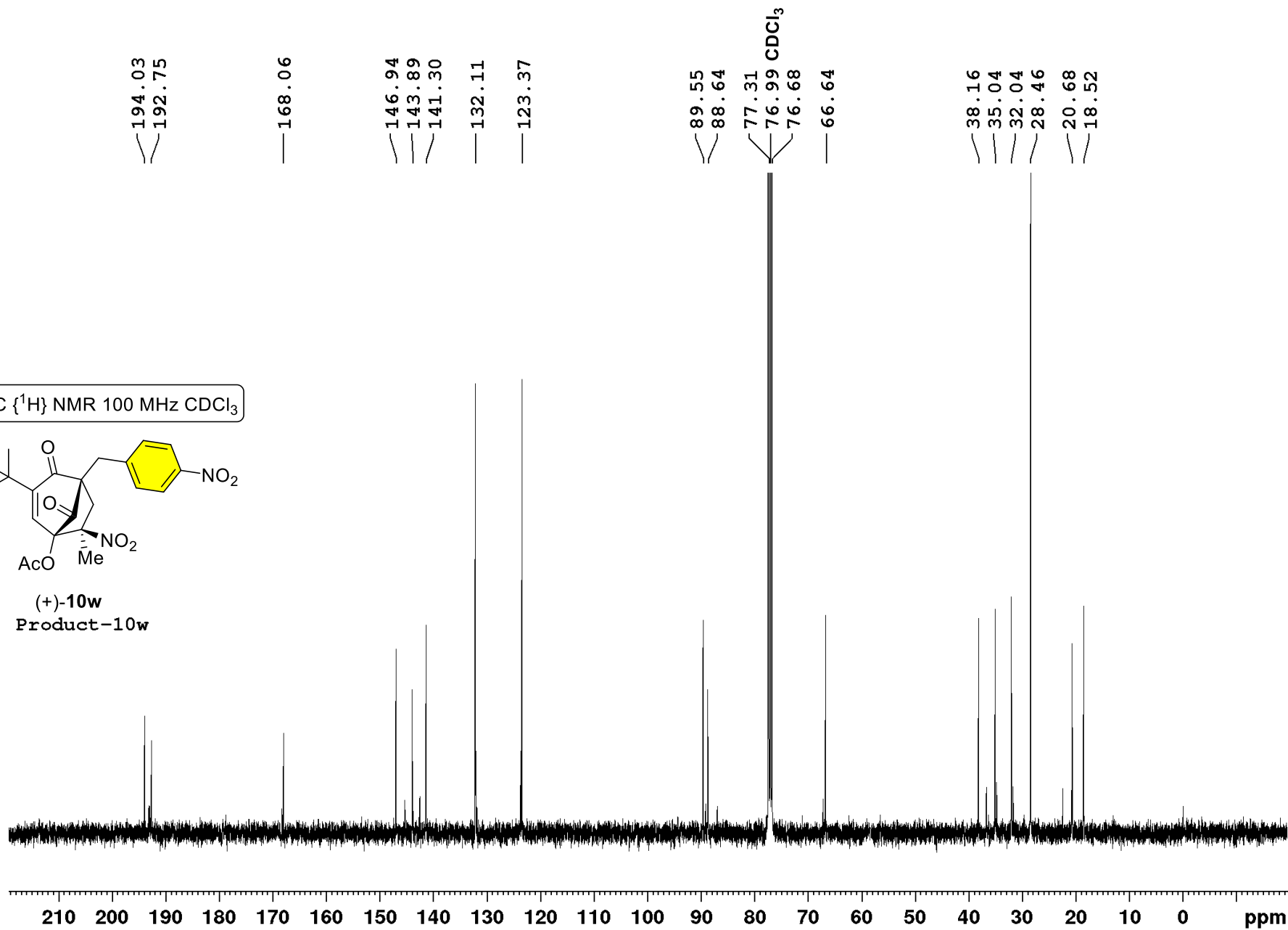
(+)-10w
Product-10w



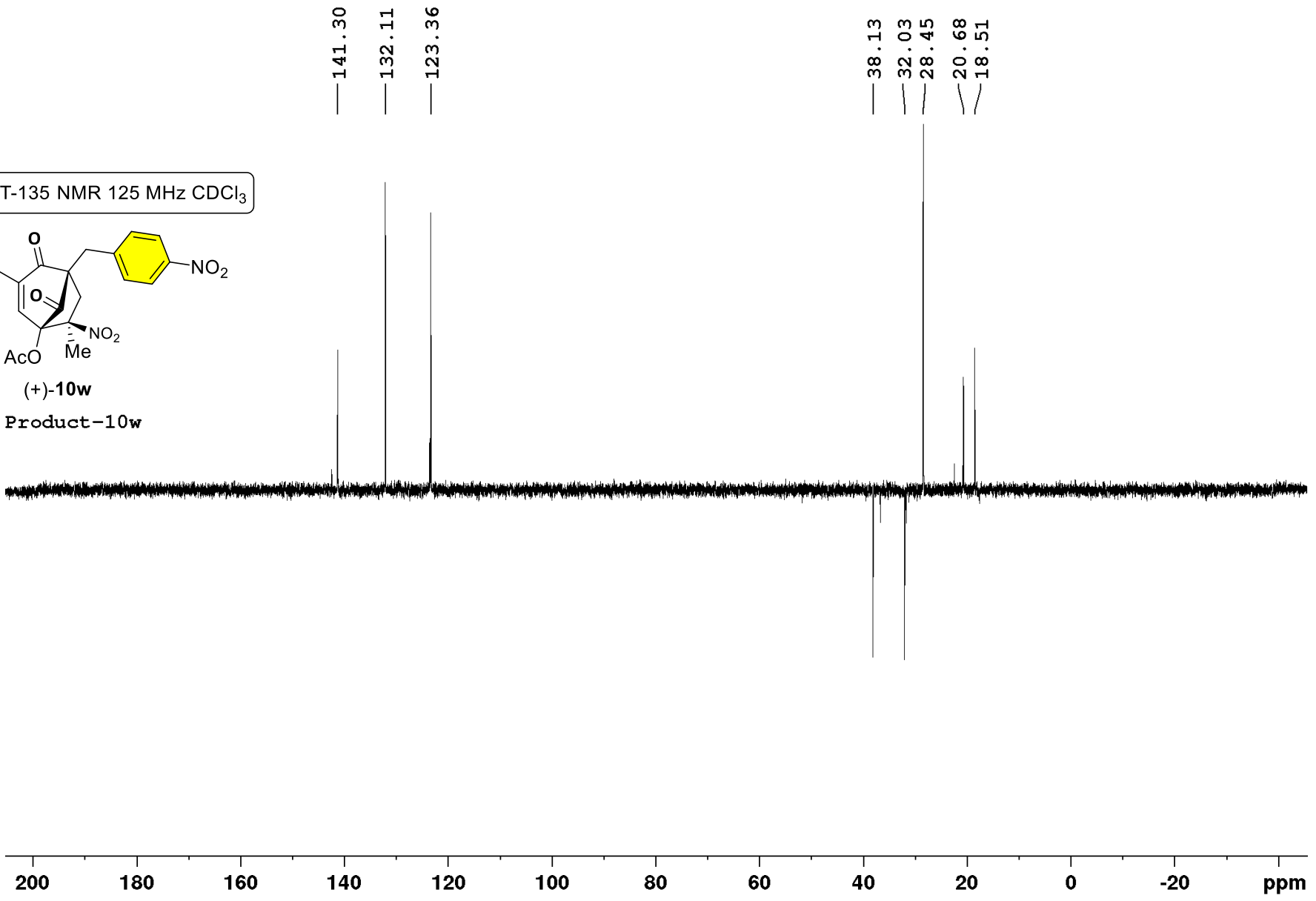
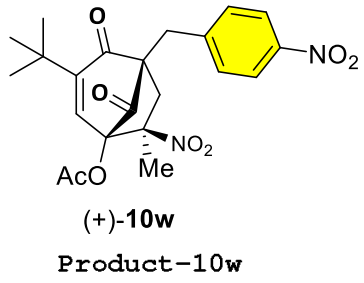
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



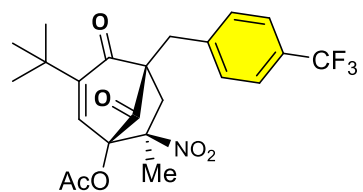
(+)-10w
Product-10w



DEPT-135 NMR 125 MHz CDCl₃

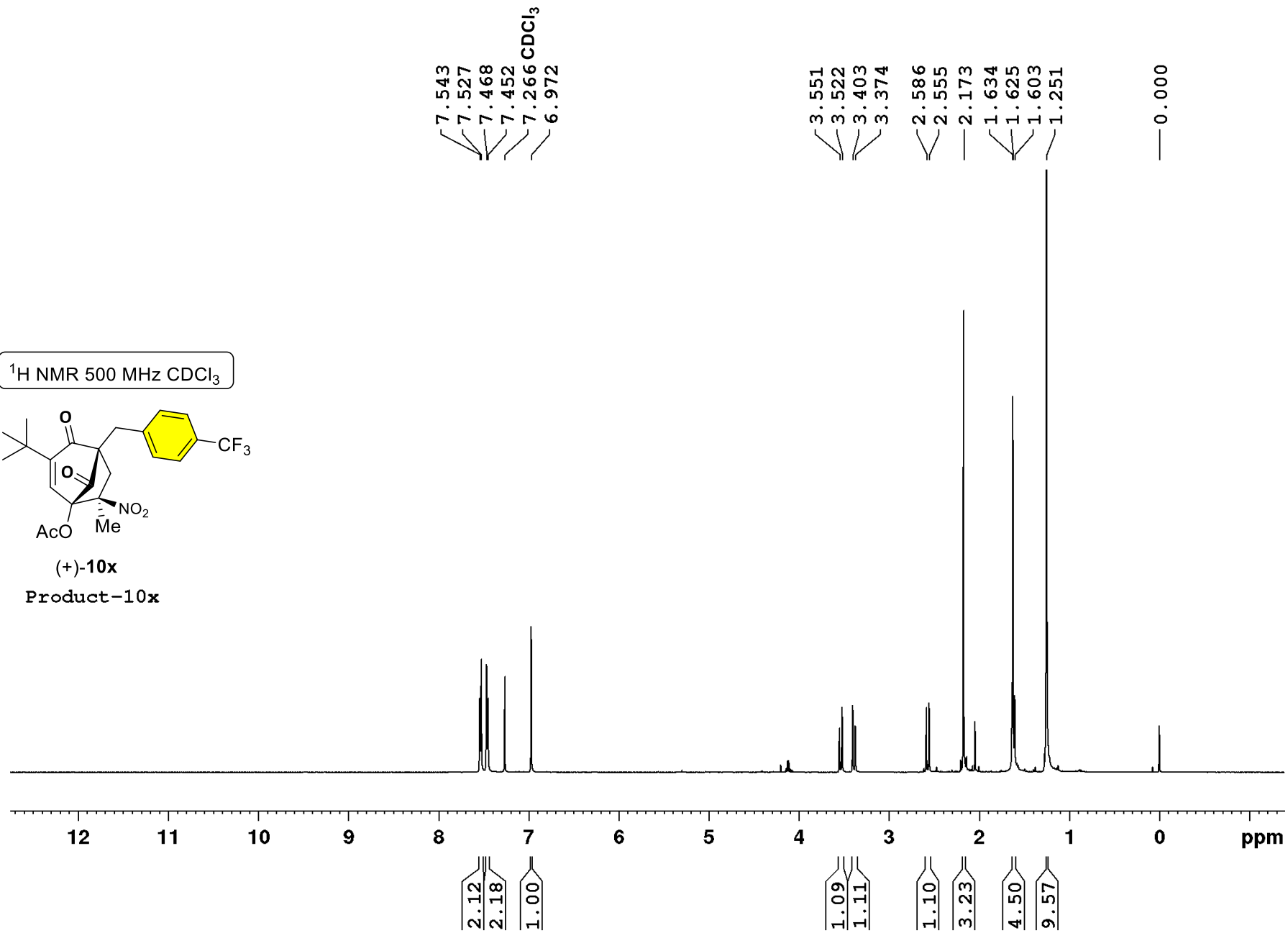


¹H NMR 500 MHz CDCl₃

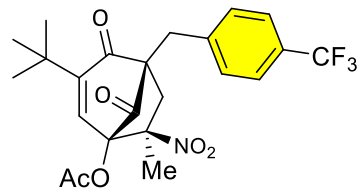


(+)-10x

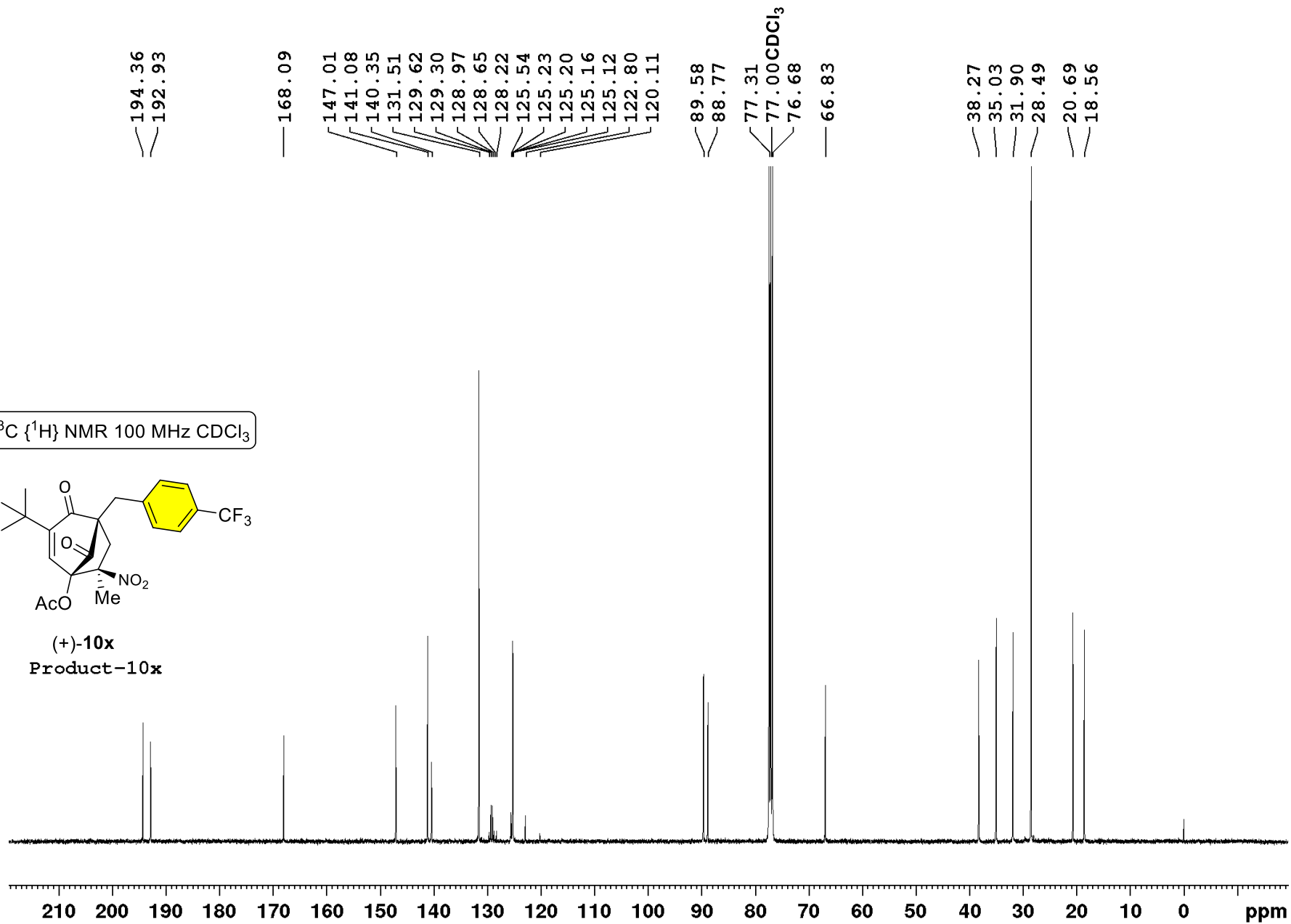
Product-10x



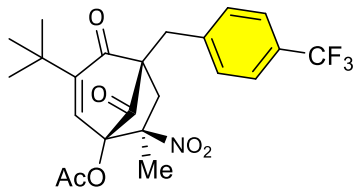
$^{13}\text{C} \{^1\text{H}\}$ NMR 100 MHz CDCl_3



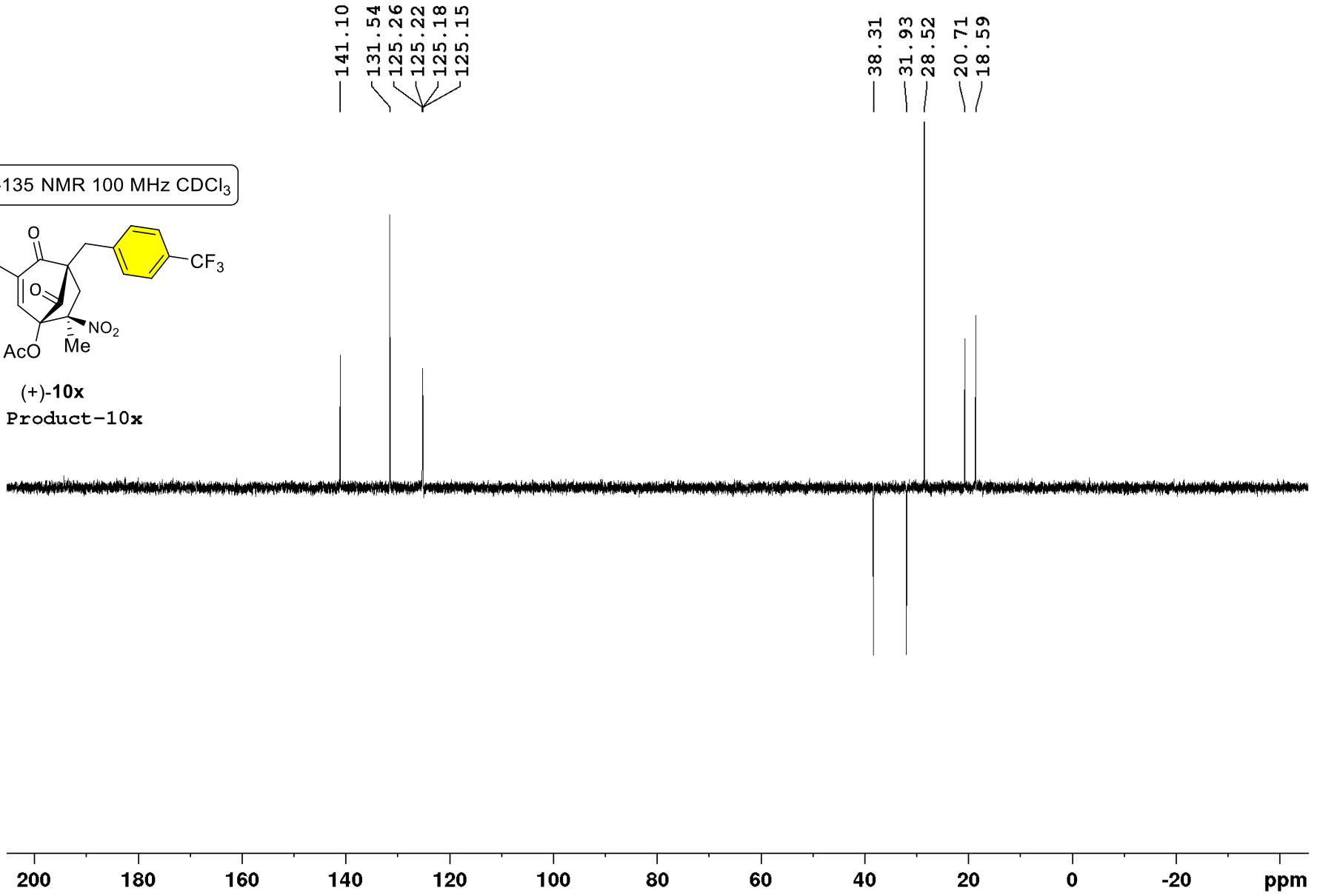
(+)-10x
Product-10x



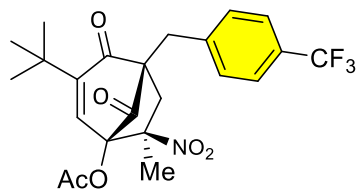
DEPT-135 NMR 100 MHz CDCl₃



(+)-10x
Product-10x



^{19}F NMR 375 MHz CDCl_3

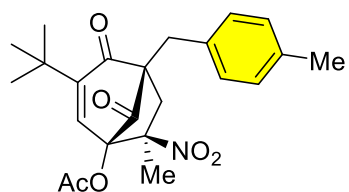


(+)-10x
Product-10x

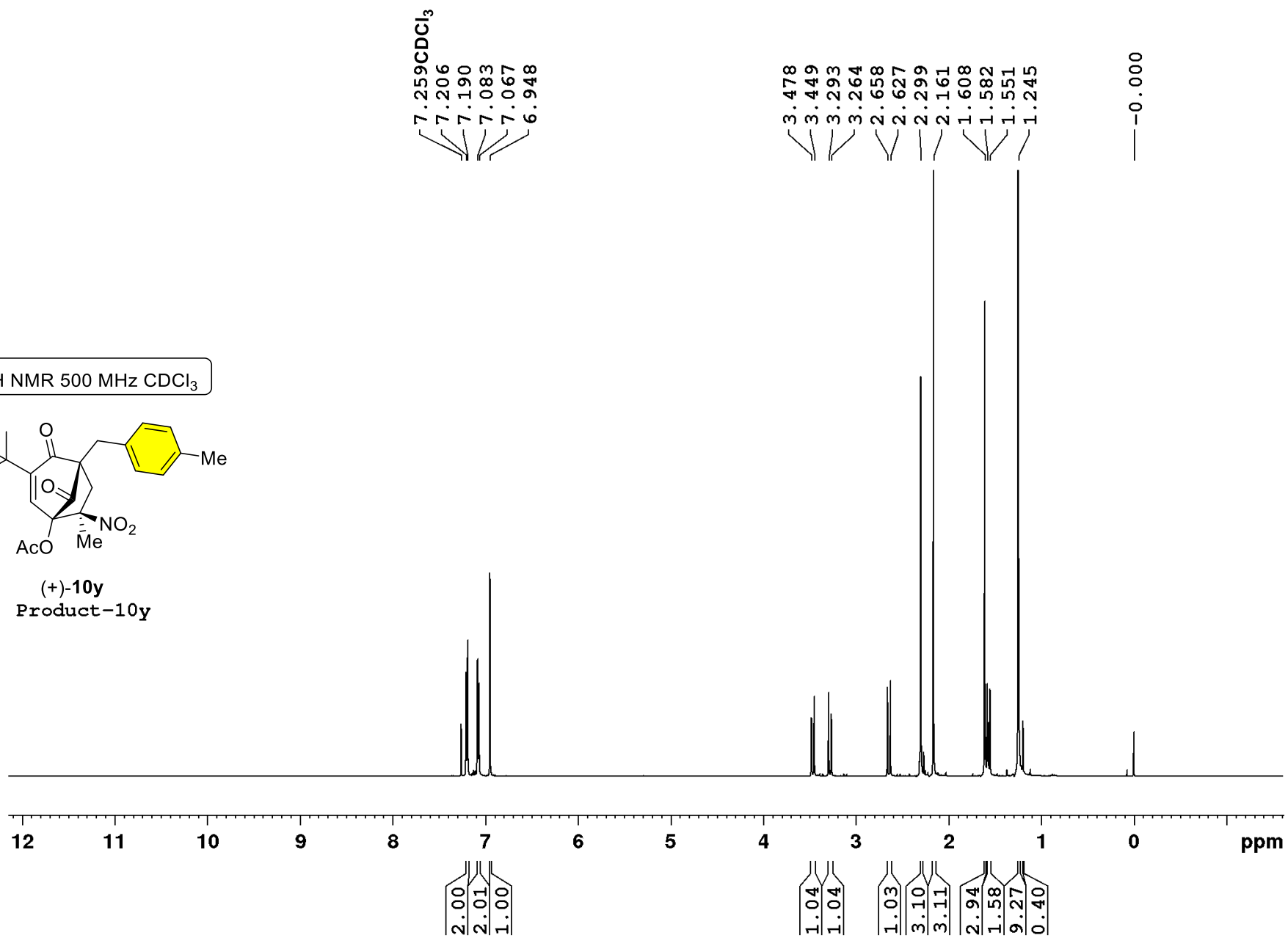
-62.46

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

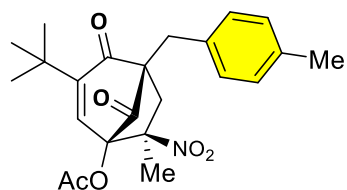
¹H NMR 500 MHz CDCl₃



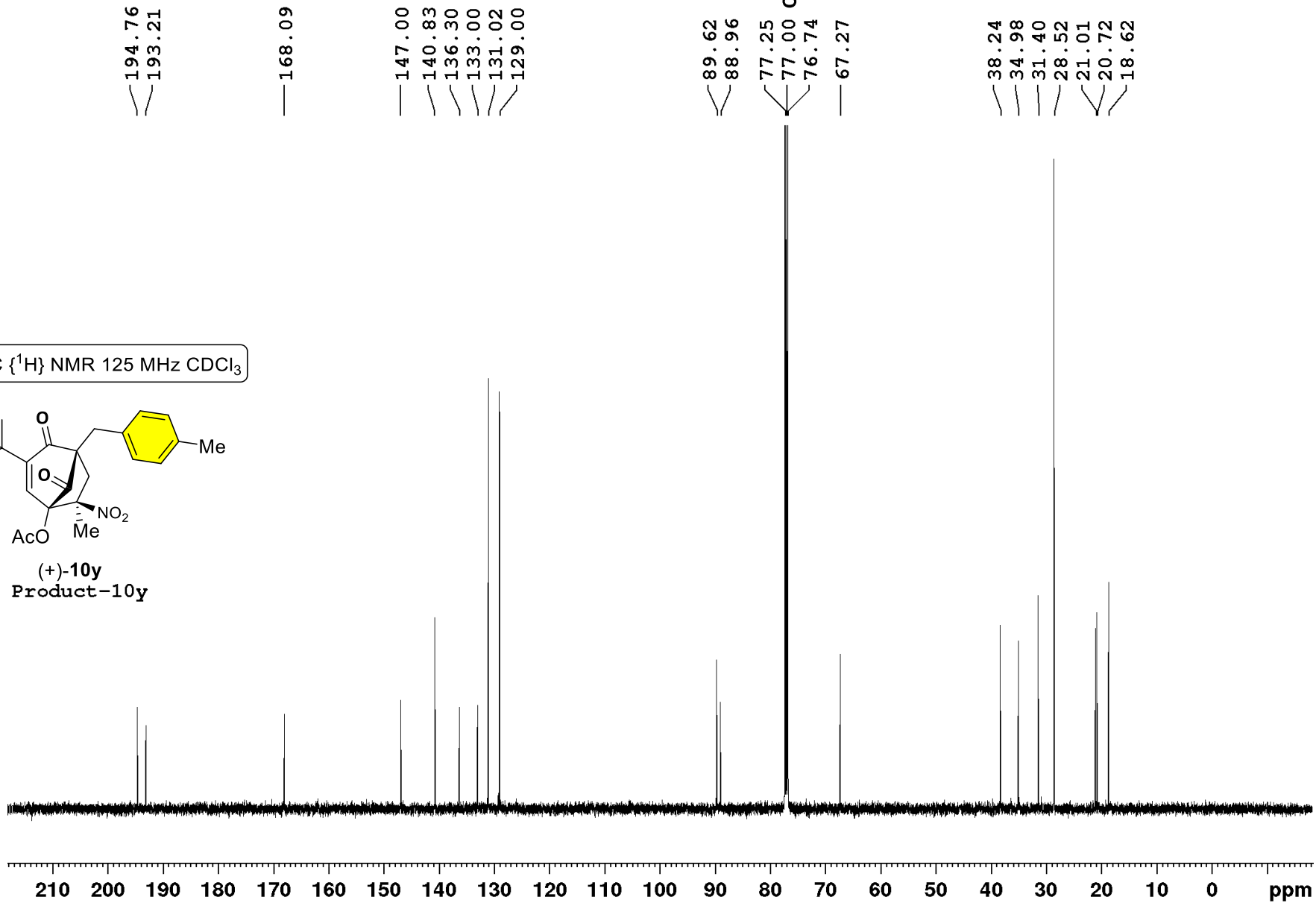
(+)-10y
Product-10y



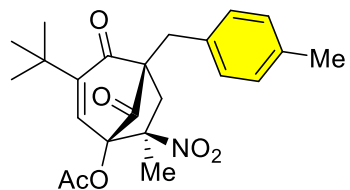
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



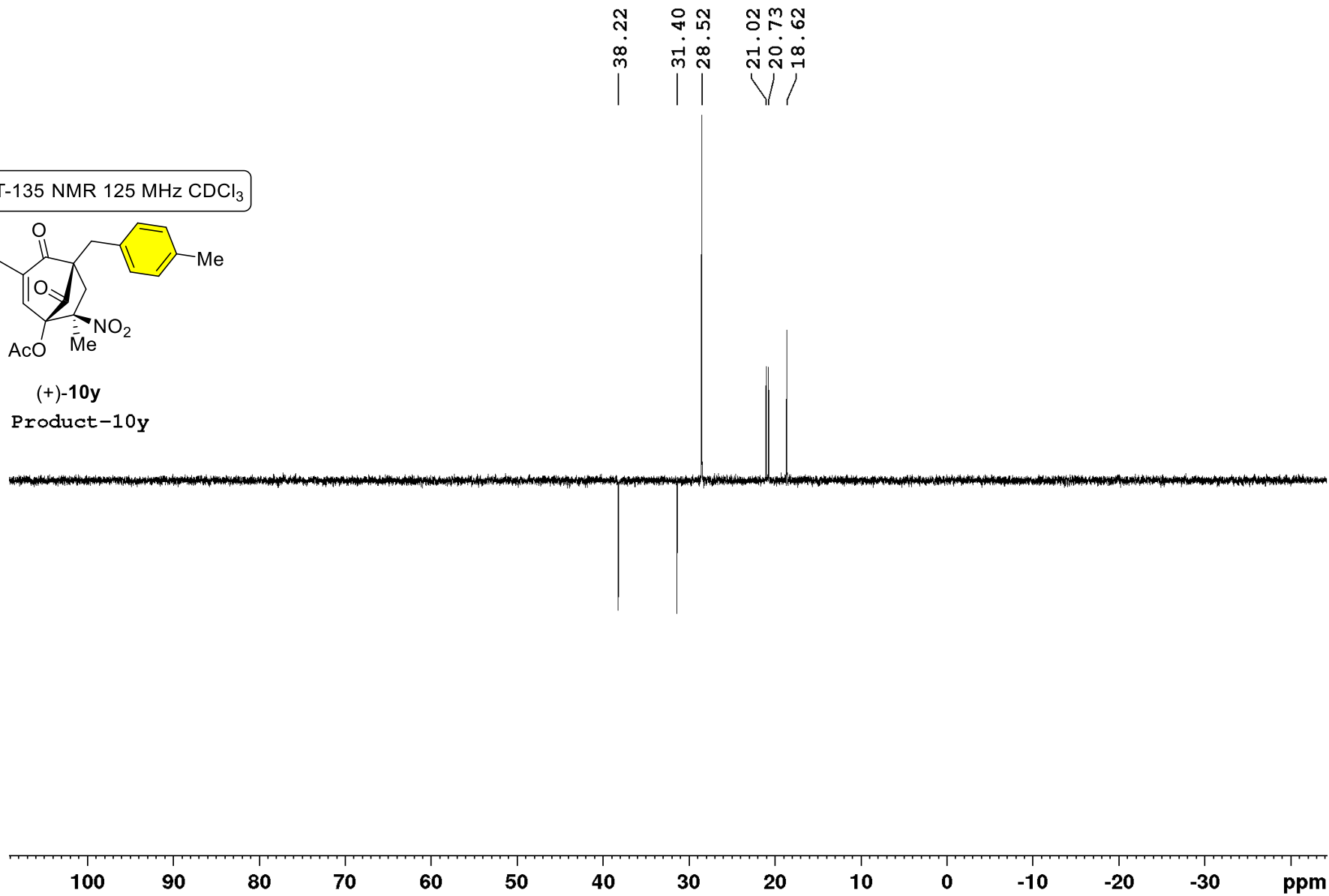
(+)-10y
Product-10y



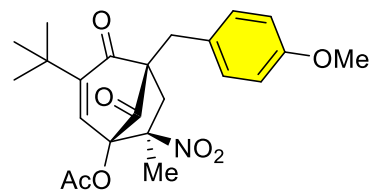
DEPT-135 NMR 125 MHz CDCl₃



(+)-10y
Product-10y

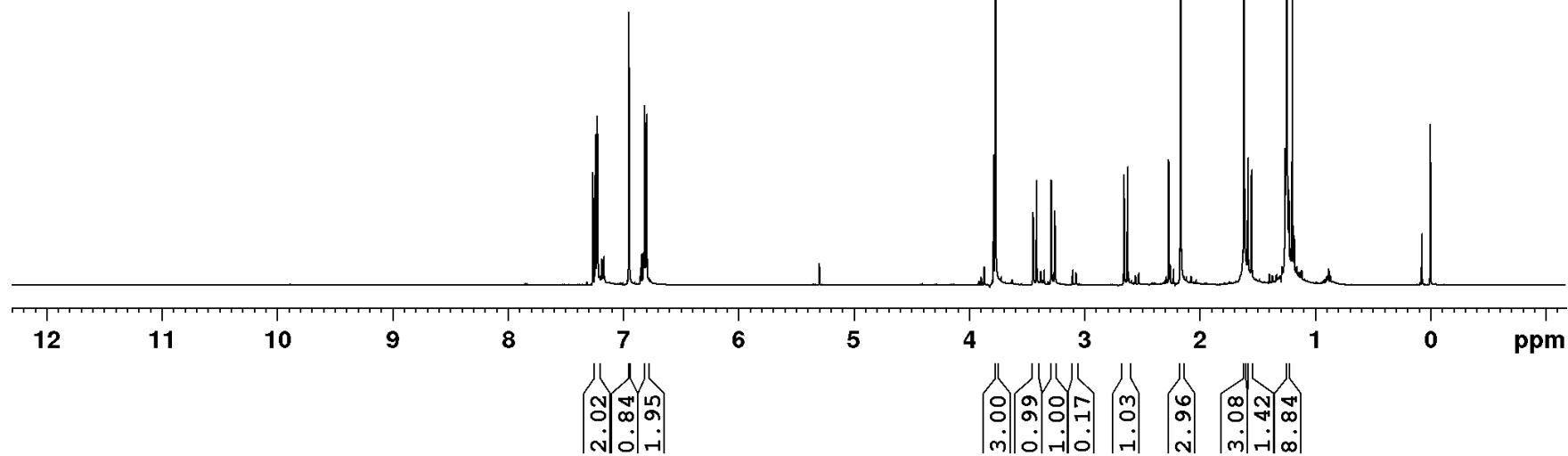


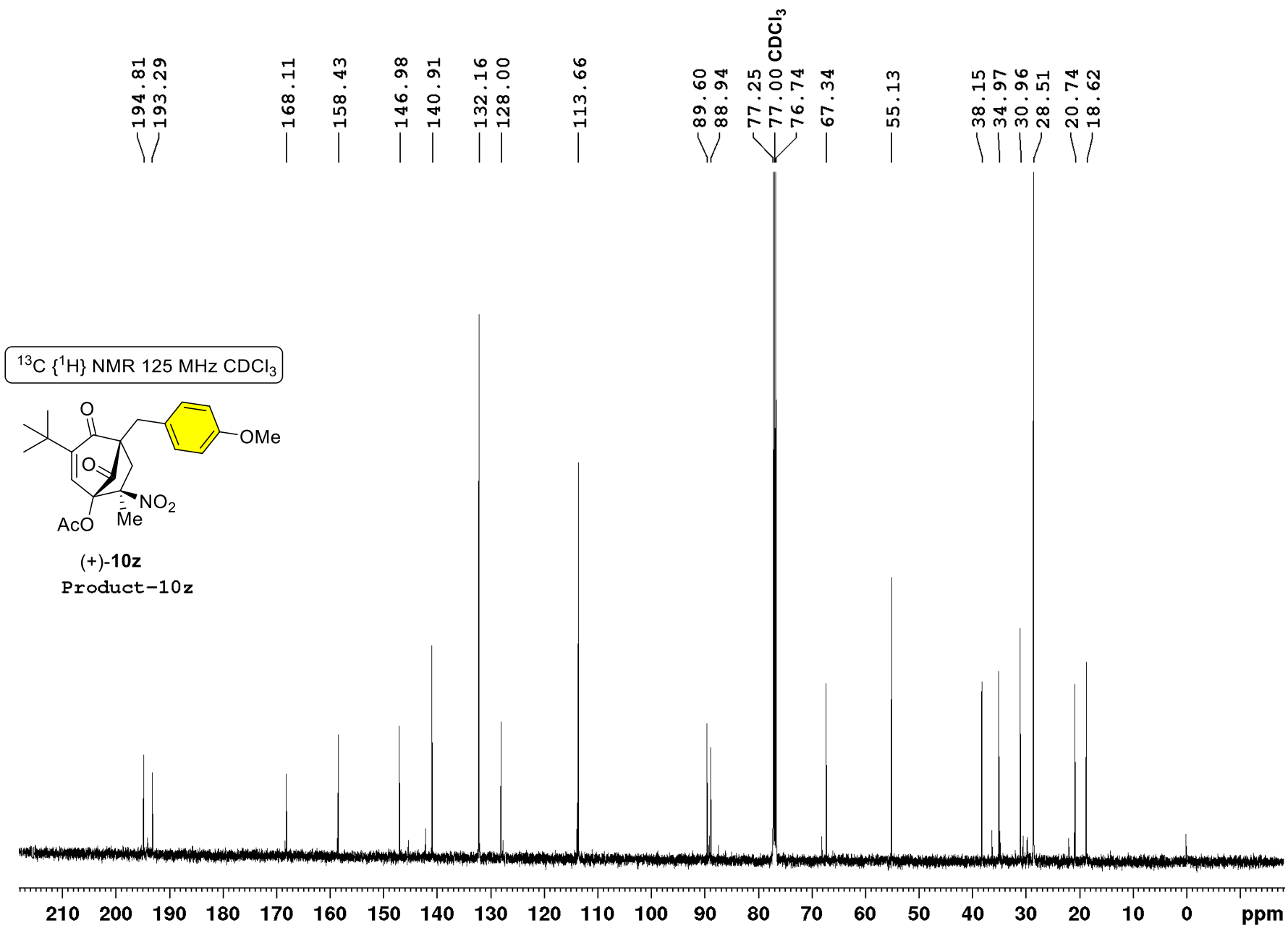
¹H NMR 500 MHz CDCl₃



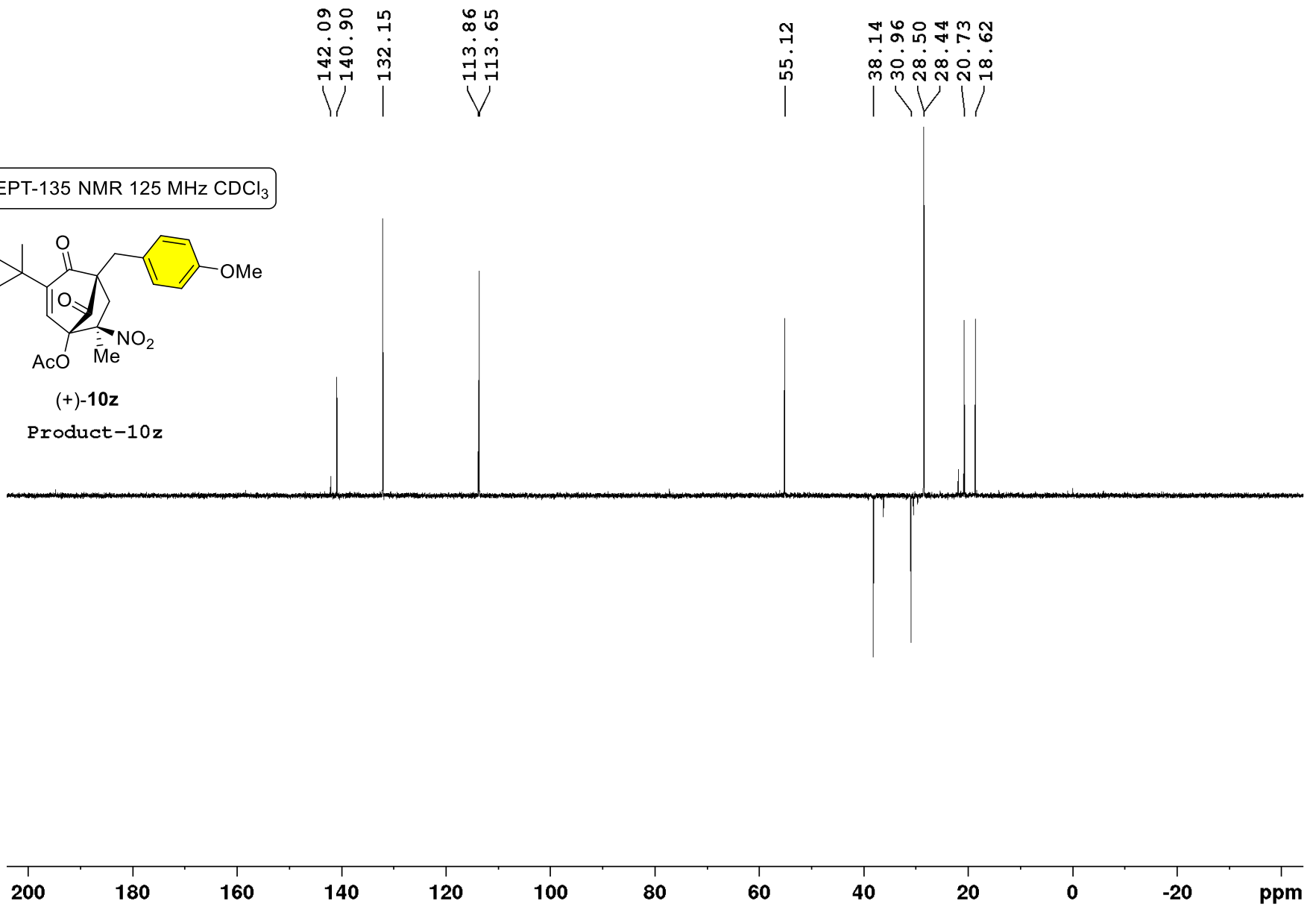
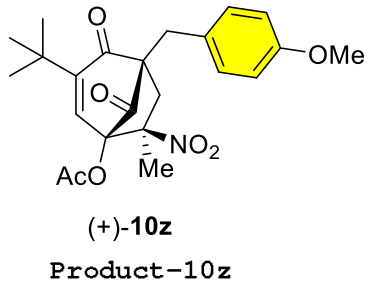
(+)-10z

Product-10z

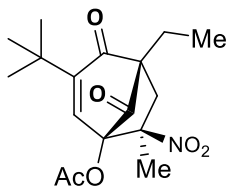




DEPT-135 NMR 125 MHz CDCl₃

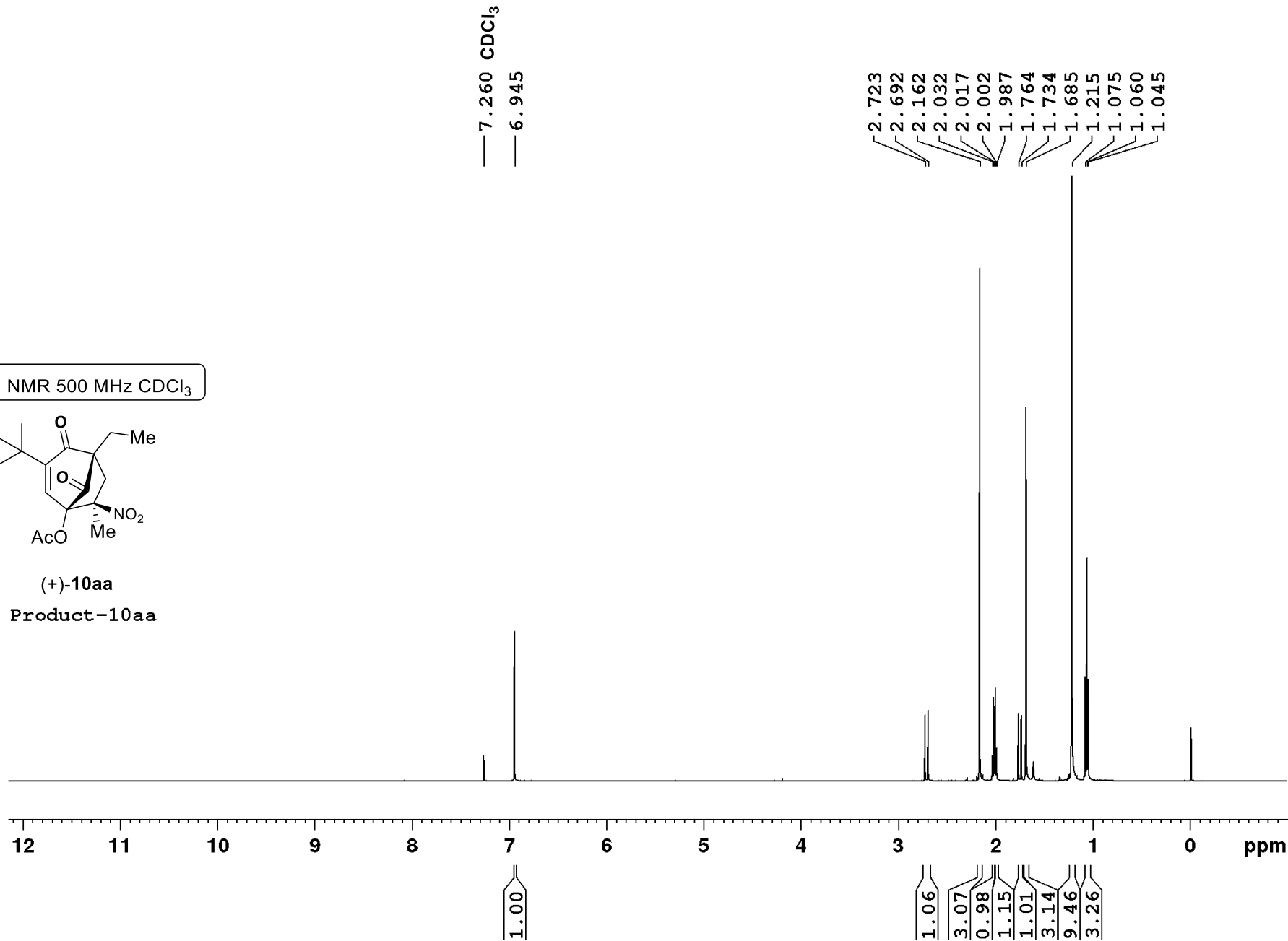


¹H NMR 500 MHz CDCl₃

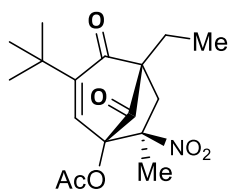


(+)-10aa

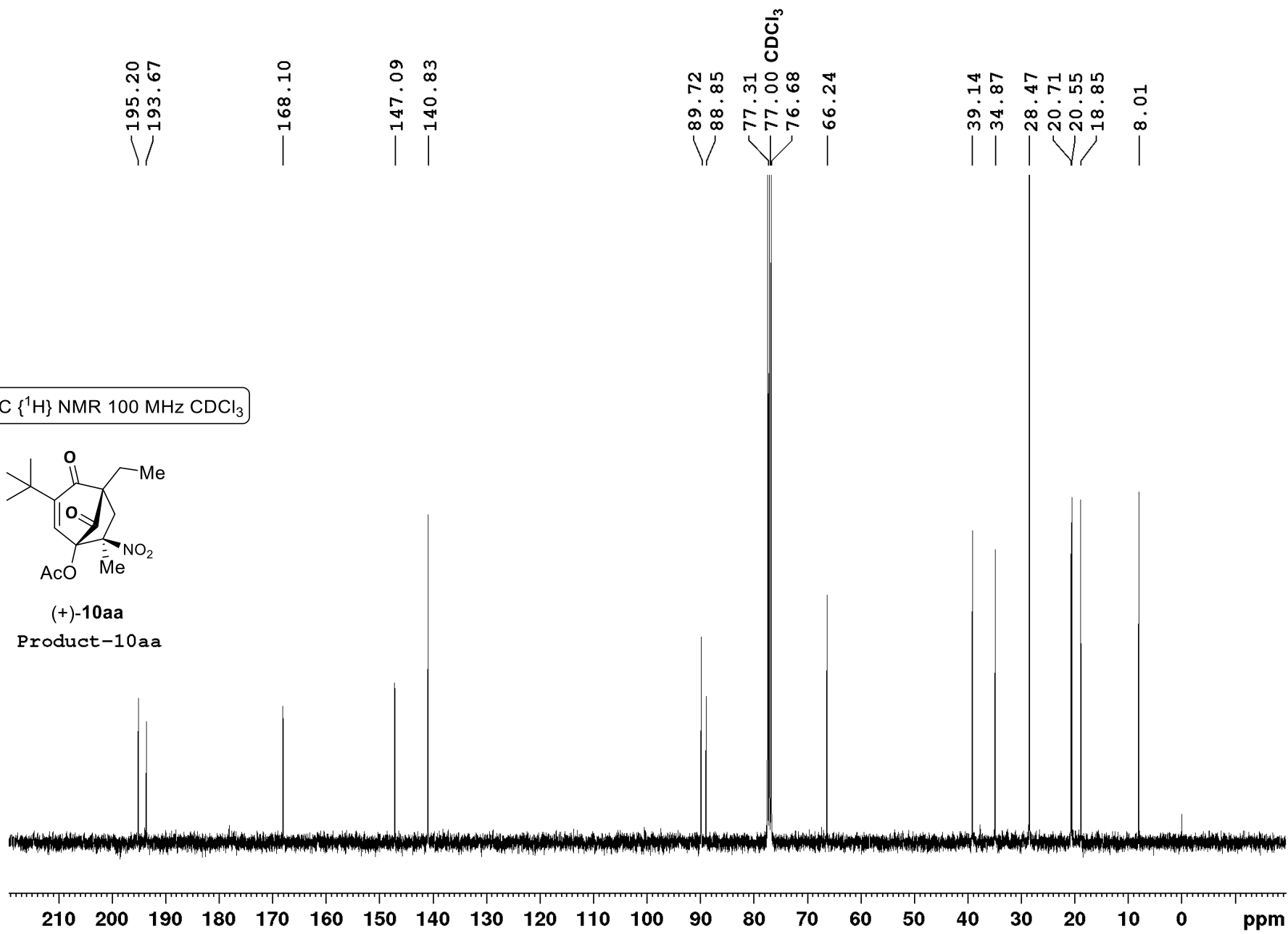
Product-10aa



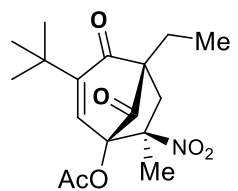
^{13}C $\{^1\text{H}\}$ NMR 100 MHz CDCl_3



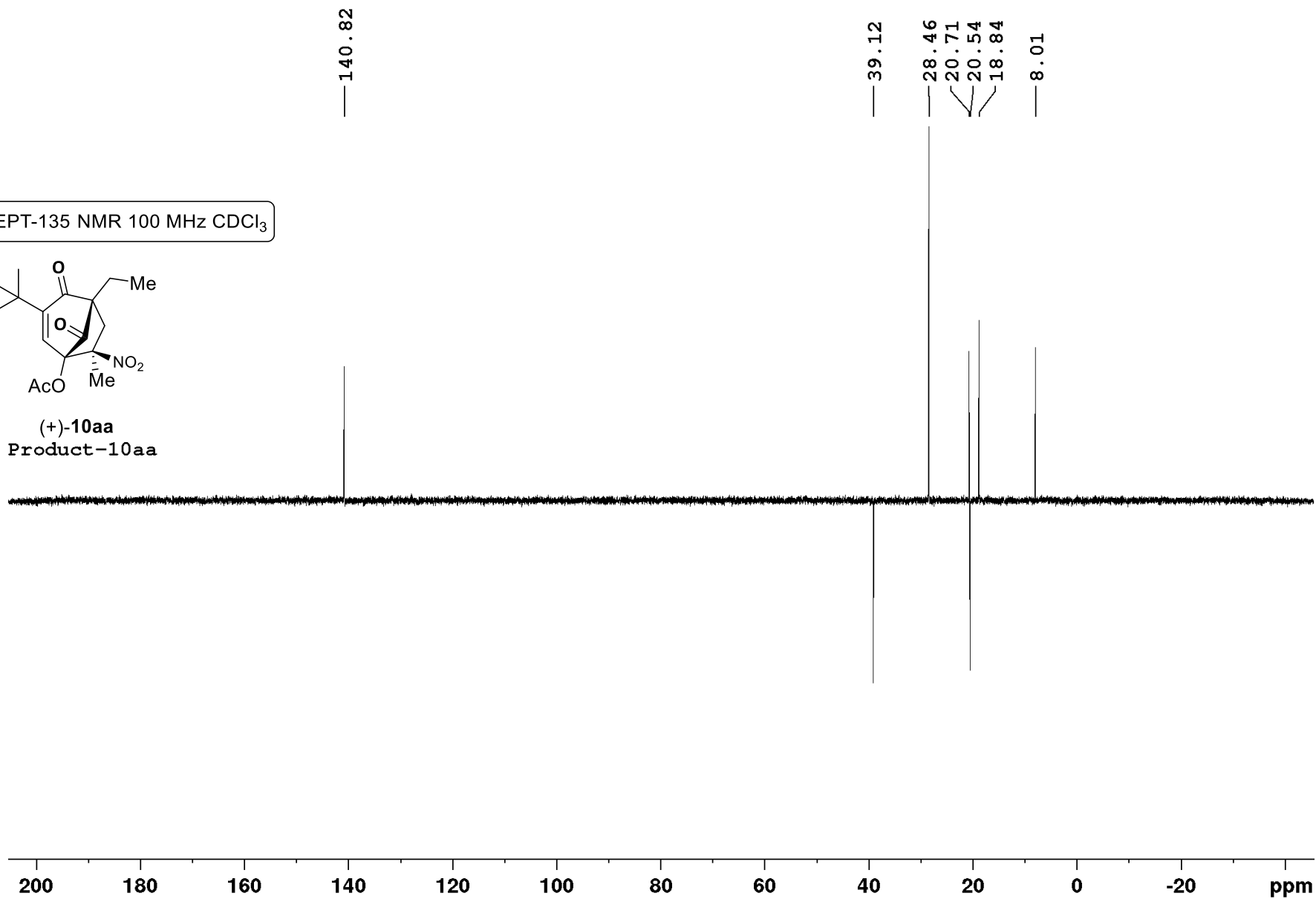
(+)-10aa
Product-10aa



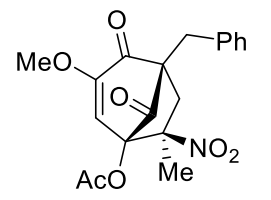
DEPT-135 NMR 100 MHz CDCl₃



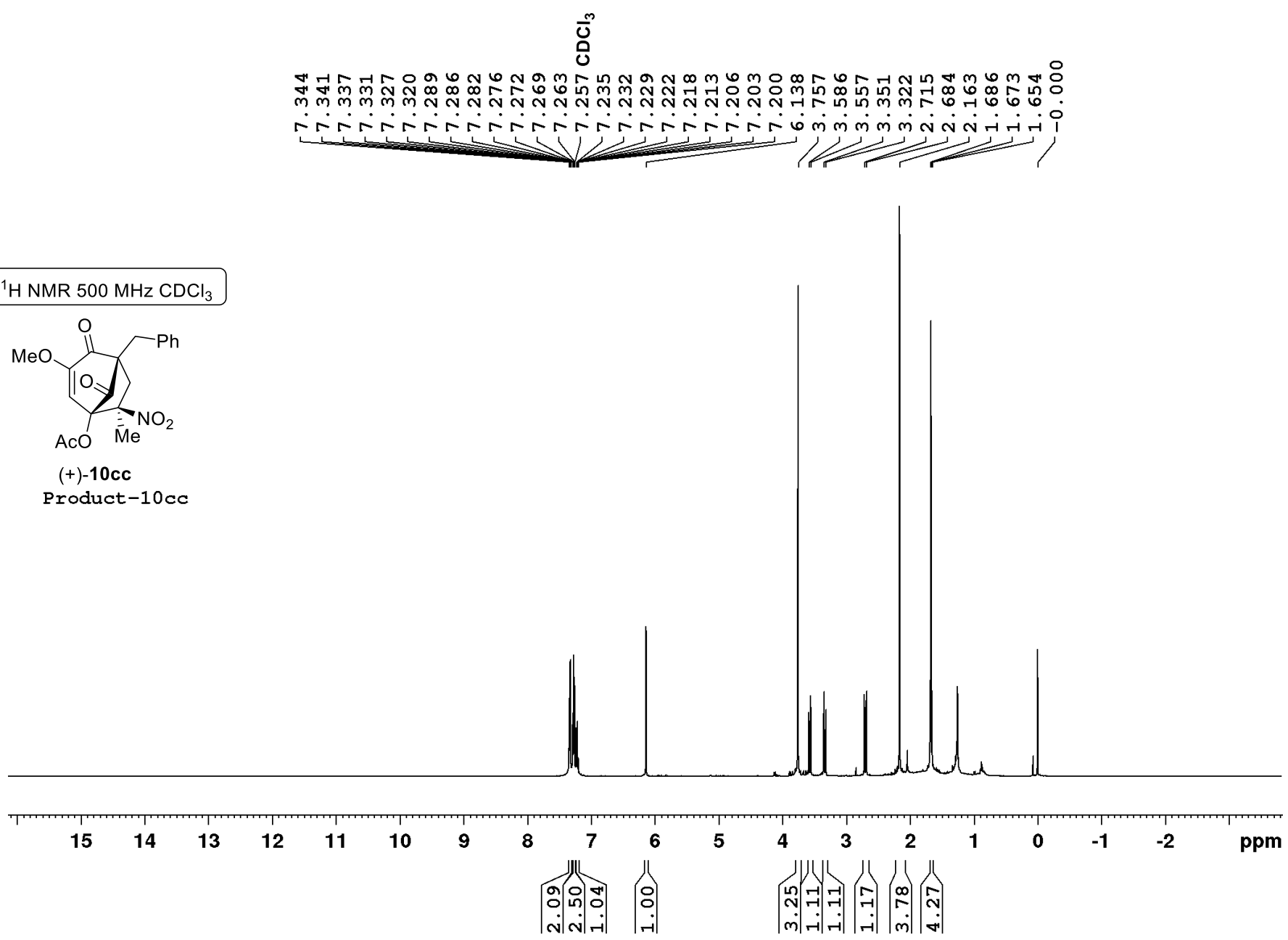
(+)-10aa
Product-10aa

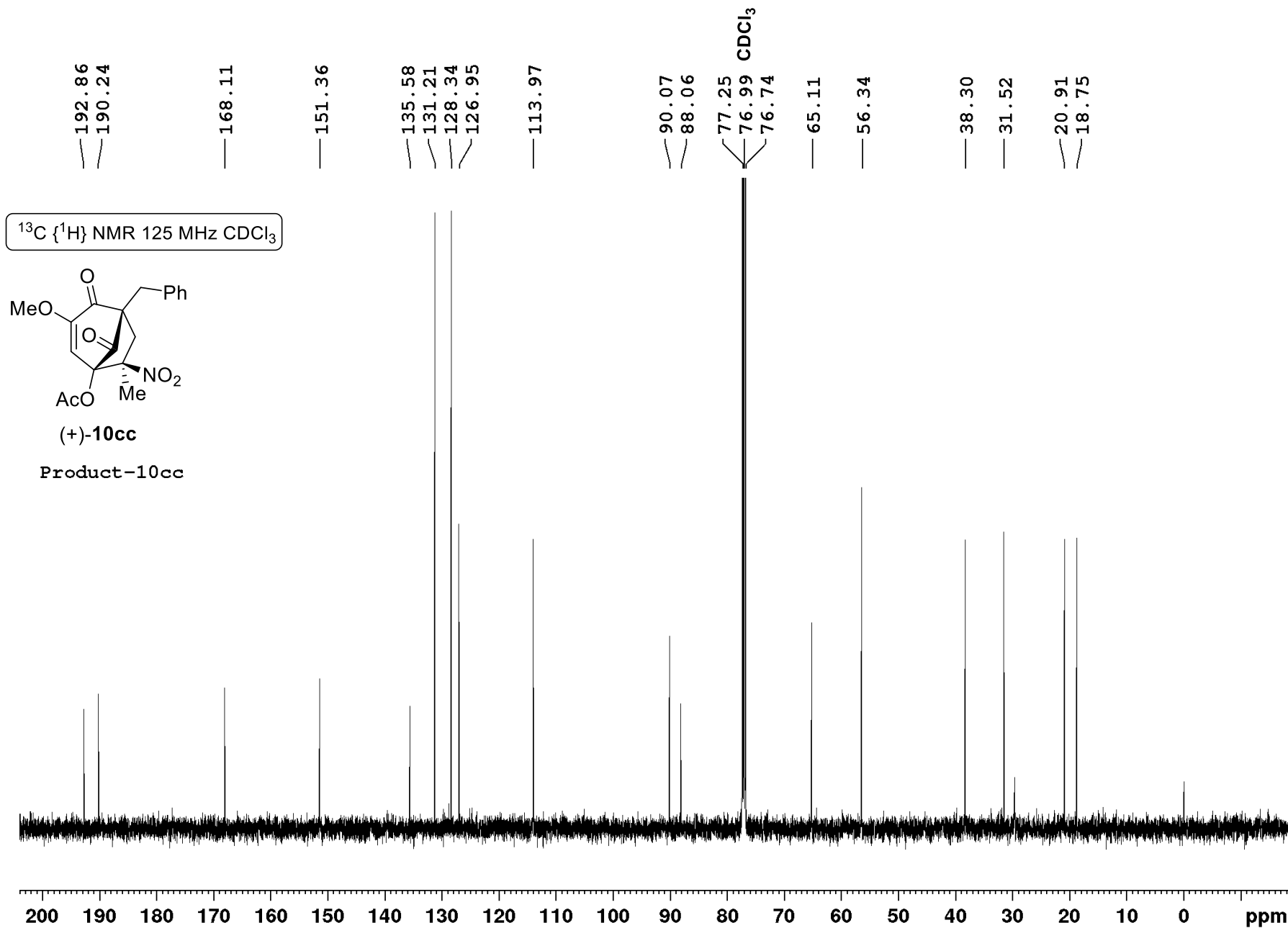


¹H NMR 500 MHz CDCl₃

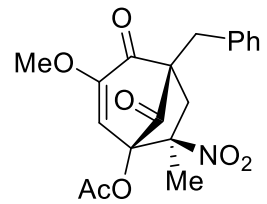


(+)-10cc
Product-10cc

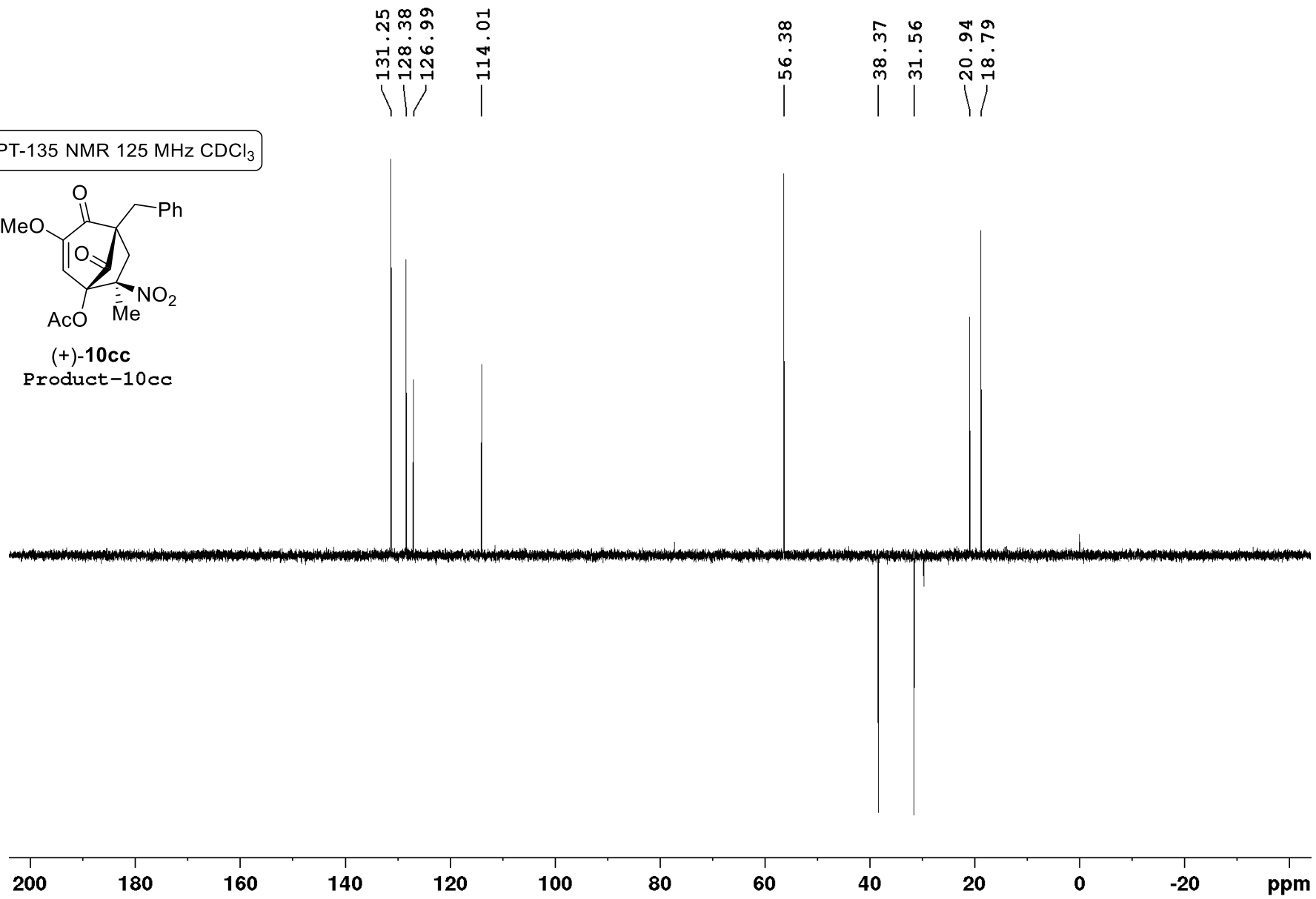


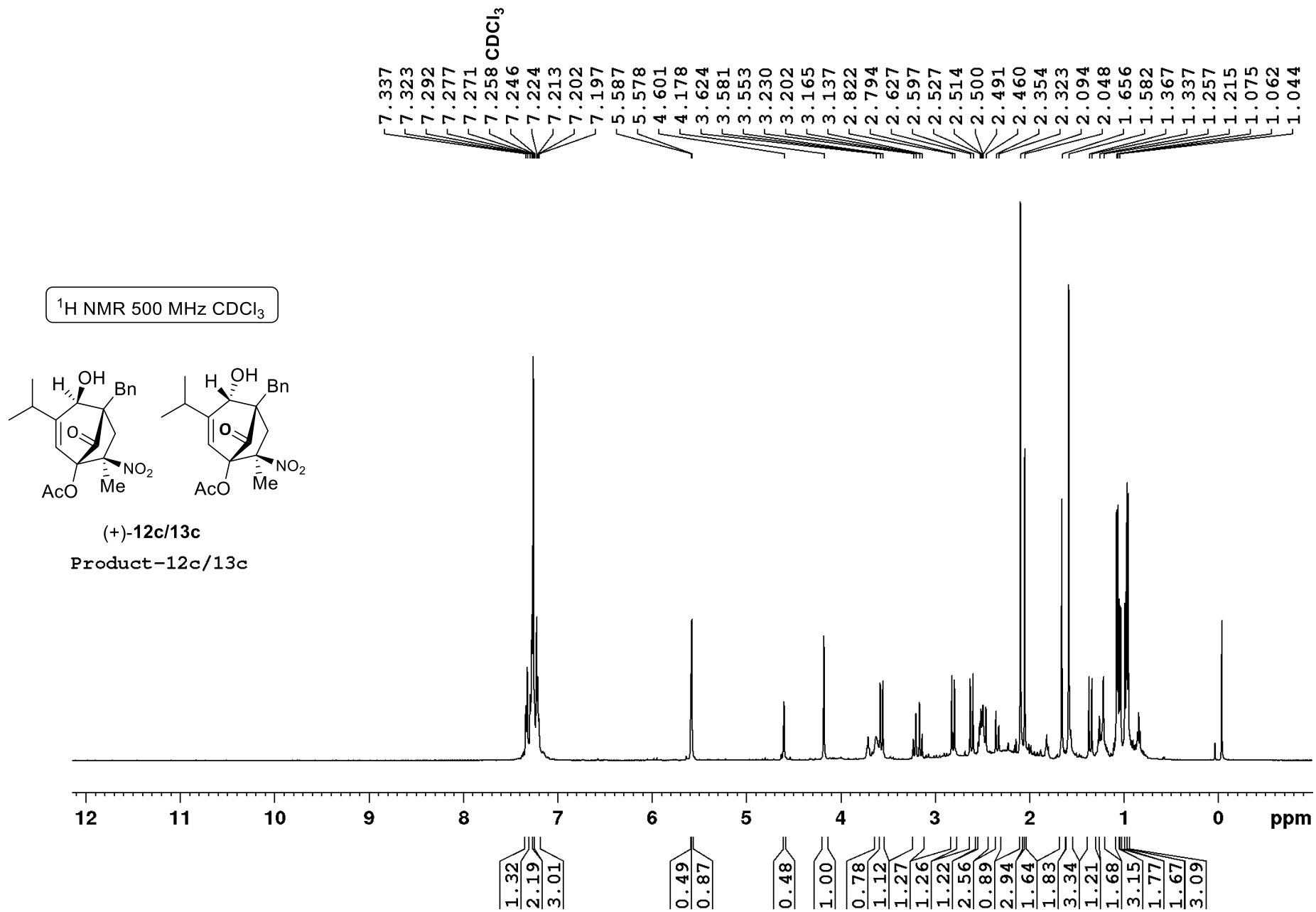


DEPT-135 NMR 125 MHz CDCl₃

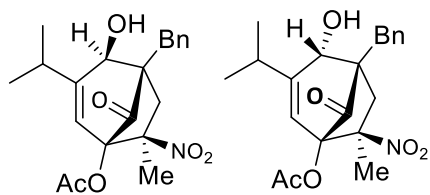


(+)-10cc
Product-10cc

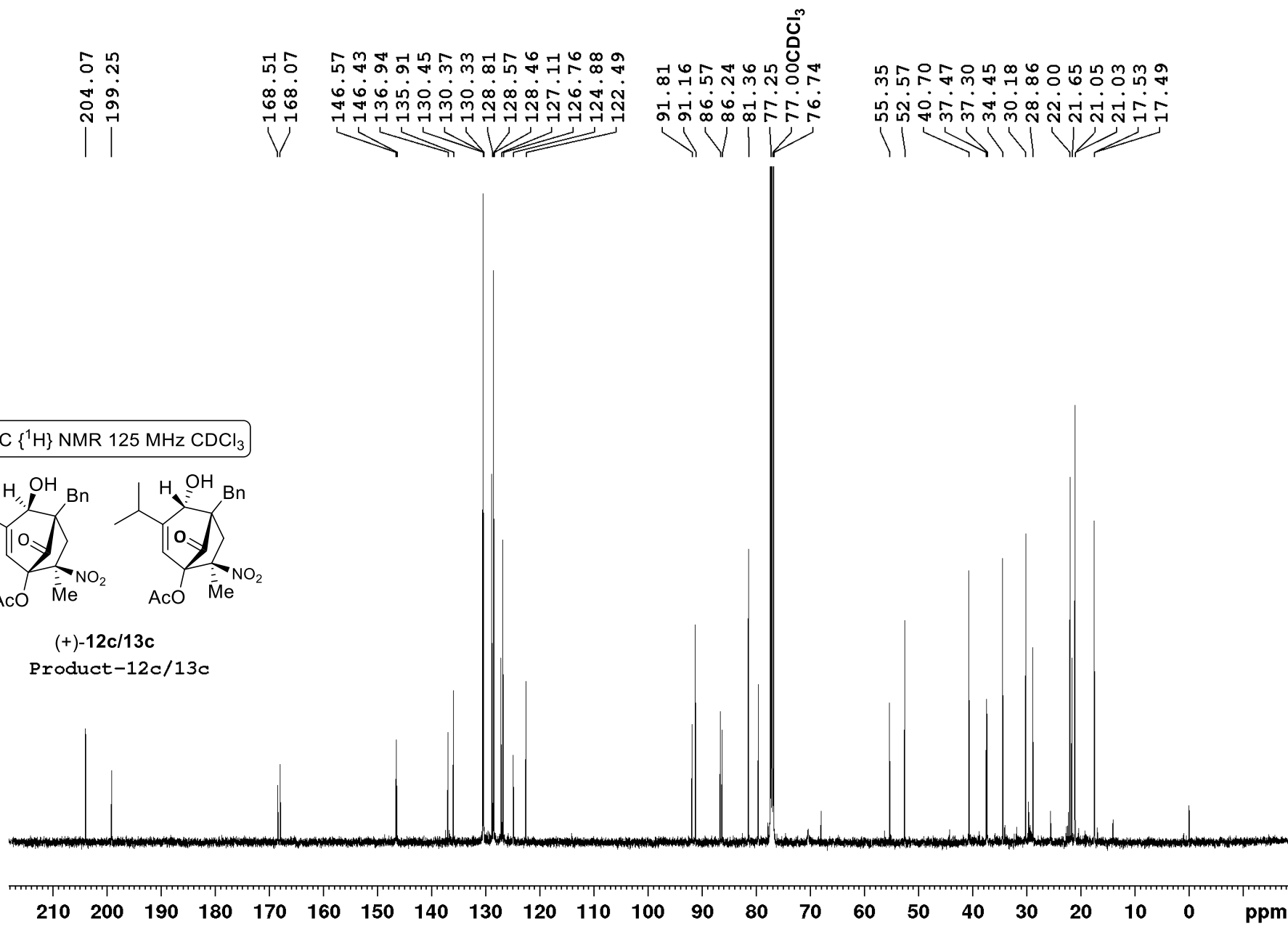




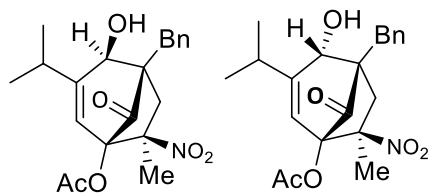
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



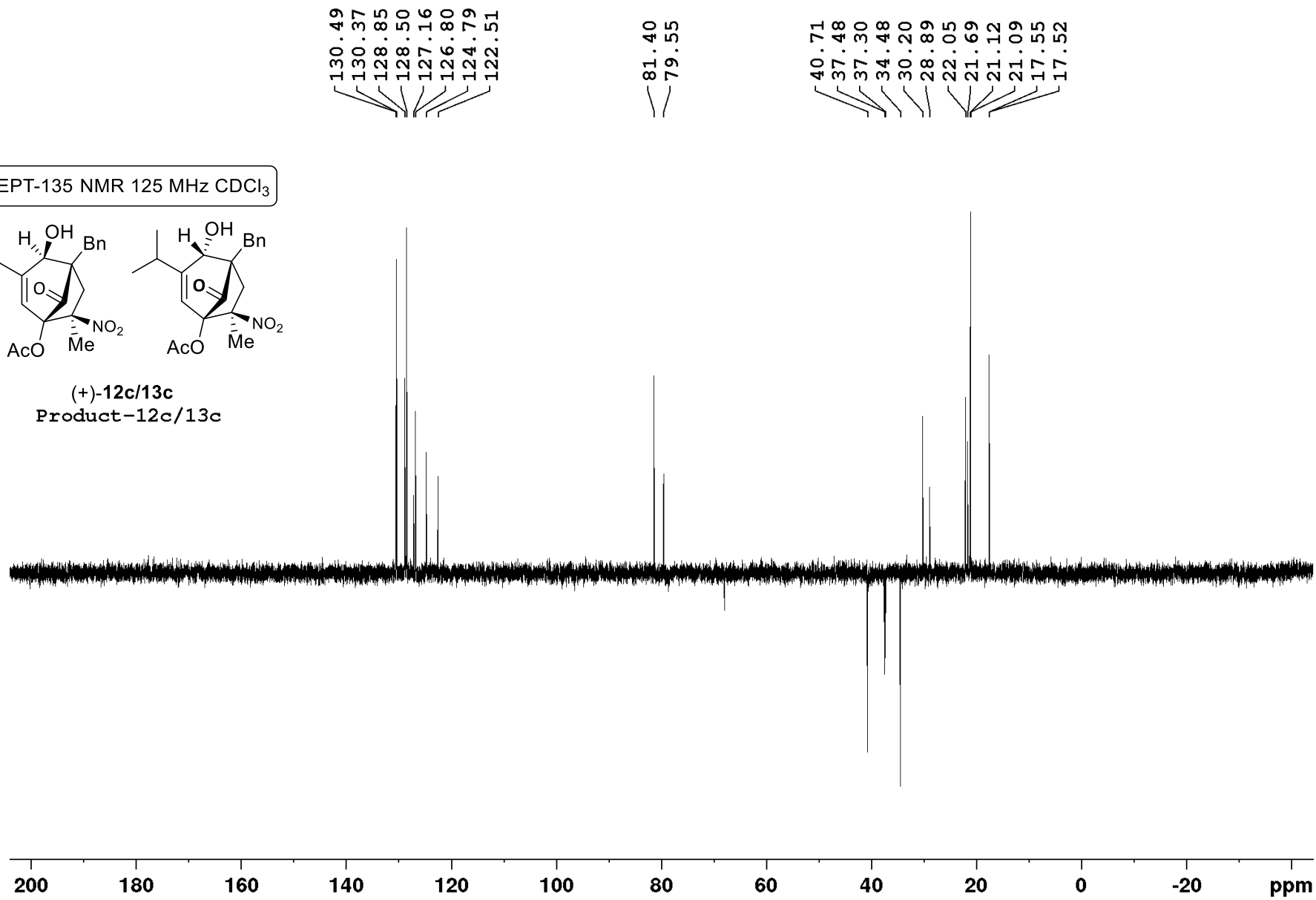
(+)-12c/13c
Product-12c/13c



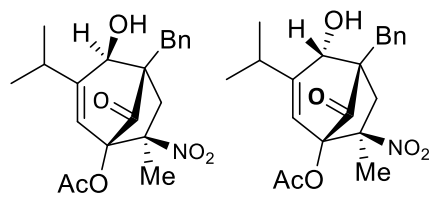
DEPT-135 NMR 125 MHz CDCl₃



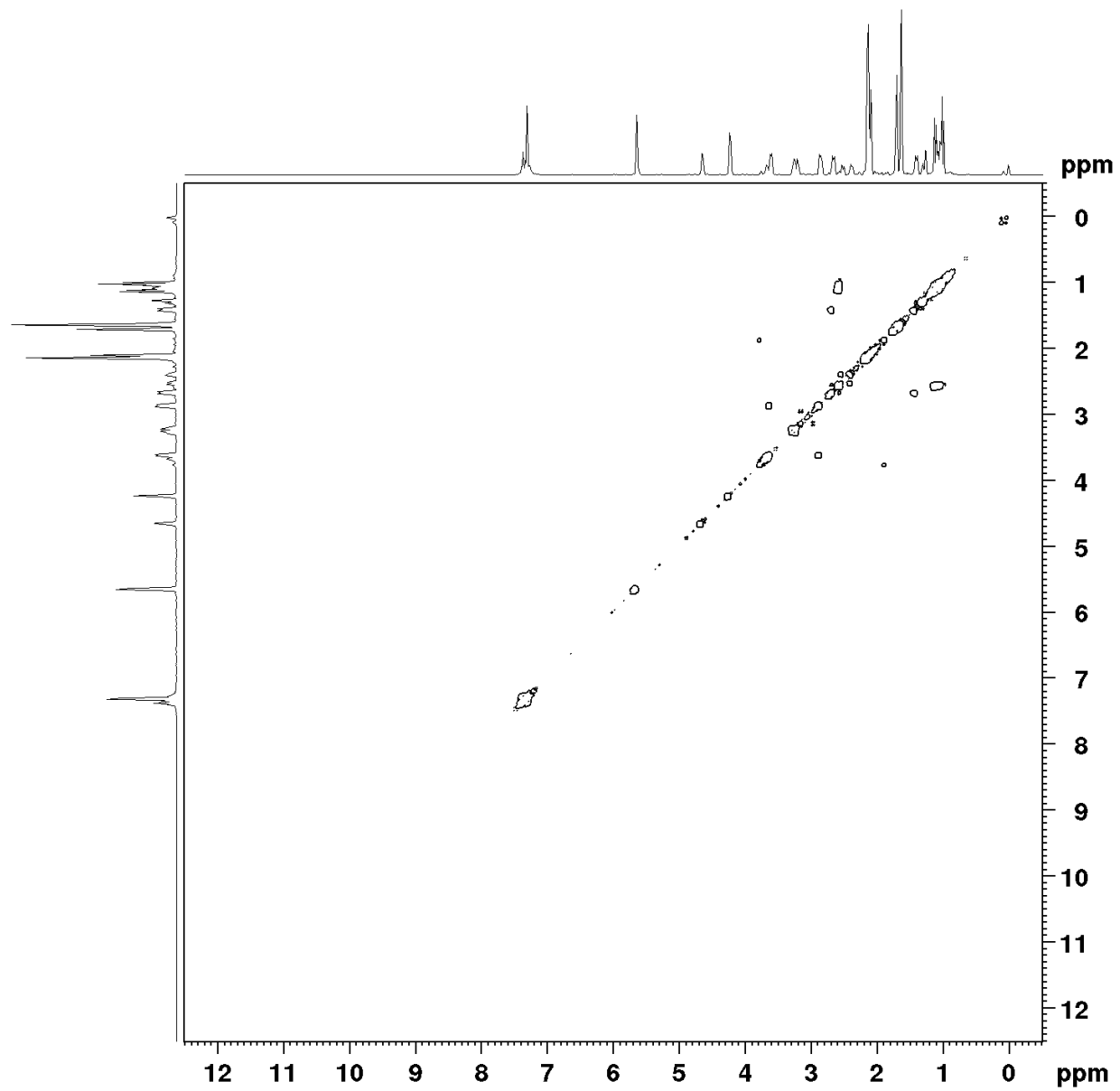
(+)-12c/13c
Product-12c/13c



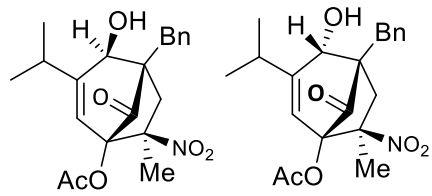
Product-12c/13c



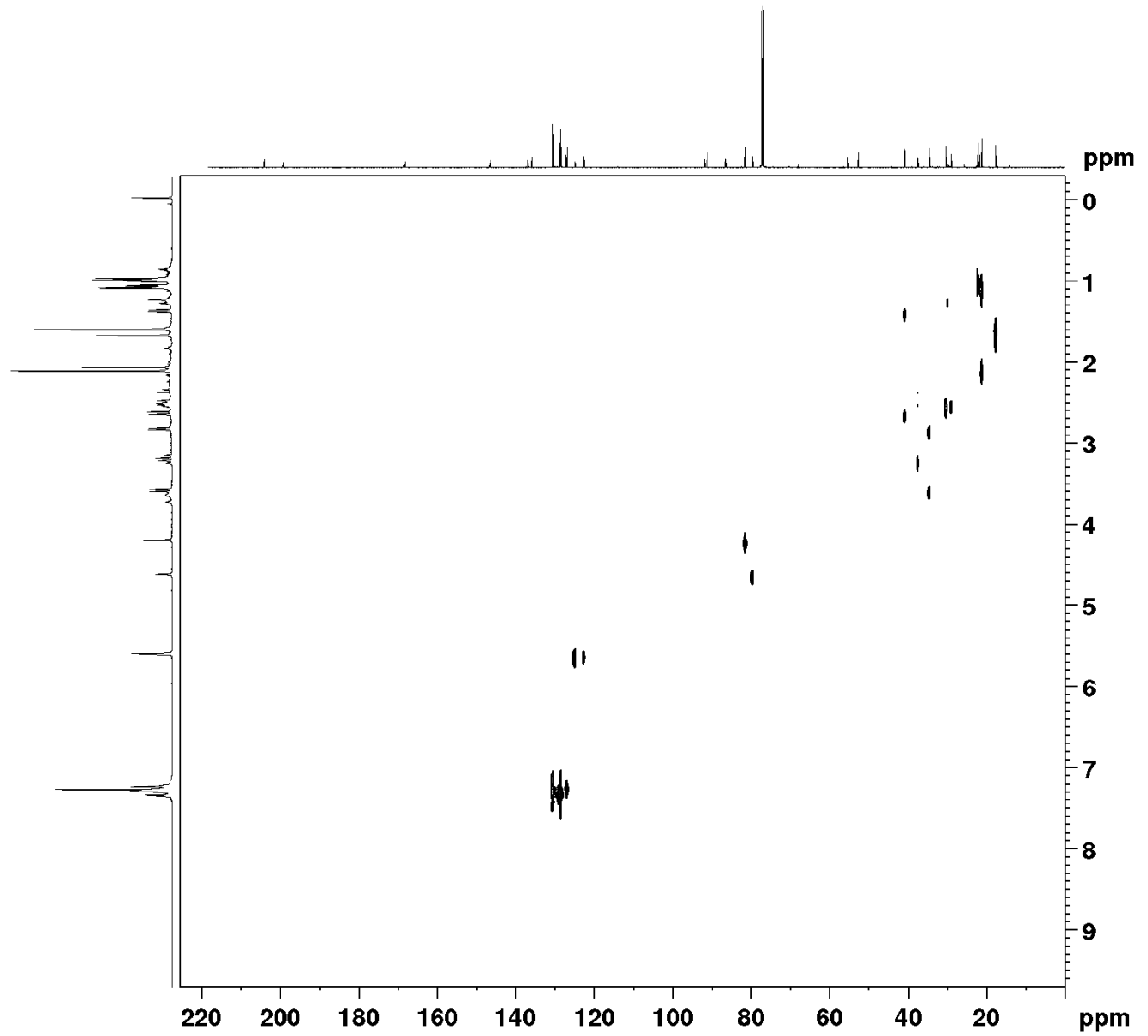
(+)-12c/13c

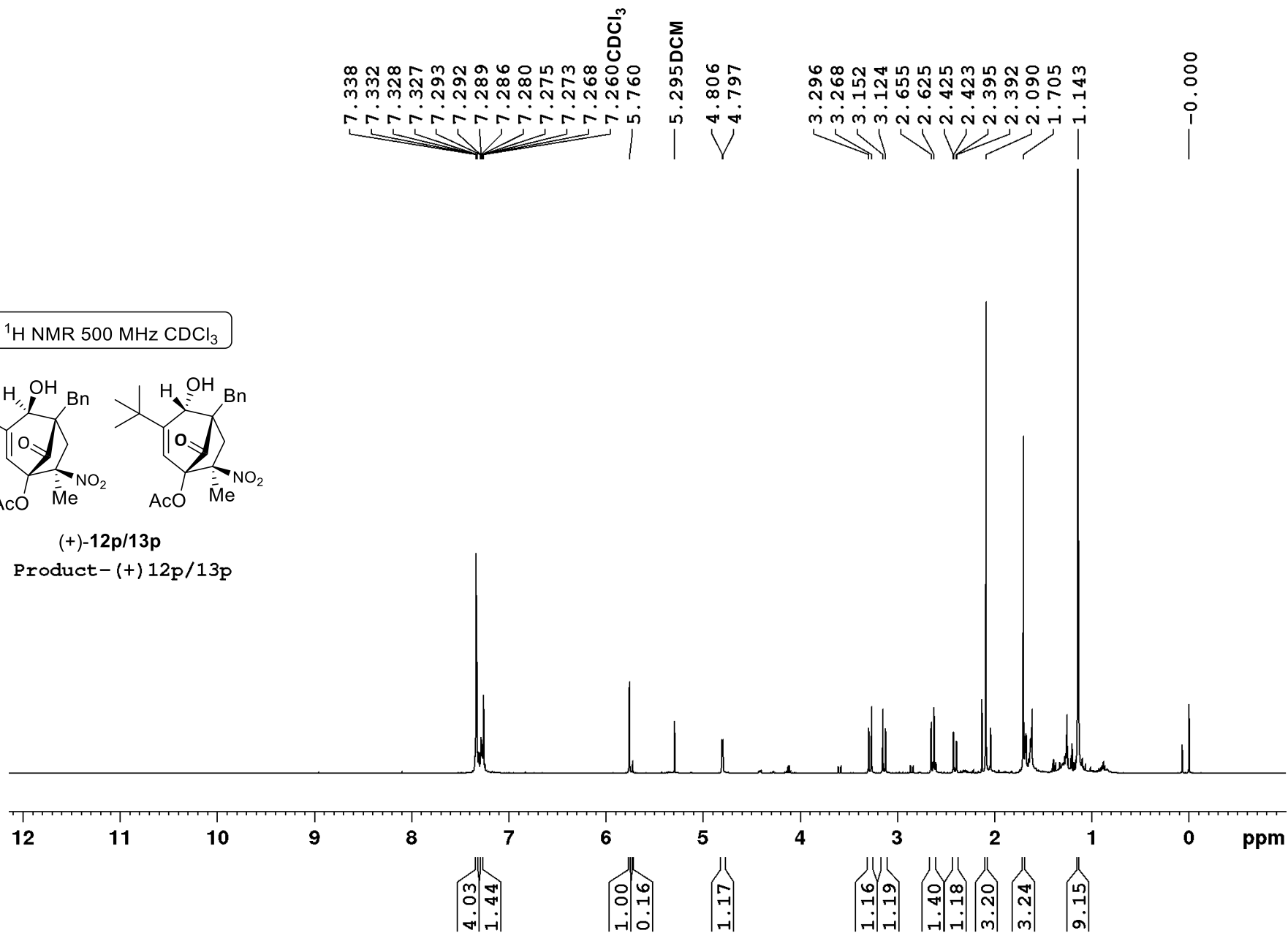
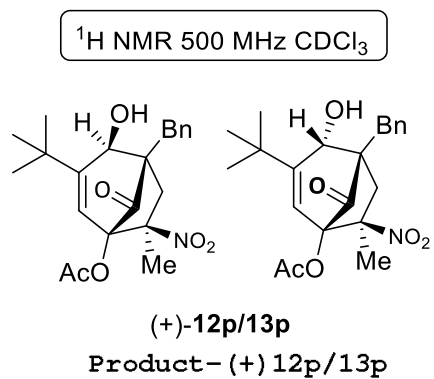


Product-12c/13c

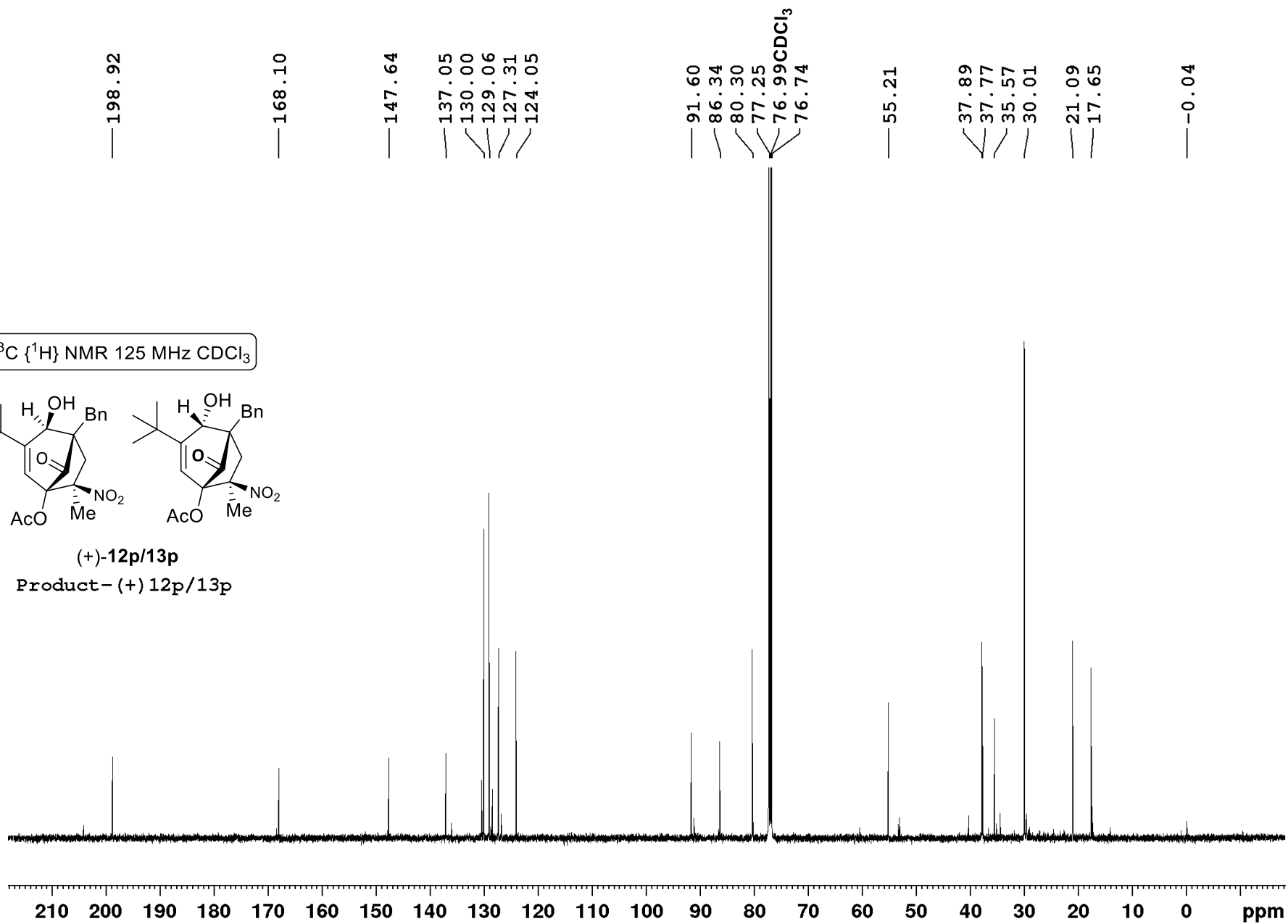
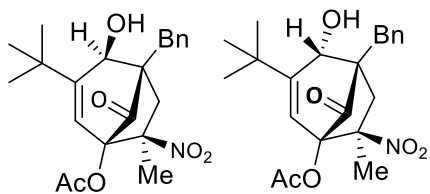


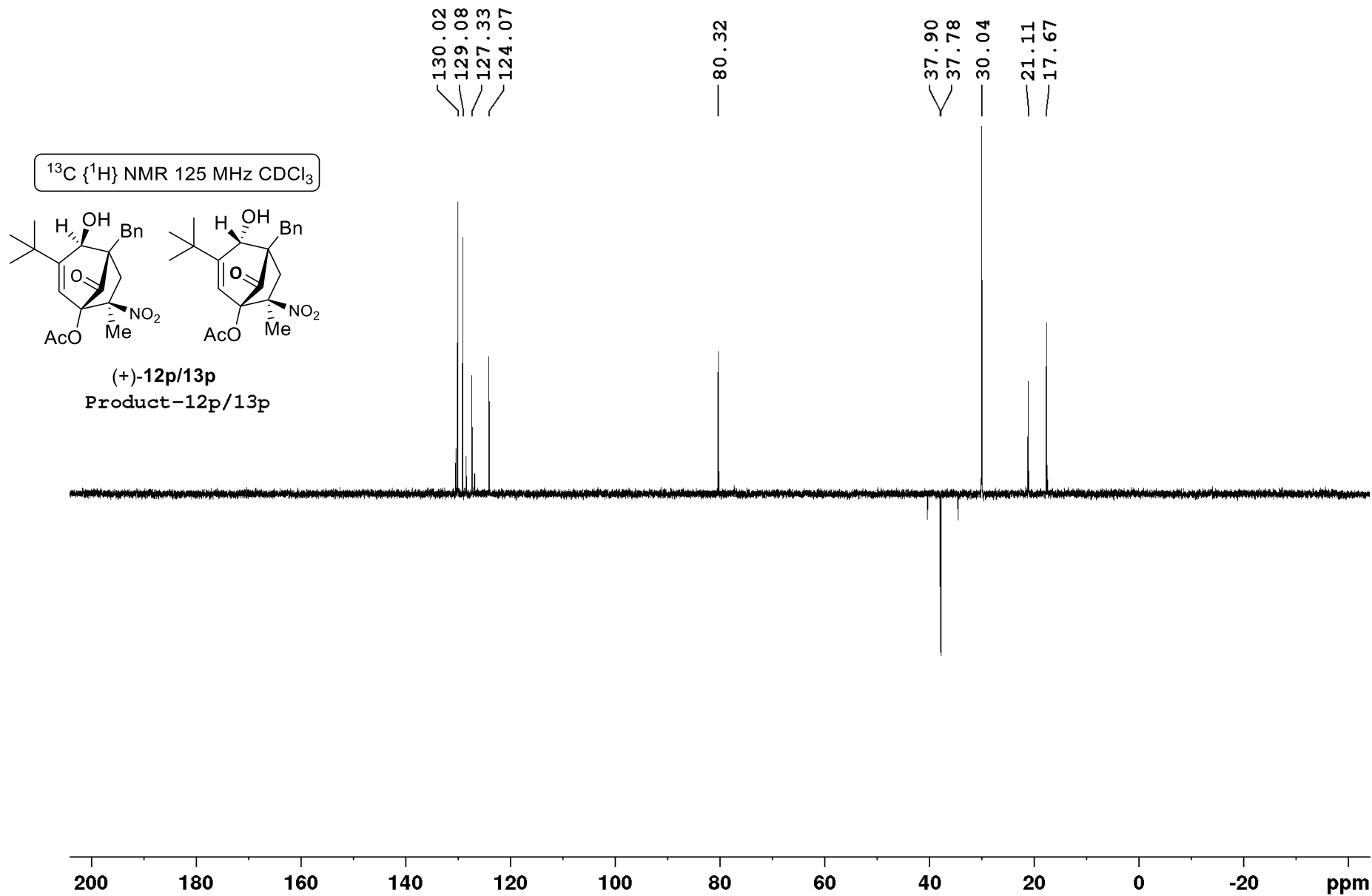
(+)-12c/13c



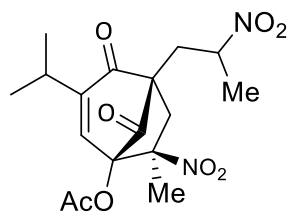


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



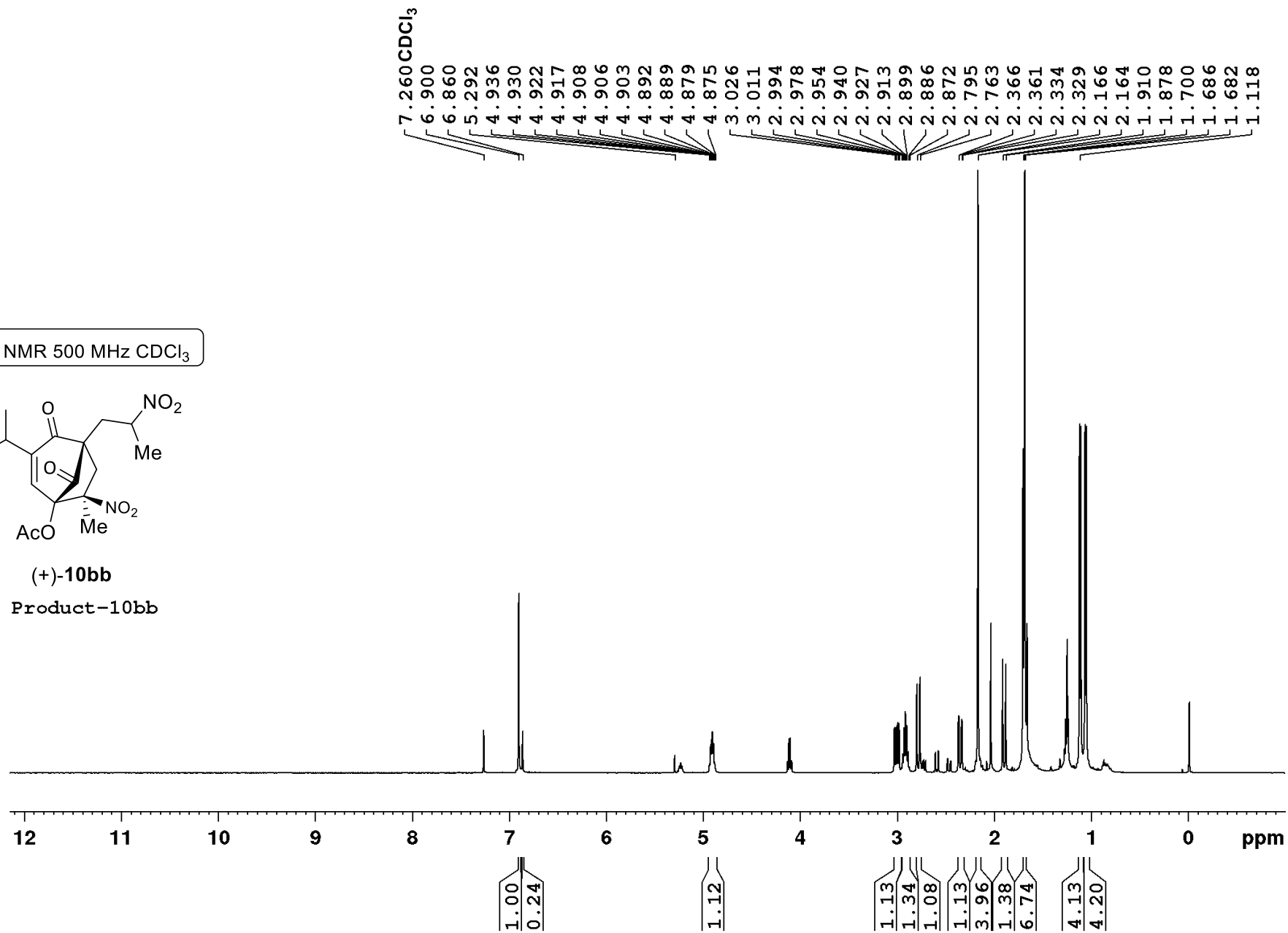


^1H NMR 500 MHz CDCl_3

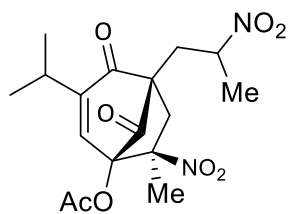


(+)-10bb

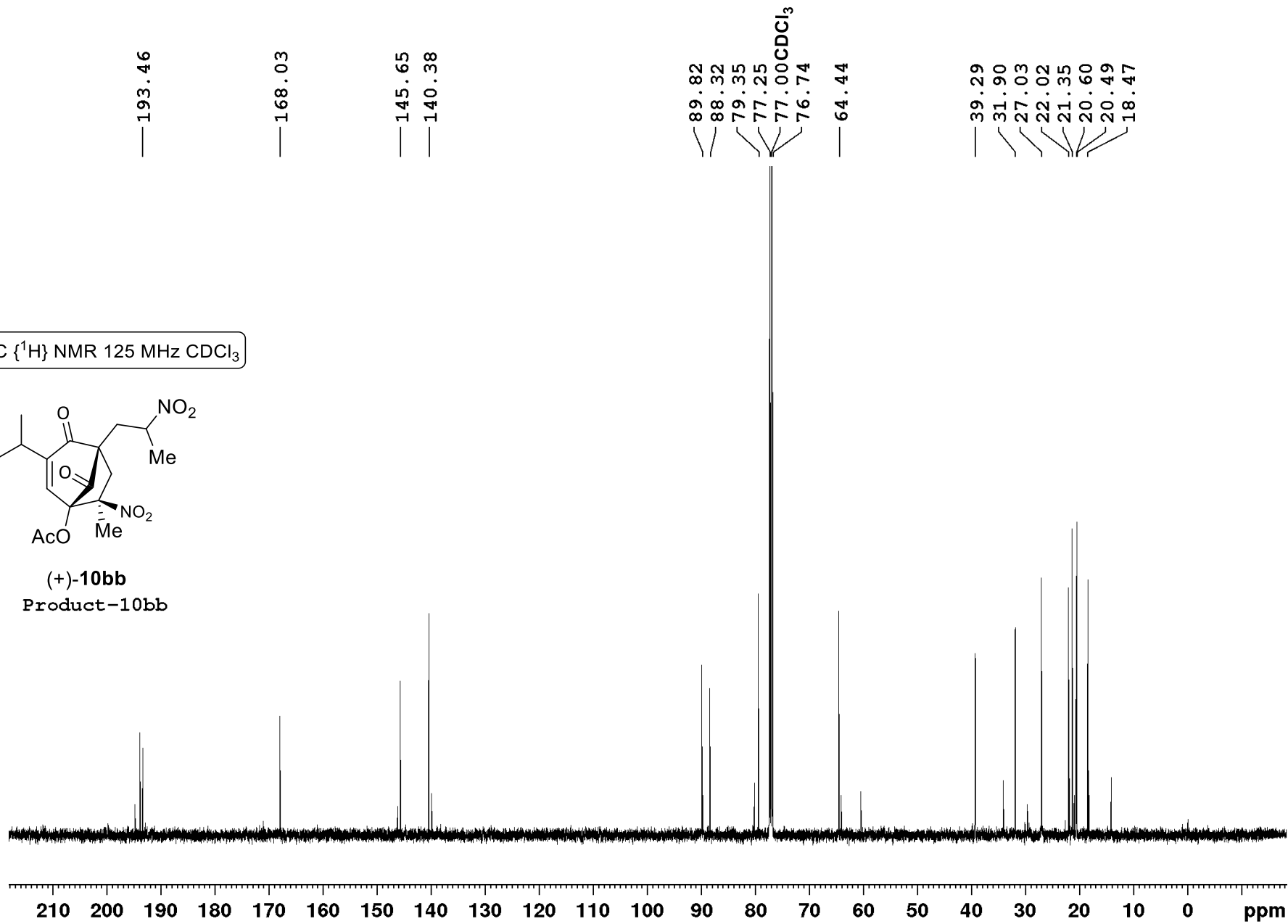
Product-10bb



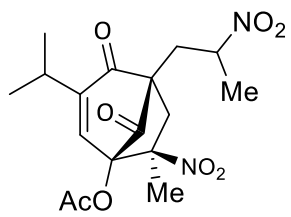
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(+)-10bb
Product-10bb

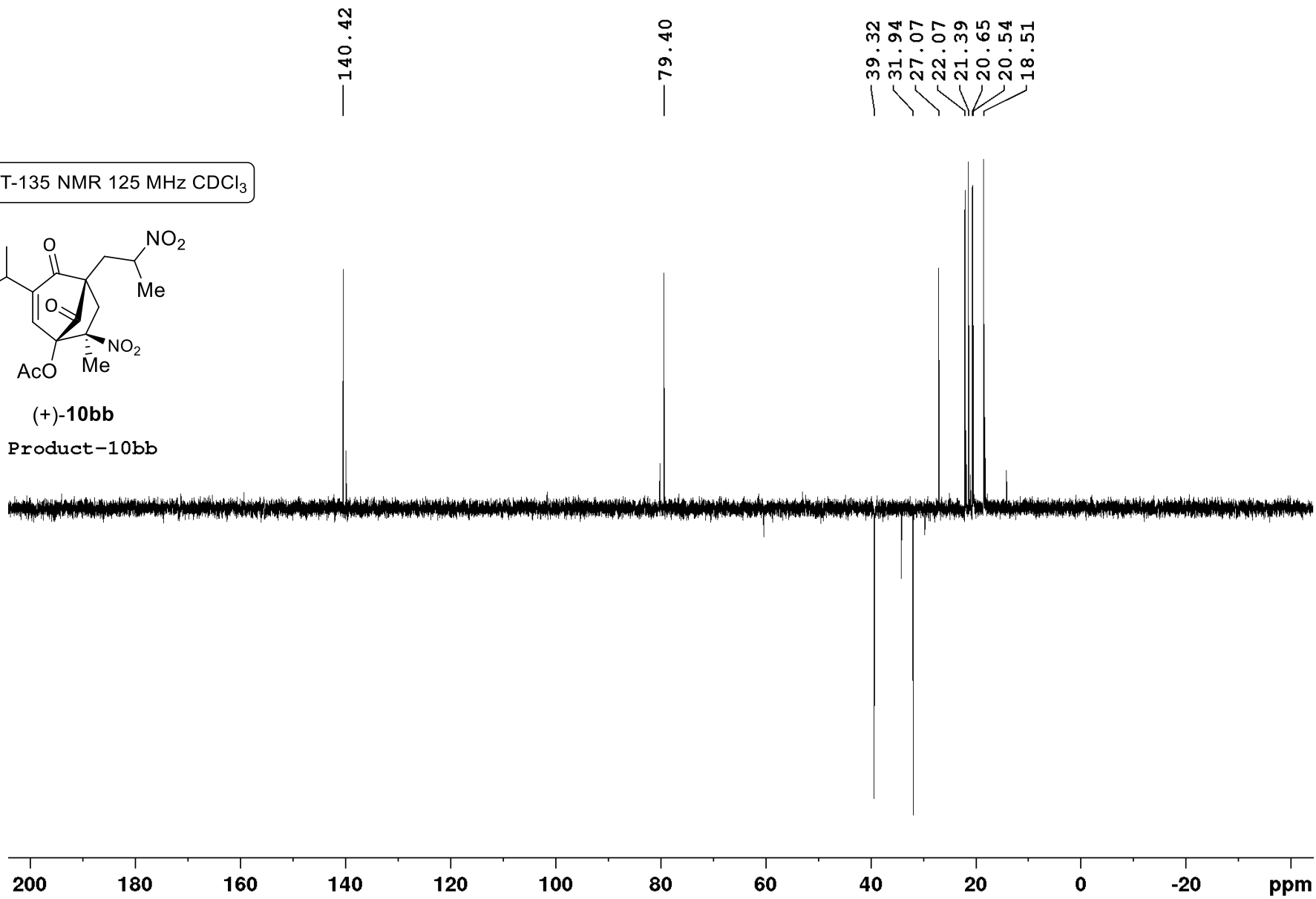


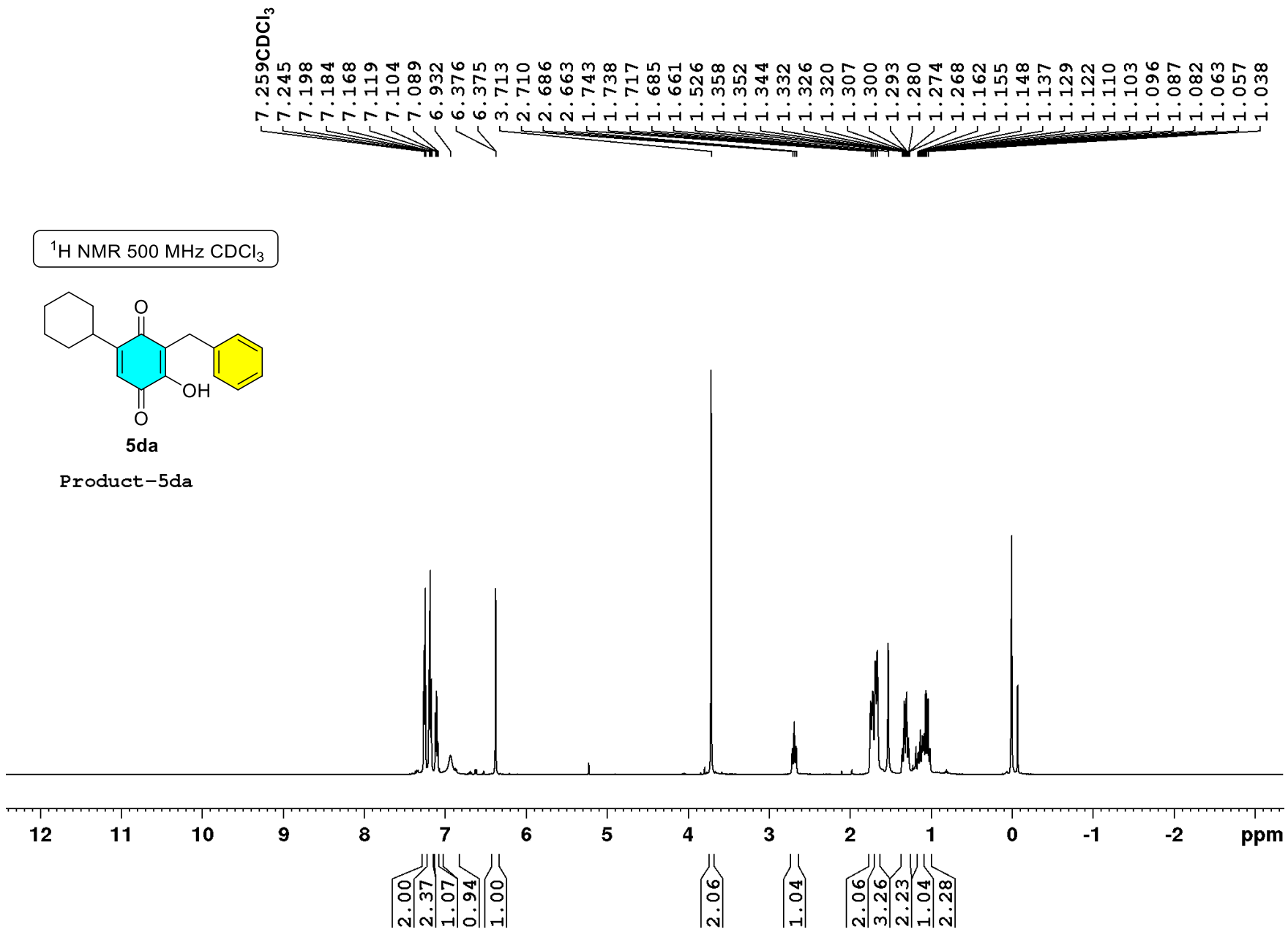
DEPT-135 NMR 125 MHz CDCl₃

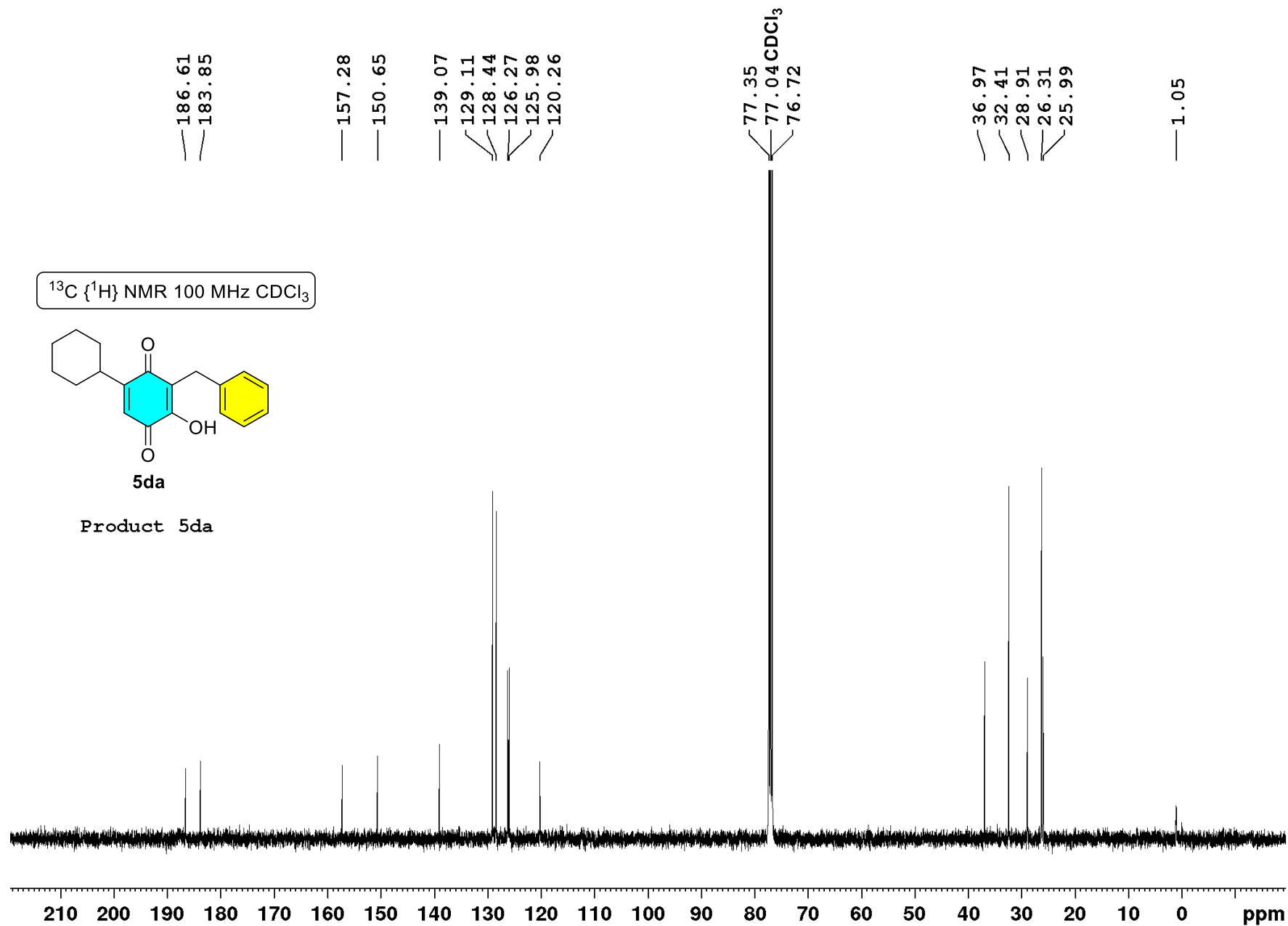


(+)-10bb

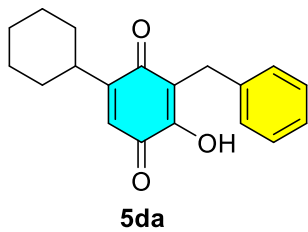
Product-10bb



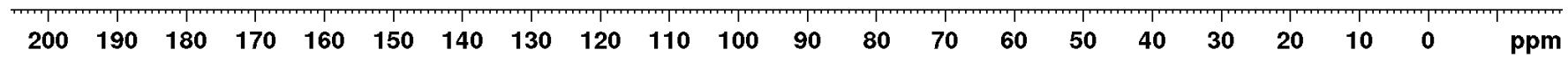




DEPT-135 NMR 100 MHz CDCl₃

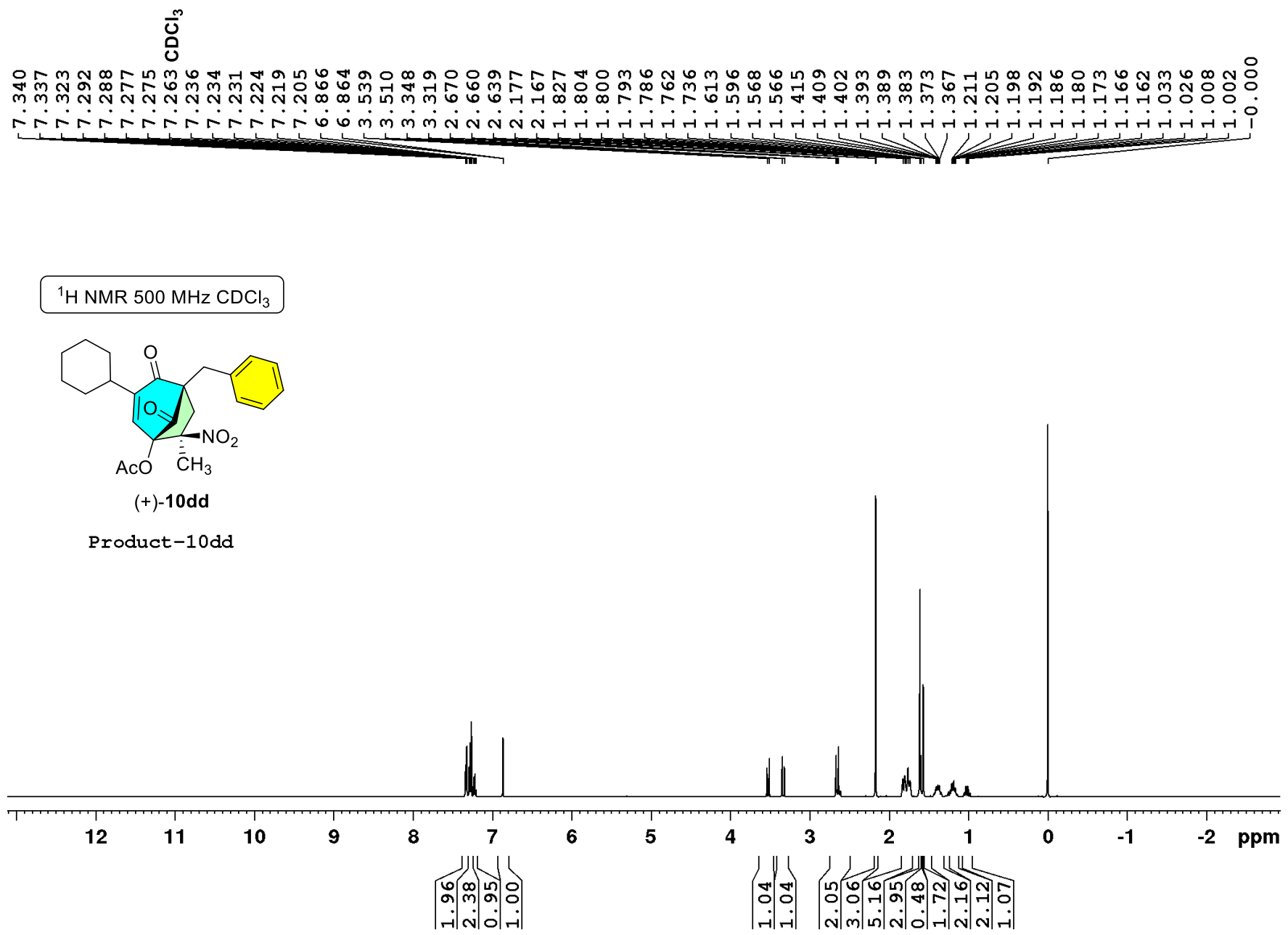


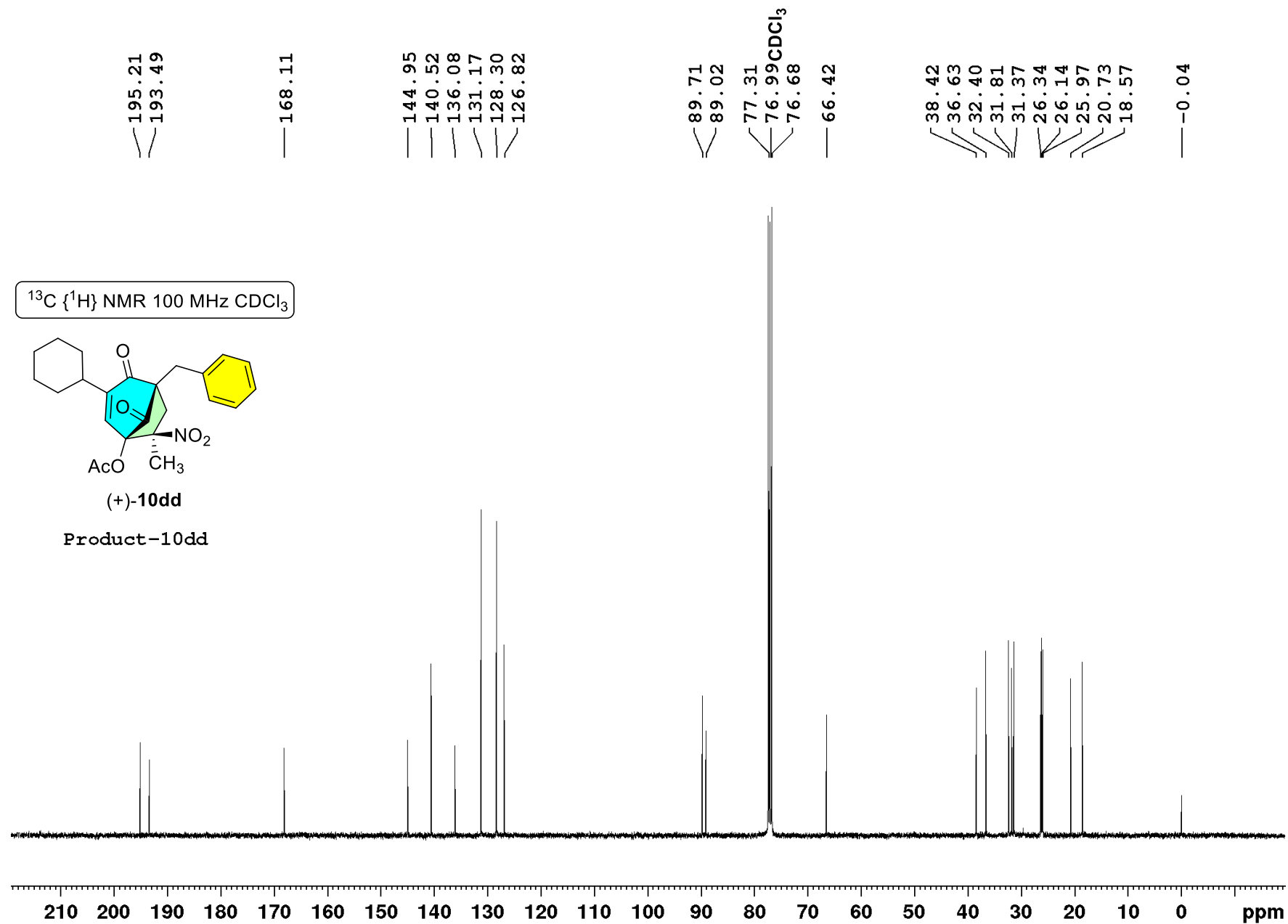
Product 5da

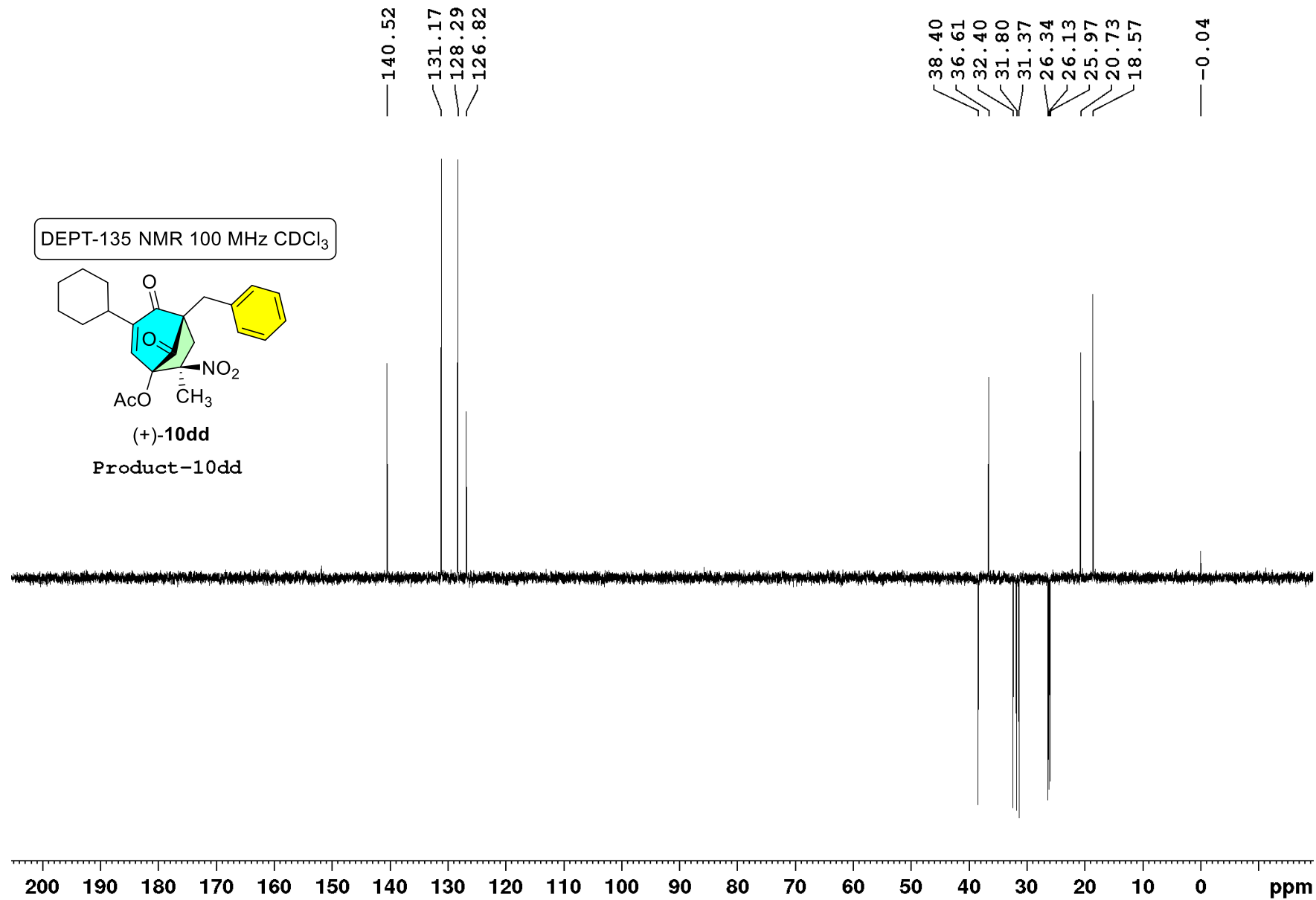


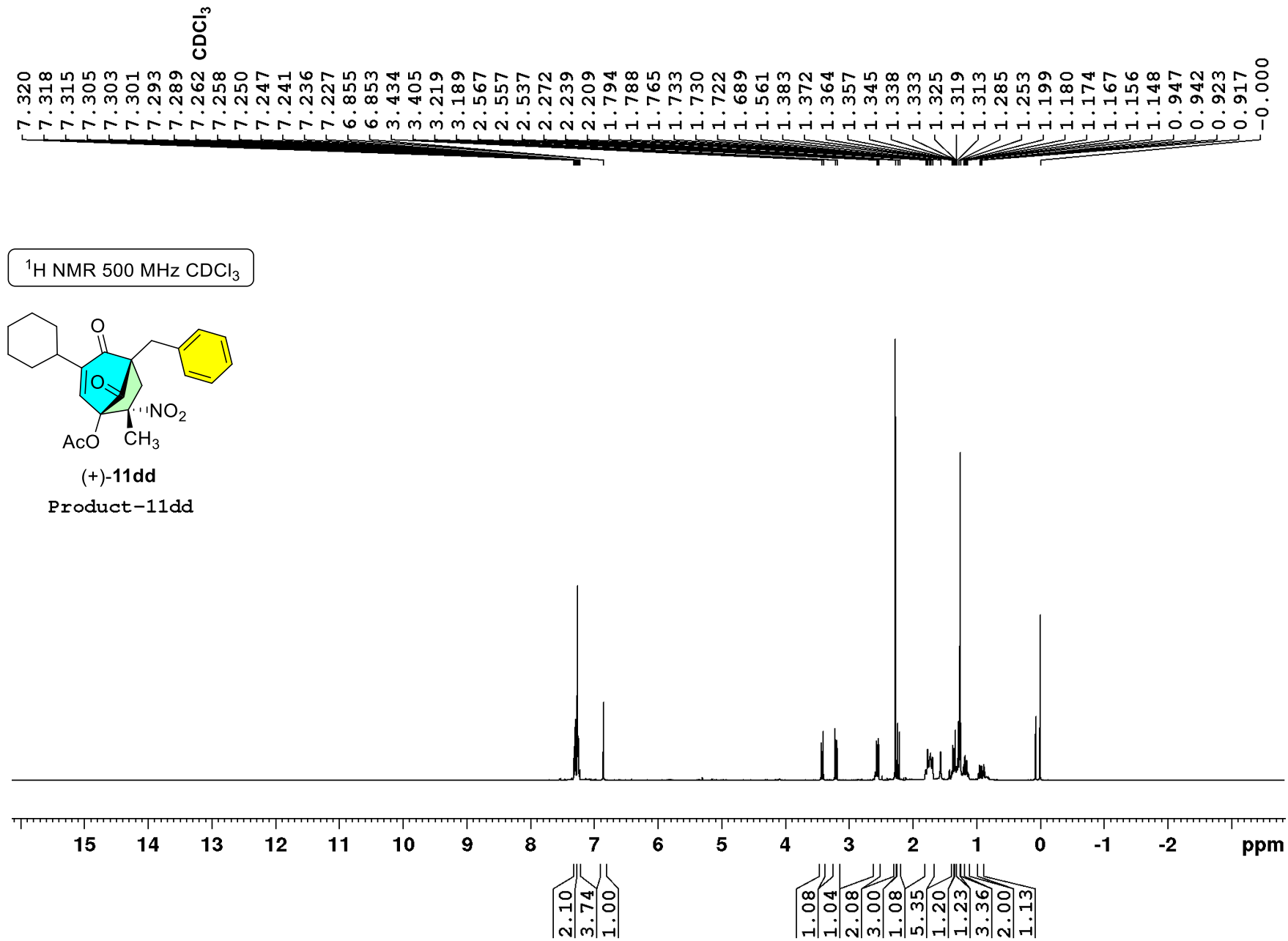
129.11
128.44
126.27
125.98

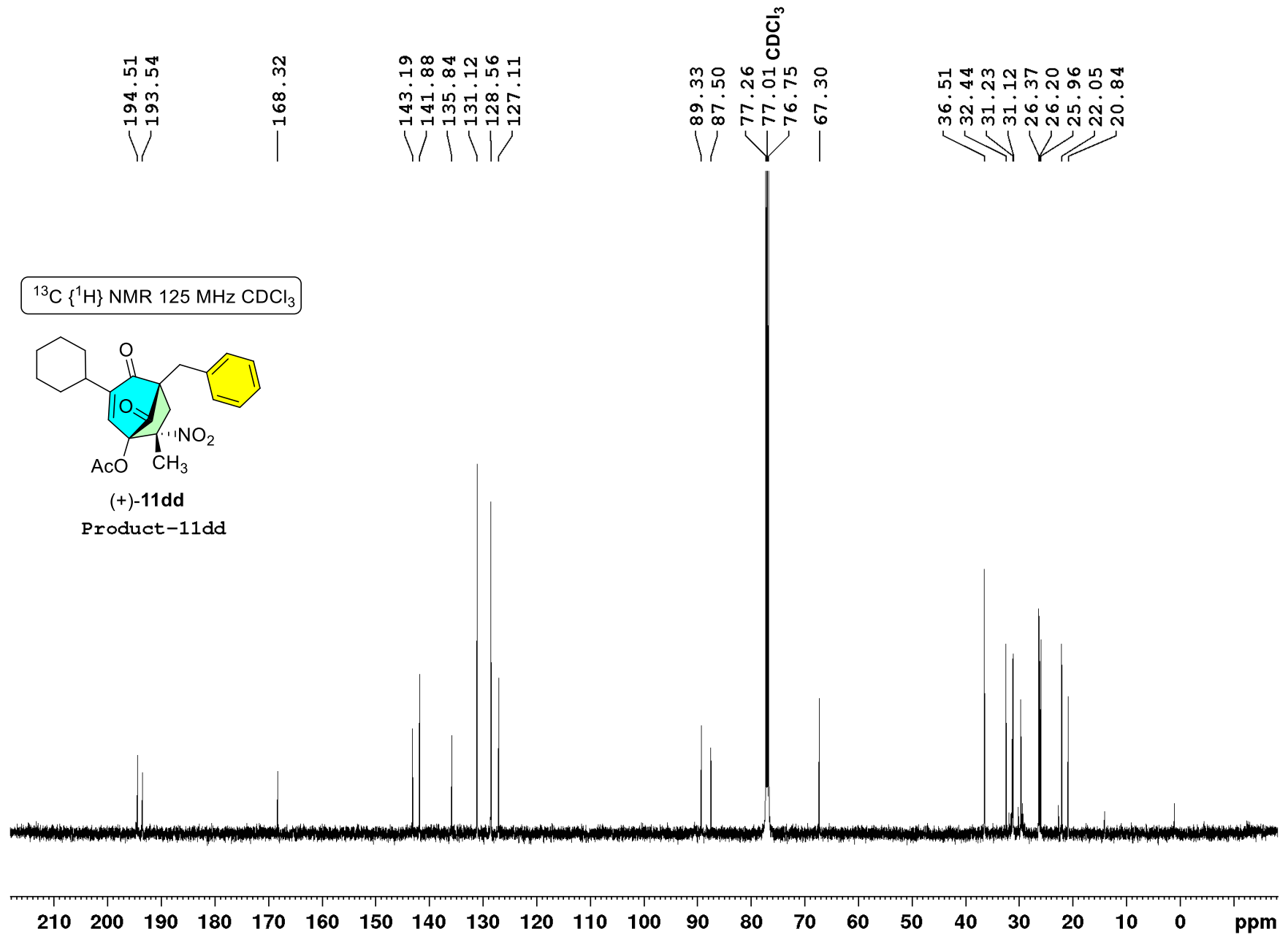
36.97
32.41
28.91
26.31
25.99



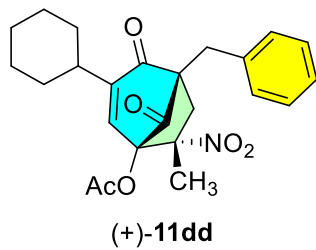




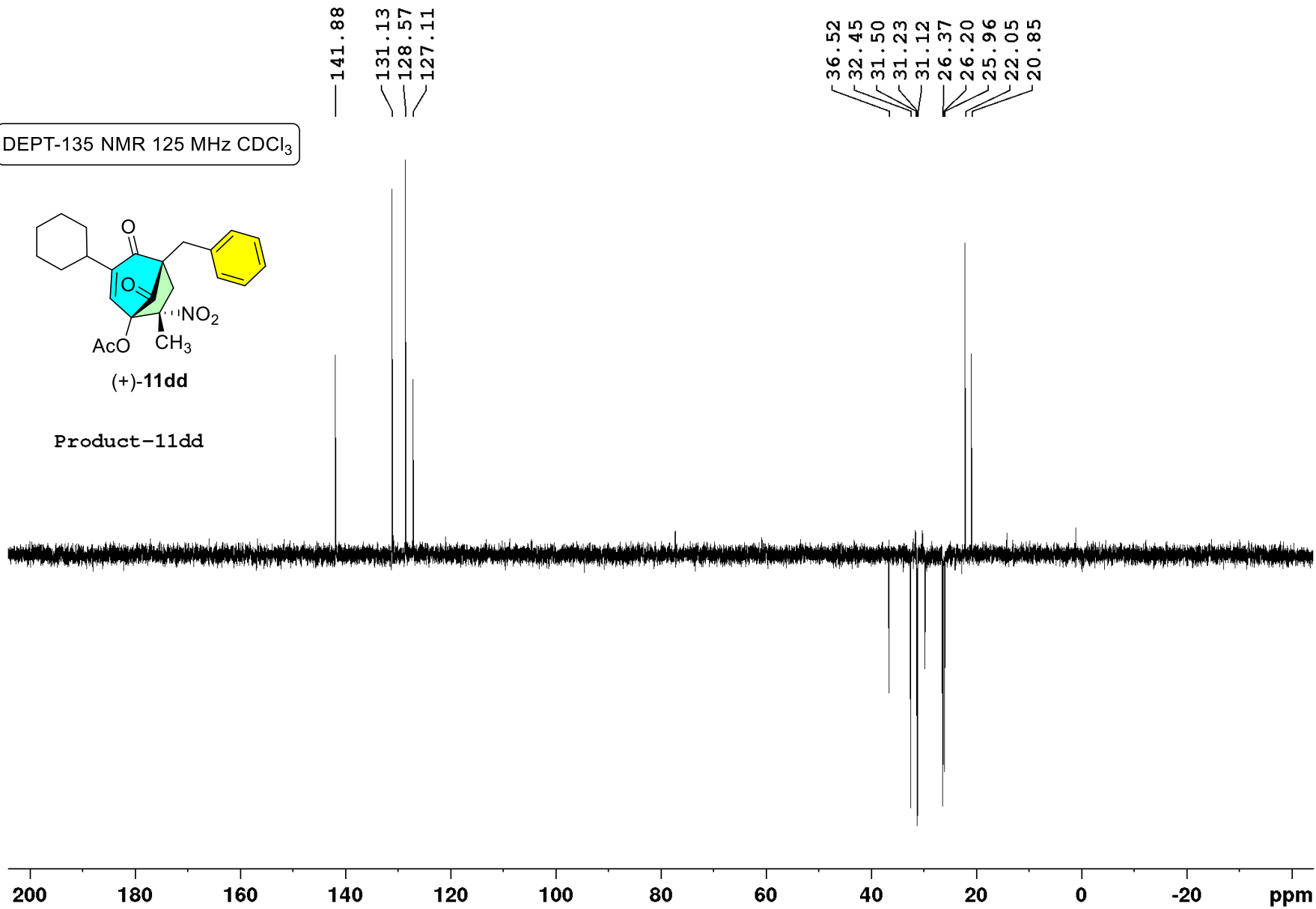




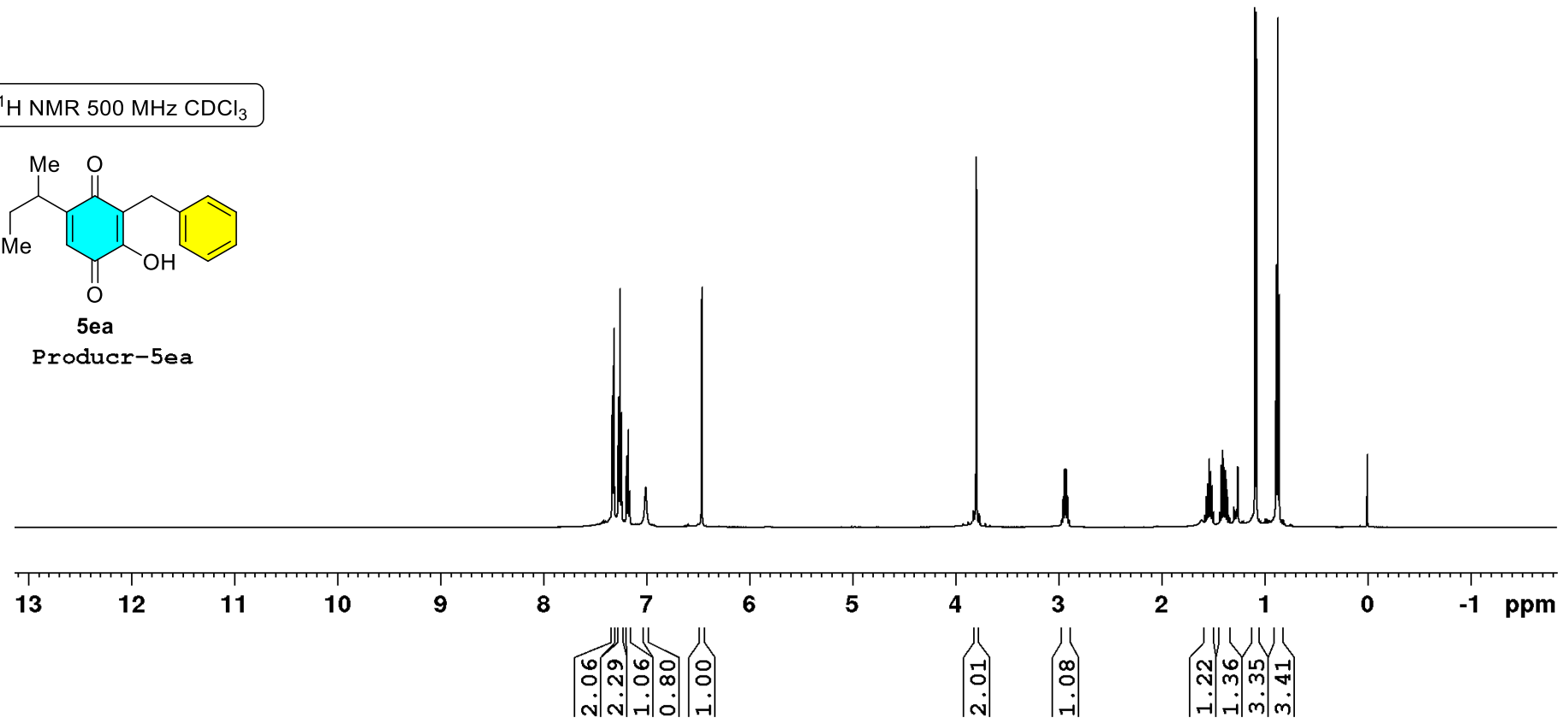
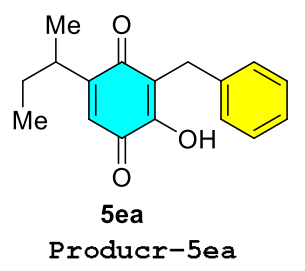
DEPT-135 NMR 125 MHz CDCl₃



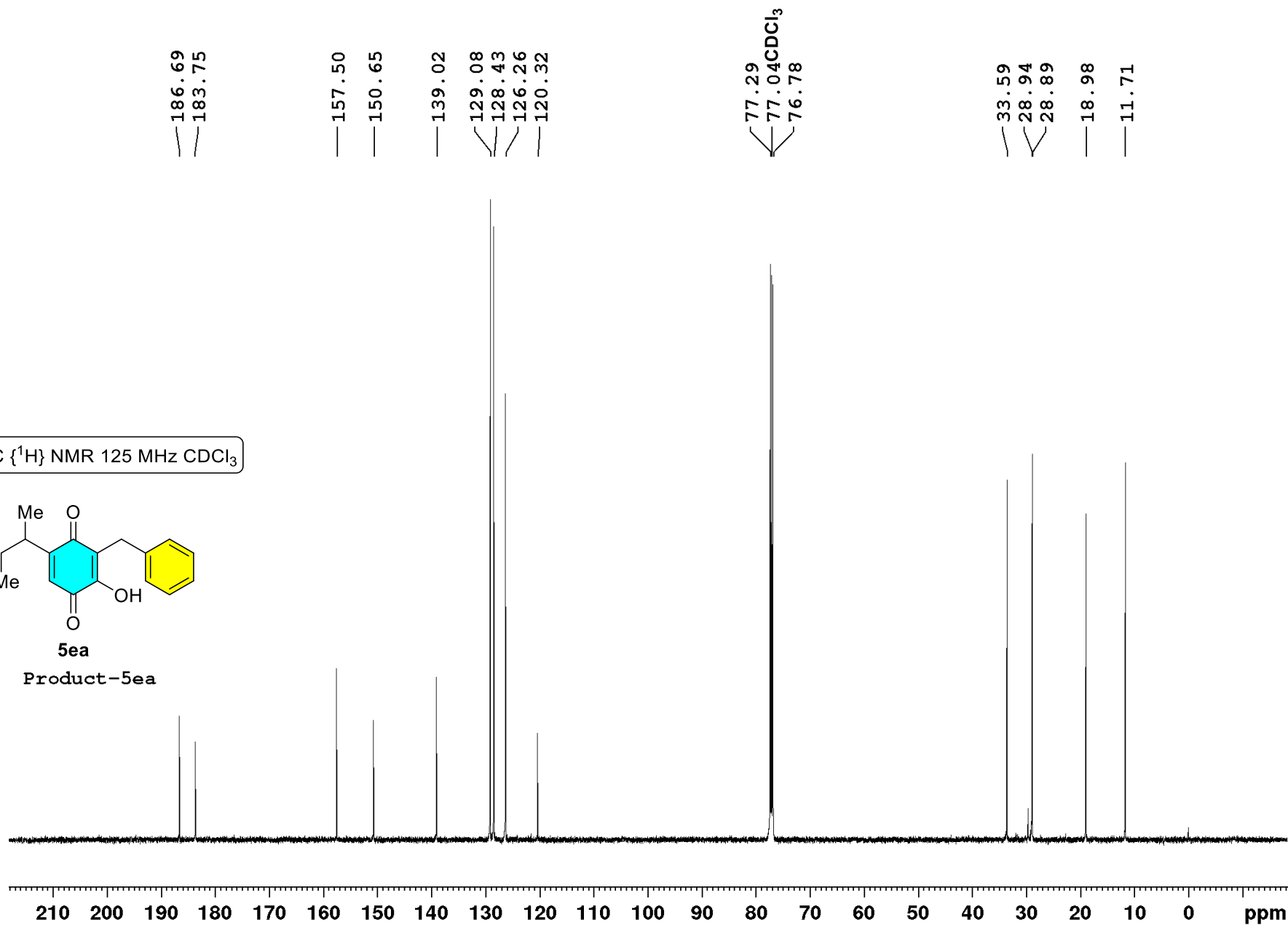
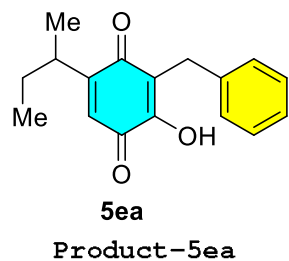
Product-11dd

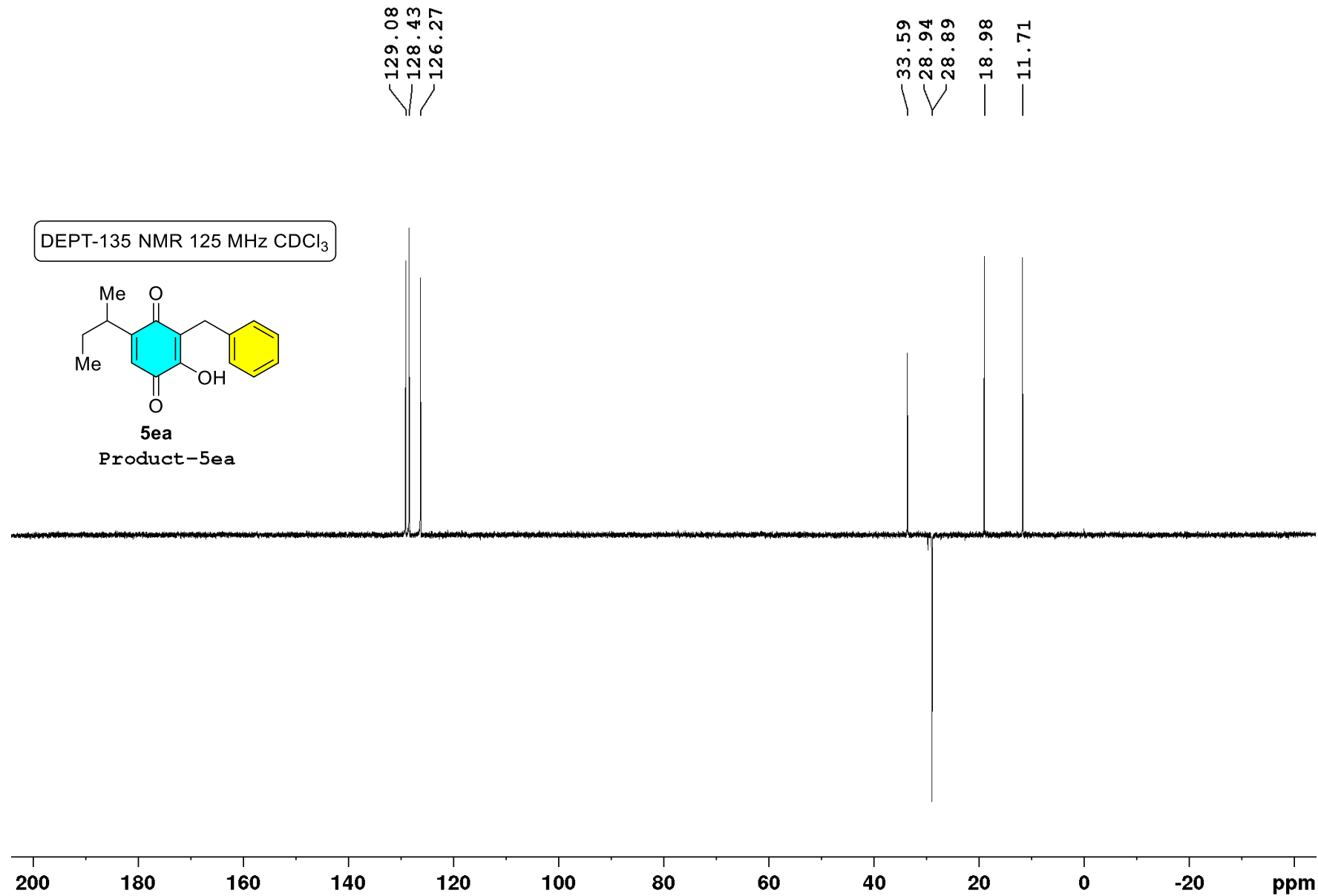


¹H NMR 500 MHz CDCl₃

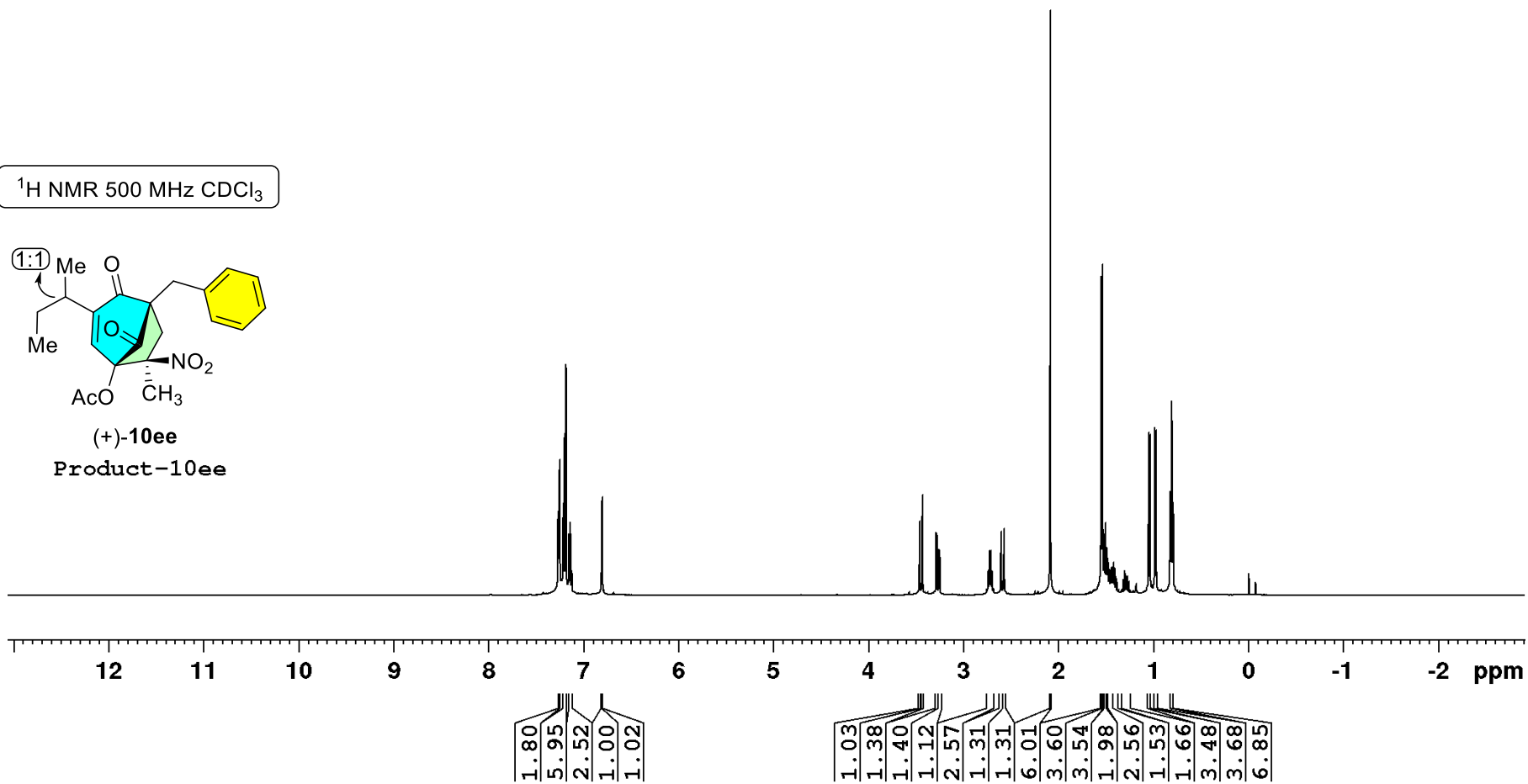
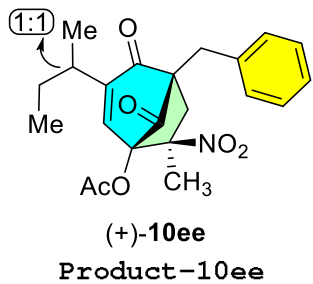


$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3

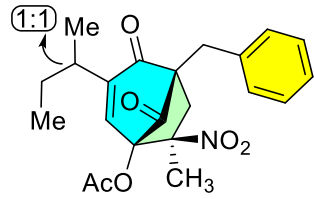




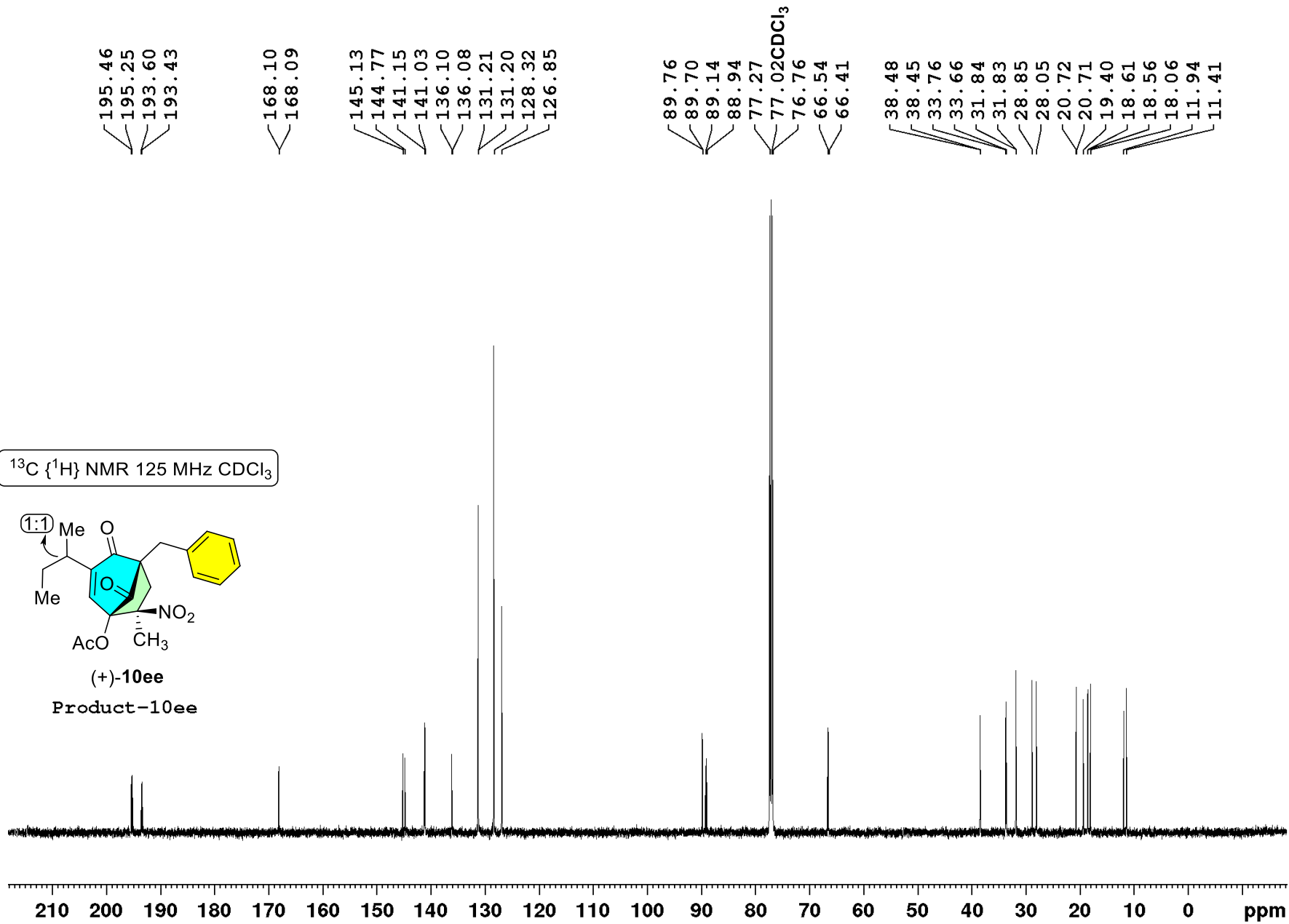
¹H NMR 500 MHz CDCl₃



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



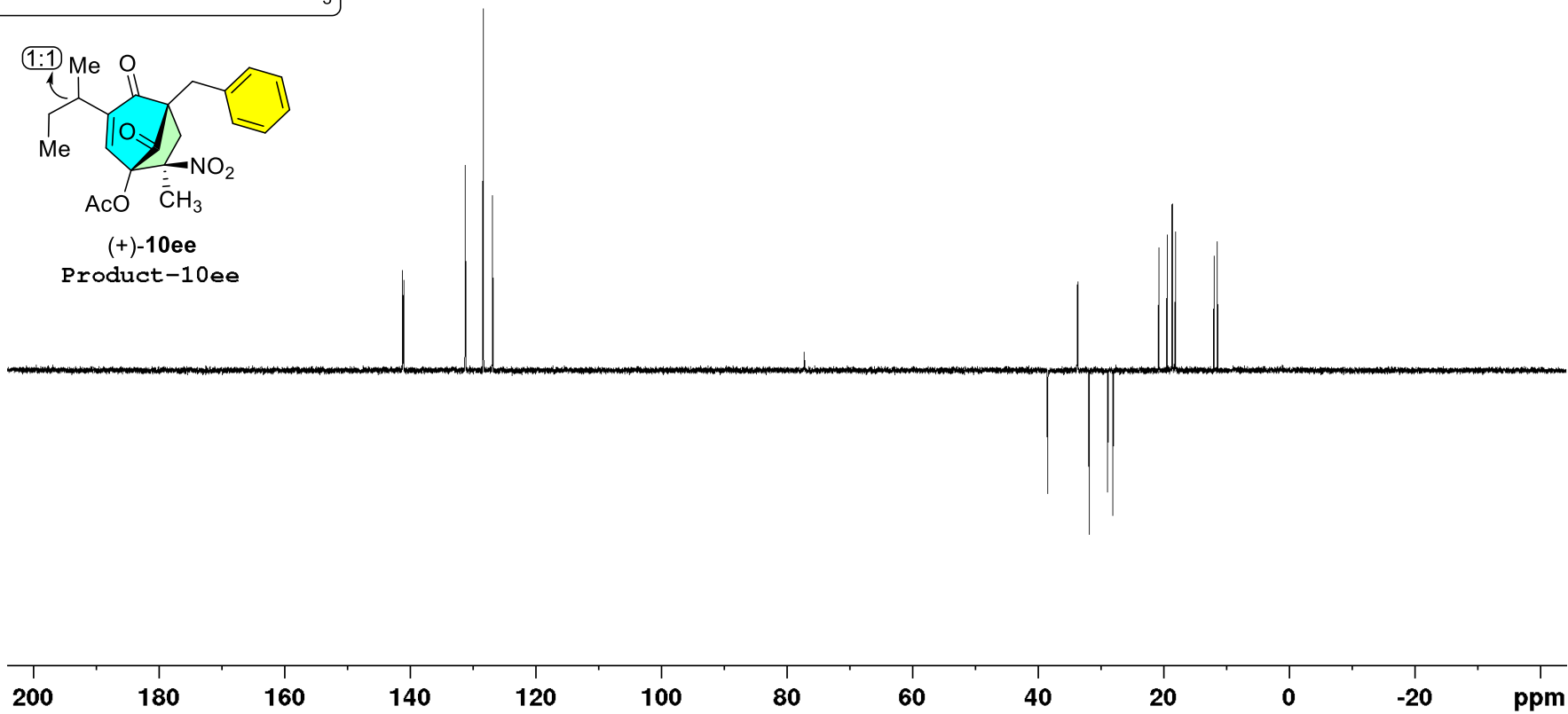
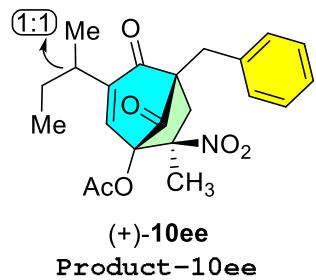
(+)-10ee
Product-10ee

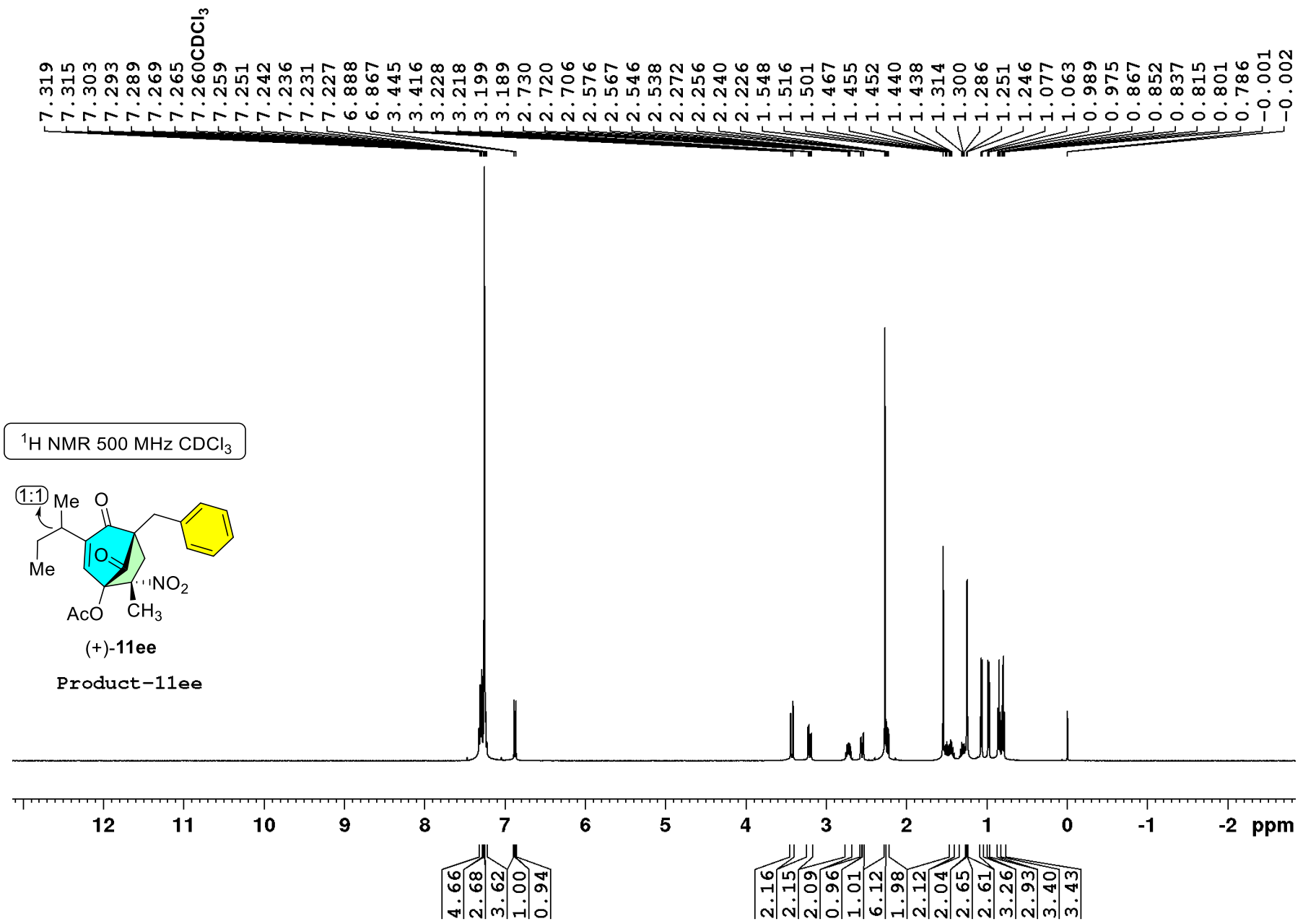


141.17
141.03
131.22
128.33
126.86

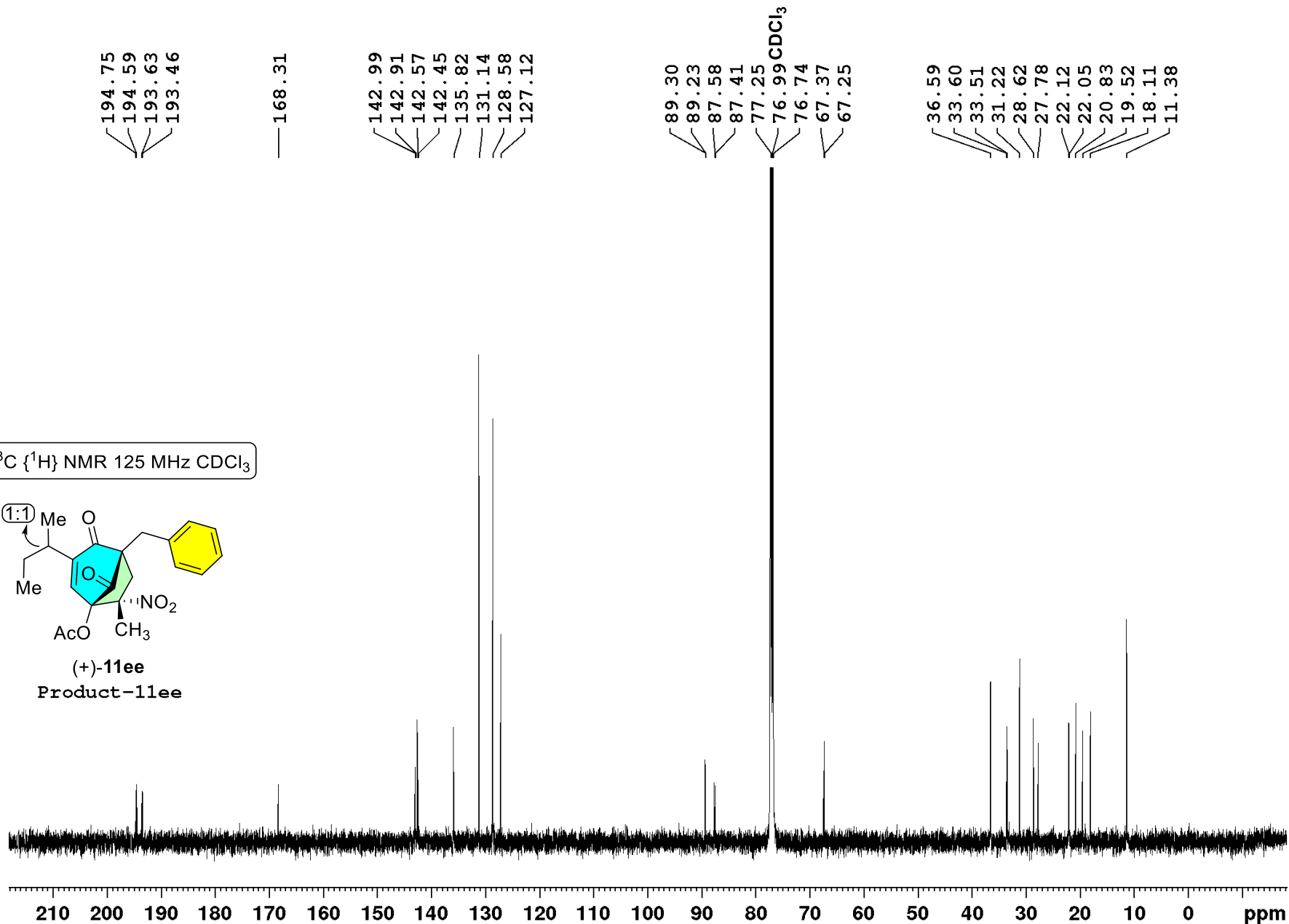
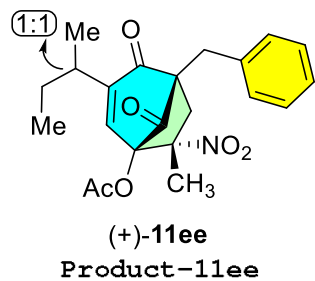
38.45
38.42
33.74
33.64
31.83
31.82
28.86
28.04
20.74
20.73
19.42
18.61
18.56
18.06
11.95
11.42

DEPT-135 NMR 125 MHz CDCl₃





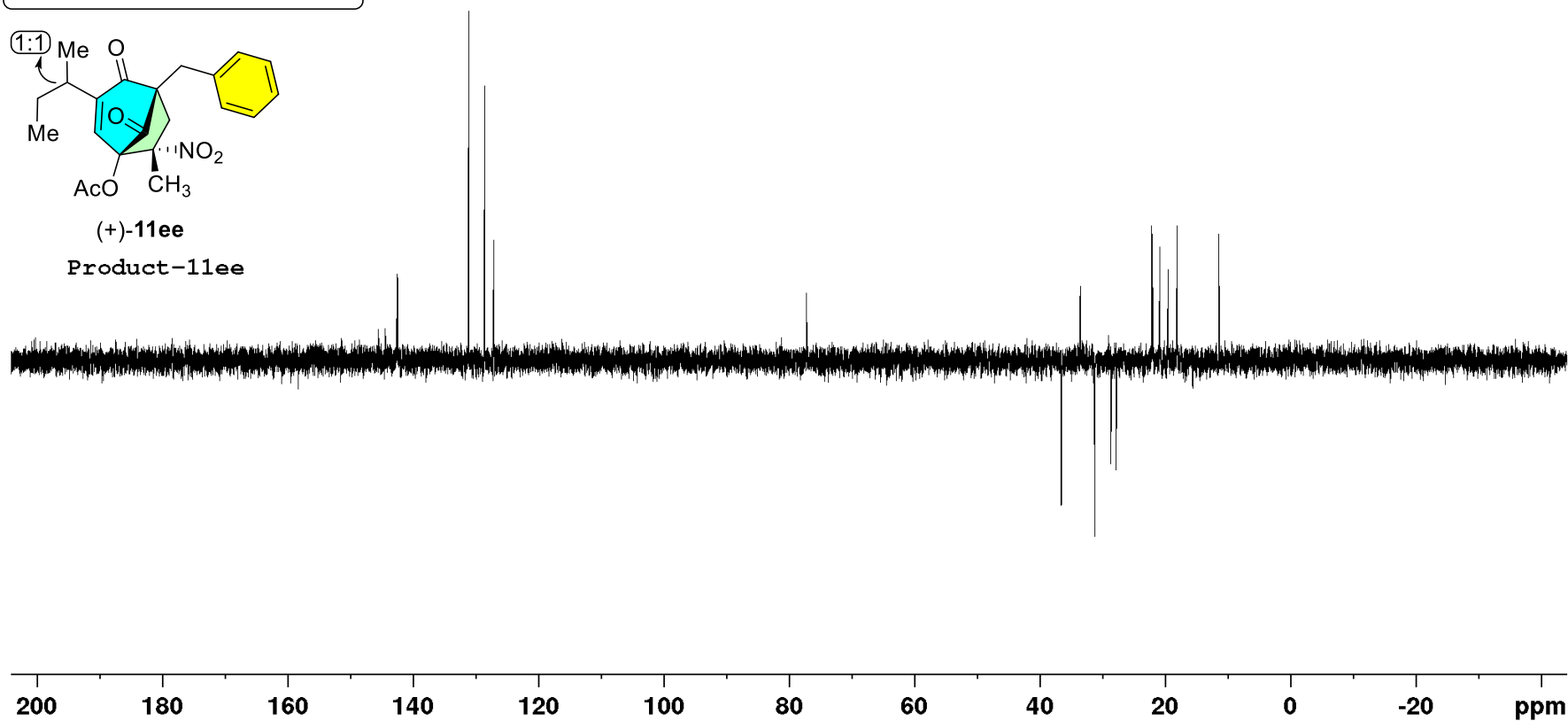
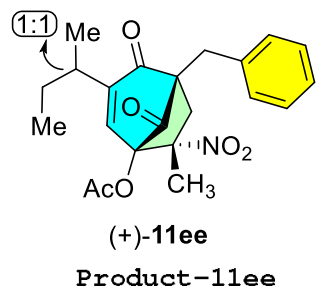
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



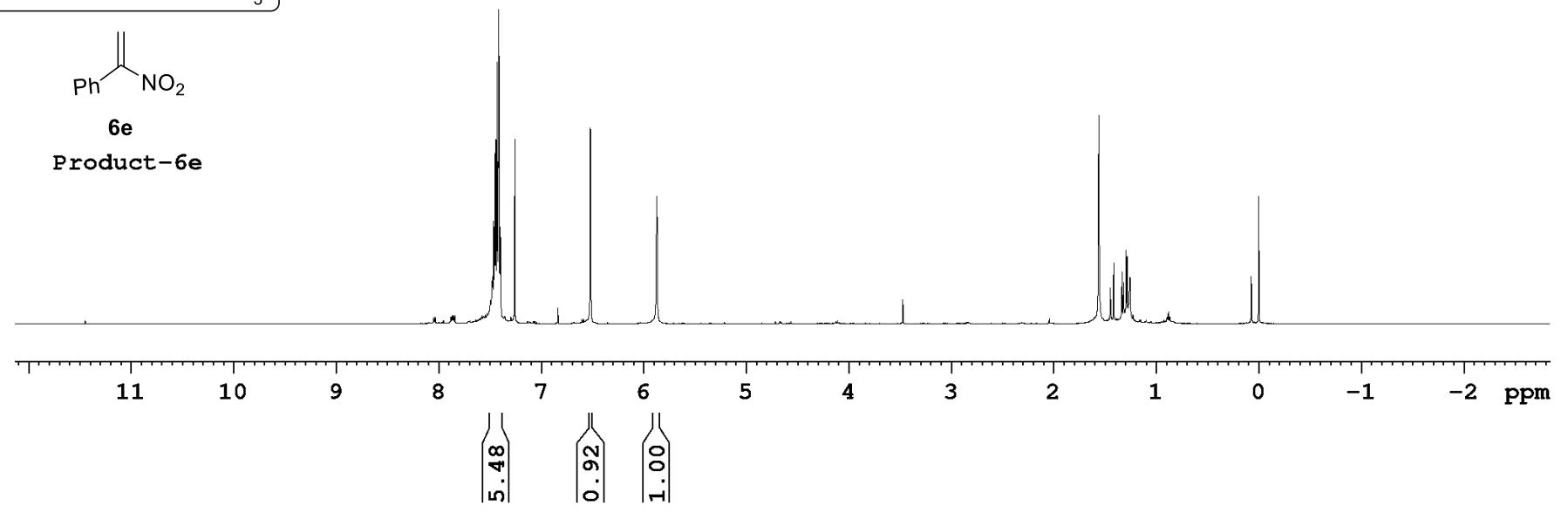
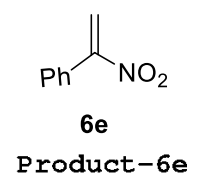
142.57
142.45
131.14
128.58
127.14

36.55
33.58
33.48
31.21
28.62
27.77
22.12
22.05
20.86
19.55
18.11
11.39

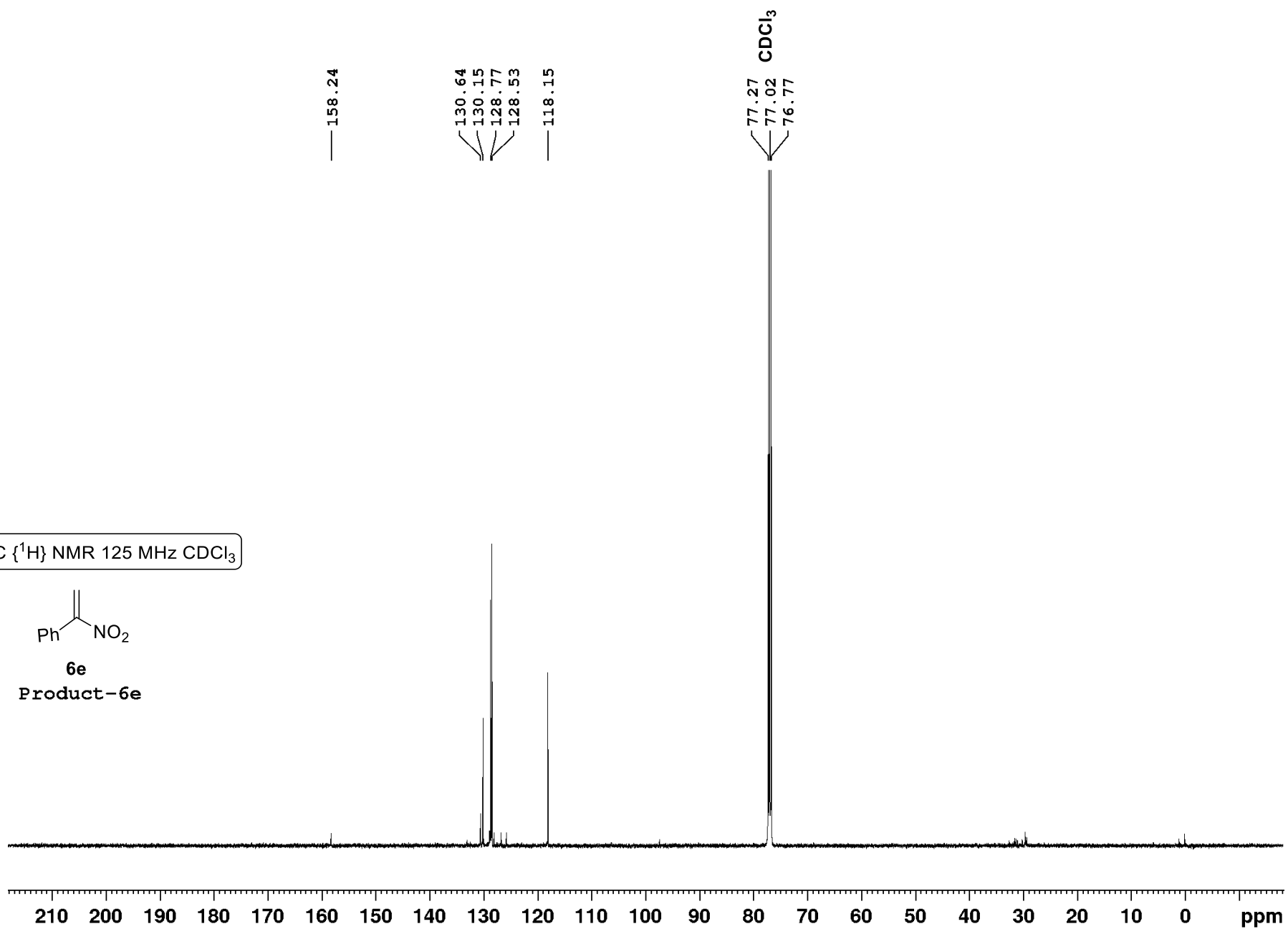
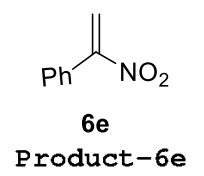
DEPT-135 NMR 125 MHz CDCl₃



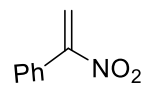
¹H NMR 500 MHz CDCl₃



^{13}C { ^1H } NMR 125 MHz CDCl_3

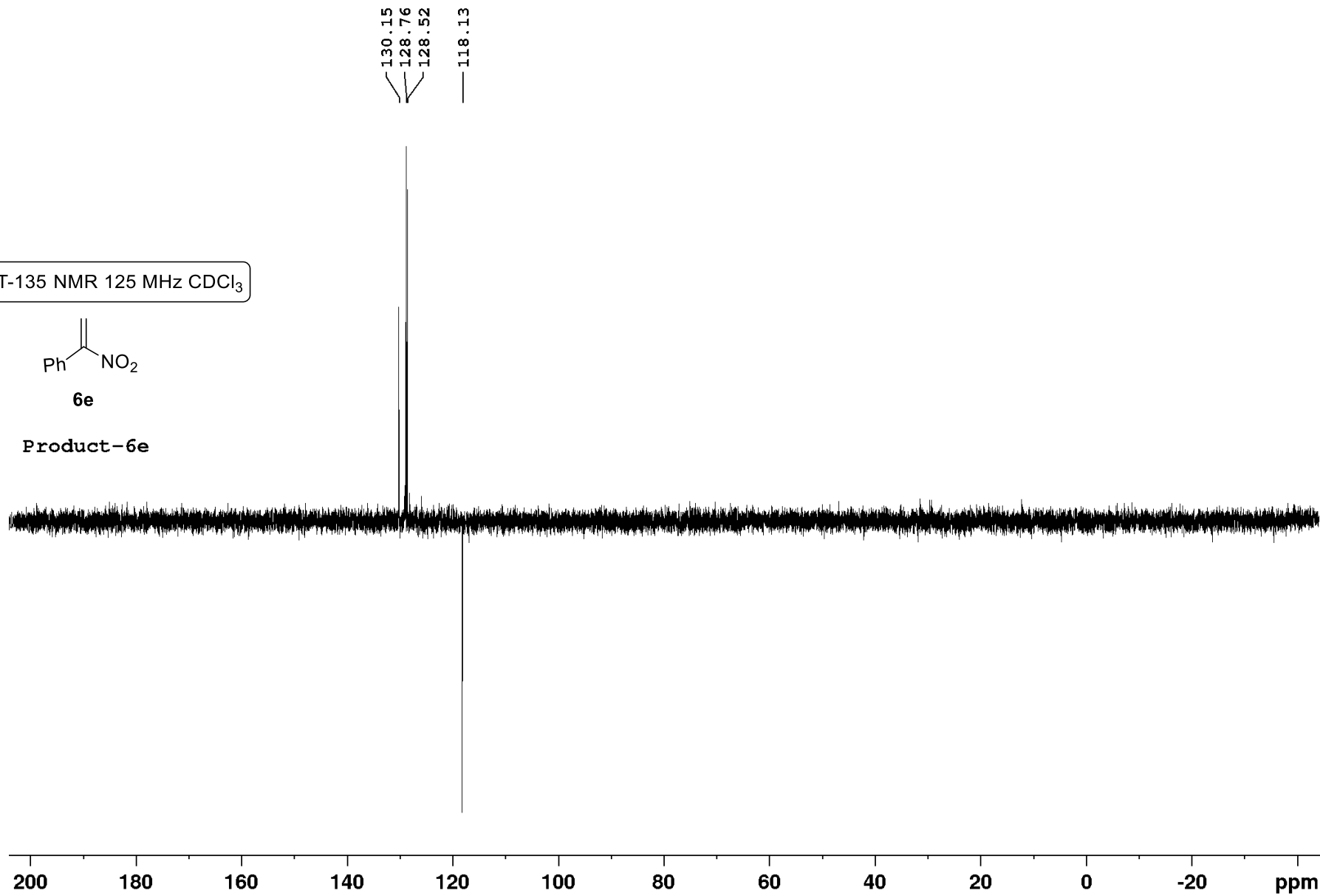


DEPT-135 NMR 125 MHz CDCl₃

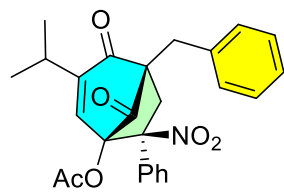


6e

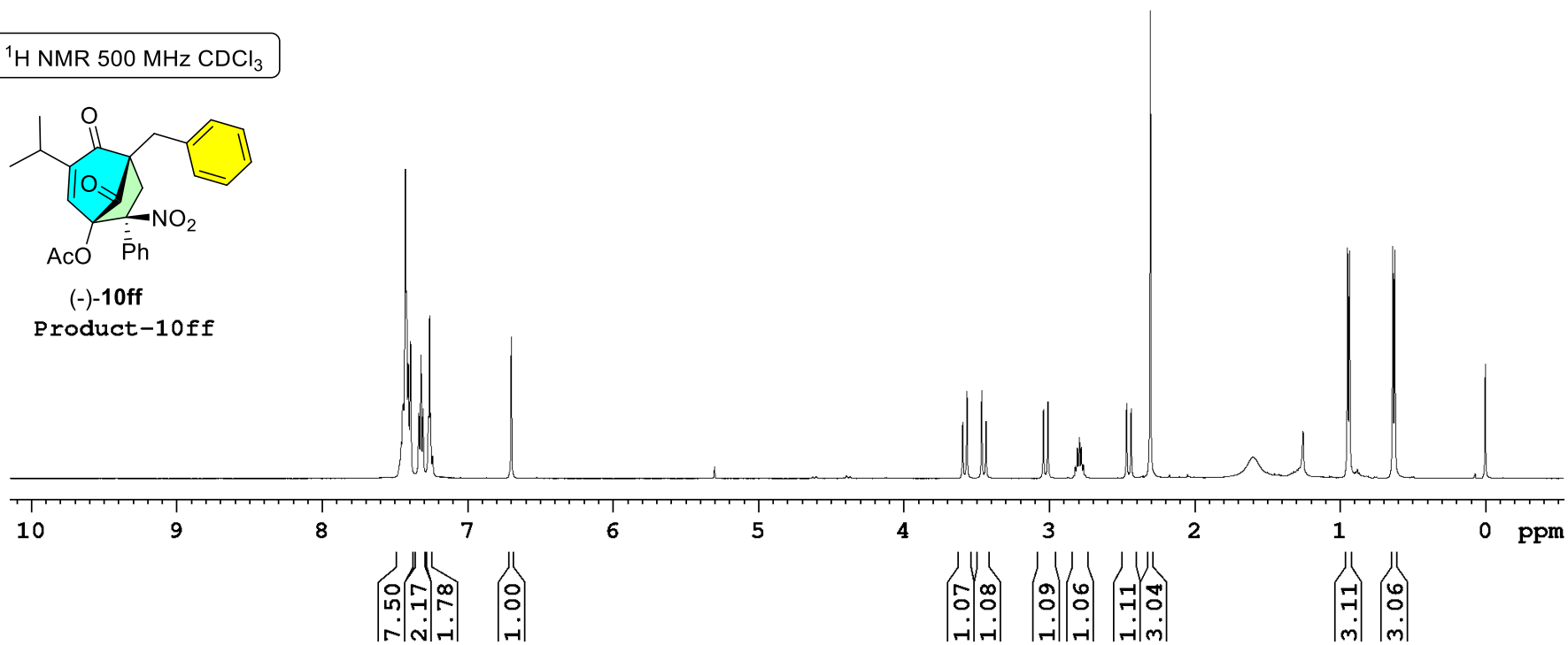
Product-6e



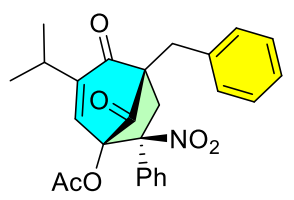
¹H NMR 500 MHz CDCl₃



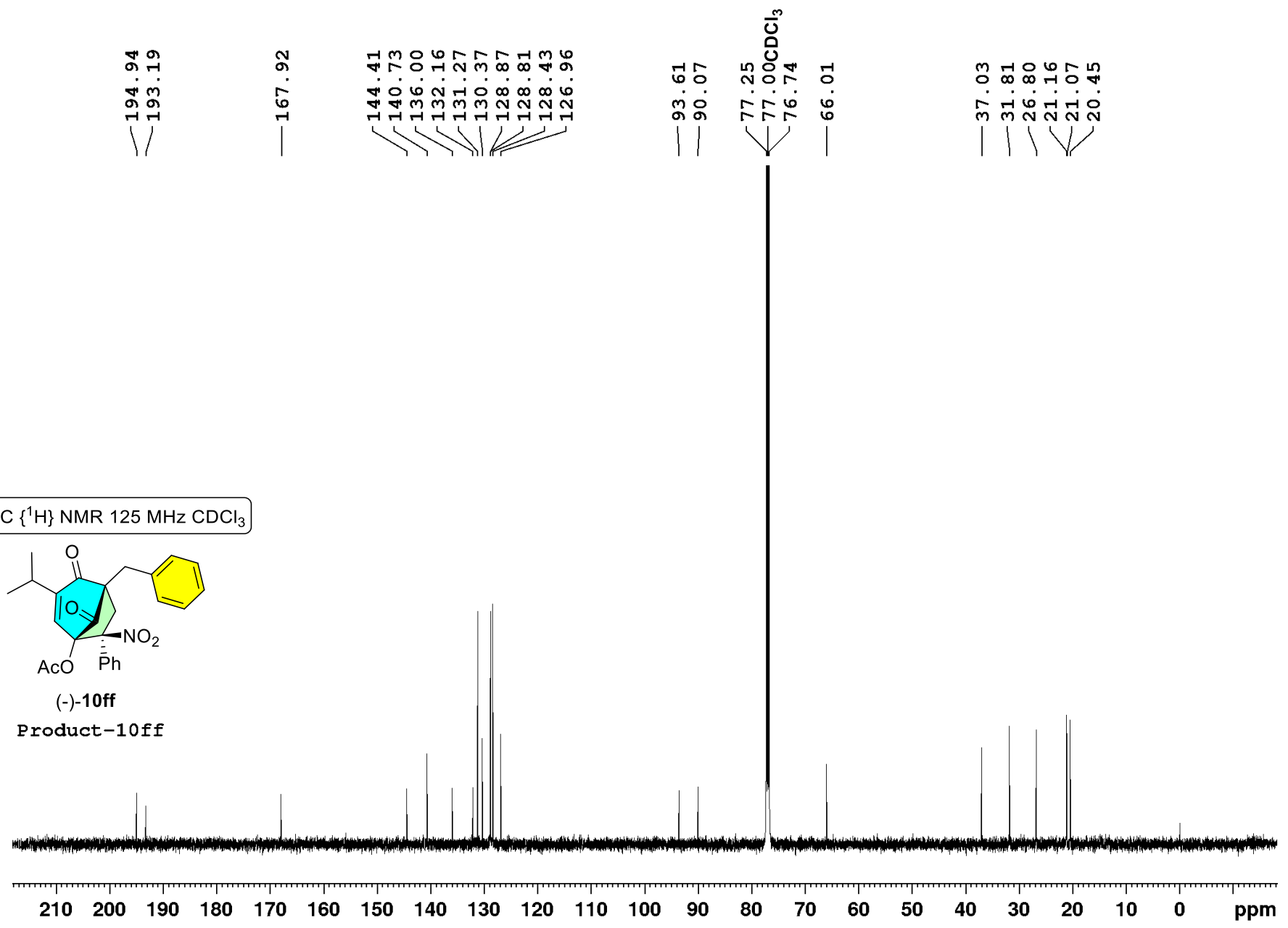
(-)-10ff
Product-10ff



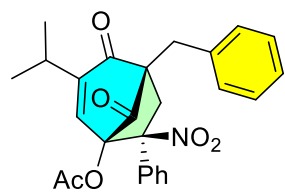
$^{13}\text{C} \{^1\text{H}\}$ NMR 125 MHz CDCl_3



(-)-10ff
Product-10ff



DEPT-135 NMR 125 MHz CDCl₃



(-)-10ff
Product-10ff

140.72
131.27
130.39
128.86
128.81
128.43
126.97

36.99
31.79
26.78
21.17
21.09
20.45

