



Supporting Information

for

Bifurcated synthesis of methylene-lactone- and methylene-lactam-fused spirolactams via electrophilic amide allylation of γ -phenylthio-functionalized γ -lactams

Tetsuya Sengoku, Koki Makino, Ayumi Iijima, Toshiyasu Inuzuka and Hidemi Yoda

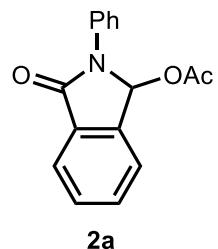
Beilstein J. Org. Chem. **2020**, *16*, 2769–2775. doi:10.3762/bjoc.16.227

Copies of ^1H and ^{13}C NMR spectra of all new compounds

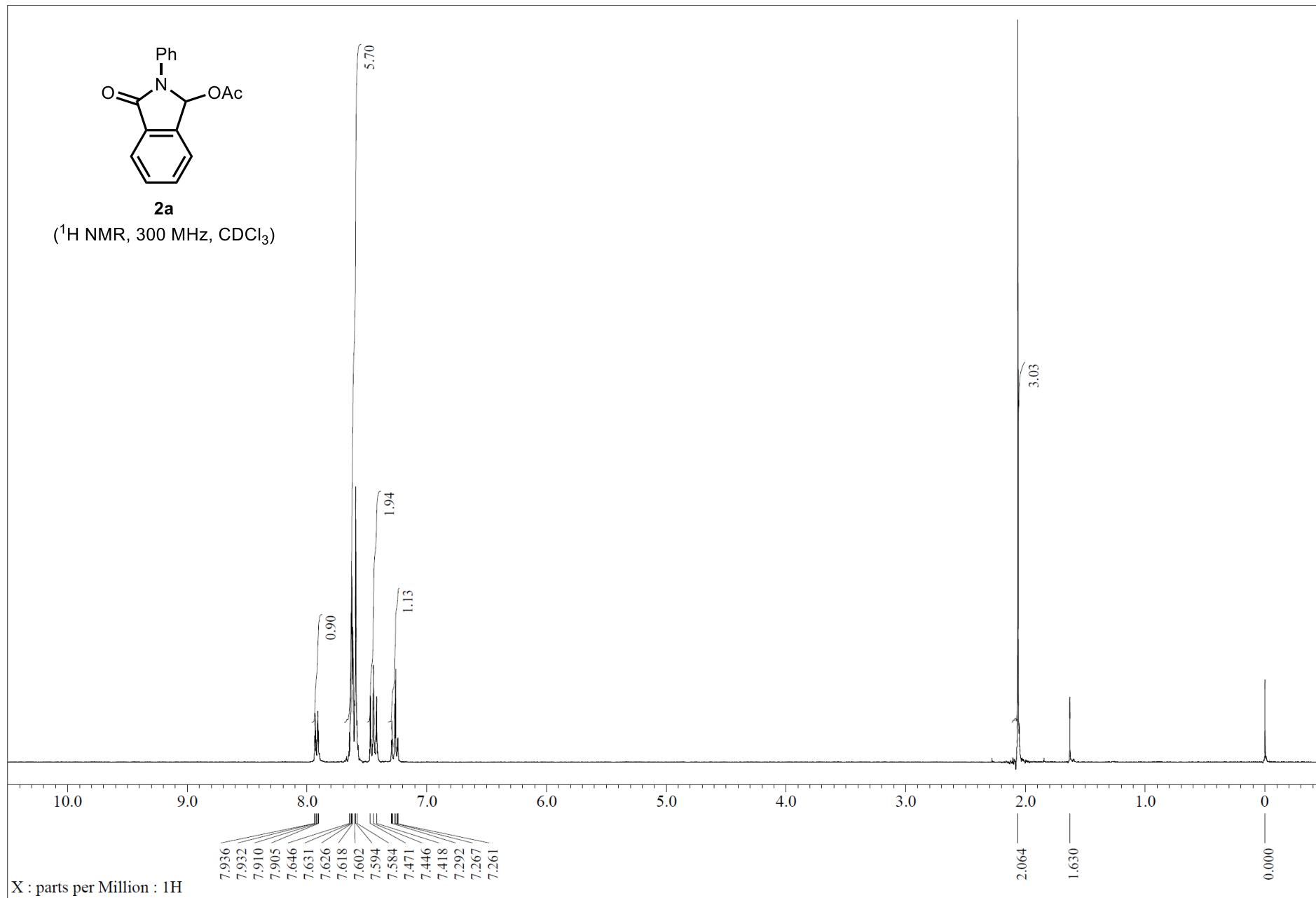
The following data are included in this material:

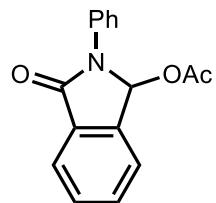
Copies of ^1H and ^{13}C NMR spectra

S2–S141



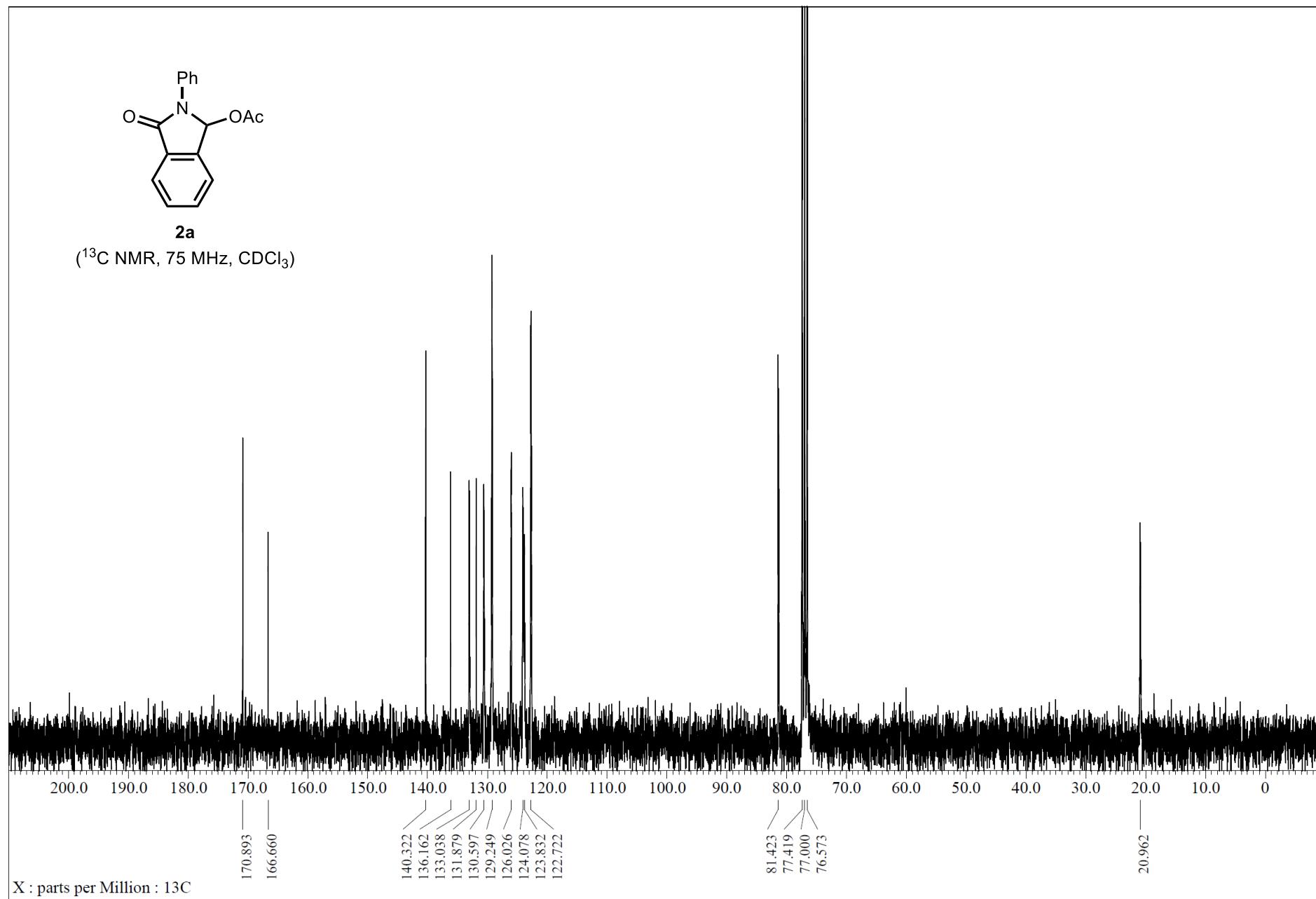
(^1H NMR, 300 MHz, CDCl_3)

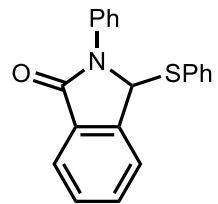




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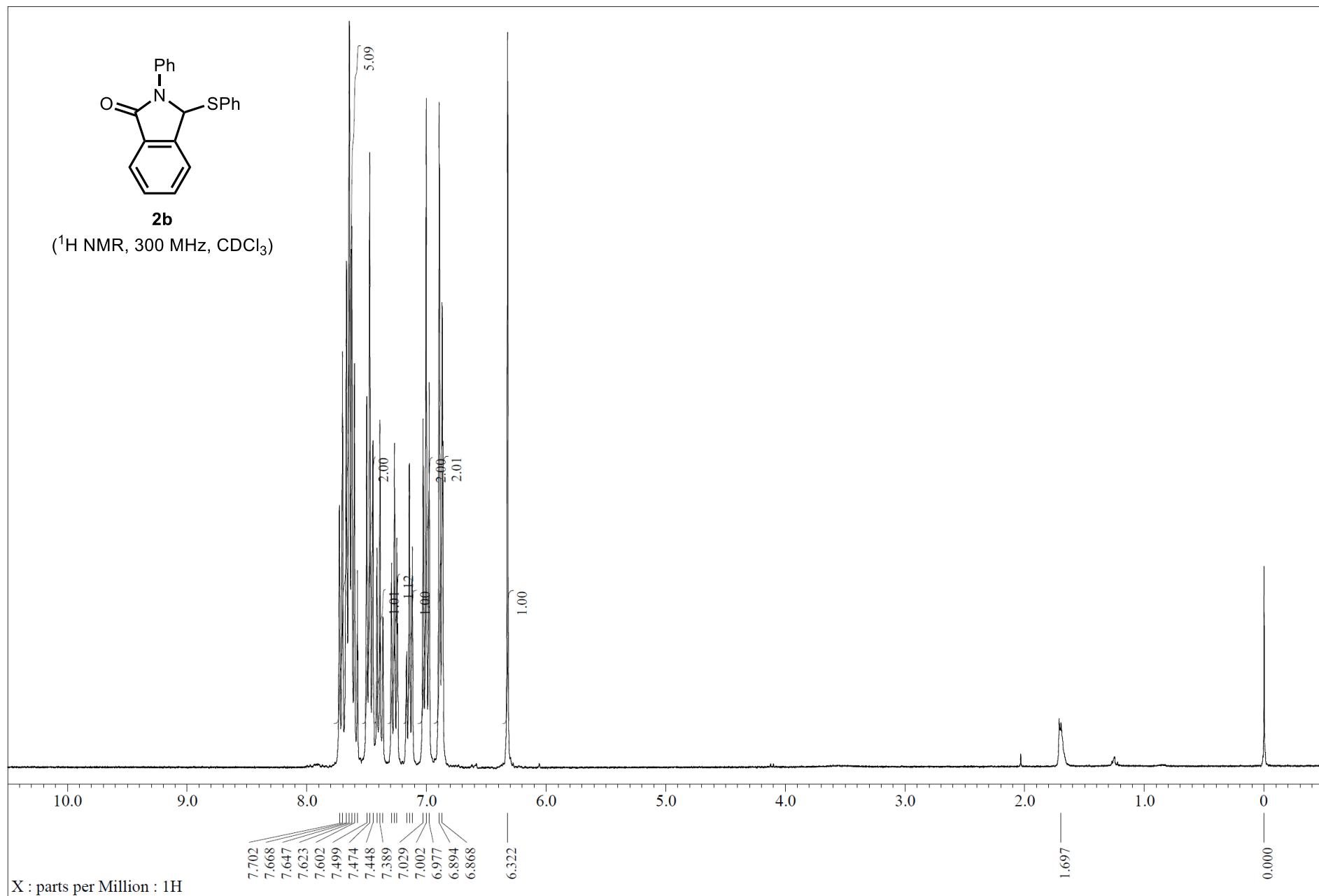
(^{13}C NMR, 75 MHz, CDCl_3)

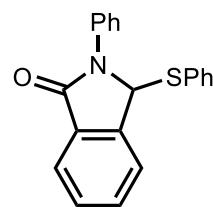




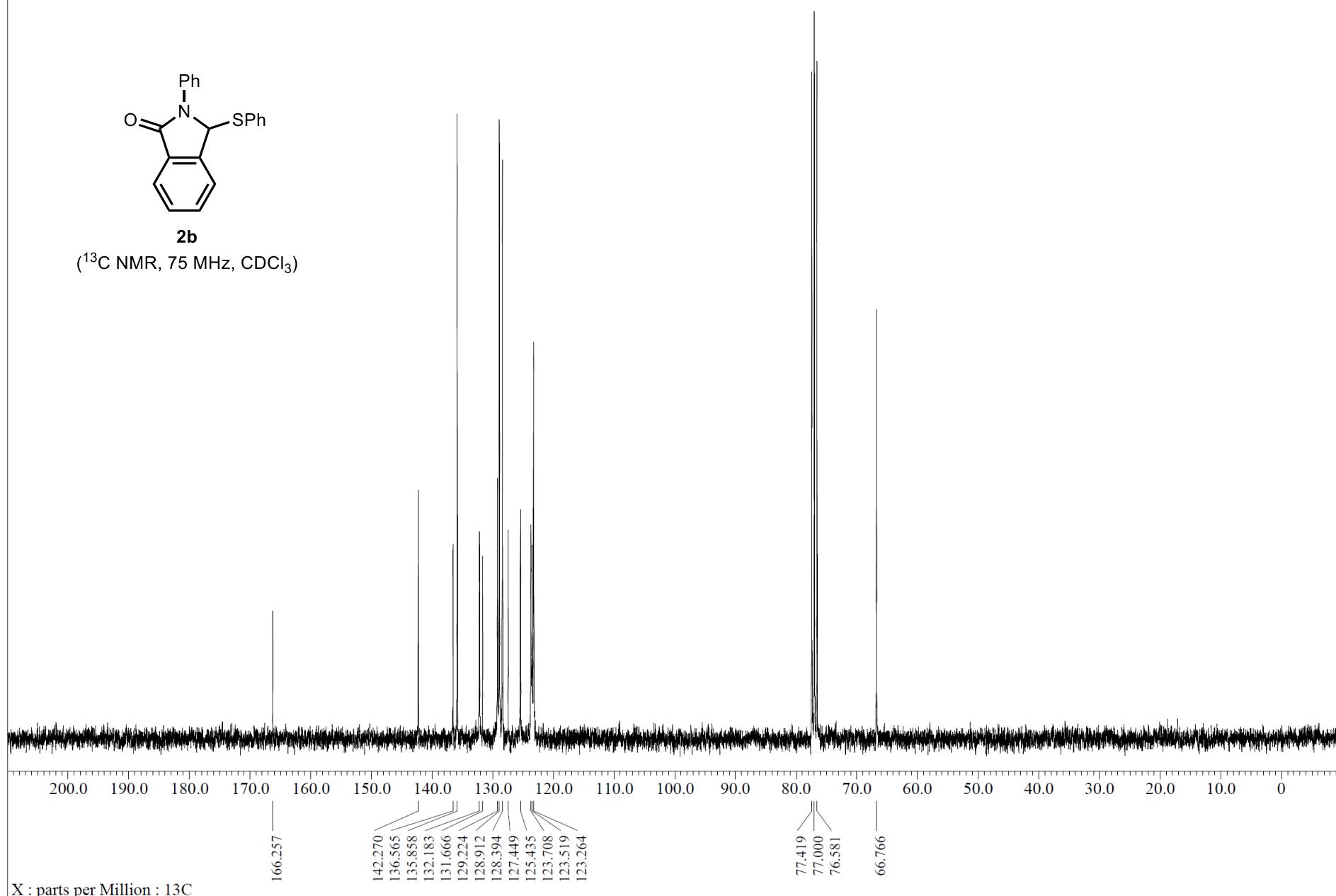
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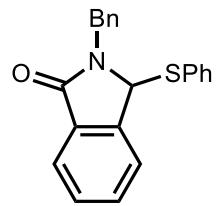
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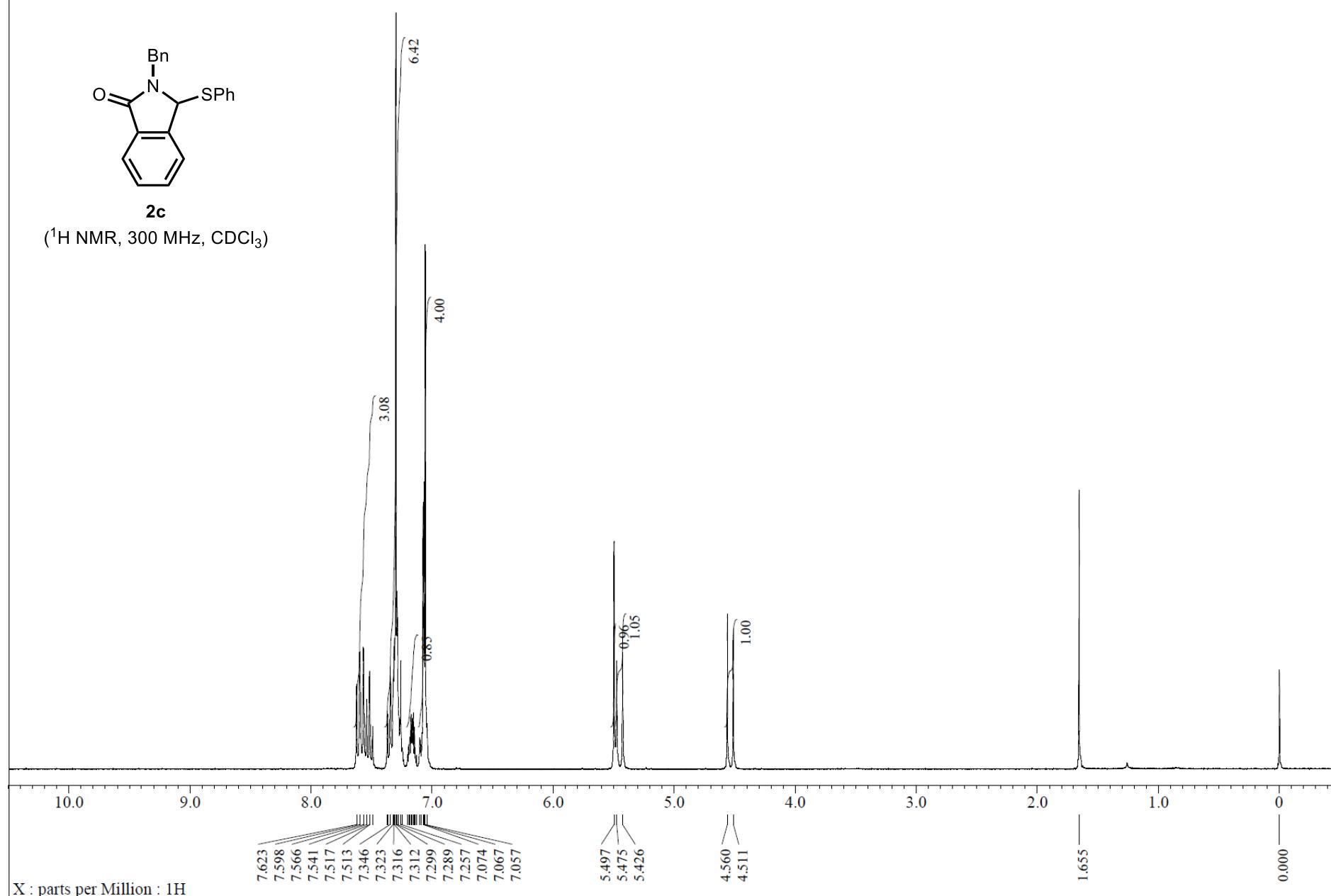
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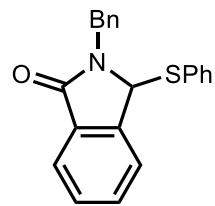




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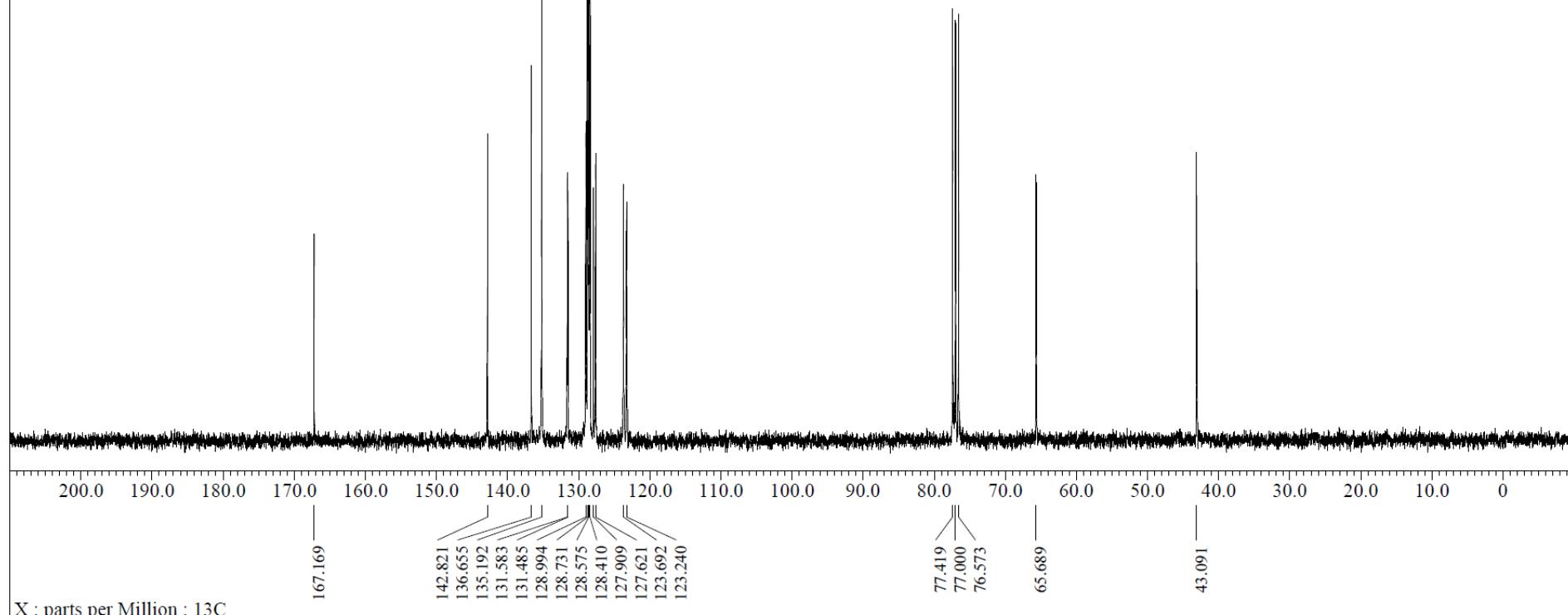
(^1H NMR, 300 MHz, CDCl_3)



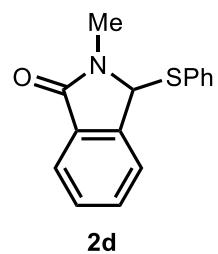


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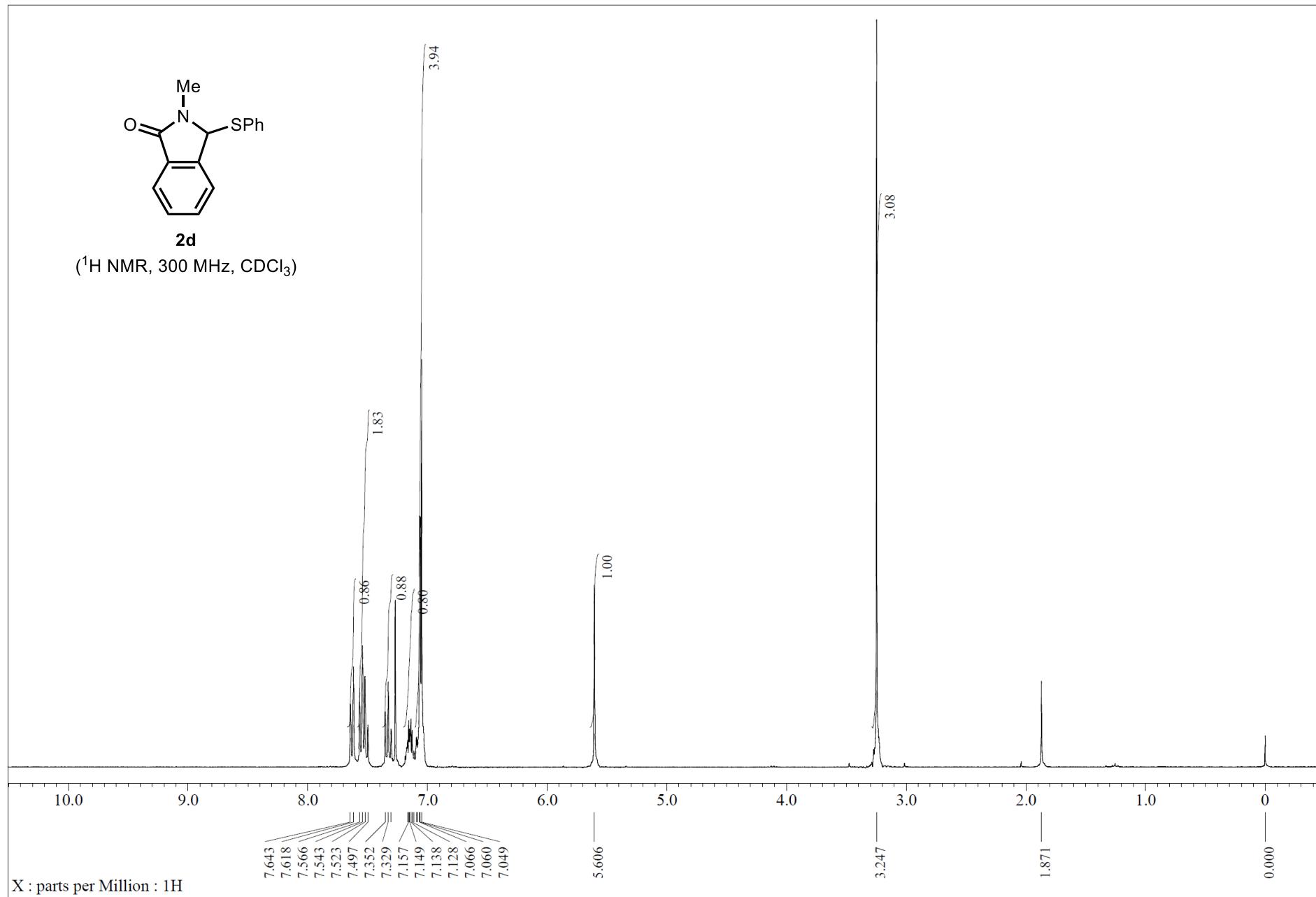
(^{13}C NMR, 75 MHz, CDCl_3)

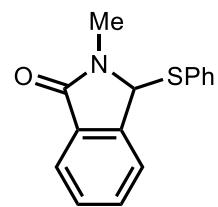


X : parts per Million : ^{13}C



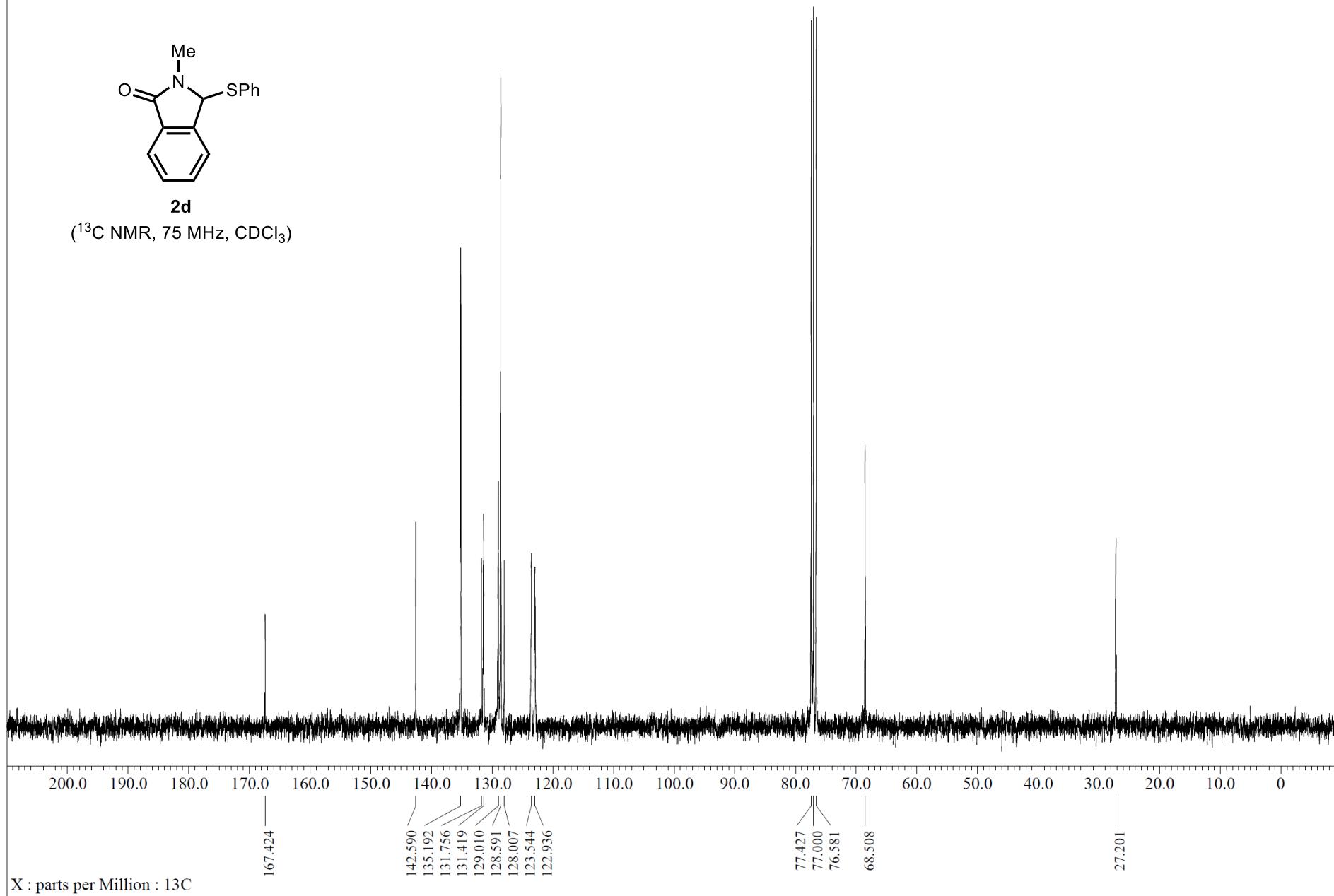
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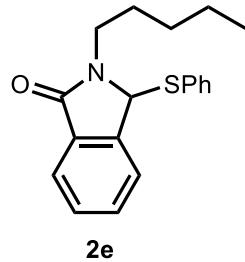


2d

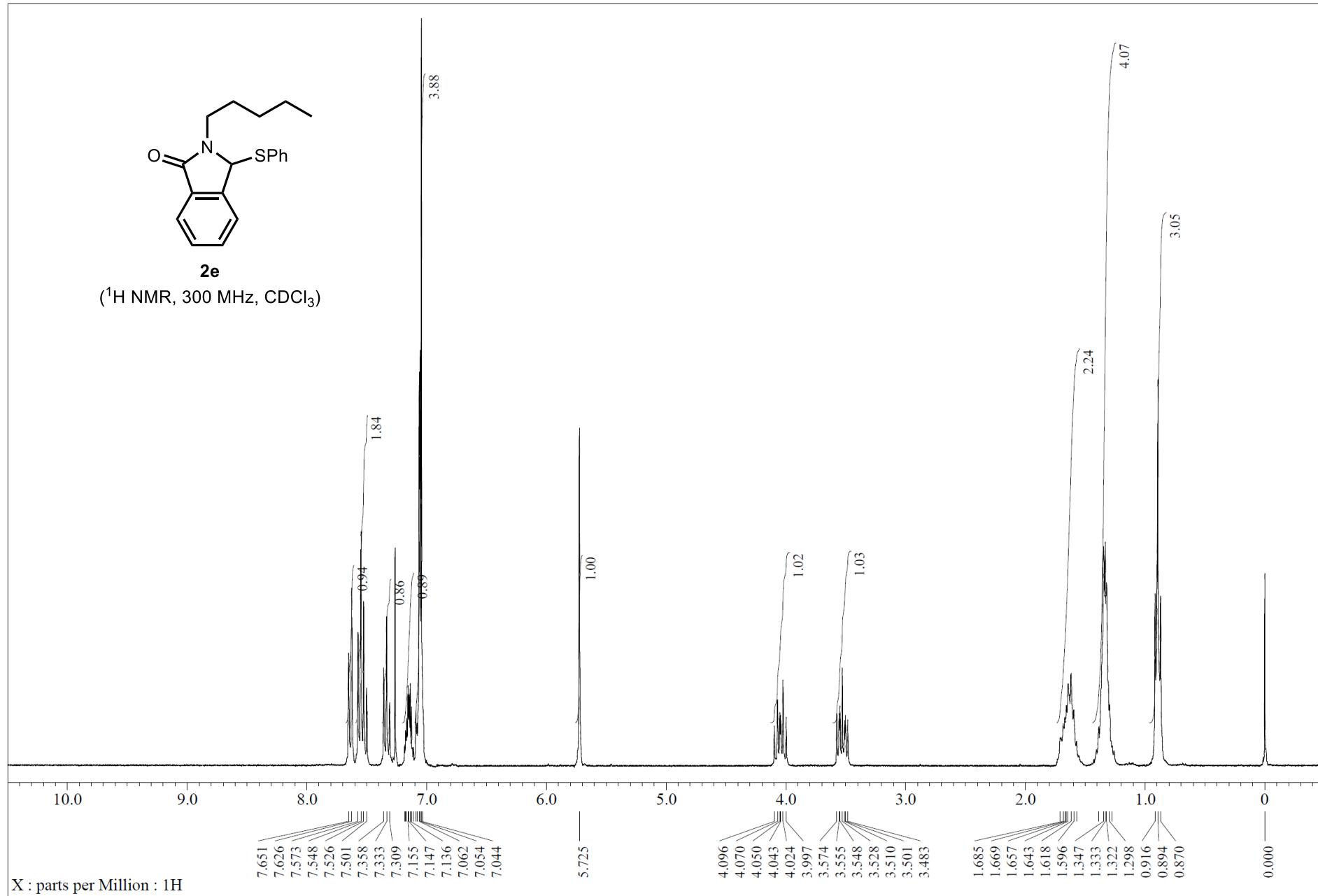
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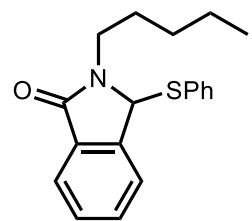


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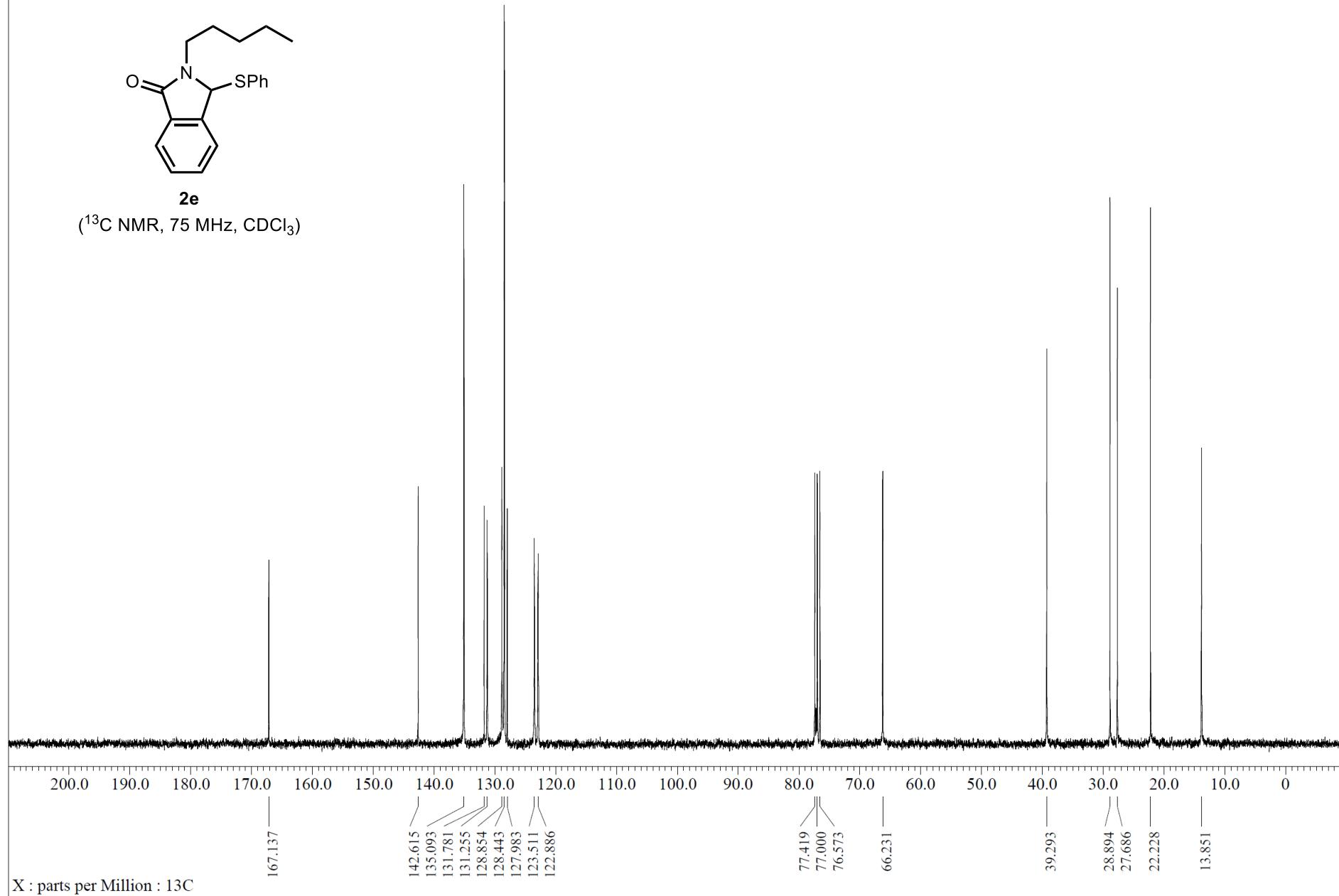
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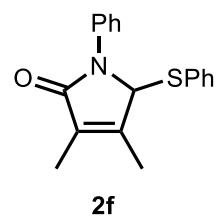




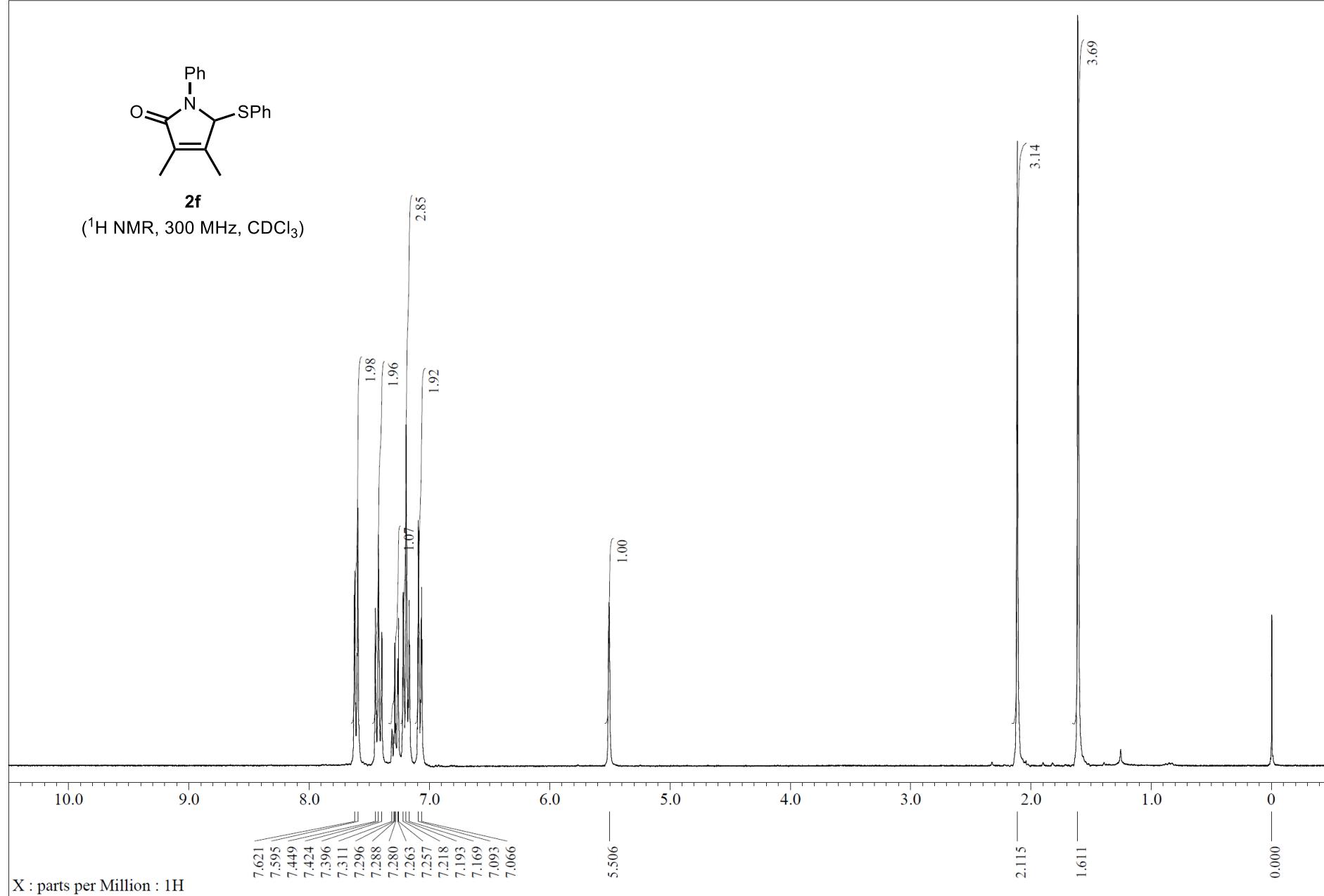
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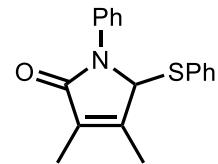
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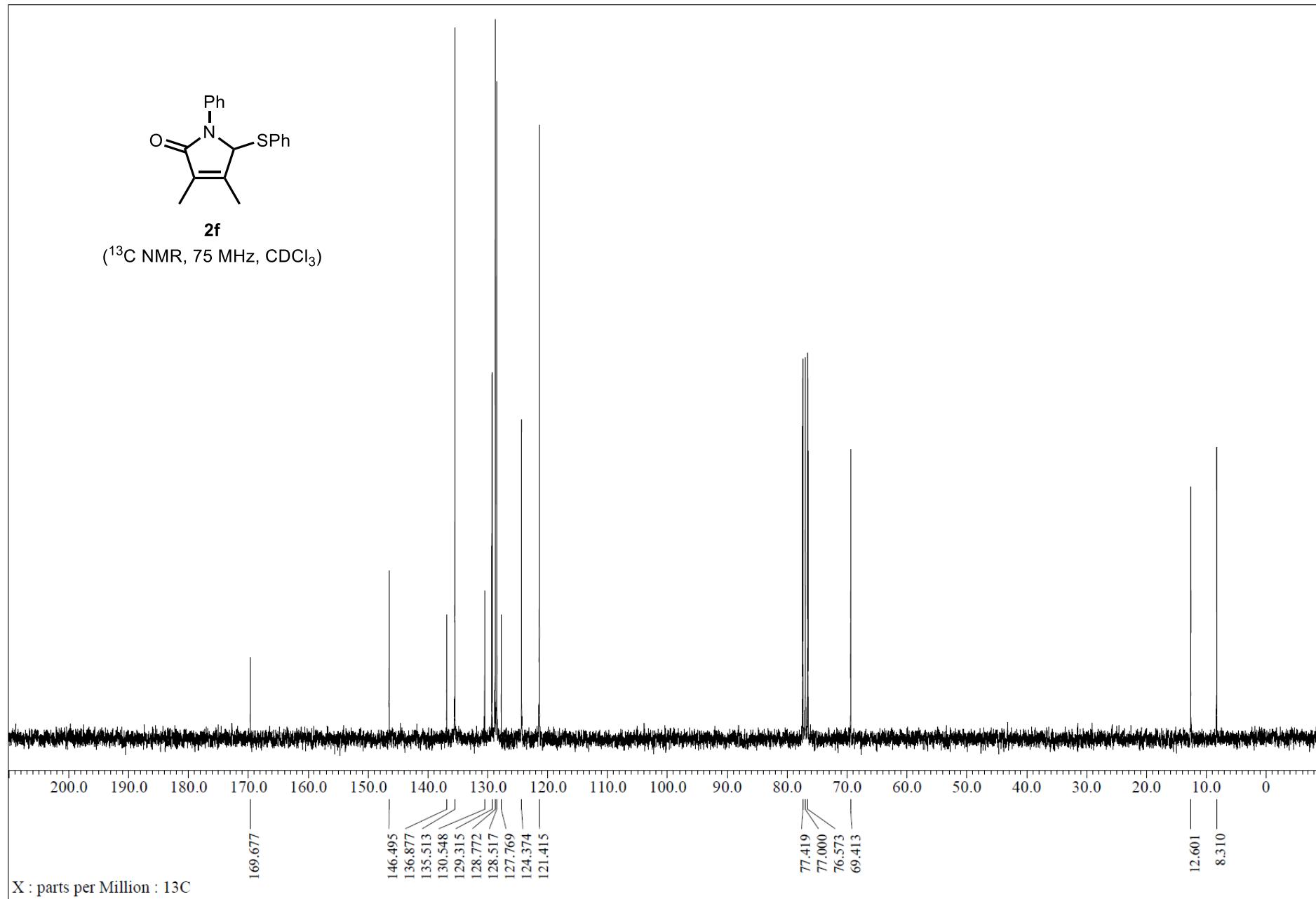


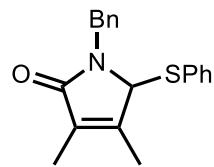
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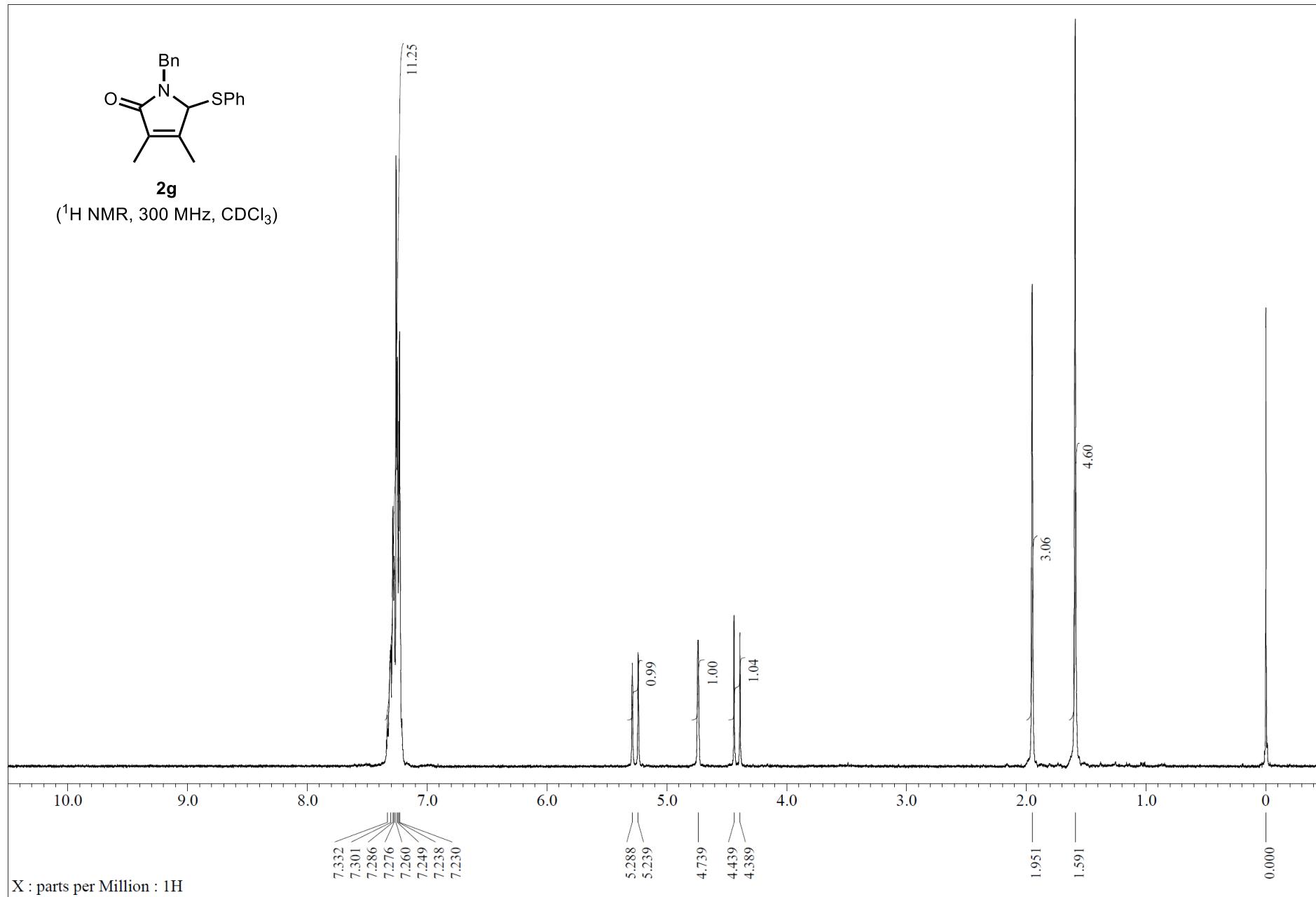
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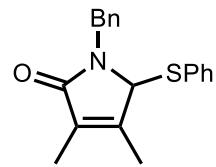




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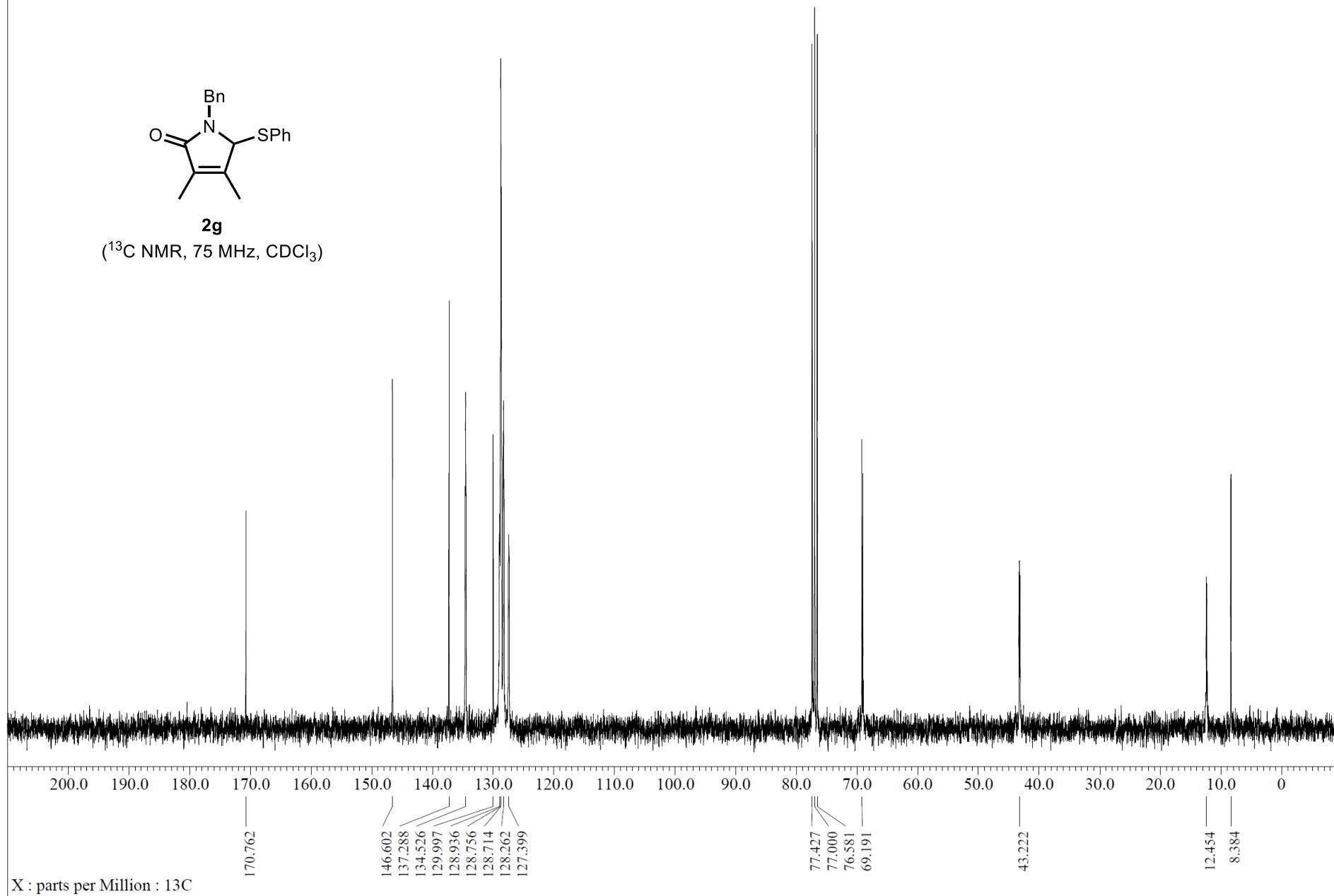
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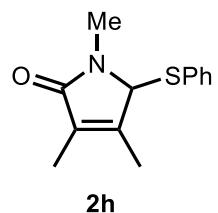


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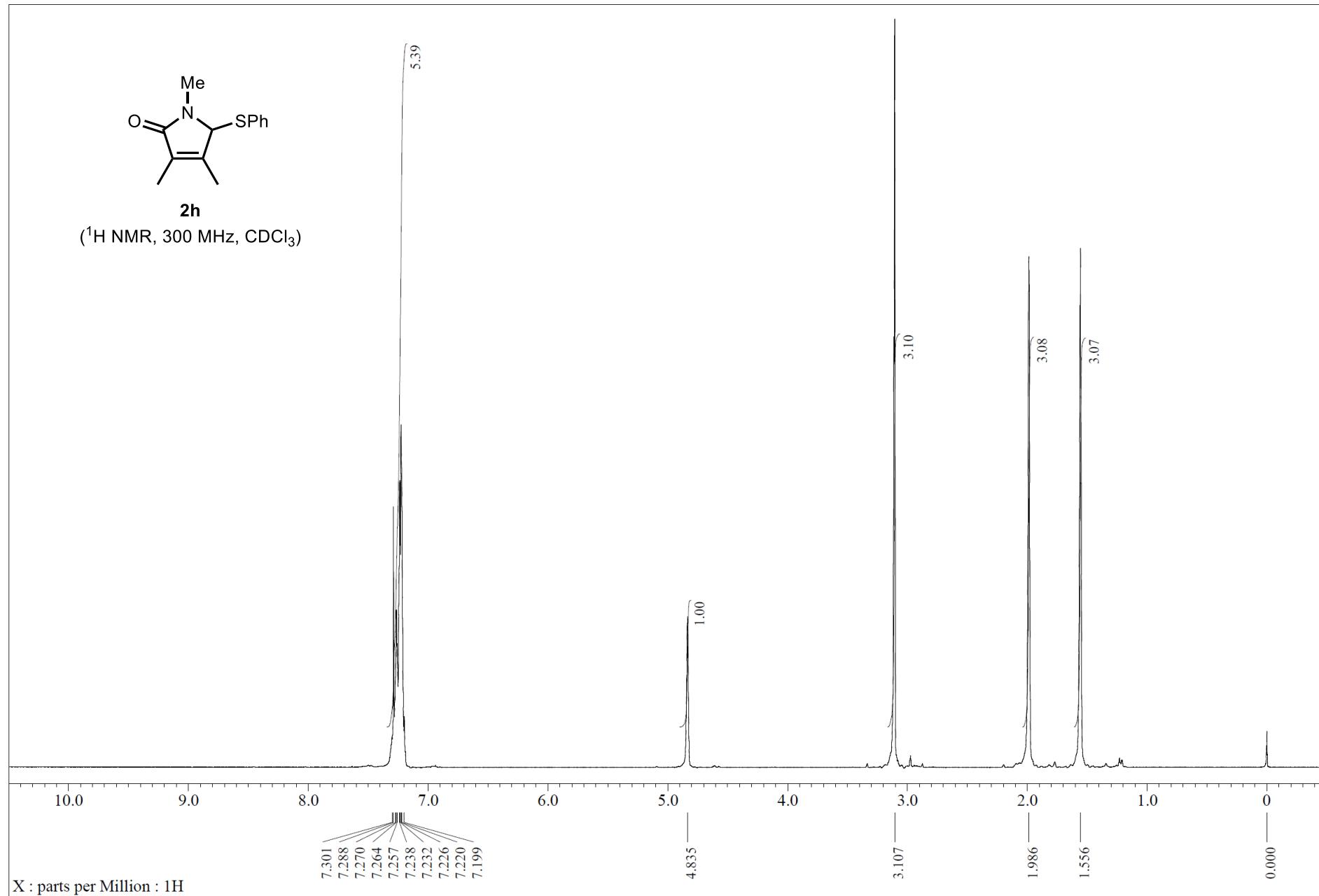
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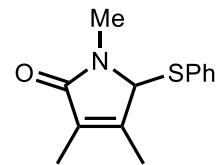


X : parts per Million : ^{13}C



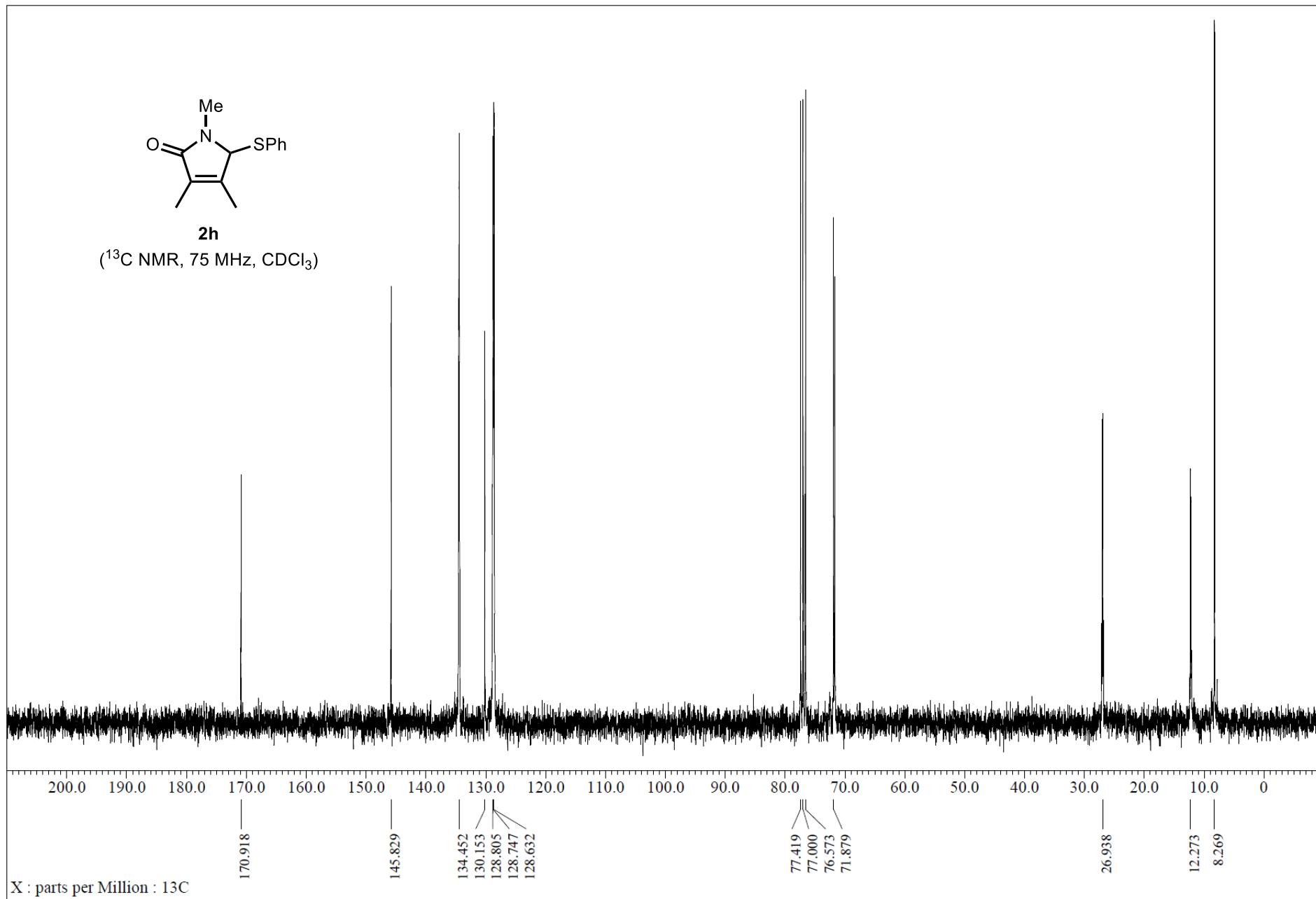
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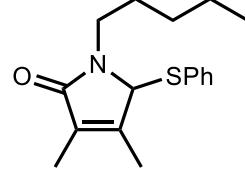




2h

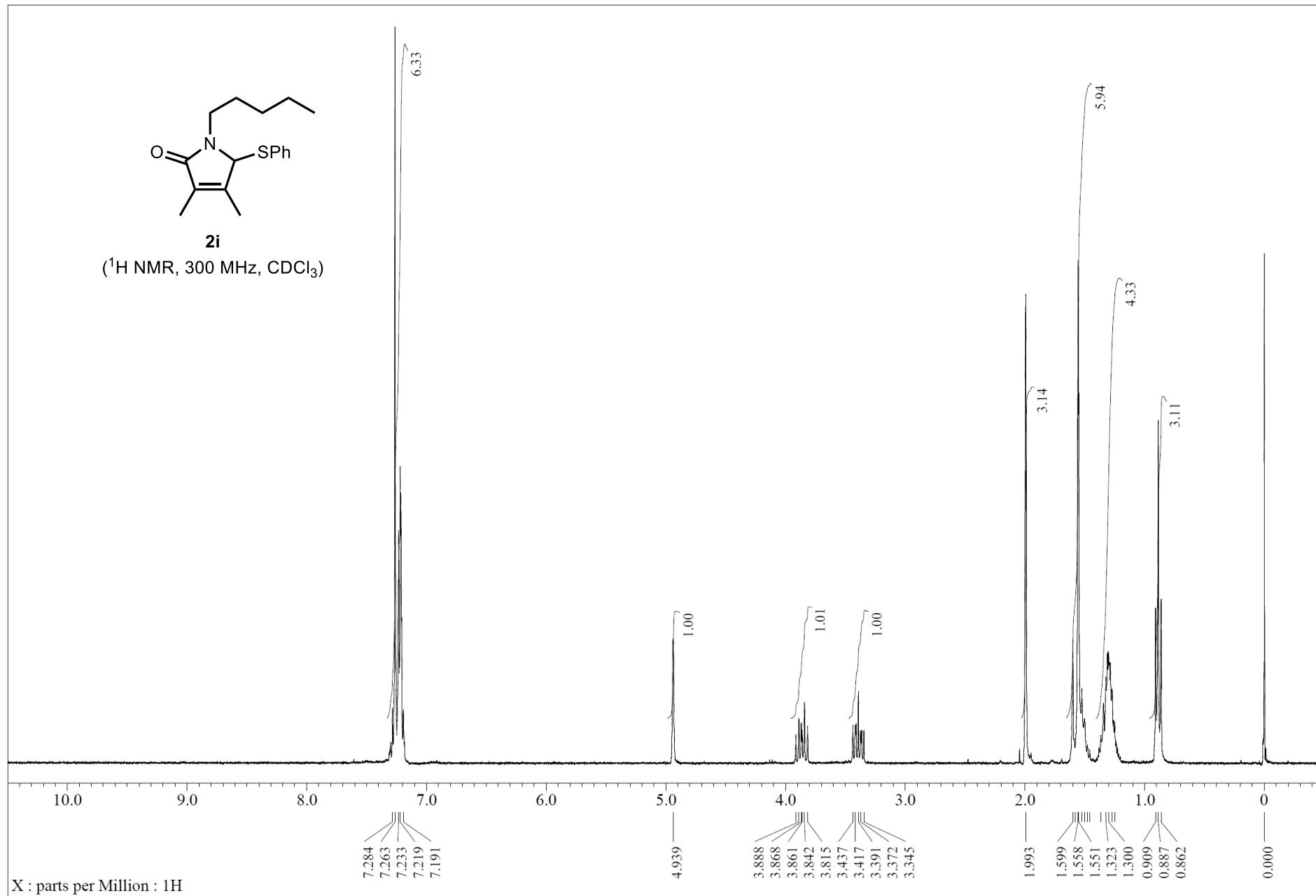
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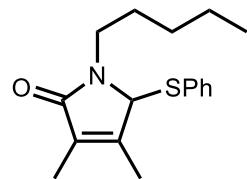


2i

(^1H NMR, 300 MHz, CDCl_3)

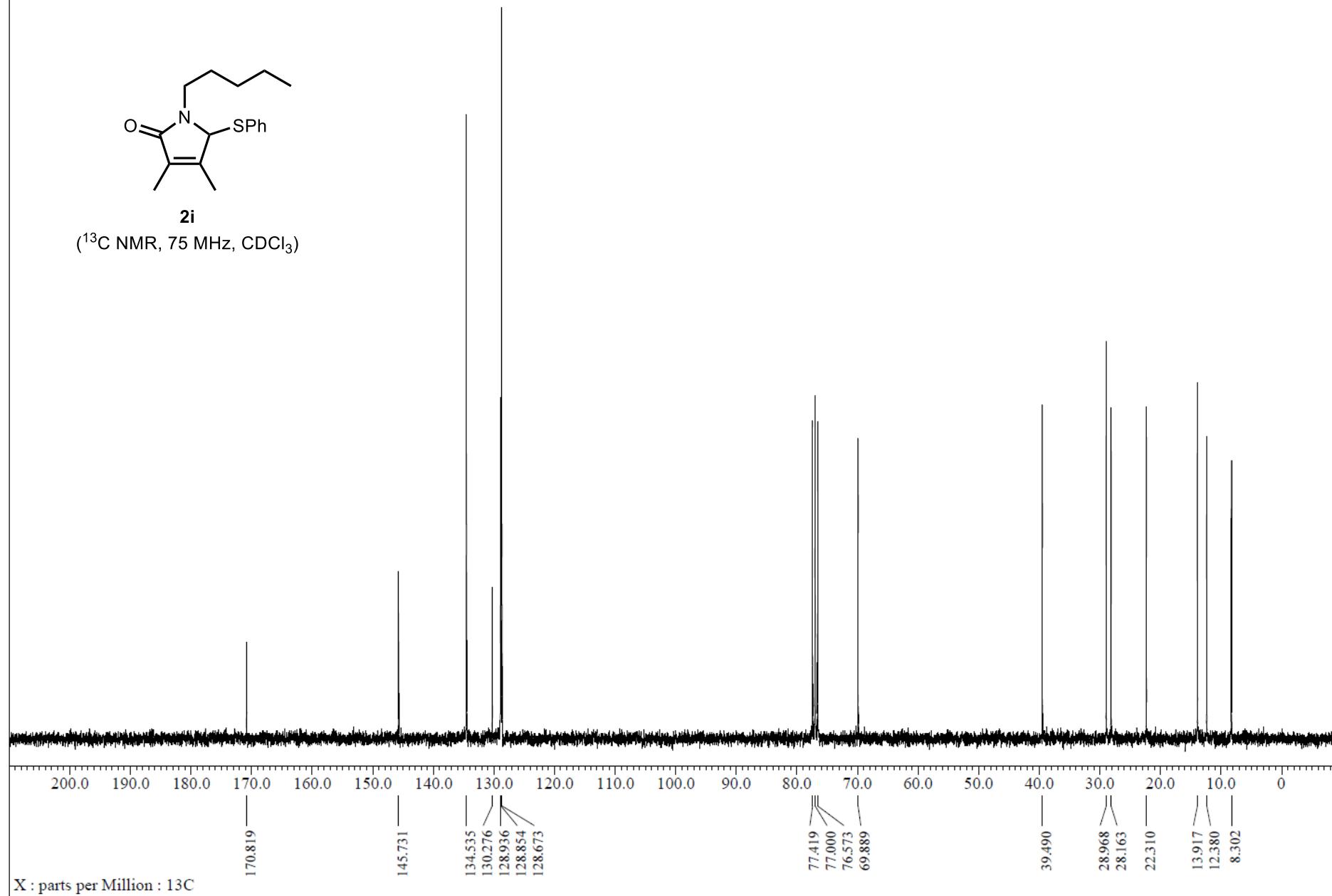


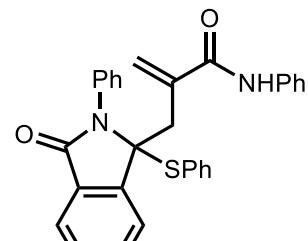
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2i

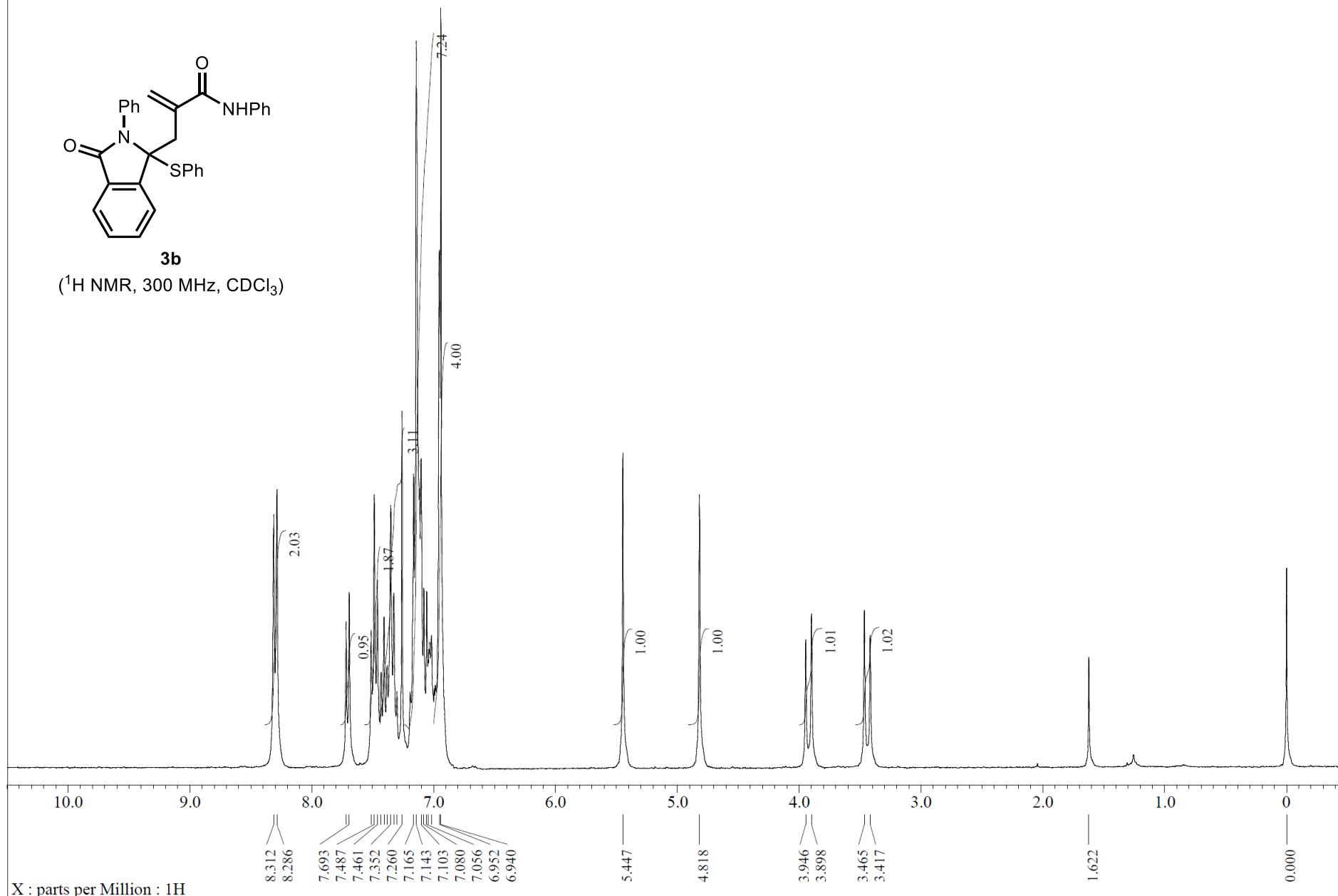
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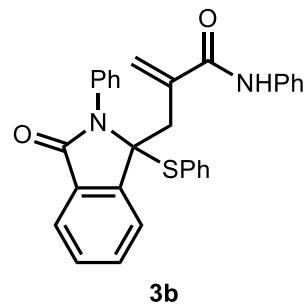


3b

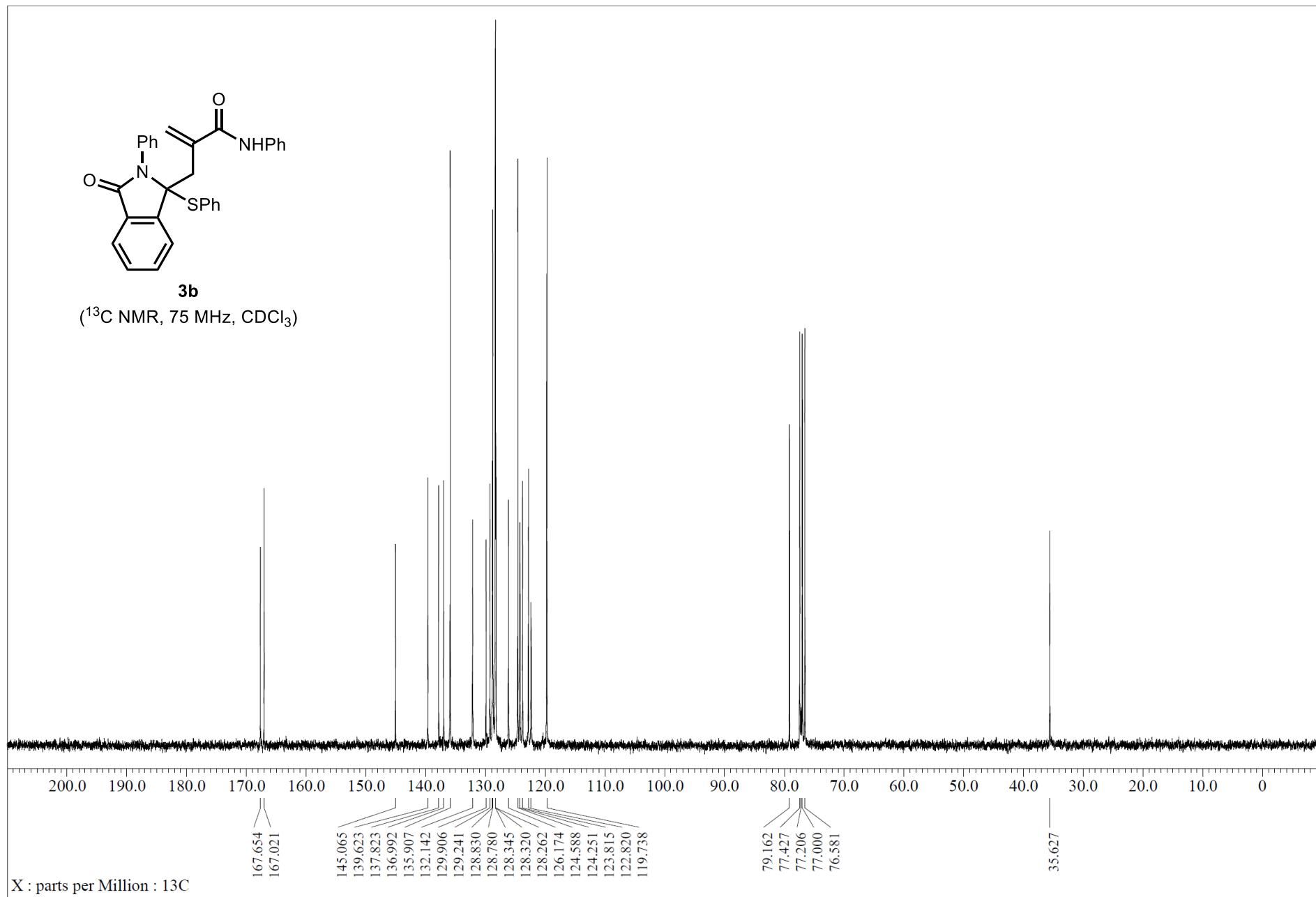
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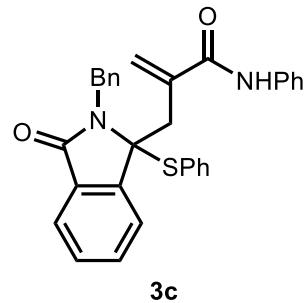


X : parts per Million : 1H

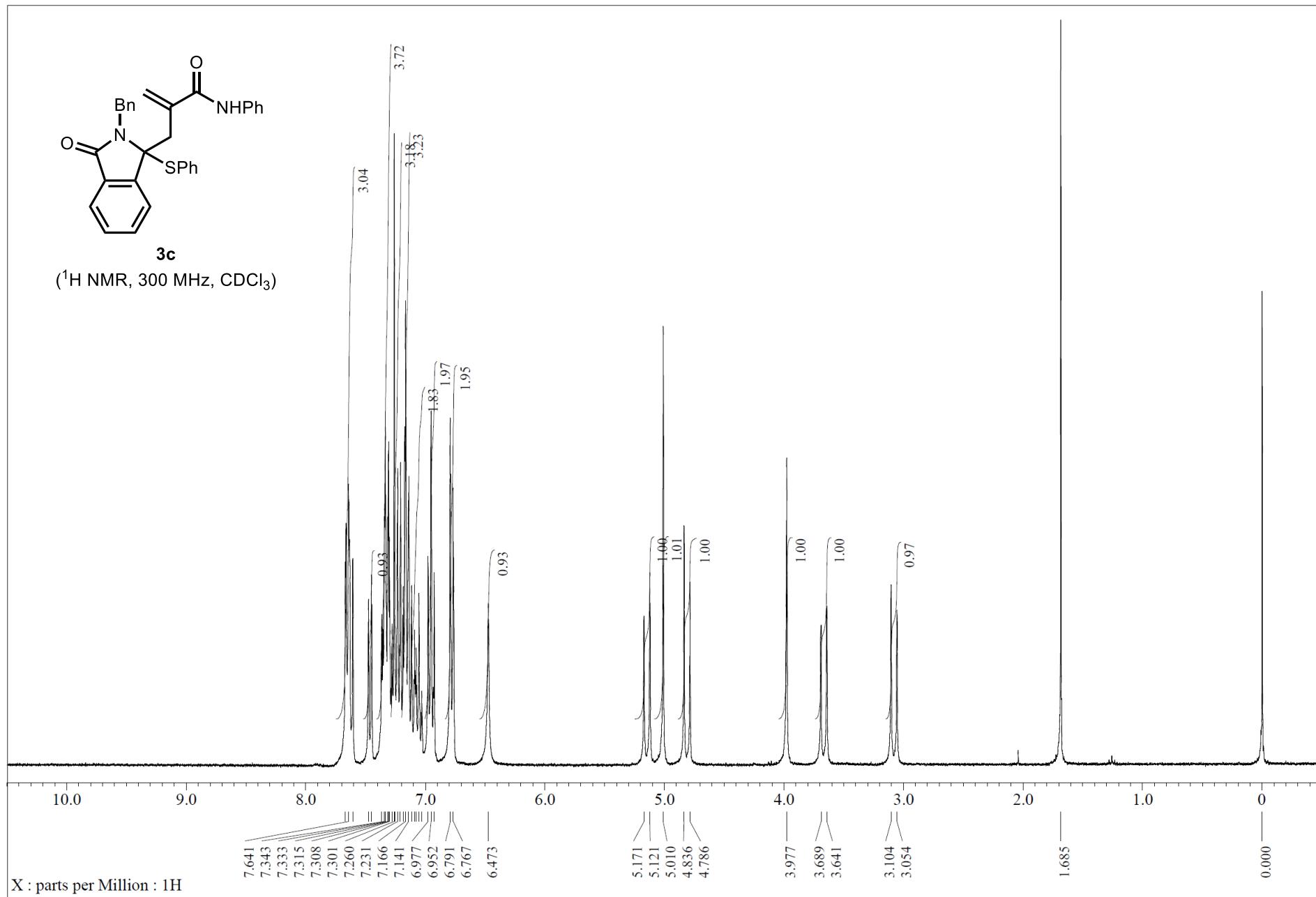


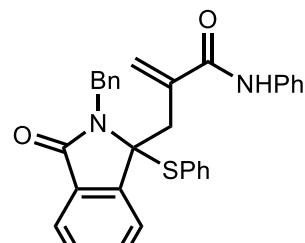
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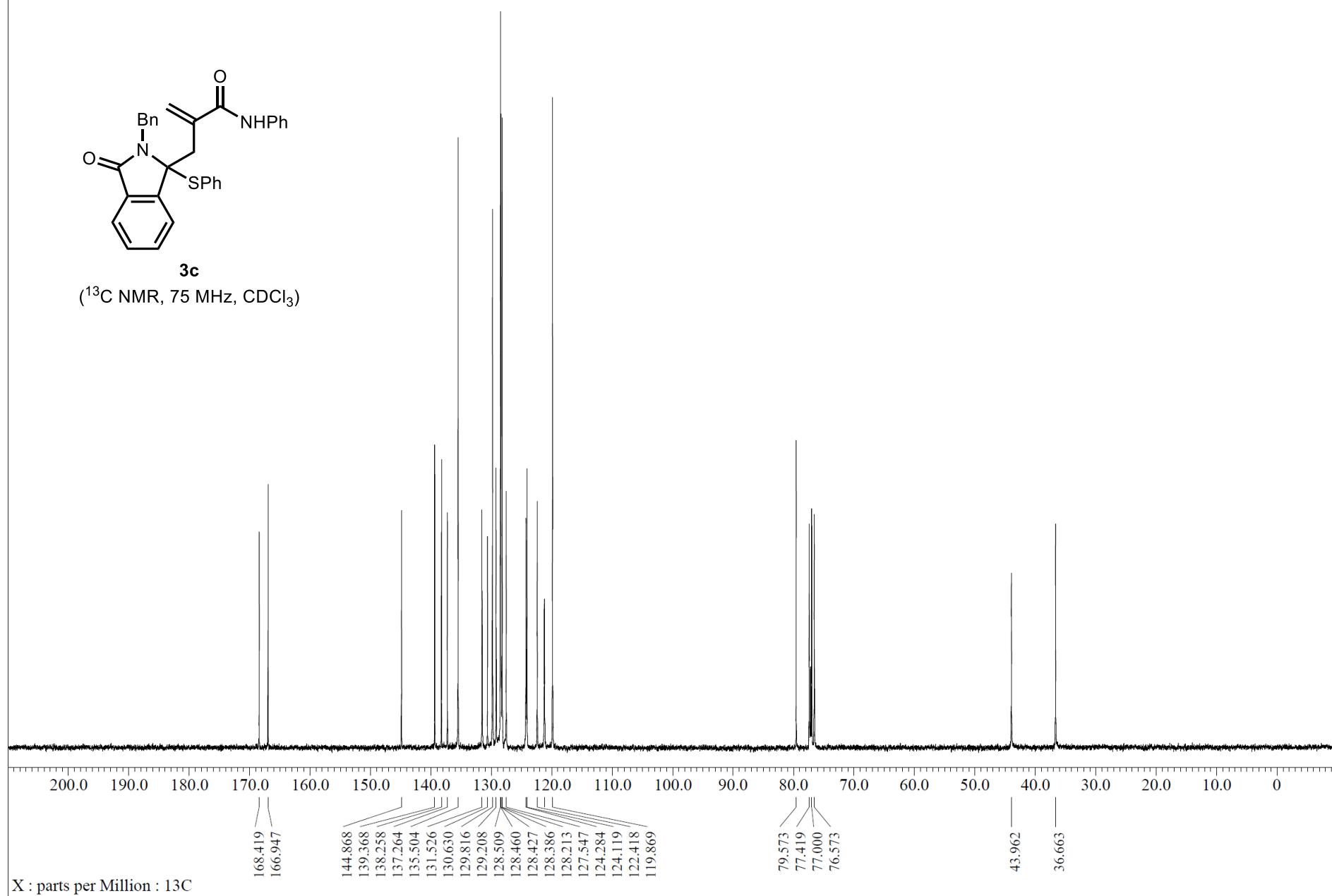
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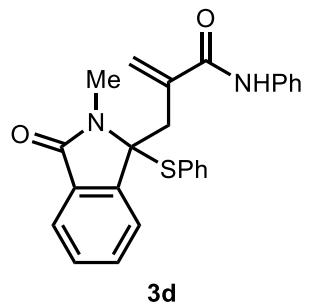


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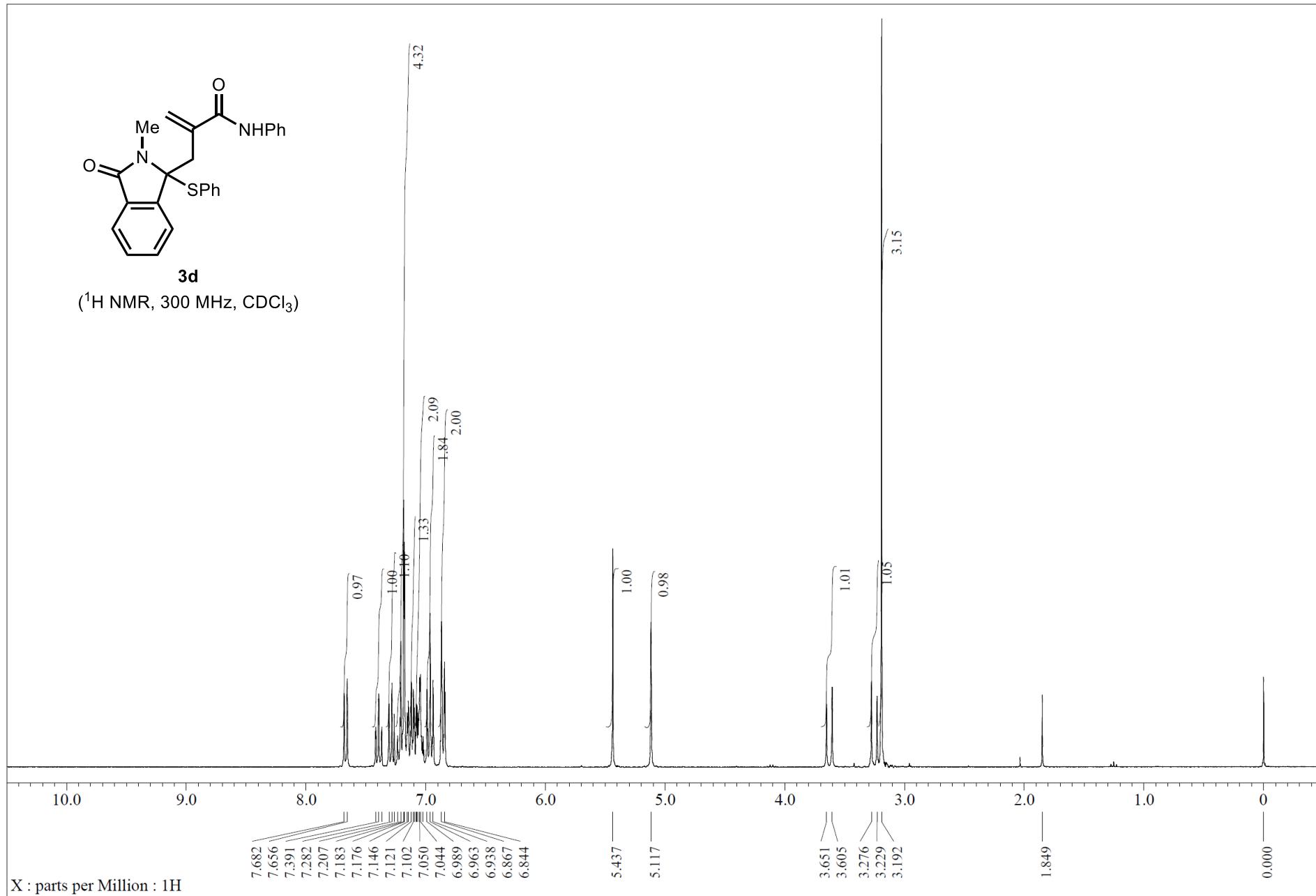
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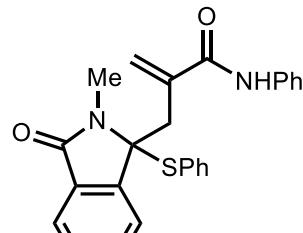


X : parts per Million : ^{13}C



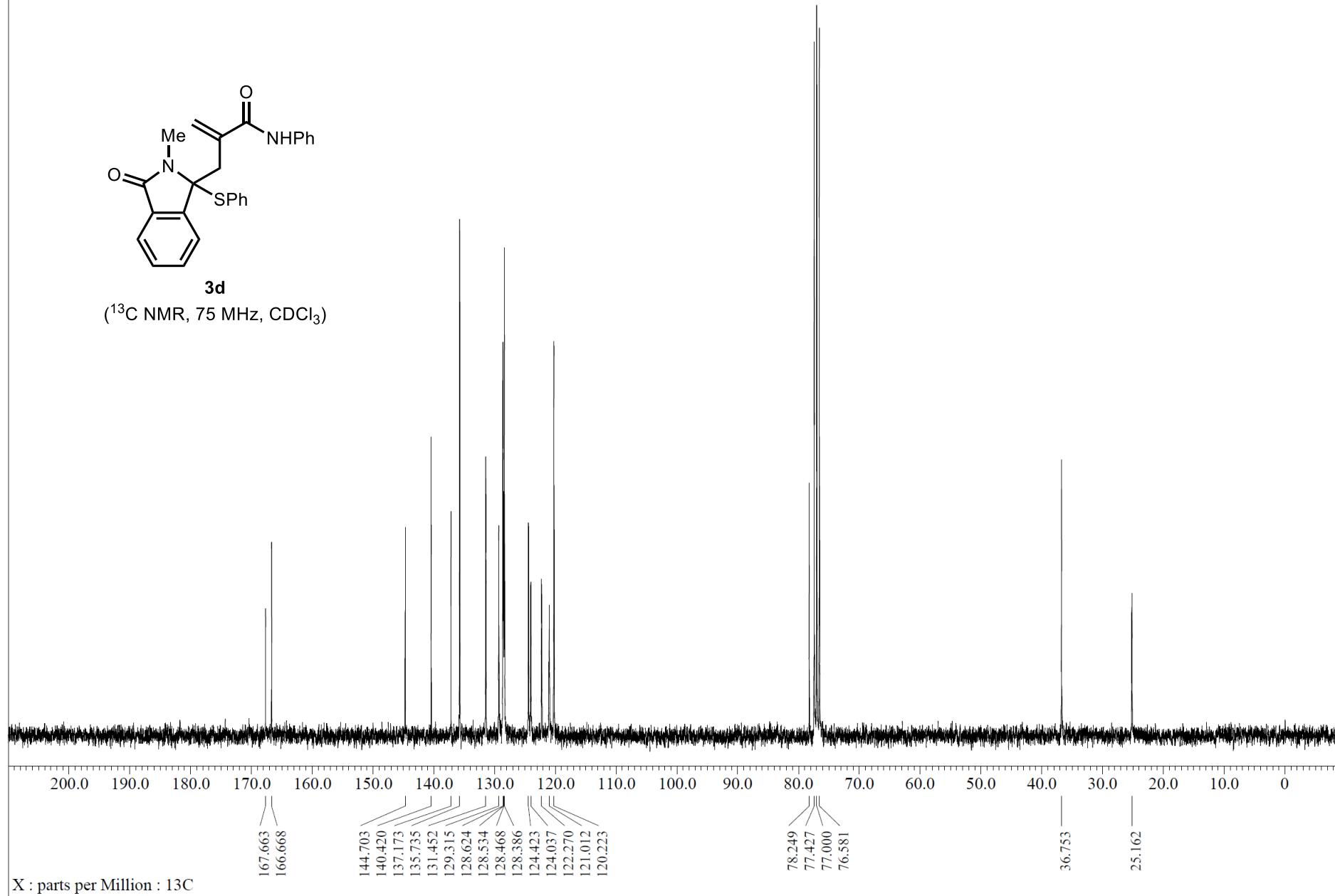
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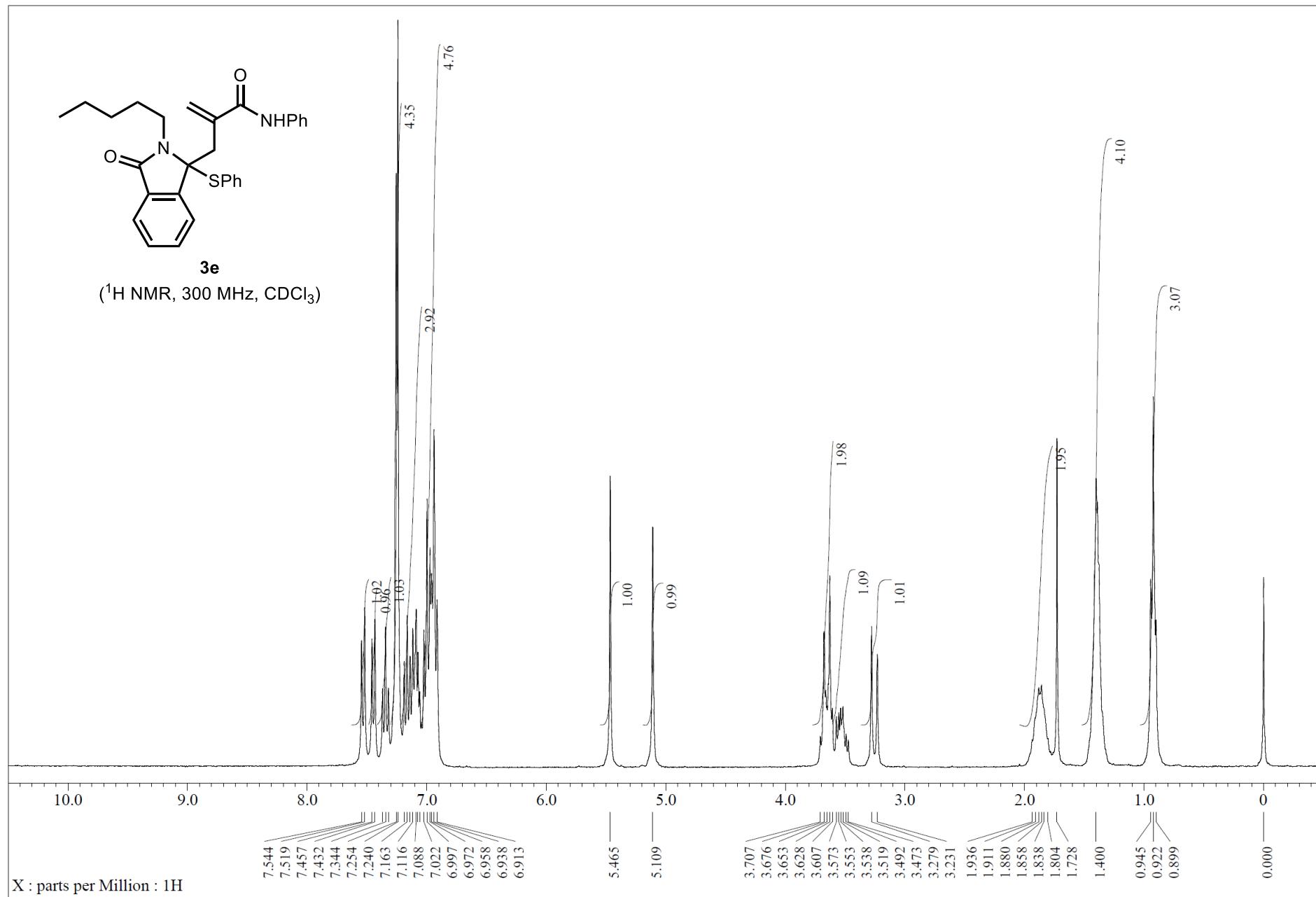


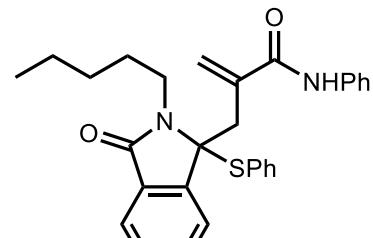
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(^{13}C NMR, 75 MHz, CDCl_3)



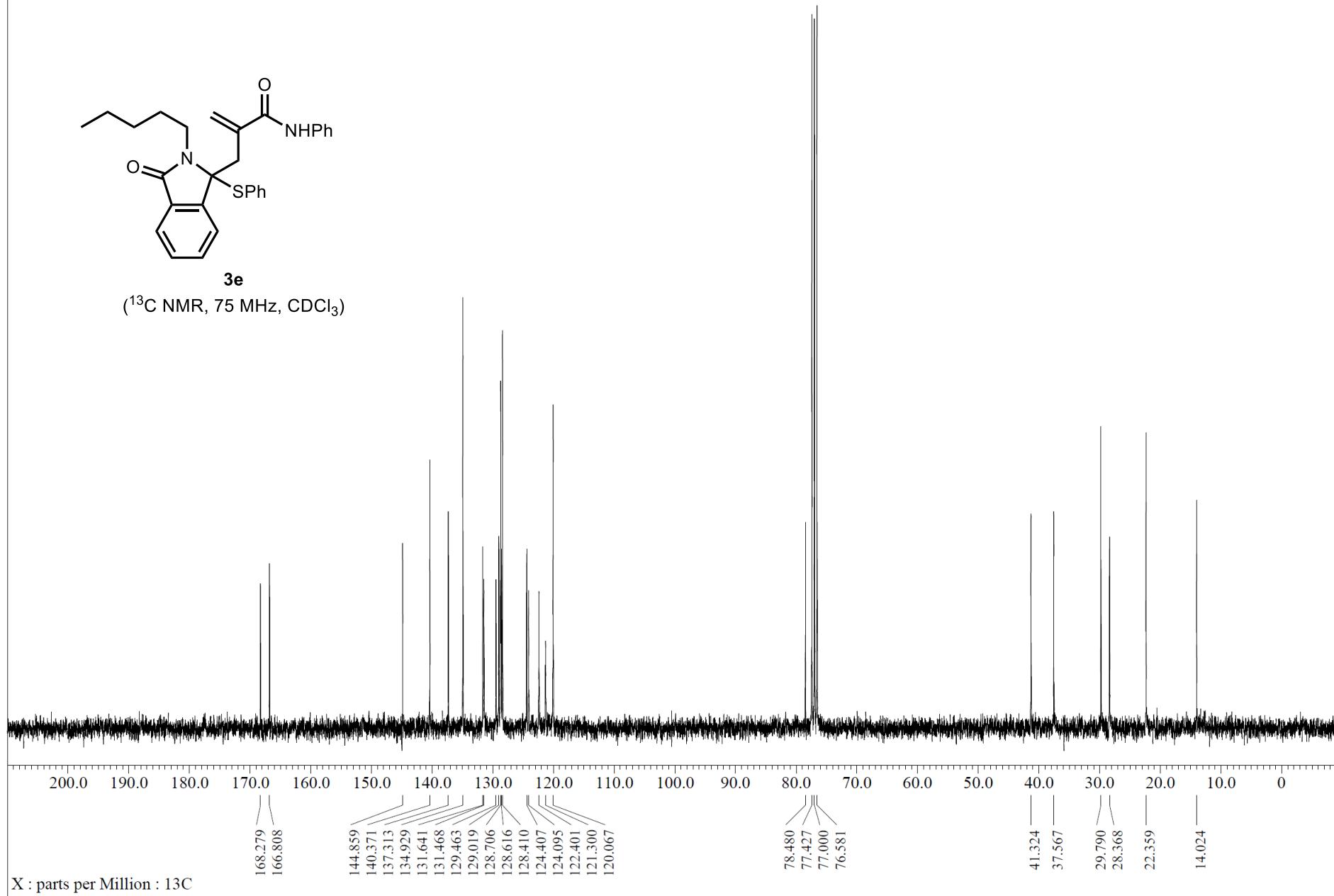
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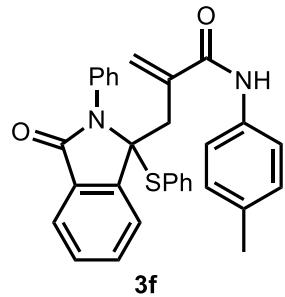




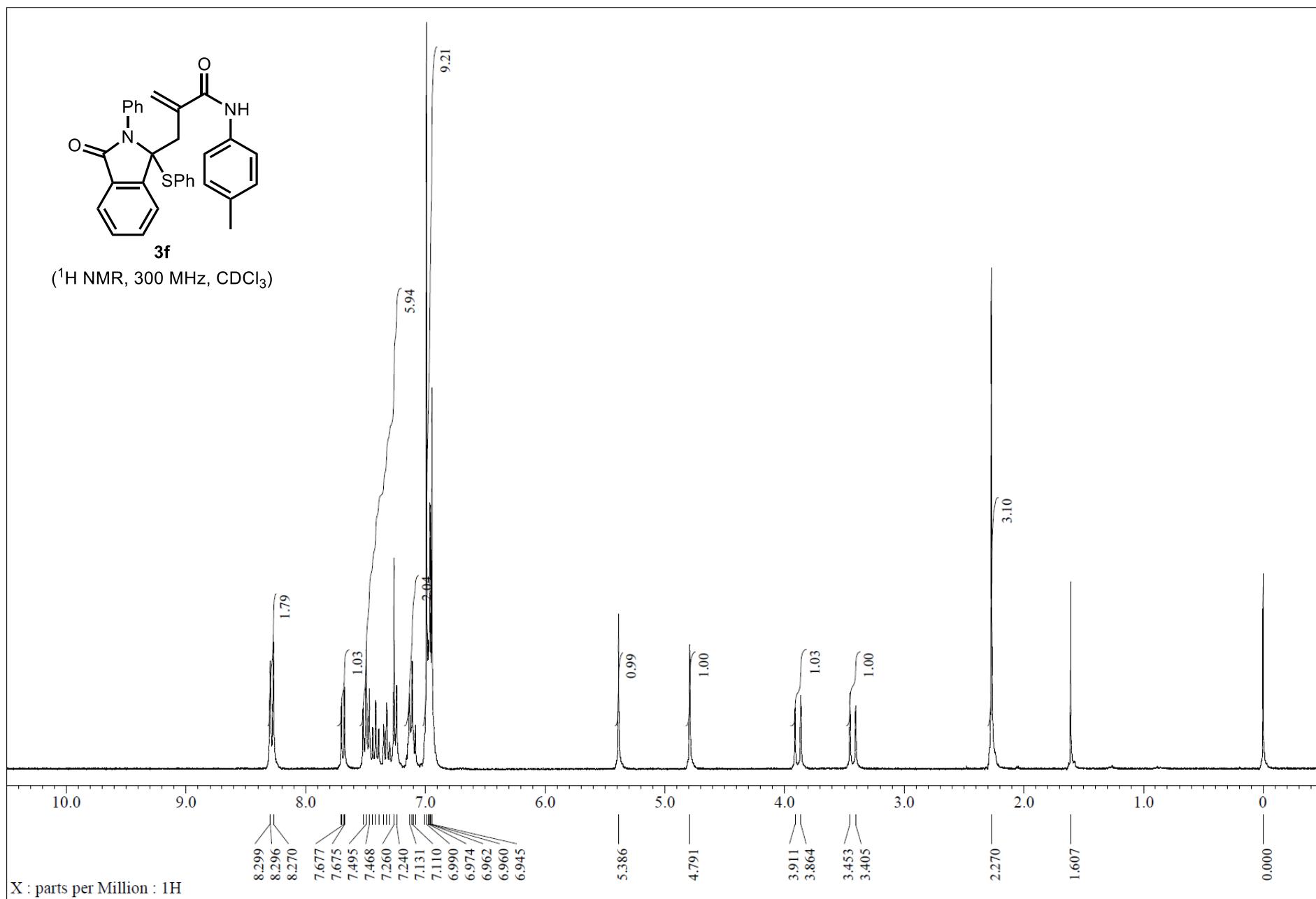
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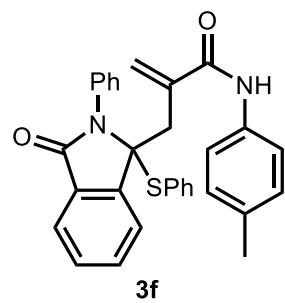
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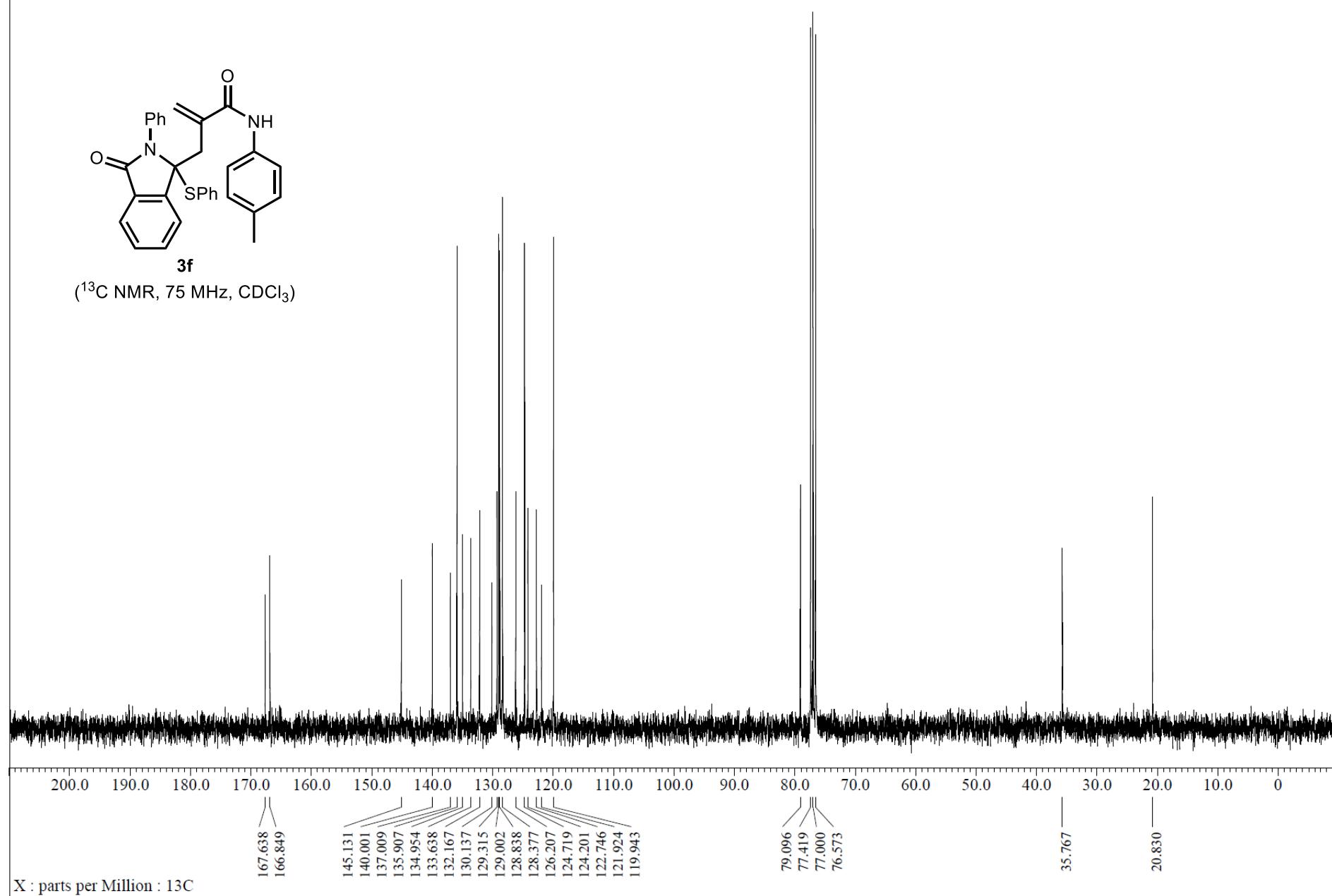


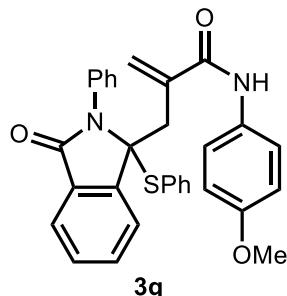
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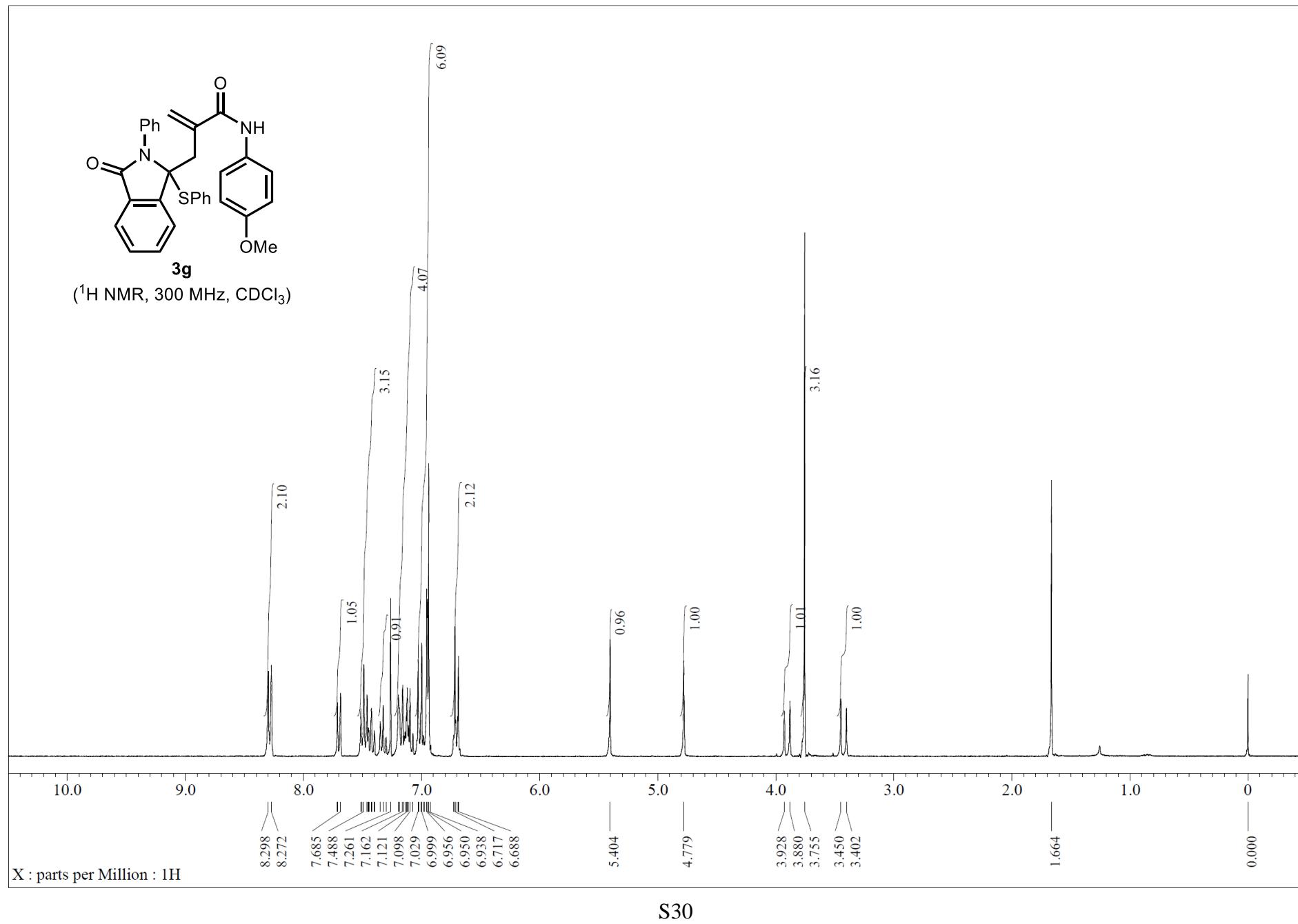


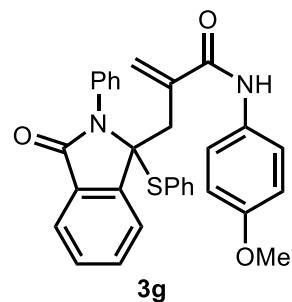
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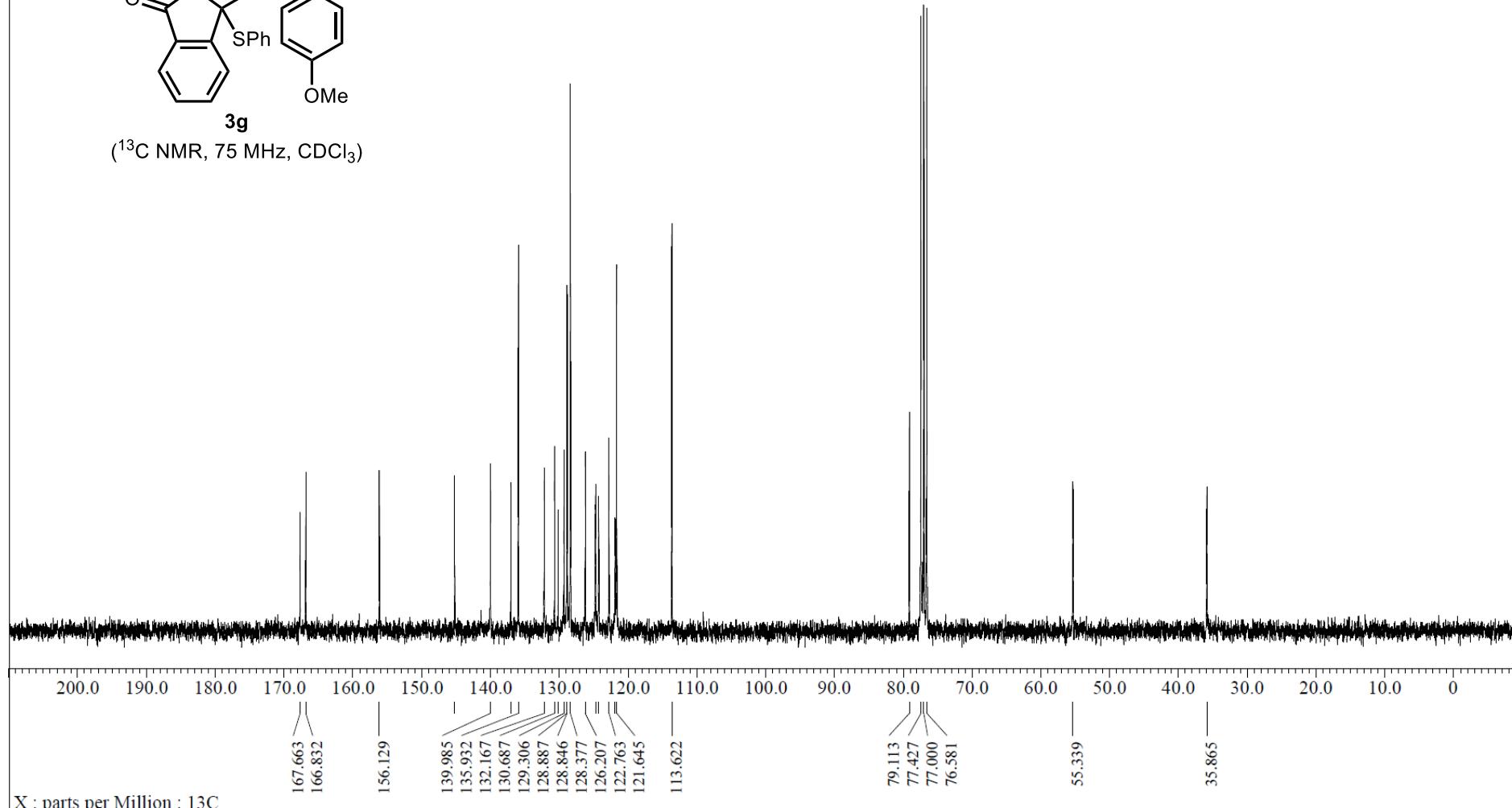


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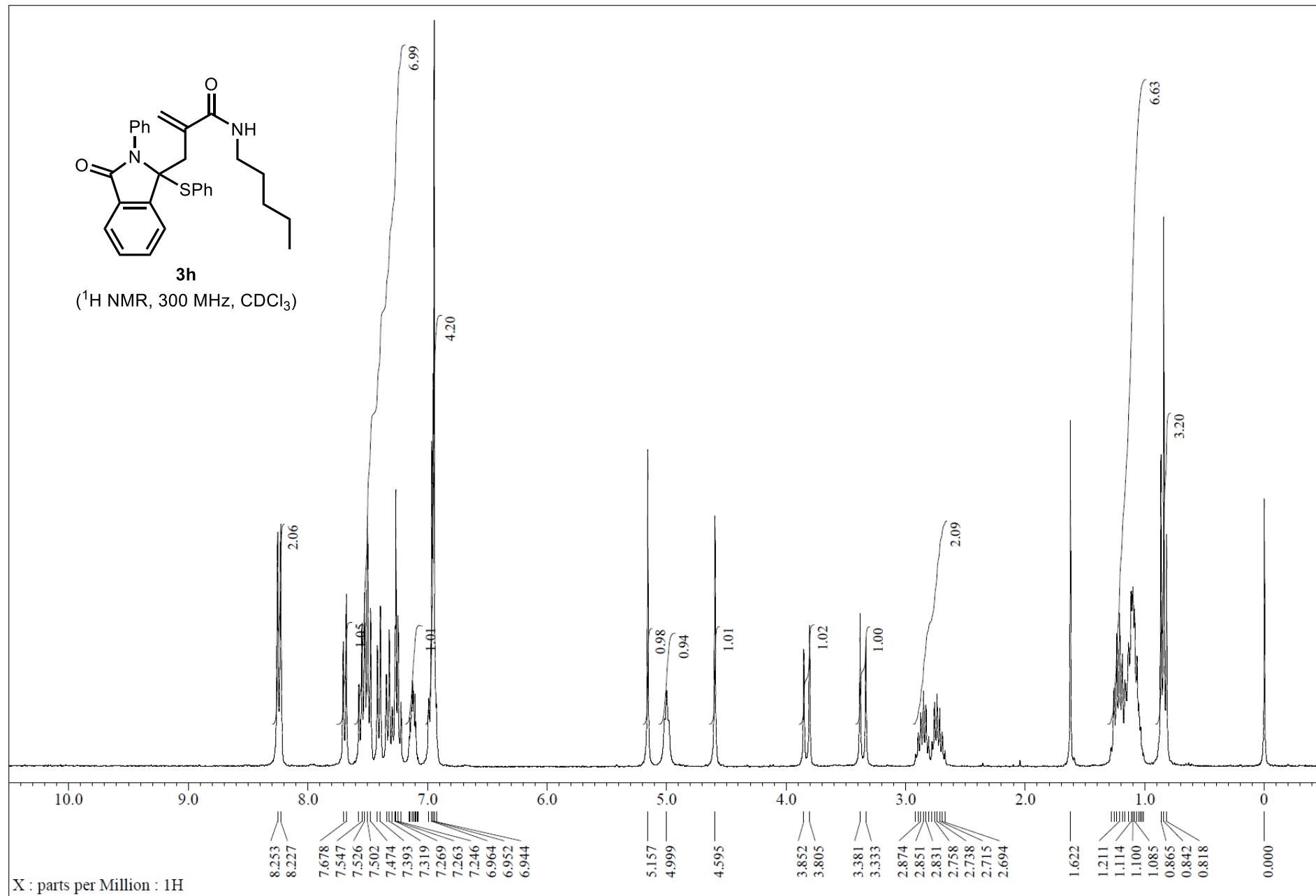


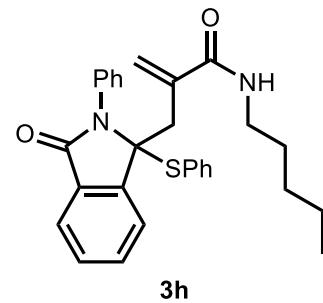


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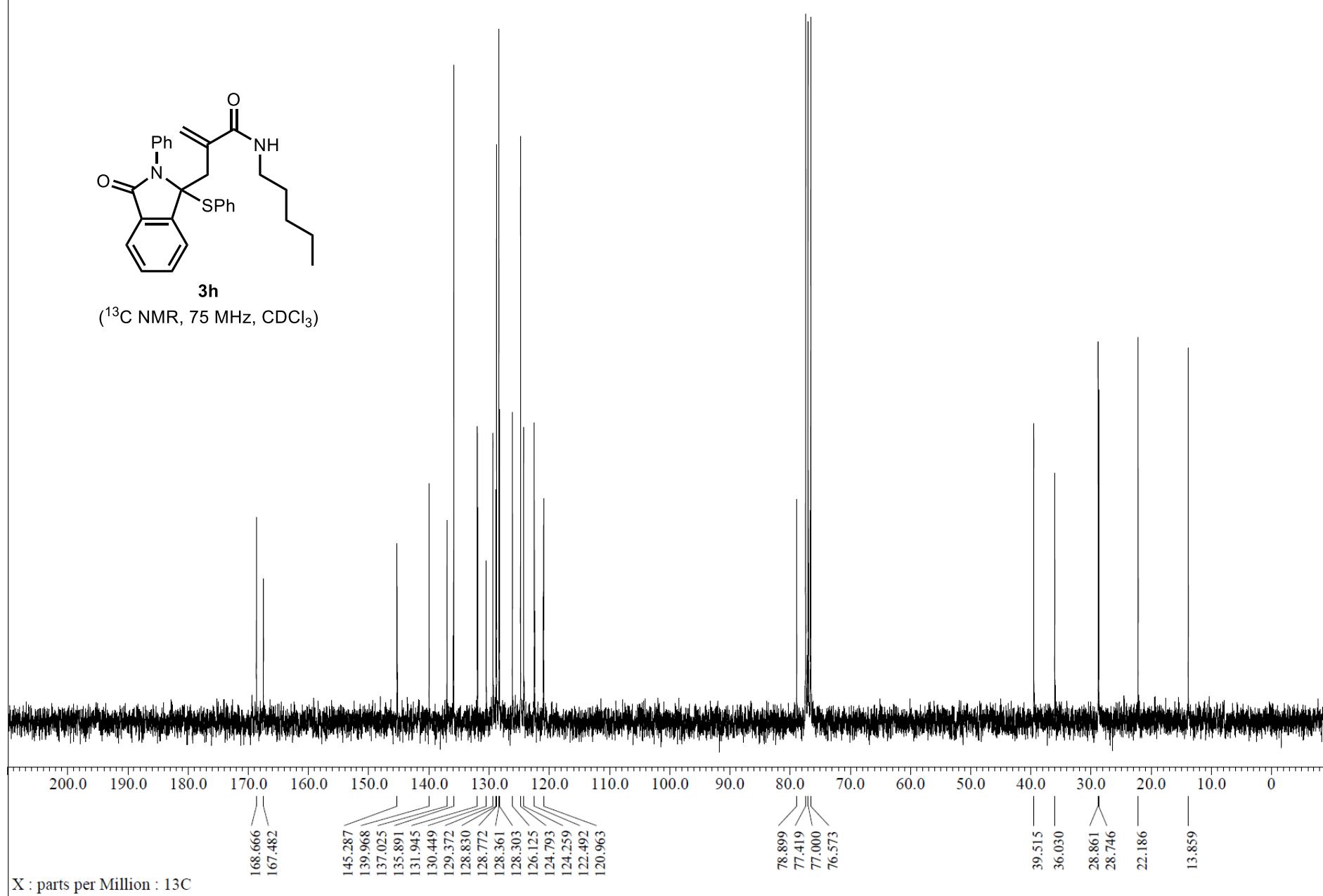


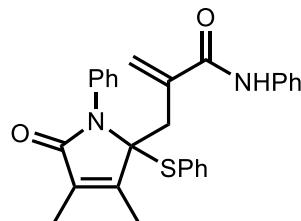
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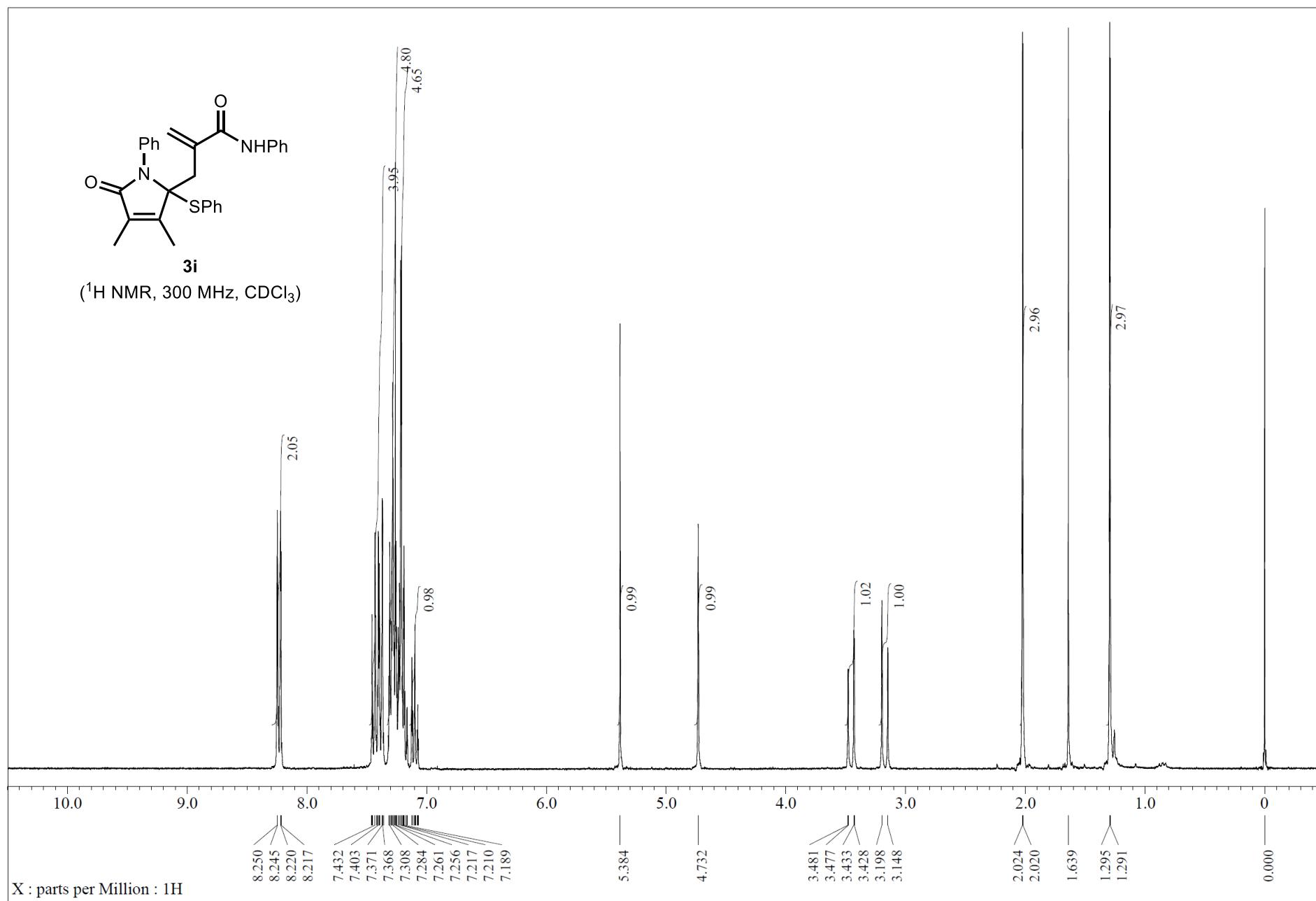


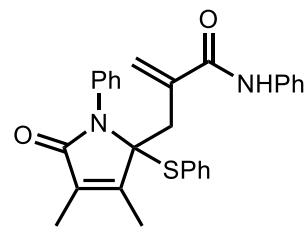
(^{13}C NMR, 75 MHz, CDCl_3)



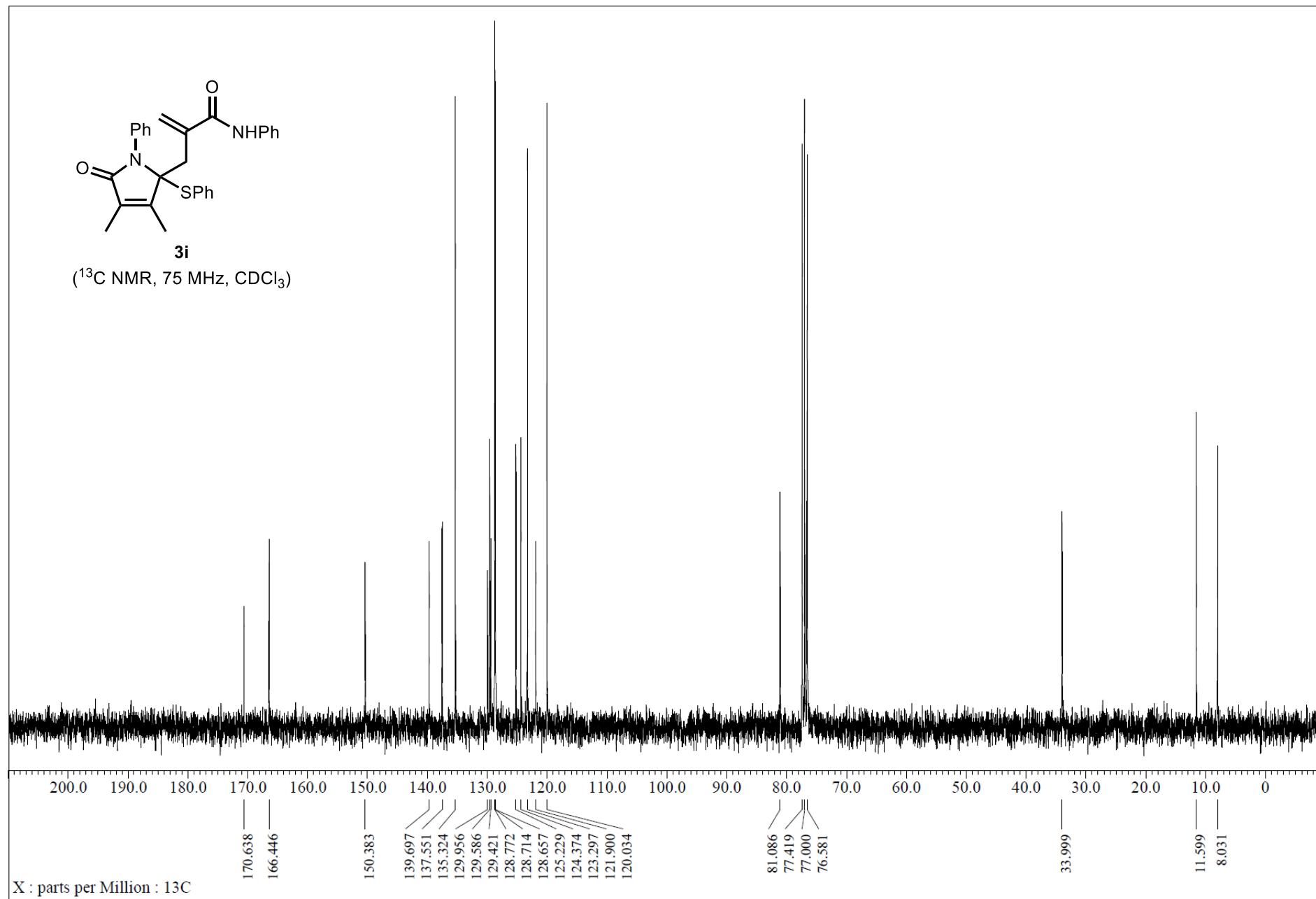


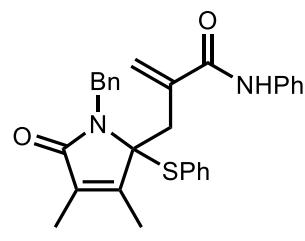
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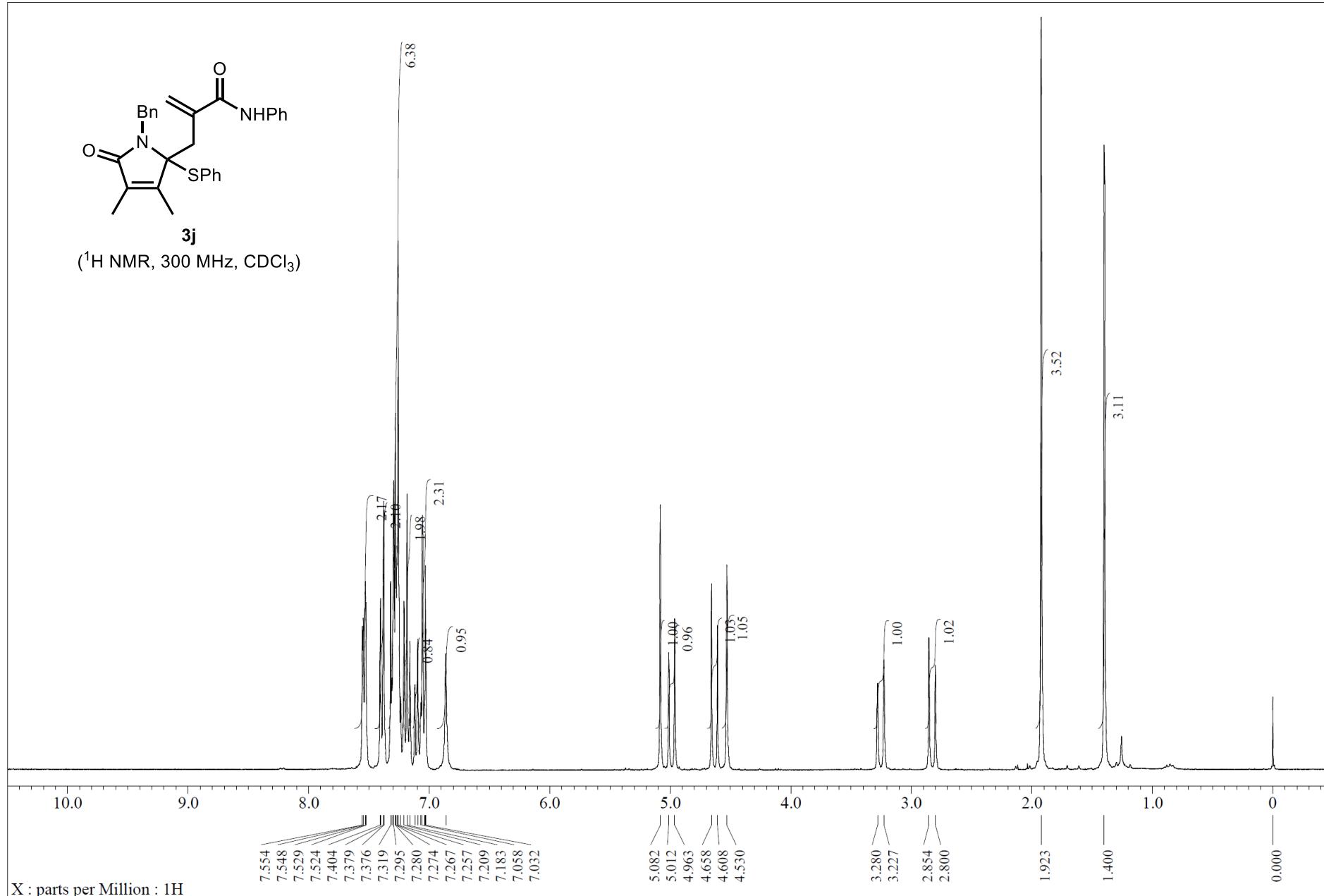


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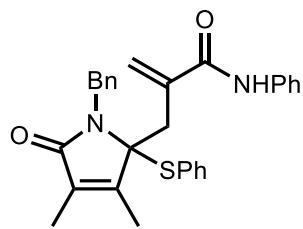




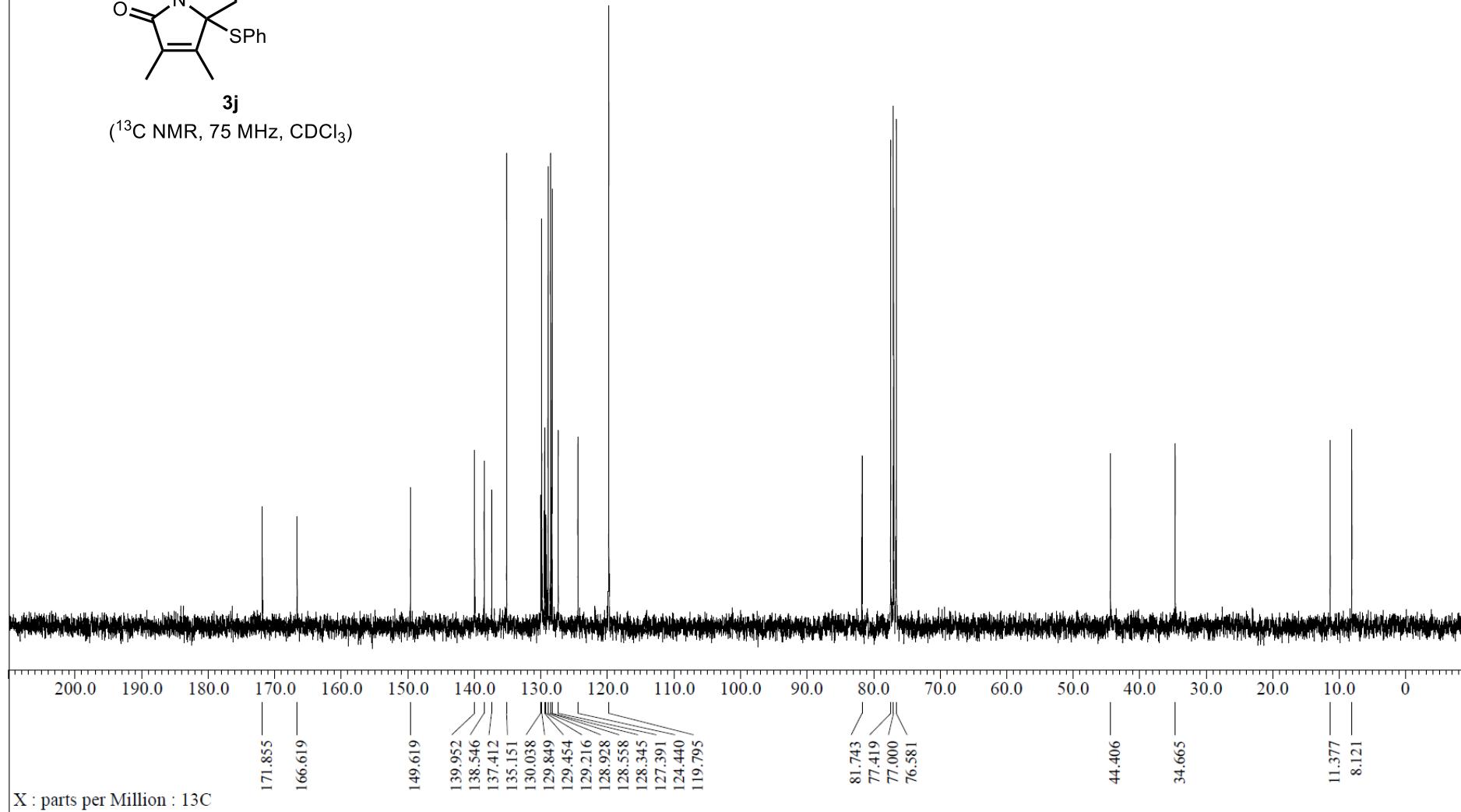
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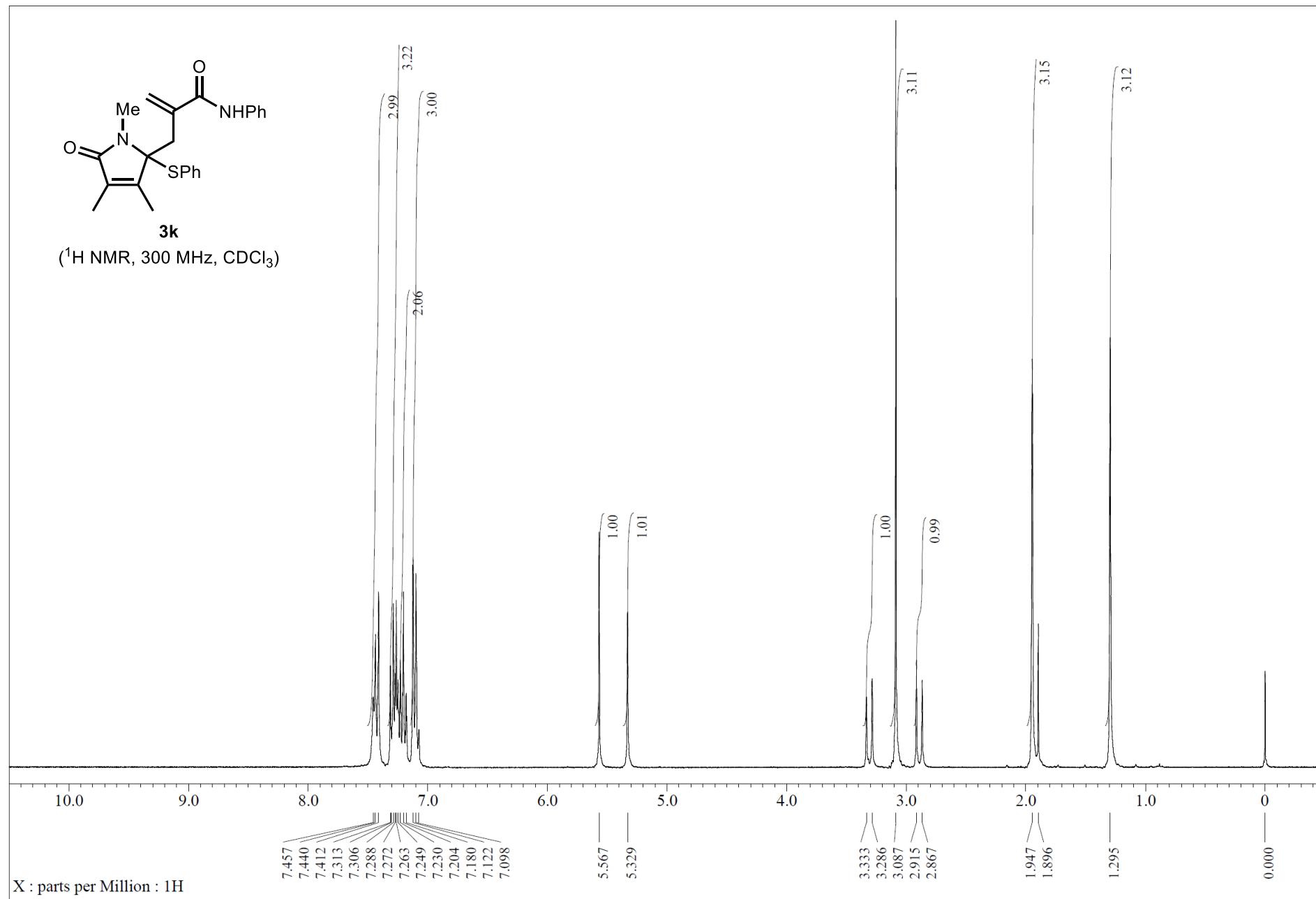


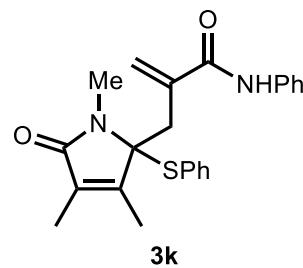
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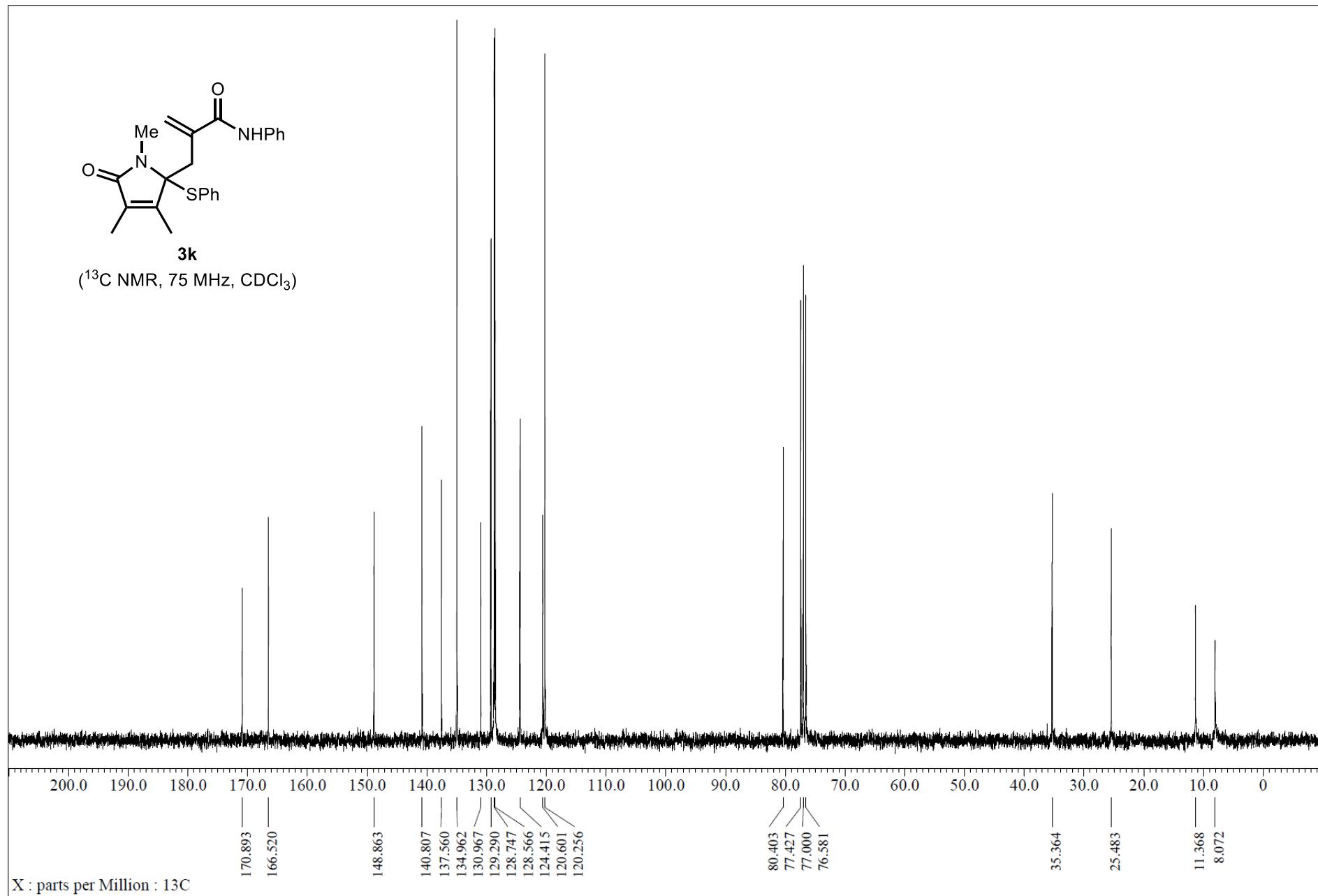
(^{13}C NMR, 75 MHz, CDCl_3)



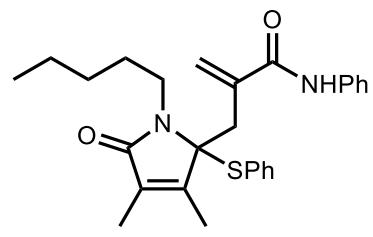




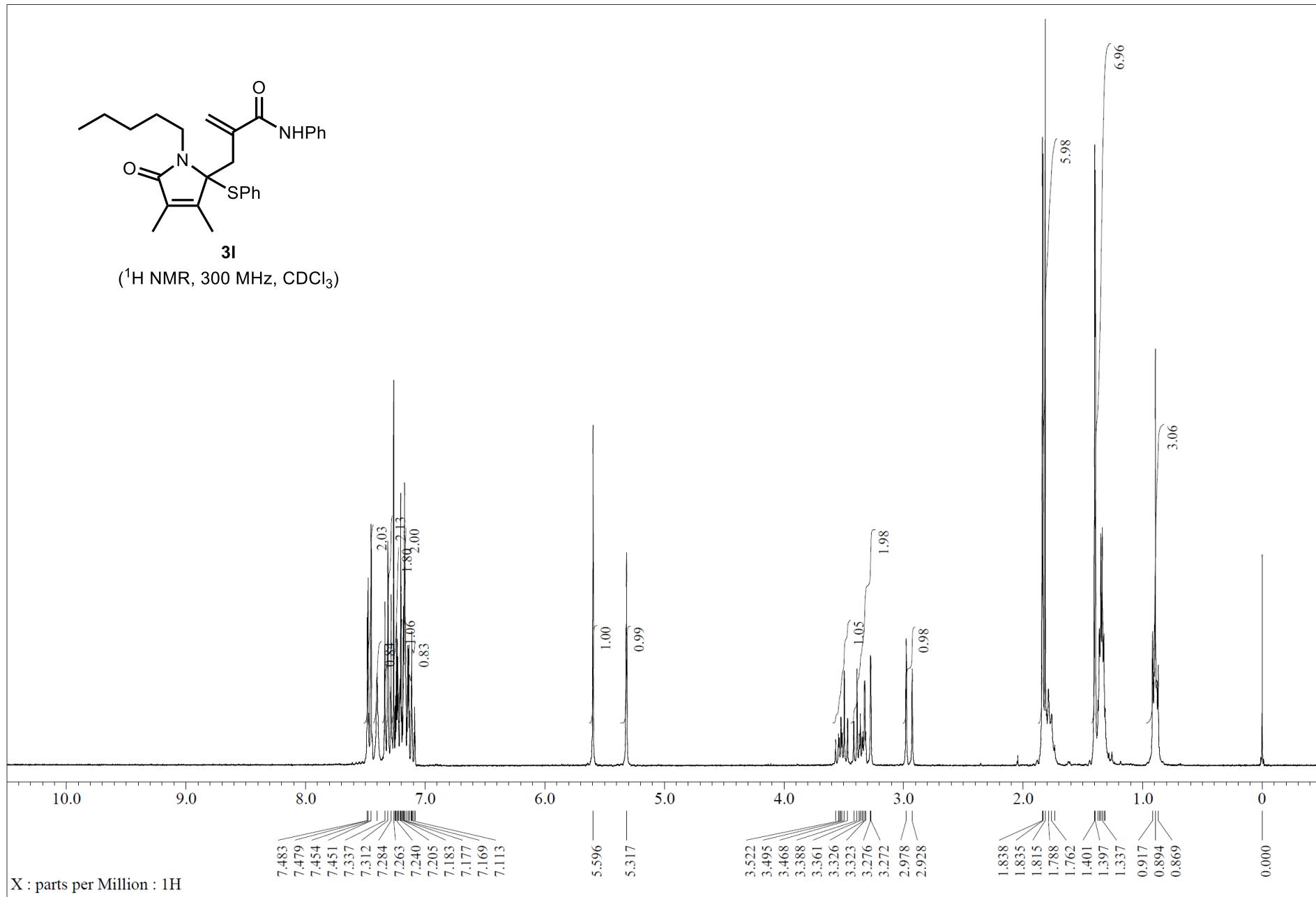
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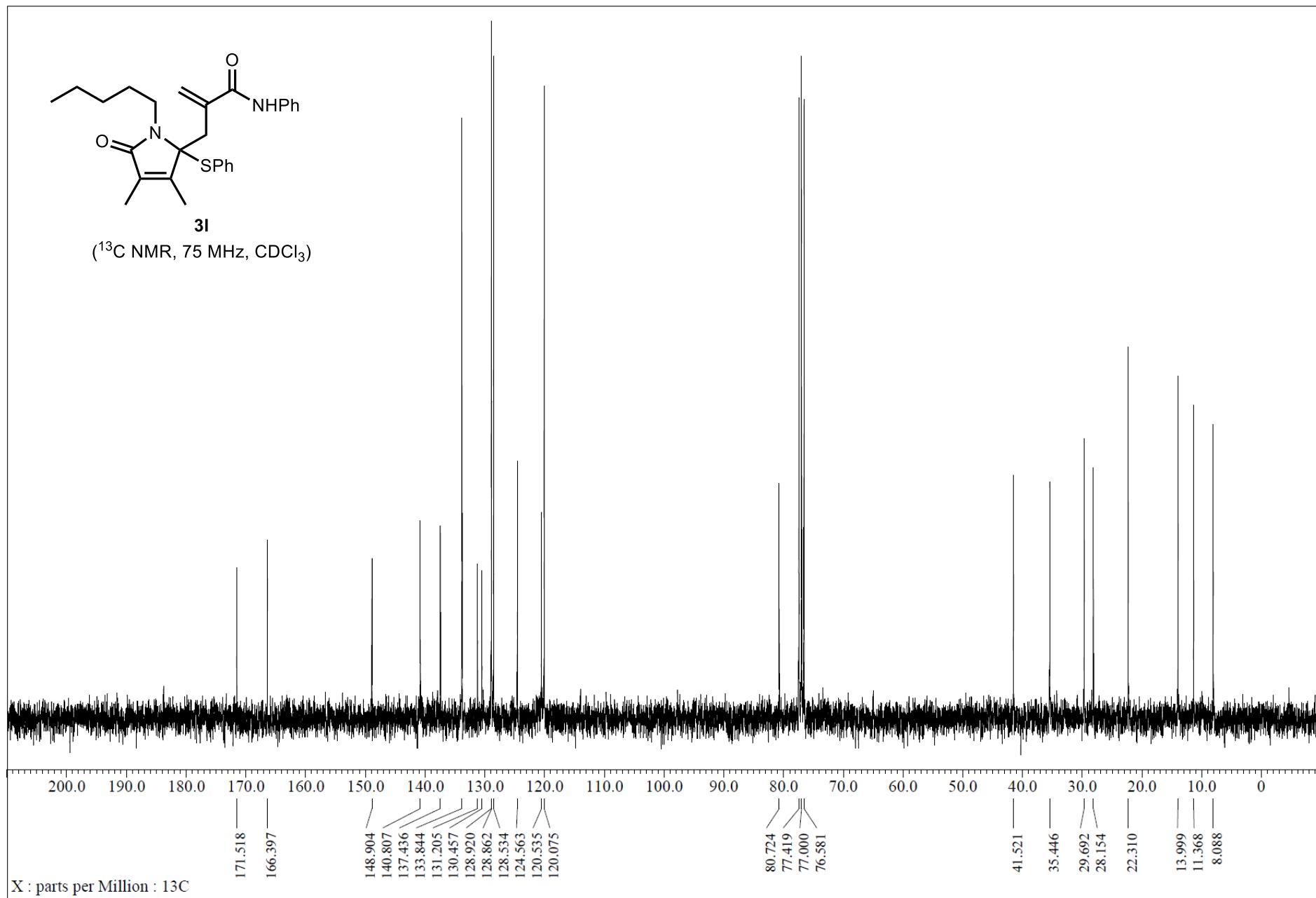


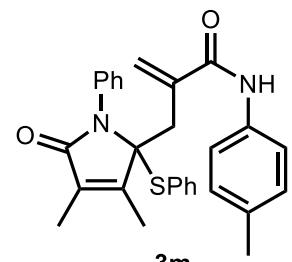
X : parts per Million : ^{13}C



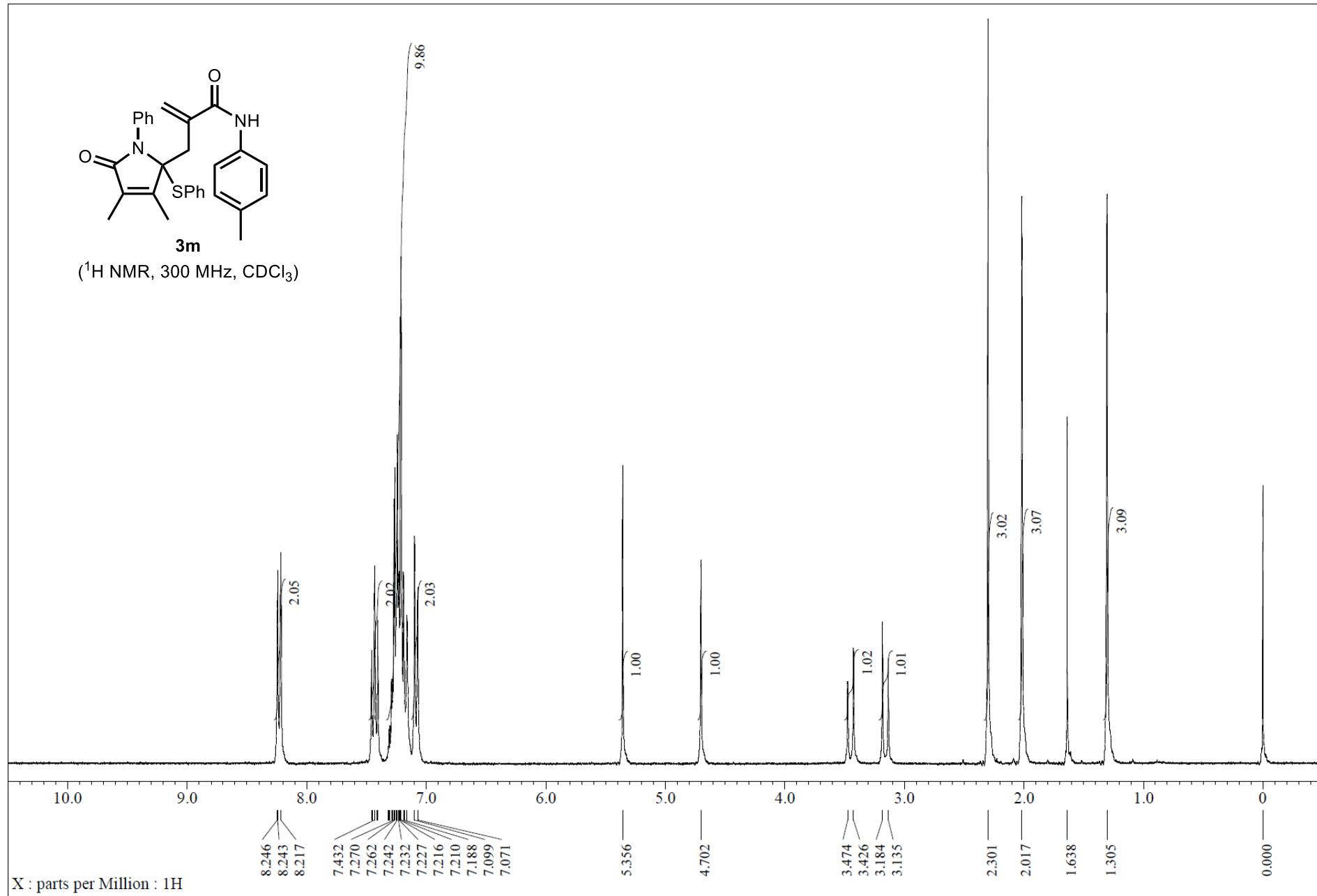
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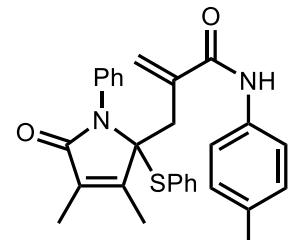




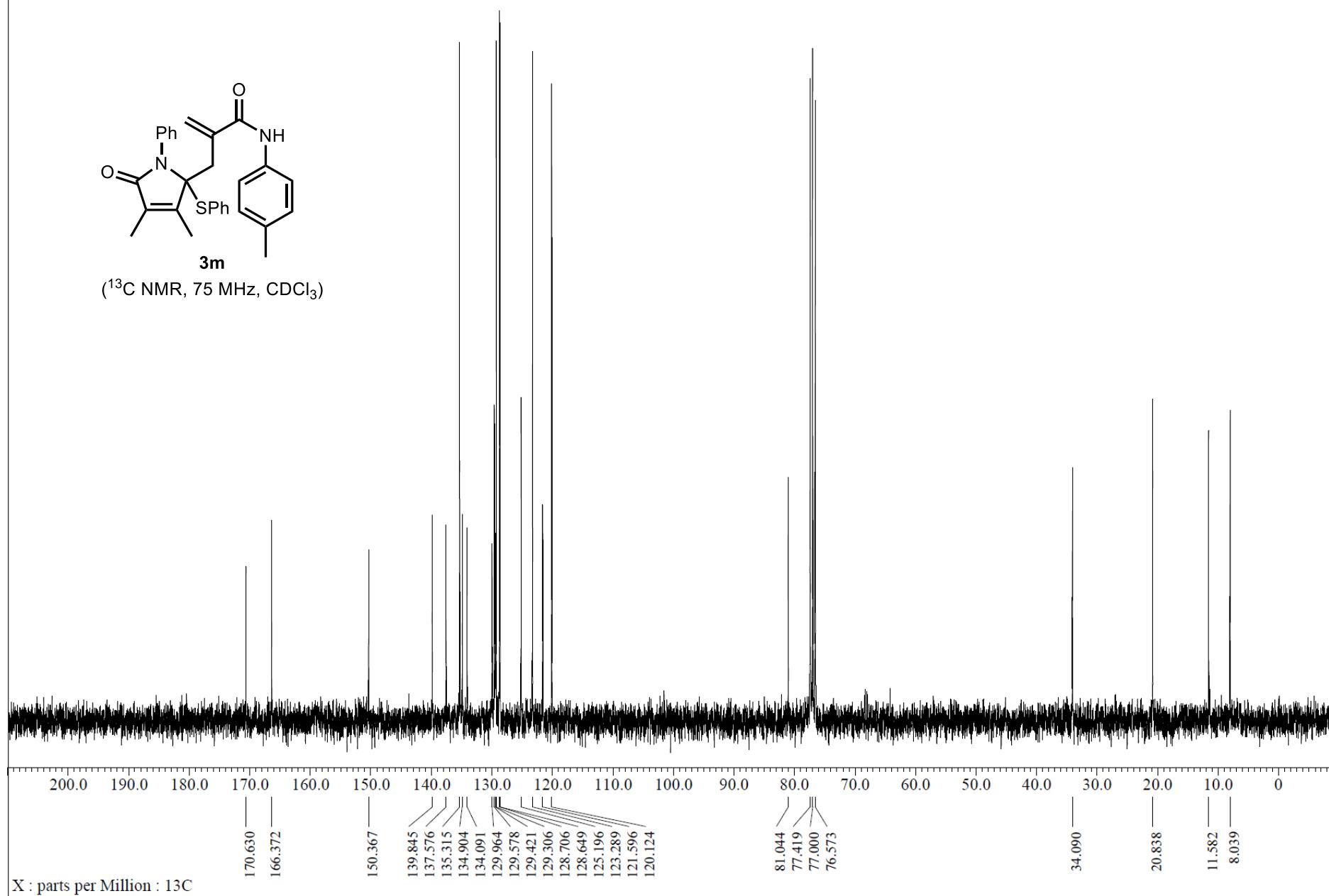


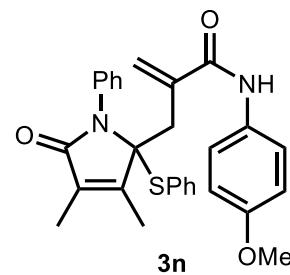
(^1H NMR, 300 MHz, CDCl_3)



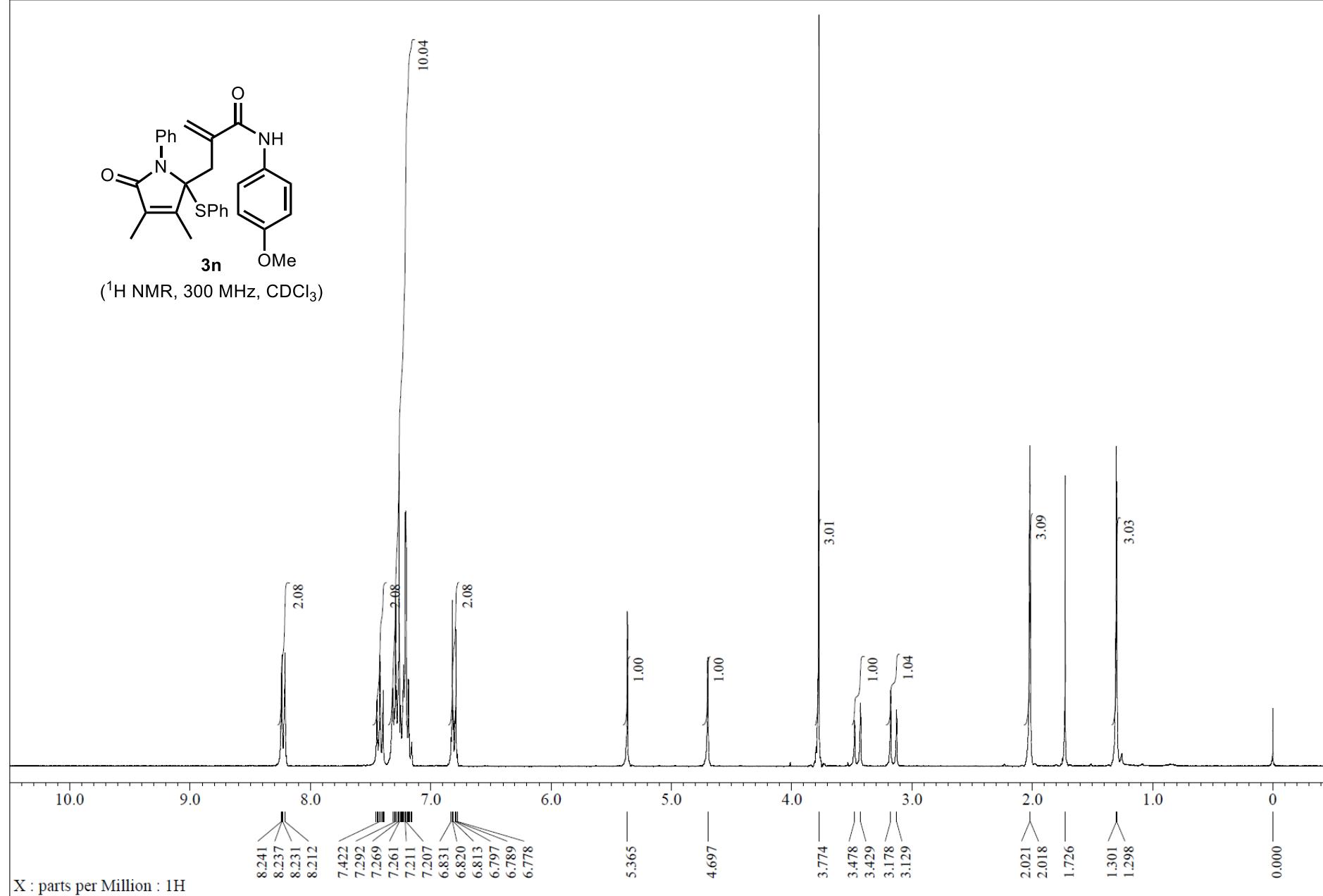


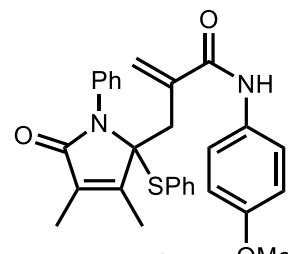
(¹³C NMR, 75 MHz, CDCl₃)



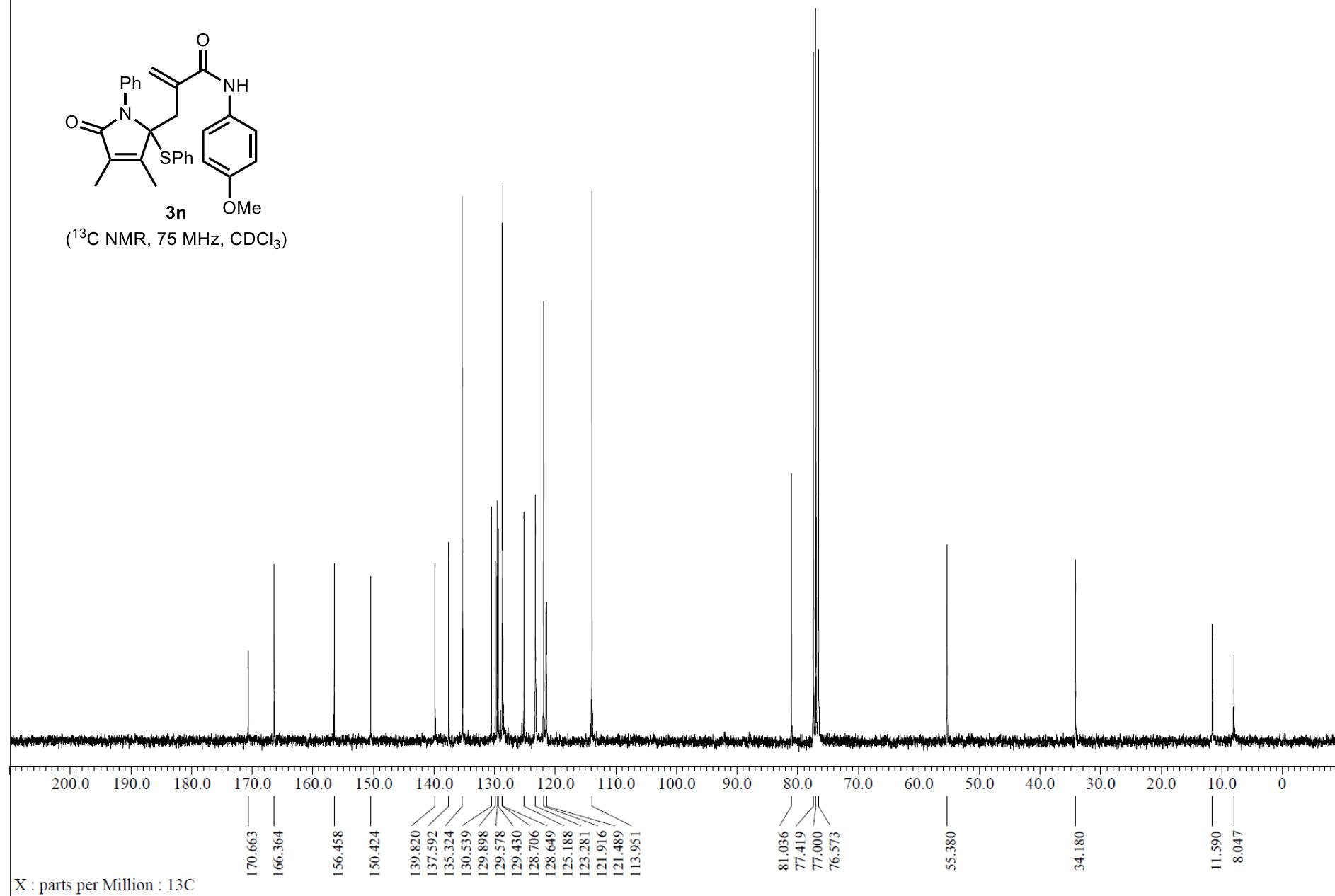


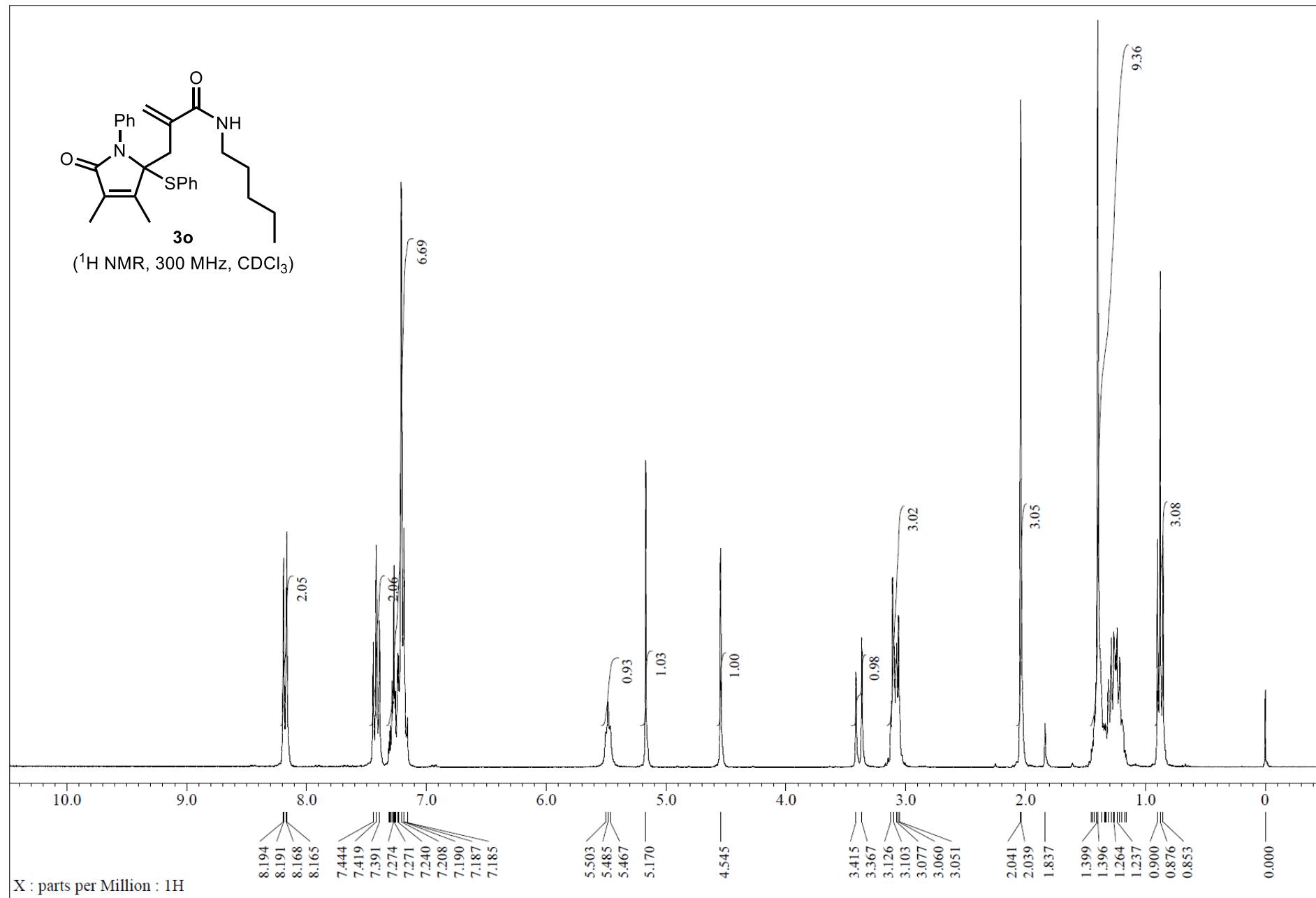
(^1H NMR, 300 MHz, CDCl_3)

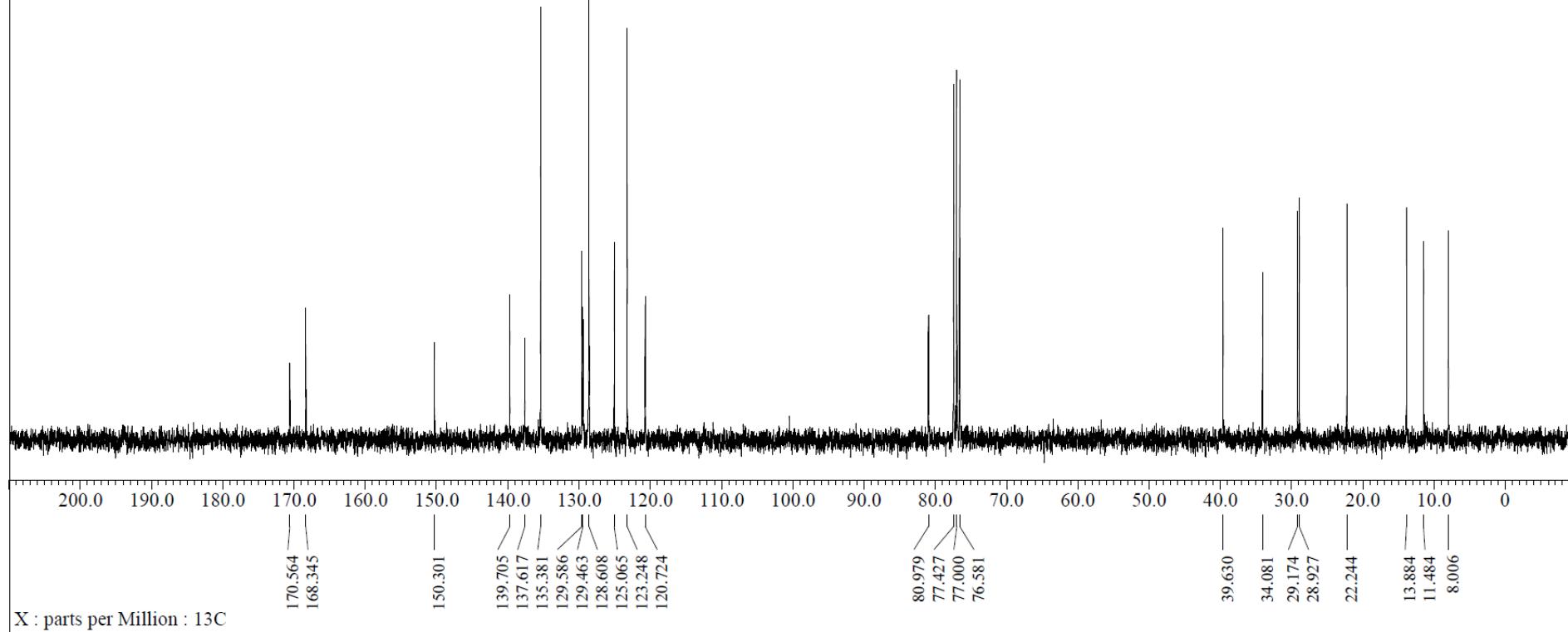
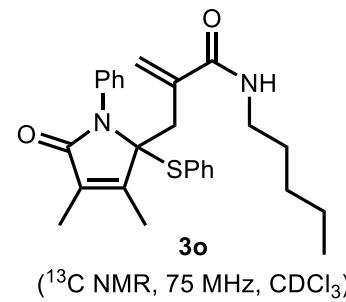


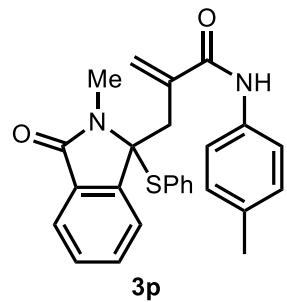


(^{13}C NMR, 75 MHz, CDCl_3)

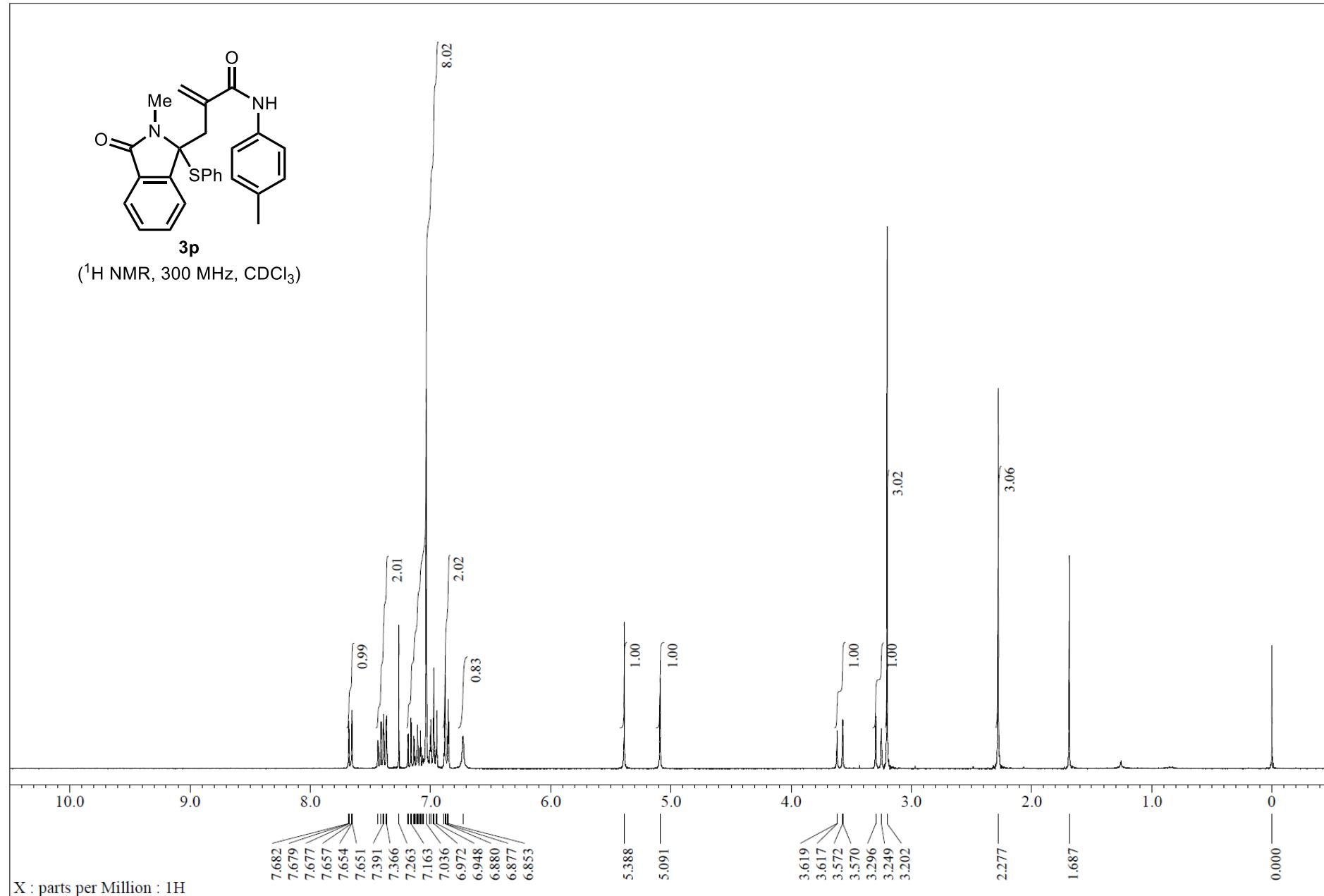


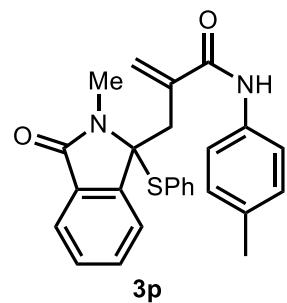




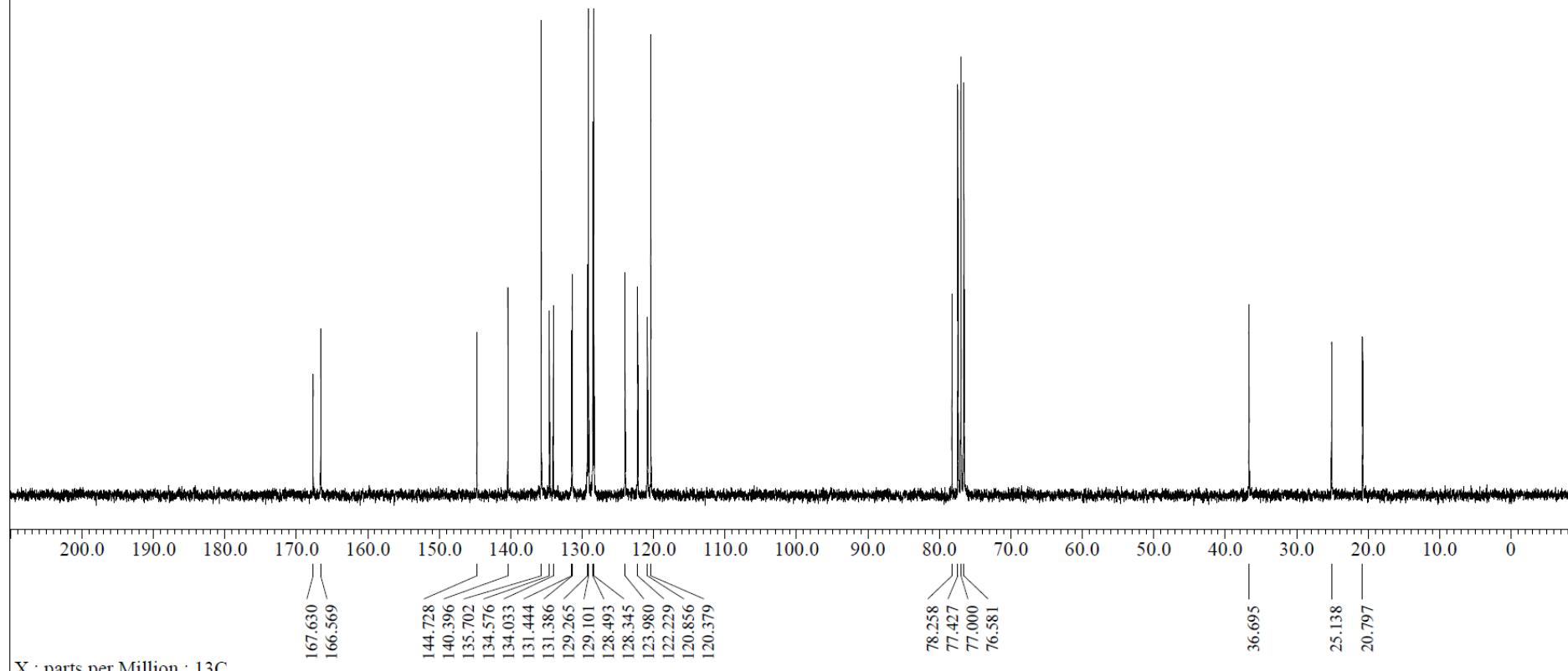


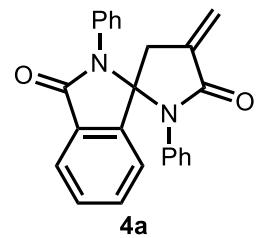
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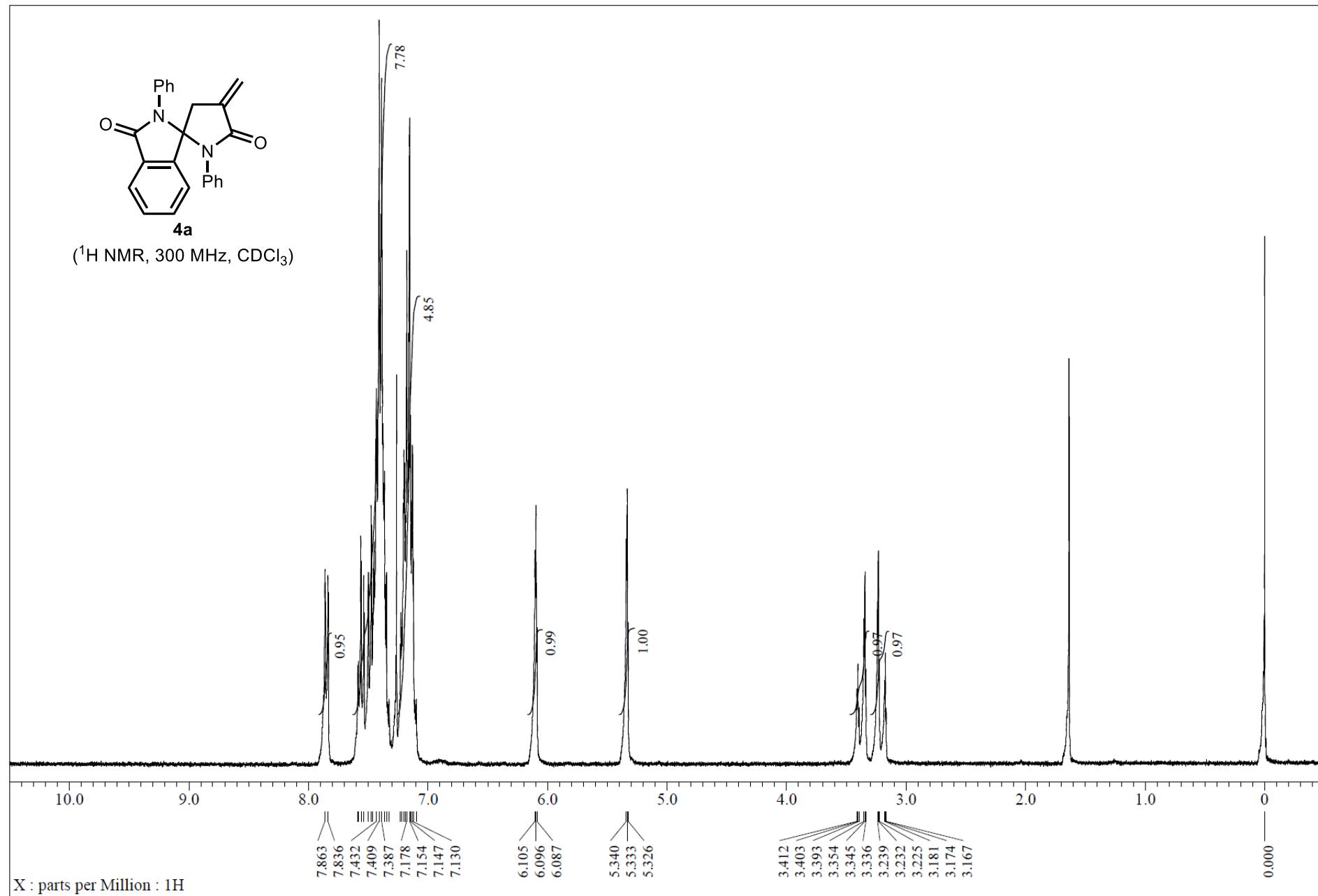


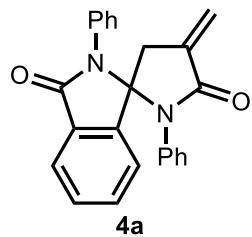
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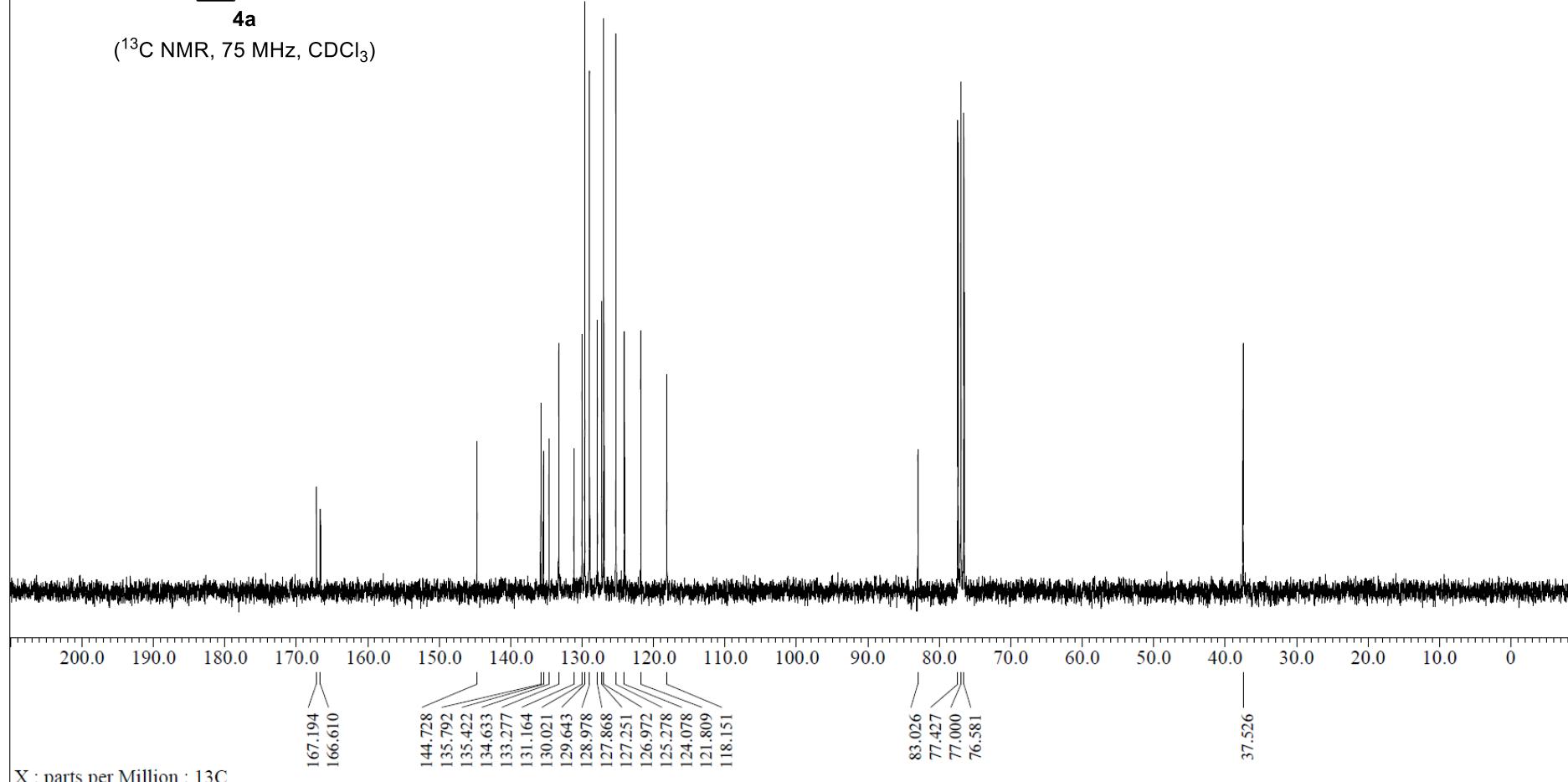


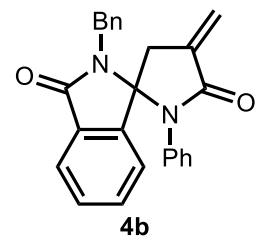
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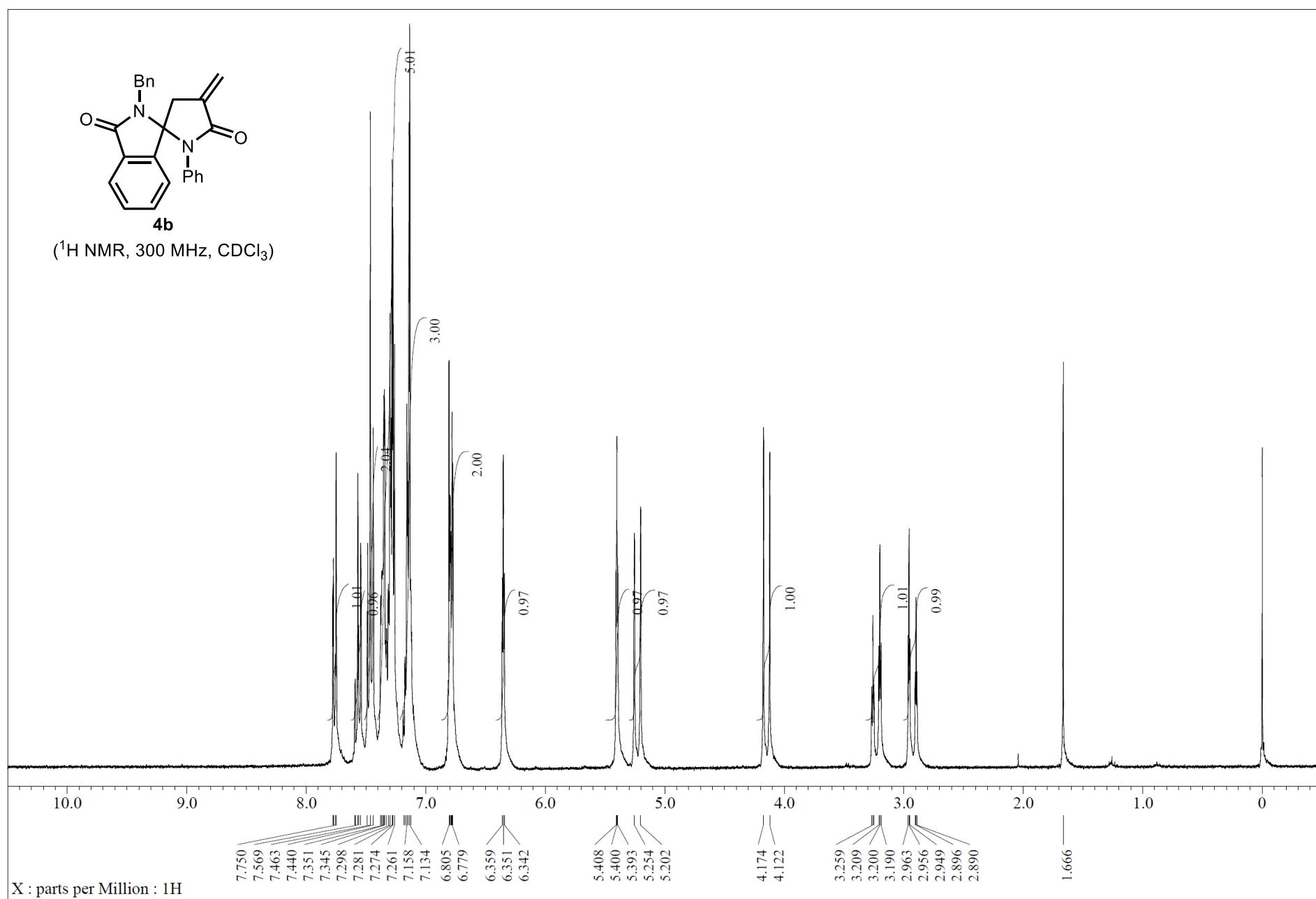


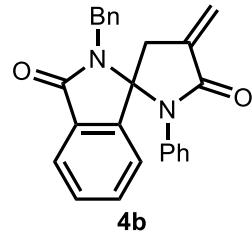
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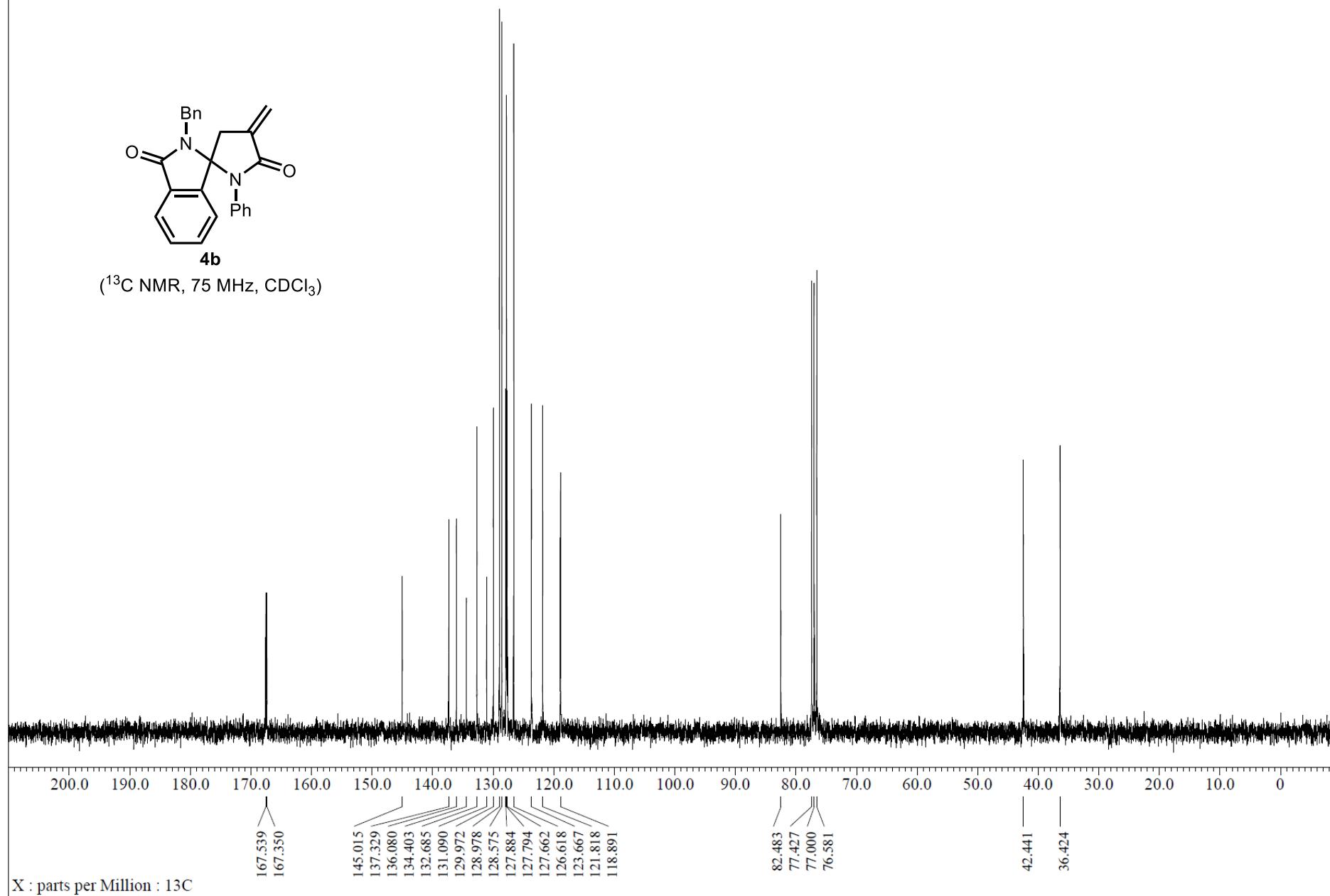


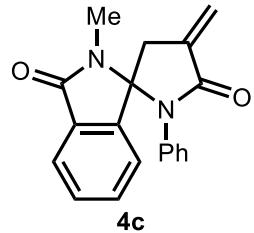
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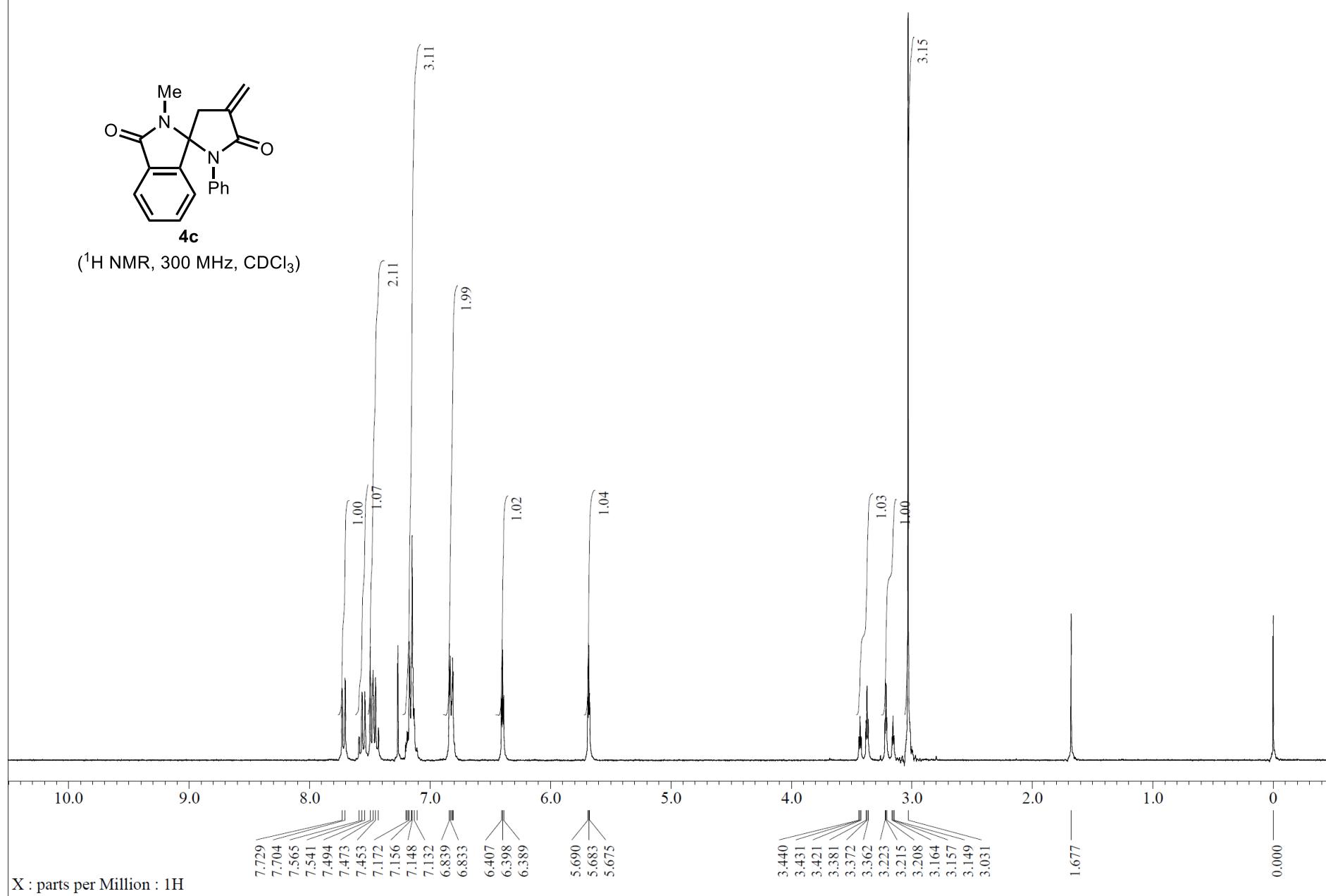


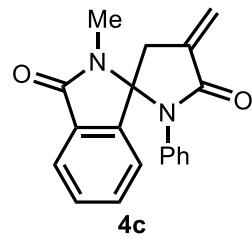
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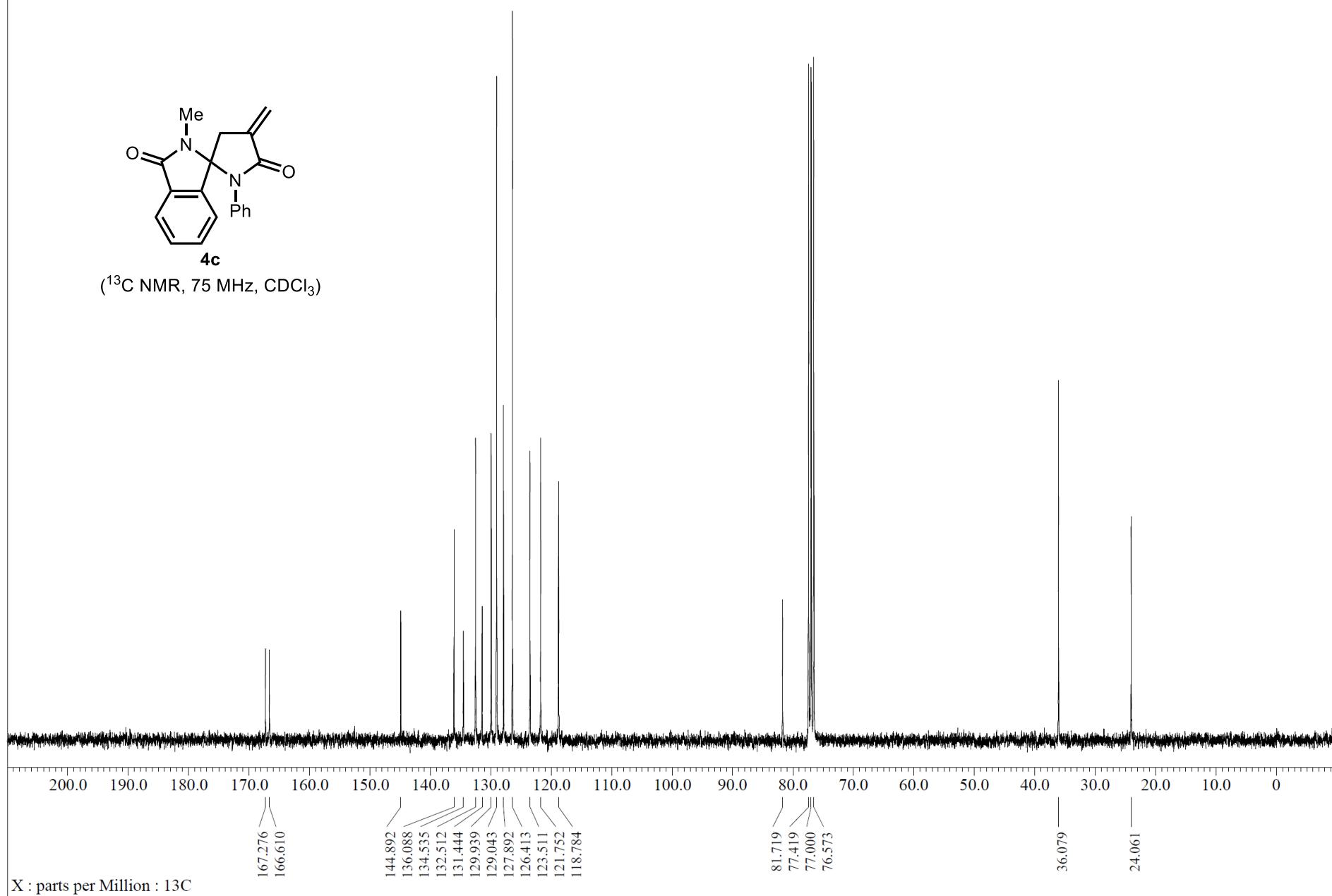


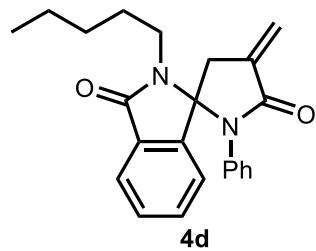
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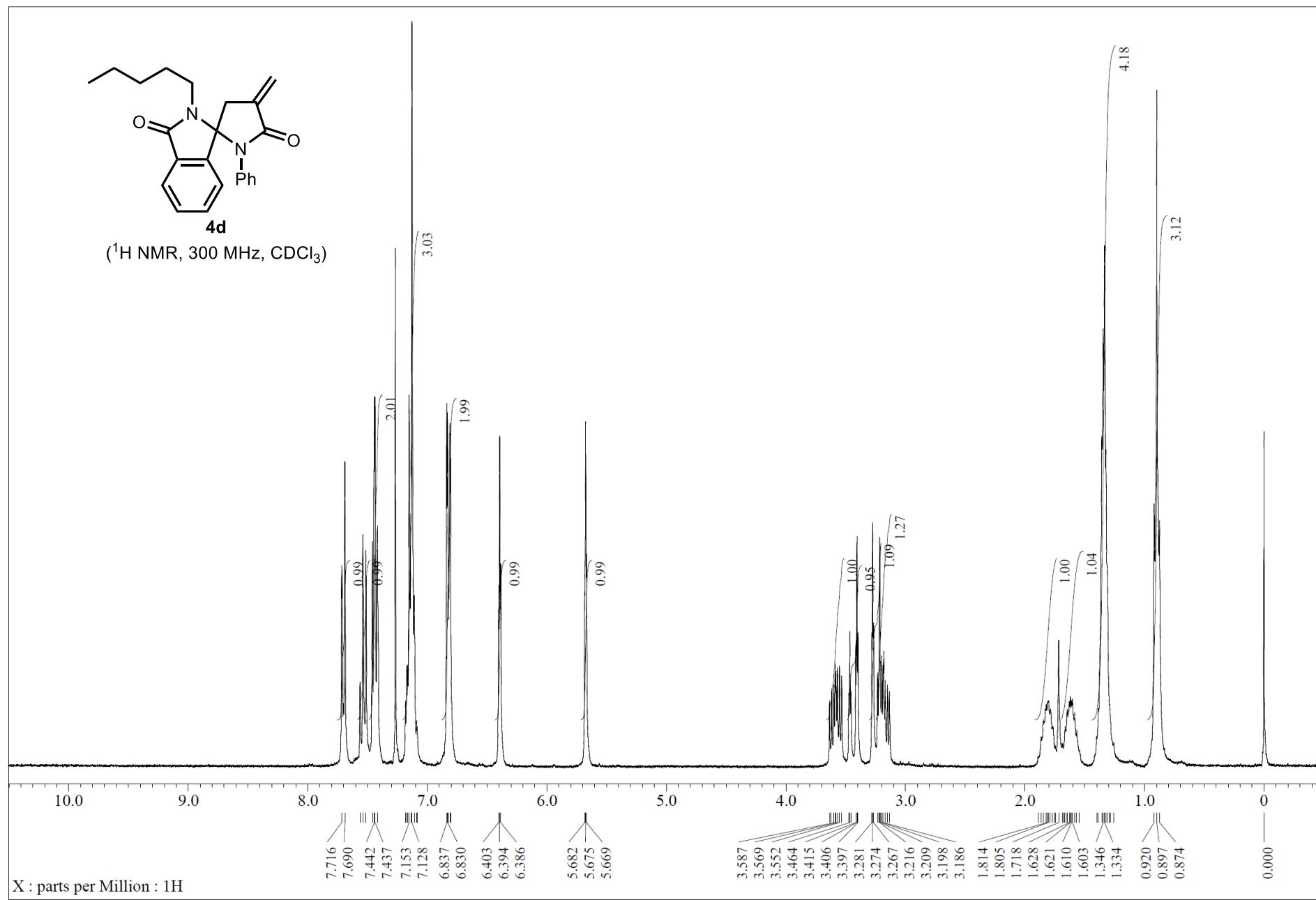


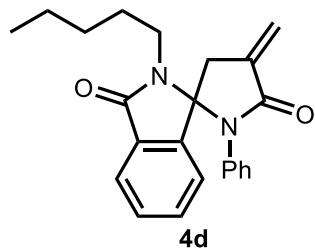
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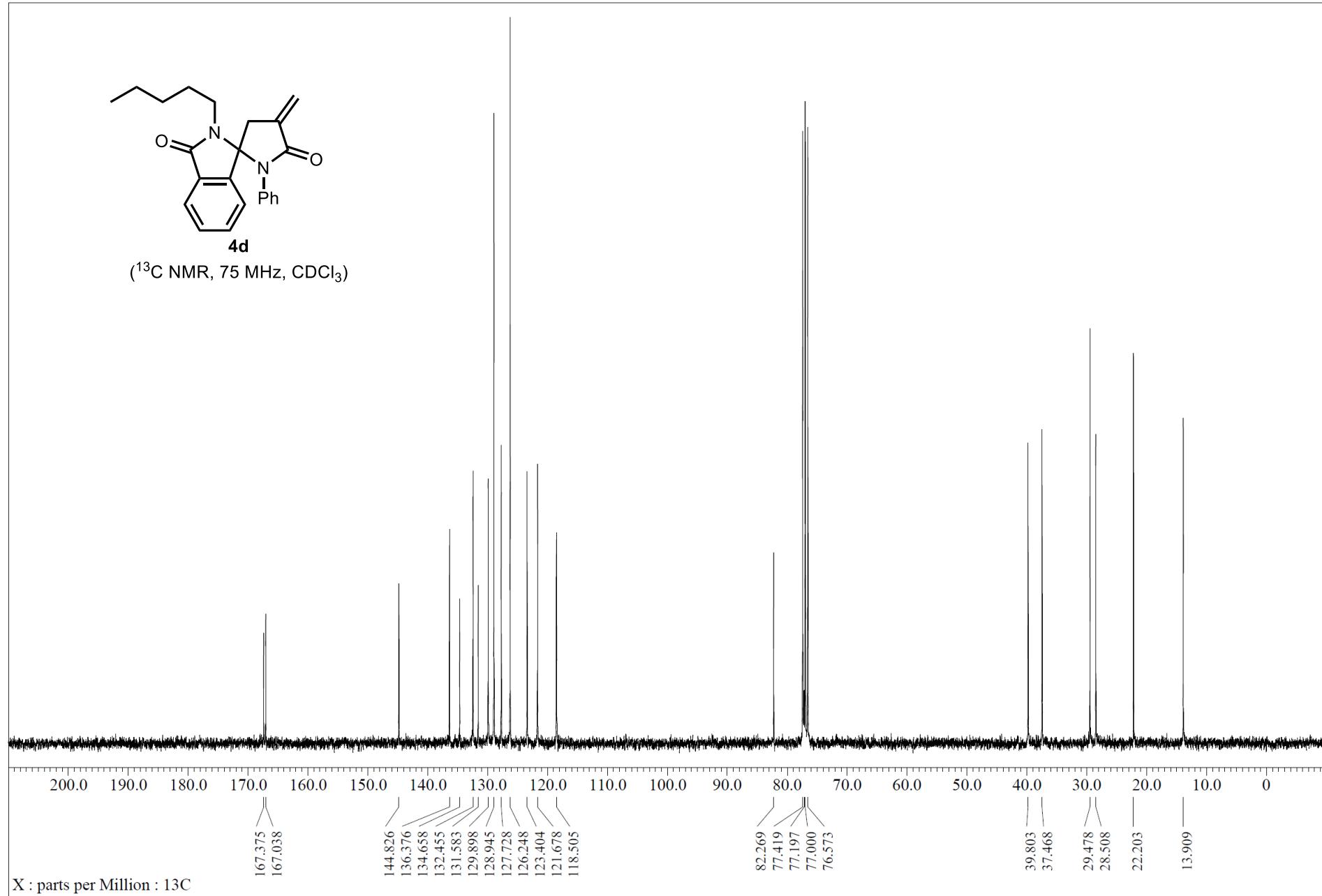


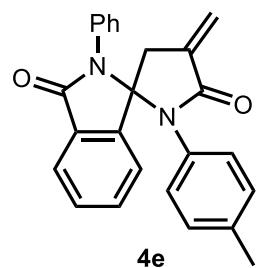
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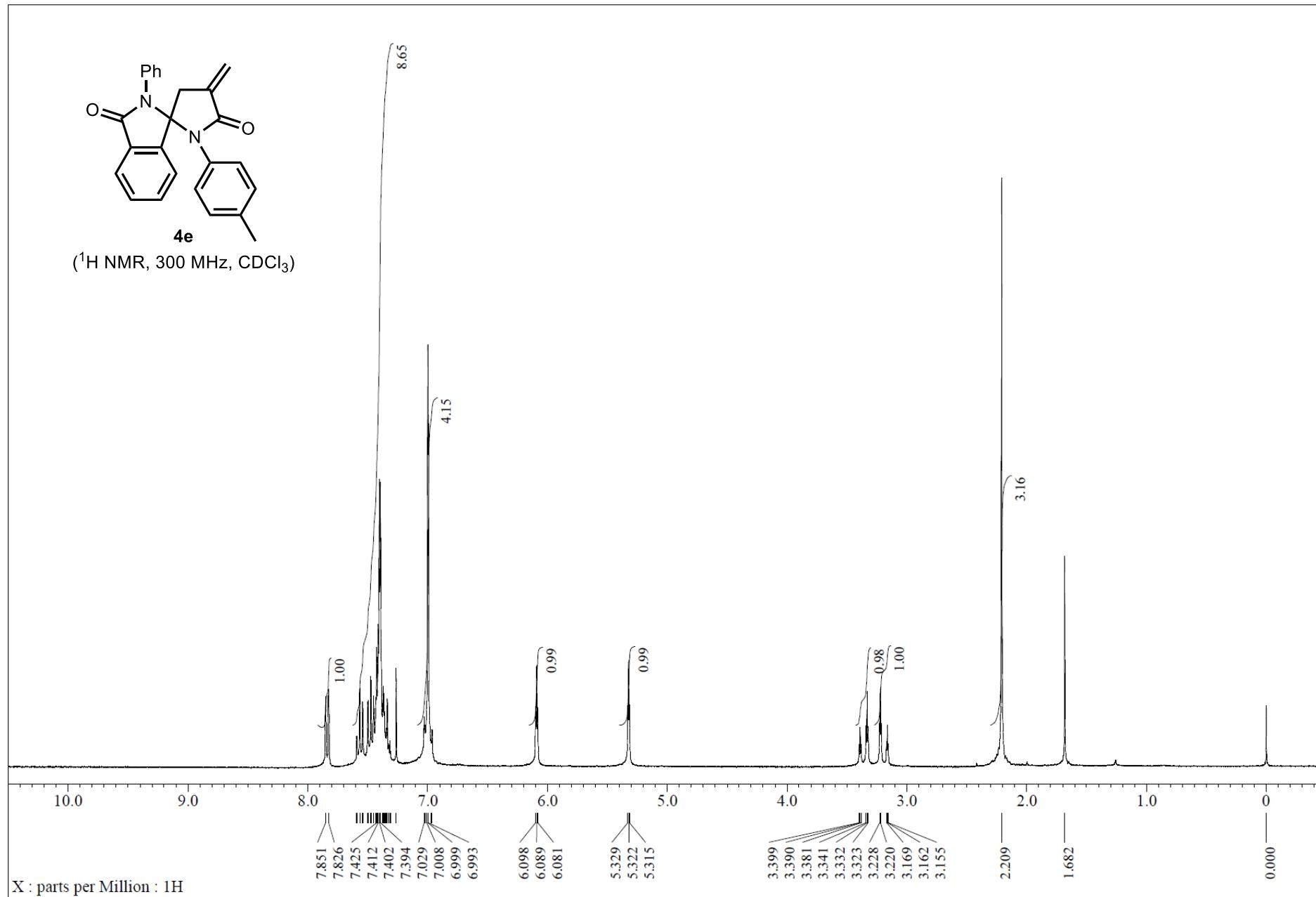


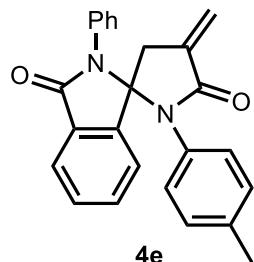
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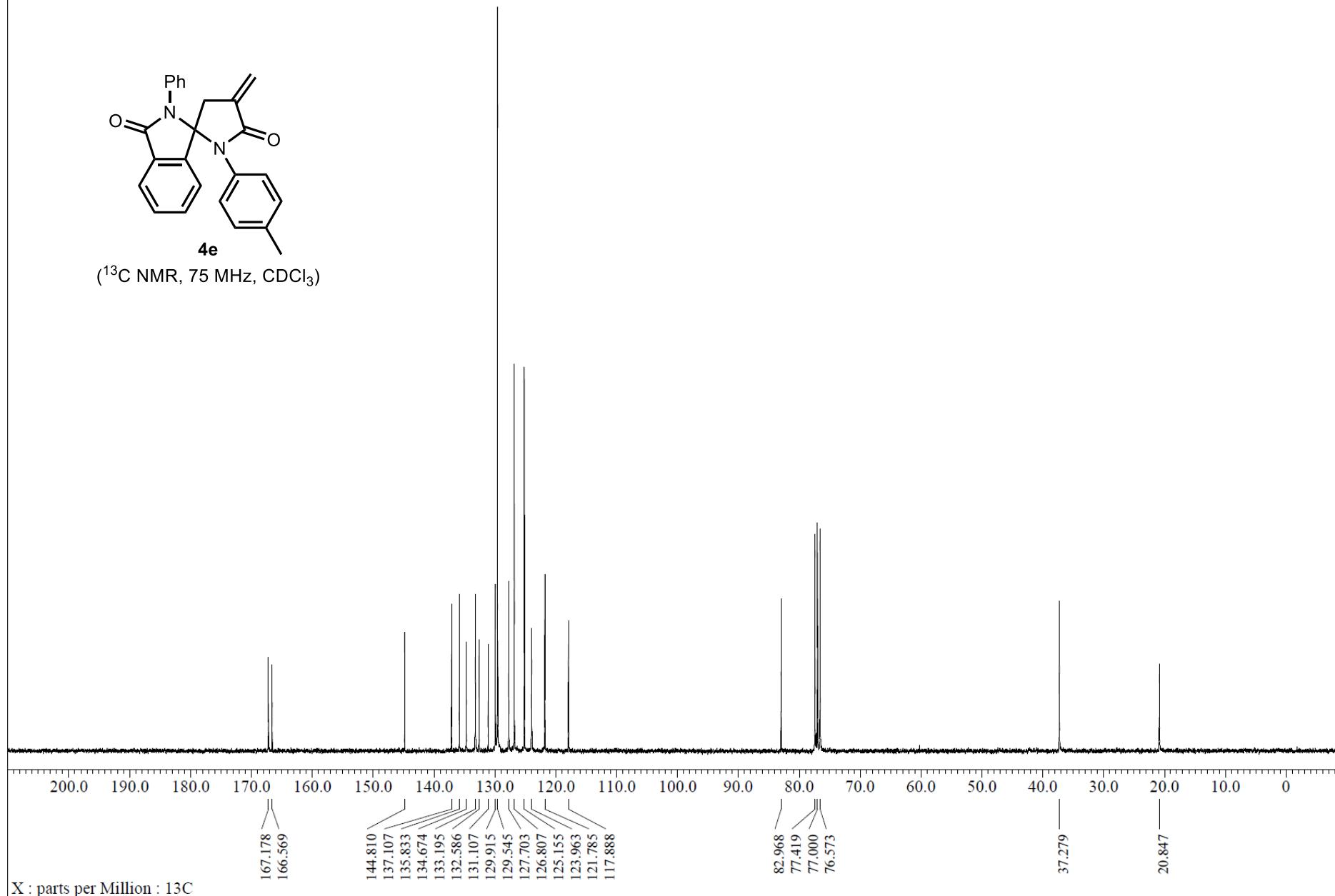


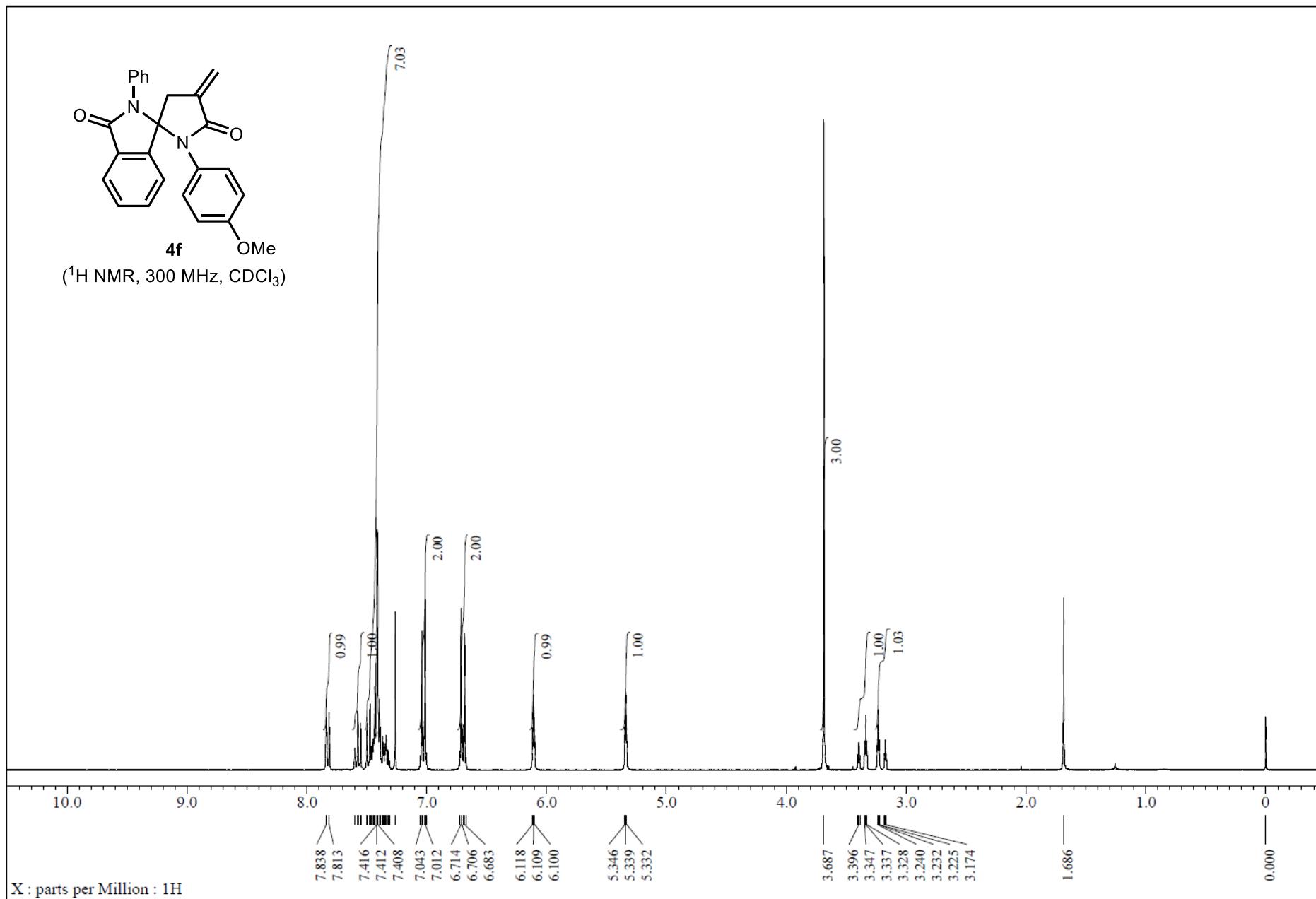
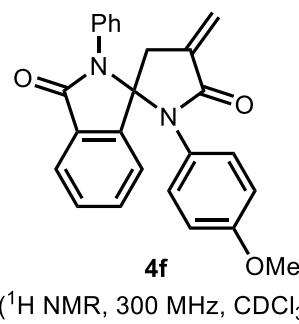
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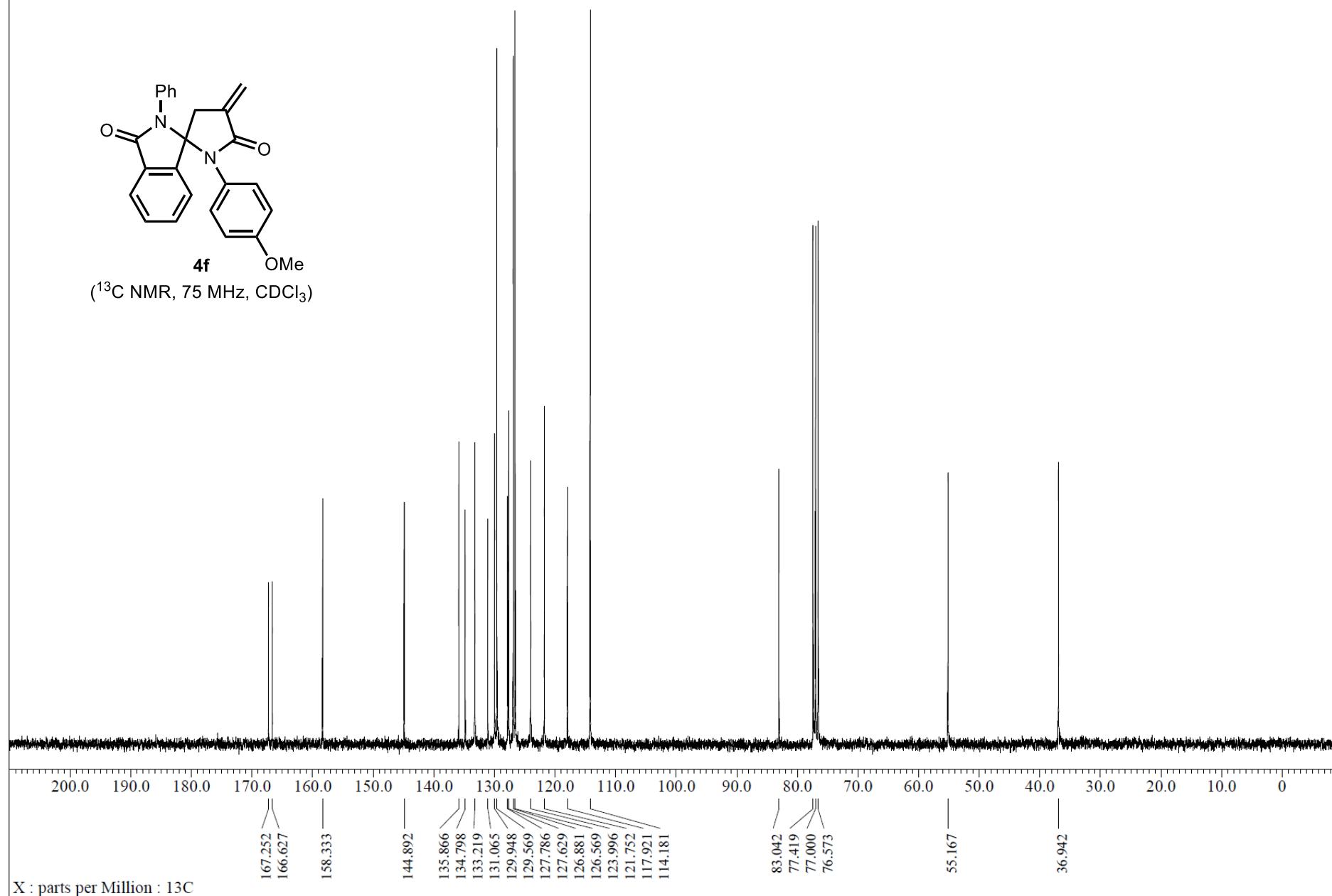
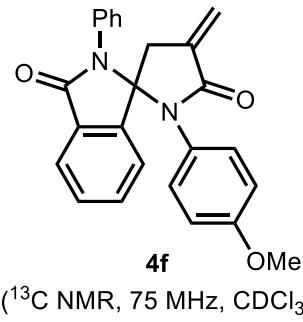




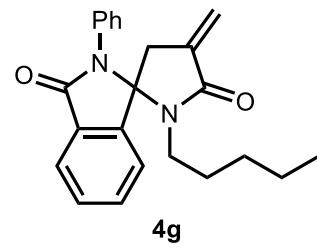
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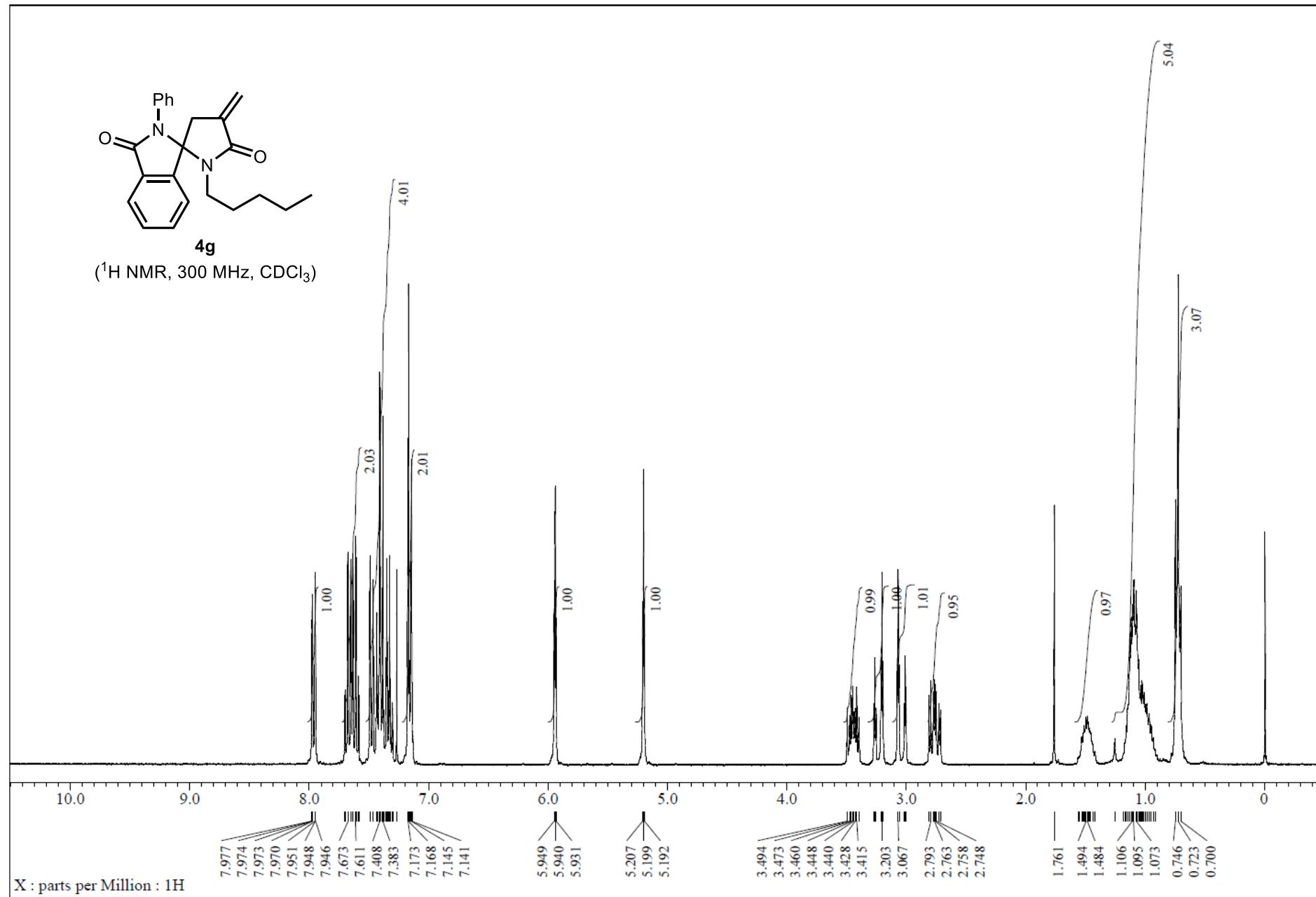


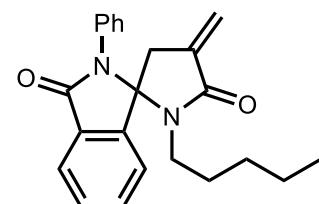


X : parts per Million : ^{13}C



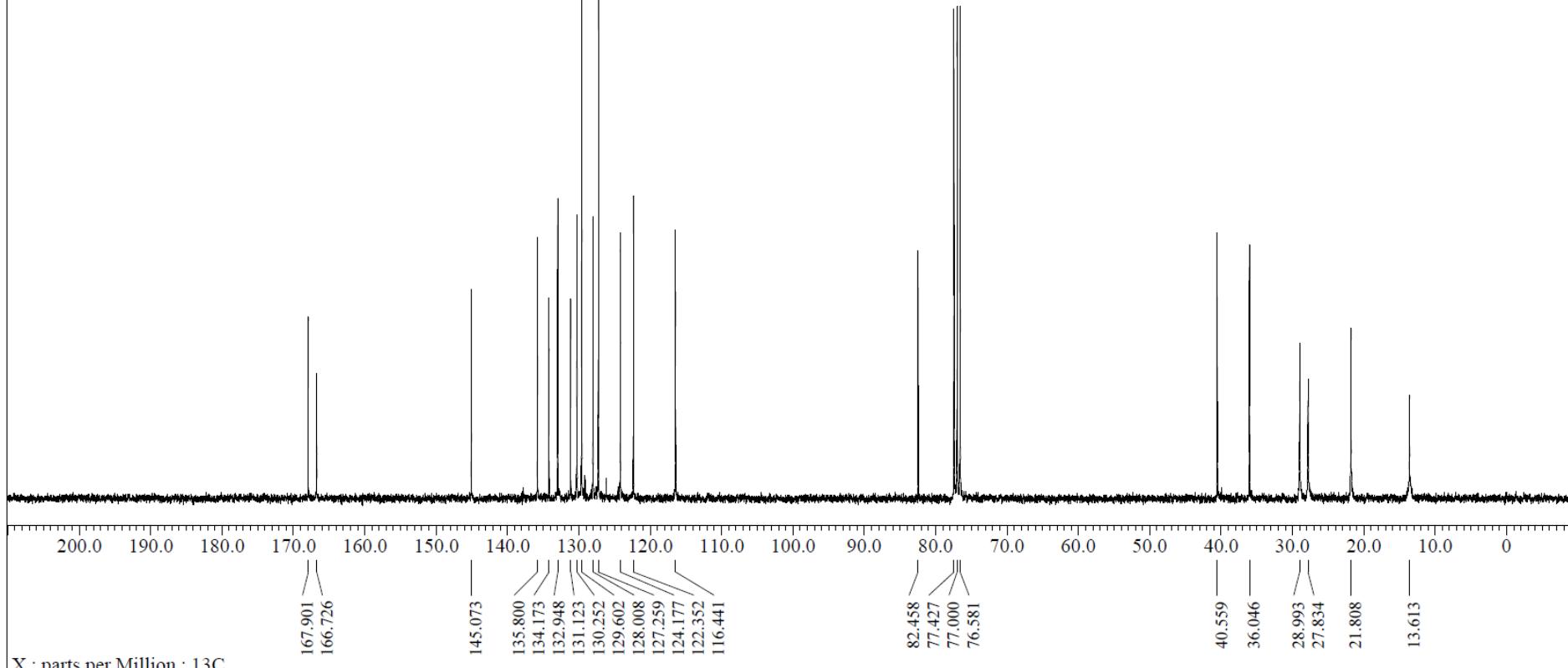
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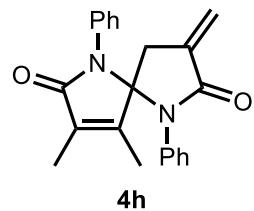


4g

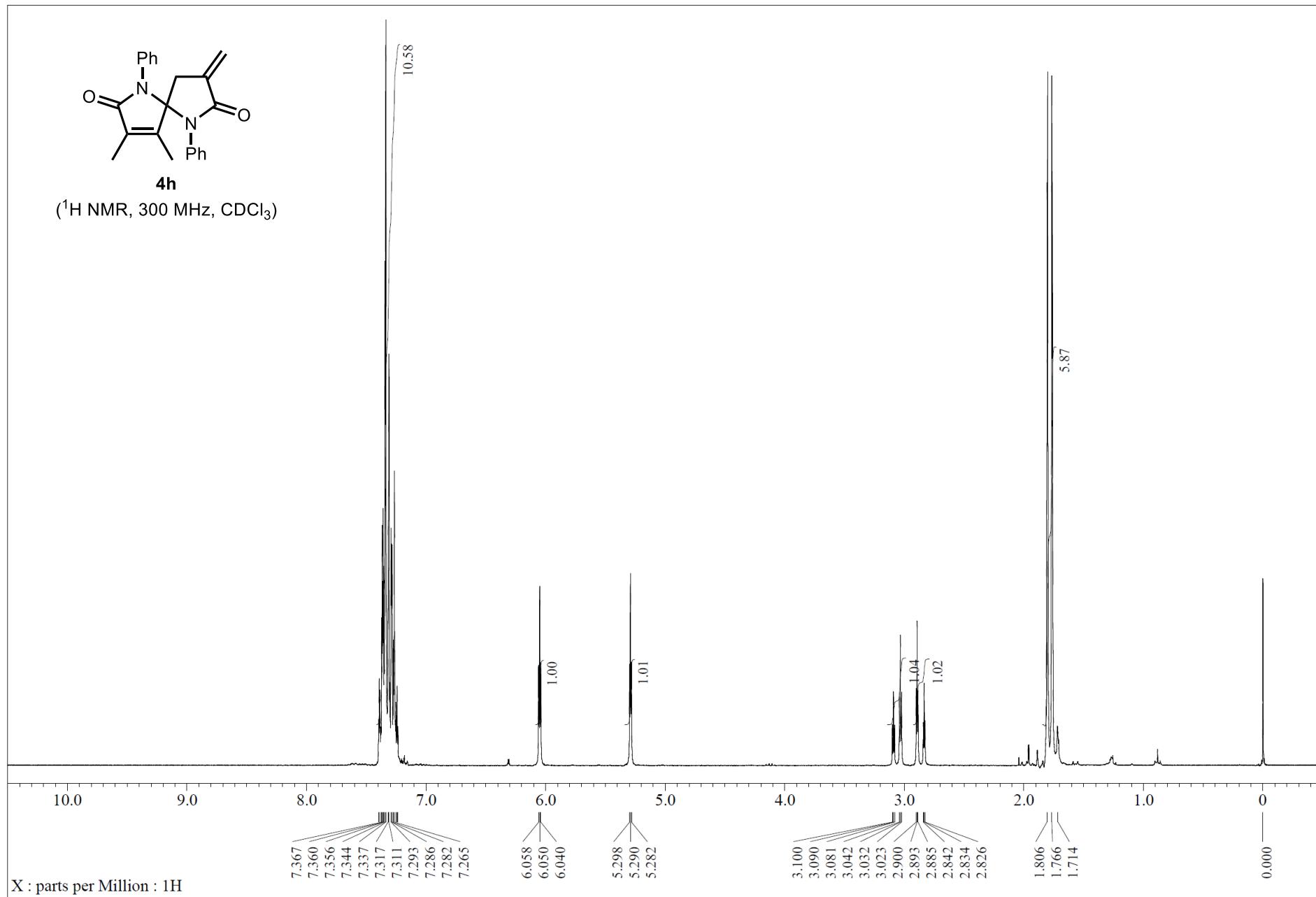
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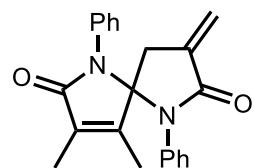


X : parts per Million : ¹³C



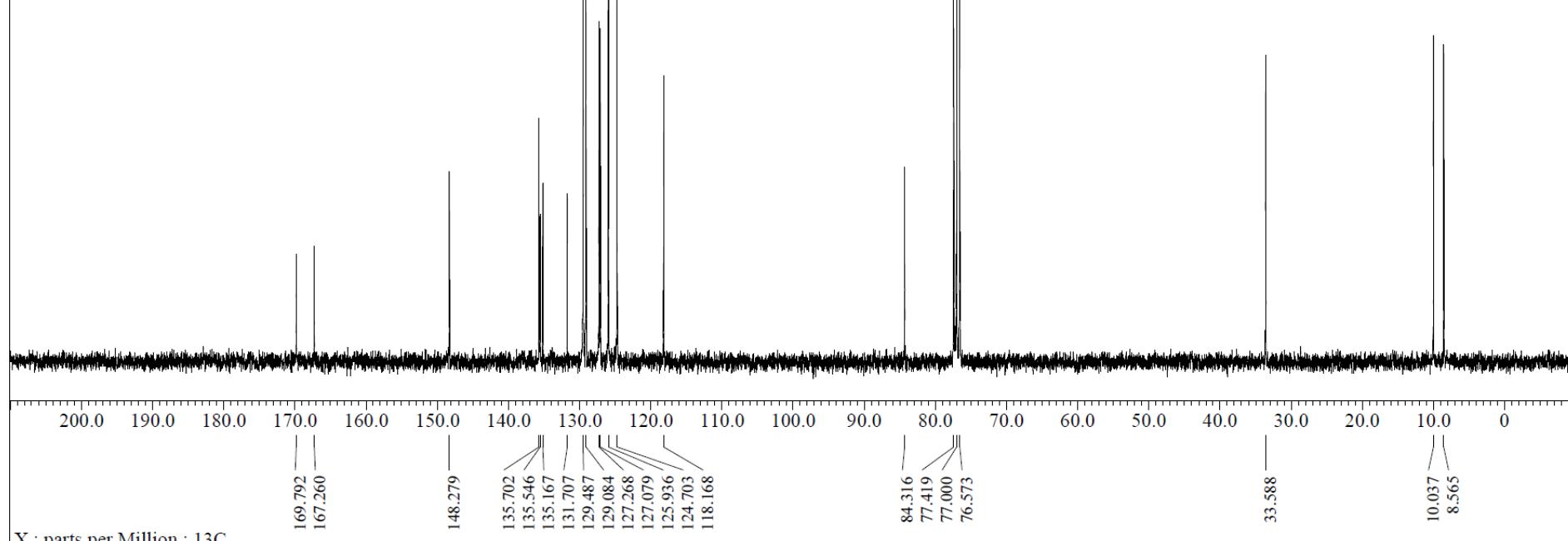
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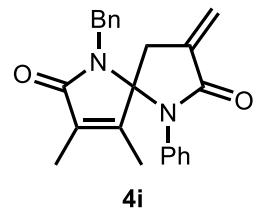


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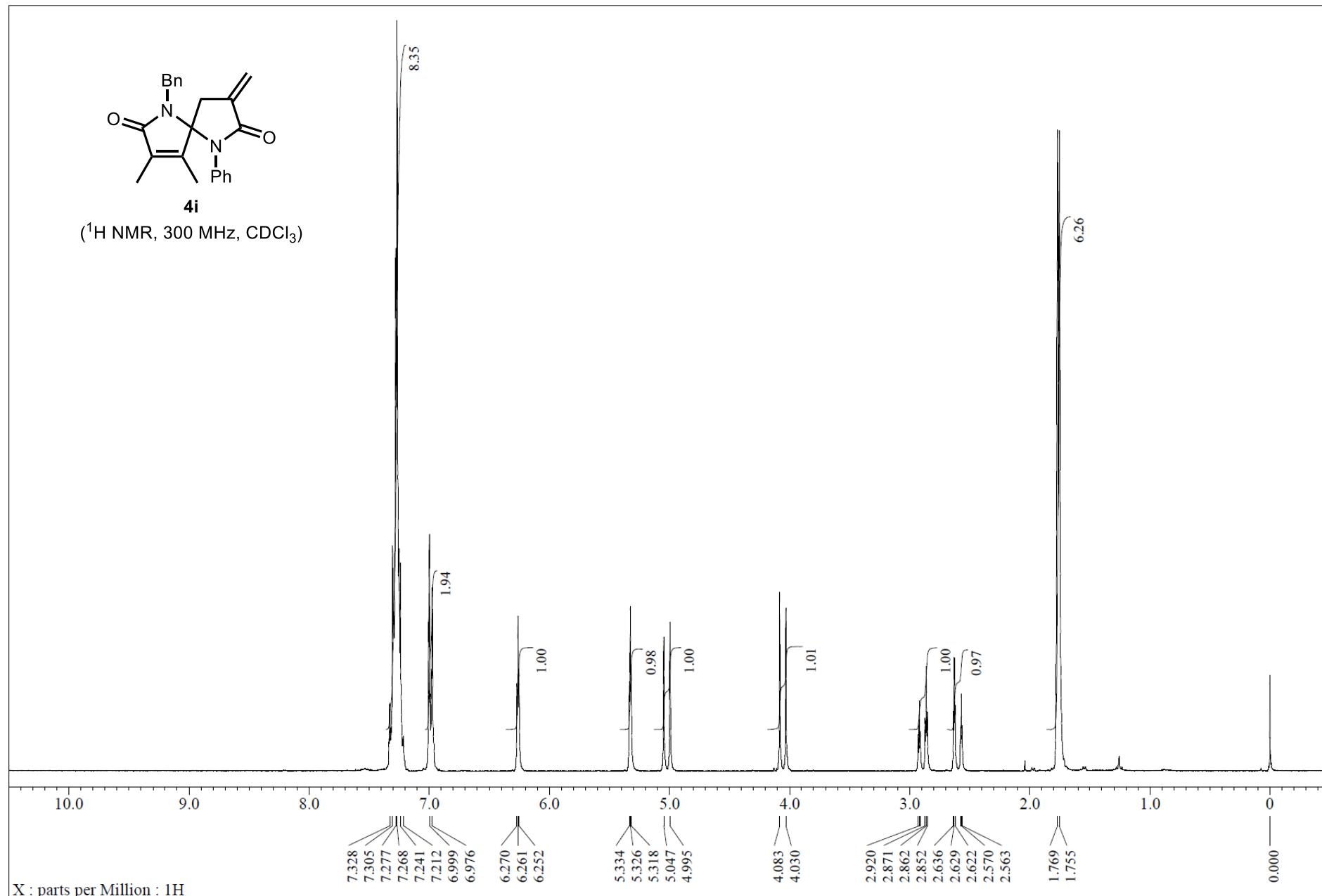
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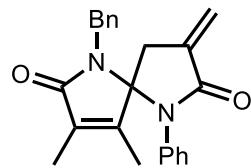


X : parts per Million : ^{13}C

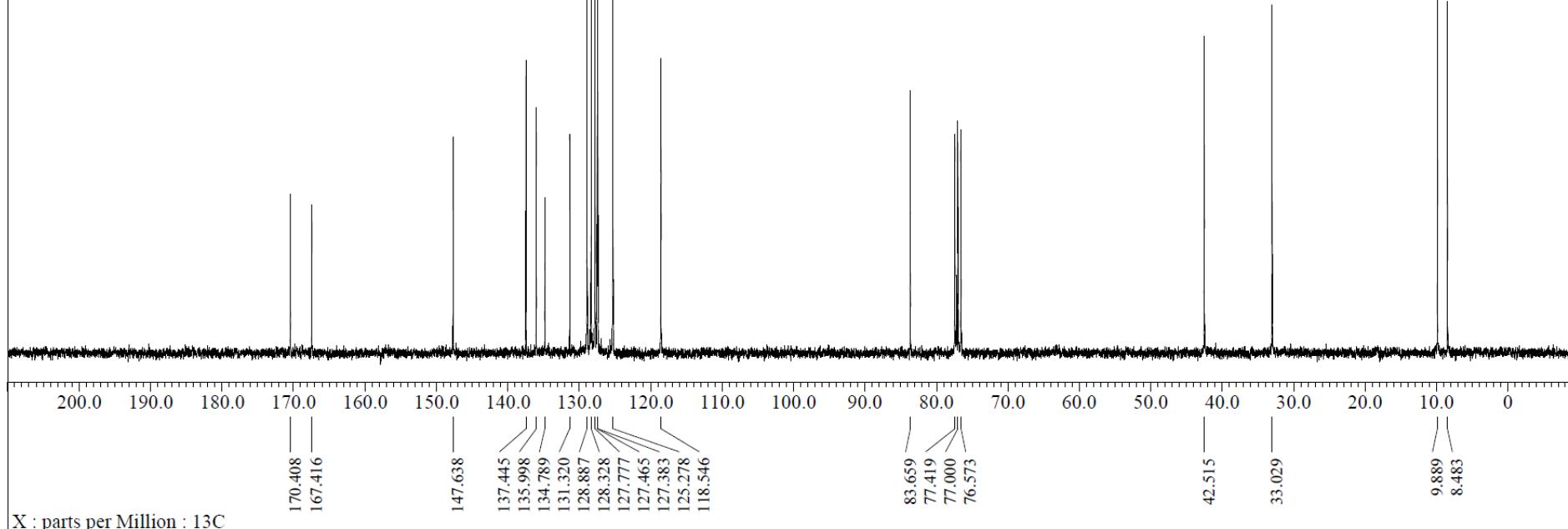


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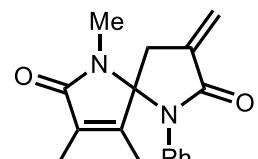




(^{13}C NMR, 75 MHz, CDCl_3)

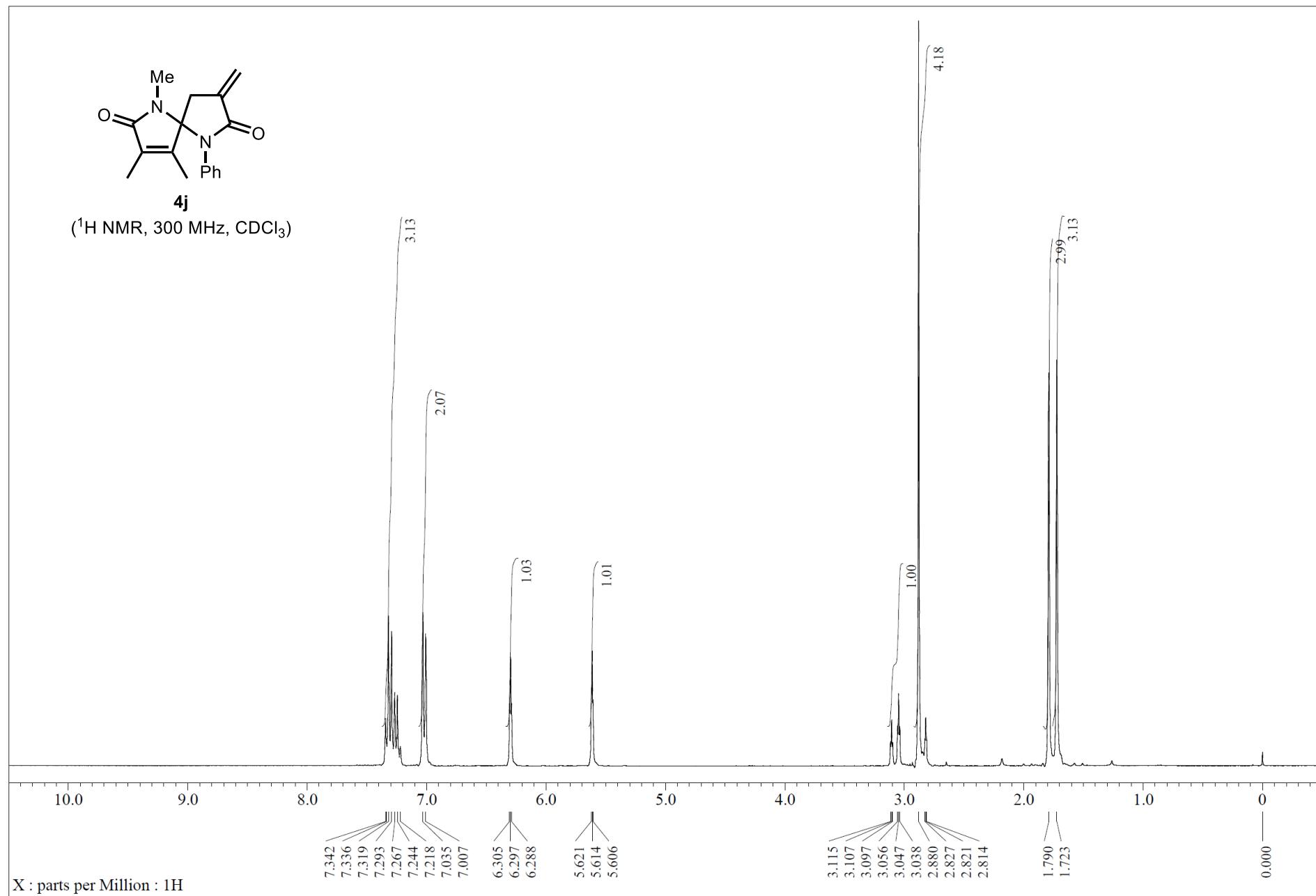


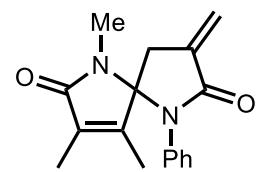
X : parts per Million : ^{13}C



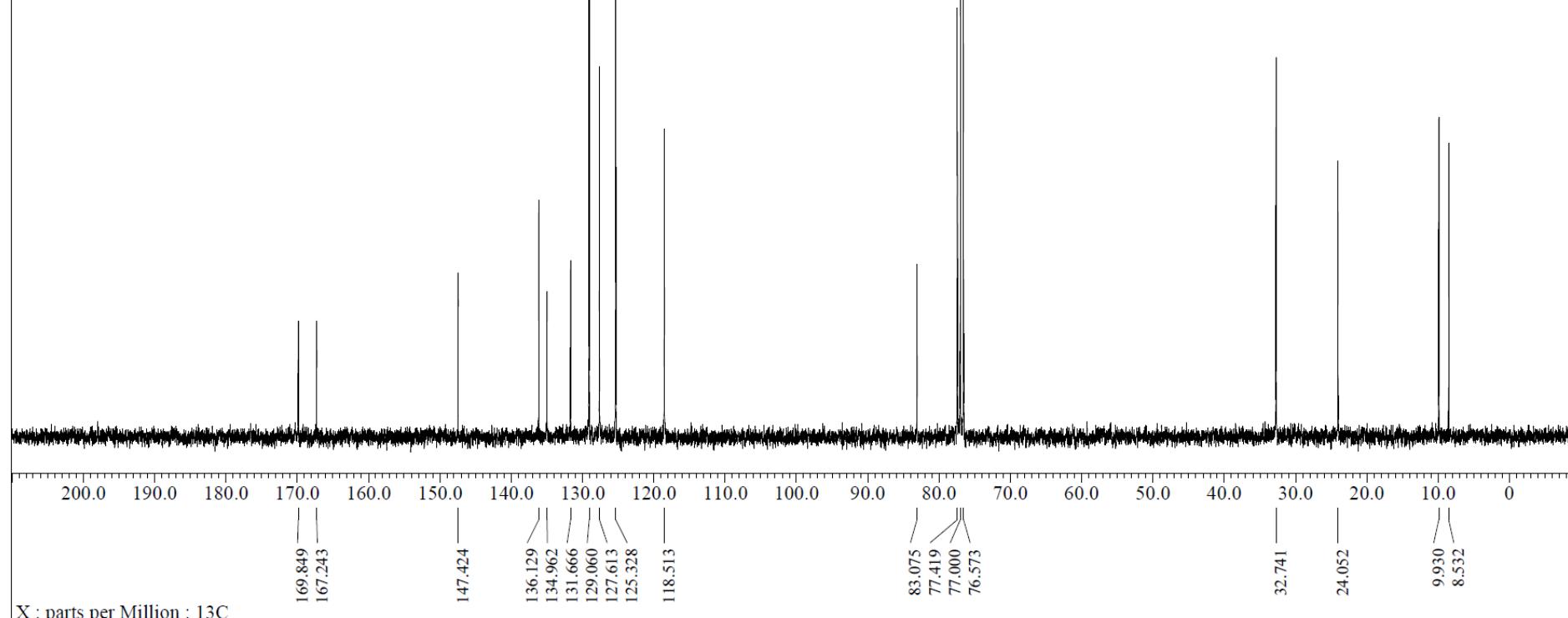
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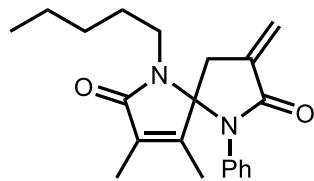




4j
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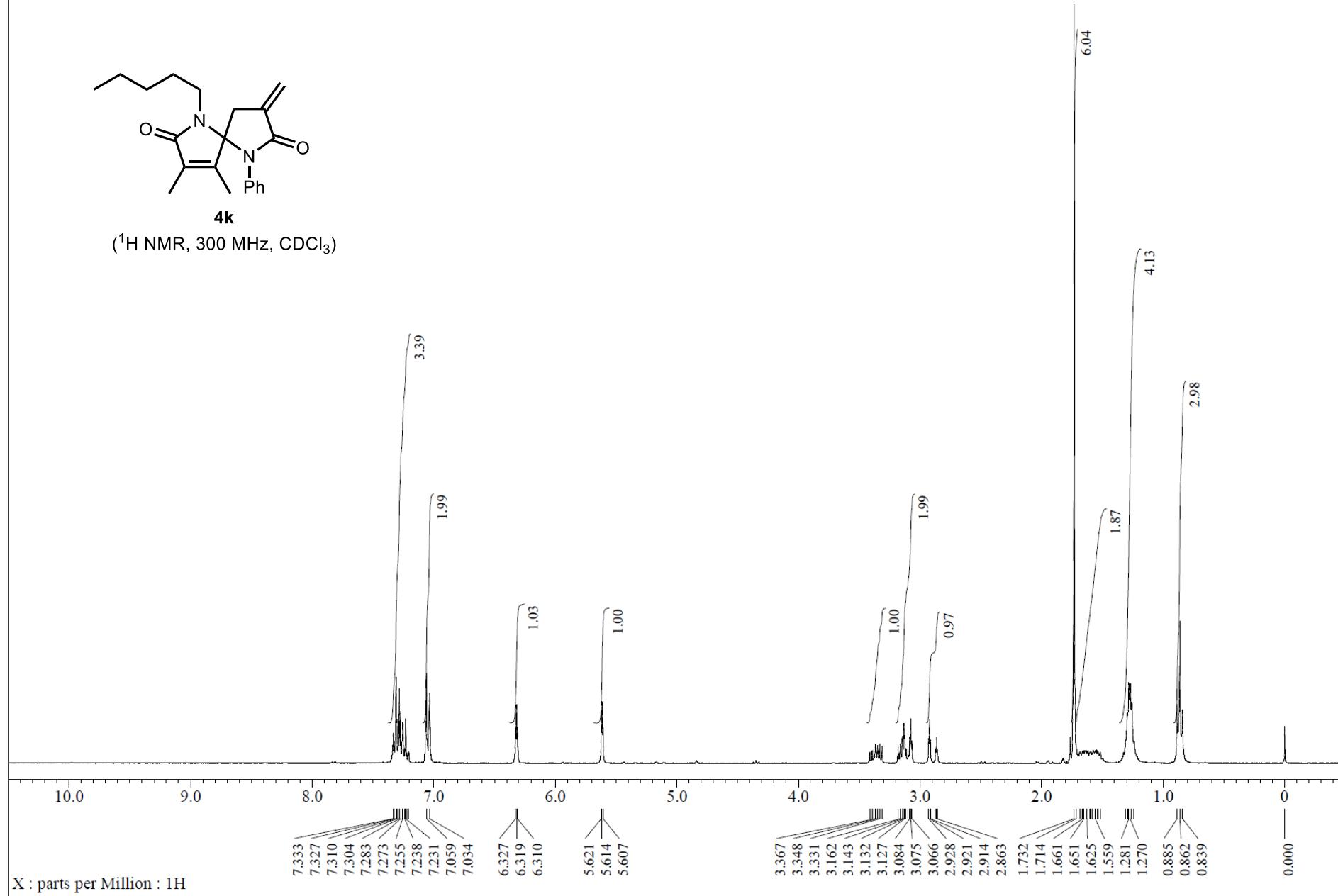


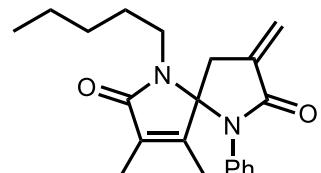
X : parts per Million : ^{13}C



4k

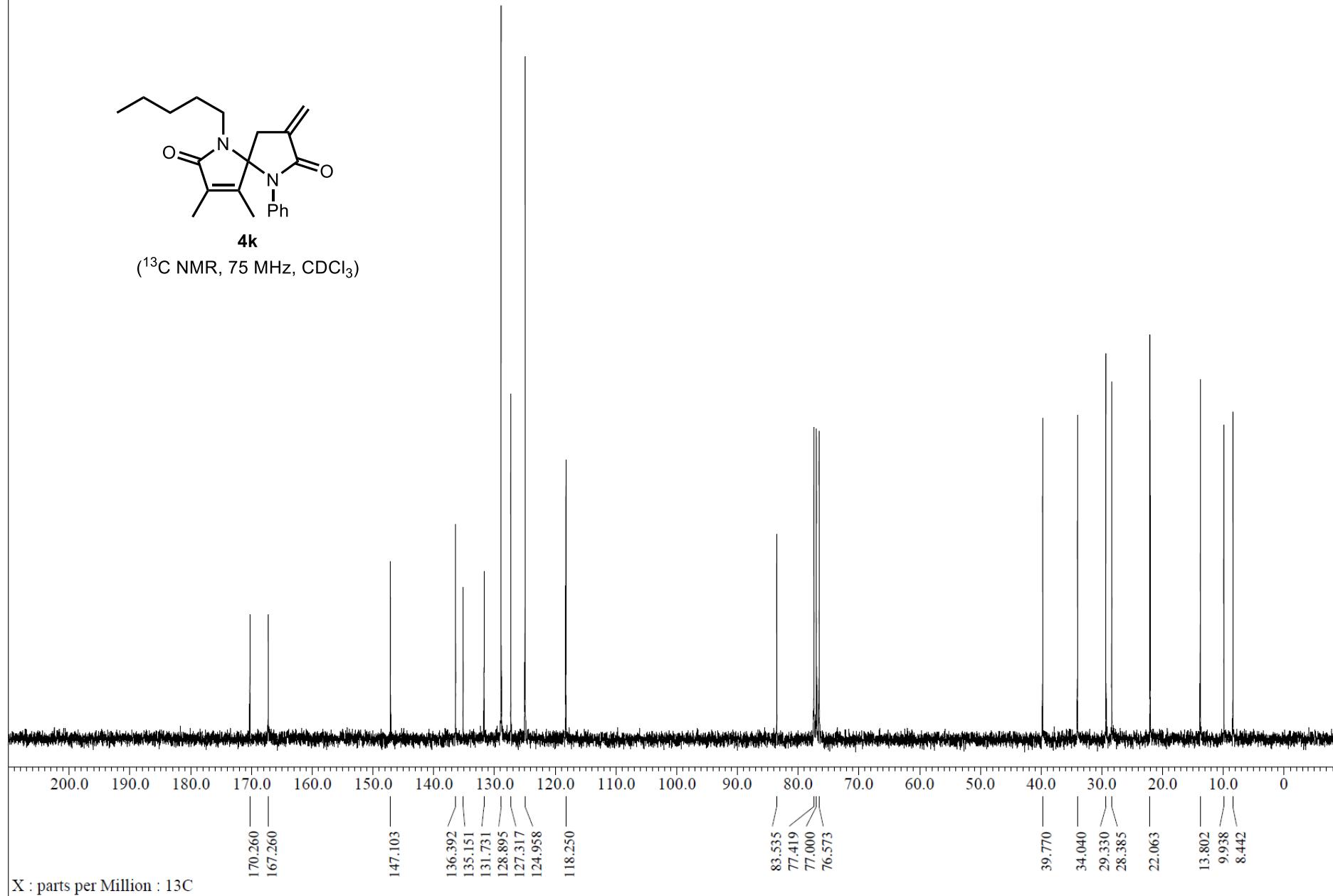
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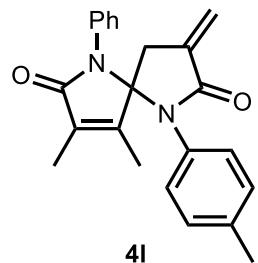




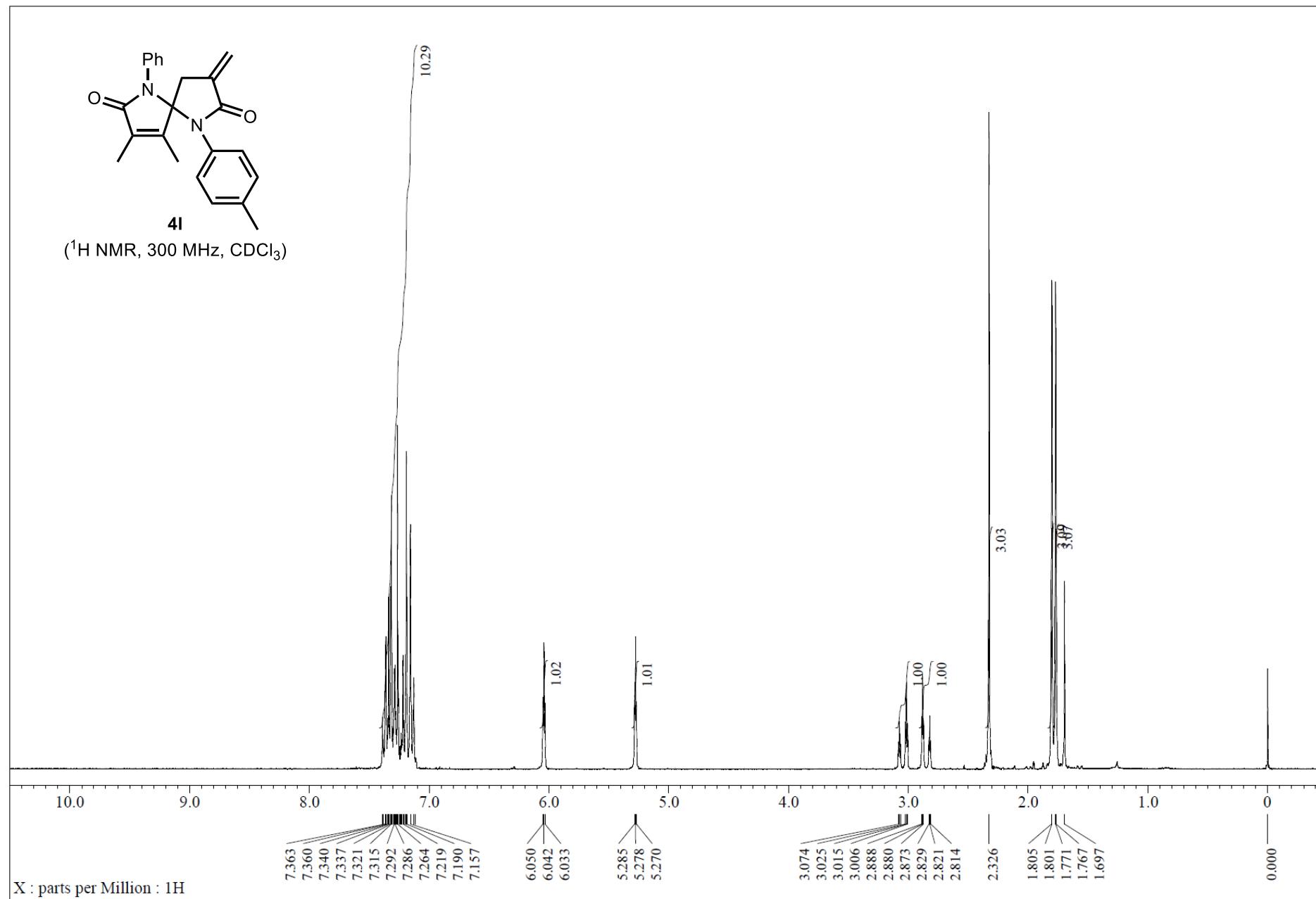
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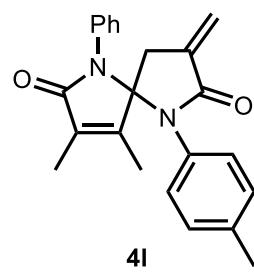
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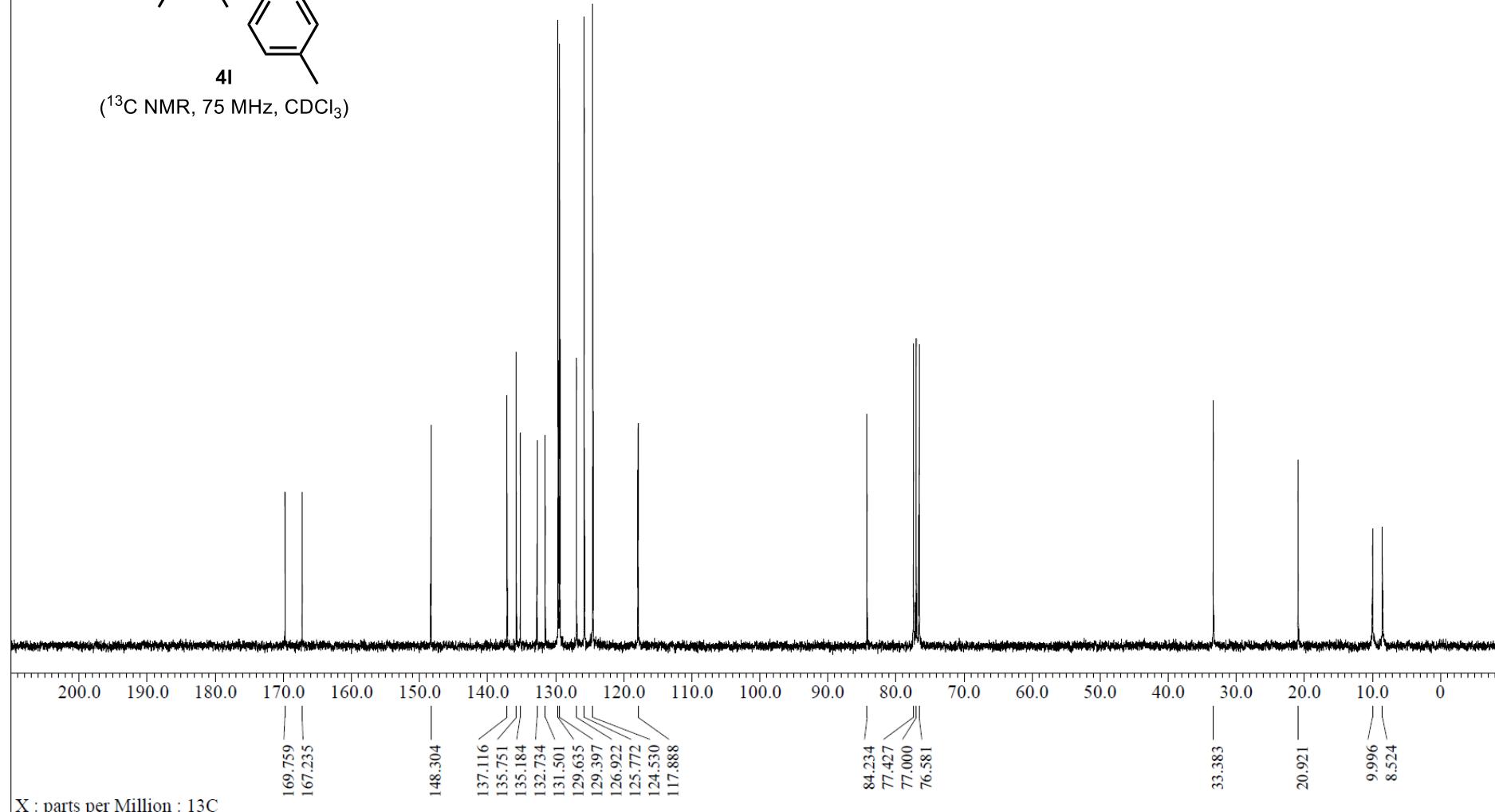


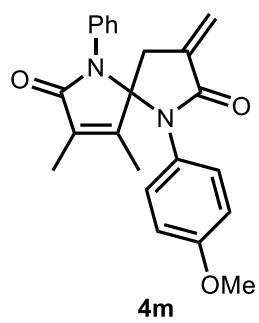
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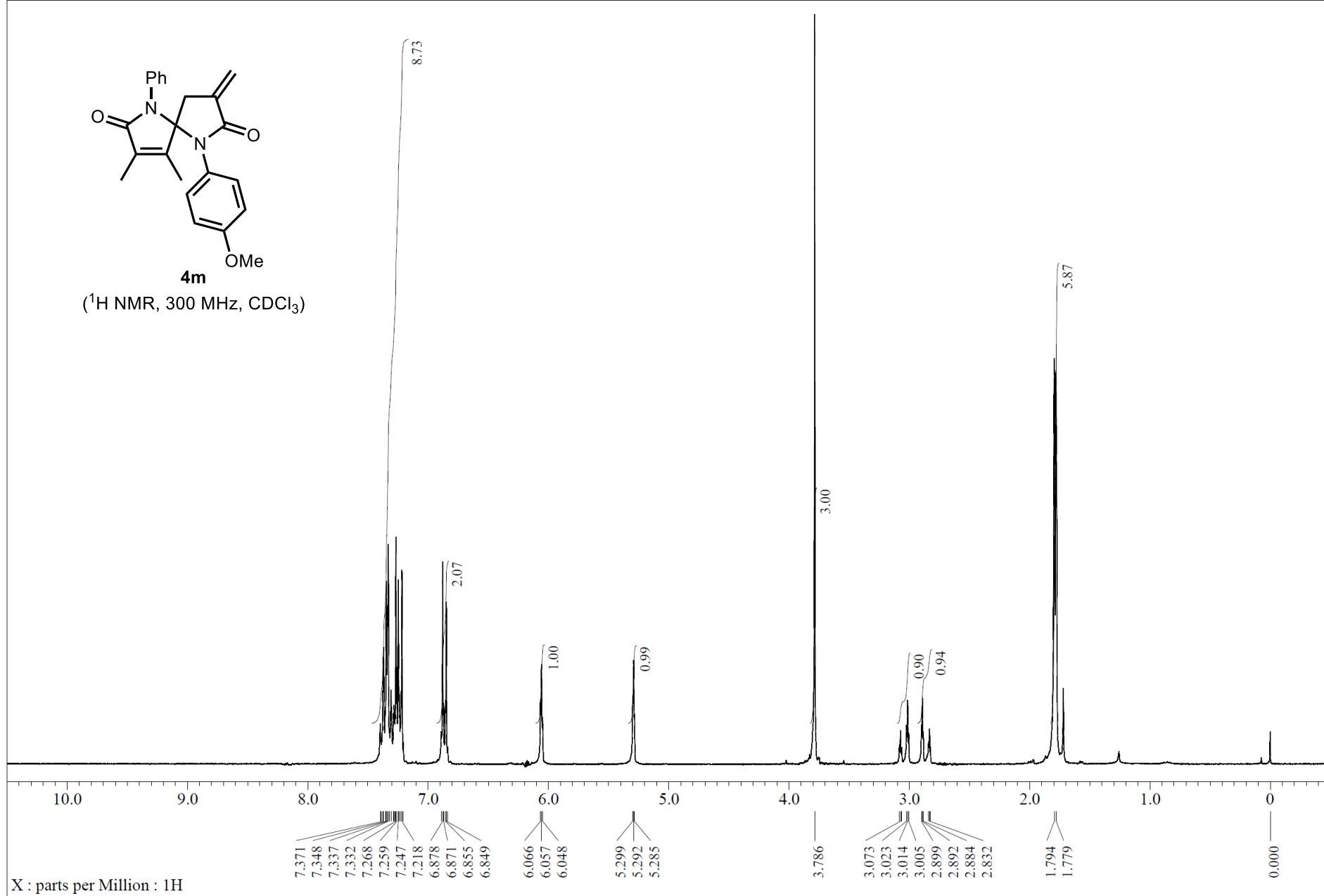


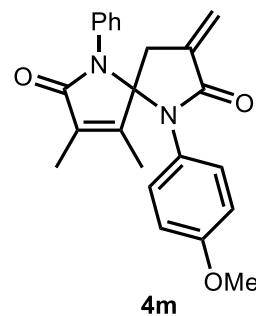
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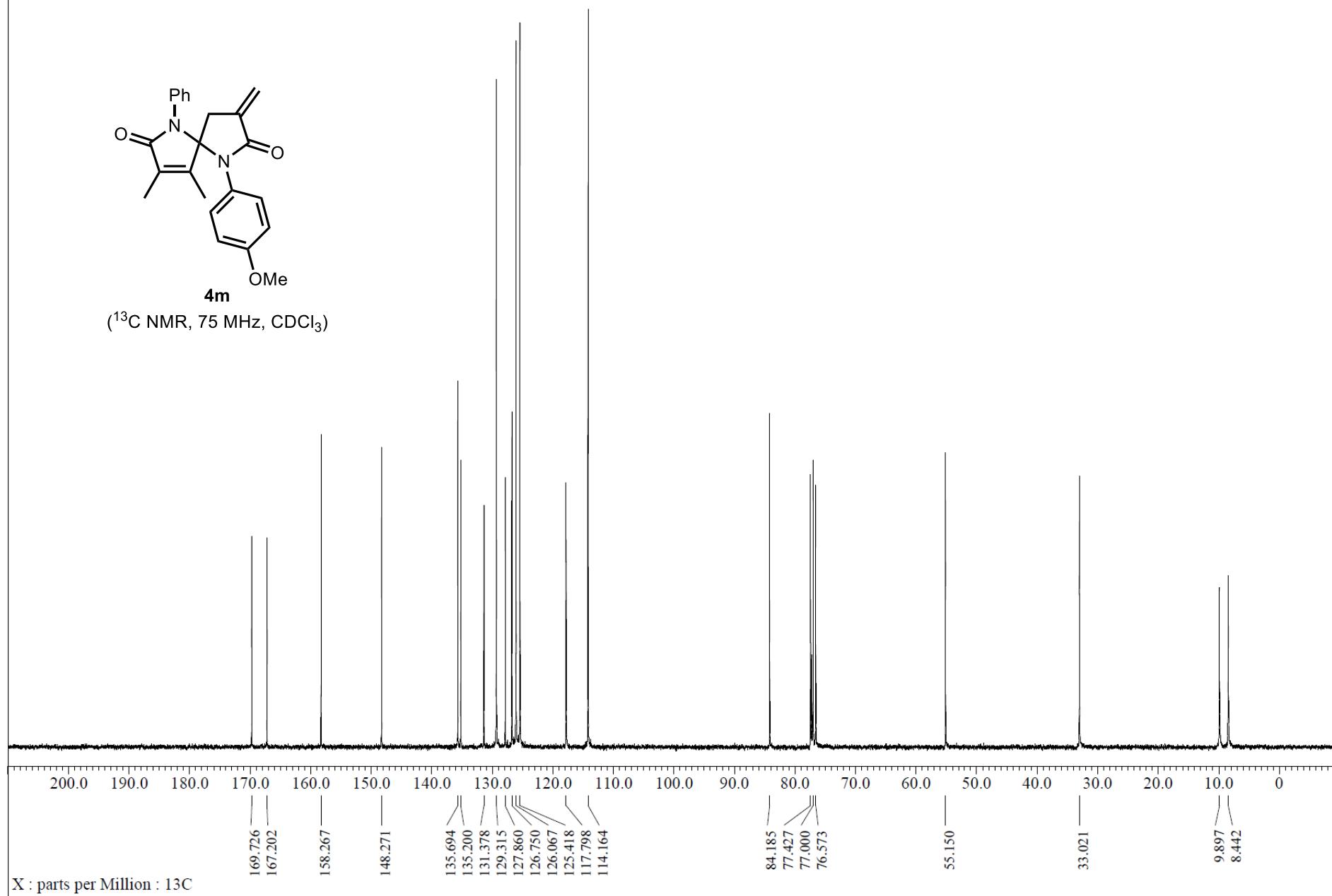


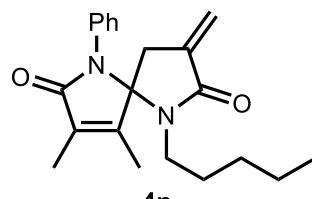
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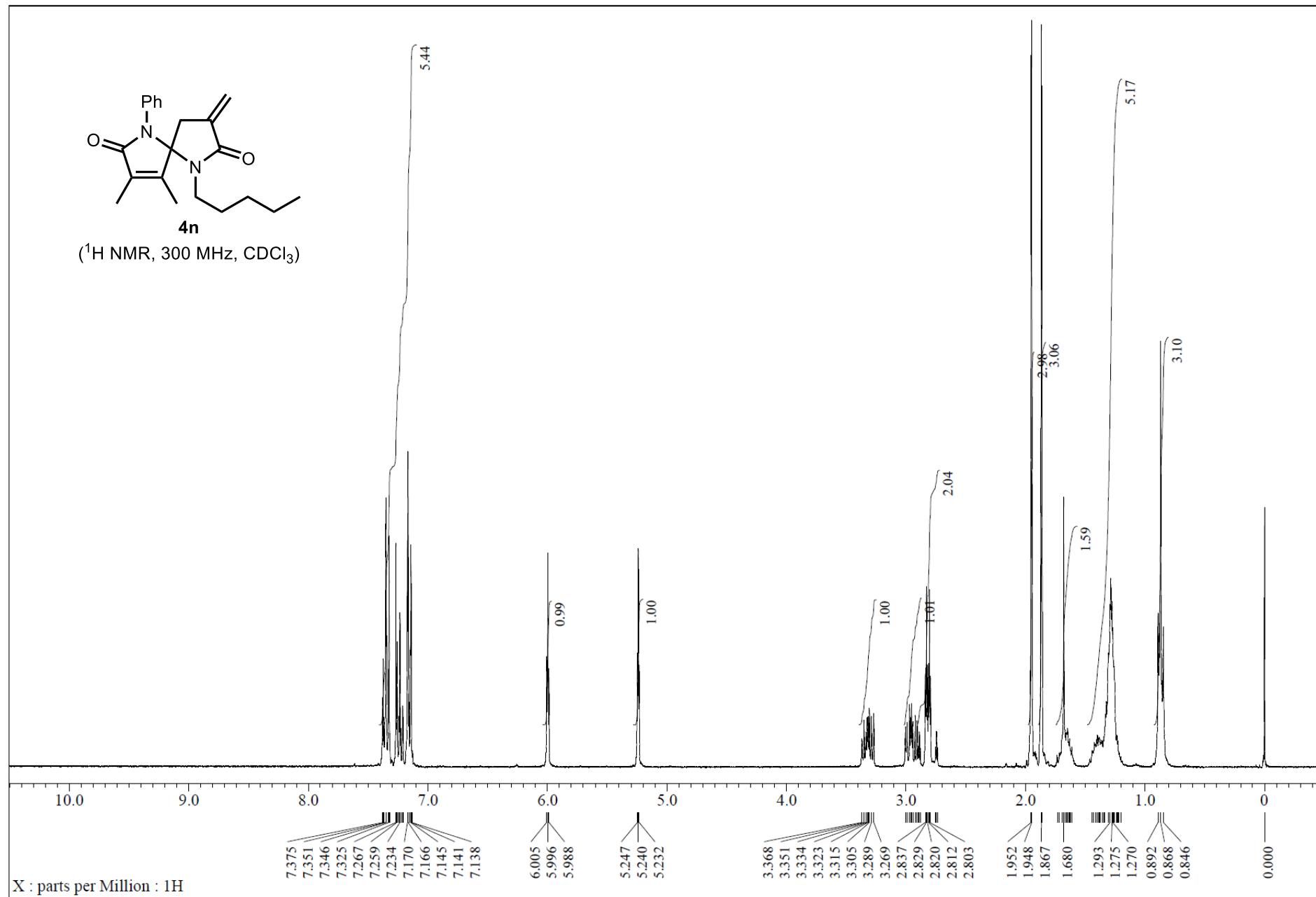


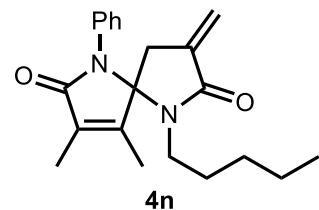
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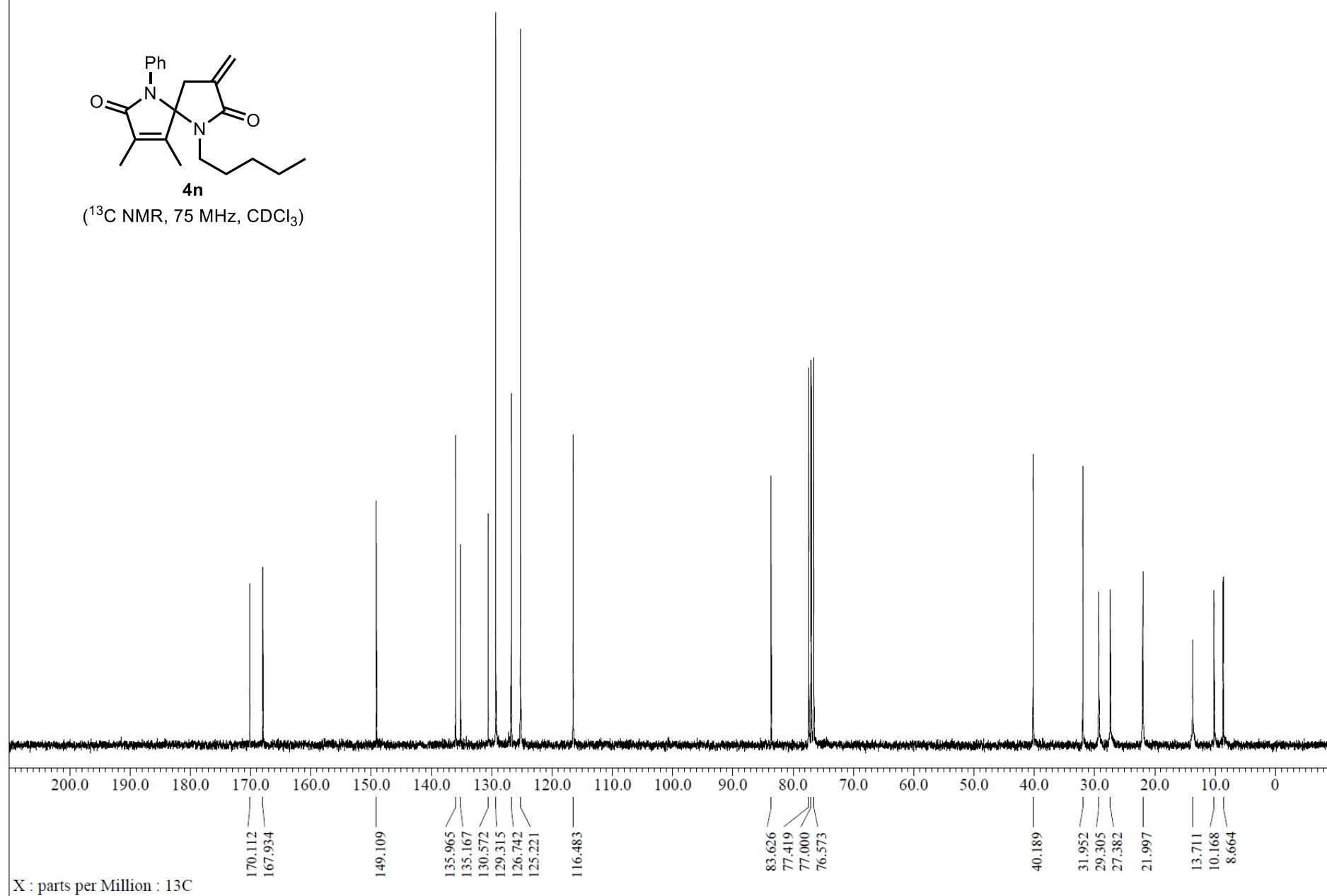


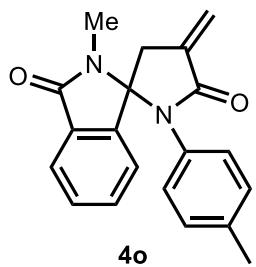
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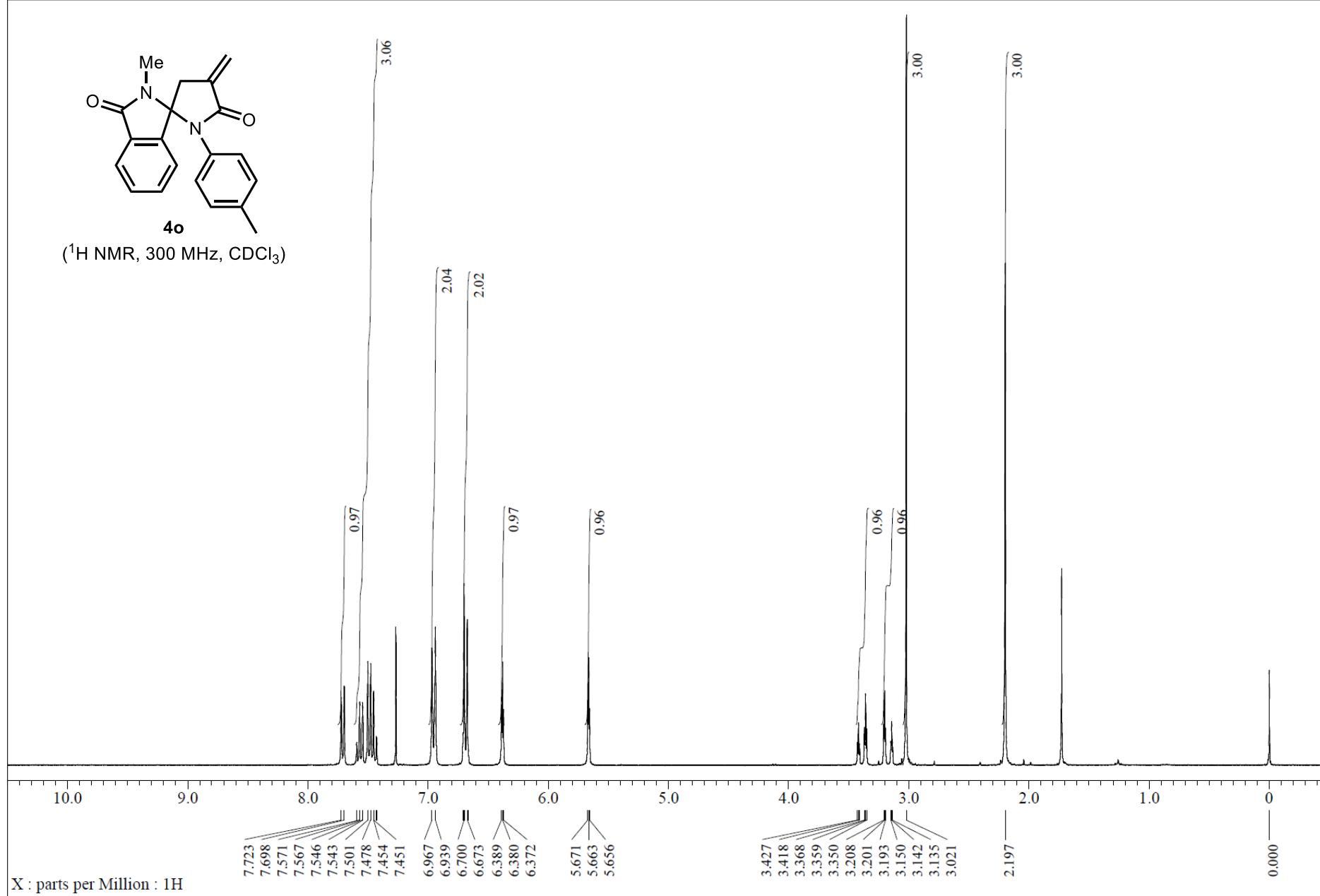


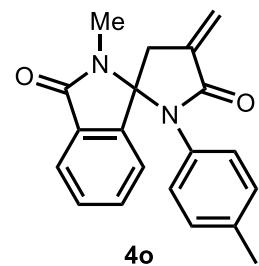
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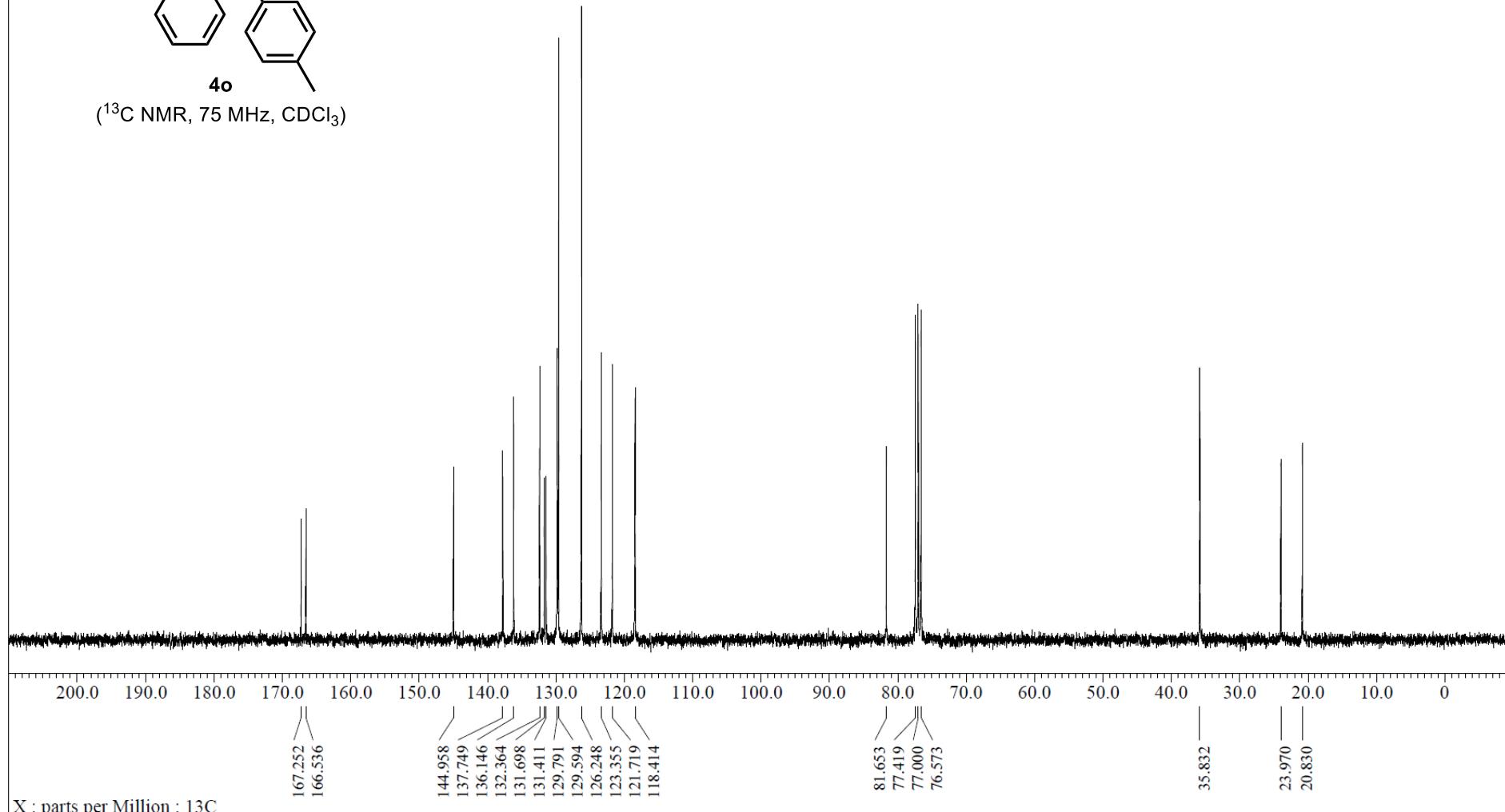


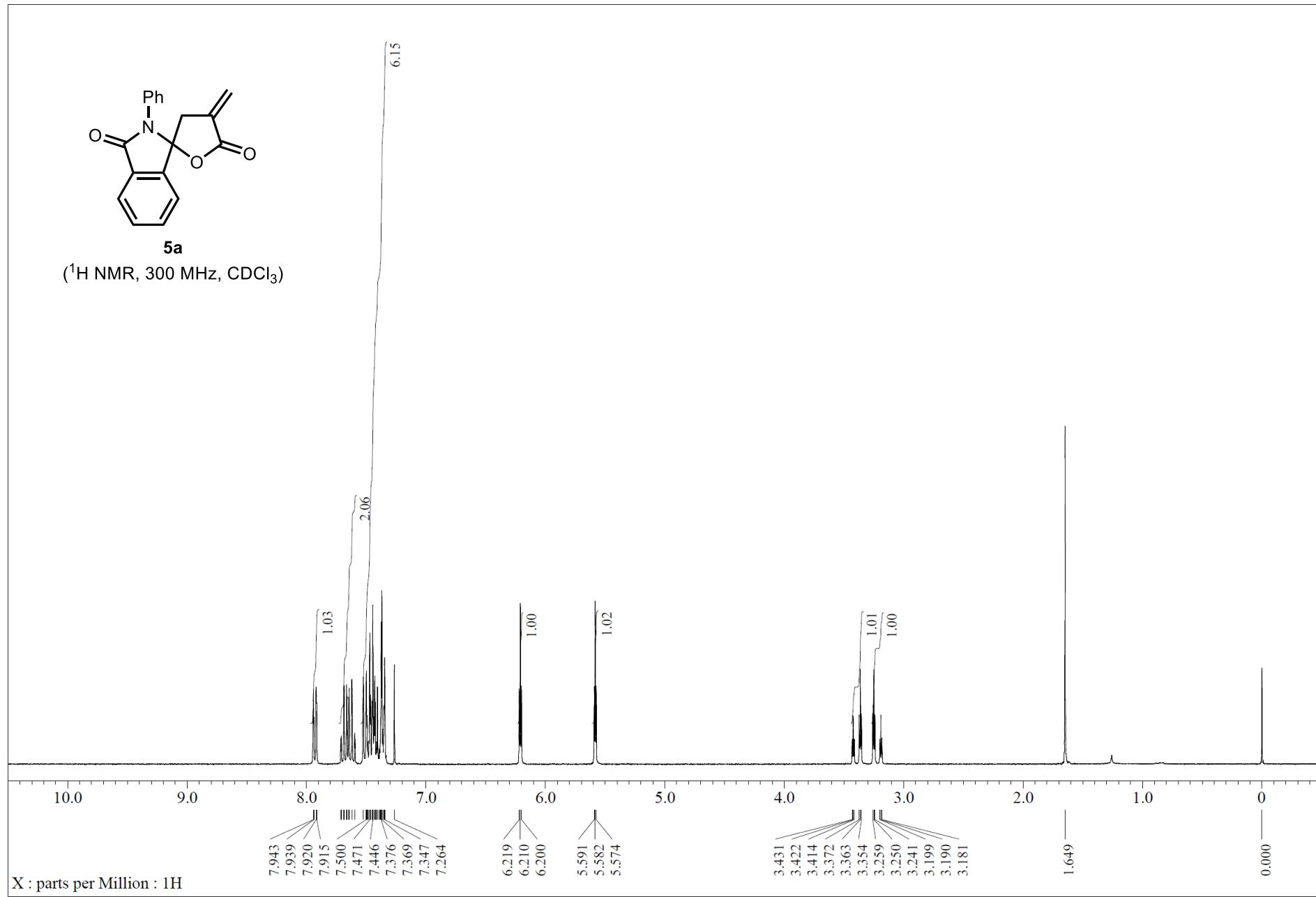
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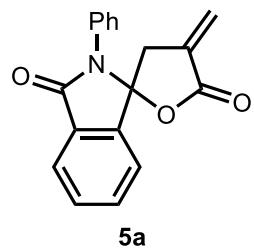




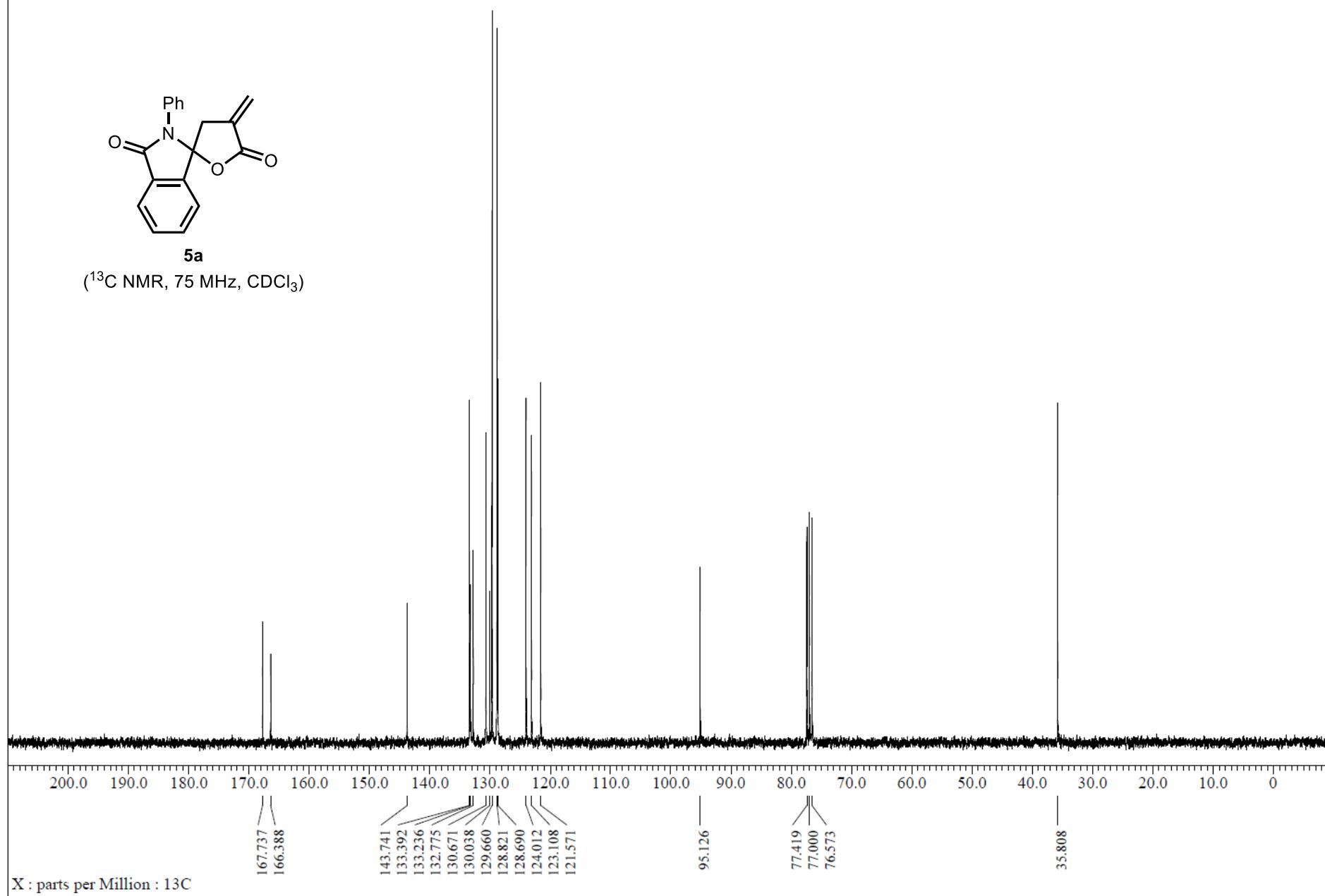
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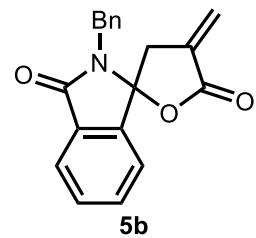




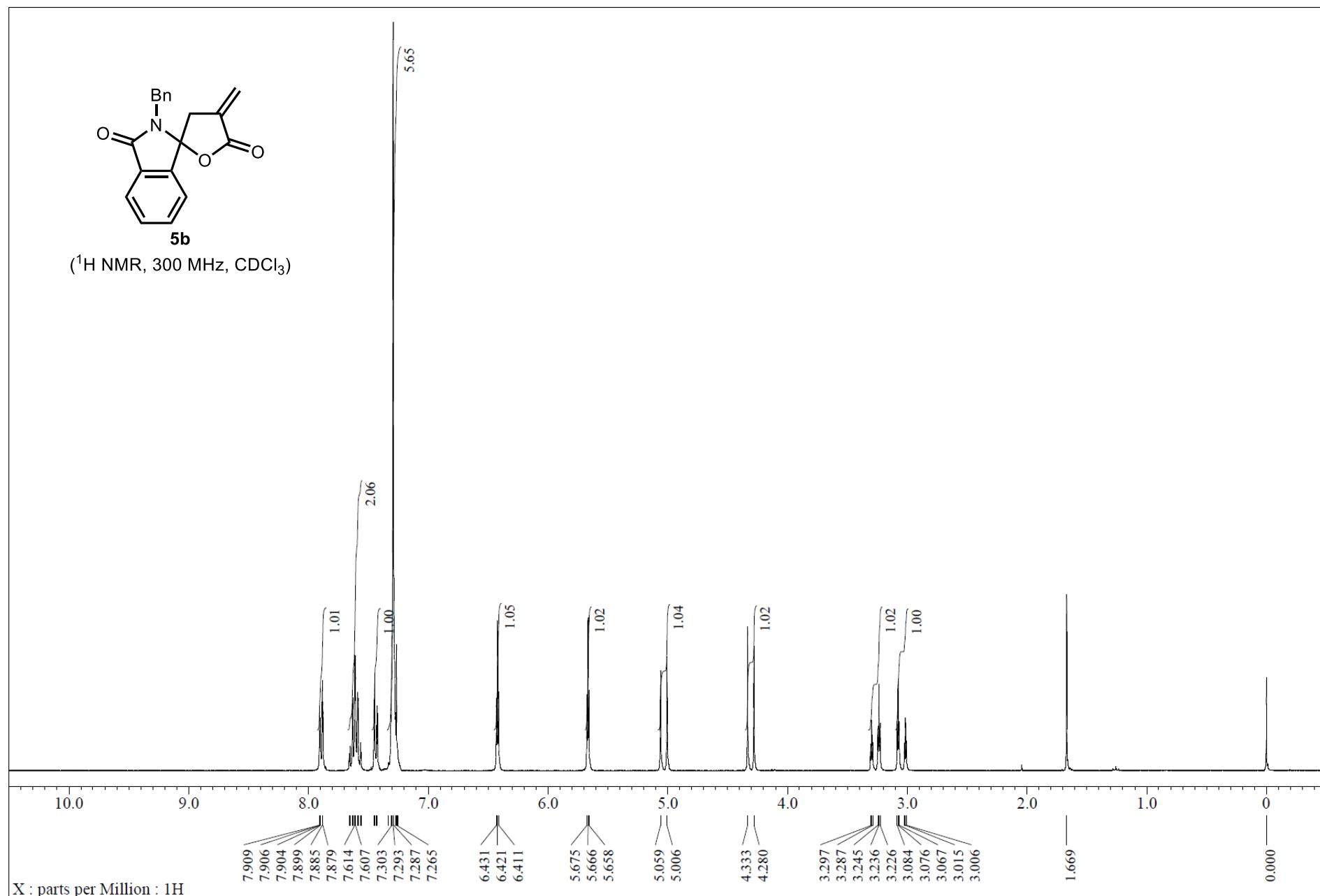


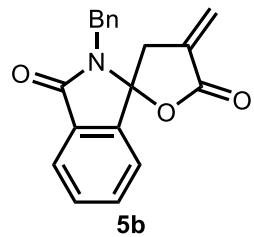
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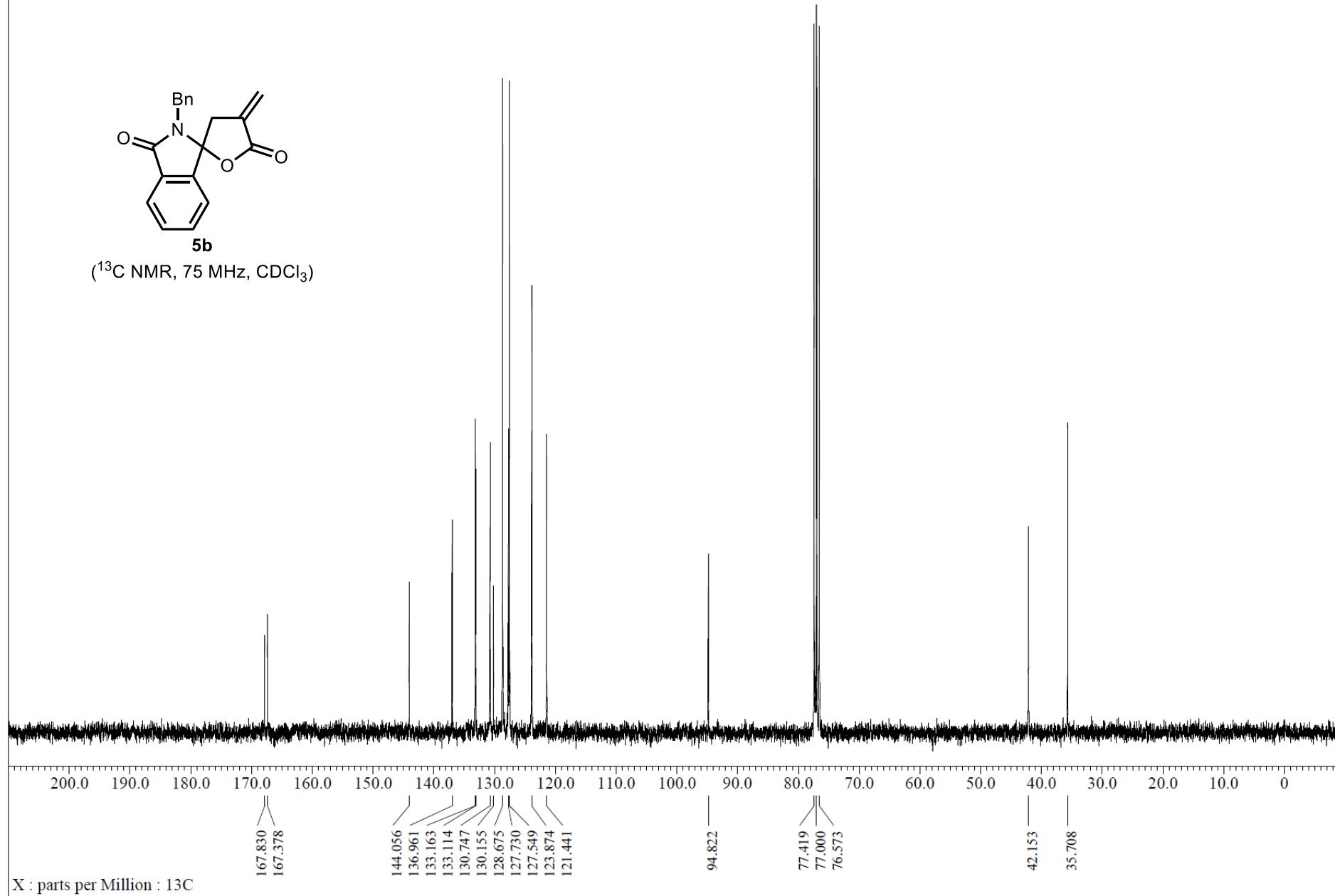


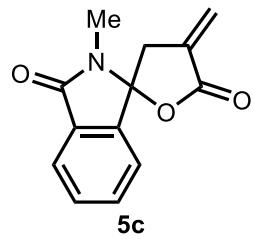
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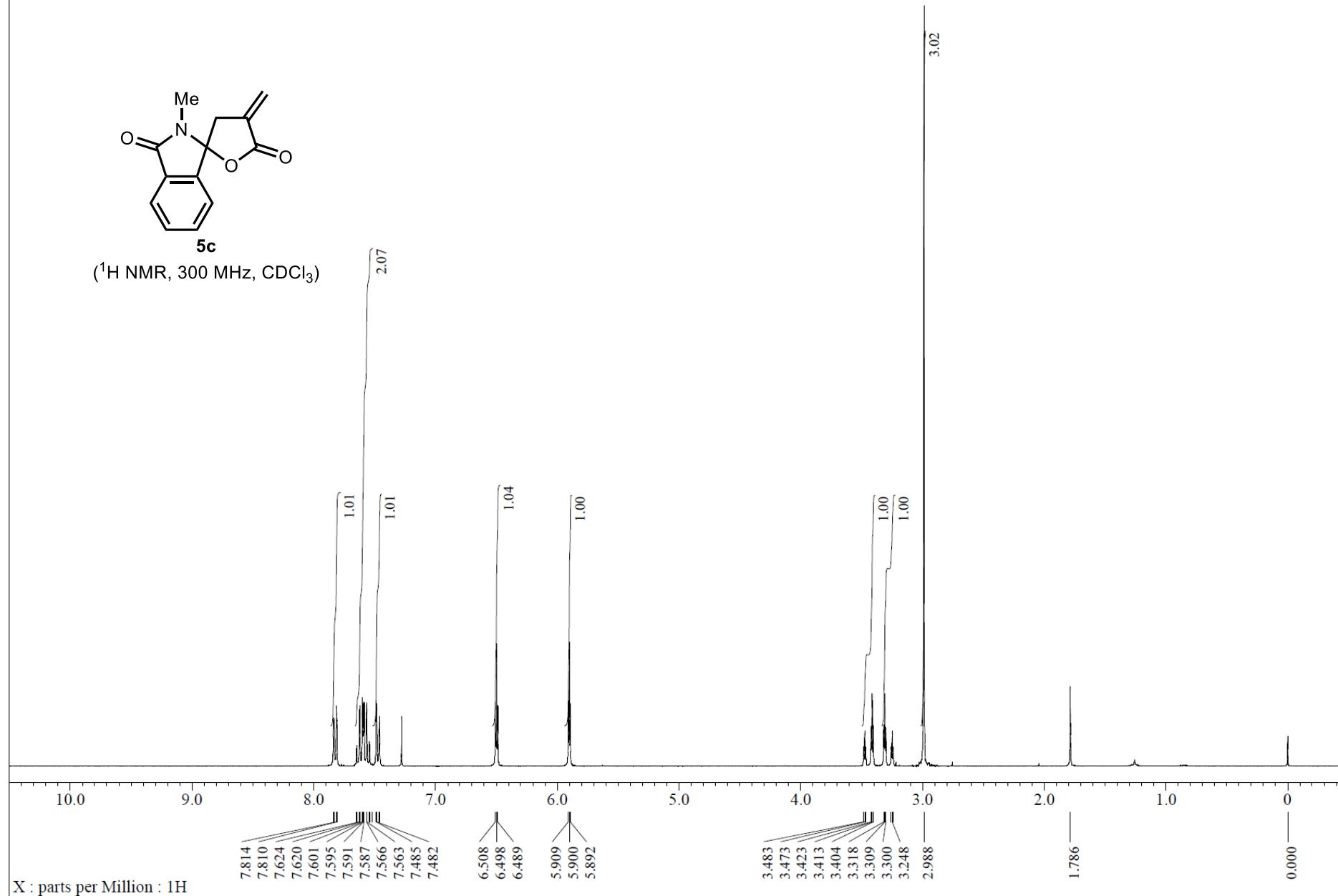


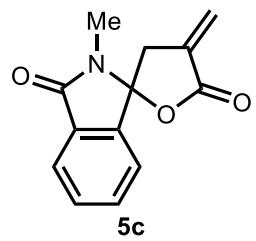
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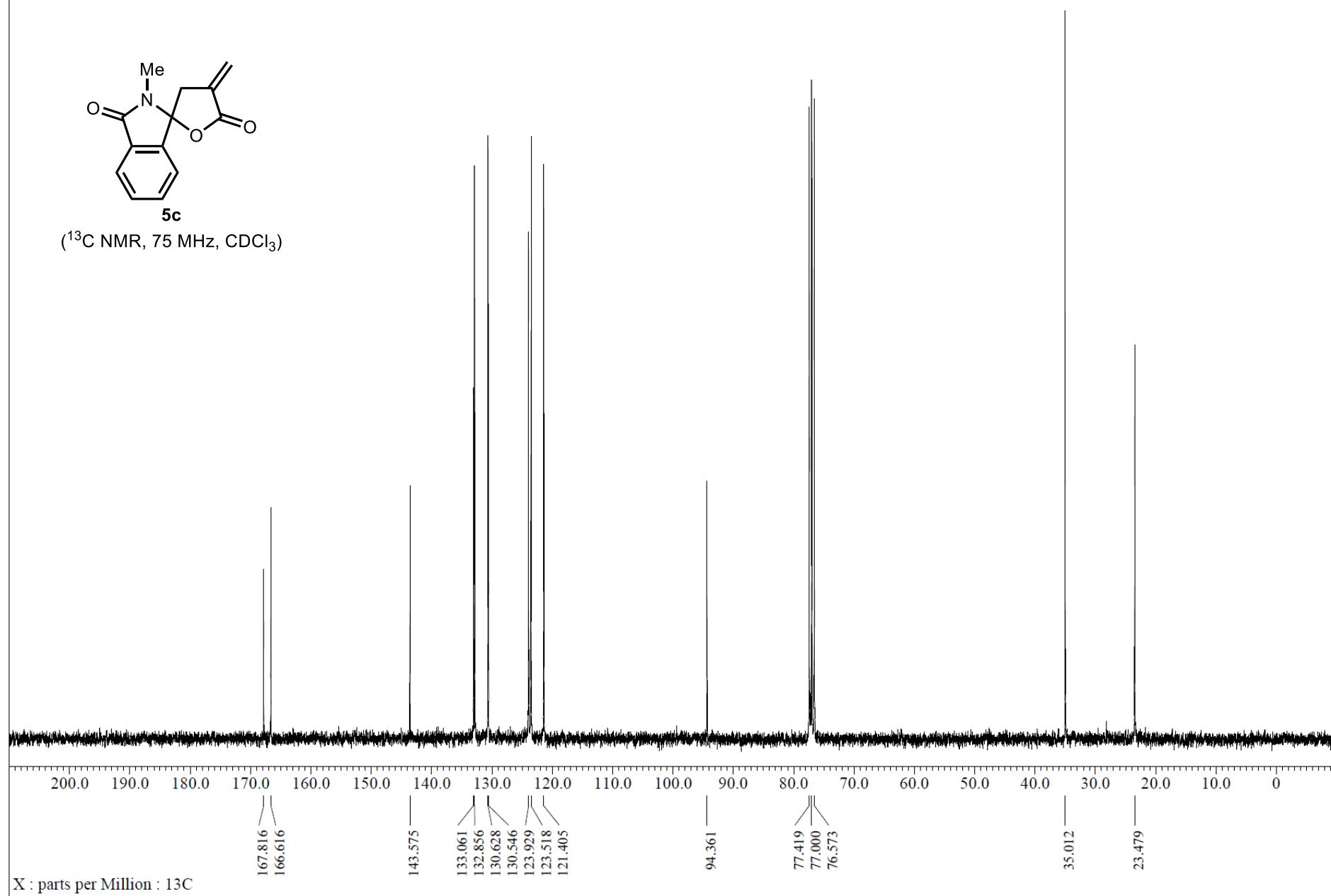


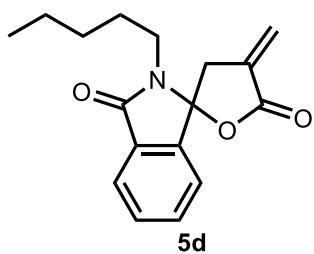
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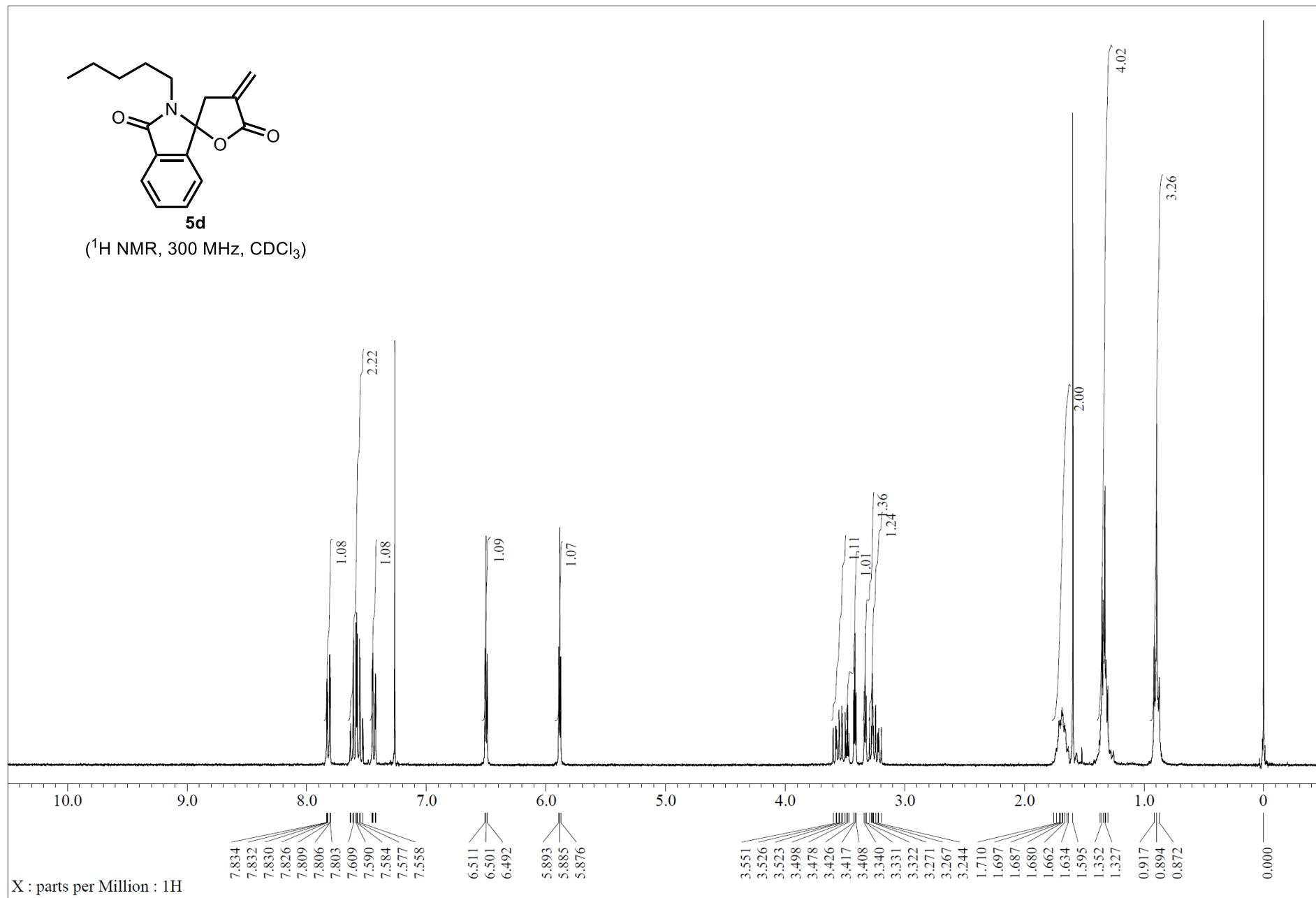


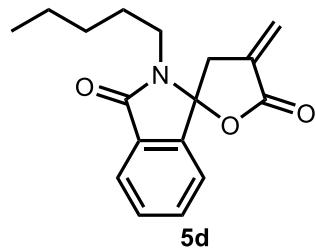
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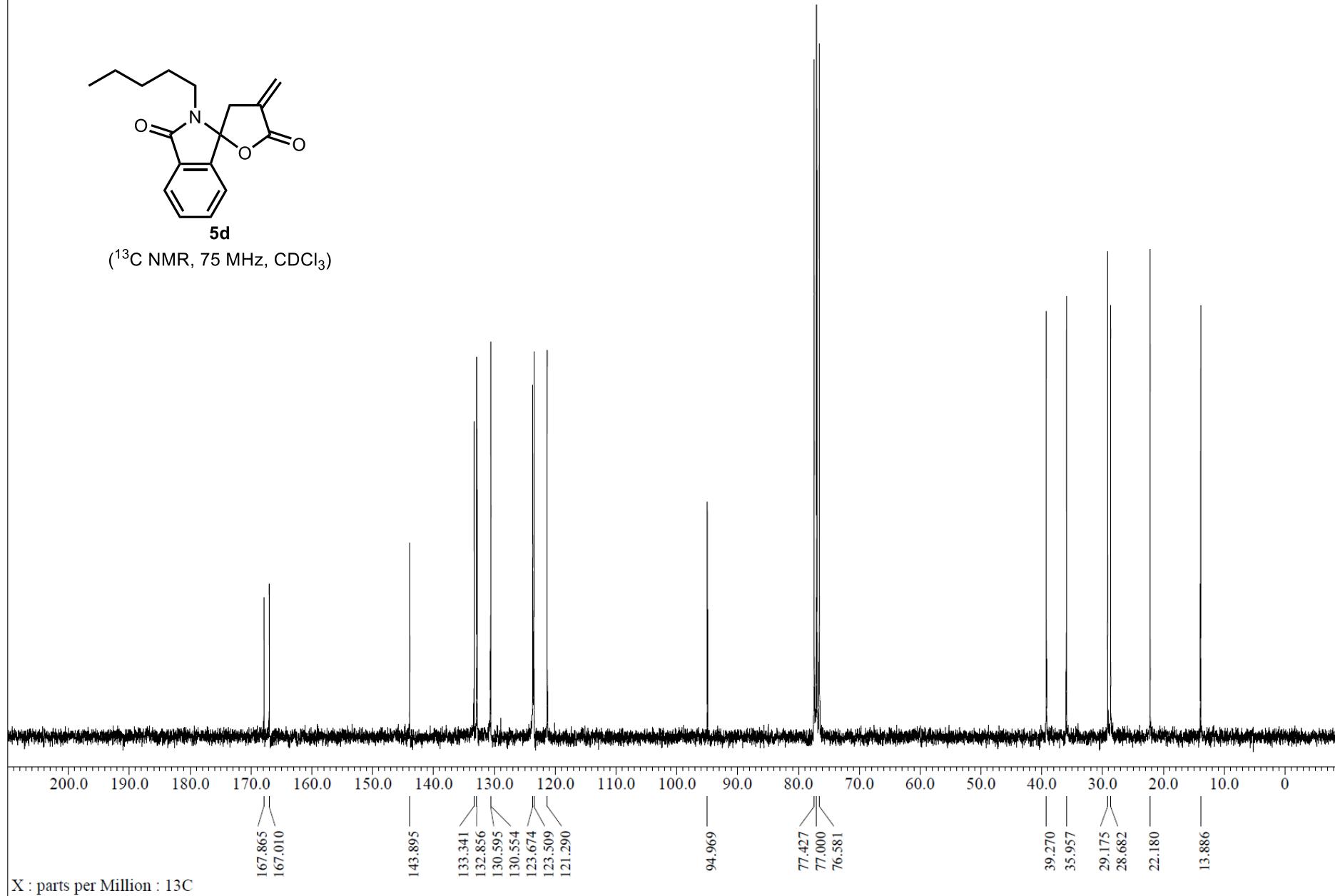


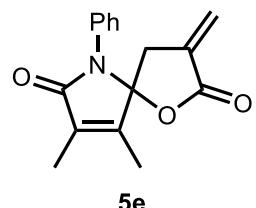
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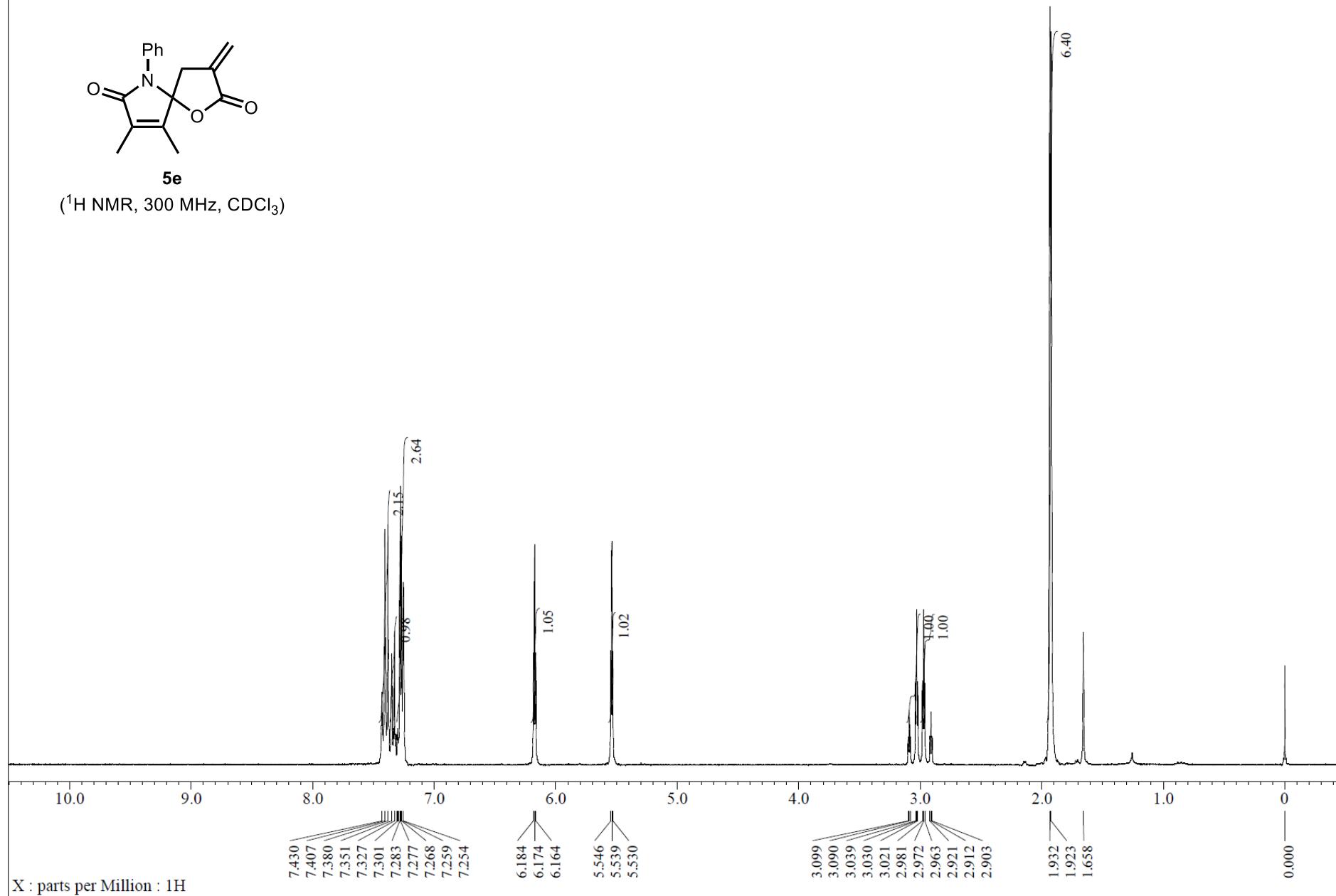


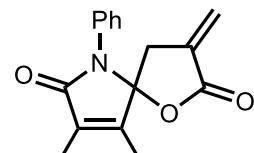
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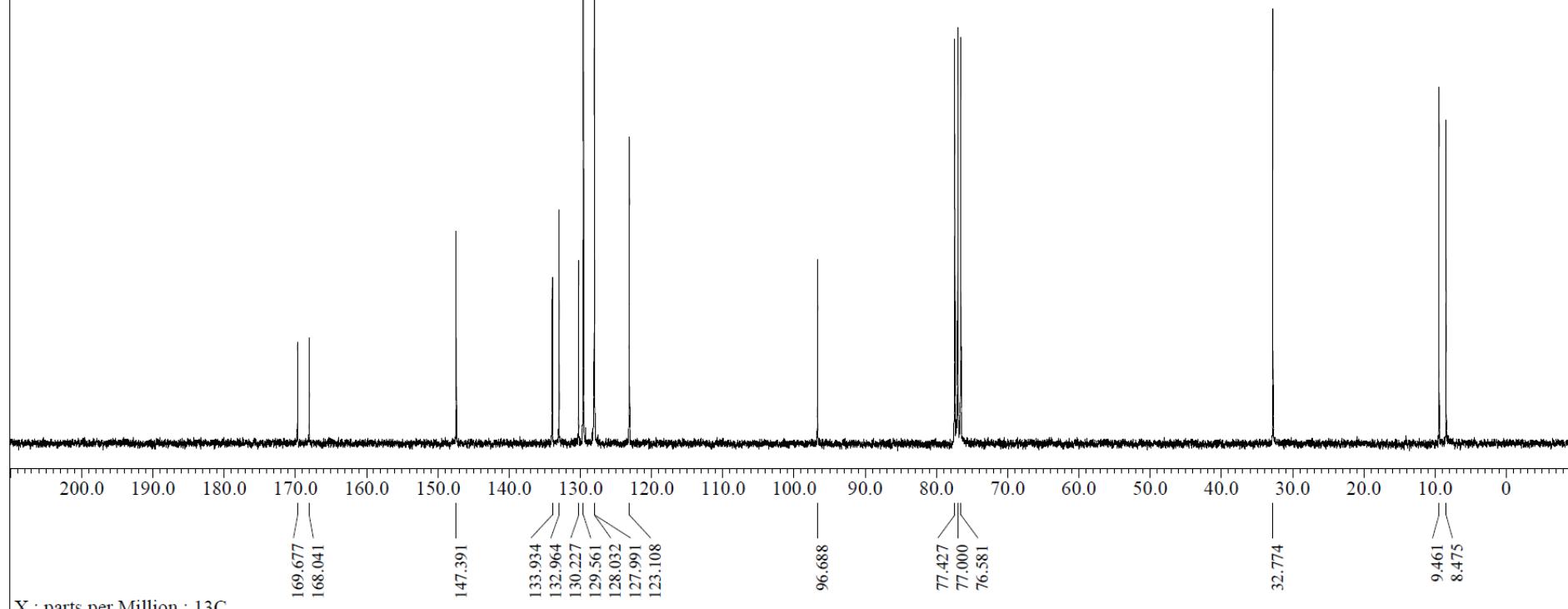


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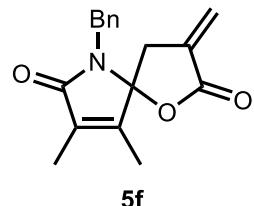




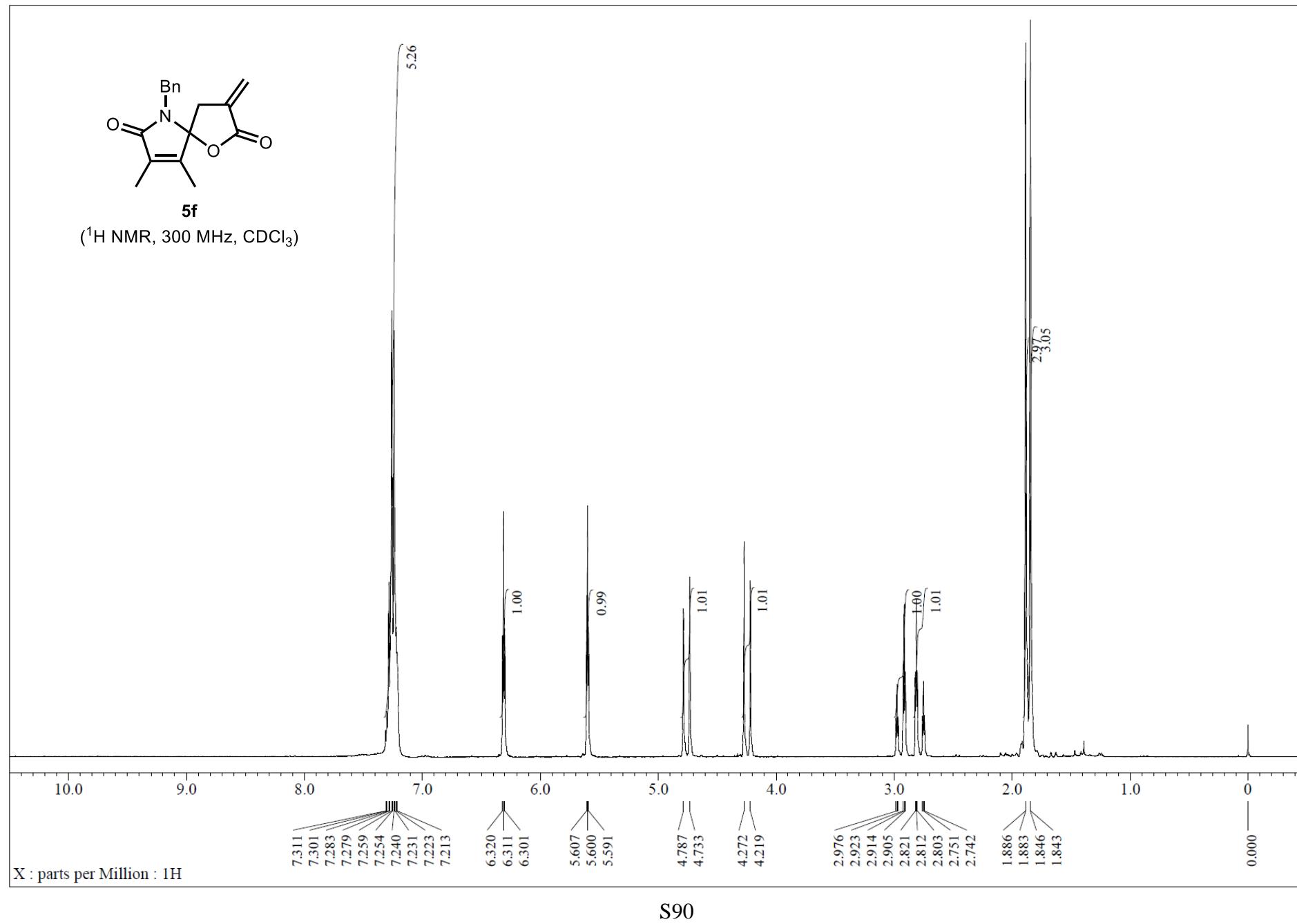
(^{13}C NMR, 75 MHz, CDCl_3)

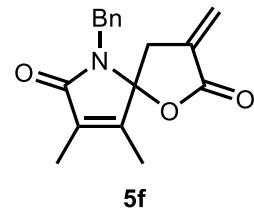


X : parts per Million : ^{13}C

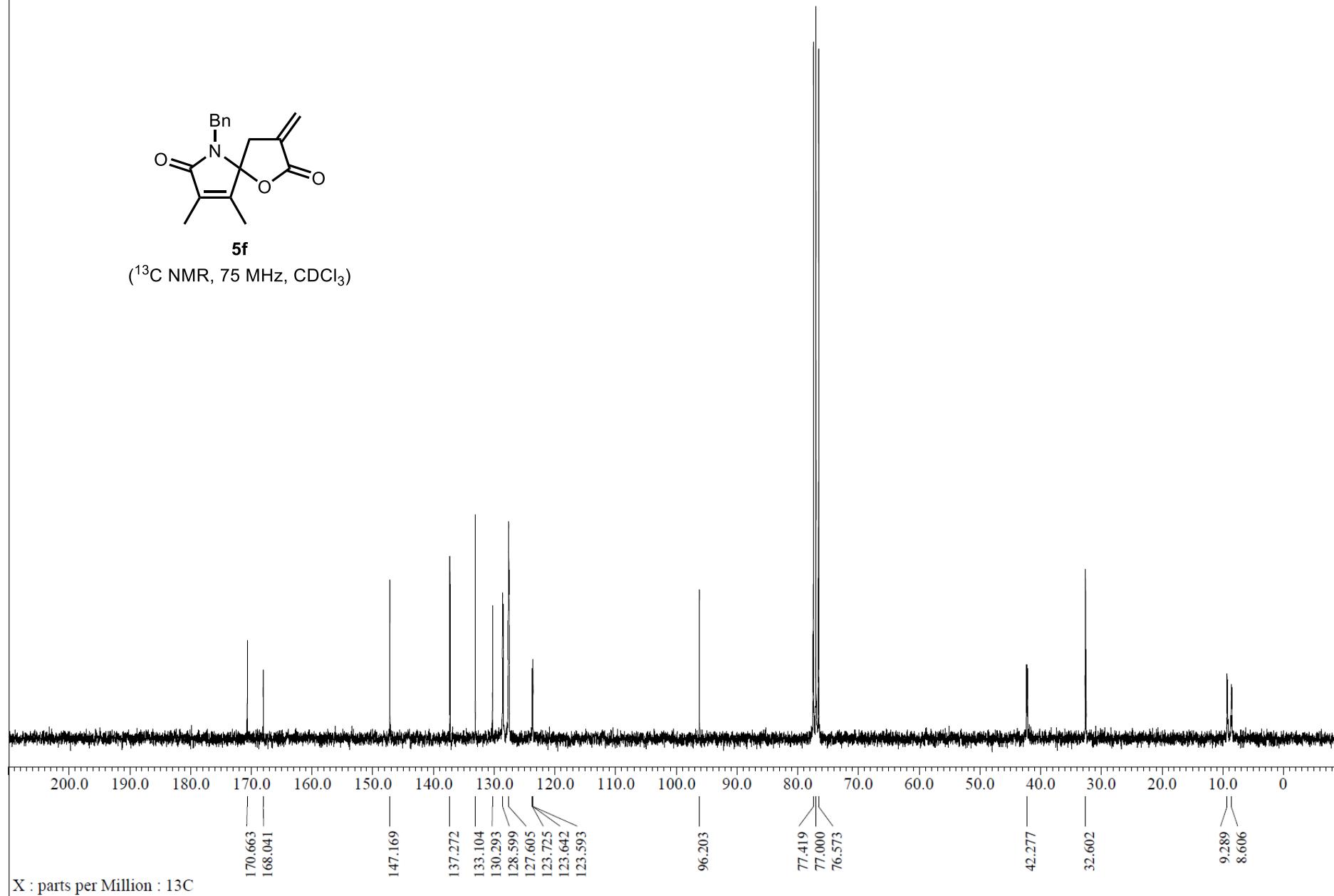


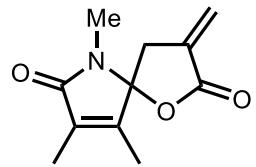
(^1H NMR, 300 MHz, CDCl_3)



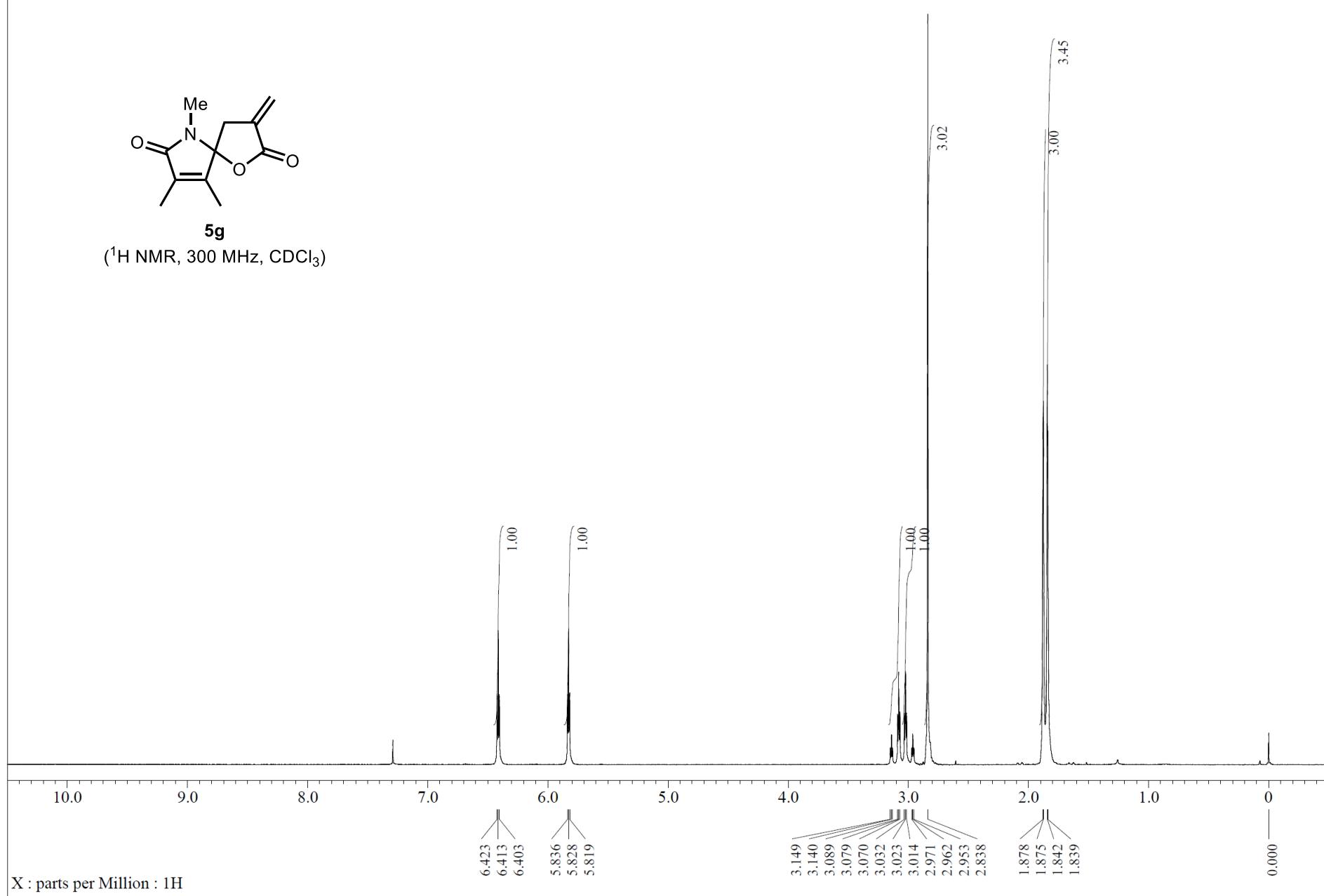


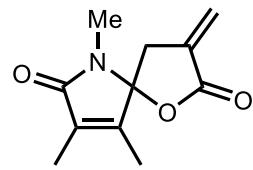
(^{13}C NMR, 75 MHz, CDCl_3)





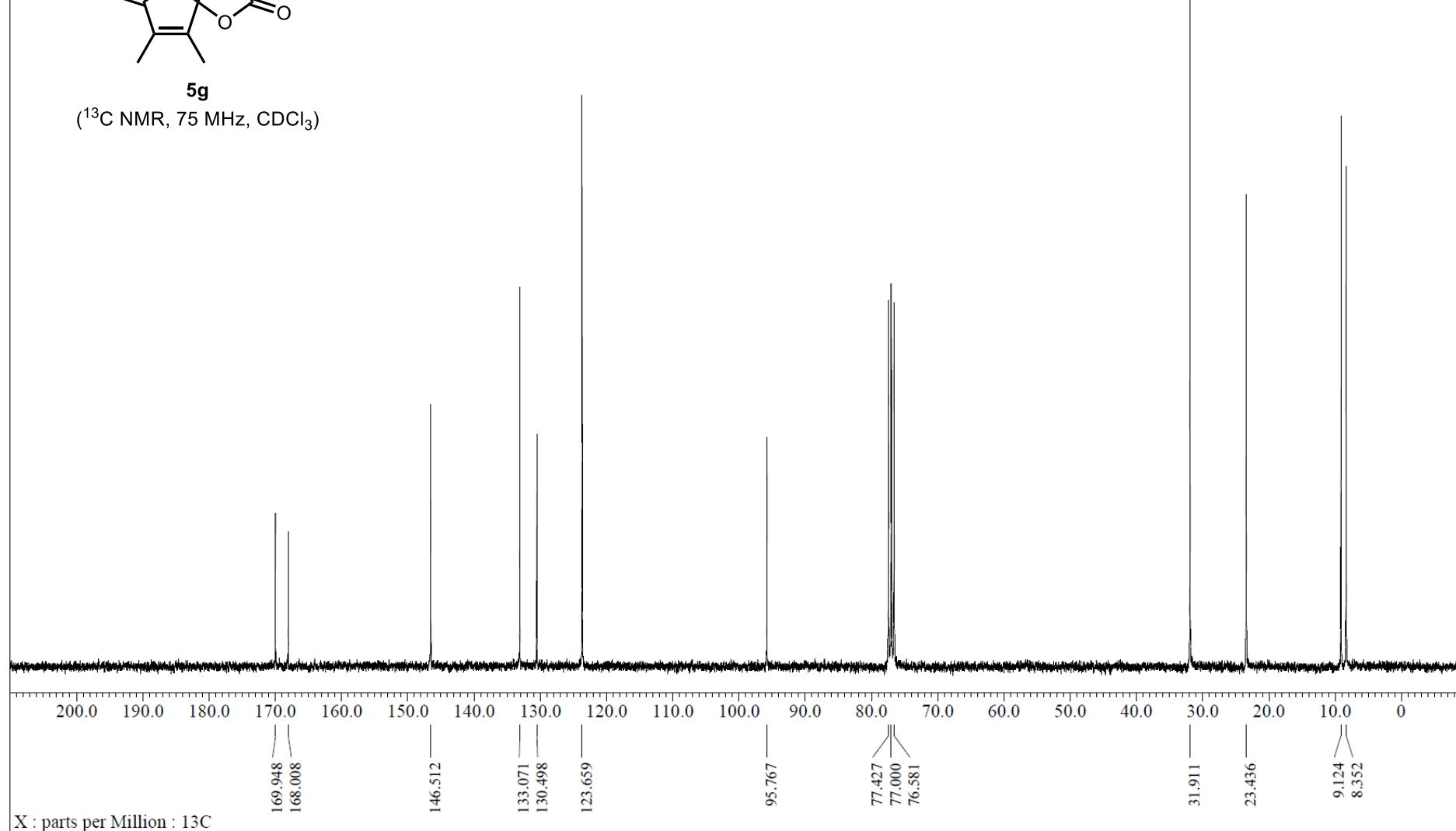
(^1H NMR, 300 MHz, CDCl_3)



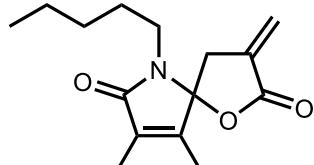


5g

(^{13}C NMR, 75 MHz, CDCl_3)

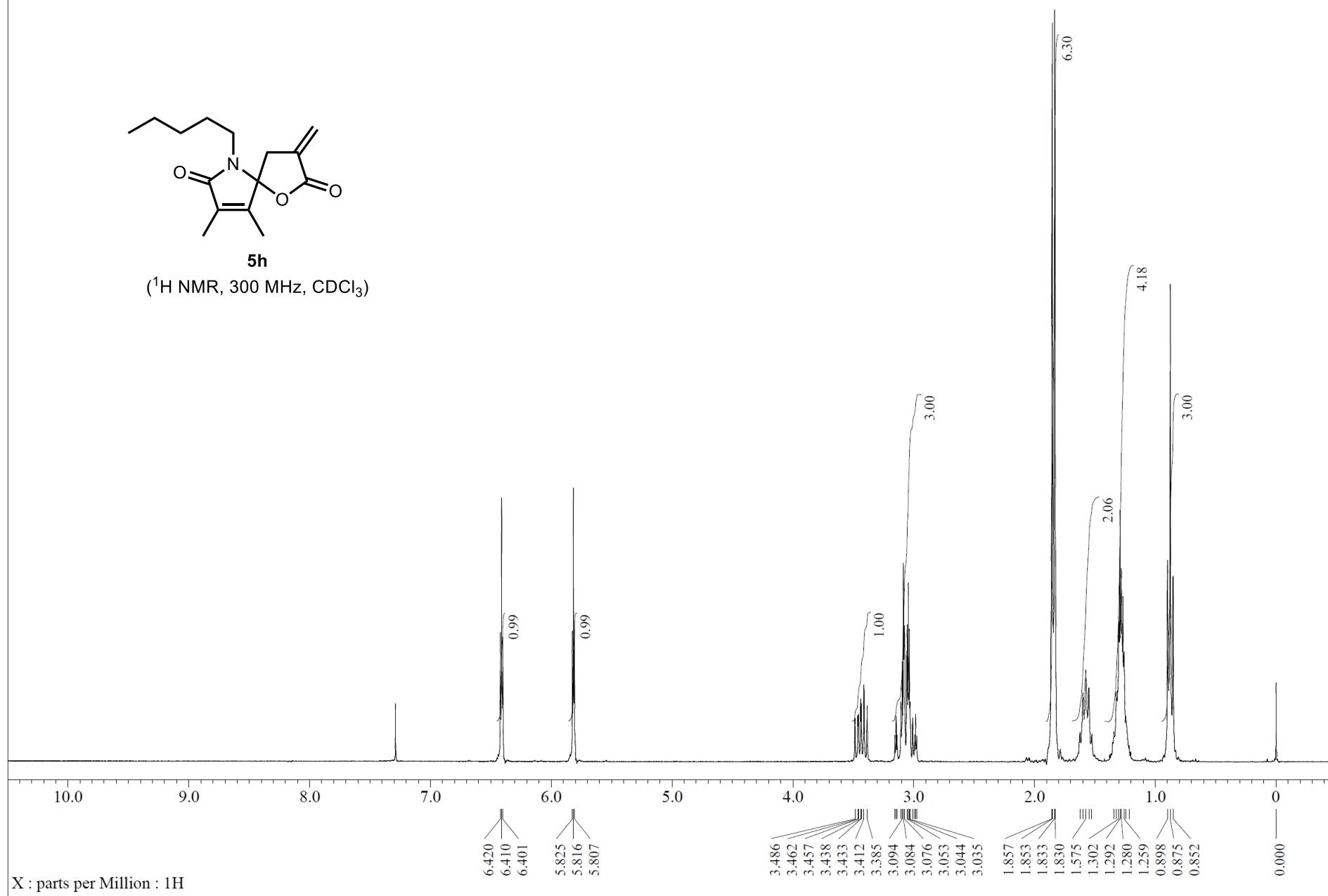


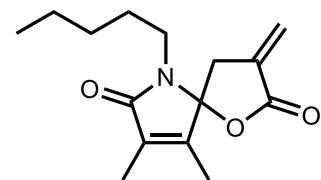
X : parts per Million : ^{13}C



5h

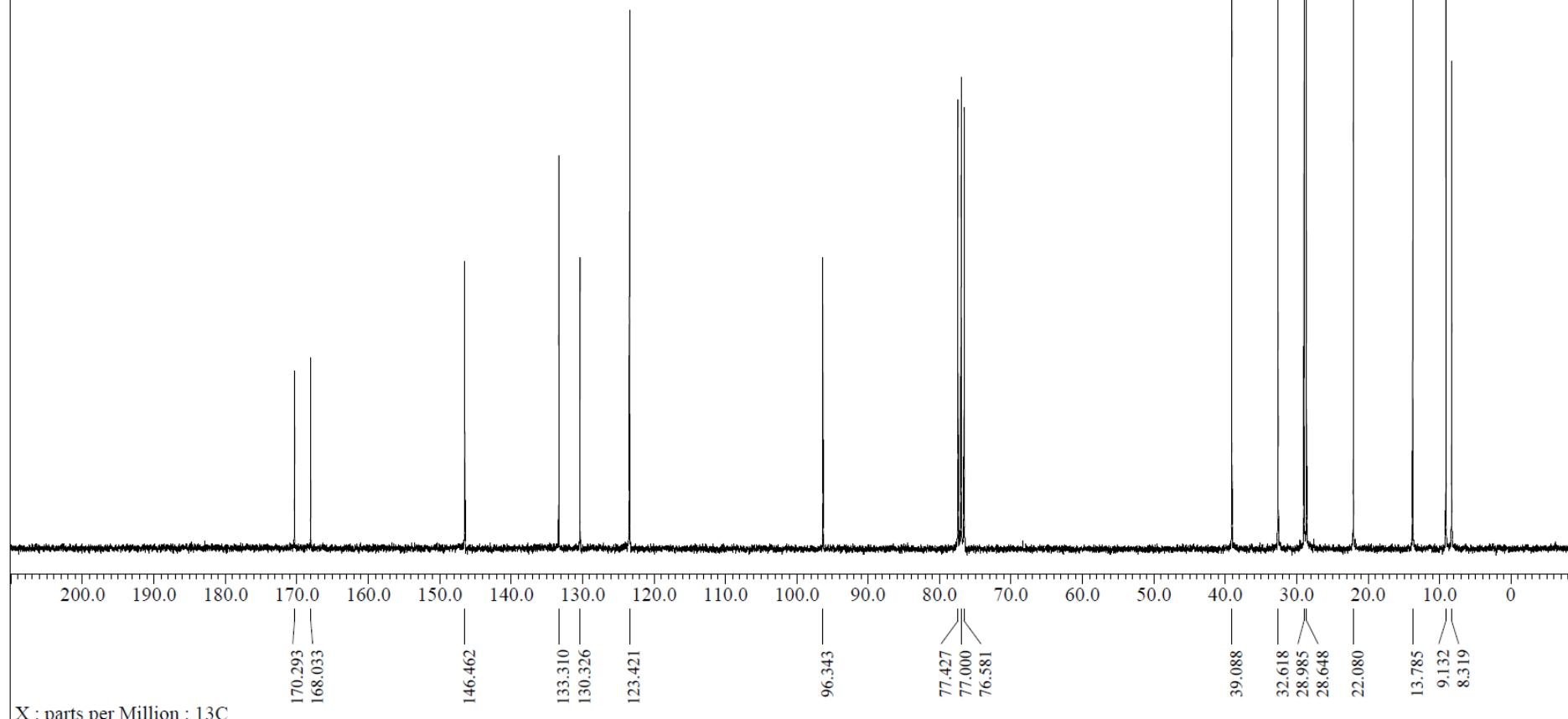
(^1H NMR, 300 MHz, CDCl_3)



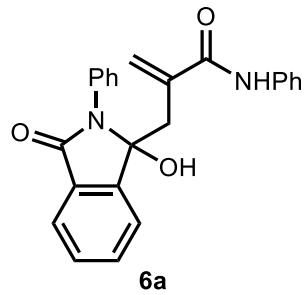


5h

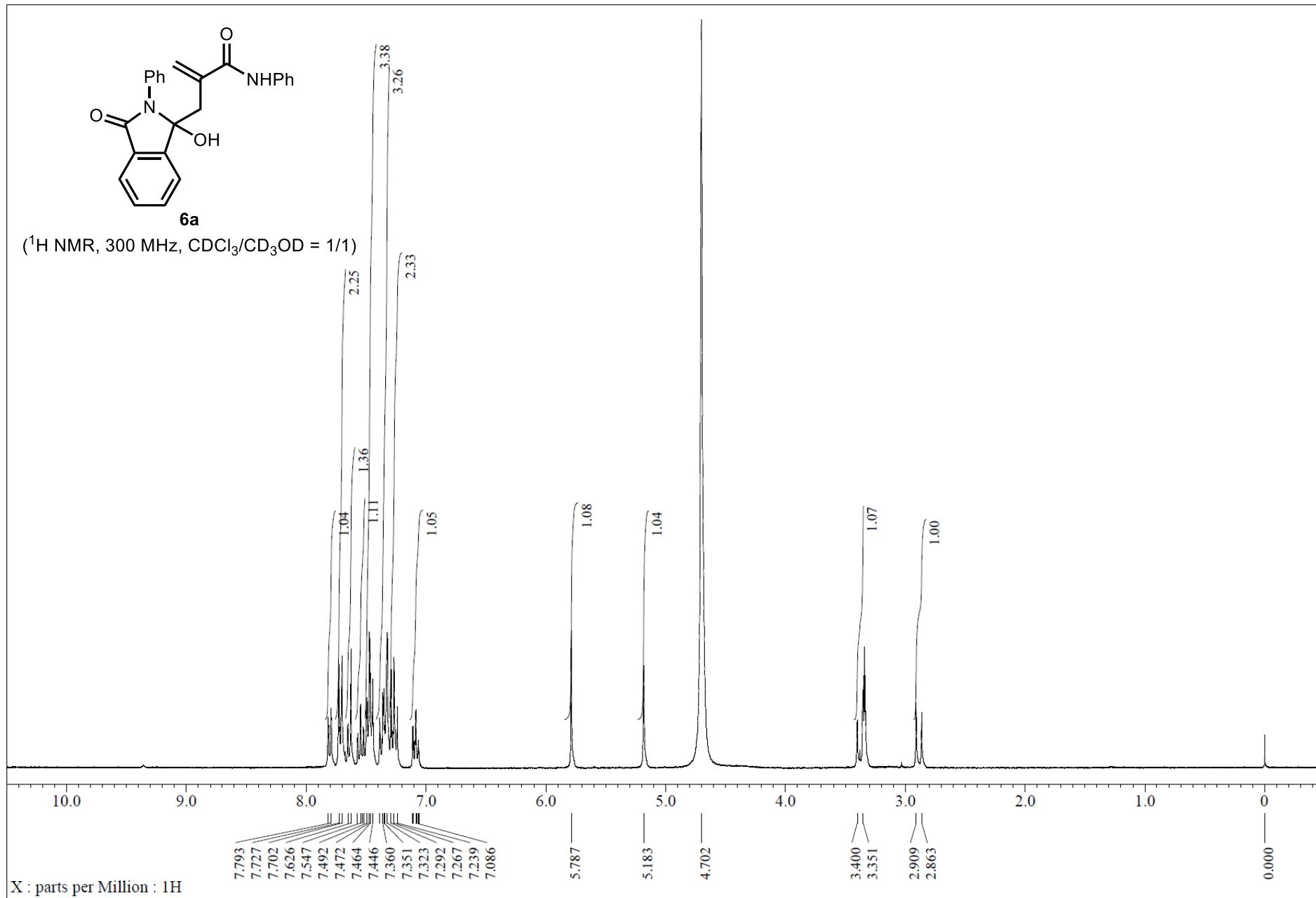
(^{13}C NMR, 75 MHz, CDCl_3)

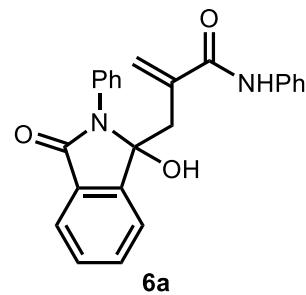


X : parts per Million : ^{13}C

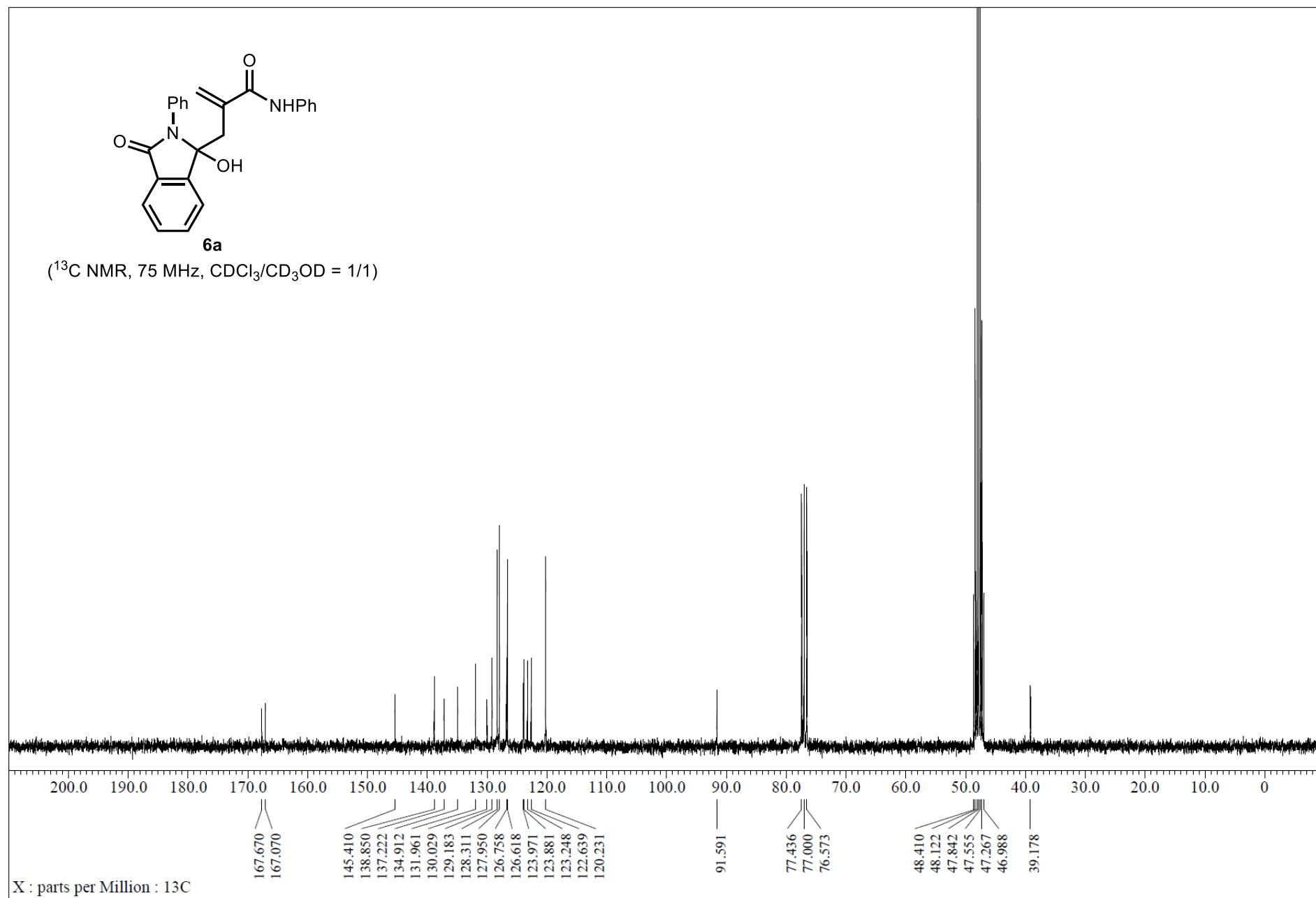


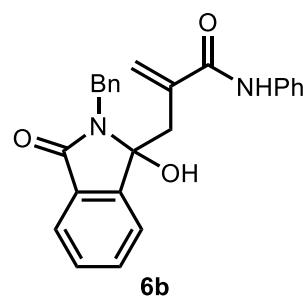
(^1H NMR, 300 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)



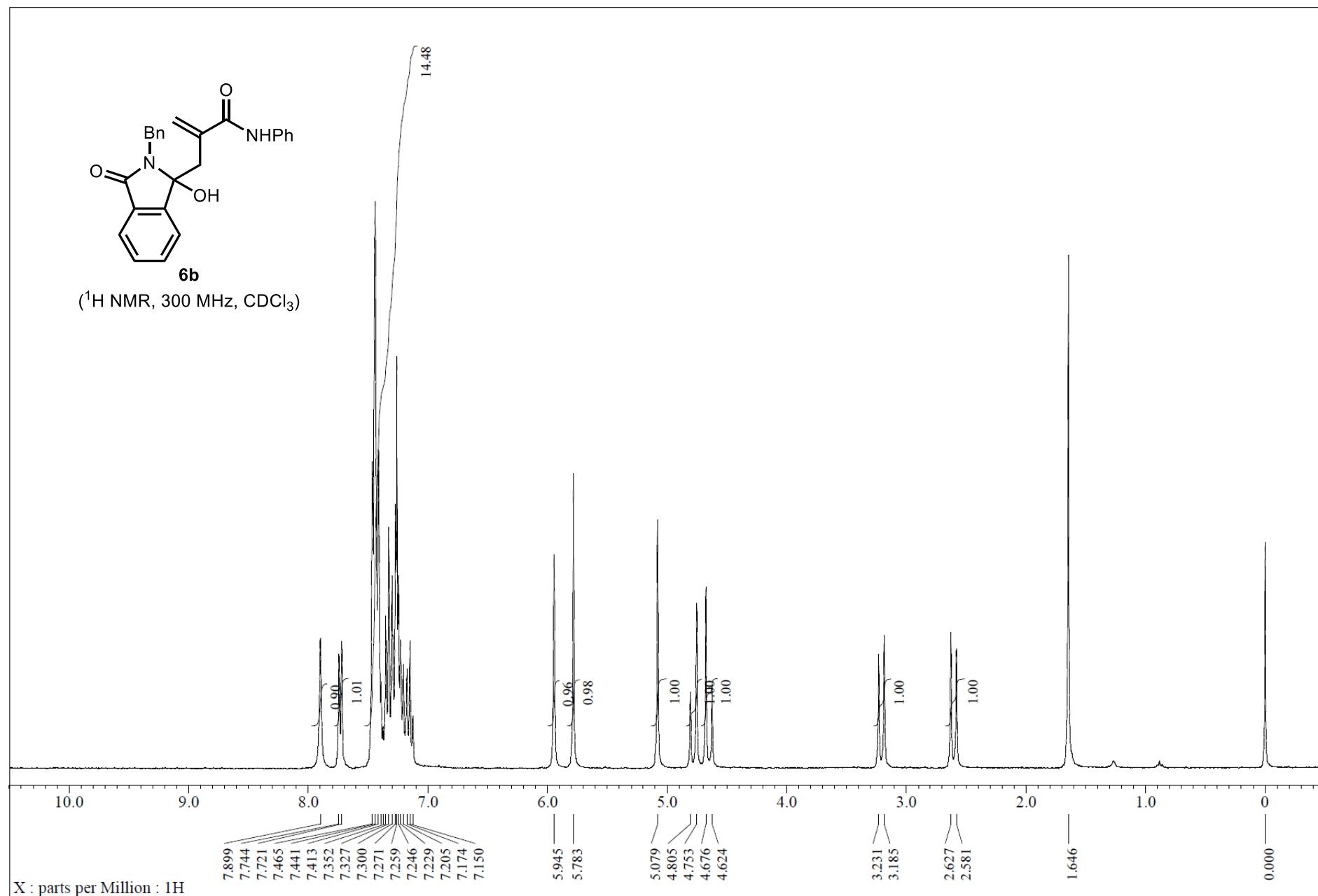


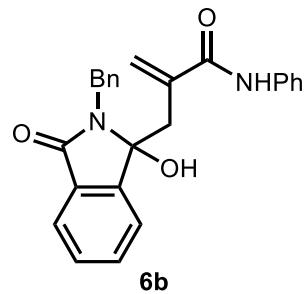
(^{13}C NMR, 75 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)



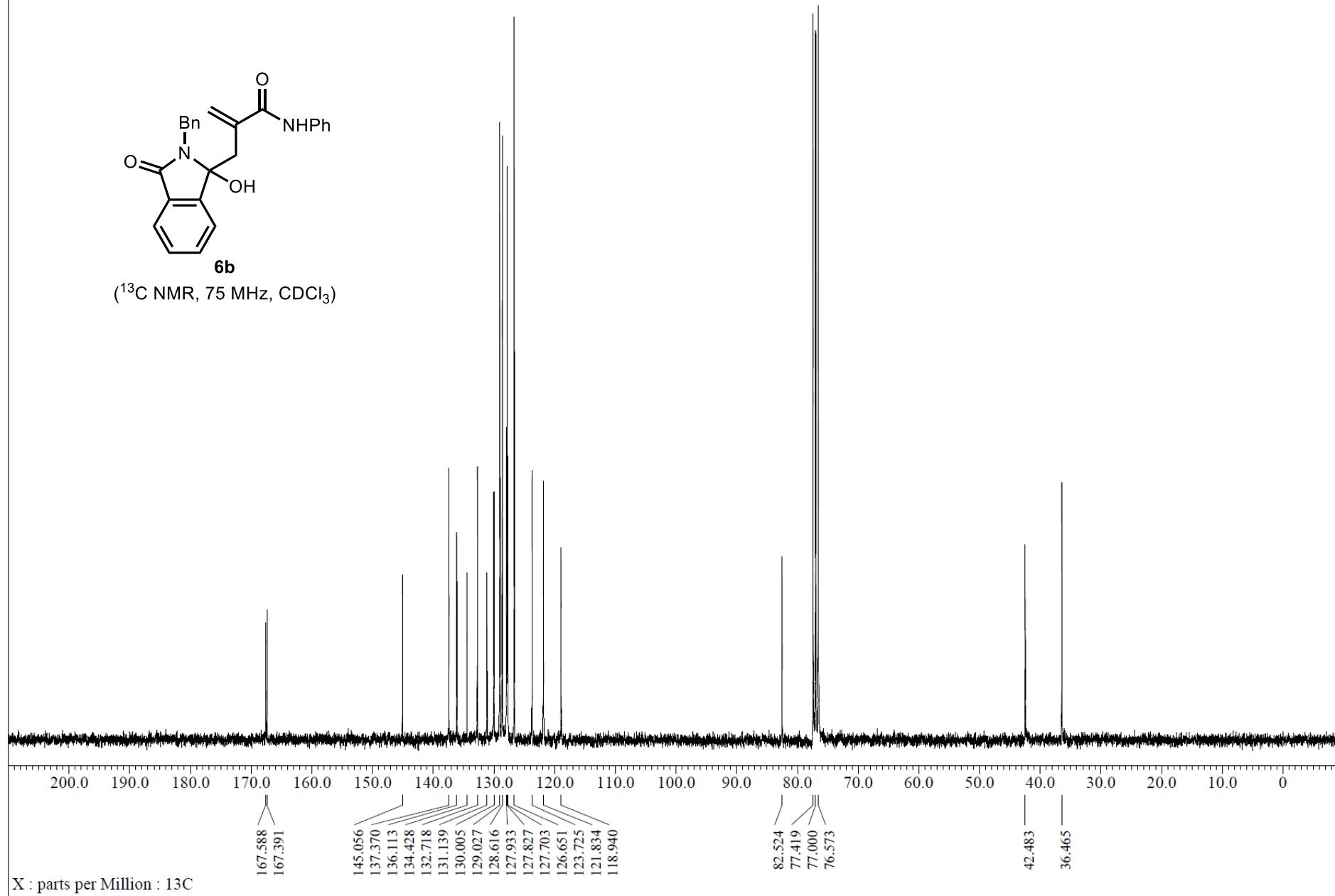


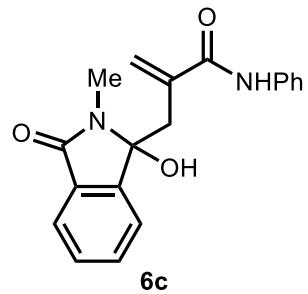
(^1H NMR, 300 MHz, CDCl_3)



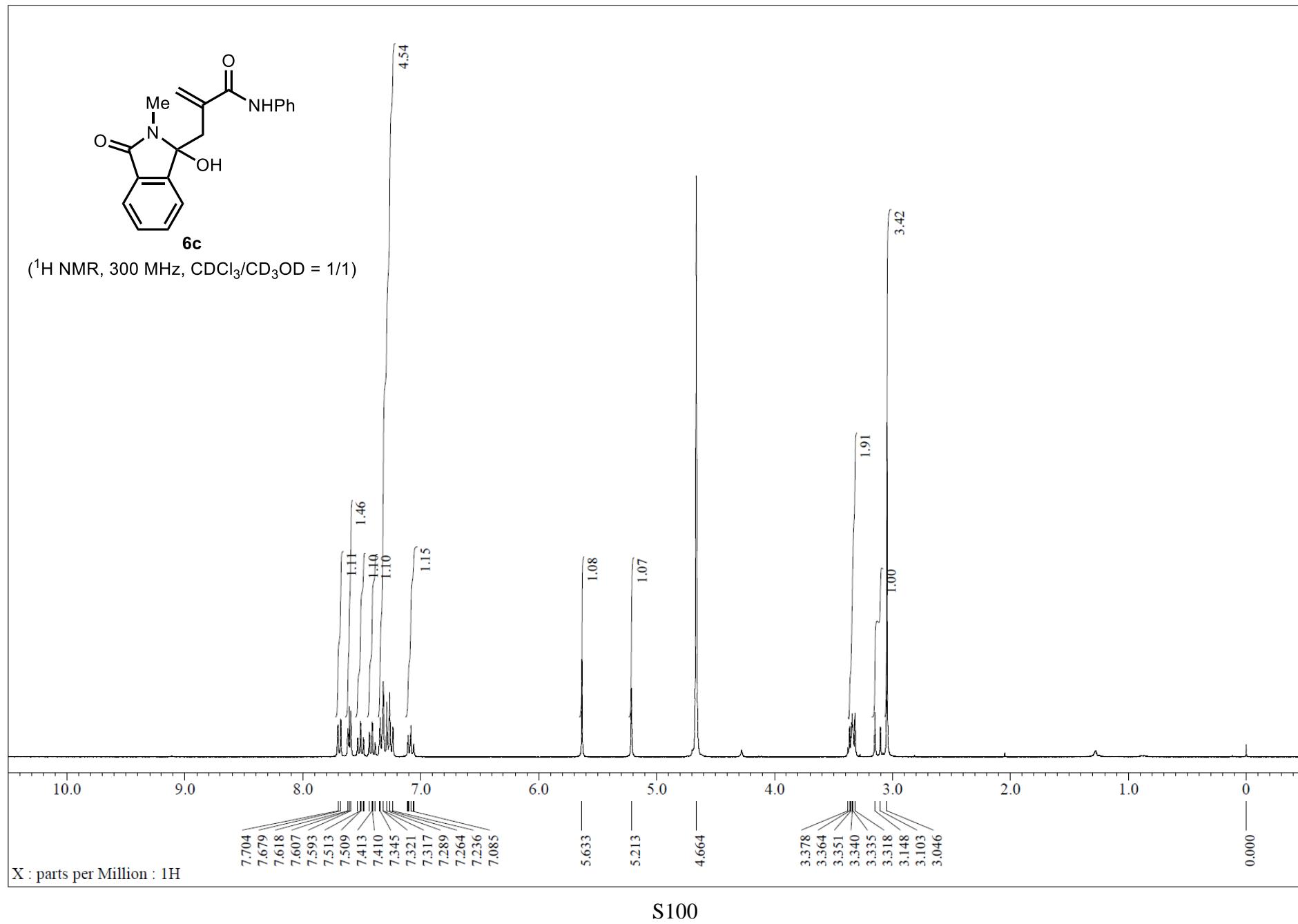


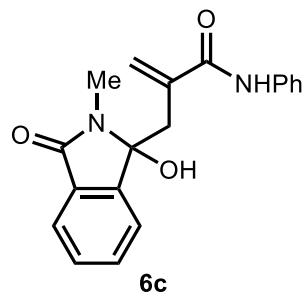
(^{13}C NMR, 75 MHz, CDCl_3)



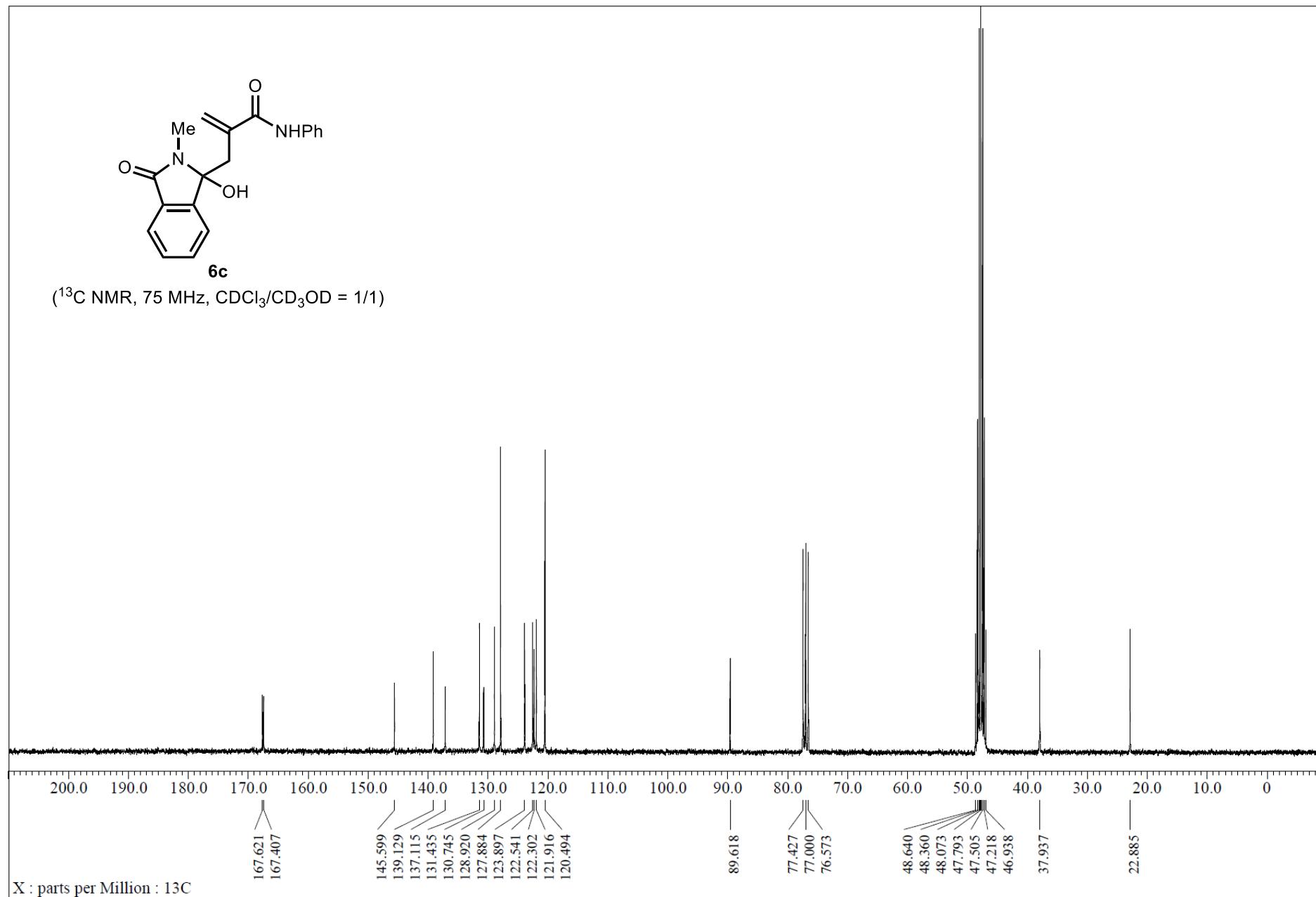


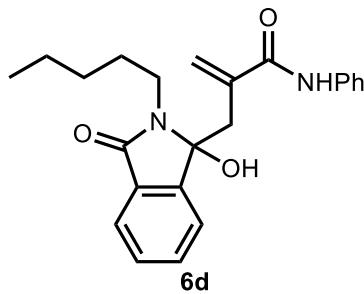
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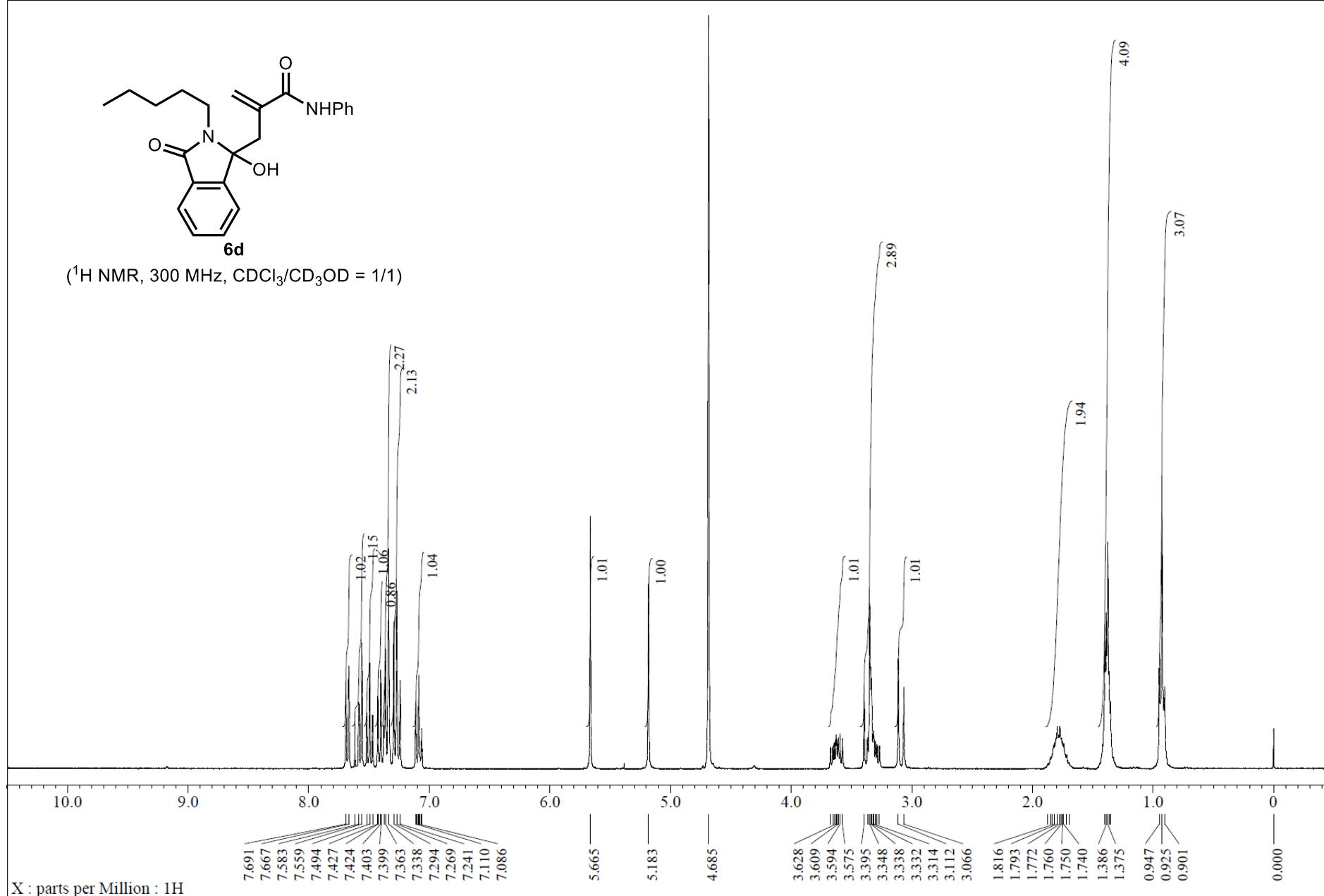


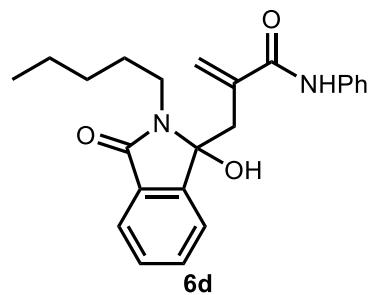
(^{13}C NMR, 75 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)



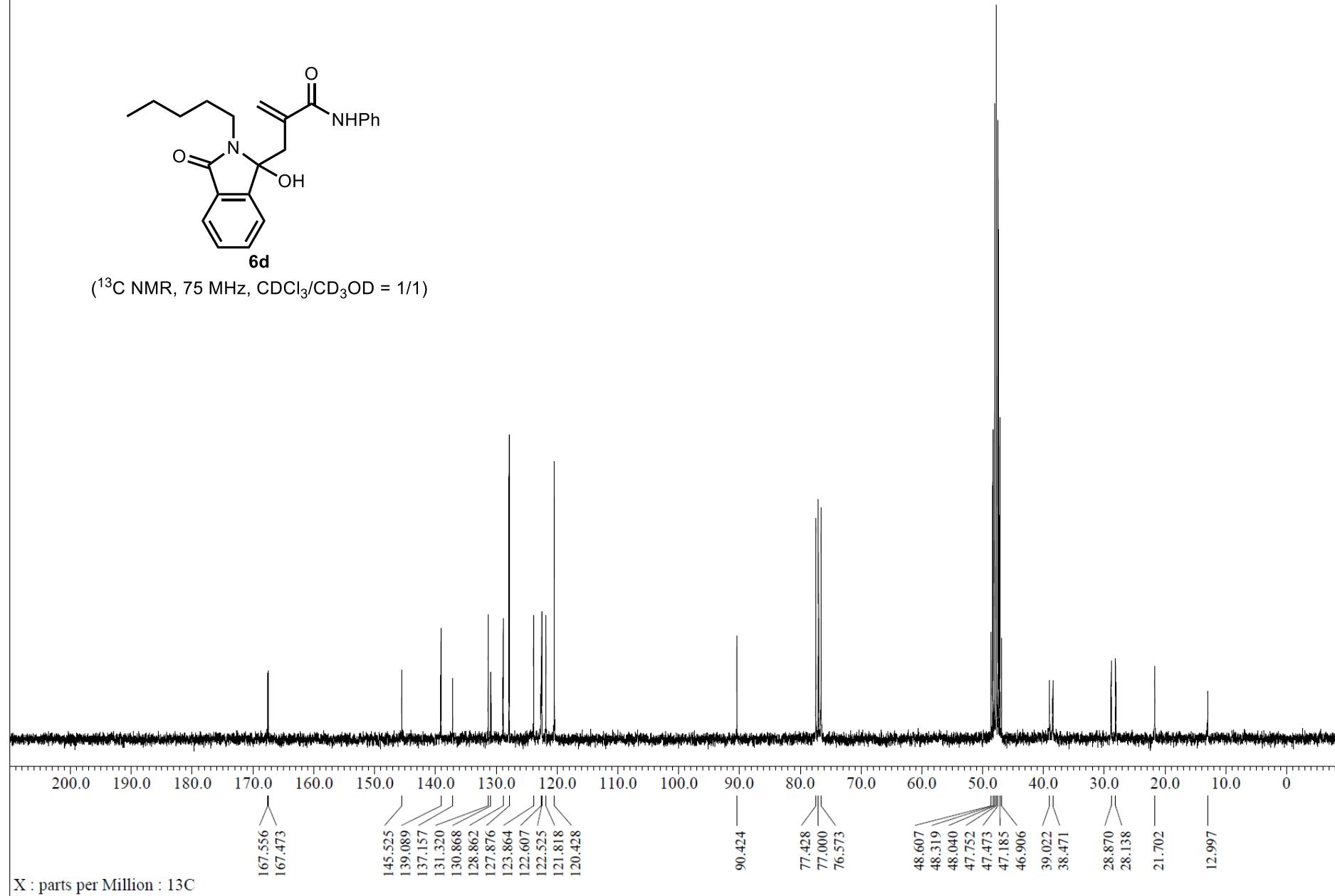


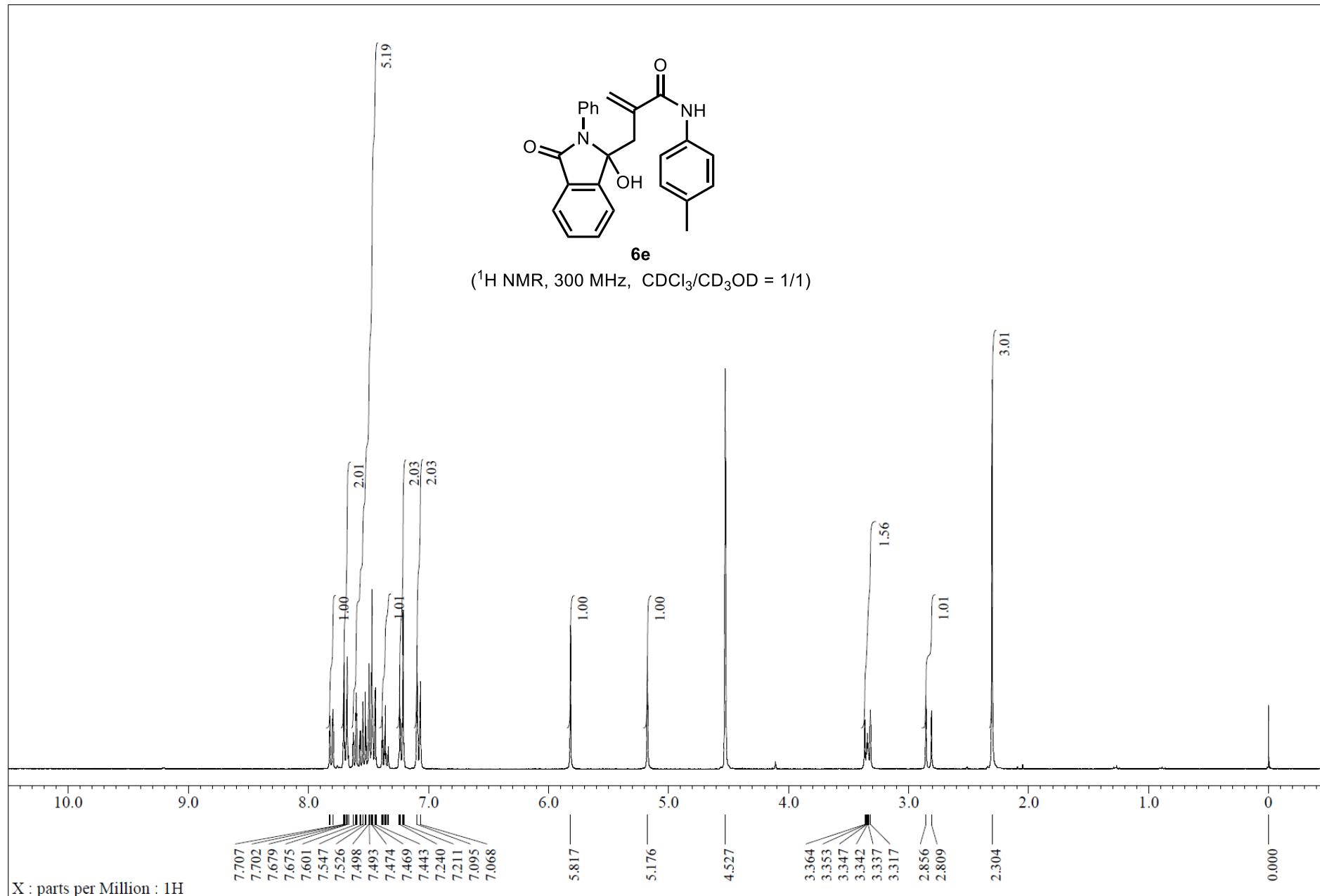
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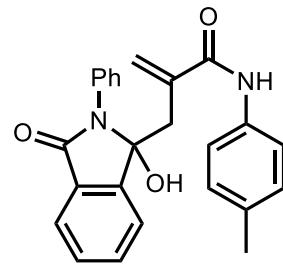




(^{13}C NMR, 75 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)

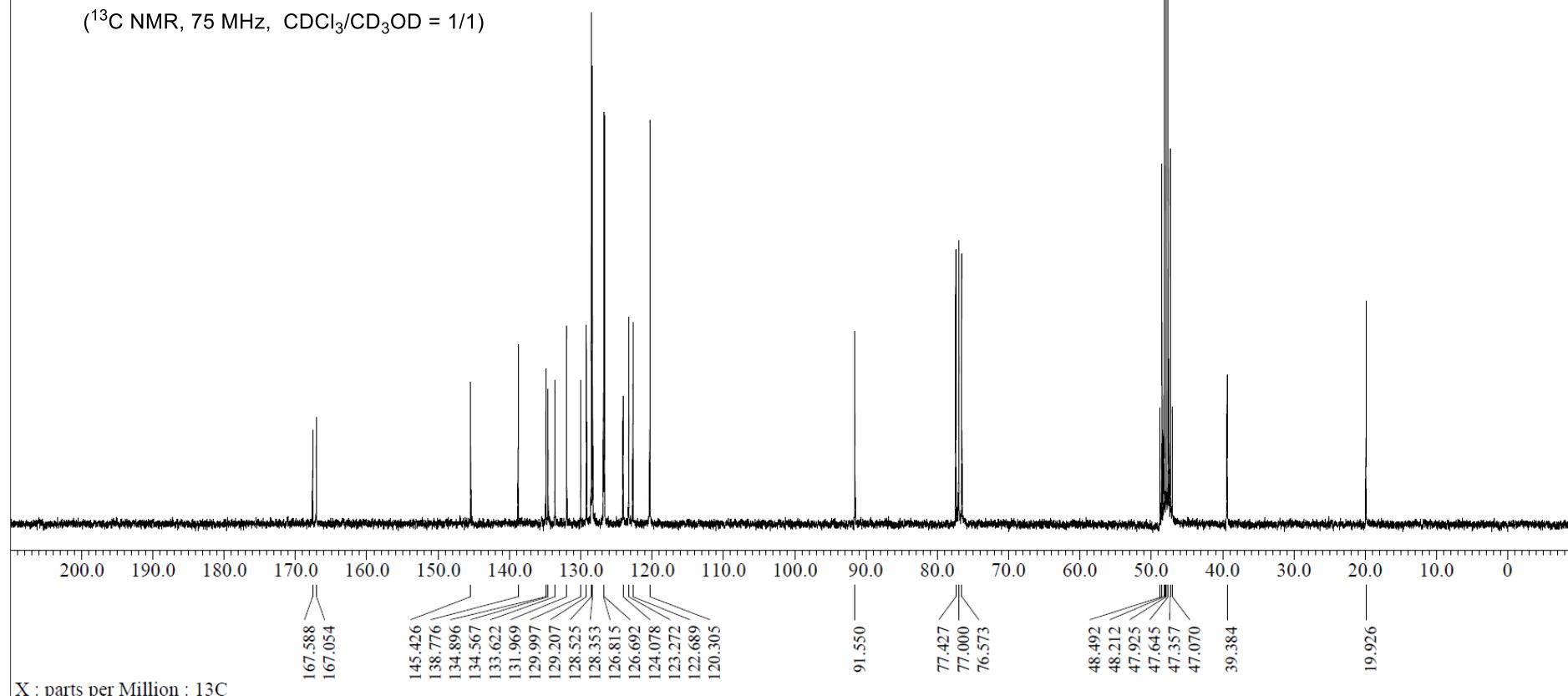




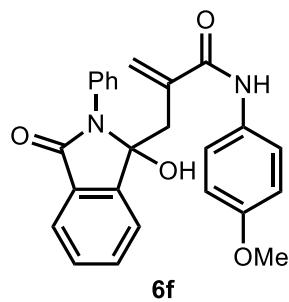


6e

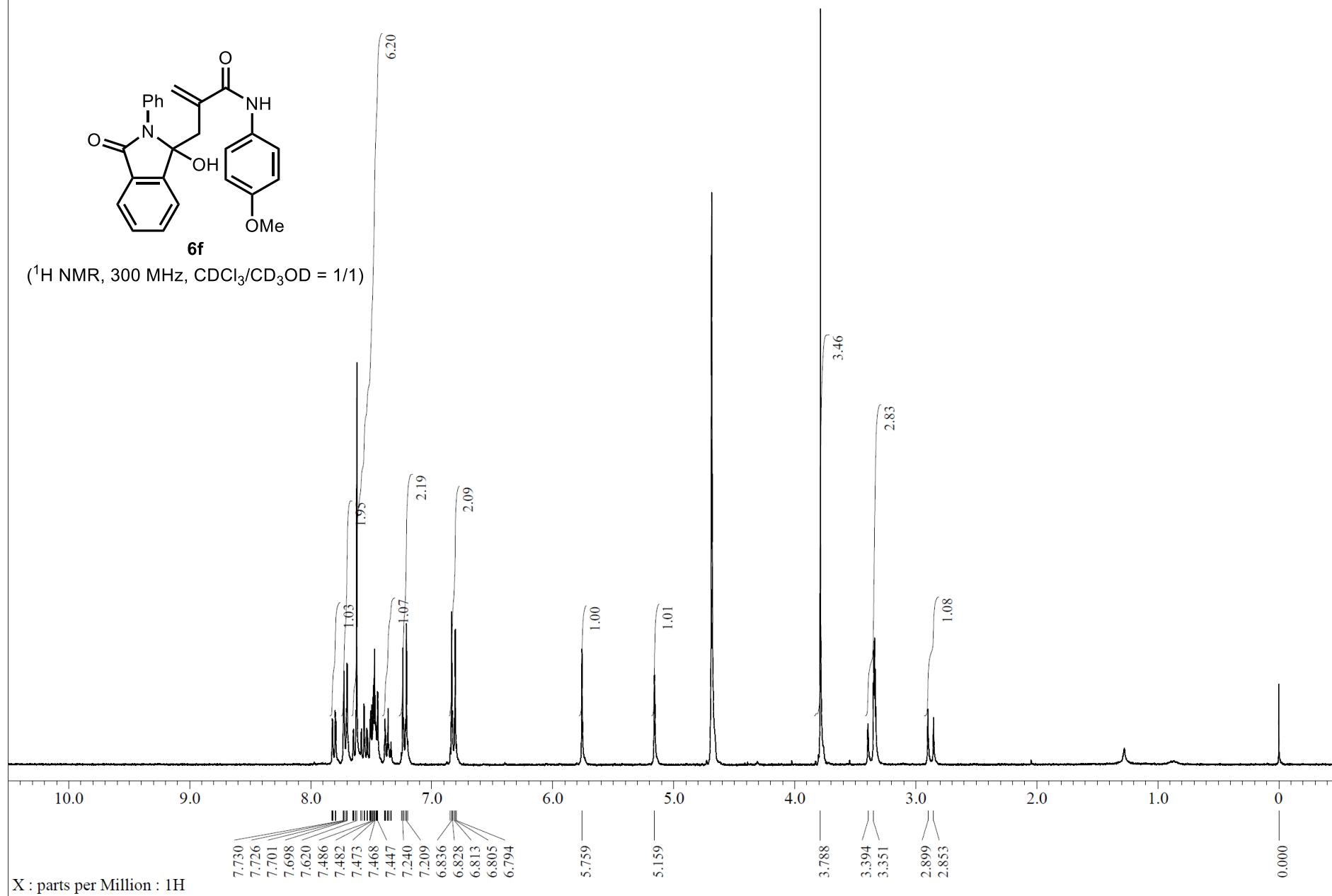
(^{13}C NMR, 75 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)

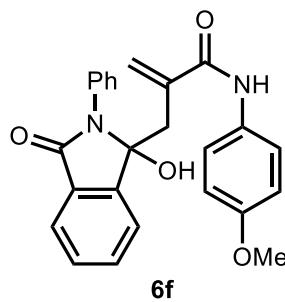


X : parts per Million : ^{13}C

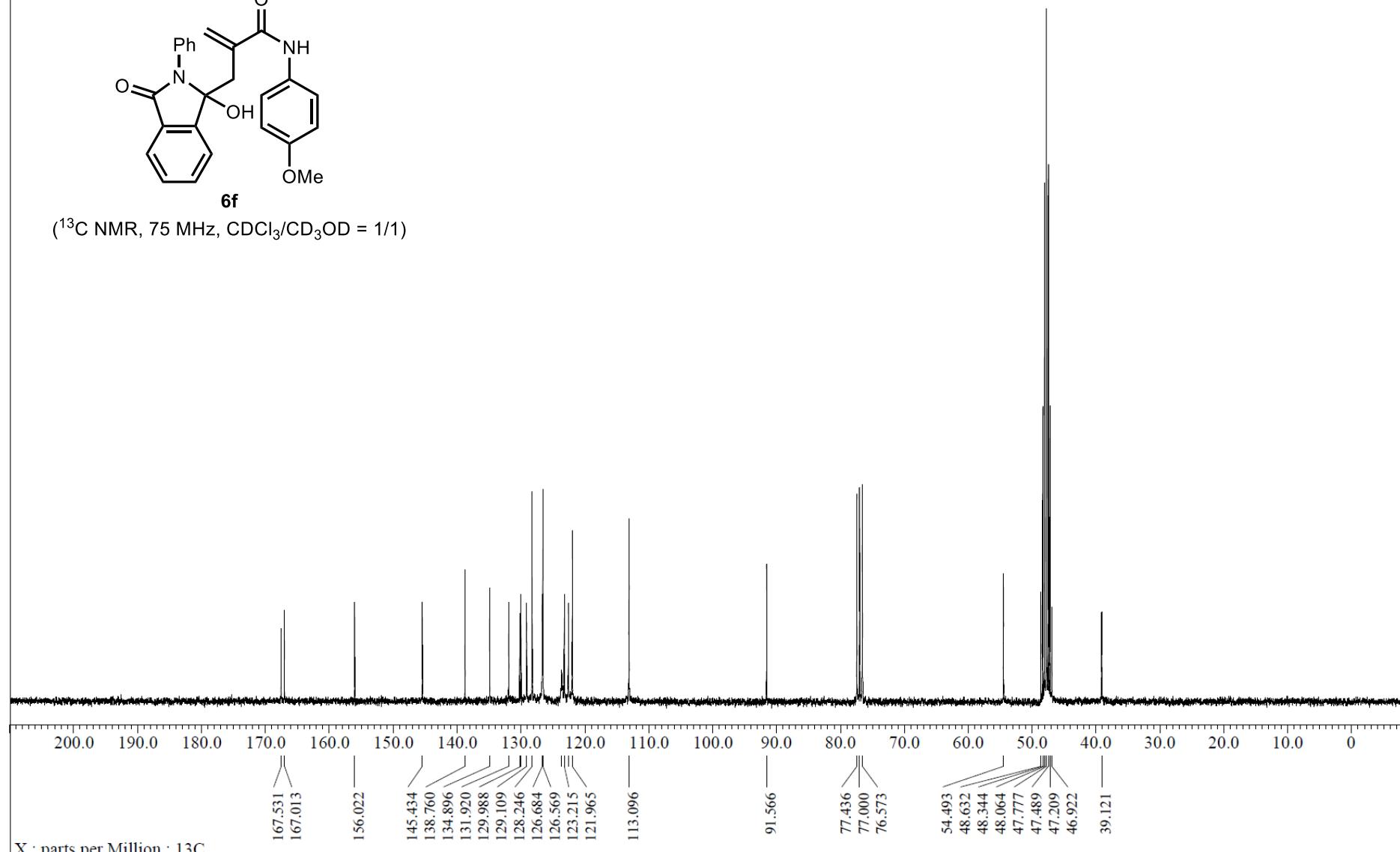


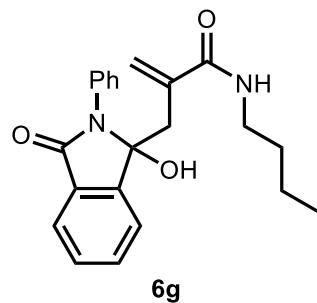
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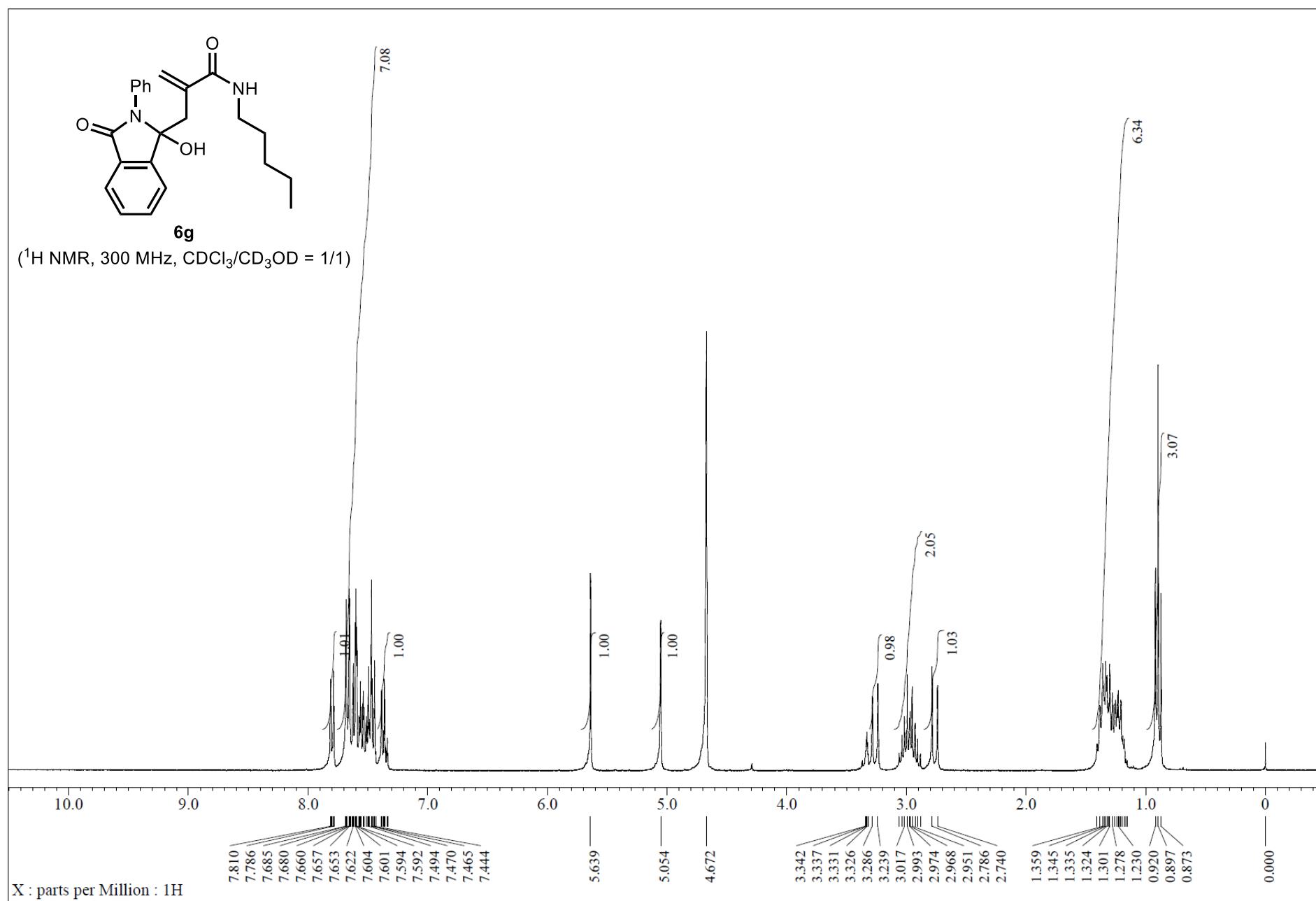


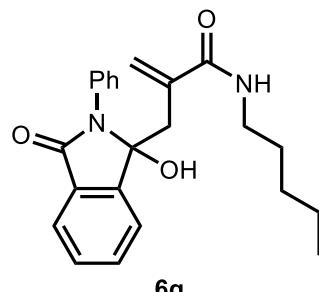
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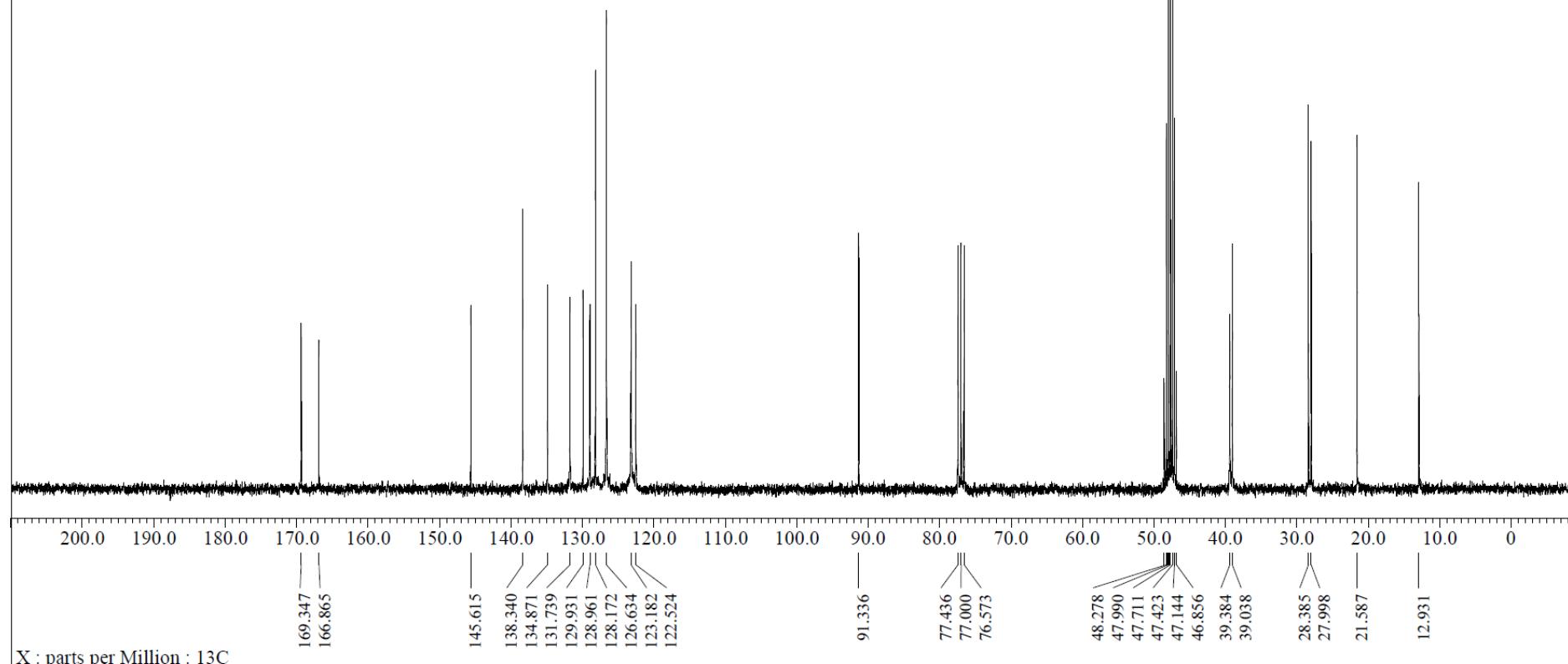


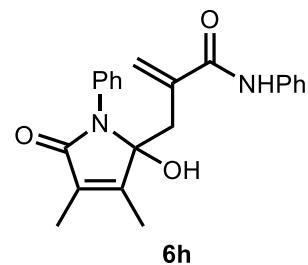
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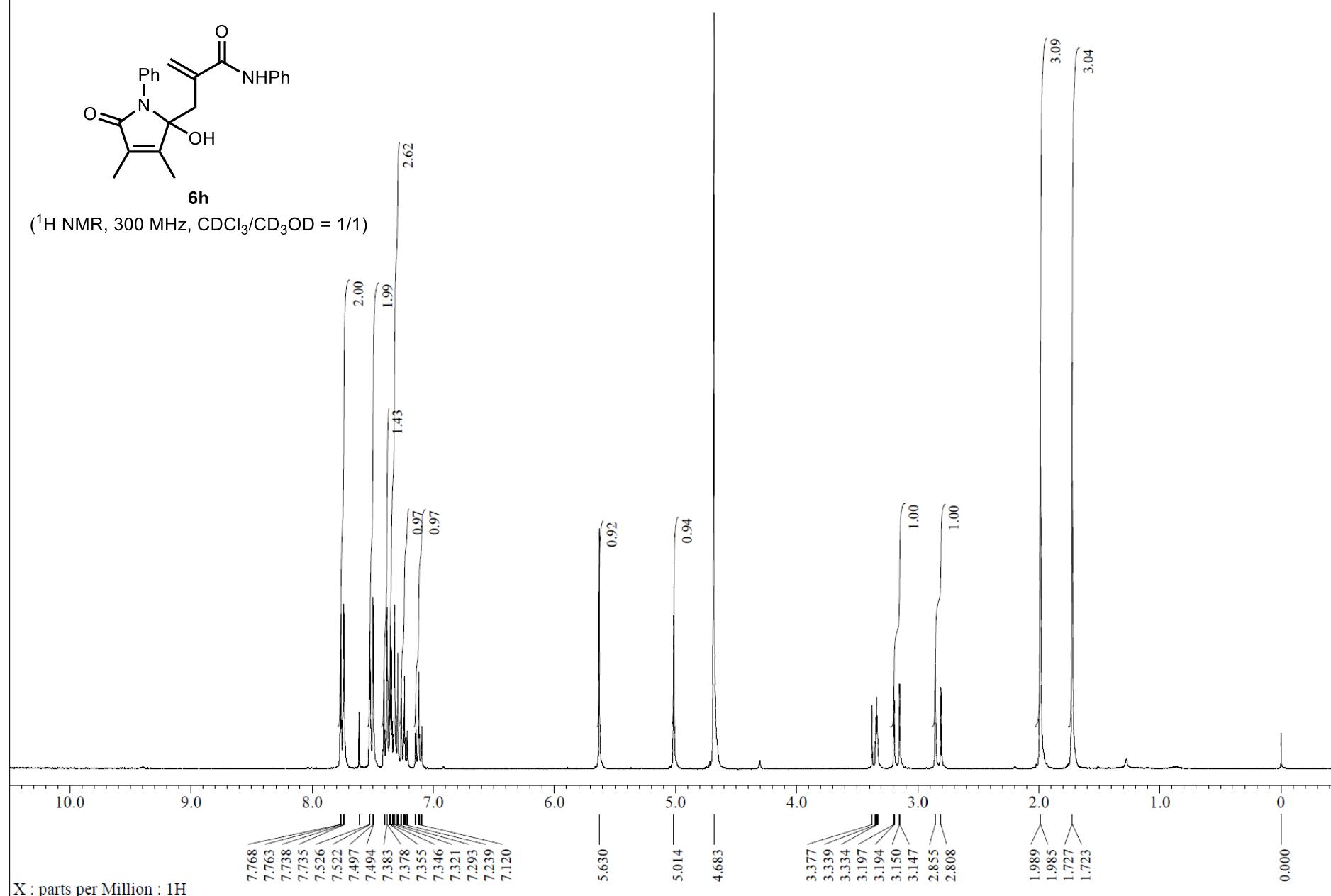


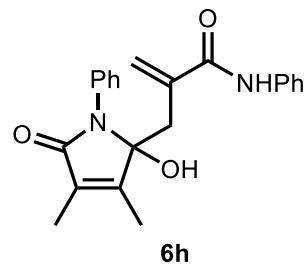
(^{13}C NMR, 75 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)



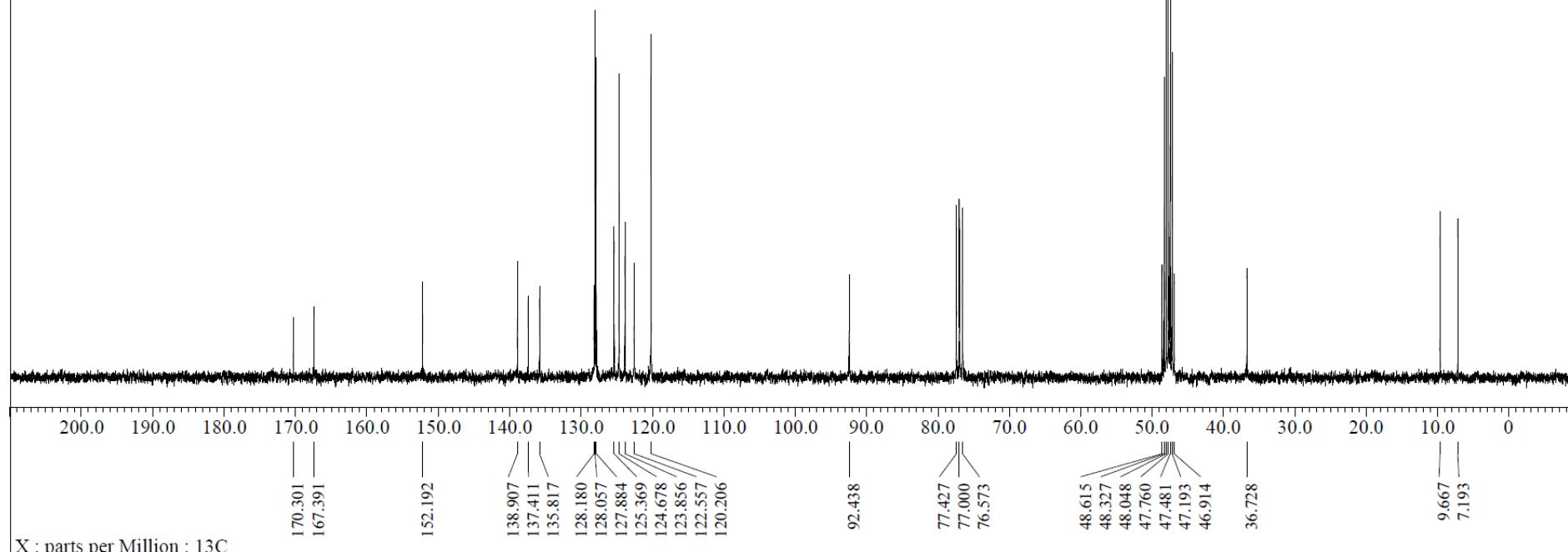


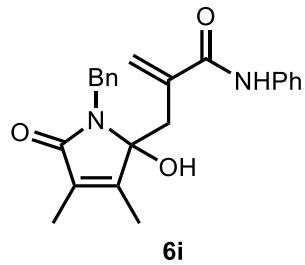
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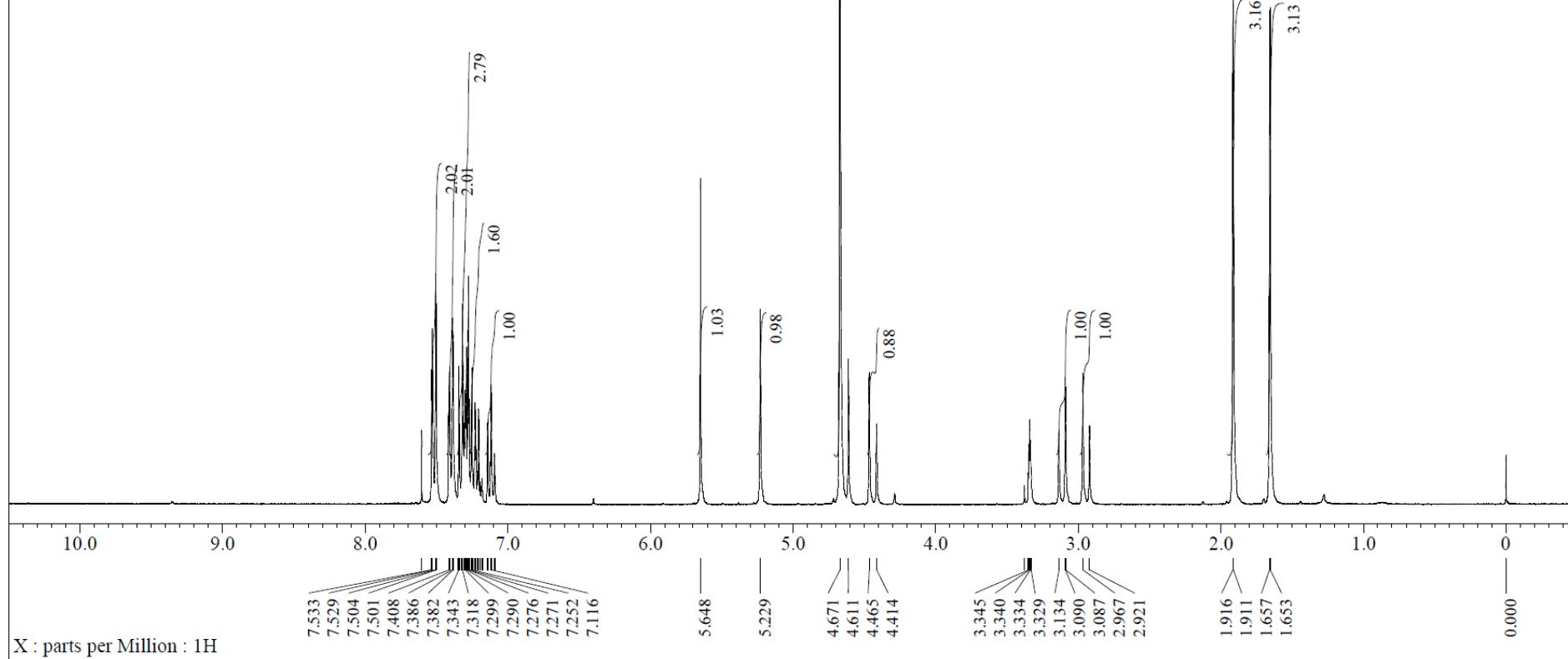


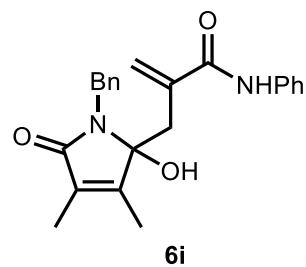
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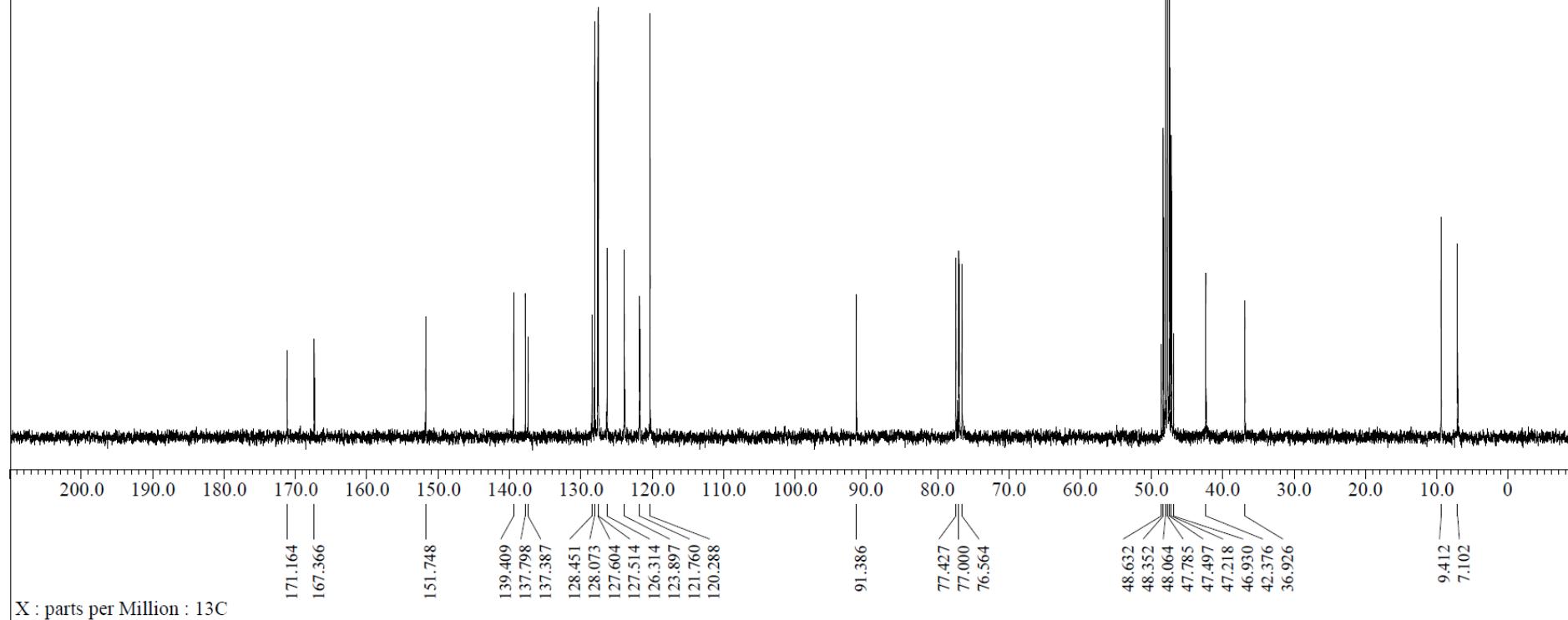


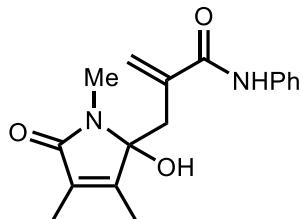
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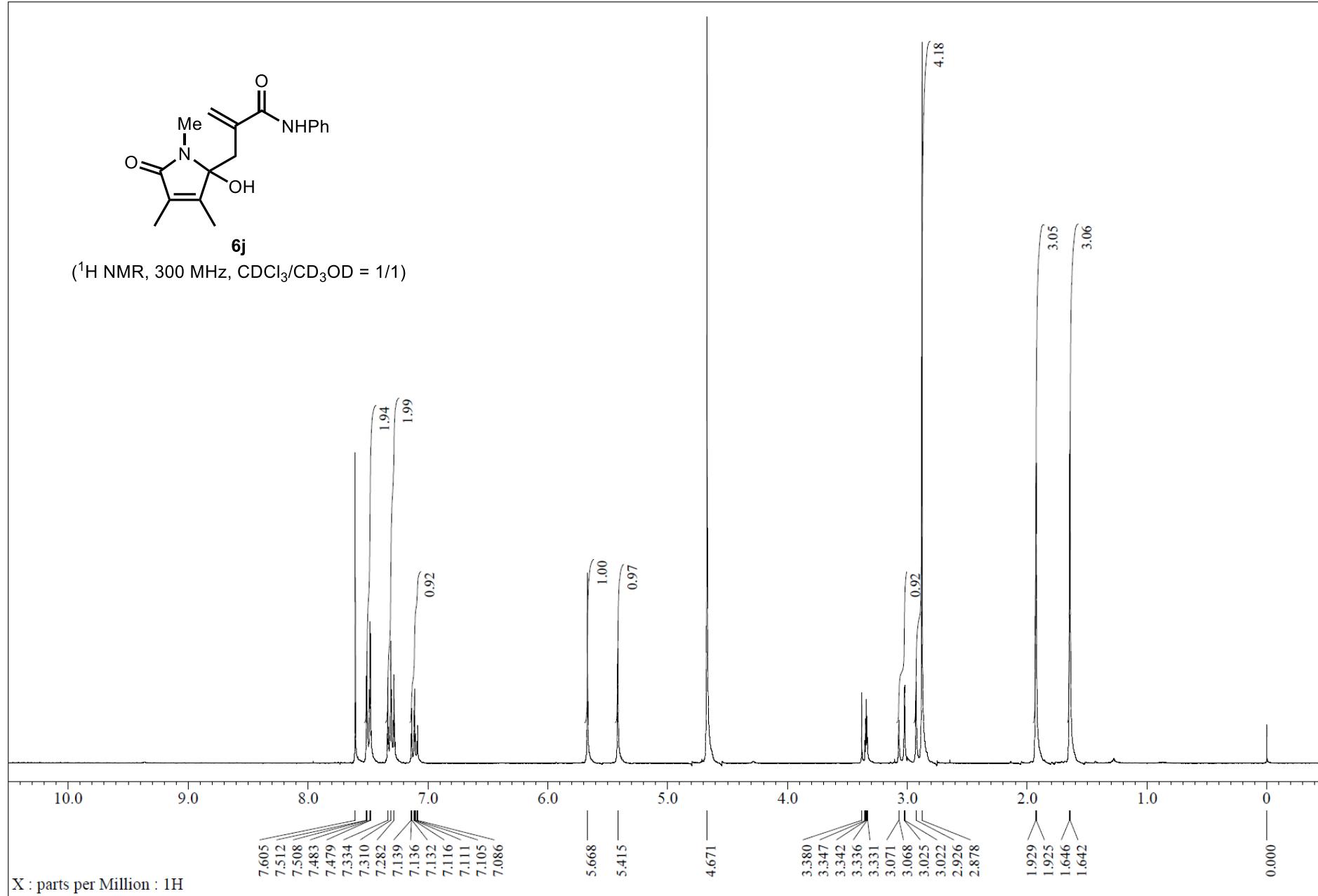


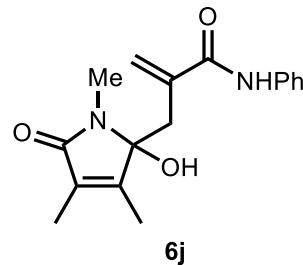
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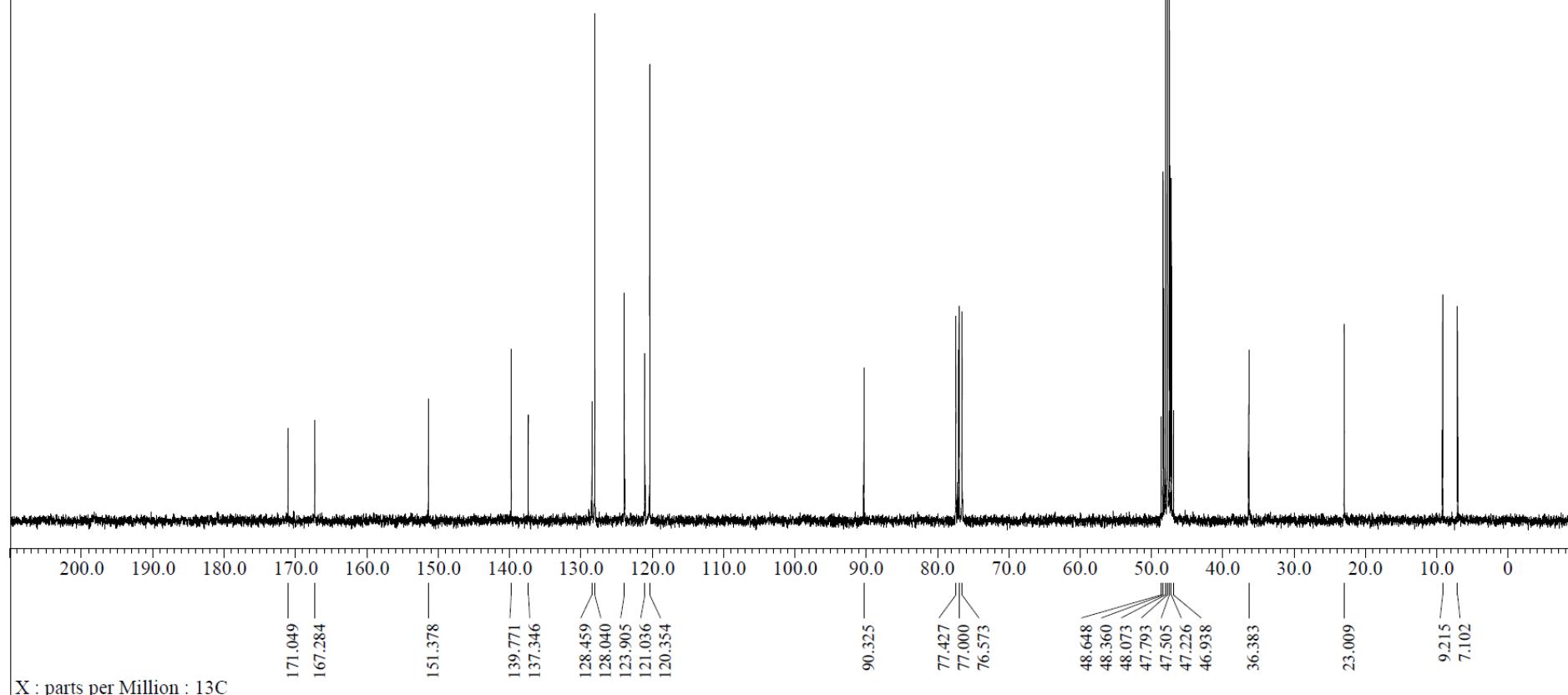


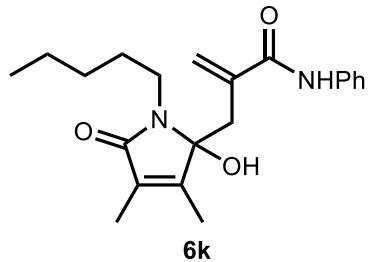
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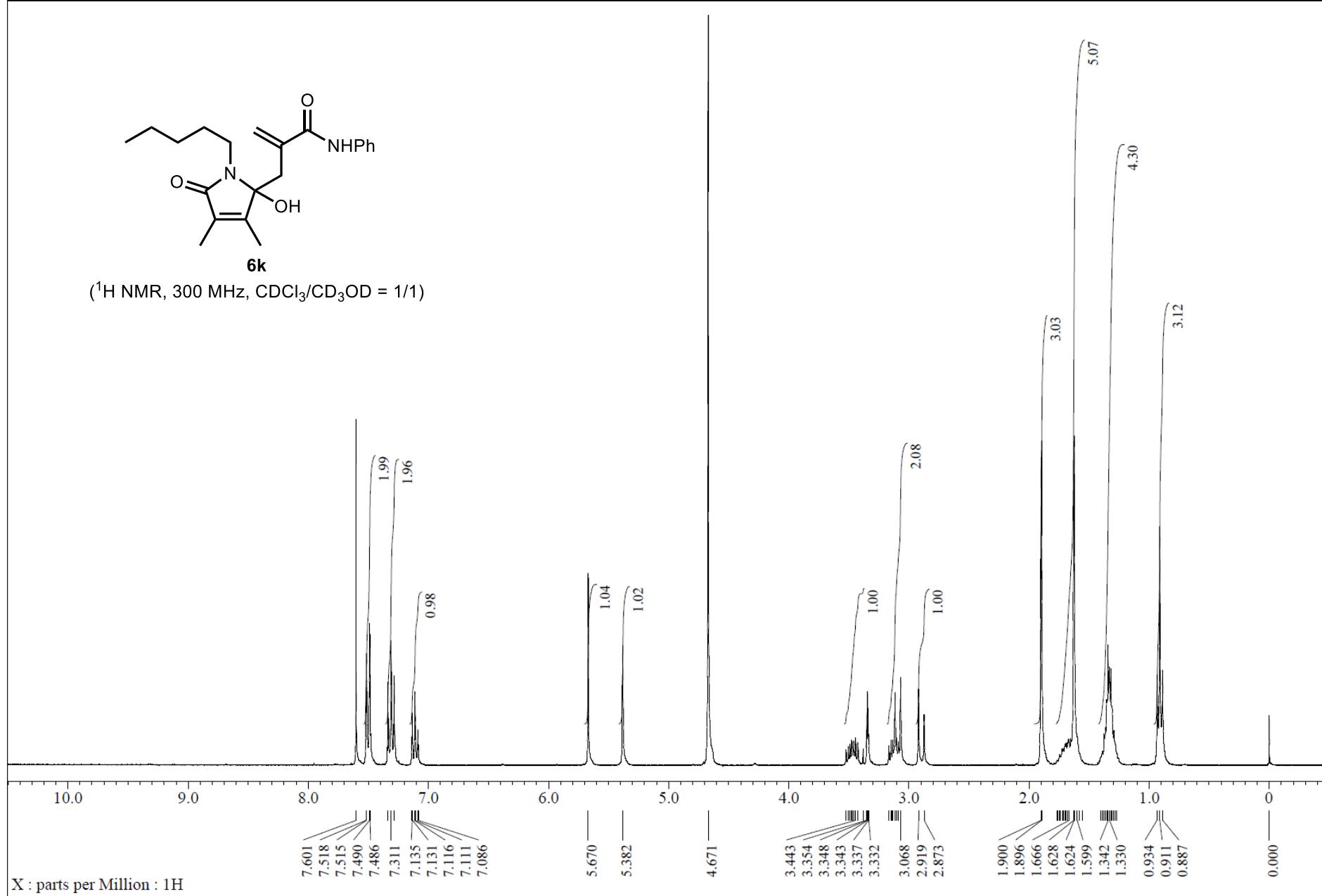


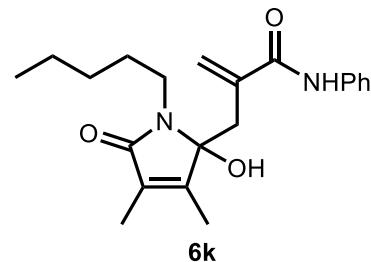
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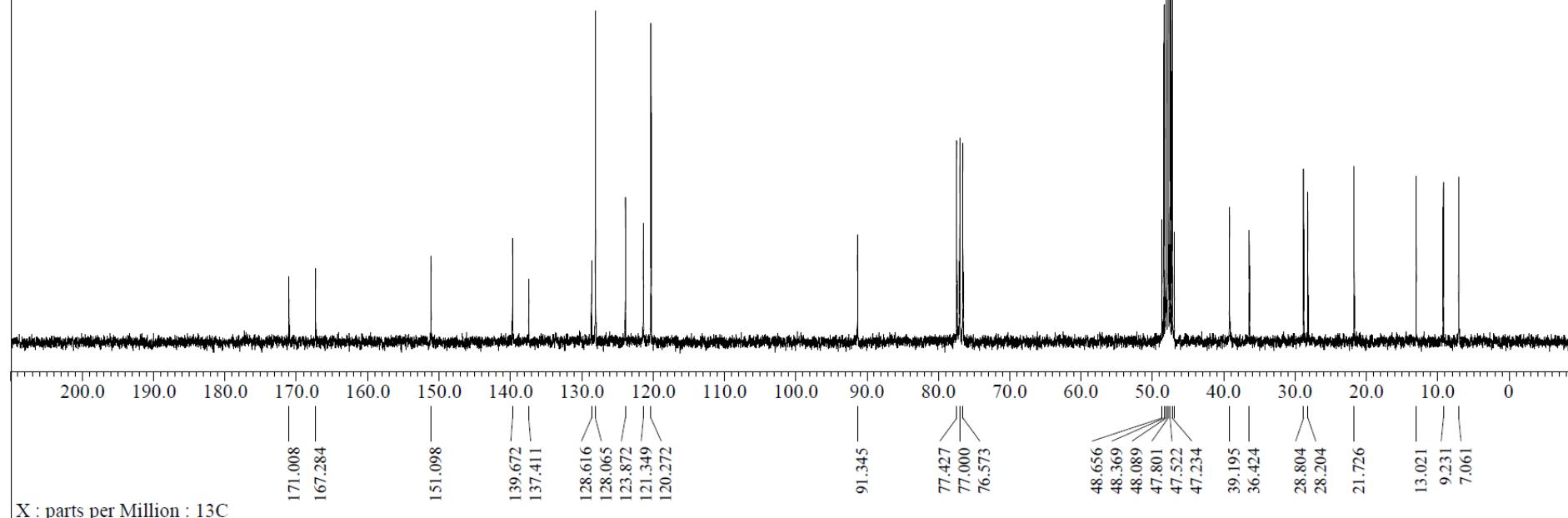


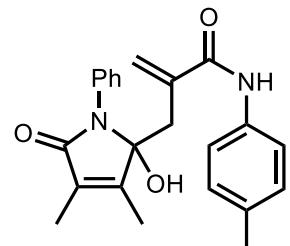
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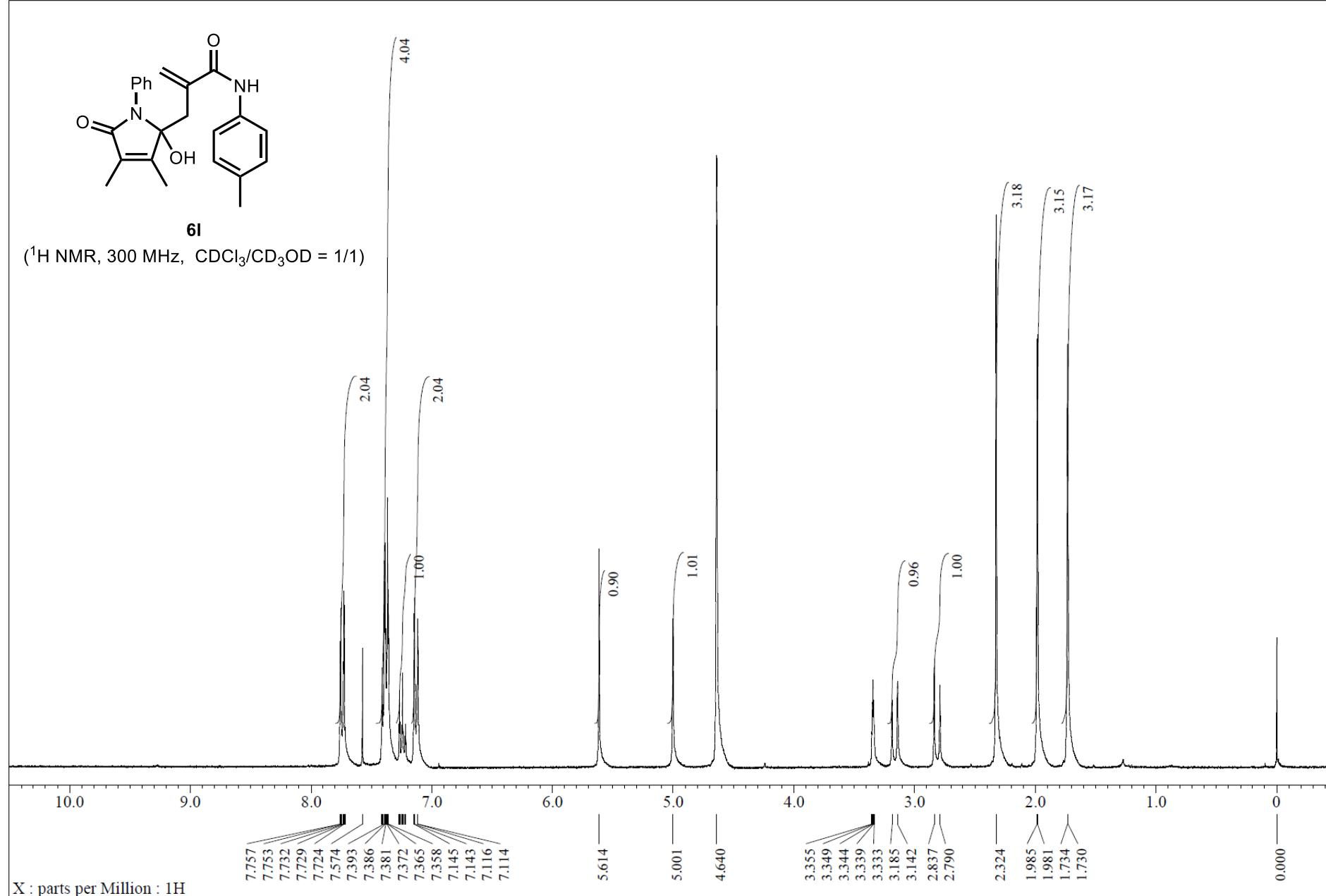
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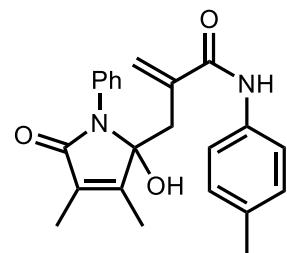




6l

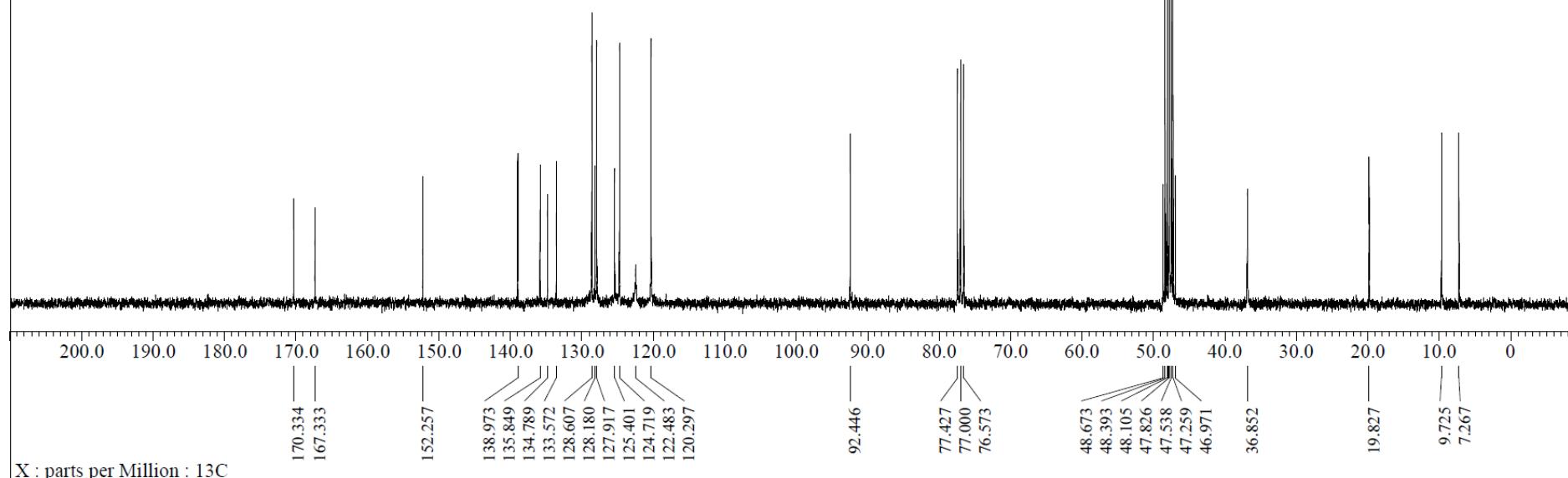
(¹H NMR, 300 MHz, CDCl₃/CD₃OD = 1/1)



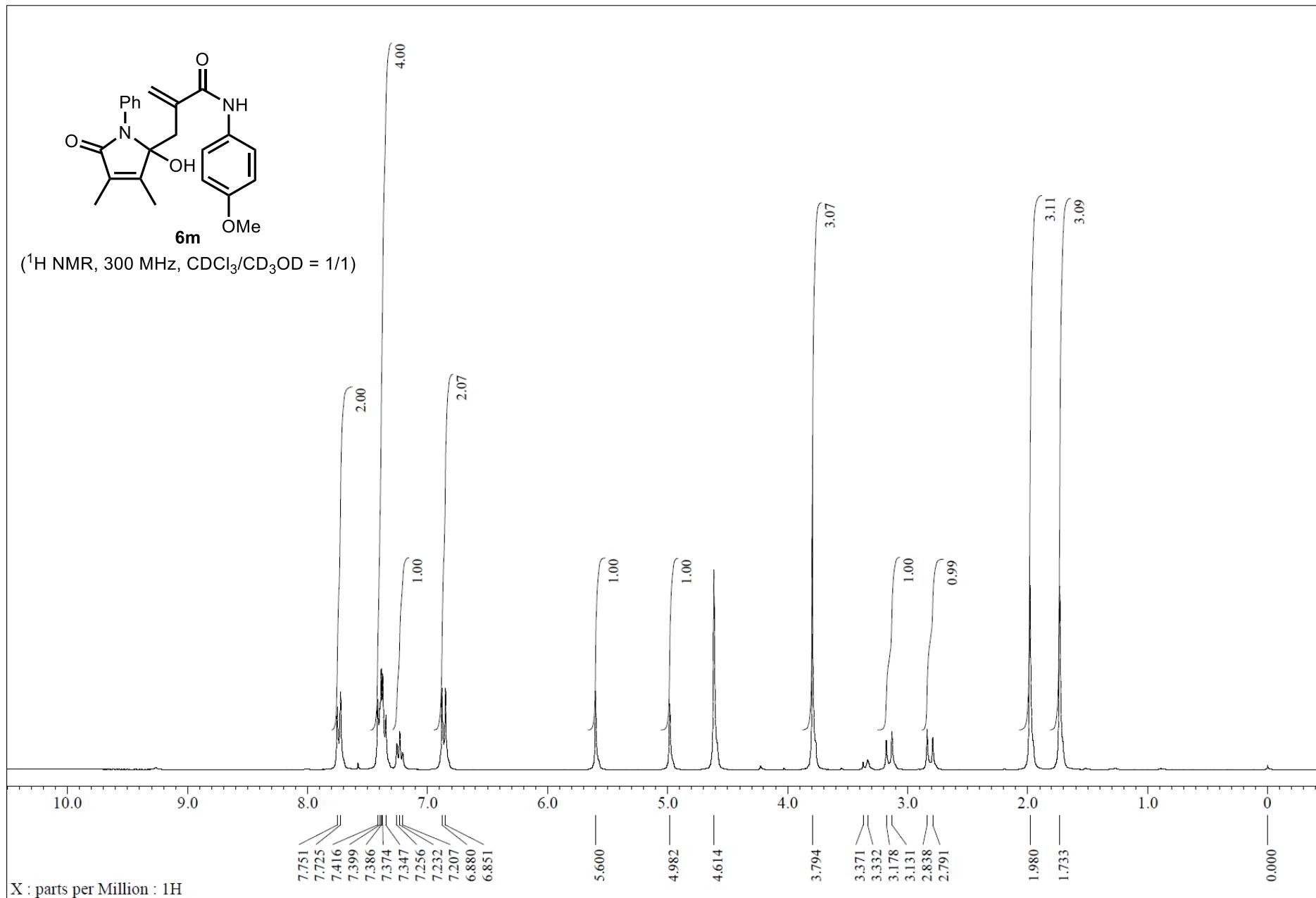


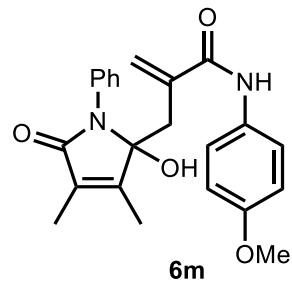
6l

(¹³C NMR, 75 MHz, CDCl₃/CD₃OD = 1/1)

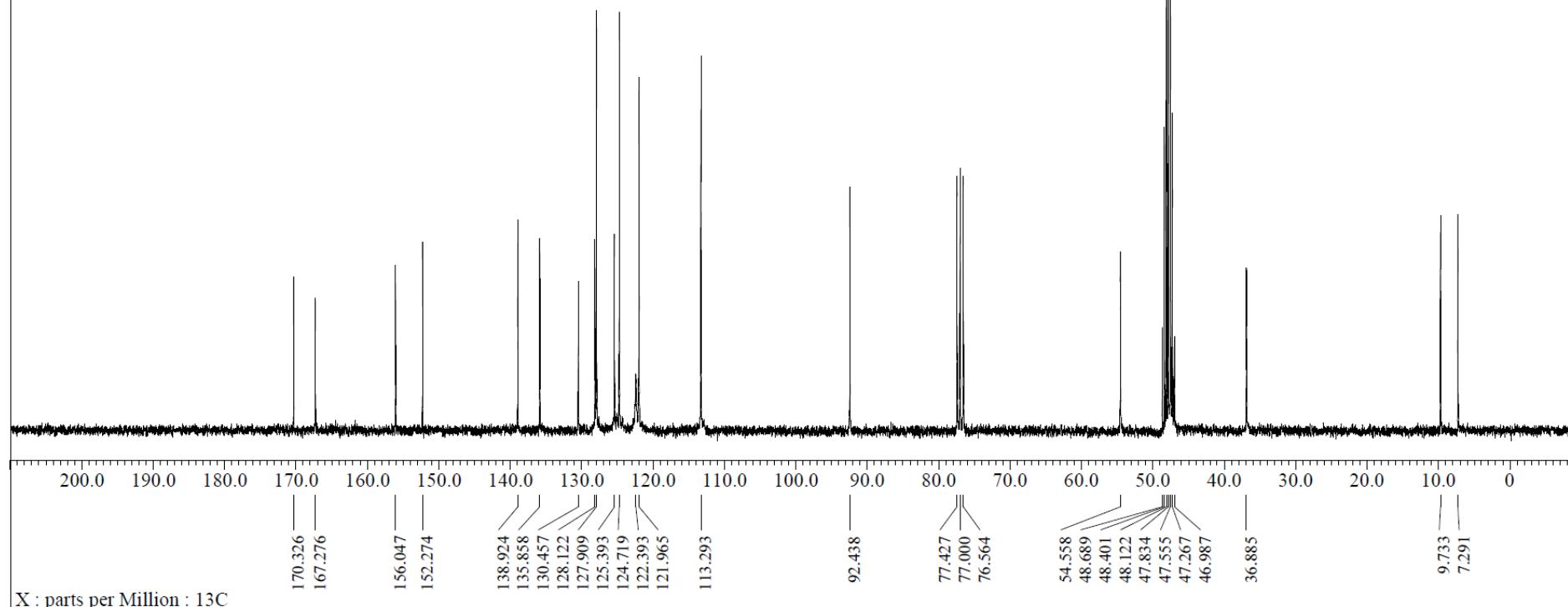


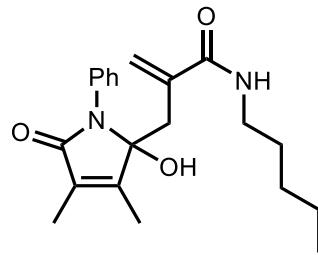
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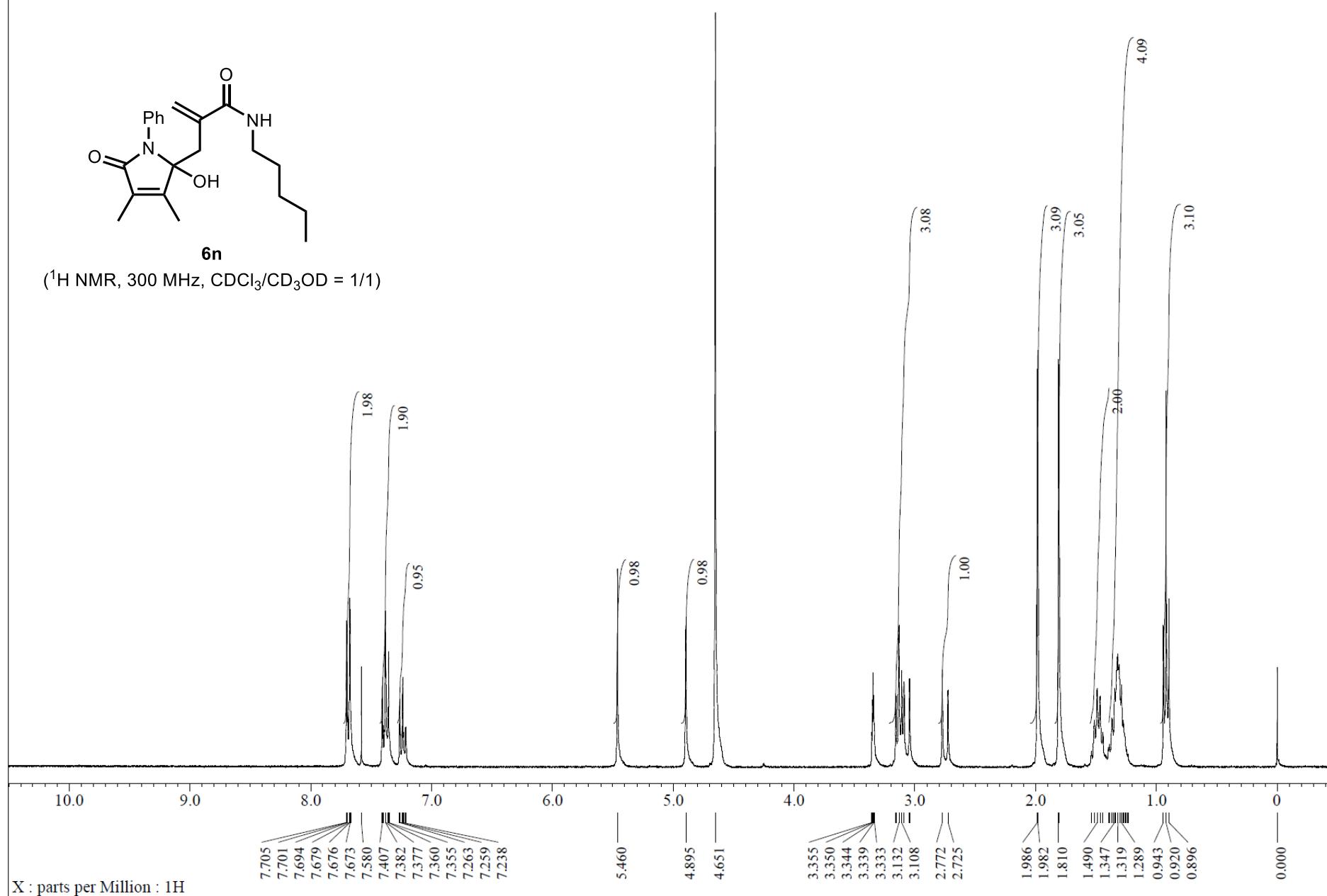


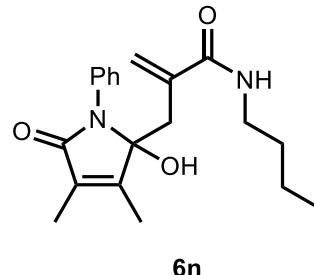
(^{13}C NMR, 75 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)



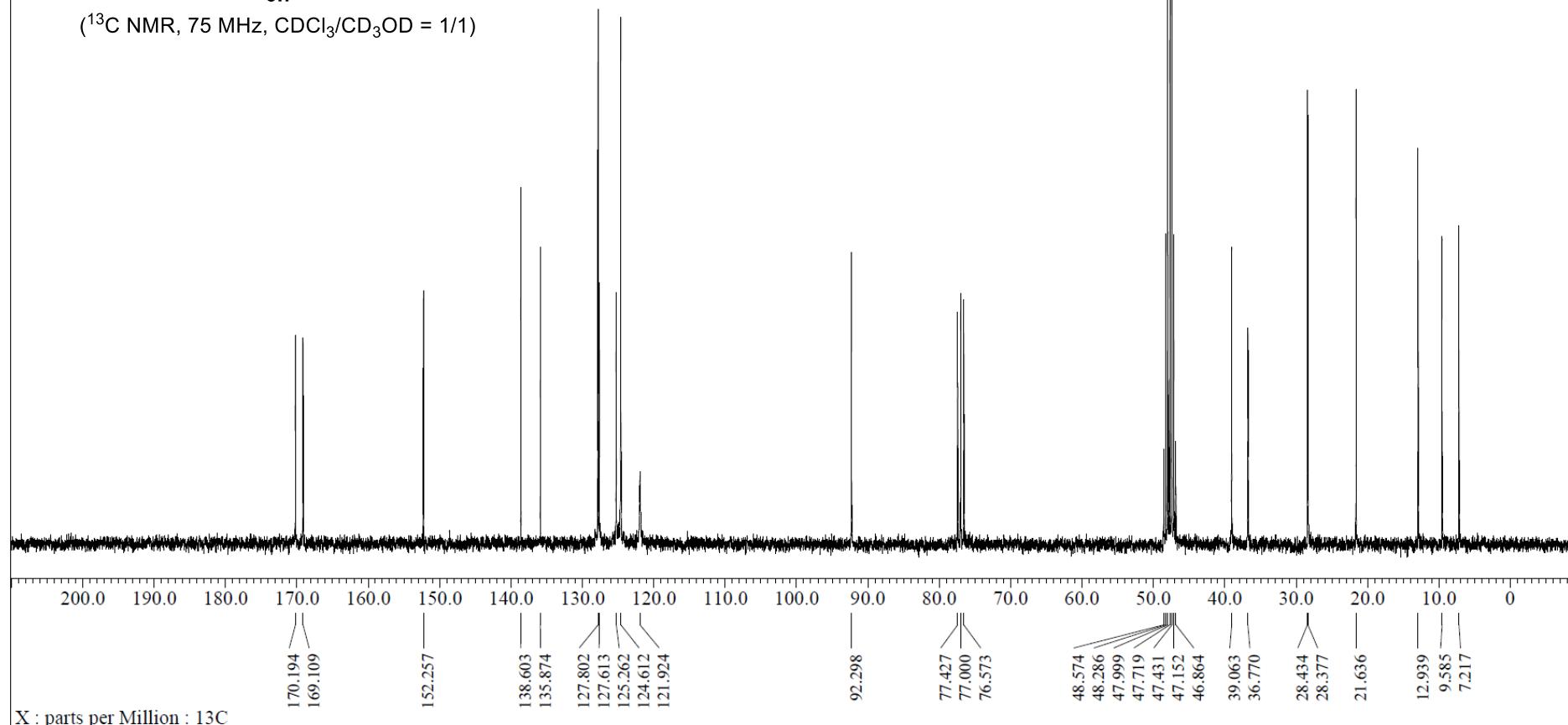


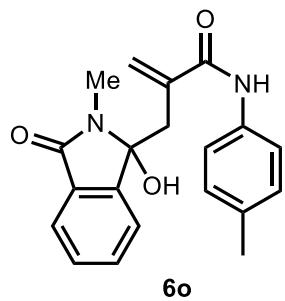
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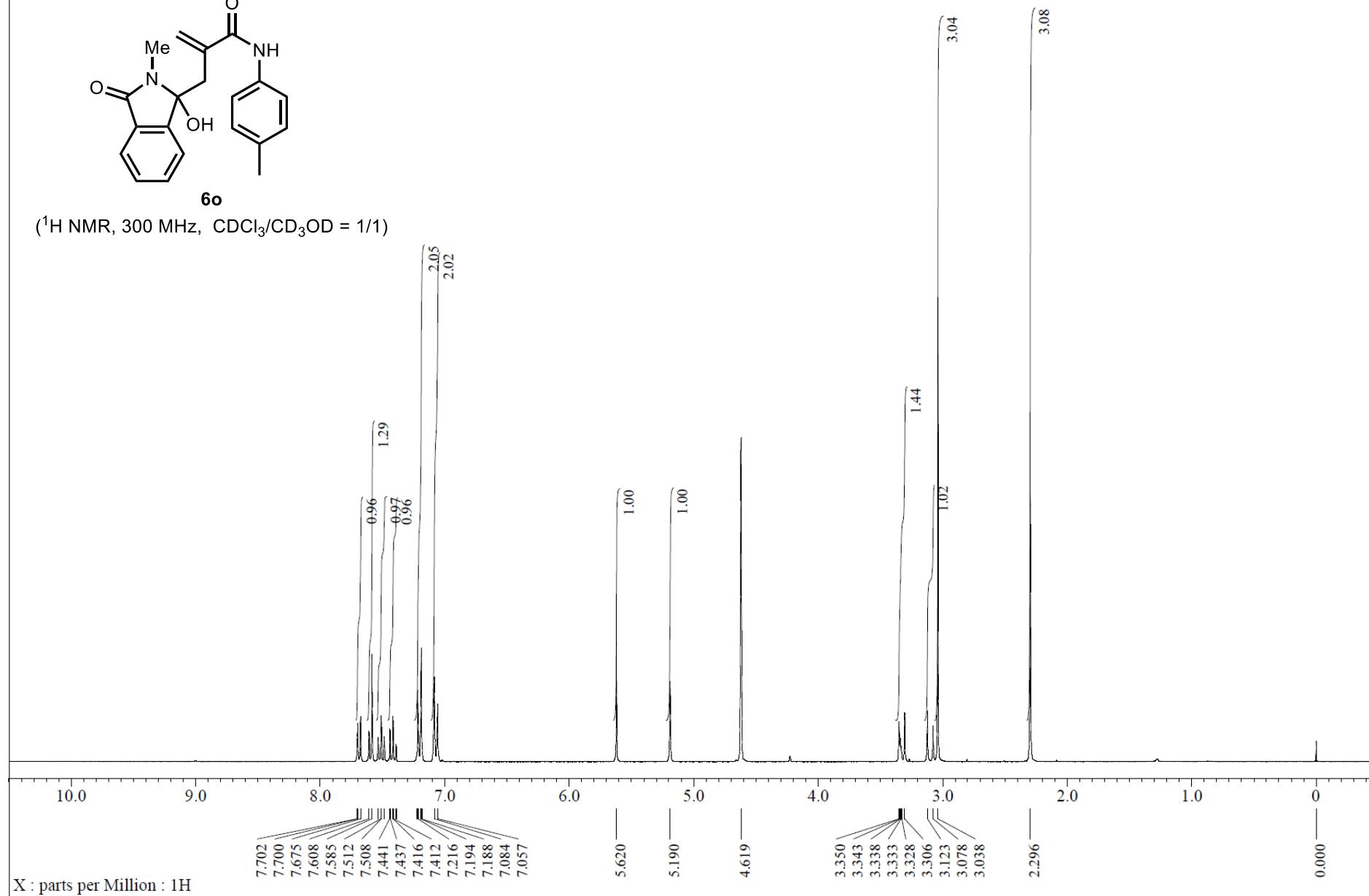


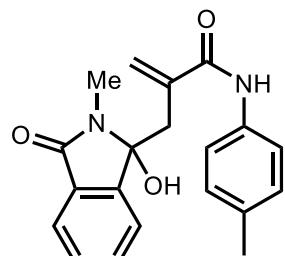
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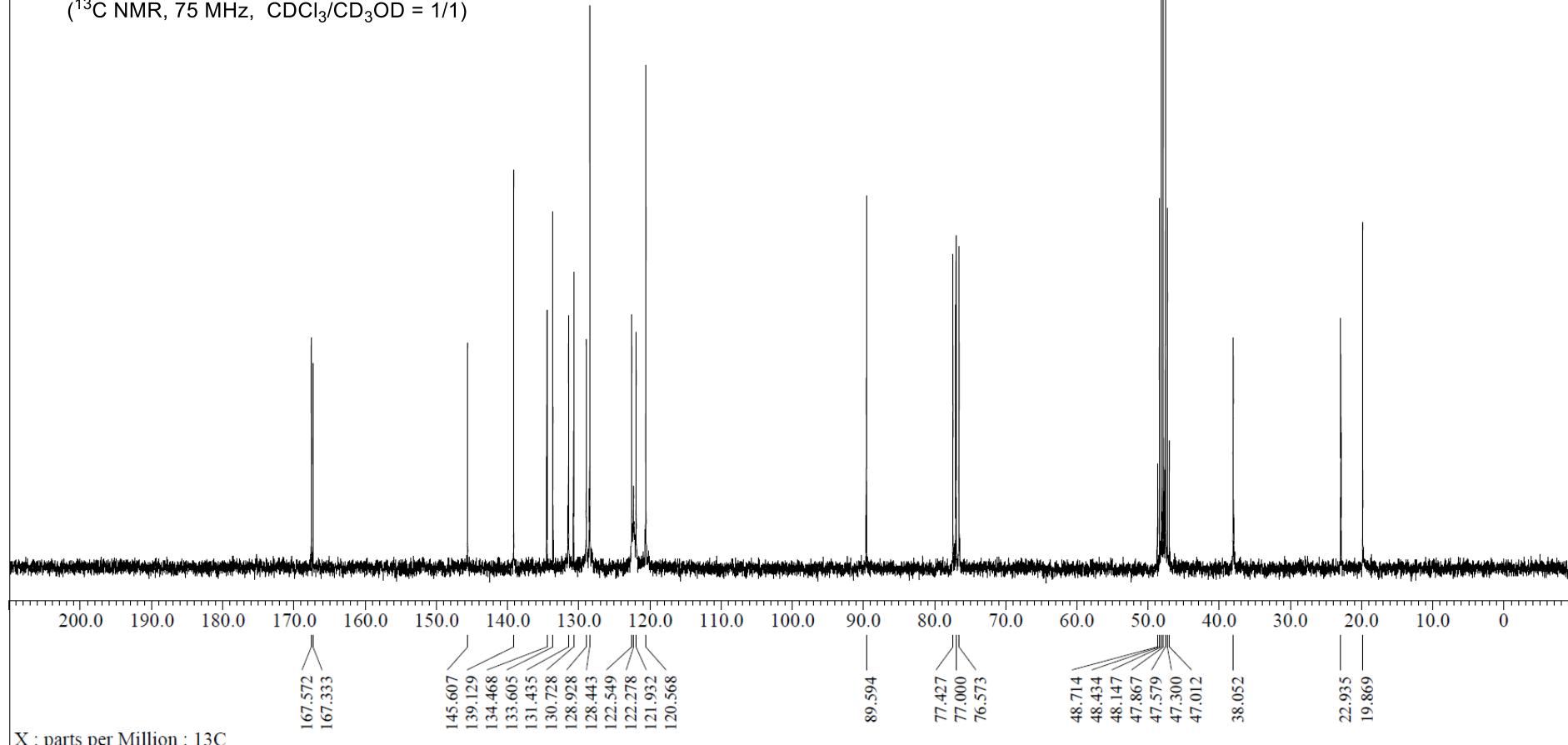


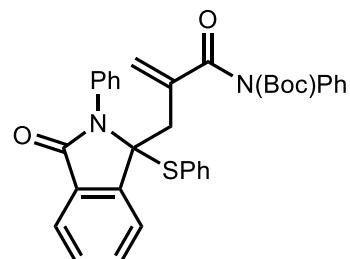
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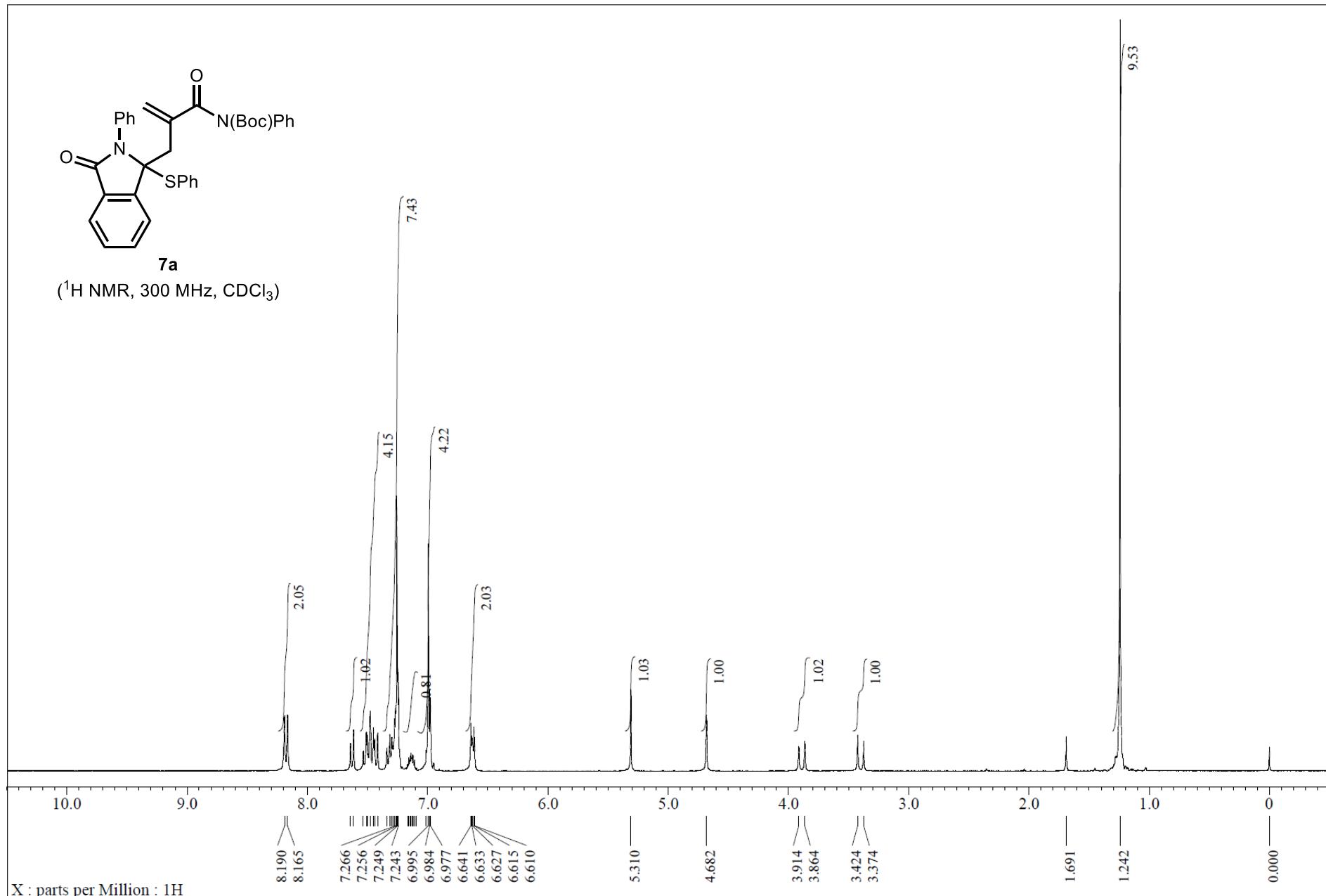


(^{13}C NMR, 75 MHz, $\text{CDCl}_3/\text{CD}_3\text{OD} = 1/1$)

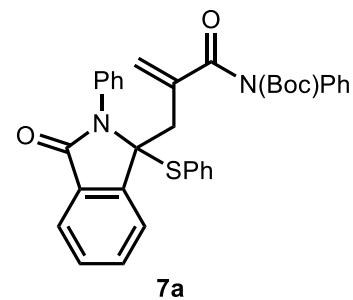




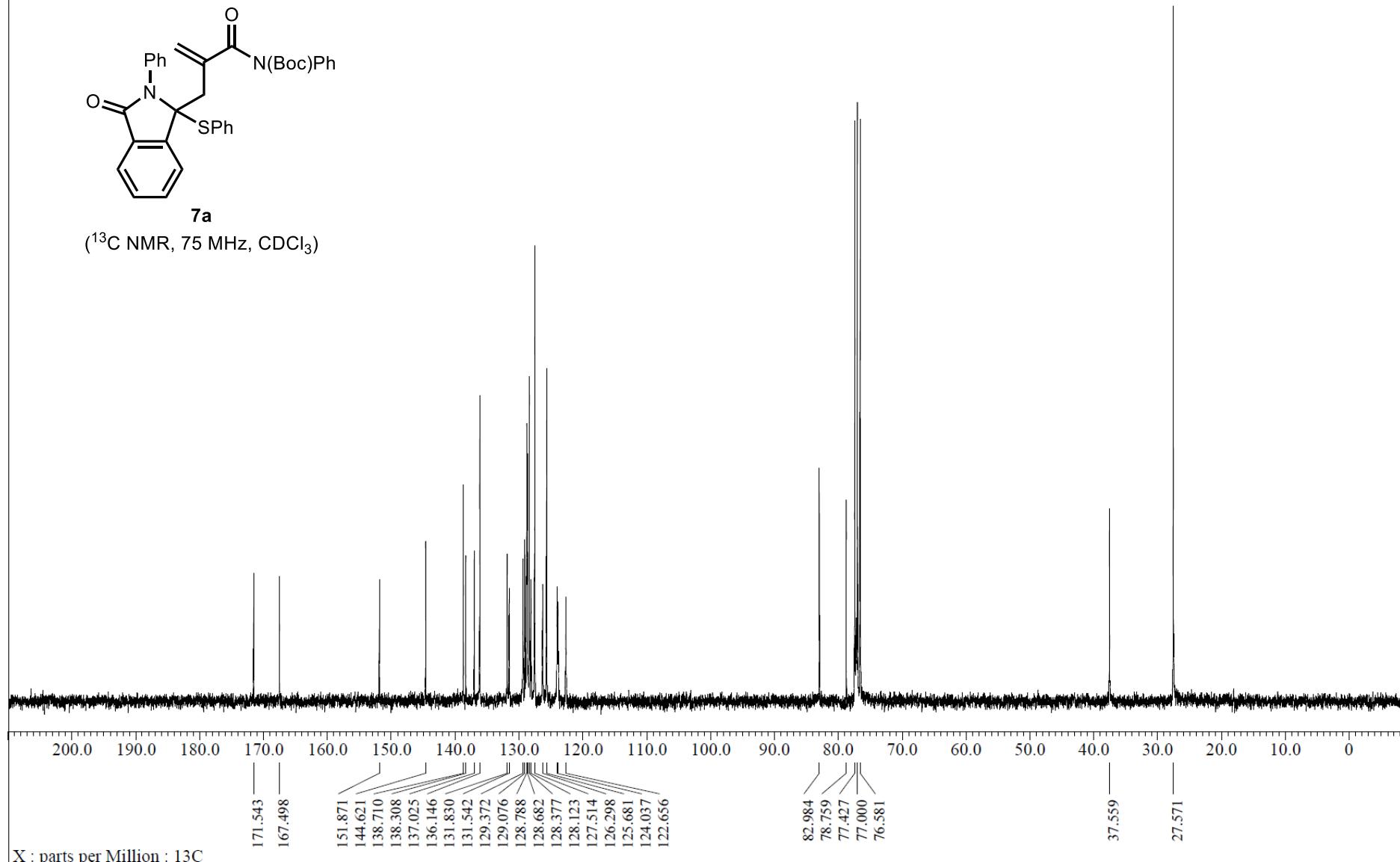
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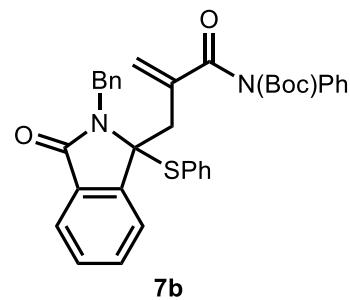


X : parts per Million : ^1H

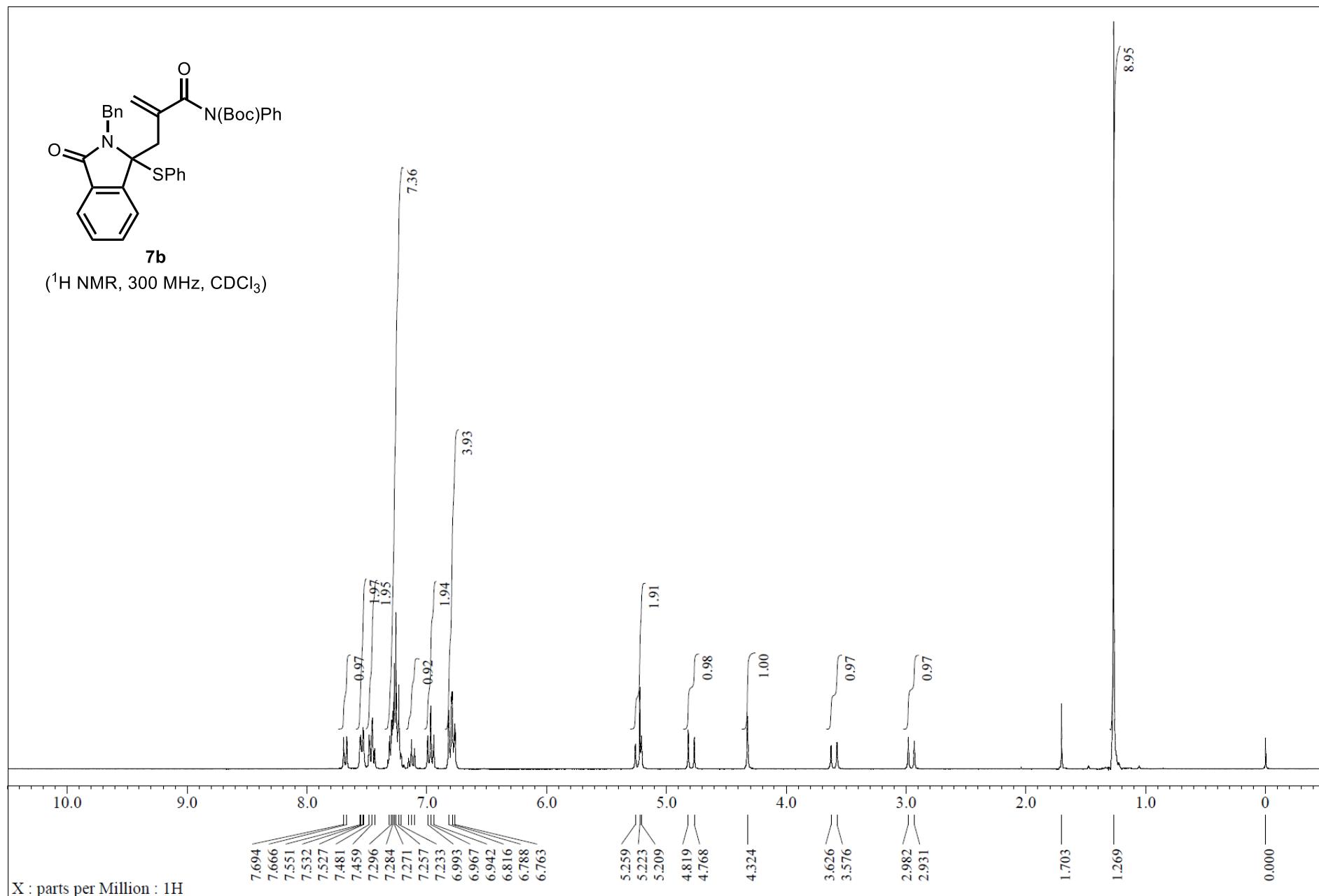


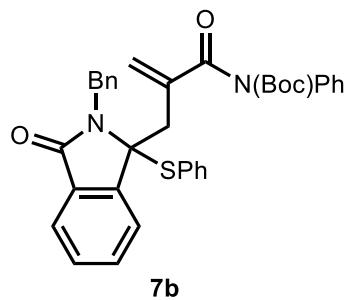
(^{13}C NMR, 75 MHz, CDCl_3)



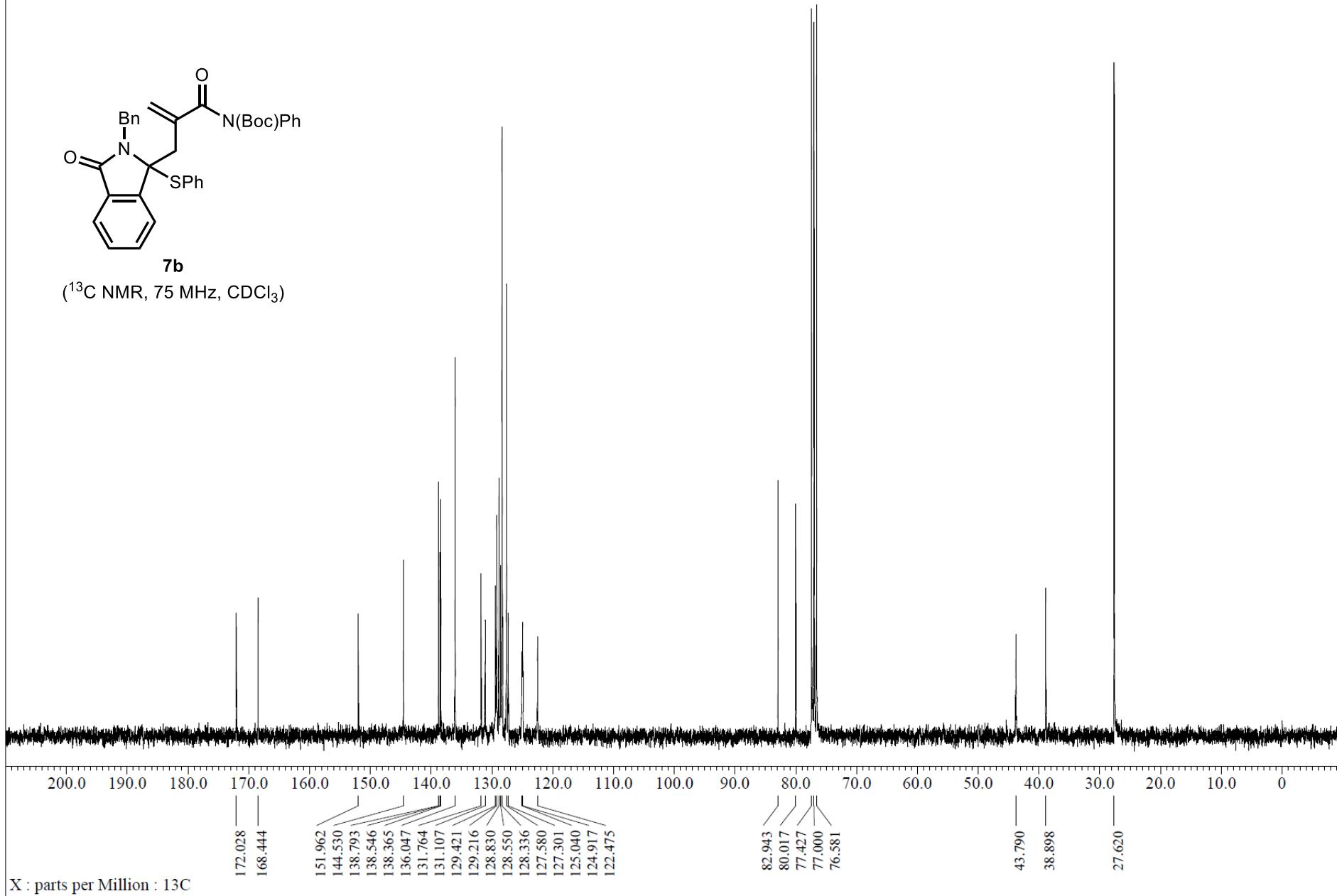


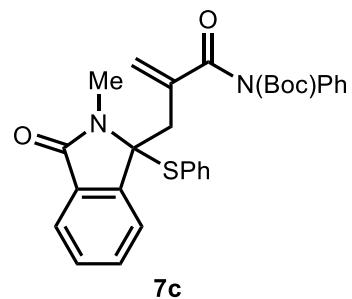
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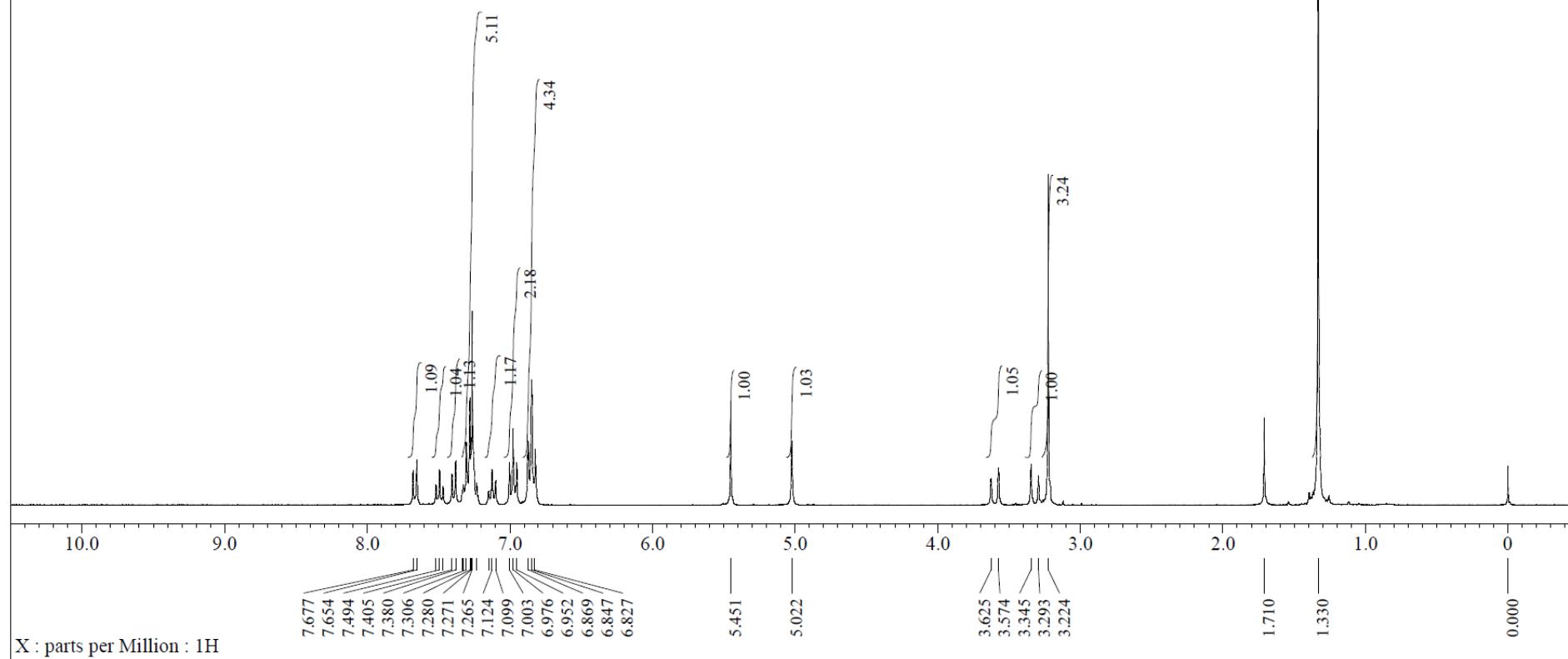


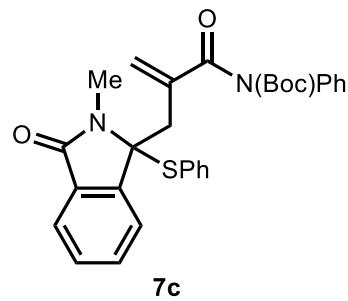
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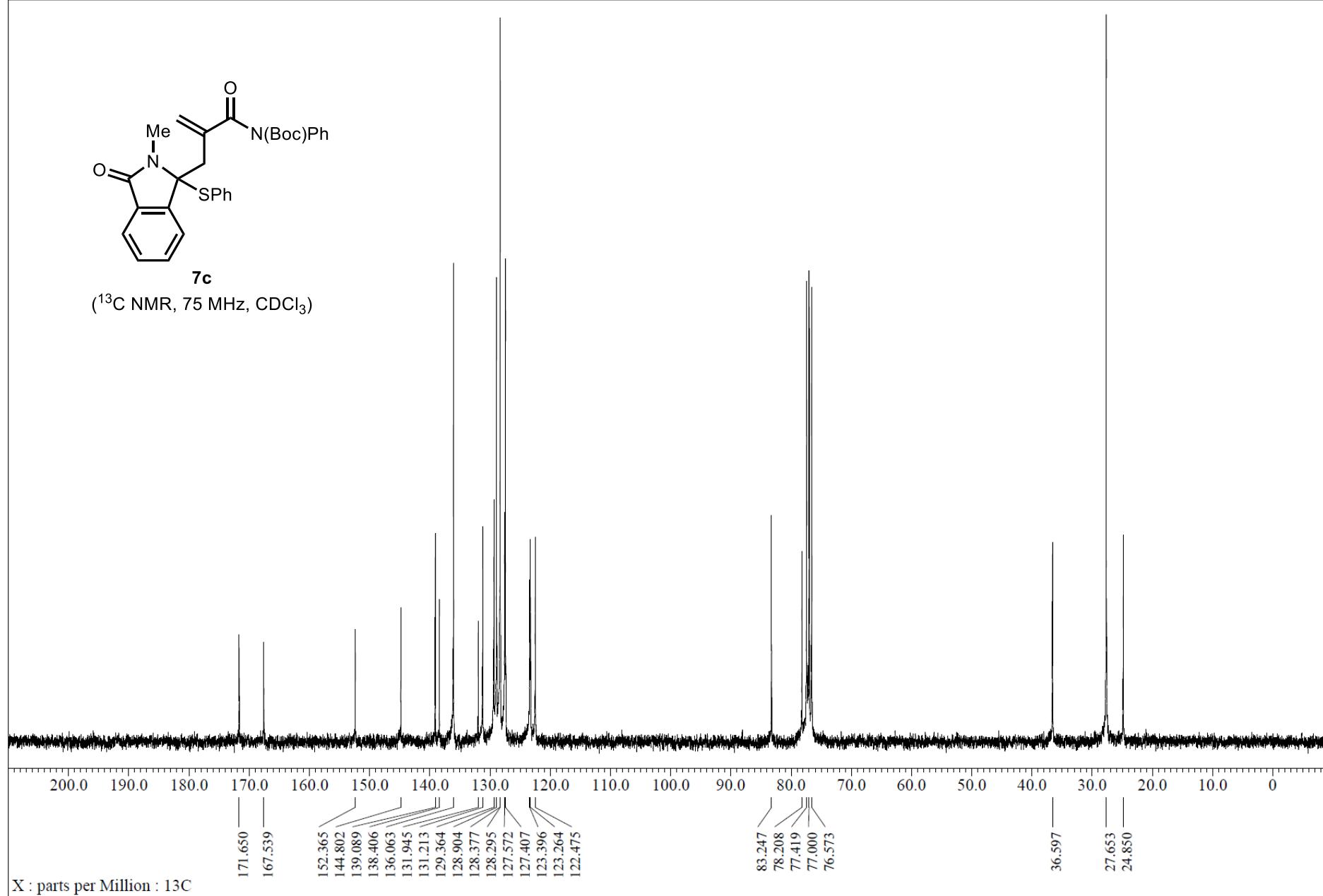


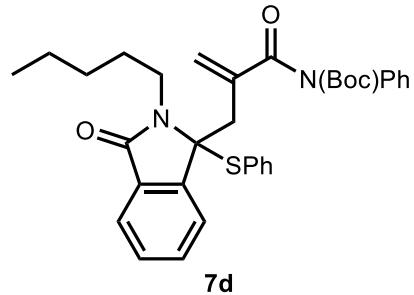
(^1H NMR, 300 MHz, CDCl_3)



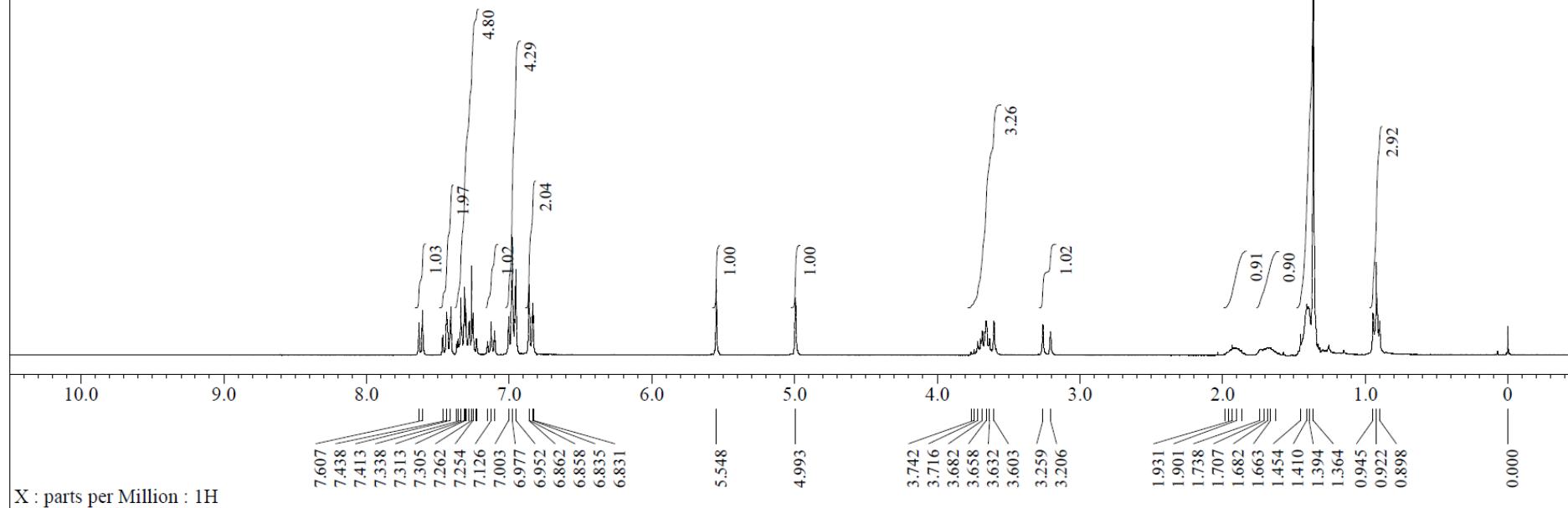


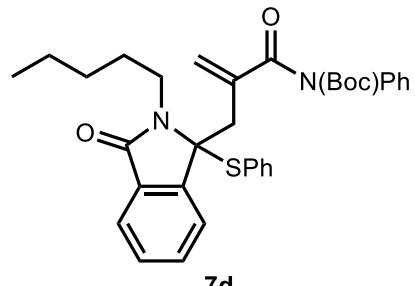
(^{13}C NMR, 75 MHz, CDCl_3)



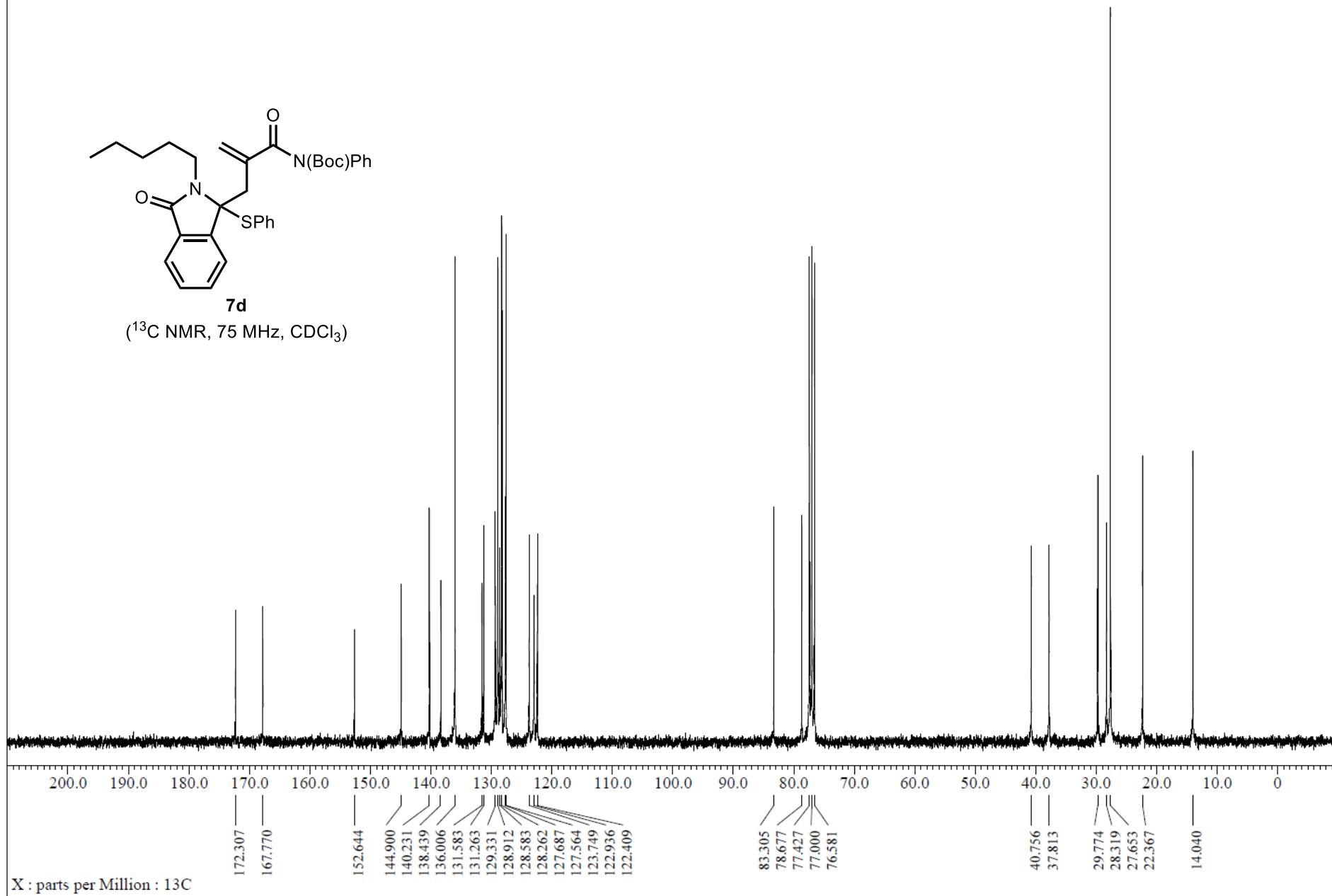


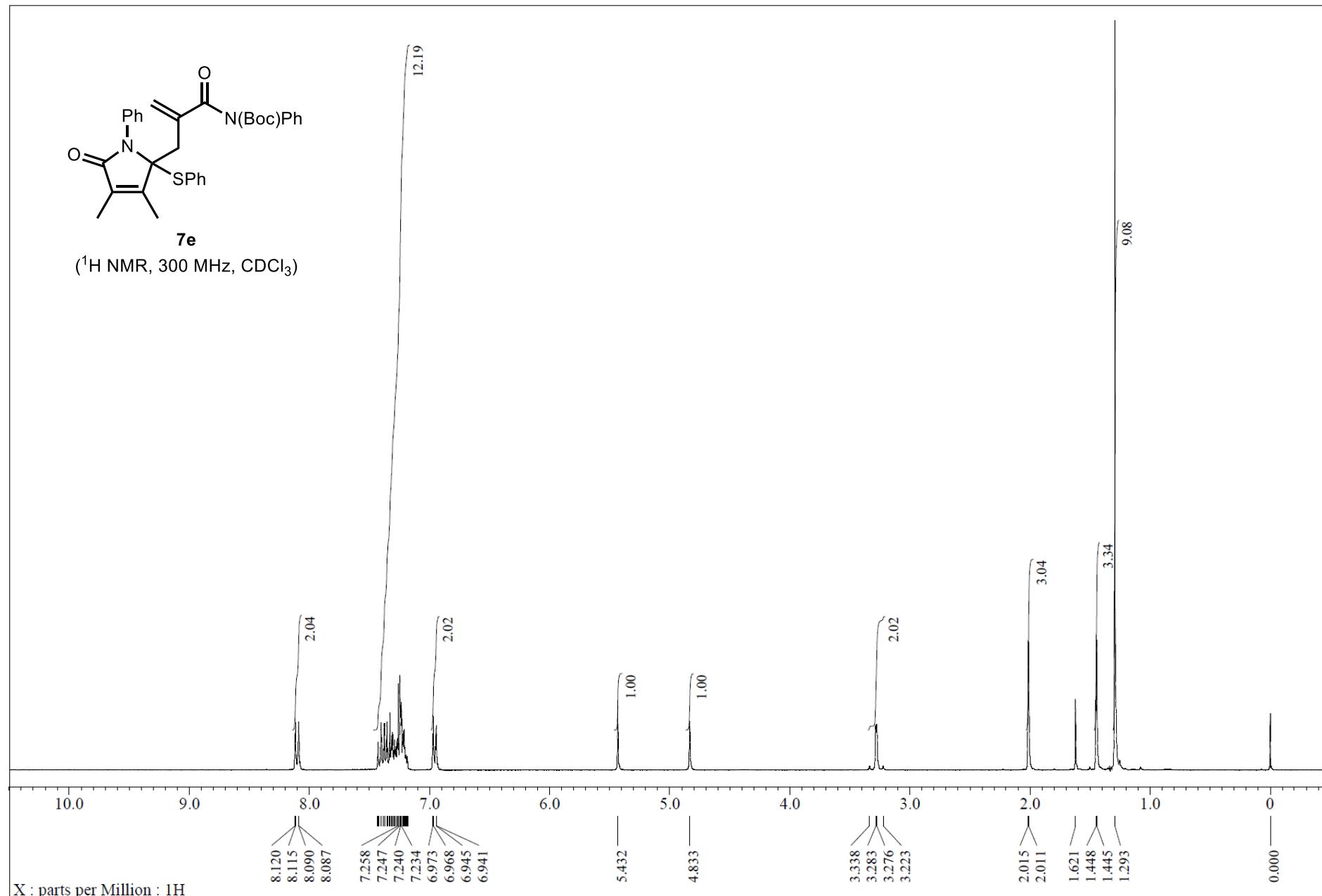
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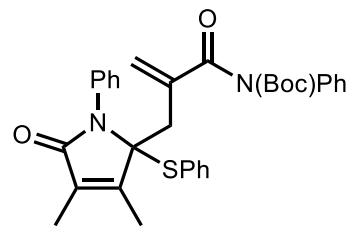




(^{13}C NMR, 75 MHz, CDCl_3)

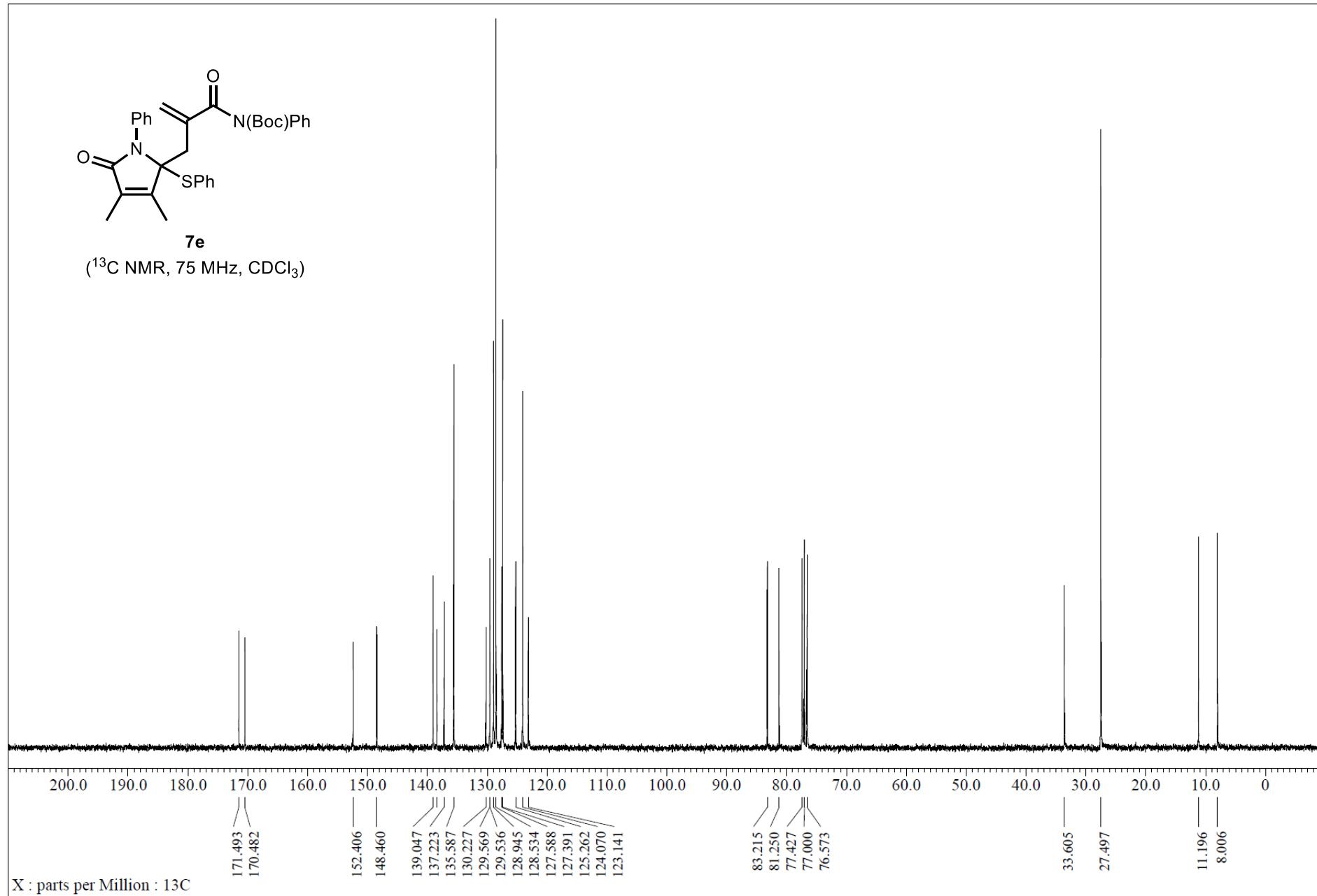


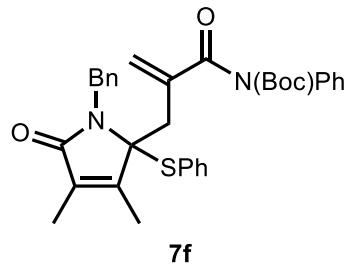




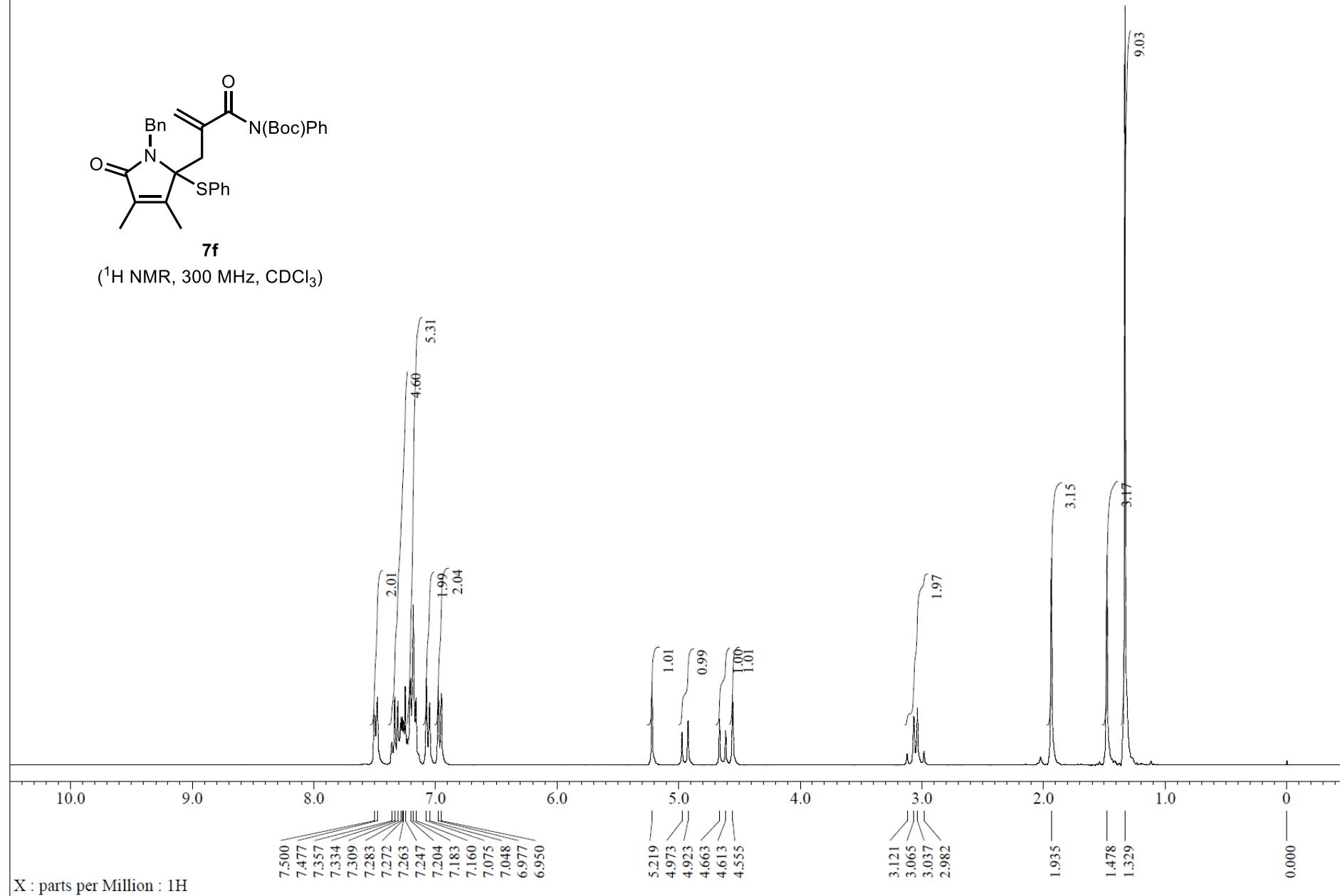
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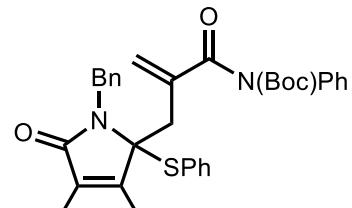
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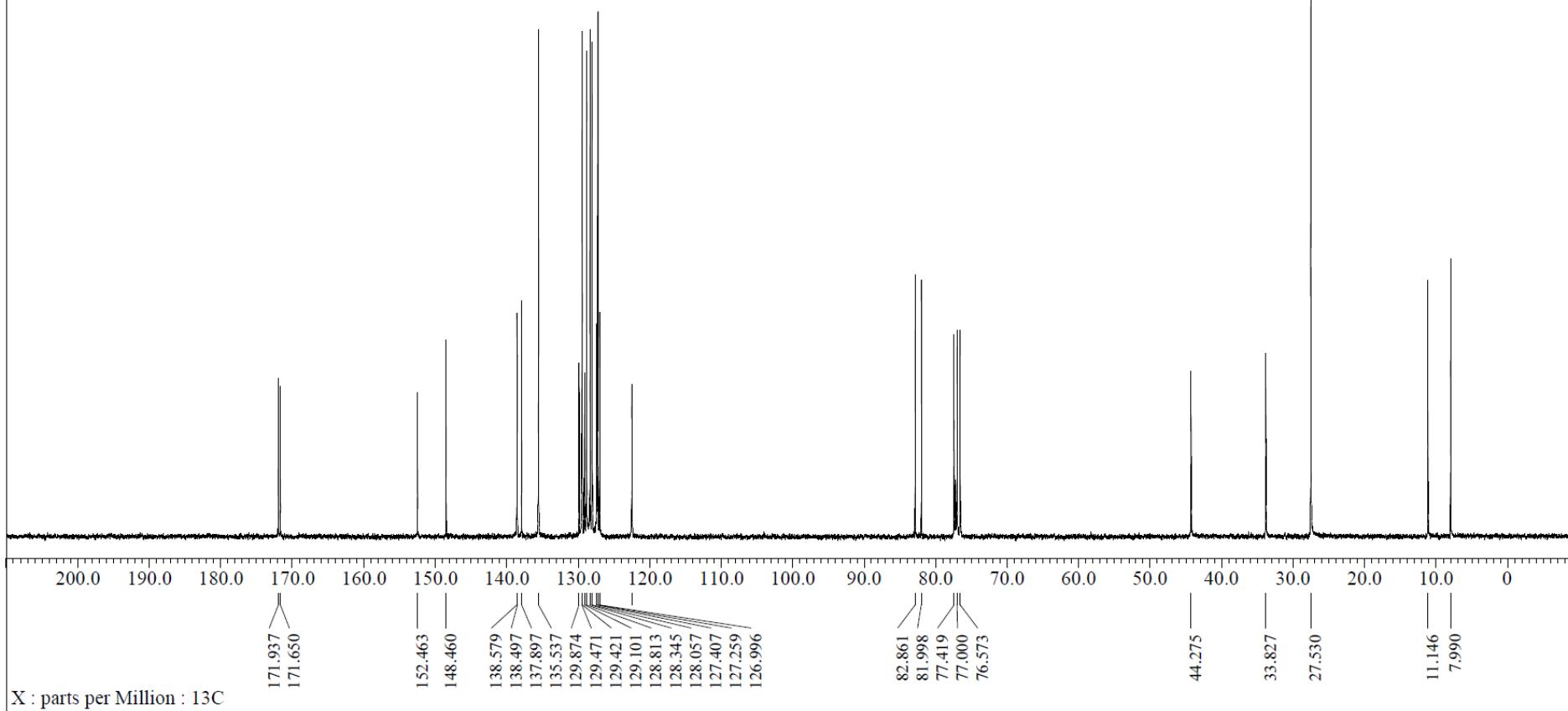
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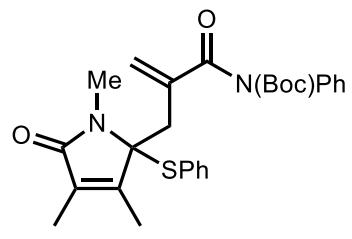




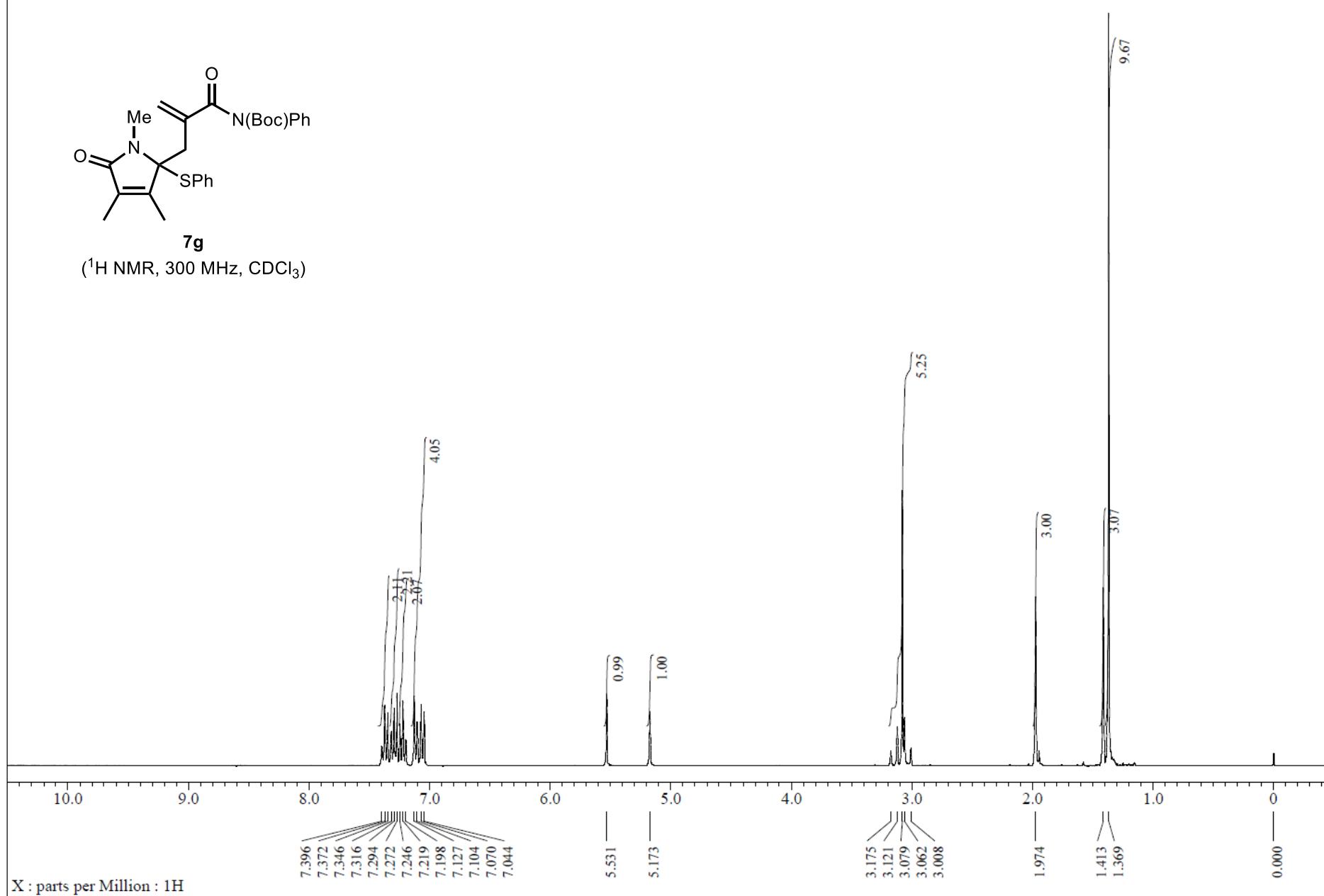
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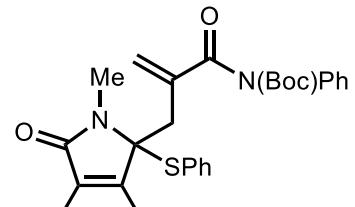
(^{13}C NMR, 75 MHz, CDCl_3)





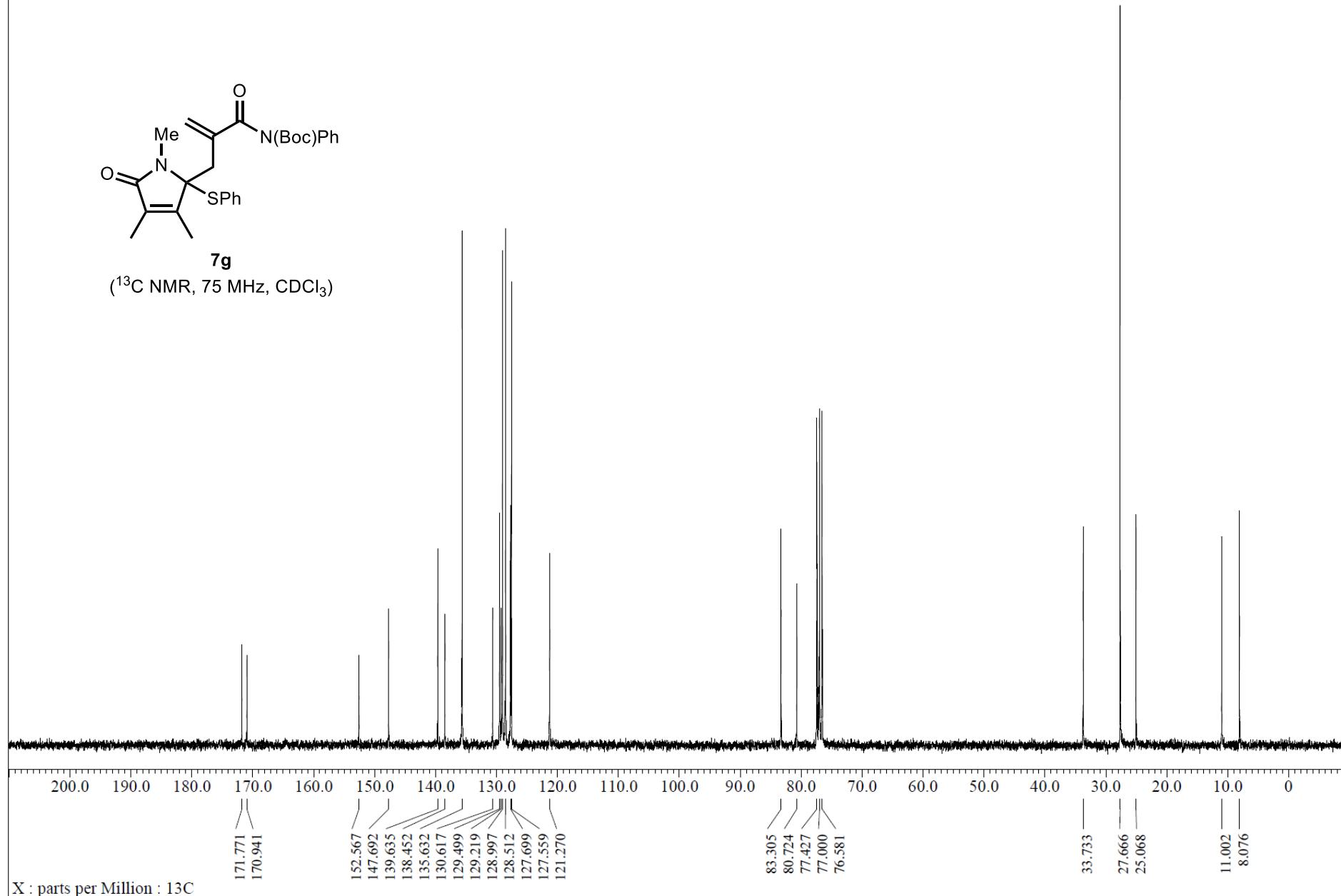
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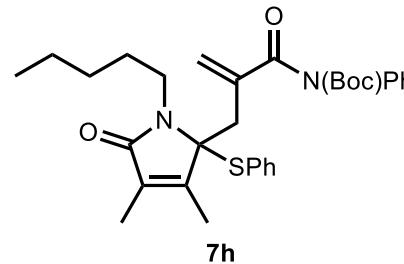


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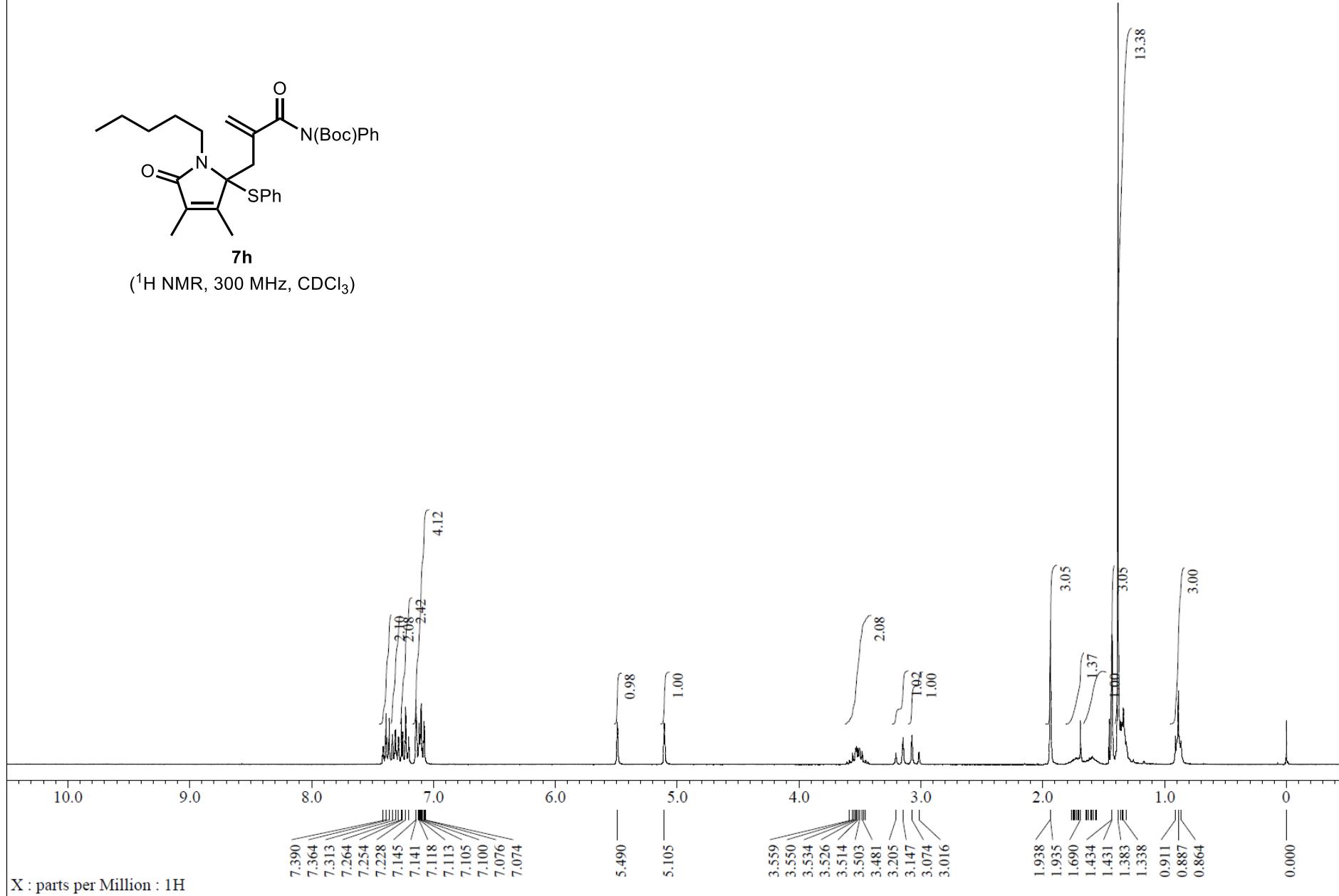
(^{13}C NMR, 75 MHz, CDCl_3)

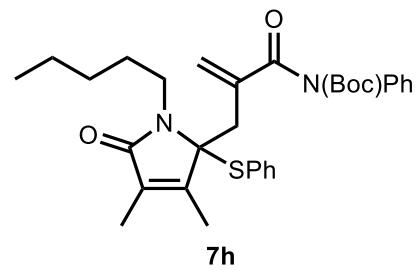


X : parts per Million : ^{13}C



(^1H NMR, 300 MHz, CDCl_3)





(^{13}C NMR, 75 MHz, CDCl_3)

