

## **Supplementary Materials**

# **Synthesis and characterization of a new series of bis-(allylic- $\alpha$ -aminophosphonates) under mild reaction conditions**

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<sup>3</sup> Department of Organic Chemistry I. Faculty of Pharmacy and Lascaray Research Center, University of the Basque Country (UPV/EHU). Paseo de la Universidad 7, 01006 Vitoria, Spain

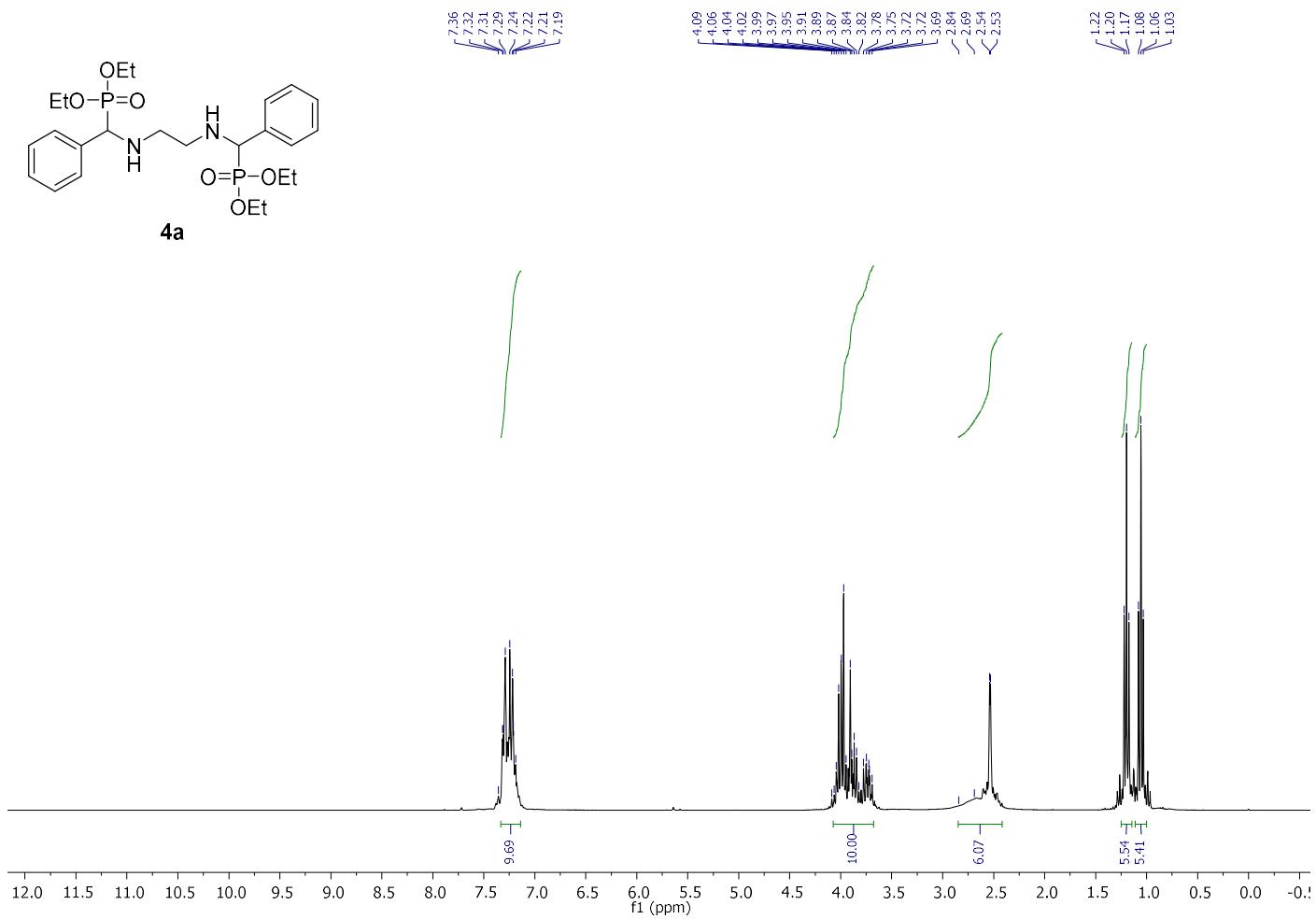
\* Correspondence: [ichrak.souii@fst.utm.tn](mailto:ichrak.souii@fst.utm.tn) (I.S.), ORCID: 0009-0006-2522-343X; [jesus.delossantos@ehu.eus](mailto:jesus.delossantos@ehu.eus) (J.M.S), ORCID: 0000-0003-1315-4263

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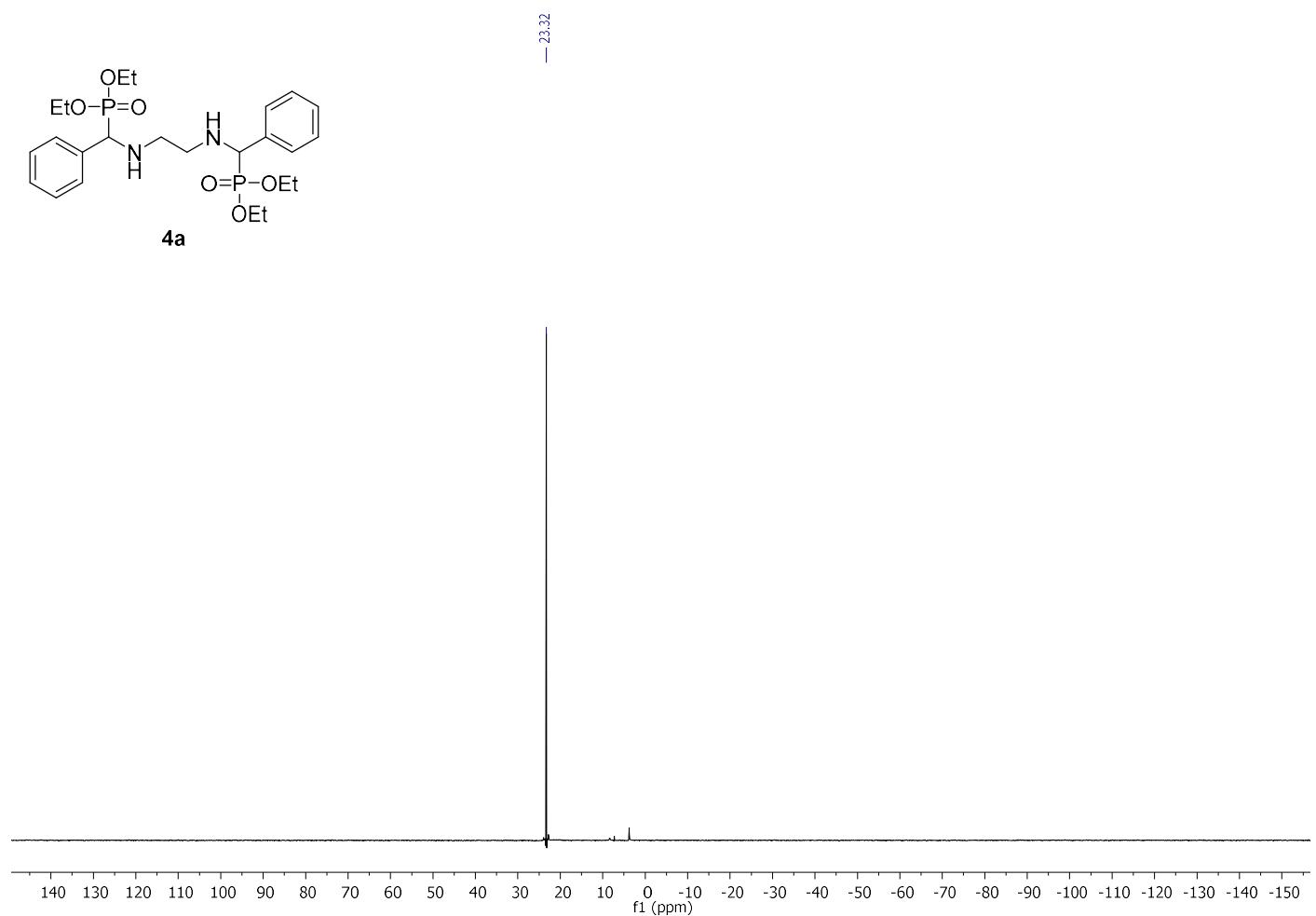
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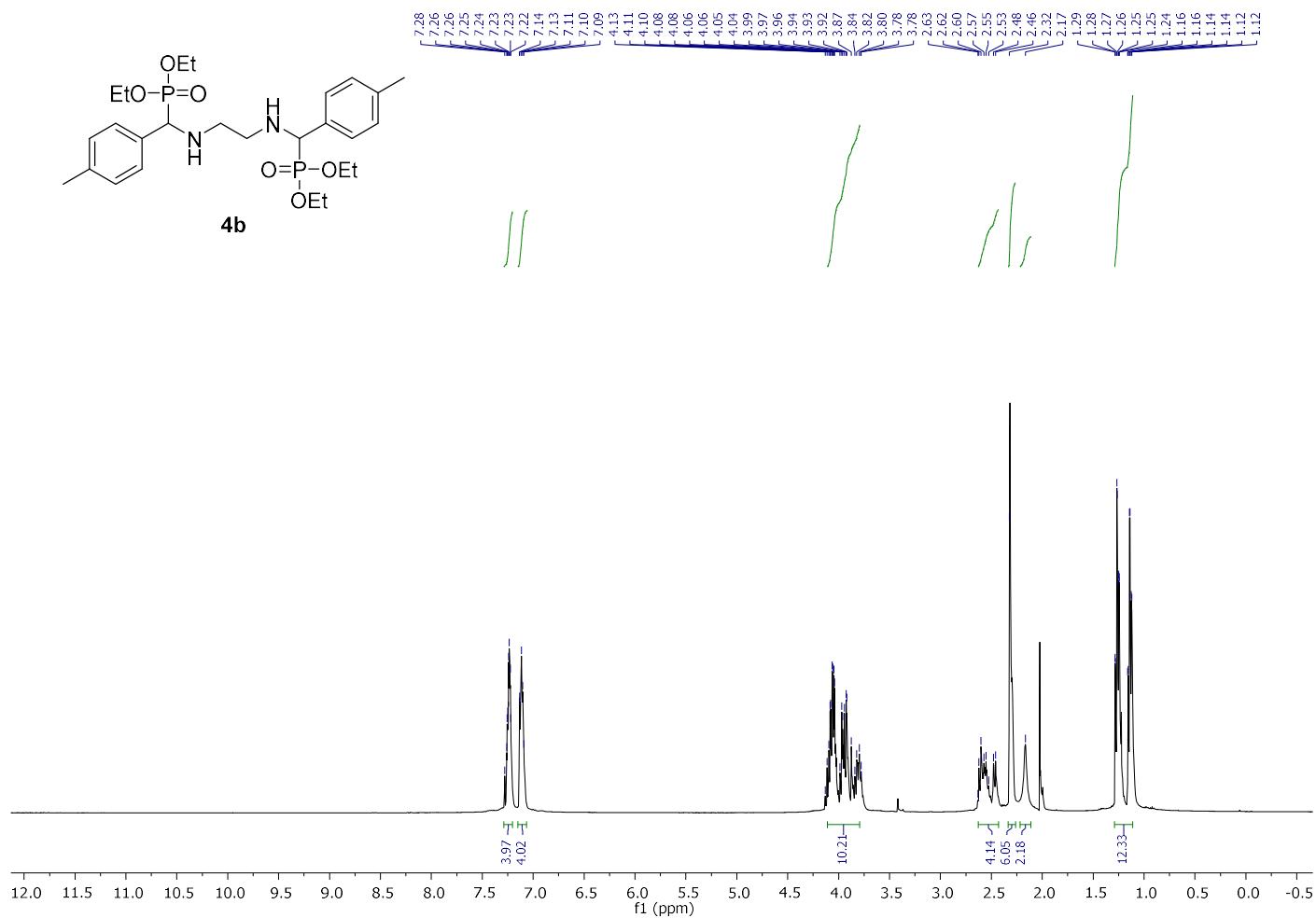
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound 4a.



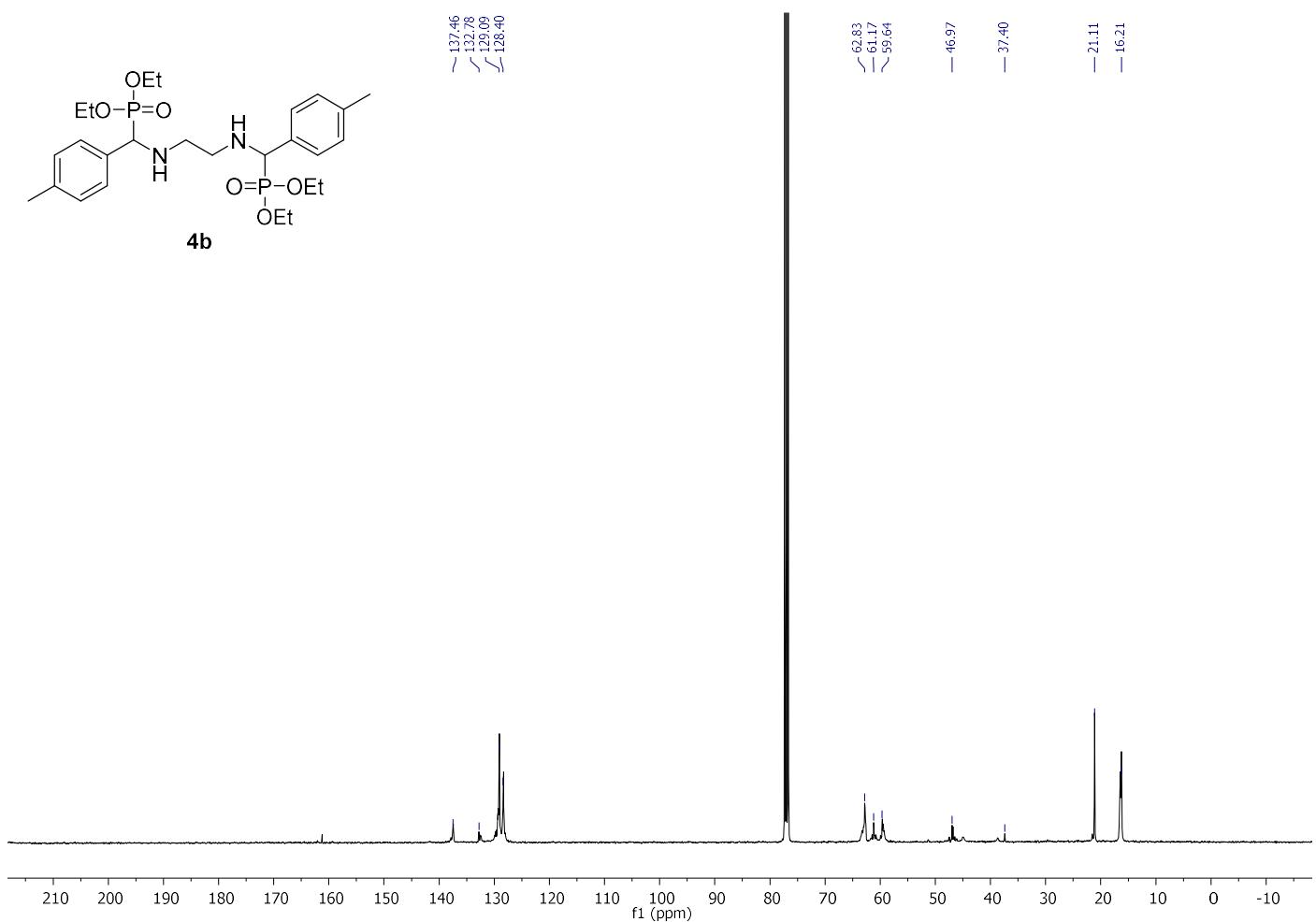
$^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ ) of compound **4a**.



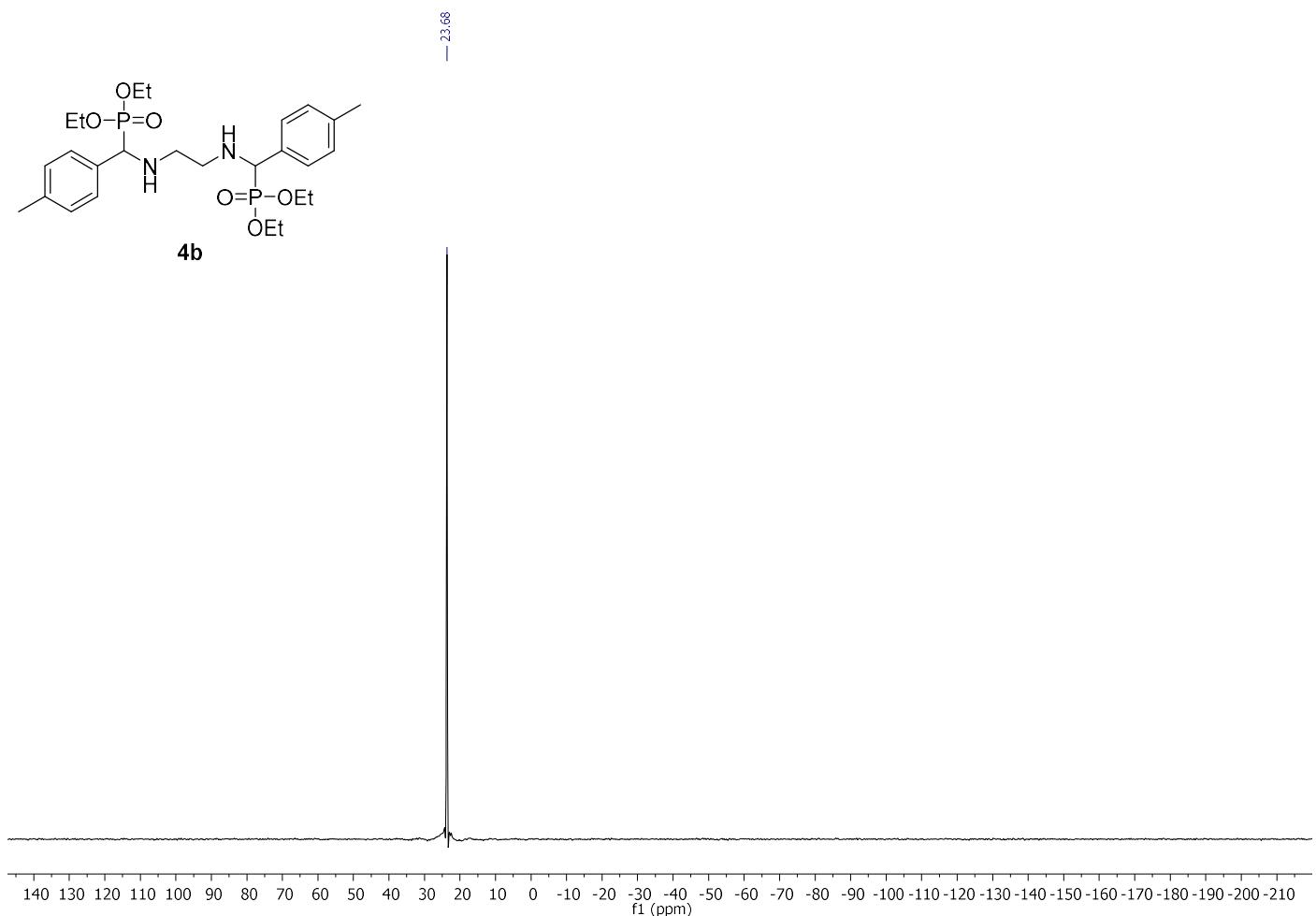
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **4b**.



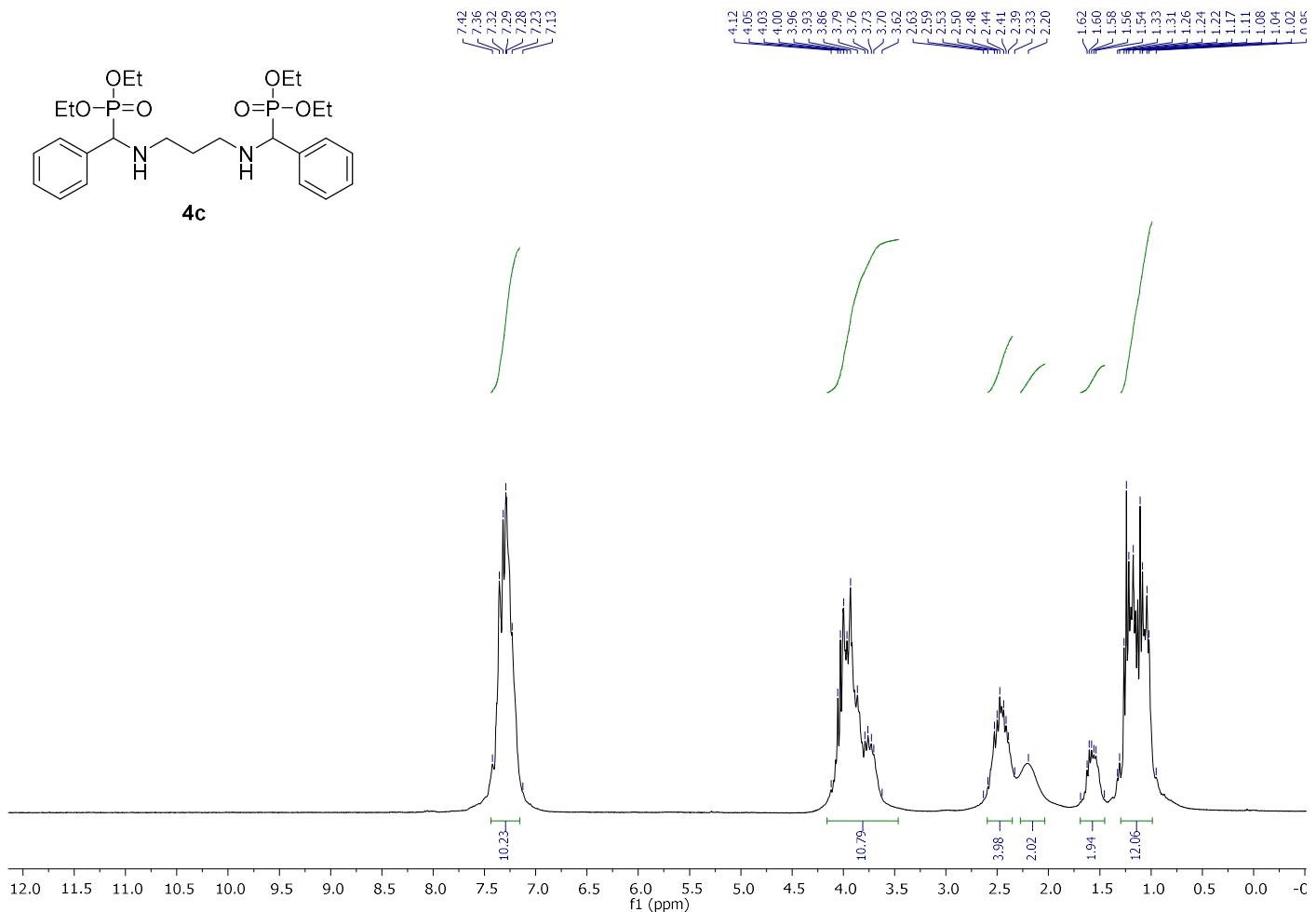
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **4b**.



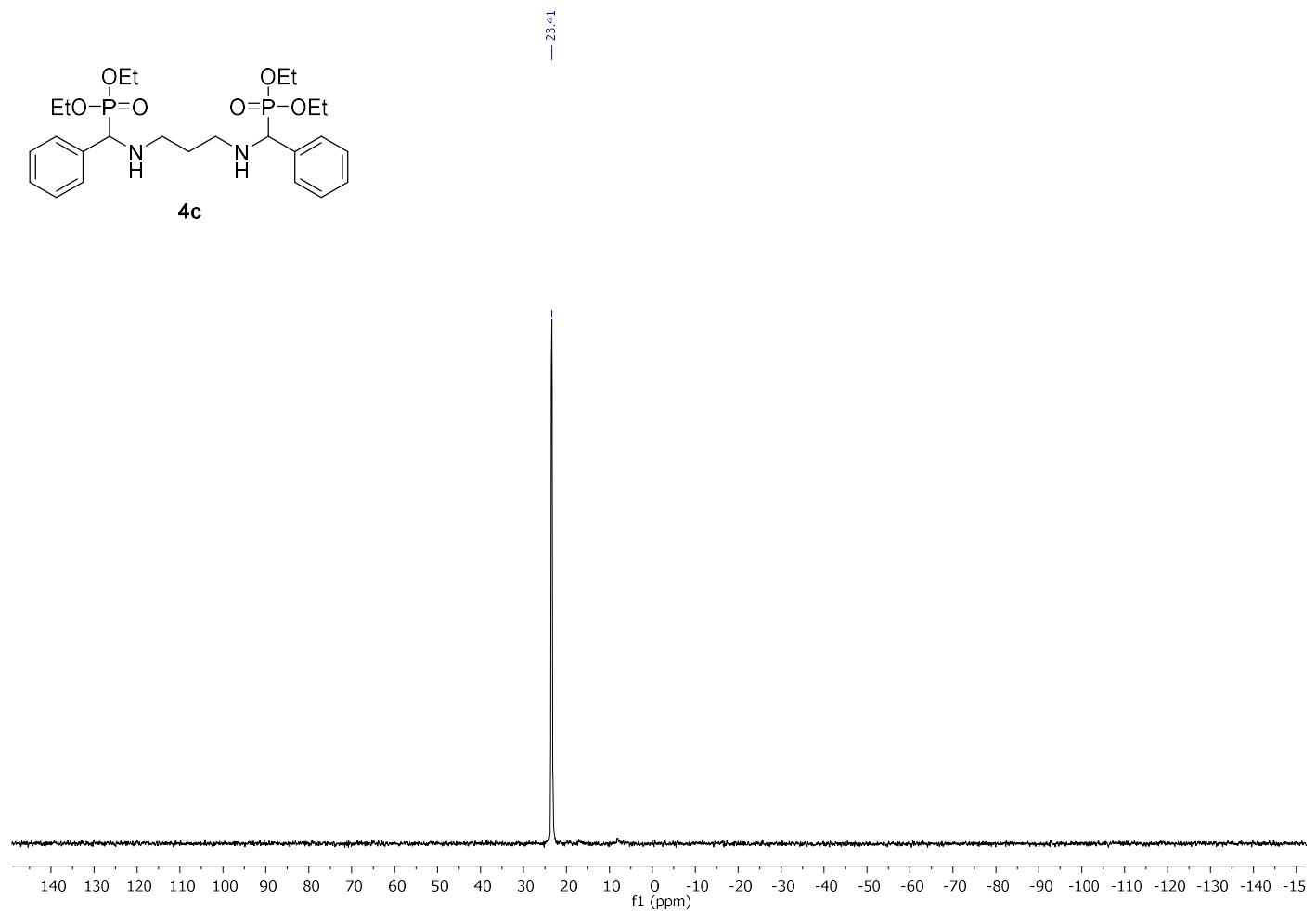
$^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ ) of compound **4b**.



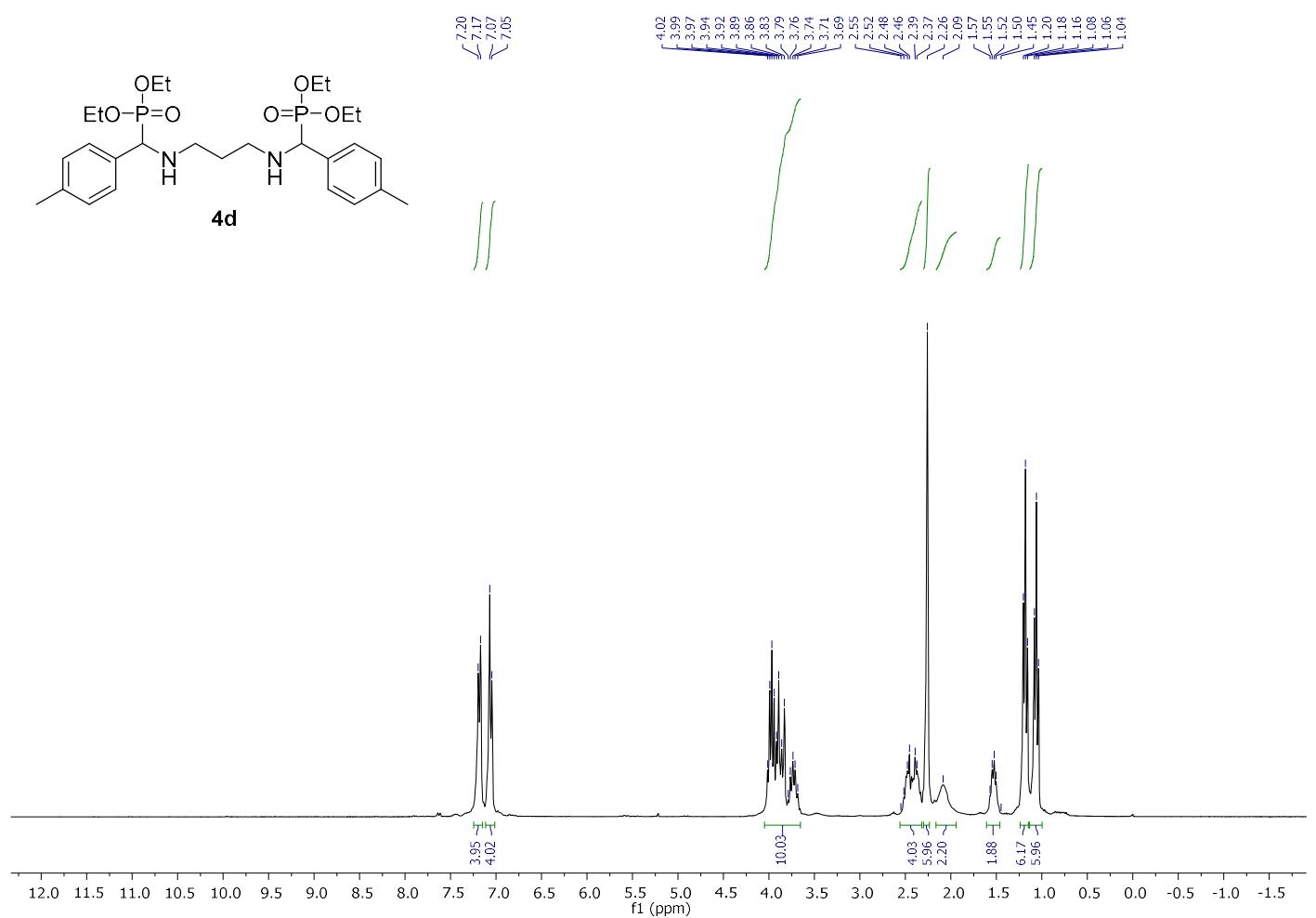
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **4c**.



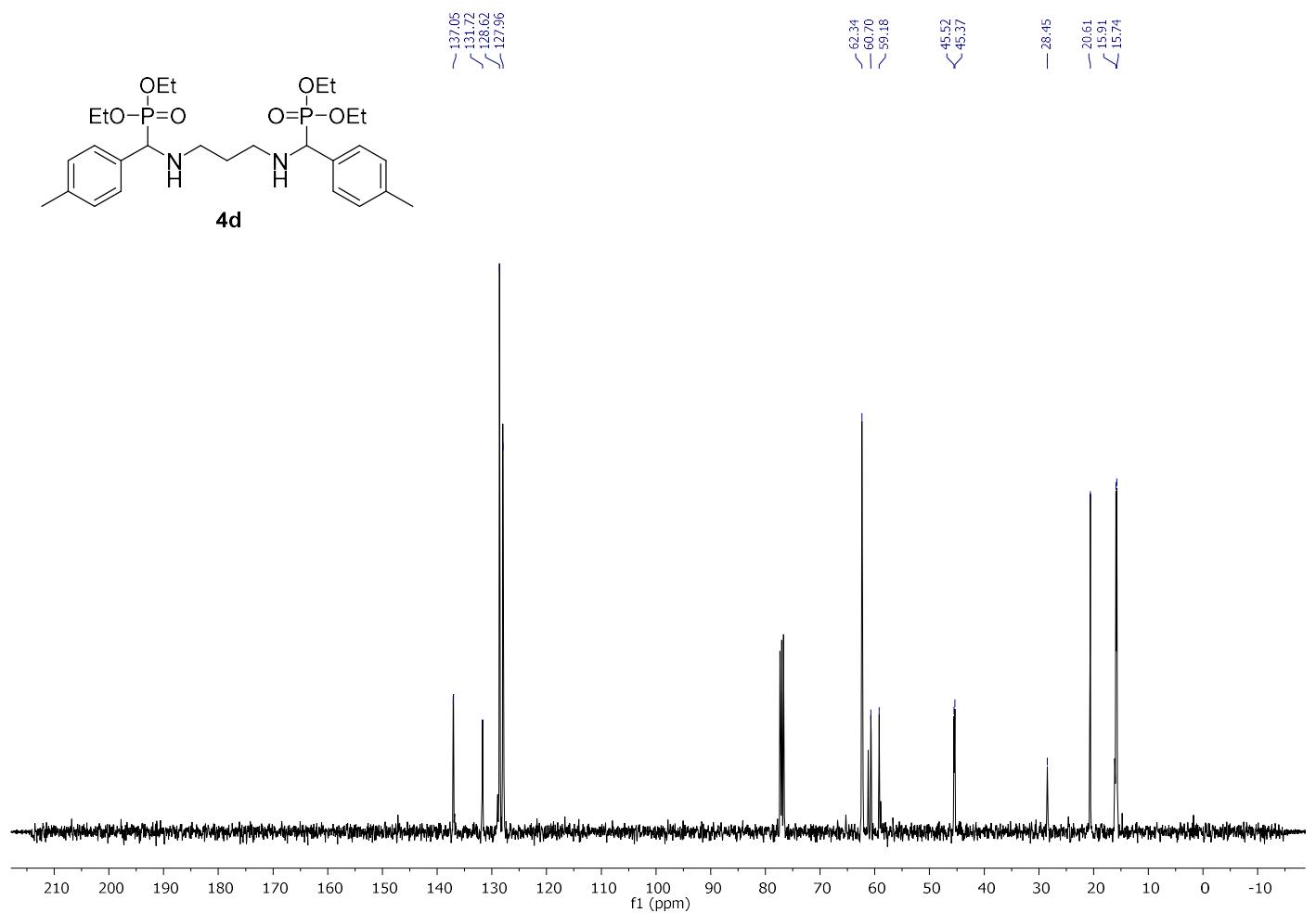
<sup>31</sup>P NMR (162 MHz, CDCl<sub>3</sub>) of compound **4c**.



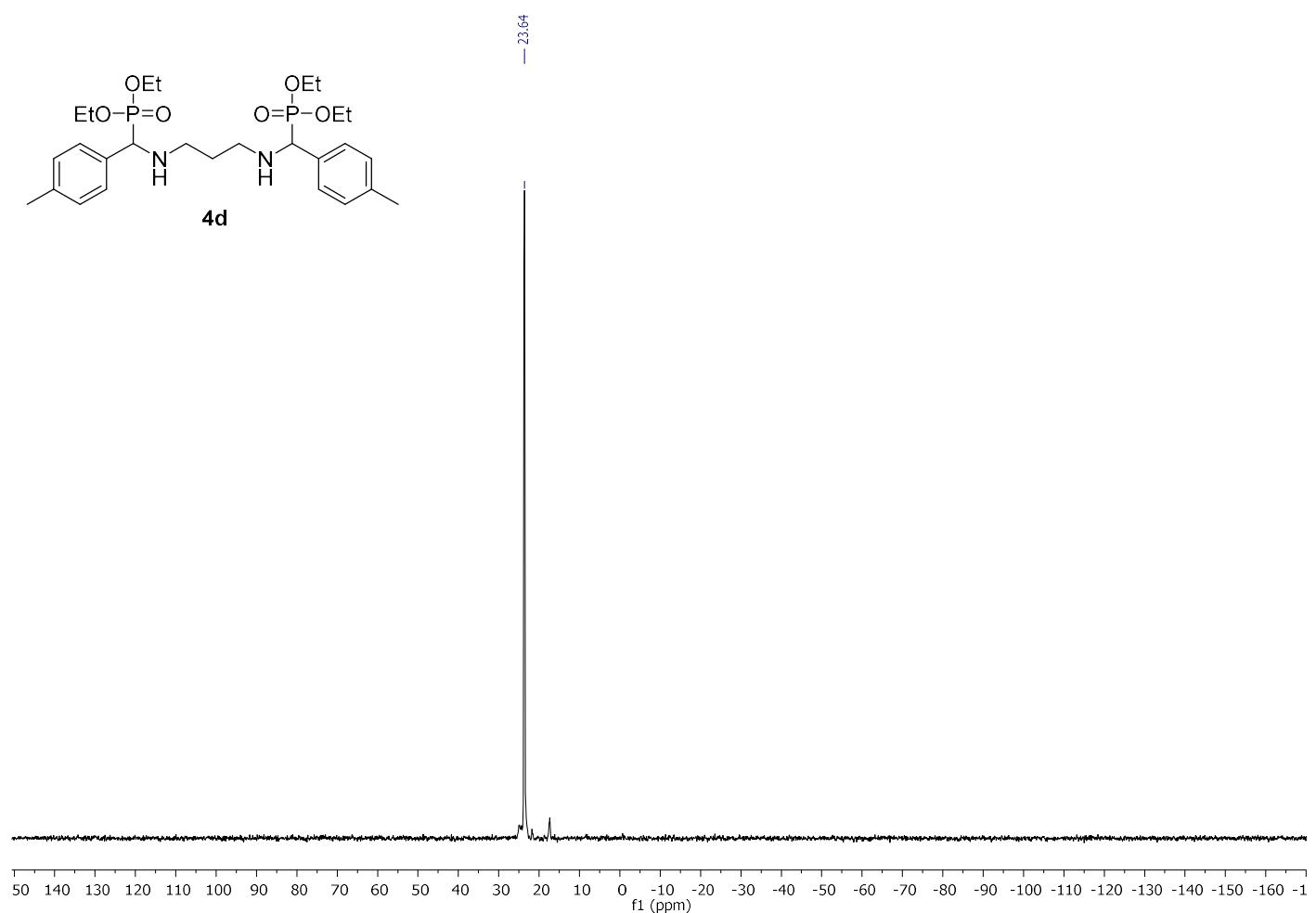
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **4d**.



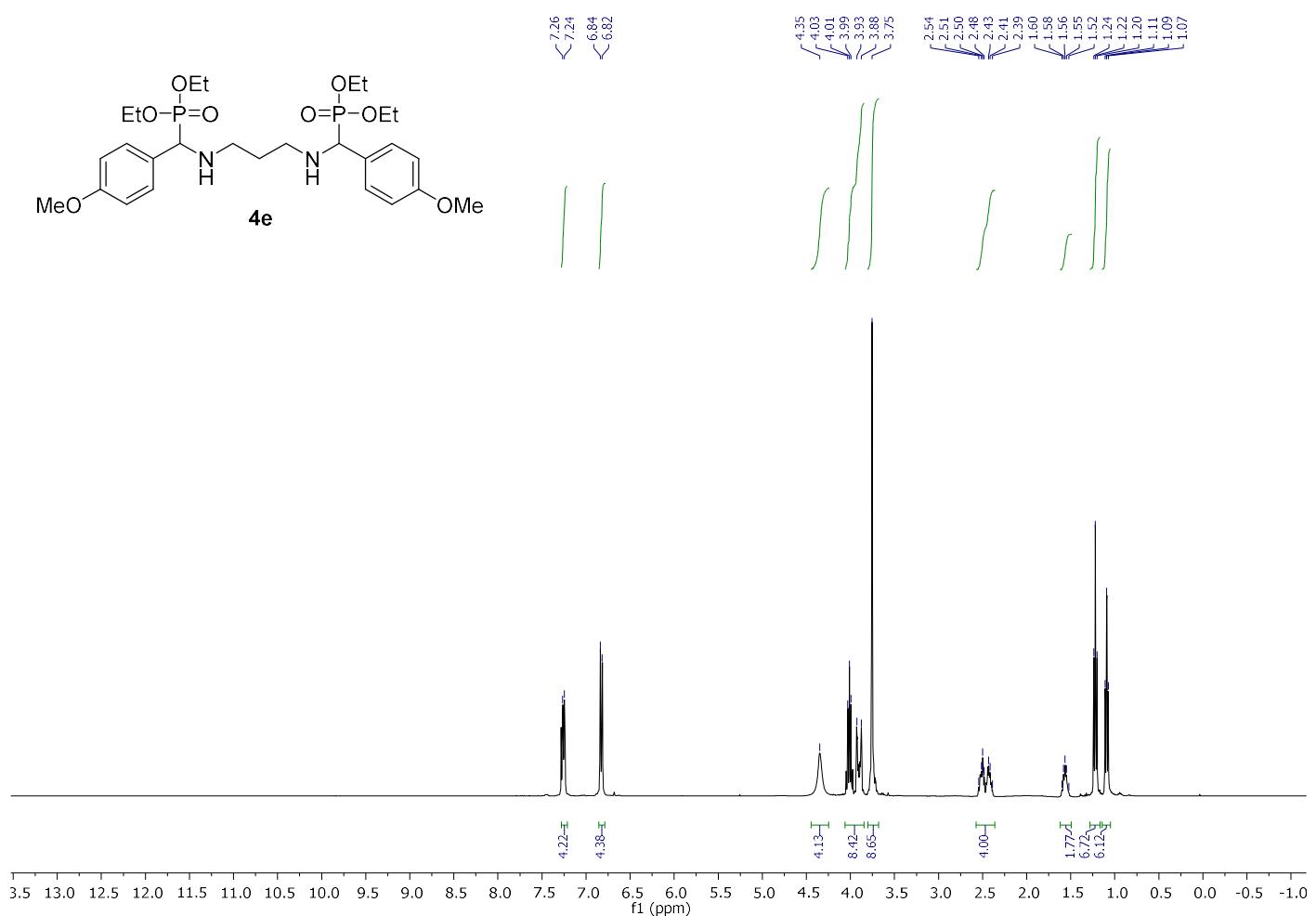
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **4d**.



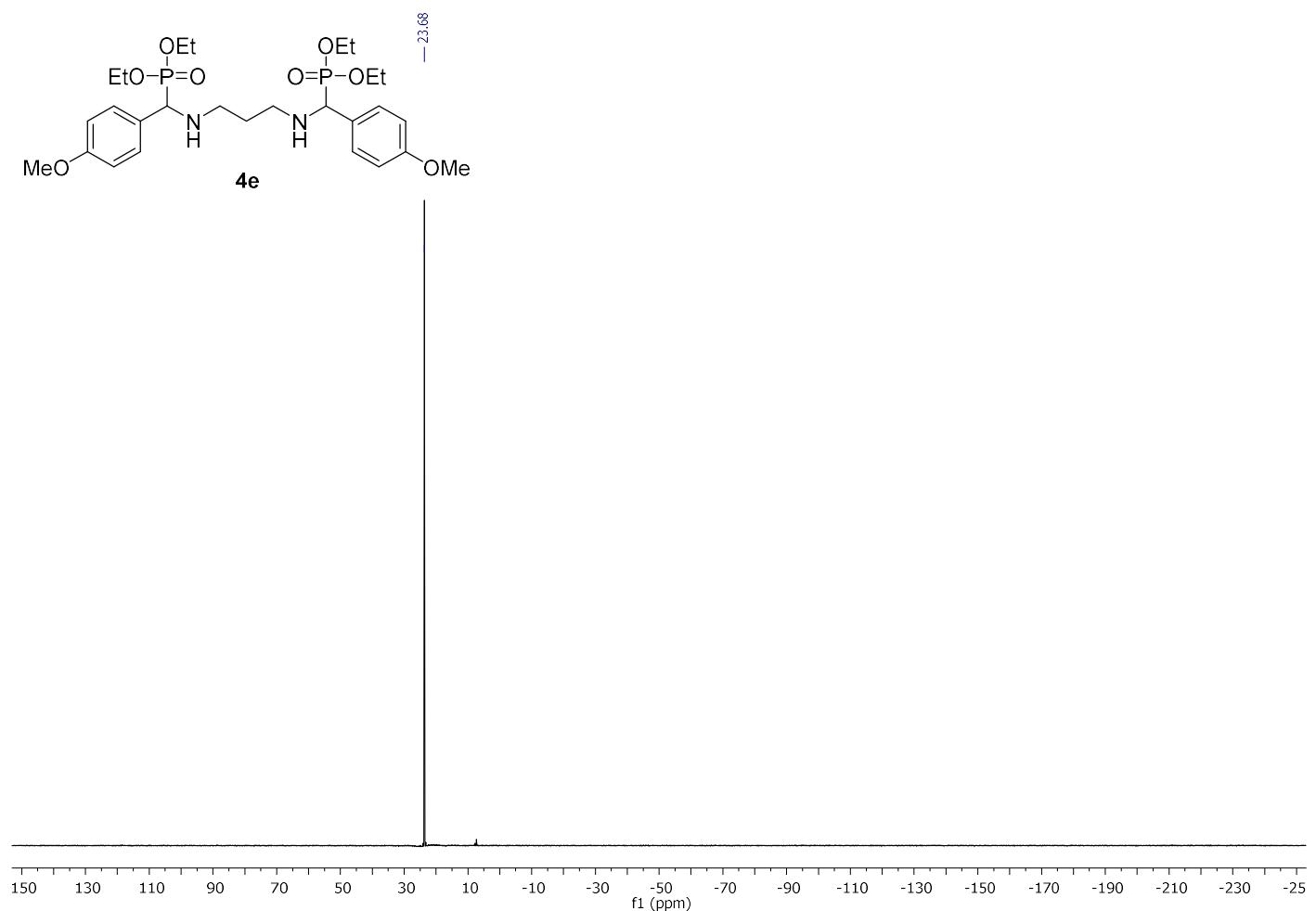
$^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ ) of compound **4d**.



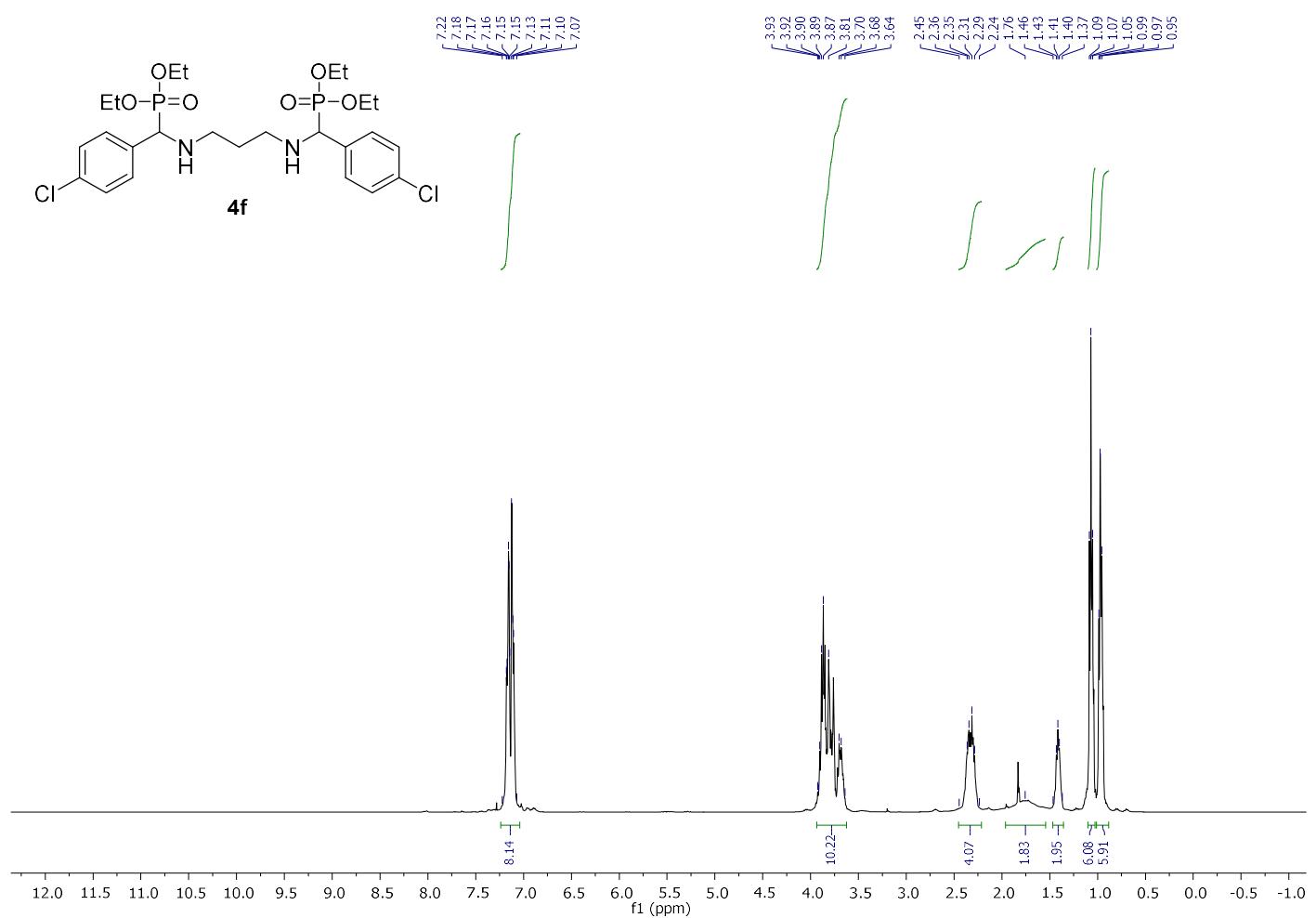
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **4e**.



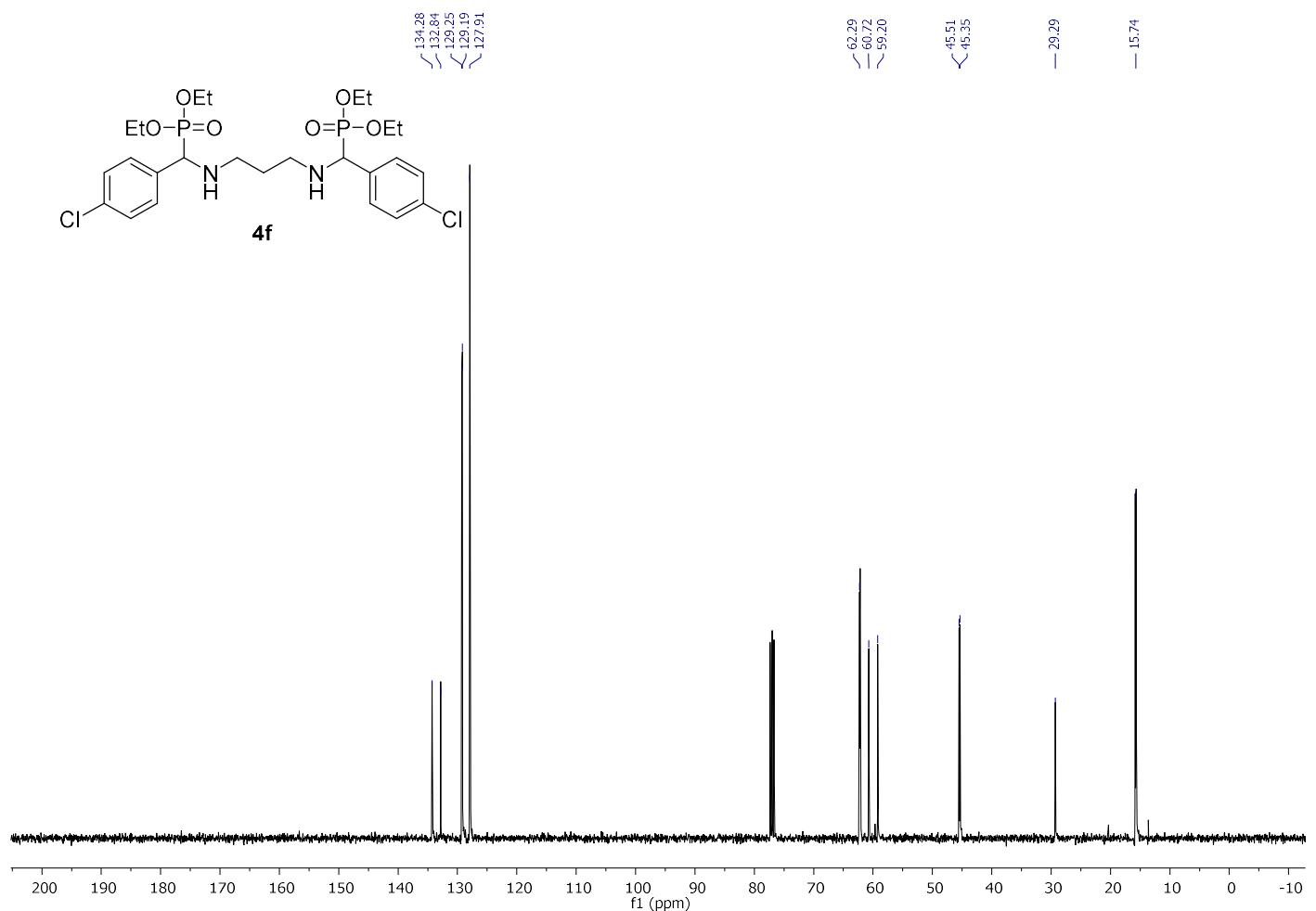
$^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ ) of compound **4e**.



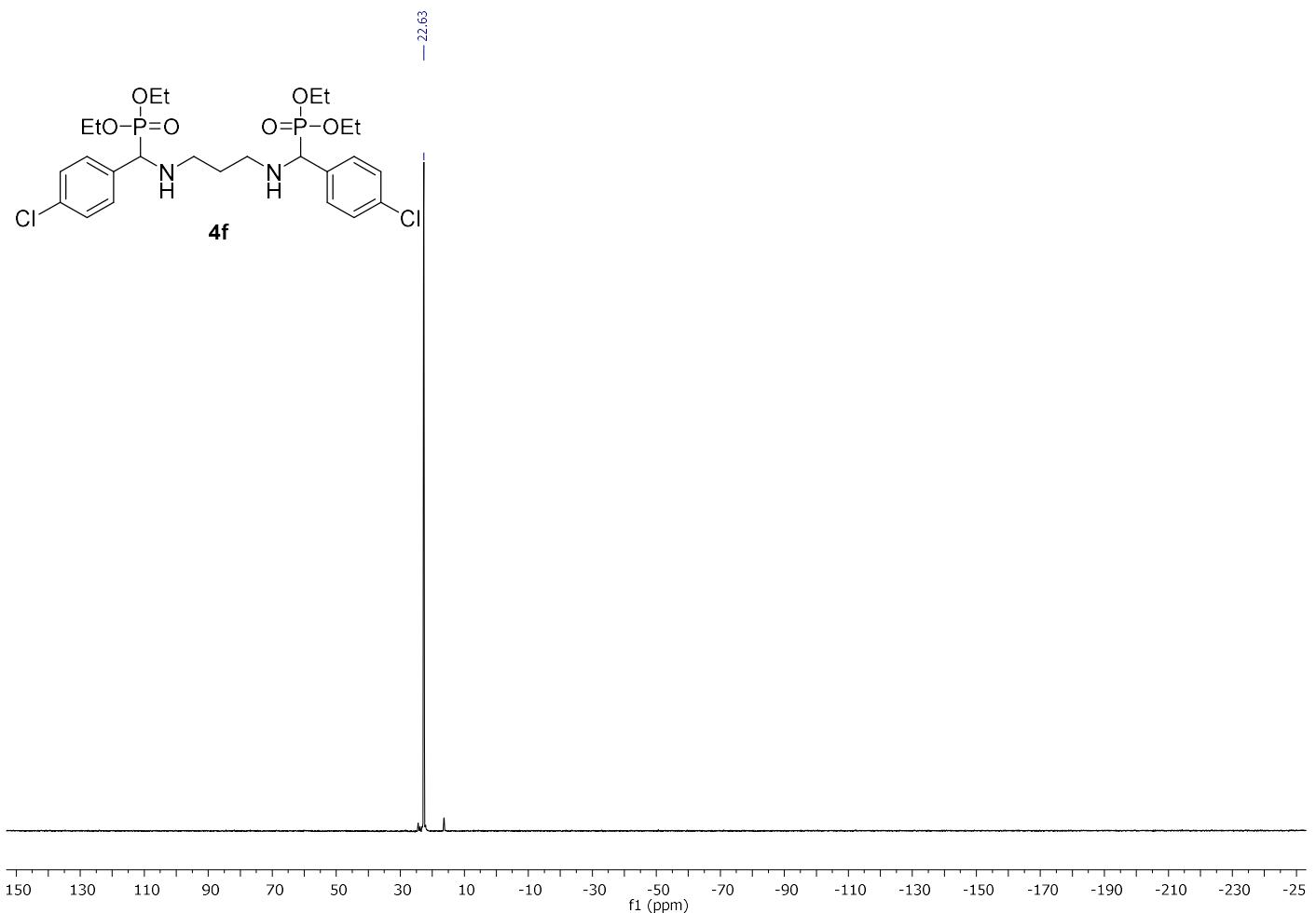
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **4f**.



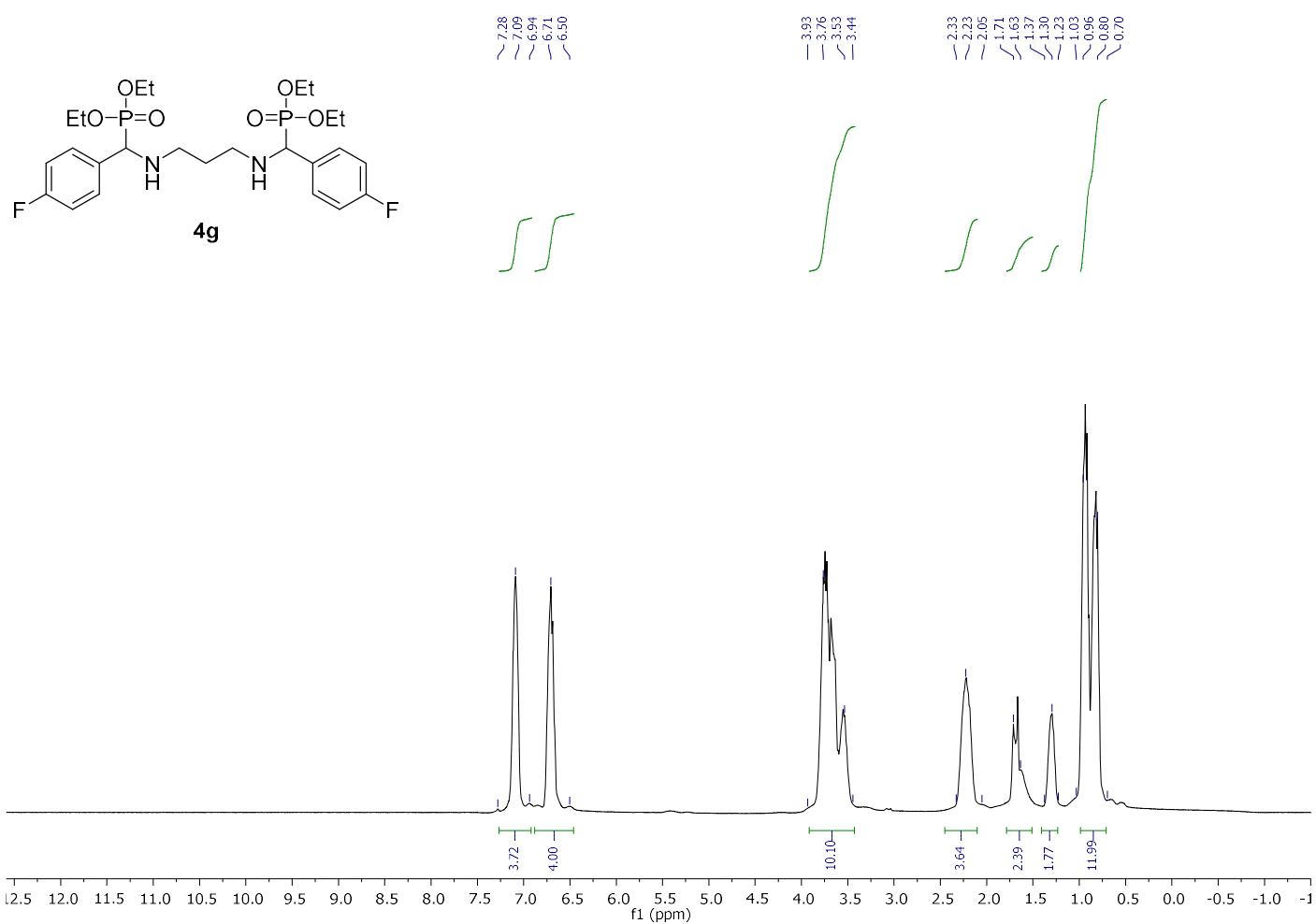
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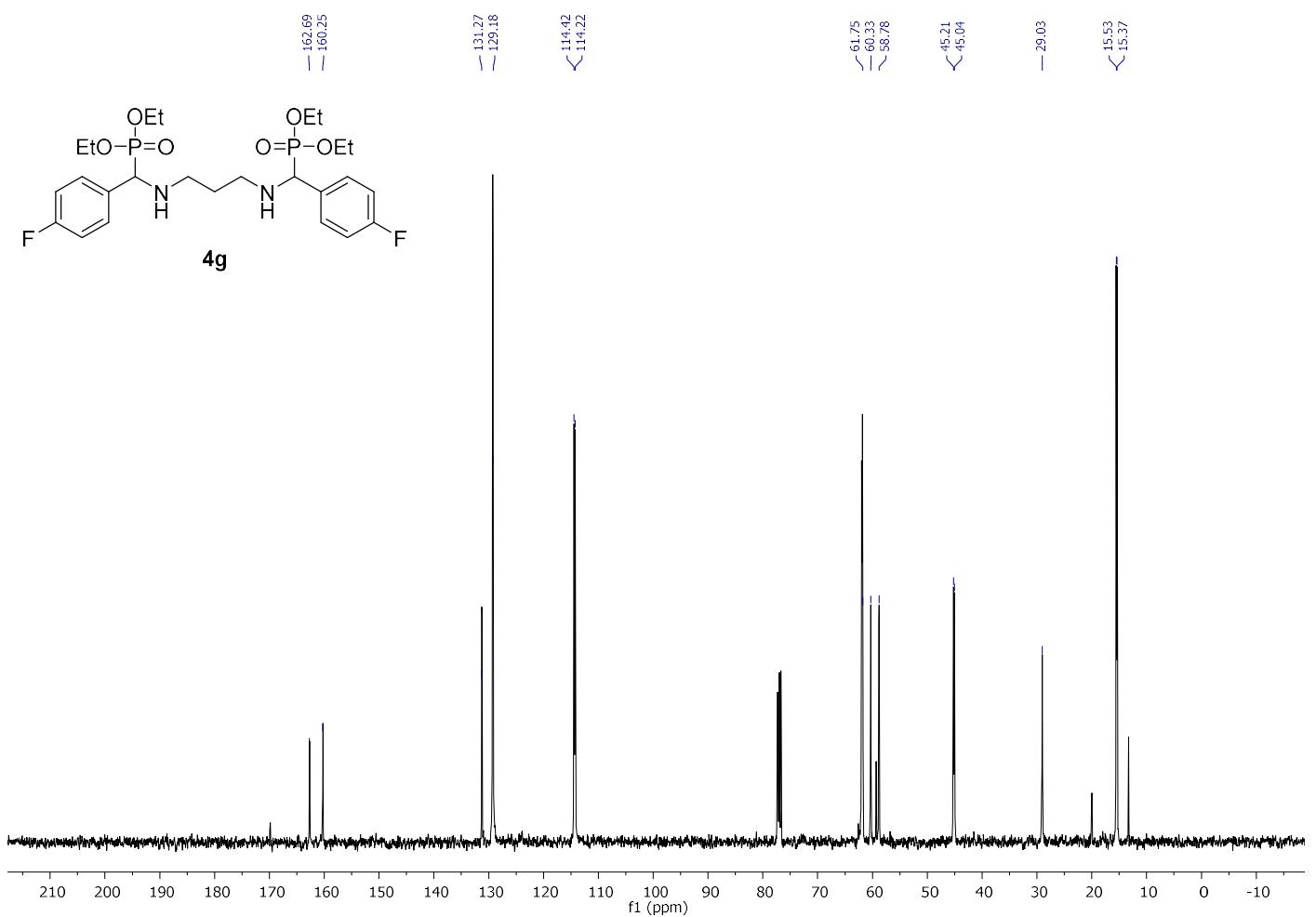
<sup>31</sup>P NMR (162 MHz, CDCl<sub>3</sub>) of compound **4f**.



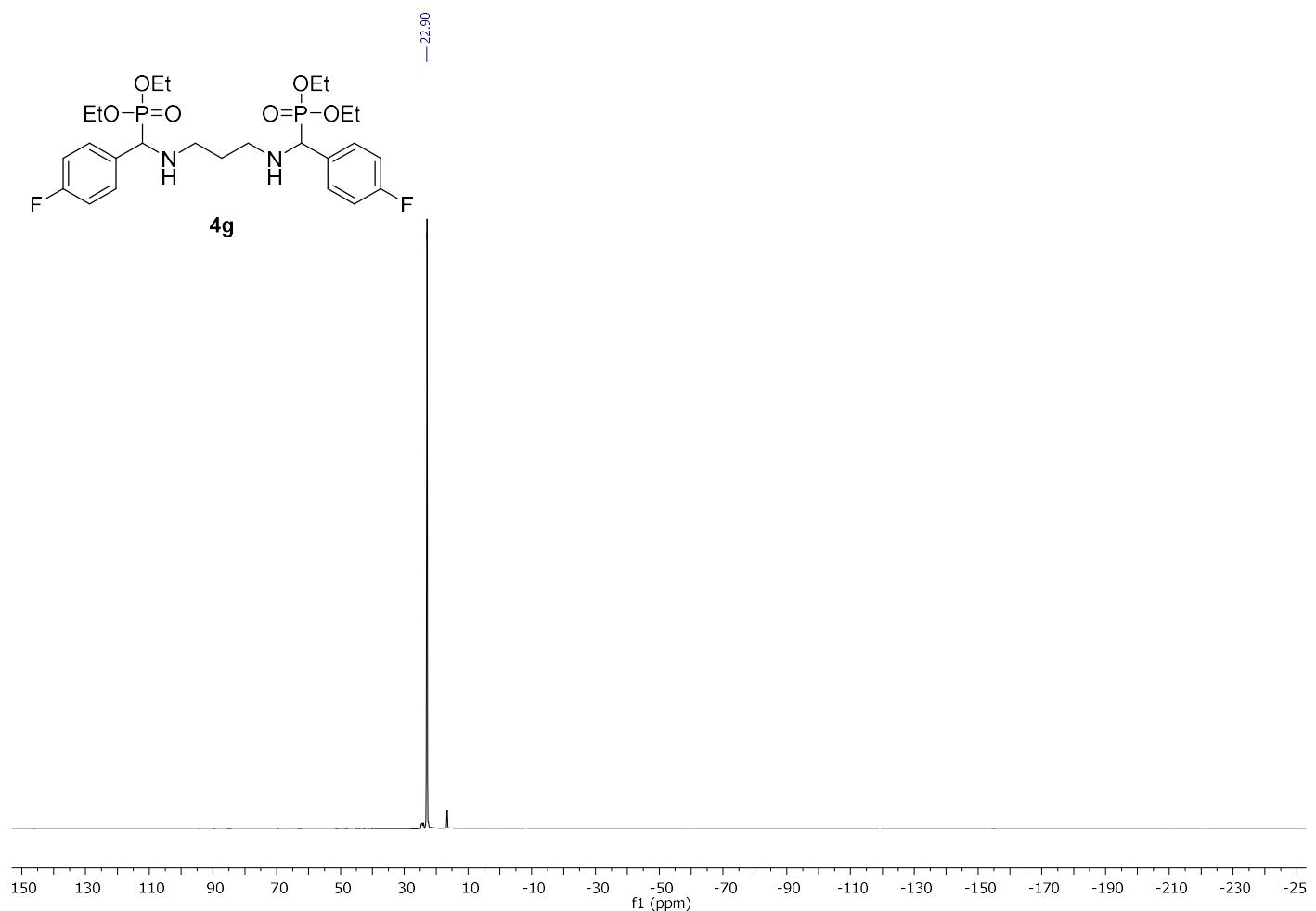
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound 4g.



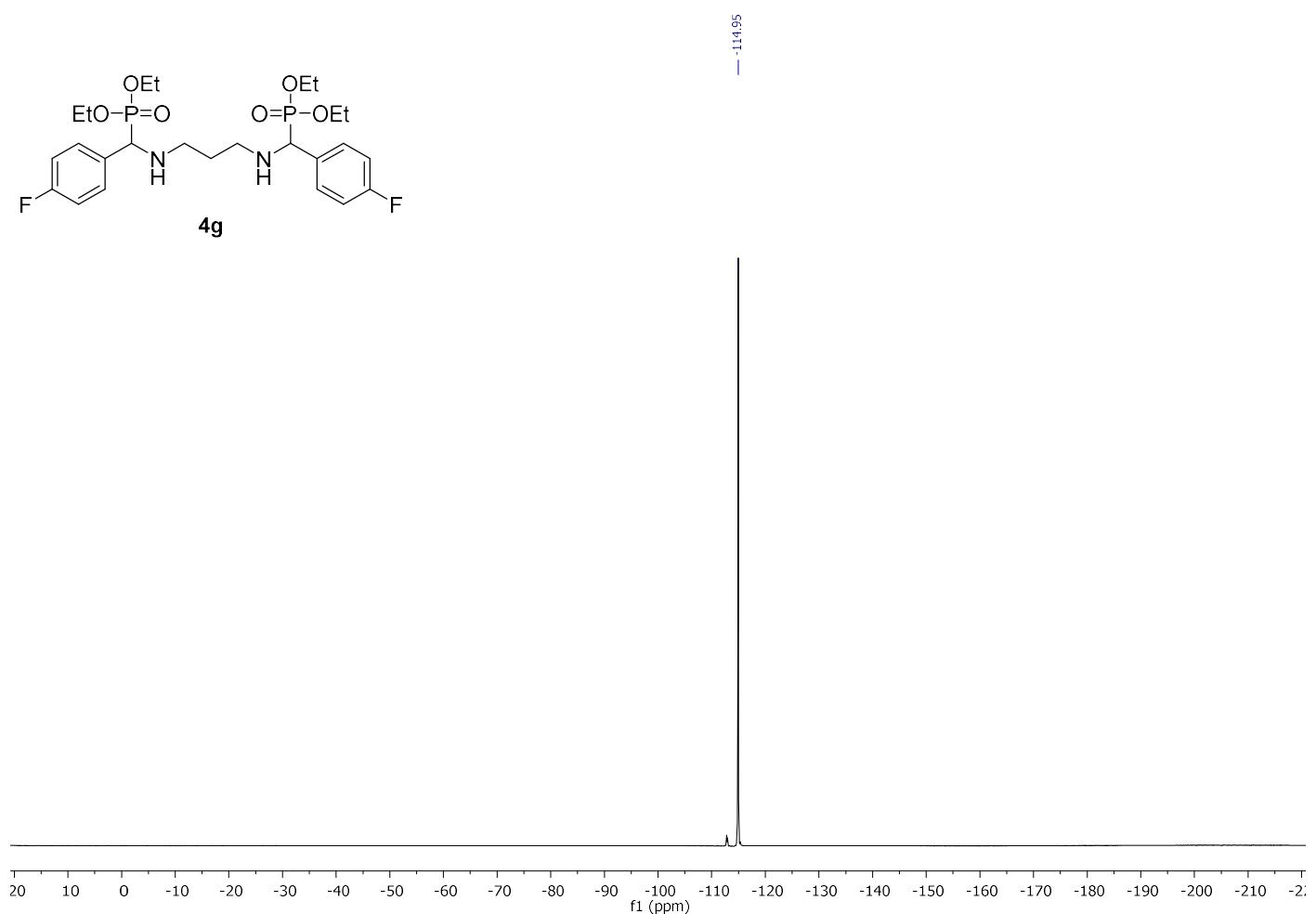
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **4g**.



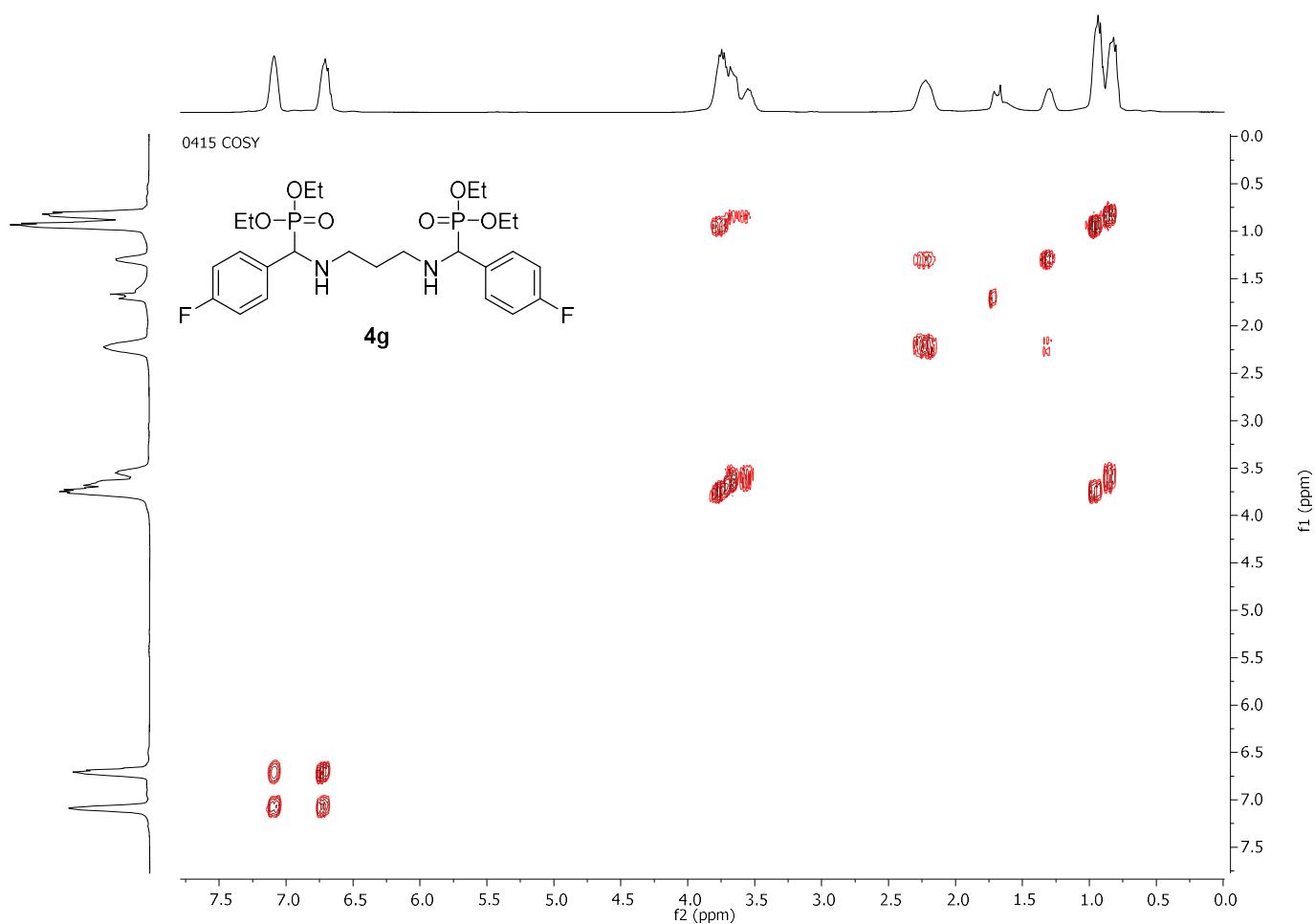
$^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ ) of compound **4g**.



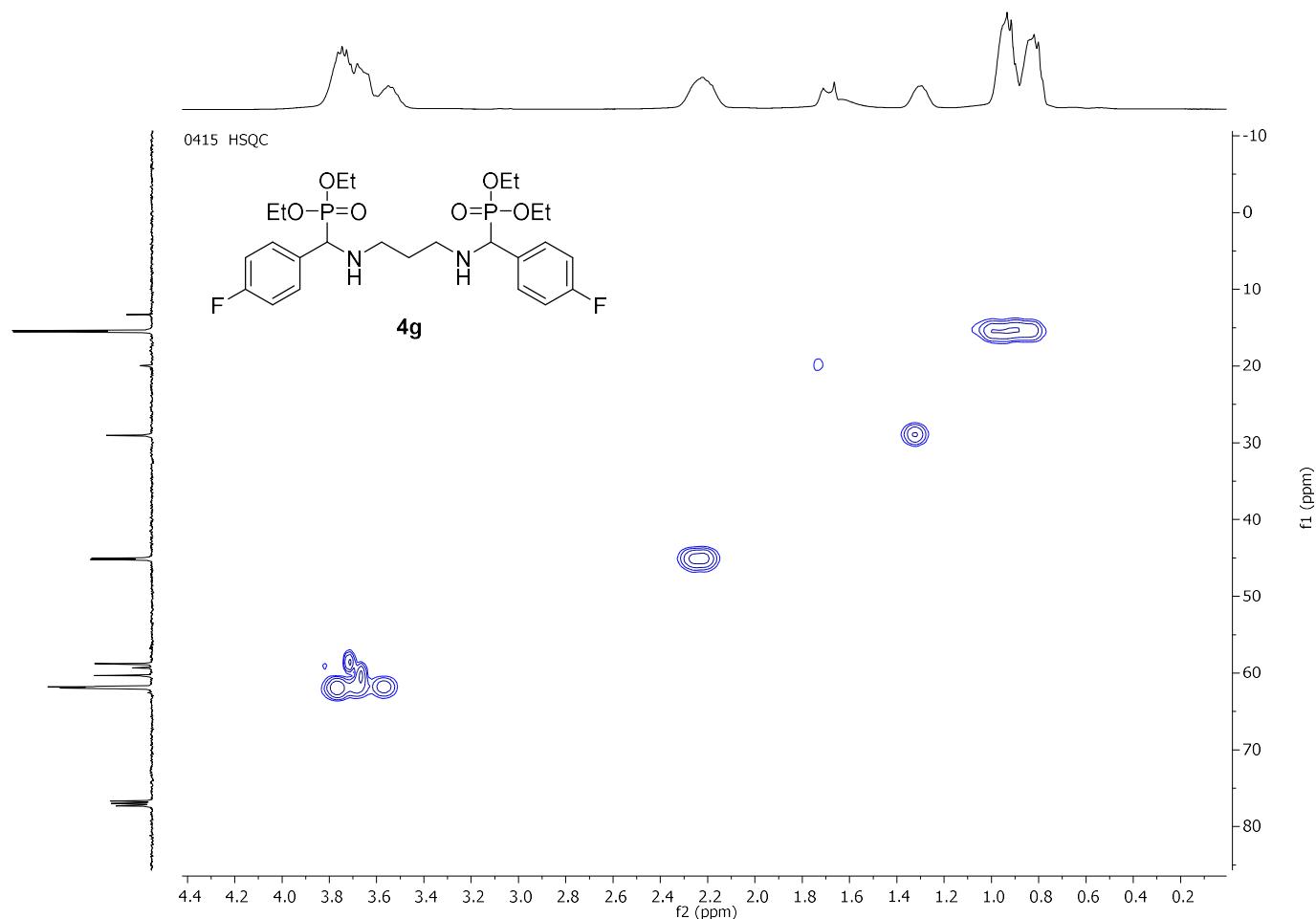
<sup>18</sup>F NMR (376 MHz, CDCl<sub>3</sub>) of compound **4g**.



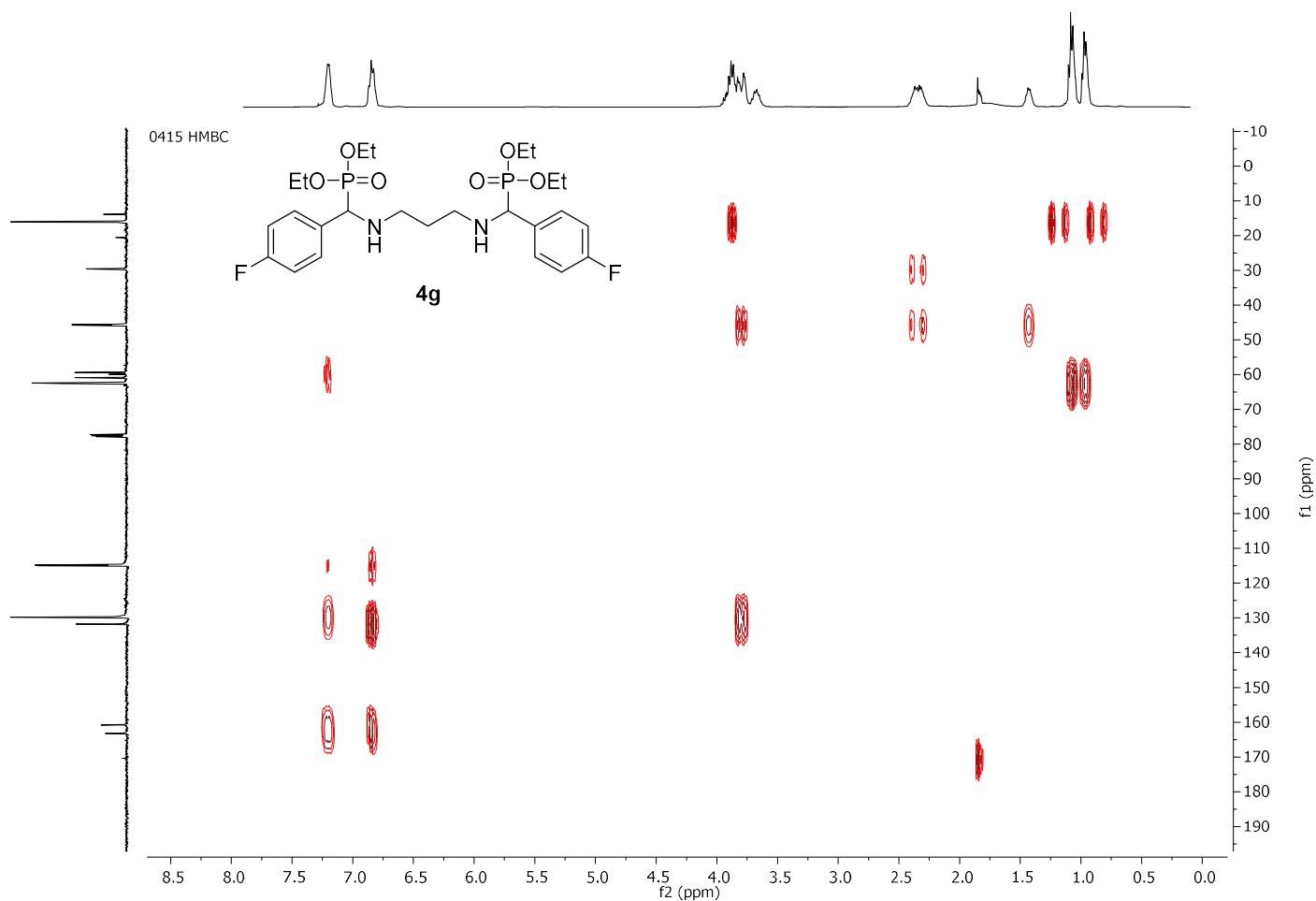
2D-COSY NMR  $\{^1\text{H}-^1\text{H}\}$  (400 MHz,  $\text{CDCl}_3$ ) of compound **4g**.



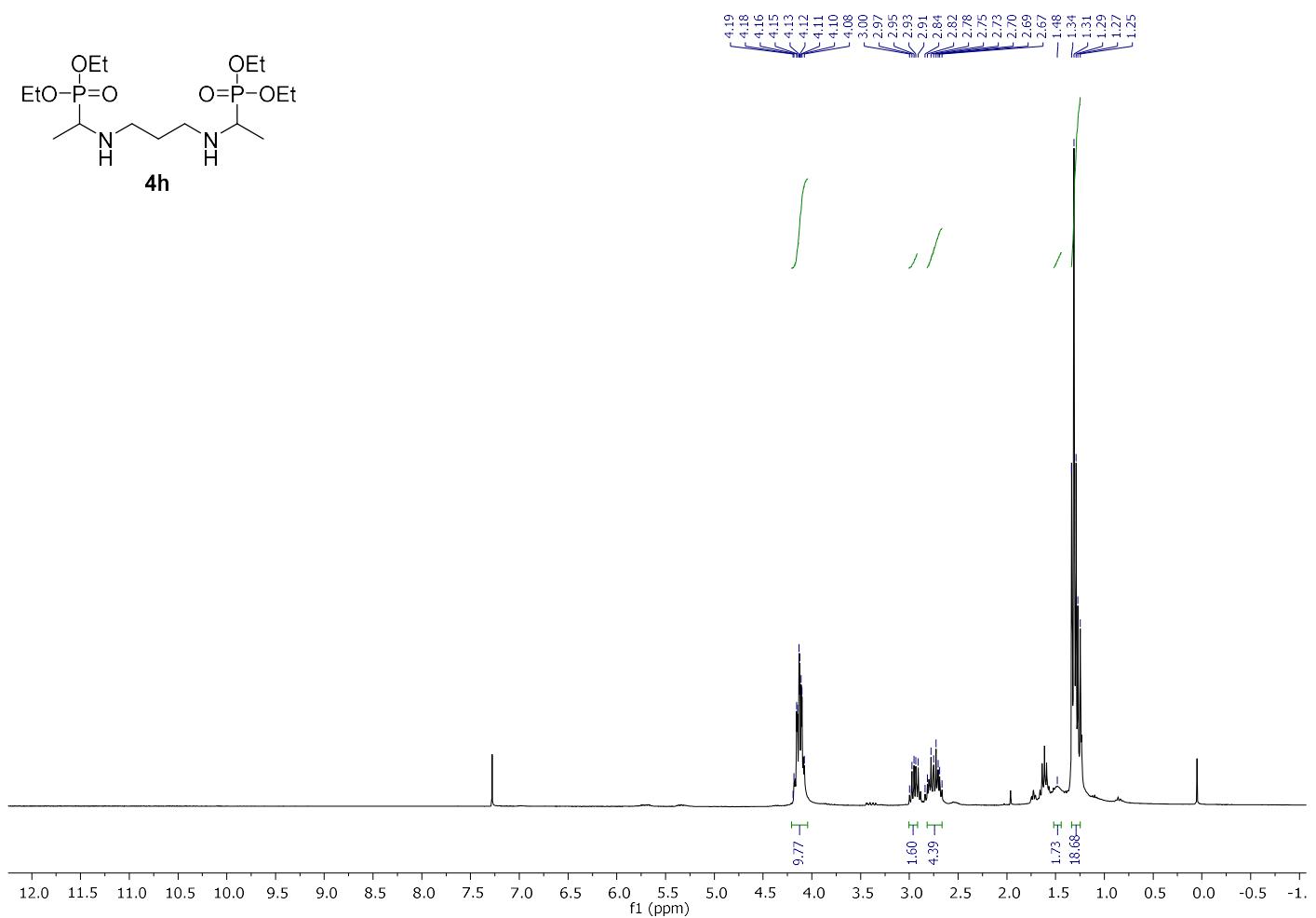
2D-HSQC NMR {<sup>1</sup>H-<sup>13</sup>C} (<sup>1</sup>H: 400 MHz, <sup>13</sup>C: 101 MHz, CDCl<sub>3</sub>) of compound **4g**.



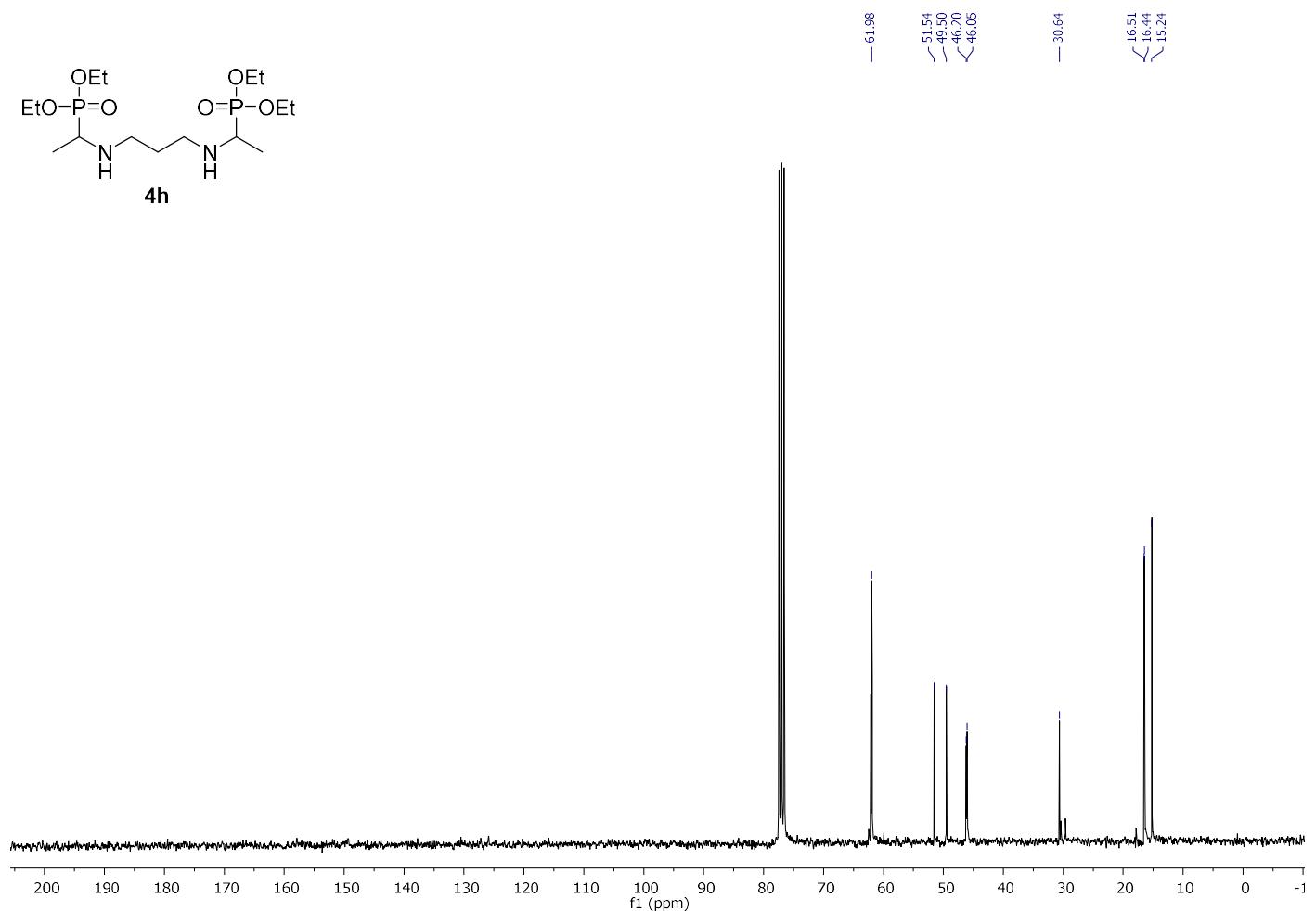
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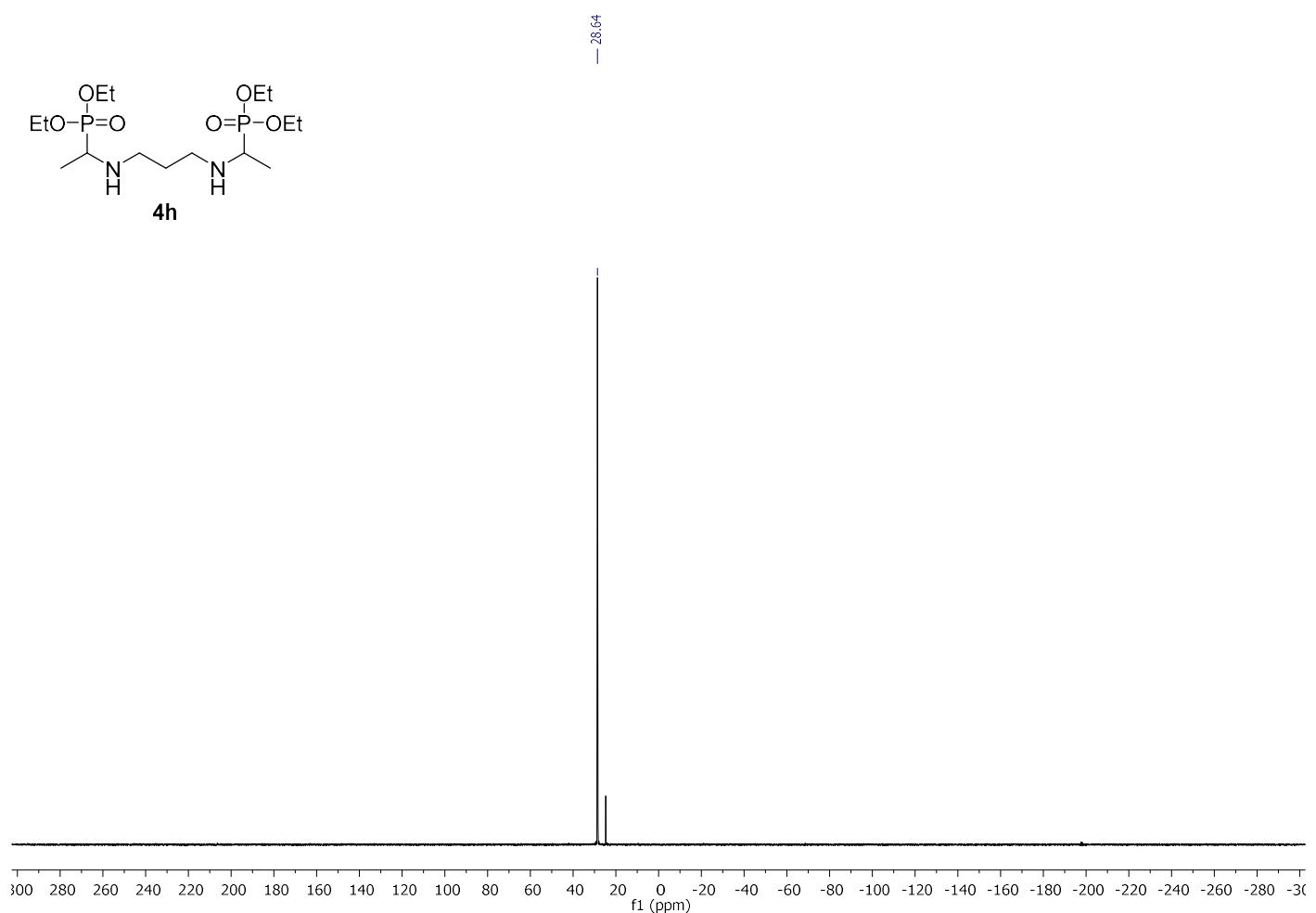
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **4h**.



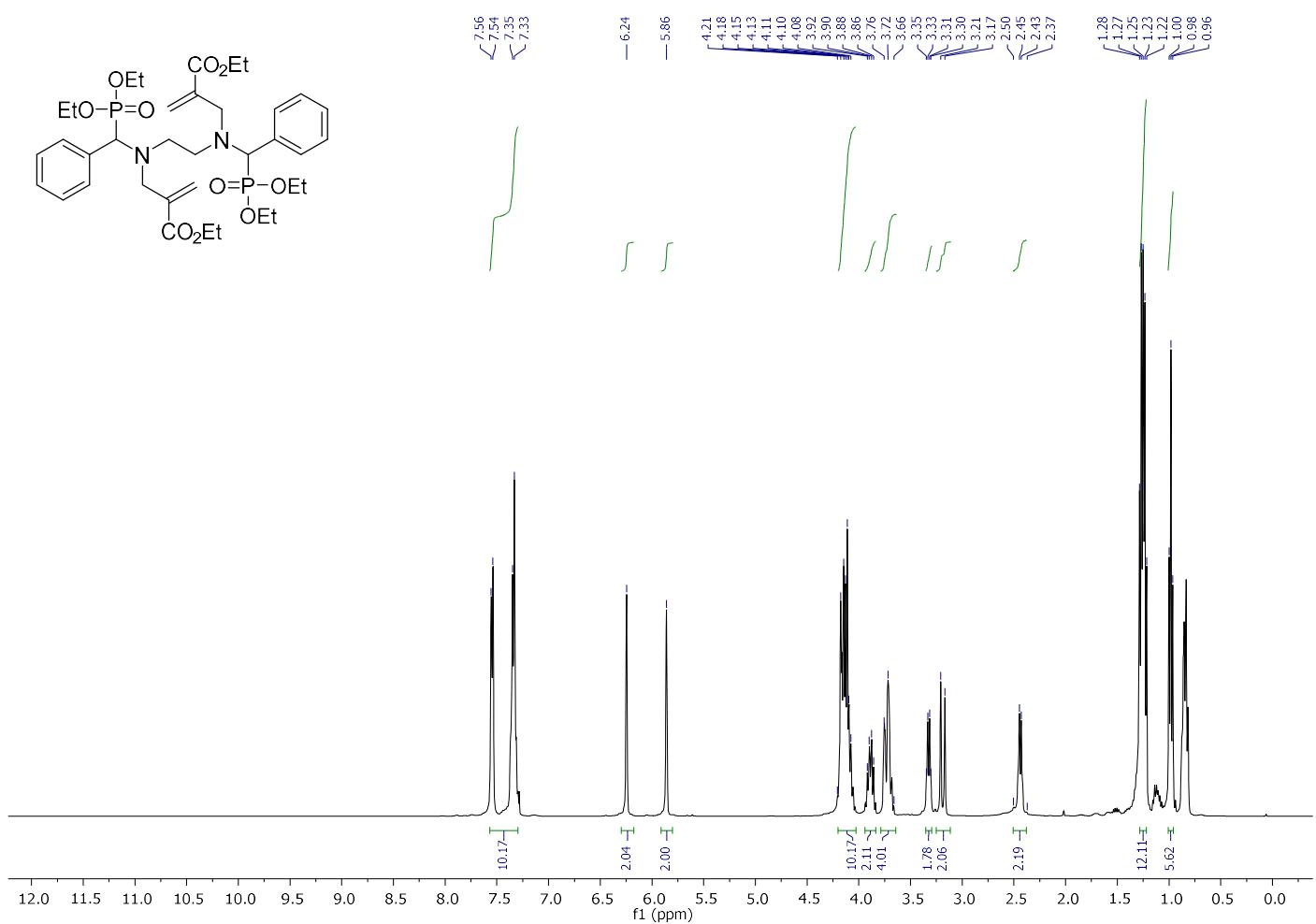
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **4h**.



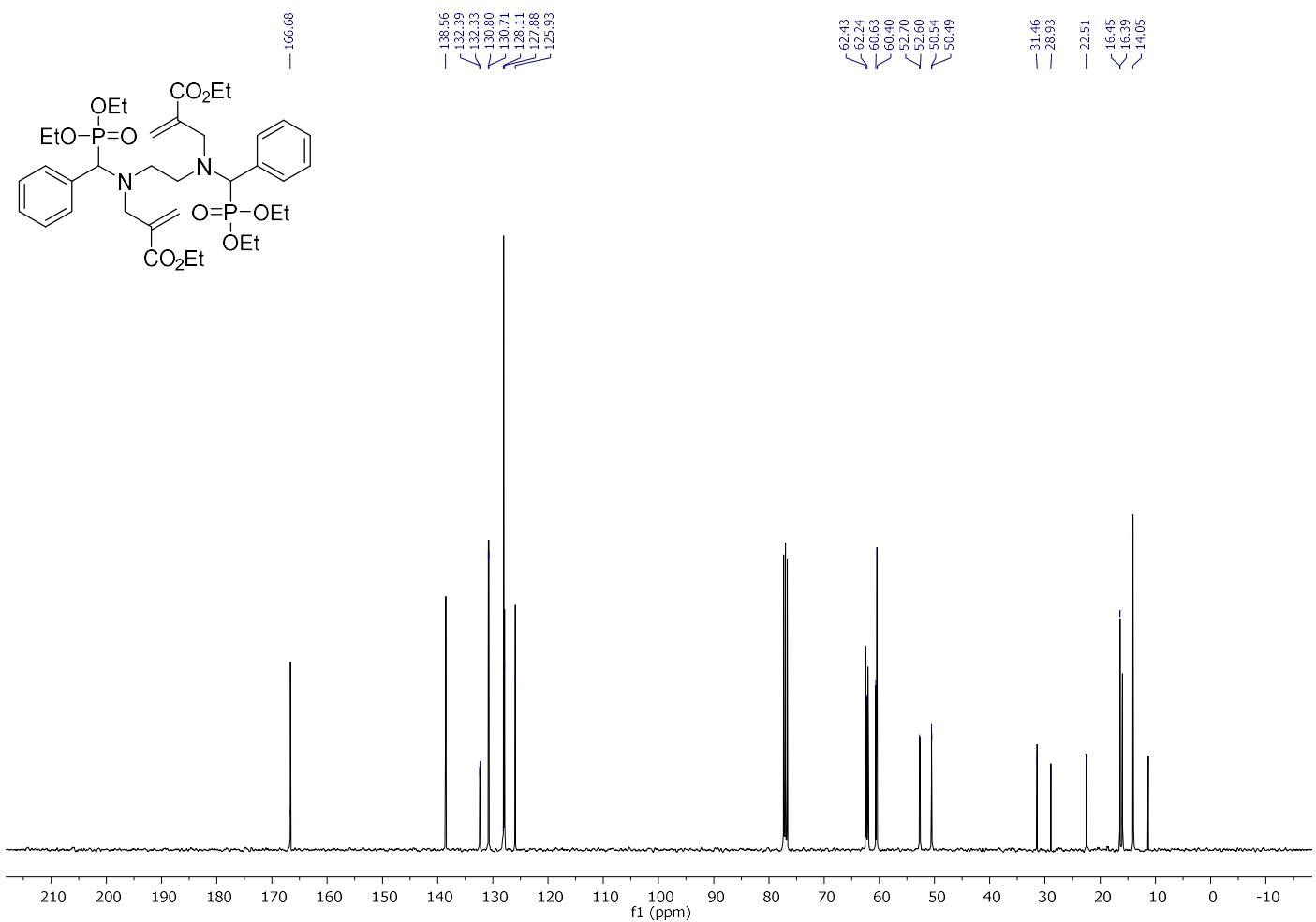
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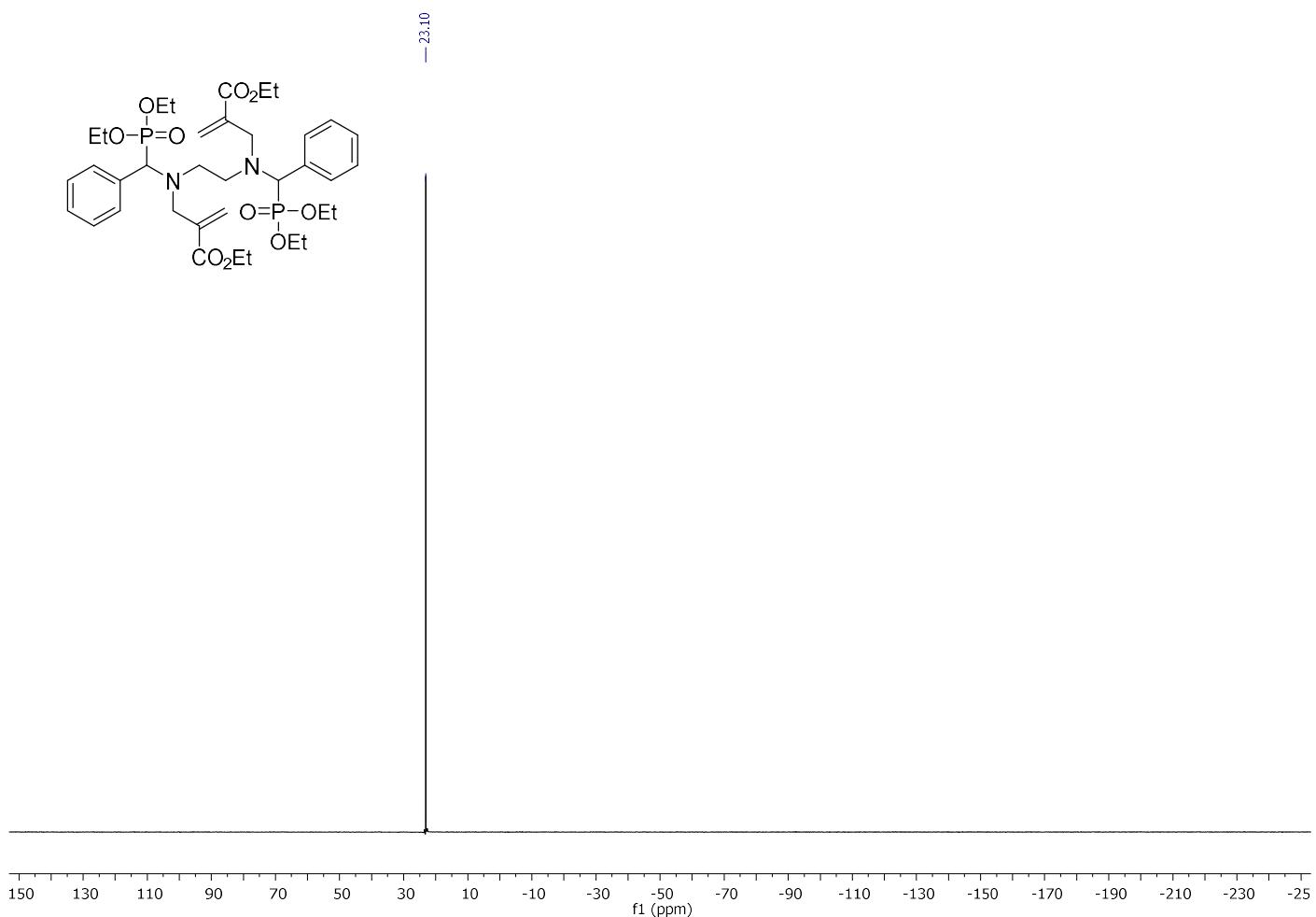
<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) of compound **6a**.



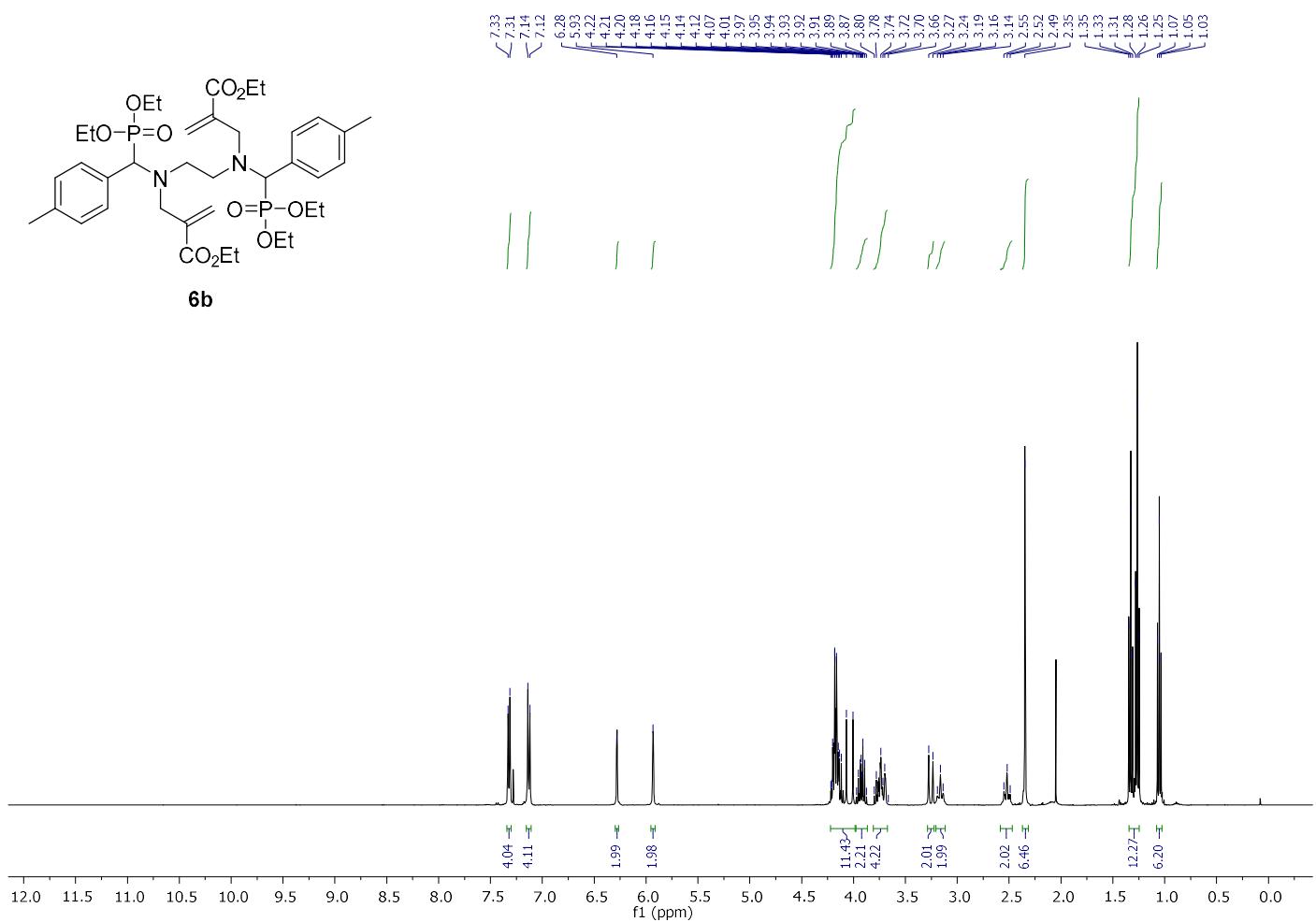
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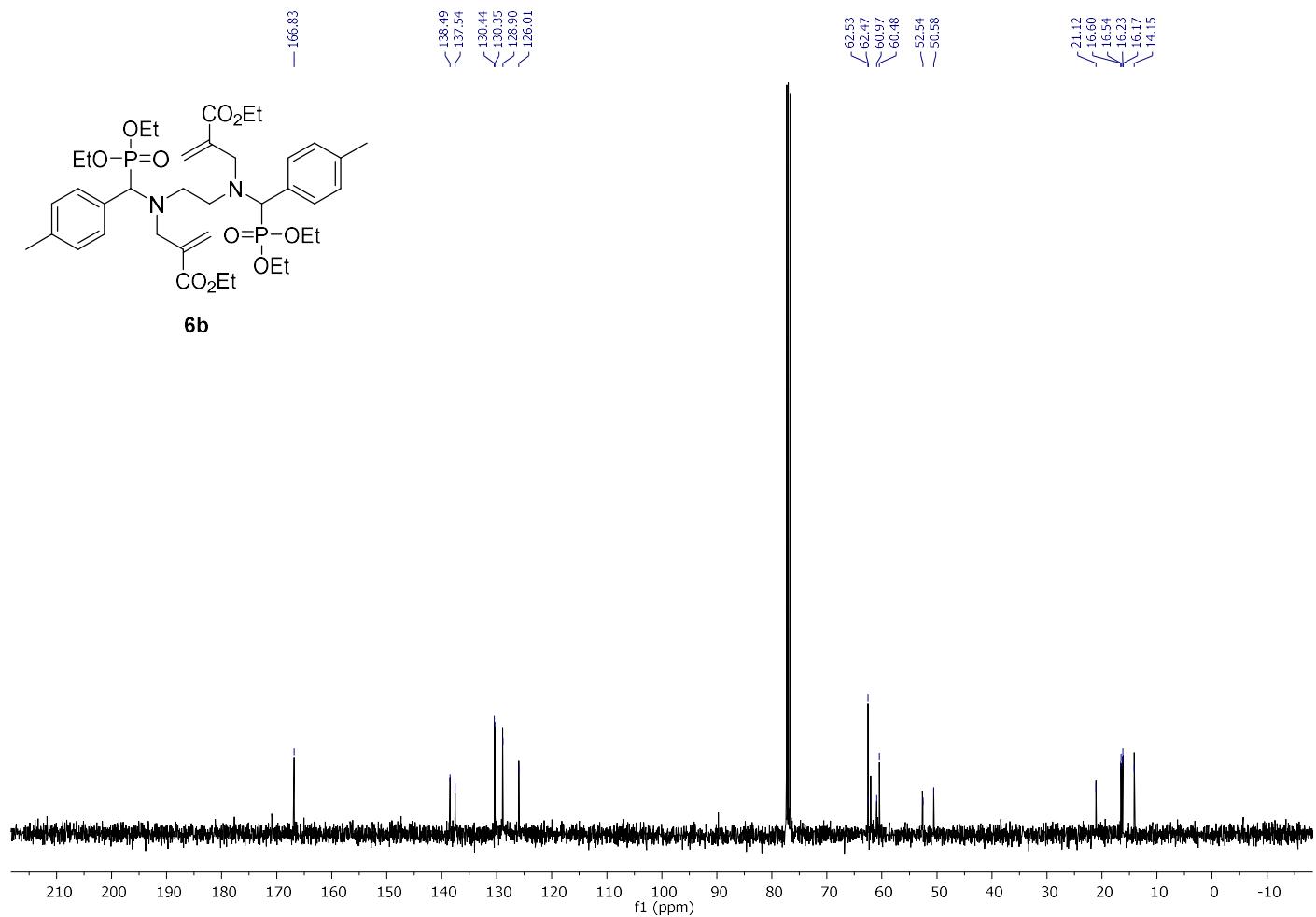
$^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ ) of compound **6a**.



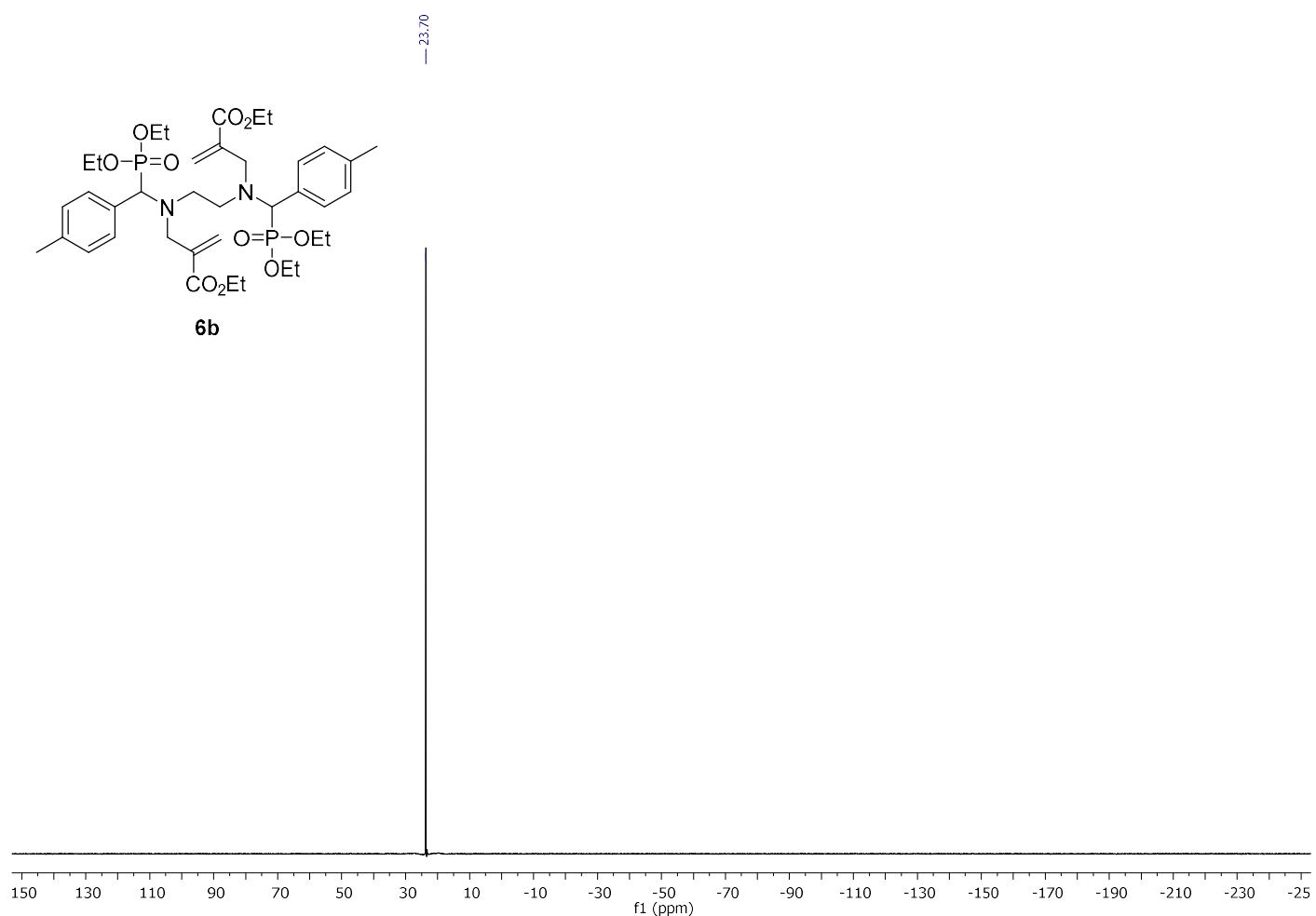
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **6b**.



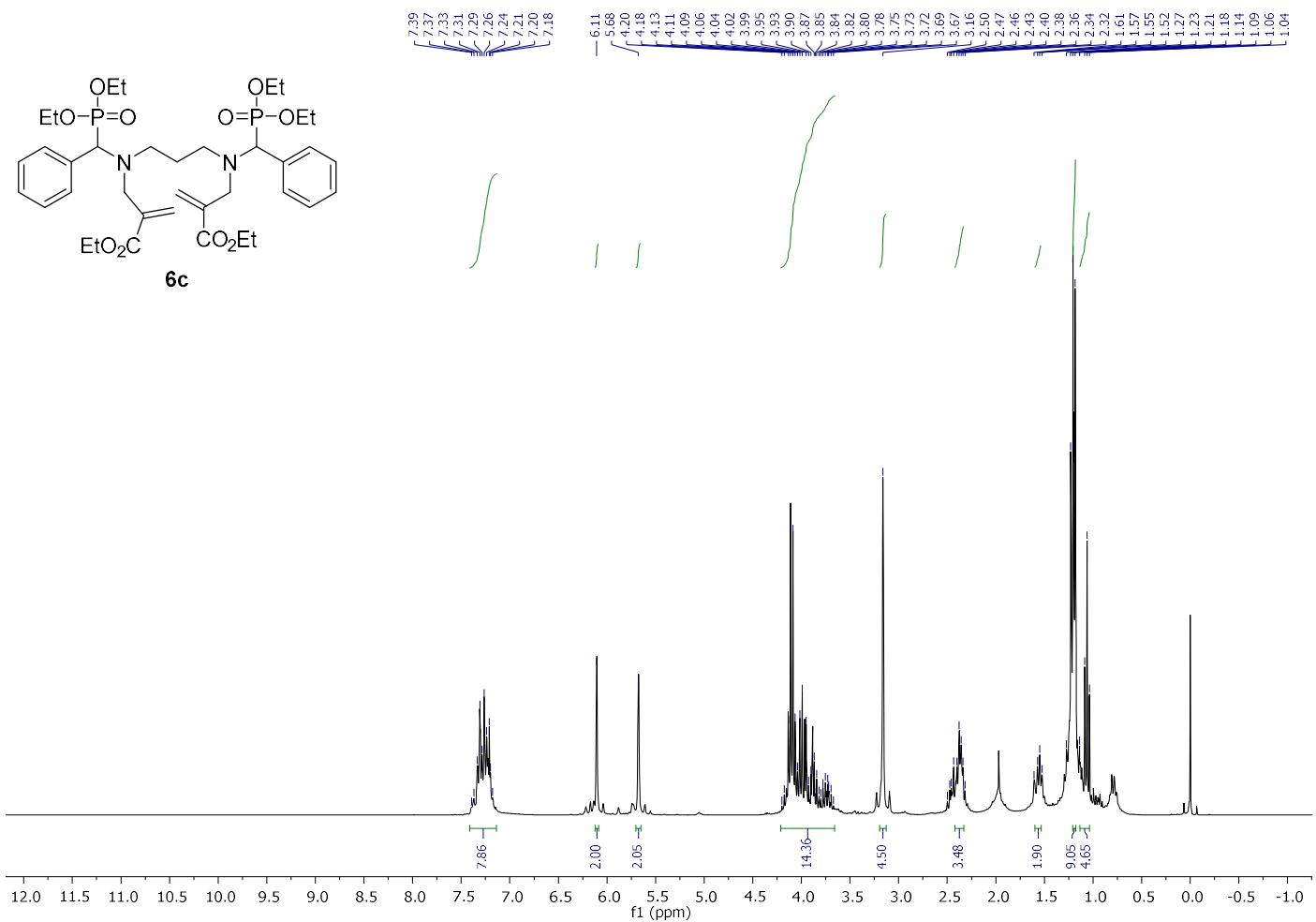
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **6b**.



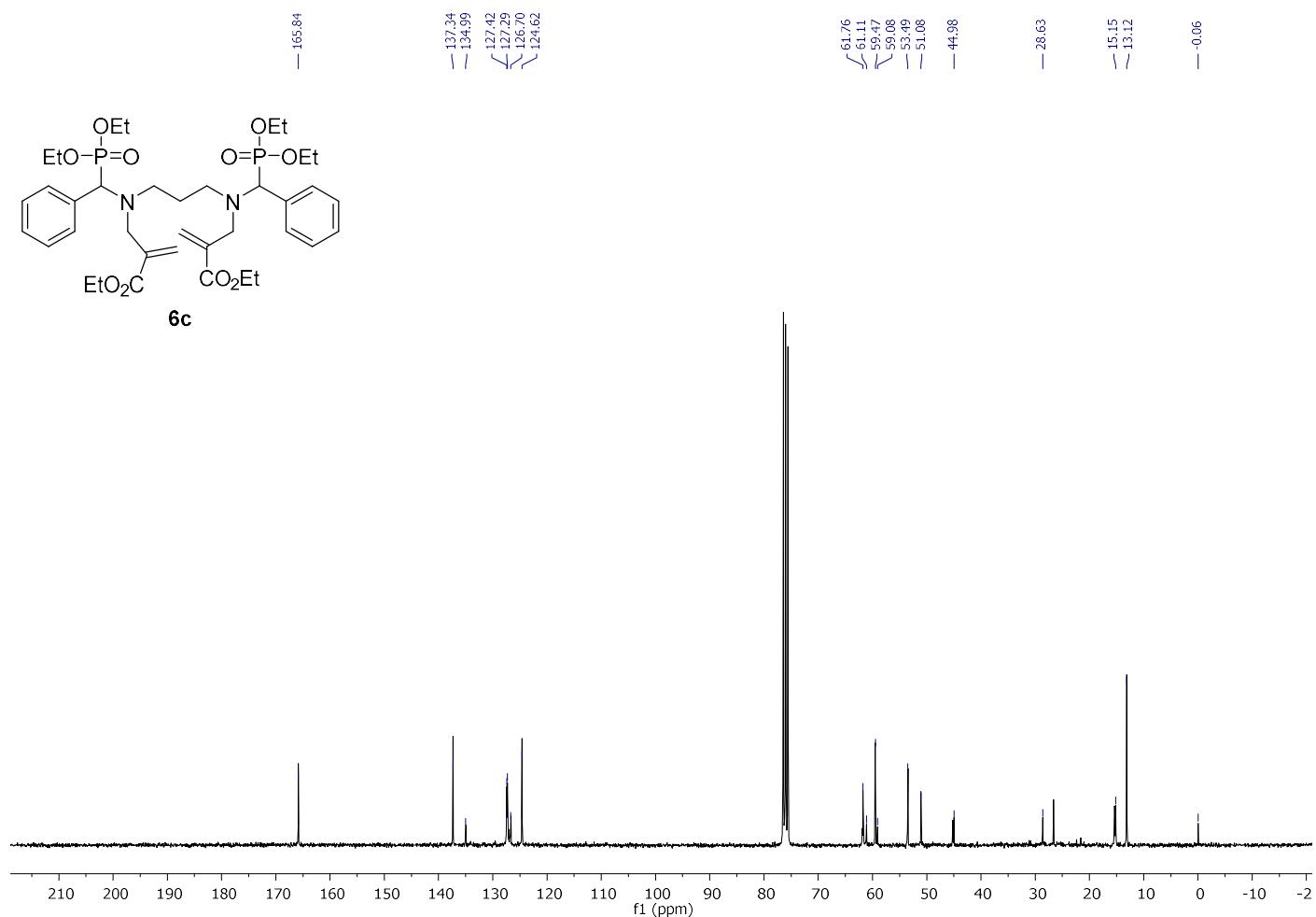
$^{31}\text{P}$  NMR (162 MHz,  $\text{CDCl}_3$ ) of compound **6b**.



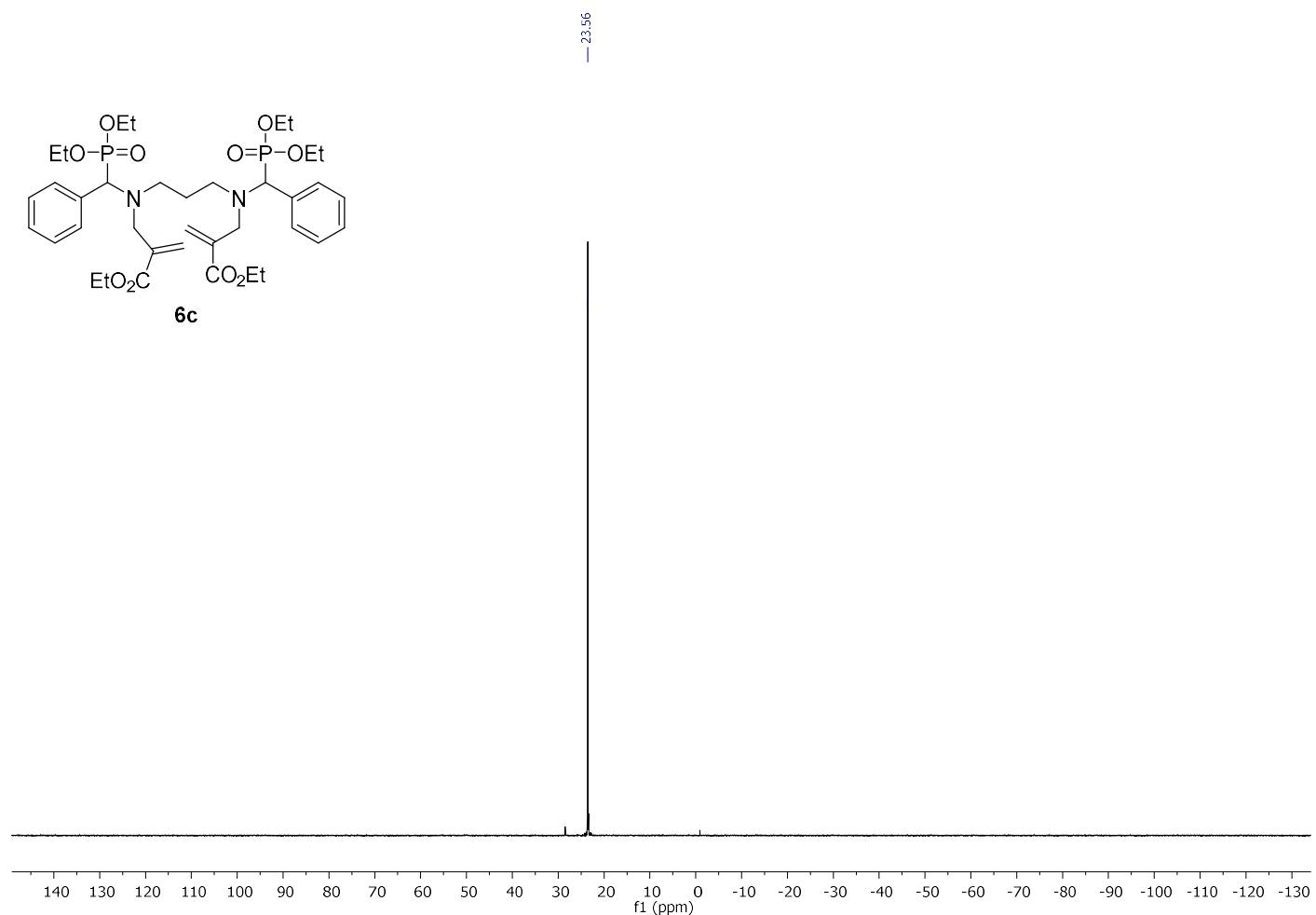
<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) of compound 6c.



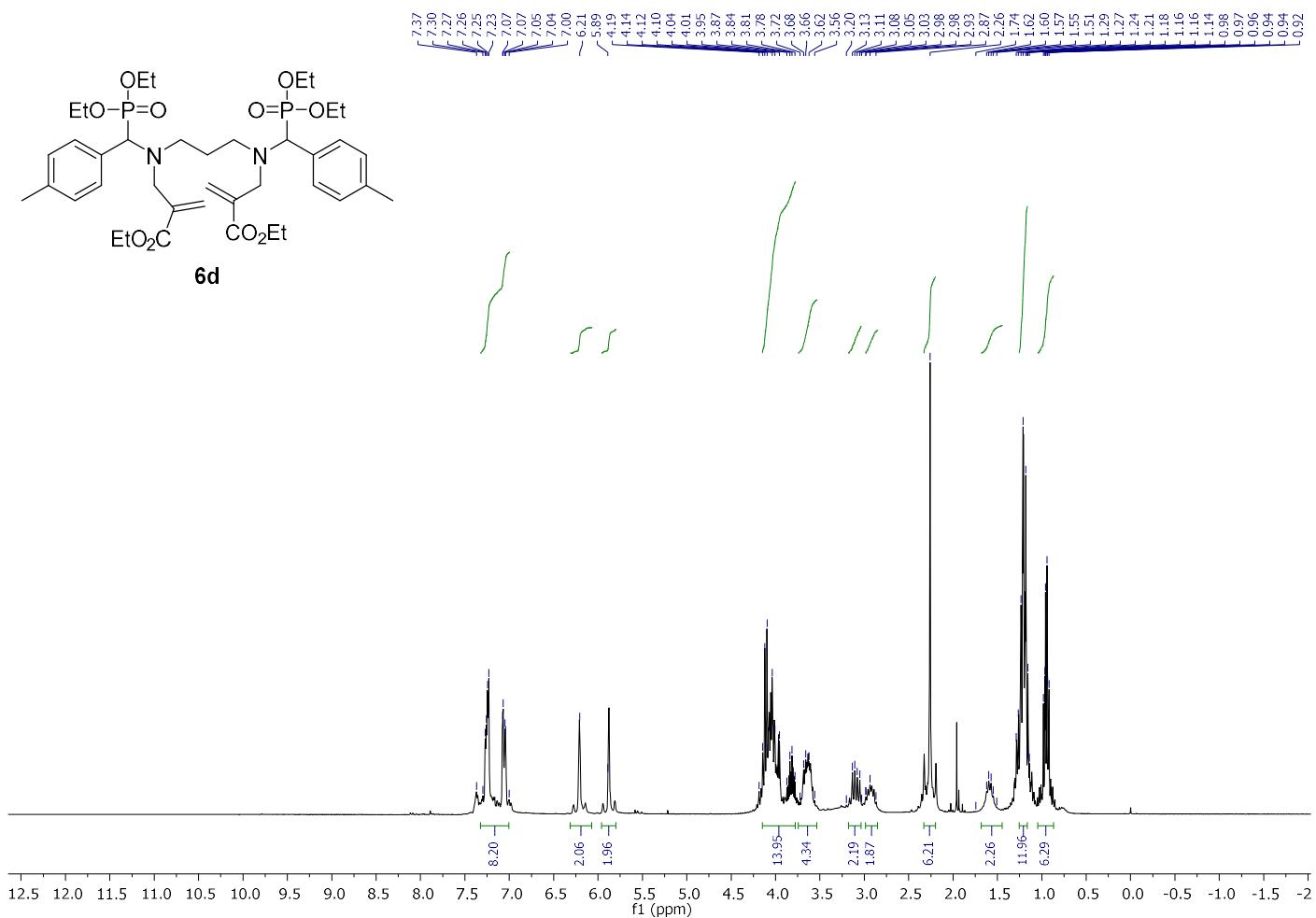
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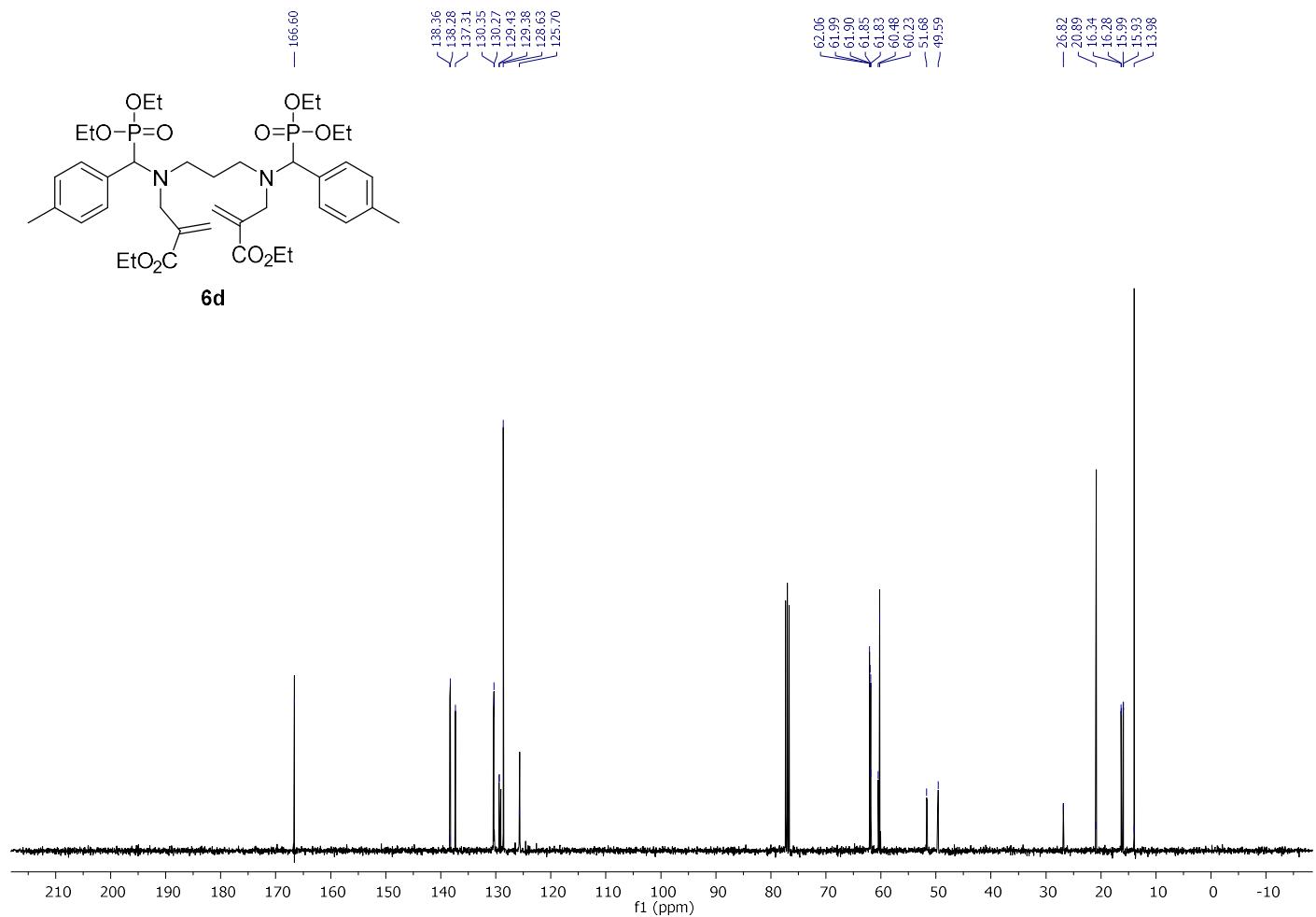
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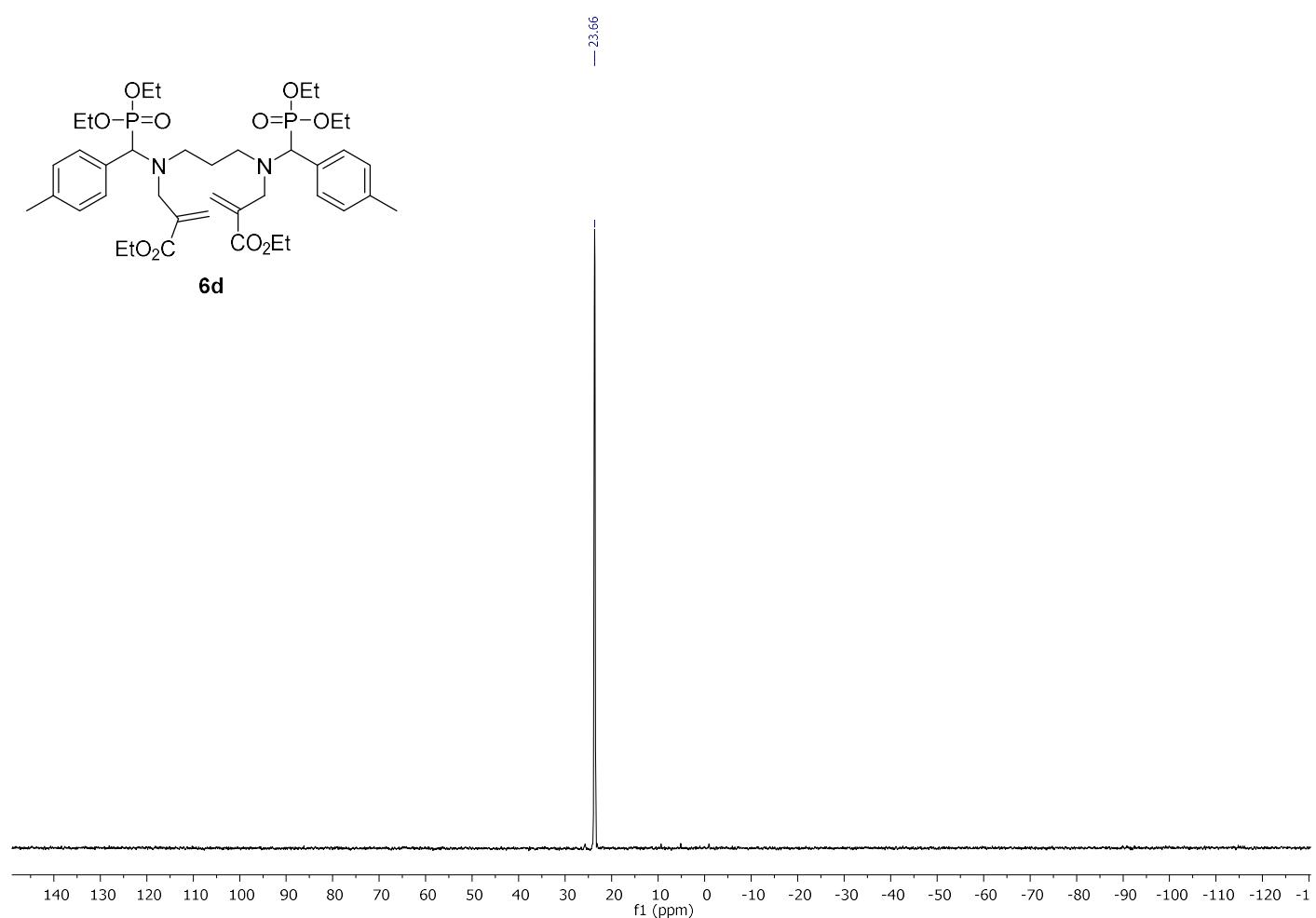
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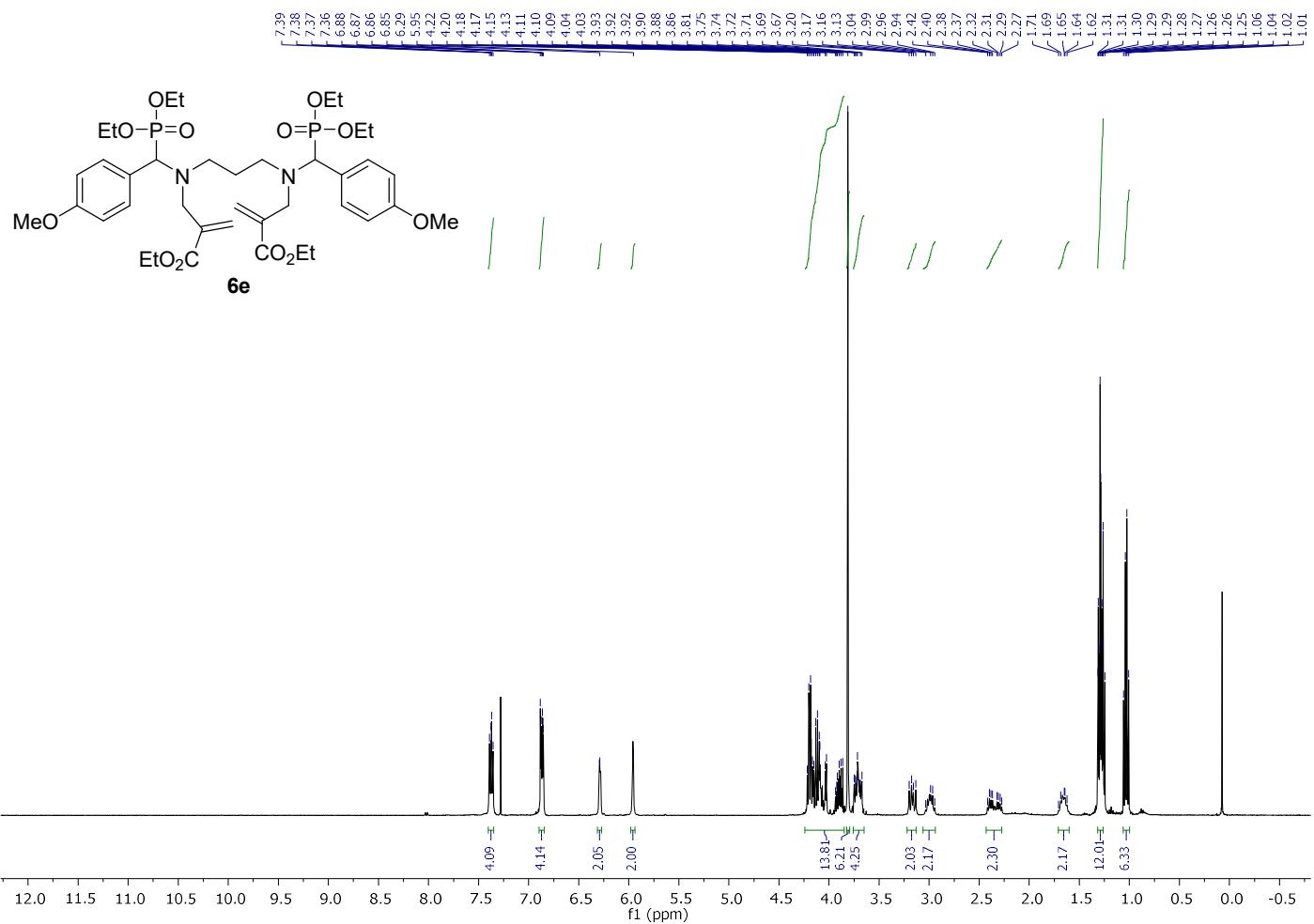
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **6d**.



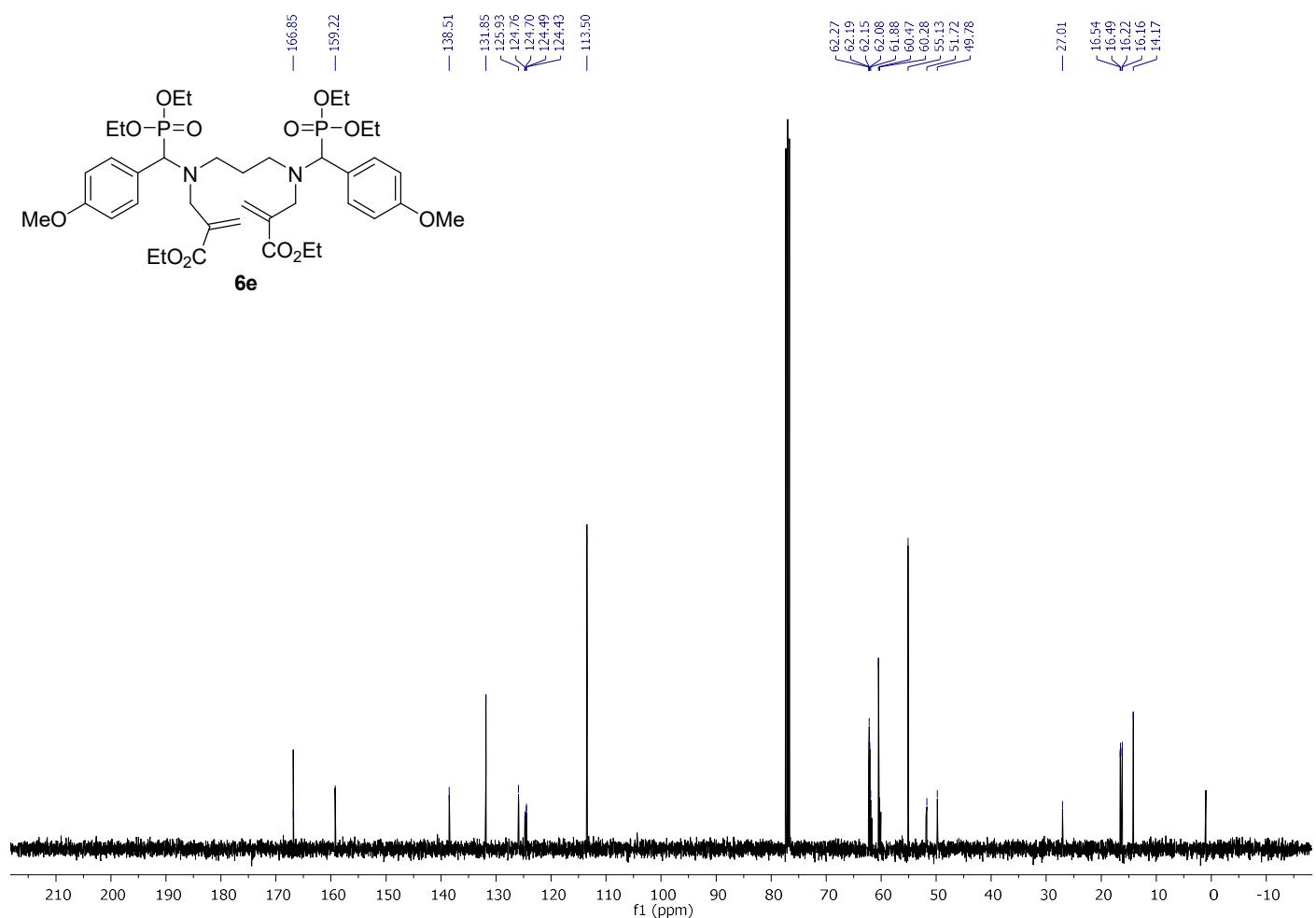
$^{31}\text{P}$  NMR (121 MHz,  $\text{CDCl}_3$ ) of compound **6d**.



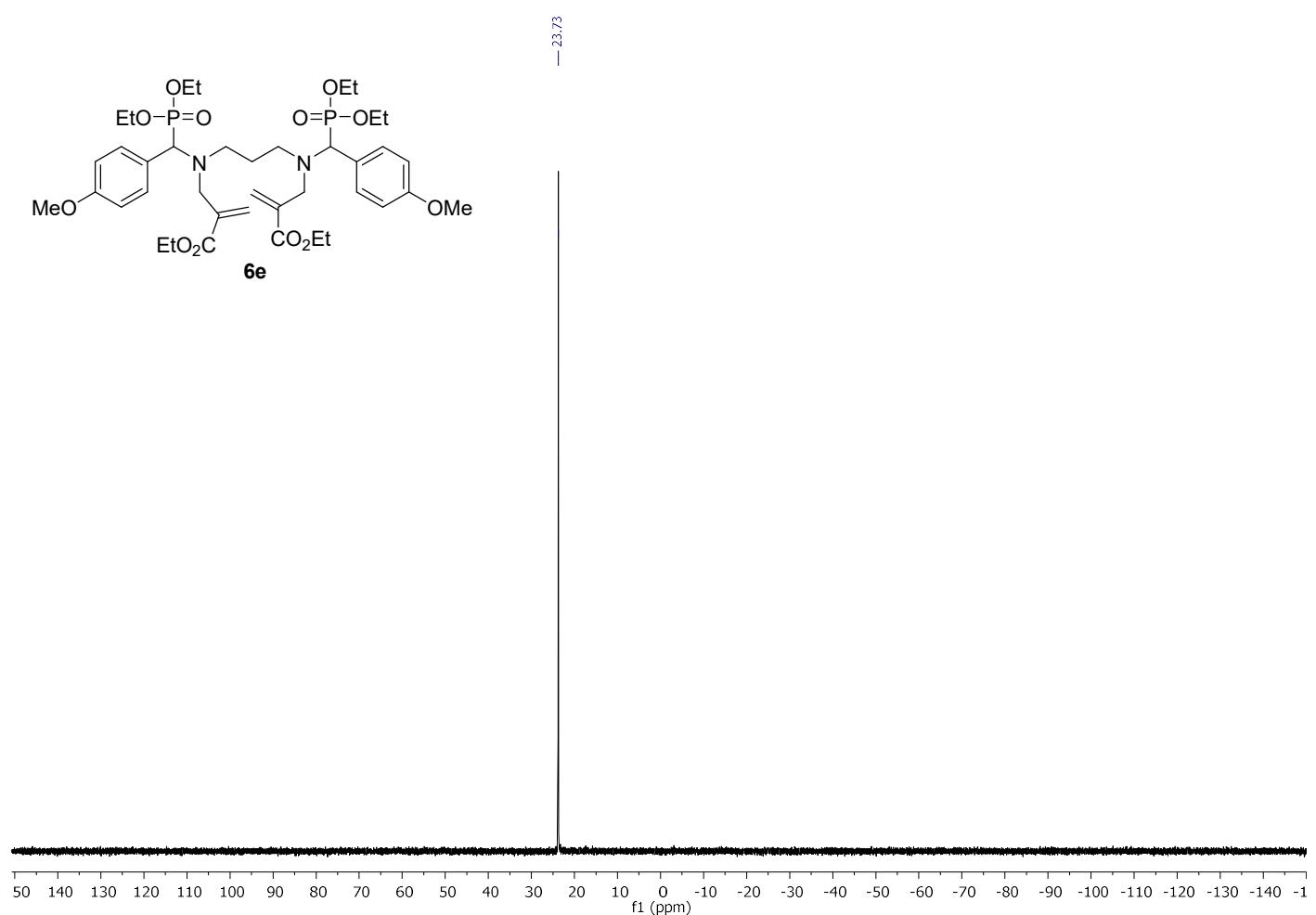
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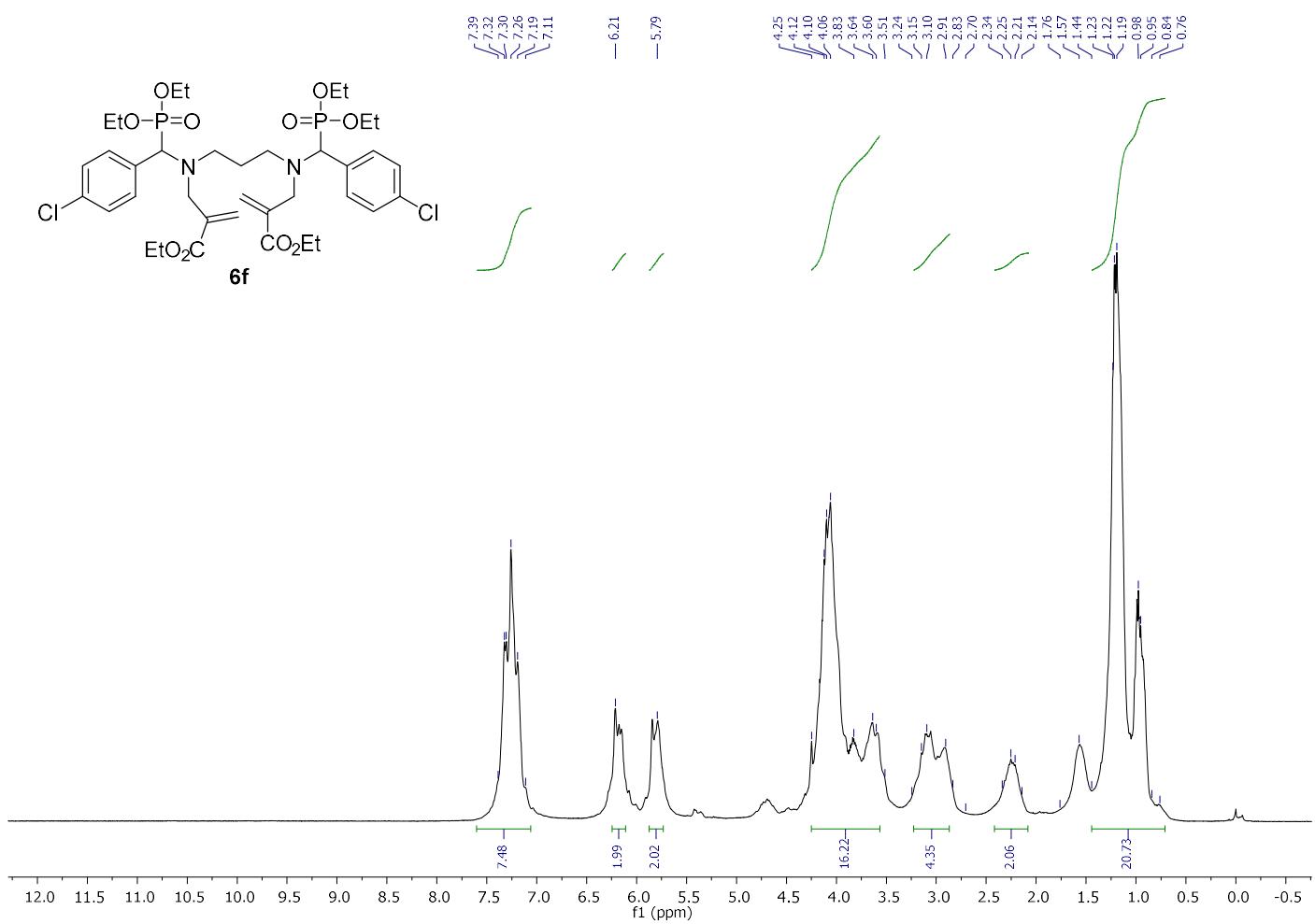
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **6e**.



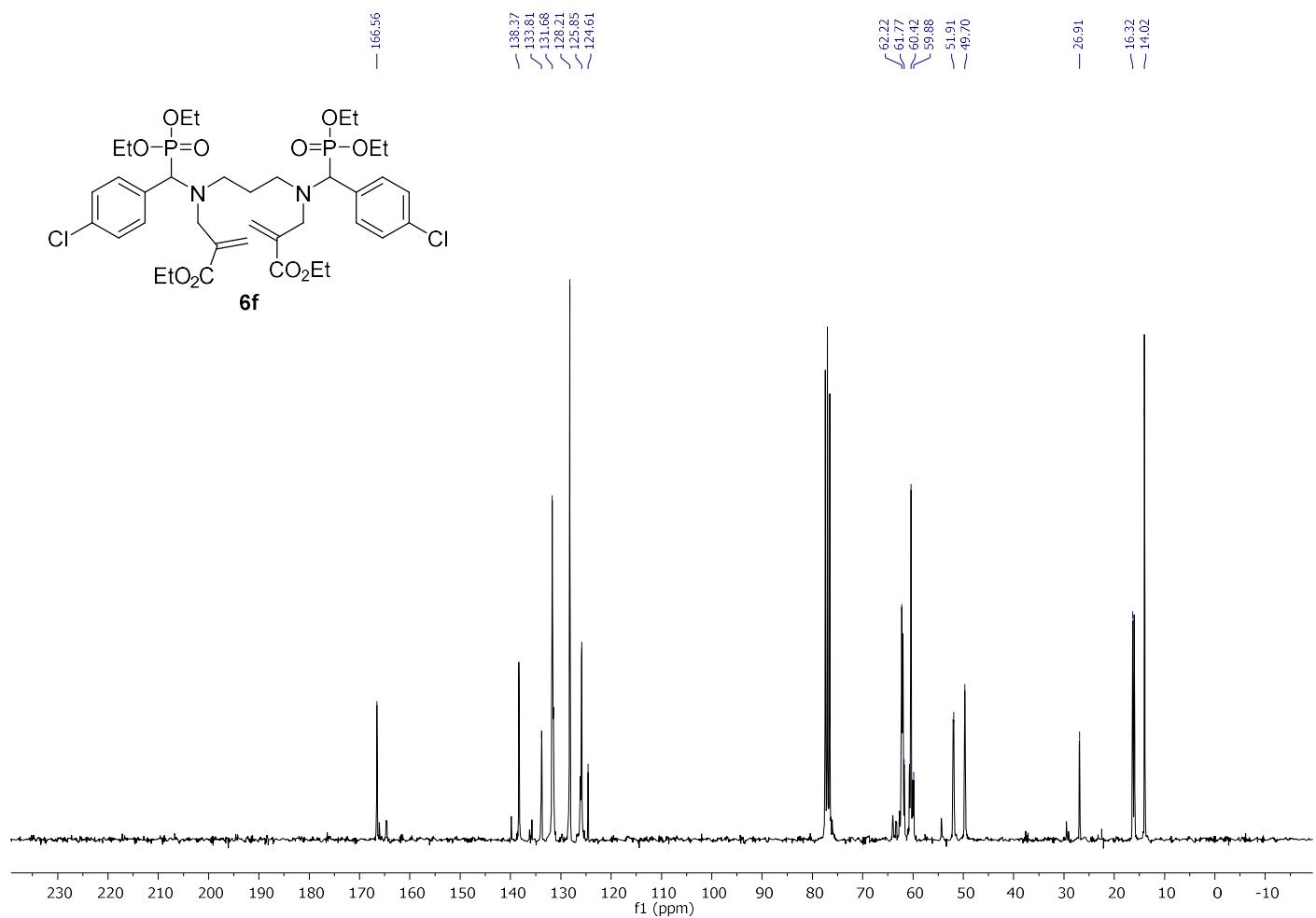
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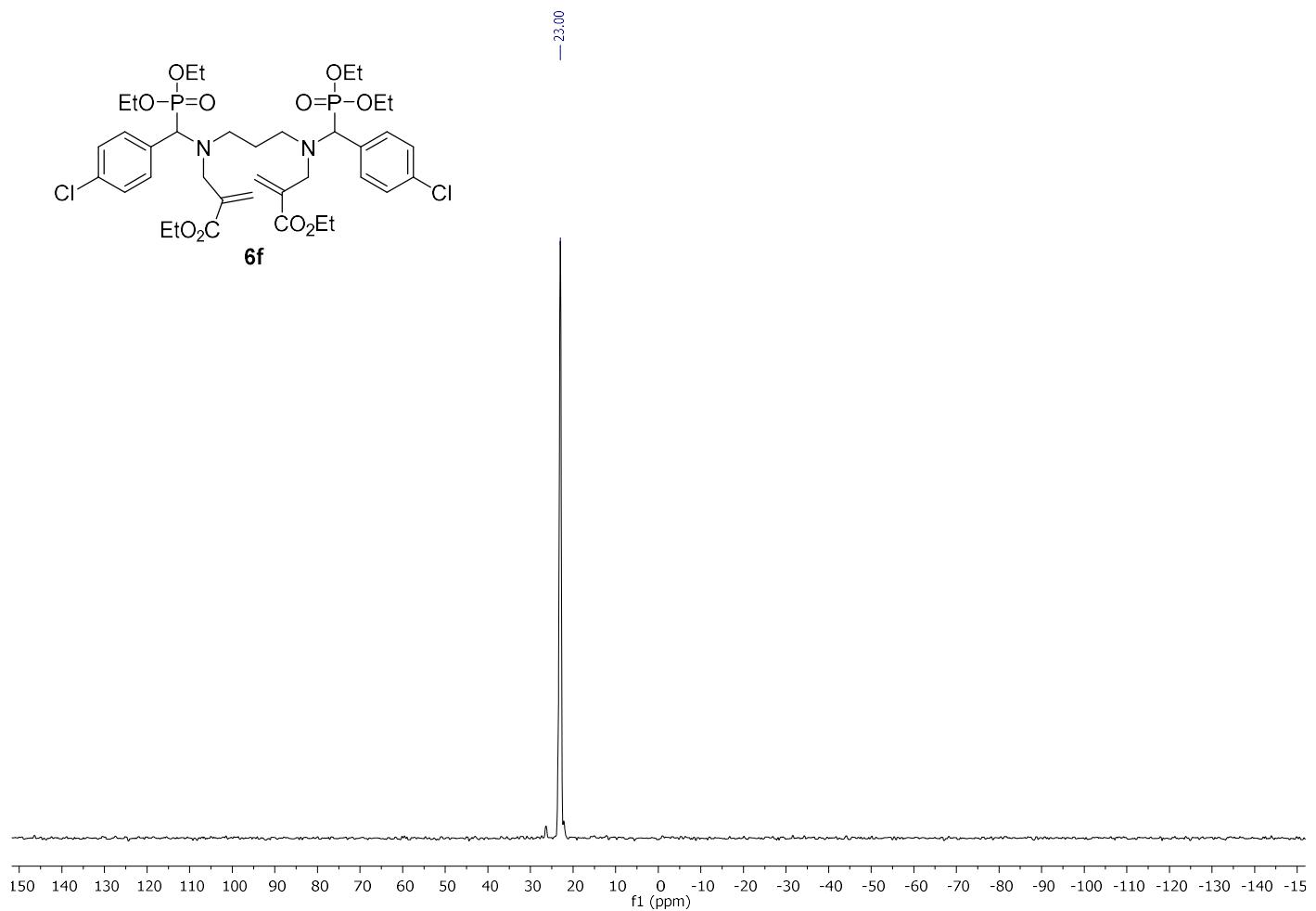
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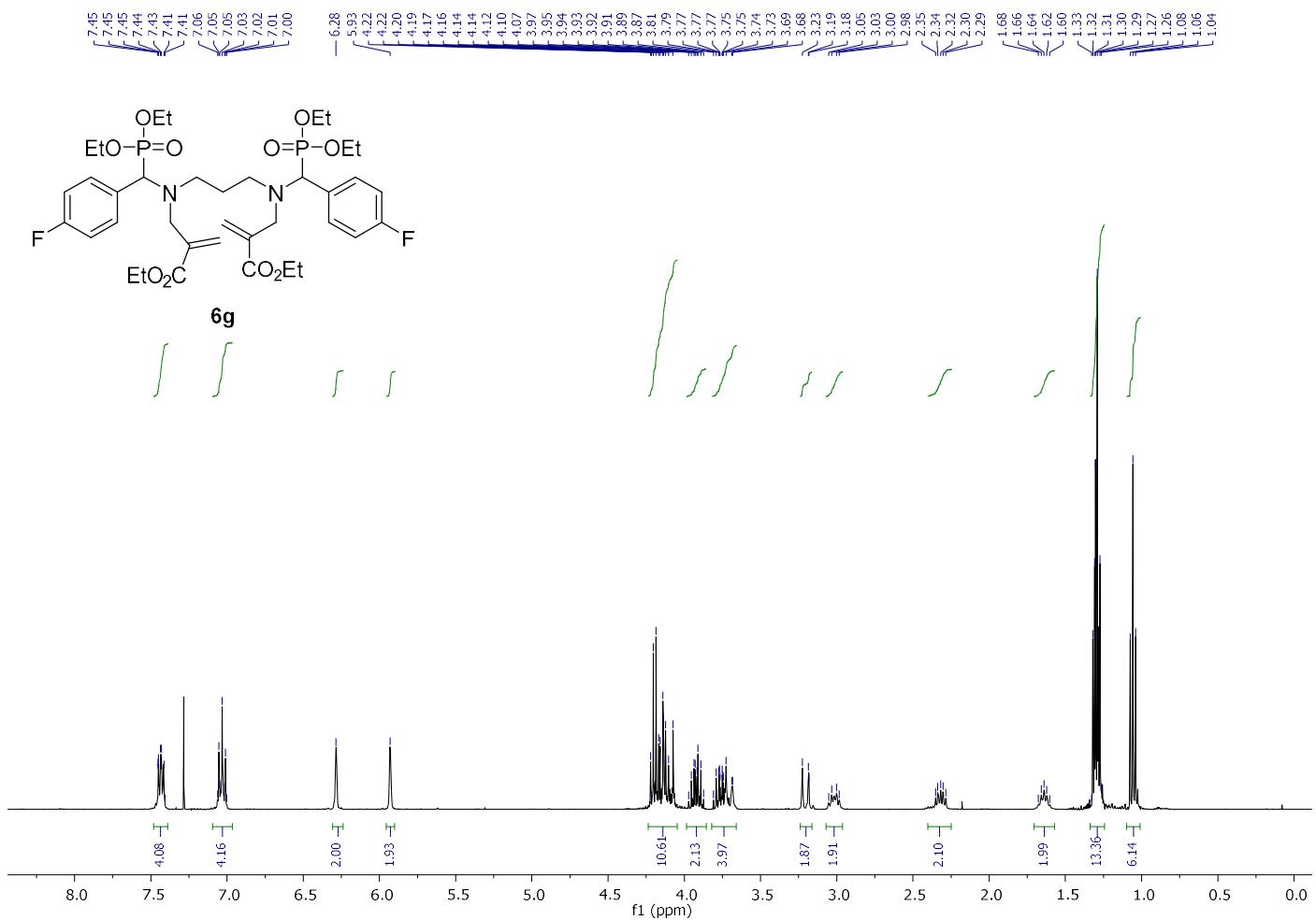
$^{13}\text{C}$  { $^1\text{H}$ } NMR (75 MHz,  $\text{CDCl}_3$ ) of compound **6f**.



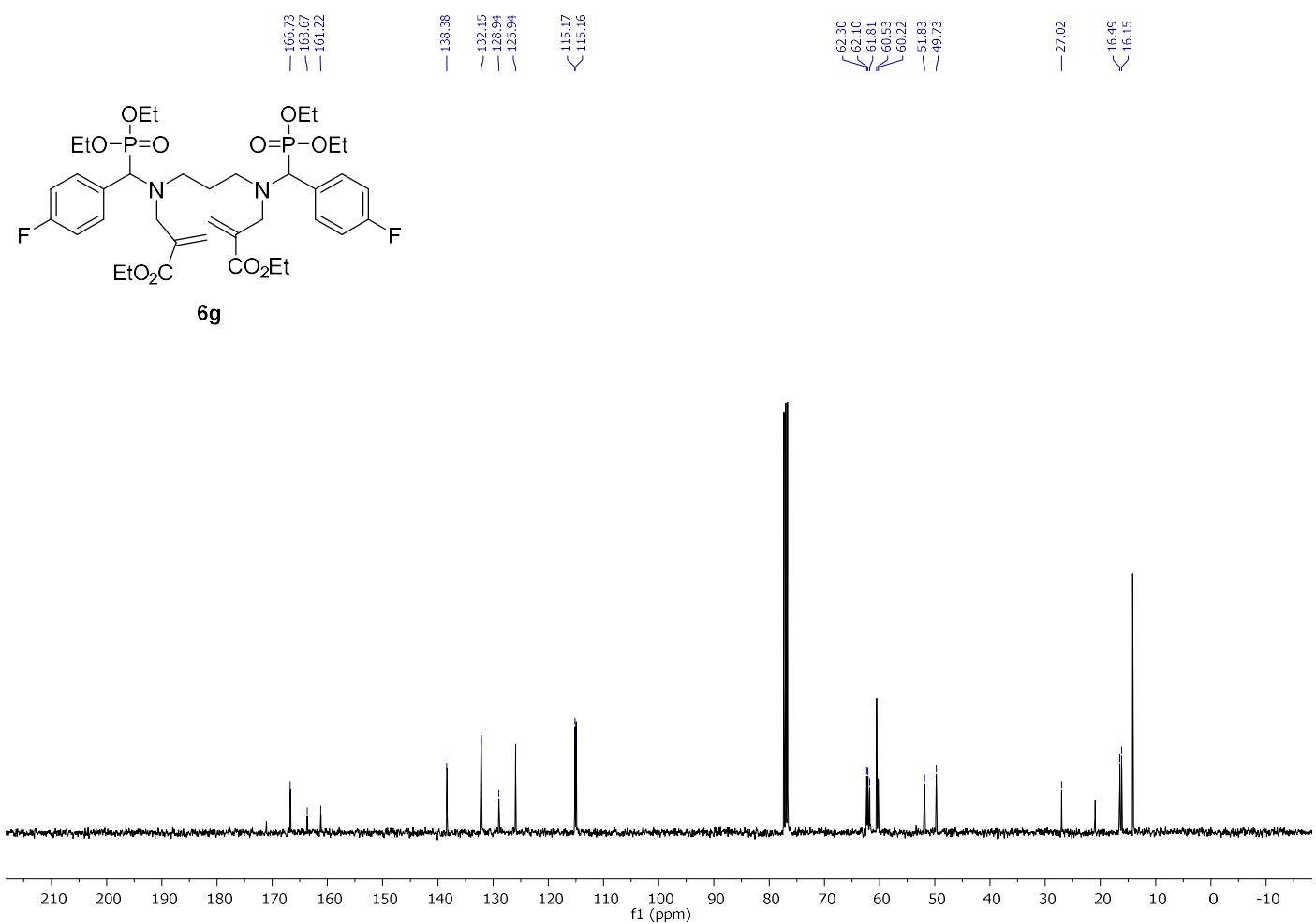
$^{31}\text{P}$  NMR (121 MHz,  $\text{CDCl}_3$ ) of compound **6f**.



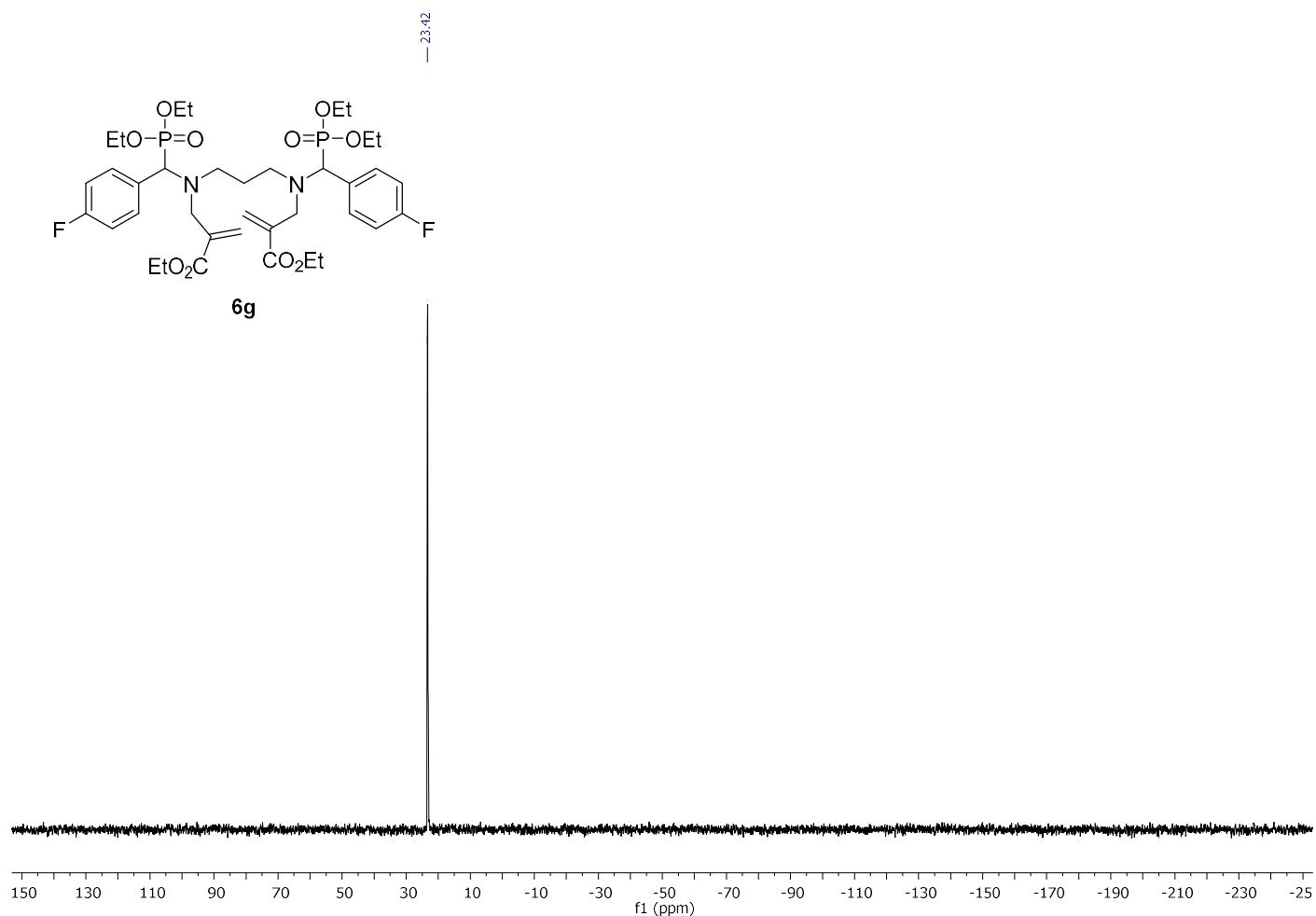
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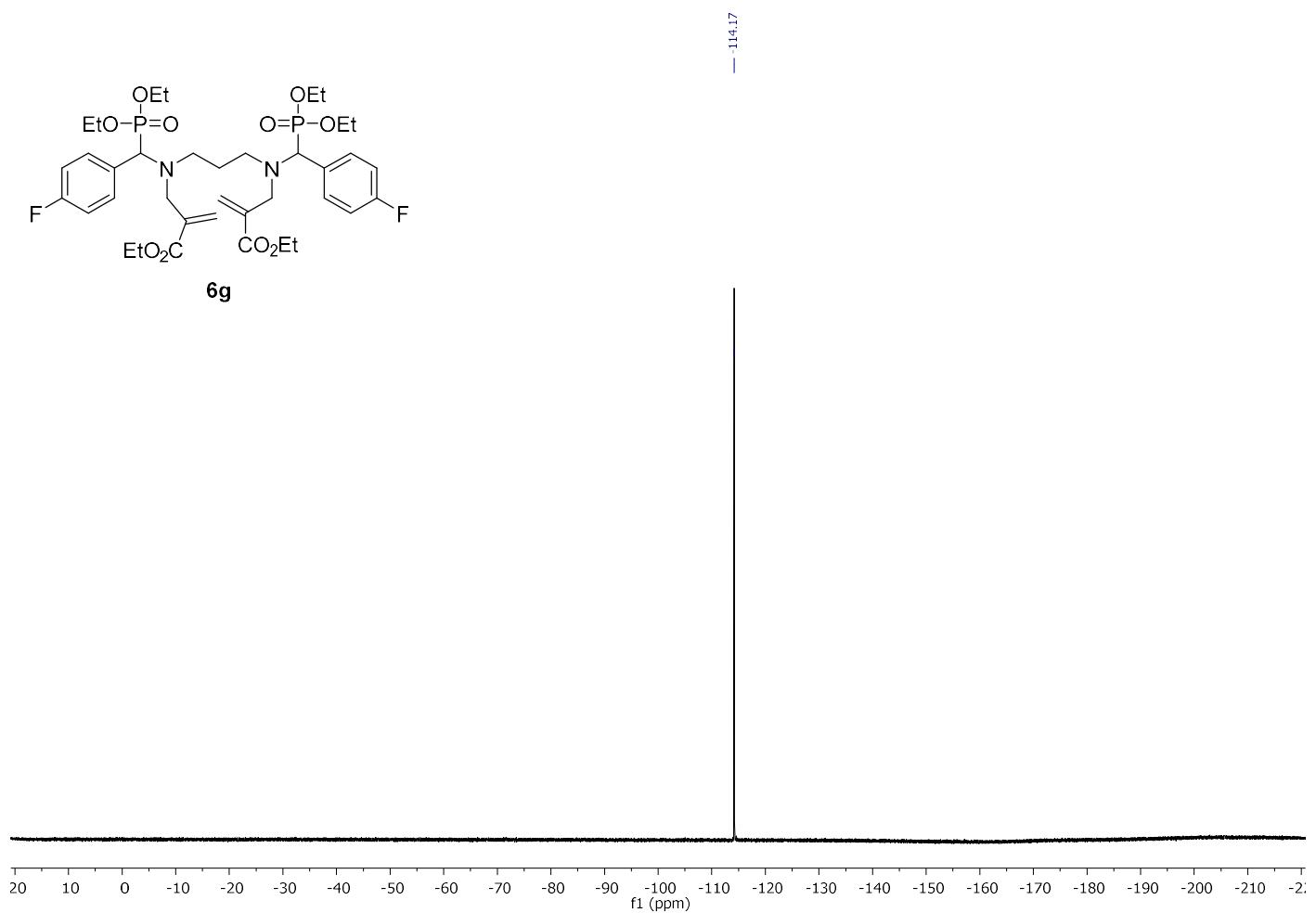
$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **6g**.



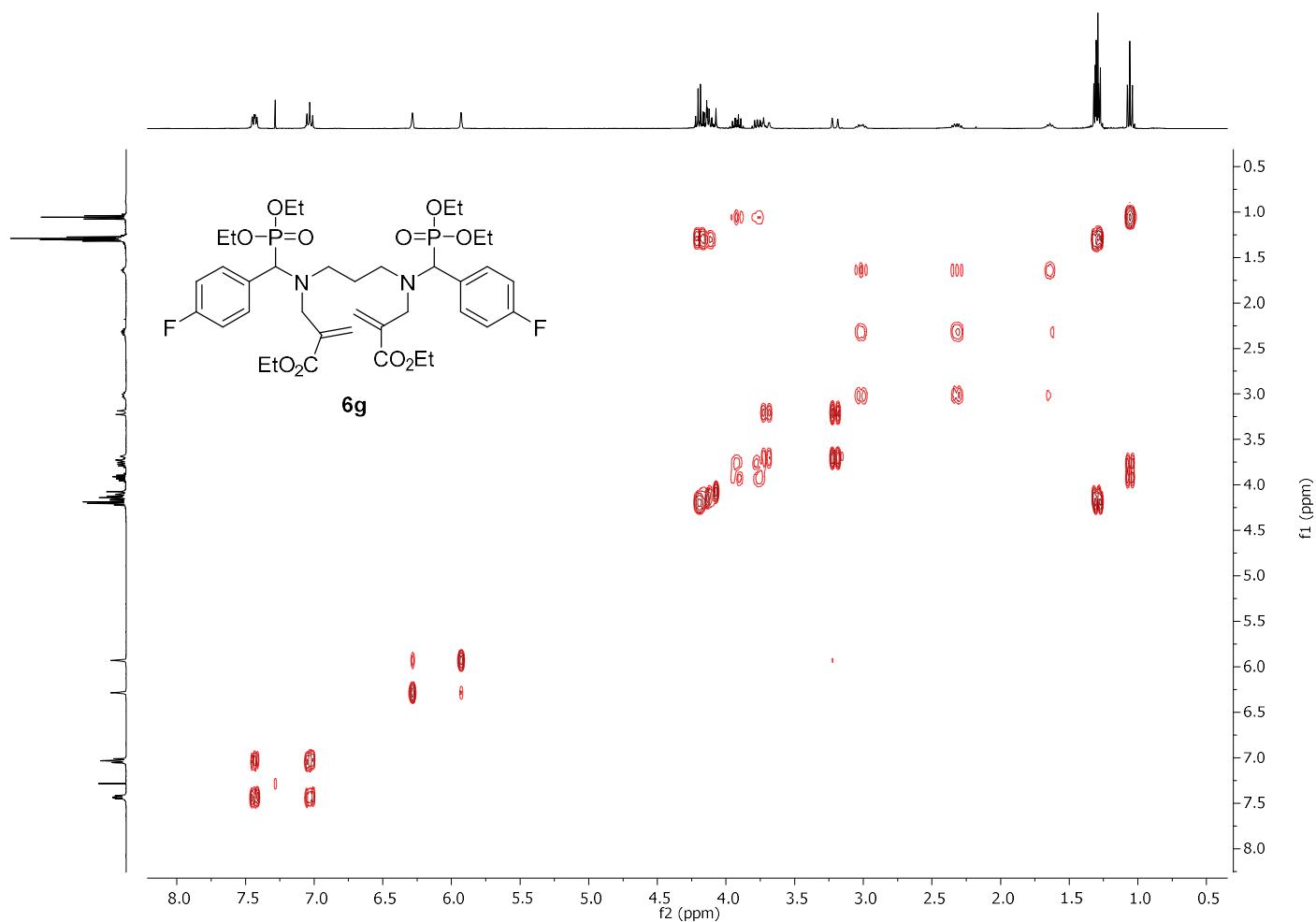
<sup>31</sup>P NMR (162 MHz, CDCl<sub>3</sub>) of compound **6g**.



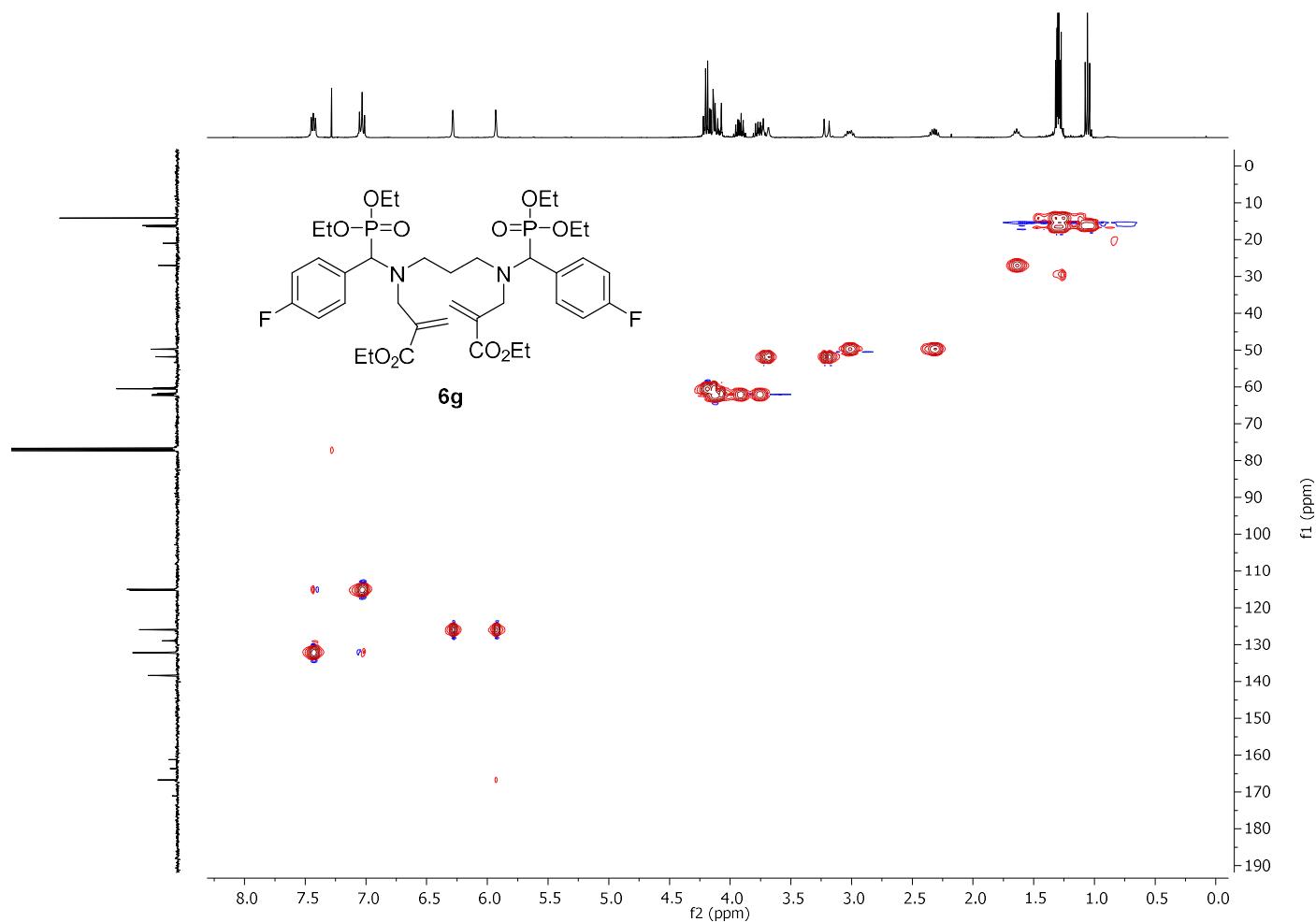
<sup>19</sup>F NMR (376 MHz, CDCl<sub>3</sub>) of compound **6g**.



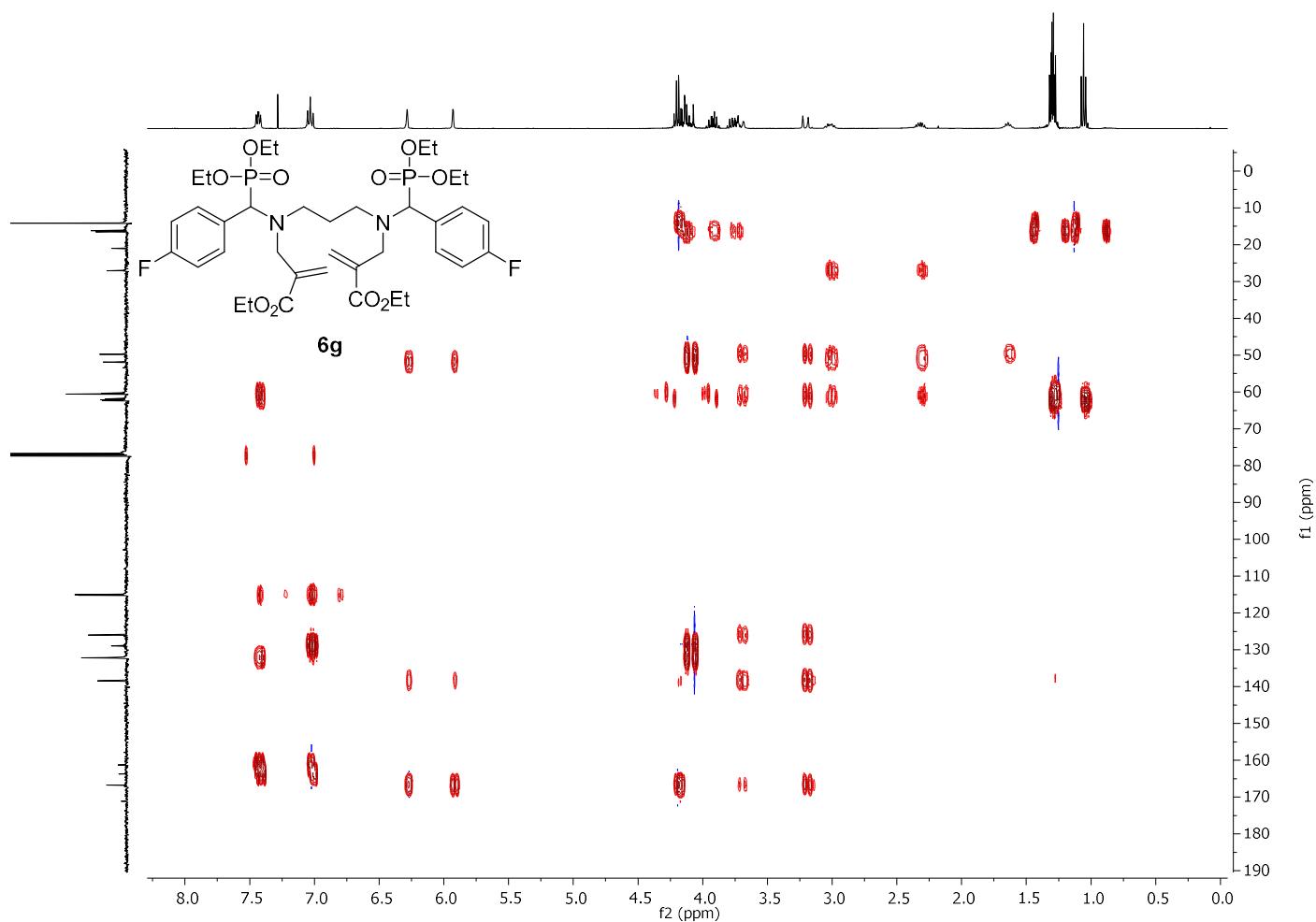
2D-COSY NMR  $\{^1\text{H}-^1\text{H}\}$  (400 MHz,  $\text{CDCl}_3$ ) of compound **6g**.



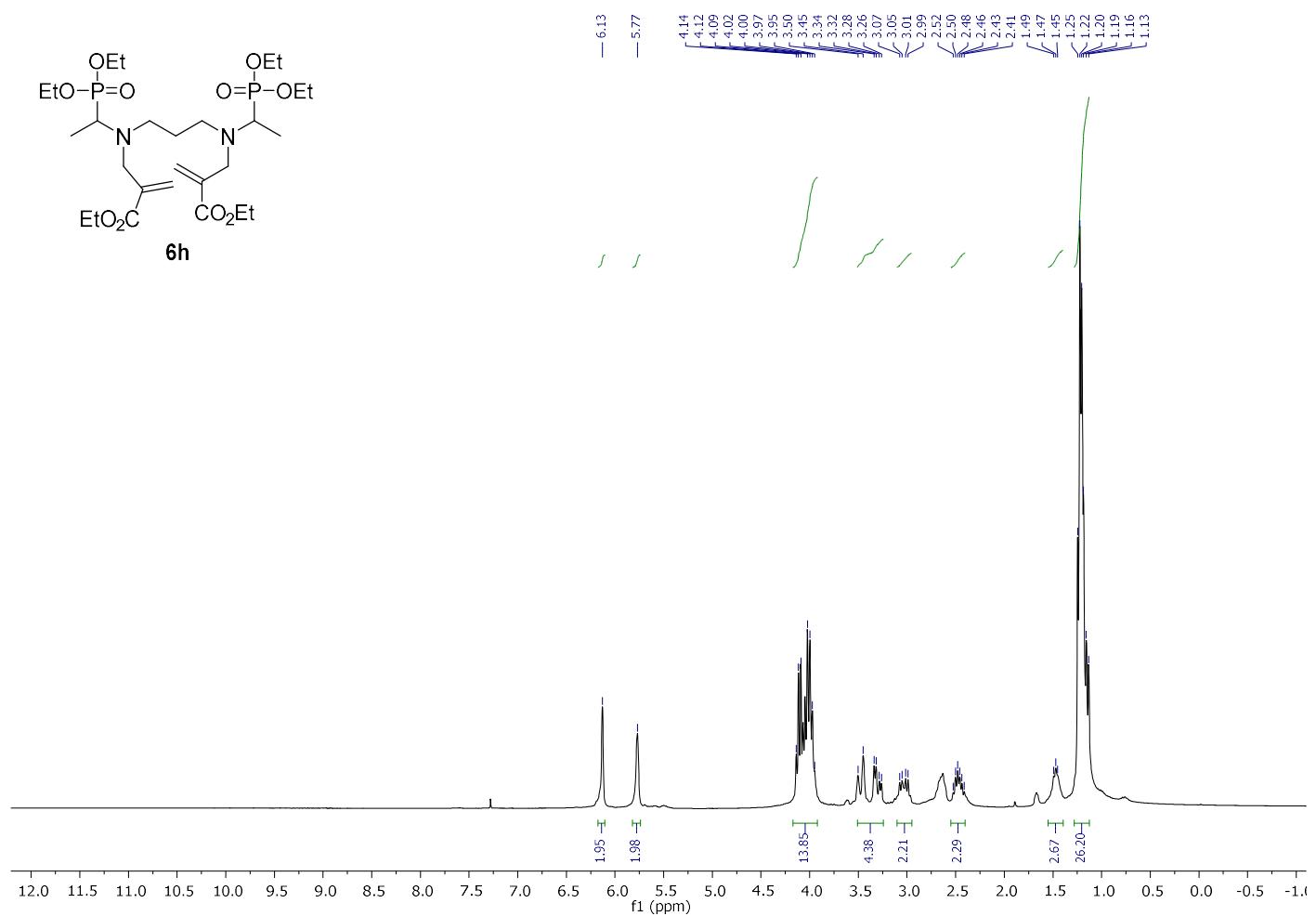
2D-HSQC NMR {<sup>1</sup>H-<sup>13</sup>C} (<sup>1</sup>H: 400 MHz, <sup>13</sup>C: 101 MHz, CDCl<sub>3</sub>) of compound **6g**.



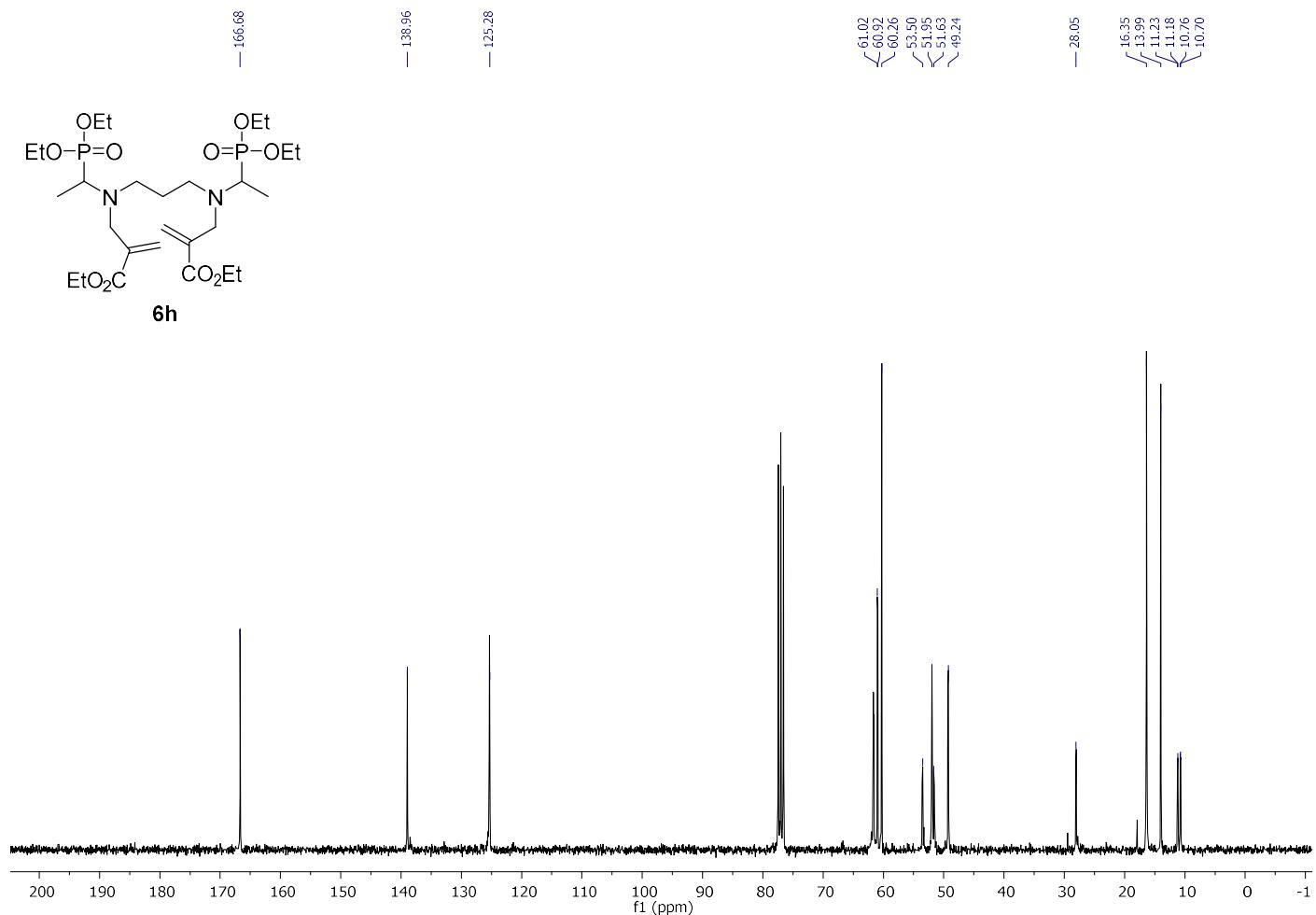
2D-HMBC NMR { $^1\text{H}$ - $^{13}\text{C}$ } ( $^1\text{H}$ : 400 MHz,  $^{13}\text{C}$ : 101 MHz,  $\text{CDCl}_3$ ) of compound **6g**.



<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of compound **6h**.



$^{13}\text{C}$  { $^1\text{H}$ } NMR (101 MHz,  $\text{CDCl}_3$ ) of compound **6h**.



<sup>31</sup>P NMR (162 MHz, CDCl<sub>3</sub>) of compound **6h**.

