

## **Pseudo Enantiomeric Mixed S/P Ligands Derived from Carbohydrates for the 1,4-Addition of Phenyl Boronic Acid to Cyclohexenone**

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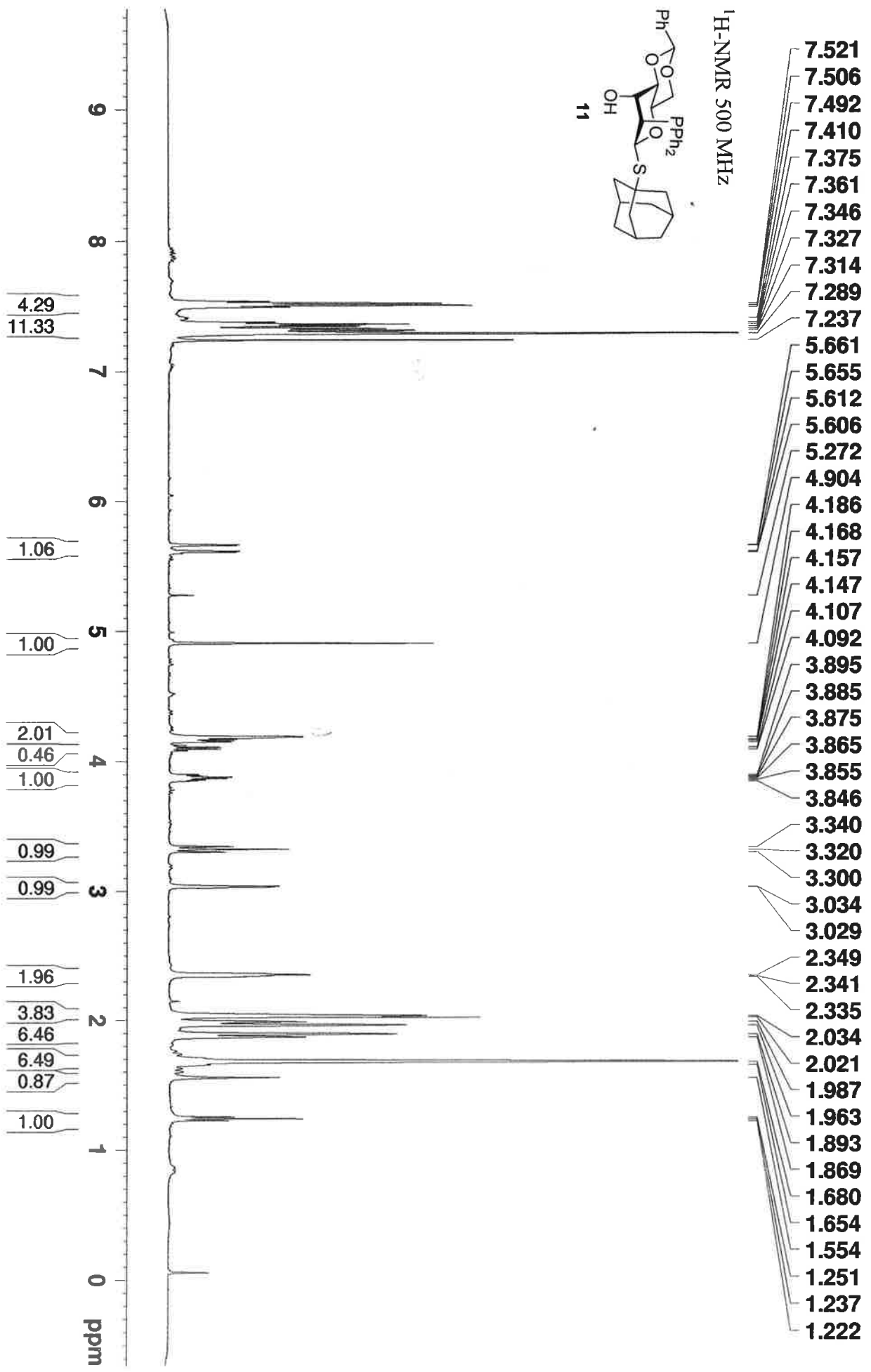
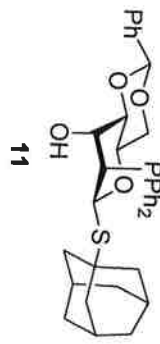
<sup>a</sup> Asymmetric Synthesis and Functional Nanosystem Group *Instituto de Investigaciones Químicas, C.S.I.C-Universidad de Sevilla, c/. Américo Vespucio, 49., Isla de la Cartuja, 41092 Sevilla, Spain. Fax:+34954460565; Tel: +34954489559; E-mail: [khlar@iiq.csic.es](mailto:khlar@iiq.csic.es)*

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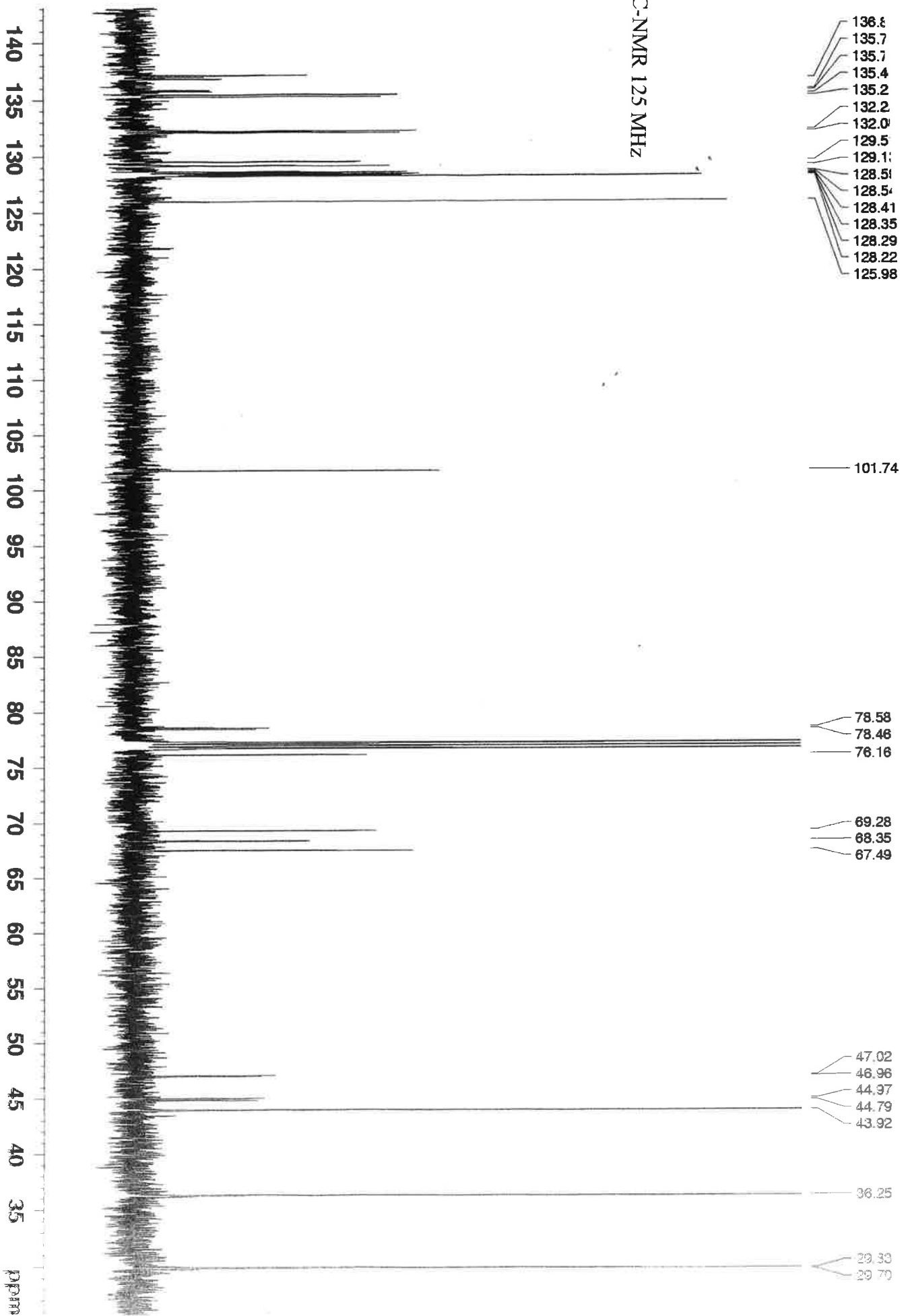
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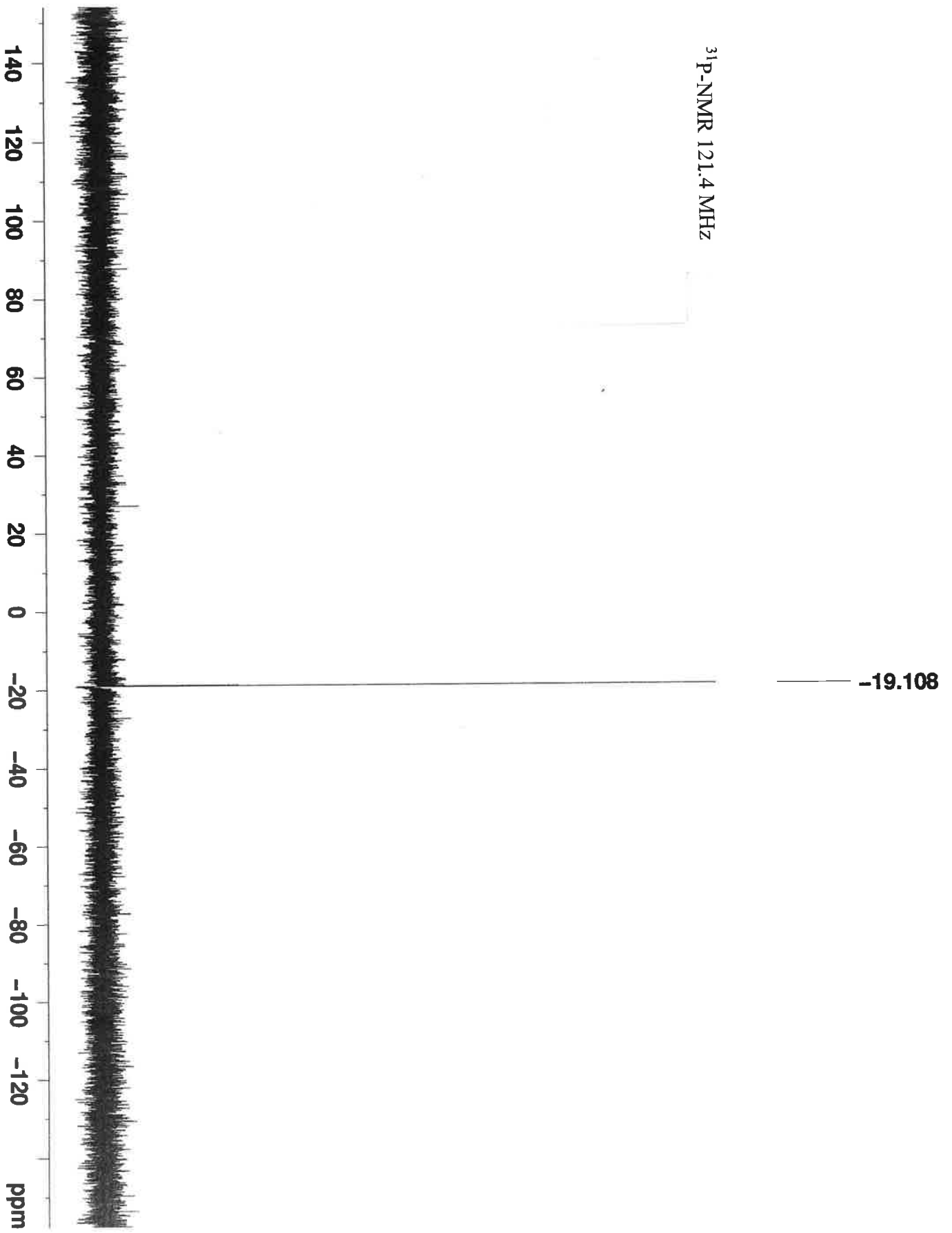
<sup>1</sup>H-NMR 500 MHz



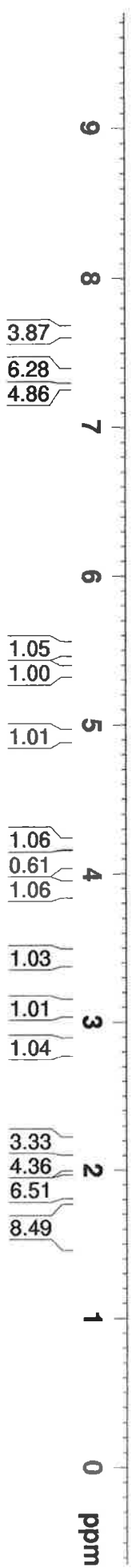
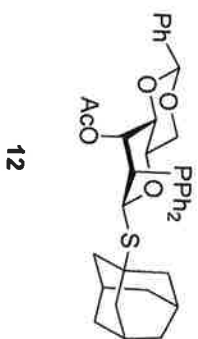
$^{13}\text{C-NMR}$  125 MHz



$^{31}\text{P}$ -NMR 121.4 MHz

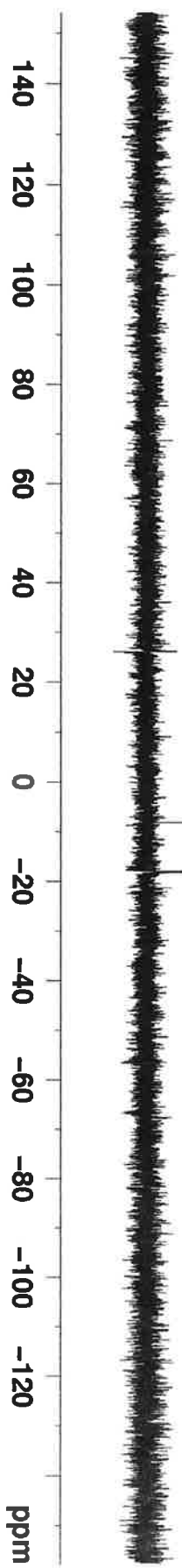


<sup>1</sup>H-NMR 500 MHz

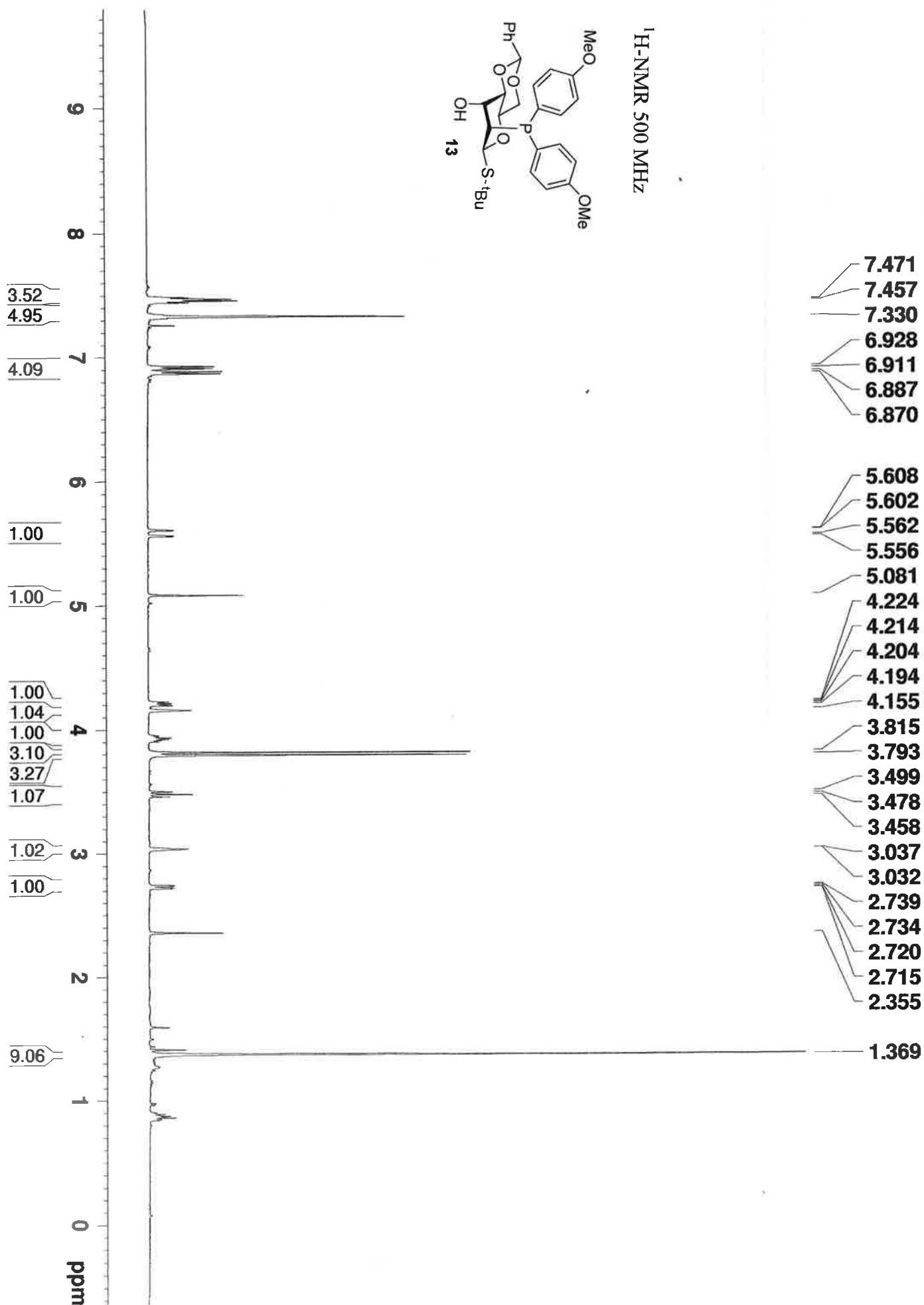
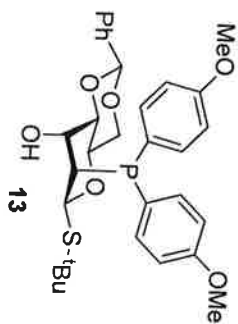


$^{31}\text{P}$ -NMR 121.4 MHz

-18.160

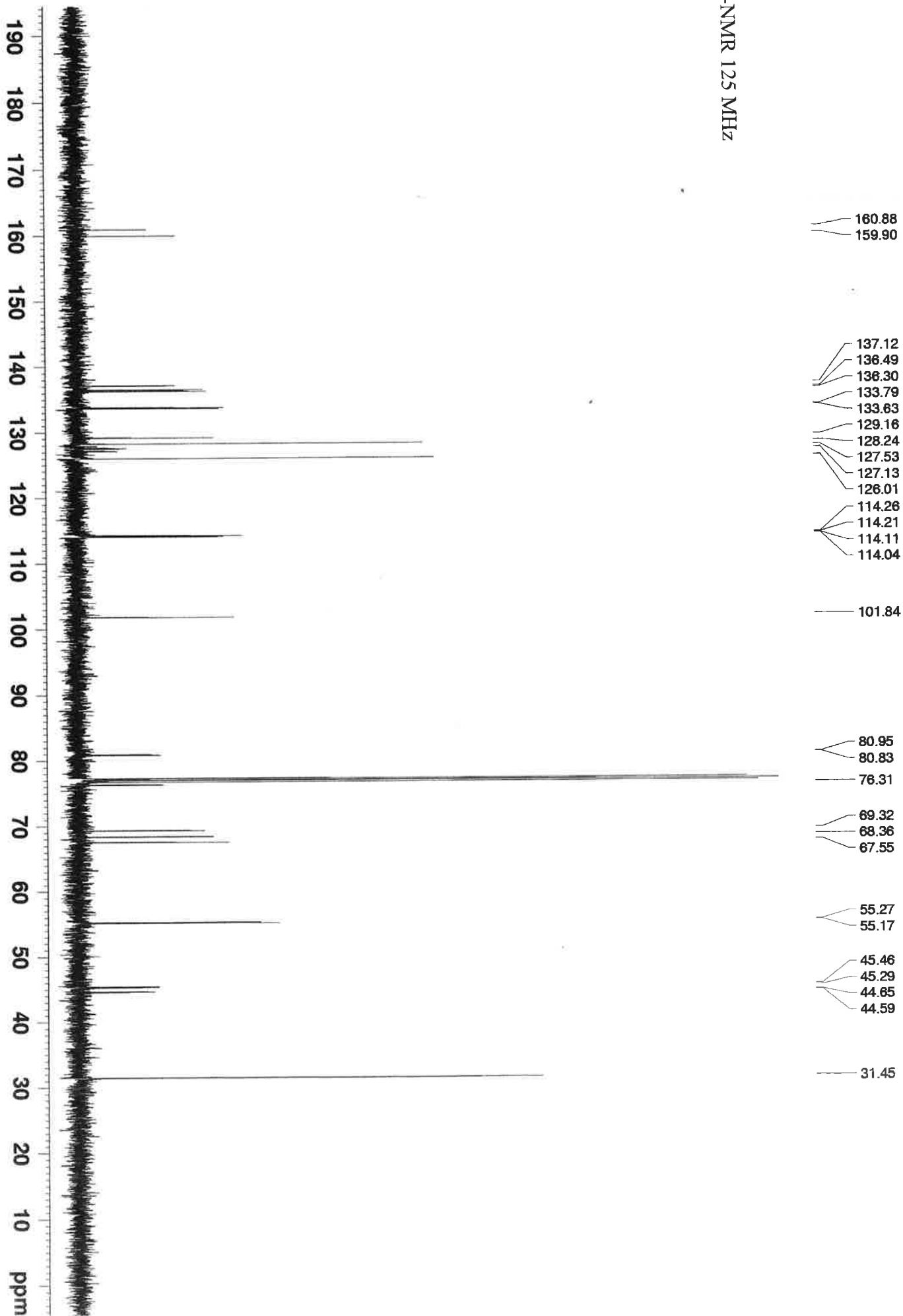


<sup>1</sup>H-NMR 500 MHz

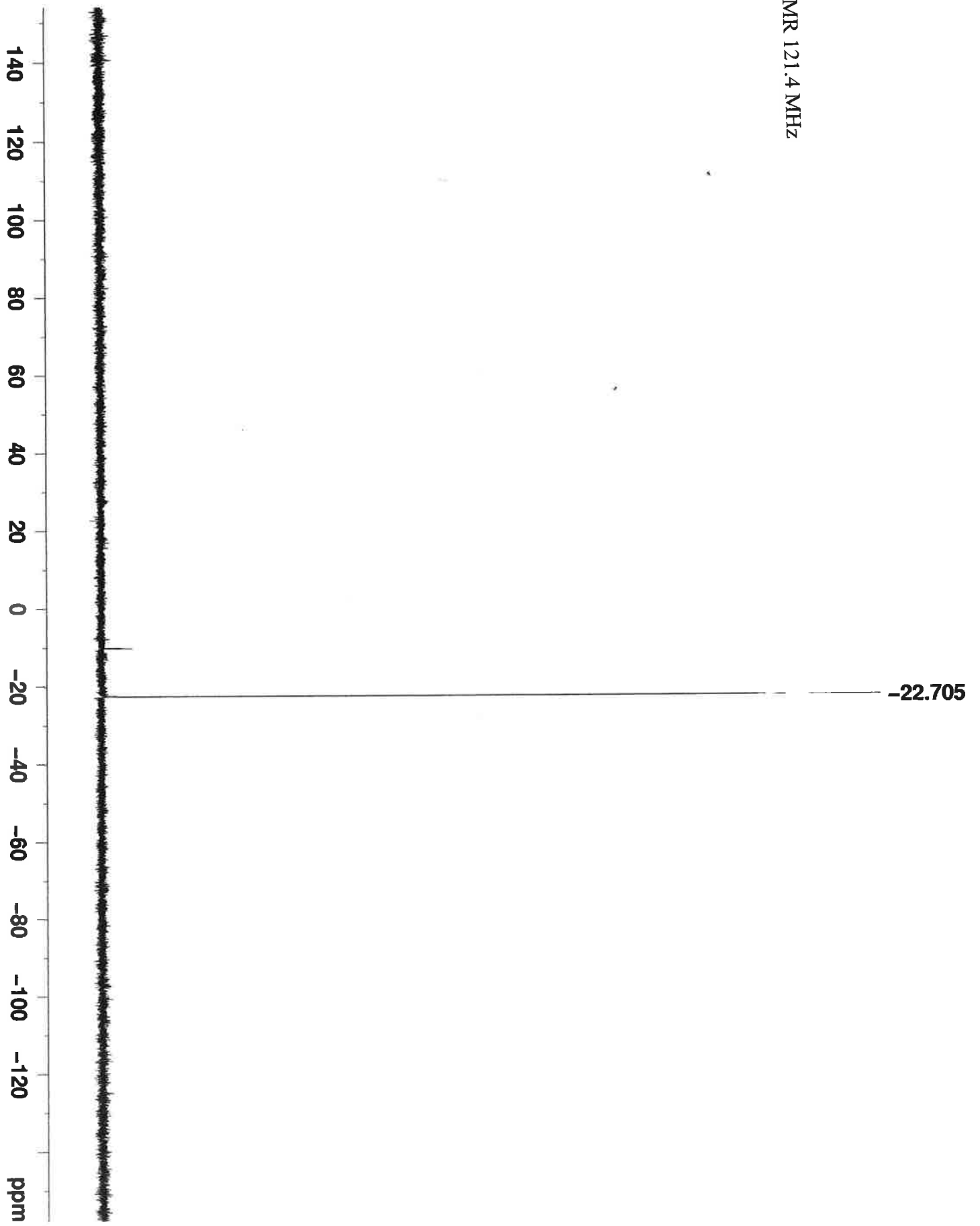




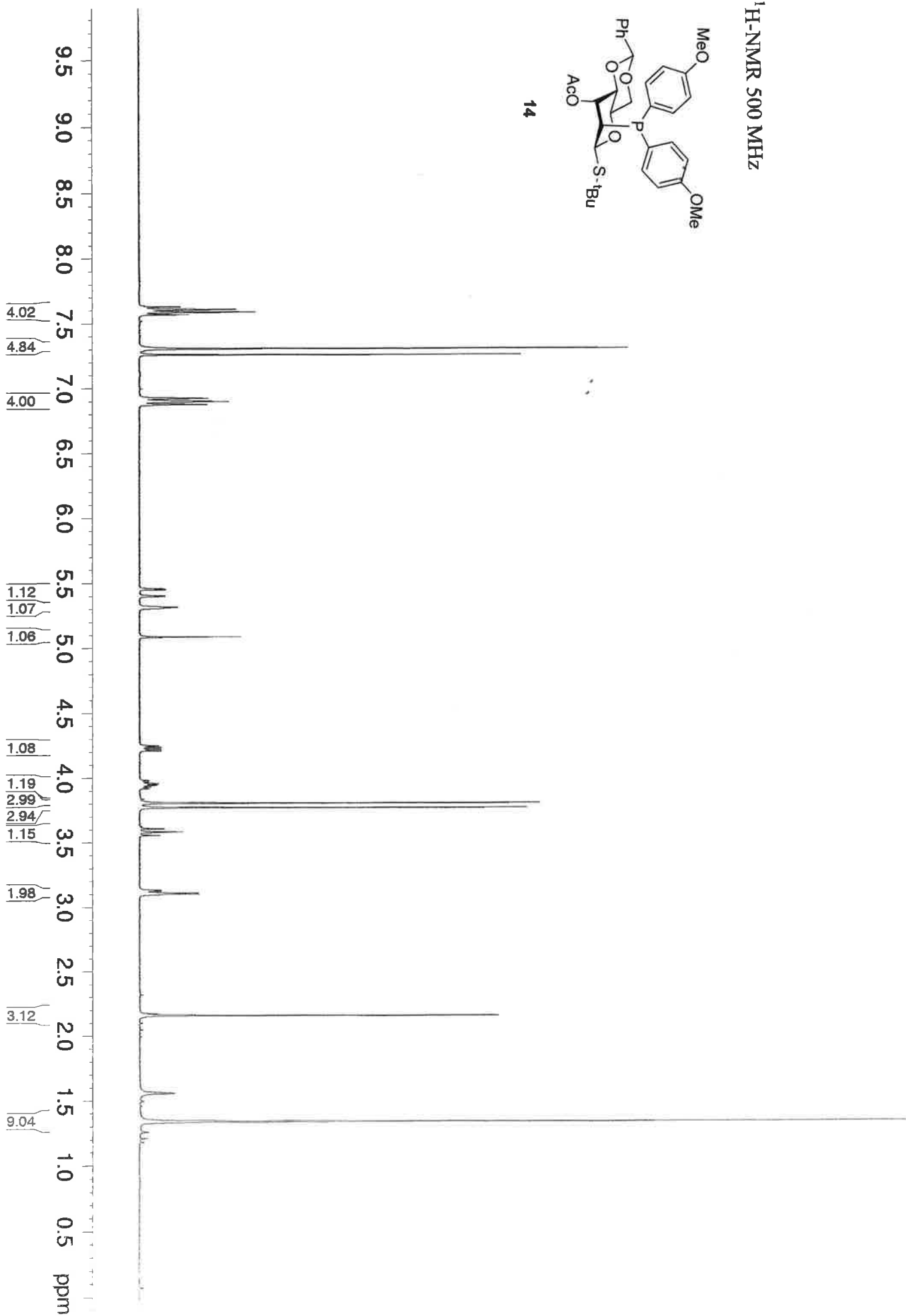
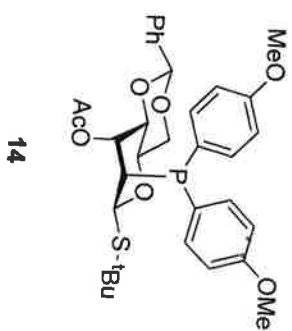
<sup>13</sup>C-NMR 125 MHz



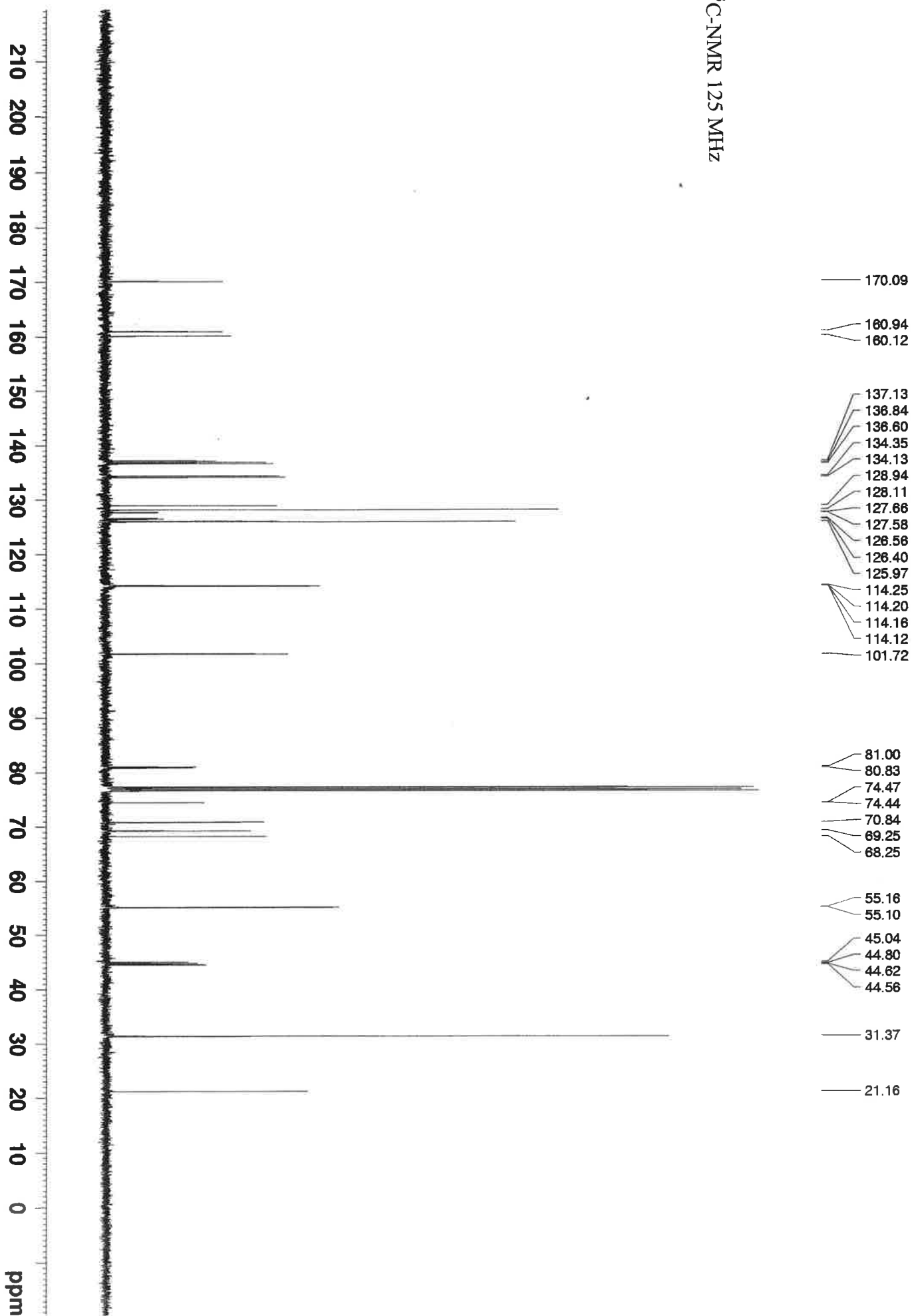
$^{31}\text{P}$ -NMR 121.4 MHz



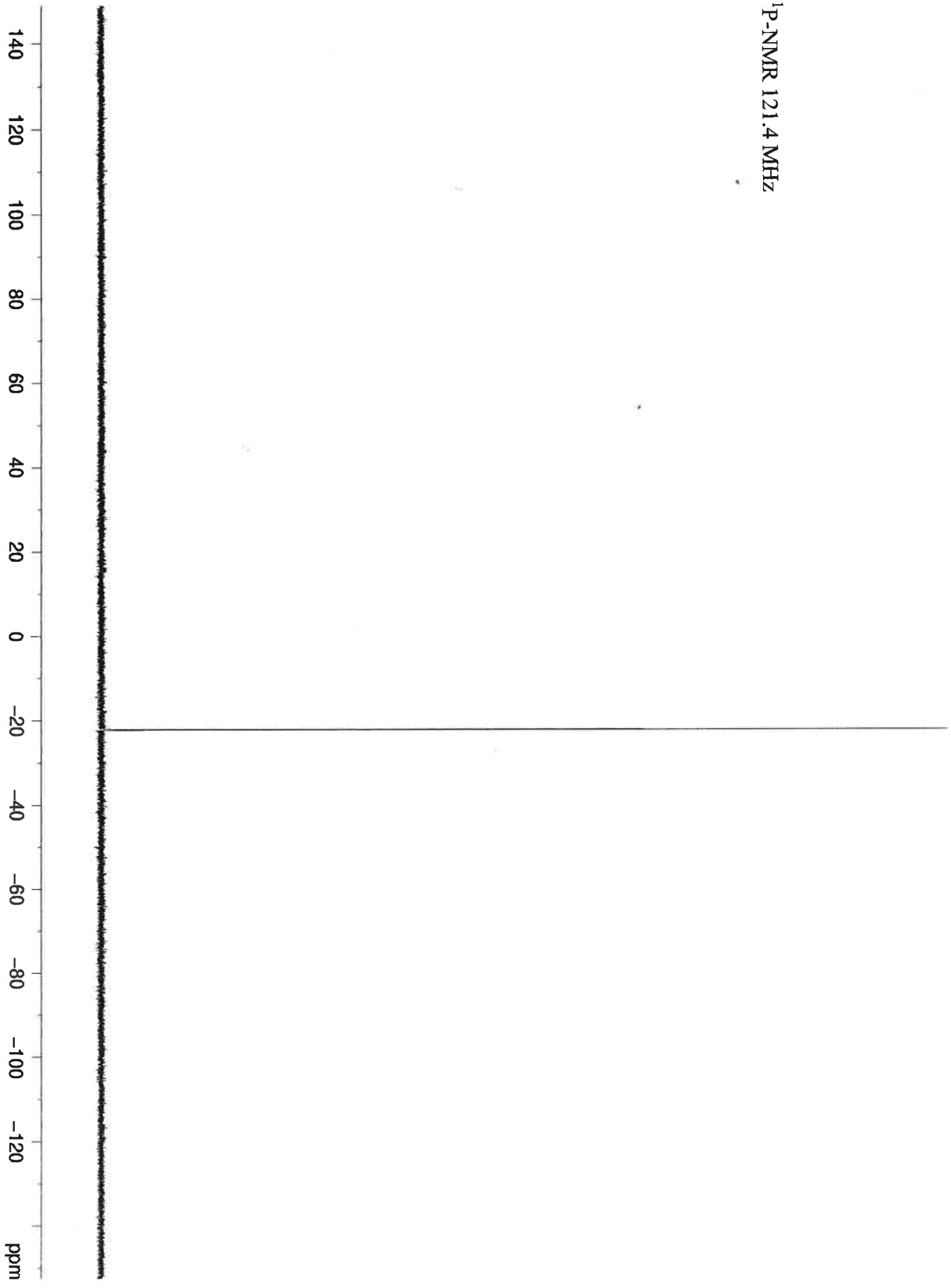
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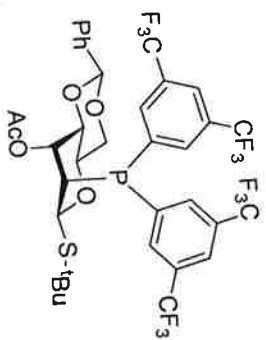
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$^{31}\text{P}$ -NMR 121.4 MHz



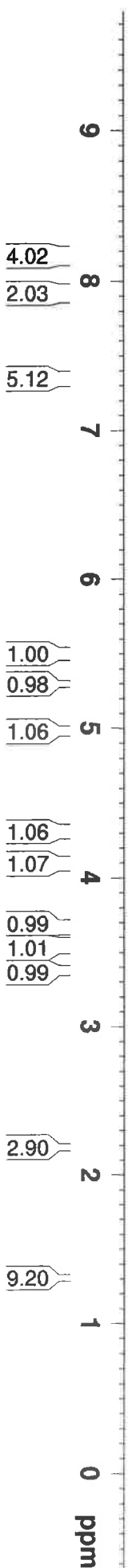
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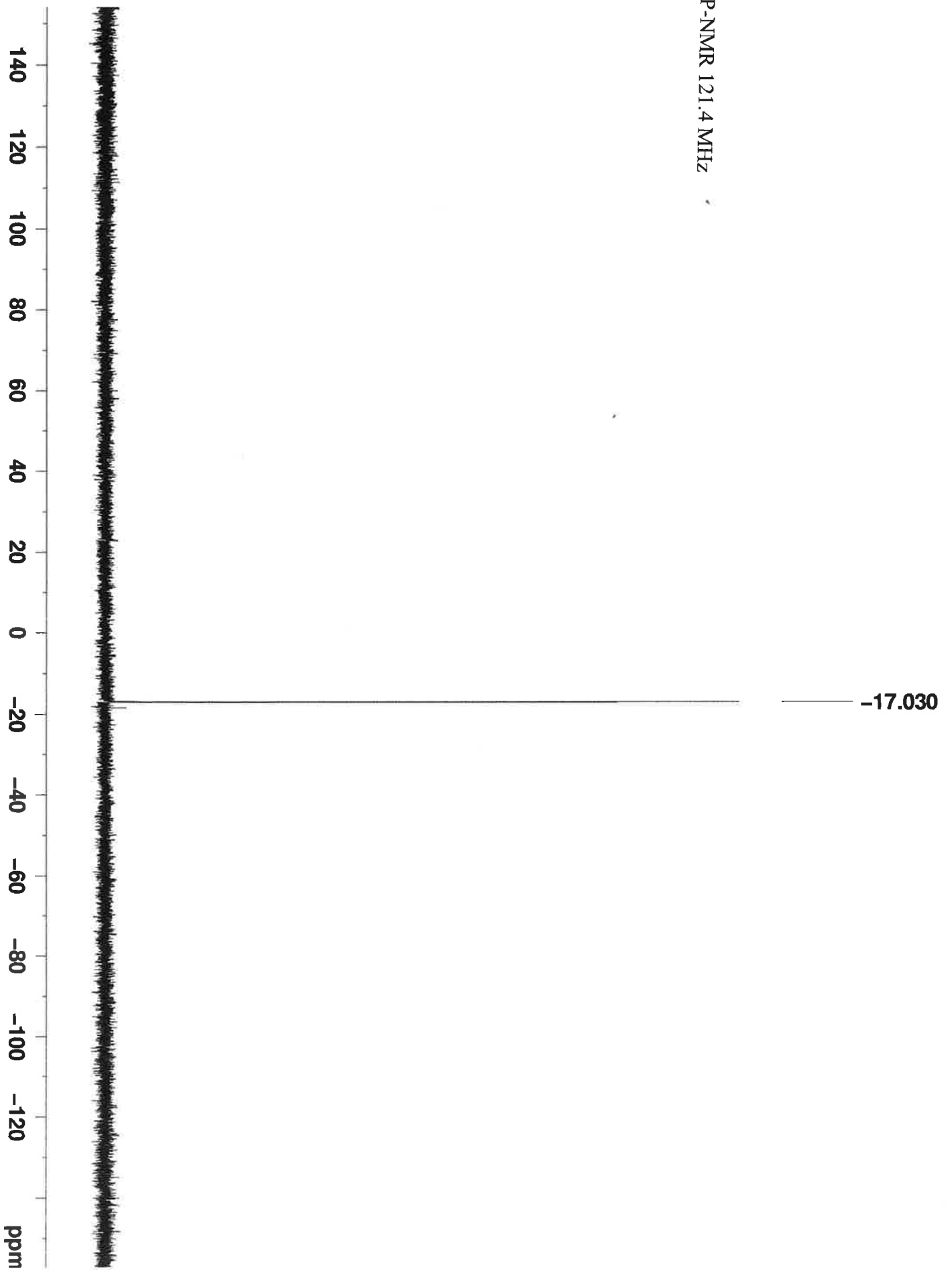
16

5.5 5.4 5.3 5.2 5.1 5.0 4.9 4.8 4.7 4.6 4.5 4.4 4.3 4.2 4.1 4.0 3.9 3.8 3.7 3.6 3.5 3.4 ppm

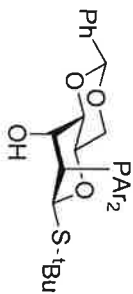
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5.522  
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5.293  
4.985  
4.327  
4.318  
4.306  
4.297  
4.110  
4.091  
4.081  
4.072  
4.062  
4.038  
4.026  
3.687  
3.667  
3.646  
3.558  
3.539  
3.390  
2.312  
2.216  
2.191  
2.053  
2.048  
1.810  
1.612  
1.597  
1.543  
1.376  
1.360  
1.345  
1.315  
1.274  
1.261  
1.209  
0.937  
0.923  
0.909  
0.896  
0.882



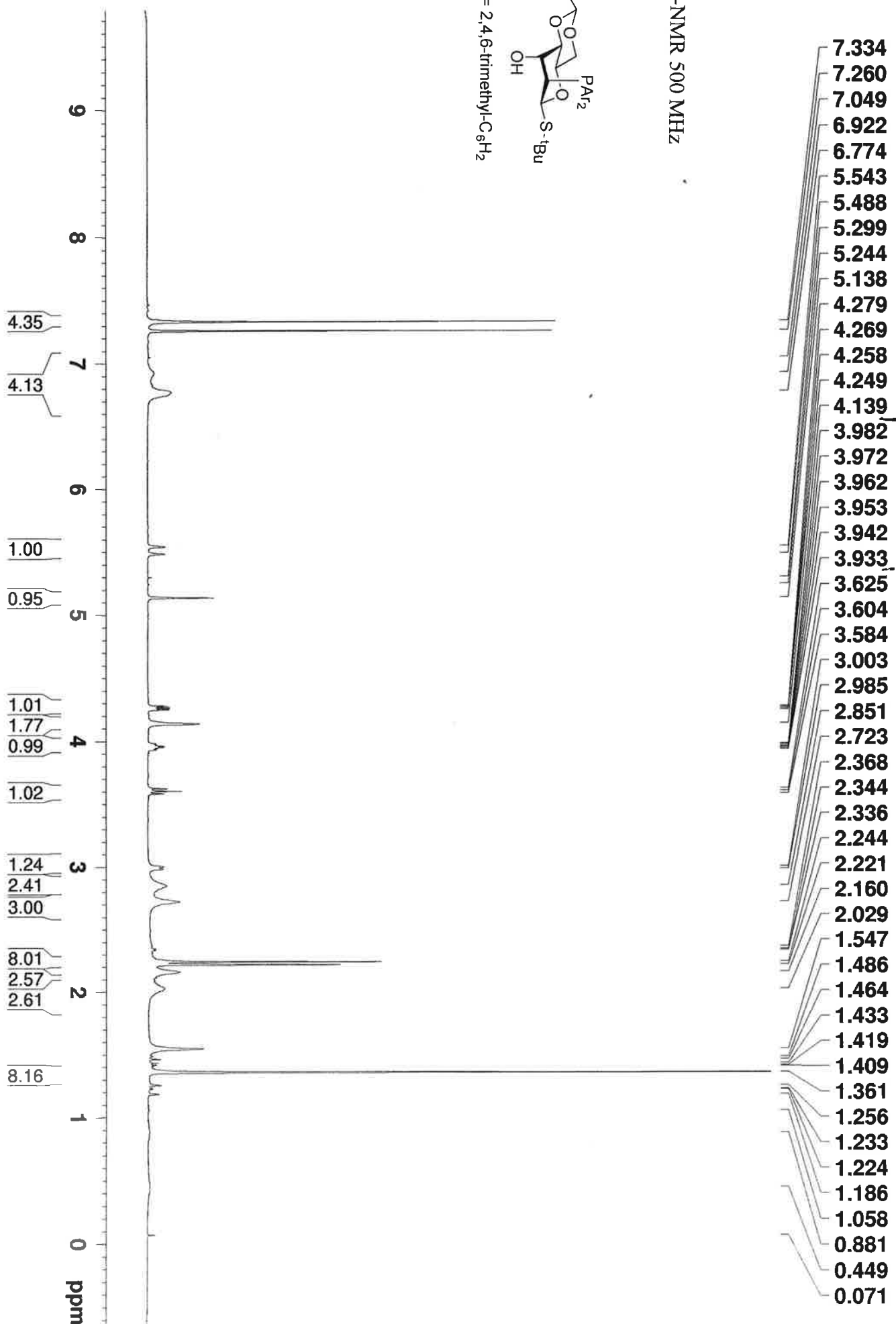
$^3\text{P}$ -NMR 121.4 MHz



<sup>1</sup>H-NMR 500 MHz

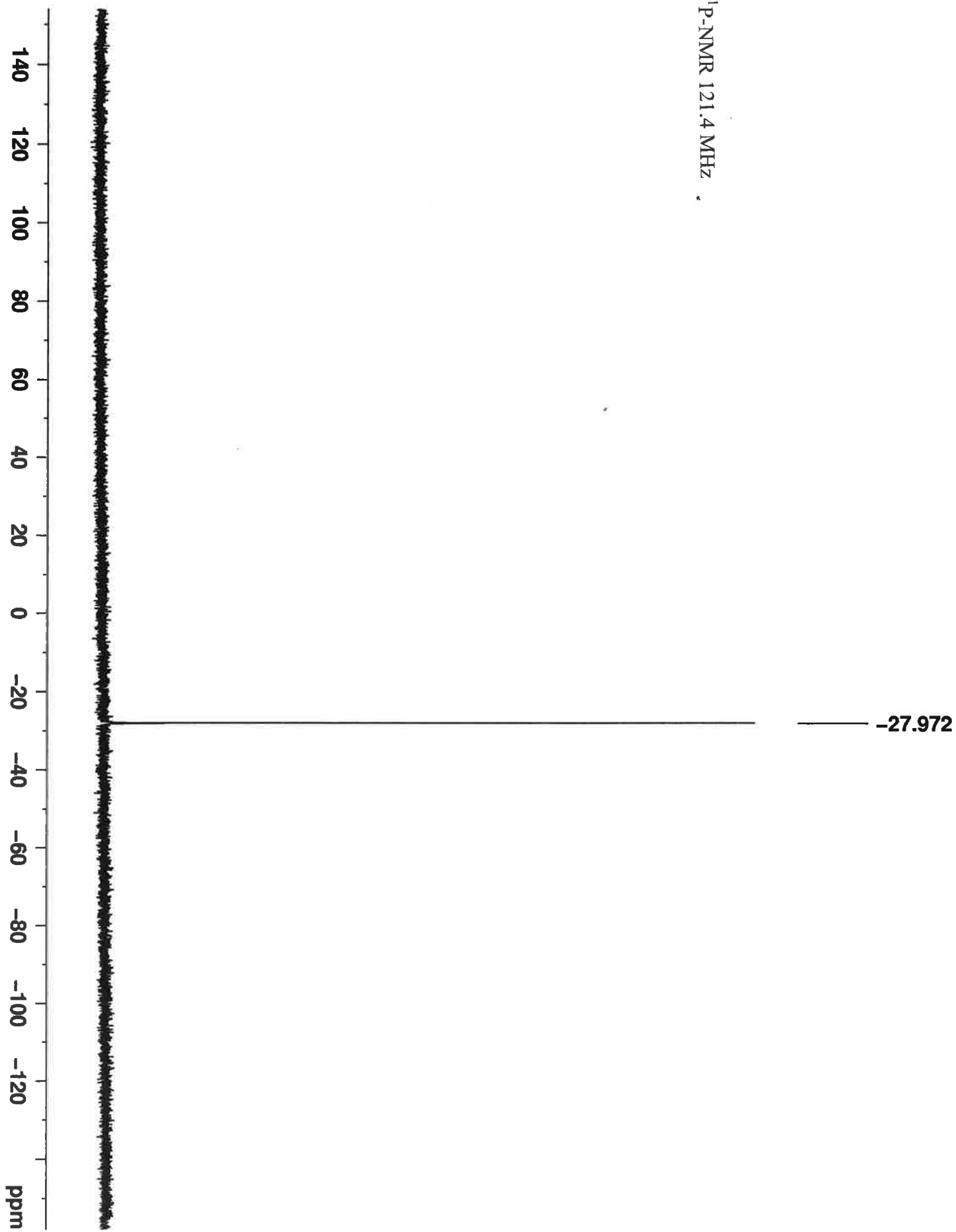


17 Ar = 2,4,6-trimethyl-C<sub>6</sub>H<sub>3</sub>

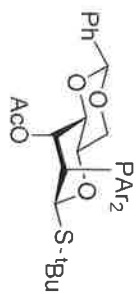




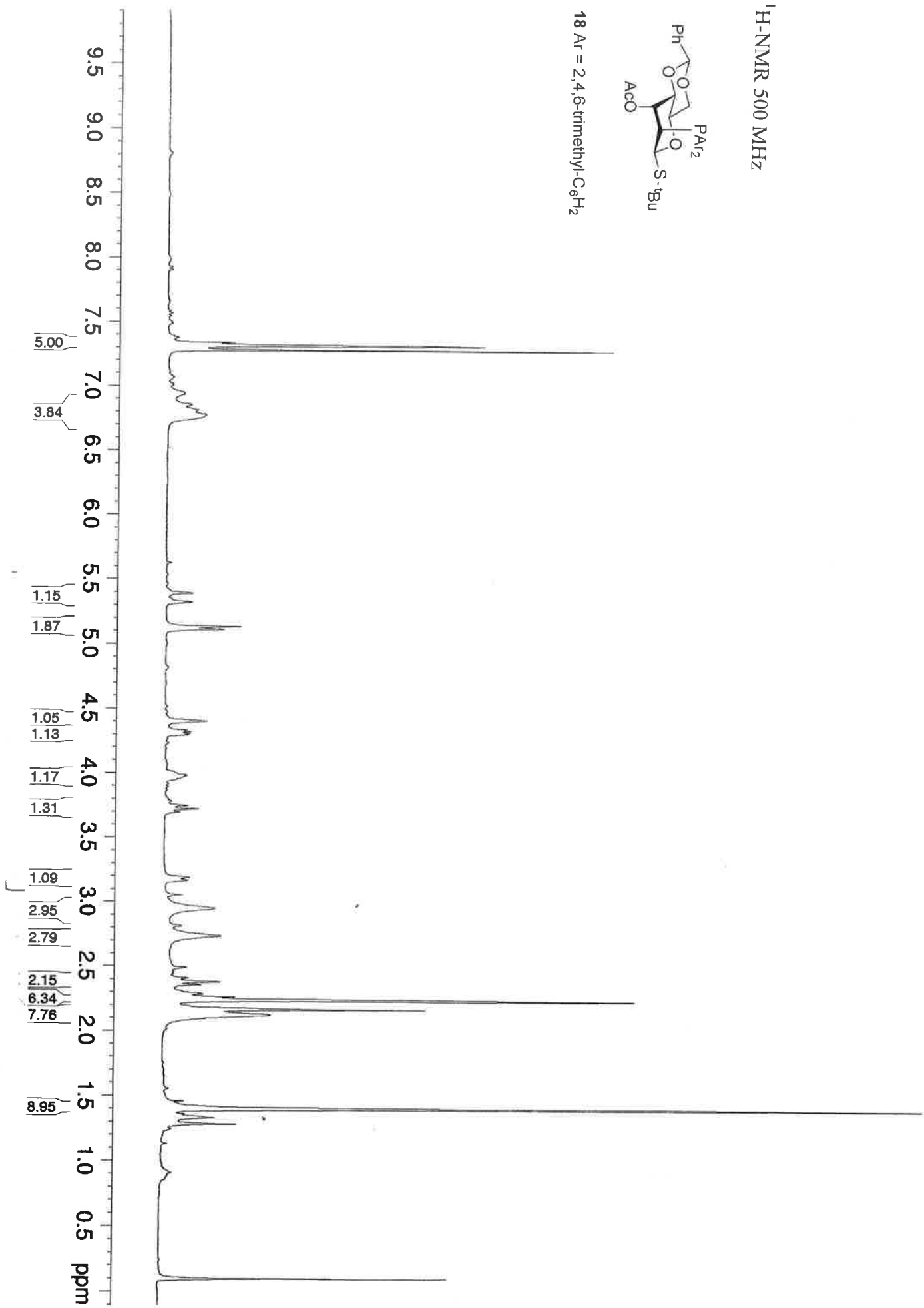
$^3\text{P}$ -NMR 121.4 MHz



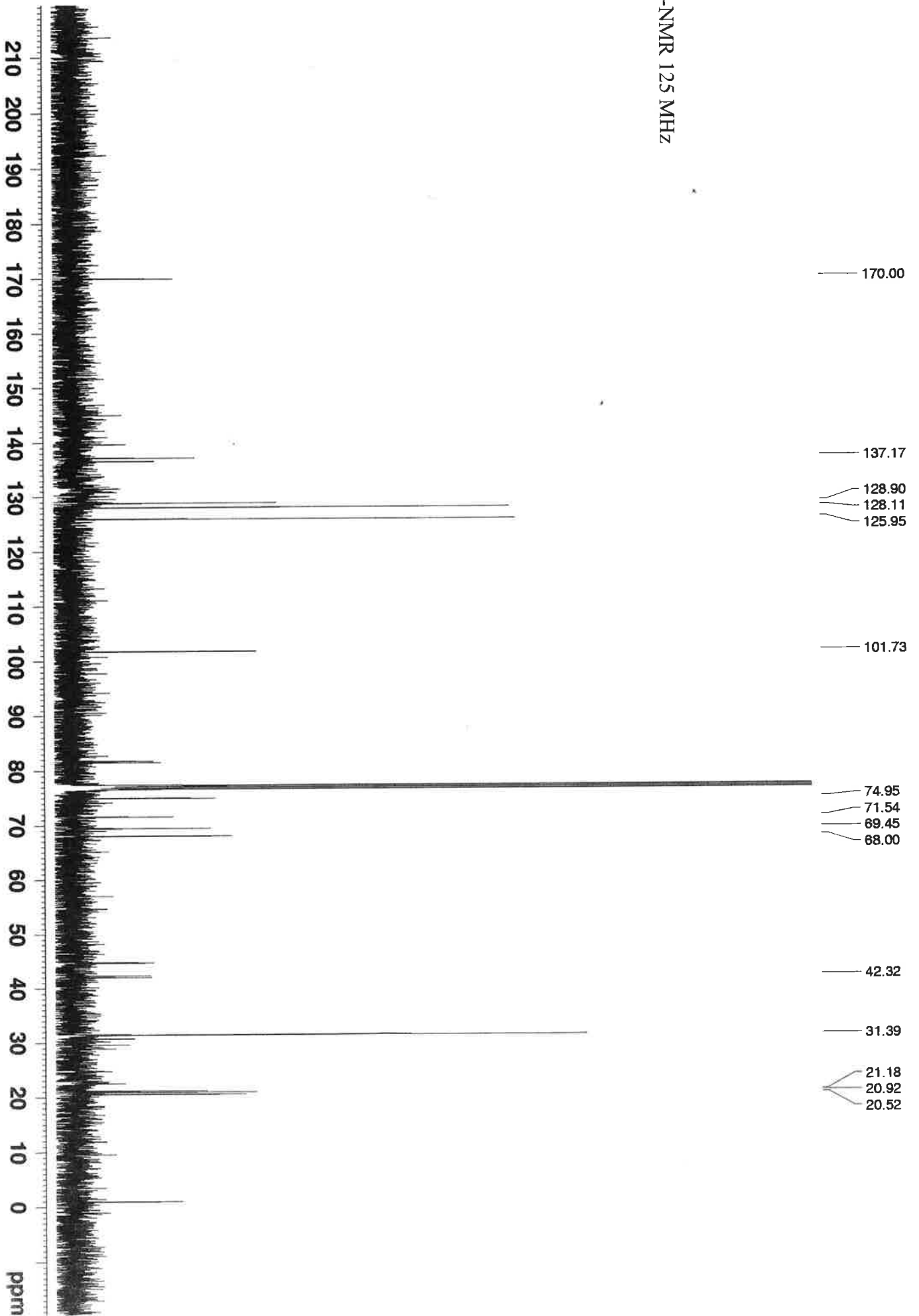
<sup>1</sup>H-NMR 500 MHz



**18** Ar = 2,4,6-trimethyl-C<sub>6</sub>H<sub>2</sub>



$^{13}\text{C-NMR}$  125 MHz



$^3\text{P}$ -NMR 121.4 MHz

