

# Asymmetric Synthesis of Functionalized Tetrasubstituted $\alpha$ -Aminophosphonates through Enantioselective Aza-Henry Reaction of Phosphorylated Ketimines

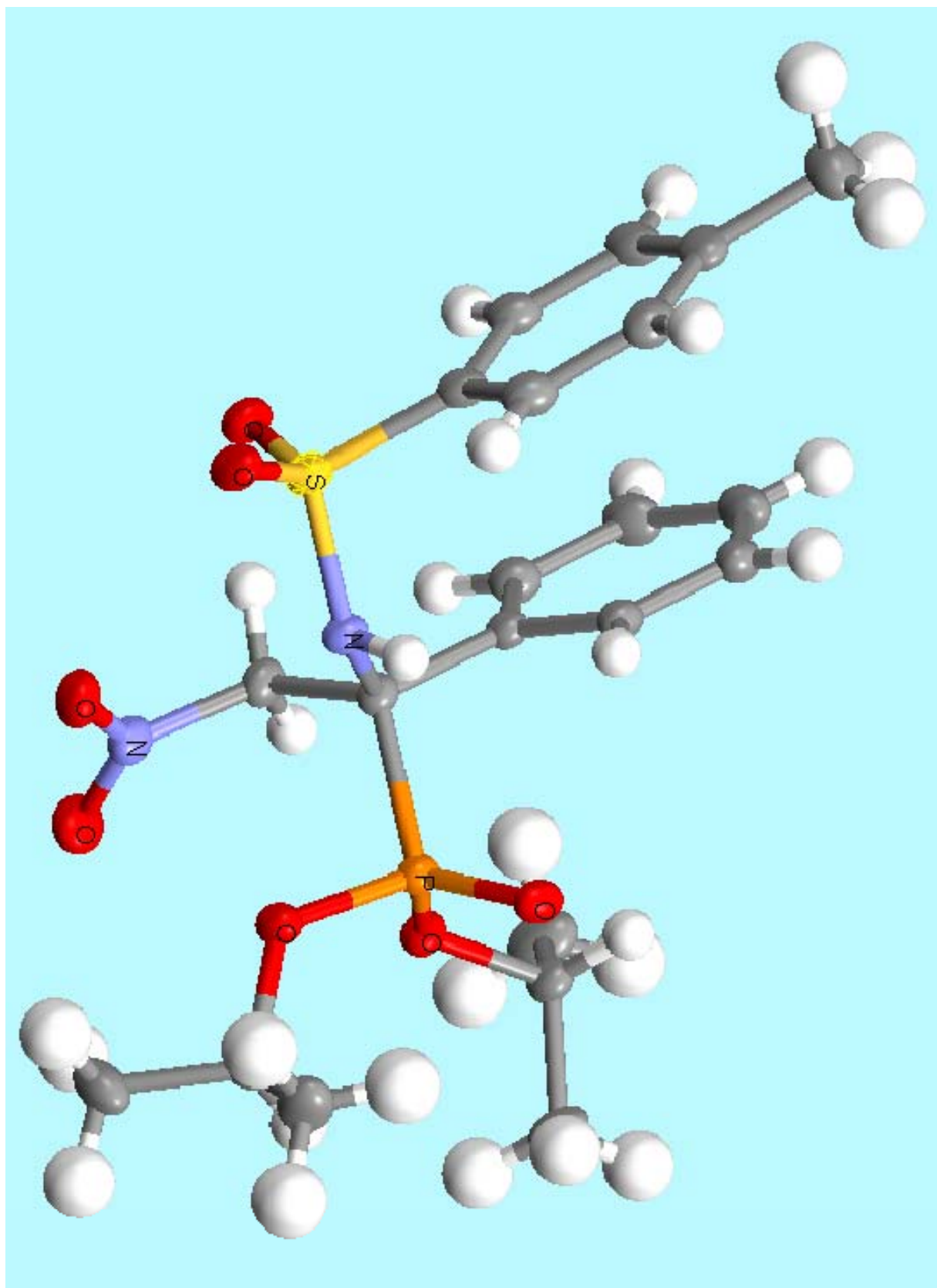
Javier Vicario, Pablo Ortiz, José M. Ezpeleta, and Francisco Palacios\*

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## Electronic Supporting information.

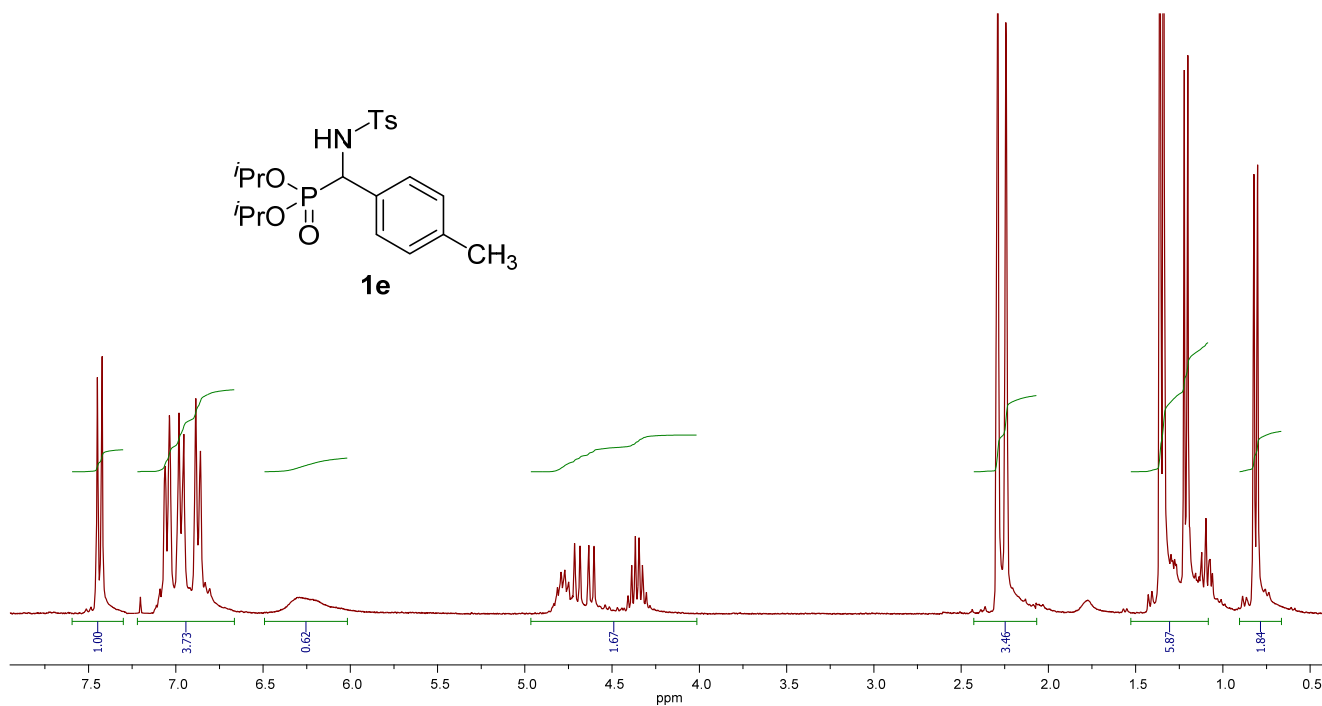
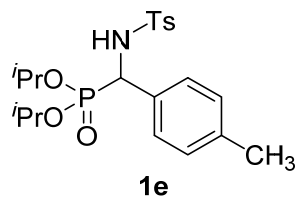
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1. Thermal ellipsoid plot of  $\alpha$ -amino phosphonate 3d (50% contour probability level).

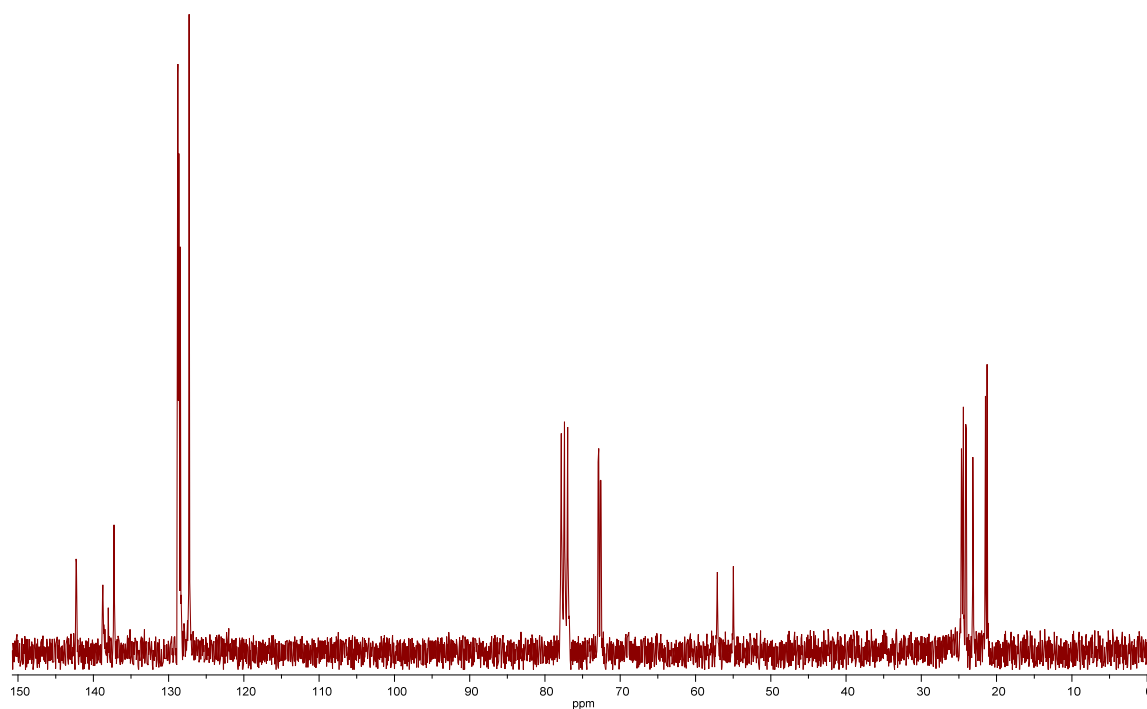


2.  $^1\text{H}$  and  $^{13}\text{C}$  NMR copies of *N*-tosyl  $\alpha$ -aminophosphonates 1.

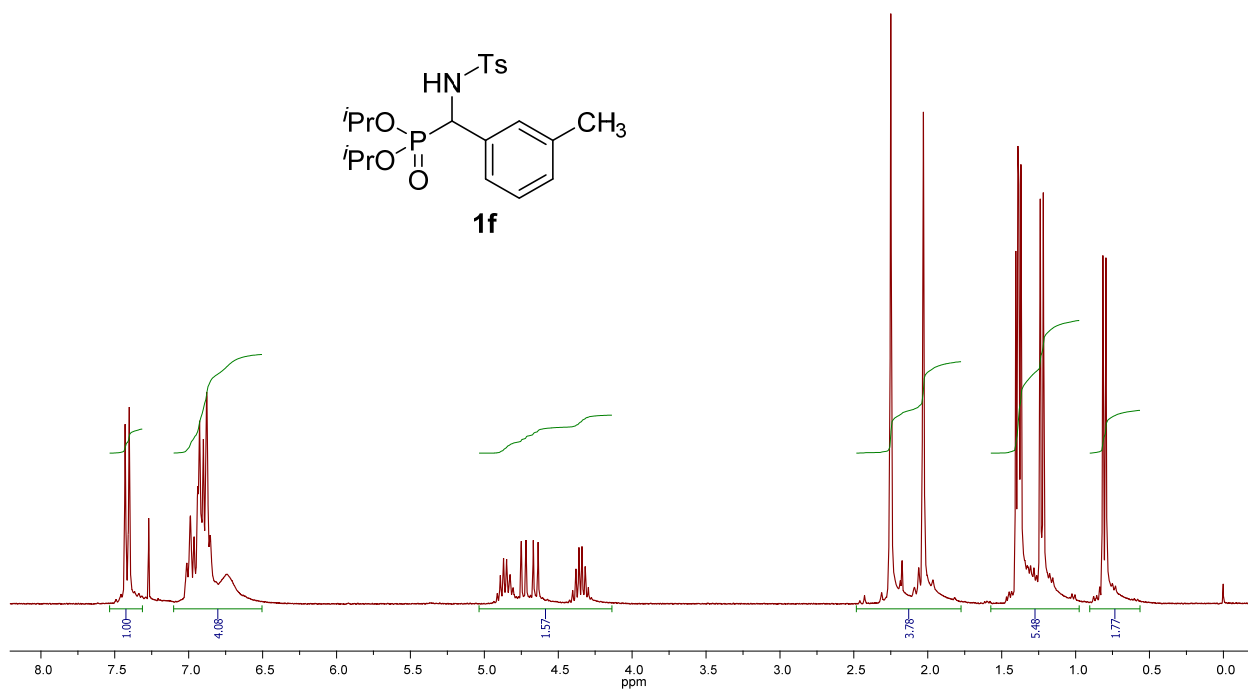
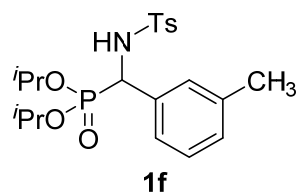
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



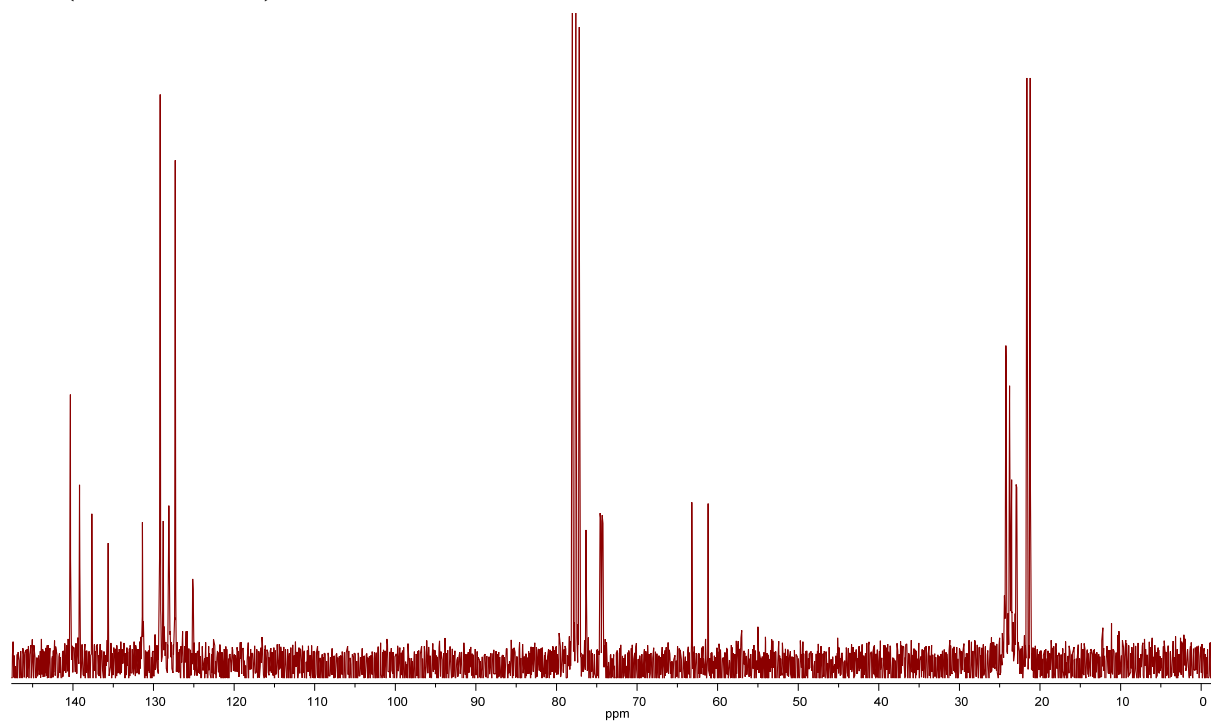
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



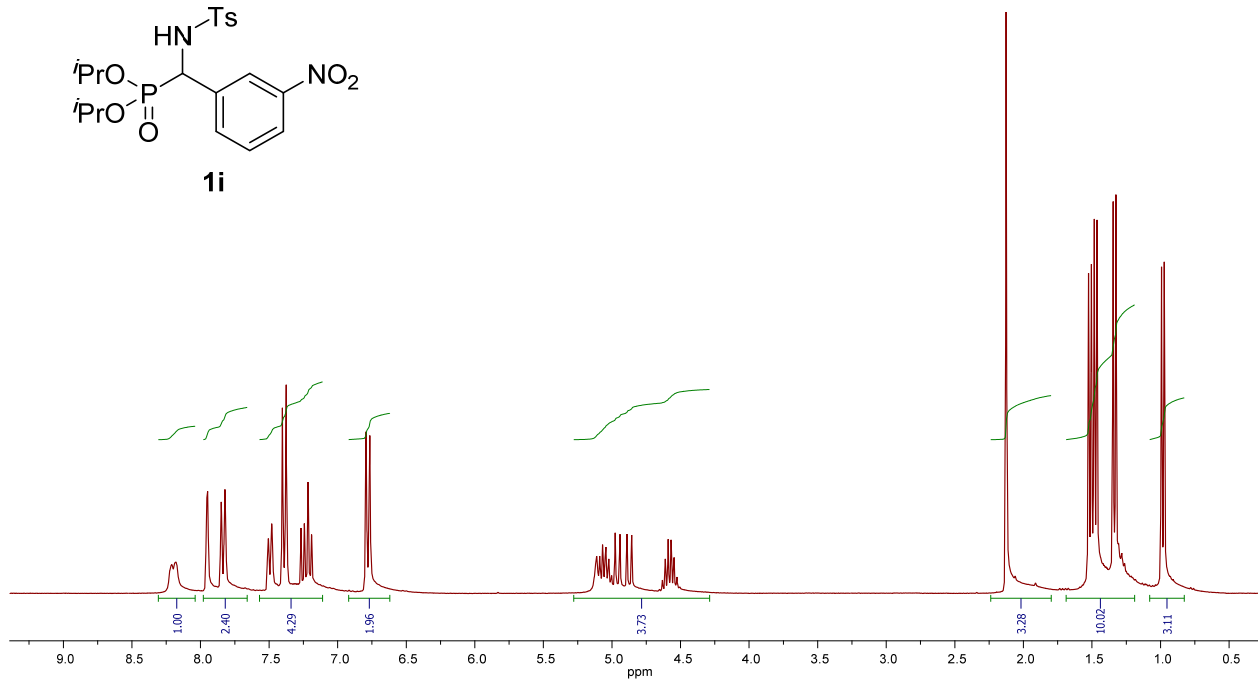
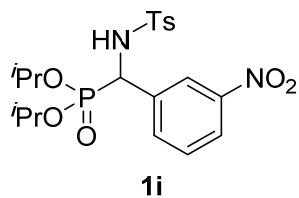
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



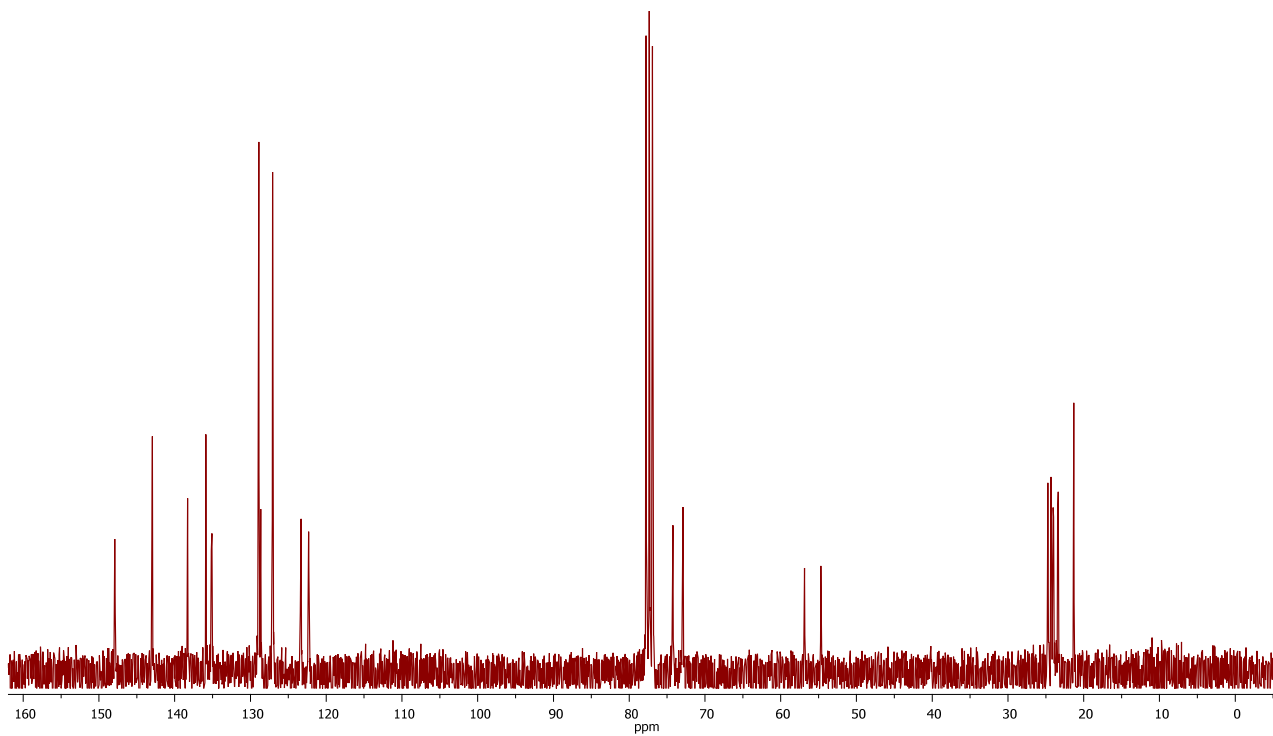
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



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

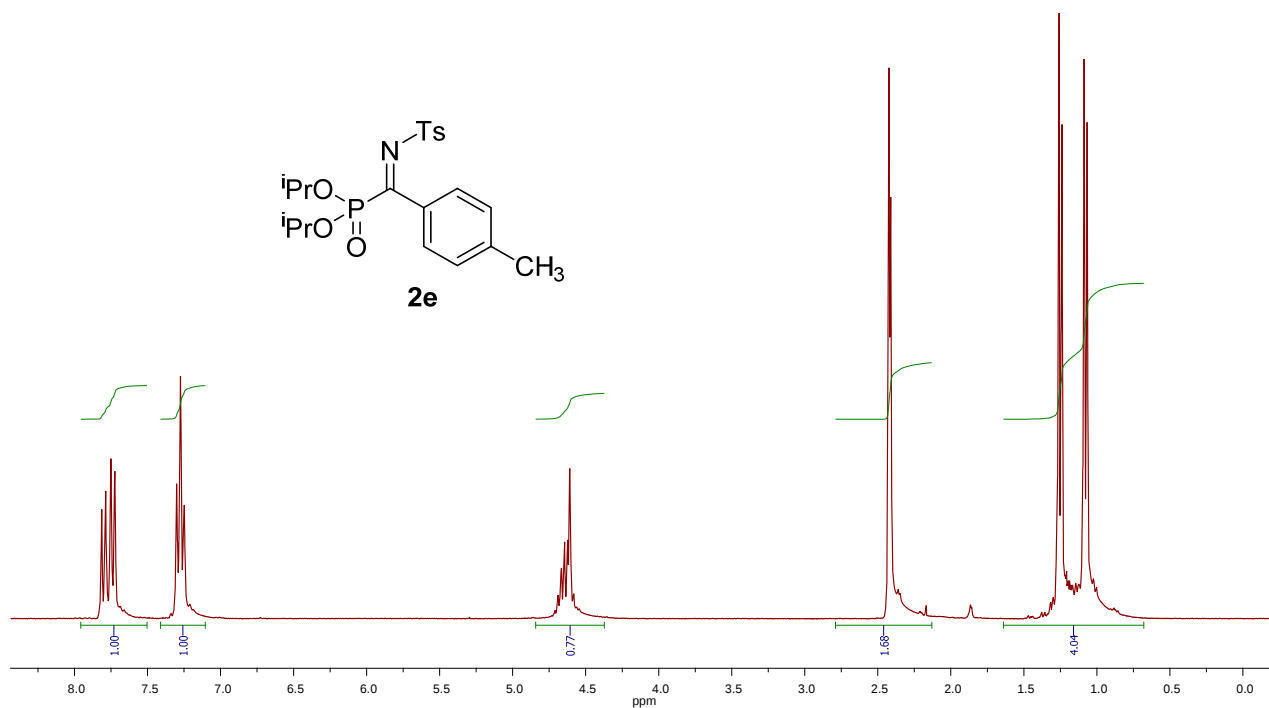


$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)

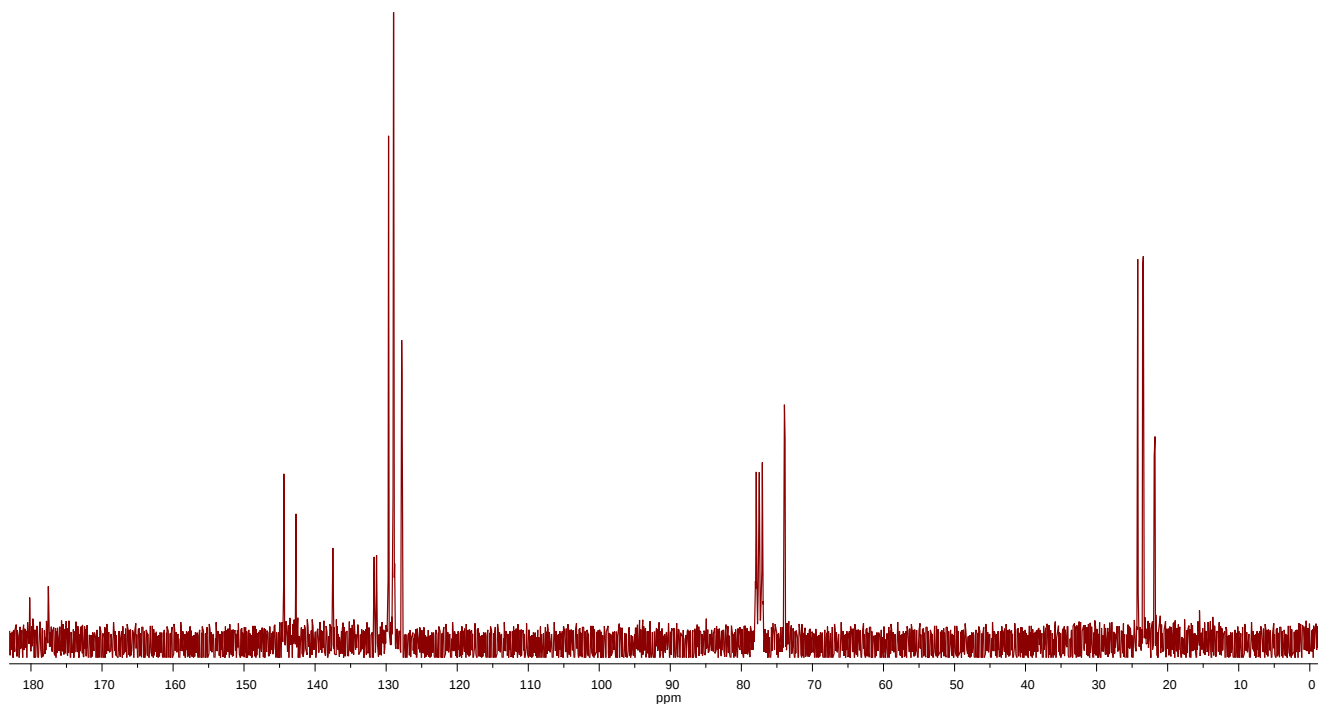


3.  $^1\text{H}$  and  $^{13}\text{C}$  NMR copies of *N*-tosyl  $\alpha$ -iminophosphonates 2.

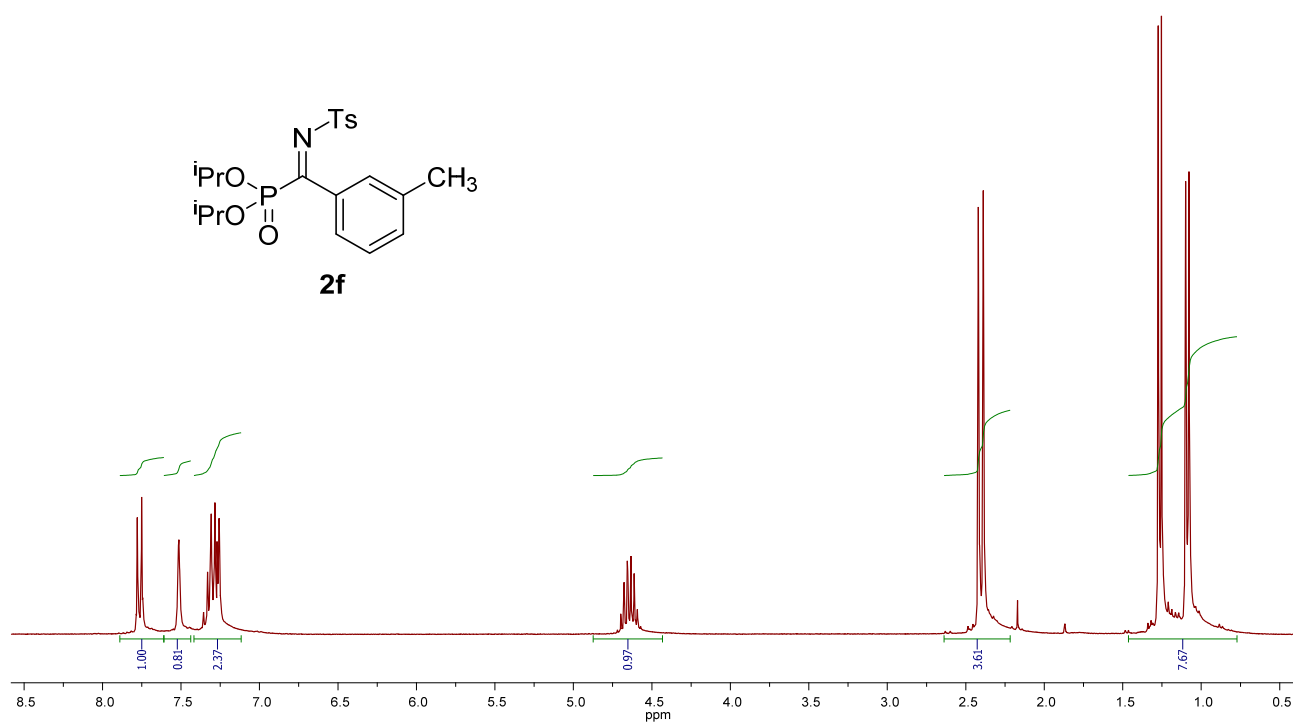
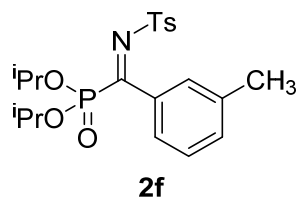
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



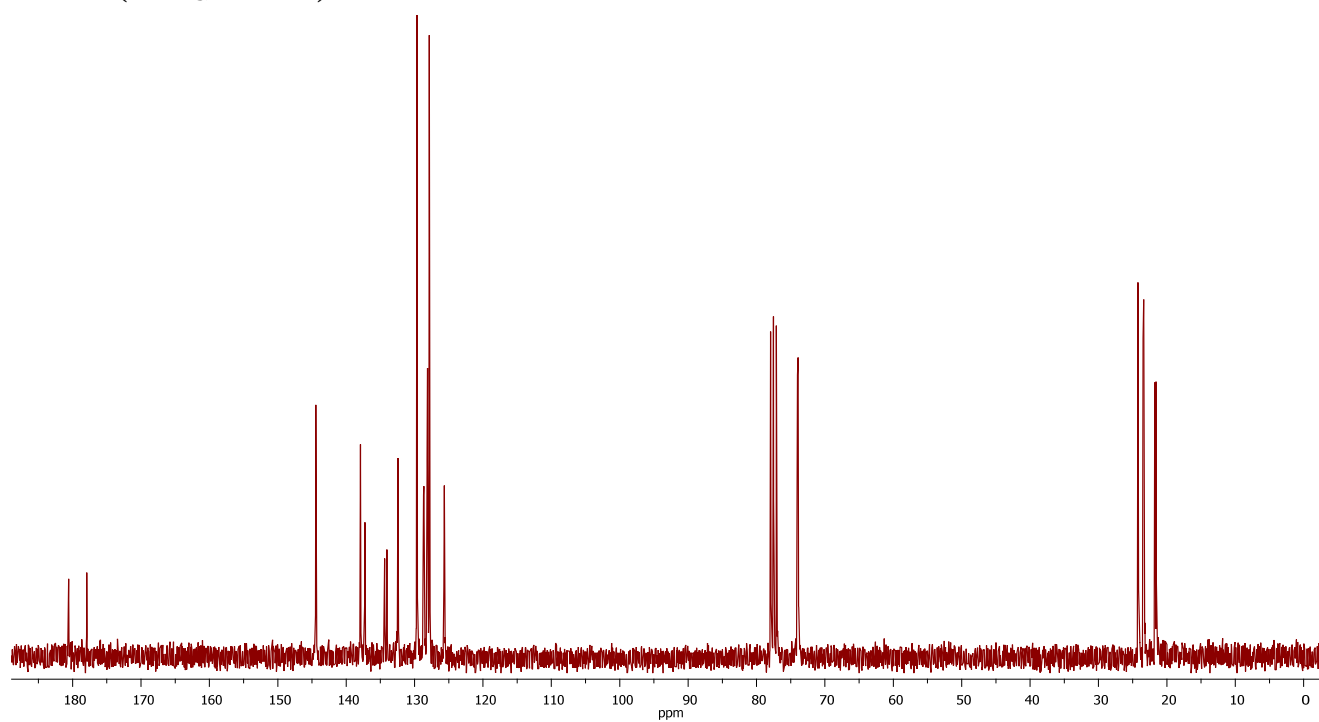
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



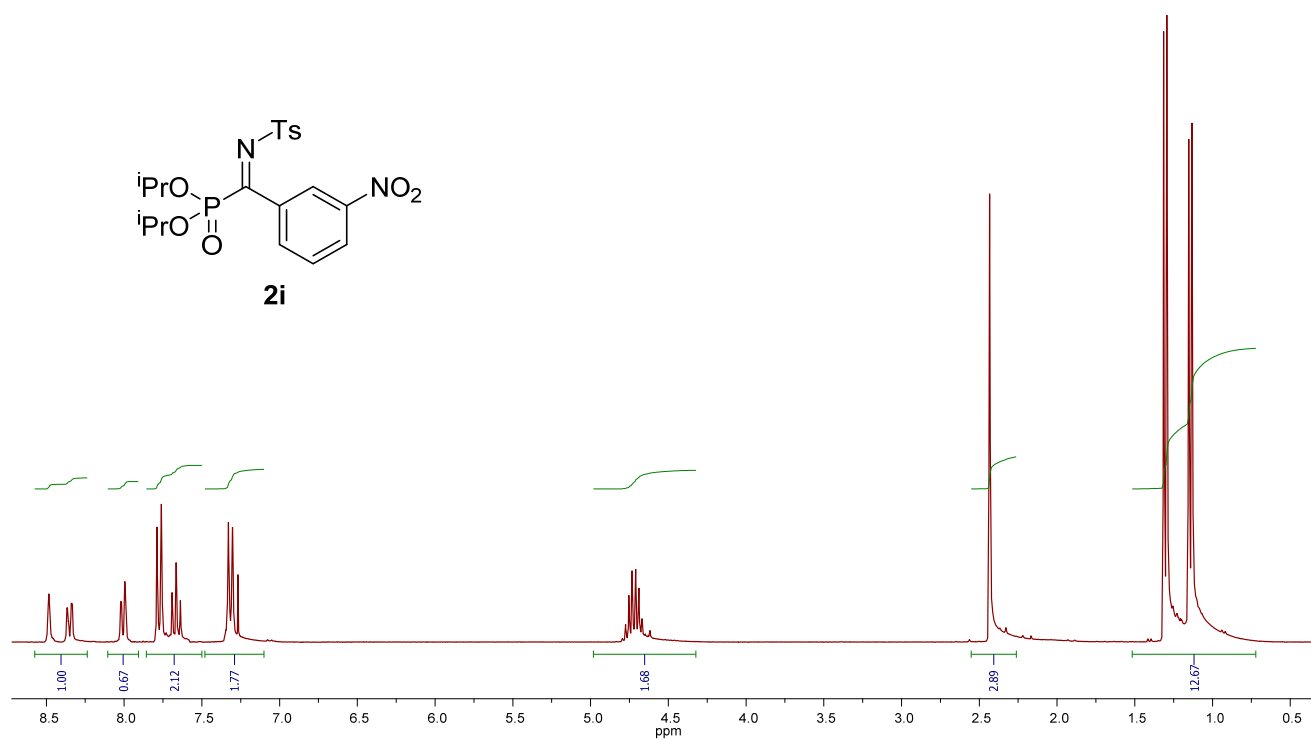
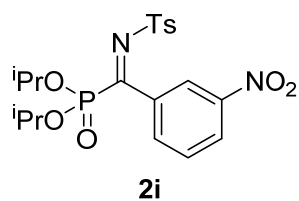
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



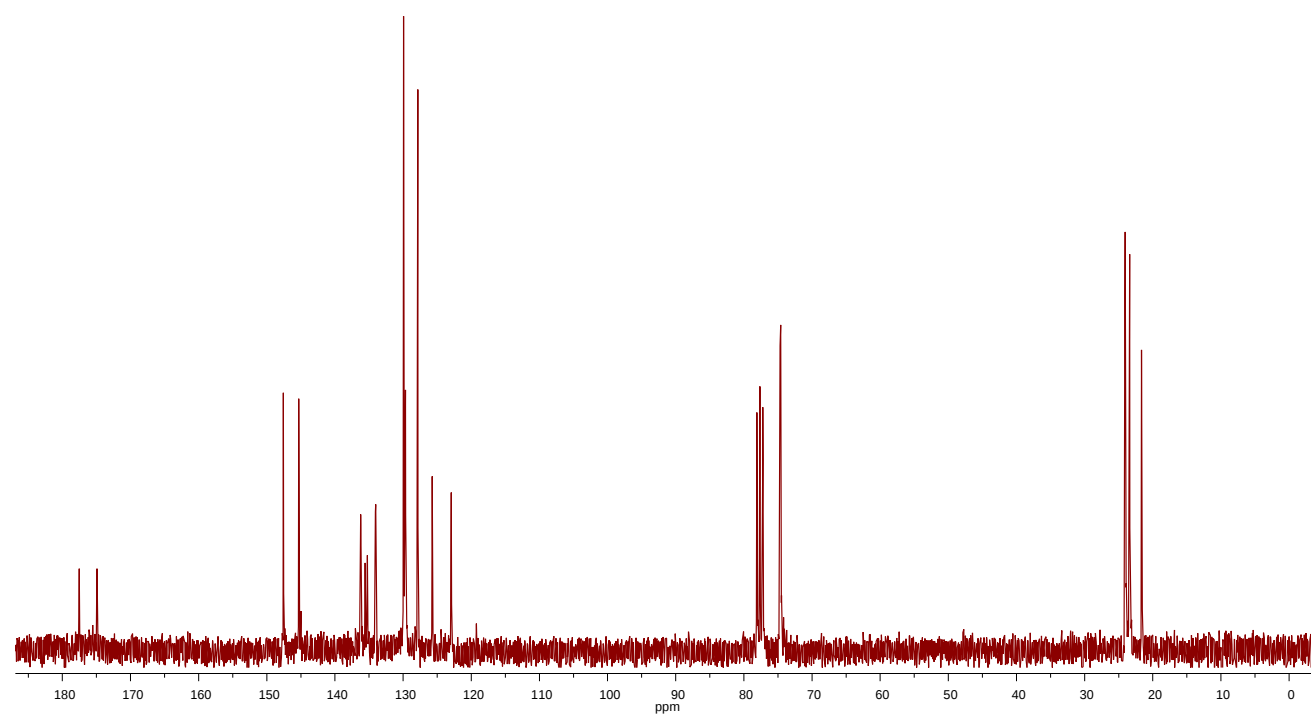
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



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

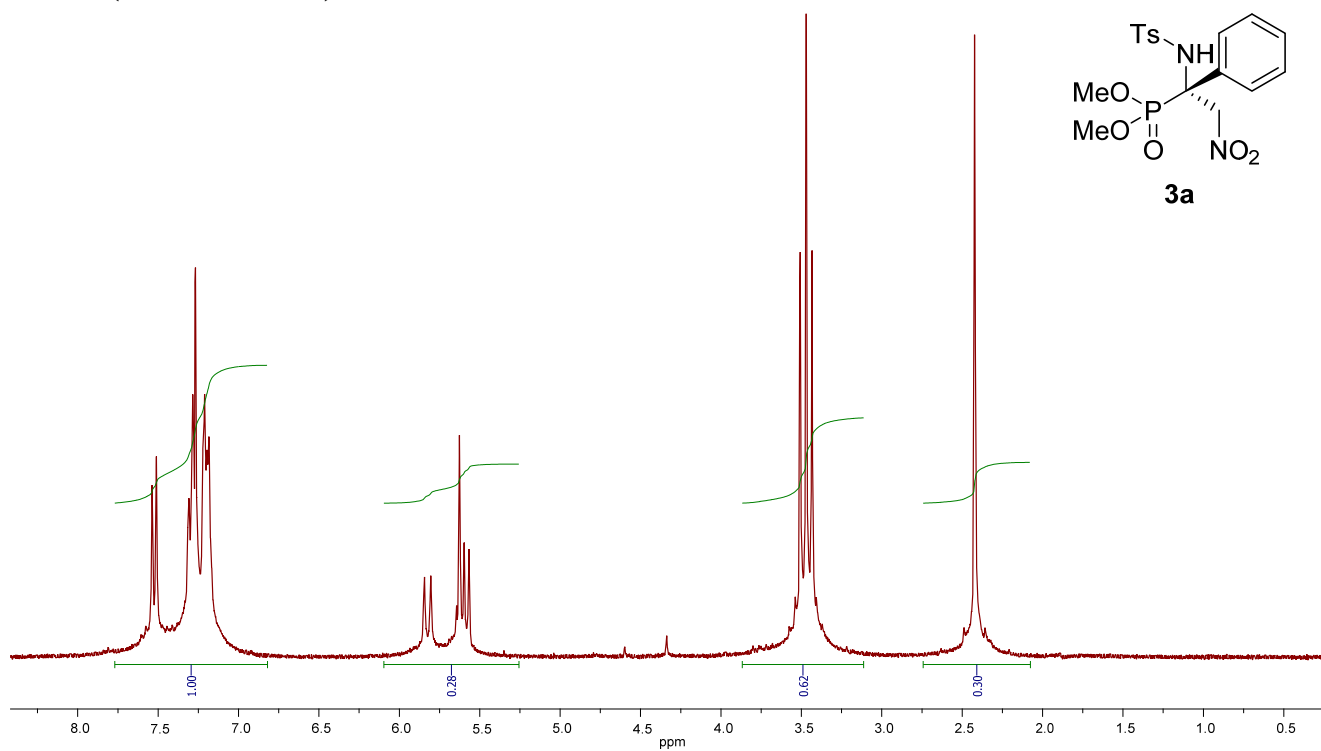


$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)

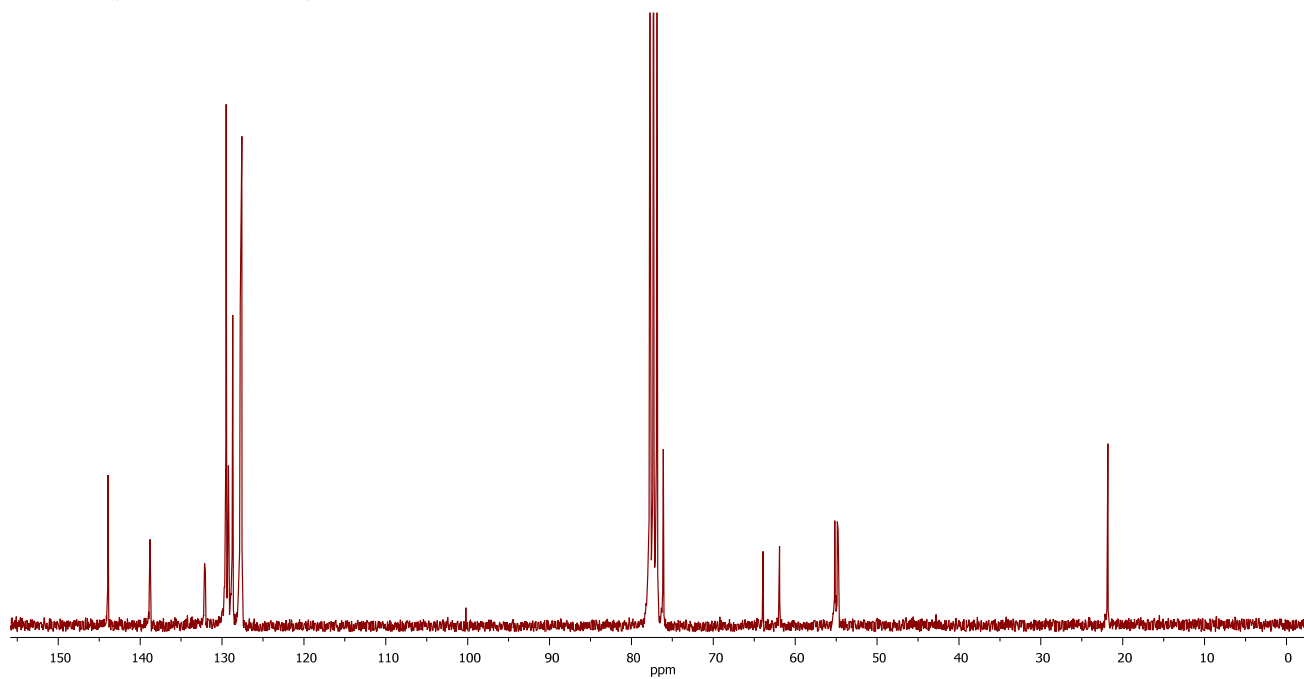


4.  $^1\text{H}$  and  $^{13}\text{C}$  NMR copies of  $\alpha$ -amino  $\beta$ -nitrophosphonates 3.

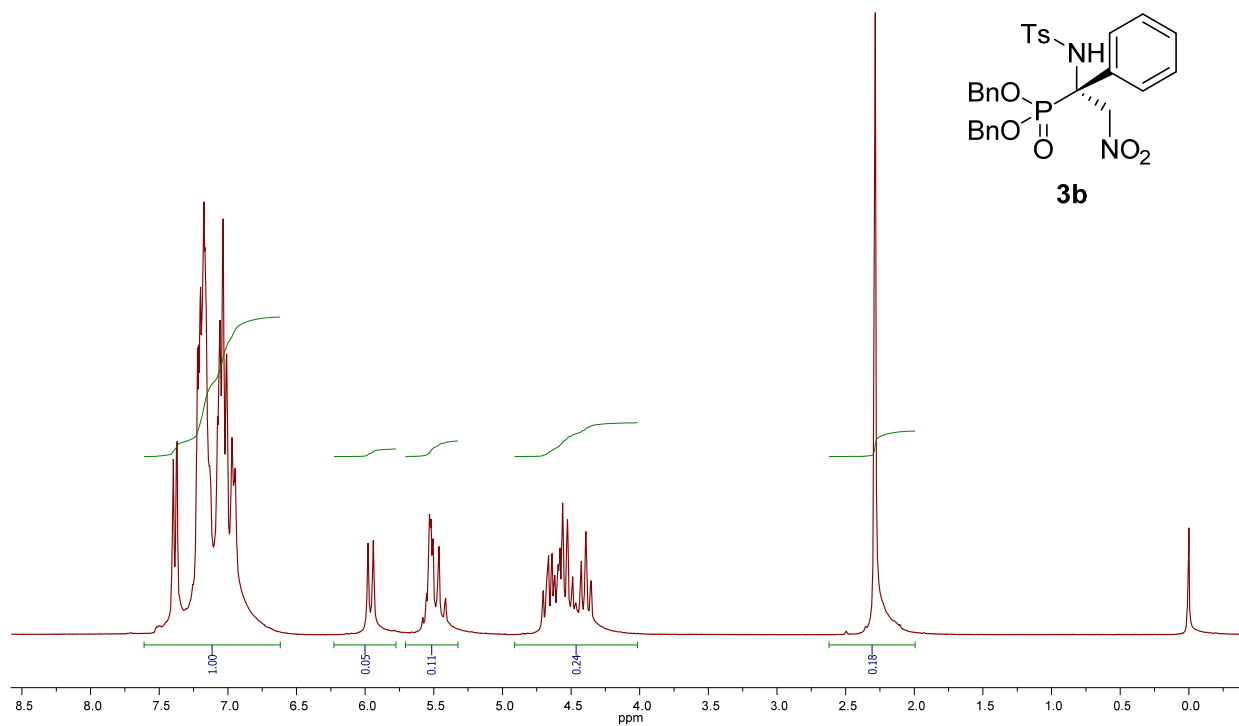
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



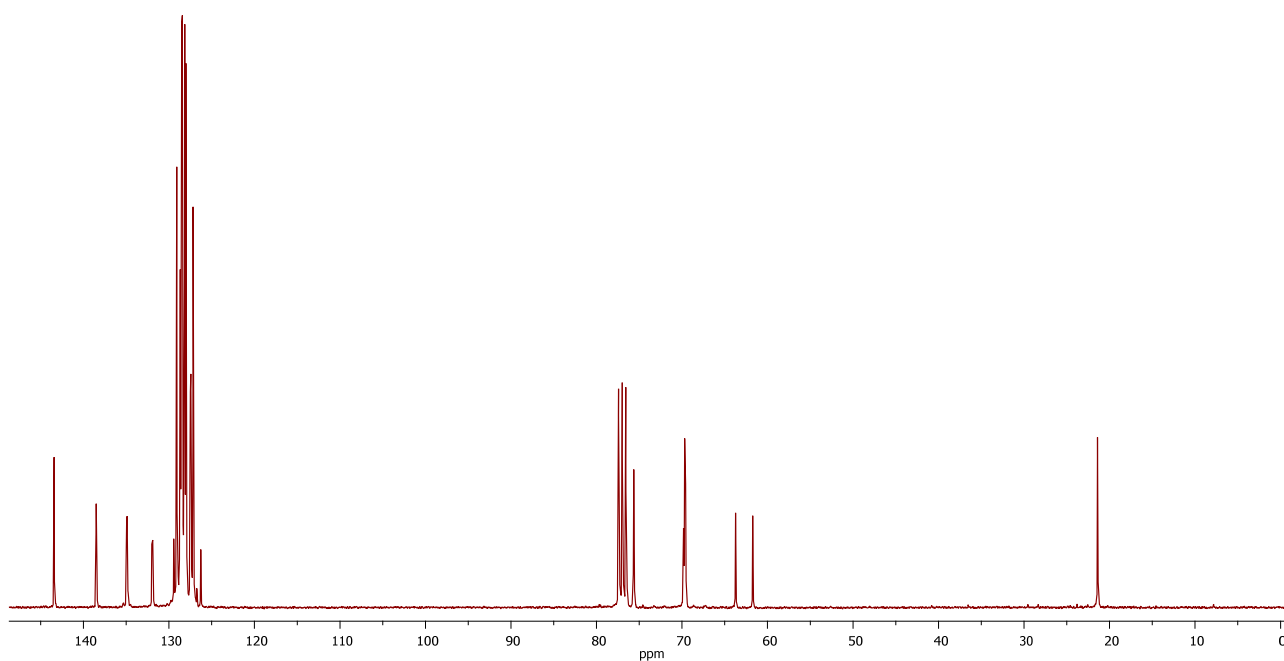
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



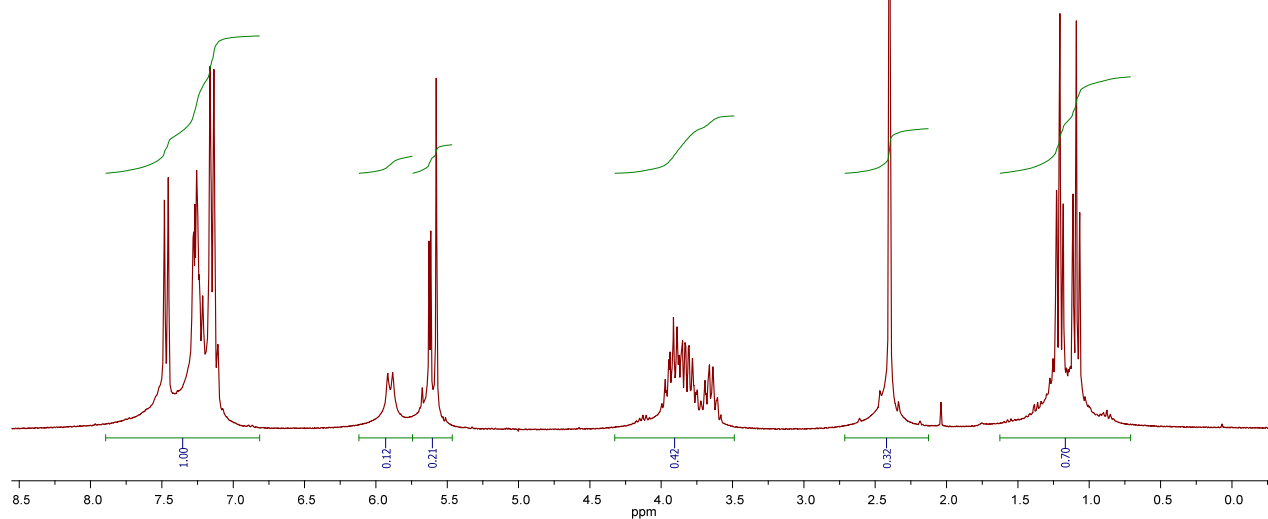
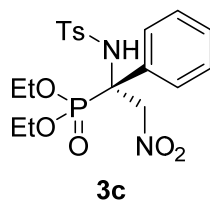
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



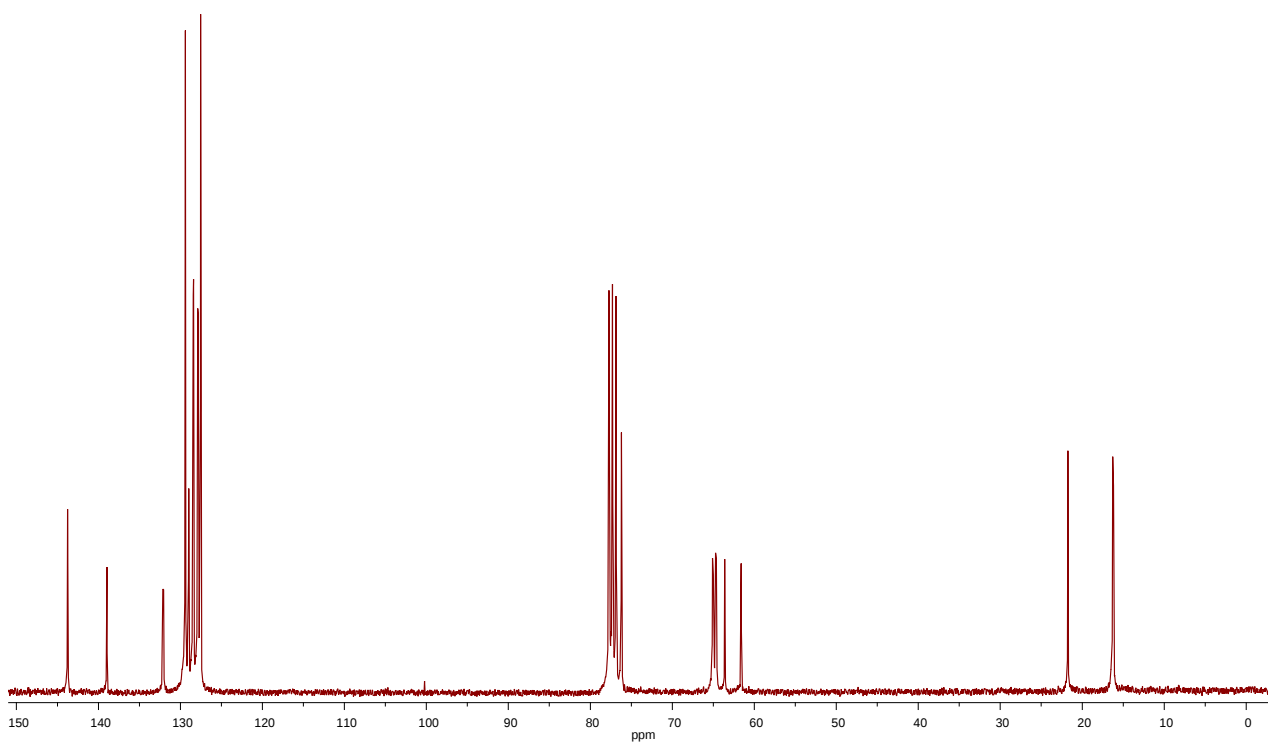
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



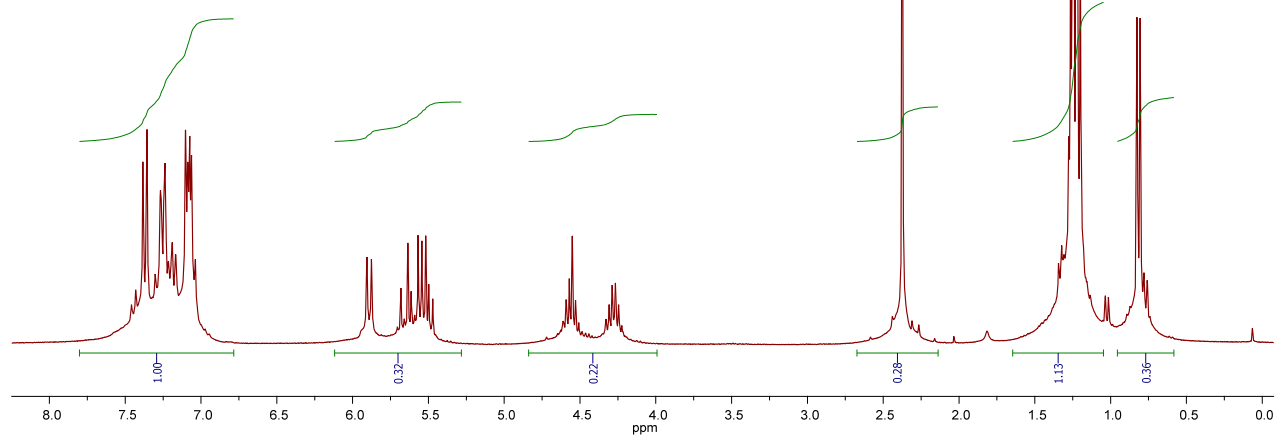
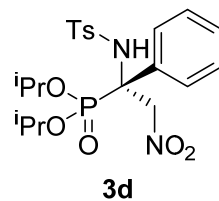
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



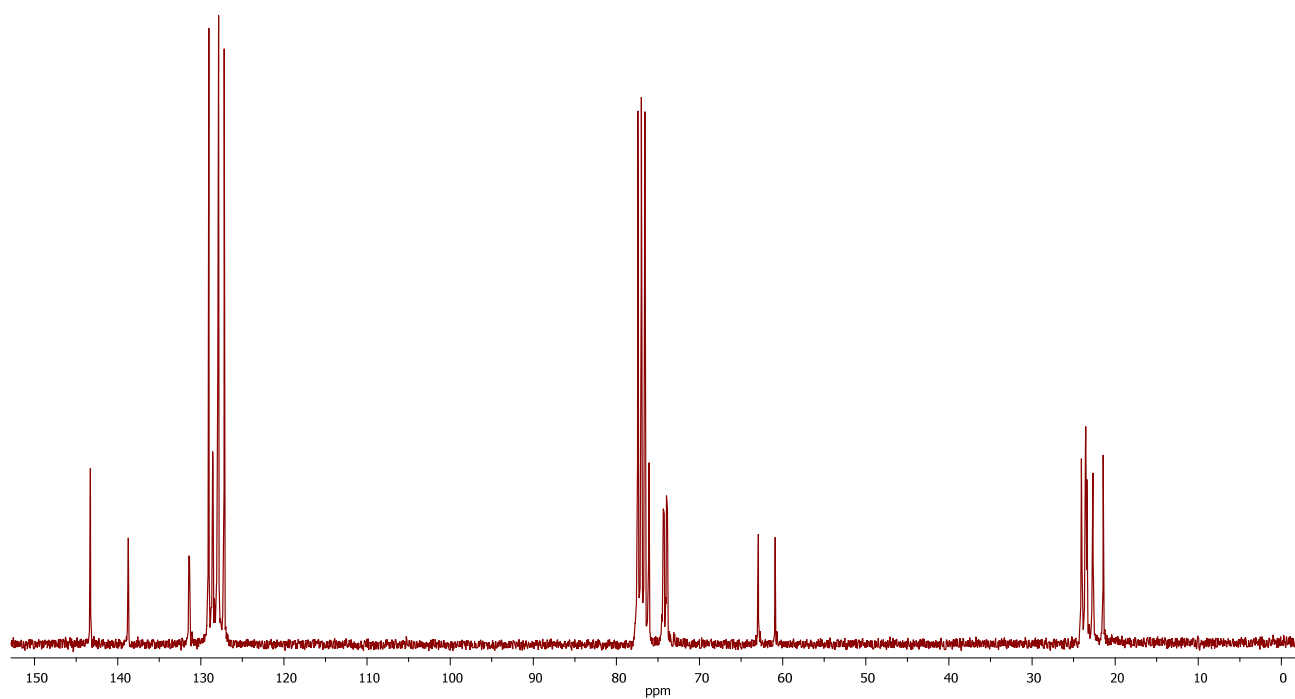
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



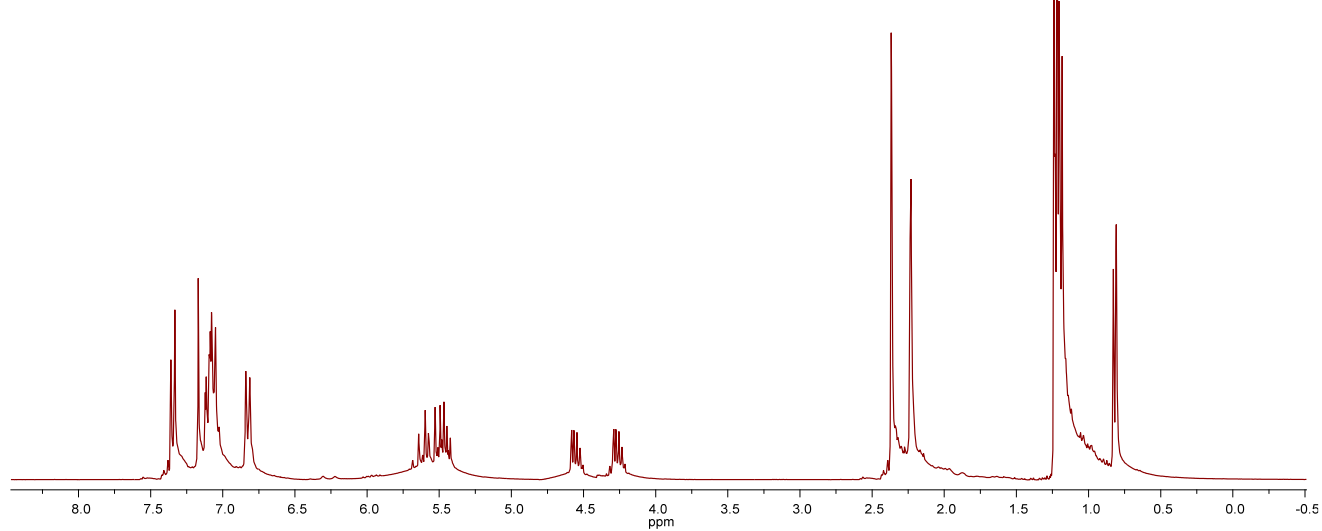
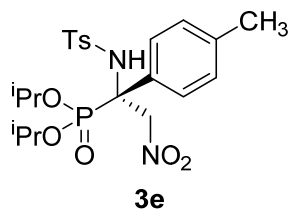
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



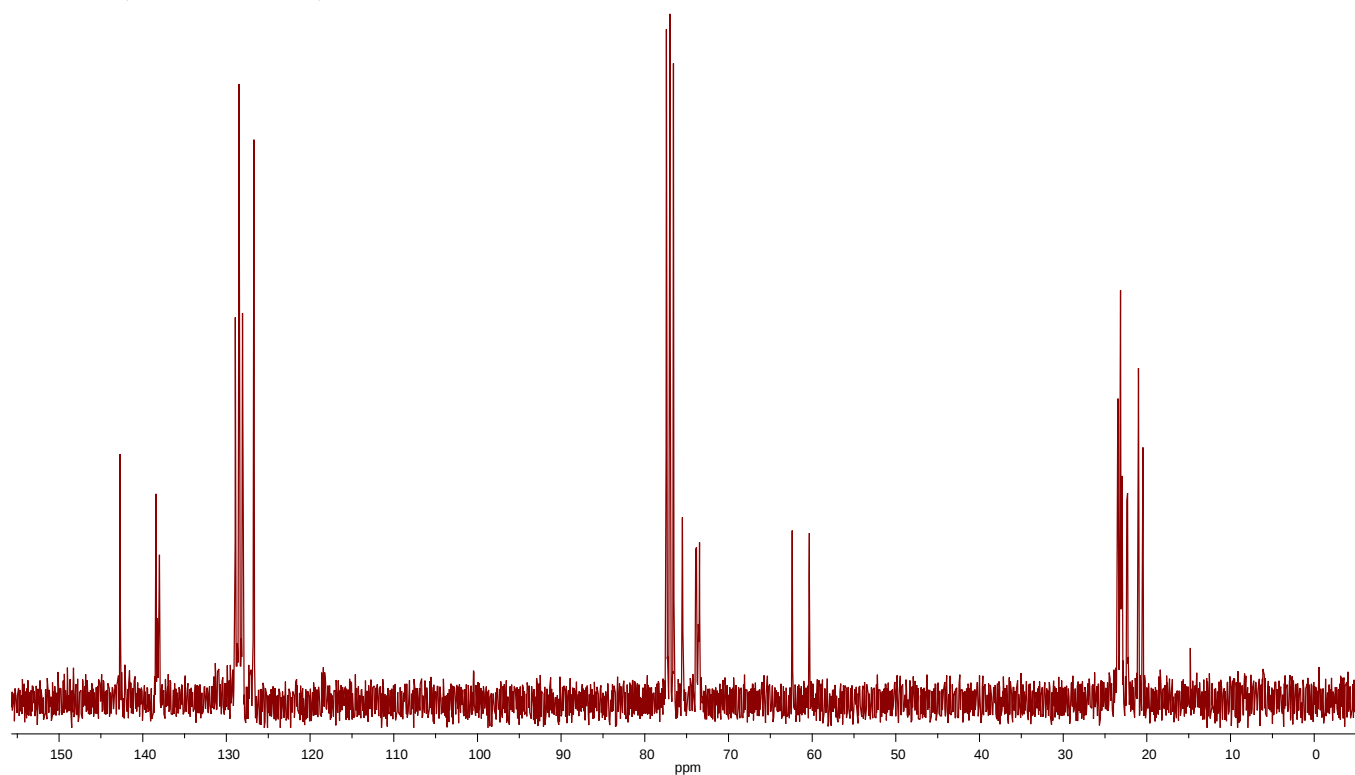
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



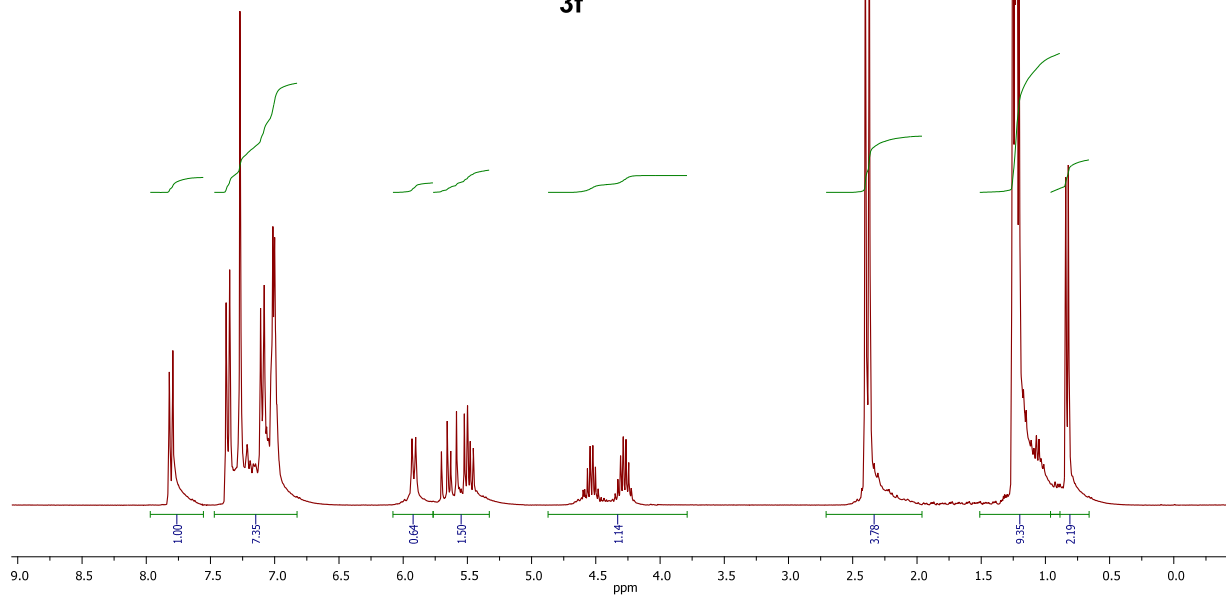
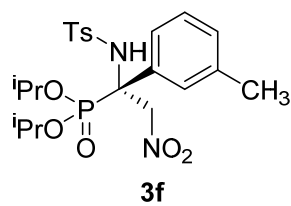
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



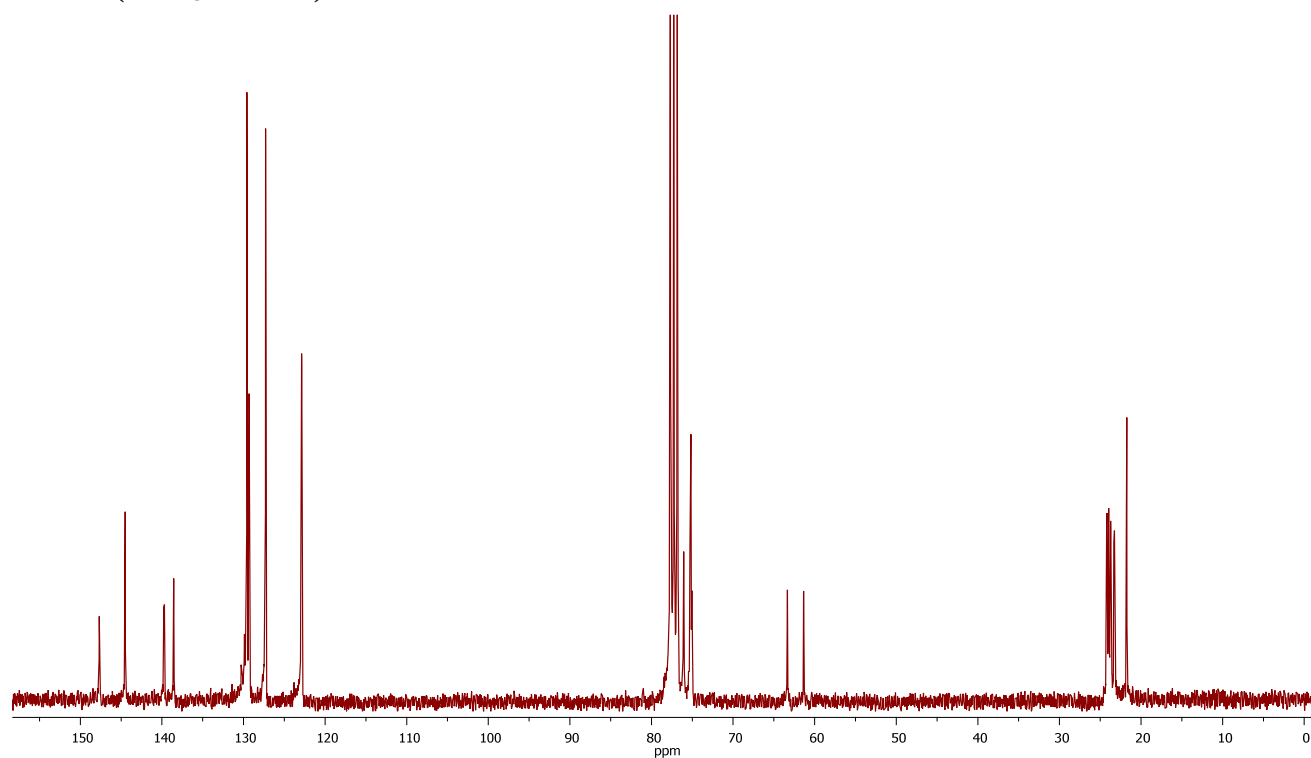
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



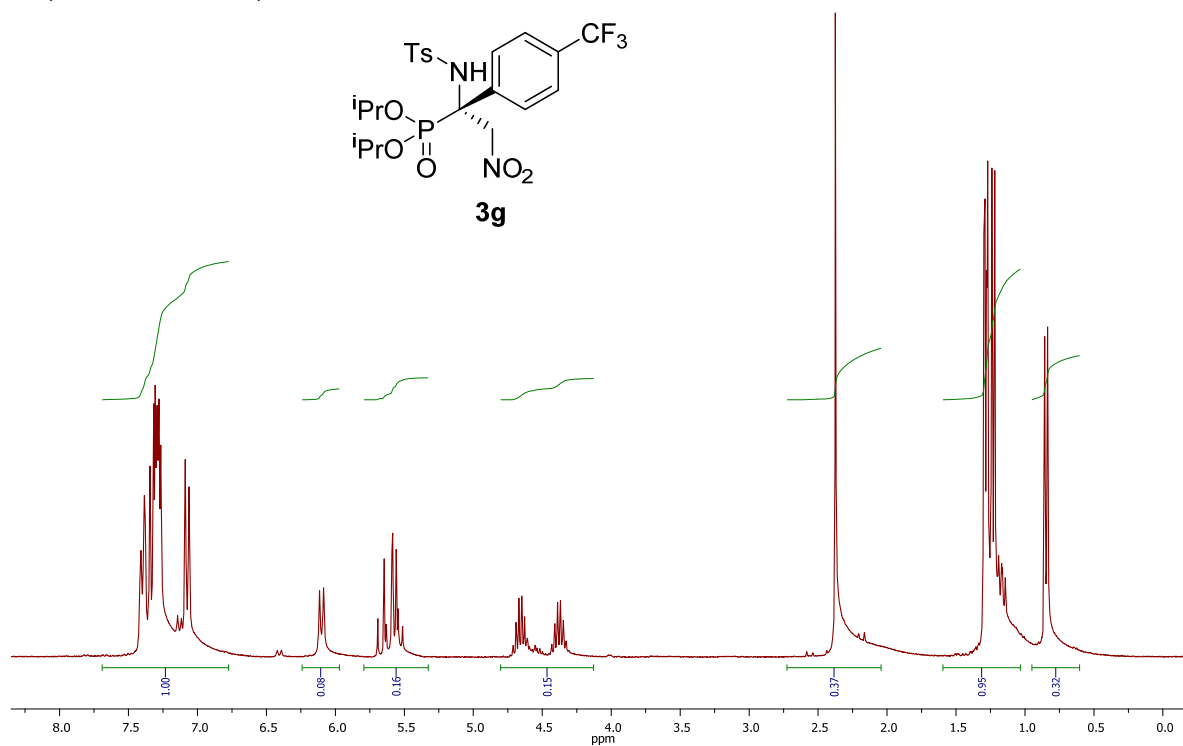
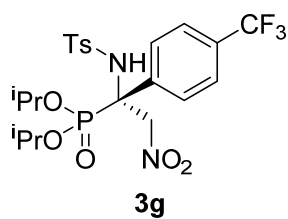
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



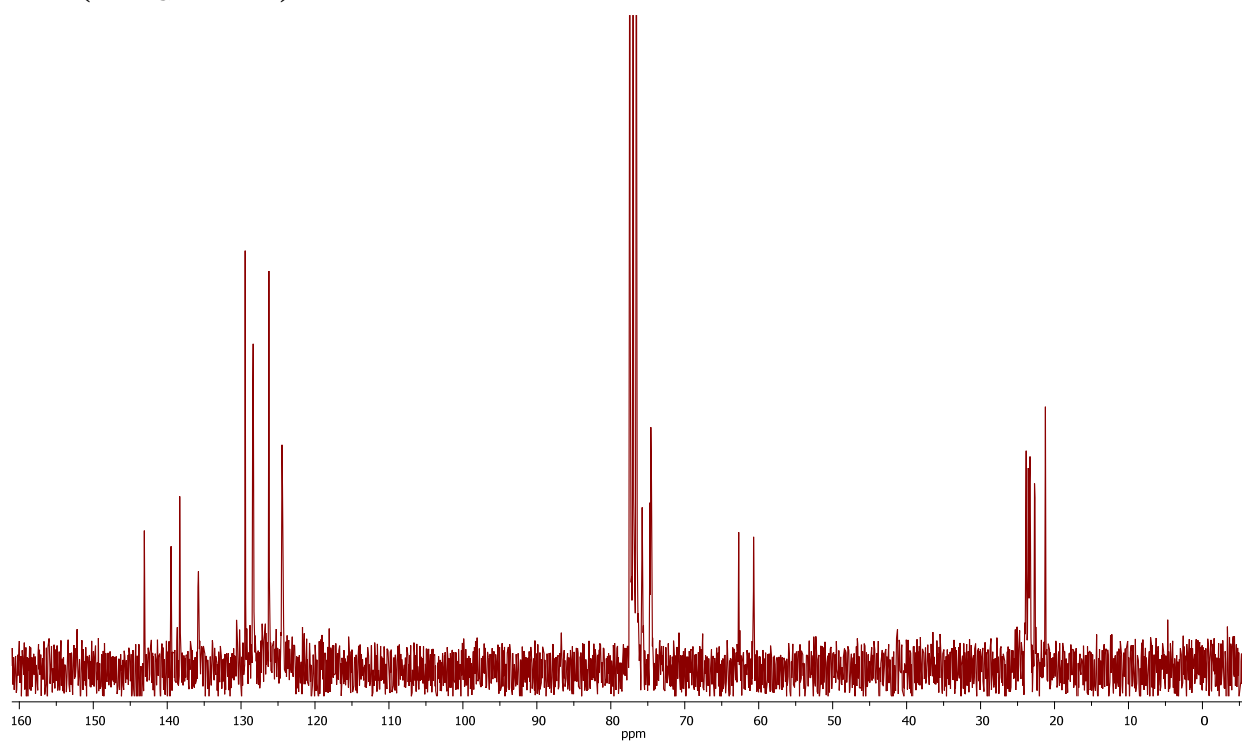
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



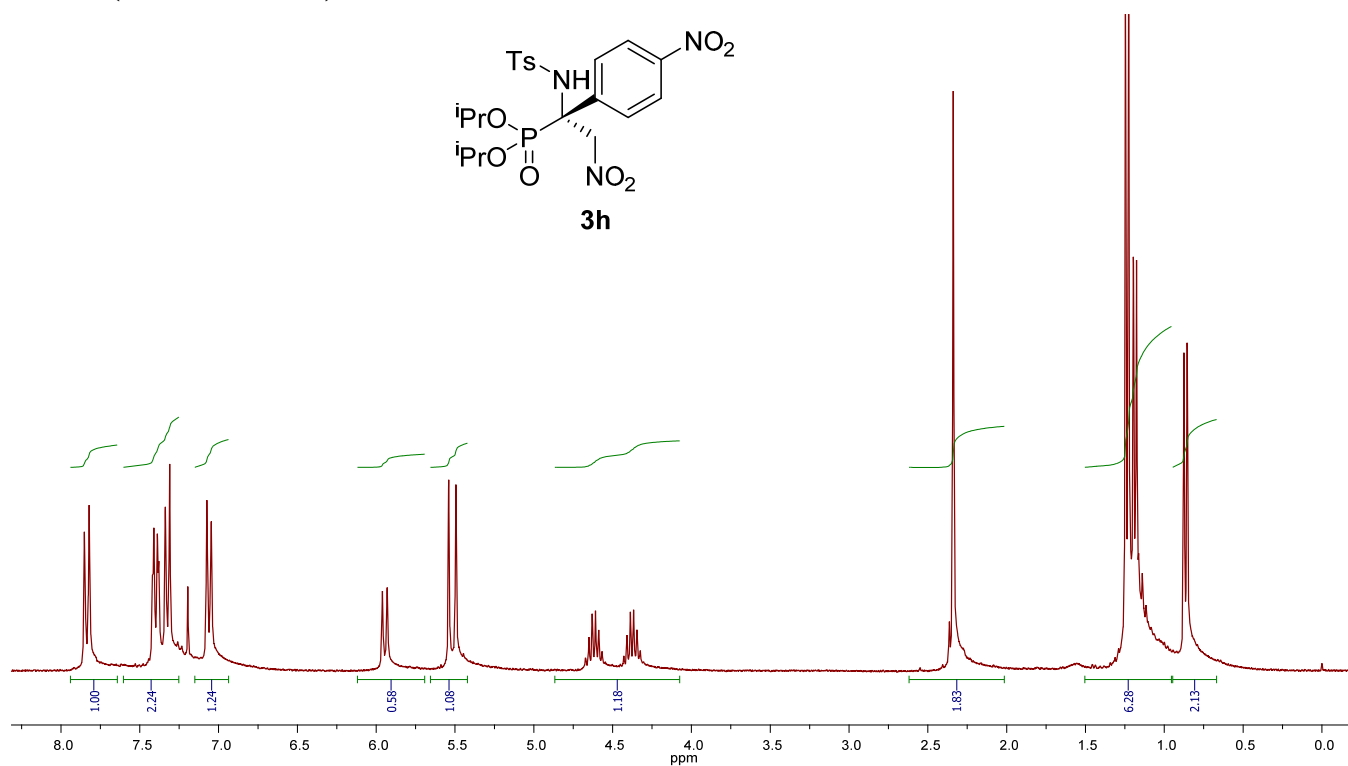
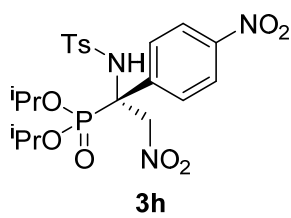
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



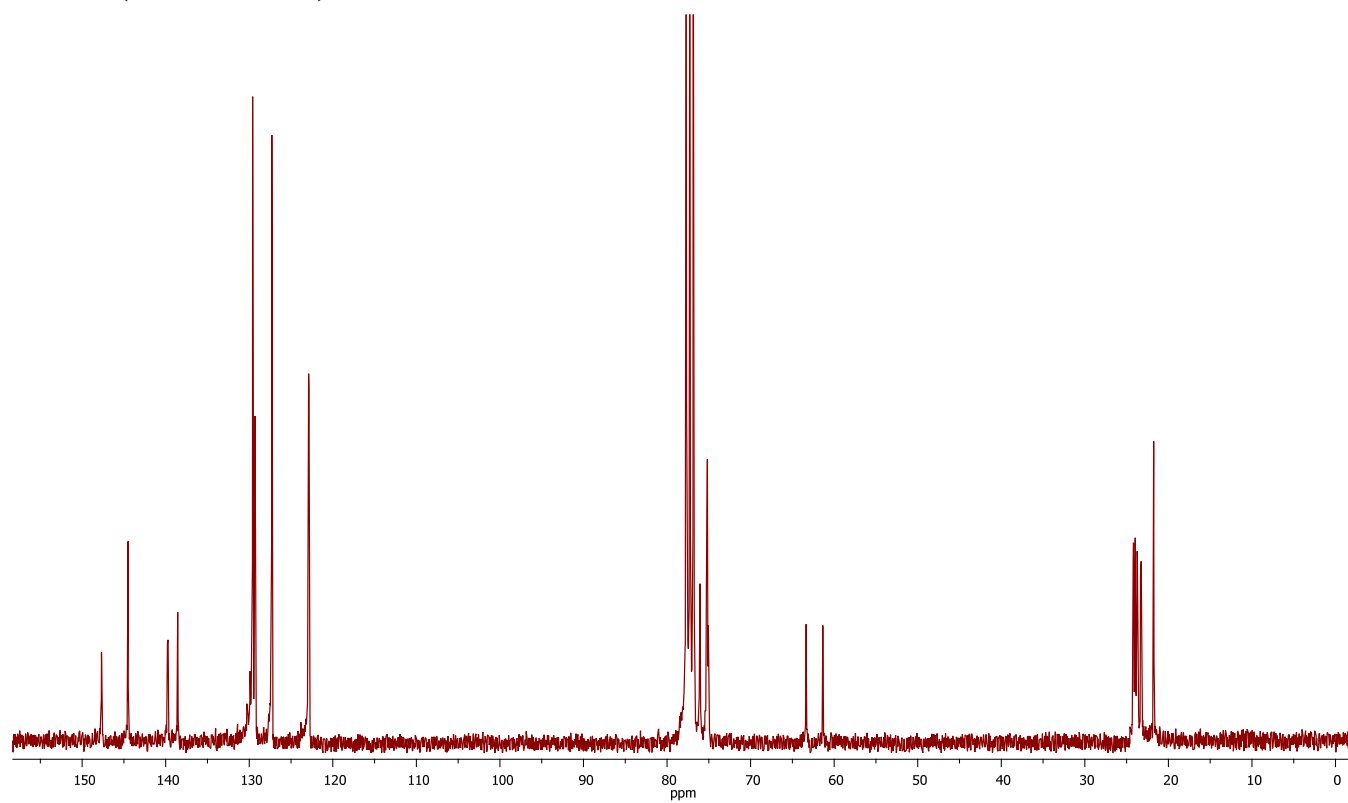
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



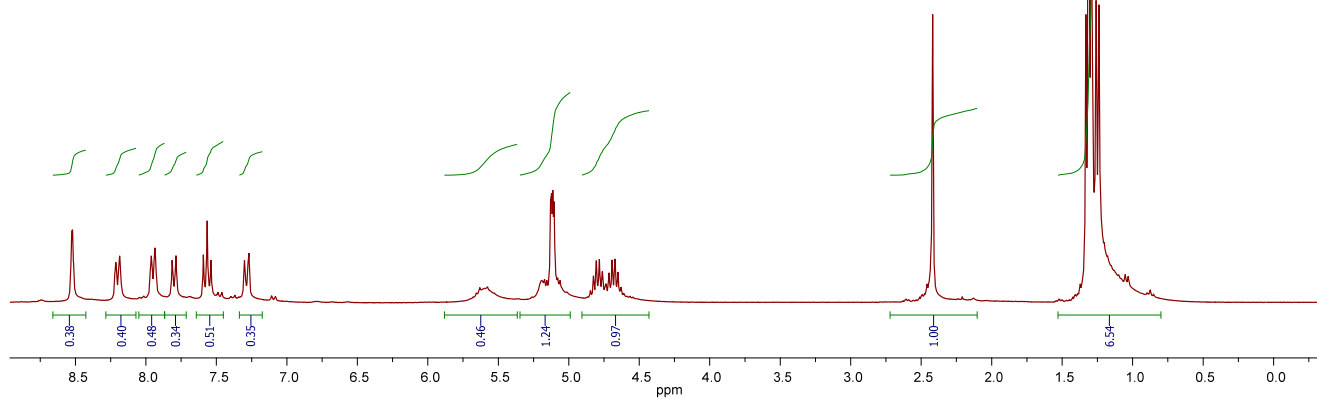
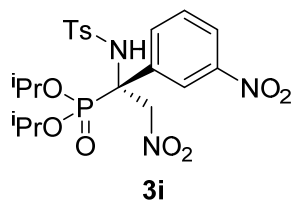
$^1\text{H}$  NMR ( $\text{CDCl}_3$ , 300 MHz)



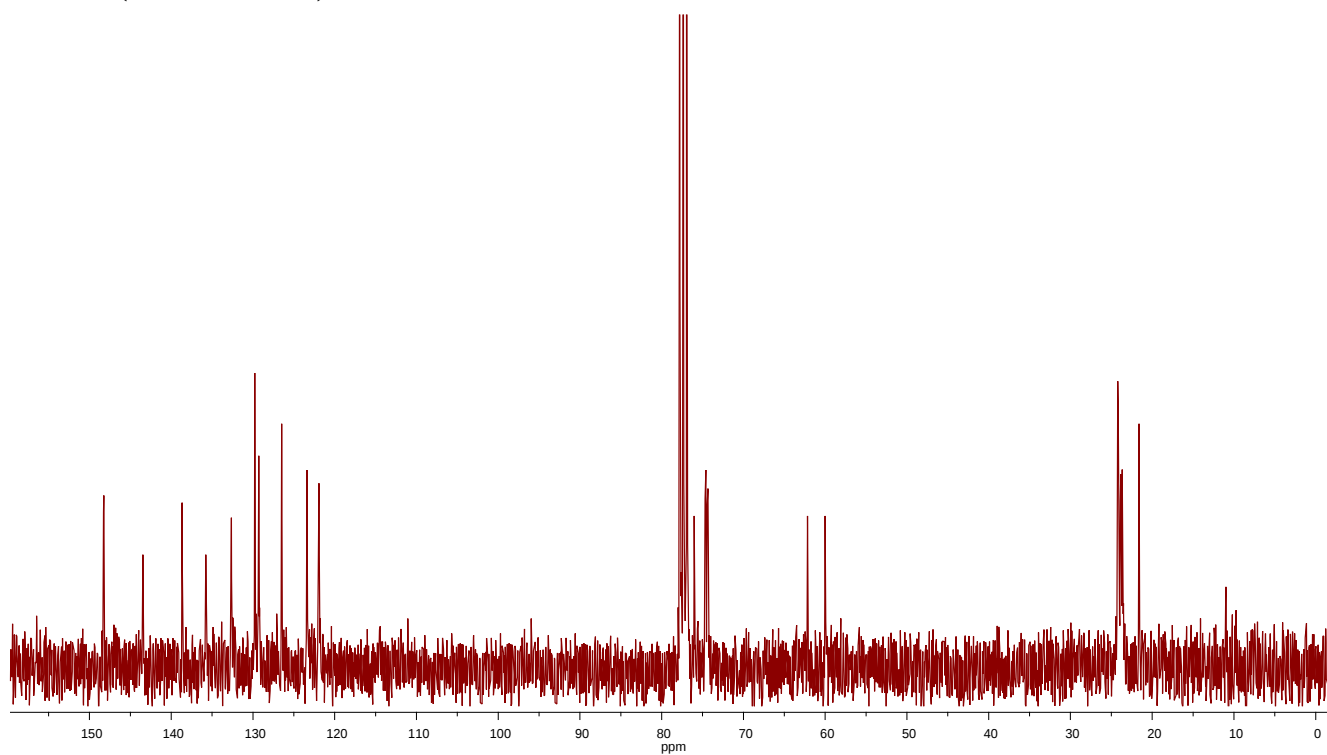
$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



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

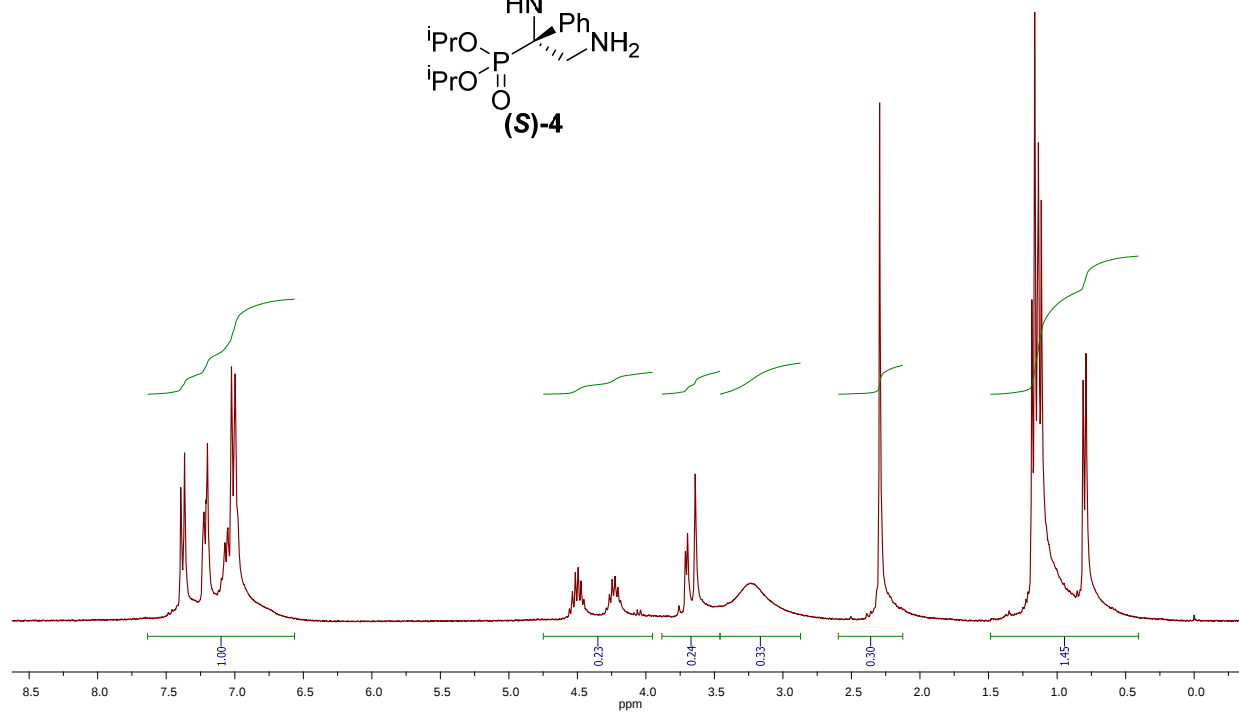
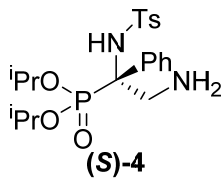


$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)



5.  $^1\text{H}$  and  $^{13}\text{C}$  NMR copies of  $\alpha,\beta$ -diaminophosphonate (*S*)-4

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



$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75 MHz)

