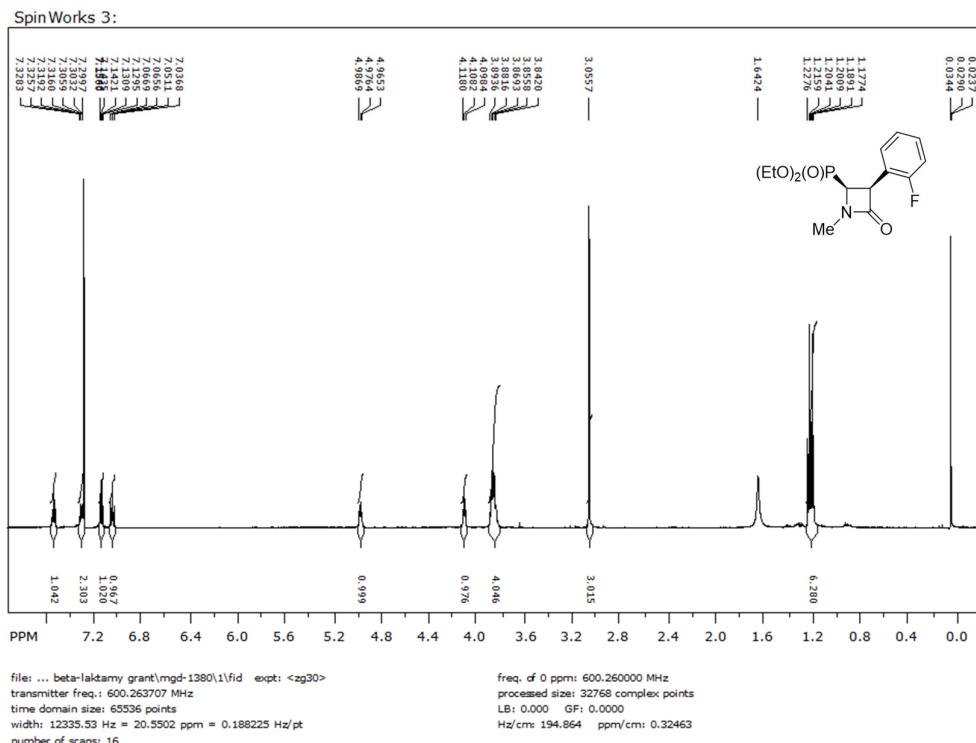


## Supplementary Materials

NMR spectra for compounds *cis*-**10**/*trans*-**10** and *cis*-**11**/*trans*-**11**:

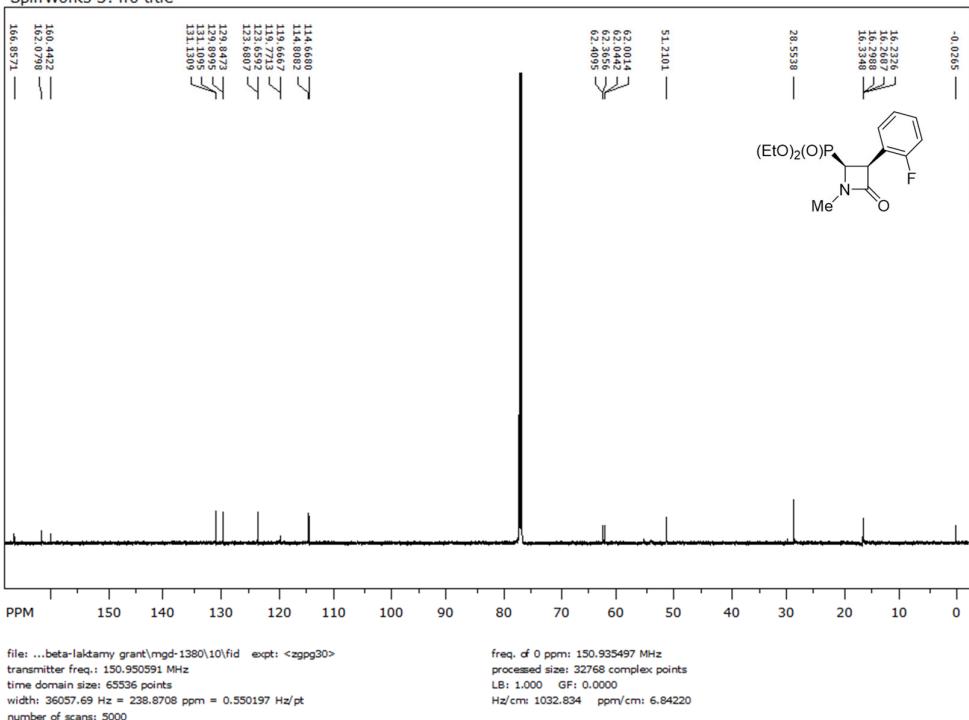
- Figure S1:  $^1\text{H}$  NMR Spectrum for *cis*-**10b** in  $\text{CDCl}_3$   
Figure S2:  $^{13}\text{C}$  NMR Spectrum for *cis*-**10b** in  $\text{CDCl}_3$   
Figure S3:  $^{31}\text{P}$  NMR Spectrum for *cis*-**10b** in  $\text{CDCl}_3$   
Figure S4:  $^1\text{H}$  NMR Spectrum for *trans*-**10b** in  $\text{CDCl}_3$   
Figure S5:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10b** in  $\text{CDCl}_3$   
Figure S6:  $^{31}\text{P}$  NMR Spectrum for *trans*-**10b** in  $\text{CDCl}_3$   
Figure S7:  $^1\text{H}$  NMR Spectrum for *trans*-**10c** in  $\text{CDCl}_3$   
Figure S8:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10c** in  $\text{CDCl}_3$   
Figure S9:  $^{31}\text{P}$  NMR Spectrum for *trans*-**10c** in  $\text{CDCl}_3$   
Figure S10:  $^1\text{H}$  NMR Spectrum for *cis*-**10d** in  $\text{CDCl}_3$   
Figure S11:  $^{13}\text{C}$  NMR Spectrum for *cis*-**10d** in  $\text{CDCl}_3$   
Figure S12:  $^{31}\text{P}$  NMR Spectrum for *cis*-**10d** in  $\text{CDCl}_3$   
Figure S13:  $^1\text{H}$  NMR Spectrum for *trans*-**10d** in  $\text{CDCl}_3$   
Figure S14:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10d** in  $\text{CDCl}_3$   
Figure S15:  $^{31}\text{P}$  NMR Spectrum for *trans*-**10d** in  $\text{CDCl}_3$   
Figure S16:  $^1\text{H}$  NMR Spectrum for *cis*-**10e** in  $\text{CDCl}_3$   
Figure S17:  $^{13}\text{C}$  NMR Spectrum for *cis*-**10e** in  $\text{CDCl}_3$   
Figure S18:  $^{31}\text{P}$  NMR Spectrum for *cis*-**10e** in  $\text{CDCl}_3$   
Figure S19:  $^1\text{H}$  NMR Spectrum for *trans*-**10e** in  $\text{CDCl}_3$   
Figure S20:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10e** in  $\text{CDCl}_3$   
Figure S21:  $^{31}\text{P}$  NMR Spectrum for *trans*-**10e** in  $\text{CDCl}_3$   
Figure S22:  $^1\text{H}$  NMR Spectrum for *cis*-**10f** in  $\text{CDCl}_3$   
Figure S23:  $^{13}\text{C}$  NMR Spectrum for *cis*-**10f** in  $\text{CDCl}_3$   
Figure S24:  $^{31}\text{P}$  NMR Spectrum for *cis*-**10f** in  $\text{CDCl}_3$   
Figure S25:  $^1\text{H}$  NMR Spectrum for *trans*-**10f** in  $\text{CDCl}_3$   
Figure S26:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10f** in  $\text{CDCl}_3$   
Figure S27:  $^{31}\text{P}$  NMR Spectrum for *trans*-**10f** in  $\text{CDCl}_3$   
Figure S28:  $^1\text{H}$  NMR Spectrum for *cis*-**11a** in  $\text{CDCl}_3$   
Figure S29:  $^{13}\text{C}$  NMR Spectrum for *cis*-**11a** in  $\text{CDCl}_3$   
Figure S30:  $^{31}\text{P}$  NMR Spectrum for *cis*-**11a** in  $\text{CDCl}_3$   
Figure S31:  $^1\text{H}$  NMR Spectrum for *trans*-**11a** in  $\text{CDCl}_3$   
Figure S32:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11a** in  $\text{CDCl}_3$   
Figure S33:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11a** in  $\text{CDCl}_3$   
Figure S34:  $^1\text{H}$  NMR Spectrum for *cis*-**11b** in  $\text{CDCl}_3$   
Figure S35:  $^{13}\text{C}$  NMR Spectrum for *cis*-**11b** in  $\text{CDCl}_3$   
Figure S36:  $^{31}\text{P}$  NMR Spectrum for *cis*-**11b** in  $\text{CDCl}_3$   
Figure S37:  $^1\text{H}$  NMR Spectrum for *trans*-**11b** in  $\text{CDCl}_3$   
Figure S38:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11b** in  $\text{CDCl}_3$   
Figure S39:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11b** in  $\text{CDCl}_3$   
Figure S40:  $^1\text{H}$  NMR Spectrum for *trans*-**11c** in  $\text{CDCl}_3$   
Figure S41:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11c** in  $\text{CDCl}_3$   
Figure S42:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11c** in  $\text{CDCl}_3$   
Figure S43:  $^1\text{H}$  NMR Spectrum for *cis*-**11d** in  $\text{CDCl}_3$   
Figure S44:  $^{13}\text{C}$  NMR Spectrum for *cis*-**11d** in  $\text{CDCl}_3$   
Figure S45:  $^{31}\text{P}$  NMR Spectrum for *cis*-**11d** in  $\text{CDCl}_3$   
Figure S46:  $^1\text{H}$  NMR Spectrum for *trans*-**11d** in  $\text{CDCl}_3$   
Figure S47:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11d** in  $\text{CDCl}_3$   
Figure S48:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11d** in  $\text{CDCl}_3$   
Figure S49:  $^1\text{H}$  NMR Spectrum for *cis*-**11e** in  $\text{CDCl}_3$   
Figure S50:  $^{13}\text{C}$  NMR Spectrum for *cis*-**11e** in  $\text{CDCl}_3$   
Figure S51:  $^{31}\text{P}$  NMR Spectrum for *cis*-**11e** in  $\text{CDCl}_3$

Figure S52:  $^1\text{H}$  NMR Spectrum for *trans*-**11e** in  $\text{CDCl}_3$   
Figure S53:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11e** in  $\text{CDCl}_3$   
Figure S54:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11e** in  $\text{CDCl}_3$   
Figure S55:  $^1\text{H}$  NMR Spectrum for *cis*-**11f** in  $\text{CDCl}_3$   
Figure S56:  $^{13}\text{C}$  NMR Spectrum for *cis*-**11f** in  $\text{CDCl}_3$   
Figure S57:  $^{31}\text{P}$  NMR Spectrum for *cis*-**11f** in  $\text{CDCl}_3$   
Figure S58:  $^1\text{H}$  NMR Spectrum for *trans*-**11f** in  $\text{CDCl}_3$   
Figure S59:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11f** in  $\text{CDCl}_3$   
Figure S60:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11f** in  $\text{CDCl}_3$



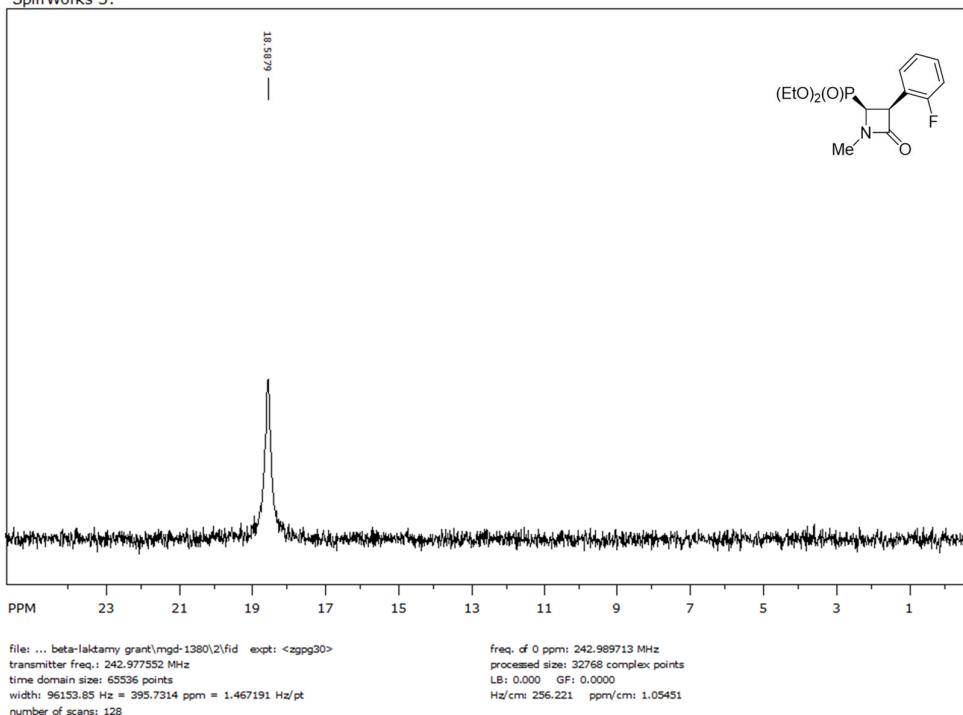
**Figure S1.**  $^1\text{H}$  NMR Spectrum for *cis*-**10b** in  $\text{CDCl}_3$ .

Spin Works 3: no title



**Figure S2.** <sup>13</sup>C NMR Spectrum for *cis*-10b in CDCl<sub>3</sub>.

Spin Works 3:



**Figure S3.** <sup>31</sup>P NMR Spectrum for *cis*-10b in CDCl<sub>3</sub>.

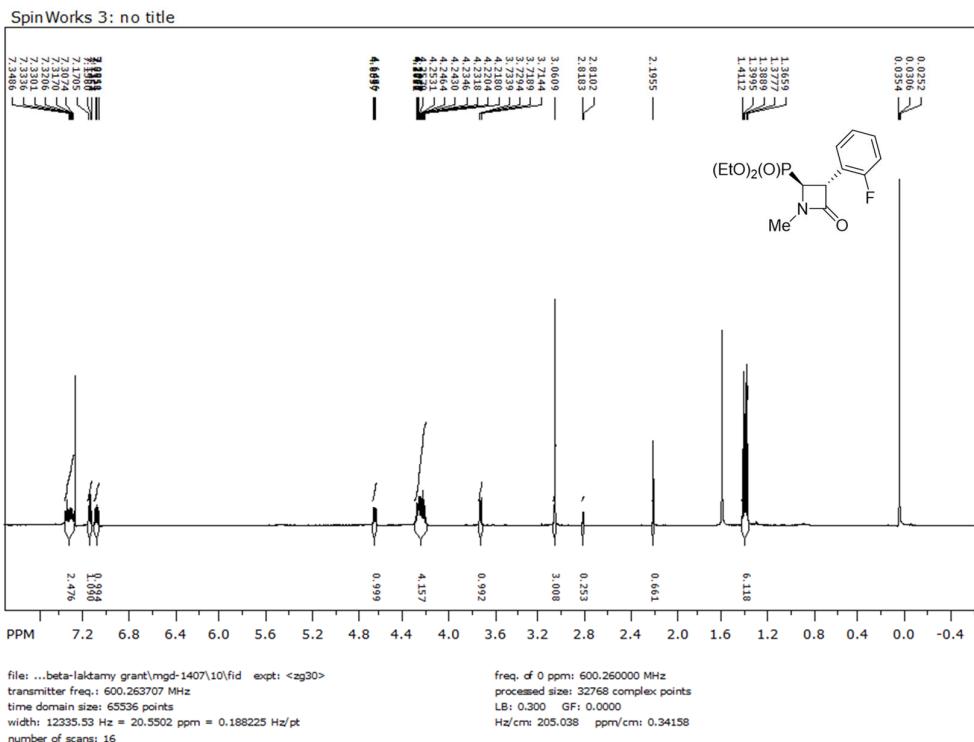


Figure S4:  $^1\text{H}$  NMR Spectrum for *trans*-**10b** in  $\text{CDCl}_3$

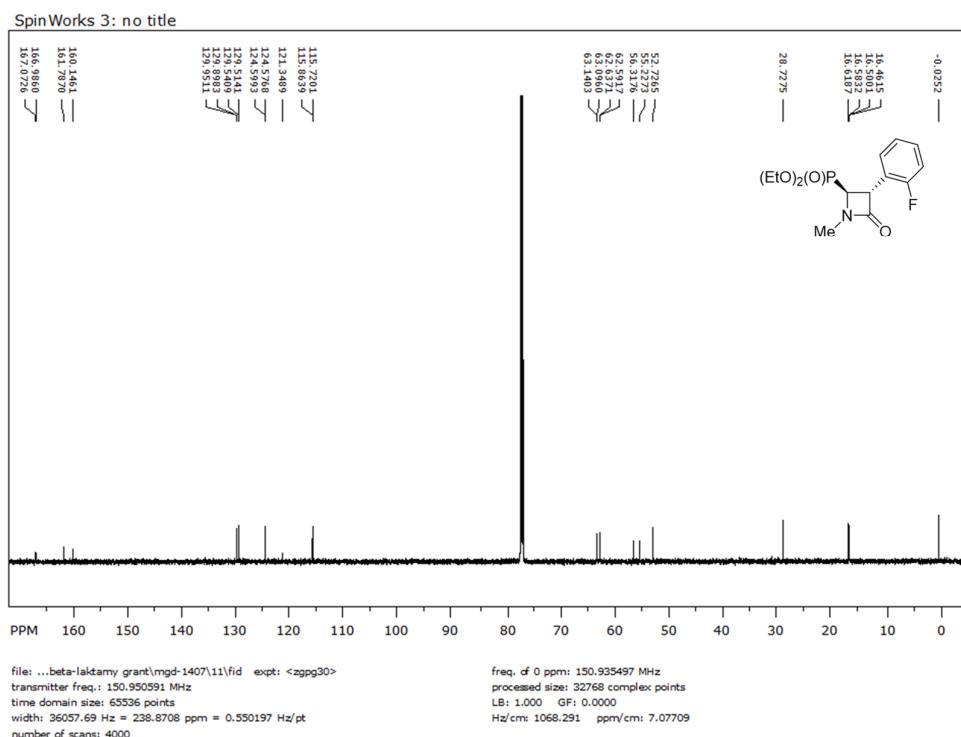


Figure S5:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10b** in  $\text{CDCl}_3$

SpinWorks 3:

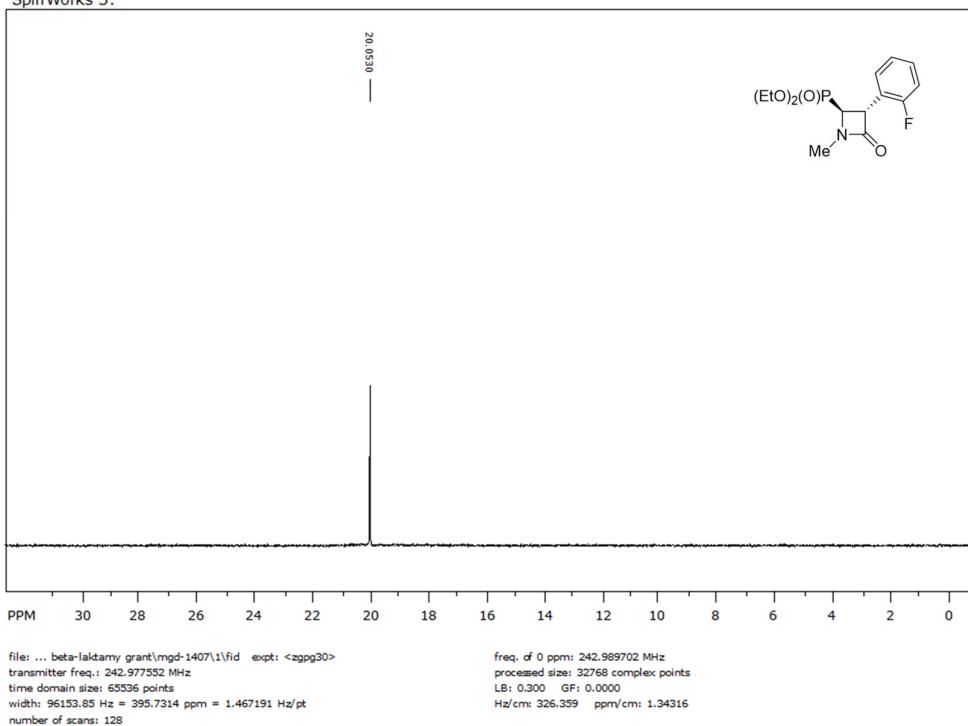
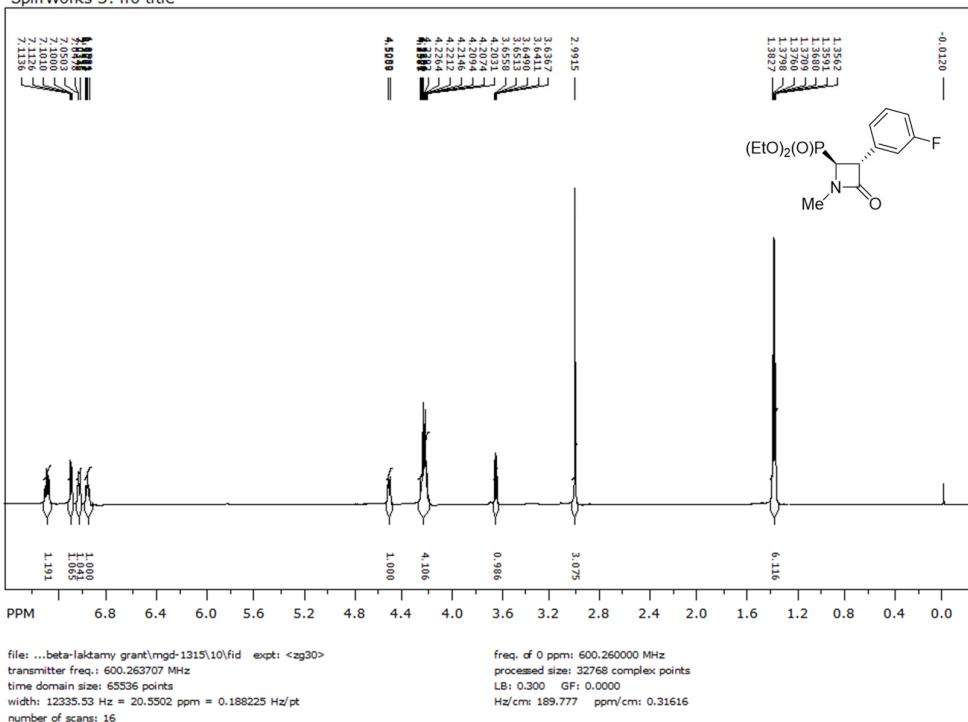


Figure S6: <sup>31</sup>P NMR Spectrum for *trans*-**10b** in CDCl<sub>3</sub>

SpinWorks 3: no title



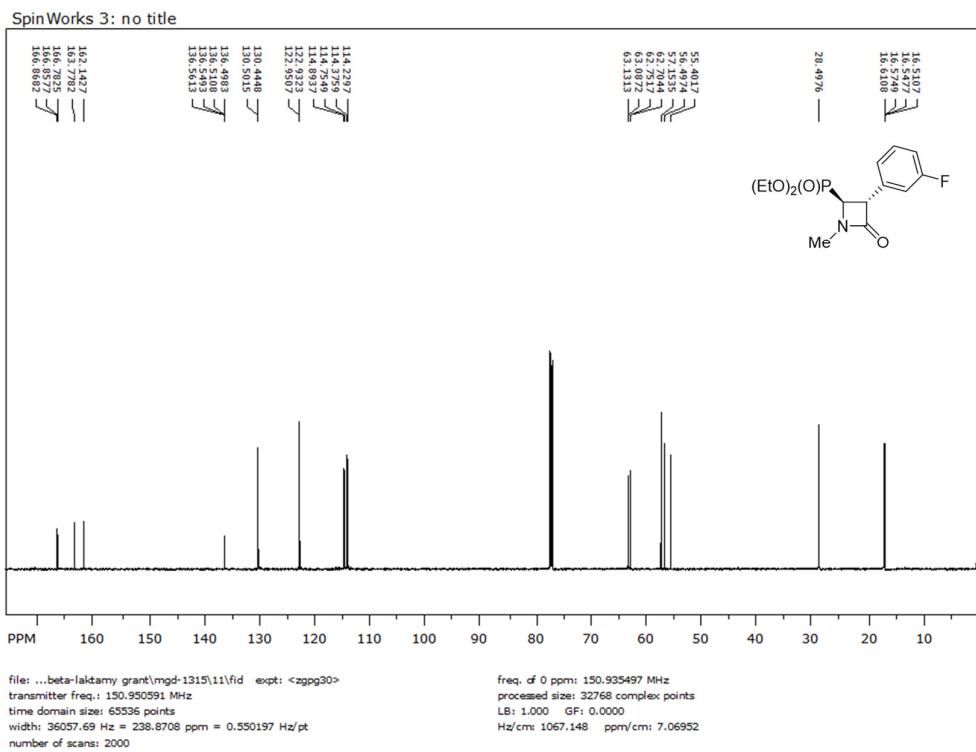


Figure S8:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10c** in  $\text{CDCl}_3$

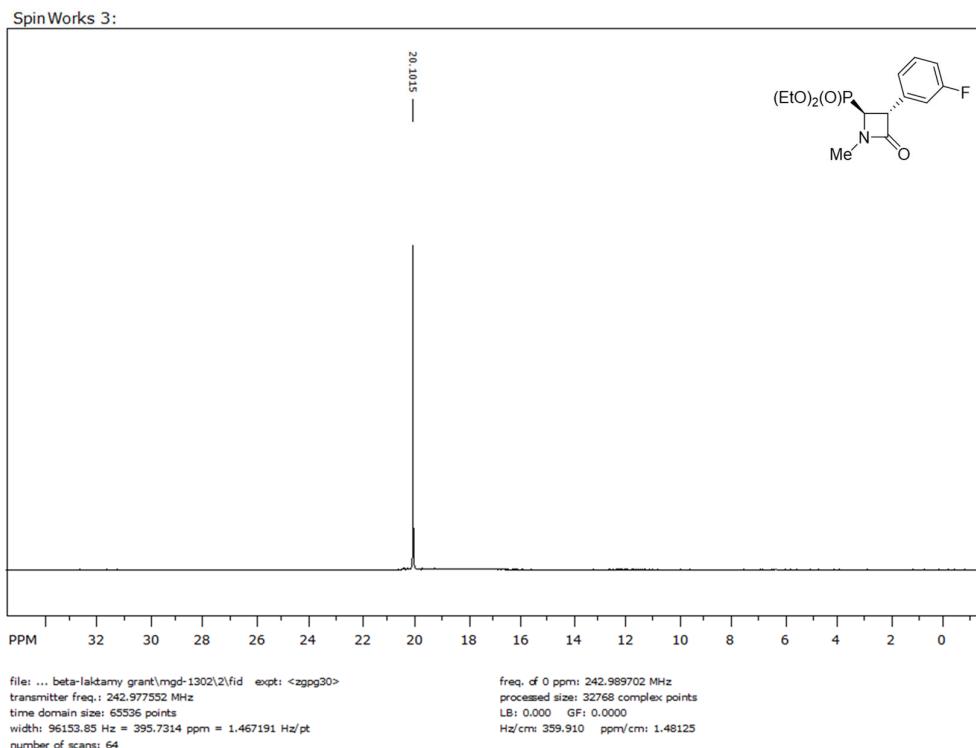


Figure S9:  $^{31}\text{P}$  NMR Spectrum for *trans*-**10c** in  $\text{CDCl}_3$

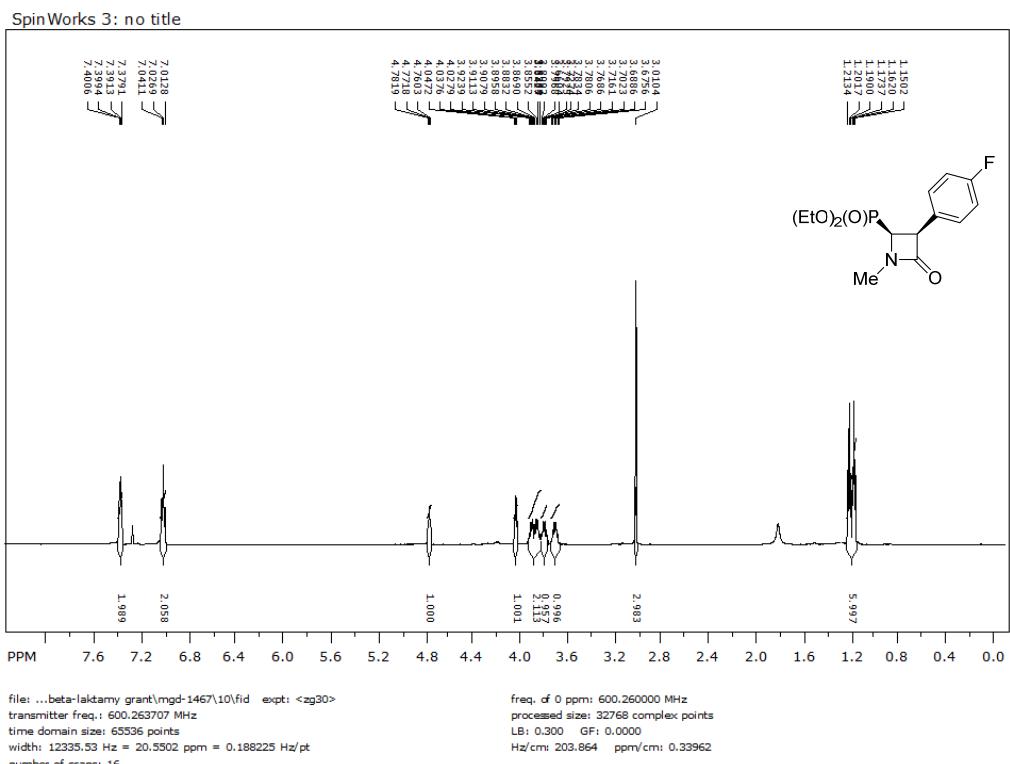


Figure S10:  $^1\text{H}$  NMR Spectrum for *cis*-**10d** in  $\text{CDCl}_3$

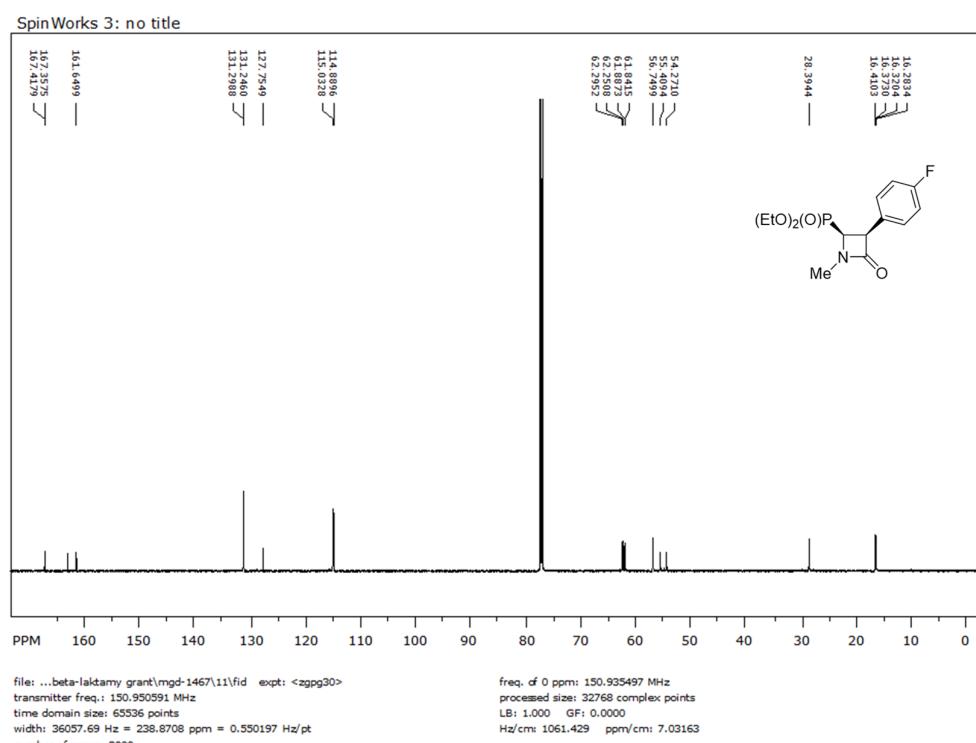


Figure S11:  $^{13}\text{C}$  NMR Spectrum for *cis*-**10d** in  $\text{CDCl}_3$

SpinWorks 3:

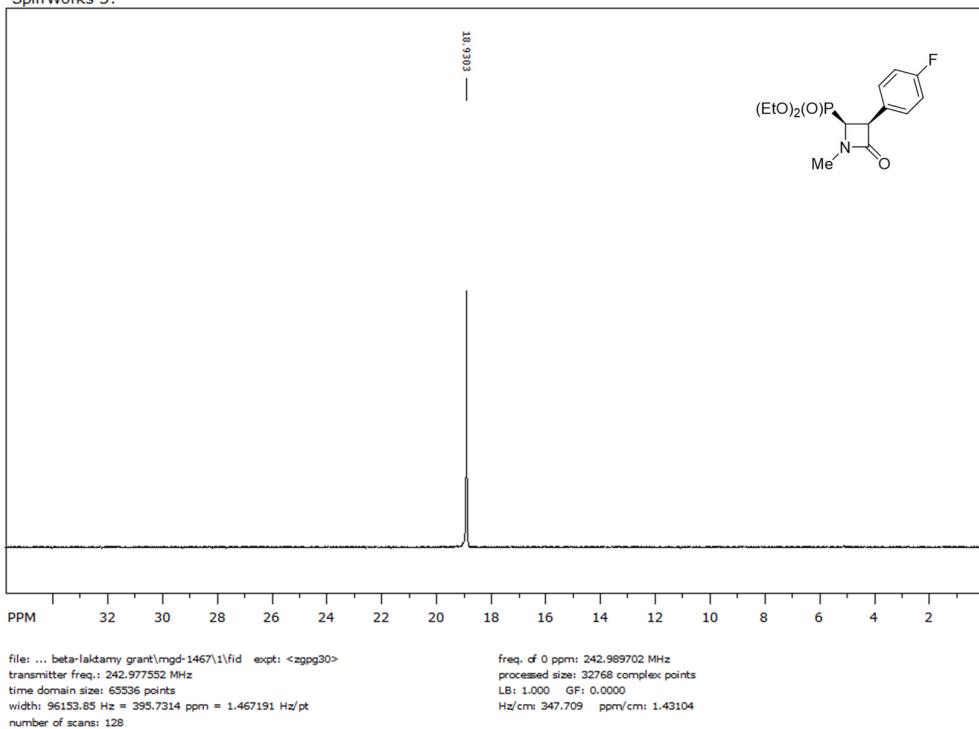


Figure S12: <sup>31</sup>P NMR Spectrum for *cis*-10d in CDCl<sub>3</sub>

Spin Works 3: no title

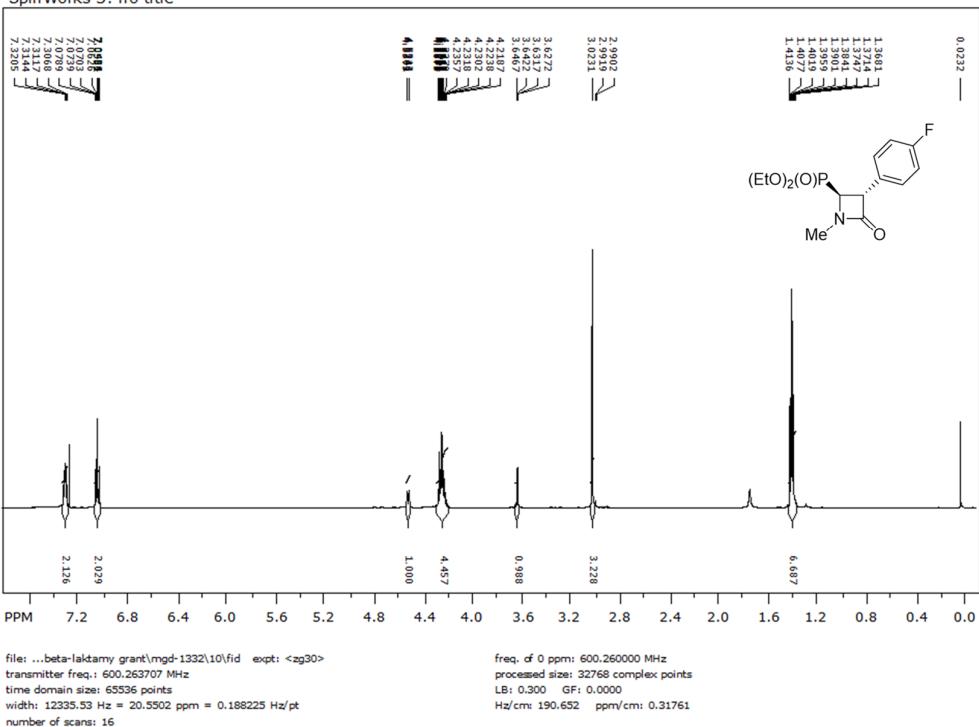


Figure S13: <sup>1</sup>H NMR Spectrum for *trans*-10d in CDCl<sub>3</sub>

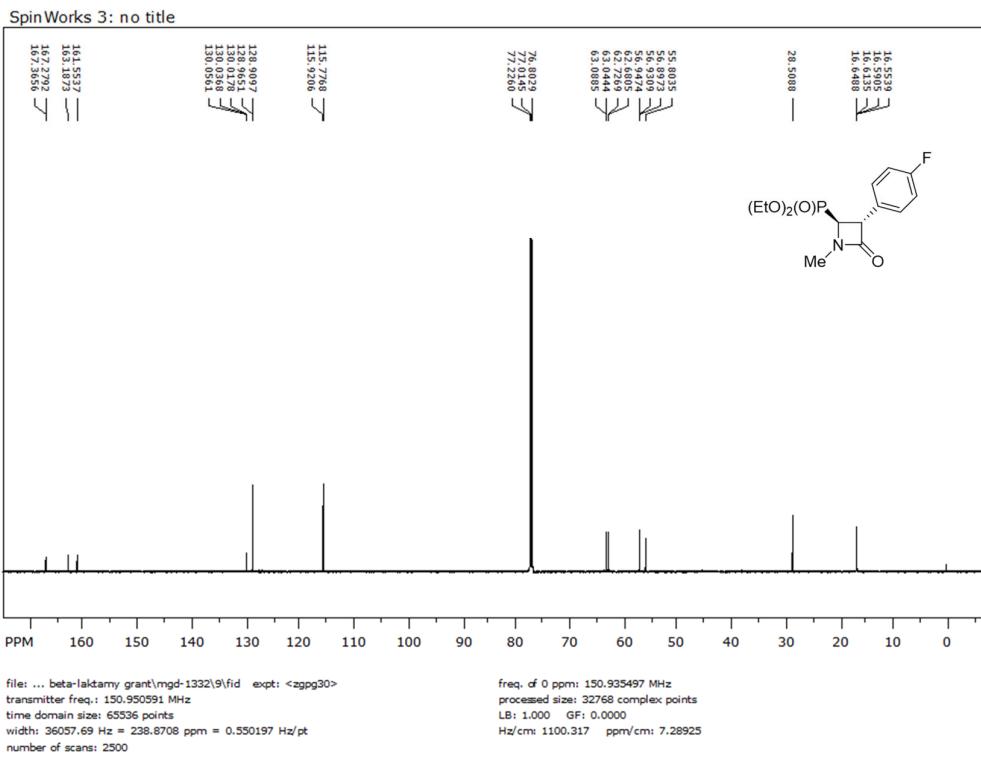


Figure S14:  $^{13}\text{C}$  NMR Spectrum for *trans*-**10d** in  $\text{CDCl}_3$

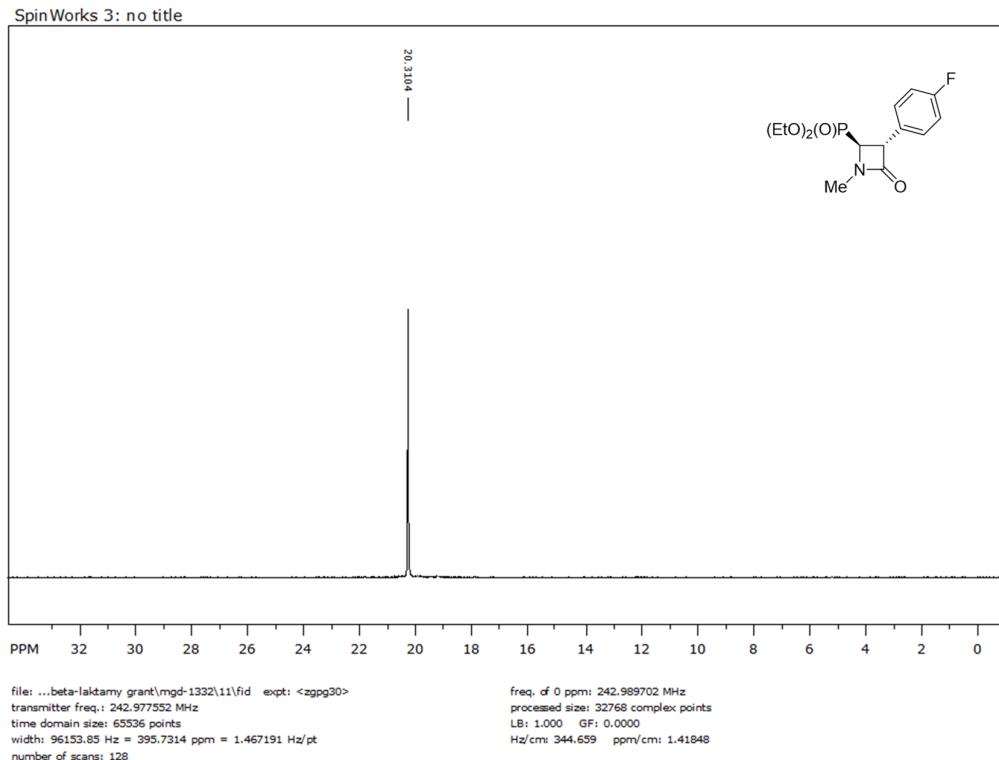


Figure S15:  $^{31}\text{P}$  NMR Spectrum for *trans*-**10d** in  $\text{CDCl}_3$

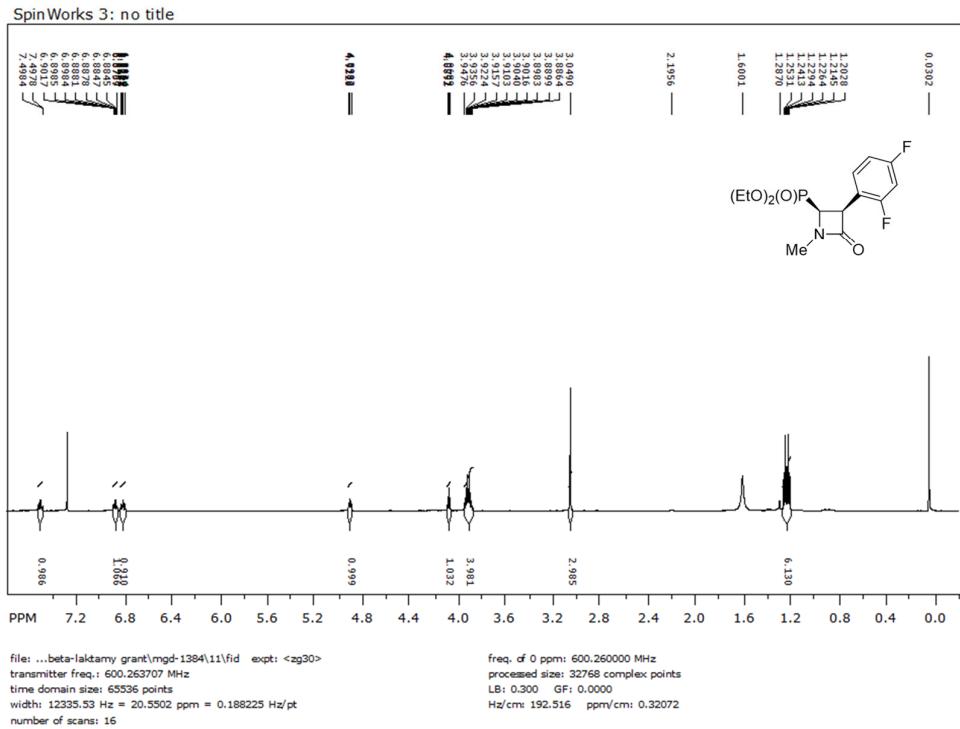


Figure S16:  $^1\text{H}$  NMR Spectrum for *cis*-**10e** in  $\text{CDCl}_3$

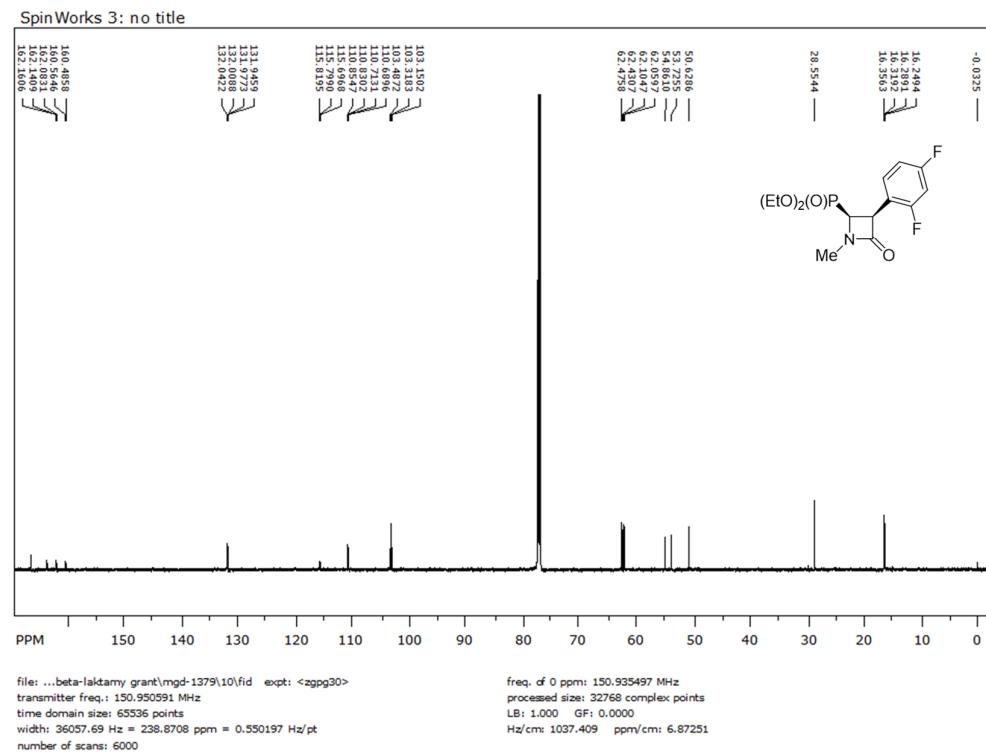


Figure S17:  $^{13}\text{C}$  NMR Spectrum for *cis*-**10e** in  $\text{CDCl}_3$

SpinWorks 3: no title

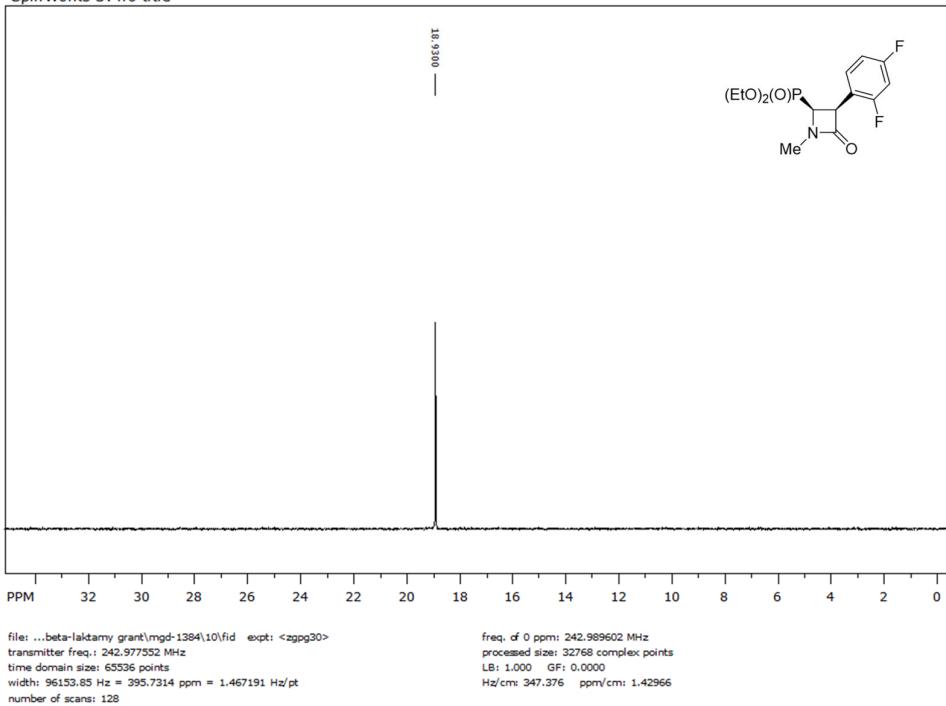


Figure S18: <sup>31</sup>P NMR Spectrum for *cis*-10e in CDCl<sub>3</sub>

SpinWorks 3: no title

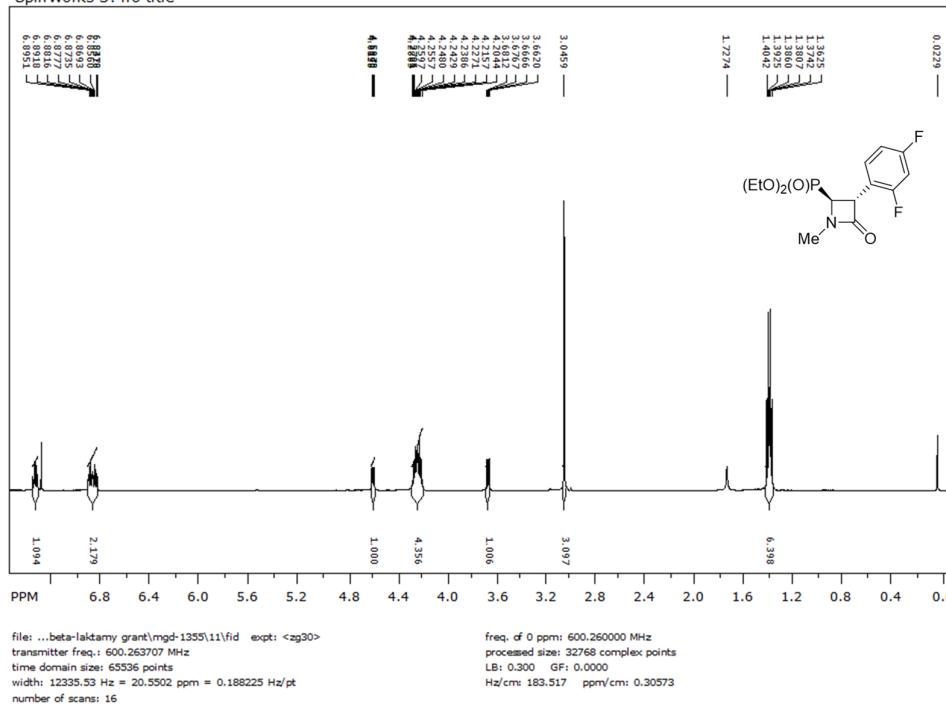


Figure S19: <sup>1</sup>H NMR Spectrum for *trans*-10e in CDCl<sub>3</sub>

SpinWorks 3: no title

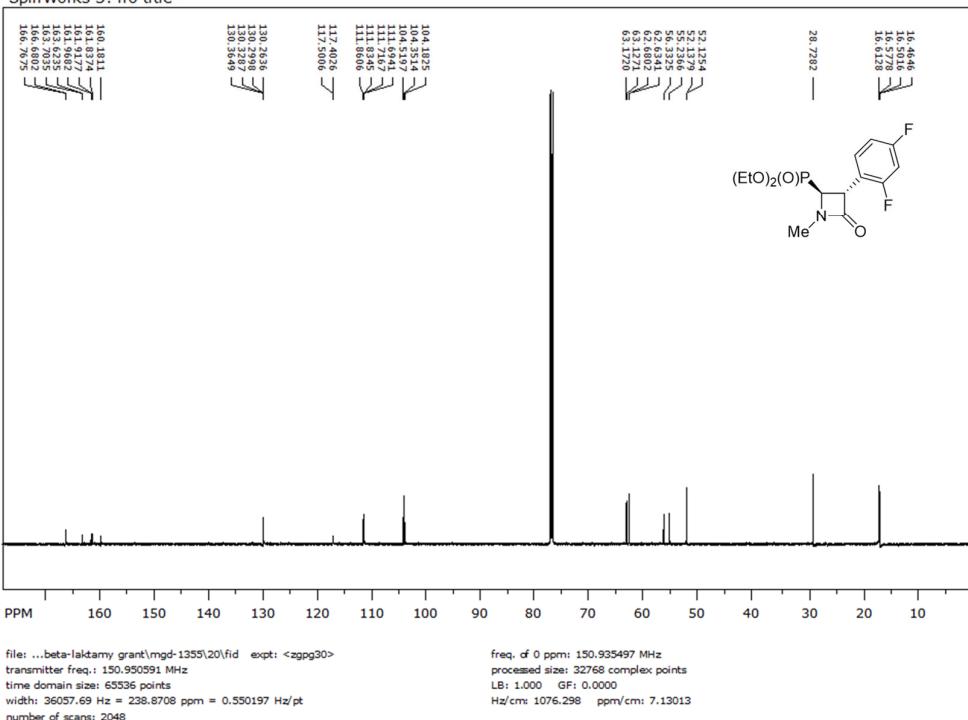


Figure S20: <sup>13</sup>C NMR Spectrum for *trans*-**10e** in CDCl<sub>3</sub>

SpinWorks 3: no title

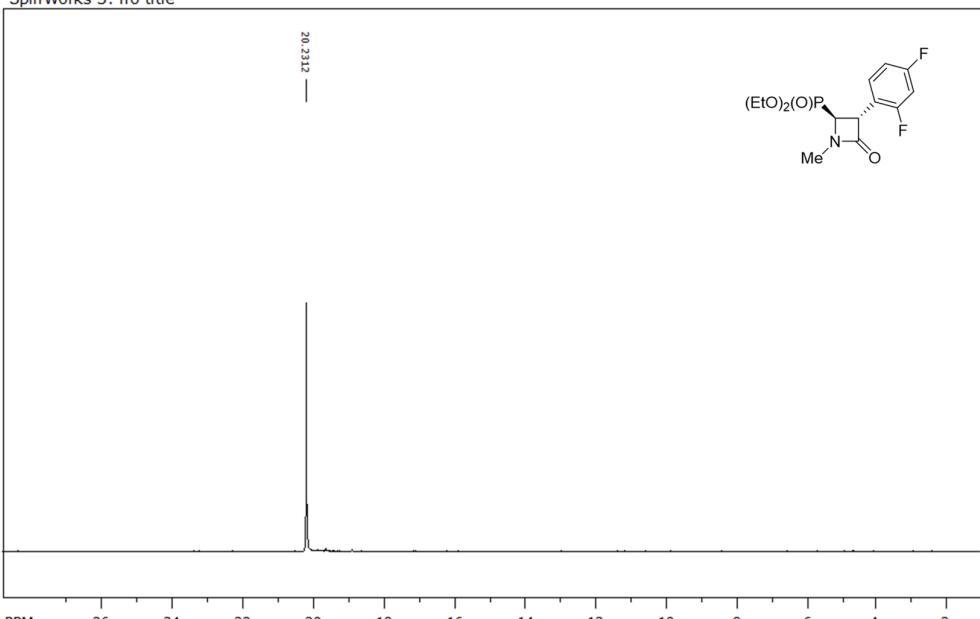


Figure S21: <sup>31</sup>P NMR Spectrum for *trans*-**10e** in CDCl<sub>3</sub>

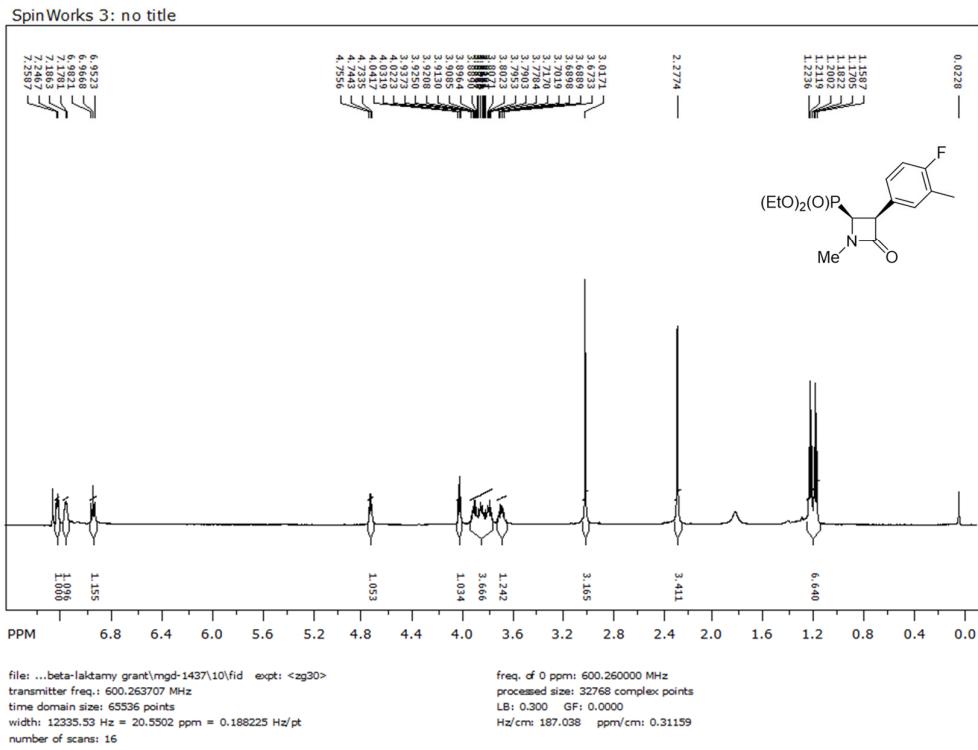


Figure S22:  $^1\text{H}$  NMR Spectrum for *cis*-**10f** in  $\text{CDCl}_3$

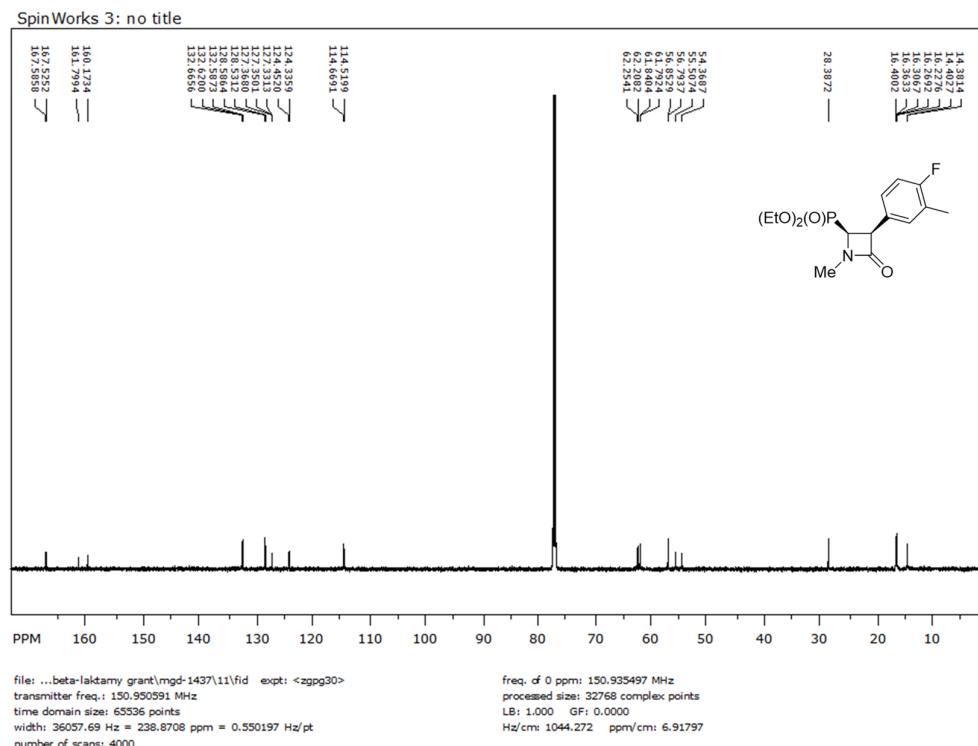


Figure S23:  $^{13}\text{C}$  NMR Spectrum for *cis*-**10f** in  $\text{CDCl}_3$

SpinWorks 3: no title

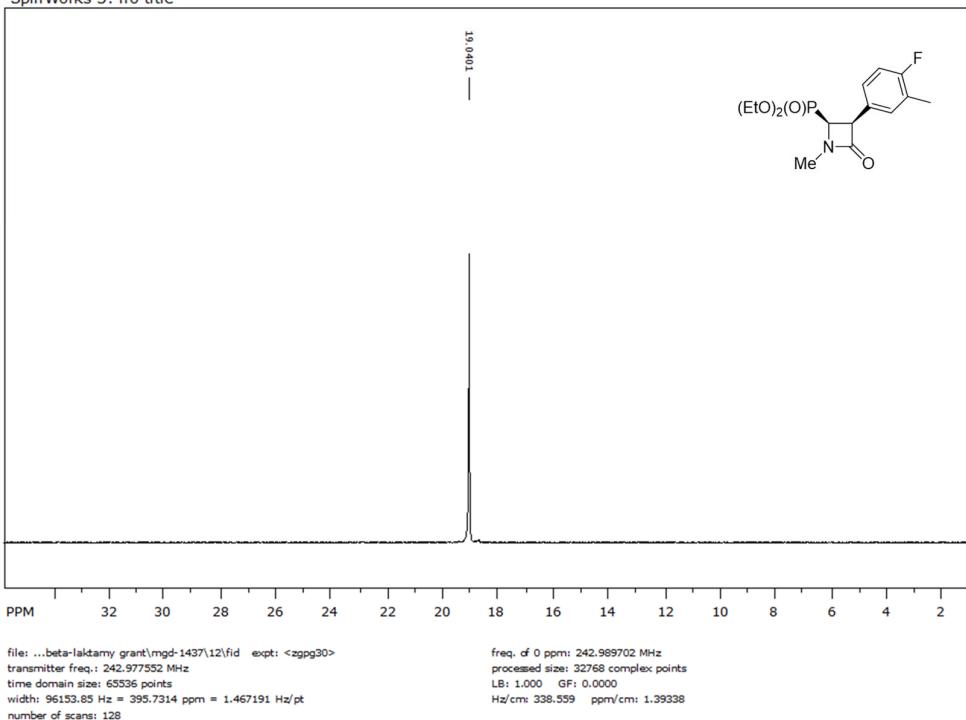


Figure S24: <sup>31</sup>P NMR Spectrum for *cis*-10f in CDCl<sub>3</sub>

SpinWorks 3: no title

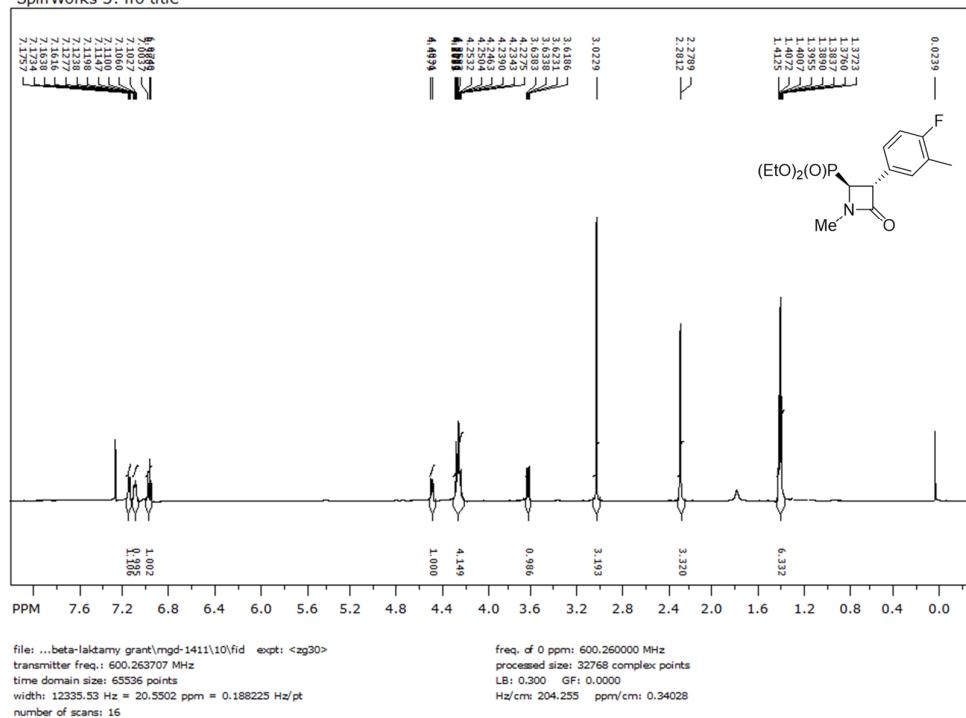
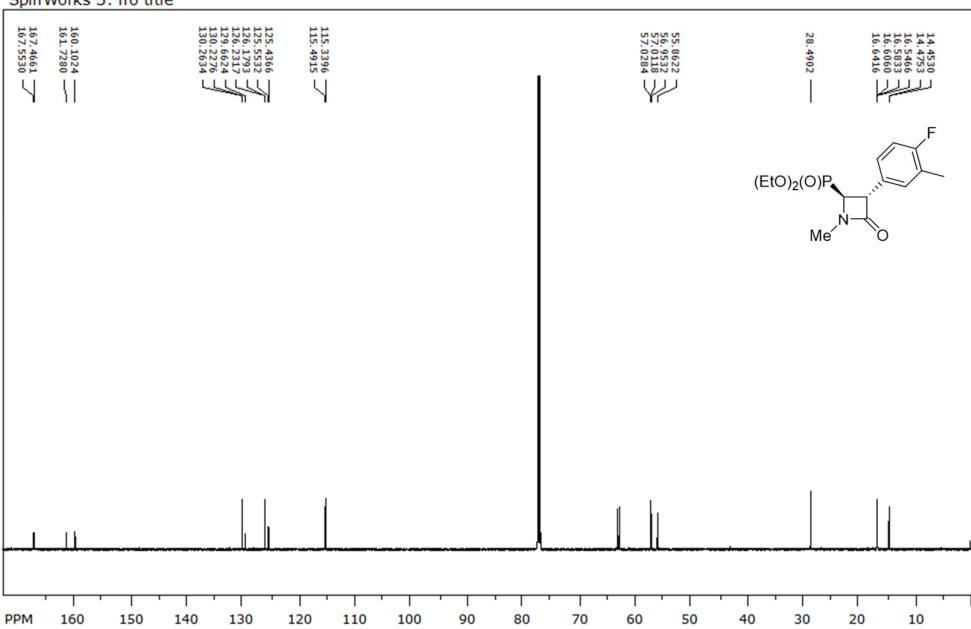


Figure S25: <sup>1</sup>H NMR Spectrum for *trans*-10f in CDCl<sub>3</sub>

SpinWorks 3: no title



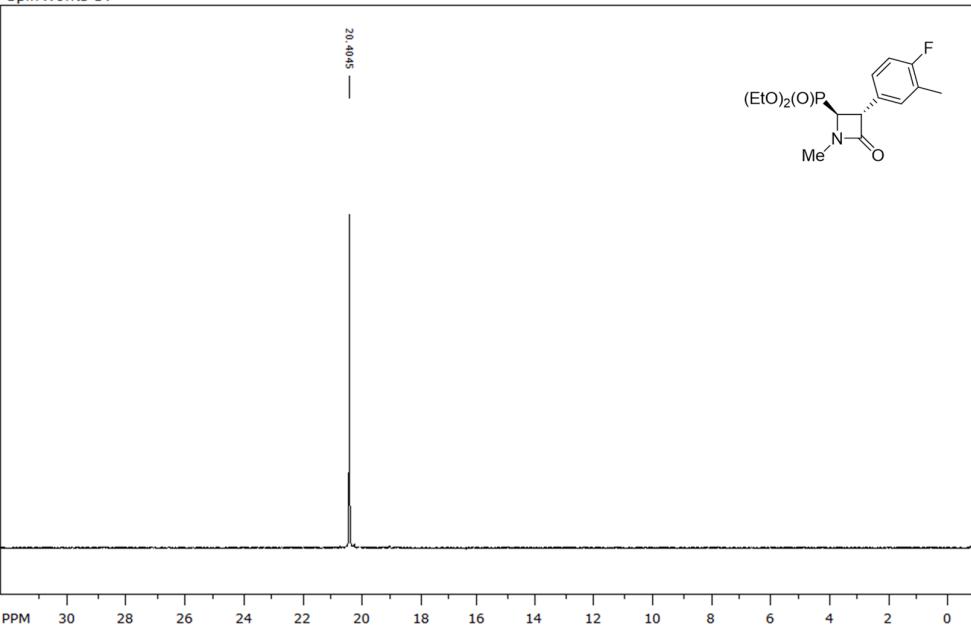
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width: 36057.69 Hz = 238.8708 ppm = 0.550197 Hz/pt
number of scans: 3000
freq. of 0 ppm: 150.935497 MHz
processed size: 32768 complex points
LB: 1.000  GF: 0.0000
Hz/cm: 1049.991  ppm/cm: 6.95586

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Figure S26: <sup>13</sup>C NMR Spectrum for *trans*-10f in CDCl<sub>3</sub>

SpinWorks 3:



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time domain size: 65536 points
width: 96153.85 Hz = 395.7314 ppm = 1.467191 Hz/pt
number of scans: 64
freq. of 0 ppm: 242.989702 MHz
processed size: 32768 complex points
LB: 0.300  GF: 0.0000
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Figure S27: <sup>31</sup>P NMR Spectrum for *trans*-10f in CDCl<sub>3</sub>

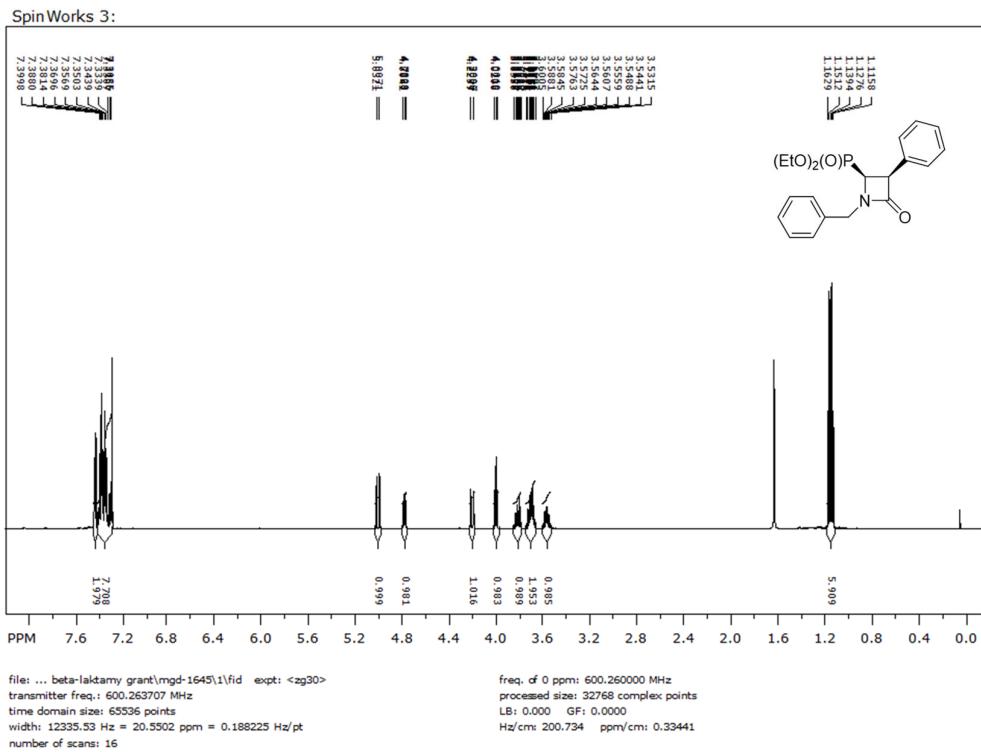


Figure S28:  $^1\text{H}$  NMR Spectrum for *cis*-**11a** in  $\text{CDCl}_3$

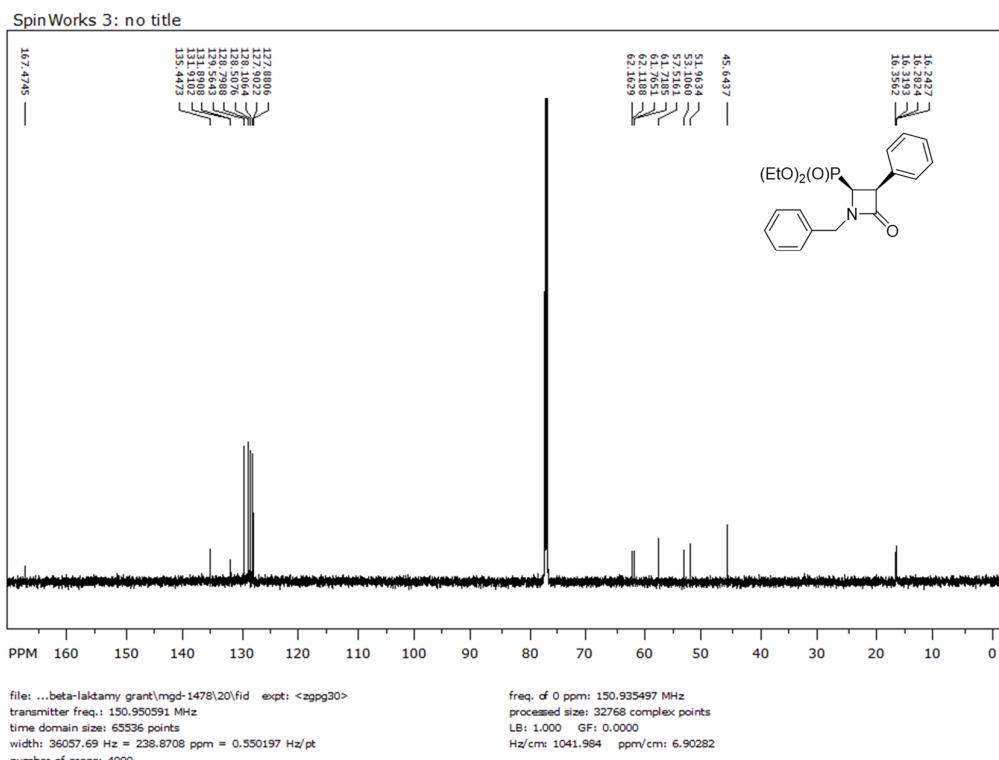


Figure S29:  $^{13}\text{C}$  NMR Spectrum for *cis*-**11a** in  $\text{CDCl}_3$

SpinWorks 3:

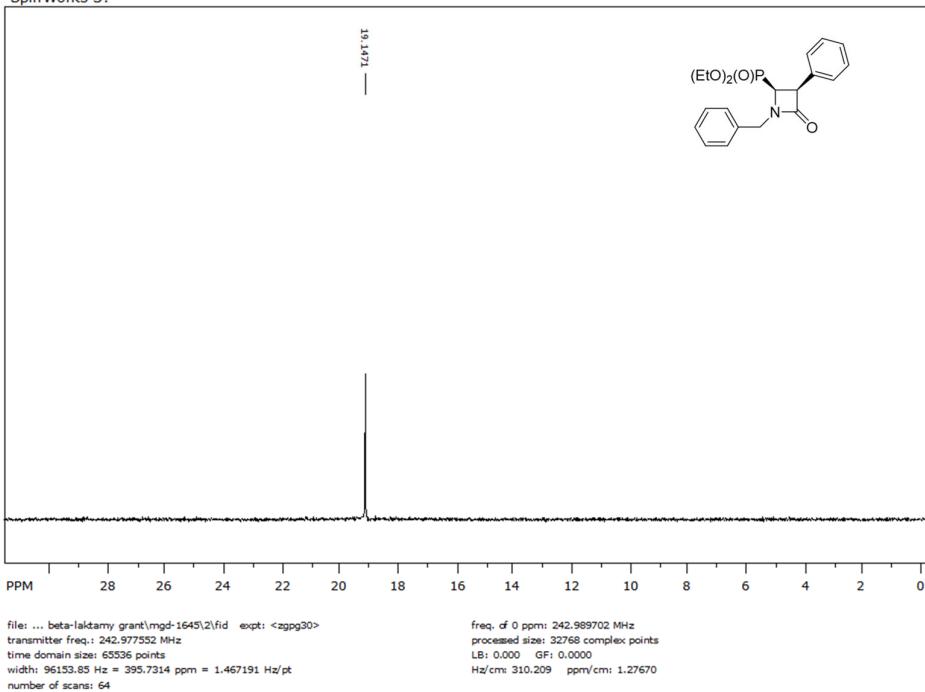


Figure S30: <sup>31</sup>P NMR Spectrum for *cis*-11a in CDCl<sub>3</sub>

SpinWorks 3: no title

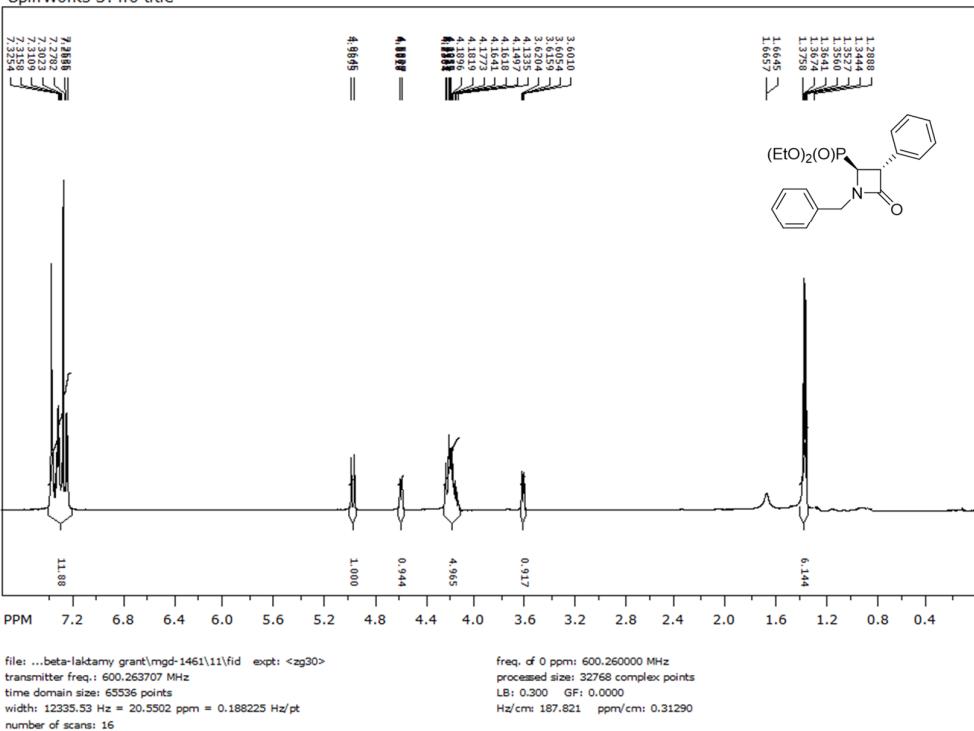


Figure S31: <sup>1</sup>H NMR Spectrum for *trans*-11a in CDCl<sub>3</sub>

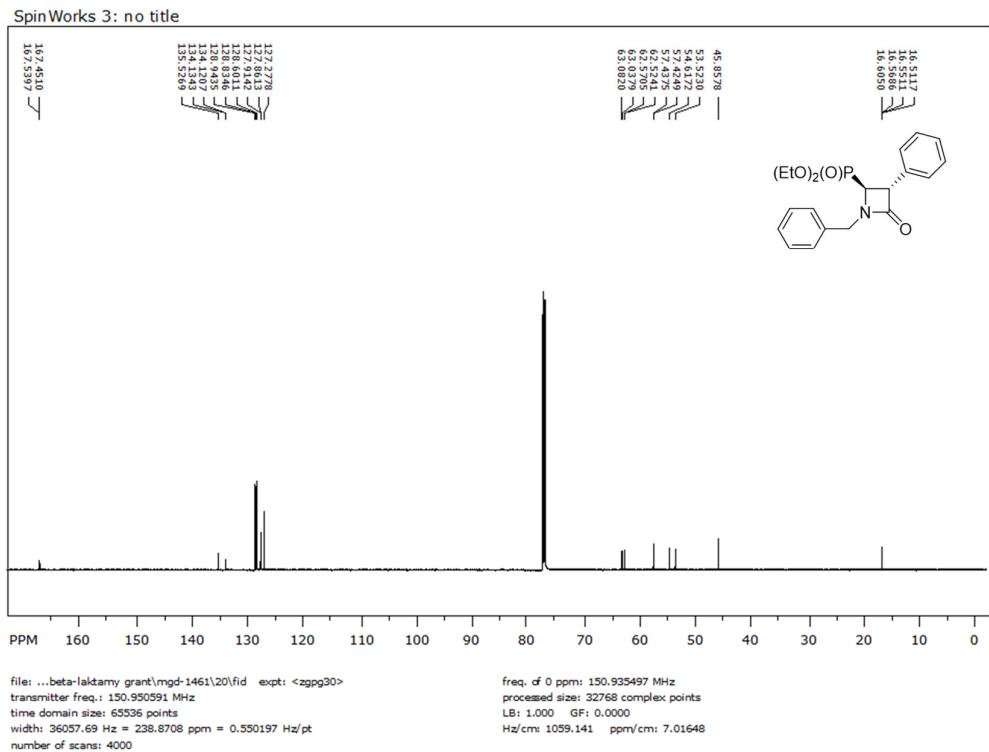


Figure S32:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11a** in  $\text{CDCl}_3$

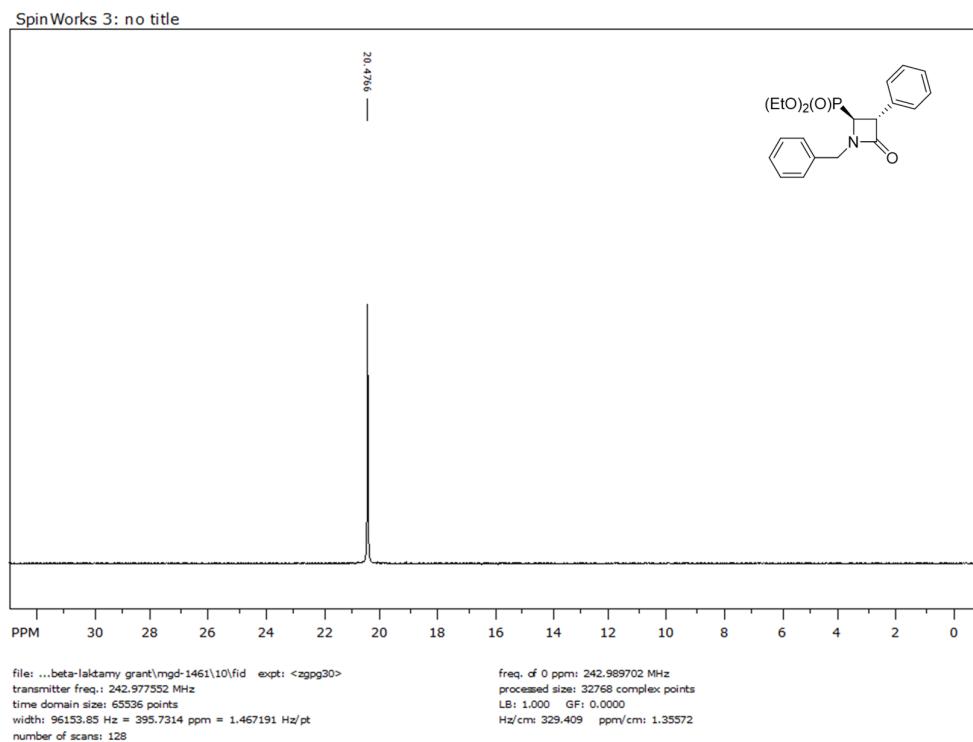


Figure S33:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11a** in  $\text{CDCl}_3$

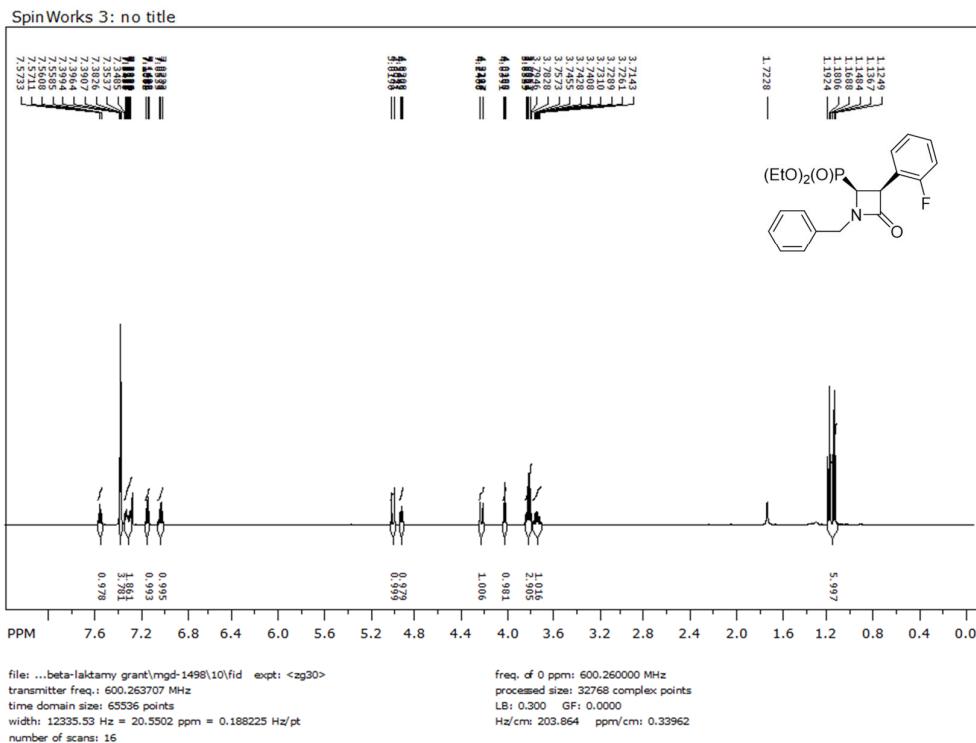


Figure S34:  $^1\text{H}$  NMR Spectrum for *cis*-**11b** in  $\text{CDCl}_3$

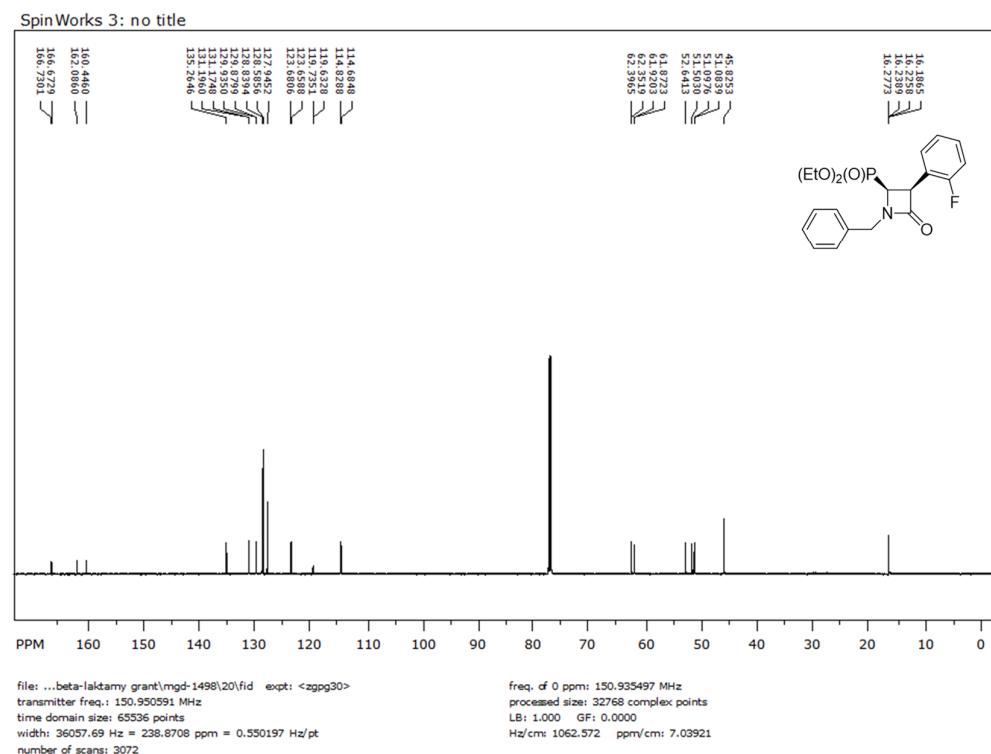


Figure S35:  $^{13}\text{C}$  NMR Spectrum for *cis*-**11b** in  $\text{CDCl}_3$

SpinWorks 3: no title

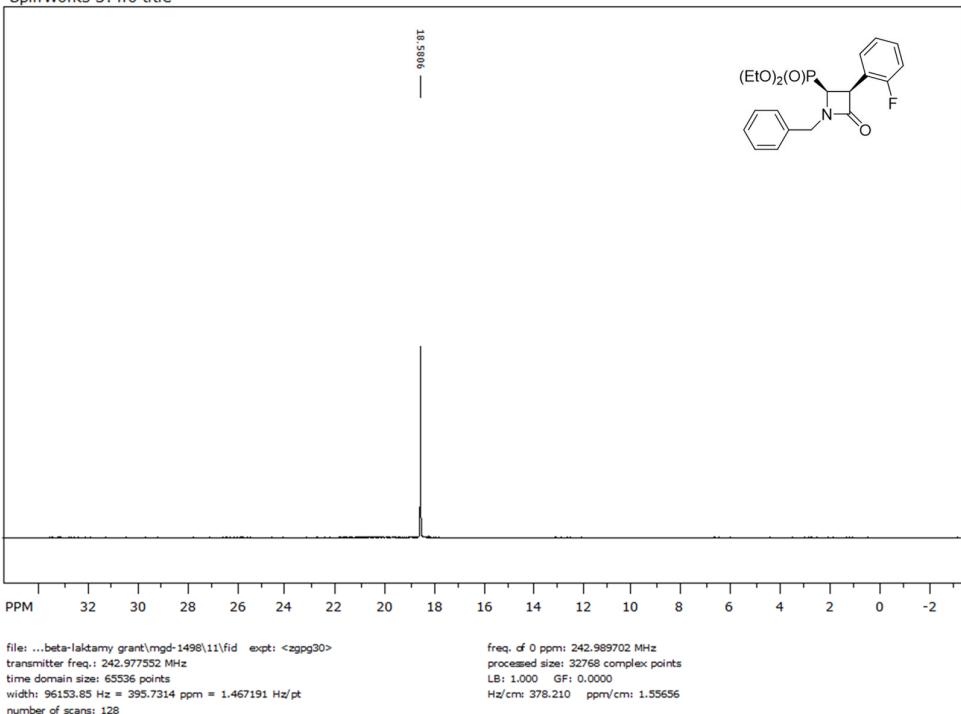


Figure S36: <sup>31</sup>P NMR Spectrum for *cis*-11b in CDCl<sub>3</sub>

SpinWorks 3: no title

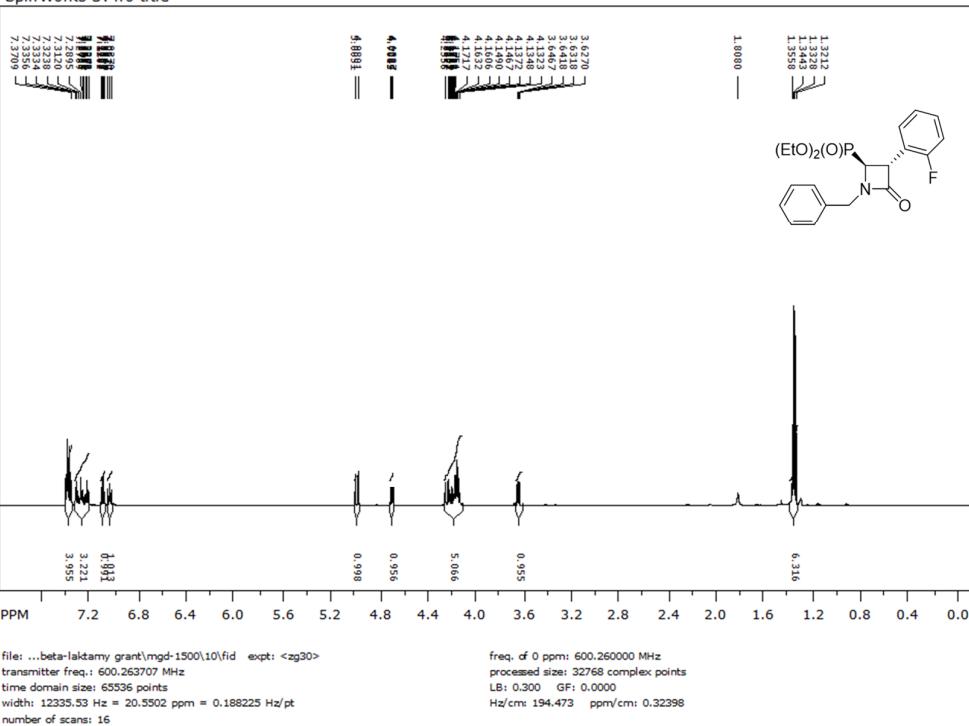


Figure S37: <sup>1</sup>H NMR Spectrum for *trans*-11b in CDCl<sub>3</sub>

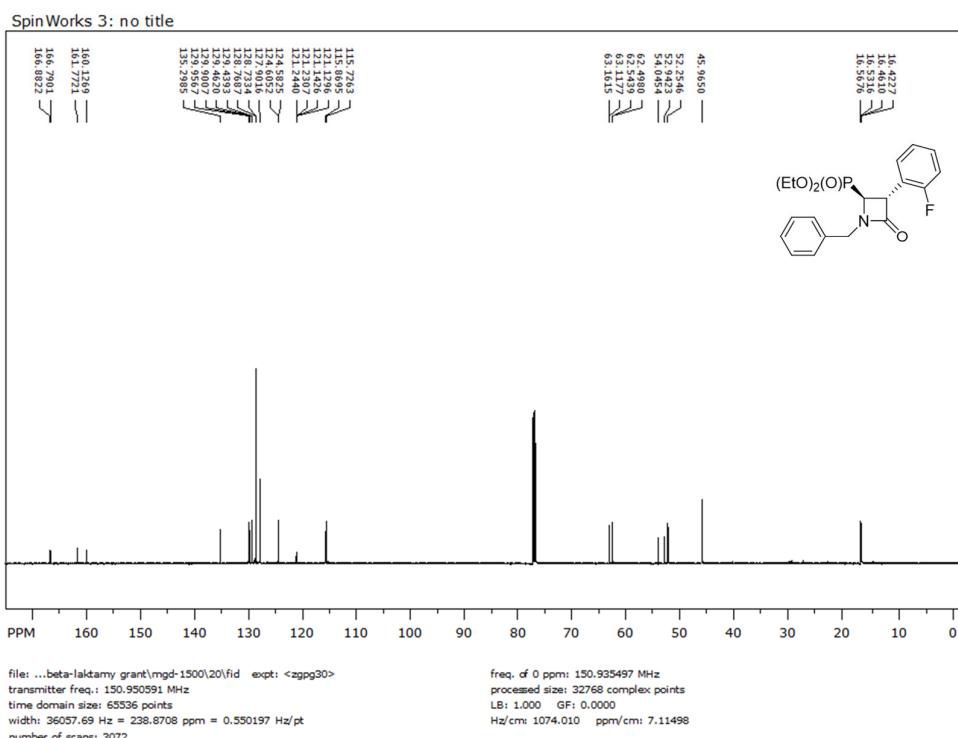


Figure S38:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11b** in  $\text{CDCl}_3$

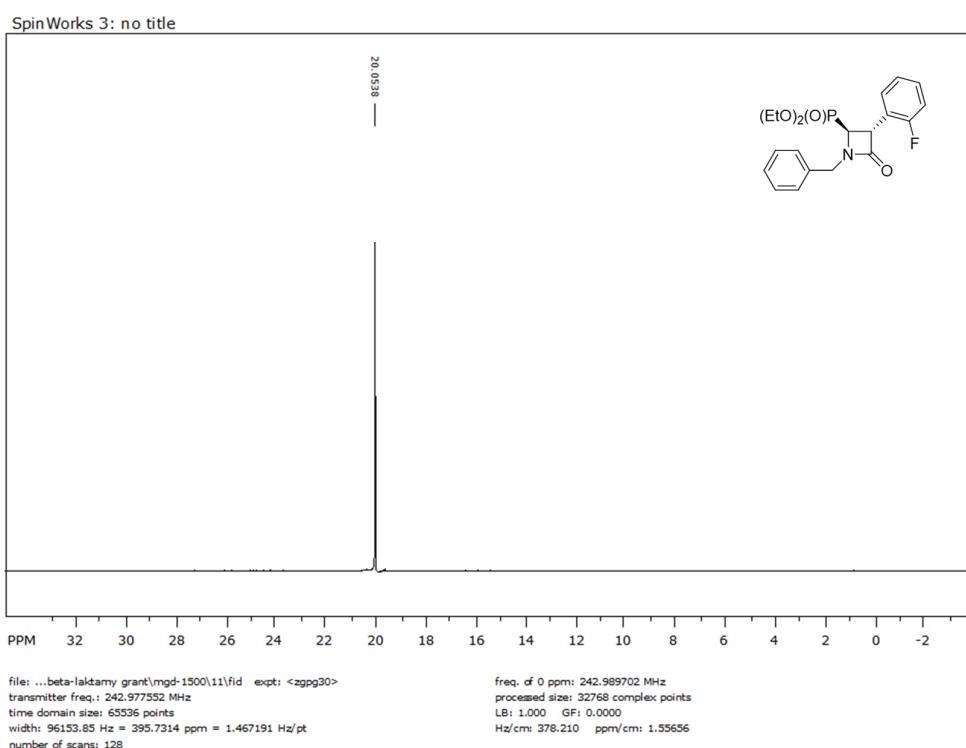


Figure S39:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11b** in  $\text{CDCl}_3$

SpinWorks 3: no title

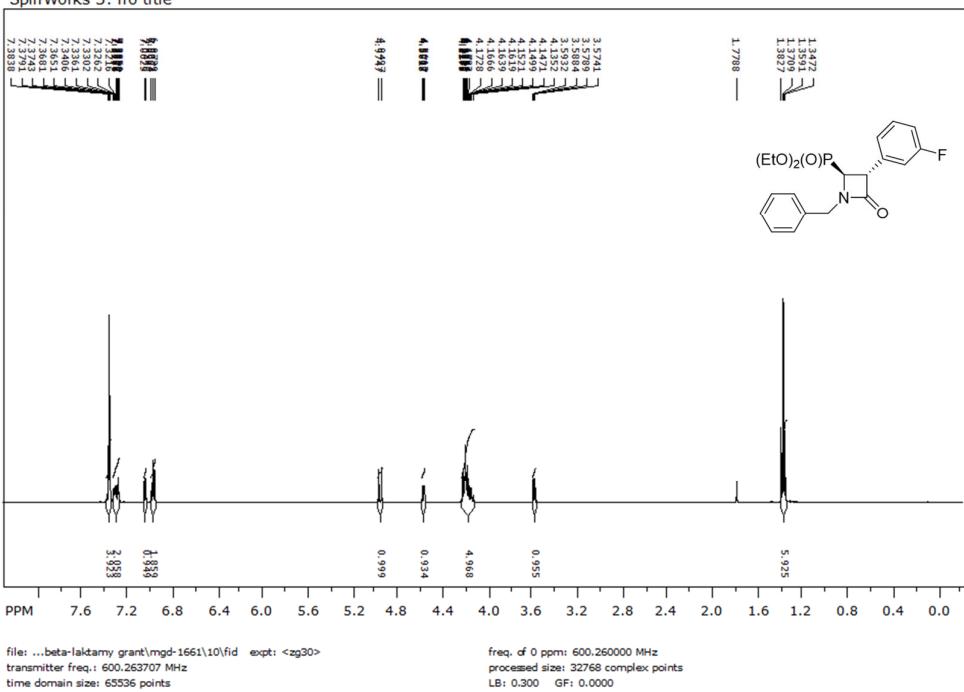


Figure S40: <sup>1</sup>H NMR Spectrum for *trans*-11c in CDCl<sub>3</sub>

SpinWorks 3: no title

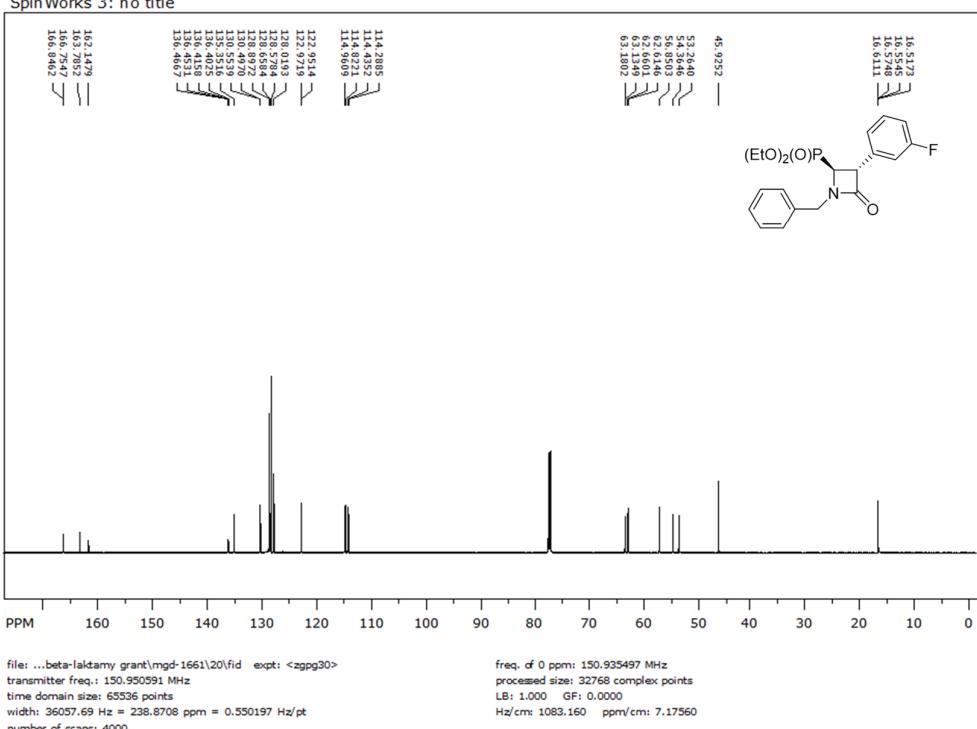


Figure S41: <sup>13</sup>C NMR Spectrum for *trans*-11c in CDCl<sub>3</sub>

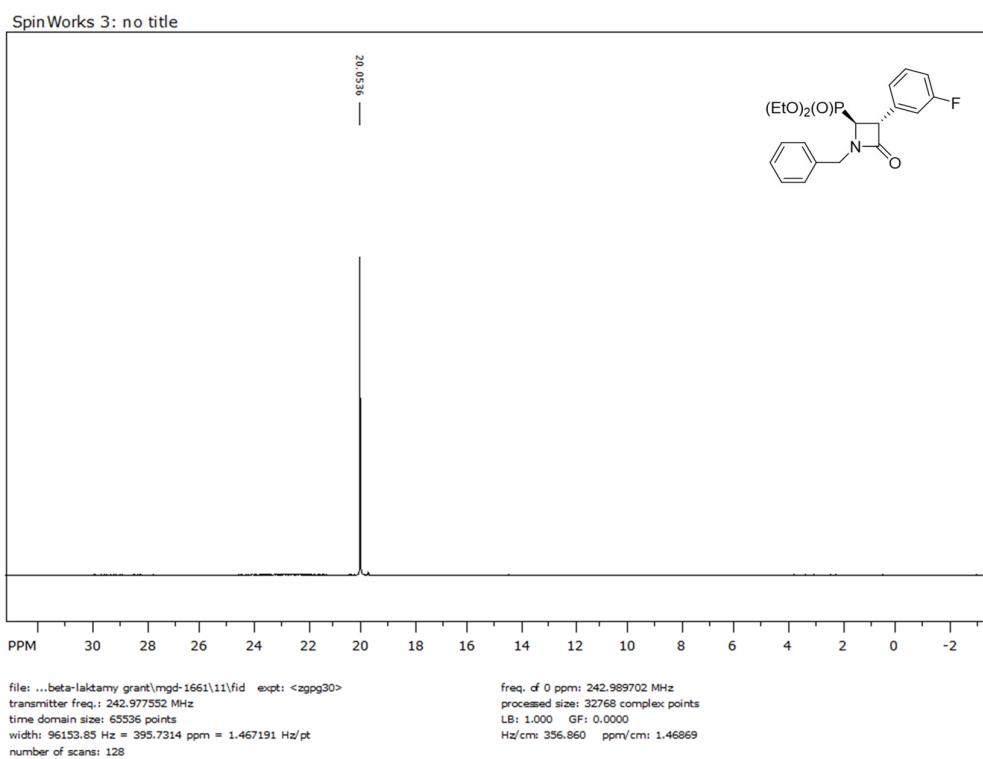


Figure S42:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11c** in  $\text{CDCl}_3$

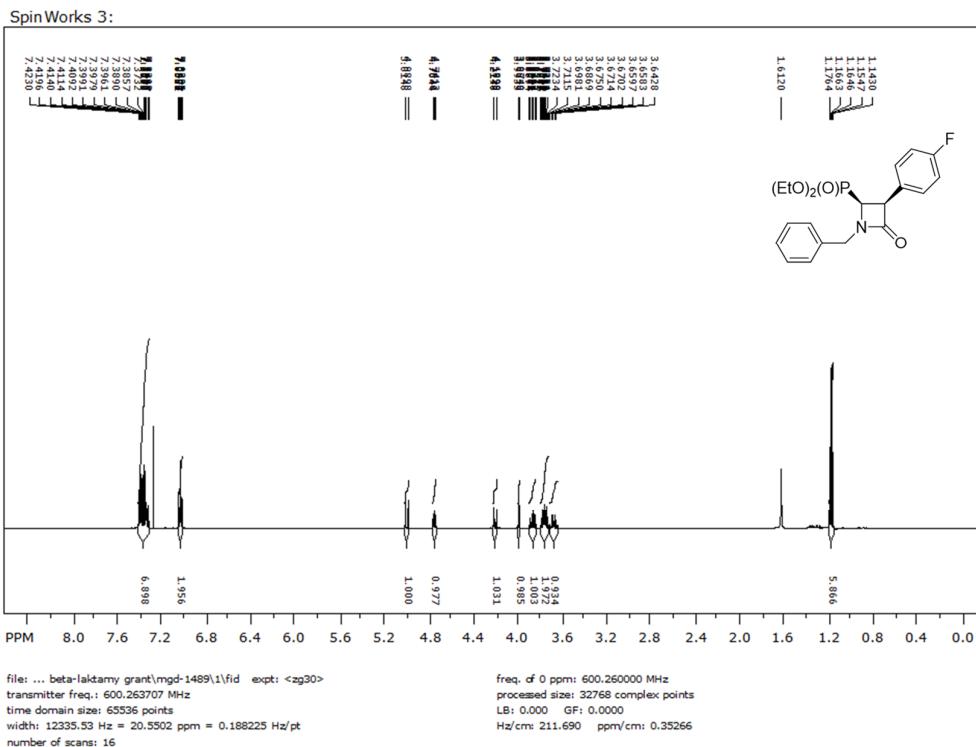


Figure S43:  $^1\text{H}$  NMR Spectrum for *cis*-**11d** in  $\text{CDCl}_3$

SpinWorks 3: no title

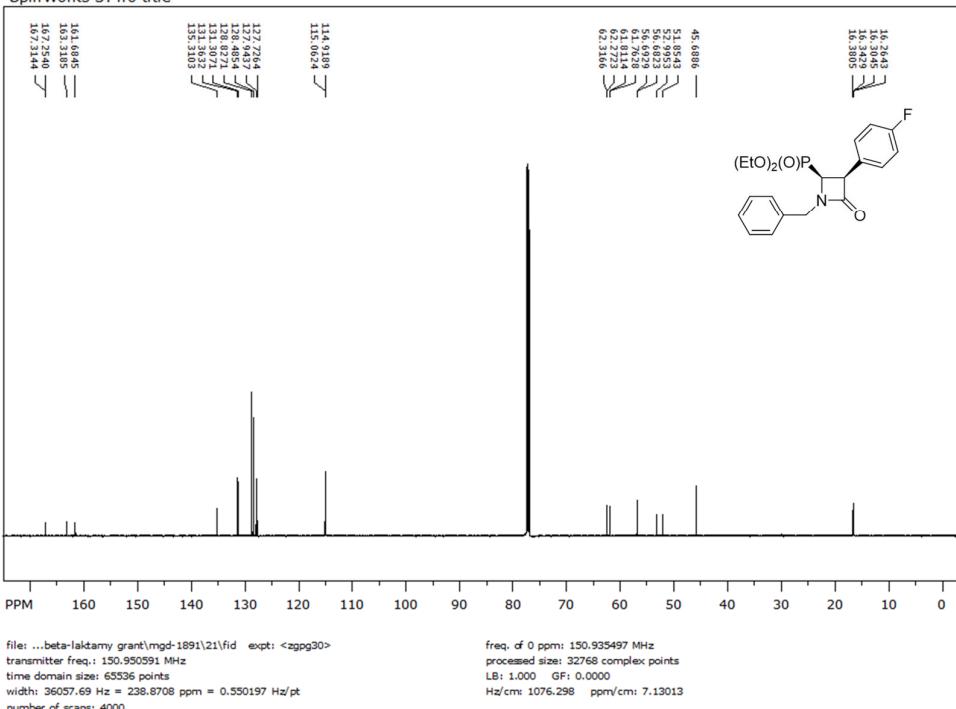


Figure S44: <sup>13</sup>C NMR Spectrum for *cis*-11d in CDCl<sub>3</sub>

SpinWorks 3:

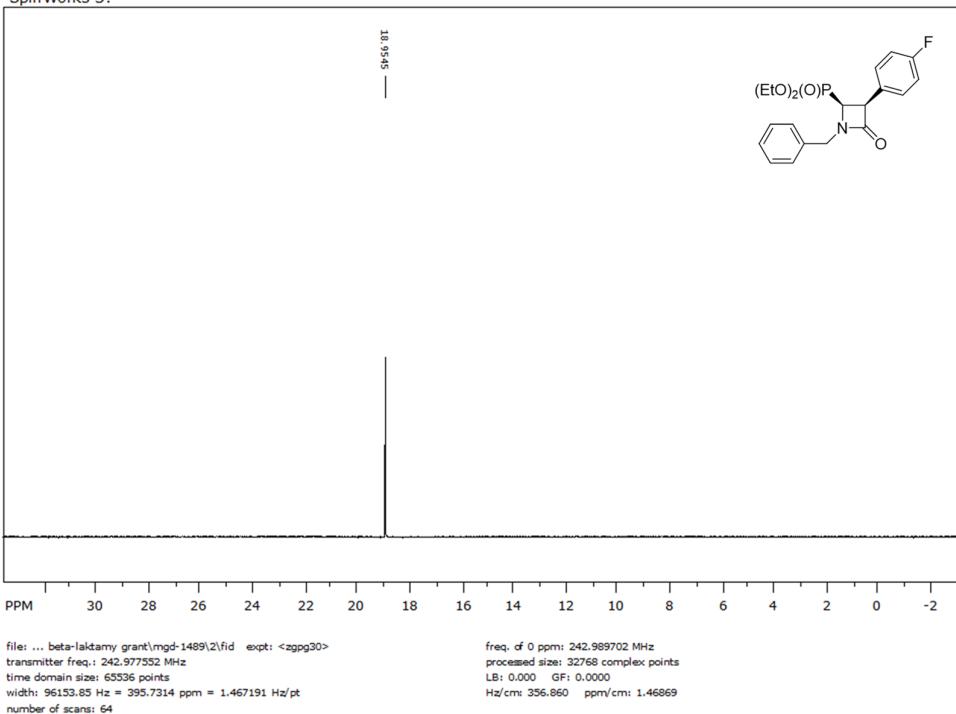


Figure S45: <sup>31</sup>P NMR Spectrum for *cis*-11d in CDCl<sub>3</sub>

Spin Works 3:

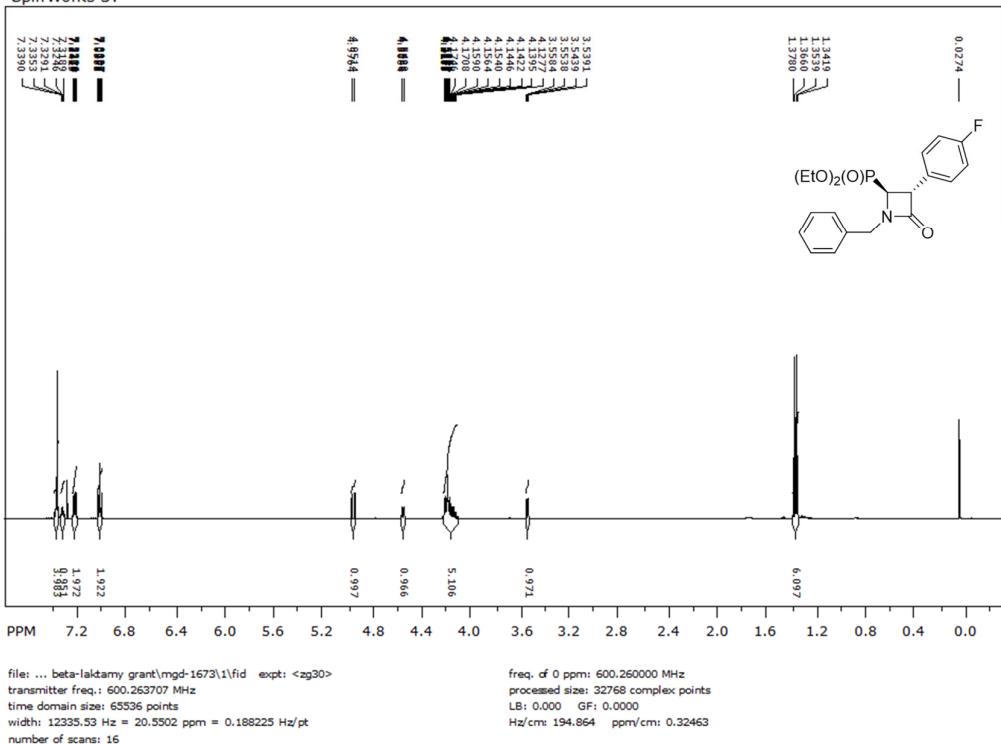


Figure S46: <sup>1</sup>H NMR Spectrum for *trans*-11d in CDCl<sub>3</sub>

Spin Works 3: no title

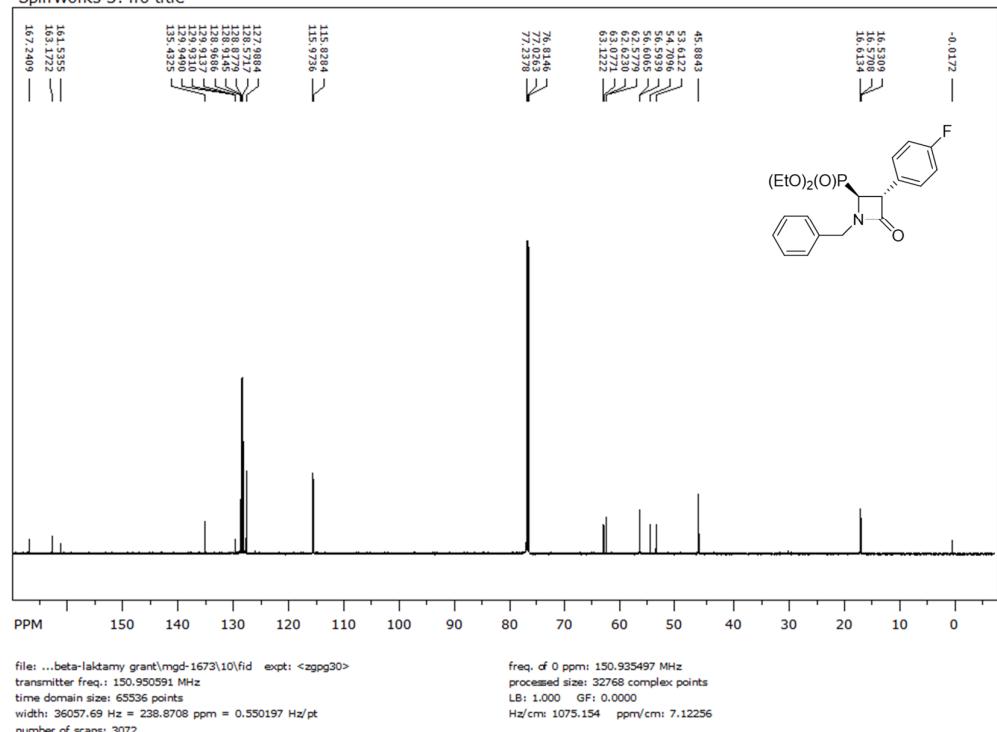


Figure S47: <sup>13</sup>C NMR Spectrum for *trans*-11d in CDCl<sub>3</sub>

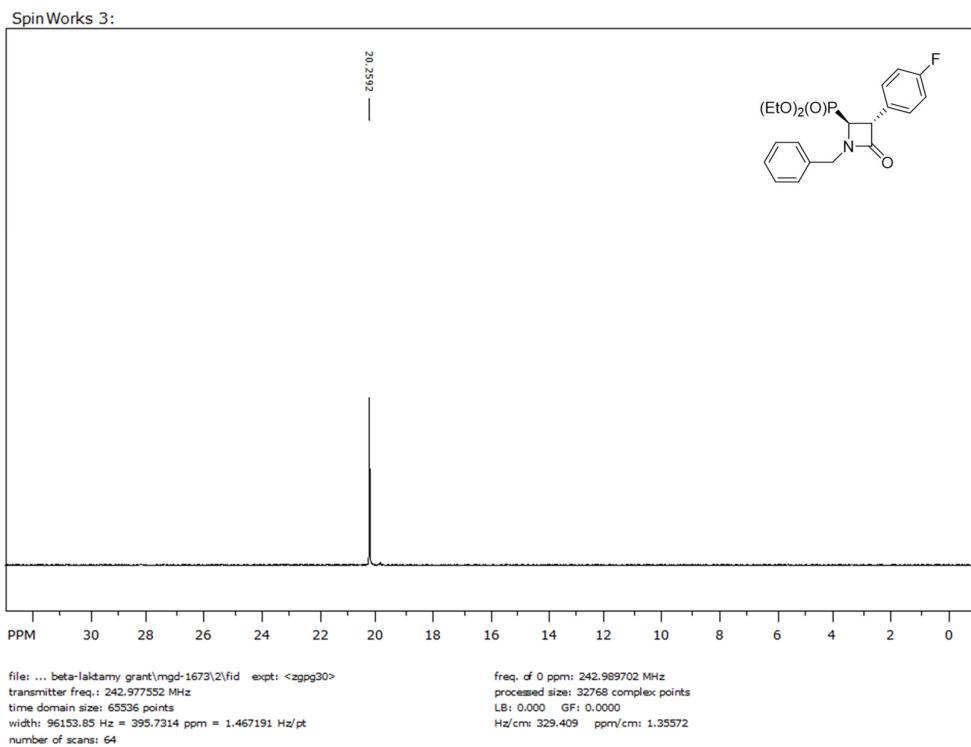


Figure S48:  $^{31}\text{P}$  NMR Spectrum for *trans*-**11d** in  $\text{CDCl}_3$

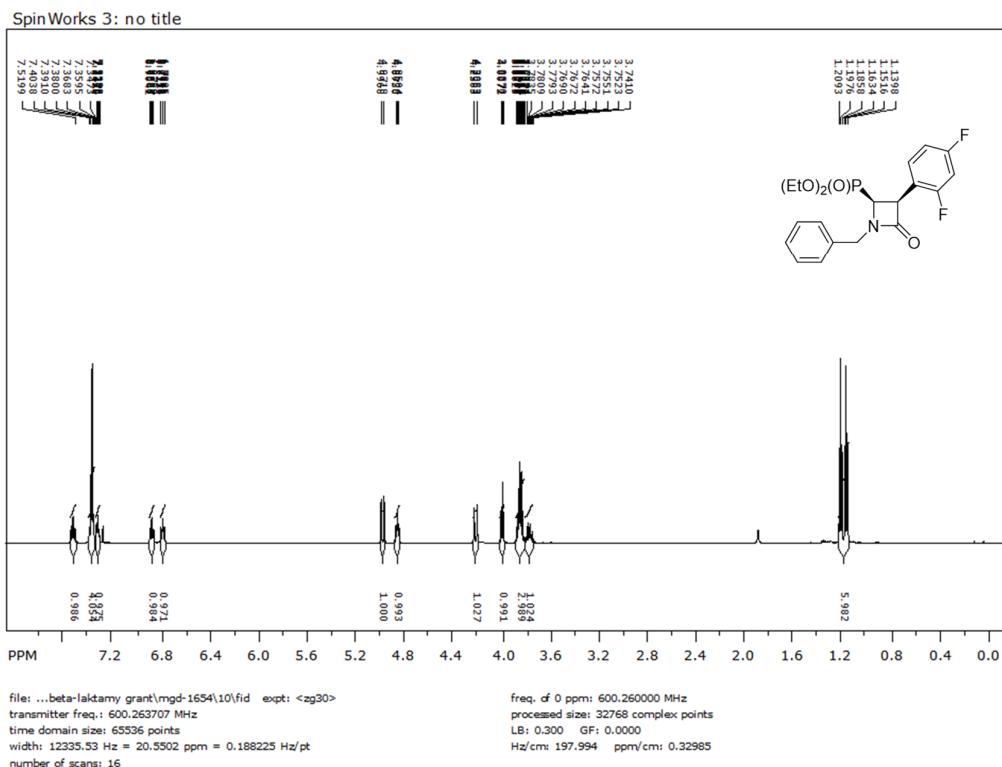


Figure S49:  $^1\text{H}$  NMR Spectrum for *cis*-**11e** in  $\text{CDCl}_3$

SpinWorks 3: no title

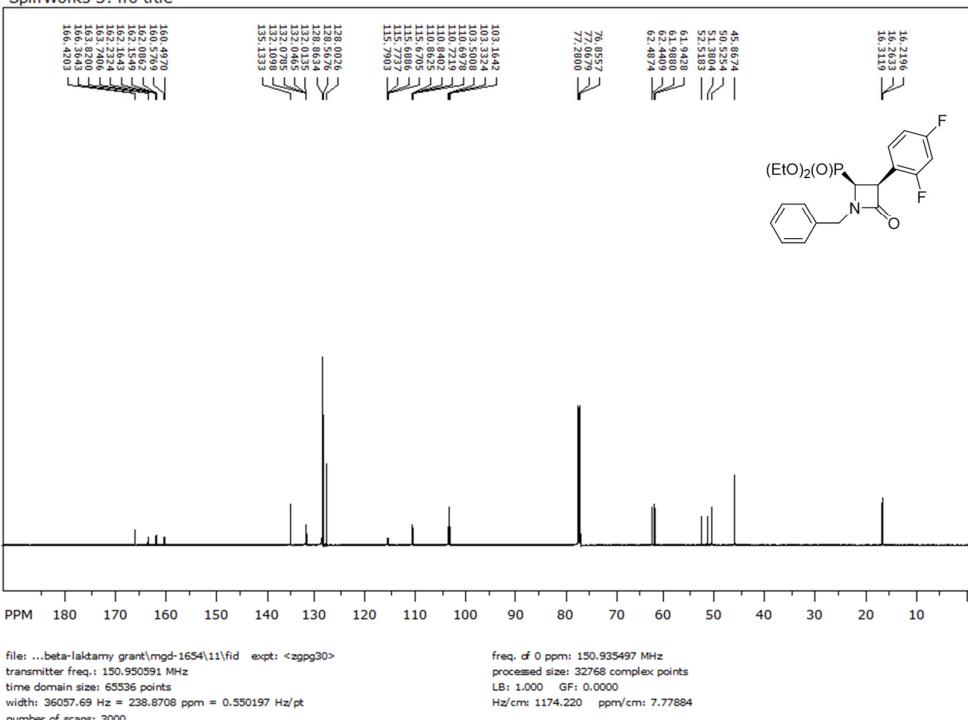


Figure S50: <sup>13</sup>C NMR Spectrum for *cis*-11e in  $\text{CDCl}_3$

SpinWorks 3:

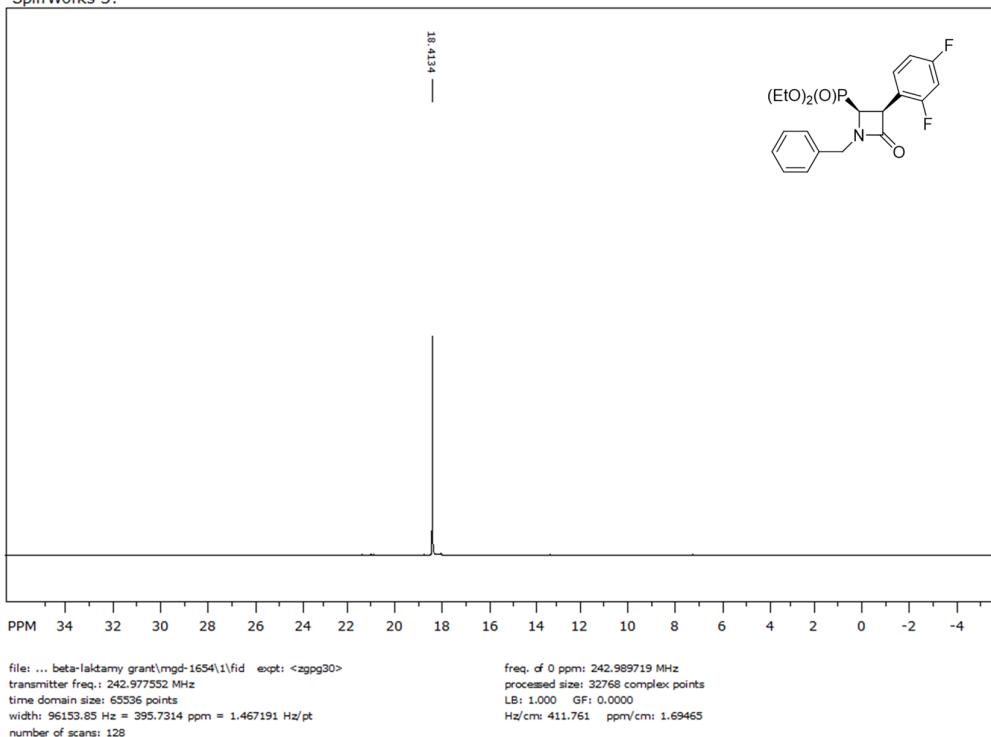


Figure S51: <sup>31</sup>P NMR Spectrum for *cis*-11e in  $\text{CDCl}_3$

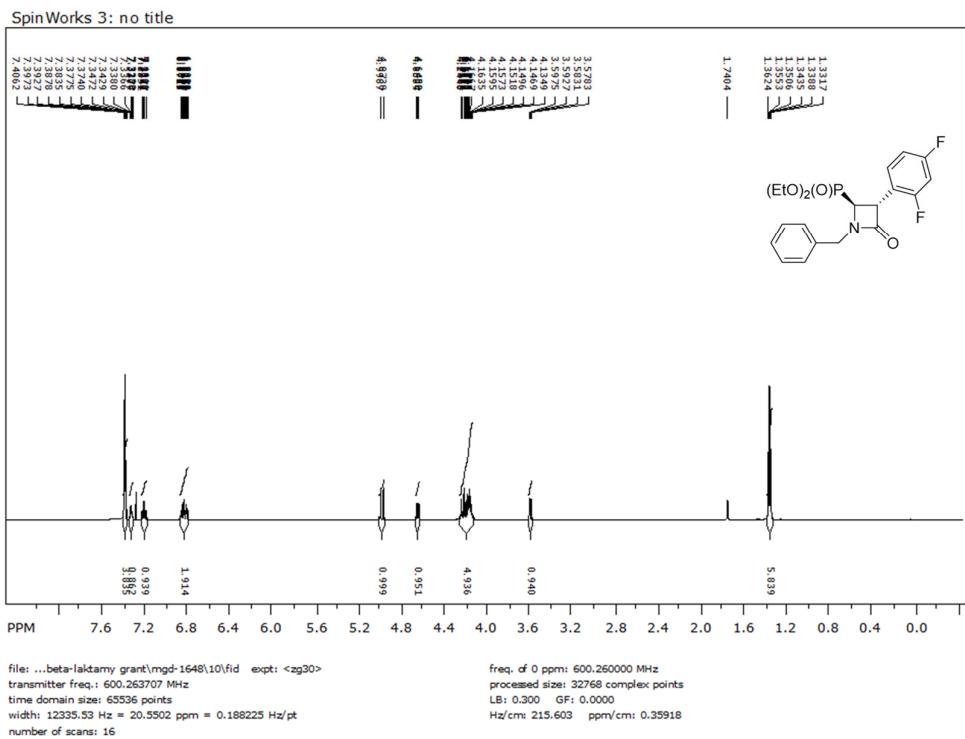


Figure S52:  $^1\text{H}$  NMR Spectrum for *trans*-**11e** in  $\text{CDCl}_3$

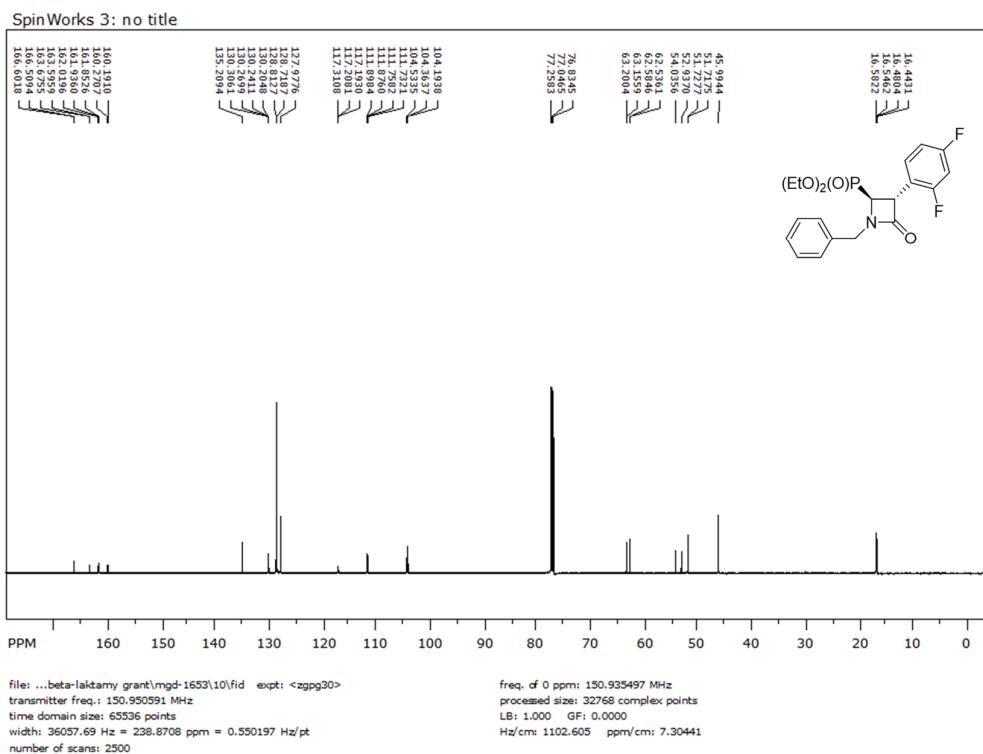


Figure S53:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11e** in  $\text{CDCl}_3$

SpinWorks 3: no title

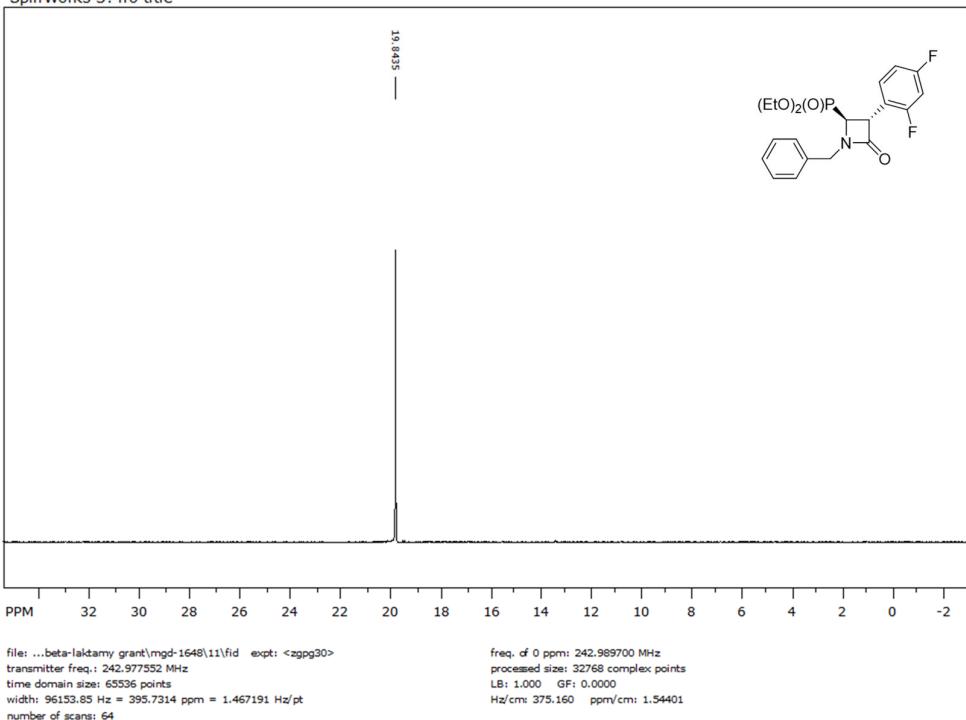


Figure S54: <sup>31</sup>P NMR Spectrum for *trans*-11e in CDCl<sub>3</sub>

SpinWorks 3:

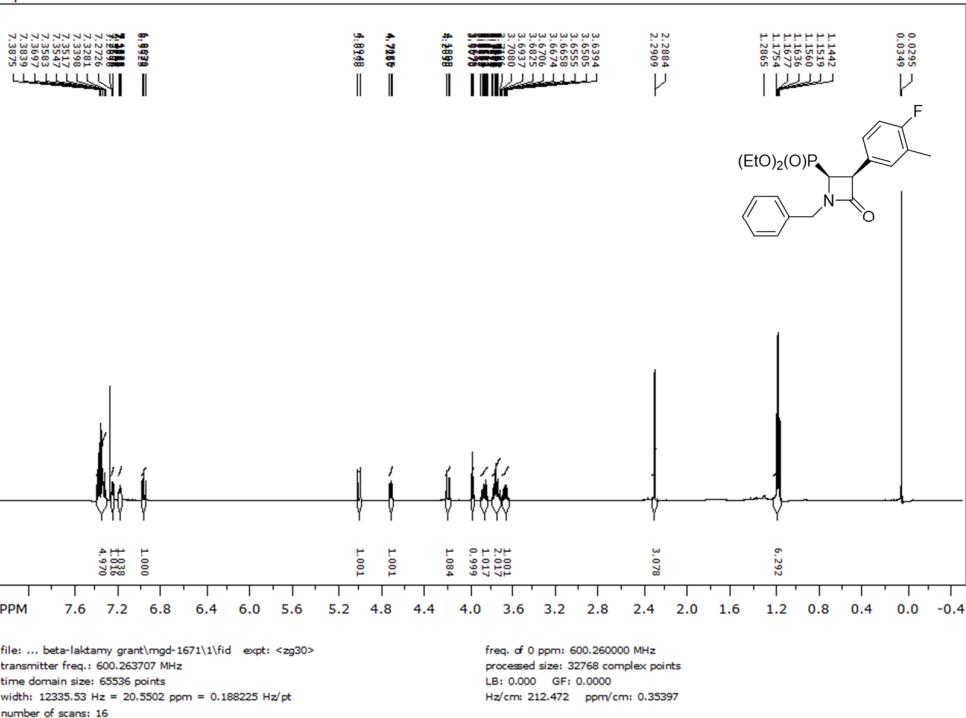


Figure S55: <sup>1</sup>H NMR Spectrum for *cis*-11f in CDCl<sub>3</sub>

SpinWorks 3:

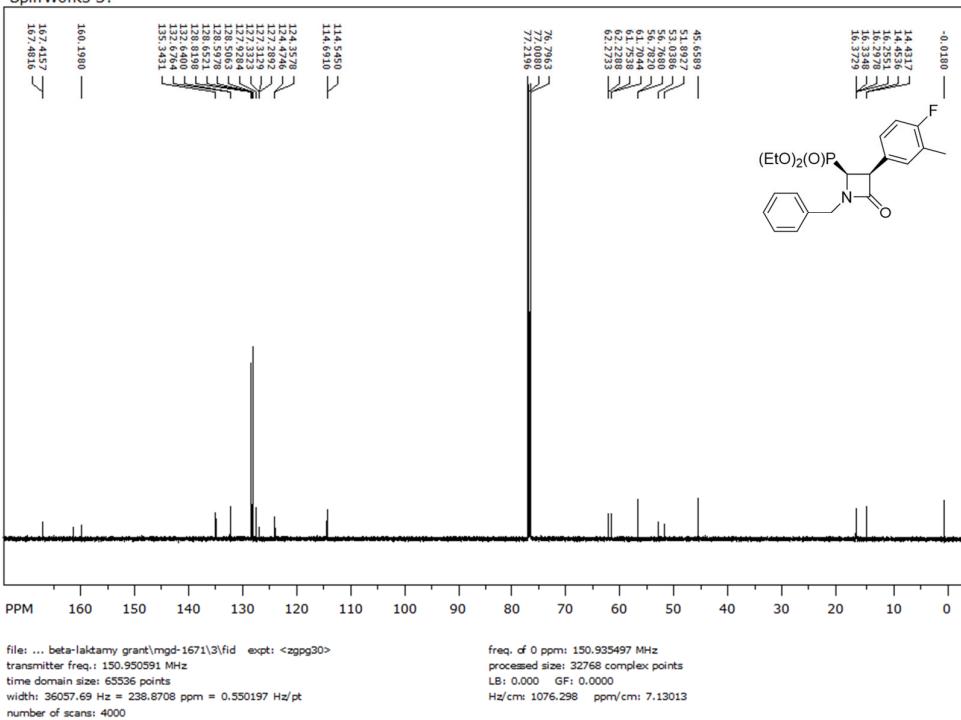


Figure S56: <sup>13</sup>C NMR Spectrum for *cis*-11f in CDCl<sub>3</sub>

SpinWorks 3:

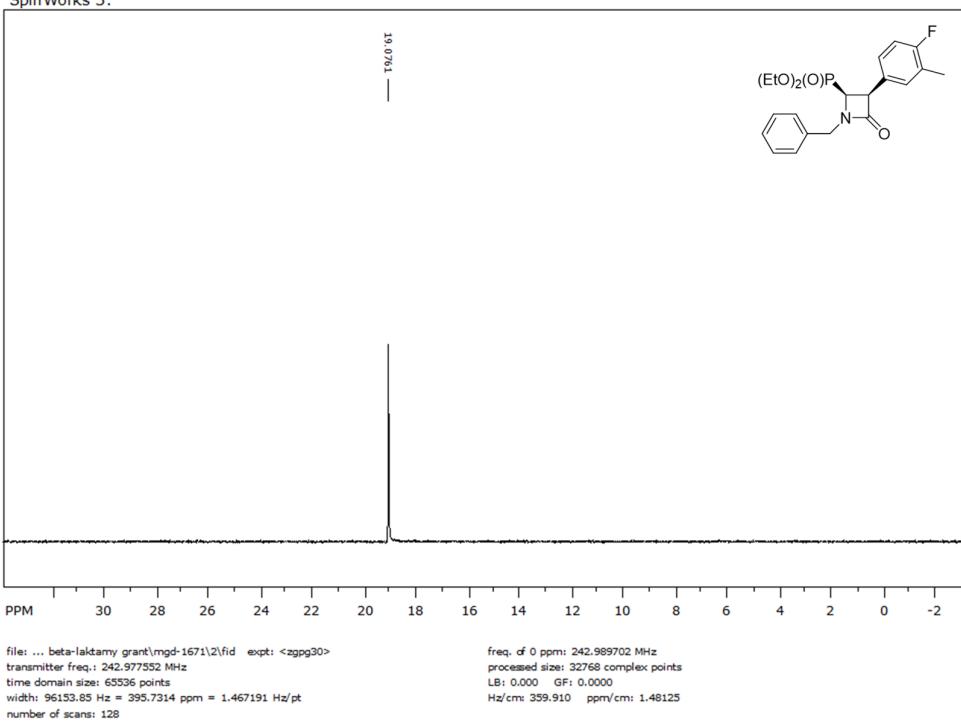


Figure S57: <sup>31</sup>P NMR Spectrum for *cis*-11f in CDCl<sub>3</sub>

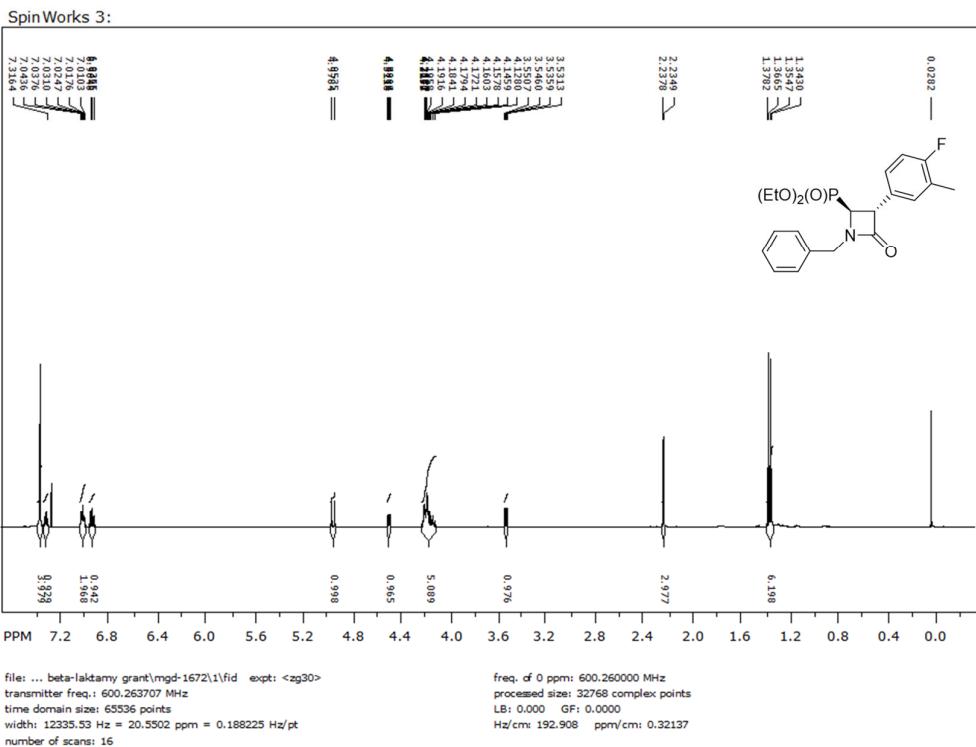


Figure S58:  $^1\text{H}$  NMR Spectrum for *trans*-**11f** in  $\text{CDCl}_3$

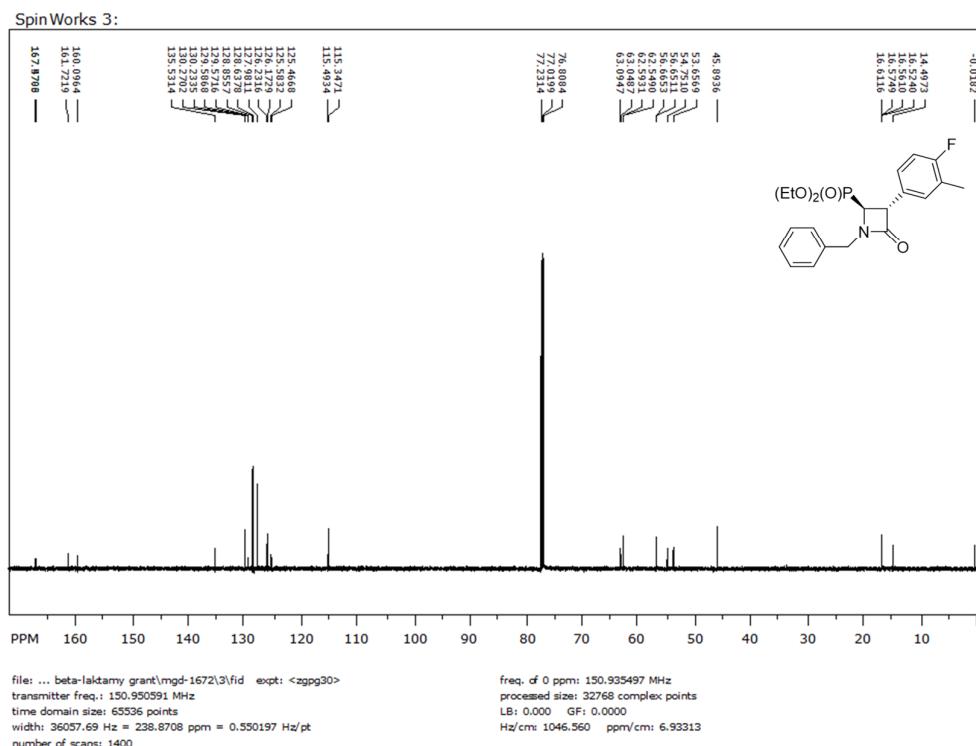


Figure S59:  $^{13}\text{C}$  NMR Spectrum for *trans*-**11f** in  $\text{CDCl}_3$

SpinWorks 3:

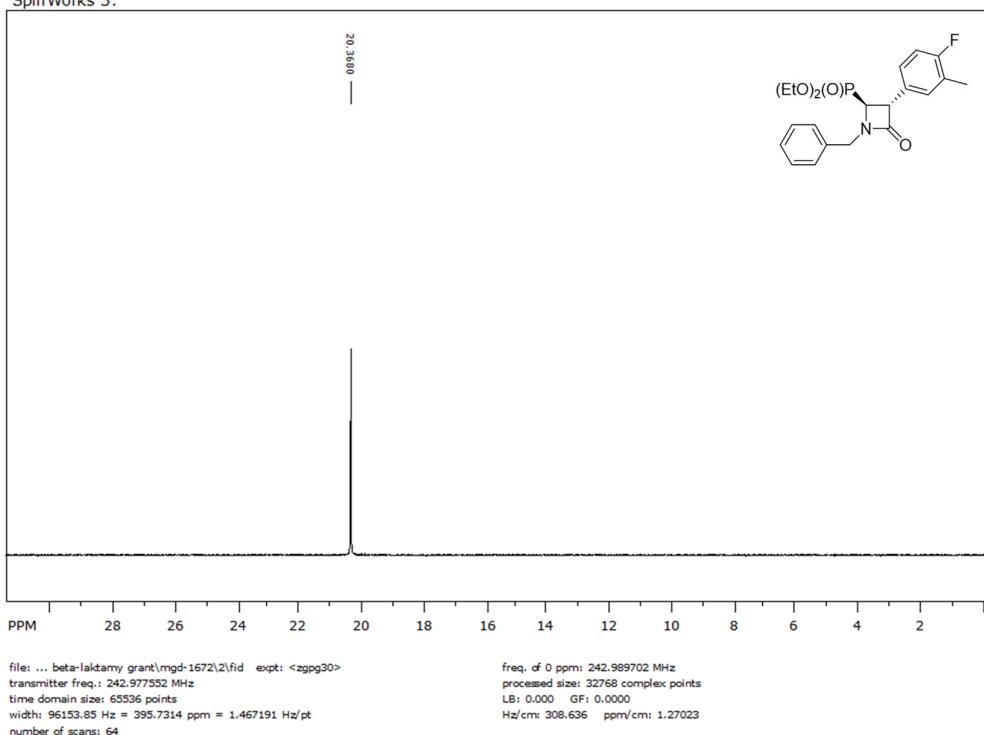


Figure S60:  $^{31}\text{P}$  NMR Spectrum for *trans*-11f in  $\text{CDCl}_3$