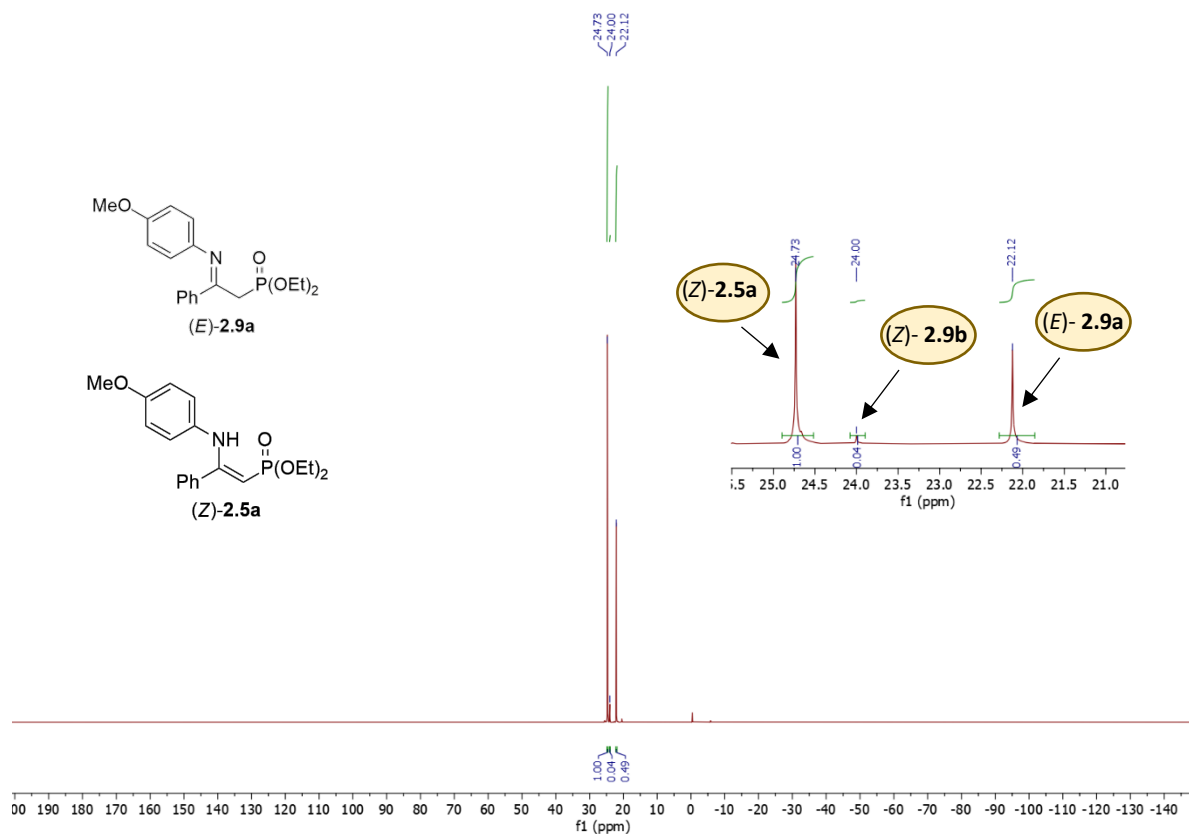
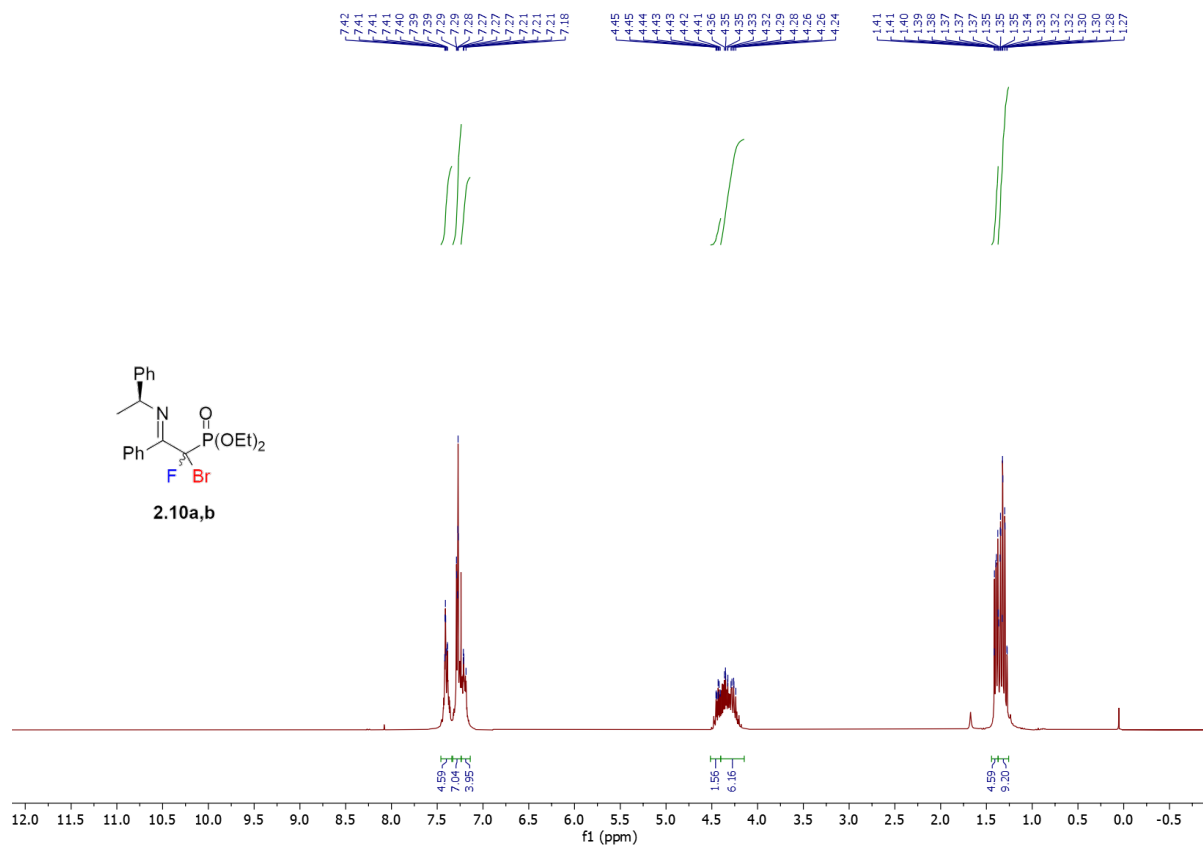


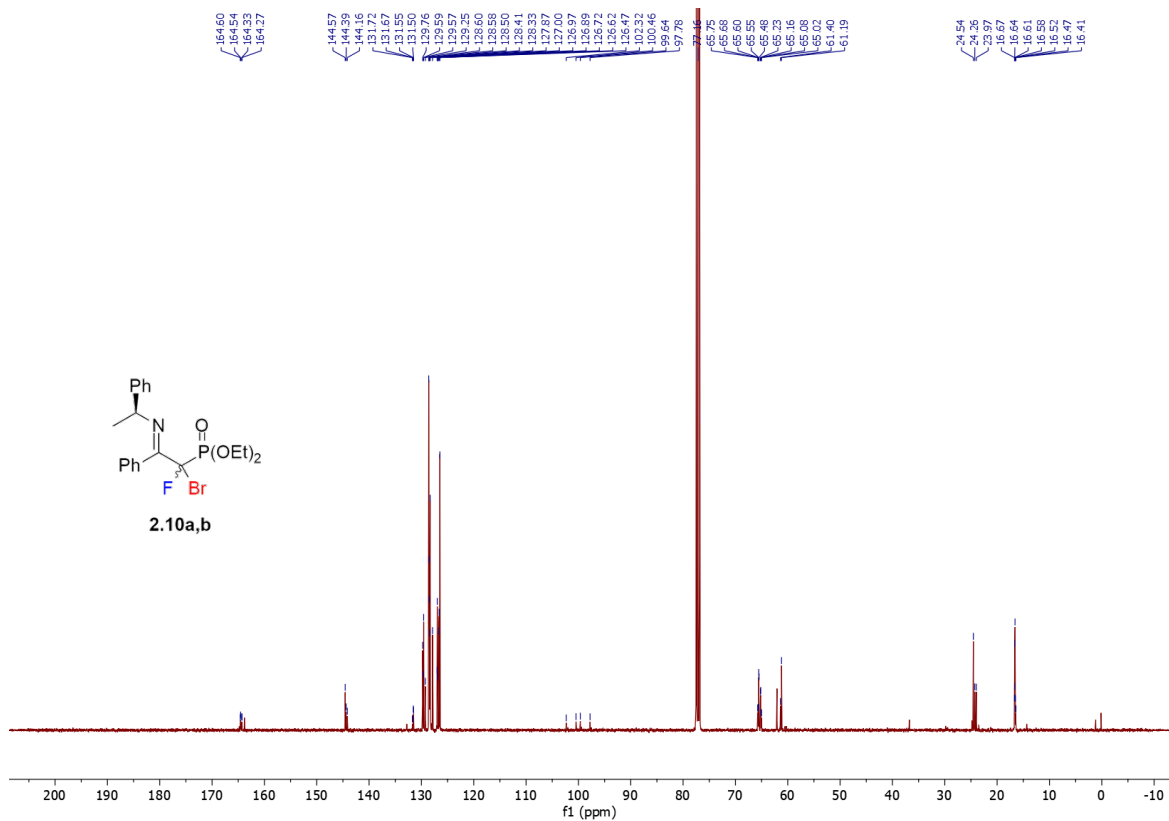
6. WIDMA NMR



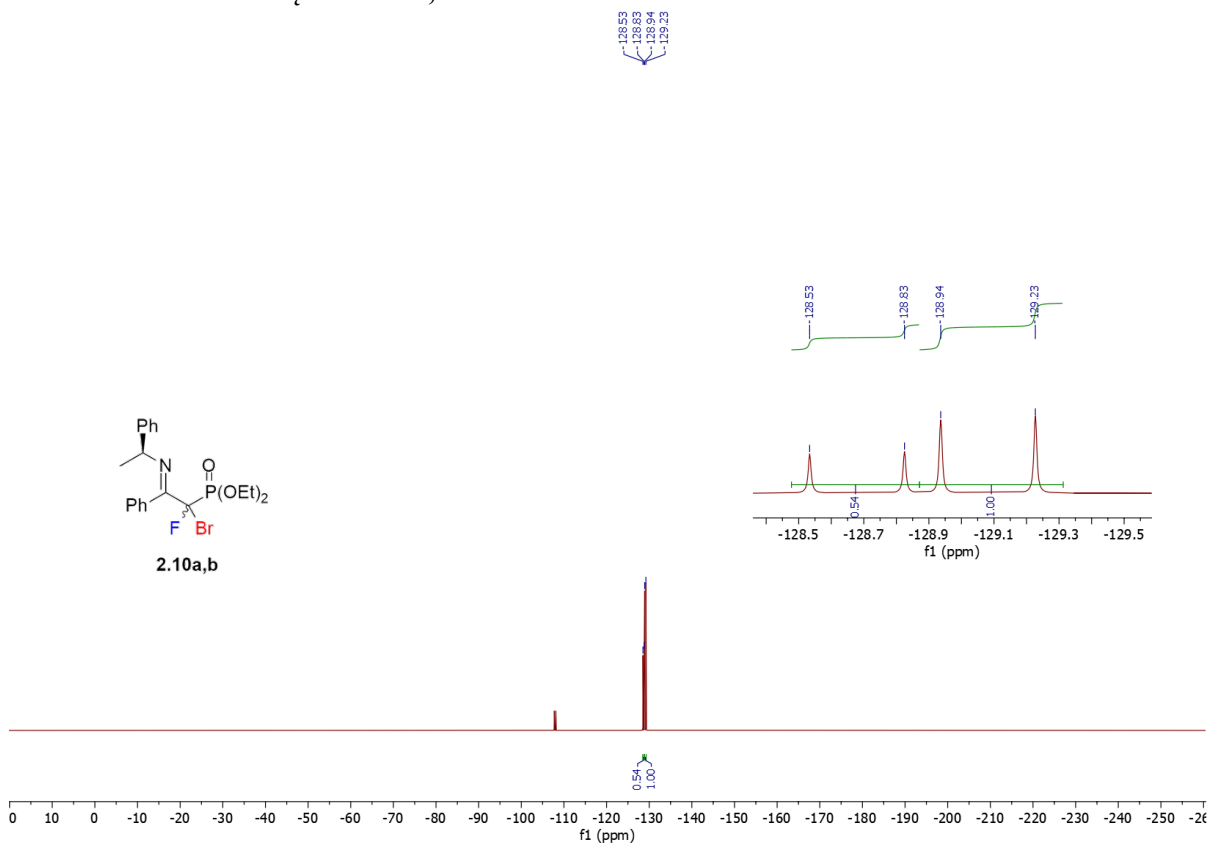
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR mieszaniny **2.5a/2.9a,b** 1:0.53. (E)-2.9a/(Z)-2.9b 1:0.08.



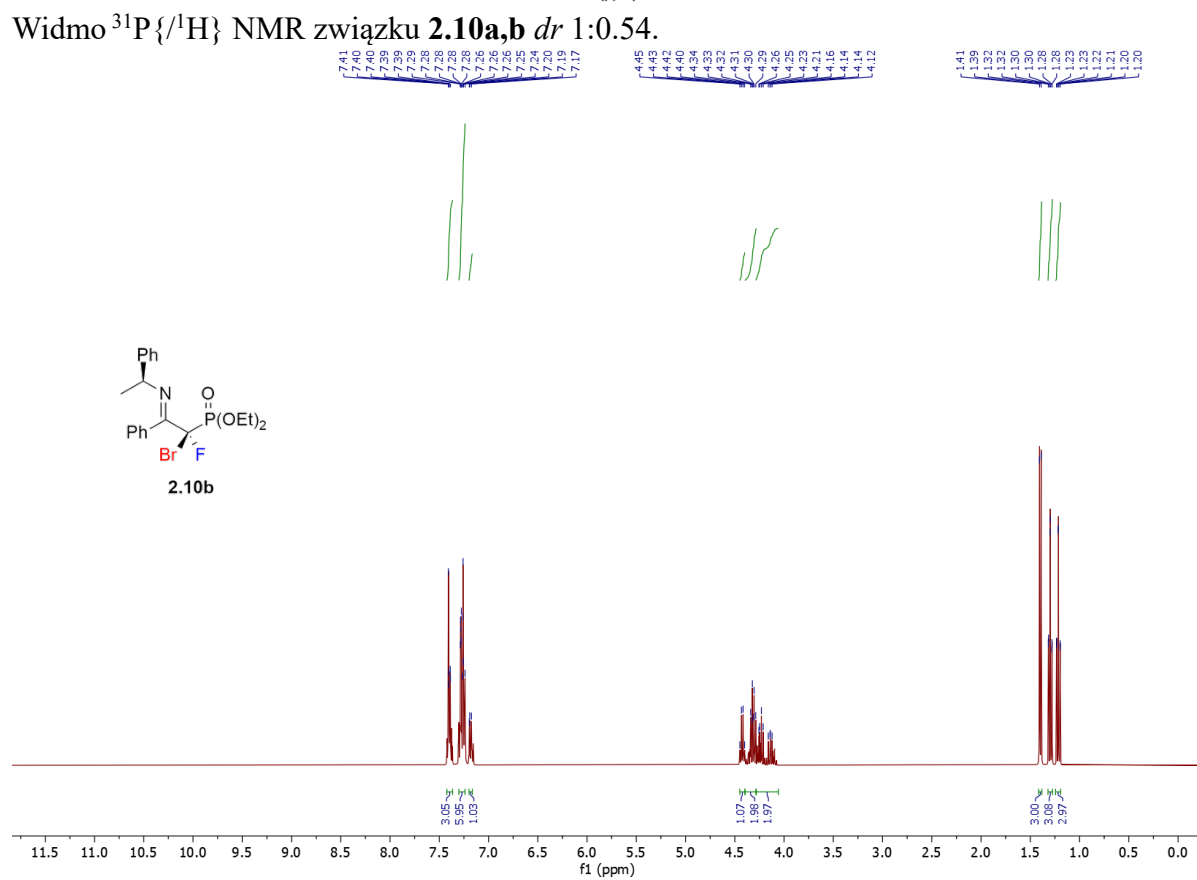
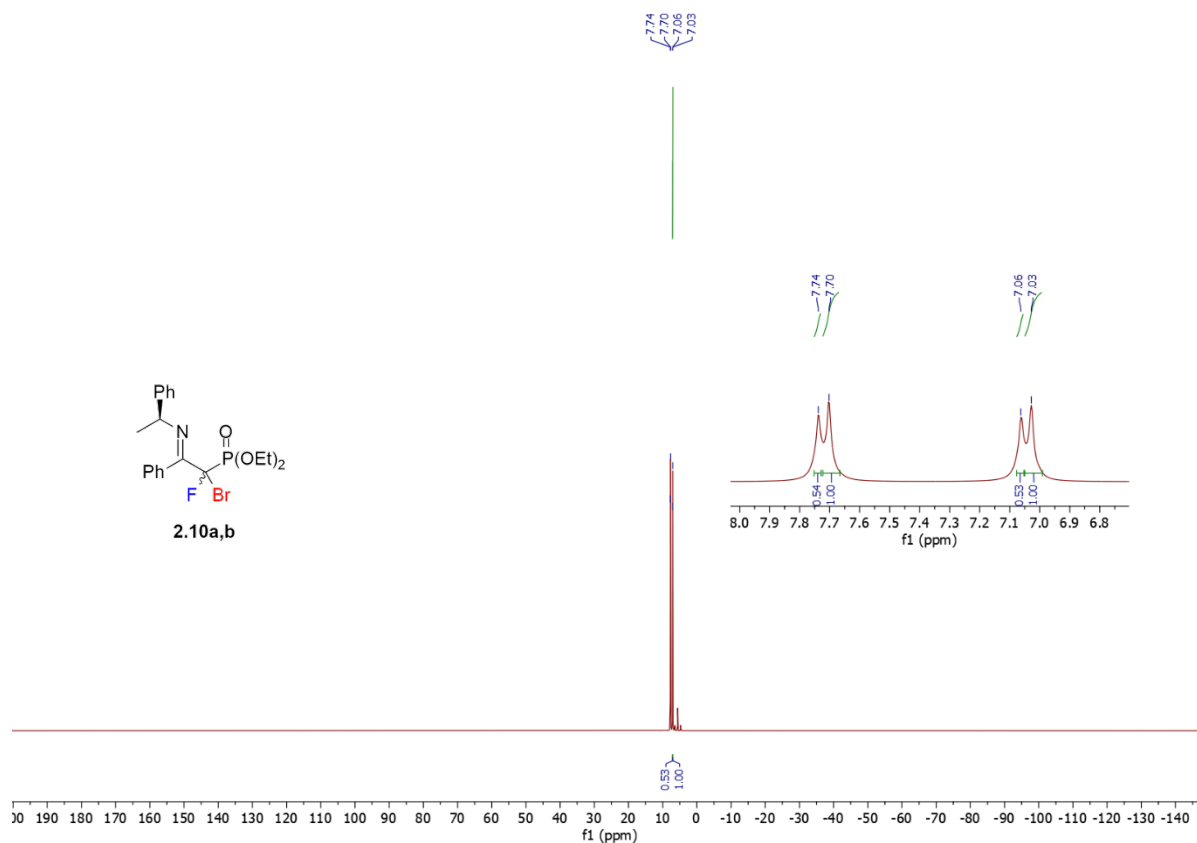
Widmo ^1H NMR związku **2.10a,b** dr 1:0.54.

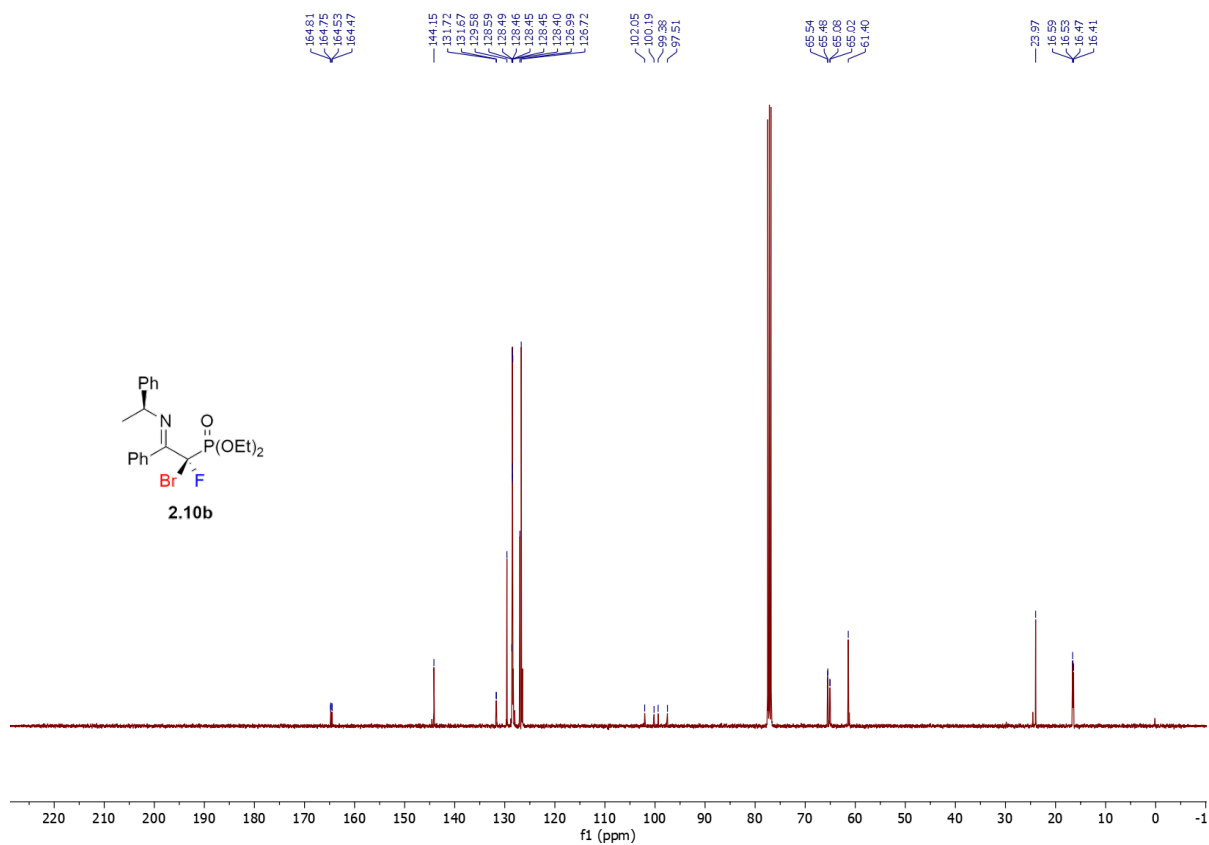


Widmo ¹³C NMR związku **2.10a,b** *dr* 1:0.54.

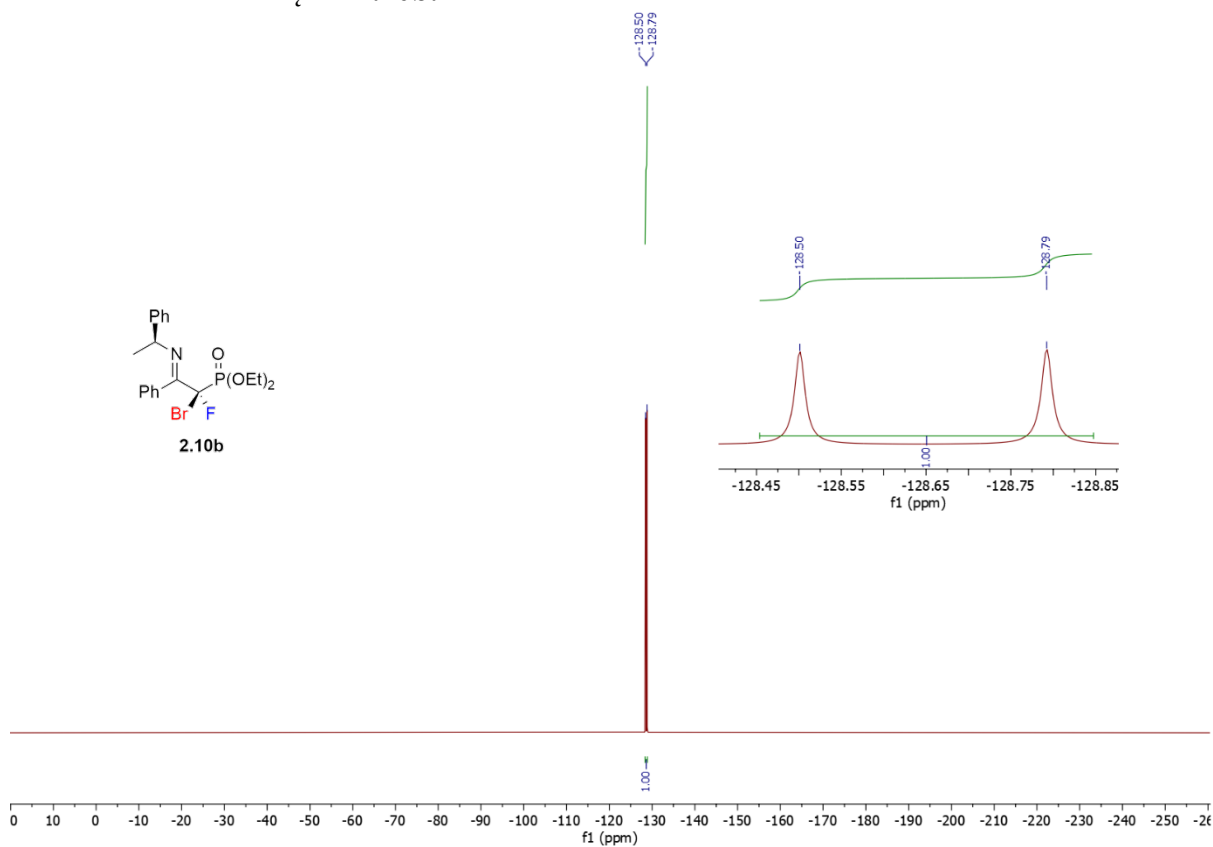


Widmo ¹⁹F NMR związku **2.10a,b** *dr* 1:0.54.

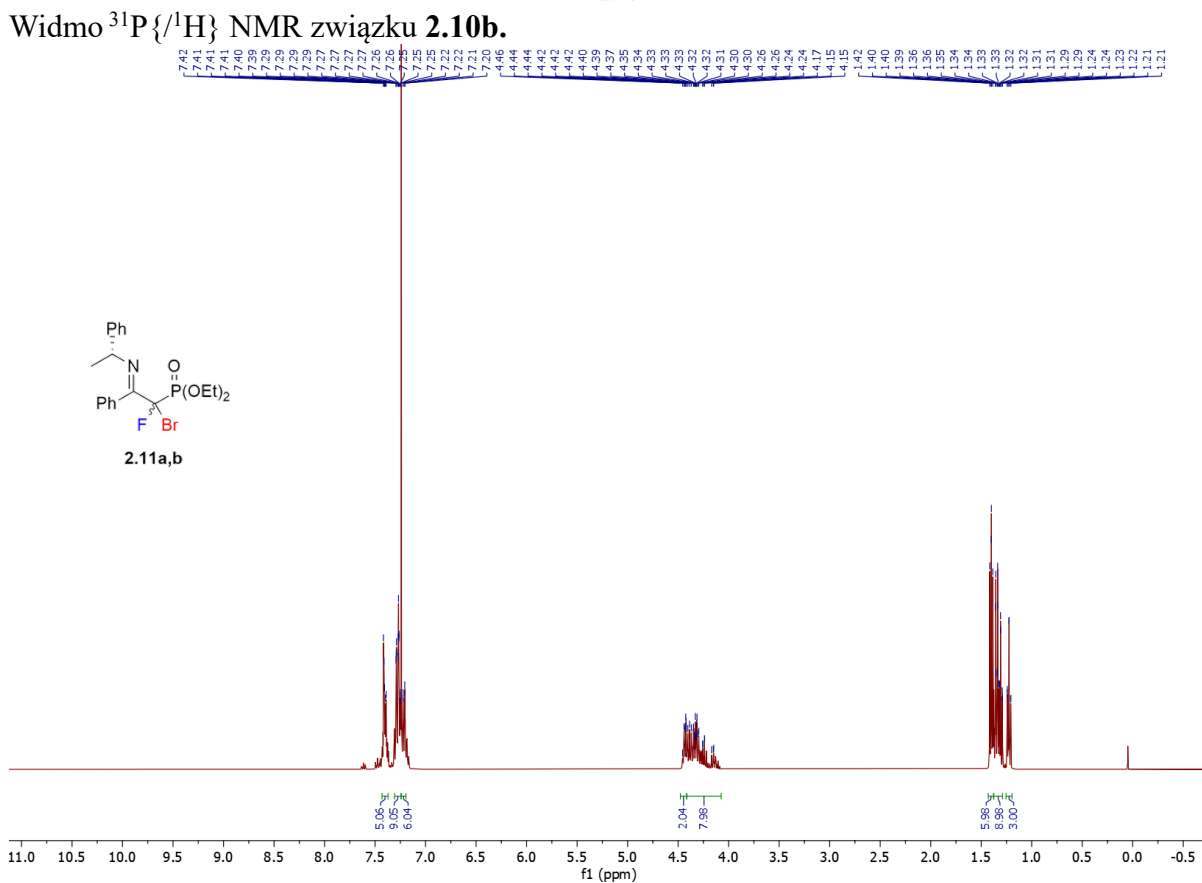
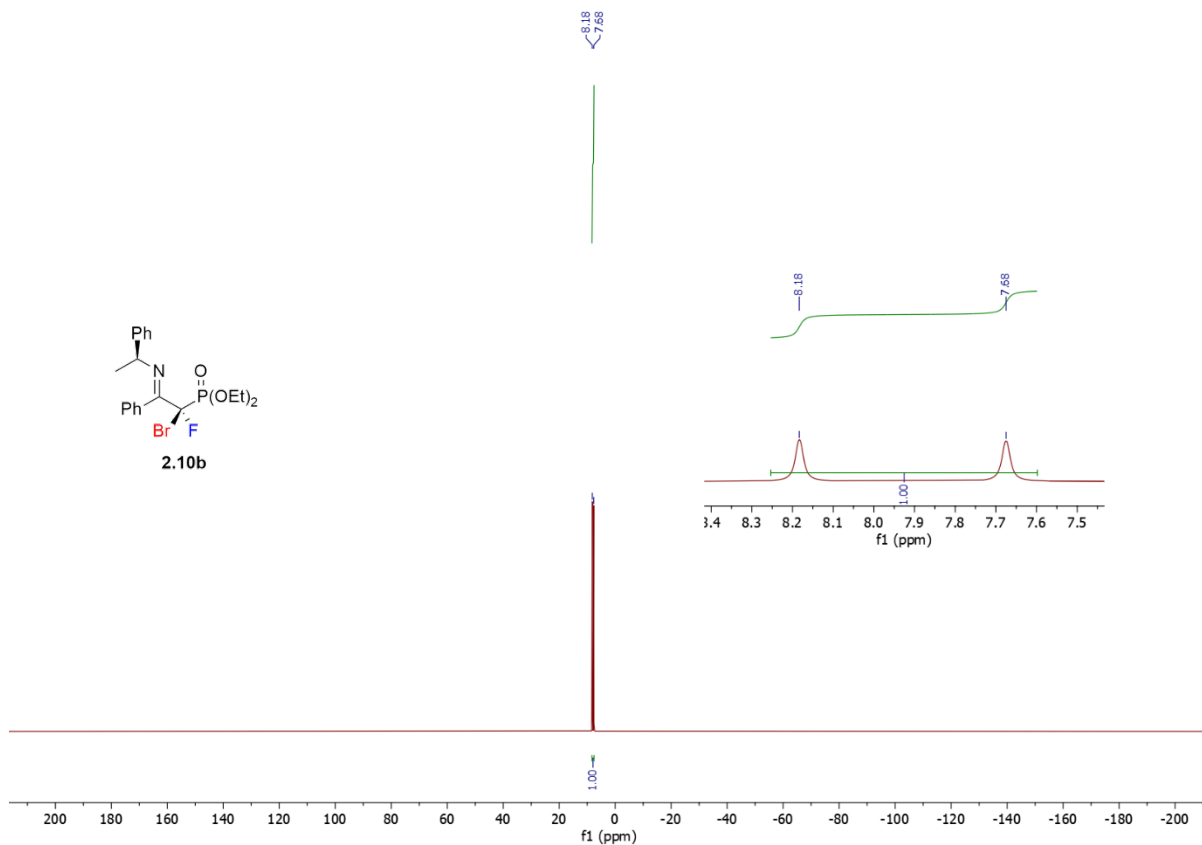


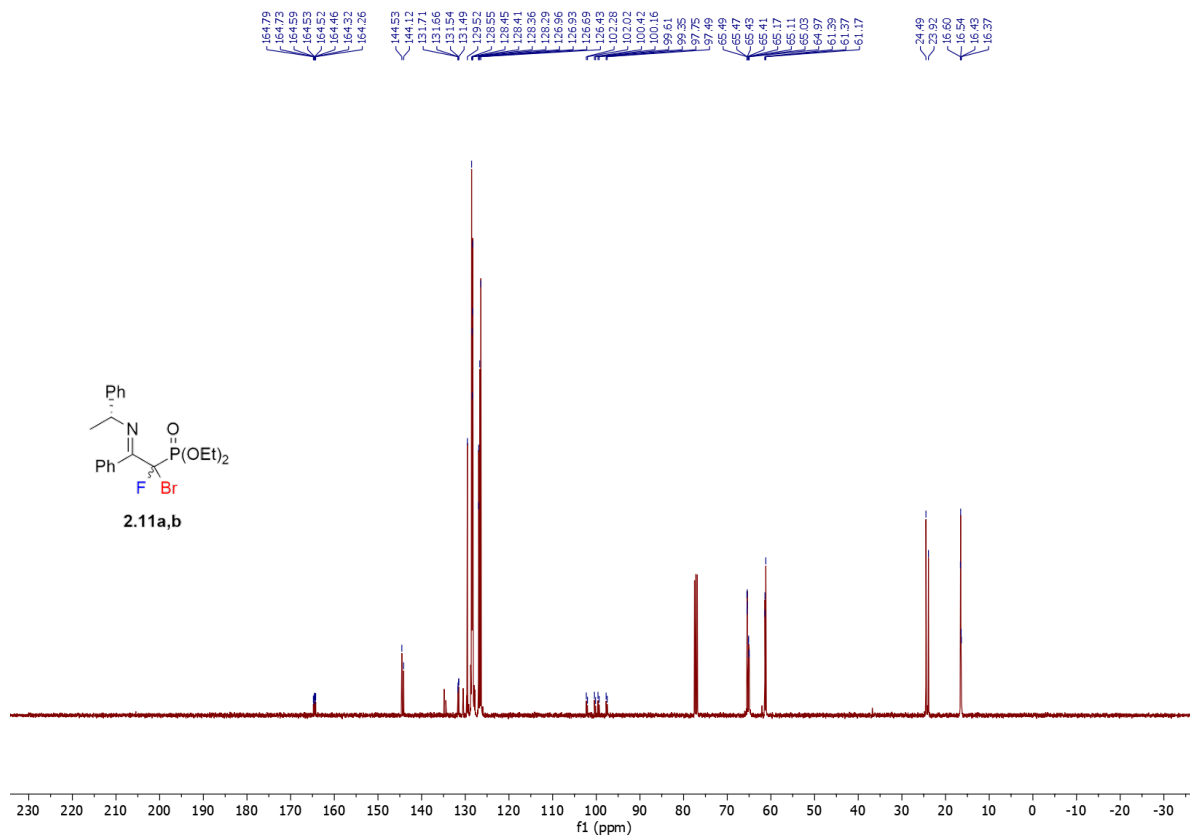


Widmo ¹³C NMR związku **2.10b**.

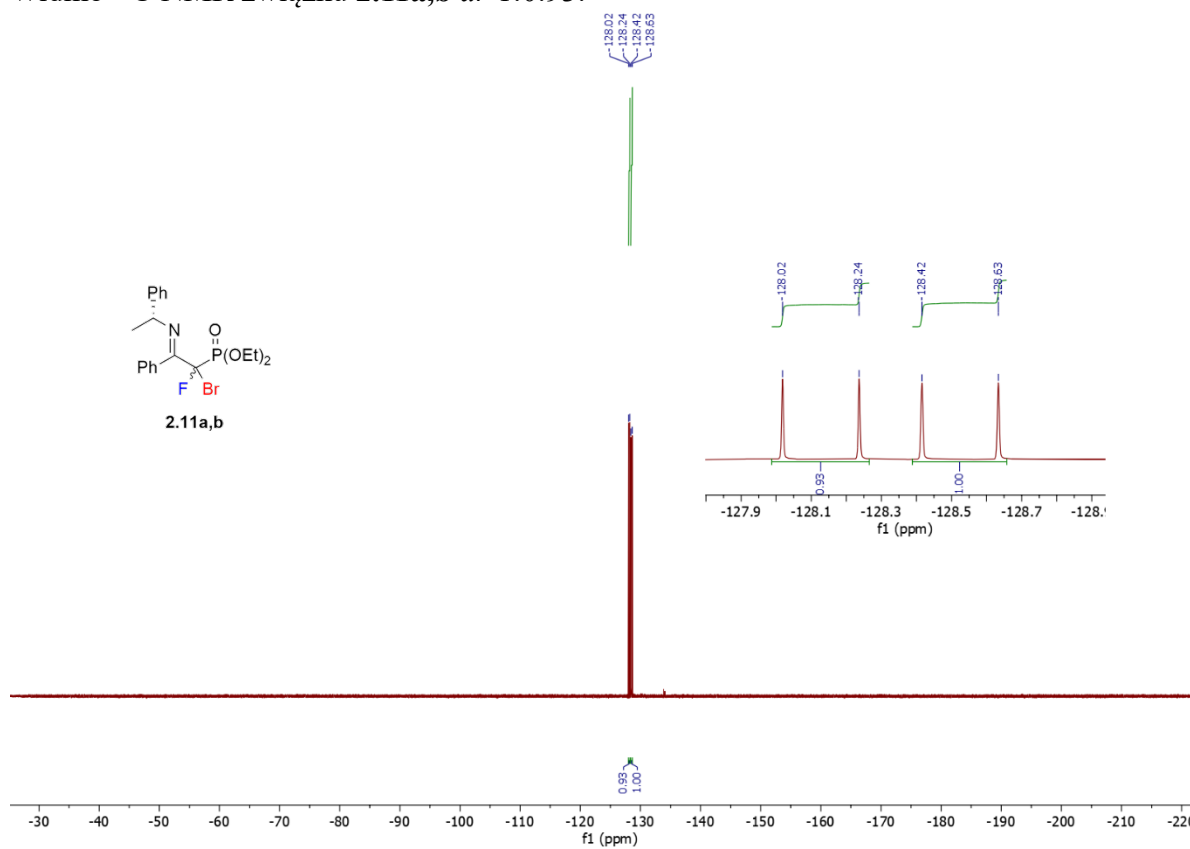


Widmo ¹⁹F NMR związku **2.10b**.

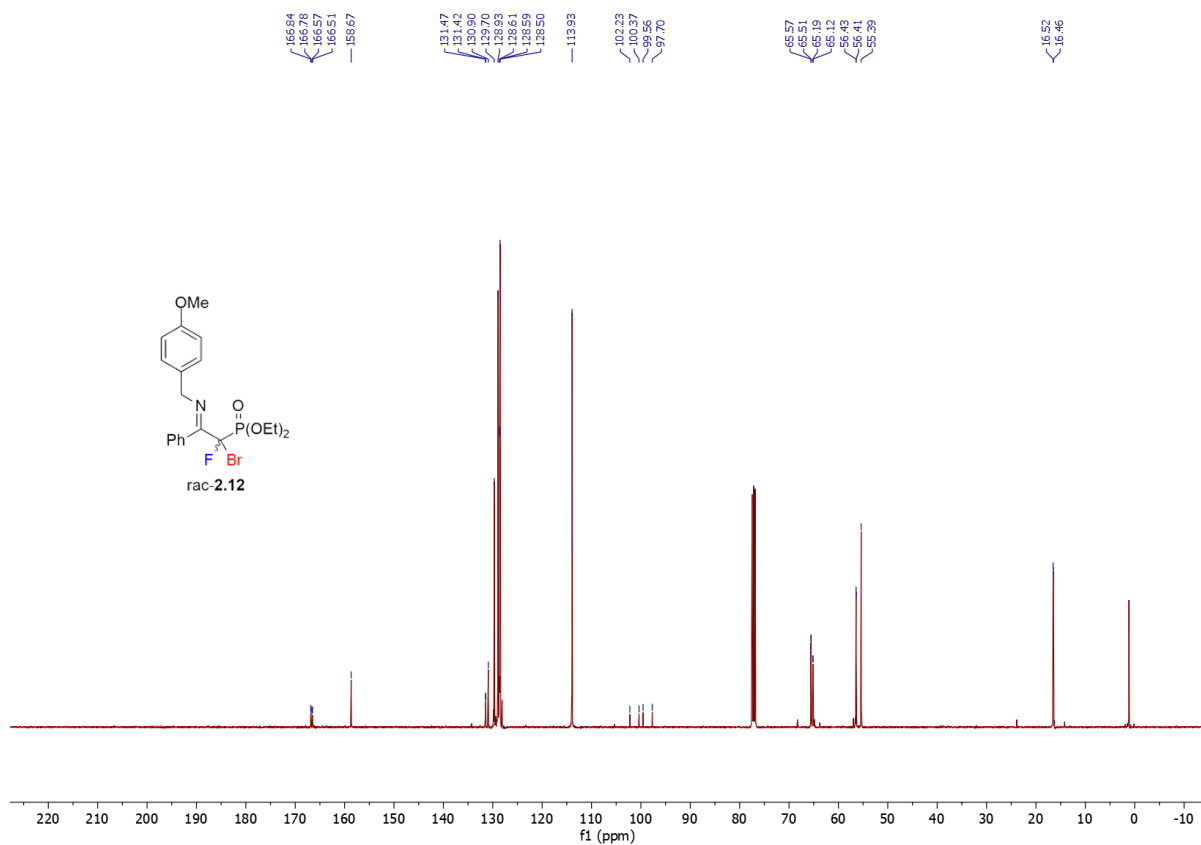




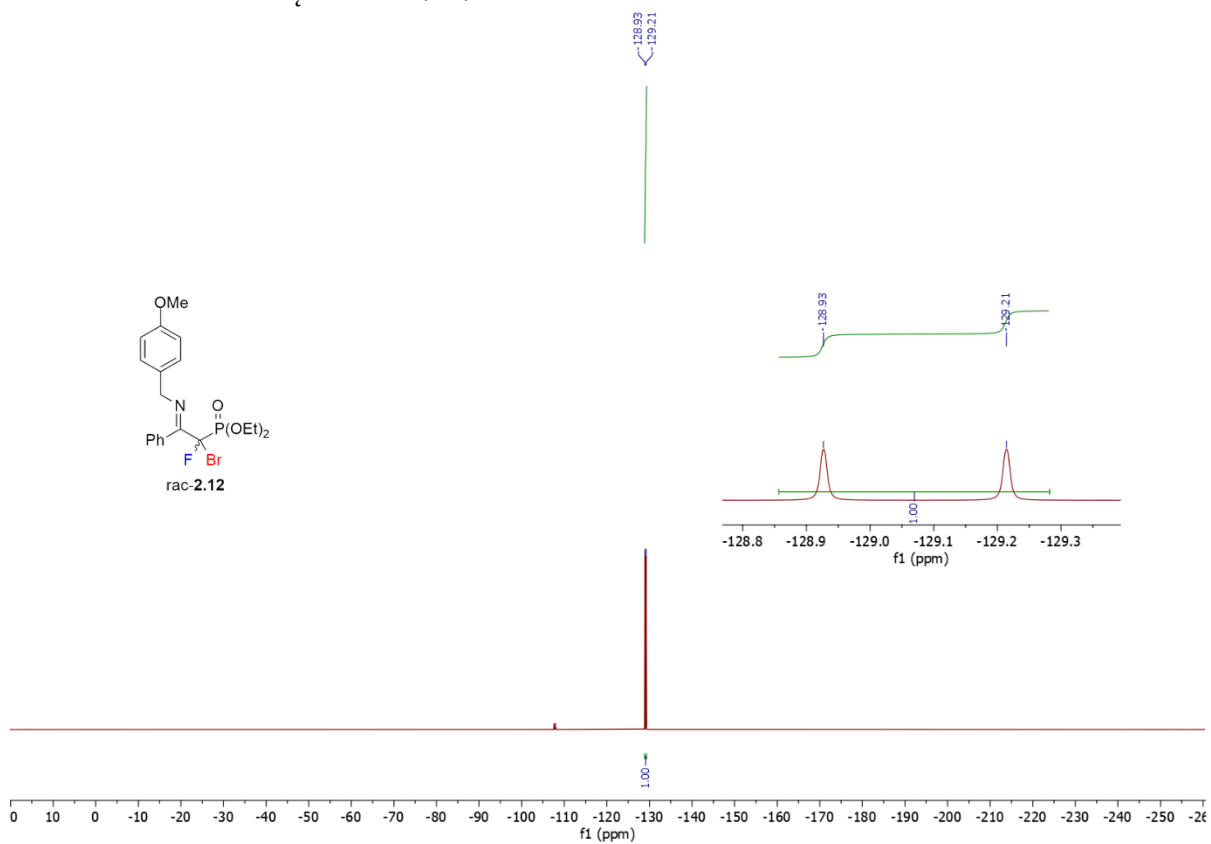
Widmo ^{13}C NMR związku **2.11a,b** *dr* 1:0.93.



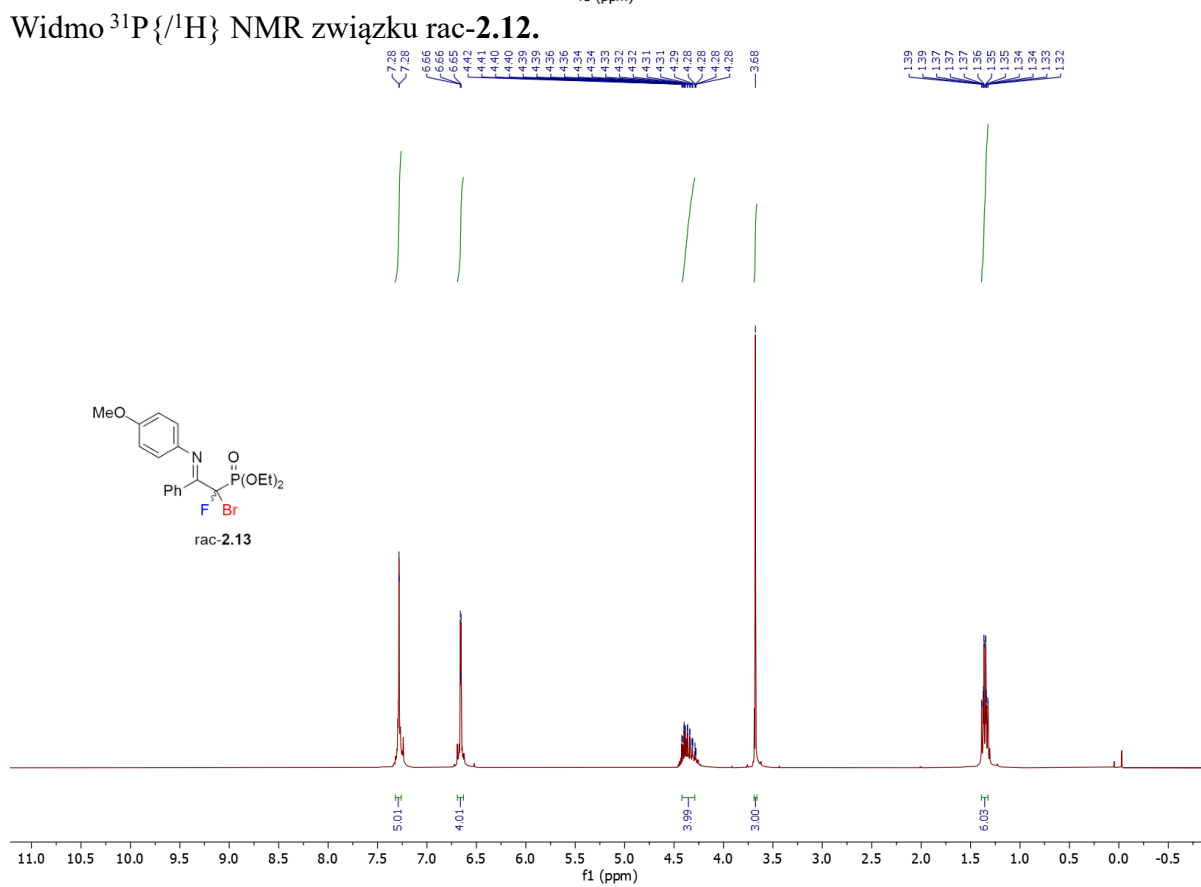
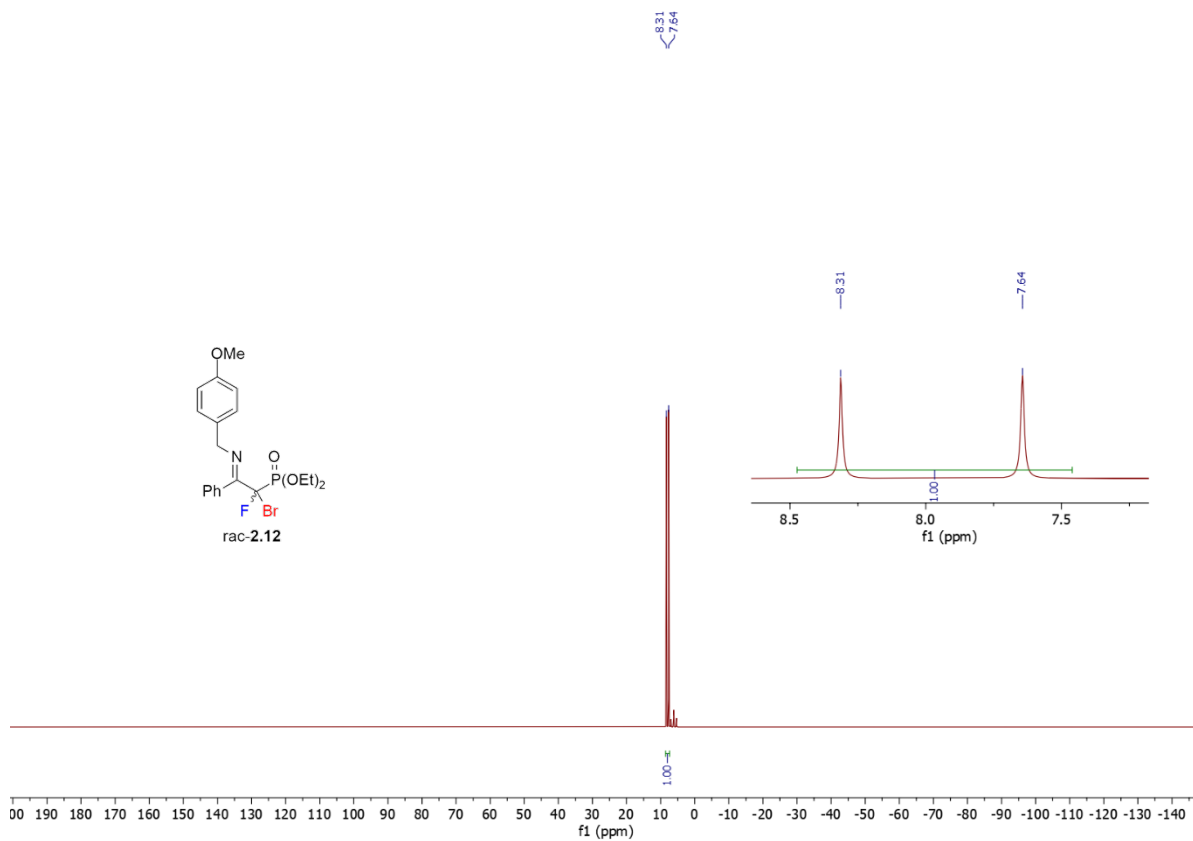
Widmo ^{19}F NMR związku **2.11a,b** *dr* 1:0.93.

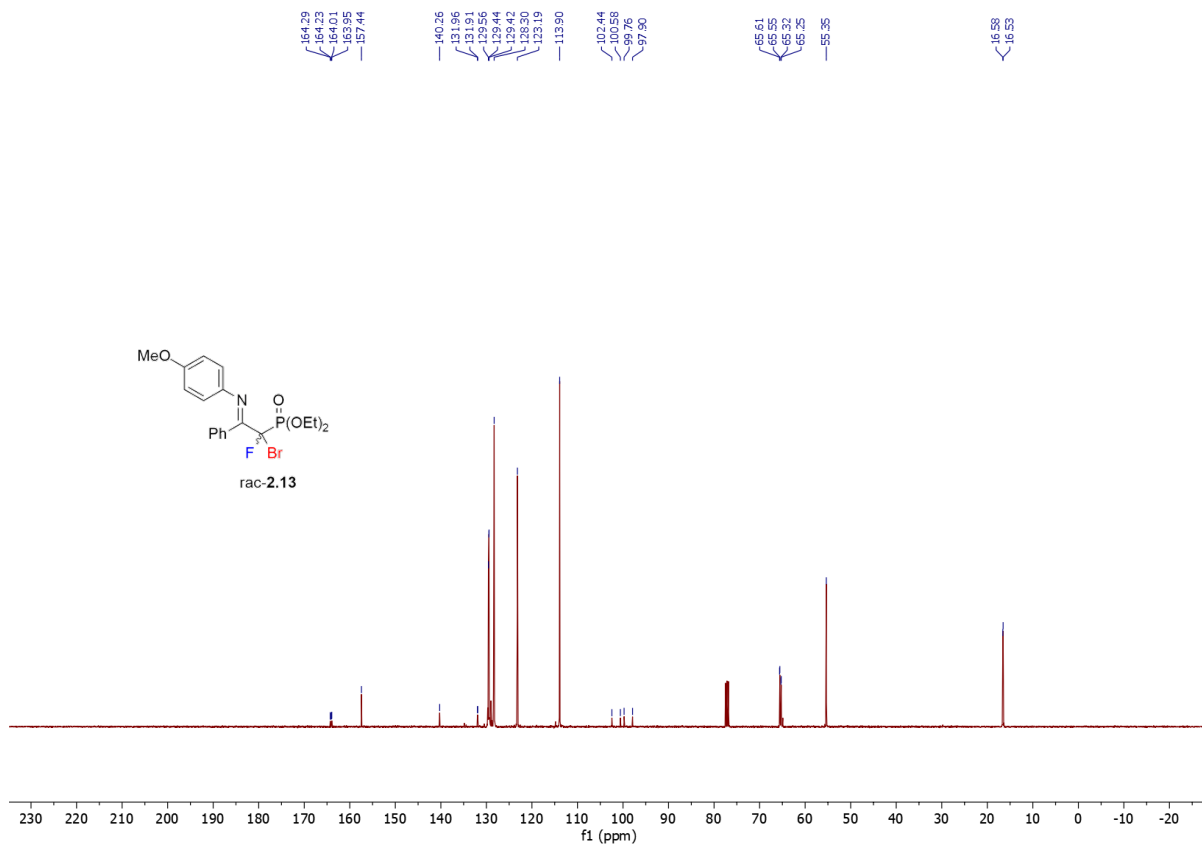


Widmo ¹³C NMR związku **rac-2.12**.

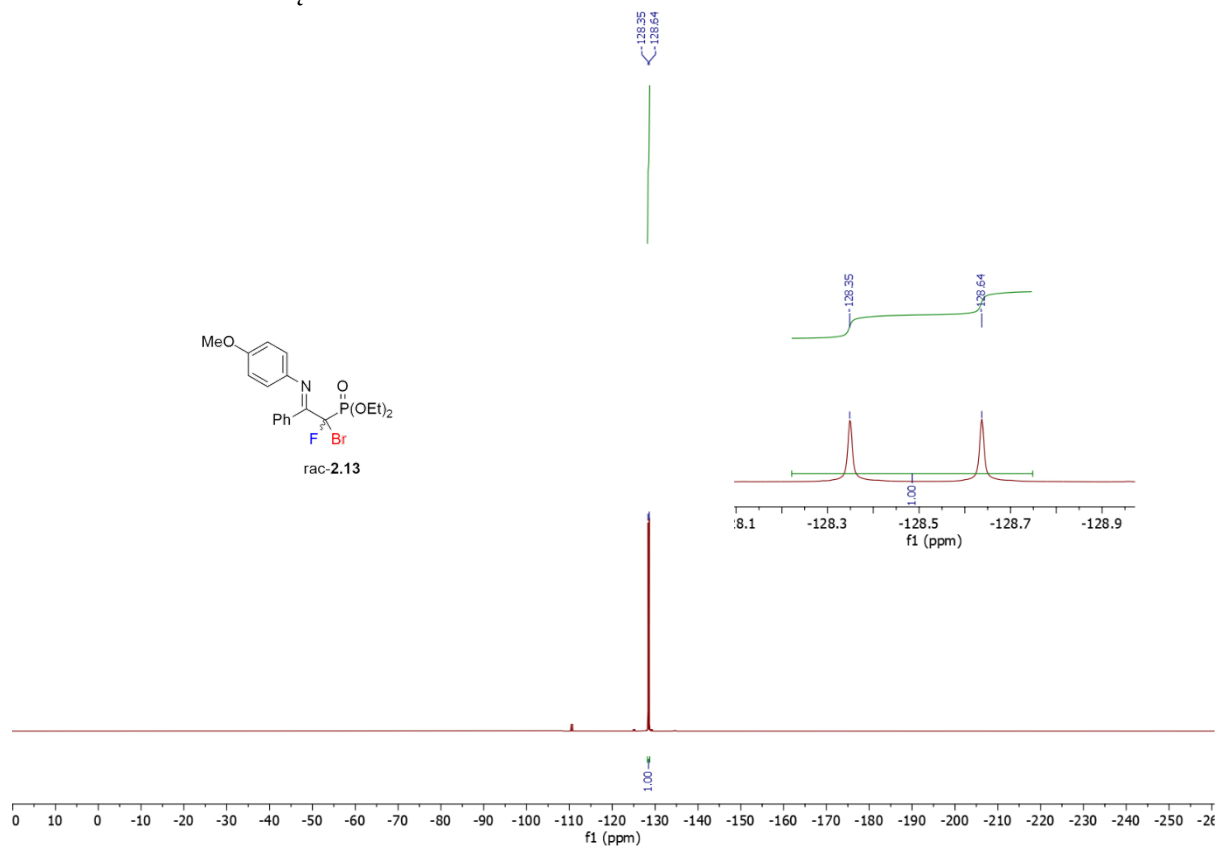


Widmo ¹⁹F NMR związku **rac-2.12**.

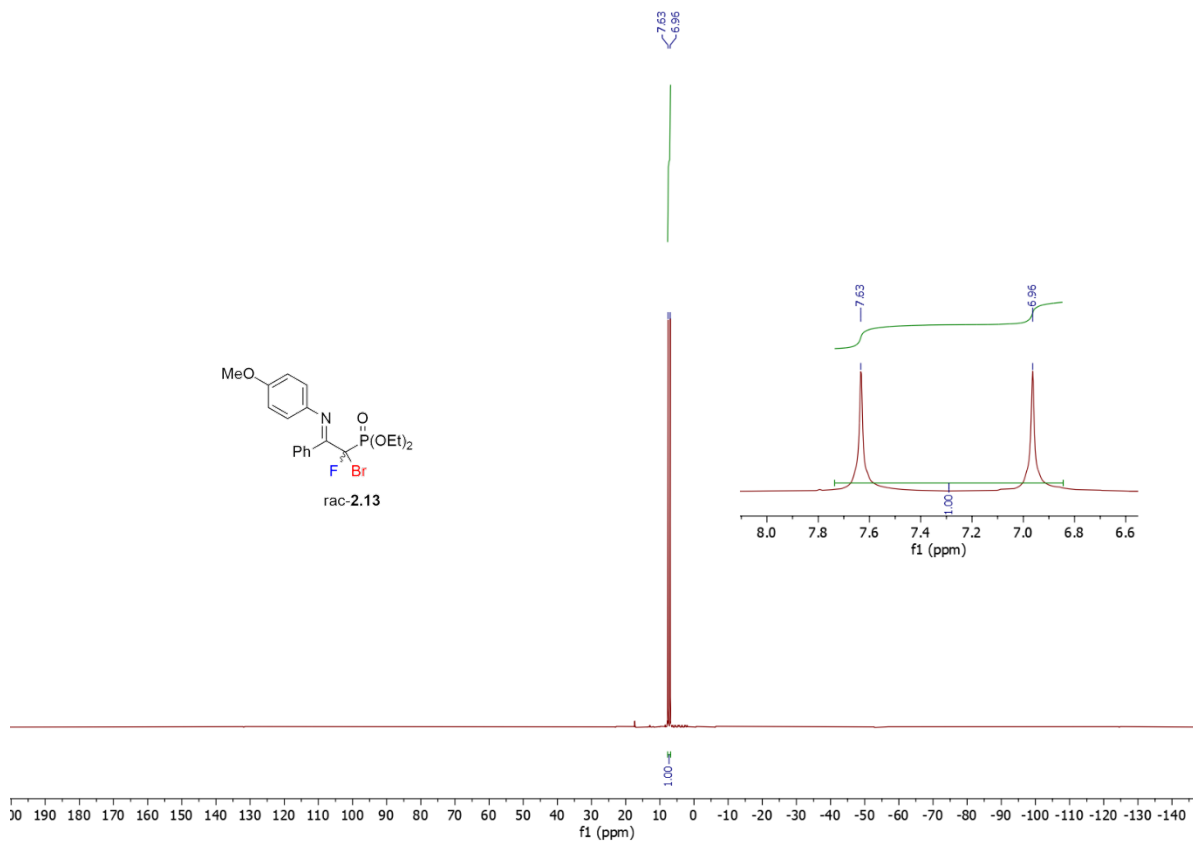




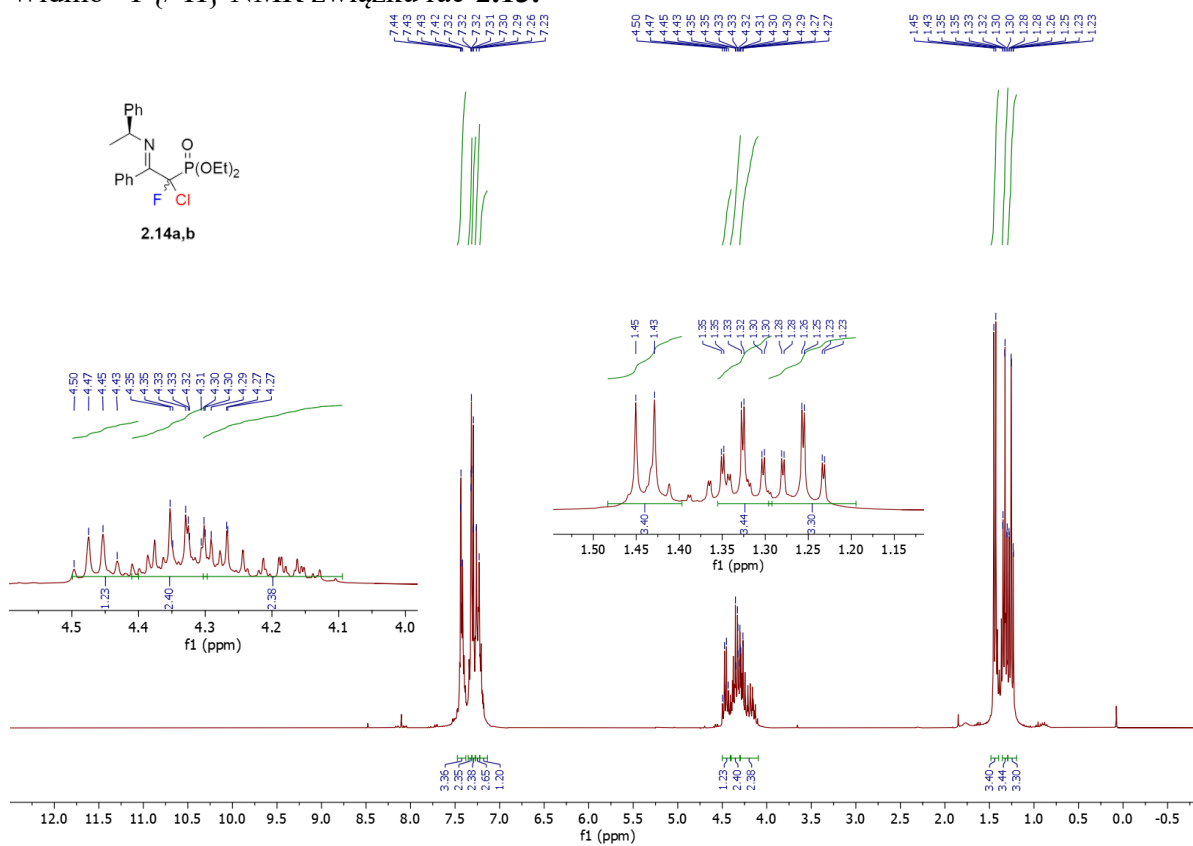
Widmo ^{13}C NMR związku rac-2.13



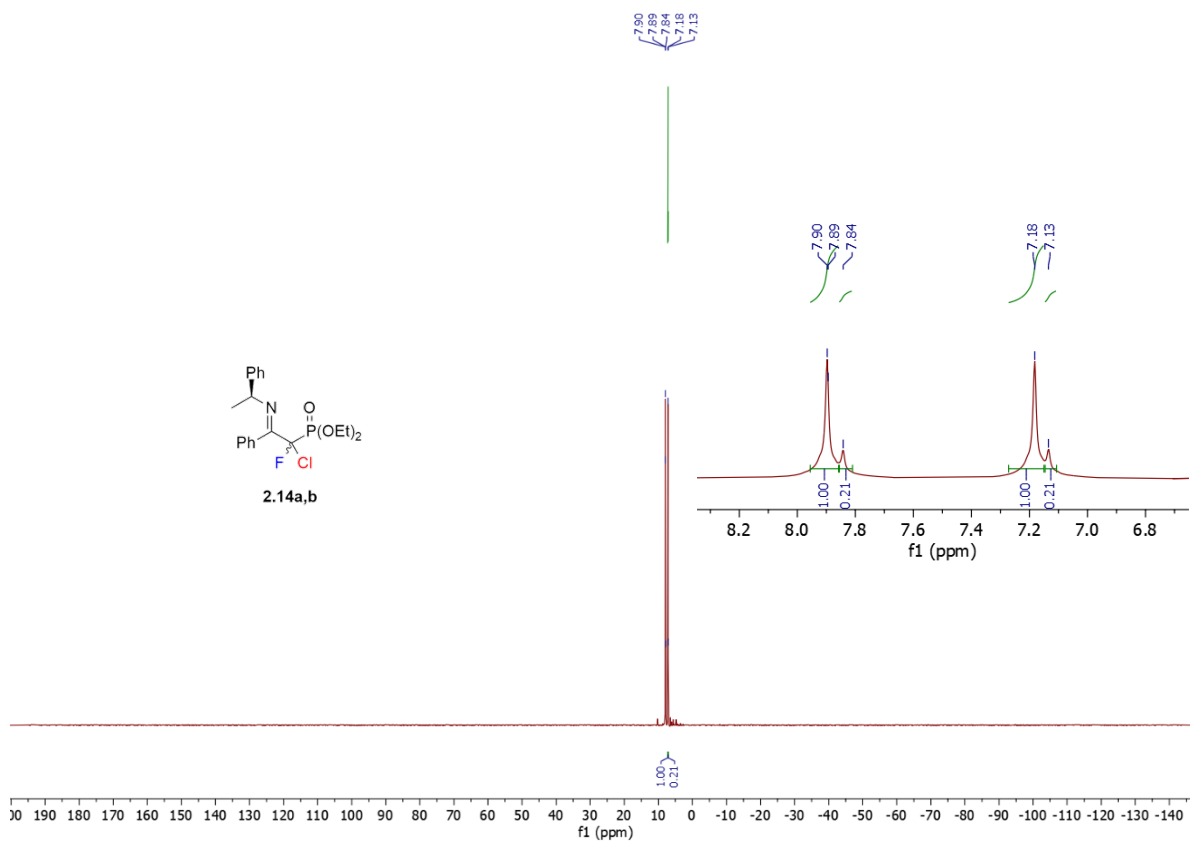
Widmo ^{19}F NMR związku rac-2.13.



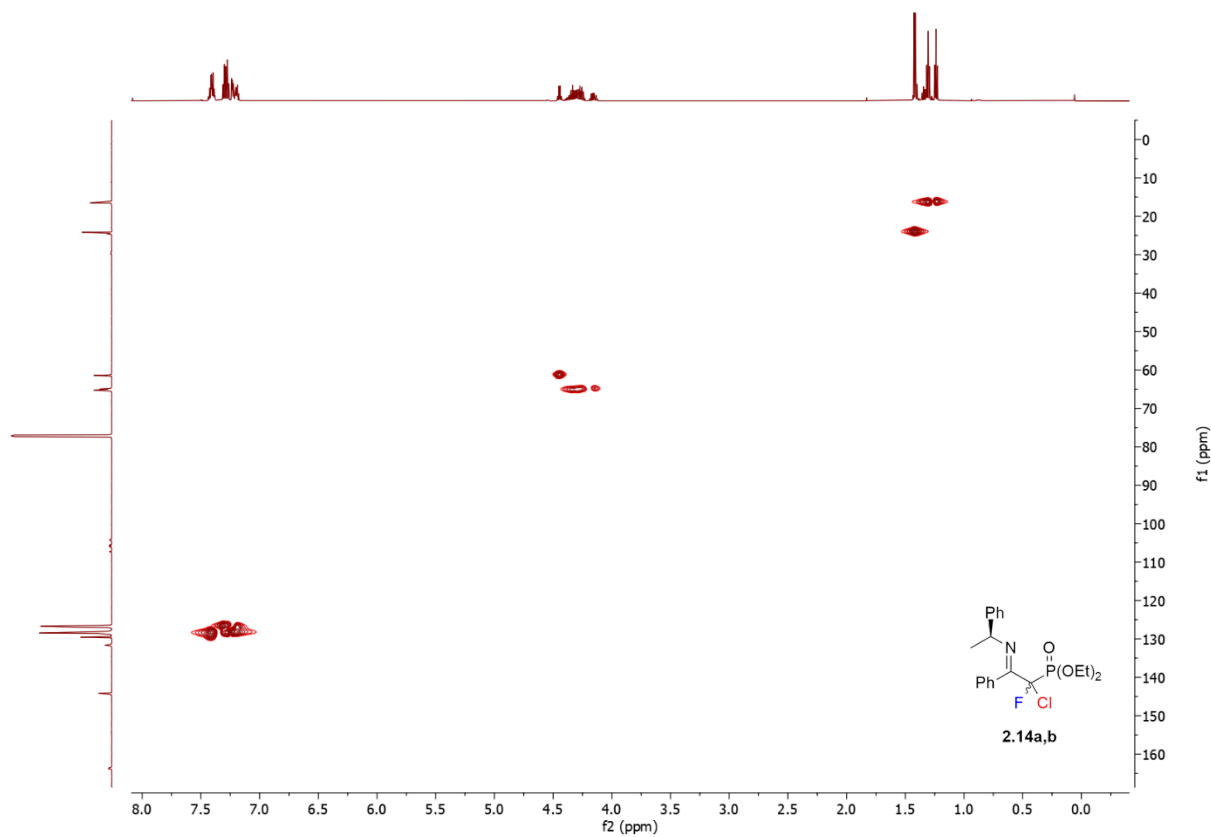
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **rac-2.13**.



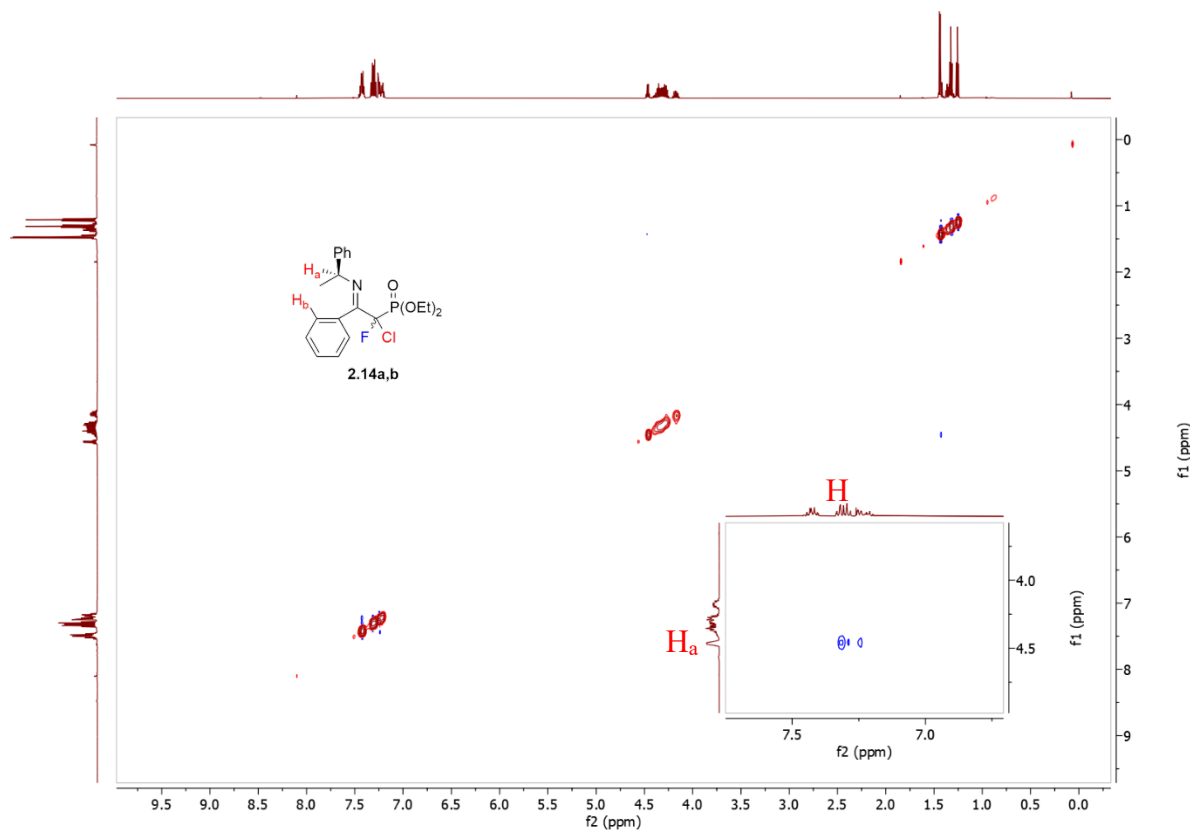
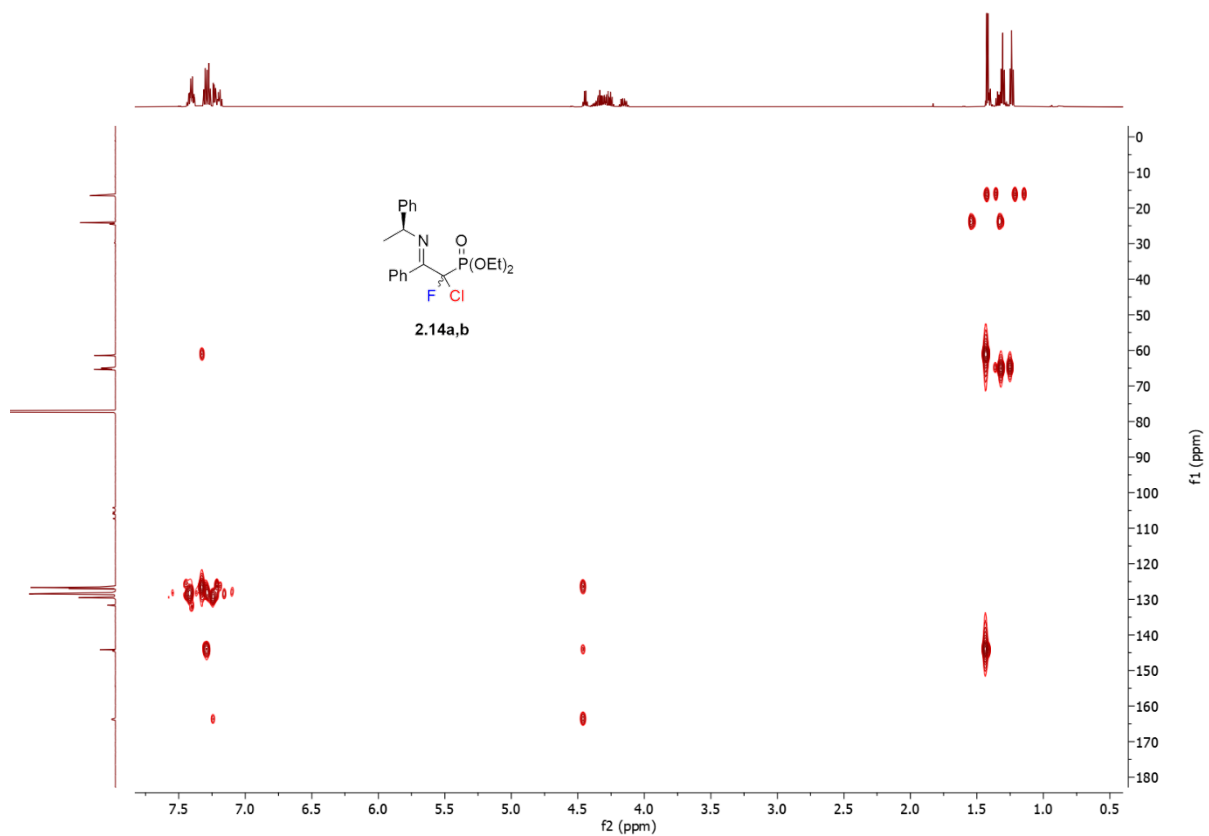
Widmo ^1H NMR związku **2.14a,b** *dr* 0.2:1

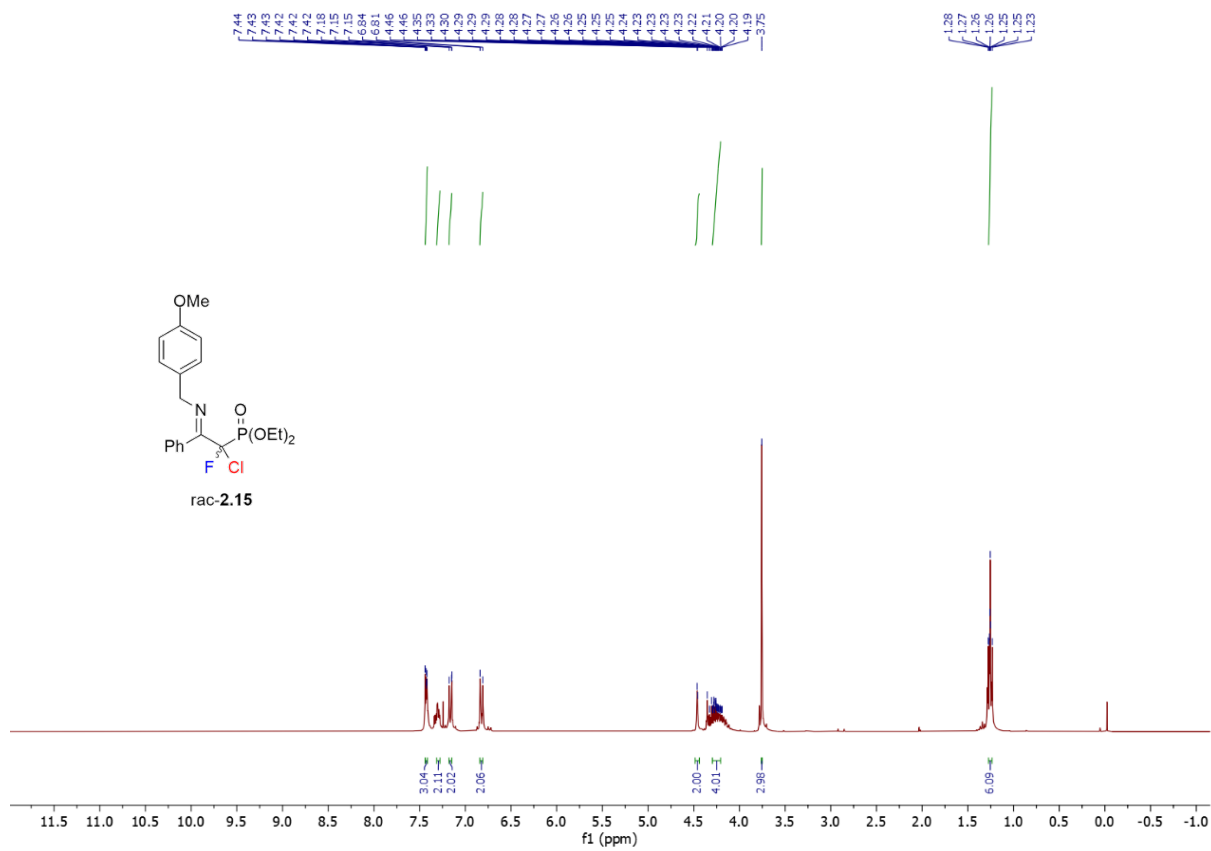


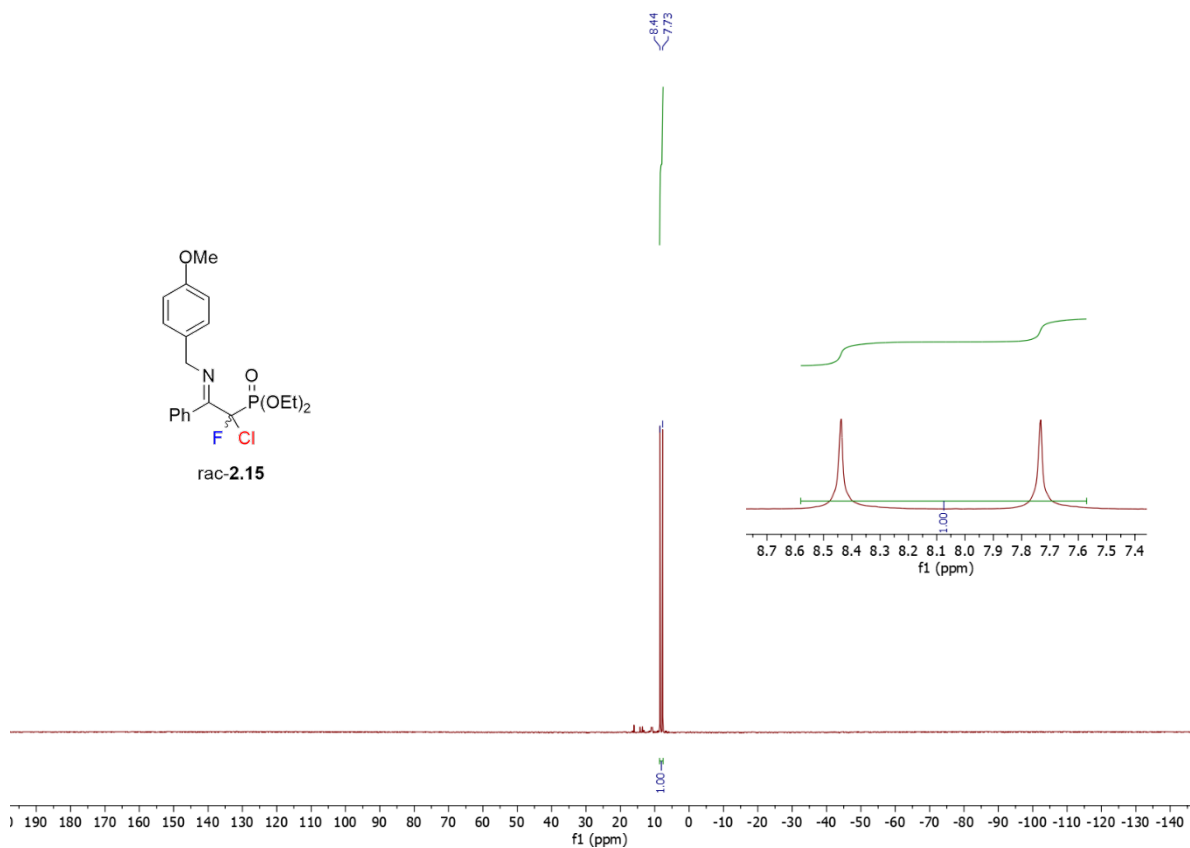
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.14a,b** *dr* 0.2: 1.



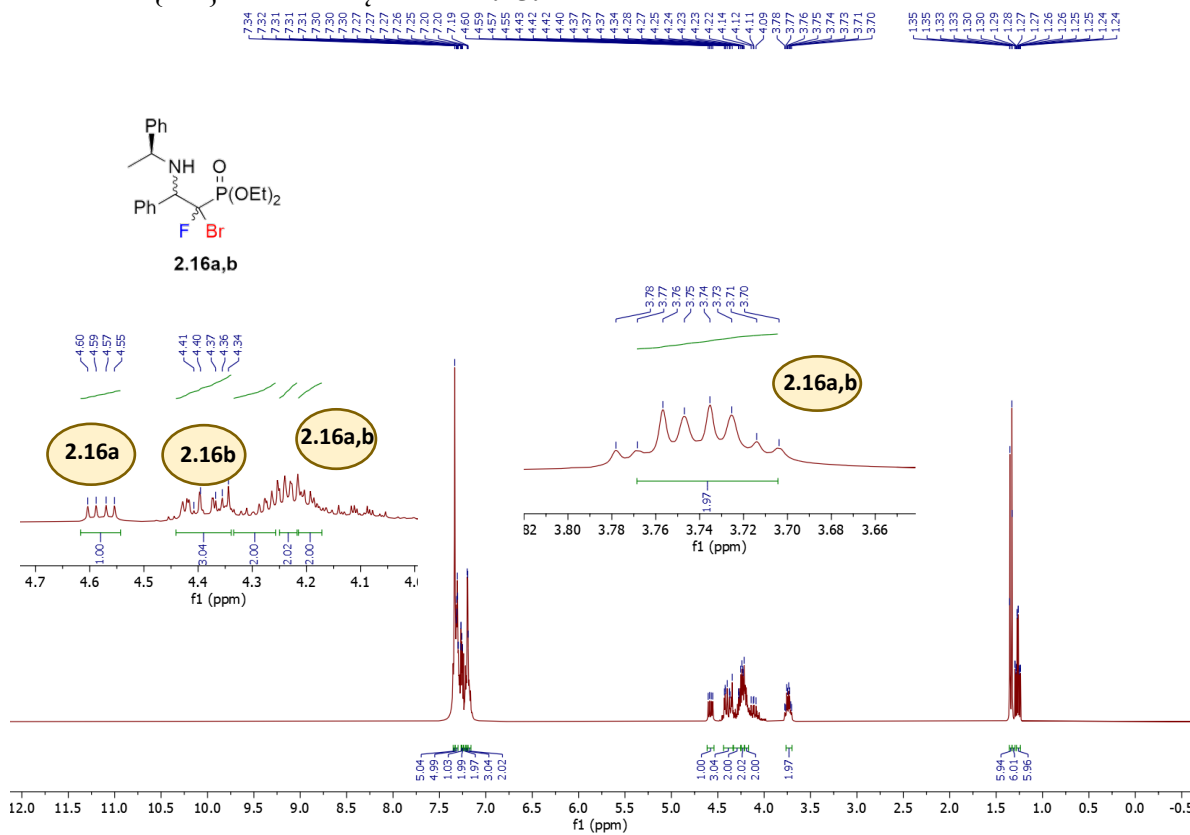
Widmo ^1H - ^{13}C HSQC NMR związku **2.14a,b** *dr* 0.2: 1.



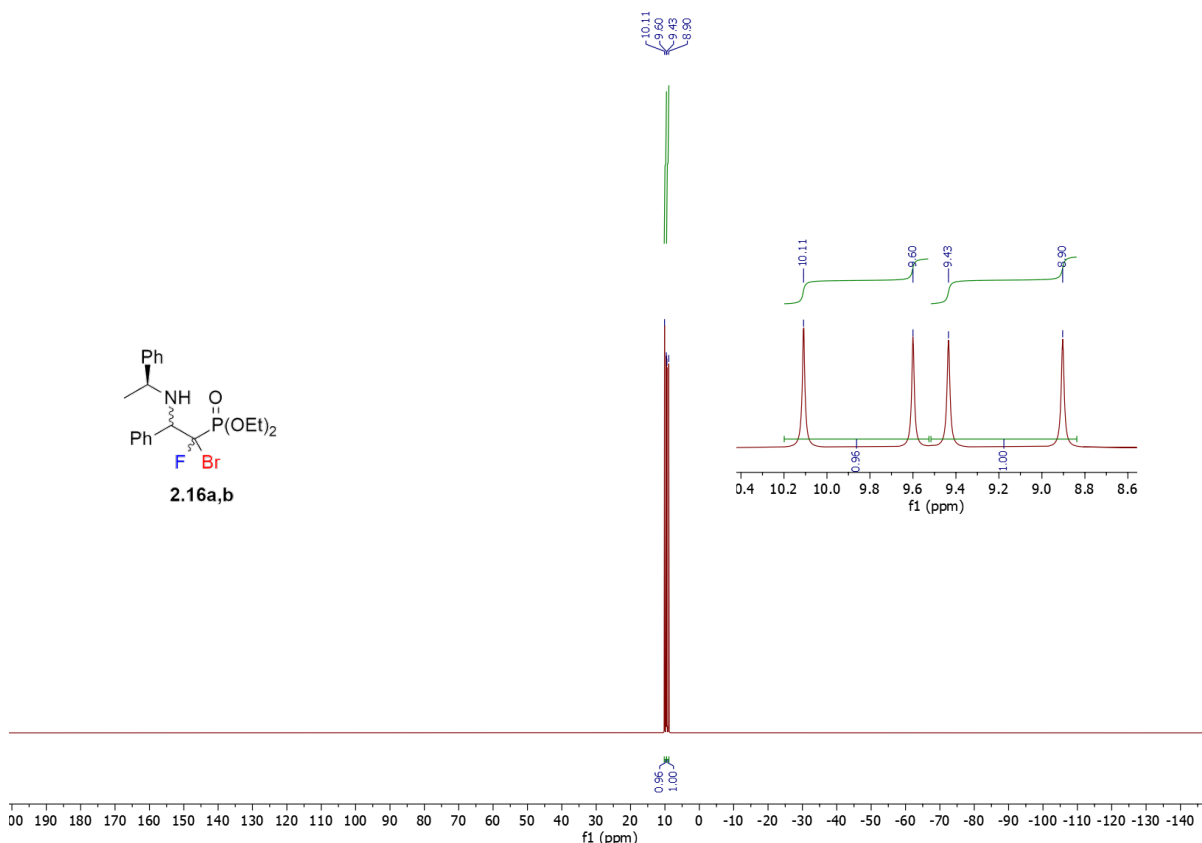




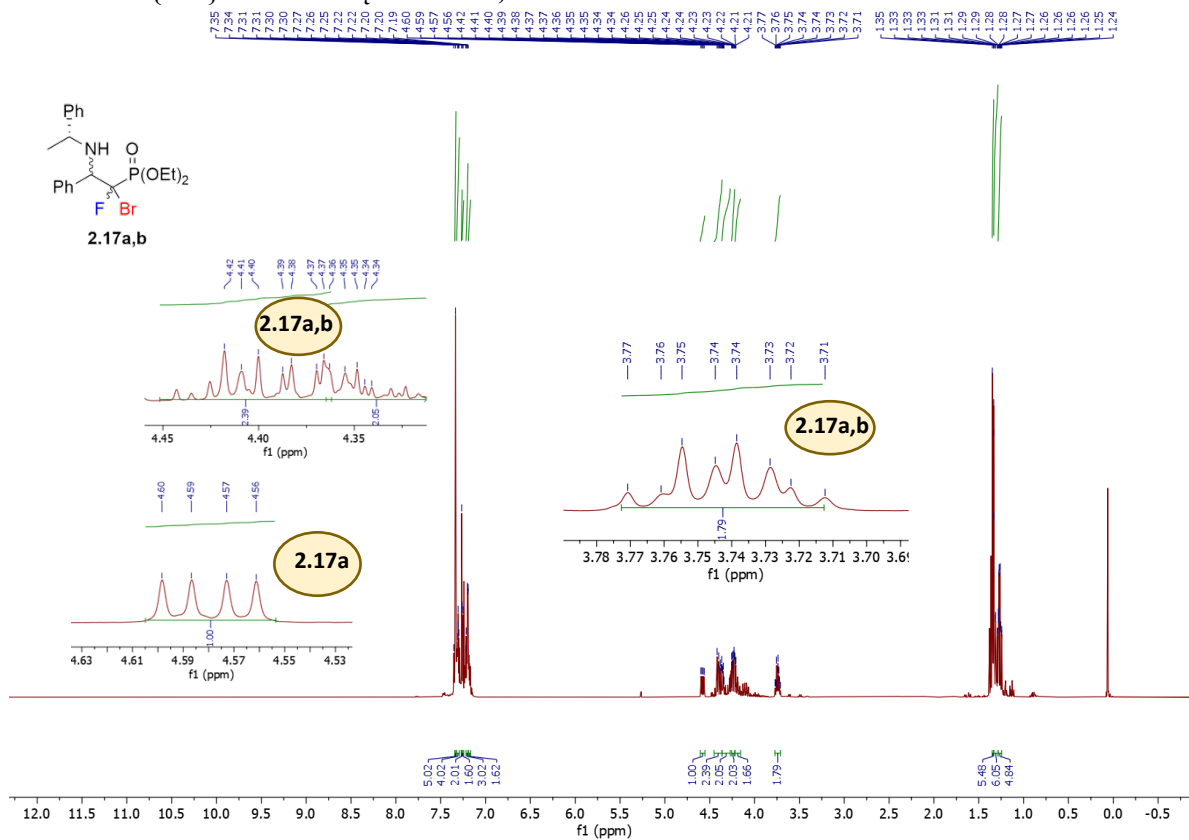
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **rac-2.15**.



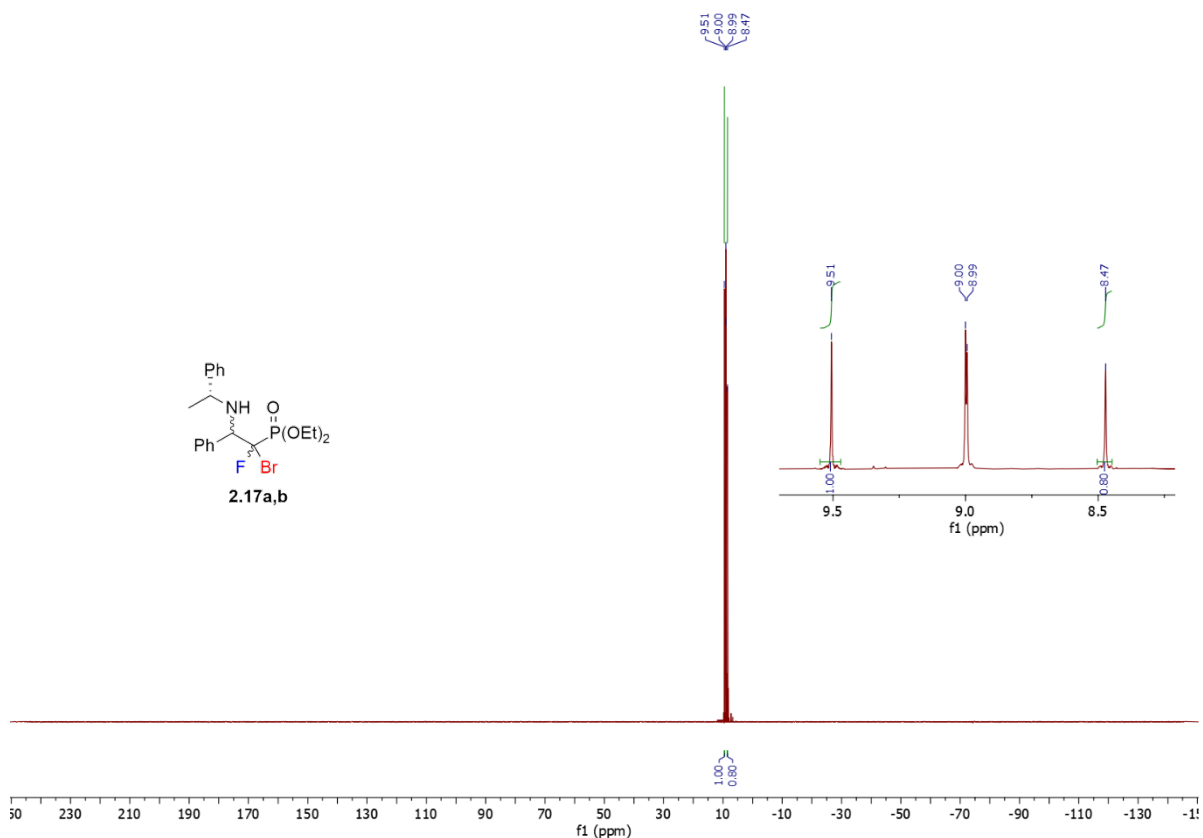
Widmo ^1H NMR związku **2.16a,b** dr 1:0.96.



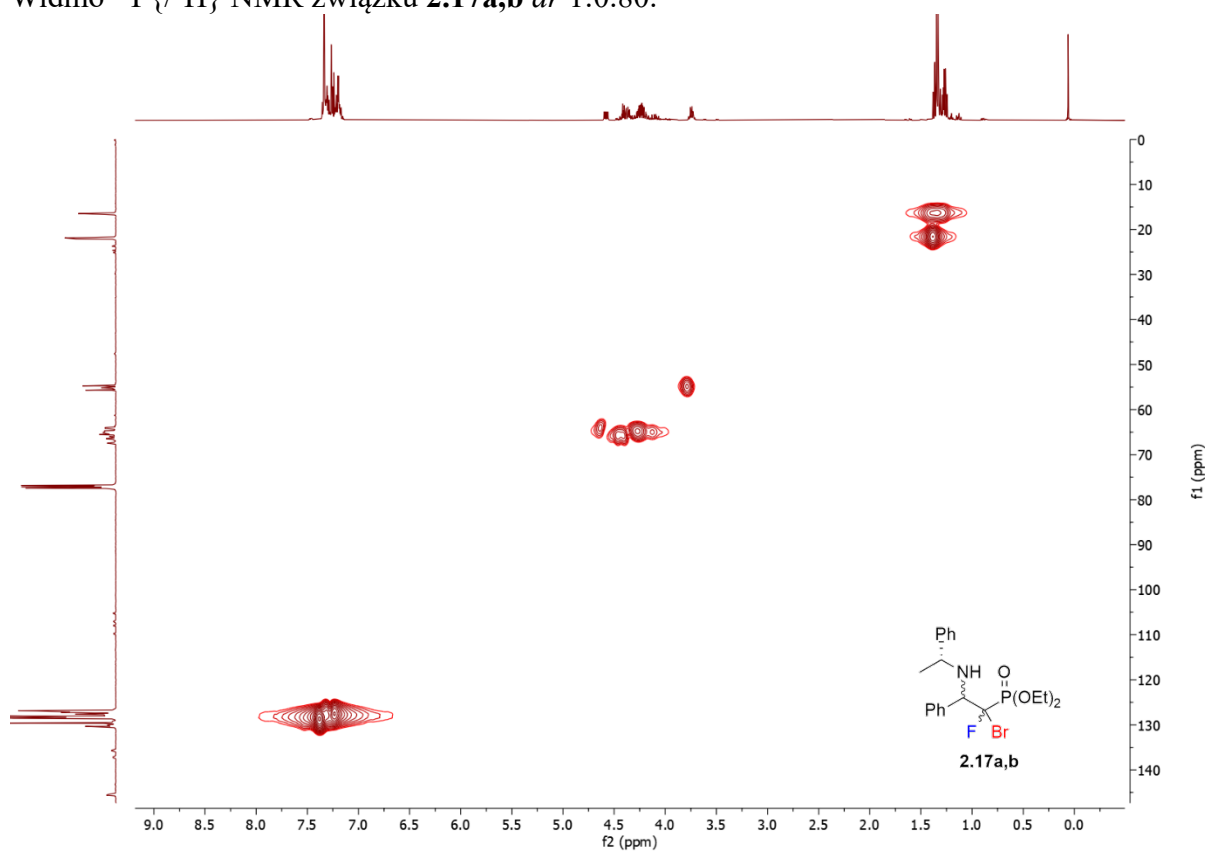
Widmo ^{31}P $\{^1\text{H}\}$ NMR związku **2.16a,b** dr 1:0.96.



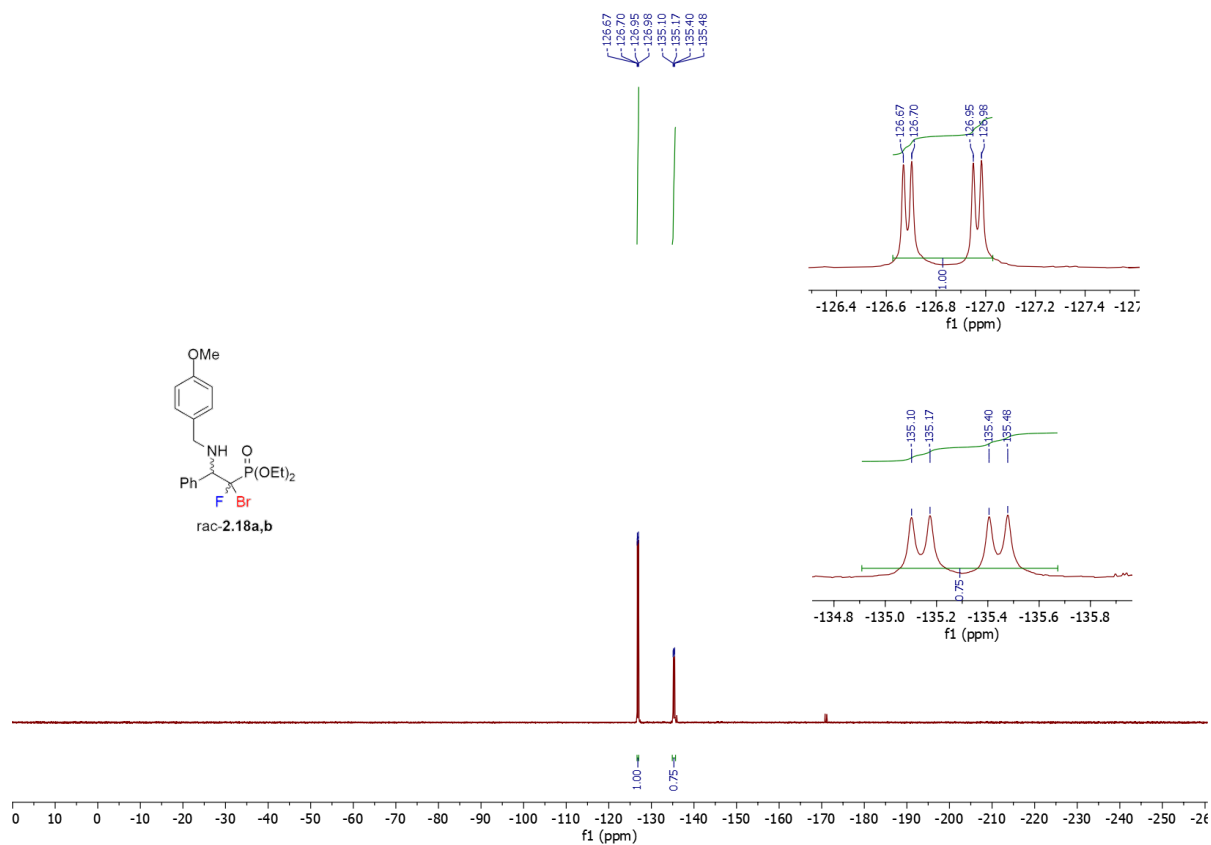
Widmo ^1H NMR związku **2.17a,b** dr 1:0.80.



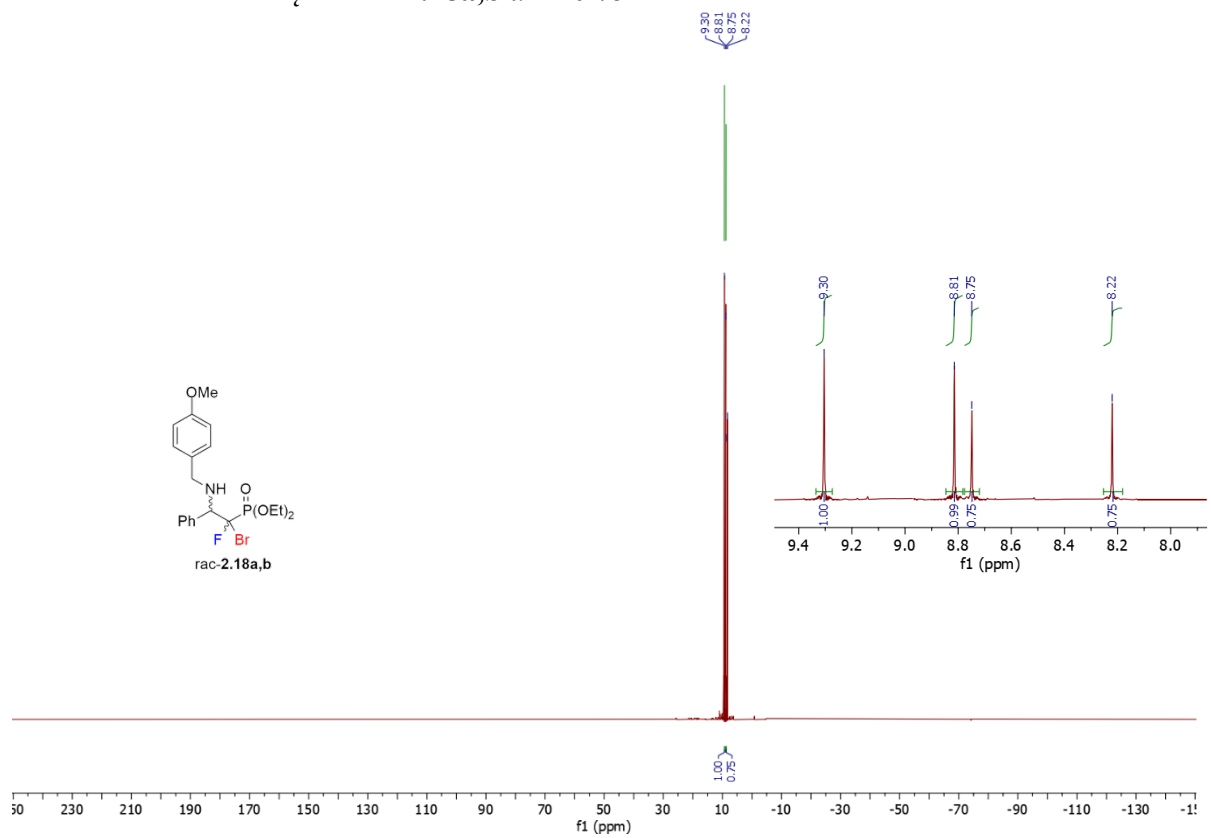
Widmo ³¹P{¹H} NMR związku **2.17a,b** *dr* 1:0.80.



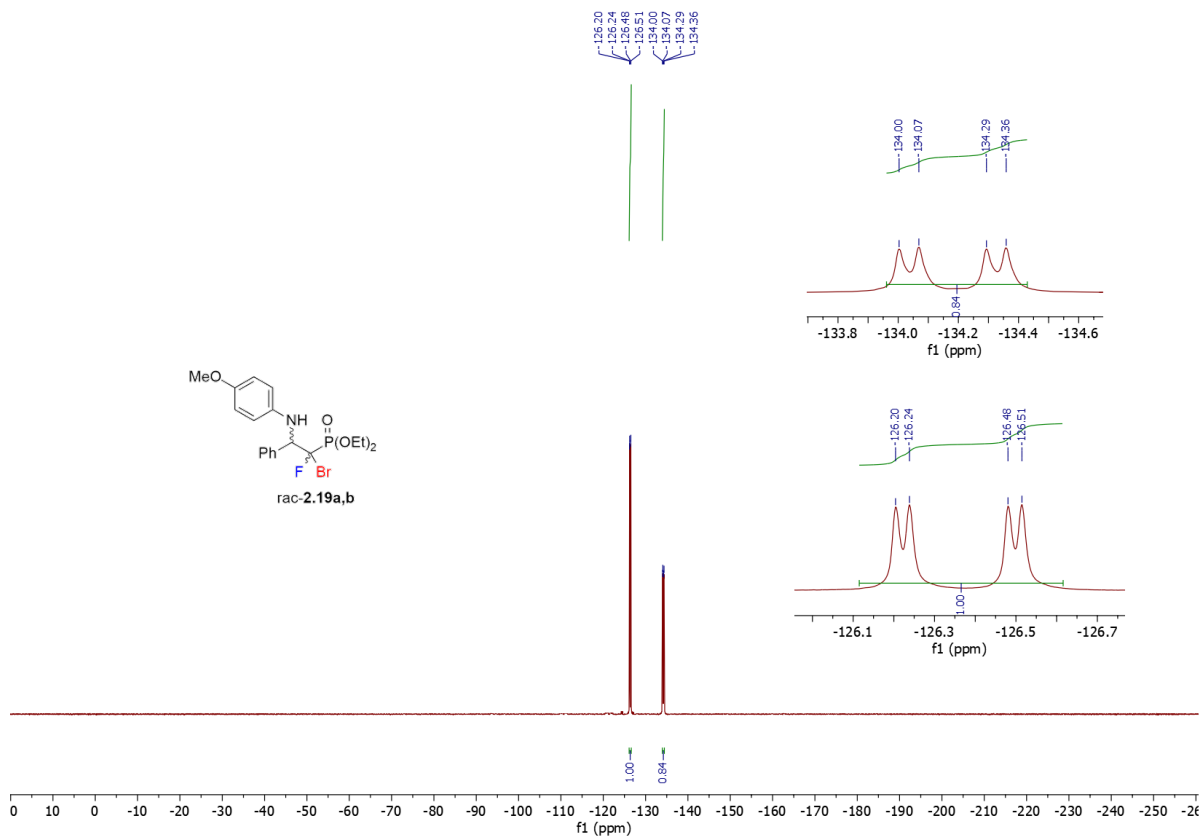
Widmo ¹H-¹³C HSQC NMR związku **2.17a,b** *dr* 1:0.80.



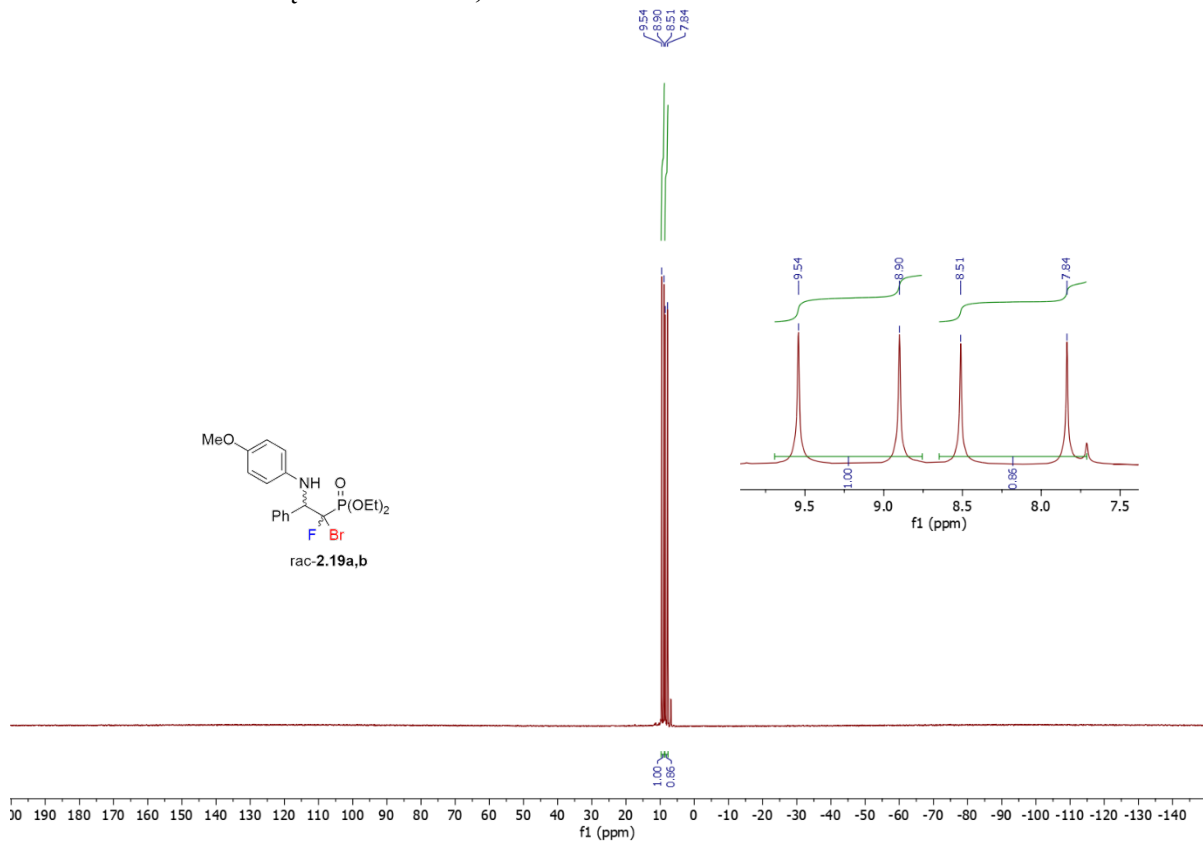
Widmo ^{19}F NMR związku **rac-2.18a,b** *dr* 1:0.75.



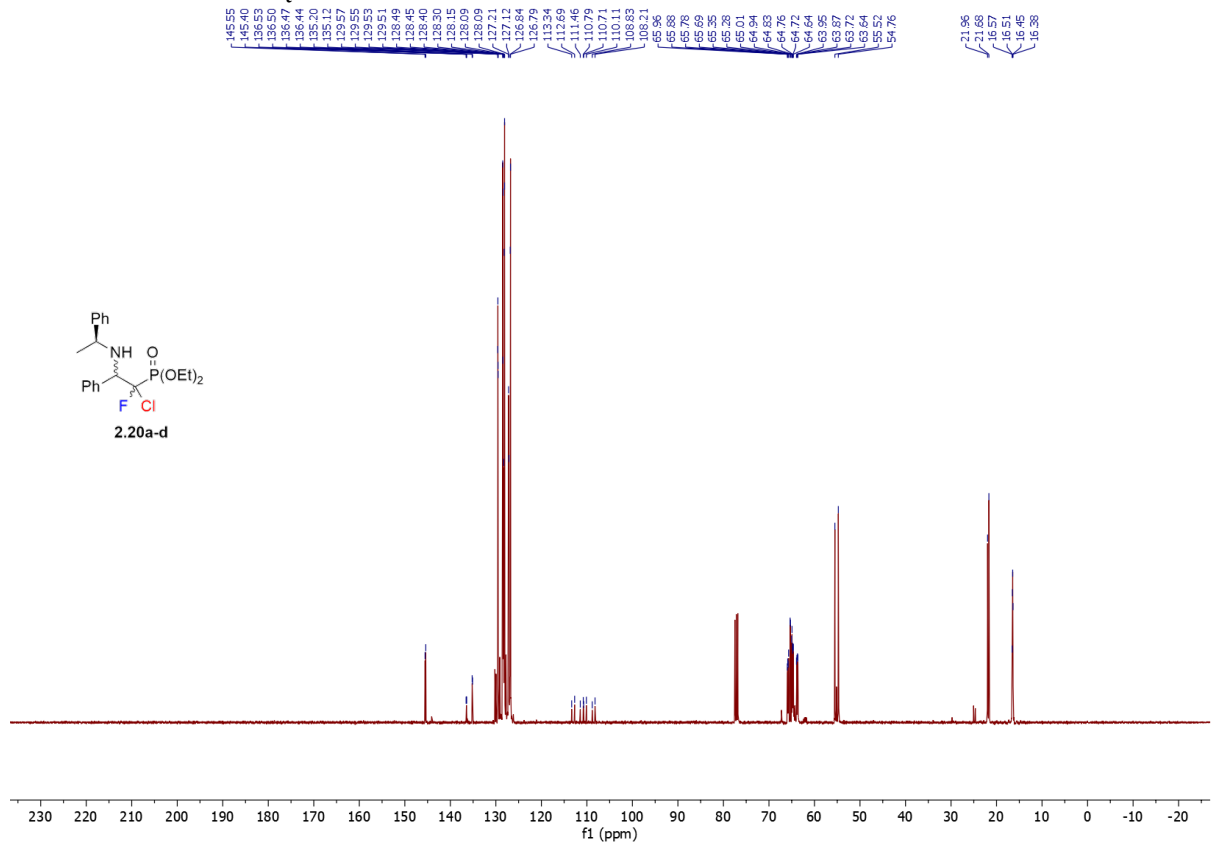
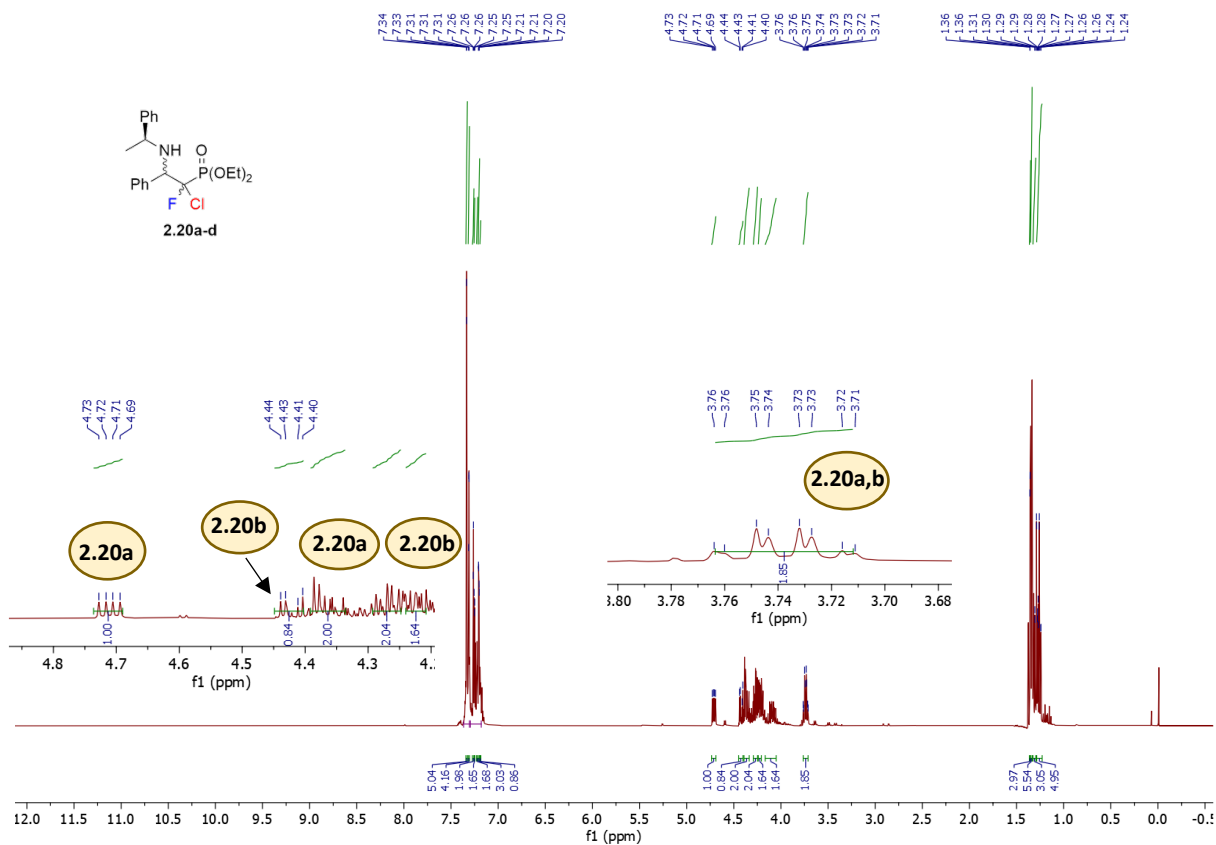
Widmo $^{31}\text{P} \{^1\text{H}\}$ NMR związku **rac-2.18a,b** *dr* 1:0.75.

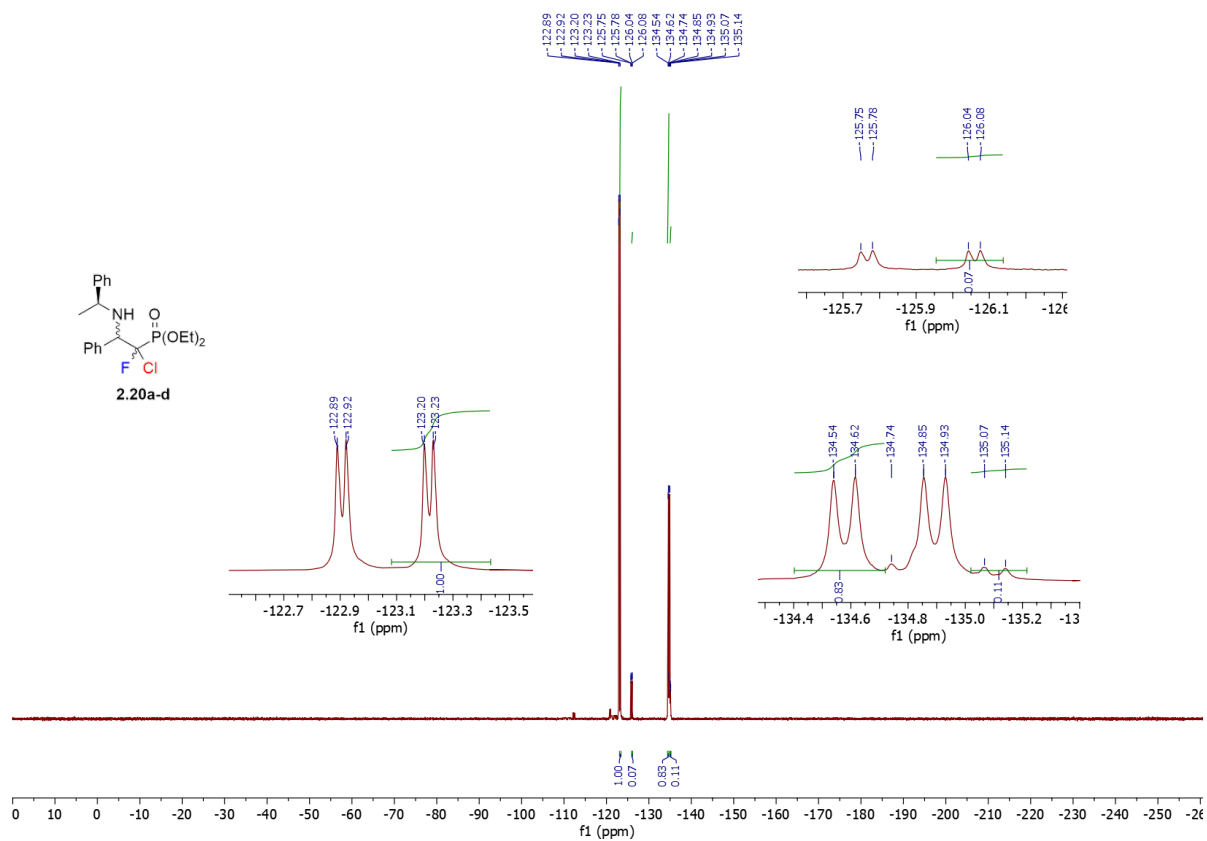


Widmo ^{19}F NMR związku **rac-2.19a,b** *dr* 1:0.86.

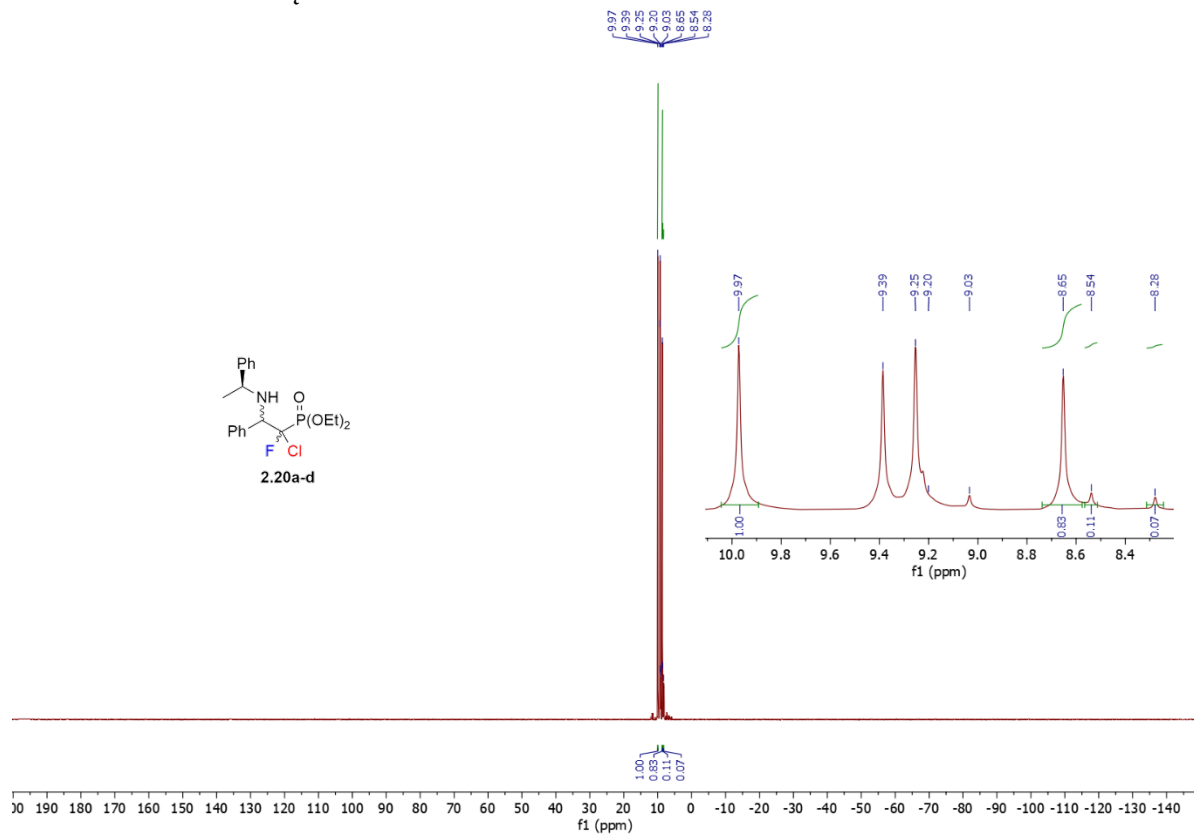


Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **rac-2.19a,b** *dr* 1:0.86.

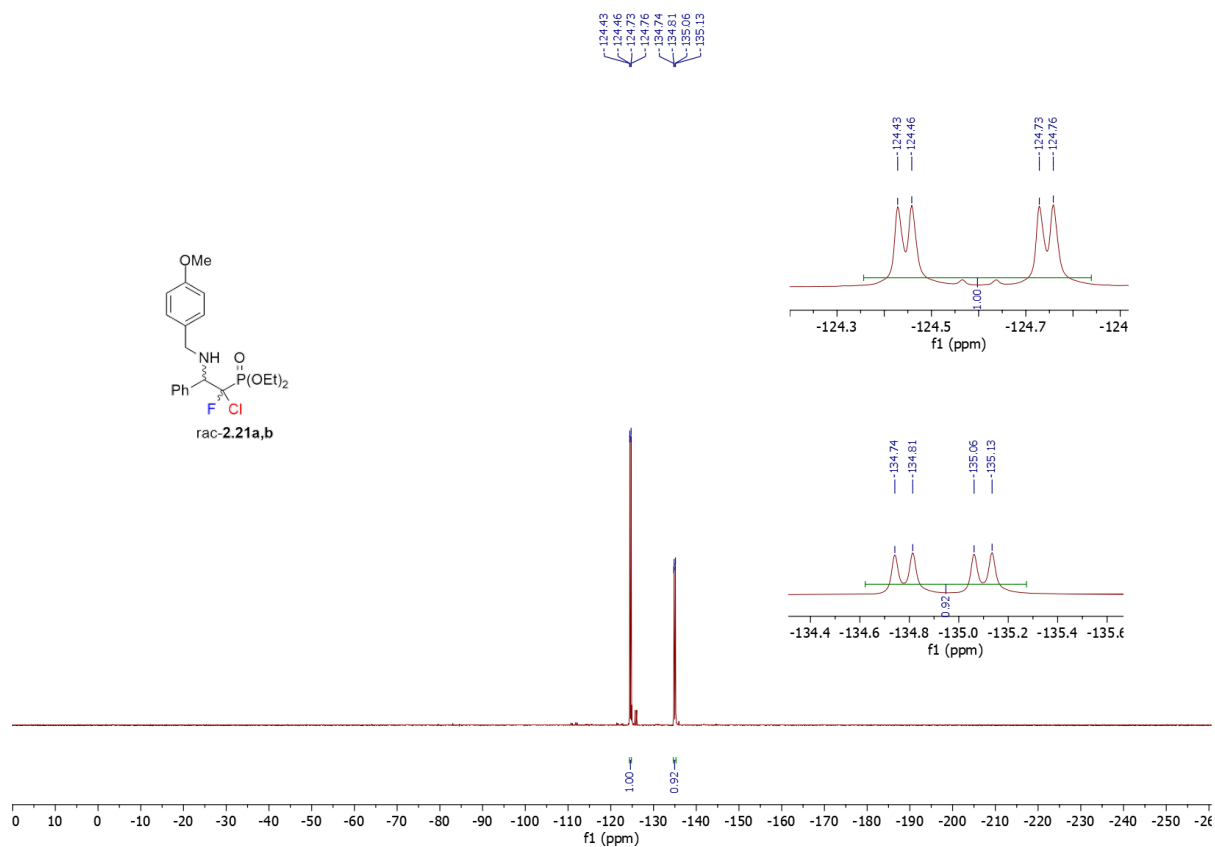




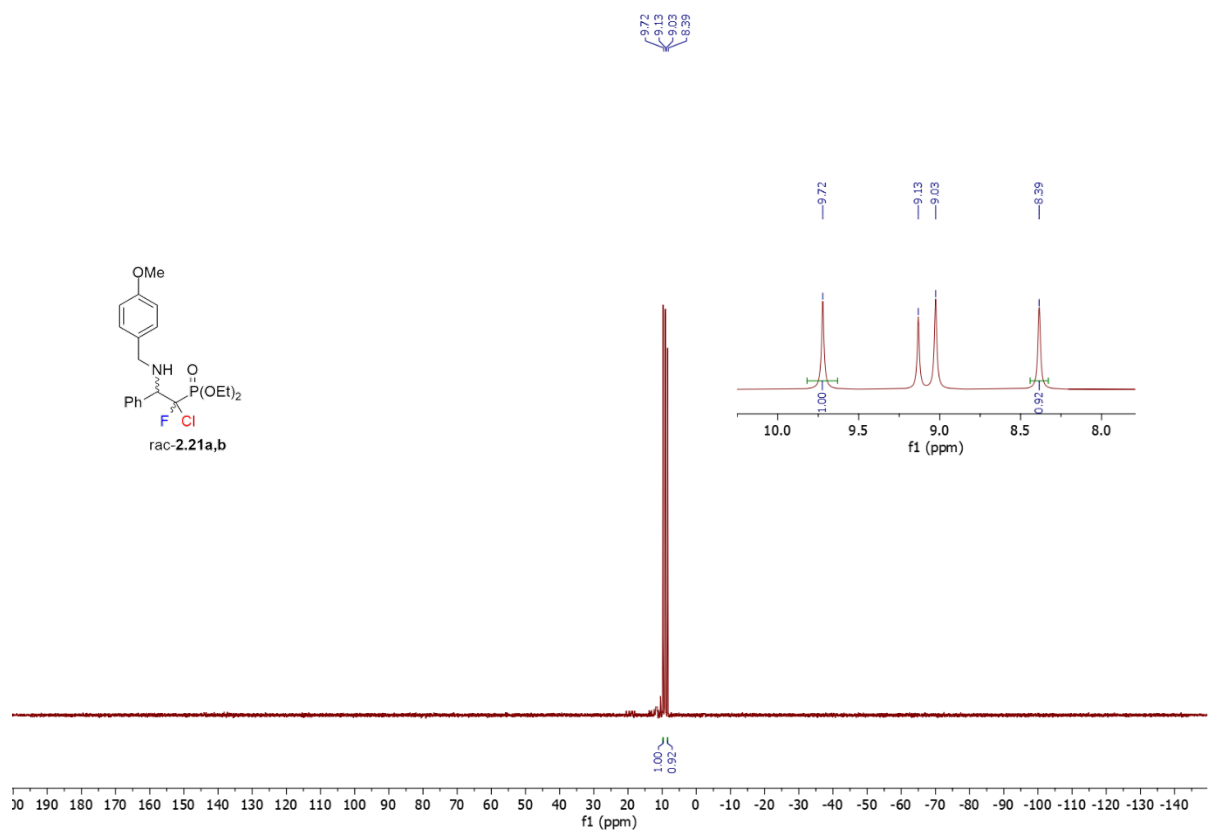
Widmo ^{19}F NMR związku **2.20a-d** dr 1:0.83:0.07:0.11.



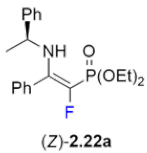
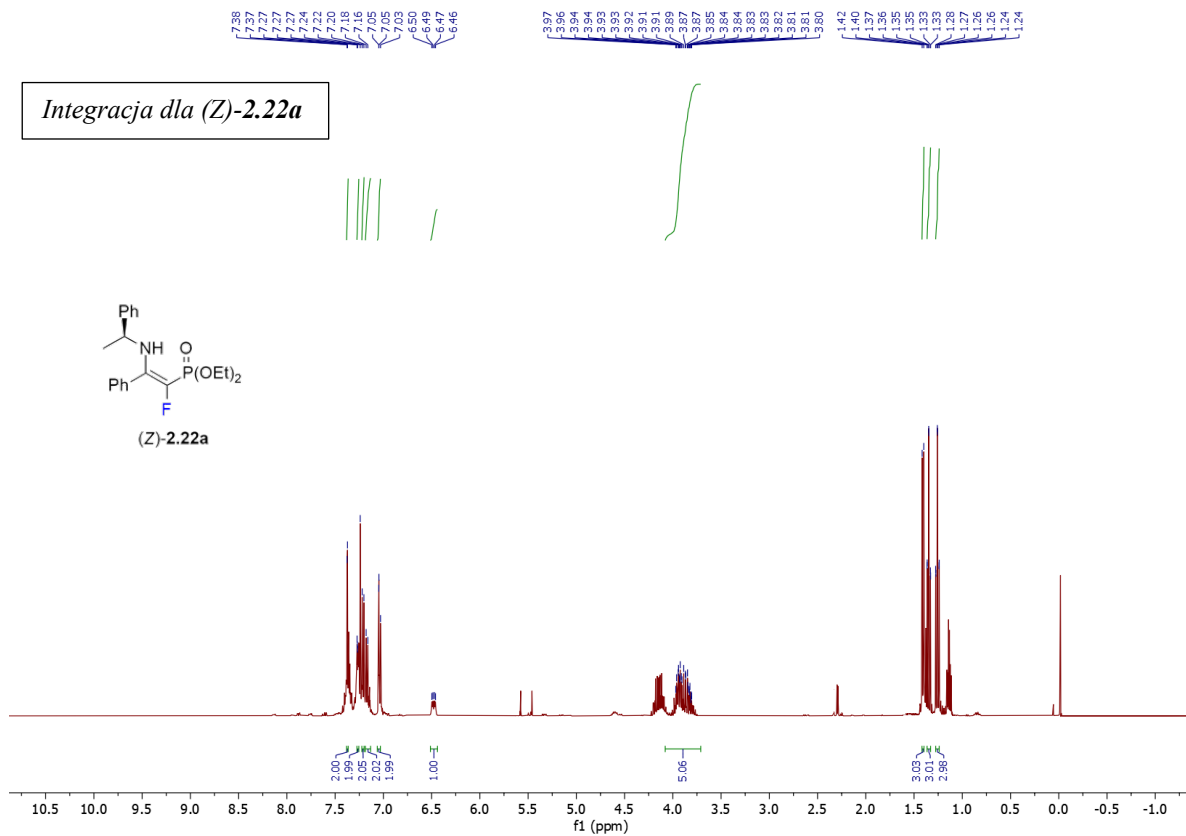
Widmo ^{31}P $\{^1\text{H}\}$ NMR związku **2.20a-d** dr 1:0.83:0.07:0.11.



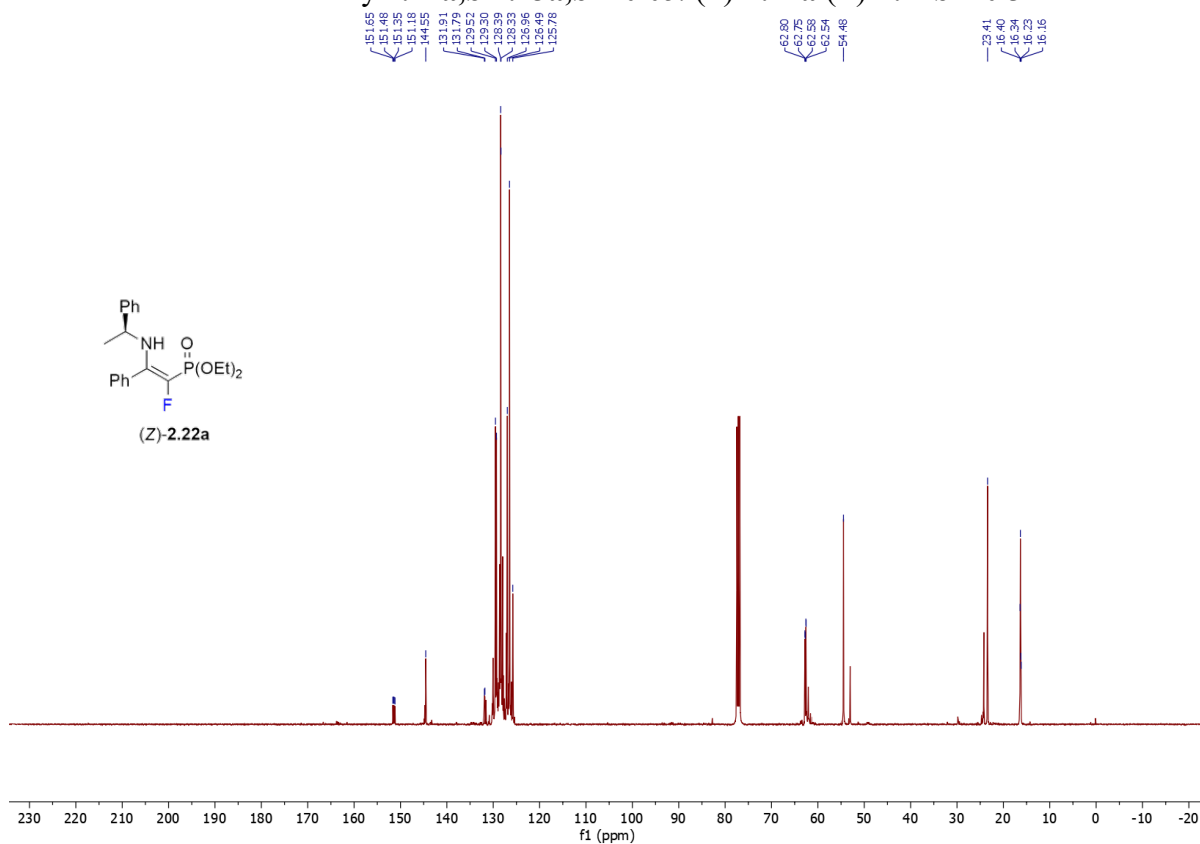
Widmo ^{19}F NMR związku **rac-2.21a,b** *dr* 1:0.92.



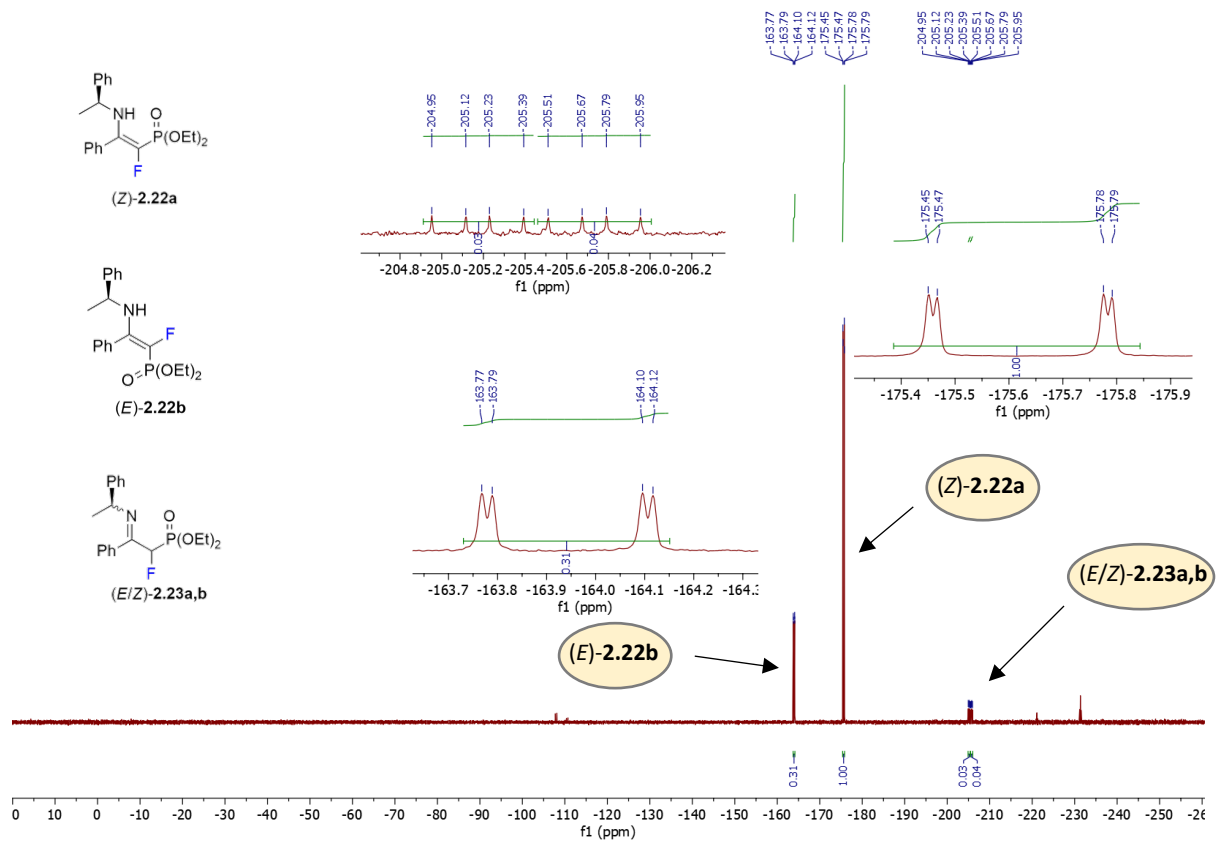
Widmo ^{31}P $\{^1\text{H}\}$ NMR związku **rac-2.21a,b** *dr* 1:0.92.



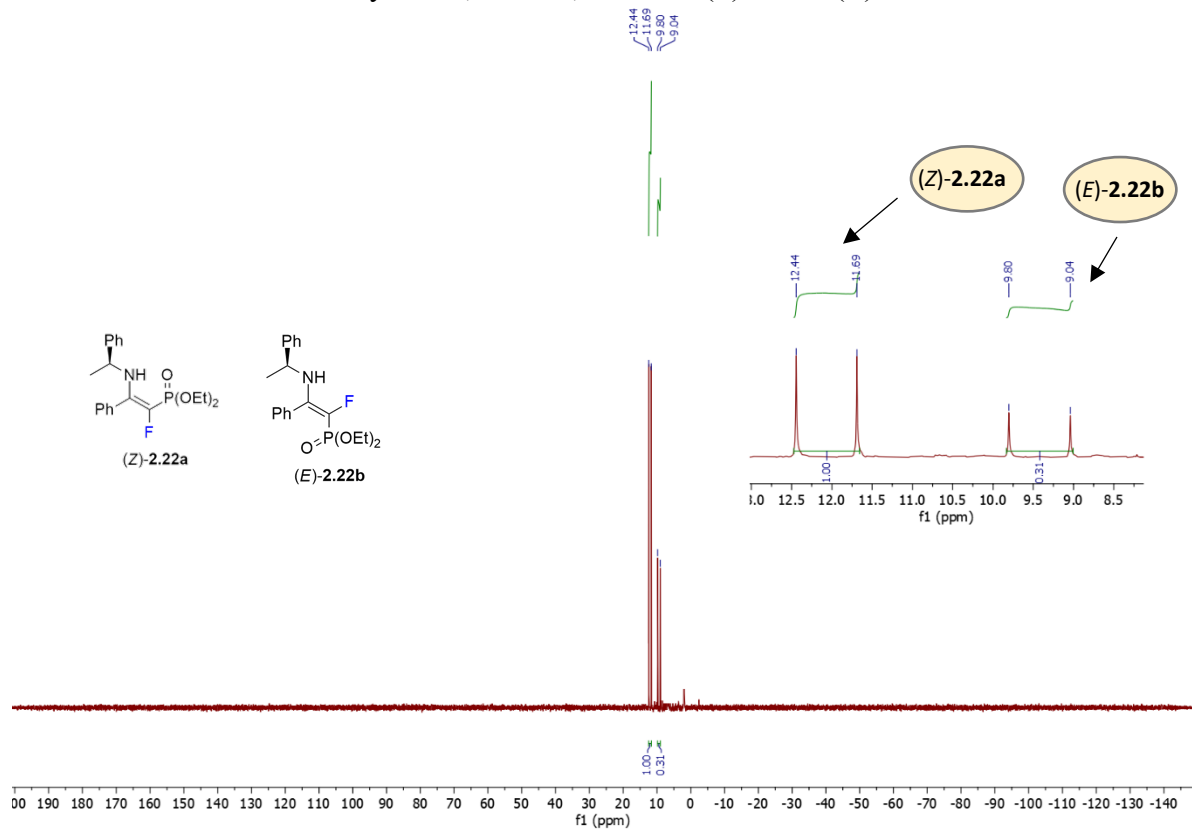
Widmo ^1H NMR mieszaniny **2.22a,b/2.23a,b** 1:0.05. (Z)-2.22a/(E)-2.22b 1:0.31.



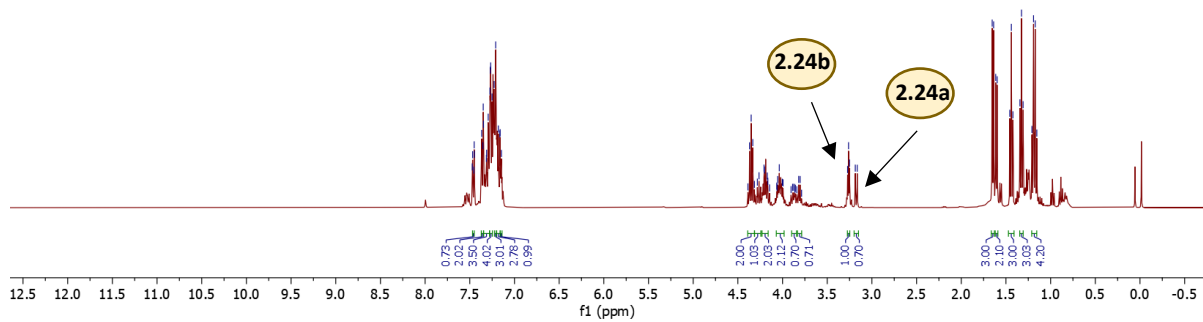
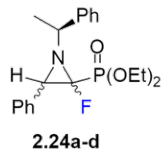
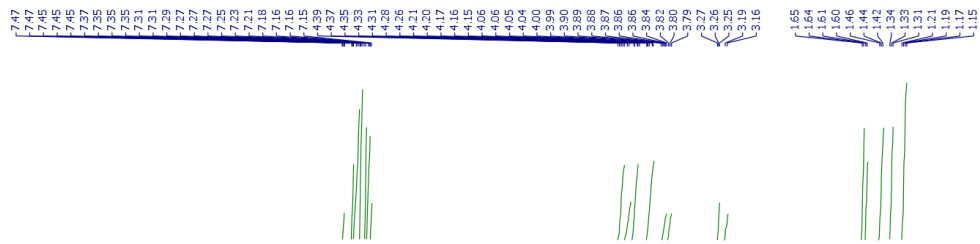
Widmo ^{13}C NMR mieszaniny **2.22a,b/2.23a,b** 1:0.05. (Z)-2.22a/(E)-2.22b 1:0.31.



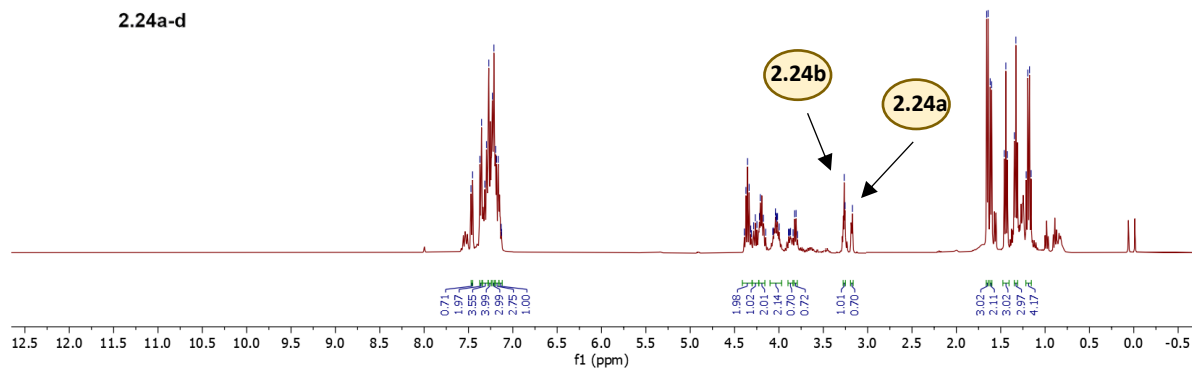
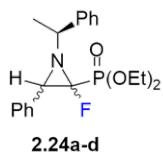
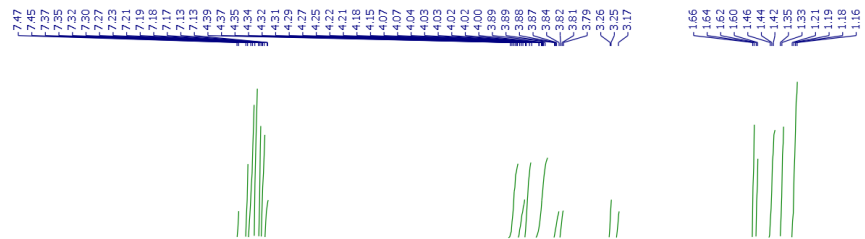
Widmo ^{19}F NMR mieszanki **2.22a,b/2.23a,b** 1:0.05. (Z)-2.22a/(E)-2.22b 1:0.31.



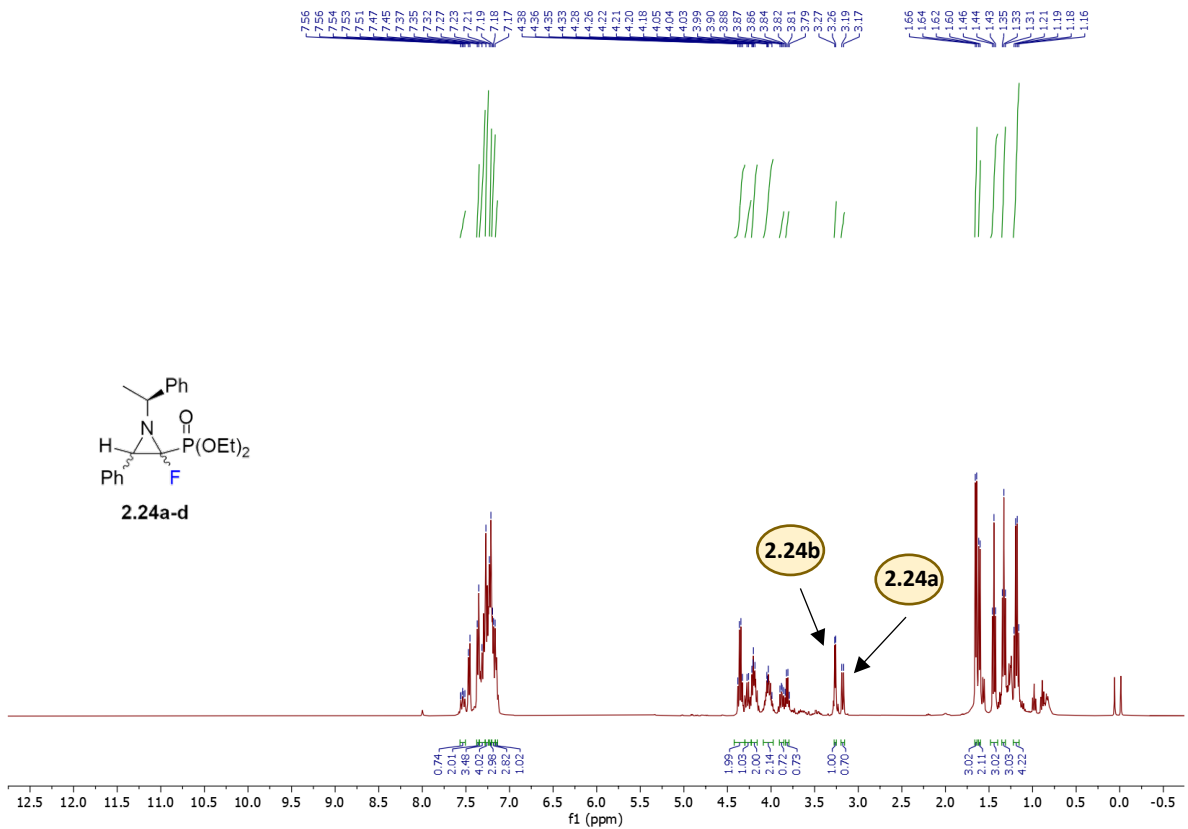
Widmo ^{31}P NMR mieszanki **2.22a,b/2.23a,b** 1:0.05. (Z)-2.22a/(E)-2.22b 1:0.31.



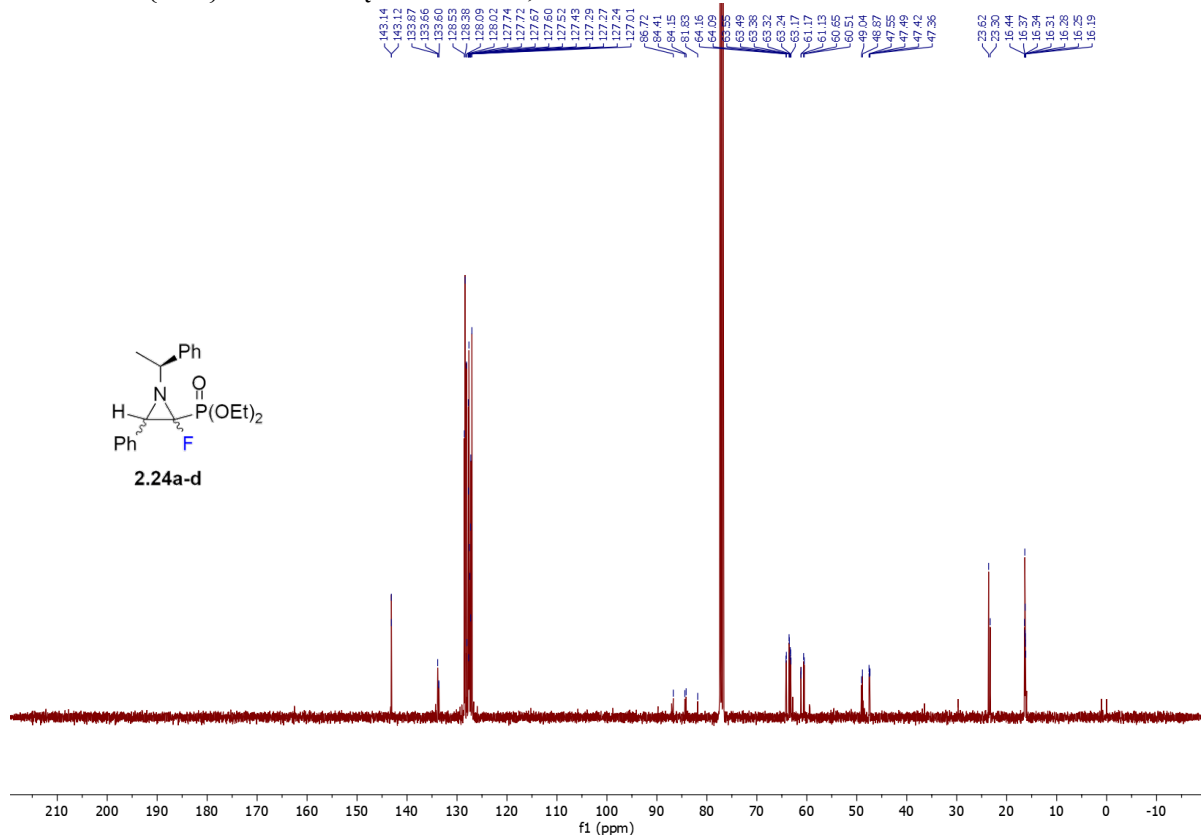
Widmo ^1H NMR związku **2.24a-d**, dr 0.70:1:0.17:0.04.



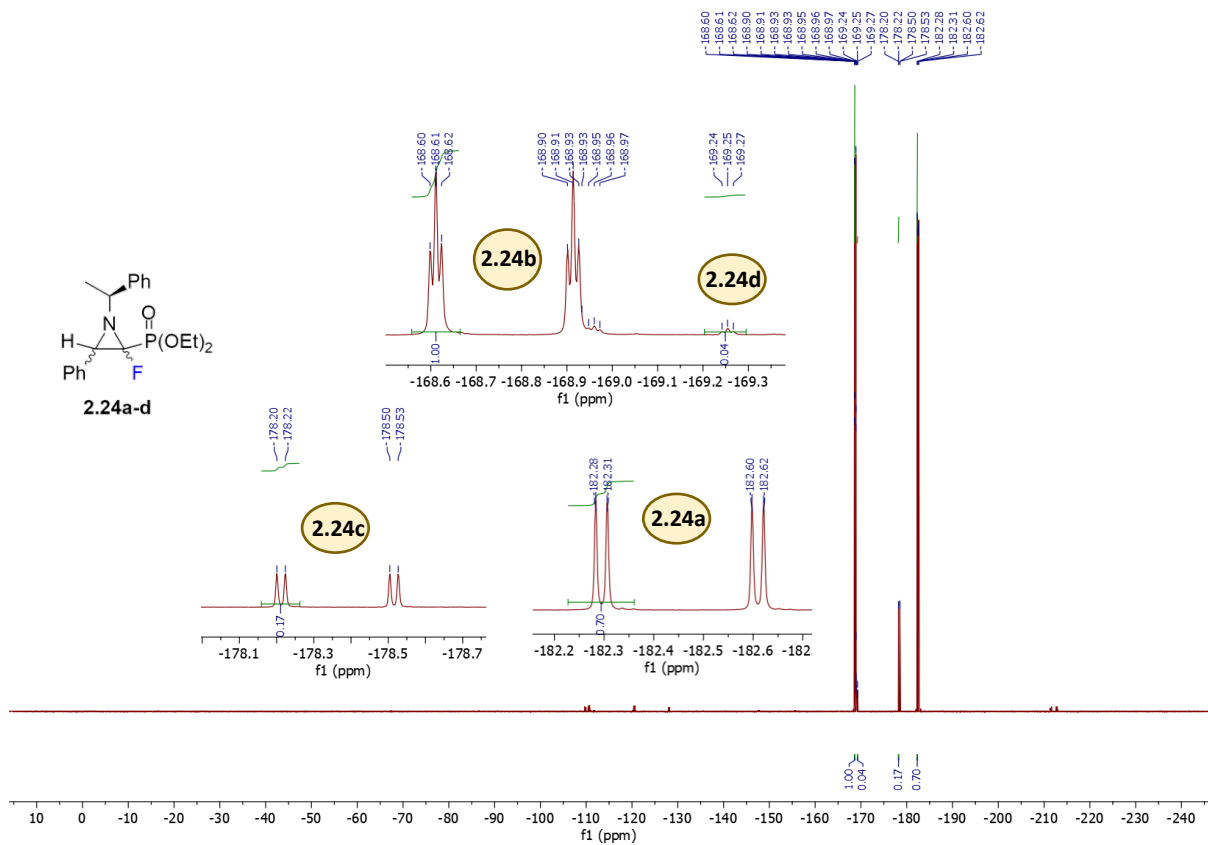
Widmo $^1\text{H}\{^{19}\text{F}\}$ NMR związku **2.24a-d**, dr 0.70:1:0.17:0.04



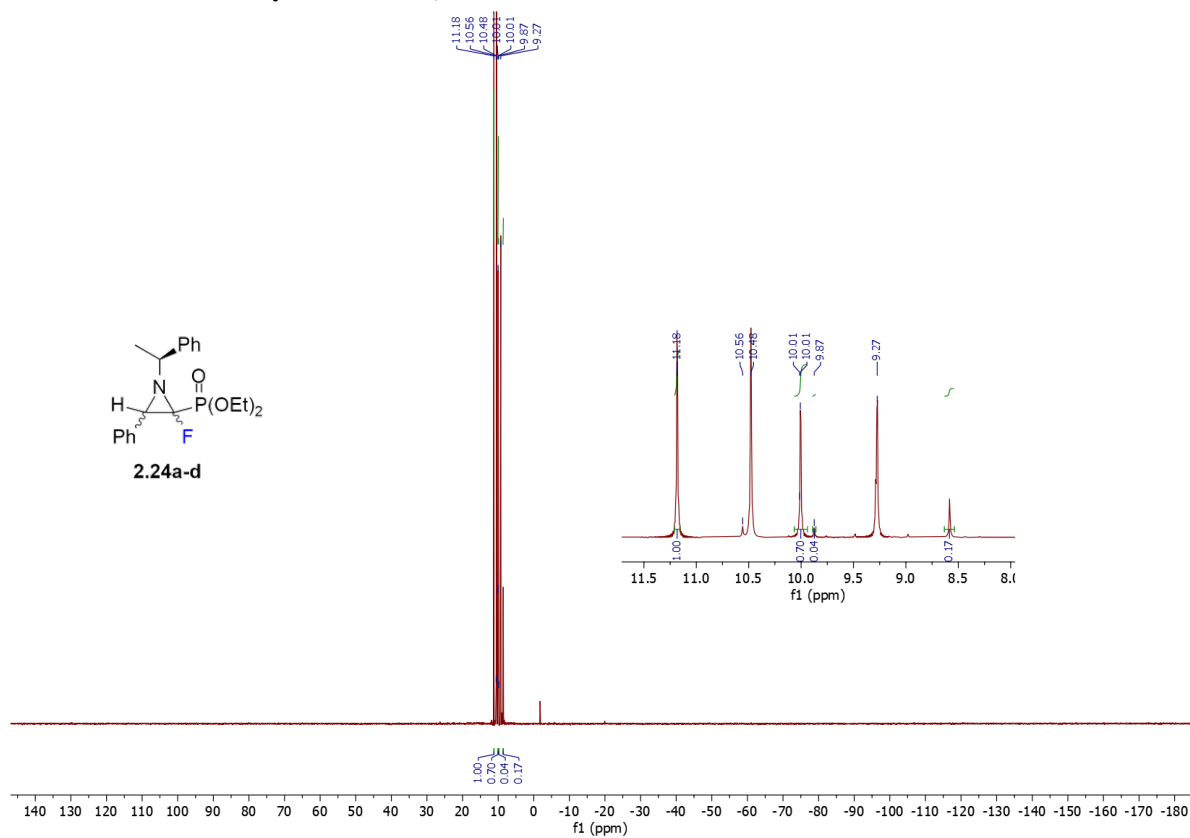
Widmo $^1\text{H}\{^31\text{P}\}$ NMR związku **2.24a-d**, *dr* 0.70:1:0.17:0.04.



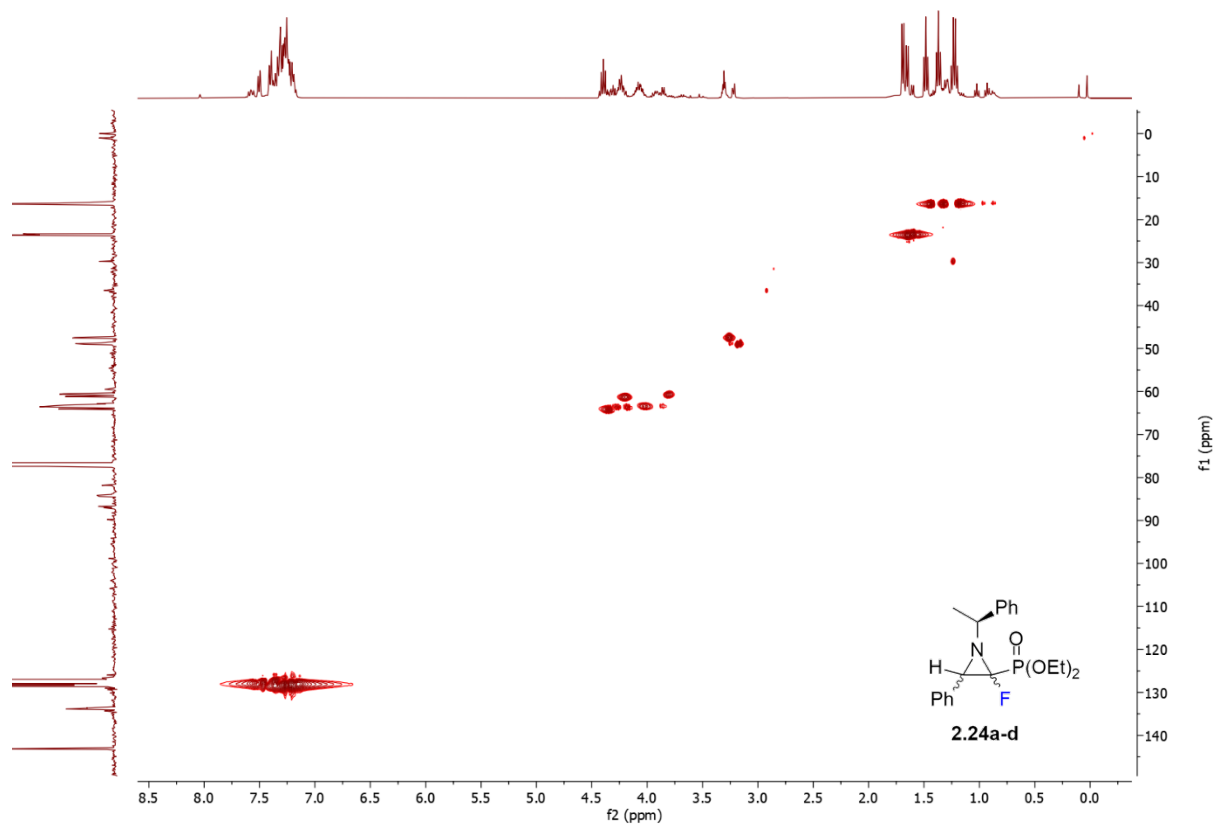
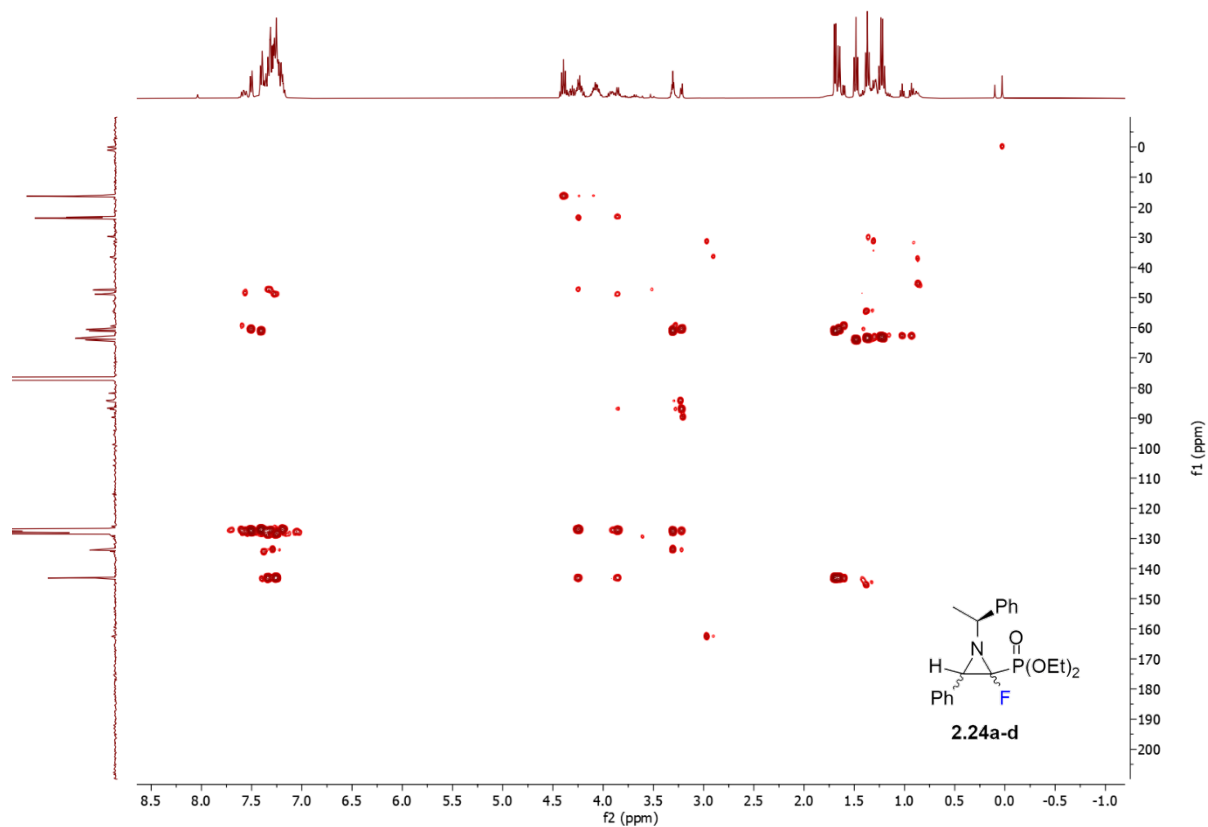
Widmo ^{13}C NMR związku **2.24a-d**, *dr* 0.70:1:0.17:0.04.

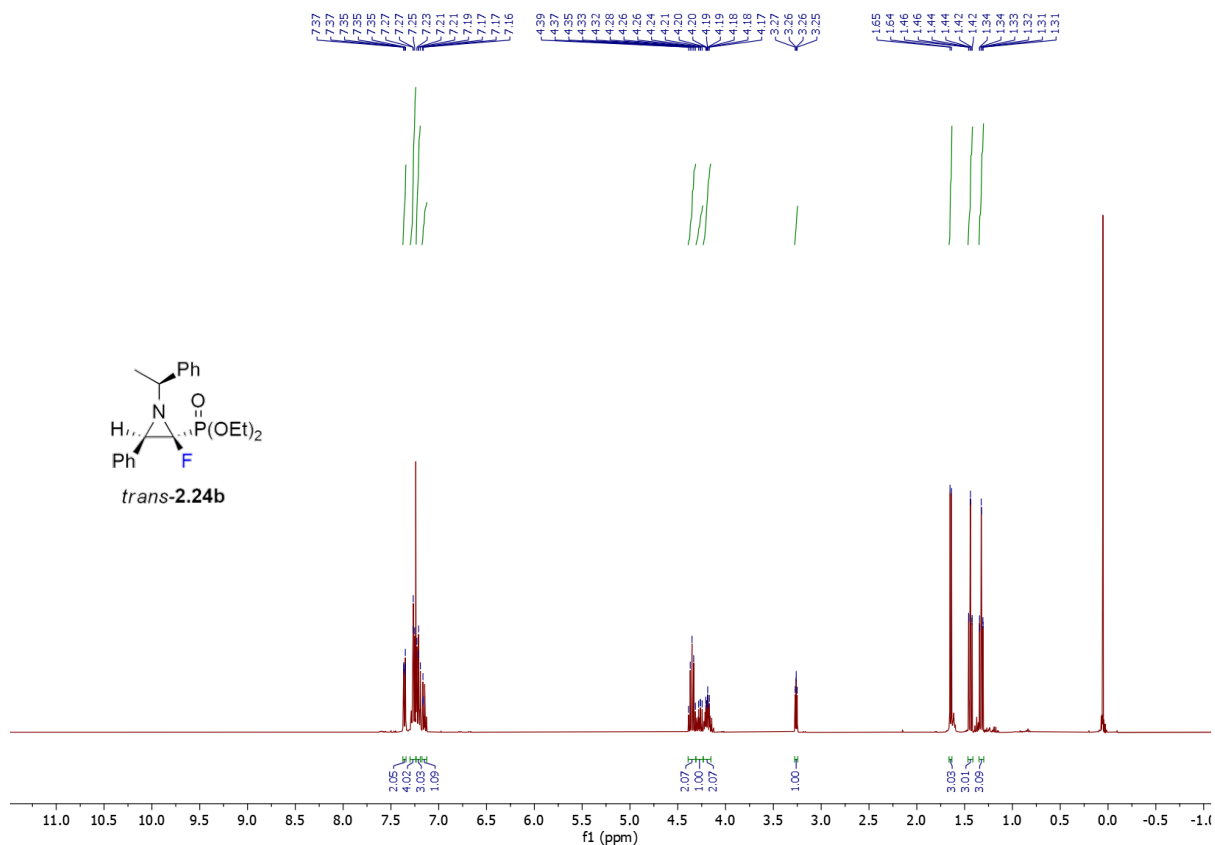


Widmo ^{19}F NMR związku **2.24a-d**, *dr* 0.70:1:0.17:0.04.

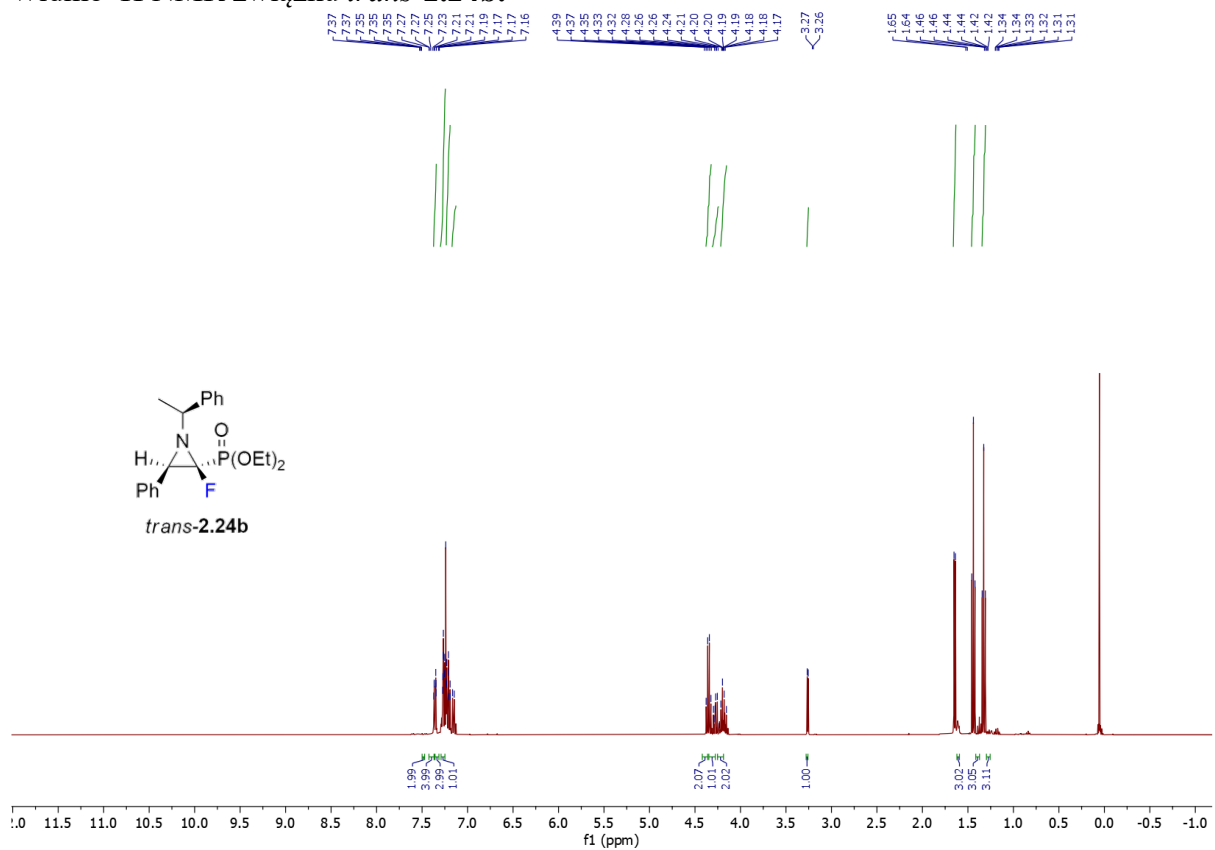


Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.24a-d**, *dr* 0.70:1:0.17:0.04.

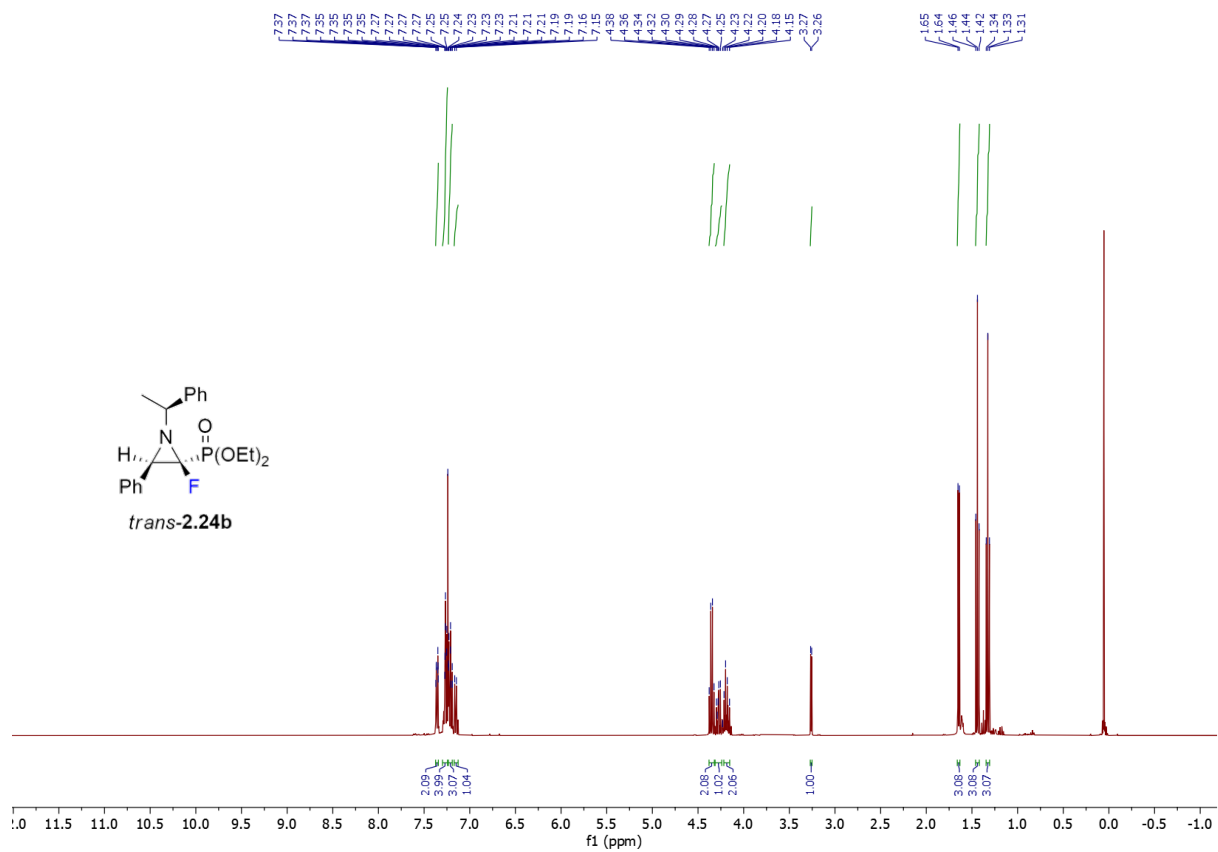




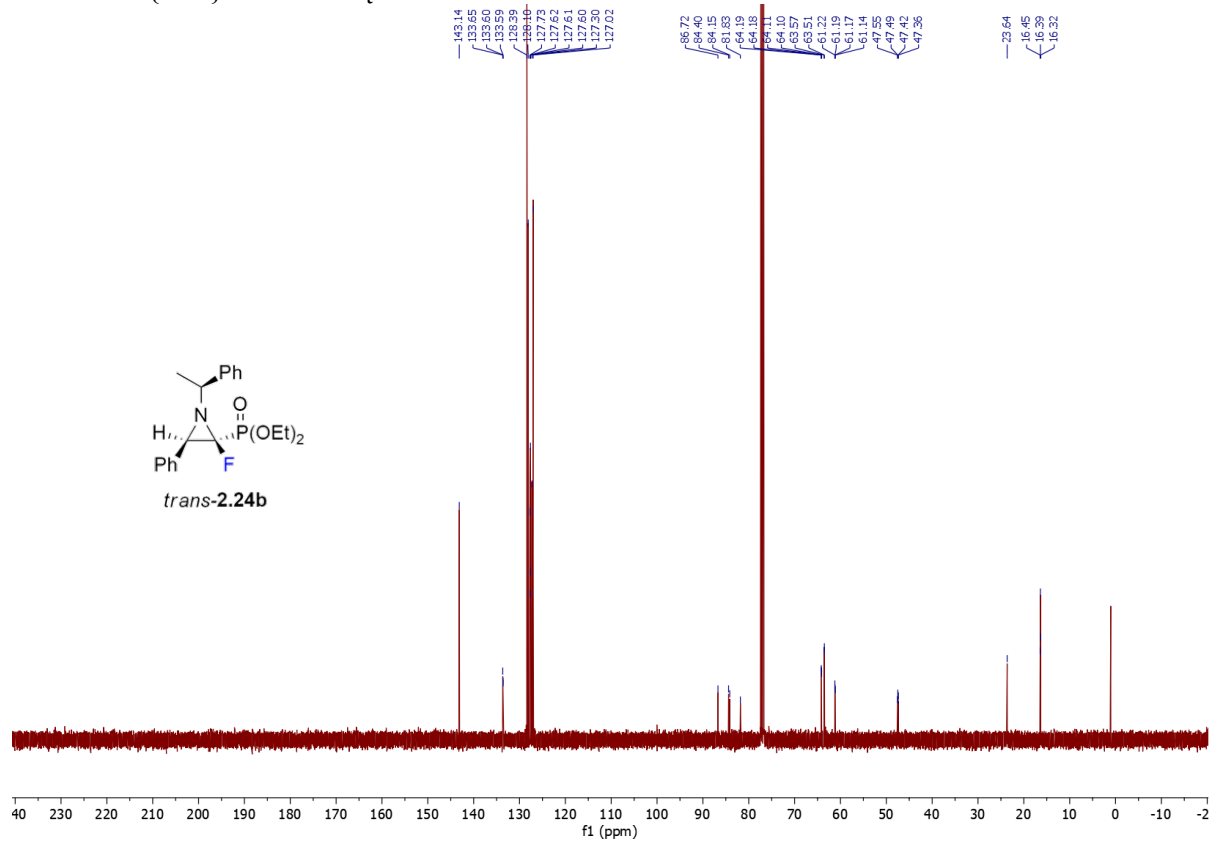
Widmo ^1H NMR związku *trans*-2.24b.



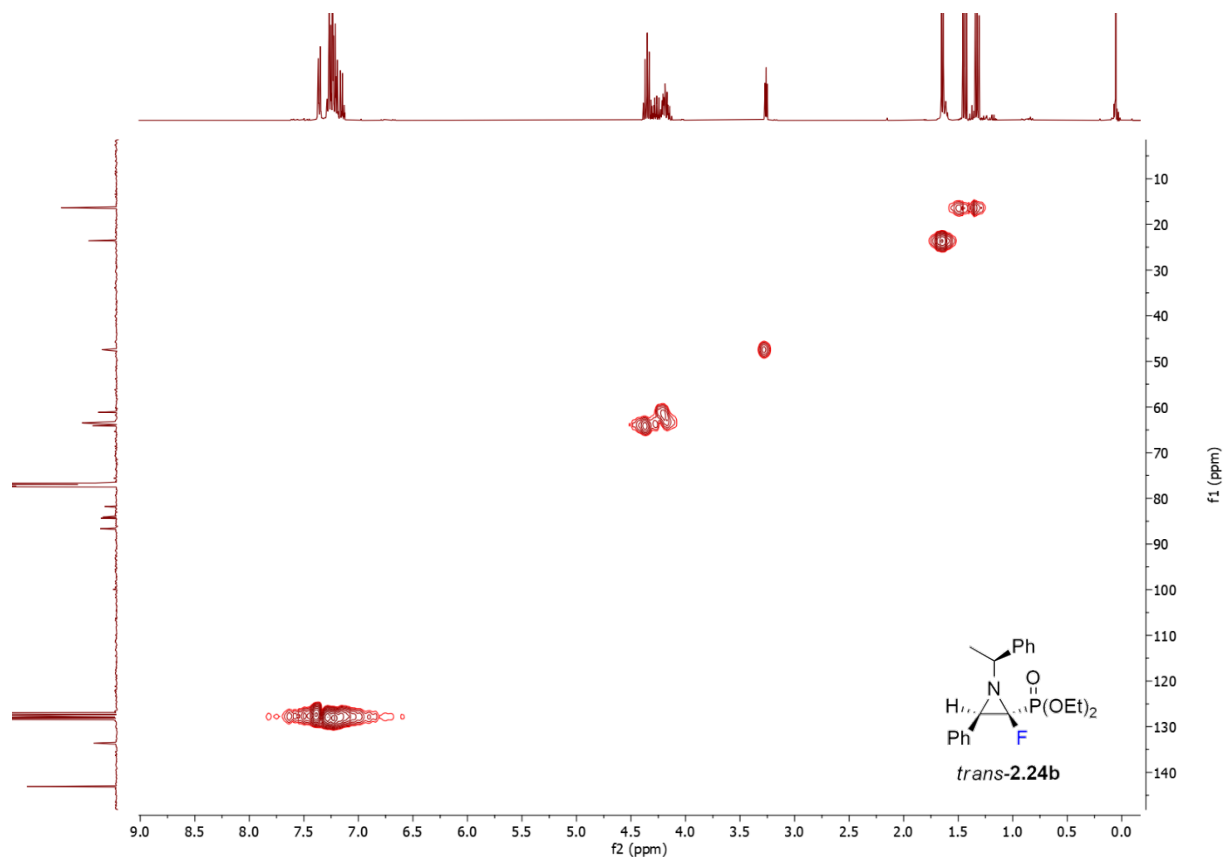
Widmo $^1\text{H}\{^{19}\text{F}\}$ NMR związku *trans*-2.24b.



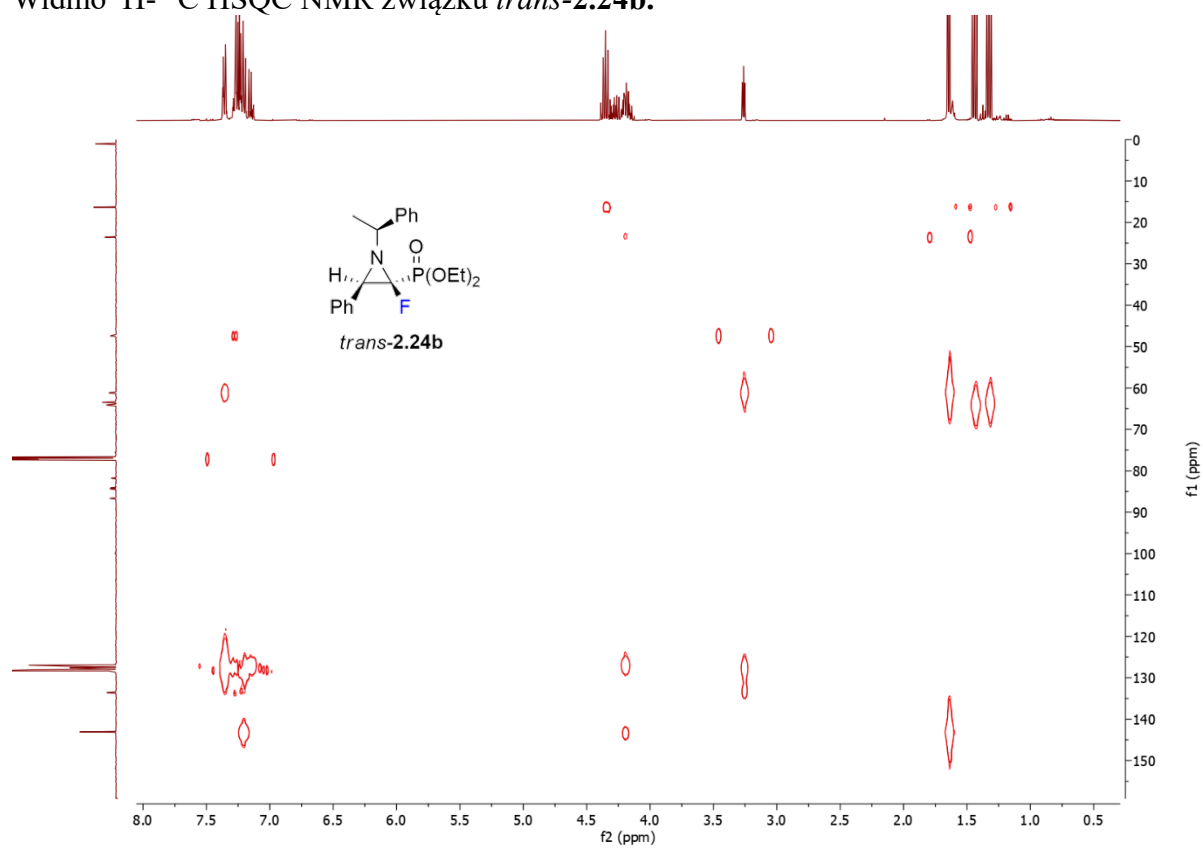
Widmo $^1\text{H}\{^{31}\text{P}\}$ NMR związku *trans*-2.24b.



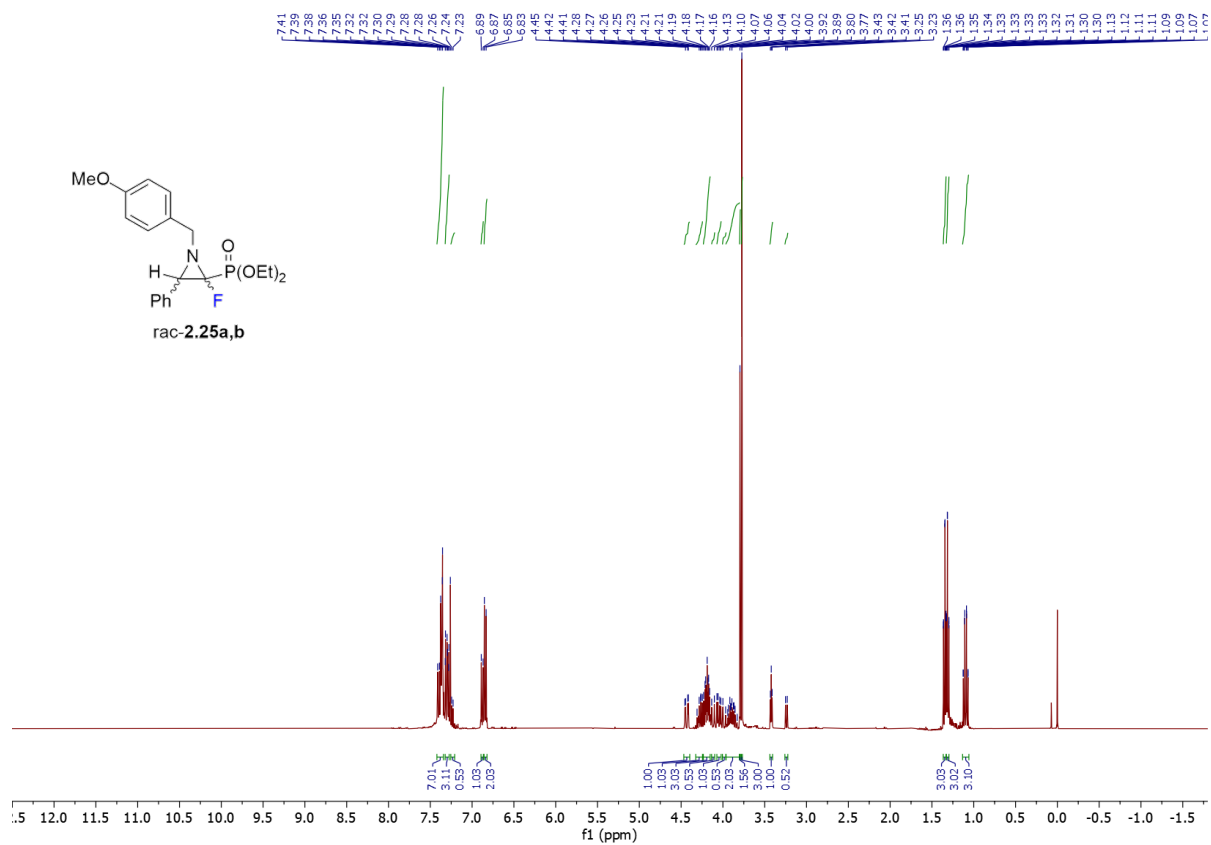
Widmo ^{13}C NMR związku *trans*-2.24b.



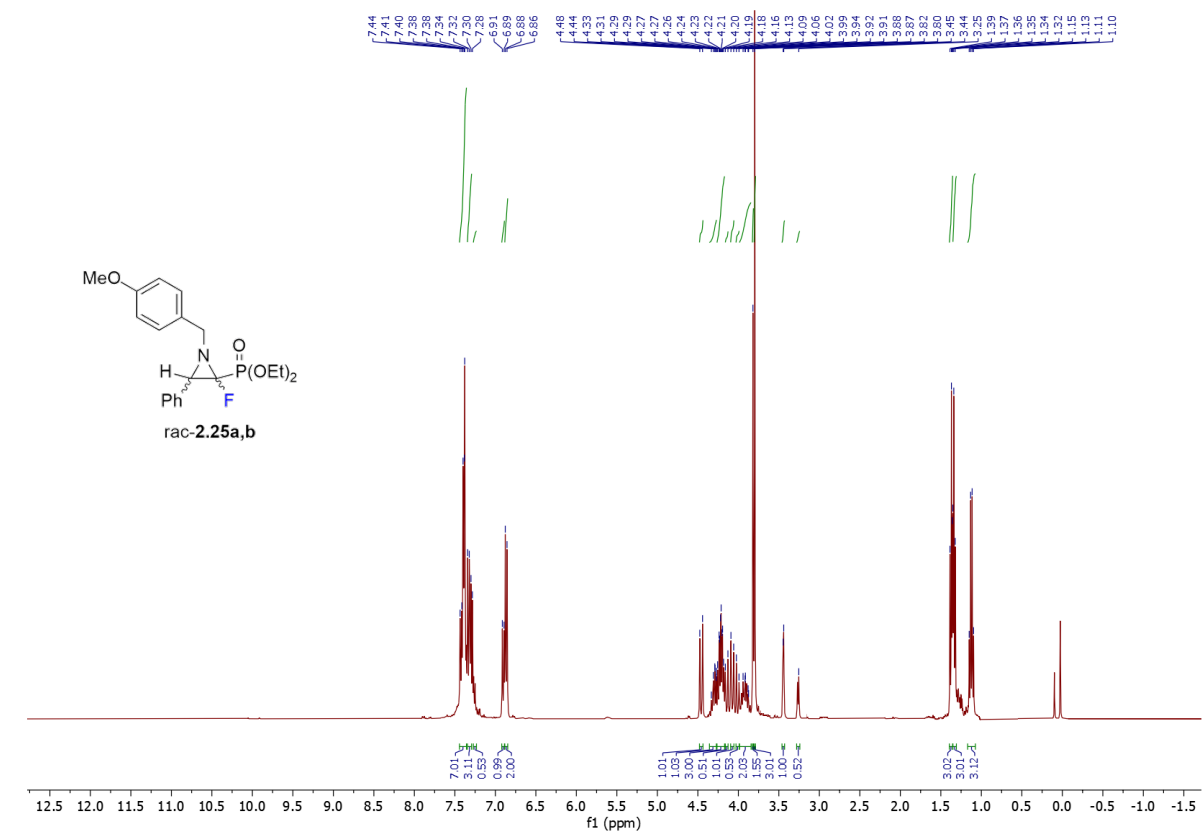
Widmo ^1H - ^{13}C HSQC NMR związku *trans*-2.24b.



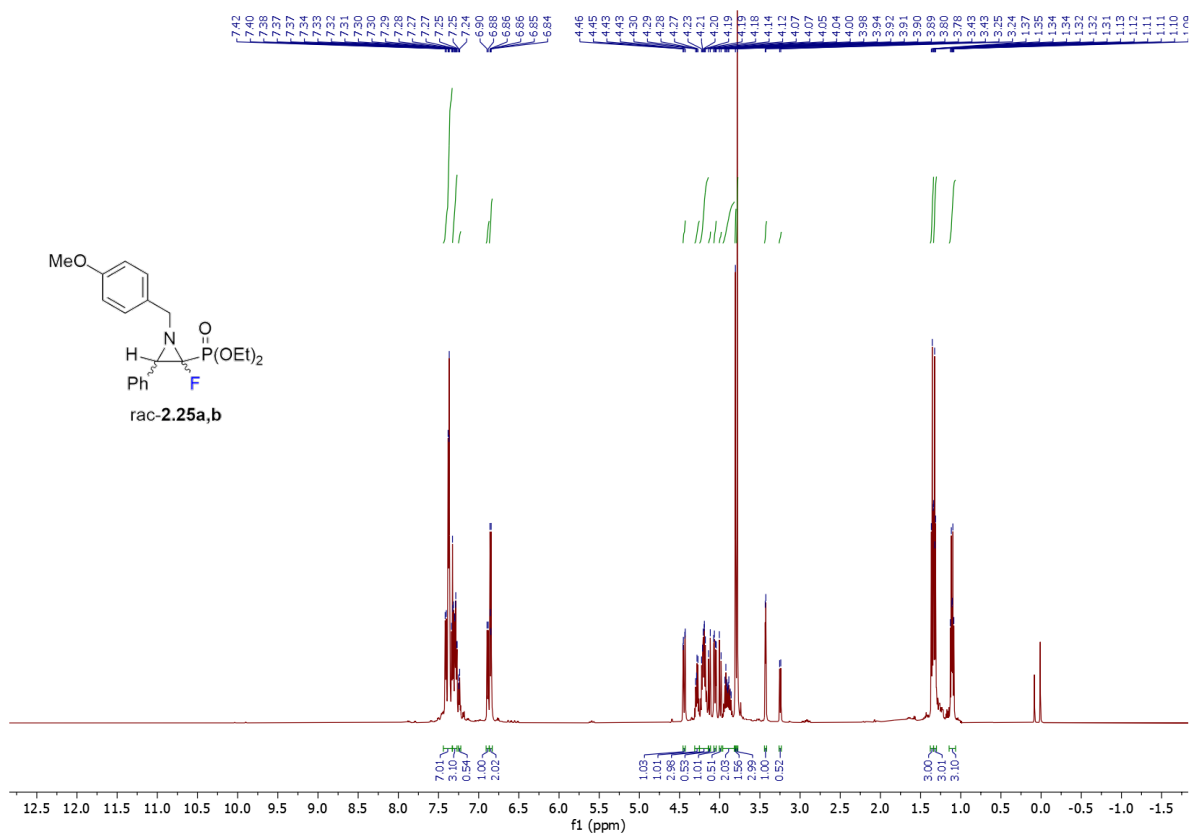
Widmo ^1H - ^{13}C HMBC NMR związku *trans*-2.24b.



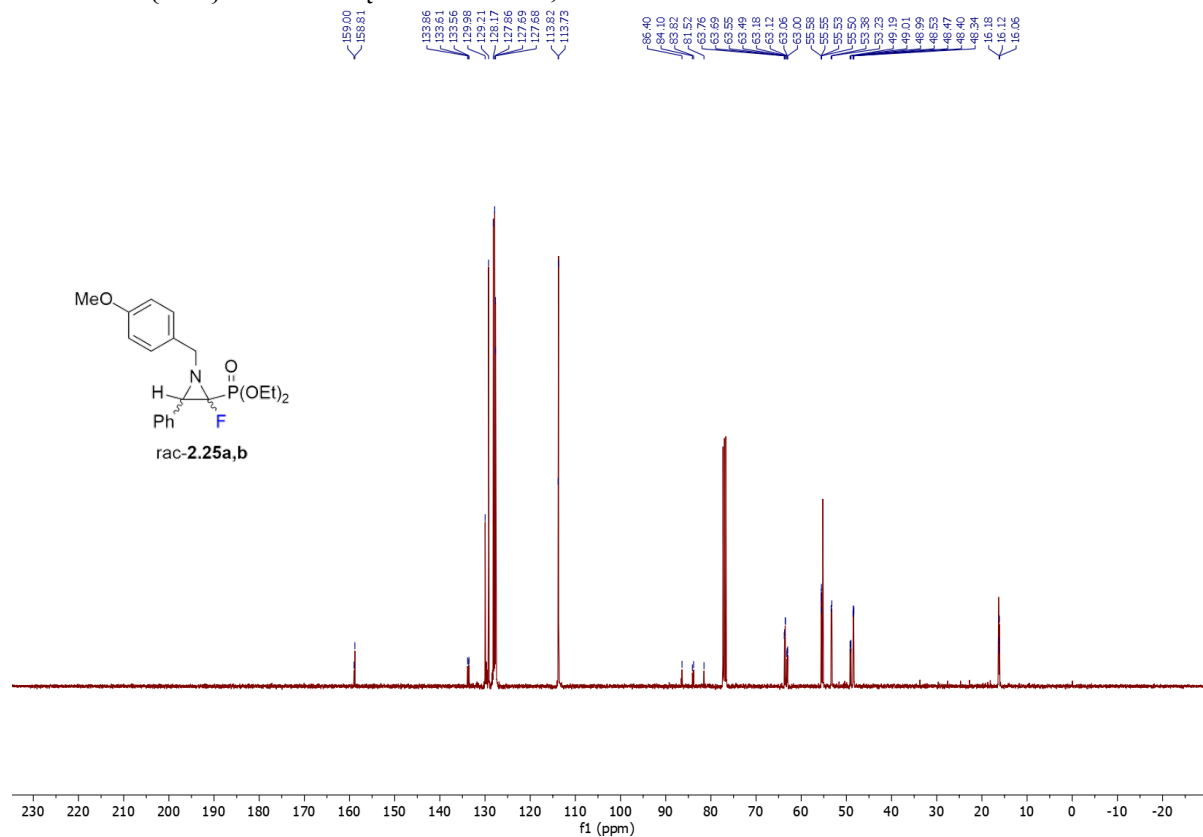
Widmo ¹H NMR związku **rac-2.25a,b** *dr* 0.52:1.



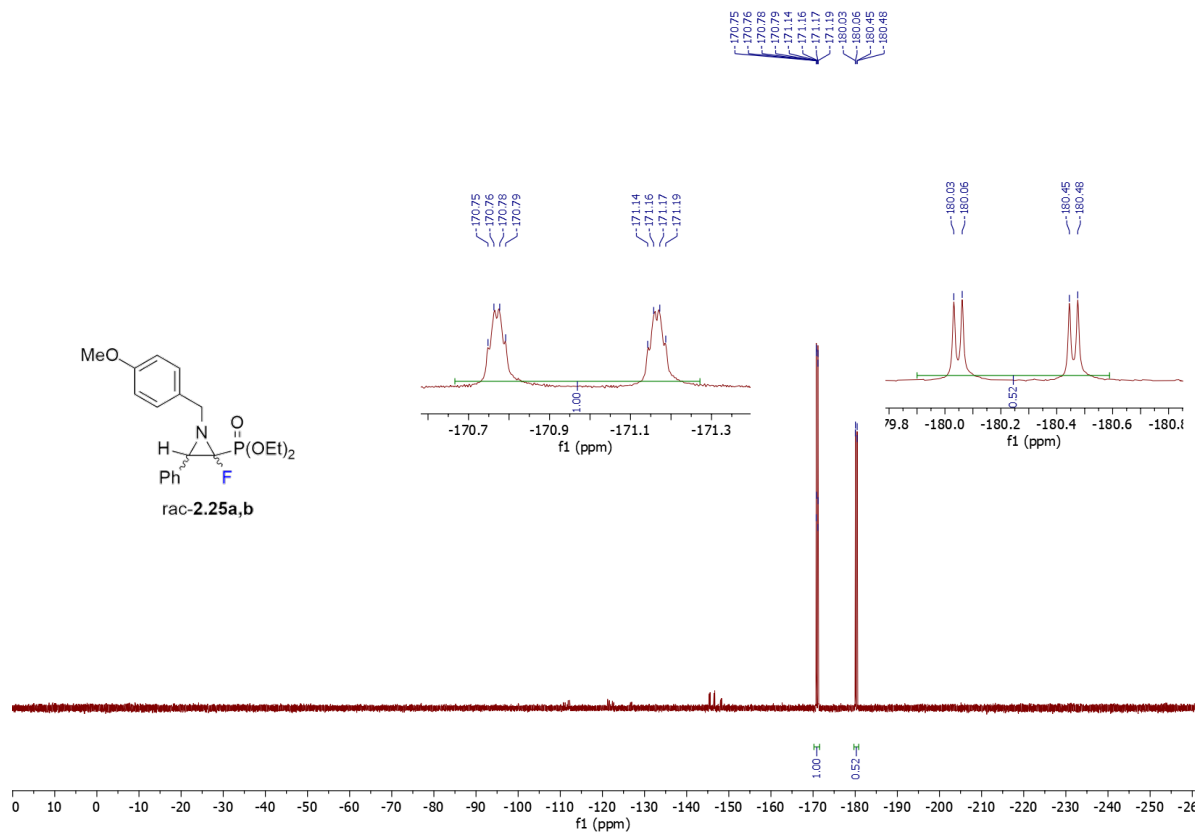
Widmo ¹H{¹⁹F} NMR związku **rac-2.25a,b** *dr* 0.52:1.



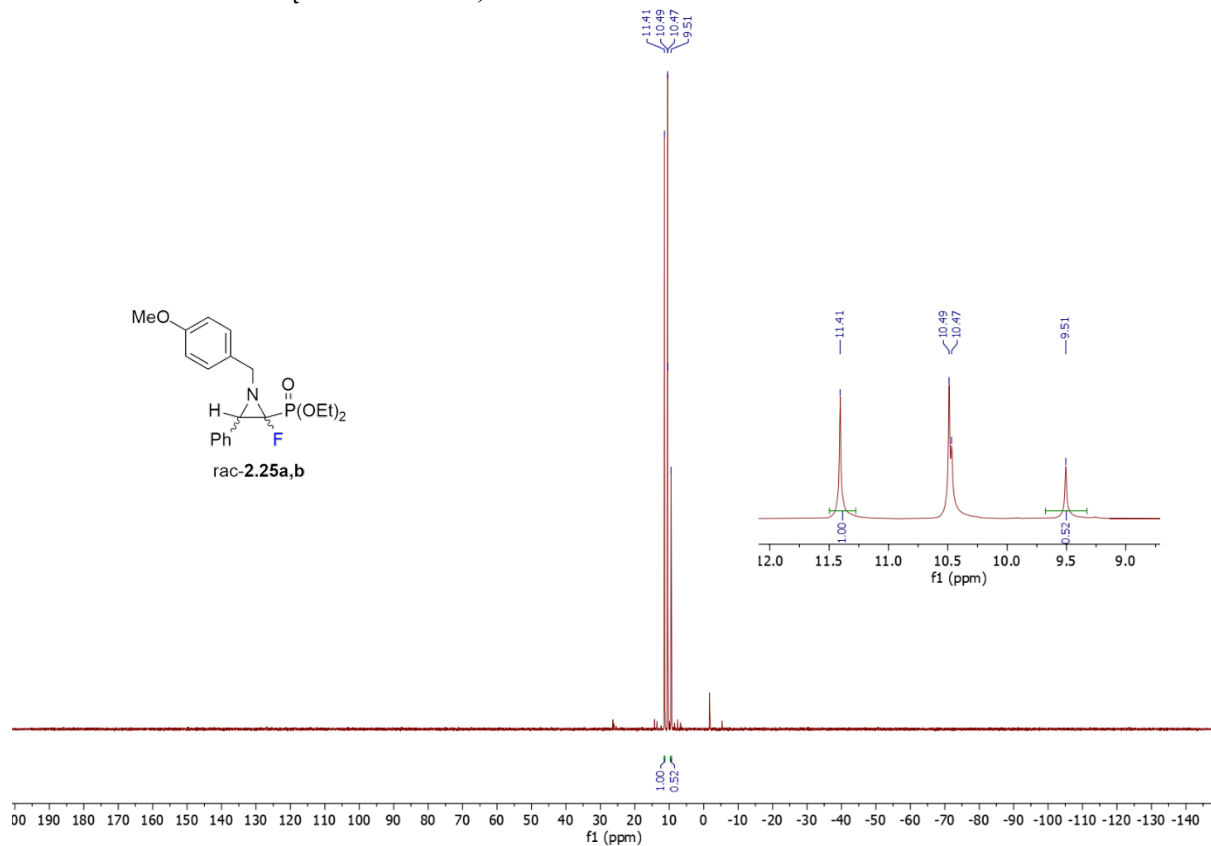
Widmo $^1\text{H}\{^31\text{P}\}$ NMR związku **rac-2.25a,b** dr 0.52:1.



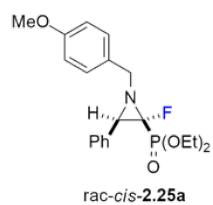
Widmo ^{13}C NMR związku **rac-2.25a,b** dr 0.52:1.

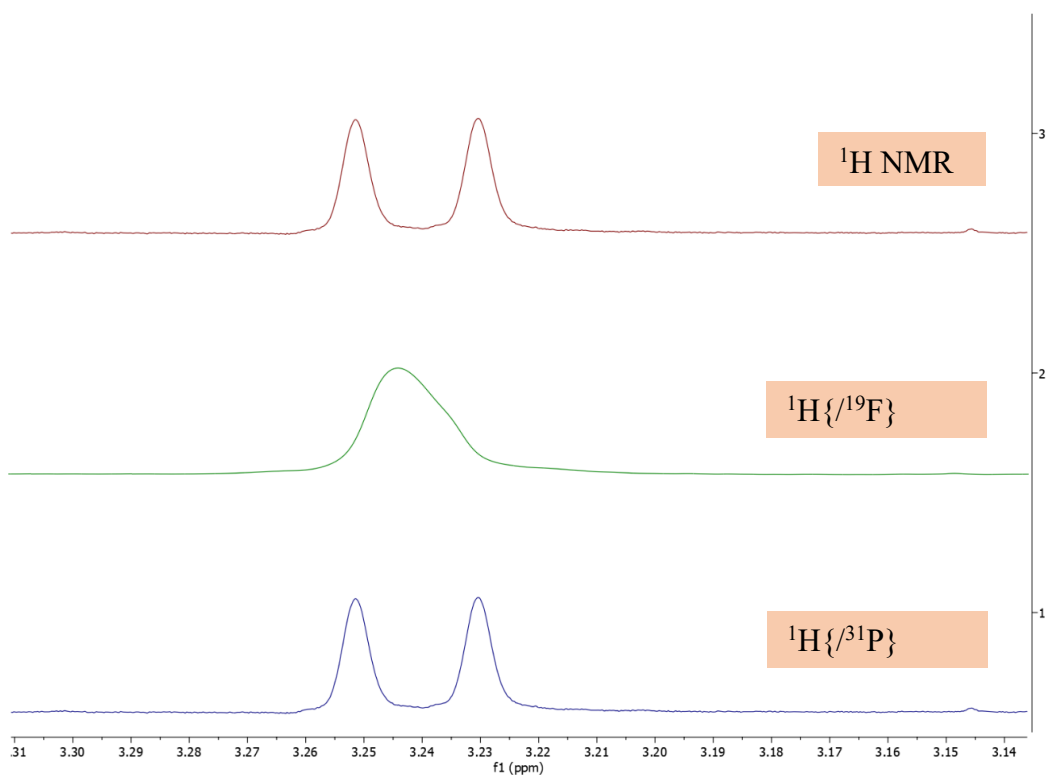


Widmo ^{19}F NMR związku **rac-2.25a,b** *dr* 0.52:1.

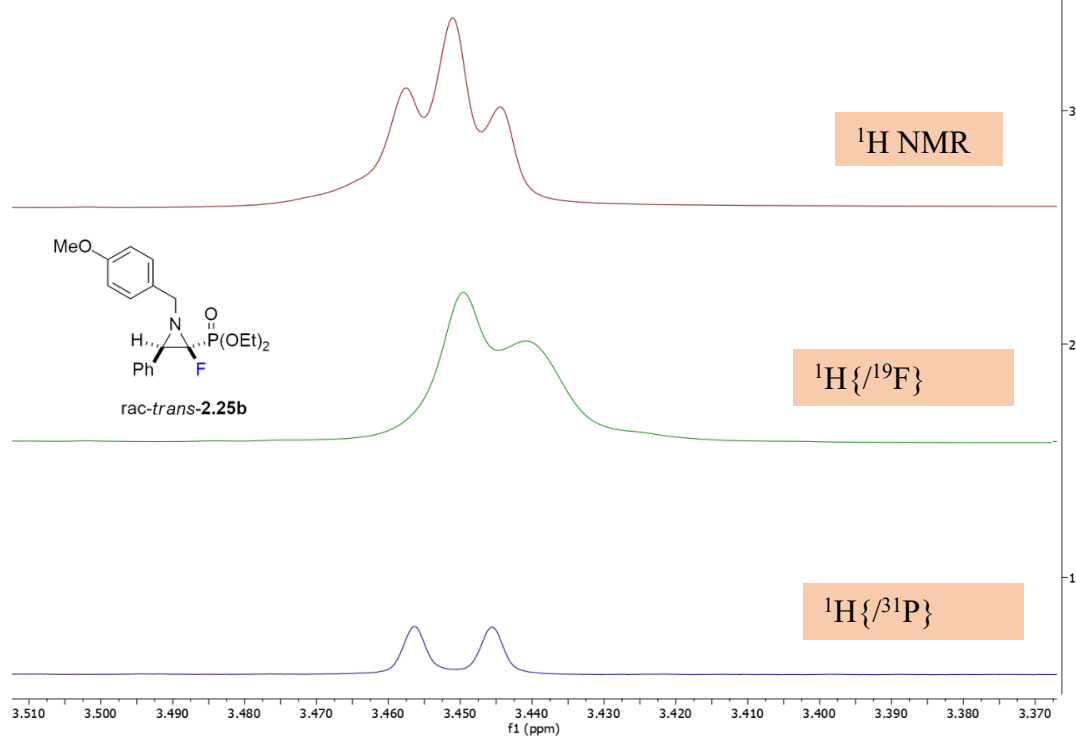


Widmo ^{31}P $\{^1\text{H}\}$ NMR związku **rac-2.25a,b** *dr* 0.52:1.

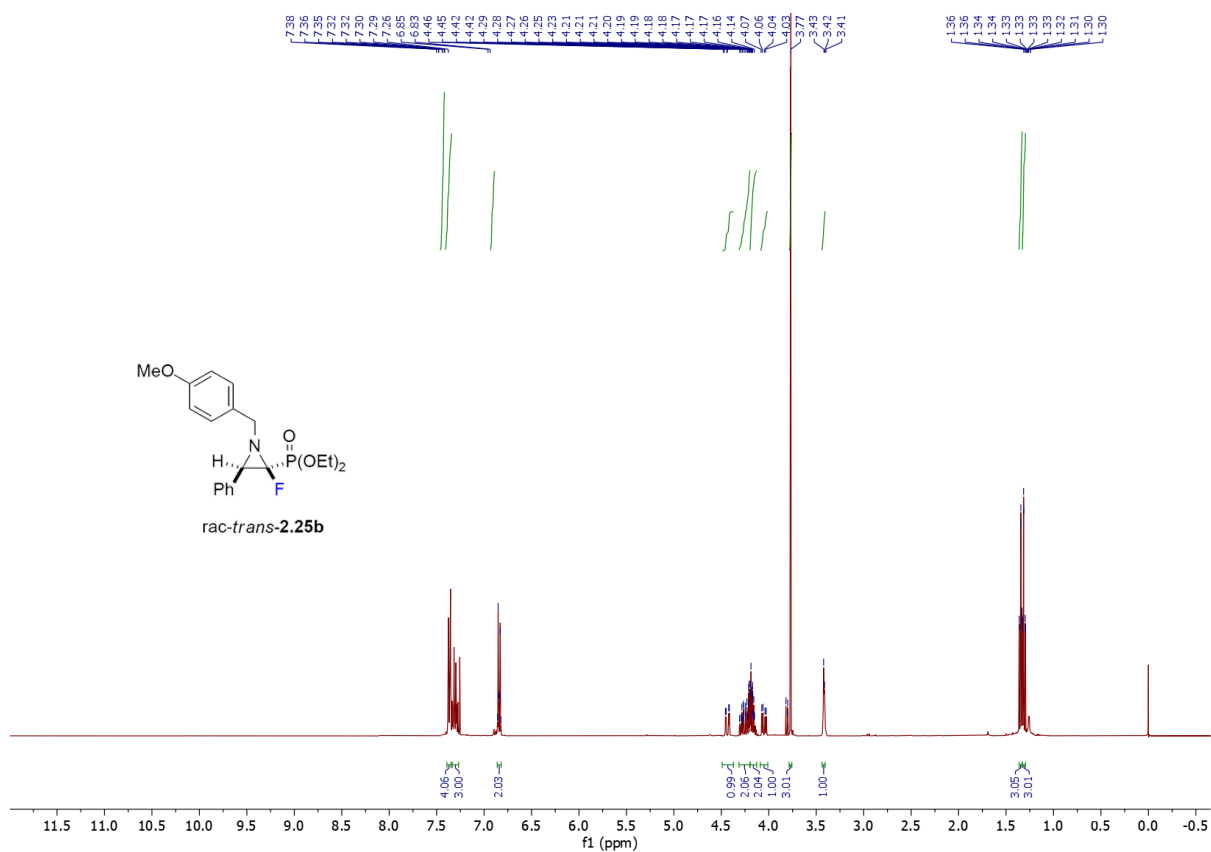




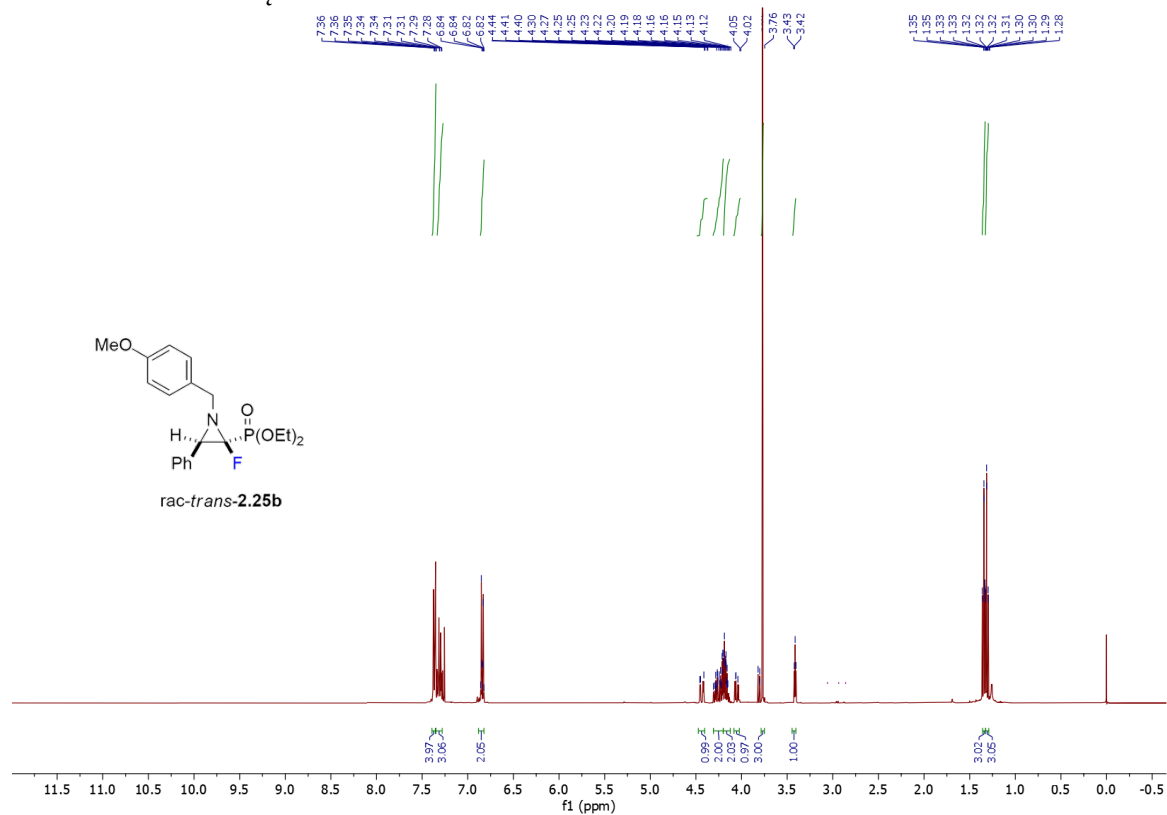
Porównanie widm ^1H , $^1\text{H}\{^{19}\text{F}\}$, $^1\text{H}\{^{31}\text{P}\}$ NMR protonu ($\text{CH}(\text{Ph})\text{CF}$) związku *rac-cis-2.25a*



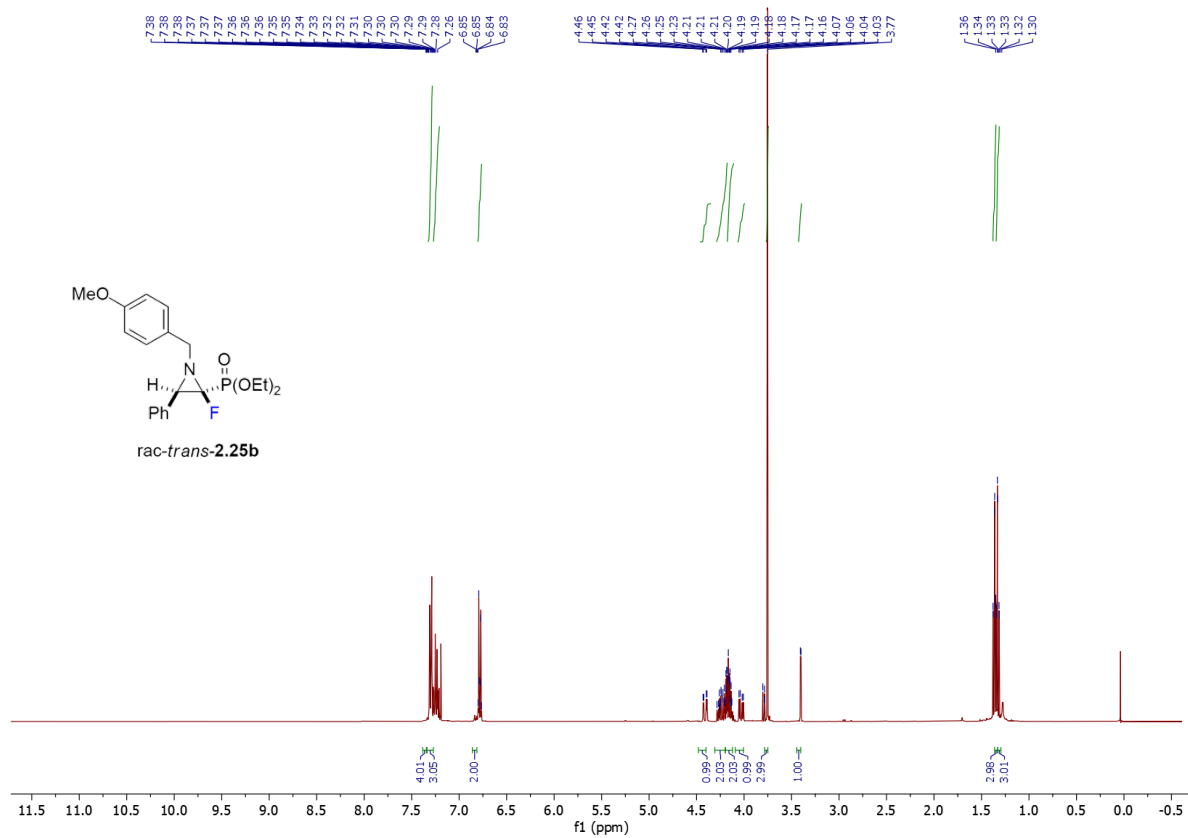
Porównanie widm ^1H , $^1\text{H}\{^{19}\text{F}\}$, $^1\text{H}\{^{31}\text{P}\}$ NMR protonu ($\text{CH}(\text{Ph})\text{CF}$) związku *rac-trans-2.25b*



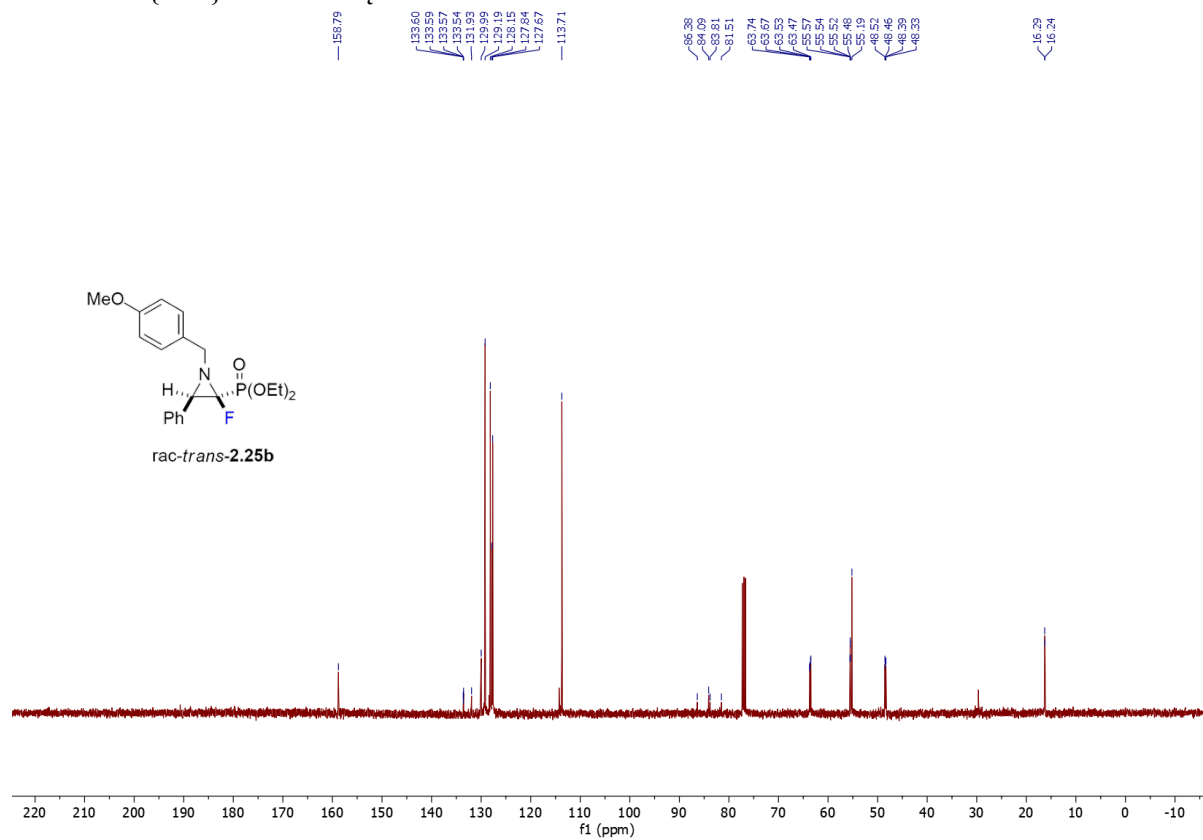
Widmo ^1H NMR związku *rac-trans*-2.25b.



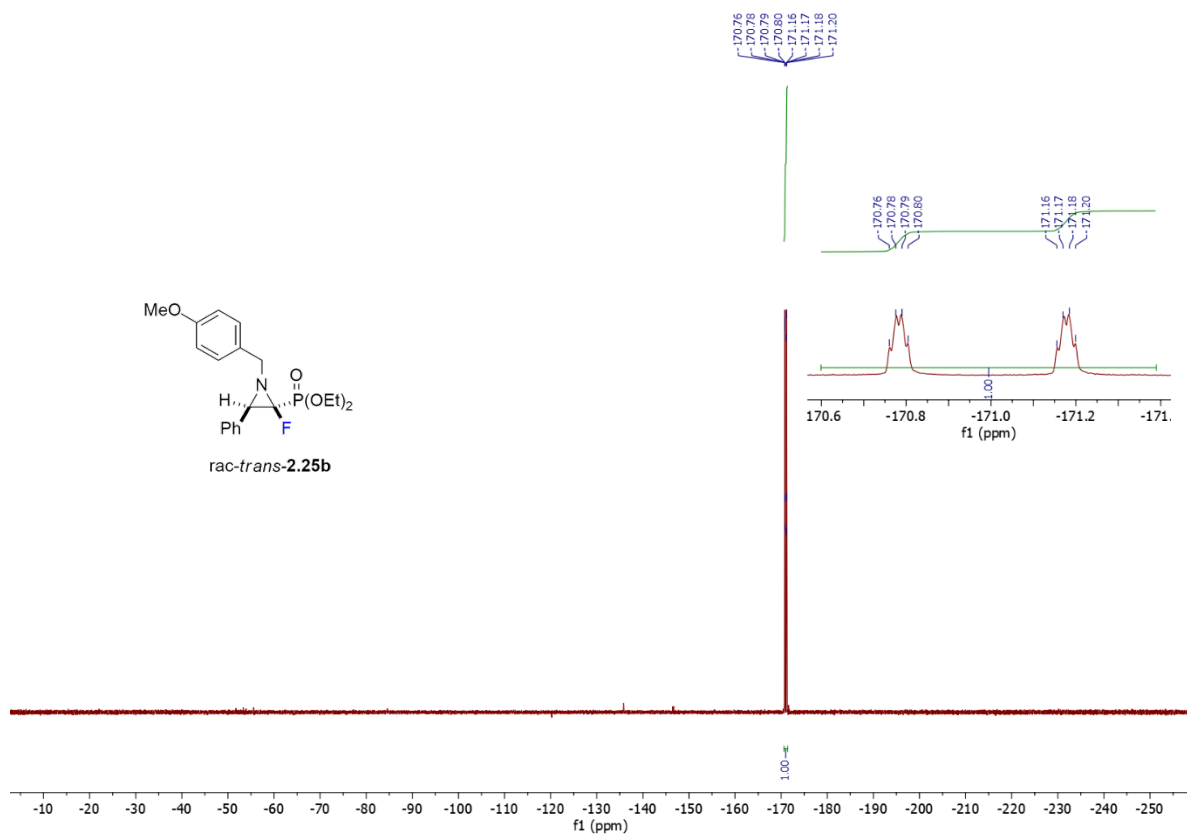
Widmo $^1\text{H}\{^{19}\text{F}\}$ NMR związku *rac-trans*-2.25b.



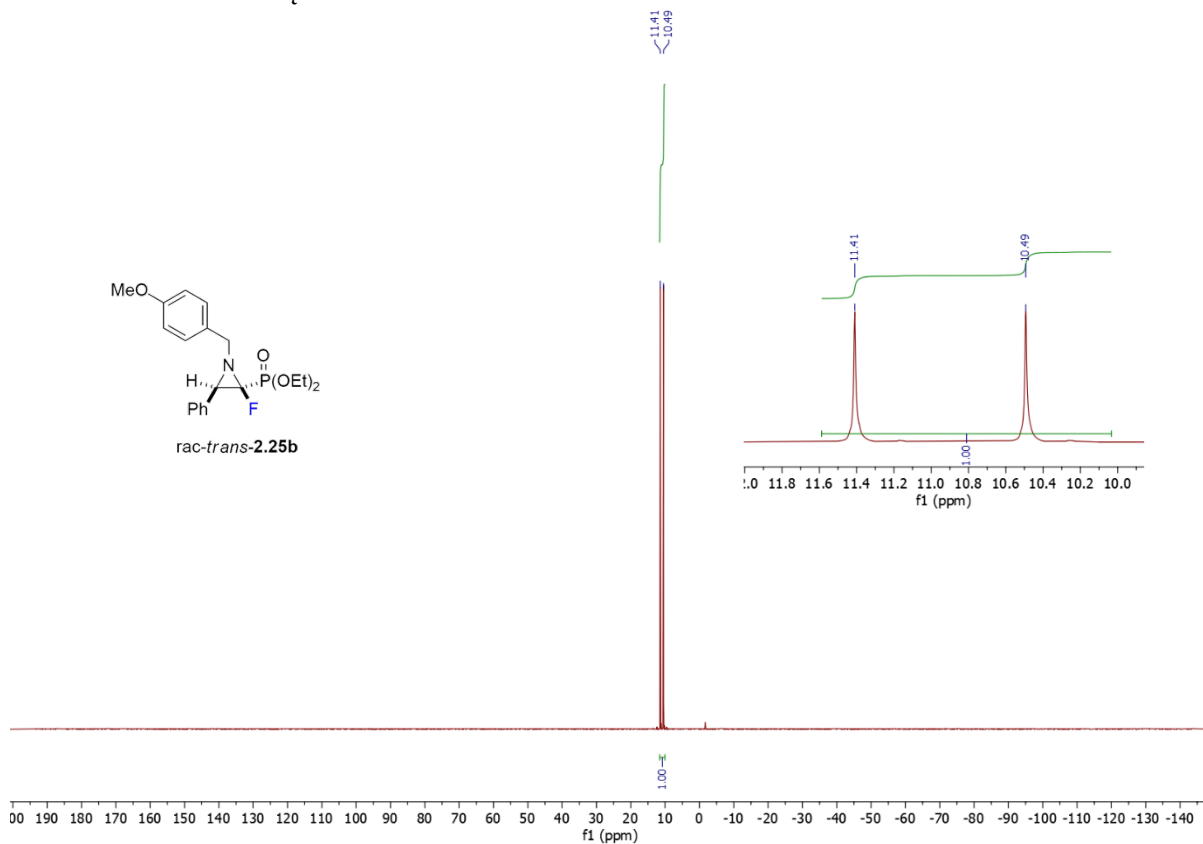
Widmo $^1\text{H}\{^{31}\text{P}\}$ NMR związku *rac-trans*-2.25b.



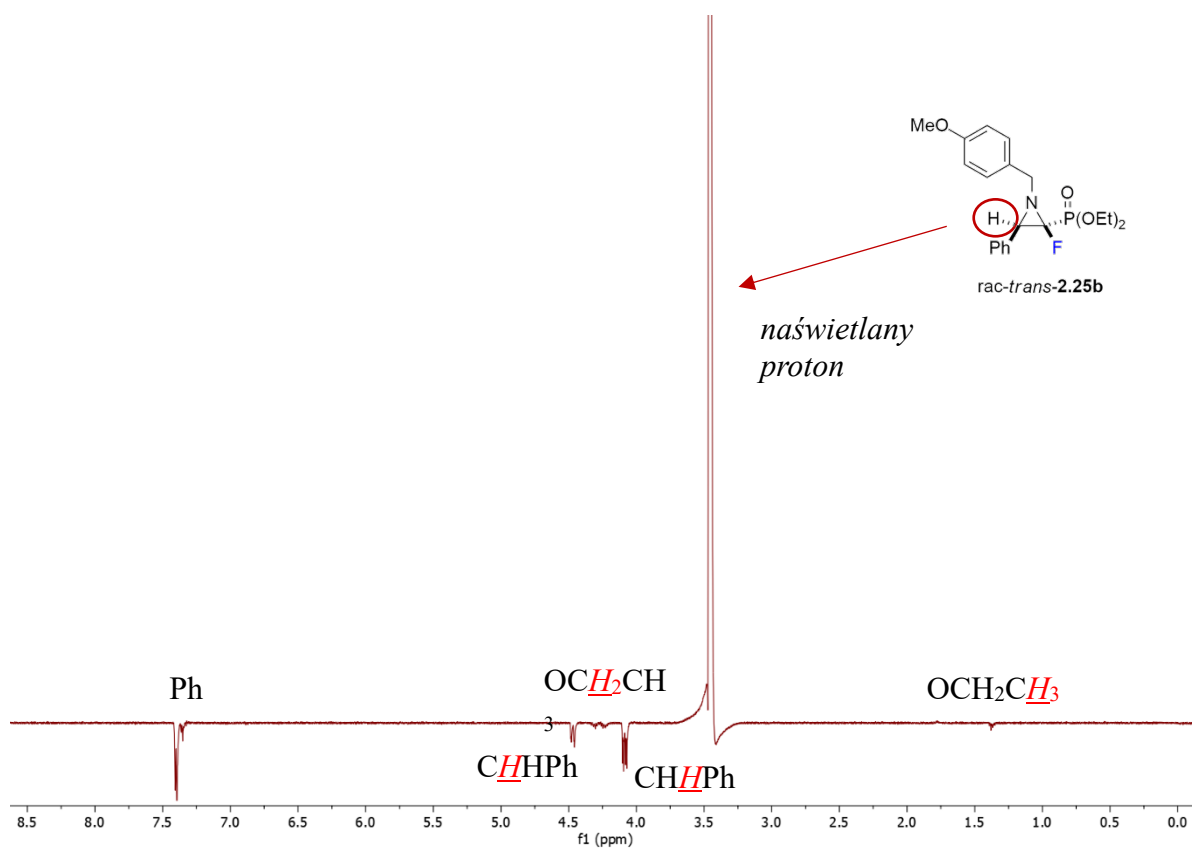
Widmo ^{13}C NMR związku *rac-trans*-2.25b.



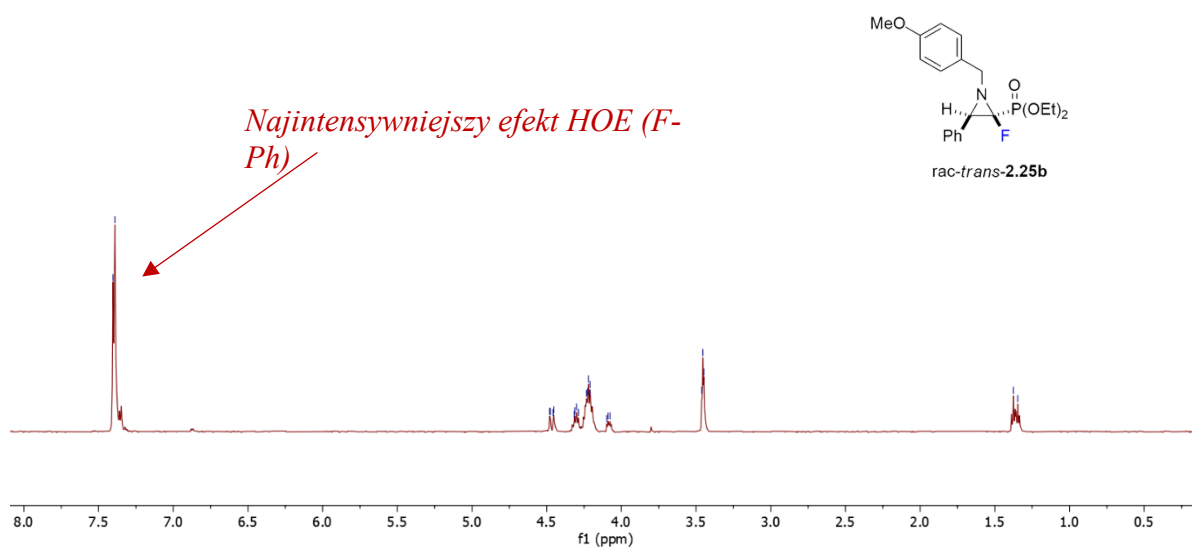
Widmo ^{19}F NMR związku *rac-trans*-2.25b.



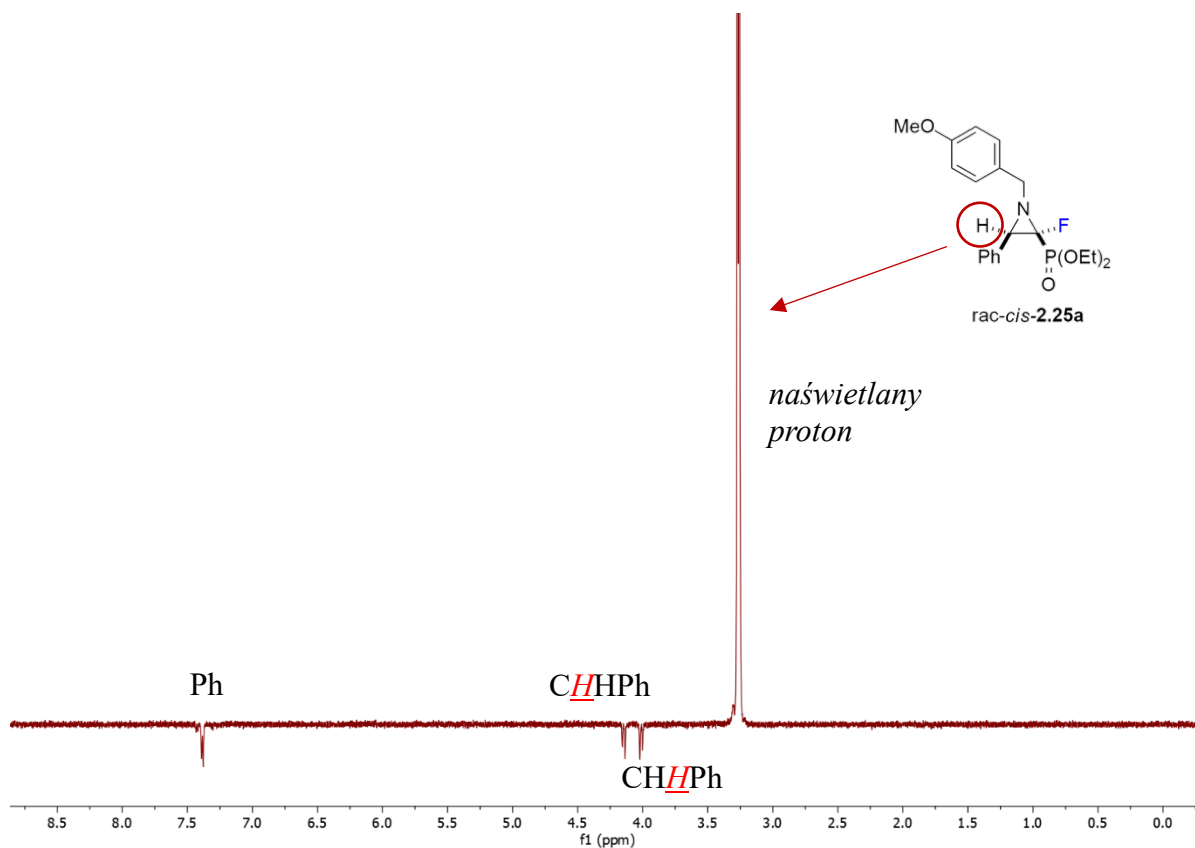
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku *rac-trans*-2.25b.



Widmo 1D ^1H - ^1H NOE NMR związku *rac-trans*-2.25b.



Widmo 1D ^1H - ^{19}F NOE NMR związku *rac-trans*-2.25b.

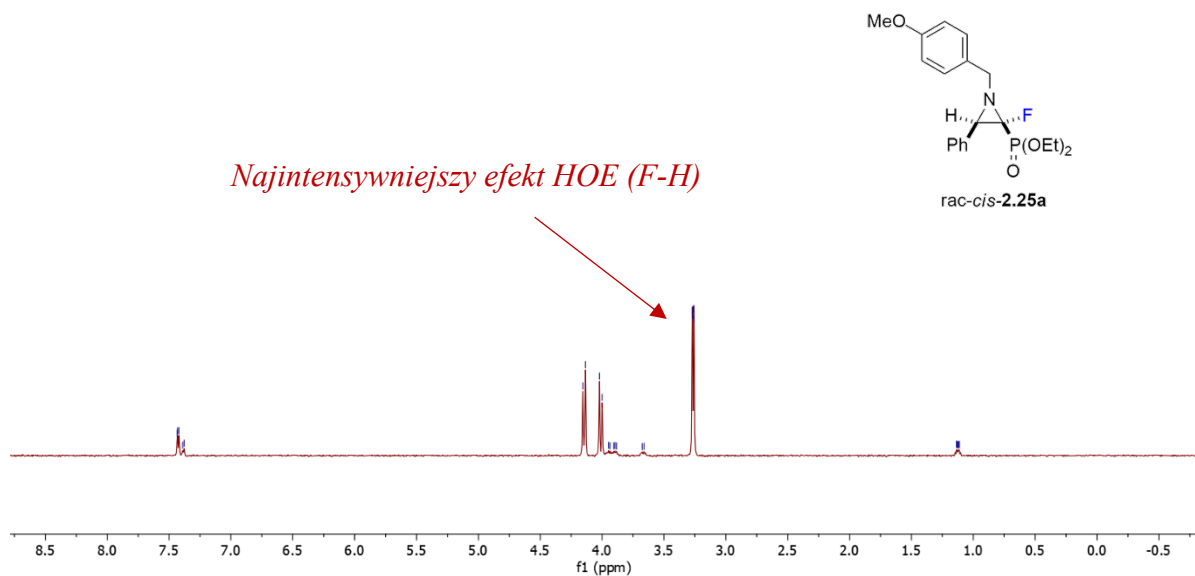


Widmo 1D ^1H - ^1H NOE NMR związku rac-cis-2.25a.

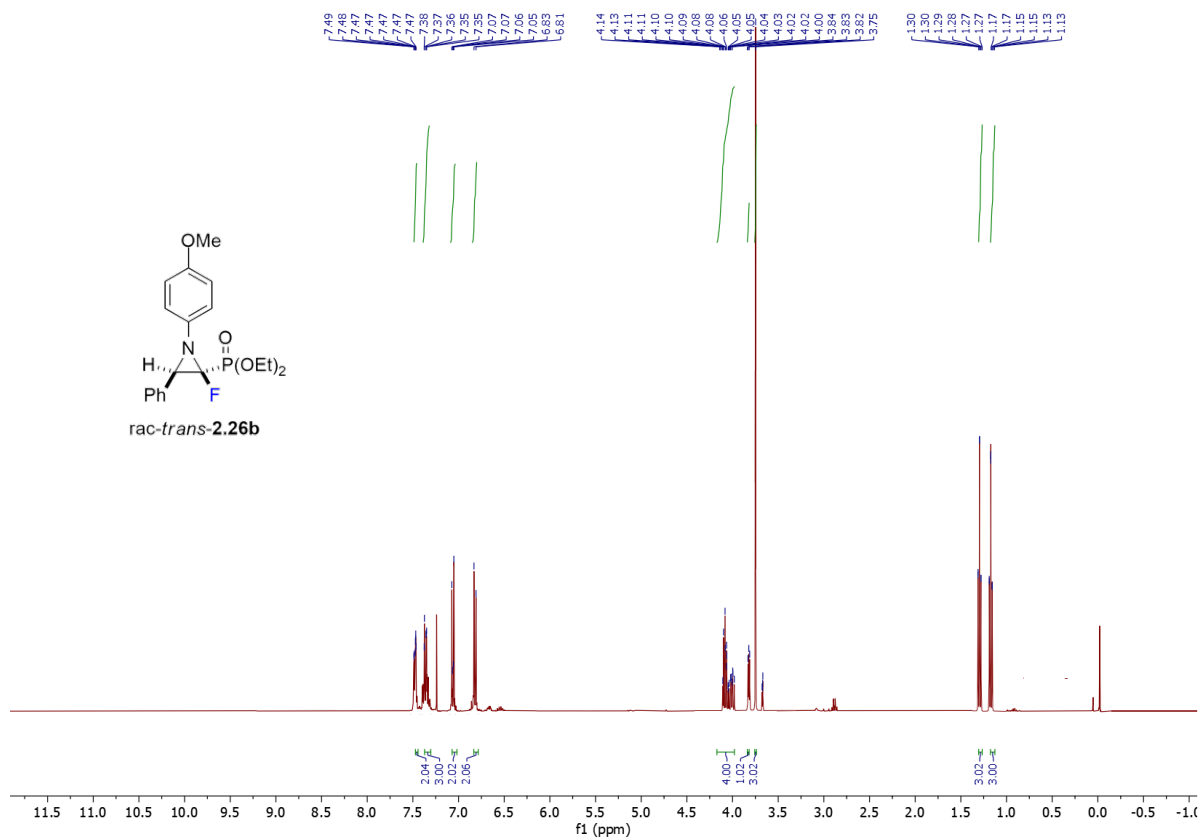
7.44
7.43
7.42
7.39
7.38

4.16
4.13
4.00
3.95
3.94
3.91
3.89
3.88
3.85
3.77
3.72
3.26

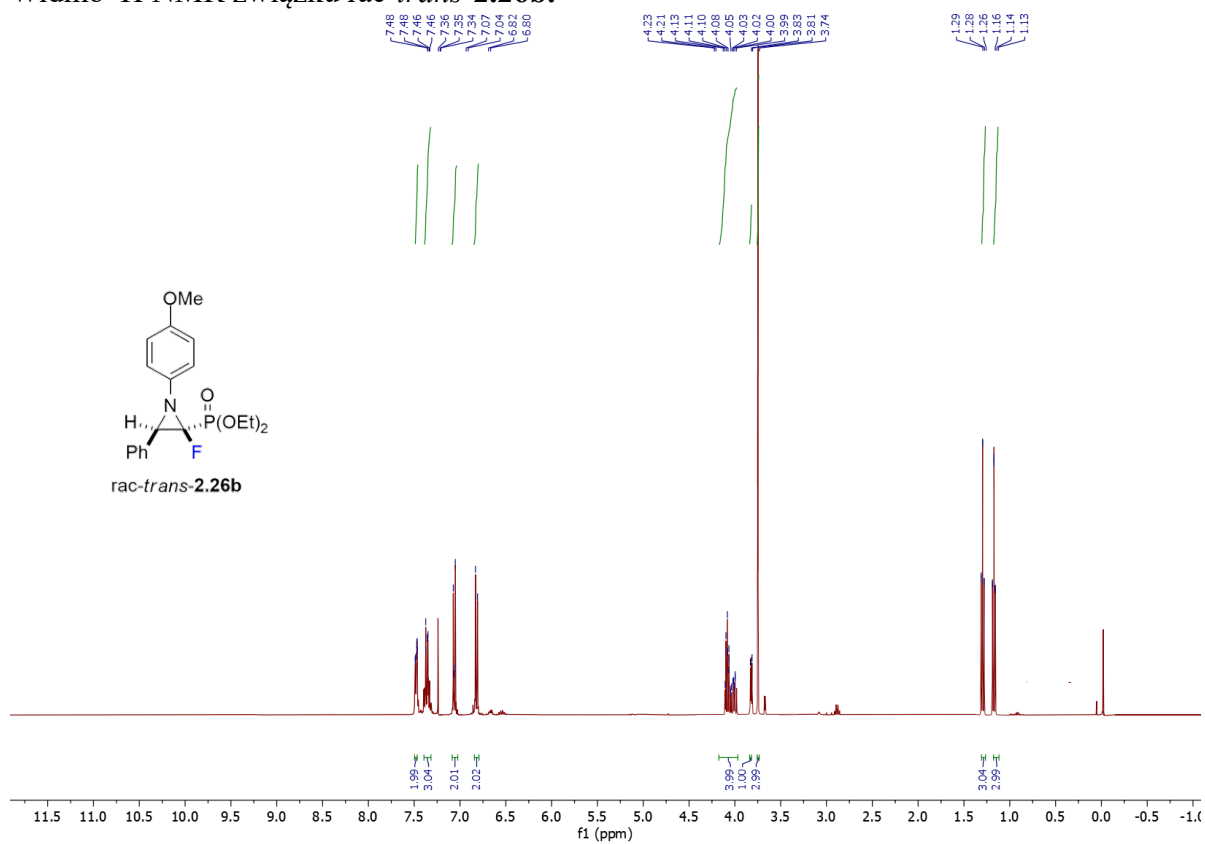
1.14
1.13
1.12
1.12
1.11



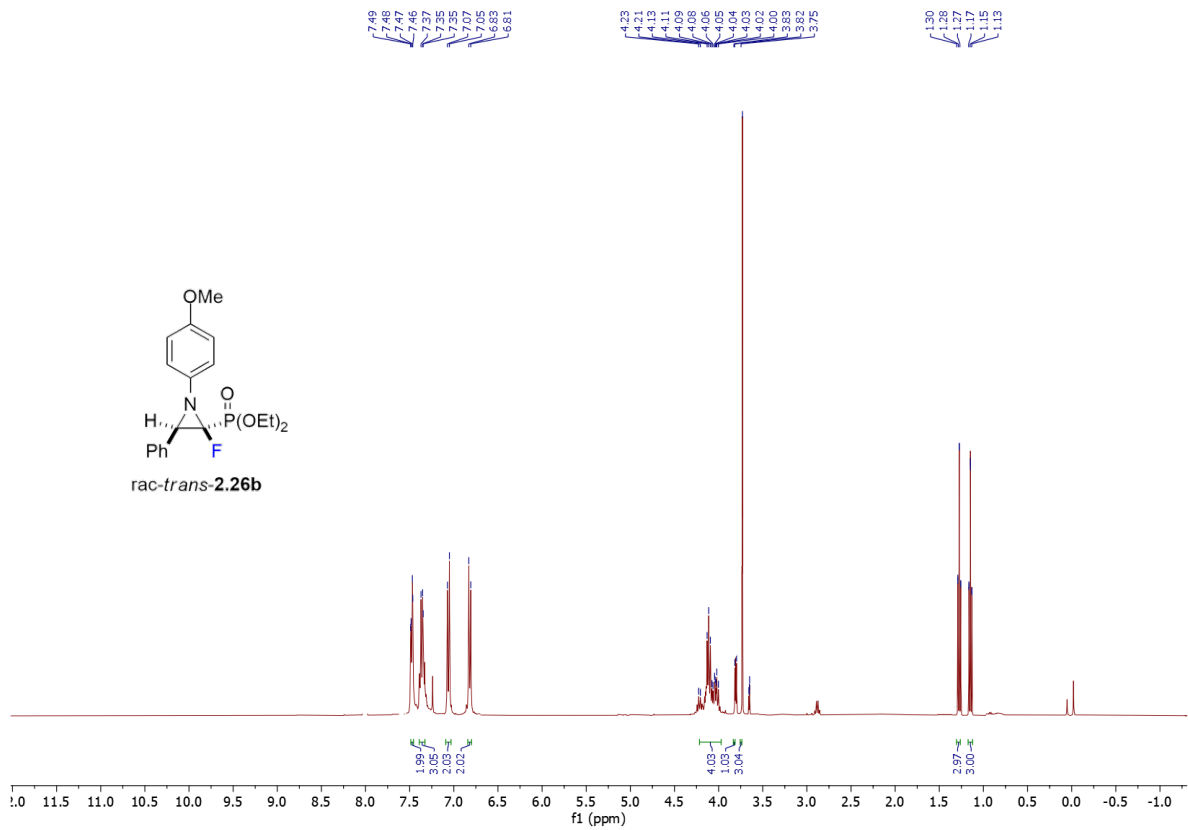
Widmo 1D ^1H - ^{19}F NOE NMR związku rac-cis-2.25a.



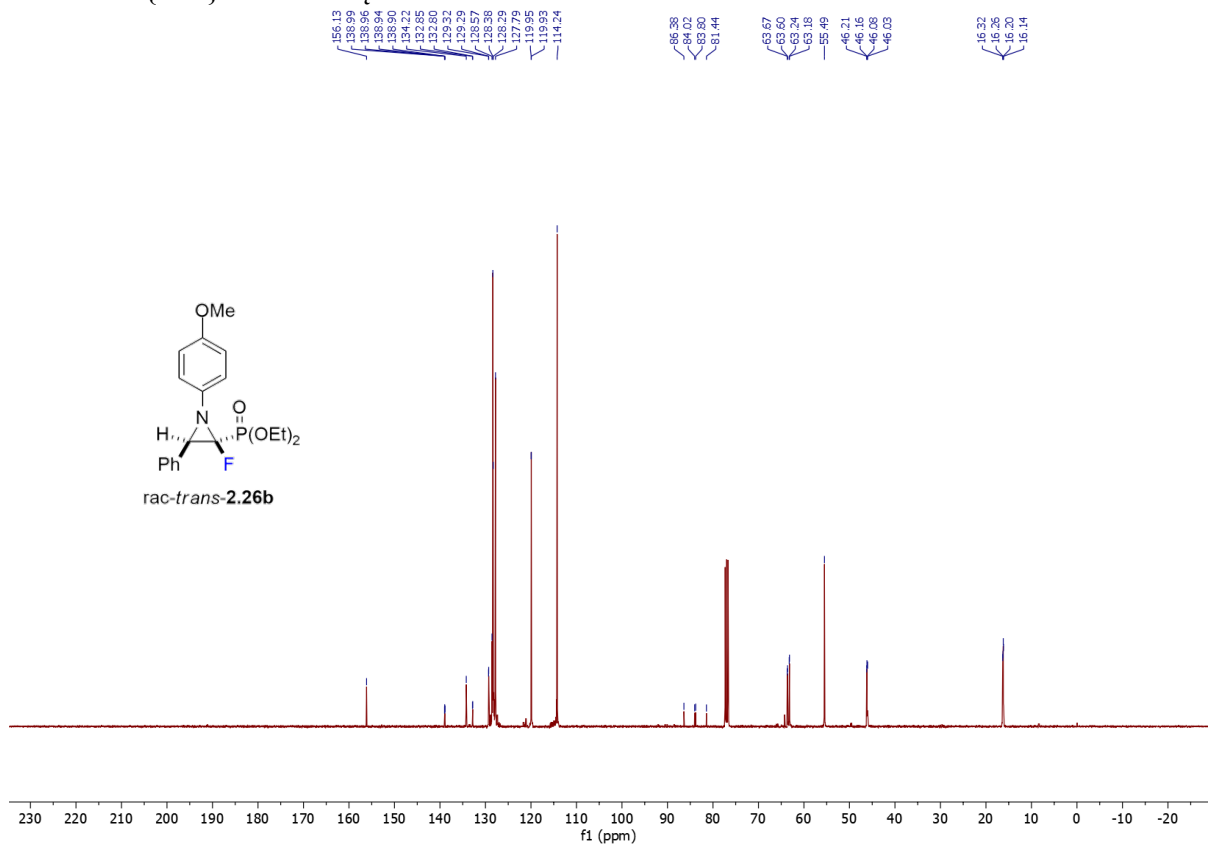
Widmo ^1H NMR związku *rac-trans*-**2.26b**.



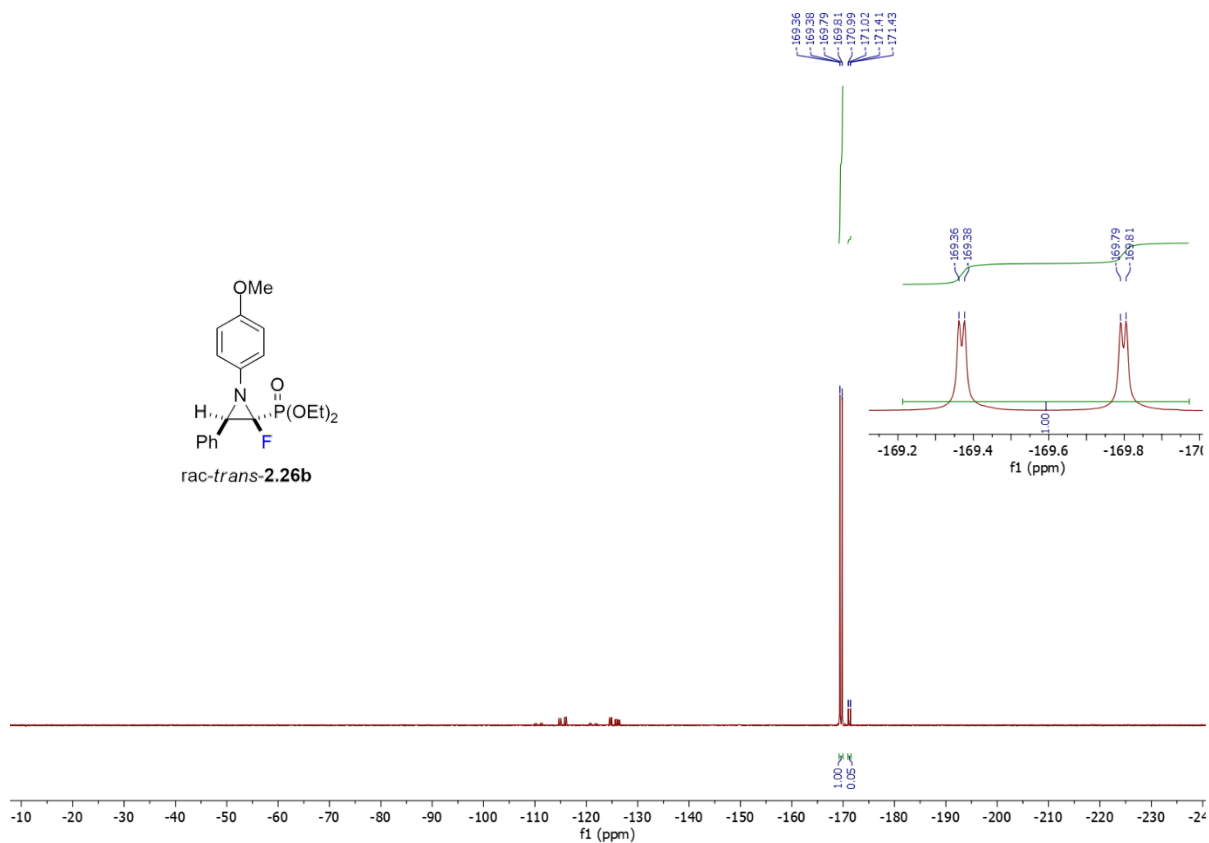
Widmo $^1\text{H}\{^{31}\text{P}\}$ NMR związku *rac-trans*-**2.26b**.



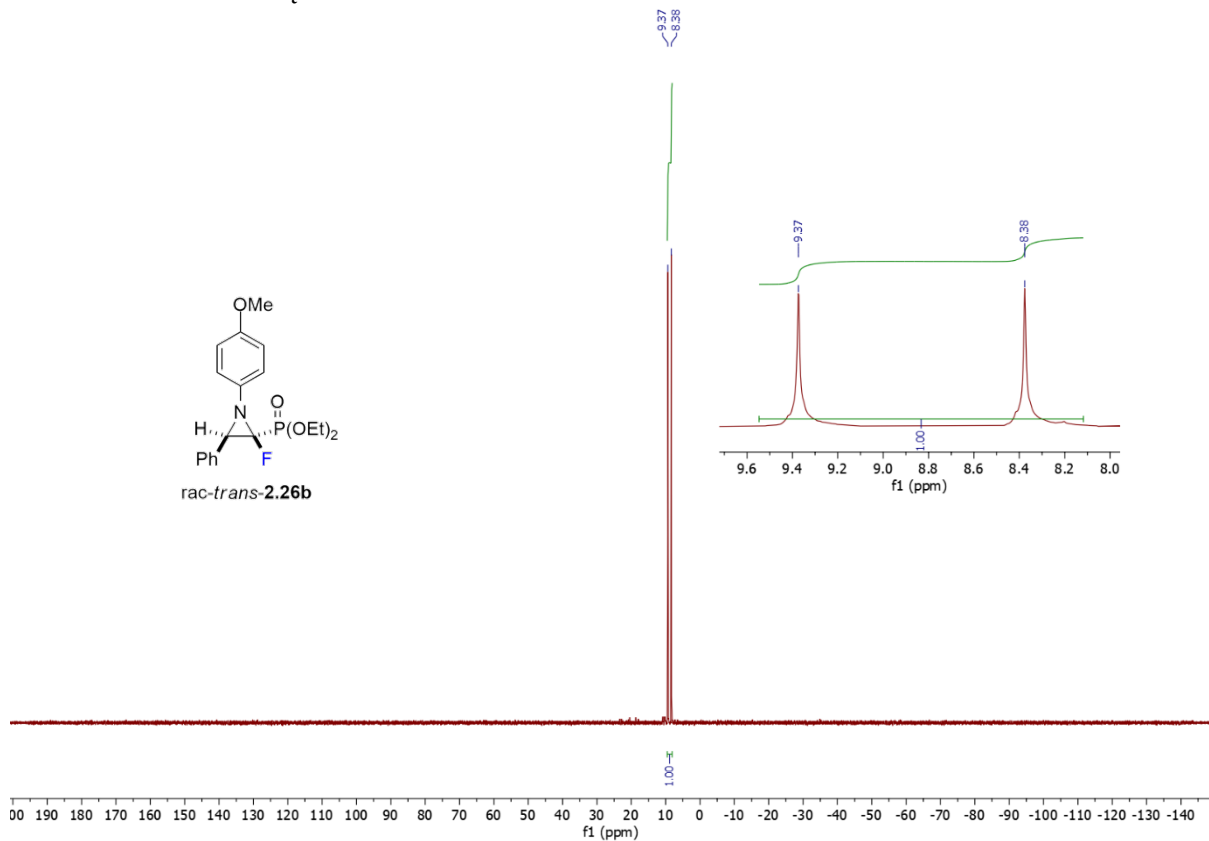
Widmo $^1\text{H}\{^{19}\text{F}\}$ NMR związku *rac-trans*-**2.26b**.



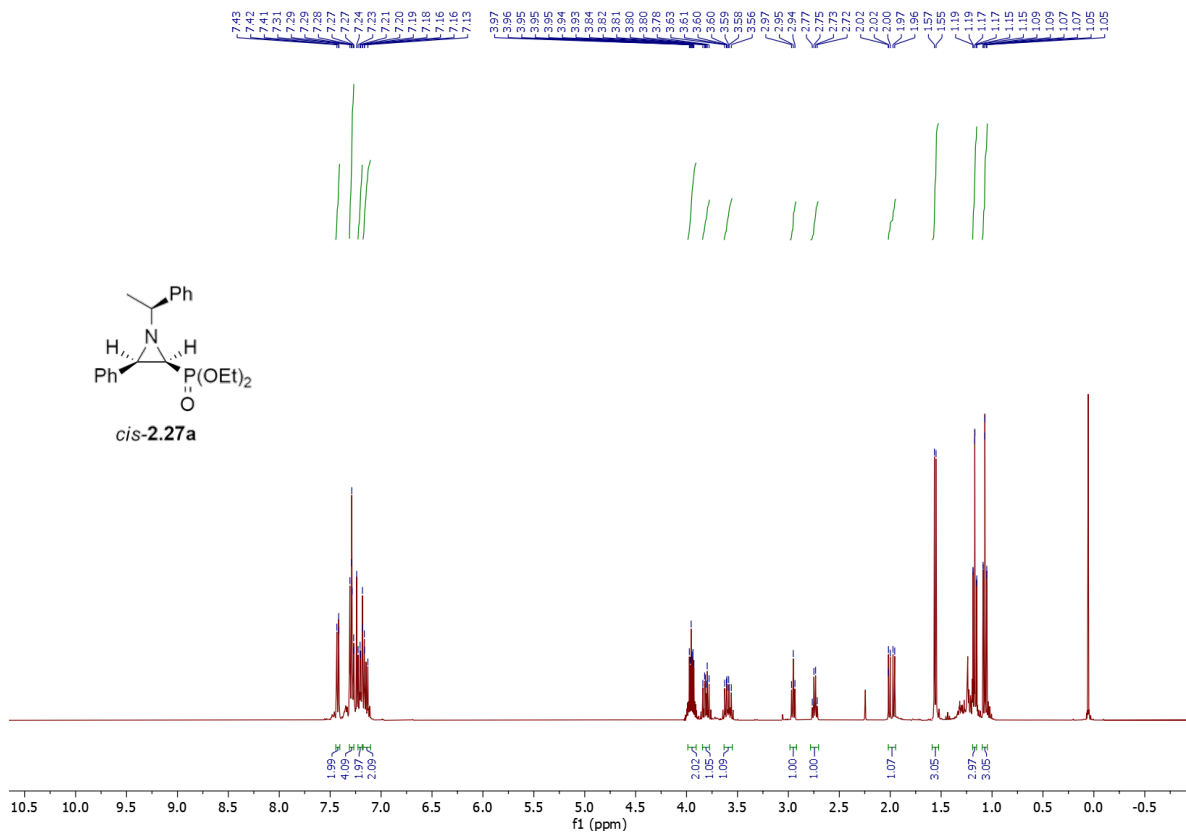
Widmo ^{13}C NMR związku *rac-trans*-**2.26b**.



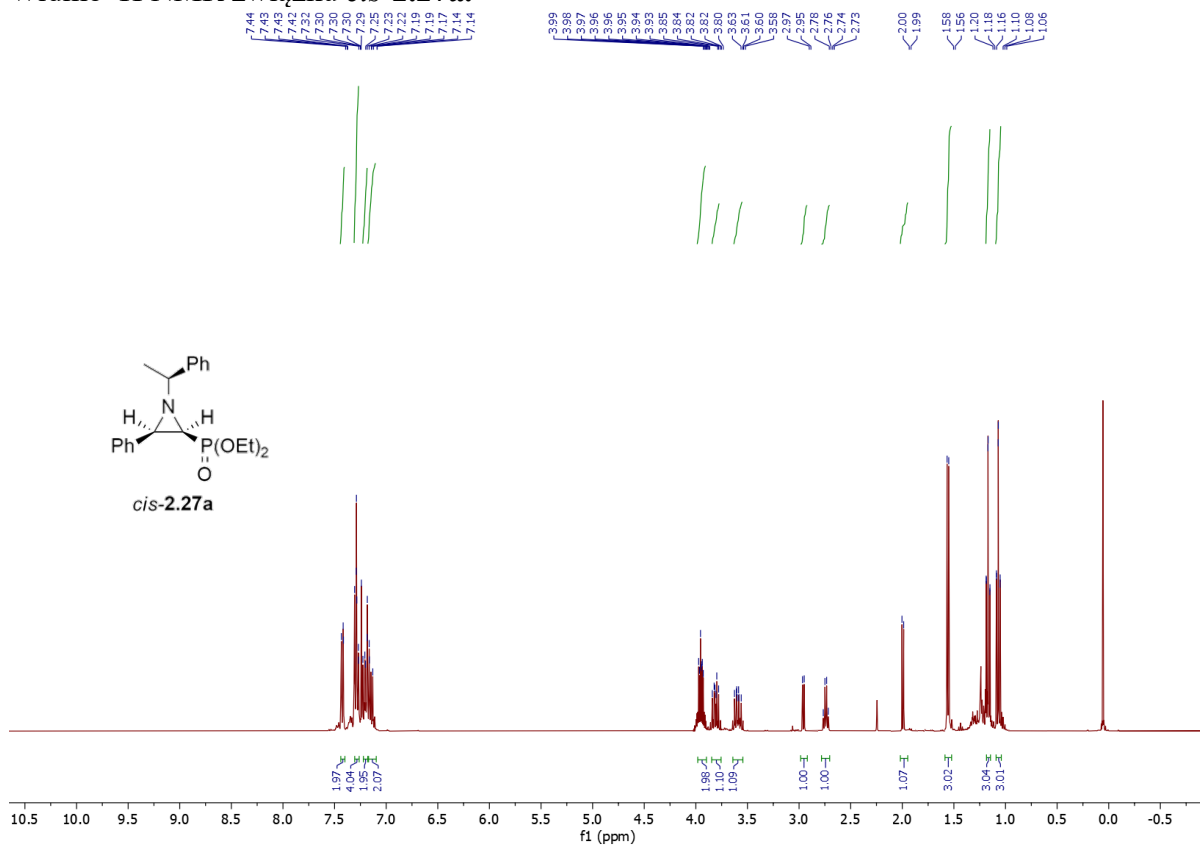
Widmo ^{19}F NMR związku *rac-trans*-**2.26b**.



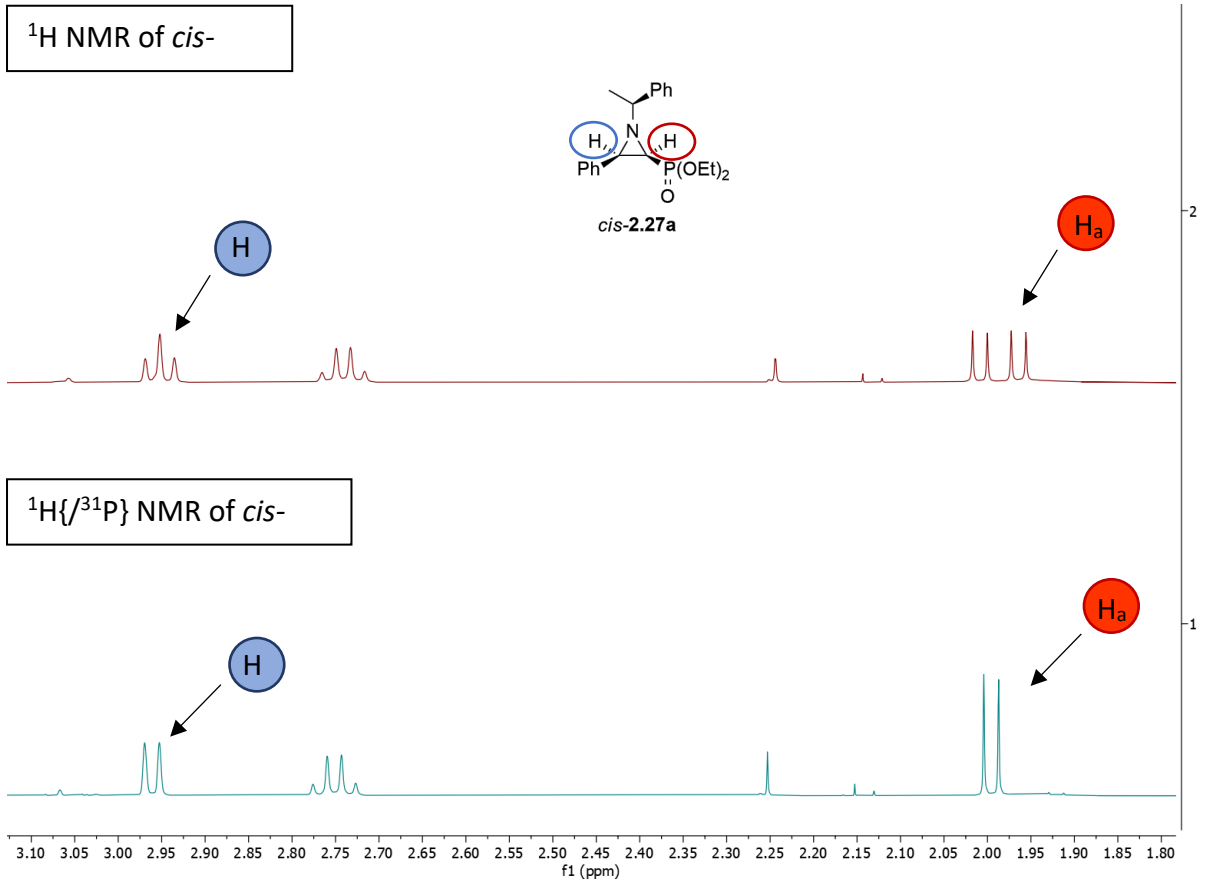
Widmo ^{31}P { ^1H } NMR związku *rac-trans*-**2.26b**.



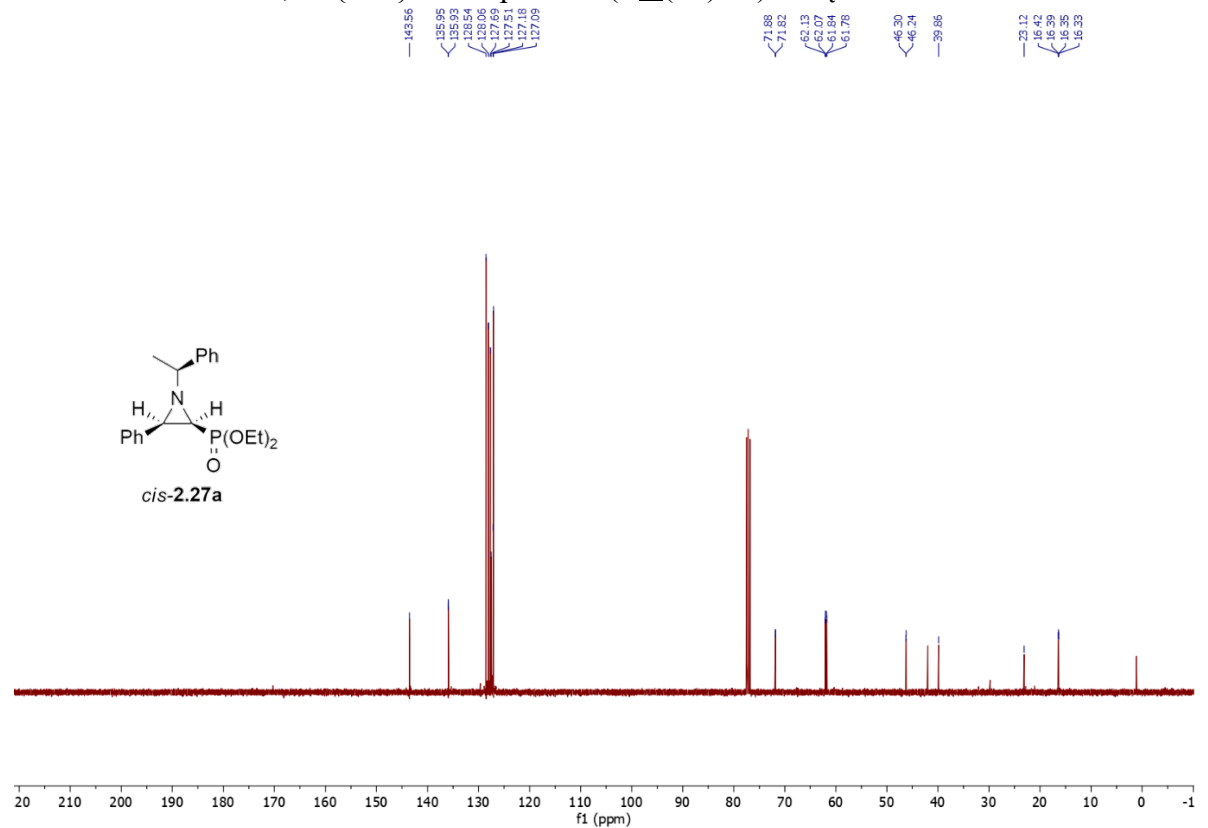
Widmo ^1H NMR związku *cis*-2.27a.



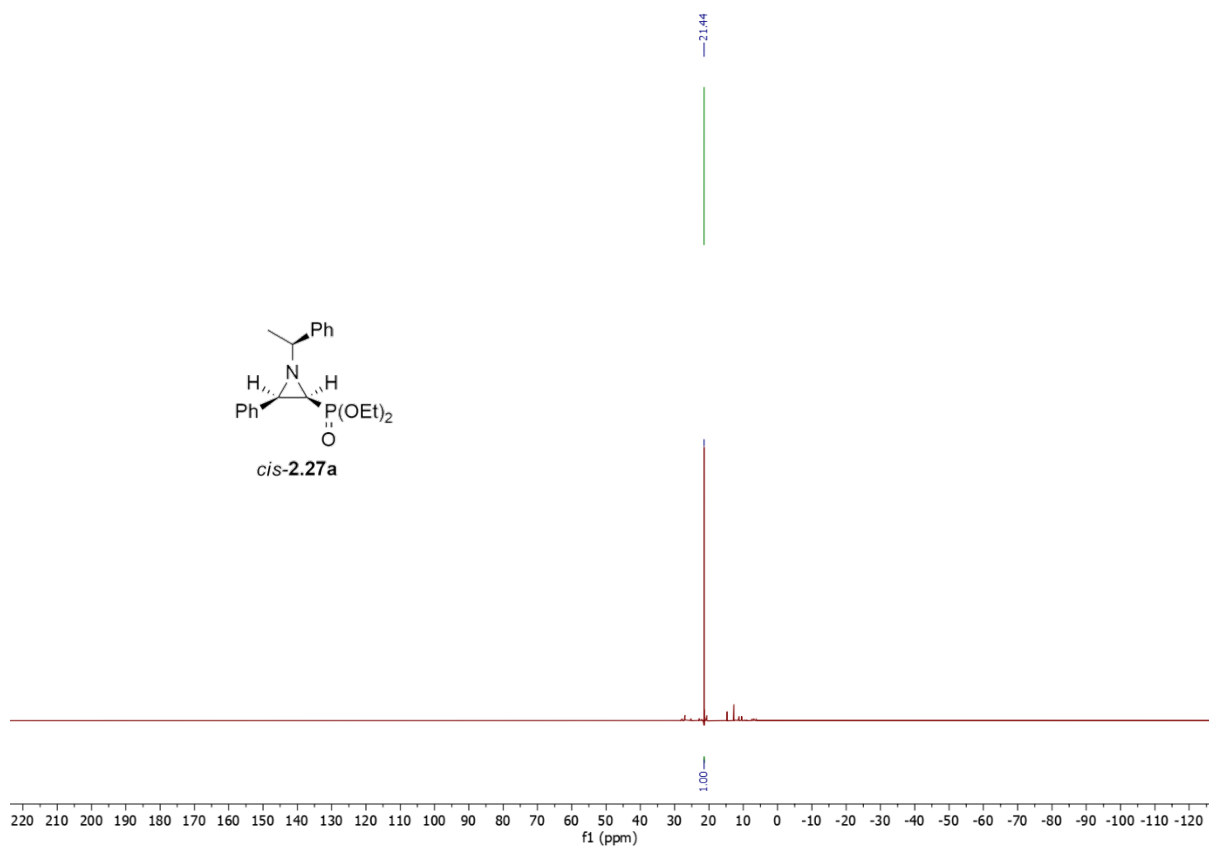
Widmo $^1\text{H}\{^{31}\text{P}\}$ NMR związku *cis*-2.27a.



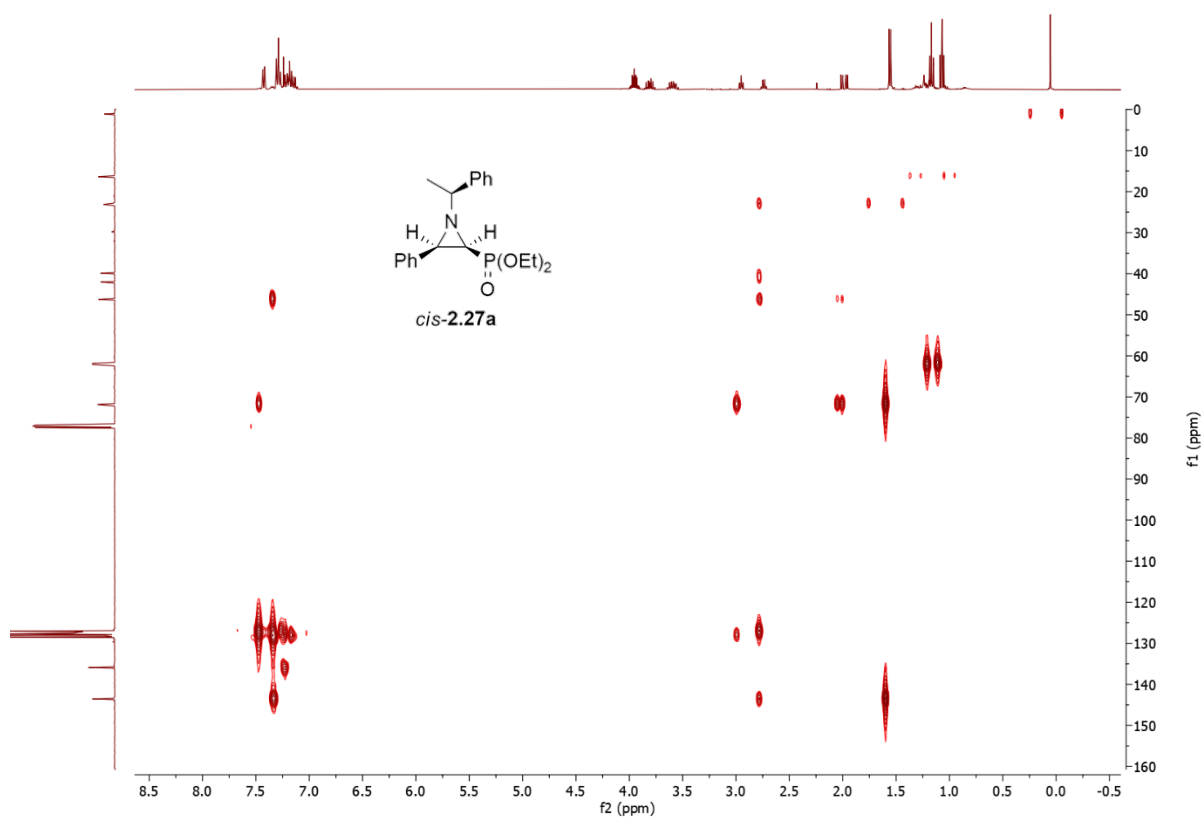
Porównanie widm ^1H , $^1\text{H}\{^{31}\text{P}\}$ NMR protonu ($\text{CH}(\text{Ph})\text{CP}$) związku *cis*-2.27a.



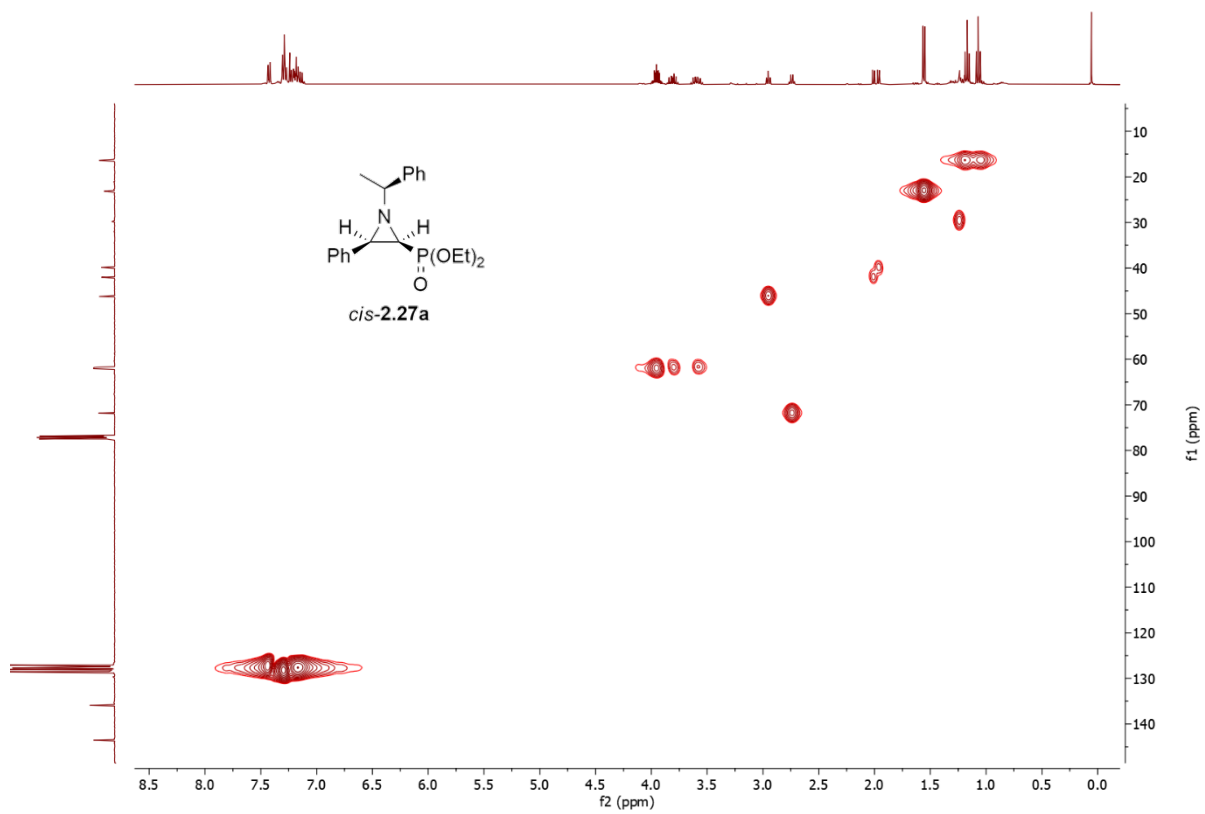
Widmo ^{13}C NMR związku *cis*-2.27a.



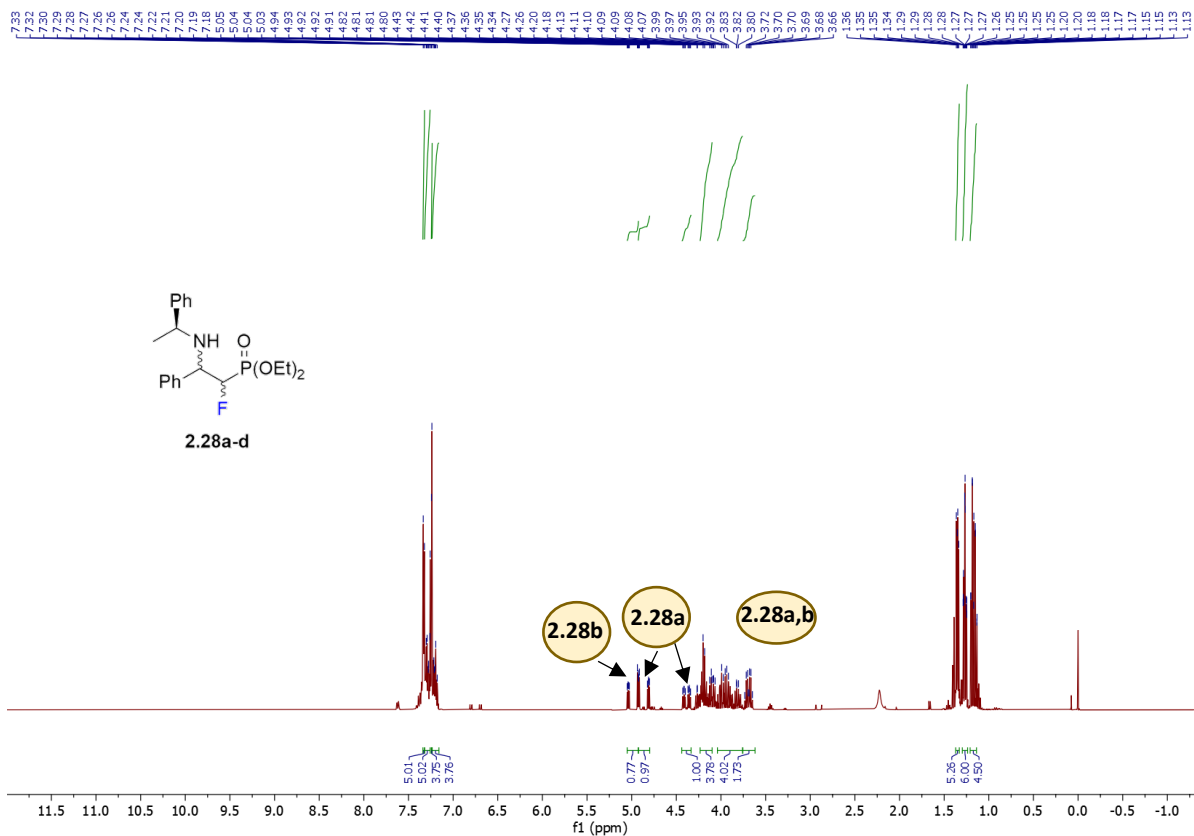
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku *cis*-**2.27a**.



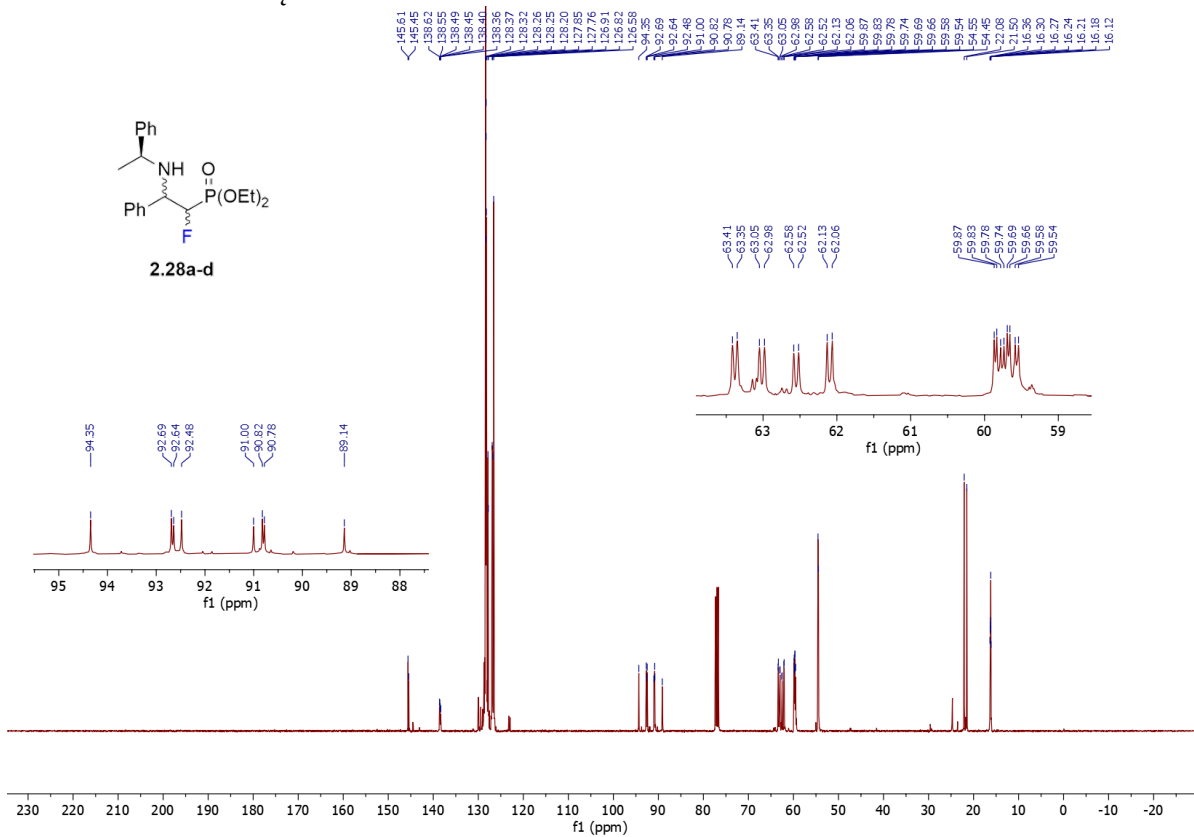
Widmo ^1H - ^{13}C HMBC NMR związku *cis*-**2.27a**.



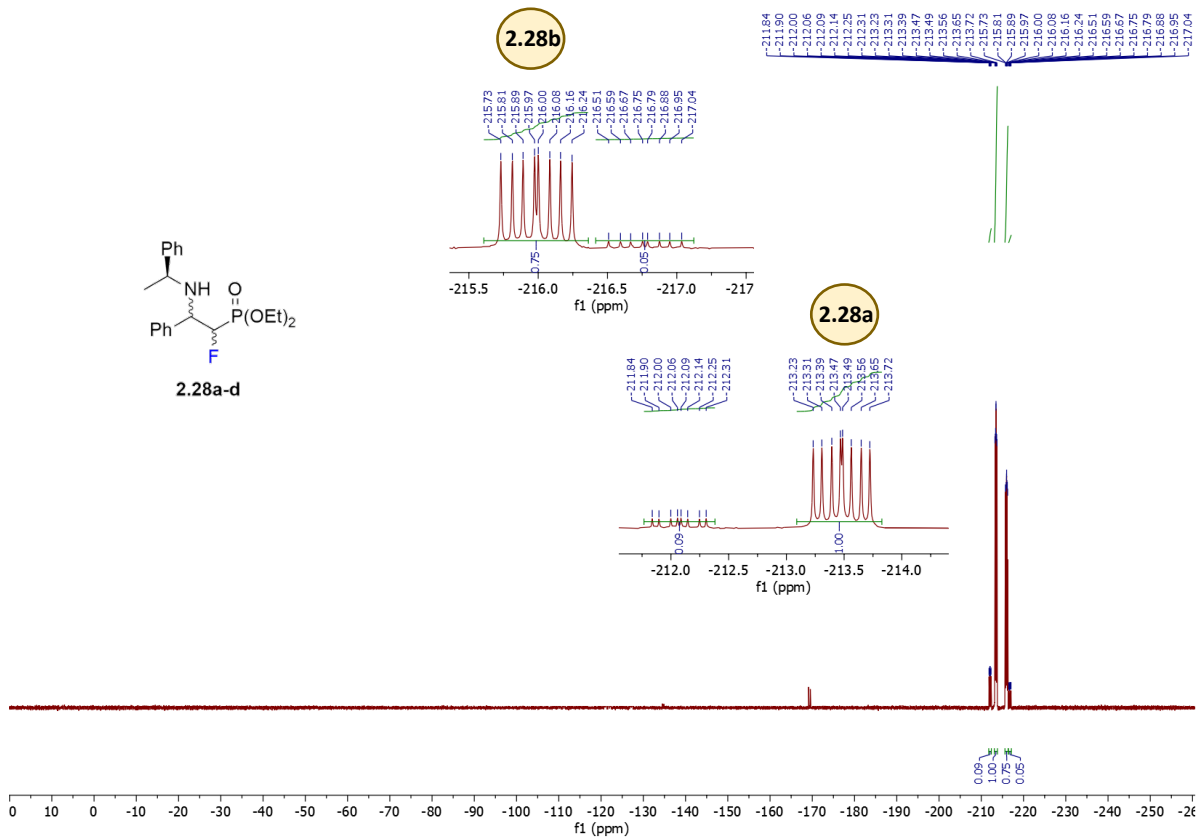
Widmo ^1H - ^{13}C HSQC NMR związku *cis*-**2.27a**.



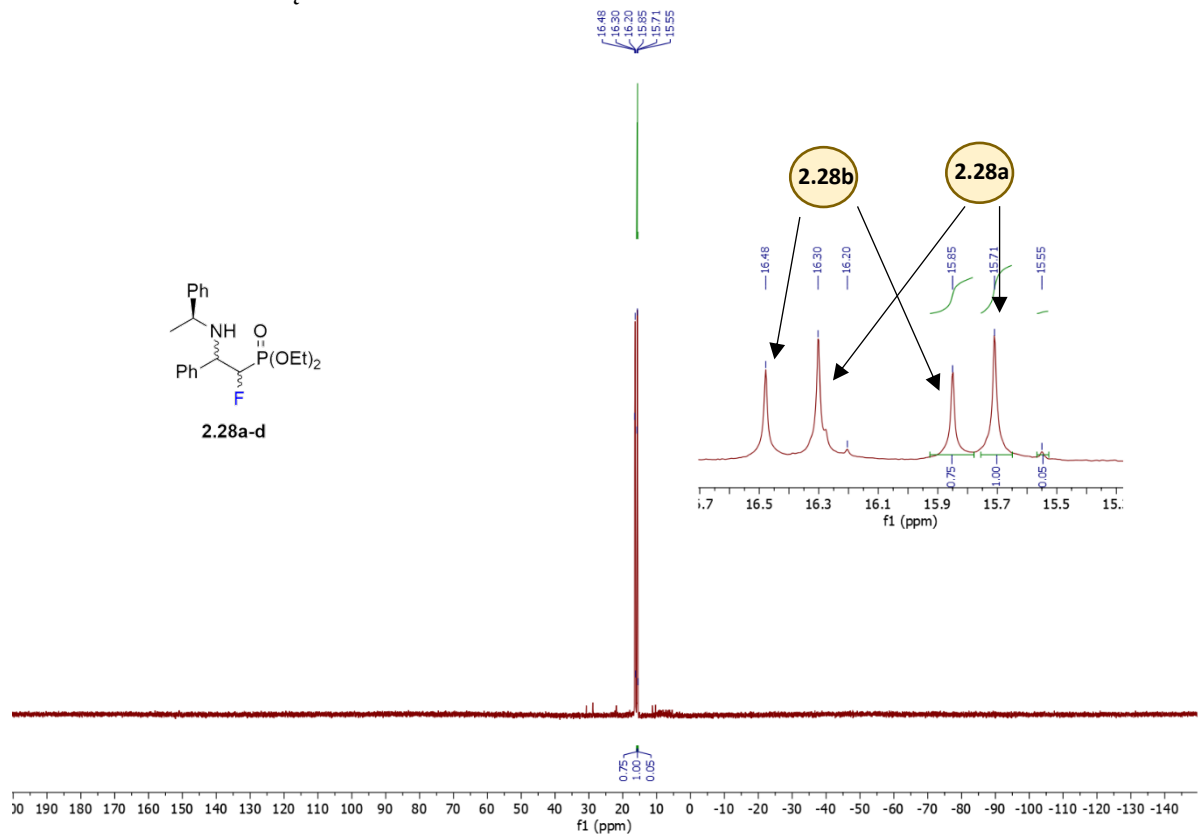
Widmo ¹H NMR związku **2.28a-d** dr 1:0.75:0.09:0.05.



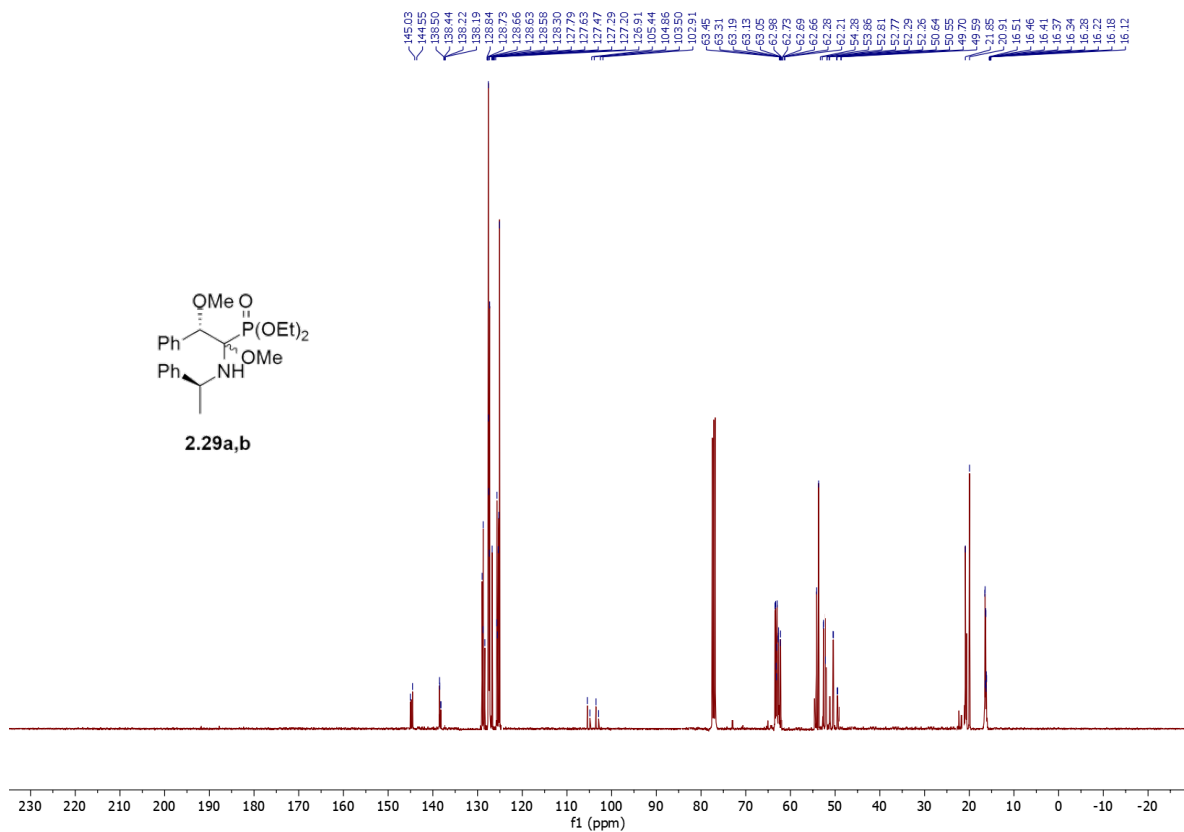
Widmo ¹³C NMR związku **2.28a-d** dr 1:0.75:0.09:0.05.



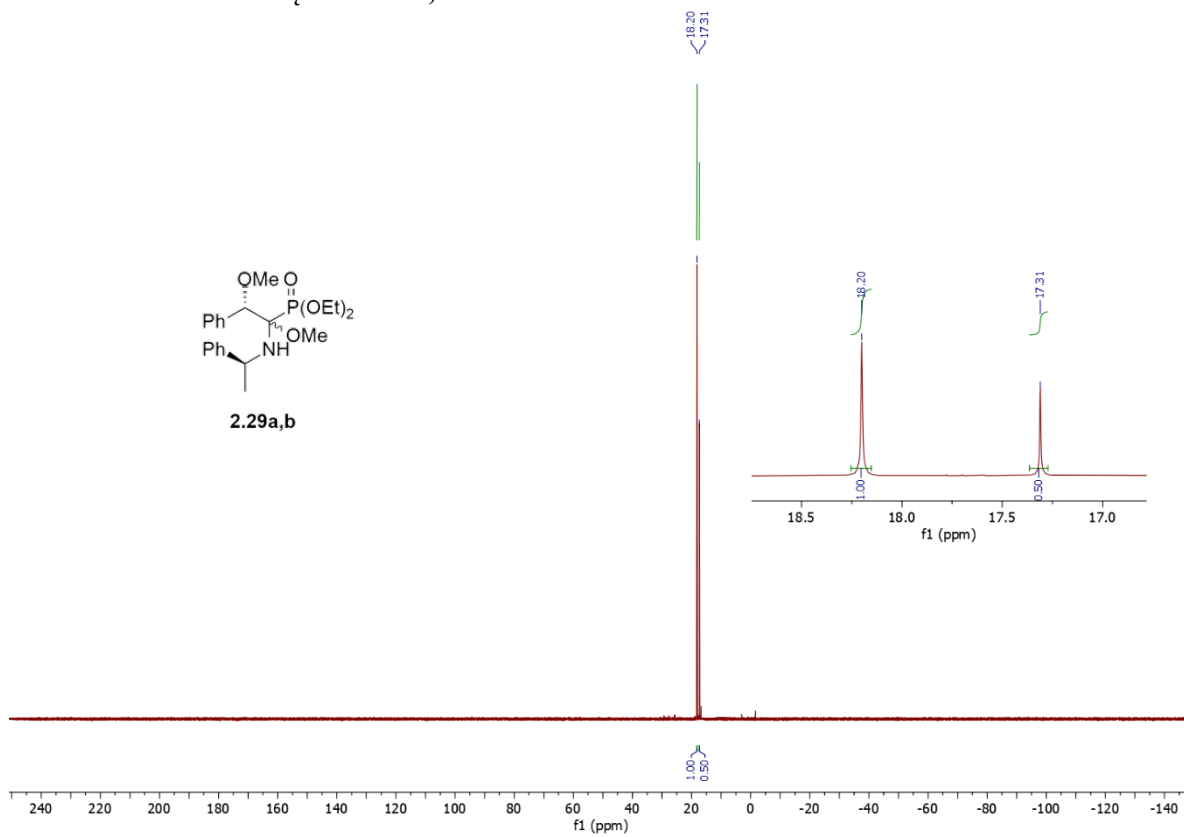
Widmo ^{19}F NMR związku **2.28a-d** dr 1:0.75:0.09:0.05.



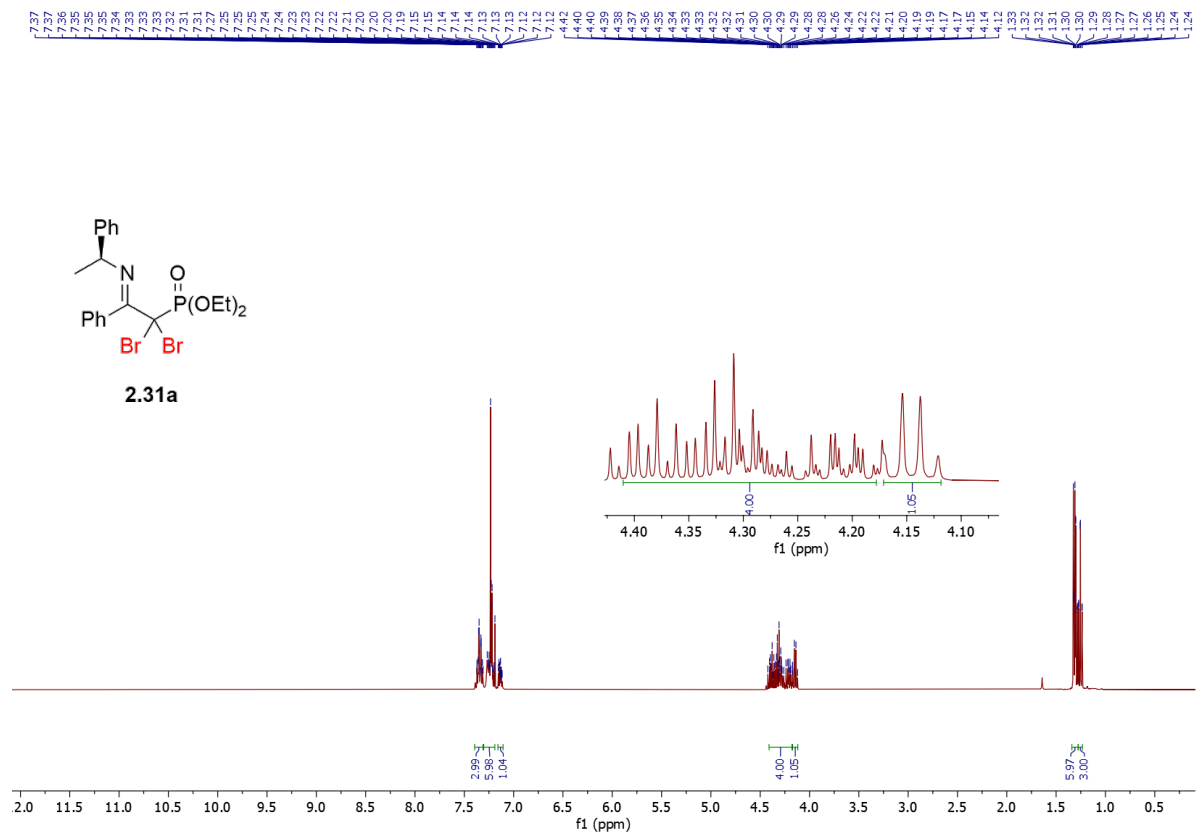
Widmo ^{31}P NMR związku **2.28a-d** dr 1:0.75:0.09:0.05.



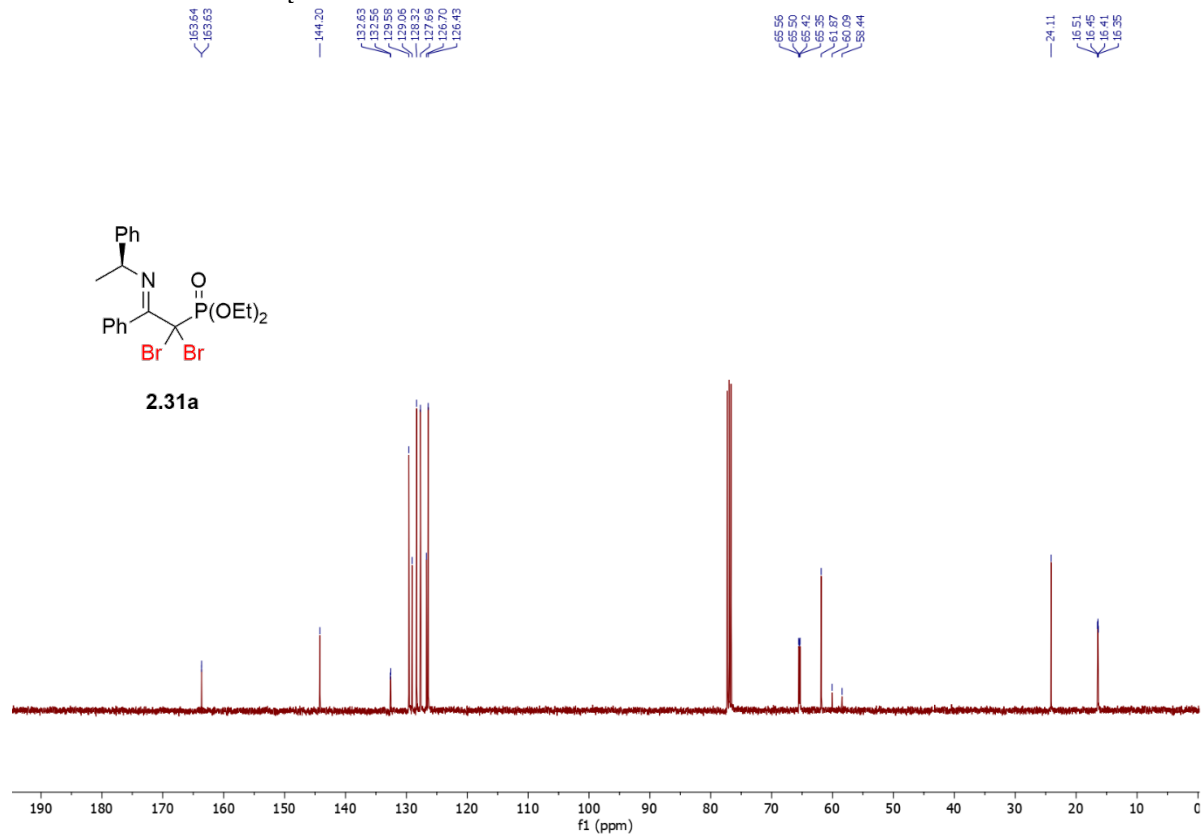
Widmo ^{13}C NMR związku **2.29a,b** *dr* 1:0.5.



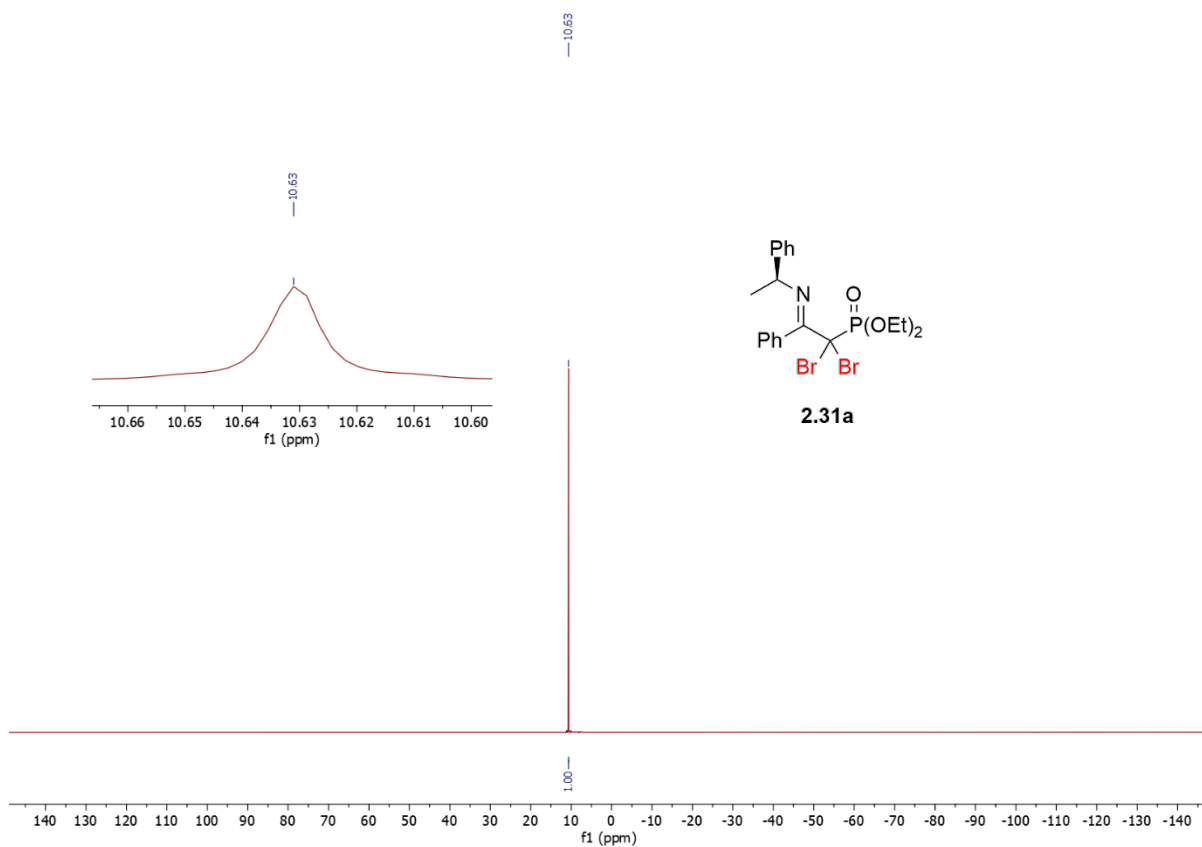
Widmo ^{31}P $\{^1\text{H}\}$ NMR związku **2.29a,b** *dr* 1:0.5.



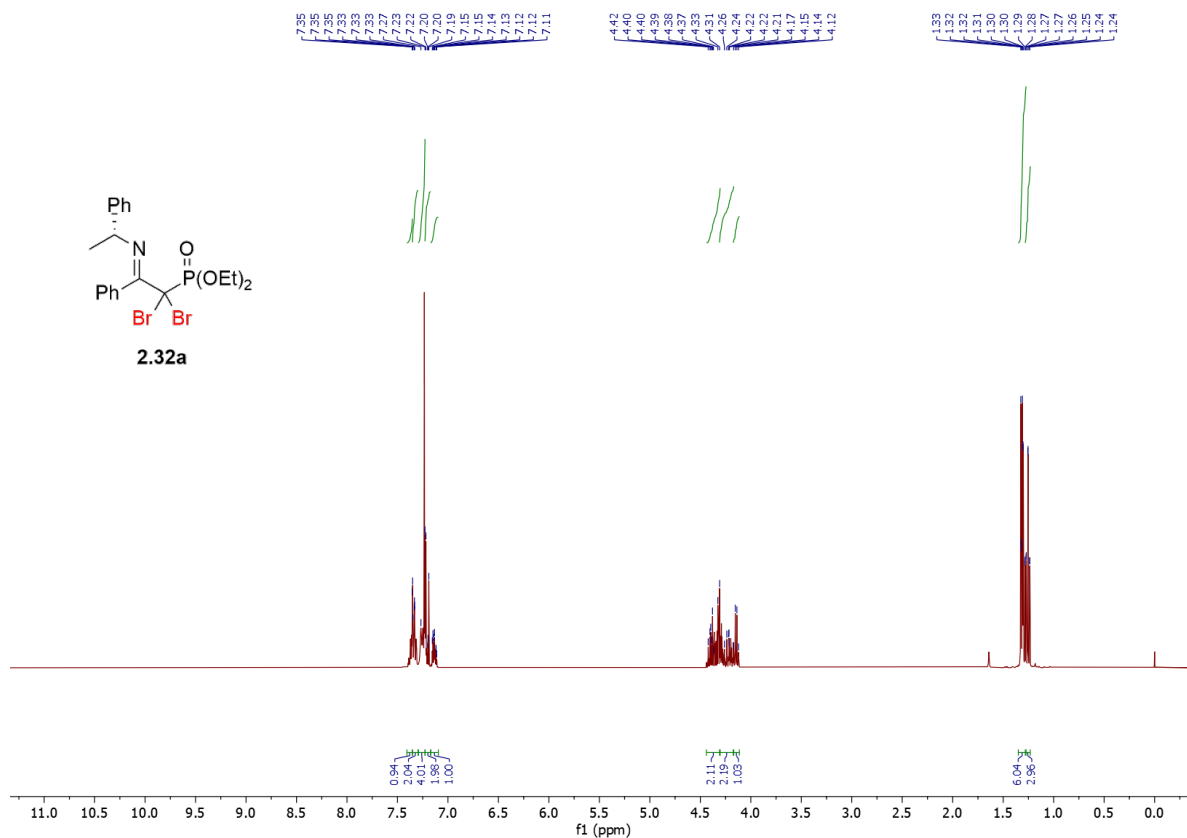
Widmo ^1H NMR związku **2.31a**.



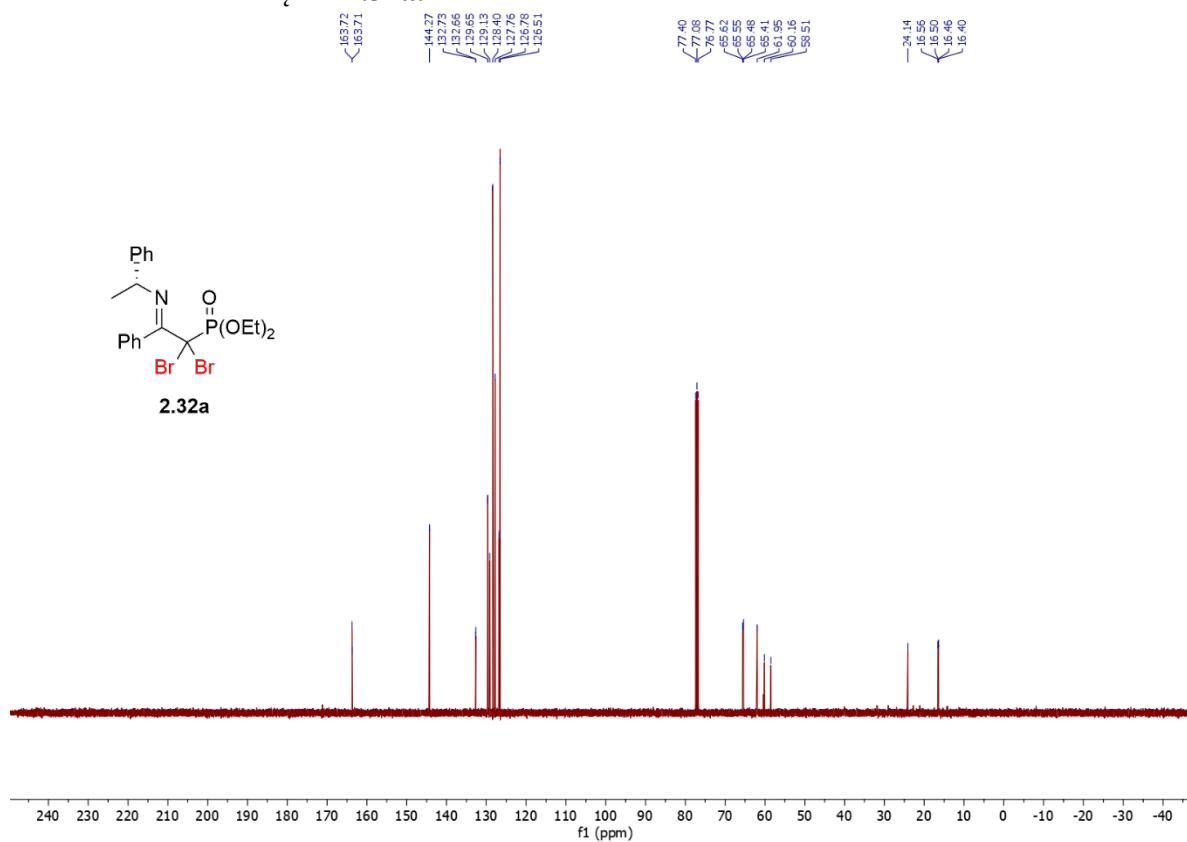
Widmo ^{13}C NMR związku **2.31a**.



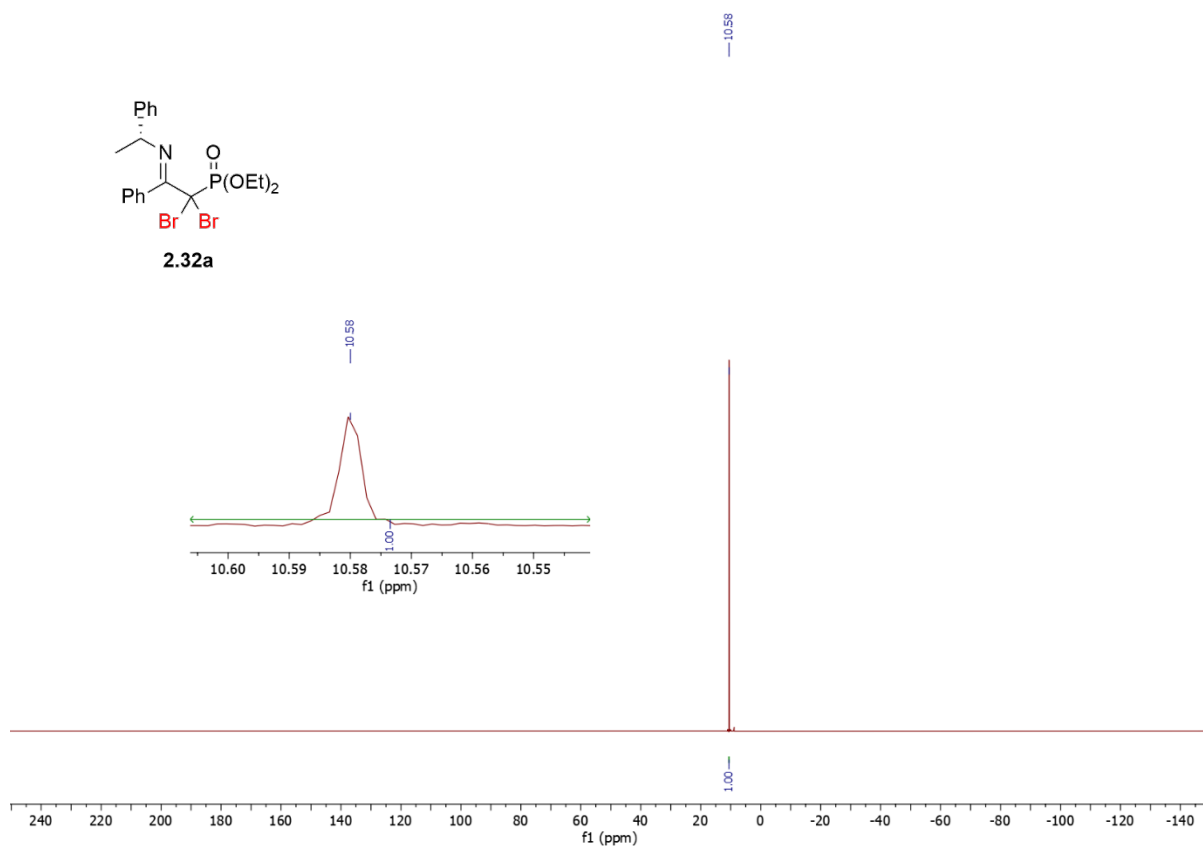
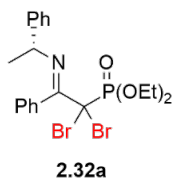
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.31a**.



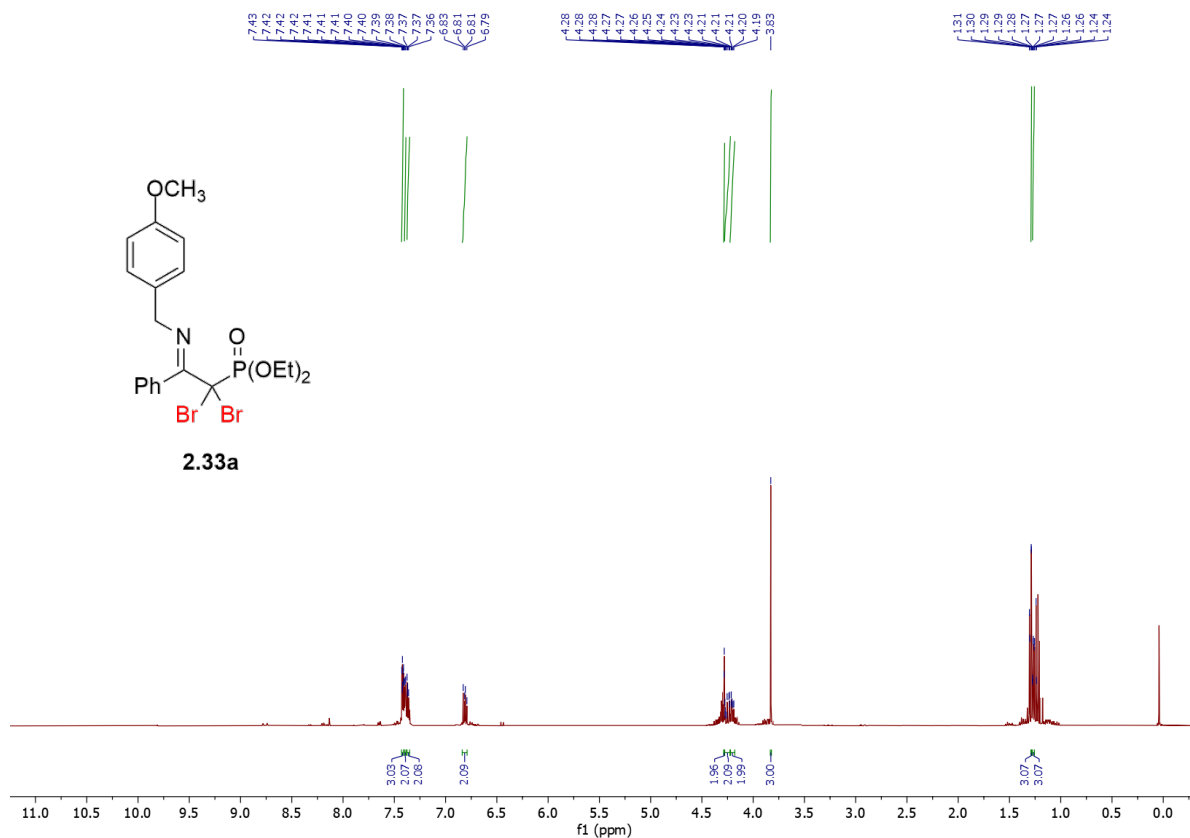
Widmo ^1H NMR związku **2.32a**.



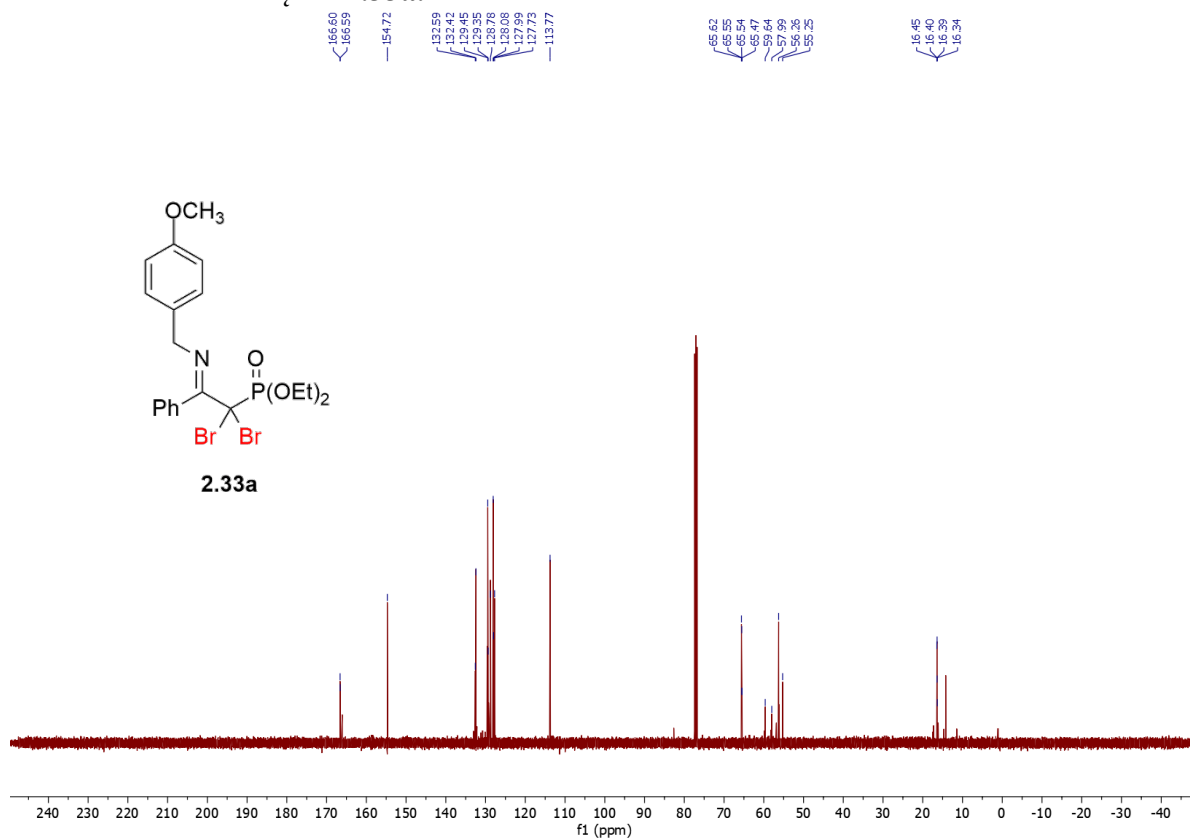
Widmo ^{13}C NMR związku **2.32a**.



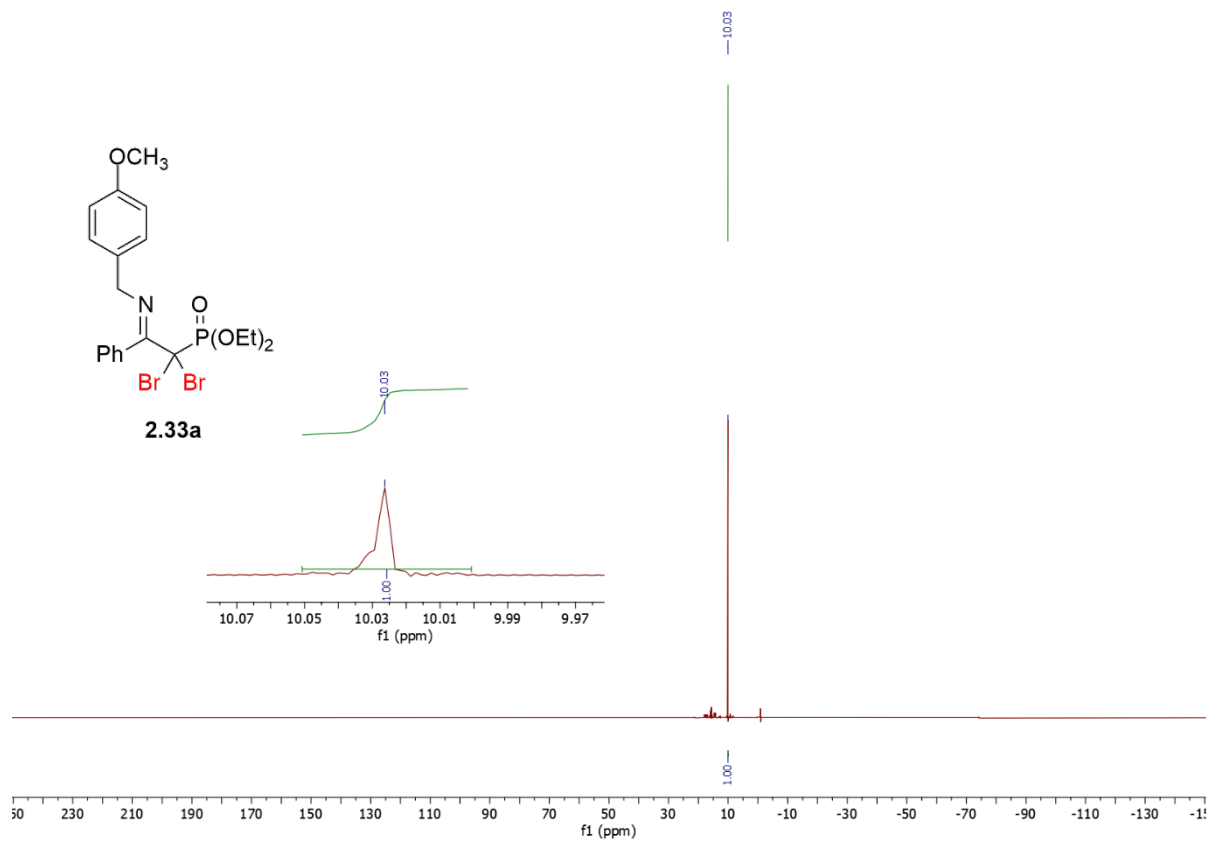
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.32a**.



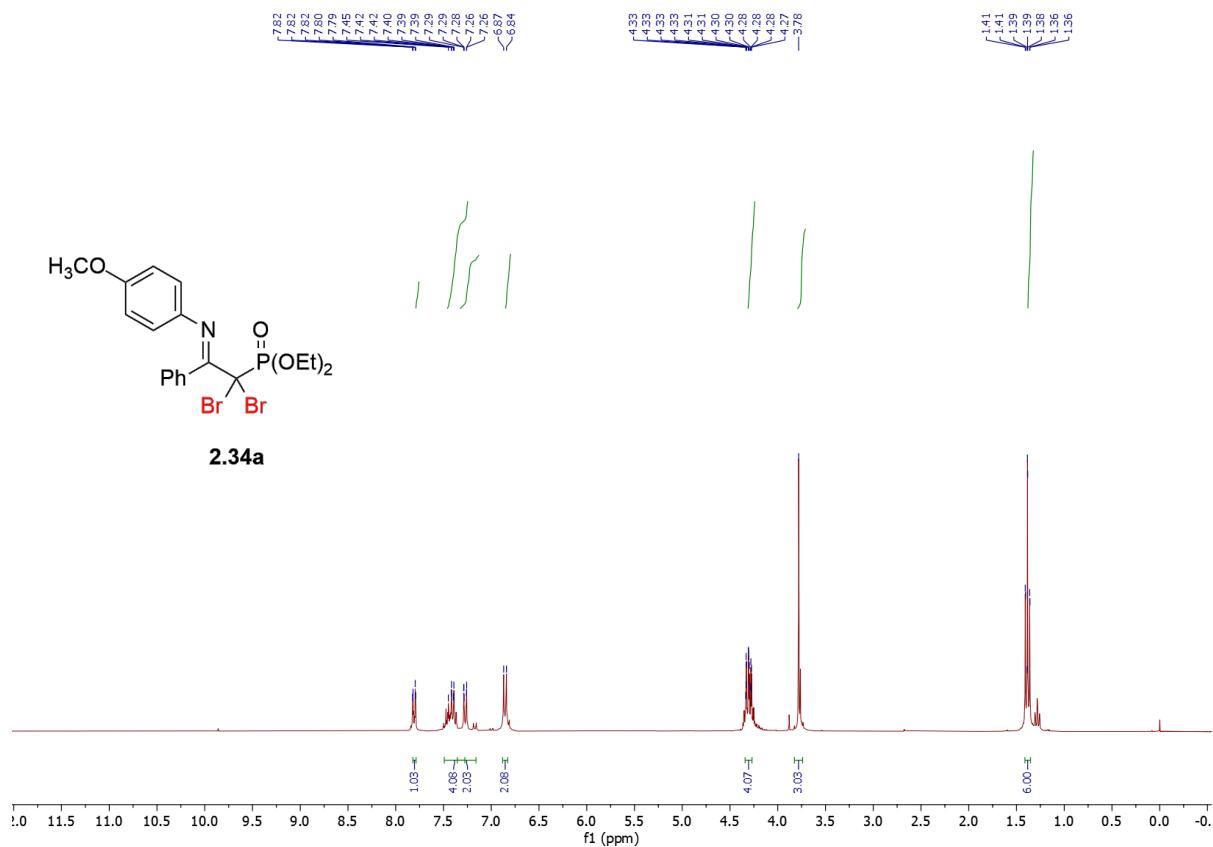
Widmo ¹H NMR związku **2.33a**.



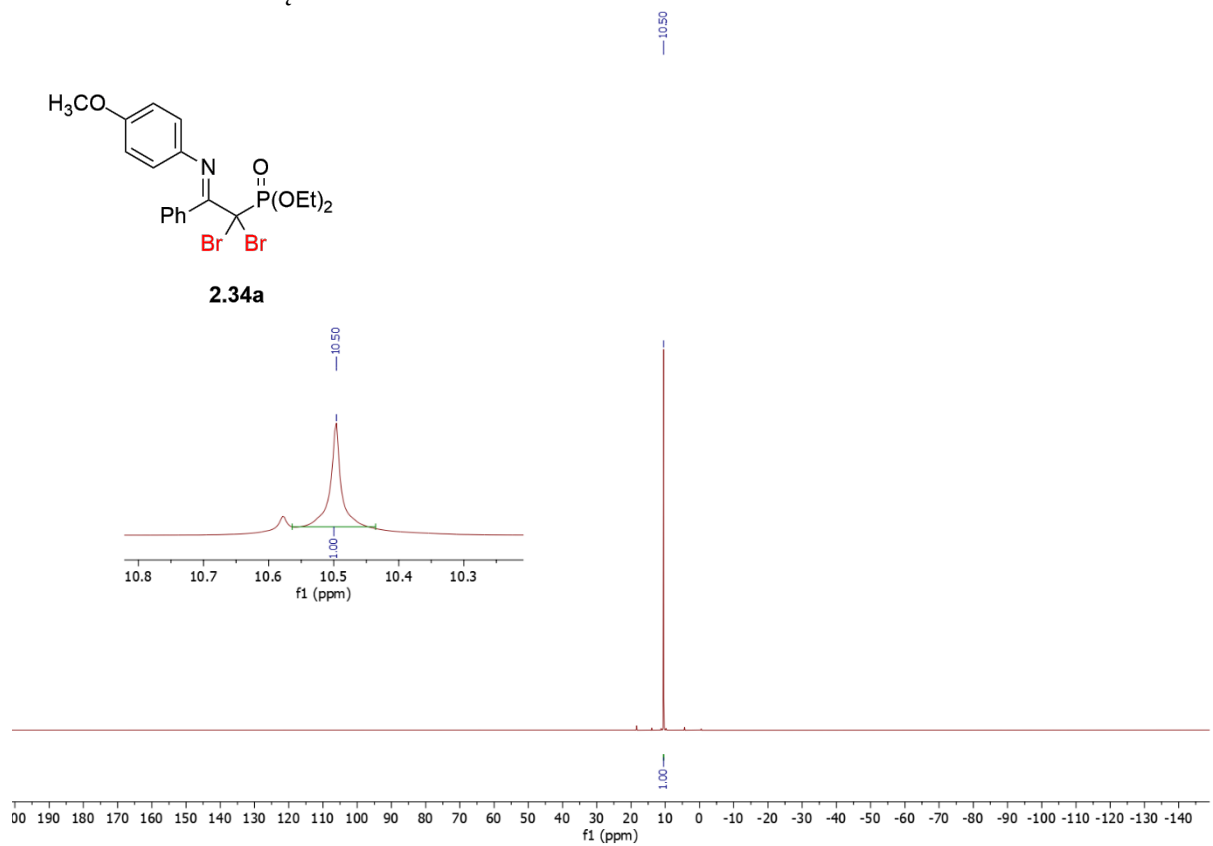
Widmo ¹³C NMR związku **2.33a**.



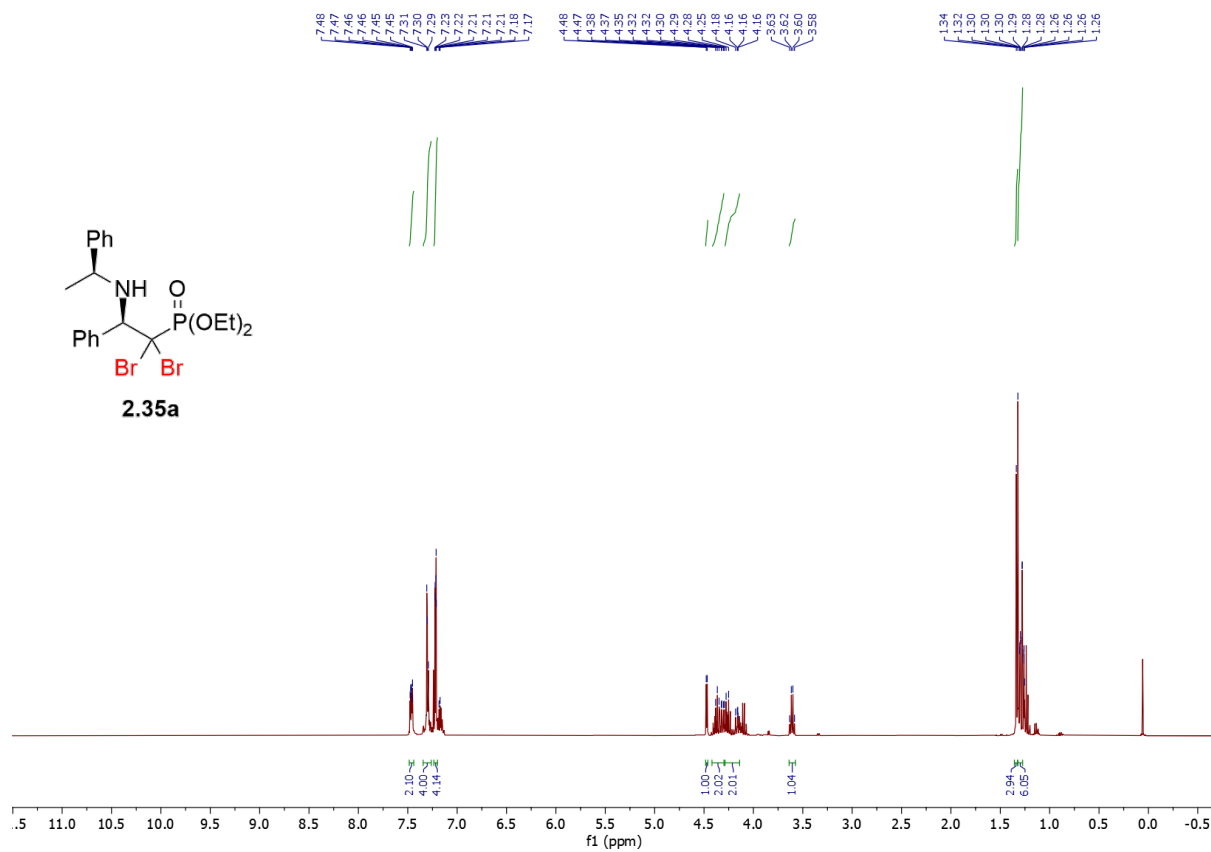
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.33a**.



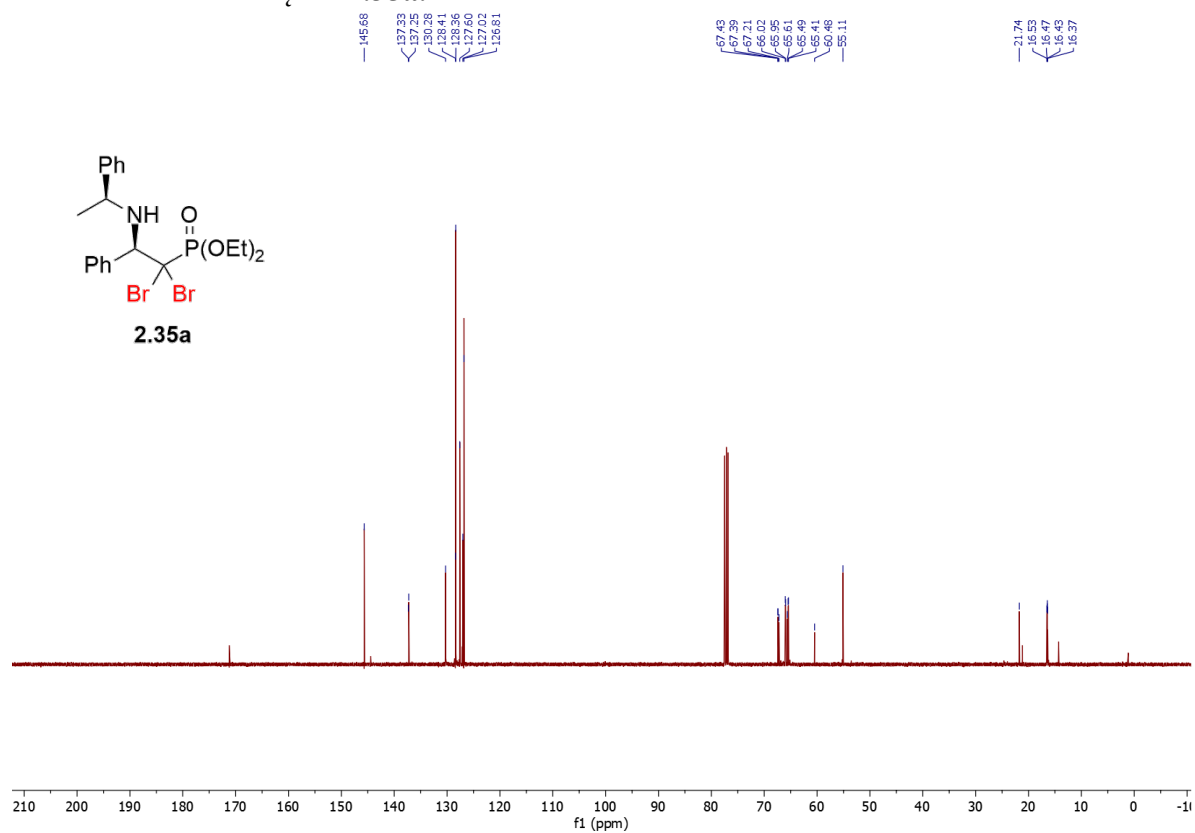
Widmo ^1H NMR związku **2.34a**.



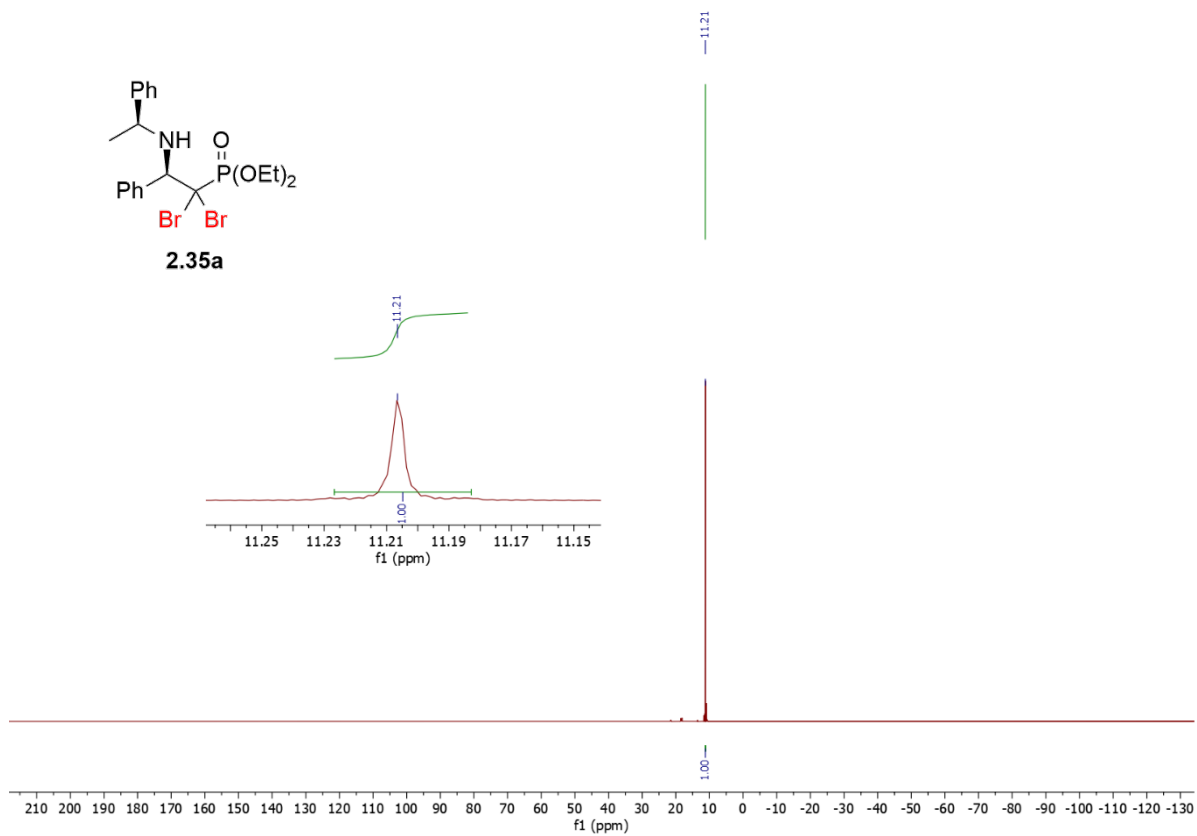
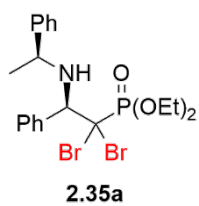
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.34a**.



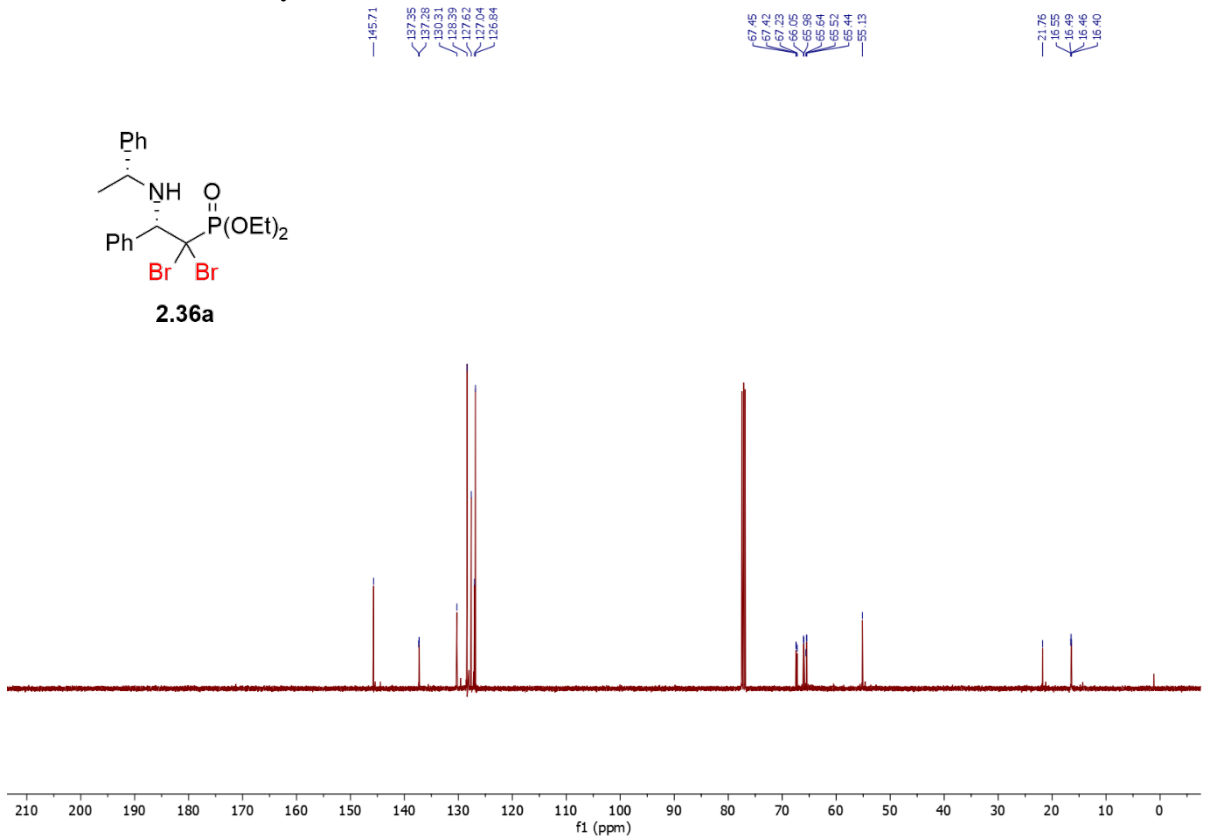
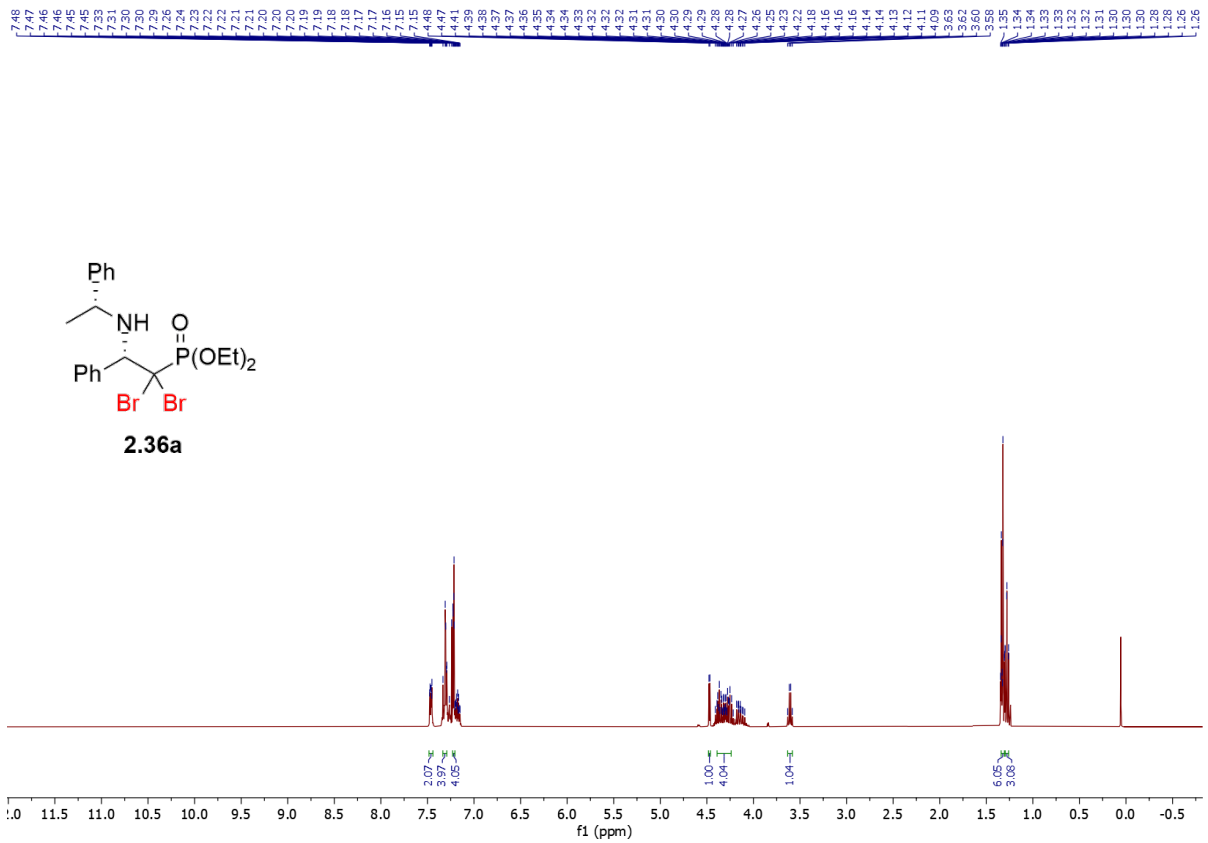
Widmo ^1H NMR związku **2.35a**.

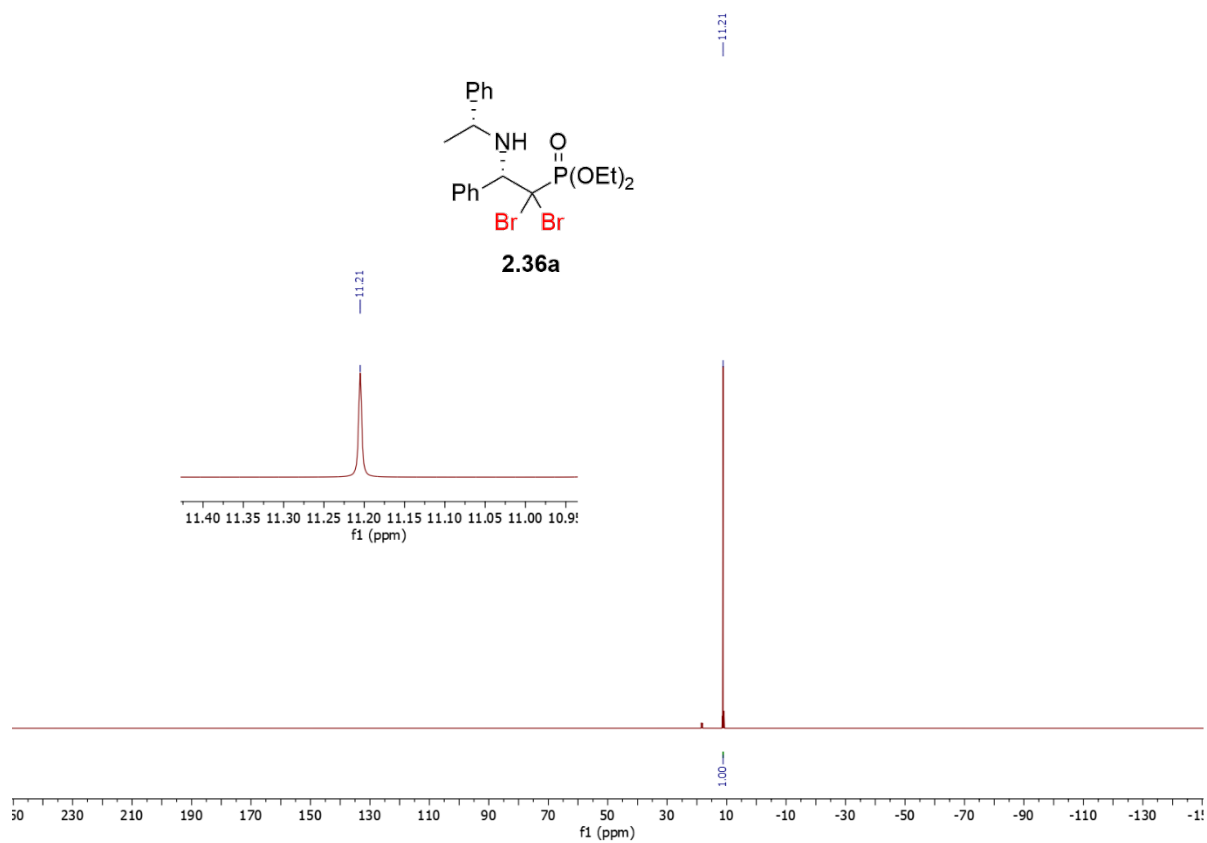


Widmo ^{13}C NMR związku **2.35a**.

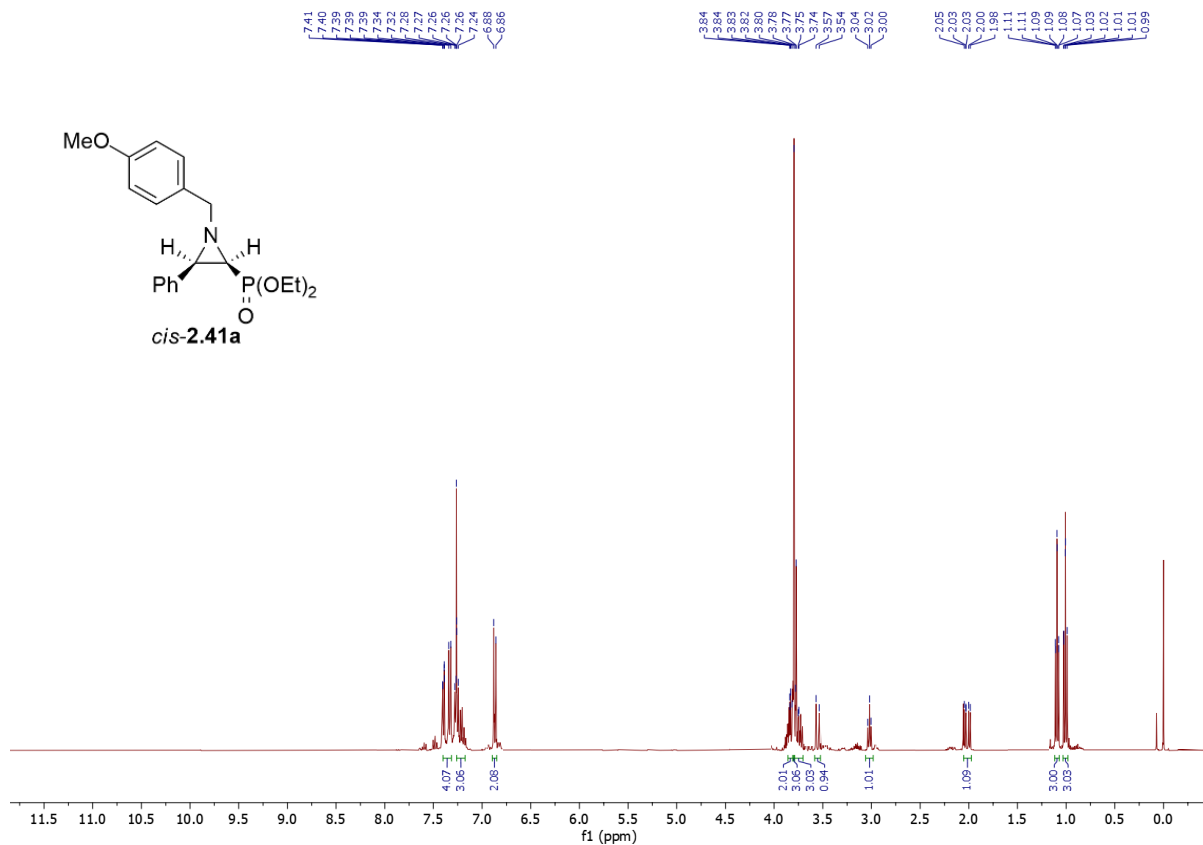


Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.35a**.

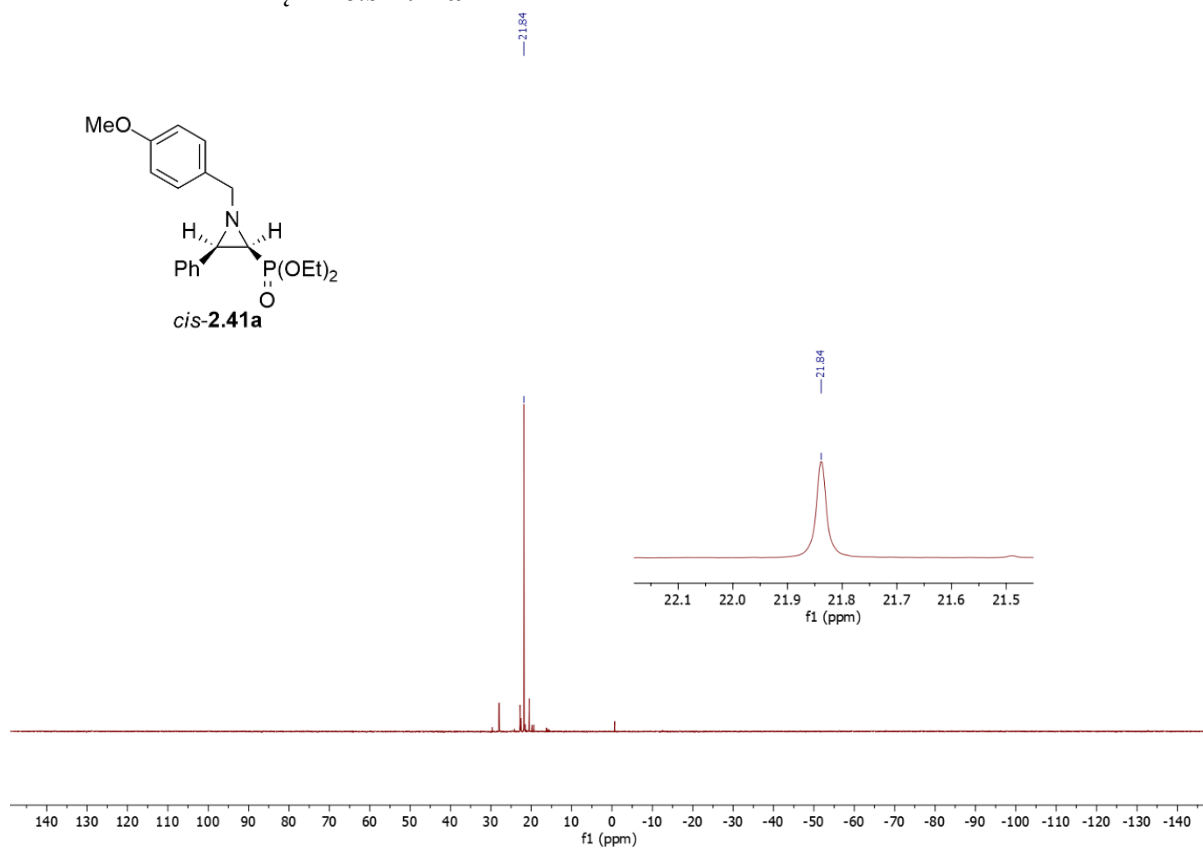




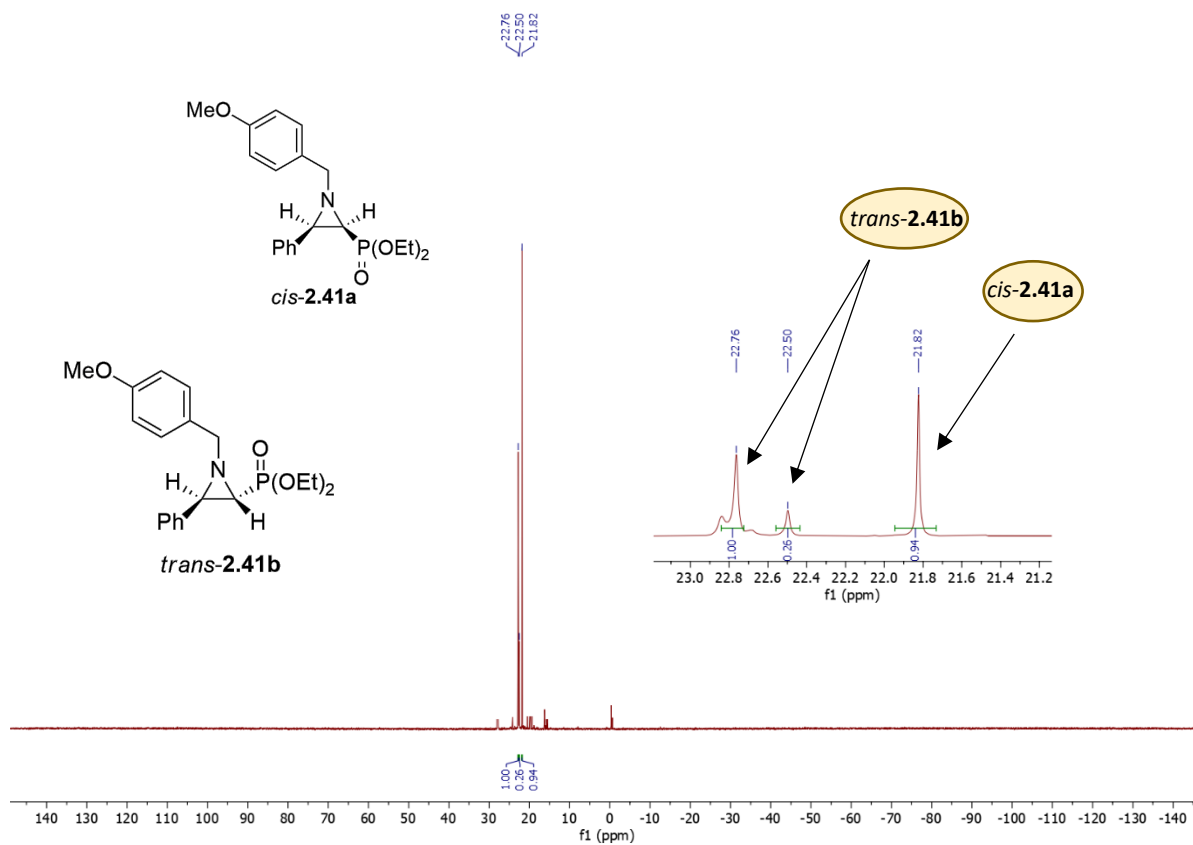
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.36a**.



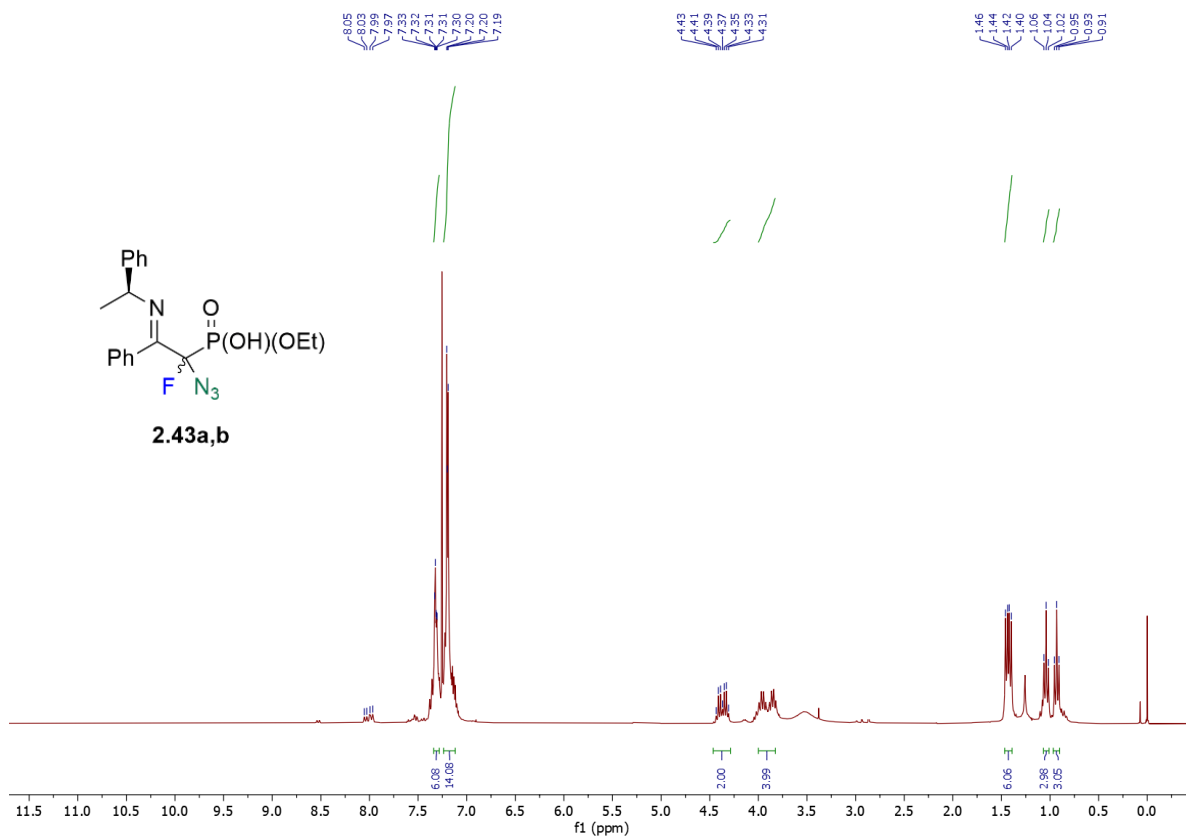
Widmo ^1H NMR związku *cis*-2.41a.



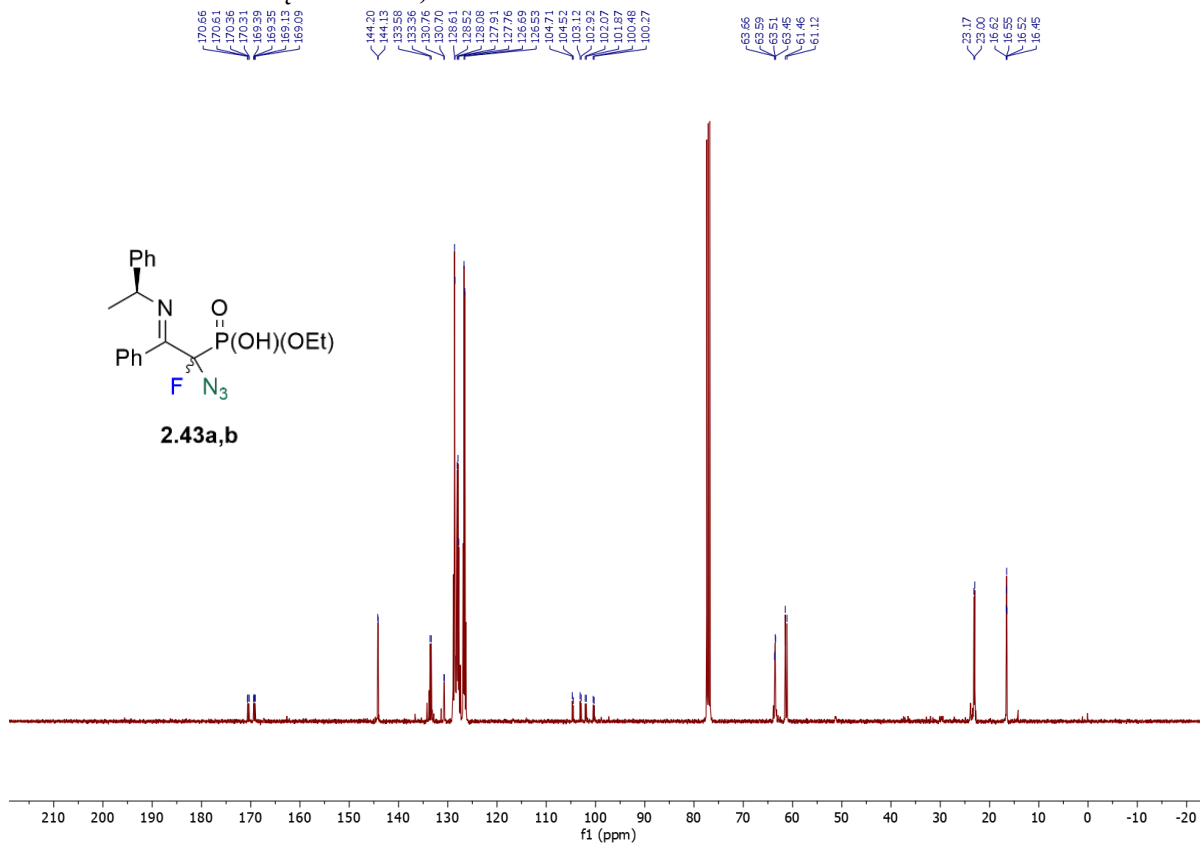
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku *cis*-2.41a.



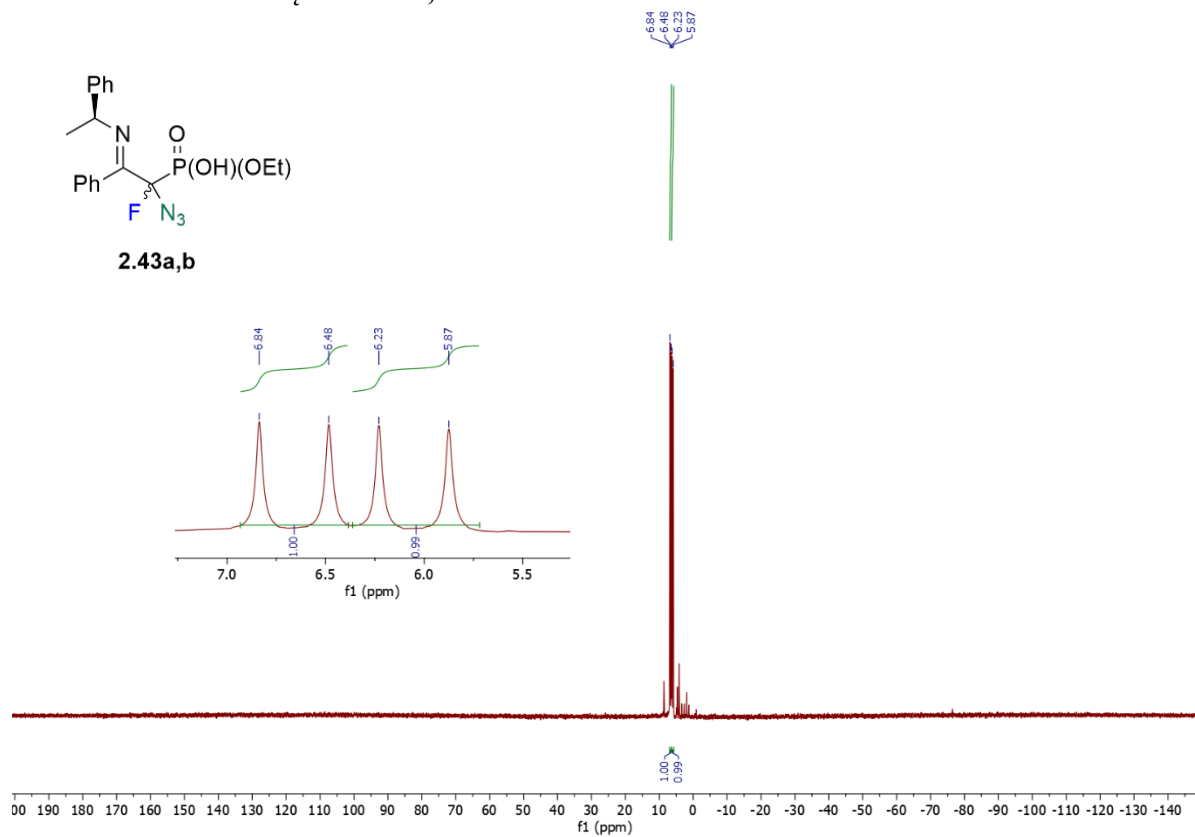
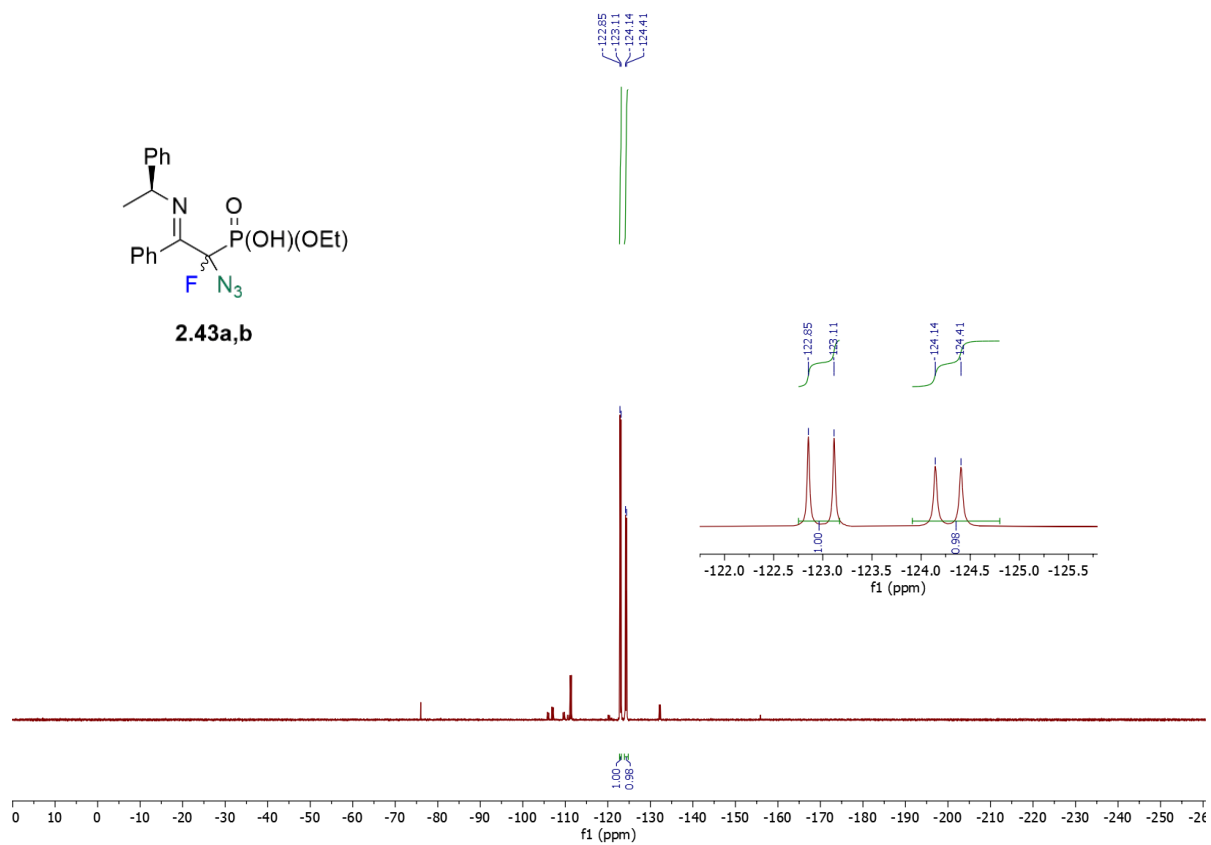
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR surowej mieszaniny *cis*-2.41a oraz *trans*-2.41b (inwertomery).

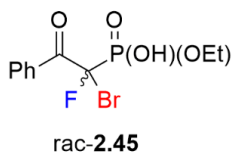
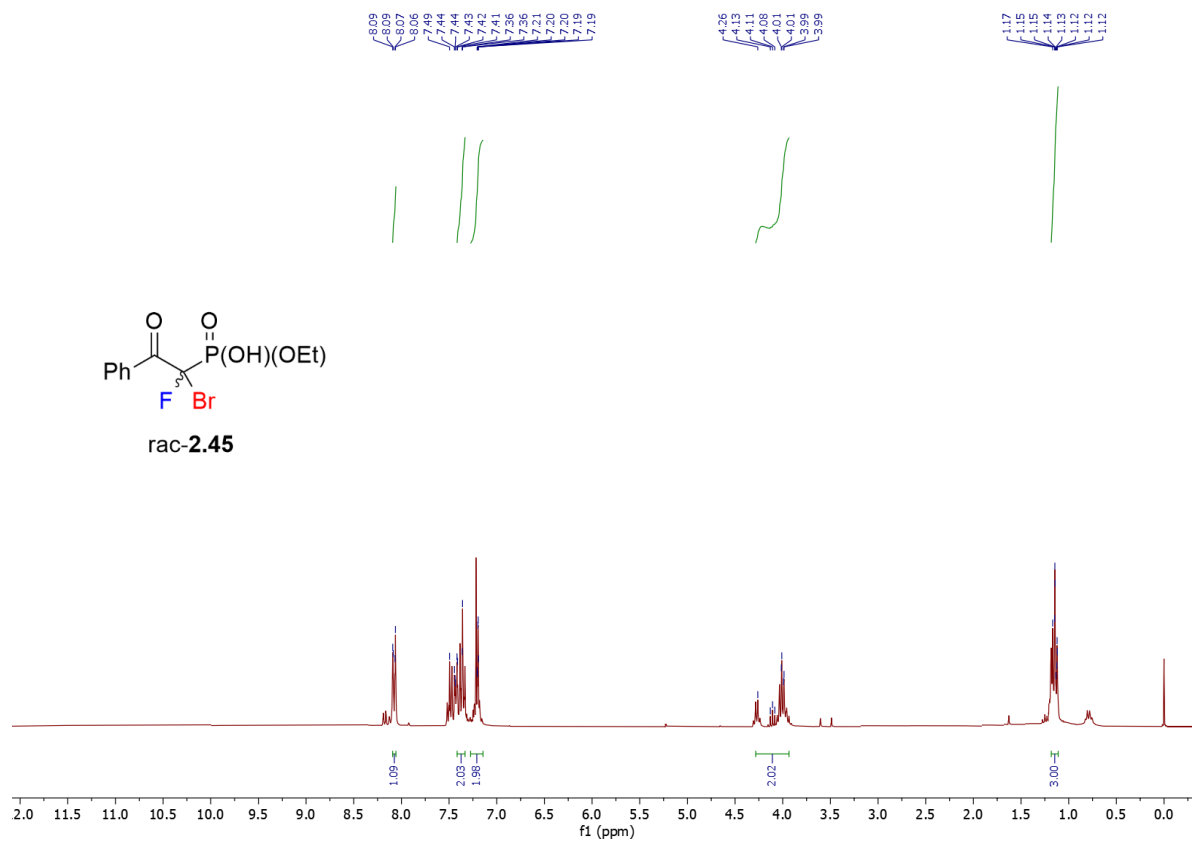


Widmo ^1H NMR związku **2.43a,b** *dr* 1:1.

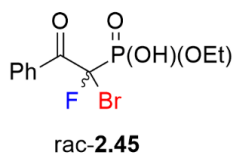
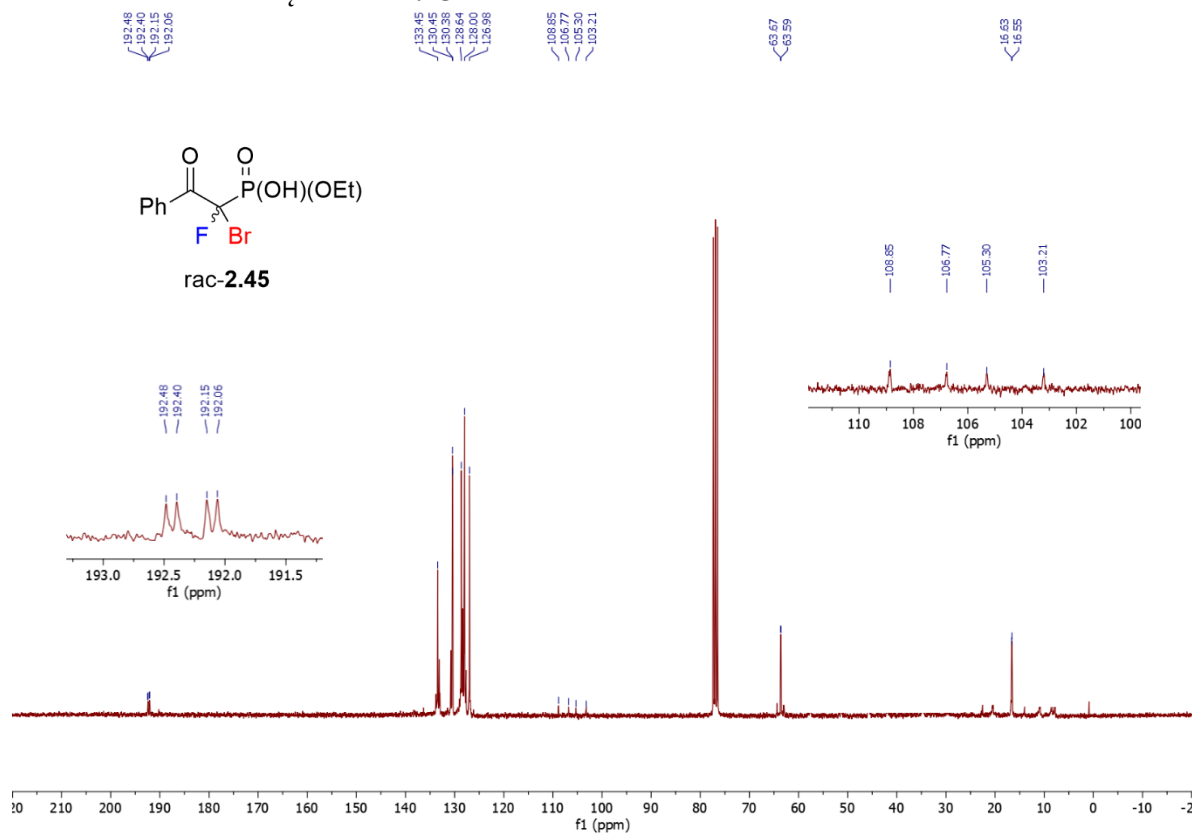


Widmo ^{13}C NMR związku **2.43a,b** *dr* 1:1.

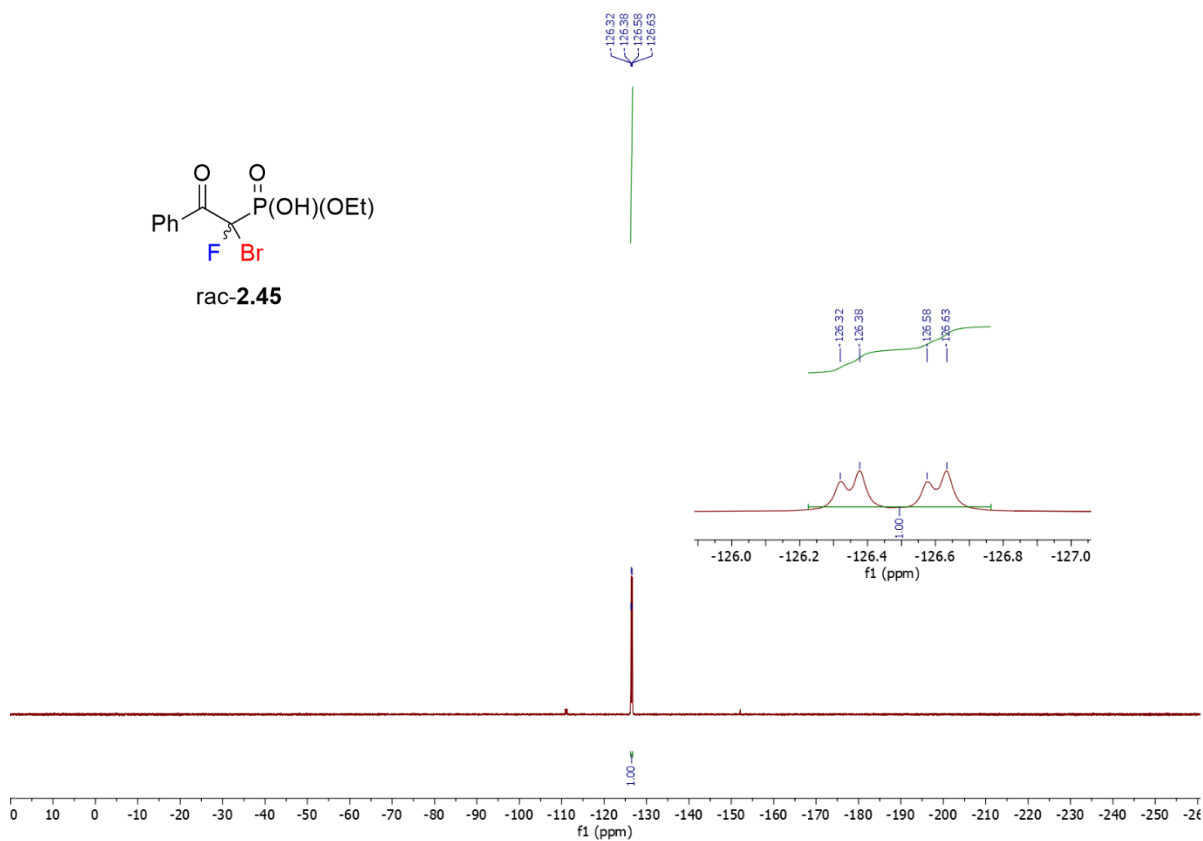




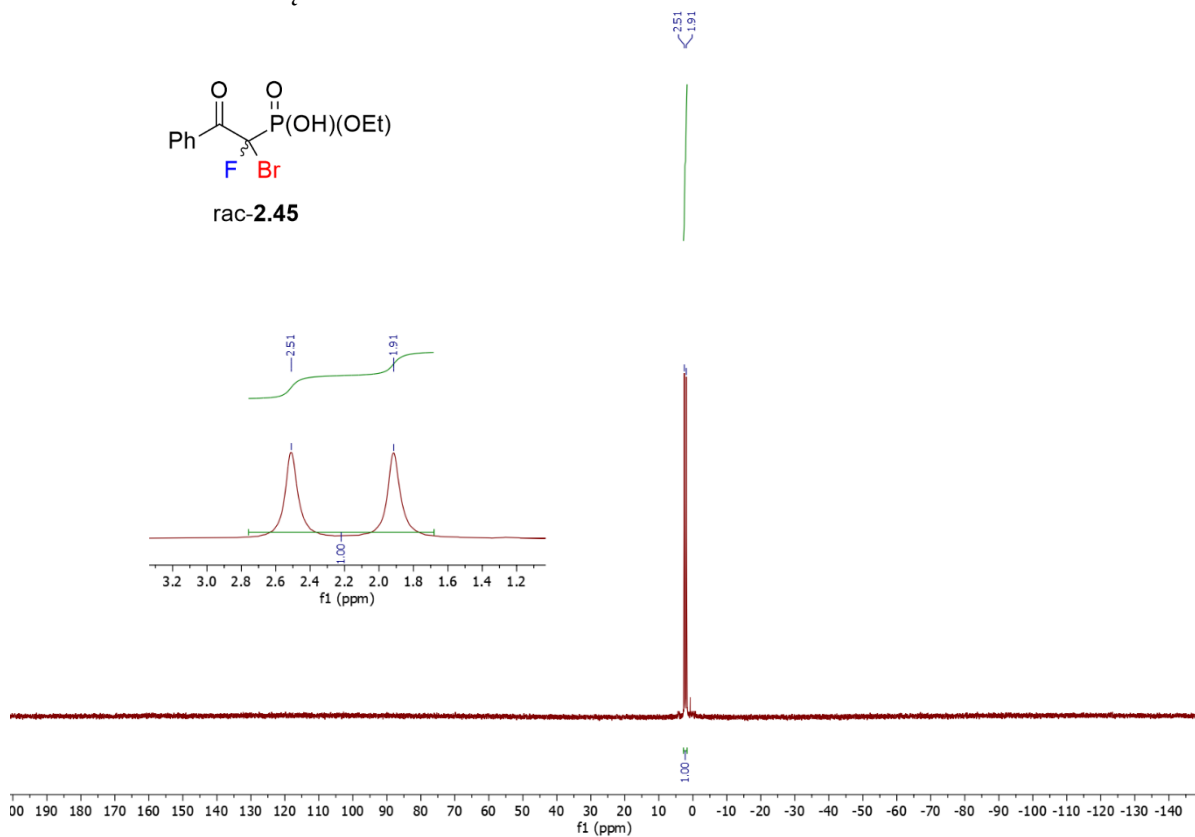
Widmo ¹H NMR związku rac-2.45.



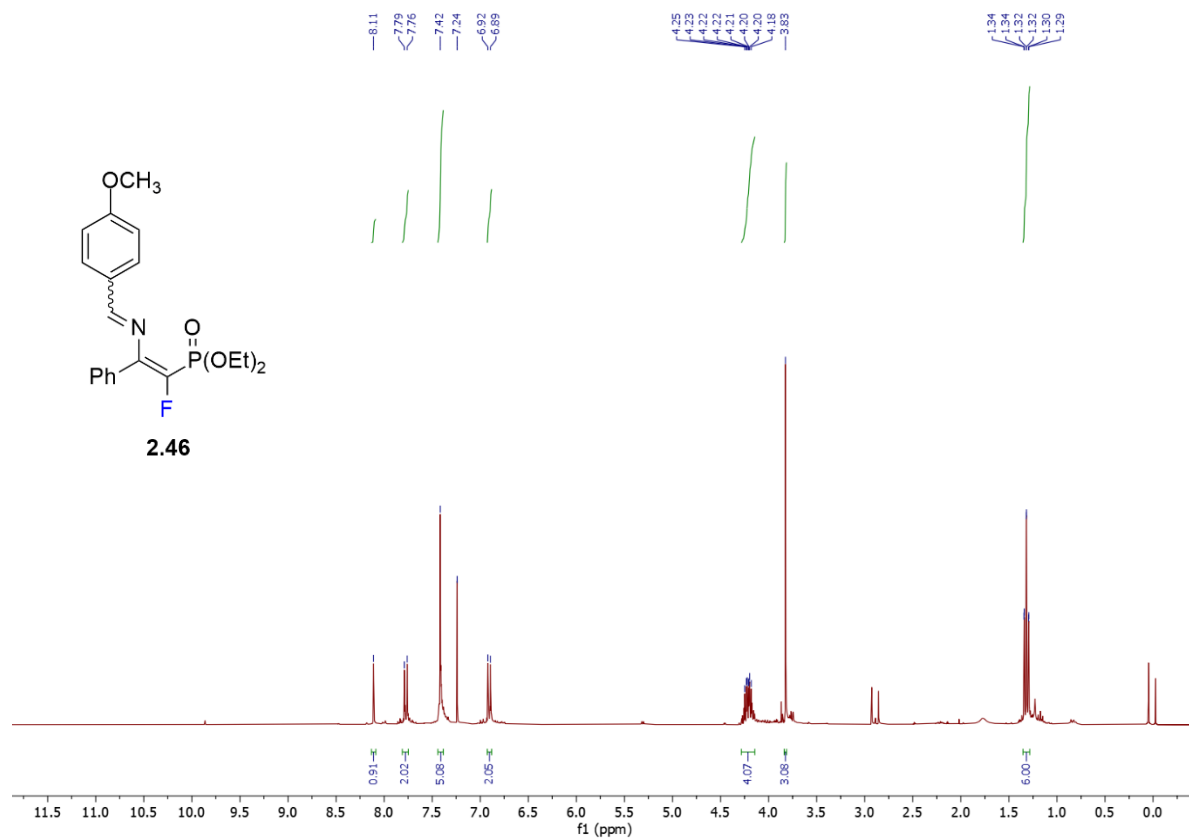
Widmo ¹³C NMR związku rac-2.45.



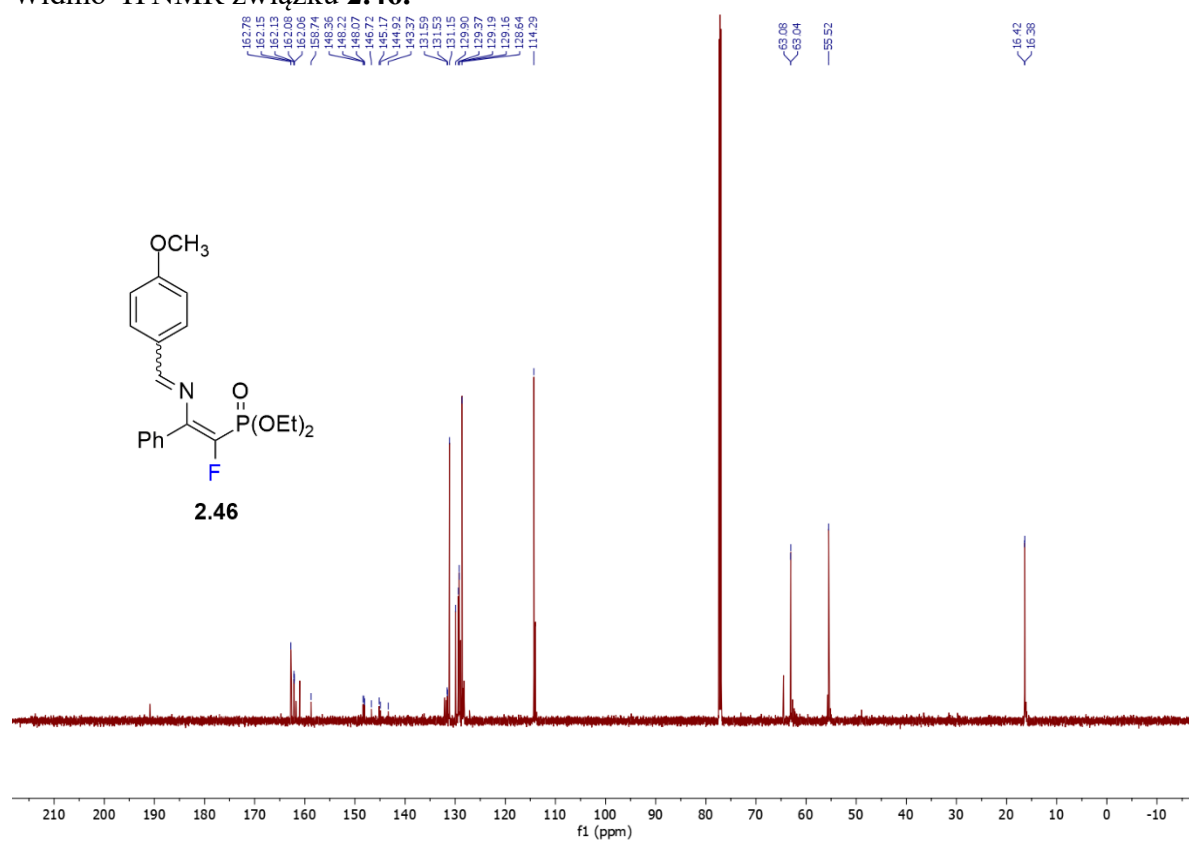
Widmo ^{19}F NMR związku **rac-2.45**.



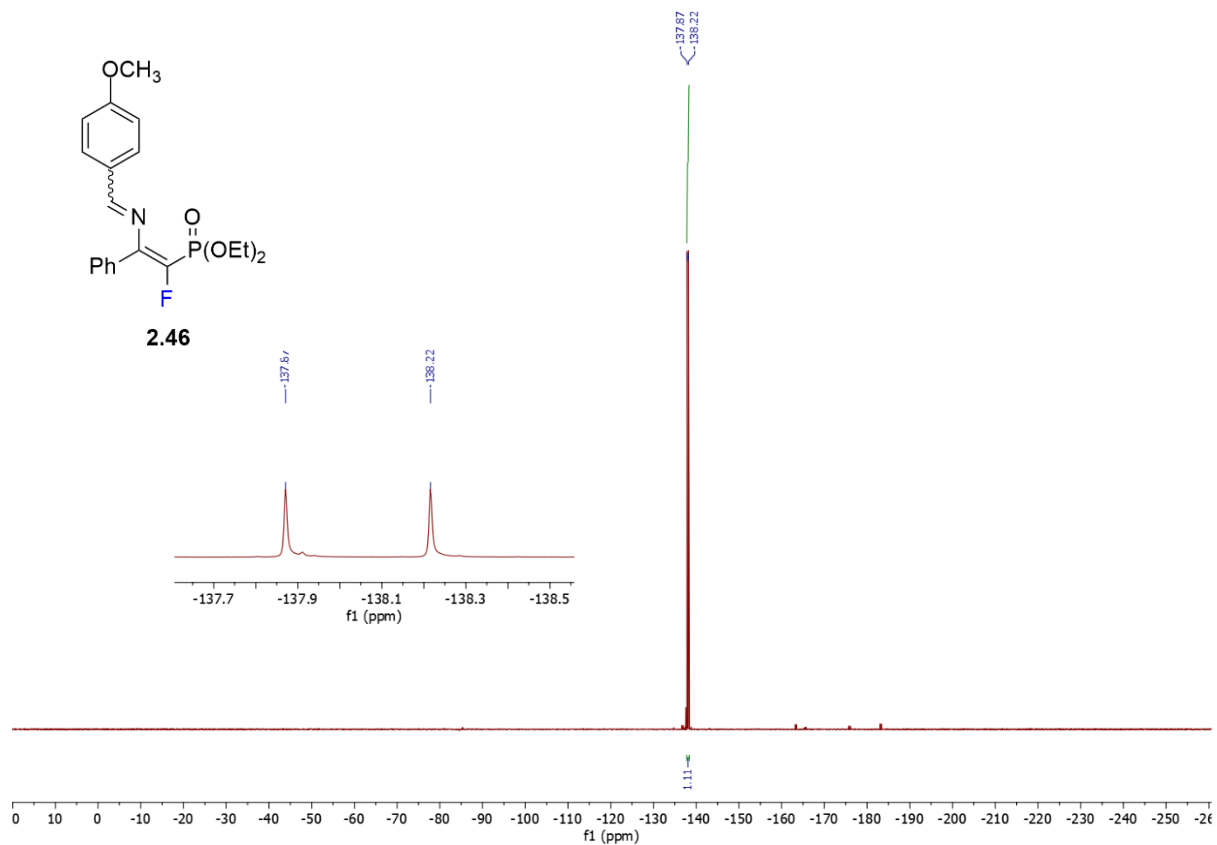
Widmo ^{31}P $\{^1\text{H}\}$ NMR związku **rac-2.45**.



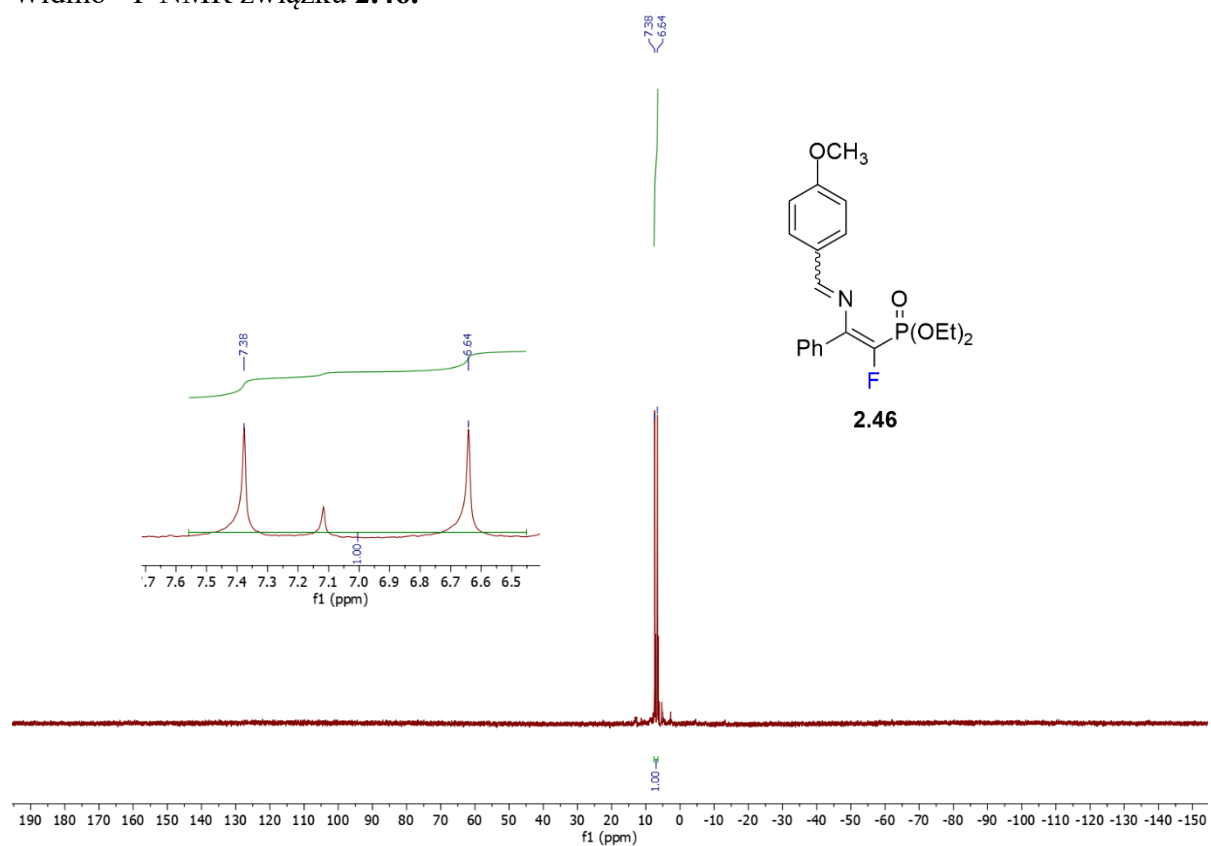
Widmo $^1\text{H NMR}$ związku **2.46**.



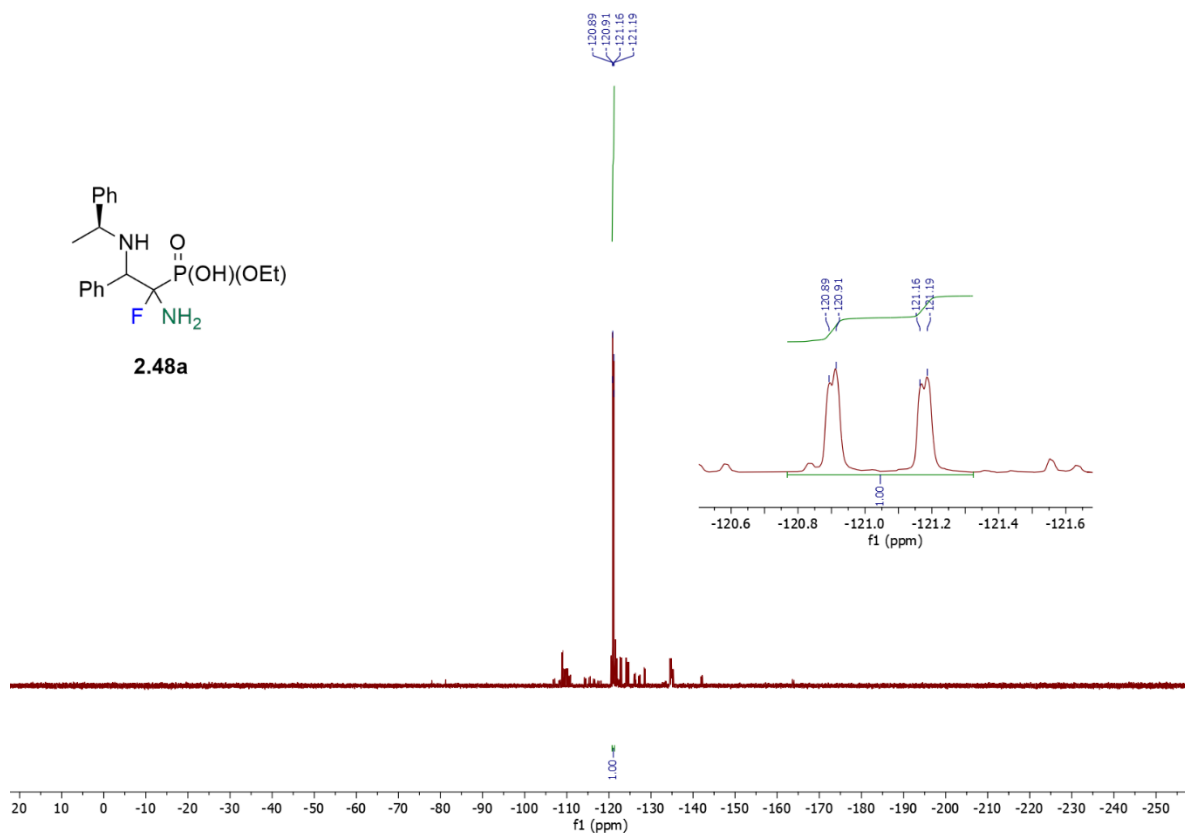
Widmo $^{13}\text{C NMR}$ związku **2.46**.



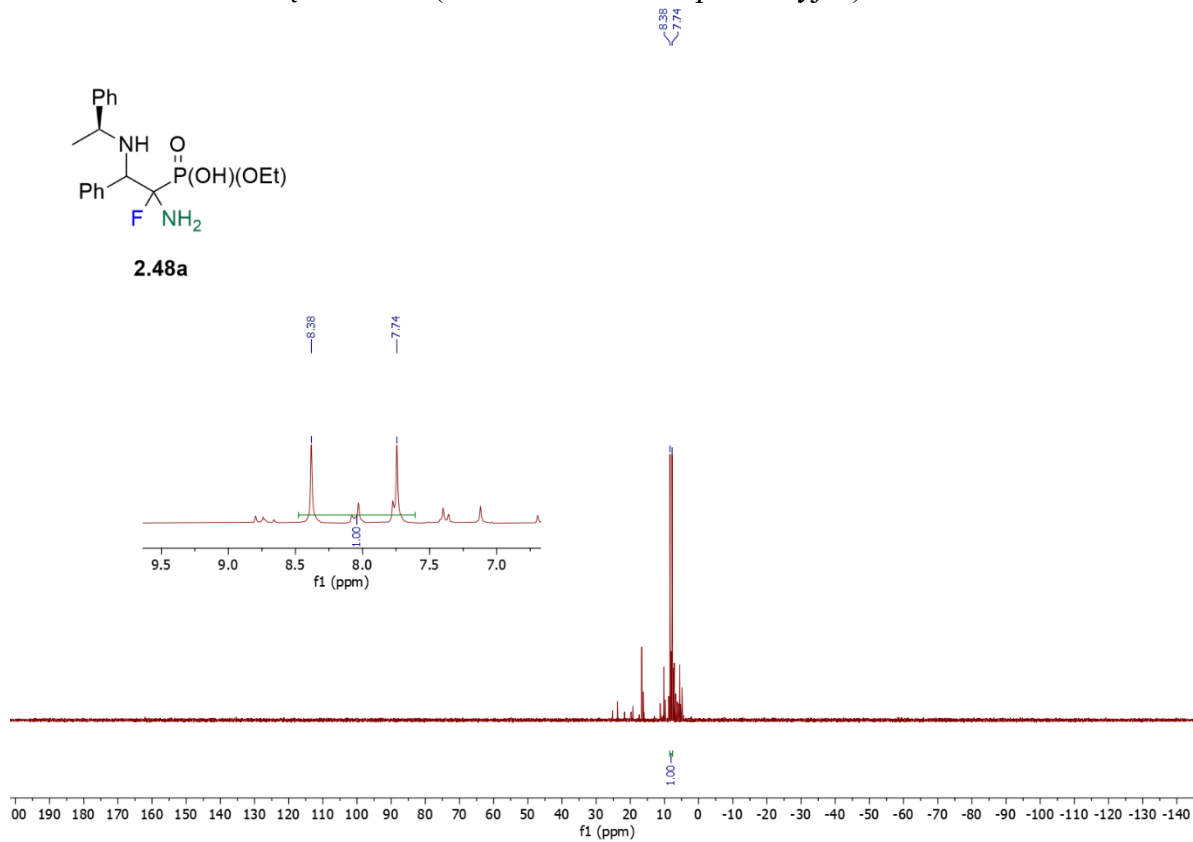
Widmo ^{19}F NMR związku **2.46**.



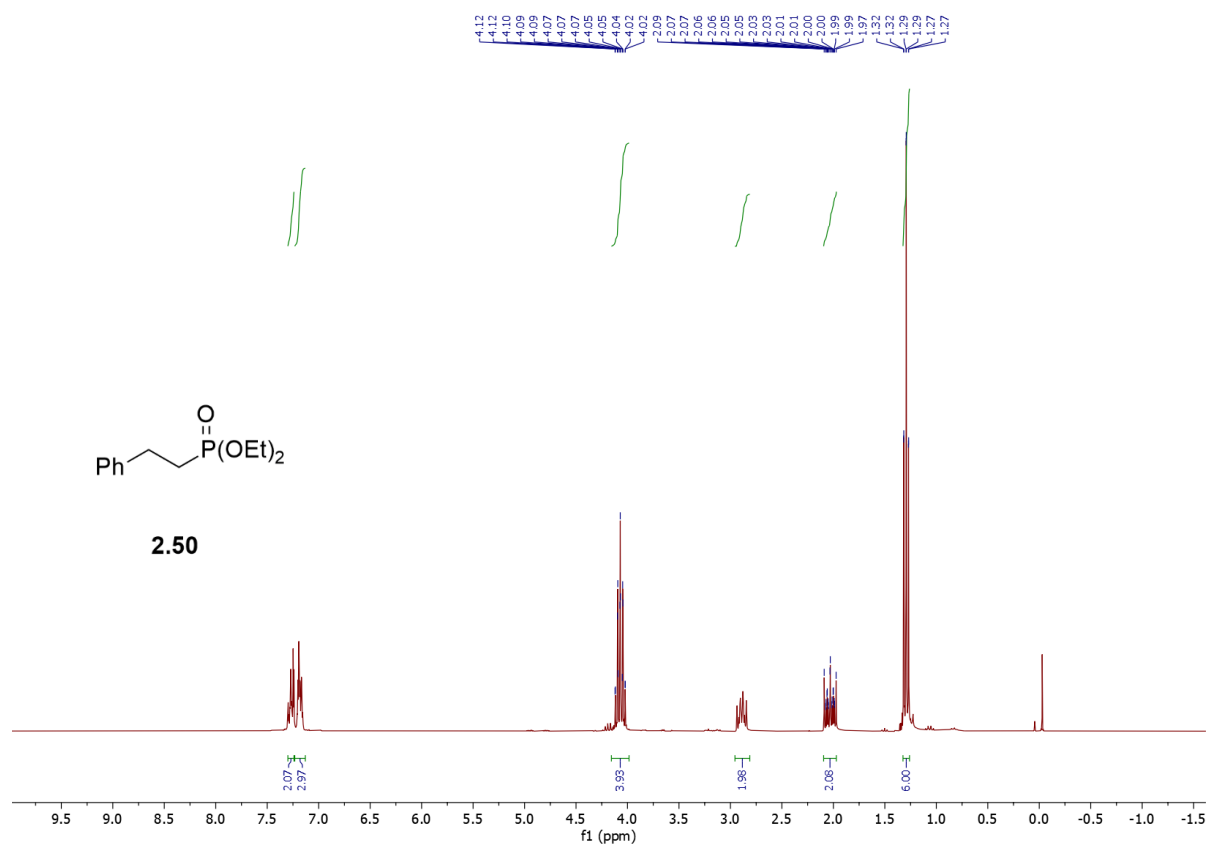
Widmo ^{31}P $\{^1\text{H}\}$ NMR związku **2.46**.



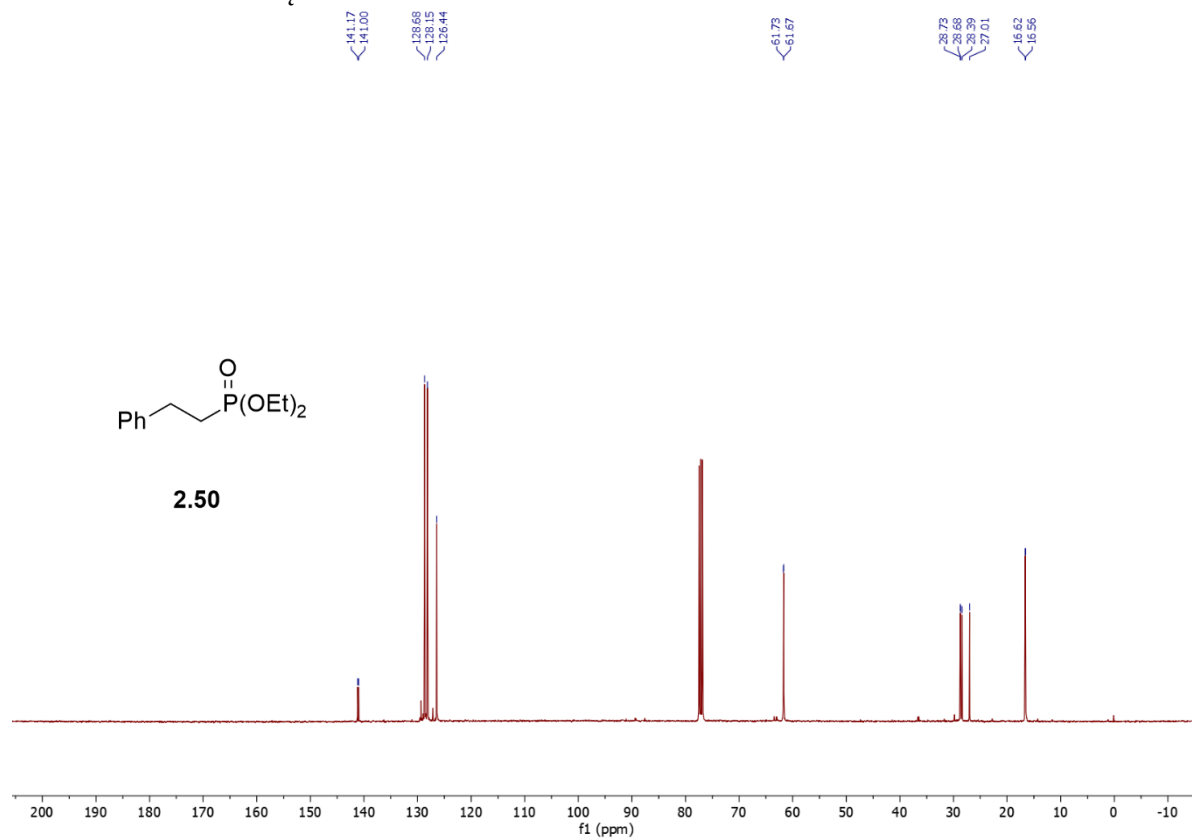
Widmo ^{19}F NMR związku **2.48a** (surowa mieszanina poreakcyjna).



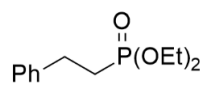
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.48a** (surowa mieszanina poreakcyjna).



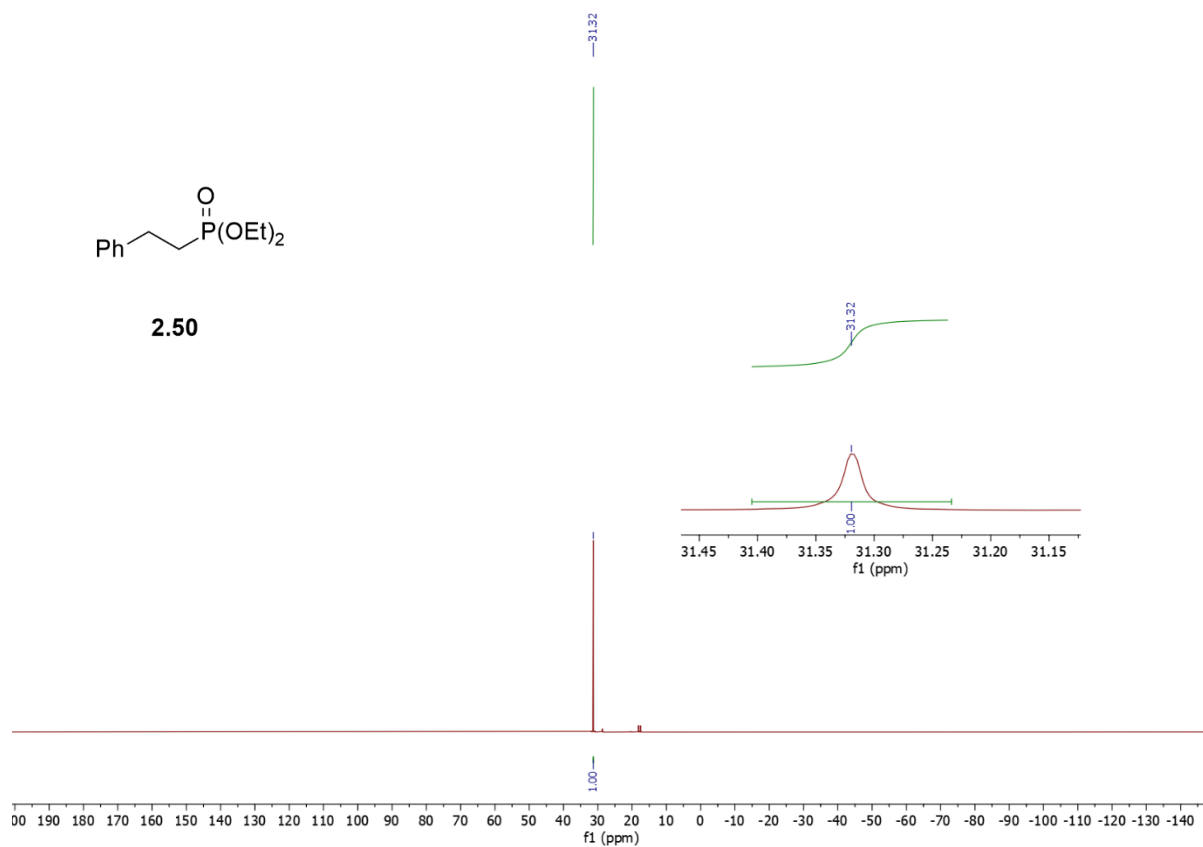
Widmo ^1H NMR związku **2.50**.



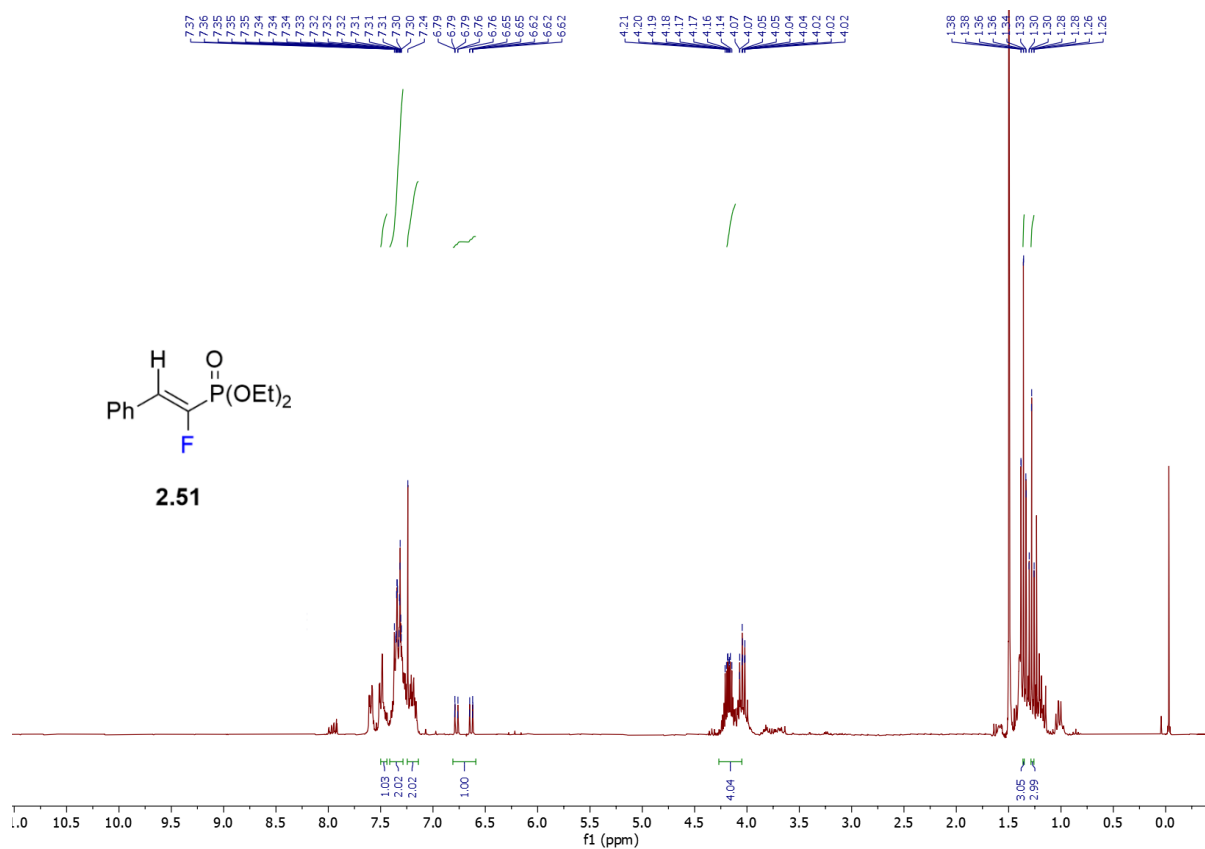
Widmo ^{13}C NMR związku **2.50**.



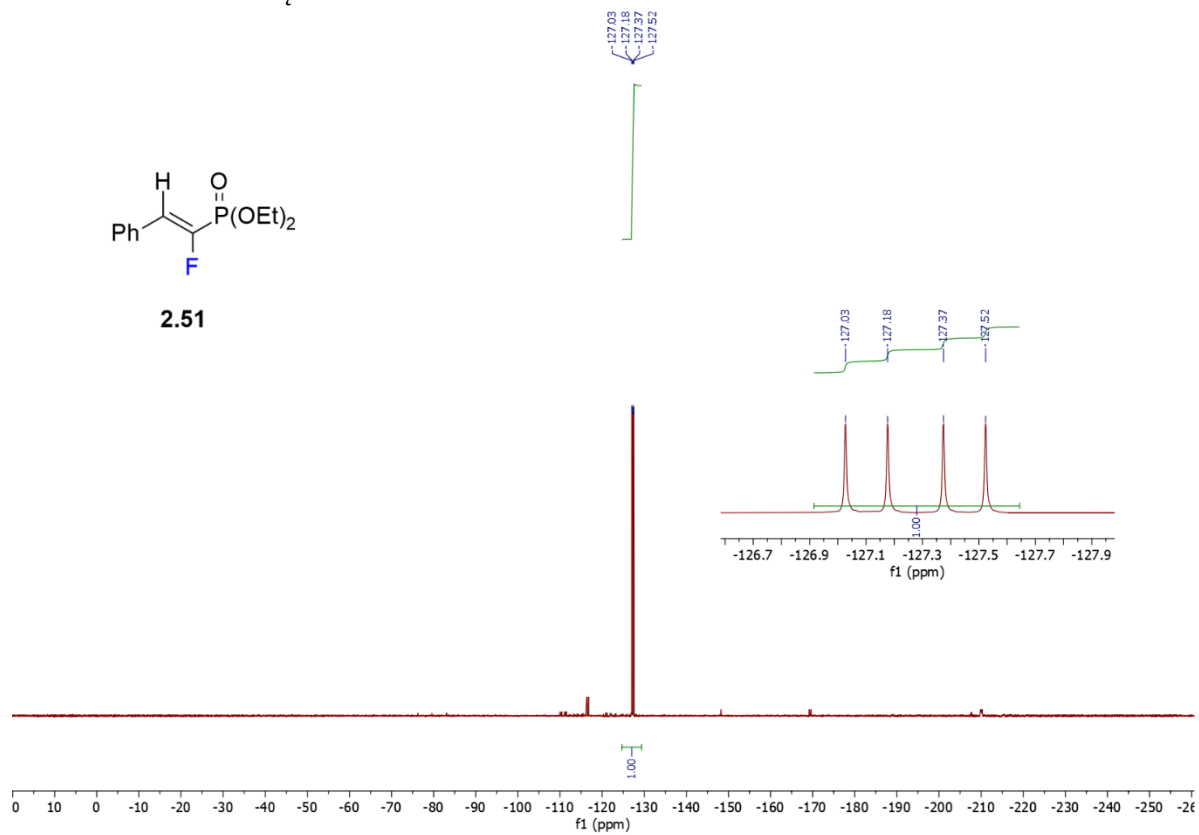
2.50



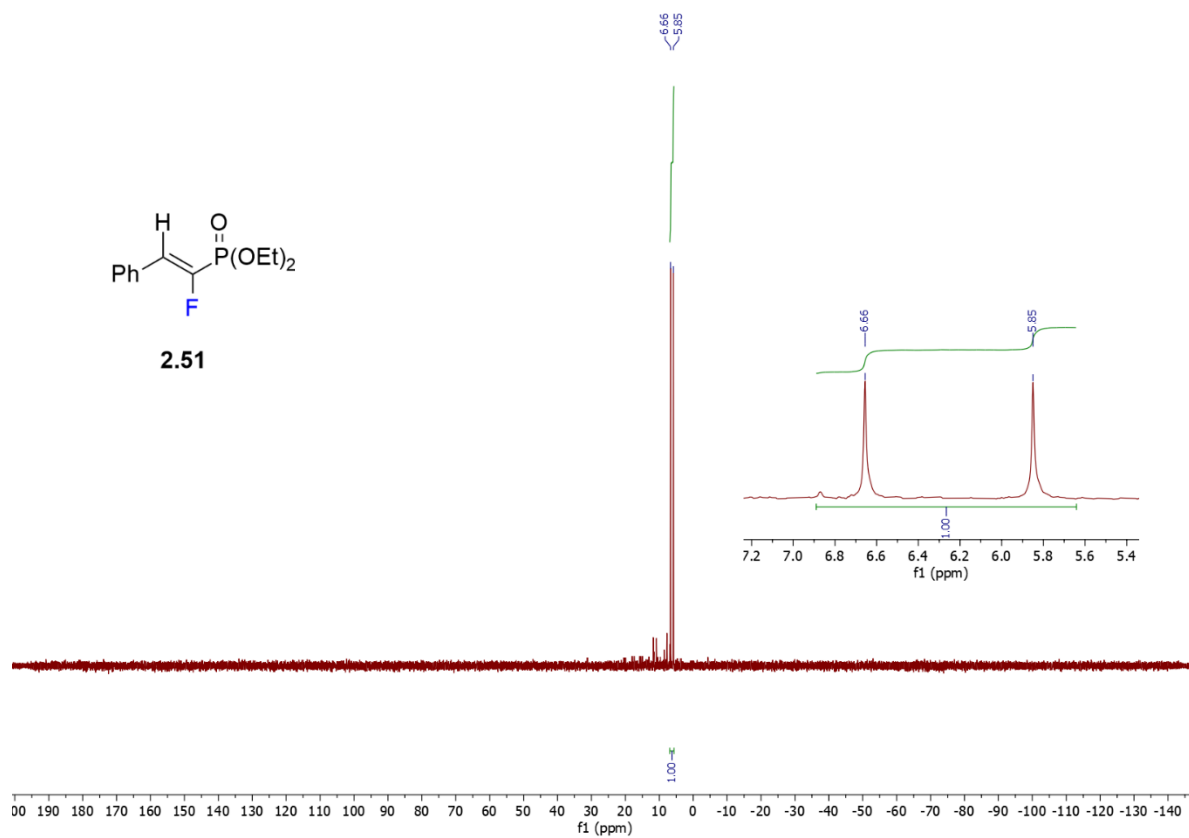
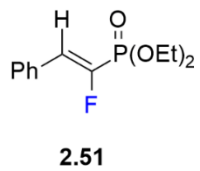
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.50**.



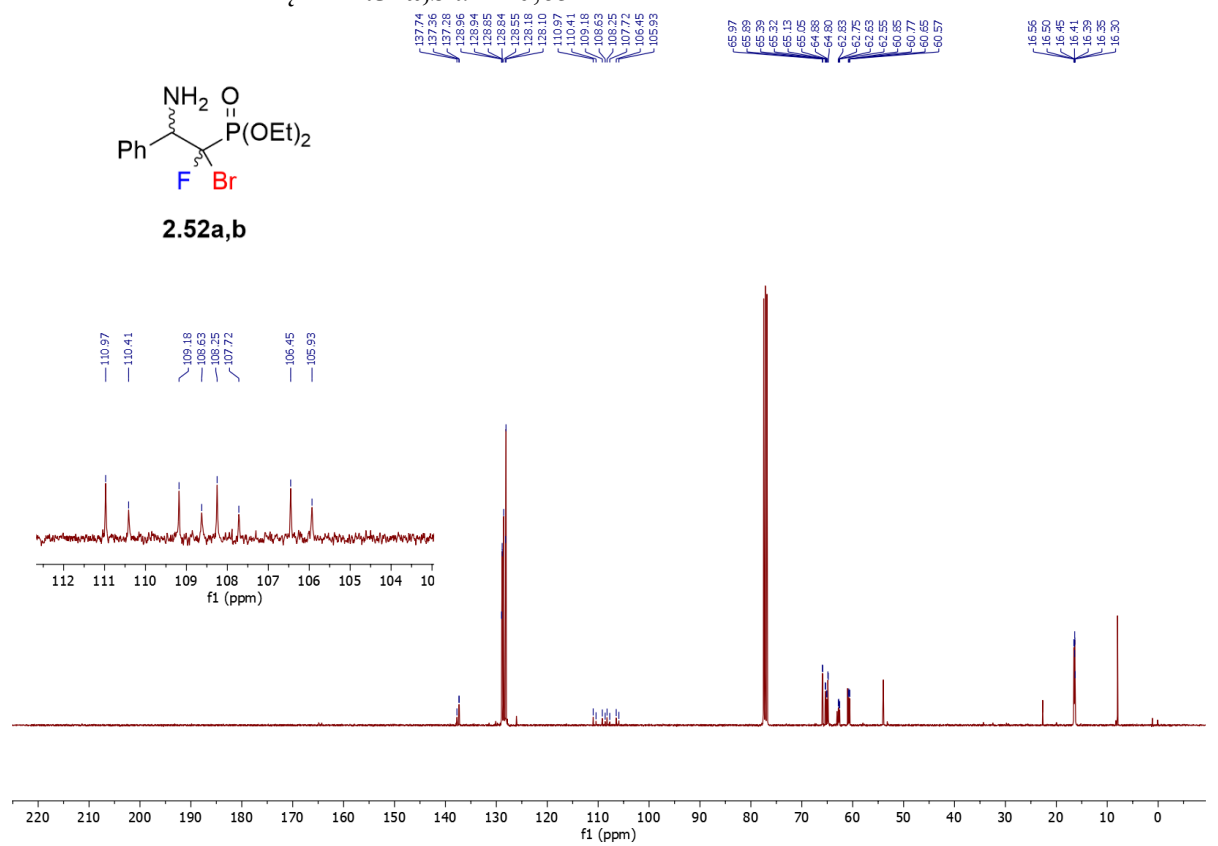
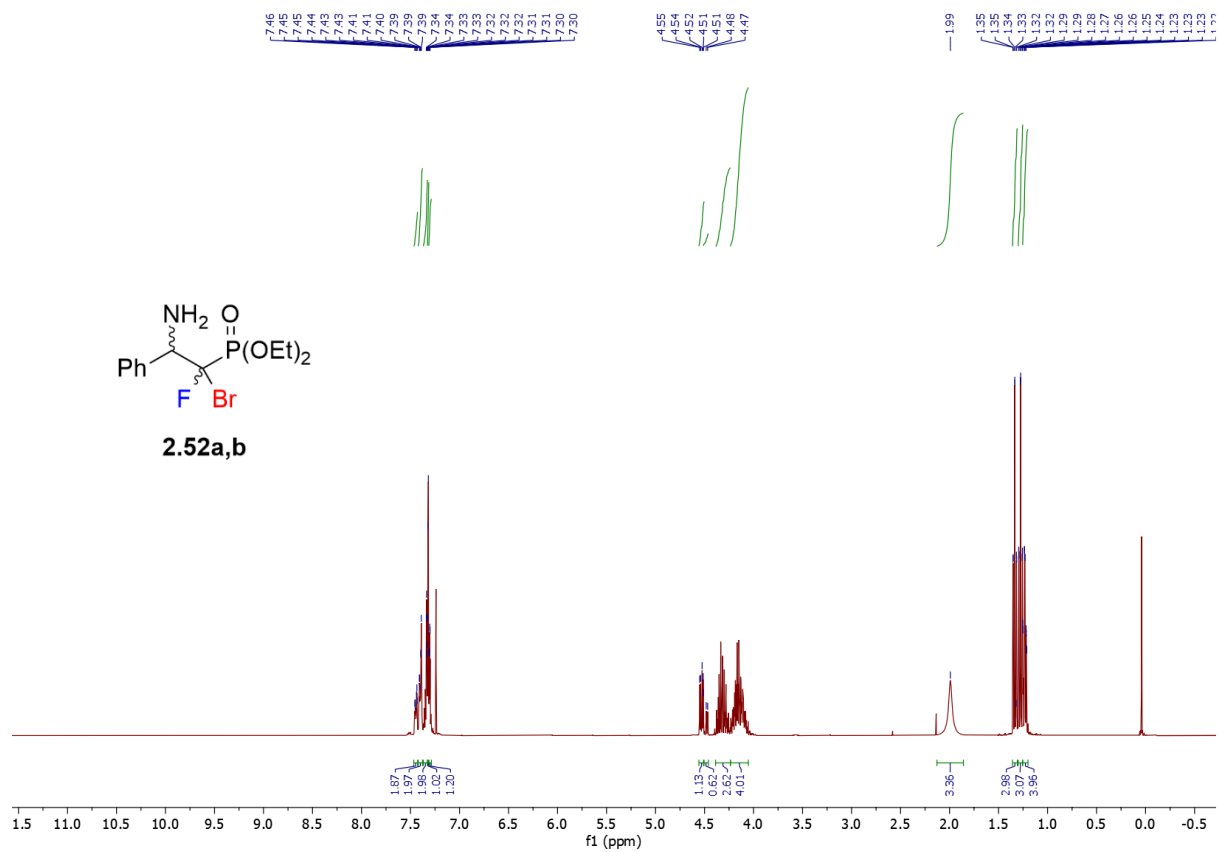
Widmo ^1H NMR związku **2.51**.

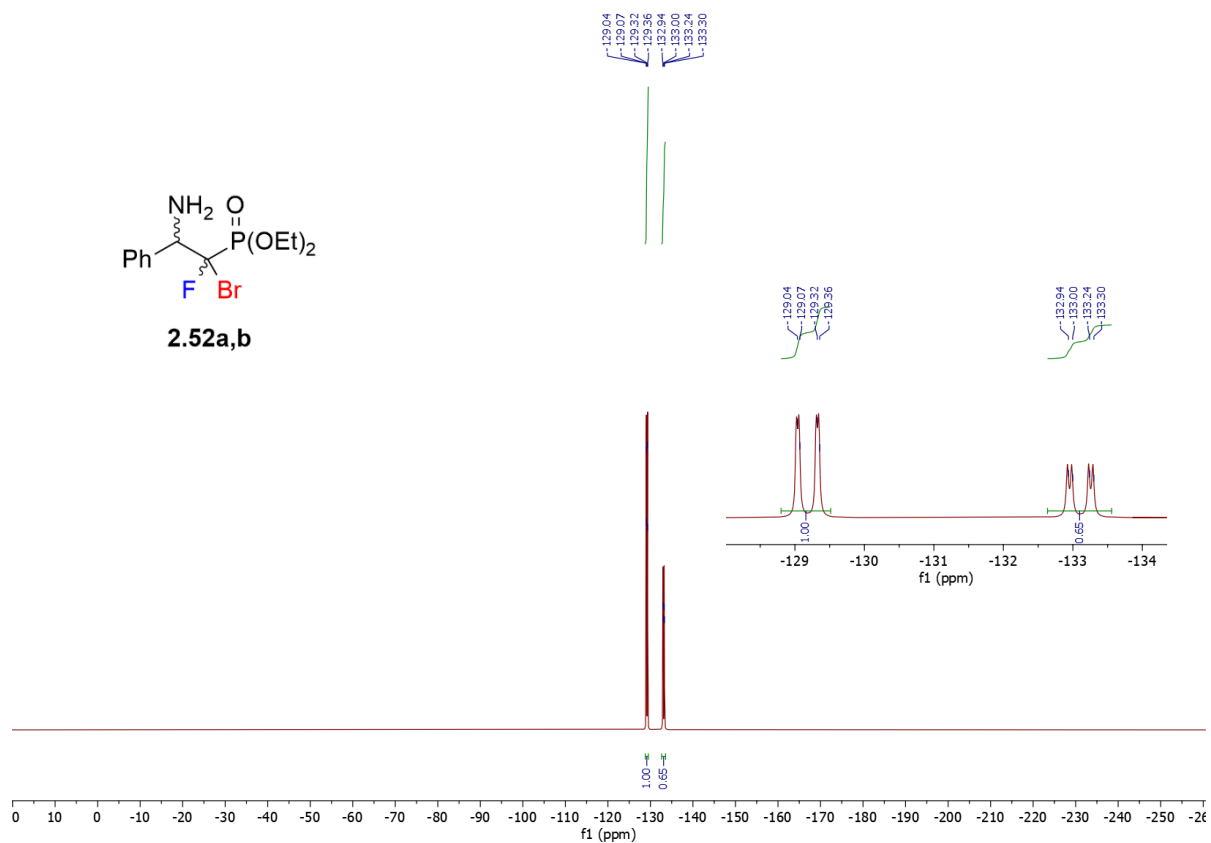
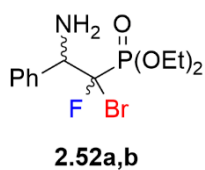


Widmo ^{19}F NMR związku **2.51**.

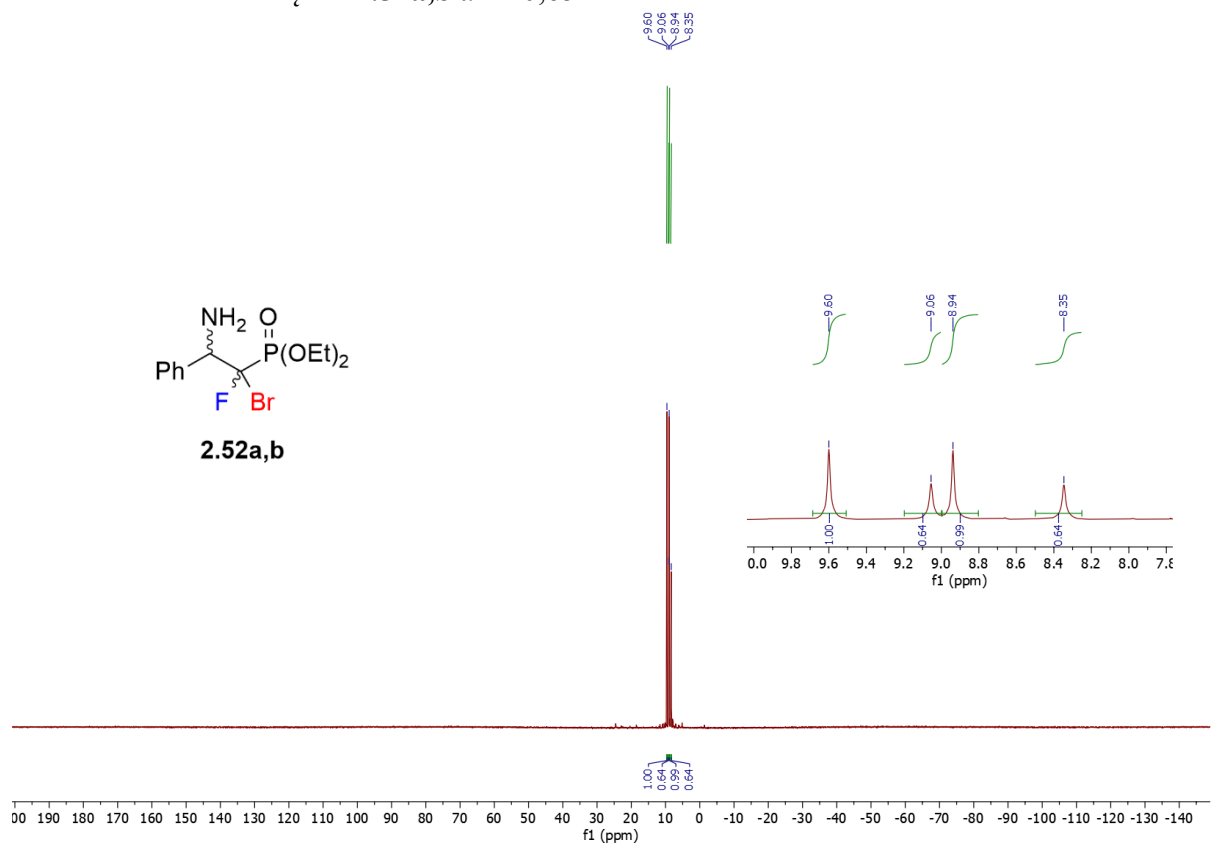
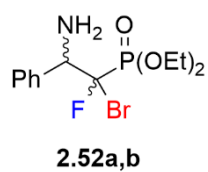


Widmo ^1H NMR związku **2.51**.

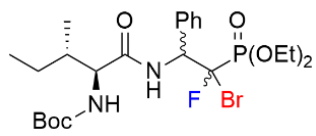




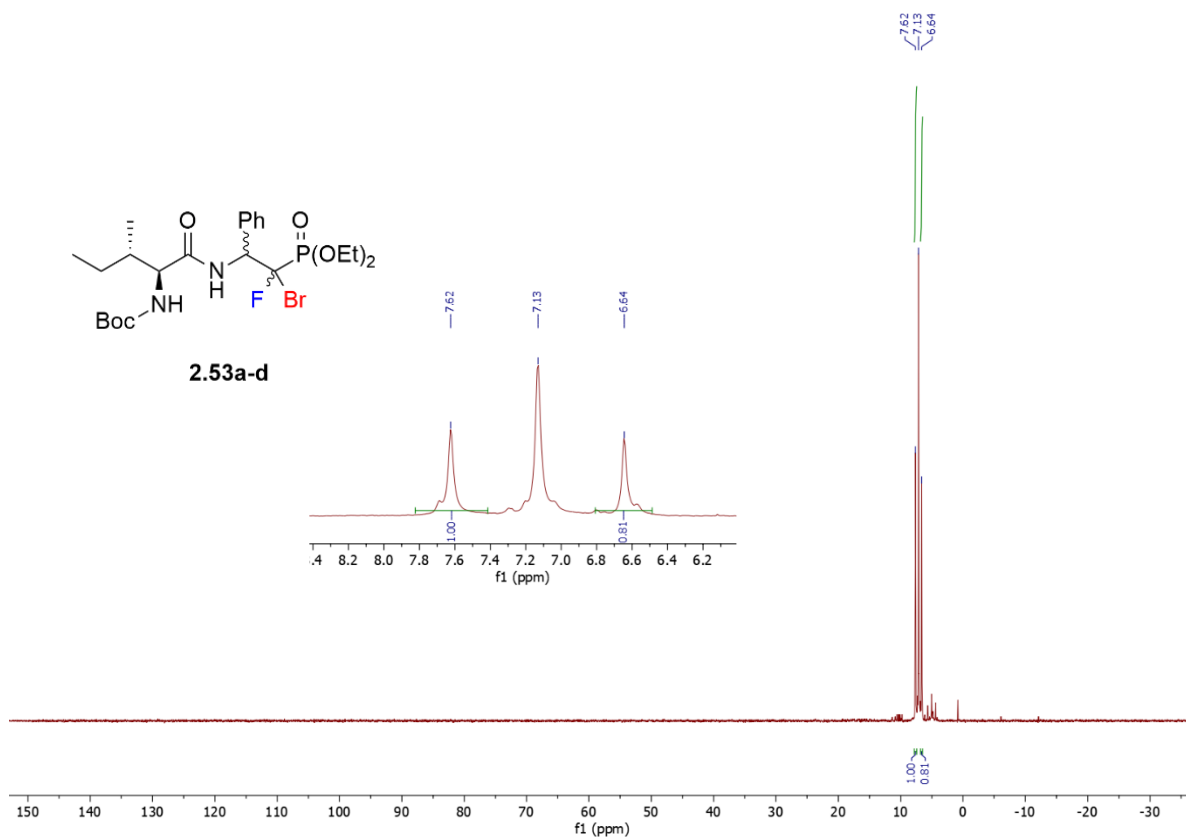
Widmo ^{19}F NMR związku **2.52a,b** *dr* 1:0,65.



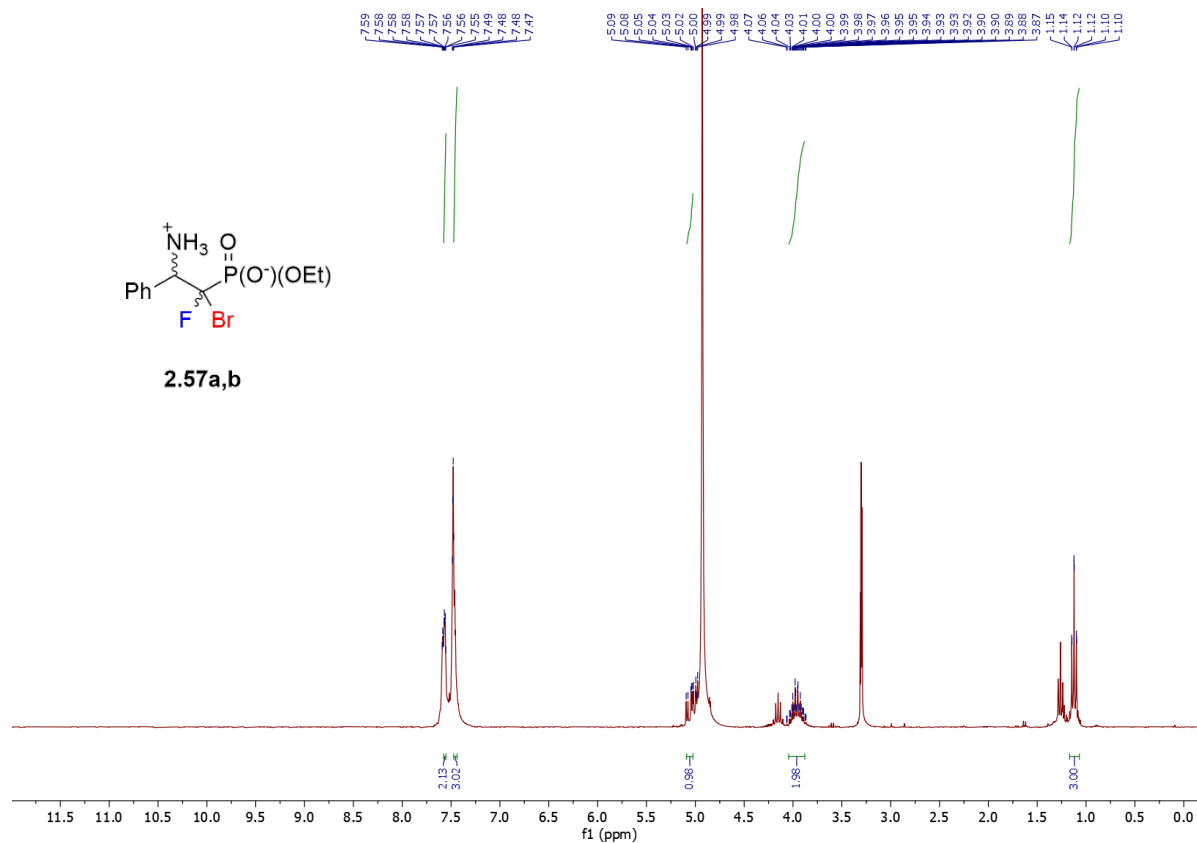
Widmo $^{31}\text{P}\{^1\text{H}\}$ NMR związku **2.52a,b** *dr* 1:0,65.



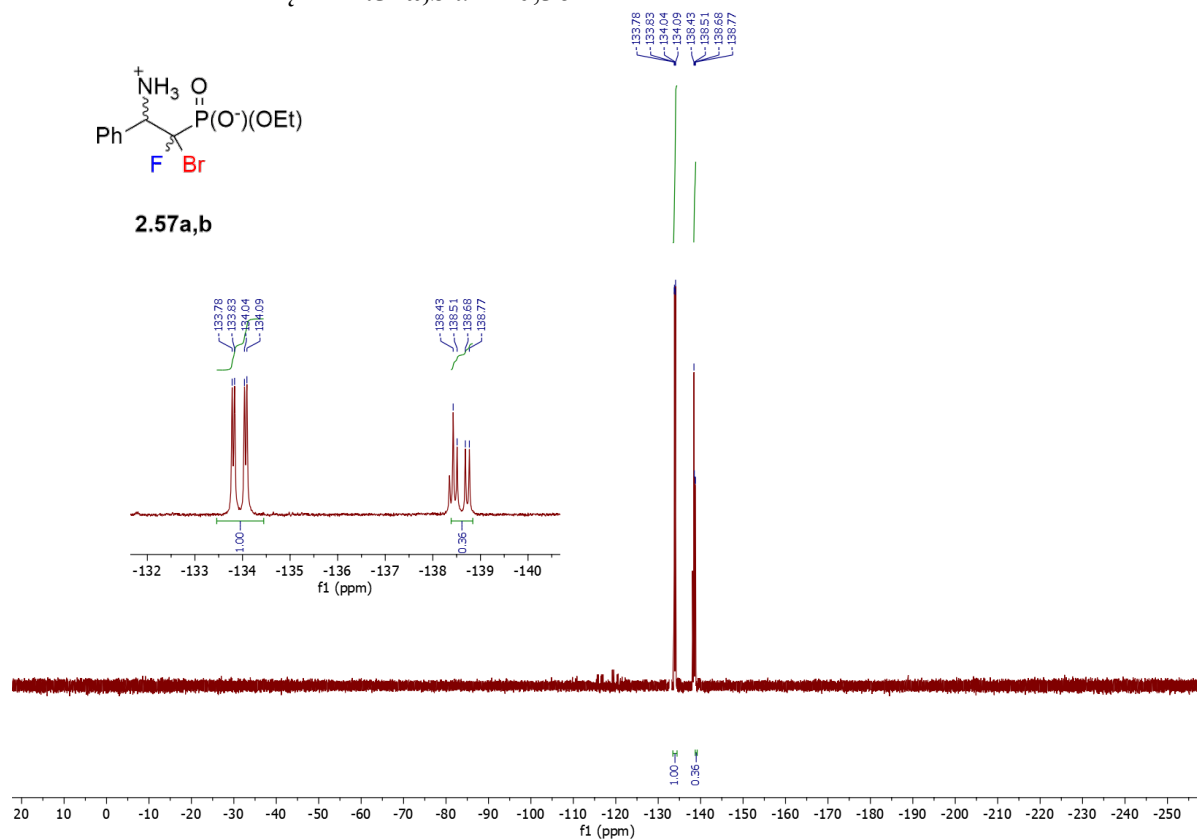
2.53a-d



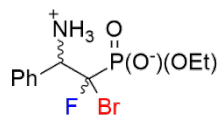
Widmo $^1\text{H}\{^1\text{H}\}$ NMR związku **2.53a-d** *dr dr* 1:0,81:0,10:0,09.



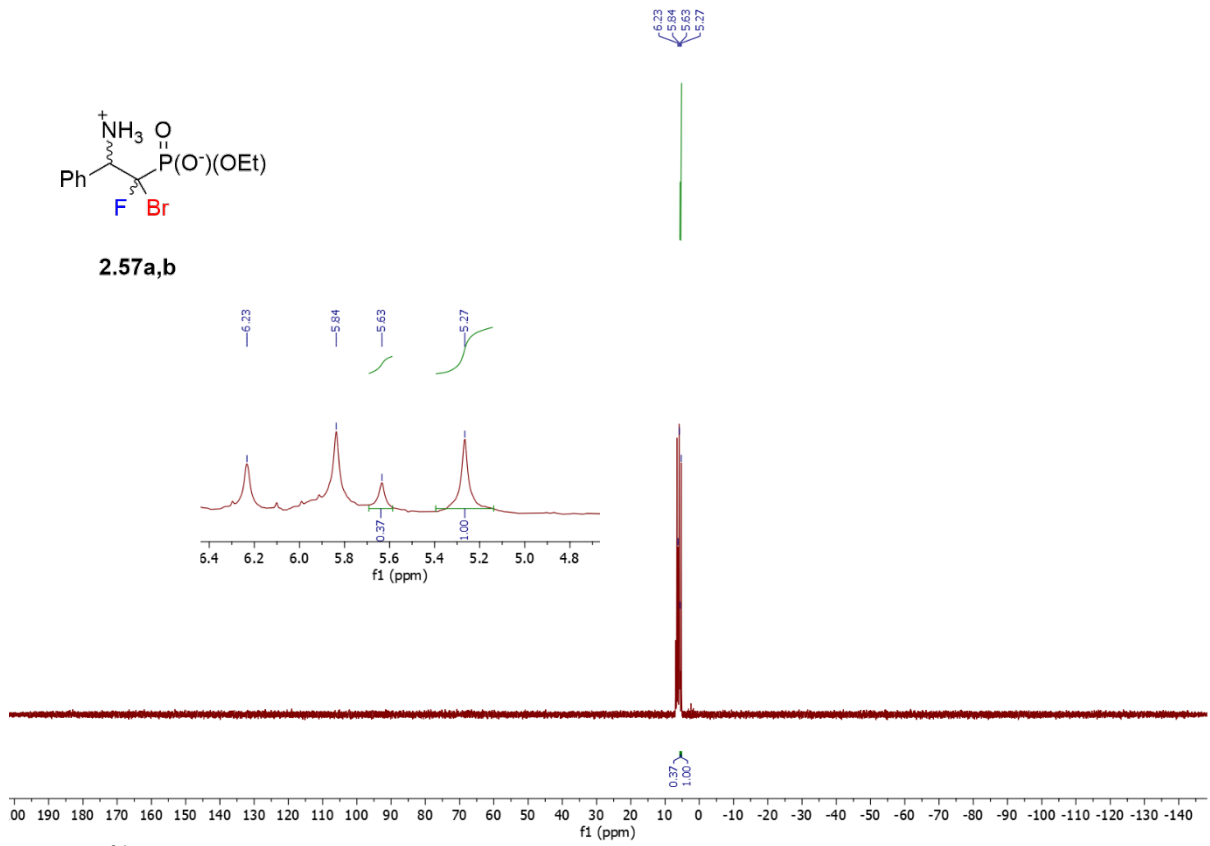
Widmo ^1H NMR związku **2.57a,b** *dr* 1:0,36.



Widmo ^{19}F NMR związku **2.57a,b** *dr* 1:0,36.



2.57a,b



Widmo ³¹P NMR związku 2.57a,b *dr* 1:0,36.