

Supplementary Information

(2-Fluoroallyl)pyridinium tetrafluoroborates: novel fluorinated electrophiles for Pd-catalyzed allylic substitution

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Fax: +7499 135 63 90; e-mail: manovikov@ioc.ac.ru

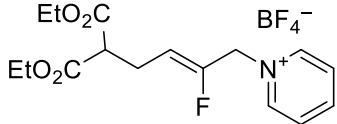
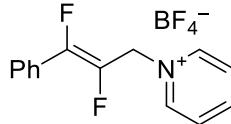
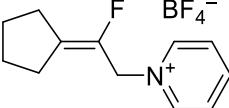
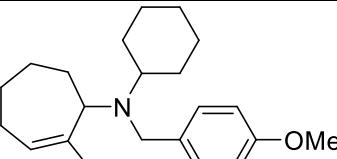
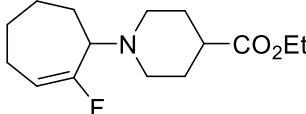
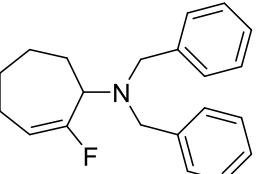
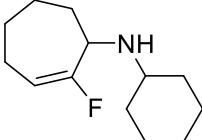
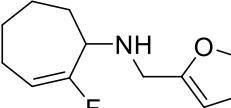
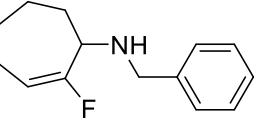
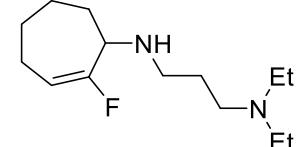
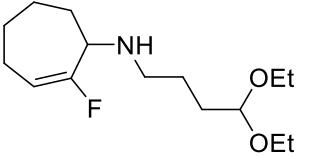
Copies of ¹H, ¹⁹F, ¹³C NMR

gem-Bromofluorocyclopropanes

		S6 S7 S8			S9 S10 S11
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(2-Fluoroallyl)pyridinium tetrafluoroborates

		S12 S13 S14			S24 S25 S26
		S15 S16 S17			S27 S28 S29
		S18 S19 S20			S30 S31 S32
		S21 S22 S23			S33 S34 S35

2i		¹ H ¹⁹ F ¹³ C{ ¹ H}	S36 S37 S38	2k		¹ H ¹⁹ F ¹³ C{ ¹ H}	S42 S43 S44
2j		¹ H ¹⁹ F ¹³ C{ ¹ H}	S39 S40 S41				
Tertiary 2-fluoroallyl amines							
4a		¹ H ¹⁹ F ¹³ C{ ¹ H}	S45 S46 S47	4c		¹ H ¹⁹ F ¹³ C{ ¹ H}	S51 S52 S53
4b		¹ H ¹⁹ F ¹³ C{ ¹ H}	S48 S49 S50				
Secondary 2-fluoroallyl amines							
5a		¹ H ¹⁹ F ¹³ C{ ¹ H}	S54 S55 S56	5d		¹ H ¹⁹ F ¹³ C{ ¹ H}	S63 S64 S65
5b		¹ H ¹⁹ F ¹³ C{ ¹ H}	S57 S58 S59	5e		¹ H ¹⁹ F ¹³ C{ ¹ H}	S66 S67 S68
5c		¹ H ¹⁹ F ¹³ C{ ¹ H}	S60 S61 S62				

2-Fluoroallyl anilines

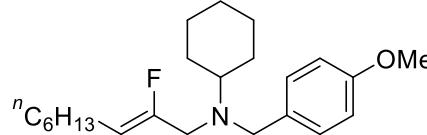
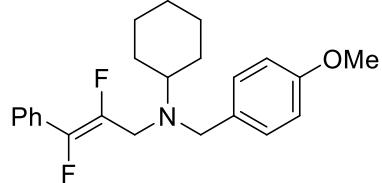
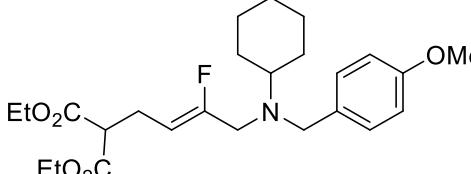
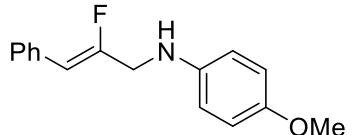
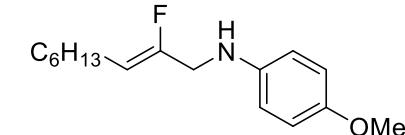
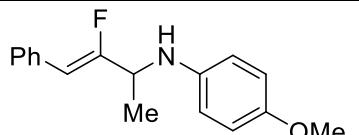
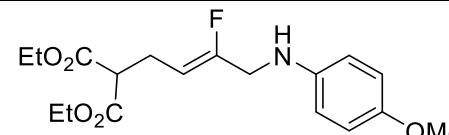
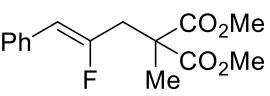
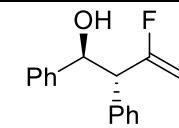
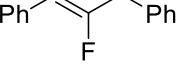
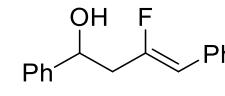
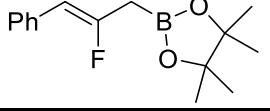
6a		^{1H} ^{19F} ^{13C{1H}}	S69 S70 S71	6d		^{1H} ^{19F} ^{13C{1H}}	S78 S79 S80
6b		^{1H} ^{19F} ^{13C{1H}}	S72 S73 S74	6e		^{1H} ^{19F} ^{13C{1H}}	S81 S82 S83
6c		^{1H} ^{19F} ^{13C{1H}}	S75 S76 S77	6f		^{1H} ^{19F} ^{13C{1H}}	S84 S85 S86

2-Fluoroallyl amides/sulfamides

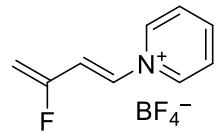
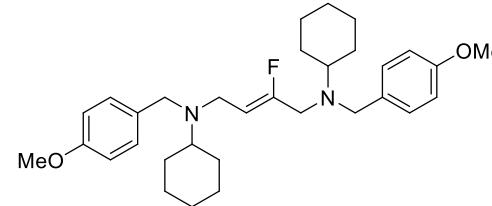
7		^{1H} ^{19F} ^{13C{1H}}	S87 S88 S89	8		^{1H} ^{19F} ^{13C{1H}}	S90 S91 S92
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(2-Fluoroallyl)pyridinium salt scope with amines

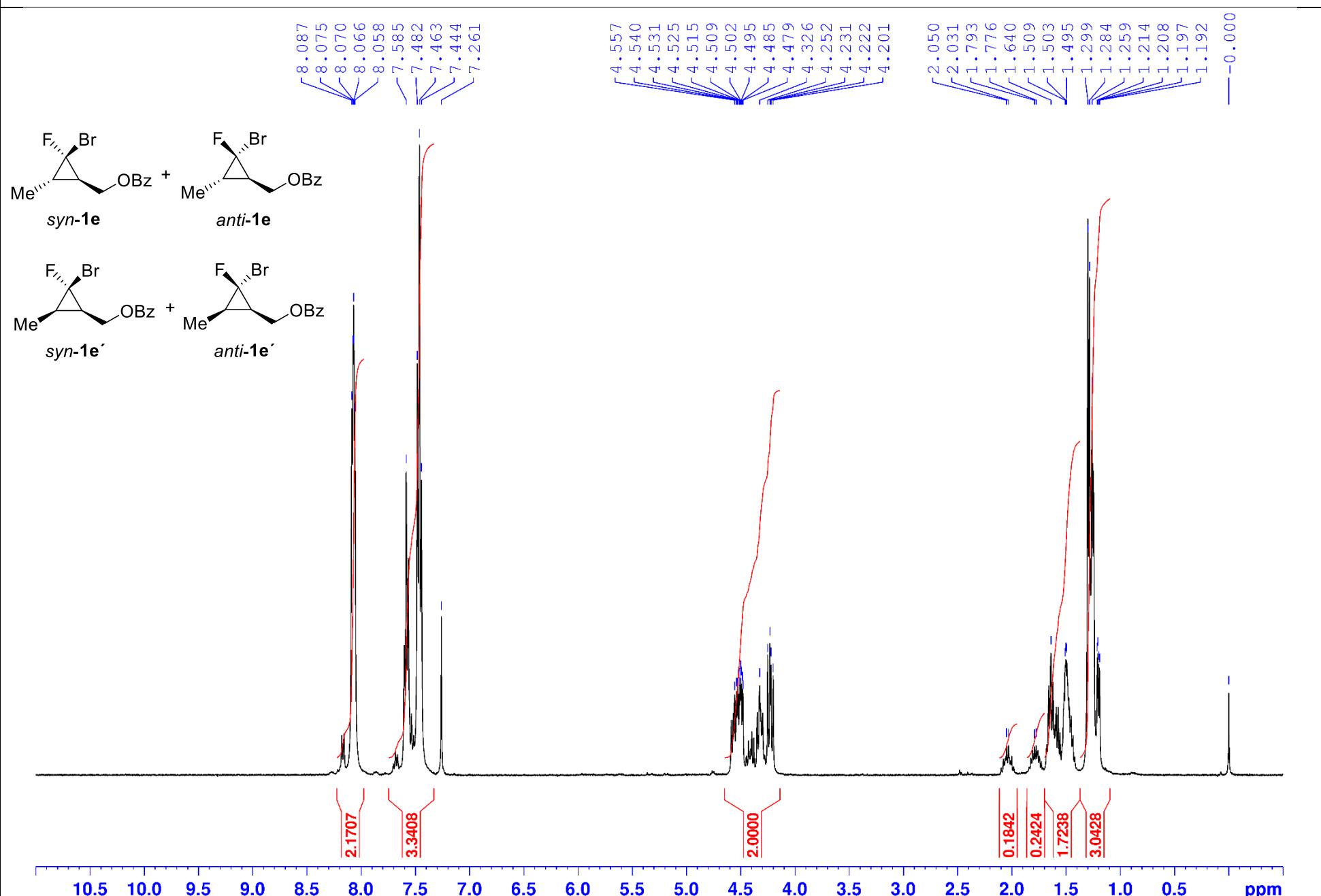
10a		^{1H} ^{19F} ^{13C{1H}}	S93 S94 S95	10d		^{1H} ^{19F} ^{13C{1H}}	S99 S100 S101
10b		^{1H} ^{19F} ^{13C{1H}}	S96 S97 S98	10e		^{1H} ^{19F} ^{13C{1H}}	S102 S103 S104

10f		¹ H ¹⁹ F ¹³ C{ ¹ H}	S105 S106 S107	10k		¹ H ¹⁹ F ¹³ C{ ¹ H}	S111 S112 S113
10i		¹ H ¹⁹ F ¹³ C{ ¹ H}	S108 S109 S110				
(2-Fluoroallyl)pyridinium salt scope with anilines							
11a		¹ H ¹⁹ F ¹³ C{ ¹ H}	S114 S115 S116	11f		¹ H ¹⁹ F ¹³ C{ ¹ H}	S120 S121 S122
11b		¹ H ¹⁹ F ¹³ C{ ¹ H}	S117 S118 S119	11i		¹ H ¹⁹ F ¹³ C{ ¹ H}	S123 S124 S125
Reactions with other nucleophiles							
13		¹ H ¹⁹ F ¹³ C{ ¹ H}	S126 S127 S128	16		¹ H ¹⁹ F ¹³ C{ ¹ H}	S135 S136 S137
14		¹ H ¹⁹ F ¹³ C{ ¹ H}	S129 S130 S131	17		¹ H ¹⁹ F ¹³ C{ ¹ H}	S138 S139 S140
15		¹ H ¹⁹ F ¹³ C{ ¹ H}	S132 S133 S134				

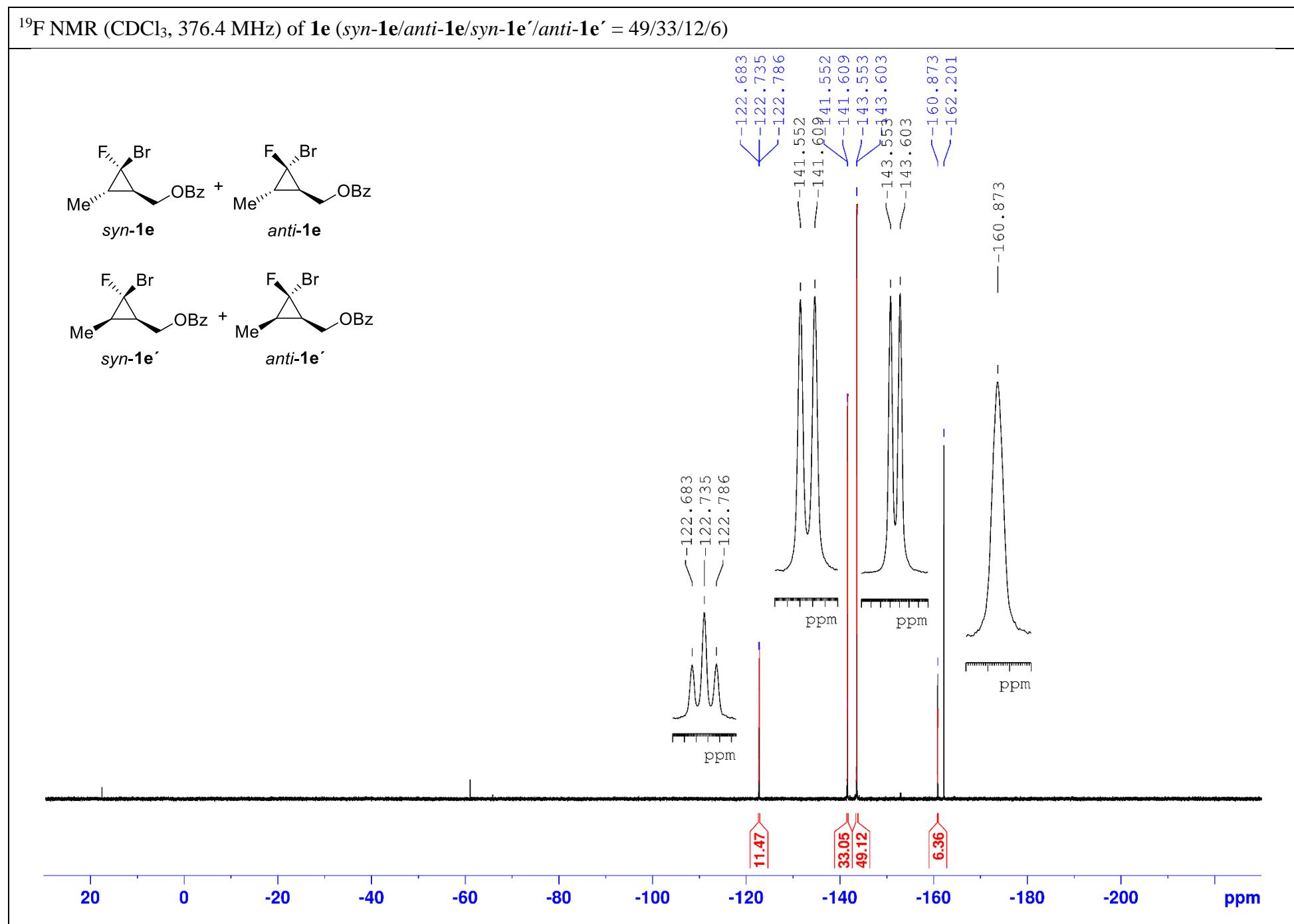
Side products

S2 $\frac{^1\text{H}}{^{19}\text{F}}$
 $\underline{\text{C}\{^1\text{H}\}}$ S141
S142
S143**12** $\frac{^1\text{H}}{^{19}\text{F}}$
 $\underline{\text{C}\{^1\text{H}\}}$ S144
S145
S146

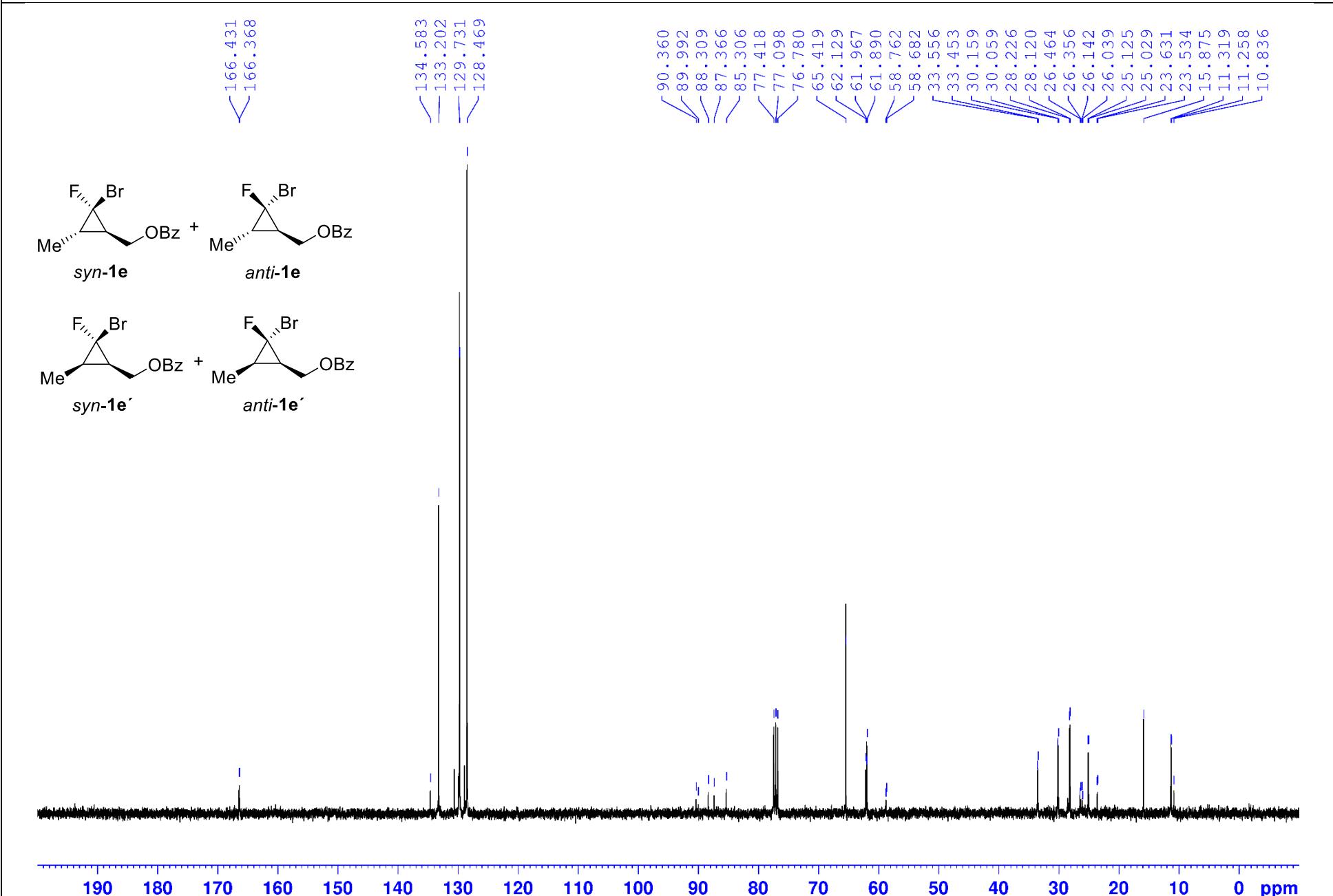
¹H NMR (CDCl_3 , 400.0 MHz) of **1e** (*syn*-**1e**/*anti*-**1e**/*syn*-**1e'**/*anti*-**1e'** = 49/33/12/6)



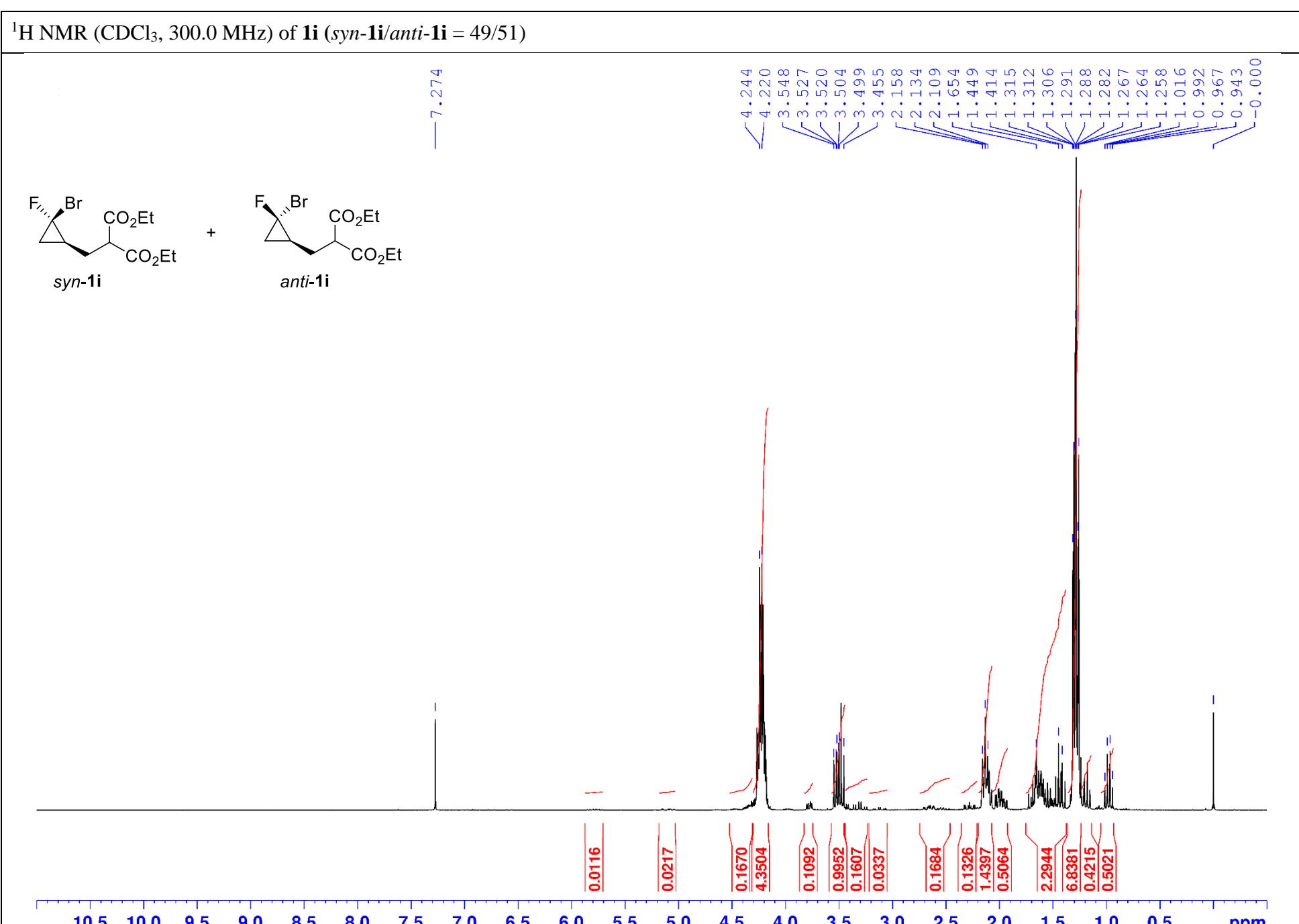
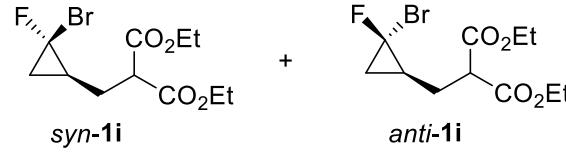
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **1e** (*syn*-**1e**/*anti*-**1e**/*syn*-**1e'**/*anti*-**1e'** = 49/33/12/6)



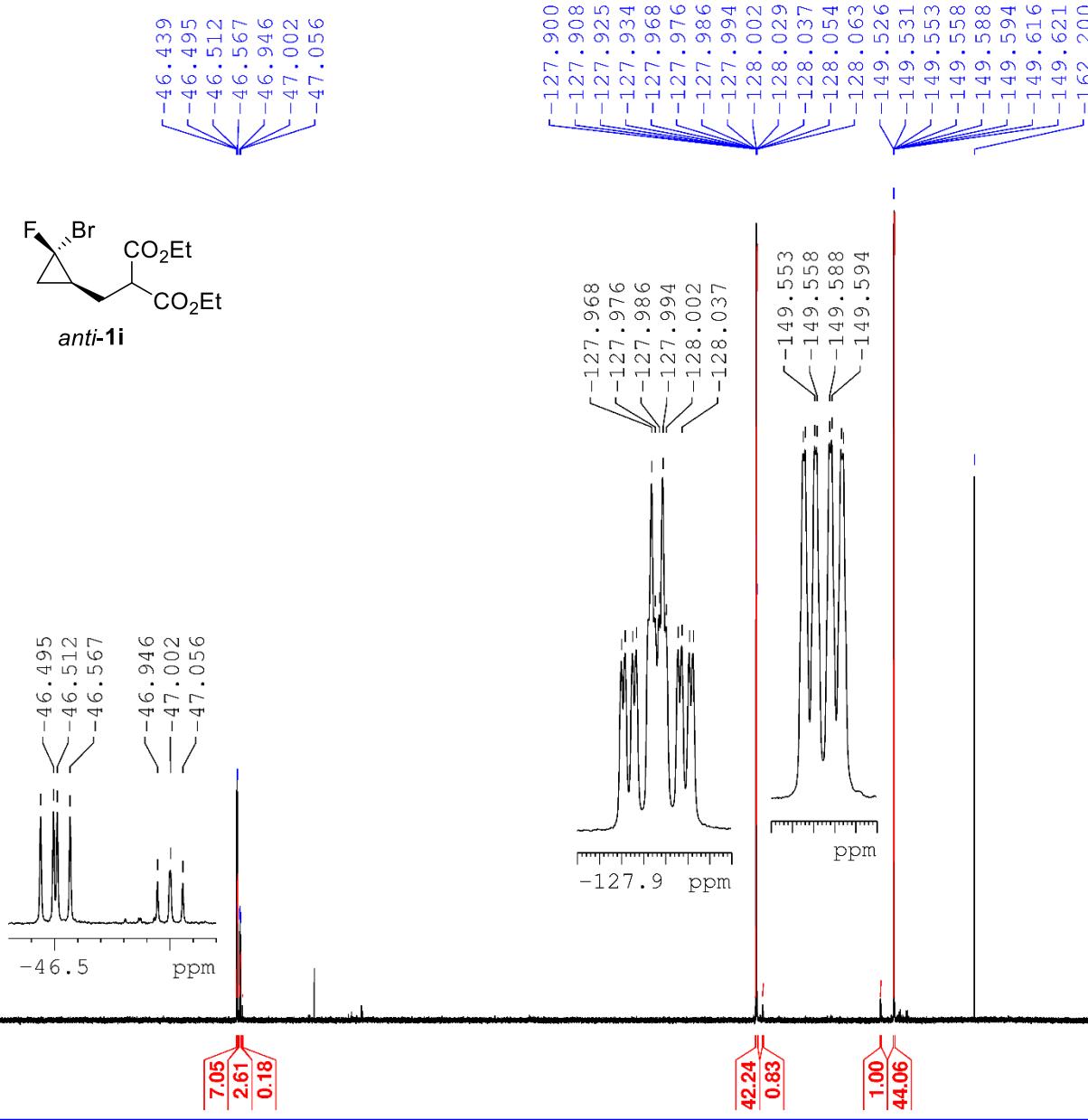
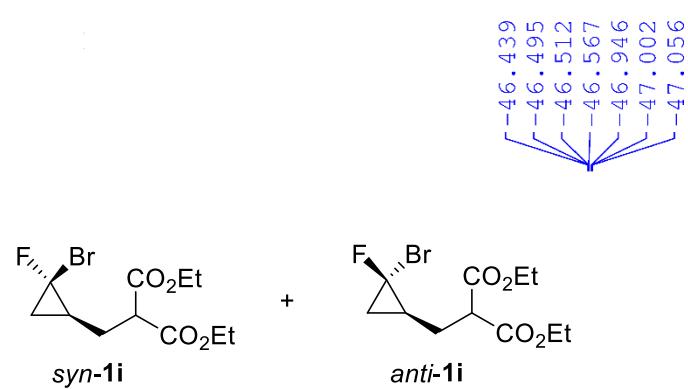
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **1e** (*syn-1e/anti-1e/syn-1e'/anti-1e'* = 49/33/12/6)



¹H NMR (CDCl₃, 300.0 MHz) of **1i** (*syn-1i/anti-1i* = 49/51)

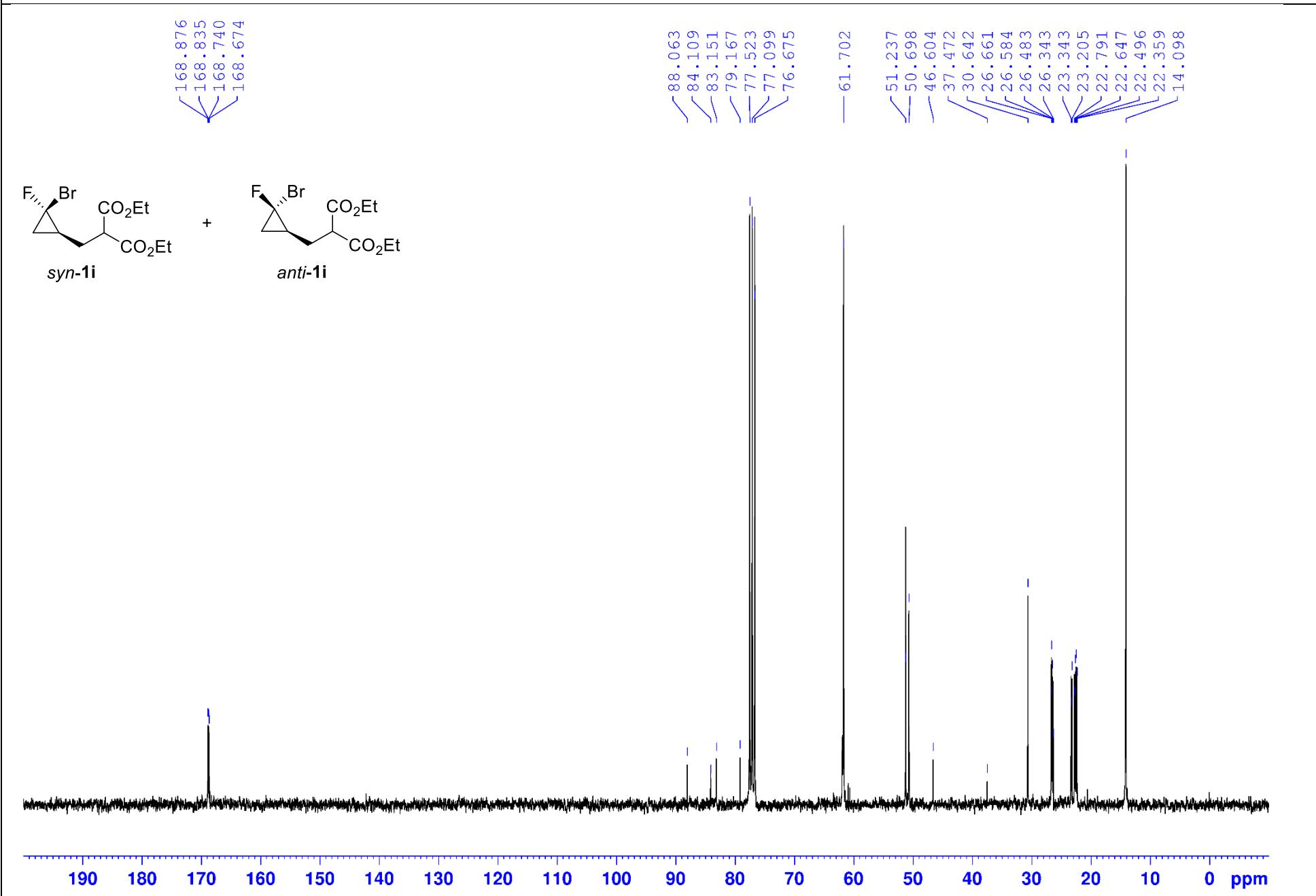


¹⁹F NMR (CDCl_3 , 282.4 MHz) of **1i** (*syn-1i/anti-1i* = 49/51)

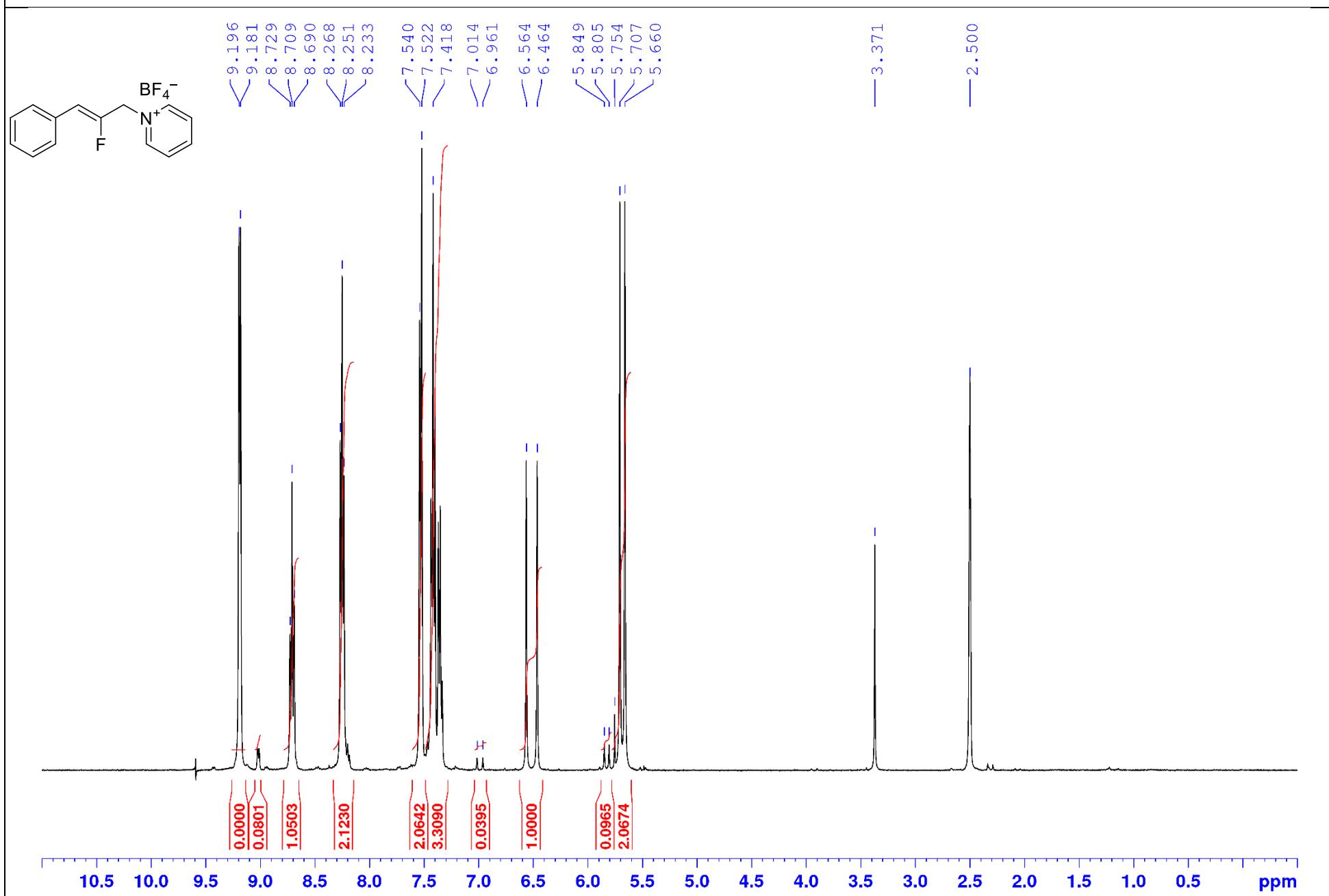


20 0 -20 -40 -60 -80 -100 -120 -140 -160 -180 -200 ppm

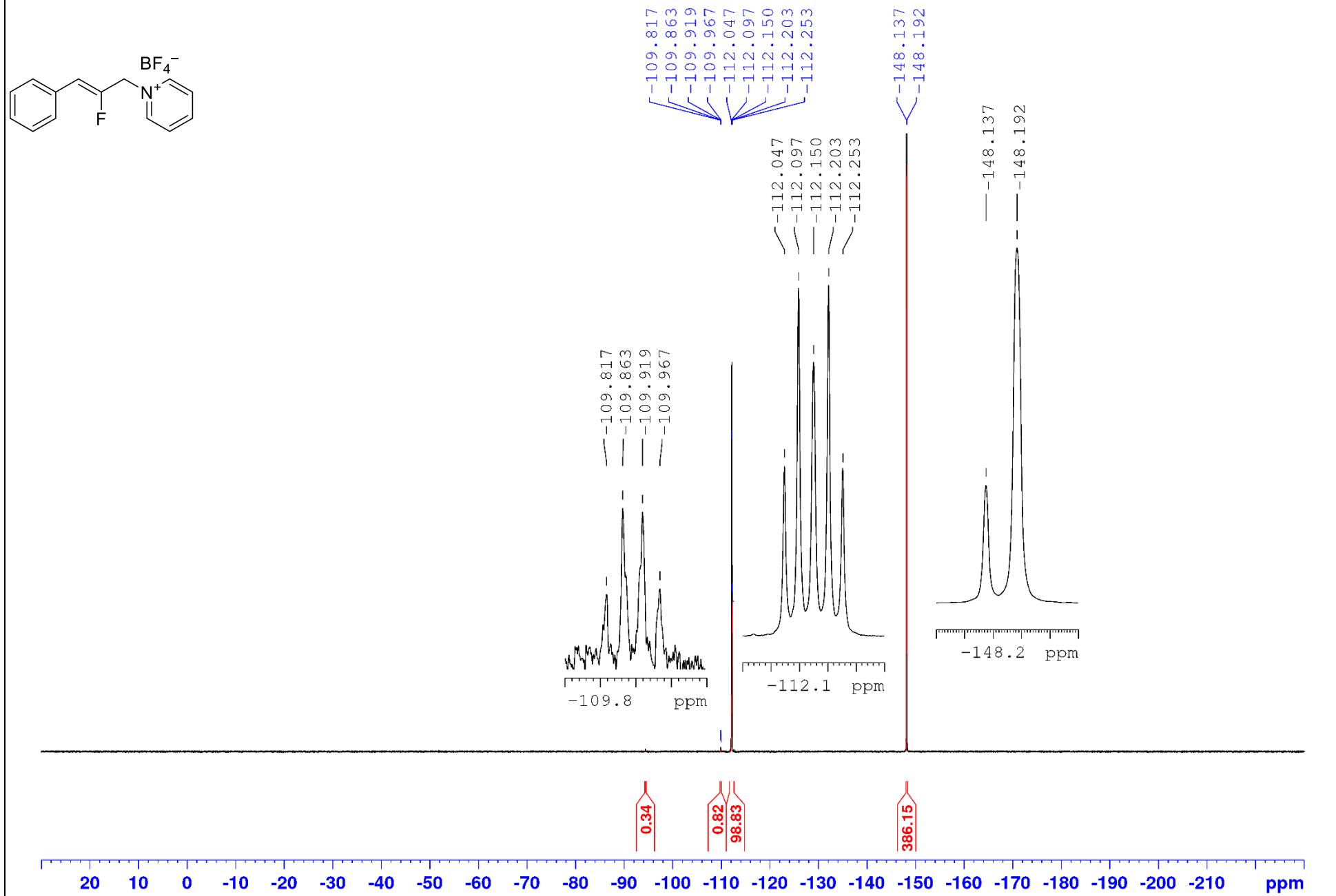
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 75.5 MHz) of **1i** (*syn*-**1i**/*anti*-**1i** = 49/51)



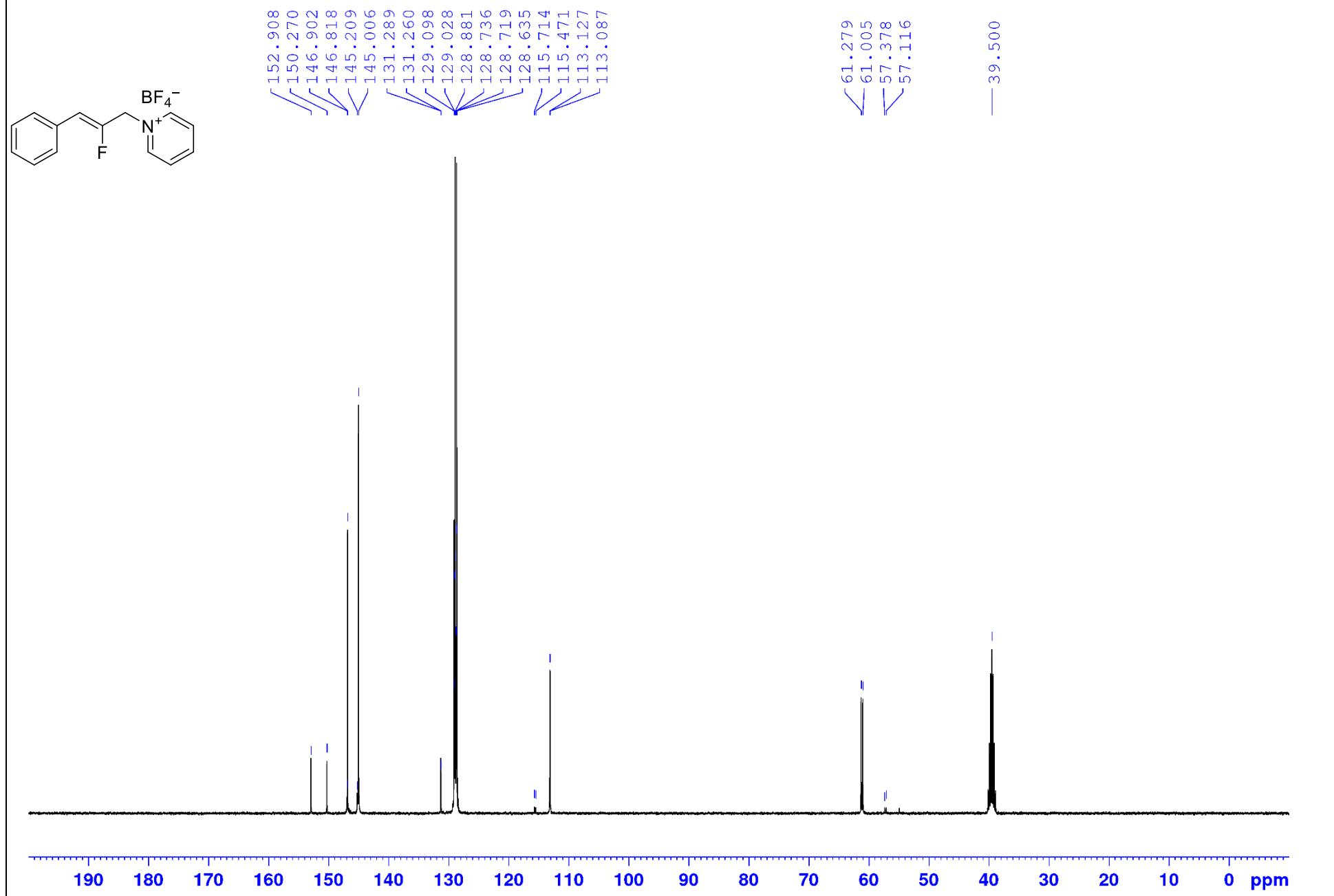
¹H NMR (DMSO-d₆, 400.0 MHz) of **2a** (Z/E = 99/1)



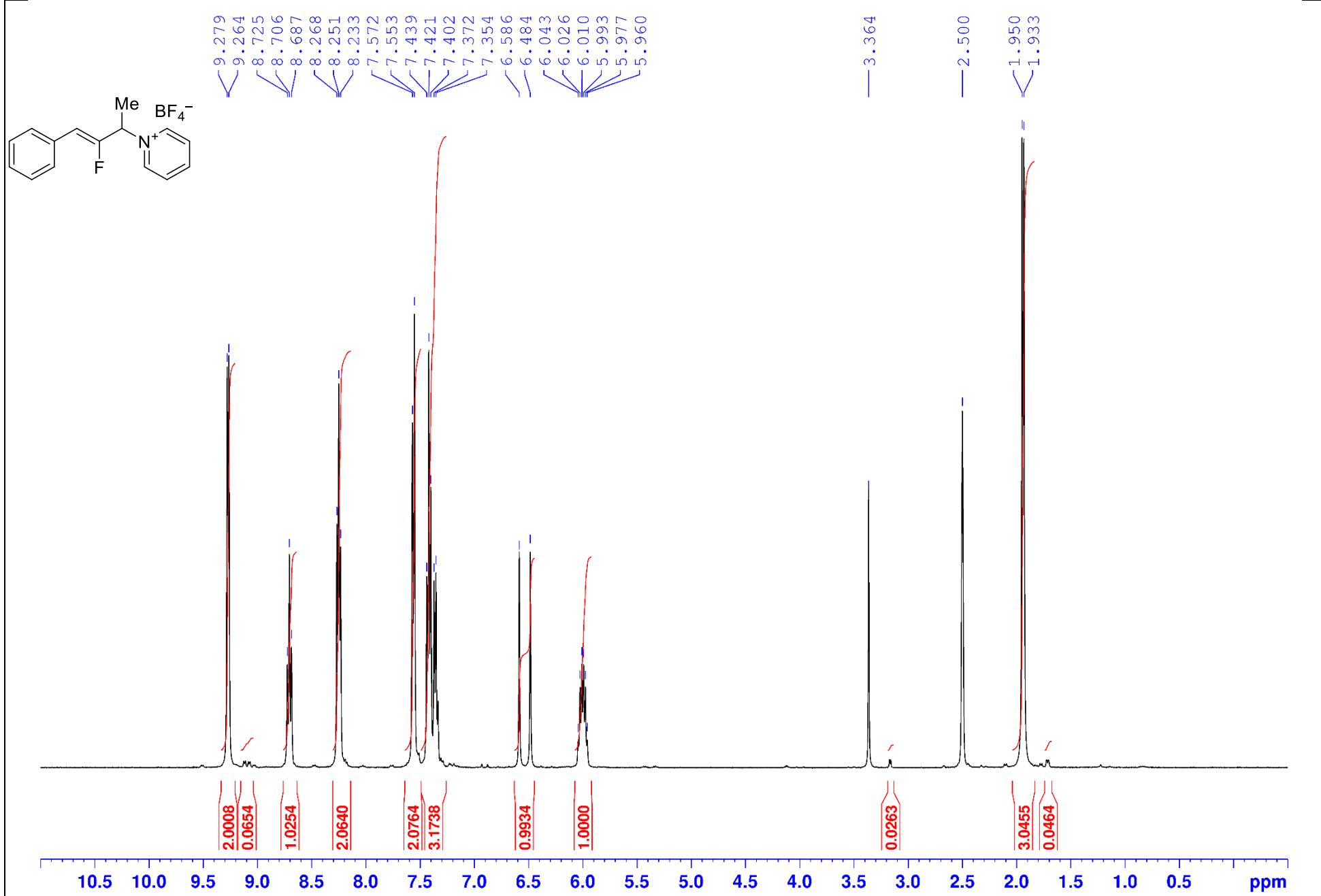
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2a** (Z/E = 99/1)



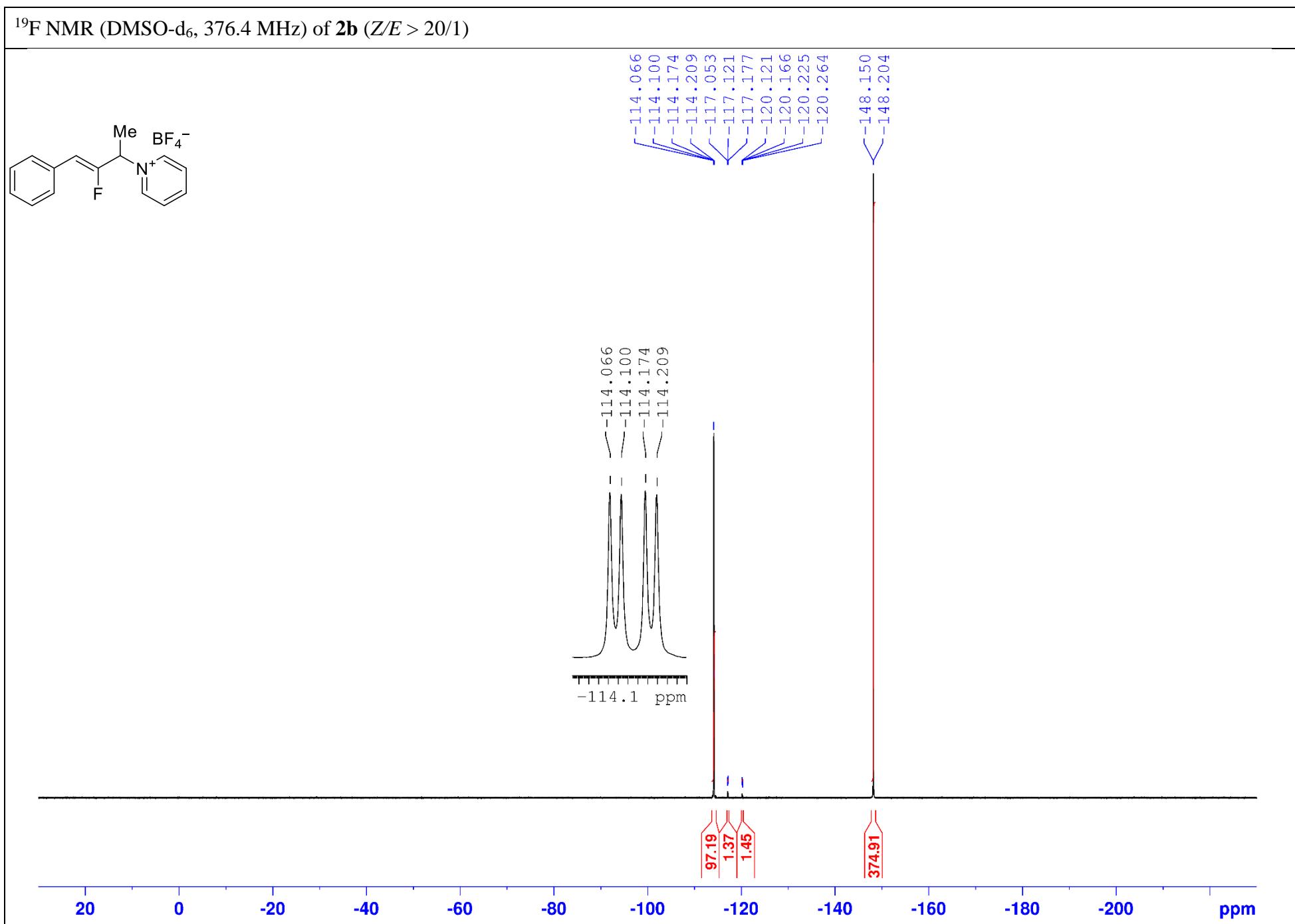
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2a** (*Z/E* = 99/1)



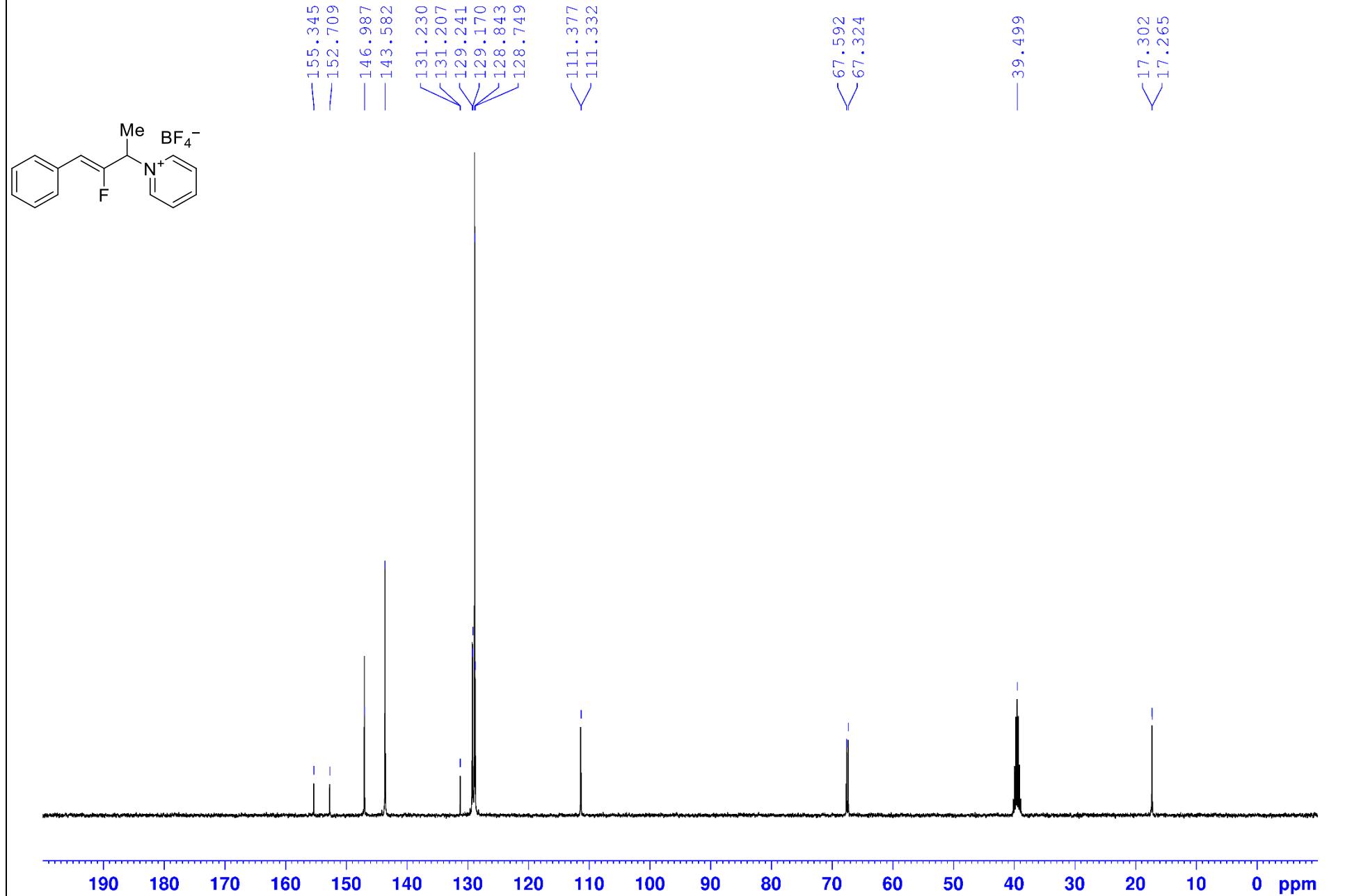
¹H NMR (DMSO-d₆, 400.0 MHz) of **2b** (Z/E > 20/1)



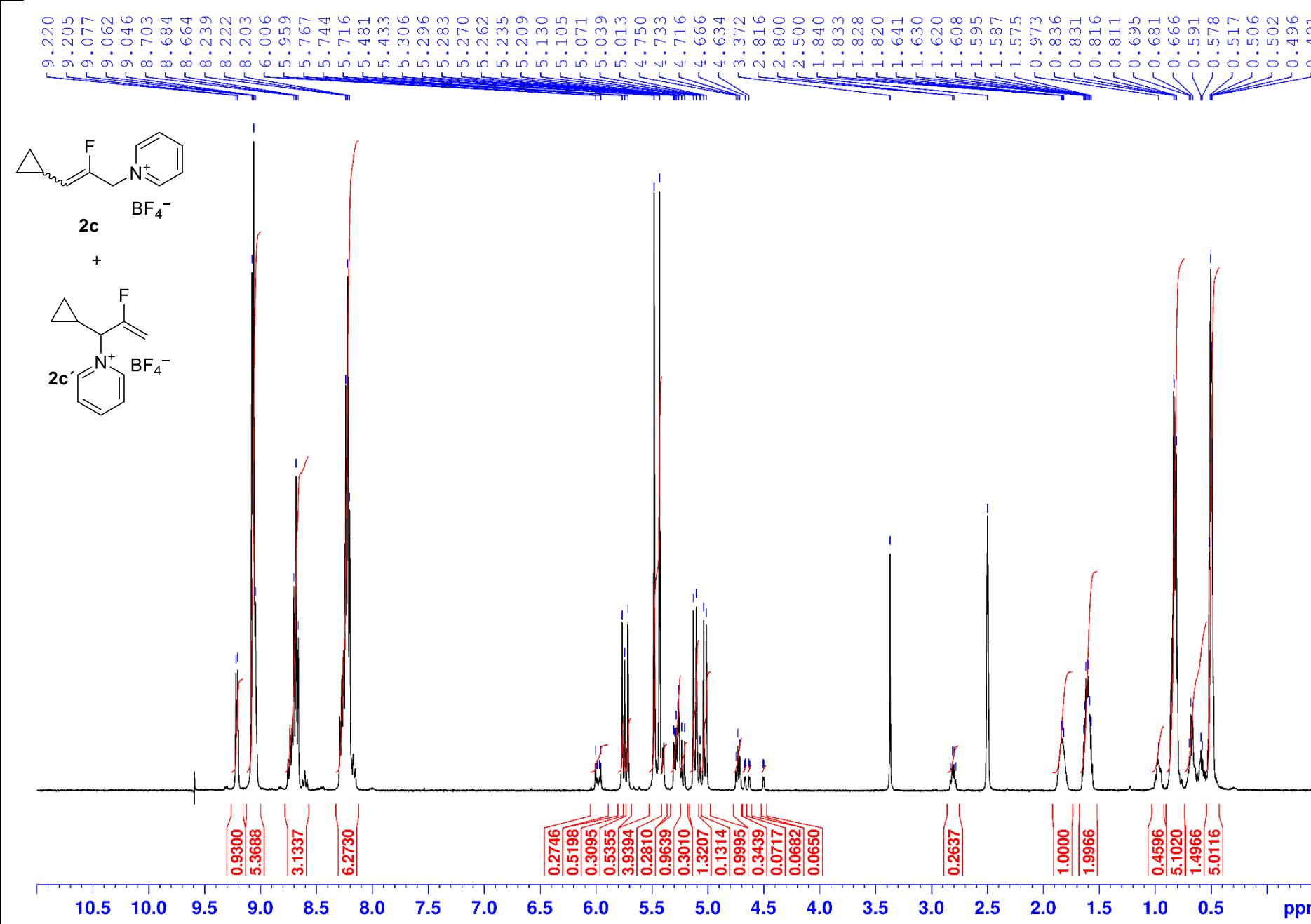
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2b** (Z/E > 20/1)



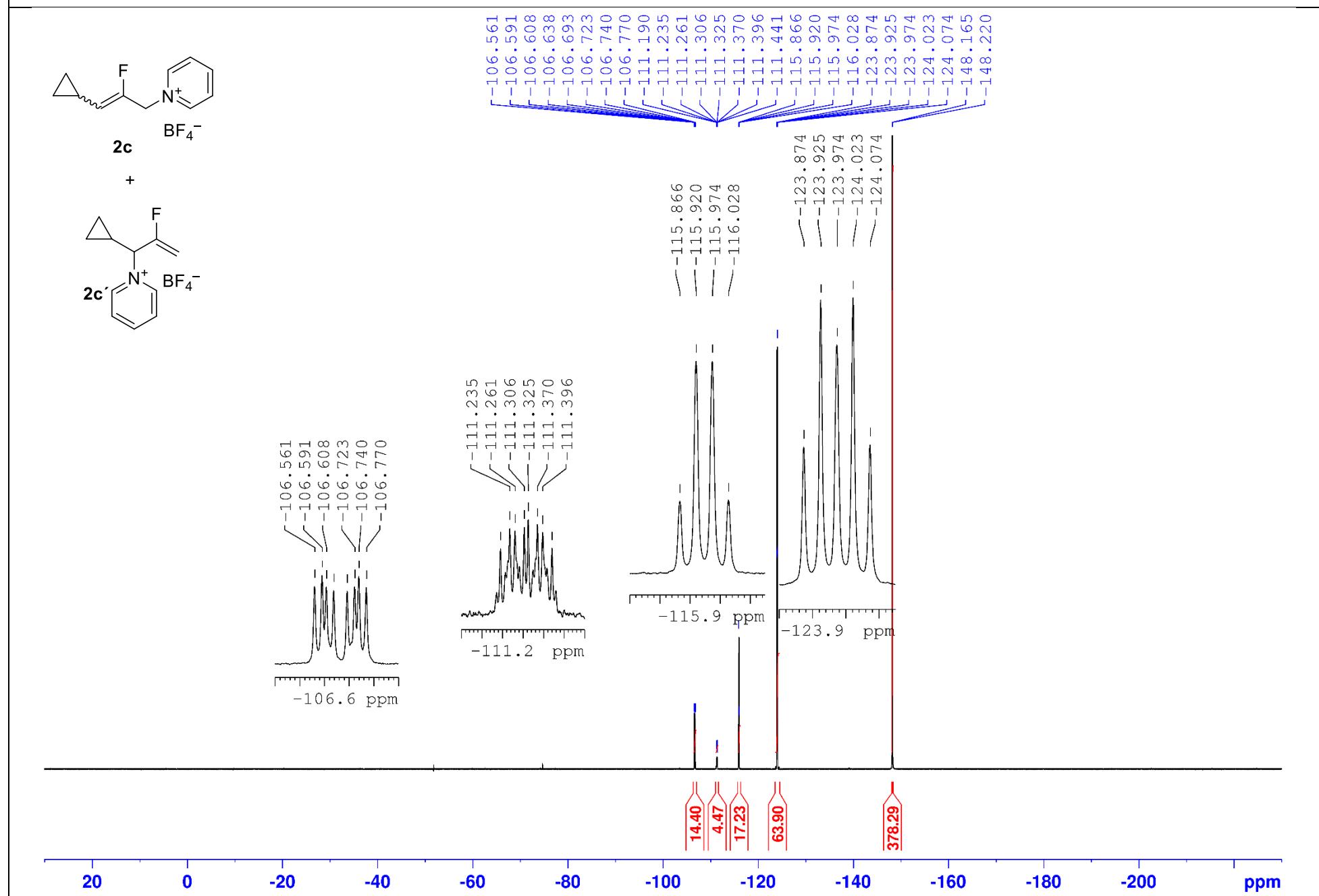
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2b** (*Z/E* > 20/1)



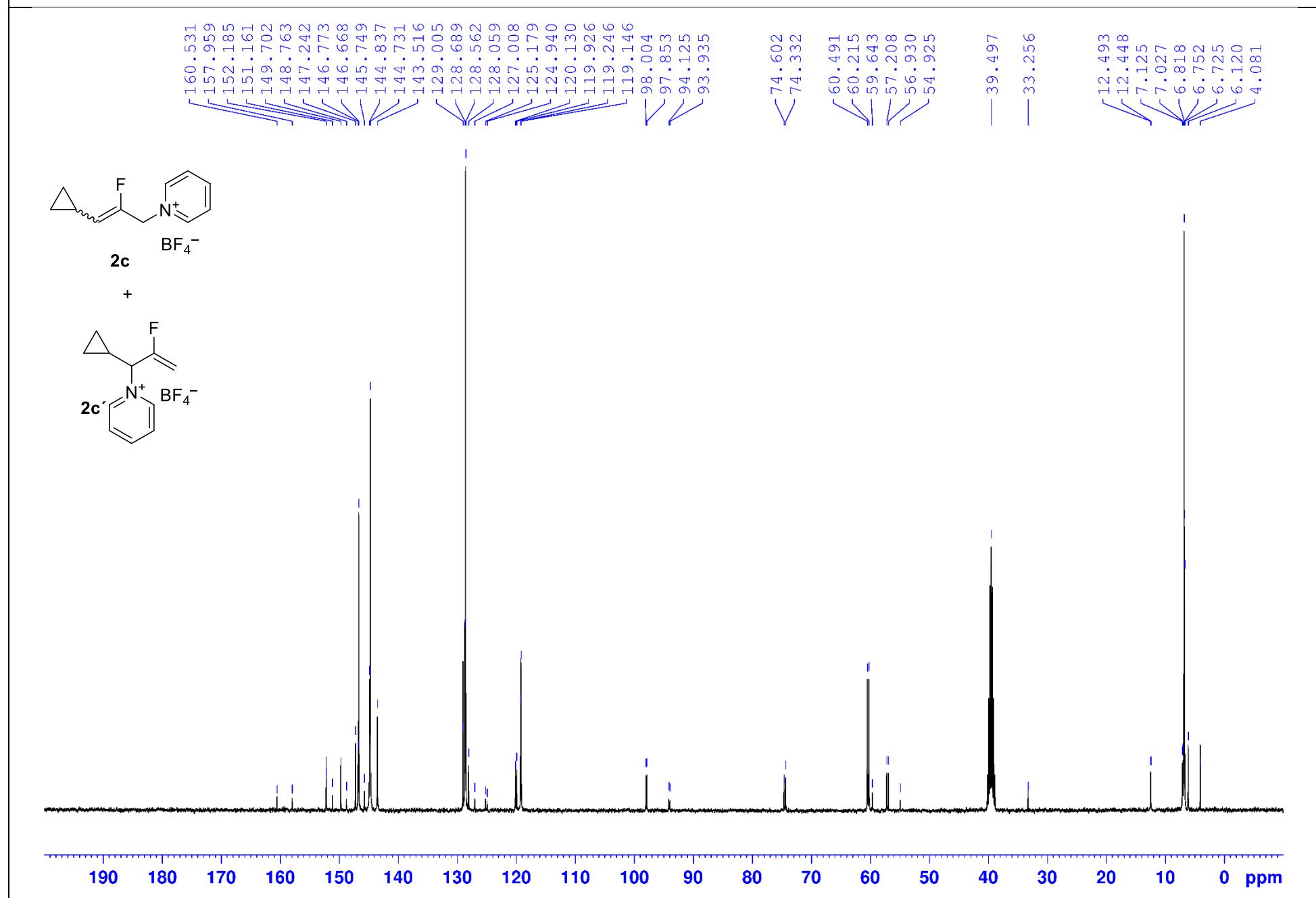
¹H NMR (DMSO-d₆, 400.0 MHz) of **2c** (Z-2c/E-2c/2c' = 67/18/15)



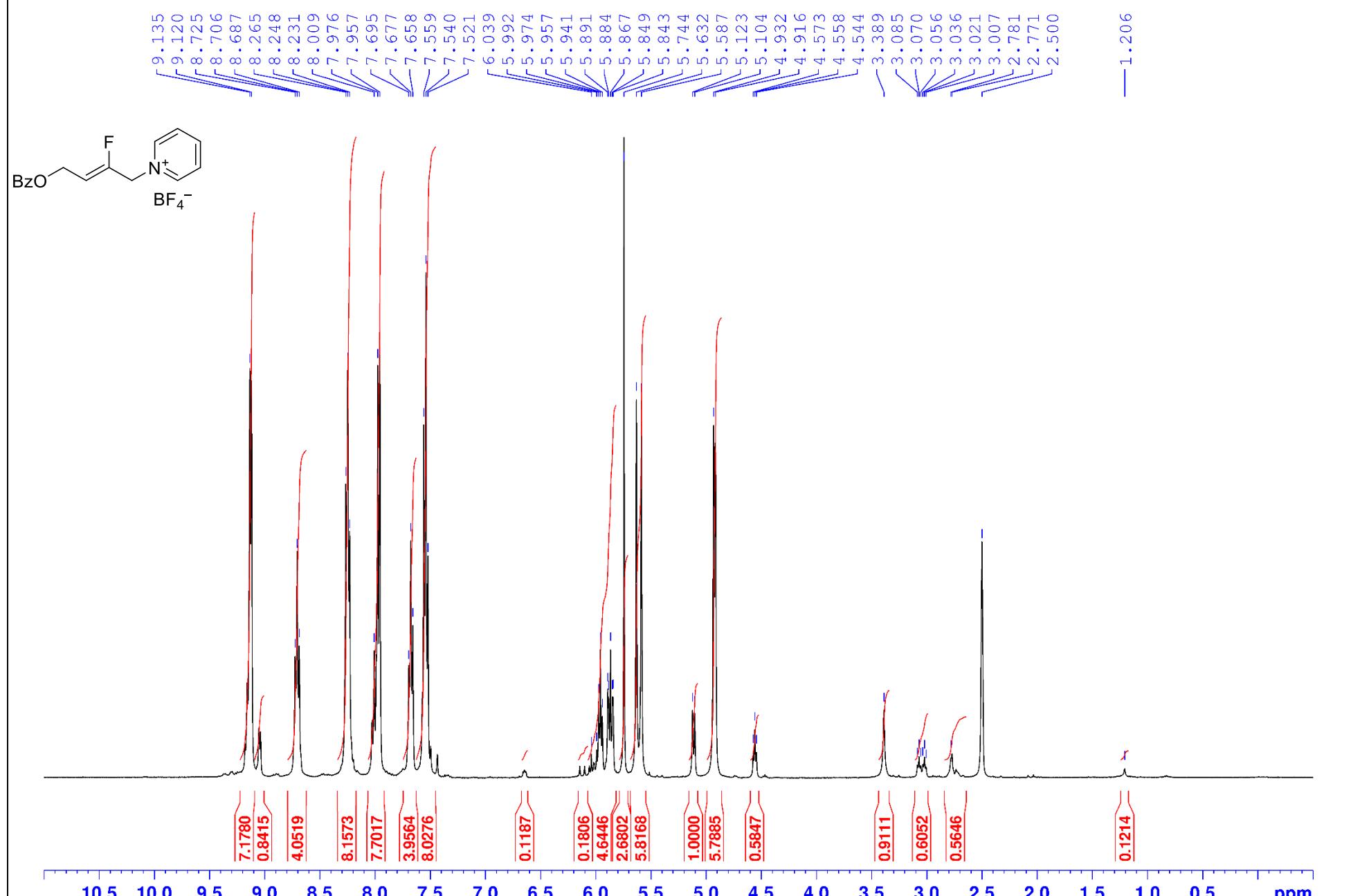
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2c** (Z-**2c**/E-**2c**/**2c'** = 67/18/15)



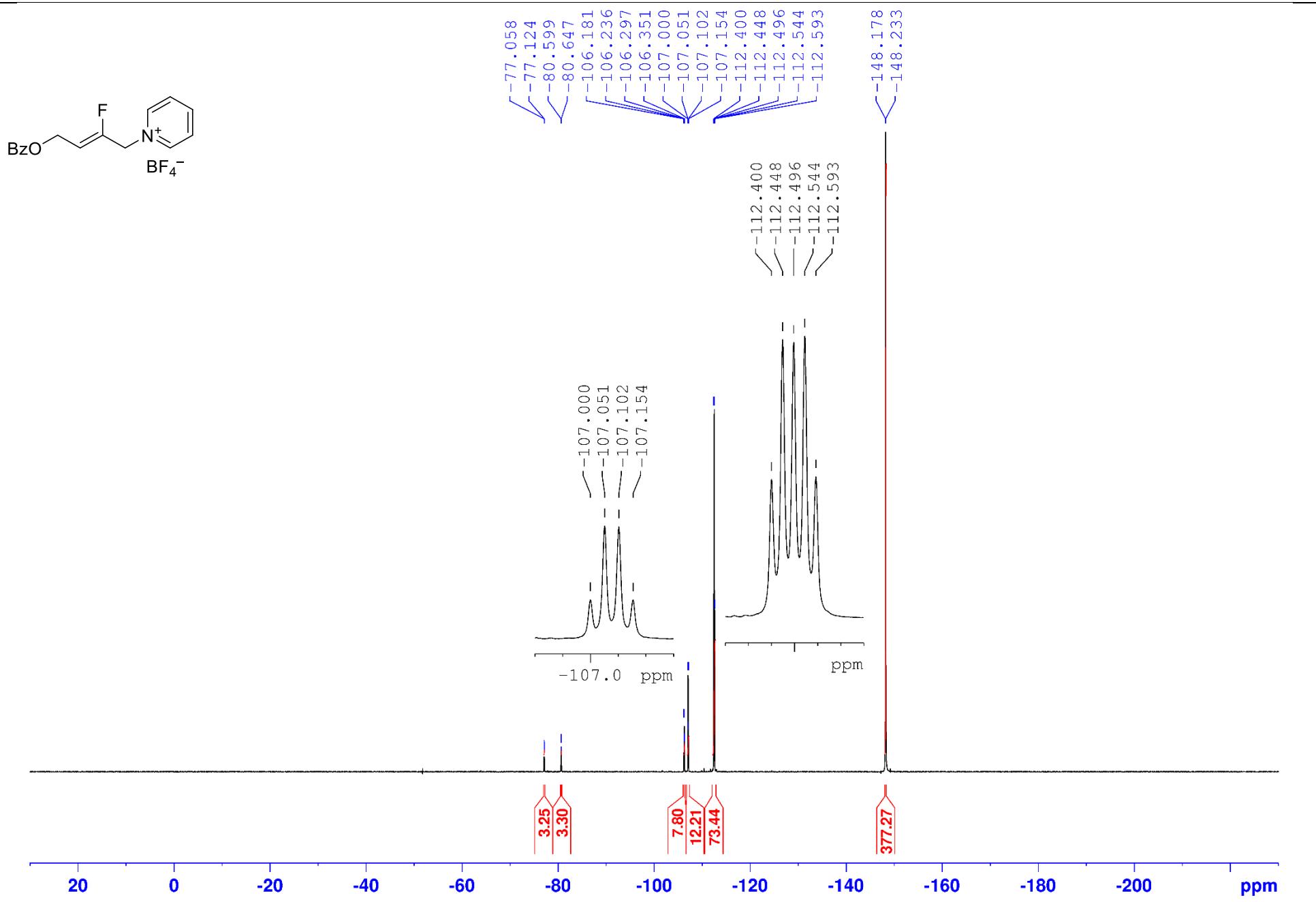
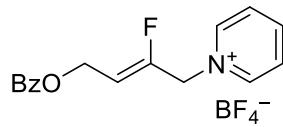
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2c** (*Z*-**2c**/*E*-**2c**/**2c'** = 67/18/15)



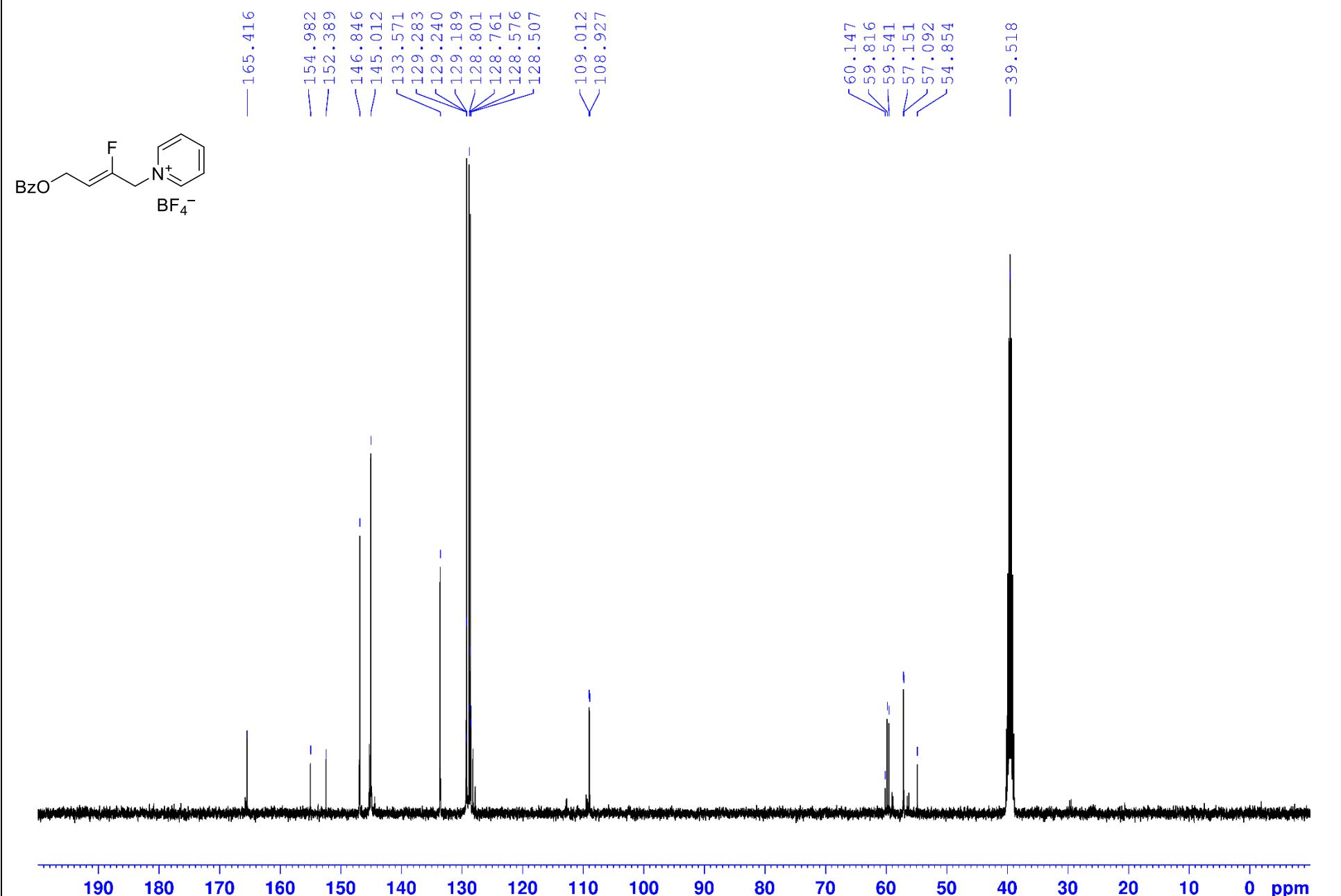
¹H NMR (DMSO-d₆, 400.0 MHz) of **2d** (Z/E = 86/14)



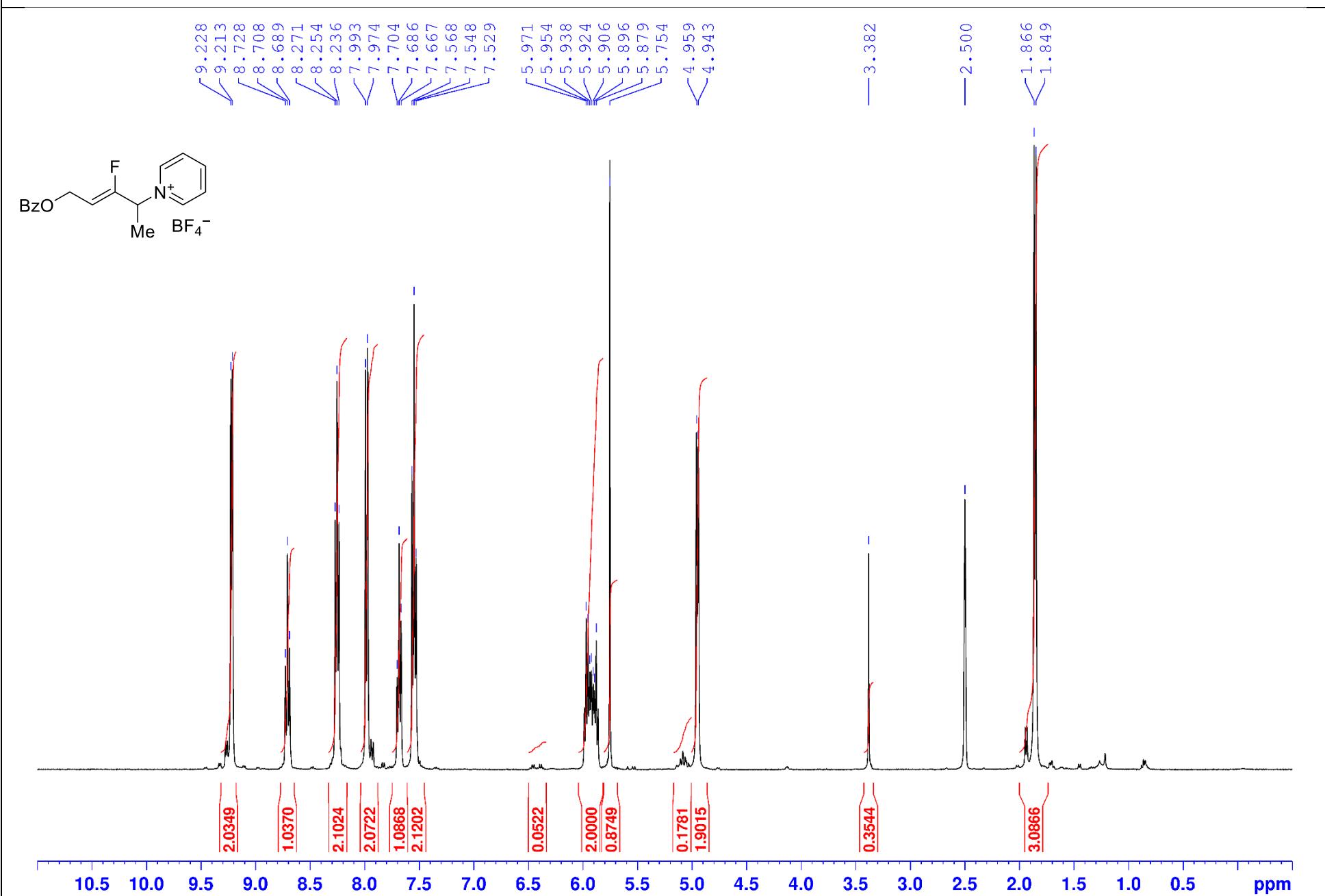
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2d** (*Z/E* = 86/14)



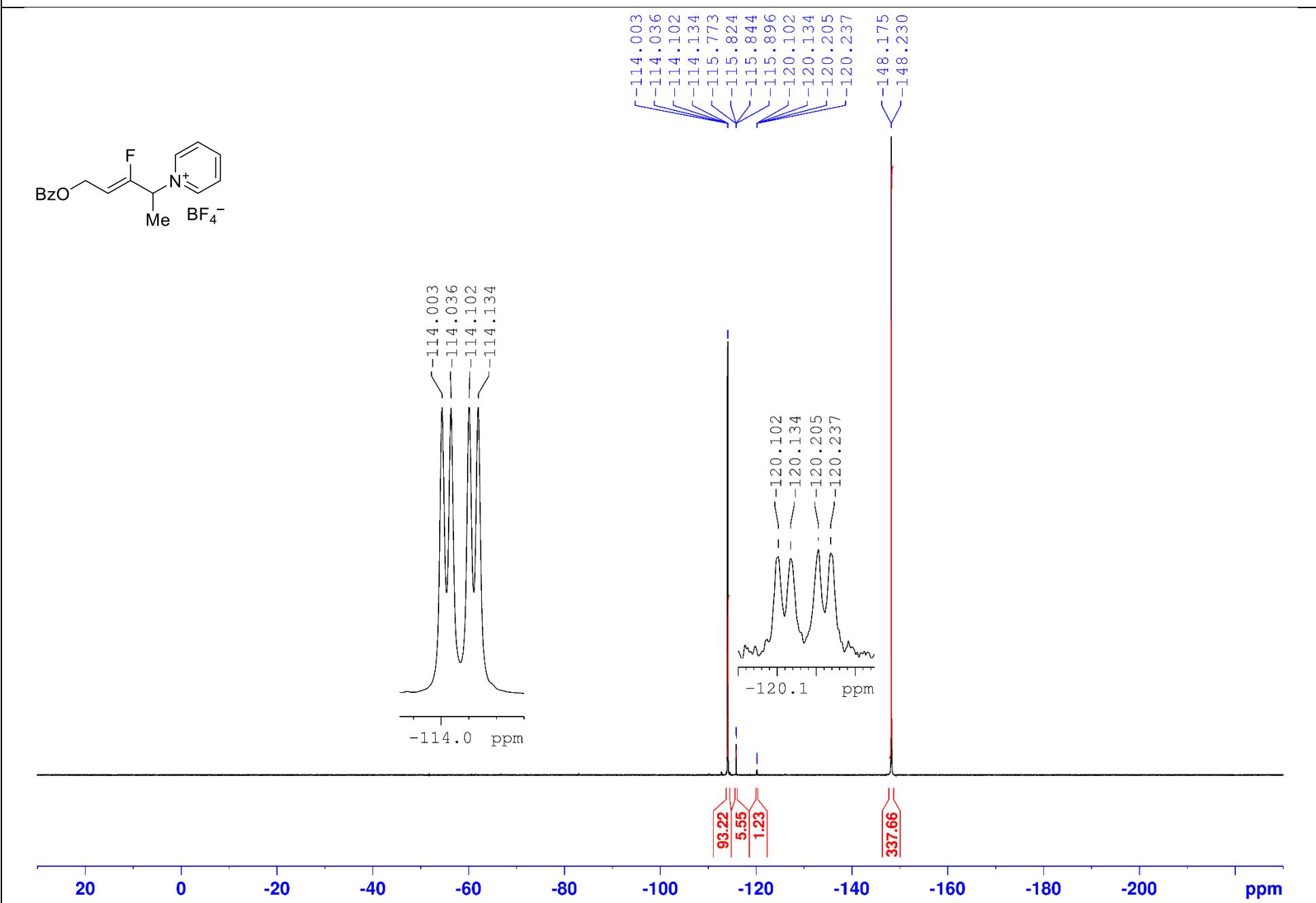
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2d** (*Z/E* = 86/14)



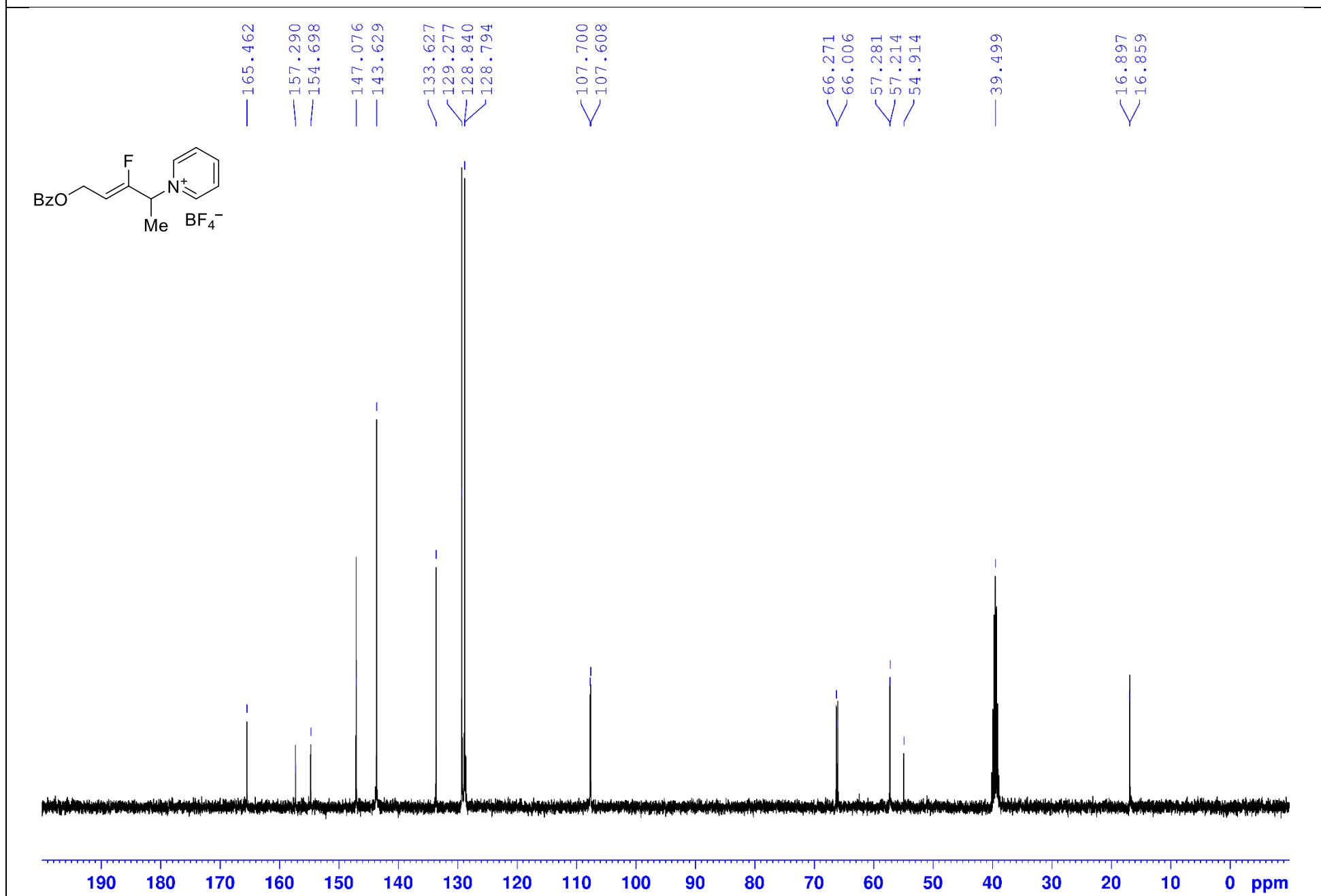
¹H NMR (DMSO-d₆, 400.0 MHz) of **2e** (Z/E = 94/6)



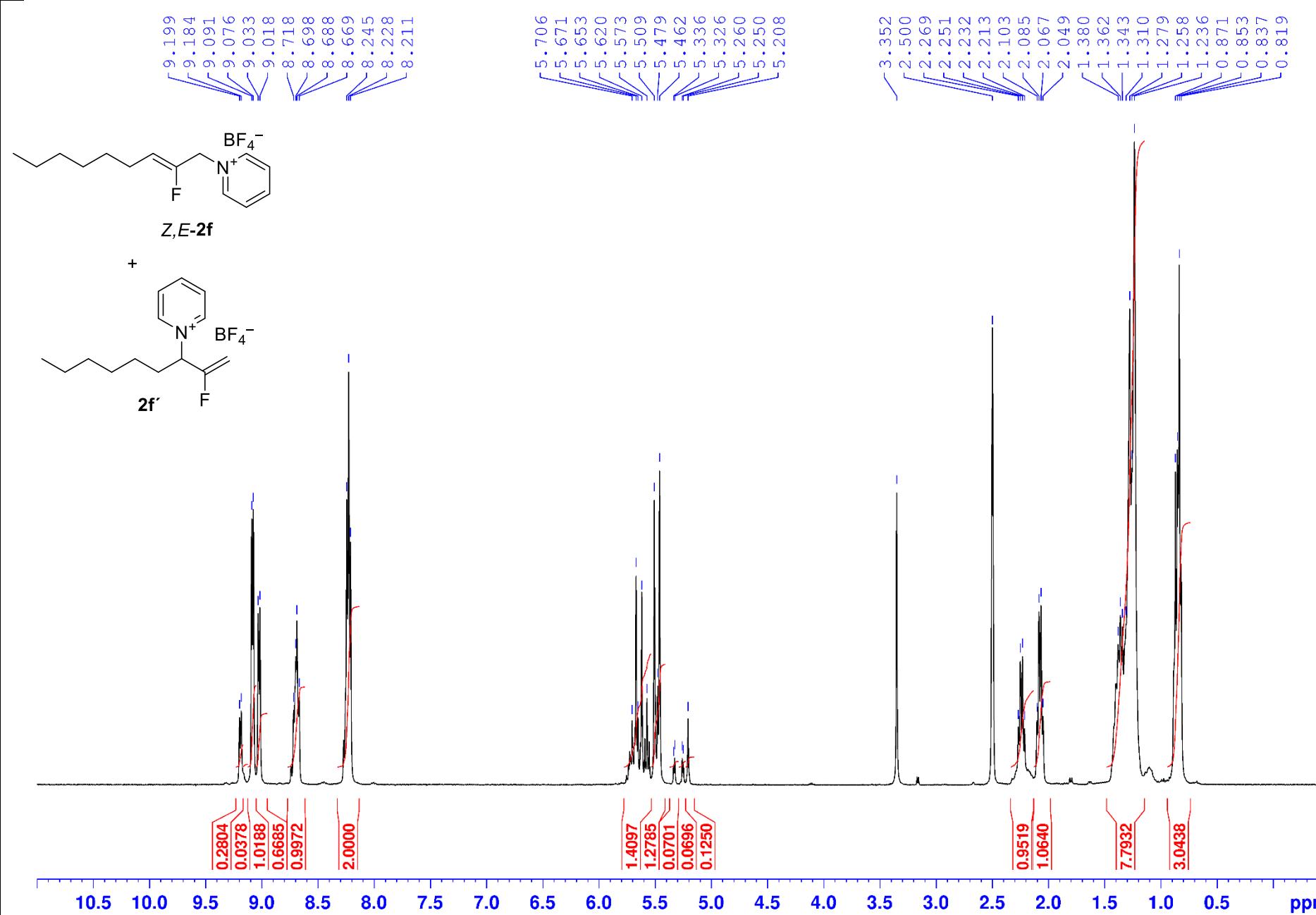
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2e** (Z/E = 94/6)



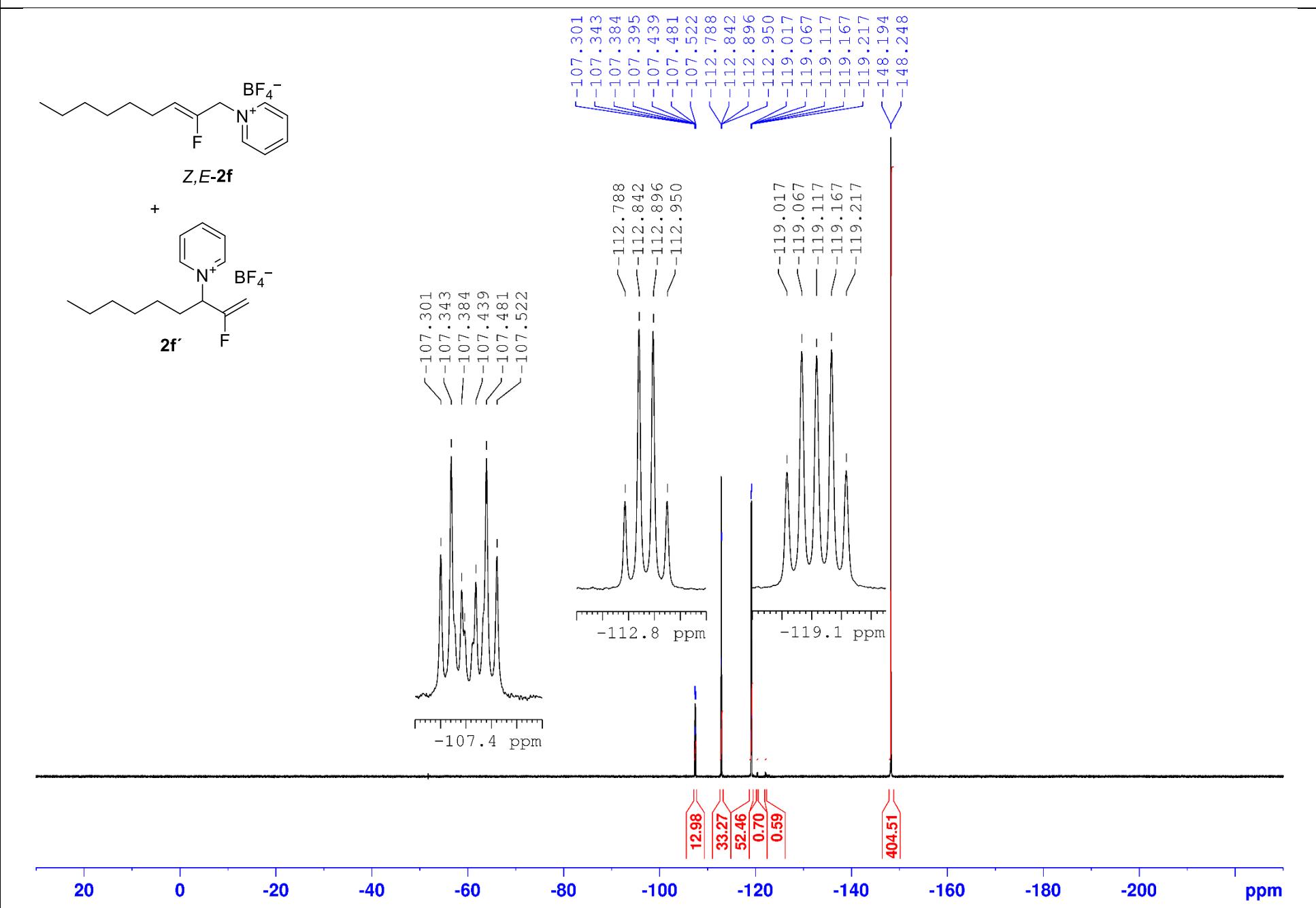
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2e** (*Z/E* = 94/6)



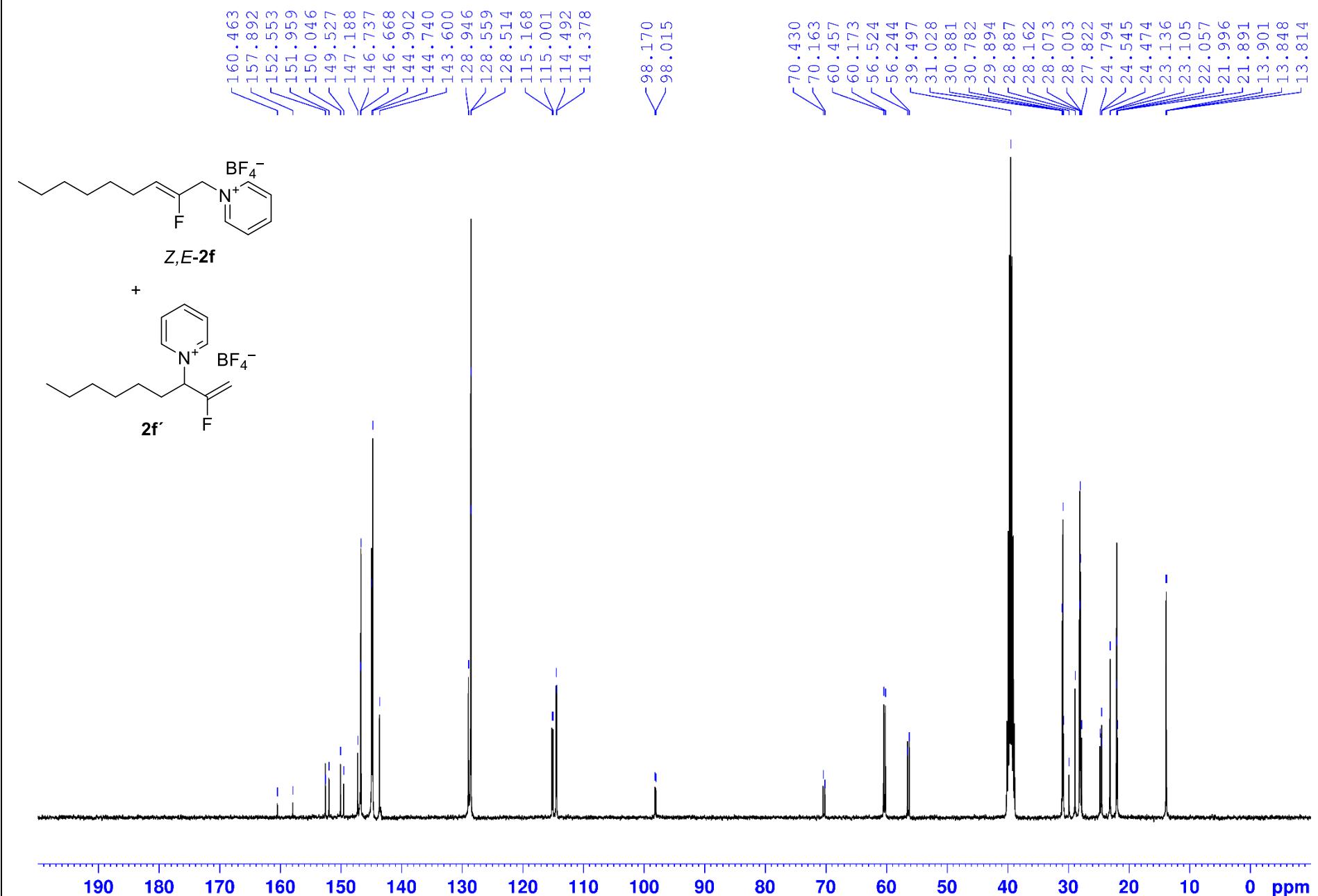
¹H NMR (DMSO-d₆, 400.0 MHz) of **2f** (*Z*-**2f**/*E*-**2f**/**2f'** = 53/34/13)



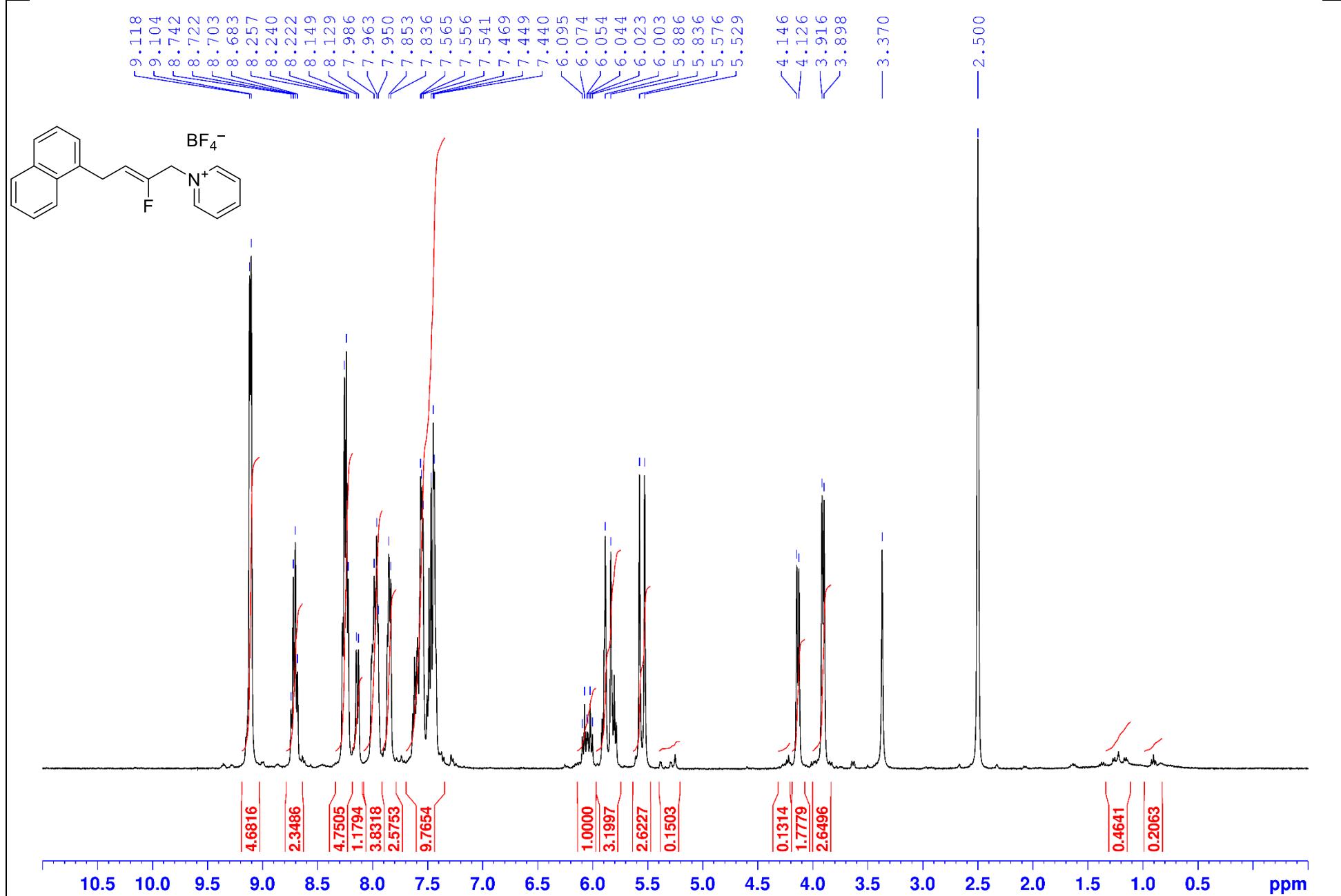
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2f** (*Z*-**2f**/*E*-**2f**/**2f'** = 53/34/13)



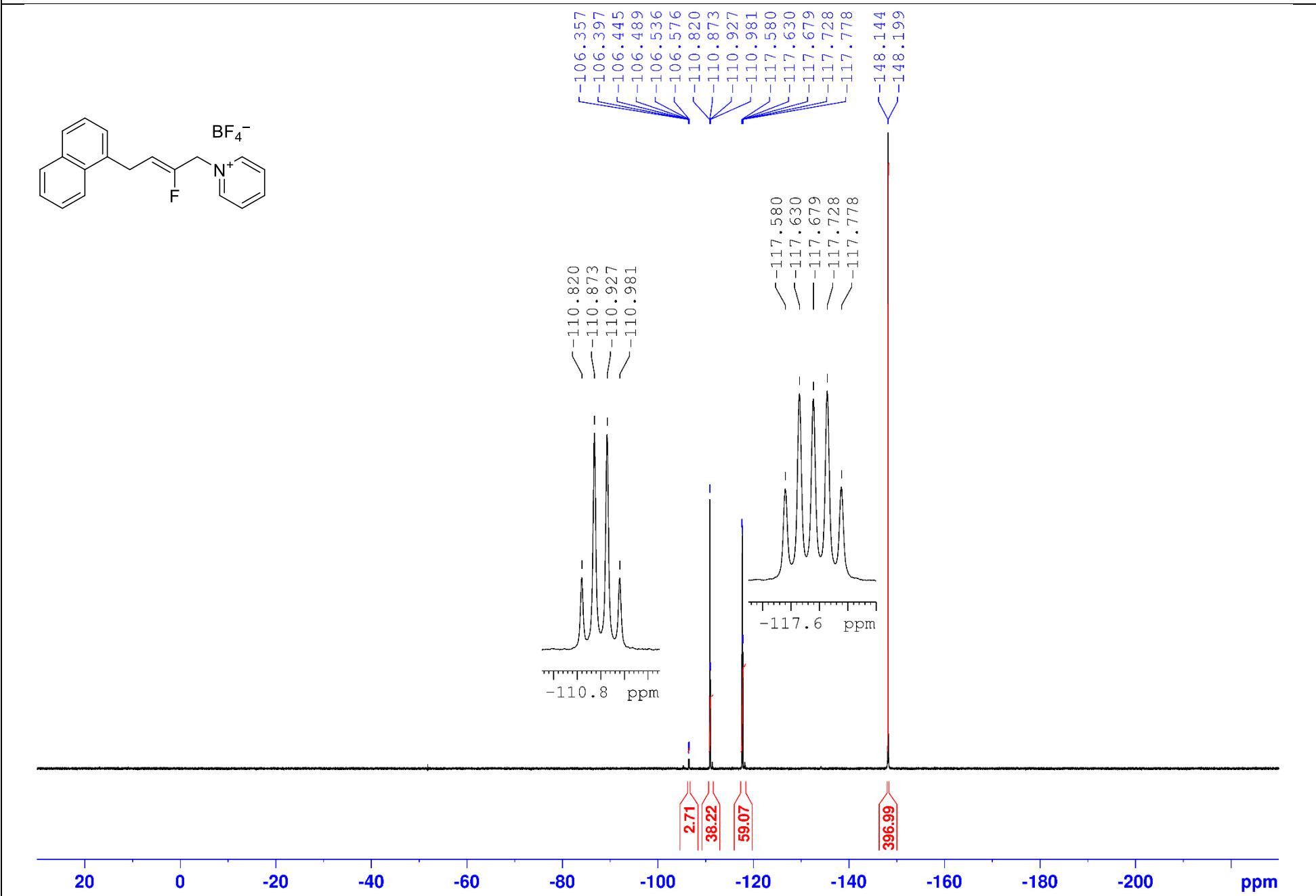
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2f** (*Z*-**2f**/*E*-**2f**/**2f'** = 53/34/13)



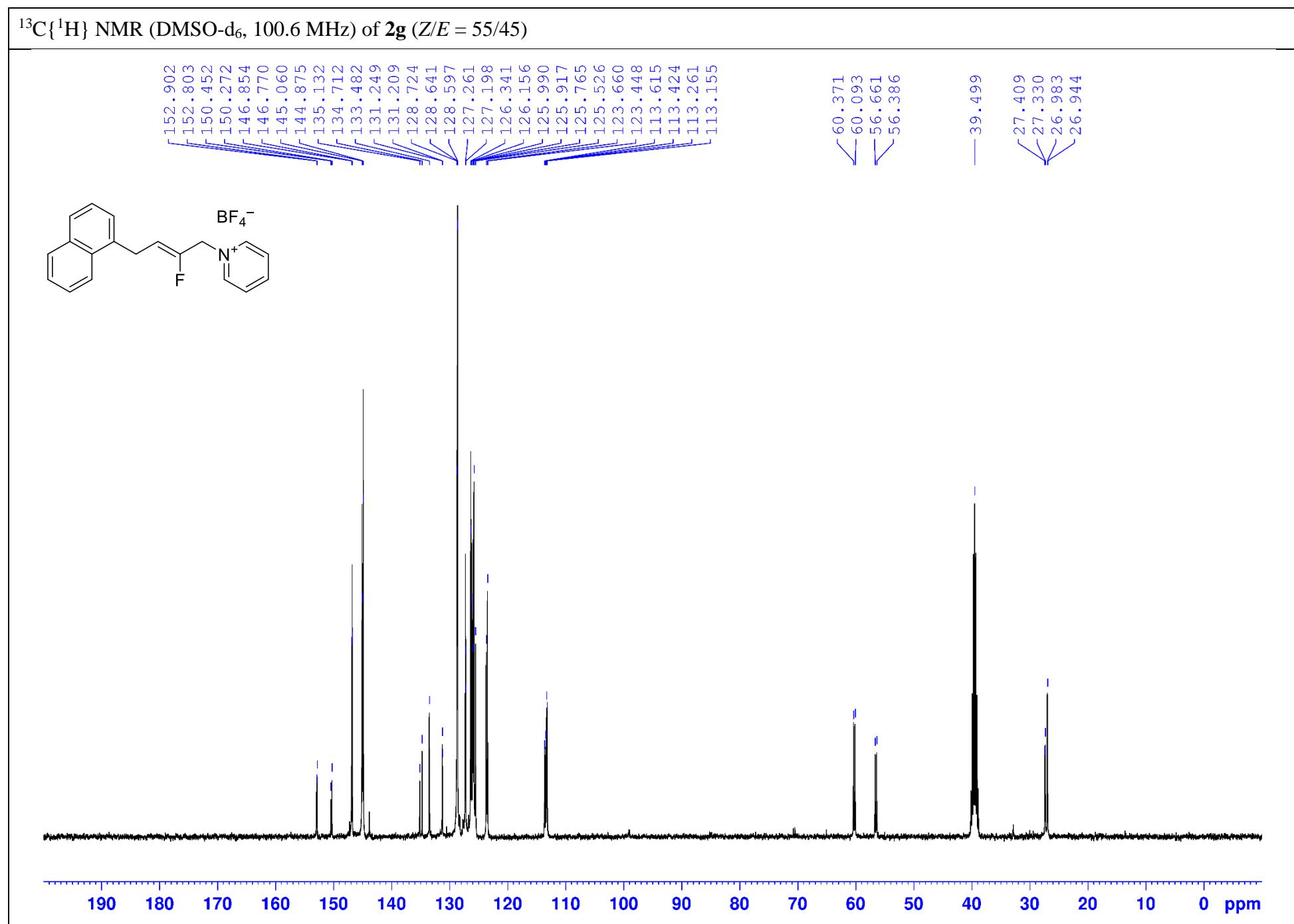
¹H NMR (DMSO-d₆, 400.0 MHz) of **2g** (*Z/E* = 55/45)



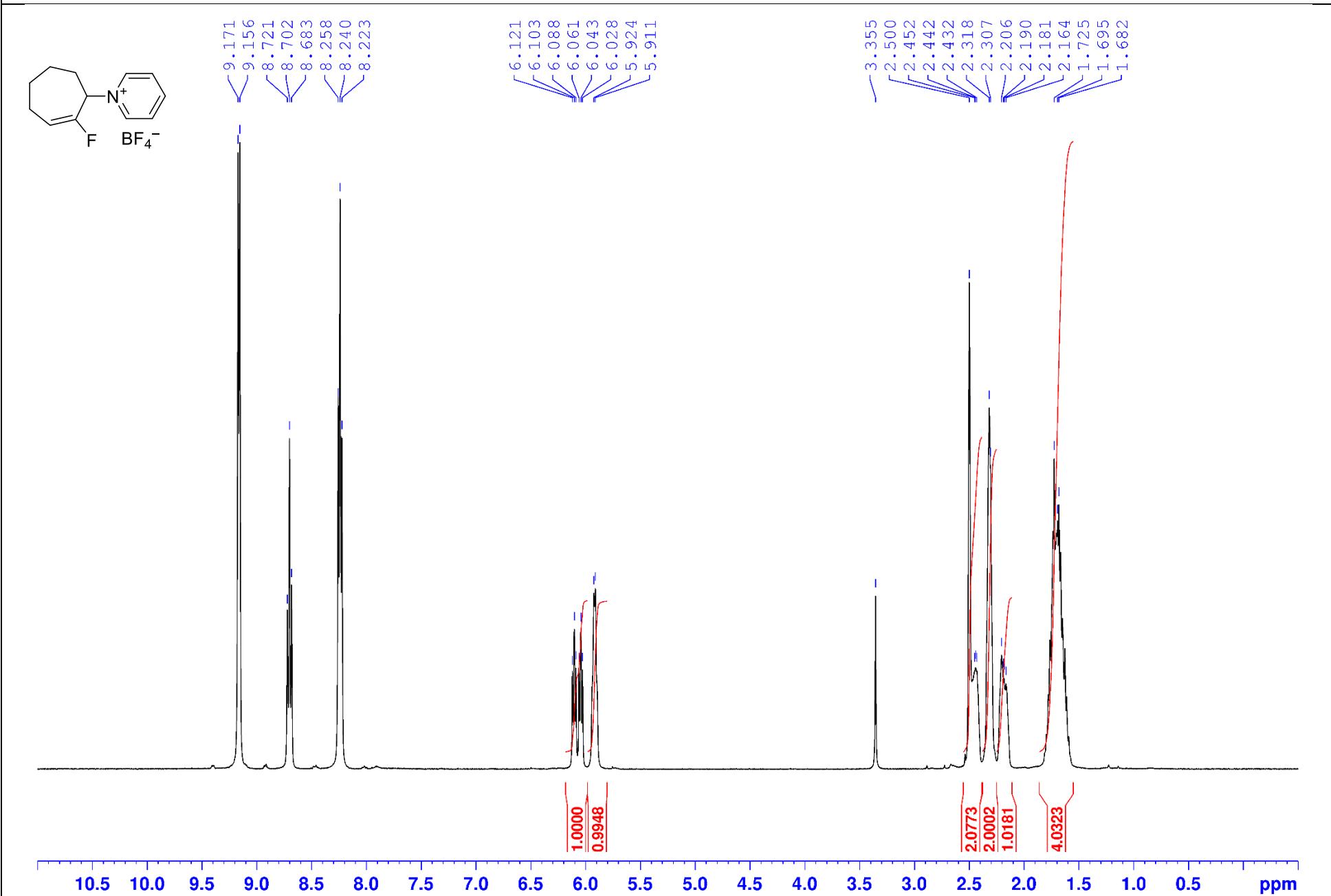
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2g** (Z/E = 55/45)



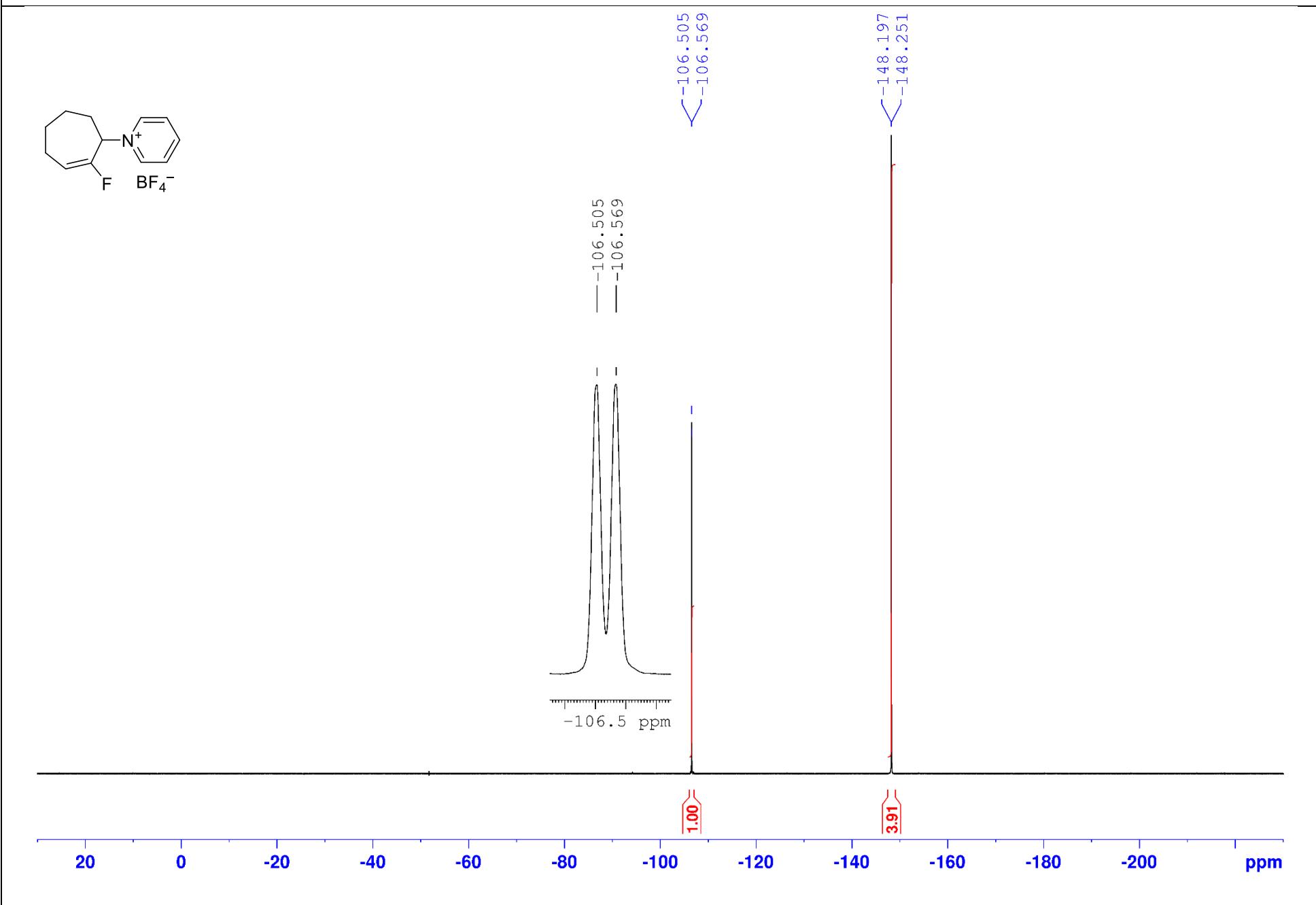
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2g** (*Z/E* = 55/45)



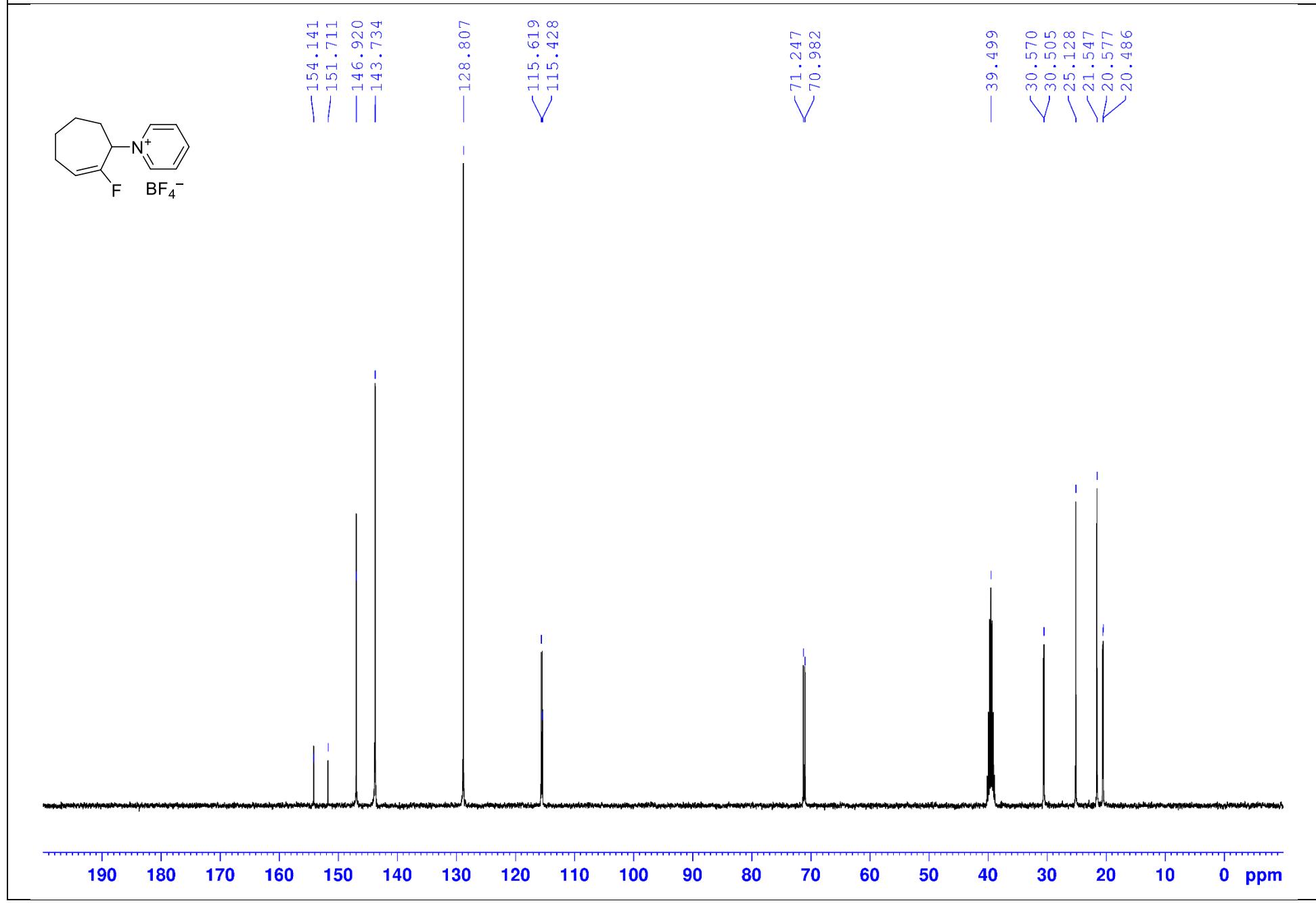
¹H NMR (DMSO-d₆, 400.0 MHz) of **2h**



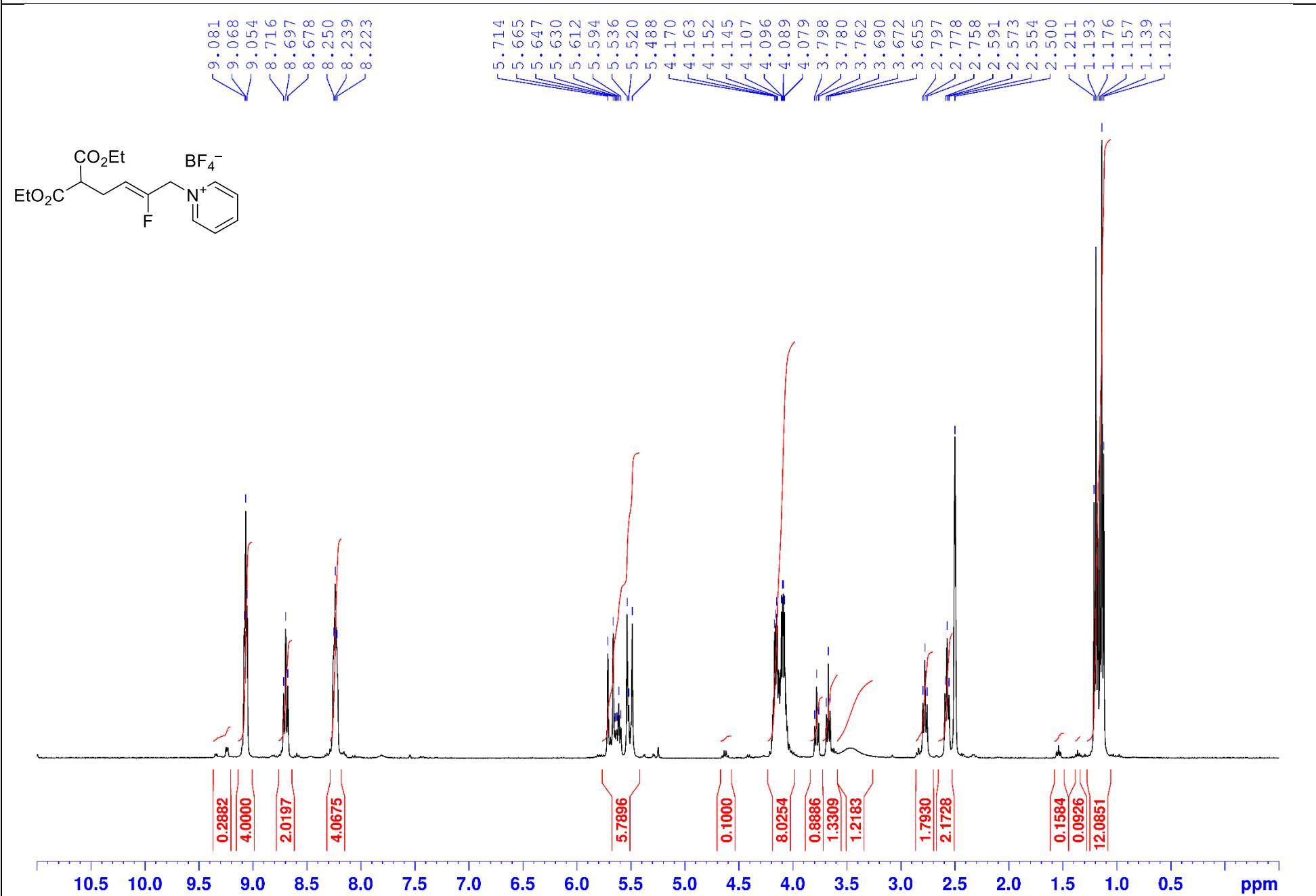
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of 2h



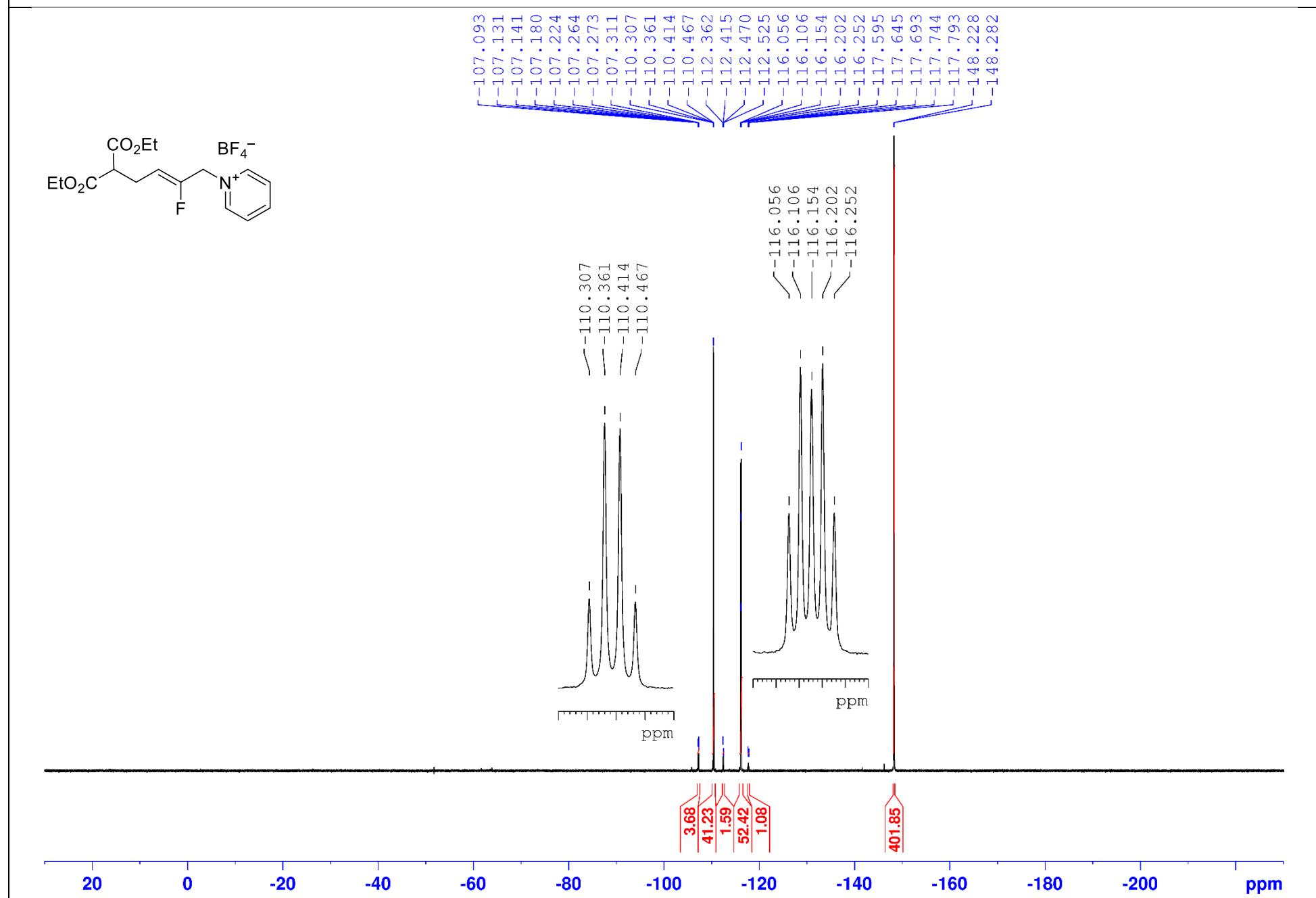
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2h**



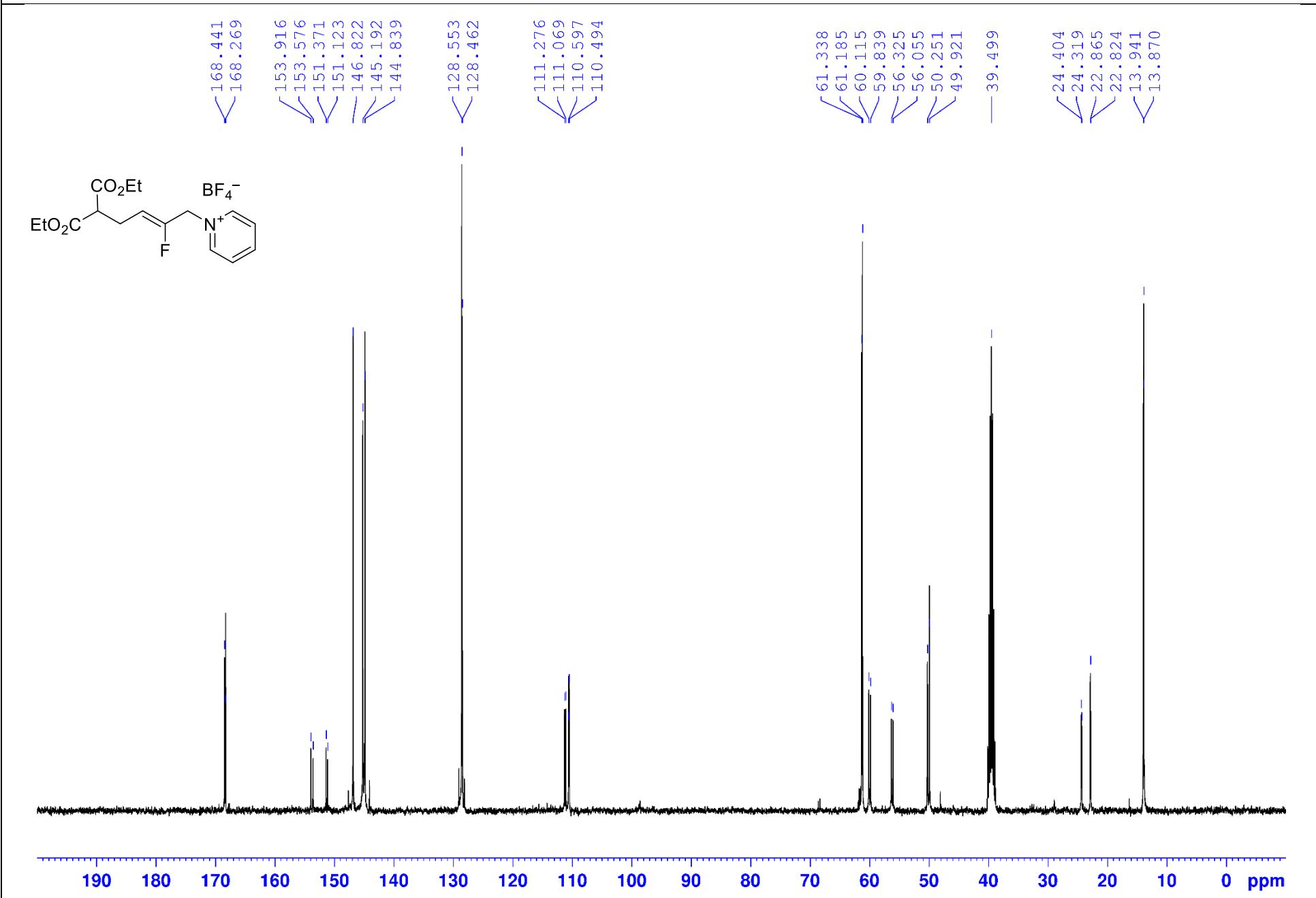
¹H NMR (DMSO-d₆, 400.0 MHz) of **2i** (*Z/E* = 56/44)



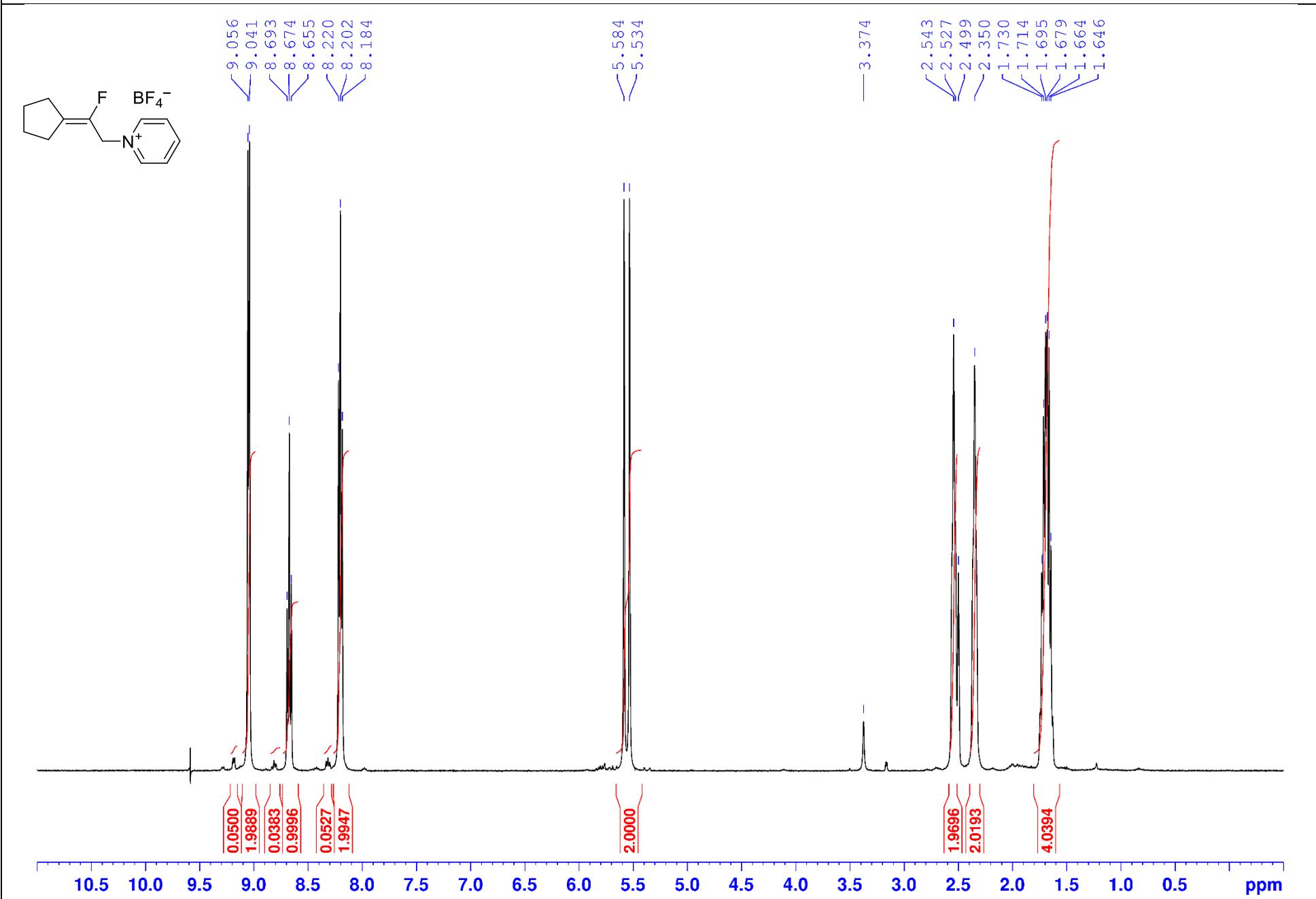
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2i** (Z/E = 56/44)



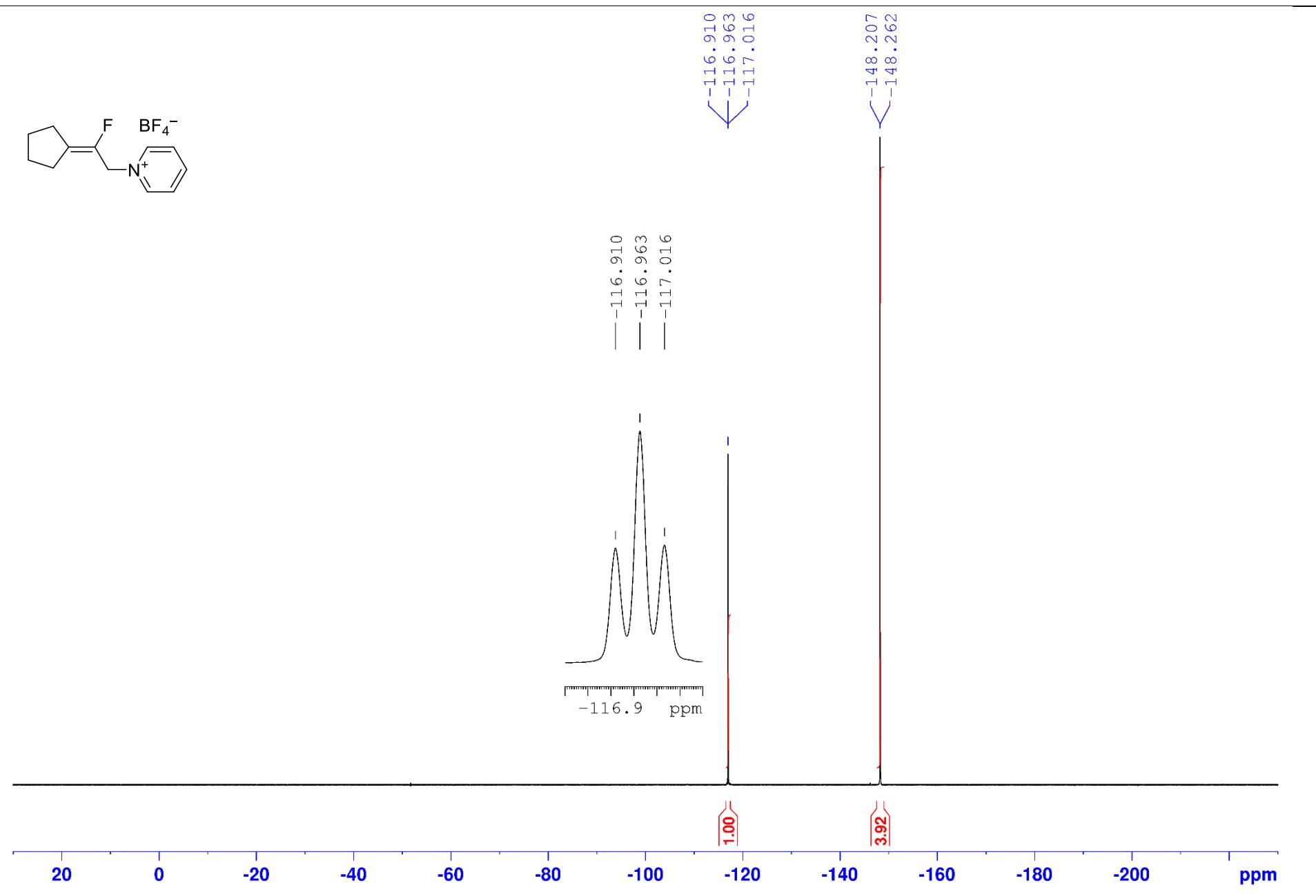
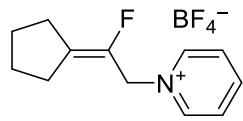
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2i** (*Z/E* = 56/44)



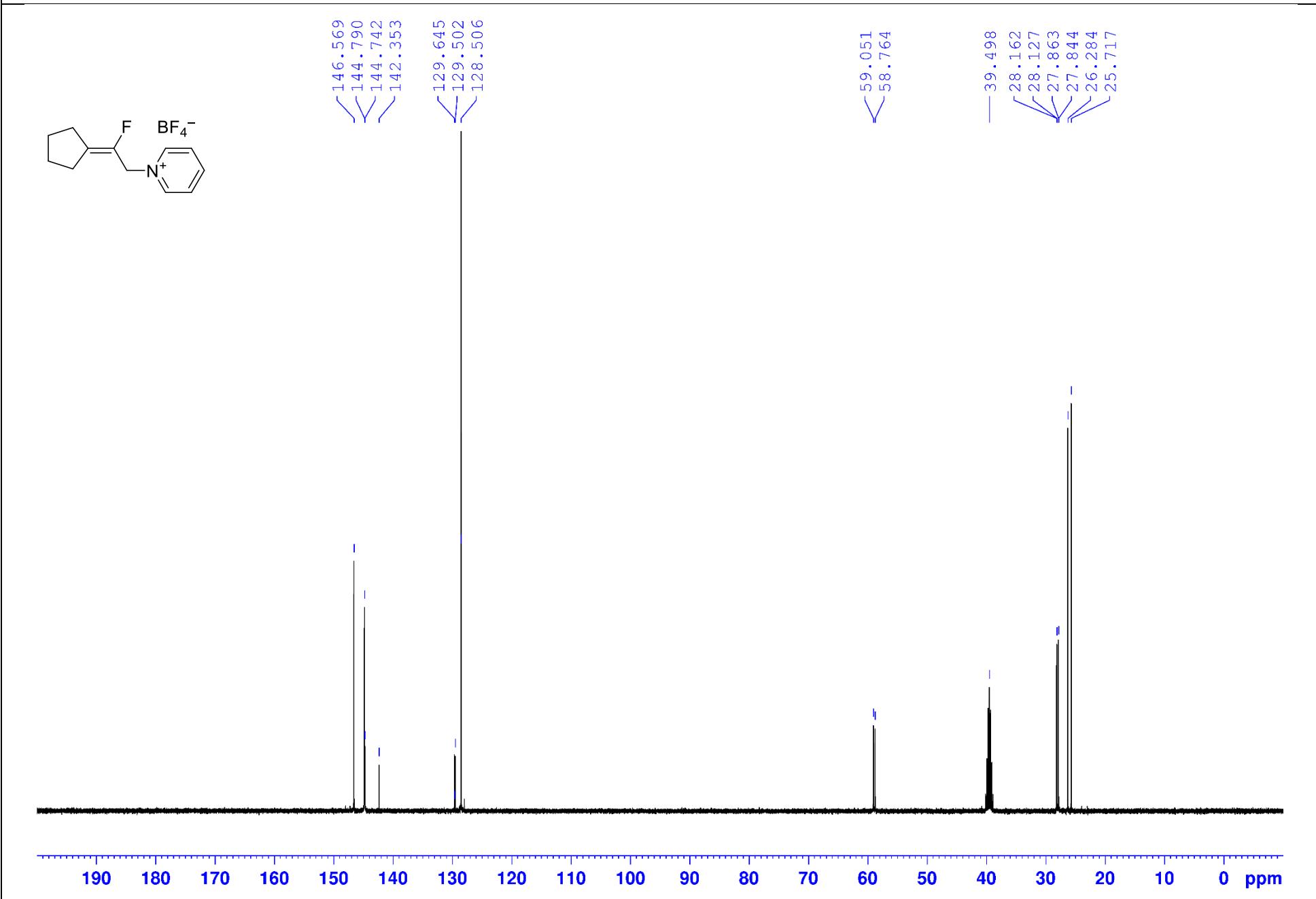
¹H NMR (DMSO-d₆, 400.0 MHz) of **2j**



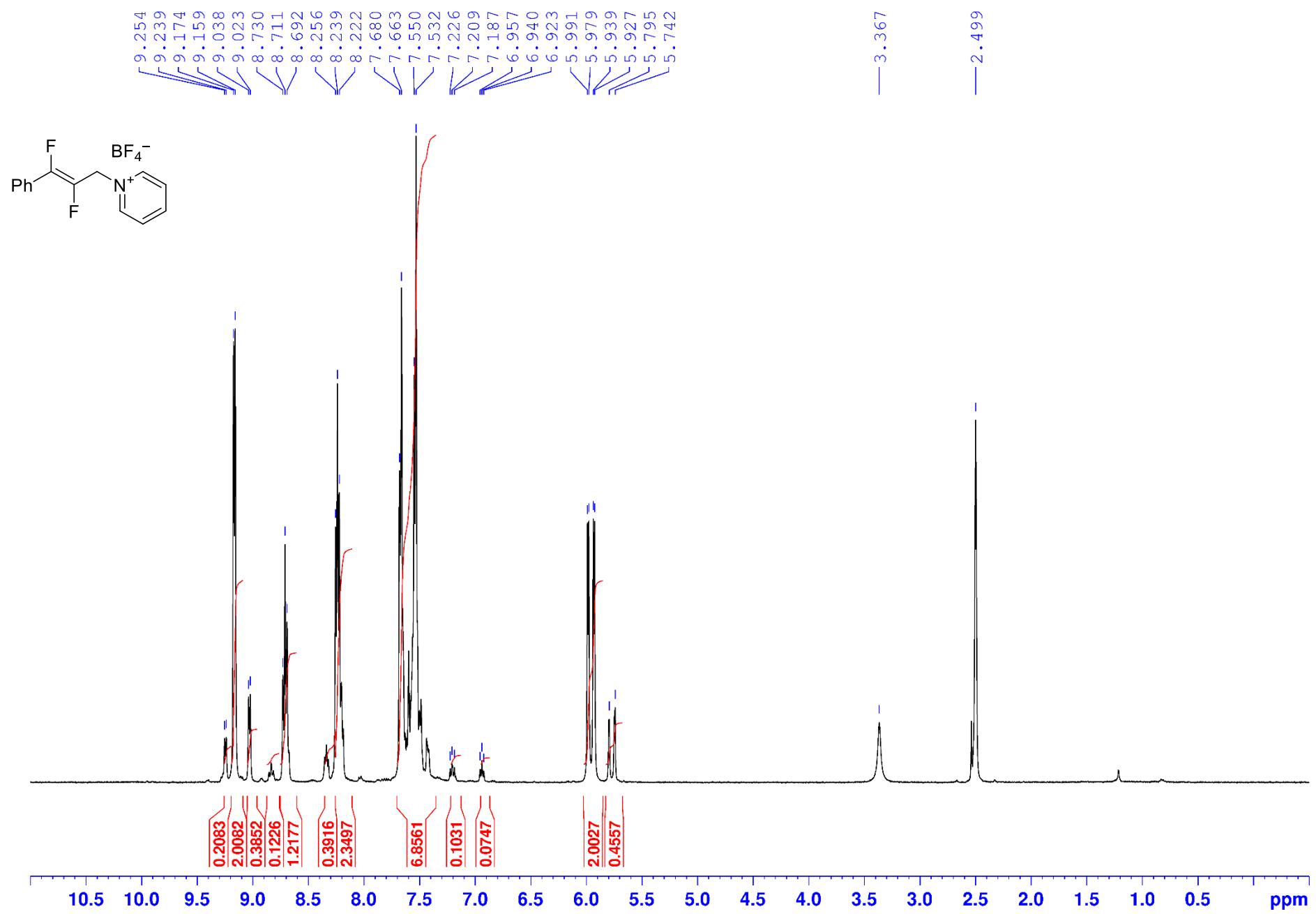
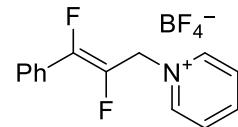
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **2j**



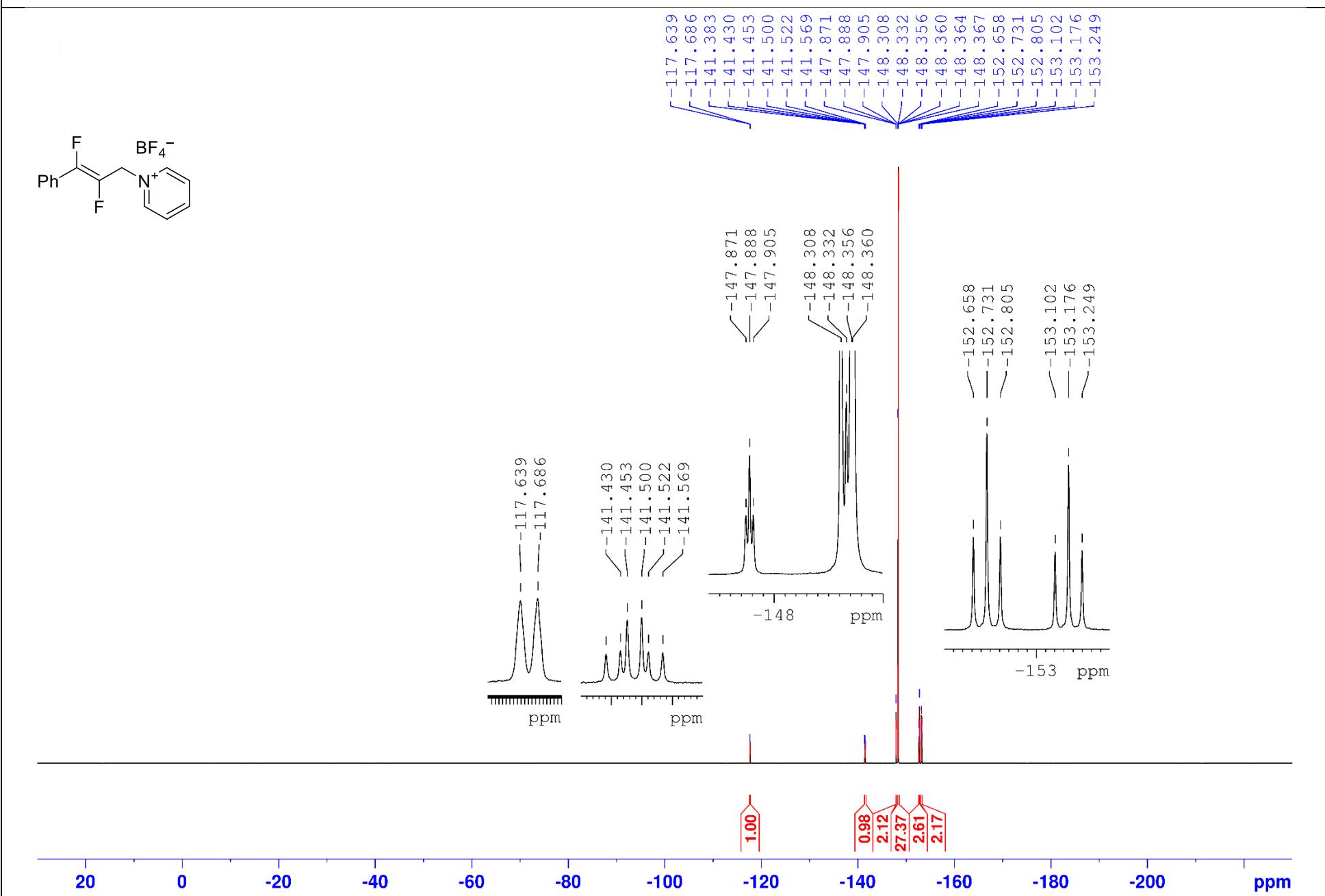
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2j**



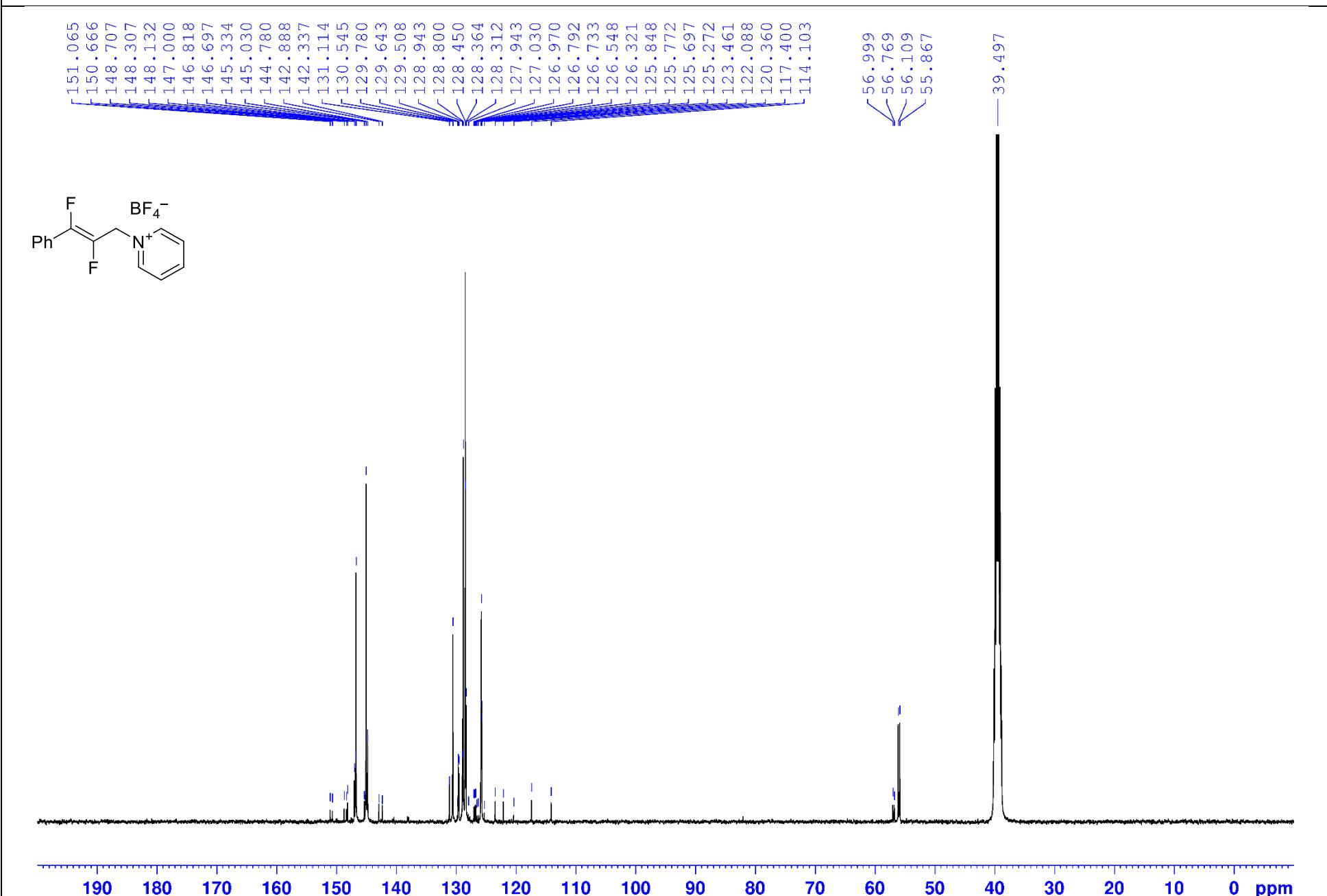
¹H NMR (DMSO-d₆, 400.0 MHz) of **2k** (*E/Z* = 83/17)



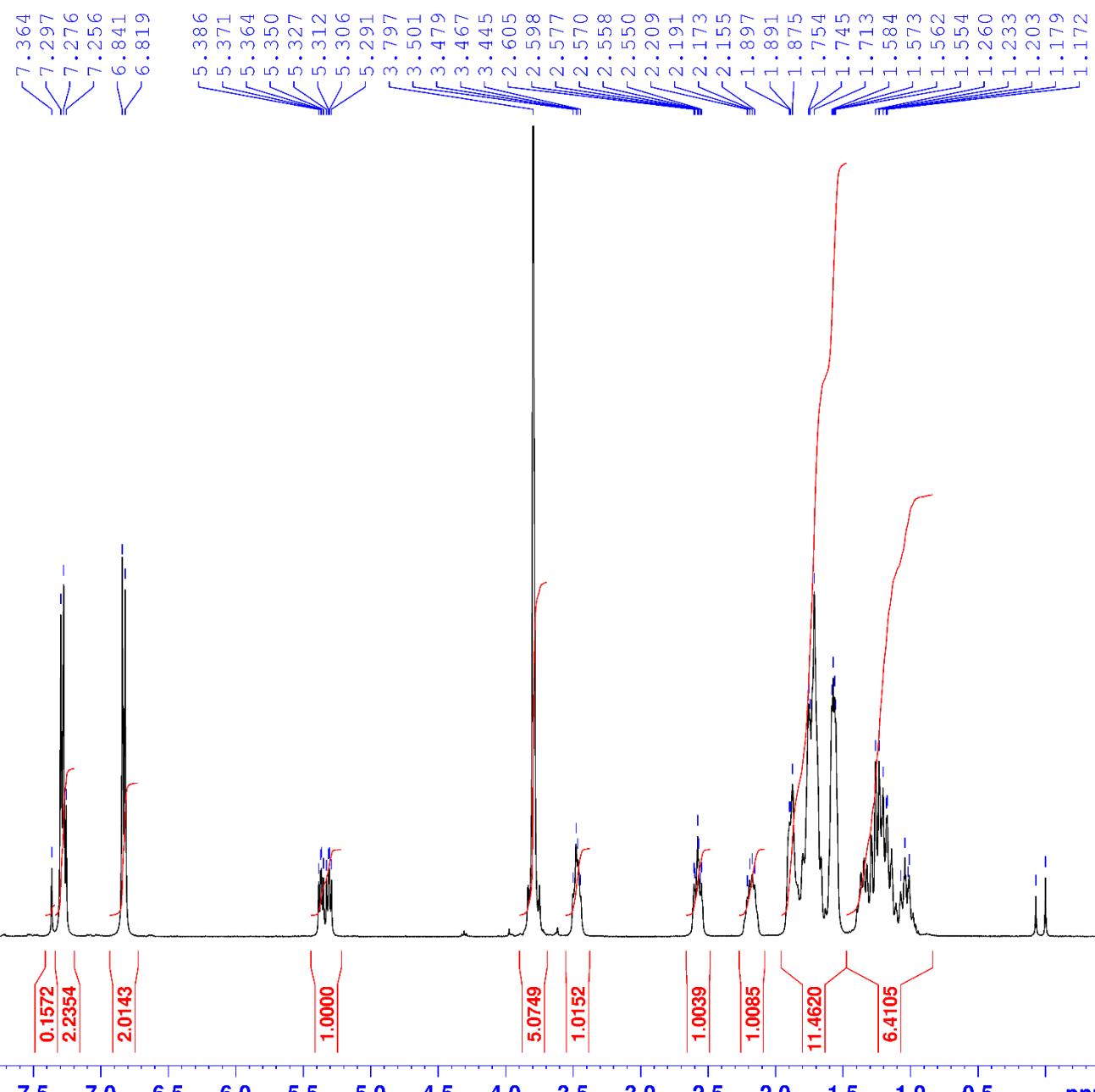
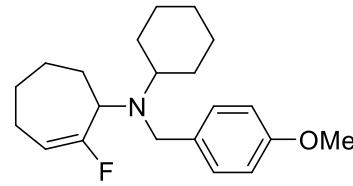
¹⁹F NMR (DMSO-d₆, 282.4 MHz) of **2k** (*E/Z* = 83/17)



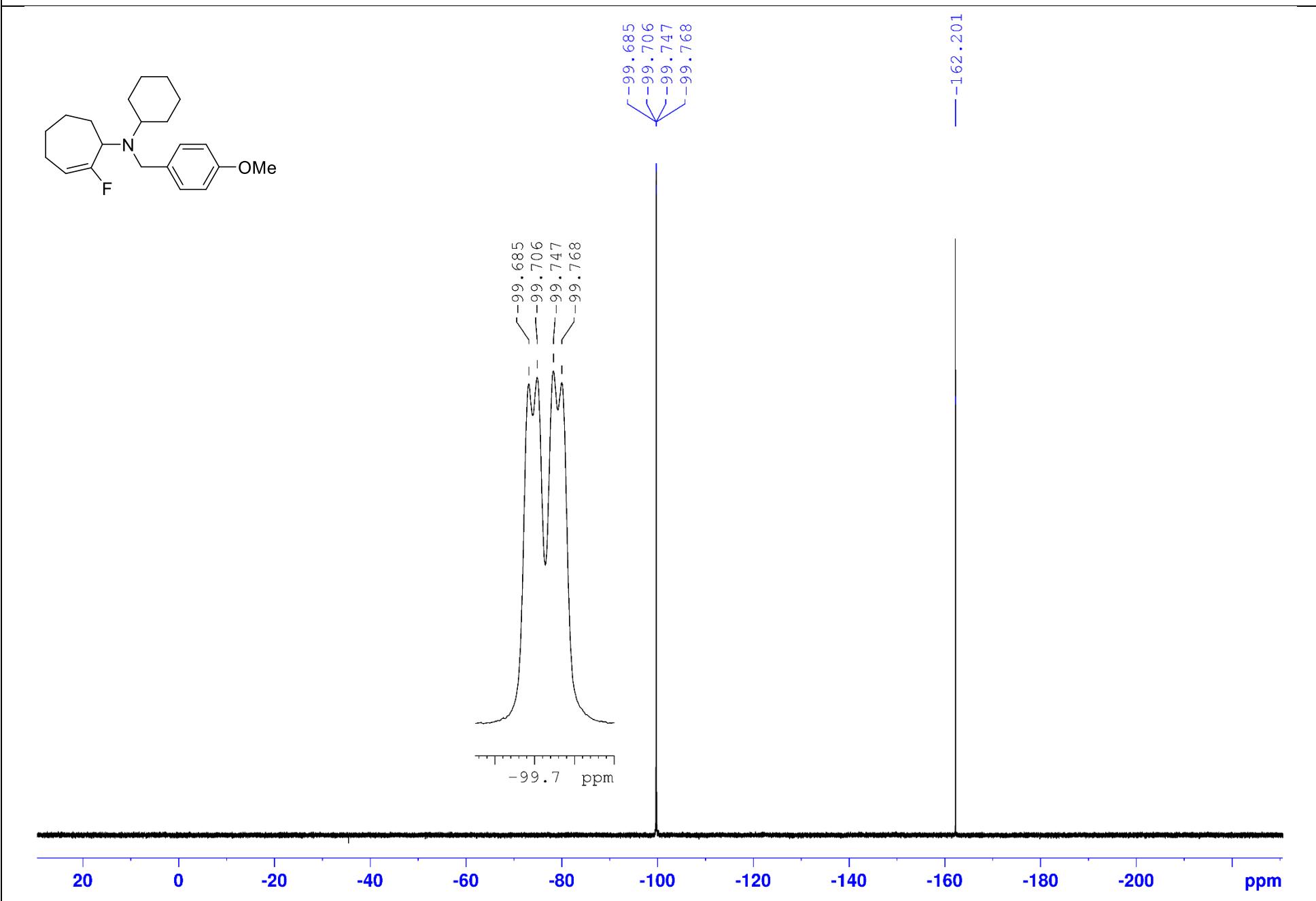
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **2k** (*E/Z* = 83/17)



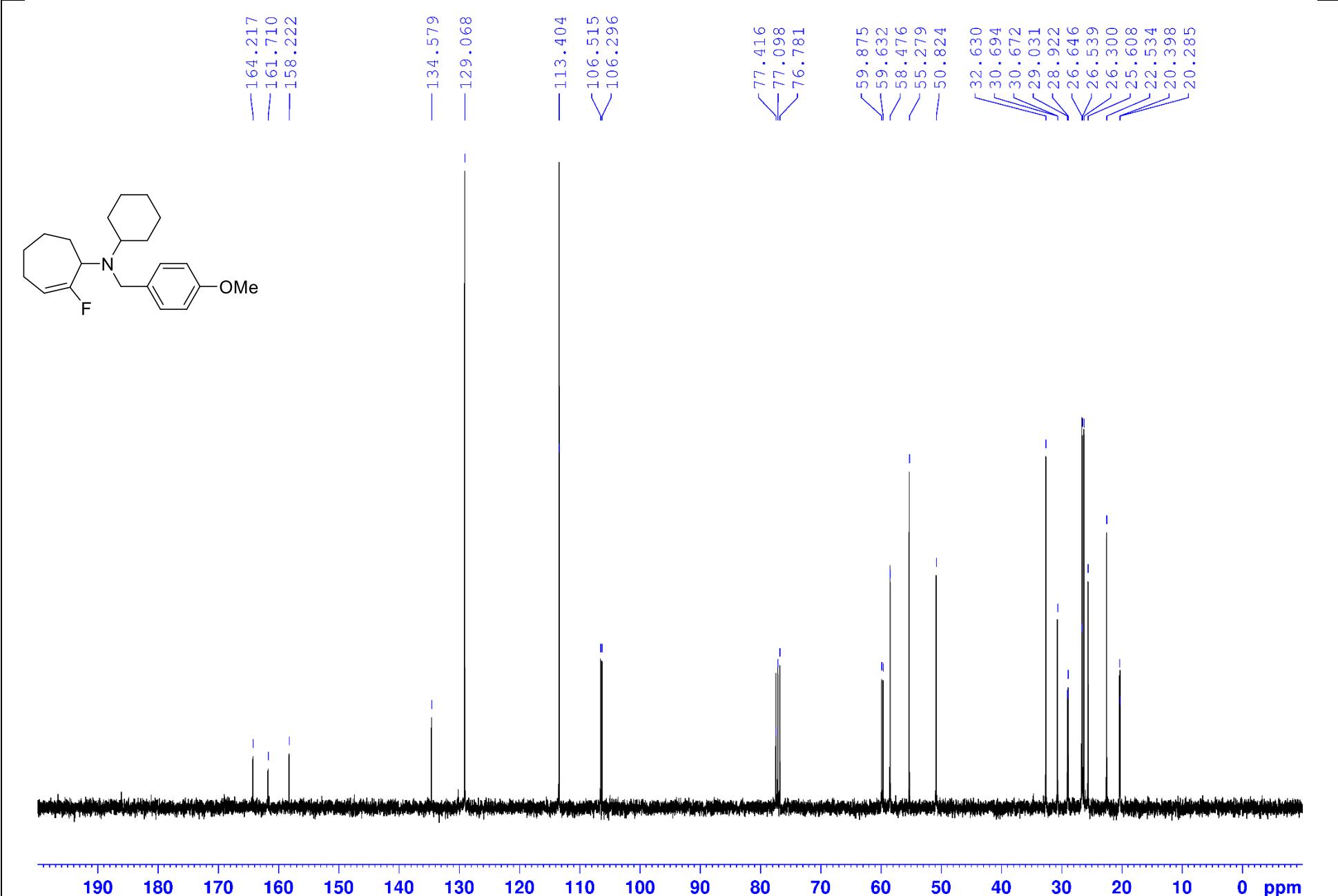
¹H NMR (CDCl₃, 400.0 MHz) of **4a**



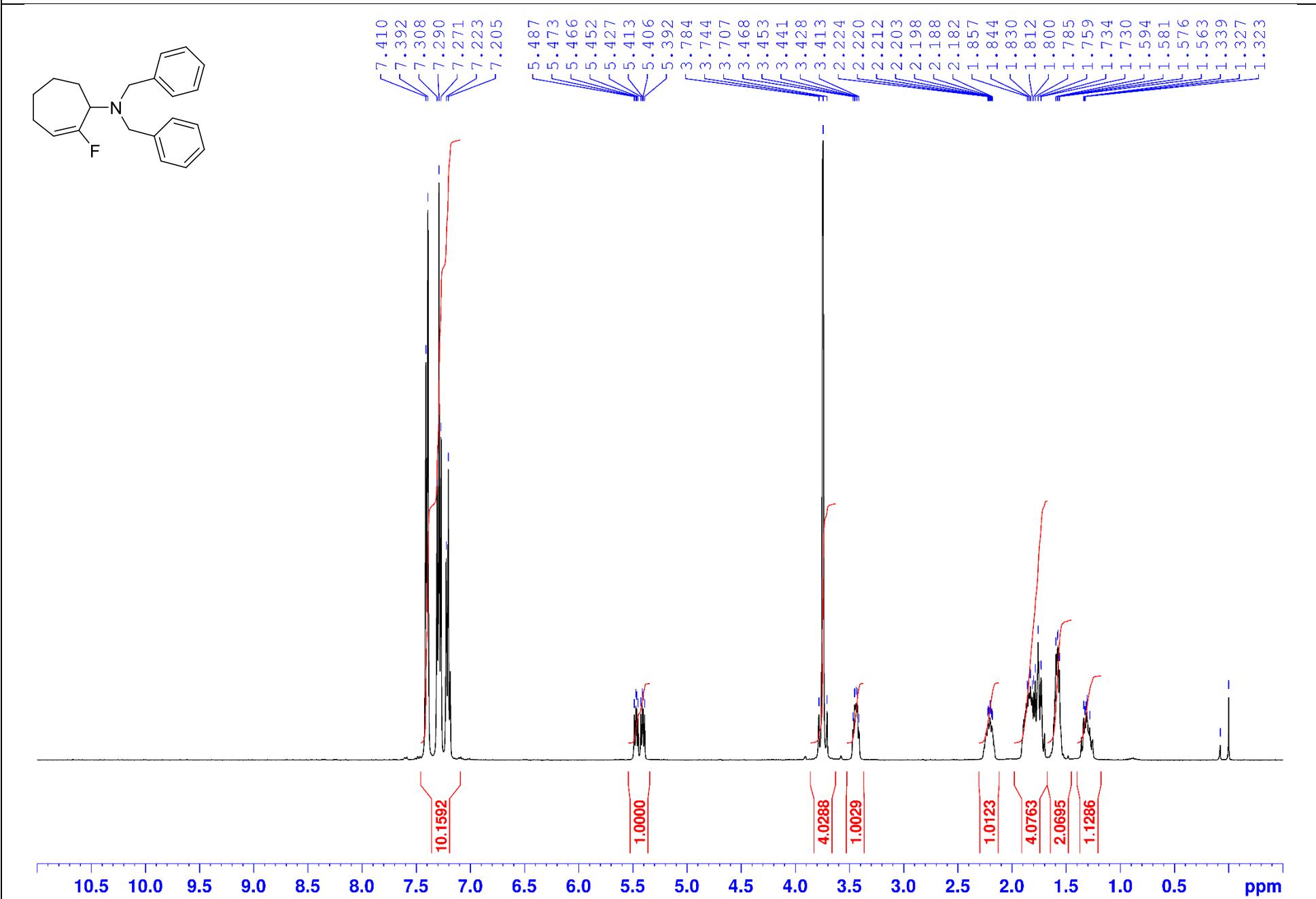
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **4a**



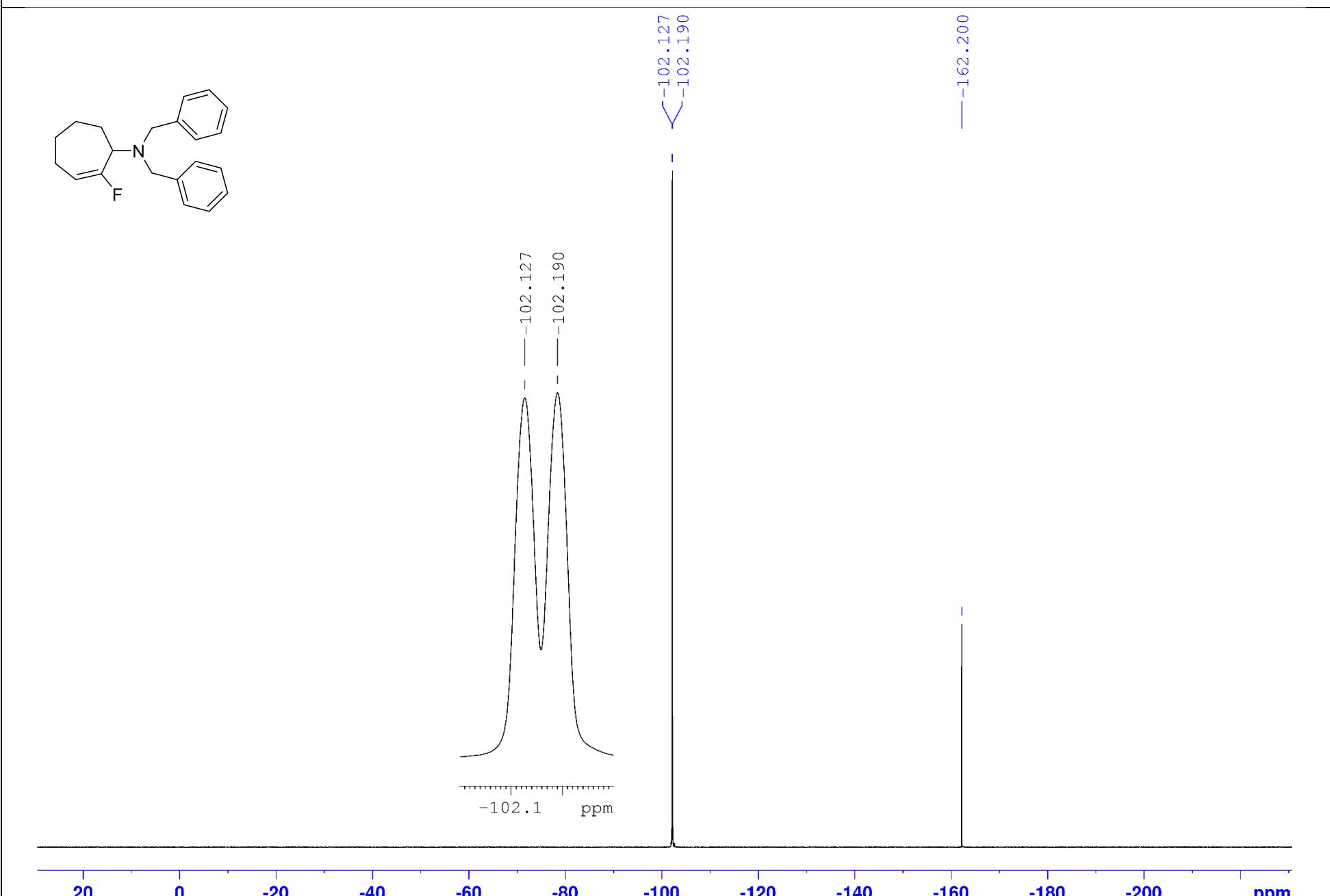
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **4a**



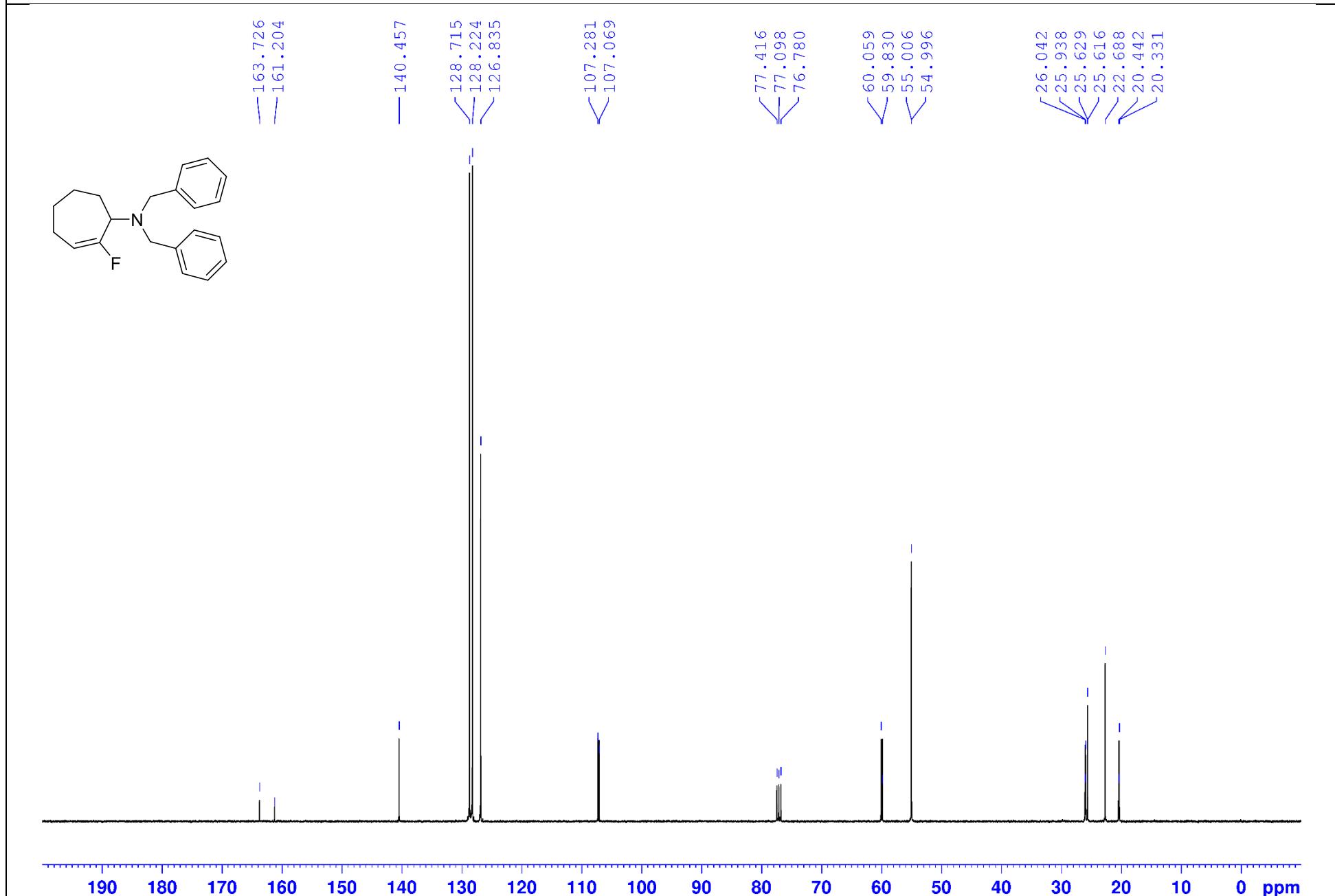
¹H NMR (CDCl_3 , 400.0 MHz) of **4b**



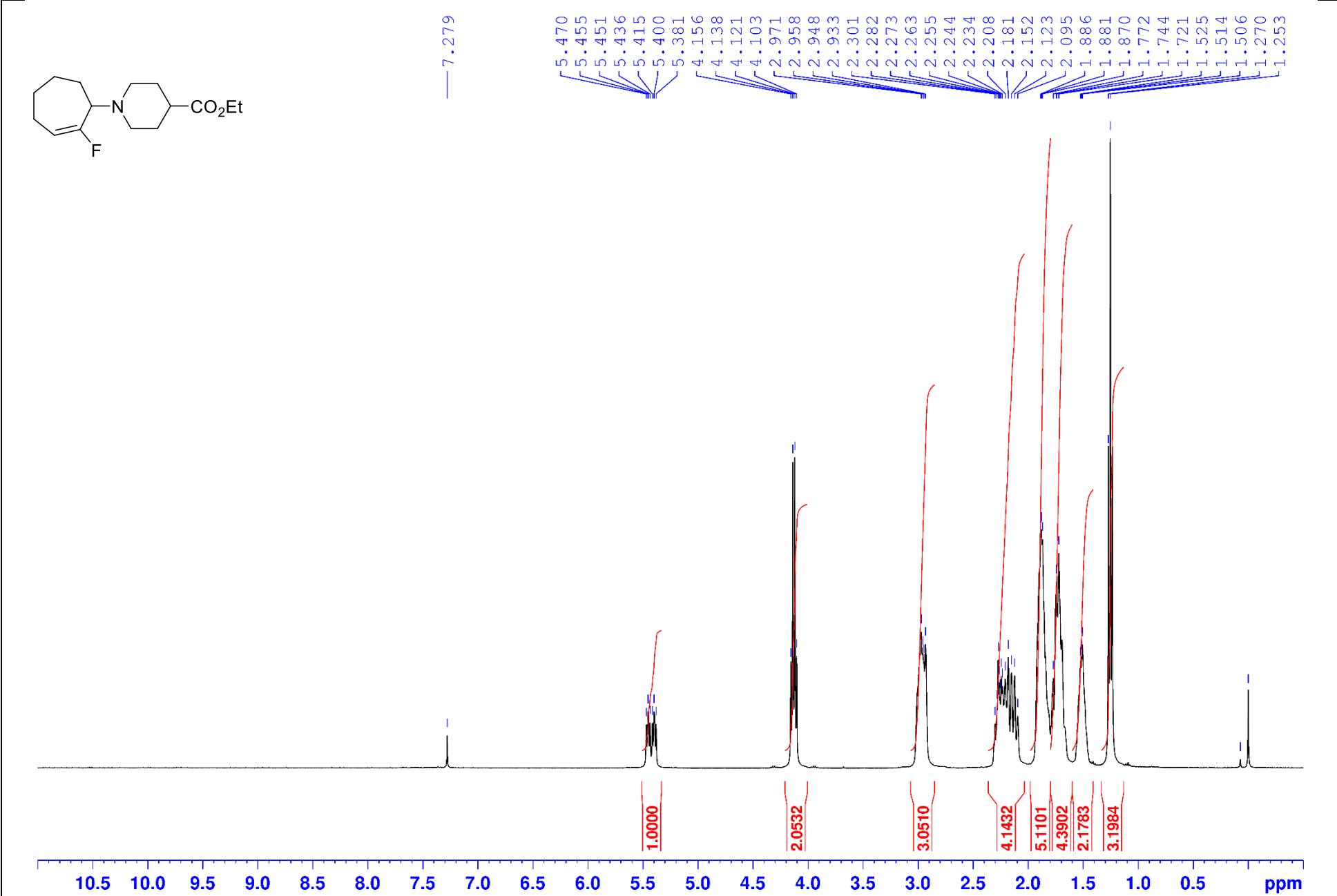
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **4b**



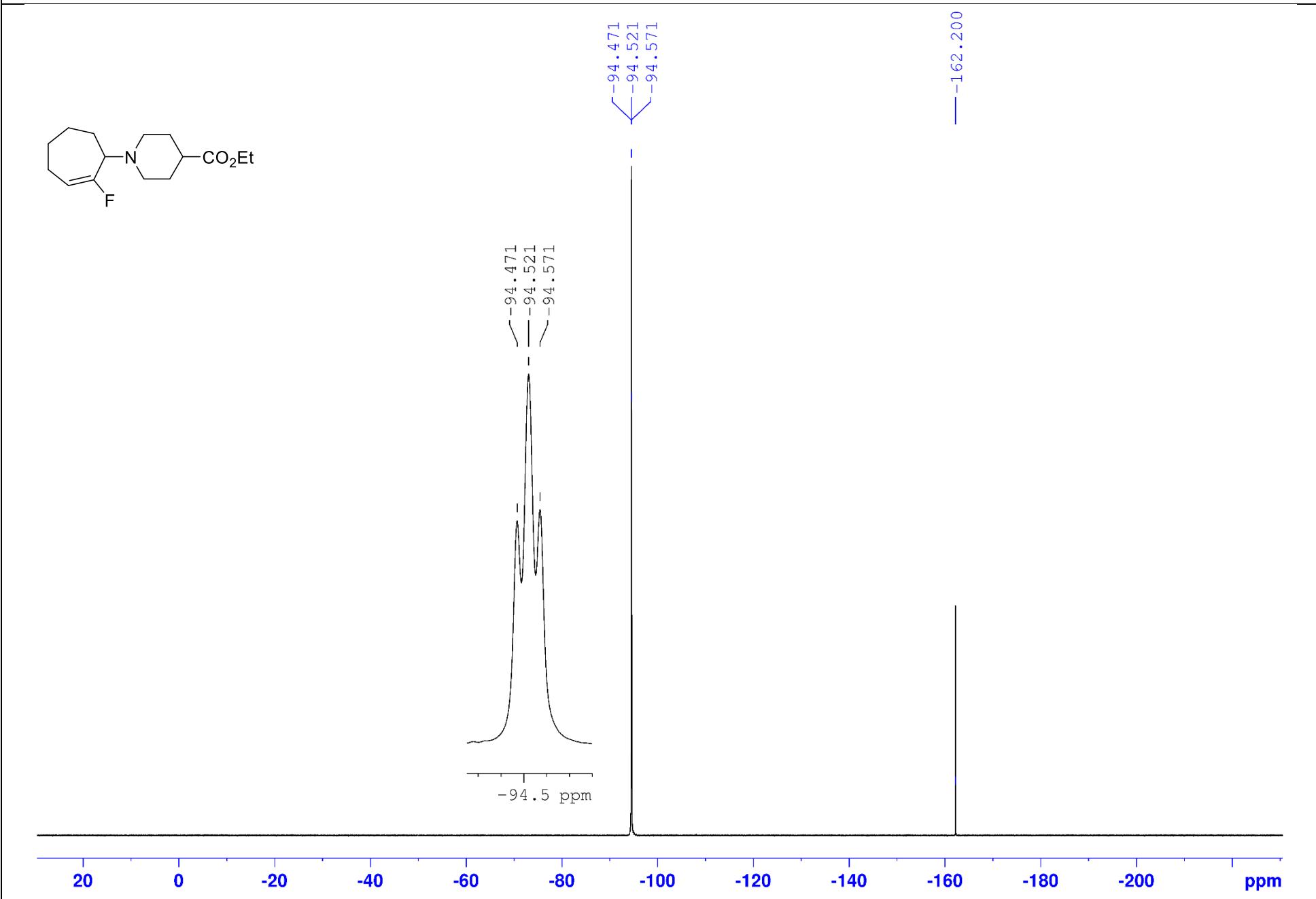
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **4b**



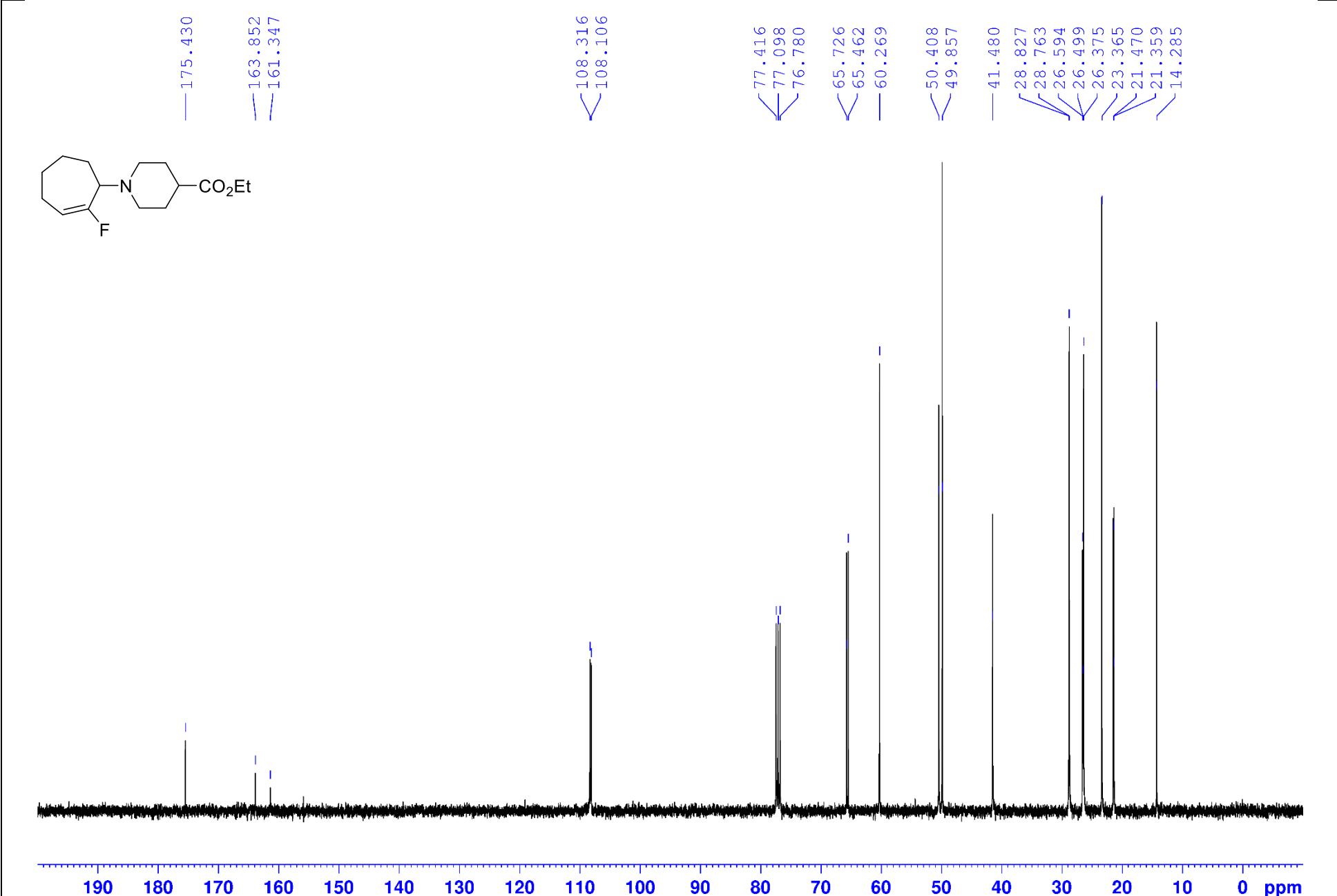
¹H NMR (CDCl_3 , 400.0 MHz) of **4c**



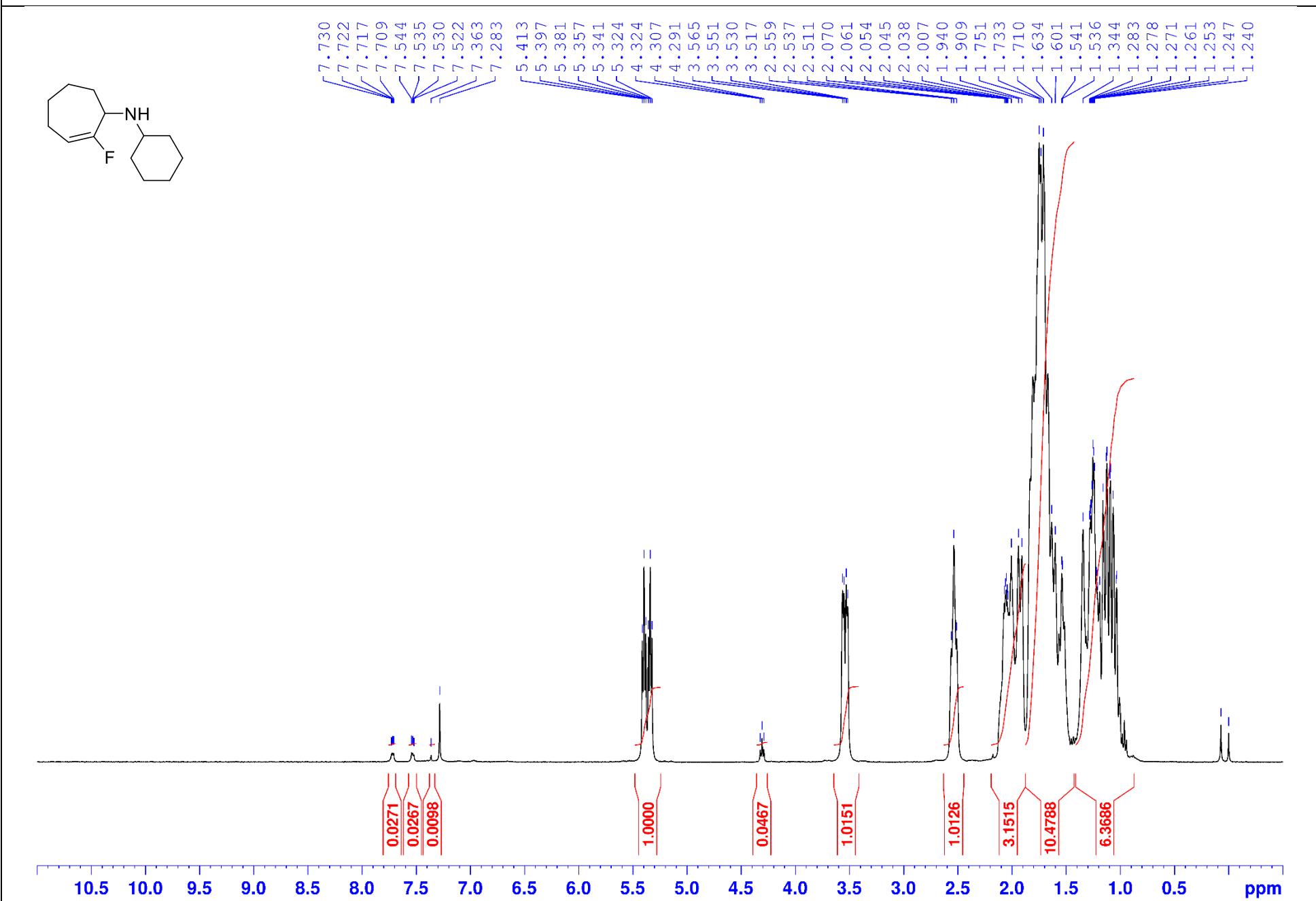
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **4c**



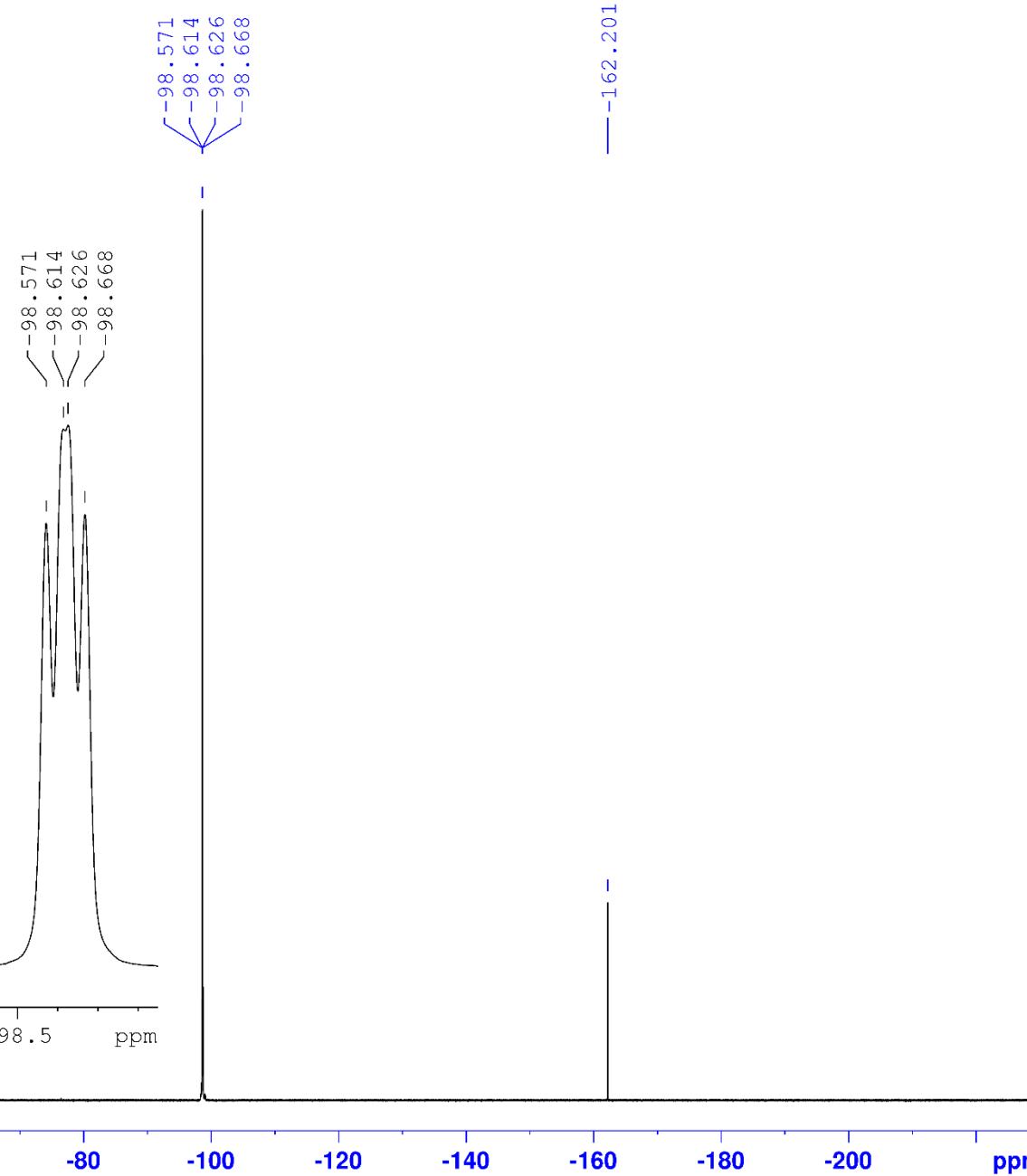
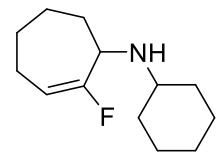
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **4c**



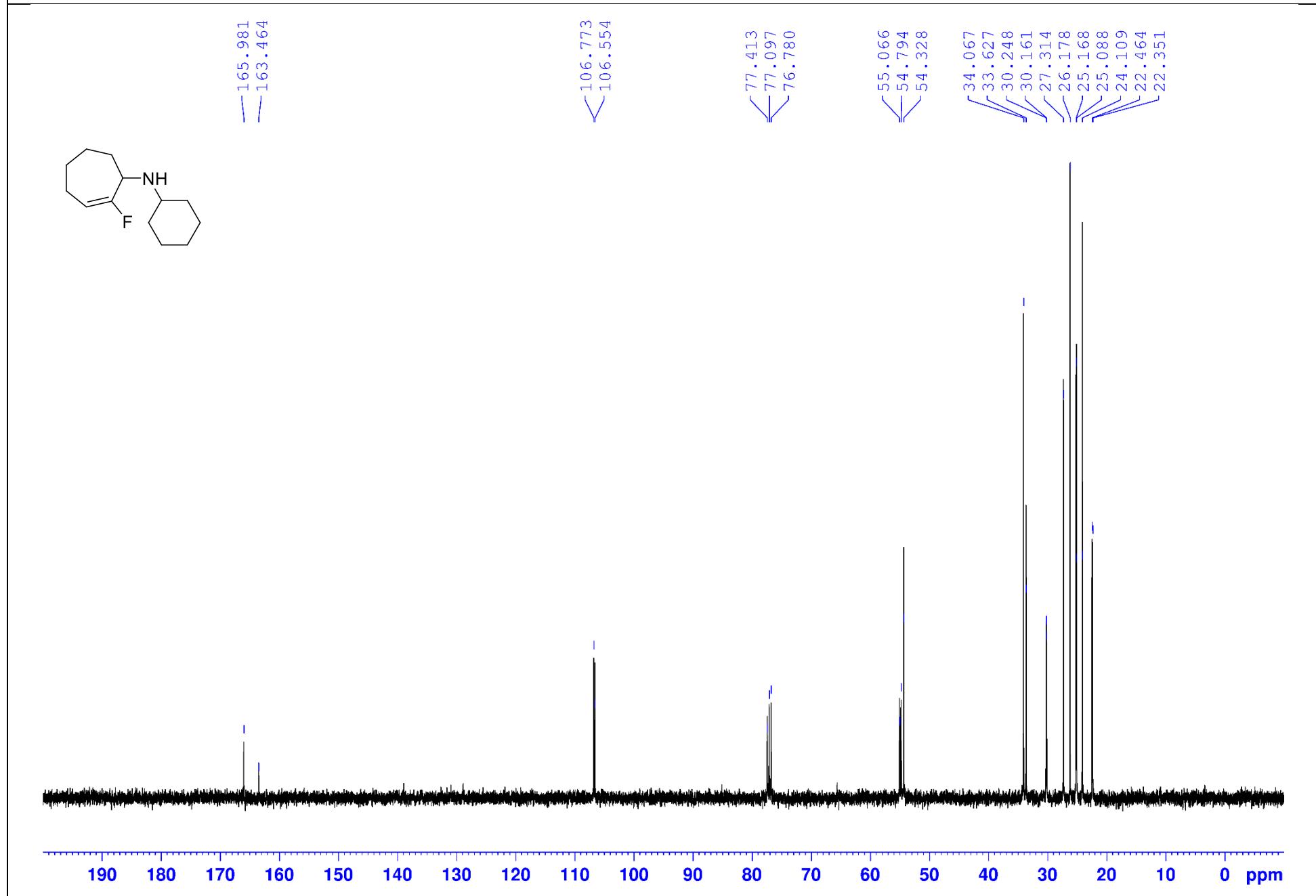
¹H NMR (CDCl_3 , 400.0 MHz) of **5a**



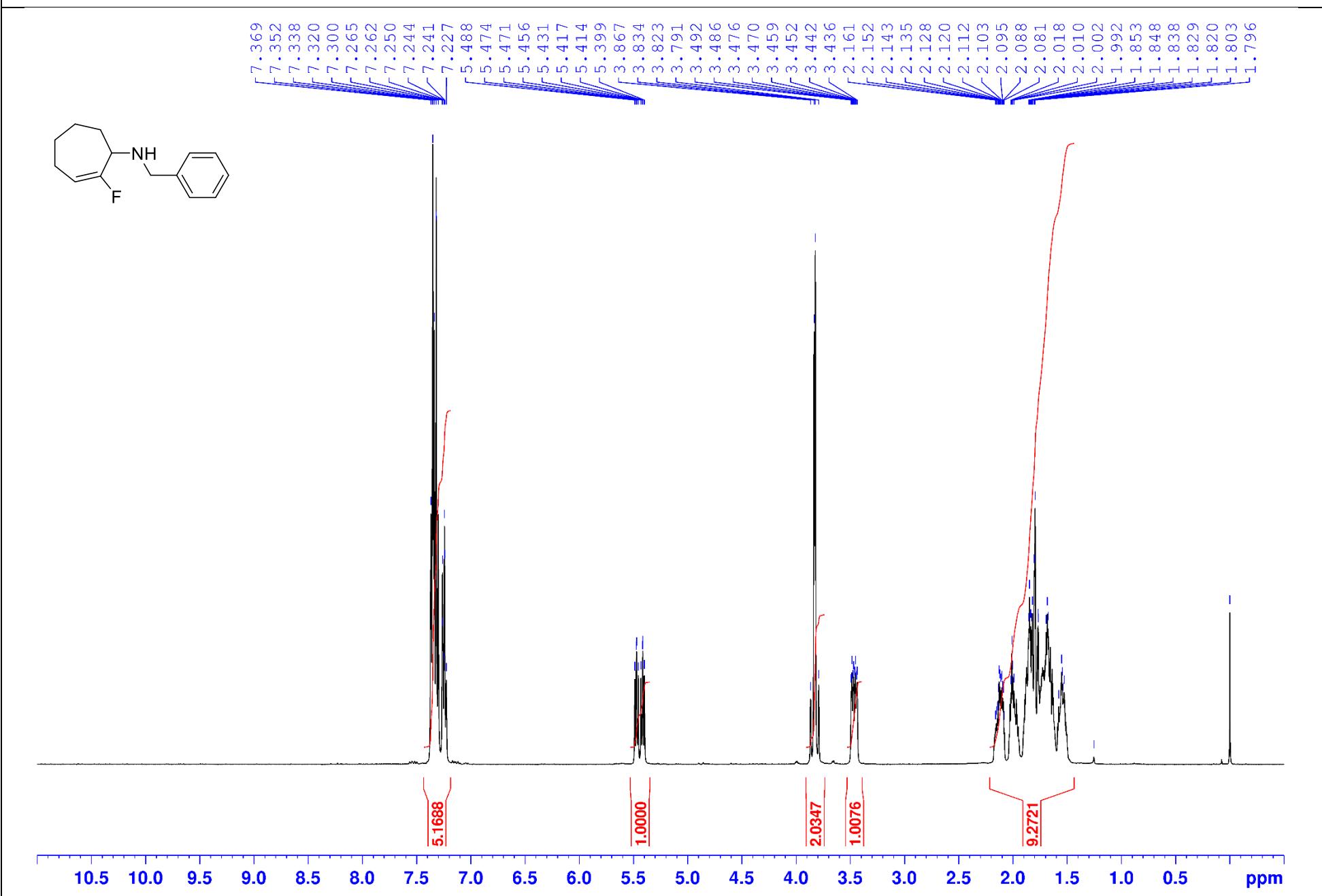
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **5a**



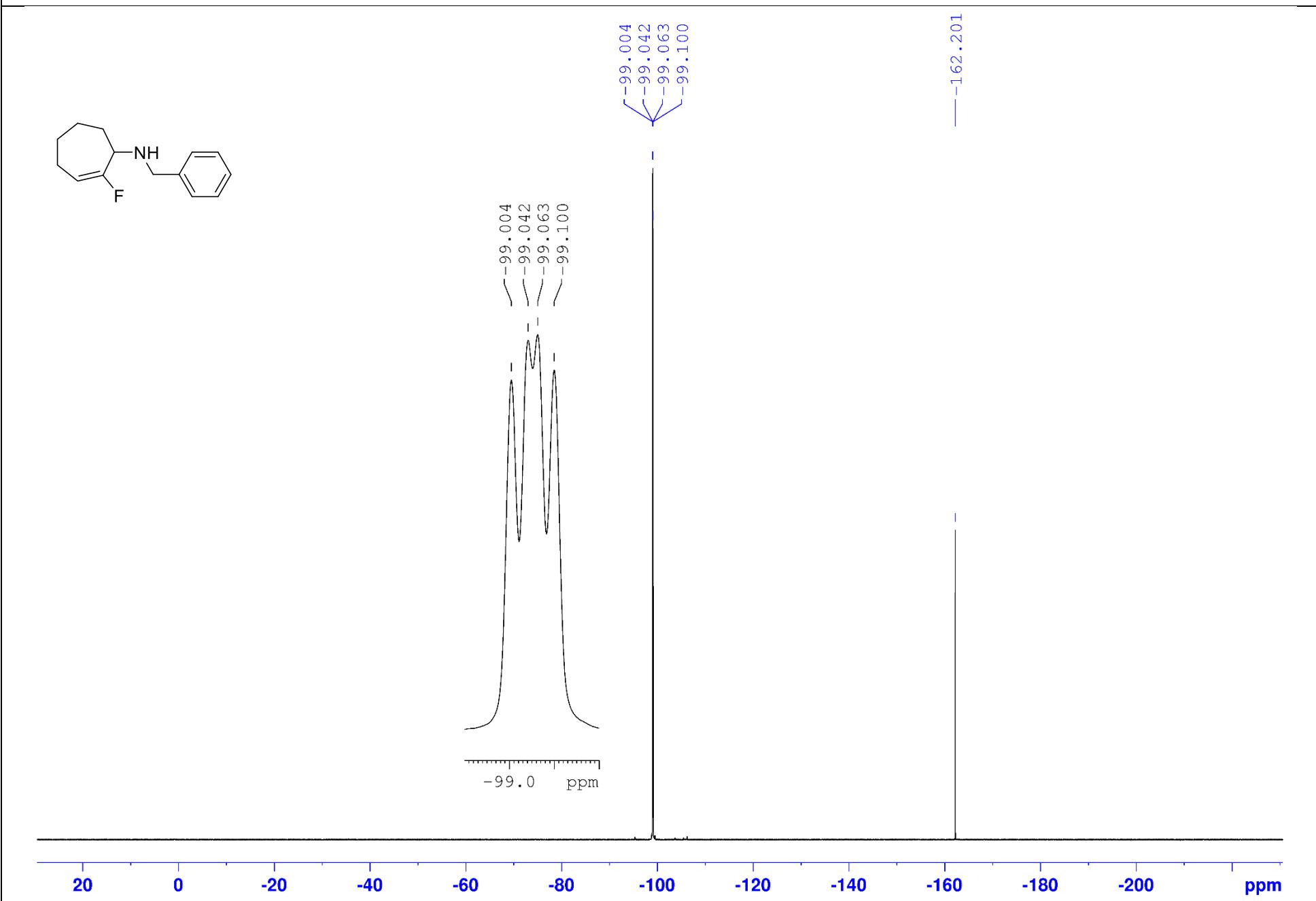
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **5a**



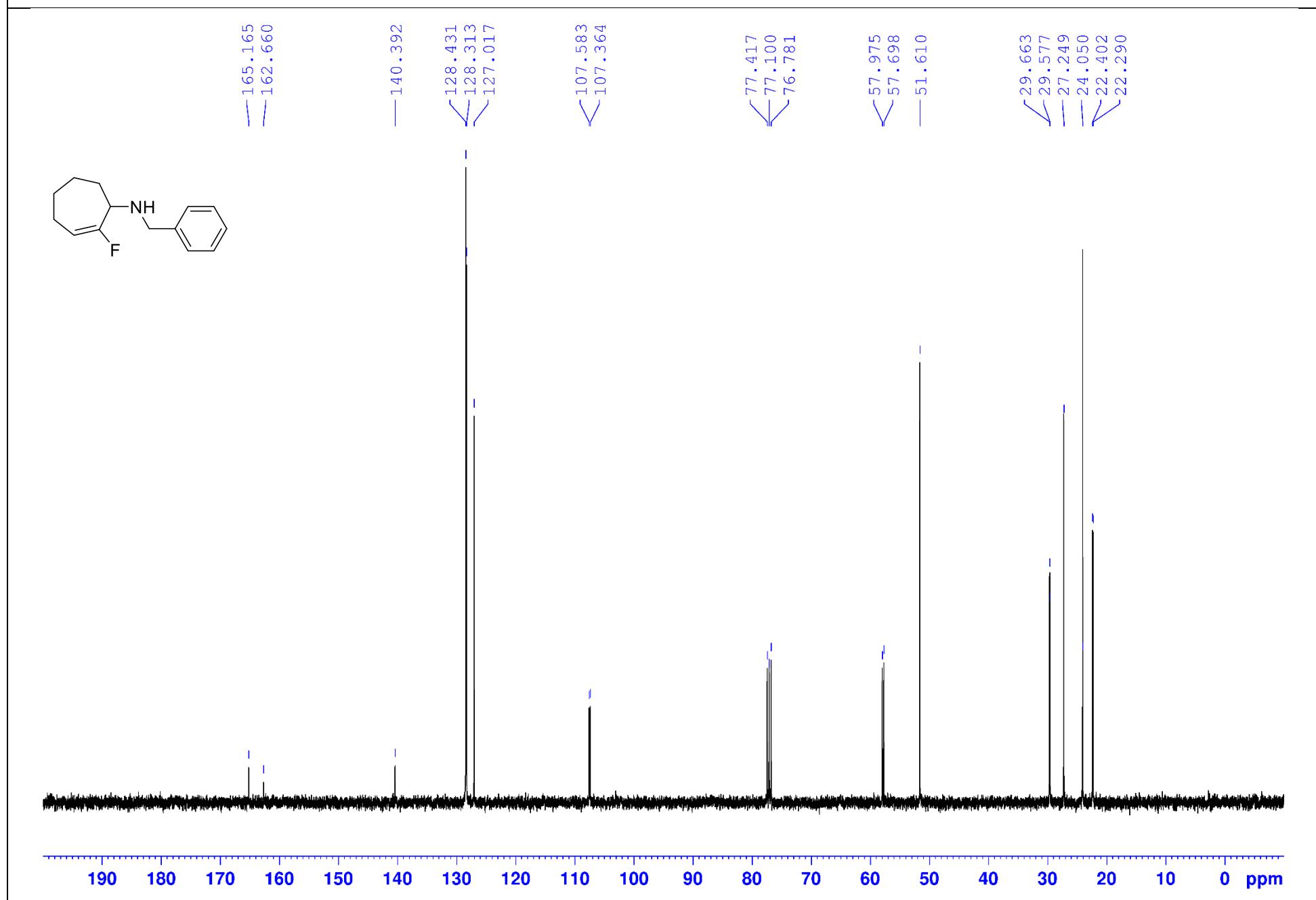
¹H NMR (CDCl_3 , 400.0 MHz) of **5b**



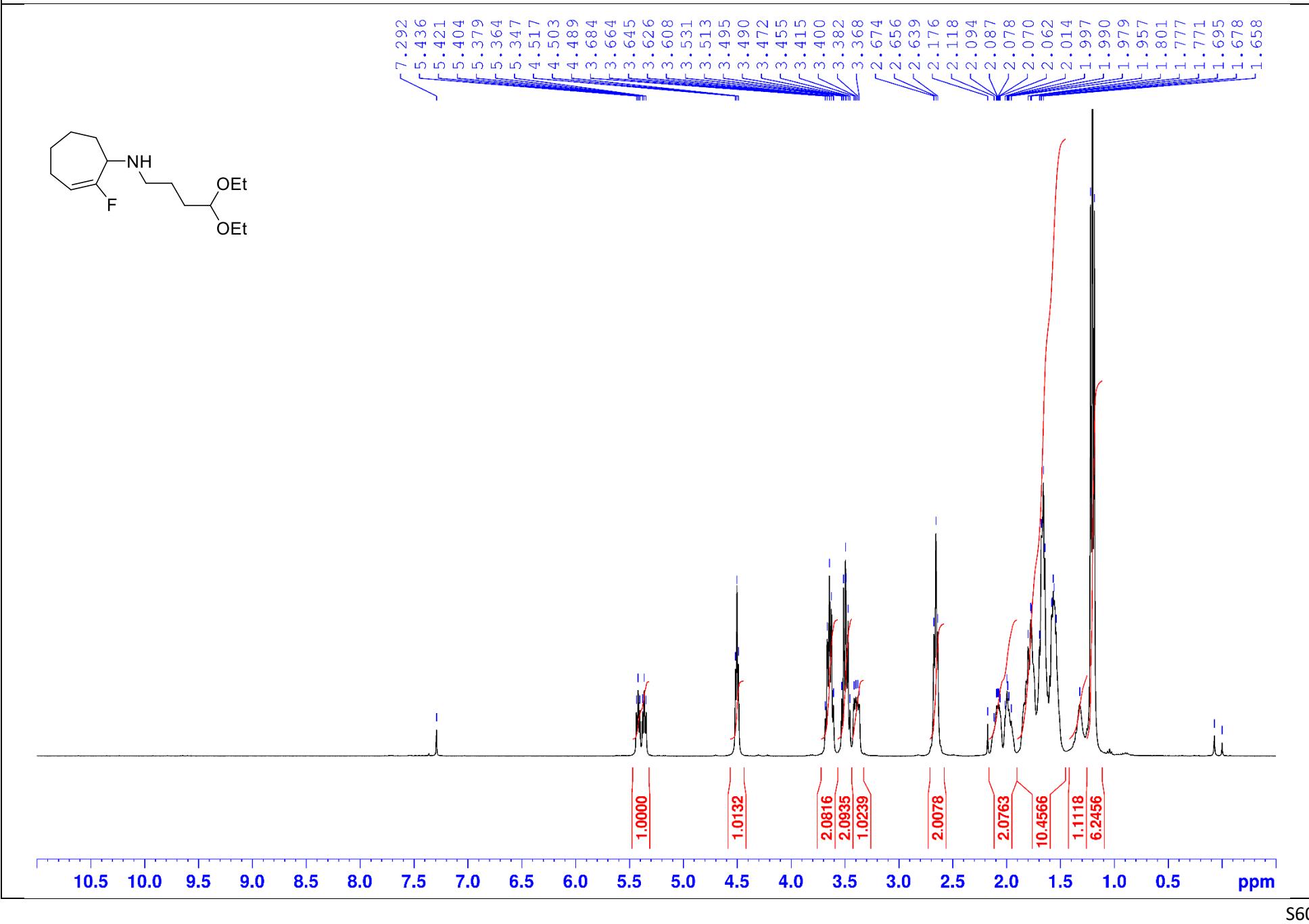
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **5b**



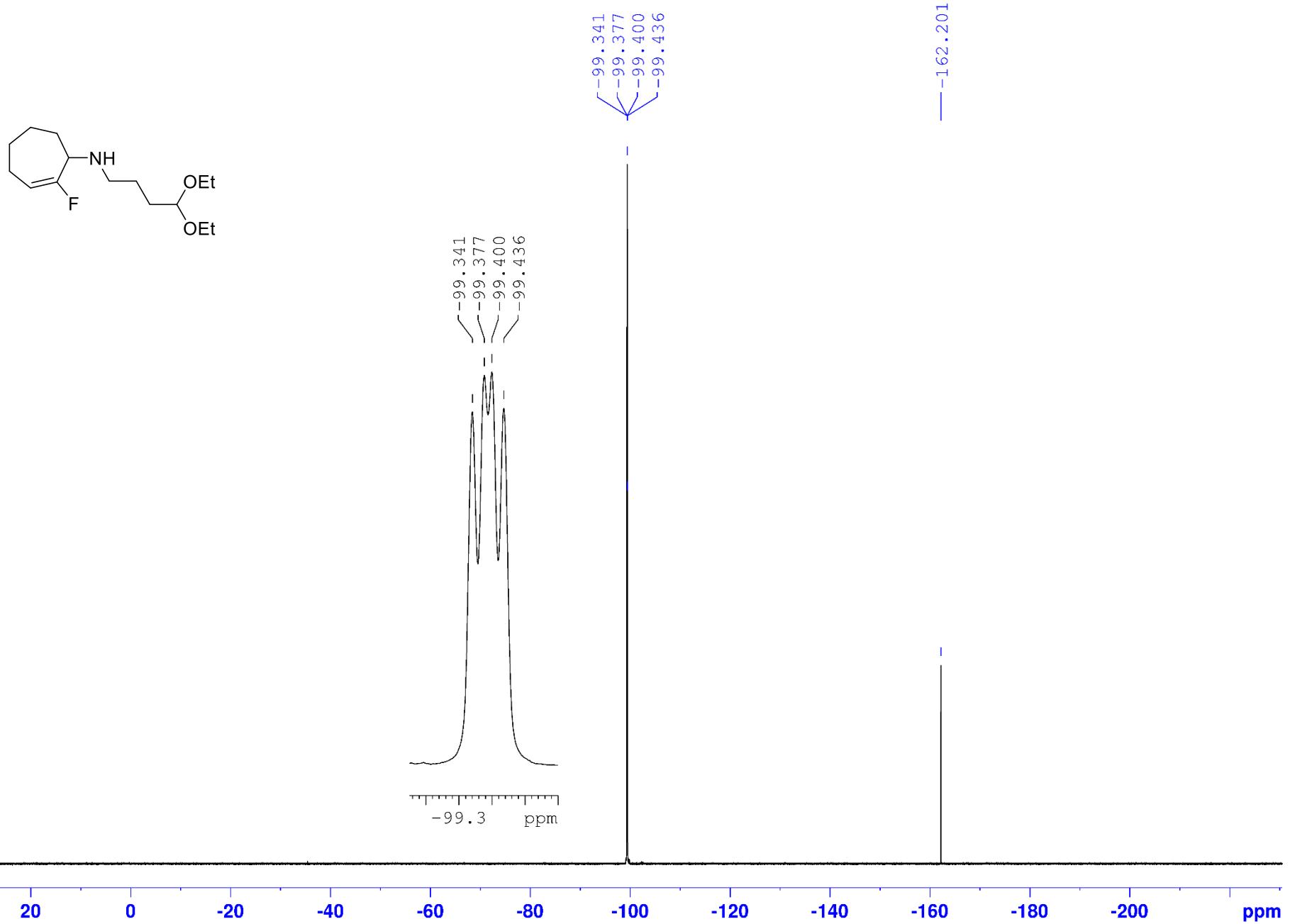
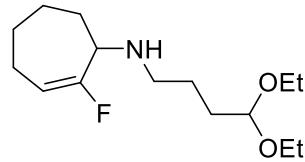
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **5b**



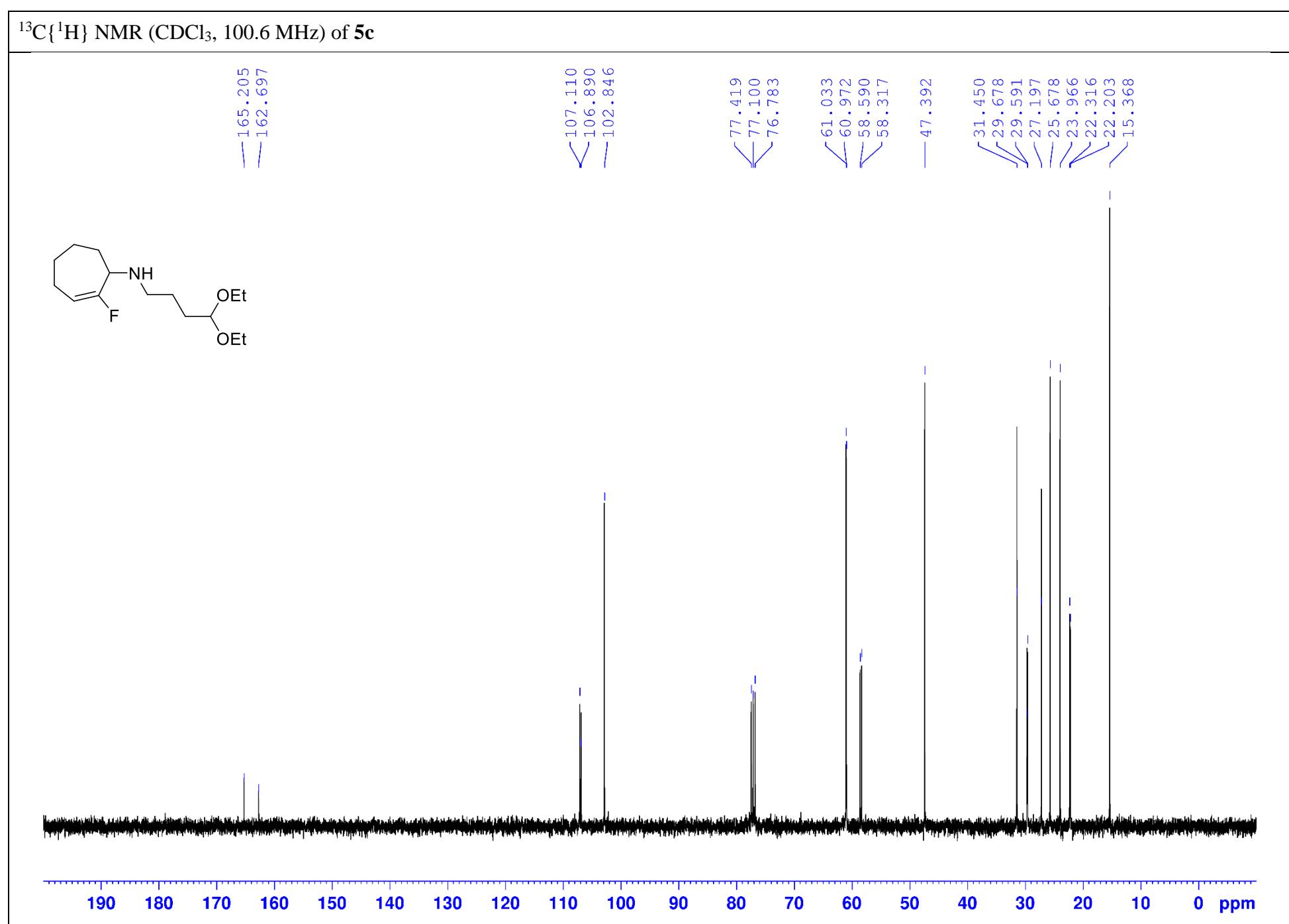
¹H NMR (CDCl_3 , 400.0 MHz) of **5c**



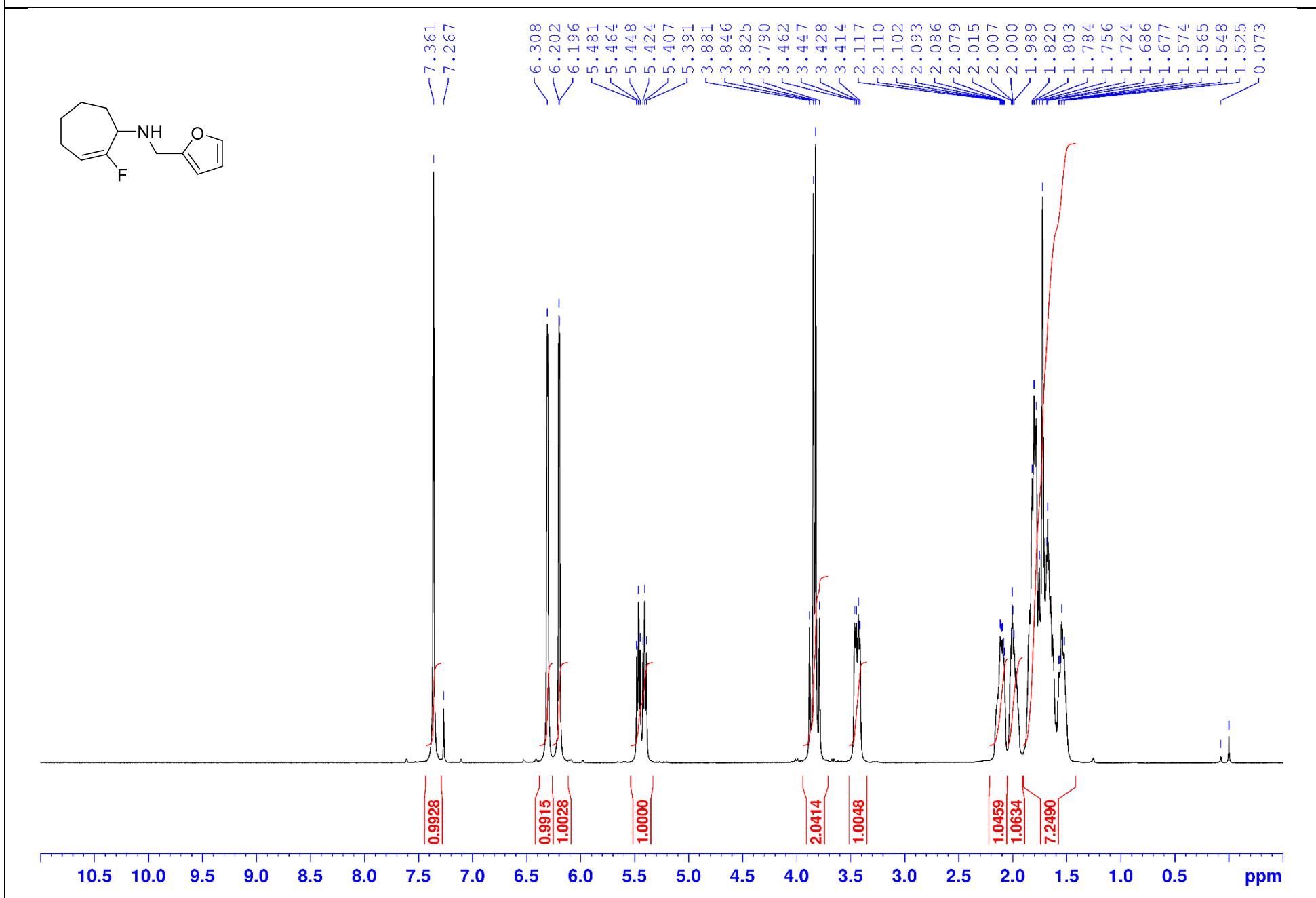
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **5c**



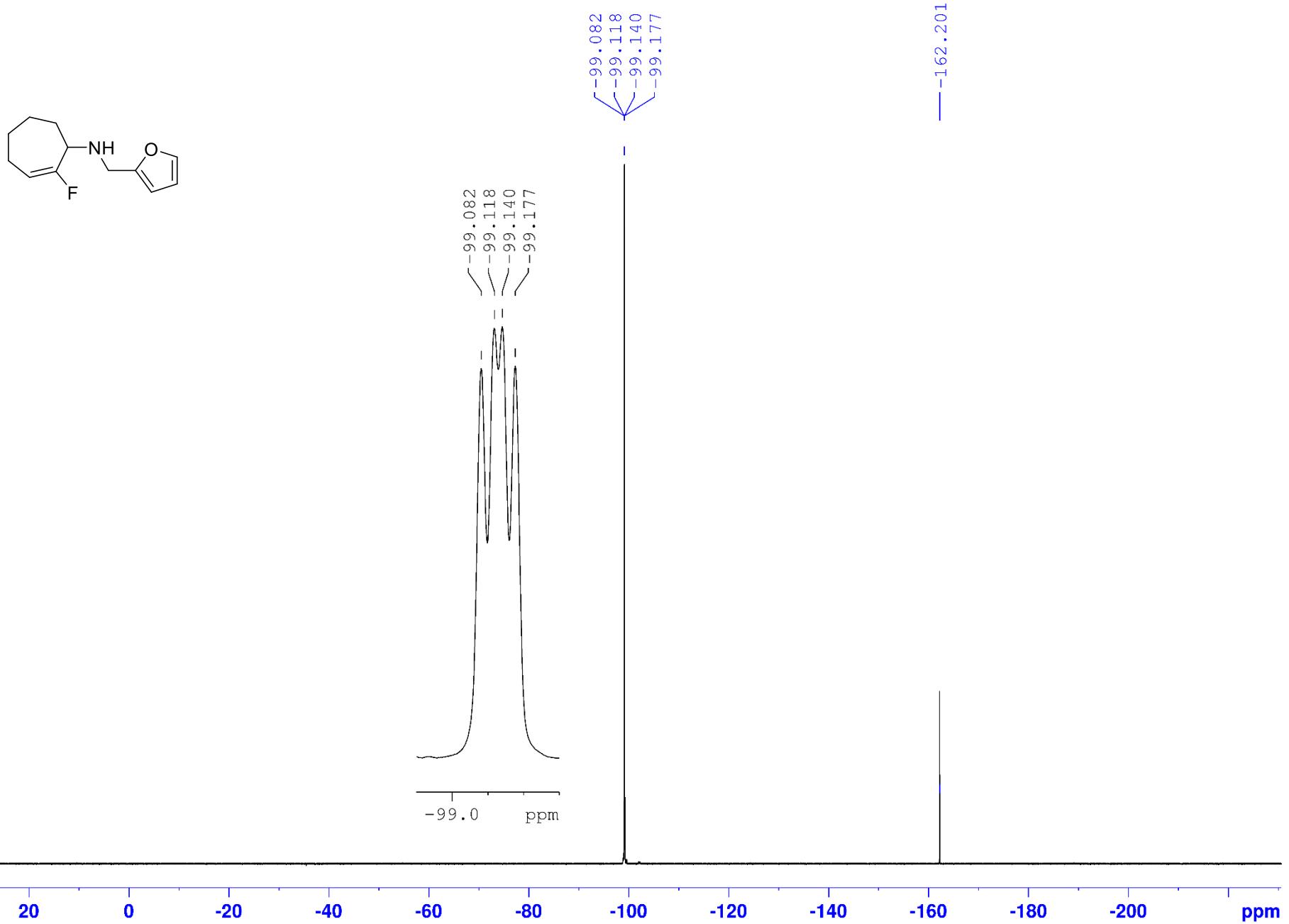
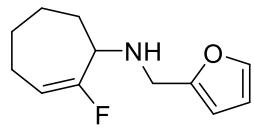
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **5c**



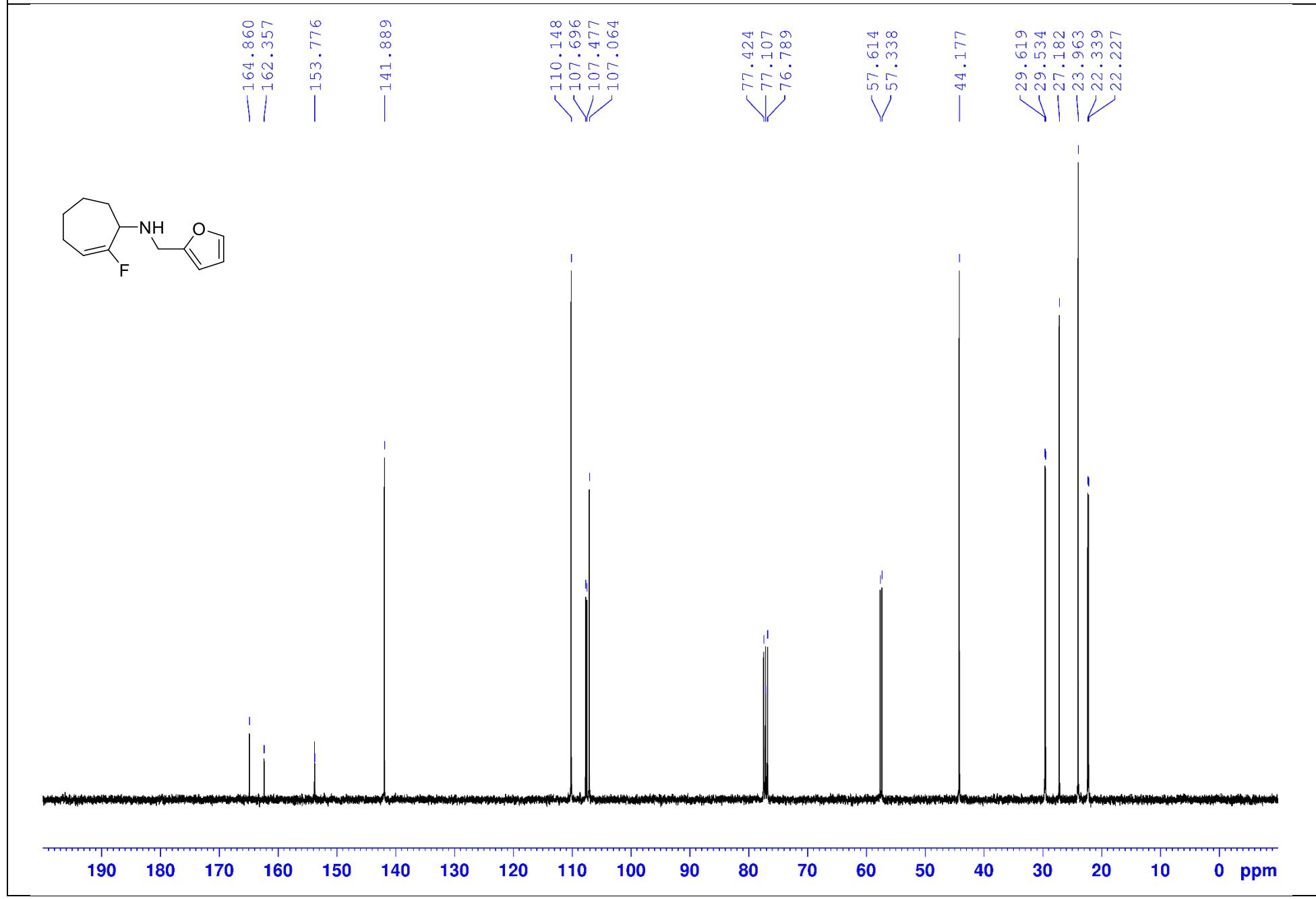
¹H NMR (CDCl_3 , 400.0 MHz) of **5d**



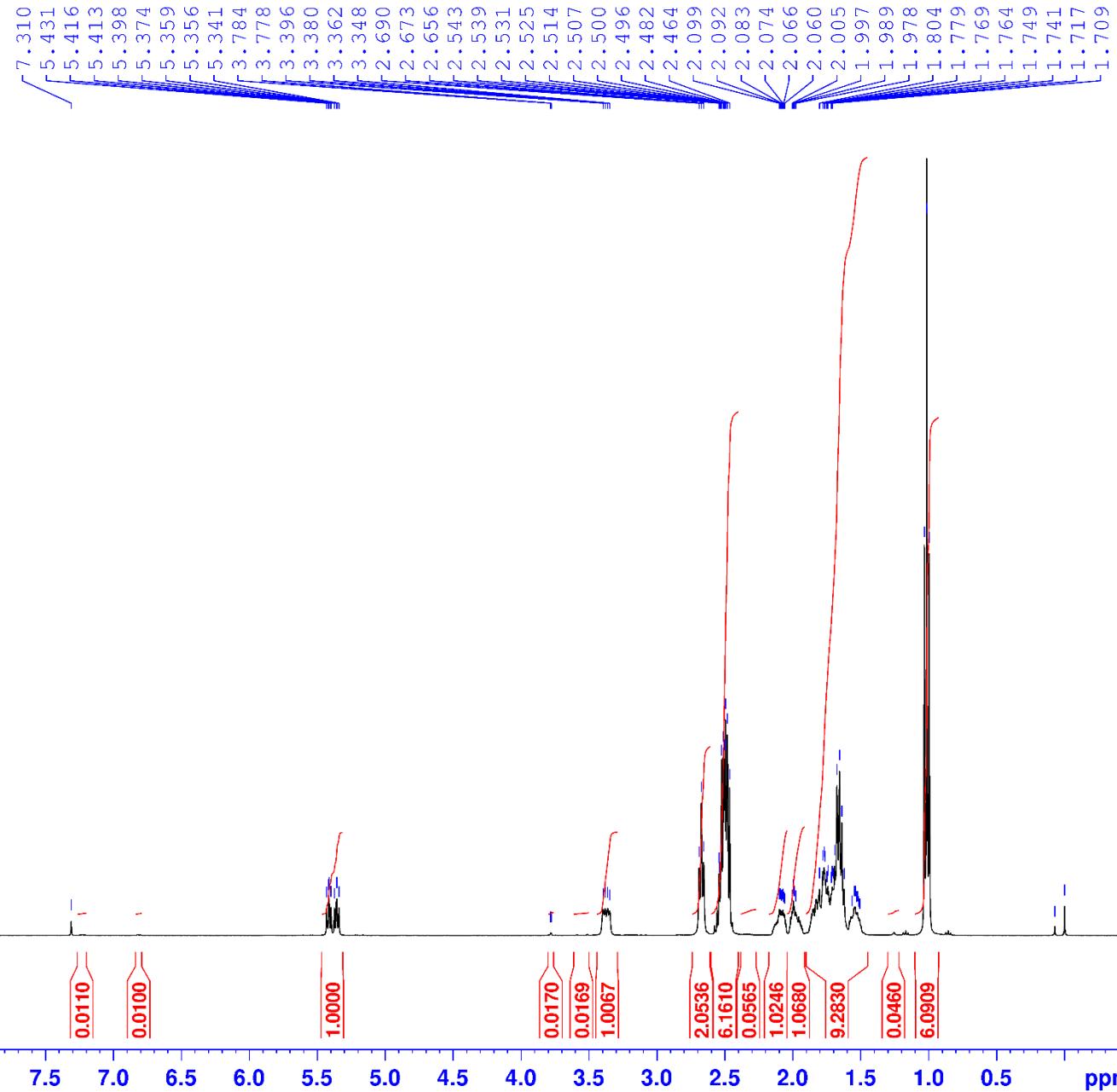
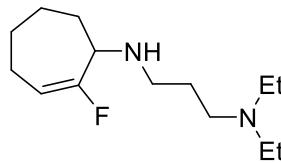
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **5d**



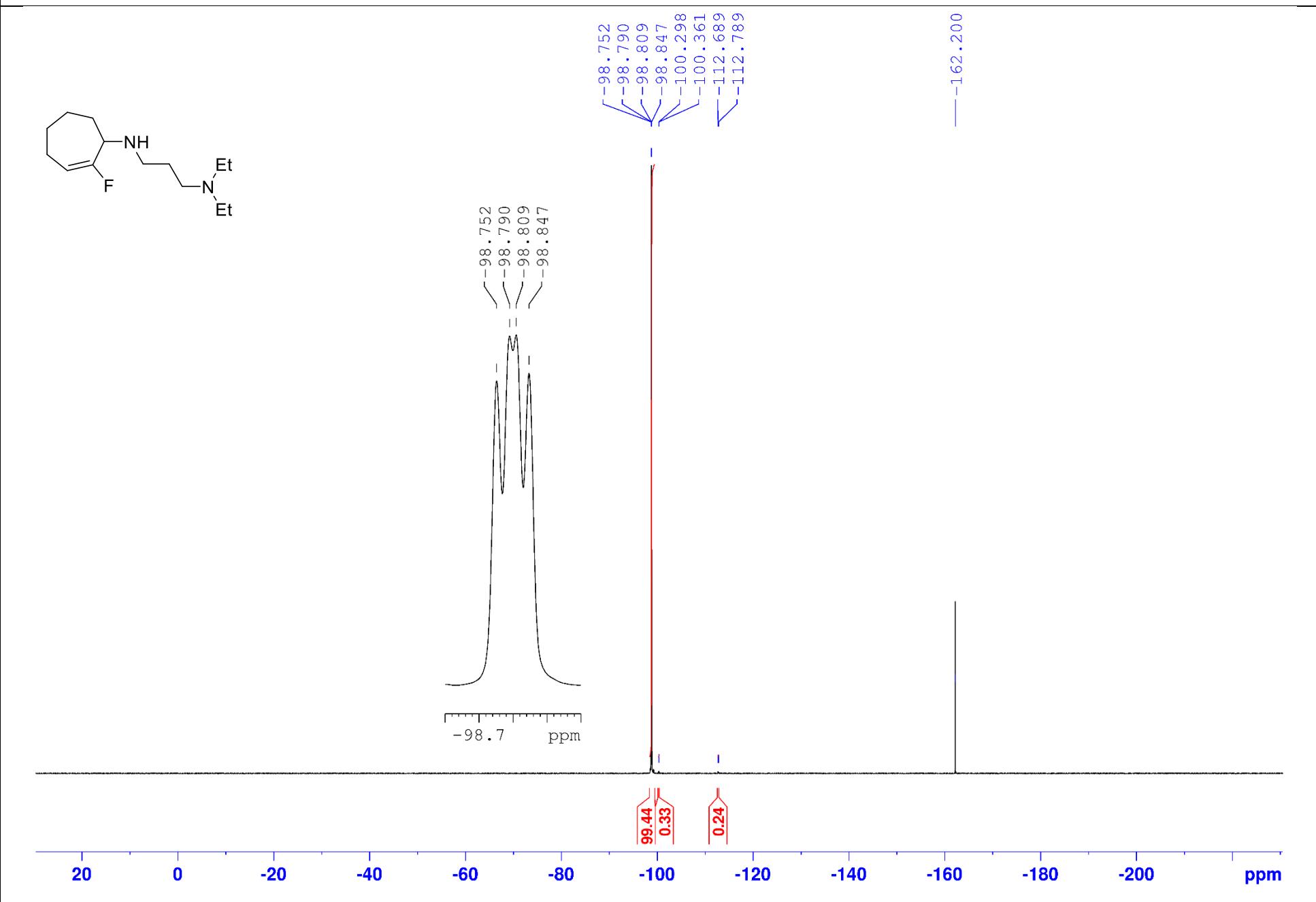
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **5d**



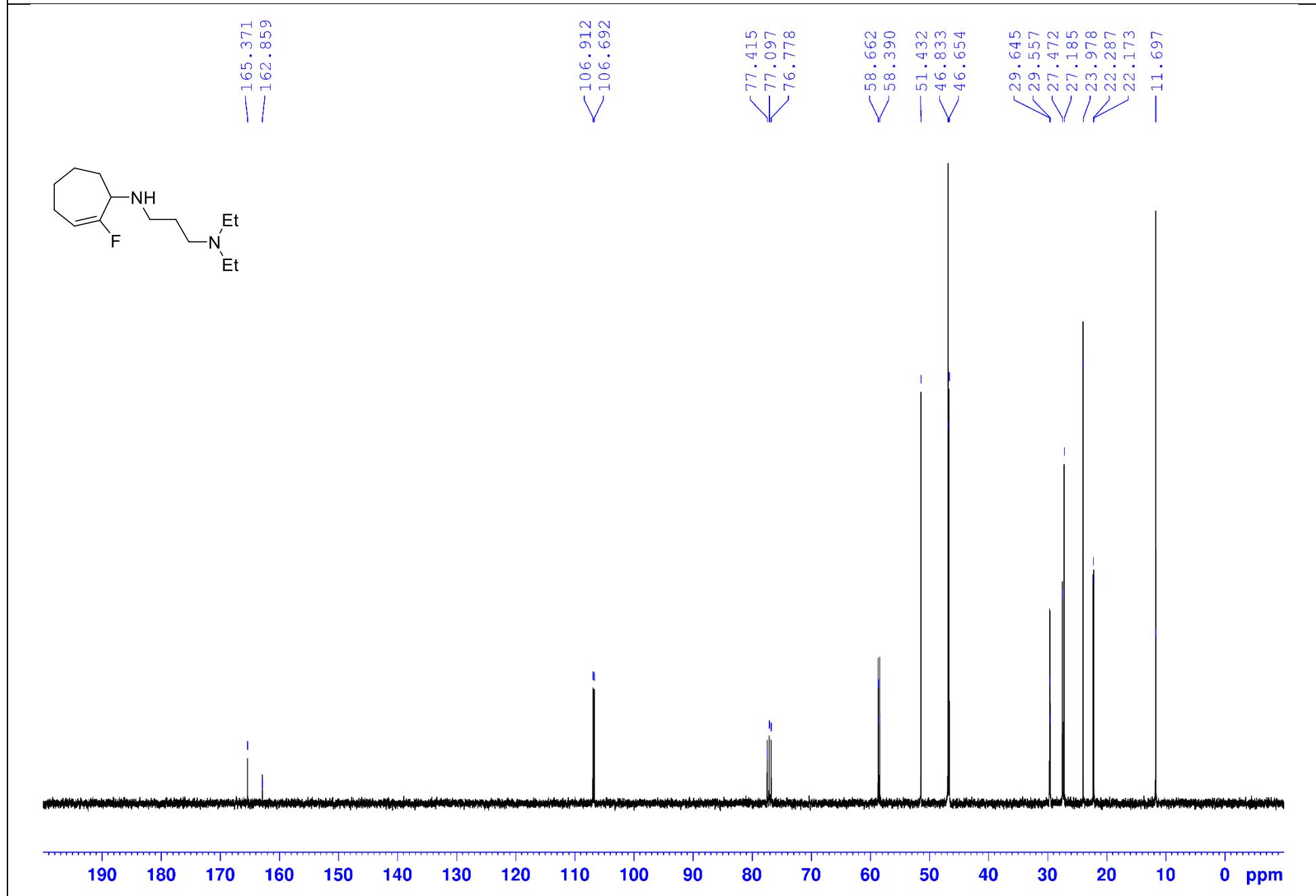
¹H NMR (CDCl₃, 400.0 MHz) of **5e**



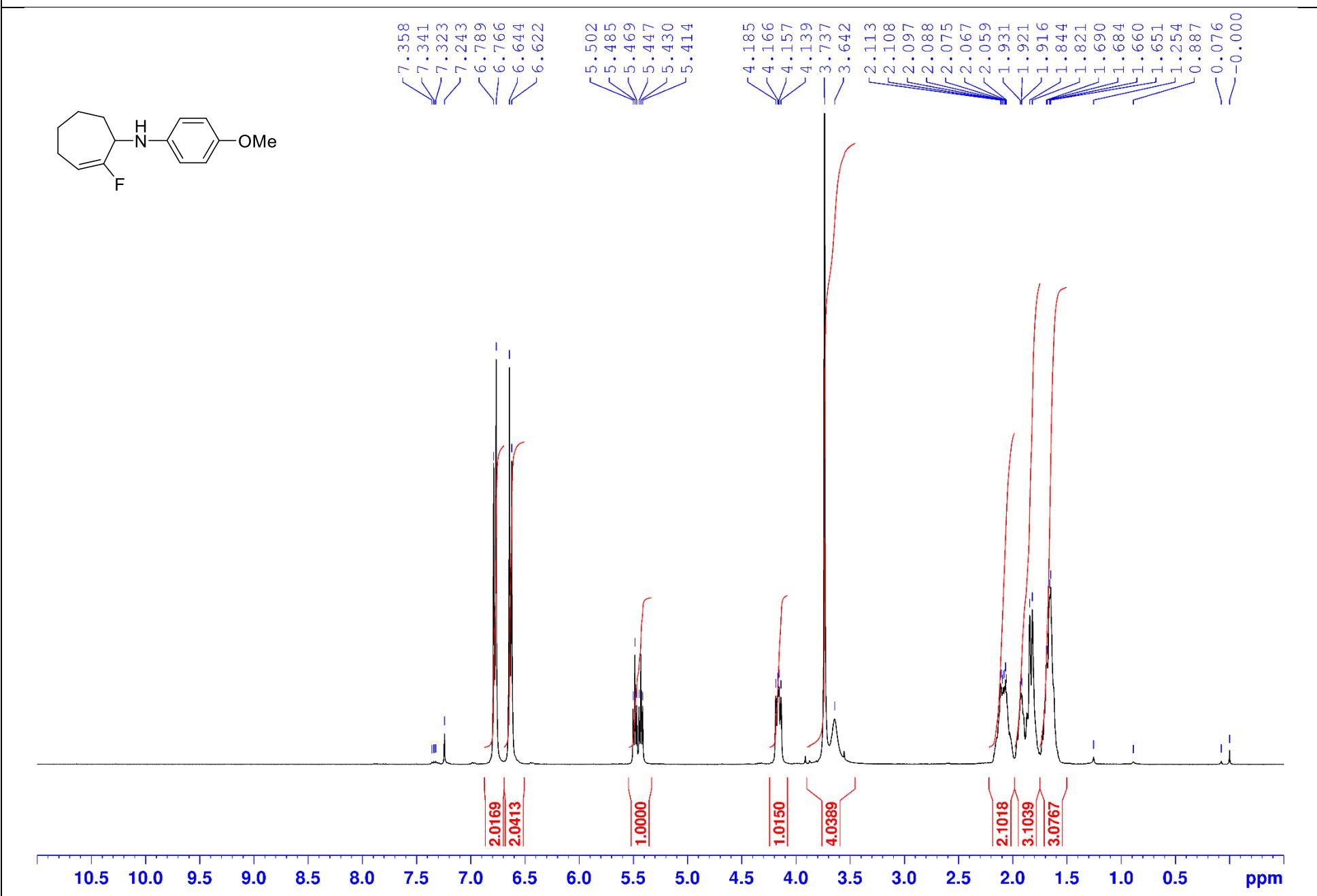
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **5e**



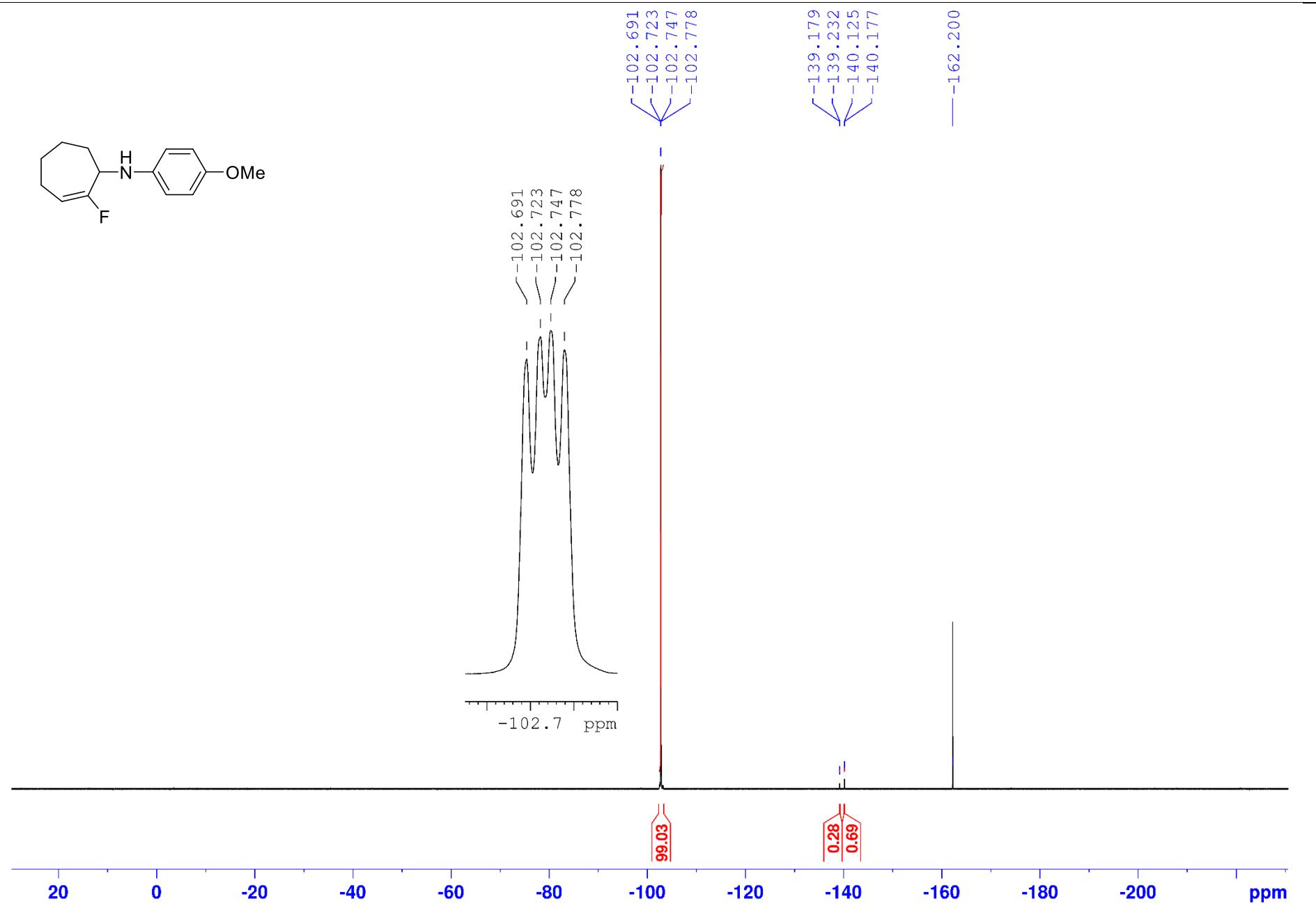
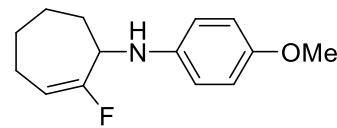
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **5e**



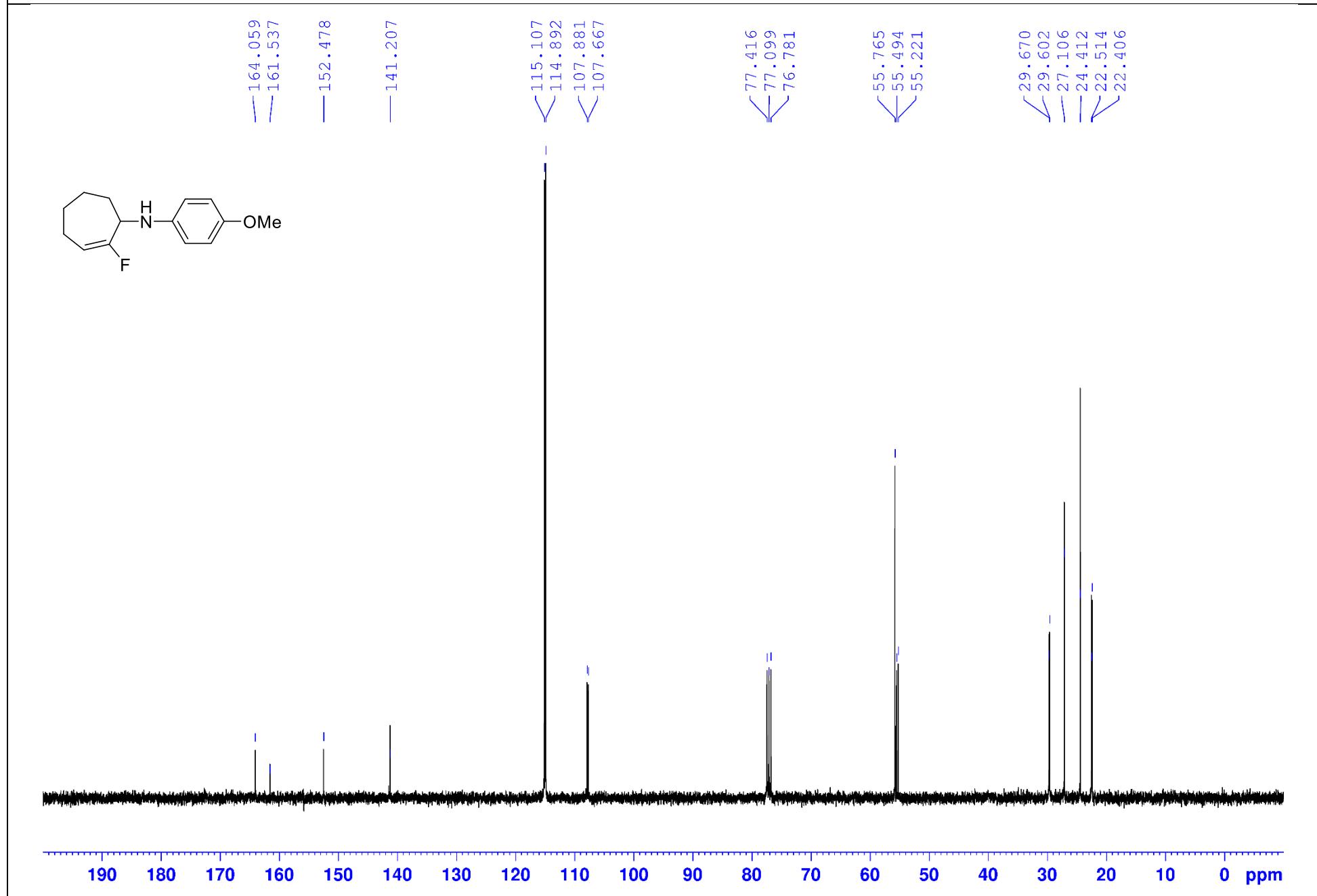
¹H NMR (CDCl_3 , 400.0 MHz) of **6a**



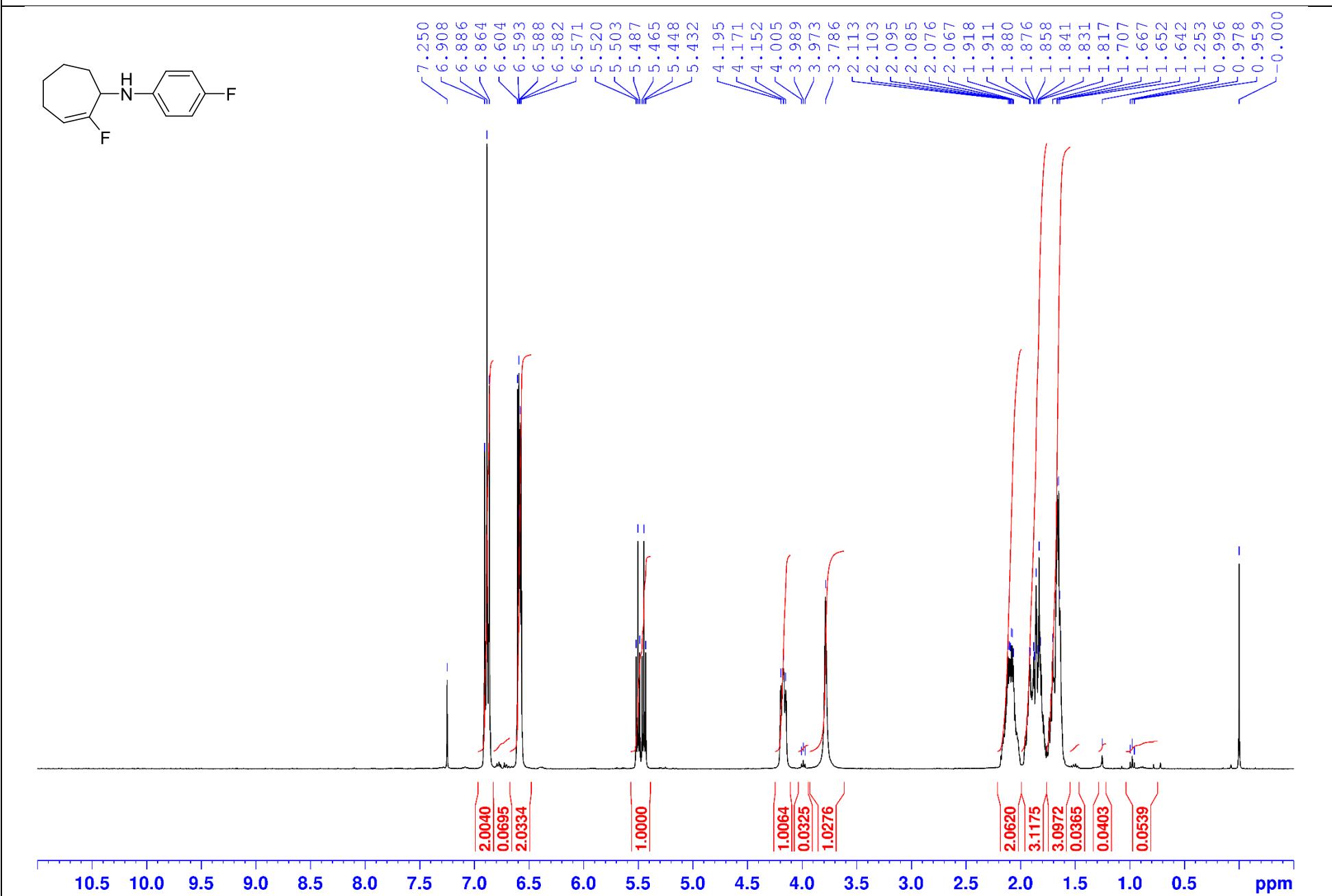
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **6a**



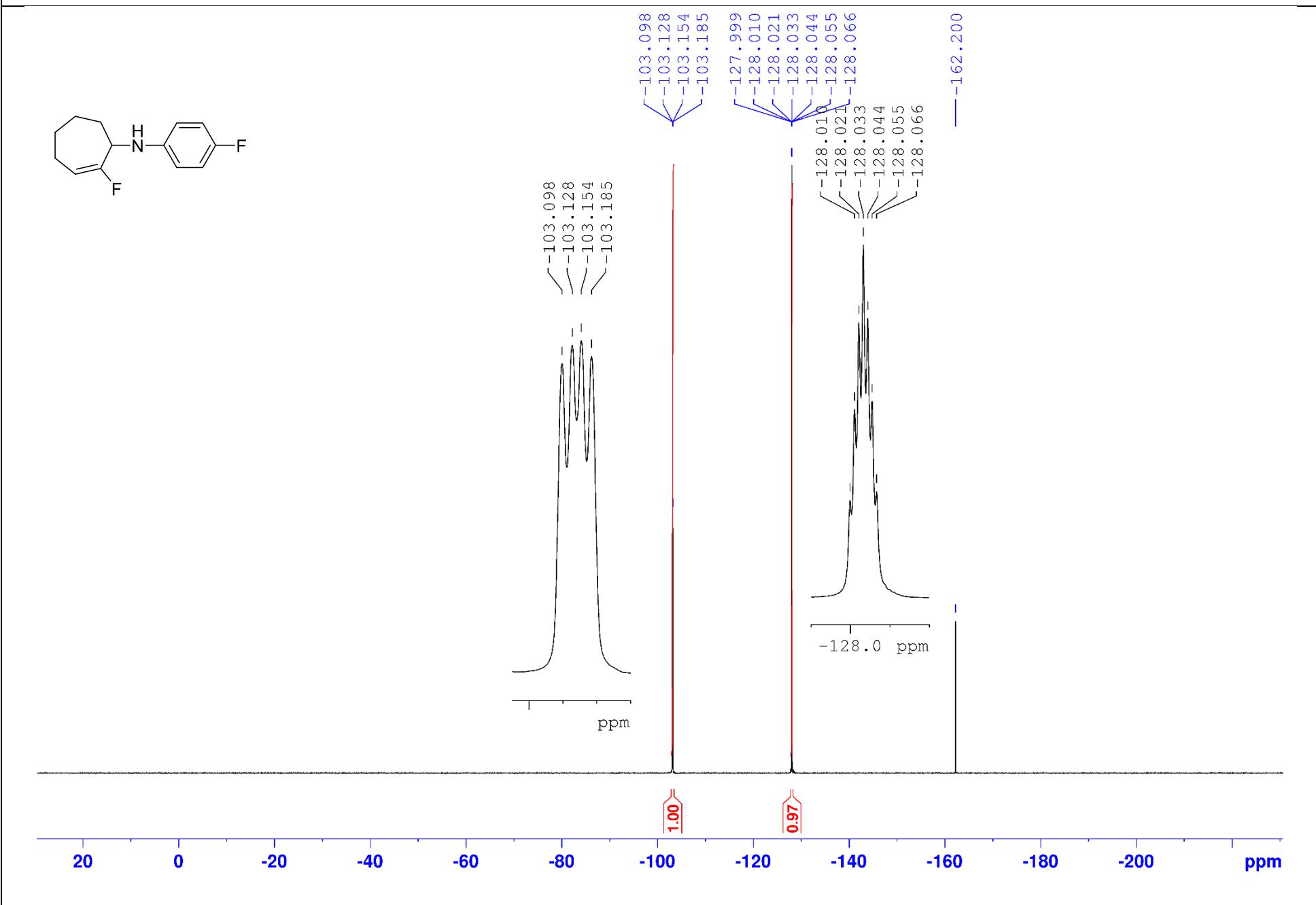
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **6a**



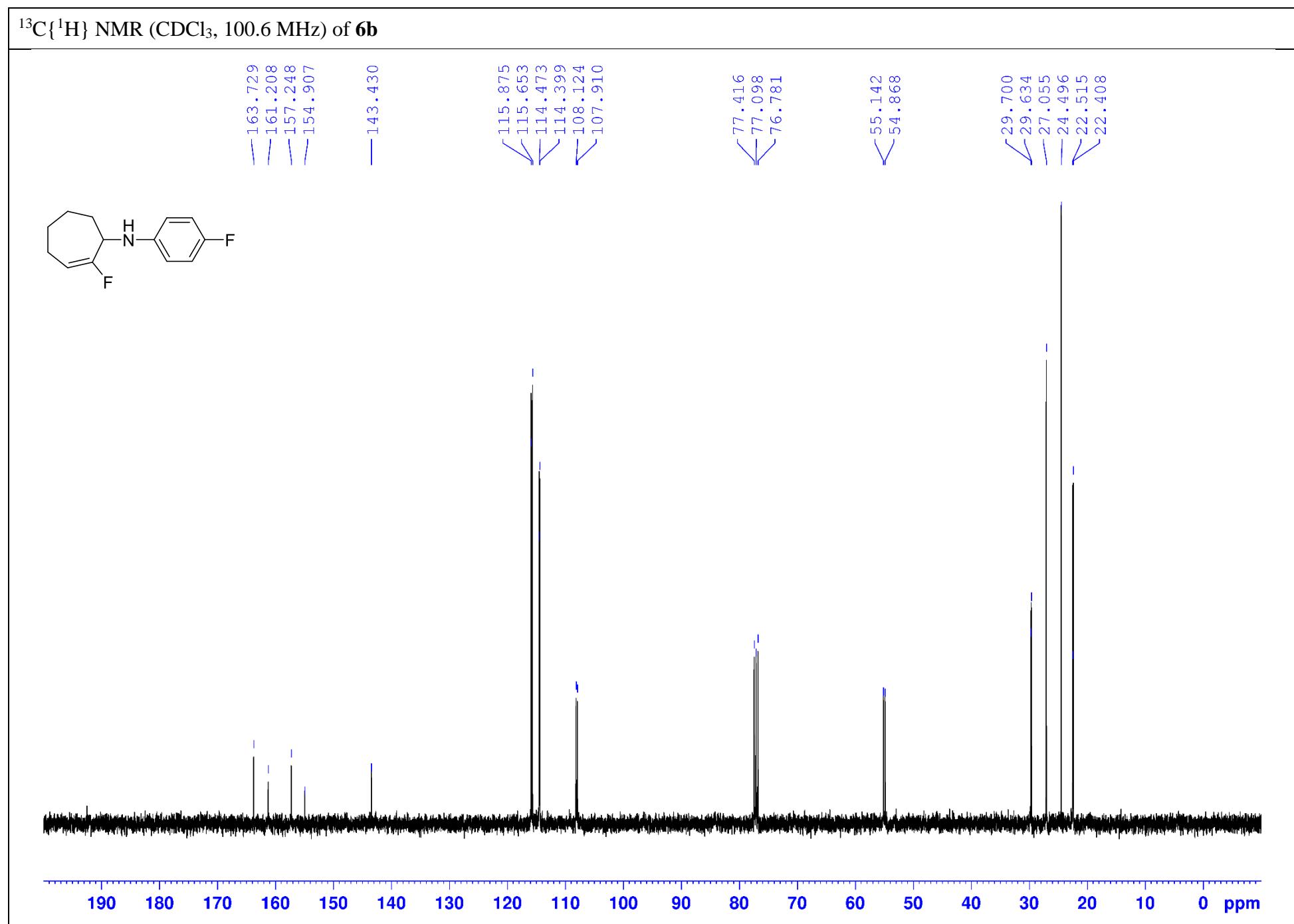
¹H NMR (CDCl_3 , 400.0 MHz) of **6b**



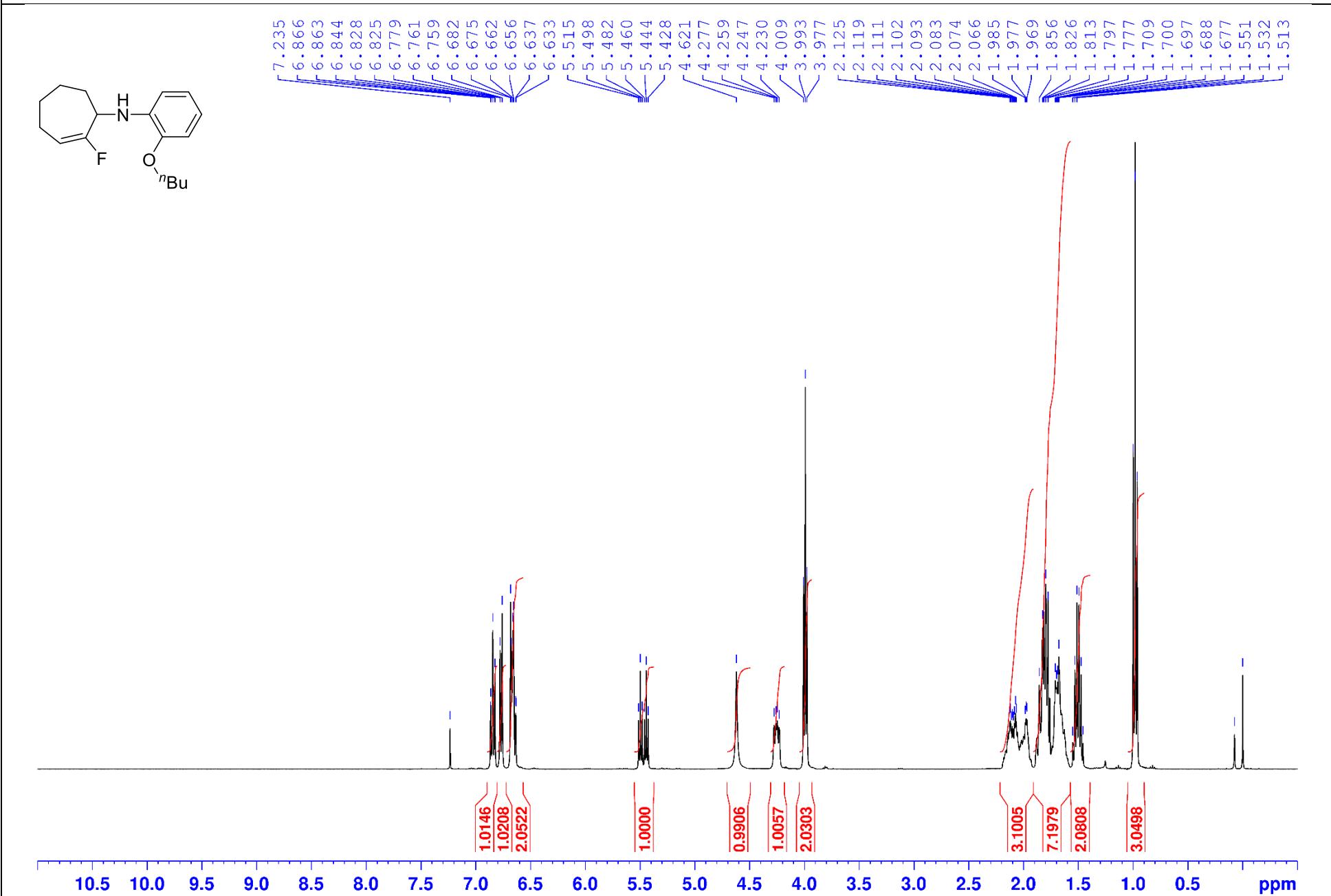
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **6b**



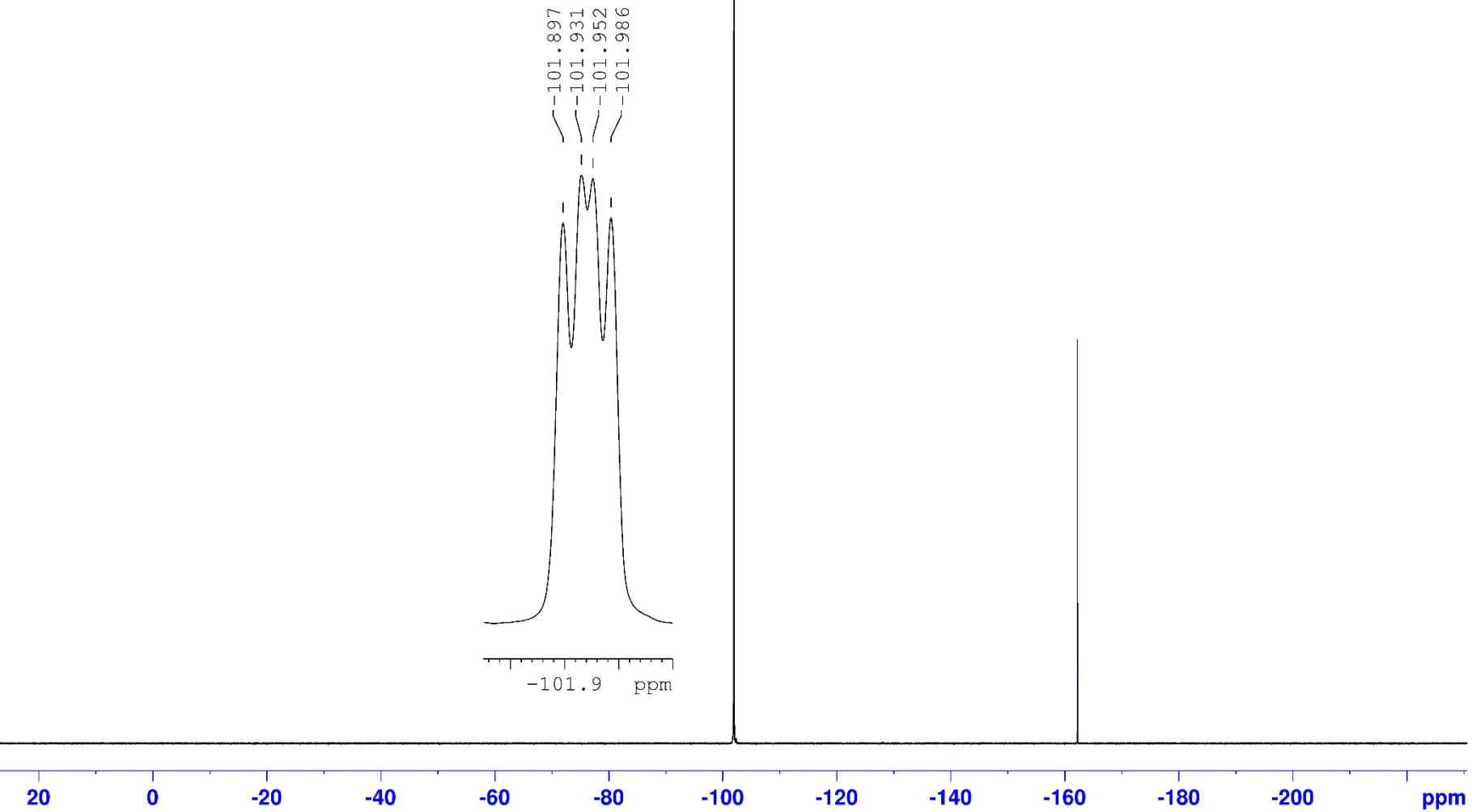
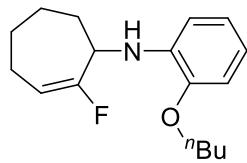
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **6b**



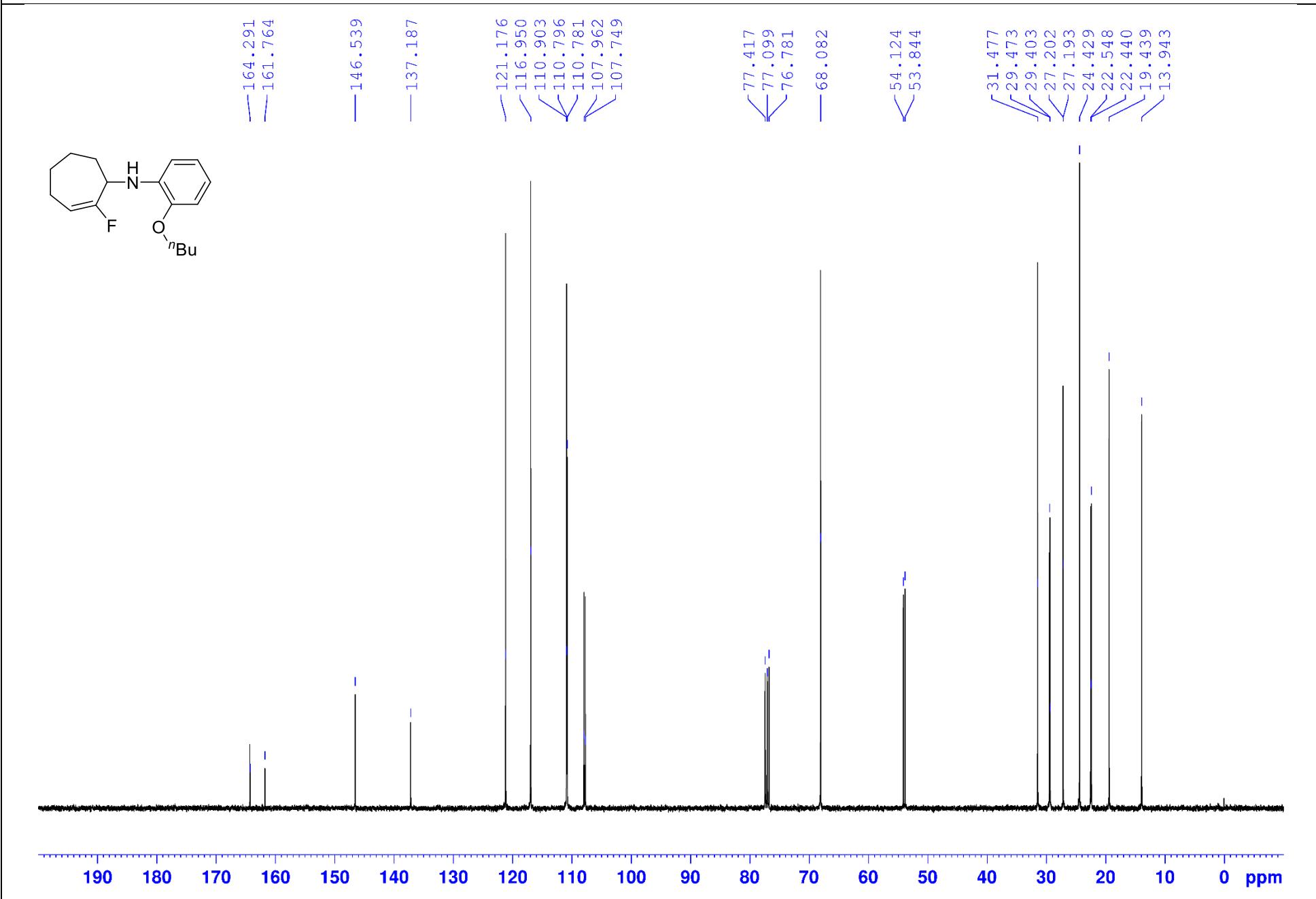
¹H NMR (CDCl_3 , 400.0 MHz) of **6c**



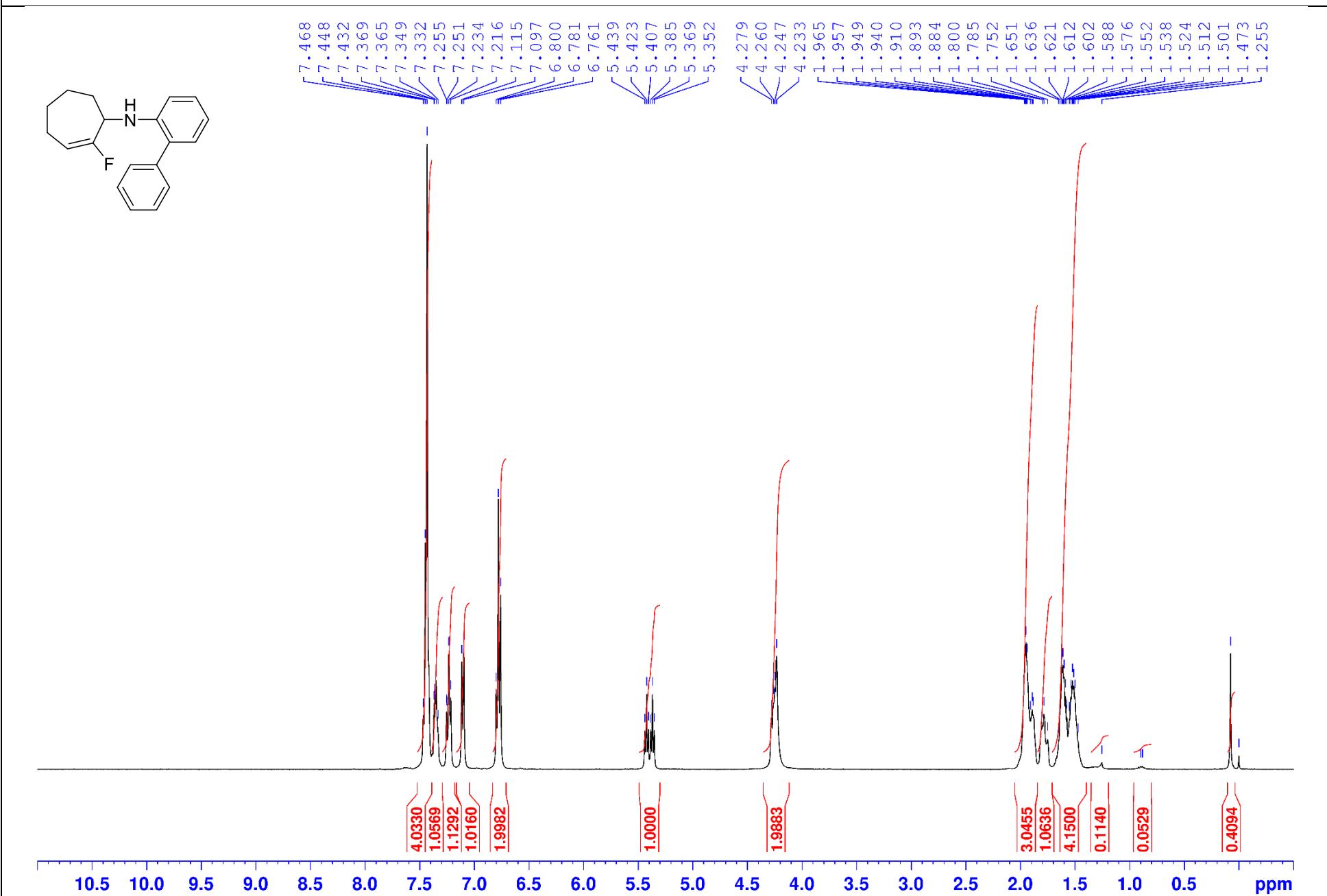
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **6c**



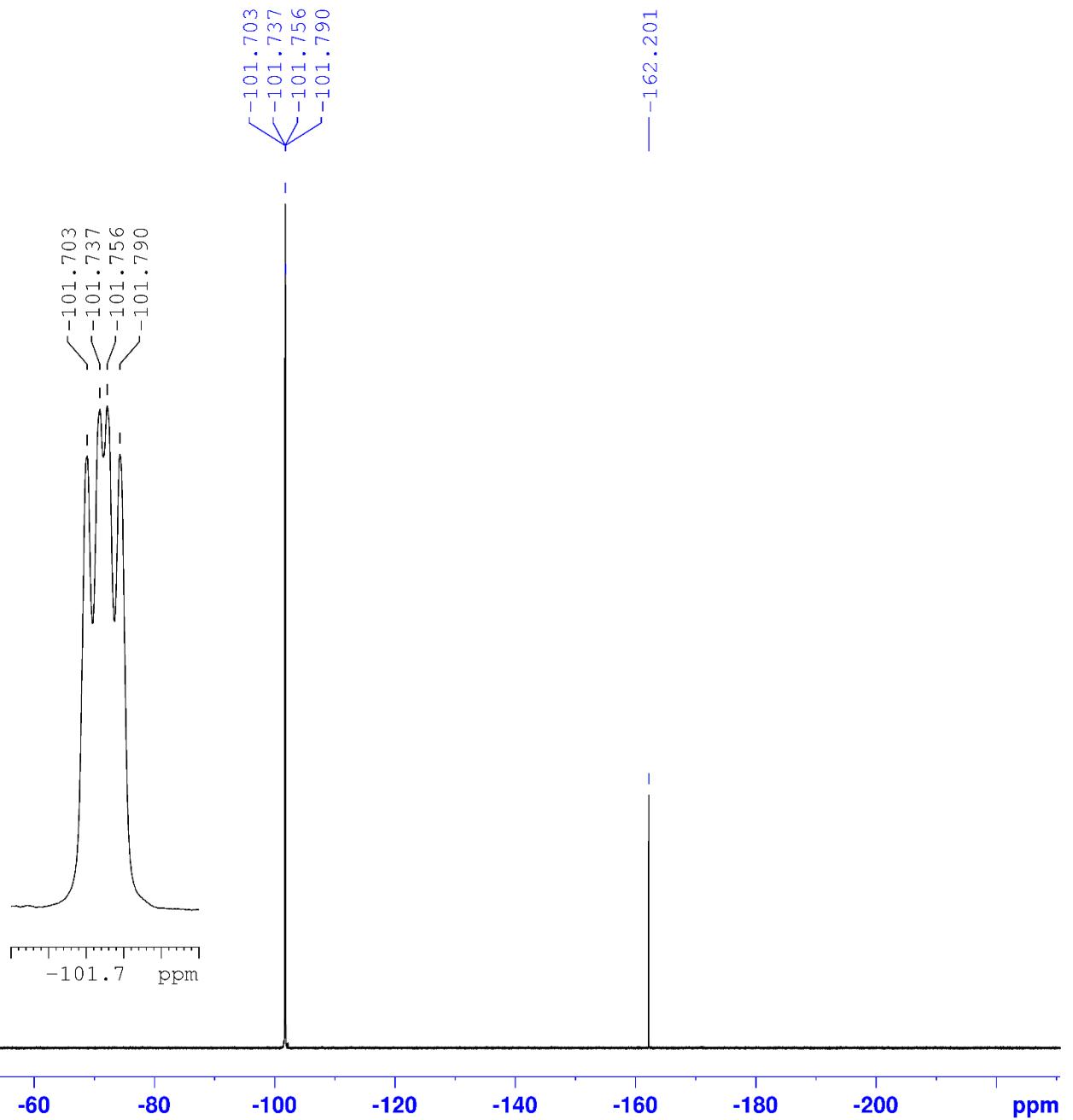
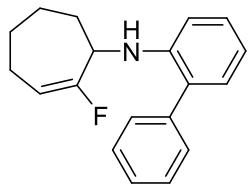
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **6c**



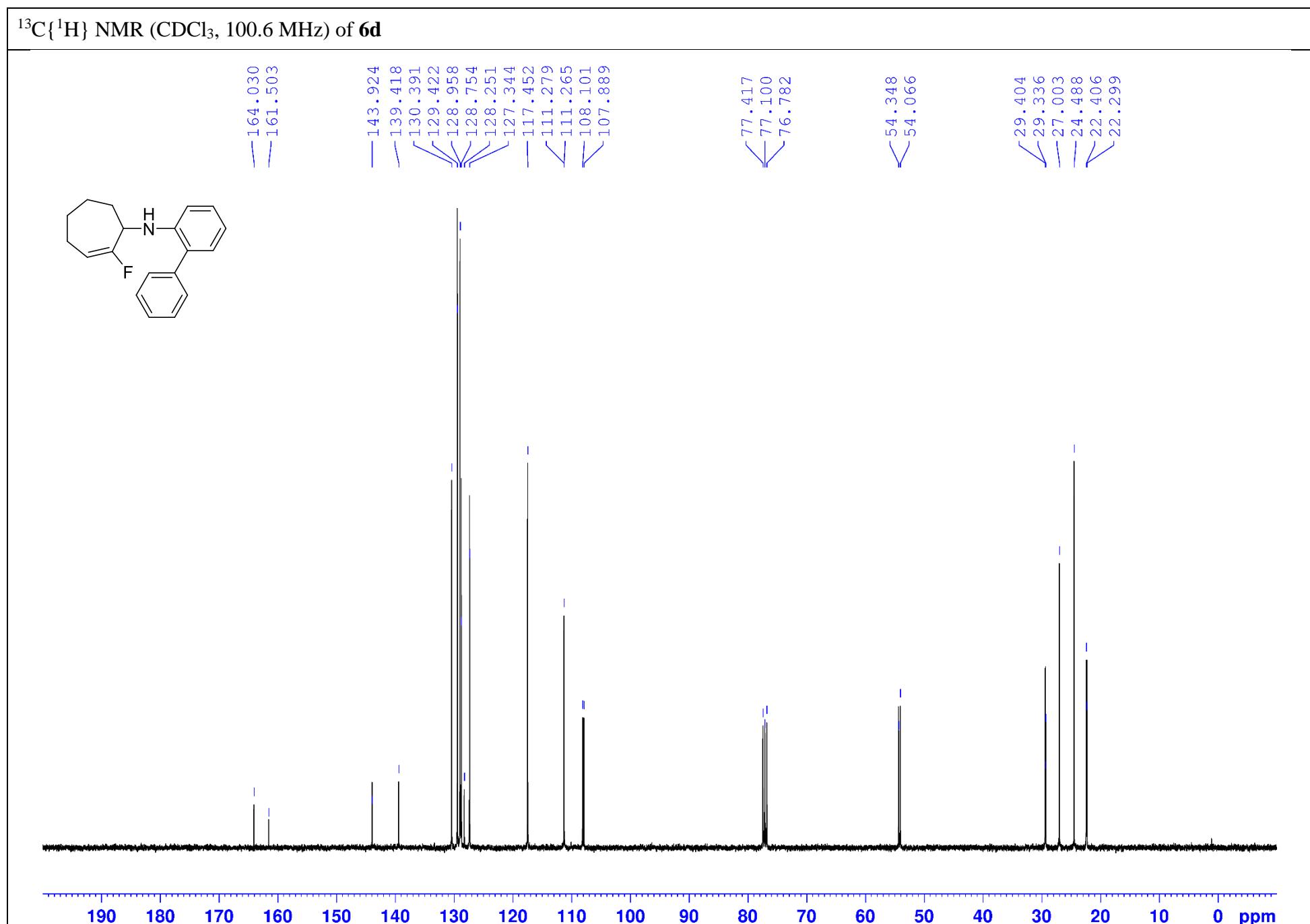
¹H NMR (CDCl_3 , 400.0 MHz) of **6d**



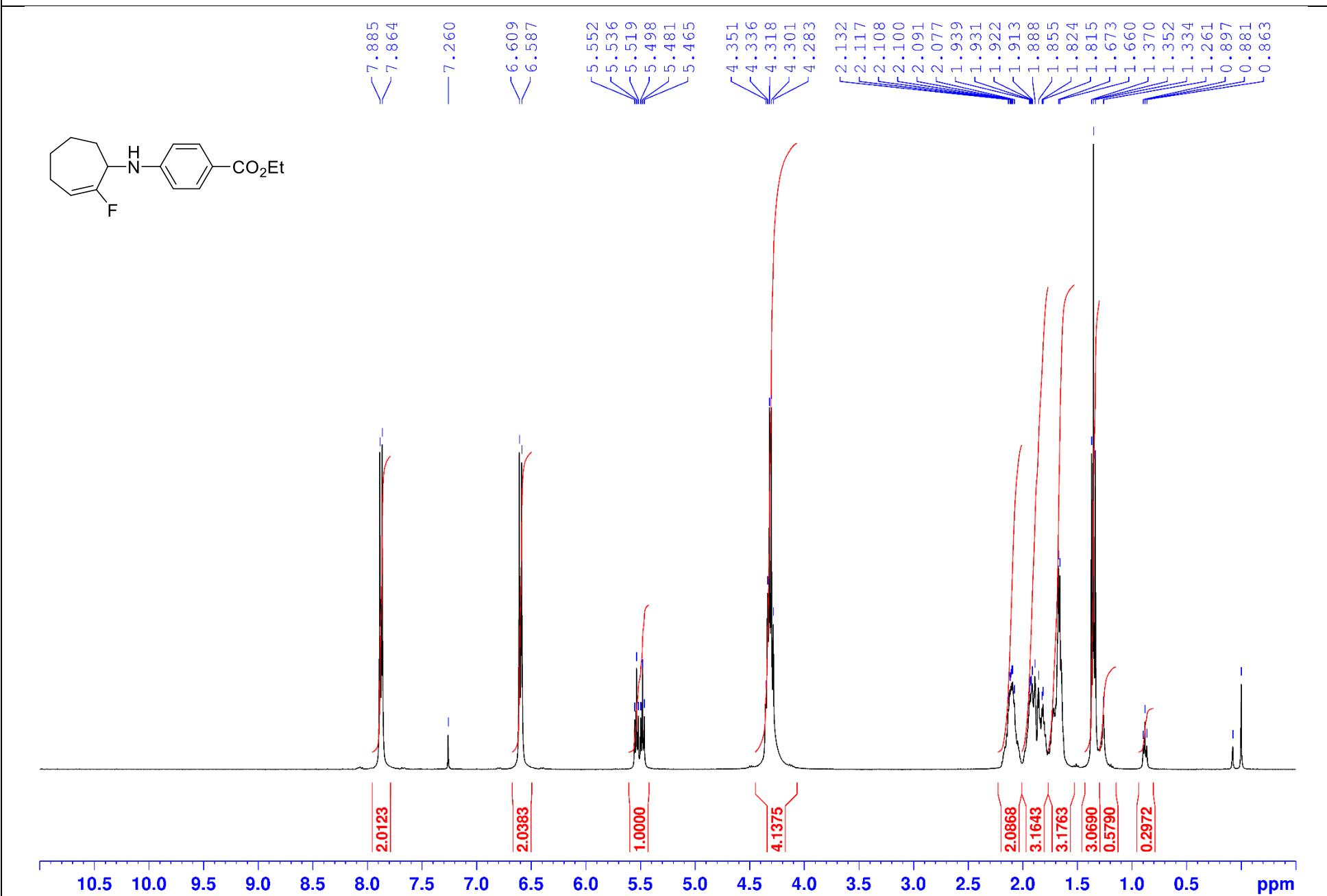
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **6d**



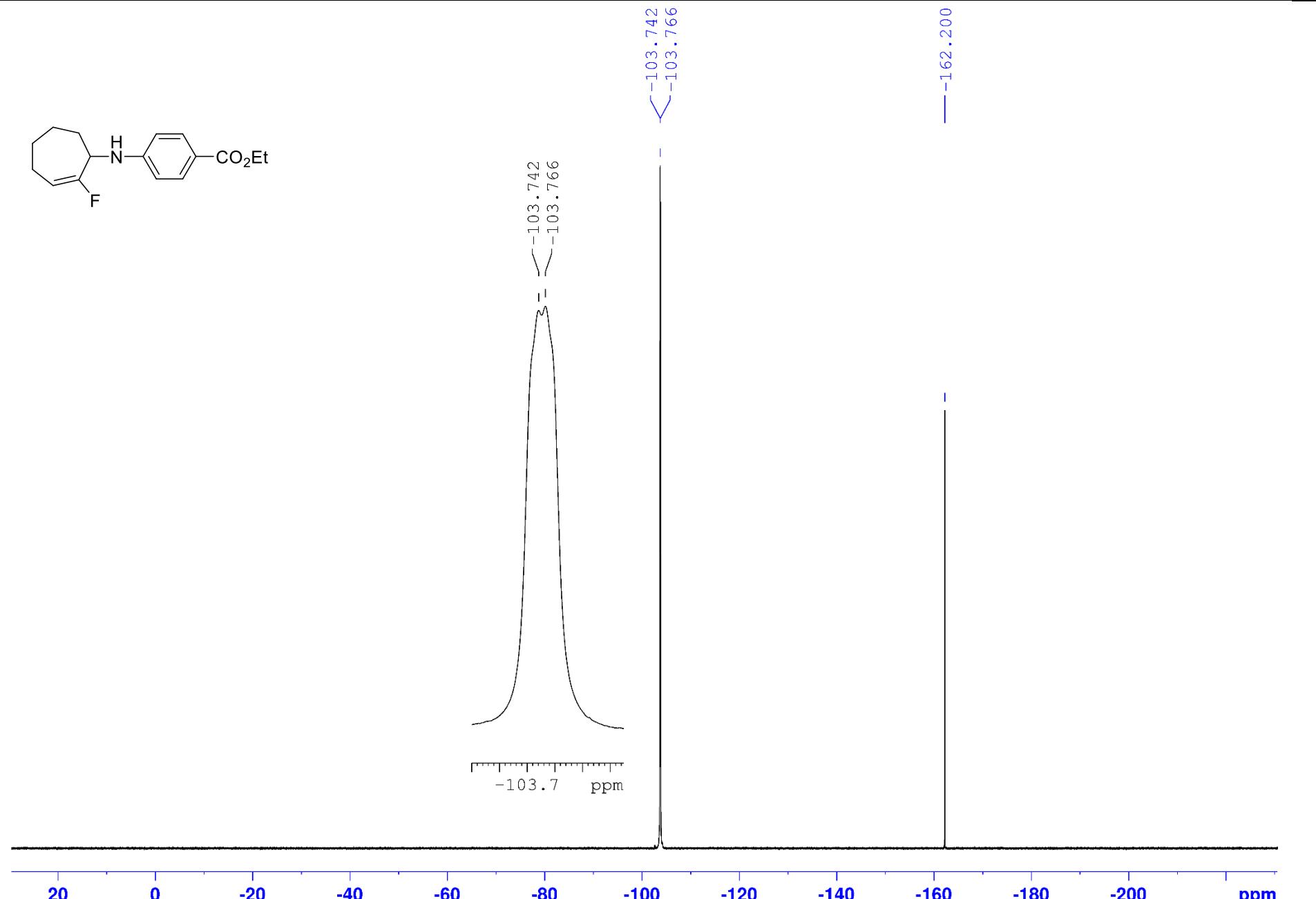
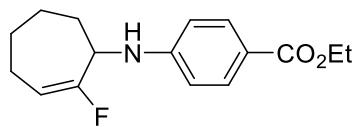
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **6d**



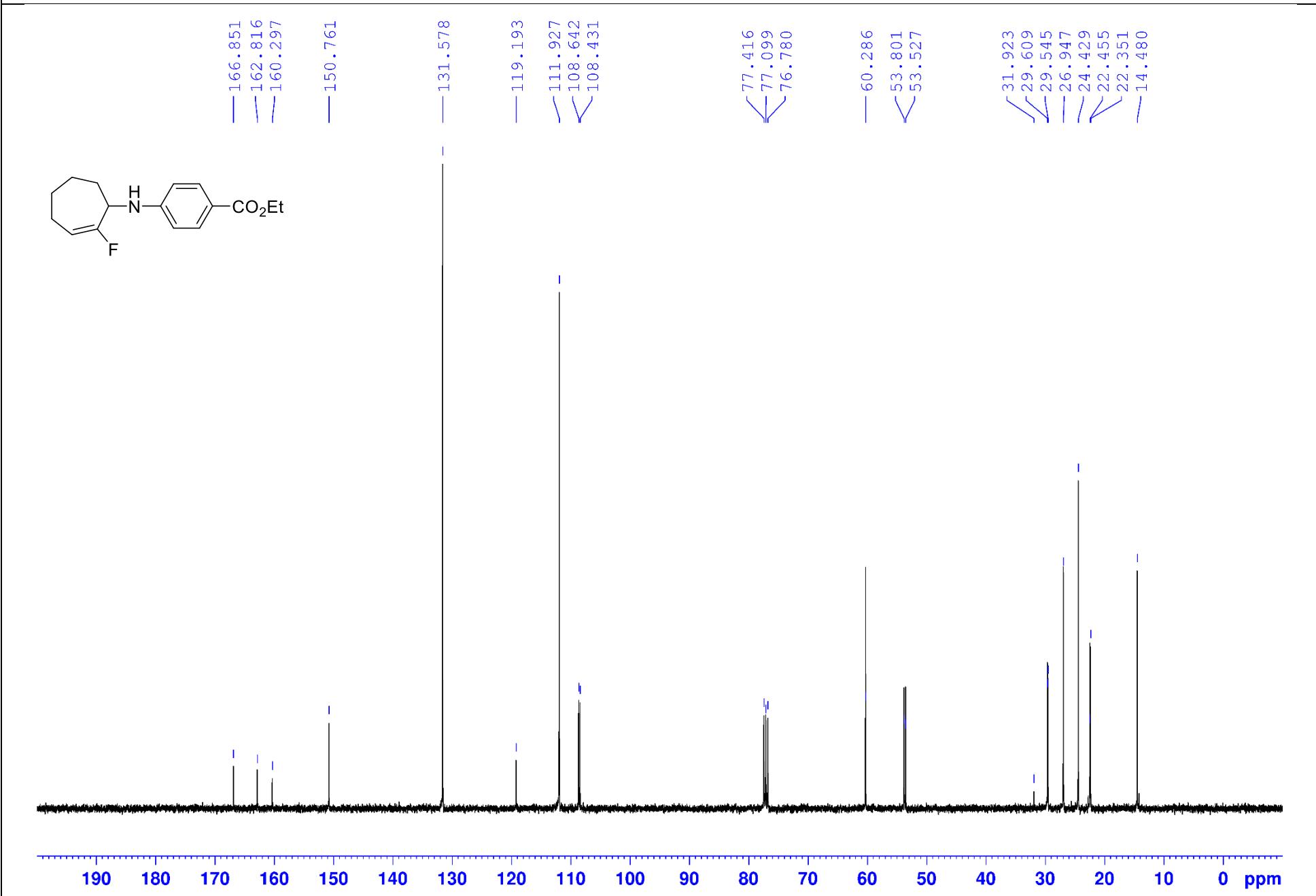
¹H NMR (CDCl_3 , 400.0 MHz) of **6e**



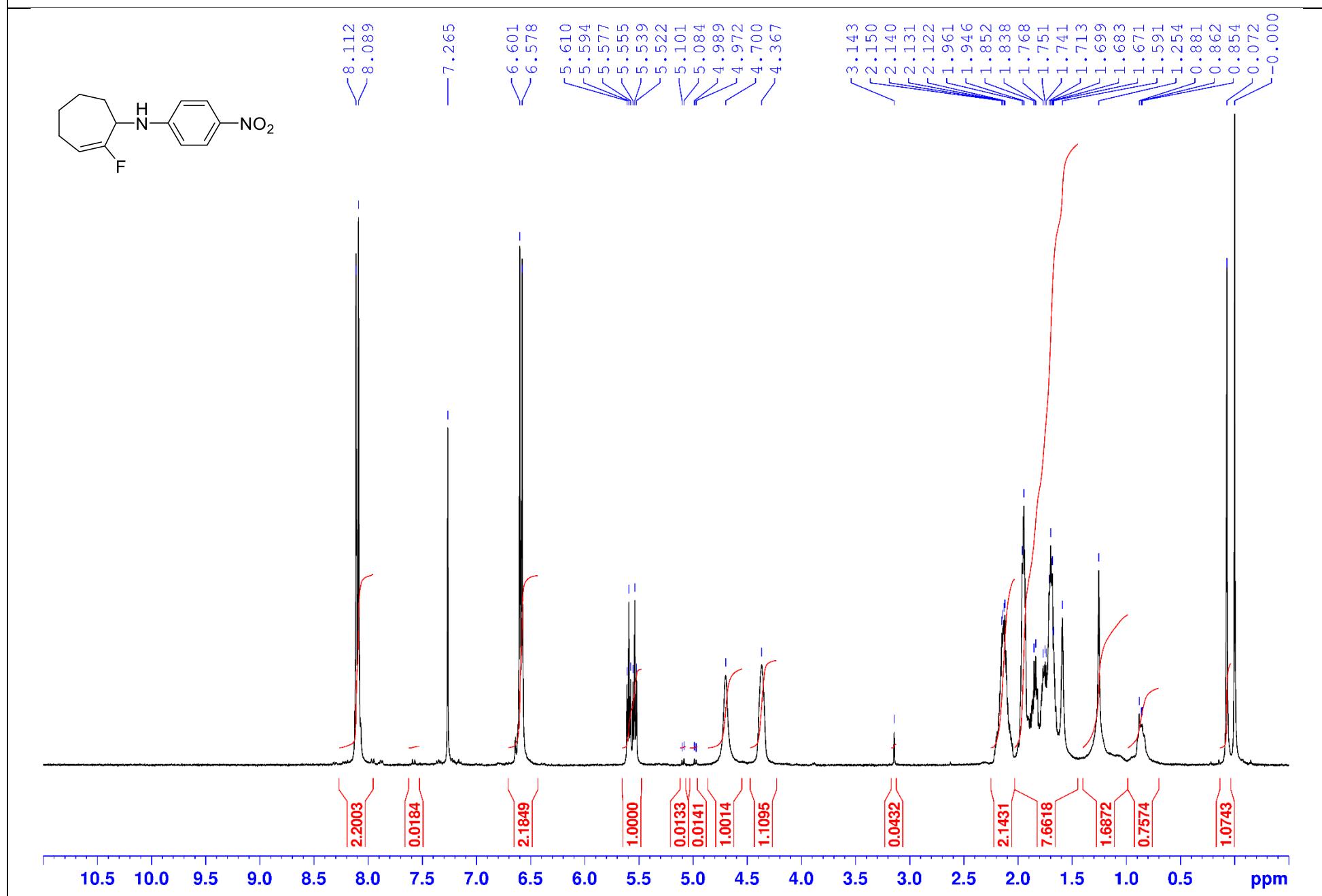
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **6e**



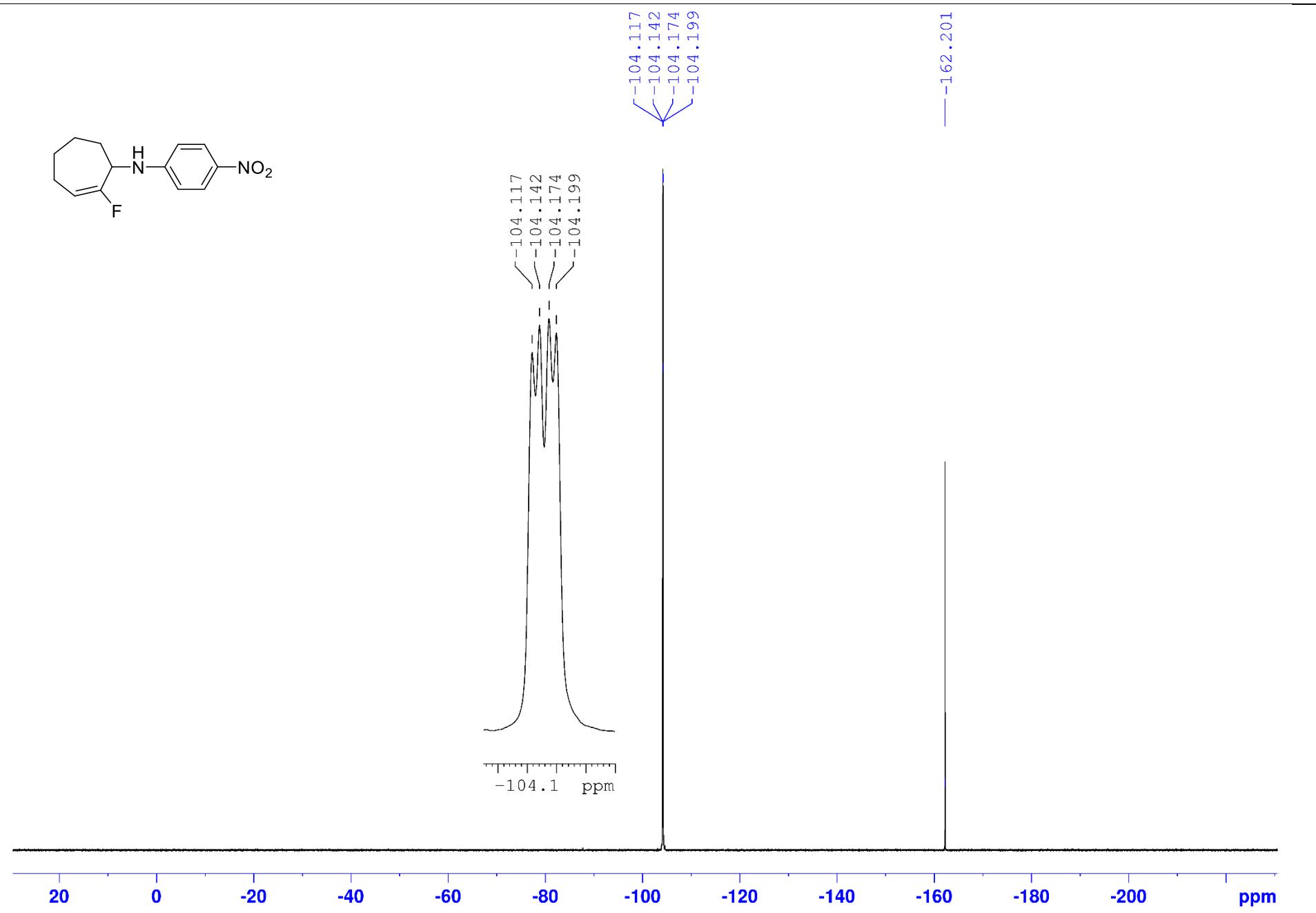
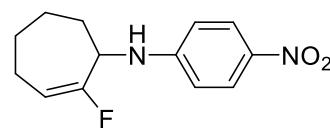
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **6e**



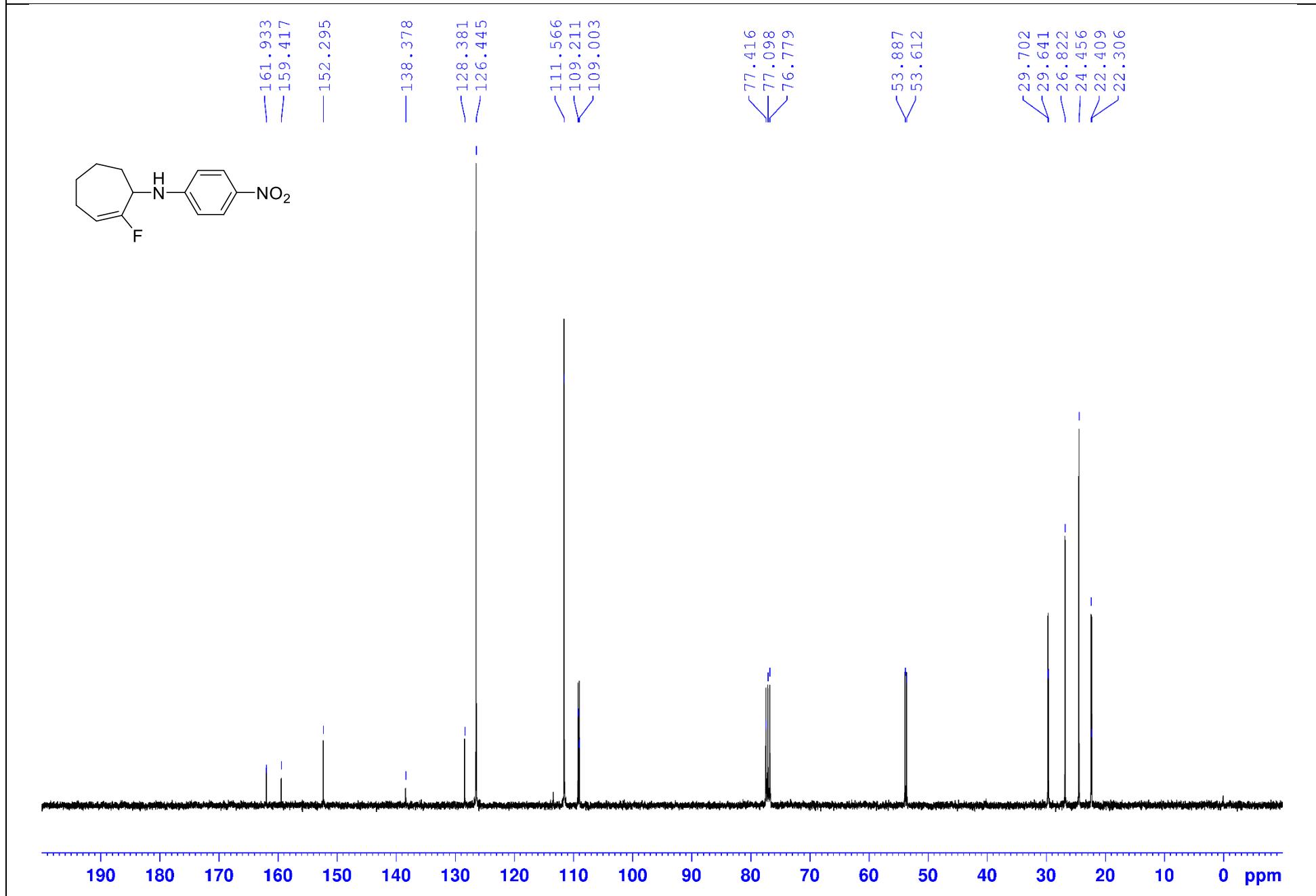
¹H NMR (CDCl₃, 400.0 MHz) of **6f**



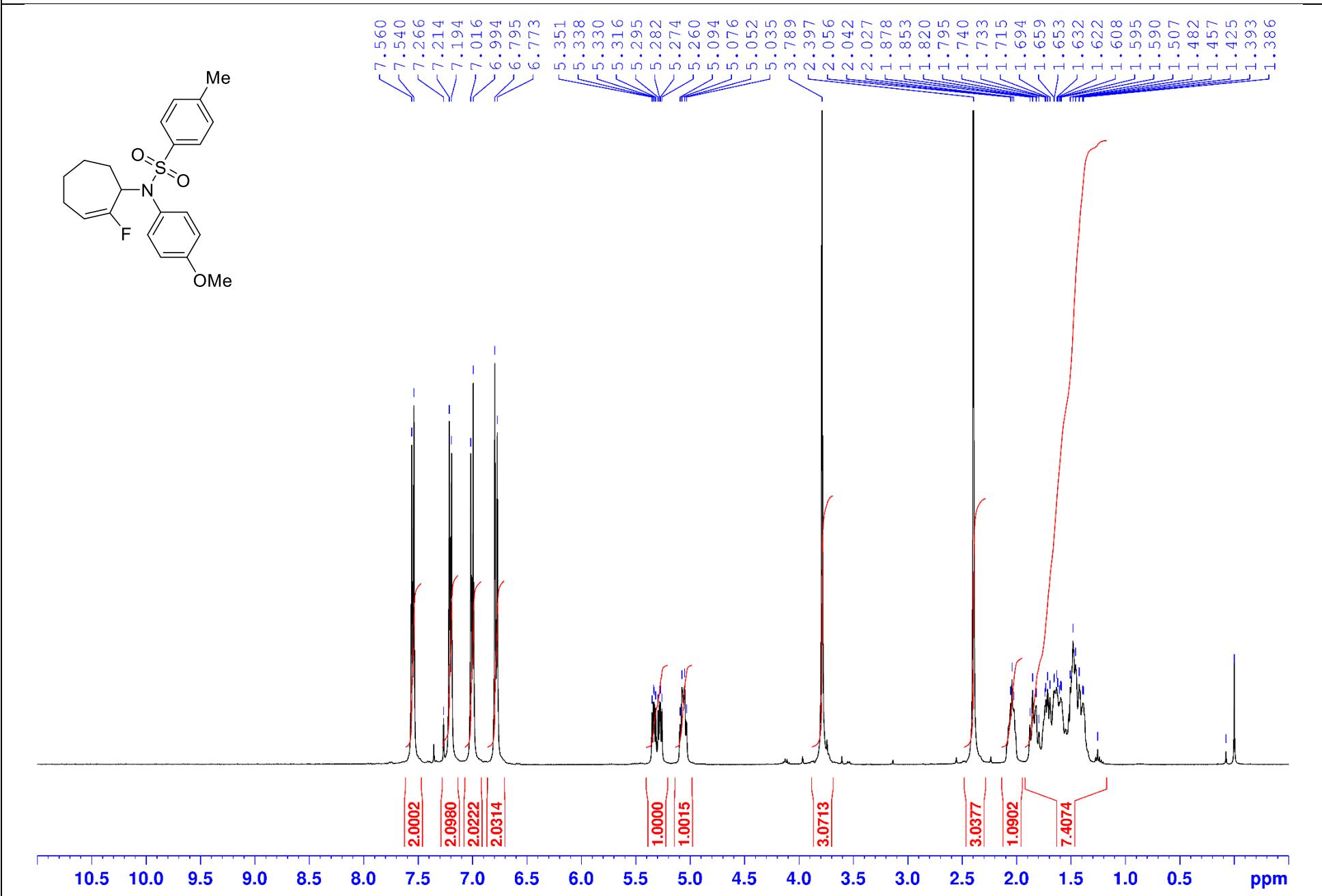
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **6f**



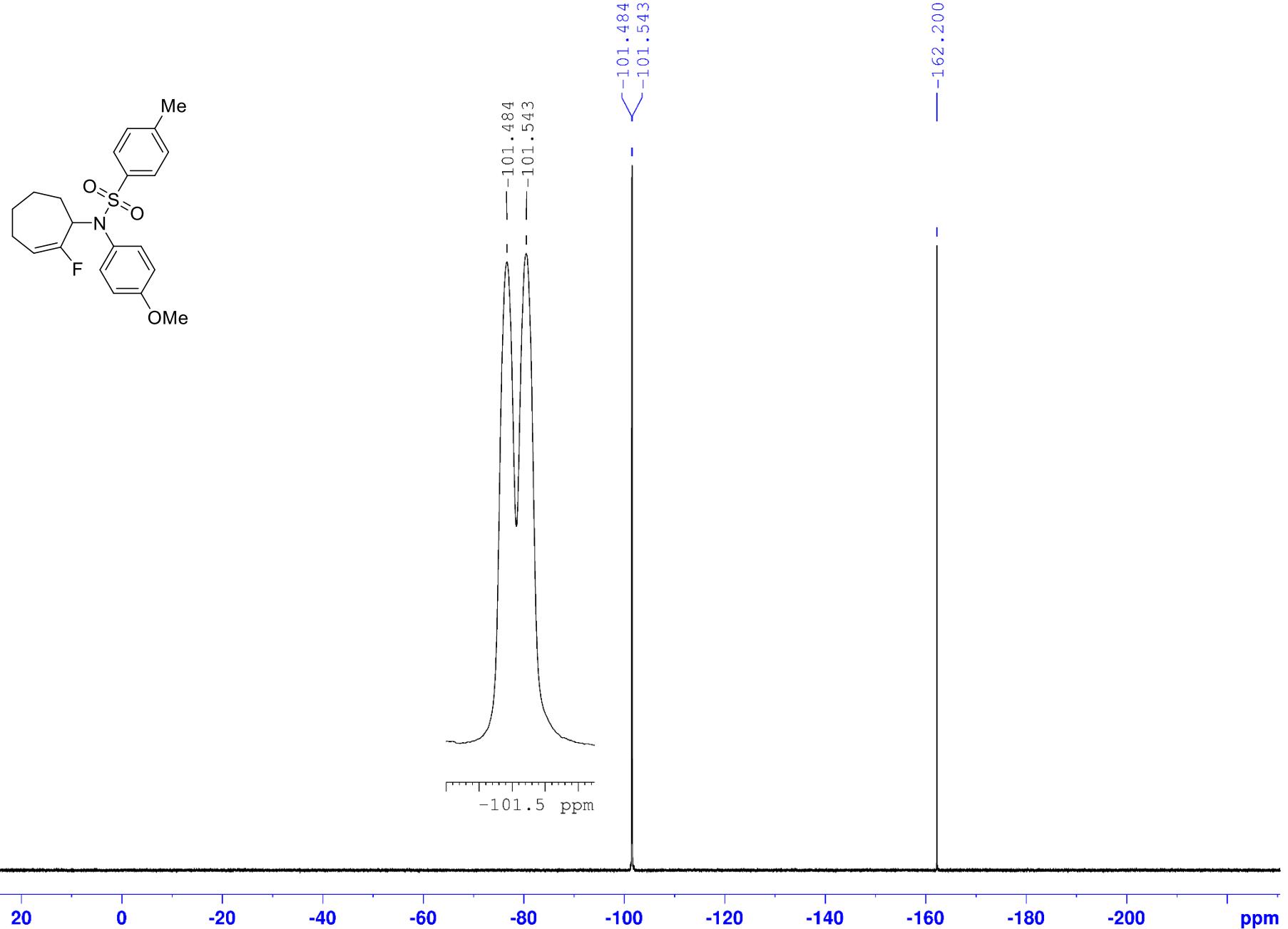
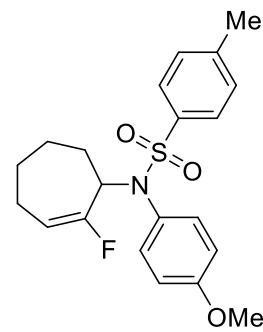
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **6f**



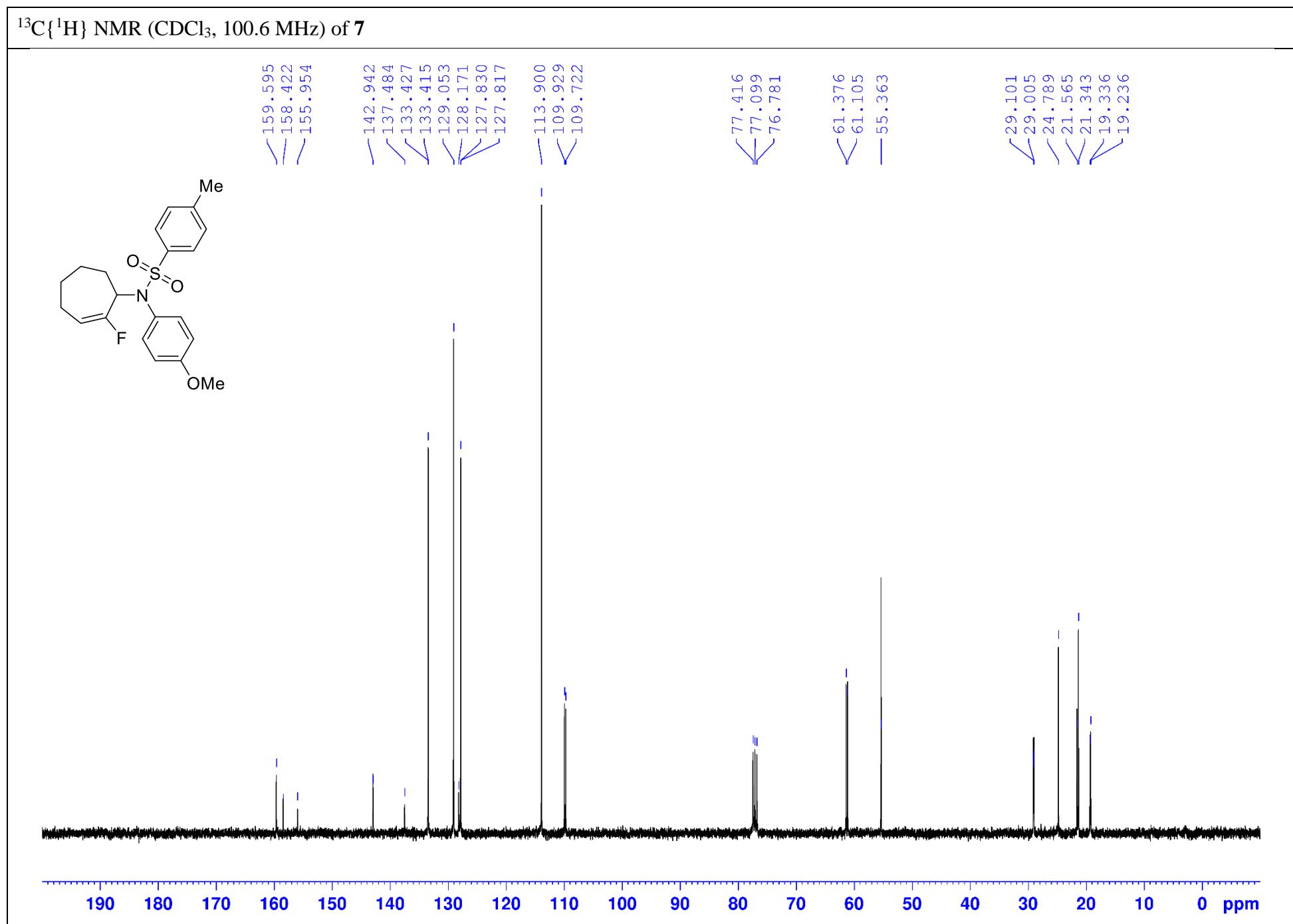
¹H NMR (CDCl_3 , 400.0 MHz) of **7**



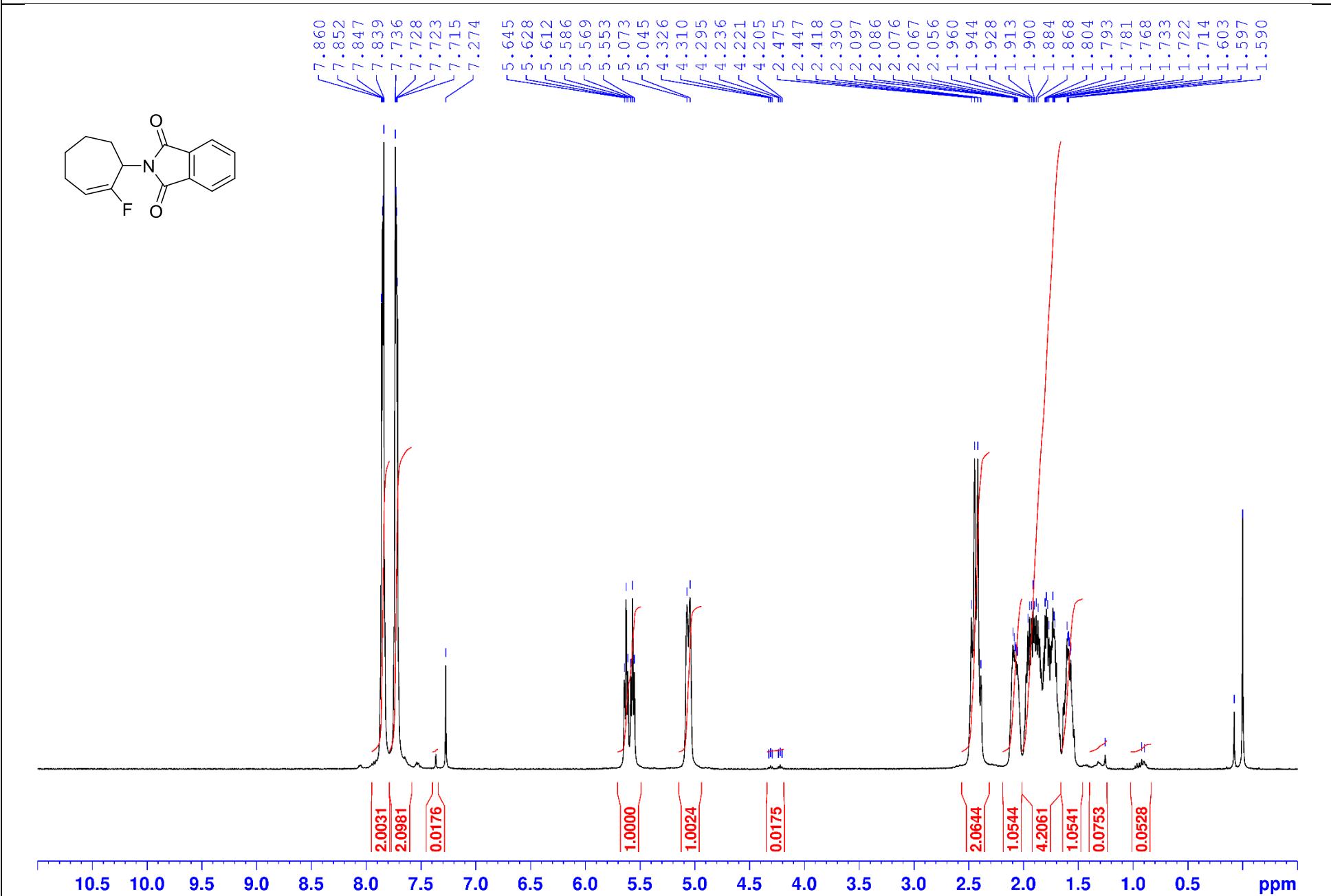
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **7**



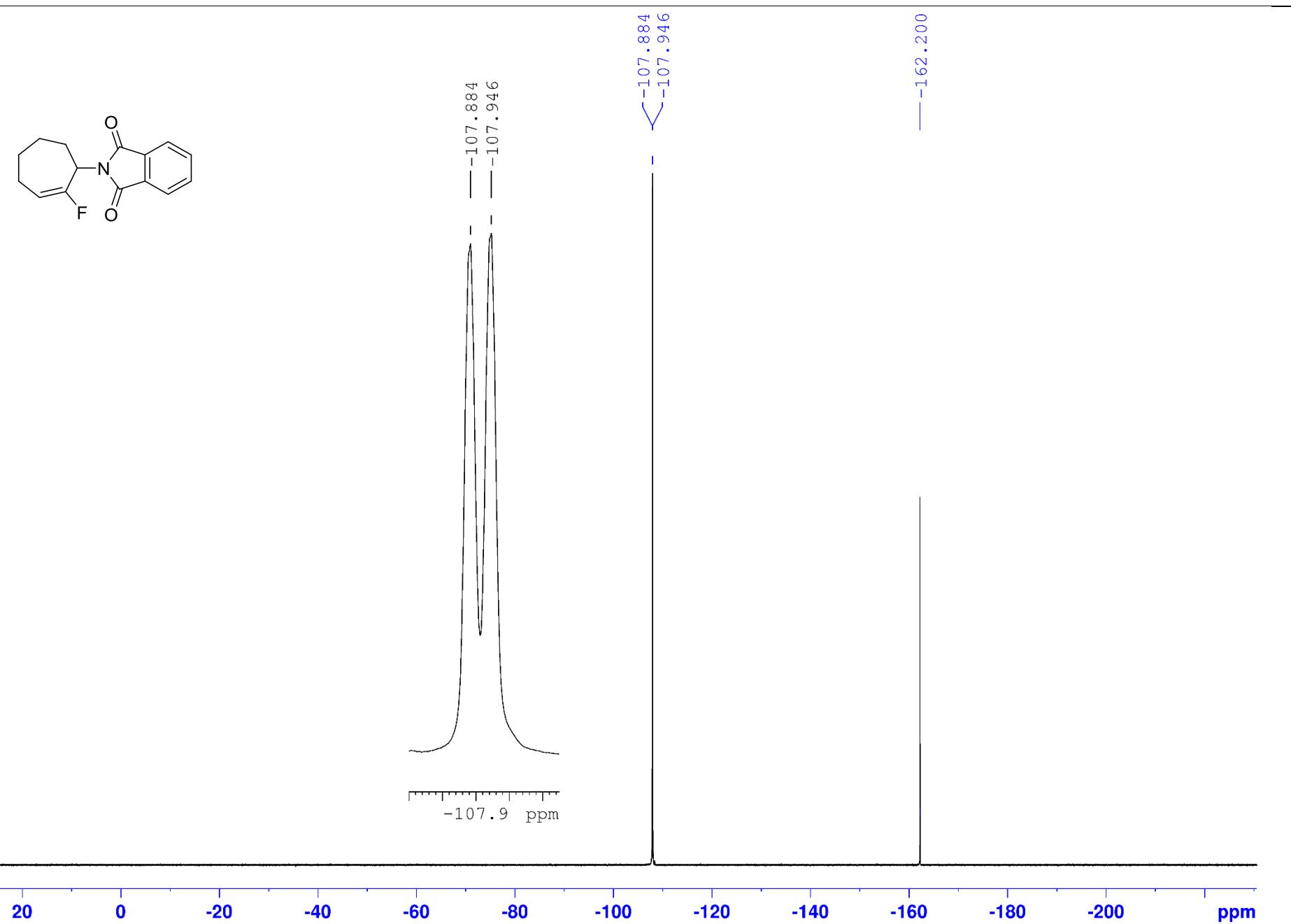
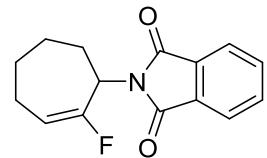
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of 7



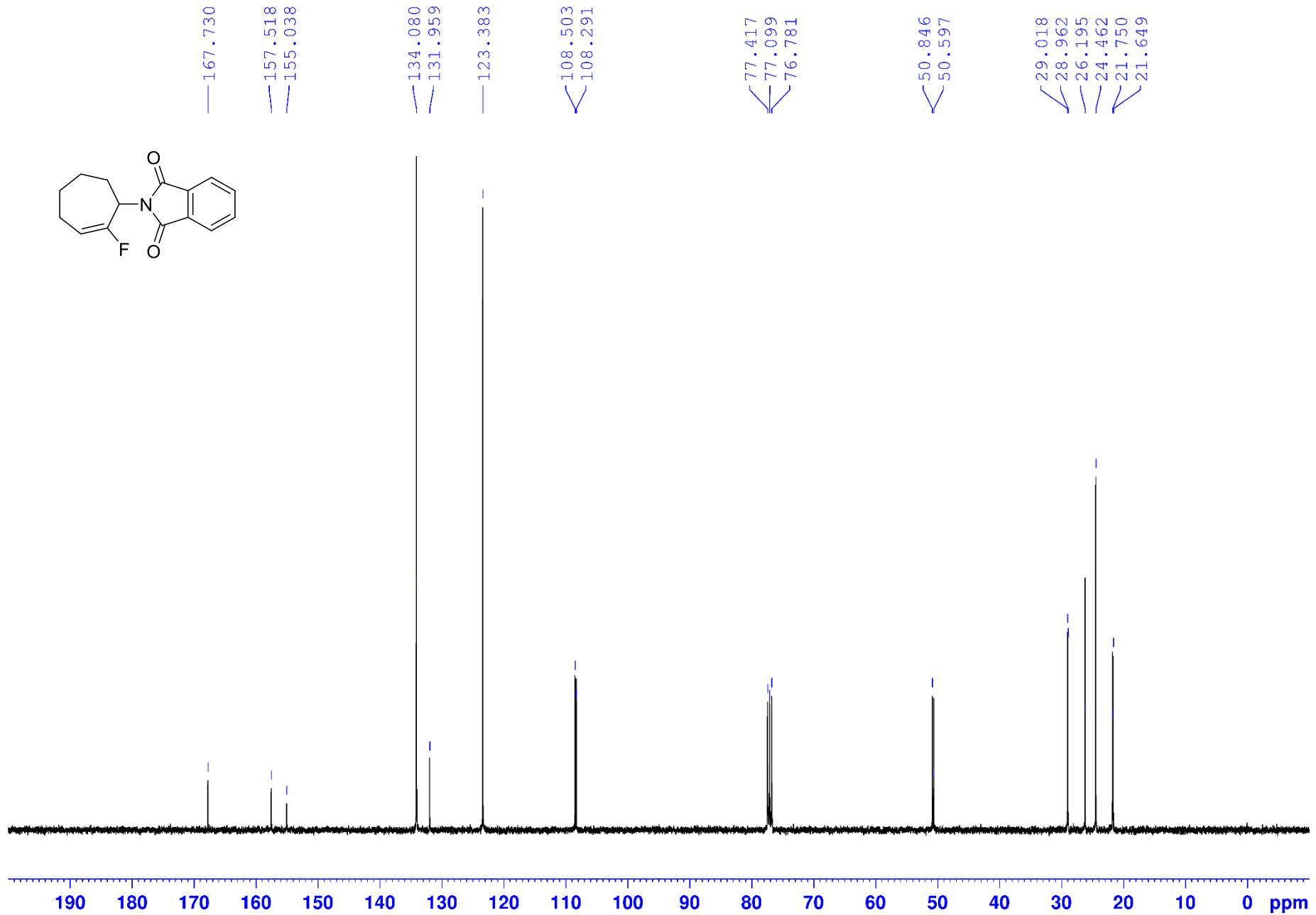
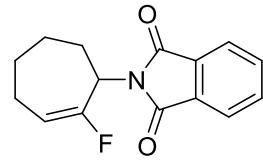
¹H NMR (CDCl_3 , 400.0 MHz) of **8**



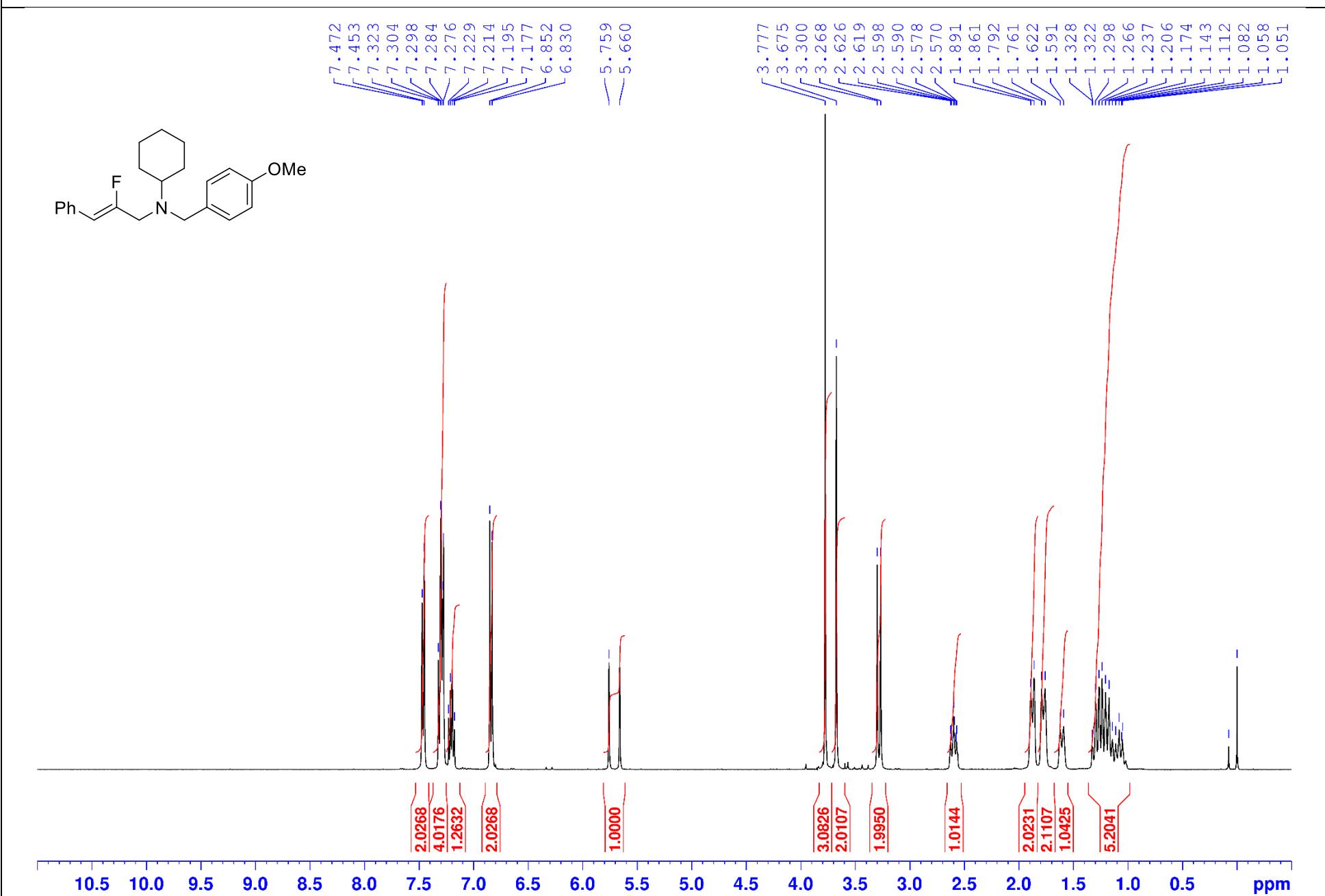
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **8**



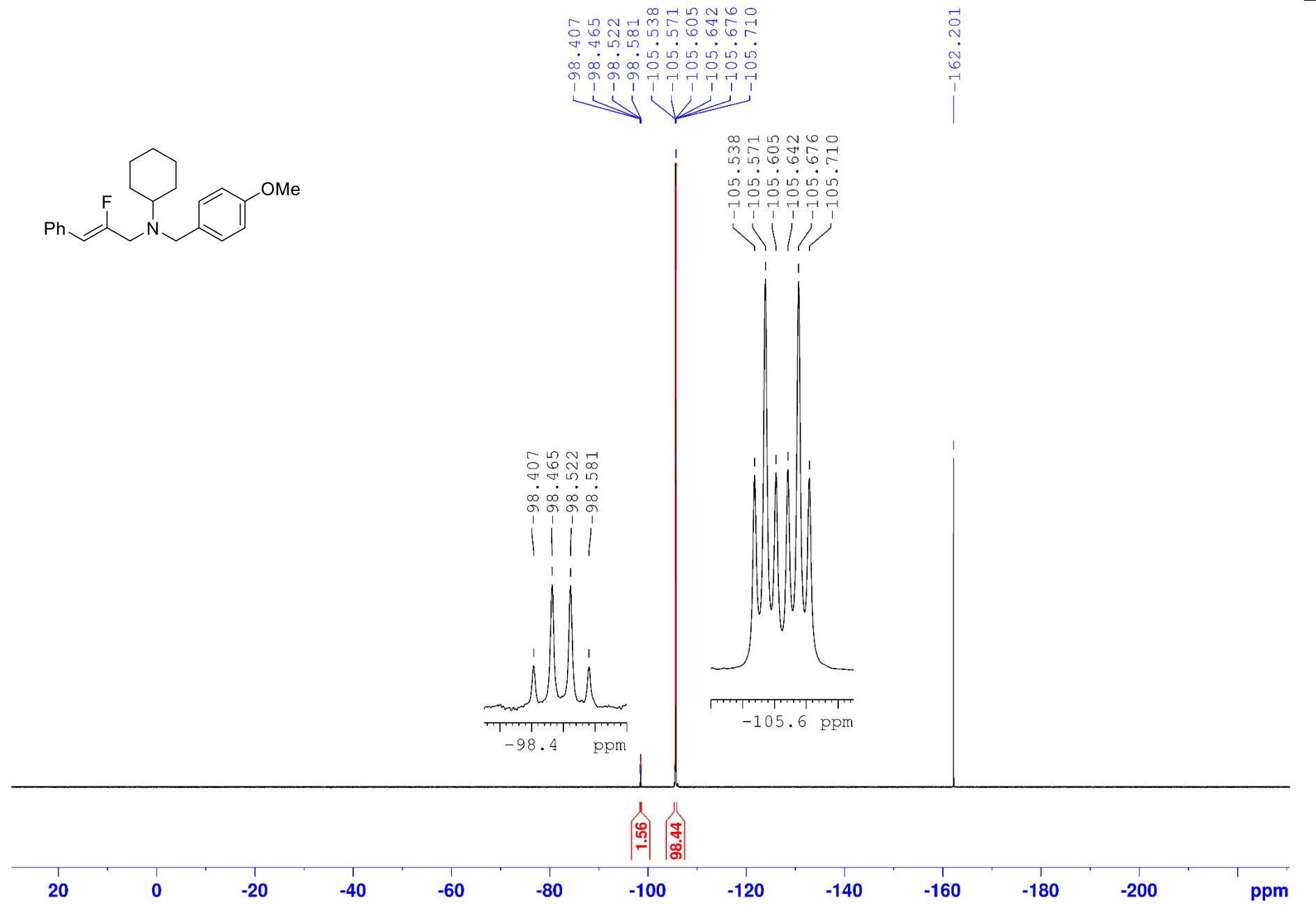
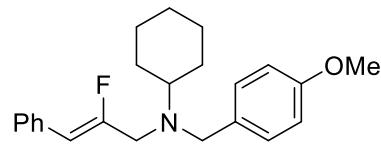
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **8**



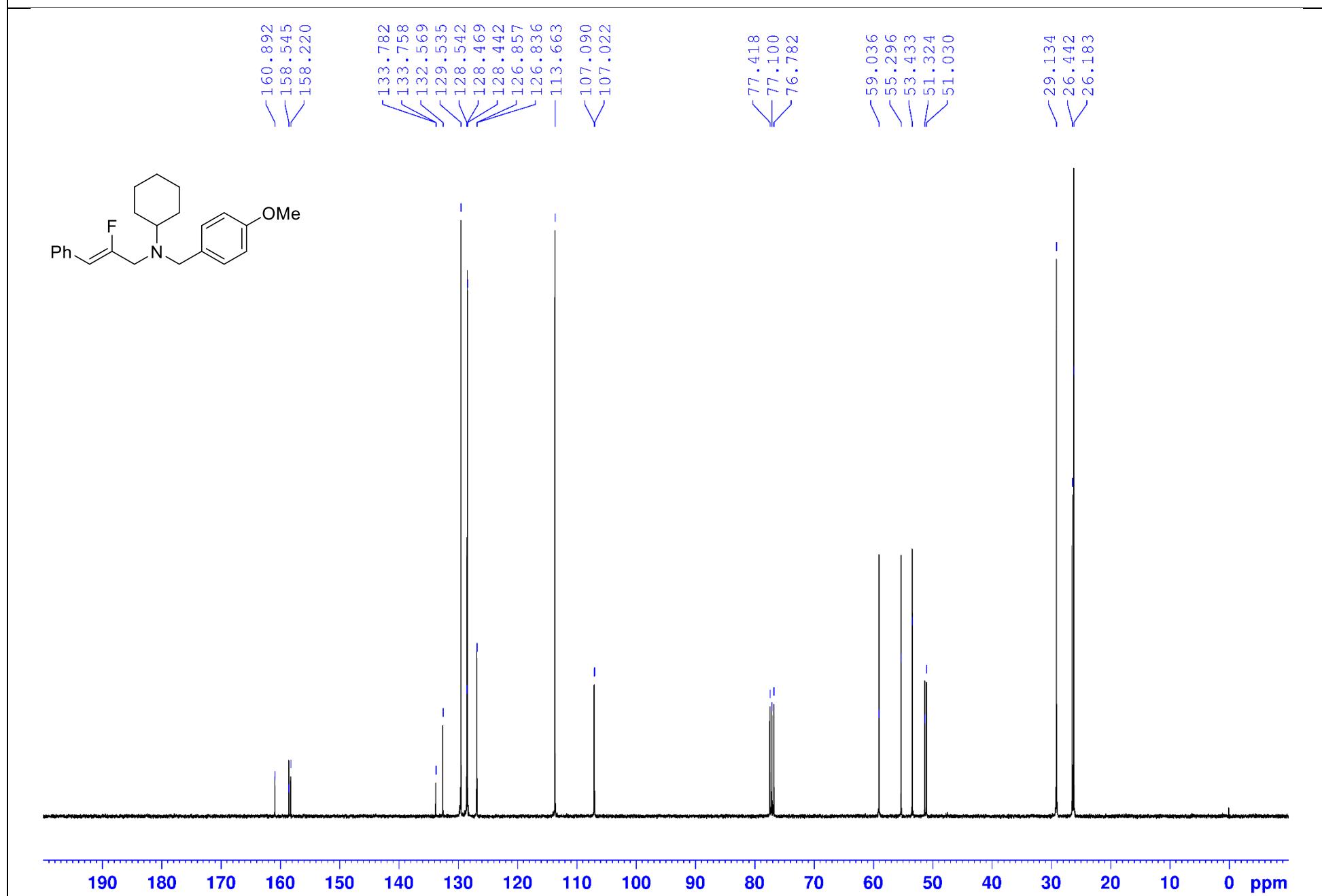
¹H NMR (CDCl_3 , 400.0 MHz) of **10a** ($Z/E = 98/2$)



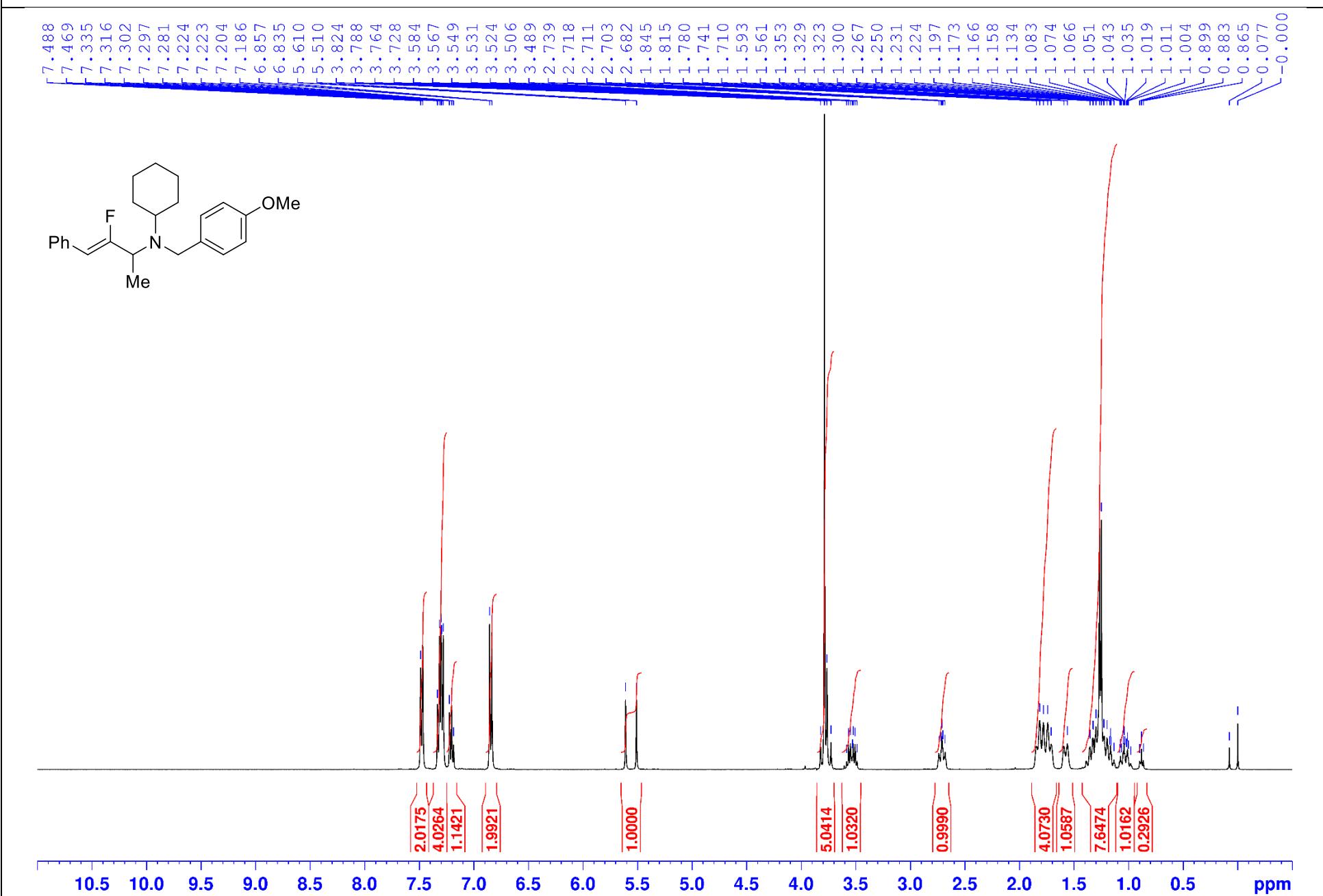
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **10a** ($Z/E = 98/2$)



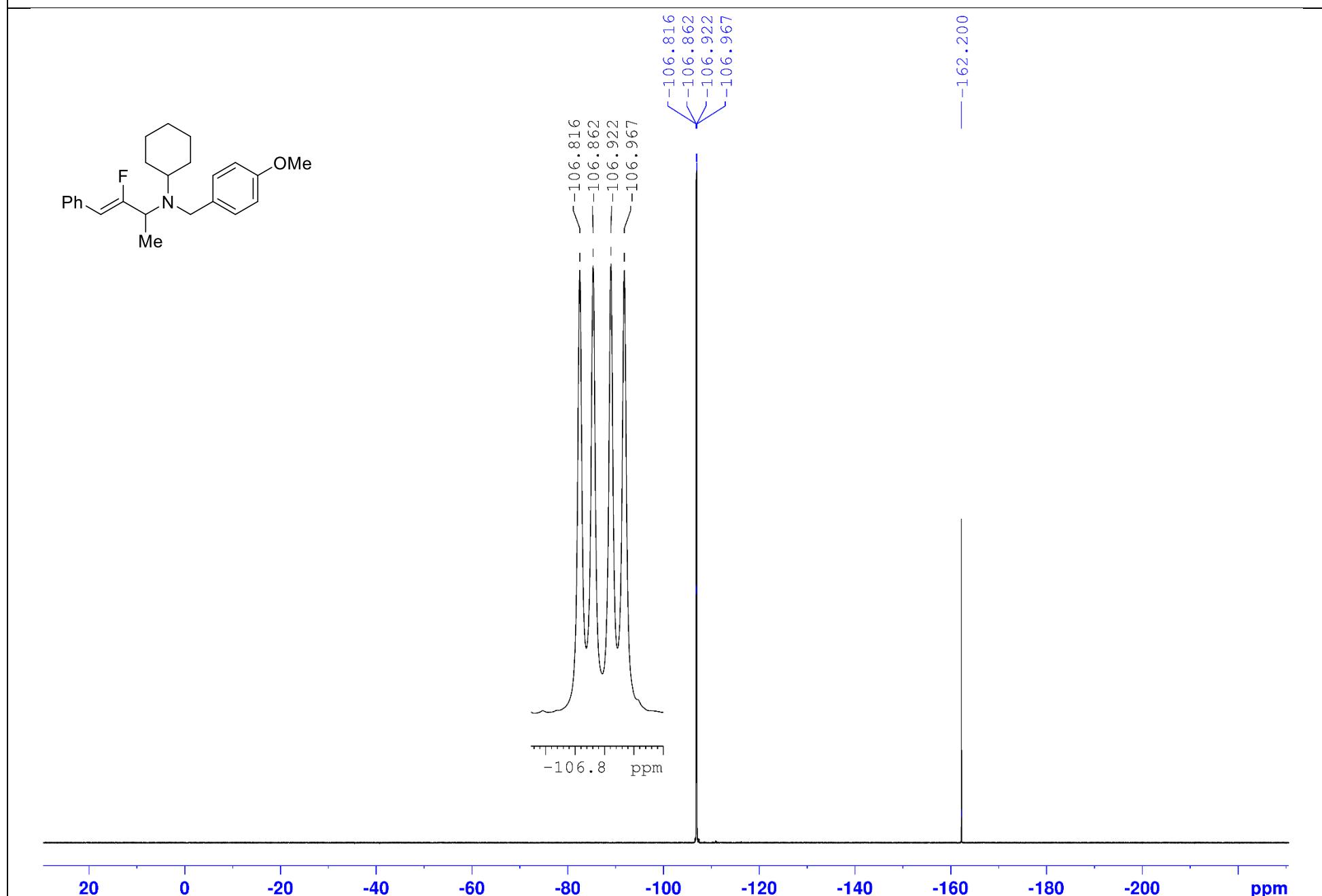
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **10a** ($Z/E = 98/2$)



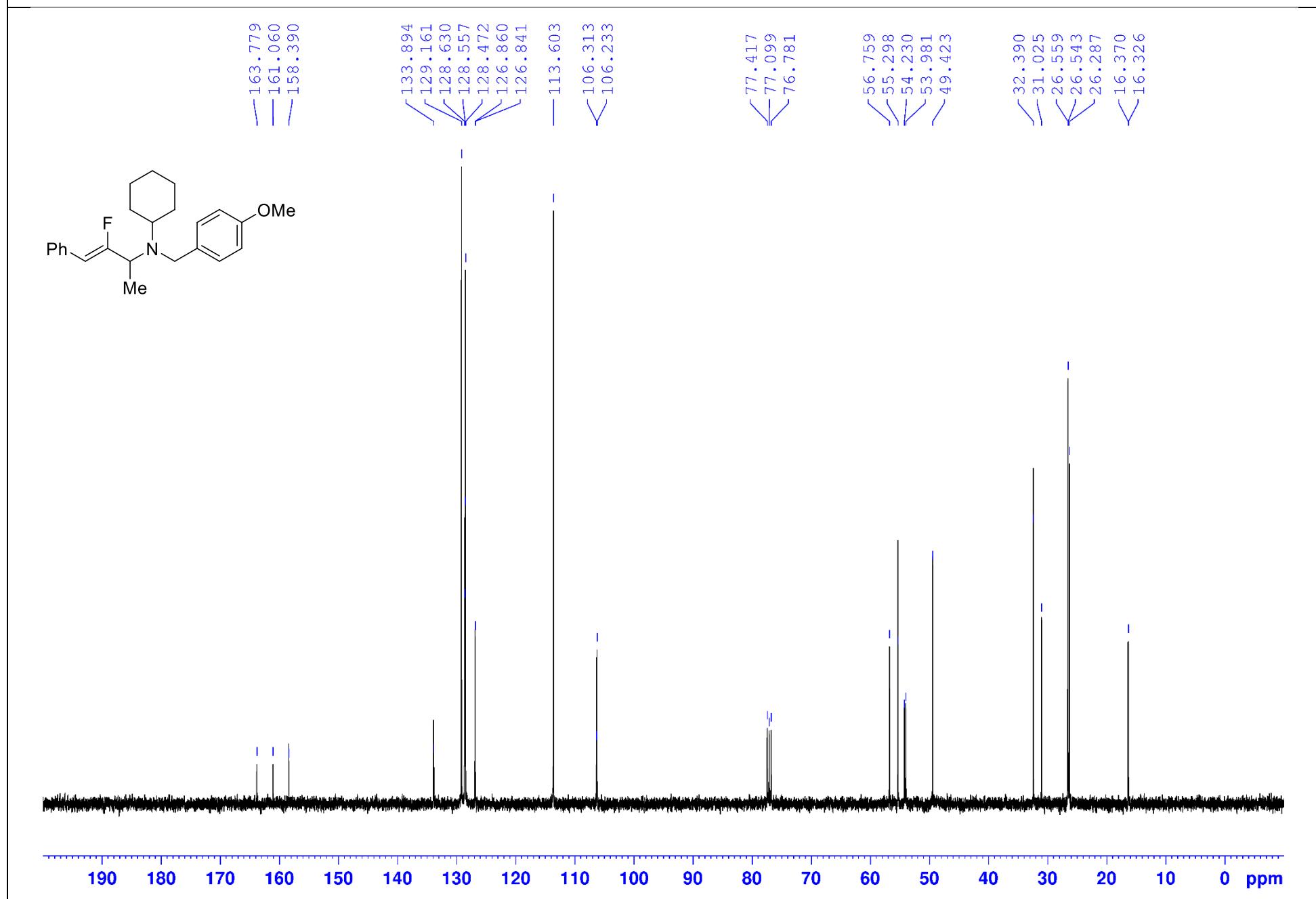
¹H NMR (CDCl_3 , 400.0 MHz) of **10b** ($Z/E > 20/1$)



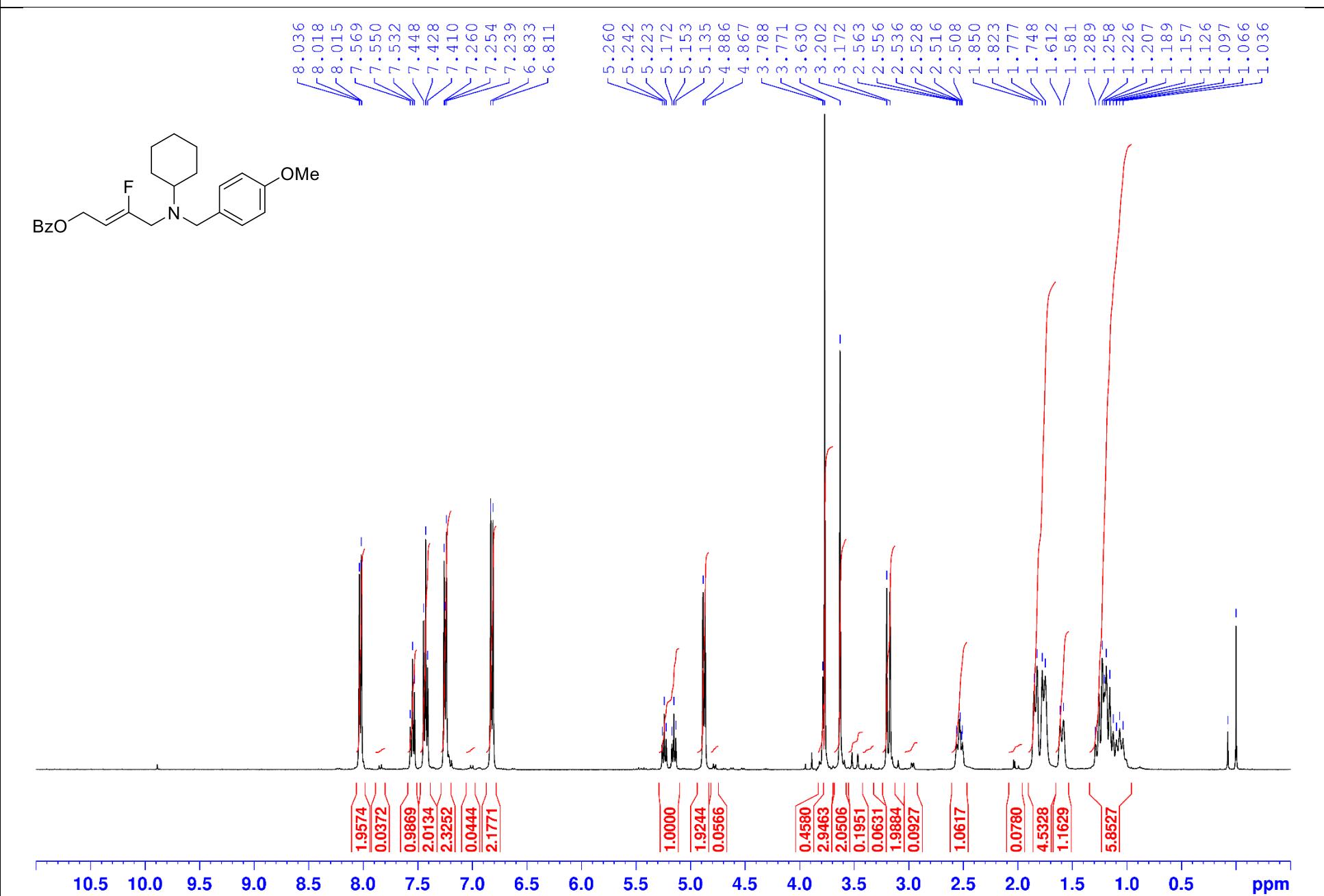
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **10b** ($Z/E > 20/1$)



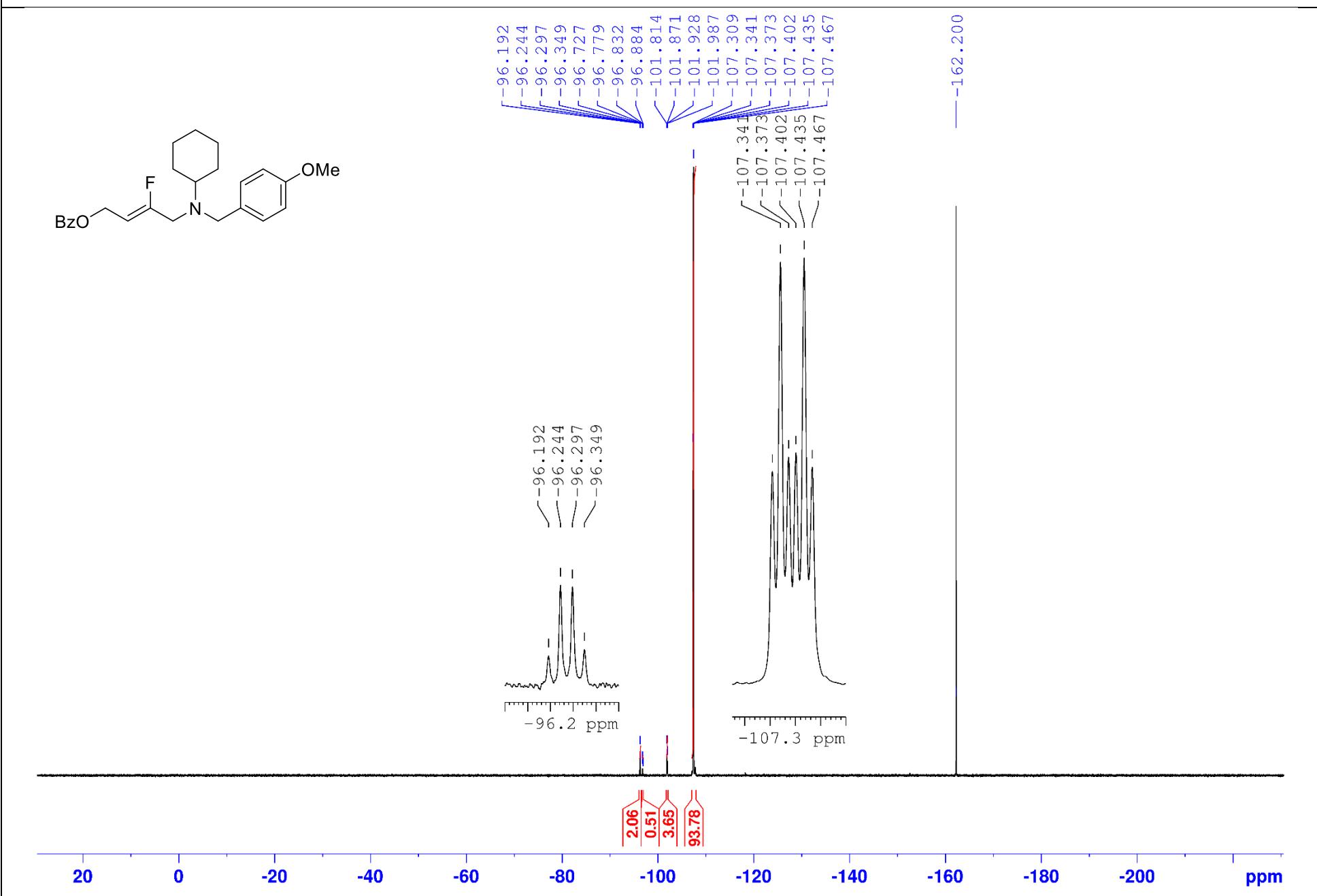
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **10b** ($Z/E > 20/1$)



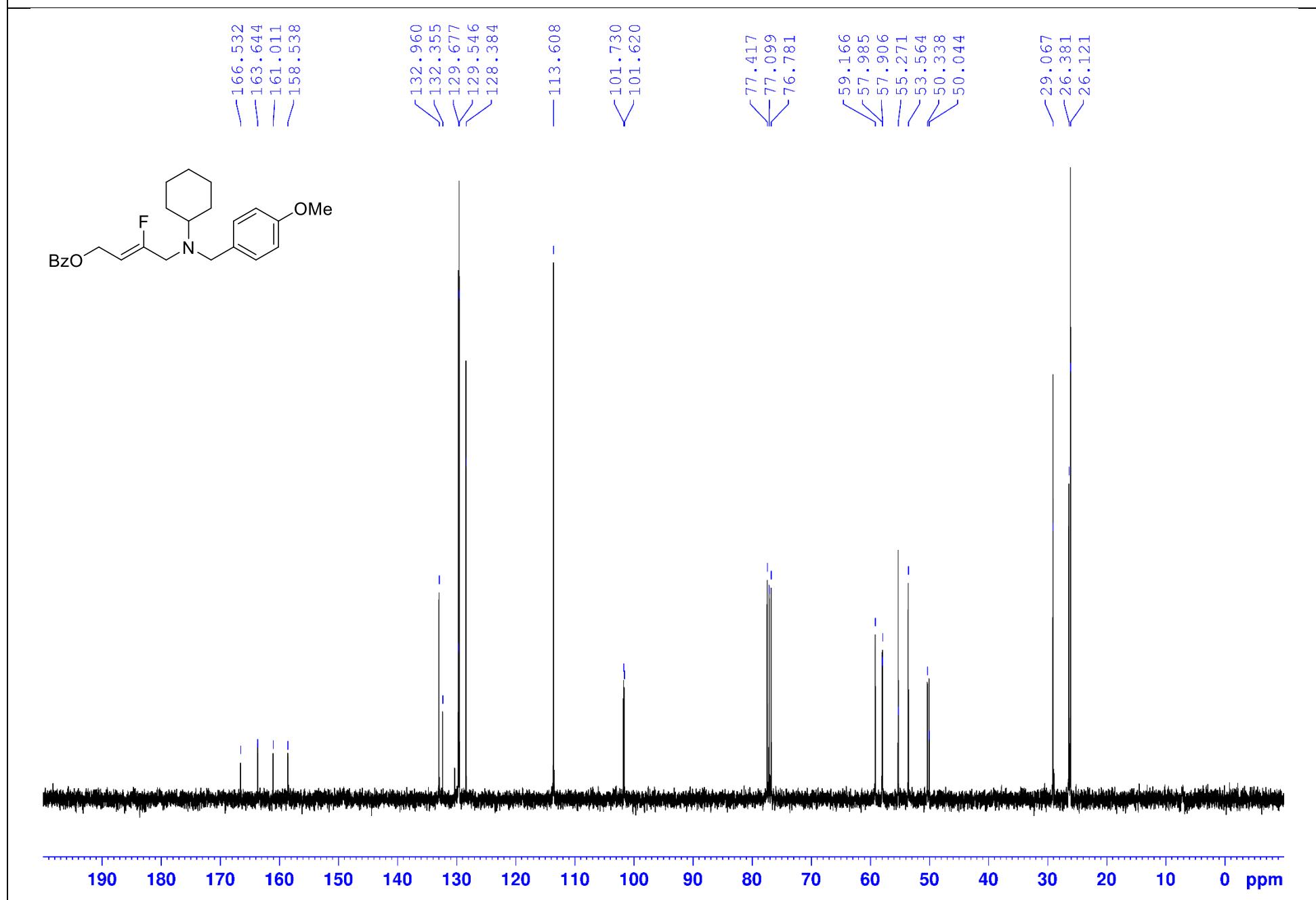
¹H NMR (CDCl_3 , 400.0 MHz) of **10d** ($Z/E = 98/2$)



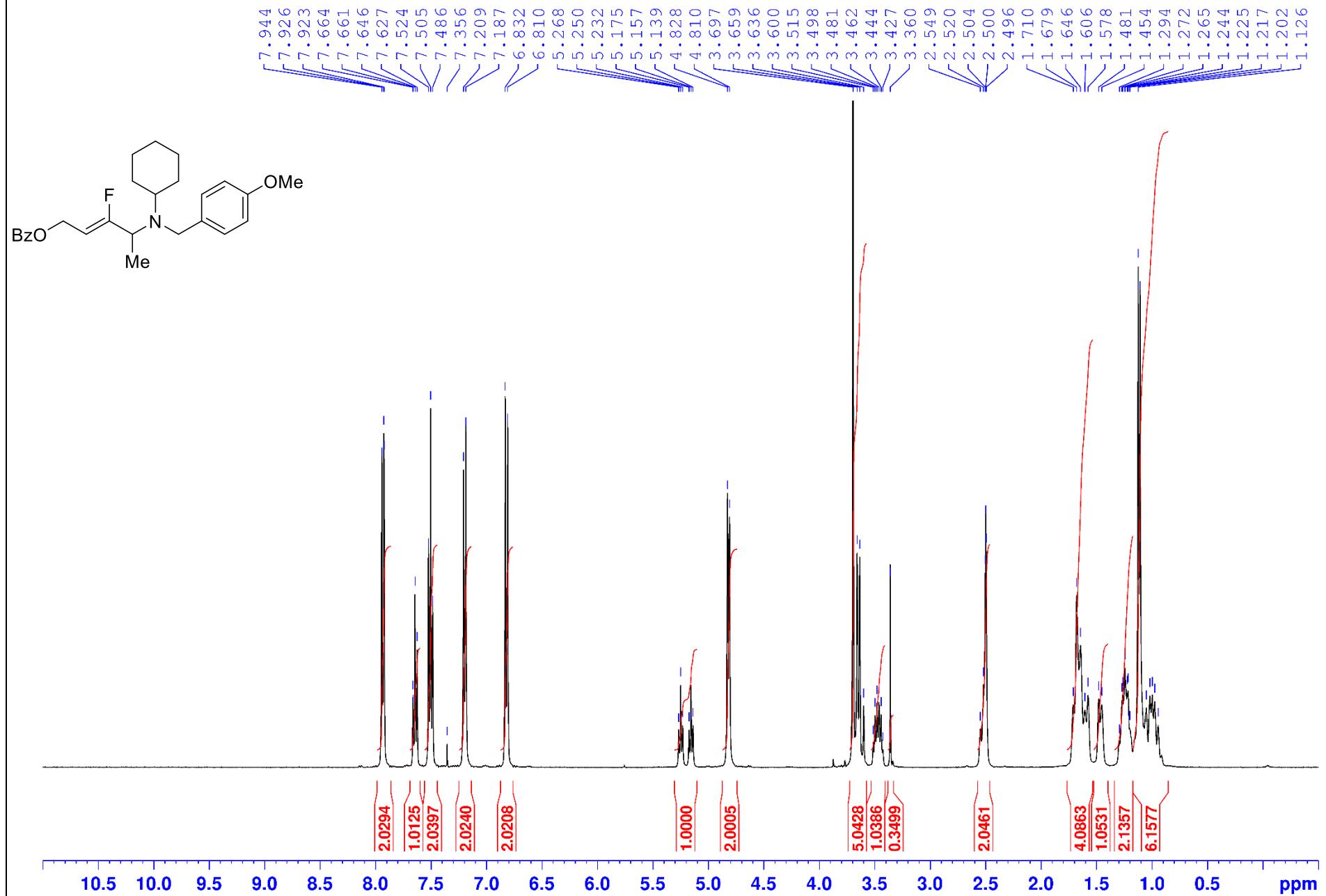
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **10d** ($Z/E = 98/2$)



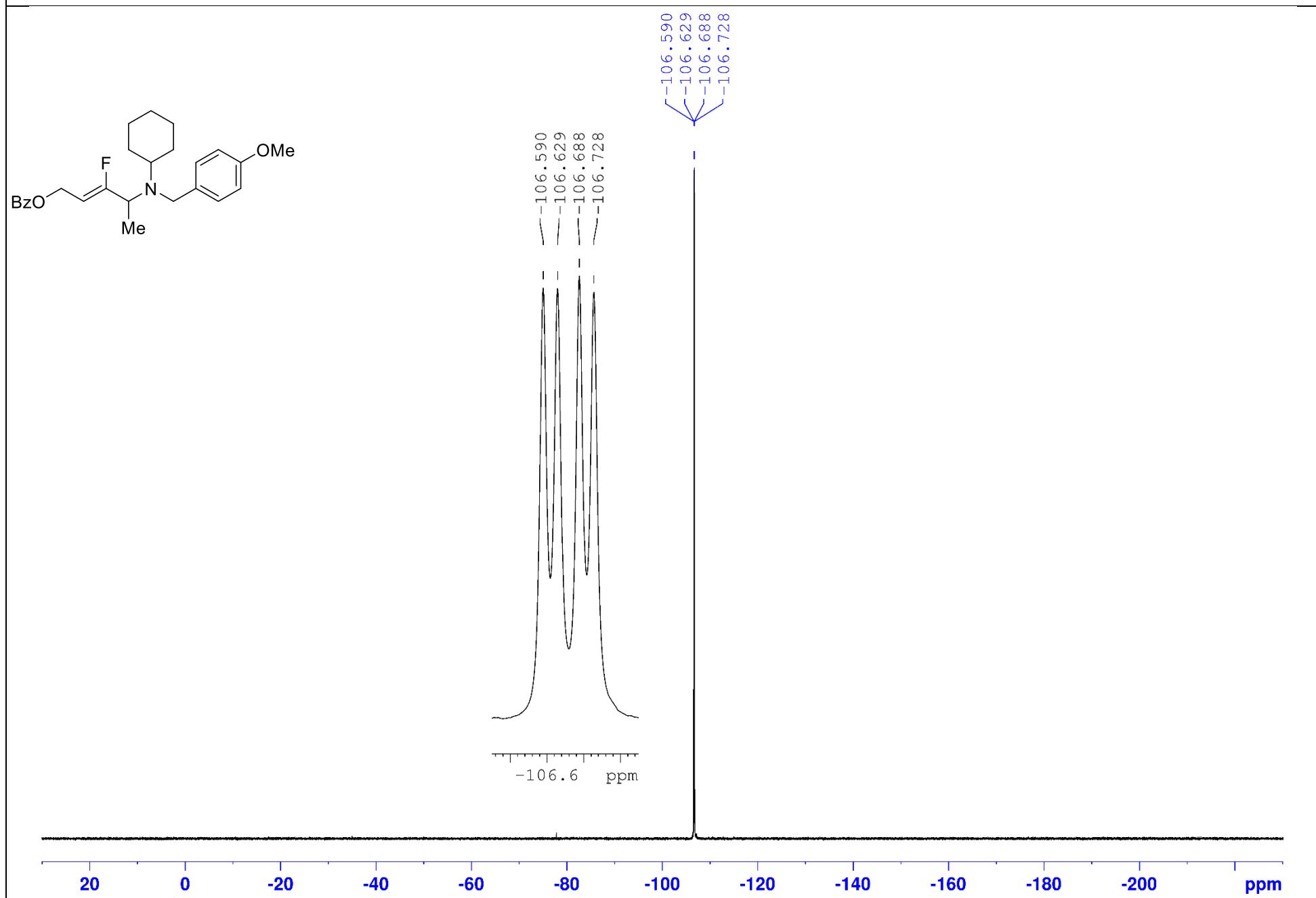
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **10d** ($Z/E = 98/2$)



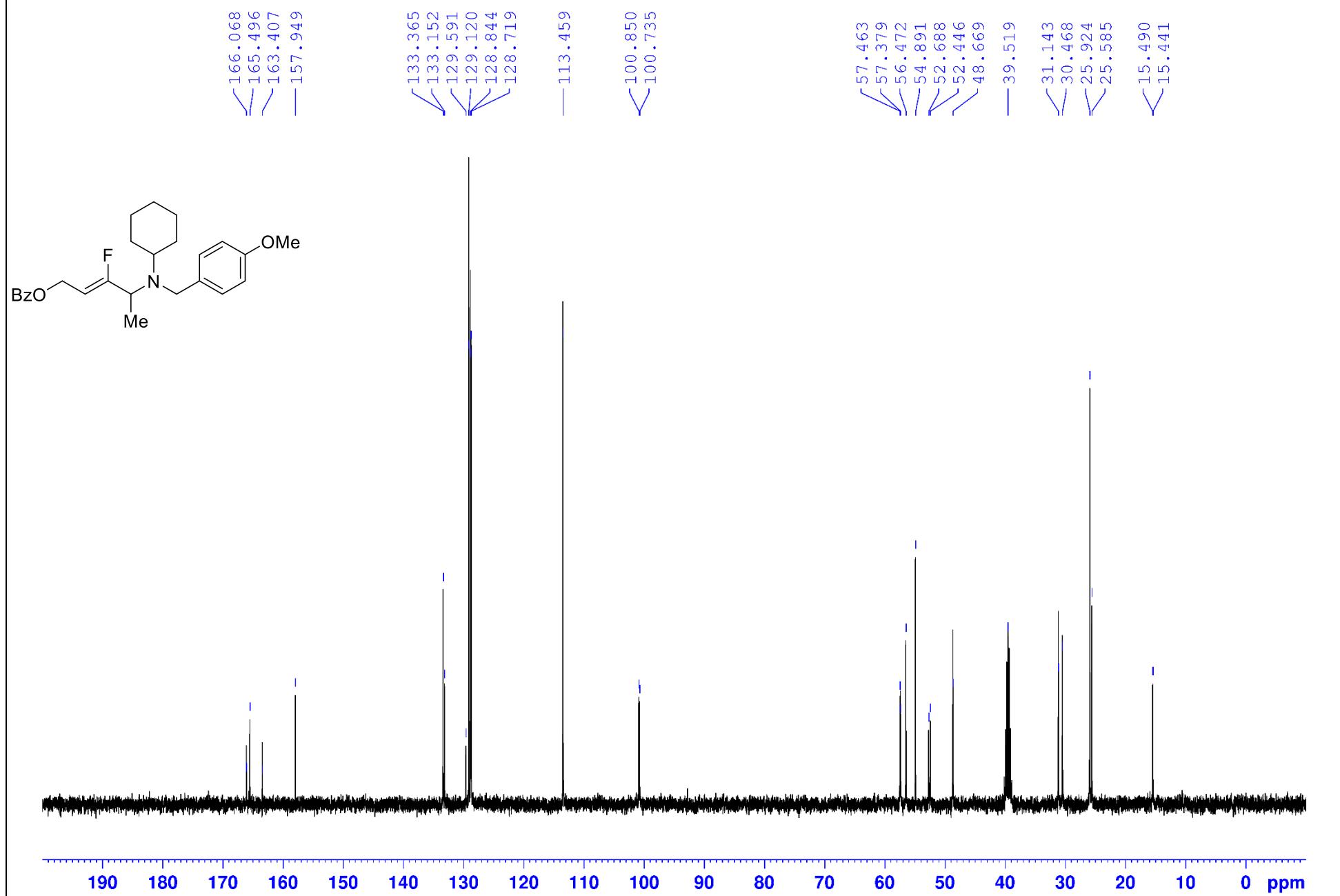
¹H NMR (DMSO-d₆, 400.0 MHz) of **10e** (*Z/E* > 20/1)



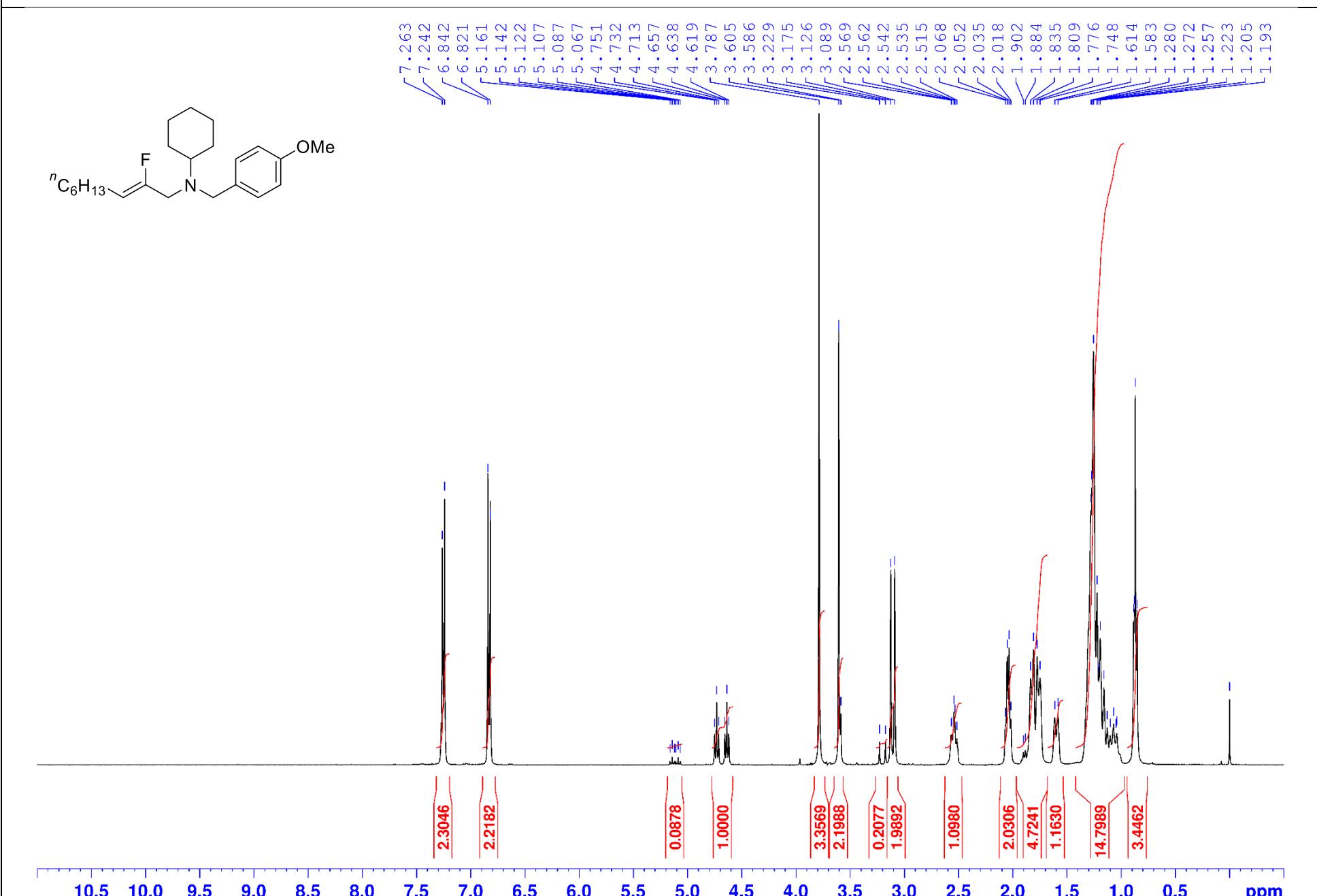
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of **10e** (*Z/E* > 20/1)



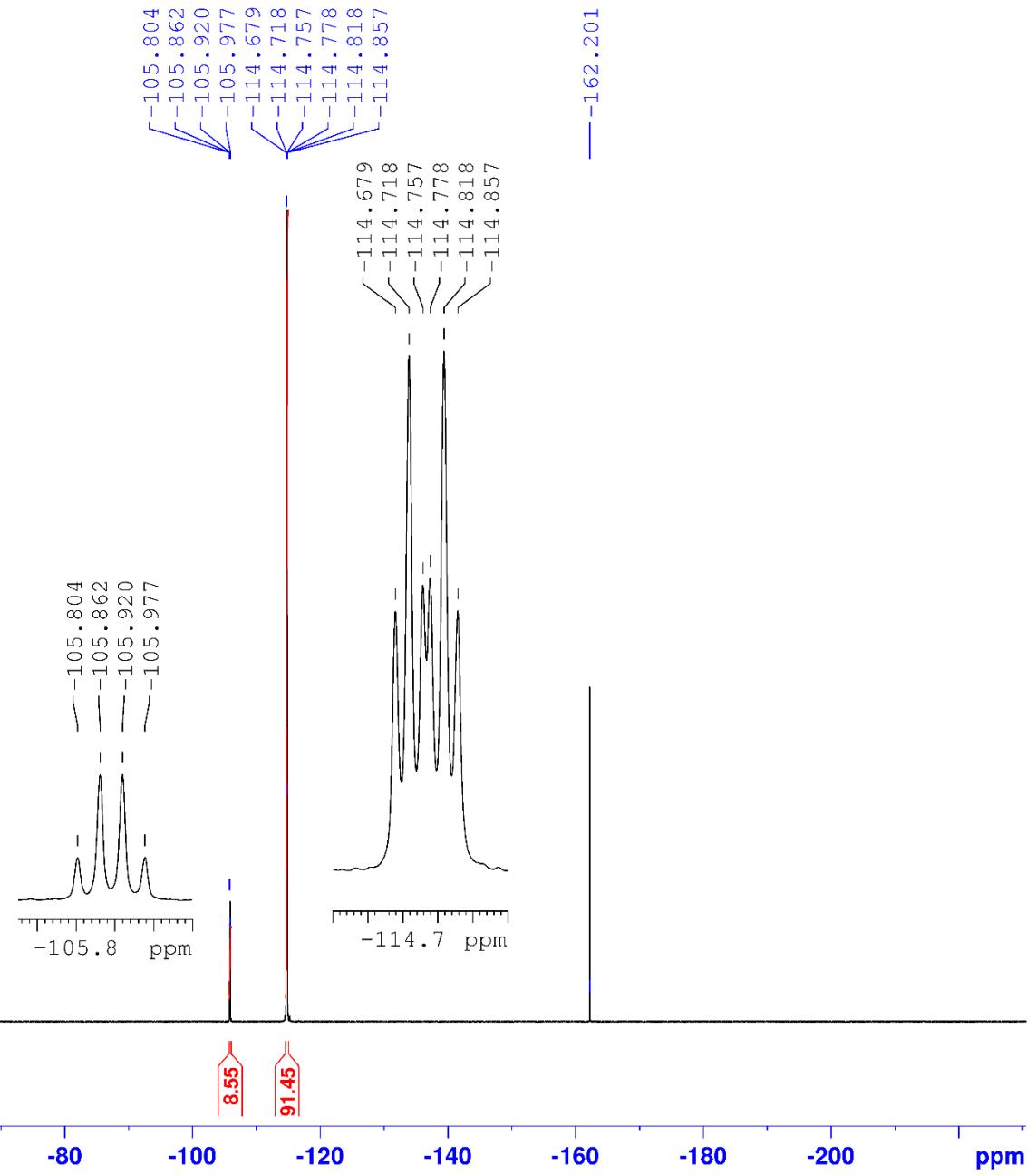
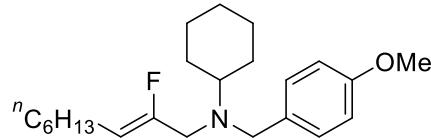
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of **10e** (*Z/E* > 20/1)



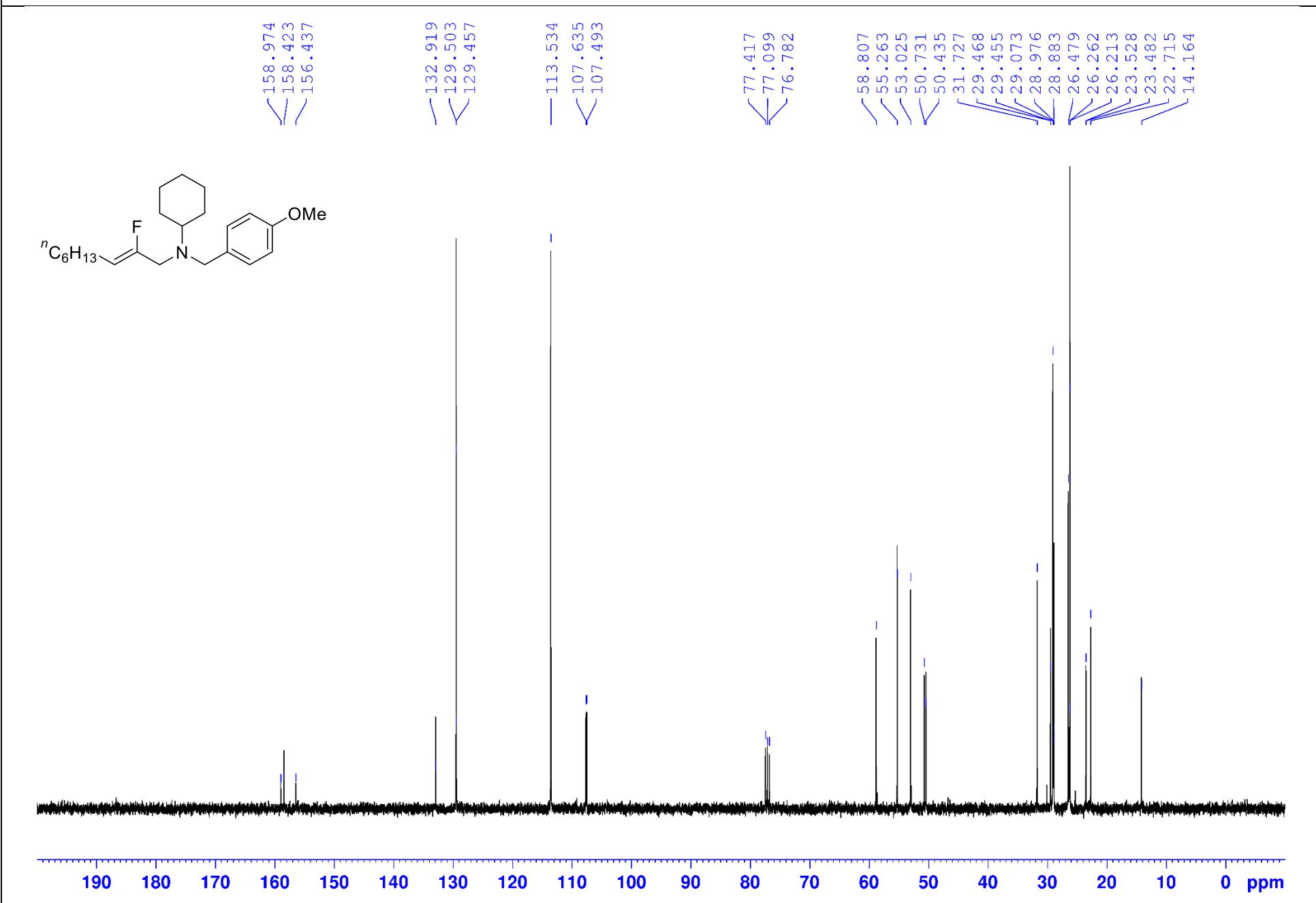
¹H NMR (CDCl_3 , 400.0 MHz) of **10f** ($Z/E = 91/9$)



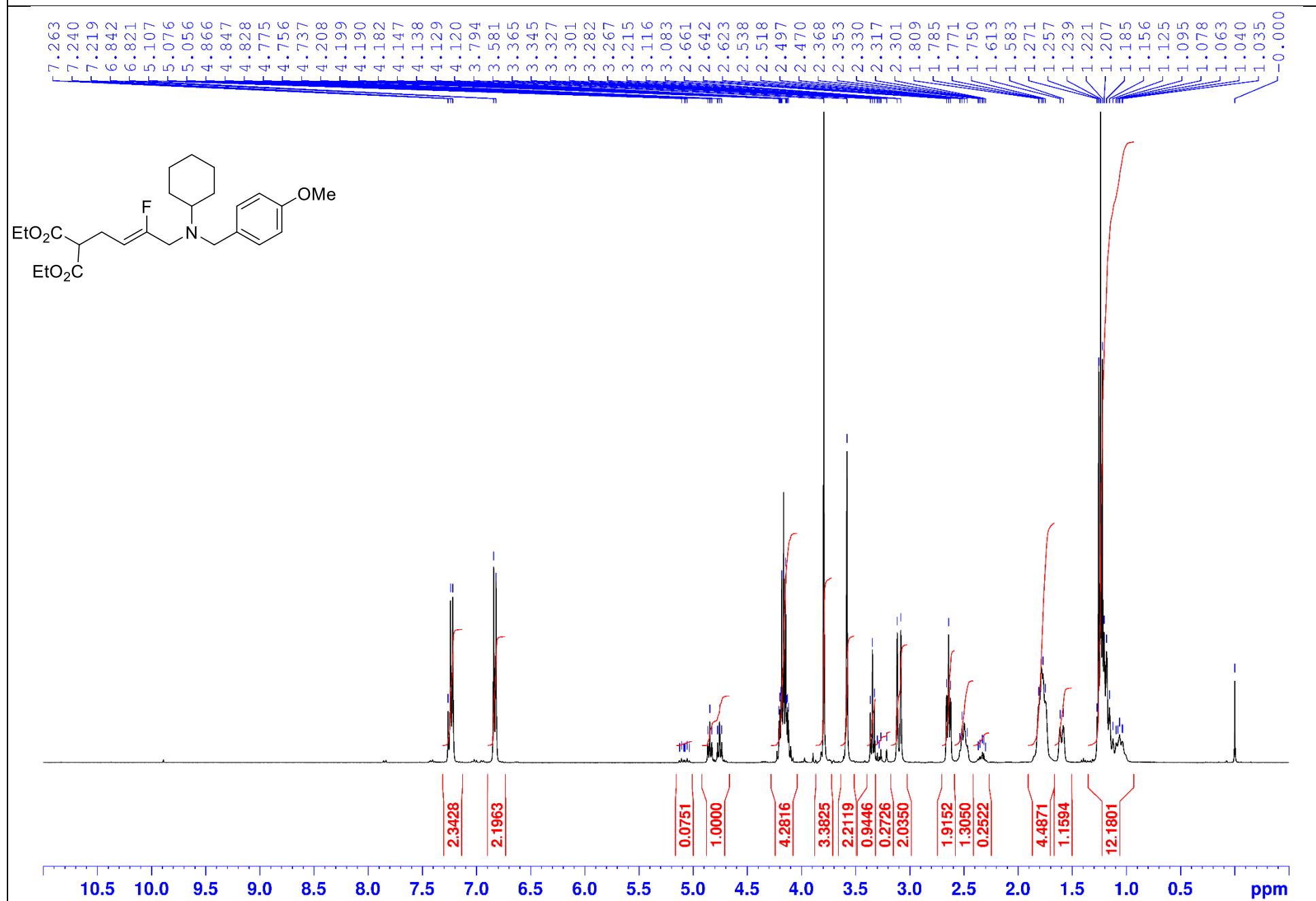
¹⁹F NMR (CDCl₃, 376.4 MHz) of **10f** (Z/E = 91/9)



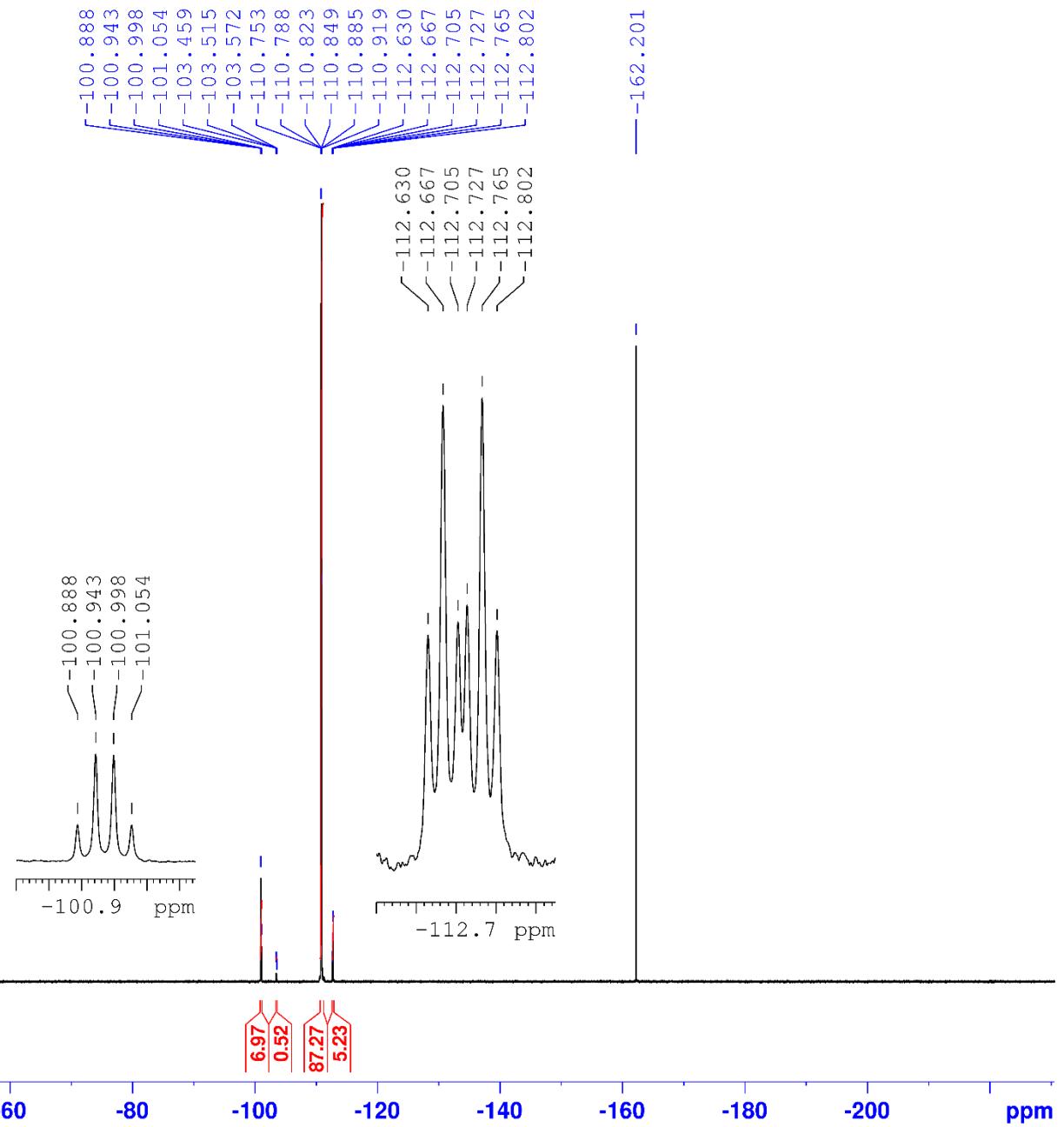
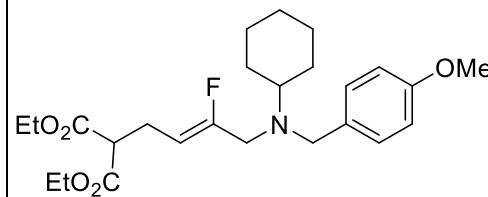
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **10f** ($Z/E = 91/9$)



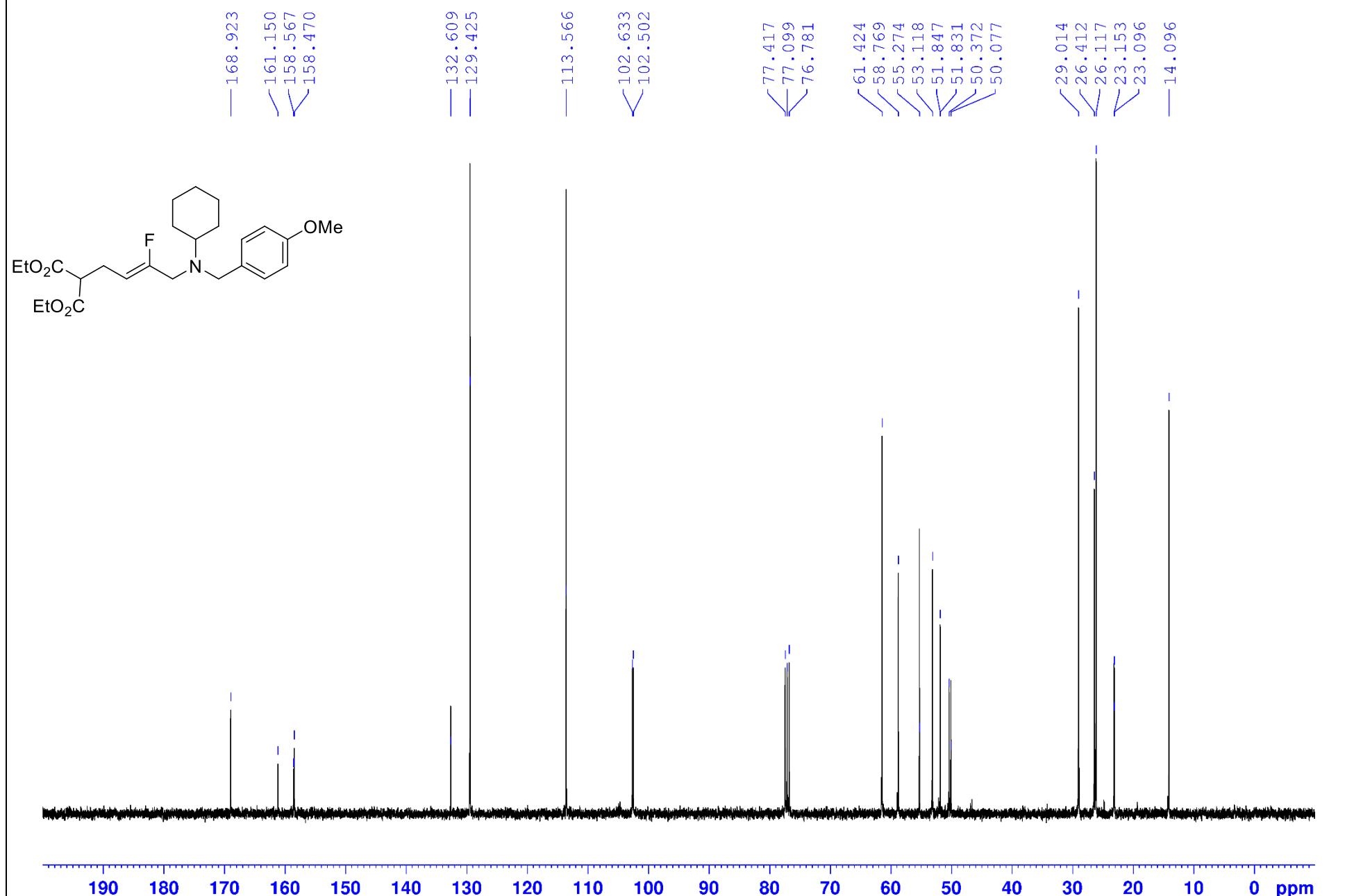
¹H NMR (CDCl₃, 400.0 MHz) of **10i** (Z/E = 93/7)



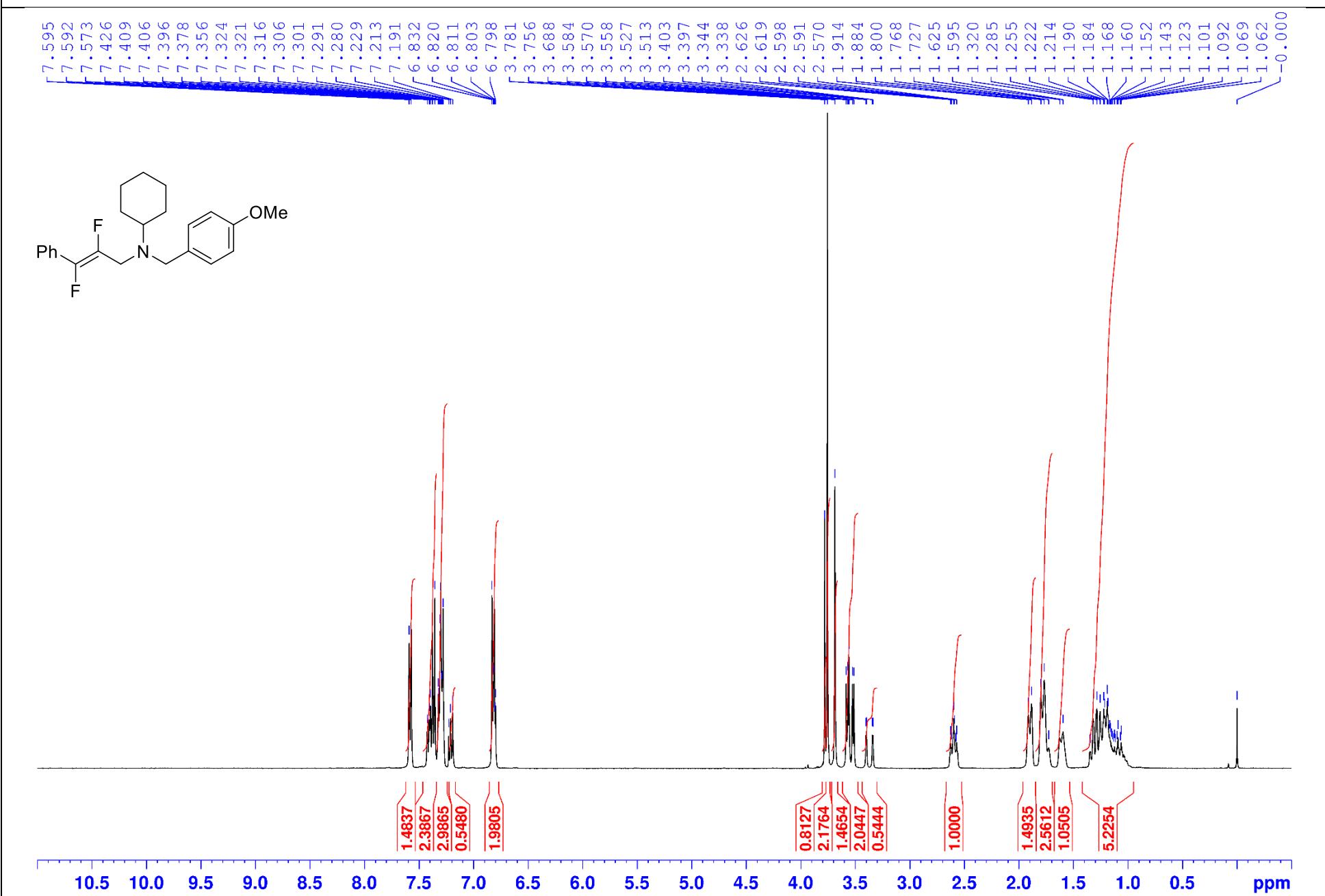
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **10i** ($Z/E = 93/7$)



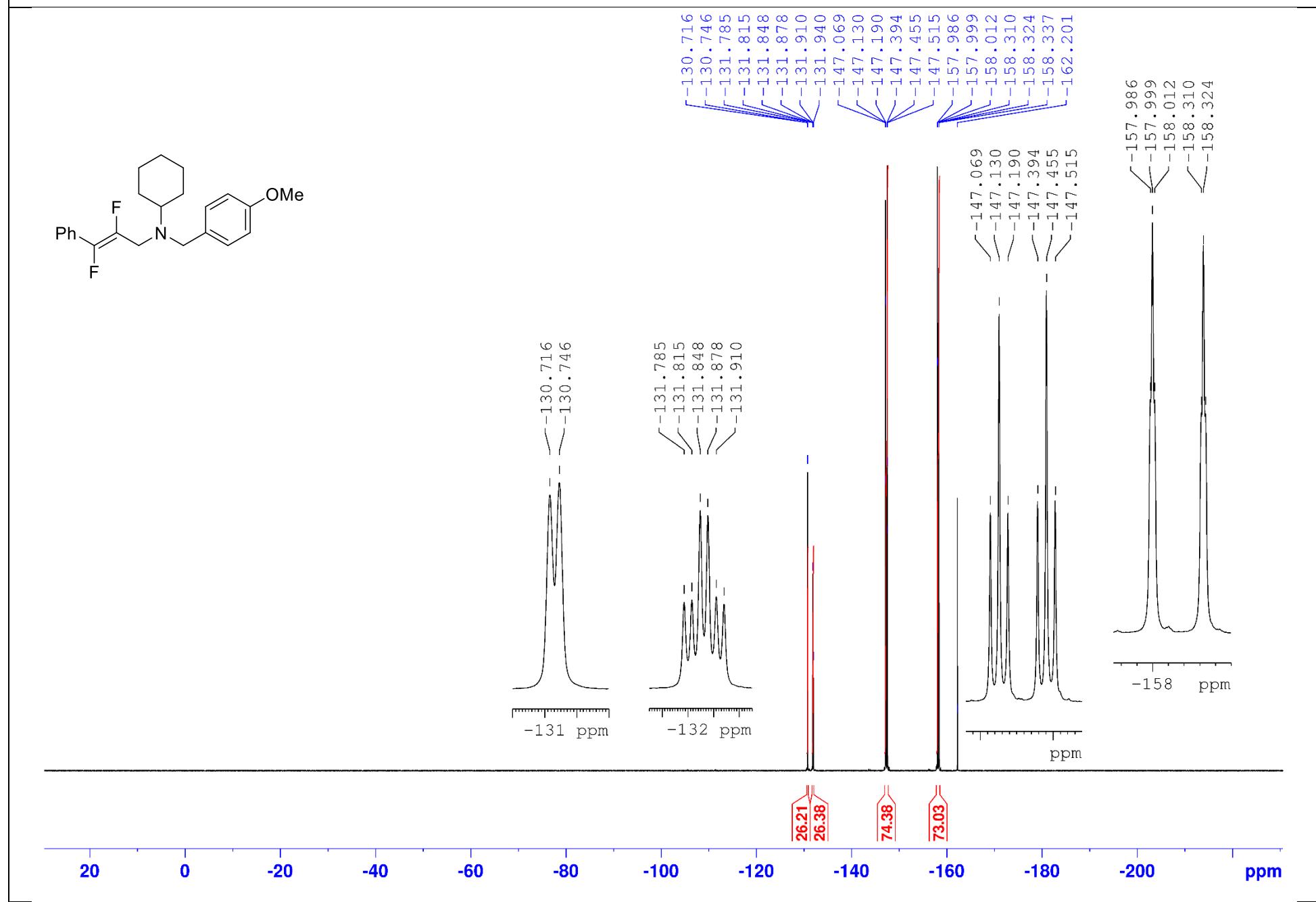
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **10i** ($Z/E = 93/7$)



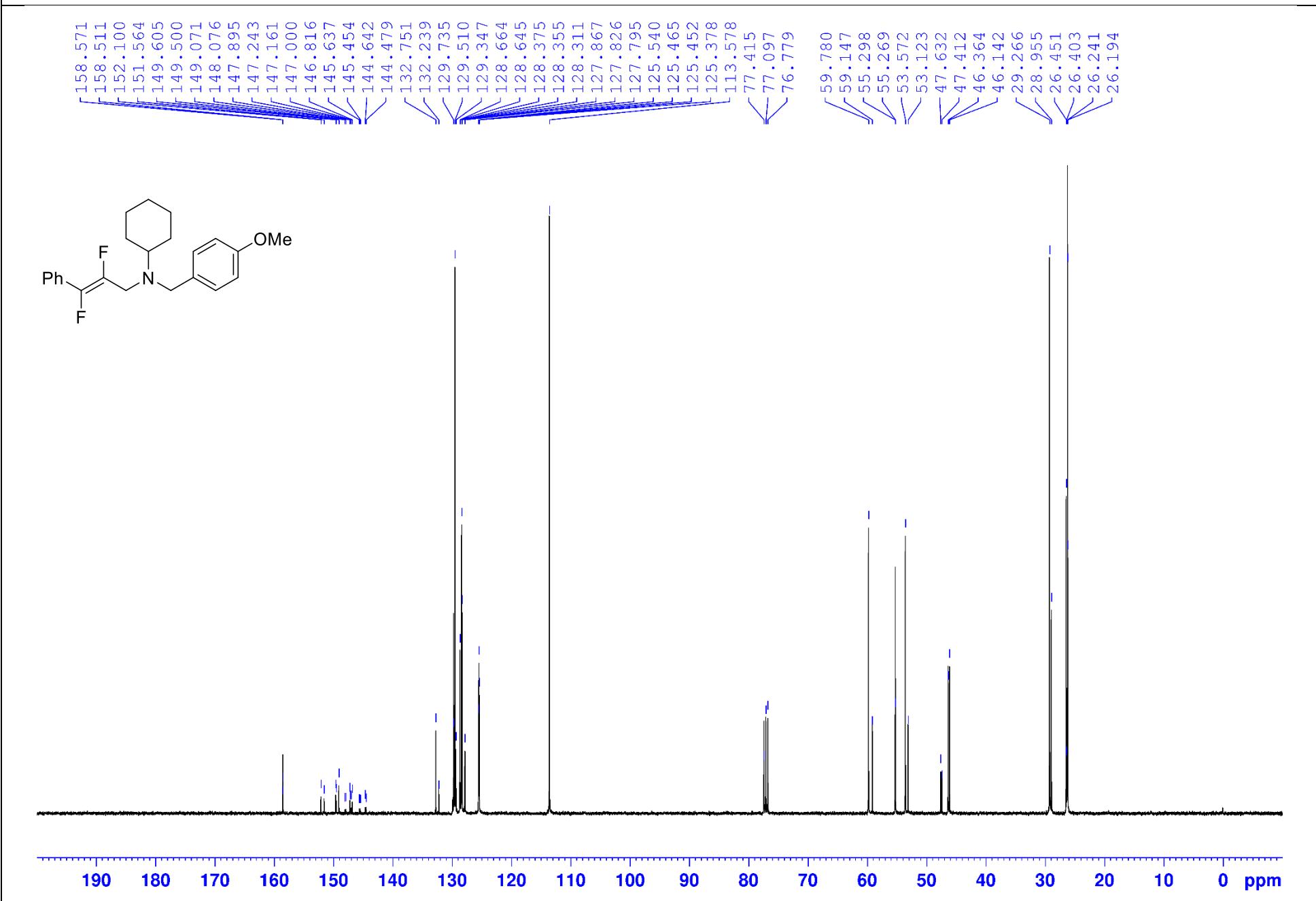
¹H NMR (CDCl₃, 400.0 MHz) of **10k** (*E/Z* = 74/26)



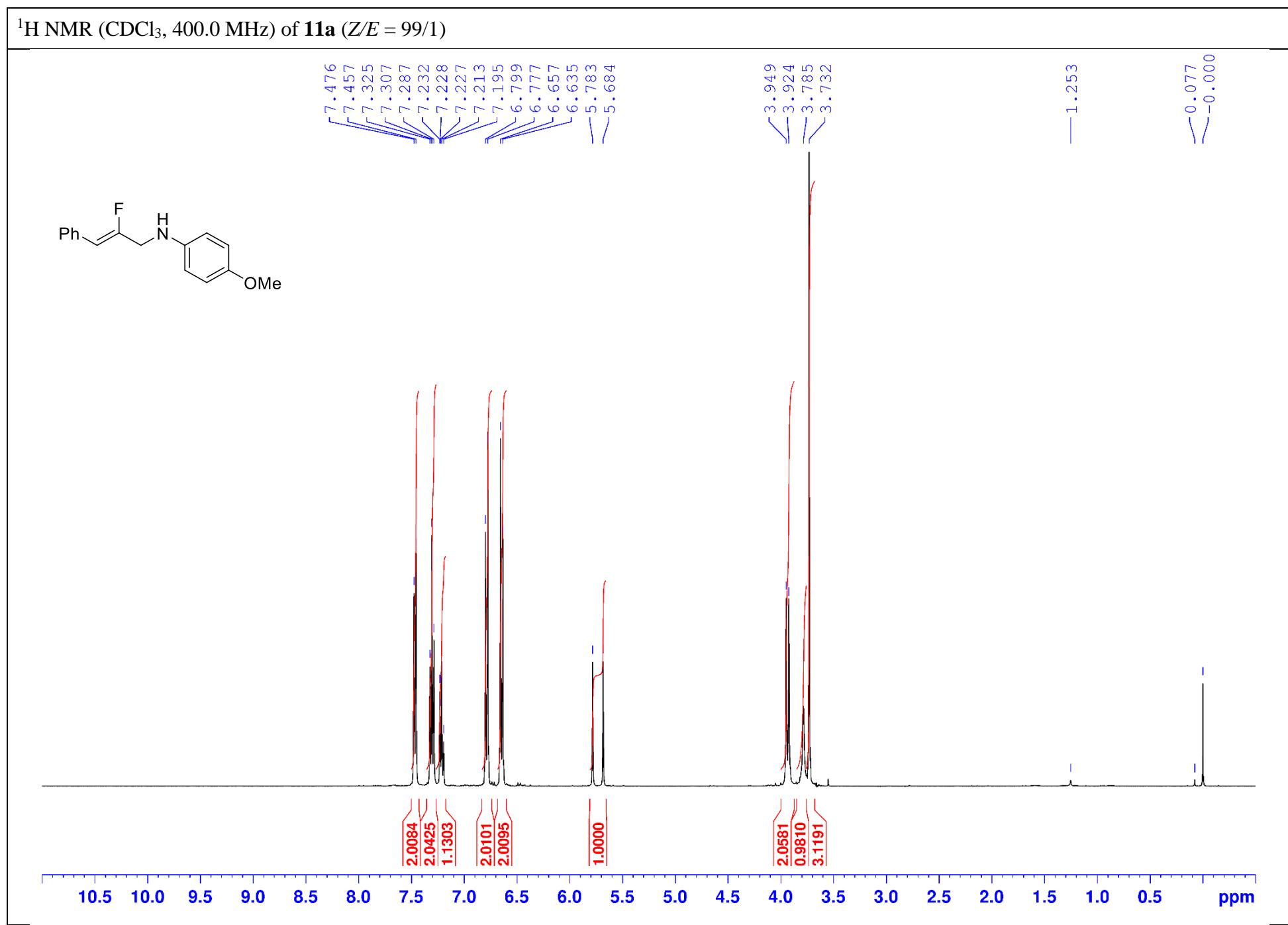
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **10k** (*E/Z* = 74/26)



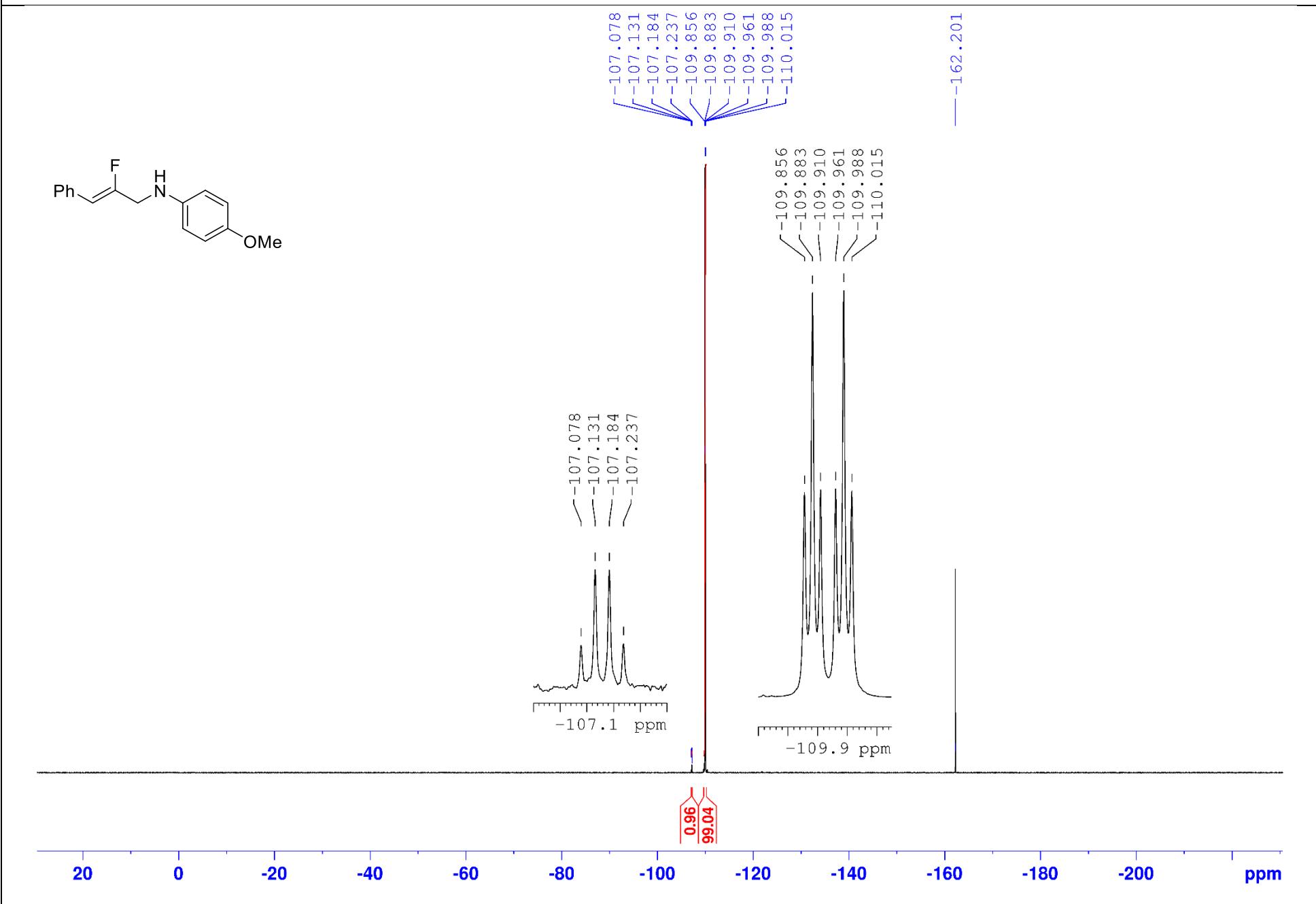
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **10k** (*E/Z* = 74/26)



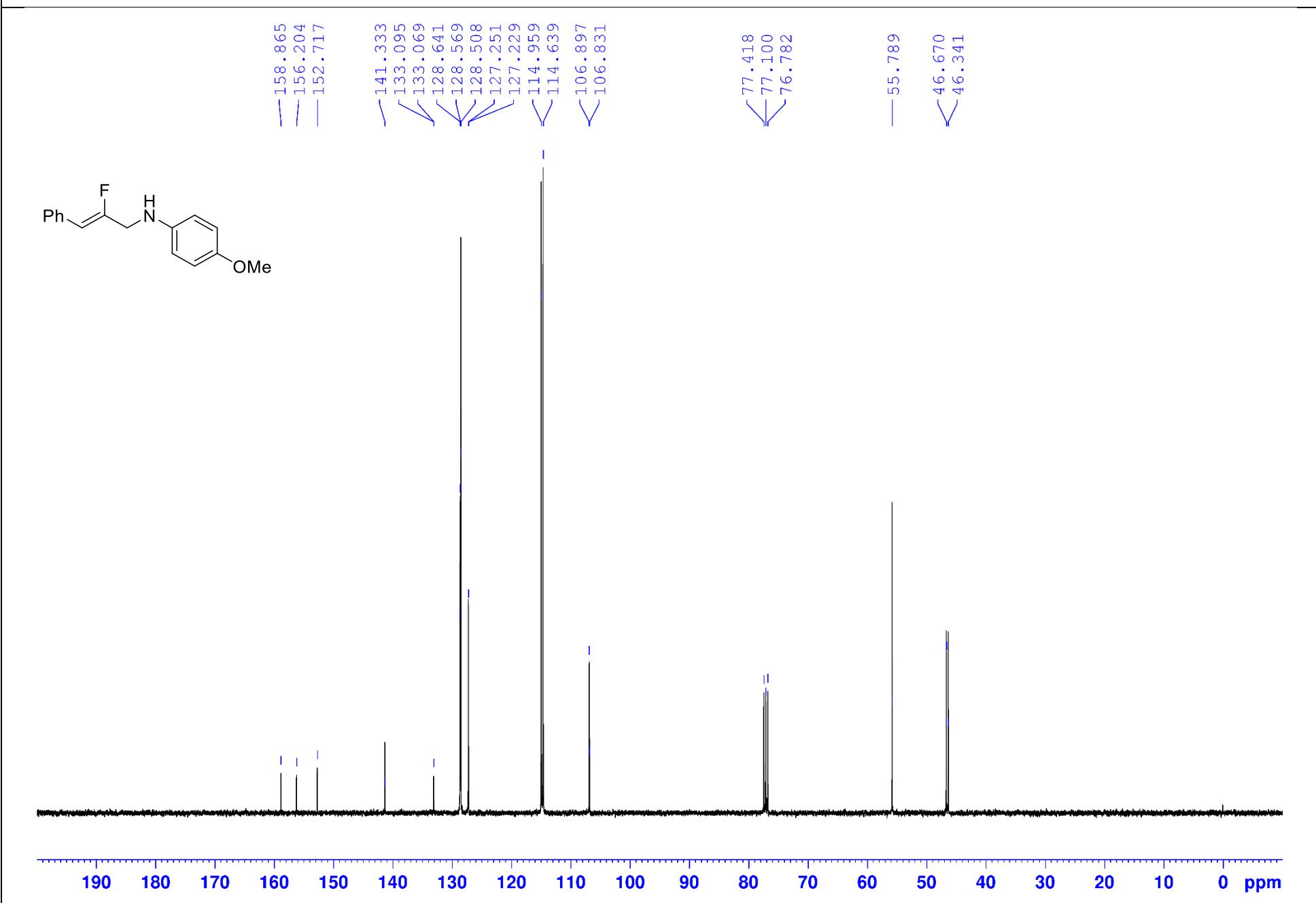
¹H NMR (CDCl_3 , 400.0 MHz) of **11a** (*Z/E* = 99/1)



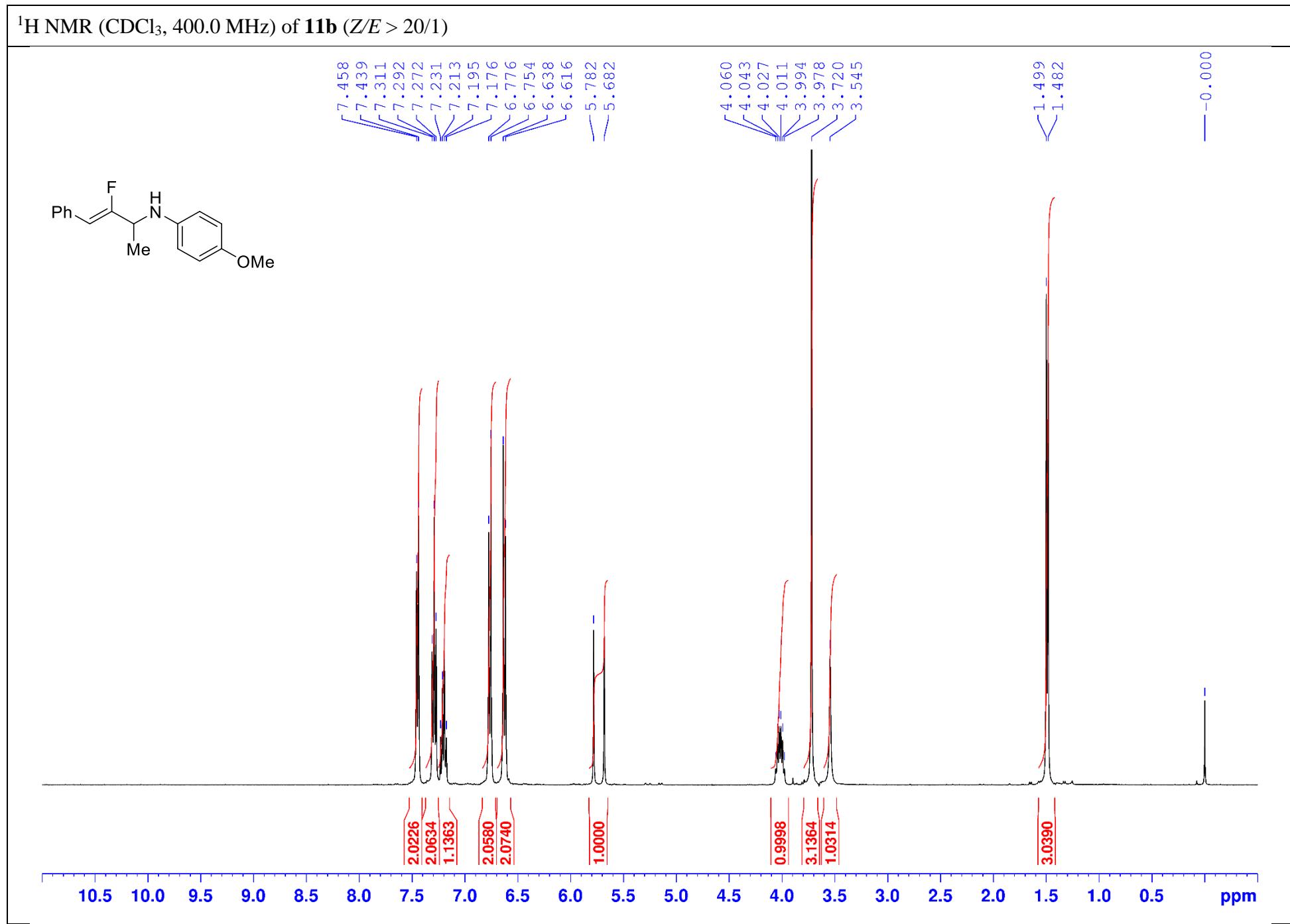
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **11a** ($Z/E = 99/1$)



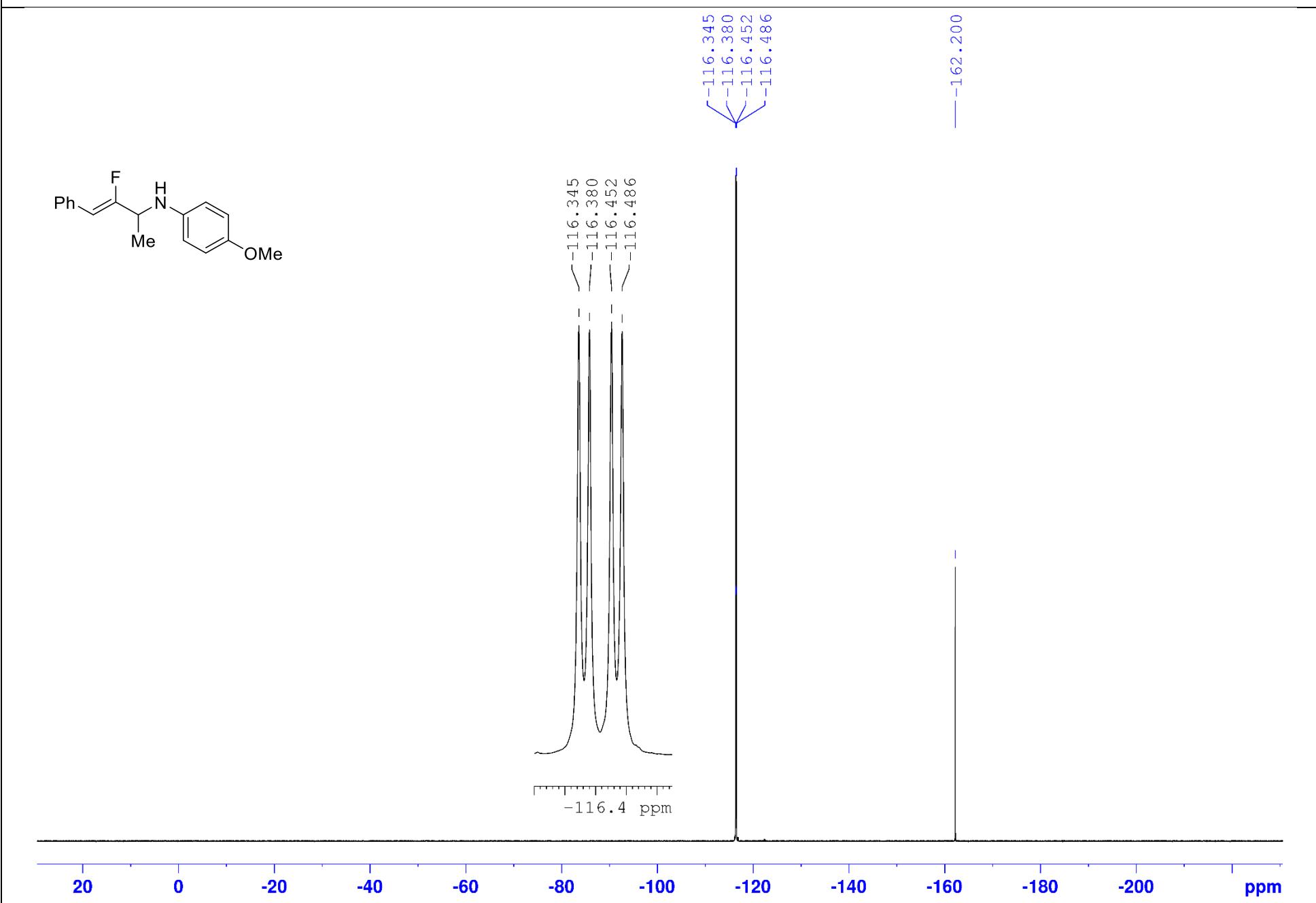
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **11a** ($Z/E = 99/1$)



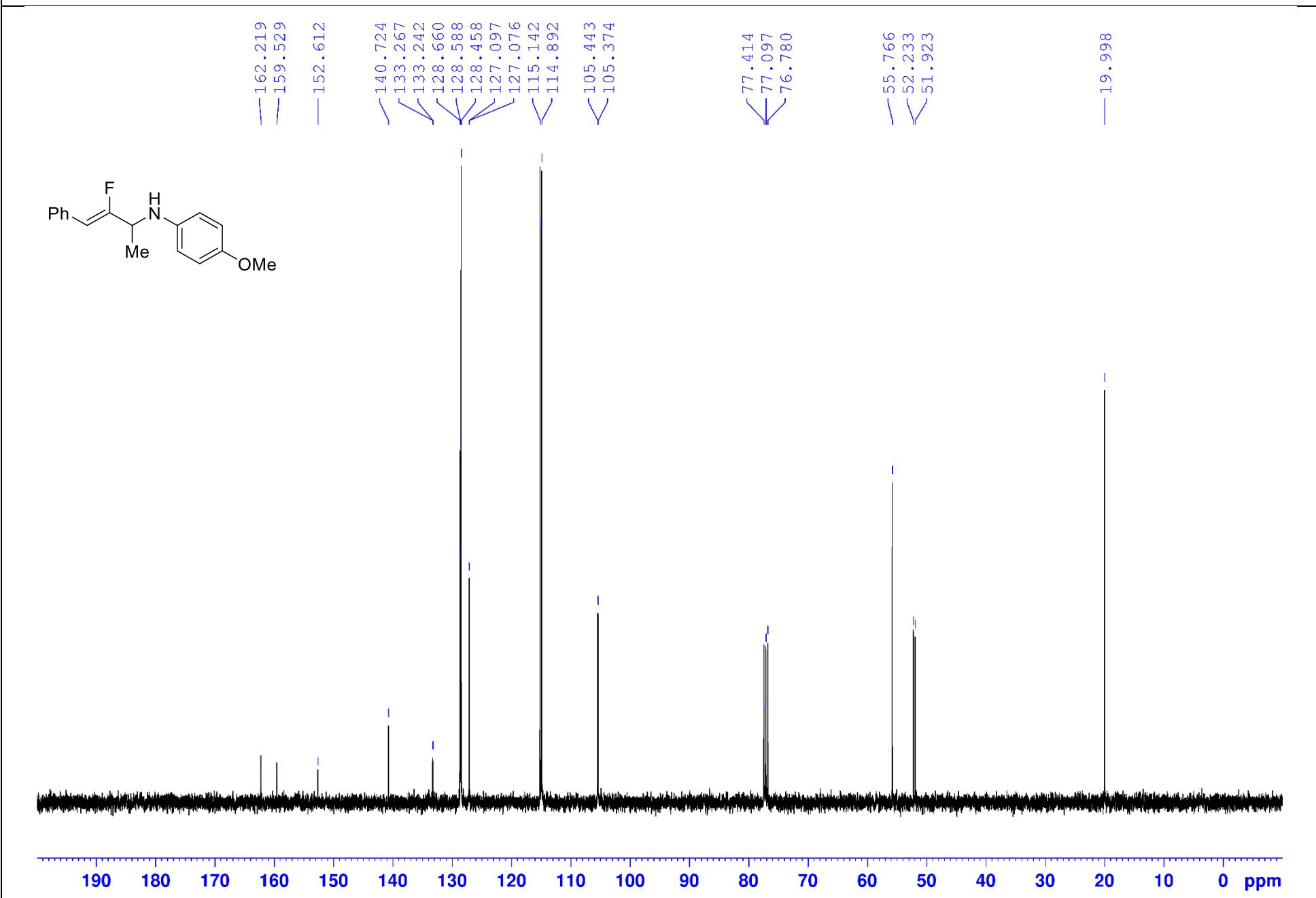
¹H NMR (CDCl_3 , 400.0 MHz) of **11b** ($Z/E > 20/1$)



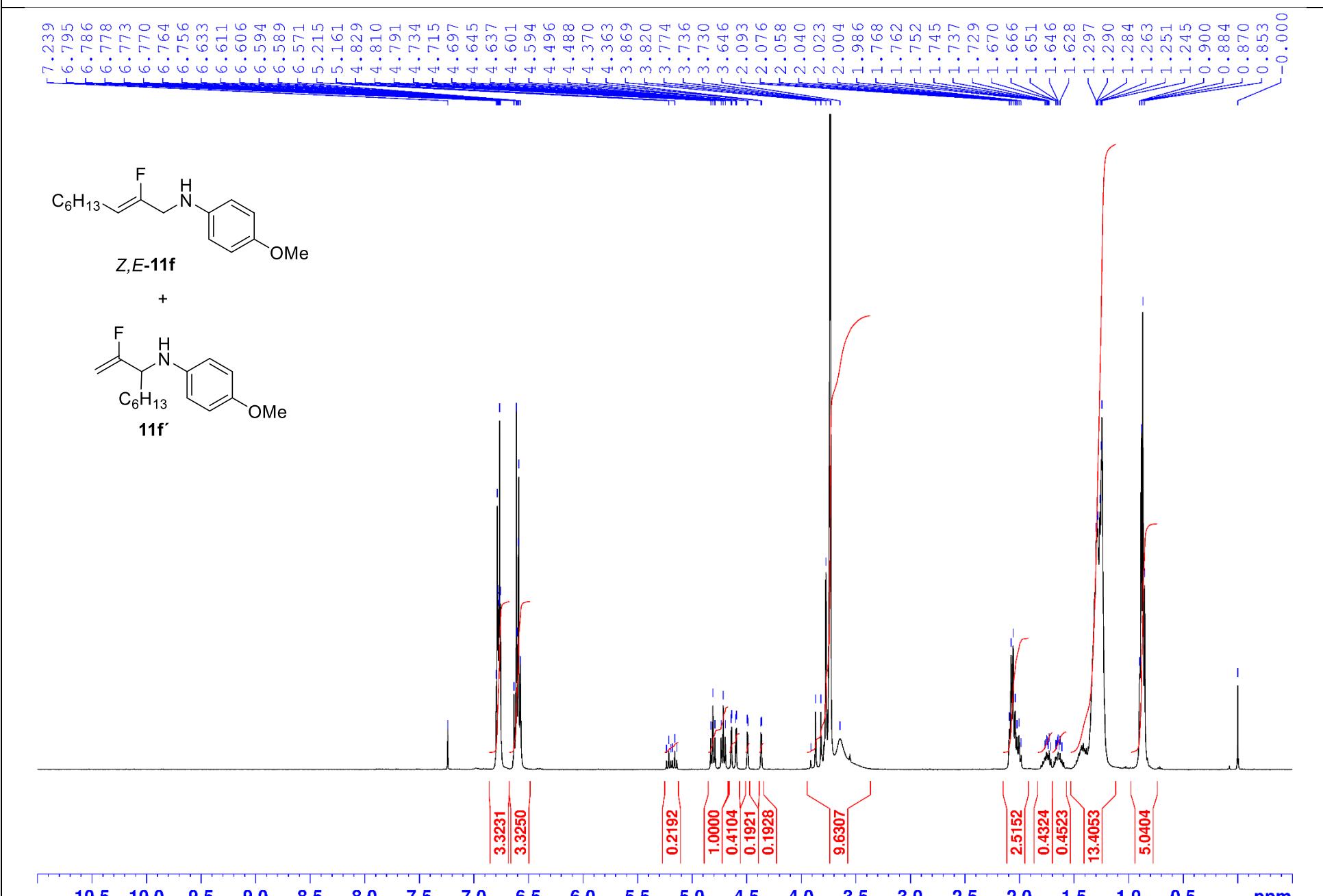
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **11b** ($Z/E > 20/1$)



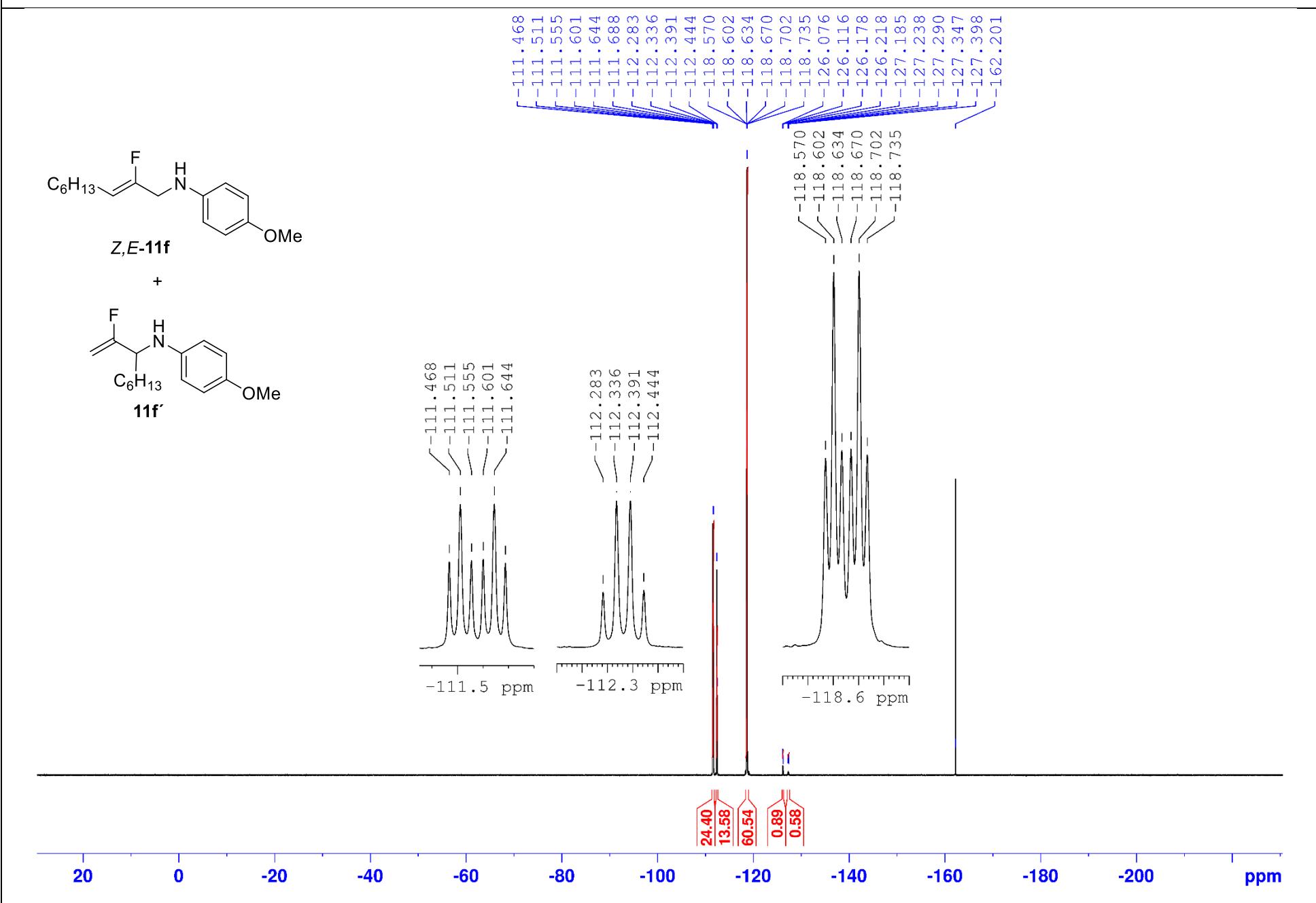
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **11b** ($Z/E > 20/1$)



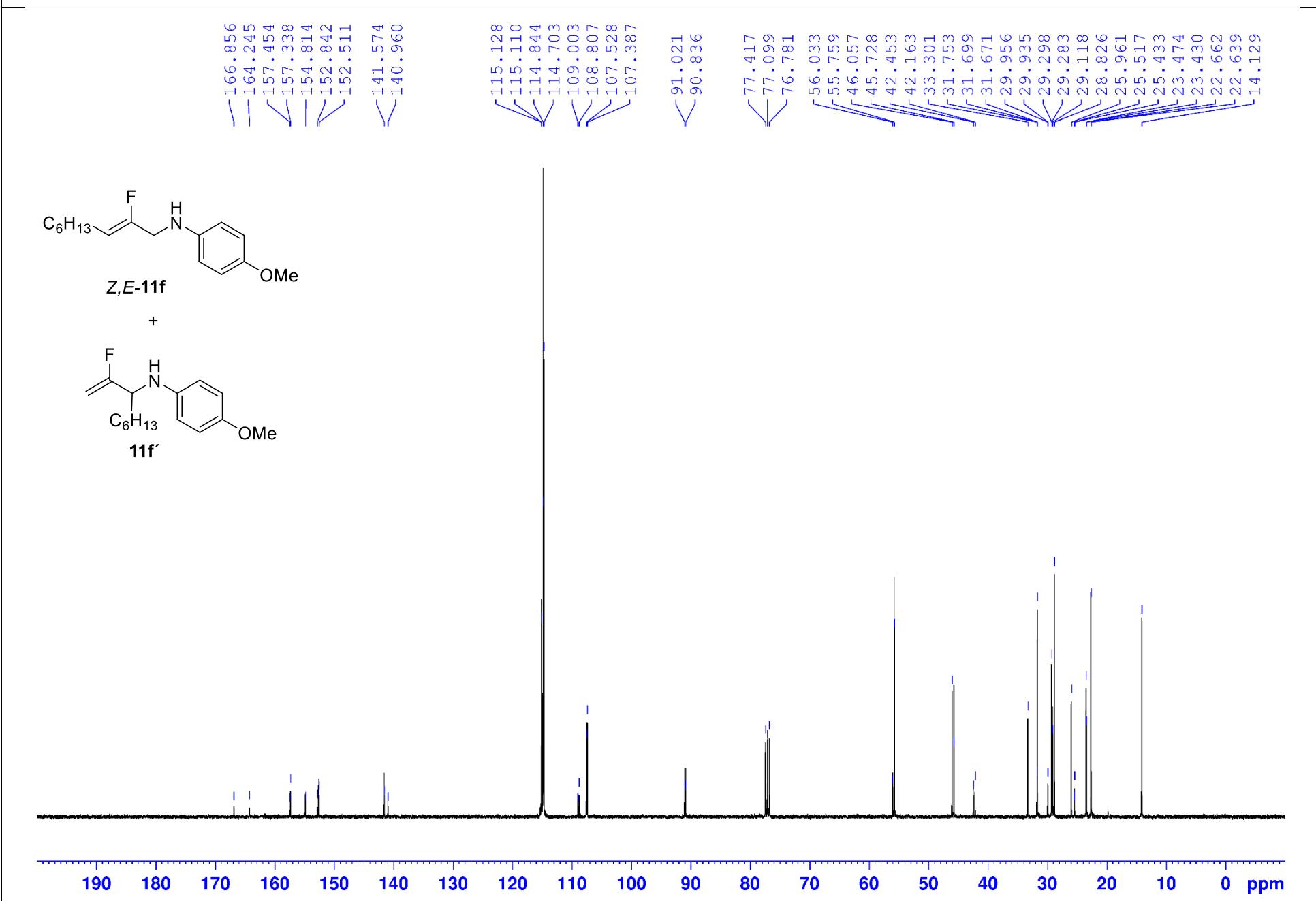
¹H NMR (CDCl₃, 400.0 MHz) of **11f** (Z-**11f**/E-**11f**/**11f'** = 61/14/25)



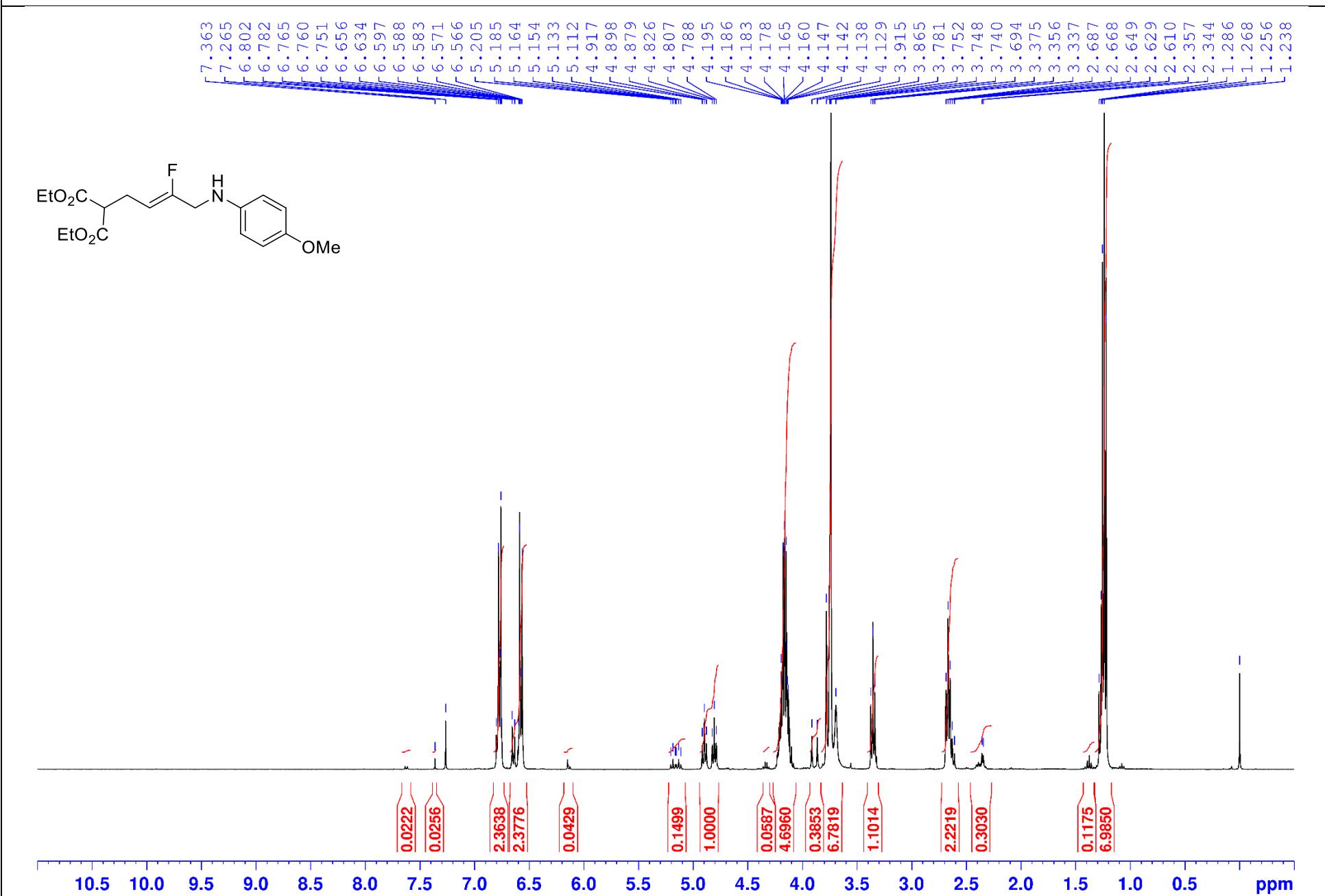
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **11f** (*Z*-**11f**/*E*-**11f**/**11f'** = 61/14/25)



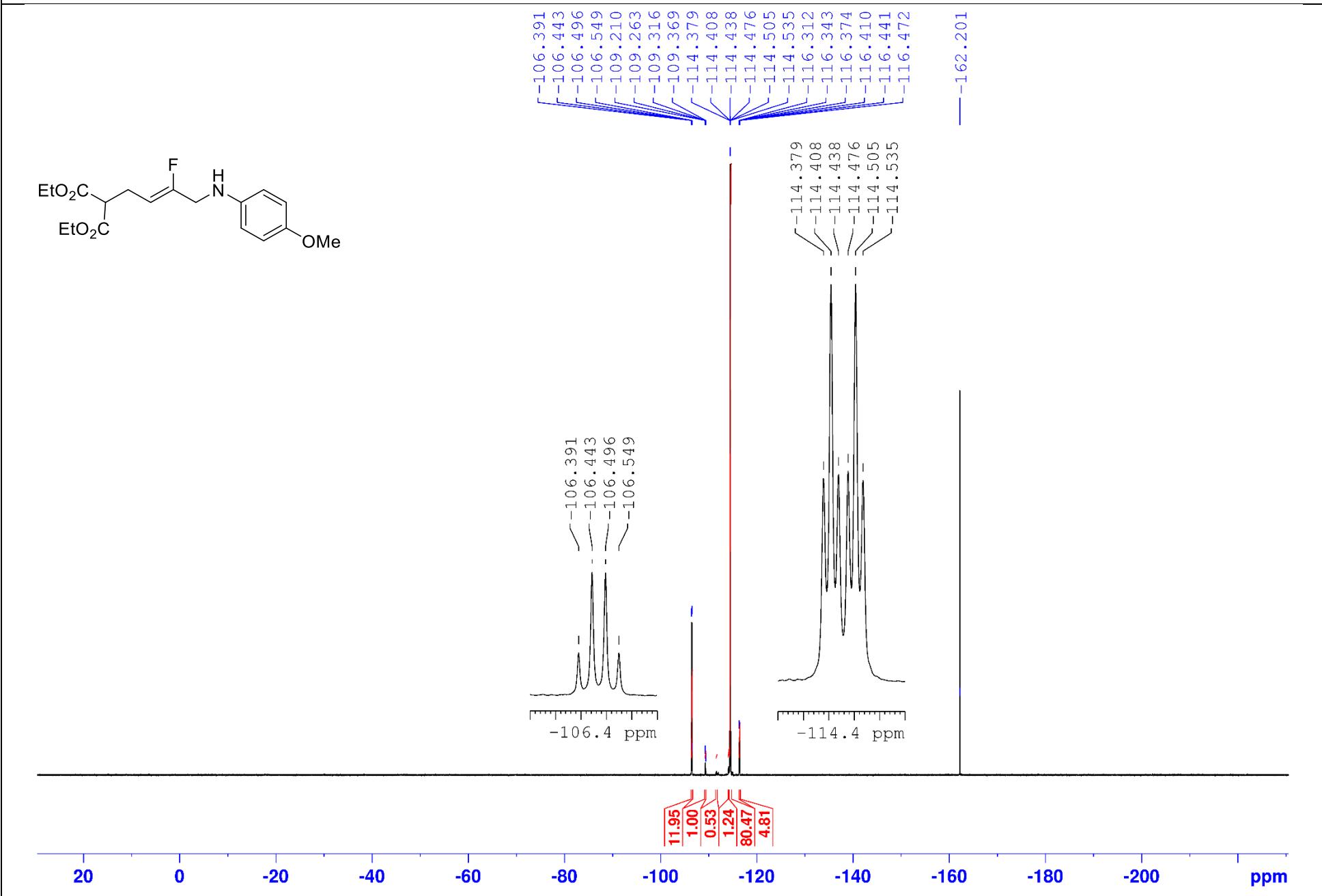
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **11f** (*Z*-**11f**/*E*-**11f**/**11f'** = 61/14/25)



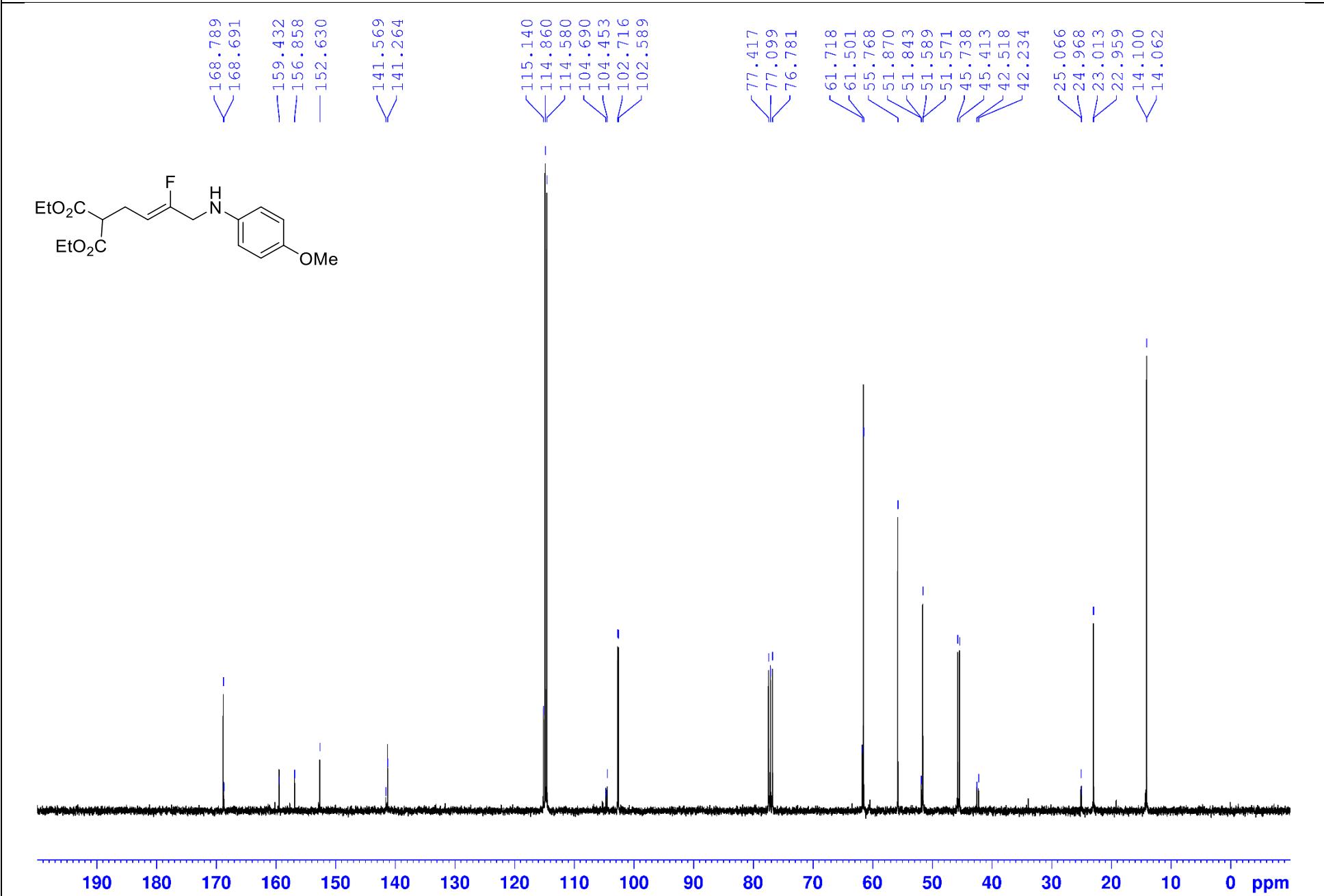
¹H NMR (CDCl_3 , 400.0 MHz) of **11i** ($Z/E = 87/13$)



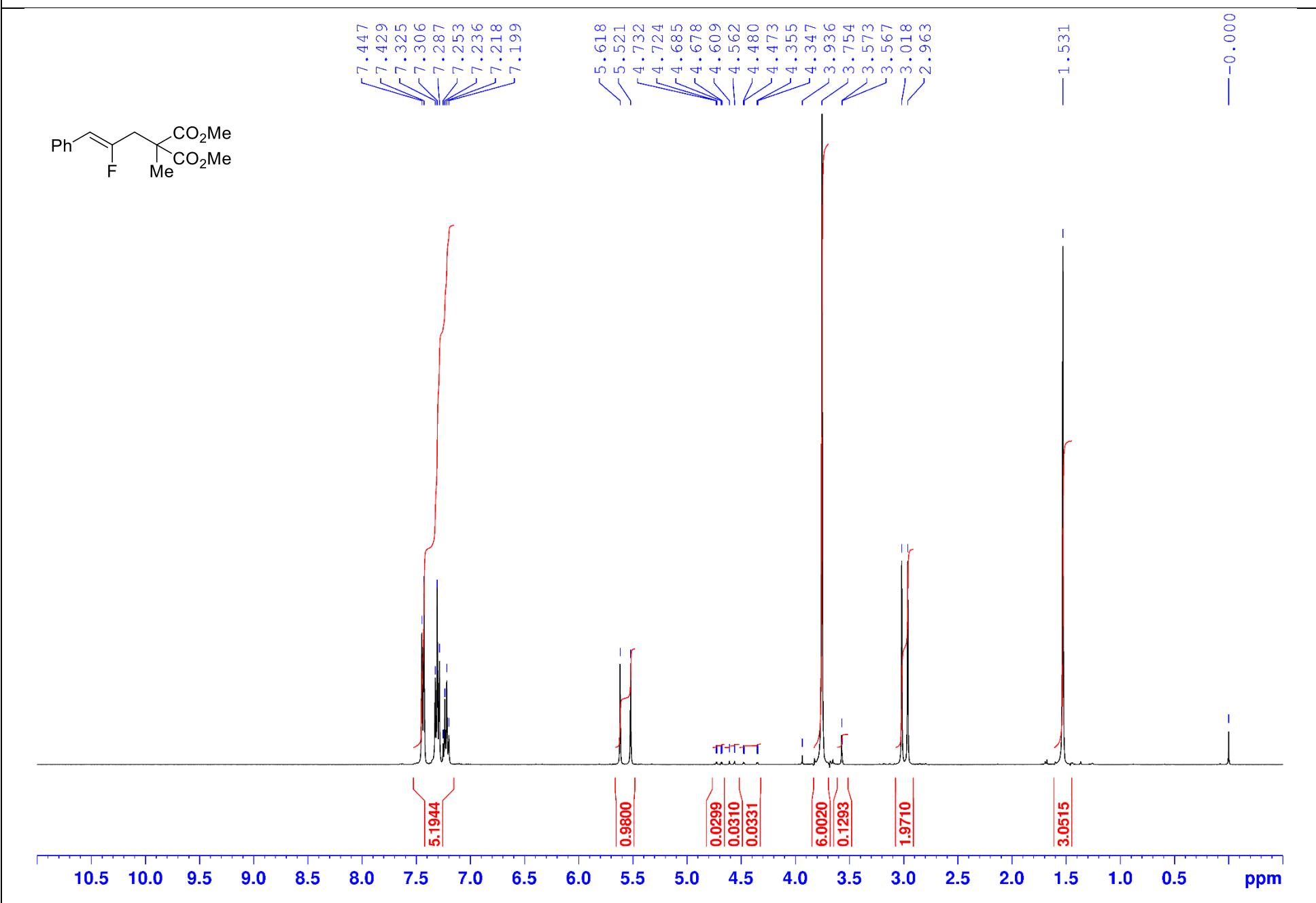
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **11i** ($Z/E = 87/13$)



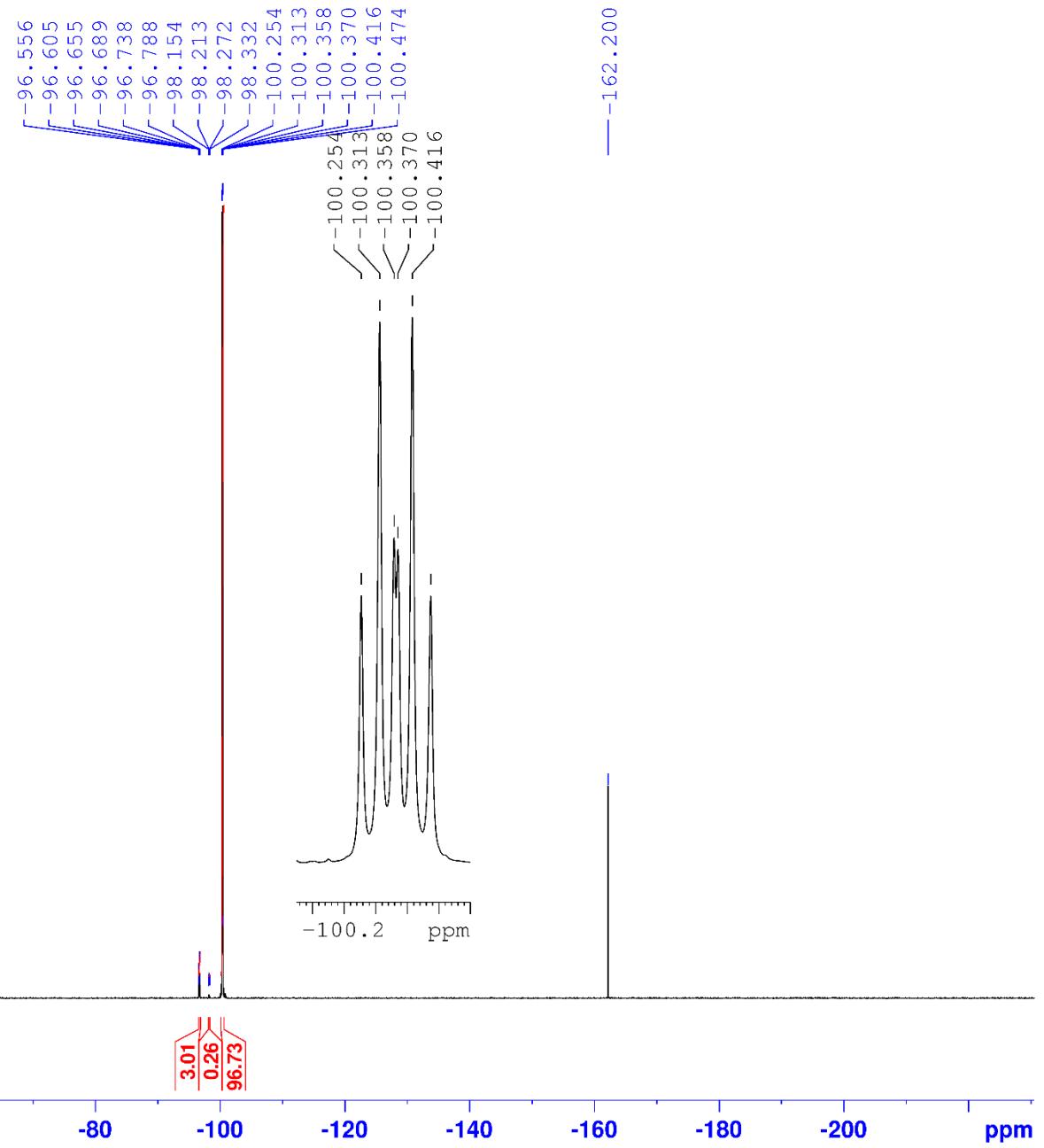
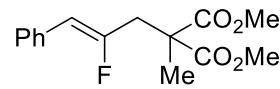
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **11i** ($Z/E = 87/13$)



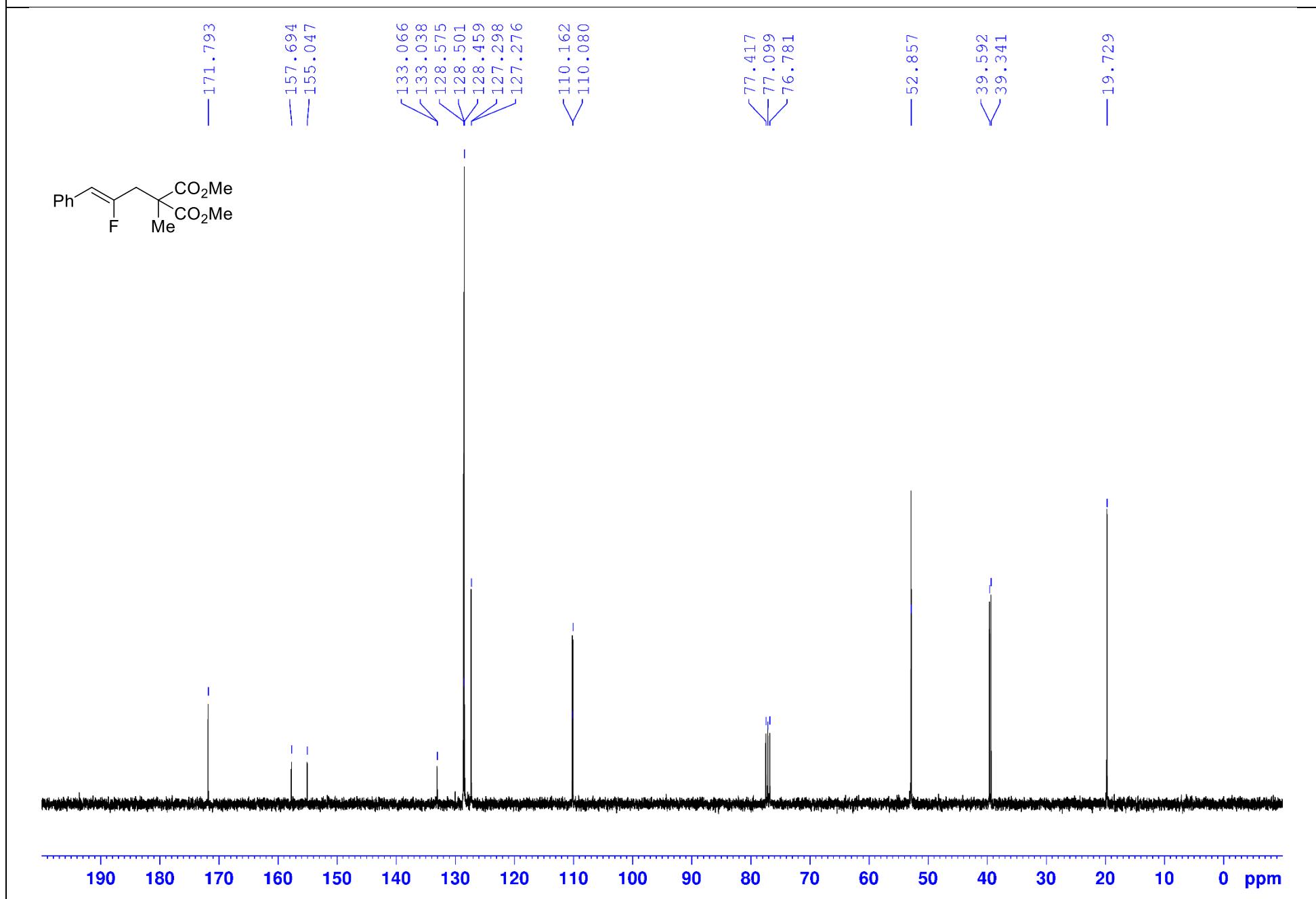
¹H NMR (CDCl_3 , 400.0 MHz) of **13** ($Z/E > 20/1$)



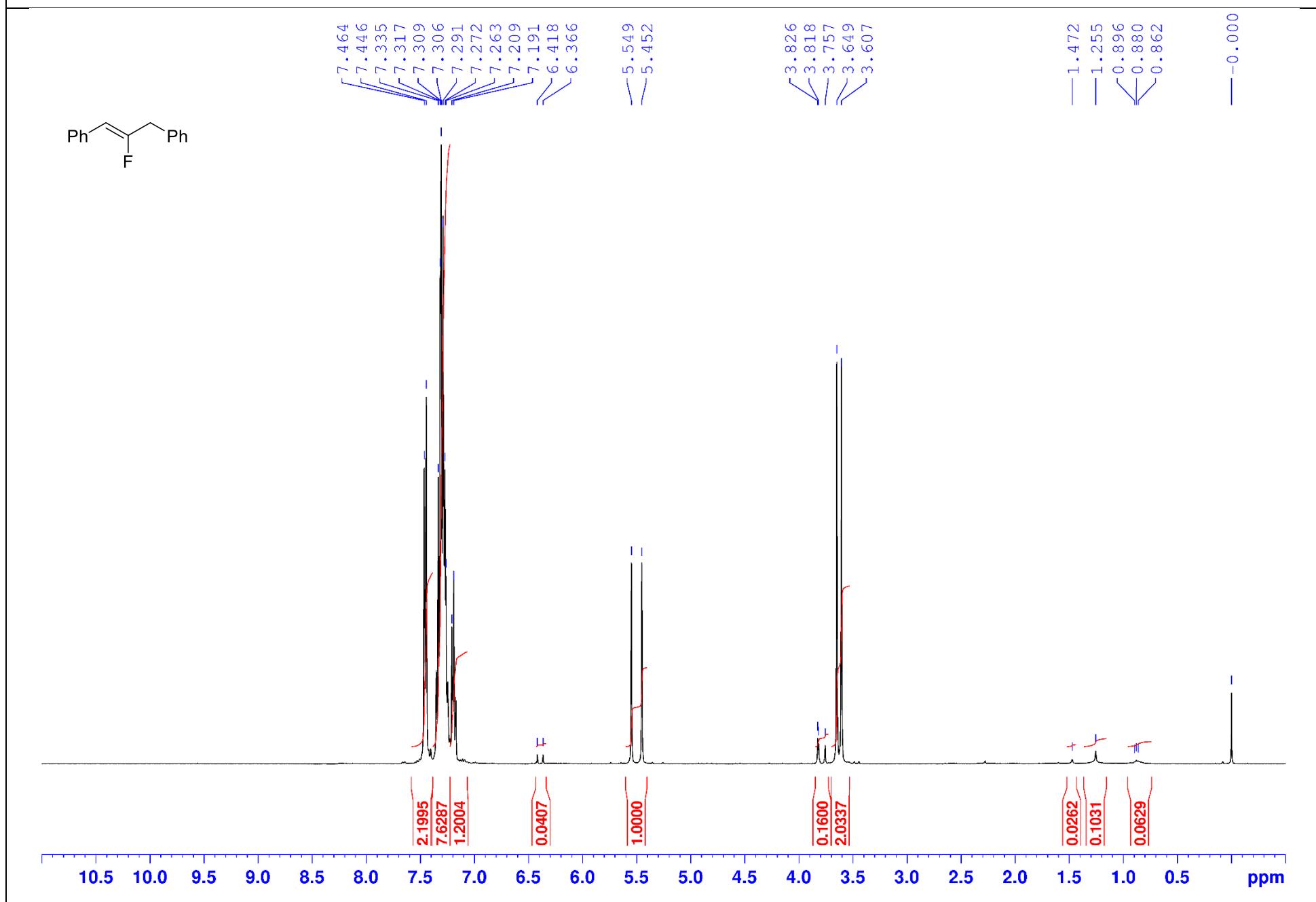
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **13** ($Z/E > 20/1$)



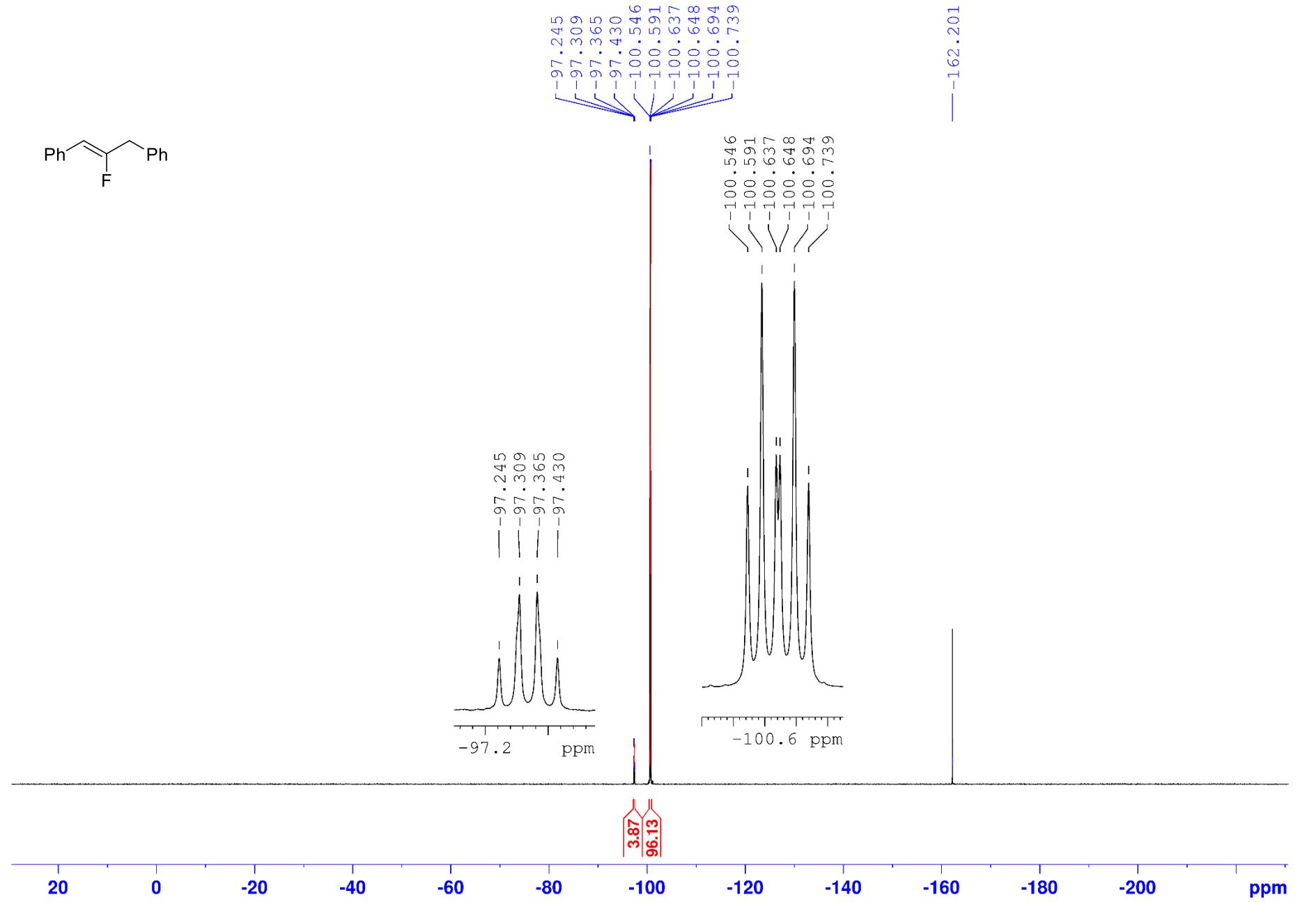
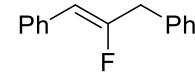
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **13** ($Z/E > 20/1$)



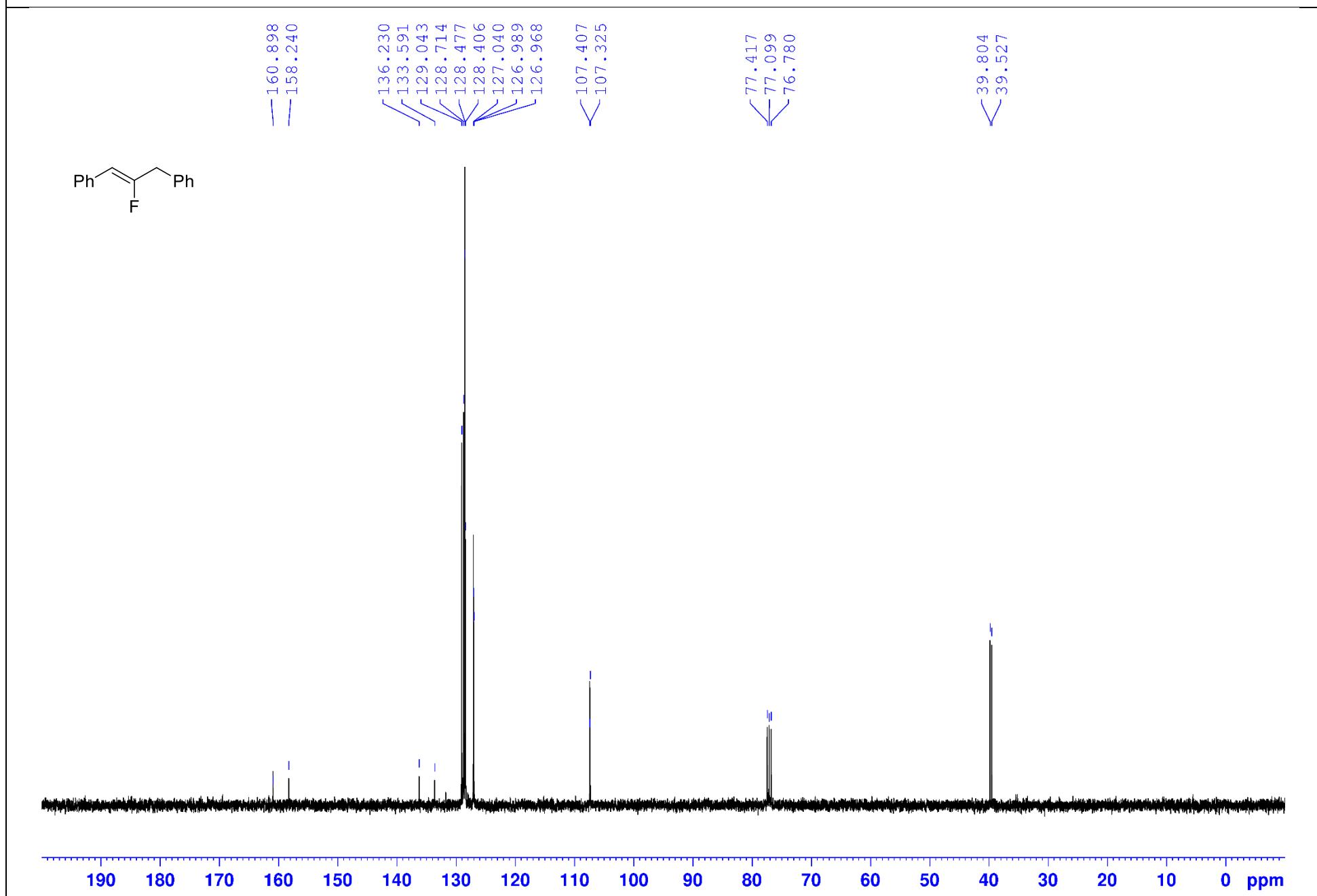
¹H NMR (CDCl_3 , 400.0 MHz) of **14** (*Z/E* = 96/4)



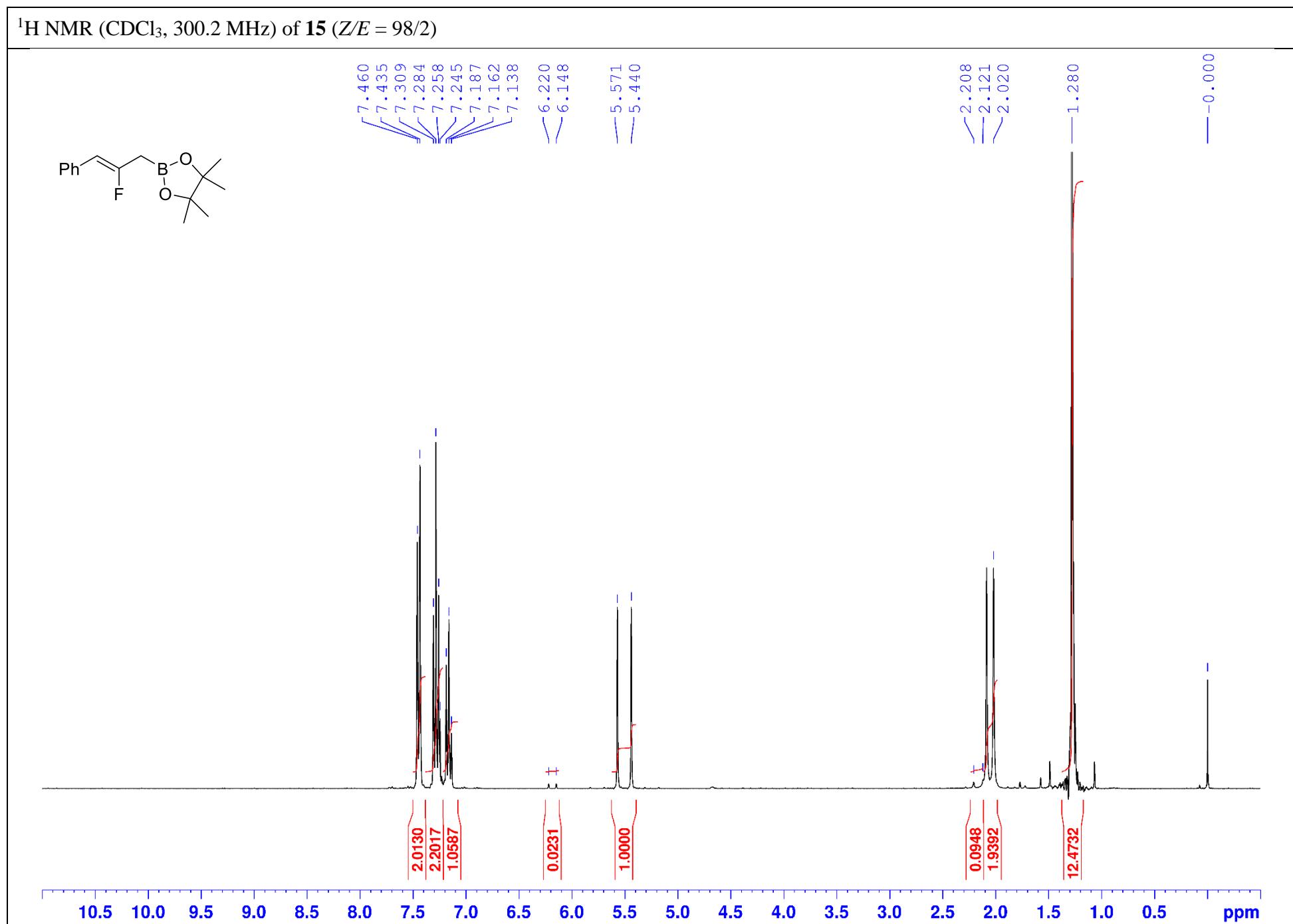
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **14** ($Z/E = 96/4$)



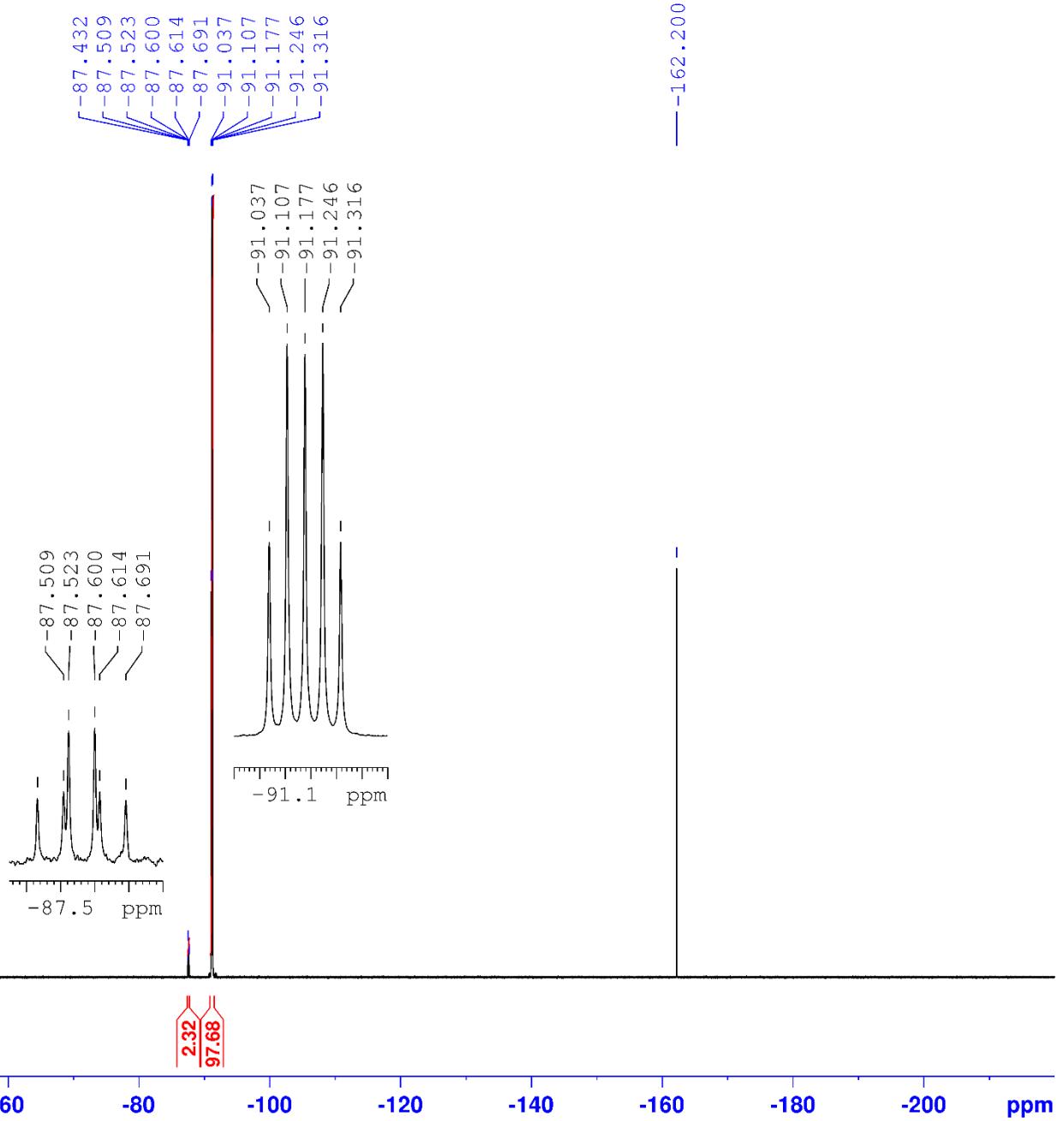
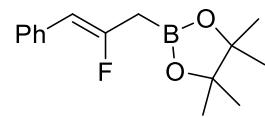
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **14** ($Z/E = 96/4$)



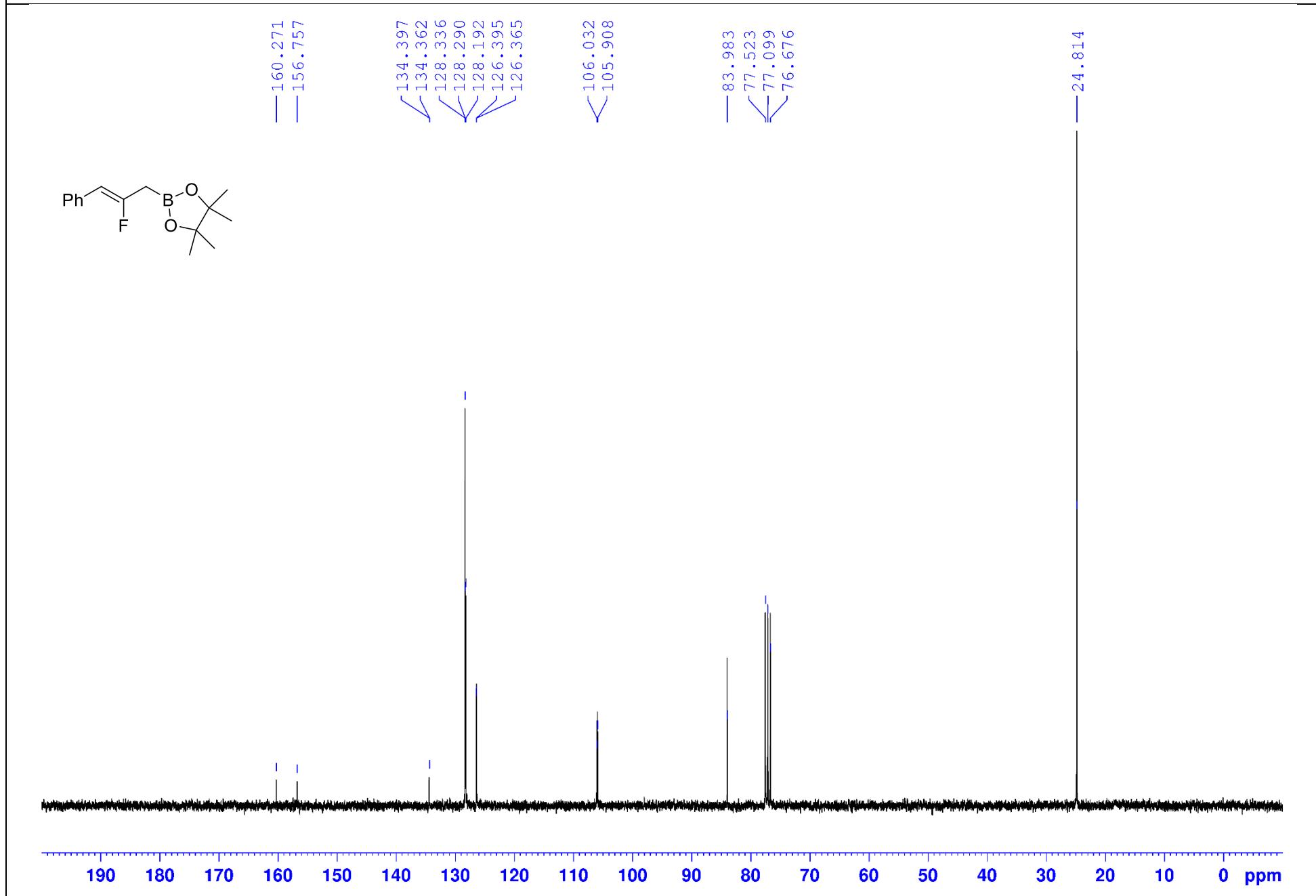
¹H NMR (CDCl_3 , 300.2 MHz) of **15** ($Z/E = 98/2$)



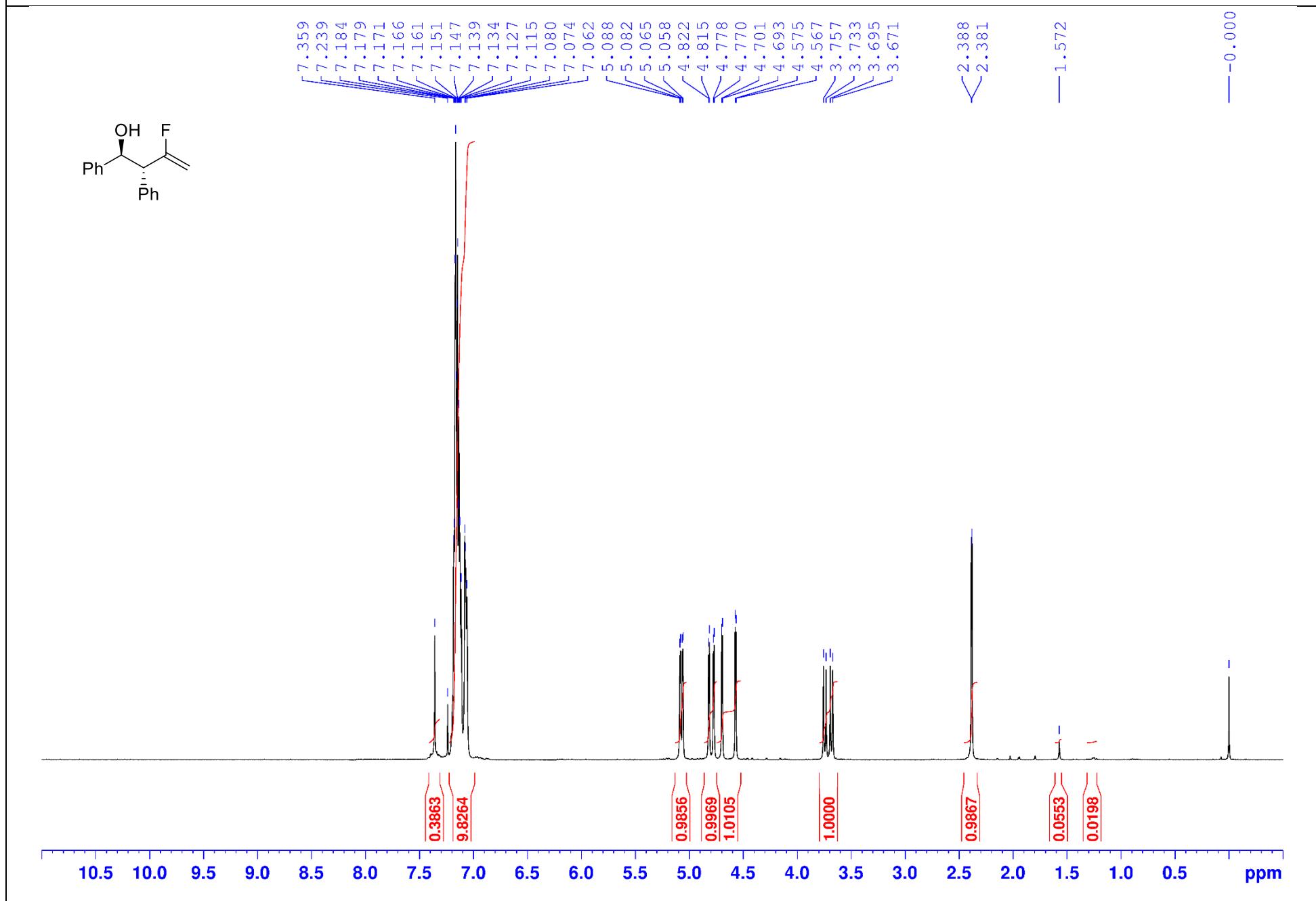
¹⁹F NMR (CDCl_3 , 282.5 MHz) of **15** ($Z/E = 98/2$)



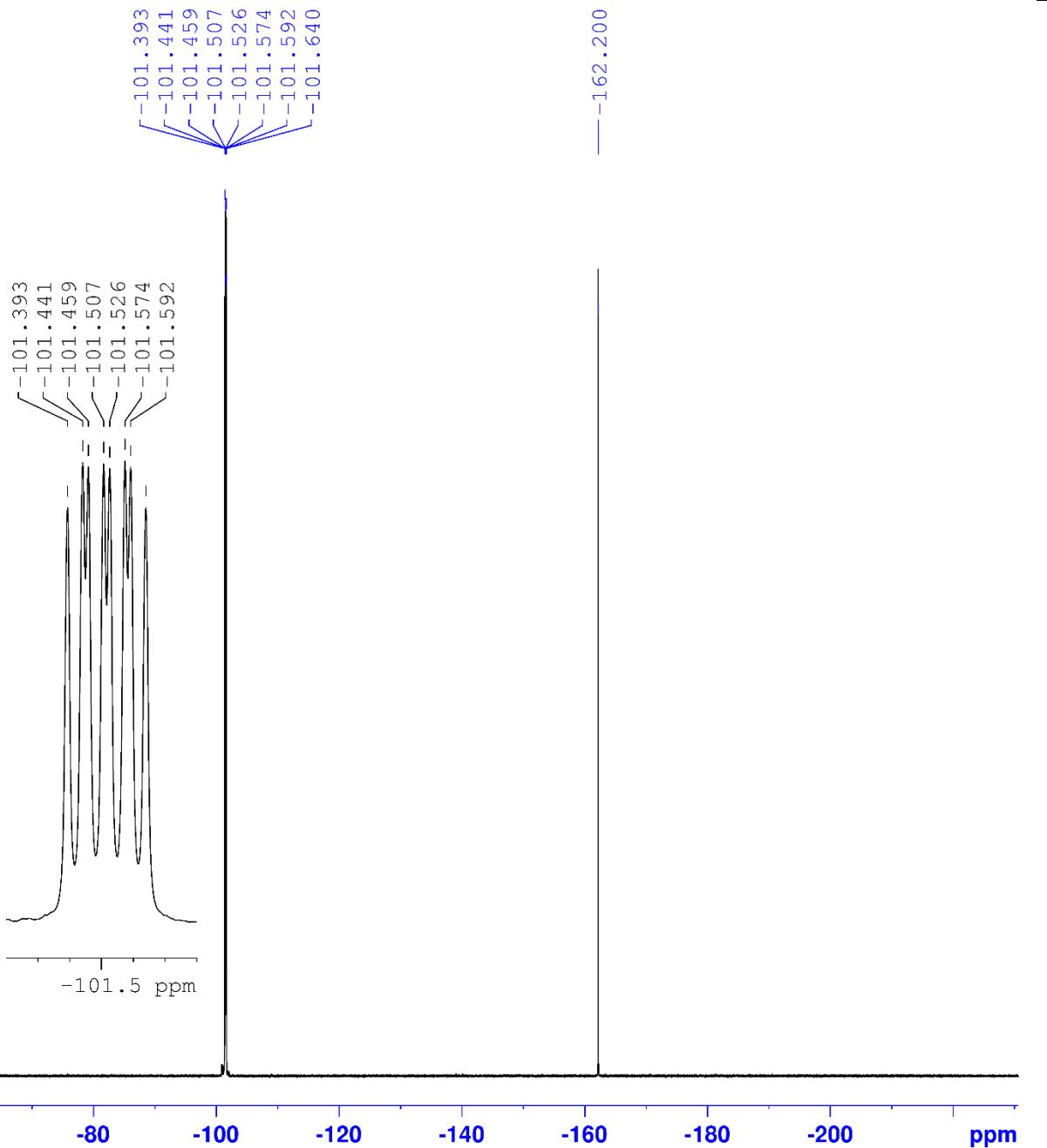
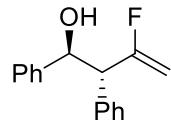
$^{13}\text{C}\{^1\text{H}\}$ NMR (CDCl_3 , 75.5 MHz) of **15** ($Z/E = 98/2$)



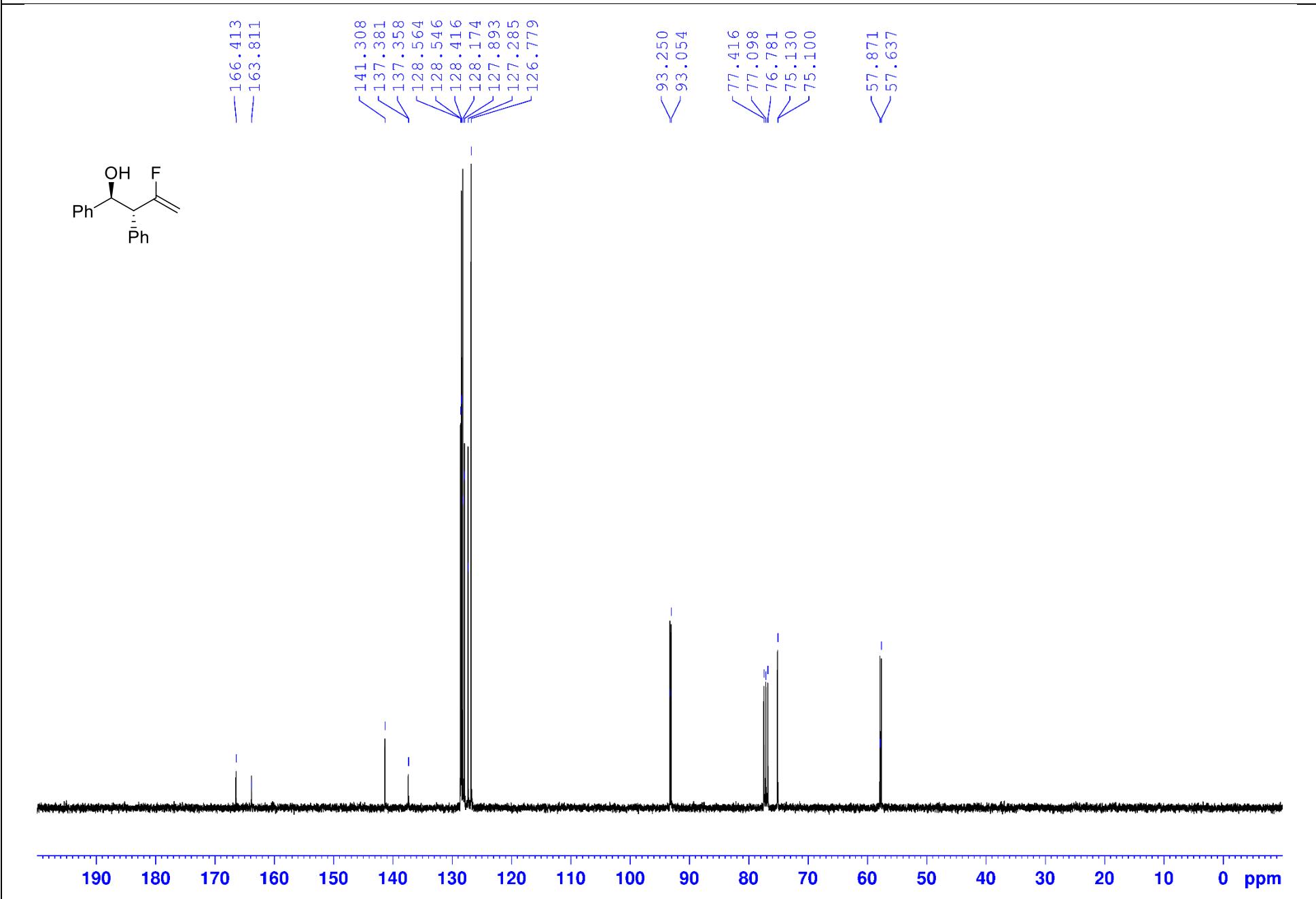
¹H NMR (CDCl₃, 400.0 MHz) of **16** (*anti/syn* > 20/1)



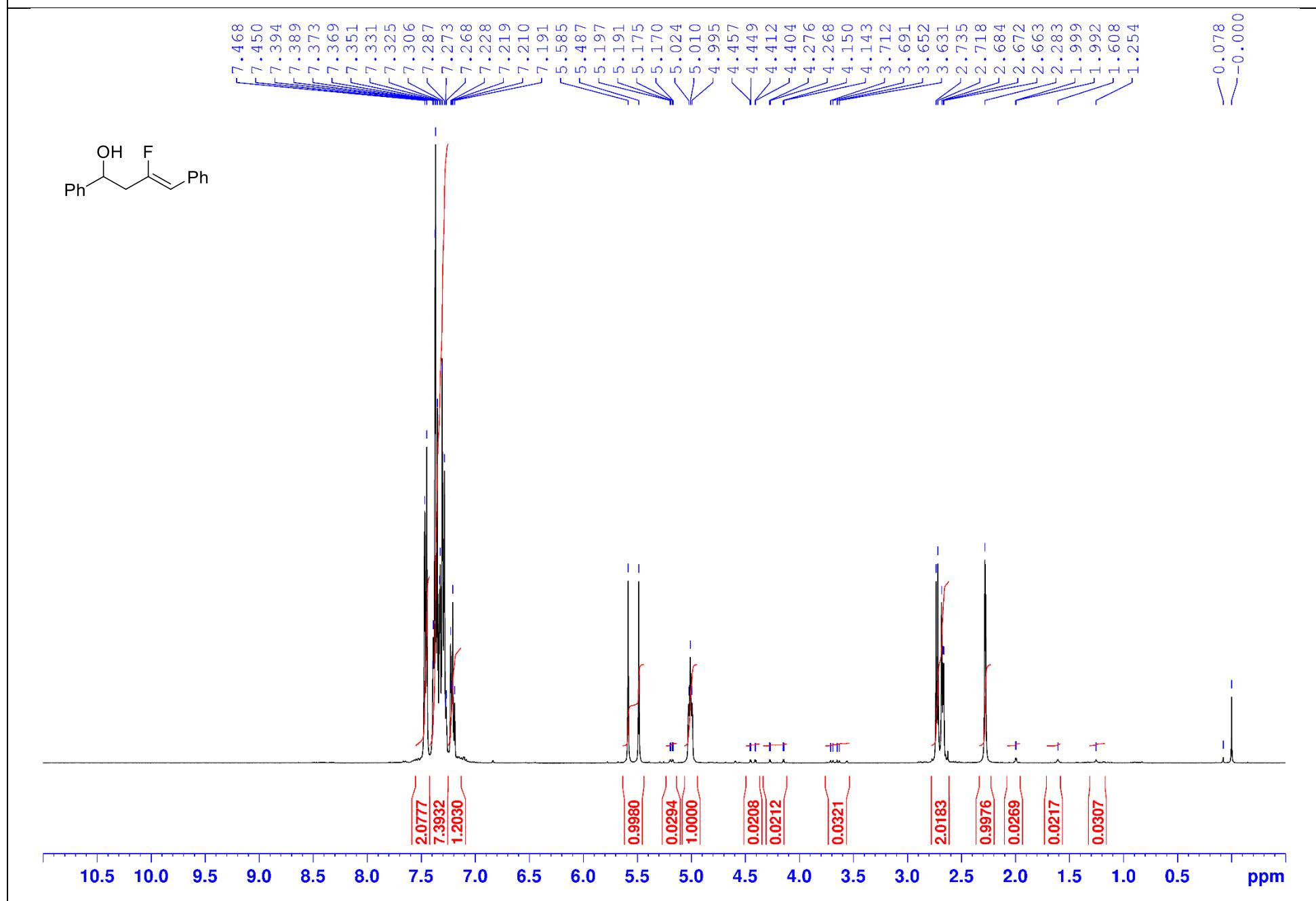
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **16** (*anti/syn* > 20/1)



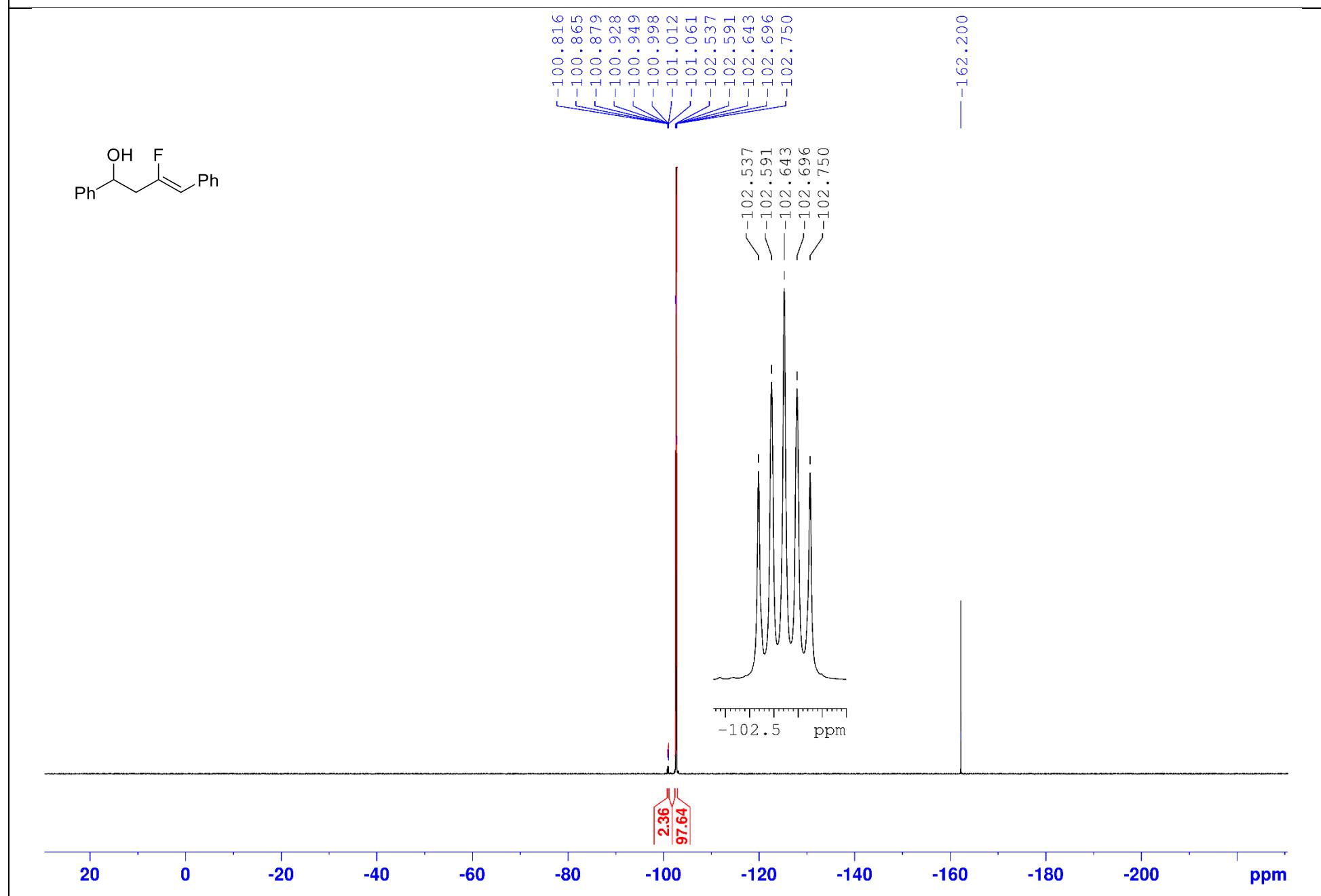
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **16** (*anti/syn* > 20/1)



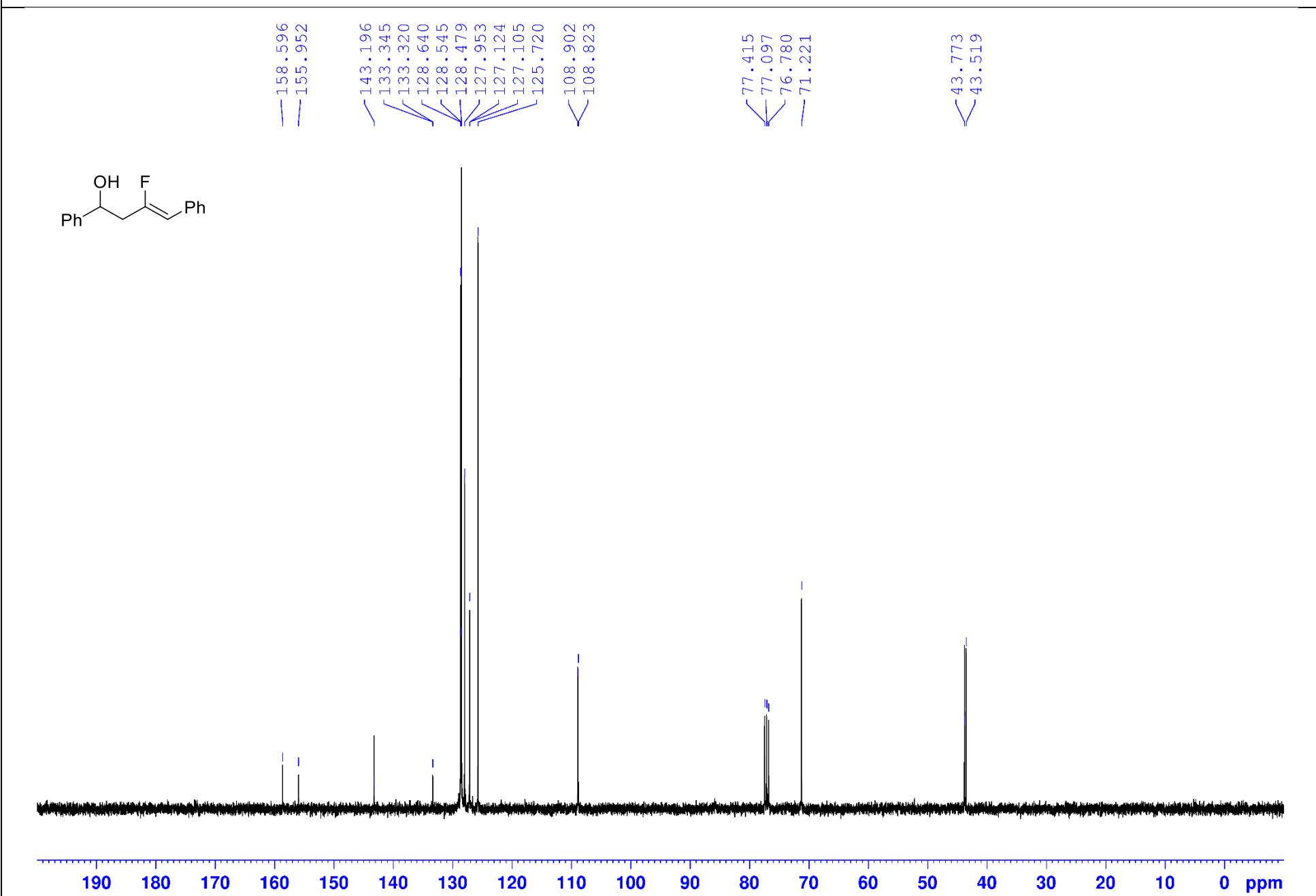
¹H NMR (CDCl_3 , 400.0 MHz) of **17** ($Z/E > 20/1$)



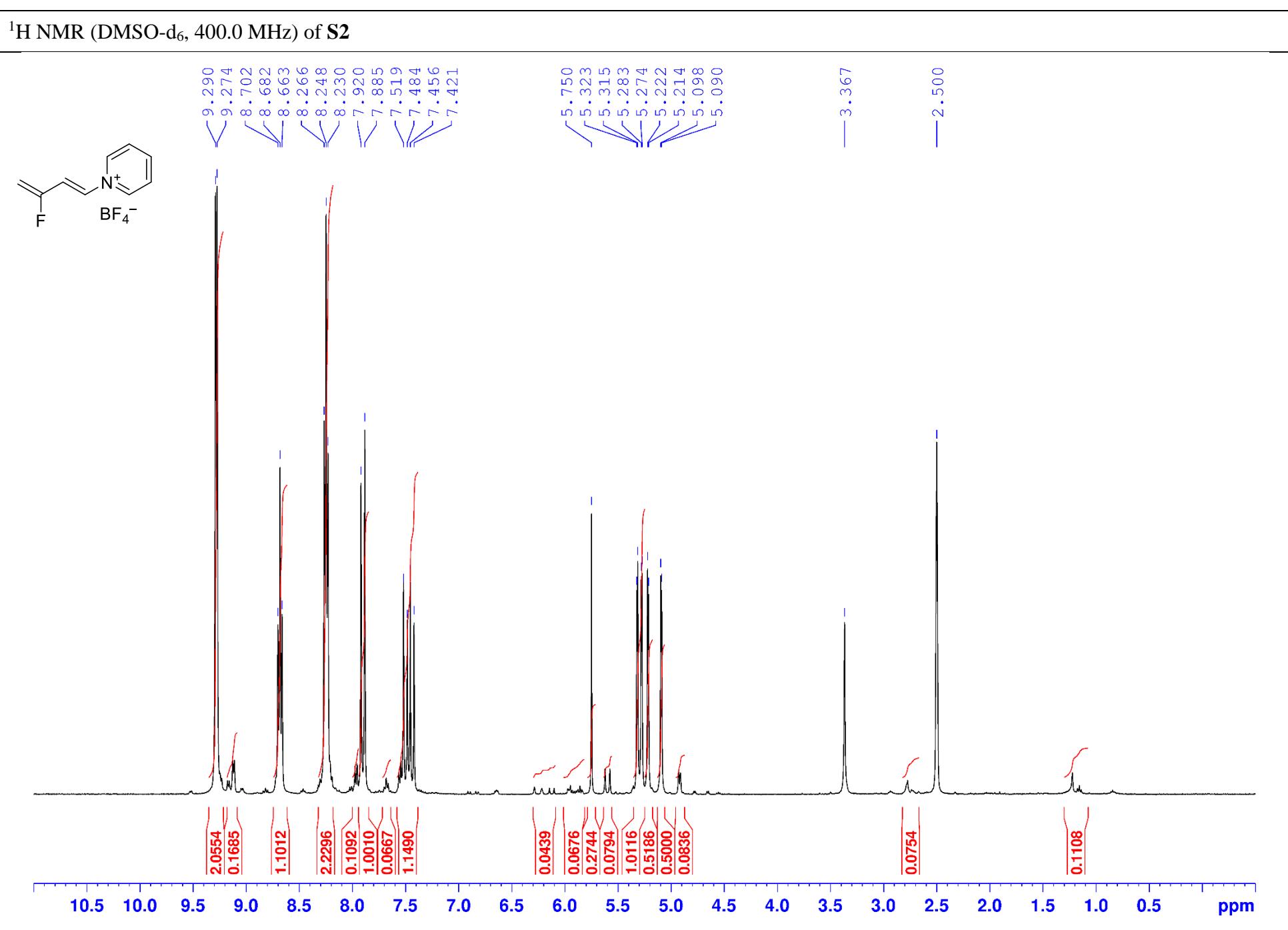
¹⁹F NMR (CDCl_3 , 376.4 MHz) of **17** ($Z/E > 20/1$)



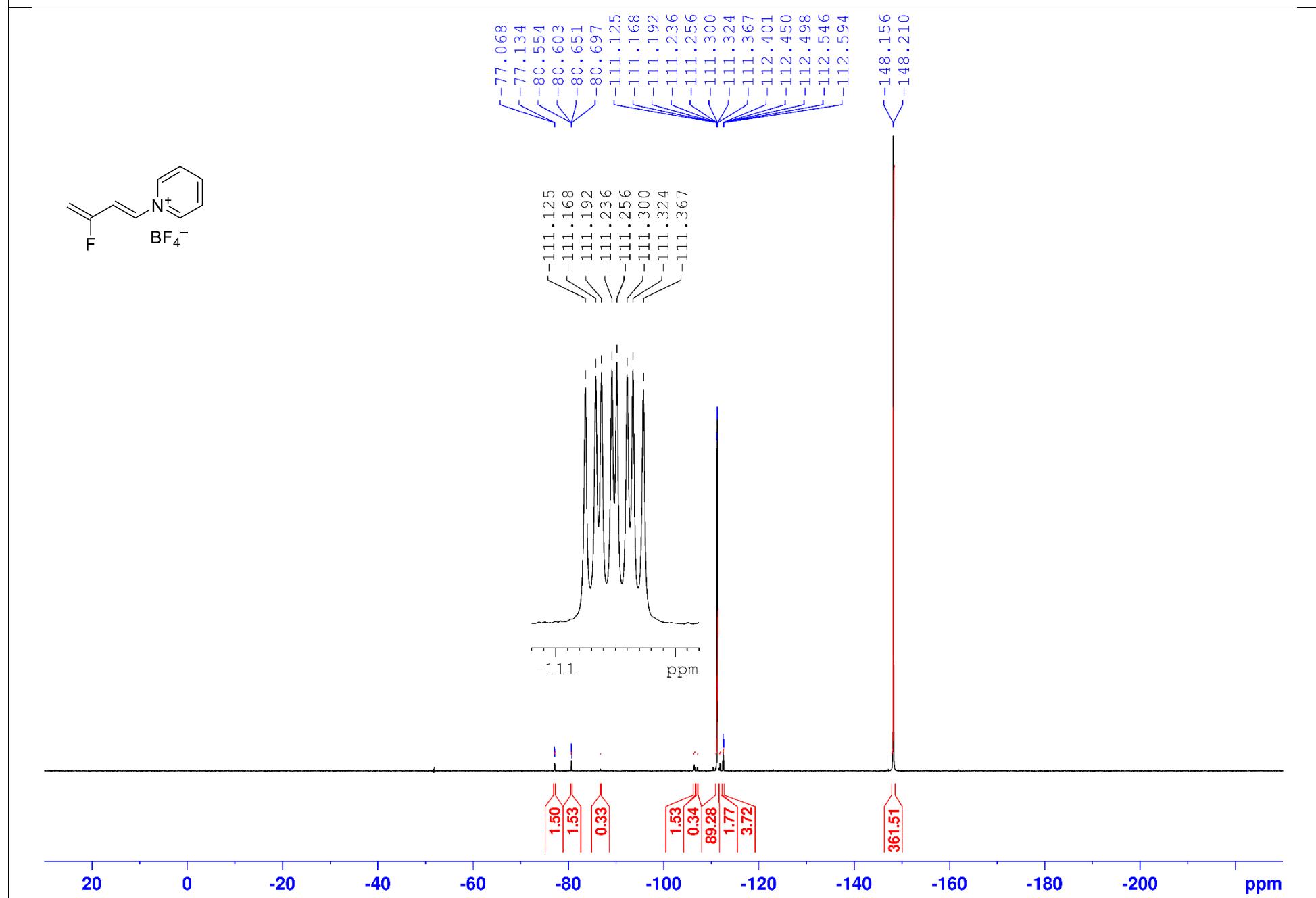
$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **17** ($Z/E > 20/1$)



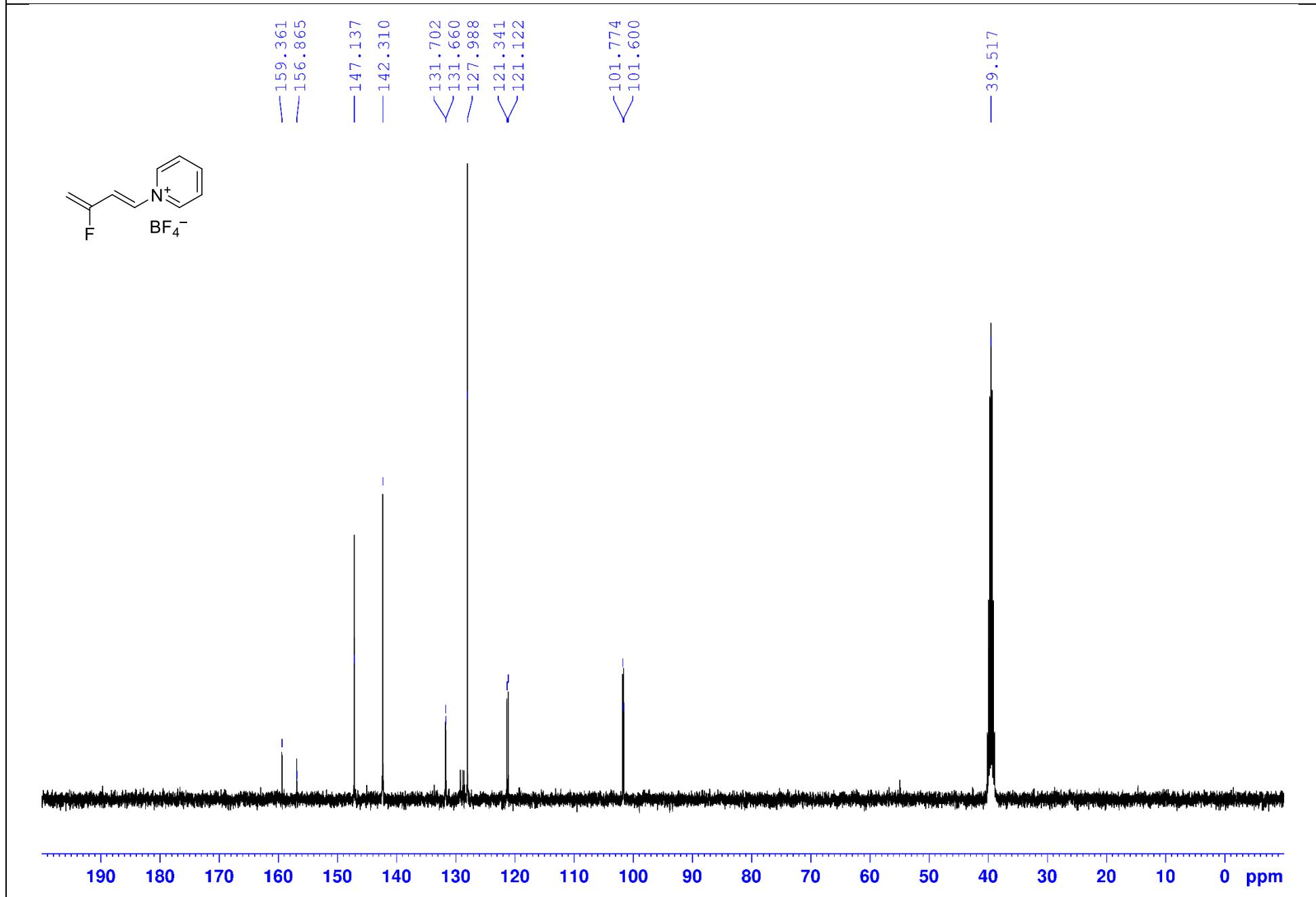
¹H NMR (DMSO-d₆, 400.0 MHz) of S2



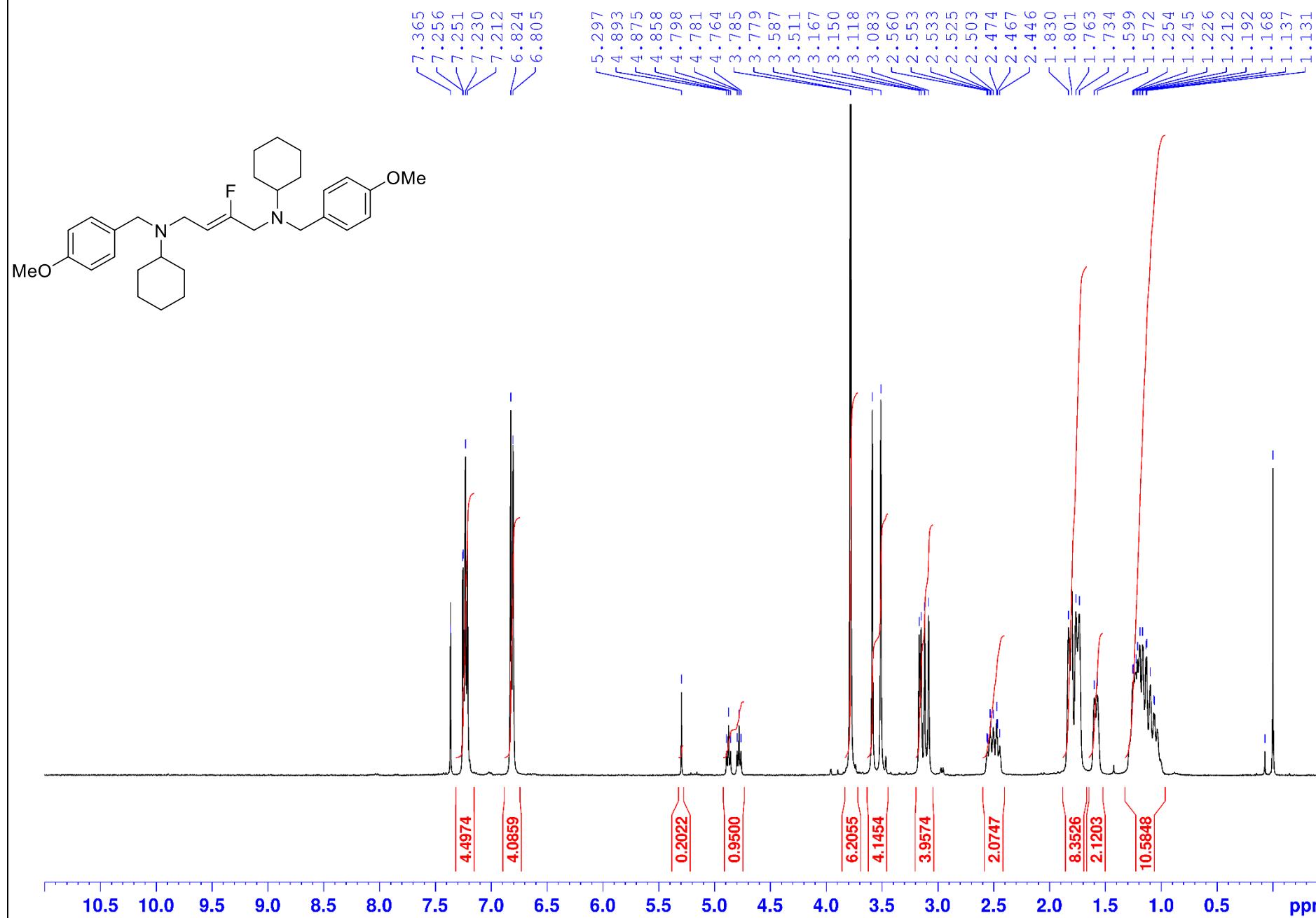
¹⁹F NMR (DMSO-d₆, 376.4 MHz) of S2



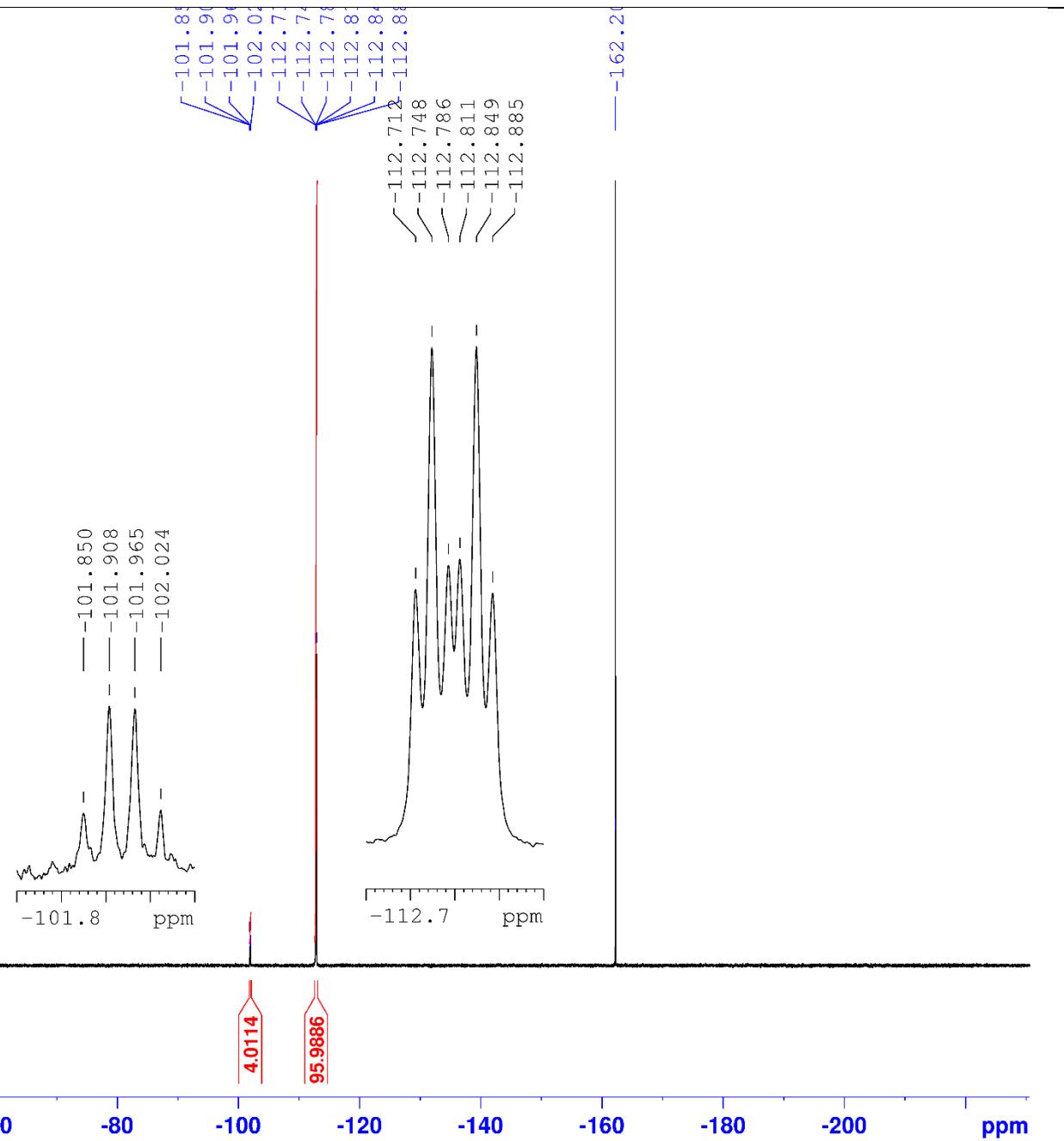
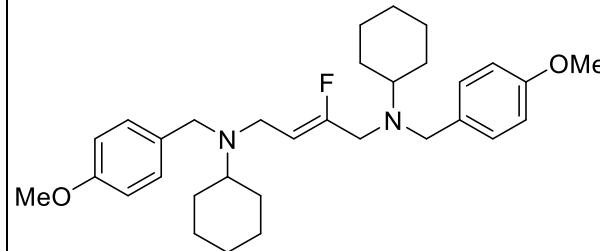
$^{13}\text{C}\{\text{H}\}$ NMR (DMSO-d₆, 100.6 MHz) of S2



¹H NMR (CDCl_3 , 400.0 MHz) of **12** ($Z/E = 96/4$)



¹⁹F NMR (CDCl_3 , 376.4 MHz) of **12** ($Z/E = 96/4$)



$^{13}\text{C}\{\text{H}\}$ NMR (CDCl_3 , 100.6 MHz) of **12** ($Z/E = 96/4$)

