

## Multiple-site decoupling method

In most cases,  $^{19}\text{F}$  decoupling is not completely achieved (Fig. 2) because of wide chemical shifts of  $^{19}\text{F}$  (Fig. 1). ECA series, employing multiple sequencer system, can assign more than one RF source to a single channel. Thereby, simultaneous irradiation from several RF sources having various offsets can effectively decouple entire regions. Also, each decoupling range can be limited, and so heating problem is easily avoided (Figs. 3 and 4). For example, in the case of  $\text{CF}_3\text{CHF}_2\text{OCH}_2\text{CH}_3$ , giving  $^{19}\text{F}$  signals around -80ppm and -212ppm (Fig. 1), simultaneous decoupling at these regions yield a  $^{13}\text{C}\{^1\text{H}, ^{19}\text{F}\}$  spectrum where couplings with  $^{19}\text{F}$  are completely decoupled (Fig. 5). Thus, multiple-site decoupling is useful for many fluorine-containing samples, where  $^{19}\text{F}$  signals appear in separate regions.

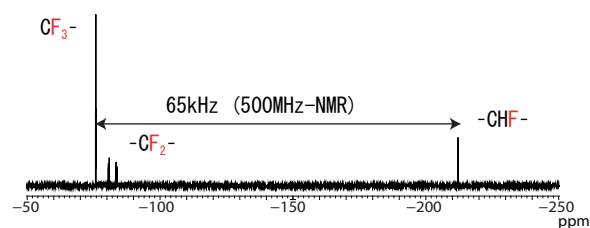


Fig. 1  $^{19}\text{F}\{^1\text{H}\}$  spectrum of  $\text{CF}_3\text{CHF}_2\text{OCH}_2\text{CH}_3$ .

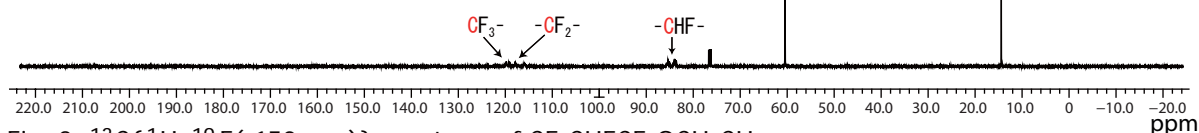


Fig. 2  $^{13}\text{C}\{^1\text{H}, ^{19}\text{F}(-150\text{ppm})\}$  spectrum of  $\text{CF}_3\text{CHF}_2\text{OCH}_2\text{CH}_3$ .

※ $^{19}\text{F}$  irradiation at -150ppm does not cover the entire region and fails in complete decoupling.

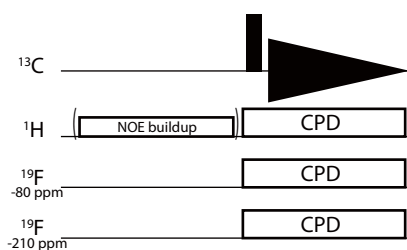


Fig. 3  $^{19}\text{F}$  double irradiation sequence.

Set tri channel at -80ppm and quad channel at -212ppm.



Fig. 4 Parameter setting window for  $^{19}\text{F}$  double irradiation.

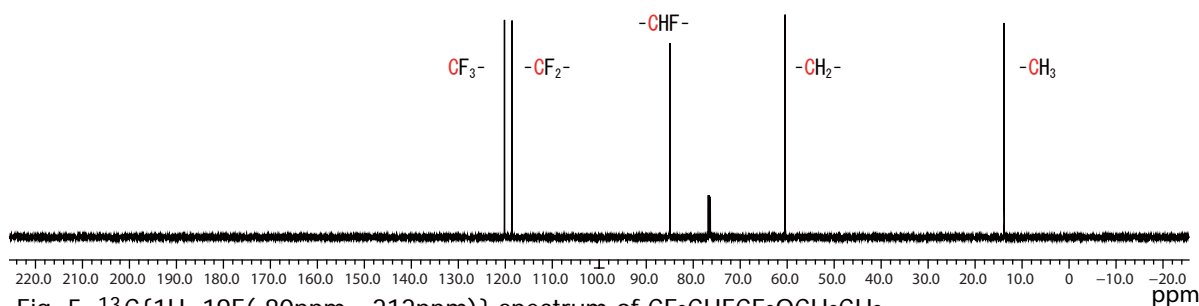


Fig. 5  $^{13}\text{C}\{^1\text{H}, ^{19}\text{F}(-80\text{ppm}, -212\text{ppm})\}$  spectrum of  $\text{CF}_3\text{CHF}_2\text{OCH}_2\text{CH}_3$ .

Spectrometer: JNM-ECA500