

## New function of ECZ Luminous part 1- Multiple Frequency Drive System

Product used : Nuclear Magnetic Resonance (NMR)

### Multiple-Resonance Measurements on ECZ Luminous

A standard NMR system has one high-frequency channel and one low-frequency channel. The total of two radiofrequency channels allows us to perform single-resonance and double-resonance experiments. However, sometimes a higher number of channels is desirable. A third channel would allow us to decouple additional nuclide simultaneously, for example. Traditionally, this requires adding one more radiofrequency channel. To make multiple-resonance experiments feasible on two-channel NMR spectrometers, the ECZ Luminous has a new function called the Multi Frequency Drive System (MFDS). This unique function allows us, to simultaneously generate two frequencies from a single frequency channel and irradiate the sample. This means that if you have a triple-resonance probe, you can perform triple-resonance measurements without the need to expand the number of channels in your spectrometer. Note: This functionality is available on ECZ spectrometers in the combination with the ROYALPROBE™ HFX. Two-channel ECZ spectrometers can irradiate  $^1\text{H}$  and  $^{19}\text{F}$  pulses simultaneously, but this is only limited to the high-frequency channel. The ECZ Luminous spectrometers with the MFDS function extend this approach to the low-frequency channel as well. This is shown in Fig. 1.

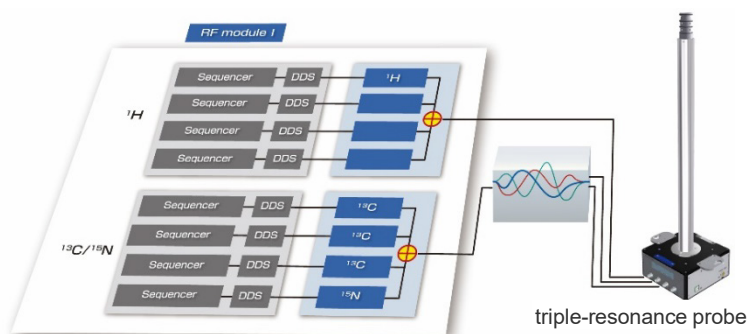


Fig. 1: Schematic diagram of the Multiple Frequency Drive System (MFDS)

Fig. 2 shows an example of  $^1\text{H}$ ,  $^{13}\text{C}$ , and  $^{31}\text{P}$  triple resonance measurement when using an HCX triple-resonance probe. As shown in Fig 2 b), the doublets collapse into singlets by the simultaneous  $^1\text{H}$  and  $^{31}\text{P}$  decoupling. This increases sensitivity and makes the analysis of the spectrum easier. Fig. 3 shows an example of  $^1\text{H}$ ,  $^{13}\text{C}$  and  $^{15}\text{N}$  triple-resonance measurement performed on a labeled protein using an HCN triple-resonance probe. Both triple-resonance measurements were performed on a standard 2-channel JNM-ECZL600G instrument. It is clear that the triple-resonance measurements were properly performed.

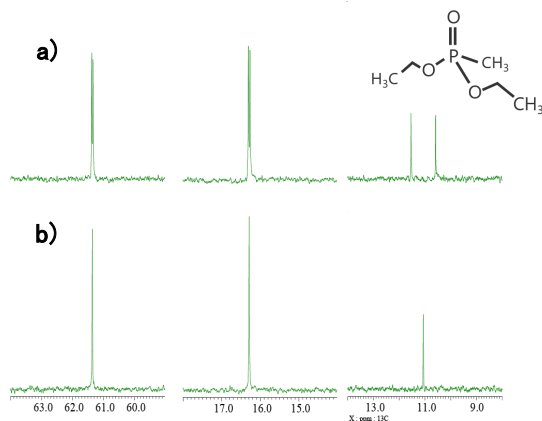


Fig. 2: a)  $^{13}\text{C}\{^1\text{H}\}$  and b)  $^{13}\text{C}\{^1\text{H}\}\{^{31}\text{P}\}$  spectra of diethylmethylphosphonate in  $\text{CDCl}_3$  by HCX probe

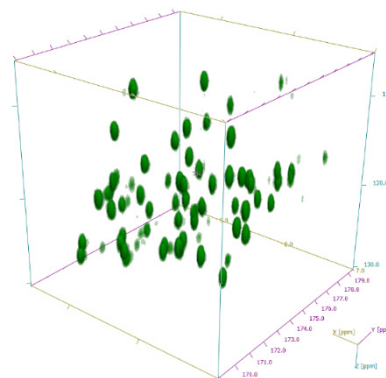


Fig. 3: 3D HNCOCO spectrum of  $^{13}\text{C}/^{15}\text{N}$  labeled Ubiquitin in 90%  $\text{H}_2\text{O}$  / 10%  $\text{D}_2\text{O}$  by HCN probe

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