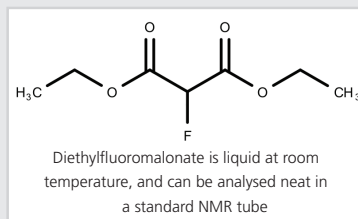


### Introduction

Nuclear Magnetic Resonance (NMR) spectroscopy is an invaluable analytical technique; the information from an NMR spectrum complements the information obtained from other types of molecular spectroscopy and in many cases it offers unique diagnostic information about the sample material.

Benchtop NMR performs well when a quick analysis of a high-concentration sample is needed, demonstrated using the example of diethylfluoromalonate.



The **Pulsar** 60 MHz NMR spectrometer has two frequency channels: one acquires spectra of  $^1\text{H}$  and  $^{19}\text{F}$  and the other,  $^{13}\text{C}$ . The probe can be manually tuned and matched for optimal performance. In this example, the first channel was tuned to  $^1\text{H}$  and then the pulse width was lengthened to ensure effective radiofrequency (RF) transmission for the  $^{19}\text{F}$  experiment.



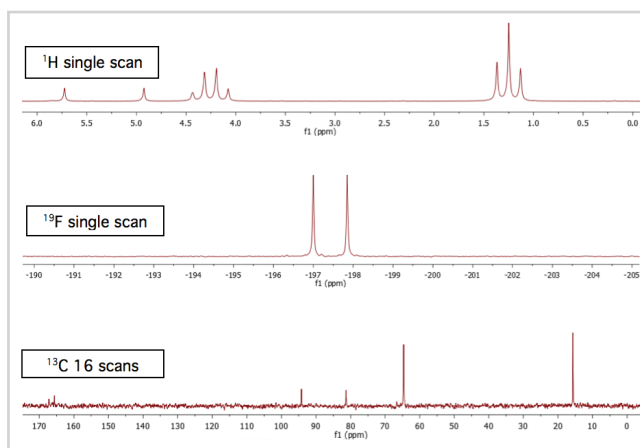
### Method

0.4 mL of diethylfluoromalonate was pipetted into a standard 5 mm NMR tube and placed in the **Pulsar** 60 MHz spectrometer with no temperature preconditioning. The sample was run unlocked and data was processed with Mestrelab's Mnova software.

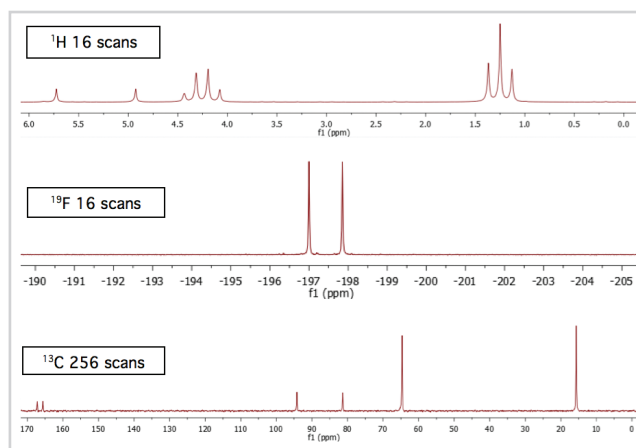
### Results

The results can be seen in the following scans.

*Note that the spectra are approximately referenced. 1Hz exponential apodization was applied to the  $^{13}\text{C}$  spectra.*



**Figure 1.** Total acquisition time for three spectra = approximately 75 seconds.



**Figure 2.** Total acquisition time for the three spectra = approximately 30 minutes.

Acquiring a greater number of scans provides spectra with better signal to noise ratio. This is particularly noticeable for low-sensitivity nuclei such as  $^{13}\text{C}$ . The quaternary carbon doublet (split by the fluorine) signals at 166 ppm can be compared in Figure 1 and Figure 2.

## Conclusion

This application note shows that for a sample of high enough concentration, it is possible to rapidly acquire meaningful 1D spectra of different nuclei on a benchtop NMR spectrometer.

### About the Pulsar Benchtop NMR Spectrometer

**Pulsar** is a high-resolution, 60 MHz benchtop NMR spectrometer, providing high-quality 1D and 2D NMR spectra of  $^1\text{H}$ ,  $^{19}\text{F}$ ,  $^{13}\text{C}$  and  $^{31}\text{P}$ . It uses a permanent magnet so requires neither liquid helium nor liquid nitrogen.

### Applications

Advanced, automatic shimming produces a highly homogeneous magnetic field meaning that **Pulsar** is suitable for use in almost any academic or industrial chemistry laboratory, for teaching, for organic synthesis analysis, or for materials identification.

### Analysis

For many analyses, liquid samples can be run neat; solid samples can be dissolved in deuterated or non-deuterated solvents. Intuitive, step-by-step software takes the user seamlessly through the measurement process, and data is processed using the industry-renowned Mnova software from Mestrelab. A library of pulse sequences is included, so everything is ready to go.

### Benefits

The benefits of **Pulsar** include:

- High performance with many measurements possible instantly
- The power of NMR spectroscopy in your own lab
- Easy operation
- Only standard mains electricity supply needed
- No special health and safety requirements
- **SoftLock** – an advanced software lock that guarantees spectral stability
- No need for liquid nitrogen, liquid helium or compressed gases
- Auto setup optimises peak performance regardless of user expertise

To find out more about **Pulsar** visit [www.oxford-instruments.com/pulsar](http://www.oxford-instruments.com/pulsar)



“Great system – very simple to obtain good quality data whilst still retaining the important aspects of NMR so students gain real hands-on experience. It also aids and develops a student’s understanding of the technique.”

**Dr Ryan Mewis, Lecturer, Division of Chemistry and Environmental Science, Manchester Metropolitan University**

visit [www.oxford-instruments.com/pulsar](http://www.oxford-instruments.com/pulsar) for more information or email: [magres@oxinst.com](mailto:magres@oxinst.com)

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