Pulsar™

Delivering NMR to your benchtop



OXFORD INSTRUMENTS

The Business of Science®

Pulsar™

NMR for *your* laboratory

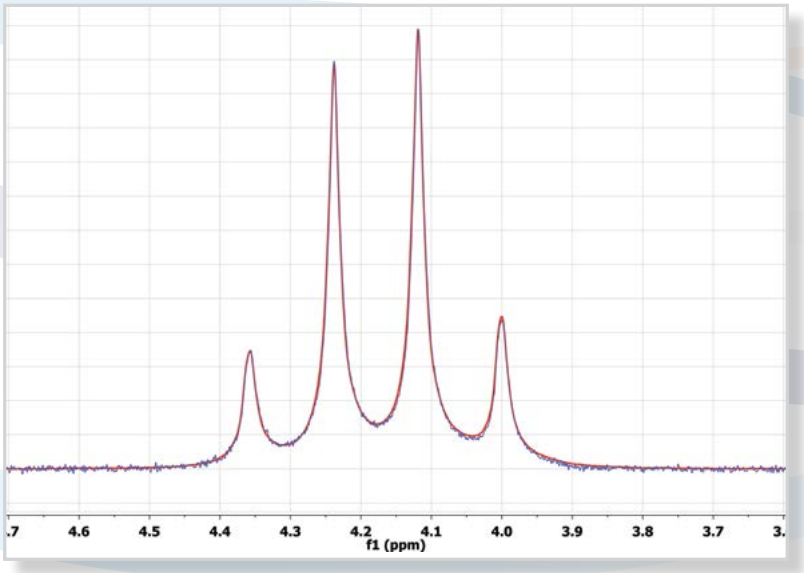
The **Pulsar**™ NMR spectrometer from Oxford Instruments delivers affordable, high performance NMR spectroscopy into the laboratory environment.

NMR where you want it

Pulsar is a benchtop NMR spectrometer that offers high resolution performance without the need for liquid nitrogen, liquid helium or compressed gases. It uses a standard mains electricity supply, and has no special health and safety requirements. This means you can run NMR spectra in your own lab, close to your own process, without having to send samples away to a remote NMR facility and wait for the results. Of course, measurements by high-field NMR may still be needed from time to time, but **Pulsar**'s outstanding performance means a high proportion of measurements can be done instantly, on the spot – when you need them.



Pulsar in the laboratory environment



*Single scan superimposed over 64 scans using **SoftLock***

Easy operation

Pulsar uses standard 5mm NMR tubes, and has a highly efficient automated shimming routine that optimises the shim in just a few minutes when needed.

For simple 1D spectra, **Pulsar** has **SoftLock** – an advanced software lock that guarantees absolute spectral stability without the need for deuterated solvents. **SoftLock** is so effective that 2000 scans can be overlaid with no detectable line broadening from misalignment.

Pulsar offers a traditional deuterium lock for running 2D experiments.

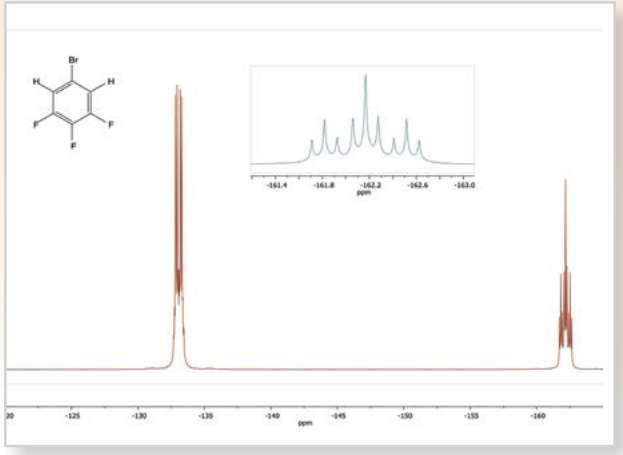


Superior Performance

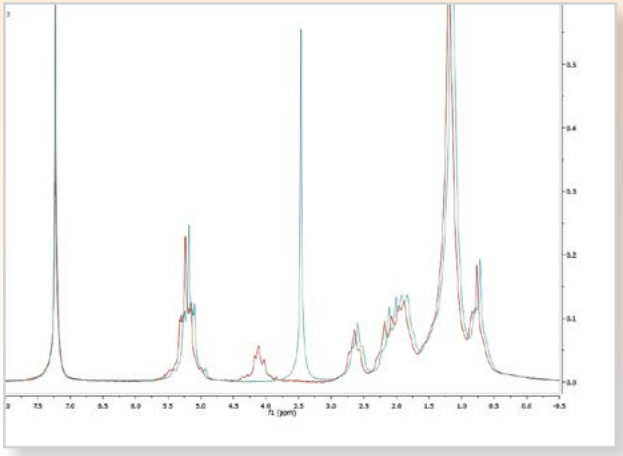
Pulsar gives you class-leading performance, obtained using a 1.4T (60MHz proton resonance) rare-earth permanent magnet with superior homogeneity. The traditional design of the **Pulsar** magnet means that well-known and understood shimming techniques can be used to achieve the best resolution available on any benchtop NMR instrument.

Additional Experiments

In addition to routine ^{1}H spectra, every **Pulsar** can also acquire ^{19}F spectra using the same probe. An example ^{19}F spectrum of 5-bromo-1,2,3-trifluorobenzene is shown below. **Pulsar** is also ideal for arrayed experiments. Sequential acquisition of data during a chemical reaction provides a method for monitoring changes in specific functional groups during the reaction. Visual comparison of the spectra at different stages of the reaction is straightforward. An example shown below is the transesterification of a triglyceride.



^{19}F spectrum of 5-bromo-1,2,3 trifluorobenzene



Overlaid spectra of starting material and final product

Using **Pulsar**

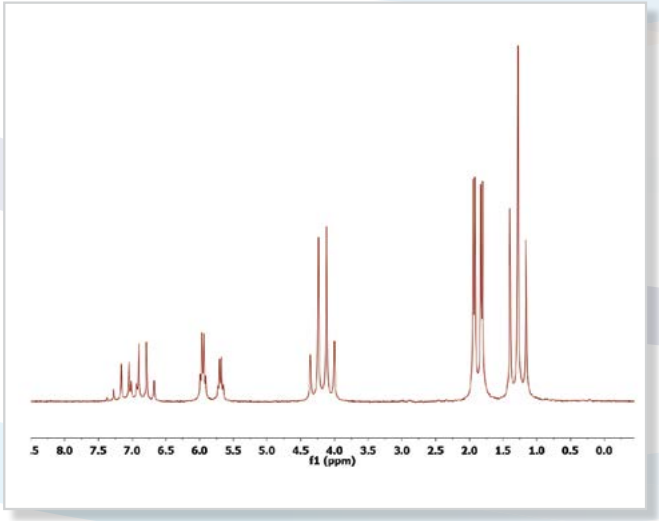
Routine Experiments

NMR spectroscopy is an invaluable analytical technique for chemical analysis. The information from an NMR spectrum complements the information obtained from other types of instrumentation. In many cases it offers unique information about the sample material.

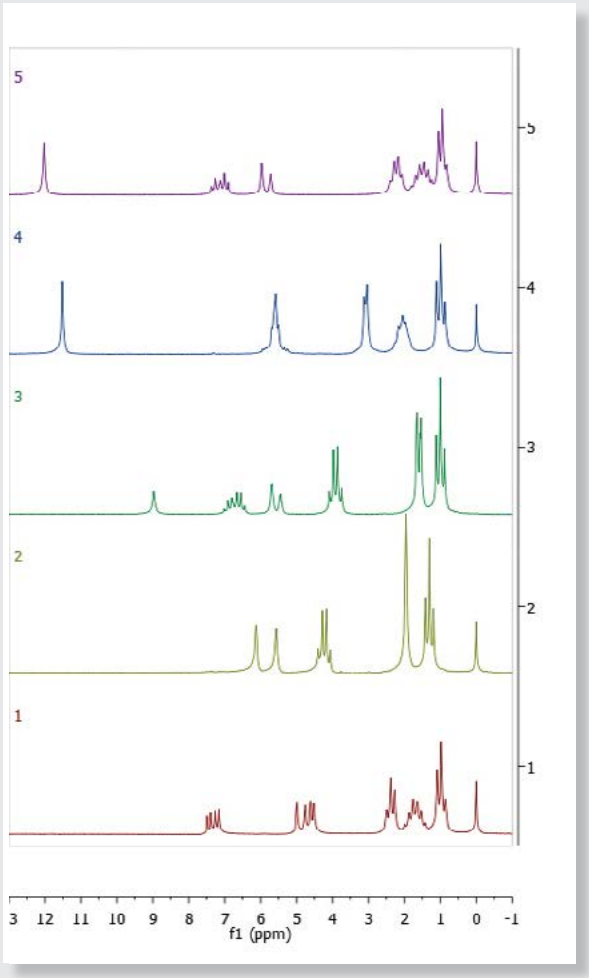
NMR is an excellent technique for the identification of materials and chemical groups. These example spectra (below) show materials with the same molecular formula, $C_6H_{10}O_2$, yet which are chemically different. The NMR spectra differ significantly even in the case of trans-2- and trans-3-hexenoic acids (a pair of structural isomers which consist of the same functional groups and chain lengths).

The spectral data obtained on **Pulsar** shows clear separation of the multiplets commonly observed in NMR spectra. The example below shows the typical multiplets generated by hydrogen atoms in an ethyl (CH_3CH_2-) group in the molecule.

Integration of the peaks provides a method for determining the number of hydrogen atoms present in each chemical group. The distance between the peaks in these multiplets allows measurement of the coupling constants.



1D ^1H spectrum of ethyl crotonate



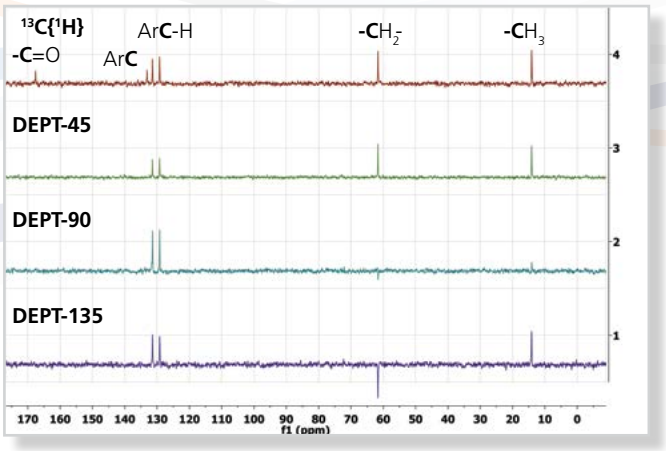
Spectra of different structural isomers of $C_6H_{10}O_2$

Carbon-13

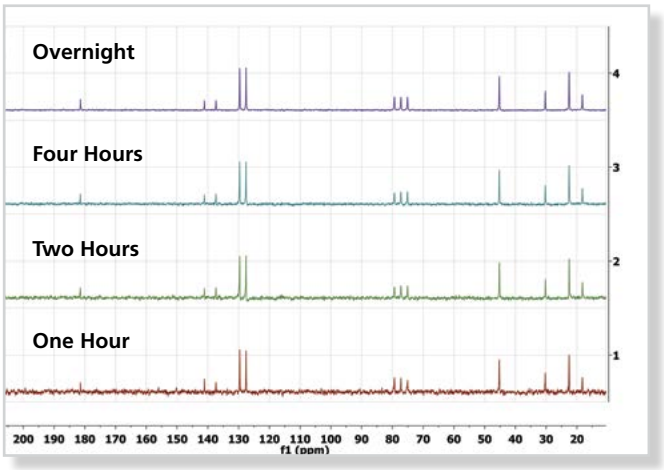
^{13}C measurements are a common requirement in organic chemistry laboratories, and **Pulsar** offers outstanding ^{13}C performance. The excellent sensitivity, resolution and lineshape of **Pulsar** mean that measurement of ^{13}C compounds with sample concentrations down to 0.5 M is practical in less than 2 hours. Neat samples can give good results literally in minutes. Even with weaker samples the excellent stability of the **Pulsar** shims and frequency lock mean that high quality data can be collected in an overnight run.

In addition to 1D proton decoupled carbon, polarisation transfer experiments such as DEPT are available providing additional information about the number of hydrogen atoms attached to each carbon. The data from DEPT-45, DEPT-90 and DEPT-135 experiments can be combined in linear combination to produce edited spectra containing signals from only CH, CH_2 and CH_3 groups respectively.

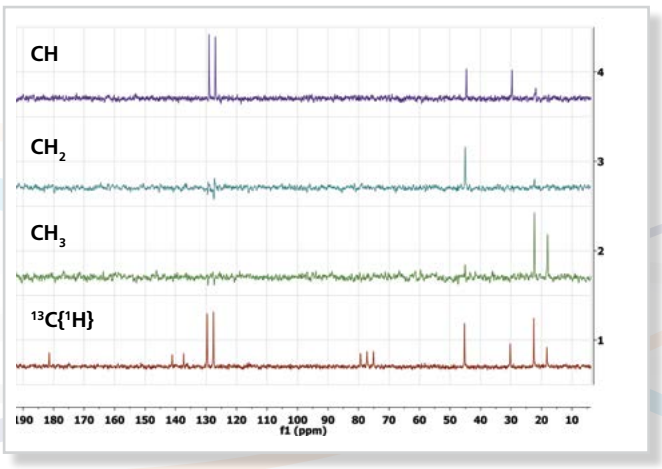
2D ^{1}H – ^{13}C correlation experiments are also available.



DEPT dataset from diethyl phthalate. Total time for acquisition four minutes



1D ^{13}C spectra of 0.5 M ibuprofen



DEPT experiments linearly combined

2D Homonuclear NMR

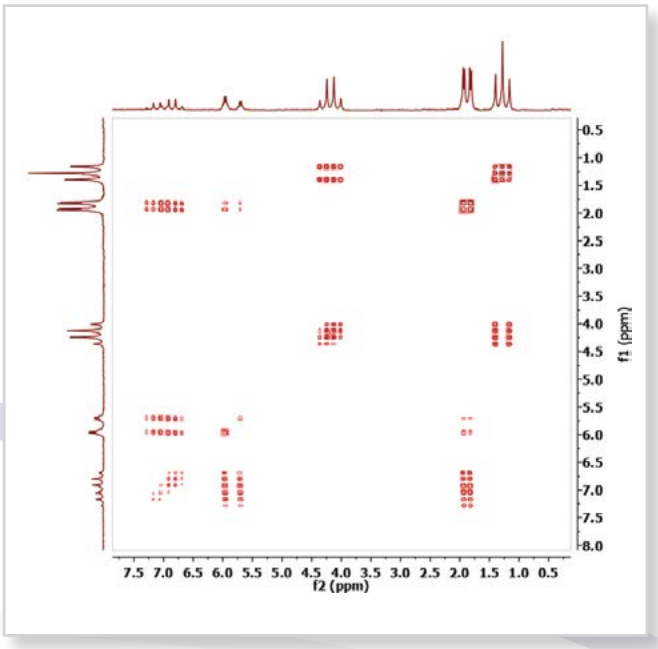
Pulsar's exceptional stability and high performance electronics allow a wide range of 2D homonuclear experiments to be carried out. These include:

COSY – classic 2D correlation spectroscopy providing information about mutually coupled nuclei and neighbouring atoms.

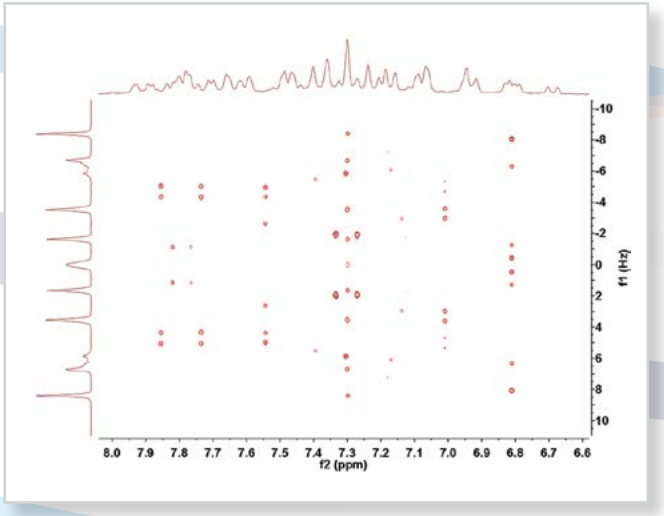
J-resolved – decoupling the chemical shift information from the J-coupling which helps separate overlapping multiplets.

TOCSY – exploits the connectivity through the J-couplings of an unbroken chain of coupled nuclei to provide information on the backbone structure of organic molecules.

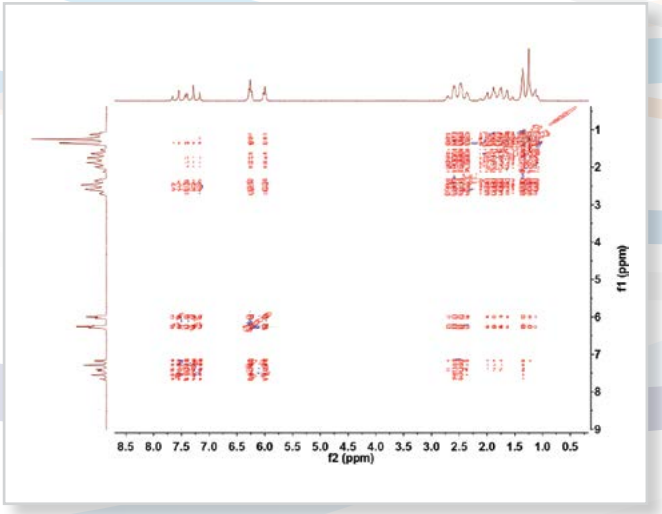
Pulsar is also able to offer selective 1D TOCSY, which allows the user to quickly identify all the peaks coupled in an unbroken chain to the chosen peak.



Correlation Spectroscopy (COSY) data for ethyl crotonate



J-resolved spectroscopy of the aromatic region of 2-(2-hydroxy-phenyl) benzothiazole



Total Correlation Spectroscopy (TOCSY) data of 2-hexenoic acid

Class leading performance

Innovative, Intuitive, Intelligent Software

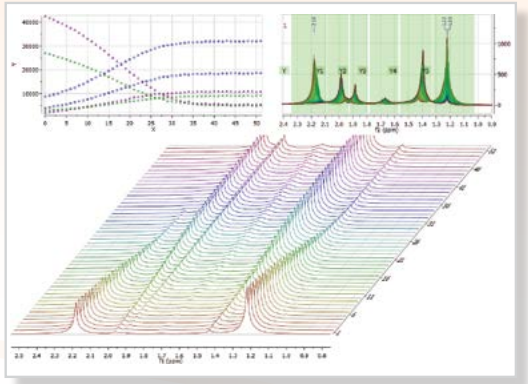
Pulsar software is a combination of Oxford Instruments' own **SpinFlow** graphical user interface, and Mestrelab's powerful Mnova software.

SpinFlow enables the user to quickly and easily create routine experiments for spectra collection or relaxation measurements, using an intuitive, seamless workflow package. Automated setup routines ensure that the instrument can be optimised for peak performance by all users regardless of their level of expertise. Running a sample can be as simple as selecting the experiment and clicking the "Acquire" button. **SpinFlow** also caters for experienced users who may wish to alter the experimental parameters, or even write their own pulse sequences.

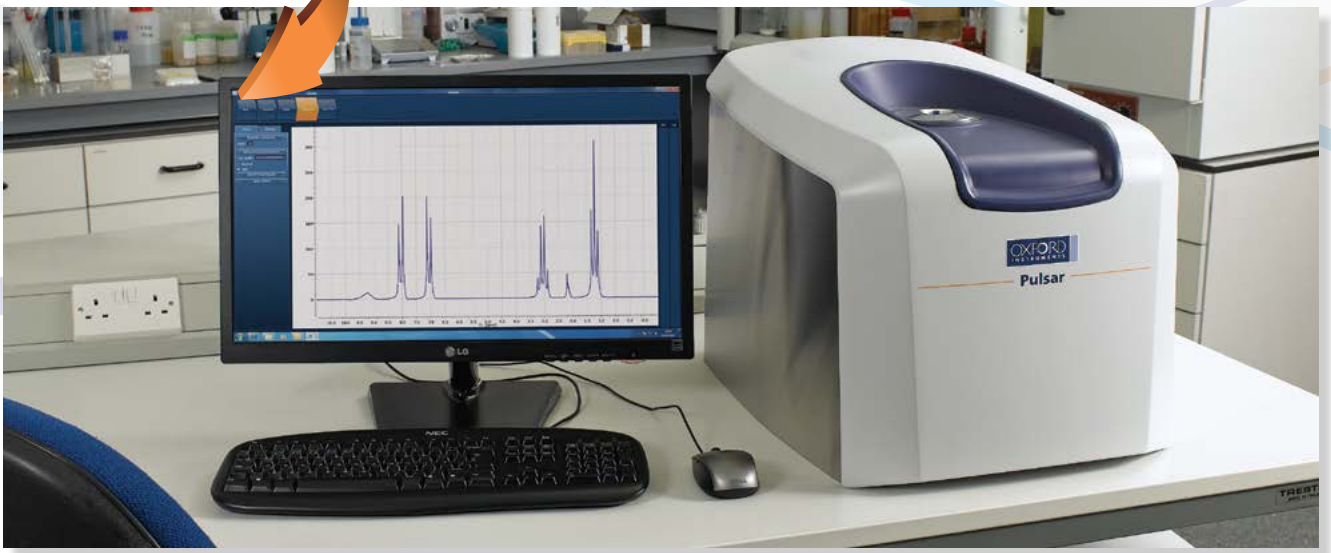
Workflow approach enhancing productivity



Once data collection is complete, the data is automatically transferred into Mnova, which has a full suite of advanced routines for processing and analysing NMR data. It also has a range of spectral display options including 2D and 3D stacking, which are particularly useful for reaction monitoring experiments.



Stack display allows analysis of time course experiments



PULSAR

Providing a wide range of service giving total peace of mind



MQC

Oxford Instruments
Worldwide Support and Service

We take great pride in working in close partnership with our customers. Our goal is to provide comprehensive technical support throughout the product's life.

When choosing to work with Oxford Instruments you are safe in the knowledge that you have the backup and support of our skilled product champions and dedicated support engineers throughout the complete lifetime of your instrument. We offer a range of support packages that provide you with the level of service you require.

Our goal is to provide our customers with faultless service and swift expert maintenance on our products to ensure they perform to their highest capabilities.

Also available from Industrial Analysis:

MQC benchtop NMR analysers for fast and easy measurement of fat, oil and moisture.



visit **www.oxford-instruments.com/pulsar** for more information or email: **industrial@oxinst.com**

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