Pulsar™

NMR

Delivering NMR to your benchtop

OXFORD INSTRUMENTS

The Business of Science®

Pulsar™

Intelligent NMR for *your* laboratory

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

Benchtop NMR where you want it

Pulsar is a benchtop, cryogen-free NMR system that offers convenience without the special requirements associated with superconducting magnet instruments.

With a small footprint, **Pulsar** is suited to virtually any laboratory from side-by-side with a reaction vessel in the applied research environment, to near-line in an industrial production area.

Pulsar in the laboratory environment.

Low Setup and Running Costs

Pulsar works in your laboratory with no need for a separate room with special Health and Safety requirements. Without costly, time-consuming refills of liquid helium to contend with, the user can concentrate on more important tasks like measuring samples. **Pulsar** only requires a standard mains electrical supply; no other external services are required.

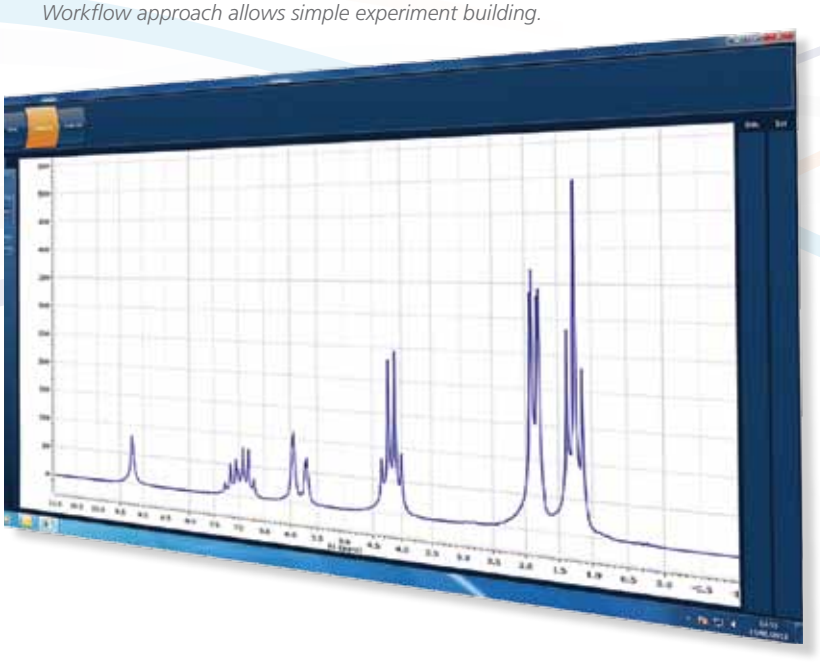
Superior Performance

Pulsar gives you class-leading performance. Incorporating a 1.4 T (60MHz proton resonance) rare-earth permanent magnet with superior homogeneity, Pulsar provides outstanding spectral resolution in a benchtop system.

Innovative, Intuitive, Intelligent Software

The **SpinFlow**™ software's graphical user interface enables the user to quickly and easily create routine experiments for simple spectra collection, relaxation measurements or advanced data collection. Instrument control comes from an intuitive, seamless workflow package, and data processing and manipulation is achieved using Mestrelab's powerful, industry-leading Mnova NMR software.

Workflow approach allows simple experiment building.



Cryogen free

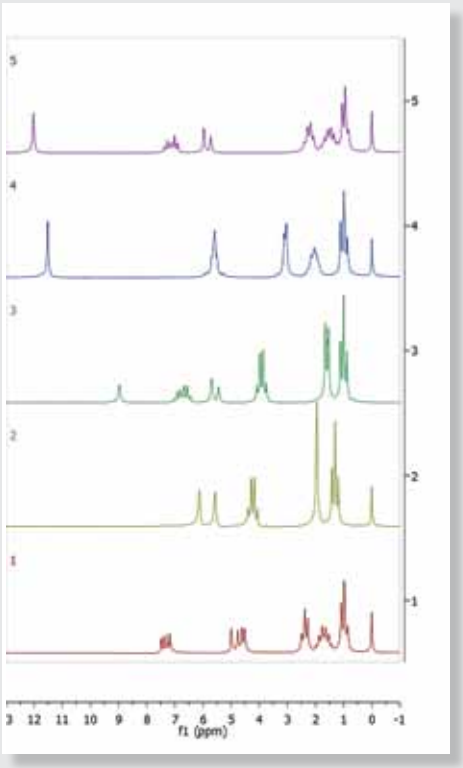
Fast measurements are possible generating routine spectra in seconds, making **Pulsar** the perfect tool to monitor and understand reaction processes (an ideal capability for researchers studying chemical reactions).

Routine and advanced experiments

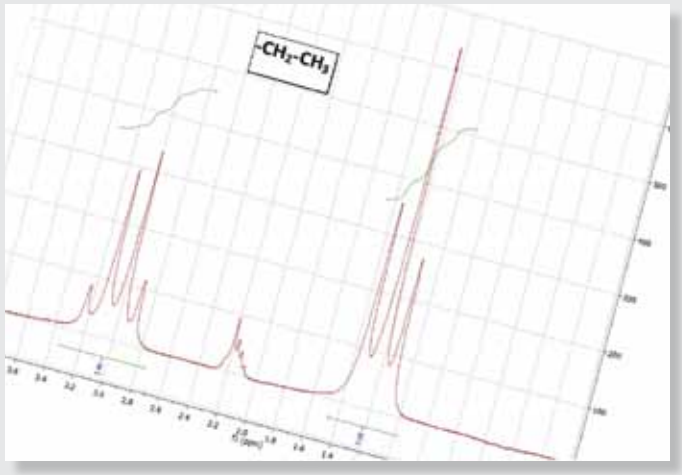
Routine Experiments

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 (right) 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).



Spectra of different structural isomers.



Spectrum showing peak splitting and integration.

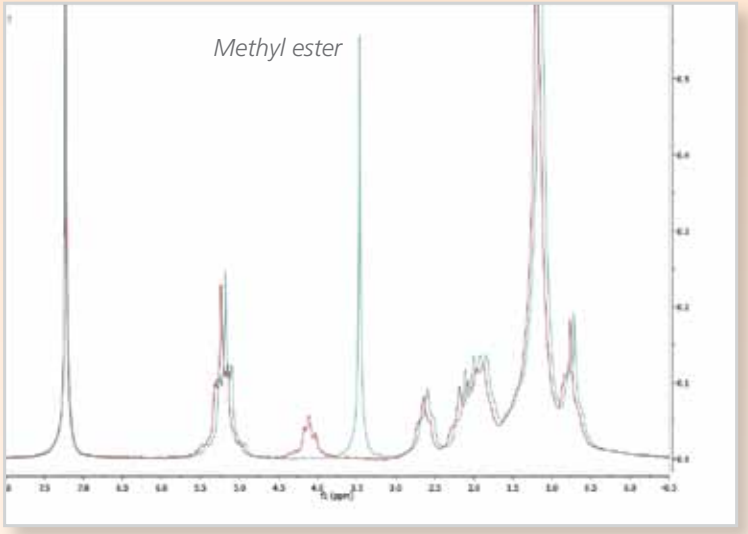
The spectra obtained on **Pulsar** have sufficient resolution to separate out the multiplets commonly observed in NMR spectra. The example above shows the typical multiplets generated by hydrogen atoms in an ethyl (CH_3CH_2-) group in the molecule.

Integration of the peaks quantifies the number of hydrogen atoms present. The distance between the peaks in these multiplets allows calculation of the coupling constants for the molecule.

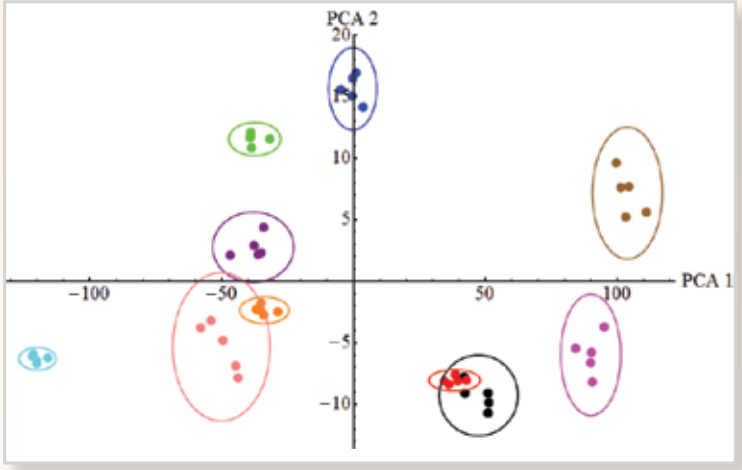
Pulsar uses standard 5mm NMR tubes.

"Advanced" Experiments

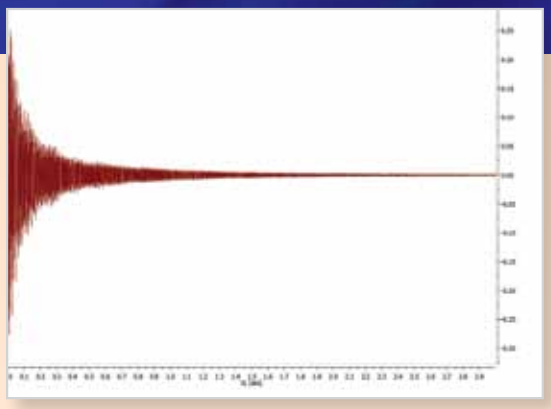
In addition to the routine collection of NMR spectra, **Pulsar** is capable of performing "more advanced" experiments. The advanced user has access to the "raw" Free Induction Decay (FID) signal (right), allowing a variety of data processing and calculation options.



Overlaid spectra of starting material and final product.



Principal Components (PC) plot showing discrimination of vegetable oil types.



A typical Free Induction Decay (FID) signal.

Pulsar is ideal for reaction monitoring. Repetitive collection of data during an experiment allows reaction profiles to be generated for specific functional groups within the reaction mixture. Visual comparison of the spectra at various stages of the reaction is then easy. An example shown (left) is the transesterification of a triglycerol.

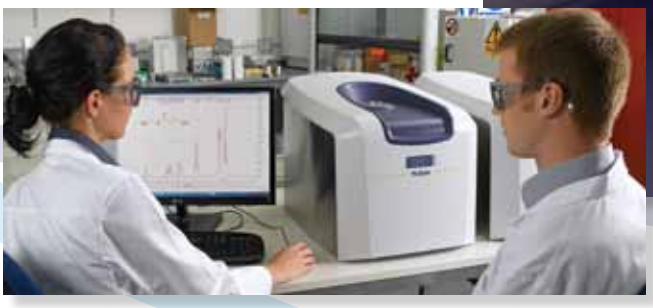
An NMR spectrum gives specific information about all the materials present in a sample. If the sample is impure or contains additional materials as adulterants, the NMR spectrum will change. Subtle spectral differences may not be obvious when comparing the spectra directly, especially when the materials are very similar. Chemometrics may be applied to the datasets for classification of the samples.

Materials can be discriminated by the clustering of groups in the Principal Components (PC) plot. Each cluster represents one class of material and for best discrimination the clusters should be well separated. The example here shows the classification of a series of vegetable oils with good separation between the clusters.

NMR Simplified

Instrument performance

Pulsar is designed for a wide range of operators, ranging from novice users to experienced NMR spectroscopists.

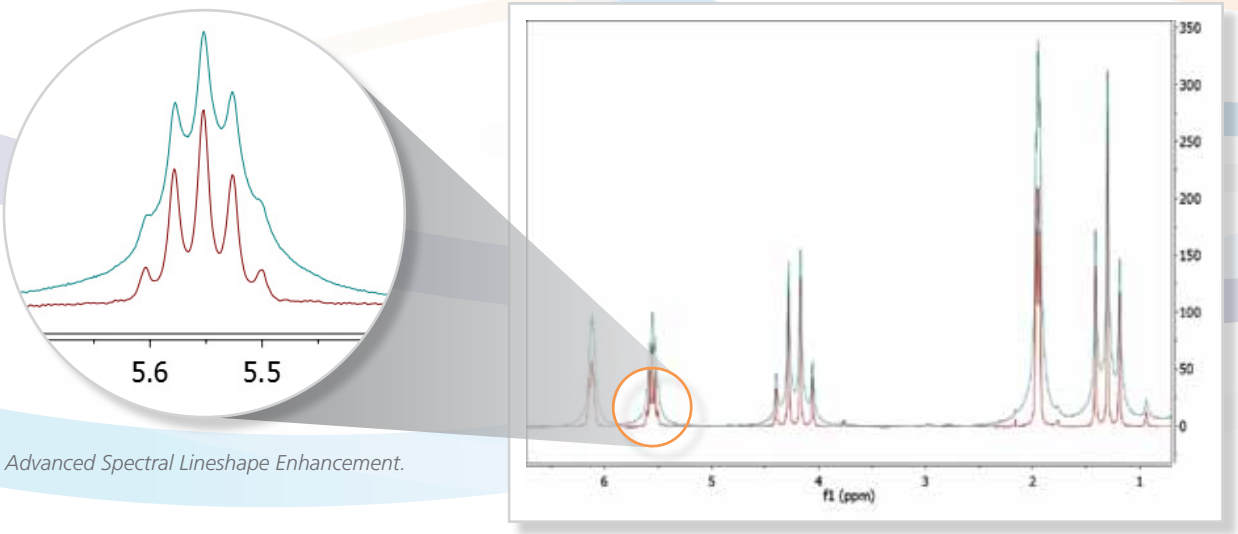


Easy access for sample insertion.

Pulsar utilises standard 5mm sample tubes requiring less than 1ml of sample. The excellent sensitivity of the instrument allows ^{1}H spectra from samples in the millimolar range to be obtained in a short time; a typical sample gives a good quality spectrum within a few seconds. For more demanding samples, multiple scans and signal averaging will yield a more accurate spectrum with less noise.

The resolution of an NMR instrument is dependent on the field homogeneity of its magnet. **Pulsar's** permanent magnet is extremely homogeneous and delivers excellent spectral resolution, leading to increased separation of closely spaced peaks.

For situations where even better resolution is required, the spectral lineshape enhancement routine can be used.



Advanced Spectral Lineshape Enhancement.

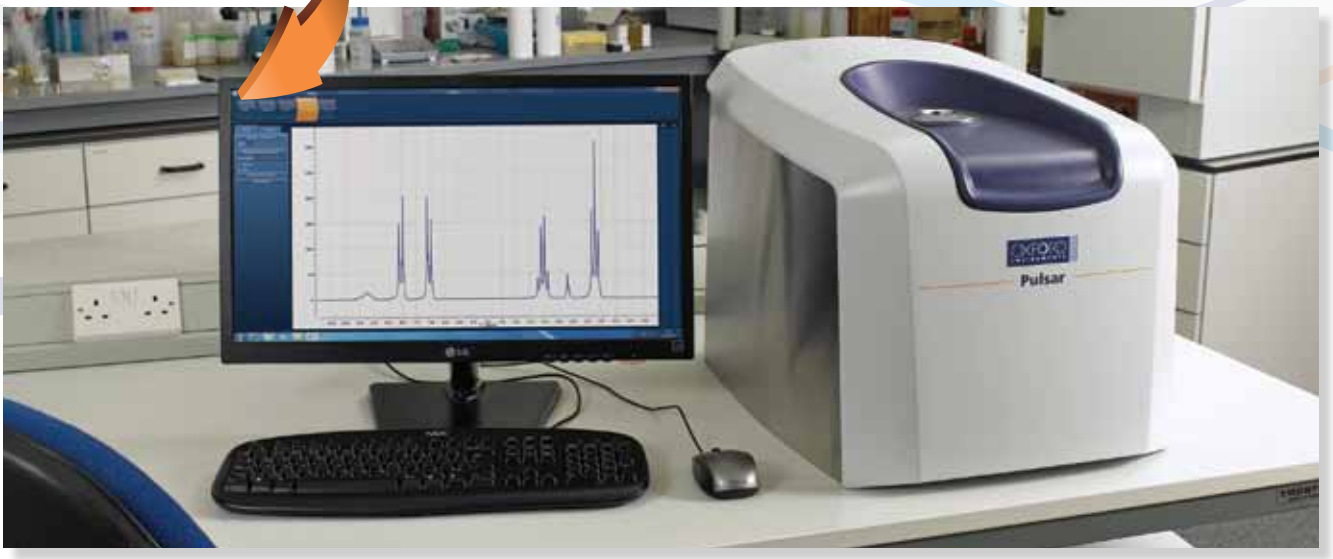
Class leading performance

Software functionality

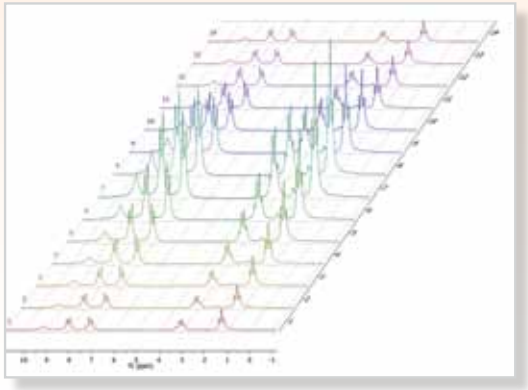
The **Pulsar SpinFlow** instrument control software provides an intuitive user interface. This allows non-expert operation and measurement of sample spectra, as well as catering for the advanced user who may wish to alter experimental parameters. A series of automated routines will assist in ensuring the instrument is set up for peak performance on the sample, giving high quality spectra in the minimum time.

The process of running a sample can be as simple as selecting the experiment and clicking on the 'Acquire' button to collect the spectral data. A complete analysis is summarised by the workflow below.

Workflow approach enhancing productivity.



Once the data collection is complete, the spectrum is available for reporting or further data manipulation. **Pulsar** is packaged with a perpetual license for the powerful Mnova software from Mestrelab. This software has a full suite of routines for processing and analysing NMR data, and has a range of spectral display options including 2D and 3D stacking. This is particularly useful for reaction monitoring experiments.



Stack display allows visualisation of time based experiments.

PULSAR

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