

Unique Benchtop NMR Reader to Quantify Hyperpolarization

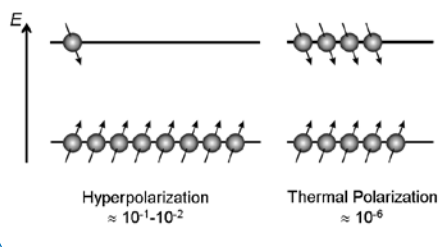
● HyperQuant™

HyperQuant is a benchtop time-domain NMR reader that precisely and quantitatively delivers both the magnetic hyperpolarization and thermal polarization status of a sample. This proprietary solution applies a unique permanent 0.94 Tesla magnet system combined with an innovative MR probe design and novel NMR pulse sequence capabilities. This unique combination enables quantification of the thermal polarization level of ^{13}C -labeled samples using volumes as low as 1 ml. The hyperpolarization enhancement factors can be obtained directly on the sample of interest, without the need for a separate calibration reference.

Features

- Direct quantification of magnetic hyperpolarization and thermal polarization levels
- Calibration-free technology based on direct comparison of hyperpolarized and thermally polarized state
- Turn-key ^{13}C application
- Proven benchtop TD-NMR design
- Unique 0.94 T permanent magnet system
- Only 1 ml of sample volume required
- Tracing of the ^{13}C hyperpolarization decay
- Thermal signal determination with 99% accuracy
- Quantifying concentrations of fully labeled ^{13}C samples
- External trigger interface to HyperSense®
- Applicable to all hyperpolarization methods including DNP and Para-Hydrogen

Effect of Hyperpolarization



Hyperpolarization

Hyperpolarization promises to be a useful technique with its potential to boost contrast in MRI and sensitivity in solid-state NMR. Hyperpolarization provides a means to increase the nuclear magnetic polarization by orders of magnitude (enhancement factors of 100,000) from the otherwise physical limit of the thermal Boltzmann polarization. Hyperpolarization can be obtained by various mechanisms, both physical and chemical in nature, such as DNP (dynamic nuclear polarization) and parahydrogen induced polarization (PHIP). Typically labeled ^{13}C samples are utilized because of the preferential MR properties of the ^{13}C nucleus.

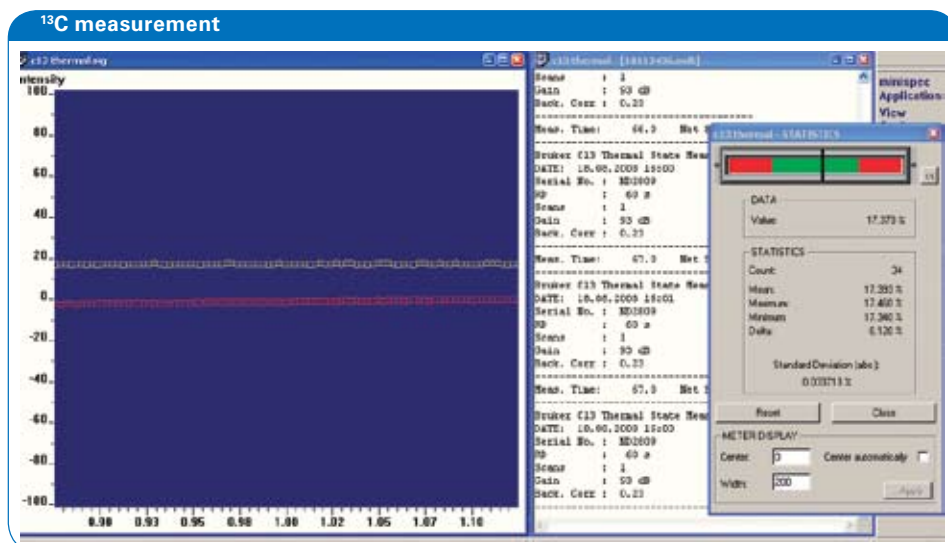
Direct Quantification

HyperQuant delivers a unique direct quantification of the enhancement factor, by being able to measure both the hyperpolarized and the thermally polarized state of the ^{13}C sample. Thus, it does not require a separate calibration reference.

Applications

For academic researchers and manufacturers of hyperpolarization systems, HyperQuant delivers quantitative measurements for research studies and product validation.

In the research field of hyperpolarized agents in MRI or NMR, HyperQuant provides a precise measure of the enhancement factor.



^{13}C TD-NMR signal of the thermally polarized sample with statistics on the superior repeatability.

HyperQuant™

Quantifying Hyperpolarization

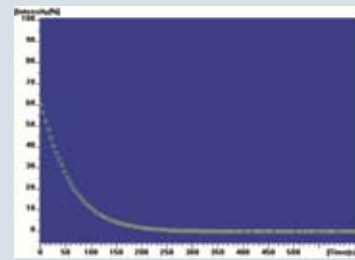
The hyperpolarization is quantified by using a carefully calibrated small flip angle excitation pulse. The measurement hardly affects the polarization state of the sample. Alternatively, HyperQuant can also closely trace the decay rate of the hyperpolarization.

Thermal Polarization

The thermal polarization of ^{13}C labeled samples is enabled by a unique combination of a 0.94 T magnet, a high Q ^{13}C probe (10 MHz) and a multipulse NMR sequence. The plug-and-play concept of the probes allows for easy exchange and handling. In addition, 40 MHz ^1H probes are also available.

Pulse Flip Angle Calibration

Key to the precise determination of the enhancement factor is the automatic flip angle calibration to determine and validate both the 90° and 180° pulse length.



Decay of the Hyperpolarized ^{13}C signal.