Bruker Optics


# The Minispec Contrast Agent Analyzer

The minispec is used to characterize and validate the properties of pharmaceuticals known as "MRI contrast agents".

- No waste of expensive MRI time
- Operates all common pulse sequences for relaxation time analysis, at a touch of a button
- No special siting requirements
- No cryogens required for magnet
- Simple operation

## Contrast Agent Analysis using TD-NMR

The minispec Contrast Agent Analyzer is used to study the effect of pharmaceuticals known as "MRI contrast agents" on the NMR relaxation of water or fat in-vivo or in-vitro. Contrast agents are used to enhance contrast in Magnetic Resonance images between tissues that otherwise would be difficult to differentiate, especially in the soft tissue of the central nervous system, liver, digestive system, lymphatic system, breast, cardiovascular system, and lung."

Design of a successful contrast agent requires conflicting pharmaceutical and MRI properties to be met at once: although metal ions like Mn2+ and Gd3+ may lead to a very good contrast enhancement, they need to be chelated because the 'naked' ions are toxic.

The minispec mq-series of bench-top NMR instruments play a key role in characterizing and validating the properties of contrast agents. The task is to elucidate the influence of contrast agents on the NMR spin-lattice and spin-spin relaxation times ($T_1$ and $T_2$, respectively) of the fat and water protons predominantly responsible for the MR image.

Bruker is the only vendor to offer table-top 60 MHz system for contrast agent research.

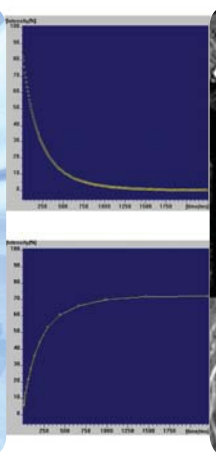
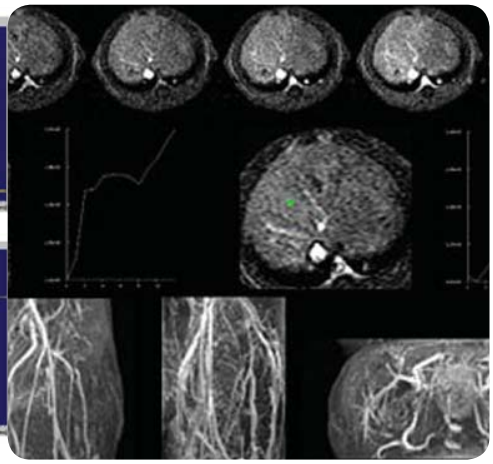


Figure shows T2 analysis performed at 60 MHz with the minispec system.



The minispec complements the Clinical MRI contrast agent research.

A contrast agent will always accelerate the relaxation rates, $1/T_1$ and $1/T_2$, resulting in a positive and negative contrast enhancement, respectively. Clinical MRI systems are certainly capable of the measurements, but are not the most efficient instruments for this task. The minispec provides the perfect solution, since it's able to match the magnetic field strength of Clinical MRI systems (e.g. 0.5 T, 1 T and 1.5T), at a fraction of the cost and space requirements.

The minispec Contrast Agent Analyzer is a sophisticated NMR instrument, yet is simple to use. Many researchers have chosen to use the minispec for routine analysis, since it provides a performance advantage due to faster setup and simple single button operation, which triggers acquisition, data processing and reporting. It can be fully automated with an autosampler, for unattended operation.

Bruker is the only vendor of a table-top 60 MHz system dedicated to contrast agent research. With Bruker's range of magnet systems available between 7.5 MHz and 60 MHz, and further accessories like sample temperature control systems, full characterization of the designated contrast agent is only a step away.

### Contrast Agent Analyzers:

- **mq60 ~1.5T**
  mq60 for measurement of $T_1$ , $T_2$ near the field of a 1.5 T Clinical MRI system
- **mq40 ~1 T**
  mq40 for measurement of $T_1$ , $T_2$ near the field of a 1 T Clinical MRI system
- **mq20 ~0.5 T**
  mq20 for measurement of $T_1$ , $T_2$ near the field of a 0.5 T Clinical MRI system
- **mq10 ~0.23 T**
  mq10 for measurement of $T_1$ , $T_2$ at 0.23 T
- **mq7.5 ~0.17 T**
  mq7.5 for measurement of $T_1$ , $T_2$ at 0.17 T

## SPECIFICATIONS

### Console with Broadband RF Electronics:

- Measuring frequency: 2 to 65 MHz
- Modulator: 0°, 90°, 180°, and 270° RF phase channels with an accuracy better than 0.2°
- Transmitter: maximum power 300 Watts, linear power attenuation
- Receiver: digital phase sensitive detection and quadrature detection; analogue and digital filter selection
- Pulse Programmer: 12 pulse channels, resolution 20 nsec Digitizer: 12–bit, 32K points per single shot

### Magnet Unit:

- Fields available: 0.17T, 0.23T, 0.47T, 0.94T, and 1.41T

### Probe Temperature Options

- Fixed Temperature: Sample chamber is regulated by magnet heating system, between 35 to 45 °C
- Variable Temperature by external heating/cooling waterbath, +5 to +50 °C (mq40, mq60), -5 to +65 °C (mq10, mq20)
- Wide-range Variable Temperature using gas flow system, -120 to +200 °C (mq20)

### System Requirements

- Footprint: 65 x 75 cm (DxW)
- System Weight: ~120 kg depending on magnet field
- Operating Temperature: 20-25°C ideal, 18°C min., 28°C max.
- Humidity: 20-80%, non-condensing
- Voltage Range: 90-130 VAC or 190-260 VAC
- Frequency Range: 50-60Hz. Rated Current: 3 A

### Options

- Automation: Autosampler for unattended operation for more than 100 prepared samples. Barcode reader for sample tracking.
- Multiple Magnet Units Accessory: allows connection of multiple magnets (for field dependence studies).

Magnetic safety measures apply to the operation of the minispec.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