



## Exstrom Laboratories LLC

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### **New Earth's Field NMR Instrument is Versatile and Affordable**

April 7, 2003. Demonstrating nuclear magnetic resonance (NMR), observing variations in the Earth's magnetic field, calibrating low field magnetometers, and teaching modern signal processing, can all be done with a new instrument costing only \$1,995. The Magnum is a proton precession NMR instrument. It can be used to calculate the nuclear magnetic relaxation times for different liquid samples. In addition, daily variations of the Earth's field, seasonal variations, and geomagnetic storms can be monitored. The Earth's magnetic field is determined with this instrument by use of the fundamental NMR formula  $B = 2\pi f / \gamma$  where  $f$  is the resonant frequency, and  $\gamma$  the gyromagnetic ratio of the proton. The Magnum is, therefore, useful for calibrating low field magnetometers. This instrument is also a tool by which modern signal processing techniques can be taught. Included with the Magnum is signal processing software for spectral analysis and digital filtering.

The operation of the Magnum is as follows. In a standard 2 ounce (59 ml) bottle, filled with a hydrogen rich liquid such as water or alcohol, the protons are polarized perpendicular to the Earth's magnetic field using several amps of current through the polarizing coil. When the current is cut off, the protons begin precessing in unison about the Earth's field. This momentary harmony induces a voltage in the signal coil. After going through a high gain amplifier, the signal voltage is digitized by a data acquisition card in the computer. The digitized signal is then processed, resulting in a precise determination of the Earth's total magnetic field, as well as providing information about the hydrogen rich sample used.

The Magnum consists of the following components:

- Sensor with Tilttable Platform
- Low Noise, High Gain Amplifier
- Programmable Current Switch with Power Supply
- Data Acquisition System
- Software

More information about the Magnum is available at the web address:  
<http://www.exstrom.com/magnum.html>

The price for the complete system is \$1,995 with free shipping and handling to anywhere in the USA.