Application note

Calibration of sensor equipment

3 axis active Helmholtz 3m cube

Objectives

To create a homogenous zone of 300mm x 300mm x 300mm. The homogeneity required across this volume needs to be approximately ±150nT. This will then be used to calibrate equipment used in down-hole drilling applications. Full access to the equipment is needed.

Instrumentation

- Hirst 3m cube Helmholtz coil including
  - 2 x MAG-03MS three-axis magnetic field sensors
  - Power supply to power the Helmholtz coil
  - Equipment rack with PC based control system

Key benefits

- Easy to use and control via integrated software on PC
- Precise and accurate way to generate a known, homogenous field.
- Open sides and structure provide easy access to calibration rigs.
- Very small variation in magnetic field in homogenous area (±150nT)

Applications

- Precision sensor calibration

Hirst Magnetic Instruments Ltd,
Tesla House, Tregoniggie Industrial Estate,
Falmouth, Cornwall, TR11 4SN

T: +44(0)1326 372734
sales@hirst-magnetics.com
www.hirst-magnetics.com

Method

The overall system consists of the Helmholtz cube frame, and an equipment rack housing a pair of dual-channel power supply units, an instrumentation enclosure, and the controlling computer.

The Helmholtz cube itself contains of a set of three orthogonal coil pairs (X, Y and Z), housed in an aluminium cube frame. Driving current through each of these coil pairs allows application of a magnetic field within the cube, steerable in three dimensions. A pair of MAG-03MS three-axis magnetic field sensors are mounted on the frame, to monitor the magnetic field produced within the working area and provide control feedback to the computer.

These sensors are connected, via 2 custom power supplies and a USB connected PC control system.

The two power supplies are also controlled by the computer via USB connection. One channel of each PSU supplies current to one of the three coil pairs through a relay. The relay is controlled by the computer and can be used to reverse the direction of current flow through each coil, to reverse the polarity of the magnetic field applied on each axis.

Application example

The image above shows the cube in its final application, complete with the equipment calibration rig inside.
The cube sits within a trench, so that there is easy access to the calibration rig, and personnel can easily move in and out of the area. The cube is controlled via the instrumentation which sits outside in racks.

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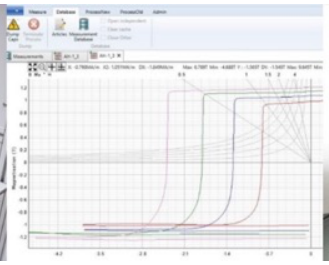
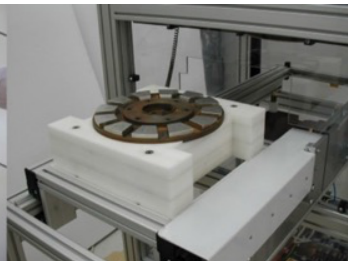
Conclusions

The 3 axis active Helmholtz cube provided an easy to use, accurate method for calibrating equipment, and gave the user the access they required around their calibration rig.

Hirst Magnetic Instruments has been active in providing solutions for 60 years in magnetics and magnetic measurement. Hirst manufacture precision hand-held gaussmeters, Fluxmeters, de-magnetisers, bench top & workstation industrial magnetisers, industrial production-line magnetisers, pulse field magnetometers (PFMs) for developing and characterising magnetic materials.

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