

# Magnetically shielded room

## Controlling the magnetic environment

Stray magnetic fields, which penetrate most materials, are a challenge for measurement systems using magnetic field sensors due to pervasive environmental magnetic noise. At Fraunhofer IPM, we address this issue by carrying out low-noise magnetic field measurements in a magnetically shielded room (MSR) specially designed for this purpose.

The MSR at Fraunhofer IPM employs two layers of Mu metal for low-frequency shielding and an aluminum shell for high-frequency shielding, achieving an effective reduction of magnetic noise across all frequencies. Regular demagnetization of the MSR is performed to maintain low static magnetic fields at approximately 1–2 Nanotesla within its central volume.

## Our offer

- Consulting and studies
- Simulation and measurement of magnetic field distributions
- Magnetic cleanliness measurements
- Magnetic material testing



You would like to learn more about our research and services in the area of magnetic field measurements? Please, don't hesitate to get in touch.

## Contact

Dr. Peter Koss  
Caloric Systems  
Phone +49 761 8857-243  
peter.koss@ipm.fraunhofer.de

Fraunhofer Institute for Physical  
Measurement Techniques IPM  
Georges-Köhler-Allee 301 | 79110 Freiburg, Germany  
[www.ipm.fraunhofer.de/en](http://www.ipm.fraunhofer.de/en)



Low-noise environment for sensitive measurements

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## Optimum environment for quantum sensing

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Quantum sensors mark a major advance in measurement technology as they achieve high sensitivity. Quantum magnetic field sensors, a specific type of quantum sensors, exploit the quantum properties of atoms to measure magnetic fields with exceptional accuracy.

Quantum magnetic field sensors are particularly valuable in fields where high accuracy is crucial:

- **Geological surveying**  
Detecting variations in the Earth's magnetic field that indicate valuable mineral deposits
- **Medical imaging technologies**  
E.g. magnetoencephalography for tracking brain activity by detecting magnetic fields produced by neural currents
- **Flow metering**  
Innovative technology for measuring flow non-invasively
- **Material testing**  
A new magnetic field camera for measuring magnetic field distributions with high accuracy

Prototyping or reference measurements for quantum sensors must be performed in a well-controlled magnetic environment. The only way to ensure that ambient magnetic noise doesn't affect the measurement is to make use of an MSR.

## Magnetic cleanliness measurements for nano-satellites

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The shift towards small satellite missions is mainly driven by the use of commercial off-the-shelf components (COTS), which reduce costs but also pose challenges for »magnetic cleanliness«. These components can have slight permanent magnetizations that interfere with the satellite's attitude control.

To address this, we developed a simple technique to measure the magnetization of nanosatellites using sensitive magnetic field sensors in an MSR. This allows for quick measurement within minutes, keeping residual magnetization within  $0.03 \text{ Am}^2$ . Our measuring system provides reliable assessments that help producers monitor production and identify critical components, reduces user risks and extends the satellite mission lifespan.

*Inside the MSR, ambient magnetic noise is suppressed to a minimum, facilitating precise magnetic field measurements, such as required for magnetoencephalography.*

## Cutting-edge infrastructure and extensive expertise in magnetic field measurements

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