

Realization and maintenance of the unit Tesla of the magnetic flux density B as the base unit for magnetic quantities

The realization of the unit Tesla of the magnetic flux density B was done in the framework of the determination of the gyromagnetic coefficient γ'_P that has been determined by different national metrological institutions using different methods. The reproduction for the dissemination under the measuring conditions of the PTB can be made with an uncertainty of 10^{-6} .

With γ'_P using nuclear magnetic resonance (NMR) methods and a highly pure water sample and the exact measurement of the frequency, which can be measured with an uncertainty better than 10^{-10} , the unit Tesla is maintained as the “primary standard”.

The measurements for the realization and the maintenance of the unit are performed within a Braunbek coil system (figure 1) to avoid influences of the earth's magnetic field.



Figure 1:

Arrangement of Braunbek coils for compensation of the three components of the earth's magnetic field

Dissemination of the unit Tesla of the magnetic flux density

The dissemination of the unit Tesla is accomplished using calibrated field coils in connection with the corresponding current sources. The coil constant k (ratio of the magnetic flux density to the coil current) of the field coils is determined using the primary standard.

In the field range of $10\mu\text{T}$ to 150mT the dissemination will be made using NMR magnetometry in field coils. The measurements are done either using the method of free precession or, above 4mT , the method of absorption.

In the field range of 150mT to 2T the dissemination will be made by calibration of measuring devices for the magnetic flux density B in a precise electro magnet. These measurements are done with NMR using the method of absorption.

Detailed information in:

Weyand, K.: Maintenance and Dissemination of the Magnetic Field Unit at PTB
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