

Optically pumped magnetometer with omnidirectional magnetic field sensitivity

V. Schultze, T. Scholtes, G. Oelsner, T. Wieduwilt, F. Wittkämper, and R. Stolz

Leibniz Institute of Photonic Technology, Jena, Germany

In mobile applications such as geomagnetic surveying, two major effects hamper the use of optically pumped magnetometers (OPM): dead zones, sensor orientations in space where no signal is delivered; and heading errors, a dependence of the measured magnetic field value on sensor orientation. In our contribution we present an advanced concept for a magnetometer to overcome these effects. It uses two Cesium vapor cells, pumped by the same circularly-polarized intensity-modulated laser beam, but split in two orthogonal directions. Intensity-modulated OPM show only one narrow dead zone for magnetic fields along the laser propagation direction [1], thus, the combination of two orthogonal channels can cover the whole 3D space and offers an isotropic dependence of sensor sensitivity (Fig. 1).

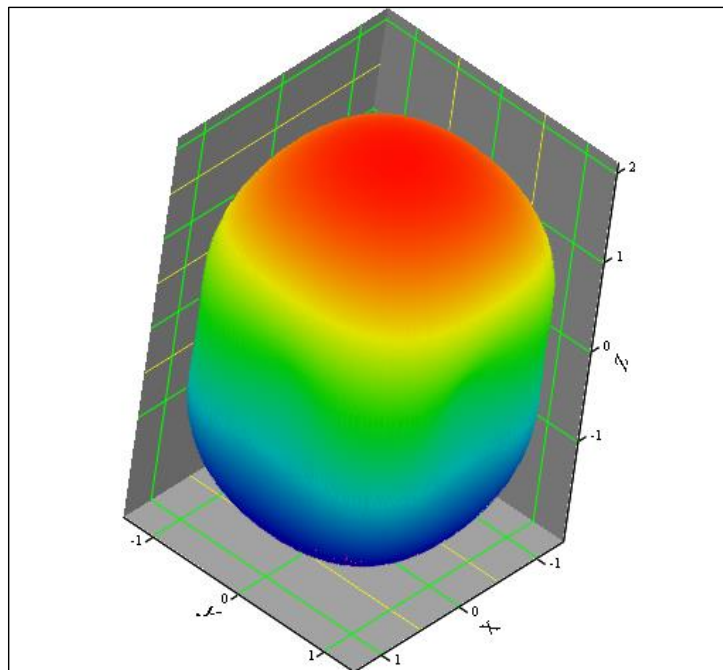


Figure 1: Directional pattern of the magnetometer sensitivity.

We present experimental investigations of this concept, using a setup, where pump beam and magnetic field direction can be freely adjusted one to each other [2], which has been adapted to the special demands of the omnidirectional setup.

References

- [1] V. Schultze, *Optics Express* **20**, 14201 (2012).
- [2] G. Oelsner, *Phys. Rev. A* **99**, 013420 (2019).