Optically pumped magnetometer with omnidirectional magnetic field sensitivity

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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.](image)

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