12

All-Optical Quantum Sensor of the Magnetic Field Deflection *

© S.P. Dmitriev, A.S. Pazgalev, M.V. Petrenko, A.K. Vershovskii ¶

Ioffe Institute,
194021 St. Petersburg, Russia

¶e-mail: antver@mail.ioffe.ru

Received June 28, 2019
Revised June 28, 2019
Accepted July 08, 2019

A method is proposed for precise measurement of the deflection of the magnetic field vector. This method does not require the use of artificially created magnetic fields; a scheme of an all-optical quantum sensor based on this method has been experimentally tested. The proposed method does not involve the use of radiofrequency field, since it is based on measuring the polarization properties of an oriented paramagnetic medium and does not use the phenomenon of magnetic resonance. However, the inclusion of a resonant radiofrequency field into the proposed scheme allows the information about the angle of the magnetic field vector to be supplemented with information about its module. The proposed method maintains operability and provides the same angular sensitivity of the order of tens of angular milliseconds in a wide range of magnetic fields, from hundreds of nT to hundreds of μT and above.

Keywords: magnetic field measurement, optical quantum sensor, polarization rotation.

* Полный текст статьи опубликован в „Optics and Spectroscopy“ V. 127 N 4 2019.