

# Optical Rotation readout Based On Alkali Vapor Cell

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We demonstrate an optical readout for rotation by virtue of the light absorption of alkali-metal vapor cells with a large measurement range and low cost. A rotational quarter waveplate, mounted on the under test object co-axially, modifies the polarization state from a linearly polarized probe beam. Because that the atomic population among ground-state and spin polarization depend on the polarization of the incident laser due to the pumping process, the transmission intensity of the laser beam or the the absorption coefficient of the vapor cell which represent the optical pumping effect of alkali atoms are related to the angular displacement of the waveplate. Then the angular displacement of the object is converted to the changing the polarization state of laser and the rotation is converted to the variation of the transmitted intensity. The information of angular velocity and angular acceleration can also be extracted from the angular displacement, certainly. The key point of the sensor is monitoring the polarization state with a vapor cell, which is not sensitive to the wobble of laser. The results show the angle sensitivity  $2 \times 10^{-5} \text{ }^\circ / \sqrt{\text{Hz}}$  without a magnetic shield.

[1]Ke.Zhang, Hongying Yang, Aixian.Li, Yanhua Wang and Nan.Zhao, A rotation sensor based on alkali-metal vapor, cell, Appl. Phys.Lett. 113, 064101 (2018).