A multi-pixel optically-pumped zero-field magnetometer

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Currently, zero-field optically-pumped magnetometers are limited to a single or small amounts of measurement point per sensor, thus restricting the spatial resolution of the imaging. We aim to enhance this resolution with a sensor that provides multiple measurement points within one rubidium vapor cell. In this implementation, the theoretical resolution is limited by the diffusion length of the rubidium atoms. The key feature of our sensor is a 200 µm-thin rubidium vapor cell with a usable radius of 4 mm. We illuminate the entire cell with a collimated laser beam and encoding magnetic field values into the local intensity of the light beam. The beam is imaged onto a photodiode array. The photodiode array measures the local light intensity, allowing us to measure the magnetic field at multiple points within the cell. Utilizing the improved resolution and femtotesla-sensitivity, we aim to expand the application of OPMs to material testing, e.g., quality control through inline monitoring.

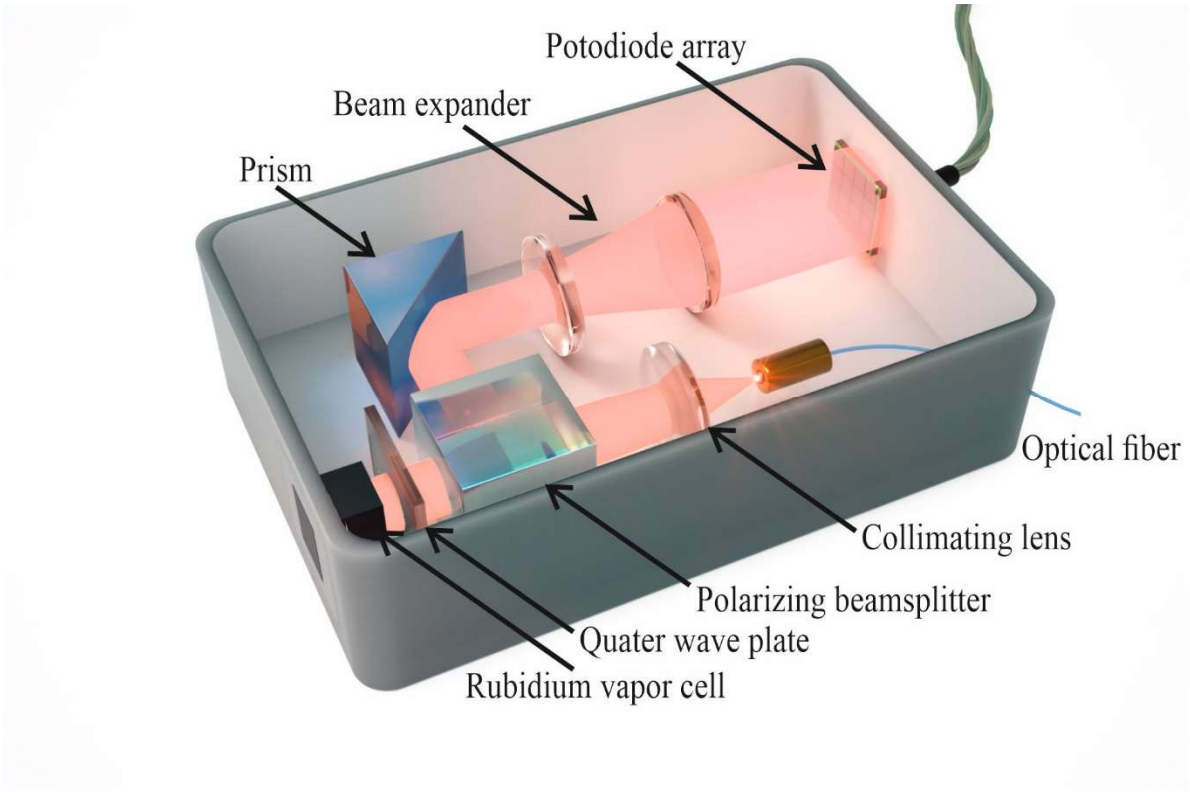

Figure 1. Setup for 2D imaging optically pumped magnetometer: laser beam is expanded and collimated to illuminate entire vapor cell. Photodiode Array reads out light intensity and therefore magnetic field.