THE KERR MAGNETOMETER BASED ON DIFFERENTIAL AMPLIFIER

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Multilayers and array of magnetic dots (with extremely thin sublayers) which are applied in spin electronics devices require a sensitive magnetometer for measurements of the hysteresis loops. The Kerr magnetometer with differential amplifier (opposite to lock-in detection technique) is especially recommended for rapid measurements up to 20 kHz. The linearly polarised light after reflection from the sample, which is magnetized by external magnetic field produced by electromagnet or Helmholtz coils, is going through the Wollaston prism where it is split into two beams with perpendicular planes of polarization. These beams are focused by lens on the photodiodes of the differential amplifier. The amplifier delivers both the common and the differential signals which are proportional to the sum and difference of the light intensity of the beams, respectively. These signals are measured by high resolution (16 bit) and rapid (200 kHz) AD converter. The differential to common signal ratio (which is proportional to the Kerr rotation angle) was accurately calibrated as a function of the polarization-plane rotation angle. Additionally the calibration of the Kerr rotation angle was performed on the standard sputtered films with thickness from 2 nm to 30 nm of Fe using Kerr spectrometer based on the polarization modulation technique. The test measurements on selected spin valve structures and array of magnetic dots will be presented. We conclude that the designed magnetometer is sensitive and simple both from the electronic as well as the mechanical point of view and the cost of this construction is very low.

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