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Quantum assisted enhancement of optical magnetometer with squeezed vacuum in hot Rb vapor EUGENIY MIKHAILOV, TRAVIS HORROM, The College of William & Mary, ROBINJEET SINGH, Louisiana State University — We demonstrate enhancement to the sensitivity of an optical magnetometer based on the nonlinear magneto-optical Faraday effect in ^{87}Rb vapor with the use of squeezed vacuum. We generate quantum squeezed vacuum states via the polarization self-rotation effect in hot ^{87}Rb vapor exhibiting noise spectrum suppression ranging from frequencies of a few hundred Hz to several MHz. Injection of such squeezed states into a magneto-optical magnetometer provides broad band noise suppression of close to 2 dB. We study various parameters of the magnetometer such as Rb cell temperature, pump power, and the noise spectrum of the probe signal to identify the most favorable conditions for quantum enhanced magnetometry. Our experimental arrangement offers potential quantum improvement to the most sensitive magnetometers at frequencies down to hundreds of Hz, which can be useful for biological, geophysical, medical, or military sensing applications.

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