Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Spatial Structure of Quantum Noise in a Squeezed Vacuum Field[1] MI ZHANG, College of William and Mary, R. NICHOLAS LANNING, ZHIHAO XIAO, JONATHAN P. DOWLING, Louisiana State University, IRINA NOVIKOVA, EUGENIY E. MIKHAILOV, College of William and Mary — We used interaction of laser light with a dense vapor of Rb atoms to modify quantum statistics of the optical field and generated a squeezed vacuum state of light with 2dB reduction in the measured quantum noise compared to the standard quantum limit. We observe that the detected quantum noise suppression strongly depends on the shape of a spatial mask inserted into the optical beam after its propagation through atomic Rb vapor. Our study of the resulting spatial distribution of the quantum noise shows that the squeezed field was generated in a spatial mode different from the mode of the pump field. Moreover, the squeezed field consisted of several spatial modes with various squeezing parameters. Our theoretical model suggests that the squeezing field can be decomposed in a small subset of Laguerre-Gaussian modes. It is possible to enhance the signal to noise ratio of opto-atomic sensors if the precise shape of the squeezed light mode is known. Thus our research has potential impact on precision metrology, quantum memory, and communication applications.

[1]This project is supported by AFOSR grant FA9550-13-1-0098.

Mi Zhang
College of William and Mary

Date submitted: 30 Jan 2015 Electronic form version 1.4