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Spatial correlation of quantum noise in a laser beam interacting with atomic ensembles[1] MI ZHANG, IRINA NOVIKOVA, EUGENIY MIKHAILOV, William & Mary Coll — We generated quantum squeezed states of light (with noise levels below the standard quantum limit or shot noise) utilizing the polarization self-rotation effect in a hot Rb vapor. We measured noise in the squeezed quadrature and the amplitude quadrature of a spatially-masked laser beam after its interaction with the Rb atomic vapor. We observed that the detected noise level was largely affected by the symmetry of the applied mask, rather than solely by the total power masked/removed from the beam. We also studied the dependence of the noise level on the Rb vapor density, and observed uncorrelated distribution of noise between different parts of the beam, which followed the power law dependence. Results of our studies are of interest for quantum metrology, spectroscopy, and quantum memory applications.

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