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Propagation of Quantized Optical Field in Gaussian Spatial Modes through non-linear Medium ZHIHAO XIAO, R. NICHOLAS LANNING, Department of Physics Astronomy, Louisiana State University, MI ZHANG, IRINA NOVIKOVA, EUGENIY MIKHAILOV, Department of Physics, College of William Mary, JONATHAN DOWLING, Department of Physics Astronomy, Louisiana State University — We examine the propagation of quantized optical field, in Gaussian spatial modes, through a non-linear medium. Due to the structure of Gaussian spatial modes, and non-linearity of the medium, both classical amplitude and the quantum state of the optical field will propagate in a unique way. We simulate the injection a linearly polarized laser beam into a Rb vapor cell, which acts as non-linear medium, creating squeezed vacuum state of light which is linearly polarized in the perpendicular direction. We examine the model using semi-classical calculation and then fully quantize the optical field. The Rb atomic structure is simplified as a three-level system. We further examine the mechanism of generation of squeezed state of light in this process and compare the theory with our experiment. Finally we discuss the distribution of squeezed state among different Gaussian spatial modes and possible improvement in setup to achieve the desired squeezed state.

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