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Squeezed Light in Laguerre-Gaussian Modes through Non-linear Medium ZHIHAO XIAO, R. NICHOLAS LANNING, Department of Physics Astronomy, Louisiana State University, MI ZHANG, IRINA NOVIKOVA, EUGENIY E. MIKHAILOV, Department of Physics, College of William Mary, JONATHAN P. DOWLING, Department of Physics Astronomy, Louisiana State University —
We examine the propagation of squeezed light, in Laguerre-Gaussian spatial modes, through a non-linear medium such as Rb vapor. We examine the quantum states in varies spatial modes. We simulate the injection into a Rb vapor cell a linearly polarized laser beam to create squeezed vacuum state of light linearly polarized in the perpendicular direction. We fully quantize the optical field's propagation which is based on previous semi-classical calculation. The Rb atomic structure is simplified to a three-level system. We reveal the mechanism that how squeezed state of light is generated in this process and compare the theory with our experiment. Further, we simulate and compare the different squeezing that can be achieved due to the change of parameters or altering experimental setups, such as multiple passing of the beam through the Rb vapor cell.

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