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Controlled Focusing Properties with Cylindrical Vector Beams[1]
MAOJIN YUN, 1 Department of Physics, Astronomy, and Materials Science, Missouri State University, 2 College of Physics Science, Qingda, LIFENG DONG, Department of Physics, Astronomy, and Materials Science, Missouri State University, Springfield, MO 65897, USA, WEI LV, College of Physics Science, Qingda University, Qingdao, 266071, China — The rapid increase of interest in cylindrical vector beams was driven largely by the unique focusing properties of such beams discovered recently. Particularly, it was found that radially polarized light can be forced into a tighter spot than those of spatially homogeneous polarization. In addition, the longitudinal component experiences an apodization effect that is different from the transverse component and is spatially separated from the transverse focal field. These effects enable three-dimensional tailoring of the focus shape. Focusing properties of cylindrical vector beams have attracted great attention and quickly became the subject of extensive worldwide research due to their applications in lithography, optical storage, and optical tweezers. In this study, pure phase plate was used to modulate phase distribution of the cylindrical vector beams to investigate their focusing properties. By using the Richards-Wolf vector diffraction theory, the simulation results show that two optical bubbles of stronger light intensity around dark spots can be obtained with the incoming cylindrical vector.

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