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Optical vortex knots in tightly-focused light beams[1] MARK DENNIS, DANICA SUGIC, University of Bristol — Optical vortices, that is, zero lines of complex amplitude in a propagating light field, can be knotted or linked in a controlled way [1]. This was demonstrated previously in experiments where a computer-controlled hologram determined the amplitude of paraxial laser light [1], meaning the longitudinal extent of the knot was several orders of magnitude larger than its width. We describe what happens to these optical knots when the transverse width of the beam, and hence the knot, is reduced. Outside the paraxial regime, the field's polarization becomes highly inhomogeneous, and knotted structures occur in a variety of polarization singularities [2]. We propose experiments realising these knotted polarization structures in tightly-focused beams, which should yield optical knots of unit aspect ratio, of several optical wavelengths in size, which could be suitable for embedding knotted defect structures in liquid crystals, Bose-Einstein condensates [3] and photopolymers. [1] M R Dennis et al, Nature Physics 6, 117-129 (2010); [2] J F Nye and J Haljnal, Proc R Soc A 409, 21-36 (1987); [3] F Maucher et al, arXiv:1512.01012 (2015).

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