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Vortex Physics in Hollow Bose-Einstein Condensates KARMELA PADAVIC, University of Illinois at Urbana-Champaign, KUEI SUN , The University of Texas at Dallas - Richardson, COURTNEY LANNERT, Smith College, University of Massachusetts - Amherst, SMITHA VISHVESHWARA, University of Illinois at Urbana-Champaign — We present studies of vortex physics in hollow spherically symmetric Bose-Einstein condensates (BEC). When BECs are stirred or rotated, due to the relation between the velocity field of the condensate and the phase of its wavefunction, vortices are generated and the remainder of the condensate remains irrotational. The behavior of such vortices and their formation of lattices at high rotation speeds have been extensively studied experimentally and theoretically. In the hollow, spherically symmetric BEC case which we consider here, a major difference is the presence of two boundary surfaces. This BEC structure supports generation of vortices at lower rotation speeds than in the fully filled case. We find that vortex lines parallel to the rotation axis located at an off-set with respect to it cannot be stationary. If vortex lines are positioned along the rotation axis, however, they can be stationary but are not fully straight at low rotation speeds i.e. they nucleate as vortex tubes with ends bent towards condensate boundaries. As a limiting case, we also study an infinitesimally thin BEC shell and determine the attractive force between pairs of vortices on such a surface.

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