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Hollow shell geometry and topological change of spherical Bose-Einstein condensates[1] KARMELA PADAVIC, University of Illinois at Urbana-Champaign, KUEI SUN, The University of Texas at Dallas, FRANCES YANG, Smith College, COURTNEY LANNERT, University of Massachusetts, SMITHA VISHVESHWARA, University of Illinois at Urbana-Champaign — We present our study [arXiv:1612.05809] and recent progress on a spherical BEC undergoing a topological change from a filled sphere to a novel hollow shell geometry. Motivated by the upcoming realization of these hollow systems by NASA's Cold Atom Laboratory, we analyze their equilibrium properties and collective mode (CM) structure. We show that distinctive non-monotonic features in the CM spectrum of a spherical BEC indicate its deformation from a filled to a hollow geometry and the emergence of an inner boundary. This topological change produces the most drastic effect for high angular momentum CMs as they correspond to surface modes localized to condensate boundaries and undergo a redistribution of nodes once an additional boundary is present. Additionally, our numerical simulations show how the CM features can be probed in typical sudden-quench experiments. Finally, we go beyond the microgravity regime, discussing how the equilibrium and CM properties are modified as gravity breaks the spherical symmetry.

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