

Topologically trapped vortex molecules in Bose-Einstein condensates

R. Geurts,¹ M. V. Milošević,^{1,2} and F. M. Peeters^{1,*}

¹*Departement Fysica, Universiteit Antwerpen, Groenenborgerlaan 171, B-2020 Antwerpen, Belgium*

²*Department of Physics, University of Bath, Claverton Down, Bath, BA2 7AY, UK*

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In a numerical experiment based on Gross-Pitaevskii formalism, we demonstrate unique topological quantum coherence in optically trapped Bose-Einstein condensates (BECs). Exploring the fact that vortices in rotating BEC can be pinned by a geometric arrangement of laser beams, we show the parameter range in which *vortex-antivortex molecules* or *multiquantum vortices* are formed as a consequence of the optically imposed symmetry. Being low-energy states, we discuss the conditions for spontaneous nucleation of these unique molecules and their direct experimental observation, and provoke the potential use of the phase print of an antivortex or a multiquantum vortex when realized in unconventional circumstances.

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