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Shell-shaped BEC with mixtures[1] PATRICK BOEGEL, ALEXANDER WOLF, MATTHIAS MEISTER, Ulm University, NACEUR GAALOUL, Leibniz University Hanover, ANTUN BALAZ, Institute of Physics Belgrade, University of Belgrade Serbia, MAXIM A. EFREMOV, WOLFGANG P. SCHLEICH, Institute of Quantum Technologies, German Aerospace Center (DLR); Ulm University
— Currently there is a huge interest in the properties of hollow Bose-Einstein condensates (BECs) [Phys. Rev. A 98, 013609 (2018)], which are commonly realized with radio-frequency (rf) dressing potentials. As an alternative method we propose to use a dual-species mixture for the preparation of such hollow BECs. By tuning the interspecies interaction strength and the number of atoms we can realize a ground state where one atomic species is centered in the middle, while the other species forms a shell around it. In order to obtain the width and the form of the shell as well as the spectrum of the collective excitations, from the filled to a hollow BEC, we solve the Gross-Pitaevskii equation both numerically and within the Thomas-Fermi approach. For the hollow case the inter-species boundary leads to a change to the collective excitation spectrum. This new method could be more robust for the creation of bubble BECs than the method of rf dressing potentials.

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Patrick Boegel
Univ Ulm

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