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Rotational properties of a rapidly rotating two-component Bose gas ELIFE KARABULUT, Mathematical Physics, LTH, Lund University, Box 118, SE-22100 Lund, FRANCESC MALET, Department of Theoretical Chemistry and Amsterdam Centre for Multiscale Modeling, FEW, Vrije Universiteit, De Boelelaan 1083, 1081 HV, Amsterdam, GEORGIOS KAVOULAKIS, Technological Educational Institute of Crete, Box 1939, GR-71004, Heraklion, Greece, STEPHANIE REIMANN, Mathematical Physics, LTH, Lund University, Box 118, SE-22100 Lund
— One of the hallmarks of a superfluid is its response to rotation. Bose-Einstein condensates (BECs) of ultra-cold atoms are ideal systems for exploring this problem. In such systems, the presence and properties of the quantized vortex states are strongly influenced by the form of the confinement. Several experimental and theoretical studies report that confining potentials rising more steeply than quadratically introduce many novel phases, where the picture becomes more interesting in the case of a multi-component BEC. We investigate the rotational properties of a two-component BEC confined in an anharmonic trapping potential using both numerical and analytic methods. More specifically, with the use of a variational approach we derive analytically the phase diagram of the system as a function of the rotational frequency of the trap and of the coupling constant for sufficiently weak values of the anharmonicity and of the coupling. The more general structure of the phase diagram is investigated numerically. We compare our results with the ones of (i) a single-component BEC confined in an anharmonic potential and (ii) a two-component BEC, which is confined in a harmonic trapping potential.

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