Two-componet BEC for Studying Quantum Turbulence

E. Pedrozo-Peñafiel, R. R. Paiva, P. Castilho, F. J. Vivanco, A. Kruger, K. Thompson, K. M. Farias, and V. S. Bagnato

Instituto de Física de São Carlos, Universidade de São Paulo, Brazil

In this work we are dealing with a mixture of Na/K Bose-Einstein Condensates (BEC). With the mixture of these two superfluids, we are going to investigate the effects of transferring quantum excitations, collective excitations and vortices, as well. Effects of modulation of the scattering length and excitation are being reviewed and will be object of investigation in the BEC of K and we will try to verify the thermalization with the second specie (Na). Our experimental system being mounted is a composition of two independently systems, Na and K. We are going to produce a trap of Na atoms from a 2D MOT [1] and the same for K. They will be combined to produce a single working chamber with two traps and finally the two condensates. In a previous work developed in our group [2] was reported the experimental observation of vortex tangles in an atomic Bose-Einstein condensate of 87Rb atoms applying an external oscillatory perturbation to the trap. Other characteristic signatures confirming the turbulence are also shown, such the suppression of the aspect ratio inversion typically observed in quantum degenerate bosonic gases during free expansion.

1. Lamporesi, G., et. al. (2013). "Compact high-flux source of cold sodium atoms". Review of Scientific Instruments 84, 063102.

2. Henn, E. A. L., et. al. (2009). "Emergence of Turbulence in an Oscillating Bose-Einstein Condensate". Physical Review Letters 103, 045301.

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