

# Spectroscopy and Emergent Order in an Ultracold Mixture of $87\text{Rb}$ - $40\text{K}$

*Wednesday, 13 September 2023 22:40 (20 minutes)*

We employ spectroscopic tools to study interactions and emergent order in an ultracold mixture of a Bose-Einstein Condensate (BEC) and spin-polarized Degenerate Fermi Gas (DFG). We characterized the effect of fermion-mediated interaction on the boson clock transition [1]. We now extend our work by tuning the fermion-mediated effect on the Bogoliubov excitation spectrum through a Feshbach resonance, where we expect a stable mixture on the attractive side of the resonance [2]. We also measured spin-squeezing effects in a bosonic spin mixture due to weak non-linear intraspecies interactions, enhanced by a Dynamic Decoupling (DD) scheme [3]. Our system is a rich playground to study controlled many-body physics.

[1] H. Edri, B. Raz, N. Matzliah, N. Davidson, and R. Ozeri, Phys. Rev. Lett. 124, 163401 (2020).

[2] K. Patel, G. Cai, H. Ando, and C. Chin, arXiv:2205.14518v1.

[3] H. Edri, B. Raz, G. Fleurov, R. Ozeri, and N. Davidson, New J. Phys. 23 053005 (2021).

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**Session Classification:** Poster Session III

**Track Classification:** Long-range Interactions and Rydberg Systems