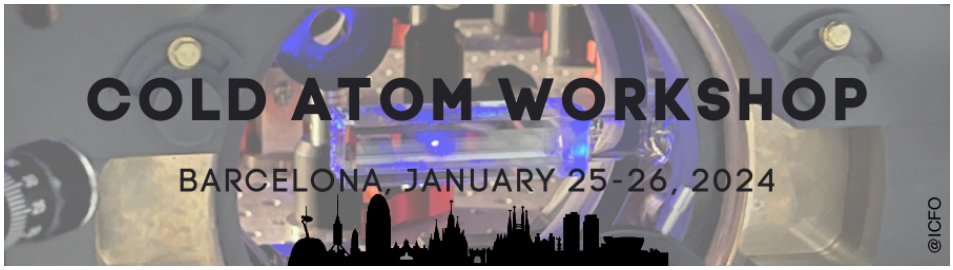

Contribution ID: **29** Type: **not specified**

Inelastic confinement-induced resonances under 3D confinement

Friday 26 January 2024 12:50 (20 minutes)

Inelastic confinement-induced resonances (ICIRs) [1] offer an alternative way to control atom-atom scattering besides Feshbach resonances [2]. These resonances have their origin in the coupling between the center-of-mass and the relative motion due to the anharmonicities in the optical confinement, irrespective of its shape (optical lattice, optical tweezer, etc.), and of the interatomic potential.

Since the first experimental observation of ICIRs under quasi-1D confinement, their existence has CIRs been also demonstrated under quasi-2D confinement [4] and even in mixed dimensional systems [5]. In this communication [6], we report on the observation of confinement-induced resonances for strong 3D confinement. Starting from a Mott-insulator state with predominantly single-site occupancy, we detect loss and heating features at specific values for the confinement length and the 3D scattering length. Two independent models predict the resonance positions to a good approximation, suggesting a universal behavior. The relation of our work with that recently reported in the Ref. [7] will be also discussed.

Our results extend confinement-induced resonances to any dimensionality and open up an alternative method for interaction tuning and controlled molecule formation under strong 3D confinement.

[1] S. Sala, P.-I. Schneider, and A. Saenz, Phys. Rev. Lett. 109, 073201 (2012); S.-G. Peng, H. Hu, X.-J. Liu, and P. D. Drummond, Phys. Rev. A 84, 043619 (2011).
[2] C. Chin, R. Grimm, P. Julienne, and E. Tiesinga, Rev. Mod. Phys. 82, 1225 (2010).
[3] E. Haller, M. J. Mark, R. Hart, J. G. Danzl, L. Reichsöllner, V. Melezhik, P. Schmelcher, H.-C. Nägerl, Phys. Rev. Lett. 104, 153203 (2010).
[4] B. Fröhlich, M. Feld, E. Vogt, M. Koschorreck, W. Zwerger, and M. Köhl, Phys. Rev. Lett. 106, 105301 (2011).
[5] G. Lamporesi, J. Catani, G. Barontini, Y. Nishida, M. Inguscio, and F. Minardi, Phys. Rev. Lett. 104, 153202 (2010).
[6] D. Capecchi, C. Cantillano, M. J. Mark, F. Meinert, A. Schindewolf, M. Landini,1 Alejandro Saenz, F. Revuelta, H.-C. Nägerl, arXiv:2209,12504 (accepted in Phys. Rev. Lett.).
[7] Y. Kyung Lee, H. Lin, W. Ketterle, arXiv:2208,06054 (accepted in Phys. Rev. Lett.).

Presenter: REVUELTA (UNIVERSIDAD POLITÉCNICA DE MADRID), Fabio

Session Classification: Day 2