

Quantum liquid droplets in a mixture of Bose-Einstein condensates

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Dilute quantum droplets are clusters of ultra-cold atoms self-trapped by attractive mean-field forces, and stabilized against collapse by the repulsive effect of quantum fluctuations. Despite not falling into the standard van der Waals paradigm, their properties are those of a liquid and reveal beyond mean-field effects in a weakly interacting system. In my talk I will describe our recent observation of quantum droplets in a mixture of Bose-Einstein condensates and the experimental study of the corresponding liquid-to-gas phase transition [1]. I will also discuss the difference existing between bright solitons and quantum droplets, which from a non-linear optics perspective can be understood as high-dimensional solitons stabilized by a higher order non-linearity due to quantum fluctuations [2].

References

- [1] C. R. Cabrera, L. Tanzi, J. Sanz, B. Naylor, P. Thomas, P. Cheiney, and L. Tarruell, *Science* **359**, 301 (2018).
- [2] P. Cheiney, C. R. Cabrera, J. Sanz, B. Naylor, L. Tanzi, and L. Tarruell, *Phys. Rev. Lett.* **120**, 135301 (2018).

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