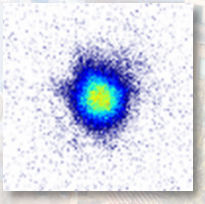
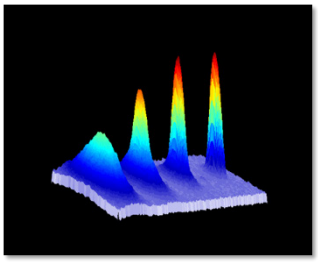
ICFO The Institute of Photonic Sciences

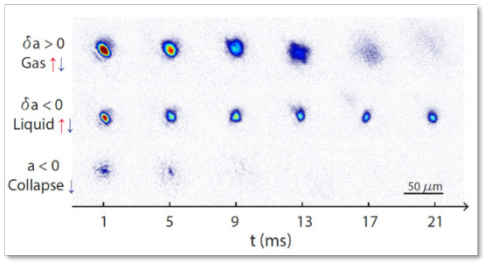
PhD in Experimental Quantum Physics
Ultracold Atoms in Barcelona



Exploring quantum liquid droplets in a mixture of Bose-Einstein condensates

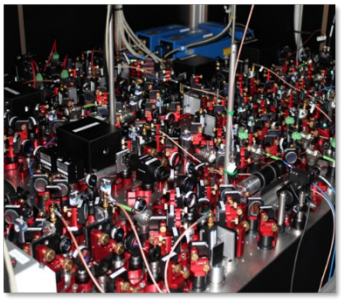
Liquids are fluids of fixed volume and very low compressibility, which remain self-bound in the absence of any external confinement. Their stability normally results from the balance of attractive and repulsive forces deriving from different parts of the inter-particle interaction potential. The typical inter-particle distance is therefore fixed by the potential range, and corresponds to a dense phase. All liquids were thought to share this feature, independently of their classical or quantum nature (think of water or liquid helium, for example). Recent experiments with ultracold atoms have demonstrated however that a very different type of quantum liquid, more than eight orders of magnitude more dilute, can be created. In our group, we have observed for the first time such a liquid using a mixture of two BECs.

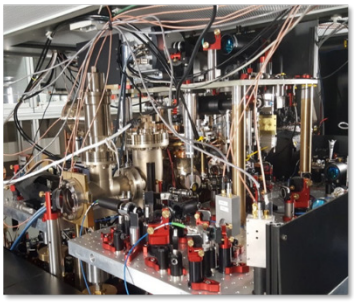




C. R. Cabrera, L. Tanzi, J. Sanz, B. Naylor, P. Thomas, P. Cheiney, and L. Tarruell, arXiv:1708.07806

The goal of this PhD project will be to explore the properties of this novel phase of matter, whose existence is due to pure quantum effects. We will experimentally measure the shape and density of these droplets, their excitations, microscopic properties, etc. in different configurations. Our experiments should allow us to gain intuition on the role of quantum fluctuations and correlations in quantum many-body systems, and at the same time constrain complex theories beyond the mean-field approximation developed together with our theory collaborators.





We are looking for PhD applicants with a good background in quantum optics, atomic physics or condensed-matter physics, and a strong motivation for setting up and conducting challenging experiments in a small team. We offer training in a broad range of cutting-edge experimental techniques (from optics, electronics, ultra-high vacuum technology and computer control to quantum state engineering), as well as in theoretical atomic, quantum, statistical, and condensed matter physics. The PhD position is funded, and the expected starting date is Fall 2017.

For more information, contact Leticia Tarruell: leticia.tarruell@icfo.eu
Ultracold Quantum Gases Group: http://www.qge.icfo.es
ICFO – The Institute of Photonic Sciences: https://icfo.eu
Av. Carl Friedrich Gauss, 3
08860 Castelldefels (Barcelona), Spain