



国立研究開発法人理化学研究所 仁科加速器科学研究センター  
第299回 RIBF核物理セミナー  
RIKEN Nishina Center for Accelerator Based Science  
The 299th RIBF Nuclear Physics Seminar

## Prediction of a “mixed bubble” quantum phase

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In this talk, I will present the results that were communicated on March 22nd, 2021.

[https://www.riken.jp/press/2021/20210322\\_1/index.html](https://www.riken.jp/press/2021/20210322_1/index.html)

I already gave a short presentation at the Nishina Center Meeting in May, but in this talk I will give more details. Atomic nuclei are examples of quantum fluids, but it is also possible to create a quantum fluids from gases of atoms by cooling them to nanokelvin temperatures (“ultracold atoms”). The interest of such experiments is that, unlike subatomic particles, atoms can be controlled. For instance, the interactions between the atoms can be engineered. By engineering an attractive interaction inside a mixture of bosonic atoms, it was recently possible to create a “quantum liquid” of atoms, analogous to the quantum liquid formed by protons and neutrons in atomic nuclei.

Inspired by this finding, my collaborator and I have investigated the opposite situation of repulsive interactions between the bosonic atoms. In this case, it was believed that mixtures of quantum gases could either fully mix, or remain completely separated when the repulsion is too strong. However, we found that quantum fluctuations allow an additional phase where bubbles of partially mixed gas can co-exist with a pure gas.

In the talk, I will explain how we obtained this result, and discuss its possible experimental observation.

\* The talk will be given in English language.

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Sep. 7th (Tue.) 2021 10:30~  
via Zoom meeting system