THE PHYSICS COLLOQUIUM

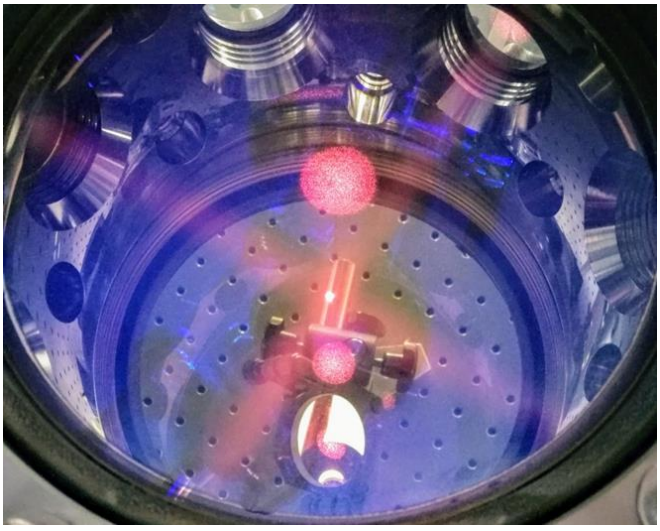
Thursday 30 November 2023, 4:00 p.m.
Bernoulliborg Room 5161.0267

Multichannel laser cooling of atoms using an optical frequency comb

Ticijana Ban
Institute of Physics, Zagreb, Croatia

Optical frequency combs (FCs) have become an unavoidable source of light in applications ranging from metrology and high-resolution spectroscopy to precision ranging and calibration of atomic spectrographs. In recent years, the applications of FCs have expanded to laser cooling and trapping of atoms and ions, and quantum communication.

In this talk, I will present our results on the FC-atom interaction in the case when the cold atoms are in free space or are placed inside a high-finesse optical cavity. For atoms in free space, FC cooling of neutral atoms [1], and simultaneous dual-species FC cooling [2] is demonstrated. For atoms placed inside a high-finesse optical cavity, a multi-frequency dispersive interaction is observed [3]. As a result of dispersive interaction, the squeezing and broadening of atomic distribution in time-of-flight images is measured.



Our results contribute to the development of novel laser cooling techniques using a single frequency comb source.

Figure 2: Cold atoms in the CALT department at the Institute of Physics in Zagreb, Croatia. The red sphere shows a cloud of cold rubidium atoms located inside an ultra-high vacuum chamber. Atoms are cooled by a laser and trapped in the center of the chamber by a magnetic field. Typical temperatures of atoms are around 50 μK.

[1] N. Šantić, D. Buhin, D. Kovačić, I. Krešić, D. Aumiler, and T. Ban, Sci Rep 6, 2510 (2019).
[2] D. Buhin, D. Kovačić, F. Schmid, M. Kruljac, V. Vulić, T. Ban, and D. Aumiler, Phys. Rev. A 102, 021101(R) (2020).
[3] M. Kruljac, PhD thesis, University of Zagreb 2022.

Join us for coffee starting 3:30 p.m. Refreshments will be served after the lecture.
For more information contact the host: Anastasia Borschevsky (a.borschevsky@rug.nl)
Website: http://www.rug.nl/research/vsi/colloquia/