



# Innsbruck Physics Colloquium

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## **Towards Satellite-based Quantum Sensors and Experiments for Fundamental Physics**

On January 23<sup>rd</sup> 2017 the first Bose-Einstein Condensate (BEC) in Space has been created onboard the sounding rocket mission MAIUS-1. The successful operation of the atom-chip based BEC source marks a major advancement in the effort of performing matter-wave interferometry in weightlessness in space vehicles. Thanks to the high-flux source, experiments could be performed during the microgravity phase of the flight, which lasted six minutes. The experiments served to characterize the creation and features of the space BECs.

There will be two follow-up missions, which will include dual-species atom interferometry using Rubidium-87 and Potassium-41. Based on the successful QUANTUS projects, MAIUS-1 opens a new path towards space-born inertial sensing employing atom interferometers with high accuracy and unprecedented sensitivity. In the recent past several missions have been proposed ranging from a test of the universality of free fall using a dual-species atom interferometer to Earth observation. Due to their small initial size and low expansion rates BECs are the ideal source for such an interferometric measurement in space.

In addition, these experiments are the basis for the BECCAL-Mission – in cooperation with NASA – for quantum gas experiments on the ISS.

**Tuesday, 29.10.2019, at 17:15 h in lecture hall C**