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# TOWARDS LONG TIME MATTER WAVE INTERFEROMETRY IN MICROGRAVITY

**Abstract**

Matter wave interferometers with chip-based atom lasers have proven their reliability in microgravity experiments as provided by the drop tower of the Center of Applied Space Technology and Microgravity (ZARM) in Bremen. The pioneering QUANTUS experiment has realized Bose-Einstein condensates (BEC) with $10^4$ $^{87}$Rb atoms and a subsequent unperturbed free evolution time of 2 s in microgravity. It could show the first atom interferometer in microgravity extended to $2T = 670$ ms. In this talk we present the second generation apparatus, QUANTUS II, comprising a novel atom chip for fast evaporation to $^{87}$Rb-BECs of $10^5$ atoms at a repetition rate of 1 Hz. The experiment is catapult-ready doubling the available microgravity time to roughly 9 s. This allows for either higher repetition rates or longer interferometer times. The apparatus is designed for atom interferometry with a quantum degenerate mixture of two species ($^{87}$Rb – $^{41}$K). Our longterm goal is a test of Einstein's weak equivalence principle with quantum objects. The QUANTUS project is supported by the German Space Agency DLR with funds provided by the Federal Ministry of Economics and Technology (BMWi) under grant number DLR 50 WM 1135.