



CRC 1227
Designed Quantum States of Matter



GUEST LECTURE

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(Guest of Dr. N. Gaaloul and Prof. K. Hammerer)

Leibniz Universität Hannover
DQ-mat Colloquium
12 May 2022, 3.00 pm
(Room D326, Welfengarten 1)

"Large scale atom gradiometry for the study of gravity"

Atom gradiometers are now being considered for the realization of a new generation of Gravitational Wave detectors. The intrinsic stability of specific atomic energy levels makes atom interferometers ideal candidates to extend the frequency window for the observation of Gravitational Waves in the mid-frequency band, ranging from 10 mHz to 10 Hz.

This seminar will focus on the realization of the MIGA large scale gradiometer prototype carried out by a French consortium of 17 partners. This gravity antenna is based on a set of Rb atom interferometers simultaneously manipulated by the resonant field of a 150 m cavity.

I will present the realization of the different systems of this experiment, which is now under installation in an underground laboratory, and detail its science perspectives.

I will also describe first results of in-cavity atom interferometry based on a preliminary experiment and present a study of the Gravity Gradient Noise that will impact the MIGA antenna. This noise source is expected to become dominant in the infrasound domain and must be tackled for the future realization of observatories exploring GWs at low frequency. To conclude, I will describe other atom gradiometer projects undertaken worldwide to realize large scale demonstrators and push further the current limitations.

All DQ-mat members and all interested are cordially invited to attend.