ulm university universität
uulm

Fakultät für Naturwissenschaften
Institut für Quantenphysik

Einladung

zum

Seminar des Instituts für Quantenphysik

Dr. David E. Bruschi
Universität Wien

Relativistic and quantum science in space

Donnerstag, den 31.01.2019
11:00 Uhr
N24/252

ABSTRACT: We are living in the Quantum Era. Quantum features, such as entanglement, have enabled the discovery of many exciting phenomena, and are now being exploited in the development of futuristic technologies. Ultraprecise sensing and quantum communications are only two of the foreseen applications. Furthermore, cutting-edge experiments are being proposed to operate in regimes where relativity plays a role. In such situations, relativity is included as an ad-hoc modification of the standard Schrödinger equation. Regardless of the advances within their respective domains, relativity and quantum mechanics are fundamentally incompatible. It is an open question how to properly describe and characterise quantum technologies in regimes where relativity is important.

In this work we give an overview of the recent progress in the field of relativistic quantum information, with special attention to applications for space-based science. We focus on the effects of gravity and curvature on quantum entanglement present in the quantum state of localised systems that are employed for different quantum information protocols. In particular, we analyse the effects of gravity on Earth-to-satellite quantum communication schemes, and space-based tests of the predictions of the theory. This allows us to uniquely identify relativistic contributions to a plethora of measurements, which can lead to high-precision measurements of relativistic parameters. We conclude with a discussion on potential implementations with small satellites, and for space exploration.