



# *E I N L A D U N G*

Im Rahmen des Literaturseminars

zum Vortrag

von

**Christopher Hilweg**

(Vienna)

über

## *“Testing the quantum and gravity interface with single photons”*

### **Abstract:**

Quantum theory and general relativity are considered the two pillars of modern physics. Their predictions are verified with spectacular precision on scales covering several orders of magnitude. Despite their success in describing nature, a unique framework reconciling these two theories is still missing. In this talk we will present a modified version of a Mach-Zehnder interferometer, capable of realizing the first table-top experiments probing jointly the quantum superposition principle and the mass-energy equivalence principle for single photons. The novel gravitational effects to be tested in this project arise when a single photon is travelling in a superposition along two paths located at different heights above earth and which are then brought to interfere. Due to the Shapiro delay, the travel time of a photon depends on the altitude of its path above earth. For the time dilation comparable with the photon's coherence time, the visibility of the quantum interference is predicted to drop, while for shorter time dilations gravity will induce a relative phase, shifting the interference pattern. As required by quantum complementarity principle, there is a trade-off between the possibility to observe interference and the amount of information about the photon's path, in our proposed experiment available from the arrival time of the photon.

**Zeit:** Donnerstag, 27.10.2016, 14.00

**Ort:** Arbeitsgruppe Gravitation, Währinger Straße 17,  
**Raum 218, 2. Stock**

gez.: P. Chrusciel