Contribution ID: **33** Type: **Oral contribution**

Progress on satellite-to-ground single-photon interference experiment: toward a quantum test in curved spacetime

Tuesday 8 July 2025 17:30 (20 minutes)

The emergence of quantum mechanics and general relativity has transformed our understanding of the natural world significantly. However, integrating these two theories presents immense challenges, and their interplay remains untested. Recent theoretical studies suggest that single-photon interference over large spatial separations offers a promising approach to probing the interface between quantum mechanics and general relativity. To explore this possibility, we have recently conducted a series of ground-based verification experiments using unbalanced interferometers to simulate long-baseline single-photon interference under realistic atmospheric conditions. These efforts have demonstrated the feasibility of high-precision phase measurements over multi-kilometer free-space channels and validated key technologies such as high-brightness single-photon sources and ultra-stable interferometric control. Nowadays, we are developing a satellite payload specifically designed to perform satellite-based single-photon interference experiments, with the goal of ultimately testing gravitationally induced phase shifts in curved spacetime. Together, these developments mark a significant step toward experimental tests of quantum physics in the presence of gravity.

Working Group

WG3 - Low-energy gravitational effects in quantum systems

Authors: LI, Yu-Huai (University of Science and Technology of China); Dr WU, Hui-Nan (University of Science and Technology of China)

Presenter: LI, Yu-Huai (University of Science and Technology of China)

Session Classification: WG3 Low-energy Gravitational Effects in Quantum Systems 1