

**Plenary Talk**

PLV III Tue 9:00 HS 1+2

**Interferometric gravitational wave detection - a (quantum-) metrological challenge** — ●MICHÈLE HEURS — Leibniz Universität Hannover, Hannover, Germany — Deutsches Zentrum für Astrophysik (DZA) in Gründung, Görlitz, Germany — Deutsches Elektronen-Synchrotron DESY, Zeuthen, Germany

Since the first direct detection of gravitational waves in 2015, we have gained a new observation window into the universe, complementary to the electromagnetic spectrum, neutrinos, and cosmic rays.

The sensitivity of current gravitational wave detectors is so incredible that the quantum effects of the employed laser light have become limiting. Ultra-precisely stabilised lasers do not suffice; non-classical

(“squeezed”) light is already routinely employed in the current second generation of detectors (e.g., aLIGO & AdVirgo). Other noise sources, such as seismic and thermal noise, pose further challenges for third-generation detectors (e.g., the European Einstein Telescope, a planned underground gravitational wave observatory).

To achieve ever-higher detection rates for meaningful gravitational wave astronomy, ever-greater detection sensitivity is required. I will introduce the principle of interferometric gravitational wave detection and highlight some of the advanced technologies implemented, focusing on squeezed light. I will conclude my talk by showing some further possibilities related to this, as well as options for quantum noise reduction in laser interferometry and the broader field of quantum optics.