## **Nuclear Physics in Astrophysics XI**



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Type: Invited talk

## Interferometric gravitational wave detection - a (quantum) metrological challenge

Thursday 19 September 2024 16:00 (25 minutes)

Since the first direct detection of gravitational waves in 2015, we have gained an entirely new observation window to the universe. The sensitivity of these interferometers is so incredible that the quantum effects of the laser light have become limiting. Ultra-precisely stabilised lasers do not suffice; non-classical light is already routinely employed in the current generation of gravitational wave detectors (e.g. aLIGO & AdVirgo). Other noise sources, such as seismic and thermal noise, pose further challenges for next-generation detectors.

To achieve ever-higher detection rates for meaningful gravitational wave astronomy, ever-greater detection sensitivity is required. I will briefly introduce the principle of interferometric gravitational wave detection (for any students present) and highlight some of the advanced technologies implemented. The European Project "Einstein Telescope", a third-generation observatory, will also be featured. I will conclude my talk by showing some further possibilities related to this, as well as options for quantum noise reduction in laser interferometry.

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