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Type: **Talk**

Quantum entangled beams to improve the sensitivity of gravitational wave interferometers

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Vacuum fluctuations of the electromagnetic field are responsible for quantum noise in interferometric gravitational wave detectors.

The injection of squeezed vacuum states represents an effective solution to reduce it as it has been demonstrated first in GEO600 and afterwards in Advanced Virgo and Advanced LIGO, where it contributed to improve the detector sensitivity above 200 Hz by reducing quantum shot noise.

Recent upgrades will improve the sensitivity of these two last detectors at lower frequencies by reducing technical noises that, during the previous scientific run, covered another component of quantum noise called “radiation pressure noise”. For this reason a broad-band quantum noise reduction, achievable using a “frequency-dependent” squeezing is needed. The adopted solution is to “filter” frequency-independent squeezed vacuum states, using a detuned external cavity.

In this talk, an innovative technique, based on Einstein-Podolsky-Rosen (EPR) entangled vacuum fields will be introduced.

This technique has been successfully tested in two table-top experiments, one performed in Germany and one in Australia, using a test cavity instead of the whole interferometer. Moreover, some Italian groups in collaboration with a Korean group are building an updated experiment where, for the first time, this technique will be employed in a radiation-pressure limited device: a small interferometer with suspended masses. This work, whose progress will be shown in the last part of the talk, is still ongoing.

Is this abstract from experiment?

Yes

Name of experiment and experimental site

EPR-squeezing R&D experiment (European Gravitational Observatory)

Is the speaker for that presentation defined?

Yes

Details

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Internet talk

Yes

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