



Contribution ID: 70

Type: **Invited Talk**

Optical signal detection beyond the quantum limit: a case study from gravitational astronomy

Tuesday, 6 September 2022 11:15 (35 minutes)

The newborn field of gravitational wave astronomy is gaining speed and after the first detection in 2015, gravitational waves coming from almost a hundred compact binary coalescences were detected between 2015 and 2020. Among all GW detections, more than two third were detected in the last observation run (O3). This was possible only thanks to the various upgrades implemented in between observation runs. One of such upgrade, which has already proven extremely effective, is the implementation of squeezed state of light to reduce the quantum noise limit of the interferometer. The central piece of squeezed state production is an Optical Parametric Oscillator (OPO). In this talk I will present the status of the quantum noise reduction techniques applied to GW astronomy and the prospects of future generation detectors.

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Session Classification: Signal processing and photonics

Track Classification: Signal processing and photonics