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Building 222, room 013

Patrick Kwee

MIT LIGO Lab, Cambridge, MA

Pushing the quantum limit of gravitational wave detectors - The experimental challenges

Interferometric gravitational wave detectors perform the most sensitive length measurements. The goal of these detectors is to measure the tiny length fluctuations on Earth caused by gravitational waves from astrophysical sources, such as inspiraling neutron stars or black holes. The second generation detector Advanced LIGO, which is installed at the moment, will be able to measure relative differential length fluctuations of $10^{-23} \text{ Hz}^{-1/2}$ which corresponds to less than 1/10000 of a proton diameter over a base line length of 4km.

The largest noise source in gravitational wave detectors is quantum noise of the optical read out. This talk is about two different approaches and their experimental challenges to reduce quantum noise. The stabilization of high-power laser systems and the transformation of squeezed light with filter cavities are presented.

