Contribution ID: **96** Type: **poster**

Laser power stabilization for future gravitational wave detectors

Tuesday, 24 May 2016 18:00 (0 minutes)

The fundamental limit of all future generation of interferometric gravitational wave detectors, namely quantum radiation pressure noise and photon shot noise, can only be reached with an improved laser power stability. The traditional active power stabilization schemes have also a fundamental limit set by the quantum noise (shot noise) in the sensing process which is bound by technical limitations of the maximal detectable power. In this poster we study a new scheme for power stabilization in which power fluctuations are transferred to another observable, the phase of the light field. The great advantage of such a scheme is to use the full beam power in the transfer process, and hence not be limited by the relative shot noise in the sensing process used by the traditional schemes. We present different experimental setups and also their sensitivity to detect relative power fluctuations of 10-9/sqrt(Hz).

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Session Classification: Poster Session