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Broadband quantum noise reduction via frequency dependent squeezing for Advanced Virgo Plus

Monday 7 September 2020 18:40 (6 minutes)

Quantum noise is limiting the sensitivity of ground based gravitational wave detectors both at high frequency, in the form of shot noise, and low frequency, in the form of radiation pressure noise. In the last observing run, the injection of frequency independent squeezing improved Virgo and LIGO sensitivities at high frequency, slightly worsening the performance at low frequency. A broadband quantum noise reduction can be achieved using frequency dependent squeezing, i. e. rotating the vacuum squeezed ellipse below 100 Hz by reflecting the squeezed vacuum off a Fabry-Perot cavity, called filter cavity. The first demonstration of this technique at the right configuration to reduce quantum noise in the whole observation bandwidth, has been obtained in TAMA, at NAOJ, Tokyo, Japan, where I worked for my master thesis. The experiment uses a 300 meter long filter cavity, similar to the ones planned to be installed in Virgo and LIGO. Once the frequency dependent squeezing is produced, it has to be injected into the interferometer. The interface between the squeezing setup and Virgo is not trivial, since it requires the installation of additional benches and a 285 meter long cavity and also to couple the rotating squeezed vacuum with the detector. In this context, I work on the preparation and installation of the two benches connecting the vacuumsqueezed source to the filter cavity. An important issue which can worsen the performance of frequency dependent squeezing or directly the interferometer sensitivity is the stray light. To avoid the propagation of additional stray light, I traced the ghost beams on these benches, inside linking tubes and inside the filter cavity andwe will install several diaphragms and baffles to limit this problem.

Internet talk

Is this abstract from experiment?

Yes

Name of experiment and experimental site

Virgo

Is the speaker for that presentation defined?

Yes

Details

E. Polini

Primary author: Ms POLINI, Eleonora (LAPP)

Presenter: Ms POLINI, Eleonora (LAPP)

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