

Development of audio-band frequency-dependent vacuum squeezer for Advanced Virgo Gravitational Wave detector

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Quantum Noise (QN) is a phenomenon which gives high contribution to the overall noise in the advanced interferometric Gravitational Wave detectors. In the previous interferometer generation the most relevant QN component was dominating in the high frequency region (300 Hz-10 kHz) of the detection band which could be corrected by injection of optimal squeezed state [1]. Virgo Scientific Collaboration is currently working on implementation of an audio-band frequency-dependent squeezing injection to the readout port of Advanced Virgo.

A facility for the production of squeezed vacuum in the audio-frequency band is being developed and preliminary measurements have been performed. The facility represents a first step toward implementation of the new squeezing generation technique [2]. It is aimed at decreasing the radiation pressure noise that now limits the sensitivity in the low frequency detection band. For the purpose of the project Perugia group assembled a test bench for development of various types of photo-detector as low noise, fast, demodulated on-board and homodyne detectors.

In the presentation I overview the current state of work on the facility and I summarize in details tasks related to the development of electronics and software. In particular I present the engineering of analogue electronics for cavity locking and squeezed state measurement. In the conclusions I include the near future steps: noise hunting, lock automation and commissioning phase of the squeezer bench.

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