Contribution ID: **113** Type: **talk**

Demonstration of length control for a filter cavity with coherent control sidebands

Tuesday, 18 May 2021 23:40 (15 minutes)

For broadband quantum noise reduction of gravitational-wave detectors, frequency-dependent squeezed vacuum states realized using a filter cavity is a mature technique and will be implemented in Advanced LIGO and Advanced Virgo from the fourth observing run. To obtain the benefit of frequency-dependent squeezing, length and alignment of the filter cavity with respect to squeezed vacuum states must be controlled accurately. To this purpose, we suggested a new control scheme of the filter cavity using coherent control sidebands which are already used to control squeezing angle. We implemented the new control scheme for length control of a 300 m filter cavity and demonstrated the improvement of the locking accuracy of the filter cavity. In this talk, I report the result of the demonstration of the new control scheme for the filter cavity.

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Session Classification: Quantum noise and optical configurations workshop

Track Classification: Workshops: Quantum noise and optical configurations workshop