ID de Contribution: **5** Type: **Non spécifié**

Study of the optical losses as a function of beam position on the mirrors in a 285 m suspended Fabry-Perot cavity

lundi 17 juin 2024 14:40 (20 minutes)

Optical losses introduce noise, impair noise reduction techniques, and degrade signal gain in gravitational wave detectors. The squeezed vacuum state of light is a well-established method for quantum noise reduction. An optical cavity, often called a filter cavity, is essential to impose a frequency-dependent phase rotation on the squeezed vacuum. In the Virgo gravitational wave detector, the filter cavity is 284.9 meters long with a finesse of about 10,000.

In this talk, we report on the characterization of optical losses within the Virgo filter cavity. By using cavity angle information, we reconstructed the beam position inside the cavity and conducted an in-situ optical loss mapping. Our findings indicate that optical losses depend significantly on the beam's position on the input mirror, while losses are more uniform on the end mirror. The lowest measured losses are comparable to those expected from pre-installation mirror characterizations. The larger discrepancies observed for certain beam positions are likely due to contamination. Additionally, this methodology enabled the regulated identification of an optimal cavity axis position within half an hour, achieving some of the lowest round trip losses ever recorded. This work contributes to meeting the stringent loss requirements for the optical cavities of future gravitational wave detectors, such as the Einstein Telescope and Cosmic Explorer.

Auteur principal: M. ZHAO, Yuhang (APC, Université Paris Cité)

Orateur: M. ZHAO, Yuhang (APC, Université Paris Cité)

Classification de Session: Contributions (15' + 5' de questions)