CECI SEMINAR

CENTER FOR EXPERIMENTAL COSMOLOGY & INSTRUMENTATION

TECHNOLOGIES FOR NEXT-GENERATION GRAVITATIONAL WAVE DETECTORS

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Future gravitational wave detectors such as Cosmic Explorer and Einstein Telescope are envisioned to operate with better optical coatings and substrates to reduce the impact of thermal noise and optical losses. Crystalline silicon (cSi) is planned to be used as test mass optic and suspension in Einstein Telescope and LIGO Voyager as it has desirable thermal properties at cryogenic temperatures. However, the optical and mechanical properties of cSi require thorough investigation as these factors influence the overall losses in an interferometer, and thereby the sensitivity. My work focuses on the design, modelling and commissioning of a cryogenic low-vibration test facility for delicate opto-mechanical cavities using silicon cantilevers which can help guide the design of suspensions in future cryogenic ground-based gravitational-wave detectors.

Cosmic Explorer is designed to be a 40km laser interferometer building on LIGO A+ technologies. To mitigate coating thermal noise in A+ and beyond, new designs of optical coatings (such as Ti:Ge) need to be rigorously tested. The air annealing scatterometer at Cal State Fullerton is equipped to characterize optical coatings up to 850C. Annealing these samples using a suitable temperature ramp can help determine the onset of scatter and crystallization which is crucial to determining the optimal recipe for low coating noise. In collaboration with Caltech and MIT, these samples undergo various calibrations and measurements across different experiments to determine the overall scatter and coating thermal noise.

WEDNESDAY APRIL 30TH | READING ROOM | STARTING AT 3PM

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