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Testing novel high-reflectivity mirror technologies from room-temperature to 4 K

We are presenting a low-vibration closed-cycle cryostat setup for the characterization of mirror coatings performance and direct Brownian thermal noise measurements from room-temperature to 4 K.

Using a high-finesse optical resonator as well as multiple techniques to circumvent technical noise sources related to vibration and temperature fluctuations this facility will enable the investigation of the optical behavior of crystalline AlGaAs/GaAs multilayer coatings across a broad temperature range, which in turn can help understanding the source of an observed novel excess noise. The same system will also offer the possibility to verify thermal noise estimates and ruling out yet unknown noise sources in other novel high-reflectivity mirror designs such as nanostructured meta-etalons and amorphous-Si multilayer coatings.

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