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## A New Facility for Testing GW Thermal Compensation Systems at Full Scale

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Improving the sensitivity of current and next generation gravitational wave detector requires increased circulating power and improved quantum noise suppression from squeezing. To achieve the sensitivity increases requires that the optical surfaces within the interferometer must be controlled to exquisite precision. These surfaces are controlled by the thermal compensation system. Unfortunately, changes to the thermo-optic state of the interferometer have very long-time constants and affect the control signals of multiple interferometer degrees of freedom. This makes the commissioning and improving the thermal compensation systems in-situ and extremely complicated and time-consuming task. Further, commissioning time in the full-scale interferometers is extremely valuable and to date the time needed to completely understand and optimize the thermal compensation systems

We are building a full-scale thermal compensation test facility. This will allow us to characterize the thermal response of LIGO size test masses at full scale and also full characterize new actuation and sensing schemes before they are installed in the LIGO Observatories. In this talk we will describe this new facility.

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