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A Control Based System of Mechanical Loss Measurement for High Quality Factor Oscillators LOUIS LOUIS GITELMAN, American University, NICOLAS SMITH, California Institute of Technology, ISAAC JAFAR, Columbia University, GREGORY HARRY, JONATHAN NEWPORT, American University, MATT ABERNATHY, California Institute of Technology, LIGO COLLABORATION — In this poster we will present the control system being developed to measure the quality factor of optics used in the Advanced LIGO gravitational wave detectors to predict thermal noise levels. It works by locking the phase between the optic's exciter and normal mode to $\pi/2$ and locking the optics's amplitude allowing one to equate the energy output of the exciter to the mechanical loss of the optic. To do this the amplitude of the normal mode is detected using a birefringence meter and lockin amplifier, which is then feedback to an electrostatic exciter to control the mode's amplitude and phase with a PID controller written on a python script. The poster will discuss the components and assembly of this system and the theoretical control structure behind it. It will also discuss the speed, accuracy and general feasibility of this method of quality factor measurement relative to other methods, and steps to improve and develop this method of quality factor measurement and the possible applications for LIGO and in general.

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