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Measuring Nonequilibrium Thermal Noise Effects for Gravitational-Wave Detectors[1] JENNIFER SANCHEZ, Cal State University of Fullerton, ITALY'S NATIONAL INSTITUTE OF NUCLEAR PHYSICS (INFN) COLLABORATION, UNIVERSITY OF PADUA COLLABORATION — One of the most important noise sources for current and future gravitational-wave detectors is thermal noise. A standard way to measure thermal noise relies on the assumption that the system is in thermal equilibrium, however, most natural systems are not in thermal equilibrium. Since there is no complete theory that explains thermal noise in nonequilibrium states, experimental exploration is important for understanding how nonequilibrium effects might contribute to thermal noise, including thermal noise for gravitational-wave detectors. In this talk, I will describe an experiment whose aim is to explore nonequilibrium thermal noise. Using a mechanical resonator with low frequency acoustic modes placed in a vacuum chamber, we introduce a thermal gradient that allows us to observe how the transverse and longitudinal resonant modes behave and thus to determine the amplitude spectral density of the thermal noise. We tested this method on a resonator in thermal equilibrium, and the experiment with a resonator not in thermal equilibrium is ongoing.

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Jennifer Sanchez
Cal State University of Fullerton

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