Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Application of MEMS Devices to the Study of Liquid ^{3}He[1] MIGUEL GONZALEZ, PAN ZHENG, ERIK GARCELL, Department of Physics, University of Florida, Gainesville, FL 32611, USA, HO BUN CHAN, Department of Physics, The Hong Kong University of Science and Technology, Hong Kong, China, YOONSEOK LEE, Department of Physics, University of Florida, Gainesville, FL 32611, USA — We report measurements on the mechanical properties of a micro-electro-mechanical (MEMS) resonator submerged in liquid ^{3}He at millikelvin temperatures and at pressures 3, 21 and 29 bar. The device consists of a pair of parallel plates with a well-defined gap of 0.75 μm. The sub-micron gap size and geometry of the device gives access to physics in the high Knudsen regime and allows the investigation of surface scattering effects in thin films of quantum fluids. Details of design, fabrication, and operation will be presented along with a study of the damping characteristics of the submerged resonator through a wide range of temperatures spanning from classical fluid to degenerate Fermi liquid. The device shows potential for the use in low temperature experiments and to investigate novel phenomena in quantum fluids at the micro/nano scale such as superfluid ^{3}He films.

[1]Supported by NSF through DMR- 0803516 (YL)

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Date submitted: 11 Nov 2011 Electronic form version 1.4