Abstract Submitted
for the TSF06 Meeting of
The American Physical Society

Developing a Capacitive Probe for Measuring Charging Effects on In-Vacuum Optics DENNIS UGOLINI, ROBERT MCKINNEY, Trinity University — Many gravitational-wave observatories such as LIGO use suspended fused-silica optics in a Michelson interferometer in an effort to measure oscillations in the curvature of space between 40 Hz and 1 kHz. One potential noise source in this frequency range is the buildup and motion of surface charge on the optics, which can generate fluctuating electric fields, interfere with position control, and attract dust to the optical surface. The noise contribution depends on the magnitude of charge buildup and the time constant for motion of deposited charge, neither of which is well understood *in situ*. Many commercial probes exist that measure surface charge by modulating the capacitance between probe and sample through a vibrating probe tip. We have developed a probe that modulates capacitance with a tuning-fork optical chopper between probe and sample, chosen for vacuum compatibility and minimal cost. The probe has a resolution of $3 \times 10^5 \quad e^-/cm^2$ in air, which we expect will improve once the probe is moved to vacuum. We will report on efforts to characterize the probe's behavior and initial attempts at measuring the charging time constant.

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Date submitted: 08 Sep 2006 Electronic form version 1.4