Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Nonlinear Oscillations of Gas Bubbles and Their Impact on Plasma Breakdown in Water[1] BRADLEY SOMMERS, JOHN FOSTER, University of Michigan, Ann Arbor, MI, USA — We investigate the effects of a time varying electric field on air bubbles submerged in water. For a sufficiently strong field, a large electrical stress acting on the liquid-gas boundary can deform the volume and shape of the bubble. This deformation may drastically alter the internal pressure and polarization of the bubble, thus easing the conditions for streamer formation within the gas volume. This type of enhancement could have a broad impact on the viability of liquid plasma technologies, which tend to suffer from high voltage requirements. Bubbles with 0.5-3 mm diameter are trapped in the node of a 26.5 kHz underwater acoustic field while either alternating or pulsed voltage signals of 5-20 kV are applied across their diameter. Bubble response is captured using a high speed camera (10,000 fps), along with a high sensitivity hydrophone. The response is documented over a wide range of factors, including bubble size, field frequency, and field strength. The observed deformations of the bubble shape are then used to predict changes to the reduced field (E/N) within the bubble volume.

[1]Research supported by the NSF (CBET #1033141).

Bradley Sommers
University of Michigan, Ann Arbor, MI, USA

Date submitted: 22 Jul 2011 Electronic form version 1.4