Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

**Collapse of cylindrical vapor cavities in a compressible fluid** DERRICK TREICHLER, KEN KIGER, University of Maryland — The collapse of infinitely long cylindrical vapor cavities in water is studied computationally using Gemini, a compressible hydrocode developed by NSWC/IHD. Simulation results are compared to dynamics given by the cylindrical analogue of the Rayleigh-Plesset equation for spherical bubble dynamics. The results of the incompressible solution are known to depend on size of the domain due to a logarithmic dependance in the governing equation. Compressibility is shown to be a controlling factor in the dynamics of the cavity collapse, both as a means to limit the amount of fluid mass to be accelerated and as a source of radiated energy. As a result, the compressible case reaches an invariant collapse time for fluid domains large enough that acoustic waves traveling outward from the cavity wall are unable to return to the bubble before collapse. Analytical results predict a monotonically increasing collapse time with increasing fluid domain size. Thus, for sufficiently large fluid domains, the analytical solution greatly over-predicts the cavity collapse time given by the computational results.

Derrick Treichler
University of Maryland

Date submitted: 07 Aug 2009 Electronic form version 1.4