Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Active Control of Vortex Induced Vibrations of a Tethered Sphere in a Uniform Air Flow RENE VAN HOUT, Technion-Israel Institute of Technology, DAVID GREENBLATT, AMIT ZVI KATZ, Technion - Institute of Technology — VIV of two heavy tethered spheres (D = 40 mm, $m^* = m_{sphere}/\rho_f V_{sphere}$ = 21 and 67, $L^* = L/D$ = 2.50) were studied in a wind tunnel under uniform free stream velocities up to $U^* = U/f_n D$ = 15.9, with and without acoustic control. Control was achieved using two speakers mounted on either side of the spheres and driven in-phase at f= 35Hz (f^* = 22.3). In the non-controlled case, the bifurcation map of transverse sphere oscillation amplitude, A_y, showed stationary motion as well as periodic and non-stationary oscillations with increasing U^*. For m^* = 21, $A_y^{\max}$ was about twice as large as for m^* = 67. Acoustic control dampened $A_y^{\max}$ in the periodic region (m^* = 67) and increased $A_y^{\max}$ in the non-stationary region for both spheres. Sphere boundary layer dynamics in the three different bifurcation regions were studied using time resolved PIV with a horizontal laser sheet positioned at the center of the sphere. The field of view was 55x55 mm^2 containing one quarter of the sphere. Results will be presented on the vortex dynamics near the sphere's surface with and without acoustic control.

Rene van Hout
Technion-Israel Institute of Technology

Date submitted: 05 Aug 2011 Electronic form version 1.4