Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Accurate calculation of high-frequency sound generated by interaction of low Mach number flows and rigid bodies[1] YASER KHALIGHI, PARVIZ MOIN, Stanford University — According to N. Curle, the interaction of turbulent flow and rigid bodies is an efficient mechanism of sound generation at low Mach number regimes. A popular approach to compute the sound due to this interaction is to use an approximation of Curle's solution to Lighthill's equation. In this approximation, pressure on rigid surfaces is replaced by the hydrodynamic pressure which can be easily obtained from the solution of incompressible Navier-Stokes equation; however, this approximation is known to be valid only at low frequencies and under-predict the sound at high frequencies. The objective of the present study is to improve this approximation for the high frequency range. In this work we construct the high frequency sound by formally decomposing the surface pressure into contributions from hydrodynamics and acoustics. The acoustic pressure on the surface is obtained by splitting the acoustic Green's function and solving a boundary integral equation. The projection of surface acoustic pressure to the farfield compensates for the missing portion of sound at high frequencies. This method is applied to the problem of sound generated by turbulent vortex shedding of a cylinder at Re=10,000.

[1]This work is supported by Franklin P. and Caroline M. Johnson Fellowship.

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Date submitted: 11 Aug 2009 Electronic form version 1.4