## Abstract Submitted for the DFD07 Meeting of The American Physical Society

Finite-wavelength scattering of incident vorticity waves at a shrouded-jet exit ARNAB SAMANTA, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, USA, JONATHAN B. FREUND, Department of Mechanical Science and Engineering & Department of Aerospace Engineering, University of Illinois at Urbana-Champaign, USA — We consider a round jet shrouded for a finite downstream distance by a sharplyterminated concentric cylinder. The scattering of waves supported by a vortex-sheet model of the jet into acoustic modes in the neighborhood of the sharp shroud exit is studied using the Wiener–Hopf method. Scattering into radiating acoustic modes is quantified. Of greater interest in the present study, however, is the scattering of the outgoing vortical disturbance into acoustic modes, that travel back into the shroud surrounding the jet. These are hypothesized to close a resonance "loop" that sustains the high-amplitude resonances commonly observed in similar configurations. These upstream-moving acoustic waves are thought to seed vortical disturbances at the jet-nozzle lip. Finite-wavelength (finite-frequency) analysis is essential for investigating this mechanism: the long-wavelength limit degenerates to a fully reflective fixed-pressure condition at the shroud exit, while the short-wavelength limit produces no reflection since the vortex sheet in this case does not interact with the shroud. Resonances are observed for wavelengths comparable to the shroud exit diameter, upon which we focus.

> Arnab Samanta Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, USA

Date submitted: 03 Aug 2007

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