

Abstract Submitted
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Adjoint problem in duct acoustics and its reciprocity to forward problem by the Time Domain Wave Packet method IBRAHIM KOCAOGUL, FANG HU, Old Dominion University, XIAODONG LI, Beihang University — Radiation of acoustic waves at all frequencies can be obtained by Time Domain Wave Packet (TDWP) method in a single time domain computation. Other benefit of the TDWP method is that it makes possible the separation of acoustic and instability wave in the shear flow. The TDWP method is also particularly useful for computations in the ducted or waveguide environments where incident wave modes can be imposed cleanly without a potentially long transient period. The adjoint equations for the linearized Euler equations are formulated for the Cartesian coordinates. Analytical solution for adjoint equations is derived by using Green's function in 2D and 3D. The derivation of reciprocal relations is presented for closed and open ducts. The adjoint equations are then solved numerically in reversed time by the TDWP method. Reciprocal relation between the duct mode amplitudes and far field point sources in the presence of the exhaust shear flow is computed and confirmed numerically. Applications of the adjoint problem to closed and open ducts are also presented.

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