Abstract Submitted
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Analysing the structure of the acoustic analogy based-high frequency Greens function in non-axi-symmetric sheared flows via a Ray tracing solver[1] SARAH STIRRAT, MOHAMMED AFSAR, University of Strathclyde, ADRIAN SESCU, Mississippi State University — The chevron nozzle remains a popular approach aimed at reducing jet noise. It works by breaking up large turbulence structures and by increasing mixing, but it also effects propagation of sound. In this study, we investigate the effect of chevron-type mean flow in an acoustic analogy model where the wave propagation reduces to the solution of the Rayleigh equation and is calculated using a ray theory model for a jet represented by a transversely sheared mean flow. Since the generalised acoustic analogy (GAA) shows that the acoustic pressure is given by the convolution product of a rank-2 tensor propagator and the fluctuating Reynolds Stress, we determine the propagator (that is related to the vector adjoint Green's function of the linearised Euler operator) using the high frequency Ray theory developed by Goldstein (J. S. V., Vol. 80, p. 499, 1982) under an isotropic model of the fluctuating Reynolds stress. We calculate the Rayleigh equation Greens function at high frequencies for a series of chevron mean flow patterns with multiple lobes. Our results reveal that the chevron jet introduces much more non-periodic spatial modulation of the Greens function with a local minima in amplitude within the jet. We conclude by discussing how this explains the observed reduction in sound.

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