

Abstract Submitted  
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**Identifying Lighthill source term with large-eddy simulation of subsonic turbulent jet**<sup>1</sup> HYUNSUN LEE, ALI UZUN, MOHAMMAD YOUSUFF HUSSAINI, Florida State University, FLORIDA STATE UNIVERSITY TEAM — An acoustic analogy analysis based on the decomposition of the Lighthill source term into subterms is discussed in light of a high-fidelity large-eddy simulation of a subsonic turbulent jet from a baseline nozzle. These subterms consist of density, velocity, vorticity and dilatation fields, representing their reciprocal nonlinear interactions. To understand the aerodynamic noise generation mechanism, intrinsic links between turbulence and emitted sound waves, such as cross-correlation functions, are required. This causality method is directly adopted to the LES data to identify the fundamental noise sources. The cross-correlation between each spatial subterm in the near field and acoustic pressure fluctuation at a far field position is calculated, showing its contribution to noise generation. Three principal noise production terms, related to turbulence kinetic energy and Lamb vector, are witnessed and interpreted. The results show encouraging agreement with previous predictions. Future work will extend the observation to chevron nozzle jet. A comparison of the correlation profiles will possibly lead us to characterize the distinct structures of the chevron nozzle and baseline round nozzle jets. Furthermore, this study is expected to help in better understanding and assessing of noise control devices.

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