Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Contribution of vortical structures from a circular jet to far-field sound generation[1] JUNGWOO KIM, HAECHEON CHOI, Seoul National University — In the present study, large eddy simulation of a circular jet at $Re = 10^4$ using a dynamic subgrid-scale model is performed to investigate far-field sound propagation from the Lighthill's acoustic analogy. The jet-exit velocity imposed is the top-hat velocity with laminar Blasius profile near the wall. A modal analysis is performed to investigate the contribution of vortical structures to far-field sound generation. The velocity components obtained from LES are decomposed into azimuthal modes and the acoustic sources are obtained from these modal components. Each acoustic source is used to obtain the corresponding far-field sound from the acoustic analogy. In the circular jet, vortical structures have the dominant azimuthal modes such as axisymmetric (mode-0) and helical (mode-1) modes. From the present modal analysis, it is shown that each modal structure has its own propagation direction. For example, the vortical structure having the axisymmetric mode mainly produces the downstream sound, whereas the direction of far-field sound from the helical mode is $\alpha = \pm 45^o$ and $\pm 135^o$.

[1]Supported by the National Creative Research Initiatives, MOST

Haecheon Choi
Seoul National University

Date submitted: 03 Aug 2005 Electronic form version 1.4