Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

A kinematic sub-grid scale model for large-eddy simulation of turbulence-generated sound GUOWEI HE, HUADONG YAO, XING ZHAO, LNM, Institute of Mechanics, Chinese Academy of Sciences — In the hybrid simulation of large-eddy simulation (LES) and Lighthill's acoustic analogy for turbulence-generated sound, an LES is used to solve the Navier-Stokes equations and the turbulence-generated sound at far fields is calculated from Lighthill's acoustic analogy. As only the filtered velocity fields are available from the LES, the Lighthill stress tensor, serving as a source term in Lighthill's acoustic equation, has to be evaluated from the resolved velocity fields and thus, the unresolved velocity fields are missing in the conventional LES. The sound of missing scales has been shown to be important and hence need to be modeled. The present study proposes a kinematic sub-grid model which recasts the unresolved velocity fields into Lighthill's stress tensors. A kinematic simulation is used to construct the unresolved velocity fields with an imposed temporal statistics, which is consistent with the random sweeping hypothesis. The model is used to calculate sound power spectra from isotropic turbulence with an improved result: the missing portion of the sound power spectra is approximately recovered in this calculation.

Guowei He
LNM, Institute of Mechanics, Chinese Academy of Sciences

Date submitted: 03 Aug 2008 Electronic form version 1.4