Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Generation of indirect combustion noise by compositional inhomogeneities LUCA MAGRI, JEFF O'BRIEN , MATTHIAS IHME, Center for Turbulence Research, Stanford University — The generation of indirect combustion noise in nozzles and turbine stages is commonly attributed to temperature inhomogeneities and vorticity fluctuations. Here, compositional inhomogeneities in a multi-component gas mixture are shown to produce indirect noise both theoretically and numerically. The chemical potential function is introduced as an additional acoustic source mechanism. The contribution of the compositional noise is compared to the entropy noise and direct noise by considering subsonic, supersonic and shocked nozzles downstream of the combustor exit. It is shown that the compositional noise is dependent on the local mixture composition and can exceed entropy noise for fuel-lean conditions and supersonic/shocked nozzle flows. This suggests that compositional indirect combustion noise may require consideration with the implementation of advanced combustion concepts in gas turbines, including low-emissions combustors, high-power-density engine cores, or compact burners.

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Date submitted: 27 Jul 2016 Electronic form version 1.4