Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

The Interaction of High-Speed Turbulence with Flames[1] ALEXEI POLUDNENKO, ELAINE ORAN, Naval Research Laboratory — Interaction of flames with turbulence occurs in systems ranging from chemical flames on Earth to thermonuclear burning fronts in supernovae. We present results of a systematic study of the dynamics and properties of turbulent flames formed under the action of high-speed turbulence in stoichiometric hydrogen-air mixture. Numerical simulations were performed using the massively parallel reactive-flow code Athena-RFX. Here we discuss (1) global properties of the turbulent flame in this regime (flame width, speed, etc.); (2) the internal structure of the flame brush; and (3) the internal structure of the flamelets folded inside the flame brush. We demonstrate that, in the case of hydrogen, turbulence does not affect the internal flame structure essentially for all subsonic turbulent intensities. We address the relative role of large-scale and small-scale motions on global and local properties of the turbulent flame. We also consider the processes that determine the turbulent burning velocity and identify two distinct regimes of flame evolution. Finally, we discuss the effects of non-equilibrium non-Kolmogorov turbulence on the turbulent flame properties.

[1]This work was supported in part by the National Research Council, Naval Research Laboratory, and the Office of Naval Research, and by the National Science Foundation through the TeraGrid resources.

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Date submitted: 10 Aug 2009 Electronic form version 1.4