Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Numerical Investigation of the Hydrogen Jet Flammable Envelope Extent with Account for Unsteady Phenomena BORIS CHERNYAVSKY, PIERRE BENARD, Institut de recherche sur l'hydrogene, UQTR
— An important aspect of safety analysis in hydrogen applications is determination of the extent of flammable gas envelope in case of hydrogen jet release. Experimental investigations had shown significant disagreements between the extent of average flammable envelope predicted by steady-state numerical methods, and the region observed to support ignition, with proposed cause being non-steady jet phenomena resulting in significant variations of instantaneous gas concentration and velocity fields in the jet. In order to investigate the influence of these transient phenomena, a numerical investigation of hydrogen jet at low Mach number had been performed using unsteady Large Eddy Simulation. Instantaneous hydrogen concentration and velocity fields were monitored to determine instantaneous flammable envelope. The evolution of the instantaneous fields, including the development of the turbulence structures carrying hydrogen, their extent and frequency, and their relation with averaged fields had been characterized. Simulation had shown significant variability of the flammable envelope, with jet flapping causing shedding of large scale rich and lean gas pockets from the main jet core, which persist for significant times and substantially alter the extent of flammability envelope.

Boris Chernyavsky
Institut de recherche sur l'hydrogene, UQTR

Date submitted: 10 Aug 2010 Electronic form version 1.4