Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Experimental Characterization of Inter-channel Mixing Through a Narrow Gap SIMO A. MAKIHARJU, Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI 48109, ALEXANDER G. MYCHKOVSKY, JOHN R. BUCHANAN JR., KEVIN J. HOGAN, KIRK T. LOWE, Bechtel Marine Propulsion Corporation, Bettis Atomic Power Laboratory, West Mifflin, PA 15122, STEVEN L. CECCIO, Department of Naval Architecture and Marine Engineering, University of Michigan, Ann Arbor, MI 48109 — Mixing trough narrow gaps that connect primary flow paths is an important flow process for many thermal-hydraulic applications, such as flow through nuclear reactor rod bundles or heat exchangers. The flow in a narrow gap can exhibit periodic flow structures due to travelling vortices. These flow structures in the gap, as well as any pressure gradient across the gap, have a significant effect on the rate of mixing between the primary flow paths. To investigate such flows in detail, and to develop validation quality data sets for comparison with CFD, we have conducted a canonical inter-channel mixing experiment between two channels, with a (127 mm)^2 cross-section. The channels were connected by a gap 914.4 mm long in the stream-wise direction and 50.8mm wide in the cross-stream direction. The gap height could be varied from 0 to 50.8 mm. The flow speed in both channels could be independently varied to have Re = (40 to 100) x 10^3. The integral mixing rates were determined by injecting fluorescent dye into one of the channels well upstream of the test section and by measuring the dye concentration at the channel inlets and outlets. Additionally, the flow fields in the gap and channels were measured with LDV and PIV.

Simo A. Makiharju
Department of Mechanical Engineering,
University of Michigan, Ann Arbor, MI 48109

Date submitted: 22 Jul 2013 Electronic form version 1.4