Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Pressures Losses in Grooved Channels M. MOHAMMADI, JERZY M. FLORYAN, University of Western Ontario — Pressure losses associated with presence of two-dimensional grooves in a channel are analyzed. Grooves can be oriented in an arbitrary manner with respect to the direction of the flow. When grooves' ridges are orthogonal to the flow direction (transverse grooves) the flow remains two-dimensional. As the grooves rotate away from this direction, the flow becomes three-dimensional. The largest losses occur in the case of transverse grooves. Reduction of pressure loss may occur in the case of longitudinal grooves with properly selected geometry. The analysis is carried out using an auxiliary coordinate system which is defined in such a way that one of its axes is aligned with the grooves. It is shown that the governing equations expressed in this system decouple into a two-dimensional flow across the grooves and a flow in the direction along to the grooves resulting in improved solution efficiencies. The field equations are solved using a gridless algorithm that takes advantage of the immersed boundary concept and permits efficient analysis of arbitrary grooves' geometry. The optimal shape of the grooves required either for the maximization of pressure loss or for the minimization of the loss has been identified.

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Date submitted: 29 Jul 2010 Electronic form version 1.4