Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

High-Order Finite-Difference Solution of the Poisson Equation with Interface Jump Conditions II ALEXANDRE MARQUES, Massachusetts Institute of Technology, JEAN-CHRISTOPHE NAVE, McGill University, RODOLFO ROSALES, Massachusetts Institute of Technology — The Poisson equation with jump discontinuities across an interface is of central importance in Computational Fluid Dynamics. In prior work, Marques, Nave, and Rosales have introduced a method to obtain fourth-order accurate solutions for the constant coefficient Poisson problem. Here we present an extension of this method to solve the variable coefficient Poisson problem to fourth-order of accuracy. The extended method is based on local smooth extrapolations of the solution field across the interface. The extrapolation procedure uses a combination of cubic Hermite interpolants and a high-order representation of the interface using the Gradient-Augmented Level-Set technique. This procedure is compatible with the use of standard discretizations for the Laplace operator, and leads to modified linear systems which have the same sparsity pattern as the standard discretizations. As a result, standard Poisson solvers can be used with only minimal modifications. Details of the method and applications will be presented.

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Date submitted: 06 Aug 2010 Electronic form version 1.4