Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Dimensionally-split provably stable cut-cell approach for flow calculations NEK SHARAN, PETER BRADY, DANIEL LIVESCU, Los Alamos National Laboratory — Cartesian cut-cell approaches belong to a class of immersed boundary methods that allow sharp representation of solid boundaries in a fluid domain. A Cartesian discretization for the entire computational domain highly simplifies grid generation for fluid-flow simulations over complex geometries and improves computational efficiency by providing a structured framework. This talk will discuss a finite-difference cut-cell approach that, by construction, is dimensionally split and addresses the small-cell problem without compromising on global high-order accuracy. A framework to prove time-stability with strong (or exact) boundary conditions is employed to obtain boundary stencils for centered interior schemes to solve hyperbolic and parabolic systems on cut-cell grids. Characteristic boundary treatment is used to apply the developed approach to embedded boundaries in fluid-flow calculations. Various linear and non-linear numerical tests that verify the accuracy and stability of the method will be presented.

Nek Sharan
Los Alamos National Laboratory

Date submitted: 07 Aug 2020 Electronic form version 1.4