Abstract Submitted
for the APR17 Meeting of
The American Physical Society

A Discontinuous Galerkin Method Compatible with the BSSN Formulation of the Einstein Equations[1] JONAH MILLER, Univ of Guelph, ERIK SCHNETTER, Perimeter Institute for Theoretical Physics — The BSSN formulation of the Einstein equations has repeatedly demonstrated its robustness. The formulation is not only stable but allows for puncture-type evolutions of black hole systems. Discontinuous Galerkin Finite Element (DGFE) methods offer a mathematically beautiful, computationally efficient, and highly parallelizable way to solve hyperbolic PDEs. These properties make them highly desirable for numerical relativity. To-date no one has been able to solve the full (3+1)-dimensional BSSN equations using DGFE methods. This is partly because DGFE discretization often occurs at the level of the equations, not the derivative operator, and partly because DGFE methods are traditionally formulated for manifestly flux-conservative systems. By discretizing the derivative operator, we generalize a particular flavor of DGFE methods, Local DG methods, to solve arbitrary second-order hyperbolic equations. This generalization allows us to solve the BSSN equations.

[1]The authors acknowledge support from the Natural Sciences and Engineering Research Council of Canada and from the National Science Foundation of the USA (OCI 0905046, PHY 1212401)

Jonah Miller
Univ of Guelph

Date submitted: 17 Oct 2016 Electronic form version 1.4