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**Application of Mimetic Operators to Tetrahedral Mesh MHD Codes** GEORGE MARKLIN, TOM JARBOE, Plasma Science & Innovation Center, University of Washington — Mimetic operators are numerical approximations to the grad, div and curl operators that 'mimic' the orthogonality properties of their analytic counterparts, div(curl)=0 and curl(grad)=0. They define different components of vector fields at different parts of the mesh and can be viewed as a special type of finite element basis and can be defined to arbitrarily high order. They have been used in electromagnetic simulation codes for many years. This poster will show how they can be defined to lowest order on a tetrahedral mesh and applied to Taylor state computations and to the induction equation in an MHD simulation. They have the advantage of being able to exactly maintain zero divergence in both the magnetic field and current density and to make an exact separation of static and inductive electric fields. Mimetic Operators can also be used in the momentum equation and the results will be compared to other commonly used methods like the finite volume and discontinuous Galerkin methods. The new code will be used to run simulations of the HIT-SI experiment with insulated conductor boundary conditions and different injector configurations and results compared to the experiment and to simulations done with the NIMROD code.

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