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Tetrahedral Mesh MHD Simulations and Taylor States of HIT-SI

GEORGE MARKLIN, TOM JARBOE, Plasma Science and Innovation Center, University of Washington, Seattle, WA 98195 — This poster will report on progress to validate a tetrahedral mesh resistive MHD code by doing simulations of the HIT-SI experiment at the University of Washington and comparing the results to experimental data and to Taylor state calculations. The experiment has two AC helicity injectors which generate a rotating n=1 field structure that is expected to undergo Taylor relaxation (magnetic reconnection conserving global helicity) to form and sustain a time independent n=0 spheromak. Taylor state calculations show what is to be expected if complete relaxation occurs. MHD simulations will show varying degrees of relaxation depending on how much physics is included in the MHD model. Initial simulations will only include resistive MHD and should underestimate the rate of magnetic reconnection and the amount of relaxation that occurs. Experimental observations should be bracketed by the simulation results and the Taylor states. Comparisons of predicted magnetic field structure from the MHD simulations and the Taylor states to probe and flux loop measurements will indicate how much relaxation is occurring and whether the physics included in the MHD model is adequate to predict it. Over time, more physics will be added into the MHD code until predictability is achieved.

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