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Charge Fusion Product Trajectory Simulations[1] OMAR LEON, Florida International University, PRINCETON PLASMA PHYSICS LABORATORY COLLABORATION, MEGA AMP SPHERICAL TOKAMAK, CULHAM CENTRE FOR FUSION ENERGY COLLABORATION — Spherical tokamaks use magnetic fields to produce and confine plasmas, which are hot ionized gases. Due to the magnetic properties of plasmas and the magnetic fields of tokamaks, current diagnostics focus on detecting neutral particles. When the temperature of plasmas, composed of hydrogen isotopes, reach approximately 100 million degrees Celsius, the isotopes react with one another emitting protons and other charged particles. These reactions are called fusion reactions. A new diagnostic, the charged fusion product diagnostic, is geared towards detecting protons, tackling the issue of particles interacting with magnetic fields, in order to expand the methods of studying plasmas. However, the complex nature of plasmas and the magnetic fields makes calculating many plasma properties analytically impossible. A program called the Orbit Code was developed and tailored to the requirements of the diagnostic in order to numerically calculate charged particle trajectories in the tokamak's plasmas. This Orbit Code was used to determine the trajectories of protons emitted from fusion reactions inside in the Mega Amp Spherical Tokamak (MAST) located at the Culham Centre for Fusion Energy (CCFE). Using these predictions, the diagnostic can be placed in the locations that most effectively samples the plasmas.

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