Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

One-dimensional MHD simulations of MTF systems with compact toroid targets and spherical liners IVAN KHALZOV, RYAN ZINDLER, SANDRA BARSKY, MICHAEL DELAGE, MICHEL LABERGE, General Fusion Inc. — One-dimensional (1D) MHD code is developed in General Fusion (GF) for coupled plasma-liner simulations in magnetized target fusion (MTF) systems. The main goal of these simulations is to search for optimal parameters of MTF reactor, in which spherical liquid metal liner compresses compact toroid plasma. The code uses Lagrangian description for both liner and plasma. The liner is represented as a set of spherical shells with fixed masses while plasma is discretized as a set of nested tori with circular cross sections and fixed number of particles between them. All physical fields are 1D functions of either spherical (liner) or small toroidal (plasma) radius. Motion of liner and plasma shells is calculated self-consistently based on applied forces and equations of state. Magnetic field is determined by 1D profiles of poloidal and toroidal fluxes – they are advected with shells and diffuse according to local resistivity, this also accounts for flux leakage into the liner. Different plasma transport models are implemented, this allows for comparison with ongoing GF experiments. Fusion power calculation is included into the code. We performed a series of parameter scans in order to establish the underlying dependencies of the MTF system and find the optimal reactor design point.

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Date submitted: 14 Jul 2017 Electronic form version 1.4