Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Physics objectives of PI3 spherical tokamak program STEPHEN HOWARD, MICHEL LABERGE, MERITT REYNOLDS, PETER O'SHEA, RUSS IVANOV, WILLIAM YOUNG, PATRICK CARLE, AARON FROESE, KELLY EPP, General Fusion — Achieving net energy gain with a Magnetized Target Fusion (MTF) system requires the initial plasma state to satisfy a set of performance goals, such as particle inventory (10^{21} ions), sufficient magnetic flux ($0.3Wb$) to confine the plasma without MHD instability, and initial energy confinement time several times longer than the compression time. General Fusion (GF) is now constructing Plasma Injector 3 (PI3) to explore the physics of reactor-scale plasmas. Energy considerations lead us to design around an initial state of Rvessel = 1 m. PI3 will use fast coaxial helicity injection via a Marshall gun to create a spherical tokamak plasma, with no additional heating. MTF requires solenoid-free startup with no vertical field coils, and will rely on flux conservation by a metal wall. PI3 is 5x larger than SPECTOR so is expected to yield magnetic lifetime increase of 25x, while peak temperature of PI3 is expected to be similar (400-500 eV) Physics investigations will study MHD activity and the resistive and convective evolution of current, temperature and density profiles. We seek to understand the confinement physics, radiative loss, thermal and particle transport, recycling and edge physics of PI3.

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Date submitted: 14 Jul 2017 Electronic form version 1.4