

Abstract Submitted
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Disruption Mitigation with Hyper-Velocity High-Density C60-Fullerene Plasma Jets¹ I.N. BOGATU, S.A. GALKIN, J.S. KIM, FAR-TECH, Inc. — Disruption mitigation in ITER must be a reliable technique with real-time capability. Impurity injection is proposed to convert the plasma energy density (~ 1 GJ in 840 m^3) into radiation power in ~ 1 ms and to increase the electron density by two orders of magnitude all over the plasma cross section to suppress the runaway electrons avalanche. But once the impurity atoms are ionized in the thin outer layer of tokamak plasma they can no longer penetrate the confining magnetic field unless they have high velocity. We propose to use hyper-velocity high-density C60-fullerene plasma jets to penetrate into the core tokamak plasma and deliver the necessary mass. We present the following key elements of our concept: a large mass (~ 2 g) of molecular gas produced in a pulsed power source, maximized injection velocity into plasma gun by Laval micro-nozzles grid, plasma slug acceleration to hyper-velocity (~ 30 km/s), atomic processes during the plasma jet transport, jet penetration into the tokamak hot plasma and confining magnetic field, and a feasibility study of a proof-of-principle experiment on DIII-D.

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