

Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Hyper-Velocity C60-Fullerene Plasma Jets for Disruption Mitigation and HEDP¹ I.N. BOGATU, S.A. GALKIN, J.S. KIM, FAR-TECH, Inc. — ITER needs a reliable disruption mitigation technique with real-time capability. The basic approach is to convert the plasma energy density (~ 1 GJ in 840 m^3) into radiation power within 1 ms and increase the electron density by two orders of magnitude all over the plasma cross section to suppress the runaway electrons avalanche. Impurity injection is the principle solution, 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 present the concept of producing and using hyper-velocity high-density C60-fullerene plasma jets to penetrate into the core tokamak plasma and deliver the necessary mass. We show that plasma slug model indicates that, by using a capacitive driver of 3 MJ, a C60-fullerene jet of 2.5 g can reach 30 km/s and penetrate half minor radius of ITER plasma. The heavy ion component leads to a high Mach number of the high density (10^{17} cm^{-3}) plasma jet making it an attractive candidate for HEDP studies.

¹Work supported by the US DOE SBIR program and the US DOE Office of Fusion Energy Sciences.

Ioan-Niculae Bogatu
FAR-TECH, Inc.

Date submitted: 23 Jul 2007

Electronic form version 1.4