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Probing Runaway Electrons with Nanoparticle Plasma Jet[1] I.N. BOGATU, J.R. THOMPSON, S.A. GALKIN, J.S. KIM, FAR-TECH, Inc. — The injection of C_{60}/C nanoparticle plasma jet (NPPJ) into tokamak plasma during a major disruption has the potential to probe the runaway electrons (REs) during different phases of their dynamics and diagnose them through spectroscopy of C ions visible/UV lines. A C_{60}/C NPPJ of $\sim$ 75 mg, high-density ($>10^{23}$ m^{-3}), hyper-velocity (>4 km/s), and uniquely fast response-to-delivery time ($\sim$ 1 ms) has been demonstrated on a test bed. It can rapidly and deeply deliver enough mass to increase electron density to $\sim 2.4 \times 10^{21}$ m^{-3}, $\sim$ 60 times larger than typical DIII-D pre-disruption value. We will present the results of our investigations on: 1) C_{60} fragmentation and gradual release of C atoms along C_{60} NPPJ penetration path through the RE carrying residual cold plasma, 2) estimation of photon emissivity coefficient for the lines of the C ions, and 3) simulation of C_{60}/C PJ penetration to the RE beam location in equivalent conditions to the characteristic $\sim$ 1 T B-field of DIII-D. The capabilities of this injection technique provide a unique possibility in understanding and controlling the RE beam, which is a critical problem for ITER.

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