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Modeling and Simulation for Nanoparticle Plasma Jet Diagnostic Probe for Runaway Electron Beam-Plasma Interaction[1] I. N. BOGATU, S. A. GALKIN, FAR-TECH, Inc. — The C_{60} nanoparticle plasma jet (NPPJ) rapid injection into a tokamak major disruption is followed by C_{60} gradual fragmentation along plasma-traversing path. The result is abundant C ion concentration in the core plasma enhancing the potential to probe and diagnose the runaway electrons (REs) during different phases of their dynamics. A C_{60}/C NPPJ of ˜75 mg, high-density ($>10^{23}$ m^{-3}), hyper-velocity (>4 km/s), and uniquely fast response-to-delivery time (˜1 ms) has been demonstrated on a test bed. It can rapidly and deeply deliver enough mass to increase electron density to ˜2.4x10^{21} m^{-3}, ˜60 times larger than typical DIII-D pre-disruption value. We will present the results of our on-going work on: 1) self-consistent model for RE current density evolution (by Dreicer mechanism and "avalanche") focused on the effect of fast and deep deposition of C ions, 2) improvement of single C_{60}^{q+} fragmenting ion penetration model through tokamak B(R)-field and post-TQ plasma, and 3) simulation of C_{60}^{q+} PJ penetration through the DIII-D characteristic ˜2 T B-field to the RE beam central location by using the Hybrid Electro-Magnetic 2D code (HEM-2D.

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