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Rotating Magnetic Field sustainment of hot FRCs at high zeta
ALAN HOFFMAN, HOUYANG GUO, RICHARD MILROY, University of Washington — Ultra high vacuum modifications to the TCS device have allowed FRCs to be formed and sustained by Rotating Magnetic Fields (RMF) at temperatures well over 100 eV, without increasing the RMF magnitude, B_ω. The higher temperatures result in much higher magnetic fields, B_e, and significantly higher ratios of $B_{e/}B_\omega$. The ratio of average electron rotational speed to RMF frequency, called zeta, approaches unity, resulting in a maximum possible applied RMF torque on the electrons. Power is absorbed by the plasma due to oscillating axial currents (which create the azimuthal torque), proportional to B_ω^2, and due to the azimuthal FRC currents, proportional to B_e^2. Comparison of torques and powers at high and low zeta conditions shows that at low values of B_e/B_ω, most of the power absorption is due to the axial currents (proportional to B_ω^2), but at values of B_e/B_ω exceeding 10, this component becomes insignificant. Under such conditions, the cross-field plasma resistivities are only about one order of magnitude higher ($\sim$20 $\mu\Omega$-m) than necessary for modest sized reactor efficiencies.

Alan Hoffman
University of Washington

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