

Abstract Submitted
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Experiment to Explore Superconducting Coil in Close Proximity to FRC Plasmas¹ S.J. THOMAS, C.P.S. SWANSON, Princeton Satellite Systems, S.A. COHEN, Princeton Plasma Physics Laboratory — We have designed and built an 0.5 Tesla LTS superconducting coil testbed as part of our PFRC research program. The PFRC-3 would be a steady-state FRC fusion-oriented plasma experiment with about 1 Tesla magnetic field. Similar systems can provide the bias field of pre-magnetized HED plasmas, and to demonstrate diagnostics, principles, and scaling laws at weaker fields. Our coil comprises a split pair of winding packs (ID = 25 cm, length 25 cm) to mimic a subset of the PFRC-3 magnets. A separate pulsed copper coil, inserted into the bore of the LTS coil, simulates the plasma, enabling us to study the impact of plasma startup, termination, and instabilities and equipment failures. FRC formation in a PFRC will occur in a fraction of a second and result in rapid increases in magnetic field at the windings, ameliorated, in part, by a conducting bobbin on which the LTS is wound. Depending on Covid restrictions, we plan to drive 365 A in the pulsed coil with a rise time of 15 ms, inducing a flux of 6 mVs and a current of 7 A in the LTS, to be measured with diamagnetic loops and Gauss meters. Access ports through the LTS magnet case allows radial profile measurement.

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