Abstract Submitted
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Development of a rotating magnetic field experiment for the Big Red Ball[1] S. P. OLIVA, K. J. MCCOLLAM, O. ZHANG, C. B. FOREST, UW-Madison — We are developing a rotating magnetic field (RMF) experiment to emulate a pulsar wind in the Big Red Ball (BRB) device at the Wisconsin Plasma Physics Laboratory. In the design, two coils are arranged in a quasi-Helmholtz configuration, and a second coil pair is orthogonally placed to form a square array, situated at the BRB core with coil axes in the equatorial plane. The application of quadrature-phased coil currents produces the RMF, which is to be the plasma source and driver. We present design development work, in particular on the power amplifier that is to source the RMF. Target field strengths at a 6 kHz drive frequency demand induction levels of $\sim$ 30 kA-turns, or power levels of $\sim$1.5 MVA per channel. We estimate that an optimized high-Q resonant configuration can sustain the large circulating currents with only $\sim$150–200 kW of circuit losses. Simulations suggest a loose-coupled double-resonant tuned circuit can be used to match the nominal 200 Ω class-C amplifier plate impedance to the 50 mΩ drive coil impedance. Simulation studies are to be compared with experimental measurements of prototype operation.

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