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Third-Scale Prototype of a Shielded Magnet for Measurement of the Electric Dipole Moment of the Neutron ARITRA BISWAS, Kellogg Radiation Laboratory, California Institute of Technology — Discovery of an electric dipole moment in neutrons (nEDM) would be a novel instance of CP violation, with implications for extending the Standard Model and potentially helping explain matter-antimatter asymmetry. Experiments using shifts in polarized neutron spin-precession frequency to measure the nEDM are prone to a geometric phase (GP) effect, caused by gradients of the magnetic field, that can create a false signal. Preventing the GP effect requires precise engineering to create a space-uniform magnetic field. We present a third-scale prototype of a shielded magnet suitable for a more precise nEDM measurement, with improvements over earlier models. The field is produced by a $\cos\theta$ coil wound with superconducting (SC) wire. Two cylindrical shields made of ferromagnetic Metglas and SC lead surround the magnet; the lead shield is closed on top and bottom with SC lead endcaps. An aluminum shell surrounds these components and serves as a vacuum chamber, cooling its interior to 4 K such that the coil wire and lead shield become SC. A cavity in this shell serves as a warm bore, allowing a magnetic probe to explore the field around fiducial volumes which will be used to measure the nEDM in the full-scale experiment. The magnetic field profile of this prototype is presented.

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