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High field HTS R&D solenoid for muon collider

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Abstract: This paper describes a high field High Temperature Superconductor (HTS) solenoid program with a goal to generate over 20 T field by itself and approach 40 T in a background field of ~20 T. The HTS solenoidal magnet is being built as a part of an R&D program to develop technologies for a muon cooling system and to test the limit of high field magnet technology. It is funded under a series of SBIR (Small Business Innovative Research) awards to Particle Beam Lasers, Inc. (PBL), with Brookhaven National Laboratory (BNL) being a research partner to build and test the magnet. The magnet consists of two concentric solenoids, each made with the second generation (2G) high engineering current density HTS tape from SuperPower. The first ~10 T solenoid has an inner diameter of ~100 mm and outer diameter of ~165 mm; the second ~12 T solenoid will have an inner diameter of 25 mm and outer diameter of 95 mm. Several double pancake coils of the first solenoid have already been built and tested in the temperature range between ~4 K and ~80 K. The two solenoids will be nested to generate over 20 T and will be tested at BNL and then in the background field of the ~20 T large-bore magnet at the National High Field Magnet Lab (NHFML) in Florida. Quench protection, high stresses and minimization of degradation are some of the major challenges associated with this program. We will review the status of this program and discuss the overall plan.
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