

Project Summary/Abstract

Company Name: Particle Beam Lasers, Inc.[PBL]
Address: 18925 Dearborn Street
Northridge, CA 91324-2807
Principal Investigator: Erich H. Willen
Project Title: Magnet Coil Designs Using YBCO High Temperature Superconductor
Topic No: **30:** High-Field Superconductor and Superconducting Magnet Technologies for High Energy Particle Colliders
Subtopic: **b:** Superconducting Magnet Technology

High magnetic fields approaching 25 T are needed for significant advances in the physics reach of colliders for high energy physics. The new Large Hadron Collider (LHC) at CERN needs high field magnets for planned energy and luminosity upgrades. The envisioned Muon Collider needs such magnets in several areas of the machine. High Temperature Superconductors (HTS) currently offer the best chance of producing hybrid magnets for these applications because HTS has a significantly higher critical current density than any other superconductor at high fields.

In Phase I, we propose to build coil segments in several configurations using YBCO HTS tape. This will reveal the challenges to be faced in using this material. We will consider design variations and construction techniques required to build working coils. Once built, we will measure the performance of these coil segments in liquid nitrogen.

In Phase II, we would build coils and assemble small magnets using the parameters indicated in Phase I. These magnets would be tested as inserts in available dipole magnets to study their performance in background fields. Such tests would simulate the conditions of an eventual hybrid magnet in which Low Temperature Superconductor (LTS) and HTS are paired to produce 20 T and above.

Commercial Applications and Other Benefits: The use of HTS in a practicable and proven way would be beneficial in many technological areas that require magnetic fields to be produced economically (for the overall system) and reliably. Such areas include the production and distribution of electrical energy, the growing communications industry, and the accelerating demands for medical and security-related devices. It would also advance the technology of producing newer and better types of HTS material as the vendors of these products respond to and are supported by the developing demand for their efforts.

Key Words: HTS, YBCO, hybrid magnet, high field magnet

Summary for Members of Congress: This SBIR will advance the use of an exciting new technology for generating magnetic fields. Immediate applications in particle physics are expected and numerous areas of technology could benefit if the work is successful. Young researchers will have the opportunity to contribute significantly to the work of this SBIR.