

## Project Summary/Abstract

**1. Company Name:** Particle Beam Lasers, Inc., Northridge, CA 91324-2807

**2. Project Title:** Magnet Coil Designs Using YBCO High Temperature Superconductor

**3. Principal Investigator:** Erich Willen, PhD.

**4. Topic number/subtopic letter:** 30b

**5. Problem being addressed:** Basic research in nuclear and high energy physics requires particle beams with increased energy and intensity. Improved beams would also be helpful for medical applications, material and biological sciences, and security/defense applications. Magnets are required to produce such beams, and magnets built with High Temperature Superconductor in principle offer the needed improvements.

**6. Addressing the problem:** These projects seek to develop the improved magnets. Currently available High Temperature materials have significantly different electrical and mechanical characteristics than their Low Temperature predecessors. These differences require a program to master their properties and using those properties, to build actual magnets for the improved beams of interest. The  $\cos \theta$  magnet being proposed here is the first time this promising type of design is being used with HTS conductors.

**7. Phase I Work:** Lengths of the new superconductor were obtained in a configuration as would be required in a magnet. Tooling was built to make windings of the proposed dimensions. The windings were built and tested. It was learned that the conductor could survive the handling and fabrication, opening the door to building an actual magnet in Phase II. Calculations in several technical areas related to conductor performance indicated that their more peculiar properties might be tolerable in a magnet.

**8. Phase II Work:** Designs for a complete magnet will be made incorporating the findings from Phase I regarding handling and wrapping of the conductor. Tooling and parts including the conductor will be procured. At least one magnet will be built and tested. If successful, plans will be made to extend the construction effort in Phase III in order to solidify this promising approach.

**9. Commercial Applications:** The companies making these new conductors will be supported and encouraged. Prices will decline as manufacturing experience is obtained. Many applications requiring magnets could benefit from the knowledge gained here. High Temperature Superconductors promise to become a foundation for progress in many technical areas, even whole existing and new industries.

**10. Key Words:** magnets, superconducting, high temperature superconductor, accelerator

**11. Summary for Members of Congress:** High Temperature Superconductors are needed to build the next generation of magnets for accelerators, medical applications, homeland security applications, and defense systems. This work will develop a new way to use these new and exciting materials in many types of magnets and could lead to new research and industrial technologies.