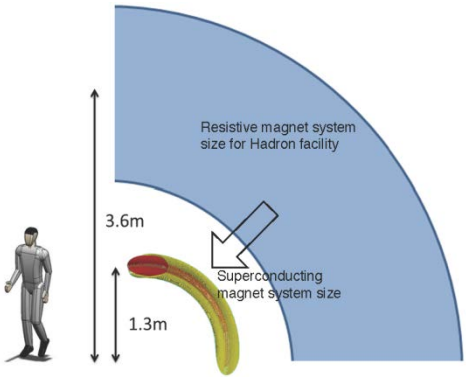
**Innovative Cancer Therapies Are a Focus of New DOE Accelerator Stewardship Grants**

The U.S. Department of Energy today announced six new grants to advance the science and technology of particle accelerators, including two grants aimed specifically at developing innovative accelerator-based treatments of cancer. The six grants, awarded on a competitive basis by the Department's Office of Science, seek to improve accelerator technologies across a wide range of applications, including accelerator-based scientific research in such fields as particle physics and materials science, uses of accelerators for industry and defense, and medical applications for advanced cancer therapies.

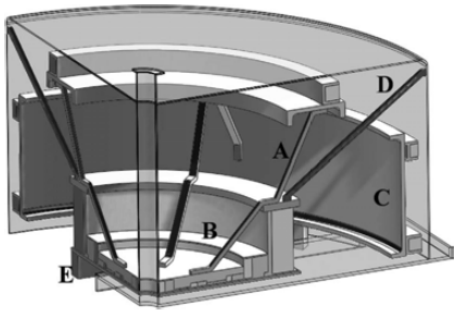
In developing the current grants, the DOE Office of Science, led by its High Energy Physics program, worked closely with the National Cancer Institute of the National Institutes of Health to target technologies that could contribute to innovative cancer therapies. In particular, the grants focus on particle-beam-based therapies, which hold out the promise of accurately targeting cancerous tumors while avoiding damage to healthy tissue.

The grants, awarded as part of the DOE Office of Science Accelerator Stewardship program, include the following:




*LBNL's Superconducting Gantry Dipole*

***Lawrence Berkeley National Laboratory,*** the ***Paul Scherrer Institute,*** and ***Varian Particle Therapy, Inc.*** will develop light-weight superconducting magnet technology that will reduce the size and weight of particle beam delivery systems by nearly a factor of 10. Leveraging technologies and techniques developed for the magnets of the Large Hadron Collider, a prototype gantry bending magnet will be built and tested.




*MIT's Ironless Cyclotron*

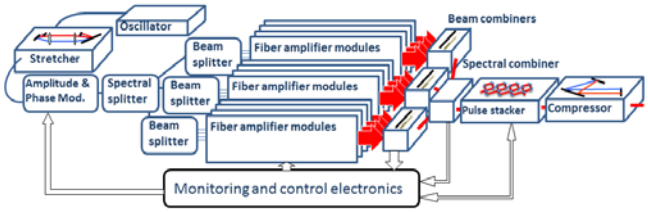
The ***Massachusetts Institute of Technology*** and ***ProNova Solutions, LLC*** will develop an innovative design for an ironless superconducting cyclotron capable of providing particle beams for cancer therapy. Cyclotrons today account for nearly 60% of all particle beam therapy machines in the world. This iron-free design will weigh 6 times less than conventional devices.

In addition to the grants aimed at potential cancer therapies, four grants focus on broad, promising new areas for improving general accelerator performance, including ultrafast laser technology,

energy recapture technology, computer automation of accelerator controls, and techniques increasing beam power.

**Ultrafast Laser Technology R&D for Accelerators**

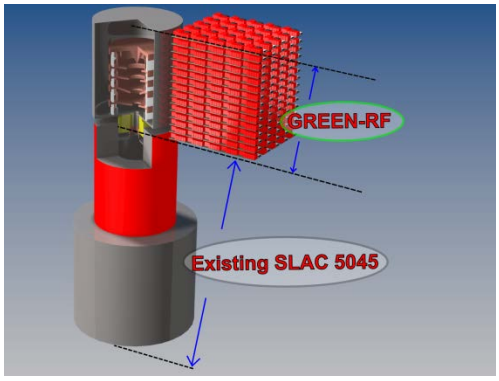
***Lawrence Berkeley National Laboratory***, ***Lawrence Livermore National Laboratory***, and the ***University of Michigan*** will test technologies that promise to increase the speed of laser-based science 1000 times. Ultrafast lasers—emitting pulses a few millionths of a billionth of a second in duration—are widely used in chemistry, biology and material science, and show promise for driving entirely new kinds of compact particle accelerators. The efficiency, reliability, and low cost of fiber lasers have led to rapid growth of their use in material processing industries. Adapting these technologies to produce higher pulse energy will speed ultrafast laser-based science, and enable compact sources of particles for a wide variety of basic research and security applications.




*Coherently combined ultrafast fiber lasers*

**Energy Efficiency Improvements for Office of Science Accelerators**

***SLAC National Accelerator Laboratory*** and ***Communications & Power Industries, LLC*** will develop energy recapture technology that can potentially save $1M per year in operating costs for Basic Energy Sciences' LCLS facility, and which could be applied wherever klystron-powered linacs are used. A significant number of accelerators are powered by high power radiofrequency sources that rarely exceed 50% energy efficiency. The new technology will capture and recycle a significant portion of the unused 50%, raising the energy efficiency to 75%, saving on operating costs and reducing DOE's carbon footprint.




*SLAC/CPI Energy Recapture Technology*

In addition to the applied R&D thrusts described above, the Stewardship program makes long-term investments in basic R&D to develop new concepts, methods, and underlying technologies needed to maintain U.S. leadership in accelerator technology.

***Cornell University*** will apply advanced optimization techniques to automate the control of complex accelerators. Modern accelerators often have thousands of "knobs" that must be precisely tuned to keep the accelerator operating at peak performance. Cornell's automation and optimization techniques will improve the performance of accelerators large and small.

***Texas A&M University*** will explore strong focusing techniques in cyclotrons to increase the beam power that this workhorse accelerator can produce. Widely used for medical and industrial uses, increased beam power equates to increases in material processing throughput and will enable new applications for this well-established technology. TAMU's R&D studies will tackle challenging beam dynamics issues that limit the power cyclotrons can produce.

It is estimated that more than 30,000 particle accelerators are currently operating worldwide, used in industry, energy, the environment, national security, discovery science, and medicine. For decades, the High Energy Physics program within DOE's Office of Science has been major force for the development and advancement of particle accelerator technologies. The current Accelerator Stewardship grants represent a continuation of DOE support for the advancement of accelerators for science, industry, and medicine.