

Taking Advantage of Opportunities in Accelerator Physics to Enhance Nuclear Science

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Perspective

- Design and construction of new particle accelerators essential to the future of nuclear physics
- Quite distinct from those planned for high energy physics
- Low energy accelerators widely used in applications of nuclear physics from medicine to cargo screening
- NP support
 - strong for large accelerator physics efforts at user facilities over many decades
 - accelerator physics and technology at universities has been a very small ad-hoc effort
 - now time to develop an accelerator science and technology program consisting of a coordinated effort between the national laboratories and a modest PI-driven effort at universities
- Effort should be explicit part of the DOE/NSF program mission

National accelerator science and technology program

- Broad-based support for particle accelerator science and technology is widely accepted as a way to reinvigorate physical science.
- Successful PI-driven program would allow the growth of targeted, high priority R&D relevant to nuclear science at universities:
 - young people can be trained and educated in accelerator science and technology.
 - essential for developing the accelerators that are key to our future experimental programs.
- Nuclear science will soon be the steward of the highest energy accelerators operating in the U.S.:
 - vigorous accelerator science R&D effort is essential for continued leadership

National accelerator science and technology program

- Essentially all R&D and training in accelerator physics directly relevant to nuclear science in the U.S. has been carried out in association with national user facilities.
- PI-driven programs can take a broader perspective with relation to exploratory accelerator physics in developing the science and technology for future accelerator initiatives:
 - less subject to local pressures of supporting an operating facility's obligation to satisfy user demands or to support new, large project initiatives.
- Partnership between national laboratories and universities can offer broad intellectual resources both within physics and allied fields such as engineering, optical sciences, and materials sciences:
 - incubation of new ideas and advancing fundamental understanding of accelerator science would be optimized.

National accelerator science and technology program

- Establish accelerator physics as a scientific discipline in a number of physics departments at universities with strong nuclear physics research groups:
 - significantly enhance nuclear science nationally
 - support new faculty and their groups to establish frontier accelerator physics research efforts attracting young people from a new, untapped talent pool
 - support direct societal applications for R&D in accelerator-based, applied nuclear science, particularly on the smaller scale more suited to university-based research:
 - development of ion beams to treat cancer tumors
 - photon and neutron beams to interrogate cargo for dangerous materials
 - sources of terahertz radiation for imaging and materials studies.

Request

"The role of university faculty and students should be expanded in all aspects of accelerator research from operating accelerators to advanced accelerator research. This will allow the breadth of knowledge and expertise that resides at the universities to be brought to accelerator research, and young scientists will have the opportunity to learn and become tomorrow's leaders."

Office of Science Occasional Paper (2003) "Accelerator Technology for the Nation"

- Programs at DOE/NSF would solicit peer-reviewed proposals from PI's at universities to carry out research in accelerator physics relevant to the priorities of nuclear science.
- Grants would support faculty summer salaries, postdocs, students, and equipment.
- We request that the Long Range Plan report include language supportive of a coordinated national program in accelerator science and technology including a PI-driven program that is relevant to U.S. nuclear science.