



U.S. DEPARTMENT OF
ENERGY

Office of
Science

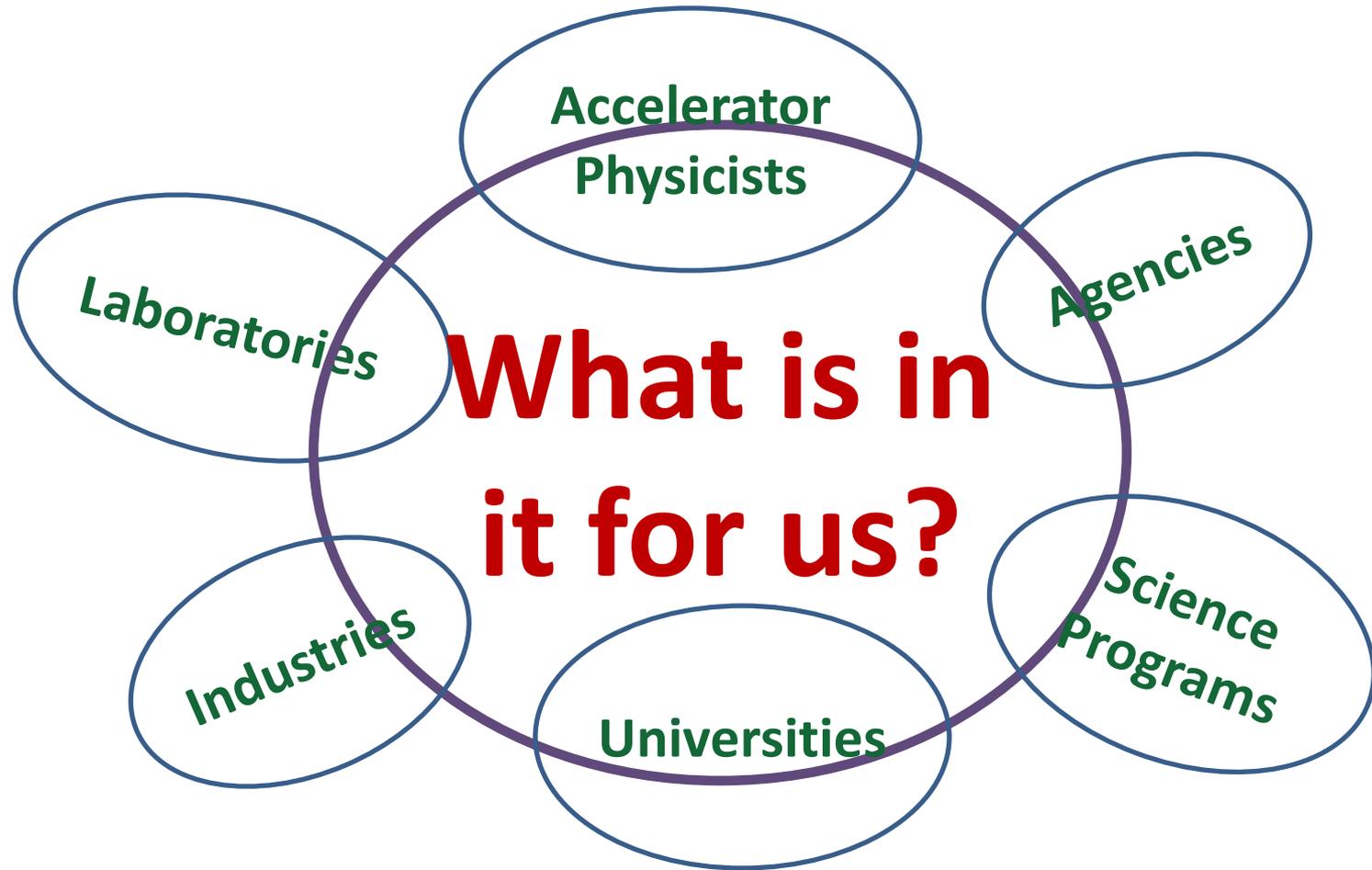
Stewardship for Accelerator Science

L.K. Len
Office of High Energy Physics
Office of Science

June 24, 2011

Other contributors:
John Boger, Bruce Strauss

Motivation...Interest



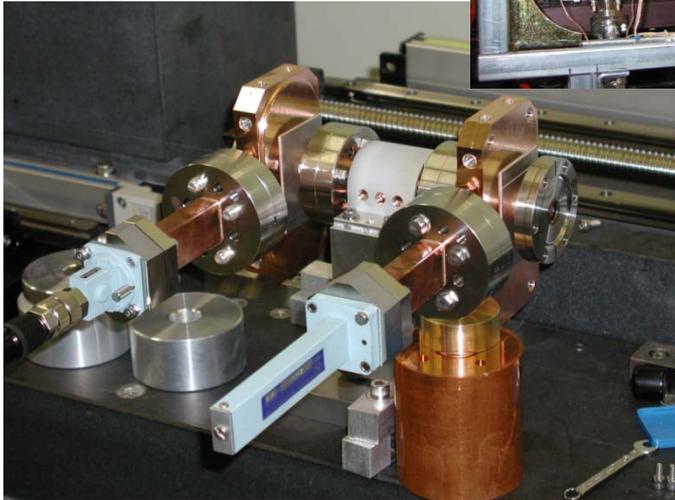
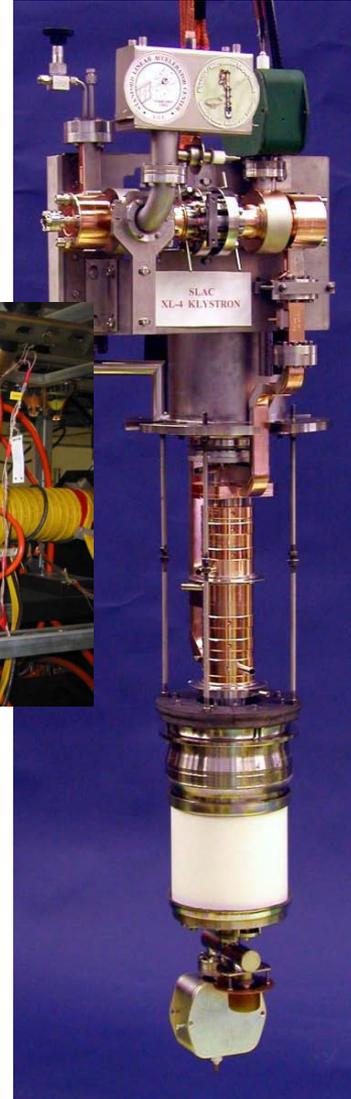
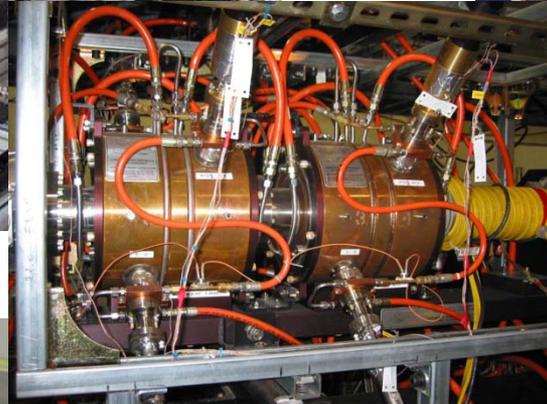
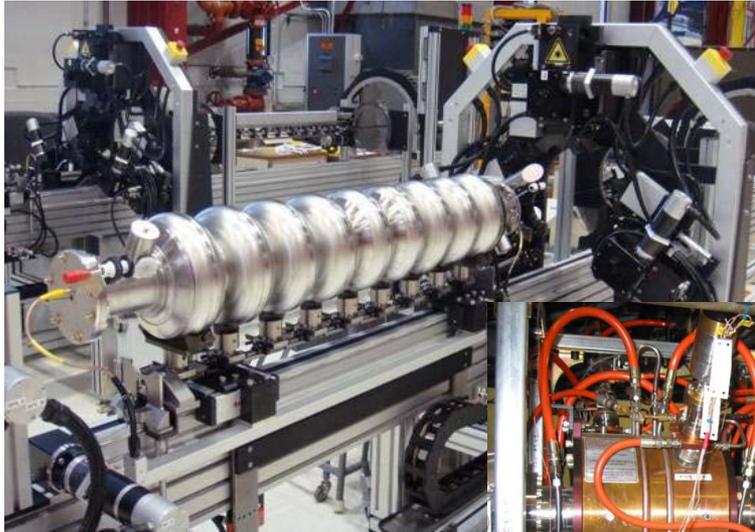
P5 Recommendation

The panel recommends a broad strategic program in accelerator R&D, including work on ILC technologies, superconducting rf, high-gradient normal-conducting accelerators, neutrino factories and muon colliders, plasma and laser acceleration, and other enabling technologies, along with support of basic accelerator science.

- **The current HEP accelerator program follows this course of action, and could position the US to recapture the Energy Frontier in the future.**
- **HEP Accelerator R&D program has always been forward looking.**

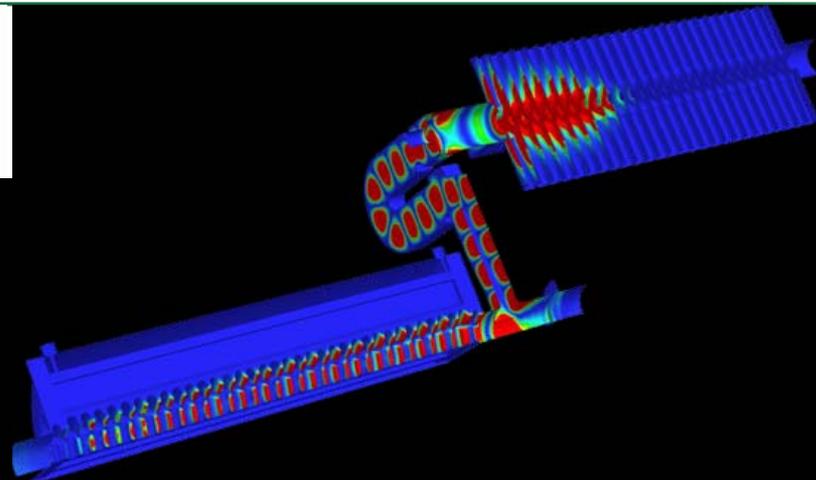
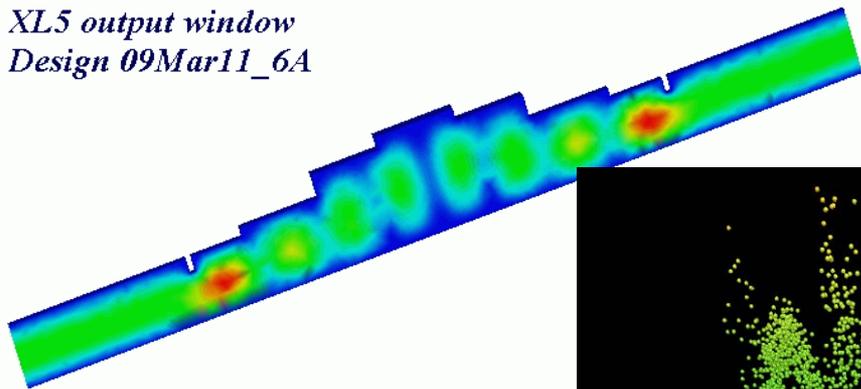


The Program has developed...

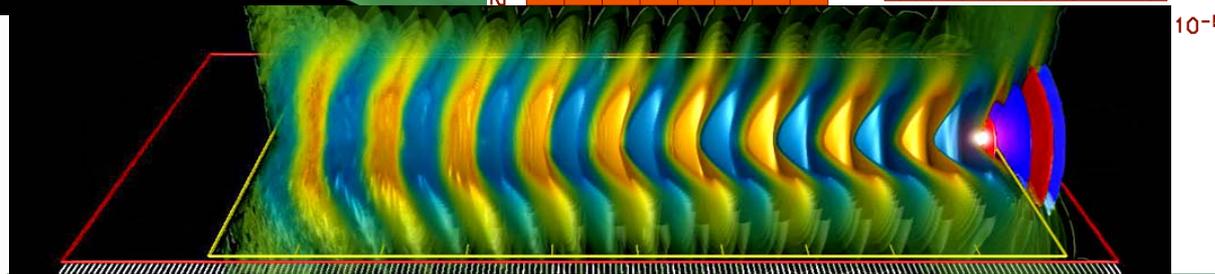
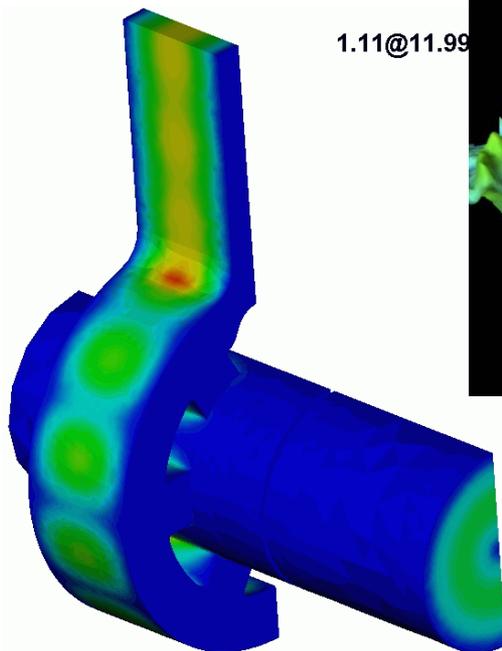
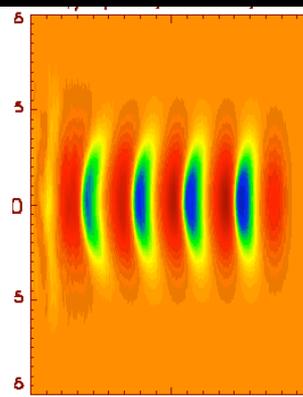
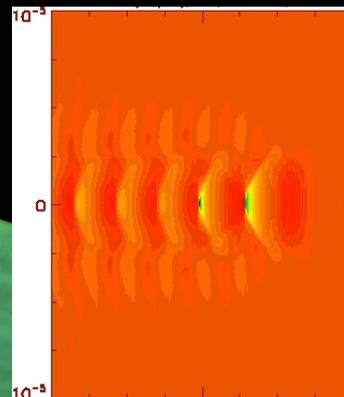
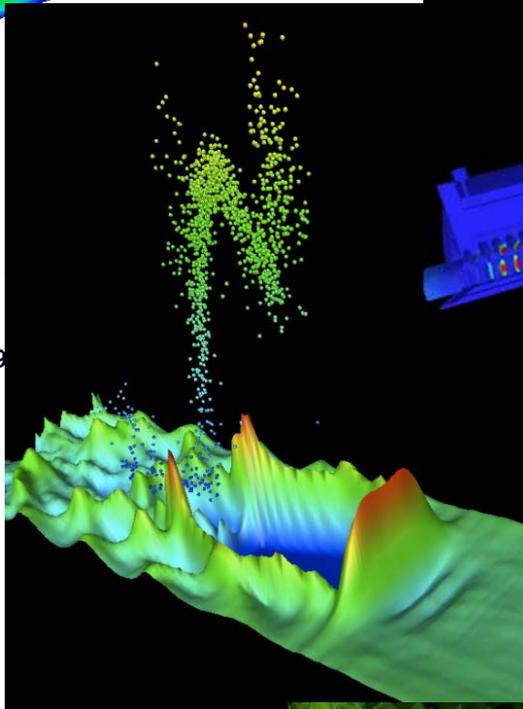


The Program has developed...

*XL5 output window
Design 09Mar11_6A*



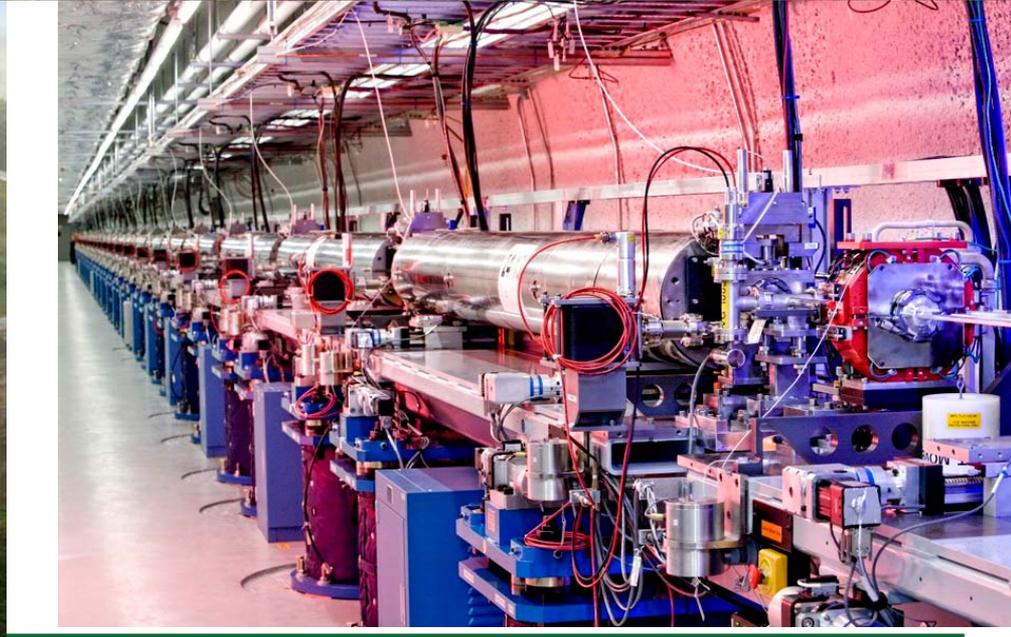
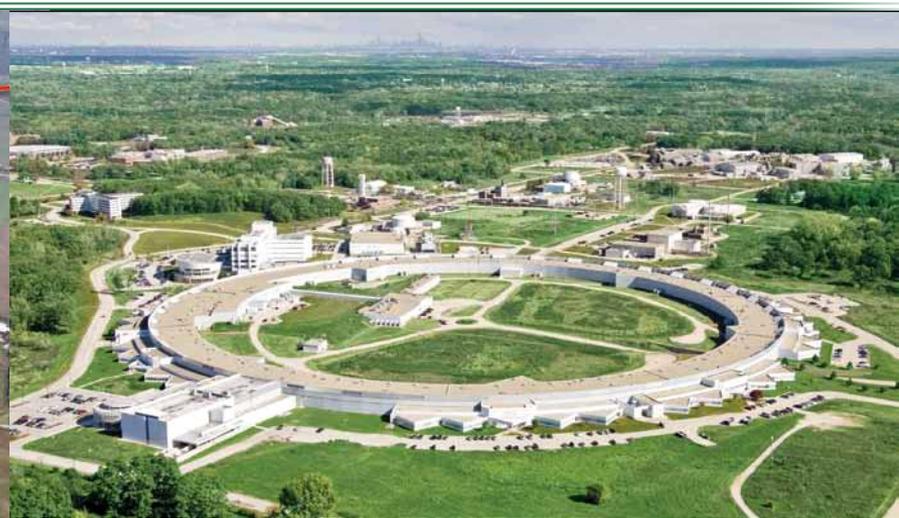
1.11@11.99



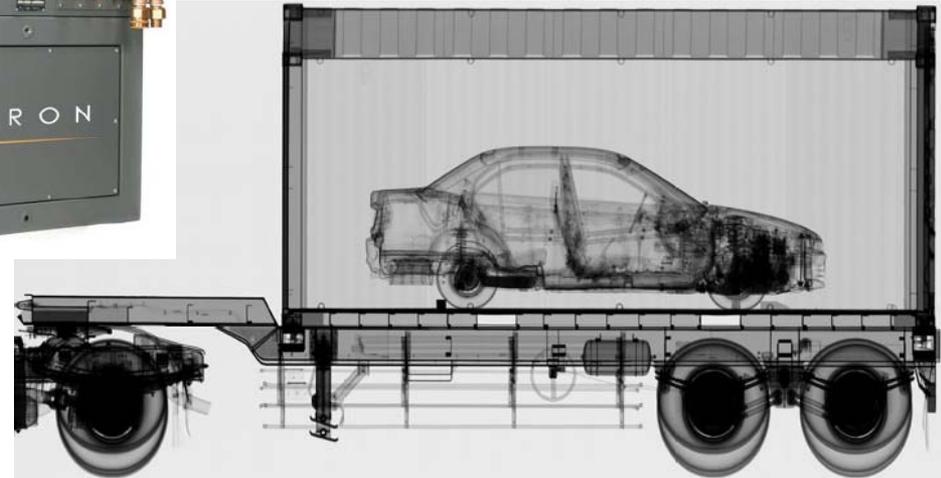
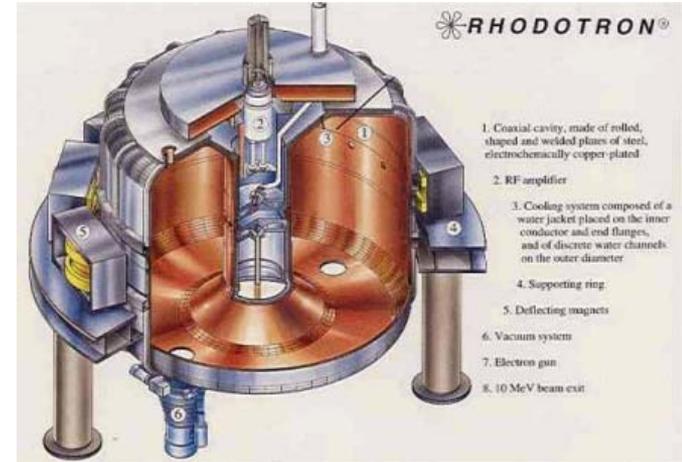
U.S. DEPARTMENT OF
ENERGY

Office of
Science

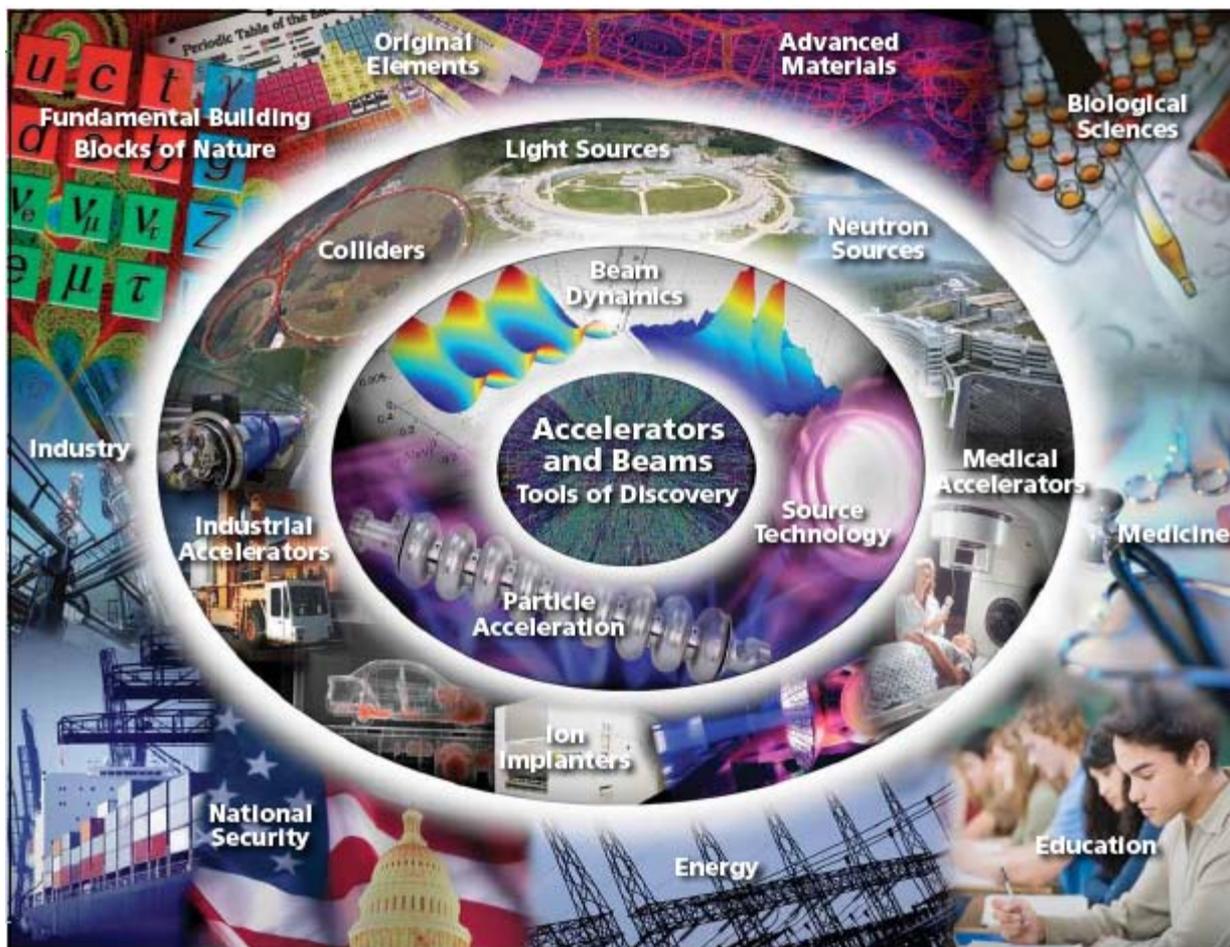
The Program has enabled...



The Program has enabled...



The Program has enabled...



From: "Accelerators and Beams - Tools of Discovery and innovation," the APS Division of Physics of Beams



The Current HEP Accelerator R&D Program

Two major parts of accelerator R&D program:

- Accelerator Science – supports long-term, fundamental research in accelerator science including advanced acceleration concepts, the physics of charged particle beams, theory and computer simulations, beam sources and instrumentations.
- Accelerator Development – supports near- and mid-term R&D on accelerator technologies to bring them to a point where they can be used to improve existing accelerators or for next-generation accelerators



Some Current Accel. Sci. Programs

- **Advanced Wakefield Accelerators**

 - BELLA (LBNL) – Laser-driven

 - FACET (SLAC) – beam-driven

 - AWA (ANL) – beam of rf-driven (dielectrics)

- **Muon Collider and Neutrino Factory**

 - MAP – consolidates NFMCC and MCTF

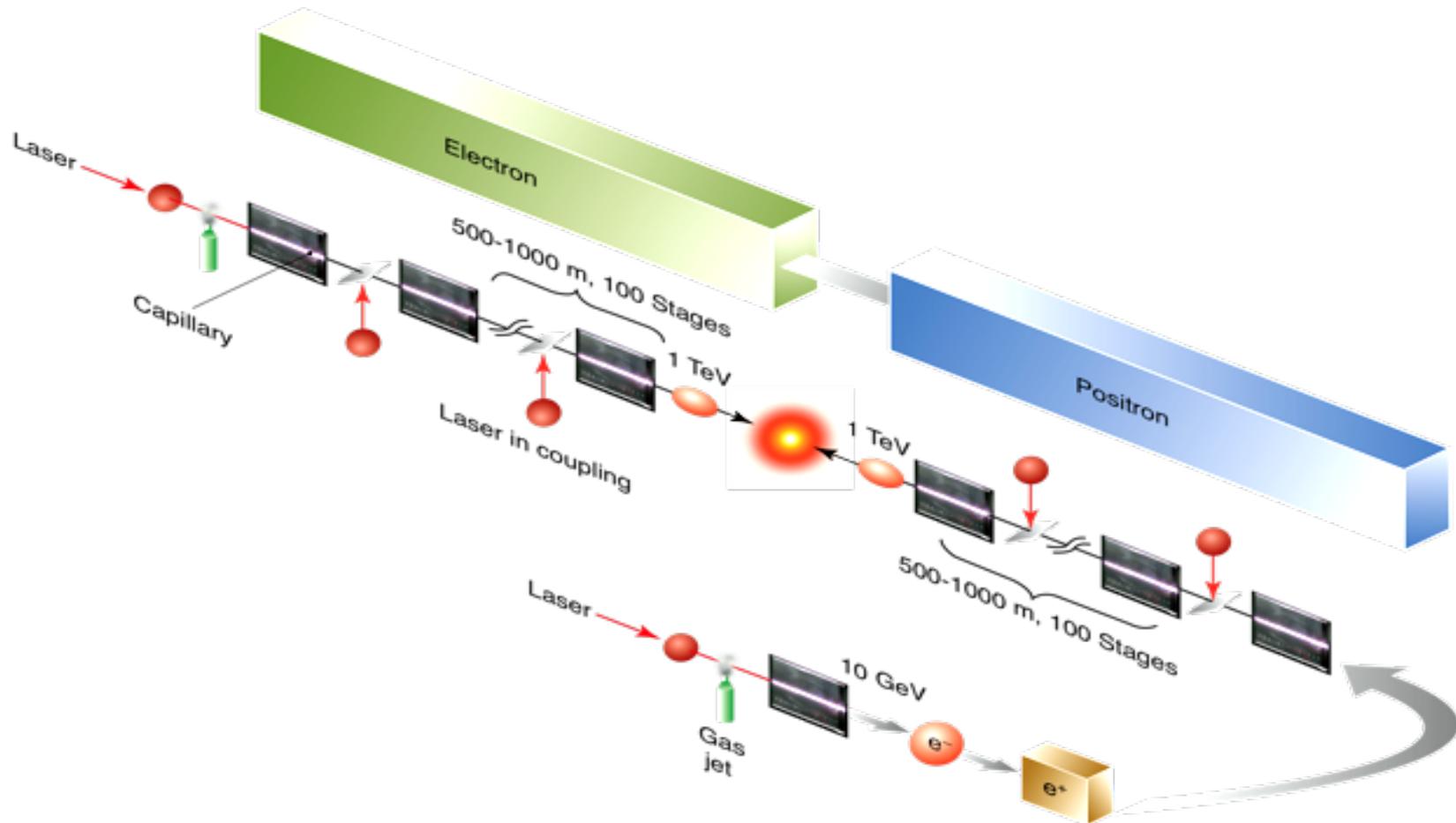
- **Accelerator Test Facility (BNL)**

- **USPAS** – two sessions per year involving on average 150 accelerator physicists, professionals and graduate students in each session. Attendees come from different disciplines and institutions – government, academic, commercial and international.



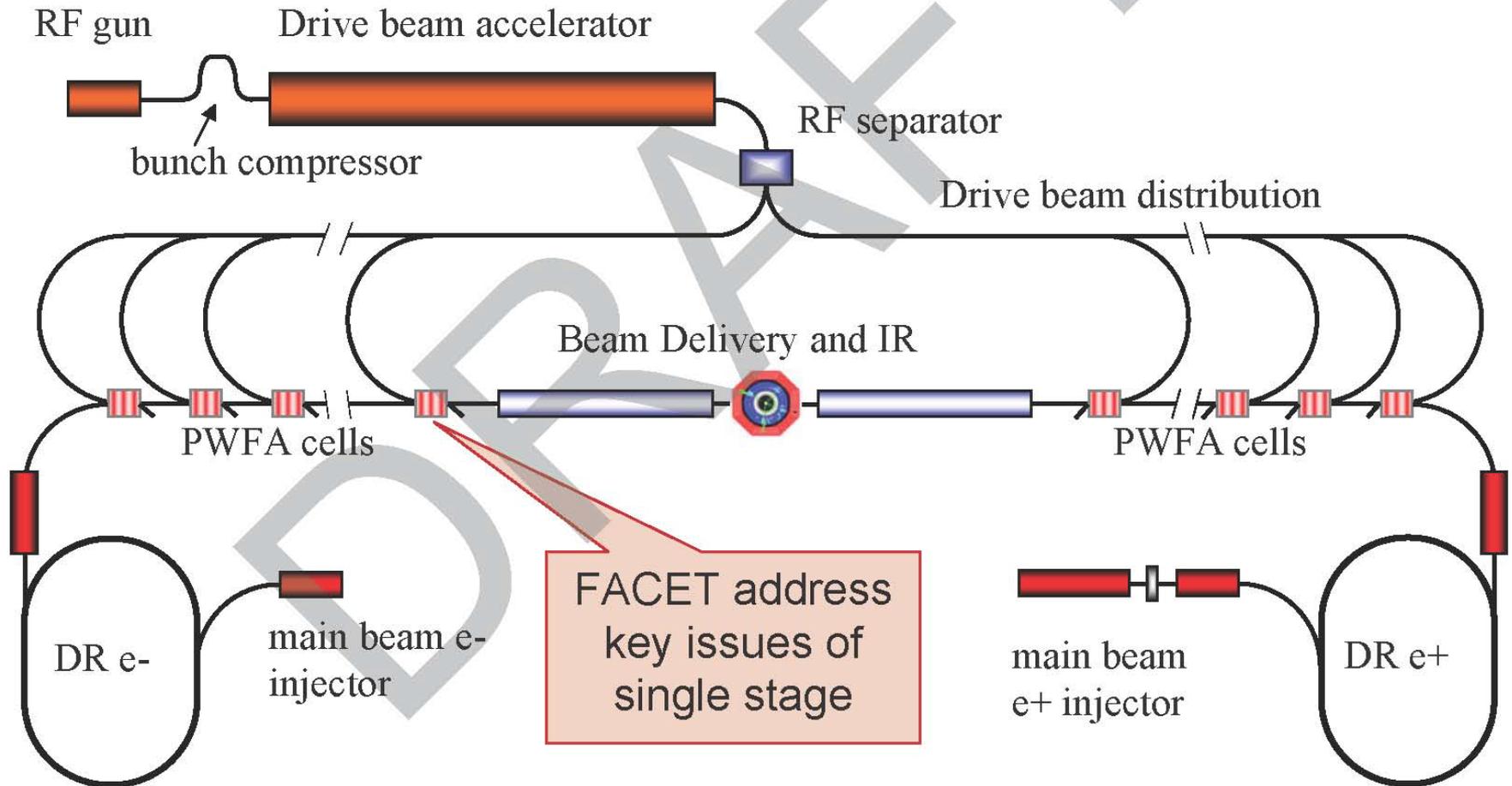
Vision in Advanced Accelerators for HEP

Layout of LWFA-driven Linear Collider (BELLA)



Vision in Advanced Accelerators for HEP

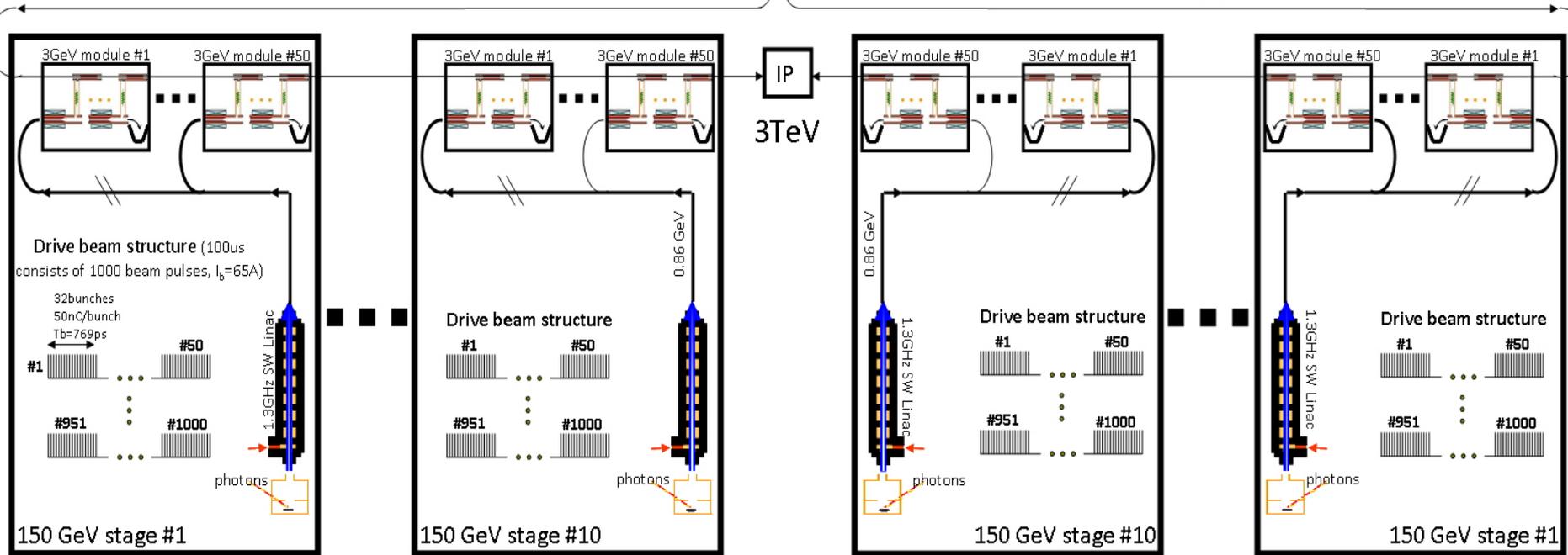
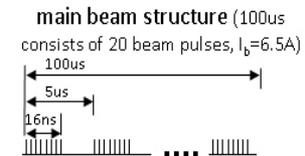
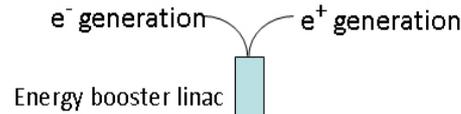
Layout of PWFA-driven Linear Collider (FACET)



Vision in Advanced Accelerators for HEP

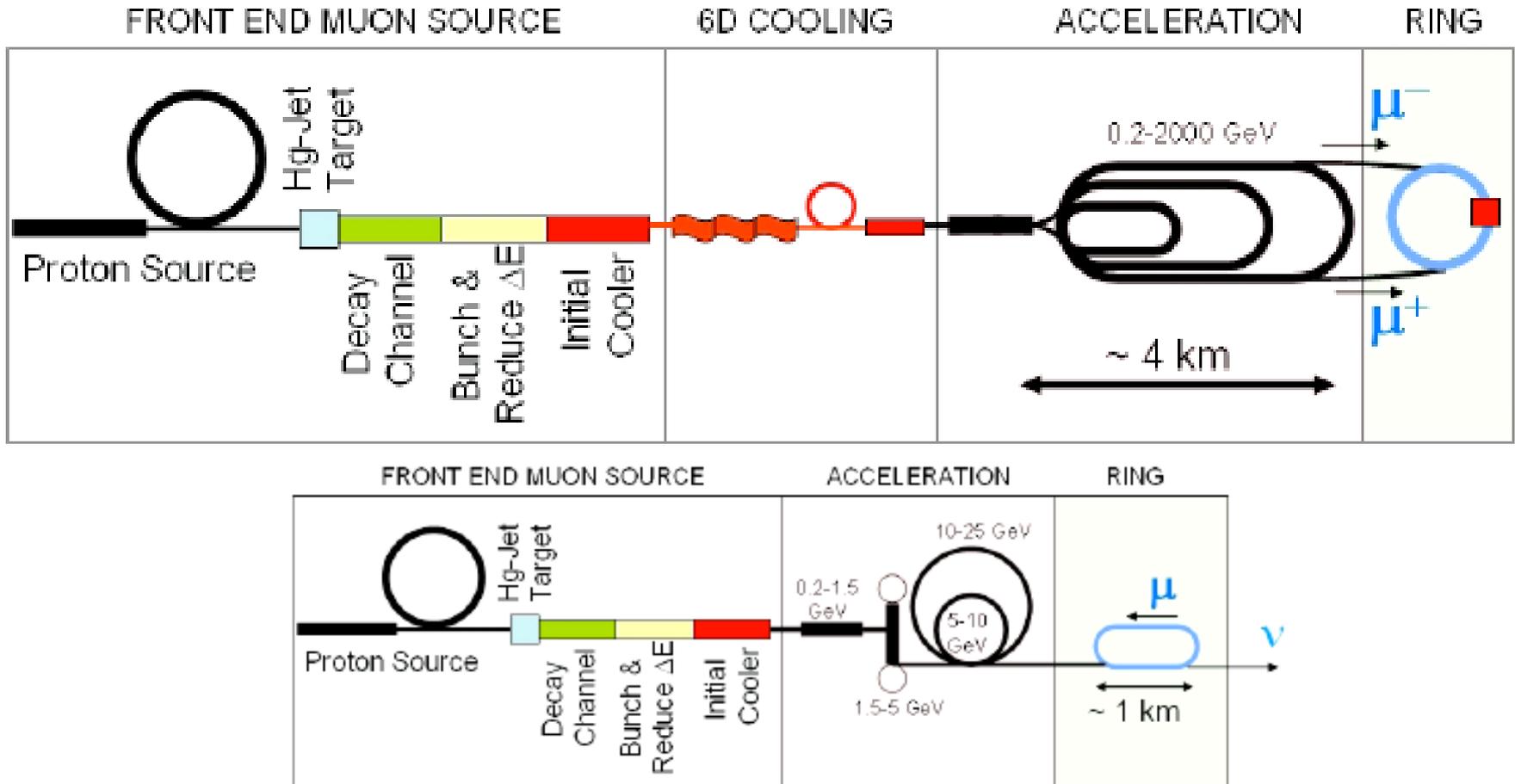
Layout of DLA-driven Linear Collider (AWA)

- 22ns rf pulse
- 267MV/m loaded gradient
- Machine Rep=5Hz



Vision in Advanced Accelerators for HEP

Muon Collider and Neutrino Factory

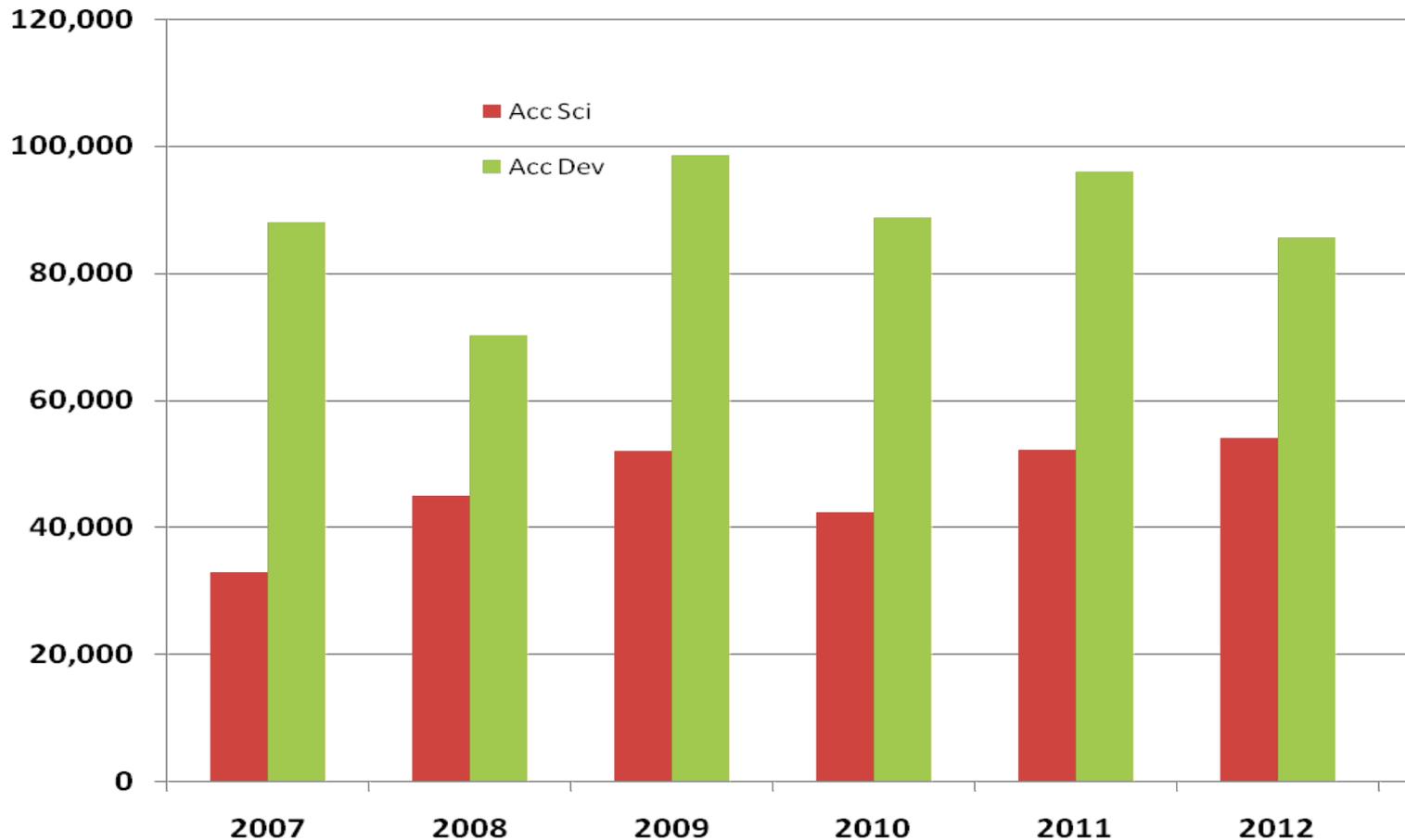


Some Current Accel. Dev. Programs

- **General Accelerator Development** – This R&D has broad applicability and covers improvements for superconducting materials for magnets; warm and cold accelerating structures; instrumentation; and RF acceleration systems.
- **LARP** – R&D in accelerator and magnet systems directed at improving the luminosity of the LHC.
- **ILC** – Goal is to demonstrate the technical feasibility of a superconducting electron/positron collider through R&D directed at achieving 31.5 MeV/m accelerating gradient among other things.
- **SRF** – Seeks to industrialize the manufacture of SRF cavities in order to lower production costs and make them more widely available. Explore improvement beyond current SC limits.



Funding History (take out 2013)



University research grants comprise ~10% of the budget



So what is HEP's plan for accelerator stewardship?



As you know...

Workshop composed of five Working Groups :

- Industry
- Discovery Science
- Energy and the Environment
- Medicine and Biology
- Security and Defense

Goals of the workshop:

- Identify stakeholder current and future needs
- Seek out crosscutting challenges—technical, cost, policy—whose solutions may have transformative impacts on opportunities for the future
- Identify the areas of accelerator R&D that hold greatest promise
- Provide guidance to bridge the gap between basic accelerator research and technology deployment

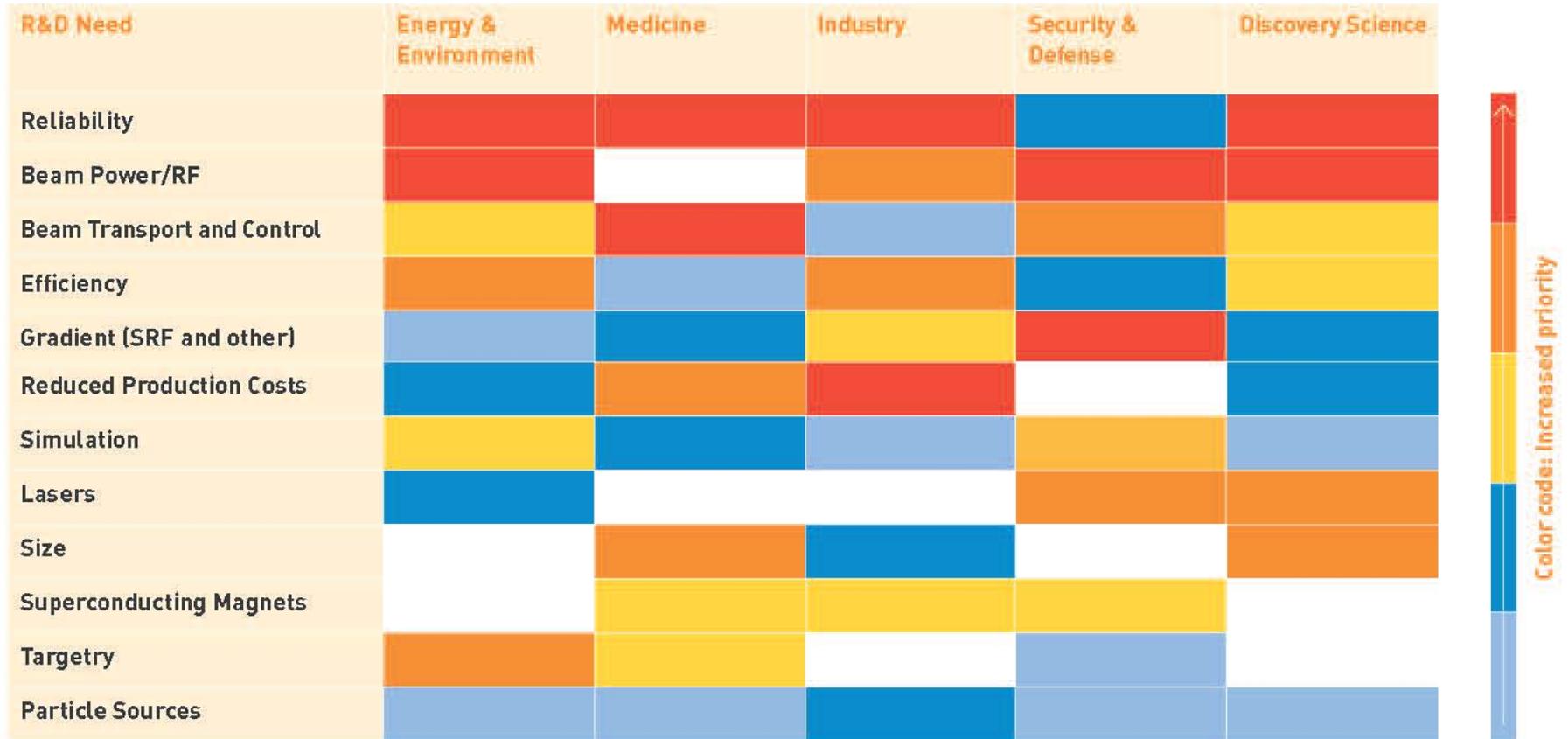


Workshop: Common Concerns

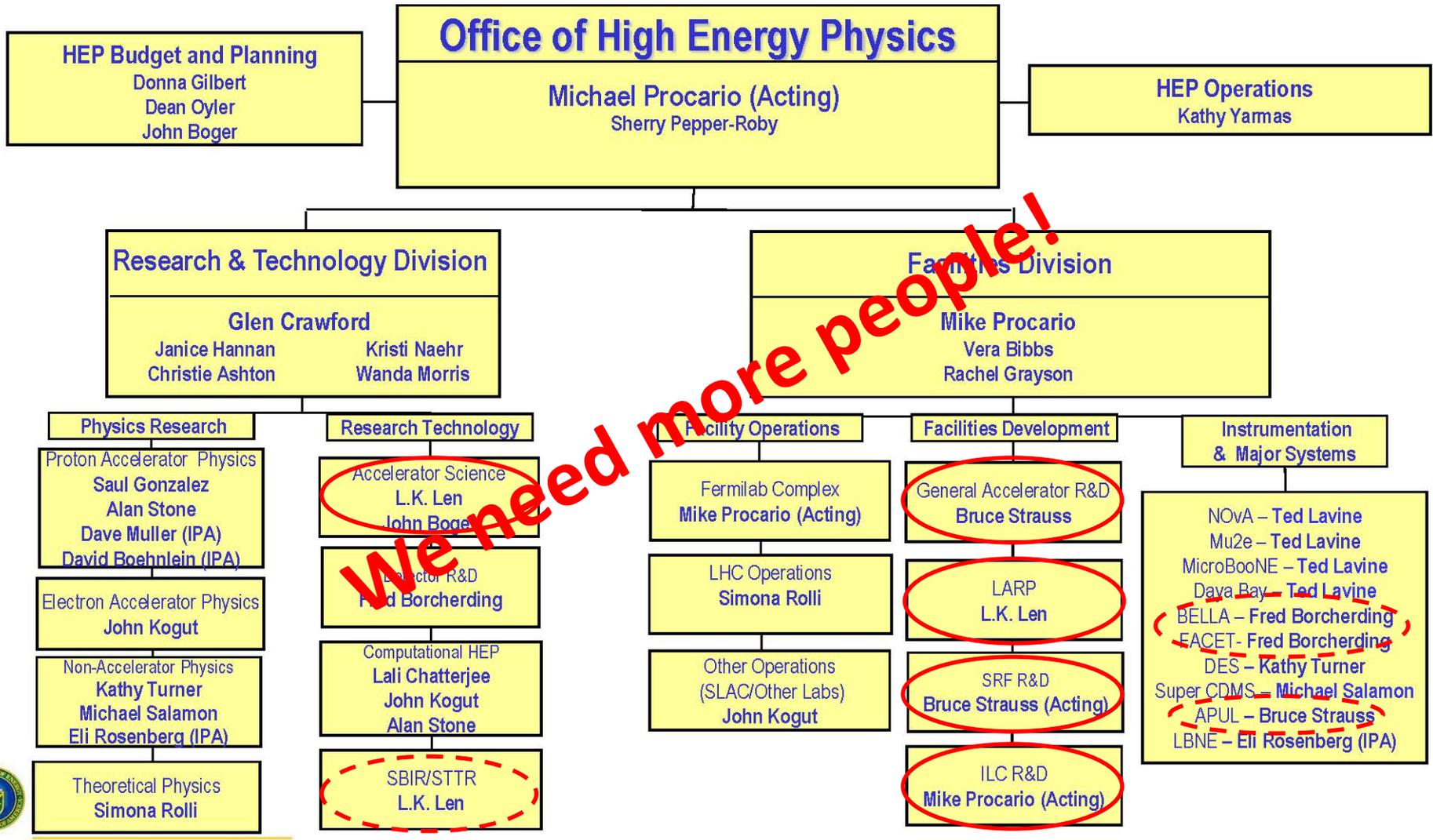
- Stakeholders have difficulty identifying a single federal owner when their requirements cut across agencies.
- The government can help to bridge the gap between bench scale demonstrations and full deployment.
- There is a need for advances in technology that will reduce construction and operating costs.
- Maintain core competence through education.

Stewardship: Prioritized R&D Areas

Areas of R&D identified by each working group. All areas are of importance to each working group. Color coding indicates areas with greatest impact.



Next steps...plan and execute



Stewardship: Status

OHEP is—

- **developing strategic plan**

- Reorganization of OHEP accelerator R&D portfolios
- Plan Funding Opportunity Announcements for selected areas identified as high priority by the Accelerator Workshop

Possible models for implementing this FOA's:

- Separate HEP Solicitation similar to the SRF grant process which received applications from labs, universities and industries.
- Have SciDAC-type solicitation with OHEP funding the core of the research efforts together with satellite efforts supported by other program offices for programmatic oriented research.

- **coordinating with other offices (and agencies)**

- Currently coordination is on the program manager level only
- Broader coordination will be necessary.



Stewardship: Status

OHEP is—

- **trying to fill the vacancies in Accelerator Science area. We are in the process of**
 - bringing in IPA's/Detailees from the field
 - Active discussion with potential candidates is ongoing
 - filling a federal program manager position
 - First round did not successfully fill the position
 - Now in second round – looking optimistic with excellent candidates



Stewardship: Status

OHEP is—

- **working on an initiative for accelerator science user facilities**
 - Identify and convert existing HEP accelerator science facilities to user facilities to better fulfill the stewardship role
 - broaden the user base
 - more visibility
 - stable funding
 - will have performance metrics
 - open access based on peer review

A Model for Accelerator R&D

	Stewardship	HEP
Accelerator research	Accelerator science grants Accelerator science centers SRF materials research	“core competencies” e.g. Magnets, SRF, Klystrons
Projects and campaigns	BELLA, FACET ALD Future initiatives	APUL, ILC, LARP, Muon collider, Project X
Accelerator R&D Facilities	ATF, AWA, NLCTA? BELLA ops, FACET ops	Infrastructure/Test Facilities SRF @ FNAL NCRF @ SLAC Superconducting Magnet @ BNL/LBNL/FNAL

Where would AWA live? IARC?

Core competencies should be a category of last resort.

Are there other activities that cannot fit into this scheme?



Summary

- **HEP Accelerator R&D program is forward looking and presently supports research areas recommended by P5**
- **Priority for stewardship areas have been identified by Accelerator for America's Future Workshop**
- **Plans for implementation are in progress**
- **OHEP is in the process of bringing additional program managers onboard for the accelerator R&D program**



Backup

