Coordination/Collaboration of Accelerator Research at Argonne and Beyond

Kwang-Je Kim

Accelerator R&D Planning Meeting at FNAL
July 10, 2003

I. Accelerator Projects at ANL
II. Coordination of Accelerator Research at ANL
III. Collaboration/Coordination of Accelerator Research in the Midwest -- Institute of Advanced Accelerator Physics (IAAP)

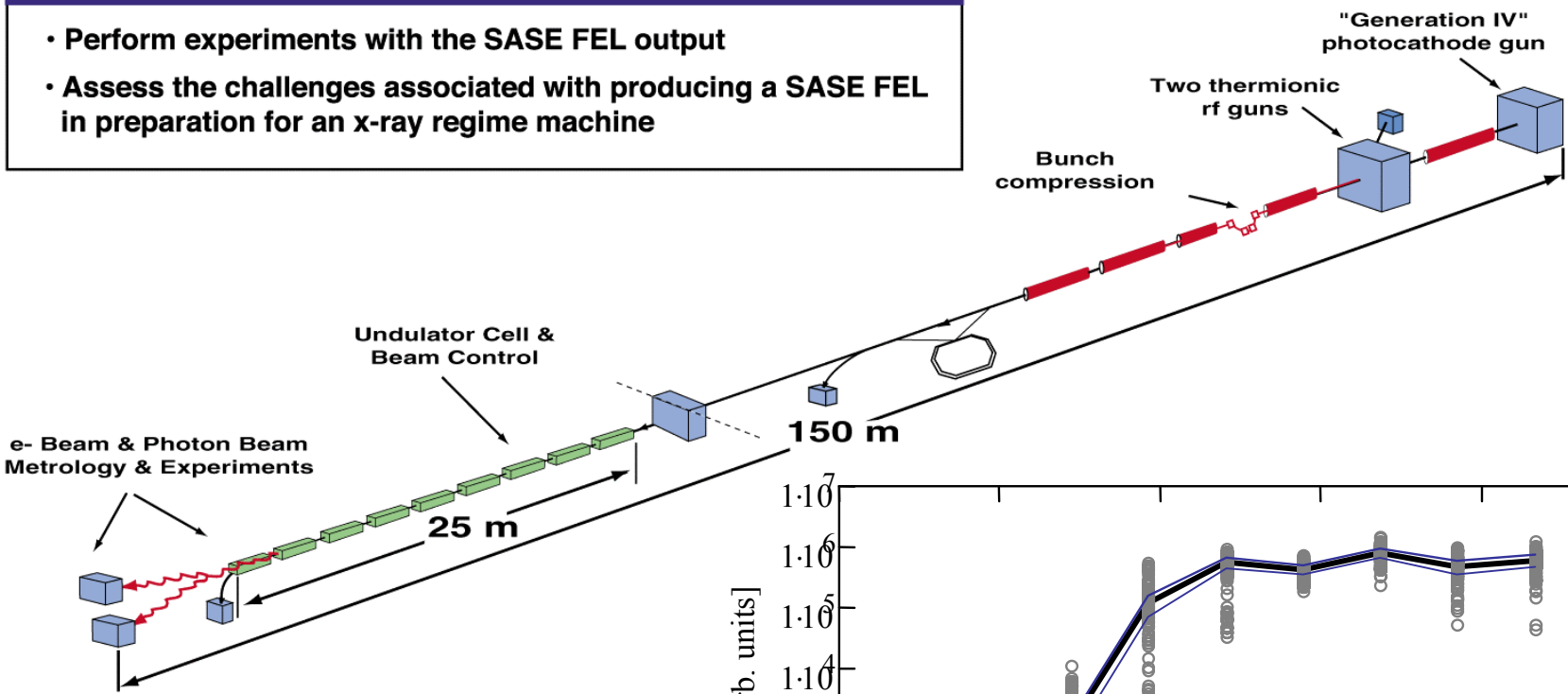
Accelerator R&D at ANL

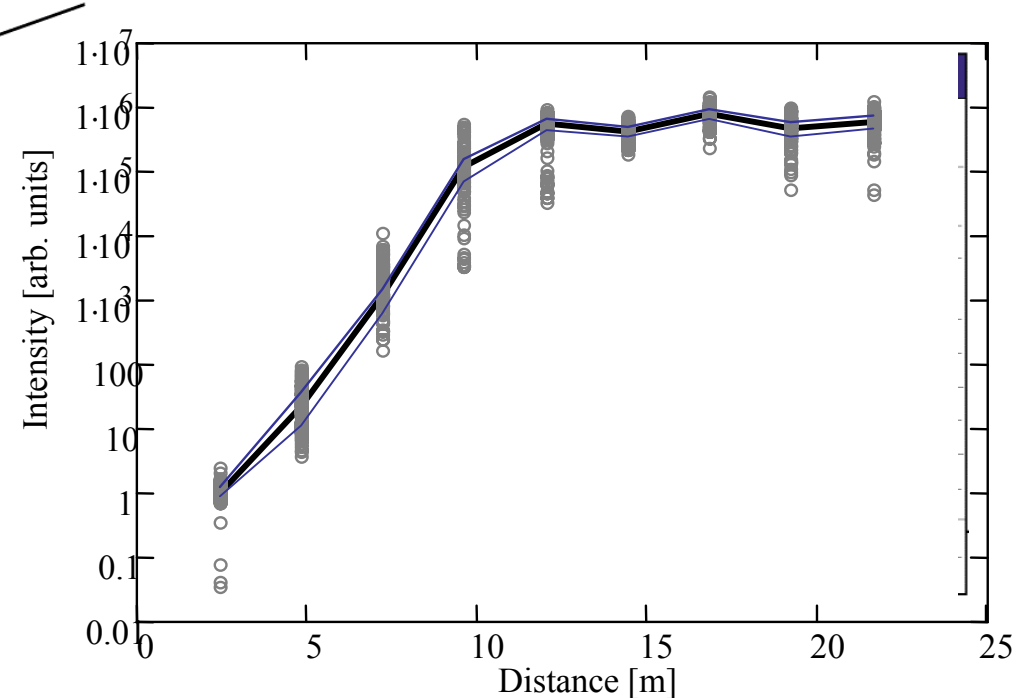
- Accelerator facilities:
  - ZGS – the first large-scale HEP facility in the Midwest
  - ATLAS – low-energy ion beams for nuclear physics
  - IPNS – pulsed neutrons for material science
  - APS – nation's premier x-ray SR facility
  - RIA – CD0 imminent?
- R&D
  - Low-frequency SCRF, ion-beam dynamics
  - Advanced acceleration scheme
  - Electron storage rings, synchrotron radiation
  - High-brightness electron sources, free-electron lasers
  - High-power ultrafast lasers

LOW-ENERGY UNDULATOR TEST LINE PARAMETERS

PROJECT GOALS

- Perform experiments with the SASE FEL output
- Assess the challenges associated with producing a SASE FEL in preparation for an x-ray regime machine

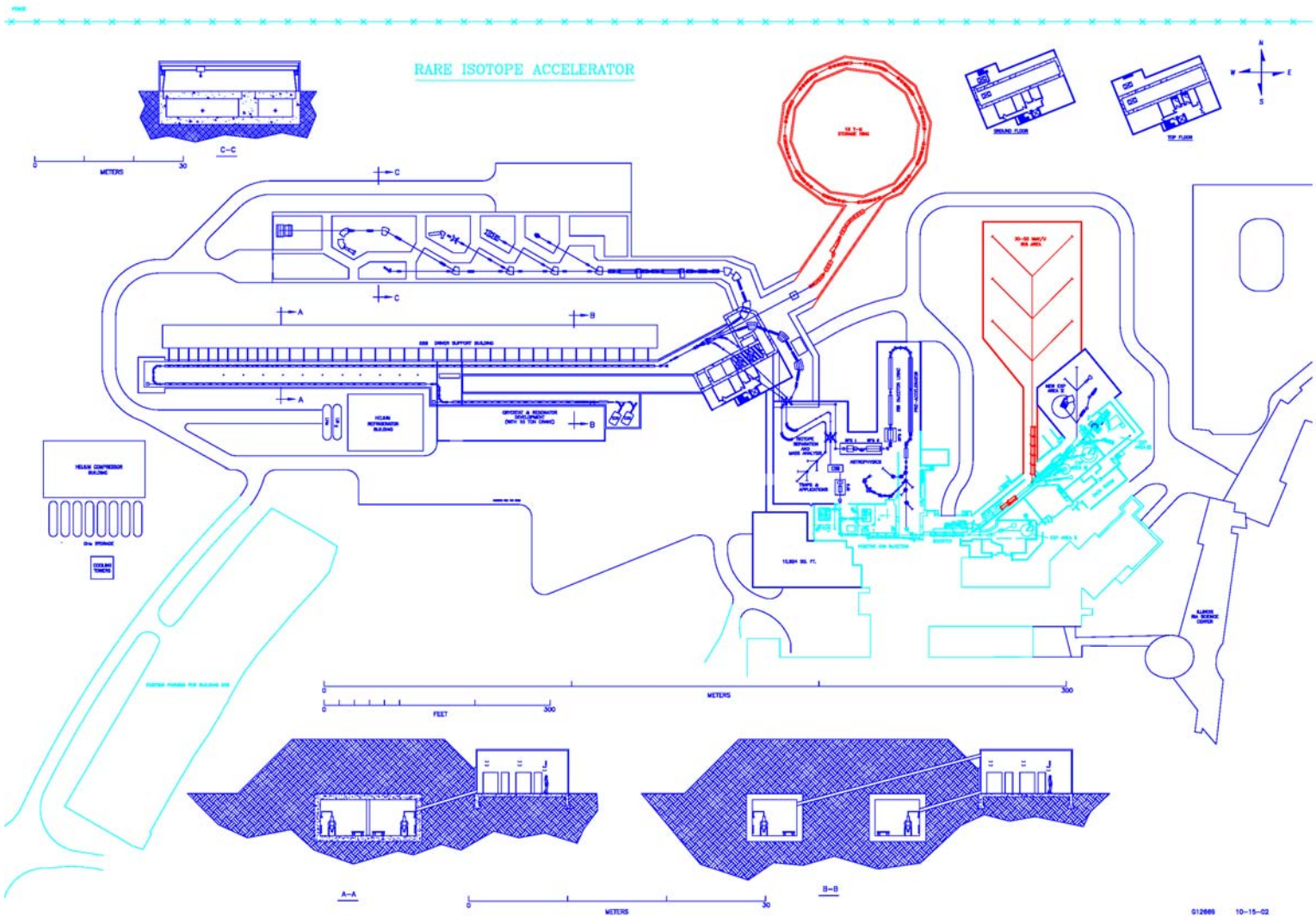




Advanced Photon Source
Argonne National Laboratory

APS/00-3

Detailed RIA Layout at Argonne



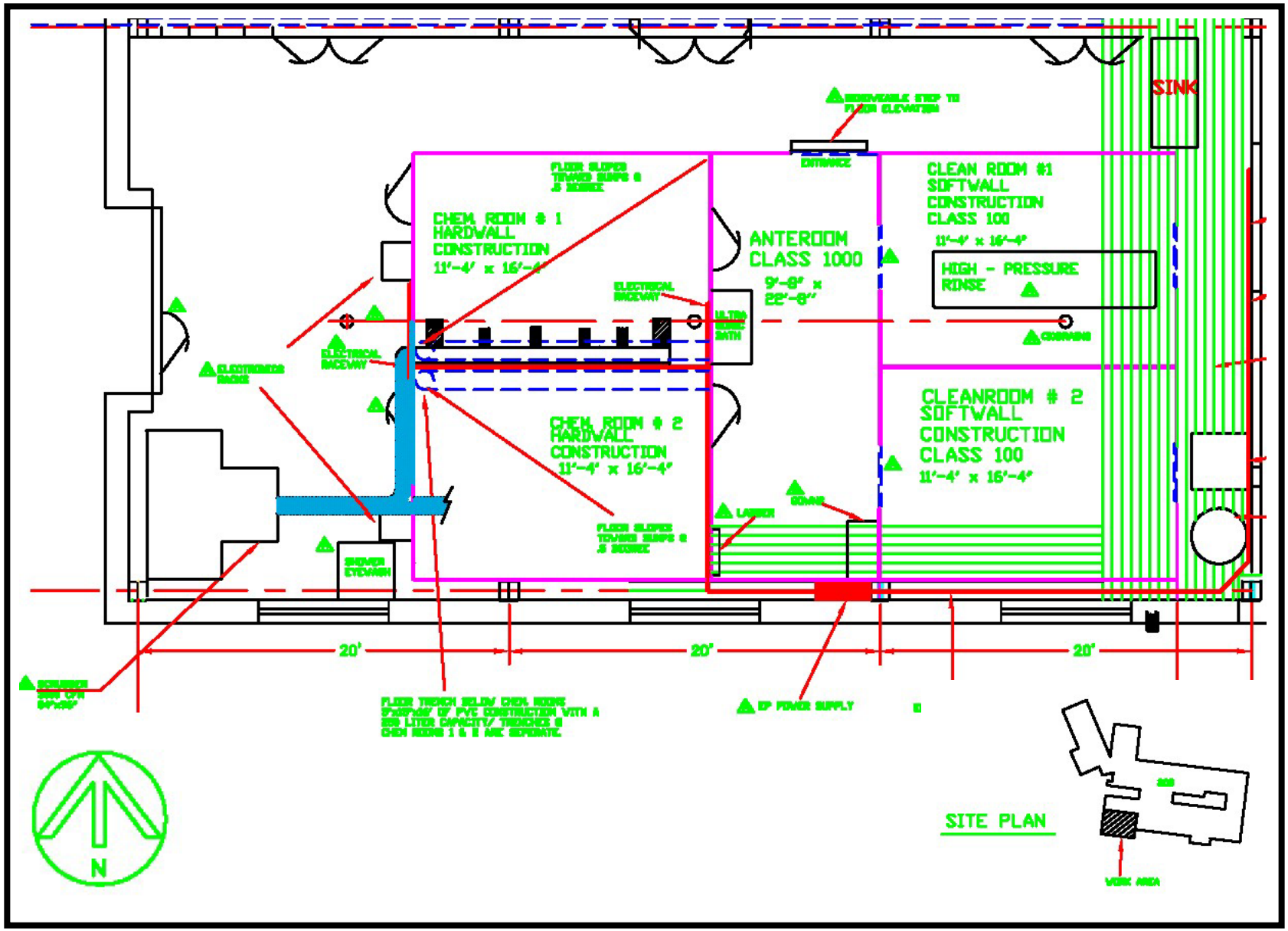
Coordination of Accelerator Research at ANL (CARA)

- A new cross-divisional activity started in April 2002 to coordinate accelerator R&D at ANL which has been pursued independently by several divisions.
- Participation from two ALDs: PBCS (HEP, CHEM, IPNS) and APS (ASD, AOD, and XFD),..
- Benefits:
  - Increased research efficiency by sharing resources and manpower.
  - Strengthen accelerator science at ANL on existing program and new initiatives.
  - Better respond to collaboration and other opportunities from outside.

CARA Activities (FY03)

- Monthly meeting
- Beams and Applications Seminar series
- Joint research
  - Linear collider LDRD
    - SCRF processing lab (ANL, FNAL)
    - High-brightness beams (HEP and ASD)
    - Damping ring studies (AOD, XFD)
  - VUV FEL user facility development (AOD, ASD, XFD)
  - Run II collaboration initiated
- *CARA initiative has been widely supported by both scientific staff and the lab management,and made positive impact on ANL accelerator research.*

Layout of a Surface Processing Facility in Building 208



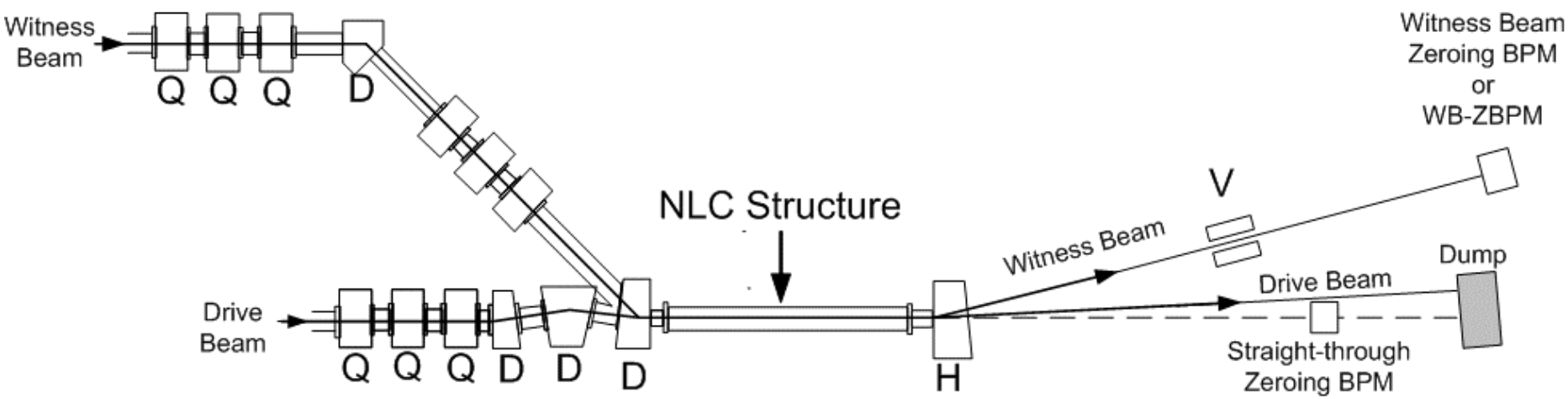
CARA Approved for FY04 Major Initiative LDRD

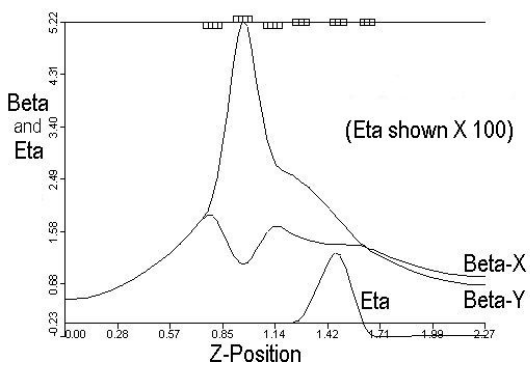
- Major initiative LDRDs
  - Major Initiative Area:
    - Advanced nuclear fuel cycle
    - Nanoscience
    - Petaflops computing and computational science
    - RIA
    - Functional genomics
  - Emerging Initiative Area:
    - National security
    - Transportation technology
    - Environmental science
    - Hydrogen research & development
    - → *Accelerator research & development*
- Director's Competitive Grants

LDRD on Advanced Accelerator Research, CARA, 2004

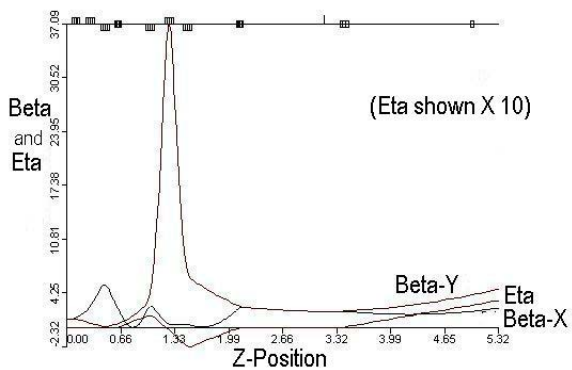
FNAL Run II collaboration	
Booster Beam Dynamics	K. Harkay, J. Dooling, J. Norem
Recyler Vacuum	J. Noonan, G. Goeppner
Tevatron optics modeling	V. Sajaev
OTR imaging for p and pbar	A. Lumpkin
Electron Cooling	W. Gai
High-Brightness electron beams	
RF photo-cathode gun	
	W. Gai J. Lewellen
Damping Rings	L. Emery
VUV FEL	
LEUTL FEL Operation	S. Milton
Optics and wigglers	E. Moog, P. Den Hartog A. Lumpkin
Ultrafast laser techniques	
Develop 10 fs synchronization	R. Crowell, Y. Li Y. Li
RIA	
High-Gradient SCRF	K. Shepard, M. Kelly
RIA Beam dynamics	P. Ostroumov, J. Nolen

Compact Wakefield Measurement Facility





Drive Beam Optics



Witness Beam Optics

Towards Collaboration/Coordination of Accelerator R&D in the Midwest

- Strong history and capabilities in the Midwest
  - Two national laboratories, ANL and FNAL
  - Several universities (ICAR, …)
- It makes sense to collaborate and coordinate, particularly in view of the possibility of future multi-billion dollar accelerator projects (LC, FLS, …)

→ *Institute for Advanced Accelerator Physics (IAAP)*

Institute for Advanced Accelerator Physics (IAAP)

Concept:

Accelerators have been in important factor in the remarkable progress of science and technology in the past and will play an even greater role in the coming decades. An urgent mission of the worldwide accelerator community is to advance accelerator techniques to higher levels of performance that will be required in the future. With its rich history in accelerator R&D, the Chicago area has developed and accumulated strong research capabilities distributed over two major national laboratories, ANL and FNAL, and over several universities. By stimulating coordination and collaboration across these institutions, the Institute for Advanced Accelerator Physics (IAAP) aims at an improved level of productivity in basic accelerator physics research. The mission of the IAAP is to enhance the accelerator sciences by providing a solid knowledge base for future advances in accelerator techniques, while preserving the current connections between the accelerator science groups and related scientific programs.

Institute for Advanced Accelerator Physics (IAAP)

- Objectives
  - Communication
  - Resource sharing
  - Collaboration for joint projects and funding
- Participating institutions:

  ANL, FNAL, NIU, IIT and other ICAR universities, laser institutes (?)
- *Early discussions have been encouraging. Meeting on September 3, 2003, for discussion/kick-off.*