Argonne NATIONAL LABORATORY

APS Upgrade Update

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APS/Users Monthly Operations Meeting

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THE UNIVERSITY OF CHICAGO

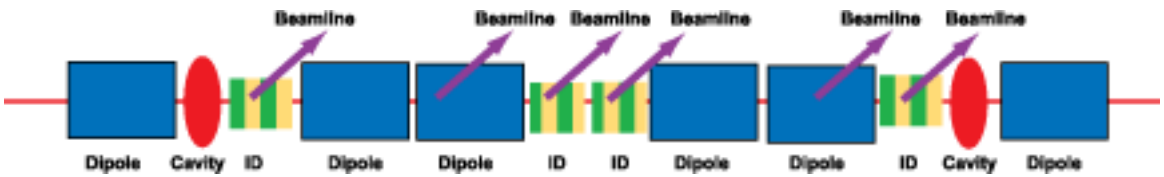
Office of Science U.S. DEPARTMENT OF ENERGY

A U.S. Department of Energy laboratory managed by The University of Chicago

Storage Ring Enhancements

- "Boundary conditions" for storage ring enhancements:

1. Will utilize the existing APS storage ring tunnel.
2. Beam energy will be at least 6 GeV, but with a goal of 7 GeV.
3. All existing insertion device beamlines will be preserved.
4. Existing bending magnet beamlines will be preserved, but may require realignment.
5. Beamlines will be able to continue operation with no changes to equipment, if that is desired, without any reduction in performance.
6. Existing capabilities for bunch patterns will be preserved, including single bunch current of up to 16 mA in hybrid mode.



Where Do We Stand Today?

- Symmetric configuration (all sectors identical) is robust
  - Good injection aperture with errors
  - Good lifetime with errors

- Work continues on optimization with low-size and low-divergence sectors

- Crab scheme appears feasible for ~1 ps FWHM pulses
  - Working on configuration with good injection aperture

- Magnets appear feasible
  - Bore diameter is 40 mm compared to 80 mm now
  - Sextupoles are near limit of conventional design
  - Dipole design needs more work to provide sufficient good field region
  - Gearing up to use a genetic optimizer for magnet designs

Status of Work (cont.)

- Vacuum chamber appears feasible
  - Chamber must be stainless or copper for strength instead of aluminium as now
  - 30 mm ID compared to 80 mm by 40 mm ellipse now
  - Chamber is symmetric to help beam stability: antechamber not necessary

- Intensity-limiting issues under investigation
  - No obvious problems at this point
  - May need bunch-lengthening cavity for high single bunch current
  - Gearing up for detailed computations with a new special-purpose cluster, new software

- First design for a new booster looks reasonable
  - Emittance reduced from 65 nm to 10 nm
  - Needed to accommodate reduced ring injection aperture

Planning Meetings

- We have held meetings to discuss:
  - Ultrafast SAXS
  - Science with High Magnetic Fields
  - Intermediate Energy (0.2- 2 keV) X-rays
  - Coherence/Imaging (to be continued July 13)

Future Planning Meetings

- And we are scheduling meetings to discuss:
  - Interfacial and Surface Science (June 29)
  - Novel Science with Polarized X-rays (June 29)
  - Pico-second Science (June 29)
  - New Structural Science from Improved High Energy Sources (July 13)
  - Biology and Life Sciences (July 14)
  - Microscopy (July 17)
  - Sub-meV Energy Resolution (July 20)
  - Detectors (July 21)
  - New Applied Materials Research from Improved High Energy Sources (July 28)

Summary Workshop

- A special summary workshop will be held at APS on August 10 and 11 which will include:
  - APS staff and users providing a summary of key ideas associated with the upgrade
  - Summary of planning meetings
  - A solicitation from the audience so that in the proposal we can emphasize revolutionary new capabilities that would be impossible without the upgrade.

Remember the submission date for the full proposal to DOE is October 31, 2006.