

Magnet Division All-Hands Meeting

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April 3, 2008

SAFETY

CONGRATULATIONS!

2050 days without a lost-time accident
continued vigilance is needed -

moving people and operations around
NSLS staff working in 902

Safety tip for this meeting room:

Note the location of the doors

Don't block the doors

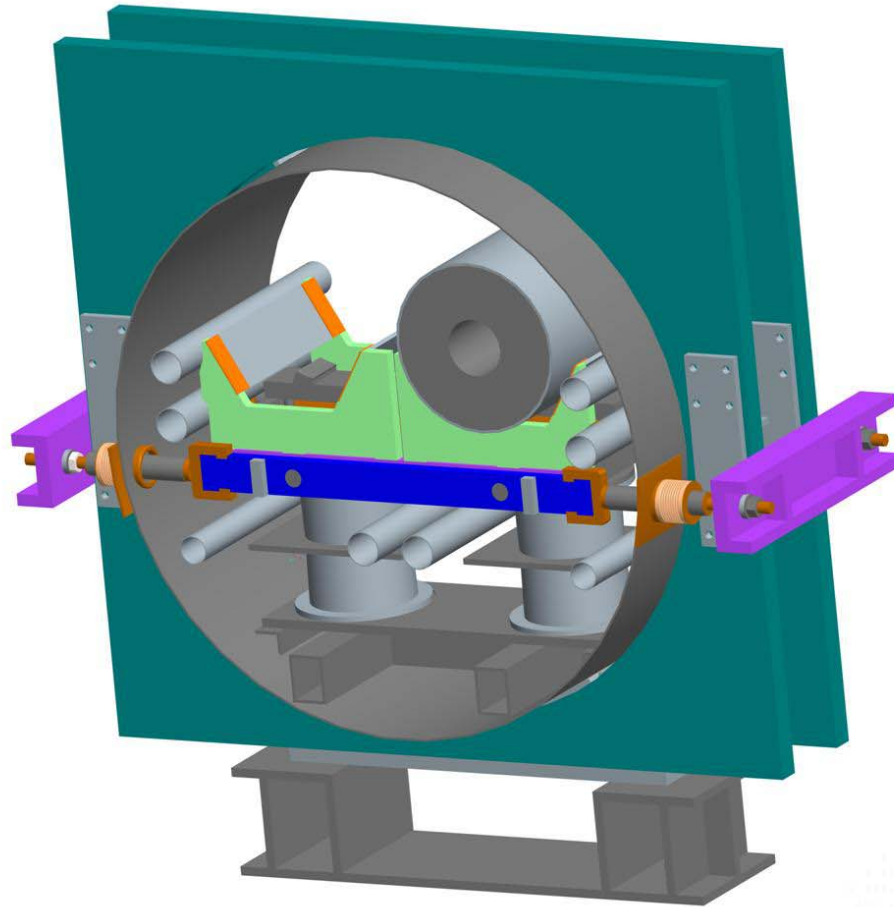
Recent technical accomplishments

- RHIC
- ILC
- LARP
- Superconductor R&D
- KEK/T2K/J-PARC
- NSLS II
- Helping others at BNL (LSST, nano)

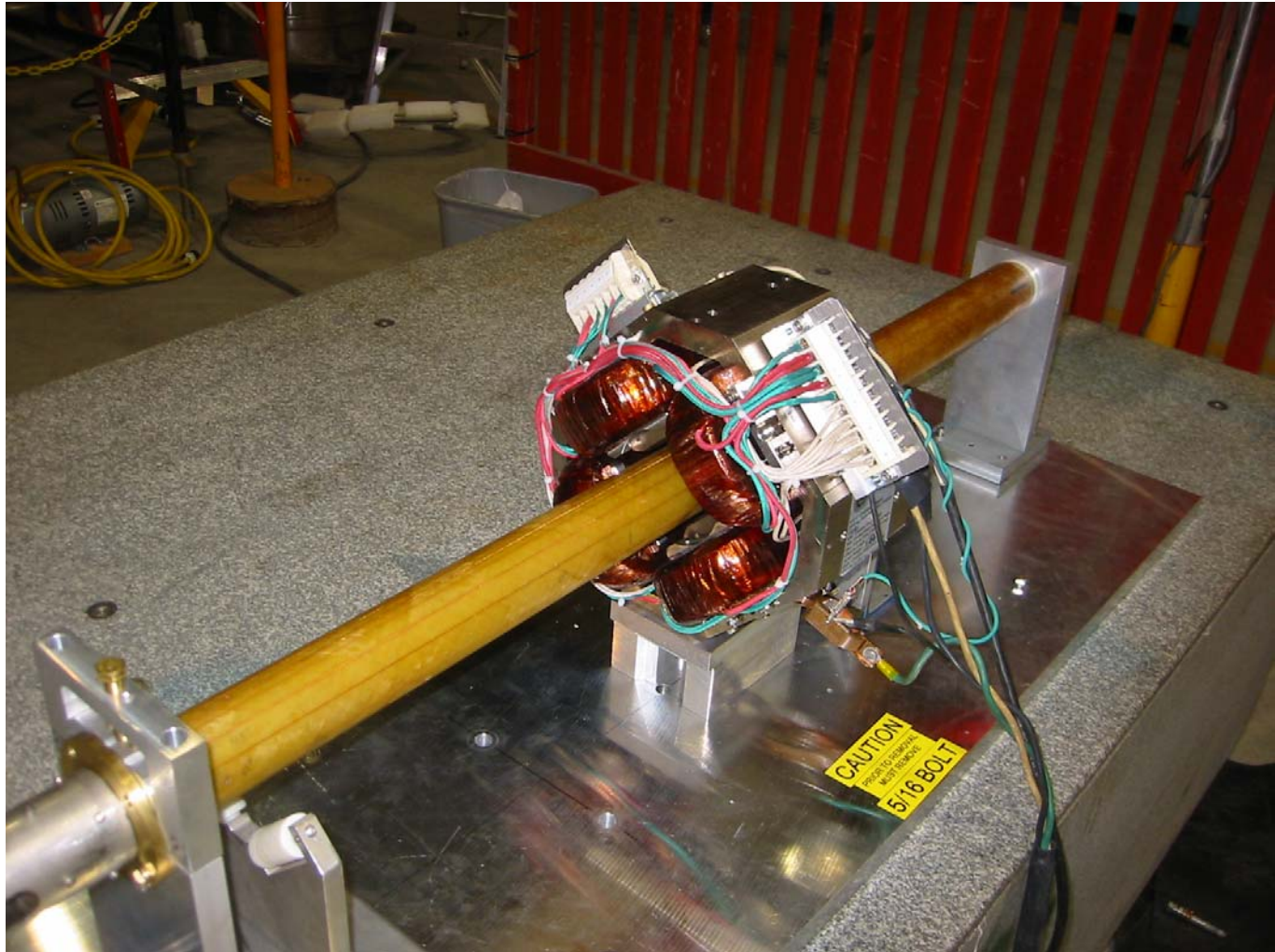
RHIC

- Completed spare helical magnets, with field measurements during ramp
- Design system to reduce horizontal vibration of RHIC IR quads a factor of 28 below present value, $\sim 0.5 \mu\text{m}$ (1/50 mil).
- Magnetic field measurements of ERL quadrupoles (resistive). Accuracy $\sim 10\text{-}25 \mu\text{m}$, 2-3 X better than RHIC.
- Work in tunnel (summer 07)

IR quad stabilization



ERL quadrupole measurements



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SMD All-Hands

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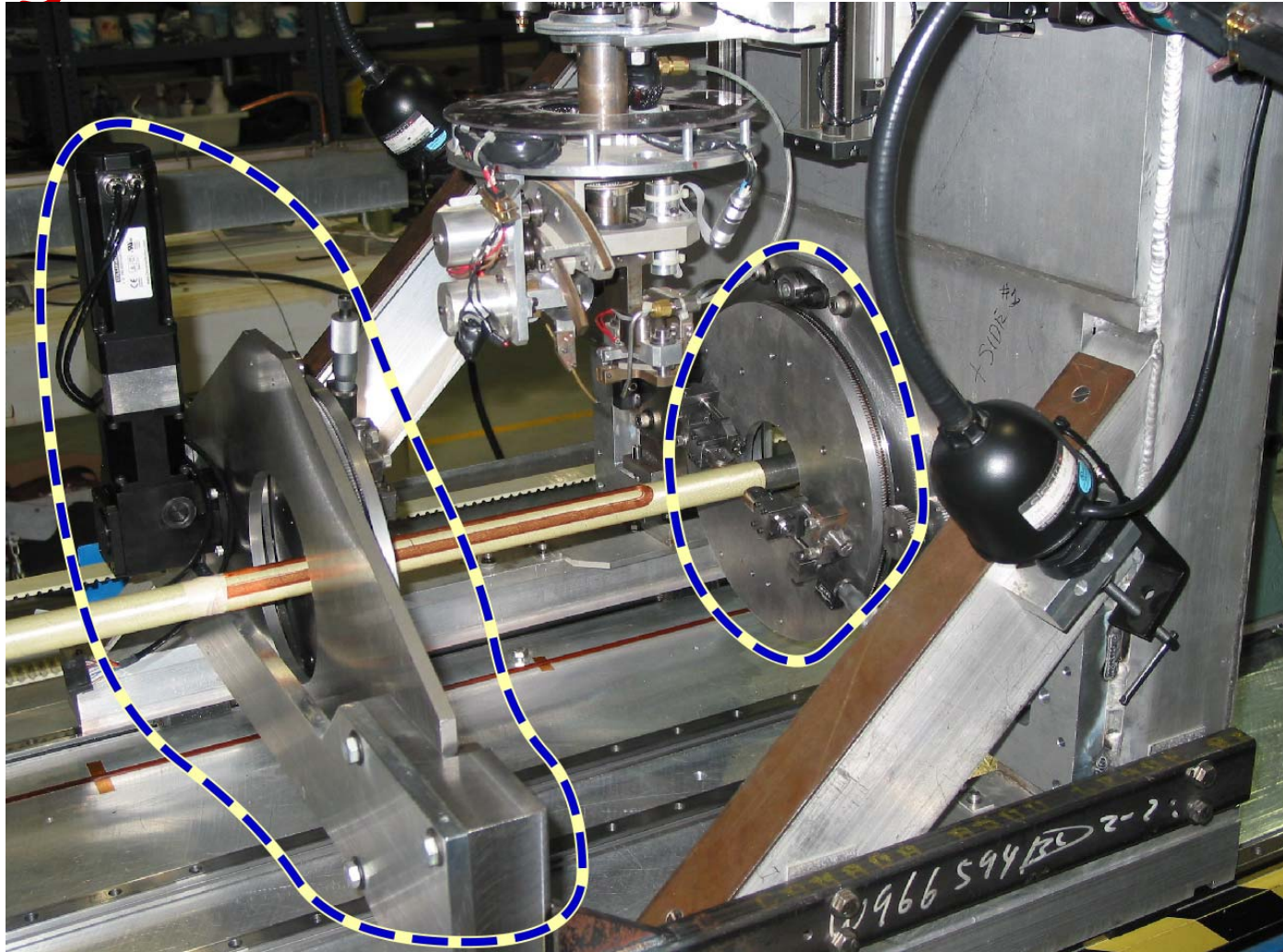
ILC - Beam Delivery *System* (BDS)

- BDS Magnets:
 - Quadrupoles/sextupoles/octupoles/...
 - Demonstration of basic quadrupole, quad with shield coil, temperature reserve
 - Design and partial construction of tooling for full-length ($\sim 2\text{m}$) coils.

ILC - Beam Delivery System

- Design work for cryostat, refrigerator
 - 1.9 K (superfluid helium)
- Measurement, damping of quad vibration
 - Want control to ~ 100 nanometers ($.1\mu\text{m}$)
- BDS interface with experiments
 - Magnets for the experiments, too.

Upgrade "direct wind" for ILC



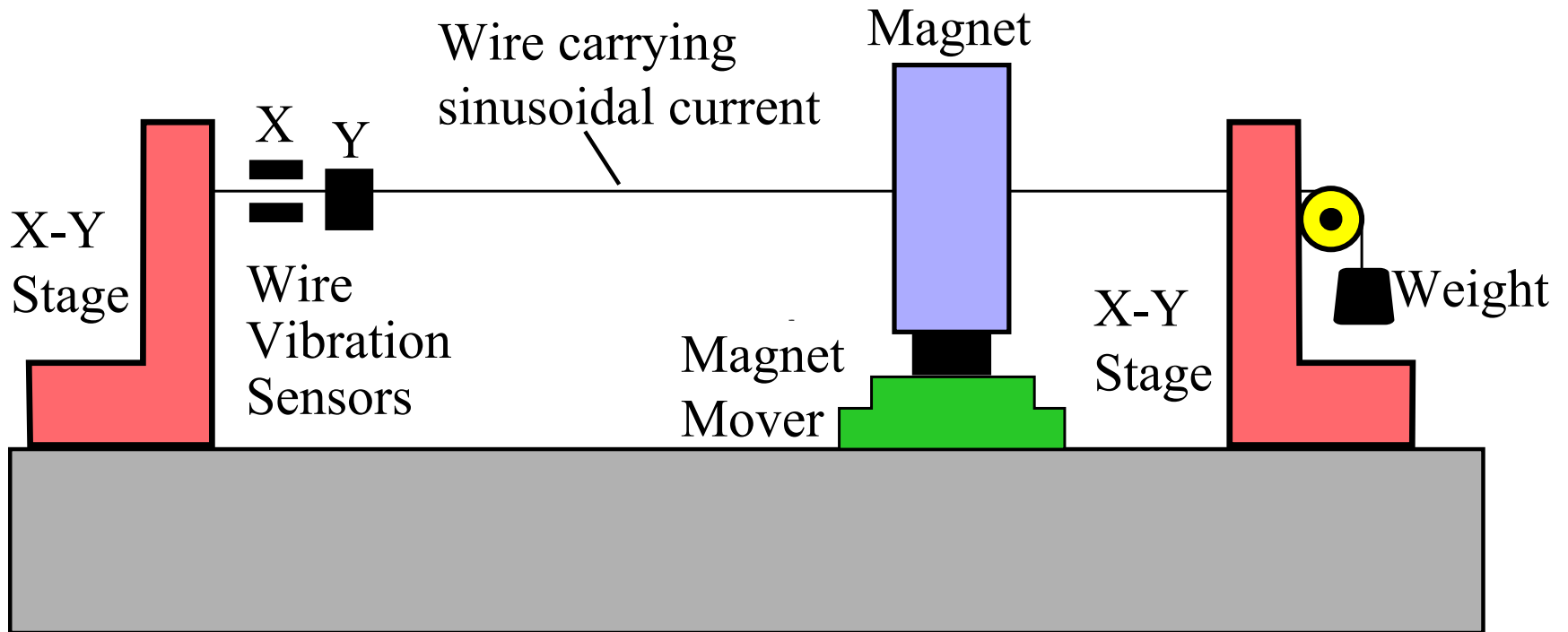
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SMD All-Hands

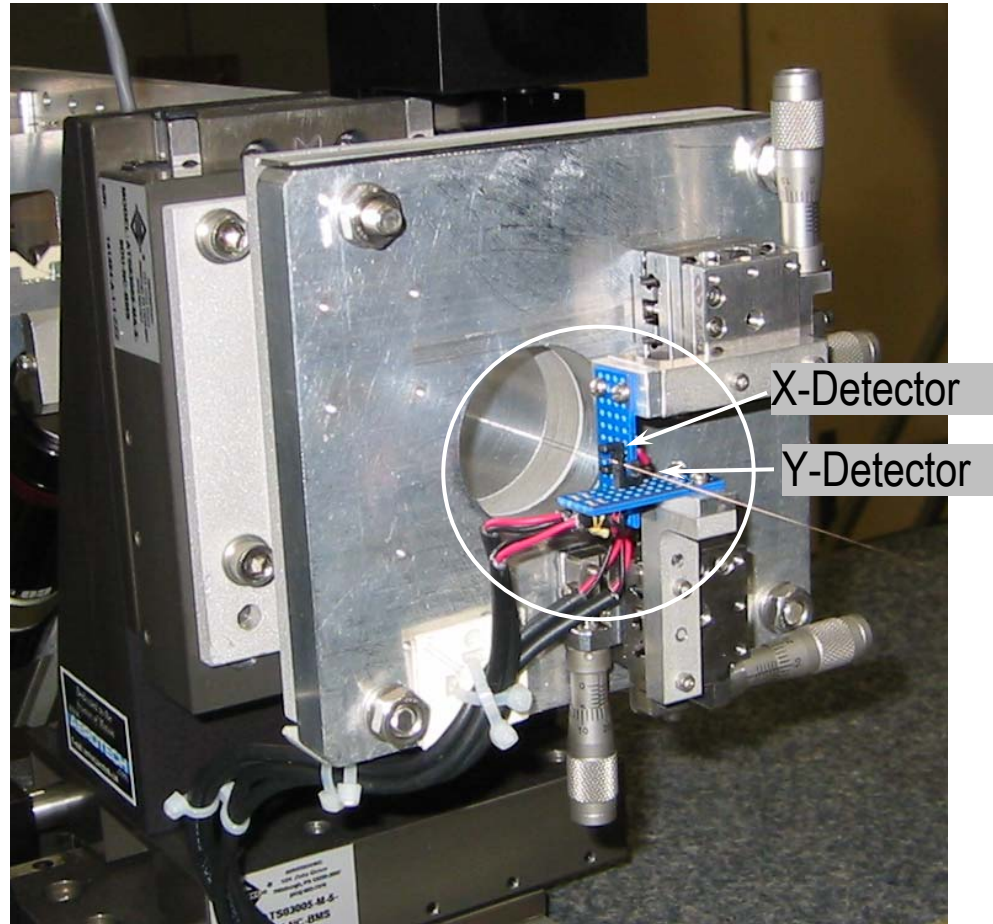
NLSL II

- Shared staff: 12 FTEs over 28 people
- Magnetic measurements:
 - Magnet centerline (using a stretched wire) to an accuracy of $\sim 7 \mu\text{m}$ (total tolerance: $\pm 30 \mu\text{m}$)
 - Magnetic fields (esp. magnets close together)
- Magnet movement, bolting to girder
 - Accuracy of $\pm 3 - 8 \mu\text{m}$.
- Magnetic design \rightarrow reduced slot length!
- Electrical systems
- Girder stability - thermal, vibration (25nm)

NSLS II magnets & movers

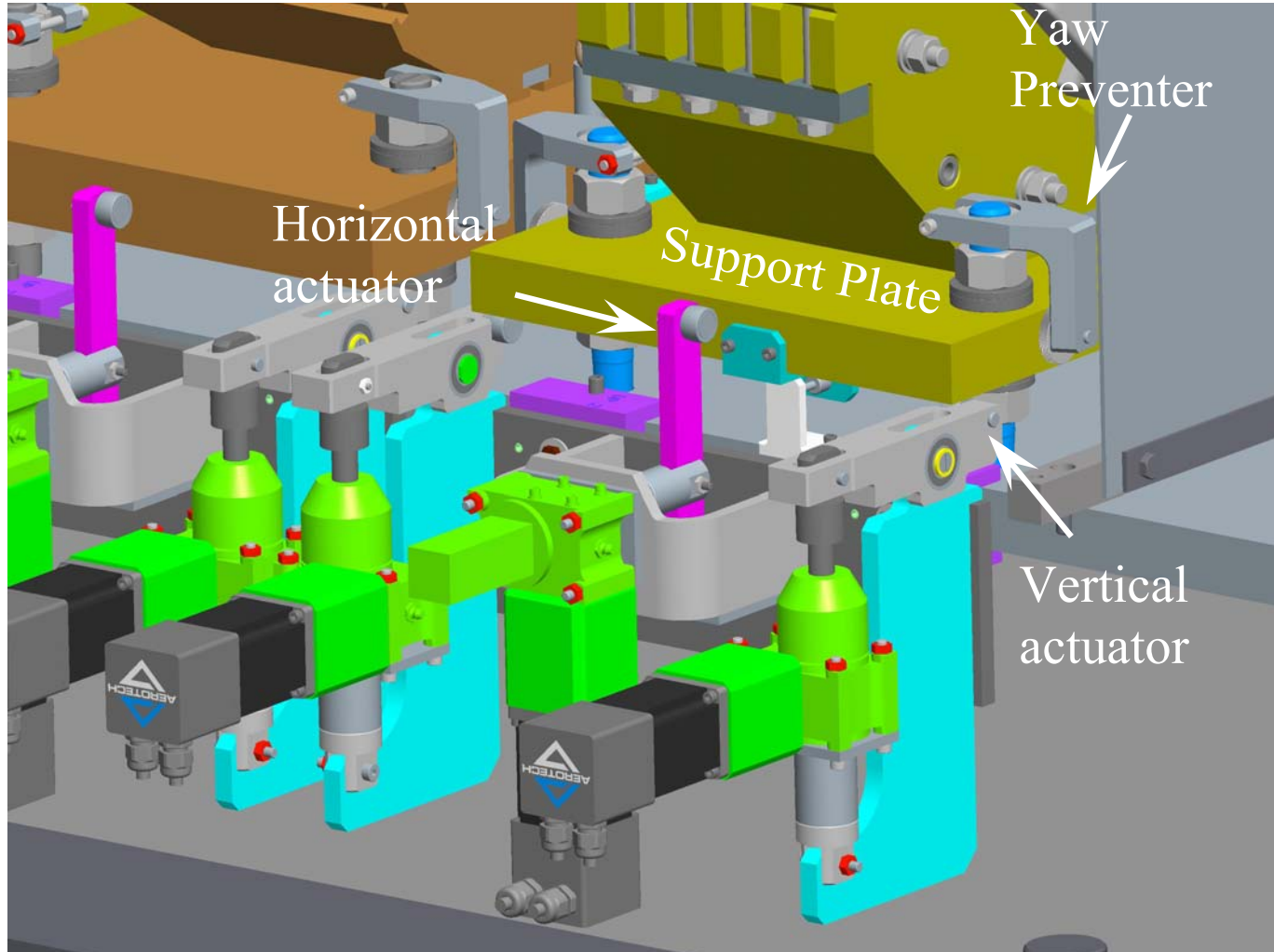


Precise wire position measurement



Wire Vibration Sensors

Precise magnet positioning

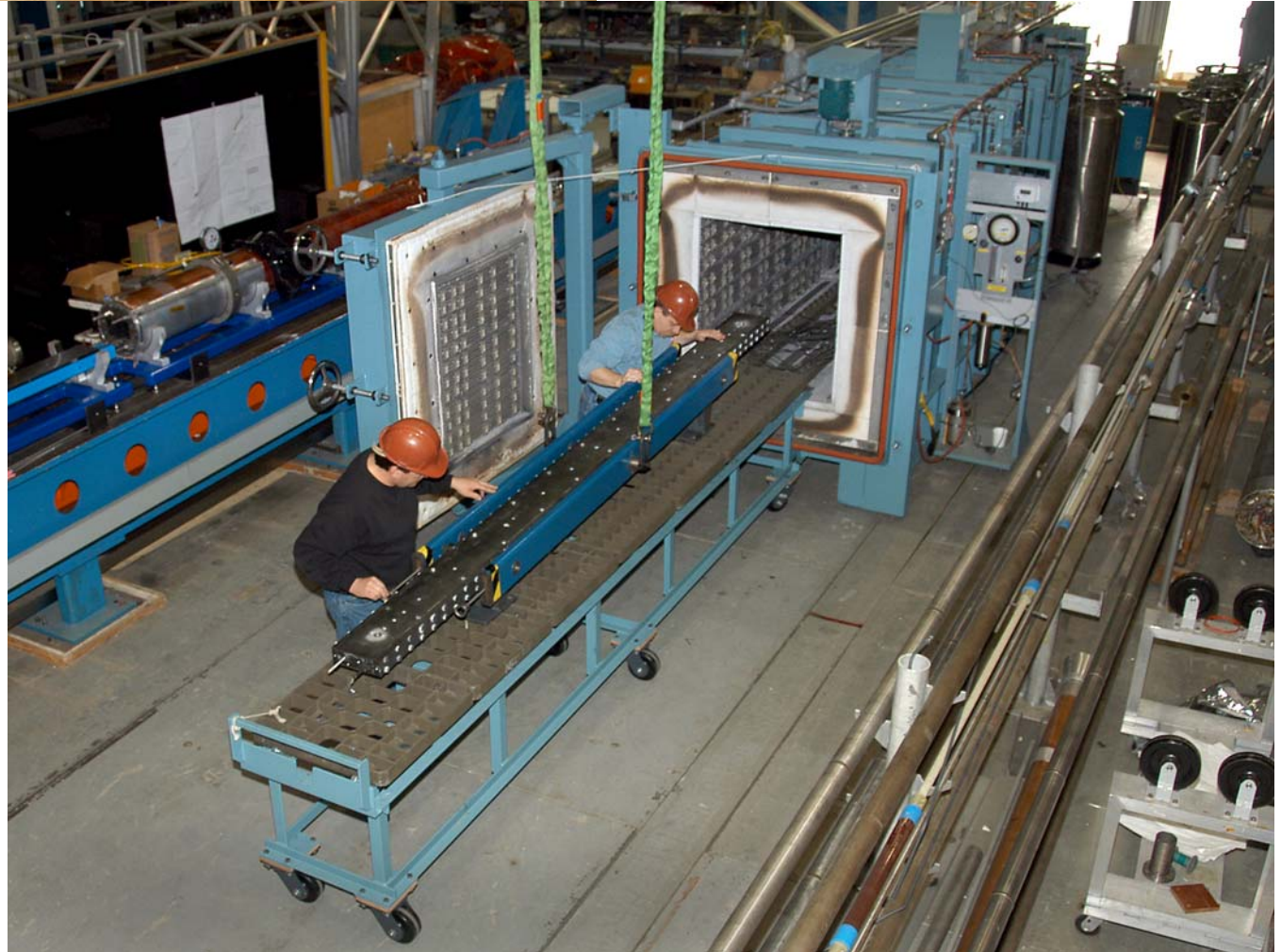
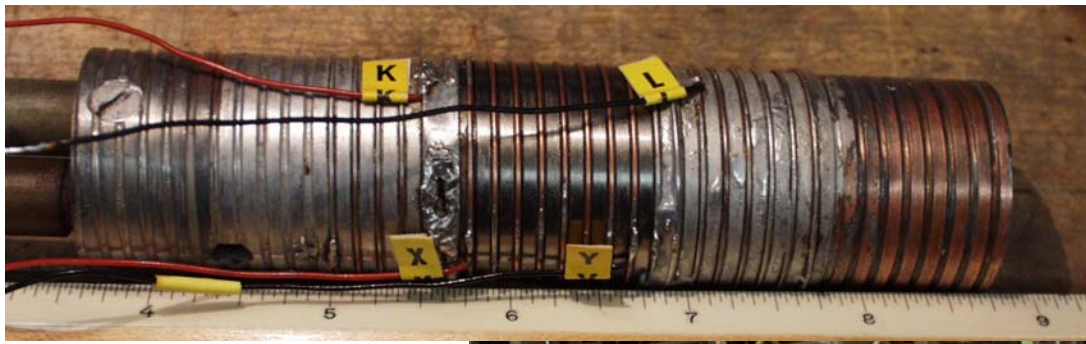


Synergy

- Obvious: magnet design, test
- Work on ILC vibration measurement technology →
 - RHIC IR quads
 - NSLS II girder
- NSLS II laser tracker → ERL dipole measurements (Hall probe positions)

LARP

- Construction, test of 3.6 m racetrack magnet with Nb₃Sn (with Berkeley)
- Design, construction of tooling for 3.6 m quad coils (with Fermilab)
- Testing of Nb₃Sn strands
- Management

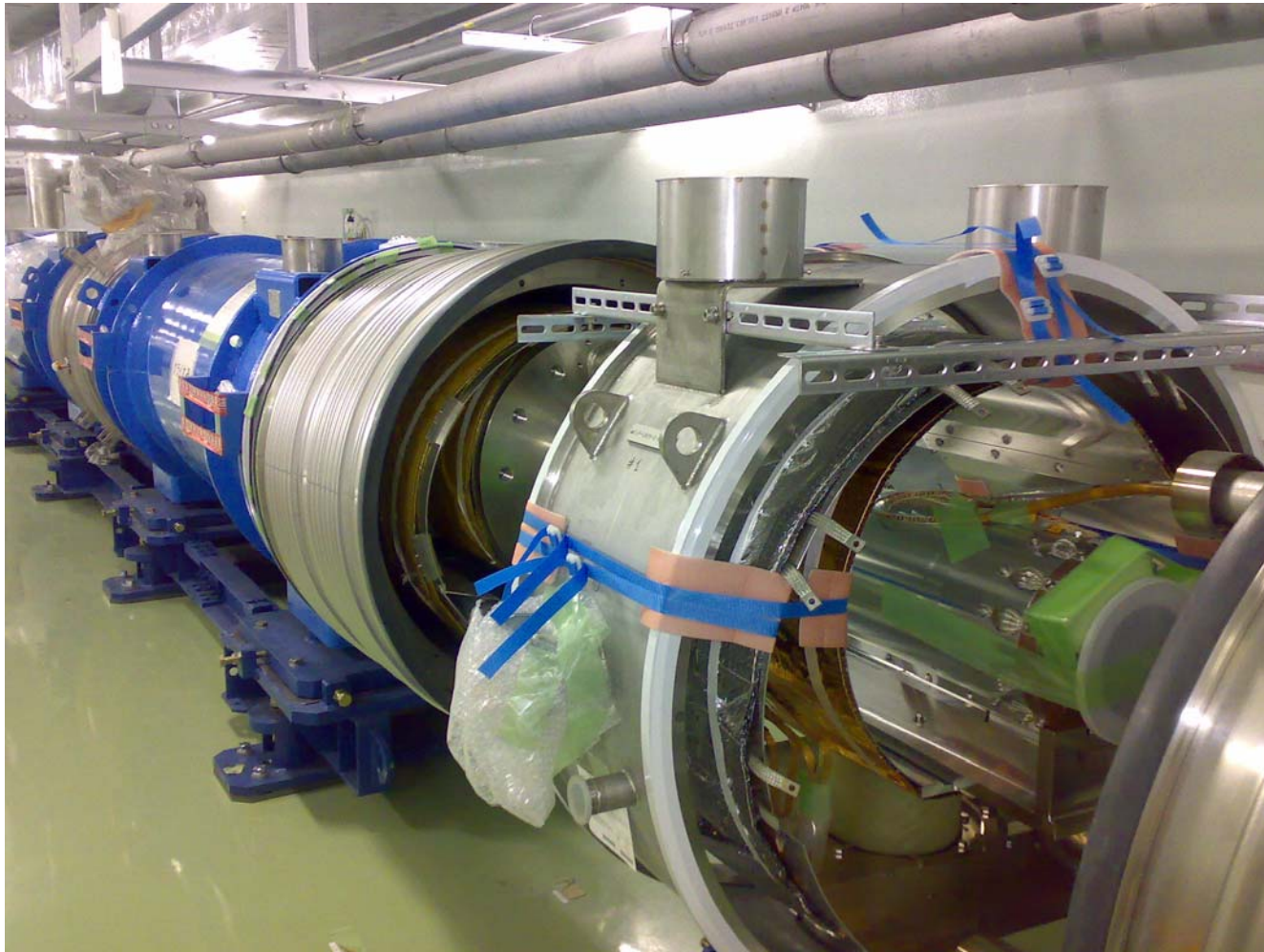


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KEK/T2K/J-PARC

- Four “direct wind” corrector magnets, attached to main bending and focusing magnets for extracted proton beam.
 - Magnets delivered “just in time”
 - Cost less than estimated

BNL correctors in J-PARC



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RIA → FRIB

- High temperature superconductor (HTS) used for quadrupole in high radiation area.
 - "tape" conductor, brittle
- Successful test of model made with "First Generation" HTS tape

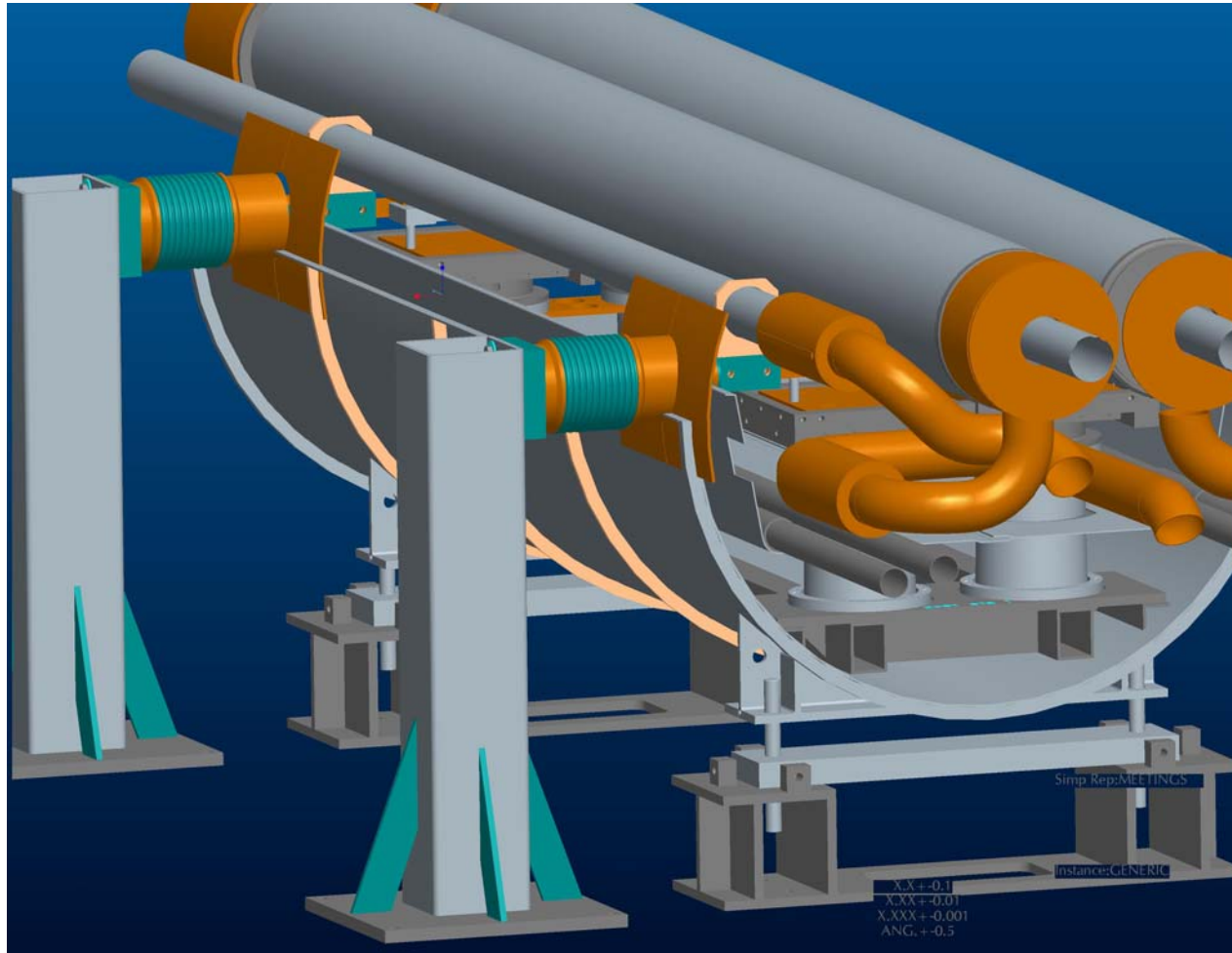
What's underway/what's ahead?

- RHIC
- LARP
- Superconductor R&D
- ILC
- NSLS II
- FRIB

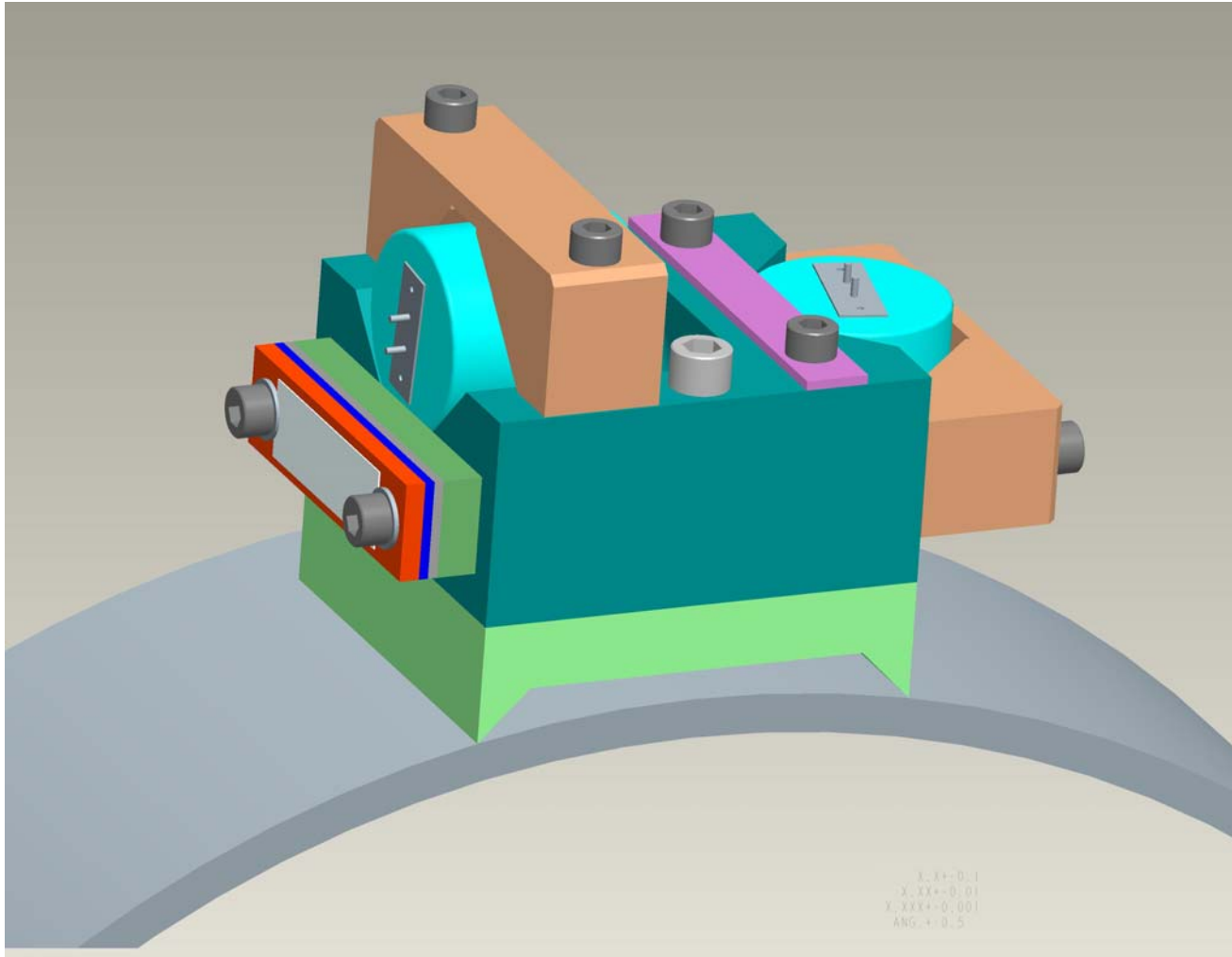
RHIC technical near term

- *Measure* motion of RHIC triplet quads during next running period (Jan. 09?)
 - Stabilization system too expensive to build at present
- Separate cryo line from triplet quads
- Locate bad solder joints in tunnel
- Repair, upgrade 902 cryo test facility
- Measure ERL dipoles
- Tunnel help, very soon → end of CY08?

Separate cryo line ...



Measure vibration



ERL dipole measurements



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RHIC financial near term

- C-AD budget cuts
 - FY08 running reduced: 30 weeks → 19
 - Partly financed by cut in support of SMD
 - No layoffs
- Continual financial pressure on C-AD
 - FY08: support = 15 FTE
 - FY09: support = 12 FTE
 - FY10: support = 9 FTE

RHIC longer term

- A cheaper way to increase luminosity is under development ("stochastic cooling")
- Electron-ion collisions
- More info in Steve's talk

LARP

- FY09:
 - Make, assemble(?) Nb₃Sn quadrupole coils
 - Design, make(?) coil tooling for larger-aperture quadrupoles
- Construction project (LHC upgrade *essential*)
 - Phase 1: deliver Dec. 2012 or (?)later
 - Deliverables TBD (DX? Large aperture Nb₃Sn quads)
 - Funding start FY10 likely
 - Phase 2: deliver Nb₃Sn quads ~ 2015
- Continue Nb₃Sn materials study several years

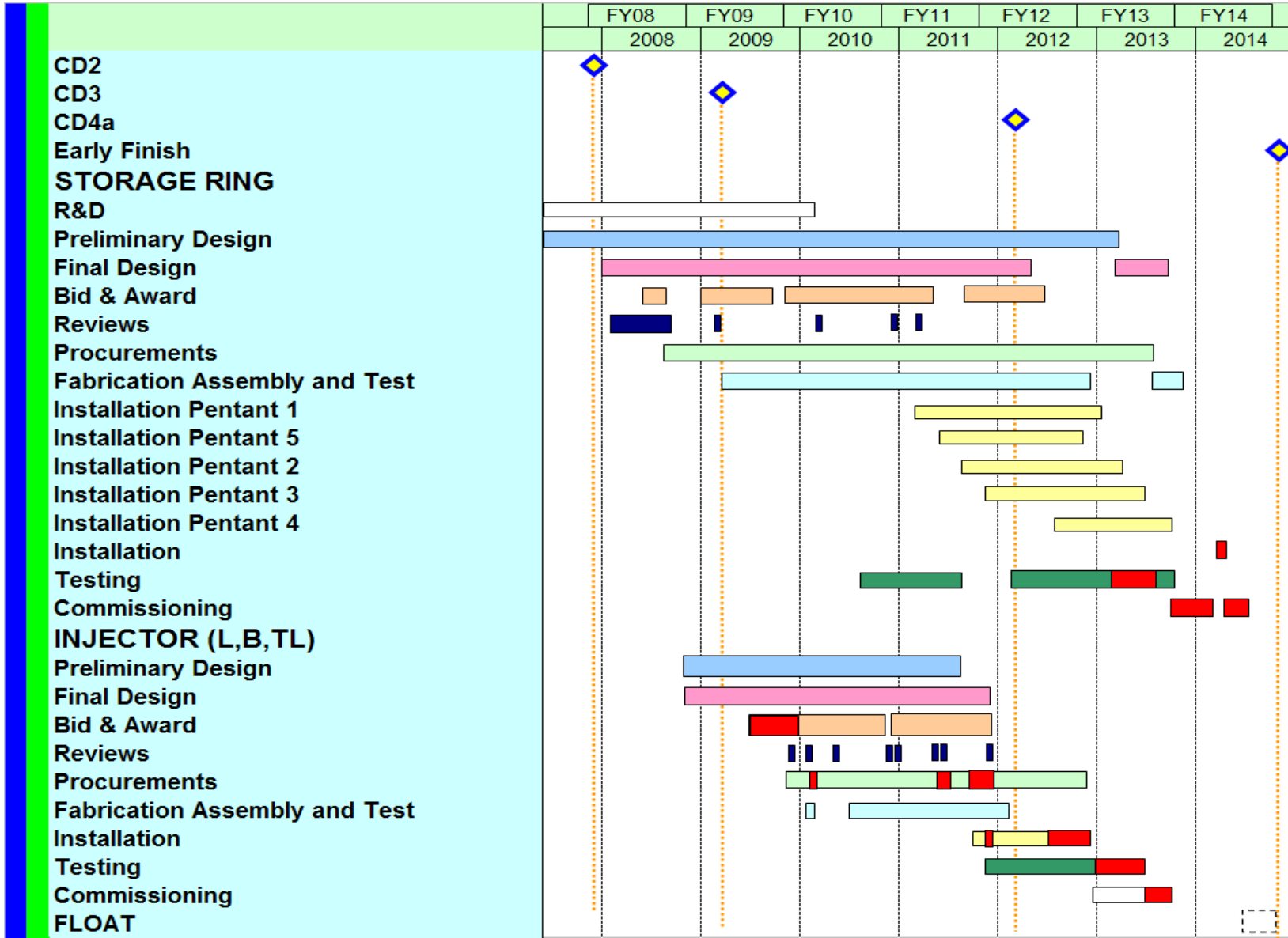
Superconductor R&D

- Nb_3Sn (complementing LARP studies)
- HTS, second generation (YBCO)
 - HTS is also "high field superconductor"
 - That is, higher fields than Nb_3Sn can tolerate
 - Muon collider needs very high field magnets
 - Fermilab strong interest in Muon Collider

ILC

- FY08P \$1.6 M → \$0.4 M (SMD)
 - FY08P \$60 M → \$15 M (national)
- FY09P \$30 M, \$1.6 M
 - FY09CR expected, \$0.4 M
 - HEP Particle Physics Project Prioritization Panel (P5) -final meeting today - LARP, ILC, Muon Collider, superconductor R&D
- ILC management: looking at non-U.S. location, will cooperate with CERN

NSLS II construction



FRIB

- DOE has issued draft RFP, will issue final RFP soon, plans to make selection by end of CY → FY10 construction start
- Both competitors (Argonne, Michigan State Univ.) have asked SMD for help with magnets for FRIB (scope TBD)
- BNL will maintain a neutral position with regard to site selection.

Overall

- FY09 looks tight:
 - ILC a major factor
- Beyond FY09:
 - There are several projects for the three DOE offices (HEP, NP, BES) where SMD can make a significant contribution.
- The high quality work done by SMD staff is an enormous asset.