

NLC - The Next Linear Collider Project



IR & Backgrounds Group Status, Plans and Goals

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SLAC

ALCPG SLAC
09 January 2004

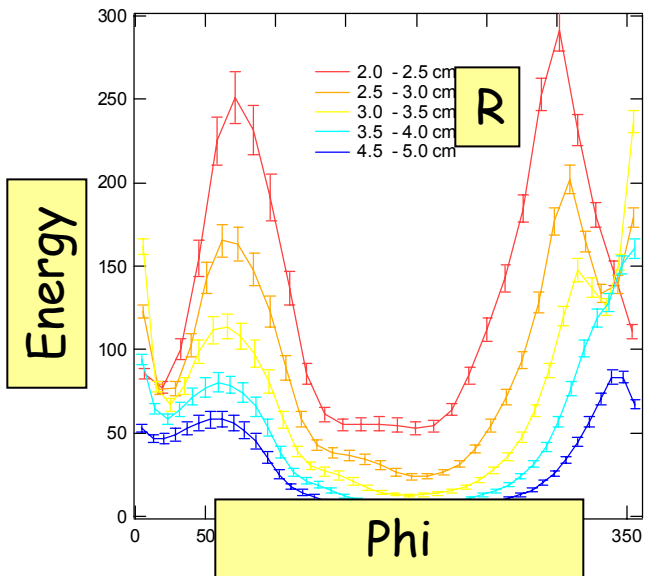


Level of Effort

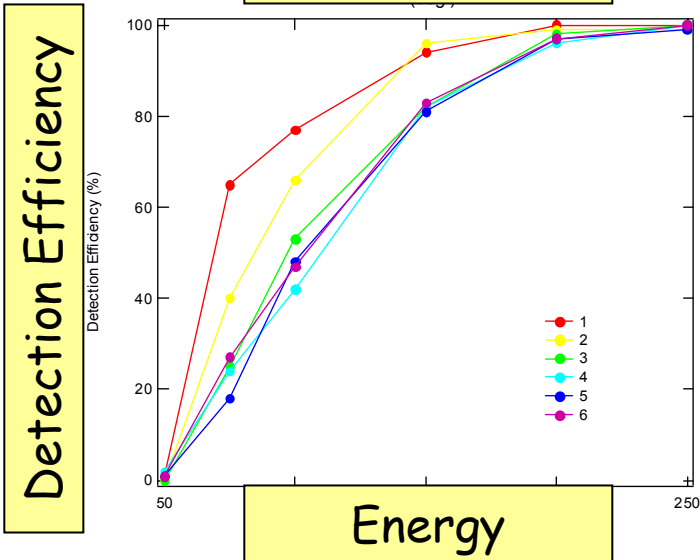
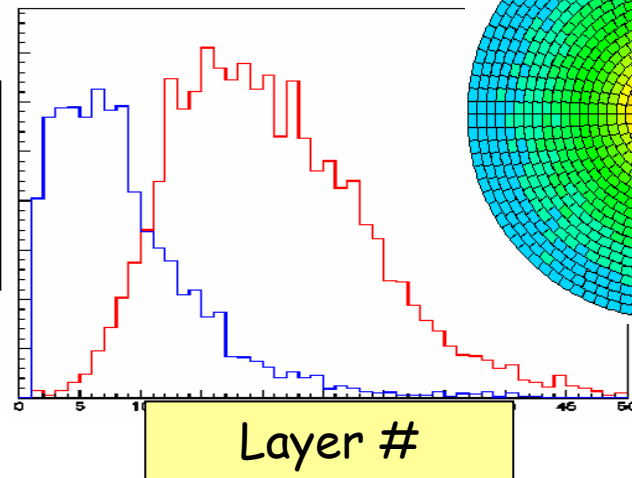
- **Backgrounds & IR Design**
 - NLC BDIR Group
 - Takashi Maruyama, Lew Keller, TWM
 - U. Mass: Stan Hertzbach
 - SLAC Research Division
 - M. Breidenbach, K. Skarpaas, J. Jaros, Tim Barklow, M. Woods
- **Beam Delivery Issues**
 - NLC Accelerator Physics Group
 - Tor Raubenheimer, Andrei Seryi, Peter Tenenbaum, Nan Phinney, Mark Woodley, Yuri Nosochkov
- **Final Doublet Magnet: Engineering, Vibration & Feedback Program**
 - NLC Engineering & Technical Team
 - Joe Frisch, Eric Doyle, Linda Hendrikson, Justin May
 - UK FONT Team: QMUL, Daresbury, Oxford: P. Burrows et al
 - BNL SC Magnet & new SC Vibration Team: Brett Parker et al
 - Brown U.: R. Partridge
 - University of British Columbia: T. Mattison
 - LLNL: J. Gronberg et al

Physics Study of Pair Background

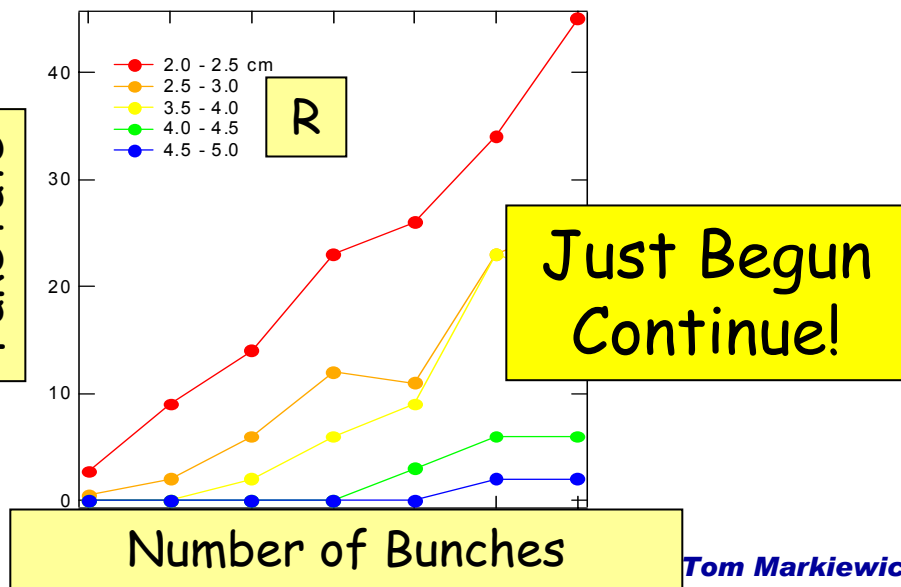
High Energy Electron Detection in LUMON



Energy



Fake rate

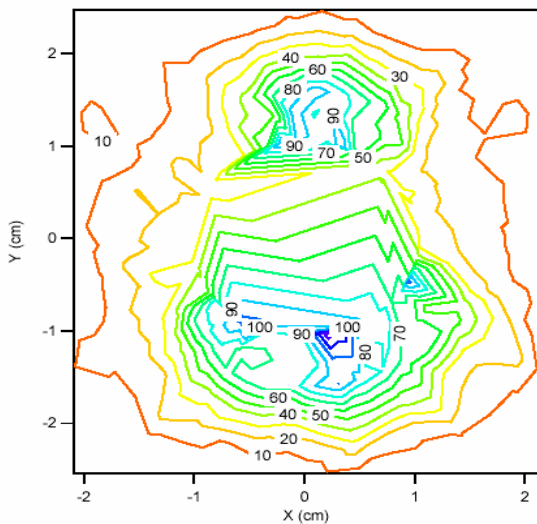




Engineering Study of Backgrounds

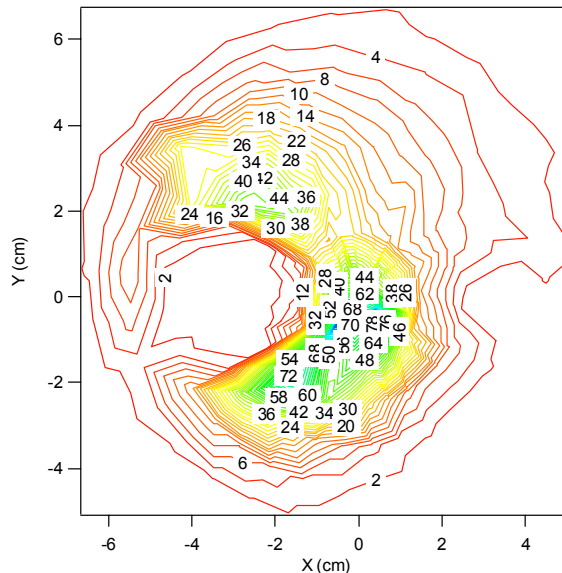
Maximum Dose Rates

QDF1



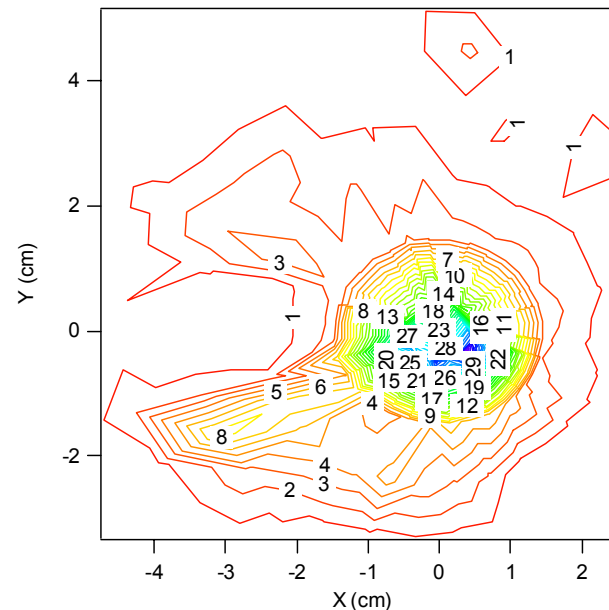
~100 Mrad/year

LUMON



~70 Mrad/year

LOW-Z



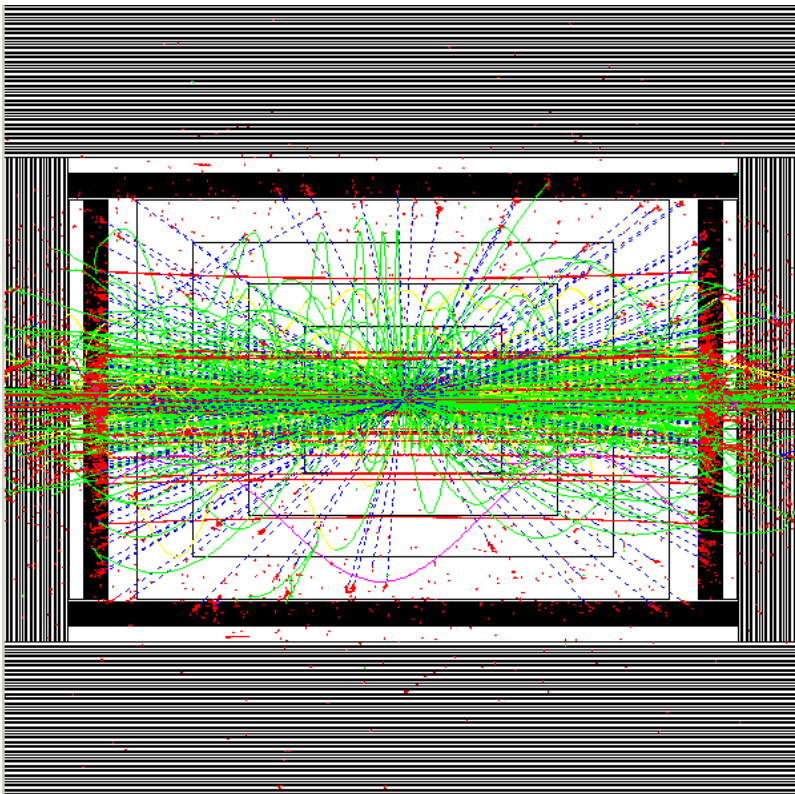
~30 Mrad/year

Other Studies in Hand:
Collimator Survivability
Required protection collimators
Minimum Aperture Study

Continue!

Less Well Studied Processes

$\gamma\gamma \rightarrow \text{hadrons}$



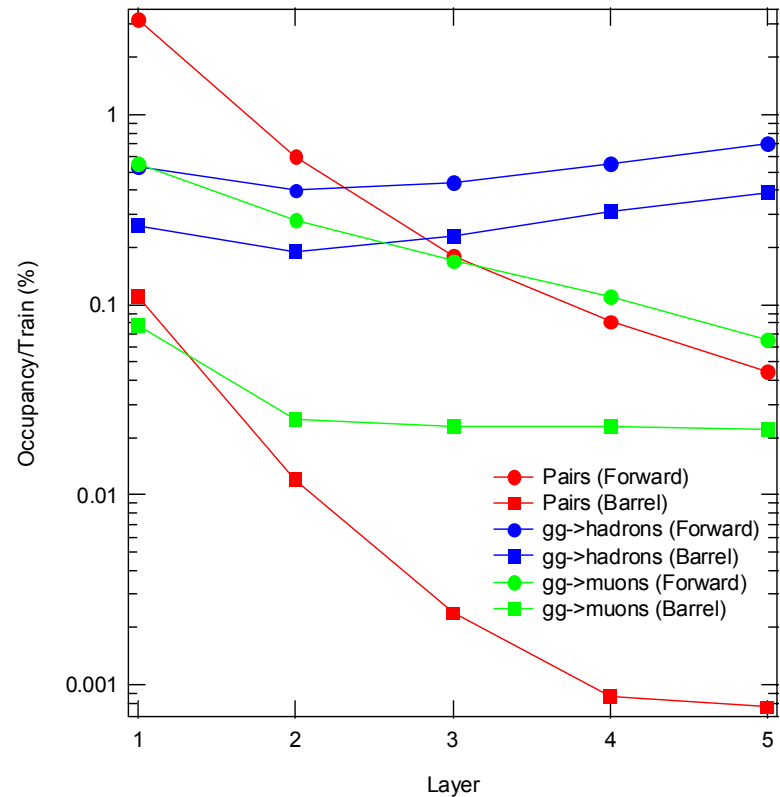
$\gamma\gamma \rightarrow \text{hadrons}$ 56 events / train

no pt cut; E_{cm} down to $\pi^+\pi^-$ threshold

454 GeV / train detected energy

100 detected charged tracks / train

Tracker Occupancies



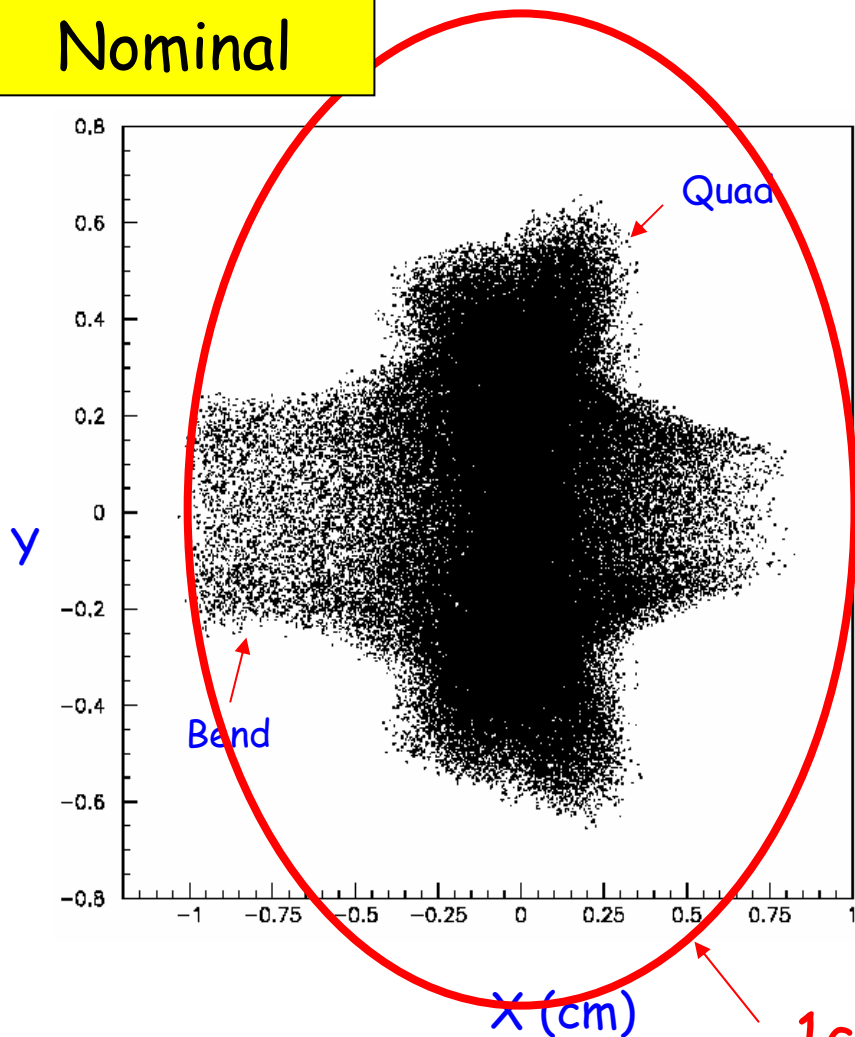
Just Begun
Continue!



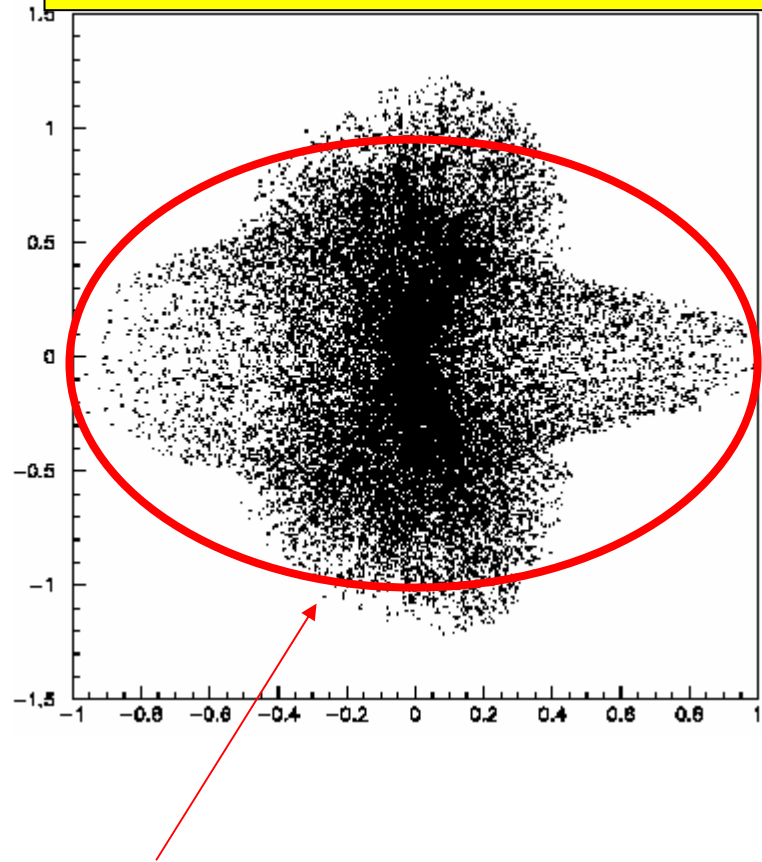
Non_Ideal Conditions

Needs Much Larger Discussion!

Nominal



Collimators Opened x2
Halo Broadened x2

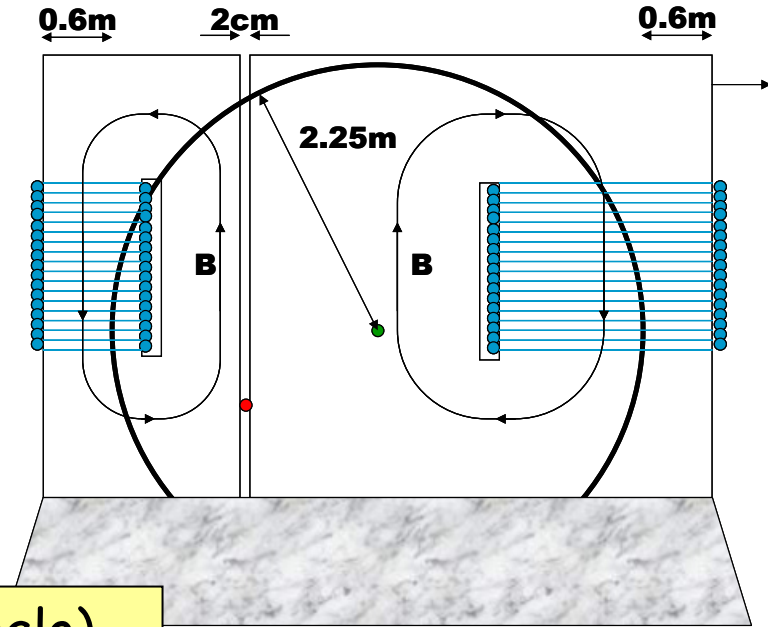
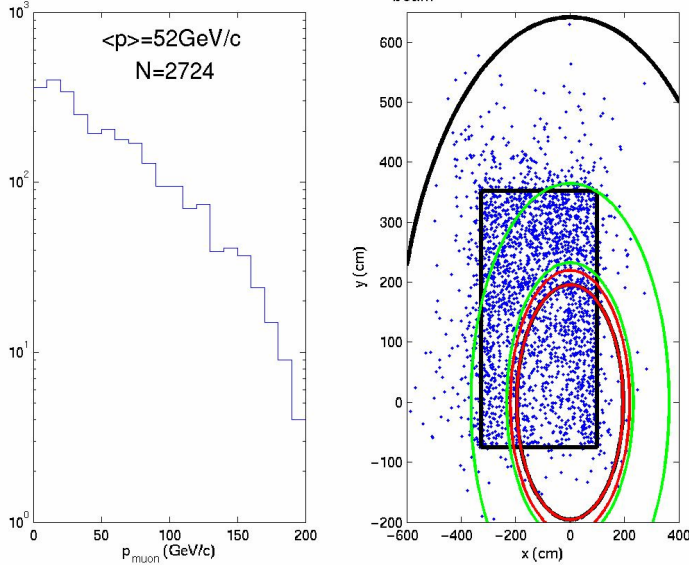


1cm Beampipe

Accelerator Backgrounds

"All" studied at a certain level

Muon p and x,y at Endcap with NO spoilers, $E_{\text{beam}} = 250 \text{ GeV}$



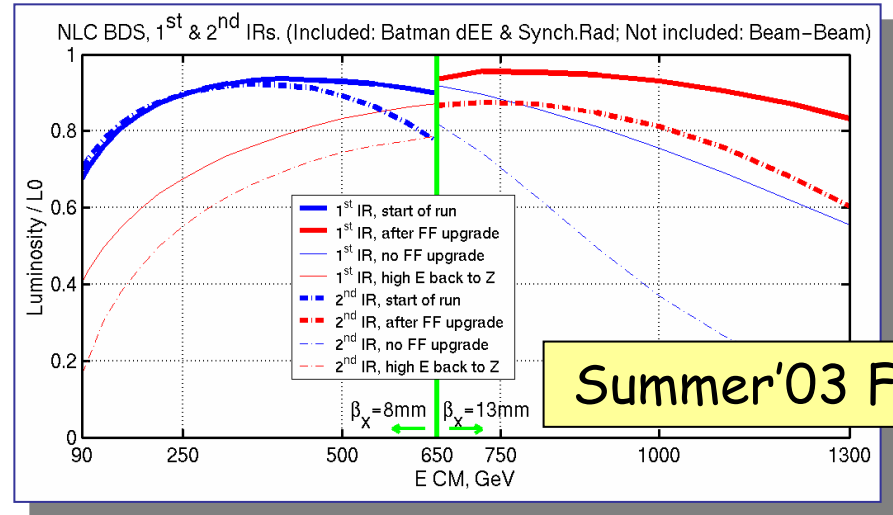
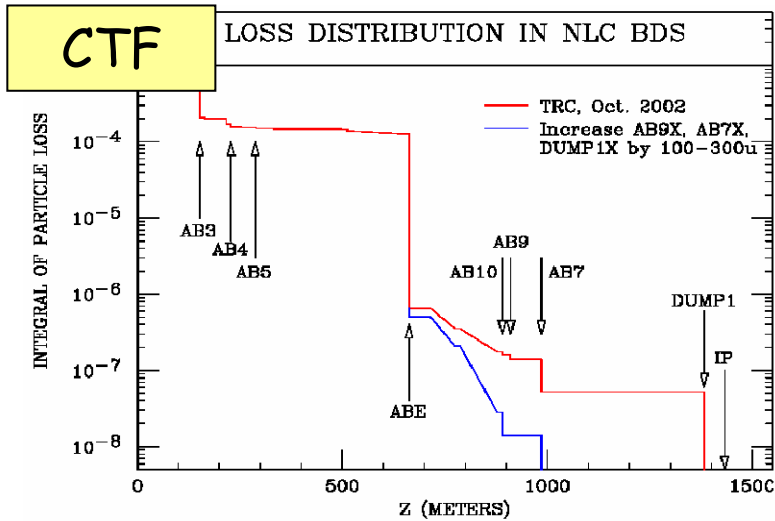
12180 μ /train \rightarrow 7 μ /train (0.1% halo)

- Updated muon background numbers for latest tunnels
- Beam-Gas backgrounds
 - Consequences for detectors
 - Better specification of beamline vacuum
- Updated neutron backgrounds for latest dump location, extraction line

Updates could be delivered by Paris

Beam Delivery Lattices

- Collimation & FF Lattices will NOT change this year
- Vancouver?: Update EXTRACTION LINE Lattice
 - SC Magnets, Dipole corrector, $L^*=6m \rightarrow$ outside SiD, LD



Detector Legend

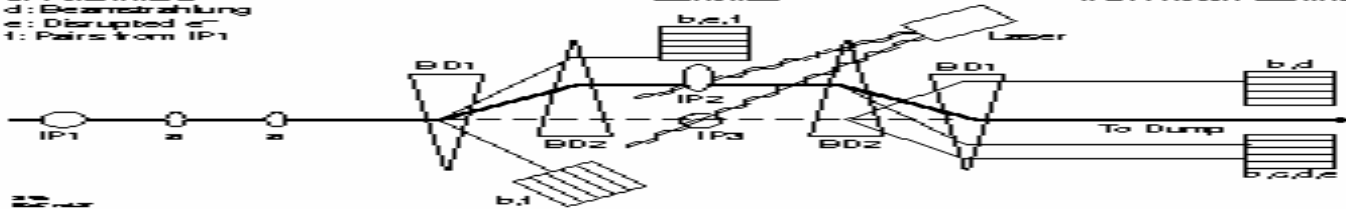
- a: BPM (deflection scan)
- b: Wire Scan/Screen
- c: Polarimeter
- d: Beamstrahlung
- e: Disrupted e⁻
- f: Pairs from IP1

Beam Legend

- On-Energy e⁻
- - - Off-Energy e⁻, e⁺
- Gammas

IP Legend

- IP1: e⁻ e⁻
- IP2: e⁻ Photon
- IP3: Photon Gamma



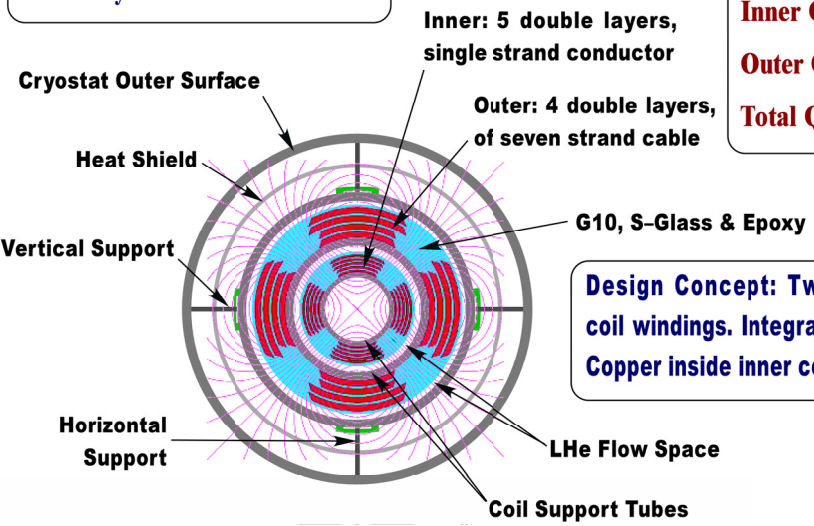
EXT

SC Magnet R&D

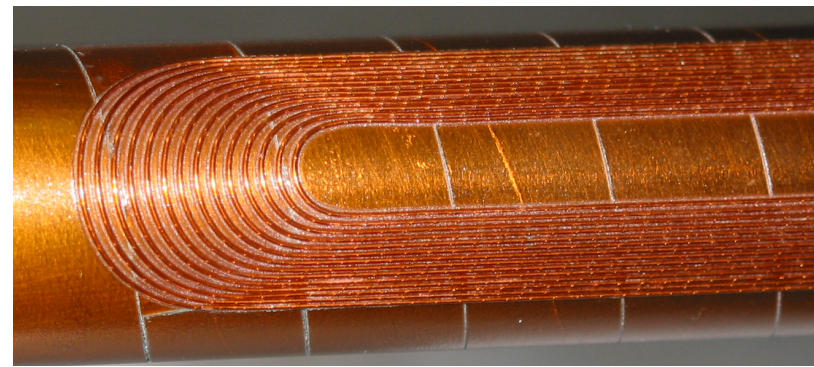
Inner Beam Tube 20 mm ID
Outer Cryostat Tube 114 mm OD

QDO Coil Parameters
Inner Quad 63 T/m
Outer Quad 81 T/m
Total Quad 144 T/m

First layer of NLC 1.8 m superconducting quadrupole prototype being wound



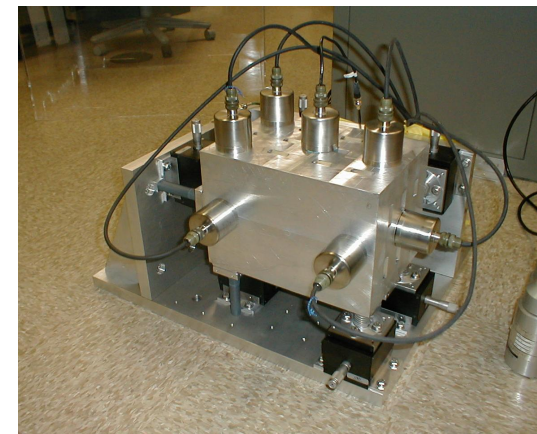
Design Concept: Two independent coil windings. Integrated helium flow. Copper inside inner coil support tube.



Hope: BNL vibration measurements can isolate mechanical vs. liquid He contributions to vibration for ITRP (& Paris)

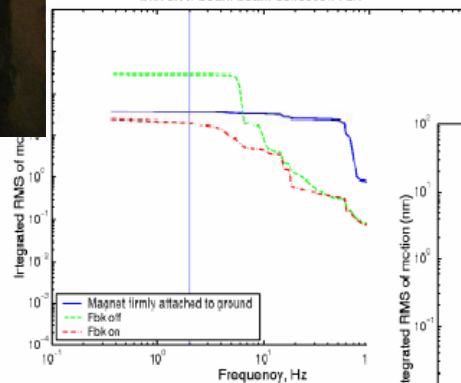
Likely: Cold tests of full 5 layer inner coil by end FY (Victoria ALCPG?)

Stabilize a Mechanical Model of QD0

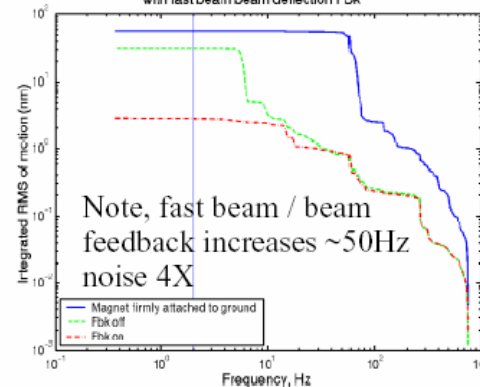


PLAN:
Final Results with commercial sensors
by ~March for ITRP

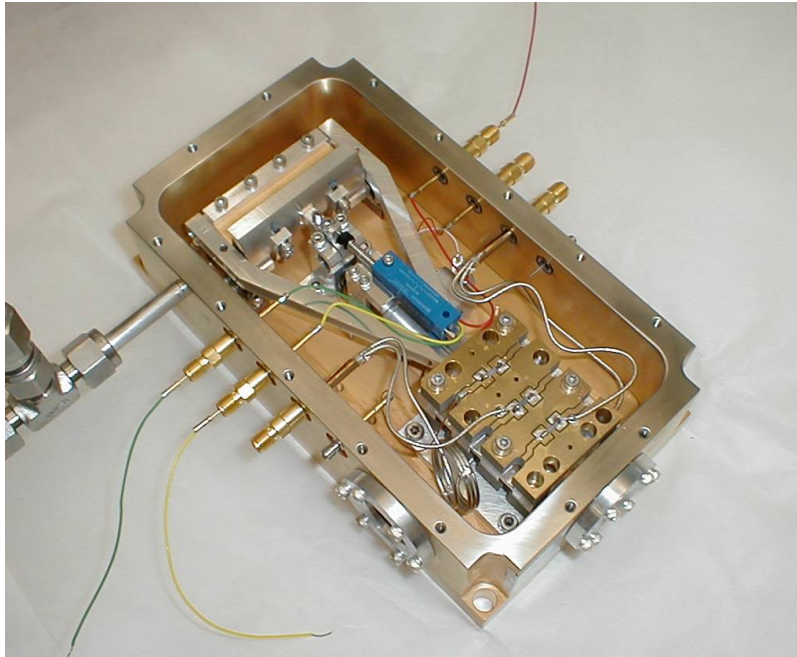
Integrated RMS of beam beam separation
with slow beam beam deflection Fbk



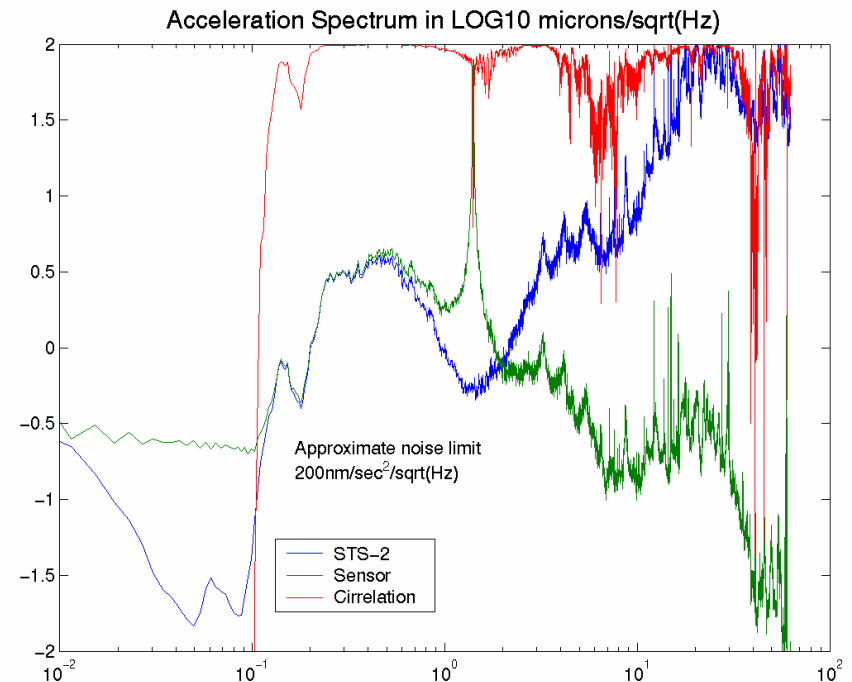
Integrated RMS of beam beam separation
with fast beam beam deflection Fbk



New Inertial Sensor



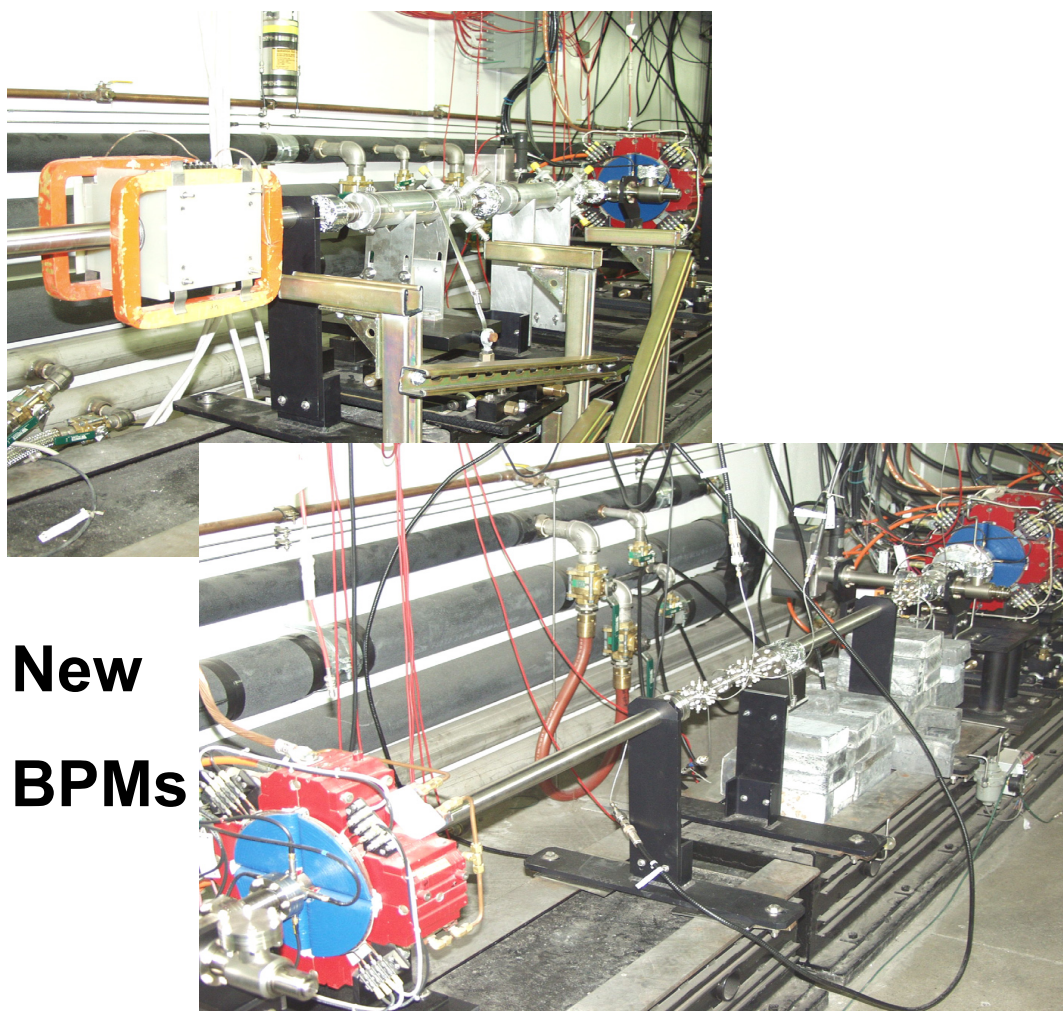
PLAN:
Measure performance of latest generation by summer '04



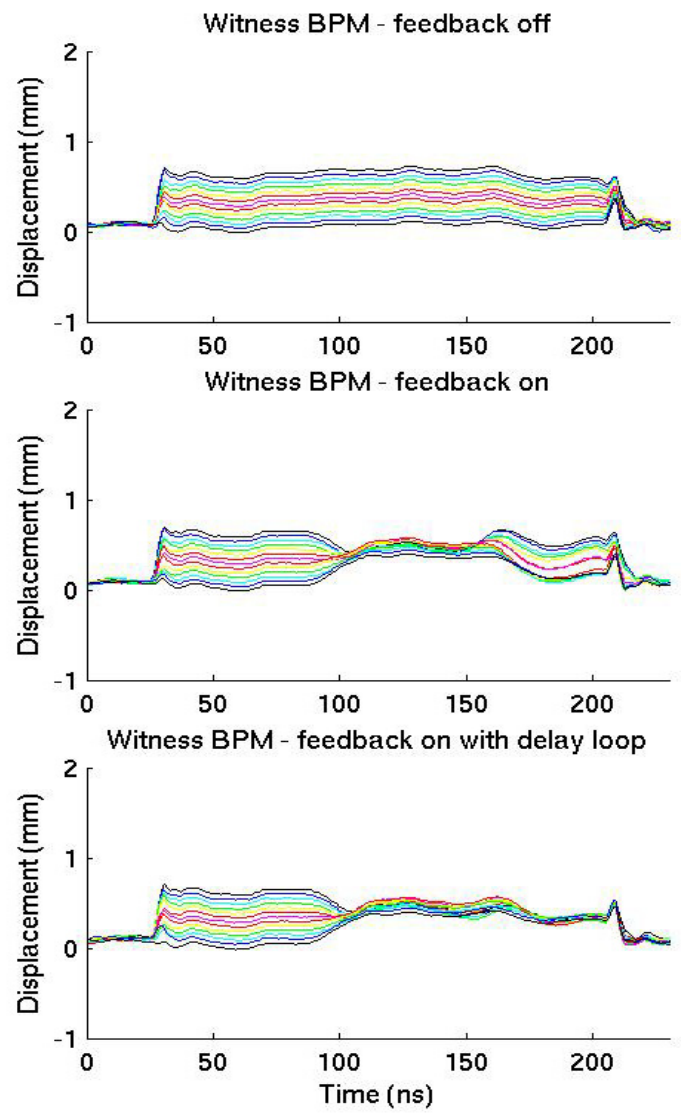
NLCTA FONT2

Feedback On Nanosecond Timescales

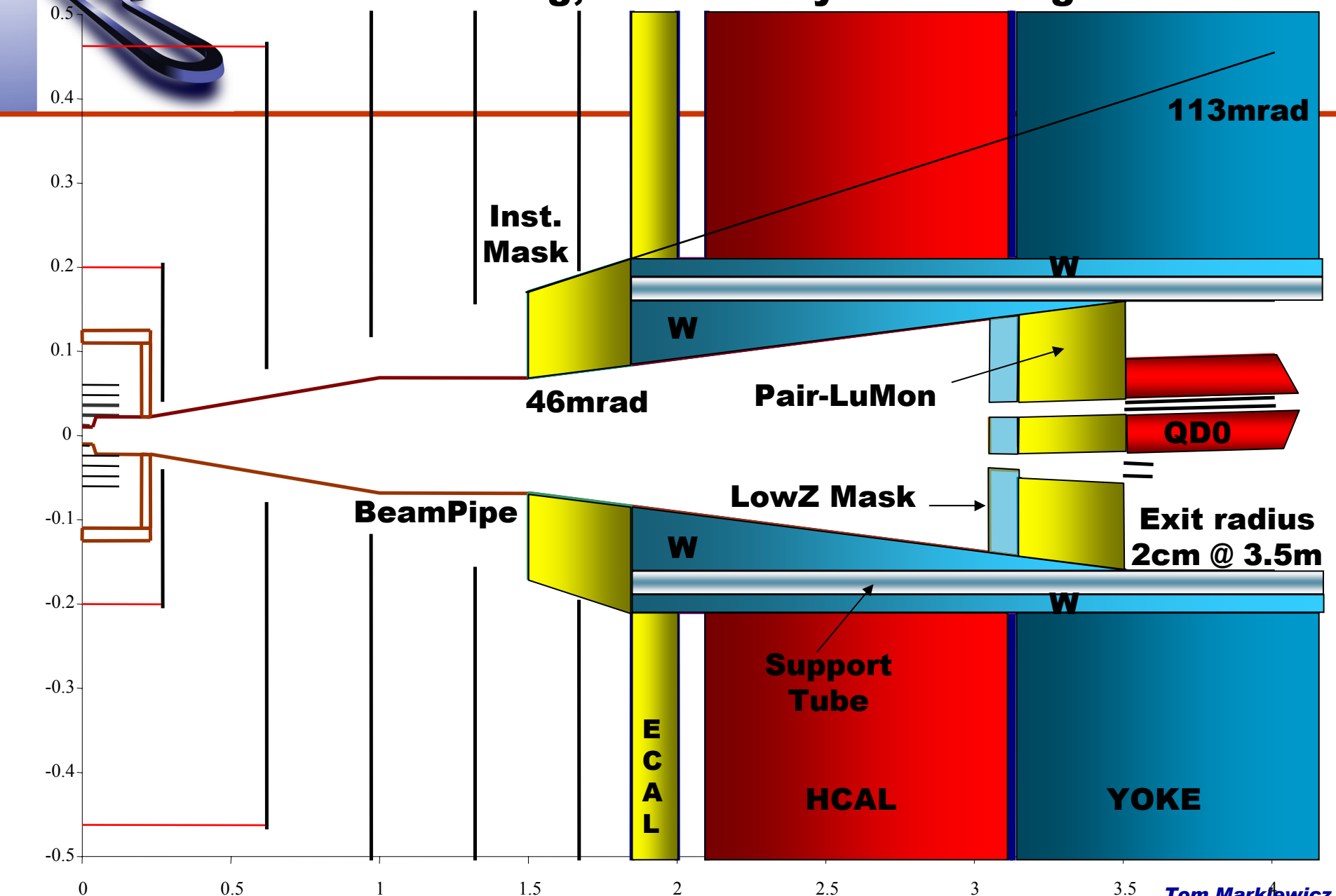
Dipole and kickers



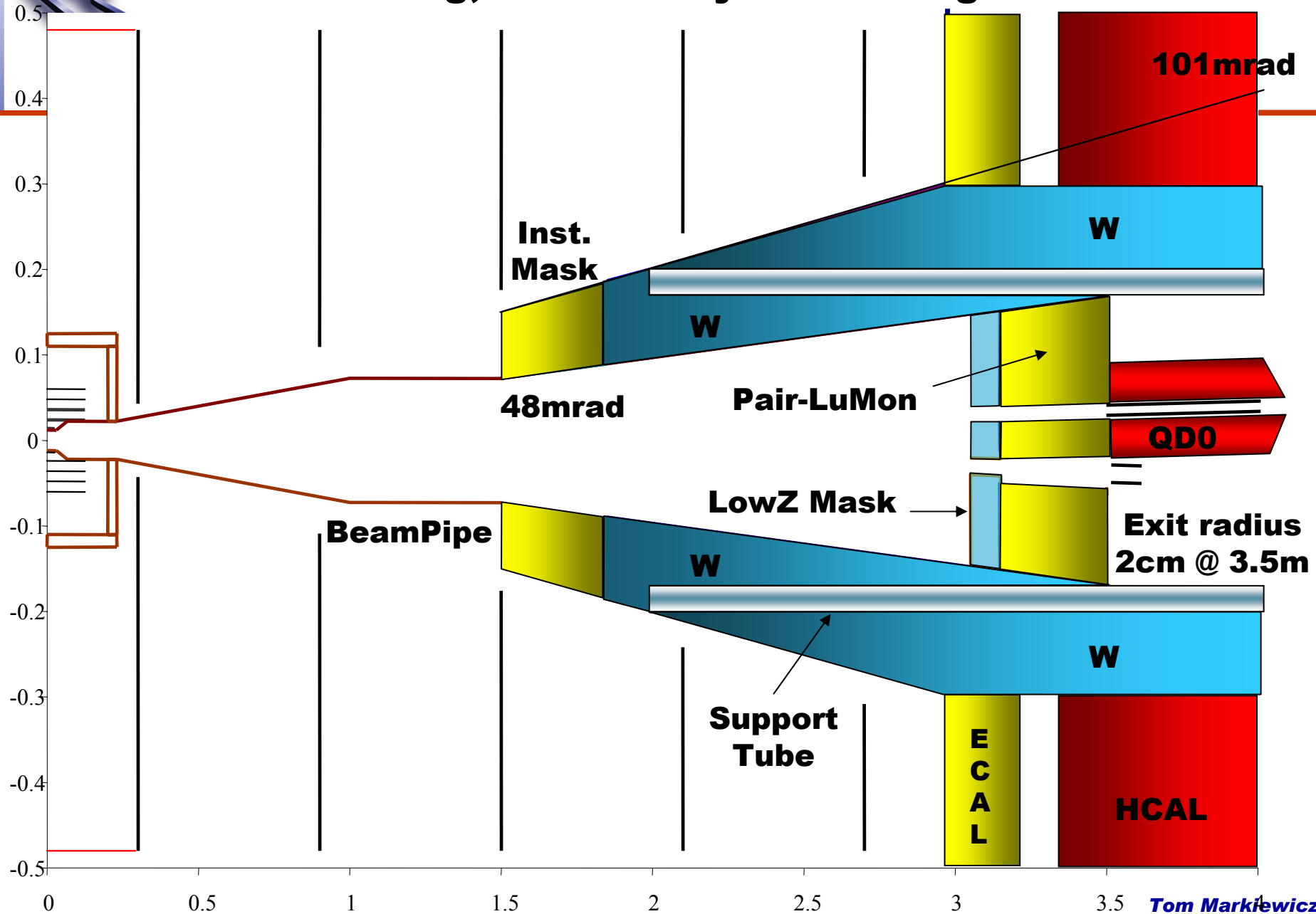
New
BPMs



SiD Forward Masking, Calorimetry & Tracking 2003-06-01



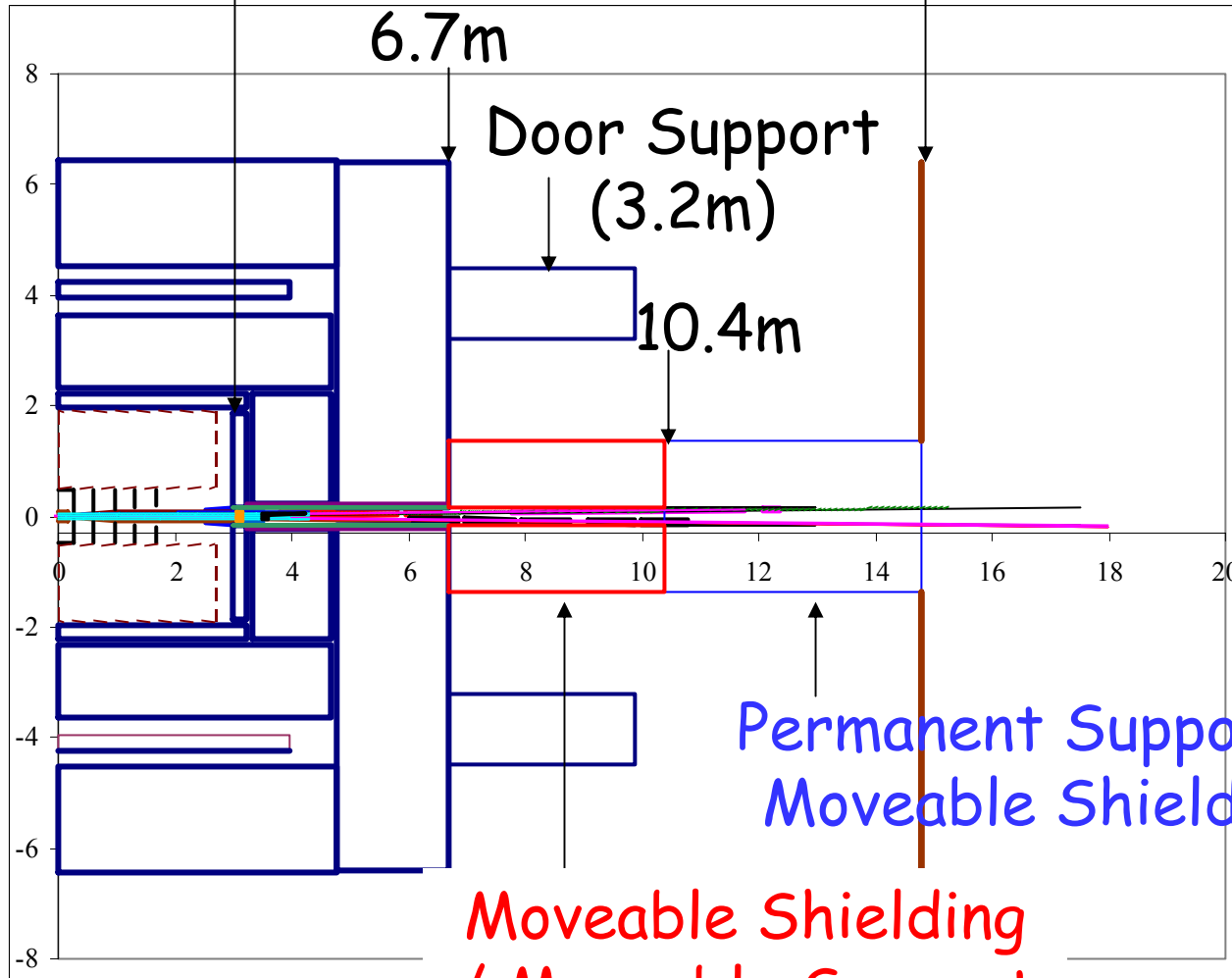
LD Forward Masking, Calorimetry & Tracking 2003-06-01



Current Large Detector Access Model

Endcap ECAL@ 3m

Pit Wall (14.8m)





Baseline Design Decisions Needed

- **Readout time per sub-detector in LD & SiD baseline**
 - A technology choice driver deserves a crisper answer than given to date
 - Note scary $\gamma\gamma$ and e- ID plots shown earlier
- **Forward Calorimetry design that**
 - Minimizes effect of Ecal, IM, LUM-PairMon edges
 - Indicates space for electronics
- **Detector Access Model:**
 - Doors & Barrel model, Pit size, R-20 QD0 support tube length, Mask mounting & xfer method
- **Max. allowed Muon Background Rate per sub-detector per unit area**
 - Do we need 4x4600 tons of shielding upstream



Longer Term Goals

- **Write Up What We've Done!**
- **NanoBPM program at ATF**
 - Stabilize 2 rafts of nano-BPMs
 - Inertial & Optical Anchor techniques
 - Use FONT to Feed Forward/Back to improve beam
- **Full 2 layer SC Quad**
 - Magnetic & Vibration measurements
- **Post CDR phase**
 - LINX: SLC colliding beam test of
 - FF
 - Collimation
 - Stabilization
 - Engineered collimators
 - Crab cavity tests