MLI Summary

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SLAC

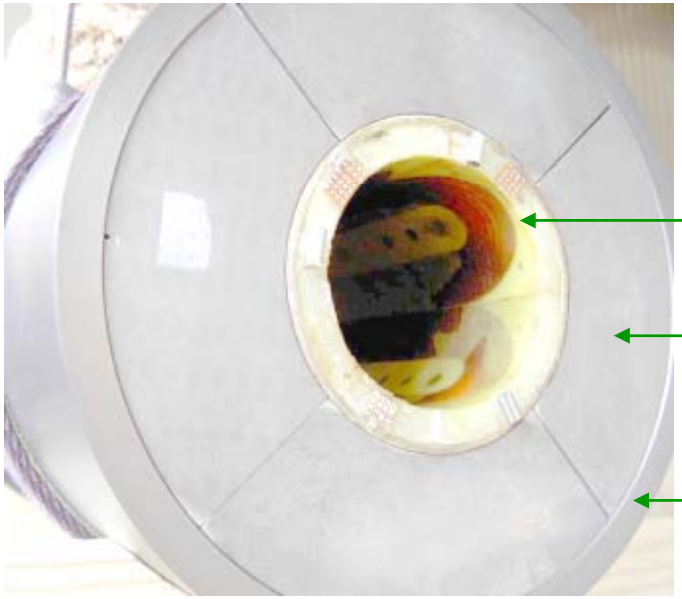
Summary of MLI Talks

- Quadrupoles (V. Kashikhin)
  - Expect test of a SLAC/CIEMAT and FNAL cos(2phi), ~ 60 T/m, SC Quads in next several months – measure:
    - Change in field center with change in field strength
    - Gauge size of persistent current effects to set lower field limit for ILC
    - Measure effect of dipole excitation on field harmonics (CIEMAT superferric quads for XFEL show large effects).
- RF BPMs (M. Wendt)
  - Currently no large aperture (70 mm) bpms meet ILC requirements
    - SACLAY re-entrant design achieved 5-10 microns resolution – low Q (~50) and common mode coupling may be limitations
    - FNAL effort starting up again – design frozen (CM suppressed), warm prototype being built
  - SLAC half-aperture (36 mm) S-band RF bpms have met ILC requirements
- Couplers (C Adolphsen)
  - Will ask cryo group to evaluate the coupler heat loads in order to better evaluate the various approaches.
- Beam Dynamics (P Lebrun)
  - Progress very slow – only ~ 4 people involved in this work and work continues to focus on comparing results of the various tracking codes (the remaining differences appear to depend on subtle differences in the steering algorithm parameters)
  - Suggest the group become involved in the ATF2 dispersion control to get real-world experience.

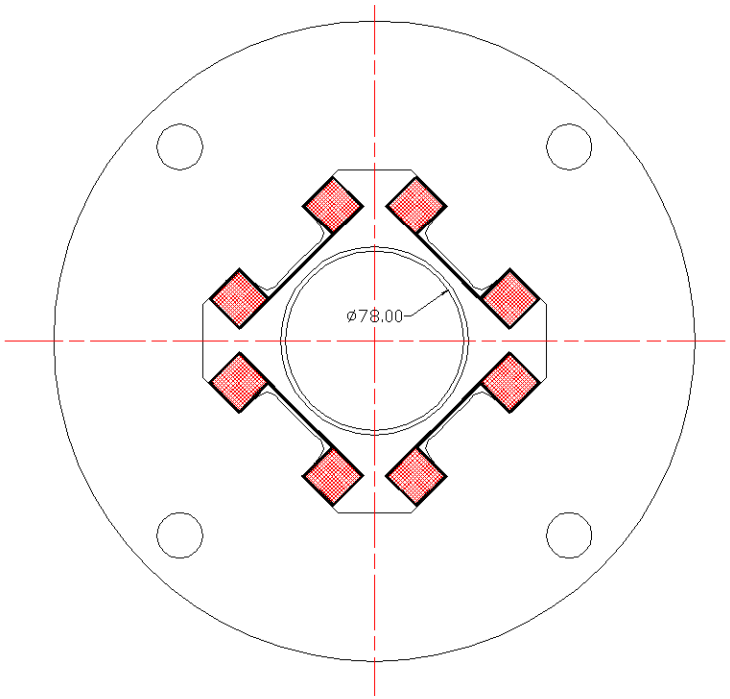
CIEMAT ILC
Cos(2Φ) SC Quad
(~ 0.7 m long)

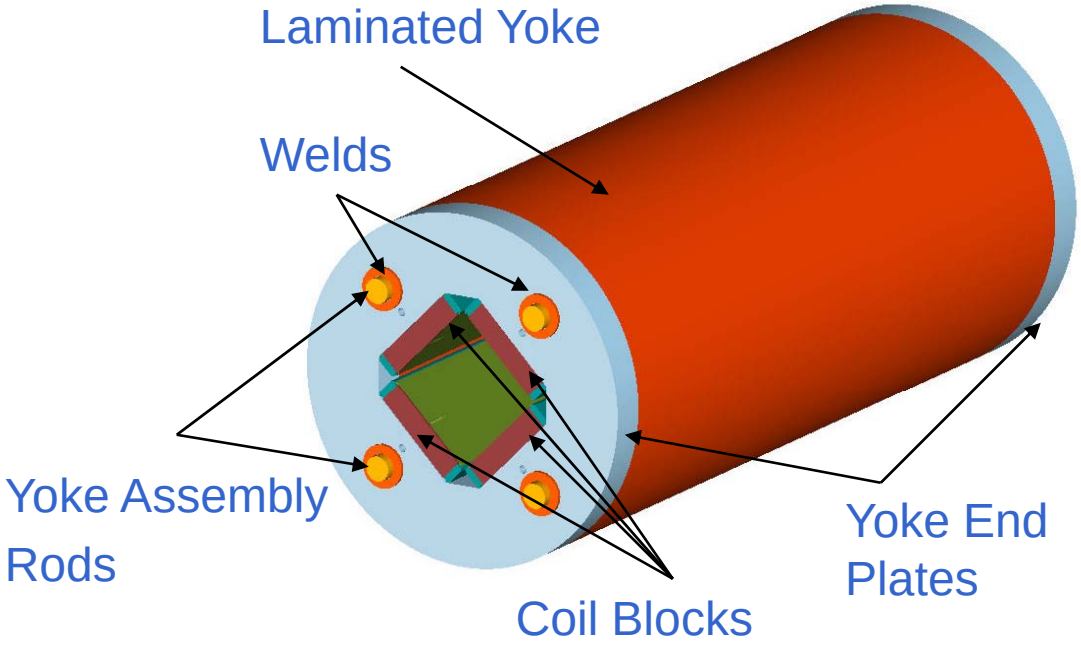
Dewar Test
at DESY

In Warm-Bore
Cryostat at SLAC



Kashikhin: Building Linac Quad and Corrector Prototypes at FNAL

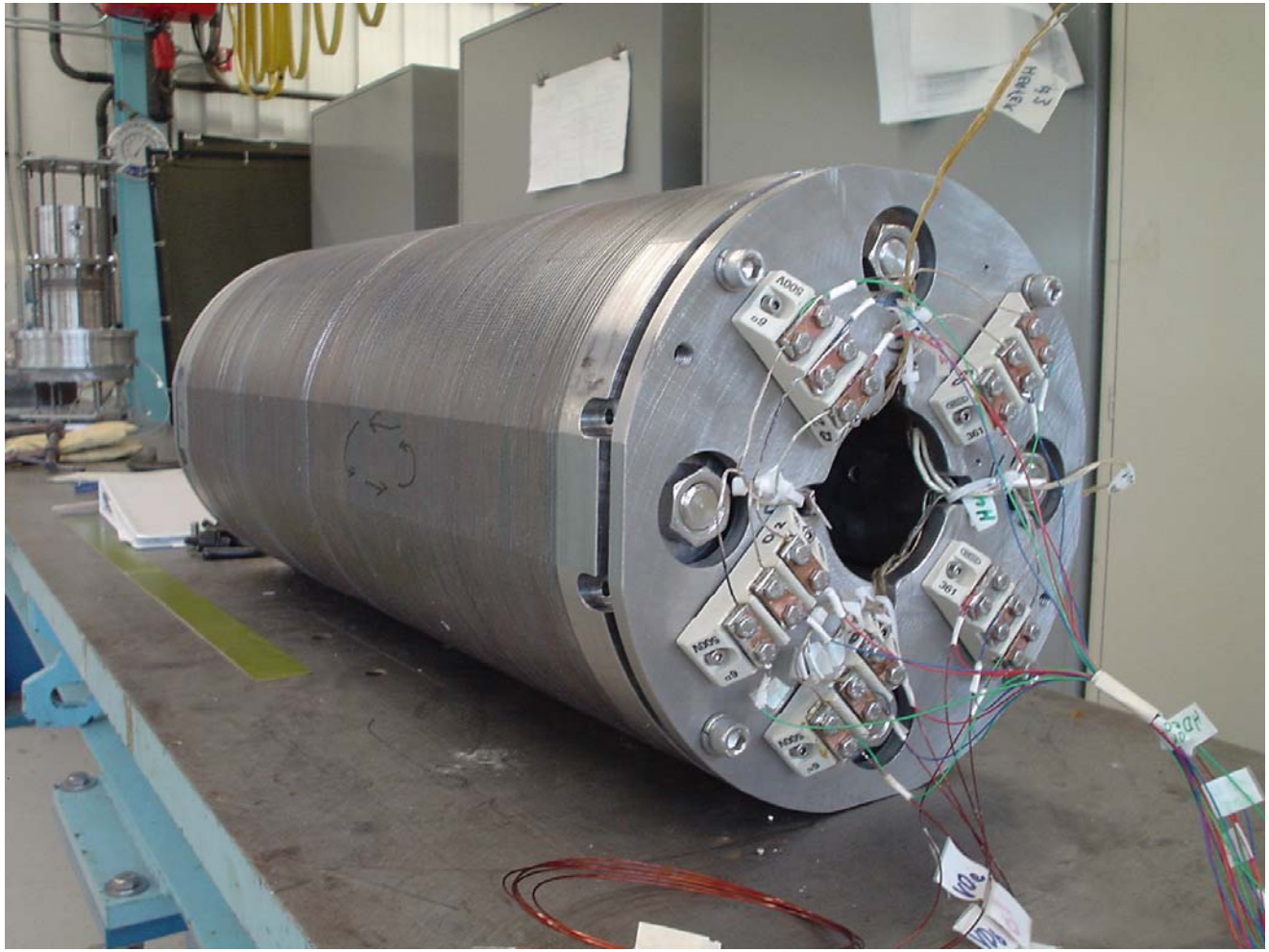




Cold mass: Length 680 mm

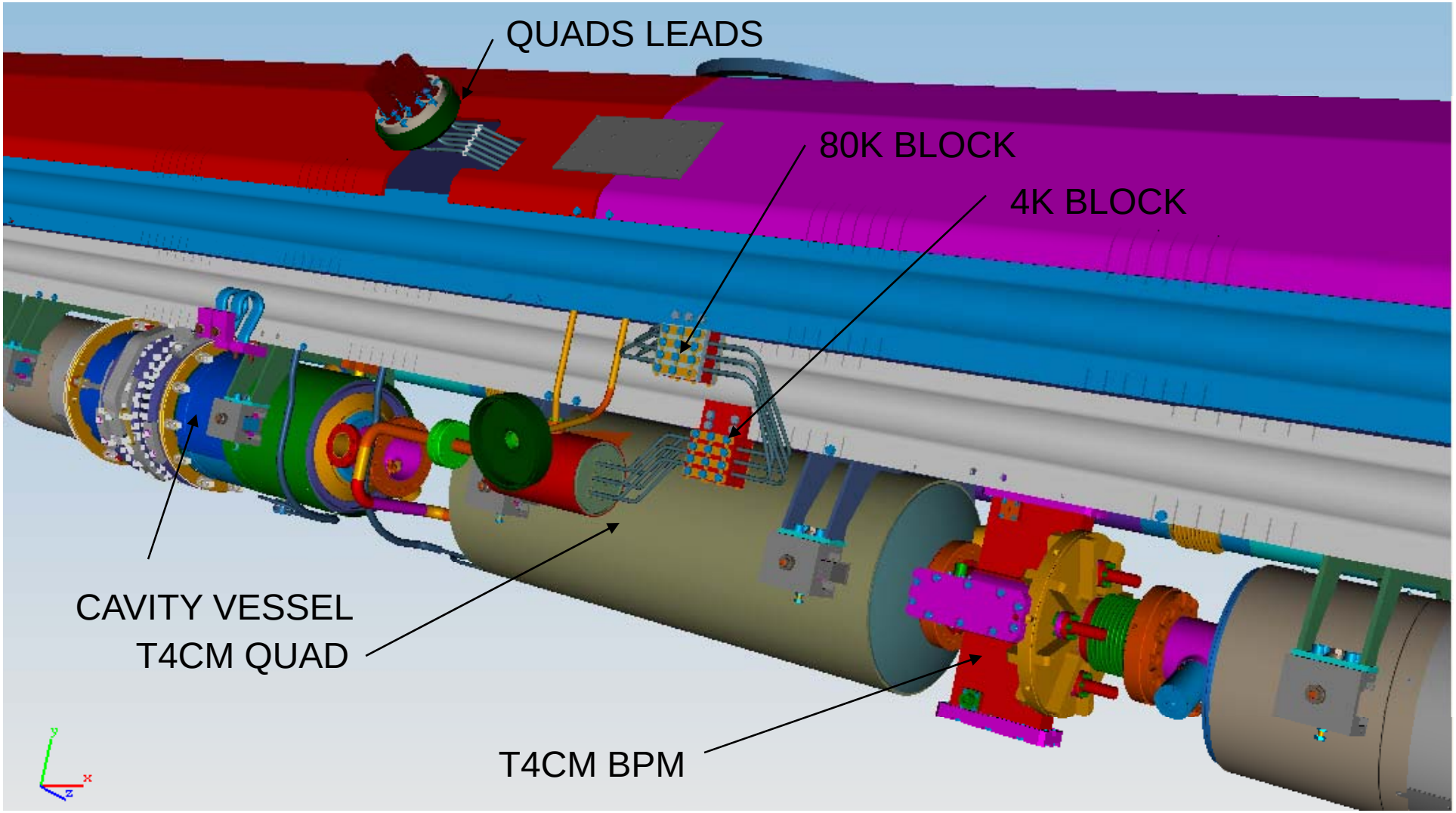
Outer Diameter 280 mm

ILC Quadrupole Model HGQ01



Quadrupole is ready for the test

Quadrupole Package



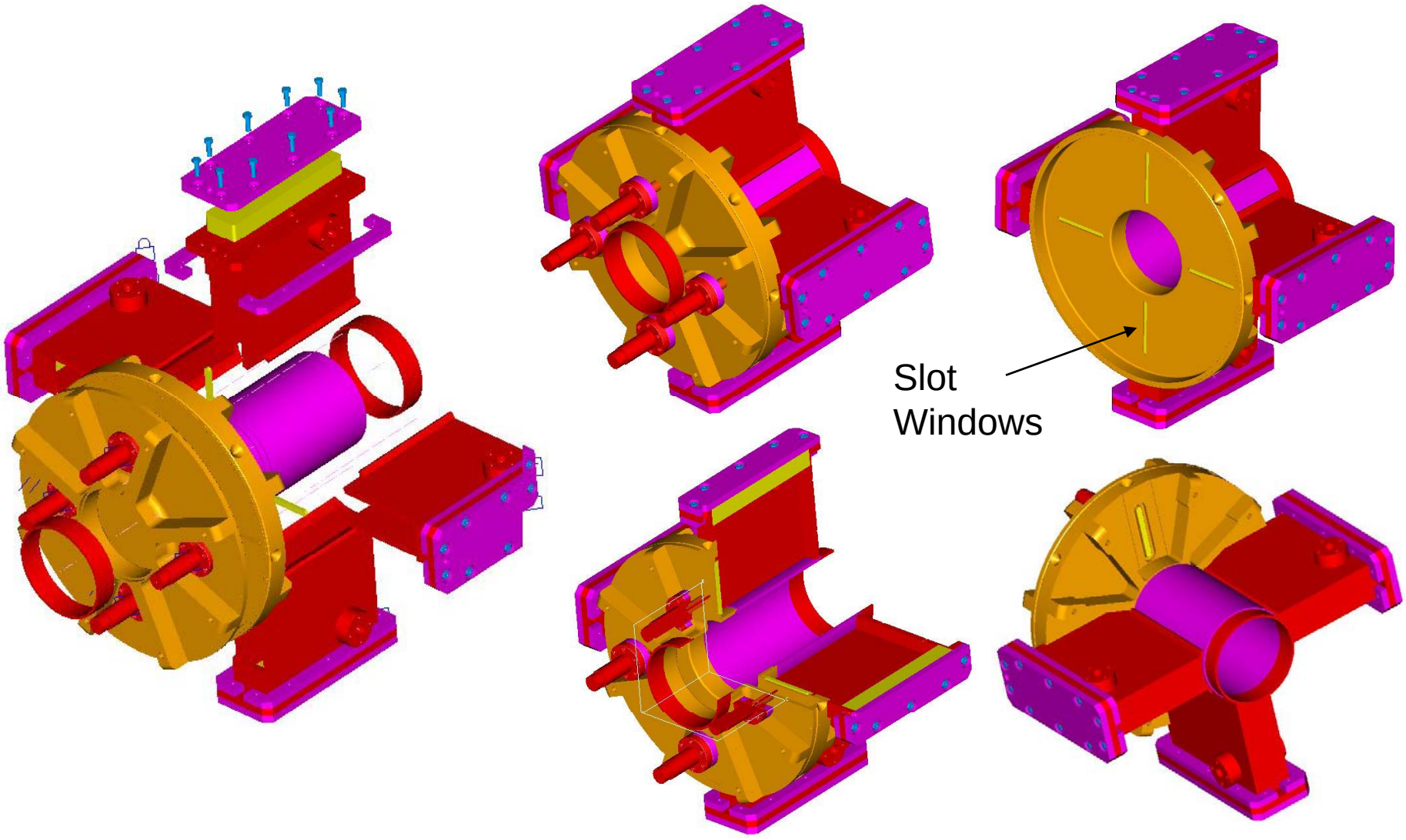
Quad Field and Position Requirements

- Installation Requirements
  - Local alignment to the cryomodule axis – covered in N. Ohuchi specs
  - Long range (10 m to 10 km) – Kubo working on specs
- Fast Motion (Vibration)
  - Require uncorrelated vertical motion > ~ 1 Hz to be < 100 nm
  - Many measurements being done – data show spec can be met
- Slow Motion (Drift)
  - For dispersion control, want quad to stay stable relative to it neighbors at few micron level, day to day
  - Although slow ground motion is large, it is correlated on over long distance range which makes its net effect small.
  - Also sensitive to cryo shielding temperature changes and tunnel temperature changes.
- Change of Field Center with Change in Field Strength
  - For quad shunting technique to be effective in finding the alignment between the quad and the attached bpm, quad center must not move by more than a few microns with a 20% change in field strength
  - Close to acquiring data on ILC prototype at SLAC
  - Vladimir will review efforts at FNAL (CIEMAT busy with XFEL Magnet Development)

RF BPMs

- Require
  - 1 micron level single bunch resolution
  - Ability to resolve bunch-by-bunch positions with 300 ns (150 ns ?) bunch spacing
  - Cleanable design so does not contaminate cavities
  - Readout system that is stable to 1 um on a time scale of a day for a fixed beam offset up to 1 mm.
- Linac Prototypes
  - SACLAY L-Band version for XFEL/ILC
  - FNAL L-Band version for NML/ILC
  - SLAC half aperture S-Band version for ILC
- No L-band cavities have yet met ILC requirements
- Manfred will review FNAL and SACLAY progress

Building Prototype μm-Resolution, 1.5 GHz, Cavity BPM at FNAL



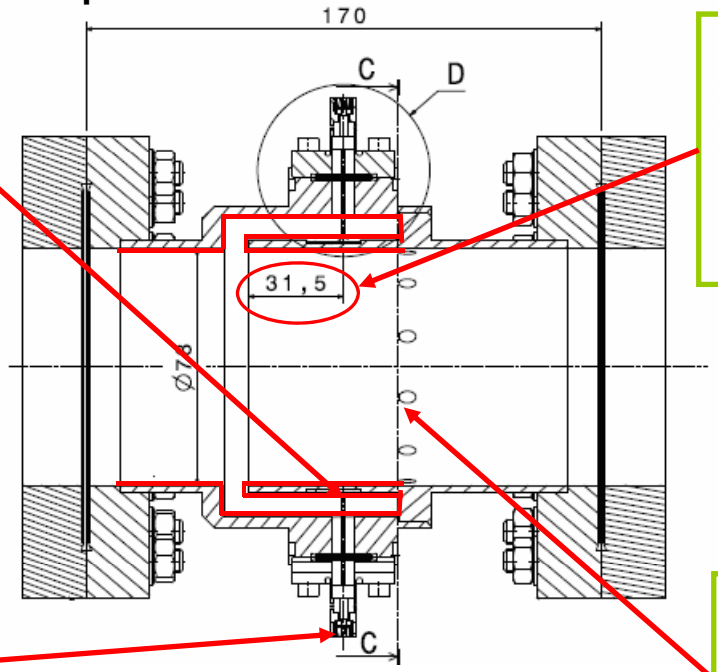
Re-entrant Cavity BPM

- It is arranged around the beam tube and forms a coaxial line which is short circuited at one end.
- The cavity is fabricated with stainless steel as compact as possible :

170 mm length (minimized to satisfy the constraints imposed by the cryomodule)

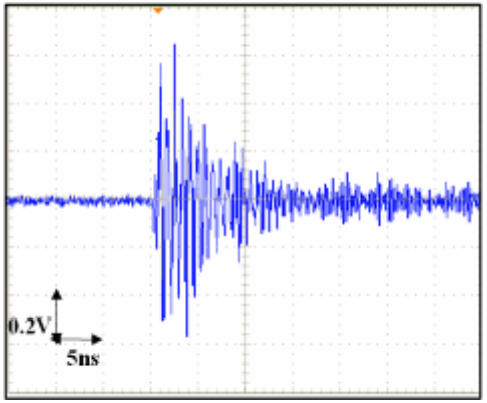
78 mm aperture.

Cu-Be RF contacts welded in the inner cylinder of the cavity to ensure electrical conduction.



Feedthroughs are positioned in the re-entrant part to reduce the magnetic loop coupling and separate the main RF modes (monopole and dipole)

Cryogenic tests in N2 : OK

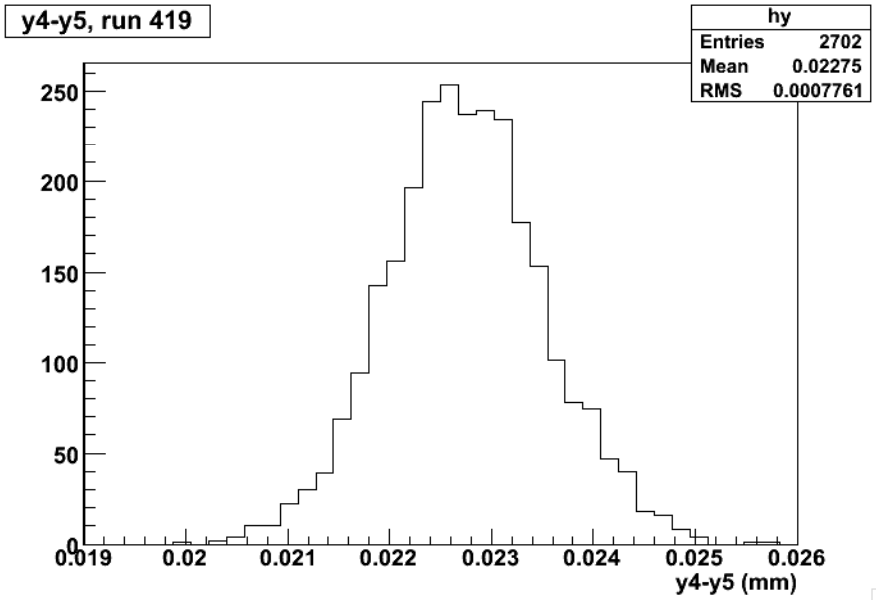


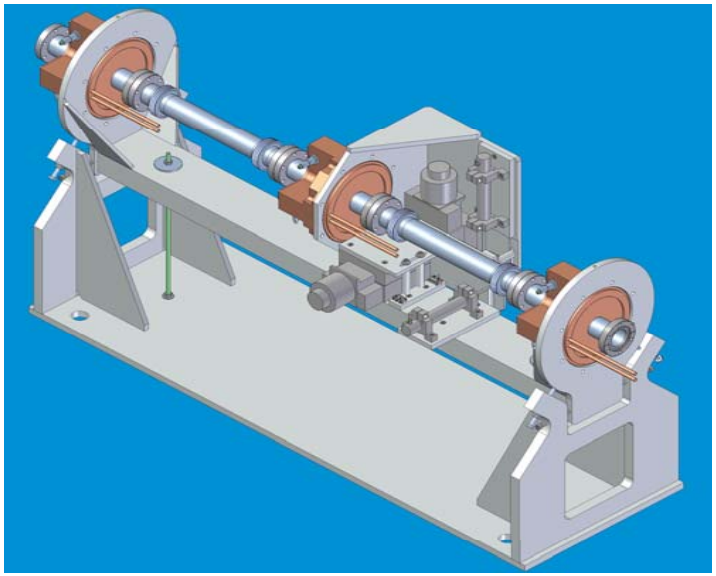
Signal from one pickup

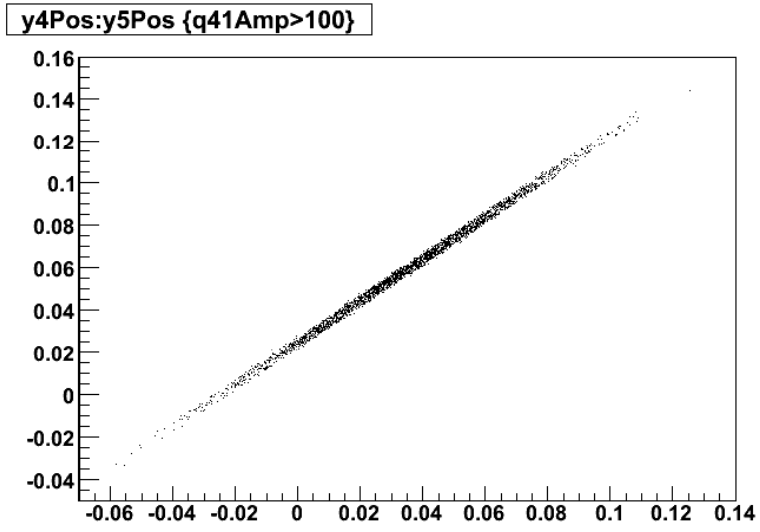
Twelve holes of 5 mm diameter drilled at the end of the re-entrant part for a more effective cleaning (Tests performed at DESY).

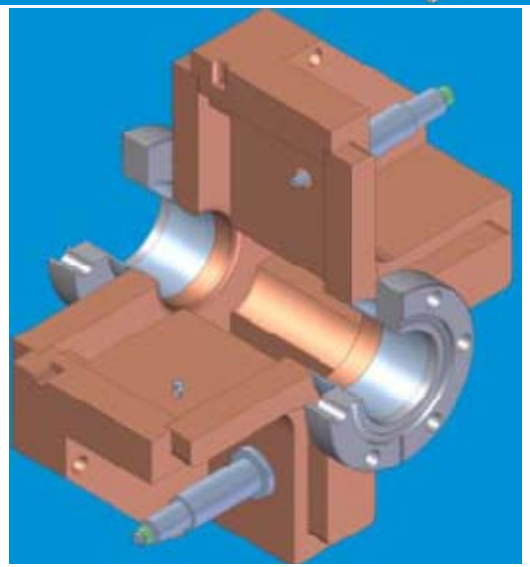
SLAC Half-Aperture BPM Prototype

(0.5 micron resolution, 1.4e10 electrons, Q of 500 for clean bunch separation)



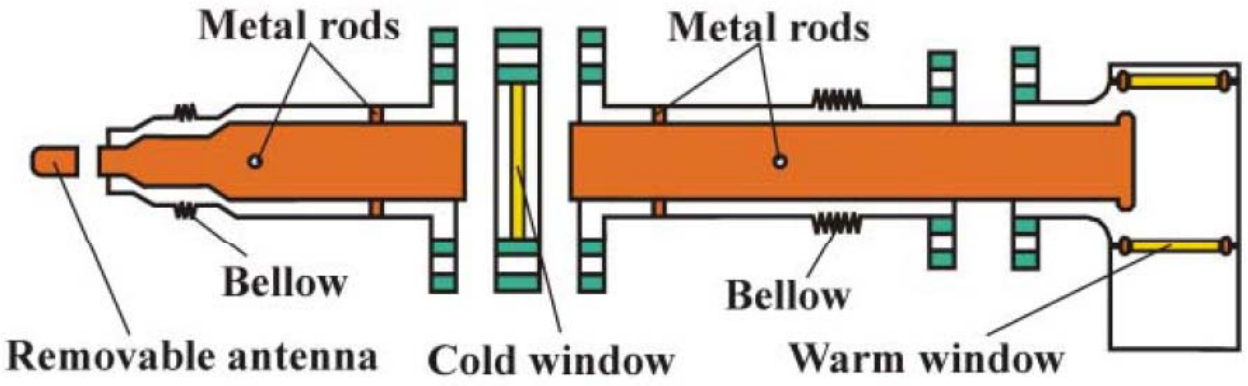






Coupler Wars – Will Ask Cryo Group to Provide Relative Heat Loss Estimates

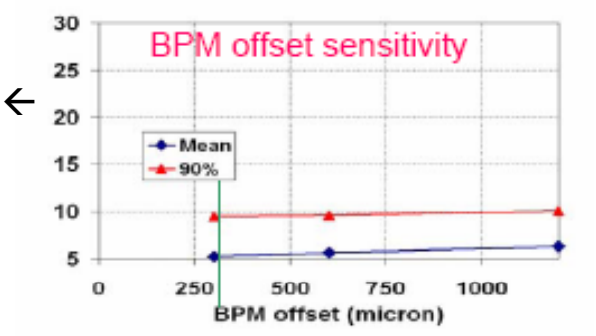
	Cold Window	Bias-able	Variable Qext	Cold Coax Dia.	# Fabricated
TTF-3	Cylindrical	yes	yes	40 mm	62
KEK2	Capacitive Disk	no	yes	40 mm	3
KEK1	Tristan Disk	no	no	60 mm	4
LAL TW60	Disk	possible	possible	62 mm	2
LAL TTF5	Cylindrical	possible	possible	62 mm	2



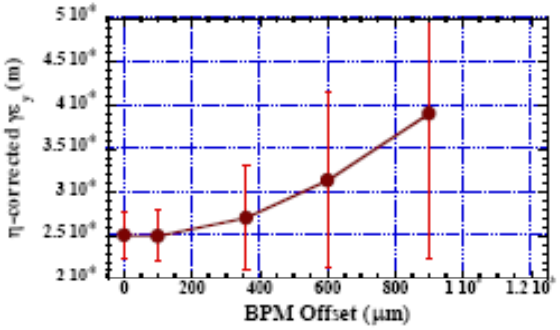
Main Linac BD Example – Continued Study of DFS Effectiveness – Paul will summarize recent activities

K. Ranjan results

Large weight?←

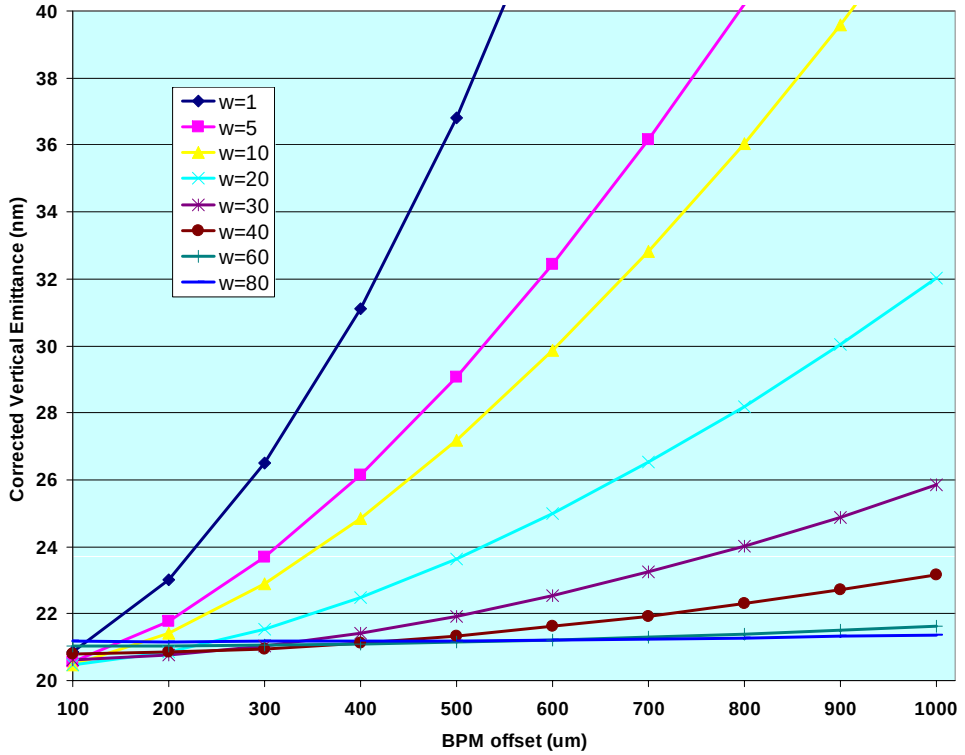


KK results



→ Small weight?

Difference between the two plots seems to be the weight (constrain)



Large weight= less dependent to BPM Offset