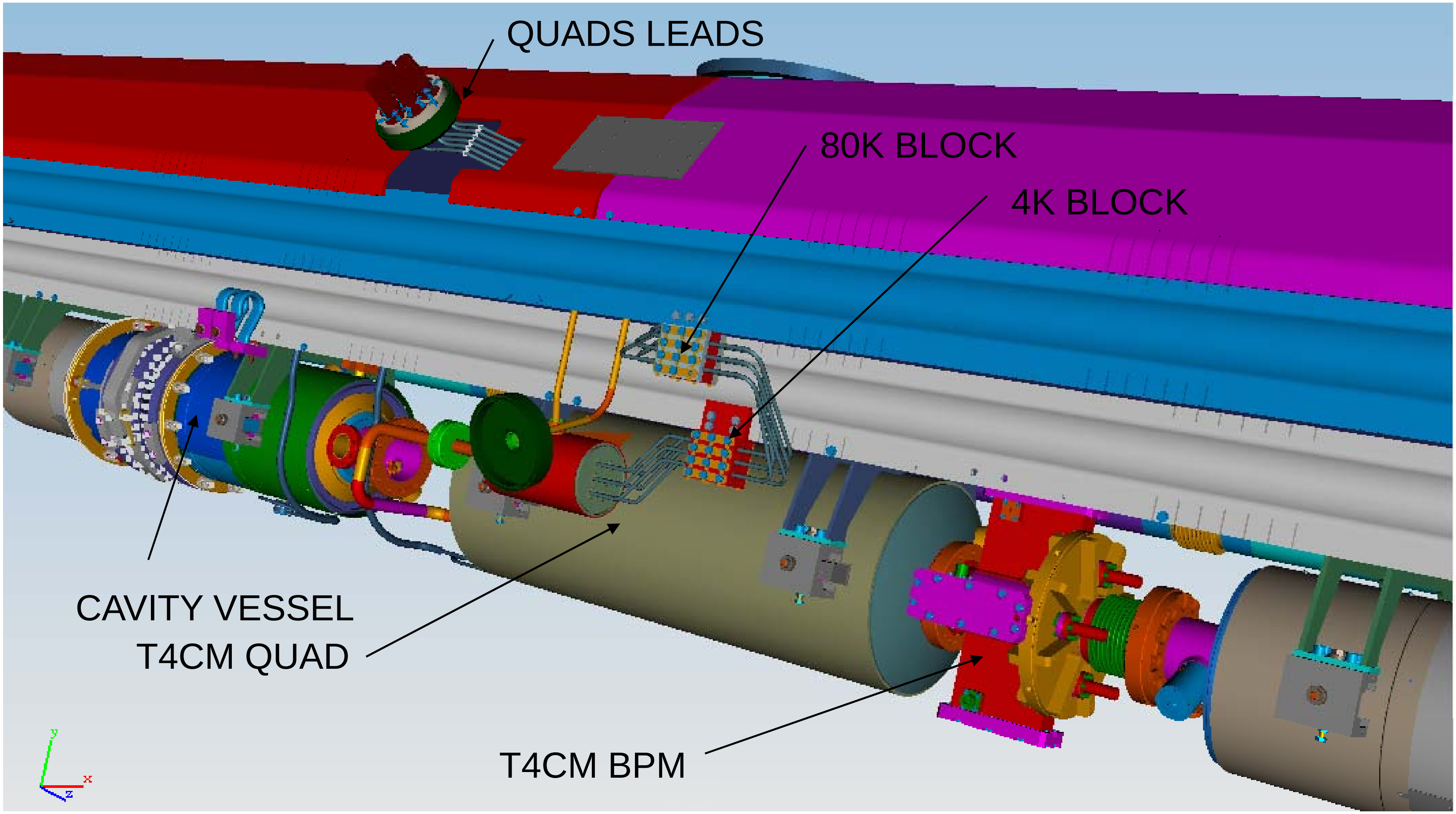
# MLI Update

Chris Adolphsen
SLAC

# Quadrupole Package



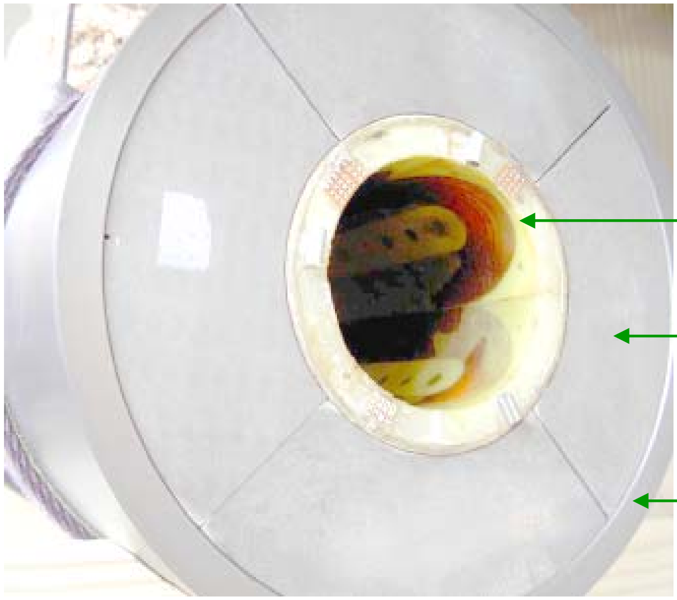
# Quad Field and Position Requirements

- 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)

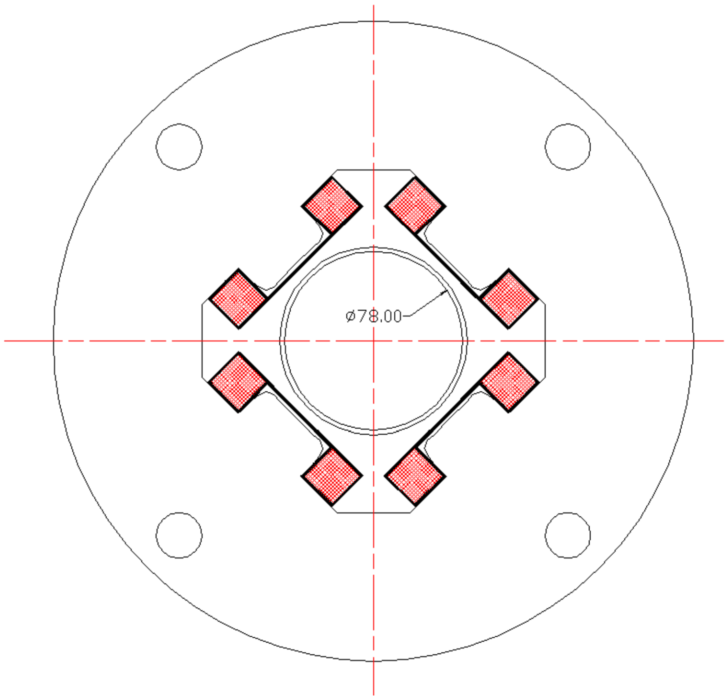
# CIEMAT
# Cos(2Φ) SC Quad
(~ 0.7 m long)

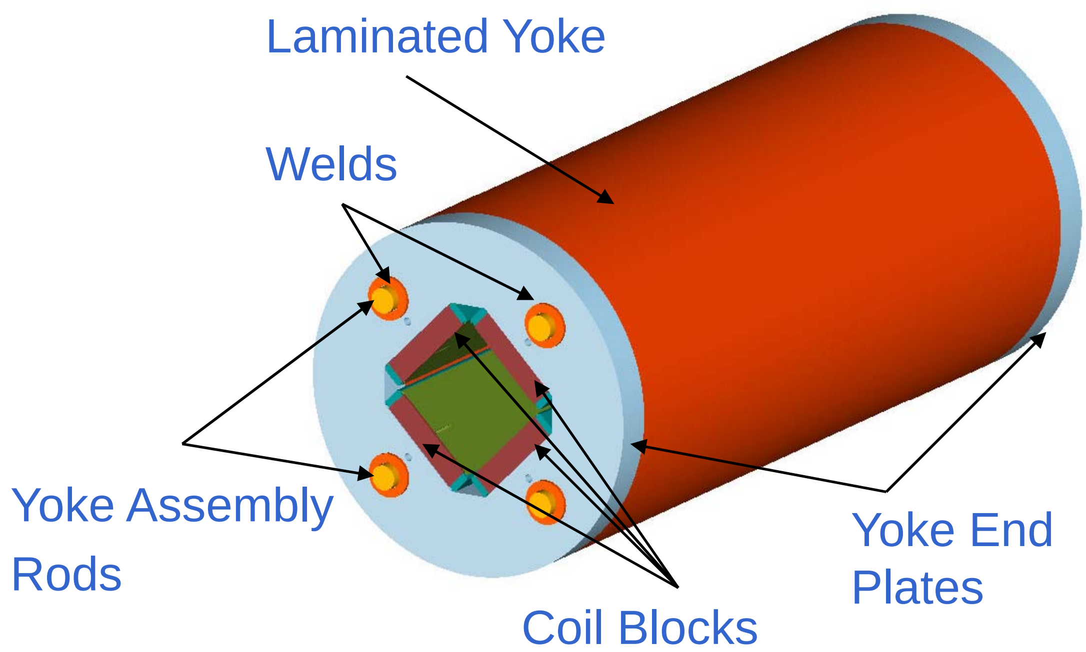
Dewar Test
at DESY

In Warm-Bore
Cryostat at SLAC



# Kashikhin: Building Linac Quad and Corrector Prototypes at FNAL



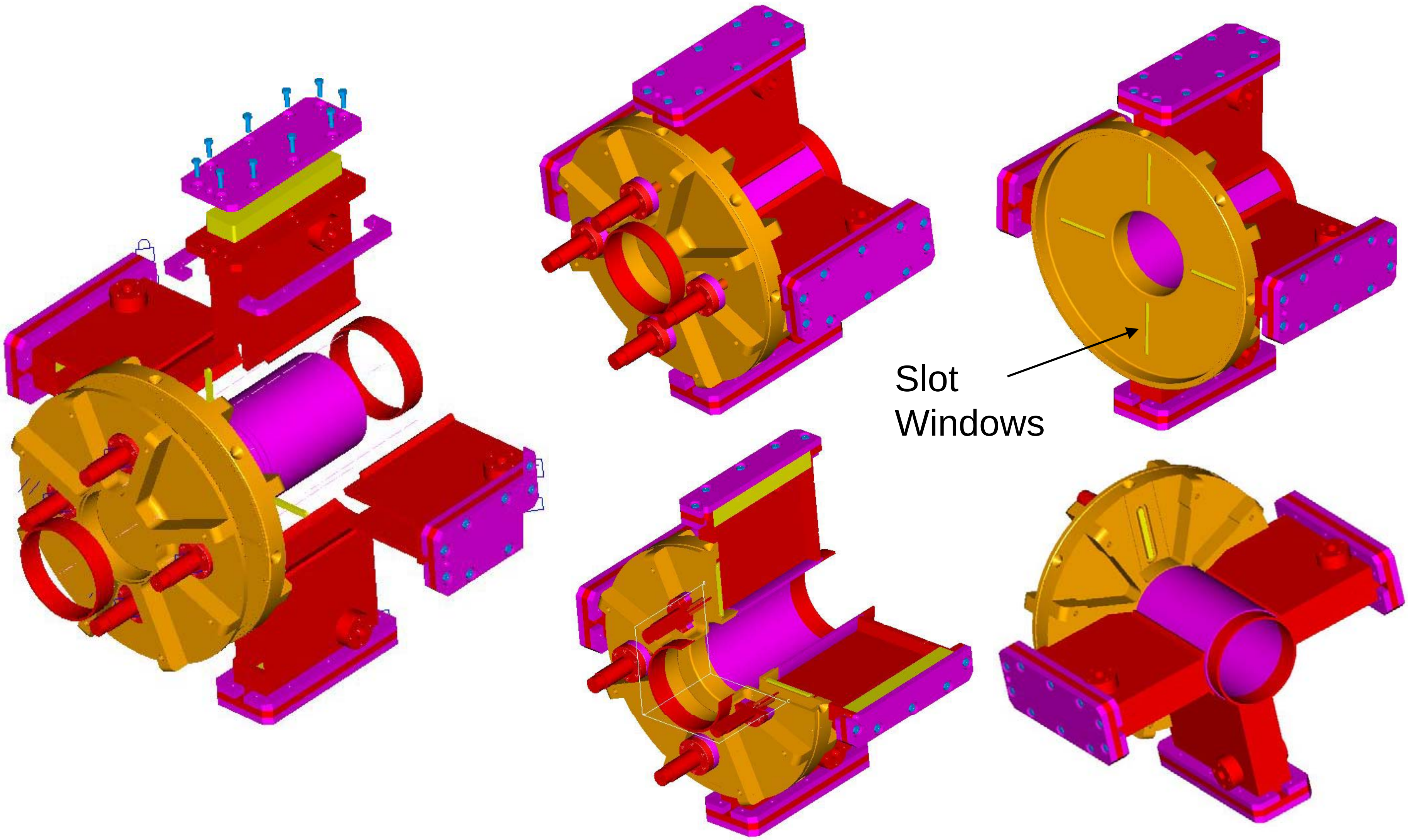

Cold mass: Length 680 mm

Outer Diameter 280 mm

# 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



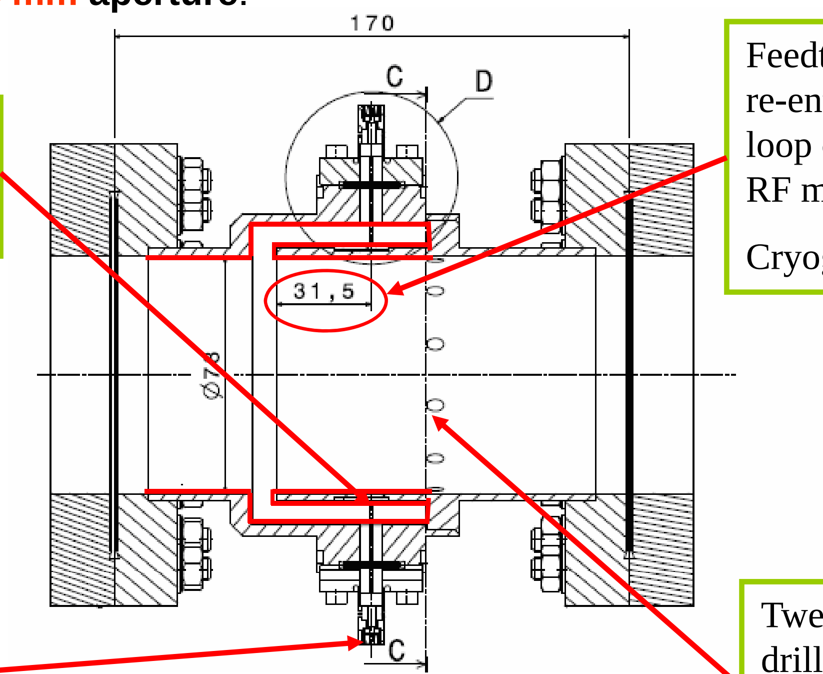
# Re-entrant Cavity BPM

• 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**.

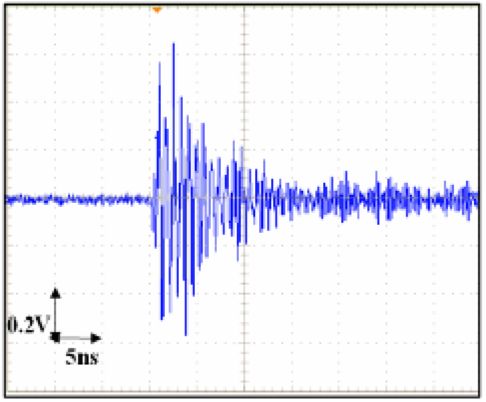



Cu-Be RF contacts welded in the inner cylinder of the cavity to ensure electrical conduction.

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

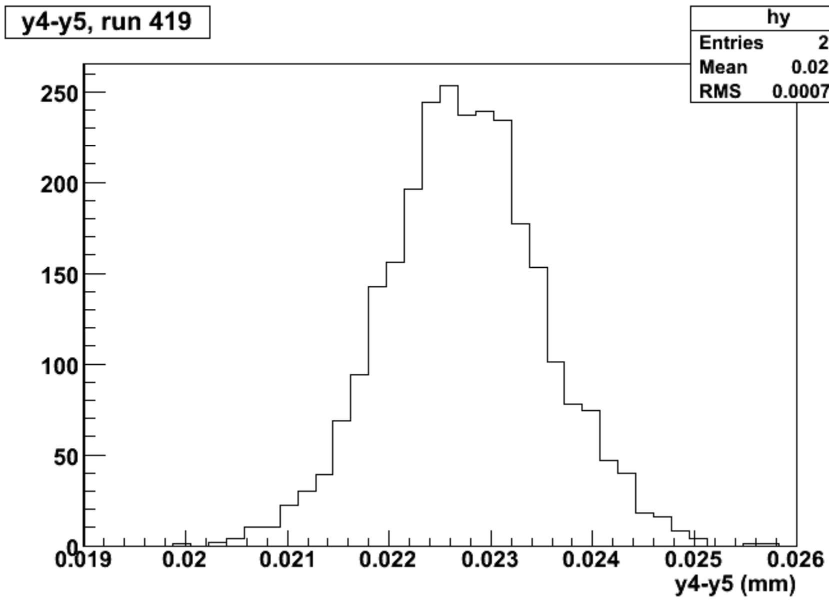
Twelve holes of 5 mm diameter drilled at the end of the re-entrant part for a more effective cleaning (Tests performed at DESY).

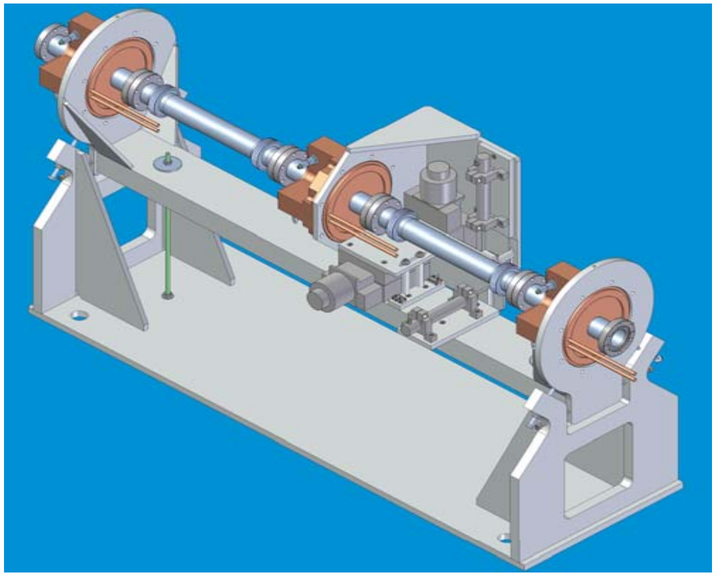


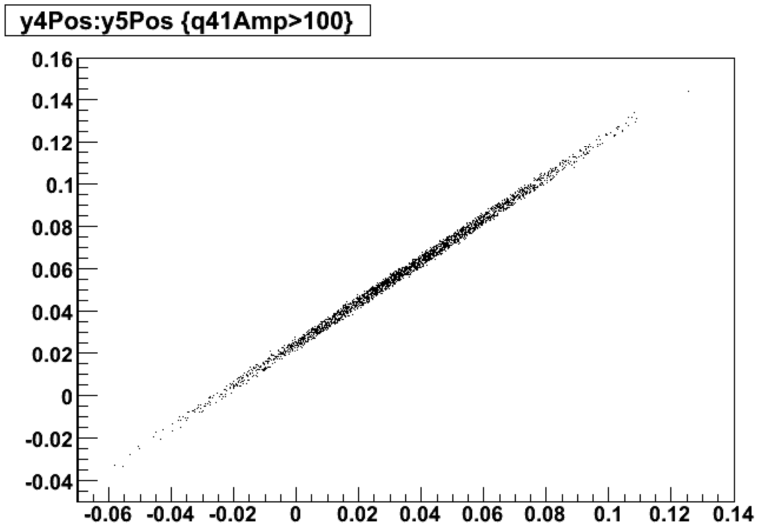

*Signal from one pickup*

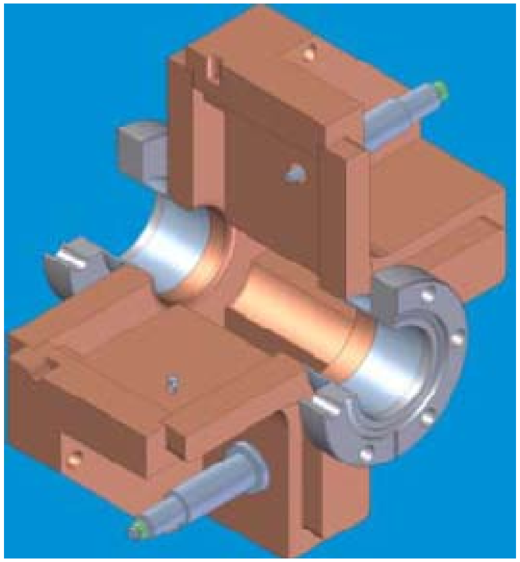
# SLAC Half-Aperture BPM Prototype

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



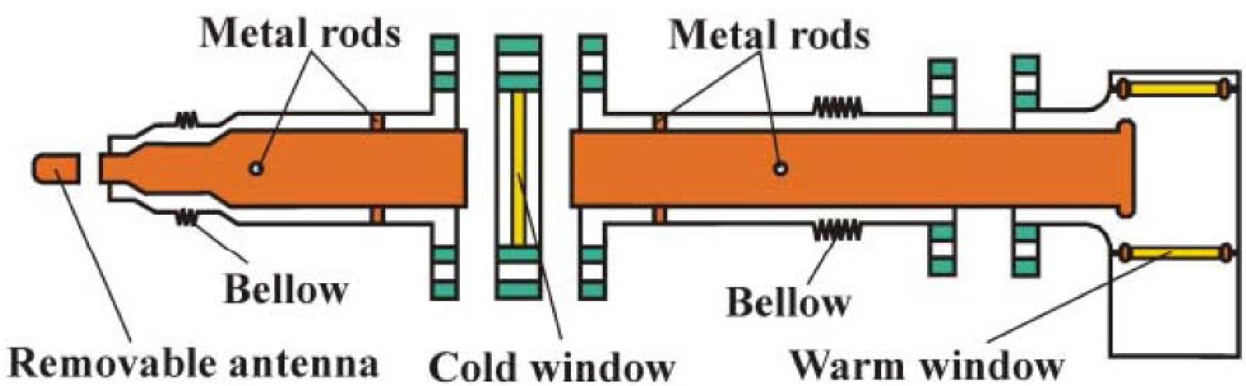





# Coupler Wars – Will Ask Cryo Group to Provide Relative Heat Loss Estimates

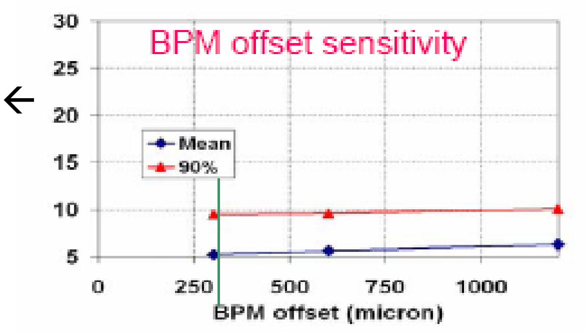
| | Cold Window | Bias-able | Variable Qext | Cold Coax Dia. | # Fabricated |
|---|---|---|---|---|---|
| TTF-3 | Cylindrical | yes | yes | 40 mm | 62 |
| KEK2 | Capacitive Disk | no | no | 40 mm | 3 |
| KEK1 | Tristan Disk | no | no | 60 mm | 4 |
| LAL TW60 | Disk | possible | possible | 62 mm | 2 |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



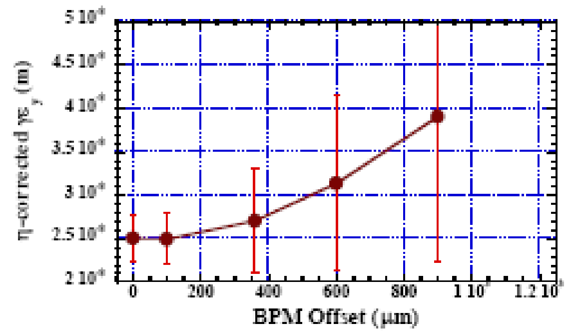
# Main Linac BD Example – Continued Study of DFS Effectiveness – Paul will summarize recent activities

K. Ranjan results

Large weight? ←

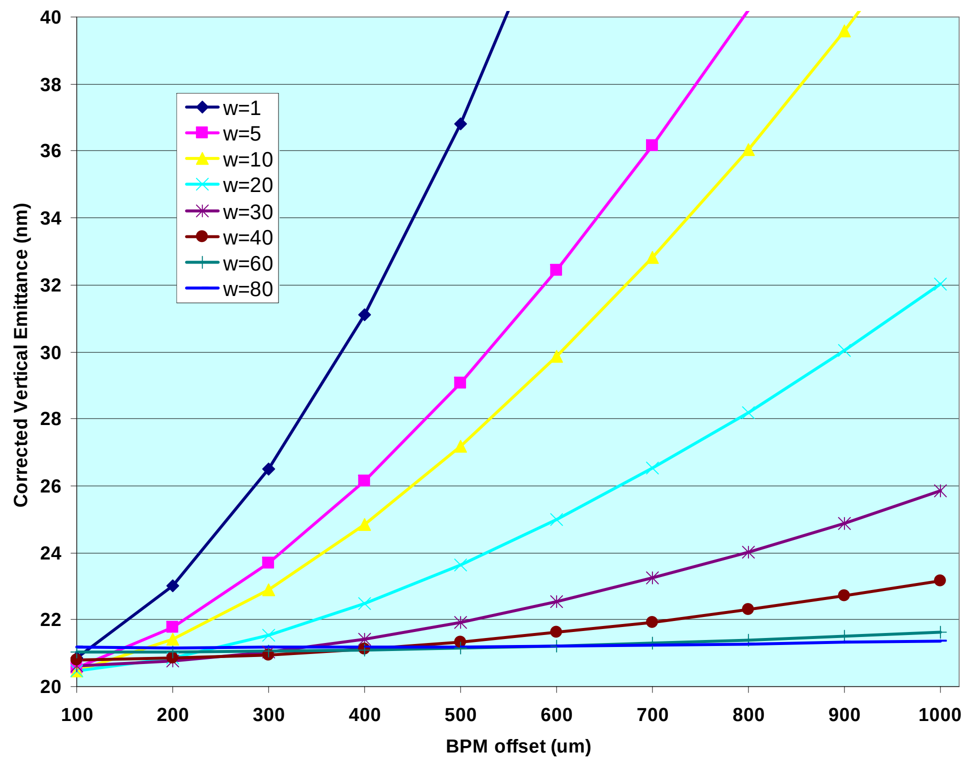



KK results




→ Small weight?

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




Large weight= less dependent to BPM Offset