IBIC 2013 Satellite Meeting
RF Cavity BPMs

September 20, 2013

SLAC LCLS Cavity BPM Upgrade Project

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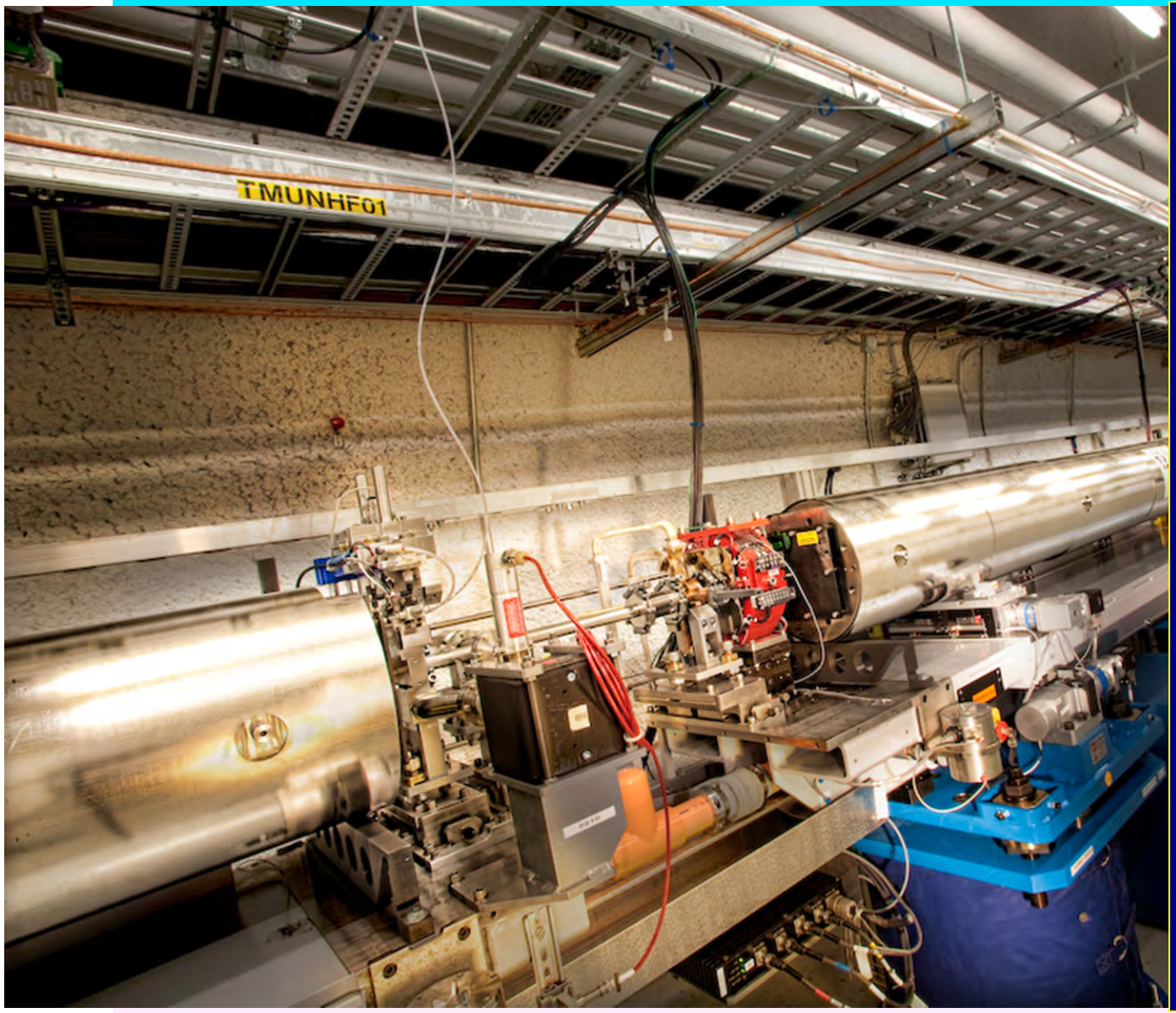
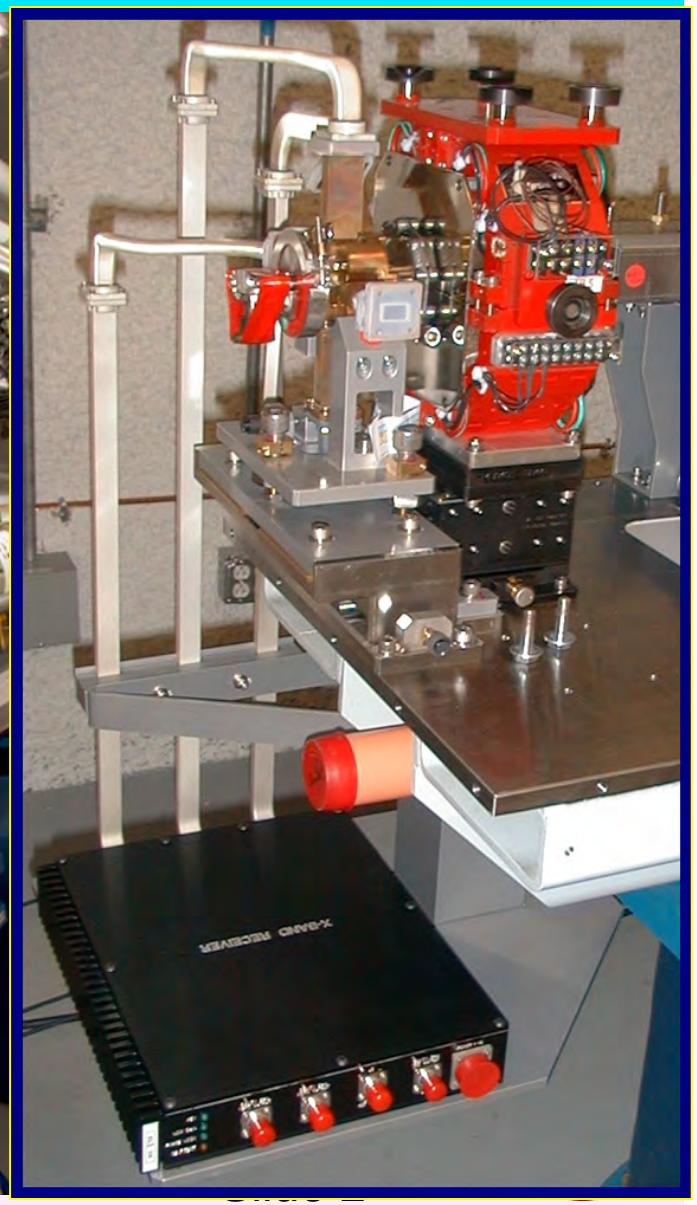
SLAC
NATIONAL ACCELERATOR LABORATORY

Existing LCLS Cavity BPM





Motivation for Revising the Design

- LCLS-I design successfully demonstrated the principal of the X-band design
  - Meeting all physics requirements for resolution
- Several problems were encountered
  - High risks in the fabrication process (RF windows)
  - Design complexity and cost that is no longer justified (number of tuners)
  - Impracticality of waveguide coupling to receivers
  - Reliability problems with the waveguide downmixer
  - Mechanical supports not stable enough
- Present design not compatible with multibunch
  - Shift frequency to beam harmonic 11.424 GHz

Main Features of the New Design

- Use the same dipole mode selective coupler (Z. Li)
  - tuned to 11.424 GHz (to be compatible with multibunch)
- Simplify the cavity design
  - 6 radial tuners instead of 12 axial ones
  - Simplify brazing design, loosen machining tolerances
  - Cavity length increases from 3 to 7 mm
- Transition to coax cable at the cavity
  - Integrated coaxial feedthrough,
- Design and build a new receiver
  - based on a monolithic microwave GaAs chip I/Q mixer
  - Abandon the Miteq waveguide mixer receiver
- Adopt same digitizer technology as used in LLRF
- Design and build new, more stable support stands

SLAC/PAL Collaboration for fabrication and testing

Changbum Kim

Seung Hwan. Kim

Pohang Accelerator Laboratory

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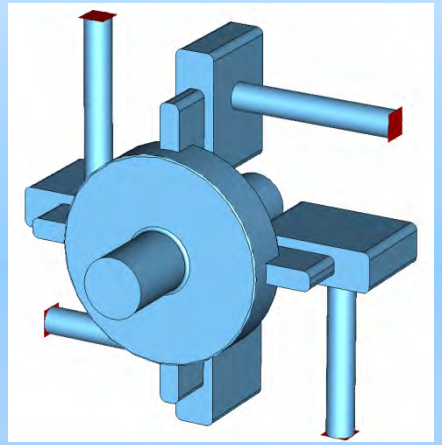
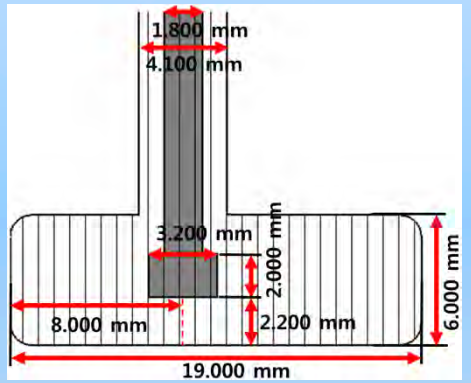
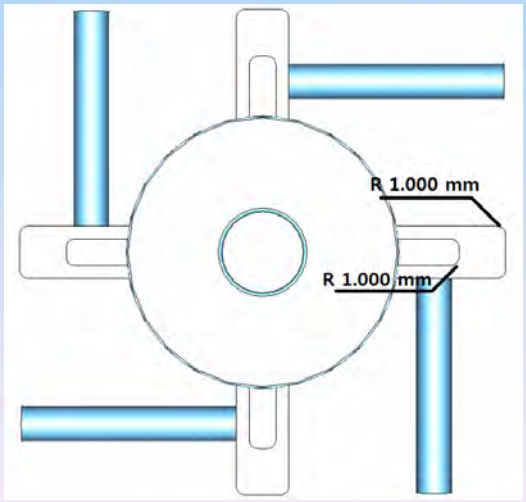
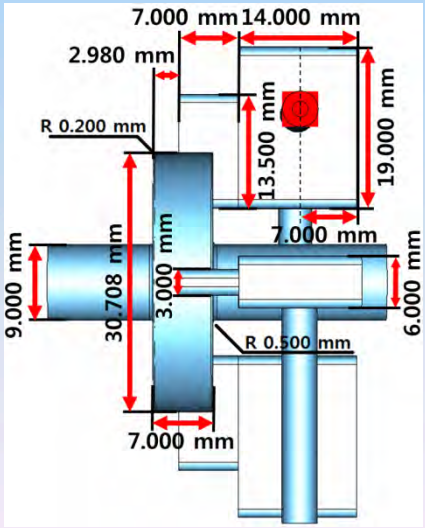
LELAND STANFORD JUNIOR UNIVERSITY DIE LUFT DER FREIHEIT WEHT 1891

Physics Design Result of the Dipole Cavity









Frequency	11.424 GHz
Q factor	7376.3
External Q	3882.56
Loaded Q	2543.68

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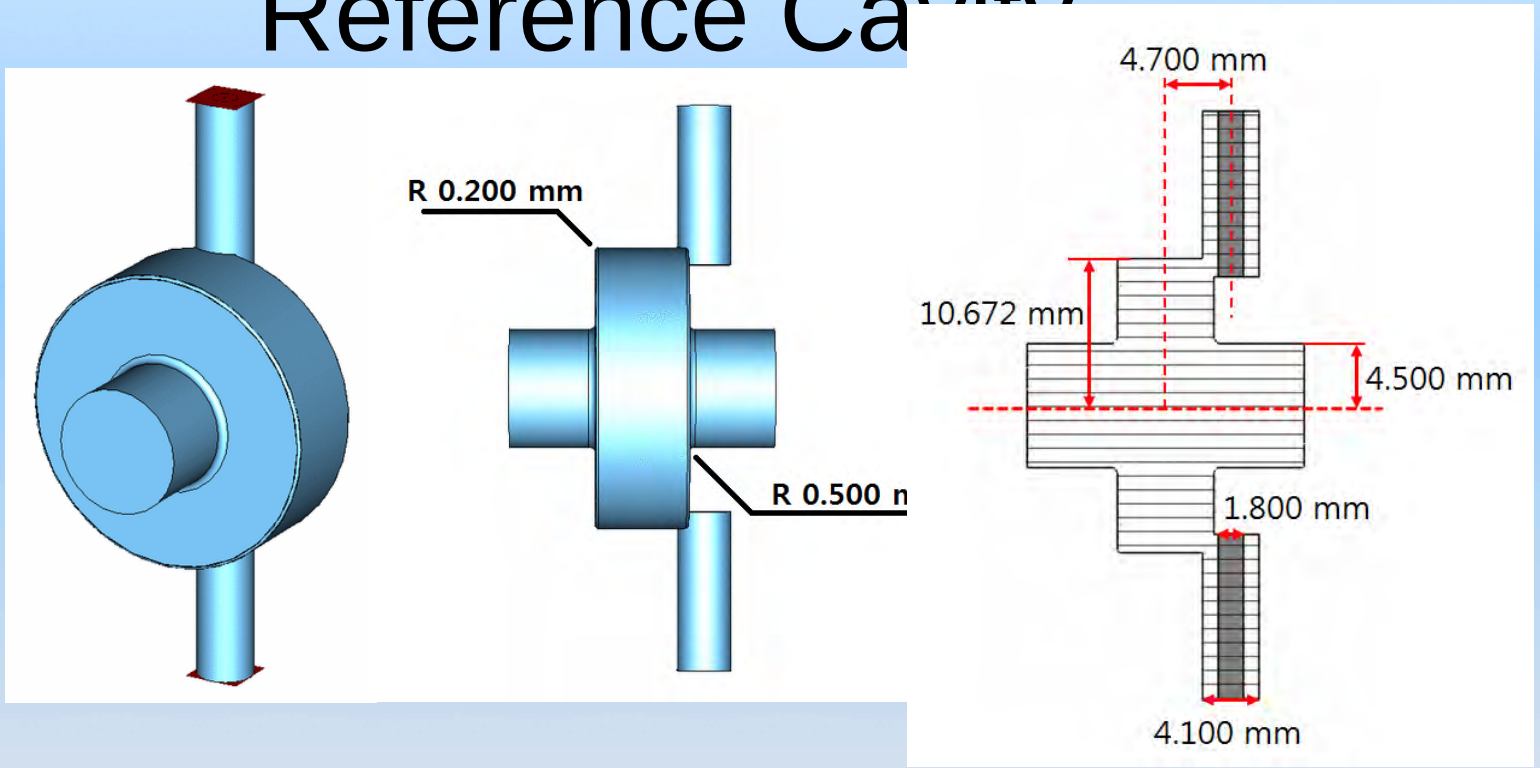
Physics Design Result of the Reference Cavity



Frequency	11.424 GHz
Q factor	6712.4
External Q	3030.9
Loaded Q	2088.1
R/Q	114.13 Ohm

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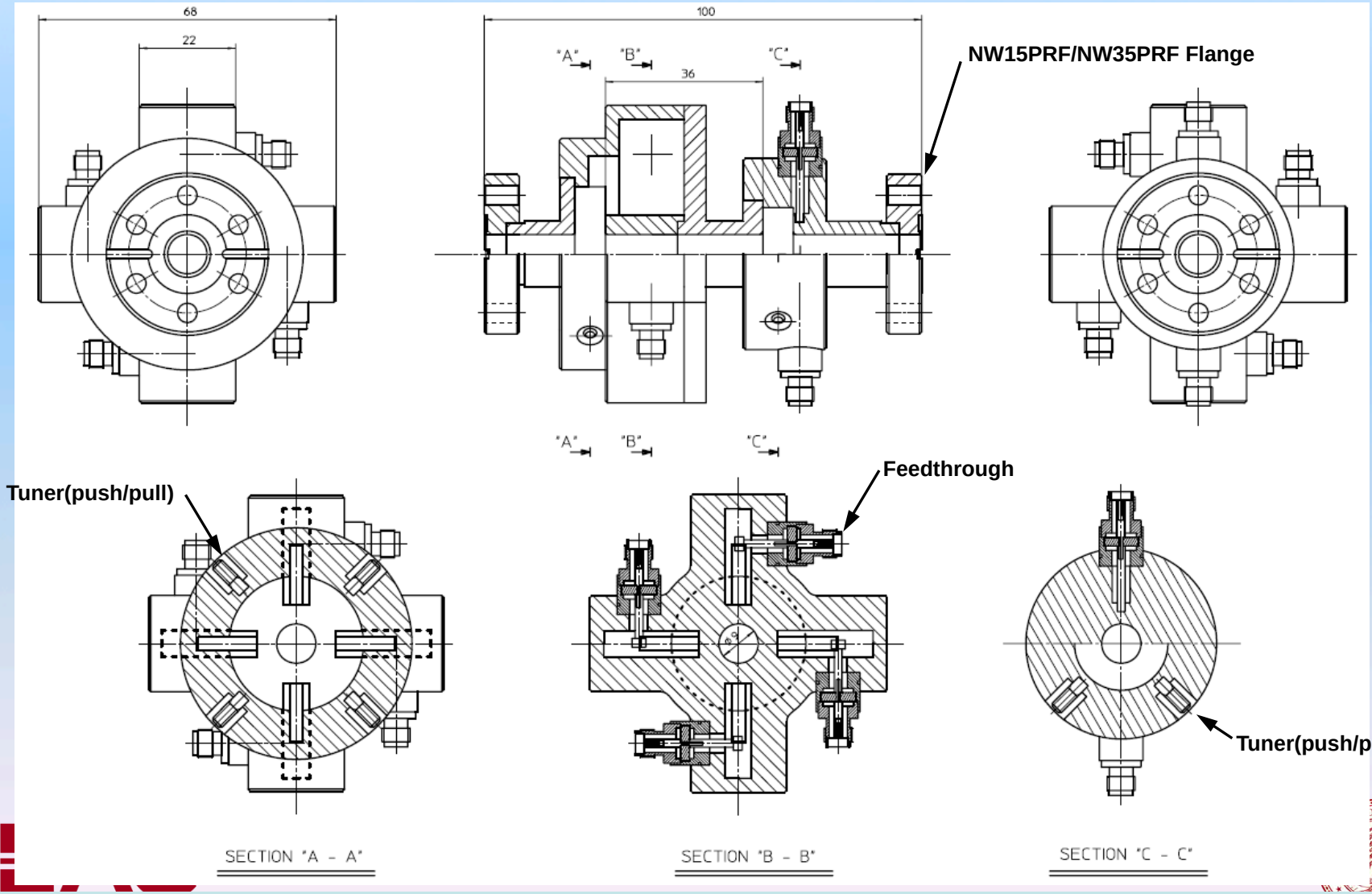
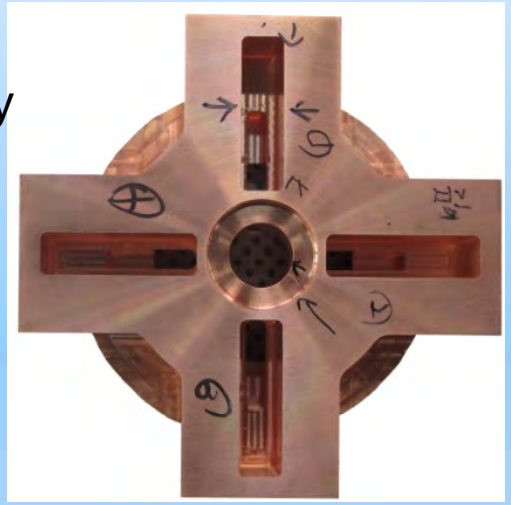
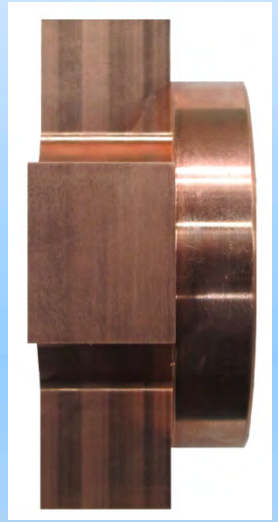
Cavity BPM Drawing

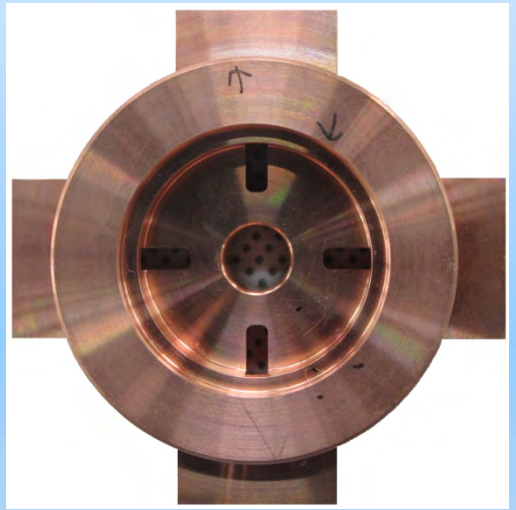


Test Cut of the Dipole Cavity

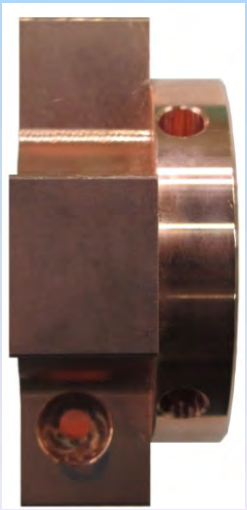
A-company

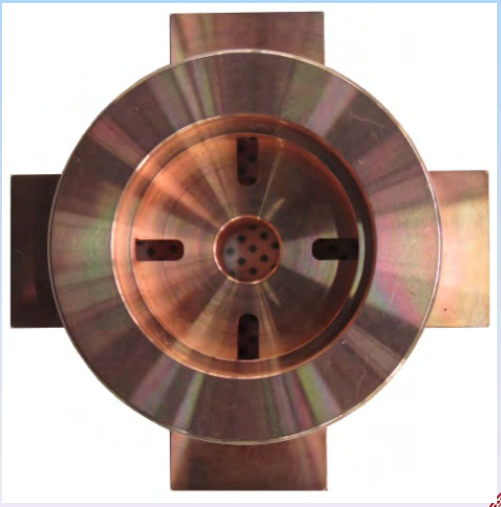




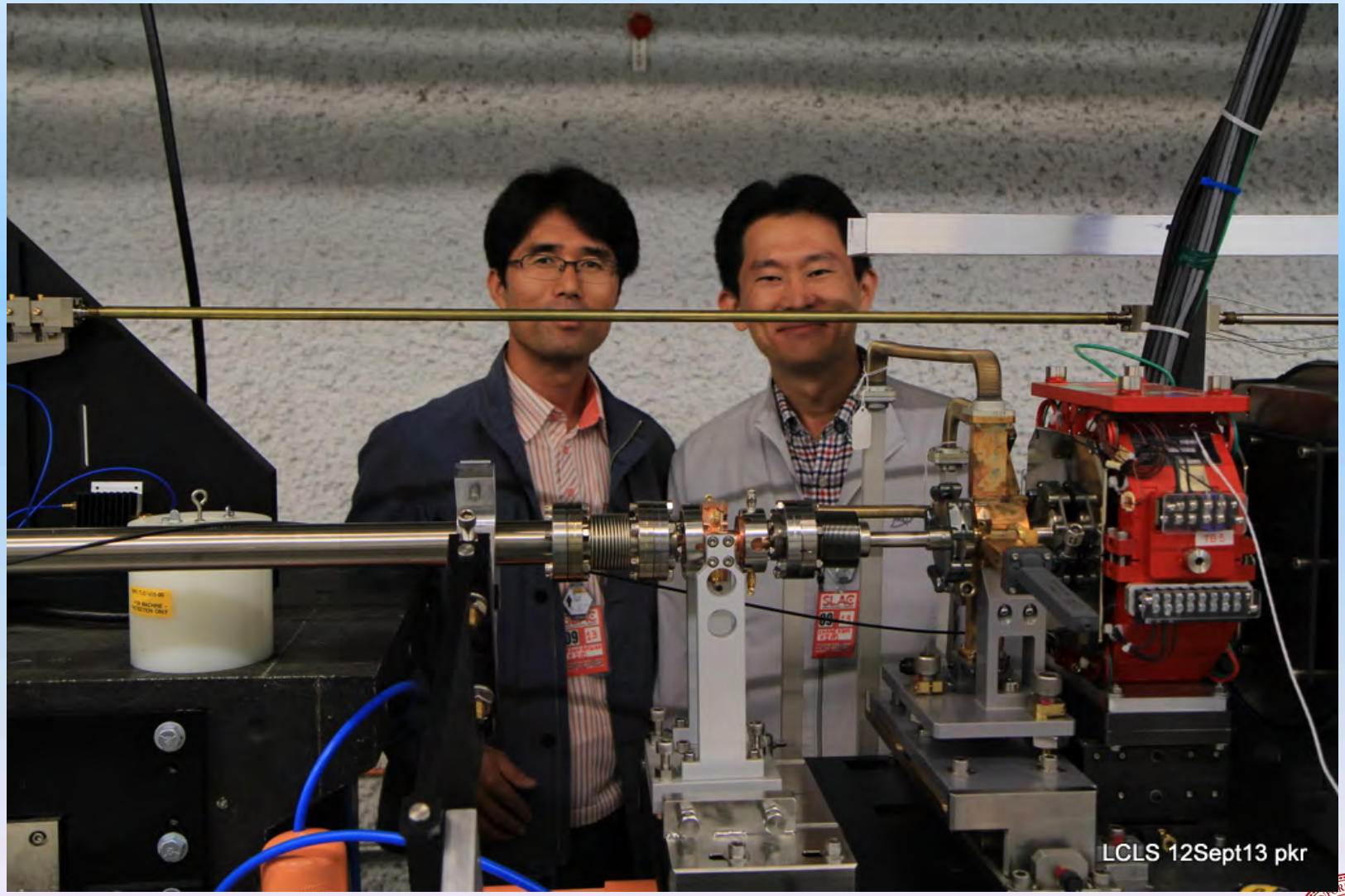


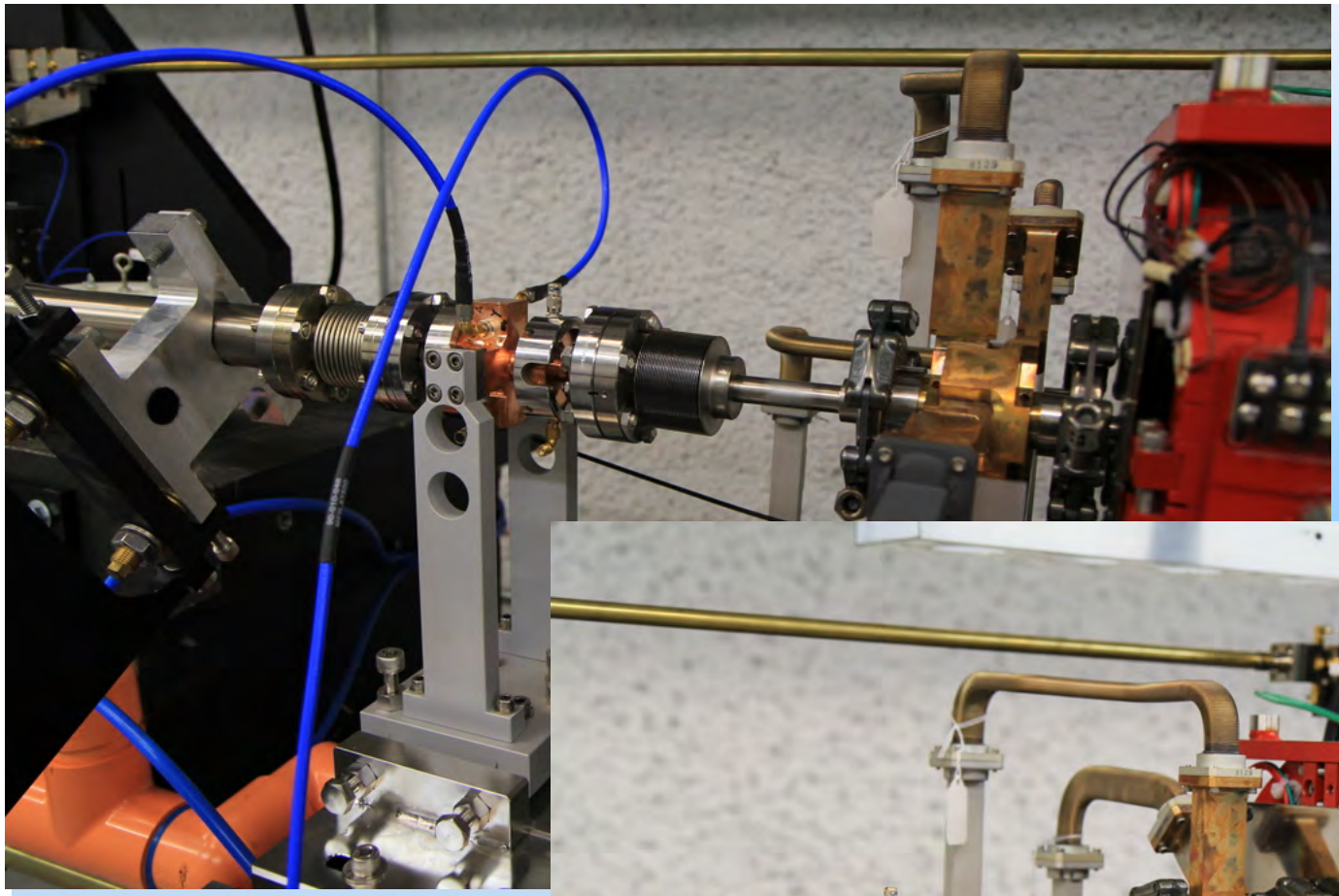
B-company

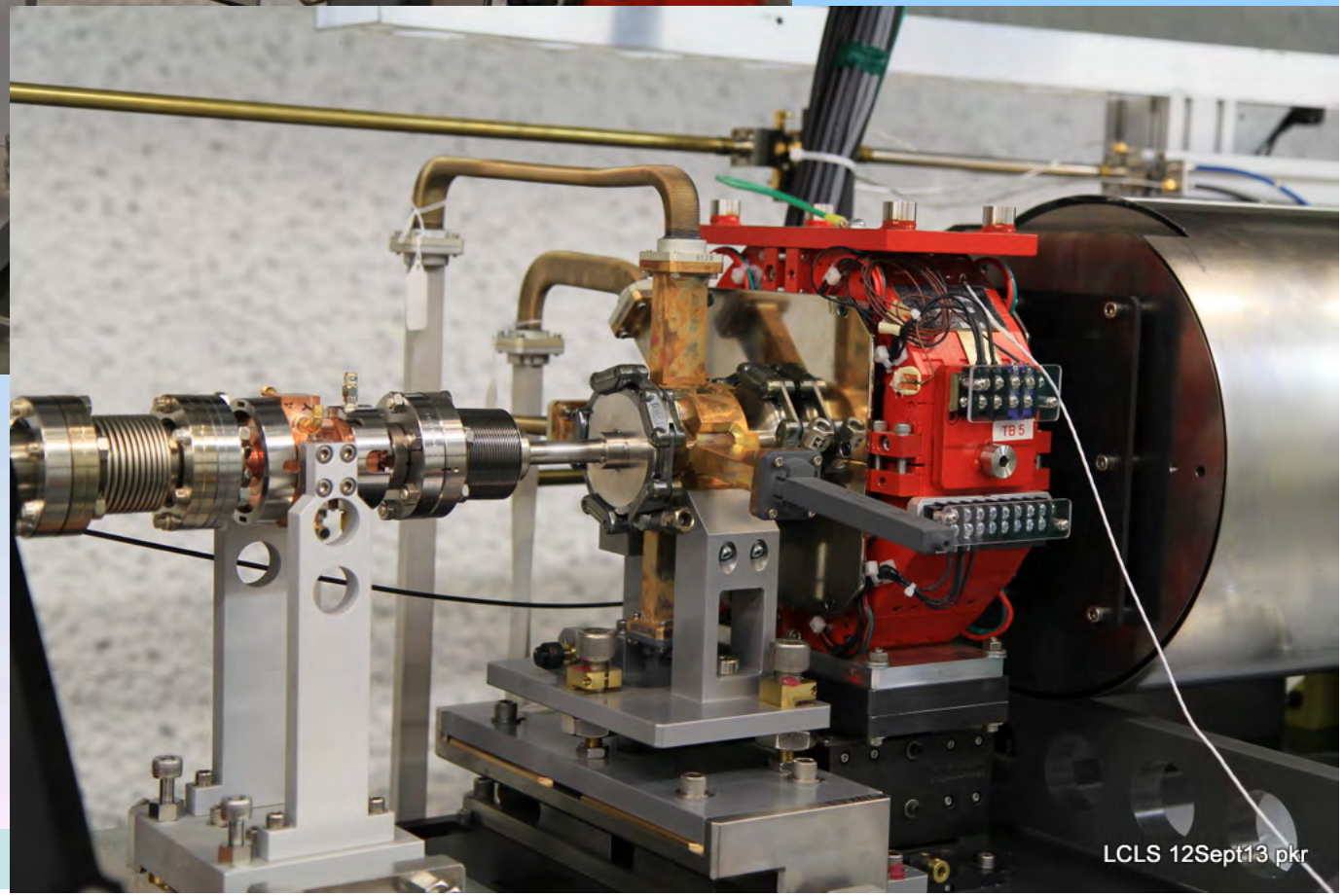




SLAC and PAL Cavity BPMs Installed at the LCLS Beam Line







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PAL 포항가속기연구소
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