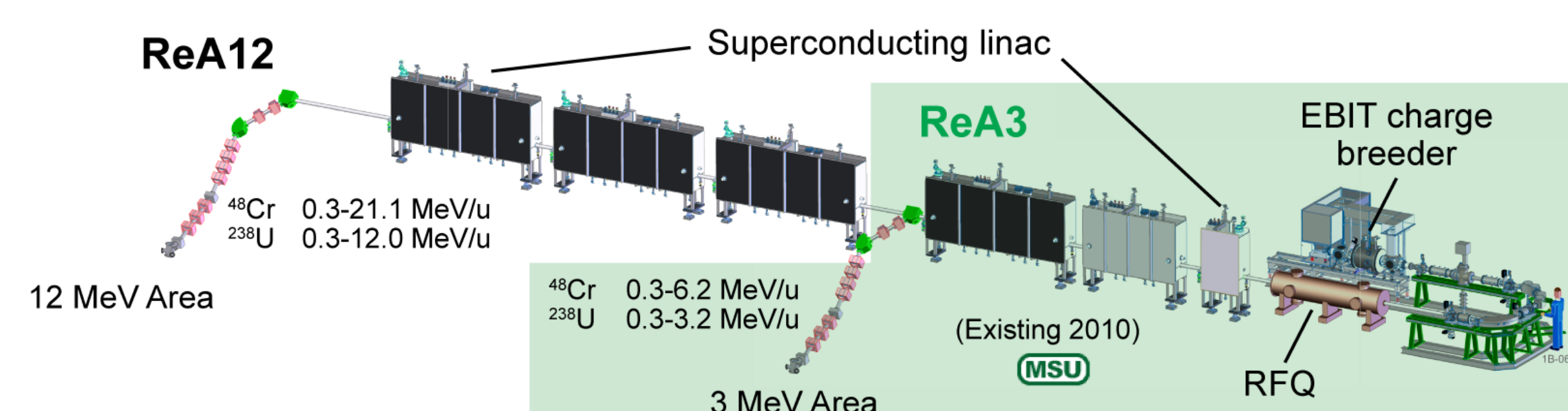


Production Cavities and Cryomodules for a Heavy Ion Re-accelerator at Michigan State University

W. Hartung, J. Bierwagen, S. Bricker, C. Compton, J. DeLauter, M. Johnson, O. Kester, F. Marti, D. Norton, J. Popielarski, L. Popielarski, N. Verhanovitz, J. Wlodarczak, R. York
Michigan State University, East Lansing, MI
A. Facco, INFN-Legnaro, Legnaro, Italy
E. Zaplatin, FZ-Juelich, Juelich, Germany

Re-accelerator (ReA3) Project

- Upgrade to NSCL experimental program
- Provide FRIB type experiments to users
- Dress Rehearsal for FRIB



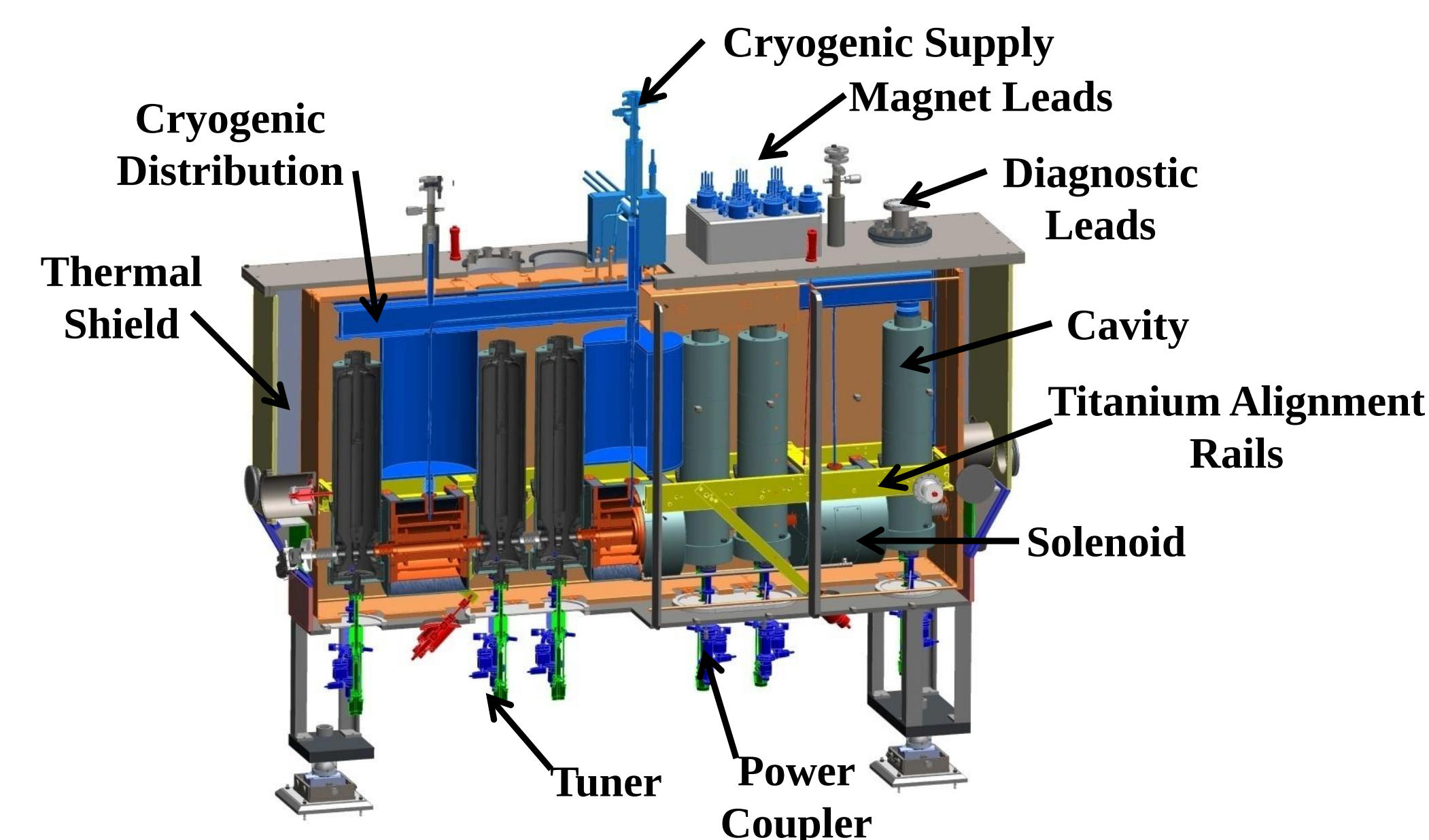
Item	Quantity
Cryomodules	3
$\beta = 0.041$ quarter wave resonators	7
$\beta = 0.085$ quarter wave resonators	8
9 tesla superconducting solenoids with x and y correctors	8

1st Cryomodule: rebuncher, $\beta = 0.041$
2nd Cryomodule: acceleration, $\beta = 0.041$
3rd Cryomodule: acceleration, $\beta = 0.085$

● = Cavity
■ = Solenoid

ReA3 Cavity & Cryomodule Designs

Optimum β	0.042	0.085
Frequency	80.5 MHz	
Design E_p	16.5 MV/m	20 MV/m
Design B_p	29 mT	45 mT
Design V_a	0.45 MV	1.03 MV
Active length	95 mm	210 mm
R_a/Q_0	433 Ω	416 Ω
G	15 Ω	18 Ω
T	4.5 K	
Design Q_0	5×10^8	
Aperture	30 mm	



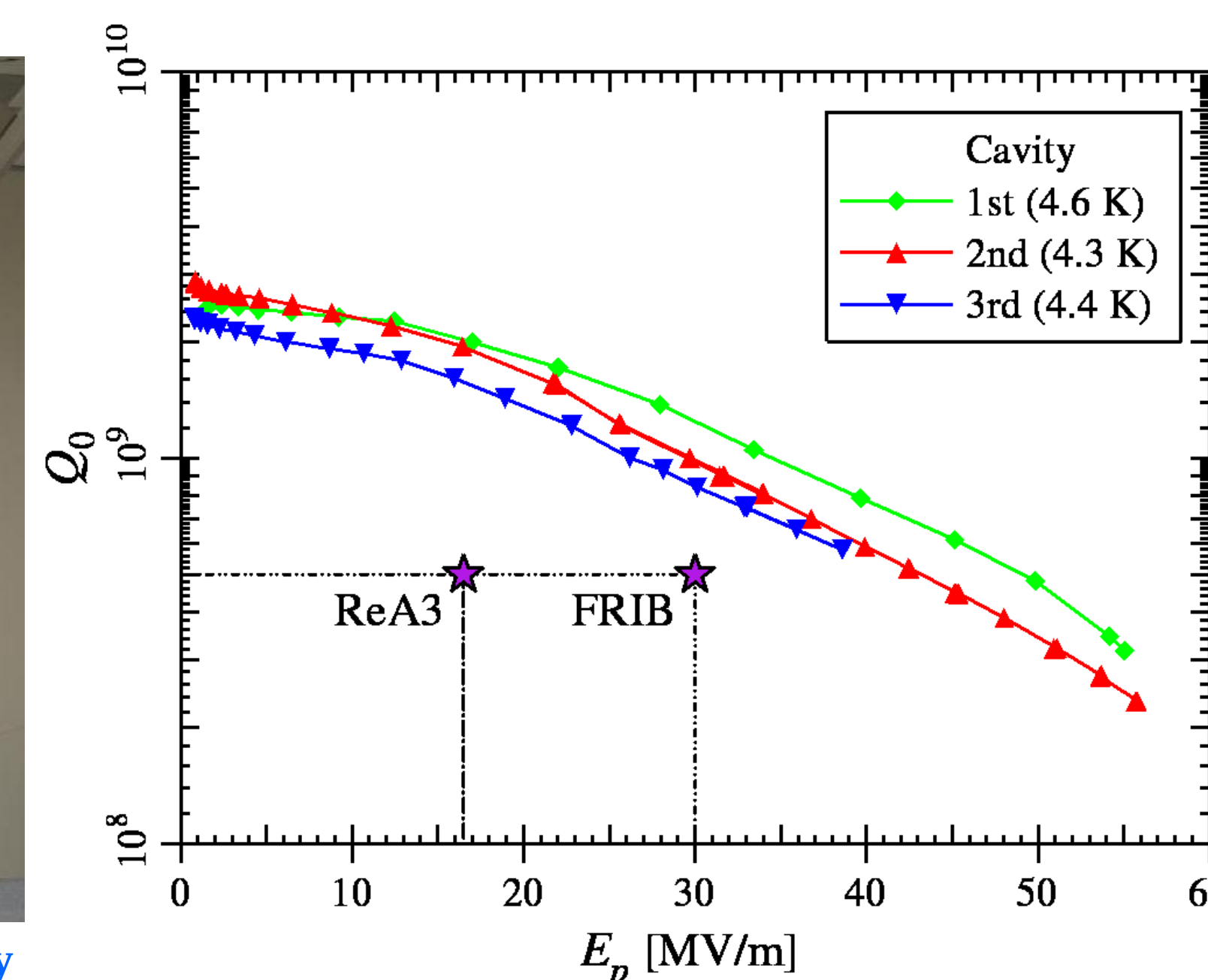
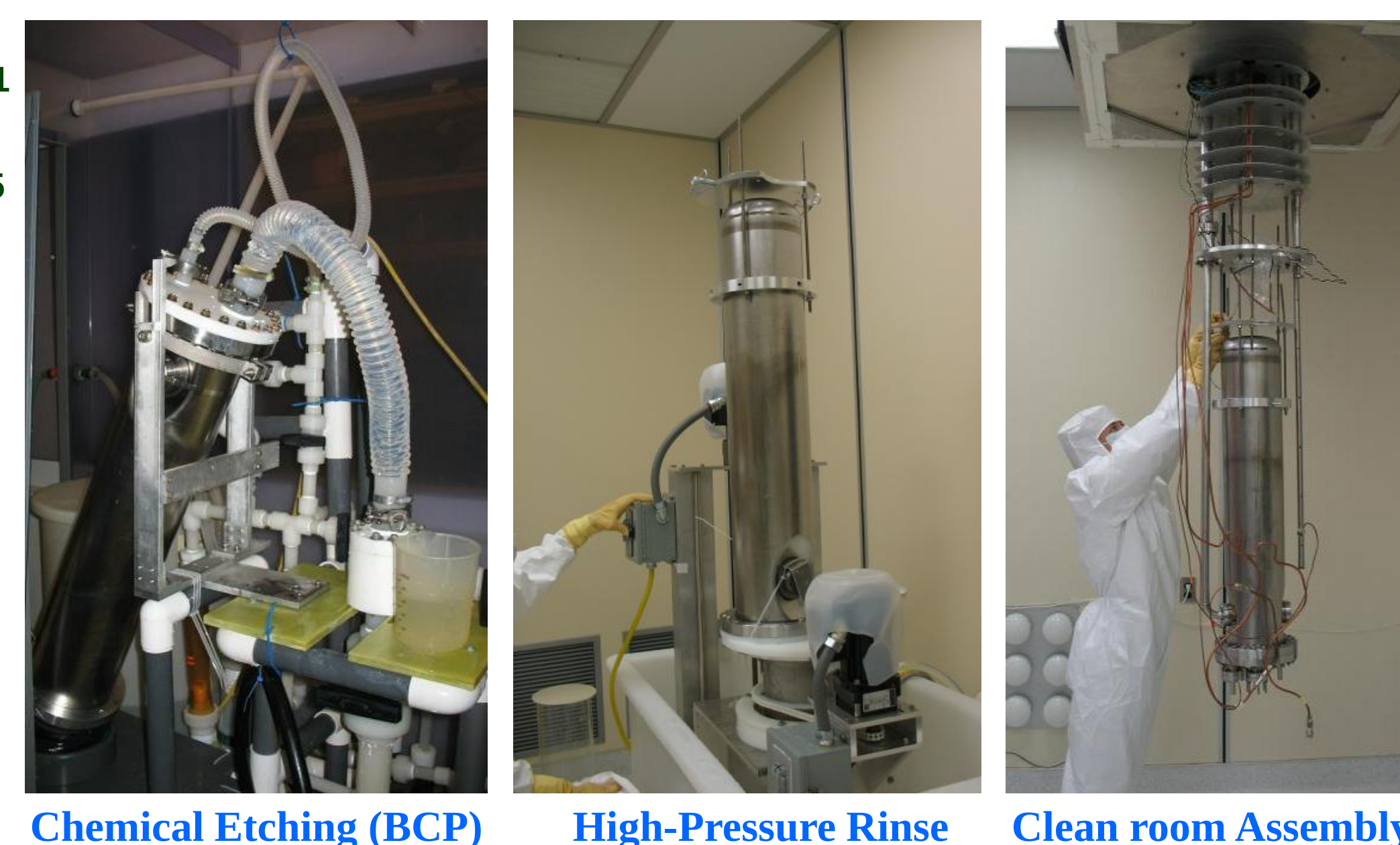
ReA3 Cavity Fabrication

Cavity Fabrication at MSU

- QWR 80.5 MHz, $\beta = 0.041$
- 8 cavities in production
- Same cavity used in FRIB linac



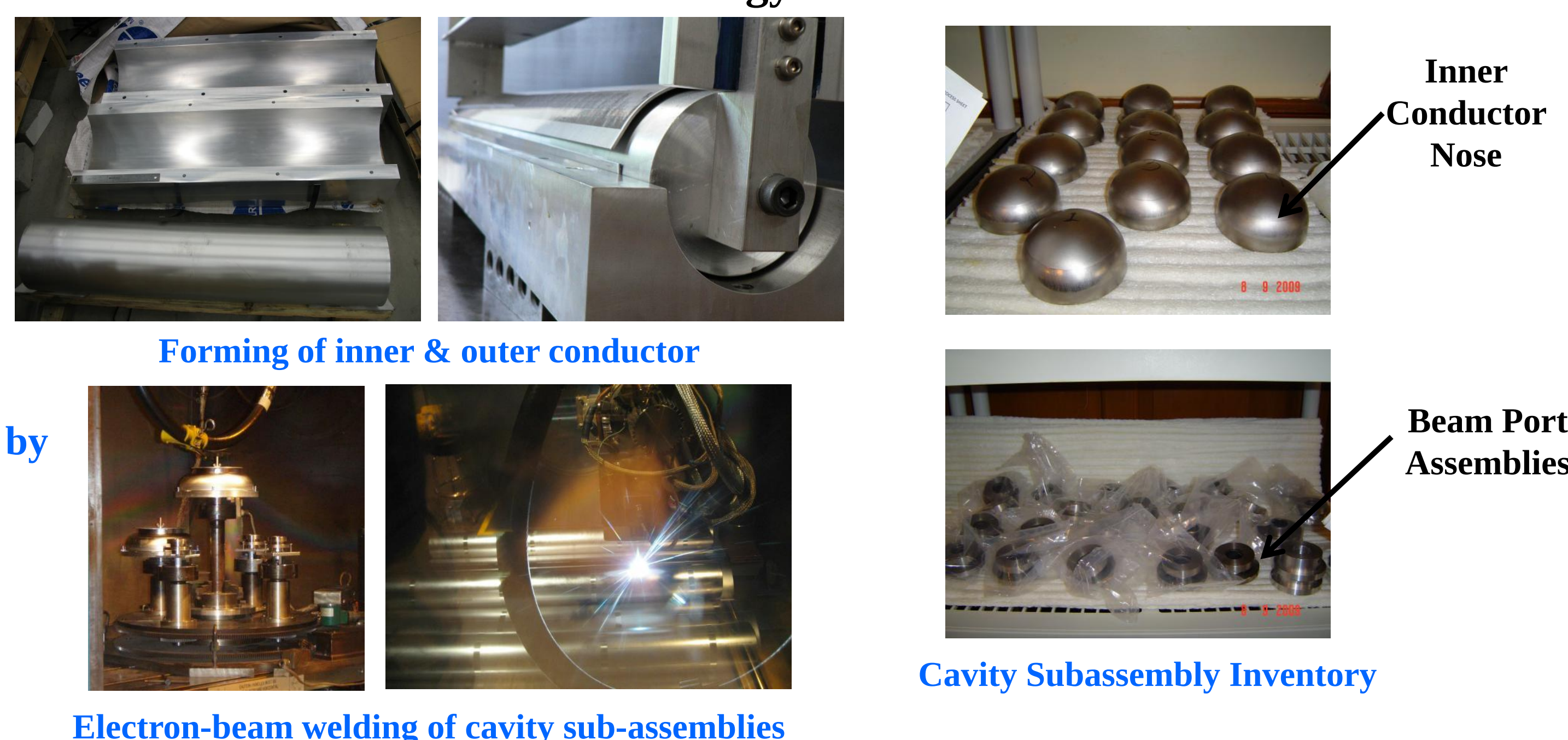
Cavity Processing and Testing at MSU



Dewar test results for $\beta = 0.041$ cavities

Industrial Fabrication – Technology Transfer

- QWR 80.5 MHz, $\beta = 0.085$
- 10 cavities in production
- Same cavity used in FRIB linac
- Sub-assemblies being fabricated by industry (Niowave, Inc.)

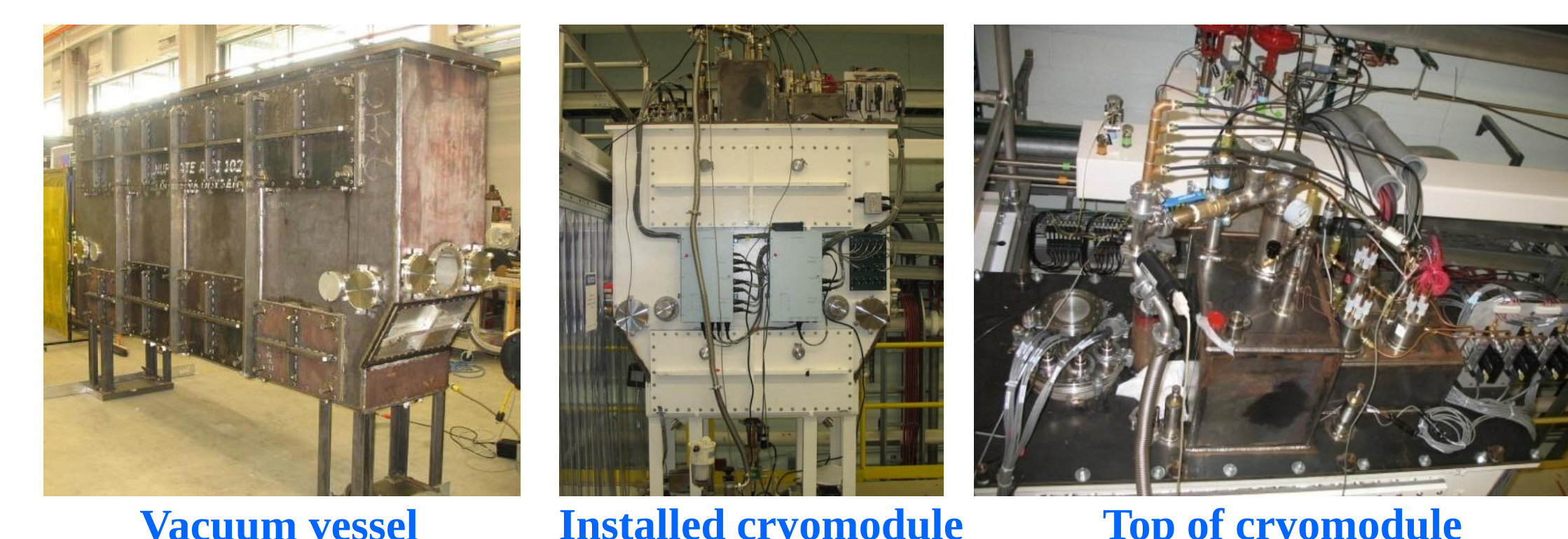


ReA3 Cryomodule Fabrication

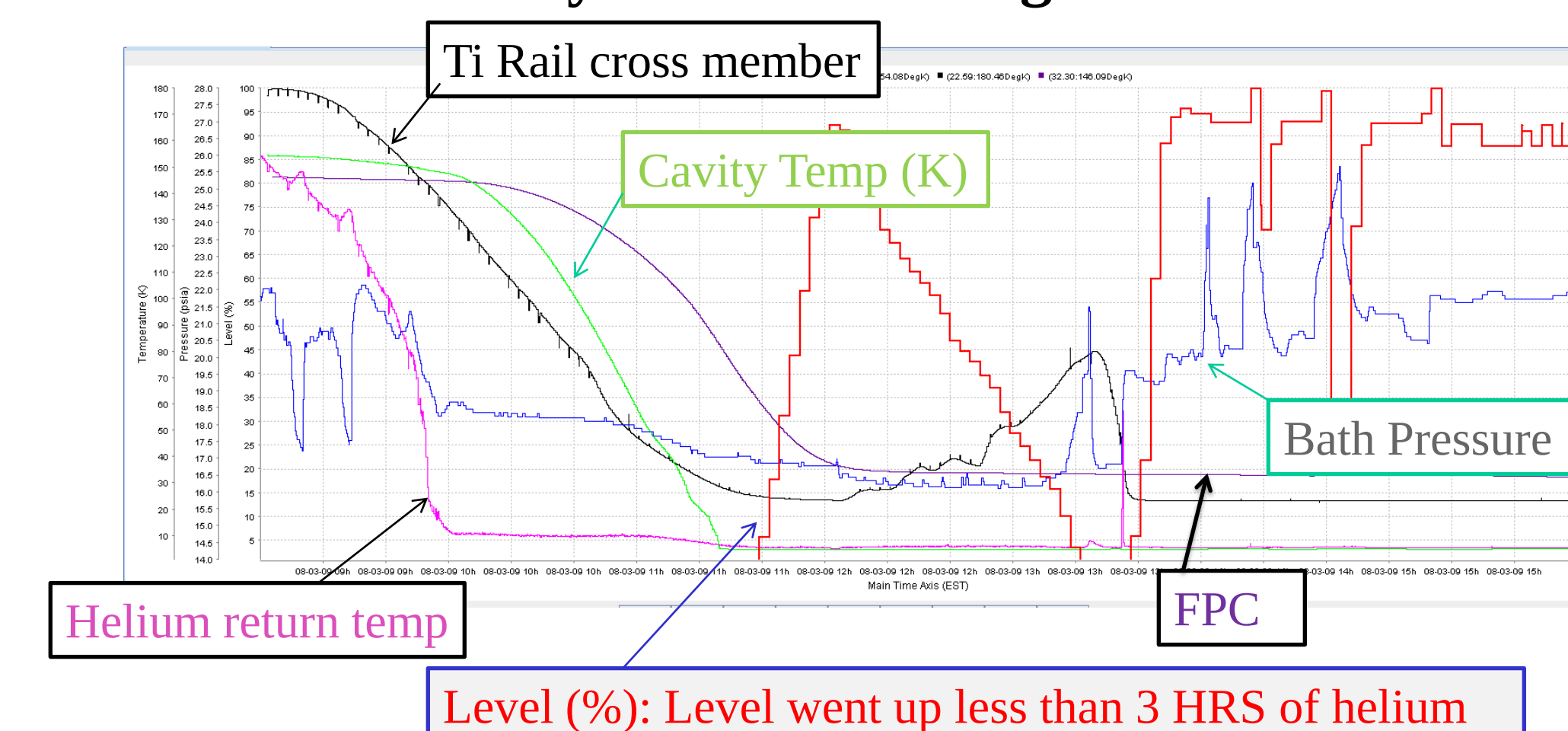
Cold mass assembly at MSU



Cryomodule assembly at MSU



Cryomodule Testing at MSU



Cool down of Rebuncher cryomodule (after nitrogen precooling) Testing

- RF measurements
 - Up to $E_p = 36$ MV/m with direct connection
 - Up to $P_t = 500$ W with direct connection
 - Input coupler $Q_{ext} = 1.2 \times 10^6$; BW = 67 Hz (design = 42 Hz)
- Static load measurement: 8 W (from level vs time)
- Tuner operation: 28 kHz tuning range (6 mm; |force| < 950 N)
- Dynamic load measurements: in progress
- Solenoid operation: in progress

Related Talks
ReA3 – Oliver Kester (MOOCAU05)
FRIB – Richard York (FROAAU02)

Related Poster
Structural Analysis – Evgeny Zaplatin (THPP013)