Some Fabrication and Measurement Issues for High Gradient Test Accelerator Structures

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Outline

1. Work Updates
   - TD24R05 Structures j
     - Motivation
     - Fabrication Status
   - Structure Damage Studies
2. How to Produce High Quality Surfaces
   - Chemical Cleaning
   - Diffusion Bonding Process

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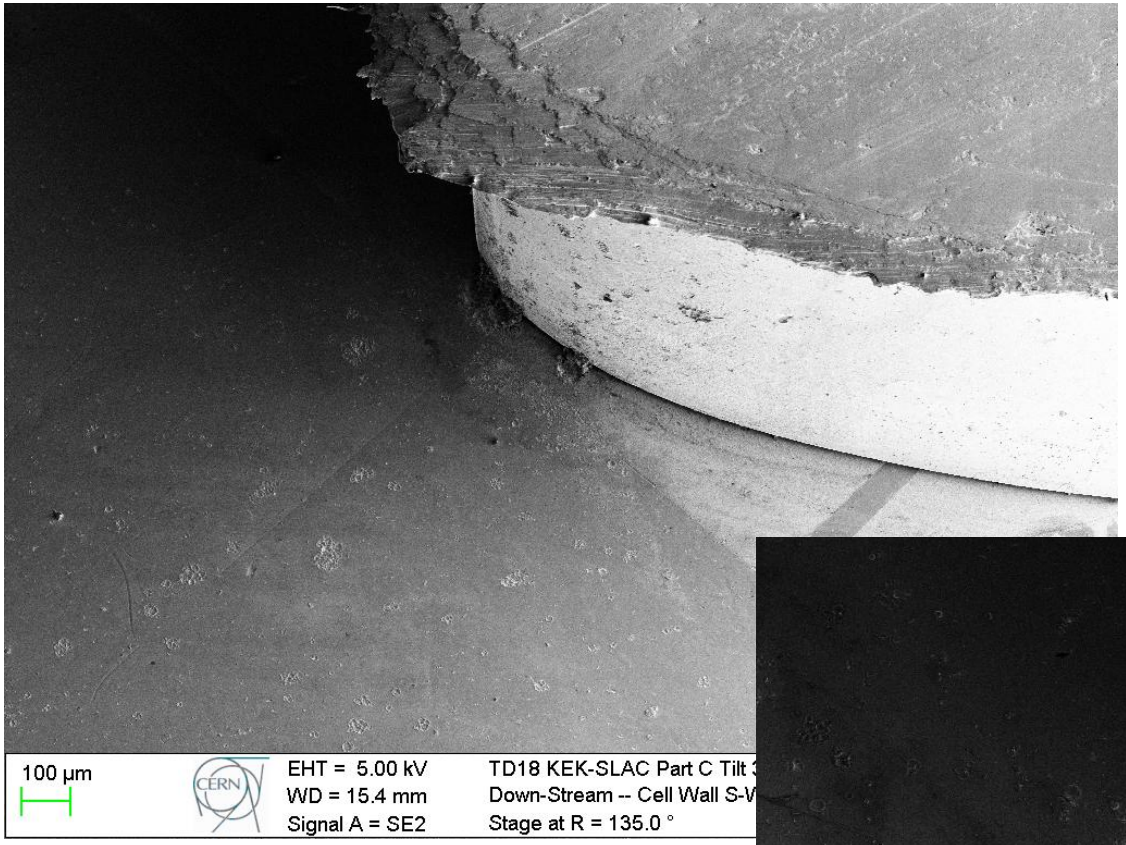
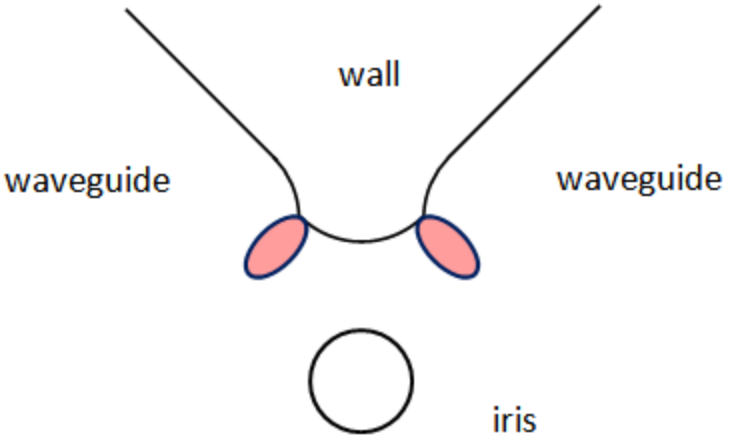
1. Work Updates

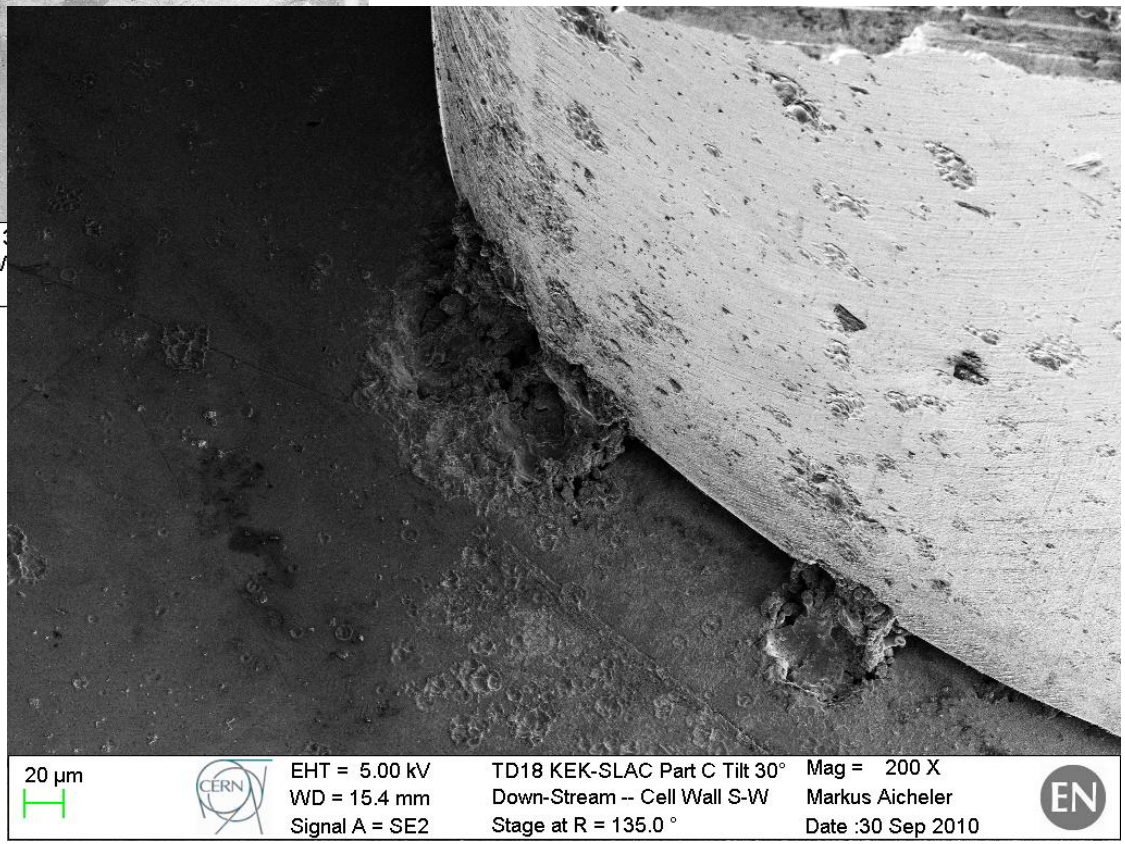
- TD24R05 Structures
  - Motivation
  - Fabrication Status one completed, 3 nearly completed.
- Structure Damage Studies

CERN Pictures for TD18 Structure after High Power Test

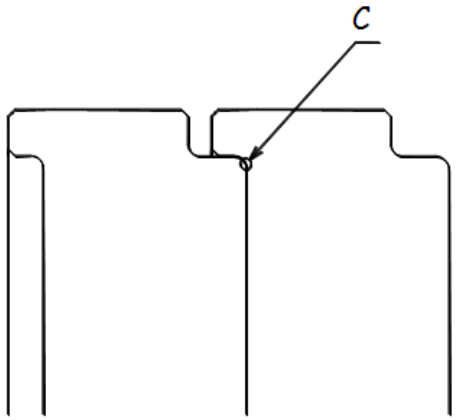
Part C
Down-stream side – Cell Wall S-W!
Tilt 30°

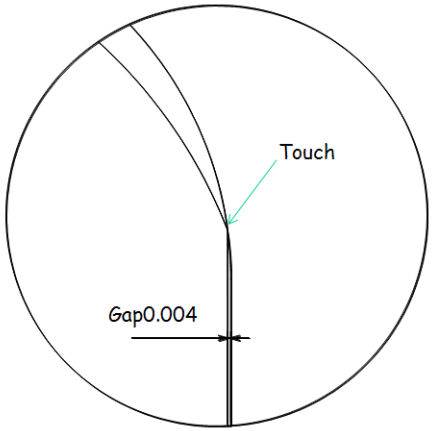






Delay due to Fabrication Problem and Correction





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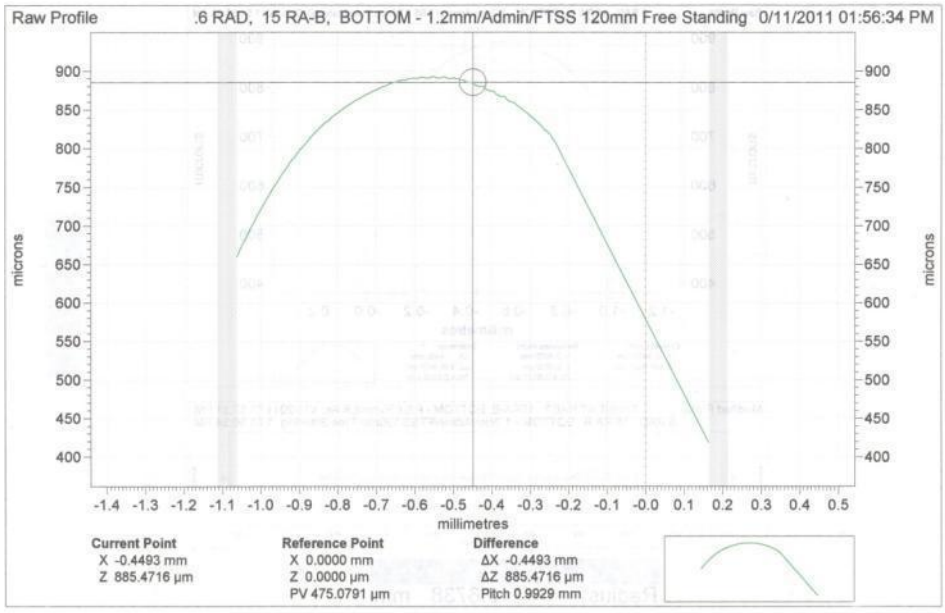

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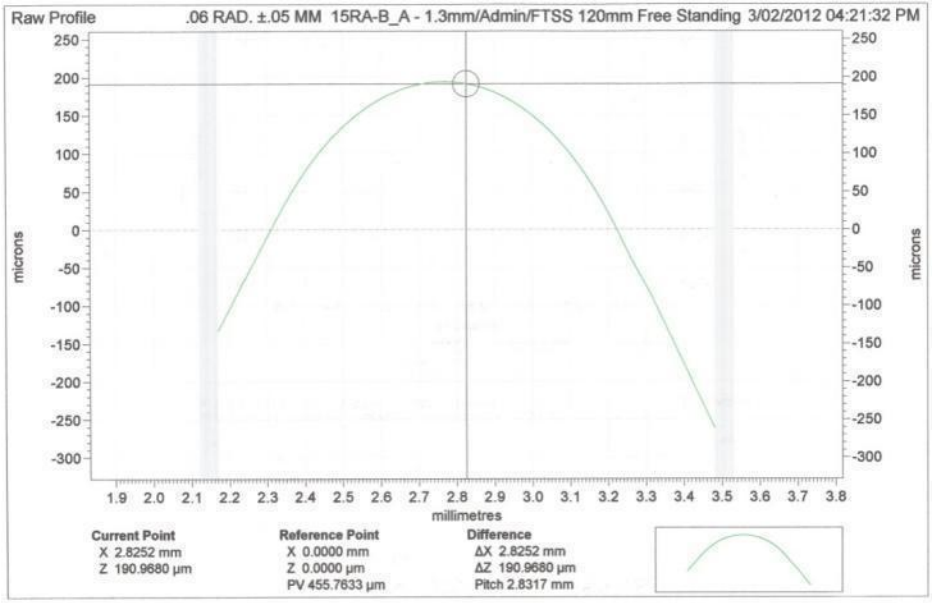
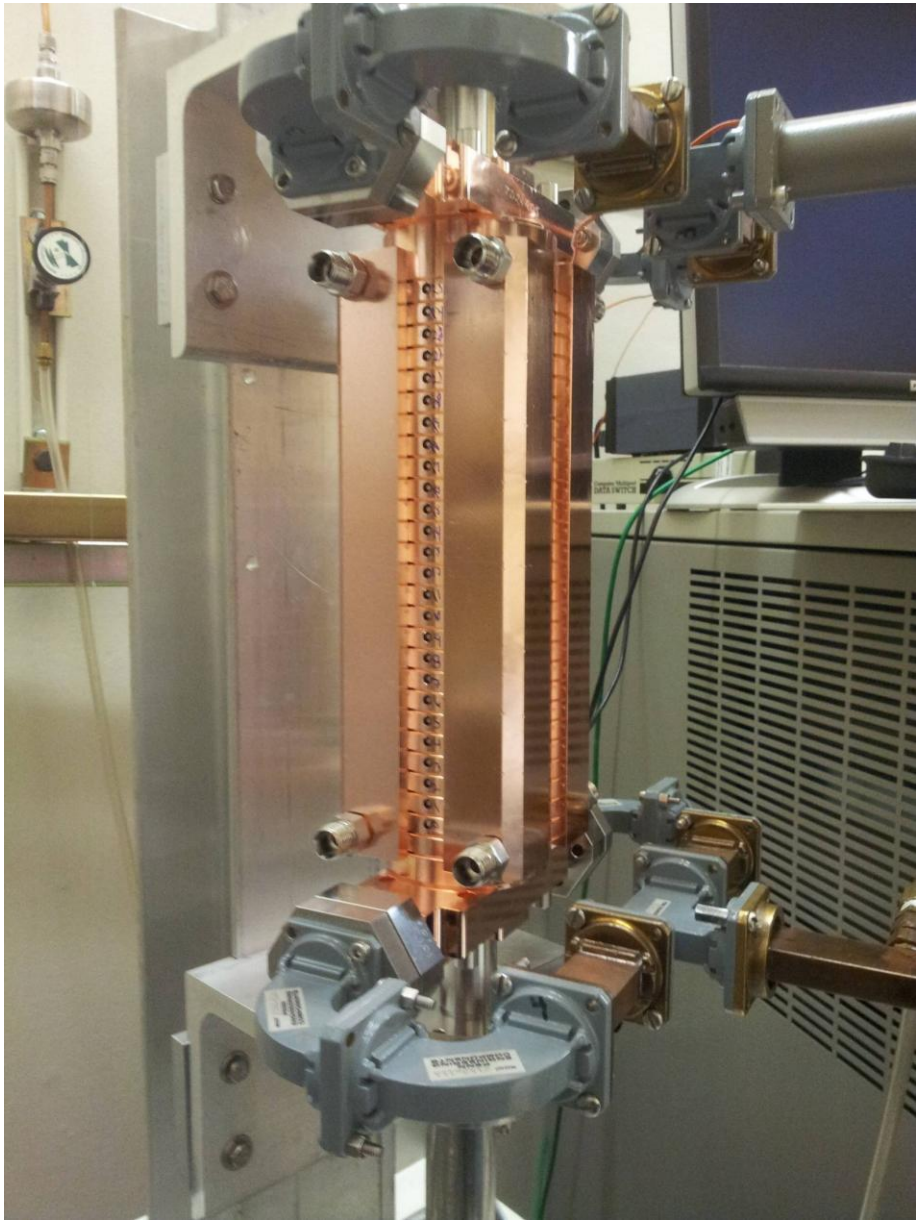
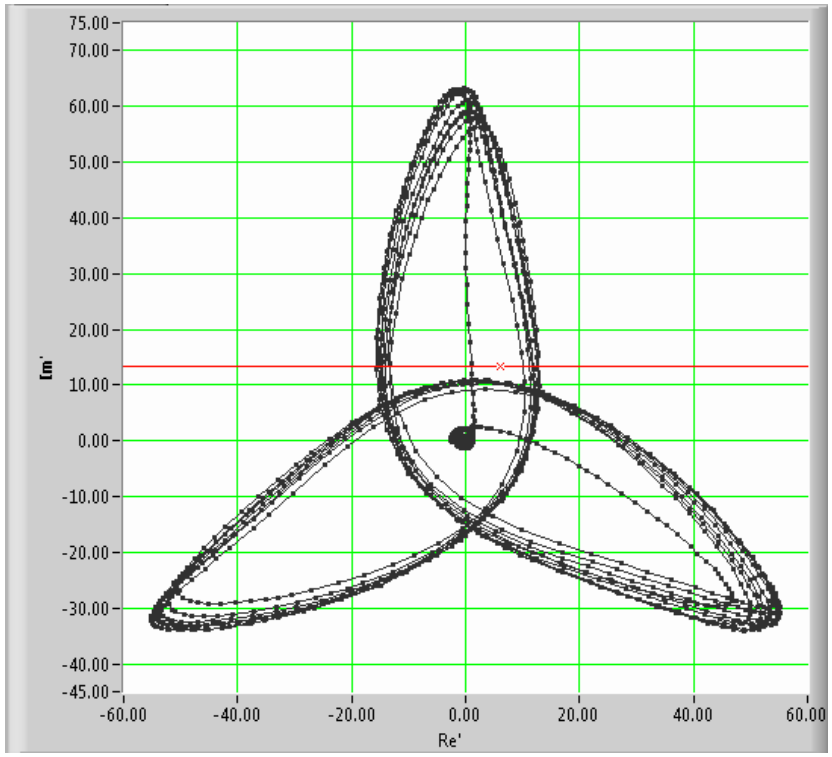


TD24R05 with KEK Flanges under Measurement

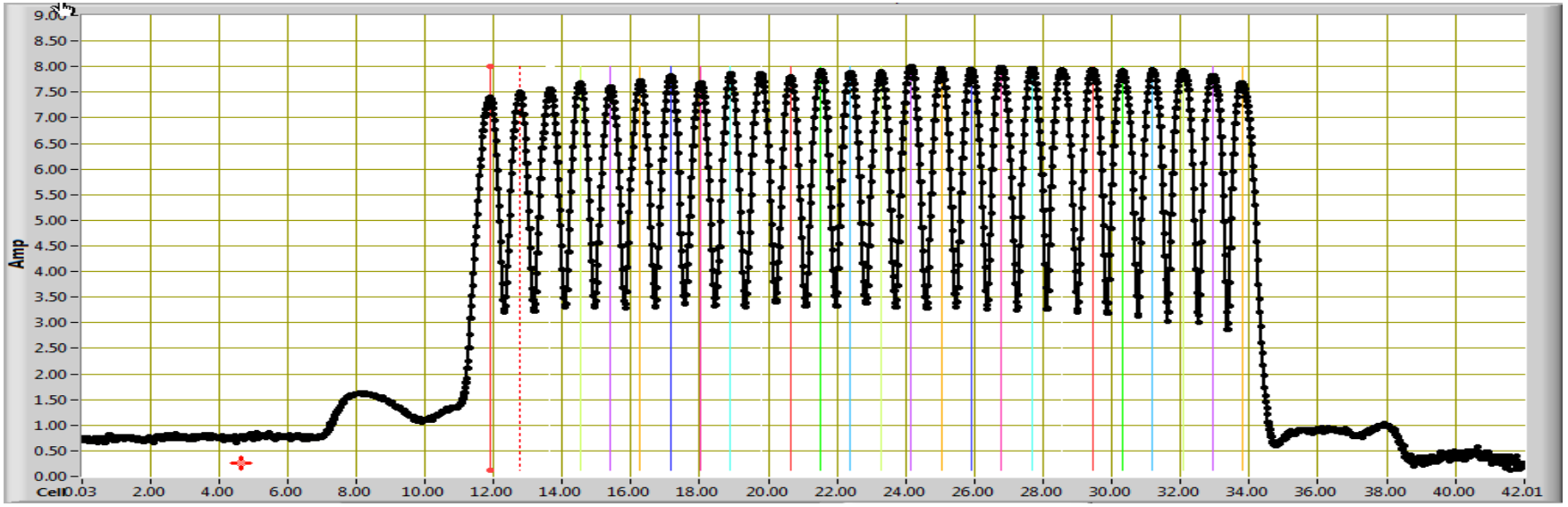


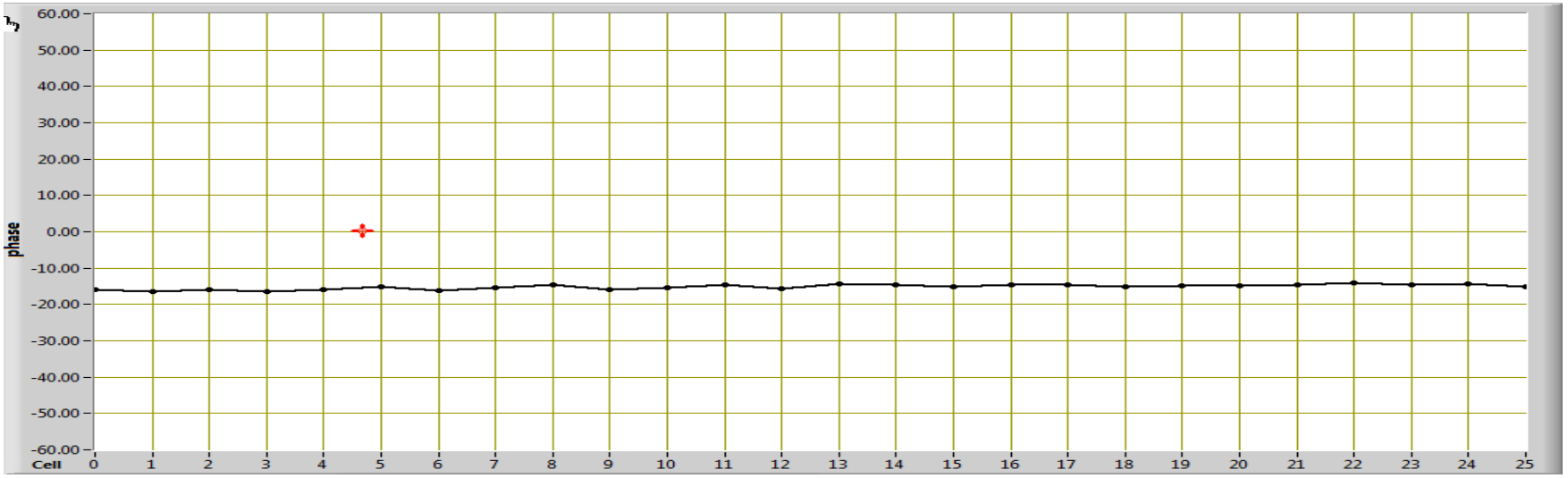
T24R05 Structure –KEK Flanges

- Operation Condition: 11424.0 MHz at 30°C, Vacuum
  (Tuning at 11420.99, 22.2°C, dry Nitrogen with String)
- S11: 0.013
- S22: 0.042
- S12: 0.64
- Filling time: 58 ns



TD24R05 with KEK Flanges





120°

Importance for Structure Damage Studies due to High Power Operation

Structure damage always is a critical issue for the life time and stabilization of the high gradient accelerating structures.

Structure Type	High Power Hours	Frequency Change	Output End Damage
T18-SLAC 100MV/m	1400	Very Small	Yes
T18-KEK 100MV/m	400	+ 1 MHz	Yes
TD18-SLAC 100 MV/m	700	+ 1 MHz	Yes
T24-SLAC 100 MV/m	600	-0.3 MHz	Yes
T24-KEK 100 MV/m	1600	+ 1 MHz	Yes
NCC/GLC Prototypes 65 MV/m	Few Hundreds	No	No

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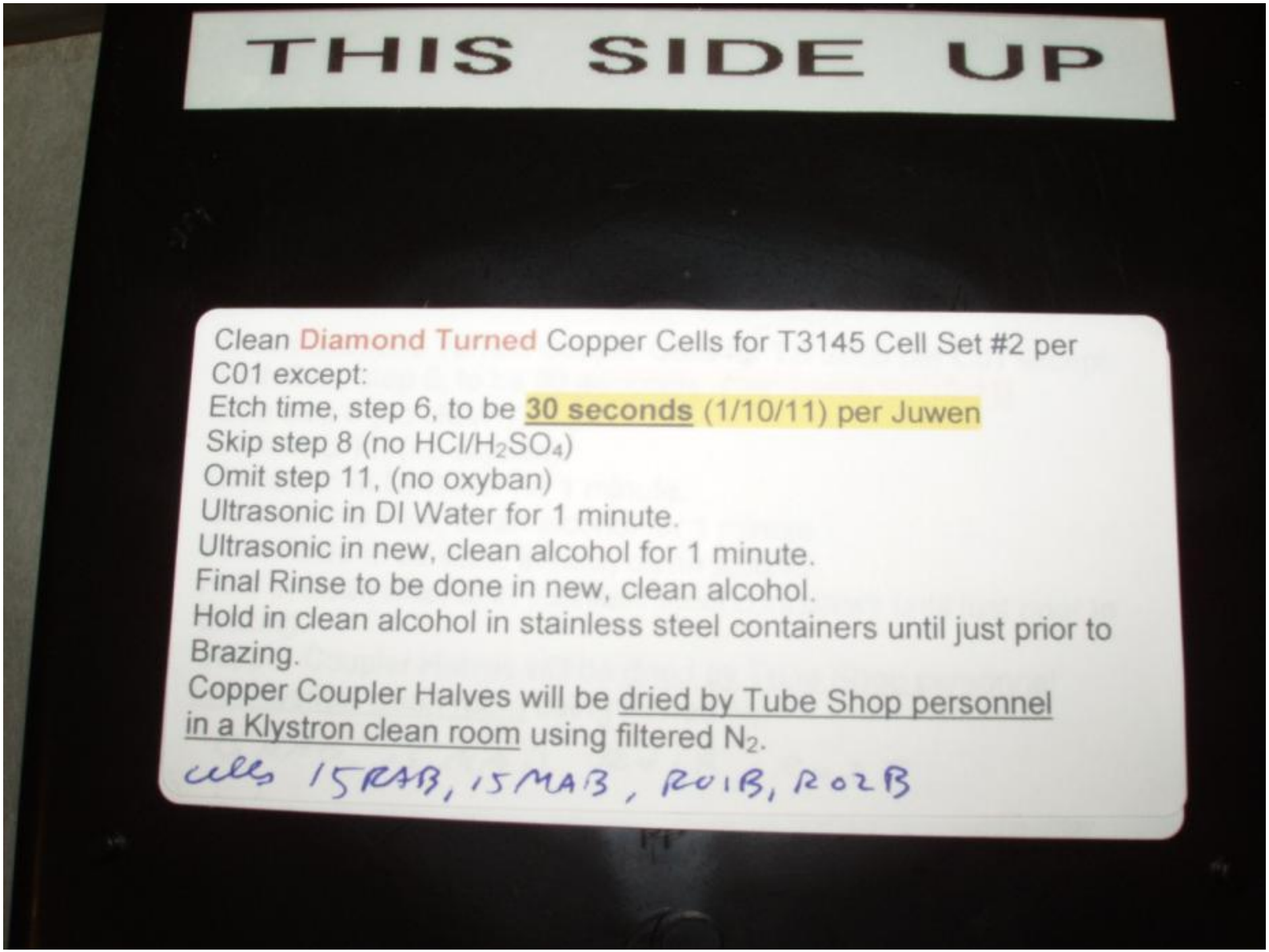
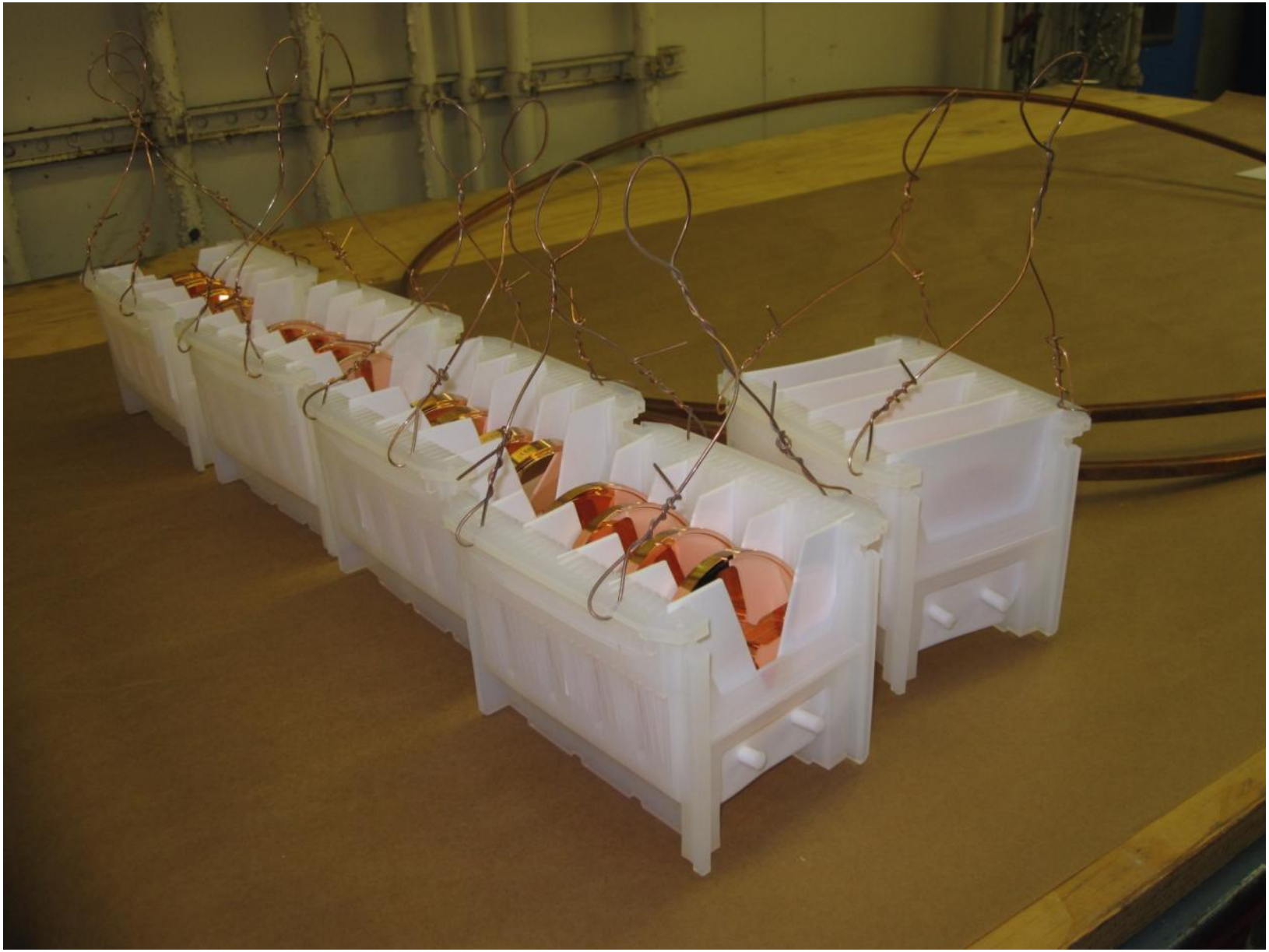
2. How to Produce High Quality Surfaces

- Chemical Cleaning
- Diffusion Bonding Process
- Following up Procedures

Label for Cleaning Procedure in Container



Accelerator Cups Ready to be Cleaned



Vapor degrease in perculoroethylene for 5 minutes

Alkaline soak clean in Enprep Q527 for 5 minutes at 180ºF.

Cold tap water rinse for 2 minutes.

Immense in 50% hydrochloric acid at room temperature for 1 minutes.

Immense in 50% hydrochloric acid at room temperature for 1 minutes.

5. Cold tap water rinse for 1 minute.

Immense in the following solution for the time depending on the surface finish required:

Phosphoric Acid, 75%	21 gallons
Nitric Acid, 42º Baume	7 gallons
Acetic Acid, Glacial	2 gallons
Hydrochloric Acid	12.6 fluid ounces
Temperature	Room

Cold tap water rinse for minimum of 2 minutes until the film on part disappears.

Rinsing the Tuning Holes

Ultrasonic in DI Water for 1 minute.

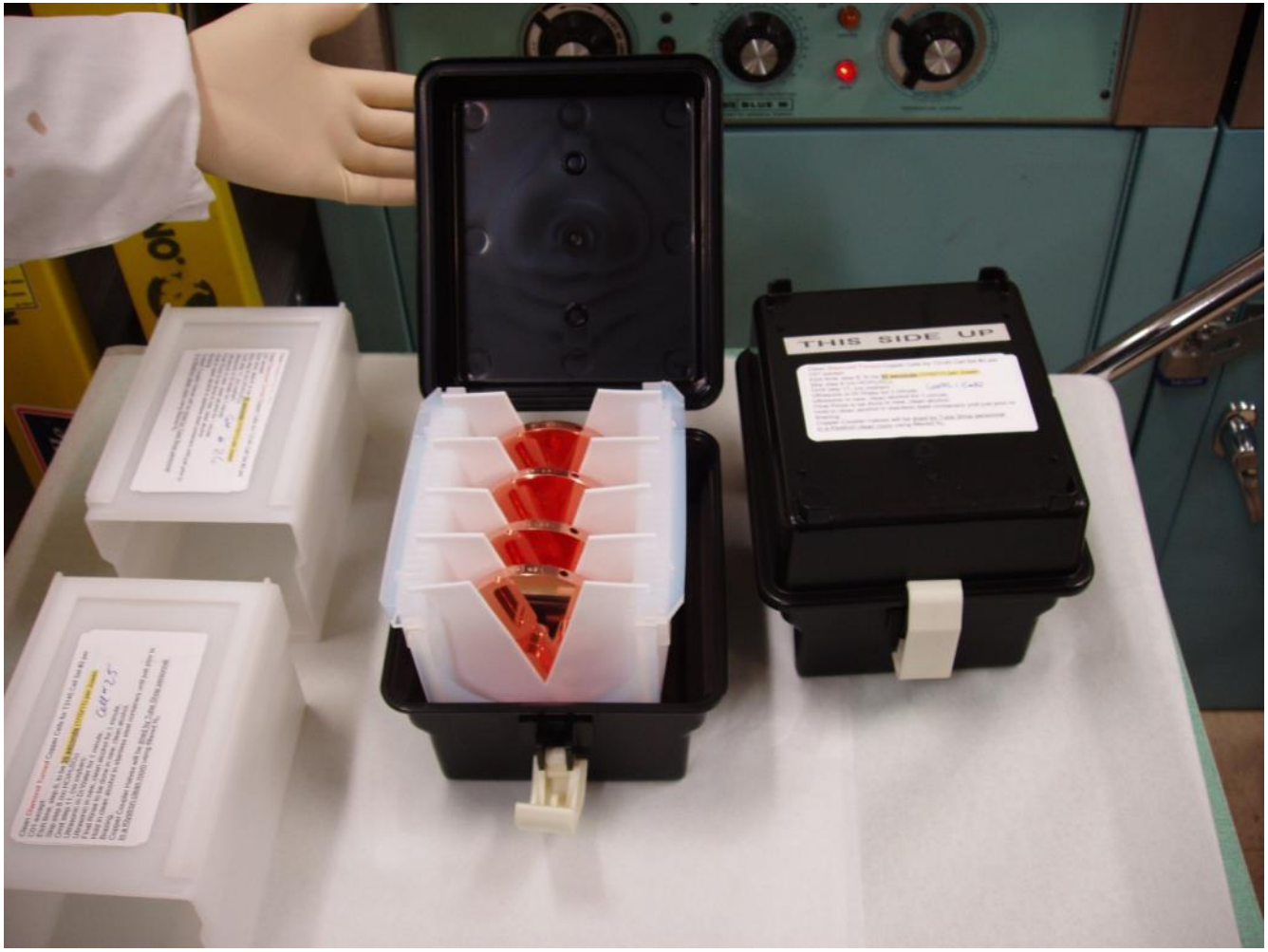
Ultrasonic in new, clean alcohol for 1 minute.

Hold in clean alcohol in stainless steel container

Ready to Ship for Diffusion Bonding

Blow Dry

Ready to Move to Furnace Area



Stacking in the Furnace

Ready for Diffusion Bonding

Proper Weight Added

Checking the Notchs Beteen Cups