

RF surface aspects at power couplers

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Fundamental Power Coupler Workshop
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Ceramic fabrication and treatment

Career of the ceramic (TTF Coupler)

> Preconditions

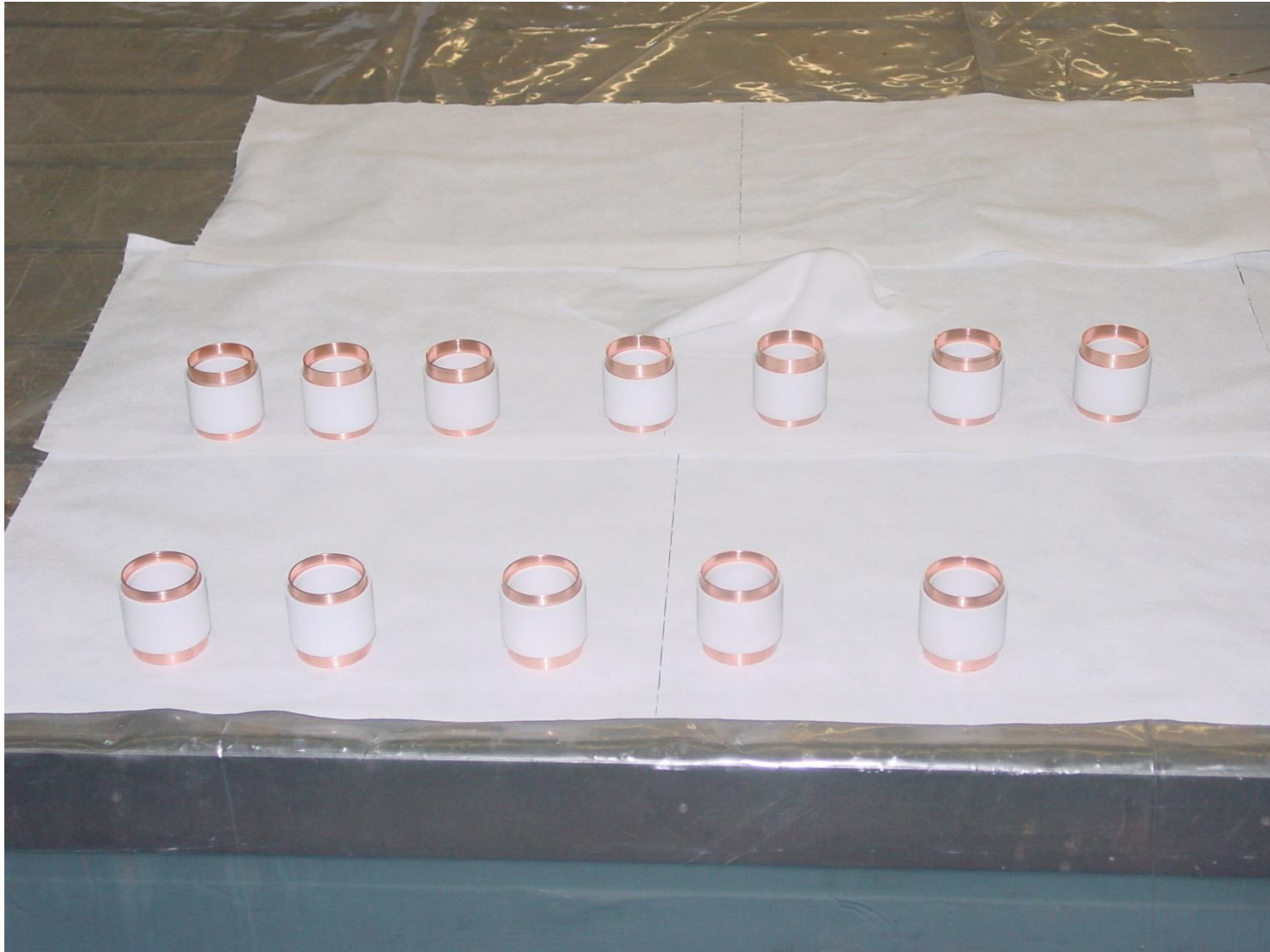
- One supplier for quality stability
- One batch of powder for one series fabrication
- Measurement of $\tan\delta$ and ϵ in the lab
- Sintering at the supplier

> at the coupler fabrication:

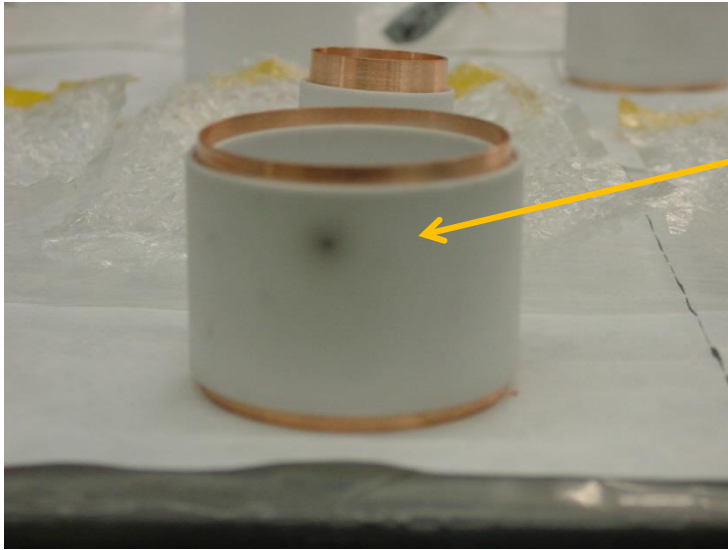
	CPI	RI
Firing at air, inspection	in house	at supplier
Metallization	in house	at supplier
800C in vacuum	-	in house
Brazing	in house	in house
Inspection and sand blasting if necessary	in house	in house
TiN coat	in house	in house
E- beam welding	subcontract	in house
Inspection	in house	in house



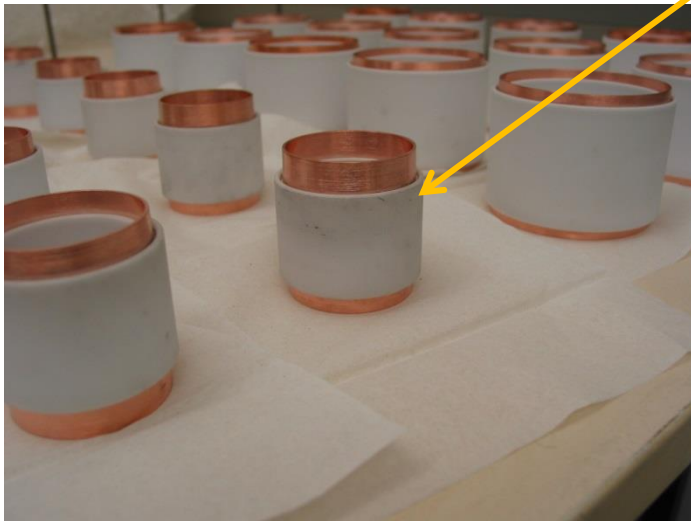
Ceramics after brazing



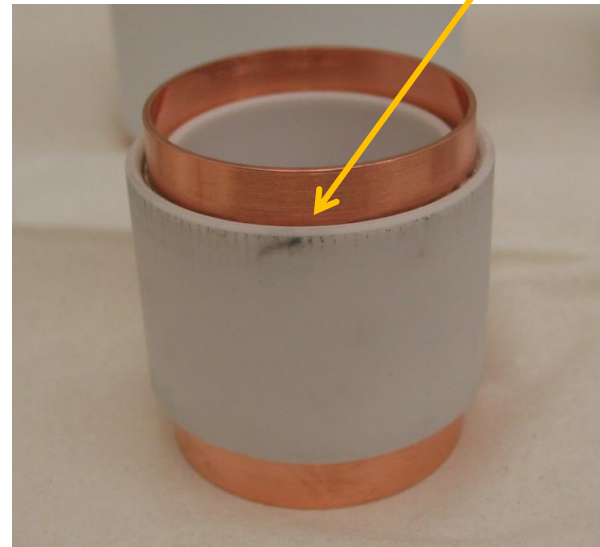
Ceramic inspection after brazing, before TiN coating



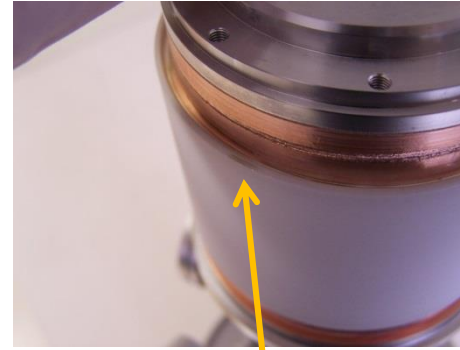
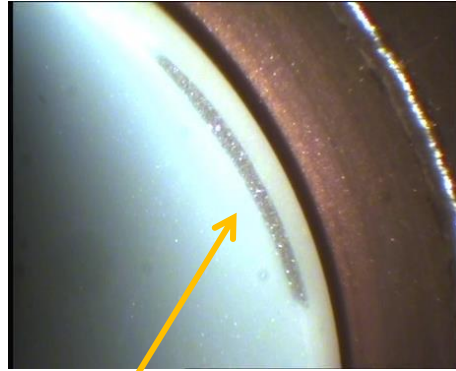
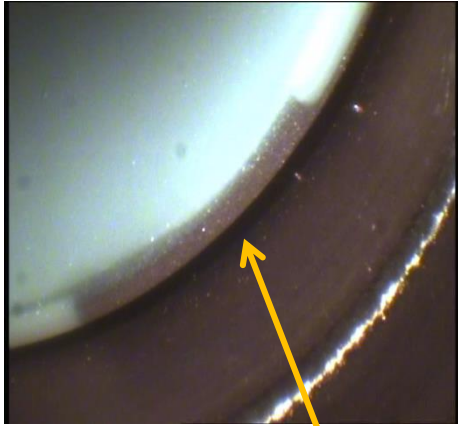
Appeared after brazing, is inside the material and cannot be removed by surface sand blasting



Appeared after brazing on surface, can be removed by sand blasting

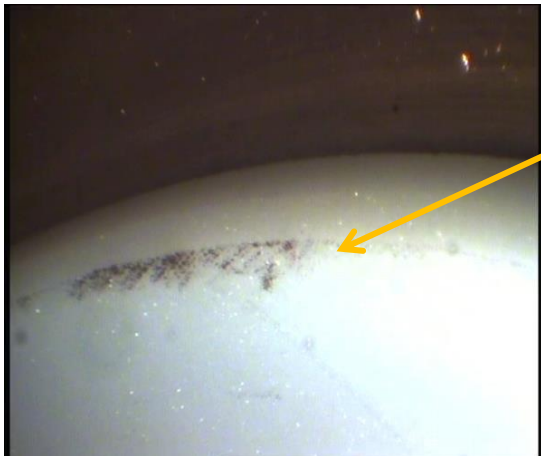


Ceramic inspection after e-beam welding



No TiN – can be sand blasted

Copper evaporation from e-beam welding,
Cannot be removed because TiN would be damaged



Metallic
residues from
friction with
tooling

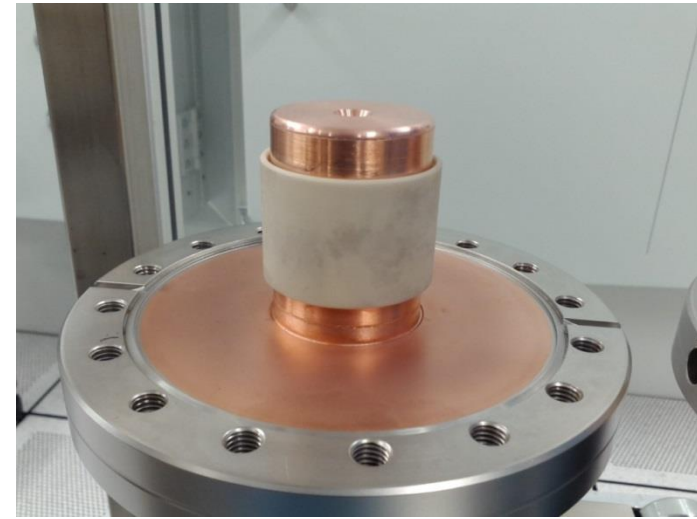
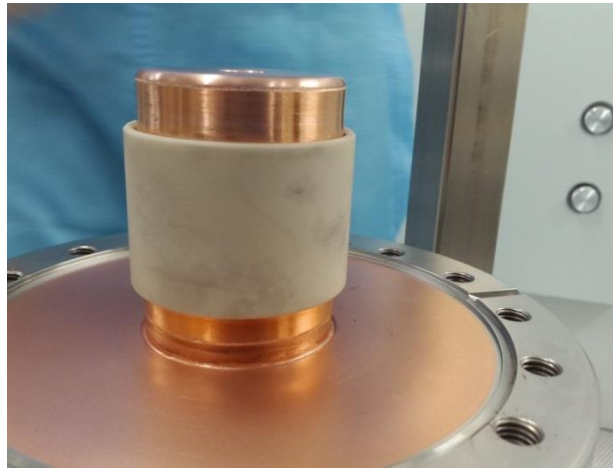
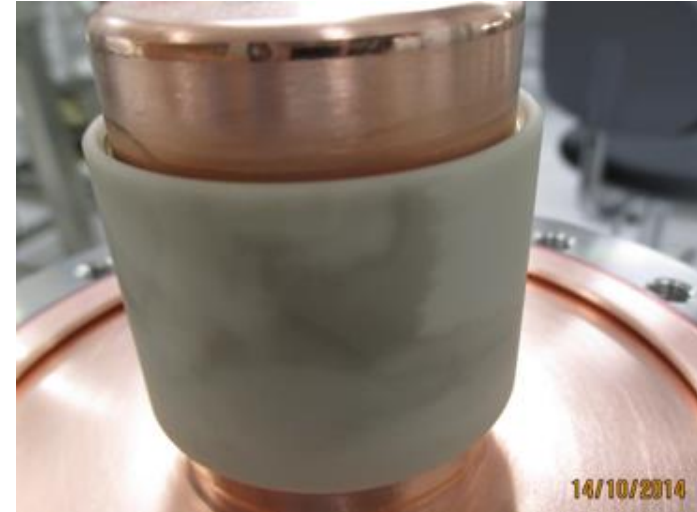
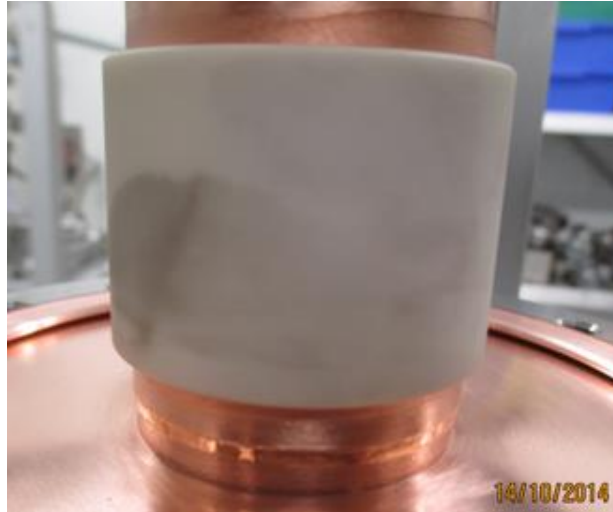


Edge broken,
ceramic has to
be replaced

- Can be sand blasted when not TiN coated
- Otherwise ceramic replacement

Ceramics after RF operation

- After RF conditioning on test stand
- Dark stains
- Origin unknown
- Analysis underway



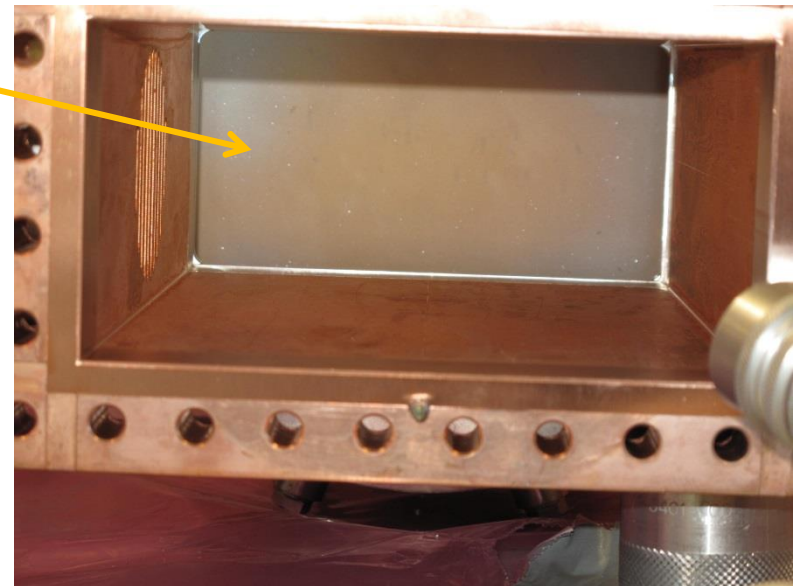
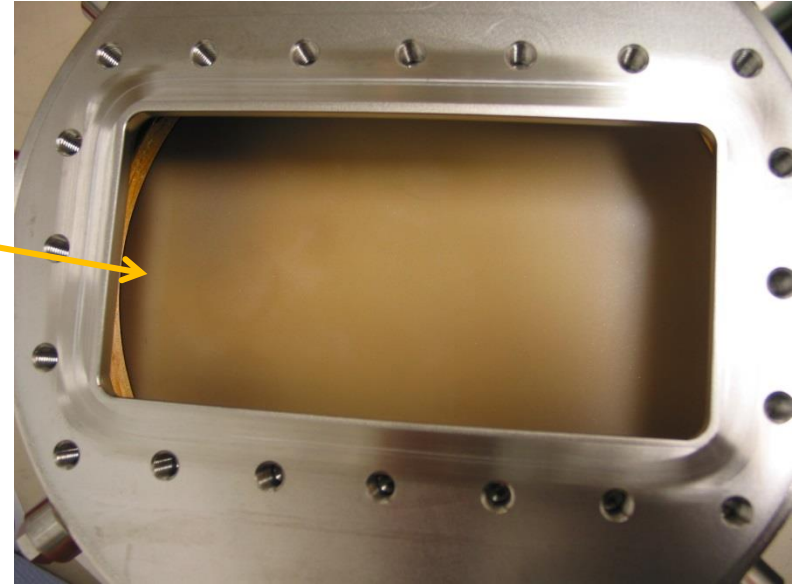
Ceramic must be replaced

Ceramics after RF operation

Wave guide window after years of operation

- Brown discoloration due to X-ray
- Gray discoloration unknown, no electrical resistance

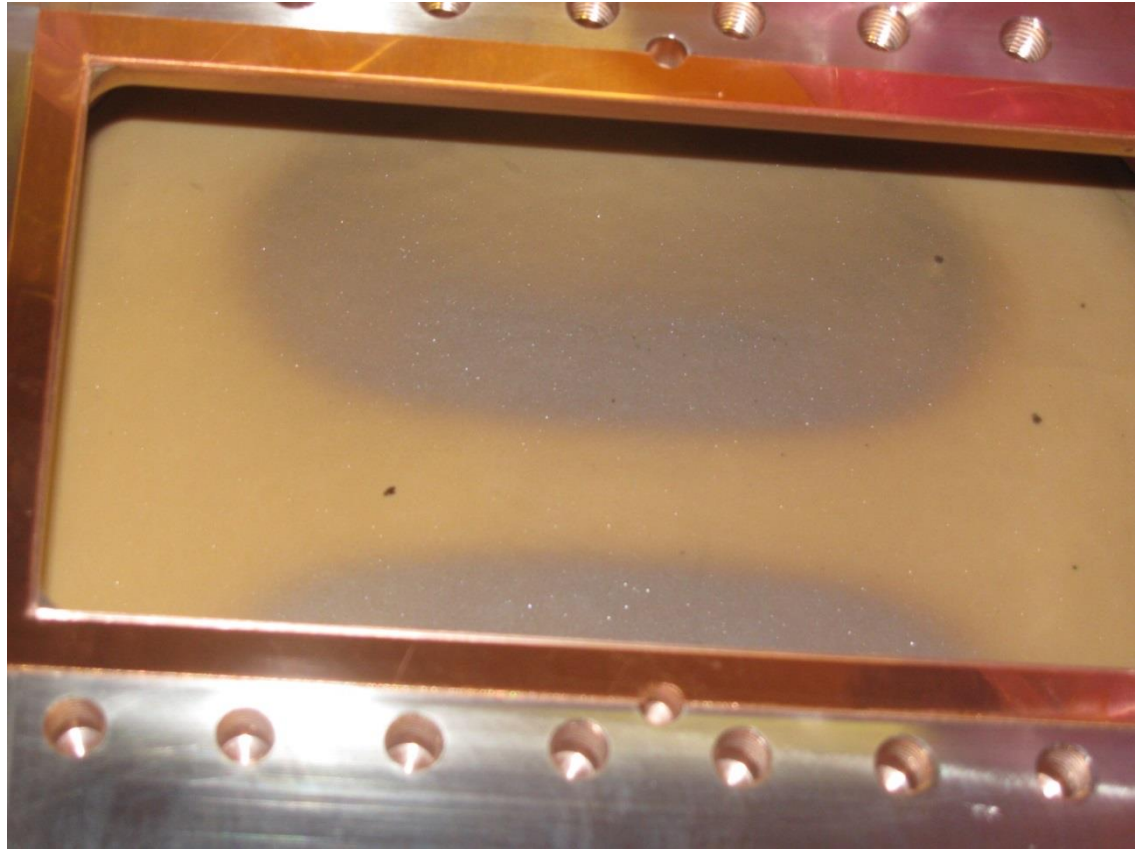
Can be used without restrictions



Ceramics after RF operation

Wave guide window after month of operation

- Strong vacuum and light activities
- Gray discoloration unknown, brown comes from X-ray
- no electrical resistance measured (measurement days after disassembly)
- No increase of thermal heating observed

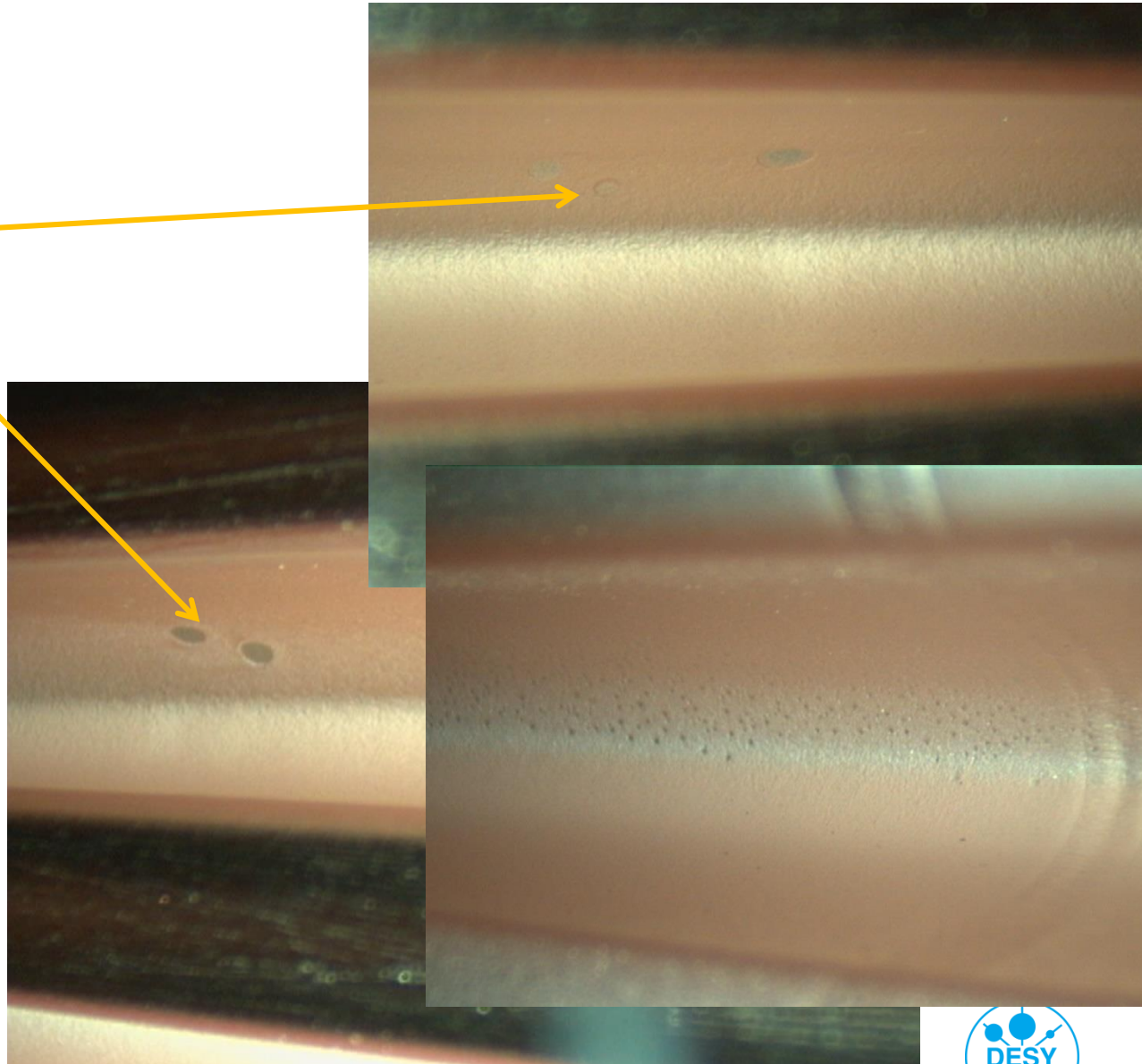


Looks like metallization => window was exchanged,

Copper plating before RF conditioning

Bellow valley

- Circular defects
 - With copper
 - Without copper
 - Multiple holes



Questions:

- How many acceptable?
- Outgassing?
- SEC?

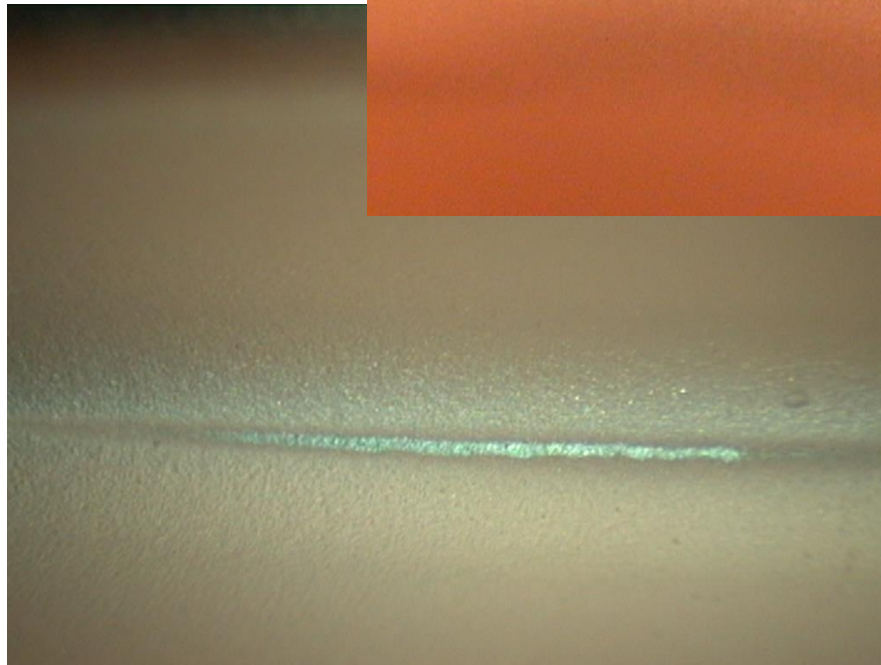
Copper plating before RF conditioning

Bellow valley

- missing copper

Question:

- Acceptable?
- Up to what size?

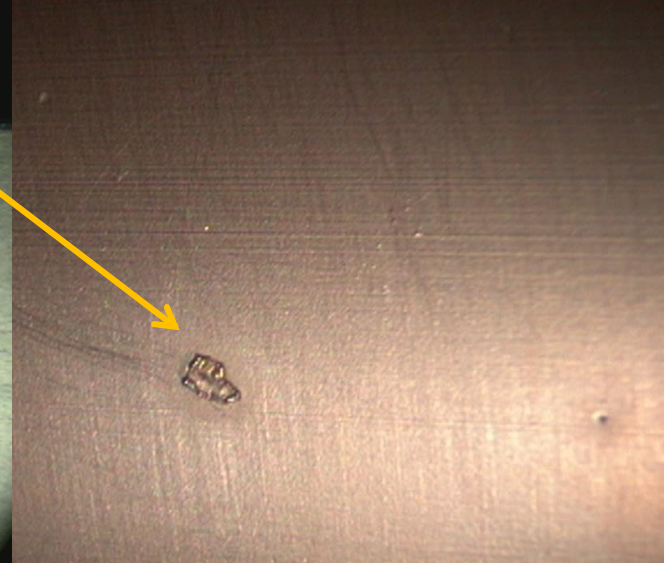
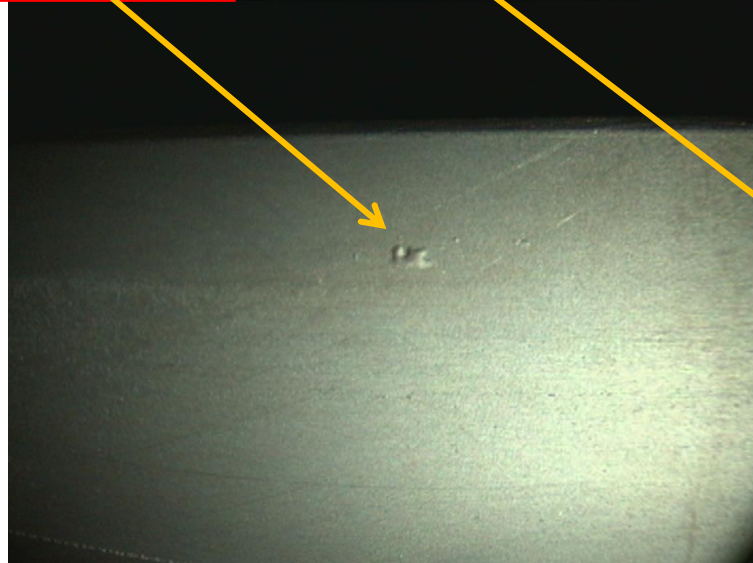
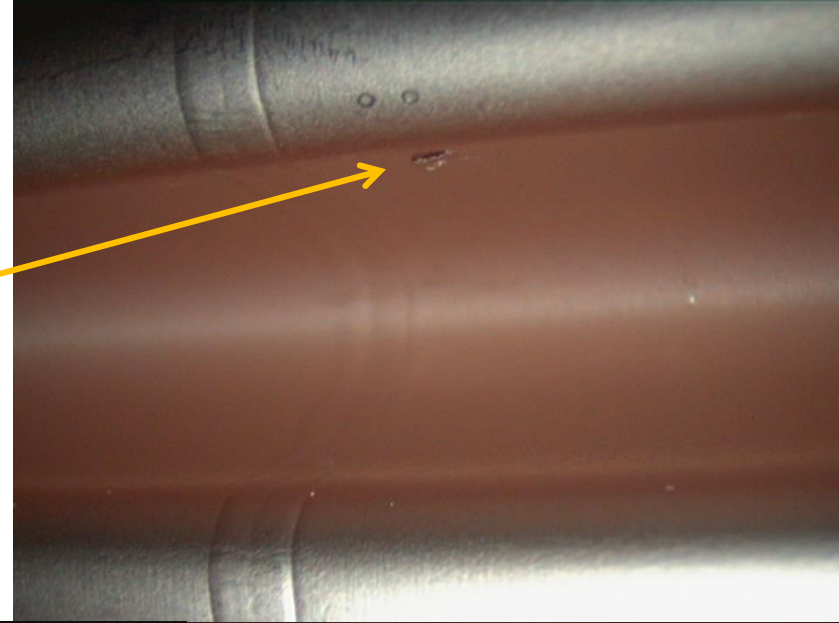


Copper plating before RF conditioning

Bellow valley

- Particles on surface and embedded

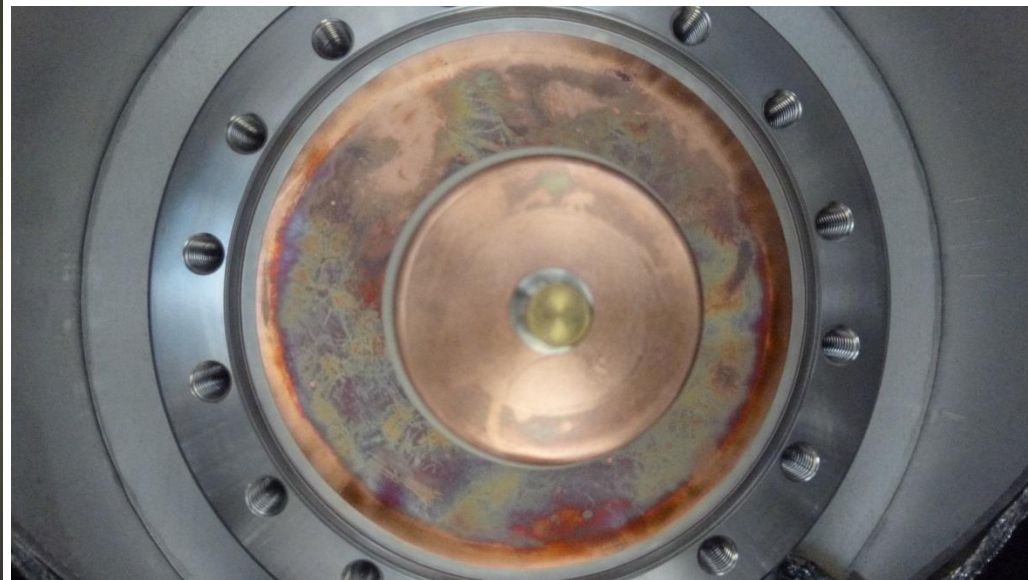
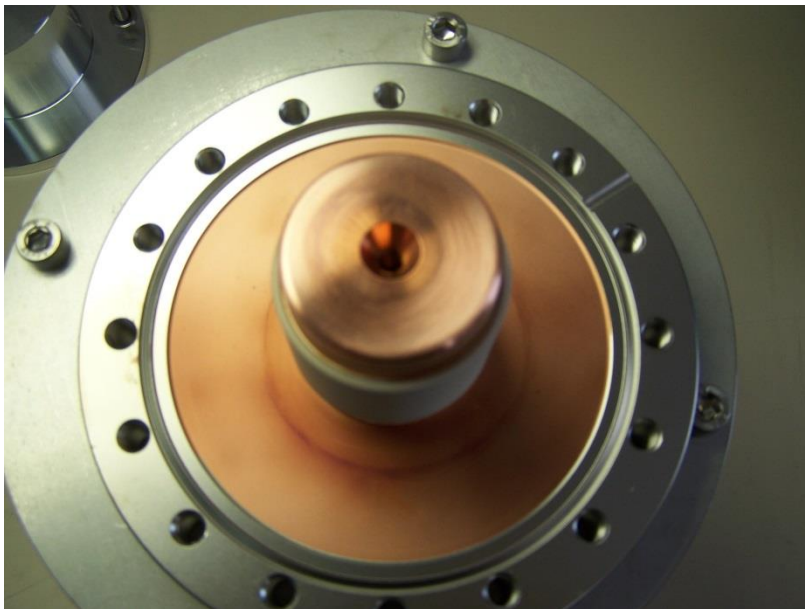
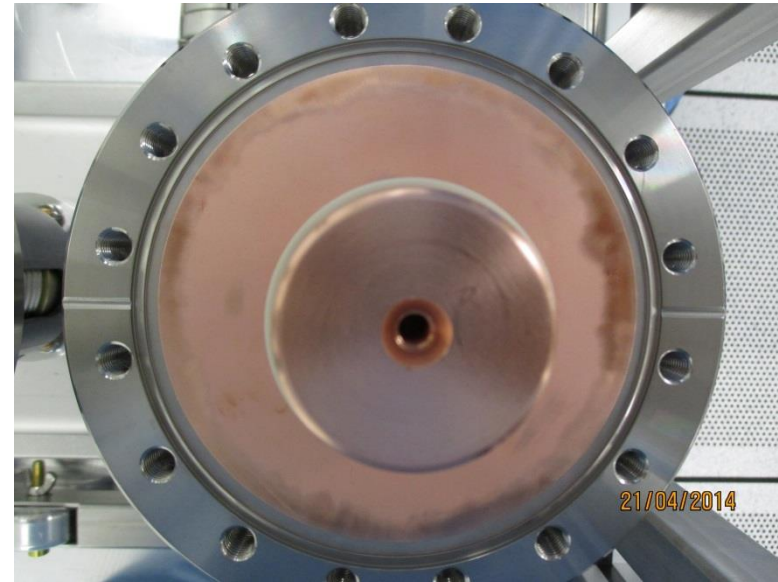
- Loose particles and sharp edges => not accepted
- Some could be removed
- Embedded particles with soft edges are accepted



Copper plating after RF conditioning

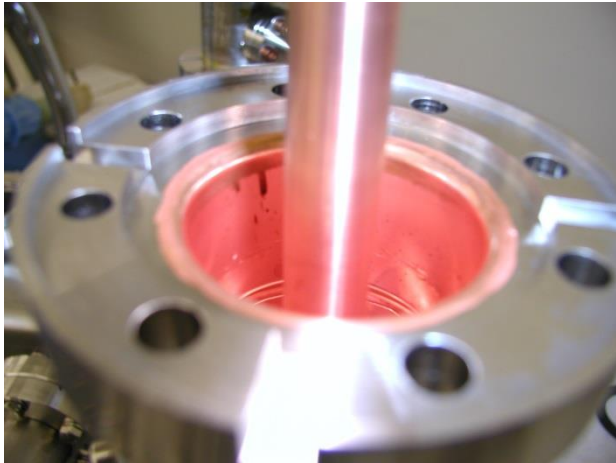
- Discoloration on copper
- Can be removed by citric acid => must be CuO
- RGA is OK

Acceptable?

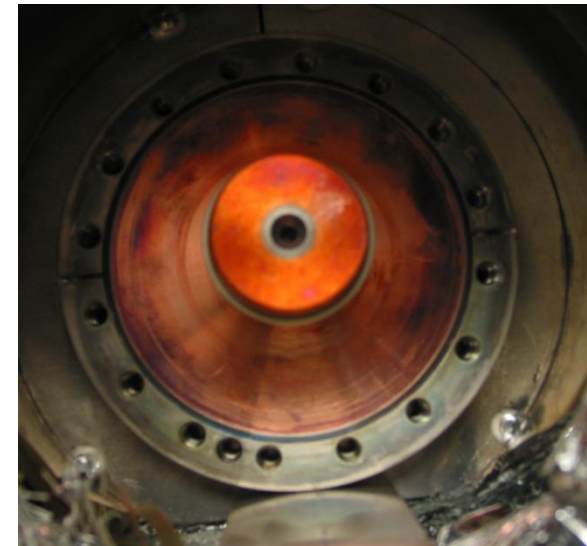
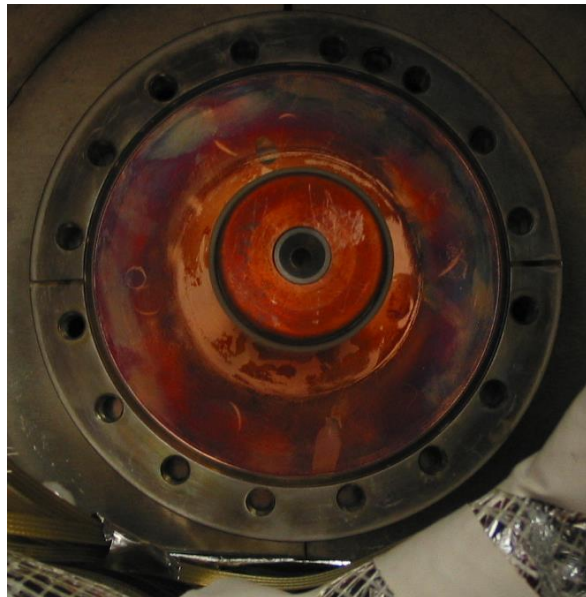
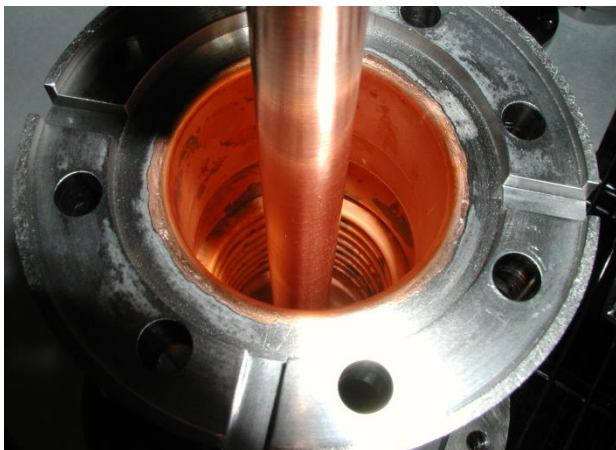
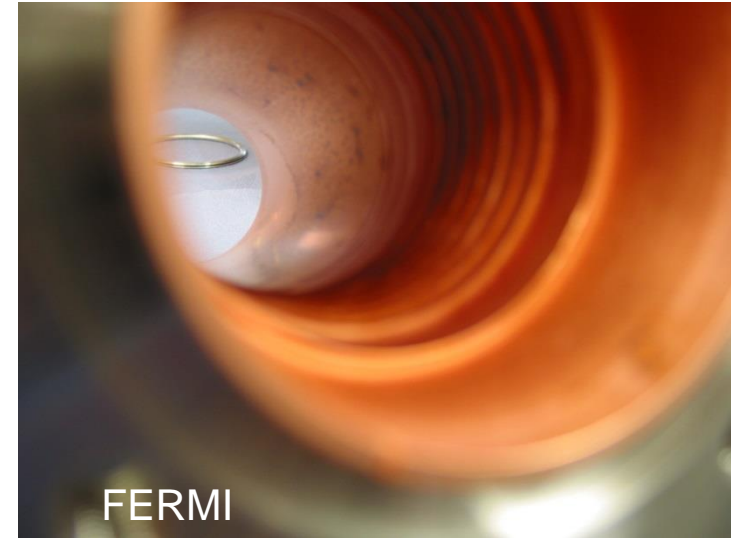


Copper plating after RF operating in modules (FLASH)

- Many stains and discolorations
- No restrictions during operation
- No hints in RGA



Acceptable?



Questions

- > What are the surface roughness limitations by scratches (brushing)?
 - see Chris's talk at TTC
- > What is the source of stains and discolorations after RF operation at ceramics and at copper?
- > Do we need to prevent stains and discolorations and how?
- >

