

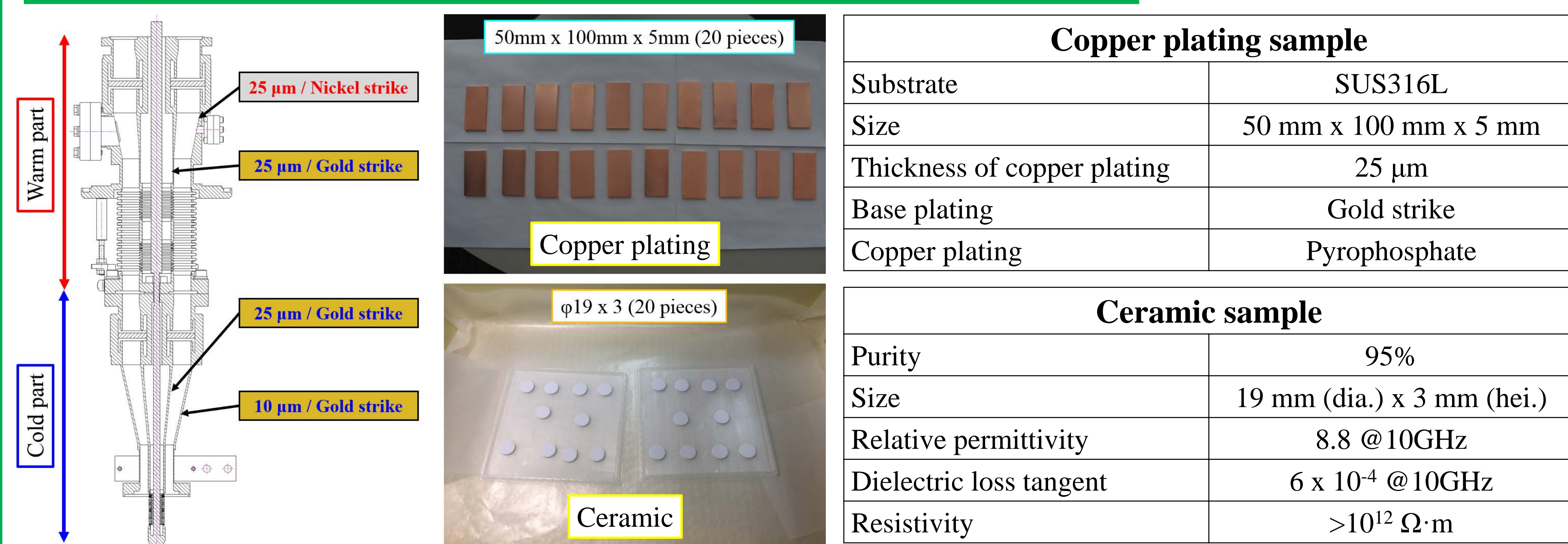
# Fundamental Studies for the STF-Type Power Coupler for ILC

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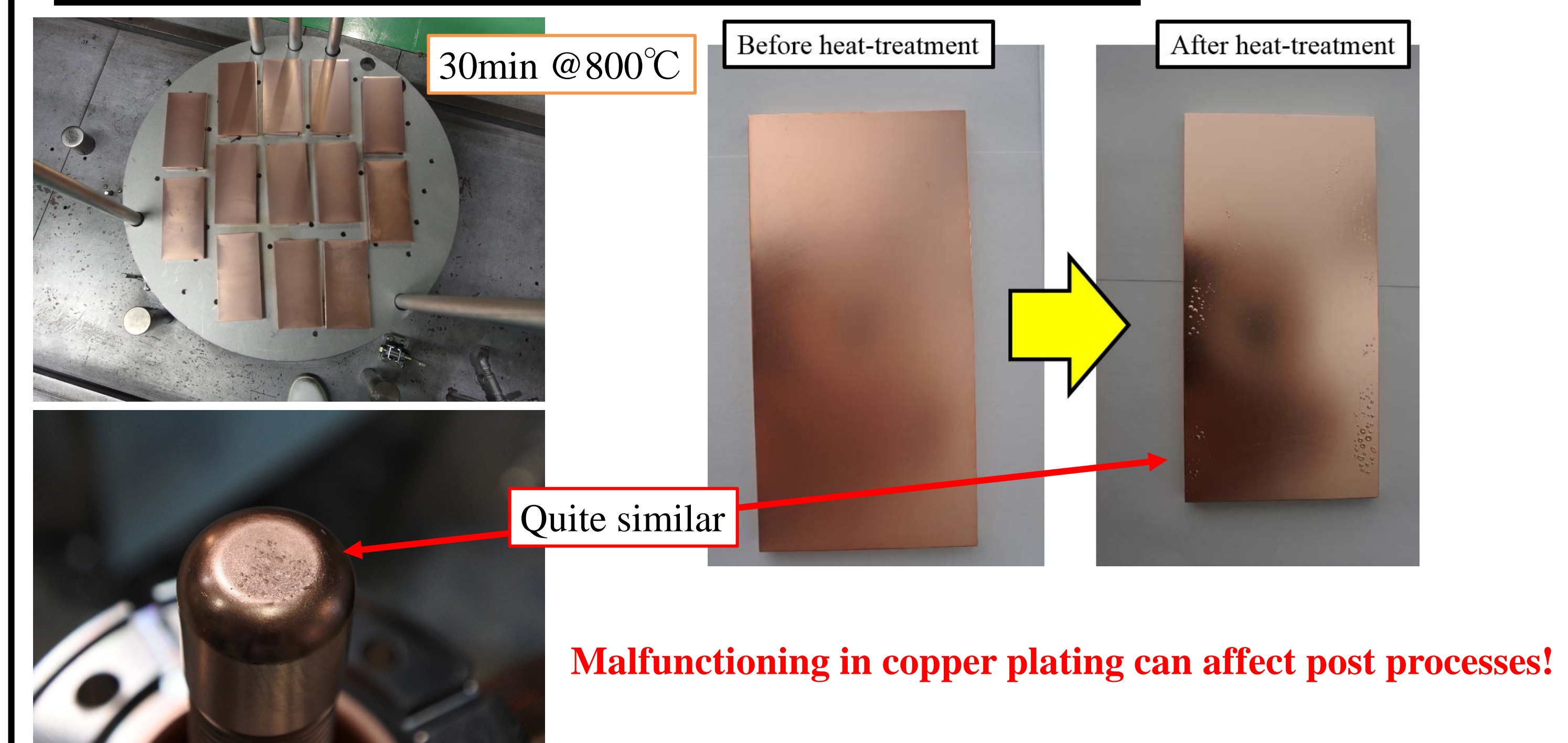
## Abstract

From the view point of mass-production for the power coupler in ILC (International Linear Collider), the fundamental studies for the STF-type power coupler are under progress by the collaboration between KEK and TETD. At present, there are various rinsing procedures for power coupler in the world-wide laboratories. In this R&D, the main topic is to investigate the various rinsing effects in the copper plating and the ceramic through the high power test. In this paper, the first results will be presented.

## Introduction & Fabrication of Test Pieces



## Blister after Heat Treatment

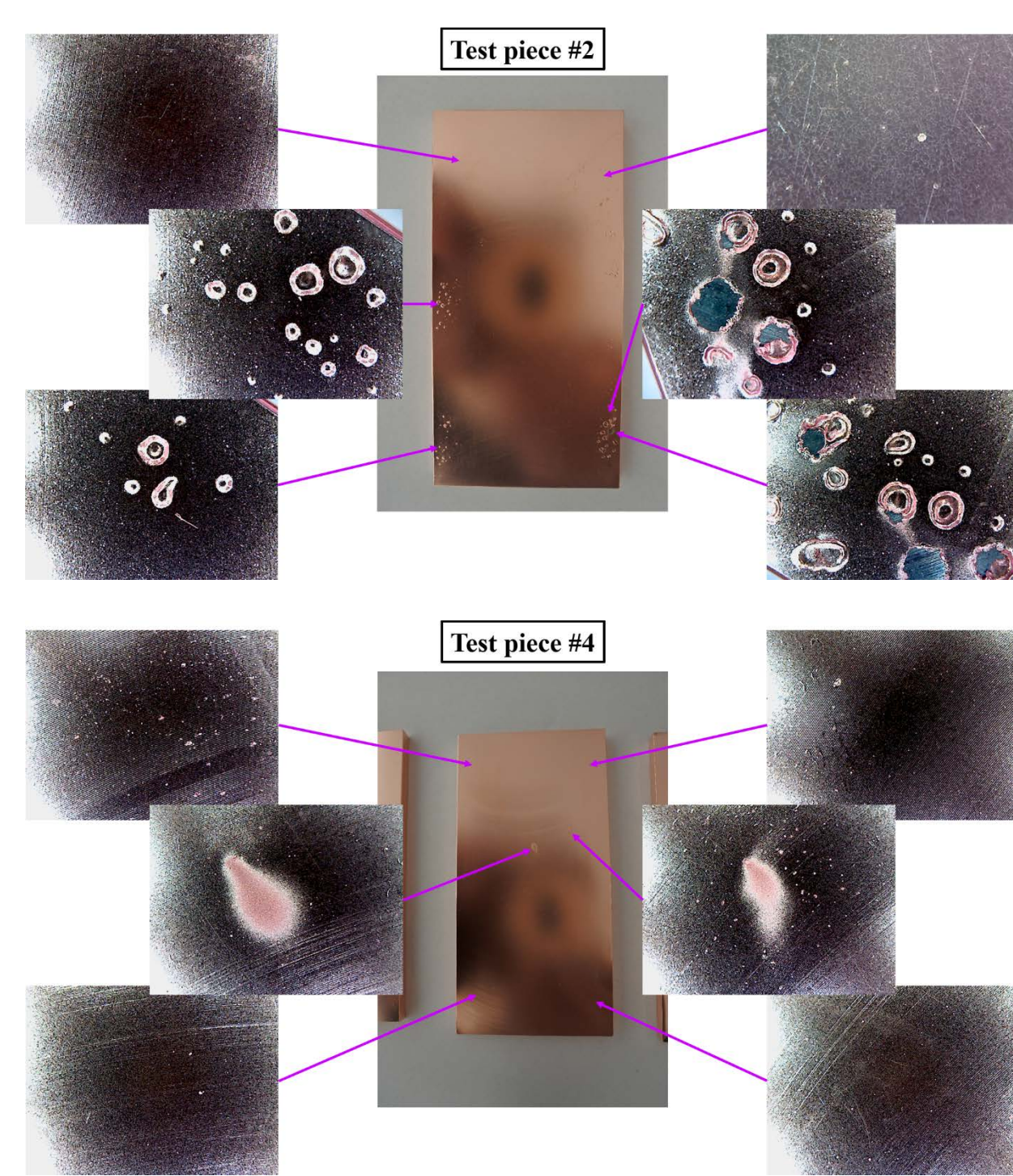


## Study for Copper Plating

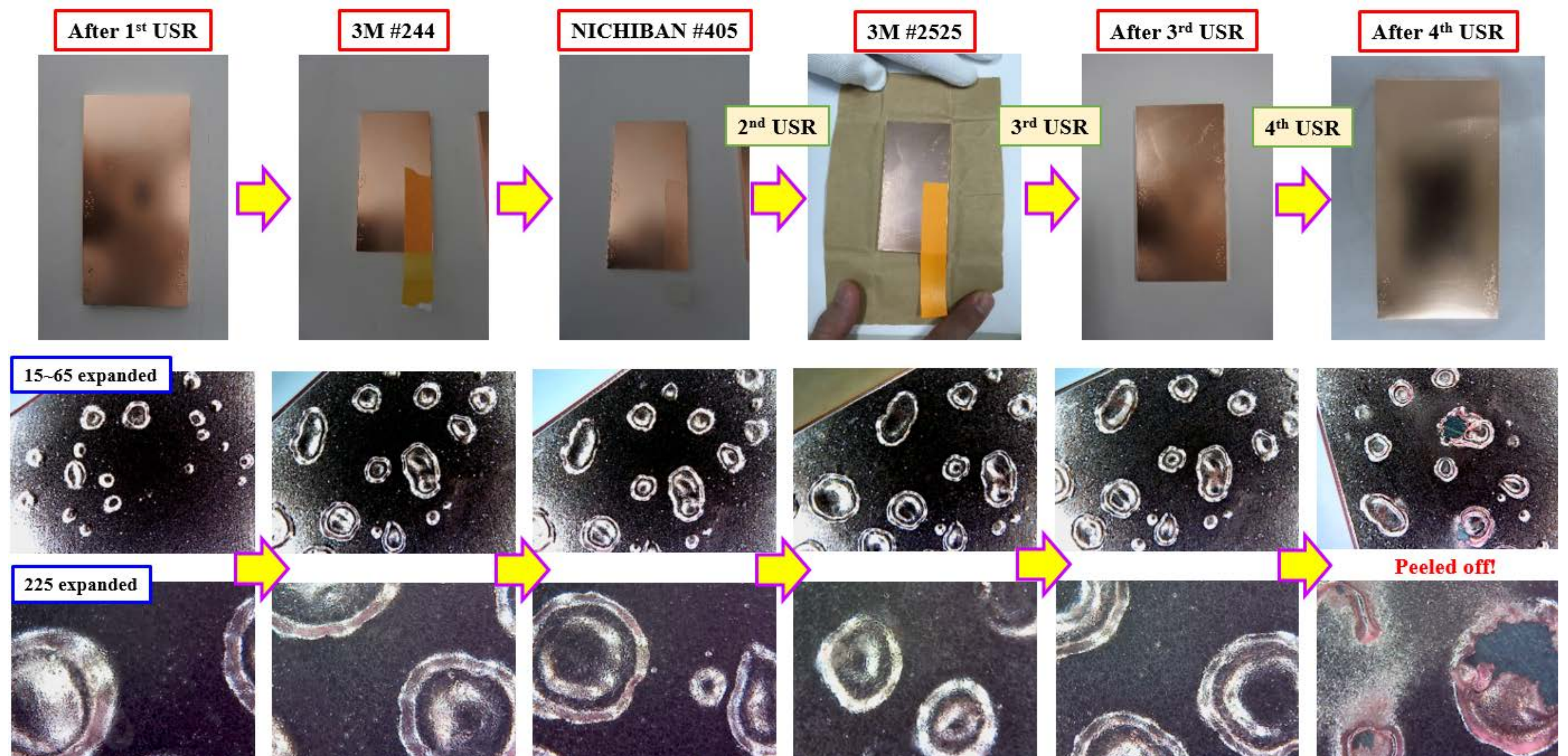
# of USR	Power level	Rinsing time	WRS
1 <sup>st</sup> rinsing	120 W	30 min.	w/o
2 <sup>nd</sup> rinsing	360 W	30 min.	w/o
3 <sup>rd</sup> rinsing	1200 W	30 min.	w/o
4 <sup>th</sup> rinsing	1200 W	30 min.	w/



Content	Tape width	Adhesion strength
JIS		8 N / 25 mm
3M #244	18 mm	2.7 N / 25 mm
CELLOTAPE No. 405	15 mm	9.8 N / 25 mm
3M #2525	18 mm	18.8 N / 25 mm



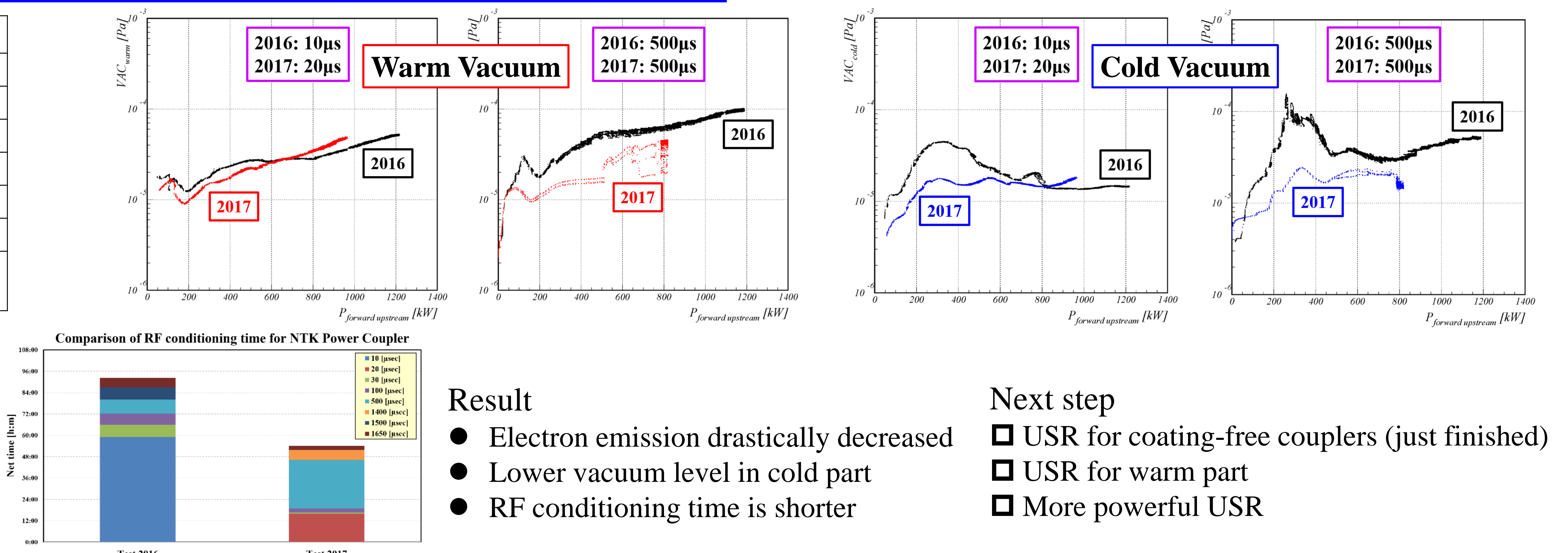
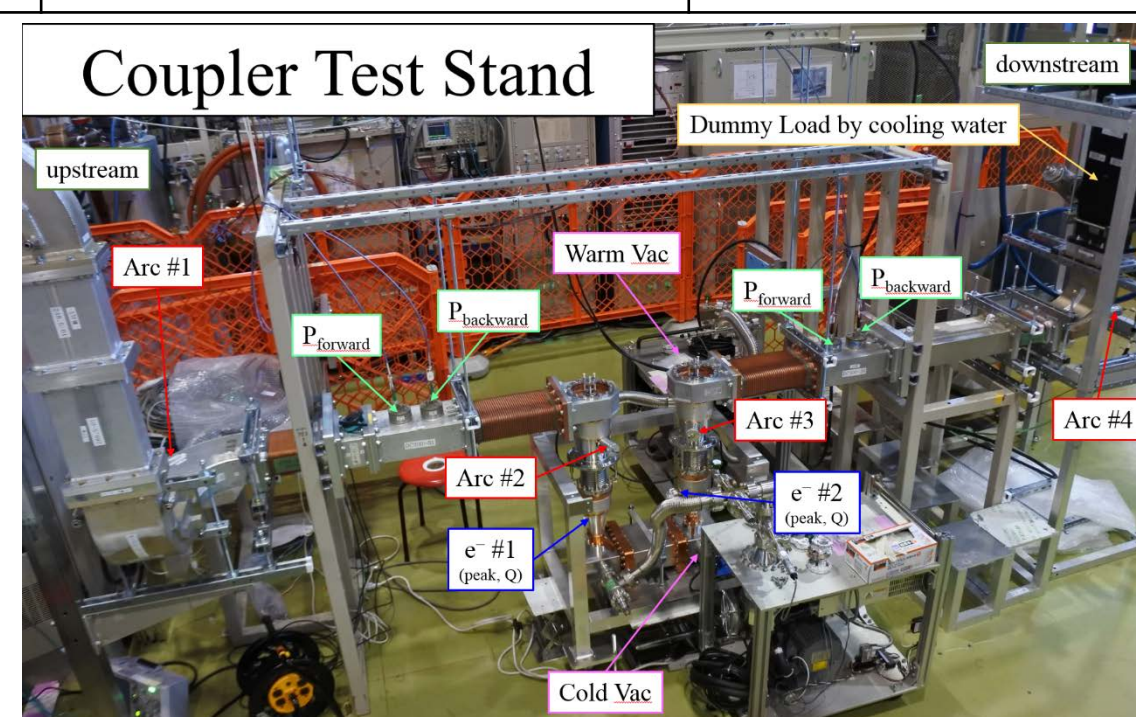
Ozonized water rinsing	
Concentration	7~8 ppm
Rinsing time	20~30 sec
Flow rate	2 l/min



Test piece #	As delivered	After 800°C heat-treatment	After 1 <sup>st</sup> USR (120W, 30min, w/o WRS)	After 2 <sup>nd</sup> USR (360W, 30min, w/o WRS)	After 3 <sup>rd</sup> USR (1.2kW, 30min, w/o WRS)	After 4 <sup>th</sup> USR (1.2kW, 30min, w/ WRS)
1	Storage					
2		Blister	No change	No change	No change	Partly peeled, white-colored
3			No change	No change	No change	No change
4		Blister	No change	No change	No change	Partly white-colored
5	Storage					
6			No change			
7	Good gloss	No change	No change			
8	Good gloss	No change	No change			
9	Good gloss	No change	No change	No change	No change	No change
Test piece #	As delivered	After 800°C heat-treatment	After O <sub>3</sub> rinsing (30sec)			
10		No change	No change			
11		No change	No change			
12		No change	No change			

## Ultrasonic Rinsing & High Power Test at Bench for Power Coupler

	STF/TETD	E-XFEL	ESS @CEA
Power [W]	120 ~ 1200	2000	3000
Power per liter [W/ℓ]	0.26 ~ 2.56	10 (at max.)	8.0
Frequency [kHz]	38	35	25
Water temperature [°C]	~25	50	50
Detergent		Tickopur R33 (2.5 %)	Tickopur R33 (2.75%)
Time duration [min]	30	15	10
Bath size [ℓ]	468 (995mm x 765mm x 615mm)	?	375 (0.5m x 0.5m x 1.5m)



### Result

- Electron emission drastically decreased
- Lower vacuum level in cold part
- RF conditioning time is shorter

### Next step

- USR for coating-free couplers (just finished)
- USR for warm part
- More powerful USR

## Conclusion

The ultrasonic rinsing did not damage for the copper plating samples, however, if the quality of the copper plating is “No good”, peeling the copper plating off might occur in the higher power level. Consequently, the “No good” copper plating can affect the post processes, that is, the heat treatment, the ultrasonic rinsing, and so on. As for the ultrasonic rinsing for the power coupler, there might be the trend that the vacuum level becomes lower.