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ARIES WP 15.2 progress

ARIES 2nd Annual Meeting, 8-12 April Budapest

Polishing of QPR samples: introduction

2 Polishing methods:

1. **SUBU5** (Chemical Polishing)
2. **EP** (ElectroPolishing)

Polishing of QPR samples

2 Polishing methods:

1. **SUBU5 (Chemical Polishing)** → first 2 samples: B1 and B2
2. **EP (ElectroPolishing)**

QPR samples



Turning machining



Milling machining

Ra ~1.6 μm , Rz ~ 12 μm
(Data from Dmitri)



Milling machining

QPR samples

No surface characterization is possible at LNL due to dimensions
Waiting for “Surface Replica” from HZB



Turning machining



Milling machining

Ra ~1.6 μm , Rz ~ 12 μm
(Data from Dmitri)



Milling machining

Test sample polishing: SUBU

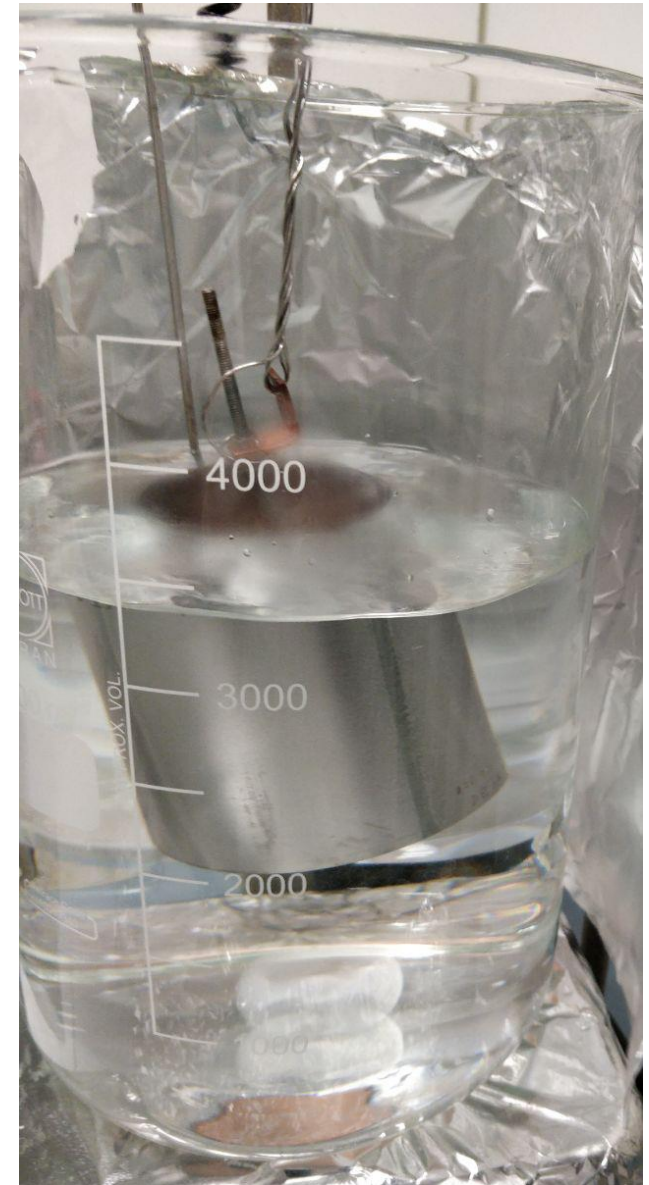
- **SUBU5 protocol → 5 minutes**

- *Sulfamic acid* – 5 g/l
- $(\text{NH}_4)_3\text{Cit}$ – 1 g/l
- H_2O_2 – 50 ml/l
- *Butanol* – 50 ml/l
- 73 °C

- **Passivation → 5 minutes**

- *Sulfamic acid* – 20 g/l

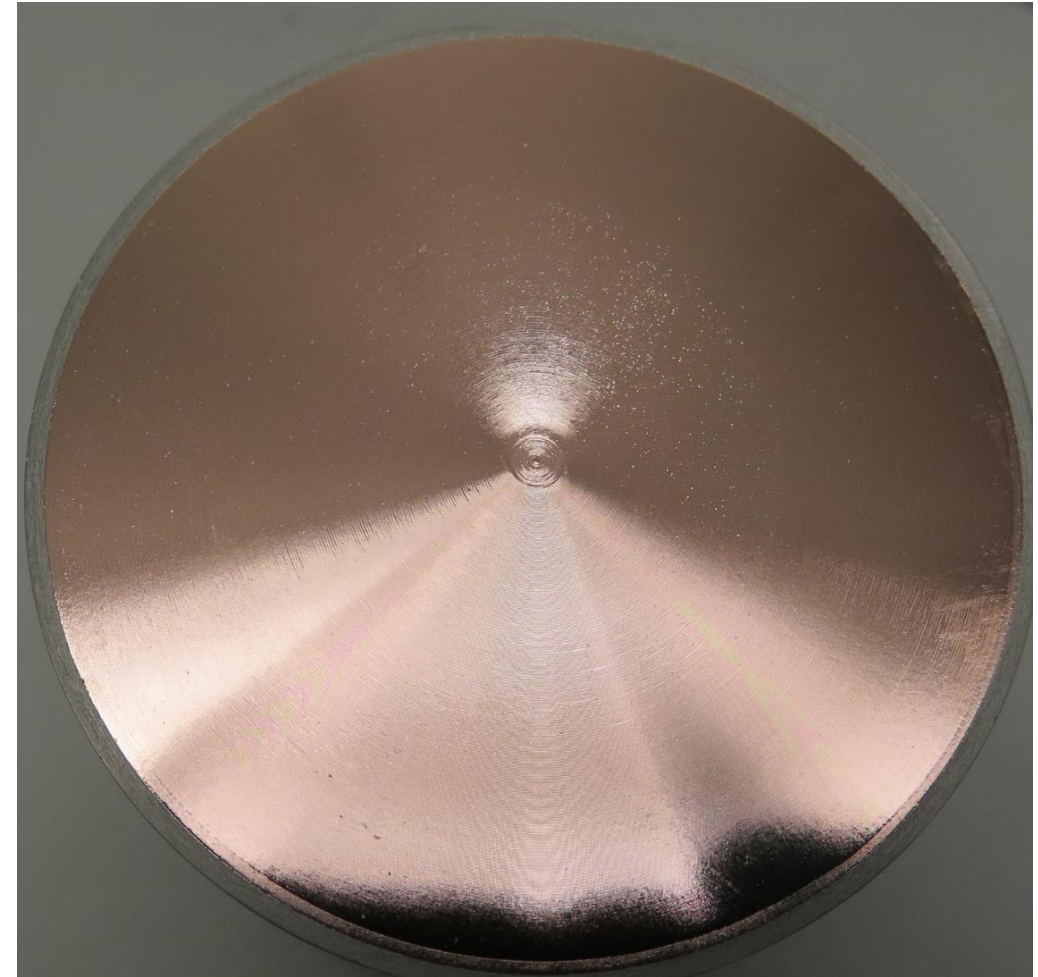
~3 um removed



Test sample polishing: issues after SUBU

- **Small pitting**

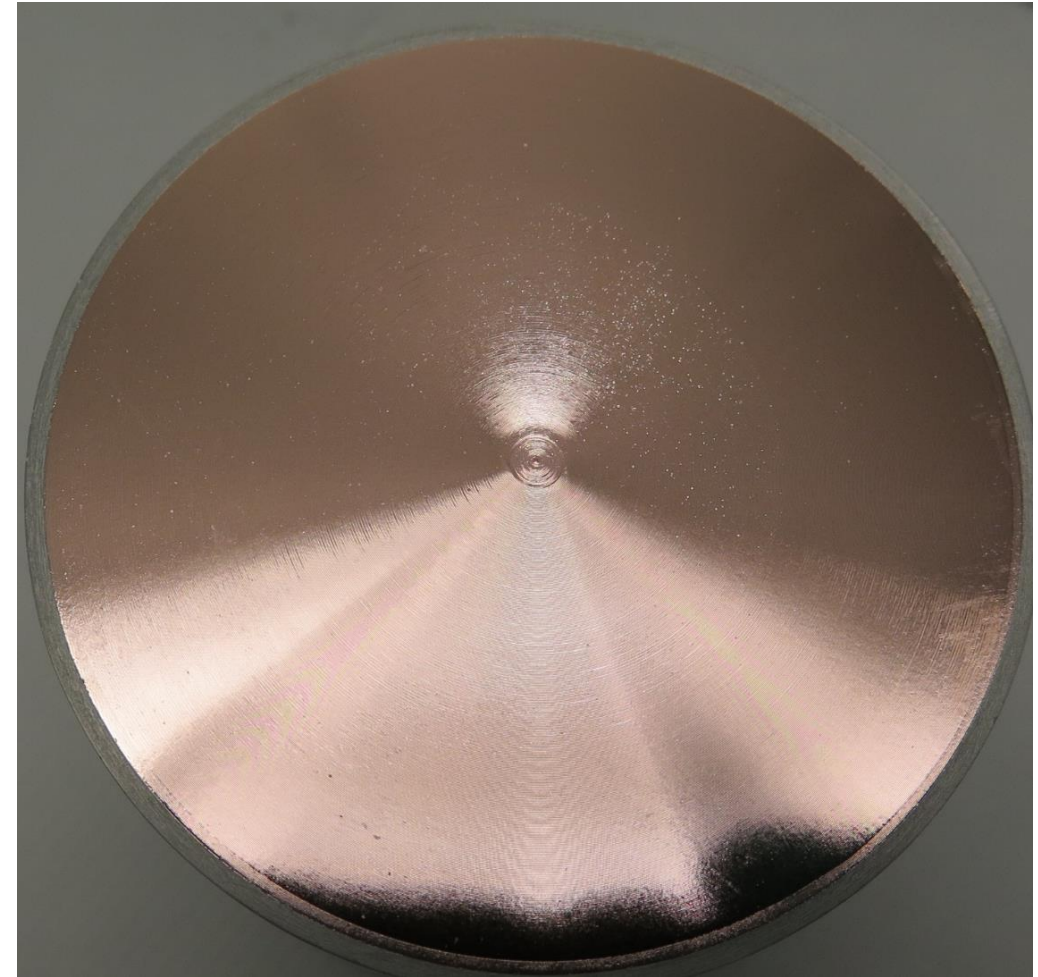
(due to vertical pos. & not proper agitation)



Test sample polishing: issues after SUBU

- **Small pitting** → **solved**

(due to vertical pos. & not proper agitation)



Test sample polishing: issues after SUBU

- **Small pitting** → **solved**

(due to vertical pos. & not proper agitation)

- **Machining texture**

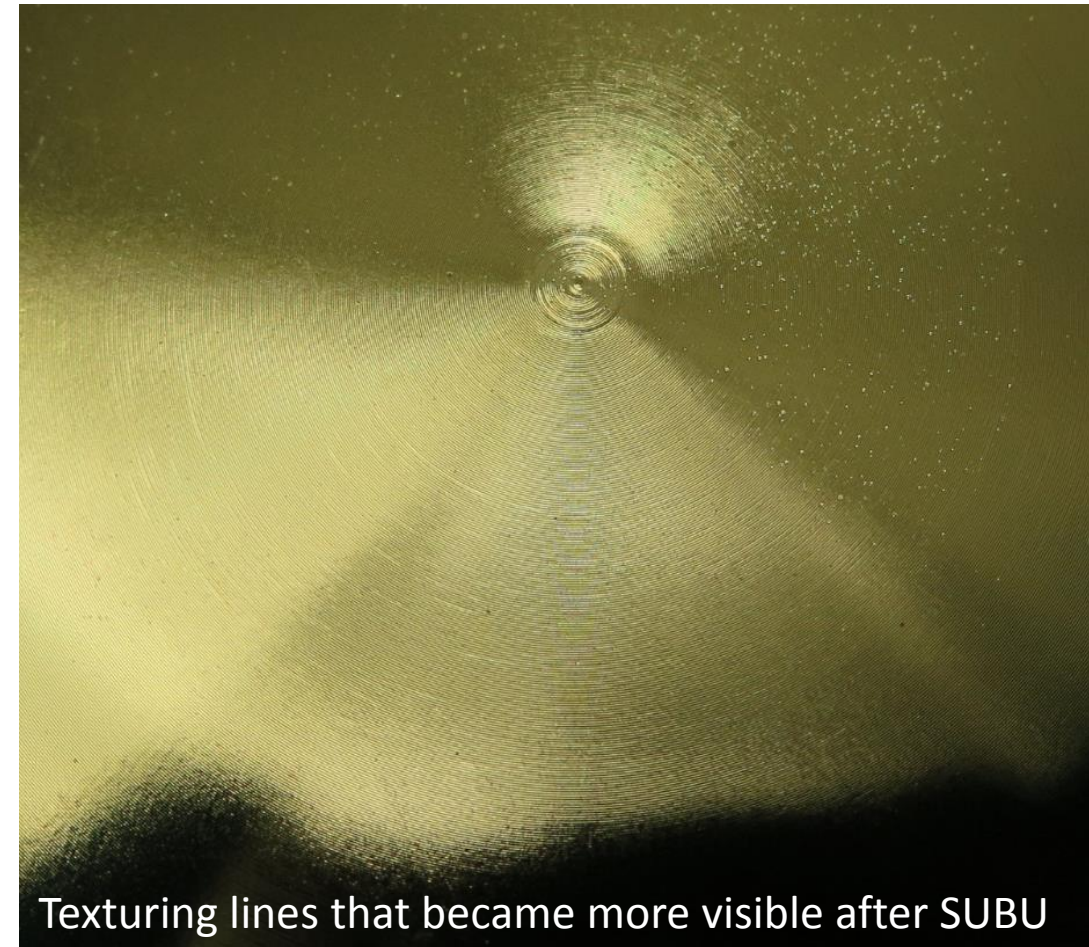


Test sample polishing: issues after SUBU

- **Small pitting** → **solved**

(due to vertical pos. & not proper agitation)

- **Machining texture** → **removed**



Test sample polishing: issues after SUBU

- **Small pitting** → **solved**

(due to vertical pos. & not proper agitation)

- **Machining texture** → **removed**

- **Tip in the center**



Test sample polishing: issues after SUBU

- **Small pitting** → **solved**

(due to vertical pos. & not proper agitation)

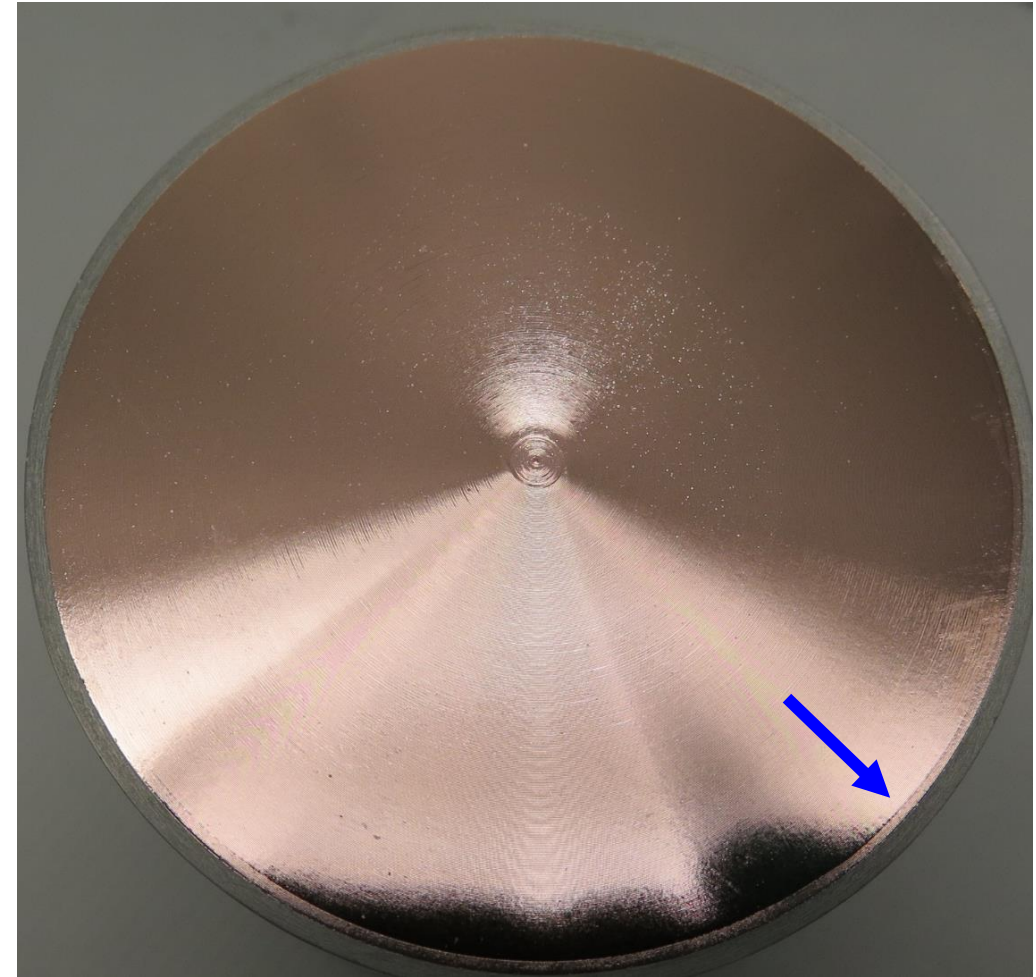
- **Machining texture** → **removed**

- **Tip in the center** → **reduced**

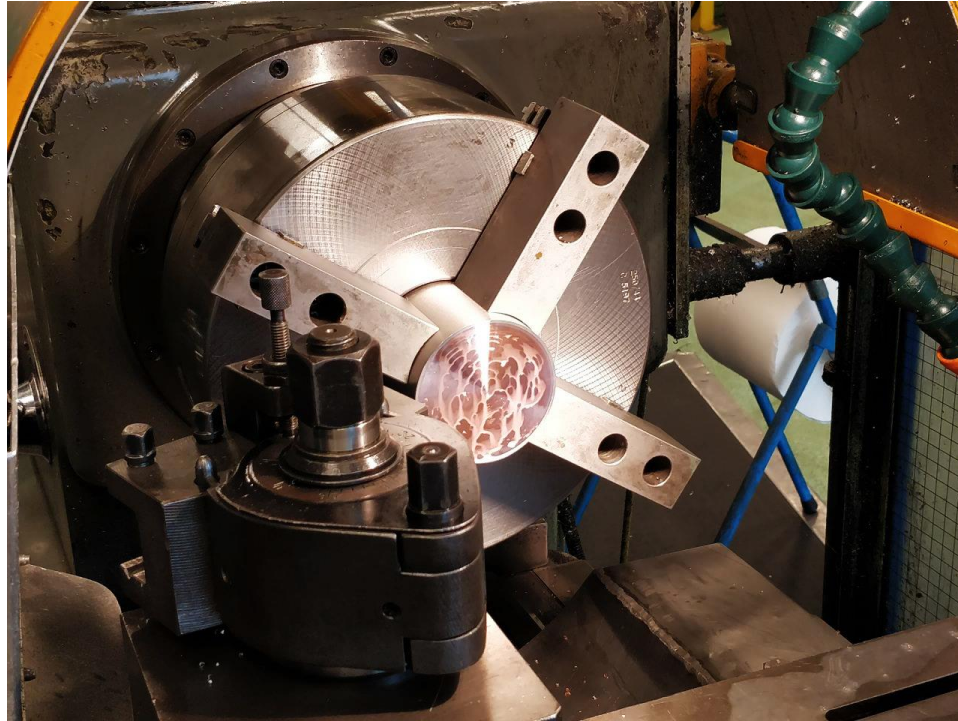


Test sample polishing: issues after SUBU

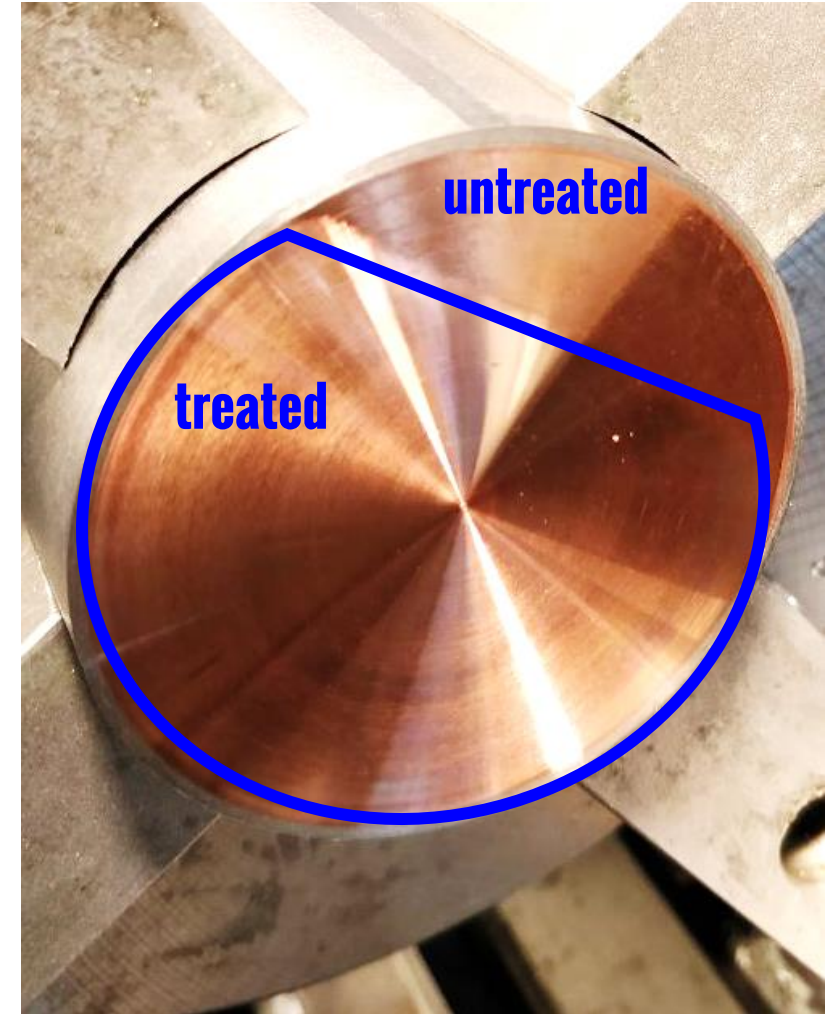
- Small pitting → solved
(due to vertical pos. & not proper agitation)
- Machining texture → removed
- Tip in the center → reduced
- Welding (brazing) line between Nb and Cu
→ strange behaviour



Test sample polishing: turning machining at LNL

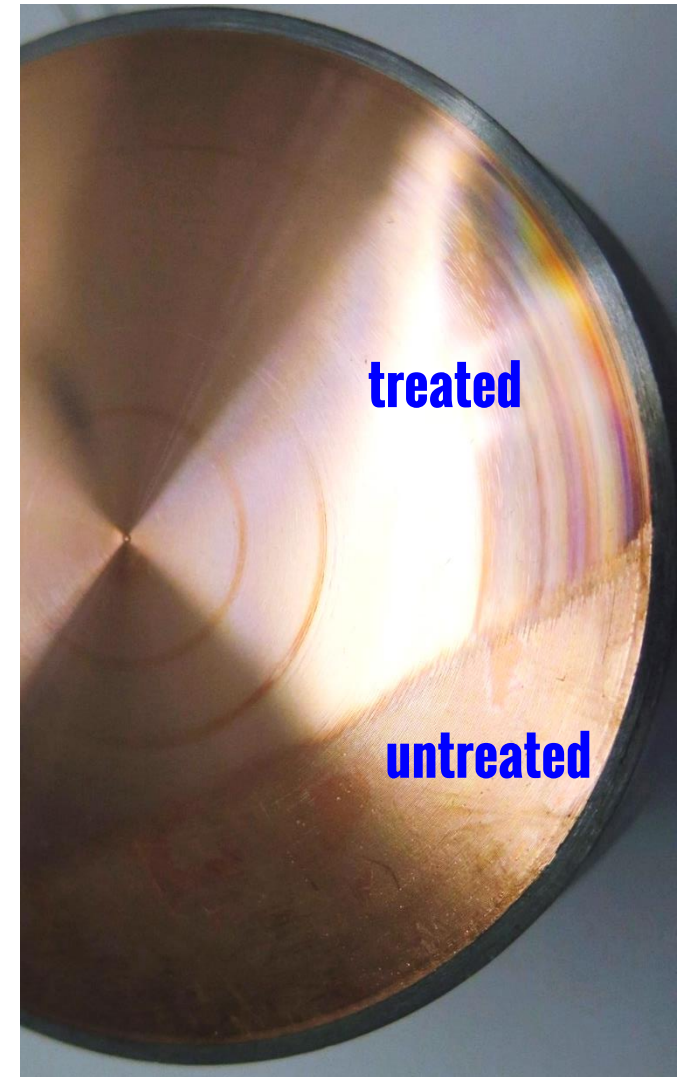


- Sample is not perfectly planar (comparator analysis)



Test sample polishing: turning machining at LNL

- 40 microns removed
- To fully remove inhomogeneity, we have to remove ~ 60 - 80 microns in total
- 2 surface finishing to test the SUBU5 capability to remove mechanical texture



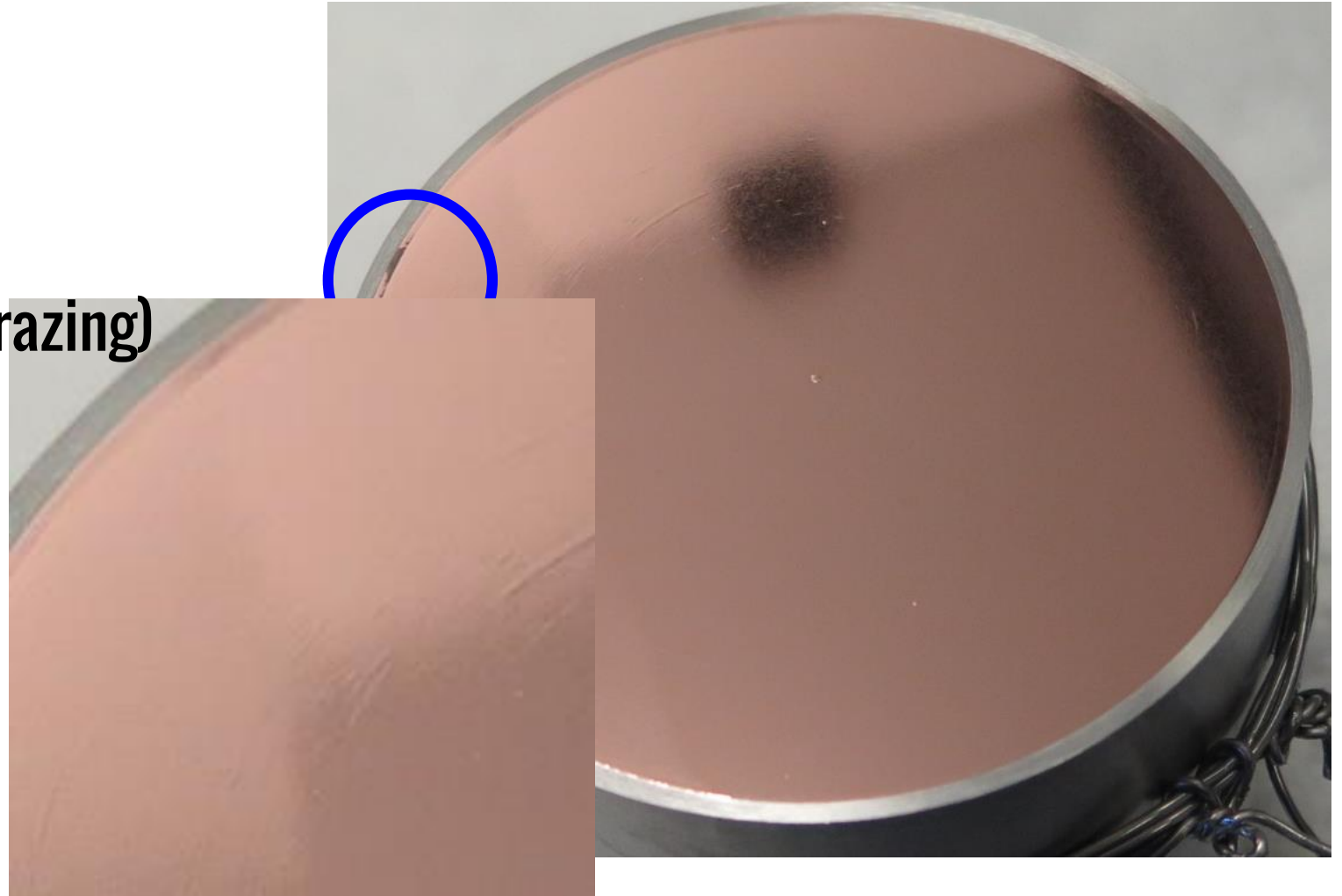
Test sample polishing: second SUBU5 (5 min)

- ~3 μm removed
- Black stains on welding (brazing)
- Surface improvement

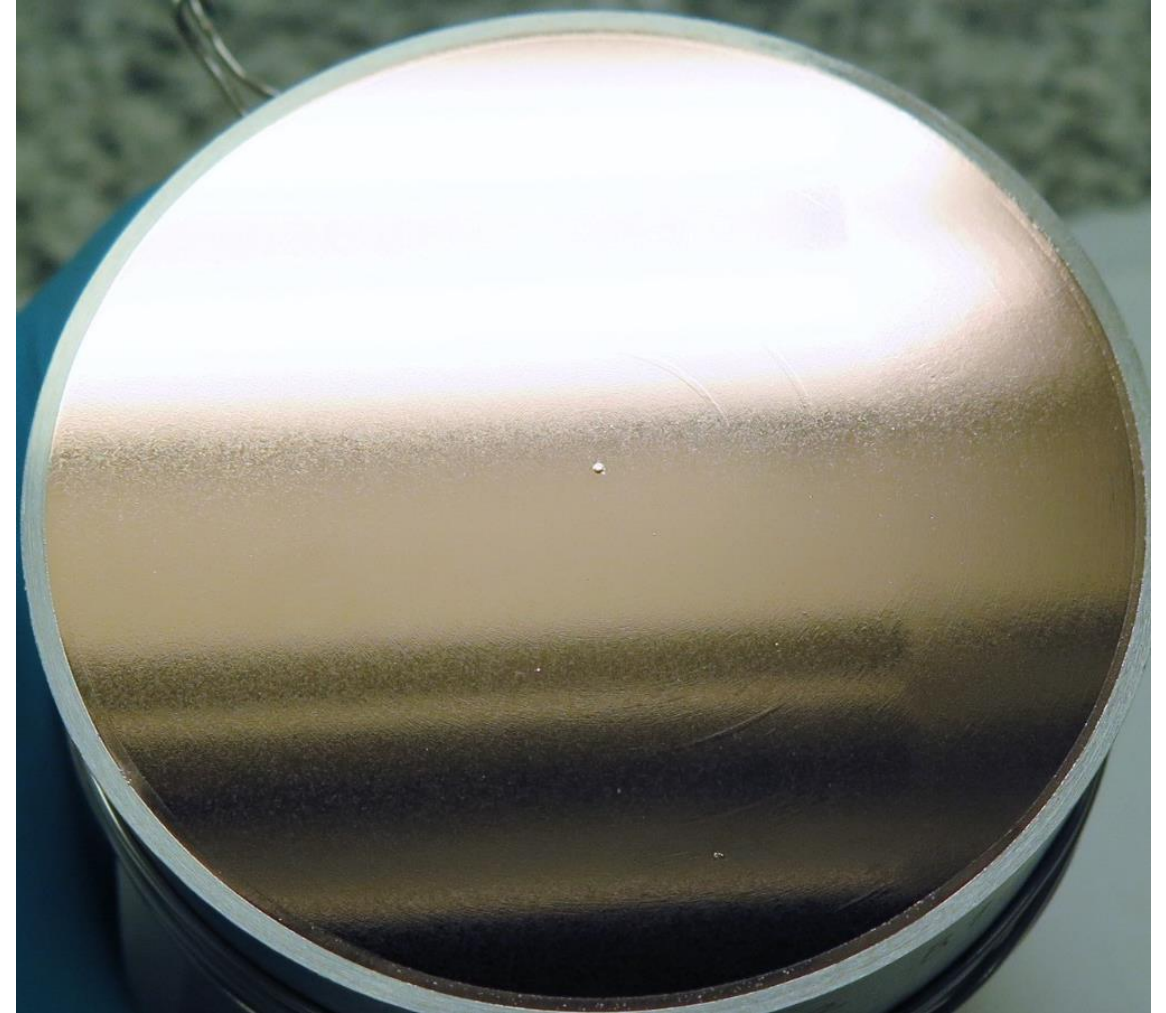


Test sample polishing: second SUBU5 (5 min)

- ~3 um removed
- Black stains on welding (brazing)
- Surface improvement
- Texture remain visible



Test sample polishing: third SUBU5 (5 min more)



- ~3 um removed
- Surface is very shining and reflective
- Texturing disappeared (except deep lines)

Test sample polishing history

Initial surface

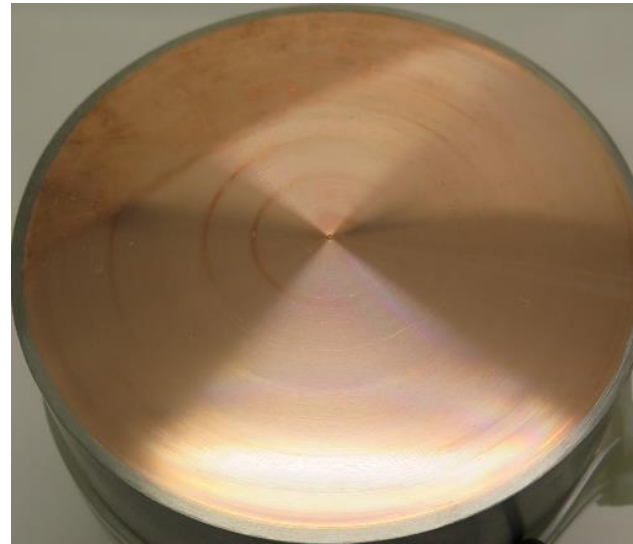


SUBU 5 min



~3 um removed

Turning machining



~40 um removed

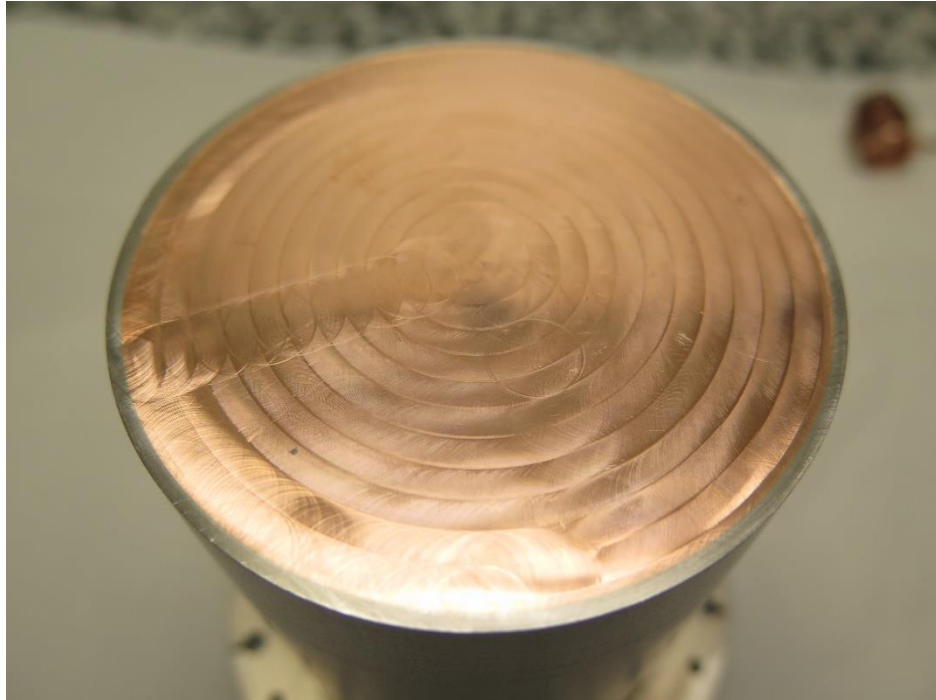
SUBU 5+5 min



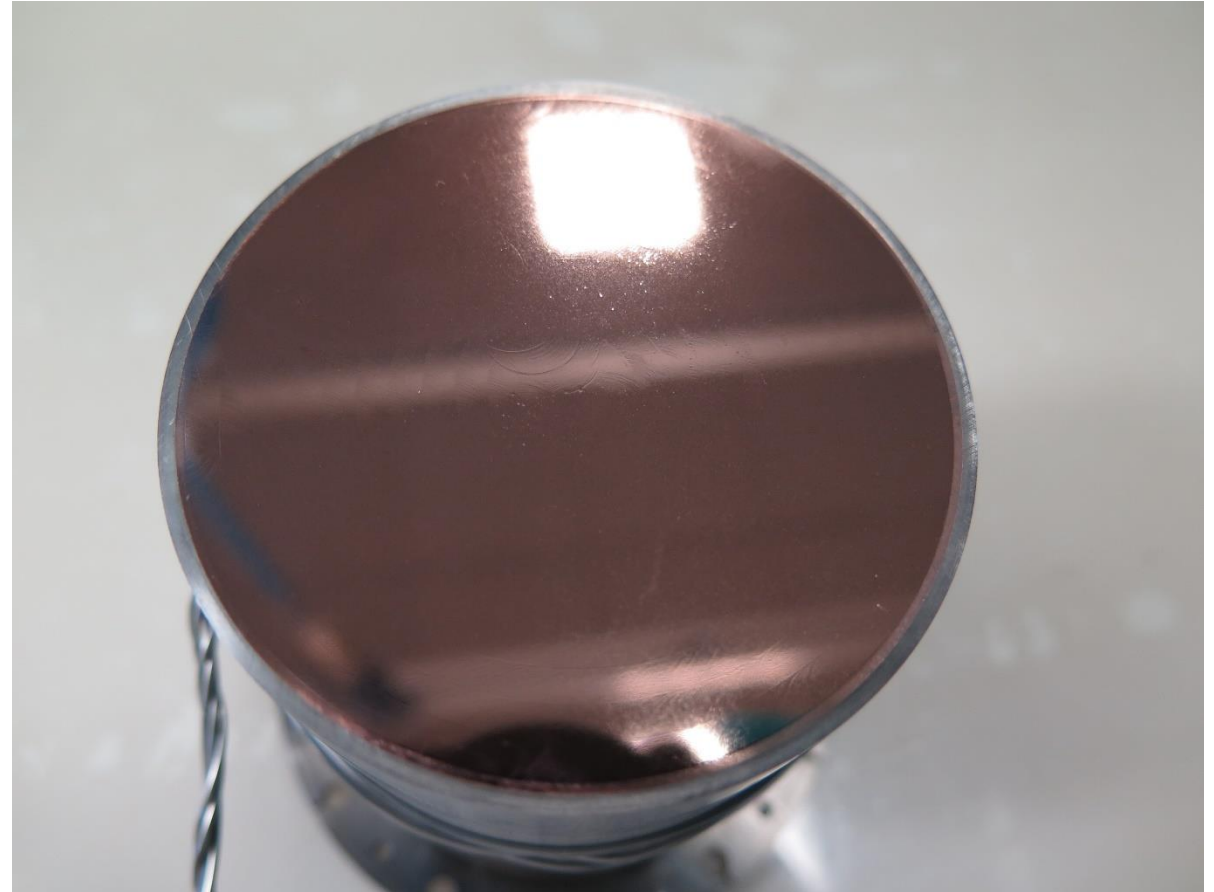
~5 um removed

B1 sample polishing

Initial surface

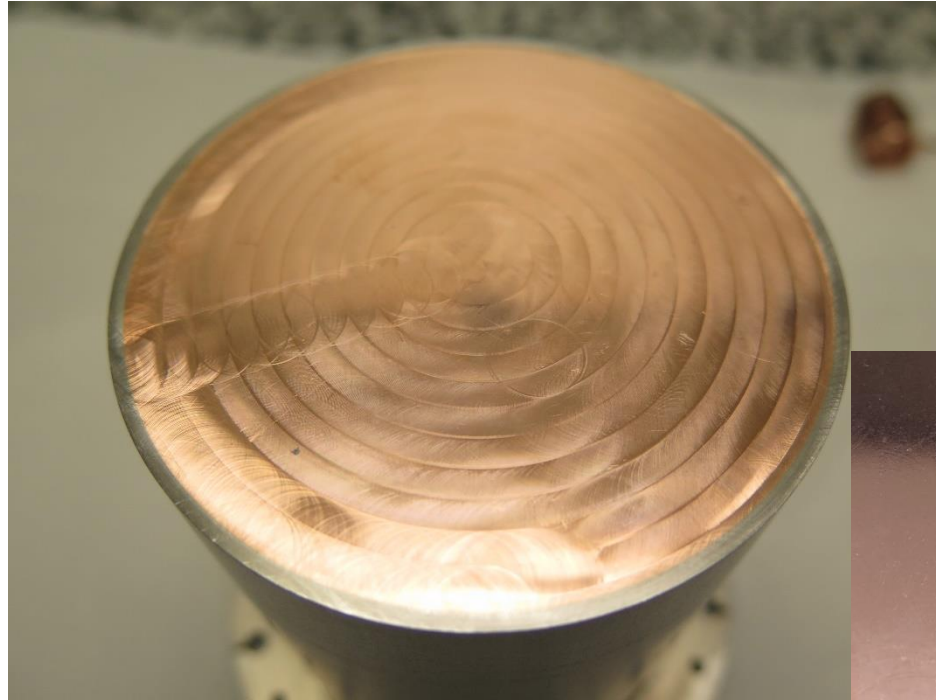


SUBU 5 min ~3 um removed

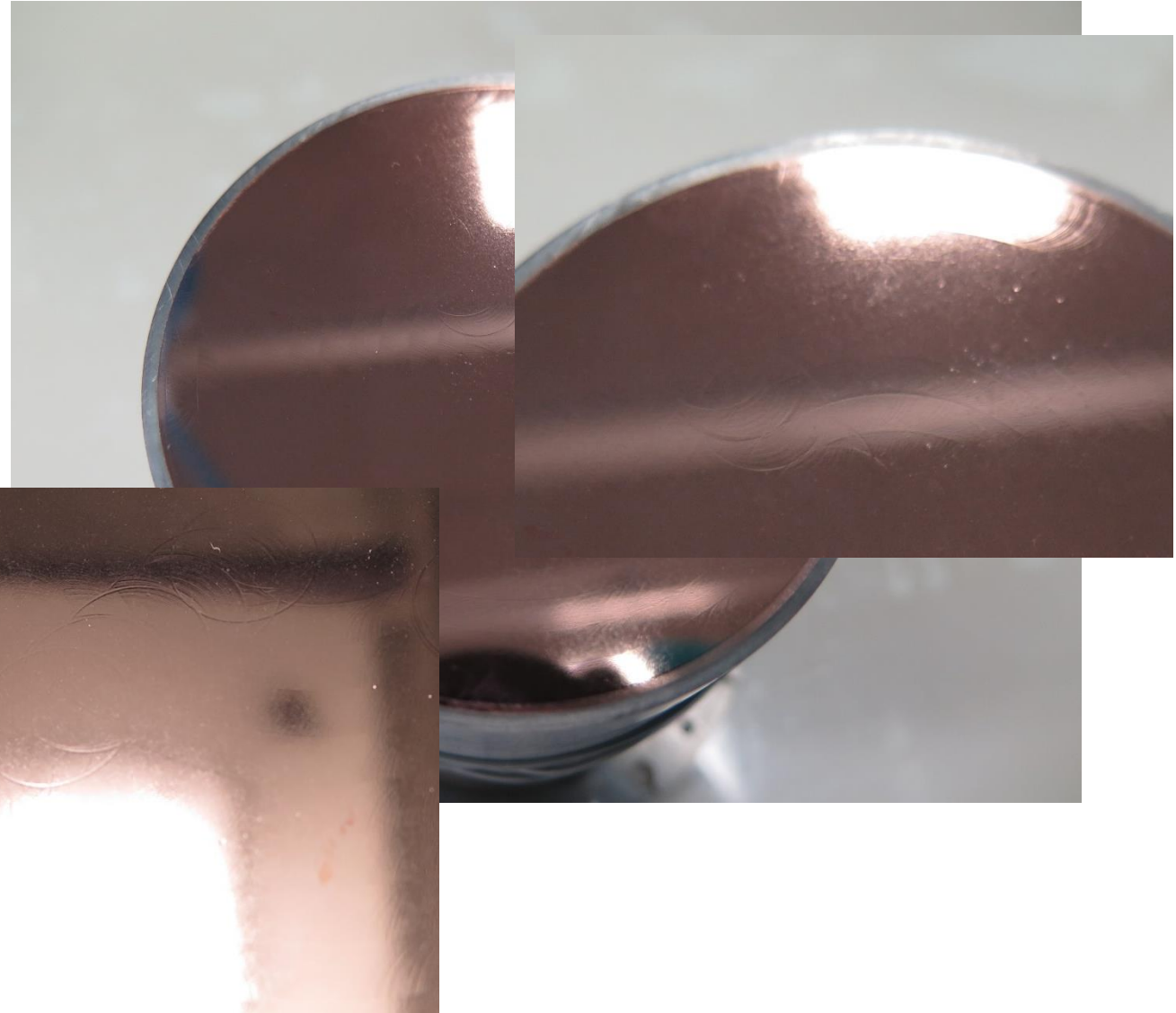


B1 sample polishing

Initial surface



SUBU 5 min ~3 um removed



B1 sample polishing schedule

- UniSiegen ready for the deposition
- Waiting for packaging box from HZB in order to do not aged the polished surface

B1 sample polishing schedule

- UniSiegen ready for the deposition
- Waiting for packaging box from HZB in order to do not aged the polished surface

2 possible polishing protocol:

1. Mechanical turning + 10 μm of SUBU → **proved protocol**
2. Only SUBU (40-50 μm ?) → **highly risk of pitting**