Cu Cavity Production

Seamless Cavity seams to be a must. 3 Techniques available:

- Hydroforming (TRL 6)
- Spinning (TRL 7)
- Additive Manufacturing (TRL 4-5)
- Electroforming (TRL 6)
- *Bulk Cavities (TRL 6)*

Cu Surface Preparation

Well Established Procedures + New promising techniques

- Chemical Polishing - SUBU5 (TRL 9)
- Electro Polishing - EP (TRL 9)
- Plasma Electrolytic Polishing - PEP (TRL 5)
- Metallographic Polishing (TRL 5)

CERN contribution

Surface Preparation:

STOP Using SUBU is the objective

Baseline:

- Electropolishing
- Validated on 1.3GHz
- **PASSIVATION IS KEY FOR ADHESION**

Objective (5 months)

- EP on 400MHz cavities with HOM ports !!!!!

QUESTION: how far should we push the efforts to reduce surface roughness? Is EP sufficient? do we need to move to PEP?

CERN contribution

- **Manufacturing:**

- Current baseline: Spinning half-cells + ½ cells welding
- Recent development: Internal ebeam welding: Very smooth welds: 1x 400MHz cavity produced (August 24).
- Electroforming: 2 cavities produced, RF tests look very promising even without chemistry. Lack of manpower for pursuing further right now. 100% weld-free.
- Bulk machined cavities: Ideal test-bed for reference. 4x 1.3GHz at CERN, 4 also at Jlab, 2x 400MHz at CERN. Some 1.3GHz to be provided to iFAST.
- Cu welding: not a problem for the film: A problem because of high probability of porosities which, i f revealed by chemistry, can entirely spoil a 200kCHF worth object. Getting rid of welds is a very interesting route.

QUESTION: How low can we accept the RRR of the substrate to go? This could open the route to non studied alloys.

CERN contribution

- **Collaborations:**
  - KEK for hydroforming: very high scalability potential, orange peel effect to adress
  - PEP looks very attractive: trials in 2024 with INFN/KEK