

Towards the technical specification for cavities, helium tank and magnetic shielding

CERN status

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Introduction

- Beta=1 cavities to be provided
 - Nb cavity :
 - 4 Nb cavities (*Industry under CERN contract*) + 4 Ti helium tanks (*to be provided by CEA*) => final assembly to be provided by end of 2011
 - Assembled string of 4 cavities (with helium tanks) by mid 2012
 - 4 additional cavities (*part Industry, part CERN*) + 3 Ti (*part CEA, part CERN*) + 1 SS (*CERN*) helium tanks by end 2013
 - Assembled string of 8 cavities (with helium tanks) by mid 2014

Introduction

- Beta=1 cavities to be provided
 - Copper cavities:
 - 1 Copper cavity for HOM testing to be provided by beginning of 2011
 - No EP for copper cavity
 - Same dimensions as Nb cavity at warm (\Rightarrow final copper dimensions at warm \neq from Nb cavity since no EP)
 - *Spinning in external company*
 - *Welding/assembly at CERN*



Process

- Cavities manufacturing process
 - Materials for cavity
 - Nb furniture ongoing by Plansee – expected delivery by beginning of 2011
 - Nb ordered for 4 cavities + 25% spare
 - NbTi to be provided by the manufacturer
 - Detailed process for manufacturing presented previously (see details)

CERN status - Nb cavity - Manufacturing

- Manufacturing Nb cavity

| Task | External Company | CERN |
|---|------------------|------------------|
| Spinnig of half-cells | X | |
| Machining for iris and stiffening rings welding preparation | X | |
| 3D control | X | |
| Degreasing | X | |
| RF measurement of half-cell frequency | X | Provides equipmt |
| Ultrasonic cleaning; Etching (20 μm on each side) inner and outer surface, rinsed in de-ionized filtered hot water of 0.2 μm max, dried in laminar airflow in clean room 1000 or better | X | |
| 3 μm chemical cleaning if storage time > 8h after previous step | X | |
| EB welding of the iris from inside (within 8h from previous) | X | |
| EB welding of stiffening rings | X | |



CERN status - Nb cavity - Manufacturing

- Manufacturing Nb cavity

| Task | External Company | CERN |
|---|------------------|-------|
| Inspection and dimensions control of “dumb-bell” | X | |
| Frequency measurement of dumb-bell | X | Equip |
| Machining of both equator ends determined by evaluation of frequency | X | |
| Ultrasonic cleaning; Etching (20 μm on each side) inner and outer surface, rinsed in de-ionized filtered hot water of 0.2 μm max, dried in laminar airflow in clean room 1000 or better | X | |
| Anodization of dumb-bell and inspection | X | |
| Grinding if needed + 20 μm etching, rinsed, dried, anodized again | X | |
| 3 μm chemical cleaning | X | |
| EB welding from outside of all equators (intermediate 3 μm etching) | X | |

Process

- Proposed general process:
 - 1st Stage
 - Manufacturing of cavity as presented before *(by Industry, some equipment to be provided by CERN)*
 - EP “hard” (*thickness ? – 110 or 140 μm depending on following procedure*) – *(to be done at CERN? TBC)*
 - Field flatness measurement + Tuning *(by Industry, some equipment to be provided by CERN)*
 - Ep 40 μm or BCP 10 μm – *(to be done at CERN? TBC)*
 - HPWR
 - 2nd Stage
 - Test in cold cryostat *(at CERN)*

Process

- Proposed general process:
 - 3rd Stage
 - 800 C annealing of the cavity with flanges
 - Ep 40 μm or BCP 10 μm – *(to be done at CERN? TBC)*
 - Re-Tuning *(by Industry, some equipment to be provided by CERN)*
 - 4th Stage
 - Welding of the helium tank *(Tank to be provided by CEA, welding by the cavity manufacturer)*
 - Ep 40 μm or BCP 10 μm – *(to be done at CERN? TBC)*
 - HPWR, ...
 - RF final test in cryomodule



Process

- Special equipment:
 - For RF tests (parts and complete cavity) + tuning
 - For transport
 - For storage (under N2 at atmospheric pressure)
- Only RF measurements equipment are should be provided by CERN
- All the others should be provided by the manufacturer



Process

- Open questions:
 - Some DESY cavities are baked at 120 C (not all of them). Do we need it?
 - DESY assemble the flanges after EP and 800 C annealing. Why?