

# PIP-II TECHNICAL WORKSHOP

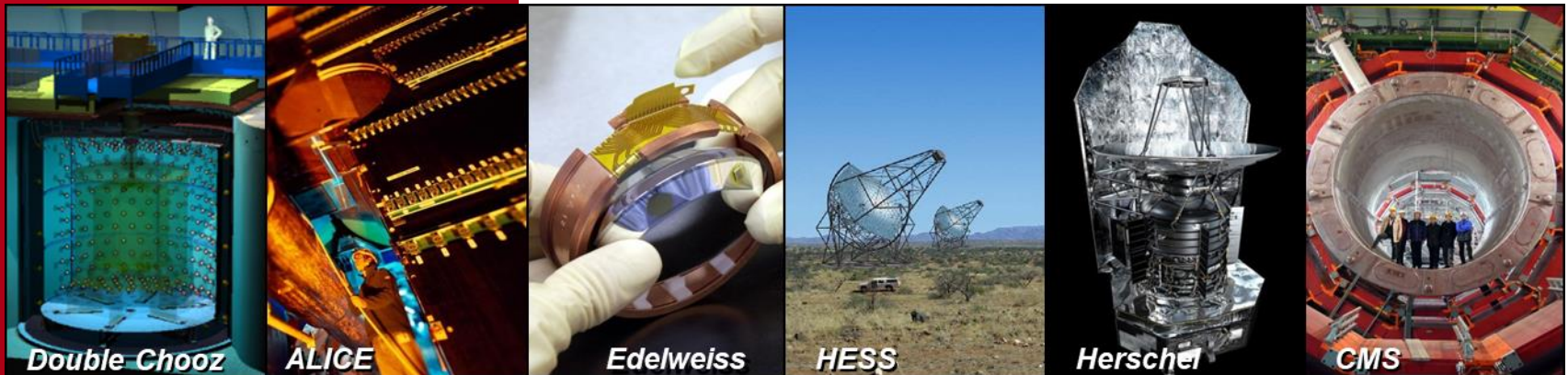
DE LA RECHERCHE À L'INDUSTRIE



## CAVITY MANUFACTURING WG

01-04 DEC20

### Topic 5- Quality Control of Cavity Production



[www.cea.fr](http://www.cea.fr)

*Déchiffrer les rayons de l'Univers*

Vincent HENNION

## Introduction

- Lessons learned gained from EXFEL and ESS Accelerator Facilities
- Production of high number of cryomodules for elliptical cavities
- Framework of quality control
  - ❖ *different partners and contributors*
  - ❖ *responsibilities sharing*
  - ❖ *Construction phase (prototype vs series production)*
  - ❖ *Expertise level*



## Objectives

- Verification that specified requirements are fulfilled
- Ensure traceability of all deviations
- Contribute to configuration management

## Consistency with system engineering

- Technical needs in different phases of the cavity lifecycle
  - ❖ *Performances/specifications*
  - ❖ *Procedures/Adjustments*
- Technical constraints
  - ❖ *Processes/optimizations/risks*
  - ❖ *Intellectual properties*

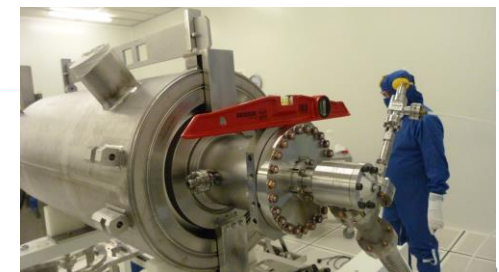
|     |     |   |  |
|-----|-----|---|--|
| cea | ess | High-β Elliptical cavities interfaces<br>ESS- | Ref : ChA-ESS/CM3-Int-039 n.1<br>ESS-32/102a |
|-----|-----|---|--|

TECHNICAL NOTE

Interfaces document  
High Beta cavities and cryomodules

|               | Names      | Role  | Institut | Date & visas |
|---------------|------------|---|----------|--------------|
| Edited by :   | HENNION V. | ESS-I System Engineering                      | cea      | 06-07-19     |
| Checked by :  | OPPIN F.   | ESS-I cavity package Resp. Officer            | cea      | 16-07-19     |
|               | BERRY B.   | ESS-I Cryomodule integration Resp. Officer    | cea      | 20-08-19     |
|               | MADEO G.   | ESS-I Cryomodule WP Leader                    | cea      | 03-09-19     |
|               | CLUSIE C.  | ESS-I QA Resp. Officer                        | cea      | 25-09-19     |
| Approved by : | DEVANZ G.  | ESS-I accelerator scientist                   | cea      | 29-08-19     |
|               | BOSLAND P. | ESS-I accelerator scientist AND ESS WP leader | cea      | 09-09-19     |
|               | CARVE C.   | ESS WP deputy leader                          | cea      |              |

Released by : Christophe MAYRI, Chef de projet ESS-  
Date et signature :



## Consistency with implemented organisation

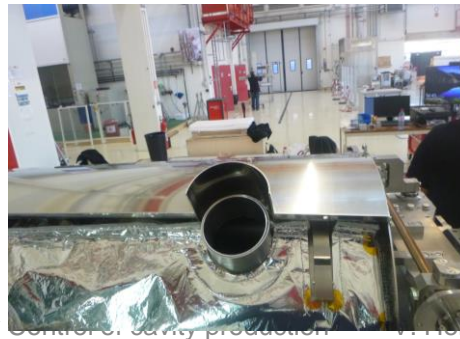
- Prototyping phase
  - ❖ *Technical challenges*
  - ❖ *Specification of the requirements for the series*
  - ❖ *Agreed way of working between partners*
  - ❖ *communication/information channels to be set up*
- planning constraints
  - ❖ *Critical path is not impacting all partners at the same time*
  - ❖ *The more partners and stakeholders there are, the more complex is the interfaces management*
  - ❖ *Higher is the number of interfaces, higher shall be the involvement and the effort by partners in Quality Control*

## Scope: elliptical cavity is a complex system

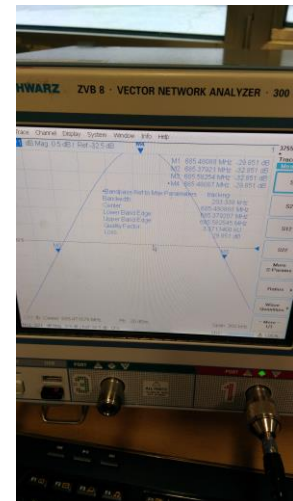
- Performances are high level requirements.
- Specs are defined from performances to reach.
- Optimization of the cavity cost is directly linked to the tolerances.
- Tolerances are directly linked to the manufacturing processes to be implemented.
- Processes to be implemented should be homogeneous (orderer shall discuss with the manufacturer as much as possible)



01-04/12/2020



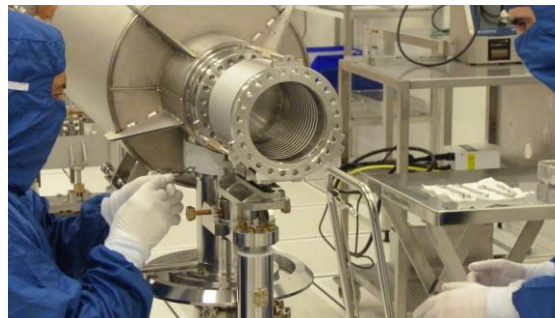
Topic 5: Quality Control, Safety production, Maintenance





## How to successfully transfer and fulfill specs?

- Find technical solutions for mechanical assemblies
  - ❖ *Relax some tolerances to extend acceptance capabilities*
  - ❖ *deviation impact analyses (dummy tools for tuner interfaces or cavity string interfaces with spaceframe)*
- References transfer
  - ❖ *Strong recommendation to specify references based on dimensions issued from milled parts (accuracy and reproducibility)*
  - ❖ *Impact on production cycle and process: technical risk management to be discussed with the manufacturer*



# Thank you

- Commissariat à l'énergie atomique et aux énergies alternatives
- Centre de Saclay | 91191 Gif-sur-Yvette Cedex
- T. +33 (0)1 69 08 76 11 | F. +33 (0)1 69 08 30 24
- Etablissement public à caractère industriel et commercial | RCS Paris B 775 685 019