DE LA RECHERCHE À L'INDUSTRIE

CEA - Saclay

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CRITICAL DESIGN REVIEW #1 FOR MEDIUM BETA CAVITY CRYOMODULES

3-4 APRIL 2017

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CRYOMODULE CONFIGURATION MANAGEMENT

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VINCENT HENNION

CM PROCESS ACTIVITIES

- **Identification**
  - Certification (safety rules, …)
  - Criticity (including prototypes)
  - Interfaces
  - Appropriate PBS level (purchased component with SoW)
- **Change control**
  - Description
  - Categorize / impact
  - Decision authority
- **Configuration status**
  - Reports
  - Documentation system
- **Verification and audit configuration**
  - PMO meetings
  - Change control process optimization
  - Tests and controls on prototype and mock-up at Saclay

LICENSING CONFORMANCE

•V2 update with Ps=1,04bar on 02 Oct15

B. Elliptical Cryomodules, WP5

Specification: IPN document No. EDMS I-036902, dated 03.03.2015 and email from Mr Bosland, dated 15.06.2015

•Extract from ESS-0033356_v4 TÜV Nord

•07 Oct15

Equipment is specified in 9 different sections:

- C1-C8 with PS 1,04 barg
- LP1-LP33 with PS 1,04 barg
- JLP1-JLP12 with PS 1,04 barg
- JSK1-JSK5 with PS 6 barg
- CC1-CC6 with PS 6 barg
- CD1-CD8 with PS 6 barg
- CP1-CP7 with PS 6 barg
- JTS1-JTS2 with PS 25 barg
- TS1-TS25 with PS 25 barg

Classification according to figure 2 (pressure vessels) or figure 7 (piping) in PED, appendix 2, was checked. Due to small equipment (volume not above 49,9 litres and DN not above 960 mms for 1,04 barg, not above 8,33 litres and 200 mms for 6 barg and not above 2 litres and 40 mms for 25 barg) all pressure equipment is classified according to PED, article 3.3.

This equipment *"must be designed and manufactured in accordance with the sound engineering practice of a Member State in order to ensure safe use. Pressure equipment and/or assemblies must be accompanied by adequate instructions for use and must bear markings to permit identification of the manufacturer or of his authorized representative established within the*

Cryomodules

As presented before, all equipment is classified according to PED, article 3.3.

PBS

PBS	Cryomodules ESS à cavités elliptiques MBL (série)								
	Version de travail : MERCI D'INDIQUER EN ROUGE LES MODIFICATIONS EFFECTUEES AVEC VOS INITIALES								contact
Code PBS		Décomposition du produit							
Code	N1	N2	N3	N4	N5	N6	N7	Matière	PLANS de définition (CEA/IPNO)
3.0.0.0.0.0.0	CRYOMODULE M-BETA								
3.1.0.0.0.0.0	DULE	CAVITE M-BETA (Ensemble cavité avec pick up)							plans LASA
3.1.1.0.0.0.0			brides de fermeture						plans LASA
3.2.0.0.0.0.0	DULE	COUPLEUR RF (Ensemble)							1000000
3.2.1.0.0.0.0	DULE	COU	Fenêtre RF + antenne					Inox / cuivre	1000001
3.2.2.0.0.0.0	DULE	COU	Tube double paroi					inox 316 L	1000002
3.2.3.0.0.0.0	DULE	COU	Doorknob					inox	1001000
3.2.4.0.0.0.0			Instrumentation coupleurs (prêts pour assemblage)						
3.3.0.0.0.0.0		CRYOSTAT EQUIPE							
3.3.1.0.0.0.0		CRY	Train de cavités (salle blanche)						0071 000
3.3.2.0.0.0.0		CRY	Train de cavités équipé (Hors SB)						24G9918
3.3.3.0.0.0.0			Circuits cryogéniques						
3.3.4.0.0.0.0			Ecran thermique - Ensemble écran						24G0400
3.3.5.0.0.0.0			Structure spaceframe. Ensemble						24J0310
3.3.6.0.0.0.0		CRY	Enceinte à vide. Ensemble						24J0200
3.3.8.0.0.0.0			Instrumentation externe						

INTERFACES IDENTIFICATION PROCESS

definition

- Technical meetings
- Workshop with ESS and partners
- Specifications to describe the interfaces
- Preliminary configuration baseline

verification

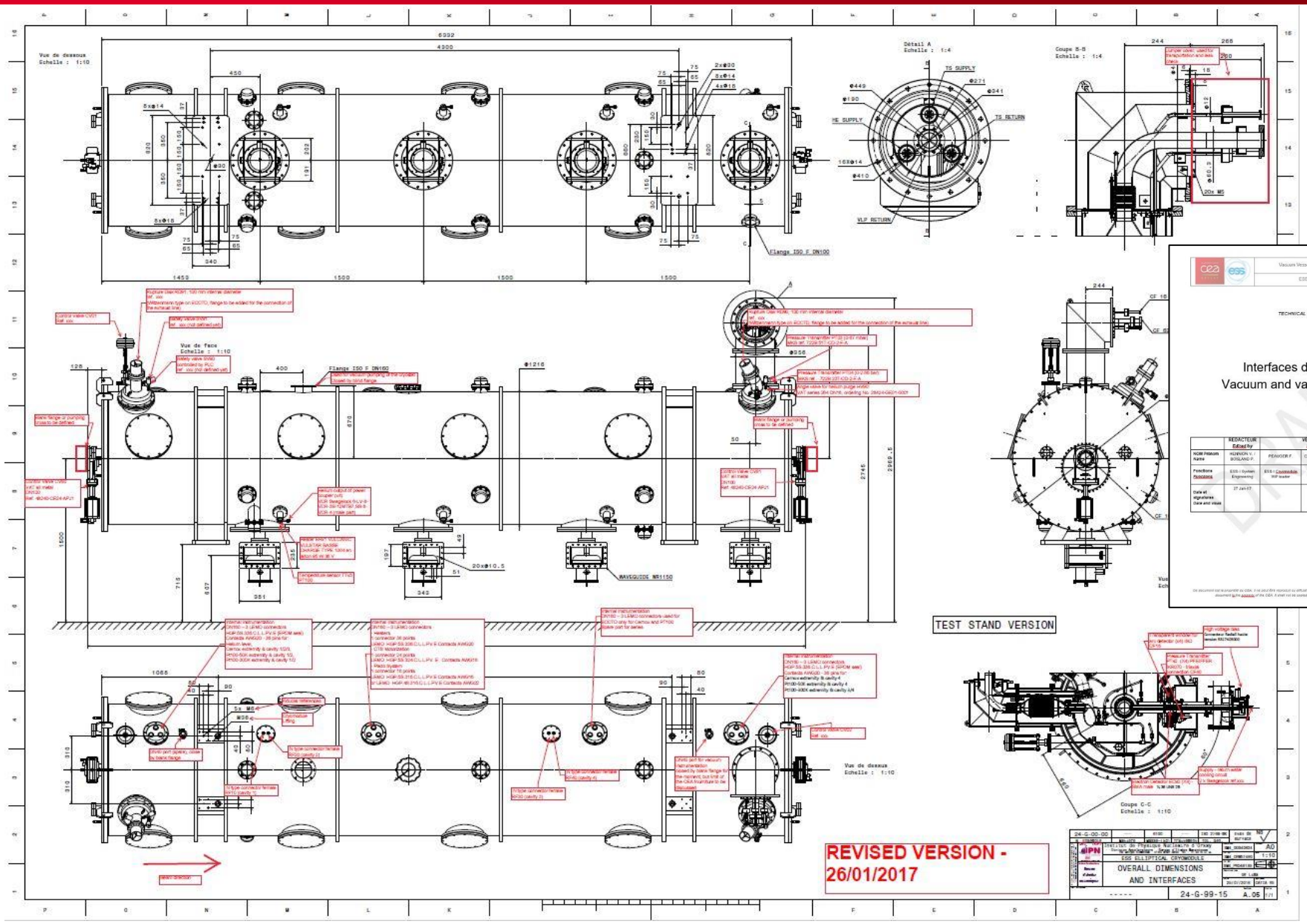
- Digital Mock-up
- drawings
- lessons learnt from demonstrators
- Tests measurement results

validation

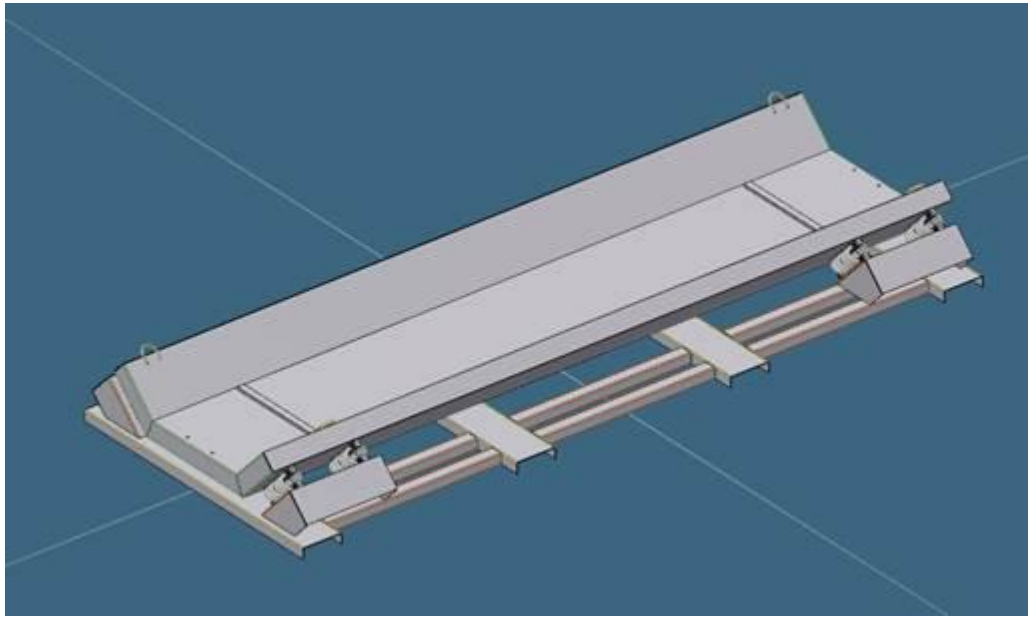
- CEA internal configuration audit
- Tools optimization
- Design review chaired by ESS

•Baseline Configuration to be approved by all partners for configuration management

INTERFACES DOCUMENT

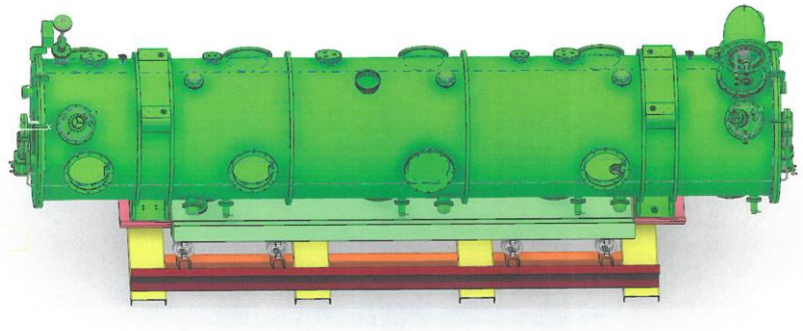


MAIN CHANGES TO BE VALIDATED



Transport frame tooling

- Designed by ESS
- Supplied by ESS
- Interfaces with CM and container



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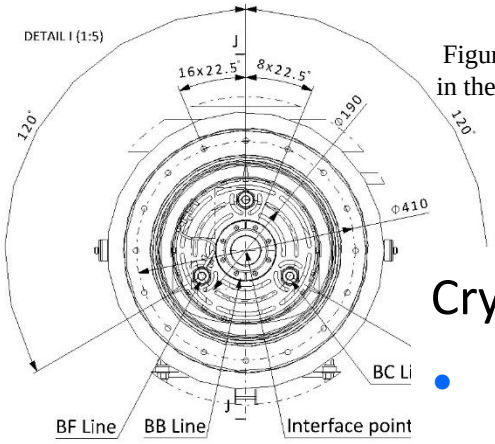


Figure 5. Arrangement of the cold process pipes in the jumper connection termination - front view

Cryogenic Distribution system

- Designed by ESS
- Supplied by ESS
- Interfaces with CM jumper lines

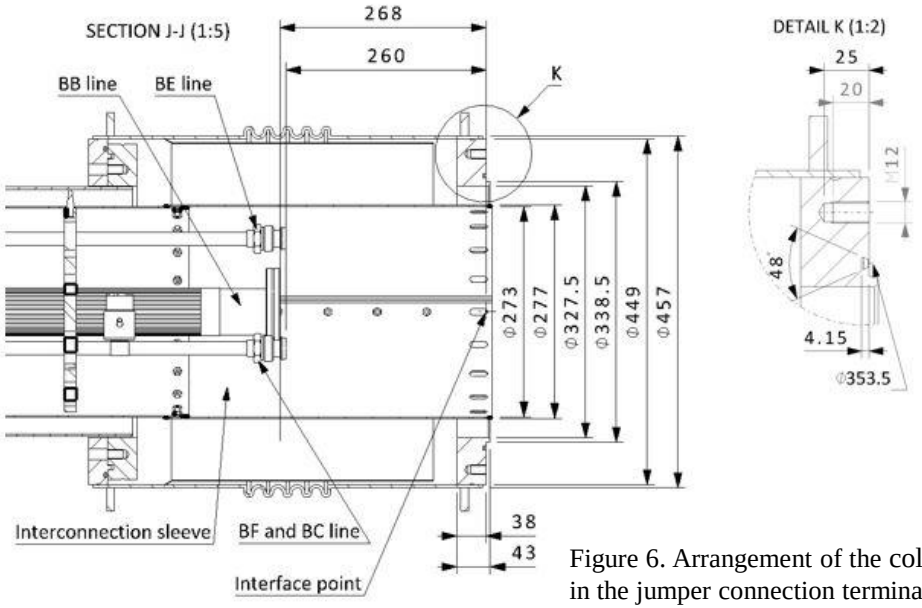


Figure 6. Arrangement of the cold process pipes in the jumper connection termination - side view

EUROPEAN SPALLATION SOURCE

Document Type	Change Request
Document Number	ESS-0100756
Date	Mar 15, 2017
Revision	1 (1)
State	Preliminary
Confidentiality Level	Internal
Page	1 (2)

Change Request

CHANGE DATA			
CR ID	Accelerator CR 11.00122.1	Date created	Mar 15, 2017
Title of the CR	Changes in the process line interconnections in the interface between Elliptical Cryomodule and Cryogenic Distribution System for Lund Test Stand 2		
Name of Change Leader	Wolfgang Hees (WP10 Leader, Test Stand 2)	Change originator	Jaroslaw Fydrych (WU 11.6 Cryodistribution coordinator)
Change class Approving entity	☐ Class A, European Spallation Source ERIC Council	☐ Class C Project Manager	☒ Class D Work Package Leader

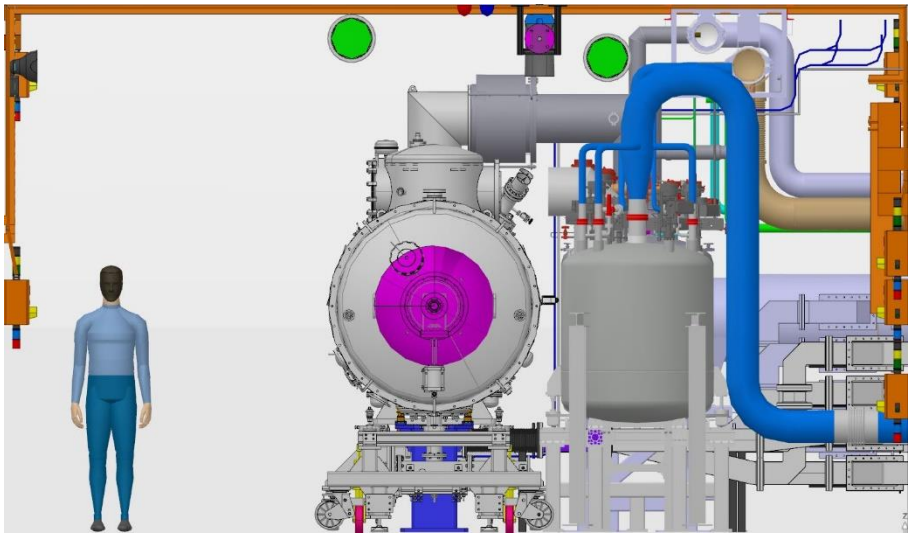
CHANGE ANALYSIS		
Item No		Baseline
Reason for change	1. Initially chosen DN10 CF flange connections at the interfaces of the cold process lines will not withstand expected pressure loads. 2. Welded connections between the auxiliary process lines of the cryomodule and CDS-LTS2 cause a need for welding works during the installations of the cryomodules in the test stand.	
Change description	1. Replacement of the DN10 CF flanges with 3/4-inch Swagelok connections as per updated interface sheet ESS-0011219R2 2. Making the auxiliary process line connections flanged with EN1092 flanges, as per updated interface sheet ESS-0011219R2. The change is recommended by the CDS-LTS2 CDR Committee (ESS-0094780, Recommendation 7)	
Change Analysis (effects, risks, time, costs etc.)	1. Replacement of the CF flanges with Swagelok reduces technical risks of damages and helium leaks from cold process lines, and in consequence reduces schedule risks related to the cryomodule site acceptance tests 2. Making the auxiliary line connections flanged rather than welded will facilitate connecting and disconnecting the cryomodules to and from the test stand at their site acceptance tests.	
Change affects other projects	Affected projects: ☐ Accelerator ☐ Target ☐ CF ☐ NSS ☐ ICS ☐ ES&H ☐ Admin ☐ Initial Ops ☐ Other	
Comment	The changes were discussed among WP5, WP11 and their in-kind partners, CEA and WUST, and the proposed solutions were agreed during a video conference on Mar 7, 2017	

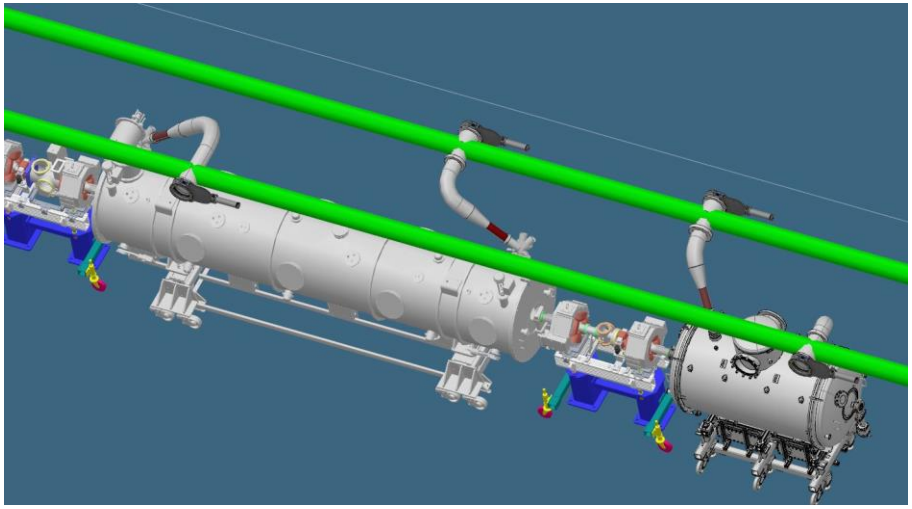
CHANGE IMPACT	
Schedule impact for affected projects	No impact
Scope impact for projects	No impact
Cost impact	Replacement of the CF flanges with Swageloks on the M-ECCTD cryomodule and

MAIN CHANGES TO BE VALIDATED

Helium collector

- Designed by ESS
- Supplied by ESS
- Interfaces with CM rupture disks

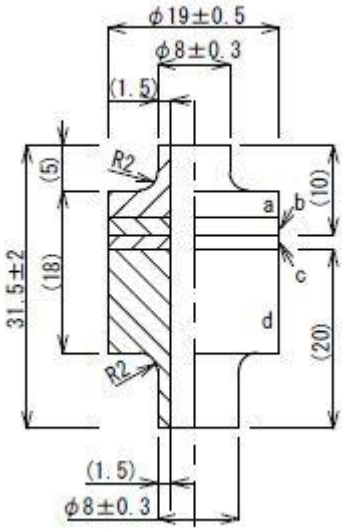


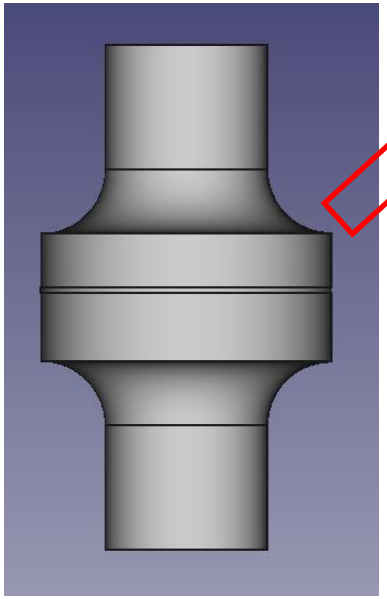


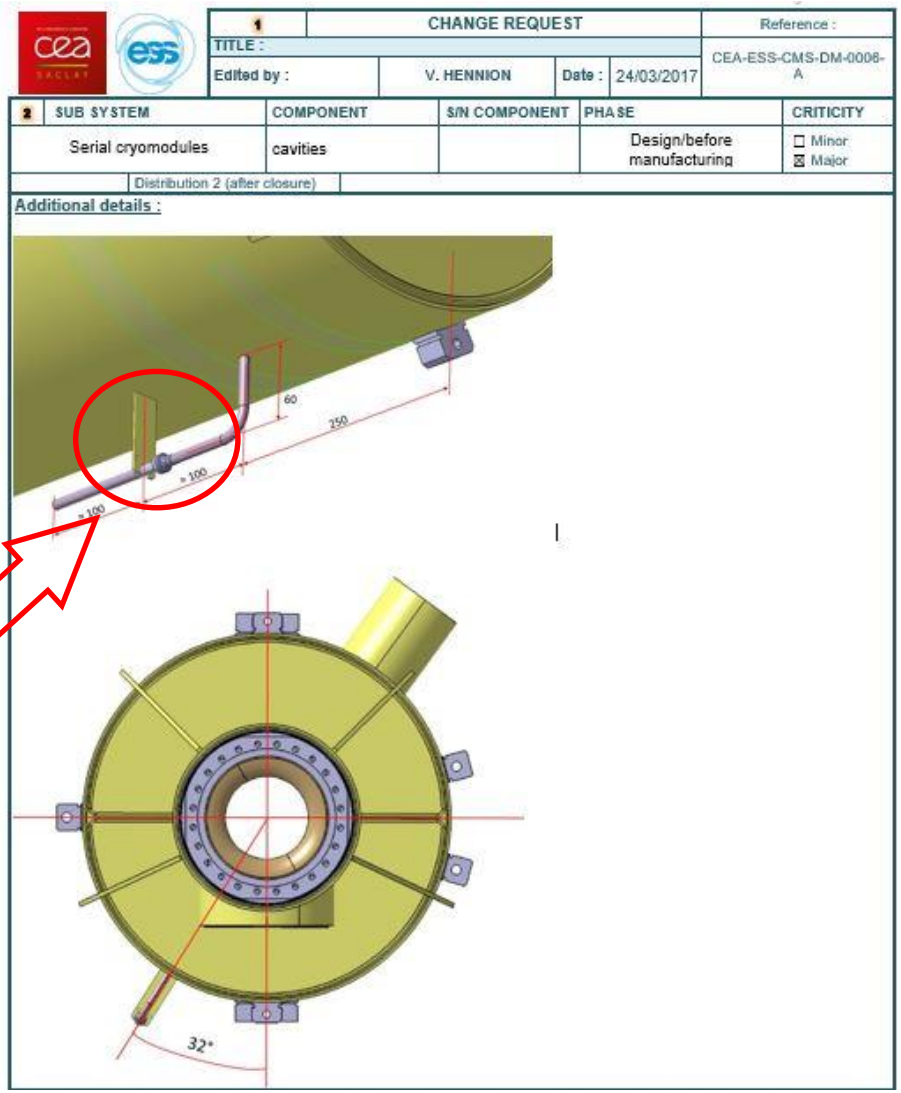
MAIN CHANGES TO BE VALIDATED

Helium inlet line

- Specified by CEA
- Designed by CEA/IPNO
- Supplied by ESS cavities partners
- Interfaces with cavities and CM

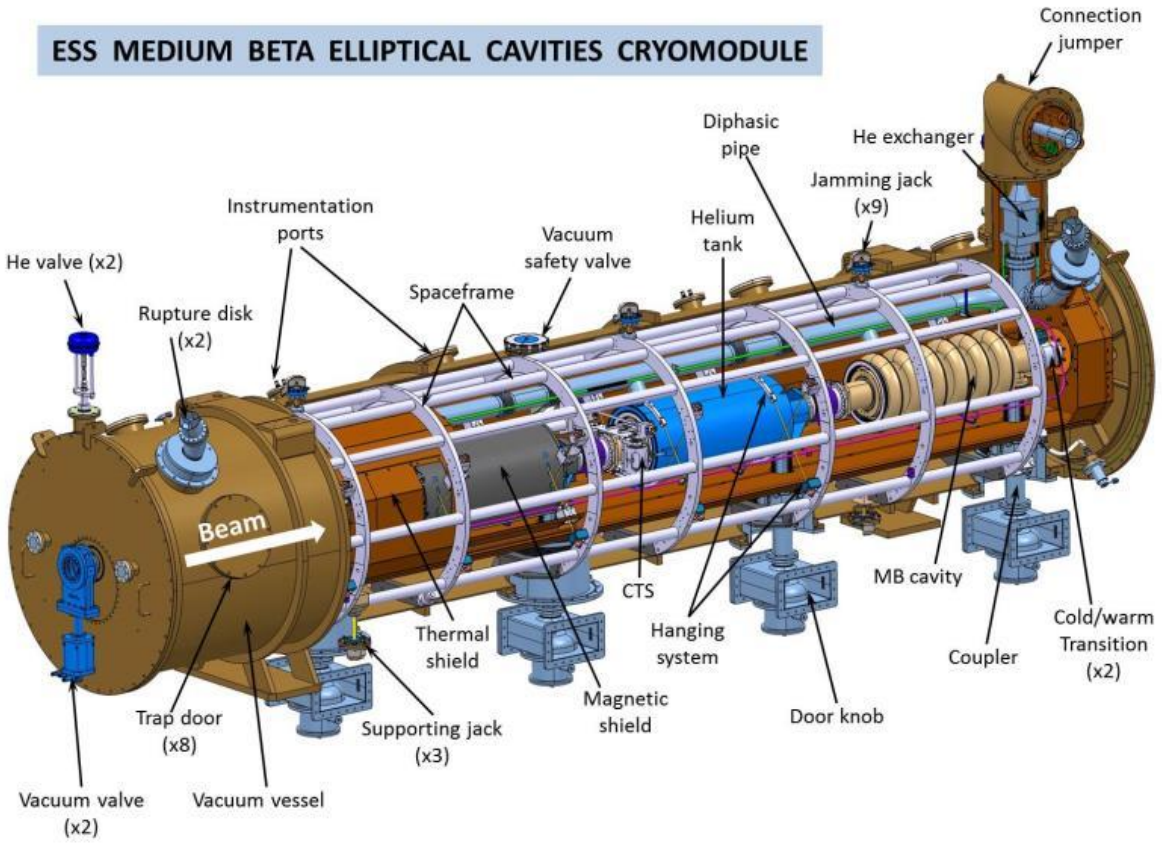






DASHBOARD

- PMO meeting: topic to Configuration Management when appropriate
- WP meeting with a dedicated topic to change control and conformity (cf FP)
- QA team for change control and documentation management
- No specific tool
- MS Excel support
- CM_GestionConf_170403.x



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