Quality assurance for Manufacturing

Dressed Cavities for SPS prototype cryomodule

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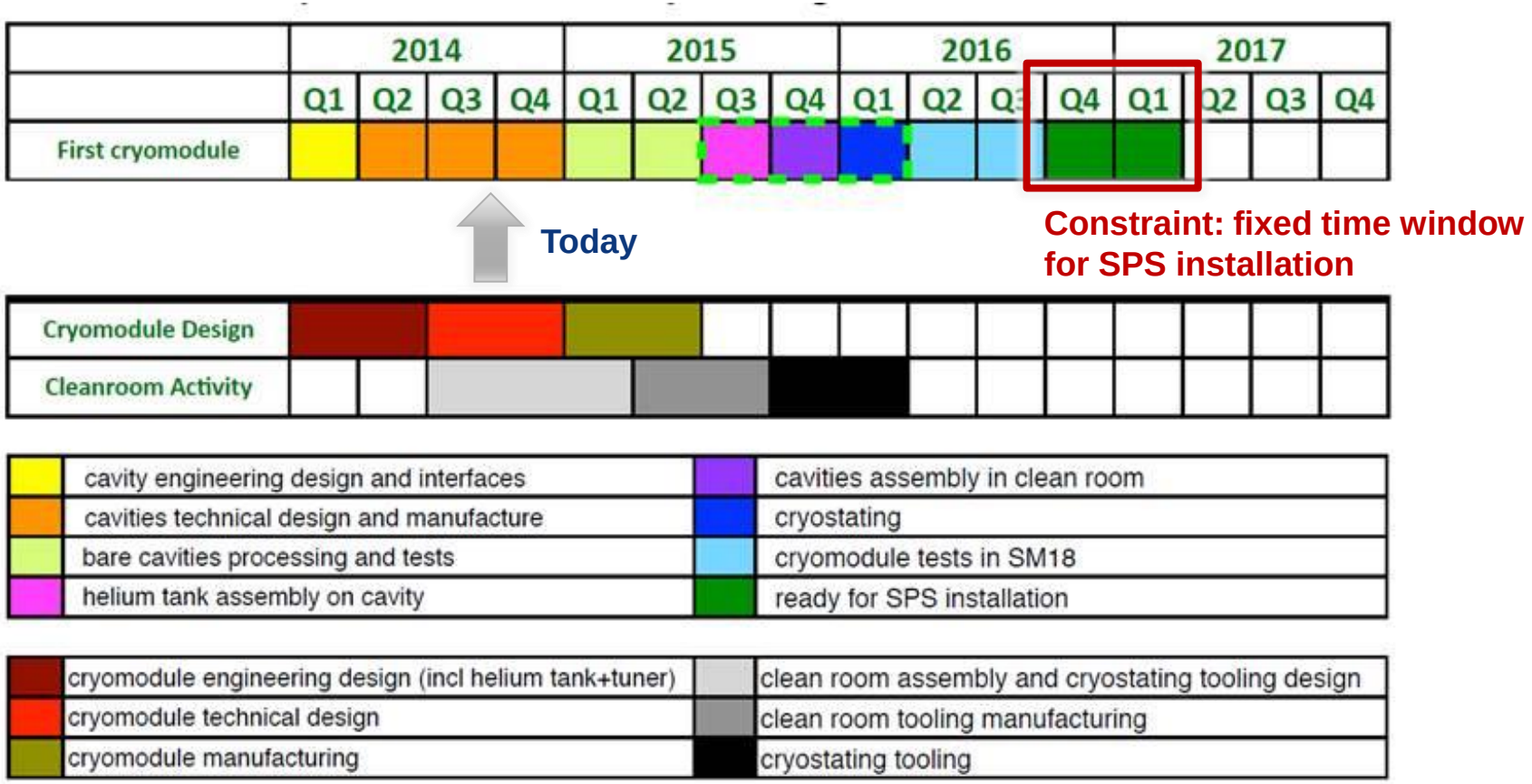
Project schedule

Presented during Crab Cavities Workshop, December 2013



Requirements for Manufacturing Readiness

Due 1 month before start of manufacturing for CERN approval

#	Requirements	Y/N
1	Niobium material samples according to Section 3.2	N
2	Material certificates and quality control of raw materials (including RRR measurements)	N
3	Material certificates of welding consumables (whenever applicable)	N
4	Functional and manufacturing drawings (with tolerances)	Y?
5	Design reports demonstrating that welds are designed to withstand the specified load cases (refer to Section 3.6.1)	N
6	Welding plan including: • Welding maps • Welding and brazing procedure qualification record including CERN acceptance criteria in Section 4.2 (WPQR and BPQR) • Welding and brazing procedure specification (WPS and BPS) • Welders performance qualification (GTAW), Welding and Brazing Operators Performance Qualifications (electron-beam welding and vacuum brazing) – WPQ, WOPQ and BOPQ	N
7	Manufacturing procedures (whenever required in Annex 6.3)	N
8	Test procedures (whenever required in Annex 6.3)	N
9	EB welded and vacuum brazed samples according to the requirements specified in Section 3.8.4	N
10	NDT personnel qualifications	N
11	Manufacturing and inspection plan (MIP) – list of all manufacturing and quality control operations.	N

Mandatory manufacturing and quality control steps

Step ID	Step name	CERN control
ACFCA-1-QA	Shaping and machining	N/A
ACFCA-2-QC	Dimensional control	HP
ACFCA-3-QA	Cleaning and chemical polishing	N/A
ACFCA-4-QA	Vacuum brazing	N/A
ACFCA-5-QC	Visual examination	HP
ACFCA-6-QC	Dimensional control	HP
ACFCA-7-QC	Helium leak tightness test	NP
ACFCA-8-QC	Ultrasonic examination	HP
ACFCA-9-QA	Chemical polishing	N/A
ACFCA-10-QA	Electron-beam (EB) welding	N/A
ACFCA-11-QC	Visual examination	HP
ACFCA-12-QC	Radiographic examination	HP
ACFCA-13-QC	Dimensional control	HP
ACFCA-14-QC	Resonator frequency check & tuning	HP
ACFCA-15-QC	Dimensional control	HP
ACFCA-16-QC	Helium leak tightness test	N/A
ACFCA-17-QA	Packaging & shipping	HP
ACFCA-18-QA	Bulk chemical polishing	N/A
ACFCA-19-QA	Heat treatment	N/A
ACFCA-20-QA	Light chemical polishing	N/A
ACFCA-21-QA	High pressure water rinse	N/A
ACFCA-22-QC	RF acceptance tests at cold temperature	HP

MTF
Equipment Management Folder

Input for CERN

Any further steps in the MIP shall be communicated to CERN !

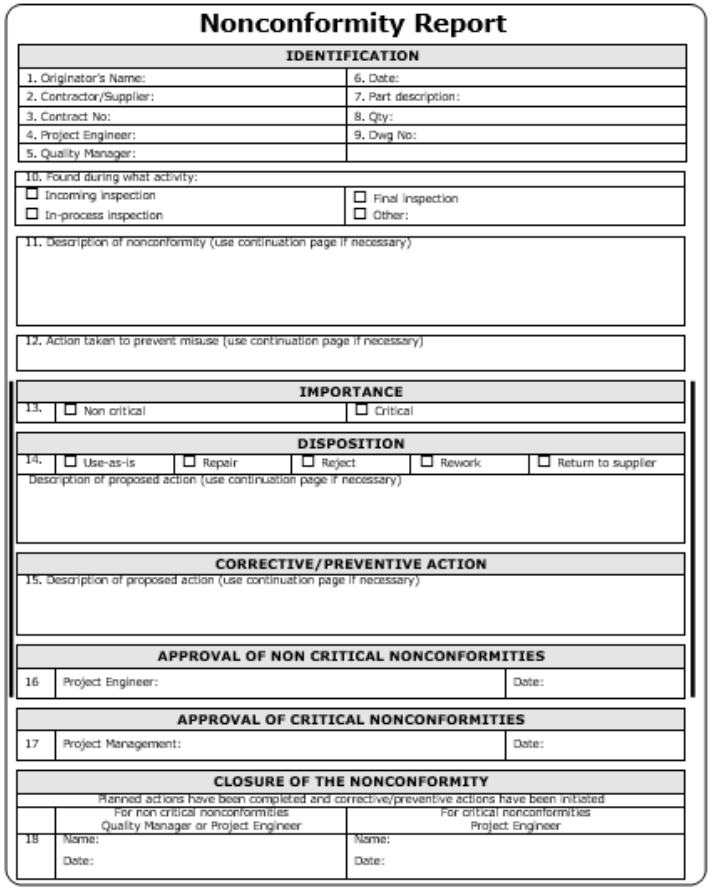
Required specific manufacturing and test procedures

Quality controls points

According to Section 1.3 of the engineering specification

- **Notification Point (NP):** CERN, or its authorized representative, is informed 5 working days in advance that a specific step has been completed and that the following step in the approved work-flow will be performed. A NP does not affect the work-flow. Work can continue without CERN, or its authorized representative, reply.
- **Hold Point (HP):** CERN, or its authorized representative, is informed that a specific step has been completed. The work-flow is stopped until CERN, or its authorized representative, provides a HP Clearance. The clearance is provided within 5 working days upon submission of the quality control documentation relative to the performed step. In case of clearance the work-flow can continue. In case of rejection, a recovery plan shall be discussed with CERN and submitted to CERN for final approval within 10 working days.

Management of non-conformities



Nonconformity Report

IDENTIFICATION	
1. Originator's Name:	6. Date:
2. Contractor/Supplier:	7. Part description:
3. Contract No:	8. Qty:
4. Project Engineer:	9. Dwg No:
5. Quality Manager:	

10. Found during what activity:

☐ Incoming inspection	☐ Final inspection
☐ In-process inspection	☐ Other:

11. Description of nonconformity (use continuation page if necessary)

12. Action taken to prevent misuse (use continuation page if necessary)

IMPORTANCE		
13.	☐ Non critical	☐ Critical

DISPOSITION				
14.	☐ Use-as-is	☐ Repair	☐ Reject	☐ Rework	☐ Return to supplier

Description of proposed action (use continuation page if necessary)

CORRECTIVE/PREVENTIVE ACTION

15. Description of proposed action (use continuation page if necessary)

APPROVAL OF NON CRITICAL NONCONFORMITIES		
16	Project Engineer:	Date:

APPROVAL OF CRITICAL NONCONFORMITIES		
17	Project Management:	Date:

CLOSURE OF THE NONCONFORMITY		
Planned actions have been completed and corrective/preventive actions have been initiated		
	For non critical nonconformities Quality Manager or Project Engineer	For critical nonconformities Project Engineer
18	Name: Date:	Name: Date:

According to Section 1.3 of the engineering specification

- Non-conformities observed during the specified quality controls in the different processes shall be appropriately managed and handled by the supplier. All reports of non-conformities, including corrective and preventive measures, shall be submitted to CERN for approval before implementation.

Non-conform parts/materials shall be appropriately labelled as “non-conform” and removed from the manufacturing chain

Conclusions

- Where we are today?
  - Schedule: about 3 months delay in the manufacturing process
  - Requirements for manufacturing readiness not fulfilled → CERN clearance for manufacturing can not be provided.
- What is the action plan from the Supplier to recover from delays/provide missing information as soon as possible?
- Where can CERN provide assistance?