



Engineering specification summary (cavity & cryomodule)

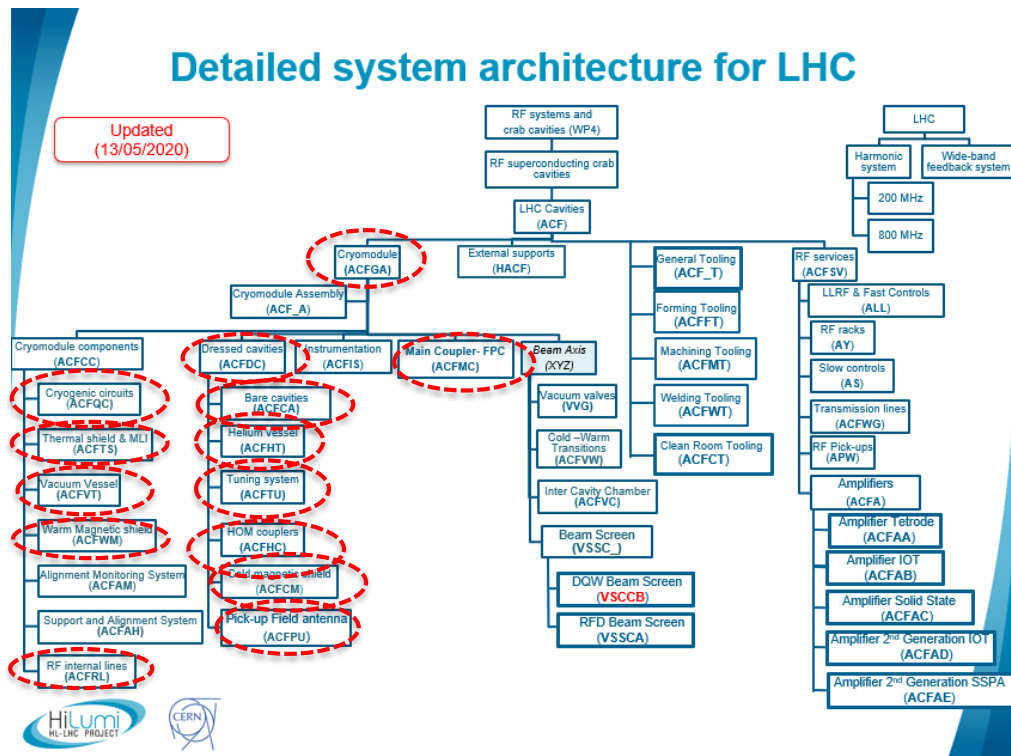
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11th HL-LHC Collaboration Meeting – CERN (online) - 19 to 22 October 2021

Cryomodule breakdown structure

From EDMS
1398306



Strategy for Crab Cryomodule (1)

CONTENT:

- Refers. to the corresponding Engineering Specification
- Demonstration of compliance, ESR by ESR

Intended for CERN internal use and for HSE, available for consultation

AUTHOR:
CERN-WP4

2 **main** documents for the cryomodule

- engineering specification
- guideline for compliance with CERN safety rule

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2 **main** documents per relevant component:

- engineering specification
- guideline for compliance with CERN safety rule , **IF NEEDED**



Respect of engineering specification
=
compliance with CERN safety Rules

CONTENT

- to catch the HL-LHC needs (functional and technical requirements)
- **to comply with ESRs**
- List of required documentation

AUTHOR:

CERN-WP4 involving Collaborating Entities

Ad-hoc agreements with Collaborating Entities based on described strategy / documentation can be discussed

Strategy for Crab Cryomodule (2)

Name	ID code	<u>Engineering Specification</u> [EDMS nr]	<u>Guideline for compl. with CERN Saf. Req.</u> [EDMS nr]
Full Cryomodule, including beam screens and references to requirements for vacuum components (Sector valves, Plug-in modules)	ACFGA	<u>2043014</u>	2043016
Dressed cavities, HOMs couplers, Pick-up antennas, Cold magnetic shield	ACFDC, ACFHC, ACFPU, ACFCM	<u>1389669</u>	2058183
Cryogenic circuits	ACFQC	<u>2093032</u>	<u>2101920</u>
Thermal shield	ACFTS	2101922	2101923
MLI	ACFTS	<u>2144140</u>	-
Vacuum vessel	ACFVT	<u>2101924</u>	<u>2101925</u>
Warm Magnetic shield	ACFWM	<u>2101926</u>	-
Fundamental Power Coupler	ACFMC	2101934	(? 2101936)
RF internal lines	ACFRL	2605345	-
Tuning system	ACFTU	2101938	-
Safety protecting devices	ACFGA	2101940	2101943

- **Released**
- Draft available for feedback
- Int .discussion at CERN
- Not available
- **In Work**

Cavity specification

Engineering Specification for the dressed bulk niobium Crab Cavities
EDMS 1389669 v.2.57 / LHC-ACFDC-ES-0002 v.2.57



List of changes available

Status: HL Engineering Check => no major comment so far

Lessons learned (to date)

Very important
feedbacks from:

- CERN Main Workshop
- RI company
- AUP colleagues
- UK colleagues and selected companies

gathered during
prototyping



- Cavity specification
 - Requirement for Titanium
 - Titanium bellows
 - ...
- For different components:
 - Cleaning for vacuum
 - Filler metal requirements
- MLI
 - Documentation
 - Technical requirements can be relaxed (i.e. surface resistivity, ...)
- Cryogenic lines
 - Bellows requirements
- Vacuum vessel
 - Lifting test
 - Bolts requirements



Review the specifications before the series production of the components for LHC

Future activities

- Finalization of the specifications not yet released
- Review of the following specification already planned:

Specification	EDMS	Modifications (example)
Cryomodule	2043014	Alignment references, ...
Vacuum Vessel	2101924	Clarification for the lifting tests, ...
WMS	2101926	Cleaning requirements, ...
MLI	2144140	Resistivity, ...
Cryogenic lines	2093032	Cleaning requirements, ...
...		

Review by mid 2022

Reminder (1)

- Documentation to demonstrate compliance with spec => MTF/EDMS tools
- In case of non-compliance 2 tools are available
 - Deviation request (before manufacturing): EDMS 1506726
 - Non-conformity record (after manufacturing): EDMS 1501109

Ongoing review of the specifications should reduce as much as possible the need of deviation requests

Reminder (2)

- All specifications available in EDMS.
- Main specification is **EDMS 2043014** (including links to all relevant documents)
- Respect of engineering specification = compliance with CERN safety Rules
- Prototype for RFD: very important test for the coherence and application of the specifications
 - **Feedback are very important in this phase.**



Thank you.

