High Luminosity LHC

HL-LHC Configuration Management

Keywords : HW Baseline, Naming, Parameters, Layout DB, Change Control

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HL-LHC Configuration Management

This presentation addresses the configuration management of HL-LHC and places it in perspective of a future merge with LHC. Compatibilities, proposals and issues are presented.

It is structured as follows:

- LHC Project and LHC Machine
- Handling concurrently HL-LHC and LHC
- Names, parameters, layout, slots, HW Baseline
- Activity and HW Baseline/Parameters
- What's next

LHC Project and LHC Machine

LHC Project (prior to its installation) was handled through configuration management to allow

- A clear view on the state of the project – in a HW Baseline, LHC Equipment Catalog for Parameters, Layout DB for MAD/X
- A common view on the state of the project – Approval of parameters and documents (PLC, TCC, LTC, LMC, Maric,…)

LHC Machine (in operation) follows the same rules, with configuration management and change control (ECRs).

- Every step/stop is traced – changes from TS/LS to TS/LS

LHC Project and LHC Machine

LHC-MQXA-ES-0001	Inner Triplet Quadrupole MQXA
LHC-MQXA-EP-0001	Parameters for MQXA
LHC-MQXB-EP-0001	Parameters for MQXB
LHC-MQXA-EC-0001	Change of protection and interlock scheme for the main quadrupole ...
LHCMQXA_0002	- - QUENCH HEATER FOR MQXA
LHC-MQXA-ES-0003	Inner Triplet Quadrupole MQXA
LHC-MQXA-EC-0001	Change of protection and interlock scheme for the main quadrupole ...
LHC-MQXA-ES-0001	Inner Triplet Quadrupole MQXA

Documents were stored in the Hardware Baseline

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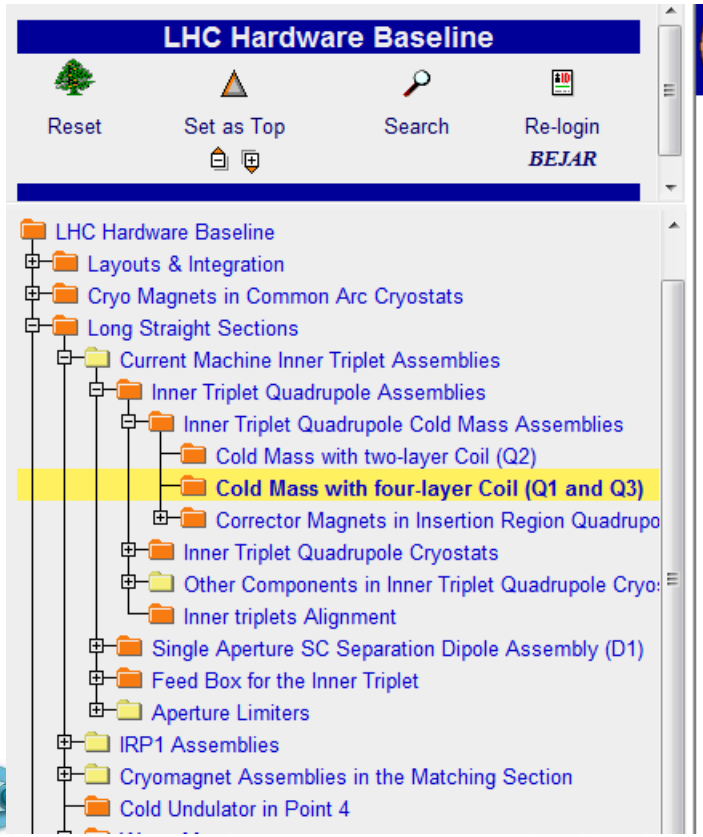
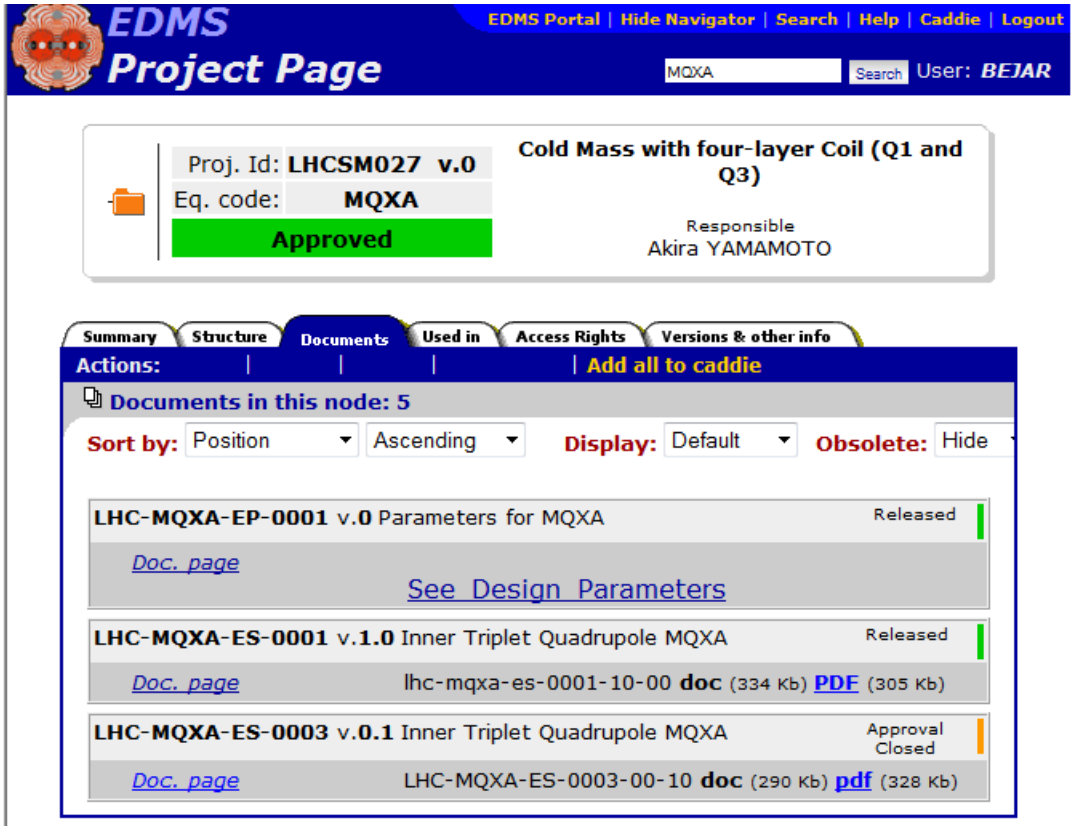




Handling concurrently HL-LHC and LHC

Several aspects to consider:

- Names
- Parameters of magnets
- Layout drawings
- Functional positions - Slots
- HW Baseline

Names

The Naming portal now covers all accelerators

Names

Names have to be compatible with existing ones and properly declared in Naming, e.g. MQXF.

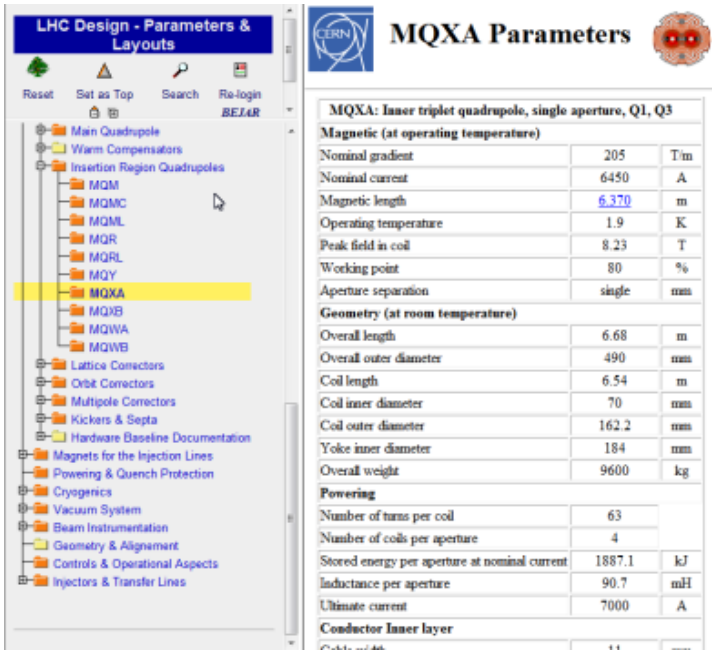
Proposal :

- Use Accelerators-naming.Service@cern.ch address
- Get a reference person in the Magnets group with an overview of all the codes

Issue :

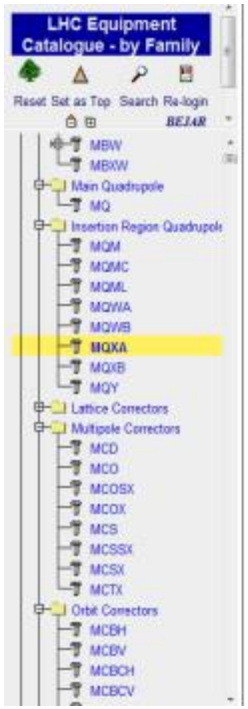
- Might be necessary to update to 8 characters for the equipment codes. QA-WG issue

Parameters



MQXA Parameters

MQXA: Inner triplet quadrupole, single aperture, Q1, Q3		
Magnetic (at operating temperature)		
Nominal gradient	205	T/m
Nominal current	6450	A
Magnetic length	6.370	m
Operating temperature	1.9	K
Peak field in coil	8.23	T
Working point	80	%
Aperture separation	single	mm
Geometry (at room temperature)		
Overall length	6.68	m
Overall outer diameter	490	mm
Coil length	6.54	m
Coil inner diameter	70	mm
Coil outer diameter	162.2	mm
Yoke inner diameter	184	mm
Overall weight	9600	kg
Powering		
Number of turns per coil	63	
Number of coils per aperture	4	
Stored energy per aperture at nominal current	1887.1	kJ
Inductance per aperture	90.7	mH
Ultimate current	7000	A
Conductor Inner layer		



From Isabel's presentation to HLTC

Parameters

As a reminder, the equipment catalogue is fully integrated into the Layout and actively used today by operations, MAD generation files, ELQA campaigns, HWC tests

Proposal :

- Use the LHC equipment catalogue

Issue :

- Approve the parameters

Layout Drawings

These are conceptual drawings LHCLSX and LHCLSXG, LHCLSS, LHCLSA and electrical drawings LHCLSD, cryogenic P&ID LHCLSQR

These names are the ones of the current LHC machine.

Proposal :

- Use new names for the drawings with a lifetime up to LS3

Issue :

- Maintain several sets of drawings: LHC vs HL-LHC, Multi-branching inside HL-LHC
- Maintain and modify by hand (trial and error), maintain and modify with a DB input (with approval and versioning)

Functional Positions - Slots

Functional Positions, Types, and Regions are going to change heavily. Still some internal mechanisms in the Layout DB help in checking integrity of the data.

Proposal :

- Use the layout DB for defining configuration of assemblies, e.g. LQXDA, functional positions e.g. LQXDA.3R5, regions e.g. 4R5
- Introduce validity dates for all elements handled in the layout DB

Issue :

- Availability of such a modification is mid-LS1 or end-LS1
- Checking and re-checking coherence once data is updated

HW Baseline

The HW Baseline is the place were long-term documents are stored. By long term documents, it is meant

- Procurement (Technical Specifications for MS, IT, PI)
- Engineering Specifications, Change Requests
- Manufacturing (Drawing folders, Assembly Procedures, Test Procedures, Installation Procedures, etc.)

Proposal :

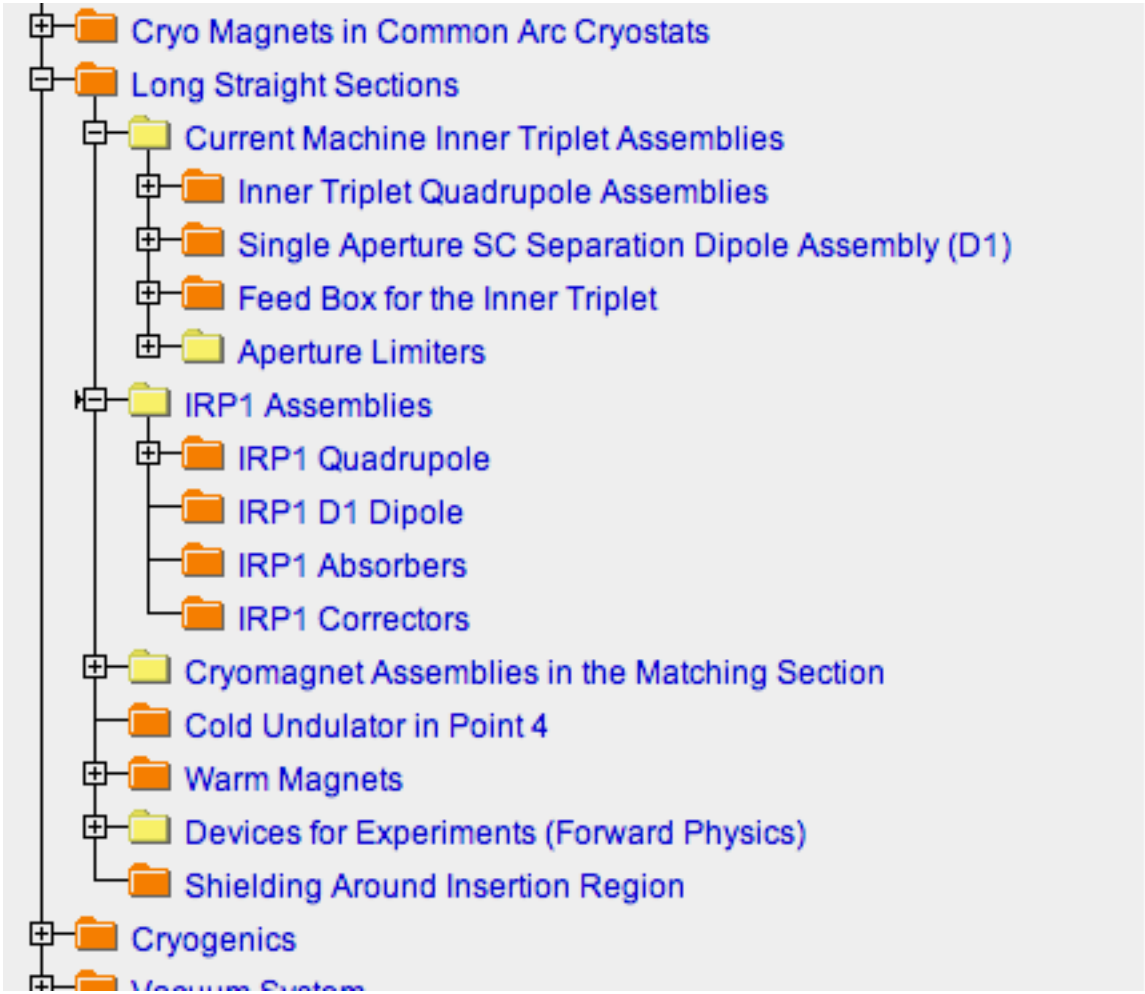
- Rename nodes with a ‘Current Machine’ prefix
- Duplicate the nodes with ‘HL-LHC’ prefix
- This eases the attachment to the activity structure (see next slide)

Issue:

- The overall baseline becomes unreadable
- Re-work the baseline to suppress nodes at LS3

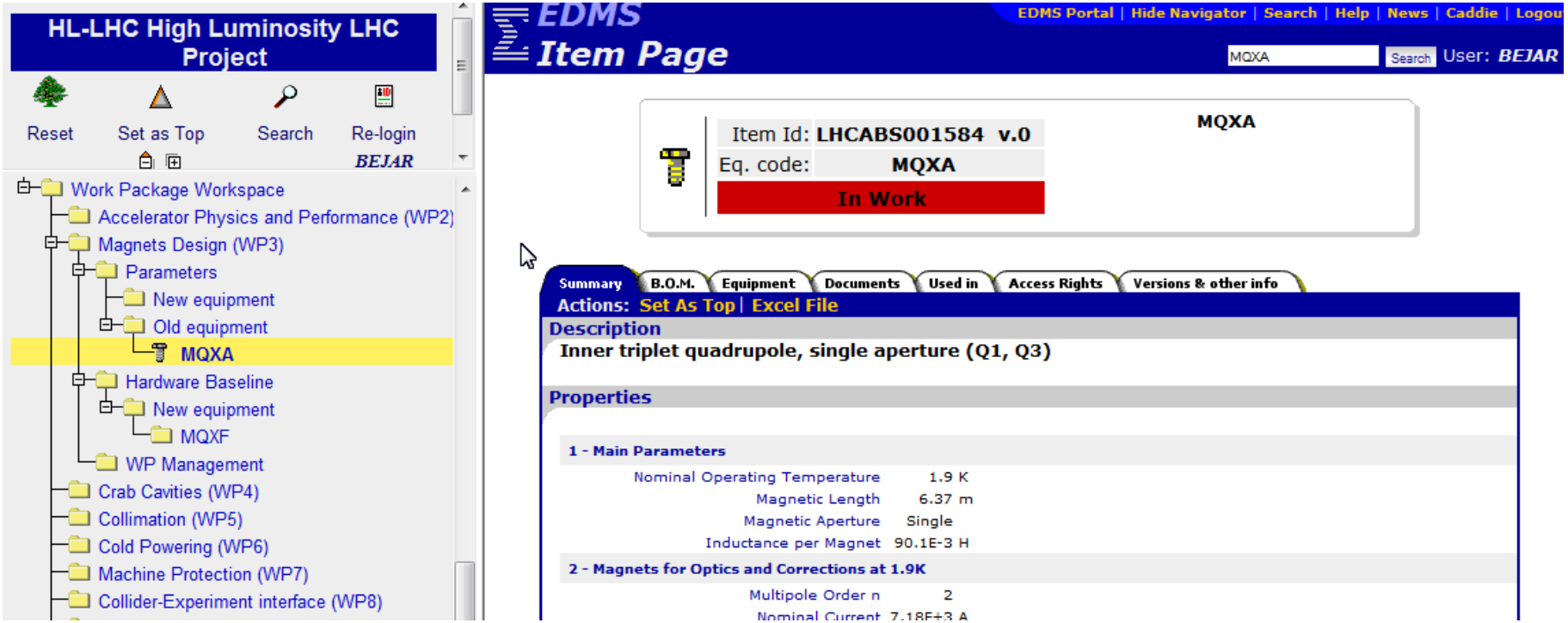
HW Baseline

This is a sample of the HW Baseline with the first upgrade project



Activity and HW Baseline/Parameters

To be able to continue storing information on the official systems but be able to find HL data without navigating



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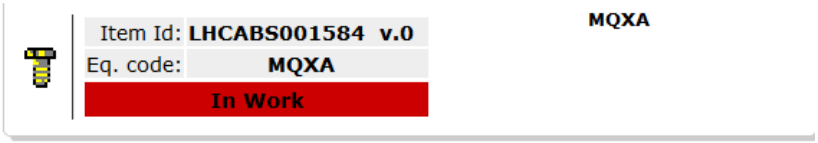
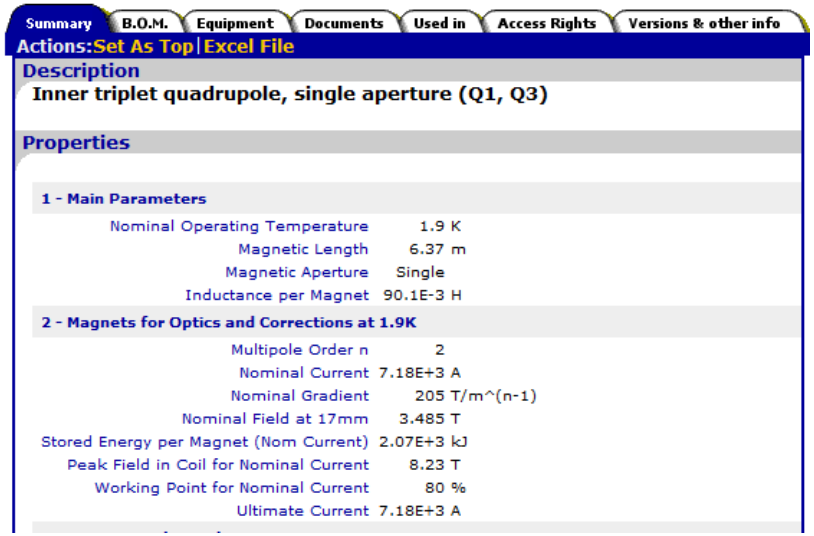
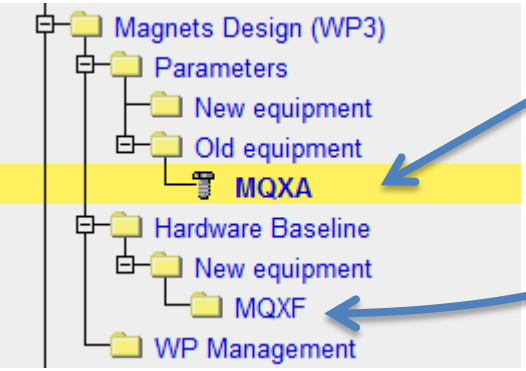
Activity and HW Baseline/Parameters

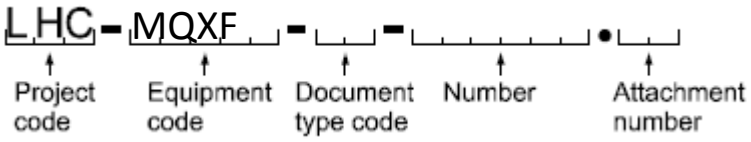
Parameters will be a mirror of the LHC equipment catalogue

Documents will be updated automatically by any document introduced in the hardware Baseline with the same equipment code but you will be able to create documents that are not “compulsory” and that will have a normal EDMS numbering









From Isabel’s presentation to HLTC

What's next

- Getting an overview on the needed codes (Naming) : correctors, dipoles, cavities, DFB…, and work with all the link persons from the groups and the PE. Already started with MQXF for example.
- Prepare the HW baseline by separating nodes where adequate
- Prepare the set of drawings handling the conceptual layout. And define methodology with the layout DB.
- Collect the parameters of the magnets approved by the PLC and insert in EDMS

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