

# What has been going on in the field: a status report

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on behalf of the HCC Team

Special thanks to F. Chevrier, R. Lauckner, B. Perea

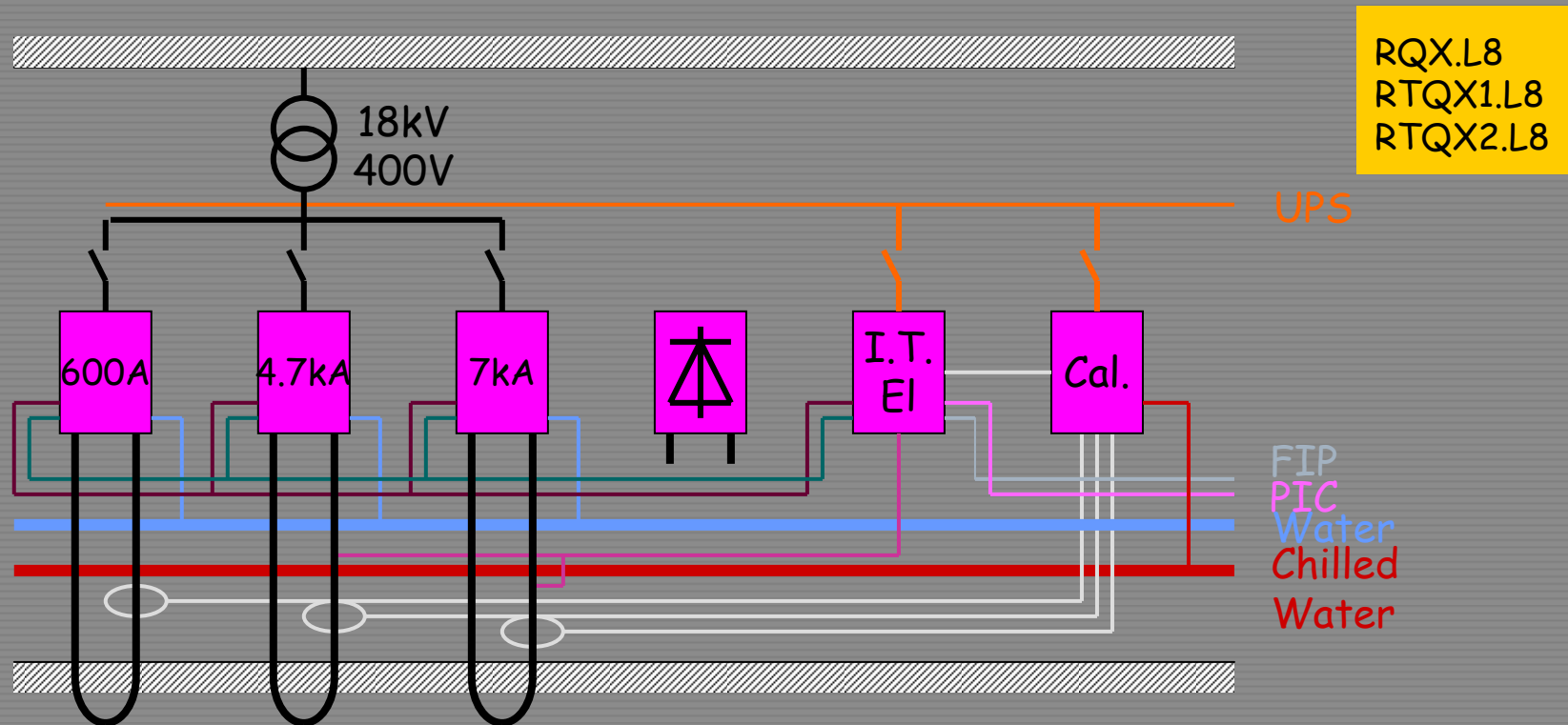
- Tests
  - Short Circuit Tests
  - Validation of controls systems
- The as-designed documentation
- The as-built documentation: MTF
- Safety aspects
  - SCT
  - QRL pressure and cold tests
- Co-activities
- Conclusions

## SHORT CIRCUIT TESTS OF POWER CONVERTERS

- Three major underground powering areas around even points (UA83, UA47, UA87) have been tested with the power converters connected to the cables (water and air cooled)
  - UA83 in Jul and Sep-Oct 2005, 81 converters
  - UA47 in Feb-Mar 2006, 55 converters
  - UA87 in Apr-May 2006, 81 converters
- One smaller underground powering area close to Point 7 is being tested now
  - RR17 in June 2006, 34 converters
- Next week, tests start in RR13/UJ14 with 62 converters

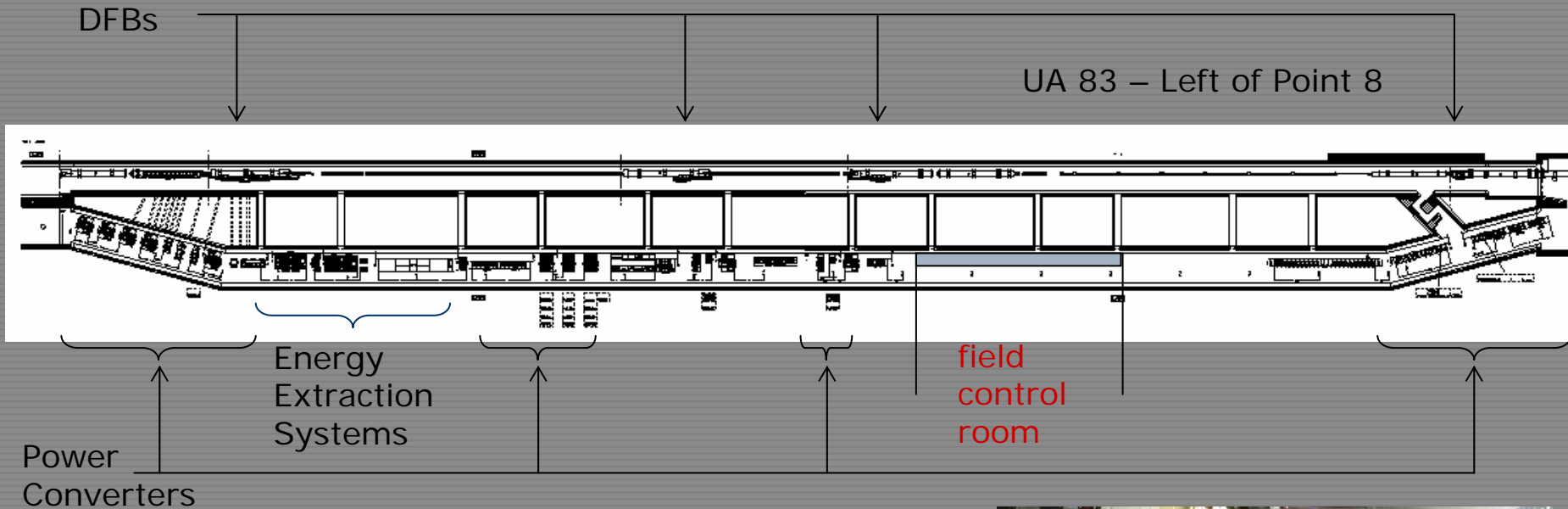
# aim and configuration ...

- The aim of these tests is to **validate the normal conducting part of the electrical circuits** powering superconducting magnets, extending from the 18 kV and 400 V feed and including the water-cooled cables before their connection to the DFB. After this, the **validation of the water and air cooling infrastructure** is carried-out by means of a 24-hour run with all the circuits powered at ultimate current.



Inner triplet in 8L

## 24h heat run of all power converters and associated infrastructure



- ✓ 3 x 13 kA power converters
- ✓ 18 x 4 to 7 kA power converters
- ✓ 31 x 600 A power converters
- ✓ 29 x 120 A power converters



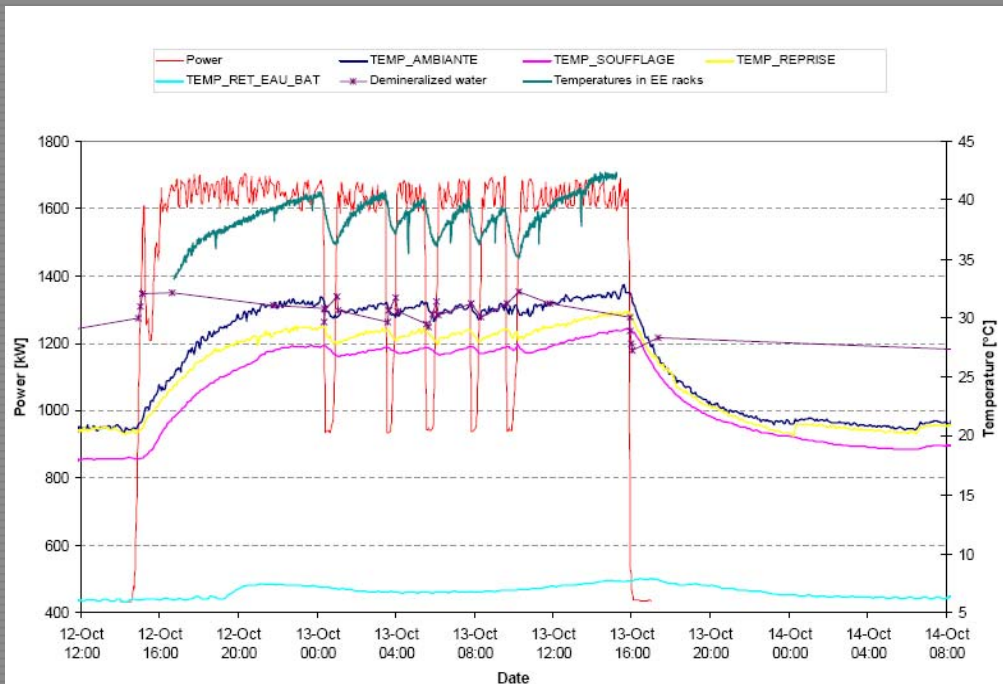
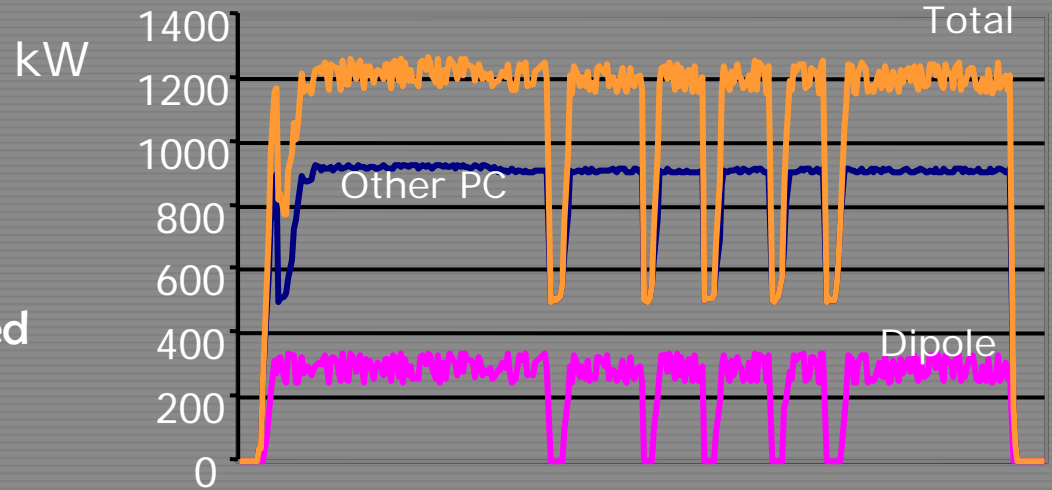
156 kA and 1.2 MW dissipated: PCs and Cables (estimation)

# results and validation of equipment

Tests are defined in an approved procedure document

Power converters are first tested on an 8-h run: connectivity and individual functionality are then checked

Final validation is given after the 24-h



Systems validated:

Power converters

Water cooling station

Ventilation and conditioned air

Energy extraction (partially)

Water-cooled and normal cables

Control applications

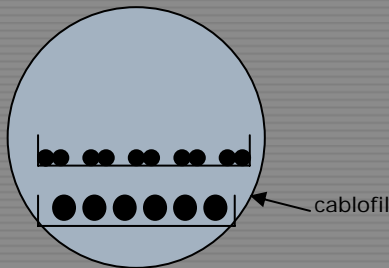
FCR infrastructure

...

# some of the main highlights ...

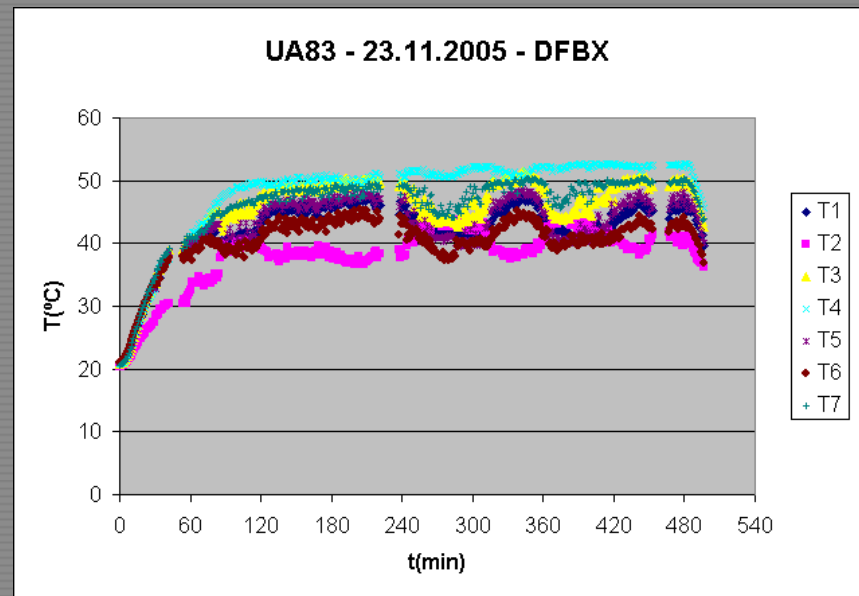
- Ventilation and conditioning air system: system validated and units which have not performed as expected identified and remedies applied
- One of the major outcomes of tests in UA83 was the need for changing the cabling layouts in the DFBAO area (trays, ducts, 600A EE systems) due to thermal reasons. The validation and decision not to indirectly cool with water the cables in the ducts was of great simplification.

Duct 250 mm



Number of cables: **4** x 240 mm<sup>2</sup>

or **6** x 240 mm<sup>2</sup> plus **10** x 35 mm<sup>2</sup>





# thermal measurements on equipment...



Location: UA83 (Beginning)  
Equipt type: LHC2-4-6-8kA  
SP1 T°C: 46°  
% conf.: 90%  
*Date: 2005-10-13 11h00*

Courtesy of Y. Thurel, AB/PO



# controls systems validated during SCT ...

- World FIP infrastructure**
  - Real-time fieldbus connecting front ends to power converters
- LHC PO Gateways and remote reboot**
  - PC bus front ends linking network to WorldFIP, running PO software for PC control, alarms, post mortem
- Technical Network and VDSL Infrastructure (IT)**
  - Ethernet for LHC control. General CERN network in LHC underground, transmitted by wi-fi in work areas
- FCRs in UA83 and UA43**
  - underground control rooms supporting control room applications close to equipment
- CCC Infrastructure**
  - LHC controlled from the CCC during night shifts
- Sequencer**
  - Automation tool that may be programmed to perform pre-defined tests involving different LHC hardware systems
- Set of the Day Management**
  - Used to define hardware subsets for monitoring and testing
- PIC hardware, PLCs and PVSS Supervision**
  - Controls and electronics for the Powering Interlocks
- Post Mortem Server and Browser**
  - Central server and software for capture of data from transient events such as PC trip
  
- Plus a long list of standard services (LASER, console manager, logging, fixed displays, logbook, databases...)**

LHC Hardware Commissioning

Simulation Debug Options Logging EditedPa

PC Short Circuit  
Circuit Interlock  
Test Monitoring  
Help

Equip State for LHC  
LASER Alarm  
Logging LHC  
SDDS Browser  
Sequencer  
Timber  
XCluc for HWC

PCs and Test Selections

Powering subsector and circuit type

Sector

Sector 1-2
Sector 2-3
Sector 3-4
Sector 4-5
Sector 5-6
Sector 6-7
Sector 7-8
Sector 8-1

select all  
clear all

Powering subsector

A78
ML8
XL8
WLR8

select all  
clear all

Circuit Type

A1
B1
B2
C

select all  
clear all

Power Converter

RPHF.UA83.RD2.L8
RPHGB.UA83.RQ5.L8B1
RPHGB.UA83.RQ5.L8B2
RPHH.UA83.RQ4.L8B1
RPHH.UA83.RQ4.L8B2
RPLB.UA83.RCBYH4.L8B2
RPLB.UA83.RCBCH5.L8B1
RPLB.UA83.RCBYHS4.L8B1
RPLB.UA83.RCBYHS4.L8B2
RPLB.UA83.RCBCHS5.L8B1
RPLB.UA83.RCBCHS5.L8B2
RPLB.UA83.RCBYV4.L8B1
RPLB.UA83.RCBV5.L8B2
RPLB.UA83.RCBYVS4.L8B1
RPLB.UA83.RCBYVS4.L8B2

select all  
clear all

Test Selection and Control

Test

24HrsHeatRunsV2
30MinuteHeatRunsV2
40SecHeatRunsSimV2
40SecHeatRunsV2
8HrsHeatRunsV2
SetPC_OFF
SetPC_ON_STANDBY
SetPC_ON_STANDBYSim
StartLogging

clear

Control

Start

Edit Parameters  
Edit Sequence

ABORT ALL

View Circuit  
View Journal

Console

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# STATUS REPORT ON THE AS-DESIGNED DOCUMENTATION

# Documentation: HCP...

EDMS DOC NUMBER	TITLE	STATUS
LHC-A-HCP-0001 rev 1.0	The Commissioning of the Hardware in the LHC Sectors: The RF System in Point 4	RELEASED
LHC-D-HCP-0001 rev 1.0	General Procedure for the Commissioning of the Electrical Circuits of a Sector	RELEASED
LHC-D-HCP-0002 rev 1.0	Commissioning of the Hardware in the LHC Sectors: Interlock Tests of Powering Subsector Prior & After Connection of the Power Cables to DFB Leads	RELEASED
LHC-D-HCP-0005 rev 1.0	PROCEDURES FOR THE SHORT CIRCUIT TESTS OF POWER CONVERTERS AND AUTOMATED COMMISSIONING OF INTERLOCKS FOR ELECTRICAL CIRCUITS OF THE LHC	RELEASED
LHC-I-HCP-0001 rev 1.0	The Commissioning of the Hardware in the LHC Sectors: the Injection Systems in Points 2 and 8 with their Associated Instrumentation	RELEASED
LHC-MW-HCP-0002 rev 1.0	GENERAL PROCEDURE FOR THE COMMISSIONING OF THE WARM ELECTRICAL CIRCUITS	RELEASED
LHC-R-HCP-0001 rev 1.1	The Commissioning of the Hardware in the LHC Sectors: the Power Converters Connected to the DC Cables in Short Circuit	RELEASED
LHC-D-HCP-0004 rev 0.4	The Commissioning of the Hardware in the LHC Sectors : The Commissioning of the Inner Triplet Region	APPROVAL CLOSED

# Documentation: HCP (2) ...

EDMS DOC NUMBER	TITLE	STATUS
LHC-D-HCP-0003 rev 0.8	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: Powering of the Superconducting Circuits of a Sector up to Nominal Current	APPROVAL CLOSED
LHC-R-HCP-0001 rev 1.3	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: The Power Converters Connected to the DC Cables in Short Circuit	APPROVAL CLOSED
LHC-R-HCP-0002 rev 0.2	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: Commissioning of the Power Converters outside the Inner Triplets with optics functions	APPROVAL CLOSED
LHC-FW-HCP-0001 rev 0.4	COMMISSIONING OF THE FLEXIBLE CONNECTIONS FOR WATER COOLED CABLES, WARM MAGNETS, ENERGY EXTRACTION SYSTEMS AND POWER CONVERTERS	UNDER APPROVAL
LHC-D-HCP-0008 rev 0.1	Safety aspects for the disconnection of cables from current leads	IN WORK
LHC-DFL-HCP-0001 rev 0.2	The connection of the power cables to the short-circuit blocks and to the current leads in the DFB	IN WORK
LHC-Q-HCP-0001 rev 0.1	The Commissioning of the Cryogenic System in the LHC	IN WORK
LHC-DFB-HCP-0001 rev 0.1	The Commissioning of the DFBs	IN WORK

EDMS DOC NUMBER	TITLE	STATUS
LHC-S-ES-0003 rev 1.0	SAFETY DURING INDIVIDUAL SYSTEM TESTS AND HARDWARE COMMISSIONING	RELEASED
LHC-S-ES-0005 rev 1.0	MESURES DE SECURITE MISES EN OEUVRE POUR LE TEST DE PRESSION DE LA QRL DANS LE SECTEUR 4-5	RELEASED
LHC-S-ES-0006 rev 1.0	MESURES DE SECURITE MISES EN OEUVRE POUR LE TEST DE PRESSION DE LA QRL DANS LE SECTEUR 3-4	RELEASED
LHC-S-ES-0007 rev 0.2	MESURES DE SECURITE MISES EN OEUVRE POUR LE TEST DE PRESSION DE LA QRL DANS LE SECTEUR 5-6	RELEASED
LHC-D-ES-0006 rev 0.3	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: Failure Scenarios for the Electrical Circuits	APPROVAL CLOSED
LHC-Q-ES-0004 rev 0.2	The Circuits of the Cryogenic System of the LHC	APPROVAL CLOSED
LHC-S-ES-0008 rev 0.3	Mesures de sécurité mises en oeuvre pour le test de pression de la QRL dans le secteur 6-7	UNDER APPROVAL
LHC-Q-ES-0003 rev 0.1	The Process of the Cryogenic System for LHC Functional Analysis	ENGINEERING CHECK

EDMS DOC NUMBER	TITLE	STATUS
LHC-CI-TP-0001 rev 1.0	The Commissioning of the Hardware in The LHC Sectors: Individual System Tests of the Powering Interlock Controller	RELEASED
LHC-E-TP-0001 rev 1.0	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: The Commissioning of the AC Electrical Distribution in the LHC Tunnels, Galleries and Caverns	RELEASED
LHC-GI-TP-0001 rev 1.0	Commissioning of the Low Beta Alignment and Repositioning Systems	RELEASED
LHC-MKI-TP-0001 rev 1.0	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: Individual System Tests of the Injection Kicker Systems MKI	RELEASED
LHC-D-TP-0002 rev 0.1	Commissioning of the Power Cables in the LHC underground area	ENGINEERING CHECK
LHC-DQ-TP-0001 rev 0.1	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: Individual System Tests of 13 KA and 600 A Energy Extraction Facilities	ENGINEERING CHECK
LHC-DQ-TP-0002 rev 0.1	THE COMMISSIONING OF THE HARDWARE IN THE LHC SECTORS: Individual System Tests of the Quench Protection System	ENGINEERING CHECK



# Documentation: IST (2) ...

EDMS DOC NUMBER	TITLE	STATUS
LHC-CBW-TP-0001 rev 0.1	Individual System Tests of the WorldFIP	IN WORK
LHC-YS-TP-0001 rev 0.1	The Commissioning of the LHC Access System	IN WORK
LHC-AB-TP-0001 rev 0.1	Collimator Final Assembly and Hardware Commissioning for LHC	IN WORK
LHC-BOC-TP-0001 rev 0.1	Individual System Tests of the Beam Instrumentation VME Crates	IN WORK

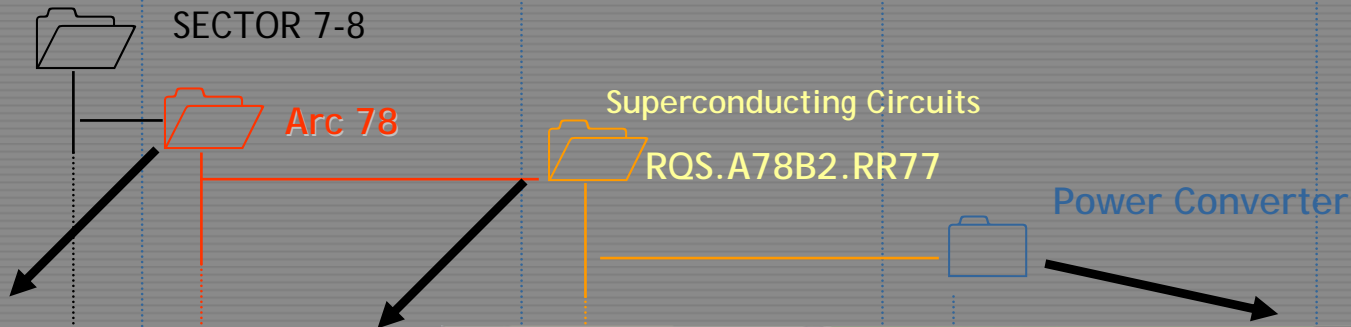
EDMS DOC NUMBER	TITLE	STATUS
LHC-PM-QA-0010 rev 1.0	Coordination for Hardware Commissioning: Document Plan, Information Management and Quality Assurance	RELEASED
LHC-PM-QA-0011 rev 0.3	LOGBOOK FOR HARDWARE COMMISSIONING: USER REQUIREMENTS	UNDER APPROVAL
LHC-PM-QA-0012 rev 1.0	MTF for the LHC Magnet Circuits. Design and Implementation	IN WORK

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# STATUS REPORT ON HARDWARE COMMISSIONING MTF

# The as-built documentation: MTF...

Sector                      Region                      Equipment group                      Equipment                      Components



**Sector 78**

Reset Set as Top Search

- Sector 78
  - Q4Q5D3D4.R7
  - Q6.R7
  - EE.R7
  - A78.LB**
  - TCL.7L8
  - Q6.L8
  - TCL.6L8
  - Q5.L8
  - DRIFT.L8
  - Q4D2.L8
  - TC.4L8
  - D1Q3Q2Q1.L8
  - LHC\_COMP.L8

**Sector 78**

Reset Set as Top Search Re-login

Top

EBARBERO

- Q6.R7
- EE.R7
- A78.LB
  - Orbit Correctors
  - Superconducting Circuits
    - DFBAN.7R7
    - RQS.A78B2.RR77**
    - RSS.A78B1.RR77
    - RSS.A78B2.RR77
    - RQTL9.R7B2.RR77
    - RQTL9.R7B1.RR77
    - RQT13.R7B1.RR77
    - RQT12.R7B1.RR77
    - RQT12.R7B2.RR77
    - RQT13.R7B2.RR77
    - RQTL10.R7B2.RR77
    - RQTL8.R7B2.RR77
    - RQTL8.R7B1.RR77
    - RQTL7.R7B2.RR77
    - RQTL7.R7B1.RR77
    - RQTL4.R7B2.RR77

**Sector 78**

Reset Set as Top Search Re-login

EBARBERO

- Sector 78
  - Q4Q5D3D4.R7
  - Q6.R7
  - EE.R7
  - A78.LB
    - Orbit Correctors
    - Superconducting Circuits
      - DFBAN.7R7
      - RQS.A78B2.RR77
        - Power Converter**
        - Power Interlock
        - Quench Protection
        - Cooling and Ventilation
        - Control
        - Power Cables
        - Cryogenics
        - El-ga

**MTF**  
Equipment Management Folder

User: EBARBERO

Search: Equipment | Location | Slot

### Slot Folder: Main Info

**Slot Identifier:** RQS.A78B2.R  
**Description:** Power Converter R for Hardware Commissioning

Main IST Documents

Actions: Edit | Attach Equipment

Slot main data

Type	RR00
Status	Manufacturing
Other Identifier	
Parent slot	
Location	

Installation data

Item	
Equipment	

Comments

## Magnet Circuit Related Systems:

AC Distribution

Powering Interlock for warm and cold circuits

Quench Protection System

Energy Extraction

Control – WorldFip, Logging, Post-Mortem

Cooling & Ventilation

Cooling

Power Cables

Electrical Quality Assurance

Power Converter

DFBs

Cryogenics

Vacuum

Access & Safety – LACS, LASS, RAMSES, ODH, Fire Detection and Evacuation

Launched discussion with ALL the groups in order to:

1. freeze MTF profiles that were already discussed: PIC IST, QPS, C&V, Cooling, Power Cables, ELQA, Power Converter, Cryogenics

2. create new MTF profiles: Energy Extraction, Control – WorldFip, DFBs, Access&Safety

The only equipments missing are AC Distribution, Control (Logging and Post-Mortem) and Vacuum.

Associated documentation has progressed

## Beam Related Systems:

### Beam Instrumentation

Controls + Energy Beam Meter

### Collimators

Kicker System

Diluters

Beam Interlock System

### Beam Dumping System

Beam Injection System

Radio Frequency

The discussion of the MTFs of beam related components was launched this May.

Beam Instrumentation (VME Crates) and Collimators have nearly frozen their MTF Profiles.

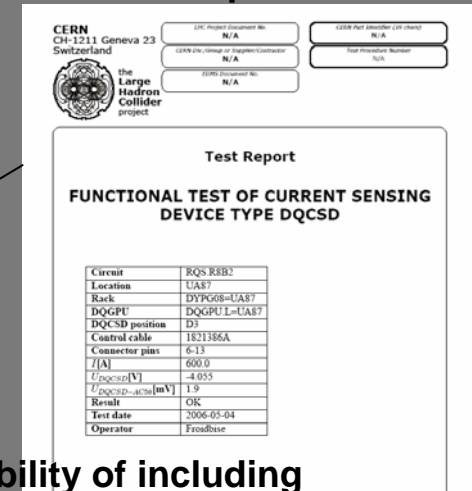
Discussions with Beam Dumping System + associated IST.

Associated documentation has progressed.

MTF is now a far more mature system:

## 1. Automatized upload through XML files: easy to attach documentation to the MTF steps !

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
- <limo:ImportData xmlns:limo="http://edms.cern.ch" version="1.5.2">
- <limo:Jobs>
- <limo:Job>
  <limo:Description>20-HCA PCSCT-PT Check of Current Sensor</limo:Description>
  <limo:Status>T</limo:Status>
  <limo:ActualStartDate>2006-03-31</limo:ActualStartDate>
  <limo:ActualEndDate>2006-03-31</limo:ActualEndDate>
  <limo:Result>Ok</limo:Result>
  <limo:ParentSlot id="RPMBB.UA47.RCS.A45B1" />
  <limo:ExecutedBy>MOURAO</limo:ExecutedBy>
  <limo:Comment>Place your comment here</limo:Comment>
  <limo:ResultDoc />
- <limo:Files>
  <limo:File>\\CERN\dfs\Users\r\rdenz\Public\MTF\DQCSD_RCS.A45B1_2006-03-31.pdf</limo:File>
</limo:Files>
```



## 2. Main parameter tab is fully developed now for Power Converters: possibility of including parameters that can be extracted with property reports.

**Slot Identifier:** RPHGA.UA83.RQ8.L8B1  
**Description:** Power Converter for Cold Circuits

Slot data | Installation & Commissioning | Documents

Actions :

External Property Values			
Property	Nominal Value	Value	Unit
Circuit Name		RQ8.L8	
I Ultimate		5820	
V Ultimate		8	
DCCT Type		6	

Property Values			
Property	Nominal Value	Value	Unit
HCA PCSCT-PT			
Name of Electrical Feeder			
8-Hour Heat Run I_Level			
HCA PCSCT-HR			
24-Hour Heat Run I_Level			

Layout  
Data Base  
Variables

Parameters associated to MTF steps



# MTF – Quality Assurance Approach

The improvements of the MTF Tool makes it more attractive to the equipment groups and this has helped to increase the Quality of the information traced in MTF.

- Quench Protection System: From a single step (10-Individual System Tests) now QPS is willing to track 10 steps with associated documentation.

**Slot Identifier:** DQ.RCBYH5.R4B2  
**Description:** Quench Protection

Slot data | Installation & Commissioning | Documents

Actions : **Create Job**

Job Id	R/E	Status	Description	Show Last Repeated
				Started   Ended   NC
<a href="#">12895726</a>		Pending	10-DYPB and DYPQ Isolation Tests	
<a href="#">13467406</a>		Pending	12-DYPB and DYPQ Functional Tests	
<a href="#">13467723</a>		Pending	14-Global Quench Protection Unit Funct. Tests	
<a href="#">13468040</a>		Pending	18-Hard. Current Loops Internal to QPS Check	
<a href="#">13468357</a>		Pending	20-Final Connect. and Powering DYPB and DYPQ	
<a href="#">13468674</a>		Pending	22-Quench Heater Magnets MB&MQ Funct. Tests	
<a href="#">13468991</a>		Pending	24-Selected Heater Firing Functional Tests	
<a href="#">13469308</a>		Pending	26-Quench Heater Insertion and Inner Triplets	
<a href="#">13469625</a>		Pending	28-Quench Protection System IST	

- Energy Extraction will track in 5 steps, add reports and register in a main parameter tab 16 parameters associated to the steps.

- Collimators will also use the main tab for the calibration parameters.

## MTF – Progress in the Data Upload

Loaded data for Sector 81, 45 and 78 (~ 1000 entries) for PIC IST and PCSCT: PIC, PC, QPS, EE and Control groups are familiarized with the upload process.

### Powering Interlock

**Slot Identifier:** CIP.RB.A81  
**Description:** Powering Interlock

The screenshot shows a software interface with a table of job data. The table has columns for Job Id, R/E, Status, Description, Started, and Ended. The first row is highlighted with a red circle around the Job Id '13460531'.

Job Id	R/E	Status	Description	Started	Ended
13460531		Done	10-Individual System Tests	2006-03-28	2006-03-28

### Power Converter Short Circuit Tests

**Slot Identifier:** RPTE.UA83.RB.A78  
**Description:** Power Converter for Cold Circuits

The screenshot shows a software interface with a table of job data. The table has columns for Job Id, R/E, Status, Description, Started, and Ended. The first row is highlighted with a red circle around the Job Id '12602178'.

Job Id	R/E	Status	Description	Started	Ended
12602178		Done	10-HCA PCSCT-PT Converter Connected to Grid	2005-09-27	2005-09-27
12602180		Pending	12-HCA PCSCT-PT Fast Power Abort Test		
12602181		Pending	14-HCA PCSCT-PT Loss of Cooling Water		
12602182		Done	16-HCA PCSCT-PT Convert.On/Control Loop Tuned	2005-09-26	2005-10-05
13292725		Done	18-HCA PCSCT-PT Test of EE with Current	2005-10-12	2005-10-13
12710109		Done	20-HCA PCSCT-PT Check of Current Sensor	2005-09-30	2005-10-10
12602183		Done	22-HCA PCSCT-PT PC Remote Operation Tests	2005-09-30	2005-10-11
12602184		Pending	24-HCA PCSCT-PT 8-Hour Heat run		
12602190		Done	26-HCA PCSCT-HR 24-Hour Heat Run	2005-10-12	2005-10-12
13116104	R	Done	26-HCA PCSCT-HR 24-Hour Heat Run (*)	2006-01-26	2006-01-26
12602189		Done	28-HCA PCSCT-HR 24-Hour Monit. Air/Water Temp	2005-10-13	2005-10-14

Ready to upload information within the next weeks for the IST of:

- Power Cables
- Cooling
- Quench Protection System
- Energy Extraction
- Control-WorldFip
- Beam Instrumentation-VME Crates

Sectors 81, 45 and 78 are implemented

### Cold regions definition:

MTF regions defined to match super-conducting electrical circuits and most of associated equipments (QPS, PIC, EE, Power Cables, Cooling)


but

need to match this granularity to: underground areas and concept of Point, which better fits to equipments such as: Control-WorldFip, Cryogenics, Access&Safety (LACS, LASS, RAMSES, ODH, Fire Detection, Evacuation), Cooling&Ventilation.

### Warm regions:

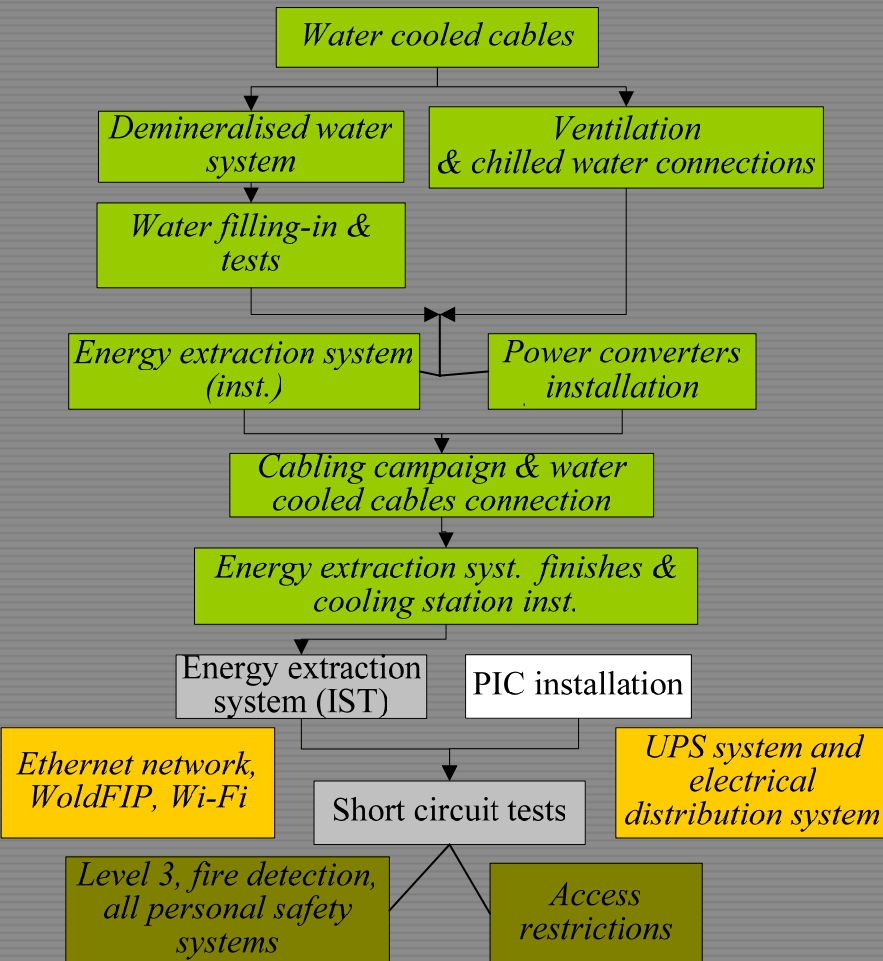
need further discussion after contact with beam-related groups. Problems of granularity appear also here, i.e. integration of the BI VME that are in surface.

The philosophy is to implement first MTF so that the information upload can start and finish the discussion on how to organize this information later.

<p>CERN CH-1211 Geneva 23 Switzerland</p>  <p>the <b>Large Hadron Collider</b> project</p>	<p>LHC Project Document No. <b>LHC-S-ES-0005 rev. 1.0</b></p>
	<p>CERN Div./Group or Supplier/Contractor Document No. <b>AT/CR-SC/GS-TS/IC</b></p>
	<p>EDMS Document No. <b>686040</b></p>
<p>Date: 2005-12-09</p>	
<p><b>Engineering Specification</b></p>	
<p><b>MESURES DE SÉCURITÉ MISES EN OEUVRE POUR LE TEST DE PRESSION DE LA QRL DANS LE SECTEUR 4-5</b></p>	
<p><i>Abstract</i> Ce document décrit les mesures (ballage, conditions d'accès, autorisation, ventilation, préparation, diffusion de l'information avant pendant et après les tests, système de sécurité, etc.) qui doivent être prises pendant le test de pression de la QRL dans le secteur 4-5.</p>	
<p><i>Prepared by :</i> Gérard Antoinet Krzysztof Brodzinski Roger Girardot Serge Grillot Evert Jonker Steffen Junker Juha Sakkinen</p>	<p><i>Checked by :</i> Claude Ducastel Joaquin Inigo-Goffin John Osborne Emmanuel Paulat Daniel Peytoud Germana Riddone Roberto Saban Manel Sanmarti Ralf Trant Marc Vadon Sylvain Weisz</p>
<p><i>Approved by:</i> Paolo Ciriani Philippe Lebrun Laurent Taviani Wolfgang Weingarten</p>	

- As an outcome of the previous Review, safety studies performed and related documents published and approved
  - Safety during IST and HC
  - Access conditions during QRL pressure tests and cold tests (sector and sub-sector)
- Implementation of Training Level 4 (risks related to superconducting electrical circuits and to operations with helium)
- Posting of signs and barriers performed in a perimeter defined by a global approach
- Safety chapter included in all IST and HC procedures
- “Visites d’inspection” are now fully integrated and monitored within the preparation activities for the tests
- Protocols for future activities should be prepared beforehand (Safety coordinators feel they are in many cases informed at the last minute)

# co-activities: from installation to IST and HC



- The re-cabling work in UA83 was a heavy task with impact on activities in both UA and RA
- Activities related to installation of inner triplets and their DFBXs, as well as to the preparation of cabling beforehand, have an impact on how the SCT are organized ...but this is nothing impossible to solve!
- Transport and SCT have been harmonized without major problem
- IST+HC activities are now integrated within the general installation schedule
- Despite some teething problems, no real showstoppers have been encountered so far!

Courtesy of E. Barbero/K. Foraz

- SCT: For most of the equipment, there is still an enormous feed back from tests performed towards the next tested areas; still new situations, new problems.
- Controls for SCT: it takes time to get tools in “production”, there is room for improvement- reliability is a must, we have to anticipate with dry runs as much as we can (for the powering of the s.c. circuits)
- Safety: a major step has been achieved to obtain integrated safety into the test procedures; documentation and training are adequate to the needs; a follow up of installations is needed (e.g. commissioning of safety systems, protections for DFB leads, etc)
- Interferences with co-activities have been solved without major problems on a week-to-week basis. Maybe there are problems to come ...
- **8:30 meetings (RAT) have proved to be a must!**
- **Regular reporting to TCC and global reports into MTF**



# hardware commissioning coordination

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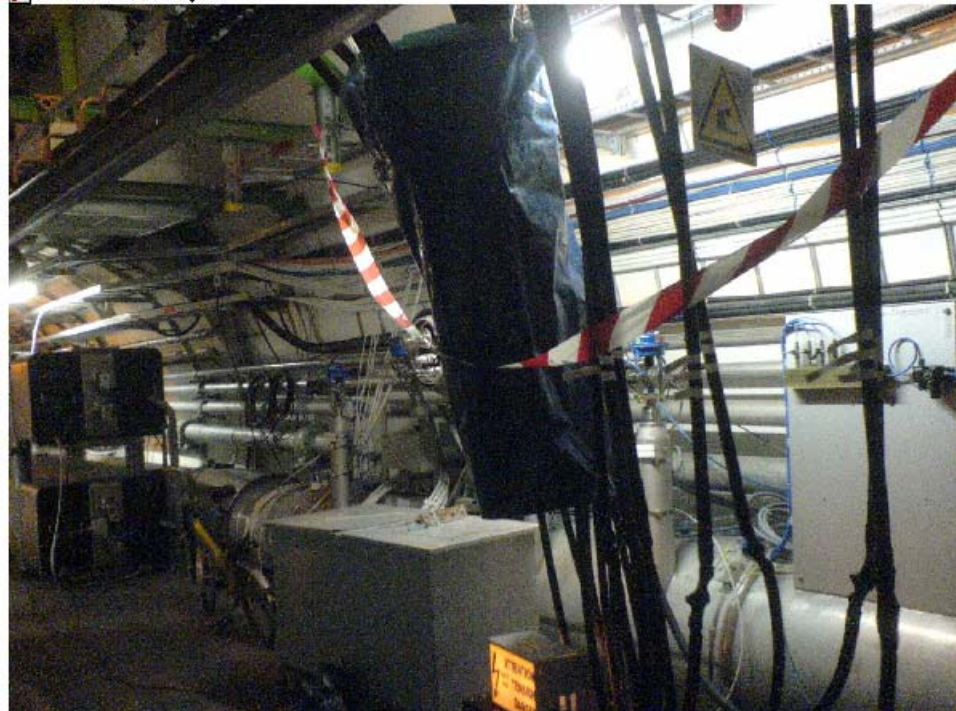
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## [une vue de la protection des cables 13kA](#)

une bache armee de fibres de verre a ete enroulee en 4 epaisseurs autour des cables refroidis et offre une bonne protection mecanique et electrique pendant les tests de courant ..quelques volts seulement...

 [RR77cables13kA.JPG](#):



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