



Powering Tests and Safety Summary and Conclusions

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Underground access during powering tests

- With the start of cool-down HWC takes the responsibility of the Sector. **Sector in Restricted mode.**
 - Rules and procedures for Access during powering are in place or being finalized (**assuming that all modifications are in place: ventilation doors reinforcement, etc**):
 - Access and Powering Conditions for the Superconducting circuits in the LHC (EDMS 1001985)
 - Access restrictions in LHC and SPS During LHC Powering Phase 2 (EDMS 1010617)
 - *Transition from Powering phase 1 to Powering Phase 2 and vice versa (EDMS1012328)* → **Ideally minimized but likely to occur during Week-ends, in particular at the beginning.**
 - **Important to read them and understand them: signature of an ADI IS NOT a stamp on the safety of the intervention**
 - Rules and procedures are designed to be **simple** but for that some flexibility might be lost
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Electrical Safety

- Interventions on electrical circuits (e.g. ELQA/IFS interventions) → actor to take care of requiring electrical safety conditions (e.g. Quench heaters discharged, etc.)
 - Clear list of elements and their location to be put in safe conditions to be made available (e.g. QH racks, etc.)
 - Electrical Safety subsector → key definition for Electrical Safety need to have drawings or better displays indicating the location and access/powering status → ongoing
 - Electrical awareness web course is needed for getting access rights → attend it
 - Yellow paper is your “access key” for safe electrical intervention
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Cryogenic safety

- Additional risks identified (partly as result of increased number of relief valves) but not only:
 - He release independently of powering (He-Jam and Multi He-Jams) in Phase 1
 - Massive He release during Phase 2 powering
- Bio-cell course will become obligatory for obtaining access rights
- Warm does not mean no risk (→ Cryo Consignation)
- Cryo permit is your “access key” for cryo-safety
- Main issues:
 - Installation of springs, mechanical protections and **deflectors** before they are actually needed → difficult for deflectors
 - Definition of compensatory measures and procedures to allow ELQA at cold and work around DFBAs (e.g. Cable re-connections) **if needed.**
 - **Need to define rules for ELQA**
 - **Need this before we start with Sector 12**
 - **Deflector installation be prioritized according to needs**
 - **Access conditions to be made public (EDMS, LMC)**

- Access will not be prevented but test will be stopped in case of incompatibility access conditions/test conditions → **Rely on the person giving access for unwanted stops of the tests**
- **Logic of the SW tools should be kept simple → interventions on FGC should be notified and agreed**
- **Current measure not latched**
- **SW interlock is meant to assist the operators/EiC only**

AN HELP IN DISTINGUISHING THE TWO PHASES

• The Powering to Nominal web page has been adapted:

Circuit type	Maximum current level
main dipoles	0A
main quadrupoles	760A
arc individually powered quadrupoles	900A
600A circuits	400A / 550A
120A orbit correctors	120A
60A orbit correctors	60A
Stand alone quadrupole	600A
Stand alone dipoles	1000A
Inner triplet quadrupoles (Q1+Q3/Q2+Q2b)	L_PCC

N.B. It is not a safety measure, but just a "guideline". For the HW/SW tools, refer to Laurette's.

More tools

Powering phases are now defined as a sector mode : this is defined in LSA : sequence available to change it
The display will show the mode of each sector and the access conditions (still in preparation...)

Sector	Mode	Access	people in zone
Sector 12	PO phase 1	Access OK	0
Sector 23	Cool down	Access OK	0
Sector 34	PO phase 2	Access OK	0
Sector 45	Shutdown	Access OK	0
Sector 56	PO phase 1	Access OK	2
Sector 67	Cool down	Access OK	3
Sector 78	PO phase 1	Access OK	1
Sector 81	Cool down	Access OK	9

Visual for another fixed display, as help for volunteers giving access :

IN	ITX 1R	LSS 1 R	Arc 12	LSS 2L	ITX 2L
ON	ROX	IPD/IPQ/cor	RB/RQ/600A	IPD/IPQ/cor	ROX



Some remarks

- Reliability of the access systems will be vital
 - Discipline during access is needed
 - ➔ Check you access path (in doubt check with the Point Owner)
 - ➔ impact of forced door is large (you will pay for that!!!)
 - Understanding of the rules and overview of the powering is needed at all times
 - Attention when only part of the machine will be powered
 - Discipline and advance preparation and announcement of interventions is needed
 - Prioritization of the modifications related to new safety requirements adapted to schedule ➔ ongoing. Important to maintain coherence
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- Safety of people has always the highest priority
- All work, tests, interventions must be planned, prepared, authorized and the agreed procedures respected

There are several colleagues prepared to help for any kind of questions

- Ghislain Roy and his team
 - John Robert Etheridge, Emmanuel Paulat, Michel Arnaud
 - Safety commission (B.Delille and colleagues)
 - and for the coordination the Hardware Commissioning Team (point owners) and the Shutdown Coordination Team
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Many thanks to all the speakers

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organizing this workshop**