Access system and radiation monitors session (session 5)

Topics and subjects discussed

Main issues

Magali Gruwé and Tomasz Ladzinski

5th February 2010

Program

What went wrong with the access system and procedures?

What would we wish to change?

What are the current issues?

- Laurette Ponce (BE/OP):
  - "How did the LHC access system perform in 2009?"
- Julie Coupard (EN/MEF):
  - "How should the access system be operated while LHC is not in beam operation?"
- Marc Tavlet (BE DSO to be):
  - "Is there a need for re-sectorization and/or additional interlocks?"

How can/will these issues be addressed?

What are the consequences for the access system?

- Rui Nunes (GS/ASE):
  - "Impact of safety related requirements and evolutions on LASS and LACS"
- Timo Hakulinen (GS/ASE):
  - "How to achieve satisfactory performances of the access system: stability, efficiency, operation, fluidity?"

What else may have an (indirect) impact on availability of LHC? Radiation monitors

- Doris Forkel-Wirth (DGS/RP):
  - "Arcon/Ramses: current status and operational risks"

Layout

- Organizational issues
- Sectorization: Justification and implications
- Access system performance
- How to improve access fluidity
- MAD
- Radiation monitors

Access organization: responsibilities

J. Coupard

Planning and coordination

Machine Status	Schedule Steps	Planning	Coordination
TECHNICAL STOP	Technical Stop	EN/MEF	EN/MEF
SHUTDOWN	Safety	EN/MEF	EN/MEF
	Activities		
	Preparation for commissioning		
	Patrols		
COMMISSIONING	Powering Tests - phase 1	EN/MEF (general overview) BE/OP (in detail)	BE/OP
	Powering Tests - phase 2		
OPERATION	Preparation for BO	BE/OP	BE/OP
	Beam Operation		

Safety coordination

Machine Status	Schedule Steps	DSO	TSO / Site coordinators	Safety coordinators
TECHNICAL STOP	Technical Stop	BE	EN/MEF	YES
SHUTDOWN	Safety	EN	EN/MEF	YES
	Activities			
	Preparation for commissioning			
	Patrols			
COMMISSIONING	Powering Tests - phase 1	BE	EN/MEF	YES
	Powering Tests - phase 2			
OPERATION	Preparation for BO	BE	EN/MEF	/
	Beam Operation			

Access organization: AET

J. Coupard

- Introduction of the AET (**Avis d'Exécution de Travaux**):
  - To be put in place before next shutdown
  - A streamlined ADI + AOC + …
  - One single document including links to VIC, DIMR, locking of equipment, hot work permit, etc… (as needed)
  - Including specific list of people who will intervene, BUT: list that could be edited even after approval of the document

Operation of the access system

J. Coupard

Machine Status	Schedule Steps	Access mode	Access console	Patrol Leaders
TECHNICAL STOP	Technical Stop	RESTRICTED	BE/OP	EN/MEF & BE/OP*
SHUTDOWN	Safety Activities Preparation for commissioning	GENERAL	/	/
	Patrols	PATROL	BE/OP	EN/MEF
COMMISSIONING	Powering Tests - phase 1	RESTRICTED CLOSED	BE/OP	EN/MEF & BE/OP*
	Powering Tests - phase 2			
OPERATION	Preparation for BO	RESTRICTED CLOSED	BE/OP	EN/MEF & BE/OP*
	Beam Operation	CLOSED	/	/

- BE/OP to give access…
  - Do we need more people qualified/habilitated to give access while not in Operation?

Current sectorization: Implications

M. Tavlet

- Current sectorization fulfills the safety functions for which it has been designed: protect people from ionizing radiation
- But:
  - **No opening of the inter-site doors** when in RESTRICTED access mode
    - Heavy constraints for people who need to intervene on site
  - Access sectorization as we know it:
    - Does not match the newly discovered needs of hardware commissioning: **strong access restrictions during powering Phase II**
  - Access system now also used to protect personnel from the risk of major Helium release without having been redesigned
    - **Need to re-adjust ventilation sectorization to access sectorization**
    - **Should it include other interlocks?**

Circulation through inter-site doors

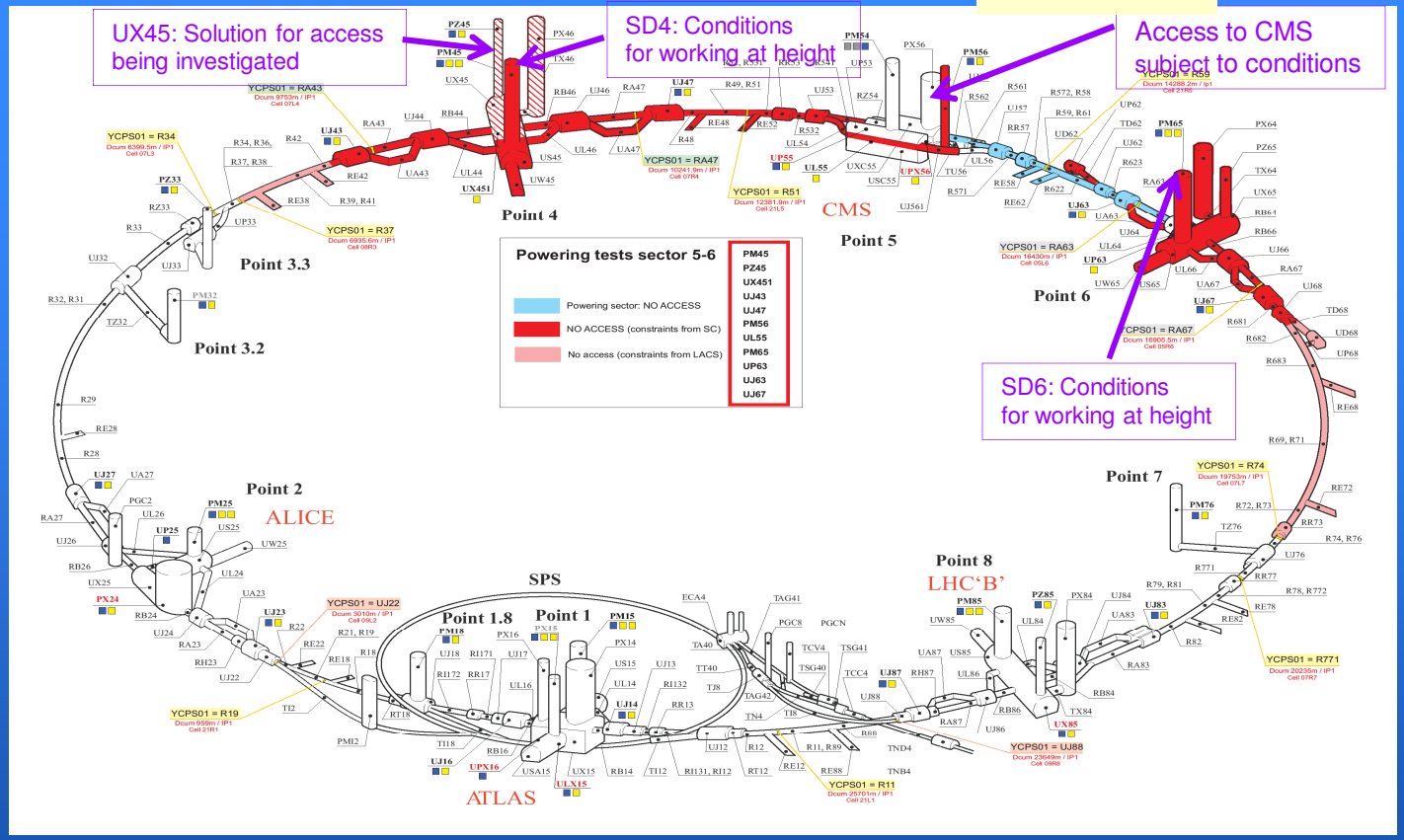
M. Tavlet and J. Coupard

- During shutdown and hardware commissioning phase circulation through inter-site doors is an issue:
- Solution?
  - Go to general mode?
  - BUT:
    - Loose patrol: issue for the localization of people
    - Some areas will soon remain in restricted or closed mode (for radiation reasons)

Access restrictions in powering Phase II

M. Tavlet

- Example:

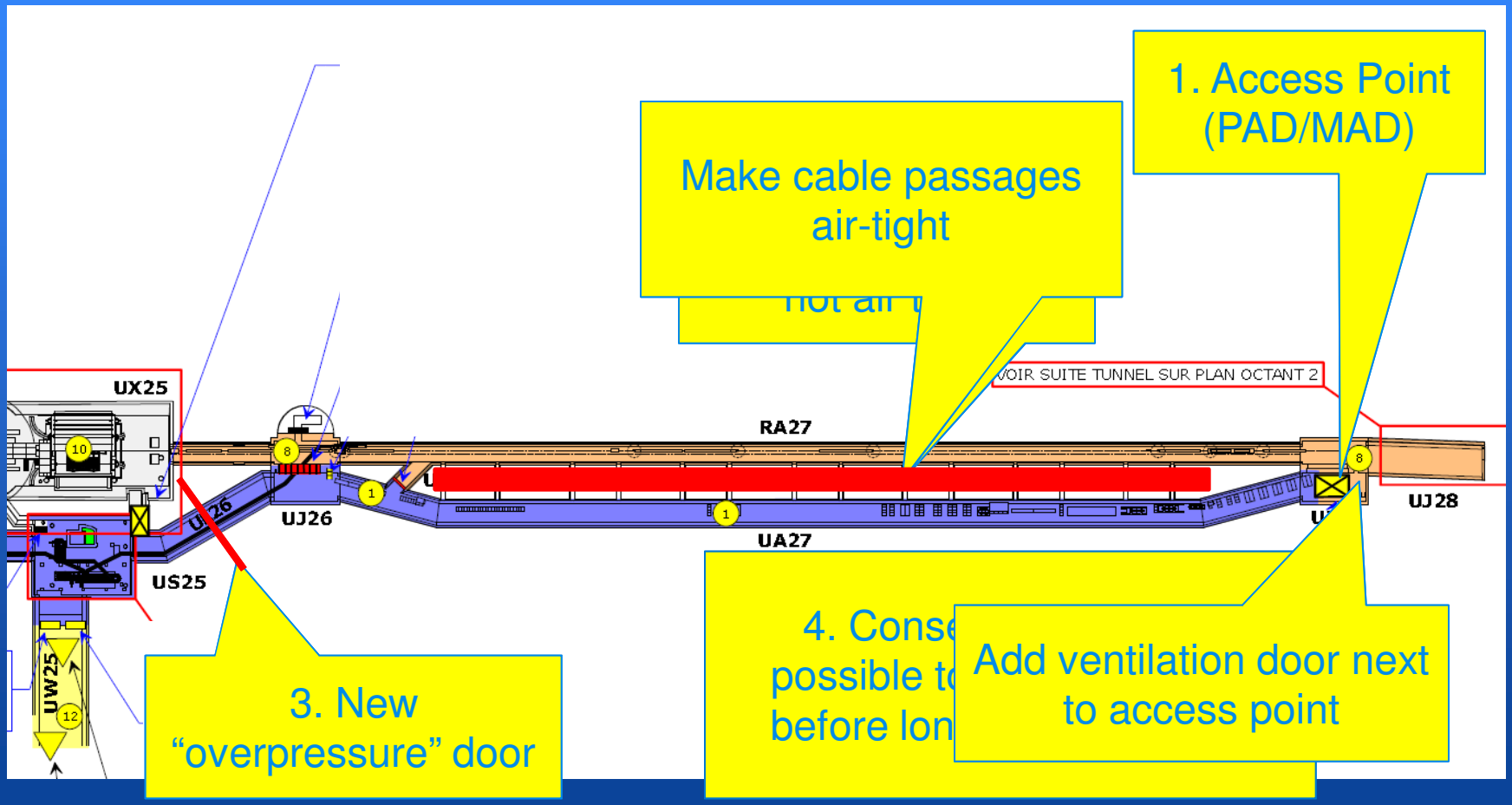


- How to address the issue?
  - Add more access points? Any useful/desirable?
  - Long term need?
  - Satisfactory for safety? Risk analysis required!

Access versus ventilation sectorization

R. Nunes and M. Tavlet

- Need to re-adjust ventilation sectorization to access sectorization



Interlocks (I)

L. Ponce and M. Tavlet

- Should the LASS have a new role, i.e. protect people from other risks than radiation?
  - Interlock cold magnets power converters with LASS?
    - Currently software interlock (Laurette's interlock)

LASS-Power Converters Interlock

L. Ponce

- Principle:
  - In addition to the existing procedure
  - Prevents powering above the Phase I current limit when people are in the zone
  - Stops the Power Converters of the relevant area when people enter a zone
- Implementation:
  - Uses the Software Interlock System
    - To generate the logic (between the access conditions and the current read in the Power Converters)
    - And to send commands to the power converters via the PIC
  - Action: in case conditions are not met:
    - A global REMOVE Power Converter permit of the relevant sector is sent… causing a Slow Power Abort
- Issue: Long chain of different software modules to connect the signals
- Question: **Move towards a HW link between the LASS signals and the Power Interlock Controller for a long term solution?**

Interlocks (II)

R. Nunes and M. Tavlet

- Should the LASS have a new role, i.e. protect people from other risks than radiation?

  - Interlock cold magnets power converters with LASS?
    - Currently software interlock (Laurette's interlock)
    - Needs further investigation
      - Is there a real need for this interlock (in the long term?)
    - Needs risk analysis
  - New interlock for fresh air supply?
  - Interlock ventilation doors (new over pressure doors) with LASS?

Access system performance

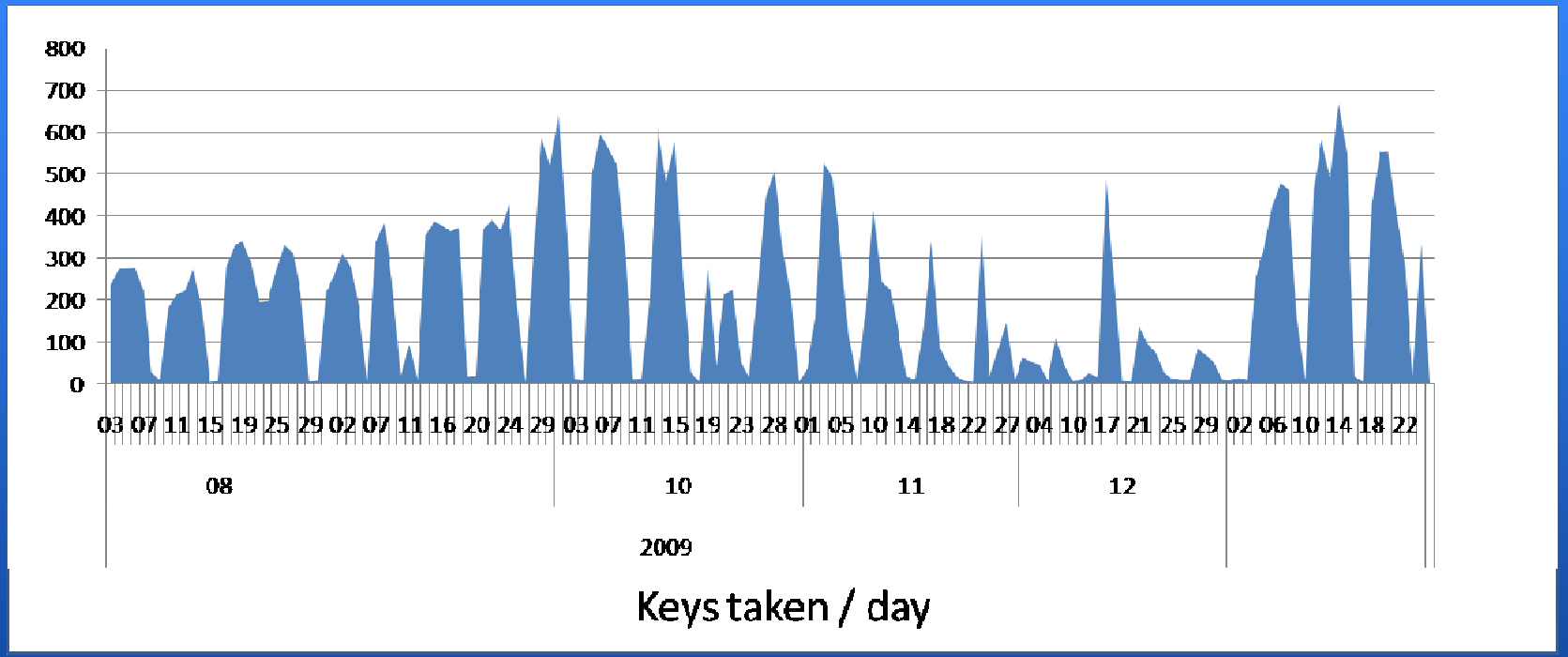
L. Ponce

- LACS:
  - Electro-mechanical problems on MAD, PAD, doors:
    - Impact in 2009:
      - Mainly a problem during HWC period, after a long shutdown
    - Most problems solved
  - Key distributors:
    - Impact in 2009:
      - Blocking possibility to switch back from access mode to beam mode
    - Currently: much improved situation but still some mechanical problems
  - Simultaneous opening of both PAD doors: patrol drop
    - New software implemented just on time for beam operation
    - But still occasional patrol drops
- LASS:
  - Only few changes since 2008, validated by the successful DSO tests
  - Connection with EIS-beam to be revisited to allow testing flexibility

Access system performance: Statistics (I)

T. Hakulinen

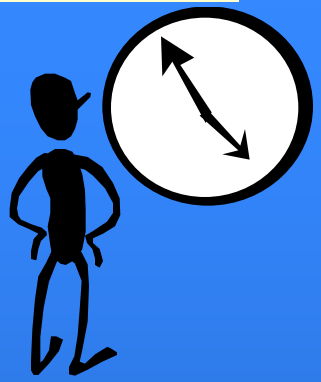
- August 1st, 2009 till January 23rd, 2010:
  - Total accesses: 181893 (average 1033 / day)
  - Accesses in Restricted access mode: 33676 (**average 191 / day**)



- **Busiest day** for operators: January 14th, 2010:
  - Accesses in Restricted access mode: **670 keys taken**

Access system performances: Statistics (II)

T. Hakulinen



- User waiting times from call to operators to access:
  - Subjective estimates based on experience
  - Still needs a proper distribution for analysis
- Best case: < 1 min (no rush, ADI ok, system ok)
- Normal: 1 – 5 min (normal operator load)
- Worst case: 30 min – ∞ (big rush, multiple access points at the same time, technical problems)

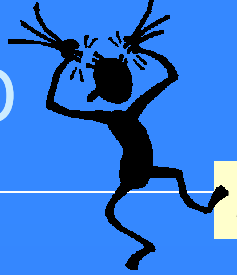
- Normal procedure:
  - 1: user calls and gives ADI – 2: operator checks ADI in EDH – 3: operator gives key to user – 4: user enters zone
  - Repeat until all users passed
- Experienced operator performance: ~1 min / call

How to improve access fluidity?

T. Hakulinen

- Technical improvements and bug fixes:
  - Correction of persistent software bugs and new ergonomics of the console windows
  - Solving network problems (IT issue)
  - Biometry on badge (to avoid dependence on network)
- Change of RESTRICTED access procedure:
  - Allowing multiple key distribution for a group entering together, i.e. separating the safety token delivery from the PAD entrance cycle.
- Organization and technical change:
  - Additional filter (valid AET) applied on the access requests:
    - Access request not treated if no valid AET

MAD



L. Ponce and R. Nunes

- Detection of personnel in Material Access Devices:
  - Ongoing issue since 2008
  - Improvements in place. BUT:
- Sensitivity versus rate of false detections is an issue
- At the limit of what is possible with the approach taken. Pending actions:
  - Making the personnel detection process fail-safe
  - Fine-tuning (but is it really possible any further?) and acceptance
  - Technological redundancy…
- Change strategy?
  - Remote human video control on demand / compensatory measures (guards on sites)
  - Explore different areas of technology (redundant system)

Radiation monitors

D. Forkel-Wirth

- RAMSES system for LHC: proven reliable
  - Decentralized system and autonomous (internal battery)
    - Detector-alarm units operate autonomously: continues to operate even if the rest of RAMSES fails
  - Areas well covered with monitor stations
    - In case of failure: single channel fails: radiation monitoring ensured by remaining channels
- ARCON system for LHC injectors:
  - In case of failure: several channels fail: whole area without radiation monitoring!
  - Major issue: spares missing!
  - Operational risk: faulty ARCON equipment: beam stop for 1-3 days
  - To be phased out and replaced by RAMSES:
    - First phase (RAMSES-light, for the LHC injectors) before end of next shutdown

Conclusions (summary of summary)

No problem* with personnel safety
but issues with availability of the LHC

- LACS:
  - Ongoing issues
  - Improvements expected (for fluidity)
- Safety issues:
  - *Ongoing (never ending?) MAD issue
  - Working group to be started to address:
    - Possible new sectorization (needs and risk analysis)
    - Possible additional interlocks (needs and risk analysis)
- Operational risks:
  - ARCON to be phased out