ACCES SYSTEMS DURING THE LHC INJECTION TESTS

S. Grau, P. Ninin, T. Ladzinski, L. Scibile, CERN, Geneva, Switzerland

Abstract

The temporary access system required for the LHC Injection Tests is described. Special hardware needed is listed as well as the software necessary to monitor the access. The procedures and limitations for accessing the zone are also described.

INTRODUCTION

During the LHC Injection Tests, the LHC Access Systems shall protect the personnel against radiation hazard generated by the presence of the beam. Therefore, access doors must be interlocked to disable beam in case the safety conditions are violated.

The LHC Injection Tests represent a very important milestone for the *LHC Access Systems* [8]. This is a real scenario test for the *LHC Access Control System (LACS)* [5], for the *LHC Access Safety System (LASS)* [2] as well as for the access procedures [1].

This paper describes the configuration of the access systems during and after the tests, as well as the challenges in terms of planning and coordination to meet this milestone.

ACCESS EQUIPEMENT

Access equipment to surface areas of Points 7 and 8 must be installed at their nominal location and be fully operational by the LHC Injection Tests. Access to machine areas of Point 8 will be possible through PM85 and access to LHCb through PZ85. Concerning Point 7, access will be done through PM76.

The same requirement is applicable for access equipment to underground areas around Points 7 and 8. The only exceptions are the two intersite doors of sectors 8-1 and 7-6 that will be temporally installed at several meters from their nominal position. The first one limits the access to the TI8 areas, the second one to the sector areas, during the tests. Access equipment installed in the underground areas is distributed over 18 patrol sectors, 5 in Point 7 and 13 in Point 8.

In particular for Point 8, a shielding wall between the experimental and the service areas shall be mounted to enable access to the service areas during the tests.

Access equipment shall also be deployed at the CCC. This concerns the man machine interfaces that will permit the operation and supervision of the LHC Access Systems, the external interfaces to alarm systems, the enrolment desks, the central servers, the database for authorisation and archiving, the audio and video controllers, and the maintenance and configuration workstations [2], [5].

The total number of equipment involved in these tests is presented in Table 1. This represents 20% of the LHC Access Systems infrastructure.

Access equipment	LHC 7	LHC 8	CCC
Personnel Access	1	6	
Material Access	1	5	
Sector doors	8	11	
End of Zone doors	2	13	
Shielding walls	1	4	6
Racks	12	20	6
CCC computers			10
Patrol sectors	5	13	
TOTAL	**30**	**72**	**16**

Table 1: Access equipment for LHC Injection Tests

ACCESS INTERFACES

For the LHC Injection Tests two interlock chains must be connected to the LASS [3]. The first one, referred to as SPS Chain 3, prevents the beam from being transferred down the tunnel TI8. The second one, referred to as LHC Chain 8, prevents the beam from being injected to the LHC at Point 8. The integration of the above mentioned interlock chains to the LASS leads to the interfaces presented in Figure 1 and described below.

The LASS system is based on a safety PLC architecture and a redundant cable loop [4]. The PLC architecture consists of an *Access Safety Central Controller* located at the CCC that gathers and distributes safety information/commands from/to the *Access Safety Local Controllers* located at each site. The communication between the controllers is ensured by a redundant and dedicated transmission network (optical loop, copper cables). For the LHC Injection Tests, only the central controller and the LHC8 and LHC7 local controllers will be connected.

The *Access Safety LHC8 Controller* will interface the three *Elements Importants de Sûreté (EIS)* of LHC Chain 8: TED 87765, MBIAH 8783M and MSIB 8813M. The interlock with this equipment is done at the EIS control system level except for the MBIAH 8783M which is done also at the 18 KV level.

The *Access Safety LHC7 Controller* will not interface an EIS-beam. The circulating beam EIS of Point 7 will not be interlocked during the tests.

Both controllers of LHC7 and LHC8 will interface with the access equipment and evacuation systems of each site. The interface with the evacuation system is required to trigger the *Beam Imminent Warning* (BIW) sirens that indicate an imminent presence of the beam in each sector.

The Access Safety Central Controller will interface with the *Beam Interlock Controller* (BIC). Whenever an access condition is violated, the LASS will ask the BIC for a correct stop of the beam. In the same way, the Access Safety Central Controller will interface with the SPS Access Safety System to interlock the equipment of the SPS Chain 3.

The central controller will also interface with the operational consoles at the CCC [9] to acknowledge the operational modes defined by operators and distribute them to the different local controllers.

The redundant cable loop will be connected to the access equipment of the external envelope of Point 7 and Point 8, to detect an intrusion. The cable loop will then directly interlock the EIS of the LHC Chain 8 and the SPS Chain 3, independently of the PLC system.

During the tests, access to the interlocked areas of Point 7 and 8 will be closed. If short access periods are required for maintenance purposes, the access will be done in a restricted mode. Access to non interlocked areas will remain open.

After the tests, LACS access equipment of Point 7 and 8 will remain fully operational. LASS access equipment will be disconnected to progressively include the remaining sites. The areas with high radioactivity levels, also named Supervised Radiation Area will require a personnel dosimeter. Access to these areas will be controlled by the LACS system but they will not be confined by access doors [6].

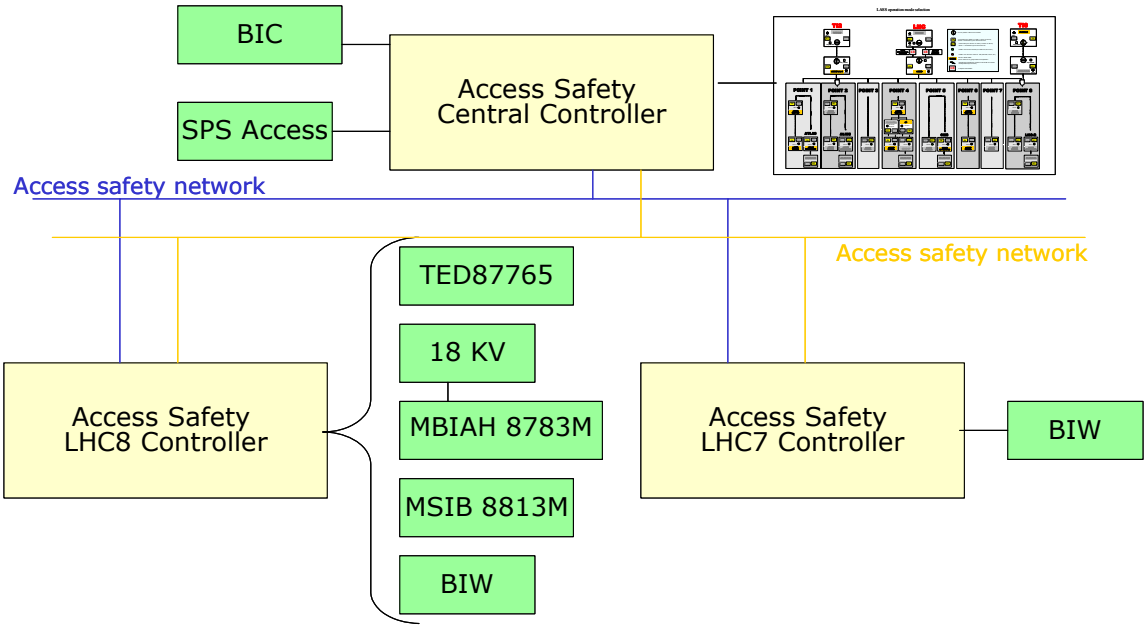

Figure 1: LASS Interfaces for the LHC Injection Test

ACCESS PROCEDURES

It is estimated that for the LHC Injection Tests, 500 people will access the concerned areas. Authorization to these areas will be given by the DSO or the GLIMOS, under the approval of AB/OP. This means that new identifiers, to be attached to the Personal Dosimeters, will be distributed to the concerned people. These personnel will have to follow an enrolling campaign to introduce their biometric data into the system.

In order to close the access to Point 7 and 8 for the start of the injection tests, patrol teams will certify that nobody remains inside the eighteen patrol sectors, and will close all the access doors. To achieve this goal, patrol procedures must be defined and tested, the patrol teams trained, and the access system configured.

PLANNING

The main difficulty of planning the installation and commissioning of the access equipment is minimizing the impact on the parallel works taking place in Points 7 and 8.

The most suitable solution to meet this goal is to install underground equipment before the Hardware Commissioning [7] and pit head equipment during the cool down, where low traffic is expected.

During the installation of the PM85, the PZ85 will remain operational to access the machine and experimental areas.

COORDINATION

To achieve this important milestone, many tasks running in parallel need to be completed following a

specific order and in accordance with the LHC Installation and Commissioning schedule constraints.

In addition to the different project actors responsible for the achievement of individual tasks, the role of the Injection Tests Coordinator has been introduced. The objective of this project actor is to have a transversal view on the running tasks, identify critical or missing tasks, find out potential solutions and report to the project leader.

CONCLUSION

During the LHC Injection Tests the LHC Access Systems shall protect personnel against radiation hazard generated by the presence of the beam.

This is a very important milestone for the access systems. Installation and commissioning of access equipment and interfaces is scheduled and organized to achieve this goal, a goal that represents 20% of the LHC access systems infrastructure.

ACKNOWLEDGEMENTS

This paper reflects the work of the *LHC Access Project* team: J-F Juget, S. Di Luca, G. Roy, E. Sanchez-Corral, G. Smith, L. Hammouti, T. Riesco, N. Rama, M. Munoz.

REFERENCES

[1] P. Ninin & all, LHC Access, Where do we stand, LHC Project Workshop Chamonix XIV, January 2006.

[2] P. Ninin, T. Ladzinski, Spécification technique détaillée du système de sûreté d'accès, EDMS 571277.

[3] P. Ninin, F. Rodriguez, Description des interface avec les éléments de la machine, EDMS 456769.

[4] M. Munoz 4, Spécification technique de la voie câblée, EDMS 69585.

[5] L. Scibile & all, "Technical Specification for the Design, Supply, Installation and Maintenance of the LHC Access Control system, EDMS: 399737.

[6] H. Vincke, "Radiation Issue", LHC Project Workshop Chamonix XIV, January 2006, Session 9.

[7] R. Saban, " Hardware Commissioning", LHC Project Workshop Chamonix XIV, January 2006, Session 9.

[8] M. Lamont, http://lhc-injection-test.web.cern.ch/lhc-injection-test/

[9] L. Hammouti, M. Munoz, Spécification du pupitre de contrôle du LHC, EDMS : 578789.