BLM System Audit Sequel

Eva Barbara Holzer, CERN

MPP

CERN, July 31, 2009

List of auditors

Audit Sequel June 2009:

- Stefan Lüders IT/DI (chair)
- Joachim Bächler BH/DT
- Reiner Denz TE/MPE
- Stefan Haas PH/ESE
- Richard Jacobsson PH/LBC
- Javier Serrano BE/CO
- Yves Thurel TE/EPC

Audit June 2008:

- Miguel Anjo (IT/DM)
- Joachim Bächler (PH/DT)
- Philippe Farthouat (PH/ESE)
- Stefan Haas (PH/ESE)
- Stefan Lüders (IT/CO)
- Javier Serrano (AB/CO)

Agenda

9:00-10:00	Beam Interlock System Changes Following the 2006 Audit	Benjamin Todd
10:00-11:00	Beam Dump System follow-up from the 2008 Audit	Jan Uythoven
11:00-11:30	BLM 2008 audit follow-up	Bernd Dehning
11:30-11:50	BLM: comparison threshold settings with loss measurements and management of threshold storage	Mariusz Sapinski
11:50-12:10	BLM ionization chamber space charge and procedures for changes of system settings during LHC running period	E. Barbara Holzer

Scope of the 2008 Audit

This audit is supposed to verify design & implementation of the BLM:

- Fundamental design decisions
- PCB schematics & layouts, FPGA programming
- Interface to the Beam Interlock Systems (BIS)

Particular focus put on safety relevant aspects:

- Safe and efficient operation of the LHC
- Sufficiently high reliability and availability
- Management of threshold values
- Single points of failures AND failure modes leading to blind faults

This audit did not cover

- In-depth verification of the FMECA (Failure Modes, Effects and Criticality Analysis)
- Placement of the ionization chambers
- System software running on PowerPC & high-level control systems

Follow-up report on the Audit Sequel

- The Follow-Up Board considers 31 (out of 46) recommendations of the initial audit as properly and sufficiently implemented, including most of the major ones.

- Most of the remaining, open recommendations are pending implementation during 2009.

- Of those, the Board would like to express *particular concern* about *the lacking procedures for changing threshold and configuration values in the Master and Stage tables*. This includes the *lack of software tools to detect erroneous values as well as to identify locations with too many disabled BLMs*.

- The Follow-Up Board is confident that the BLM team will properly implement the open recommendations.

Pending Items

3. Determine baseline shifts to BLM signal ->measurements

8. Deploy application to minimize erroneous values -> being developed *(expert THRESHOLD application)*

11. Provide alerts if a region is undermined -> being developed *(expert THRESHOLD application)*

21. PCBs: Conduct accelerated thermal aging tests -> 2009

23. Perform accelerated testing of power supplies in LSS -> 2009

24. Perform accelerated testing of power supplies in arcs -> 2009

29. FPGA programming: Agree on set of design rules -> group project

32. FPGA design: Conduct complete review -> BIS experience

34. EMC: Conduct Walkie Talkie tests: *Pending, although no problems have been seen so far in the injection regions.* -> 2009

39. Perform analysis of SEUs on the FPGA -> done for tunnel FPGA

43. Perform combined system tests with BIS -> 2009

Items with remarks

1. Summarize the results of all beam loss scenarios:

   During the 2008 important measurements with the BLMs have been performed. These measurements lead to a better understanding of the simulations and will allow for improved predictions of the expected BLM responses. Even if these simulation studies are now complete, the Board was not able to judge whether the locations and distribution of BLMs within the LHC tunnel have finally been validated and confirmed.

10. Deploy application to handle "maskable" and "disable" flags:

    According to the BLM Team, the "maskable" flags will not be used. However, the Board would like to stress that monitoring the "disable" flag is mandatory.

    -> being developed (expert THRESHOLD application)

Items with remarks

14. Implement on-disk back-ups:

OK, even if on-disk back-up have not been implemented, since the back-up of data bases follows the standard good practices of the IT/DES group. These good practices, including weekly recovery tests, are applied for all IT/DES managed data bases and considered sufficient by the Board.

15. Investigate merging MTF and Layout DB:

OK. The Board acknowledges that this is a design issue unrelated with the BLM.

16. Obtain SLA with IT DB: *This has been rejected by the involved groups. The Board disagrees with this decision.*

17. Obtain SLA with BE/CO/DM: *This has been rejected by the involved groups. The Board disagrees with this decision.*

Items with remarks

41. Use input testers: *OK. The Board acknowledges the residual risk of failing connections due to the usage of input testers. As long as the radioactive source tests are performed, the usage of input testers can be omitted.*

45. Set-up vertical slice test: *OK. The Board agrees with the plans for a vertical slice tests bench at point 2.*