# Comparison of BLM threshold settings with loss measurements

## and

## management
## of threshold storage

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# Outlook

- Quench test on LHC in 2008

- New software to manage thresholds and other LSA settings

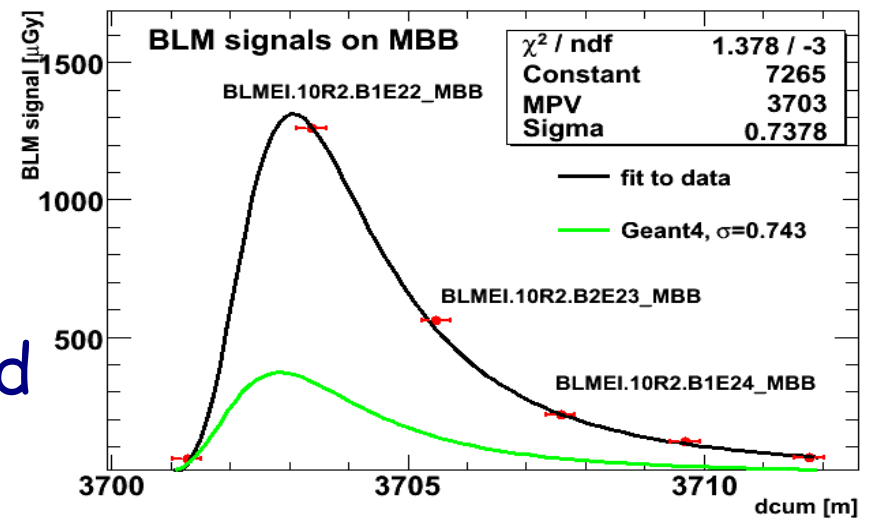- Answers to last year Recommendations
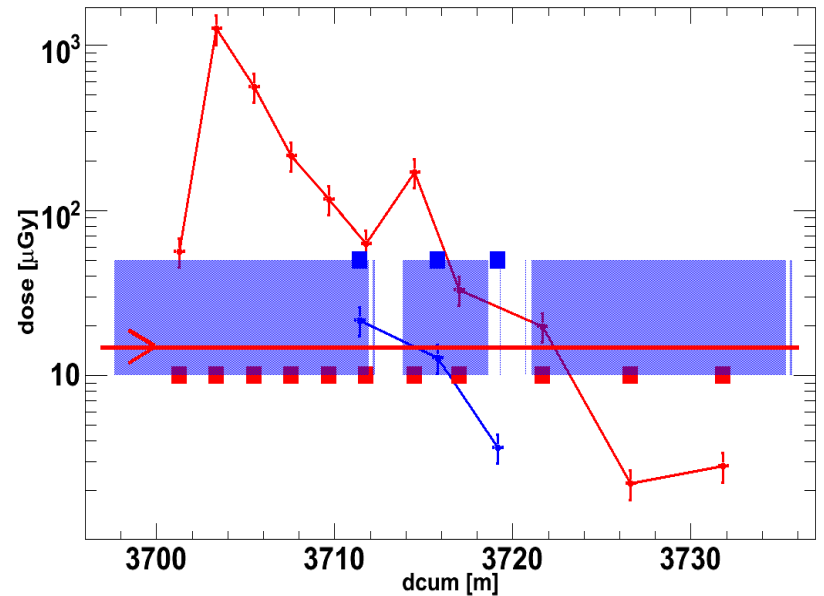
# Quench tests 2008



- 2 quenches happened in 2008 when beam was present in the machine

- In both cases MB quenched

- In both cases, according to QPS measurements, the coil was recovering to superconducting state, but the quench heaters has been triggered ⟶ Quenches perfect for calibration
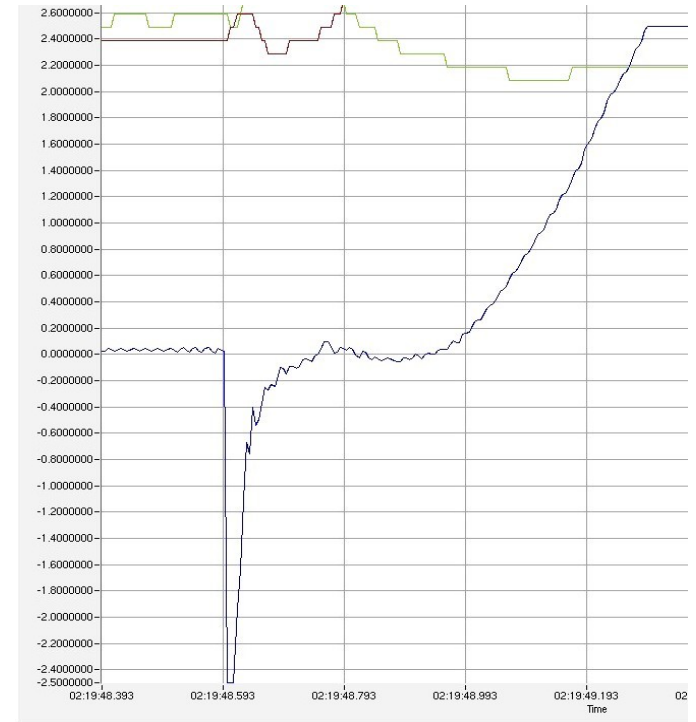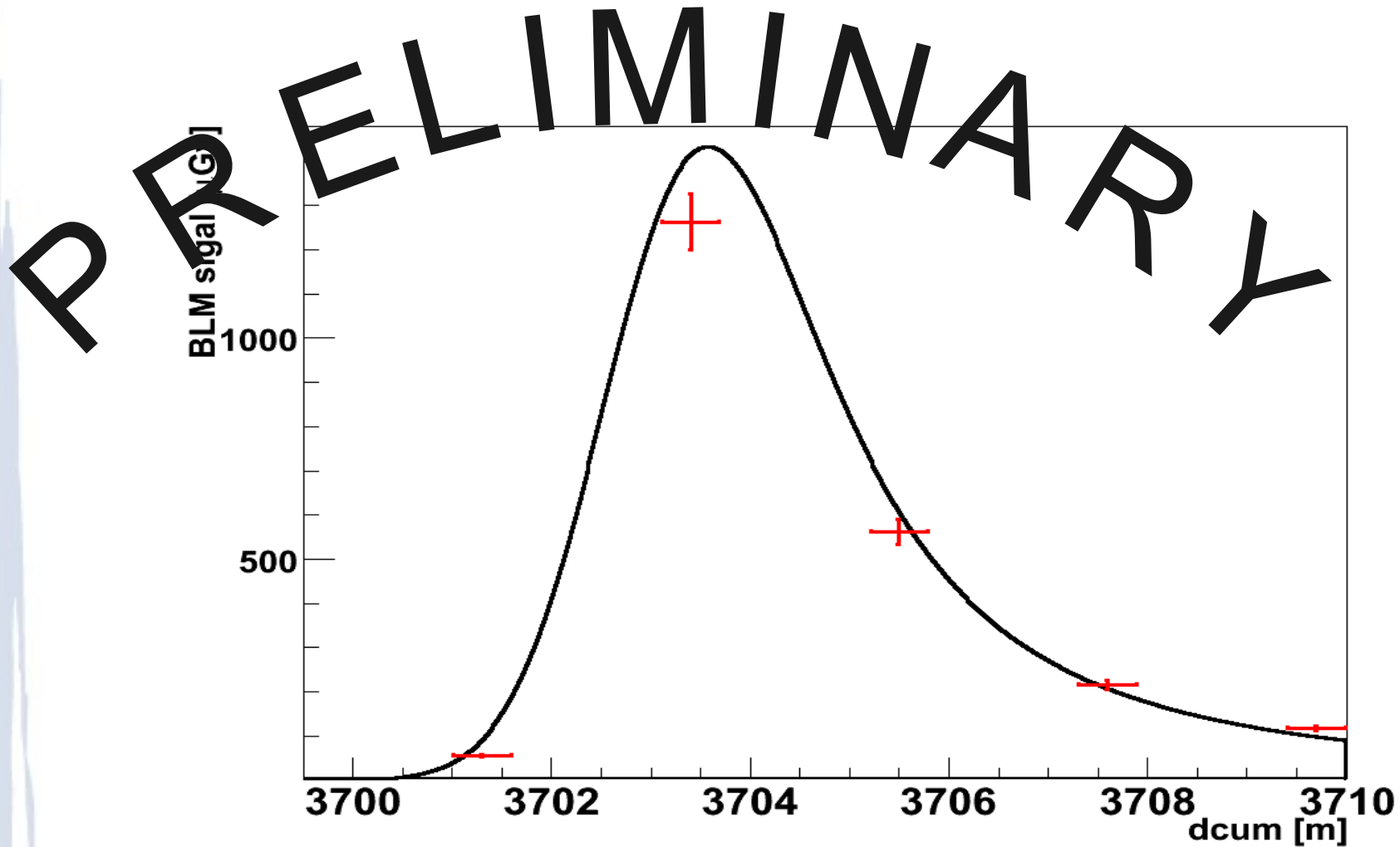
# Second quench

- September 7th 2008

- $2 \cdot 10^9$ intensity

- Large impact angle (about 750-1000 µrad)

- Signal 3 times higher then expected

- Corrections to simulations (LHC tunnel, thermal neutrons)

- Simulations indicate quench margin smaller than calculated

- CERN-LHC-Project-Note-422

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# Second quench

# Software to manage BLM parameters

- Java program to manage thresholds

- Java program to manage internal parameters of electronic cards

- stage/final tables approach

  Work of technical student but in close collaboration with BI/SW group which will follow the code development in future.

M. Sapi...

# Recommendation 5.1.1.1

Summary of the simulation efforts:

- BI/BL: Arc, dispersion suppressor, MQY, warm magnets in injection/extraction area

- FLUKA: triplets, IR7 (collimators, common effort)

We are using common units (mJ/cc, mW/cc in the coil and Gy, Gy/s in the detectors)

Computational limits usually quoted by FLUKA team is factor 3, it includes lack of cross section measurements at 7 TeV and inaccuracy of geometry implementation. The last is controlled by measurements at 450 GeV.

# Simulation summary (simplified!)

| element | status | comment |
|---|---|---|
| arc | done | Geant4, A.Priebe, A.Arauzo, Ch.Kurfuerst |
| MB | done | Geant4, Note 422 |
| Disp Supp | done | Geant3/4, L.Ponce, E.Gschwendter, A.P. |
| MB/ions (DS) | done | FLUKA, R.Bruce |
| inject/extract | geom | Geant4 |
| MQY | geom | Geant4 |
| collimators | done | FLUKA (EDMS 995569, IR7 ongoing) |
| triplets | done | FLUKA, A. Mereghetti |

not done: MBR, MQTLH, MQW... hints to set up exist
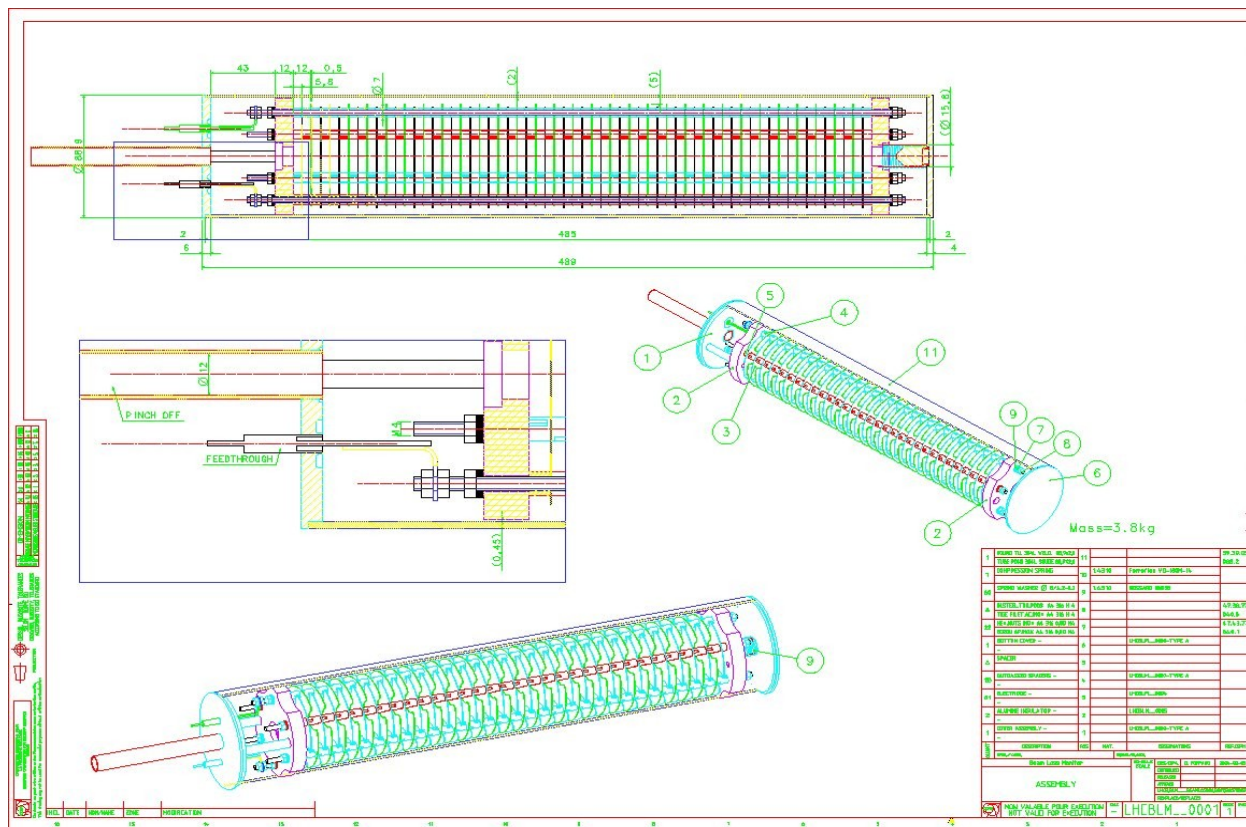
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# Recommendation 5.1.1.3

Activation studies of BLMs

- Experience from SPS

- Expected max dose: 70 MGy/year (conservative)

- The study is still to be done

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# Recommendation 5.1.1.4

Description of Monitors' geometry

- http://cern.ch/blm → Beam Loss Detectors

# Recommendation 5.1.1.5

Thresholds re-adjustments

- The 2008 quenches shown a way how to re-adjust thresholds in case of magnet quenches (simple case). It has turned out that we were at 10% of the signal at the quench level.
  This was too conservative -> thresholds increas

- More quench tests are foreseen this year (Barbara's talk).

# Recommendation 5.1.1.8

Threshold verification to minimize human errors: An application should be deployed that provides means to minimize introduction erroneous values to stage tables.

- threshold verification is still performed by looking on the graphical representations of the thresholds

- in threshold application it is foreseen to perform differential comparison before submitting to final tables

- more sophisticated methods easy to implement, but not yet developed

# Recommendation 5.1.1.9

The aforementioned procedures should cover the conditions how and when the Stage Tables can be committed and merged into the final tables. Time-outs might be useful to avoid too long latency between change of values and their commitment.

- Commissioning to the final tables is made when it is decided that the stage tables are good.

- The RBAC token times-out
  (to be decided after which time) – one has to re-login to make the changes

# Recommendation 5.1.1.10 and 11

An application should be deployed to safely handle the maskable and disable flags in the Master Table

Maskable-unmaskable flag

- It has been decided not to use maskable flag

Summary Notes of 13th Meeting of Sub Working Group on the Commissioning of the Machine Protection System
(January 9th 2008)

Disable flag

- Is handled by expert threshold application

- Nothing done for alerts when too many monitors are set as disabled

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# Recommendation 5.1.1.12

User authentication for expert applications

- We use RBAC – Role-Based Access System for Accelerator Control System - standard

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# Recommendation 5.1.1.14

Database backup on disk – protection against dropping the database objects

- Chris Roderick: The database is protected against the drop of objects, in the sense that the database objects are owned by a database user account for which only 2 database experts have access. No other database user accounts have the necessary privileges to drop objects.  As a general rule, when a request is made to modify the database structure, which involves removing existing database objects - the objects are first renamed, and then only dropped at a much later date. An on-disk backup strategy has not been followed up with IT-DES. Due to the significant increase in throughput of the ACCMEAS database, this is also not feasible with the storage that is currently available.

# Recommendation 5.1.1.15

Databases complexity

- see Barbara's presentation

- Database scheme changes are discusses with DM group (change from system construction to operation)

# Conclusions

- First test of quench-protecting thresholds has been done (for 450 GeV and fast transient loss – one of 384 thresholds!) - it has been found that the thresholds agree within factor 3 with the signal at quench – better then specification (factor 5 initially)

- A progress has been made in thresholds computations, and in software interface to LSA

- To be done: activation of monitors, threshold verification to minimize human errors, simplification of database structure