

first results and experience  
from the injection test  
of 23-25/10/2009

C. Zamantzas for the BLM team

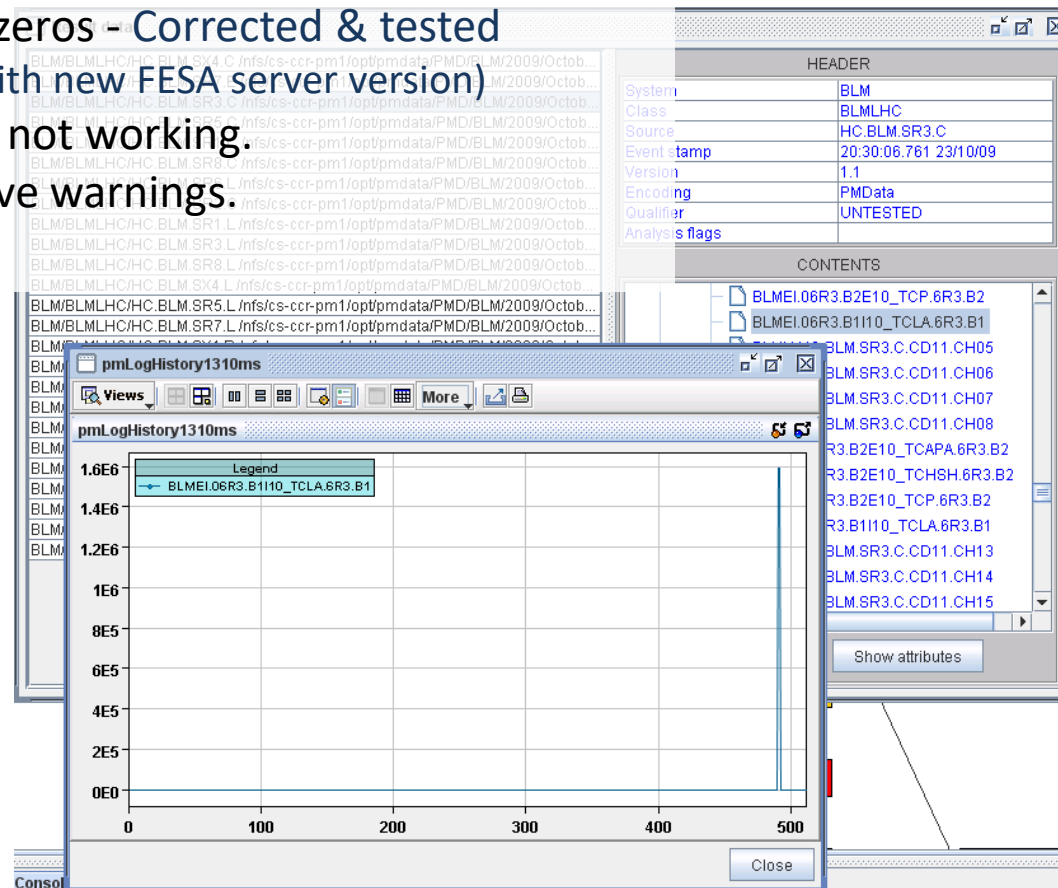
# Testing the BEAM PERMIT

**23/10/2009 - 20:30:06 First Beam to IP3 and BLMS removes the BEAM\_PERMIT.**

- **the mask for the BLM\_MASK monitors in BIS\_S3 had not been set.**
- **two crates SR3.R and SR3.C requested the dump**
- **six ionisation chambers over threshold:**
  - BLMEI.05R3.B1I10\_TCLA.A5R3.B1
  - BLMEI.05R3.B1I10\_TCLA.B5R3.B1
  - BLMEI.05R3.B1I10\_TCSM.B5R3.B1
  - BLMEI.06R3.B1I10\_TCLA.6R3.B1
  - BLMEI.07R3.B1I10\_TCLA.7R3.B1
  - BLMEI.08R3.B1I30\_MBA
- **Global Post-Mortem event was issued.**

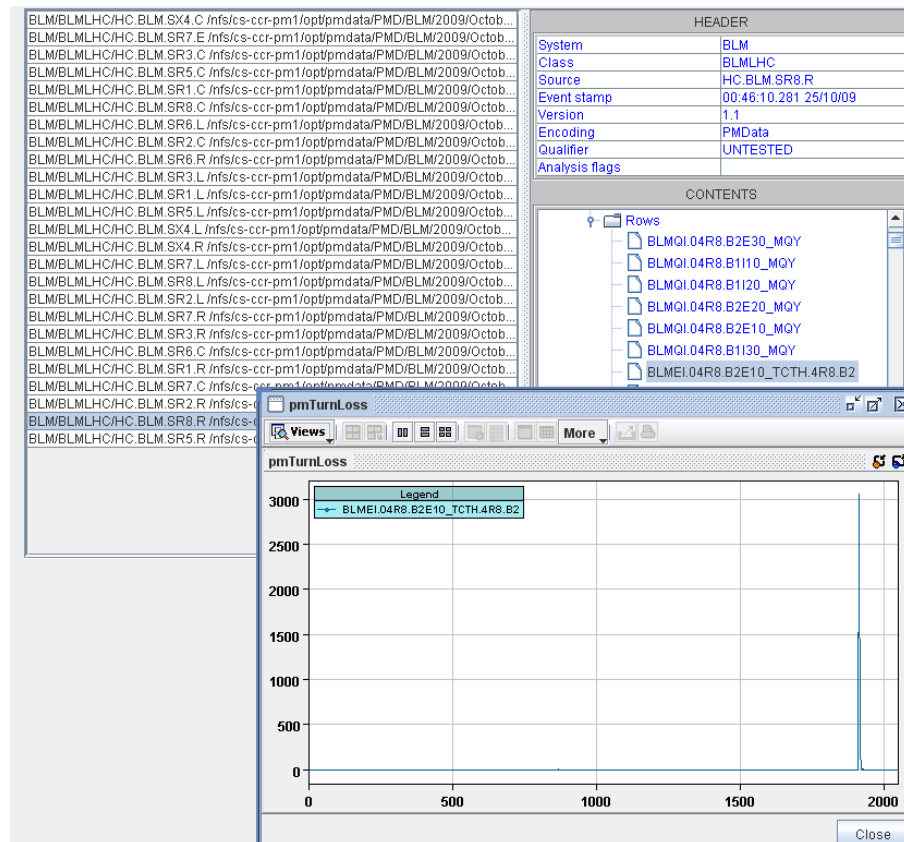
# Checking the BLM PM data..

- All crates responded correctly to the Global PM1
- BeamPermitLog flags were all empty. - Corrected but needs testing
- TurnLoss (2048 x 40 us) had mostly zeros - Corrected & tested  
(wreboot all crates @ 23/10 23:49 with new FESA server version)
- The TimeDumptoPM counters were not working
- Analysis of data in the PM server gave warnings.
- PM add-on needs some more work.



# Checking the BLM PM data..

Checking on different/later PM event (i.e. on 25/10 00:46) shows the pmTurnLoss buffer (2048 x 40 us values) has been corrected.

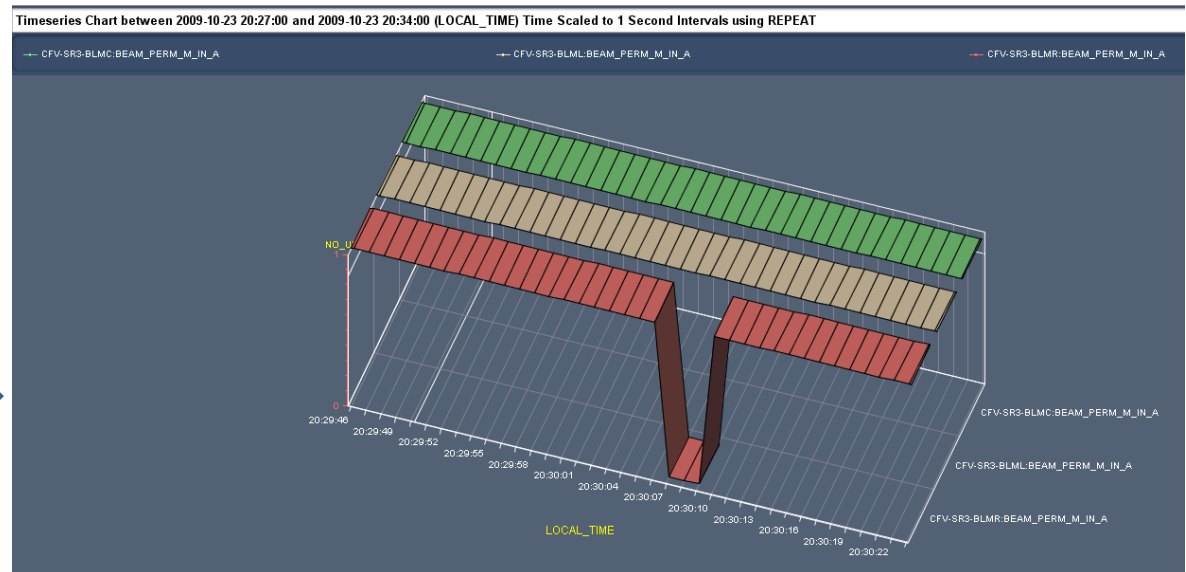


# Checking the BLM Logging data..



**BLETC** modules MASKABLE  
daisy-chain output

**BLECS** module MASKABLE A  
input from upper crate.



# Checking the BLM Logging data..

## CFV-SR3-BLMR.BLETC.02: BEAM\_DUMP\_REQUESTS: (VECTORNUMERIC – all Cards & Running Sums)

CFV-SR3-BLMR.BLETC.02: BEAM_DUMP_REQUESTS	Array Values															
Timestamp (LOCAL_TIME)	Ch01	Ch02	Ch03	Ch04	Ch05	Ch06	Ch07	Ch08	Ch09	Ch10	Ch11	Ch12	Ch13	Ch14	Ch15	Ch16
2009-10-23 20:30:07.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1023	0
2009-10-23 20:30:08.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1920	0
2009-10-23 20:30:09.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1792	0
2009-10-23 20:30:10.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1536	0
2009-10-23 20:30:13.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1024	0
2009-10-23 20:30:29.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

## Decoding the BEAM\_DUMP\_REQUEST of Channel 15: BLMEI.07R3.B1I10\_TCLA.7R3.B1

Timestamp (LOCAL_TIME)	DEC	HEX	BIN (LSB = 40us)	Comments
2009-10-23 20:30:07.000	1023	03FF	0011 1111 1111	the last two RS (20 s and 84 s integrations) wasn't logged in the first 1Hz acquisition.
2009-10-23 20:30:08.000	1920	0780	0111 1000 0000	the 20 s RS became TRUE in the following acquisition - all below 655 ms got cleared
2009-10-23 20:30:09.000	1792	0700	0111 0000 0000	now the 655 ms gets cleared too
2009-10-23 20:30:10.000	1536	0600	0110 0000 0000	the 1.3 s gets cleared
2009-10-23 20:30:13.000	1024	0400	0100 0000 0000	No change for 3 s. The 5 s gets cleared
2009-10-23 20:30:29.000	0	0000	0000 0000 0000	No change for 16 s. All clear now (dumps lasted for ~20 s)

# Checking the BIS PM data..

The BEAM PERMIT was forced to FALSE by the BLMS.  
Both MASKABLE lines have been triggered.

GLOBAL : Fri Oct 23 20:30:06 CEST 2009 (1256322606761738525)

Final analysis is finished

Modules graph Results

BIC\_RAW\_DATA

BLM\_RAW\_DATA

BPM\_RAW\_DATA

FGC\_RAW\_DATA

Console

15:19:20 - New Results have been received  
15:19:20 - Final analysis is finished  
15:19:20 - XPOC\_EXCHANGE FINISHED  
15:19:20 - XPOC\_EXCHANGE data received  
15:19:20 - New analysis session started

15:12:54 - successfully started  
15:12:54 - Global event with id

Result data

BIC/EVENT\_SEQ/ISA /nfs/cs-ccr-pm1/opt/pmdata/PMA/results/2009/October/23/...

HEADER	
System	BIC
Class	EVENT_SEQ
Source	ISA
Event stamp	20:30:06.761 23/10/09
Version	1.1
Encoding	PMData
Qualifier	
Analysis flags	11000

CONTENTS

- Arrays 1D
  - boolean[71] - beamPermitA
  - boolean[71] - beamPermitB
  - String[71] - bicName
  - long[71] - delta
  - String[71] - description
  - String[71] - eventType
  - int[71] - info
  - int[71] - inputChannel
  - boolean[34] - sourceDataValid
  - String[34] - sourceName
  - long[71] - timeStamp
  - String[2] - triggeredBicInputsArray
- Arrays 2D

Show values Show attributes

triggeredBicInputsArray

Index	Value
0	BLM_MSK (A)
1	BLM_MSK (B)

Close

# Checking the BIS PM data..

The timestamp recorded by the BIS **2009-10-23 20:30:06.761001**

The screenshot displays a software interface with a main data table, a console window, and a metadata panel.

**eventOverview Table:**

Index	0	1	2	3	4
0	A/B	Time	Delta (usec)	Description	Bic name
1	false/true	23/10/09 20:30:06 (761000)	-738	BPL record found (0xa)	CIB.SR3.S3.B1
2	false/false	23/10/09 20:30:06 (761001)	-737	BLM_MSK (A): TRUE -> FALSE [Input 11]	CIB.SR3.S3.B1
3	false/false	23/10/09 20:30:06 (761001)	-737	BLM_MSK (B): TRUE -> FALSE [Input 11]	CIB.SR3.S3.B1
4	true/true	23/10/09 20:30:06 (761006)	-732	BPL record found (0x3)	CIB.UJ33.U3.B1
5	true/true	23/10/09 20:30:06 (761022)	-716	BPL record found (0x3)	CIB.UA27.R2.B1
6	true/true	23/10/09 20:30:06 (761025)	-713	BPL record found (0x3)	CIB.UA23.L2.B1
7	true/true	23/10/09 20:30:06 (761026)	-712	BPL record found (0xc)	CIB.UA47.R4.B1
8	true/true	23/10/09 20:30:06 (761029)	-709	BPL record found (0xc)	CIB.UA43.L4.B1
9	true/true	23/10/09 20:30:06 (761041)	-697	BPL record found (0xc)	CIB.UJ56.R5.B1
10	true/true	23/10/09 20:30:06 (761043)	-695	BPL record found (0x3)	CIB.US15.R1.B1
11	true/true	23/10/09 20:30:06 (761045)	-693	BPL record found (0xc)	CIB.USC55.L5.B1
12	true/true	23/10/09 20:30:06 (761060)	-678	BPL record found (0x3)	CIB.CCR.LHC.B1
13	true/true	23/10/09 20:30:06 (761070)	-668	BPL record found (0xc)	CIB.UA63.L6.B1
14	true/true	23/10/09 20:30:06 (761073)	-665	BPL record found (0xc)	CIB.UA67.R6.B1
15	true/true	23/10/09 20:30:06 (761086)	-652	BPL record found (0xc)	CIB.TZ76.U7.B1
16	true/true	23/10/09 20:30:06 (761087)	-651	BPL record found (0x3)	CIB.US15.L1.B1
17	true/true	23/10/09 20:30:06 (761099)	-639	BPL record found (0x3)	CIB.UA87.R8.B1
18	true/true	23/10/09 20:30:06 (761102)	-636	BPL record found (0xc)	CIB.SR7.S7.B1
19	true/true	23/10/09 20:30:06 (761104)	-634	BPL record found (0x3)	CIB.UA83.L8.B1
20	true/true	23/10/09 20:30:06 (761115)	-623	BPL record found (0x0)	CIB.UA87.R8.B1
21	true/true	23/10/09 20:30:06 (761118)	-620	BPL record found (0x0)	CIB.TZ76.U7.B1
22	true/true	23/10/09 20:30:06 (761118)	-620	BPL record found (0x0)	CIB.UA83.L8.B1
23	true/true	23/10/09 20:30:06 (761127)	-611	BPL record found (0x0)	CIB.SR7.S7.B1
24	true/true	23/10/09 20:30:06 (761138)	-600	BPL record found (0x0)	CIB.US15.L1.B1
25	true/true	23/10/09 20:30:06 (761141)	-597	BPL record found (0x0)	CIB.UA67.R6.B1
26	true/true	23/10/09 20:30:06 (761151)	-587	BPL record found (0x0)	CIB.CCR.LHC.B1
27	true/true	23/10/09 20:30:06 (761152)	-586	BPL record found (0x0)	CIB.UA63.L6.B1
28	true/true	23/10/09 20:30:06 (761158)	-580	BPL record found (0x0)	CIB.UJ56.R5.B1
29	true/true	23/10/09 20:30:06 (761163)	-575	BPL record found (0x0)	CIB.USC55.L5.B1
30	true/true	23/10/09 20:30:06 (761174)	-564	BPL record found (0x0)	CIB.US15.R1.B1
31	true/true	23/10/09 20:30:06 (761184)	-554	BPL record found (0x0)	CIB.UA47.R4.B1
32	true/true	23/10/09 20:30:06 (761191)	-547	BPL record found (0x0)	CIB.UA27.R2.B1
33	true/true	23/10/09 20:30:06 (761191)	-547	BPL record found (0x0)	CIB.UA43.L4.B1
34	true/true	23/10/09 20:30:06 (761193)	-545	BPL record found (0x0)	CIB.UA23.L2.B1
35	true/true	23/10/09 20:30:06 (761206)	-532	BPL record found (0x0)	CIB.UJ33.U3.B1
36	false/false	23/10/09 20:30:06 (761219)	-519	BPL record found (0x2)	CIB.SR3.S3.B1
37	false/false	23/10/09 20:30:06 (761220)	-518	BPL record found (0x0)	CIB.SR3.S3.B1
38	true/true	23/10/09 20:30:06 (761993)	255	TIM record found (0)	CIB.CCR.LHC.B2

**Console:** 15:18:50 - success

**HEADER:**

System	BIC
Class	EVENT_SEQ
Source	ISA
Event stamp	20:30:06.761 23/10/09
Version	1.1
Encoding	PMDData
Qualifier	
Analysis flags	11000

**CONTENTS:**

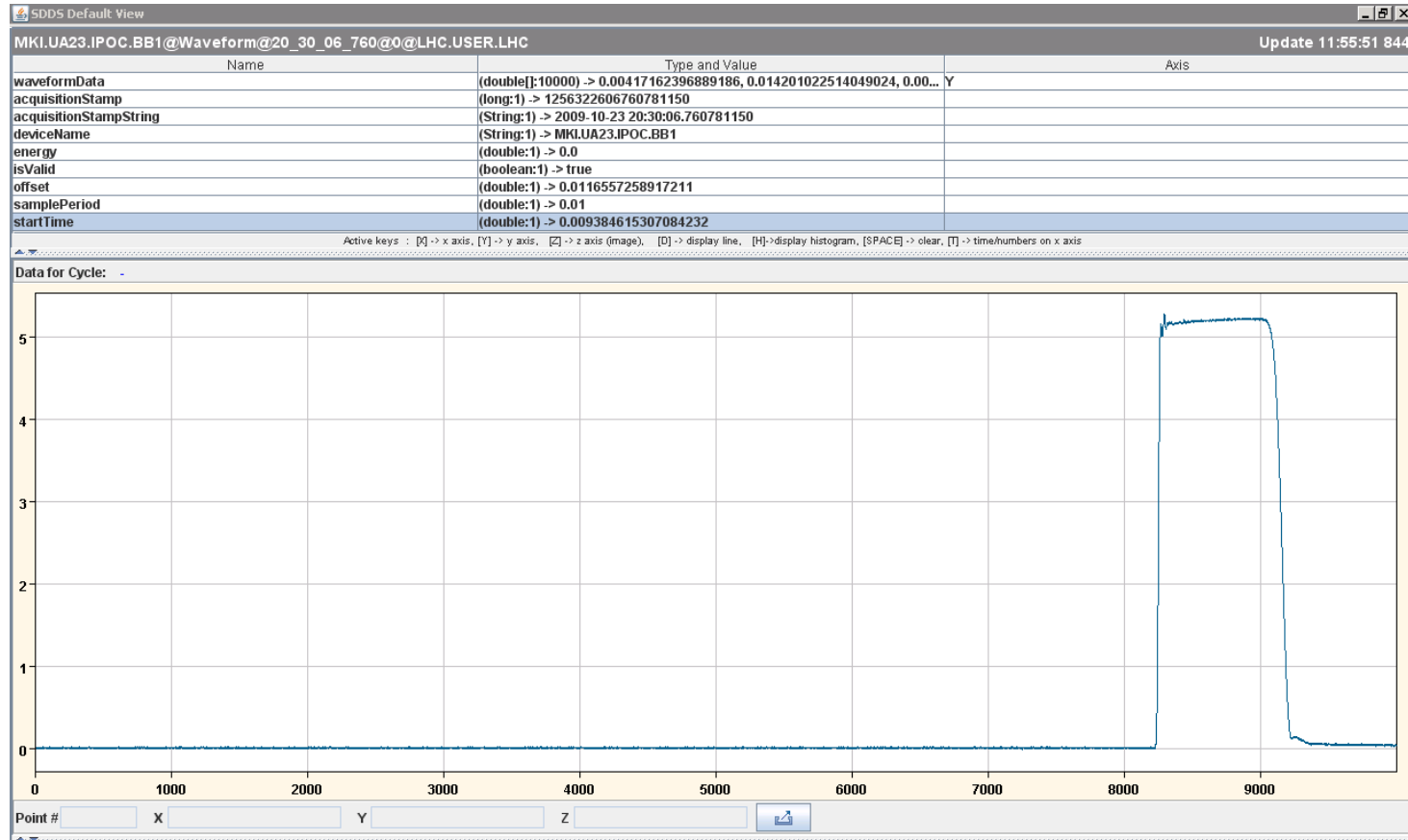
- boolean[71] - beamPermitB
- String[71] - bicName
- long[71] - delta
- String[71] - description
- String[71] - eventType
- int[71] - info
- int[71] - inputChannel
- boolean[34] - sourceDataValid
- String[34] - sourceName
- long[71] - timeStamp
- String[2] - triggeredBicInputsArray
- Arrays 2D
  - String[72][5] - eventOverview
  - String[35][2] - sourceOverview

**Console (bottom):** 1136b2-bf1f-4301-9a12-d2ec48768b97]



# Looking in the MKIs..

The beam was at the injection kicker at **2009-10-23 20:30:06.760781150 + ~87  $\mu$ s**



MKI.UA23.IPOC.BB1@Waveform@20\_30\_06\_760@0@LHC.USER.LHC.sdds  
[sent by Jan Uythoven and Nicolas Magnin]

# Latency ..

Difference of the timestamps from beam at MKI to BIS interlock:

$$\begin{array}{r} 2009-10-23\ 20:30:06.761001 \\ - 2009-10-23\ 20:30:06.760781150 \\ \hline \phantom{2009-10-23\ 20:30:06.}87 \\ \phantom{2009-10-23\ 20:30:06.} = 133\ \mu\text{s} \end{array}$$

Distance from MKI to 7R3\_TCLA using DCUM:  $|3182 - 6413| = 3281$  m or **10.7  $\mu\text{s}$**

Cable from monitor to acquisition electronics:  $\sim 500$  m or **3.0  $\mu\text{s}$**

Fibre from acquisition to processing electronics:  $\sim 1000$  m or **3.0  $\mu\text{s}$**

Detection of change in frequency in the daisy-chain: **+ 3.5  $\mu\text{s}$**   
**20.2  $\mu\text{s}$**

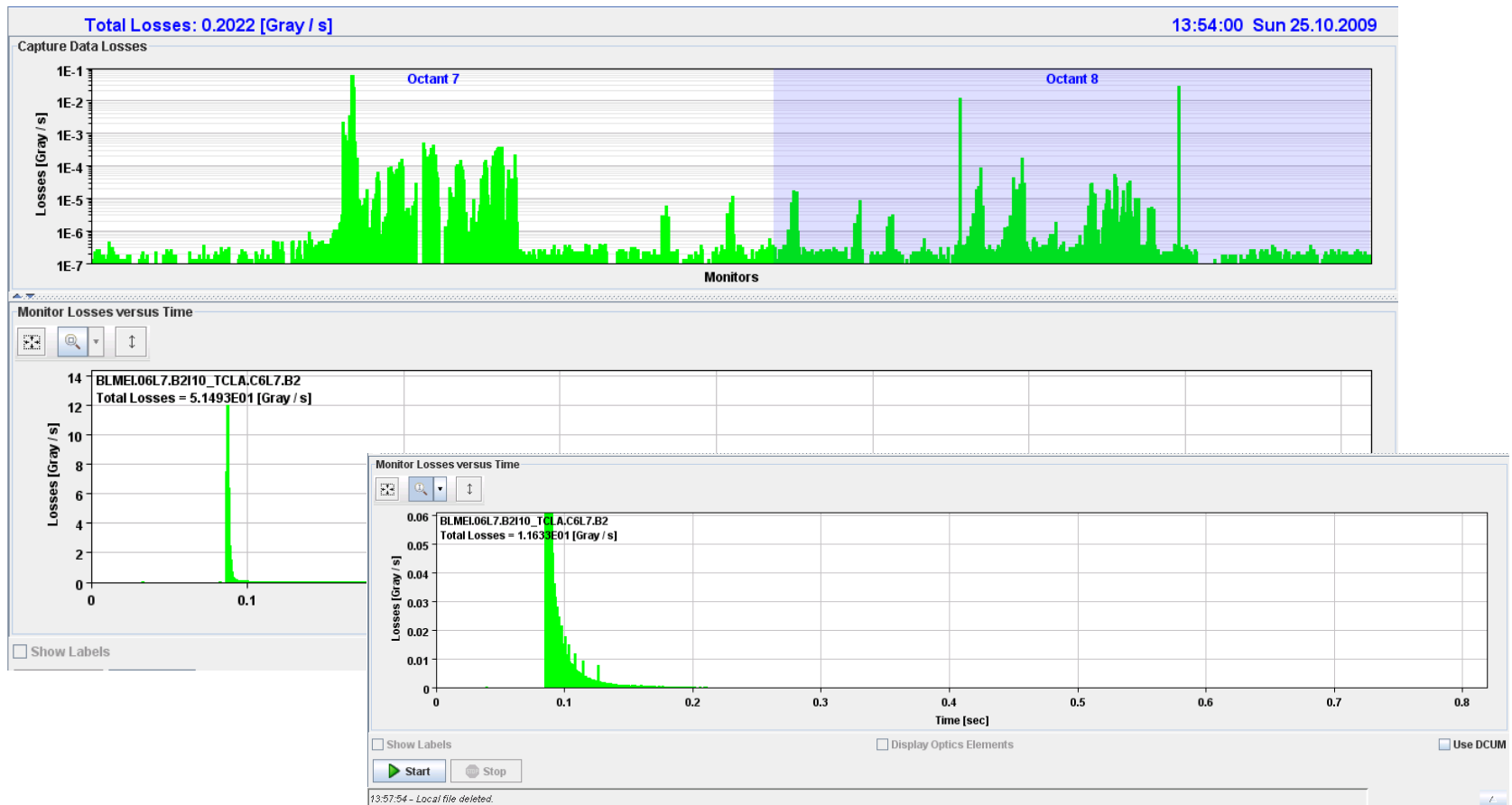
**Decision at the threshold comparator for fast losses is taken every 40  $\mu\text{s}$  but might need twice that if data are split between two acquisitions.**

# Databases & Applications

- Restructure of the LSA database has been completed.
- BLM TRIM of monitor factors and dedicated application works reliably.
- Generation of parameters (LSA Settings) works reliably.
- Drive of parameters to the electronics works reliably.
- MCS online check has included now the check of the internal parameters and can be run from the Sequencer. It works but has still few bugs - none blocking.
  
- Concentrators have been re-build and moved to faster machine.
  
- Capture buffer is reliable and has been working for the complete weekend  
(servicing the Injection Quality Check - IQC)
- Capture data transmission (as expected) doesn't block the Logging data.
  
- Global PM1 event is correctly received, freezes the buffers and triggers the RT action.
- PM data transmission (as expected) doesn't block the Logging data.

# Capture data

Could be used for detailed analysis of fast or (relatively) slow phenomena.



Zoom in the plot of Capture data using the display application.

# Capture data

## Comparing two sets of Capture data..

Several notifications are being lost and thus data never arrive to the concentrator.  
Double subscription by the concentrator. Cannot use a proxy due to a bug in CMW.

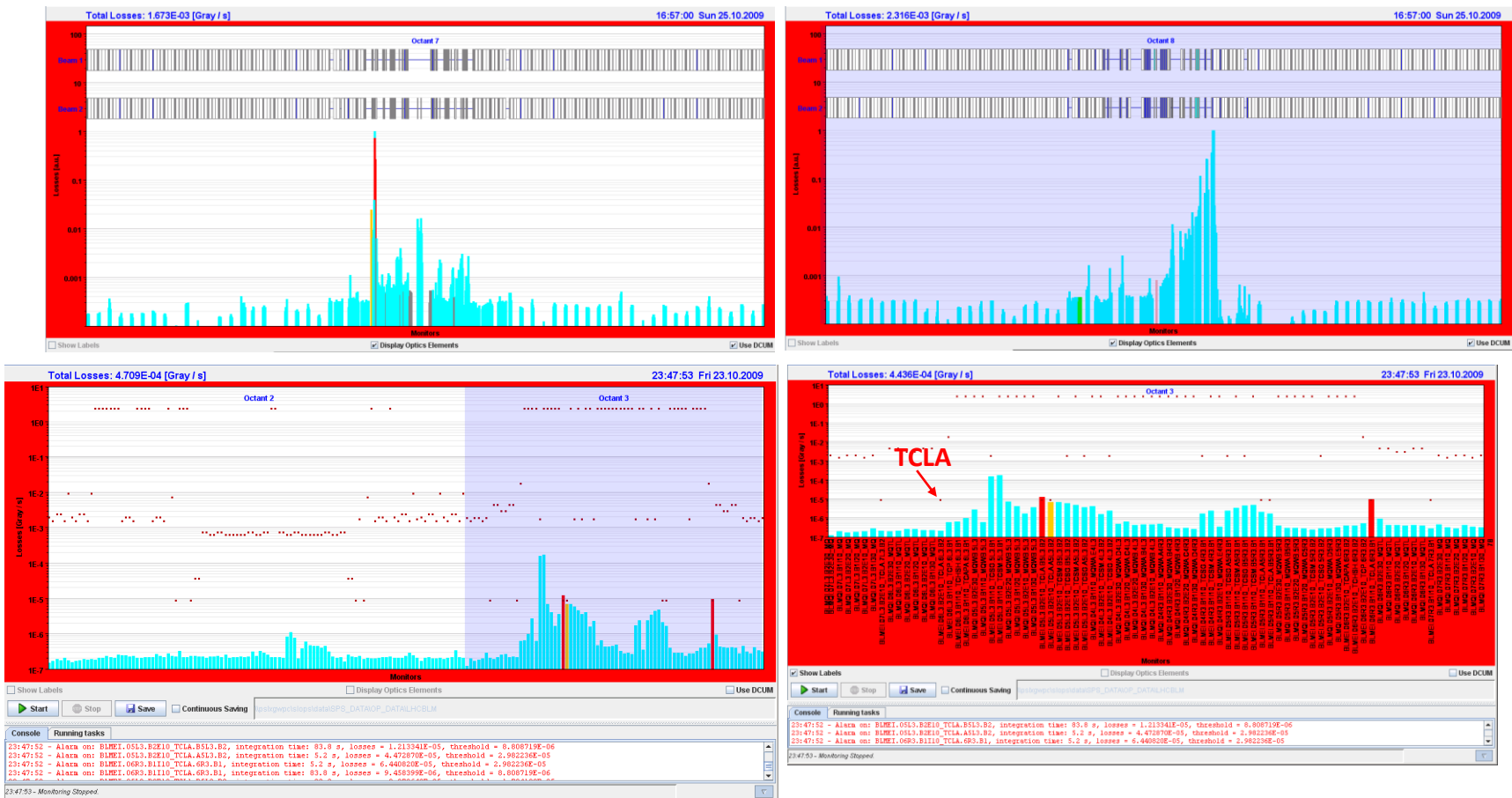


# Fixed Display

New version of the fixed display uses colours to show monitor's relation to interlock.

Several notifications are being lost or delayed for several seconds.

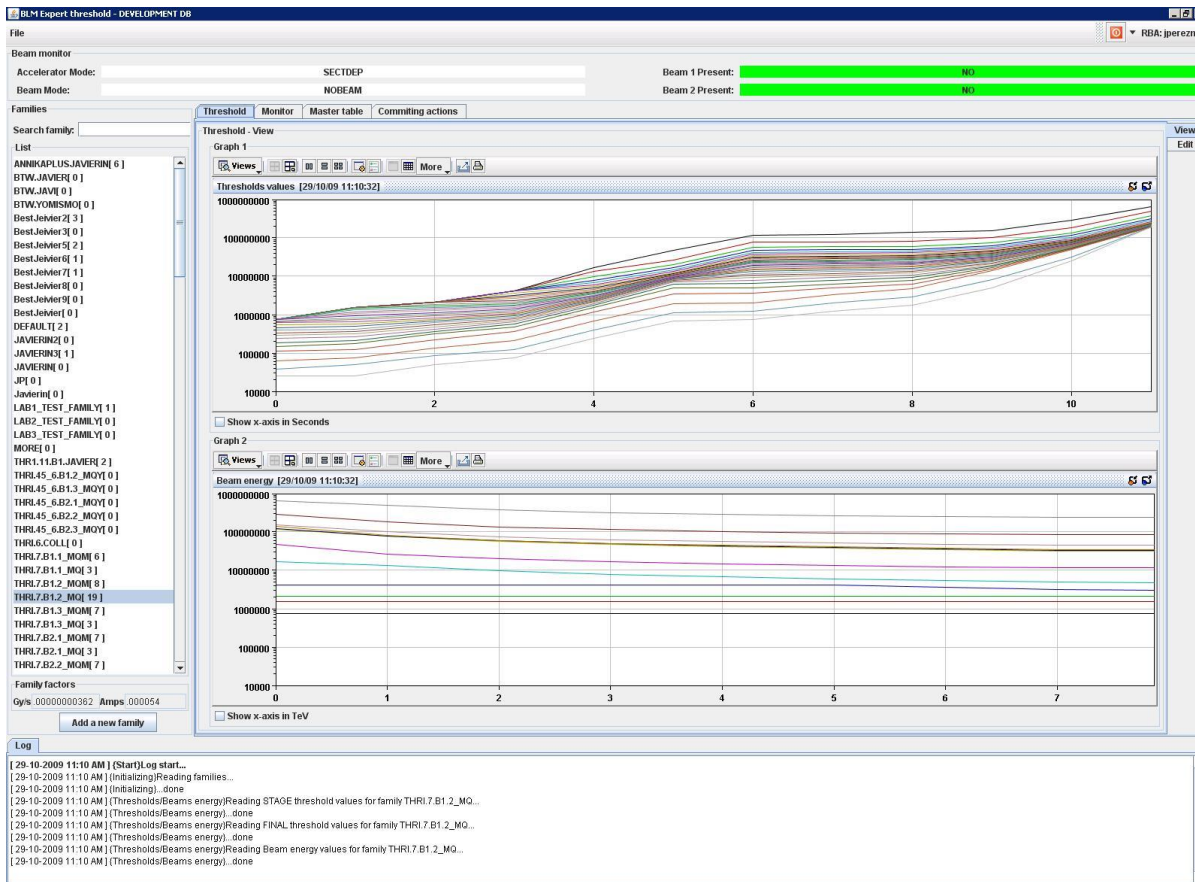
Waiting of up to 4 sec is being used by the concentrator to reduce the lost data.



# Expert Threshold Application

by Javier Perez Messeri

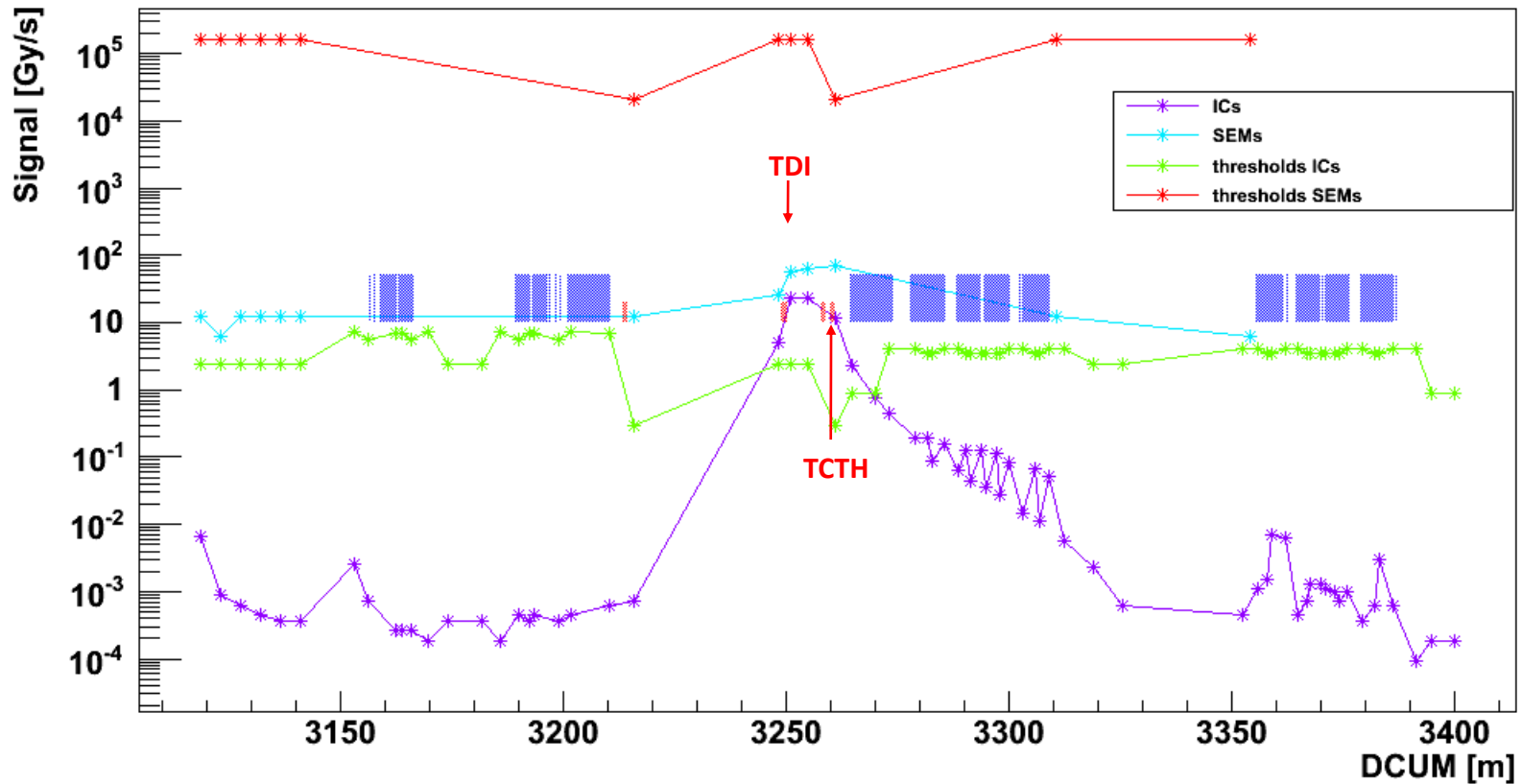
- Read-only version is now available too.
- Beam Present information through the telegram.



# Losses in 04L2 (40 $\mu$ s values)

by Aurelien Marsili

LHC

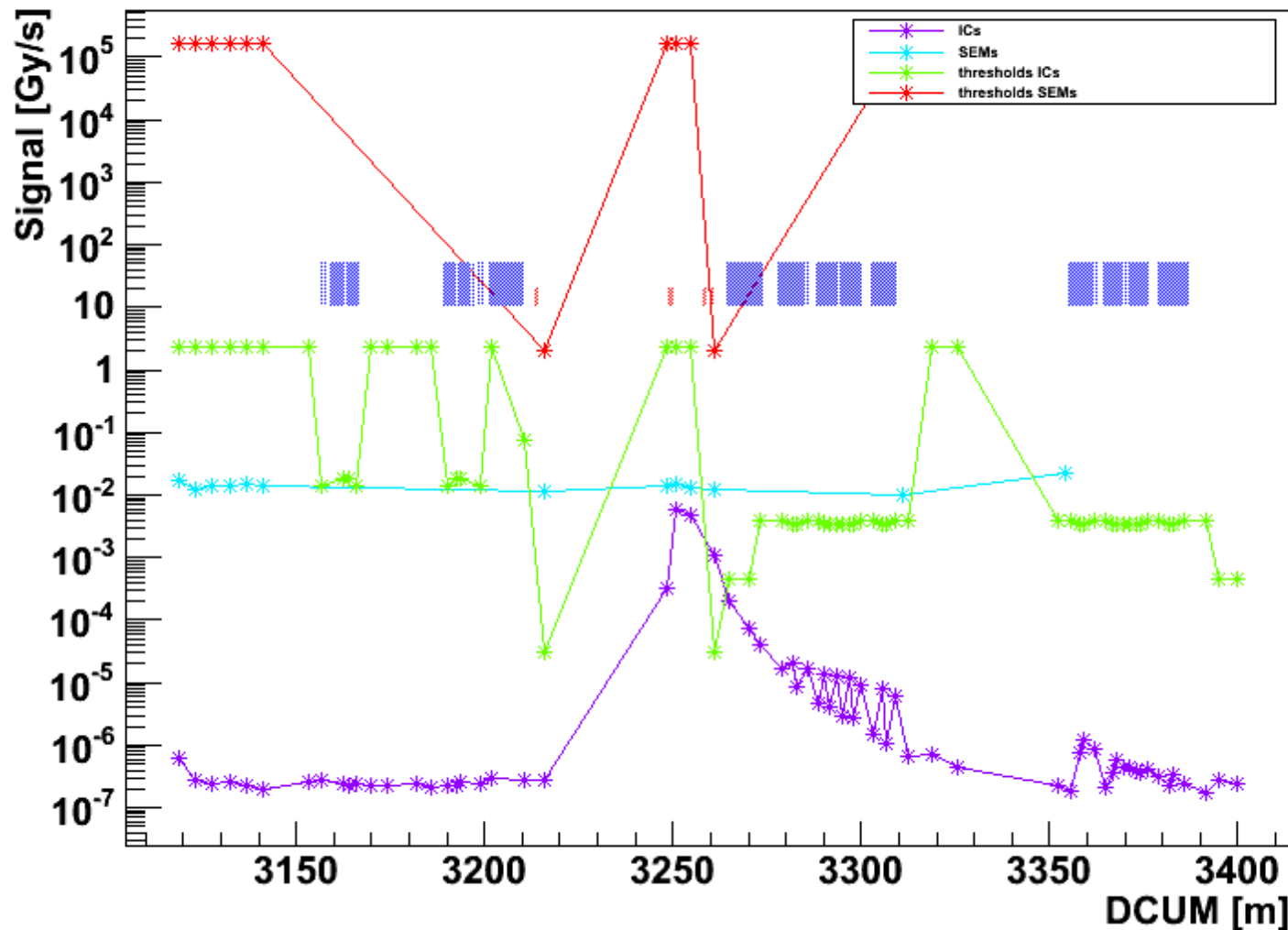




# Losses in 04L2 (1.3 s values)

by Aurelien Marsili

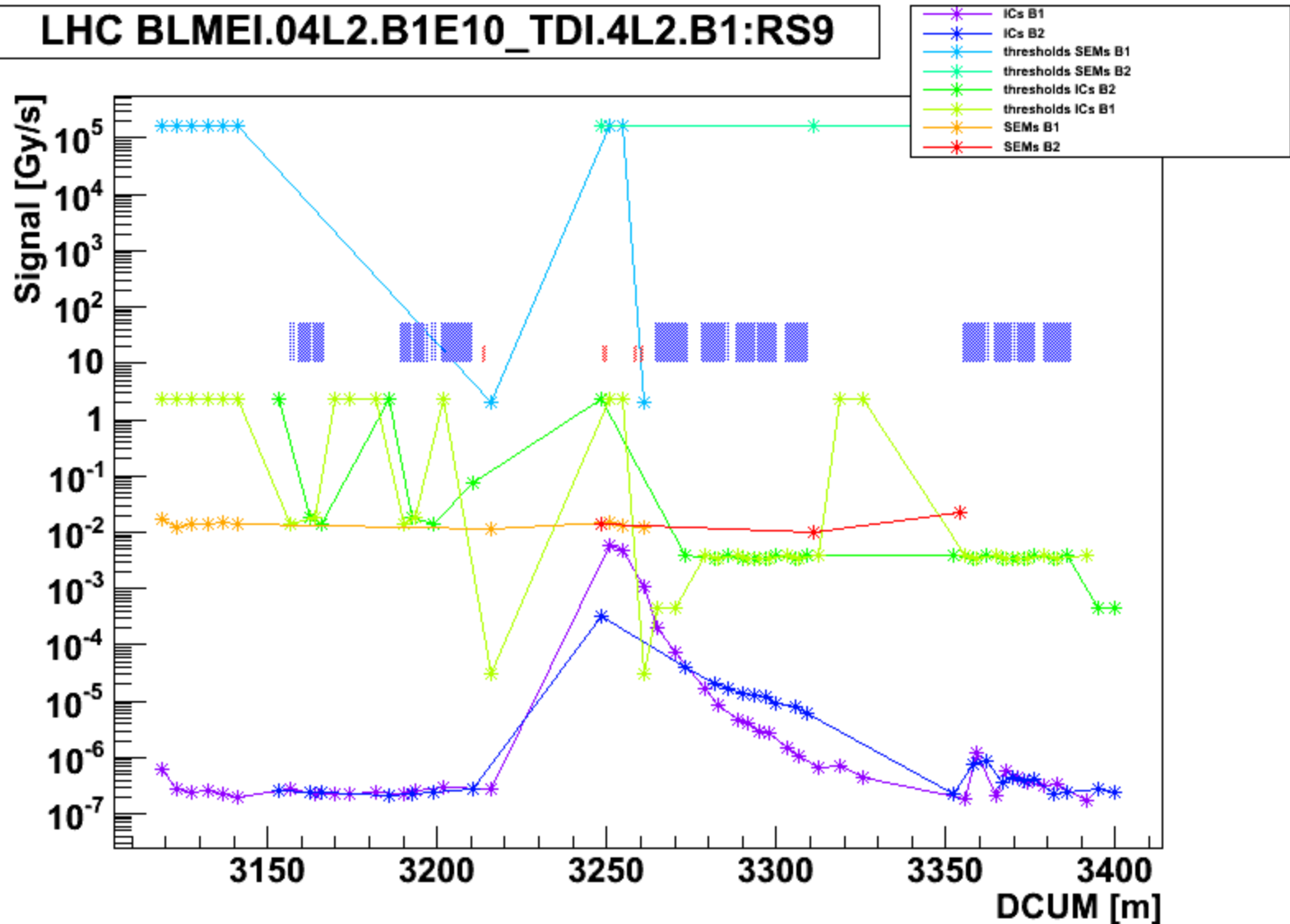
LHC 20091023-205753\_BLMEI.04L2.B1E10\_TDI.4L2.B1:RS9



# Losses in 04L2 (1.3 s values)

by Aurelien Marsili

LHC BLMEI.04L2.B1E10\_TDI.4L2.B1:RS9



# Signal over Threshold

by Mariusz Sapinski

RS09:

S/T = 26.8672 for: BLMEI.05R3.B1I10\_TCLA.A5R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:07

S/T = 26.9052 for: BLMEI.05R3.B1I10\_TCLA.A5R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:08

S/T = 19.9043 for: BLMEI.05R3.B1I10\_TCLA.B5R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:07

S/T = 19.9455 for: BLMEI.05R3.B1I10\_TCLA.B5R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:08

**S/T = 147.068 for: BLMEI.06R3.B1I10\_TCLA.6R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:07**

S/T = 147.228 for: BLMEI.06R3.B1I10\_TCLA.6R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:08

S/T = 10.3319 for: BLMEI.07R3.B1I10\_TCLA.7R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:07

S/T = 10.3805 for: BLMEI.07R3.B1I10\_TCLA.7R3.B1:LOSS\_RS09 at UTC time: 10/23/2009, 18:30:08

RS04:

S/T = 1.82403 for: BLMEI.05R3.B1I10\_TCSM.B5R3.B1:LOSS\_RS04 at UTC time: 10/23/2009, 18:30:07

S/T = 34.9563 for: BLMEI.05R3.B1I10\_TCLA.A5R3.B1:LOSS\_RS04 at UTC time: 10/23/2009, 18:30:07

S/T = 25.6067 for: BLMEI.05R3.B1I10\_TCLA.B5R3.B1:LOSS\_RS04 at UTC time: 10/23/2009, 18:30:07

**S/T = 183.354 for: BLMEI.06R3.B1I10\_TCLA.6R3.B1:LOSS\_RS04 at UTC time: 10/23/2009, 18:30:07**

S/T = 13.0226 for: BLMEI.07R3.B1I10\_TCLA.7R3.B1:LOSS\_RS04 at UTC time: 10/23/2009, 18:30:07

S/T = 1.52438 for: BLMEI.08R3.B1I30\_MBA:LOSS\_RS04 at UTC time: 10/23/2009, 18:30:07

RS02:

S/T = 4.7064 for: BLMEI.05R3.B1I10\_TCSM.B5R3.B1:LOSS\_RS02 at UTC time: 10/23/2009, 18:30:07

S/T = 17.402 for: BLMEI.05R3.B1I10\_TCLA.A5R3.B1:LOSS\_RS02 at UTC time: 10/23/2009, 18:30:07

S/T = 12.252 for: BLMEI.05R3.B1I10\_TCLA.B5R3.B1:LOSS\_RS02 at UTC time: 10/23/2009, 18:30:07

S/T = 68.757 for: BLMEI.06R3.B1I10\_TCLA.6R3.B1:LOSS\_RS02 at UTC time: 10/23/2009, 18:30:07

S/T = 5.9587 for: BLMEI.07R3.B1I10\_TCLA.7R3.B1:LOSS\_RS02 at UTC time: 10/23/2009, 18:30:07

# Collimator Thresholds

by Annika Nordt

To get the value for the threshold in BITS:

$$\left( (0.54 \times 10^{-18} \text{ [C/proton]}) / (5.4 \times 10^{-5} \text{ [C/Gy]}) \right) / (3.62 \times 10^{-9} \text{ [Gy/BITS]}) * N_{\text{prot}} \text{ [proton]}$$

This gives the threshold for TCP @450GeV for losses faster than 1 sec, e.g. RS04 = 16574585 BITS

but the electronics have a maximum number of BITS that can be set and for RS04 this limit is: 4194304 BITS

## BLM thresholds for the 640 μs integration time window (RS04)

	Nr of protons (t<1sec)	threshold [μGy]	threshold [Gy/s]	threshold [Gy/s] (FIXED DISPLAY)	threshold [BITS]
<b>collimator type</b>	injection energy	injection energy	injection energy	injection energy	injection energy
<b>TCP</b>	6x10 <sup>12</sup>	max: 1.52x10 <sup>4</sup> given: 6.00x10 <sup>4</sup>	max: 23.70 given: 93.75	23.7	max: 4194304 given: 16574585
<b>TCSG</b>	6x10 <sup>11</sup>	6x10 <sup>3</sup>	9.38	9.32	1657458
<b>TCLA</b>	3x10 <sup>9</sup>	3x10	4.69x10 <sup>-2</sup>	4.66x10 <sup>-2</sup>	8287
<b>TCT</b>	3x10 <sup>9</sup>	3x10	4.69x10 <sup>-2</sup>	4.66x10 <sup>-2</sup>	8287
<b>TCL</b>	3x10 <sup>10</sup>	3x10 <sup>2</sup>	4.69x10 <sup>-1</sup>	4.66x10 <sup>-2</sup>	82872
<b>TCLI</b>	6x10 <sup>11</sup>	6x10 <sup>3</sup>	9.38	9.32	1657458

# Summary

BLMS removes correctly the BEAM PERMIT signal if measurements over threshold.

Need to test the UNMASKABLE and trigger a few more times.

No triggers over the weekend on the UNMASKABLE lines

There are several problems transferring the data out of the system.

Many people are working on this for some months now.

Need a system Status application. We miss a complete and quick overview.

Need to have a second look in the thresholds around the collimators.