

BLM threshold changes in TS1

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MPP

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- 1) pp debris IR1/5 (triplet, TCLs, TCTs)**
- 2) pp debris IR8 (triplet, TCLs, TCTs)
- 3) collimation losses IR7 (Q6)
- 4) transient dumps IR7
- 5) Summary of TS1 BLM threshold changes

FT corrections for pp debris at IR1/5 triplets

● IR1/5 triplet BLM families

- All families have a FT correction to avoid dumping on pp debris
- General policy: debris-induced signals **should remain below 30% of the thresholds** (i.e. below the warning level)

● Revision FT correction 2016

- FT corrections increased by a **factor of 2** in YETS 2015/16 (LHC-BLM-ECR-0044)

● What's new in 2017

- Slight change in crossing angle (+ crossing angle levelling)
- ATS optics
- Cryo limit for inst. luminosity less restrictive than estimated in Chamonix:
 $1.75 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1} \rightarrow 2.2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ @6.5 TeV (K. Brodzinski, LMC #308)

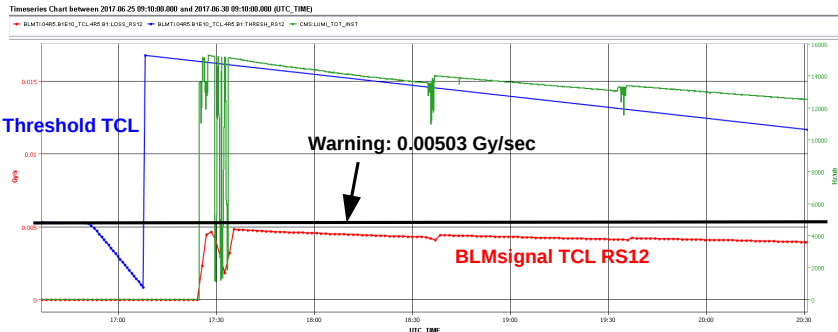
● Re-evaluation of FT corrections

- A priori no big change in triplet BLM signals/collision expected wrt 2016 → confirmed by analysis
- Extrapolation shows that no BLM would be in warning up to **$2.0 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$** and only one BLM would be in warning at **$2.2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$**
- Did not perform any adjustment now, will reassess if we would reach $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$

FT correction for pp debris at IR1/5 TCLs/TCTs

● TCLs

- TCL.4R5 would have been in warning for lumi $> 1.58 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$
- **Increased FT correction by 30%** (to allow for $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ like for triplets)



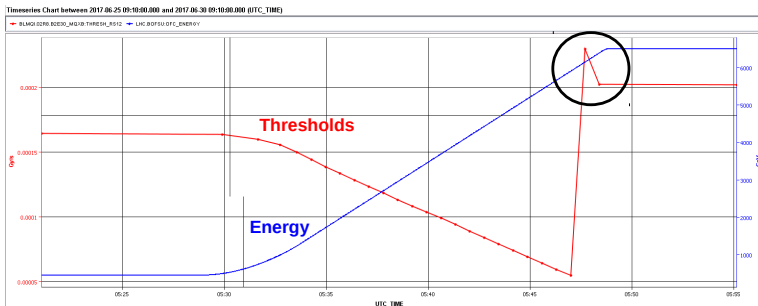
● TCTs

- Will be in warning for lumi $> 1.75 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$
- **No adjustment done now**, but to be done once we reach $1.7 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$

Analysis by A. Mereghetti

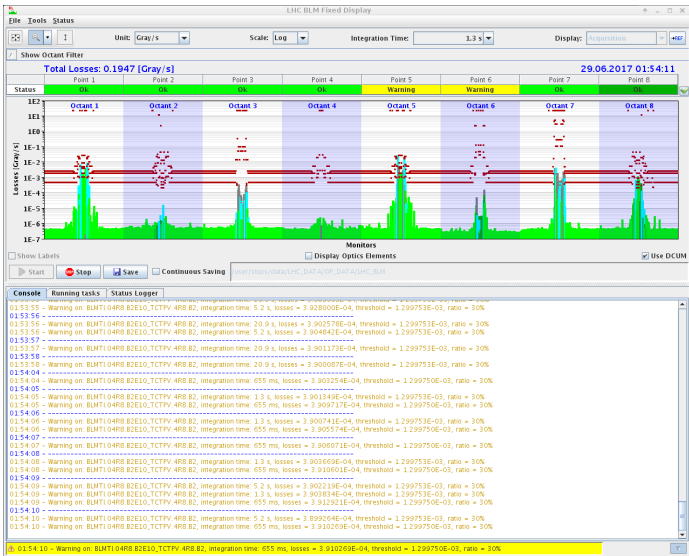
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FT corrections for pp debris at IR8 triplet/sep. dipoles



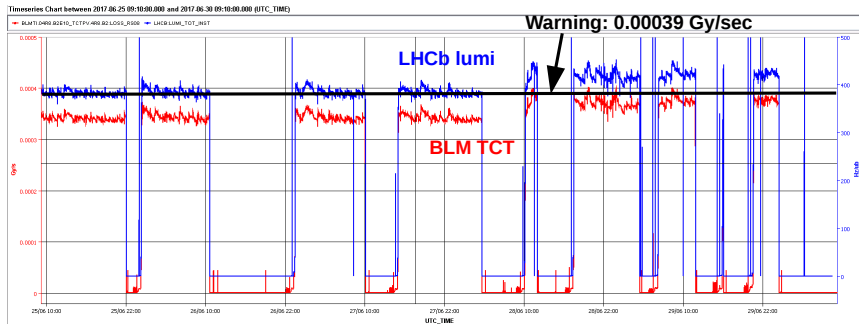
- One family (THRI.IP28.P3_MQXB_FT) had a FT correction in energy level 26 and 27 (the latter one being active at 6.5 TeV)
 - FT correction has been introduced in the beginning of 2016 for the 2016 proton run (LHC-BLM-ECR-0044) → inspired by the changes for the 2015 Pb run
 - **FT correction in energy level 26 was reverted to pre-2016 settings**, no change to energy level 27
- Otherwise: no adjustment of FT correction at magnets necessary for debris (no warnings up to $5 \times 10^{32} \text{cm}^{-2} \text{s}^{-1}$ expected, also for other spectr. polarity)

Debris-induced signals at TCTPV.4R8 (1/2)



- Reached **warning levels in long RS (≥ 8)** in the week before MD1/TS1

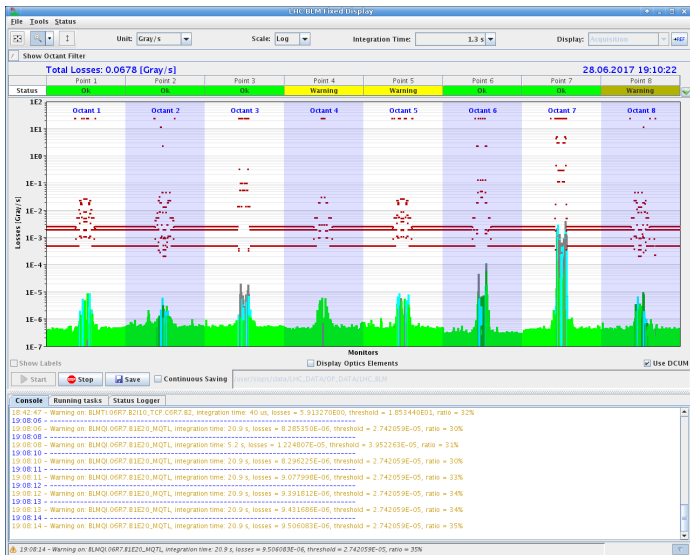
Debris-induced signals at TCTPV.4R8 (2/2)



- Warning when instantaneous lumi is $> 4.4 \times 10^{32} \text{cm}^{-2} \text{s}^{-1}$
- **Increased FT correction by 14%** to allow for $5 \times 10^{32} \text{cm}^{-2} \text{s}^{-1}$

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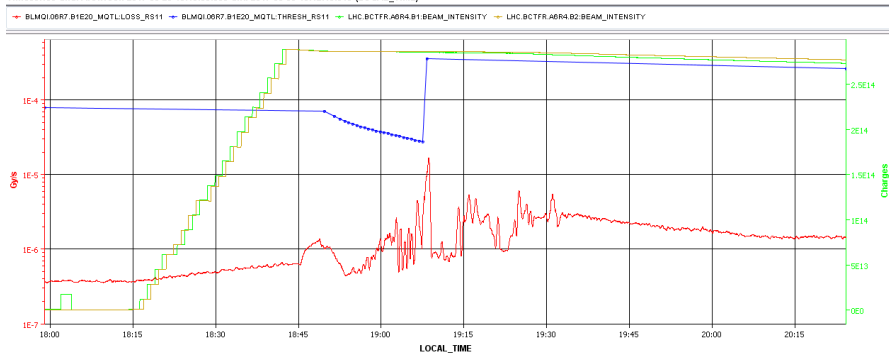
Collimation leakage to Q6.R7 (1/2)



- Reached **warning levels in RS11** in the week before MD1/TS1

Collimation leakage to Q6.R7 (2/2)

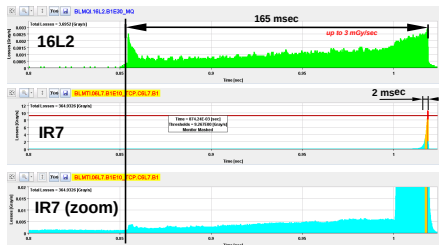
Timeseries Chart between 2017.06.28 10:45:00.000 and 2017.06.30 15:42:40.615 (LOCAL_TIME)



- Warnings during ramp **just before threshold energy level 27** is reached (FT correction not yet active) → similar behaviour in all 2500b fills
- Suggest not to perform any adjustment now, but to keep an eye on it

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Transient dumps in IR7 (following sudden losses in 16L2)



- Long story (see talks at LMC #309)
- **MFs at IR7 TCPs, TCSGs, and TCLAs** were temporarily increase from **0.4 to 0.8** (corresponds to a power loss of 400 kW for 1-10 sec and to 80 kW in steady-state conditions)
 - will likely not prevent such dumps, but beneficial to collect more data
 - was reverted before MD1
- **MF of 0.8 was re-established in TS1** (origin of the dumps remains a mystery)

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Summary of TS1 BLM threshold changes

Changes TS1:

- **Increased FT correction of THRI.TCTVB_OI_RC8 by 14%** to mitigate pp debris-induced warnings at the TCT.4R8
- **Increased FT correction of THRI.TCL by 30%** to avoid pp debris-induced warnings at the TCL.4R5
- **Removed FT correction from energy level 26 of THRI.IP28.P3_MQXB_FT** which remained there by mistake
- **Increased MF of following families from 0.4 to 0.8** to allow for a better data collection in case the transient dumps reoccur after TS1:
 - **THRI.7_TCP**
 - **THRI.7_TCSG**
 - **THRI.7_TCSG_F5**
 - **THRI.06_7_AB_TCLA**
 - **THRI.06_7_CD_TCLA**
 - **THRI.07_7_AB_TCLA**

Will keep an eye on:

- Q6.R7 BLM warnings during ramp
- IR1 triplet BLMs in case the lumi approaches $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$