

Correlating ATLAS Events with LHC Logging Data

Andreas Hoecker (CERN), Thorsten Wengler (Manchester), ADP Meeting, Oct 30, 2008

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Preliminaries...

September 10, 2008

- long runs: 87764 (beam 1+2), 87851, 87863 (beam 2)
- short runs: 87860, 87861, 87862 (beam 2)

September 11, 2008

- long runs: 88069 (beam-2)

September 12, 2008

- long runs: 88128, 88153 (beam 2), 88234 (short beam 2)

All runs reprocessed
(except for 88234)

Legend for following plots:

- BLMEI: Beam loss monitor after beam-1/2 collimators before P1 (L1/R1)
- TCTH: Collimator positions (GD = downstream gap) before P1 (L1/R1)
- TI2: Beam injection intensity in units of 10^{10} protons (beam-1/2 = TI2/8)
- ATLAS 'splash' events are selected with the indicated requirements

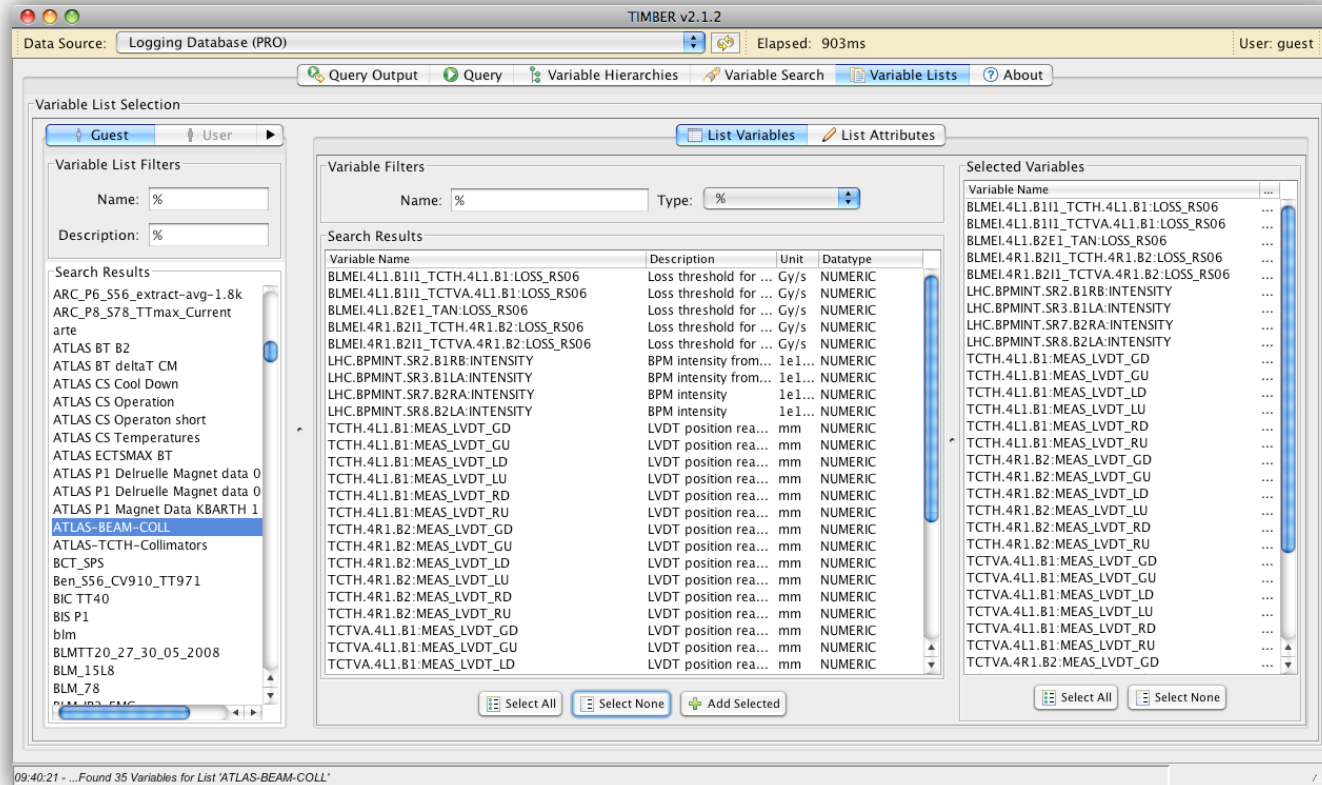
Note that UTC = Wall Clock (=GMT) – 2h

TWiki page with all the information related to obtaining the following plots in preparation → will be announced later

TAG_COMM selection of 'splash' events

Timber for LHC Logging data: <http://cern.ch/timber>

- Provides java interface to LHC Logging DB
- No grant restrictions (but: must be within CERN network)
- Provides charts, and dumps in excel or text files (wrote script to transfer to TTree)

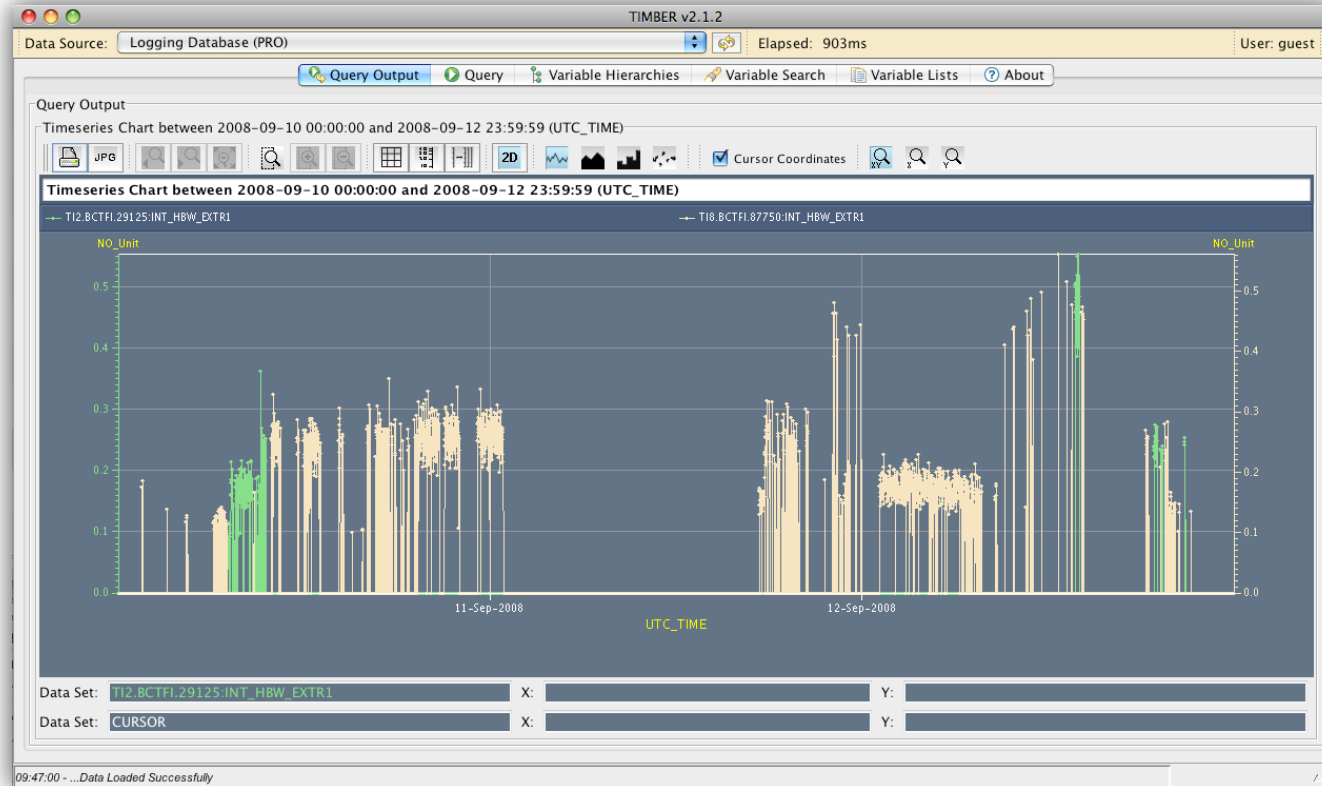


Tools...

TAG_COMM selection of 'splash' events

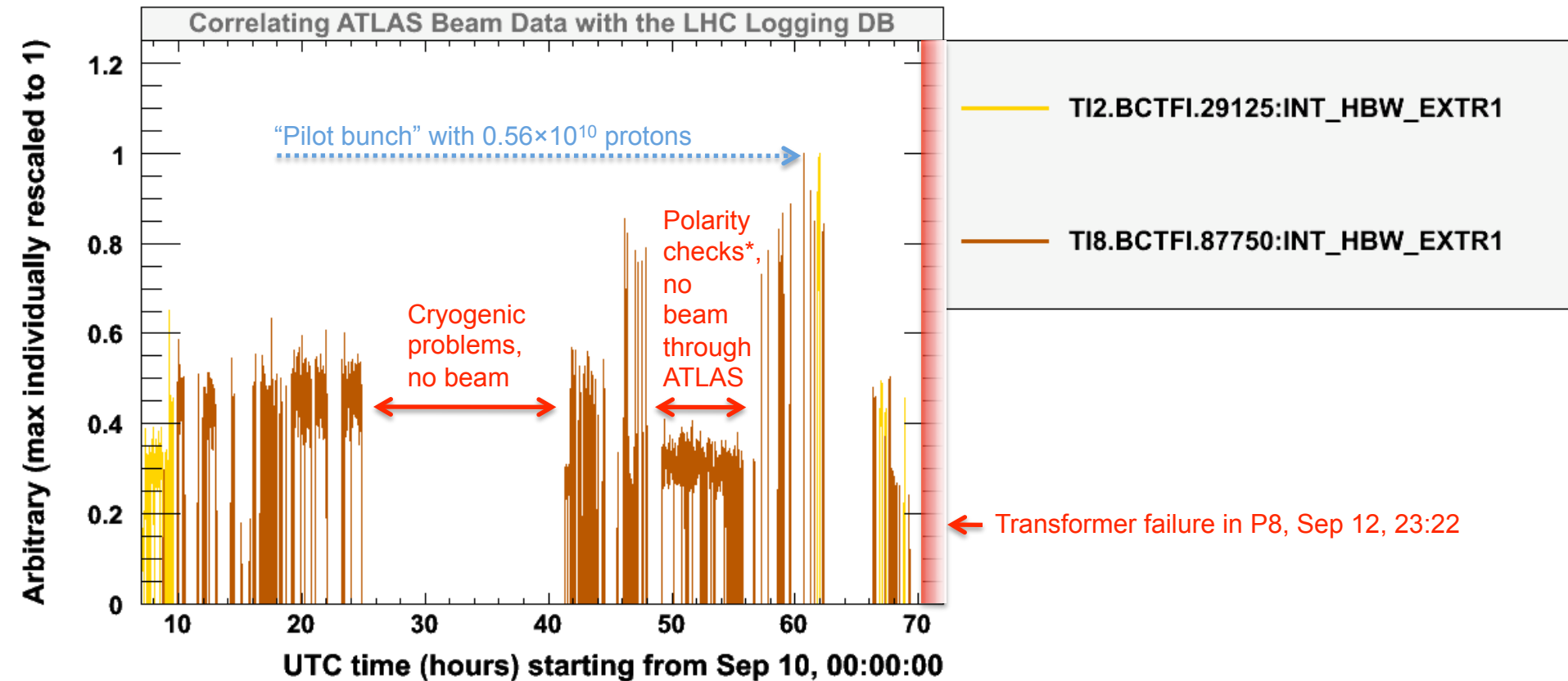
Timber for LHC Logging data: <http://cern.ch/timber>

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LHC Logging data and ATLAS runs between Sep 10 and 12, 2008

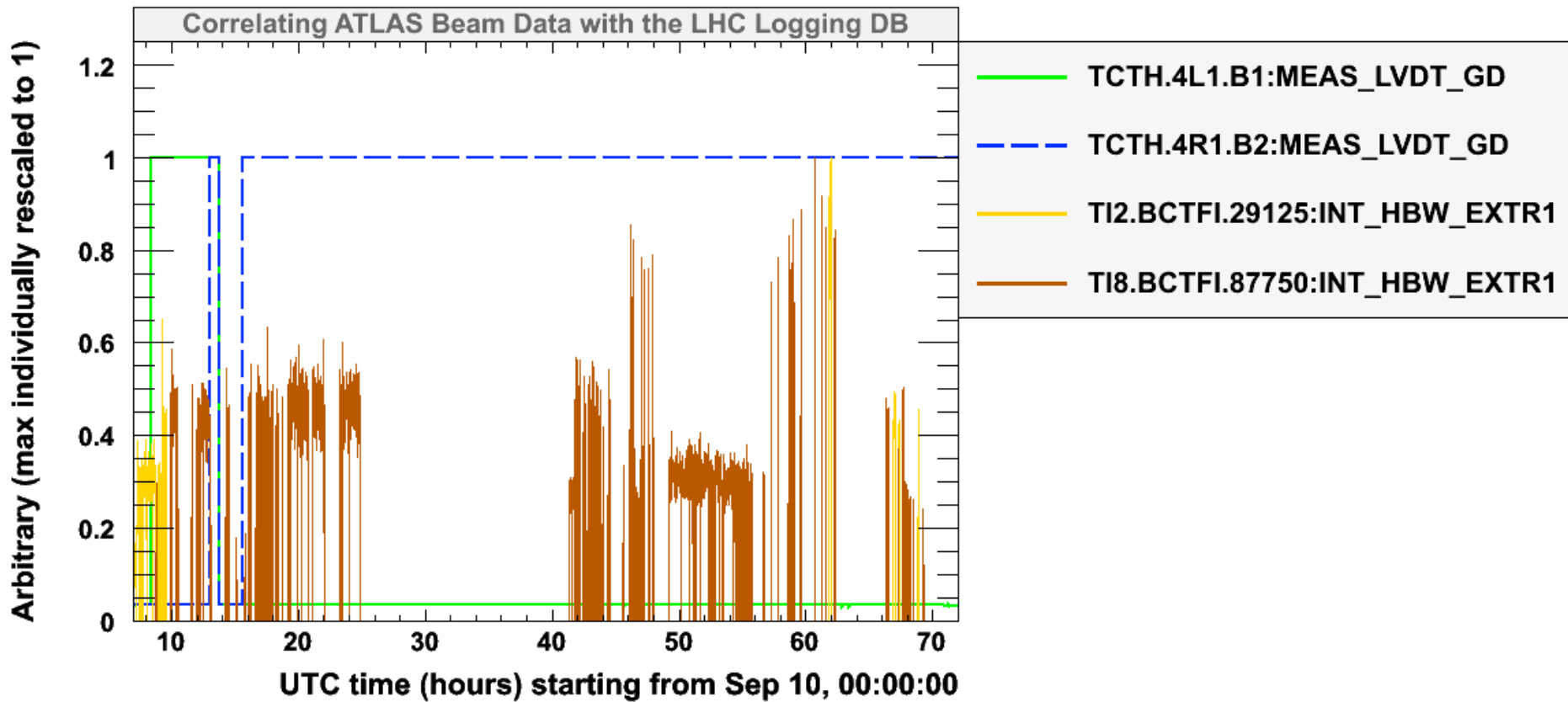
LHC logging data and ATLAS runs between Sep 10 and 12, 2008



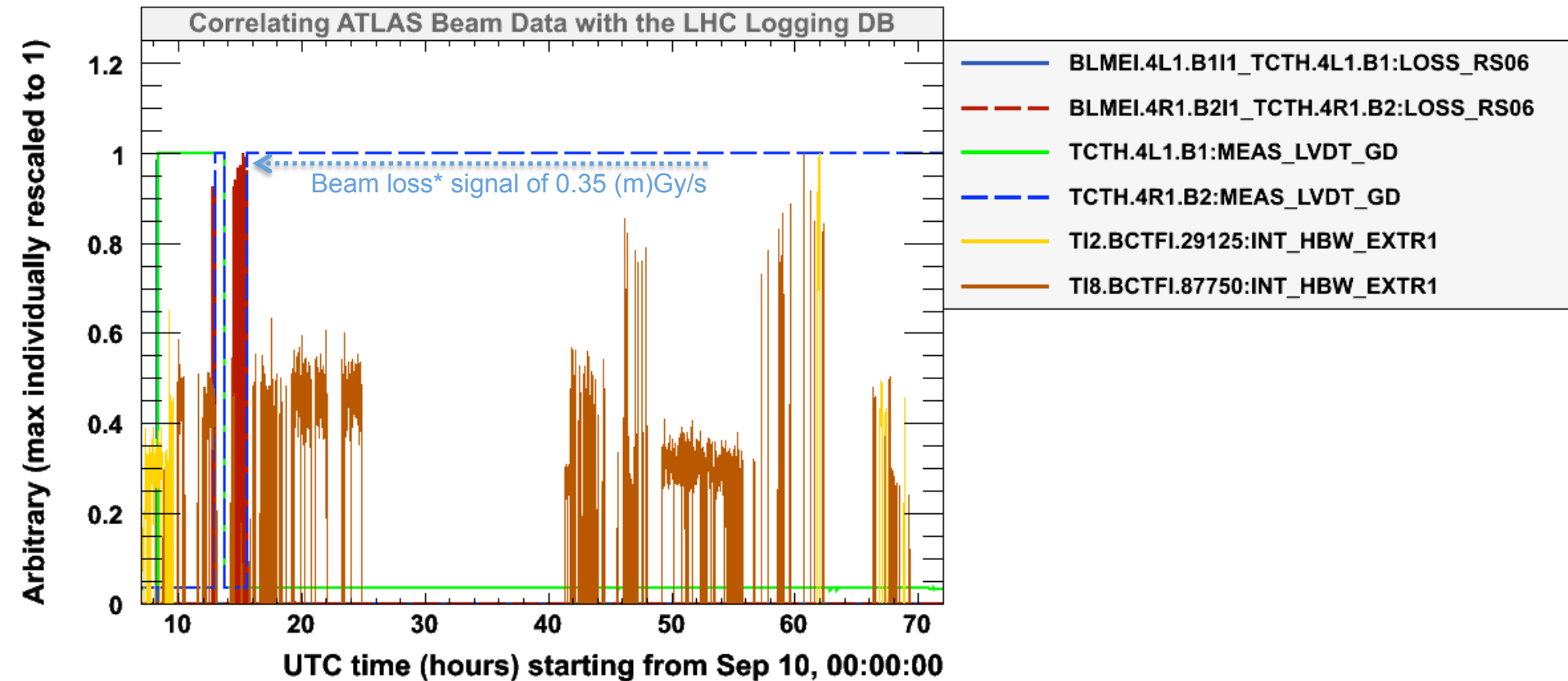
Overview of beam injections into LHC through transfer lines TI2 (beam-1) and TI8 (beam-2)

Note: this doesn't necessarily mean beam through ATLAS!

* Polarity checking scans verify multipole field order, type and polarity of the superconducting LHC magnets



Overview of beam injections into LHC through transfer lines TI2 (beam-1) and TI8 (beam-2)
Collimator positions (1 = collimator open, 0 = closed)

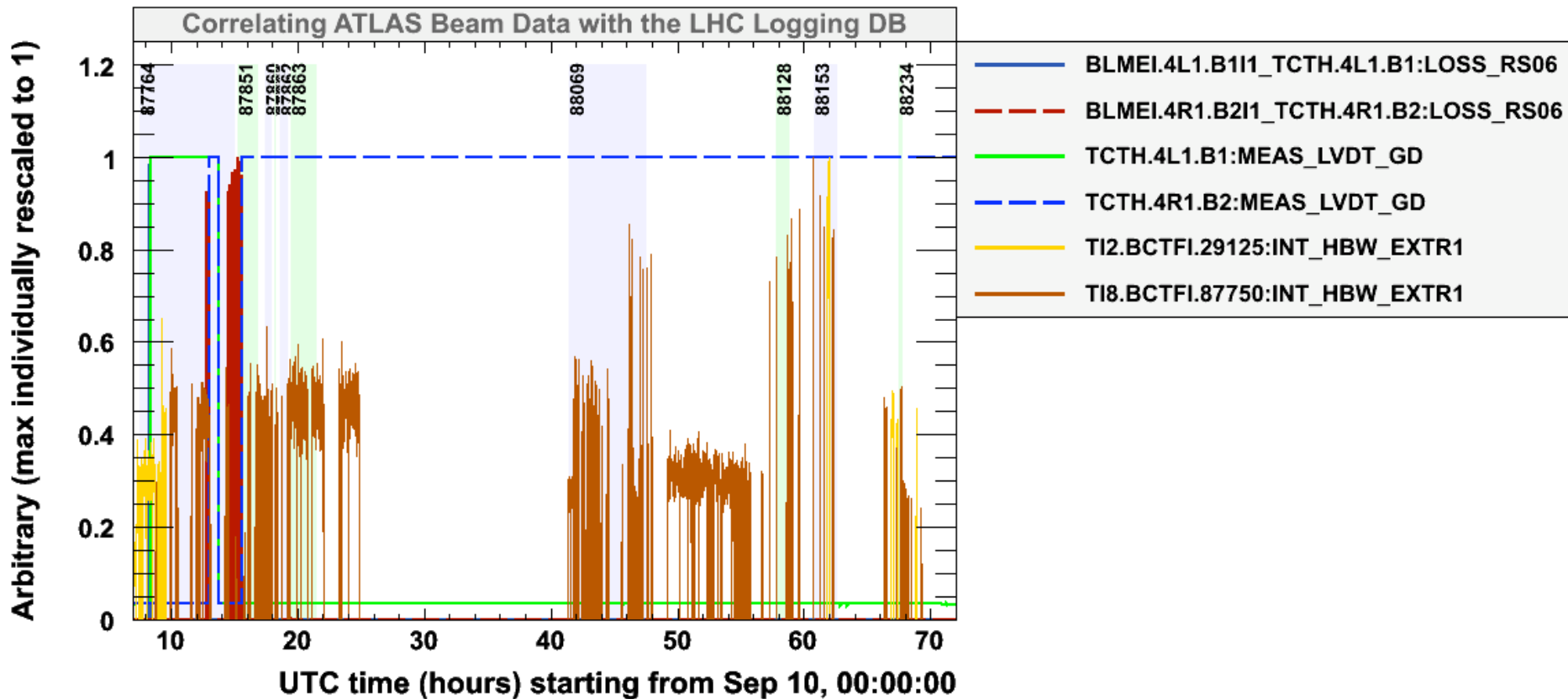


Overview of beam injections into LHC through transfer lines TI2 (beam-1) and TI8 (beam-2)

Collimator positions (1 = collimator open, 0 = closed)

Strong beam loss signals around P1

* LHC beam loss monitor system for machine protection and quench prevention comprises ~4000 detectors



Overview of beam injections into LHC through transfer lines TI2 (beam-1) and TI8 (beam-2)

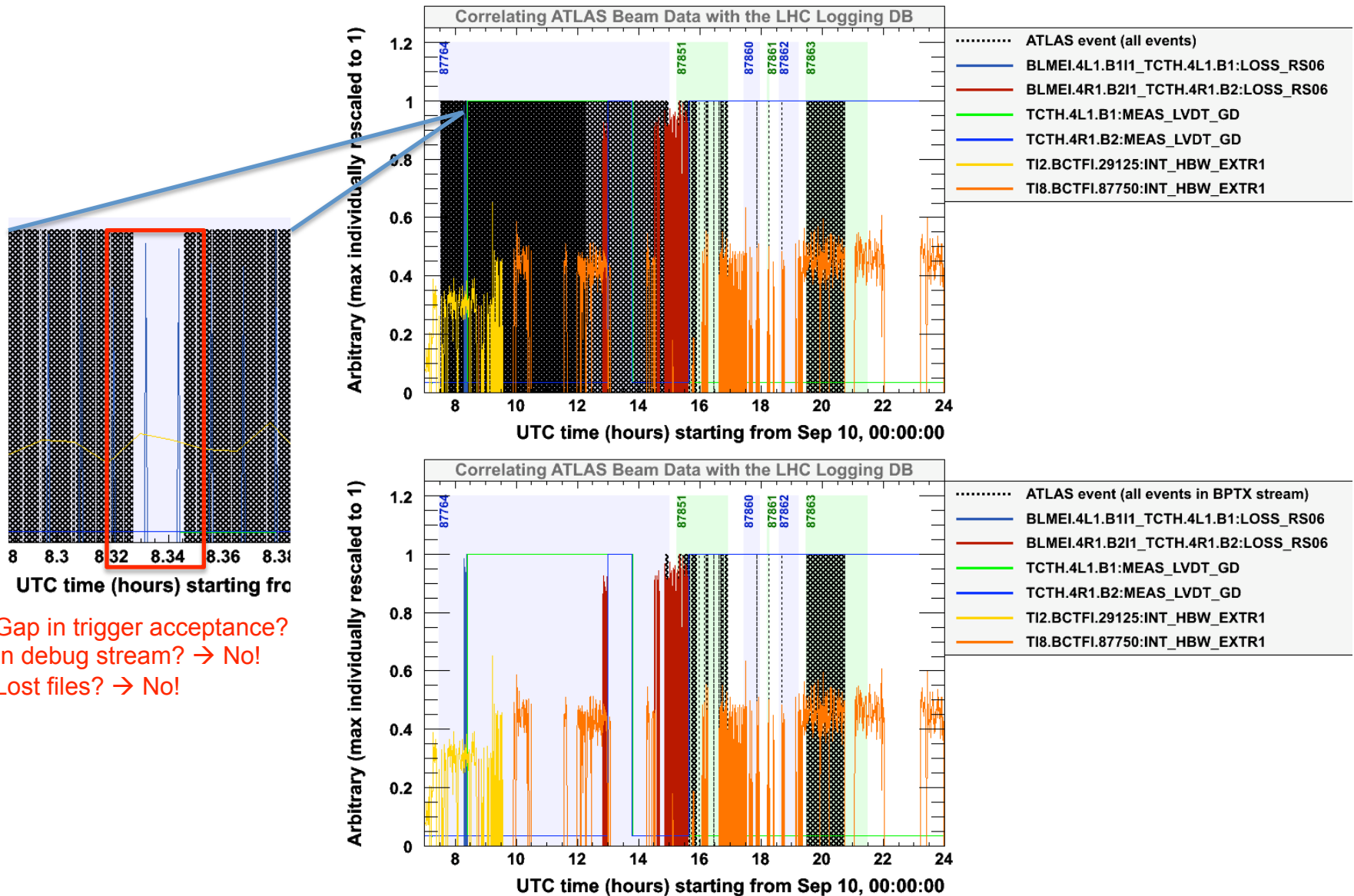
Collimator positions (1 = collimator open, 0 = closed)

Strong beam loss signals around P1

Useful ATLAS runs (incl. BPTX signal and/or MBTS, TGC and/or L1Calo triggers)

Zoom to first day: Sep 10, 2008

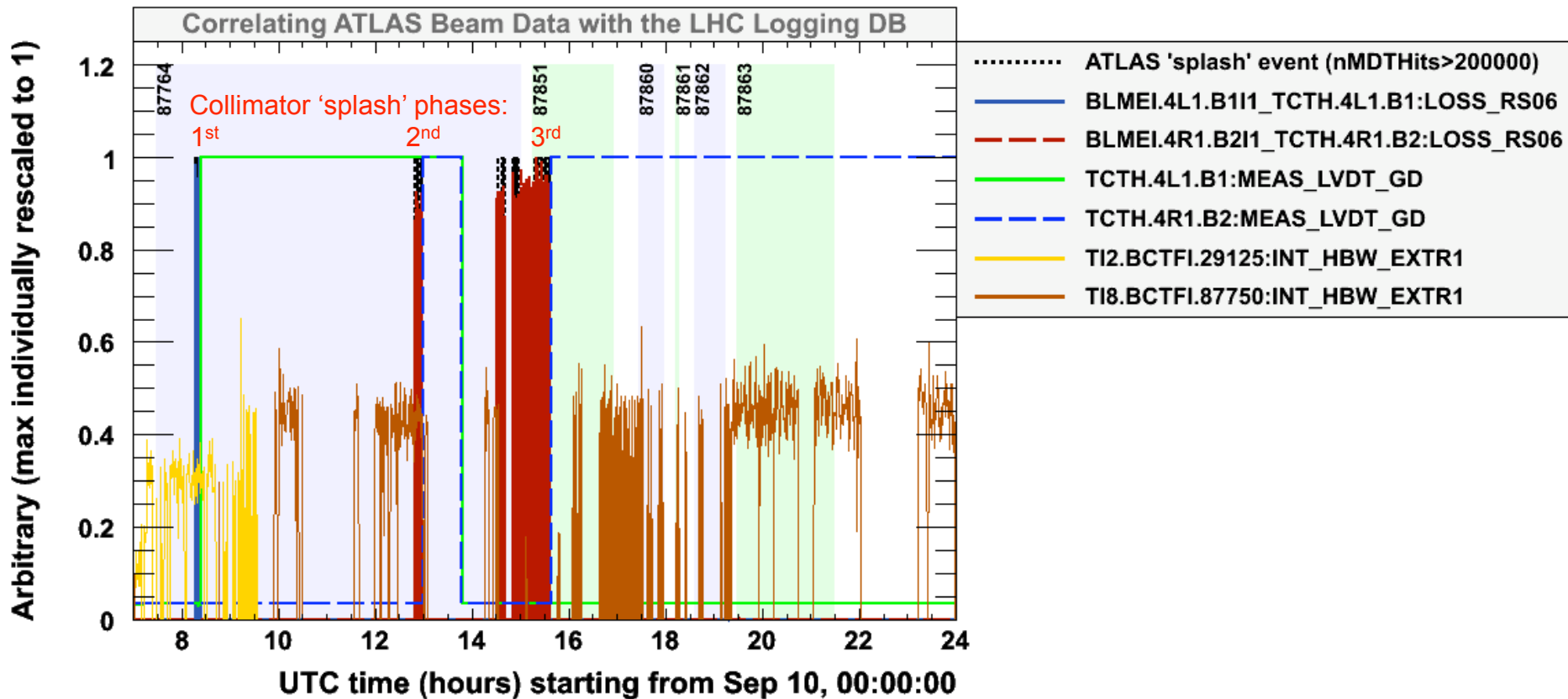
Zoom to first day: Sep 10, 2008



Overview of the ATLAS run periods on Sep 10 until midnight. ATLAS events shown by dashed-black lines. Top: all events recorded. Bottom: BPTX stream only.

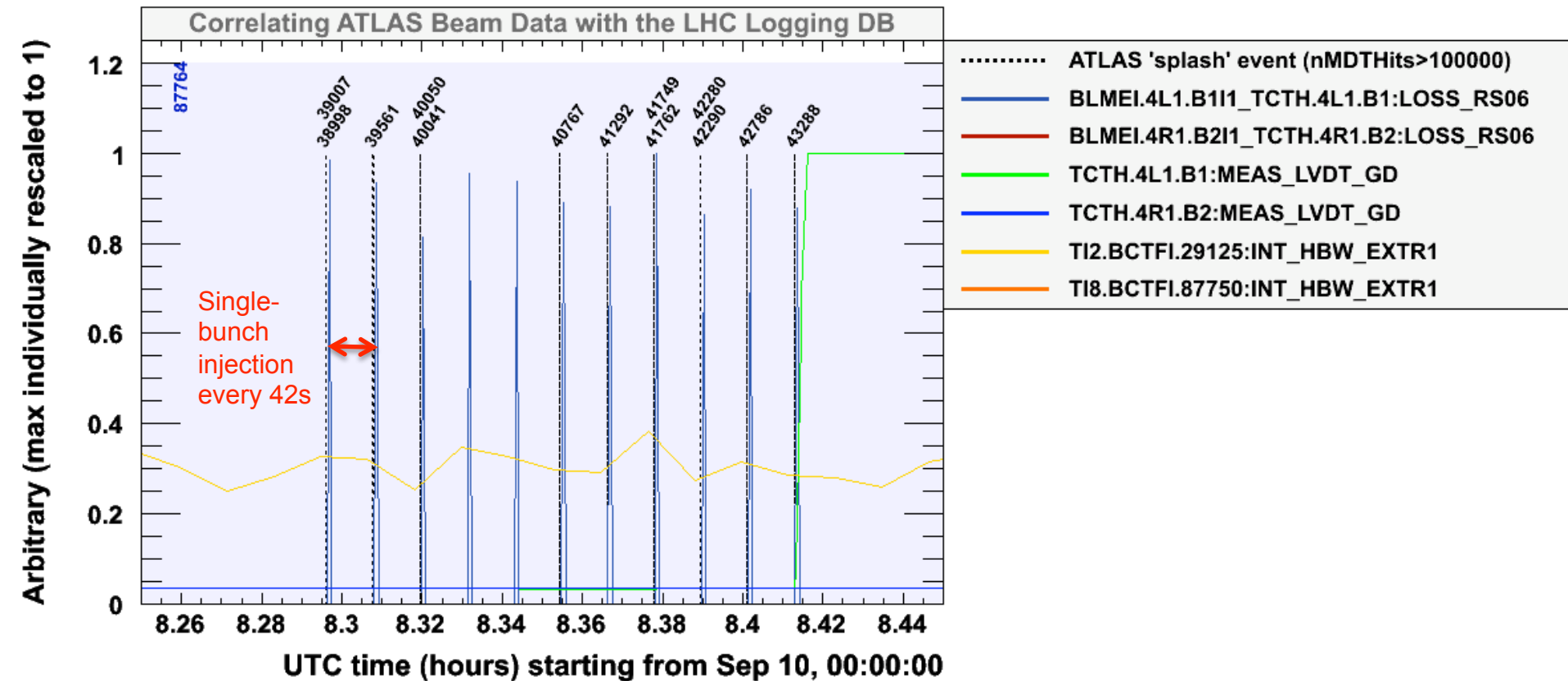
MDT hit requirements

MDT hit requirements



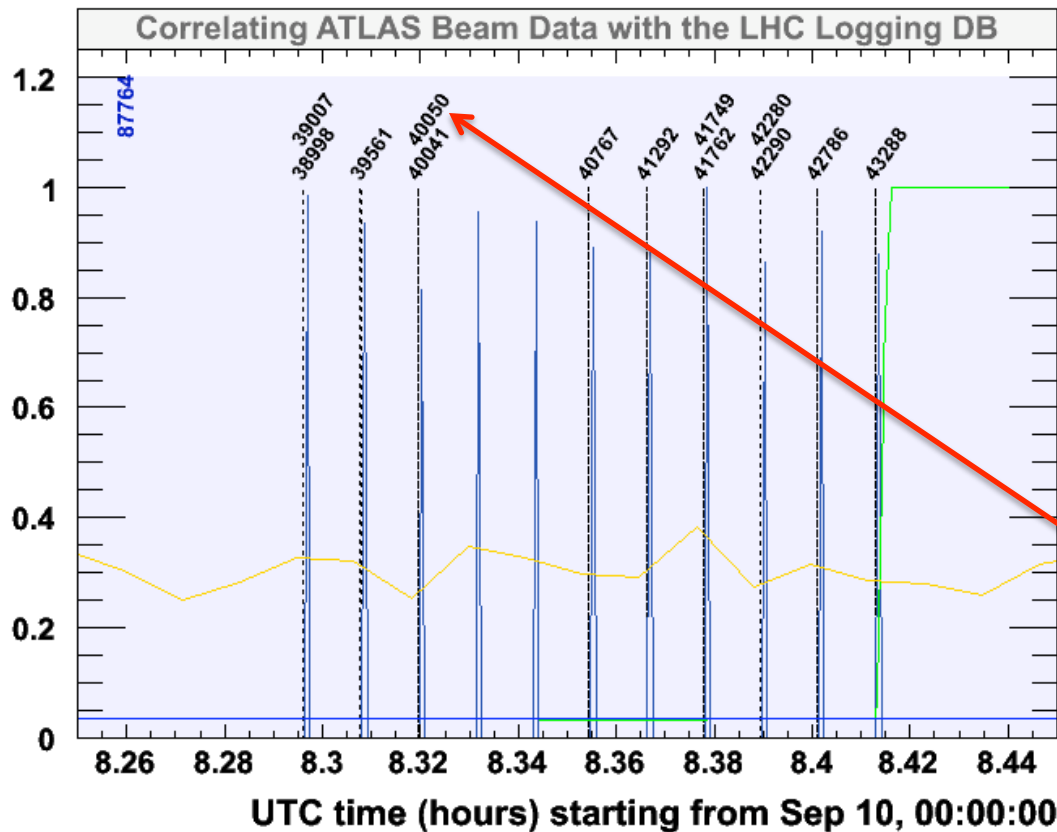
Overview of beam injections (light orange: beam-1, dark orange: beam-2), collimator positions (1 = collimator open, 0 = closed), moments of strong beam losses due to closed collimators, and the run periods on Sep 10 until midnight.

“Extreme” beam ‘splash’ events with more than 200k MDT hits only occur with closed collimators. ATLAS recorded about 70 extreme beam ‘splash’ events from a total of ca. 100.

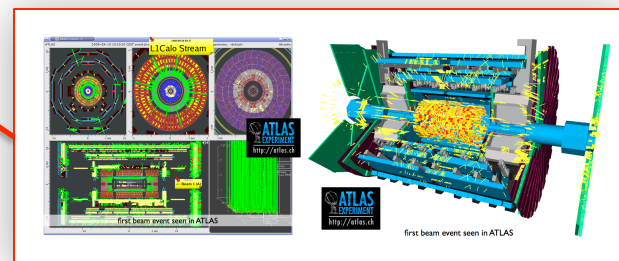


Zoom into the first beam 'splash' phase with beam-1 closed collimator, recorded in run 87764. Of 11 beam 'splashes' (solid-blue), 9 have been triggered (ATLAS events are dashed-black, the event numbers are indicated).

Arbitrary (max individually rescaled to 1)

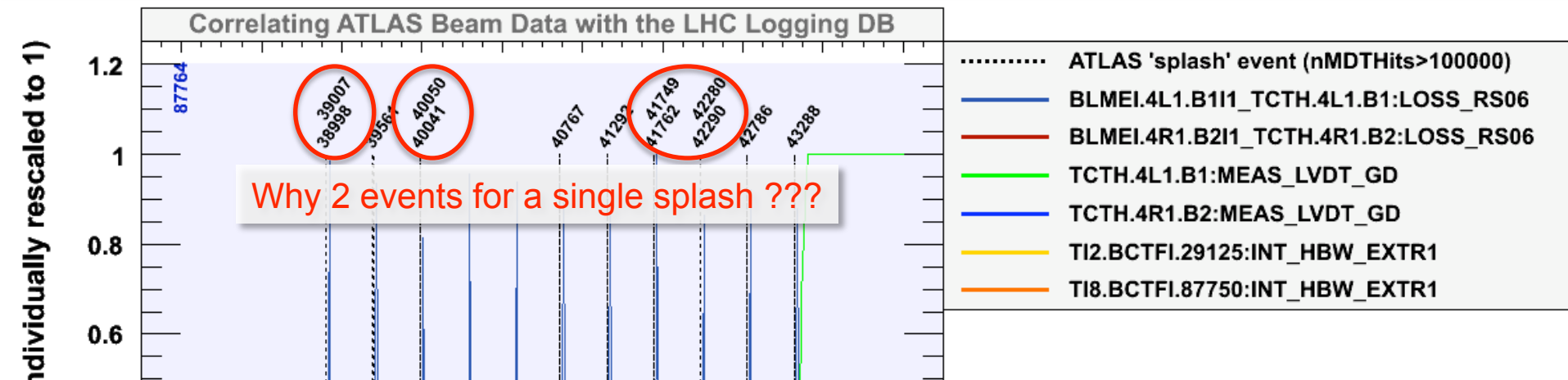


- ATLAS 'splash' event (nMDTHits>100000)
- BLMEI.4L1.B1I1_TCTH.4L1.B1:LOSS_RS06
- BLMEI.4R1.B2I1_TCTH.4R1.B2:LOSS_RS06
- TCTH.4L1.B1:MEAS_LVDT_GD
- TCTH.4R1.B2:MEAS_LVDT_GD
- TI2.BCTFI.29125:INT_HBW_EXTR1
- TI8.BCTFI.87750:INT_HBW_EXTR1



“First beam event seen in ATLAS”
(not quite !)

Zoom into the first beam ‘splash’ activity with beam-1 closed collimator, recorded in run 87764. Of 11 beam ‘splashes’ (solid-blue), 9 have been triggered (ATLAS events are dashed-black, the event numbers are indicated).



Example (thanks to David Berge for digging out the information)

Event 40041

Time stamp: 1221034750 s, 217243850 ns
 $\rightarrow \Delta = 900 \text{ ns} = 36 \text{ bunch crossings}$

L1 triggers: Tau5, J5 (L1Calo)
 $\rightarrow$ deadtime: 35 bunch crossings
 (L1Calo known to be very early)

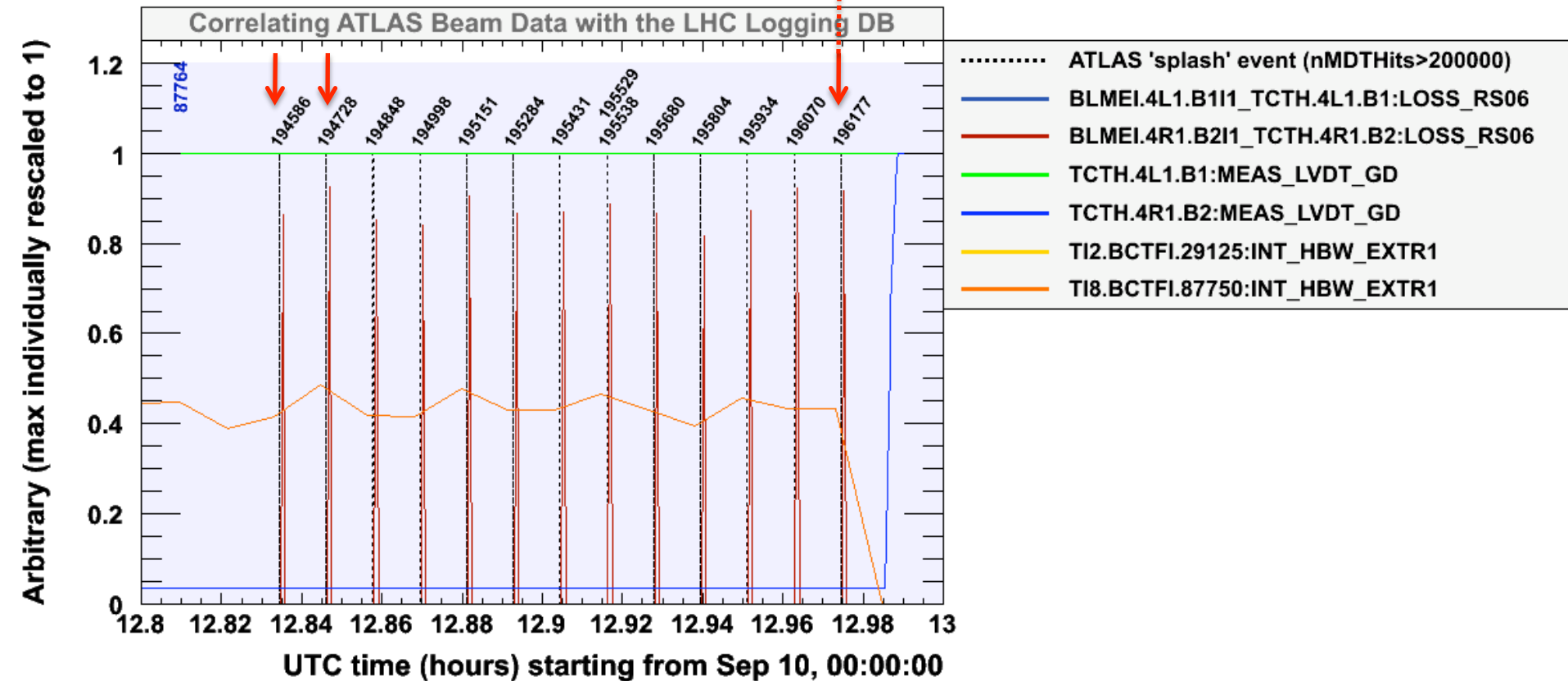
Event 40050

1221034750 s, 217244750 ns

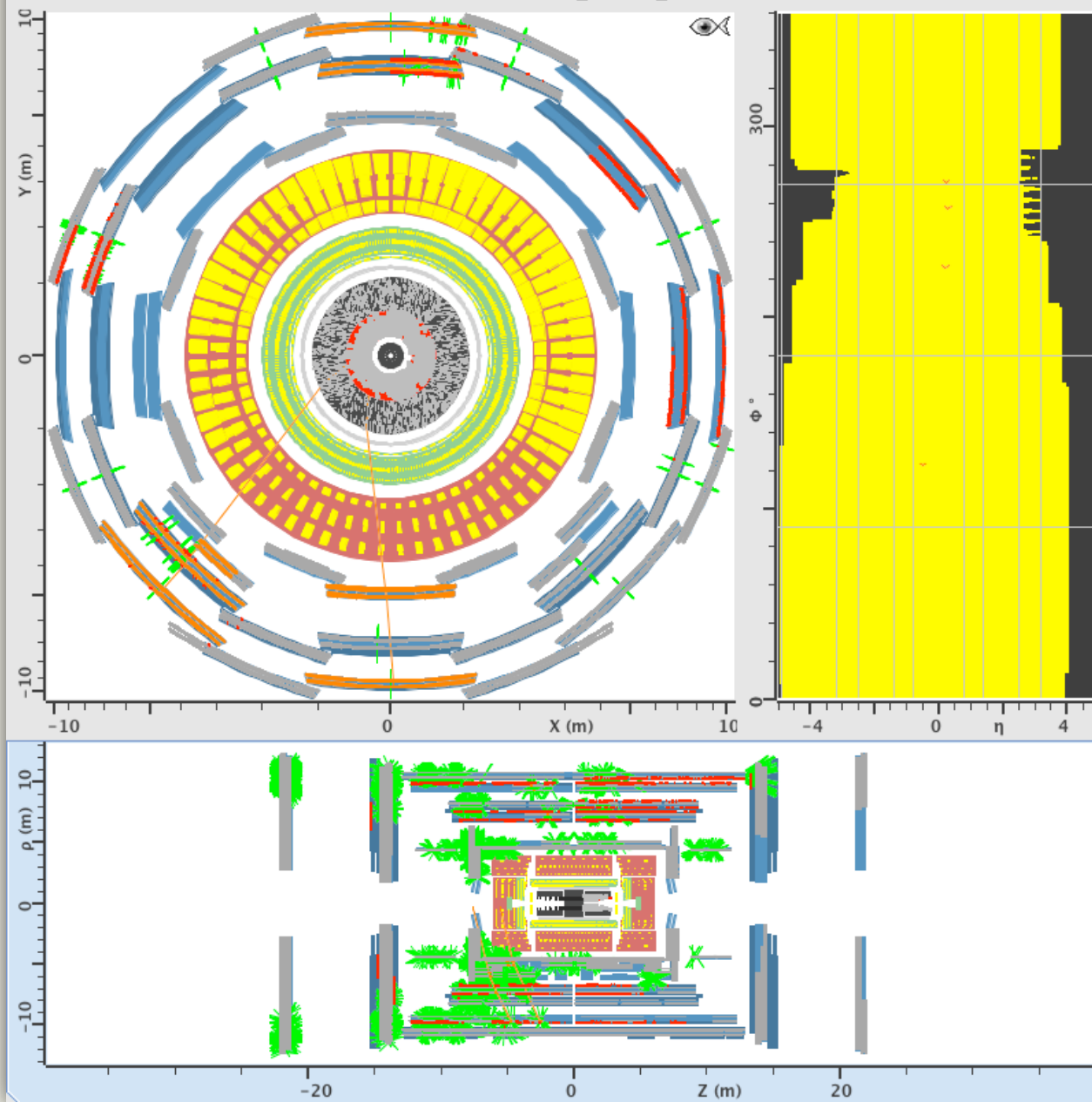
Tau5, J5, MBTS

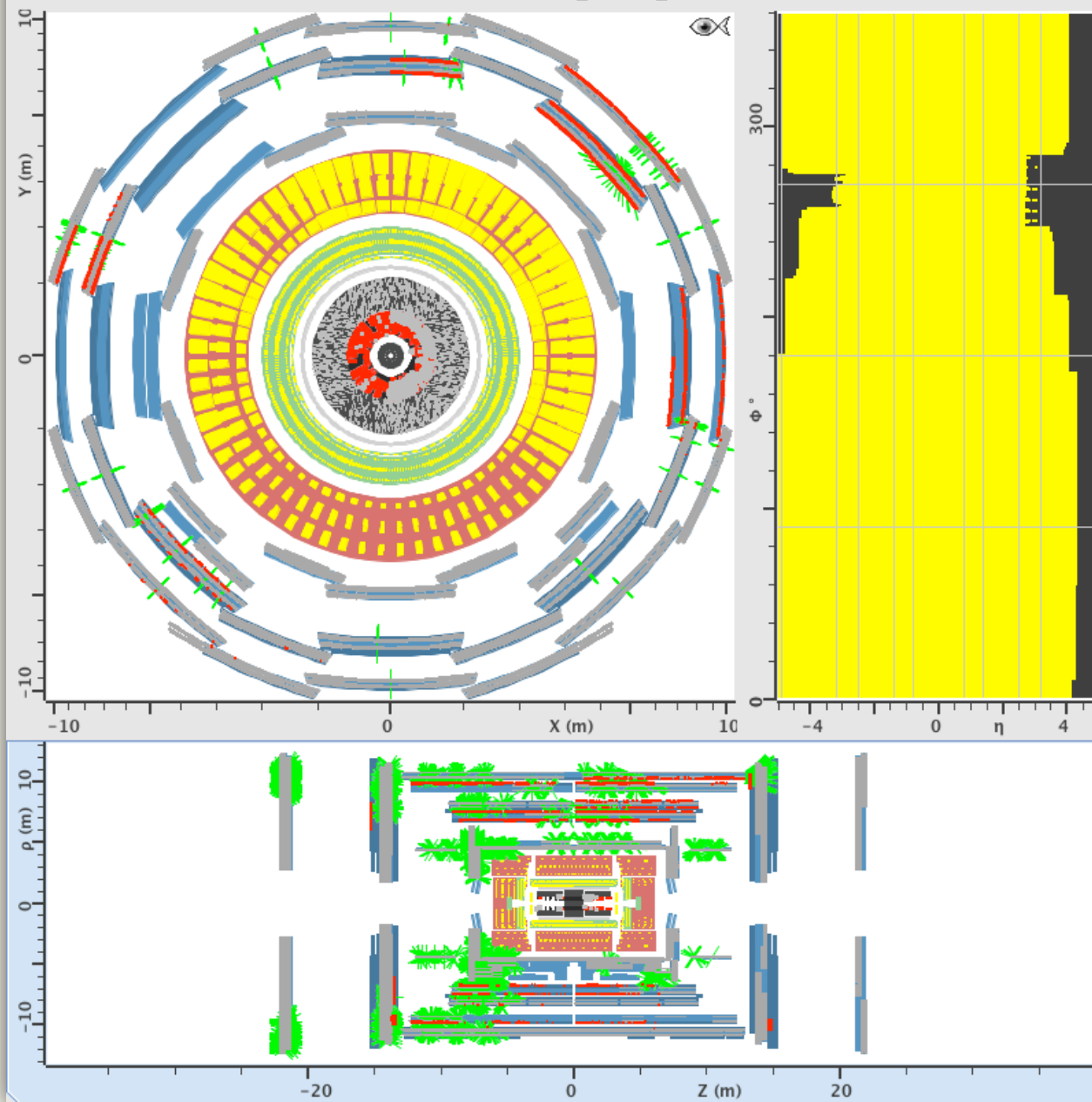
Same pattern for all other doubly triggered events.

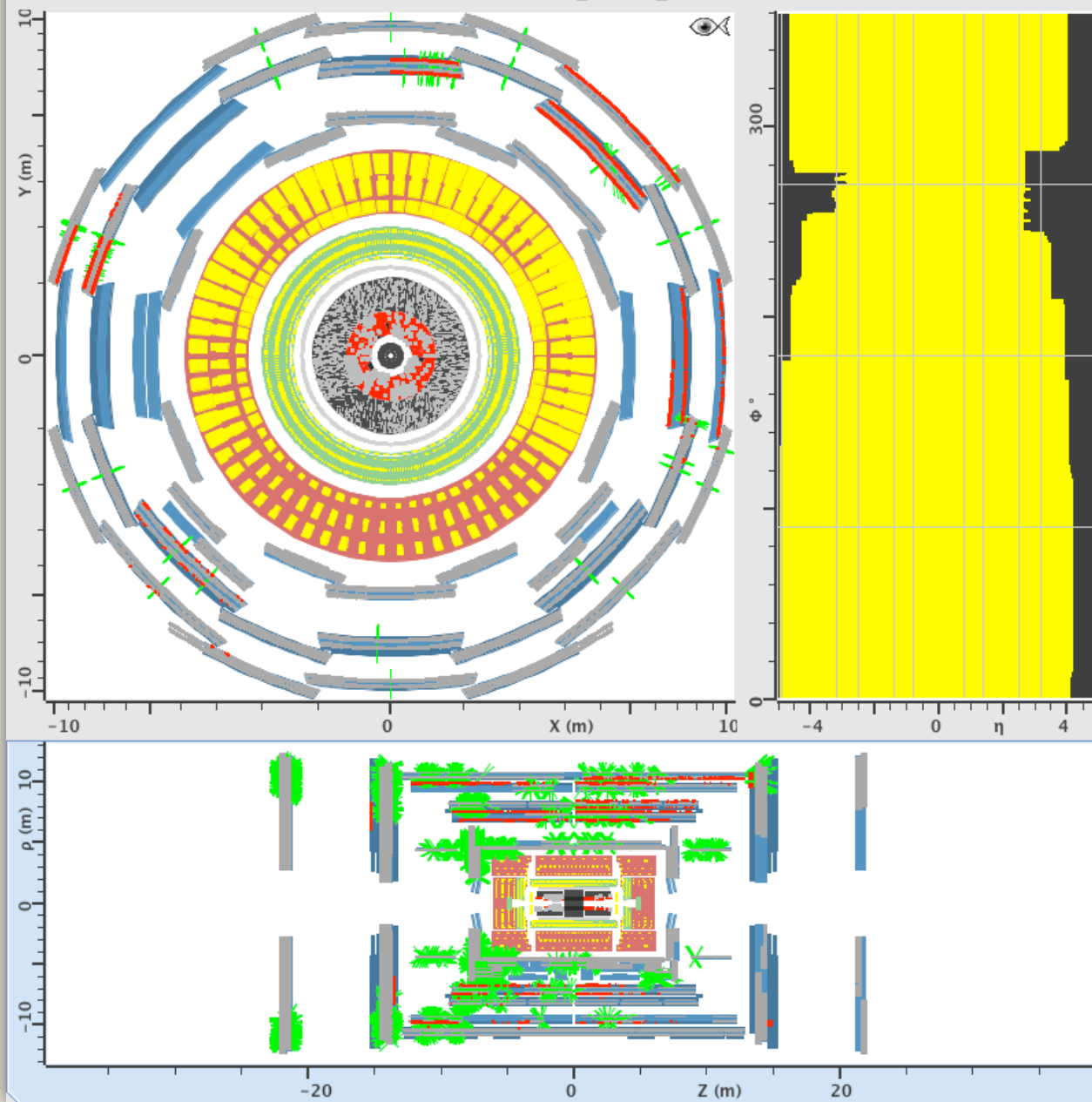
Event displays on following pages

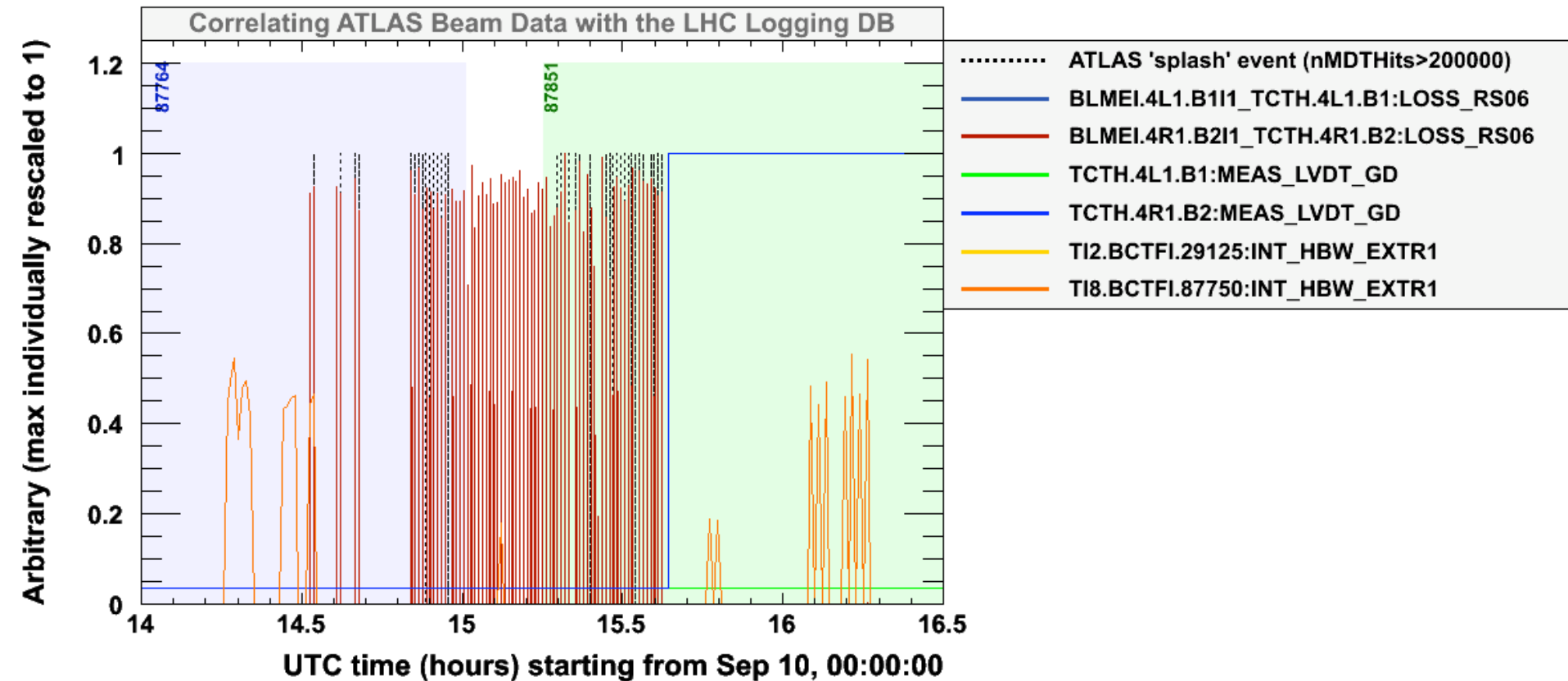


Zoom into the second beam 'splash' activity with beam-2 closed collimator, run 87764.
All beam 'splashes' (dark red peaks) recorded by ATLAS (dashed-black lines).

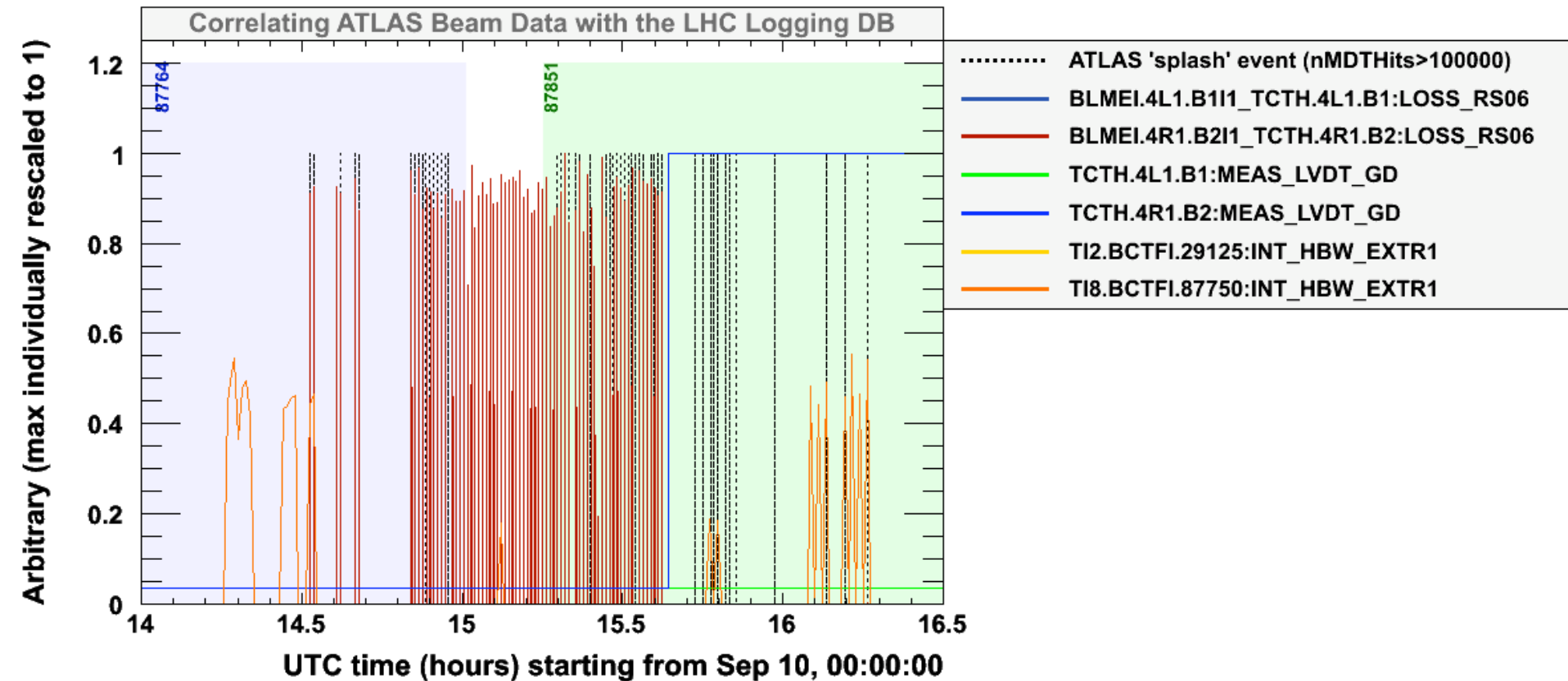








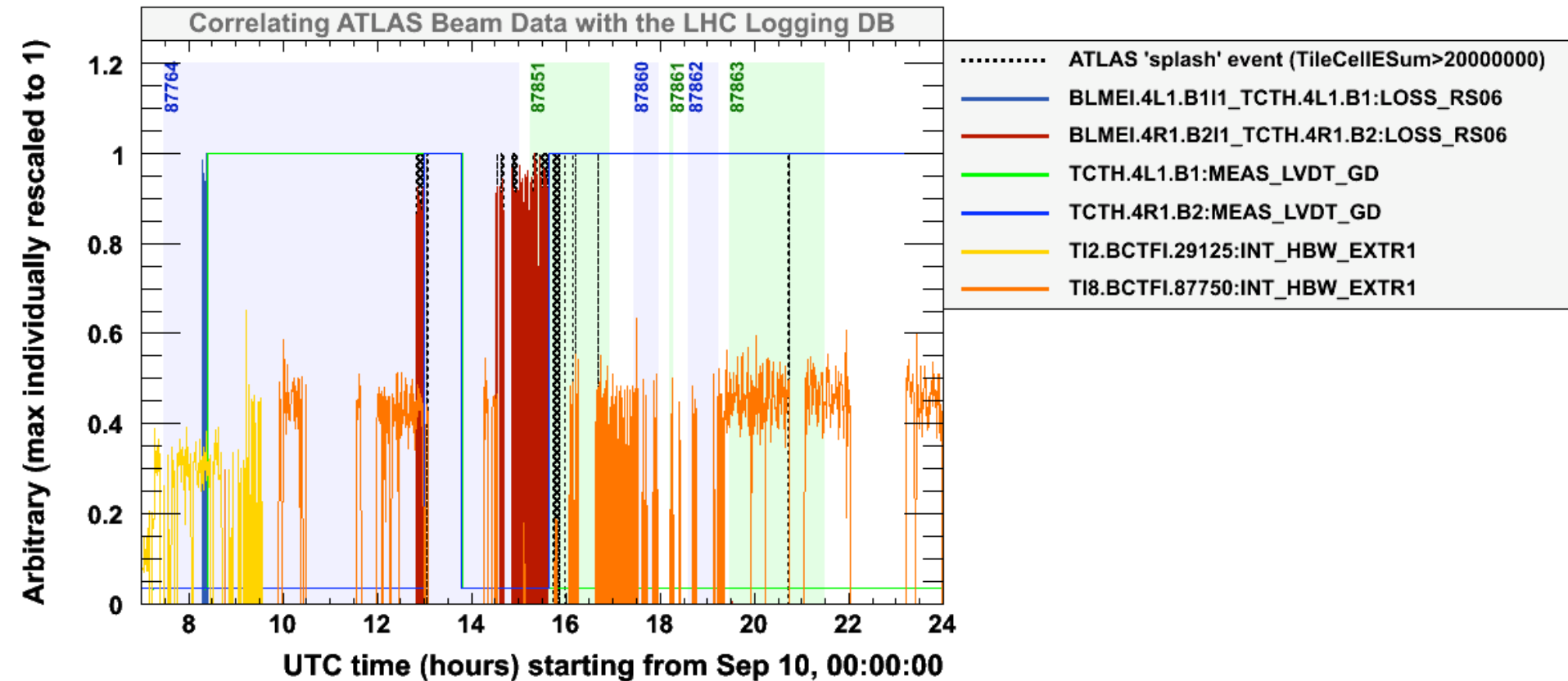
Zoom into the third beam 'splash' phase with beam-2 closed collimator, run 87851.
Some 'splash' events occurred during run change → lost.



Zoom into the second beam 'splash' activity with beam-2 closed collimator, run 87851.
 Relaxed cut on number of MDT hits. Softer 'splashes' appear in spite of open collimator
 → Random beam losses due to quadrupole tweaking in preparation of run with multiple turns

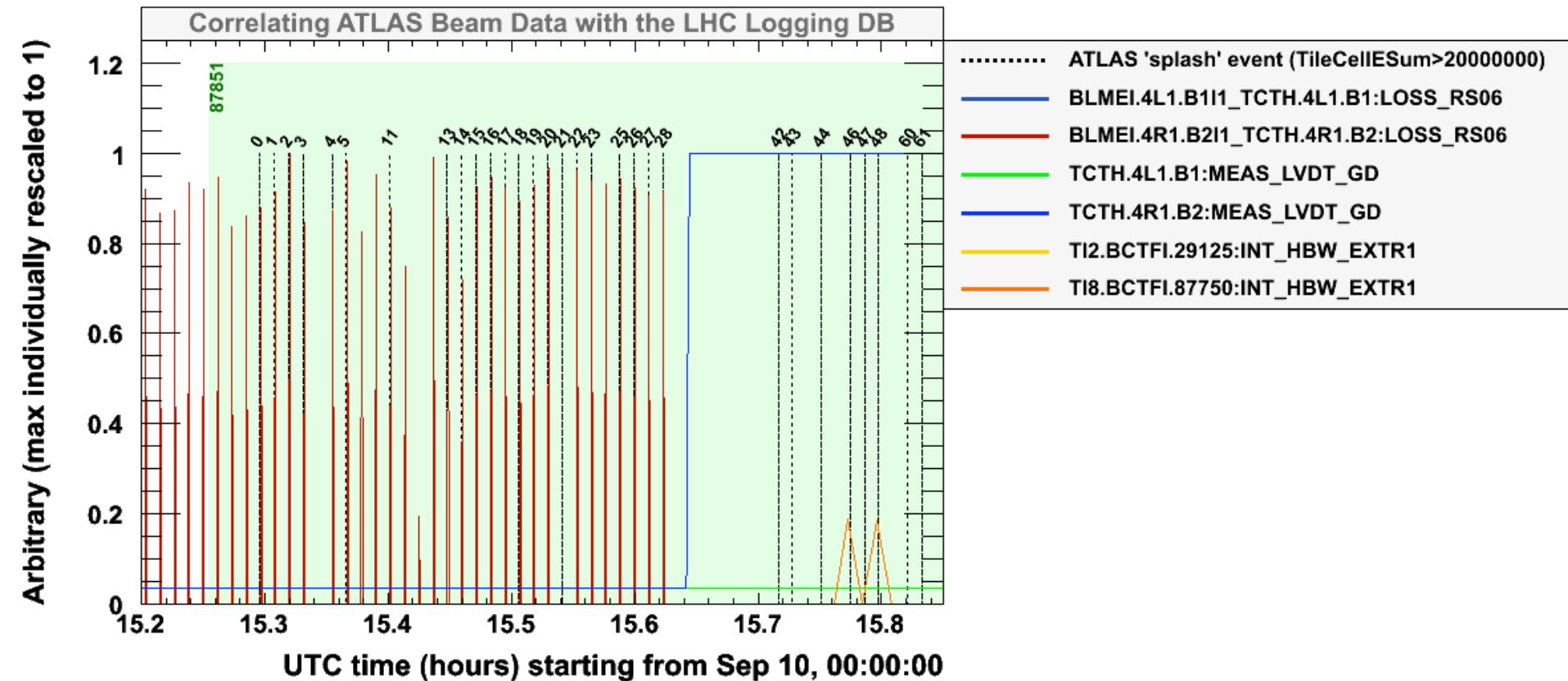
Tile energy sum requirements

Tile energy sum requirements



September 10 full overview (again).

Beam 'splash' events with more than 20 TeV energy sum over all Tile cells are shown by the dashed-black lines.



Zoom into the third beam 'splash' phase with beam-2 closed collimator, run 87851.

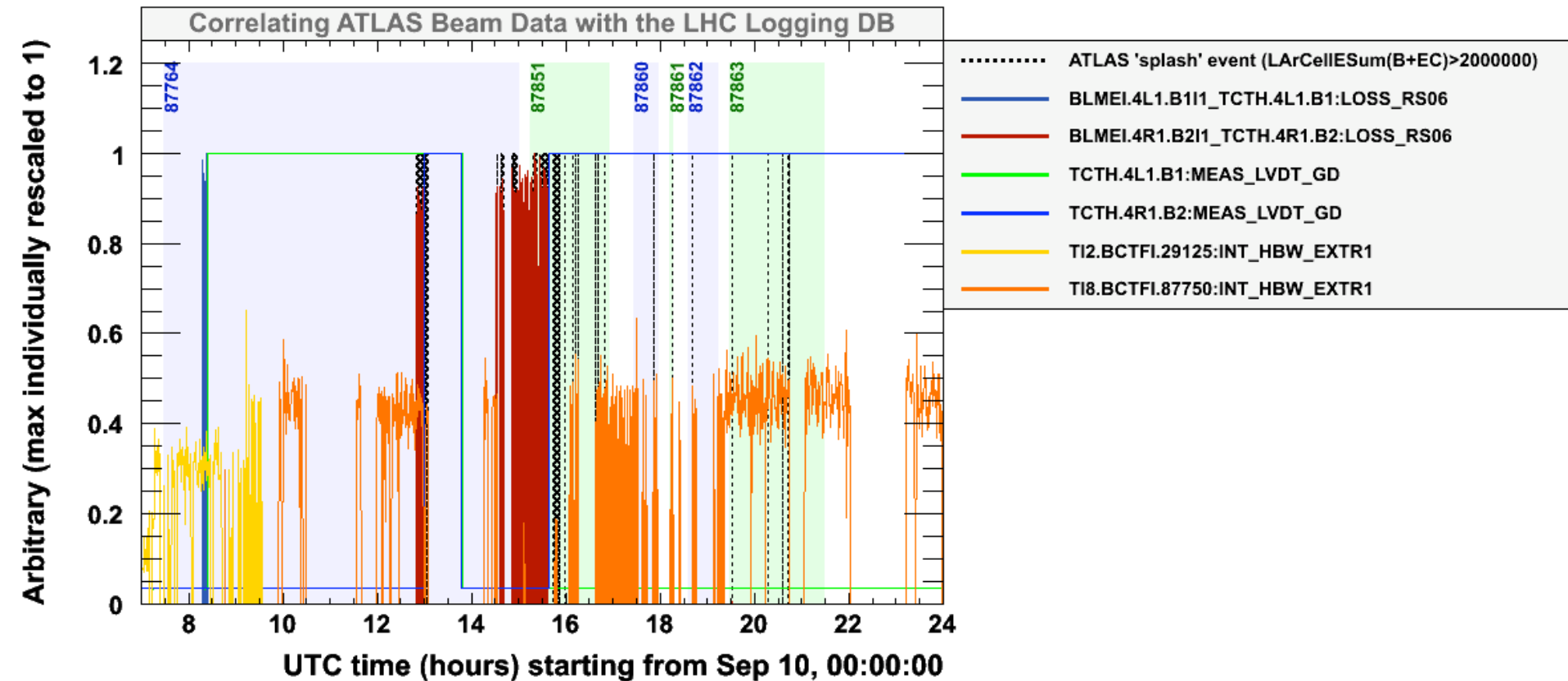
The event counter suggest that almost all splash events were triggered. Missing dashed-black lines are (most probably) events that did not pass the Tile energy cut (to be confirmed).

No efficiency during first 3 min of run.

LAr energy sum requirements

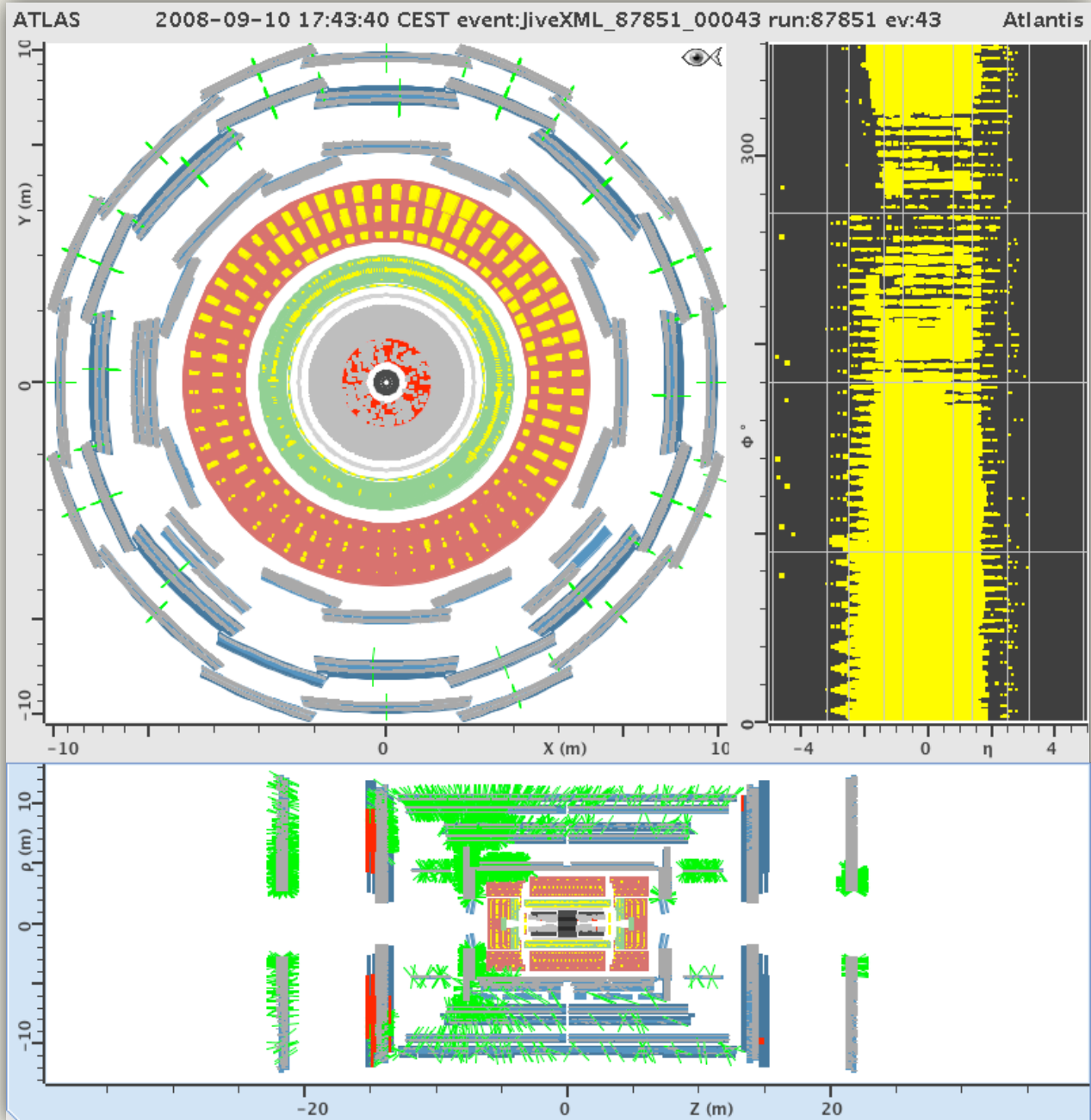
LAr energy sum requirements

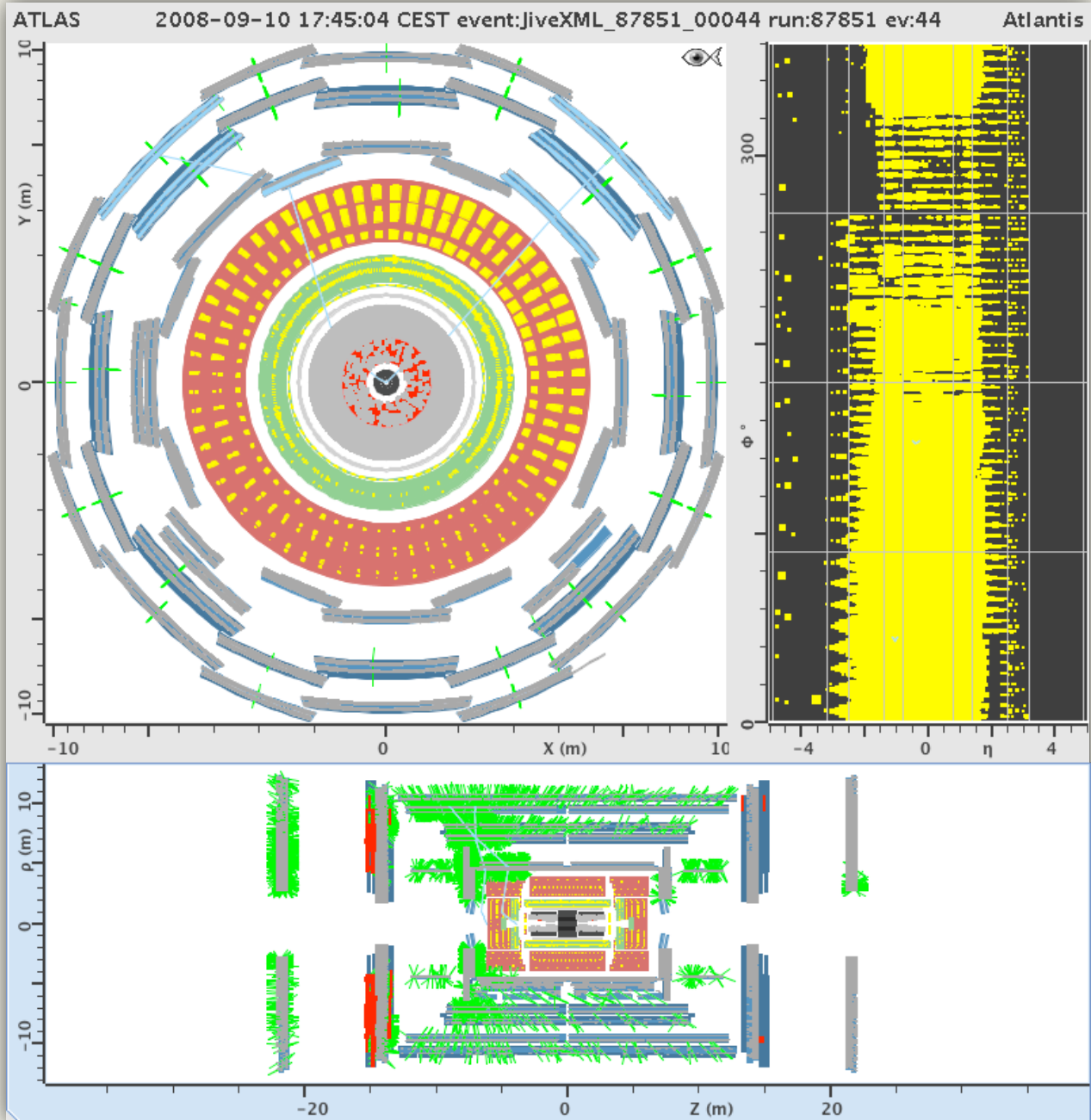
[no useful LAr data for run 87764, due to bad trigger timing
(giving events with huge negative energy sums)]

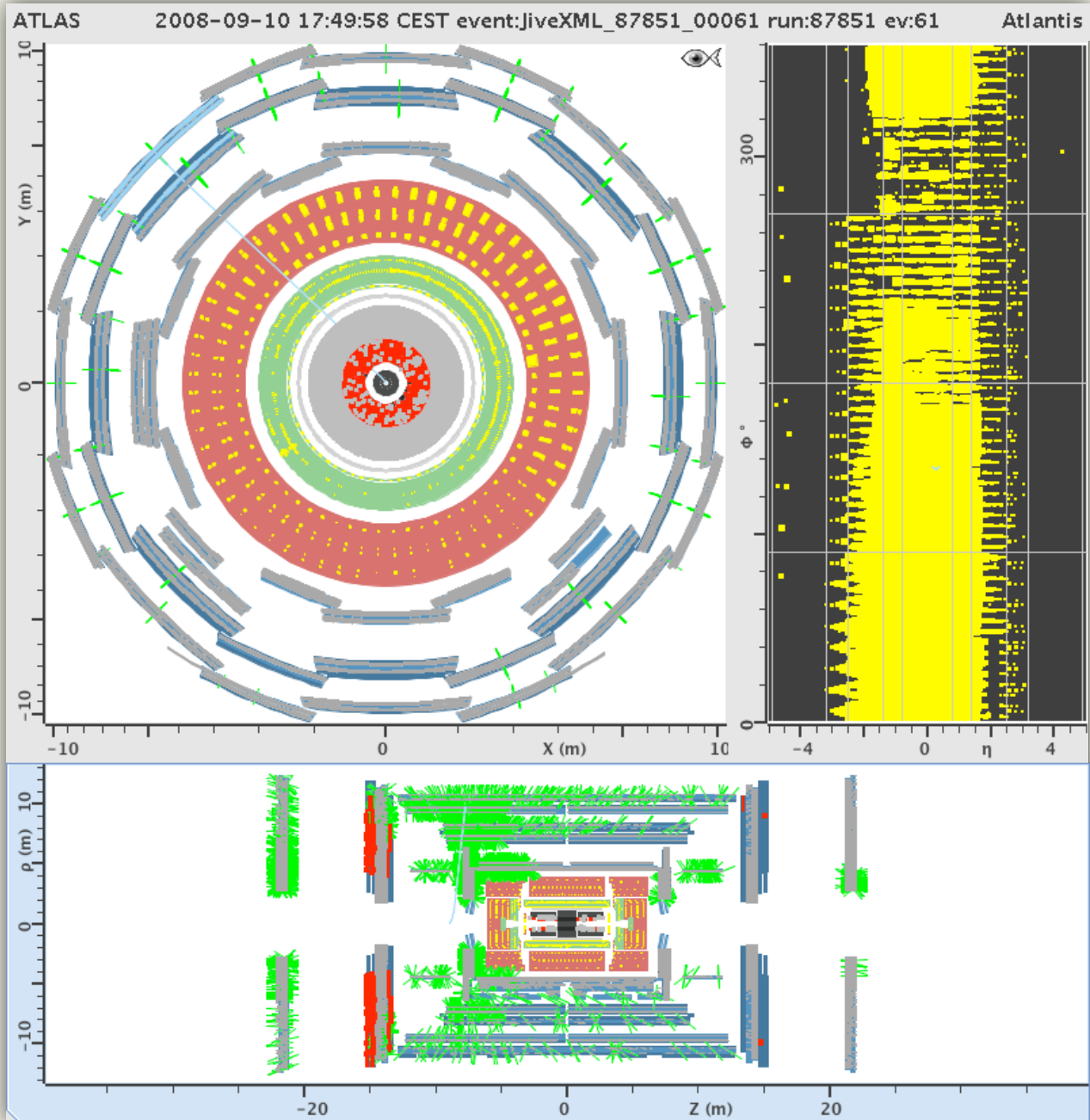


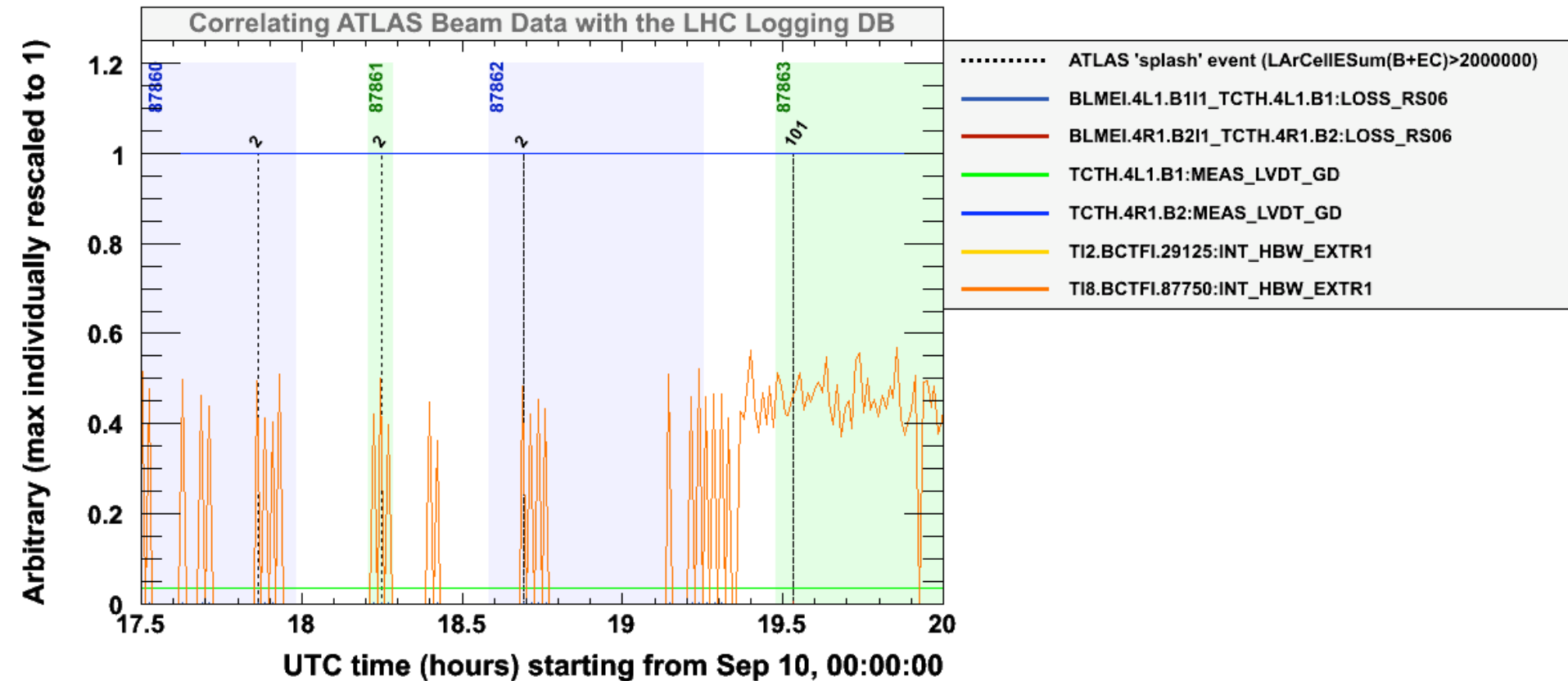
September 10 full overview (again).

Beam 'splash' events with more than 2 TeV energy sum over all LAr cells are shown by the dashed-black lines.









Zoom into the period with short consecutive runs.

Again a minimum of 2 TeV total deposited energy in the LAr calorimeter is required and events with strong beam activity are recorded.

Instructions TWiki: 'LHCLoggingData'

LHCLoggingData < Atlas < TWiki

https://twiki.cern.ch/twiki/bin/view/Atlas/LHCLoggingData

collaborate with TWiki

Atlas

ATLAS Home

ATLAS TWiki

Detectors

Trigger

Computing

Physics

Help

Glossary

Detectors

You are here: TWiki > Atlas Web > DataPreparation > LHCLoggingData

LHC Logging Data for Beam Monitoring

Not yet Certified as ATLAS Documentation

Running Timber

Timber is a java GUI application. It only runs from the CERN network, but without restrictions therein. Let's try an example:

1. Launch by clicking on [this link](#).

Converting Timber text files to TTrees and TGraphs

After dumping a Timber DB query into a text file (using either '<space>' or ',' separators), the python script [ConvertTimberToROOT.py](#) allows to convert the data into ROOT format, independently of the number, format and IOV of the variables used. The UTC time used by Timber is thereby converted into seconds using the reference given (again in UTC) as input (option: `--timeref`). For example:

```
ConvertTimberToROOT.py --input "myTimberTextFile.txt" --timeref "2008-09-10:00:00:00"
```

Will produce the ROOT file `myTimberTextFile.txt.root` containing one TTree and one TGraph for each of the variables used in the Timber query. The TTree variable `iovertime` is given in seconds and with respect to the given time reference.

Logging Variables

The LHC Logging DB contains a huge number of variables. Example for some immediately interesting ones for ATLAS are given below.

TI2.BCTFI.29125:INT_HBW_EXTR1

Beam-1 intensity in units of 10^{10} protons in the TI2 transfer line entering ATLAS from the A-Side (-z direction).

TI8.BCTFI.87750:INT_HBW_EXTR1

Beam-2 intensity in units of 10^{10} protons in the TI8 transfer line entering ATLAS from the C-Side (+z direction).

el: *Logging DataBase (PRO)*.
window. It contains the most obvious variables to
click *Add Selected*. The selected variables appear on
A variable chart is plotted.
the [ConvertTimberToROOT.py](#) script to convert the
variable list and save it.

