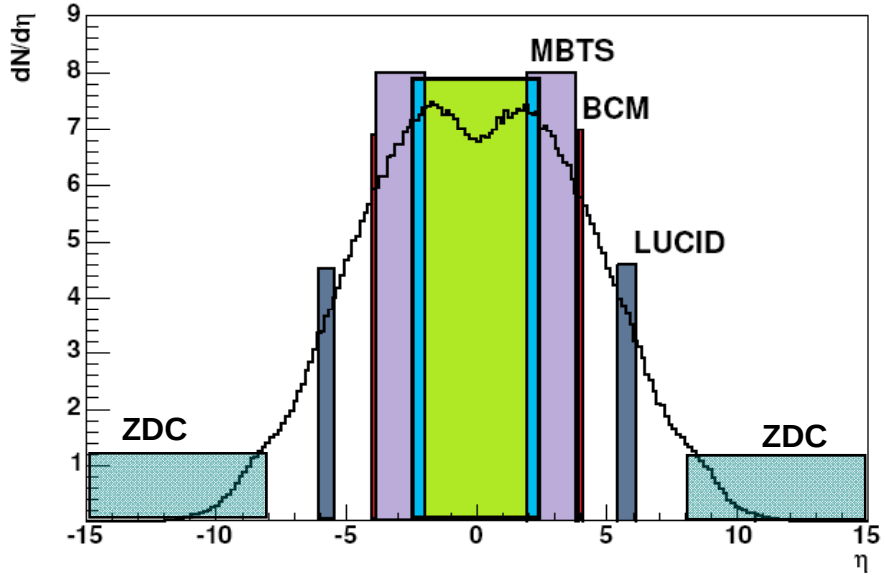
# First beam with the MBTS

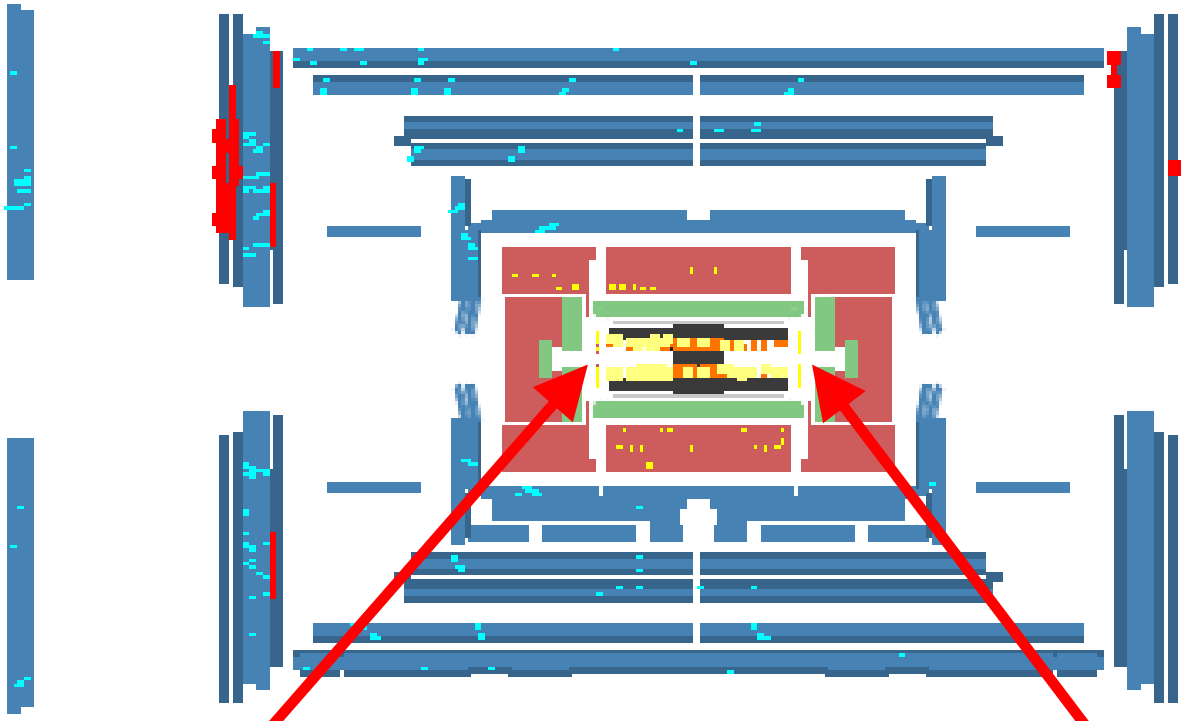
David Berge / CERN

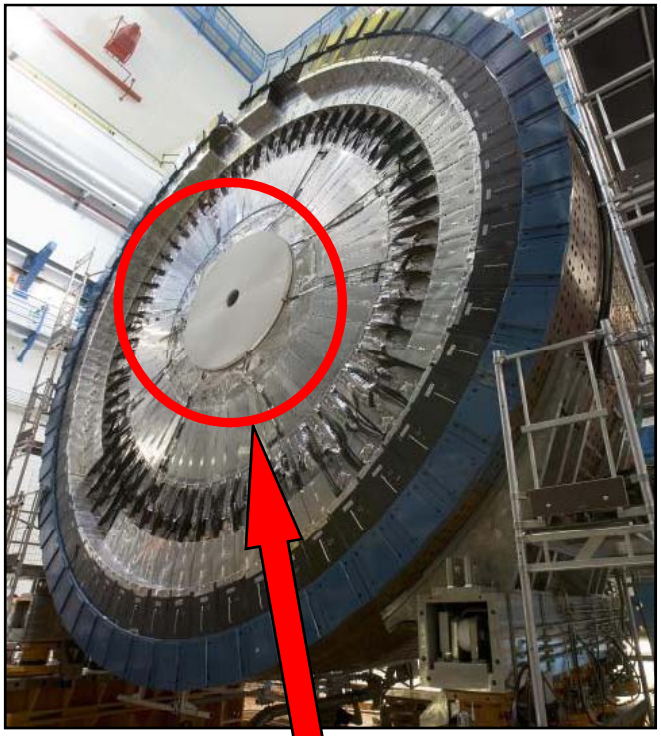
on behalf of the Central Trigger, TileCal,
and Minimum Bias MBTS-Crew

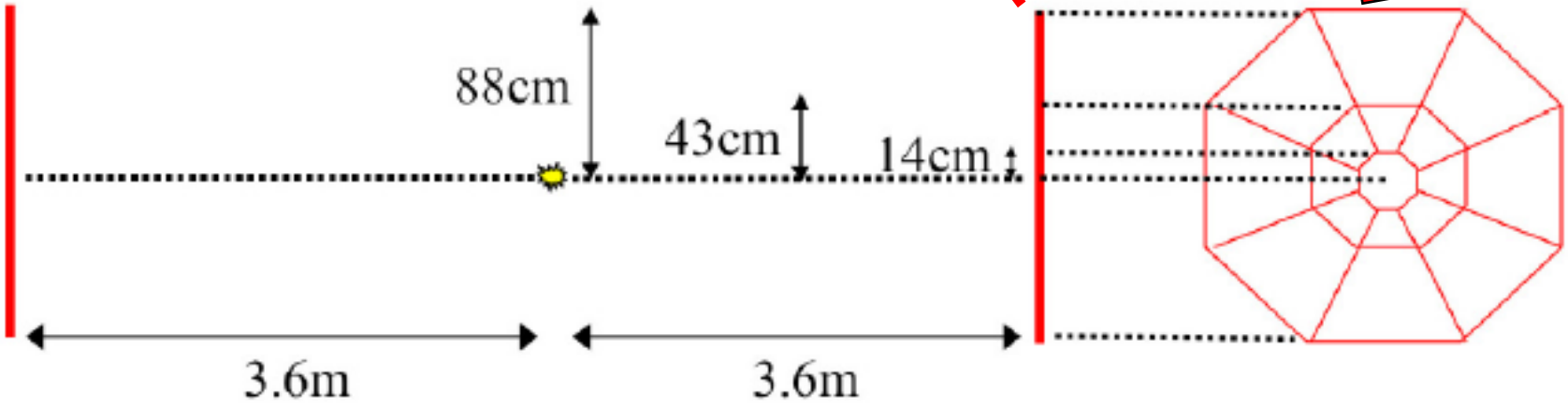
# MBTS Location and Layout

- Minimum Bias Trigger Scintillators
- Late add-on in front of the LAr cryostat
- 2x16 scintillator paddles, will be used for initial running only, usefulness limited to early running by both pile-up (all BCs will trigger) and by anticipated radiation damage to scintillators
- Rapidity coverage 2.1 to 3.8

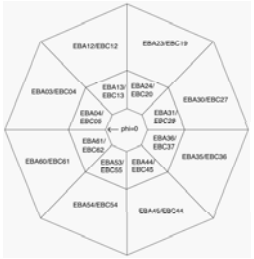







88cm
43cm
14cm
3.6m
3.6m

# MBTS Signal Path

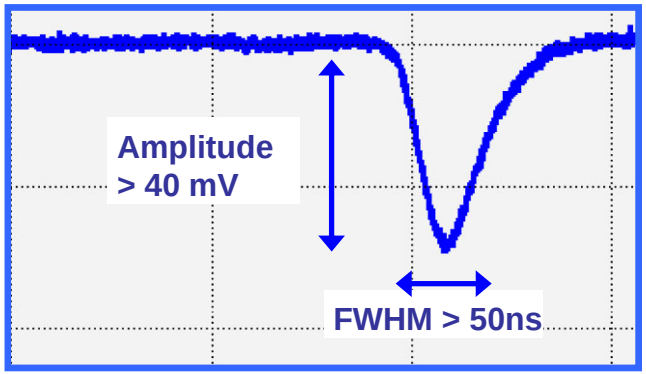


MBTS

2x16 optical signals

TileCal trigger electronics:
-PMTs
-Shapers
-Amplifiers

2x16 analog signals




32

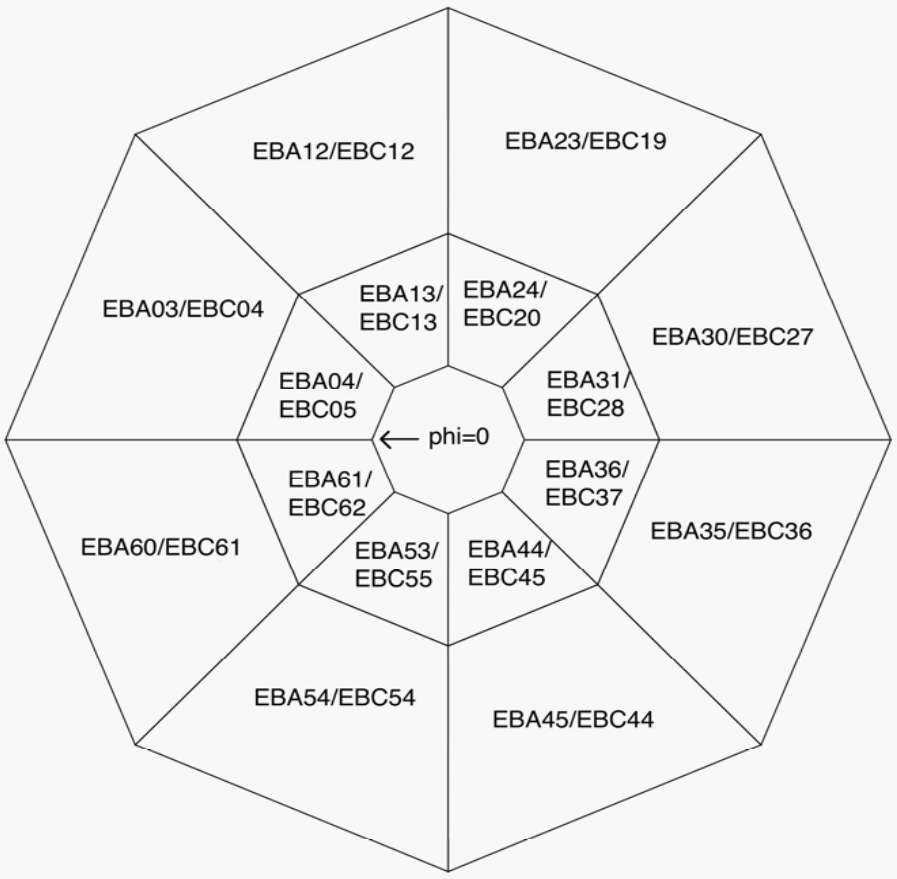
Discriminators:
- Threshold right now (with timewalk >= 1 BC)
- Constant fraction boards (thanks to BNL) in future

32

Central Trigger:
- All 32 single bits
- Plus 2x3 bits multiplicity per side
- Use only multiplicity per side eventually

HLT

# MBTS in the startup trigger menu

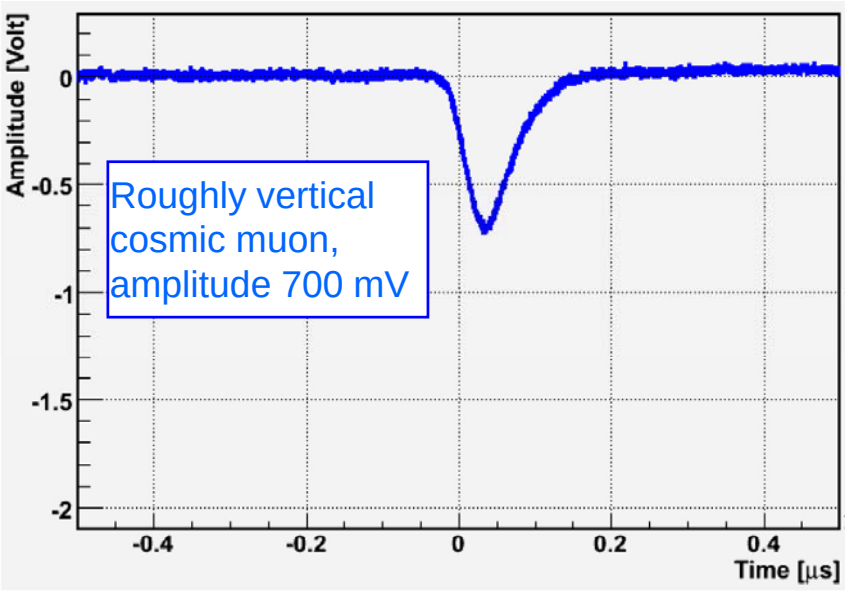


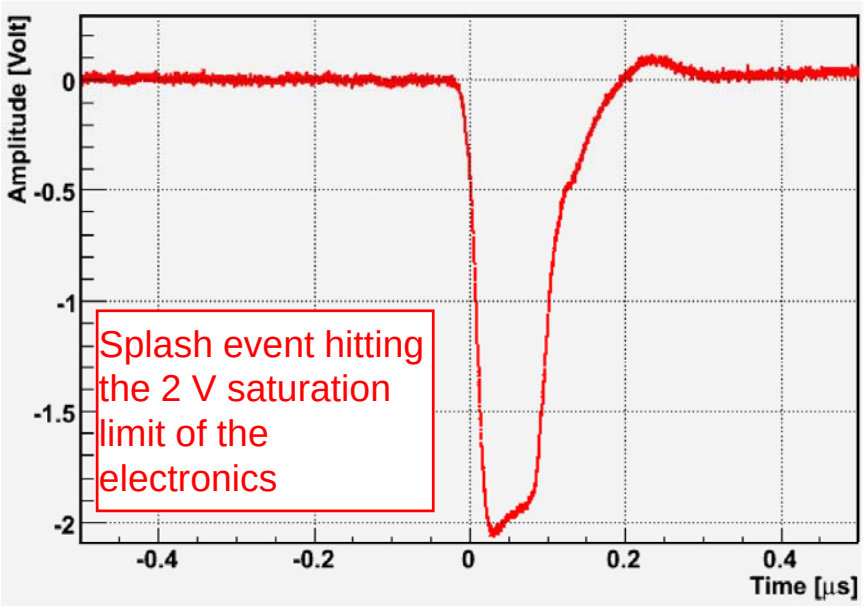

| A-side: | Threshold: | C-side: | Threshold: |
|---|---|---|---|
| Inner: | | Inner: | |
| EBA04 | MBTS_A0 | EBC05 | MBTS_C0 |
| EBA13 | MBTS_A1 | EBC13 | MBTS_C1 |
| EBA24 | MBTS_A2 | EBC20 | MBTS_C2 |
| EBA31 | MBTS_A3 | EBC28 | MBTS_C3 |
| EBA36 | MBTS_A4 | EBC37 | MBTS_C4 |
| EBA44 | MBTS_A5 | EBC45 | MBTS_C5 |
| EBA53 | MBTS_A6 | EBC55 | MBTS_C6 |
| EBA61 | MBTS_A7 | EBC62 | MBTS_C7 |
| Outer: | | Outer: | |
| EBA03 | MBTS_A8 | EBC04 | MBTS_C8 |
| EBA12 | MBTS_A9 | EBC12 | MBTS_C9 |
| EBA23 | MBTS_A10 | EBC19 | MBTS_C10 |
| EBA30 | MBTS_A11 | EBC27 | MBTS_C11 |
| EBA35 | MBTS_A12 | EBC36 | MBTS_C12 |
| EBA45 | MBTS_A13 | EBC44 | MBTS_C13 |
| EBA54 | MBTS_A14 | EBC54 | MBTS_C14 |
| EBA60 | MBTS_A15 | EBC61 | MBTS_C15 |

1 trigger item per counter, plus various multiplicities, see Rasmus' talk later on

# MBTS on day 1

- First ATLAS beam events triggered by MBTS and L1Calo
- Collimator splashes fired all modules and saturated TileCal r/o electronics

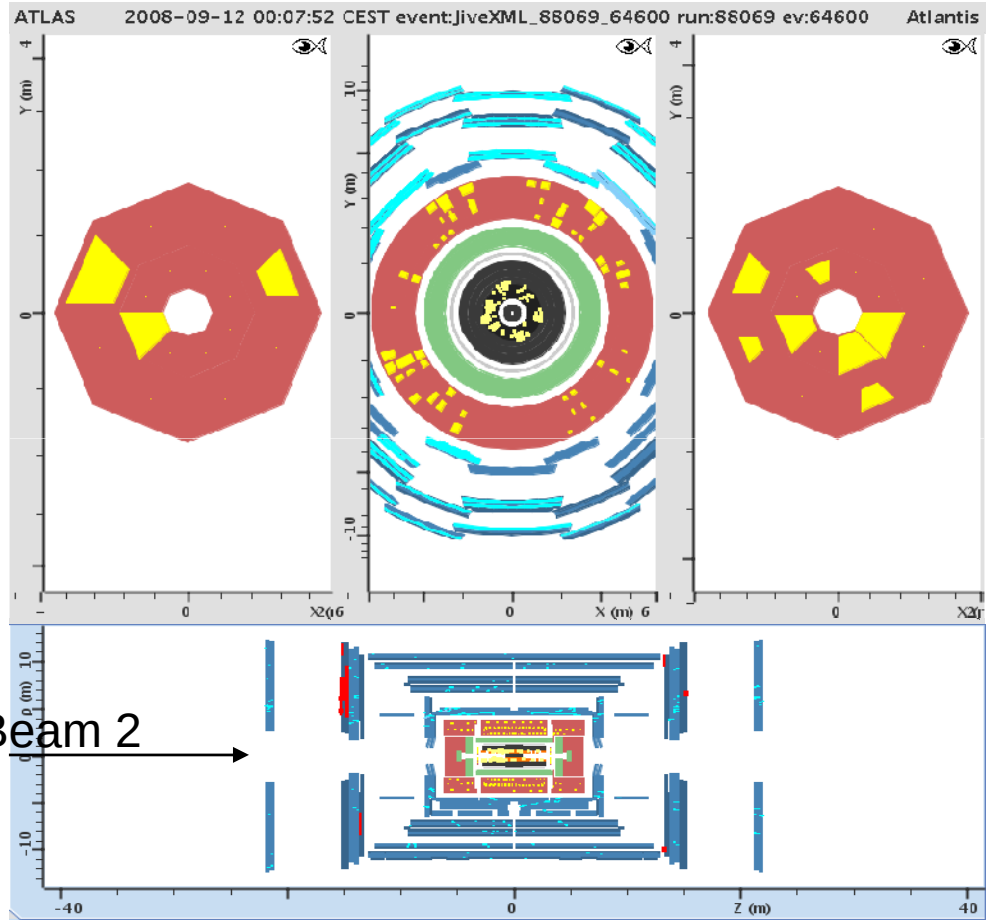


# MBTS on day 1 to 3

- Extensively used as robust and easy-to-understand trigger for timing studies with minimum activity in the detector
  - See Thilo's talk yesterday http://indico.cern.ch/materialDisplay.py?contribId=7&sessionId=0&materialId=slides&confId=20500

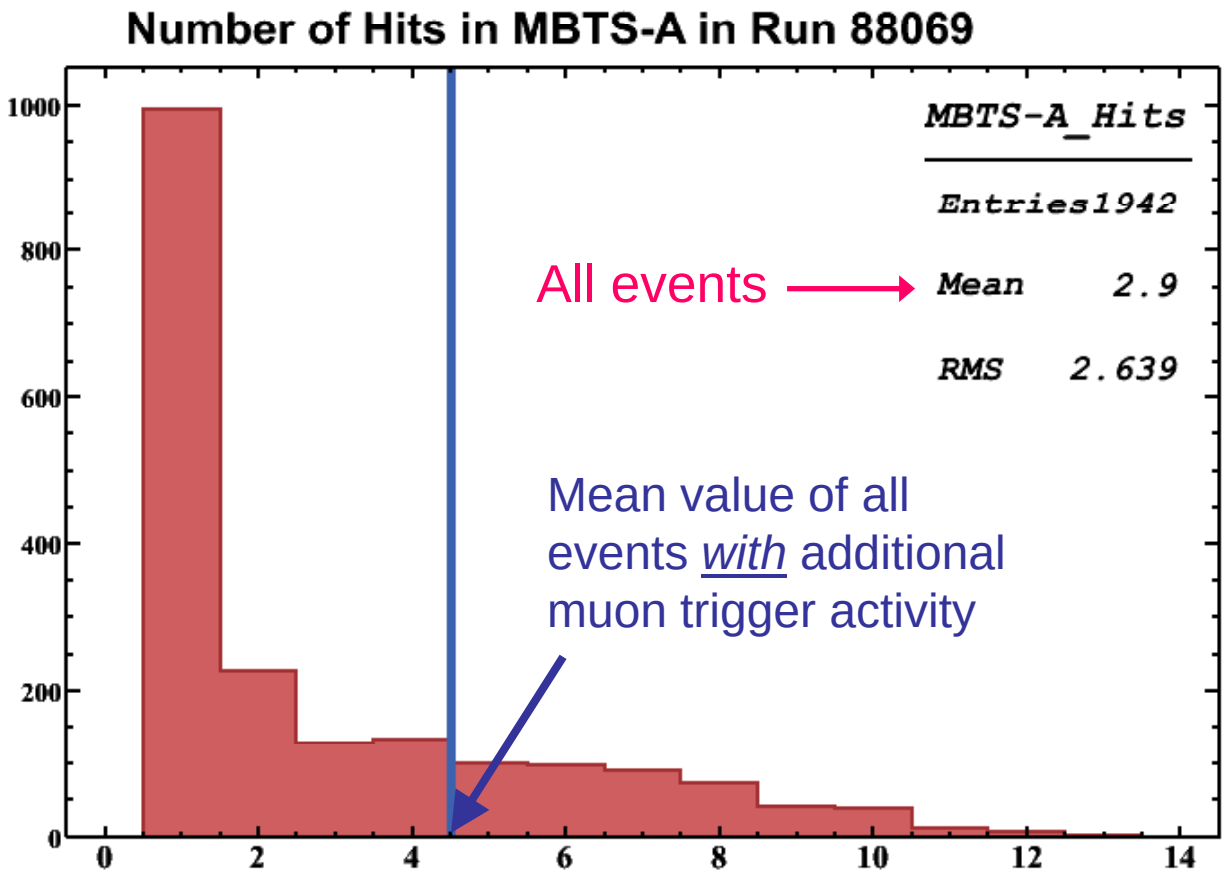
For example, run 88069 was ~ 6 hours long, out of the 25,109,504 BPTX triggers, 2006 were recorded in the MBTS stream




Run 88069, first run with circulating beam 2 and triggering on activity in time with the beam (MBTS AND BPTX)

# MBTS on day 1 to 3

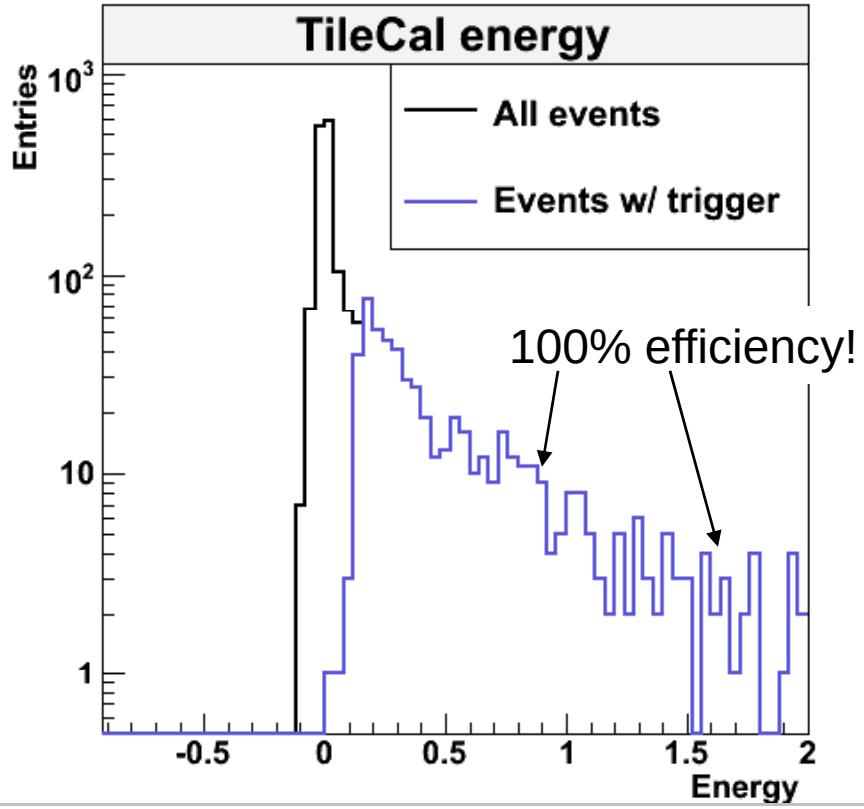
- Again run 88069, multiplicity distribution side A

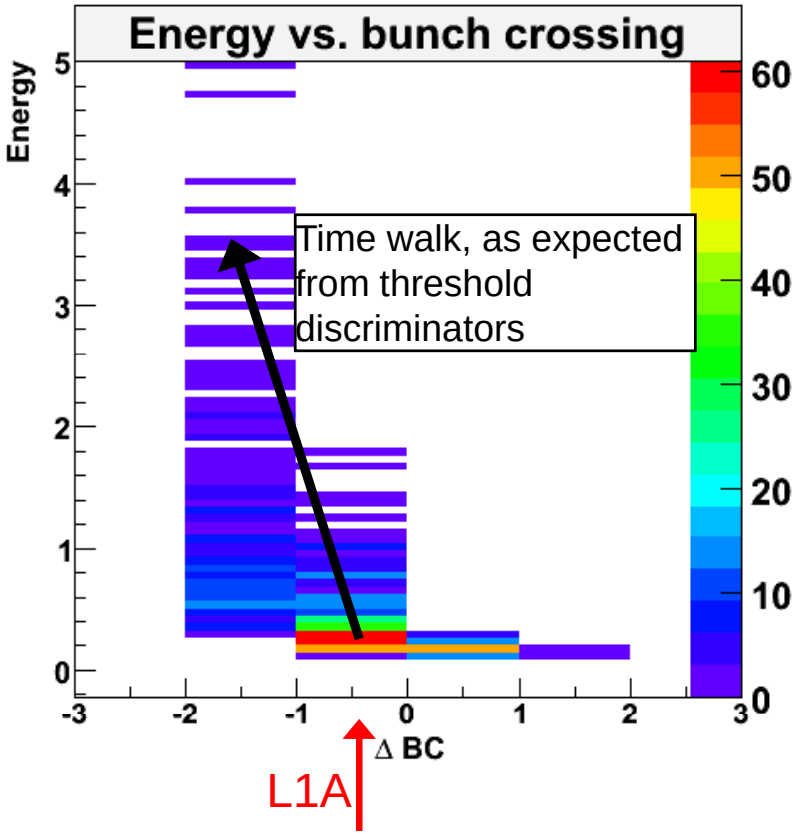


# MBTS on day 1 to 3

- Comparison of Tile digitized readout data with trigger bits
  - Only possible because we have all 32 input bits in the CTP readout
  - Absolutely crucial in order to understand trigger efficiencies and bias

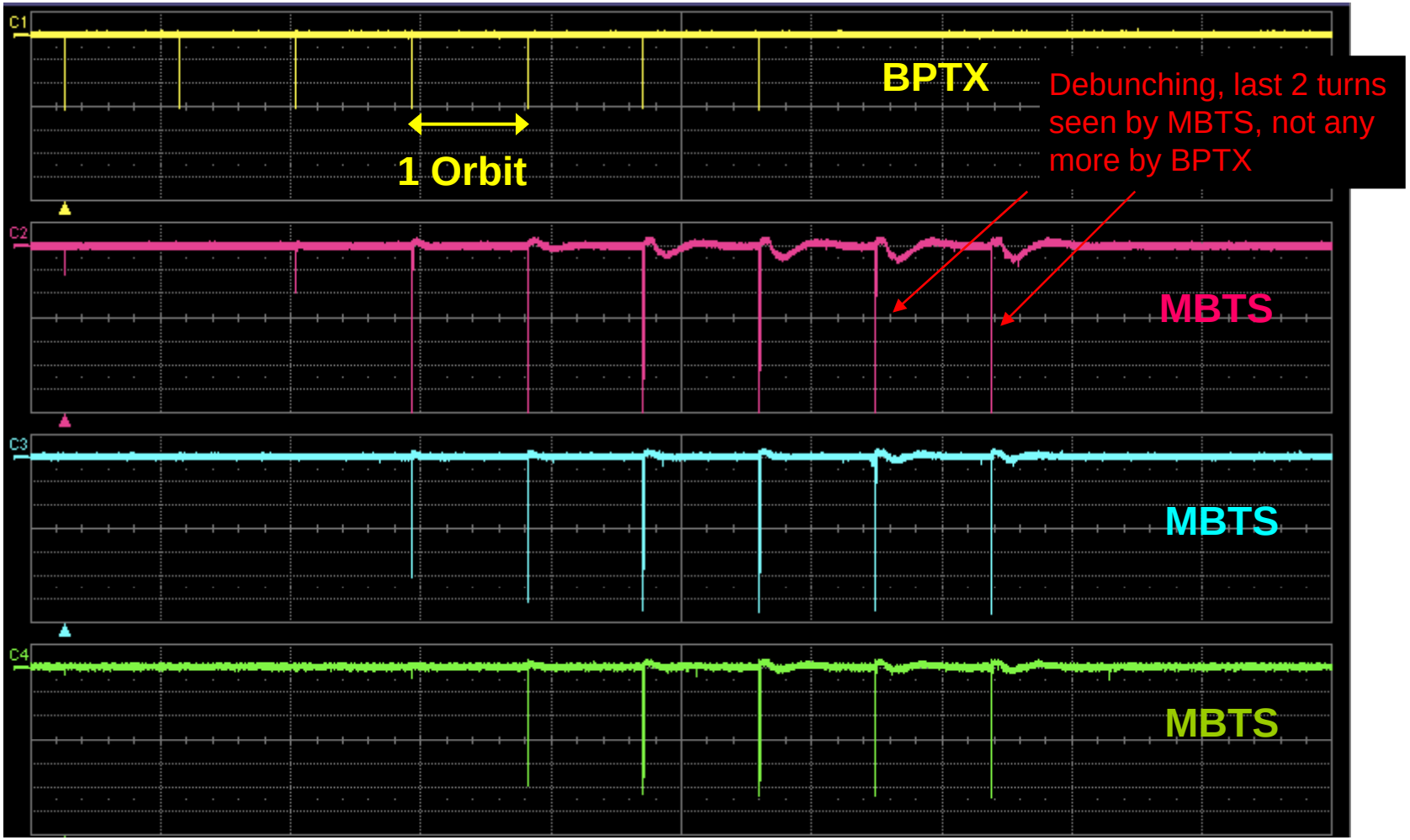
Module EBA60 (A15), not in the trigger for run 88069



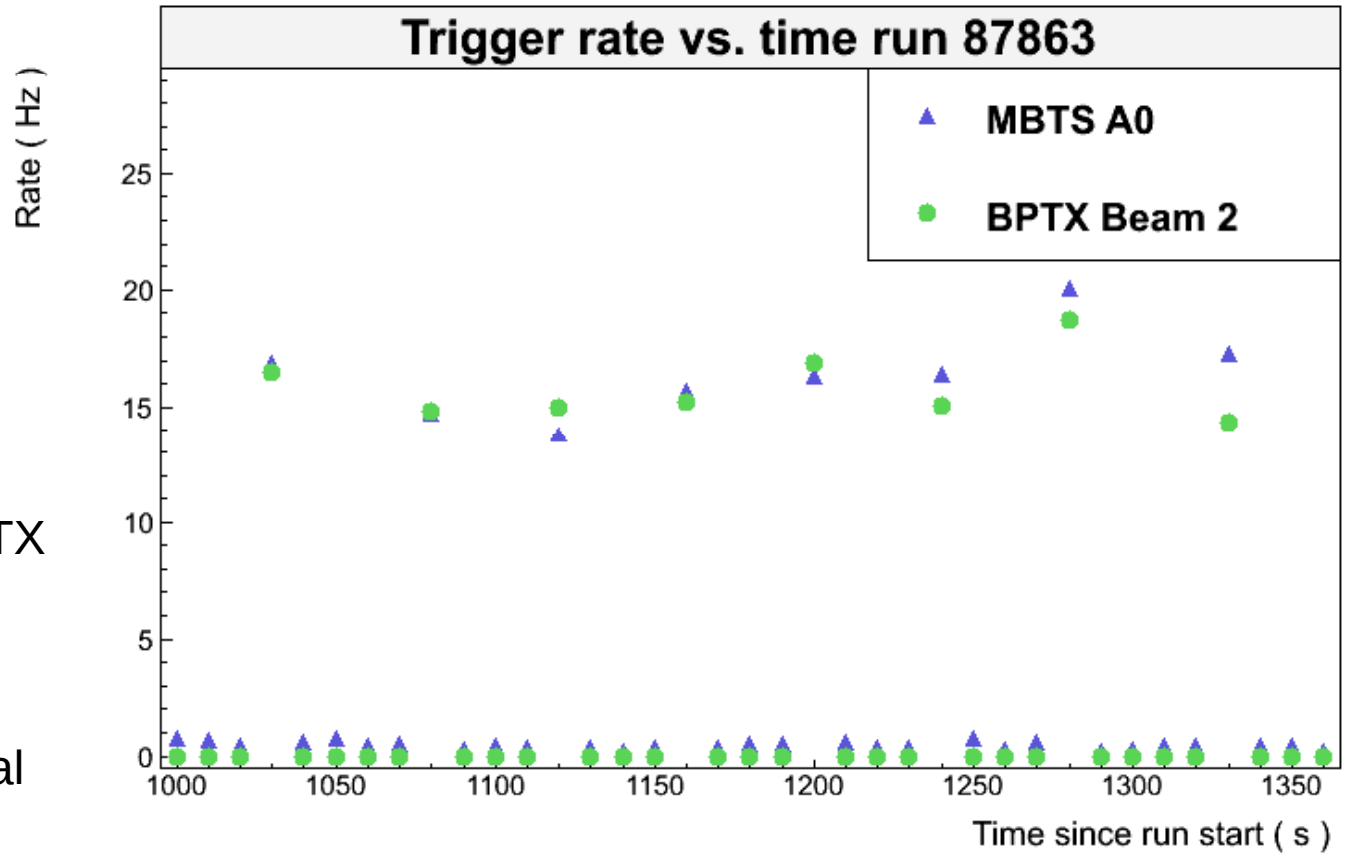
# MBTS on day 1 to 3

- Run 87863 (“splashy”, O(10) turns with a lot activity seen in the detector)



# MBTS on day 1 to 3

- Run 87863 (“splashy”, O(10) turns with a lot activity seen in the detector)




MBTS and BPTX trigger rates spike every 40 seconds, the injection interval at that time

# Conclusions and outlook

- Successfully used MBTS on day 1. Have been used as a cosmic trigger for long time already.
- Exactly the same setup will be used for triggering whenever we get back beam in ATLAS
- Preparations for switching to constant-fraction discriminators are well underway, all boards available, cabling almost finished
- It is crucial to continue using all 32 bits in the CTP readout for some time, to determine trigger efficiencies and aid timing studies
- To complete the commissioning, need to determine working point for PMT high voltage, adjust discriminator thresholds and timing delays while examining the individual-counter items in the CTP readout and their correlation with the precision TileCal readout