

# L1Muon Barrel Report

TDAQ Week  
September 12<sup>th</sup> 2018

**Claudio Luci**



SAPIENZA  
UNIVERSITÀ DI ROMA

&



On behalf of the level-1 RPC trigger team





# Outline



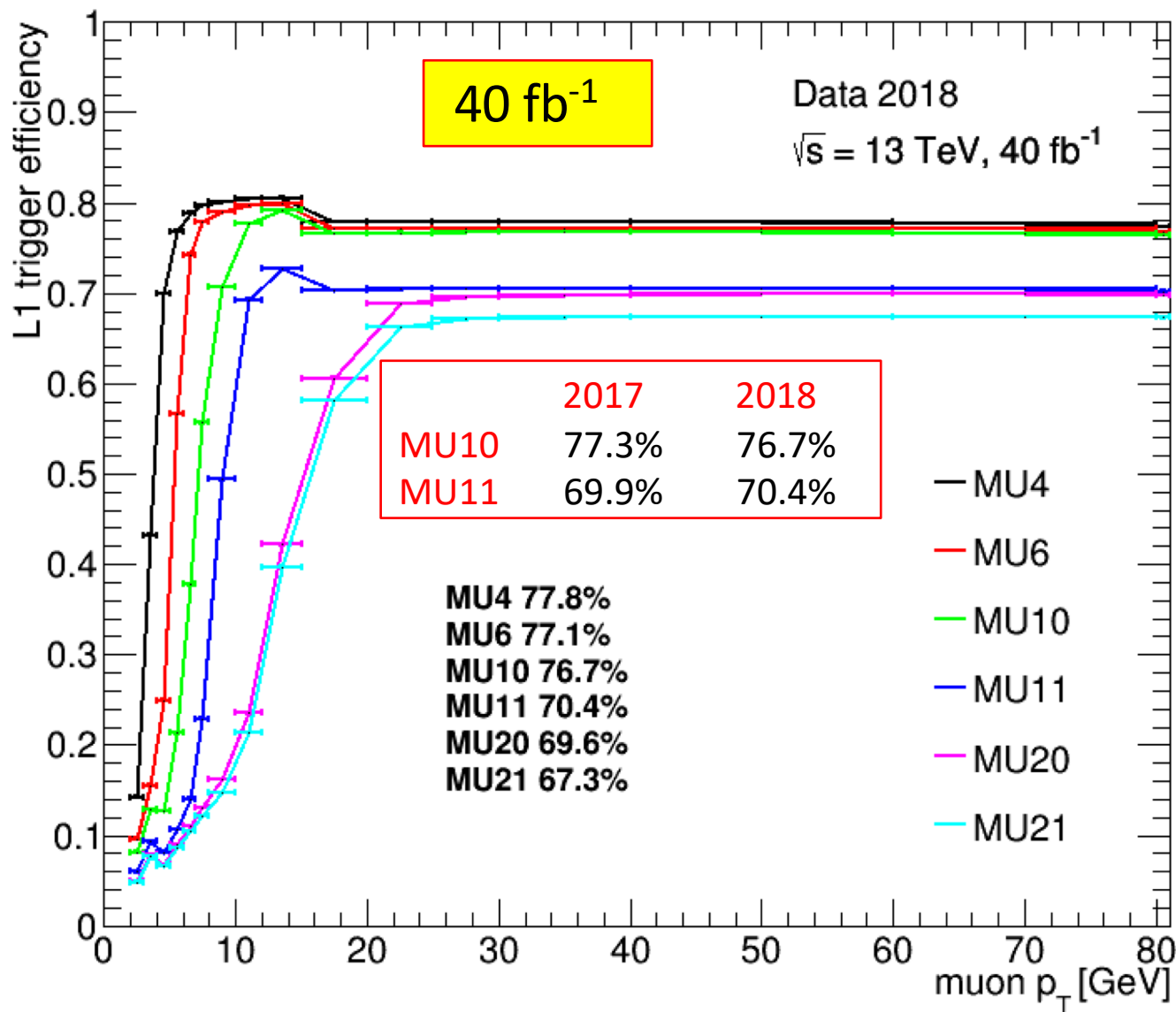
- Trigger hardware status
- Trigger efficiency
- Detector performance studies
- BME trigger efficiency
- New resynch manager
- Rod stopless removal
- Conclusion







# 2018 trigger efficiency



Low-pt slightly worse than 2017 while high-pt is better

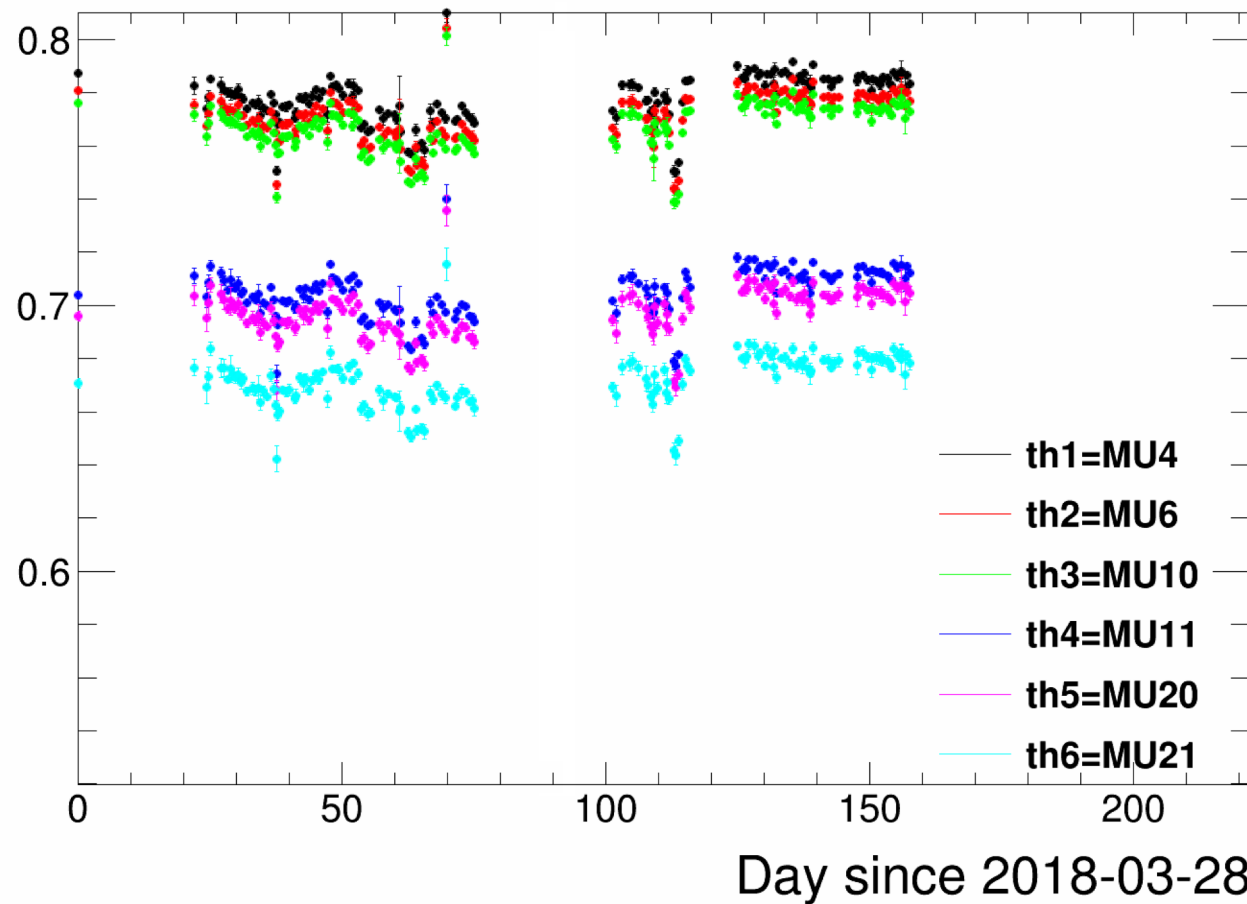




# 2018 trigger efficiency versus time



- Trigger efficiency has been fairly stable over the year, in particular in last two months.
- Some work has been done during TS1 to recover detector problems

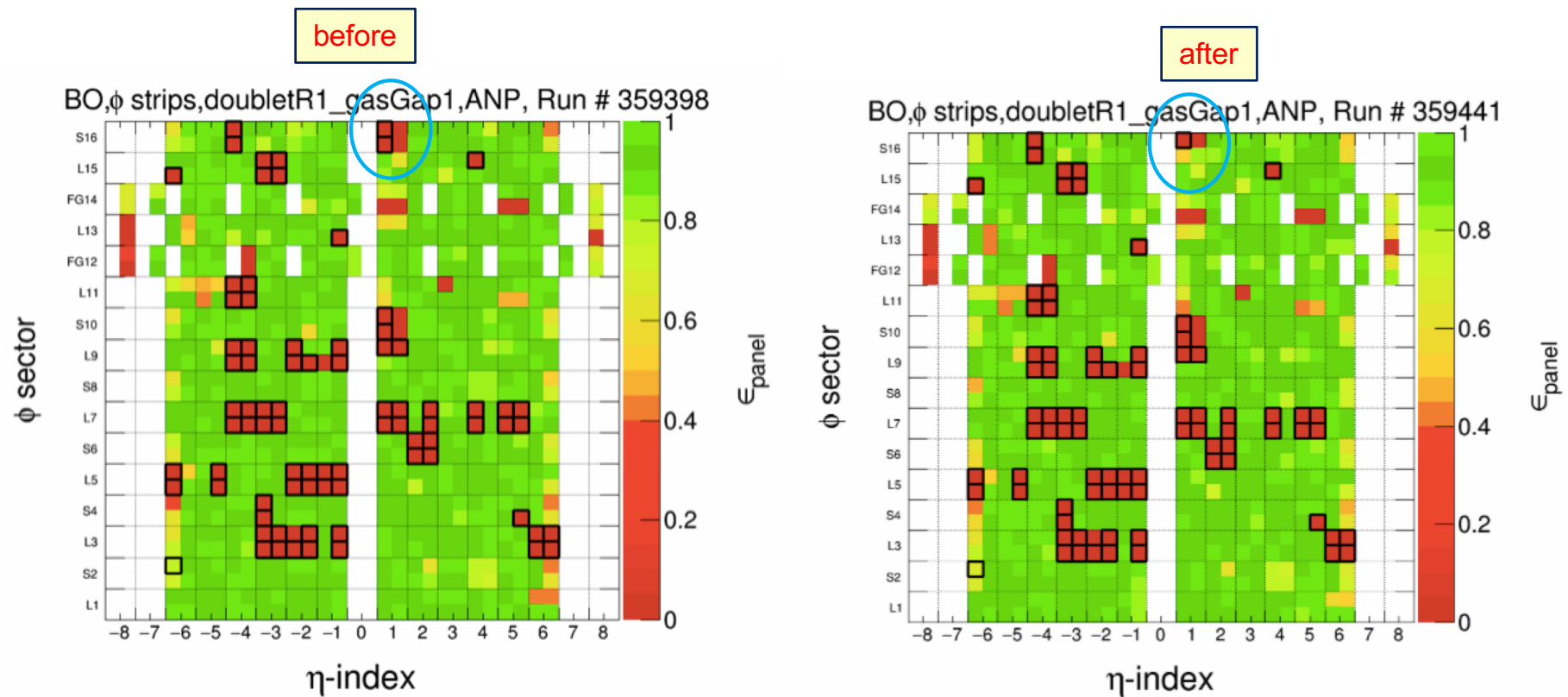




# Tools to monitor detector efficiency

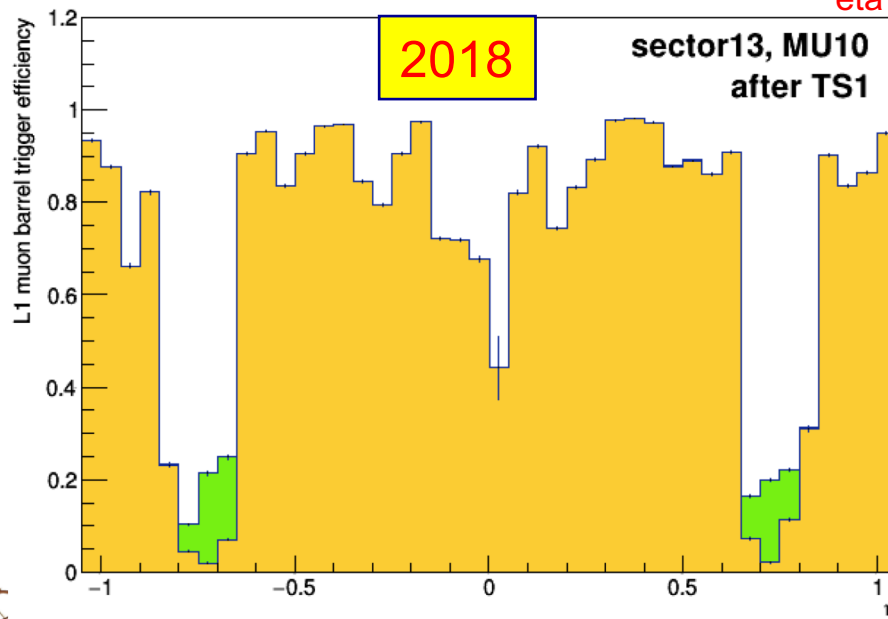
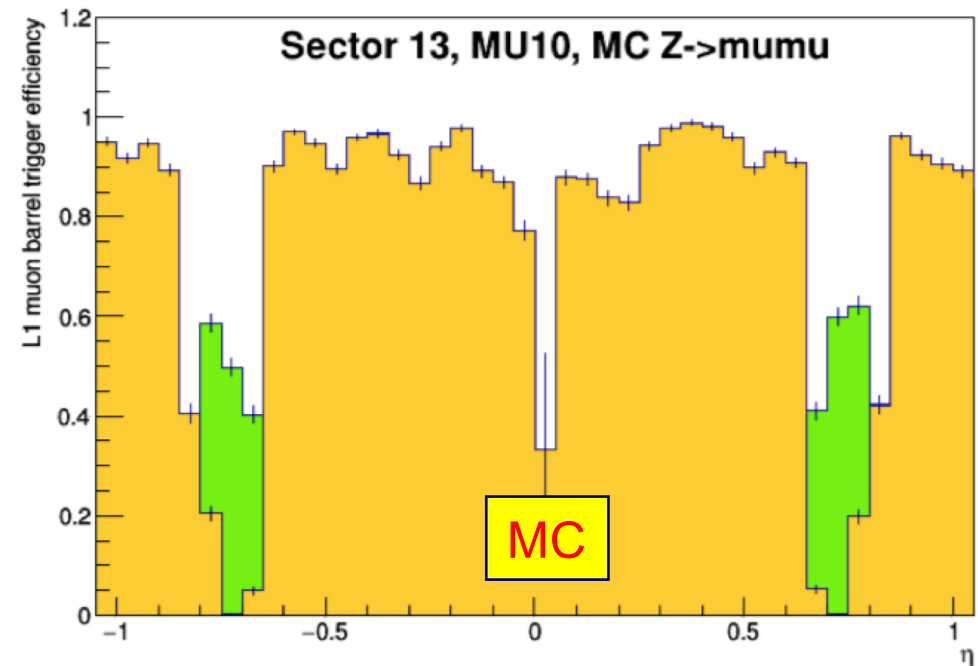
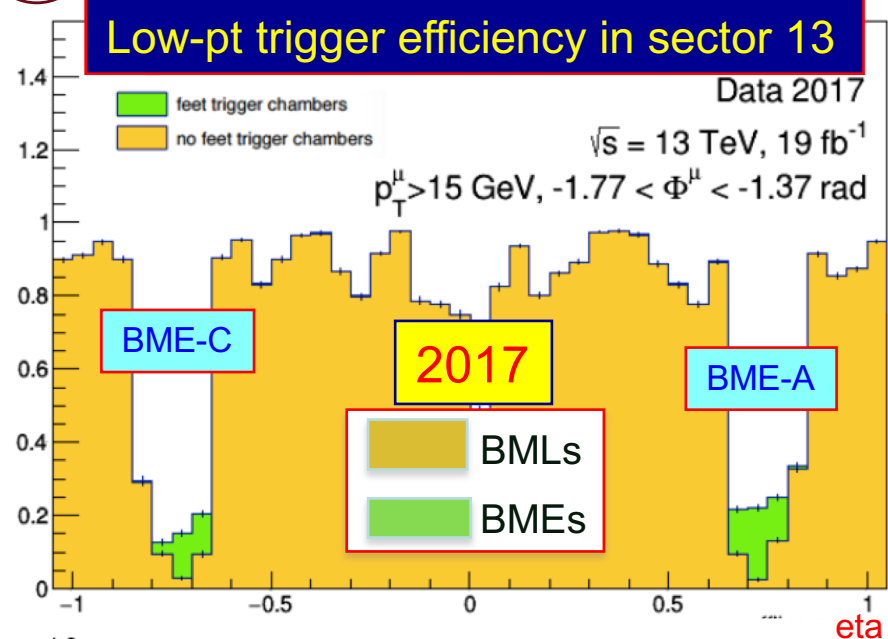


- We have tools to monitor detector efficiencies run by run and to correlate them with the DCS detector defects
- The tools are now maintained and improved by USTC people.
- As an example I show the gas gap efficiency before and after a HV cable reconnection in the cavern





# BME: 2018 trigger efficiency



**2018 efficiency slightly better than 2017**

- 1) we have two layers with HV off
- 2) we found that many channels do not send any signals, either because the FE is not working or because connectors are off.

**Trigger is working as expected**

- 1) Now we are using 2/4 coincidence
- 2) More checks during LS2





# Resynch manager status at last TDAQ week



- We have one RCD resynch manager per side (A and C). It has been deployed just in time before the first stable beam run and it has been working since then;
- At the moment it reproduces the same features we had last year, that is:
  - ROD resynchronization
  - trigger tower resynchronization (that takes about 20 seconds)
- The tool proved to be reliable enough and now we want to do better:
- We would like to have a tower resynchs in two steps:
  - 1) we do a pad initialization with a power cycle (this will be new) while the run is ongoing (so we do not waste beam time);
  - 2) we ask for a trigger hold, we reset pad and CM fifos, we resynchronise pad and SL and we release the trigger. It should take only a few seconds.
  - We need some more tests in the combined partition and we will be ready to deploy it.
- We need a better protection against LV failures. We introduced already a mechanism protection against multiply towers resynch on the same canbus chain, but we need to do better.
- The two steps tower resynch will allow a better handling of the rod removal
- We have to update the shifter assistant rules since the messages written in ERS are different from the previous ones.

**DONE**



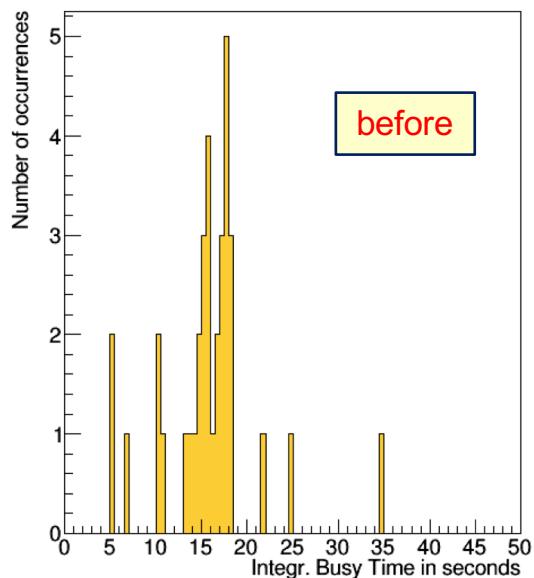




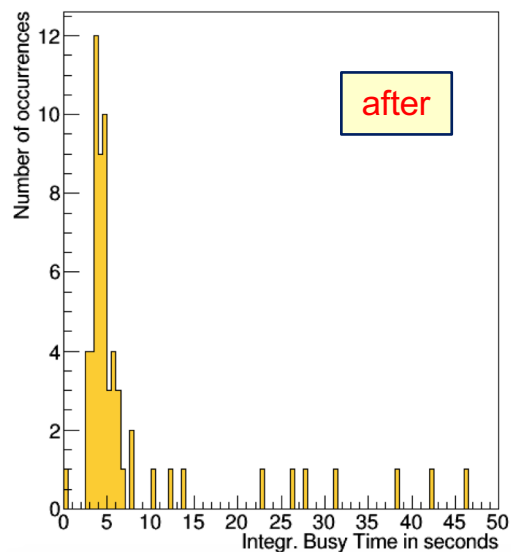
# Tower resynch in two steps



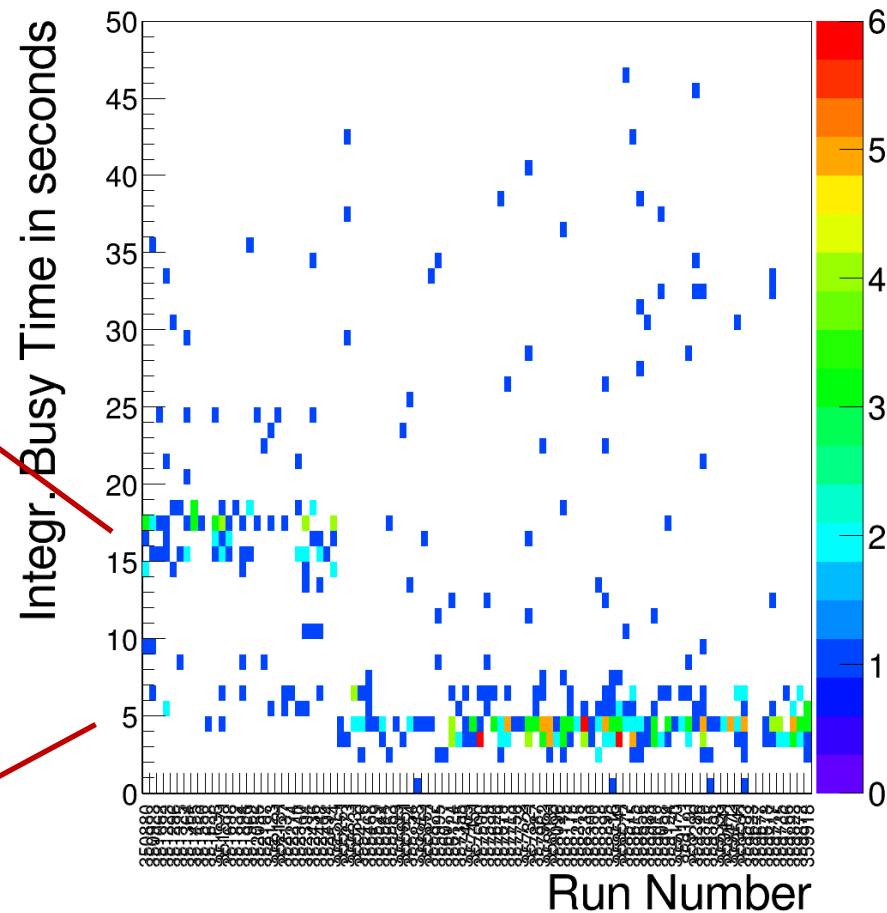
RPC Busy Distribution



RPC Busy Distribution



RPC Busy Distribution



The average time went from 17 s down to 5 s.  
We also make now a software power cycle of the two pads

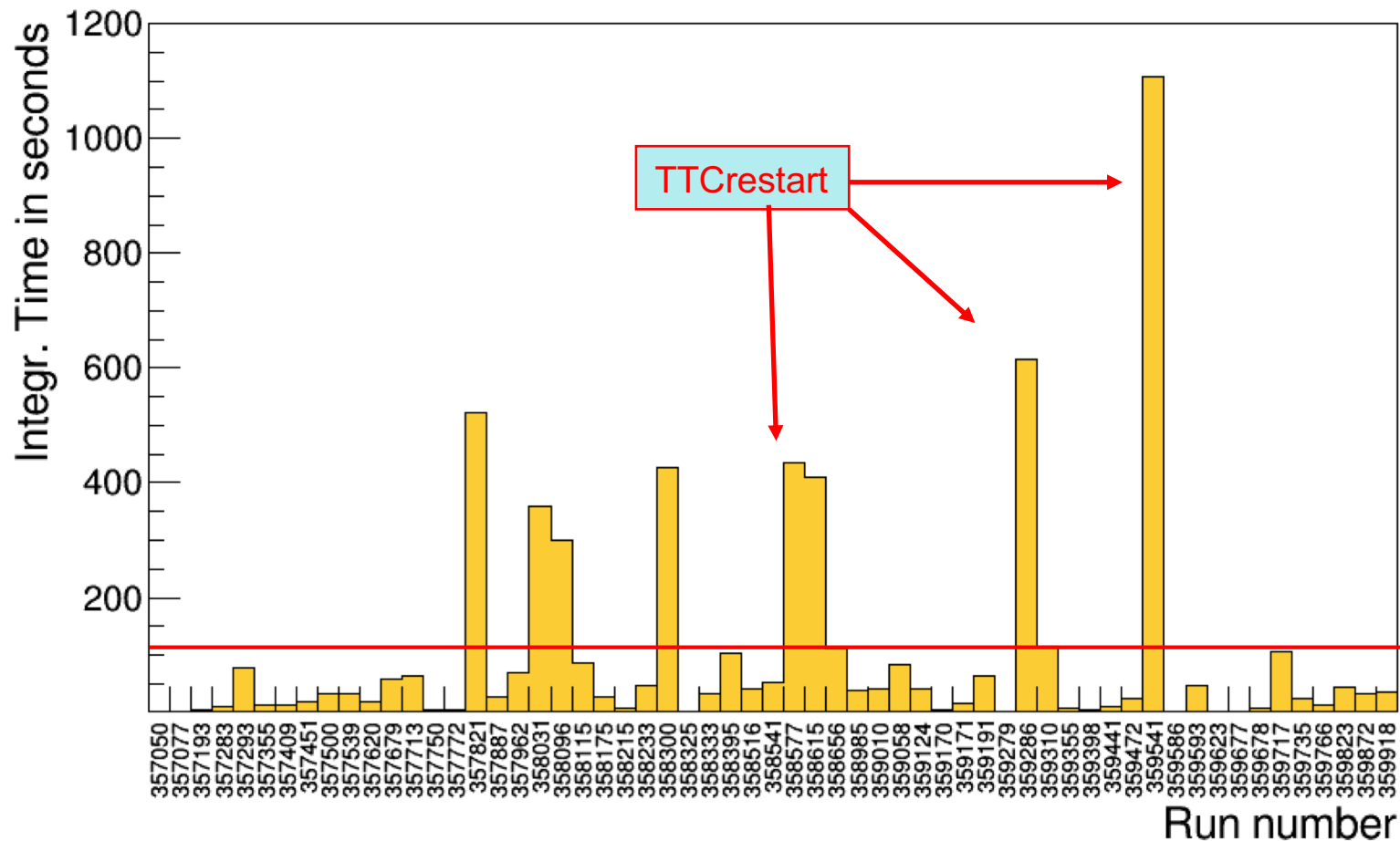




# RPC busy time versus run number



- In most of the runs the RPC induced busy time is less than 100 s.
- Unfortunately sometimes we have a ROD stopless removals where we need a TTCrestart (~300 s) to reinclude the ROD





# ROD removal issue



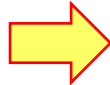
- In May we found the “smoking gun”, that is the reason causing the ROD removal . Let’s look at the sector logic dump:

```

----- fifos status -----
TXRX0: into EB, E, not busy,
TXRX2: into EB, E, not busy,
TXRX4: into EB, E, not busy,
TXRX6: into EB, E, not busy, padbusy (last)
TRIG: into EB, E, not busy,
SERDES: into EB, E, not busy,
BOARD is busy
TXRX1: into EB, E, not busy,
TXRX3: into EB, E, not busy,
TXRX5: into EB, E, not busy,
TXRX7: no EB, E, not busy, masked padmasked
L1BC: into EB, E, not busy,
SL: into EB, NE, not busy,

EB KILL FIFO BUSY PADBUSY MASK PADMASK RETRY
TXRX0: 1 0 E 0 0 0 0 0
TXRX1: 1 0 E 0 0 0 0 0
TXRX2: 1 0 E 0 0 0 0 0
TXRX3: 1 0 E 0 0 0 0 0
TXRX4: 1 0 E 0 0 0 0 0
TXRX5: 1 0 E 0 0 0 0 0
TXRX6: 1 0 E 0 1 / 1 0 0
TXRX7: 0 0 E 0 0 1 1 0
TRIG : 1 0 E 0 0 0 0 0
L1BC : 1 0 E 0 0 0 0 0
SERDES: 1 0 E 0 0 0 0 0
SL : 1 0 NE 0 0 0 0 0
----- fifo busy thresholds -----

```



Without doing a power cycle of the bad tower the problem does not go away; that’s why it is useless to do a TTC restart to reinclude the ROD before doing the power cycle.

- The “last busy” should be related to some fifo busy in the low-pt pad; it is recognized by the SL firmware but the tower is not killed and the busy “propagates” upward till the ROD.
- We need to check if the SL firmware can handle these events and kill the tower
- Another possible solution (to be implemented): we could “kill” the tower in the ROD via software emulating the SL, so the ROD will not be removed.
- Then the resynch manager will reinclude the tower.
- Top priority: deploy a rod stopless recovery in order to avoid a TTCrestart. The code is ready and will be tested this week.**





# Conclusions



- Smooth 2018 data taking, except many calls due to rod stopless removals.
- The trigger hardware is fully working.
- Trigger efficiency is similar to 2017 and have been stable through the year.
- BME trigger efficiency is not as good as expected, more work is needed.
- Offline work to study detector performances and trigger efficiencies by a new team from USTC.
- New resynch manager available since beginning of data taking. New tower resynch procedure reduced significantly the time needed for a tower resynch and improved trigger reliability.
- Most urgent problem to solve: rod stopless removal. Most likely after TS2 we will have a rod stopless recovery procedure.
- I have not mentioned other works we are doing on the online software and tools, mainly aiming at run3 data taking.

