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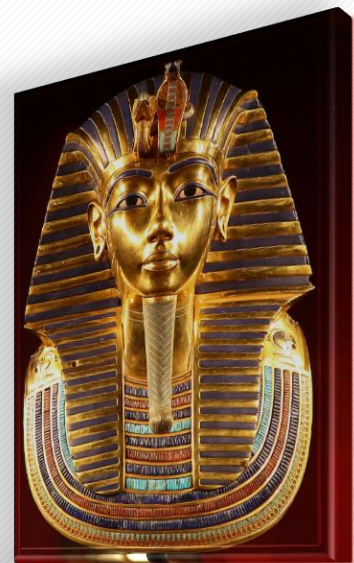
# HO Trigger Link Project

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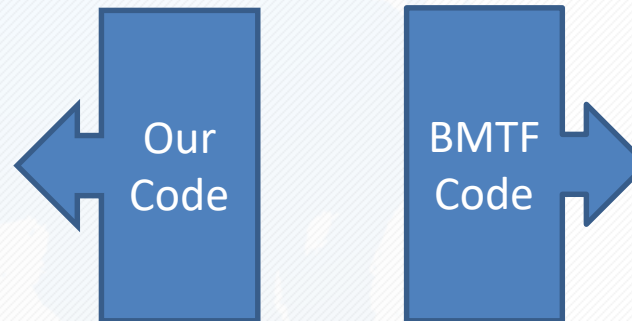
# DT-BMTF feedback

- We got a feedback from the DT and BMTF group suggested to take the more advanced variable to match the BMTF-MBTP.
- Simply it checks if an MBTP was used by the BMTF to create a track or no.
- Georgios told us to use the **Track address** .
- We should look at **Track address** of index 0 which is station 1.
- If the **Track address[0] -> 1 then only HQ MB1 used.**
- If the **Track address[0] -> 2 then only LQ MB1 used.**
- If the **Track address[0] -> 3 neither LQ nor HQ are MB1 used.**
- Also need to check muon/segments in the same wheel.
- We Got some incorrect values for this **Track address[0]**.
- Georgios suggested to use the official BMTF code to reproduce the Ntuples.

# Discussion

- Me and Soham met several times and we discussed that.
- I tried to use and after several trials I succeeded to get the correct results from both codes.

```
*****
* * bmtfTrAdd *
*****
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 3 *
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 3 *
* bmtfTrAddress[0] 1 *
* bmtfTrAddress[0] 3 *
* bmtfTrAddress[0] 1 *
```



```
tfMuonTrAdd[0]
*****
*****
trAddress 4
tfMuonTrAdd[0] 1 *
tfMuonTrAdd[0] 3 *
tfMuonTrAdd[0] 3 *
tfMuonTrAdd[0] 1 *
tfMuonTrAdd[0] 1 *
tfMuonTrAdd[0] 1 *
tfMuonTrAdd[0] 3 *
tfMuonTrAdd[0] 3 *
tfMuonTrAdd[0] 1 *
*****
```

## Next steps

- I've modified the BMTF code to add our Digi Collections and variables we need.
- It's not clear to us which path to take
  - 1- Continue with our framework (one advantage is we know what we do actually) but still need to compare our BMTF variables with George Code.
  - 2- User Georgios Code (I already added our collection to it) but the code is very wide and one need to understand it more, probably we got support from Georgios and other people.
- It's also still not clear to us how we will send out HO-TPs.
  - 1- Complement with DT-TPs (eta-mask)
  - 2- send MB1 Matched HO-TPs separately and form our tracks.



## Next steps

- BMTF Rate is 1.3 kHz at 22 GeV.
- Supported HO-MB1 HQ rate is 100 Hz at 22.
- We need to have the efficiency study(BMTF-HO).
- Over the weekend i will work on that in one of the two.
- Will meet together with Soham Monday to finalize this efficiency study.

# Danke

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# Thanks







# Back Up



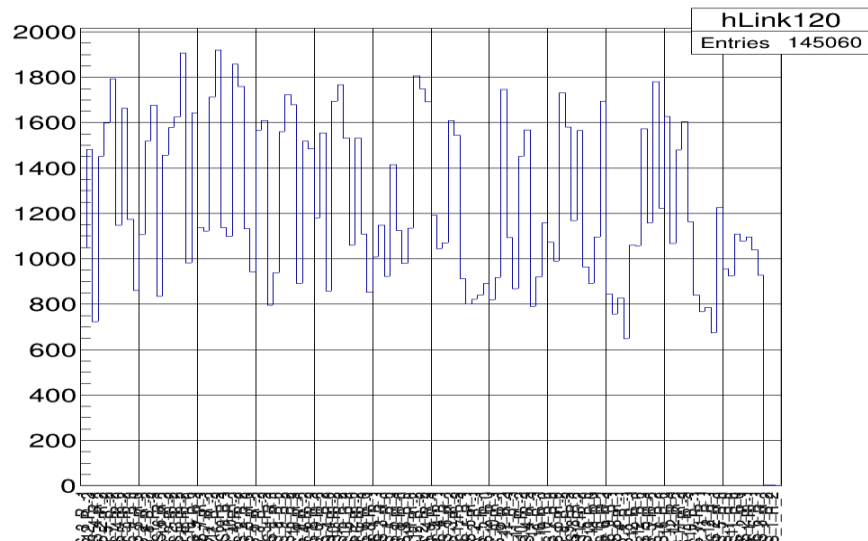
- HO used hybrid photo-detectors during CMS startup.
- Disadvantage in HPDs:-
  - 1- relatively small gain at low light flux signals  $\sim 2000$ .
  - 2- High sensitivity to the magnetic field.
  - 3- high operation Voltage  $\sim \text{kv}$ .
  - 4- The detection efficiency degrading with time.
  - 5- Instability with temp. change.
- During the LS1 the HPD replaced by SiPM.
- Advantage for SiPMs
  - 1- Gain of  $O(10^6)$  at low light flux.
  - 2- Approx. insensitive to magnetic fields.
  - 3- Significantly lower bias voltage  $O(100 \text{ v})$ .
- SiPM boards are compact enough to easily fit into the limited space of the existing readout modules.



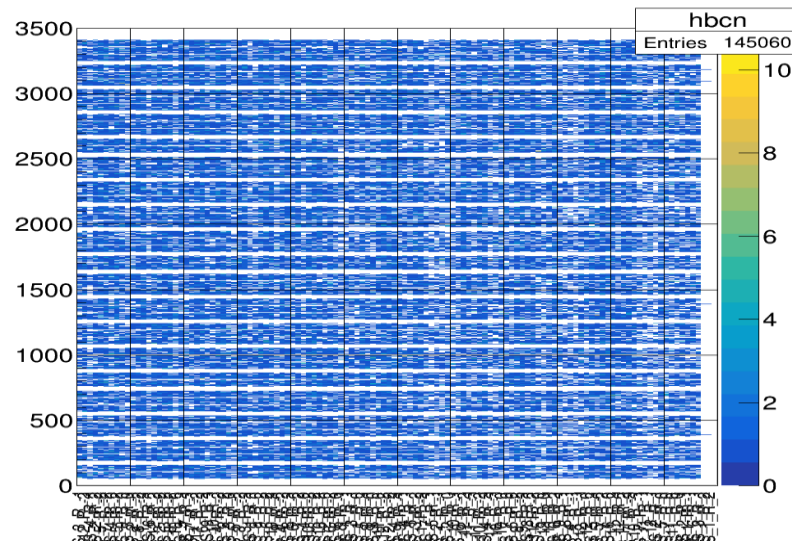


# Unpacker

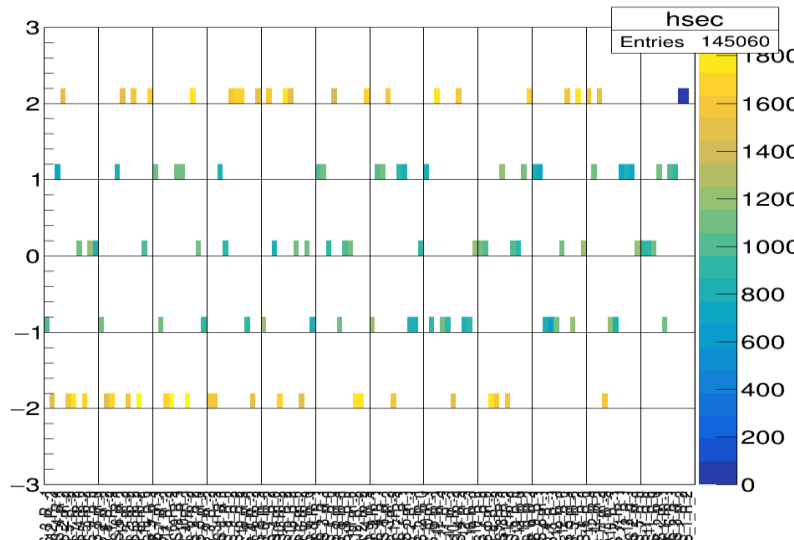
valid Link120 No.



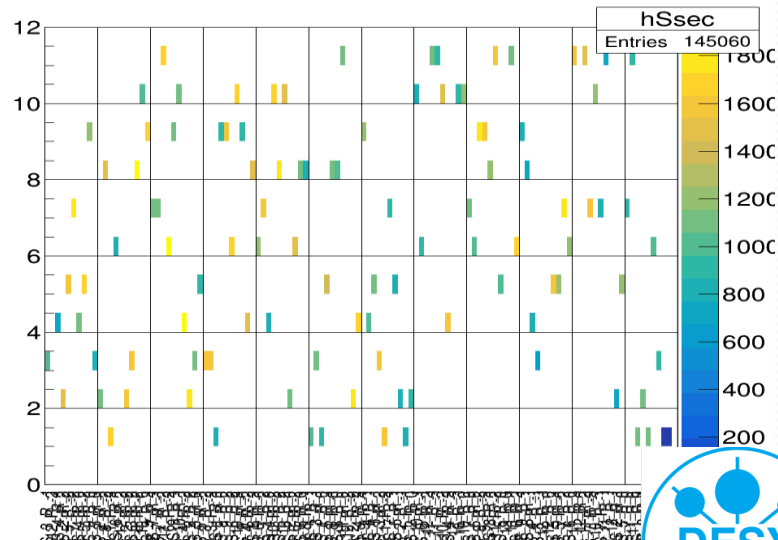
bcn vs valid



valid Wheel No.

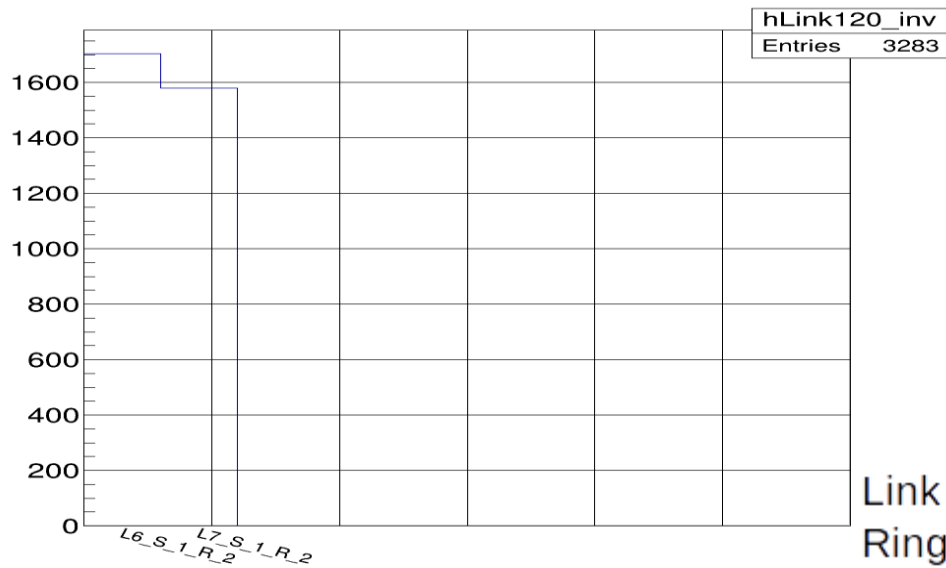


valid sector no.

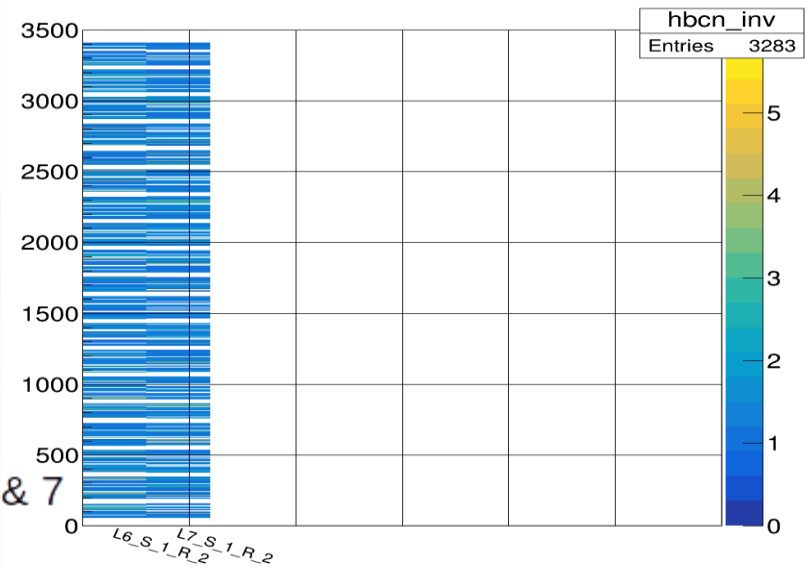


# Unpacker

invalid Link120 No.

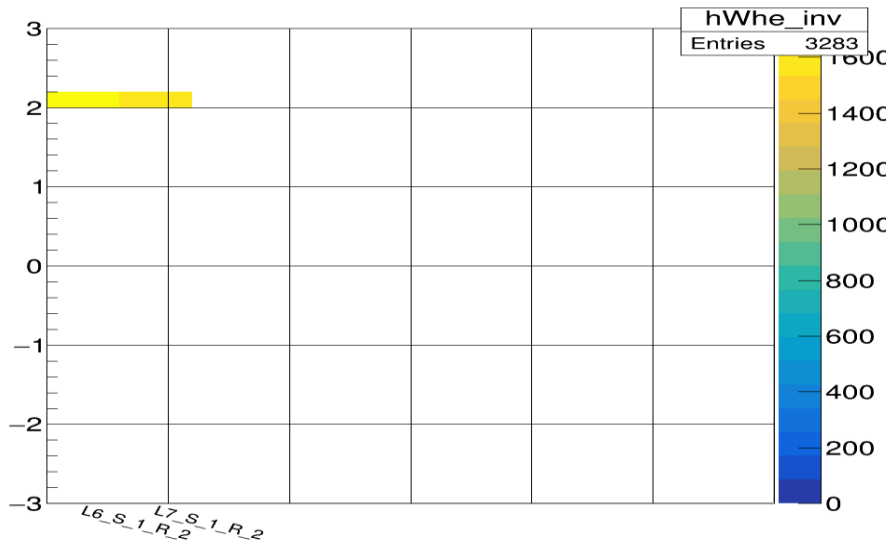


bcn vs INvalid

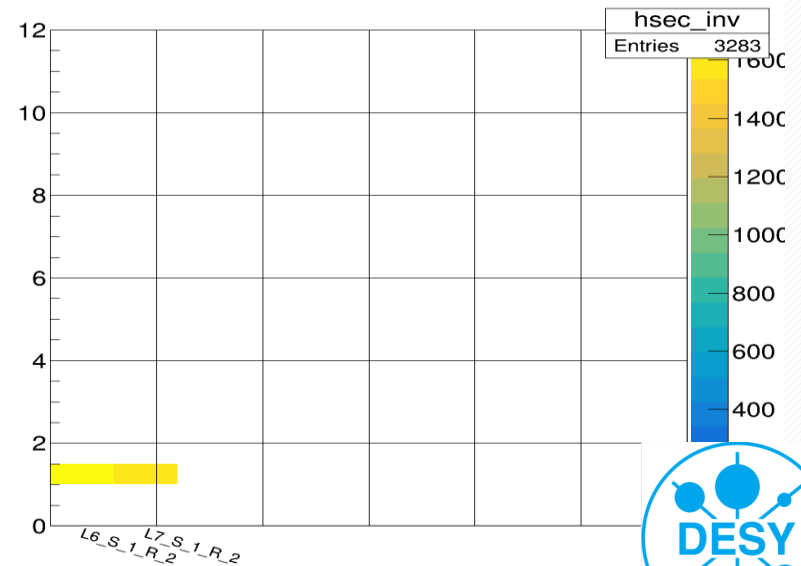


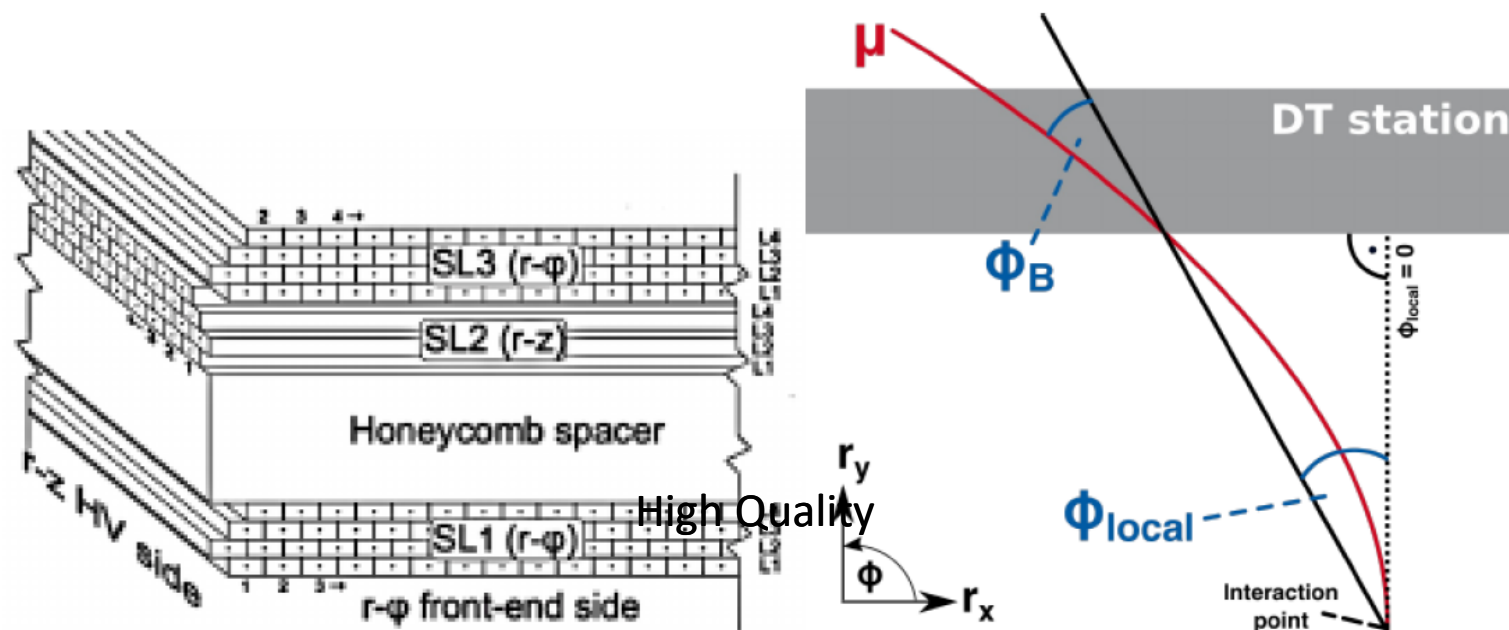
Link 6 & 7  
Ring 2  
sector 1

invalid Wheel No.



invalid sector no.





- 4 staggered layers form 1 SuperLayer (SL).
- $SL_{r-\phi}$  have wires parallel to the beamline, and measure quantities in the  $r-\phi$  plane.
- $SL_z$  have wires perpendicular to the beamline, and measure quantities in the  $r-z$  plane.
- In MB1/2/3, one chamber is formed by 2  $SL_{r-\phi}$  and 1  $SL_z$ .
- In MB4, one chamber is formed by only 1  $SL_{r-\phi}$ .
- The DT chambers provide Trigger Primitives (TPs) which store information about the location of the hit, number of aligned DT-hits, the bending angle  $\phi_B$  etc. It also contains a quality code which indicates the number of SL hits and the how well aligned they are.

# Emulator – classification of the Muons

## Low Quality (LQ)

## High Quality (LQ)

The quality is defined according to the number of aligned hits in the trigger segment.

- Low Quality if  $(0 < LQ < 4)$
  - For LQ, try to find a matching HOTP in the same wheel as the DTTP such that  $\Delta(i\eta) < 1$ .
  - High Quality  $(3 < HQ < 7)$ .
  - For HQ, try to find a matching HOTP such that  $\Delta i\eta \times \Delta i\phi < 1 \times 1$ , i.e. within a  $3 \times 3$  tile window.
- If a matching HOTP is found, then DTTP has support from the HO.
  - HO-TPs has to be combined with DT-TPs and then BMTF will treat this combined TP in a special way.
  - This modified TP could be useful in many cases such that DT frailer and increasing the efficiency in the cracked region and the gap regions

