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HO Trigger Link Project

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Needed tasks for BMTF







2- Rate estimate

3- Quality bit in the unpacker

4- BMTF Emulator

5- update TwinMux Emulator



Efficiency study





Efficiency study









- Since we have 3% gain in the iEta ± 3, now It's time to find out the rate
- The previous rate estimate was few hundred Hz at 22 GeV which is bad for us since the L1 rate is 1.3 kHz at 22 GeV.
- We founded a mistake in the rate estimate at which we simply not match the MB1 TPs same as what we do in Efficiency study.
- We hope that mistake to be true and fixing it reduces the rate.
- We also expect some reduction as now it seems we will support iEta ± 3 not 4.
- Soham is producing the Zero Bias Ntuples and we will start calculate the rate once the jobs finished.



Additional checks



- We now in the phase of we need to check every thing and be 100% confidant with our results before exchange with BMTF group.
- Dick suggested to check first the gaps as function of Eta.
- Why HO hits at iEta ±4 do not help to fill the MB gap while it should be.
- Once we did all of the needed checks we will exchange the studies.
- We also need to add the quality bit to the unpacker.
- TwinMux Emulator: we need to add our HO digi to Phi-Digi collection and then we done (need some investigations).
- BMTF emulator: we suggest not to modify it we can simply tell the BMTF to only look for HO support once the TP is isolated MB1 (need to think of it).



Needed tasks for BMTF





1- Efficiency Study 2- Rate estimate

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Thanks





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Back Up



SiPMs Upgrade in LS1



- HO used hybrid photo-detectors during CMS startup.
- Disadvantage in HPDs:-
 - 1- relatively small gain at low light flux signals ~ 2000 .
 - 2- High sensitivity to the magnetic filed.
 - 3- high operation Voltage ~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(106) at low light flux.
 - 2- Approx. insensitive to magnetic fields.
 - 3- Significantly lower bias voltage O(100 v).
- SiPM boards are compact enough to easily fit into the limited space of the existing readout modules.



Unpacker



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Unpacker







• 4 staggered layers form 1 SuperLayer (SL).

tifr

- $SL_{r-\phi}$ 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 (iEta < 1).
- High Quality (3 < HQ < 7).
- For HQ, try to find a matching HOTP such that Delta iEta x Delta iPhi < 1 x 1, i.e. within a 3 x 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 TPs in a special way.
- This modified TPs could be useful in many cases such that DT frailer and increasing the efficiency in the cracked region and the gap regions



