

# Impact of tighter electron trigger selection on very high $p_T$ electrons

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High  $p_T$  egamma 16/05/2011

# Motivation

- Need tighter selection than e20\_medium rate is too high (60Hz at  $10^{33}$ ) → need tighter selection
- Proposal: e20/22\_medium1
  - Re-optimize with medium++ : cuts proposed to decrease the rate to 20Hz
    - blayer + blayer Outlayers ( $|\eta| < 2.01$ )
    - Npix + Pix Outliers  $\geq 2$  ( $|\eta| > 2.01$ )
    - $\Delta\eta$  (0.005)
    - Loose TRT cut
    - Tighter shower shapes in  $2 < |\eta| < 2.47$

MOST of the (50%)  
of trigger rate comes  
from eta>2 bin

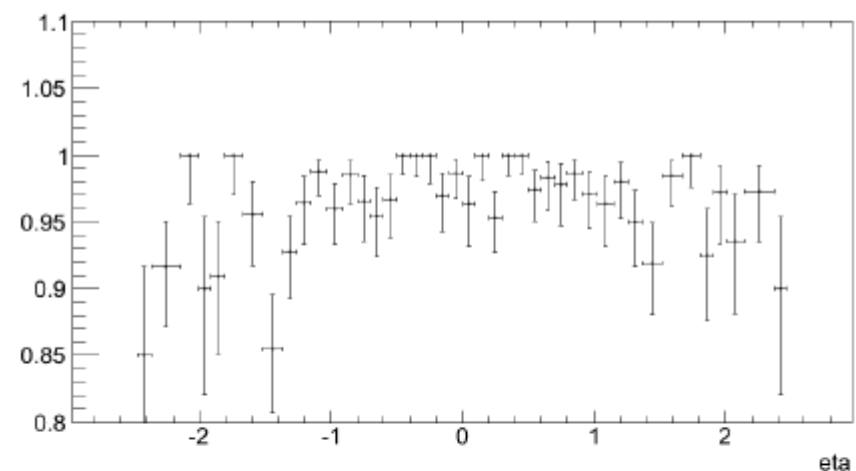
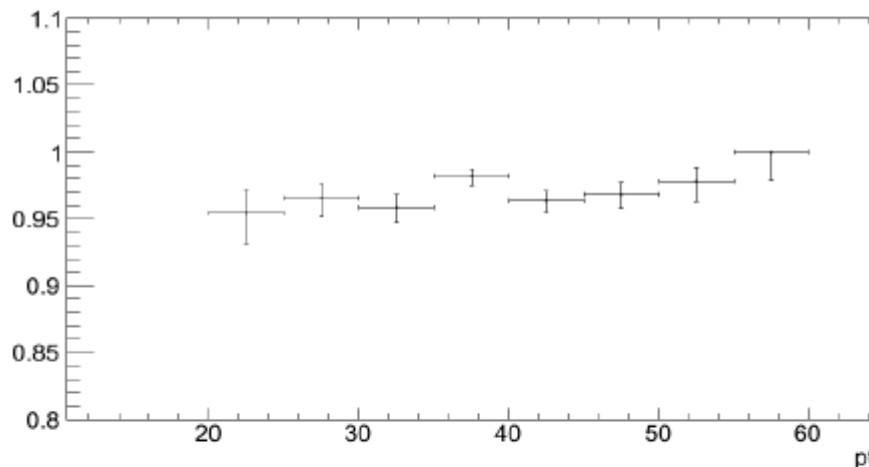
Need to check → the effect of the TRT cuts on the high pT electron efficiency

# e20\_medium1 optimisation

## trigger efficiency

### Efficiency for proposed e20\_medium1 wrt offline medium1

- with bLayer+bLayer Outliers ( $|\eta| < 2.01$ ) + nPix+Pix Outliers  $\geq 2$  ( $|\eta| > 2.01$ ), delta-eta (0.005), loose TR + tighter shower shapes in  $2 < |\eta| < 2.47$



Tag and probe on Zee, re-processed 179739, 179725 runs

**EF\_e20\_medium1 Eff. Wrt offline medium1 selection with Pt>25GeV: 96.7%**

**EF\_e20\_medium1 Eff. Wrt offline Tight selection with Pt>25GeV: 97.6%**

**Tight shower shape do not cause inefficiency when offline Pt>25GeV with this statistics**

*(NB: trigger eff. Using b-layer hit cut in whole eta region has same efficiency)*

# Samples and method

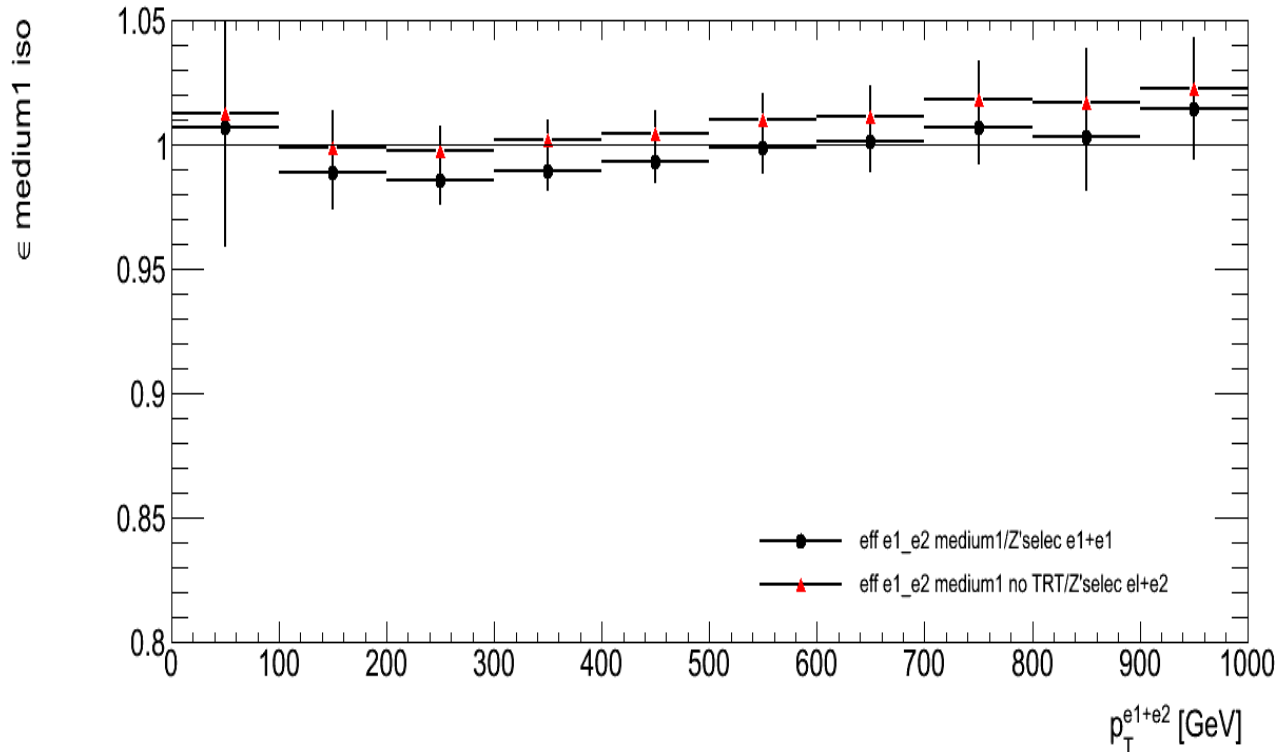
- MC10a different ssm Z' mass samples combined:
  - mc10\_7TeV.105603.Pythia\_Zprime\_ee\_SSM1000.merge.AOD.e574\_s933\_s946\_r2215\_r2260\_SMD3PD/
  - mc10\_7TeV.115274.Pythia\_Zprime\_ee\_SSM750.merge.AOD.e660\_s933\_s946\_r2215\_r2260\_SMD3PD
  - mc10\_7TeV.105549.Pythia\_Zprime\_ee\_SSM1250.merge.AOD.e574\_s933\_s946\_r2215\_r2260\_SMD3PD/
  - mc10\_7TeV.105624.Pythia\_Zprime\_ee\_SSM1500.merge.AOD.e574\_s933\_s946\_r2215\_r2260\_SMD3PD/
  - mc10\_7TeV.105554.Pythia\_Zprime\_ee\_SSM1750.merge.AOD.e574\_s933\_s946\_r2215\_r2260\_SMD3PD/
  - mc10\_7TeV.105409.Pythia\_Zprime\_ee\_SSM2000.merge.AOD.e574\_s933\_s946\_r2215\_r2260\_SMD3PD/
- Used trigger cuts (be found [https://svnweb.cern.ch/trac/atlasoff/browser/Trigger/TrigAlgorithms/TrigEgammaRec/tags/TrigEgammaRec-01-02-22-12/python/TrigEgammaElectronCutIDTool\\_medium1.py](https://svnweb.cern.ch/trac/atlasoff/browser/Trigger/TrigAlgorithms/TrigEgammaRec/tags/TrigEgammaRec-01-02-22-12/python/TrigEgammaElectronCutIDTool_medium1.py)) to simulate in offline reconstruction trigger selection cuts
  - Energy bin 20,30 GeV
  - "Offline electron" which mimics trigger is required to have loose match of L2 ROI and:
    1. TRT cut
    2. No TRT cut
- For offline selection use electron medium + Blayer cut as in current Z' analysis
- In both cases reconstructed electrons required to be truth-matched with Z' as mother

# New trigger selection efficiency

$$\epsilon = \frac{\text{Medium1 [Et bin 20,30 GeV] both electron + truth matching}}{\text{Z' standard selection on both electron + truth matching}}$$

with cut on TRT Ration

**Without cut on TRT Ration**



cuts on TRT

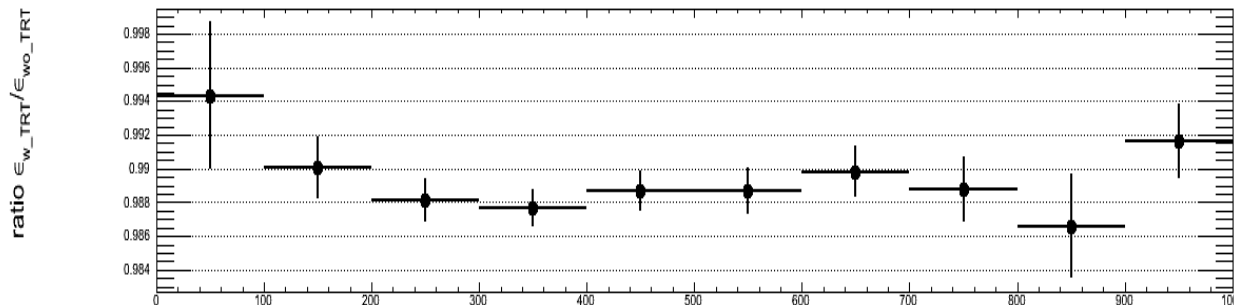
# range of eta bins for e-ID for TRT  
 self.CutBinEta\_TRT = [0.1, 0.625, 1.07, 1.304, 1.752, 2.0]

# cuts on Number of TRT hits with Outliers

self.CutNumTRT = [-15., -15., -15., -15.]

# cuts on TRT ratio with Outliers  
 TR Ratio (including Outliers)  
 rTRT = (nTRThigh+nTRThighOutliers) / (nTRT+nTRTOutliers)

self.CutTRTRatio = [0.05, 0.05, 0.05, 0.06, 0.08, 0.08]

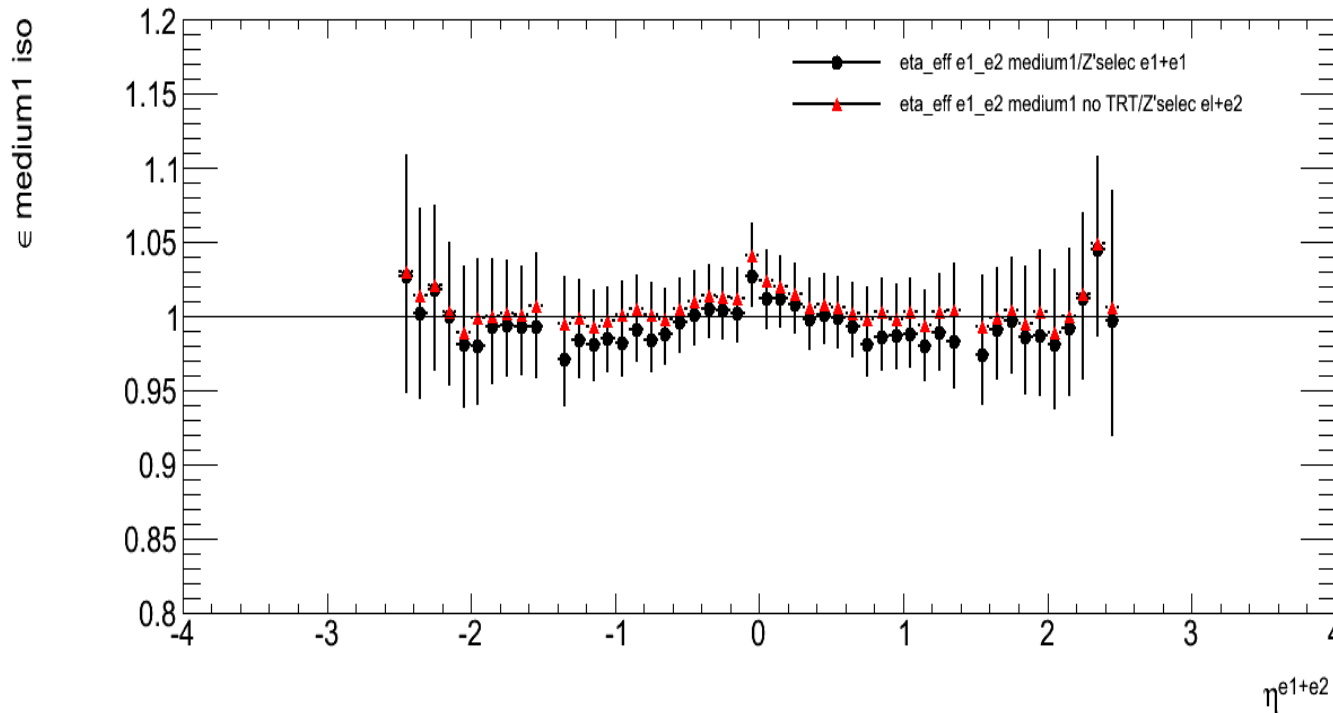


New trigger selection does not have any electron pT dependence

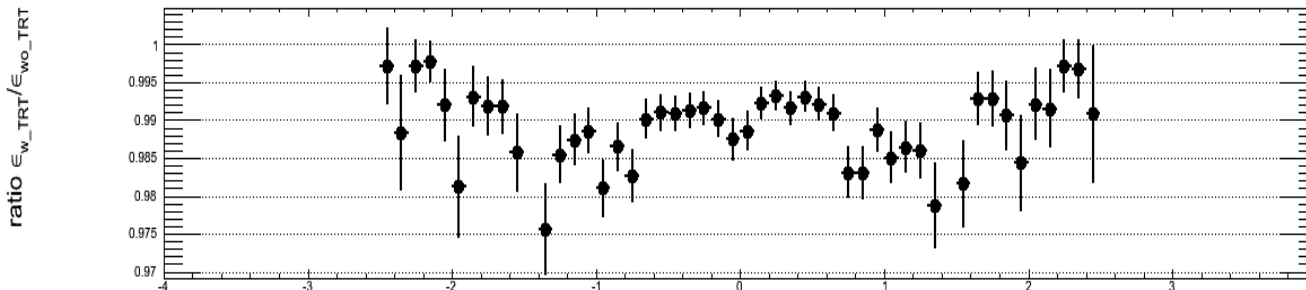
# Efficiency new trigger selection

$$\epsilon = \frac{\text{Medium1 [Et bin 20,30 GeV] both electron + truth matching}}{\text{Z' standard selection on both electron + truth matching}}$$

↗ + cut on TRT Ration  
 ↘ - cut on TRT Ration



New trigger selection does not have any electron eta dependence



# Conclusion

- MC studies of the new loose TRT cuts proposed for the e20/22\_medium1 trigger show no effect on the high pT electron efficiency up 1TeV.
  - No dependency in pt and eta distribution.