Photon medium trigger for 2012 data taking

√ EF_2g20vh_medium
√ EF_g30_medium_g20_medium

Introduction

- EF_2g20_loose trigger rate at 1e34 too high (~16 Hz)
- New di-photon trigger proposal(unique rate ~2Hz)
  - ET threshold at 20 GeV
  - no prescale
  - decrease pile-up dependence : loosen Rhad/Reta
  - decrease trigger rate : tighten Weta2 slightly and adding loose cuts on Eratio
- This presentation:
  - Study on the medium trigger proposal
  - Very preliminary plot for the medium trigger efficiency

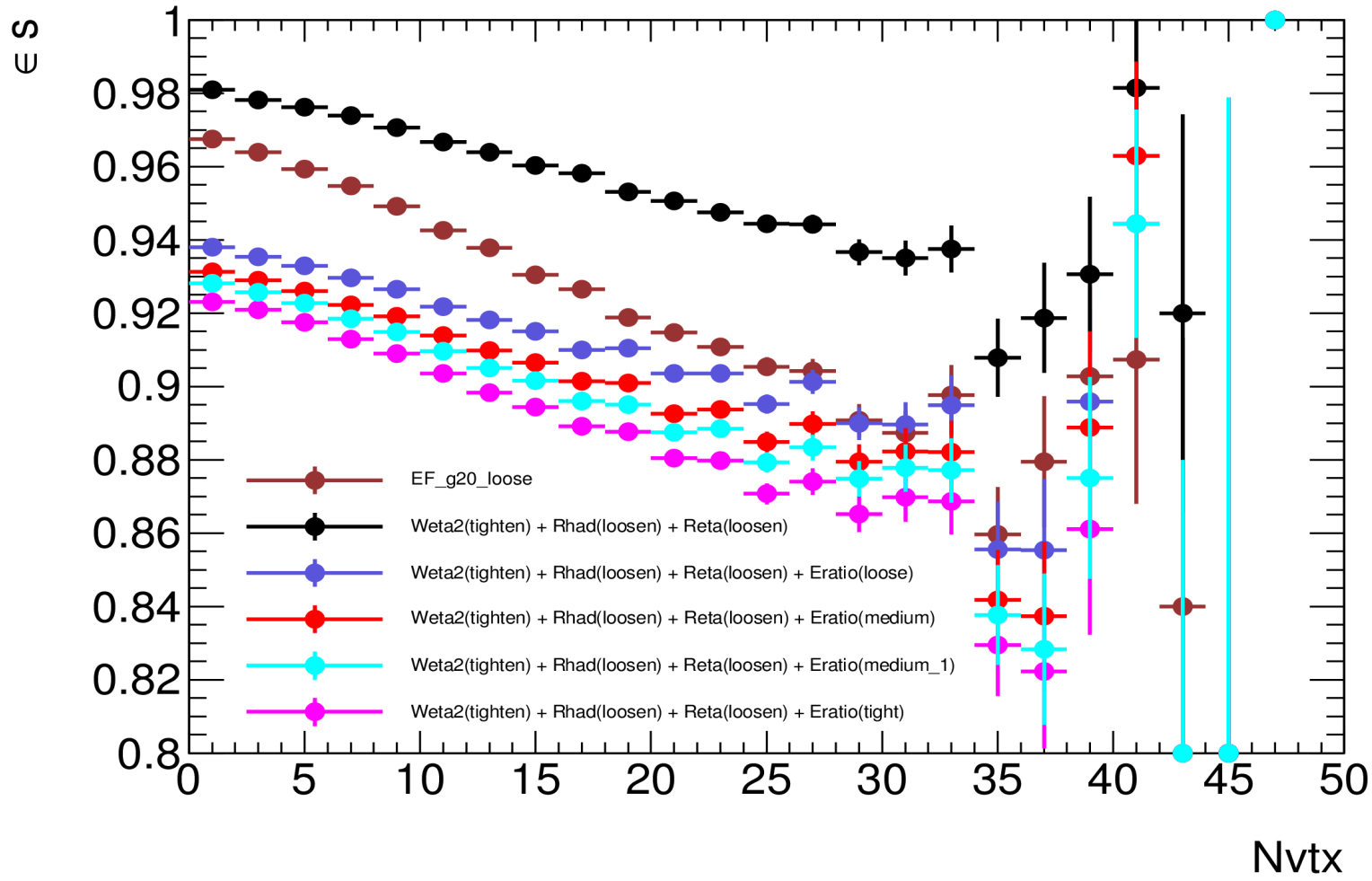
Data sets

- MC sample:
  - Signal: nominal and high pile-up(mu=20/30/40) Direct Photon samples
  - Background: nominal and high pile-up(mu=20/30/40) Di-jets samples

- Data sample: unbiased events in full 2011 data
  - events at HLT only passing L1 trigger

Trigger efficiency VS Npv with different cut combination

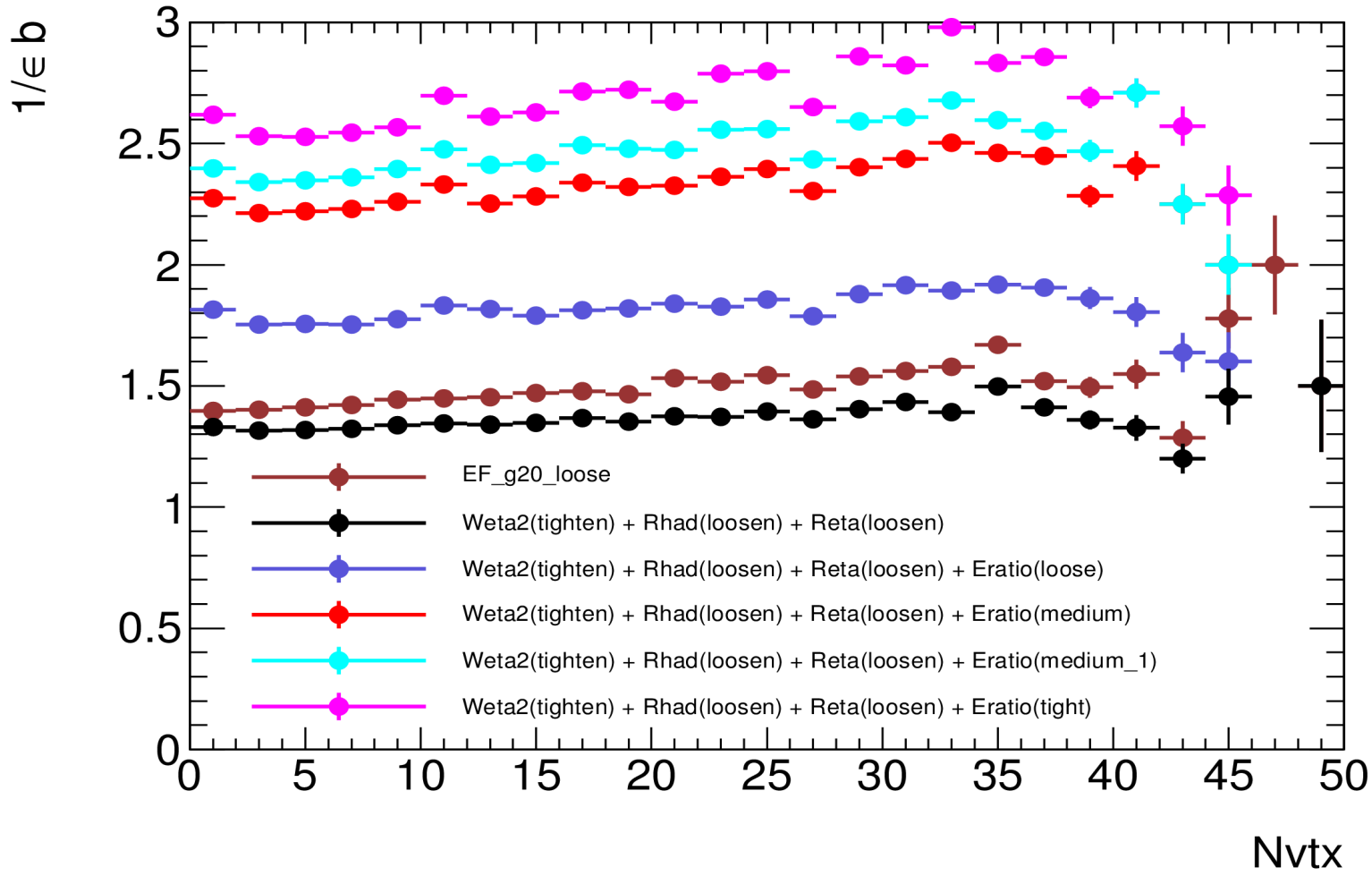
- Single photon trigger : Loosen Rhad/Reta & tight Weta2 slightly & adding different cuts on Eratio(Blue/red/green/pink)



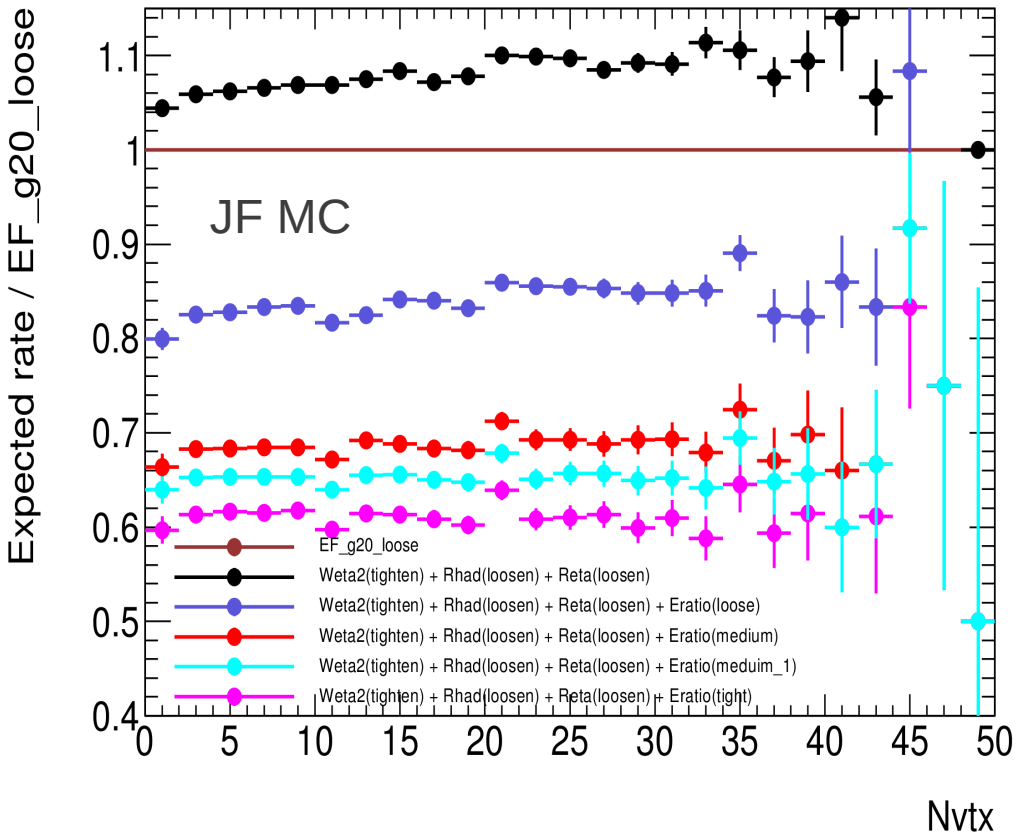
- Single trigger efficiency curves are less dependent on pile-up at hight Npv(30) comparing to EF_g20_loose(in 2011 menu).

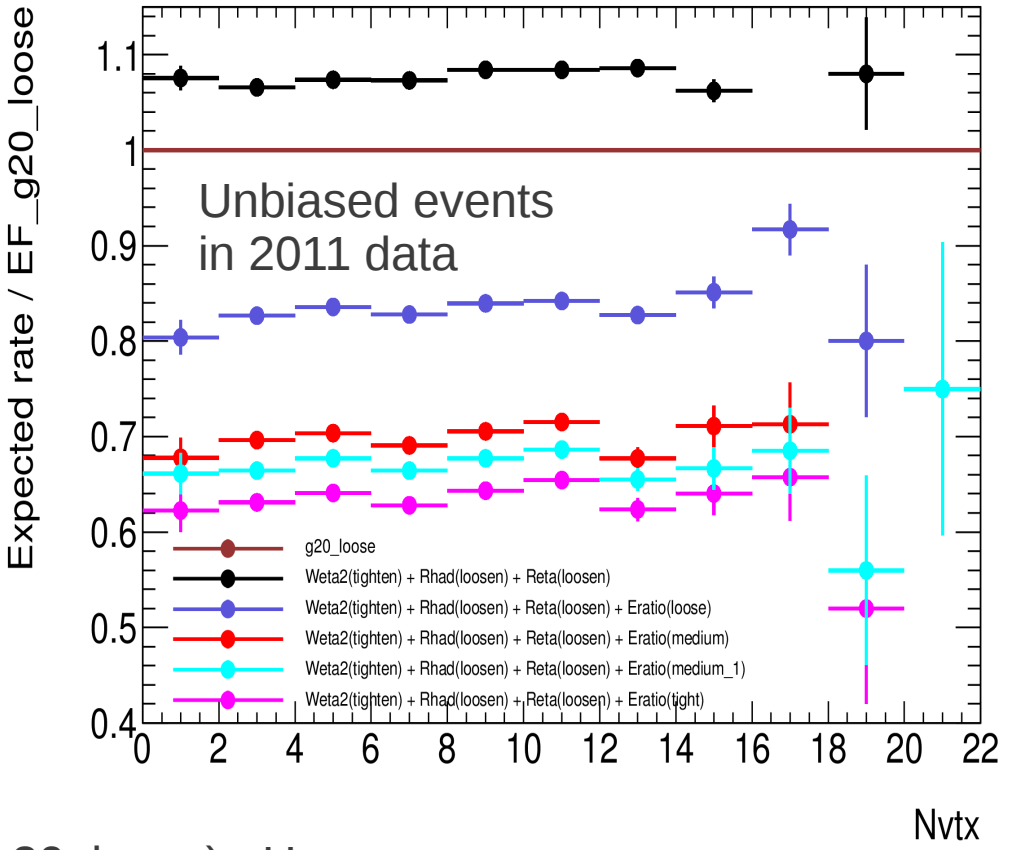
Background rejection VS Npv with different cut combination

- The powerful background rejection of new trigger could be 2 times comparing to EF_g20_loose(in 2011 menu)



Trigger rate reduction with different cut combination



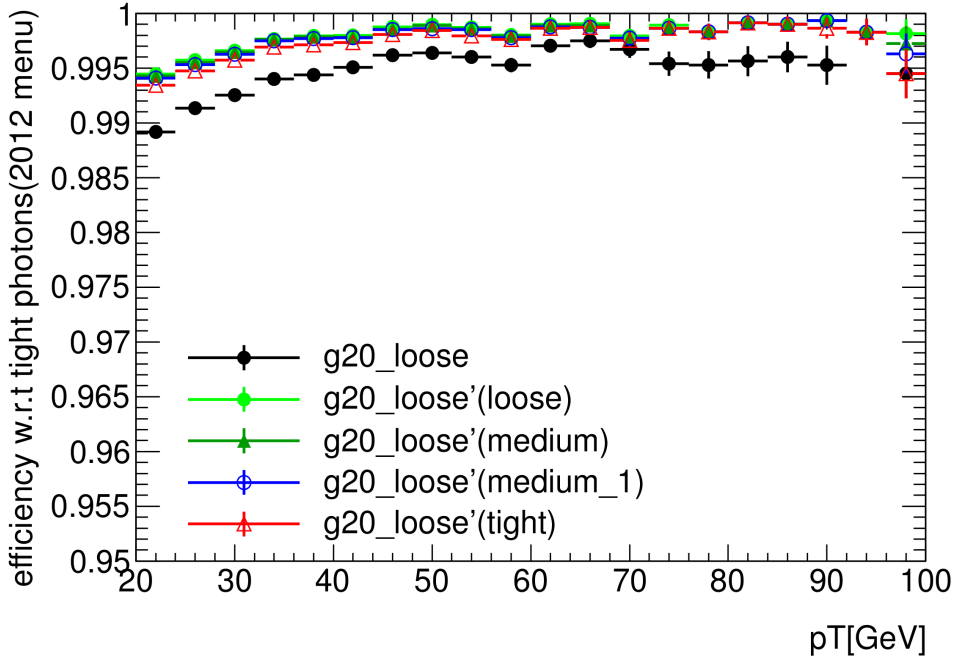


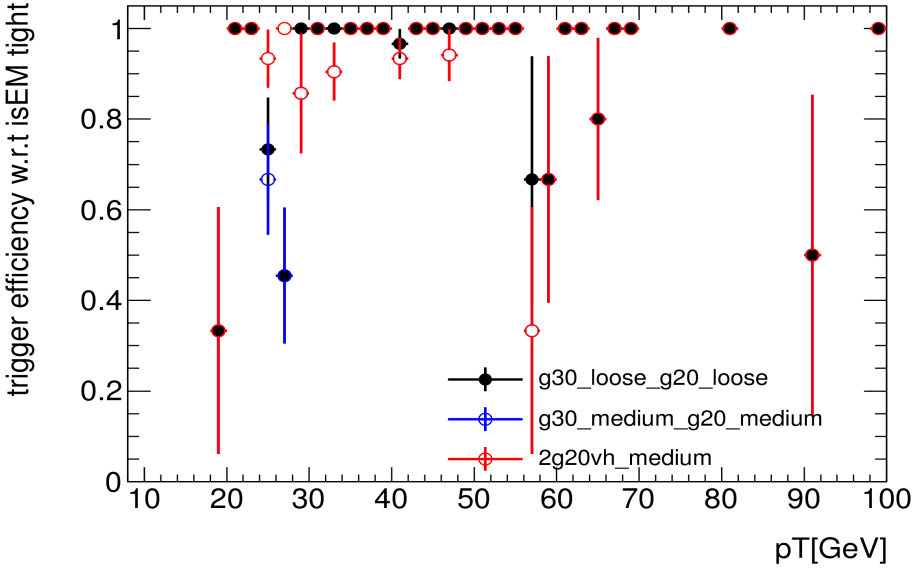
2g20_medium trigger rate(unique rate w.r.t g20_g30_loose) : Hz

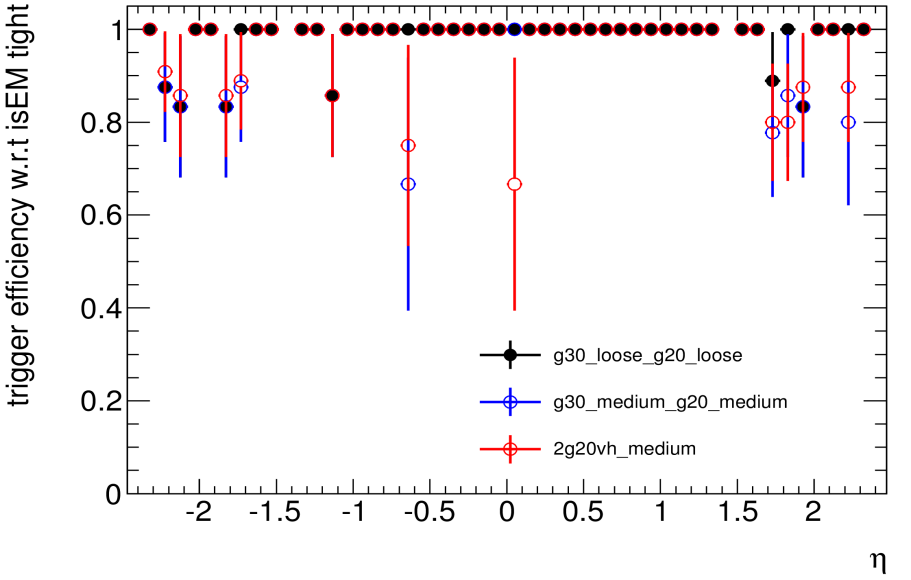
Trigger rate (unique rate)	loose	medium	medium_1	tight
MC (JF)	11.56 (4.35)	7.62 (2.89)	6.76 (2.58)	5.95 (2.24)
Data (unbiased)	11.29 (4.38±0.17)	8.06 (2.58±0.12)	7.18 (2.30±0.11)	6.55 (1.84±0.09)

Trigger efficiency w.r.t tight photons(2012 isEM menu)

- Signal efficiency for new triggers are very high(~100%) for tight photons.







- Testing in high pile up DP MC sample: top left
- Testing in high pile up data sample with Zee selection in full 2011 for the two medium trigger which are in 2012 chain: right two plots

Conclusion

- Two medium triggers are validated in 2012 chain
  - EF_2g20vh_medium
  - EF_g30_medium_g20_medium
  - trigger rate/unique rate are as predicted which were tested in 2012 data
    - g30_medium_g20_medium: 12 Hz - *as predicted*
    - 2g20vh_medium: 15 Hz [unique 3 Hz]- *as predicted*

- Cuts values:

  Rhad: [0.02425, 0.02425, 0.02275, 0.02575, 0.01975, 0.01975, 0.02725, 0.02725, 0.02725, 0.01975]
  Reta: [0.8825, 0.8825, 0.8825, 0.8575, 0.8875, 0.750, 0.8725, 0.9025, 0.8875, 0.7575]
  Weta2: [0.011, 0.011, 0.012, 0.012, 0.0125, 0.025, 0.013, 0.012, 0.0128, 0.0128]
  Eratio: [0.60, 0.60, 0.76, 0.70, 0.67, 0.68 , 0.65, 0.68 , 0.75, 0.78]

- Future : study on the trigger efficiency in 2012 data?