Feasibility of High-p_T Single Electron Trigger with TRD L1

MinJung Kweon
Physikalisches Institut, Universität Heidelberg

Questions are

- Heavy electron statistics and p_T reach
- Trigger rate with certain single electron trigger algorithm(p_T > trigger p_T with eID)
- Rejection factor
- Feasible p_T threshold

Data Sets and Track Selection

- Data Set:
  - p+p @ 10 TeV
  - ~ 2M minbias events produced with v4-16-Rev-06

- Track selection to be close to online tracker(no other cuts except for belows)
  - $|\eta| < 0.9$, 8 TRD super modules
  - TRDpidQuality >=4

    , where TRDpidQuality is # of tracklets to used for PID

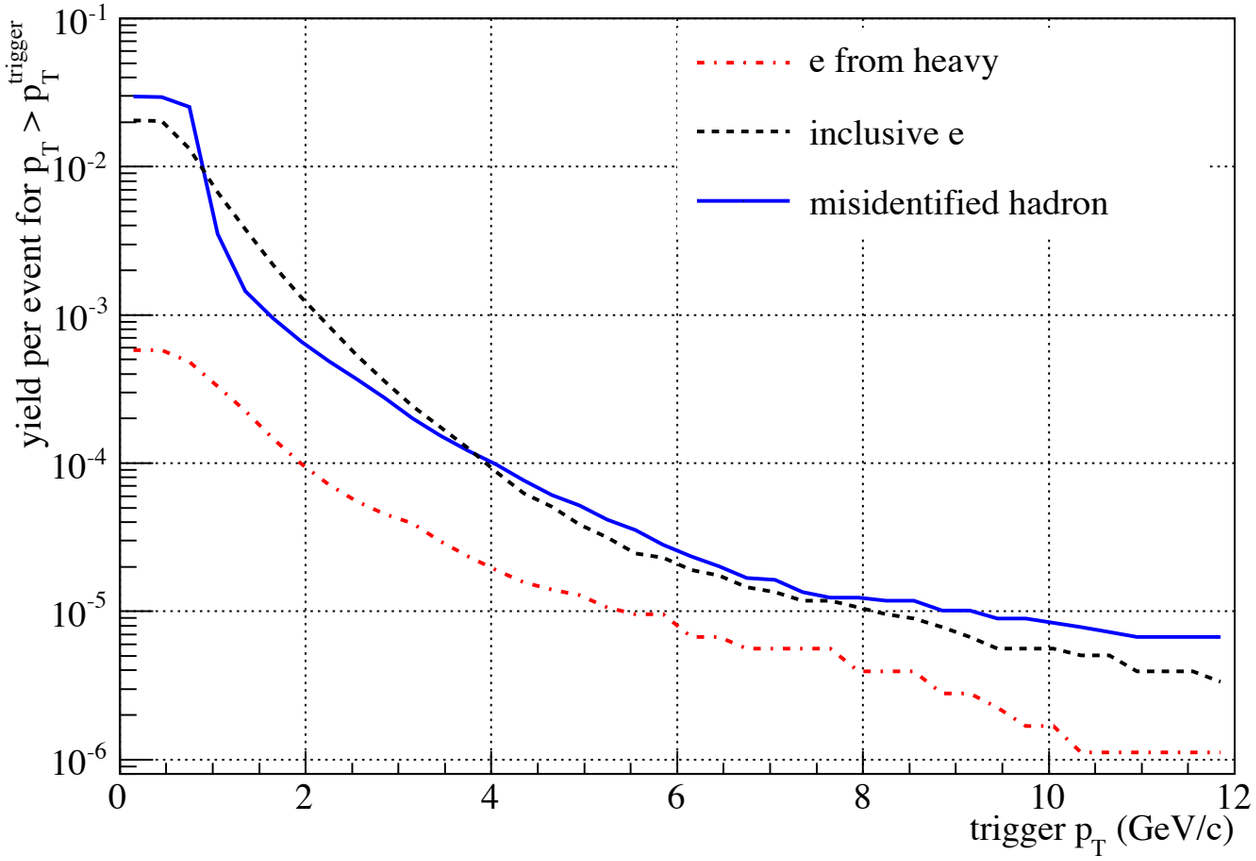
    $\Rightarrow$ caution: tracks are still TPC prolongated Tracks!

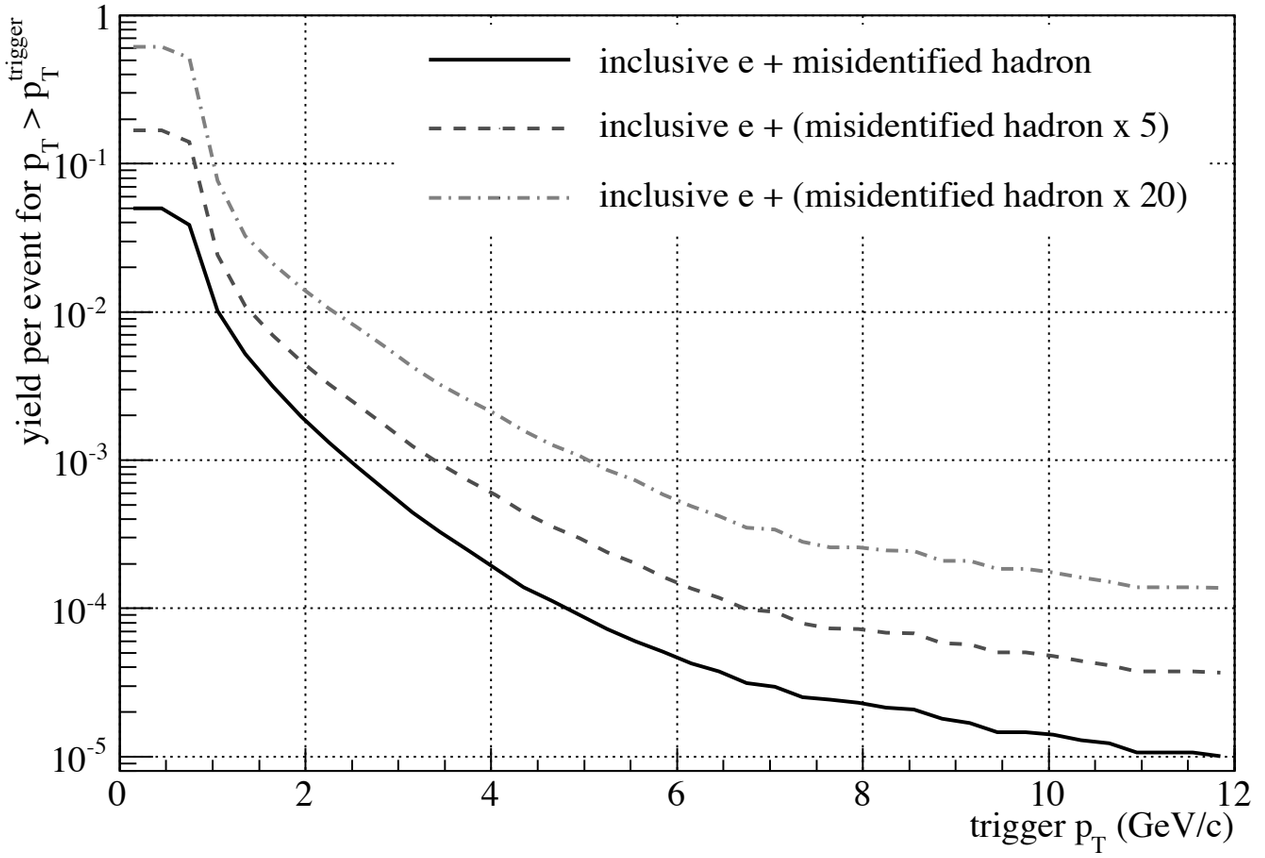
- Offline TRD pid(NN method)

Main Background Sources

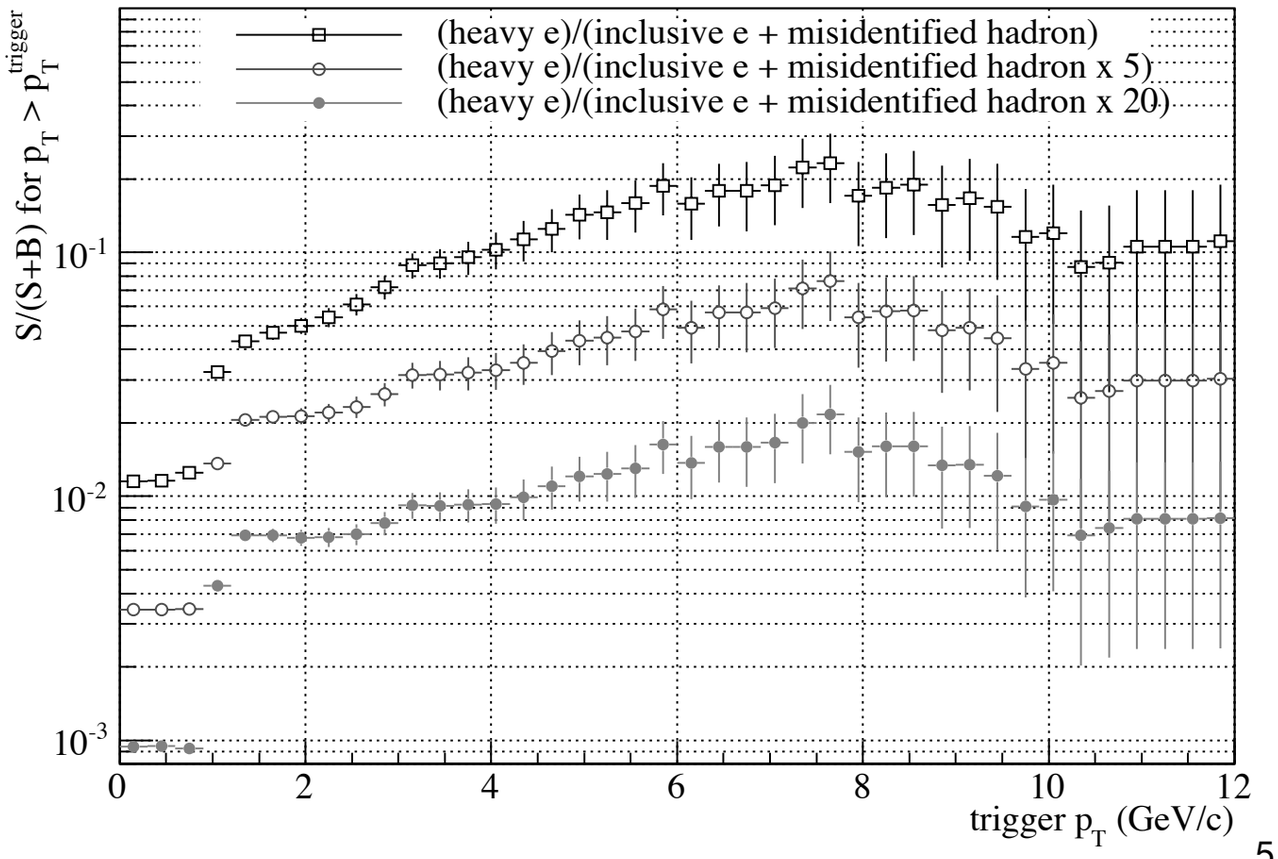
- Misidentified hadrons tracks
- Fake tracks from combination of clusters from different primary tracks
- True electron tracks due to conversion of photons before TRD

Production rate of signal and background





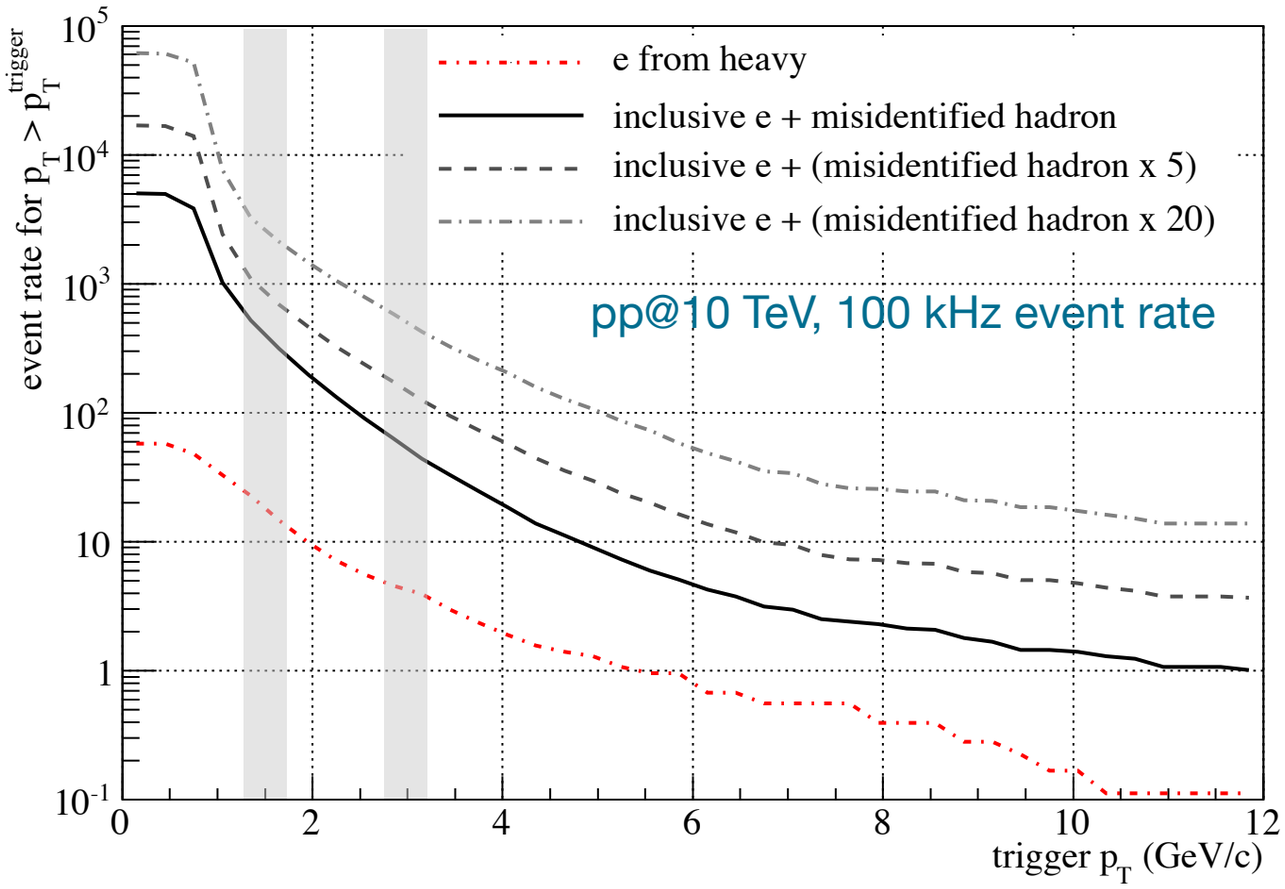
background = other sources of electrons + misidentified hadrons ⇒



- mc p_T
- TRD geometrical acceptance and offline tracking efficiency is folded in

Level-1 trigger rate of eID trigger with p_T > trigger p_T

- if we consider maximum 100 kHz TRD tolerant rate



- assume (online π efficiency) ≤ (offline π efficiency x 20), it leads maximum 2.5 kHz(500 Hz) at trigger p_T = 1.5 GeV/c(3 GeV/c)
- there are many other real factor which increase online trigger rate
  - fake tracks
  - online hadron rejection factor

⇒ have to be studied with online emulator and emulator developing in progress

Additional Suppression by HLT

- Suppression of background tracks additionally by HLT
  - hadron rejection - use offline TRD pid method
  - conversion electrons, fake tracks - ITS, TPC track matching, pixel hit requirement

$\Rightarrow$ available bandwidth to HLT and output rate to DAQ will be questions

- Other remark

  $\Rightarrow$ conversion electrons can be signal for the other physics

Outlook

- From offline analysis, high p_T electron trigger with TRD L1 looks promising but we need to check with online emulator