MBUE analysis – Status report

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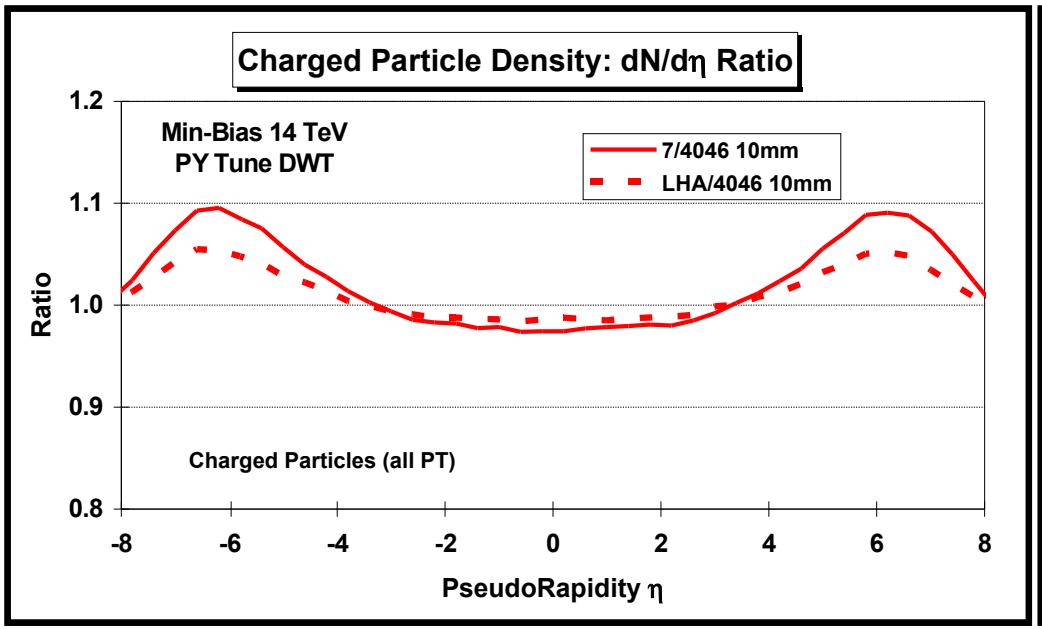
CMS Hamburg Meeting November 8th 2006

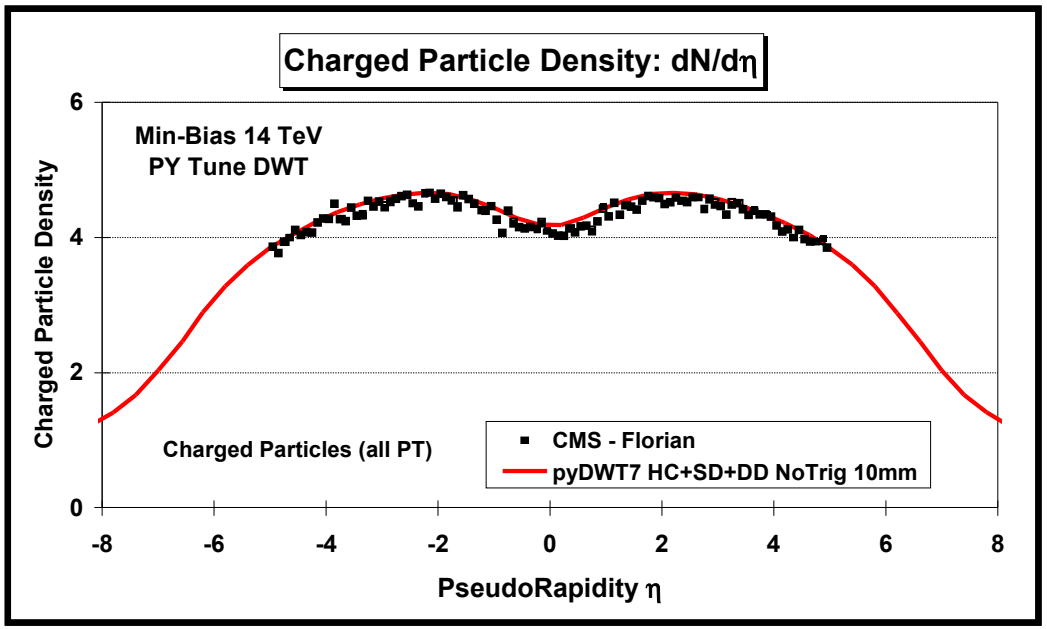
- **Validation of PythiaSourceMinBias.cfi**
- **CSA06**
  - FEVT analysis at T2 DESY
  - run Min-Bias analyzer on different skim samples
    - Higgs-tau filters
    - single muon filter
    - dilepton filter
    - 2IC5Jet100Exo filter
  - open issues

Validation of PythiaSourceMinBias.cfi

Rick Field, FB

- generate hard-core + single-diffraction + double-diffraction
- decay particles with $c\tau < 10$ mm
- choose implementation of structure function
  - Rick Field: CERNLIB CTEQ5L(4046) called externally from Pythia
  - PythiaSourceMinBias.cfi: internal Pythia parametrization of CTEQ5L(7)
  - CTEQ5L from LHAPDF





☞ 10% differences for Min-Bias but much larger effect for Underlying Event

☞ excellent agreement between PythiaSourceMinBias.cfi (■) and Rick's calculations (—)

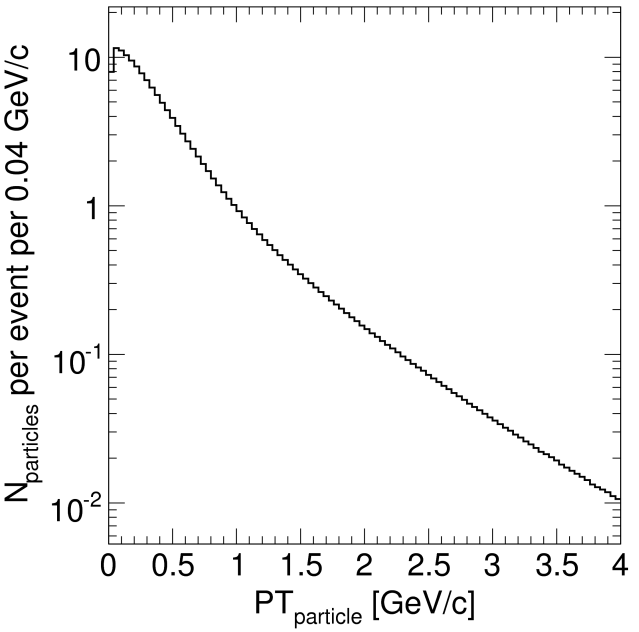
FEVT analysis T2 DESY

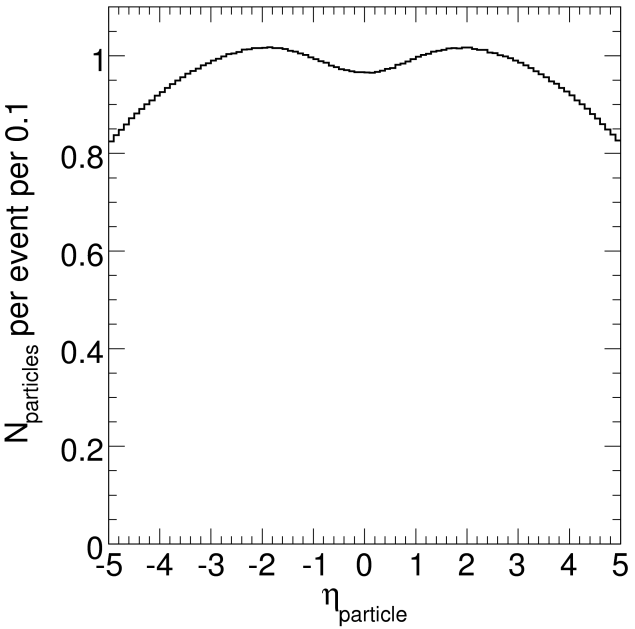
- CRAB_1_3_0, CMSSW_1_0_3, run over Min-Bias sample at DESY (~1.5 million events):
  - ☞ `/CSA06-102-os-minbias13-0/RECO/CMSSW_1_0_2-RECO_He161069e60f9472aa003070c3d42e060`

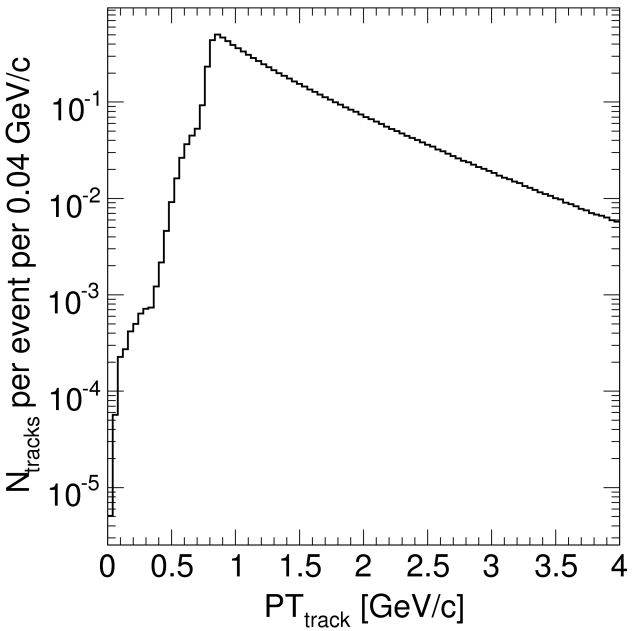
- AnalysisExamples/MinimumBiasUnderlyingEvent/test/MinimumBiasAnalyzer.cc

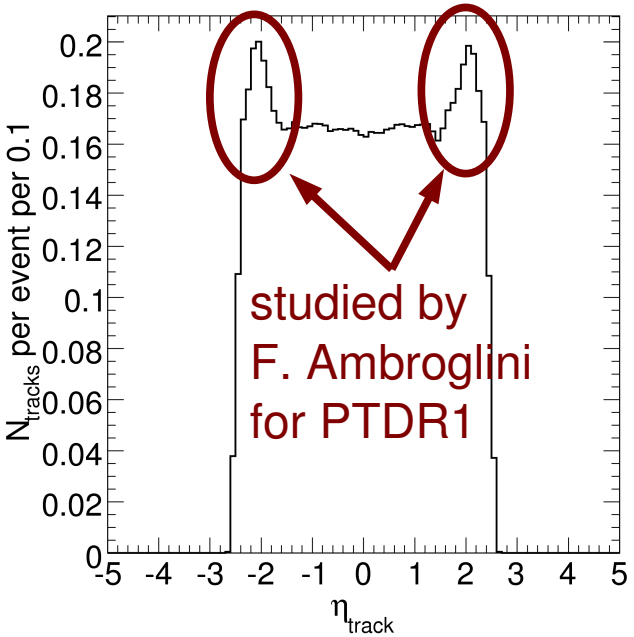
- 1553 CRAB jobs:
  - 1548 with exit code 0
  - 4 with exit code 65
  - 1 with exit code 134

- 1 544 830 generated events
- 985 026 events with rec. tracks
  - ~64 % reconstructed

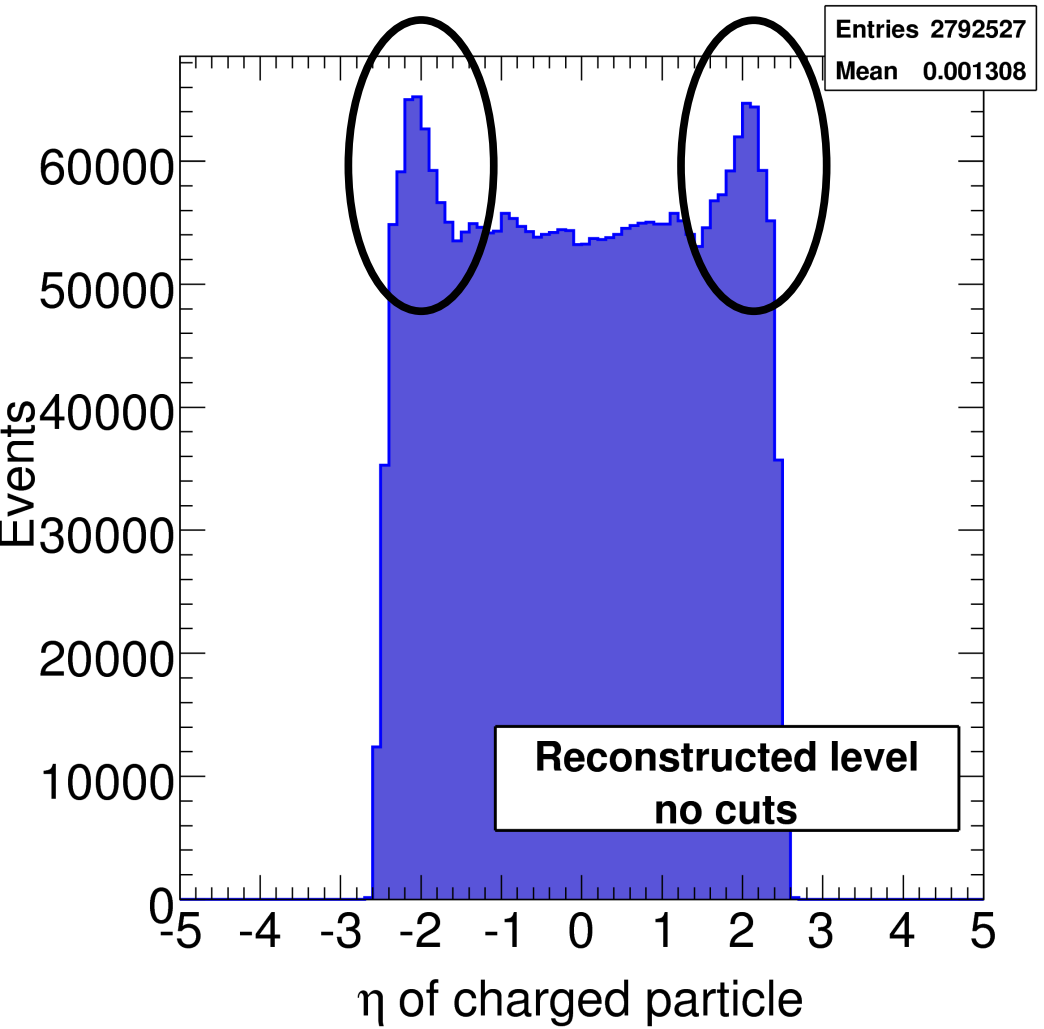


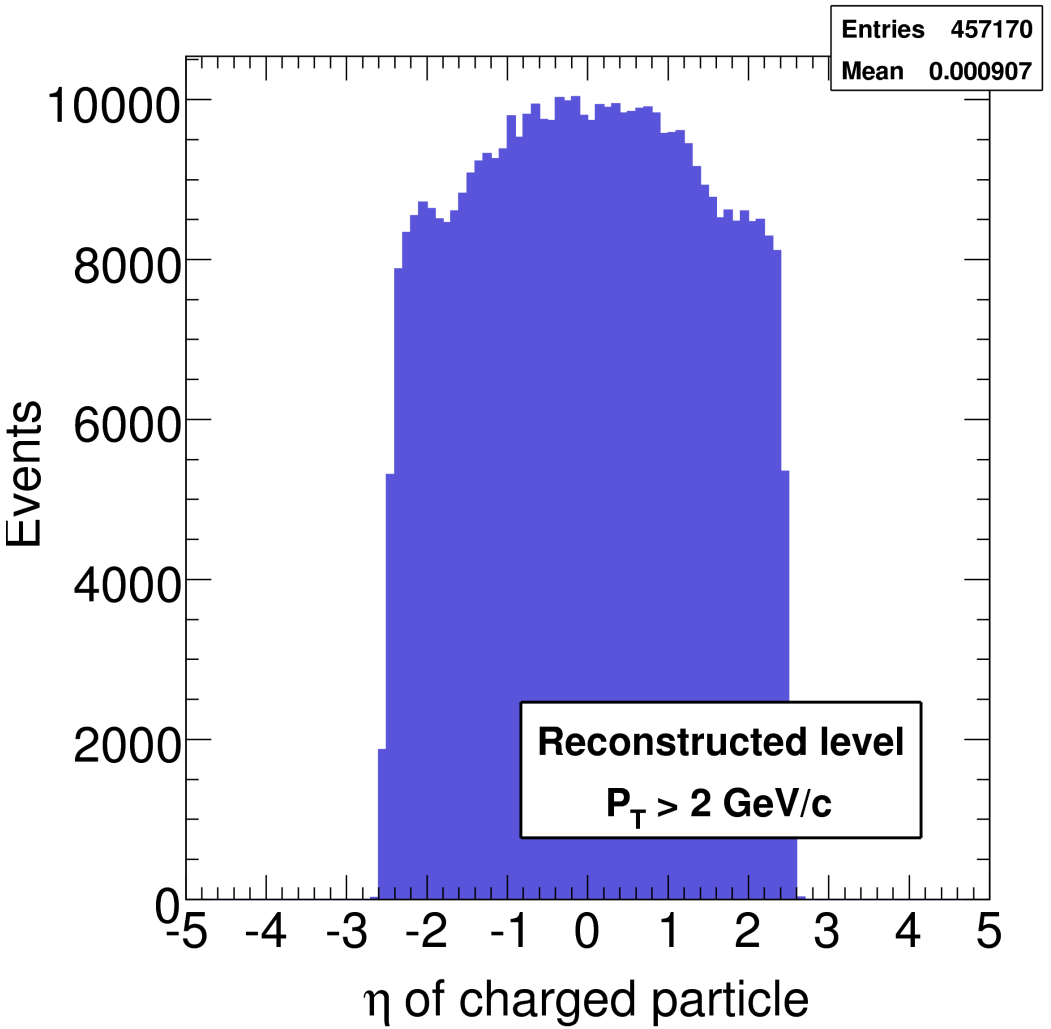






Track reconstruction

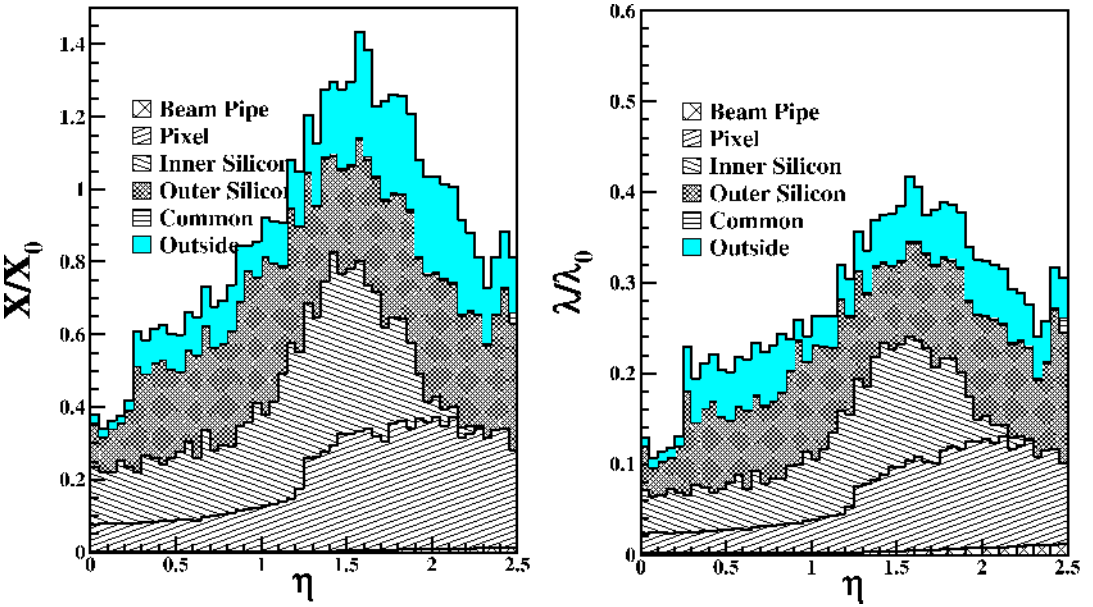




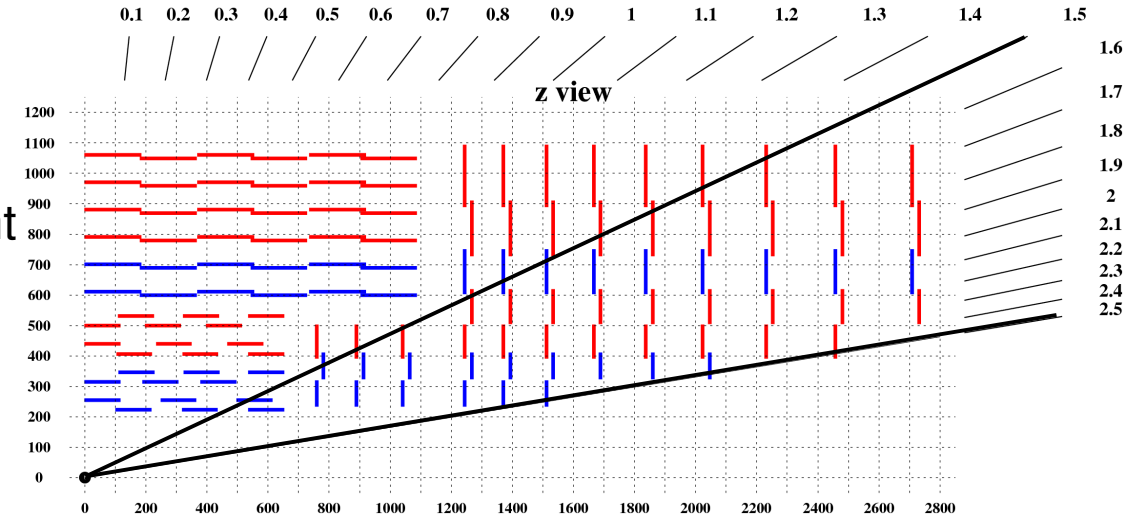
☞ "spikes" come from low-P_T tracks

Track reconstruction

large amount of material present in this eta region (☞ photon conversion)



algorithmic problem:
propagate information between different tracking subdetectors



☞ **have to discuss origin and implications with Filippo**

Moving to CRAB_1_4_0

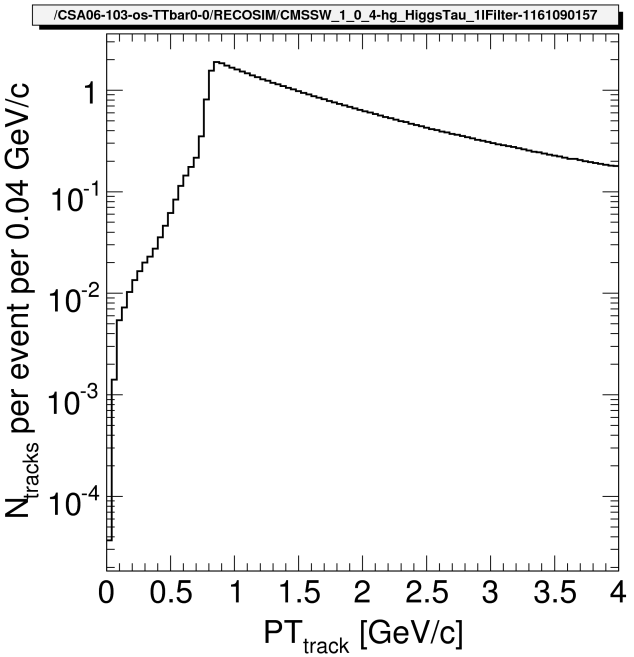
- **had been using CRAB_1_3_0**
  - submission and retrieval took very long (> 1 day each)
- **CRAB_1_4_0 offers bulk submission (submission and retrieval sped up significantly)**
  - gLite instead of LCG middleware
  - CRAB frequently failed to generate a valid proxy automatically
  - all jobs aborted at grid-ce0.desy.de
  - submission fails if the number of jobs is too large (threshold unclear...)

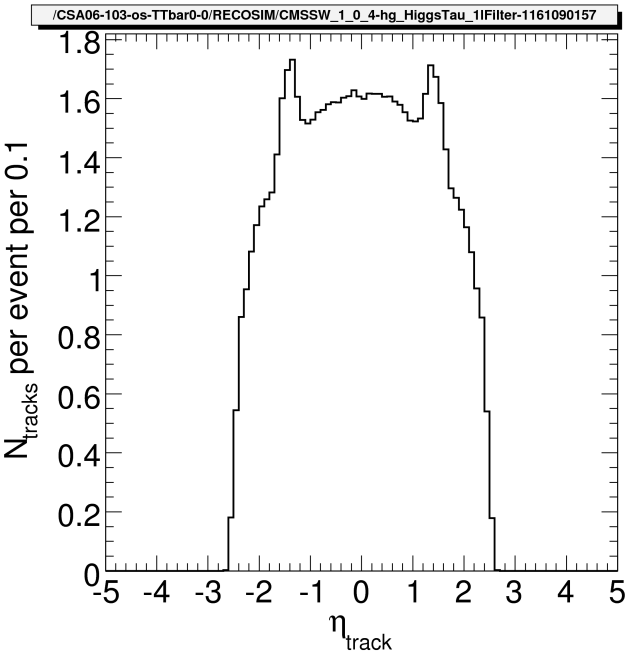
ttbar - Higgs tau filter

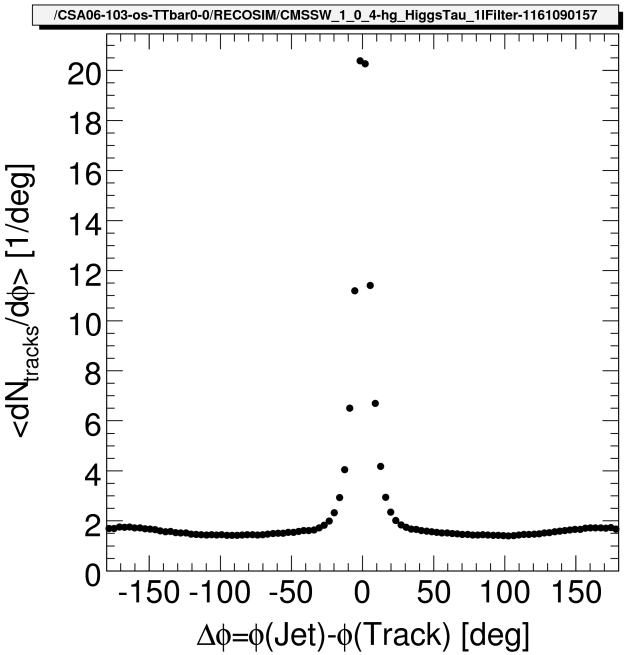
datasetpath = /CSA06-103-os-TTbar0-0/RECOSIM/CMSSW_1_0_4-hg_HiggsTau_1lFilter-1161090157

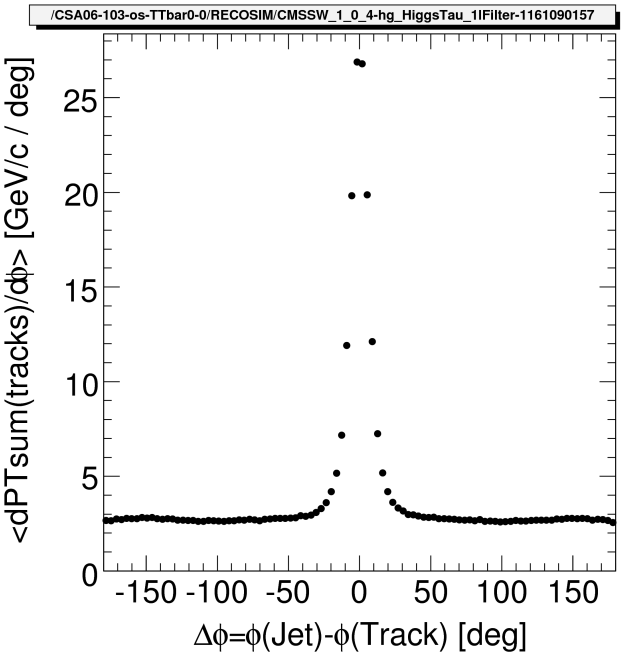
electron or muon with
$P_T > 15$ GeV/c, $|\eta| < 2.4$

- $Z \rightarrow \tau\tau$ analysis of τ group: select $Z \rightarrow \tau\tau \rightarrow$ lepton+jet events
- qqh, $h \rightarrow$ inv ana. of higgs group: Z/W+jets background from data





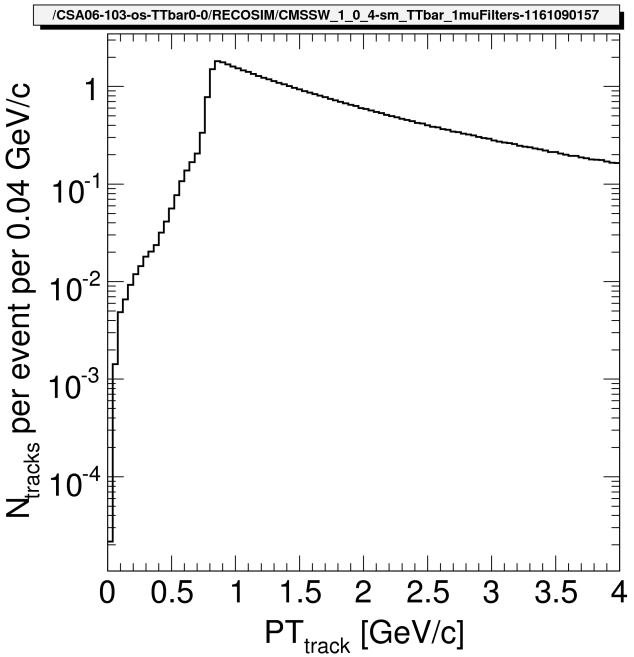


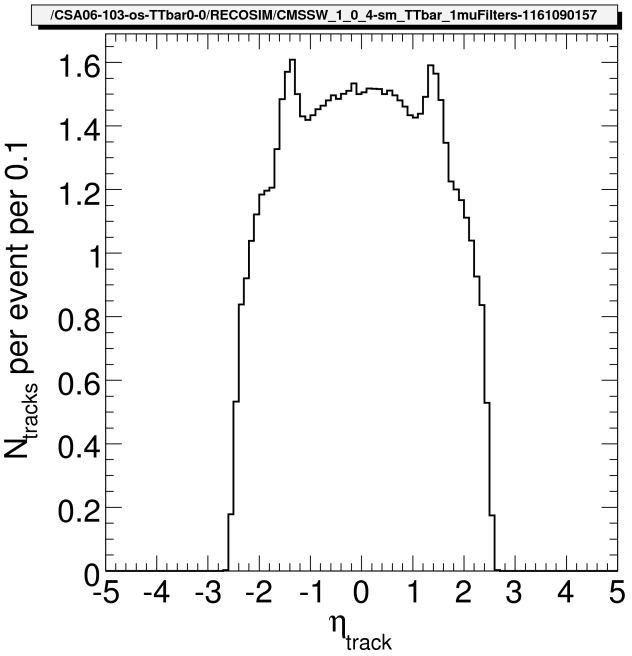


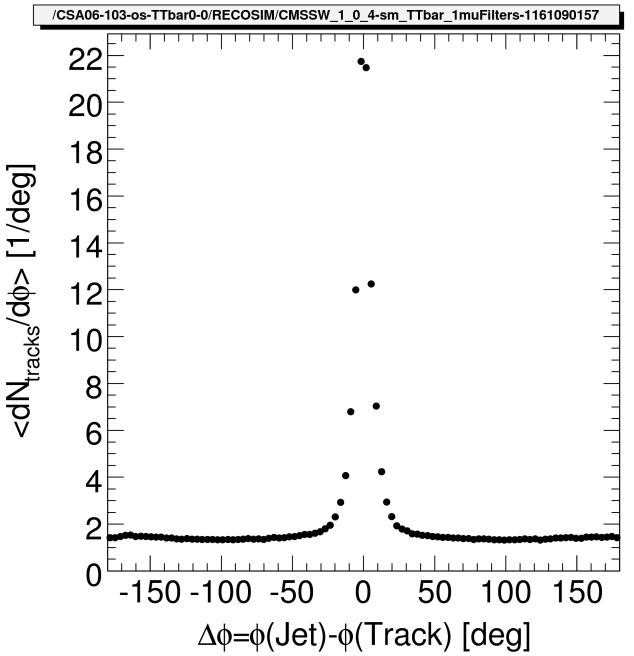
ttbar – single muon filter

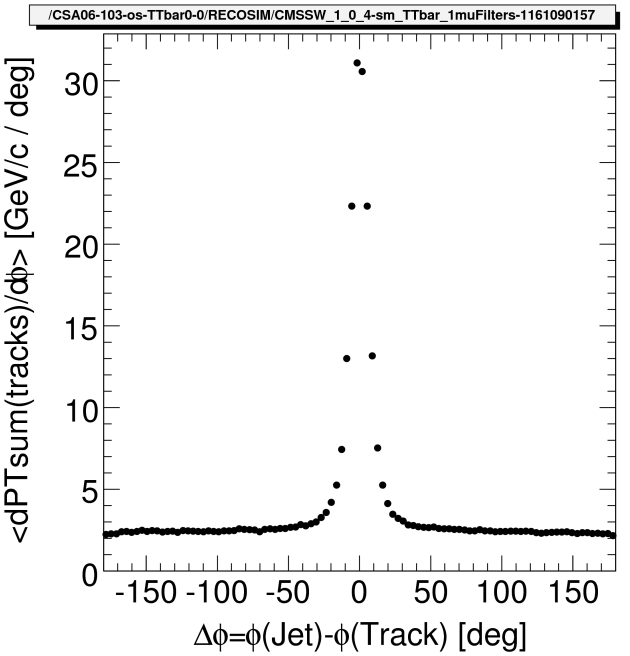
datasetpath = /CSA06-103-os-TTbar0-0/RECOSIM/CMSSW_1_0_4-sm_TTbar_1muFilters-1161090157

select events with single muons







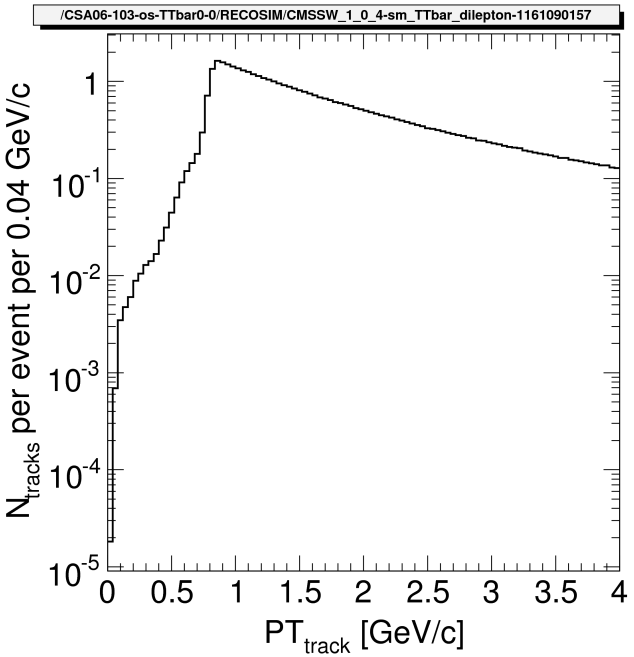


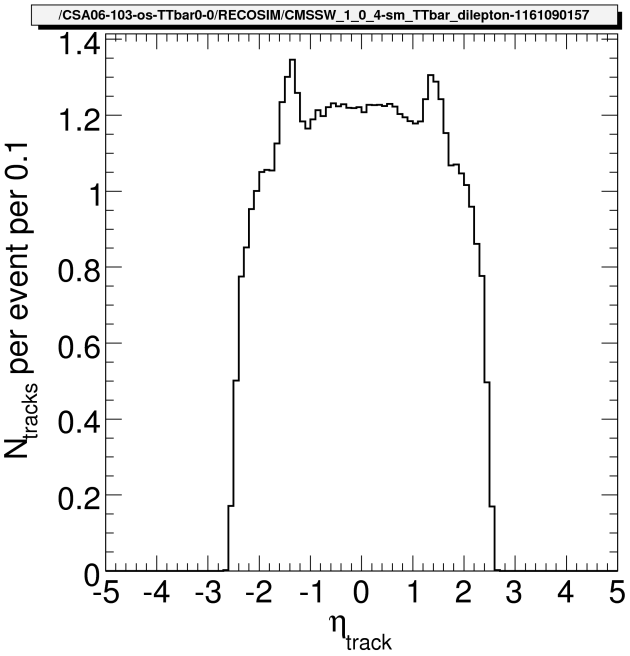
ttbar – dilepton filter

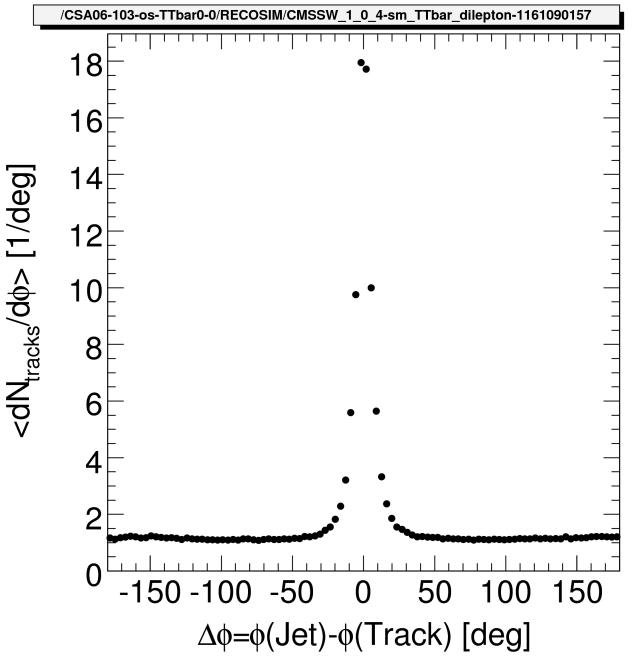
datasetpath = /CSA06-103-os-TTbar0-0/RECOSIM/CMSSW_1_0_4-sm_TTbar_dilepton-1161090157

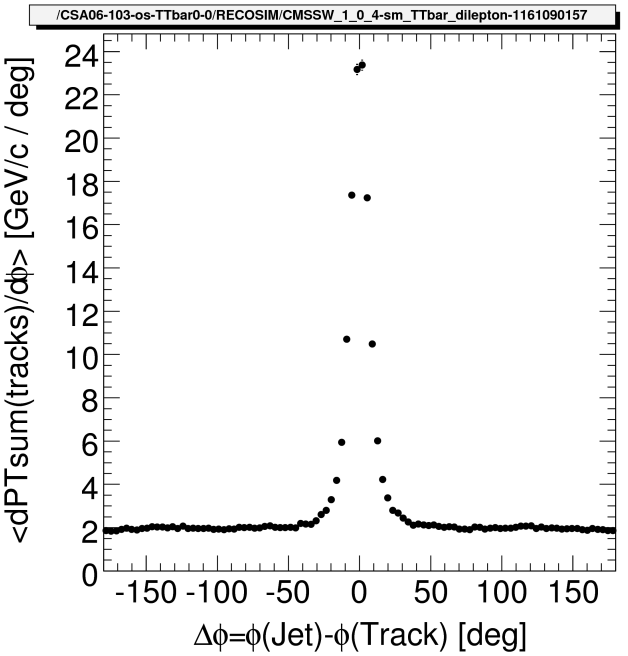
filter two oppositely charged leptons with

$|\eta| < 10$, $|m_{ll}| < 1000$ GeV/c²







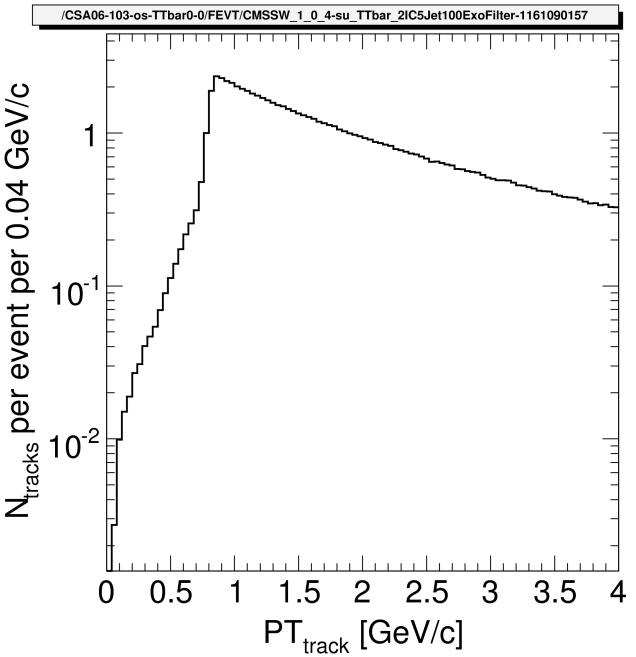


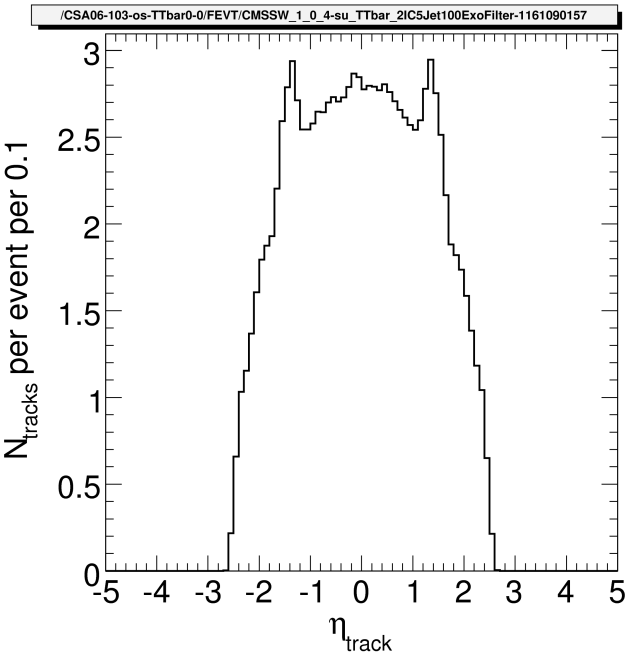
ttbar – 2IC5Jet100Exo filter

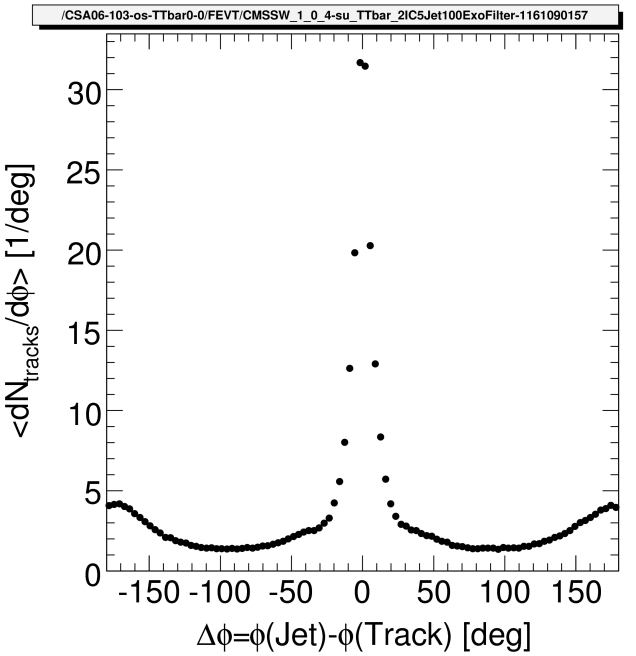
datasetpath = /CSA06-103-os-TTbar0-0/FEVT/CMSSW_1_0_4-su_TTbar_2IC5Jet100ExoFilter-1161090157

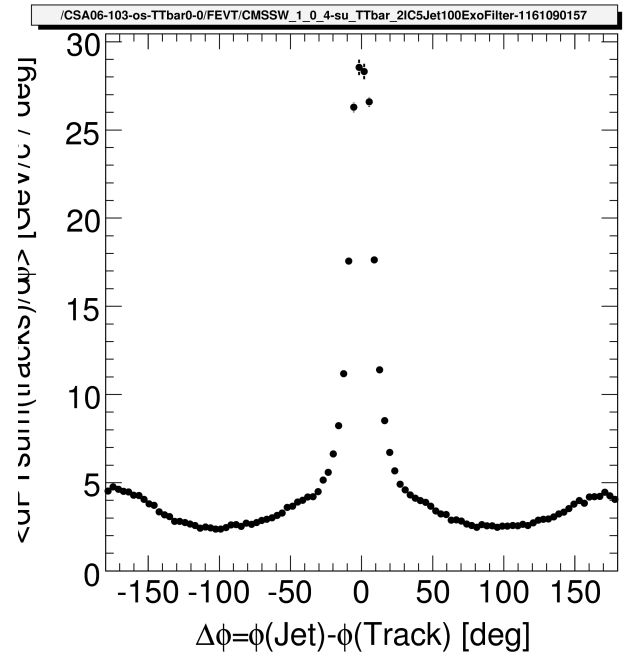
at least two jets reconstructed with iterative cone algorithm (R=0.5) with

E_T > 100 GeV





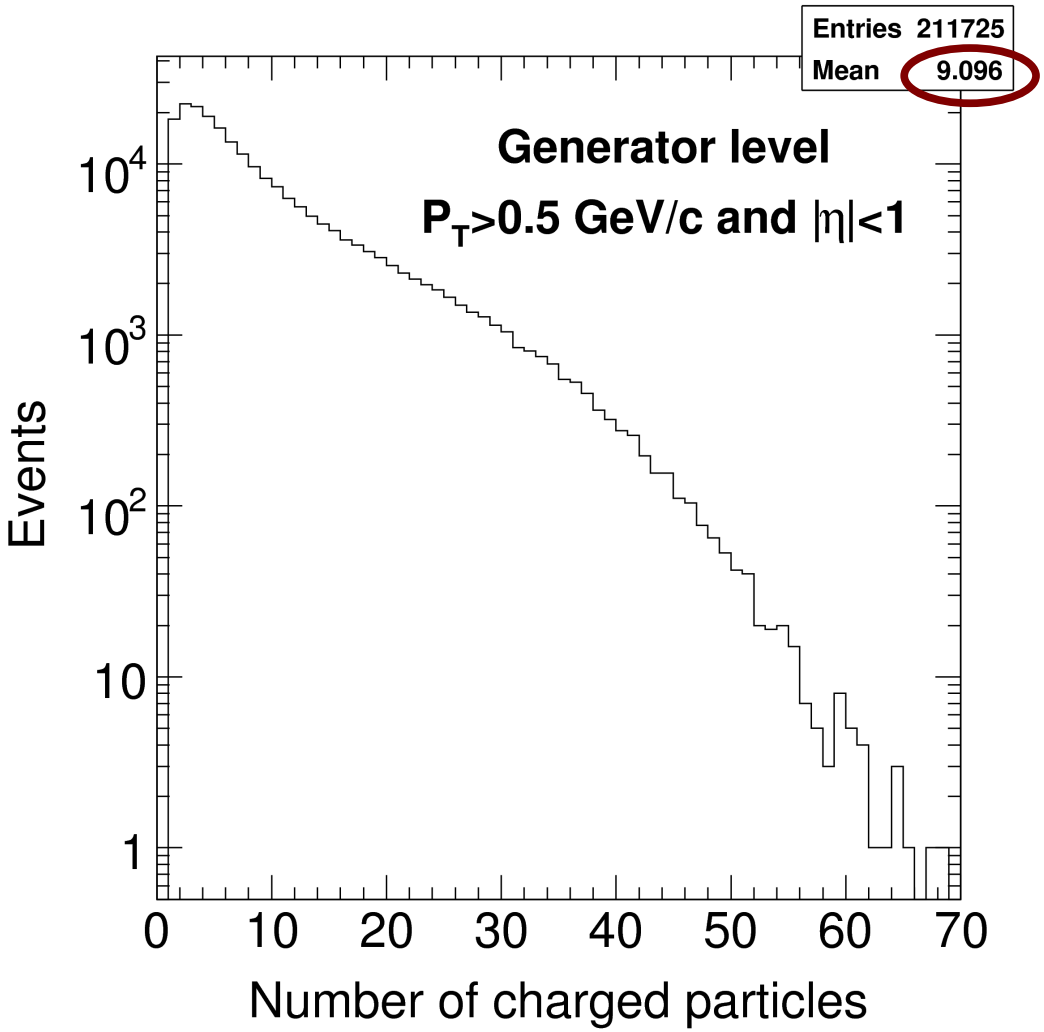


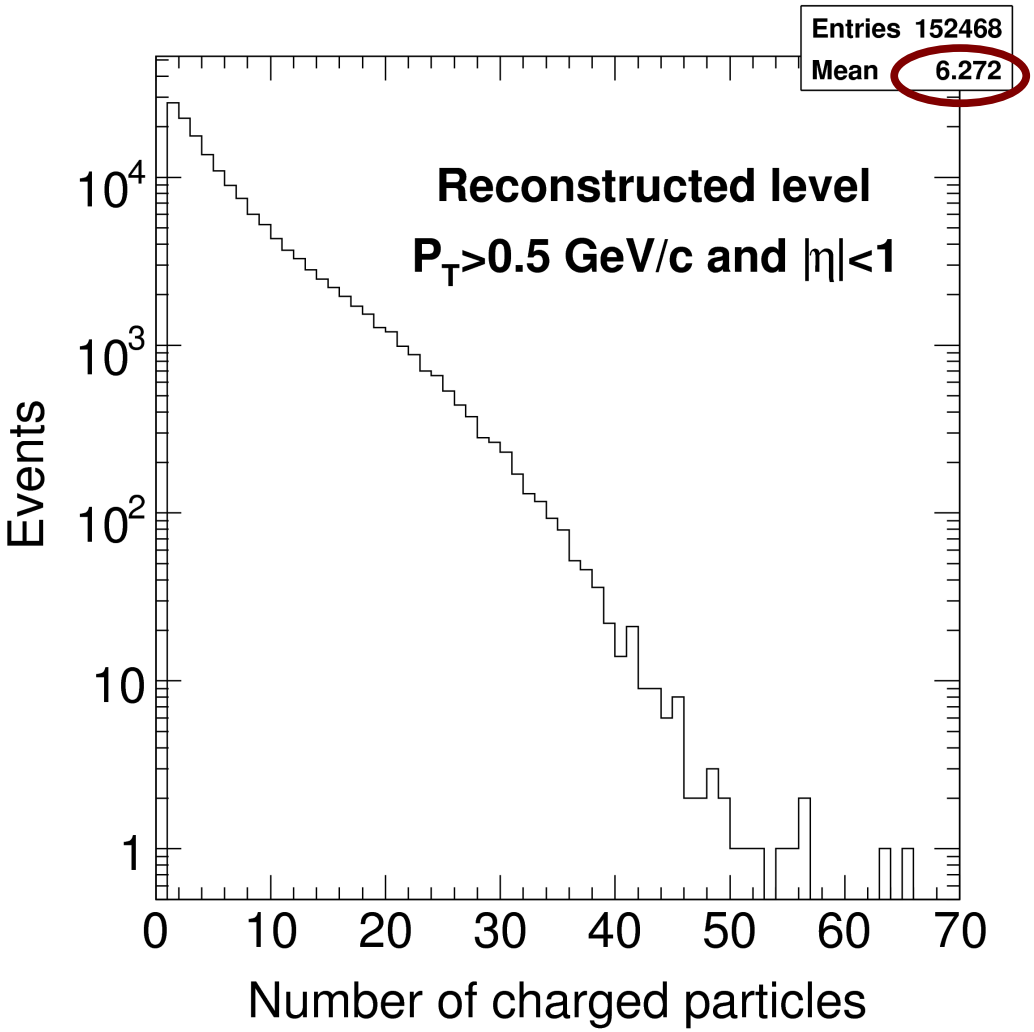


MBUE analysis code

- **available from CVS (AnalysisExamples/MinimumBiasUnderlyingEvent)**
  - only histograms filled (number of particles, P_T, η, $P_{T,Jet}$, η_{Jet}, $d\phi$, ...)
- **replace TH1D's by TTree**
  - study eta vs PT
  - study number of particles with $P_T > 0.5$ GeV/c, $|\eta| < 1$ or other selections
- **datasetpath = /CSA06-105-os-minbias13-0/RECO/CMSSW_1_0_5-RECO_H746ee88eddaa52306cd016b2f689e370**

FEVT Min-Bias: Number of particles





- **find about 1.4 times as many generated events than events with reconstructed tracks**
- **find 1.5 times as many generator particles than reconstructed tracks**

Summary and next steps

- PythiaSourceMinBias.cfi validated
- Min-Bias analysis ran succesfully on various data samples at T2 DESY

- Need to study the definition of MBUE observables (e.g. Number of particles)
- investigate quarkonium production in Min-Bias and Underlying Event