E/p studies
@ high Pt
an update

High pT egamma meeting

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Introduction/outline

- Update of study presented on 21th april Z' weekly
  - Included MC/data comparison for background
  - Corrected a bug in reverse ID template
  - Derived customed E/p cuts efficiencies
  - Behaviour of E/p @ high pT for Jet MC samples (Caterina Monini)

E/p -> MC/data comparison

- Samples

  Data - period G to I (2010)
  - Electrons from standard Z' selection as a signal data sample
  - Used reverse Id QCD background templates as a background data sample
    - Electrons pass Z' preselection until loose + blayer and fail medium identification

  MC
  - MC10 Zee sample (106046)
  - MC10 Jet samples JX (105009-105015)

- Reverse ID QCD template
  - Sarah's method
  - Corrected a bug since last meeting
  - Sample shows no Zee peak
    - Contamination was evaluated by Sarah to be ~1%
      (Z'-> ee backup note)

Reverse ID sample invariant mass
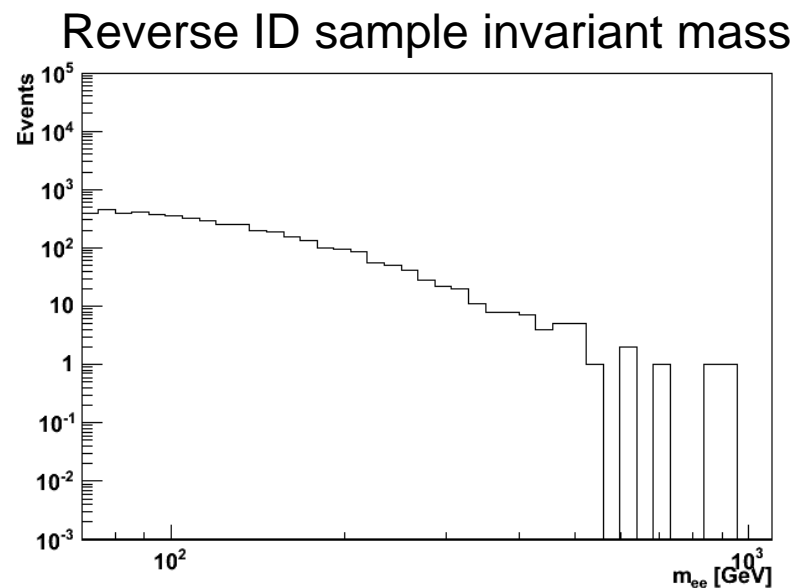
E/p -> MC/data comparison (2)

- Good agreement MC/data on signal

- Background shows faire agreement
  - QCD templates and MC sharing same preselection
  - Not requiring failing medium on MC
  - Peak @ E/p ~1 not seen any more in background since bug correction

ATL-COM-PHYS-2010-990
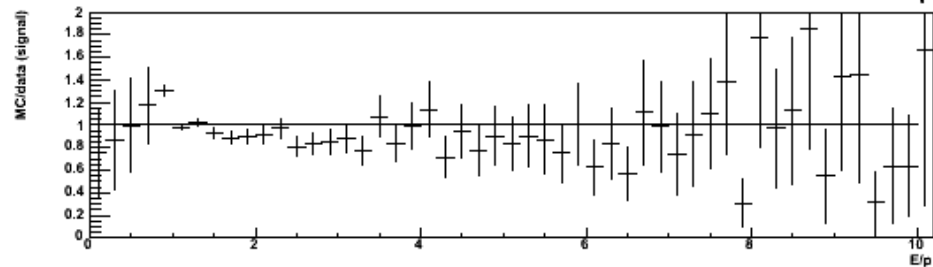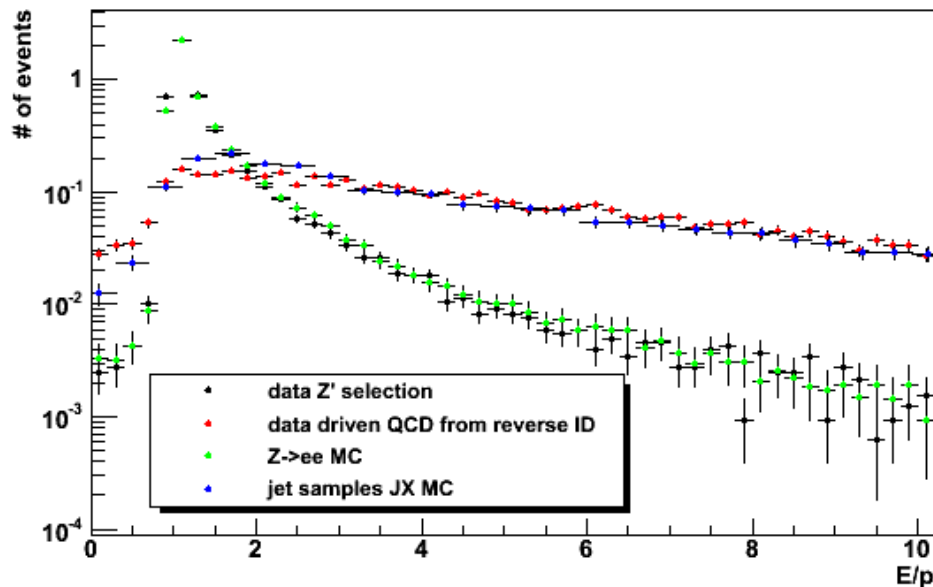
o Have to understand shape of E/p
  -> will try to examine High energy hits ratio in TRT to determine hadrons components
  -> ...
o Plan to switch to 2011 data and MC this week
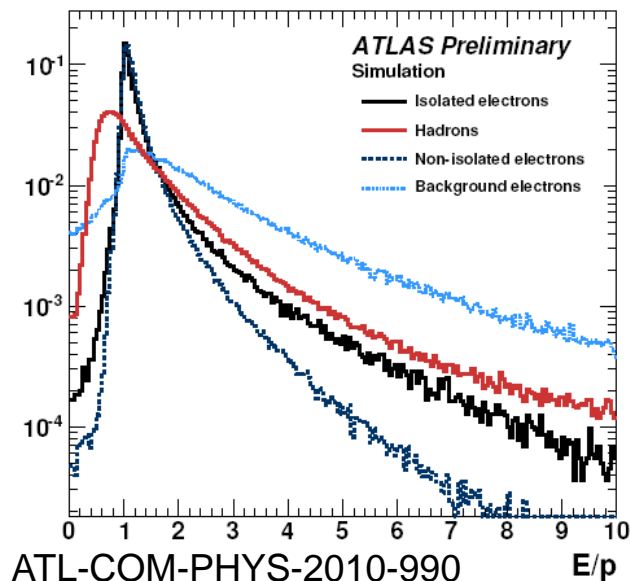
E/p cut - Signal vs background

- Derived signal and background efficiencies for E/p cut from data
  - Tried several E/p upper bound -> 5 / 8 / 10 /12 /15 / customed cuts (values in backup)
  - All eta value mixed
  - Add pT > 80 GeV cut (last Egamma Et bin)

Single electron

	E/p < 5	E/p < 8	E/p < 10	E/p < 12	E/p < 15	customed
Signal (%)	94.9	95.7	97.0	97.0	99.2	96.6
Background (%)	29.2	43.8	52.8	58.3	66.2	54.2
$\varepsilon(S)/\varepsilon(B)$	3.3	2.2	1.8	1.7	1.5	1.8

di-electron event

	E/p < 5	E/p < 8	E/p < 10	E/p < 12	E/p < 15	customed
Signal (%)	84.6	88.5	100	100	100	96.2
Background (%)	9.4	21.2	28.2	30.6	41.2	30.6
$\varepsilon(S)/\varepsilon(B)$	9.0	4.2	3.5	3.3	2.4	3.1

- efficiencies computed w.r.t medium + blayer -> signal / w.r.t loose + blayer -> background

- Baseline for set of customed cut to be changed -> for now not achieving better than E/p < 10

E/p @ high pT (Jet samples)

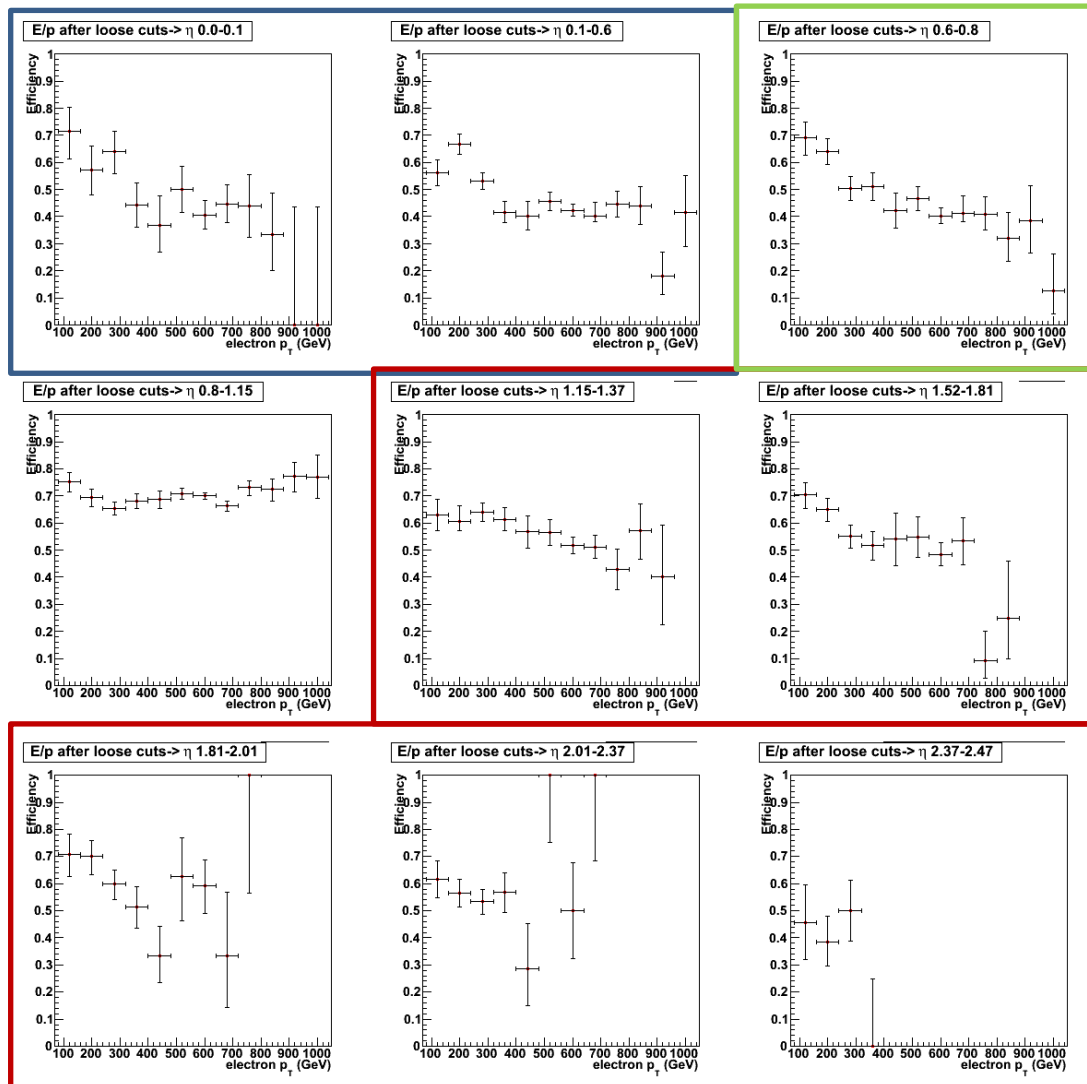- E/p efficiency w.r.t loose identification (fake e+-) -> standard cut E/p < 10

E/p after loose cuts-> η 0.0-0.1

E/p after loose cuts-> η 0.1-0.6

E/p after loose cuts-> η 0.6-0.8

– Efficiency slightly decreasing with pT

E/p after loose cuts-> η 0.8-1.15

E/p after loose cuts-> η 1.15-1.37

E/p after loose cuts-> η 1.52-1.81

E/p after loose cuts-> η 1.81-2.01

E/p after loose cuts-> η 2.01-2.37

E/p after loose cuts-> η 2.37-2.47
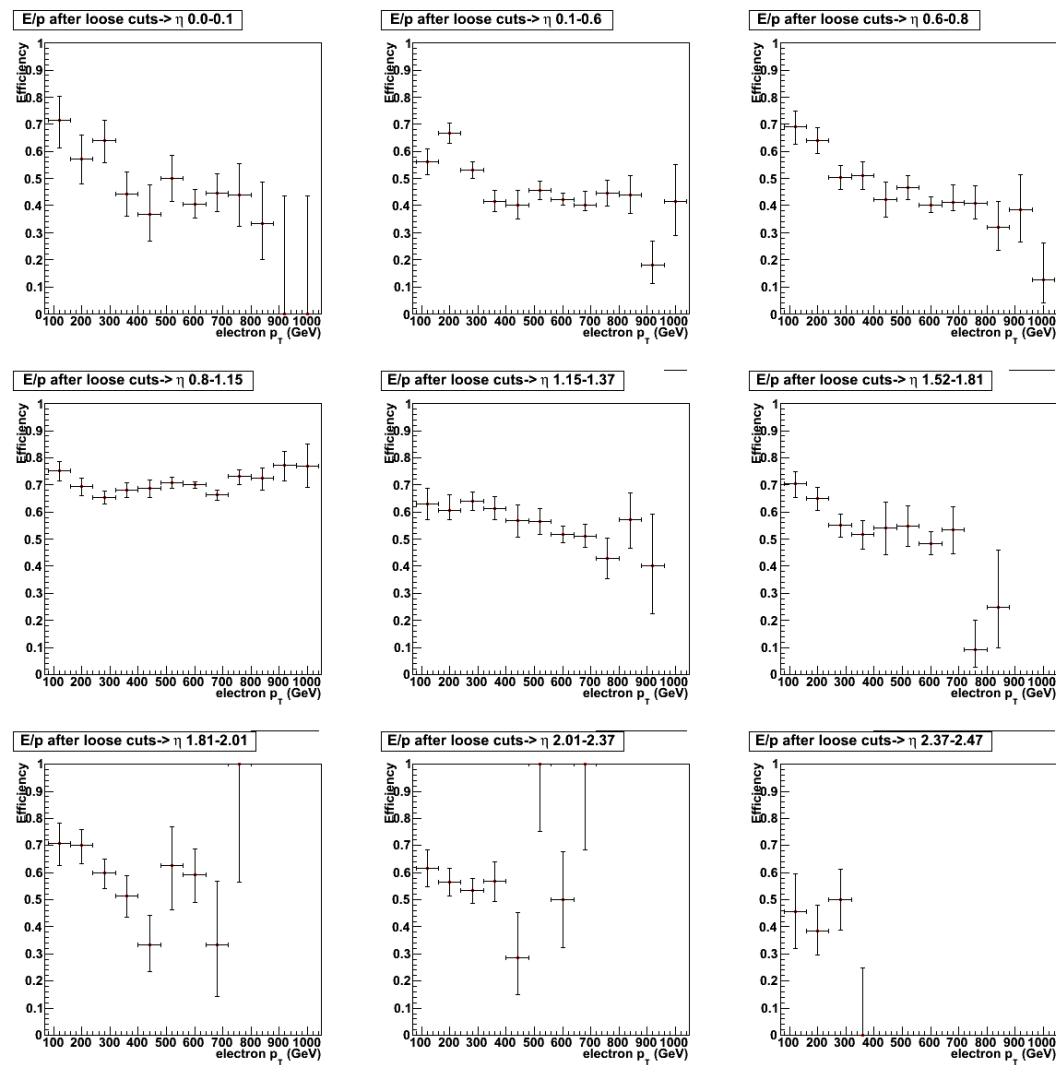
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E/p @ high pT (Jet samples -background)

- E/p efficiency w.r.t loose identification (fake e+-) -> standard cut E/p < 10

– Efficiency slightly decreasing with pT

Customed cuts
E/p < 8
E/p < 12
E/p < 15

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E/p @ high pT (Jet samples)

- E/p efficiency w.r.t loose identification (fake e+-) -> customed cuts
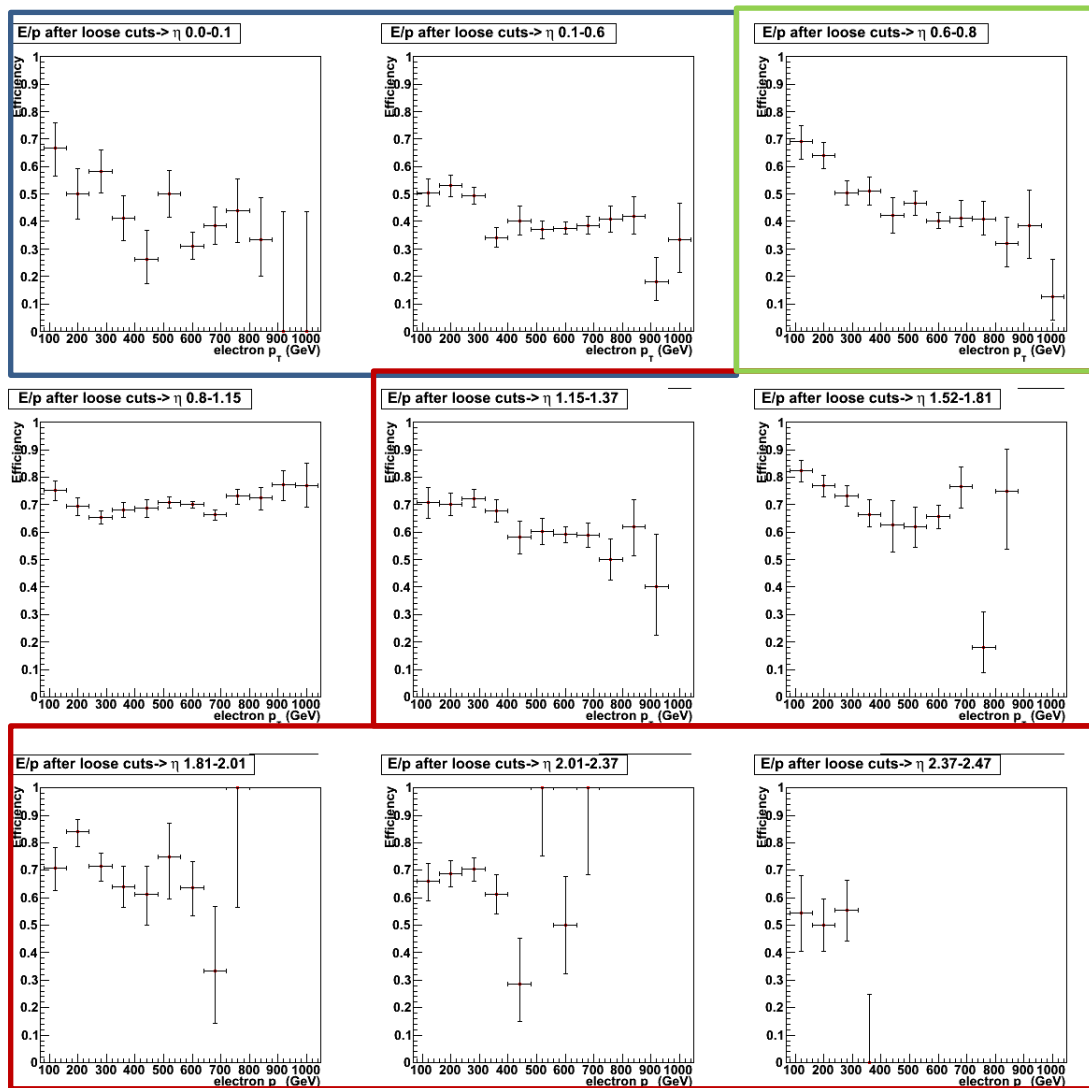
- – Relaxing cuts @ large eta
  - Low rejection whereas our signal is mainly at low eta
- – Tightening cut @ low eta
 - Not improving that much rejection but rather efficient on signal

Customed cuts
E/p < 8
E/p < 12
E/p < 15

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BACKUP

- ## Dataset used

group10.phys-sm.mc10_7TeV.115494.Pythia_Zprime_ee.recon.AOD.e670_s933_s946_r1831_tid243875_0.WZphys.101222.07.D3PD/

- ## Preselection :

  - Trigger: L1_EM14
  - N primary vertex >2
  - el author = 1 or 3
  - $|\eta| < 2.47$ + crack region $(1.37<|\eta|<1.52)$ excluded
  - E_T cluster >25 GeV
  - Object quality
  - Medium isEM

- ## Determined E/p efficiency vs p_T

  - Efficiency is computed from leading and subleading electron passing preselection
  - 9 $|\eta|$ slices reflecting isEM ones for calorimeter variables

Customed E/p (1)

- **Removed E/p lower bound**
  - No clear optimisation possible @ high pT
  - Efficiency dropping @ high pT with « loosest » cuts

- **First try of E/p upper bound optimisation**

  - Baseline -> keep rather constant efficiency w.r.t η bins

  As much independent as possible of η distribution (Z / Z')*

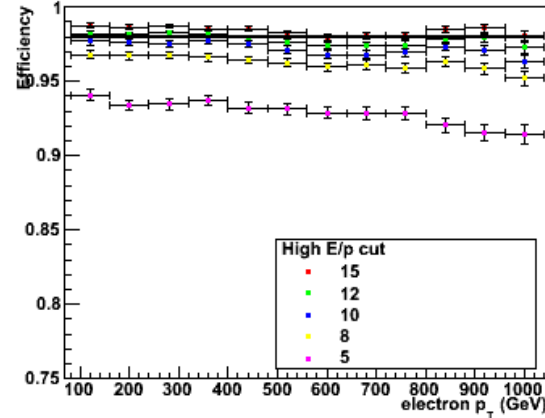 - Arbitrary choice of 98% efficiency w.r.t medium ID -> consistent with sanity cut
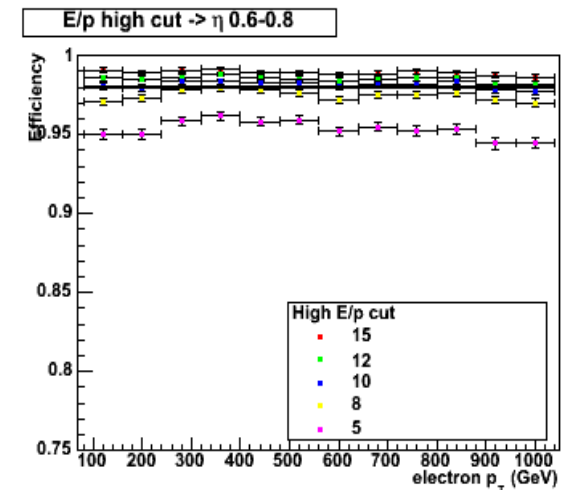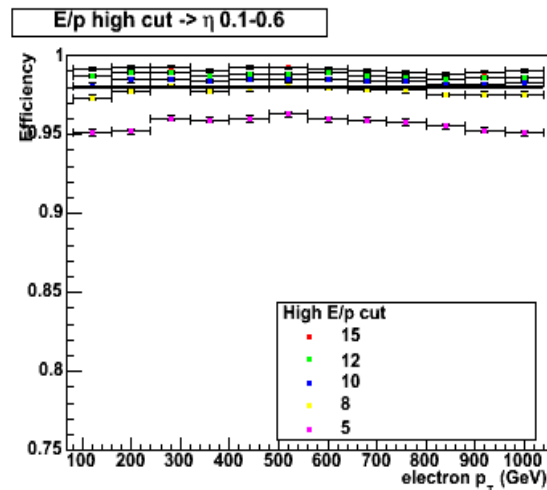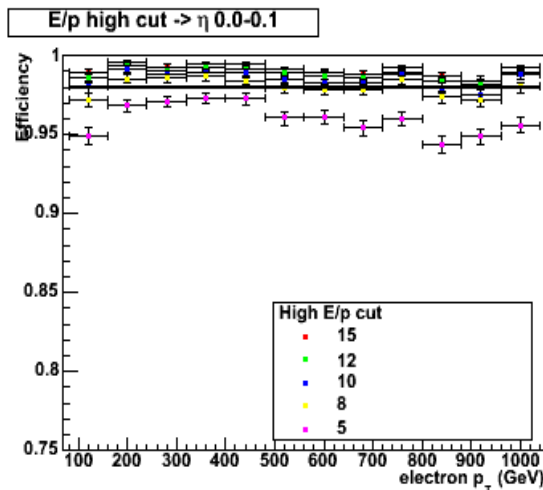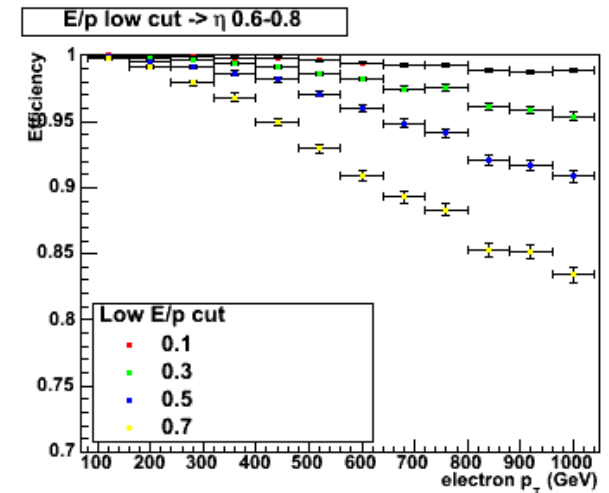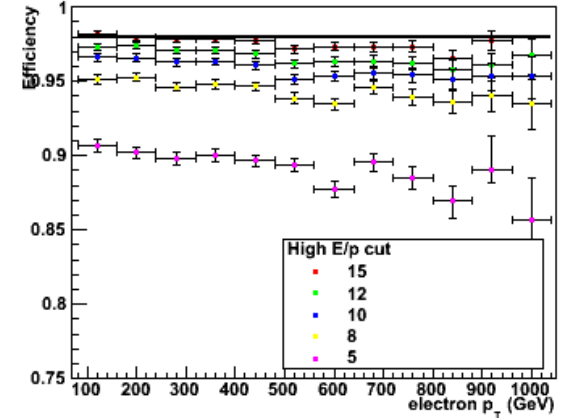
Customed E/p (2)
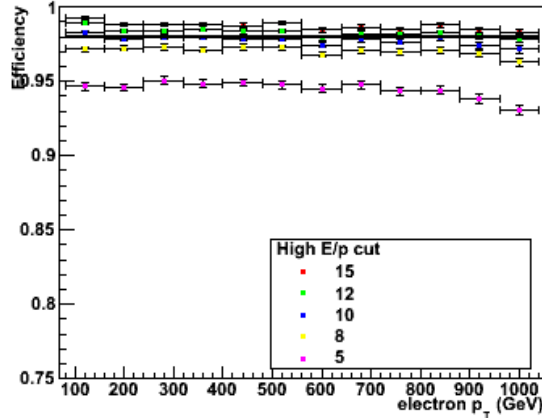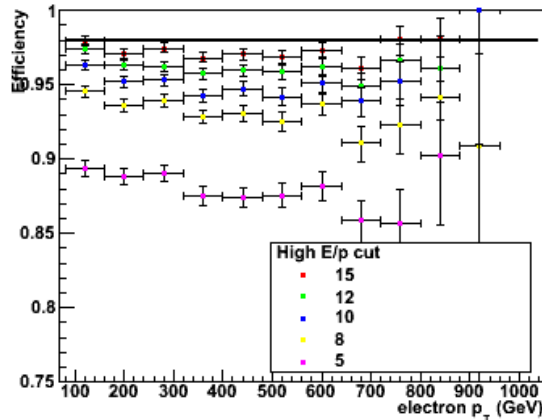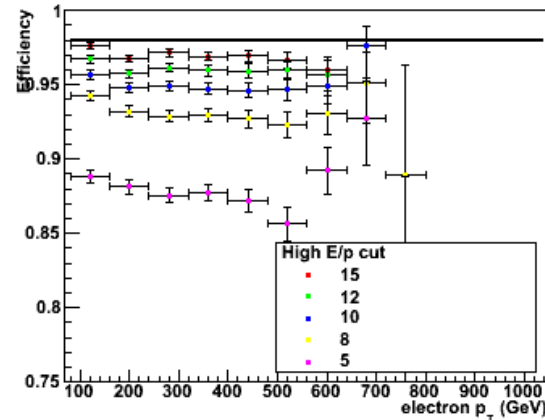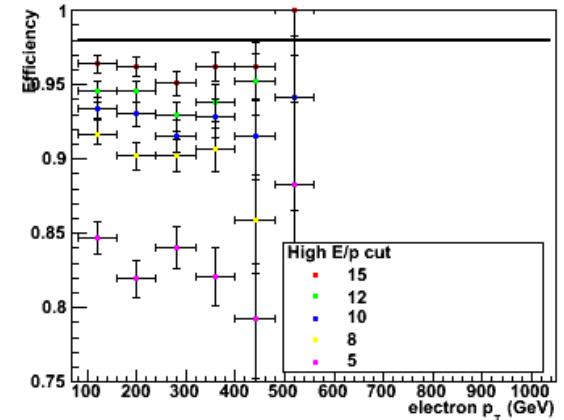
- Efficiency dropping with eta for a fixed cut value

- Defined a customed set of cuts

  η   0   0.1   0.6   0.8   1.15   1.37   1.52   1.81   2.01   2.37   2.47
  – [8.0 ; 8.0 ; 10.0 ; 10.0 ; 12.0 ; 15.0 ; 15.0 ; 15.0 ; 15.0 ; 15.0]