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ATLAS
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Two Projects

- Histomaker Program
  - Documentation tool
  - Main body of program written in C++
  - Outputs histograms and html files
  - Run with ROOT
  - Controlled with Python script
- Trigger Efficiencies
  - Understand group's analysis software
  - Write code to execute new trigger cuts
  - Try to increase trigger efficiencies

Histomaker Program

- Input two roottuples and tree name
- Draw histograms of each leaf in tree
- Produce histograms leaves by making a pdgId number "cut" (e.g., plot only electron entries from leaf)
- Thus, each leaf is drawn multiple times
- Calculate and plot percent difference
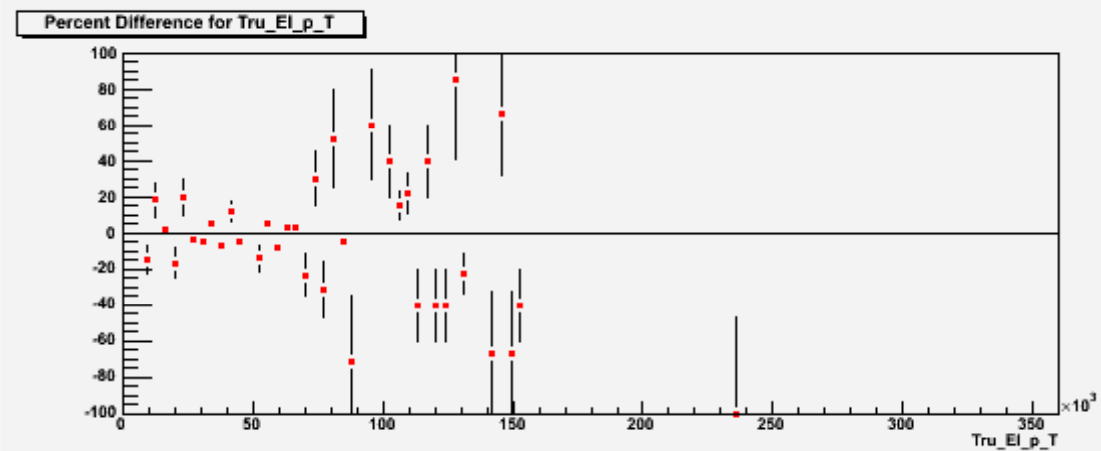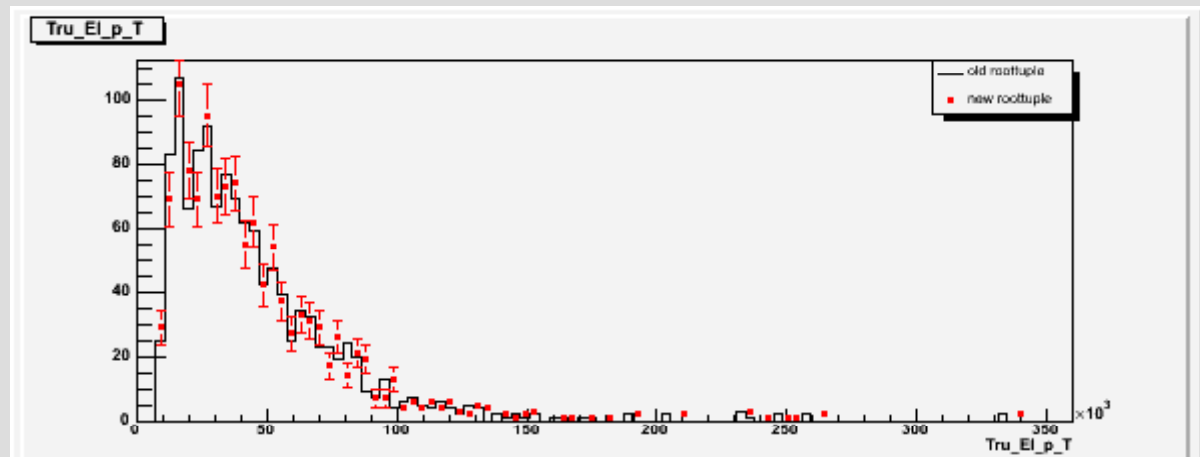- Save histograms as .gifs on a webpage for reference

Histomaker Program

- Results available at
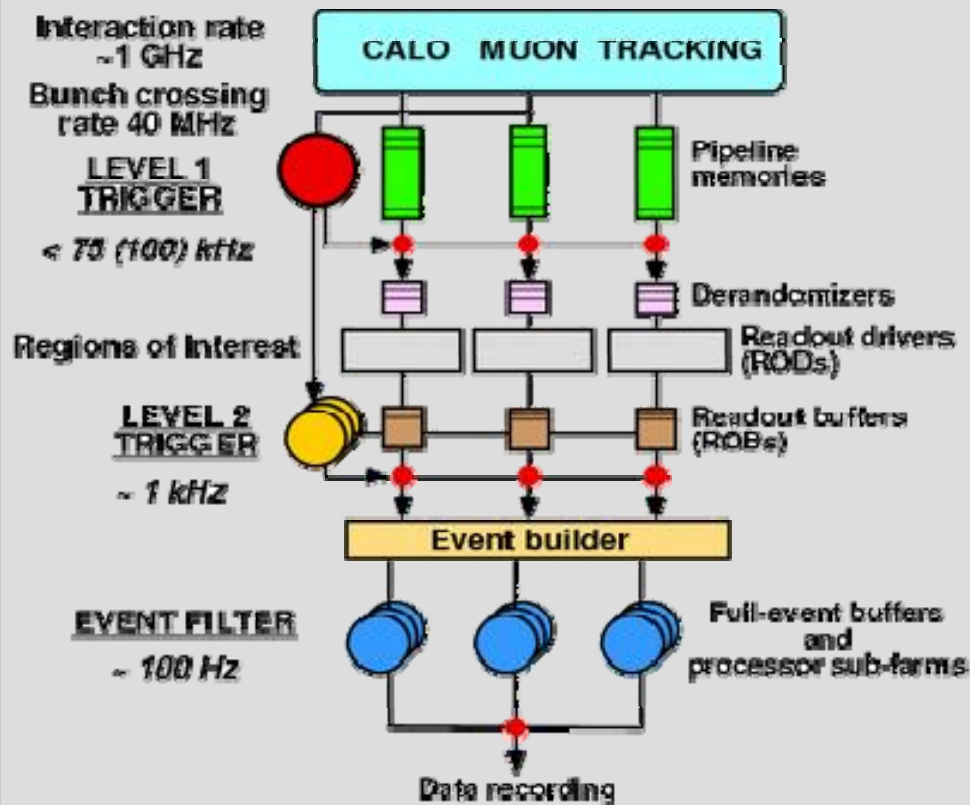 http://hep.pa.msu.edu/AtlasAnalysis/

TopView1212 vs
TopView1213
5200 Jimmyv

Electron transverse
momentum using
only electron entries
(pdgId 11)

Trigger Overview

- Triggers are immensely important
- Responsible for choosing which 0.0005% of data will be written to tape
- For ATLAS, each trigger operates in a chain:
    L1 -> L2 -> EF

Trigger Efficiencies

- Want to increase efficiency.. how?
- Modify logic of trigger cuts
- Work within framework of MSU ATLAS group's analysis software (more C++, Python)
- Start with electrons: establish how many electrons pass all three levels (L1,L2,EF) for a specific trigger (EM25I,EM60)
- Compare to how many electrons pass EM25I or EM60

Why would "or" increase eff?

- EM25I Trigger: cut such that 95% of electrons >= 25GeV will pass, but also isolation requirement
- EM60 Trigger: cut such that 95% of electrons >= 60GeV will pass, no isolation requirement
- Thus it's possible that different "types" of electrons would pass each trigger
- Using a logical "or" operator might increase number of electrons passed

Let's Check that eff!

- First, examine efficiencies (at all three levels) of EM25I and EM60 triggers
- Also, note the "overall" efficiency of the EM25I and EM60 triggers by requiring that an electron passes L1 and L2 and EF
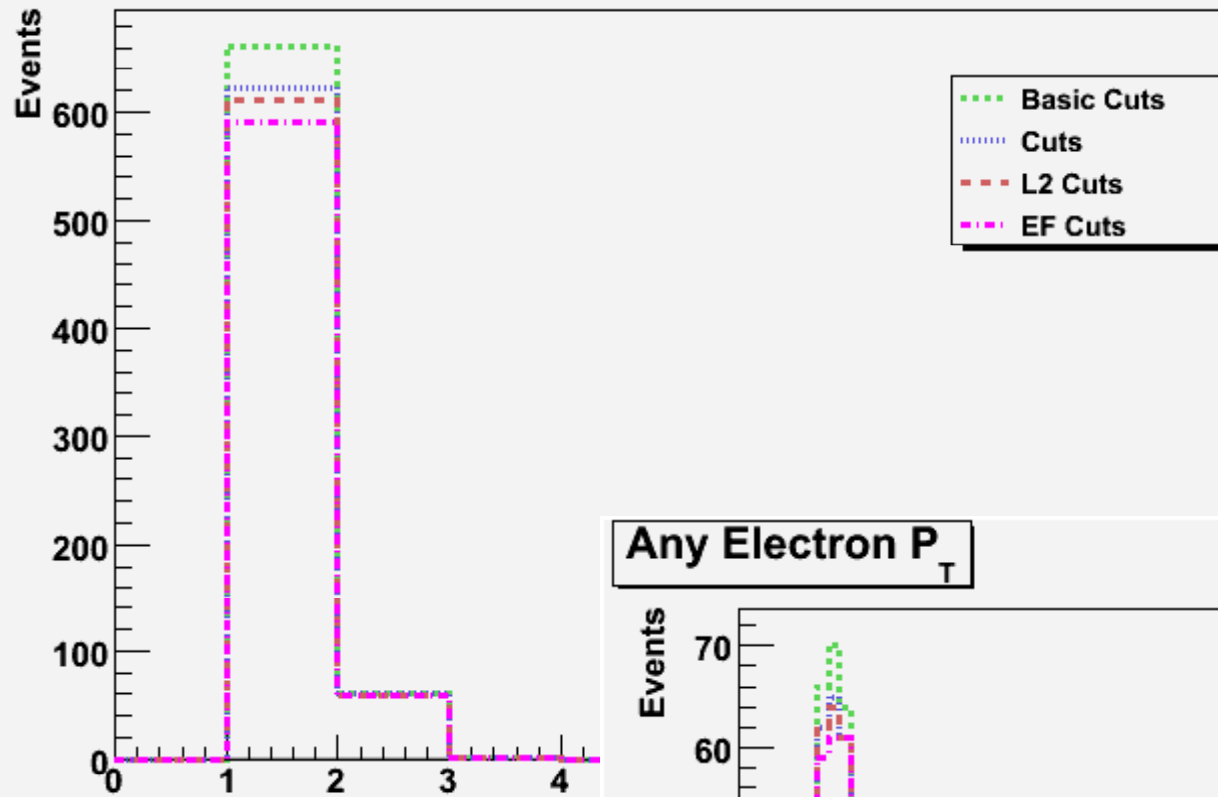- Last, determine the EM25I "or" EM60 efficiency and find out if we were right - it's higher
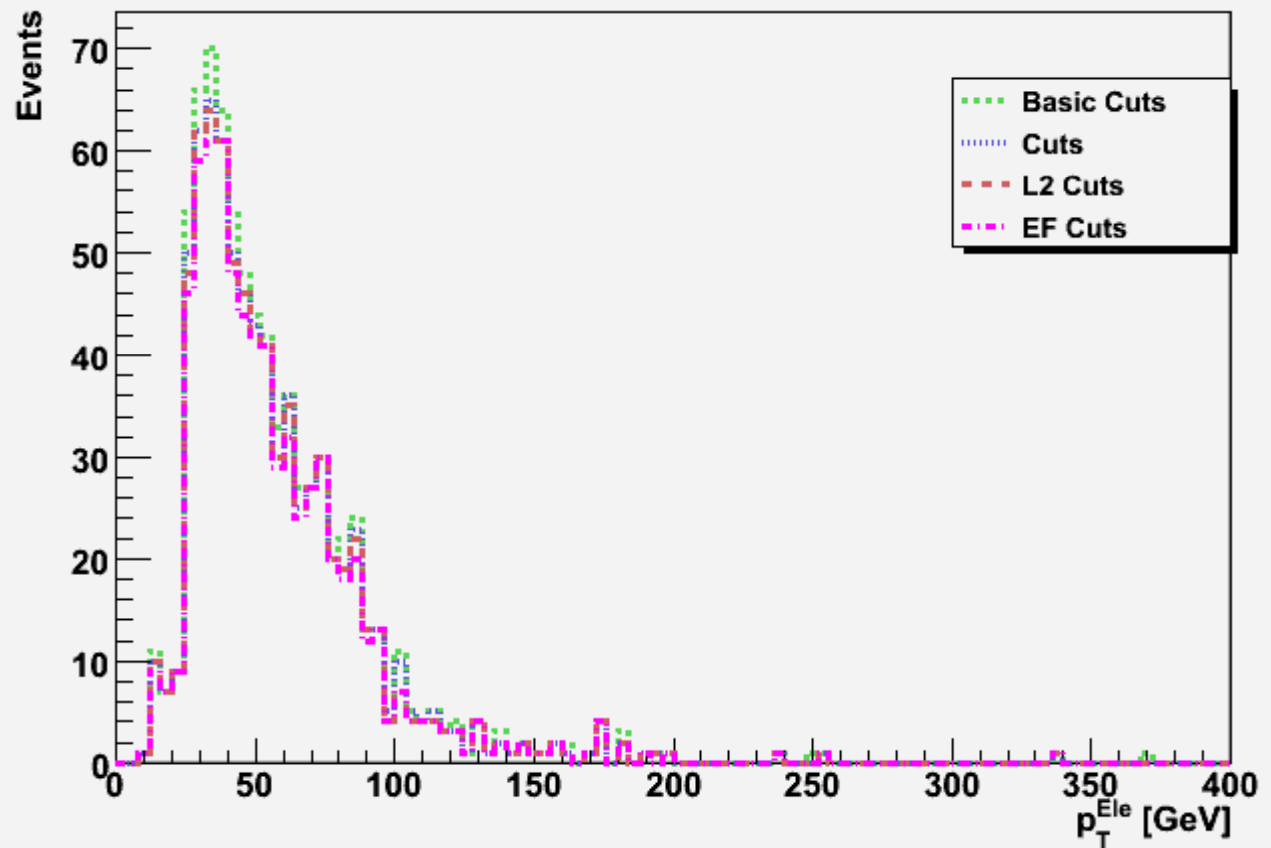
Number of Electrons

Legend:
- Basic Cuts
- Cuts
- L2 Cuts
- EF Cuts

Any Electron P_T

Legend:
- Basic Cuts
- Cuts
- L2 Cuts
- EF Cuts

x-axis: p_T^{Ele} [GeV]

EM25I Trigger:

L1 eff: 94%

L2 eff: 98%

EF eff: 97%

EM25I Trigger:

"overall" eff: 90%

Number of Electrons

Legend: Basic Cuts, Cuts, L2 Cuts, EF Cuts

EM60 Trigger:
L1 eff: 62%

L2 eff: 67%

EF eff: 91%

Any Electron P$_T$

Legend: Basic Cuts, Cuts, L2 Cuts, EF Cuts

x-axis: p_T^{Ele} [GeV]
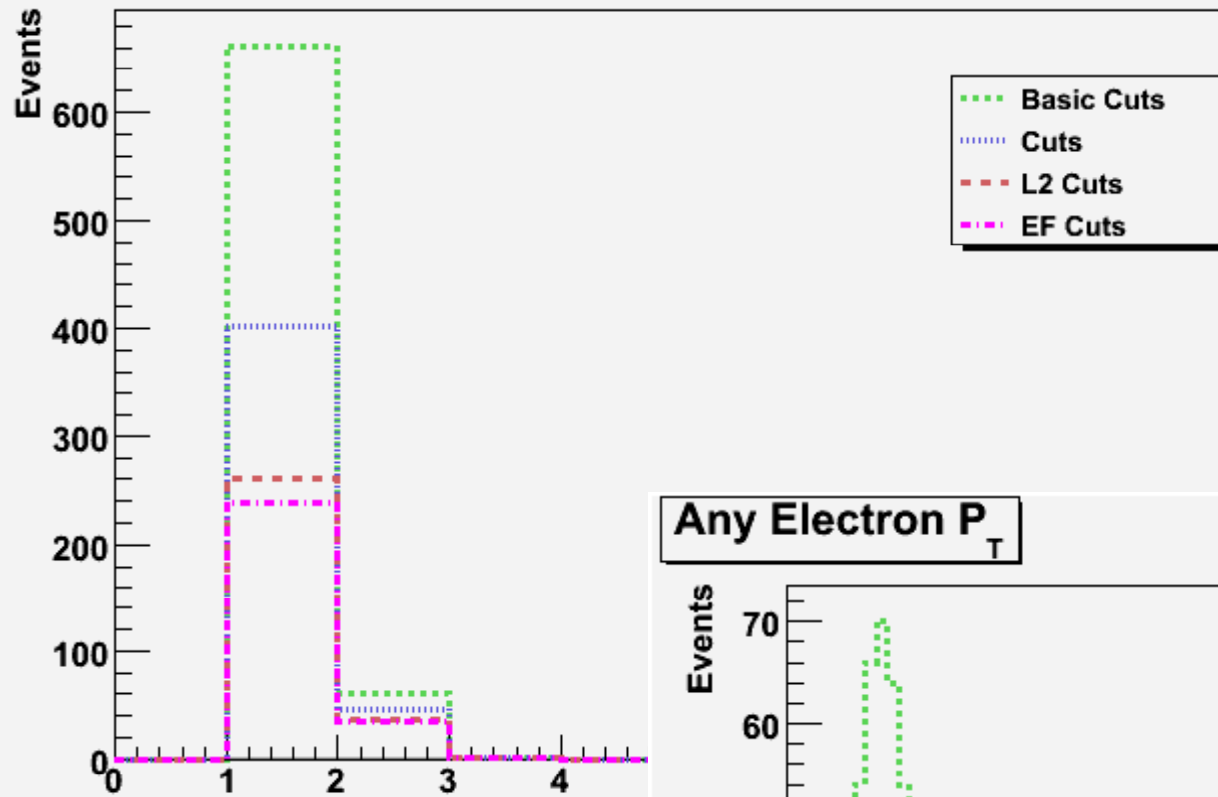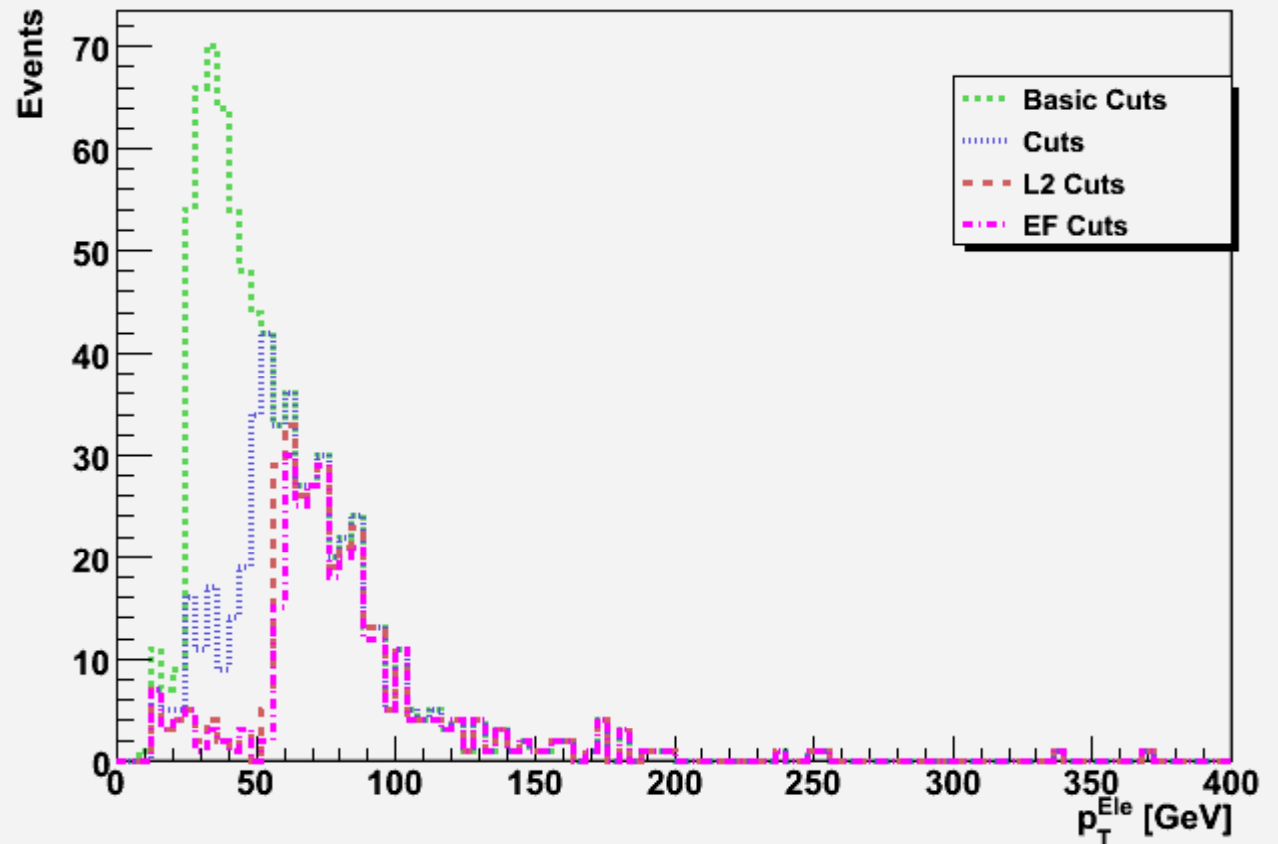
EM60 Trigger:

"overall" eff: 38%

EM25I
Trigger
or
EM60
Trigger
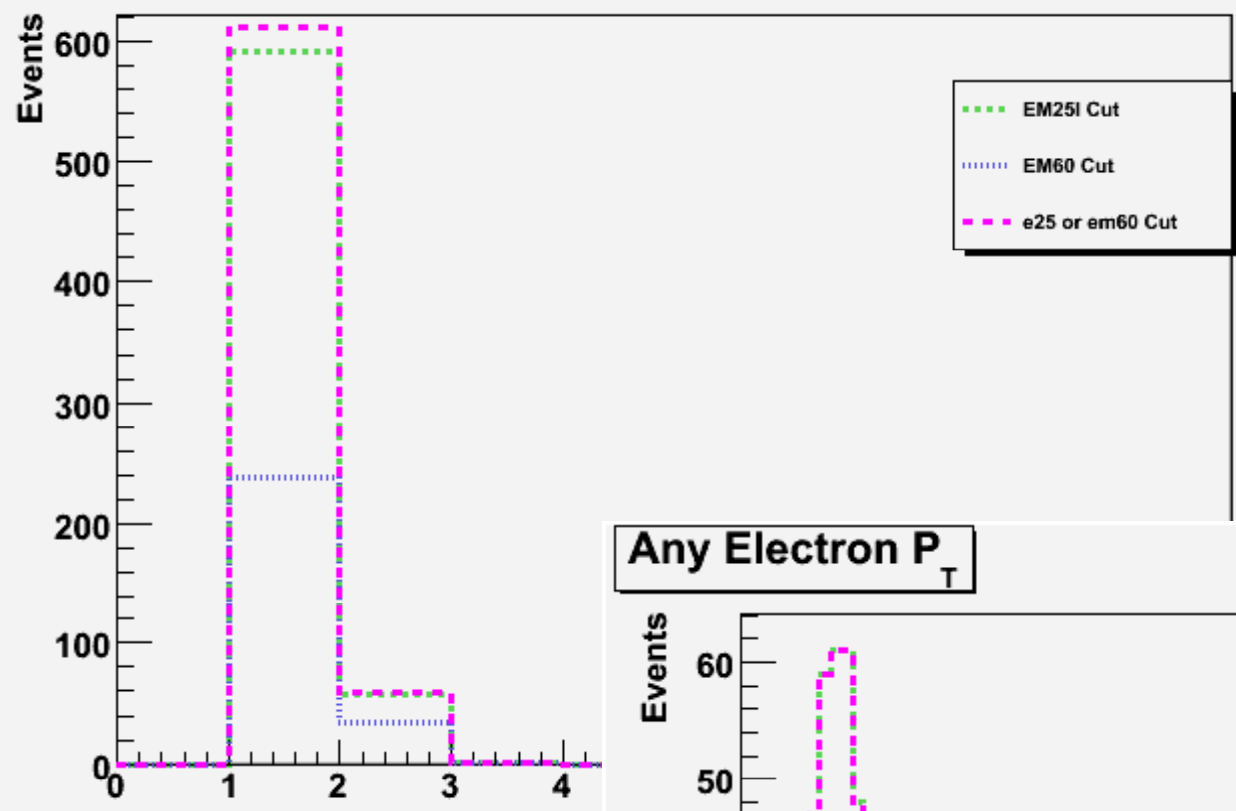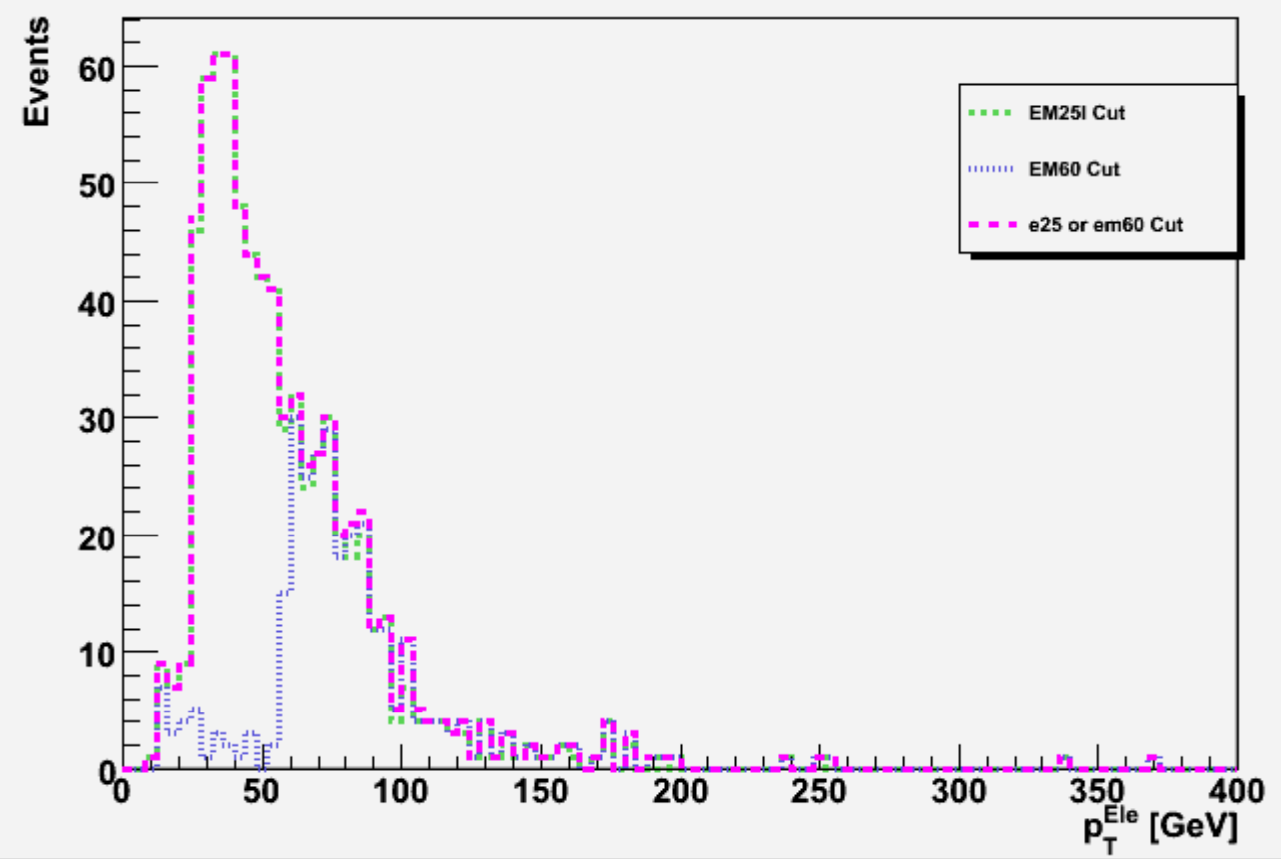
Results

- EM25I eff: 90% (650 of 723 for 5200)
- EM60 eff: 38% (273 of 723 for 5200)
- "or" eff: 93% (671 of 723 for 5200)
- As expected, "or" eff is higher
- This shows that trigger combinations have the ability to increase triggering efficiency!

A word about travel..

Many Thanks!

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CERN