

Study of Higgs Self-couplings at ILC

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Things in progress

checking the effect of tt-bar events tagging

- tagging for 6 jets events is done, I'm now preparing the other two modes.
- when checking the $ZHH \rightarrow l\nu + 6 \text{ jets}$ mode, efficiency of lepton selection was found to be a little strange.

Lepton selection

pre-selection for $e^+ + e^- \rightarrow ZHH \rightarrow (q\bar{q})(b\bar{b})(WW^*) \rightarrow lv + 6jets$

Identify a track as an isolated lepton:

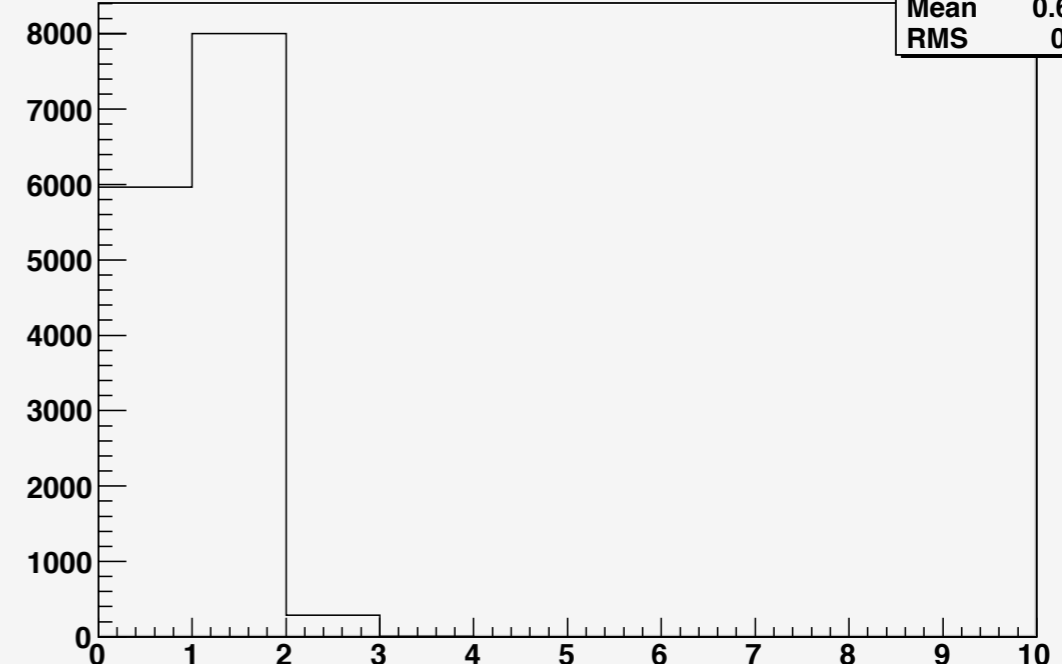
- IsLepton()
- $E_{trk} > 10\text{GeV}$
- $\cos(\theta_{cone}) = 0.94$
- $E_{cone} < 20\text{GeV}$

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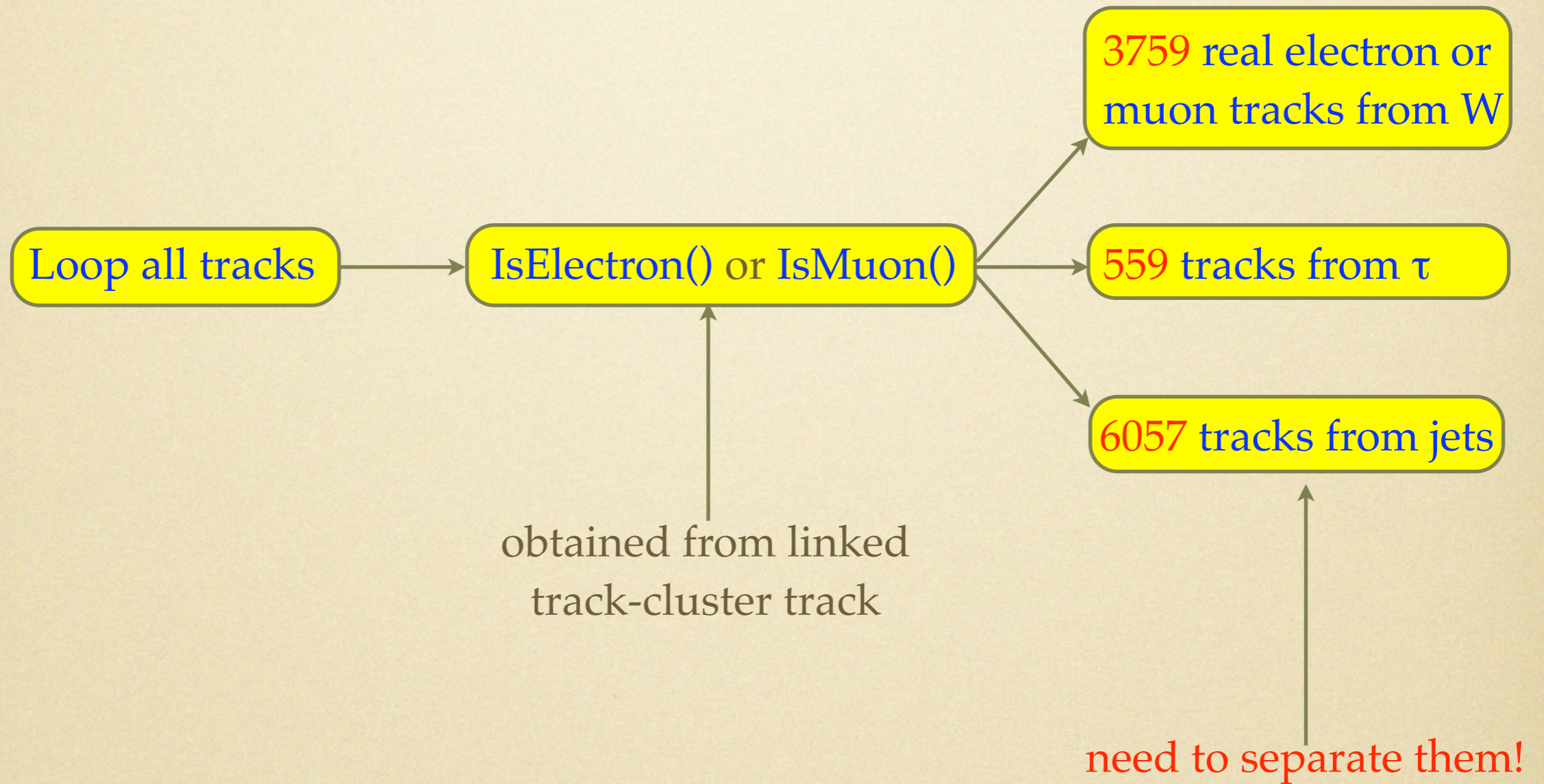
=====
Cut Summary
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-----
ID   No.Events   Cut Description
-----
  0   14429       : No Cuts
  1   14429       : Ntracks >= 25
  2   14266       : 300 < Evis < 600
  3   14266       : Pt < 999
  4   14266       : |P1| <= 999
  5   8006        : Nlepton = 1
  6   8006        : Njets >= 6
  7   8006        : Njets = 6
  8   7996        : Ejet >= 5
  9   7805        : |cos(theta_j)| <= 0.99
 10   7437        : |m_jj-m_H| <= 80 |m_jj-m_H| <= 80
 11   7437        : |cos(theta_h/z)| < 1
 12   7437        : -10 < mm < 250
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$\approx 56\%$, a bit low!

number of leptons



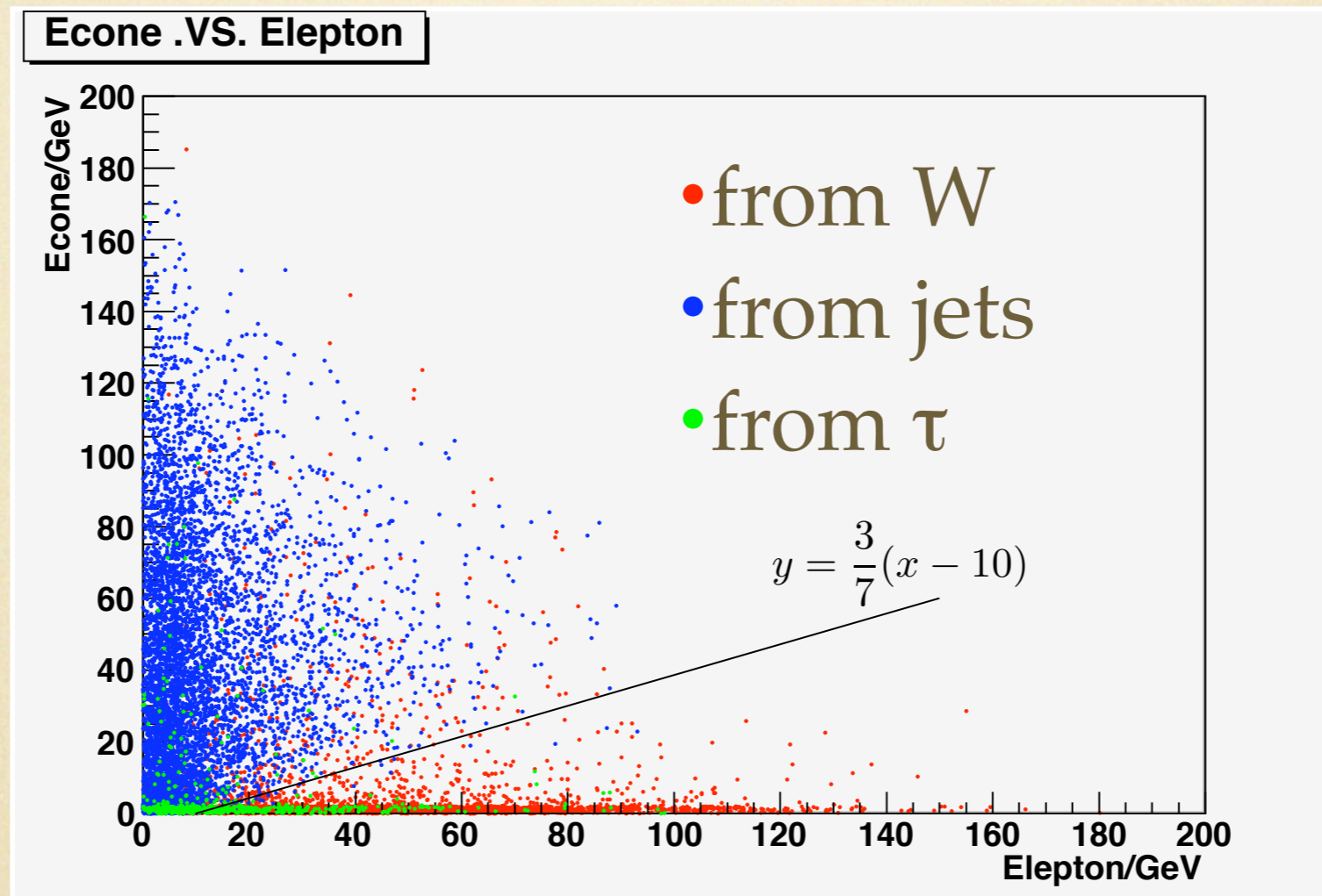
IsLepton()



Econe .VS. Elepton

assume: $\cos \theta_{cone} = 0.98$

need to be optimized

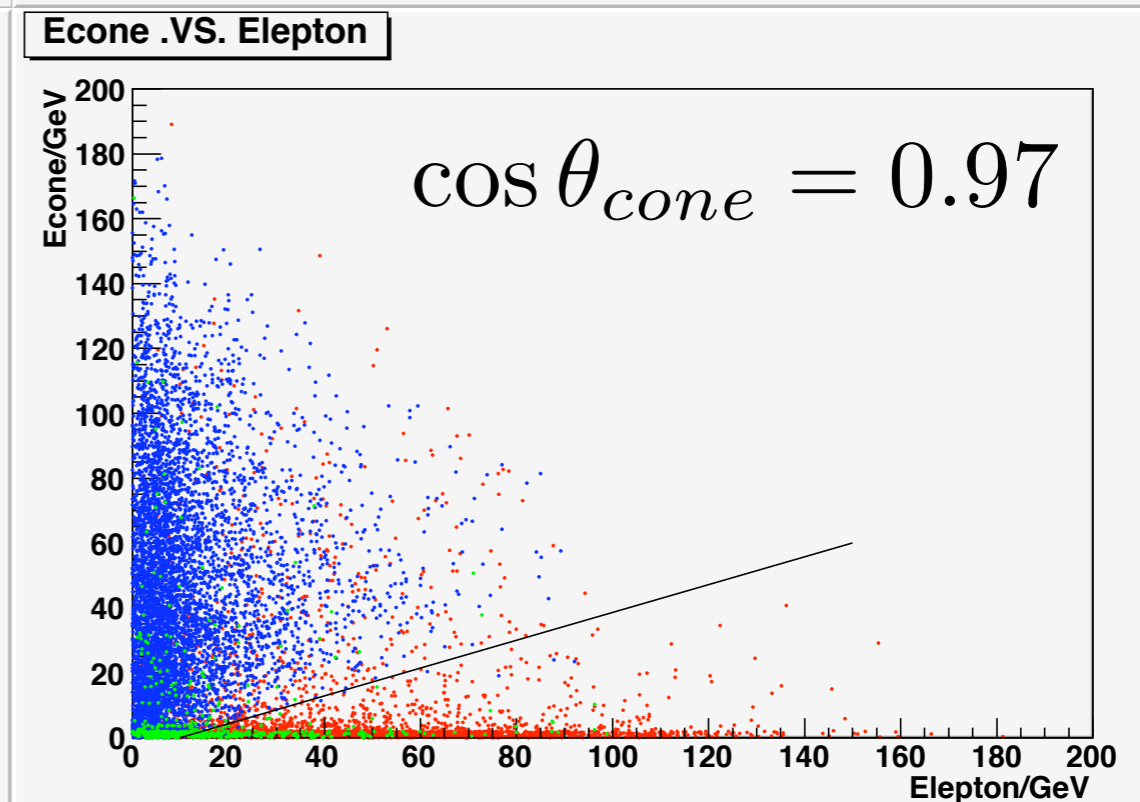
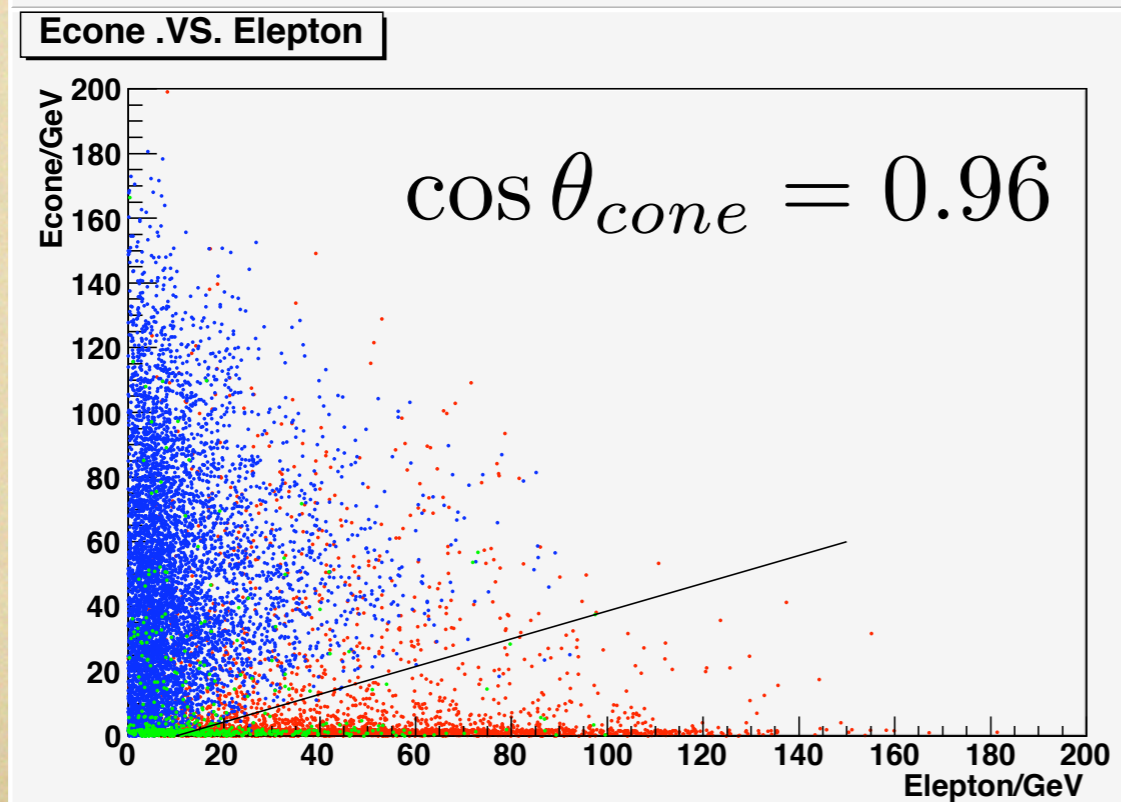
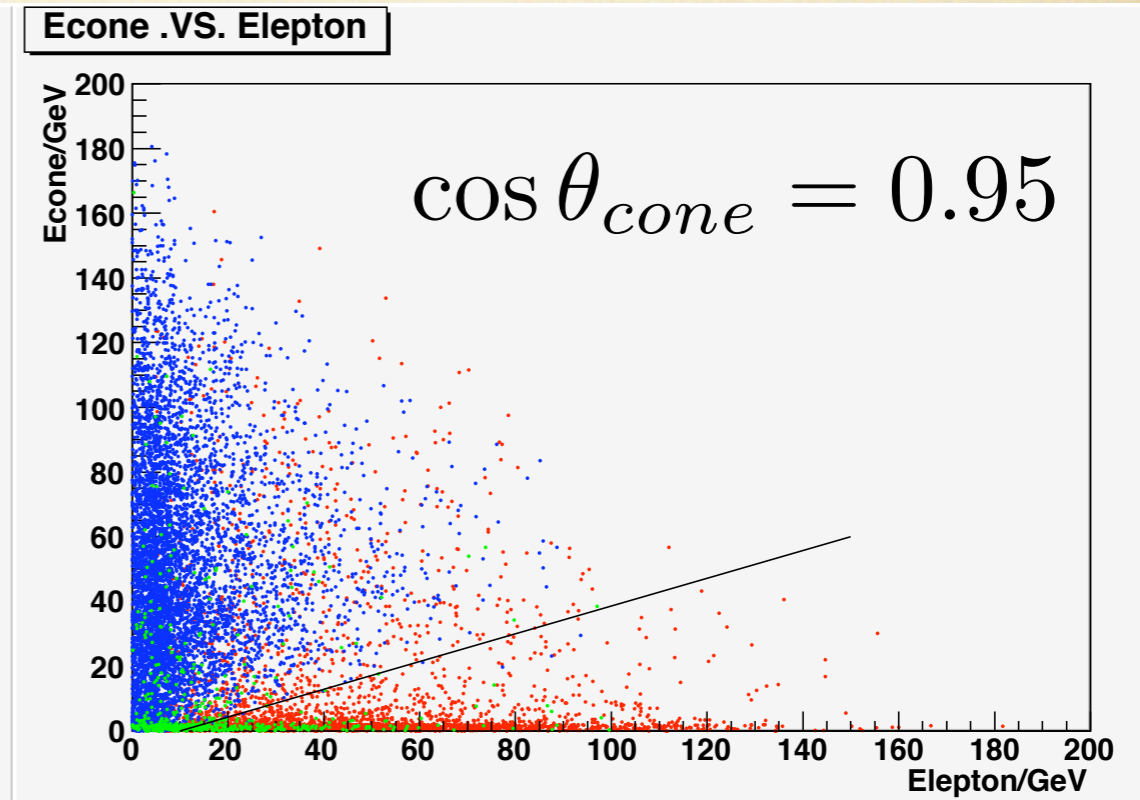
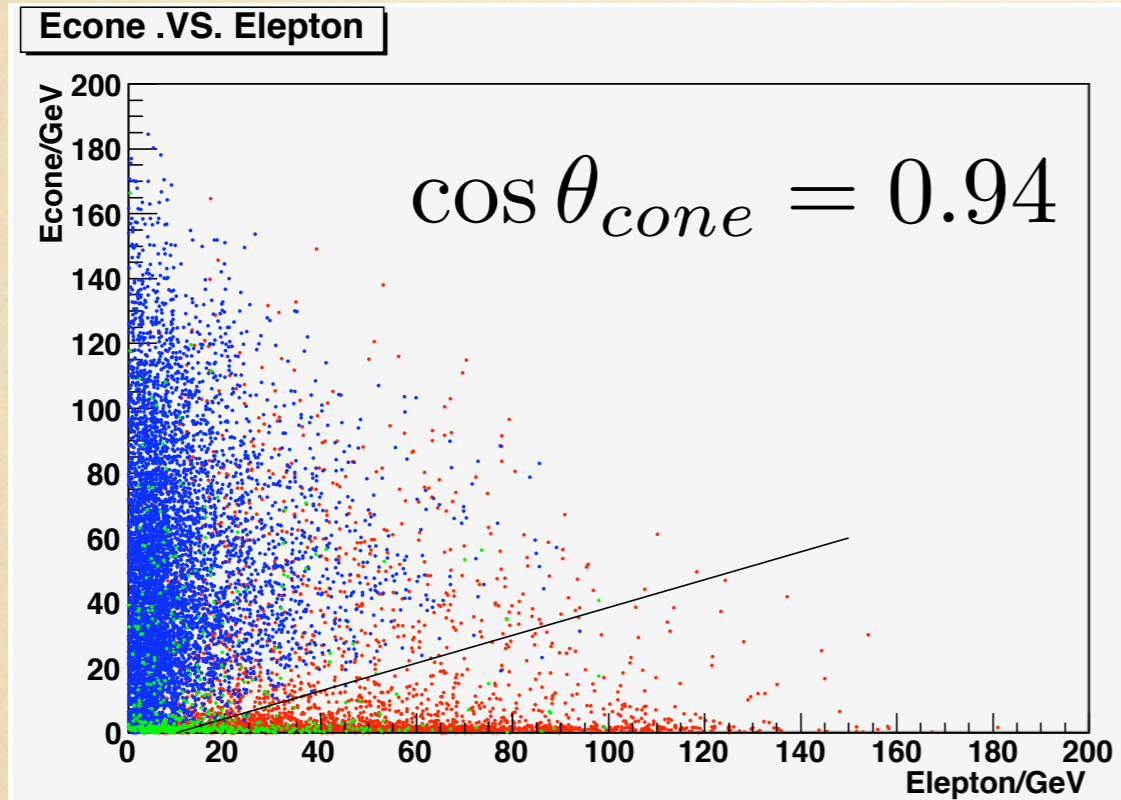


	from W	from jets	from τ
IsLepton()	3759	6057	559
Econe < (Elepton - 10) * 3 / 7	3175	46	261

identify efficiency: 79.6%

impurity: 1.32%

Econe .VS. Elepton



optimize the cone angle

$\cos \theta_{cone}$	efficiency	impurity
0.94	68.0%	0.20%
0.95	70.3%	0.33%
0.96	72.8%	0.41%
0.97	76.2%	0.57%
0.98	79.6%	1.32%
0.99	82.8%	4.13%



this is a very beginning selection, maybe efficiency is more important

$$e^+ + e^- \rightarrow ZHH \rightarrow (q\bar{q})(b\bar{b})(WW^*) \rightarrow lv + 6jets$$

$$\cos \theta_{cone} = 0.97$$

e and μ

τ

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=====
Cut Summary
=====
-----
ID   No.Events  Cut Description
-----
  0     3853   : No Cuts
  1     3853   : Ntracks >= 25
  2     3823   : 300 < Evis < 600
  3     3823   : Pt < 999
  4     3823   : |P1| <= 999
  5     3034   : Nlepton = 1
  6     3034   : Njets >= 6
  7     3034   : Njets = 6
  8     3030   : Ejet >= 5
  9     2949   : |cos(theta_j)| <= 0.99
 10     2817   : |m_jj-m_H| <= 80|m_jj-m_H| <= 80
 11     2817   : |cos(theta_h/z)| < 1
 12     2817   : -10 < mm < 250
-----

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79.4%

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=====
Cut Summary
=====
-----
ID   No.Events  Cut Description
-----
  0     1908   : No Cuts
  1     1908   : Ntracks >= 25
  2     1874   : 300 < Evis < 600
  3     1874   : Pt < 999
  4     1874   : |P1| <= 999
  5     252    : Nlepton = 1
  6     252    : Njets >= 6
  7     252    : Njets = 6
  8     250    : Ejet >= 5
  9     246    : |cos(theta_j)| <= 0.99
 10     235    : |m_jj-m_H| <= 80|m_jj-m_H| <= 80
 11     235    : |cos(theta_h/z)| < 1
 12     235    : -10 < mm < 250
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13.4%

total: 57.7% (56%)

no improvement?!