HIGGS SELF-COUPLING ANALYSIS WITH H→WW*

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STATUS

- Start to use dE/dx and shower profile
  - Using new variables to Lepton ID
  - Precise study of fake tracks(Hadrons)

- Generate DST files for the analysis
  - Target: AWLC14
  - Study @500GeV

STUDY OF FAKE LEPTONS

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FAKE TRACK STUDY

- Fraction of particle types regarded as fakes
- Electron fakes
  - Loose selection: $\frac{ECAL}{ECAL+HCAL} > 0.5 \;\&\&\; \frac{E}{P} > 0.5$

Type	π	K	p
Fraction(%)	60.6±1.1	3.0±0.2	36.4±0.9

- Muon fakes
  - Loose selection: $\frac{ECAL}{ECAL+HCAL} < 0.5 \;\&\&\; \frac{E}{P} < 0.5$

Type	π	K	p
Fraction(%)	43.8±2.1	0.6±0.2	55.5±2.3

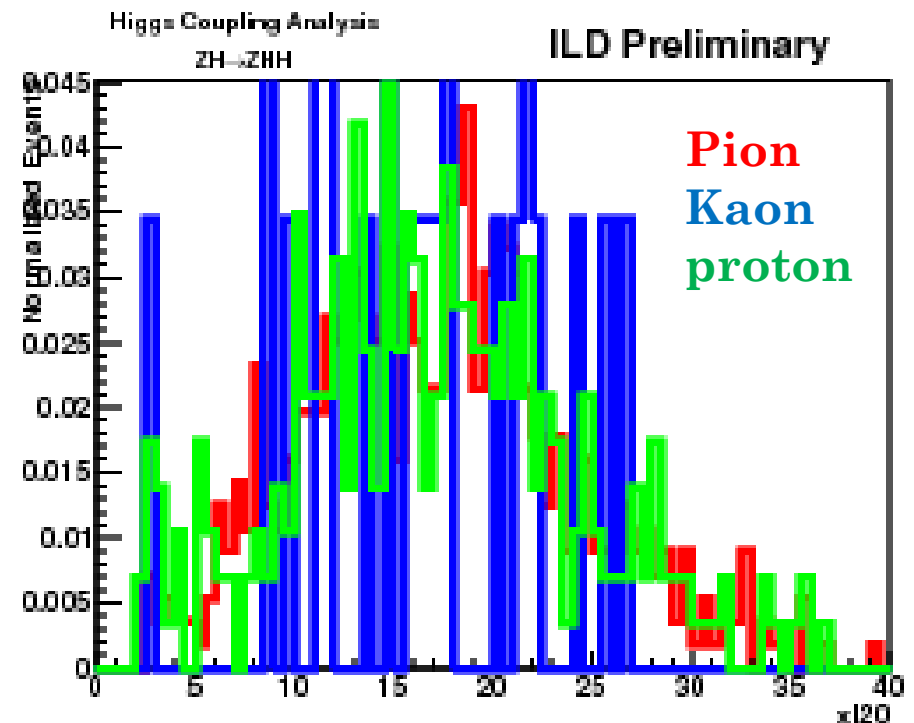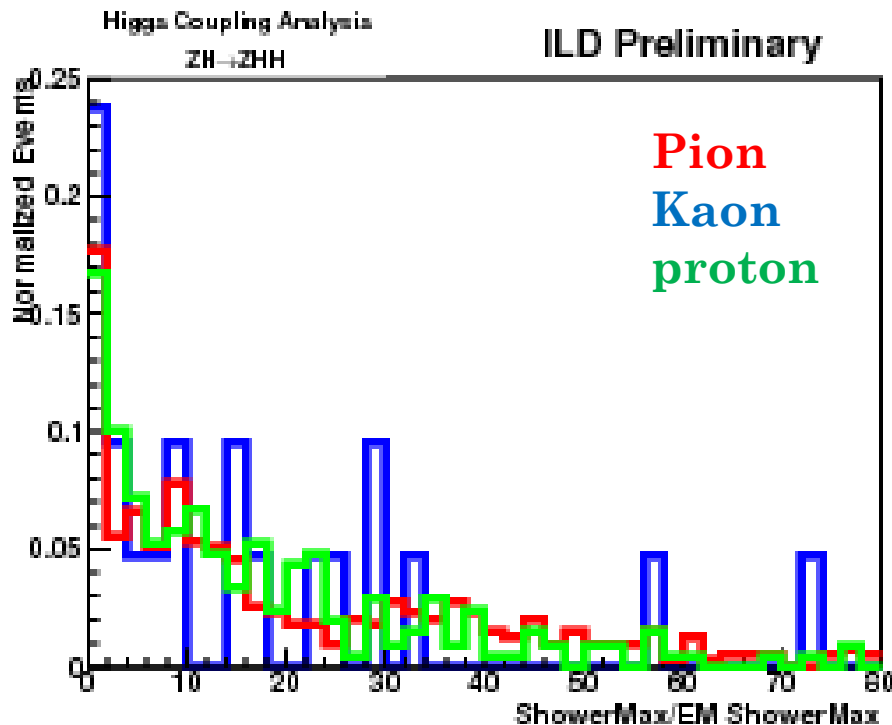# LONGITUDINAL INFORMATION

- Characterized with showerMax and xl20
- Low energy tracks E<20GeV
- showerMax is scaled using Exp. shower max
- Each particle type (π,K,p)
- No clear difference…
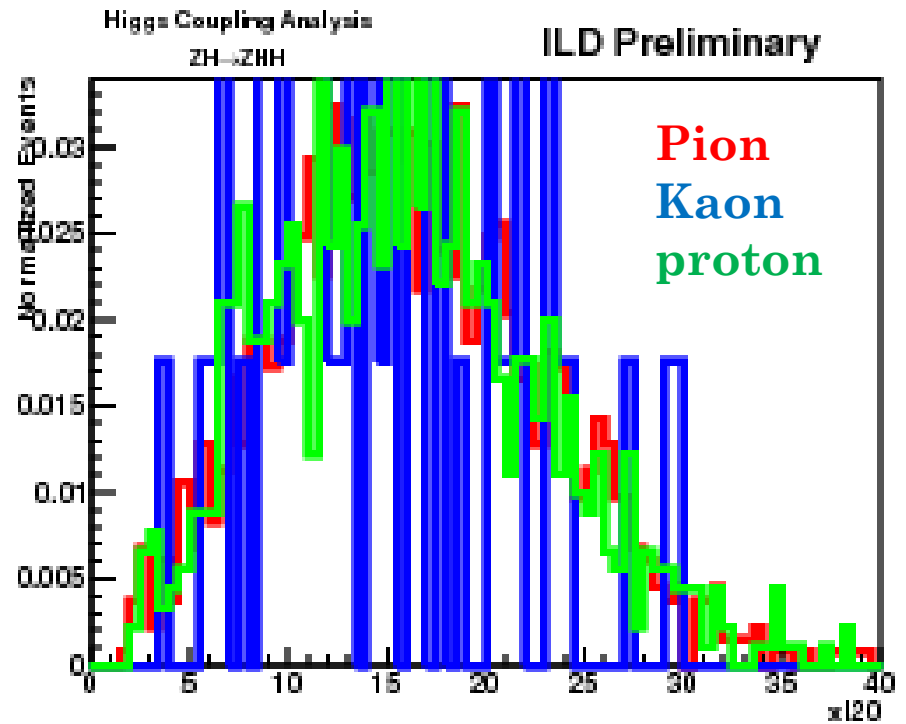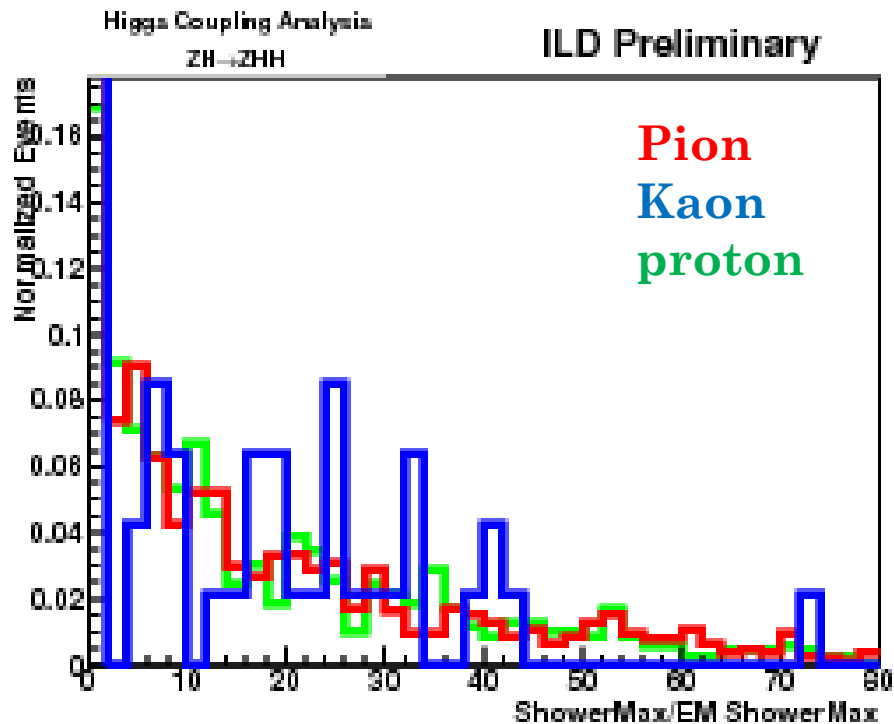
LONGITUDINAL INFORMATION
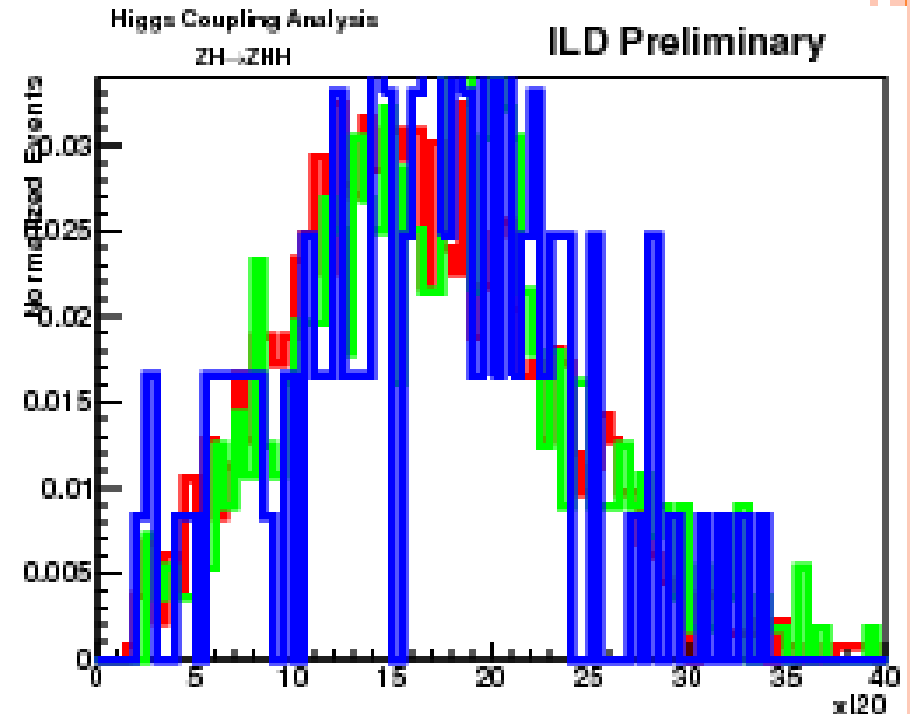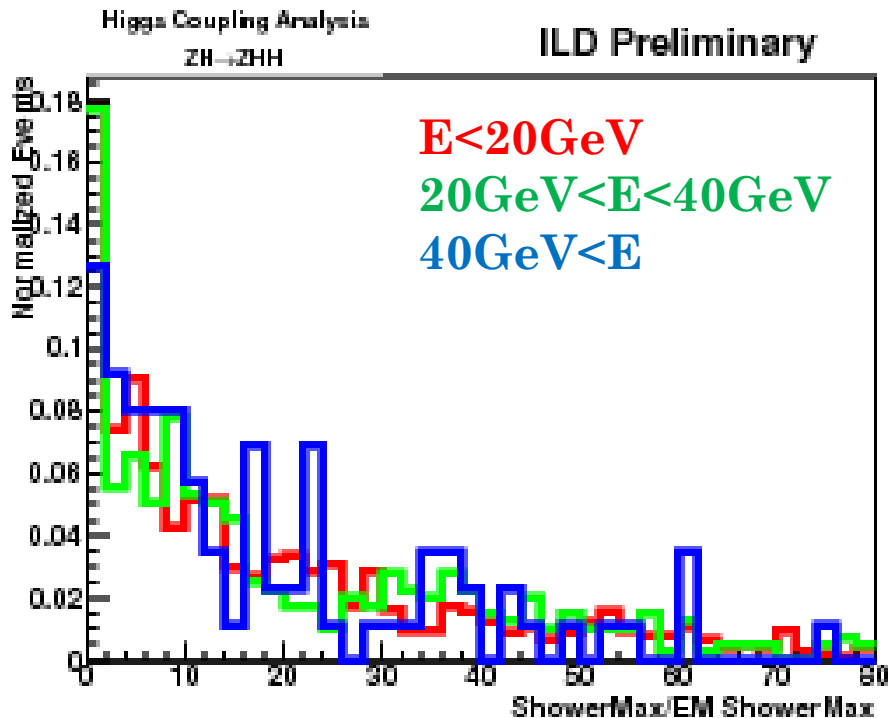
- Characterized with showerMax and xl20
- middle energy tracks 20GeV<E<40GeV
- showerMax is scaled using Exp. shower max
- Each particle type (π,K,p)
- No clear difference…

LONGITUDINAL INFORMATION

- Characterized with showerMax and xl20
- showerMax is scaled using Exp. shower max
- Pion with different energy range
- No clear difference…

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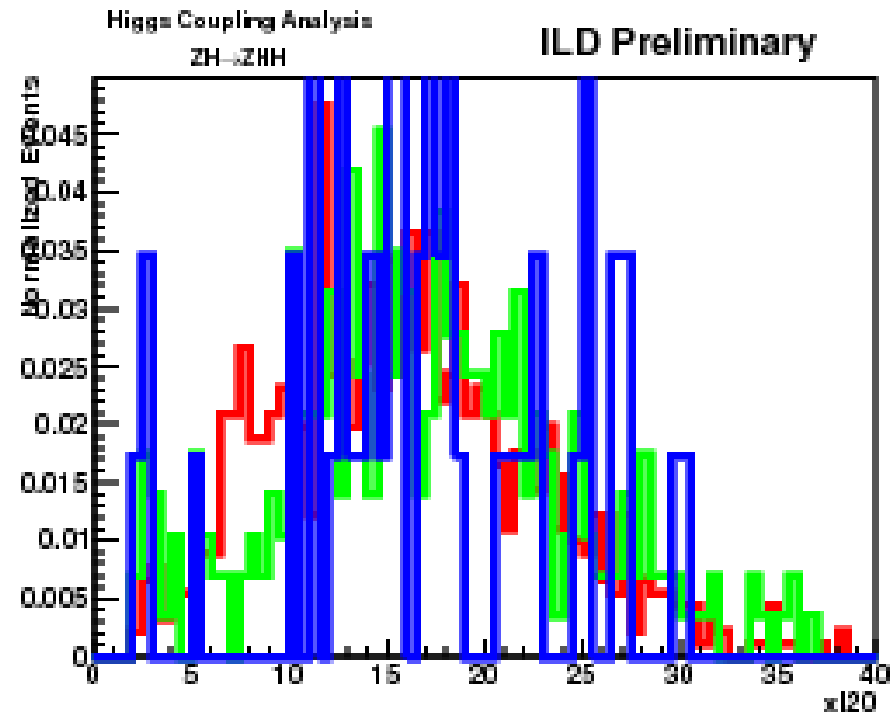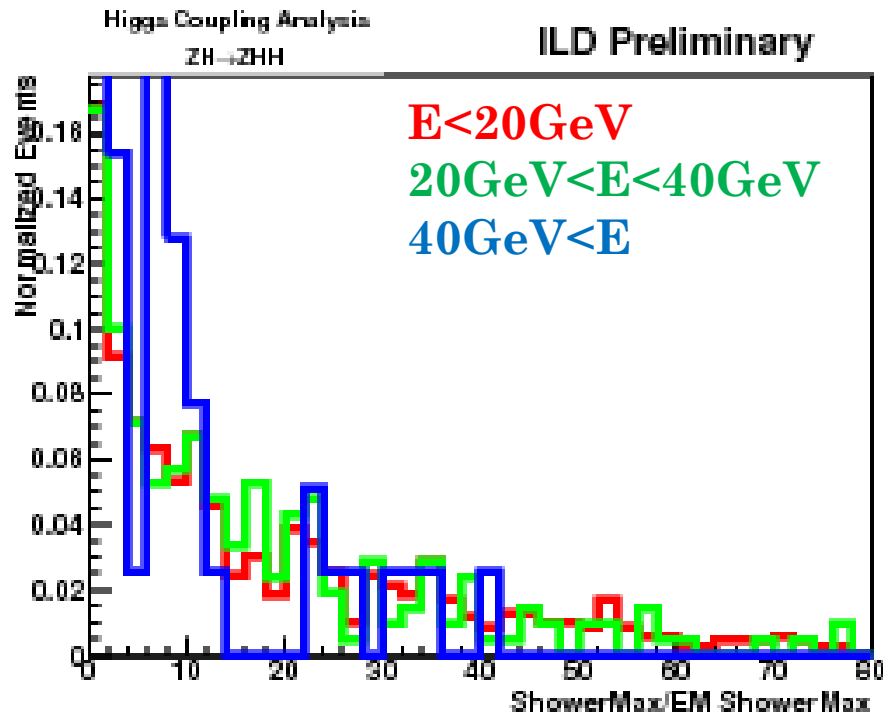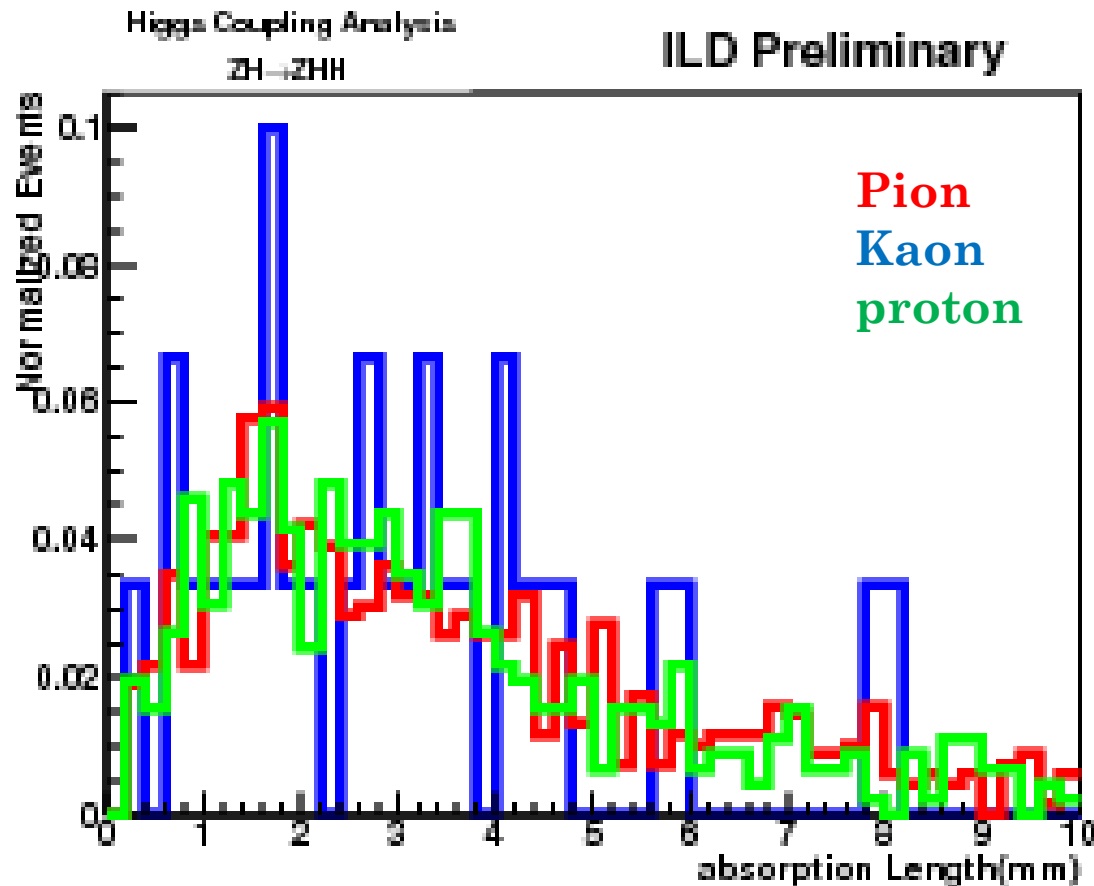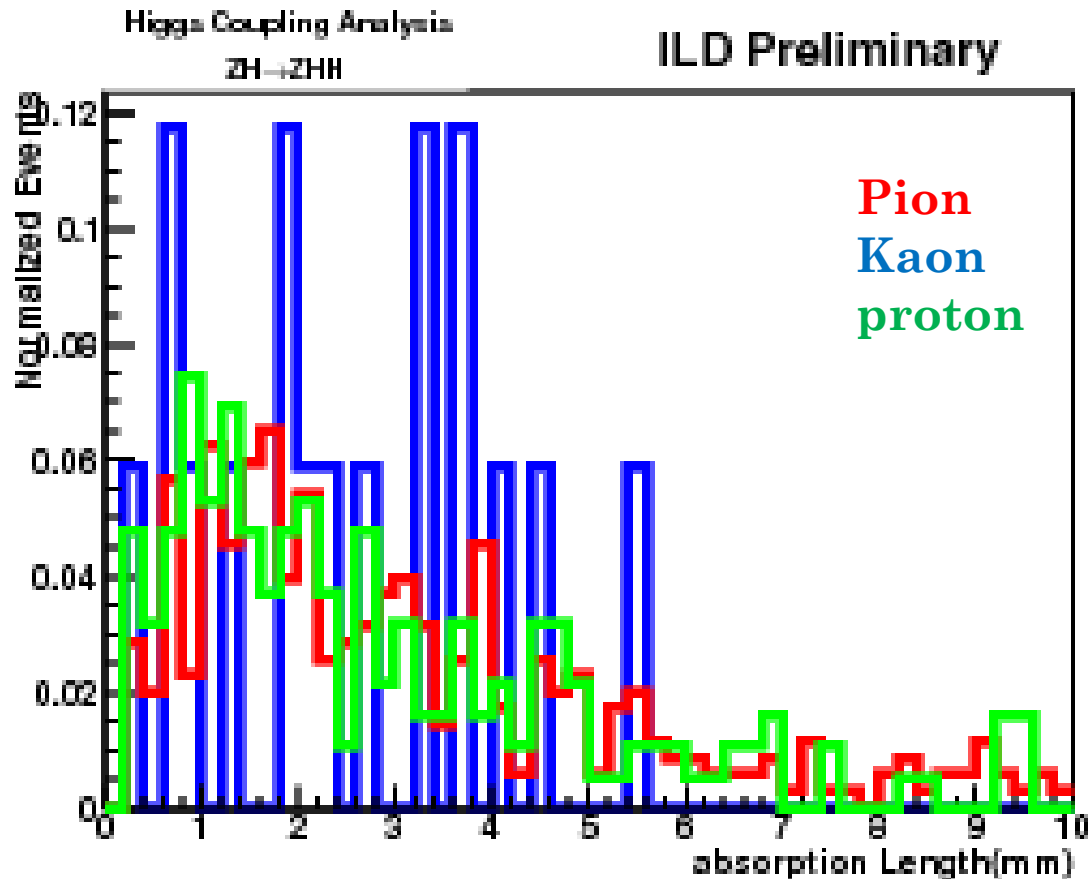
TRANSVERSE INFORMATION

- Characterized with absorption length
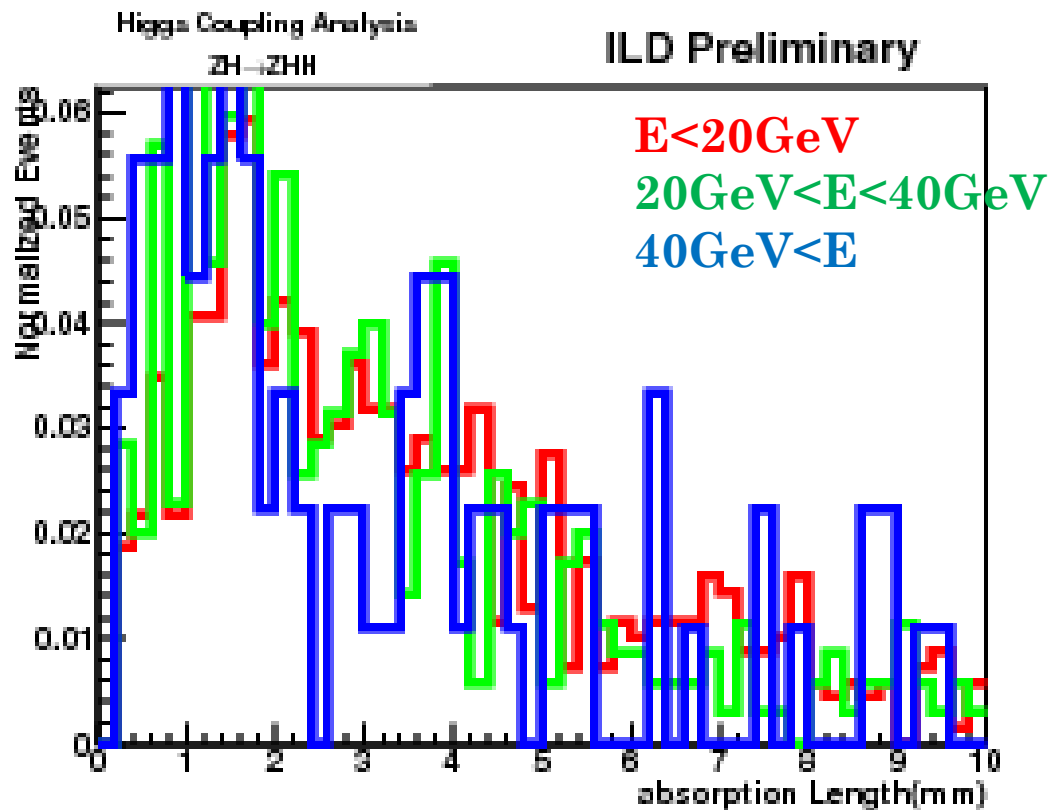- Low energy tracks E<20GeV
- Each particle type (π,K,p)
- No clear difference…

TRANSVERSE INFORMATION

- Characterized with absorption length
- middle energy tracks 20GeV<E<40GeV
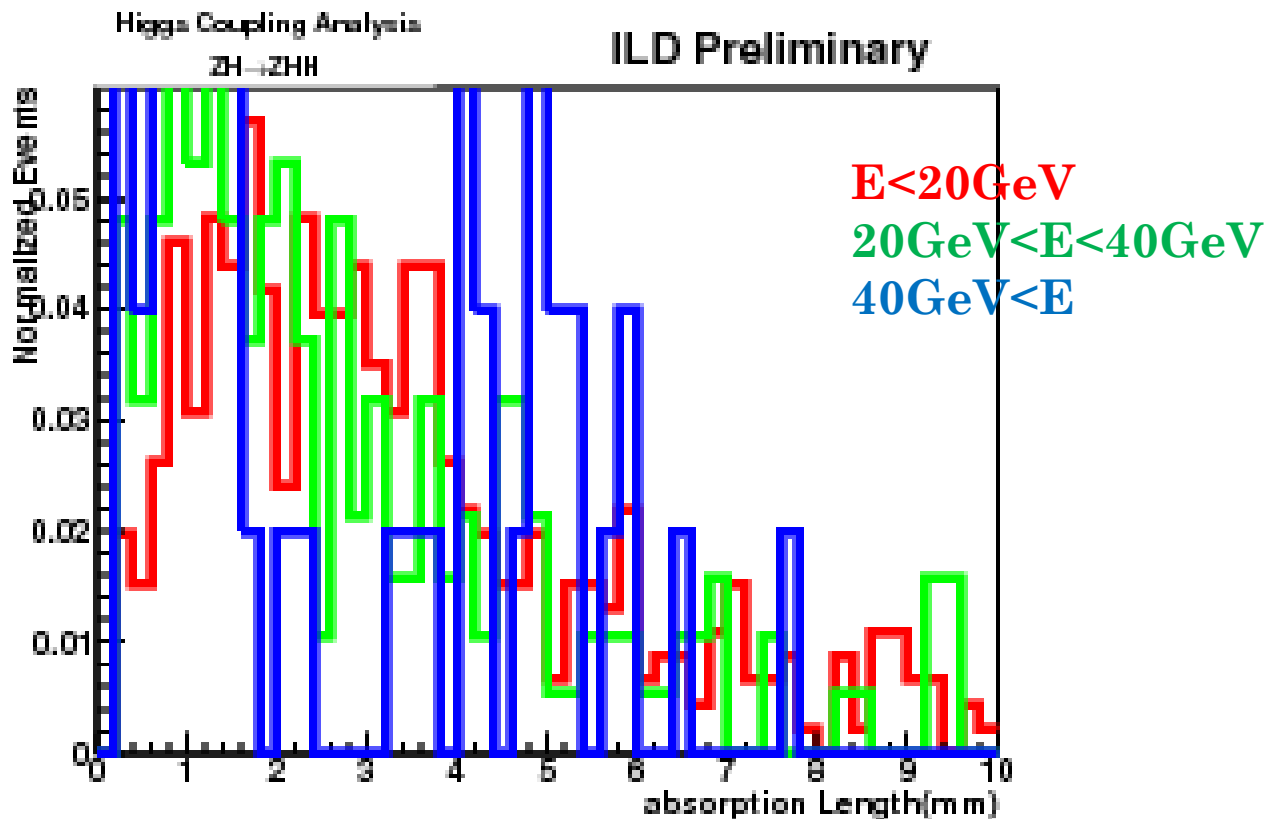- Each particle type (π,K,p)
- No clear difference…

Transverse information

- Characterized with absorption length
- Pion with different energy range
- No clear difference…(difference is slight? Due to track curvature?)

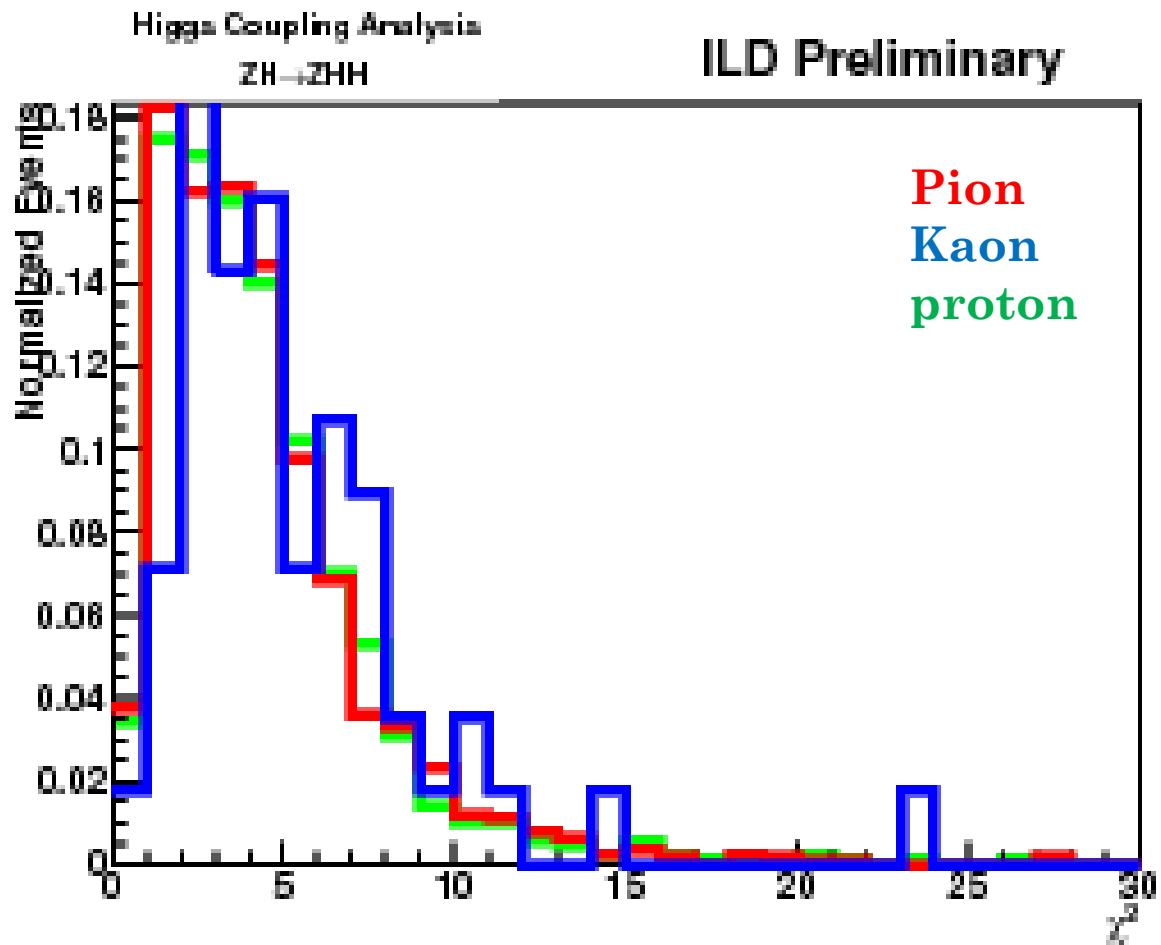# TRANSVERSE INFORMATION

- Characterized with absorption length
- Proton with different energy range
- Slight difference…(due to track curvature?)

E<20GeV
20GeV<E<40GeV
40GeV<E

X2 AS A RESULT OF FITTING

- Low energy tracks E<20GeV
- Each particle type (π,K,p)
- No clear difference…
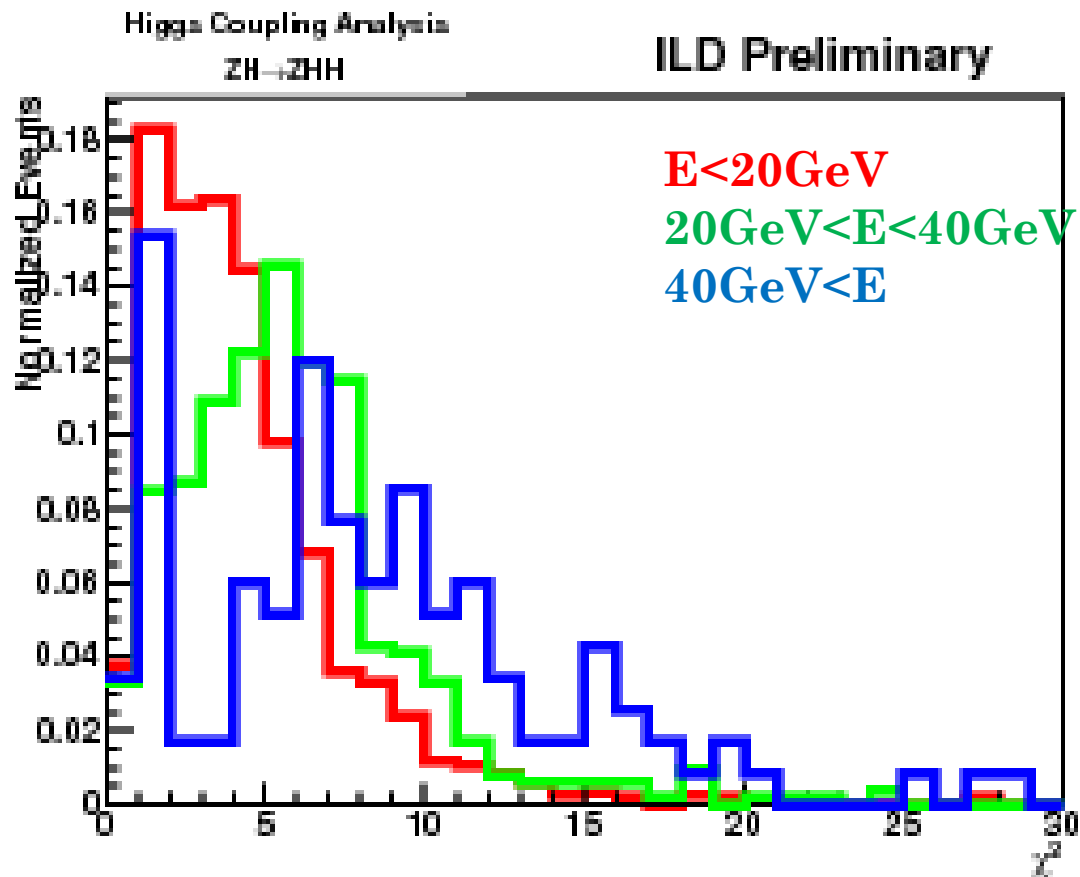
X2 AS A RESULT OF FITTING

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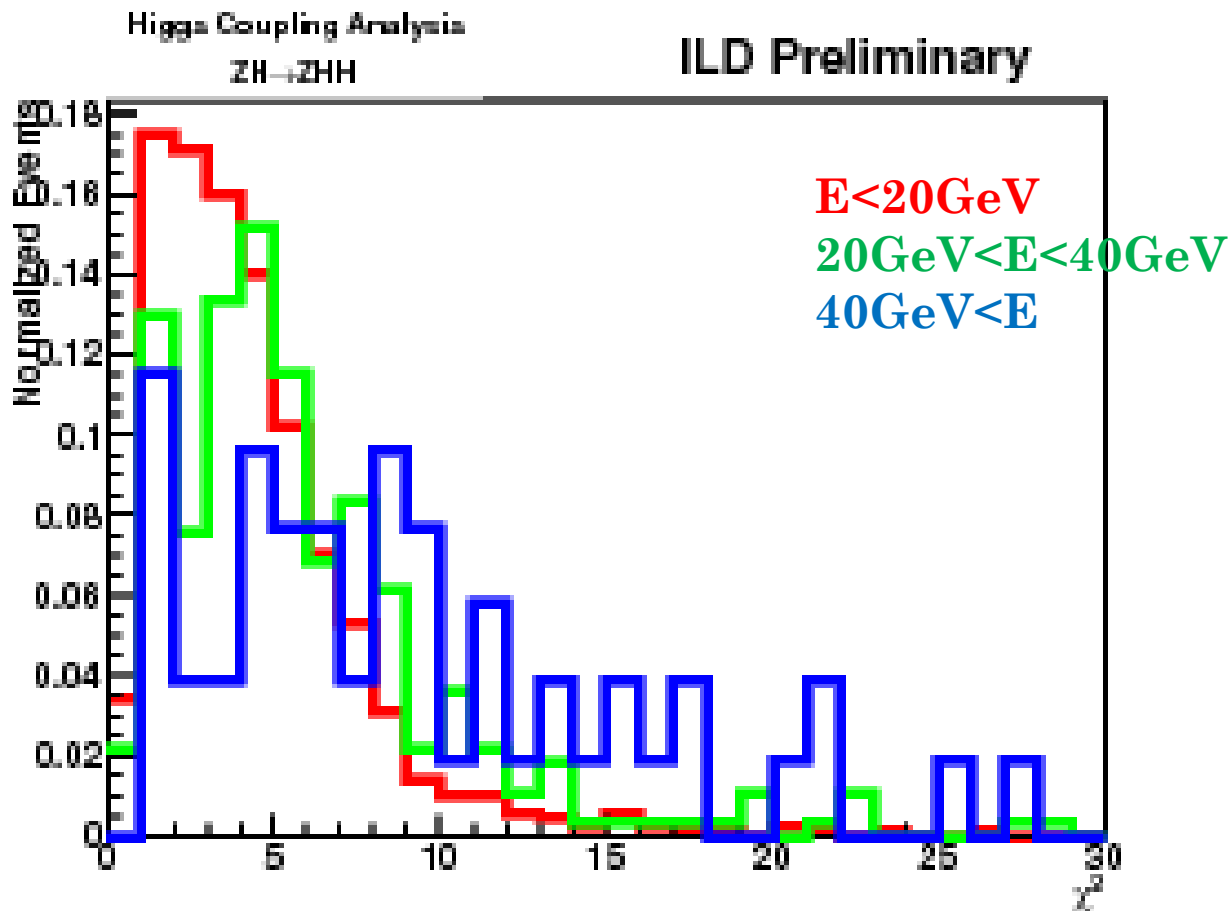- No clear difference…
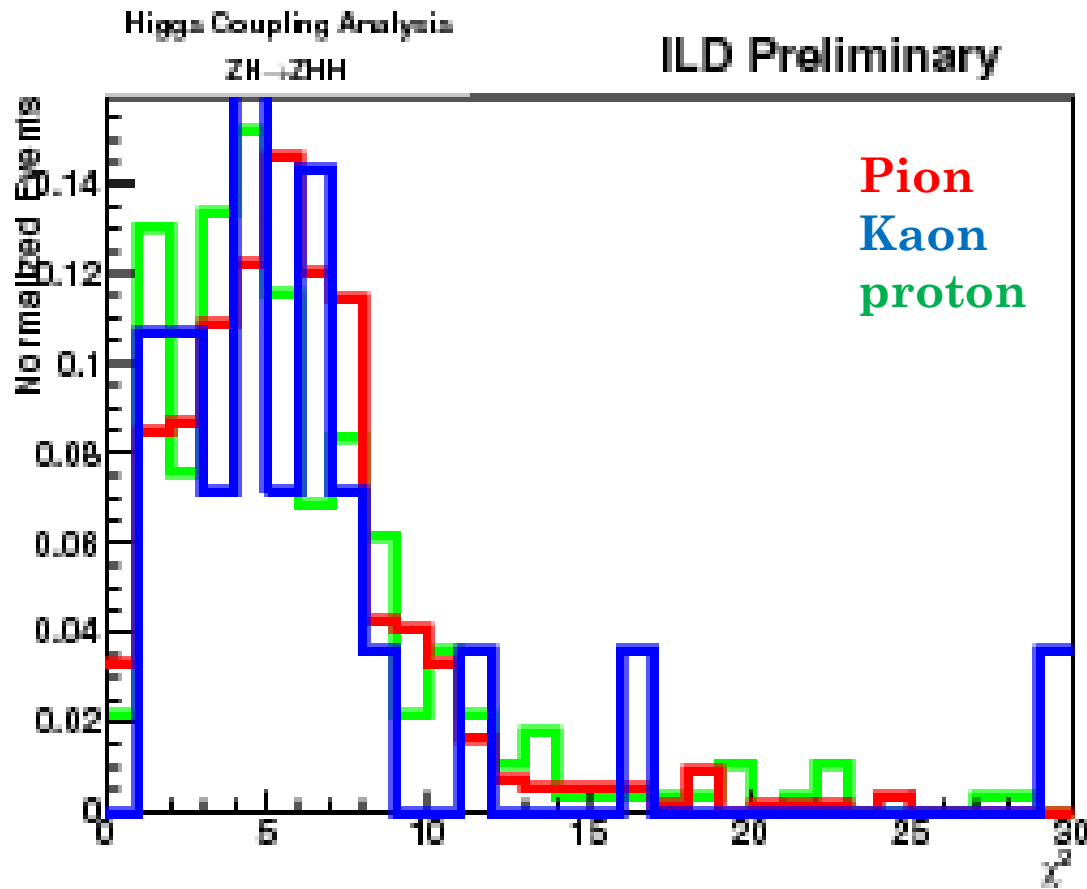
X2 AS A RESULT OF FITTING

- Pion with different energy range
- The difference is coming from track curvature?

TRANSVERSE INFORMATION

- Proton with different energy range
- Difference is coming from track curvature?

PRELIMINARY LEPTON ID

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PRELIMINARY RESULT OF LEPTON ID

- So far, all the hadron tracks are regarded as same fakes
  - No clear difference found between each particle type
- Using likelihood method
  - $L = \frac{\prod s}{\prod s + \prod b}$
- Target is the leptons coming from HH→WW*→lvjj
  - Low momentum leptons
  - Electron type
  - 24.7% improvement

- Need to optimize

Method	Cut based	w/o shower	w shower	w dE/dx
signal	98.1	98.1	98.0	**98.3**
HH→(bb)(bb)	-	1.78	1.35	**1.35**

NEXT STEP

- Using dE/dx and shower profile more
  - Low momentum track energy correction
    - Assign particle type to the tracks – Bayesian approach?
  - Start to check for b-tagging
    - First step, check the tracks which create b(or c) vertex

- It is necessary to show the significance and advantage of using dE/dx
  - It is very important!

TODO

- More study of fake lepton sample
  - Components of fake lepton candidates
    - Pion? Kaon? Proton? - fraction
  - Is there any difference between fake lepton components?
    - Overall distribution doesn't have any difference...

- Apply to lepton ID
  - Performance check

- Study for muon type
  - Any difference between muon and (I guess) punch-through pion?

- Integrating Ecal/Hcal - good estimation in Hcal
  - Very difficult!!
  - Fit function gives up fitting...