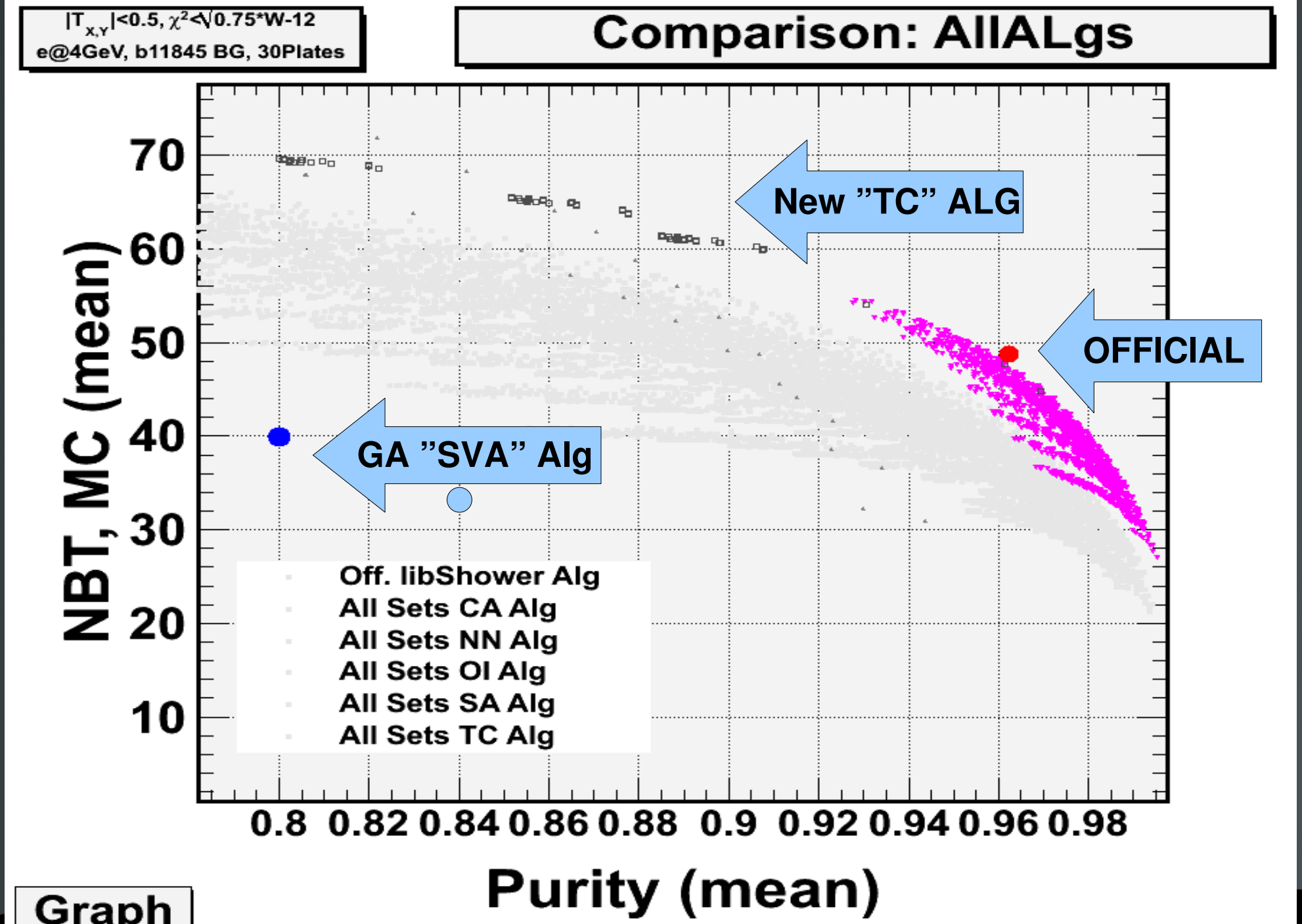
Electron Meeting

- e/gamma ID
- New Shower Reconstruction Algorithm
- Comparison GA Algorithm
- New energy estimation using e/g ID
-
- Future...

New Shower Reconstruction

- Up to now: started only from a beginning BaseTrack.
- Inspired by Giustino Alg, we consider now also tracks from linked_tracks.root
- New Alg: ”TC” - ”Track Cone”:
  - Combining starting BaseTrack and ConeTube reconstruction + Attachement of tracks into the Cone and re-reco from them as new starting points.


|T_x,Y|<0.5, χ²<√0.75*W-12
e@4GeV, b11845 BG, 30Plates
Comparison: AllALgs
New "TC" ALG
OFFICIAL
GA "SVA" Alg
Off. libShower Alg
All Sets CA Alg
All Sets NN Alg
All Sets OI Alg
All Sets SA Alg
All Sets TC Alg
NBT, MC (mean)
Purity (mean)
70
60
50
40
30
20
10
0.8
0.82
0.84
0.86
0.88
0.9
0.92
0.94
0.96
0.98
Graph

New Shower Reconstruction

- Results on reconstruction only:
- Seems very promising: gain in 25% of statistics, loss only 5% in purity!!
- Effect on ID and Energy still ongoing.... (takes long)
- If this is proven to be better it will be commited as Standard Alg.

GAs relict.

- Last year Giustino was here and worked with Frederic (providing data samples and ideas) on
  - (yes on what actually)
  - An algorithm called: ”Vertex Search”
  - An algorithm called: ”EM Shower Reconstruction”
  - An modified algorithm, also called: ”EM Shower Reconstruction”
  -
  - We got two programs, both labeled ”SVA” (2ndry vtx attchmnt)
  - Both work somehow on our data, but not equally...
- Comparison GA Algorithm

GA Algorithm comparison

I. First ”SVA” program:

- Works very well when giving a vertex point.
- BUT only for zero angle.
- On a 4GeV electron (zero angle) testsample, following numbers have been obtained (reconstructing 30 plates):
- [scanner@lheppc56 frank_test]$ cat AlgoComparison.txt
- Shower_FJ.root:
- mean sizeb*purityb = 64,86;
- mean purityb = 0.97;
- Shower_GA.root:
- mean sizeb*purityb = 97.54;
- mean purityb = 0.86;
- Shower_TC.root:
- mean sizeb*purityb = 103;
- mean purityb = 0.88;
- This looks very good improvement! but:
- Doesnt work for any angle inequal to zero!

GA Algorithm comparison

II. Second ”SVA” program:

- After recommunication, we know that this should be the original shower reco for MC data....(different from the alg doing data reconstruction...(?)).
- On a 4GeV electron (random angle) testsample, following numbers have been obtained (reconstructing 30 plates, but other scan efficency than one sample before):
- Shower_FJ.root:
- mean sizeb*purityb = 49;
- mean purityb = 0.96;
- Shower_GA.root:
- mean sizeb*purityb = 39.3;
- mean purityb = 0.80;
- Shower_TC.root:
- mean sizeb*purityb = 60;
- mean purityb = 0.90;
- Much worse than the vertex attach algorithm...
- Actually I do not know how to proceed, since both algorithms give so different results.
- In my opinion, I should focus on the TC Alg and verificate its results

e/g Separation

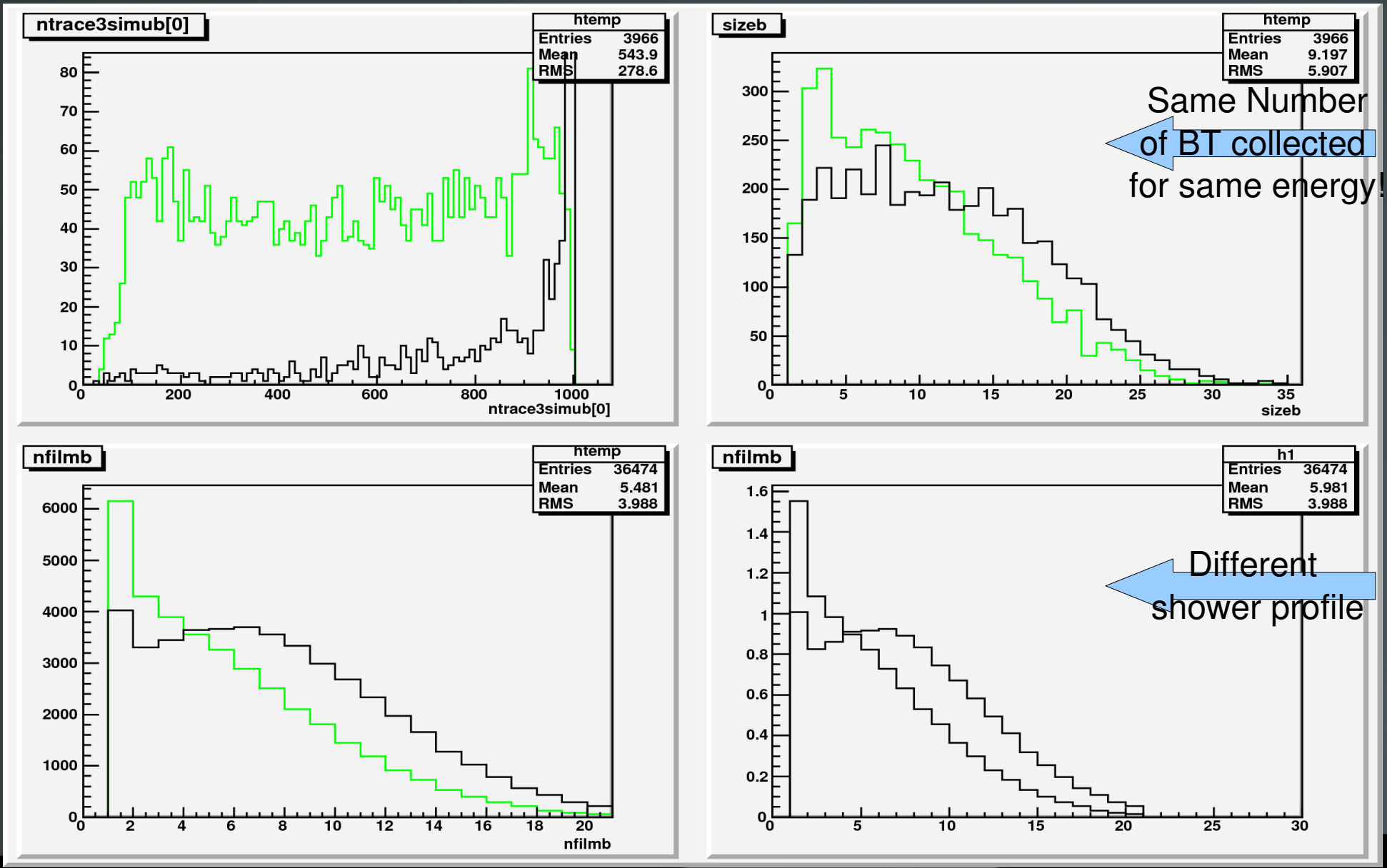
- Motivated on the fact that:
  - Low decay travel length of gamma vs scanning inefficency of electron track: f.e. Is this shower a electron or a gamma?
  - Electron / Gamma shower look similar but still different.
  - Separation helps maybe to improve reconstruction/energy estimation.
- Goal: to be able to distinguish ONLY on shower shape, indepentently of vtx decay length.
- Tune energy algorithm on particle type!

e/g Separation

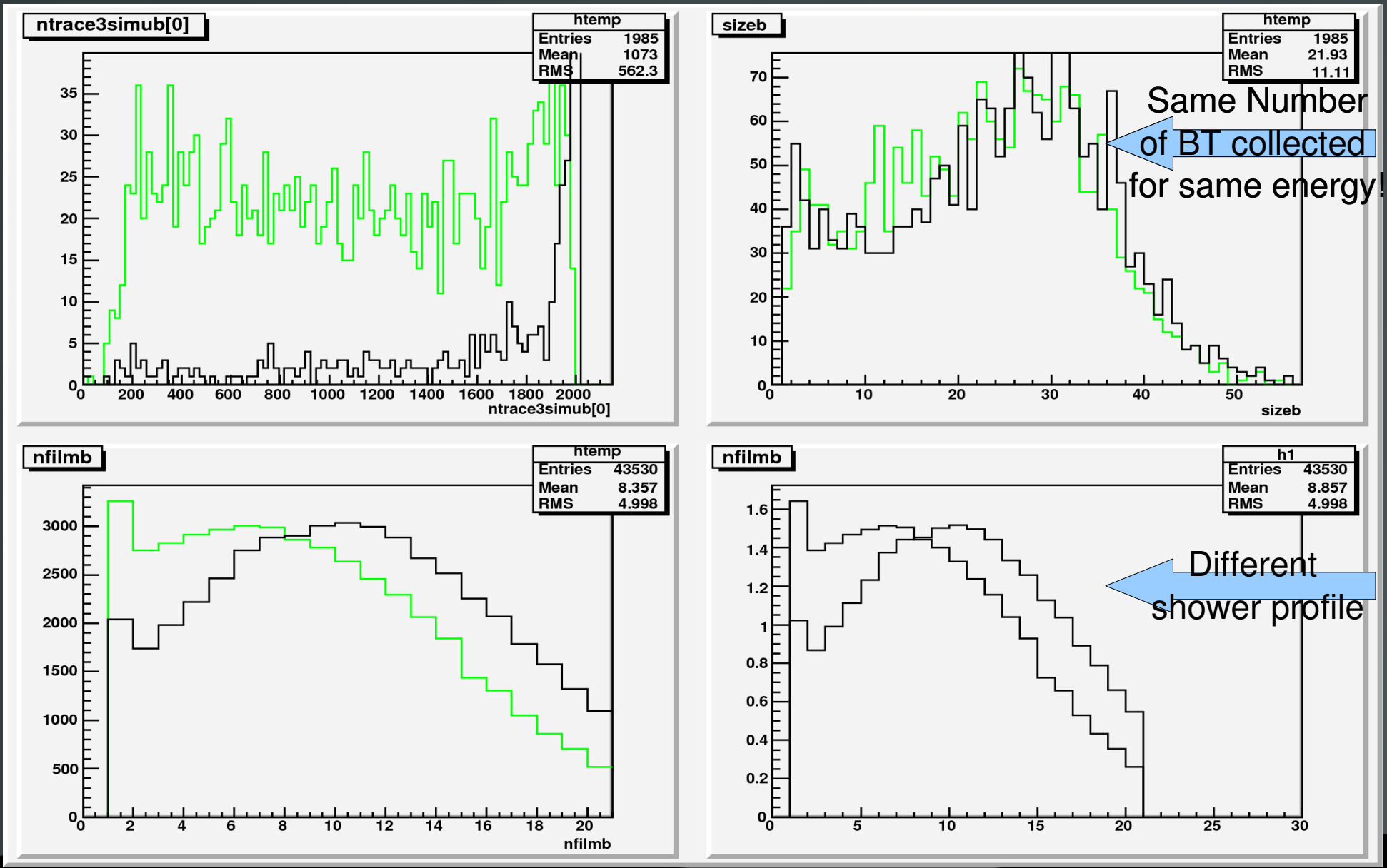
- Motivated on the fact that:

- Goal: to be able to distinguish ONLY on shower shape, independently of vtx decay length.
- Tune energy algorithm on particle type!

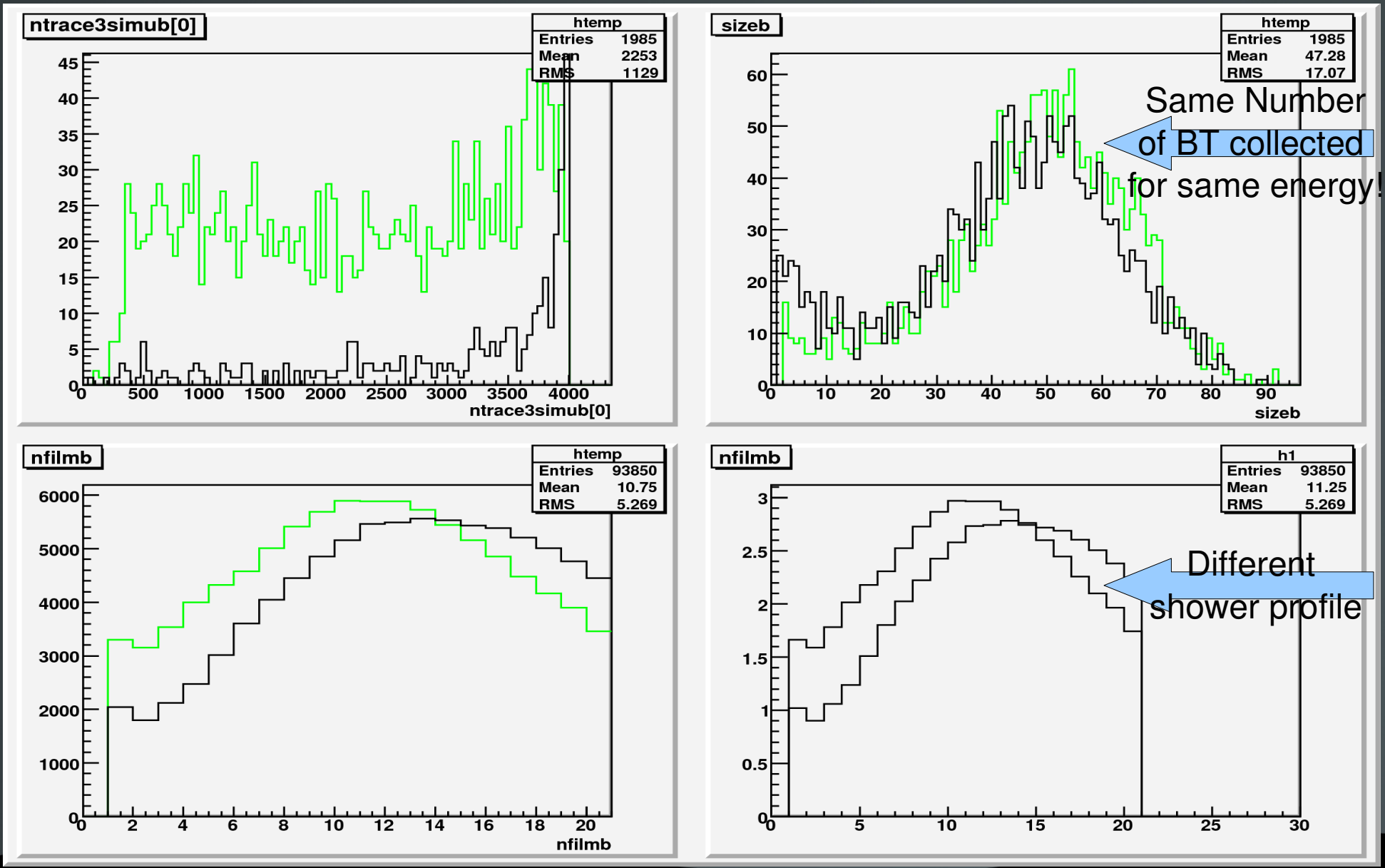
1Gev


ntrace3simub[0]
htemp
Entries 3966
Mean 543.9
RMS 278.6
ntrace3simub[0]
sizeb
htemp
Entries 3966
Mean 9.197
RMS 5.907
sizeb
Same Number
of BT collected
for same energy!
nfilmb
htemp
Entries 36474
Mean 5.481
RMS 3.988
nfilmb
nfilmb
h1
Entries 36474
Mean 5.981
RMS 3.988
Different
shower profile

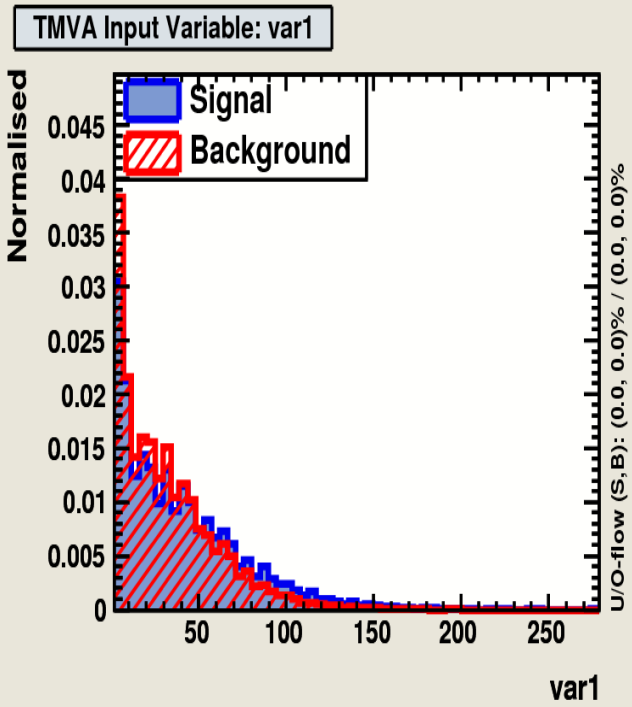
2Gev

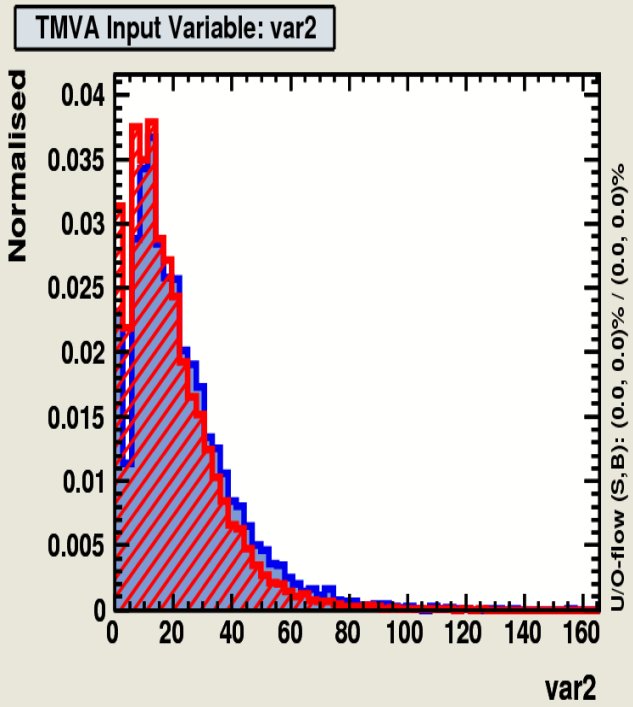

ntrace3simub[0]
htemp
Entries 1985
Mean 1073
RMS 562.3
ntrace3simub[0]
sizeb
htemp
Entries 1985
Mean 21.93
RMS 11.11
sizeb
Same Number
of BT collected
for same energy!
nfilmb
htemp
Entries 43530
Mean 8.357
RMS 4.998
nfilmb
nfilmb
h1
Entries 43530
Mean 8.857
RMS 4.998
Different
shower profile

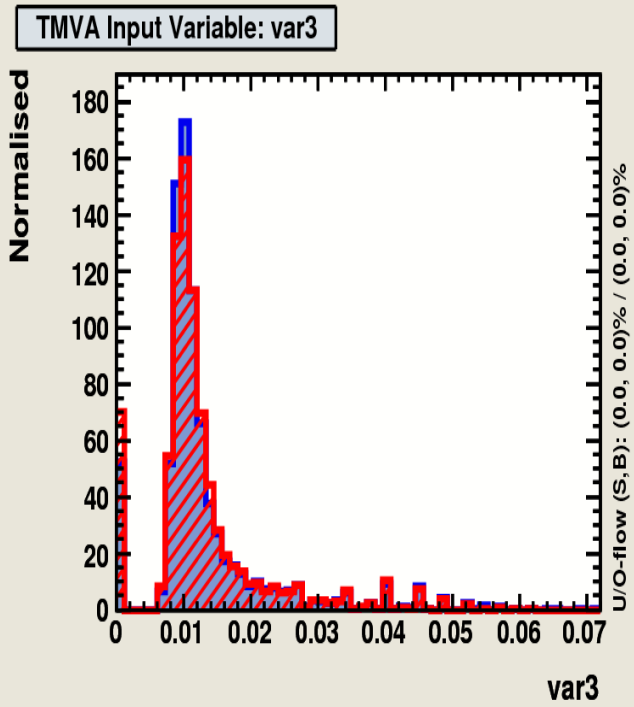
4Gev

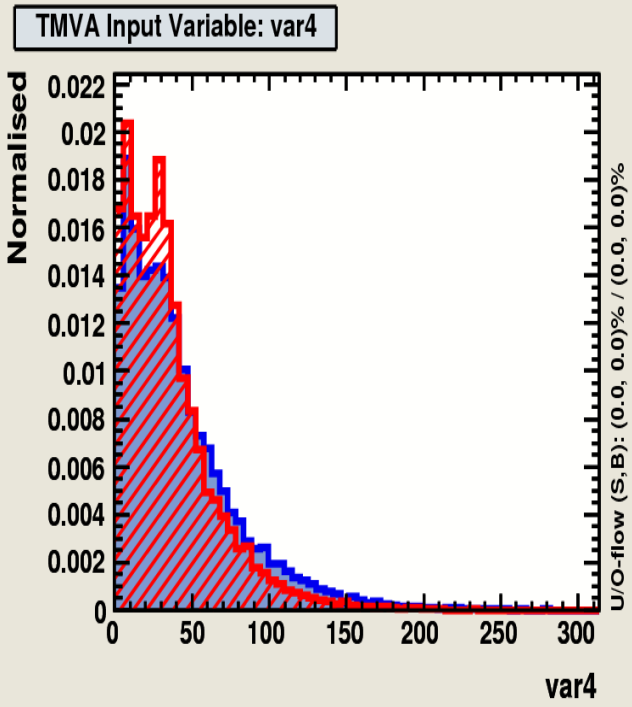

ntrace3simub[0]
htemp
Entries 1985
Mean 2253
RMS 1129
ntrace3simub[0]
sizeb
htemp
Entries 1985
Mean 47.28
RMS 17.07
sizeb
Same Number
of BT collected
for same energy!
nfilmb
htemp
Entries 93850
Mean 10.75
RMS 5.269
nfilmb
nfilmb
h1
Entries 93850
Mean 11.25
RMS 5.269
Different
shower profile

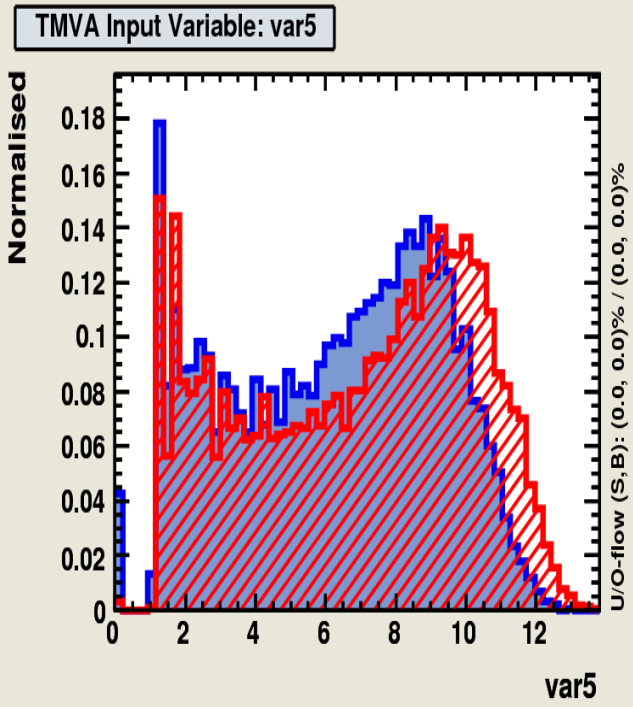
- Only finished for YC shower parametrisation.
- Averaged over all energies (from 0.4 exp to 30 GeV, mean @ 4GeV).
- Shown:
  - Inputvariables (18plates of reconstruction)
  - ANN test/trainingssample output.
  - SG efficency and BG rejection of the ANN for separationg e/g versus reconstruction lenght.

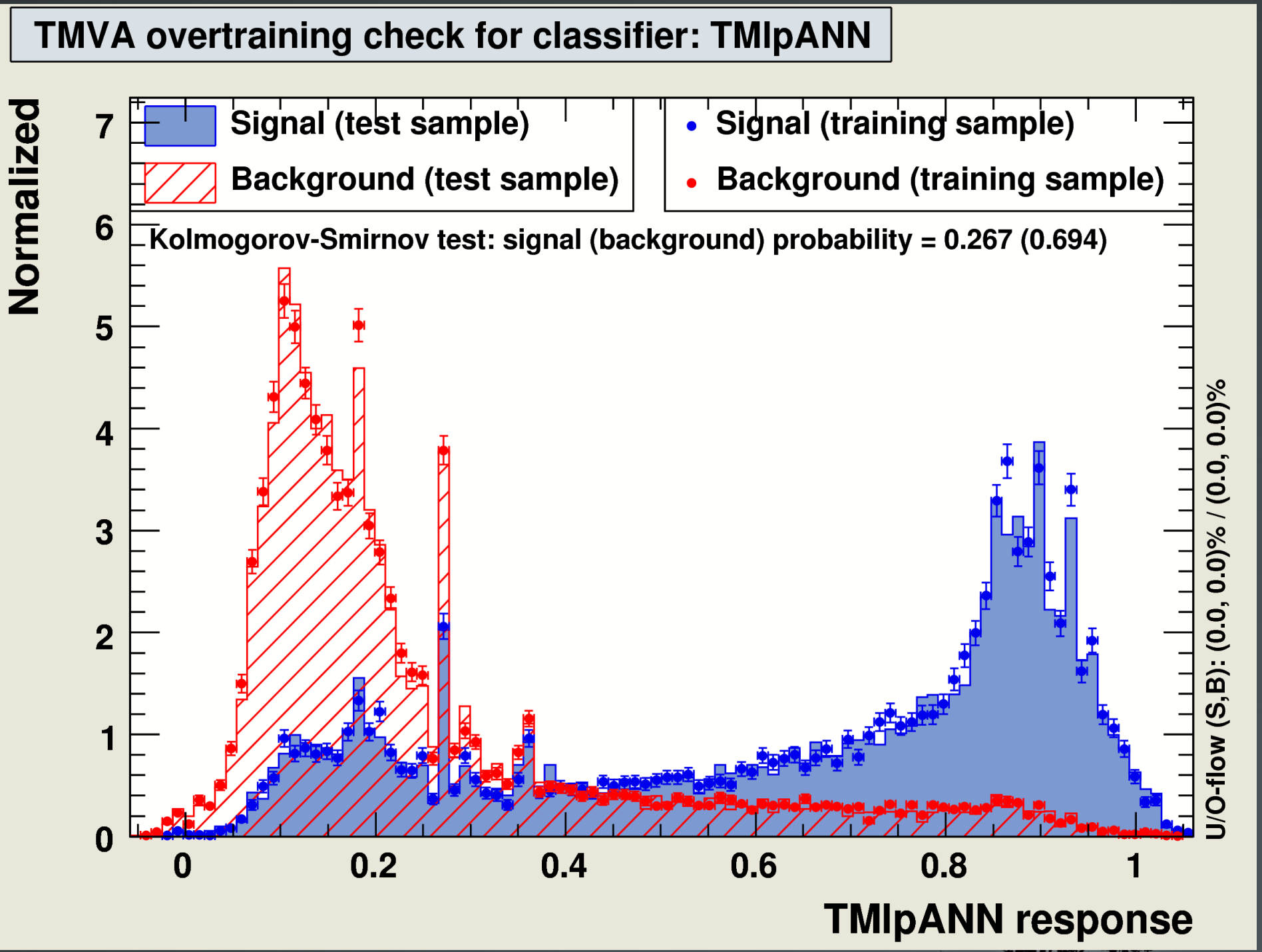

TMVA Input Variable: var1
Signal
Background
Normalised
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
var1


TMVA Input Variable: var2
Normalised
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
var2

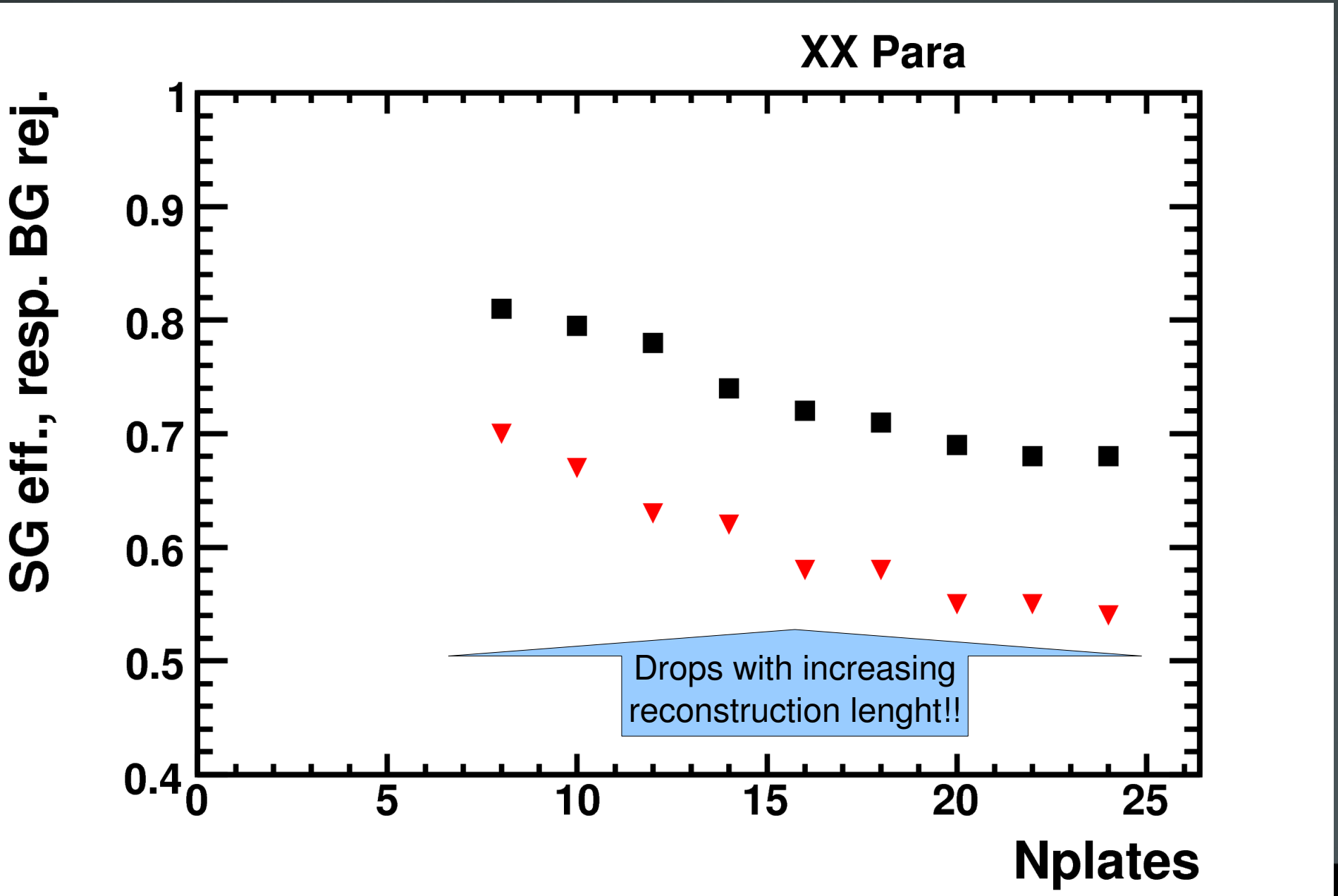

TMVA Input Variable: var3
Normalised
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
var3


TMVA Input Variable: var4
Normalised
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
var4

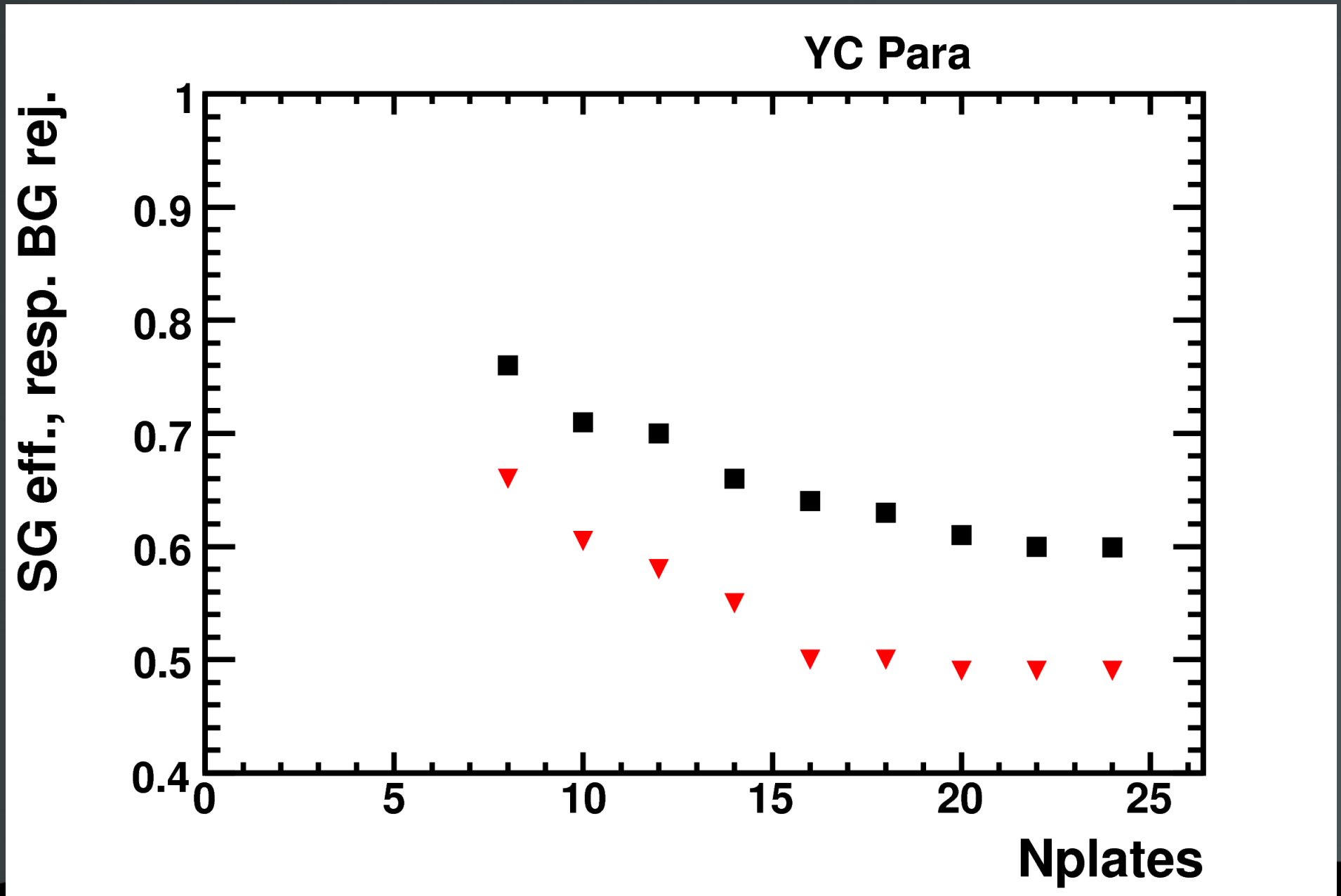

TMVA Input Variable: var5
Normalised
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
var5


TMVA overtraining check for classifier: TMlpANN
Signal (test sample)
Background (test sample)
Signal (training sample)
Background (training sample)
Kolmogorov-Smirnov test: signal (background) probability = 0.267 (0.694)
Normalized
TMlpANN response
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
0
1
2
3
4
5
6
7
0
0.2
0.4
0.6
0.8
1

Result for YC & XX Parametrisation



Result for YC & XX Parametrisation



Short Term Actions...

- Finish all MC events tracklinking... (still ongoing!!)
- Redo completely the Energy Estimation with the ”TC”-Alg to check improvements.
- Finish the ID_E_Gamma Separation; find out which method suits best → implementation into *libShower*
- Check Shower Reconstruction purity also on nu_e and tau_e sample! (up to now only shower alone)