Update of point-source analysis using showers (KM3NeT)

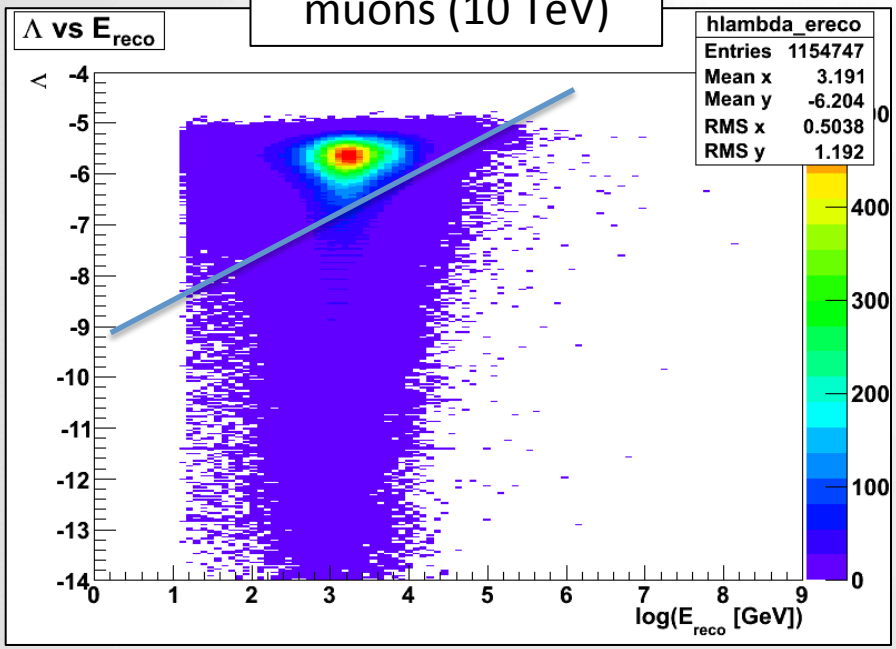
Javier

Content

- Cuts applied
  - Λ vs E_{reco} cut
  - Vertex Containment
  - Θ_{LNS} cut
- Pseudoexperiments
- Results
  - Problem with weights (again!)

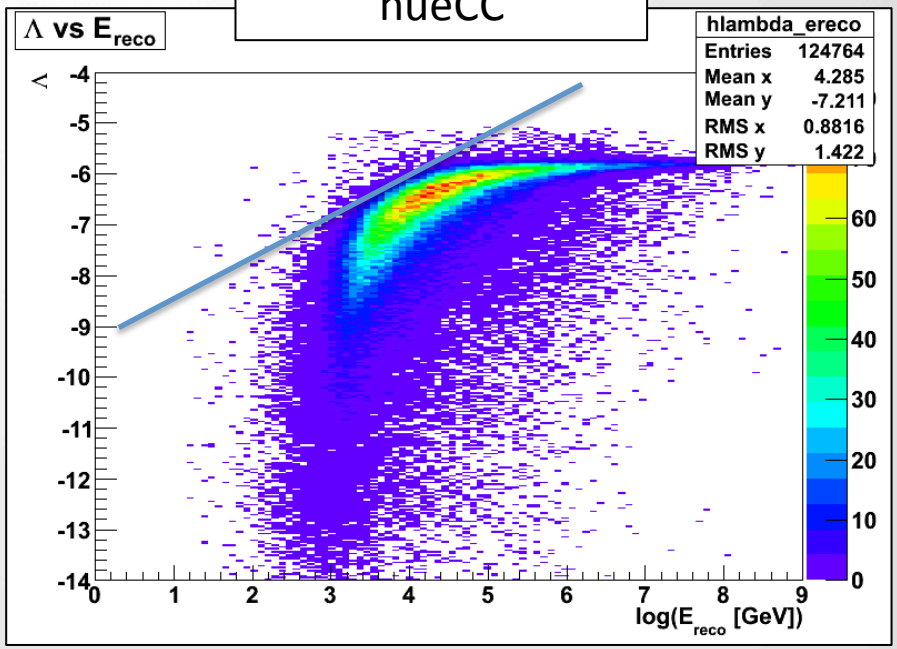
Λ vs E_{reco}

Atmospheric muons (10 TeV)



Λ vs $E_{reco,aashow}$ distribution for atmosferic muons (10 TeV sample) for a containment cut of $R_{q,cut}$= 500 m, $Z_{q,cut}$ = 300 m

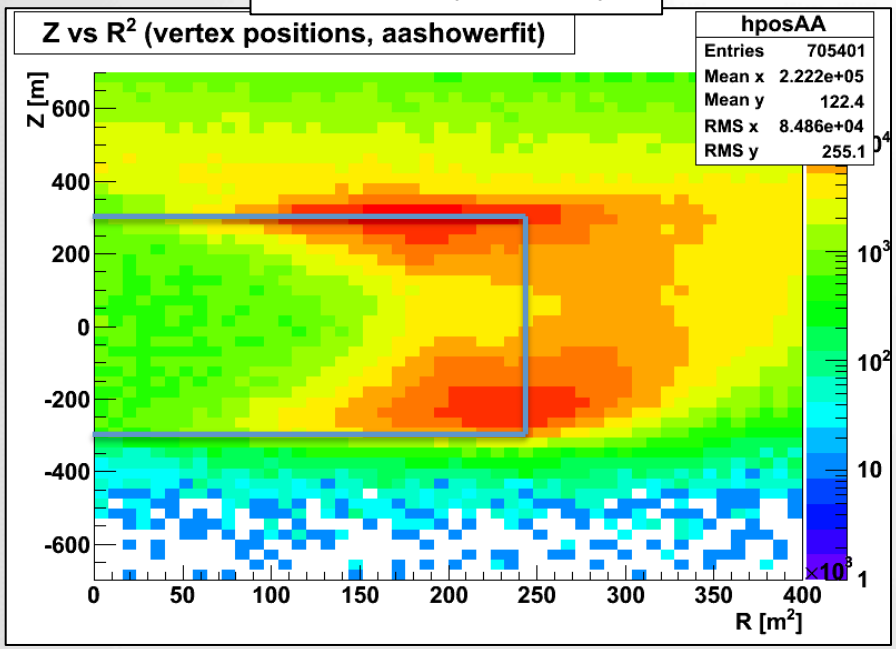
nueCC



Λ vs $E_{reco,aashow}$ distribution for cosmic nueCC for a containment cut of $R_{q,cut}$= 500 m, $Z_{q,cut}$ = 300 m

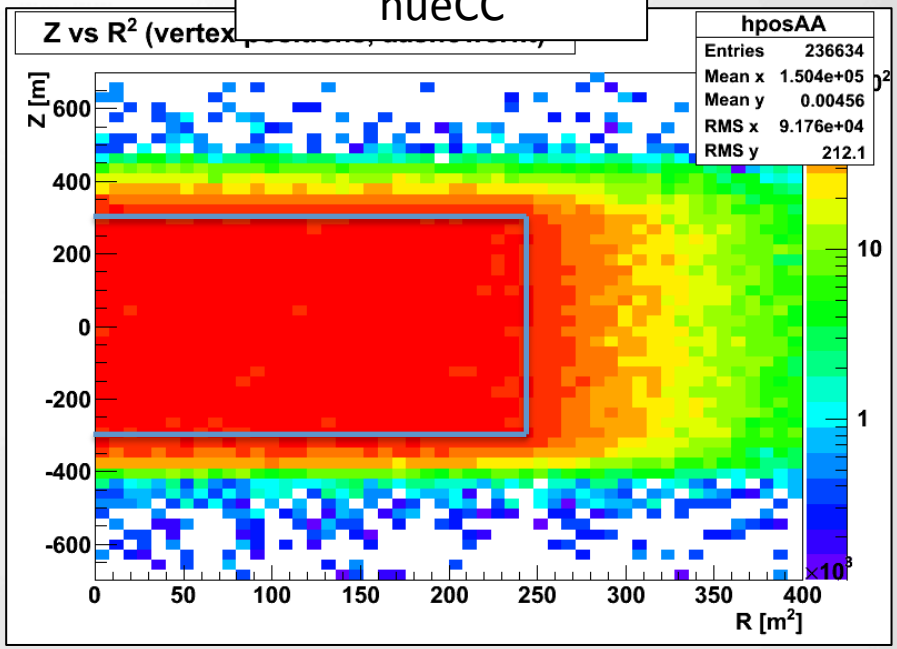
Containment cut (using aashowerfit reco vertex)

Atmospheric muons (10 TeV)



Z vs $R^2 = X^2+Y^2$ as reconstructed by aashowerfit for the 10 TeV atmospheric muon sample (Cut used: Lambda vs E_{reco})

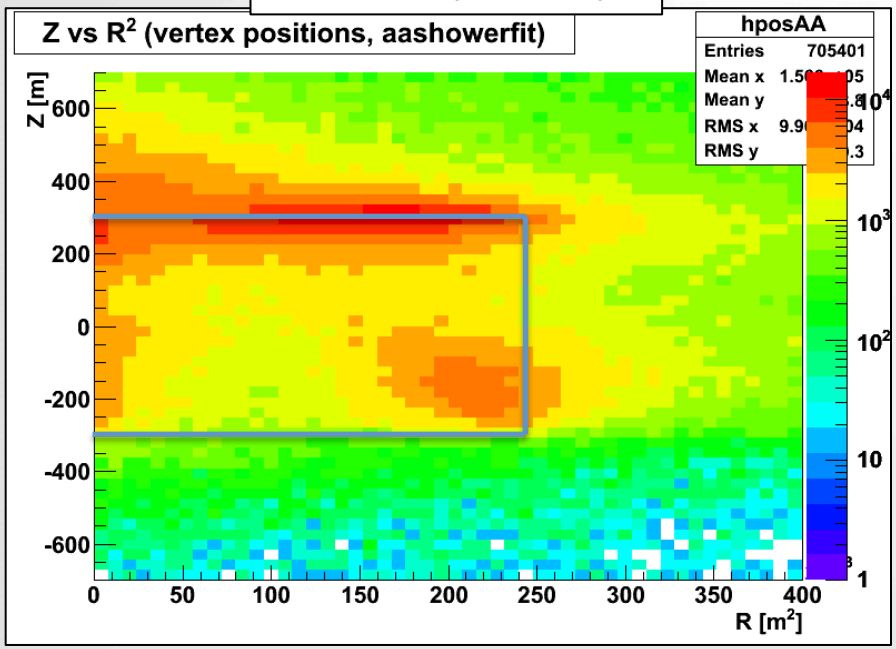
nueCC



Z vs $R^2 = X^2+Y^2$ as reconstructed by aashowerfit cosmic nueCC events (Cut used: Lambda vs E_{reco}) .

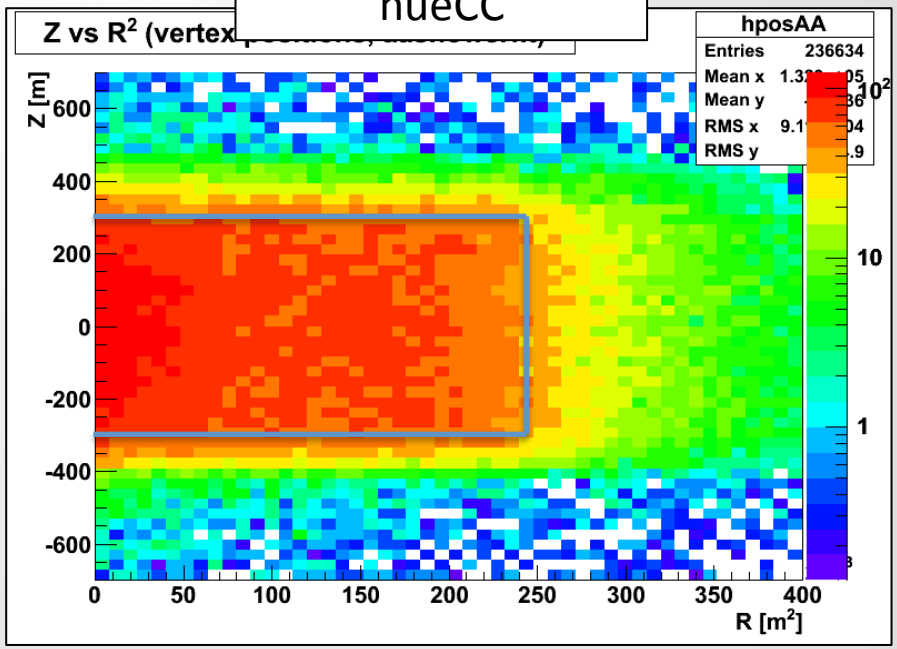
Containment cut (using q-strategy reco vertex)

Atmospheric muons (10 TeV)



Z vs $R^2 = X^2+Y^2$ as reconstructed by q-strategy for the 10 TeV atmospheric muon sample (Cut used: Lambda vs E_{reco})

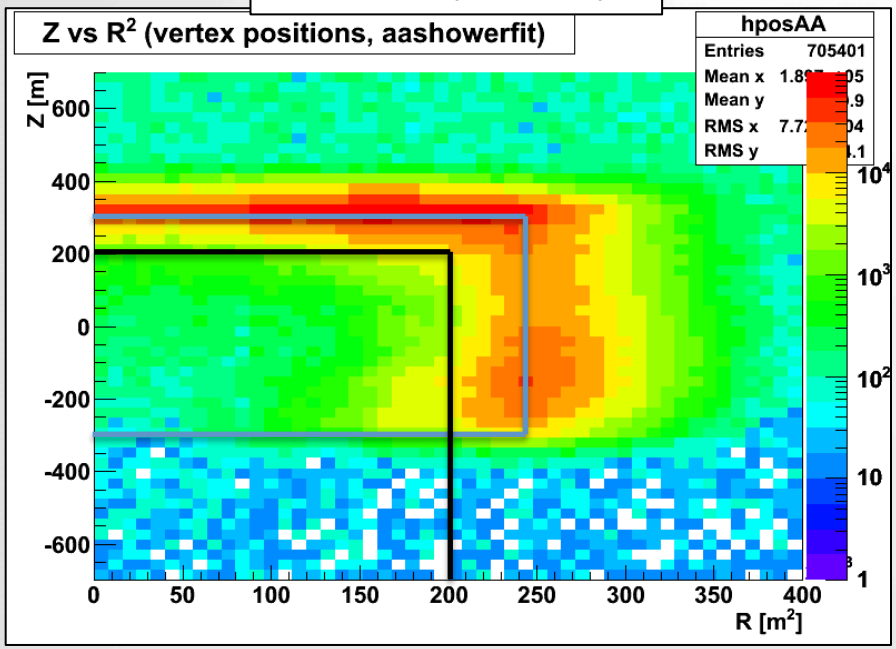
nueCC



Z vs $R^2 = X^2+Y^2$ as reconstructed by q-strategy for cosmic nueCC events (Cut used: Lambda vs E_{reco}) .

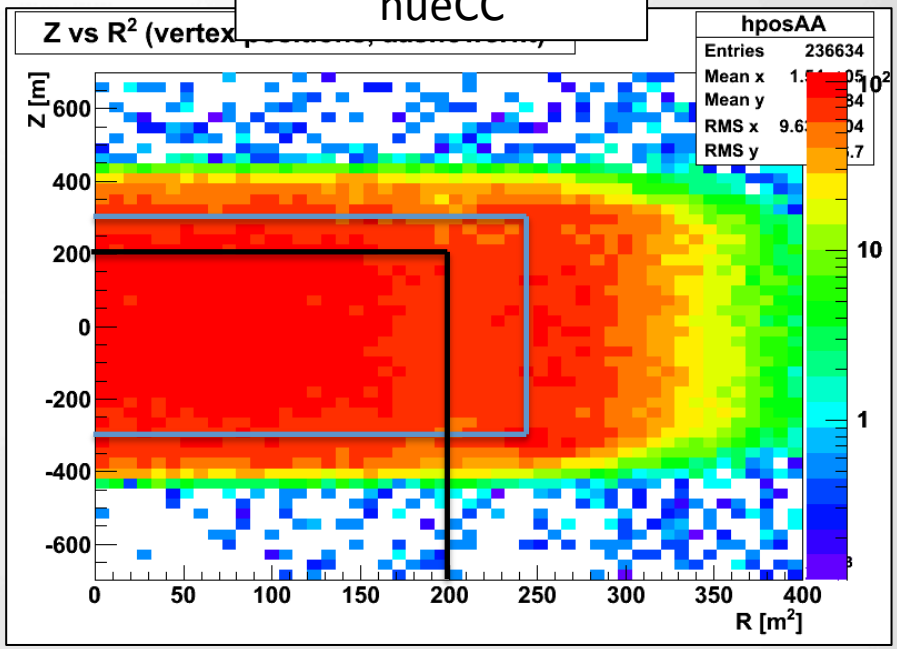
Containment cut (using recoLNS reco vertex)

Atmospheric muons (10 TeV)



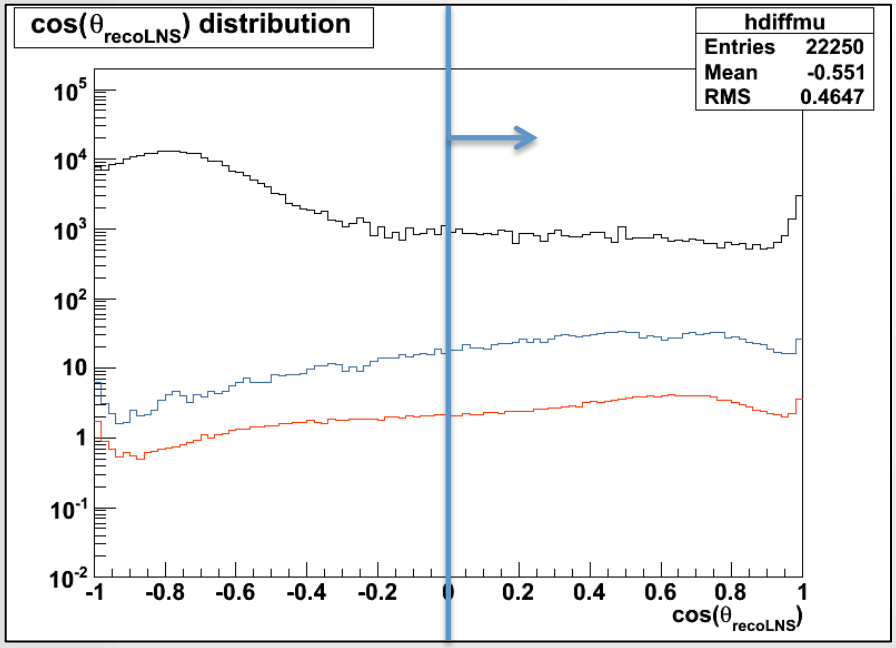
Z vs $R^2 = X^2+Y^2$ as reconstructed by recoLNS for the 10 TeV atmospheric muon sample (Cut used: Lambda vs E_{reco}). Black: Proposed cut for this analysis.

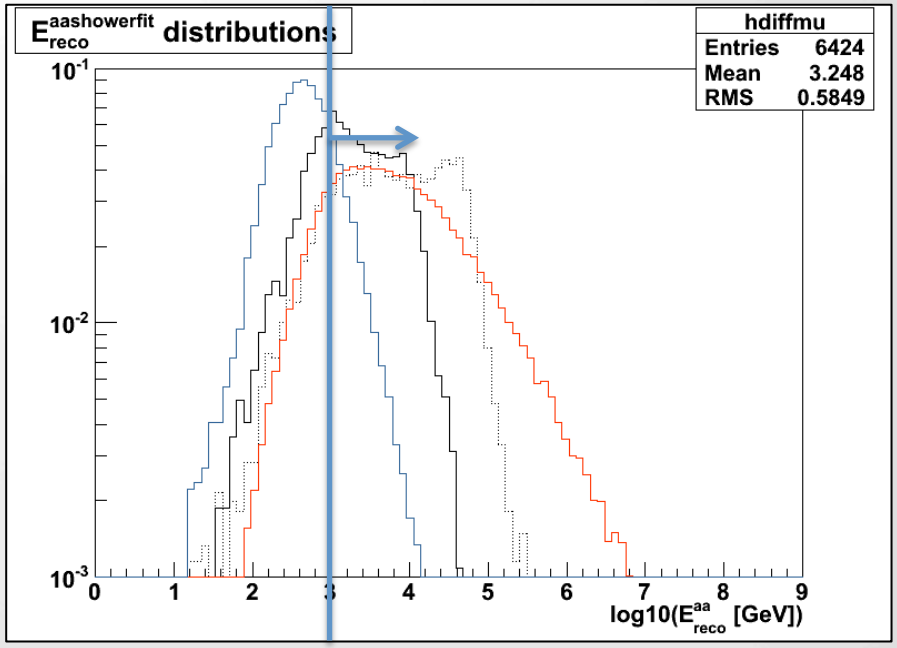
nueCC



Z vs $R^2 = X^2+Y^2$ as reconstructed by recoLNS cosmic nueCC events (Cut used: Lambda vs E_{reco}) . Black: Proposed cut for this analysis.

θ_{LNS} cut, E_{reco} cut





Black: Sample of 10 TeV atm. Muons

Blue: Atmospheric nueCC sample

Red: Cosmic nueCC (E^-2 spectra, arbitrary flux norm, **diffuse!**)

Containment cut of $R_{q,cut}$= 500 m, $Z_{q,cut}$ = 300 m

(Warning: The distributions for atm/CS neutrinos I showed in the previous presentation were not properly weighted! See the last slides of this talk)

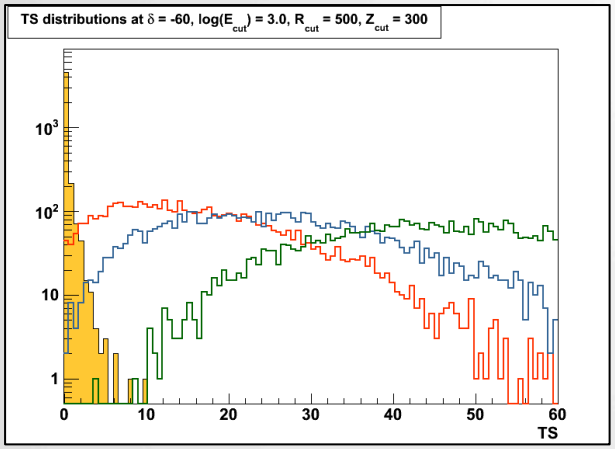
Procedure for this point-source search

- For now, only information of atm. muons and ν_e (atm+cosmic)

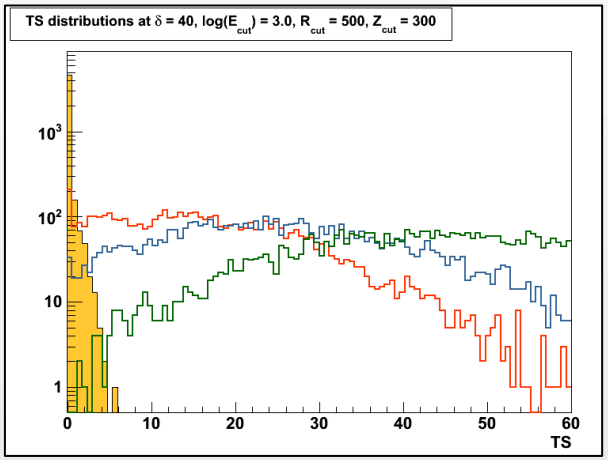
- Pseudoexperiments up to 40 signal events in different declinations (13 declinations between -80° and 80°)
  - pseudoexperiments at +60º and +80º show unreasonable results :/

Sample TS distributions

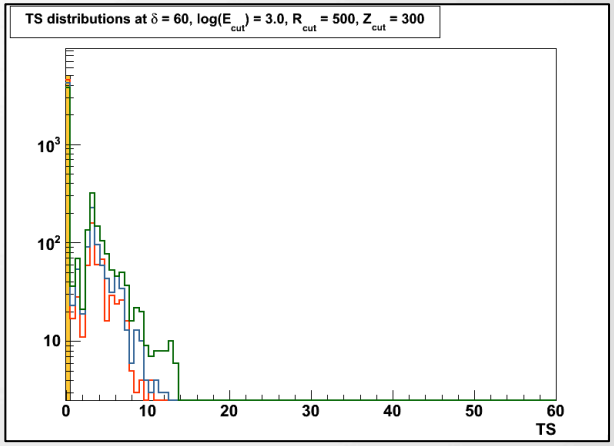
δ = -60°



δ = 40°



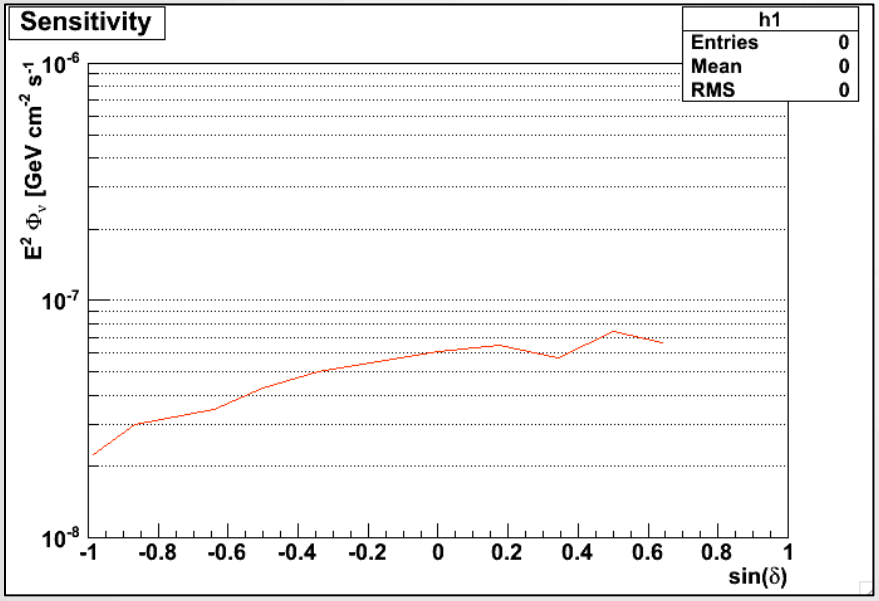
δ = 60°

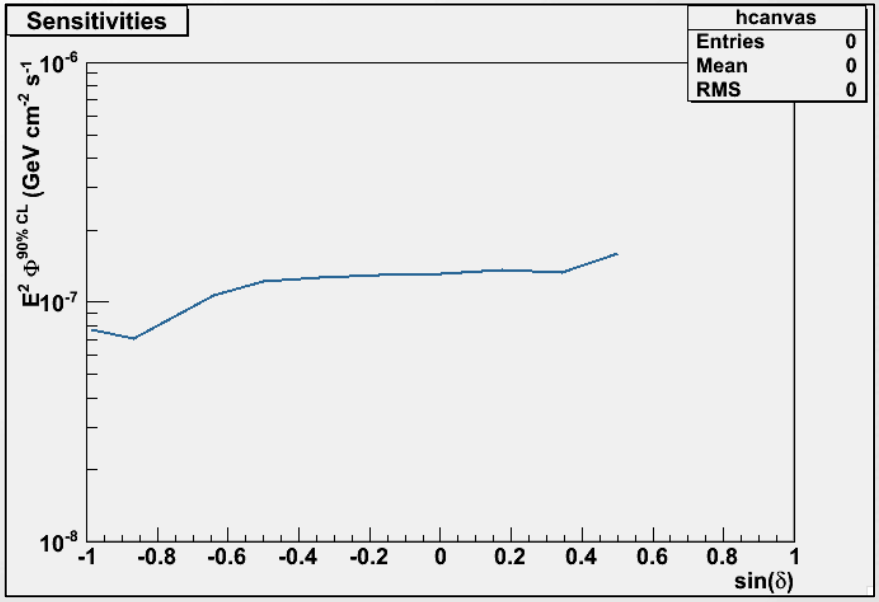


Sample TS distributions for different declinations. Yellow: TS distribution for background. Red: TS distribution for n_s = 10 events. Blue: n_s = 15 events. Green: n_s = 25 events. Results for δ = 60° (80°) need to be reevaluated!

Results: Sensitivity*

* Doubts on weights…





Left: Current result (E^{reco}_{cut} = 100 TeV). Right: result with previous cuts.

There is a significant improvement, but there's room for more!

- Addition of tau showers
- Better rejection of atmospheric muons (so to get rid off from the cutoff on θ_{LNS}).

About the weights:

- Weight in Luigi's file: MCwCosm = w2 / Ngen * phi_0 * E^{-2} * 10^4
  - Idea: Calculate the number of expected events for a PS using this weight (MCwCosm / nfiles)
  - $\Phi_0 = 10^{-7}$ GeV^{-1} cm^{-2} s^{-1} sr^{-1} , Ngen = number of generated events in one file
  - Problem: For a Point source, should we divide by 4π?
  - (Previous results were performed with this 4π factor)