Group Meeting

27/08/2020

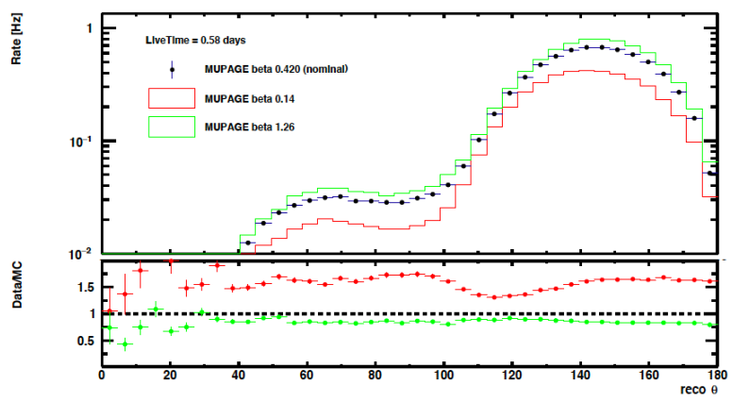
MUPAGE tuning

- MC-MC comparison of all parameters: https://drive.google.com/file/d/1yLy7cIfPPKJKLKQidGFr441nbpA_PNAD/view
- Identifies some “significant” parameters by eye

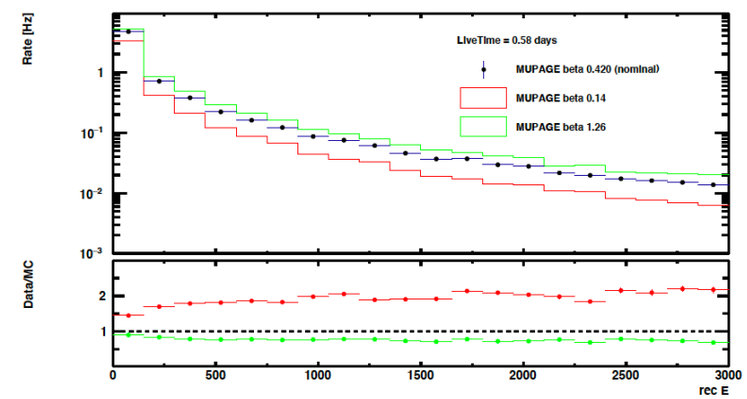
MUPAGE tuning

- E.g. β

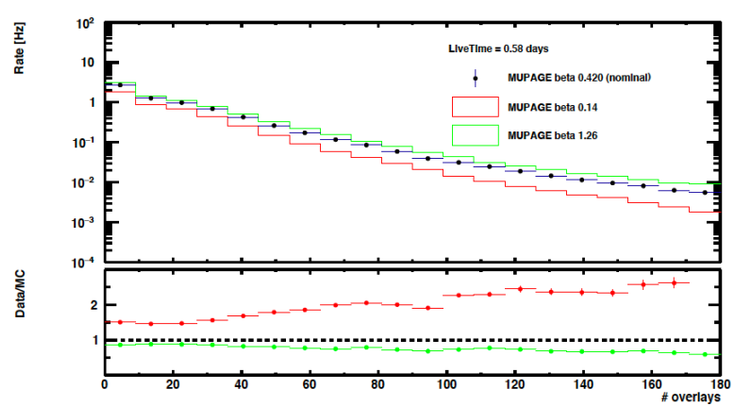
4.1 β



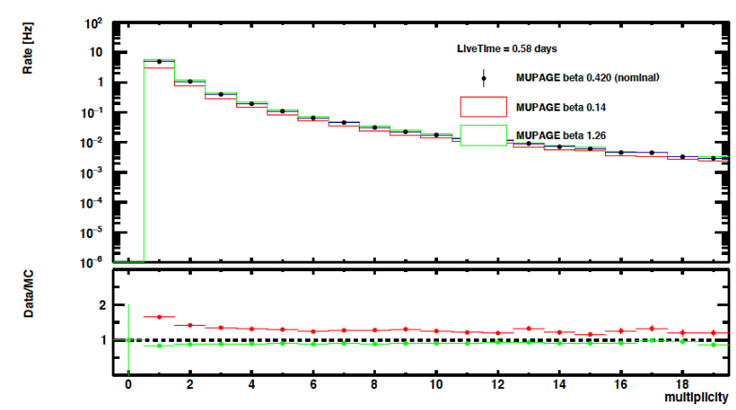
(a) beta - reconstructed zenith angle



(b) beta - reconstructed energy



(c) beta - overlays



(d) beta - multiplicity

Figure 16: beta for different observables

MUPAGE tuning

- For select MUPAGE parameters, want to determine which value of the parameter *best* agrees with the observables from data - zenith angle distribution, # overlays, energy distribution ..

MUPAGE tuning

- New histogram comparison test in *Jpp/software/JCompareHistograms/JTestSignificance (1D/2D)*
- A test of the magnitude of the difference between histograms
- Calculates the average bin significance/ “normalized significance of the difference”

MUPAGE tuning

- Method of Li Ma in gamma ray astrophysics:

ANALYSIS METHODS FOR RESULTS IN GAMMA-RAY ASTRONOMY

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Received 1982 September 20; accepted 1983 February 7

ABSTRACT

The current procedures for analyzing results of γ-ray astronomy experiments are examined critically. We propose two formulae to estimate the significance of positive observations in searching γ-ray sources or lines. The correctness of the formulae are tested by Monte Carlo simulations.

Subject headings: gamma-rays: general — numerical methods

Defining the significance S as a ratio of the excess counts above background to its standard deviation, we have

$$S = \frac{N_S}{\hat{\sigma}(N_S)} = \frac{N_{\rm on} - \alpha N_{\rm off}}{\sqrt{N_{\rm on} + \alpha^2 N_{\rm off}}} . \quad (5)$$

Astrophysical Journal, Part 1 (ISSN 0004-637X), vol. 272, Sept. 1, 1983, p. 317-324

MUPAGE tuning

- Starting with 6 ‘significant’ parameters: $\beta, \nu_{1b}, K_{1a}, d_{0b}, b_{1b}, \rho_{0b}$
- Scan parameter space for each parameter: for ~10 values of the parameter, run
  MUPAGE - JSirene - JTE - JRECO
- Run *JDataPostfit* on the output to produce histograms of the observables

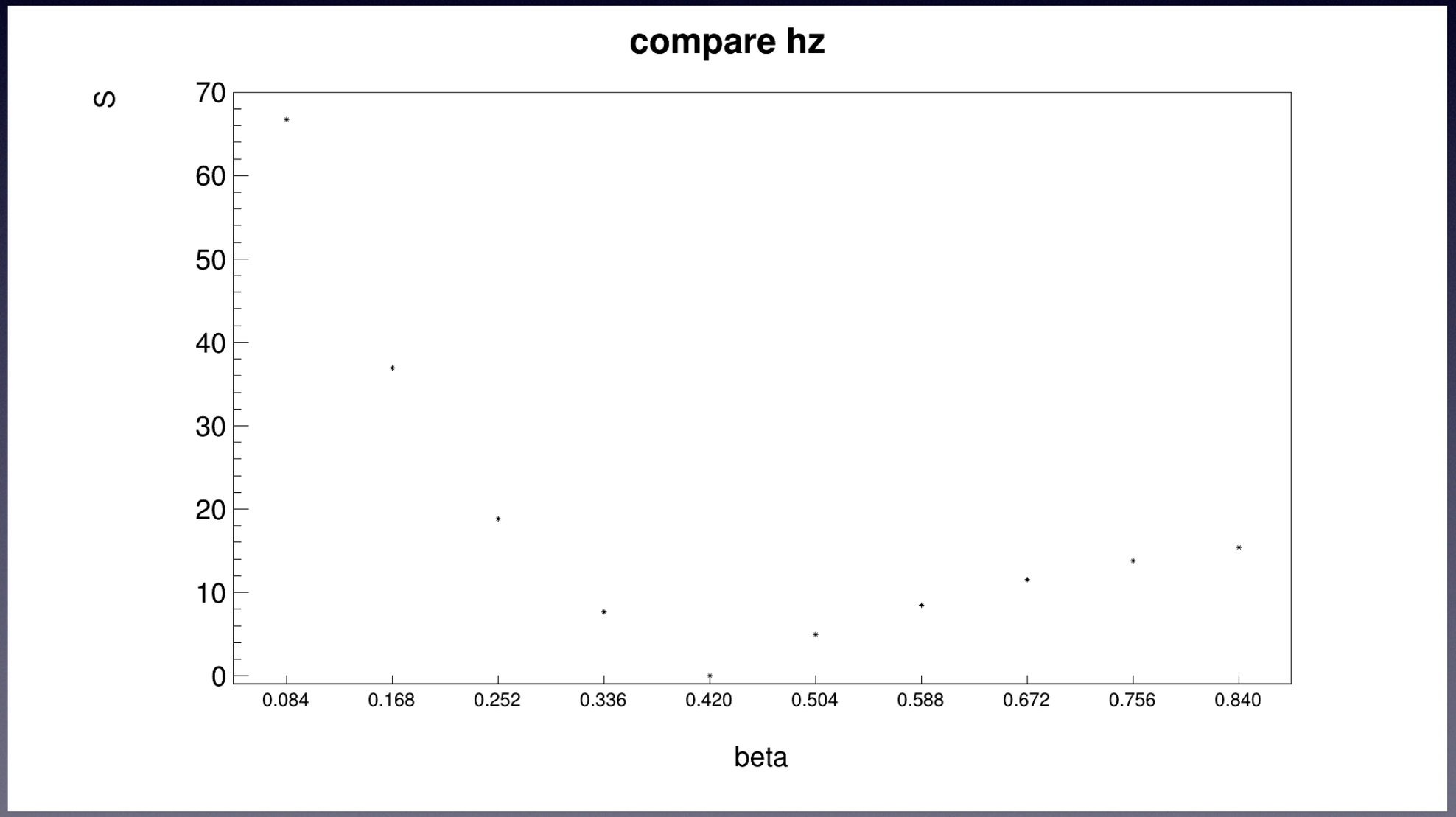
```
/sps/km3net/users/bofearra/MUPAGE/ORCA4/test_params > root beta/datapostfit/beta_0.084.datapostfit.root -l
root [0]
Attaching file beta/datapostfit/beta_0.084.datapostfit.root as _file0...
(TFile *) 0x1c9b400
root [1] .ls
TFile**         beta/datapostfit/beta_0.084.datapostfit.root
 TFile*         beta/datapostfit/beta_0.084.datapostfit.root
  KEY: TH1D     job;1
  KEY: TH1D     hz;1
  KEY: TH1D     ho;1
  KEY: TH2D     hzo;1
  KEY: TH2D     hxy;1
  KEY: TH1D     hq;1
  KEY: TH1D     hb0;1
  KEY: TH1D     he;1
  KEY: TH2D     heo;1
  KEY: TH2D     hzq;1
  KEY: TH2D     hze;1
  KEY: TH2D     hzb0;1
root [2]
```

MUPAGE tuning

- Run this comparison test with *JZebraMantis*
- As a first check, see the result of comparing hz (for the same parameter) to hz from the nominal value for that parameter

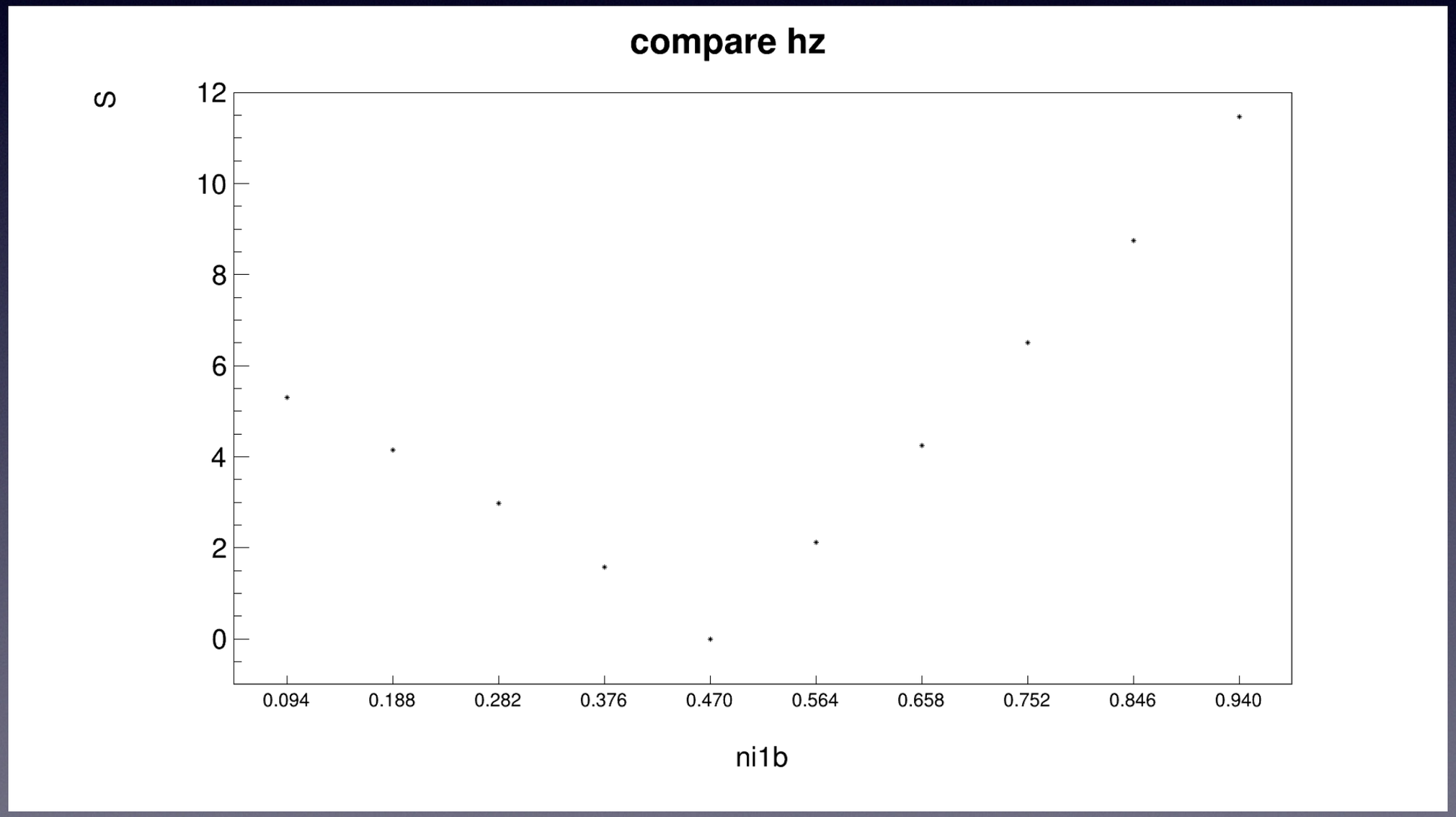
MUPAGE tuning

- E.g. for β , where S = 0 means the histograms are the exact same



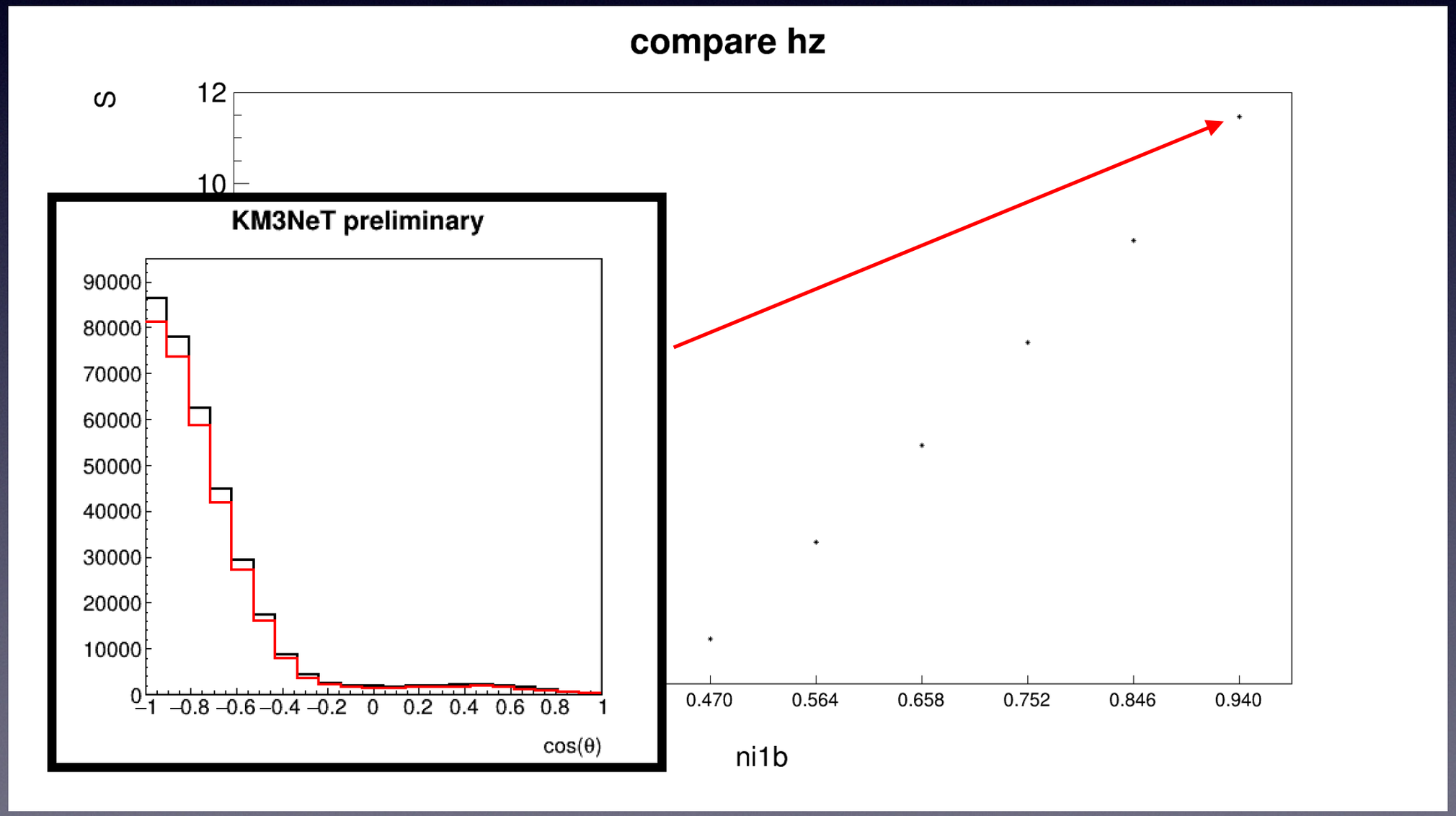
MUPAGE tuning

- E.g. for ν_{1b}, where S = 0 means the histograms are the exact same



MUPAGE tuning

- E.g. for ν_{1b}, where S = 0 means the histograms are the exact same



MUPAGE tuning

- To do:
- use this test in comparing to data
- Scan *full* parameter space, not just varying one parameter and leaving others at their nominal value