

Detector parametrization

paramNMH

The paramNMH Package

Introduction

Motivation

- Originally developed by Jürgen in 2015 as a crosscheck against Martijn's sensitivity measurement
- Uses parametrisations, instead of going an event-by-event measurement

Advantages

- Relatively fast to run
- The parametrisations can be edited quite quickly
- The result isn't affected by statistical fluctuations

Disadvantages

- The parametrisation is an approximation; some simplifying assumptions are made.

Stable version at

<http://svn.km3net.de/analysis/ParamNMH/>

Liam Quinn

Using Parametrisations to Calculate the NMH

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For details see: <https://indico.cern.ch/event/684196/contributions/2804882/attachments/1597871/2531958/rabat-meeting.pdf>

Comparing measurements in different scenarios

- 3 Years of data taking
- Full detector
- Parametrized using MC with MX trigger
- Scenarios:
 - $\sigma_E = \sigma_{\text{parametrized}}$ (Gaussian smear) vs $\sigma_E = 2 * \sigma_{\text{param}}$
 - $\Delta m_{23} = 2.4e-3 \text{ GeV}^2$ vs $\Delta m_{23} = 2.5e-3 \text{ GeV}^2$
 - $\theta_{23} = 40$ vs $\theta_{23} = 43$ for $\sigma_E = \sigma$ (parametrized)

Plots

3 years of data
taking in scenario
A:

Ereco vs $\cos(\theta_{\text{reco}})$

3 years of data
taking in scenario
B:

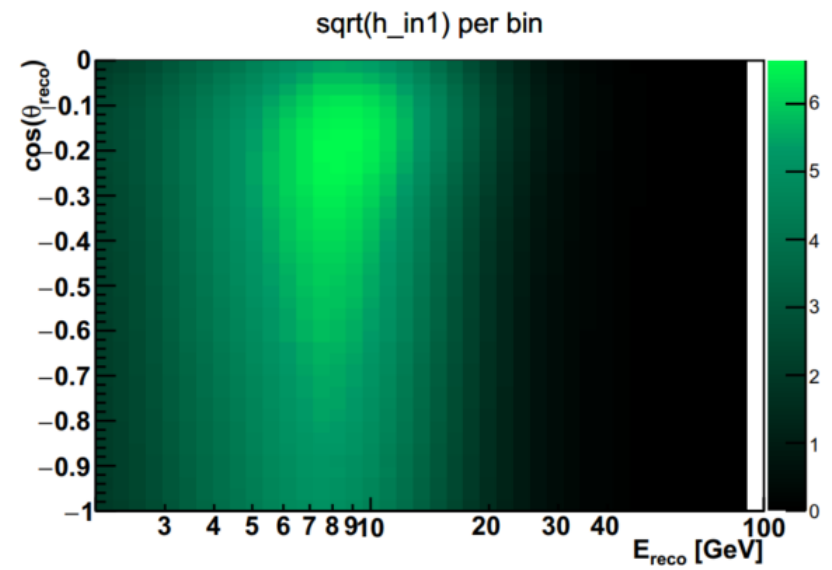
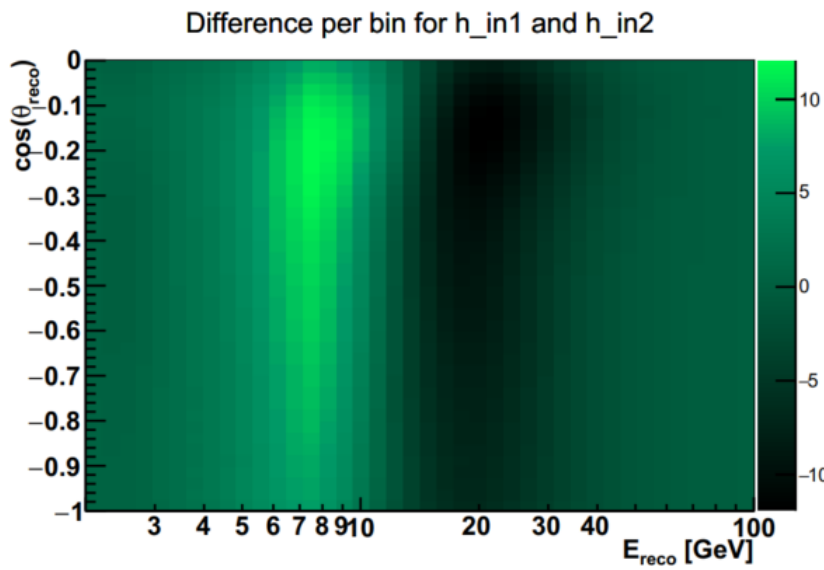
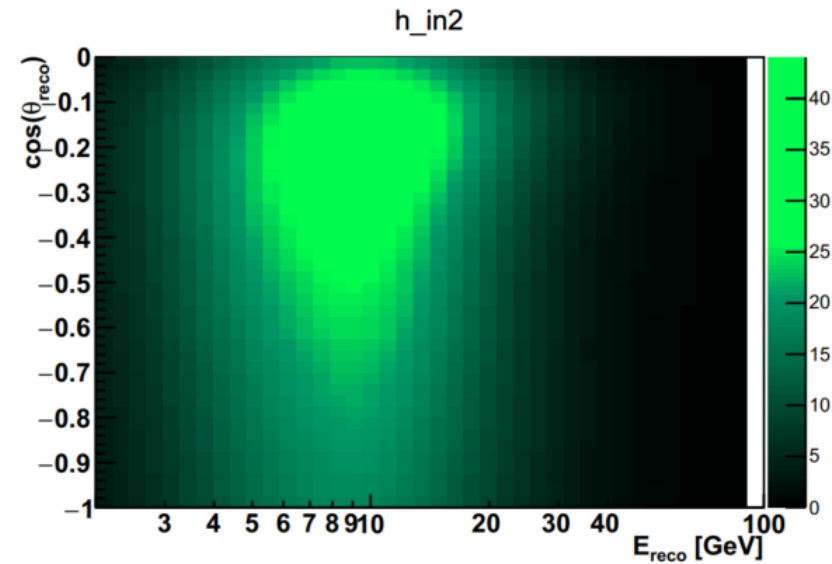
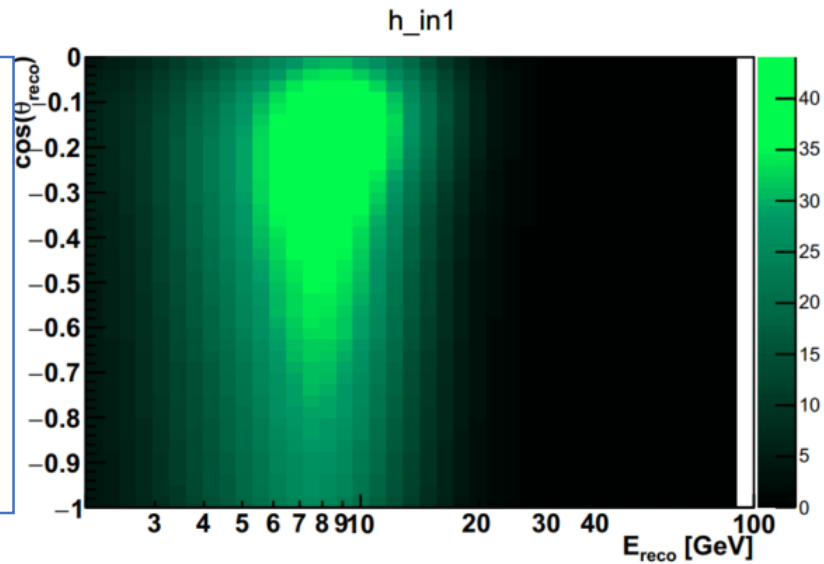
Ereco vs $\cos(\theta_{\text{reco}})$

Difference(A, B)

Errors:
 $\text{Sqrt}(A)$
(A and B are
strongly
correlated)

Scenario: $\sigma_E = \sigma$ (parametrized) vs $\sigma_E = 2\sigma$

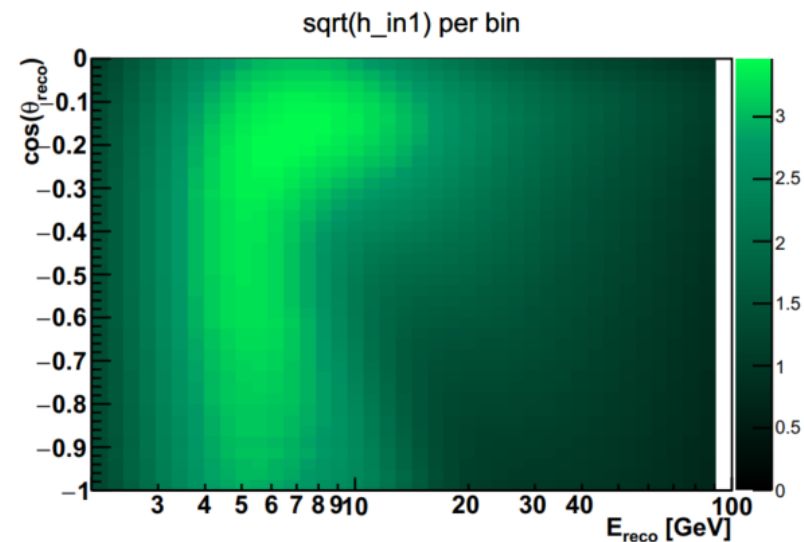
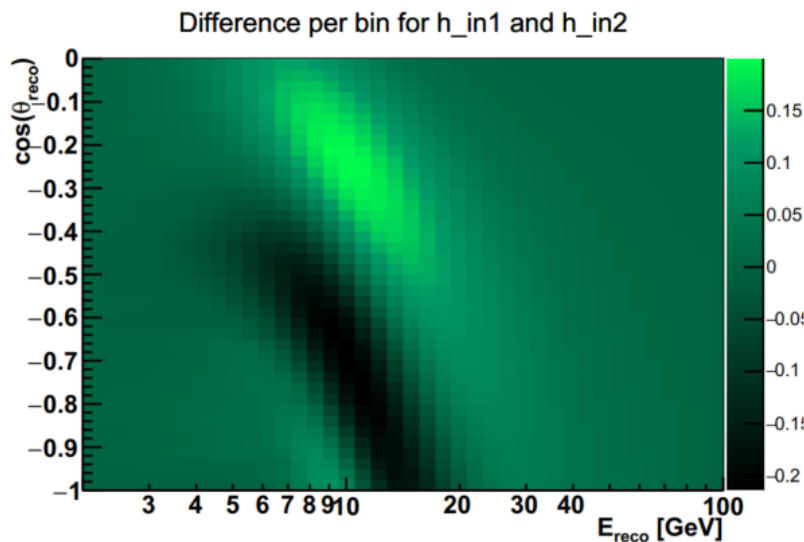
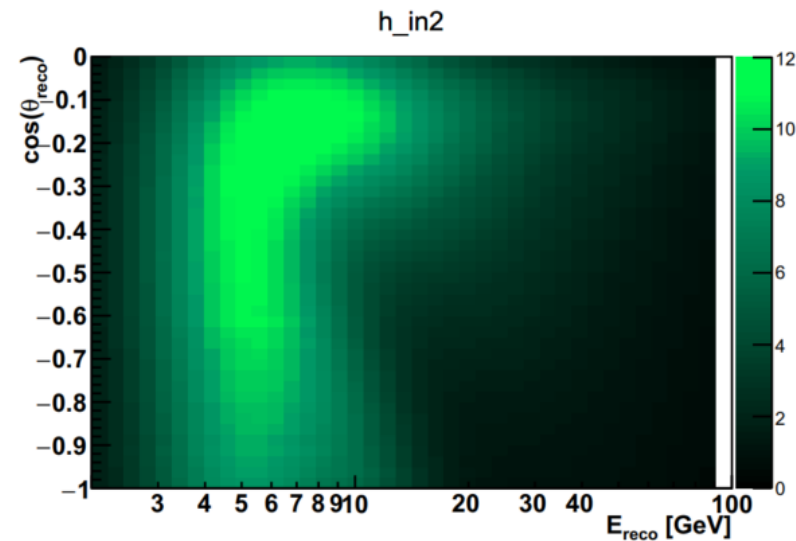
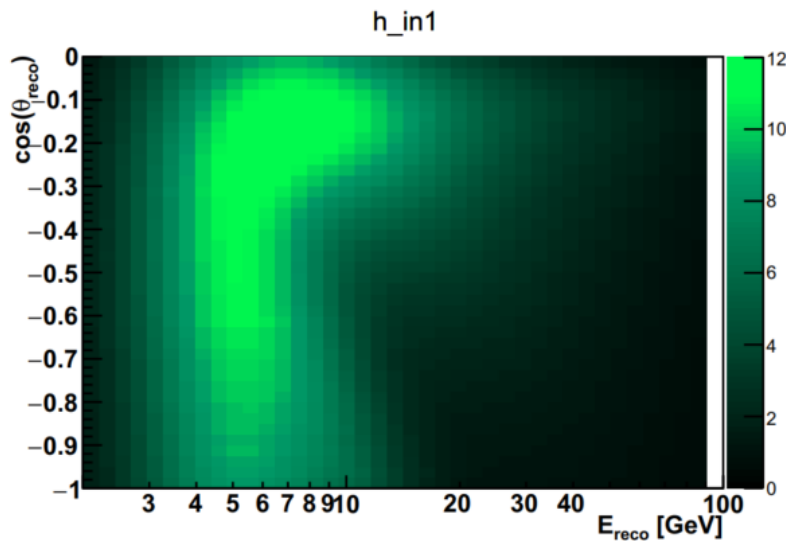
Detector: New
Type: Shower
 $\delta_{cp} = 0$
NMH=1
 $\theta_{23} = 40$



Scenario:

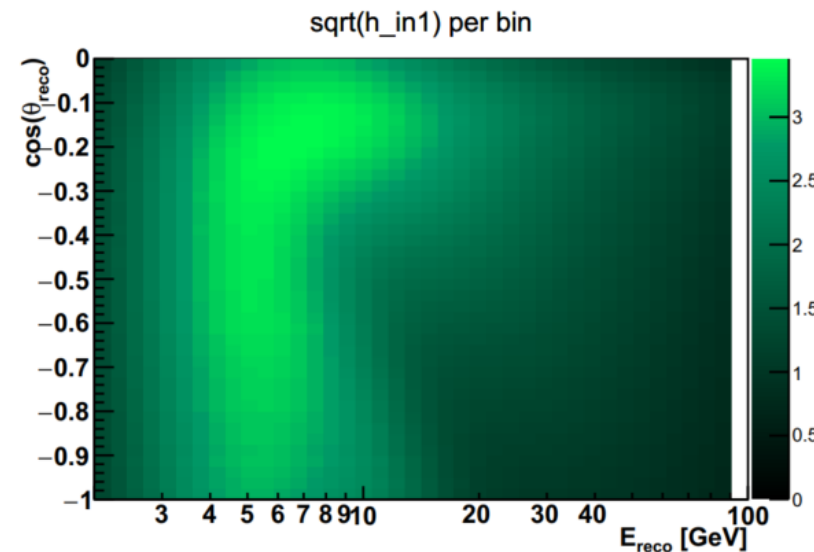
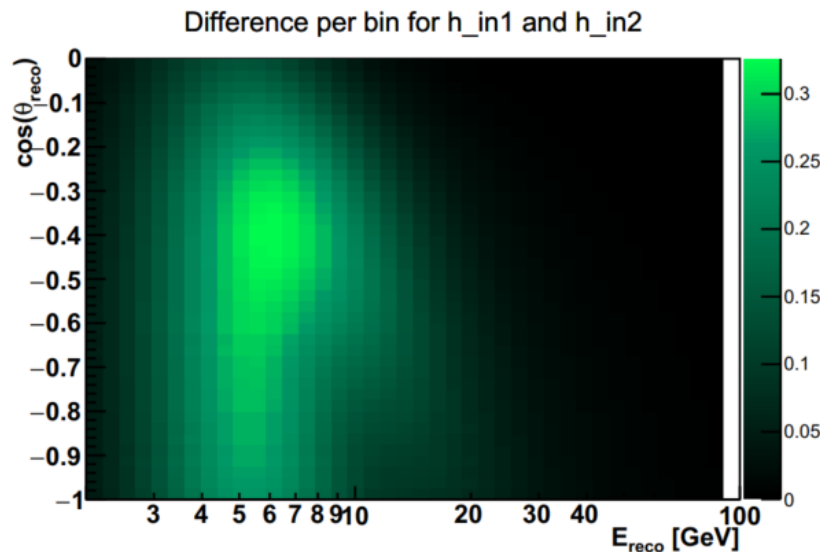
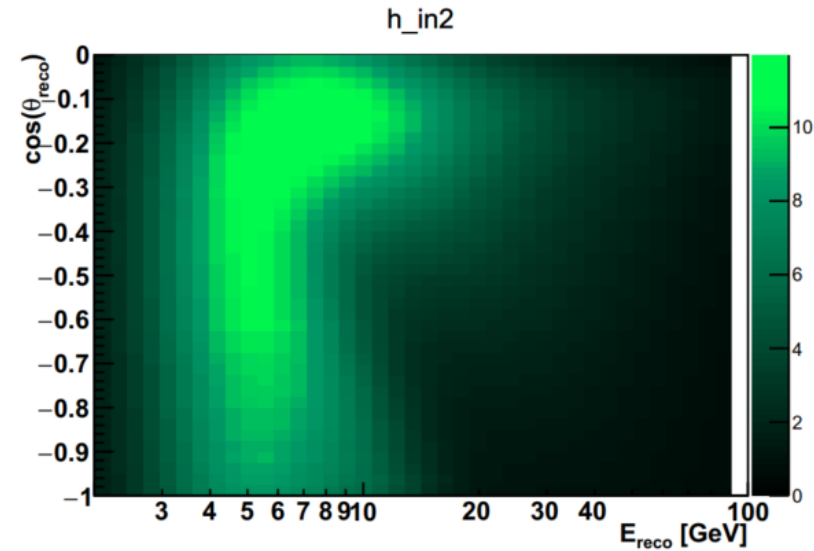
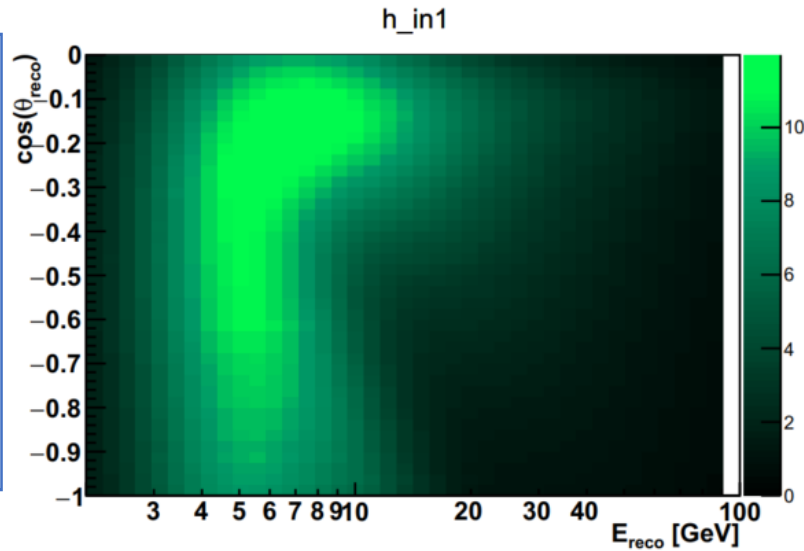
$$\Delta m_{23} = 2.4e-3 \text{ GeV}^2 \text{ vs } \Delta m_{23} = 2.5e-3 \text{ GeV}^2$$

Detector: LoI
Type: Track
 $\delta_{cp} = 0$
NMH=1
 $\theta_{23} = 40$
 $\sigma = \sigma_{\text{param}}$




Scenario: $\theta_{23} = 40$ vs $\theta_{23} = 43$ for $\sigma_E = \sigma_{(\text{parametrized})}$

Detector: LoI
 Type: Track
 $\delta_{cp} = 0$
 NMH=1
 $\theta_{23} = 40$
 $\sigma = \sigma_{\text{param}}$

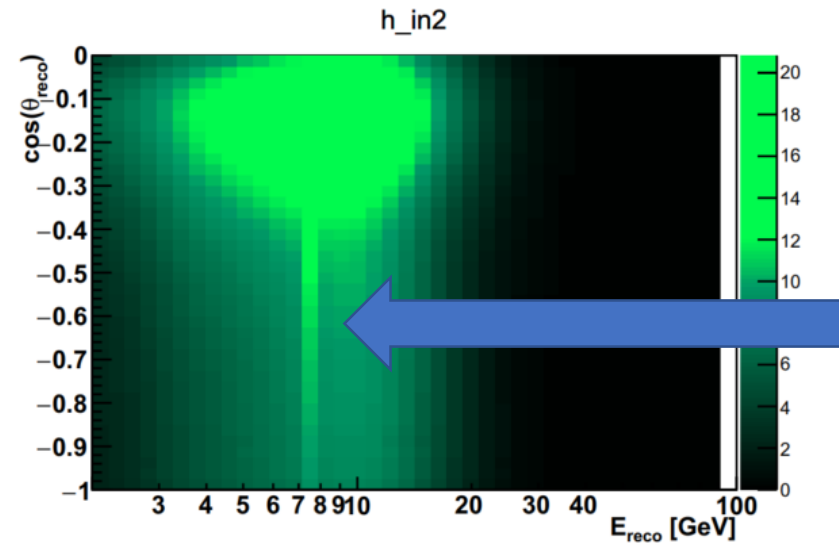
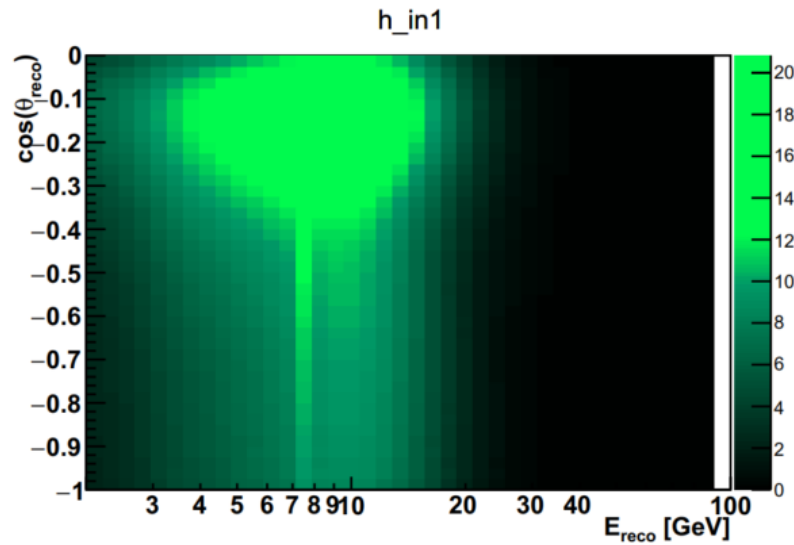


Next steps

- Energy resolution important!
 - Fit model to data
 - Check statistical significance
-
- Enjoy Kingsday 

Scenario 2: $\theta_{23} = 40$ vs $\theta_{23} = 50$

Detector: New
Type: Track
 $\delta_{cp} = 0$
NMH=1
 $\sigma = \sigma_{param}$



Fix this:
Use LoI instead

