Compton Edges vs. Xi Prediction vs. MC

17th December 2020

Compton Edge vs. xi

We would like to measure the position of the Compton Edge vs. xi!
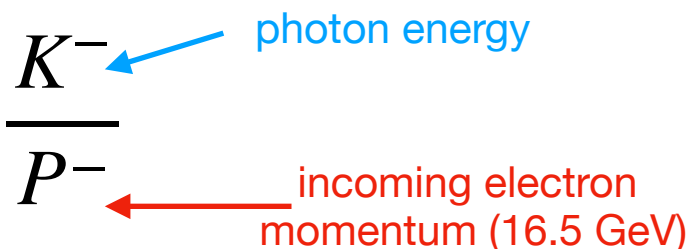
- xi here is the "true" xi of the interaction

Functional behaviour of edge position (from Ben, see also CDR theory chapter):

$$u_{\text{nonlin. QED}} = \frac{2n\eta}{2n\eta + 1 + \xi^2}$$

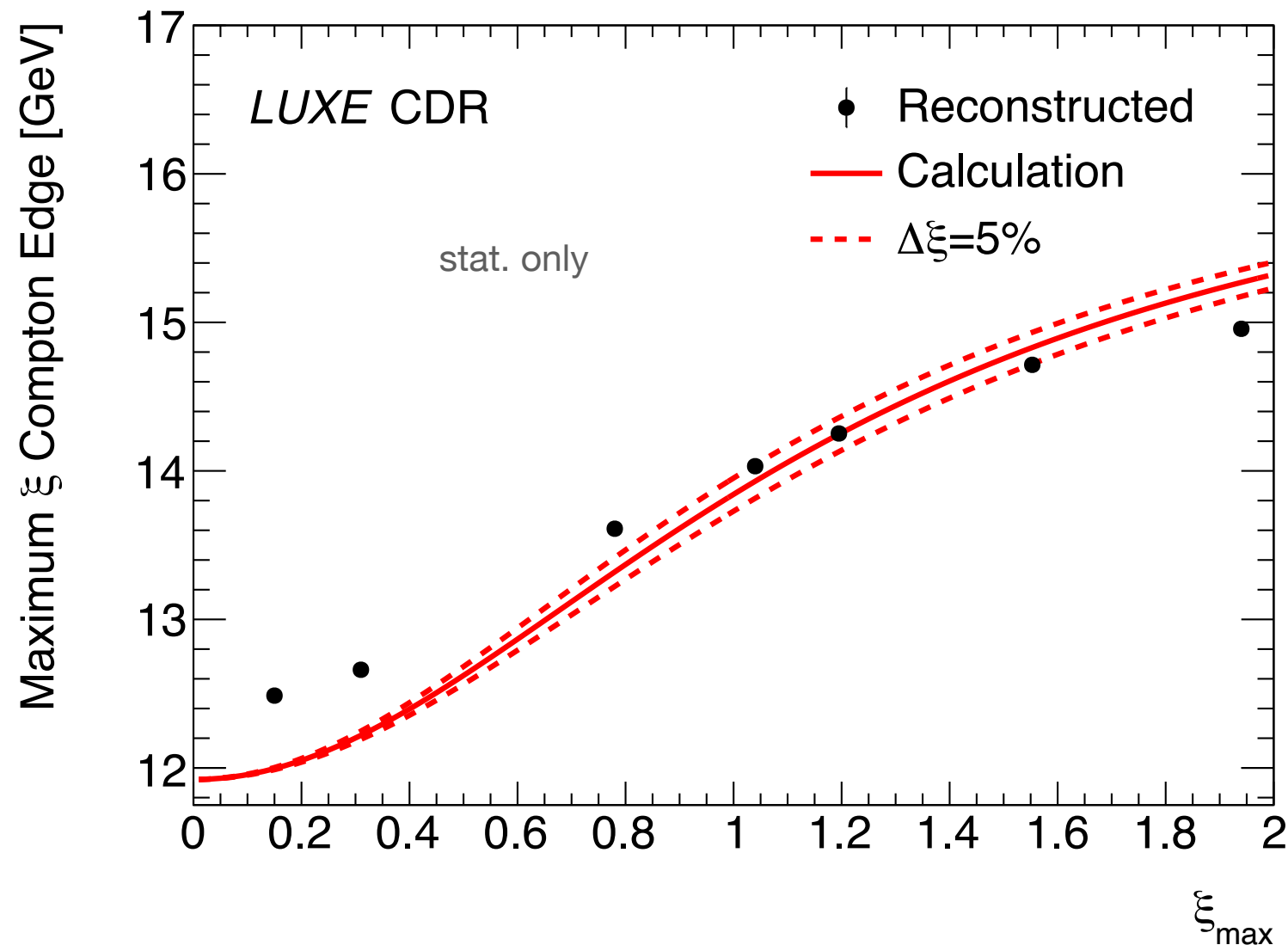$$\eta(16.5\,\text{GeV}) \approx 0.192$$
$$n = 1$$

"light front momentum fraction": $\quad u = \dfrac{K^-}{P^-}$

K^- → photon energy

P^- ← incoming electron momentum (16.5 GeV)

Functional behaviour for the electron edge (1-u):

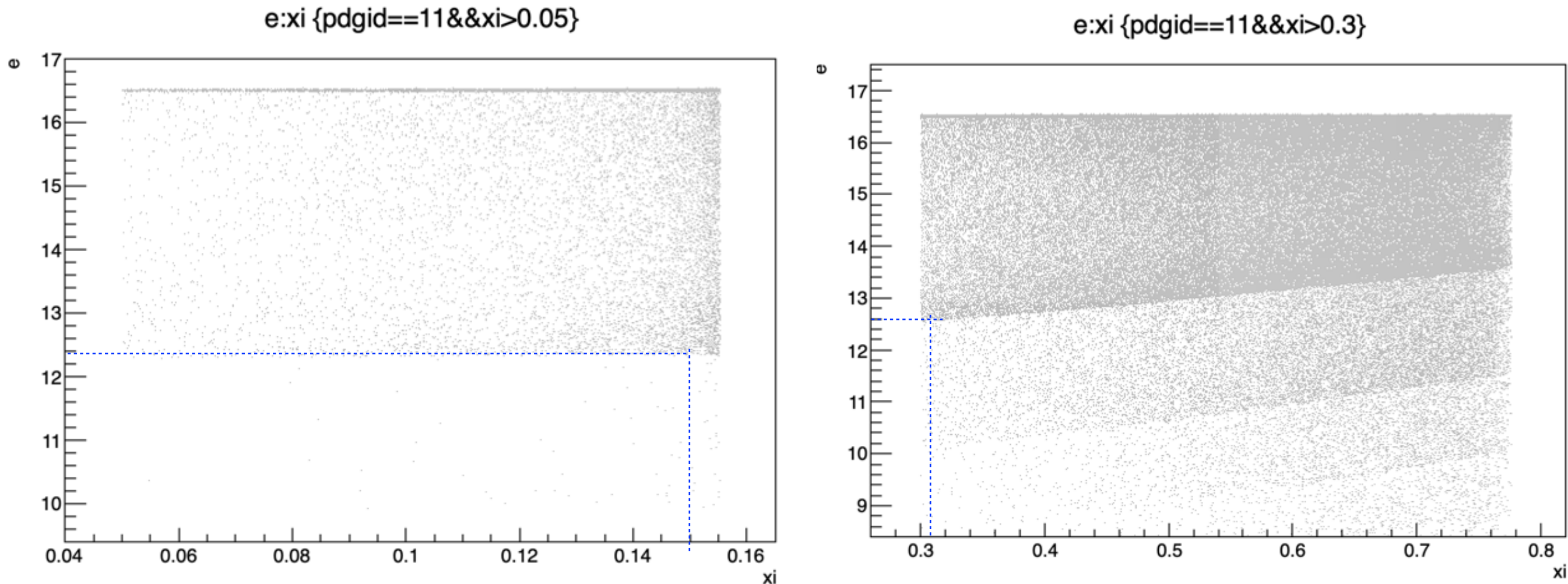$$E_{\text{e-},n} = E_{\text{beam}}\left(1 - \frac{2n\eta}{2n\eta + 1 + \xi^2}\right)$$

MC versus Functional behaviour

- black dots come from Tonys MC (using FIR edge reconstruction algorithm)
- red curve shows function from previous page
- low-xi limit of curve is ~12GeV, of MC points ~12.5 GeV

Points are above curve at low xi values!

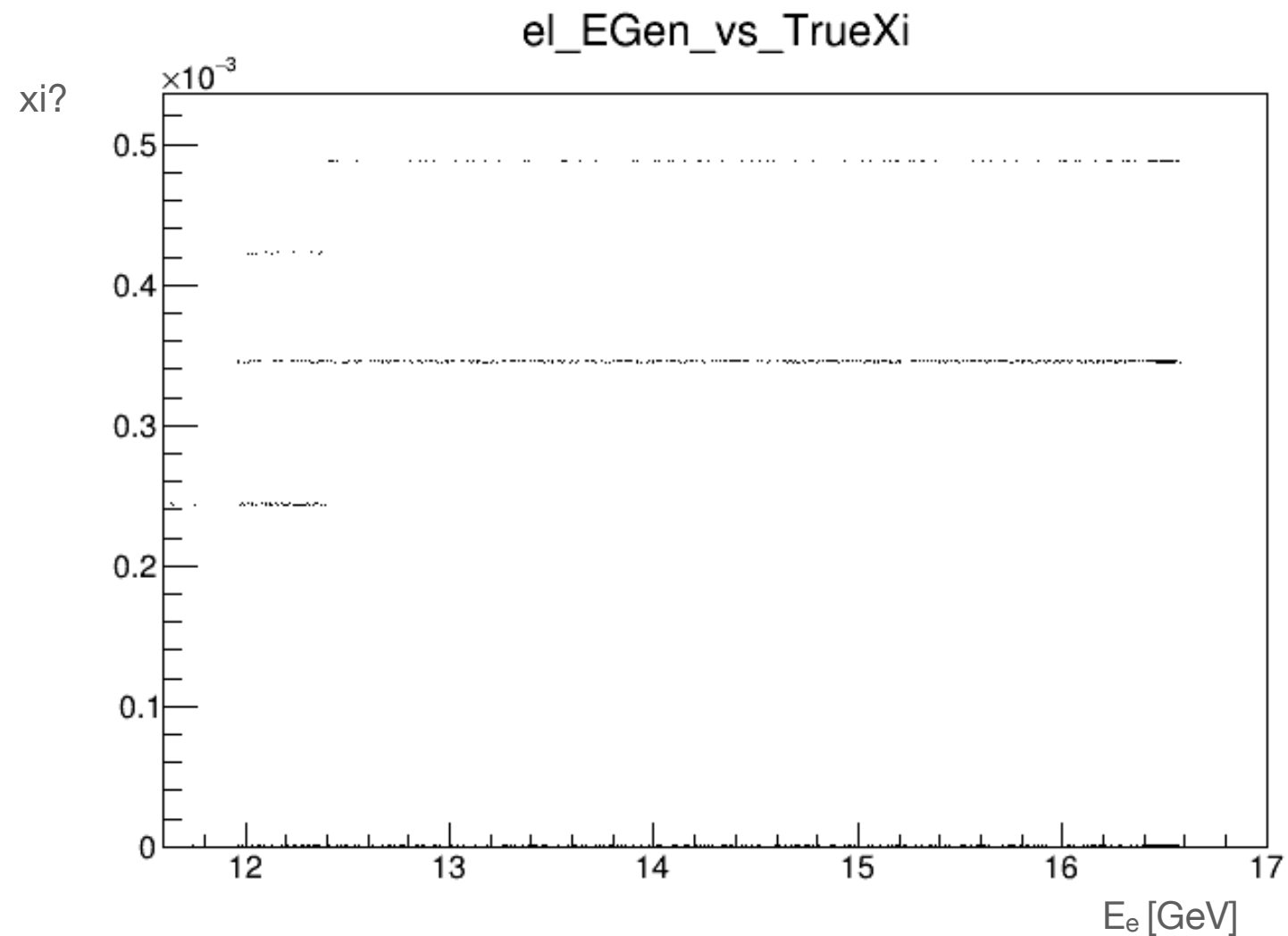# Tonys MC: Electron Energy vs true xi

- in Tonys stdhep file can access true xi per interaction

- plot this versus the electron energy spectrum

- edges are clearly visible

- lines to guide the eye where simulated xi values are

- e.g. for xi=0.15, edge is at 12.4 GeV, for xi=3.1, edge at 12.6 GeV

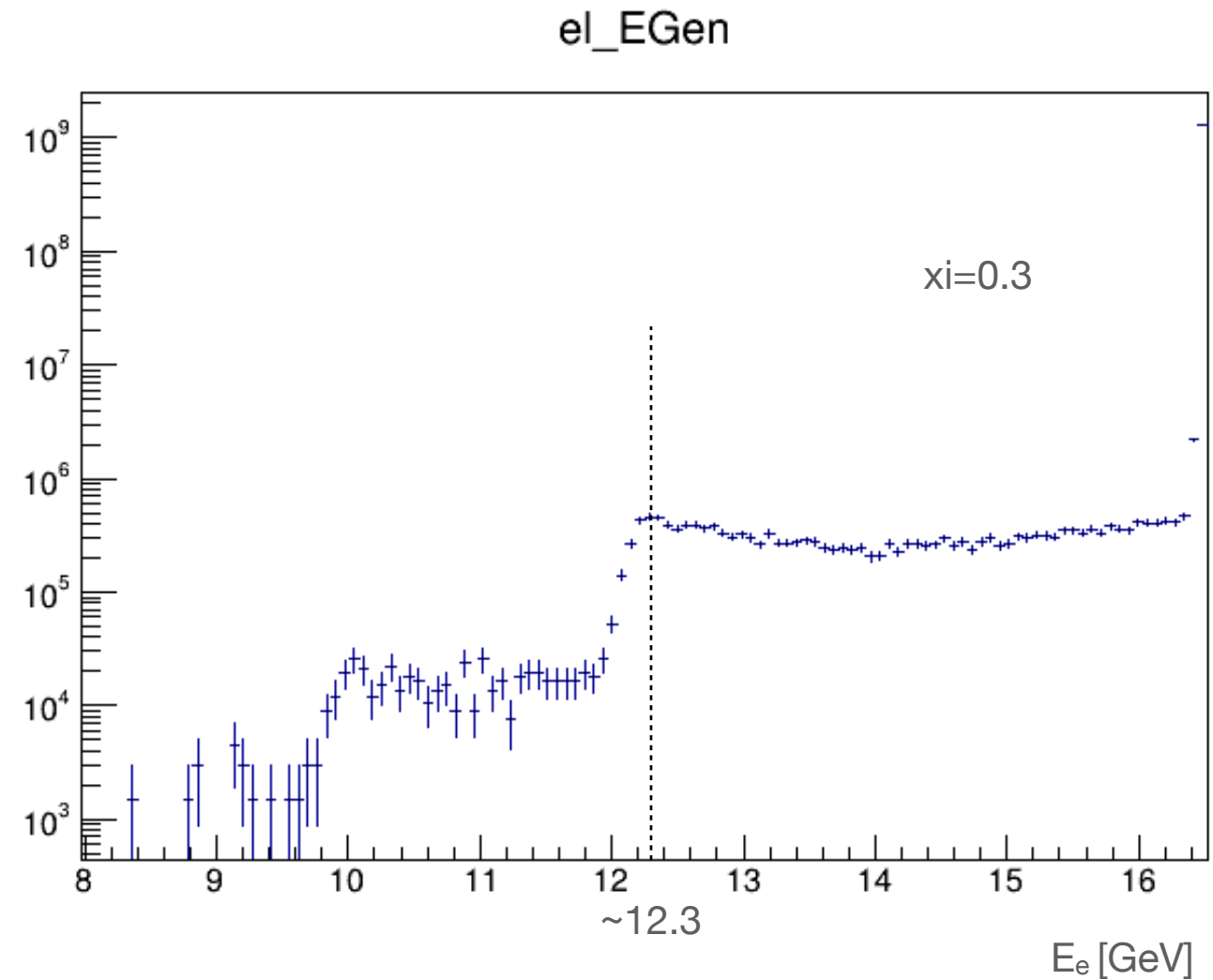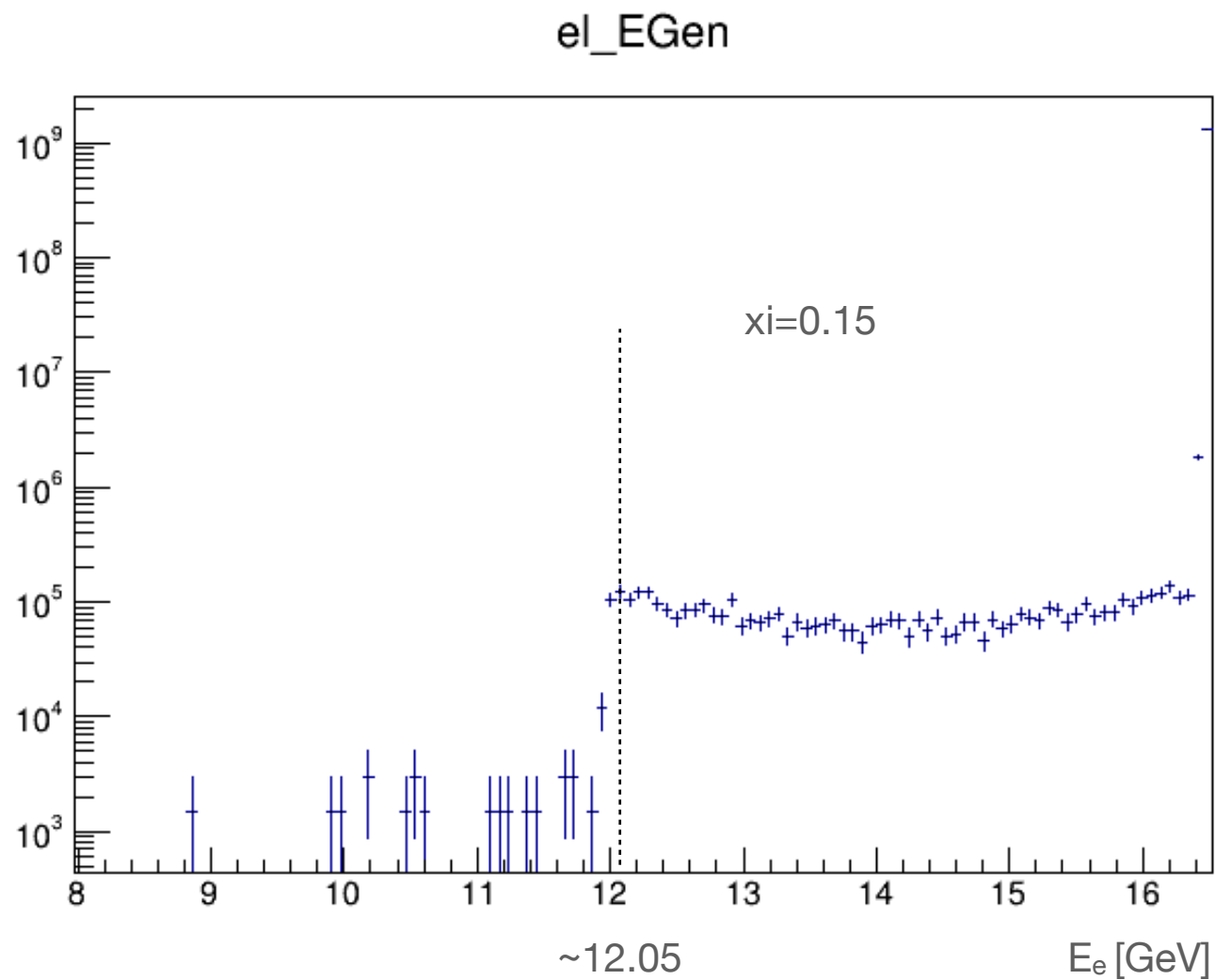**Seems this is not a bias in the edge reconstruction method!**

Why are the edge positions in Tonys MC different than in the prediction?
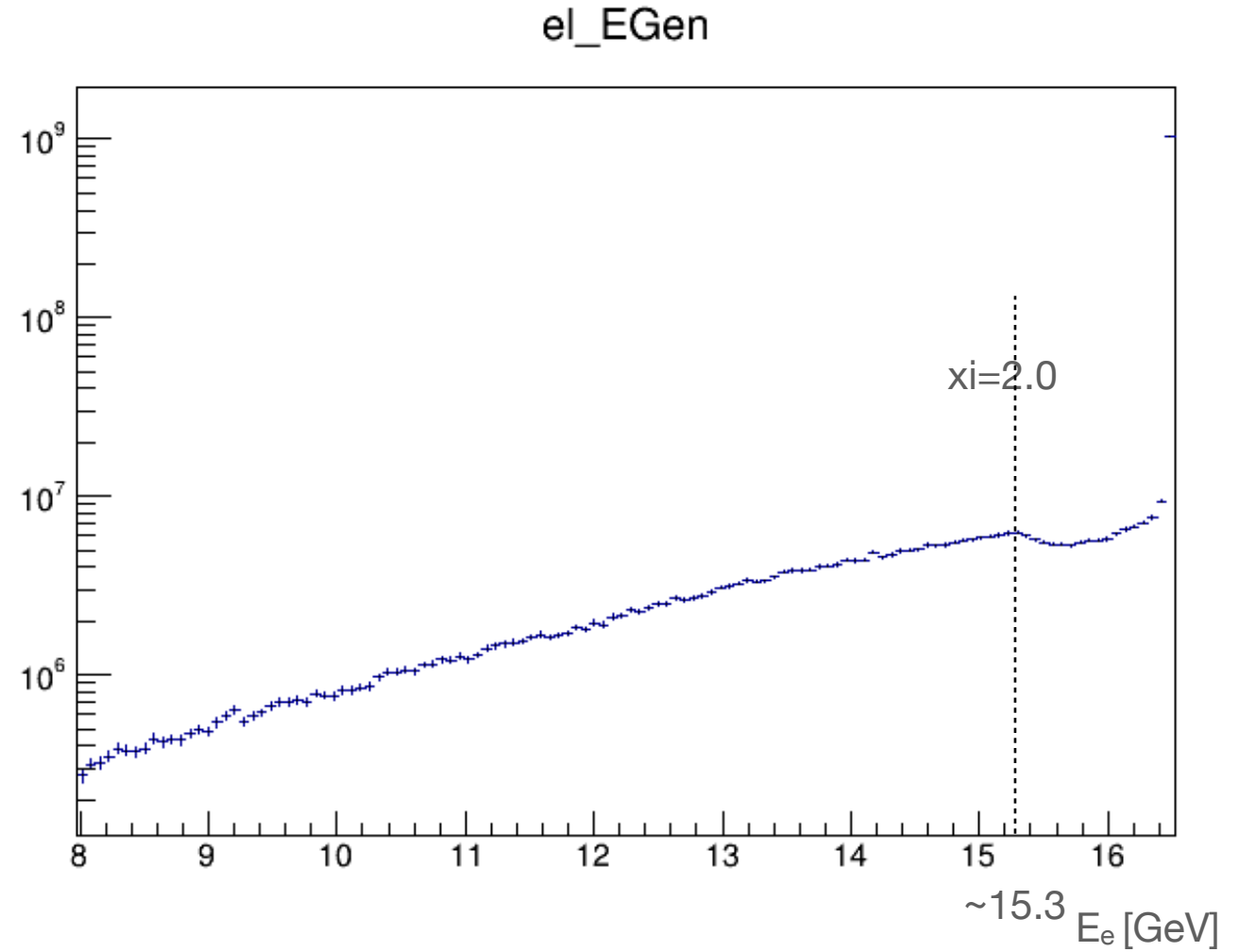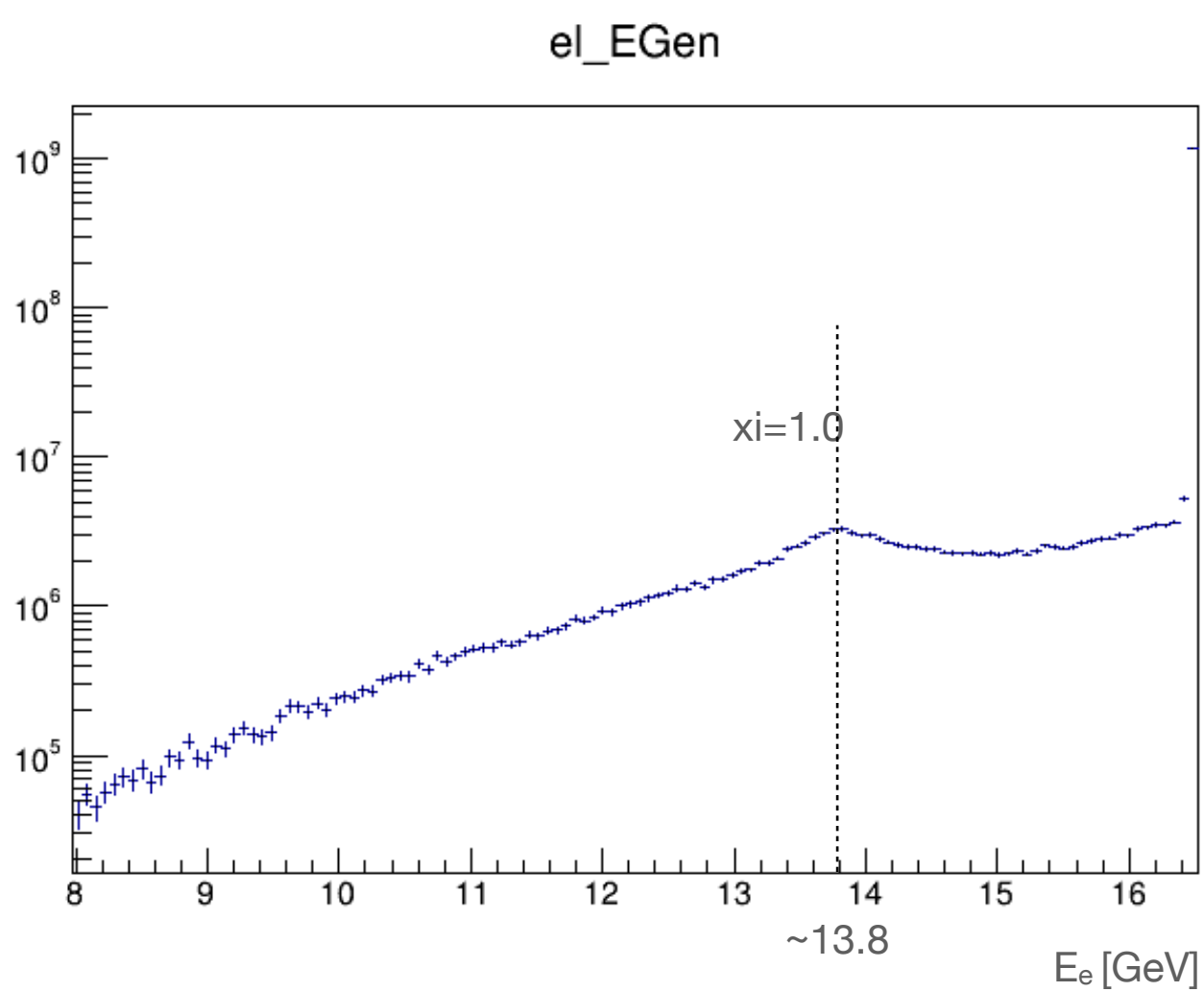
Toms MC: Electron Energy vs true xi

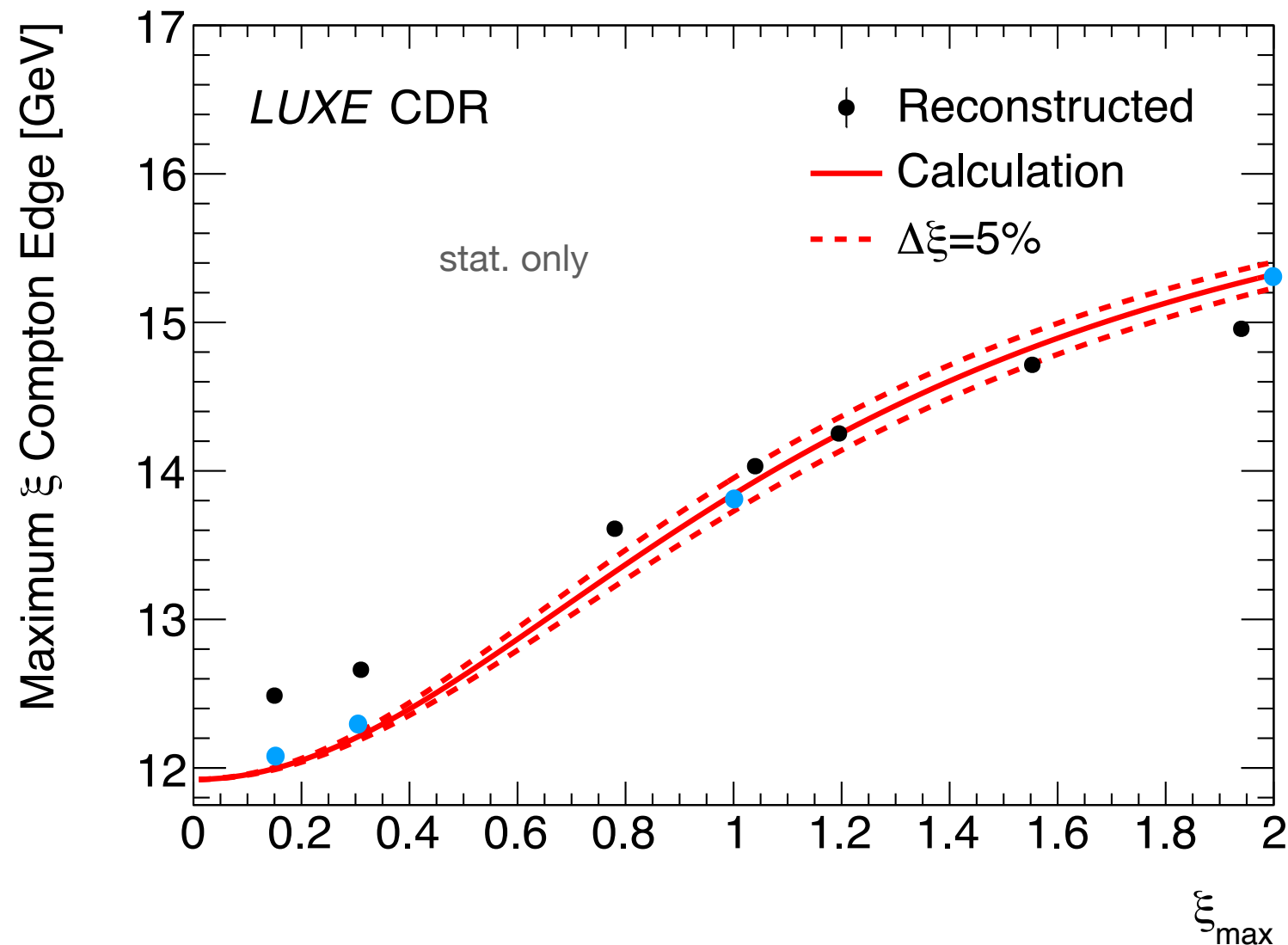**Why discrete xi values? Why is true xi so small?**

Toms MC: Electron Energy vs true xi

Toms MC: Electron Energy vs true xi

MC versus Functional behaviour

- Added points from Toms MC (blue points) by hand (truth information only, no detector binning!)

Much better agreement!