

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”:

$$u = \frac{K^-}{P^-}$$

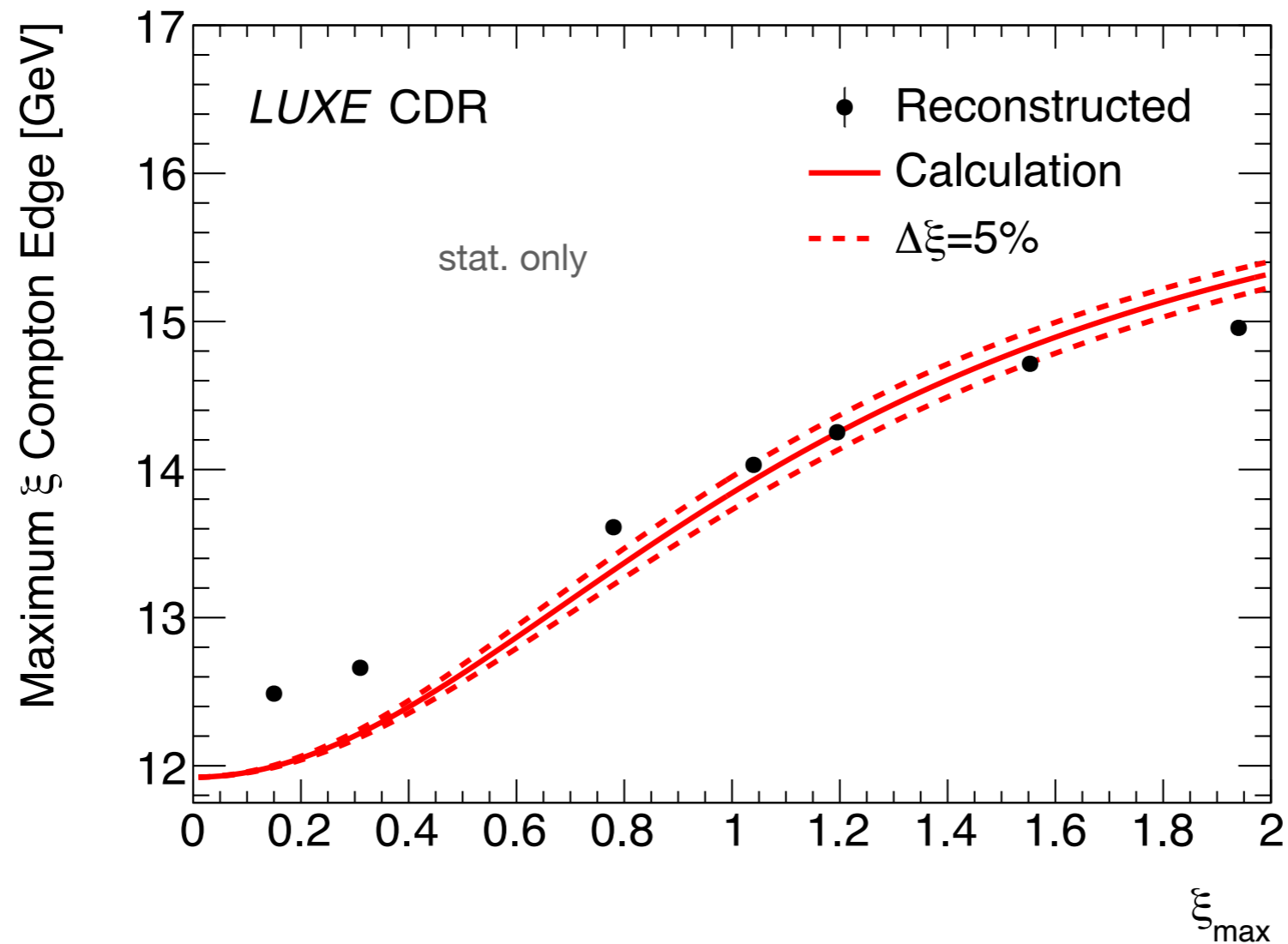
← photon energy

← incoming electron momentum (16.5 GeV)

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

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

MC versus Functional behaviour

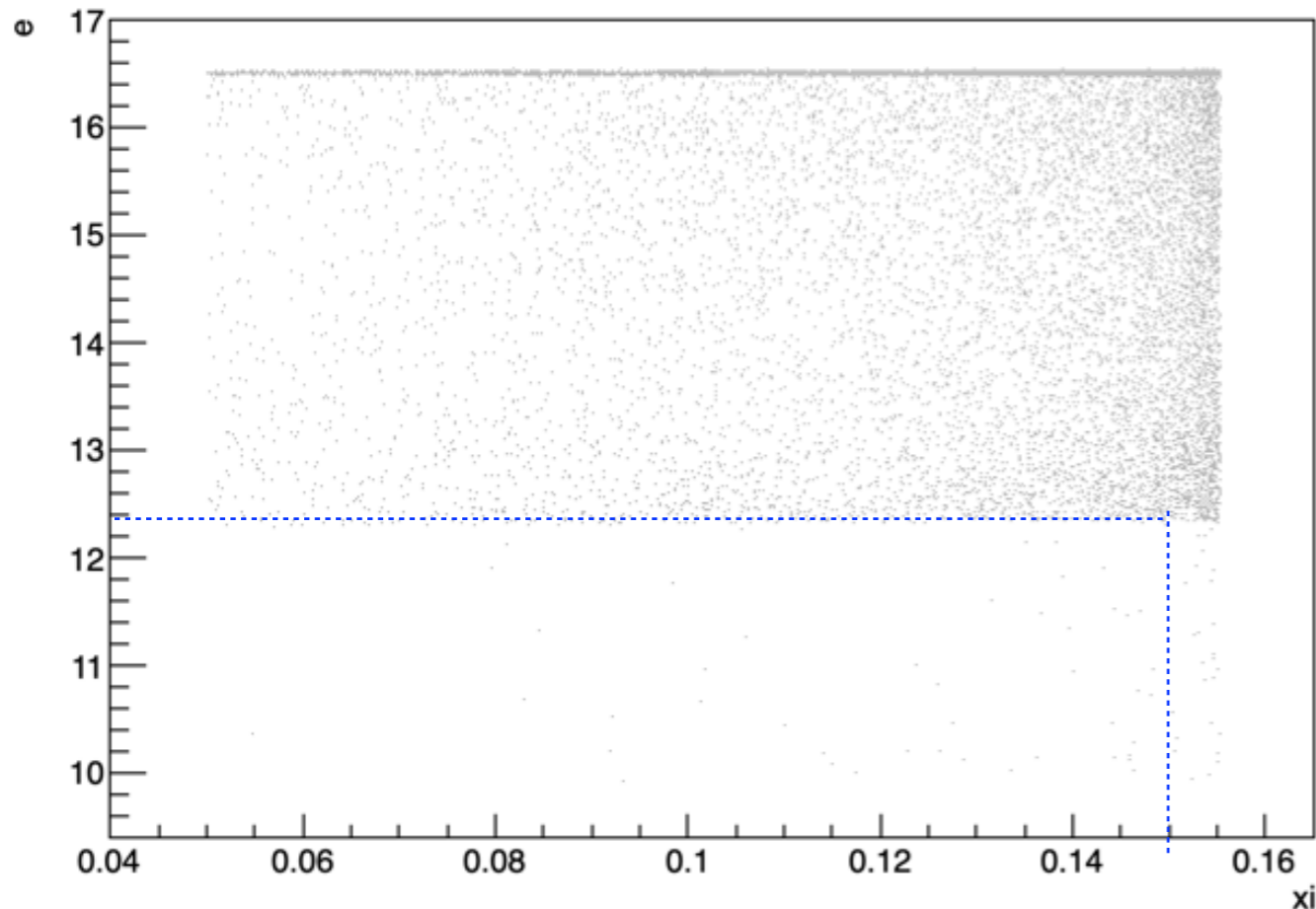


- black dots come from Tonys MC (using FIR edge reconstruction algorithm)
- red curve shows function from previous page
- low- ξ limit of curve is ~ 12 GeV, of MC points ~ 12.5 GeV

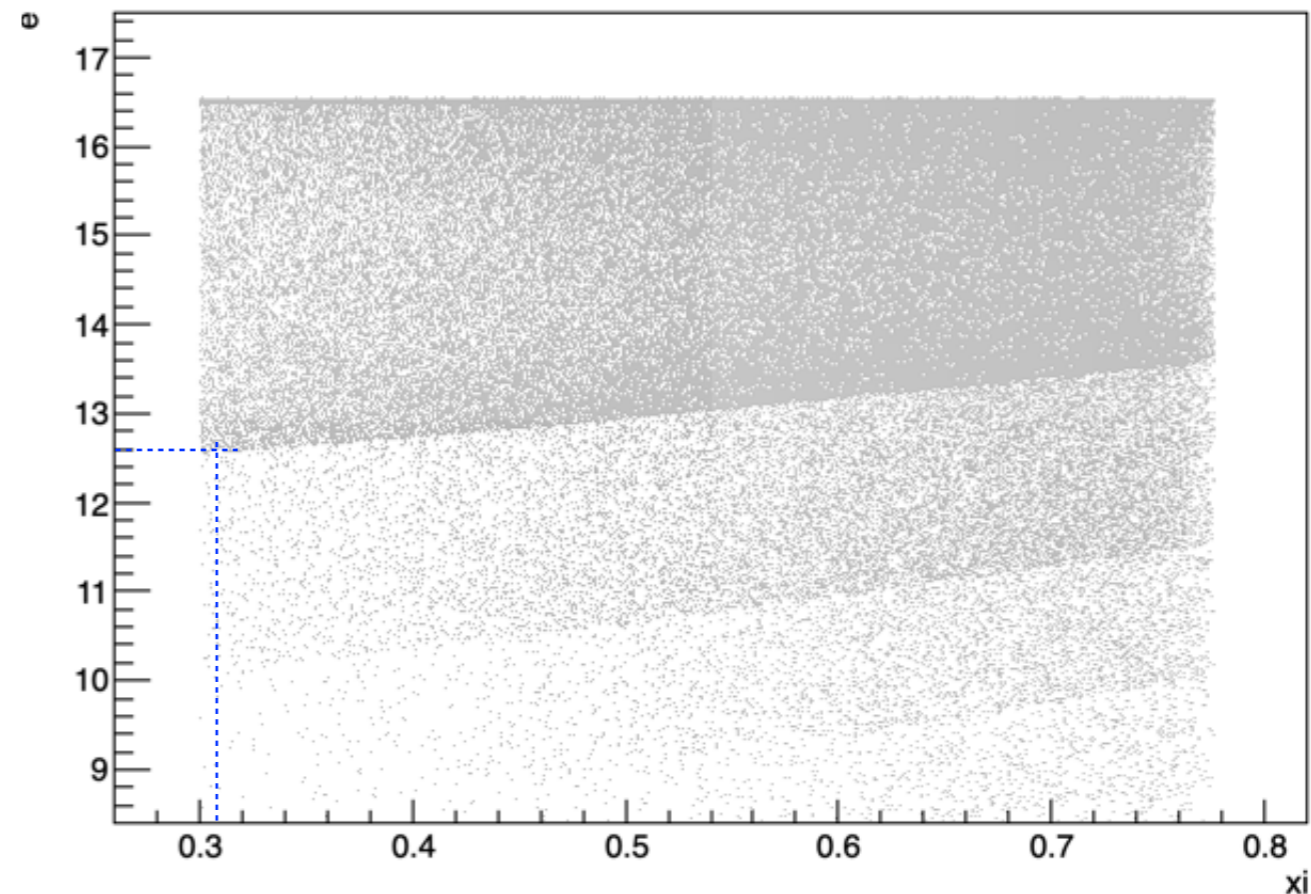
Points are above curve at low ξ values!

Tonys MC: Electron Energy vs true xi

e:xi {pdgid==11&&xi>0.05}



e:xi {pdgid==11&&xi>0.3}



- 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?