Digital RPC-HCAL slice test studies

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and **FERMILAB**

Outline

- **General**
- **Shower longitudinal profile**
- **Some results**

General

- **event selection**

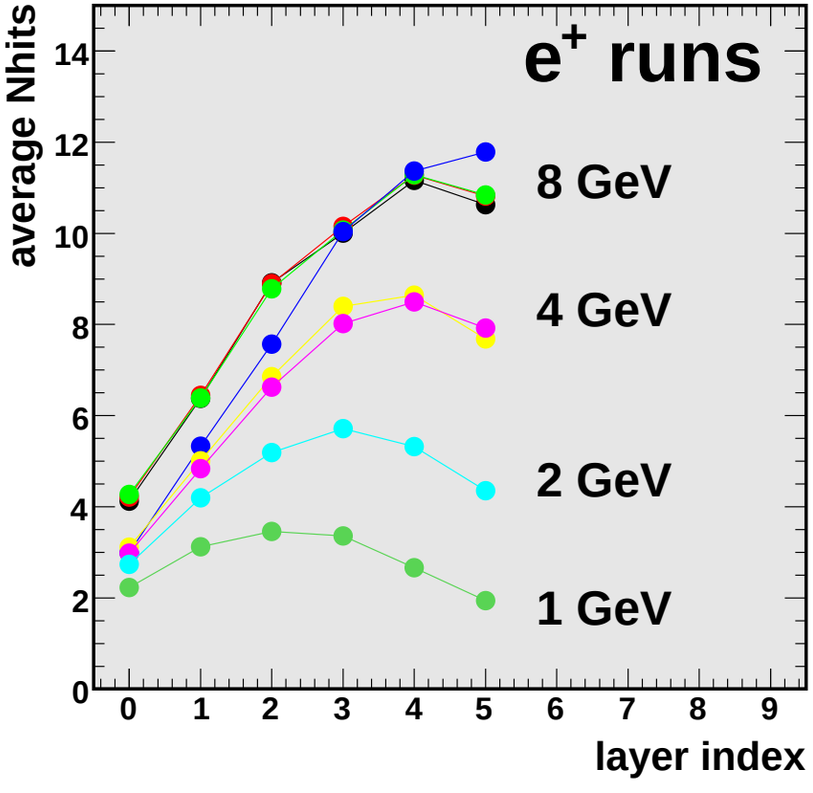
  : study with the e^+ runs,
  consider only the signal recorded from the first 6 chambers
  (6 absorber layers, 16mm steel + 4mm Cu each $\simeq 1.19X_0$ per layer)

  : preliminary results, no selection cuts, no corrections

- **runs under study**

E(GeV)	e^+ run	# of events	
8	240 241 242 254	39060	(=685+10808+15279+12288)
4	259 260	13192	(=779+12413)
2	262	8636	
1	270	12097	

Shower longitudinal profile



showers are not well contained (but shower maxima are, almost)

Shower longitudinal profile

- **· calorimetry basics**

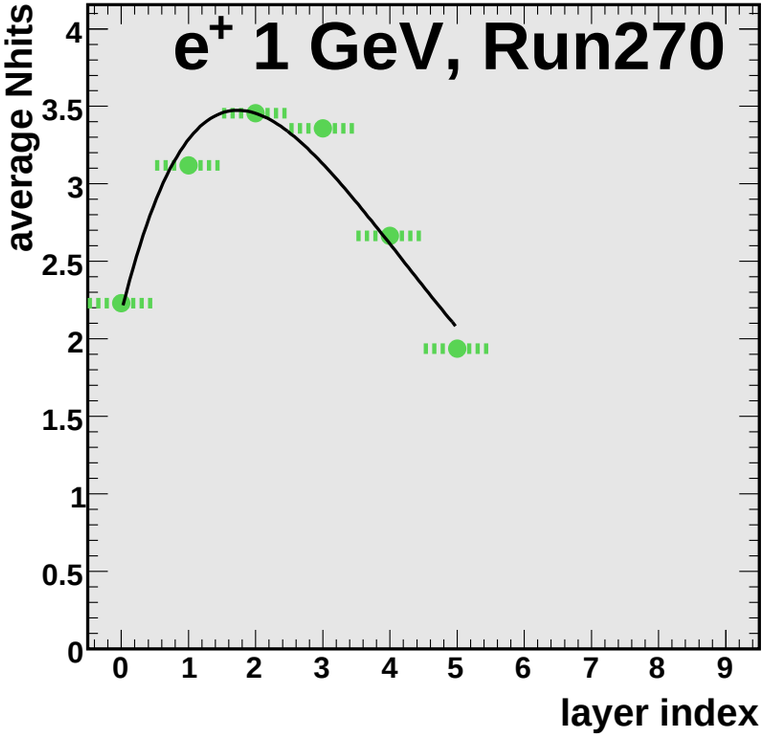
  : the mean longitudinal profile of the energy deposition in an electromagnetic shower is reasonably described by

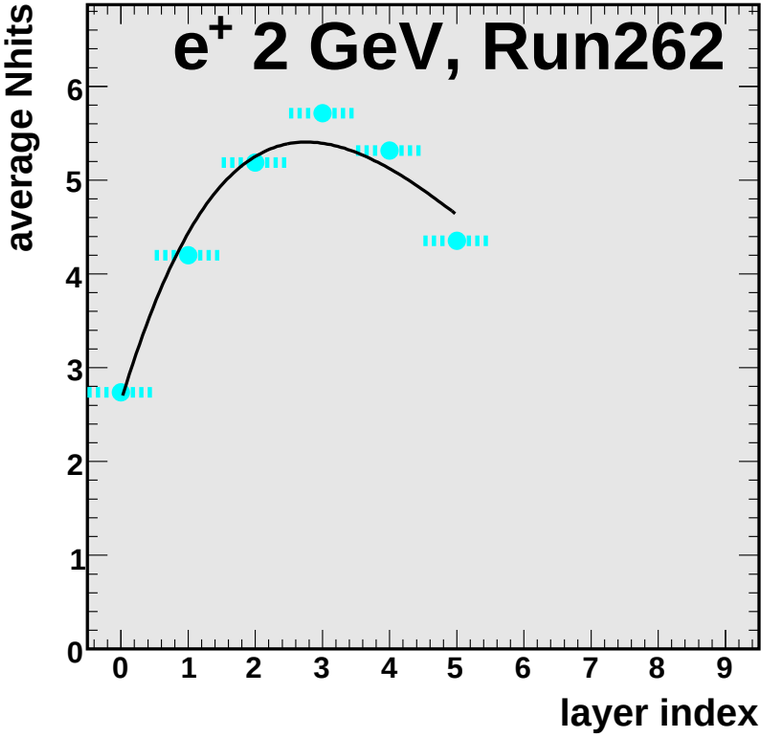
$$\frac{dE}{dt} = E_0 \cdot b \cdot \frac{(bt)^{a-1} e^{-bt}}{\Gamma(a)}$$ (with $t = x/X_0$)

  : the maximum occurs at $t_{max} = (a-1)/b$ and it scales logarithmically with incident energy

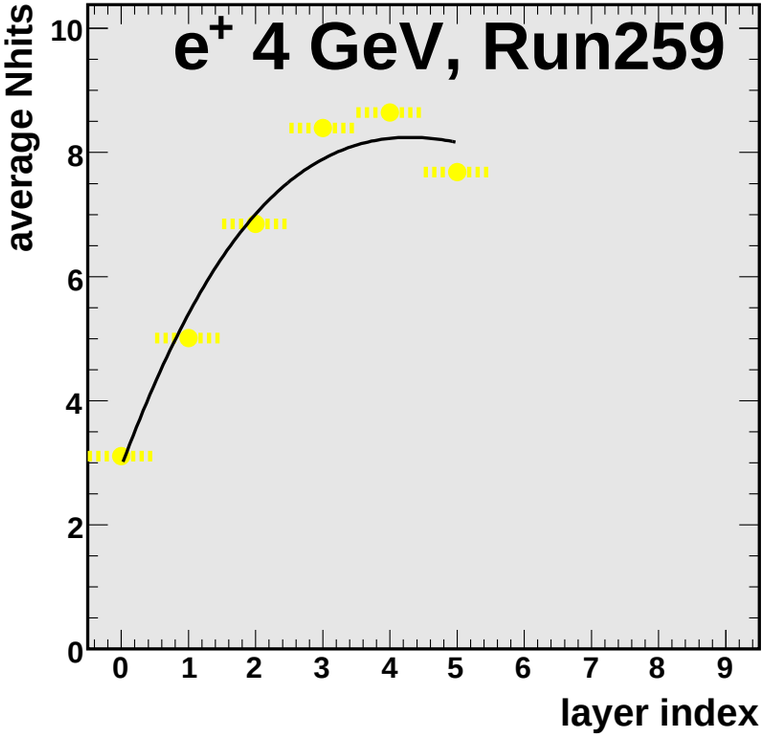
- **· Is this true for a digital calorimeter ?**

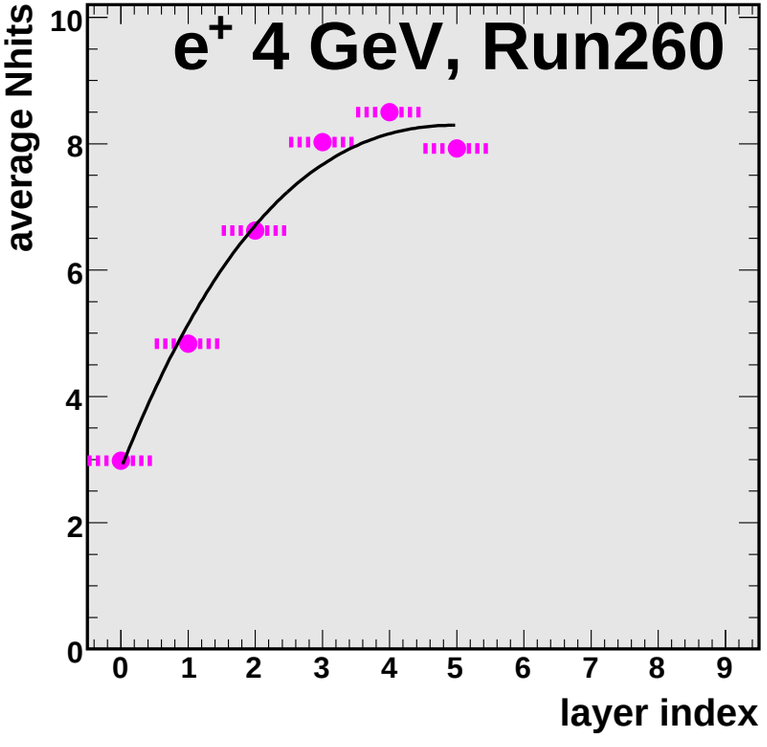
Slice test data at 1 & 2 GeV



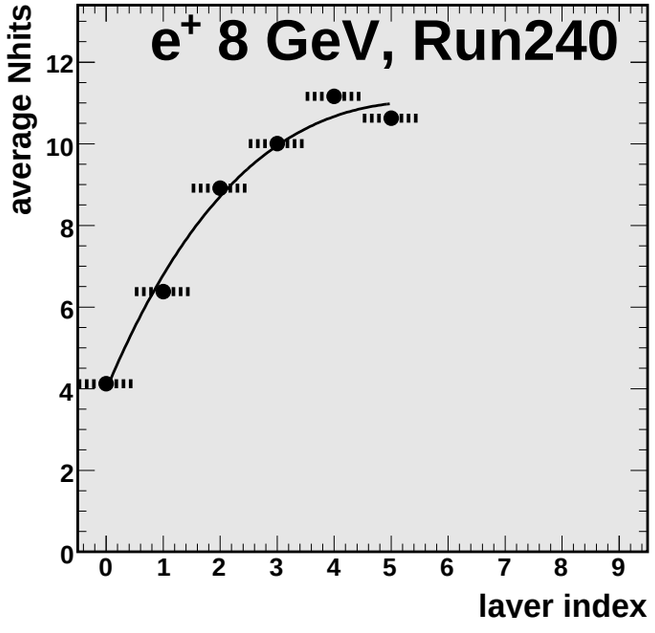


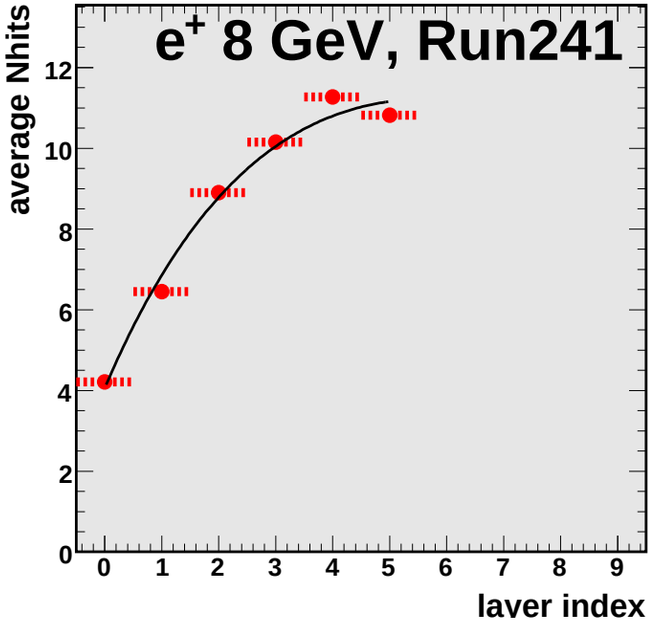
Slice test data at 4 GeV

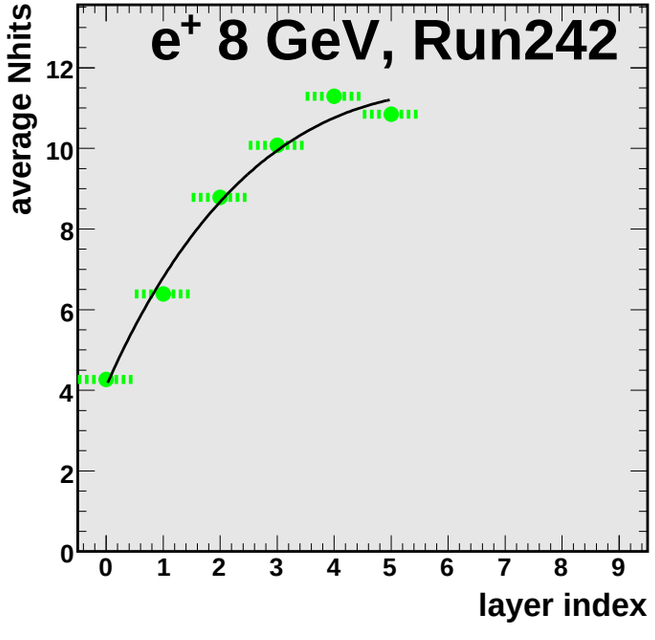


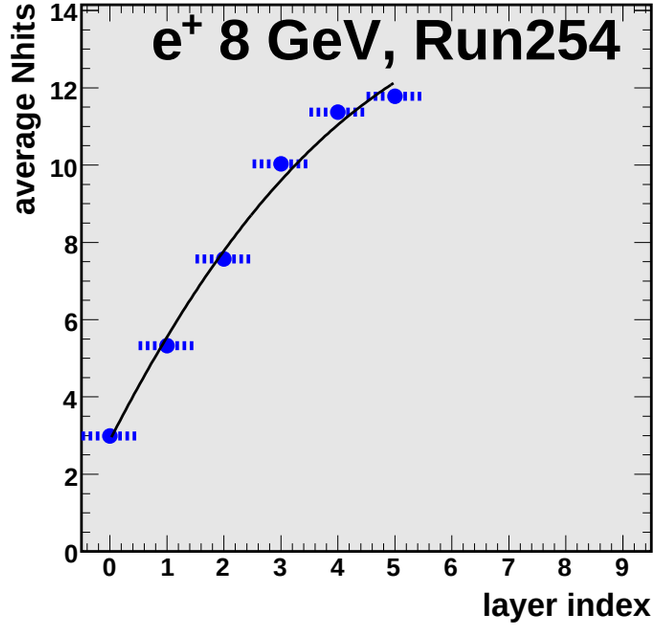


Slice test data at 8 GeV

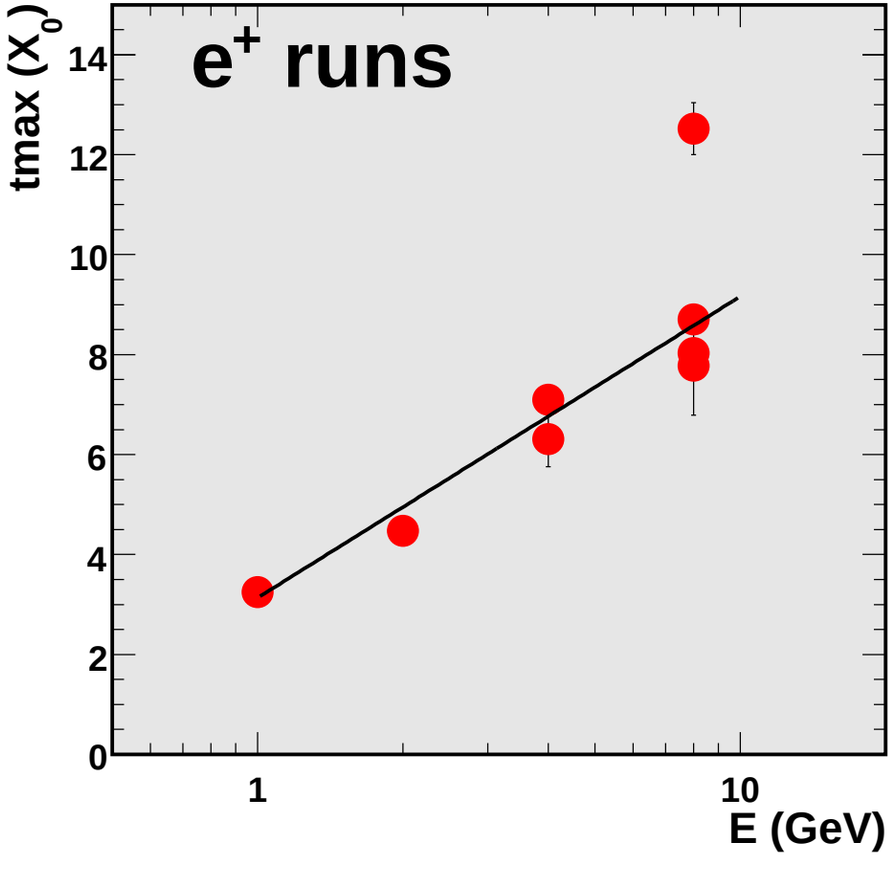






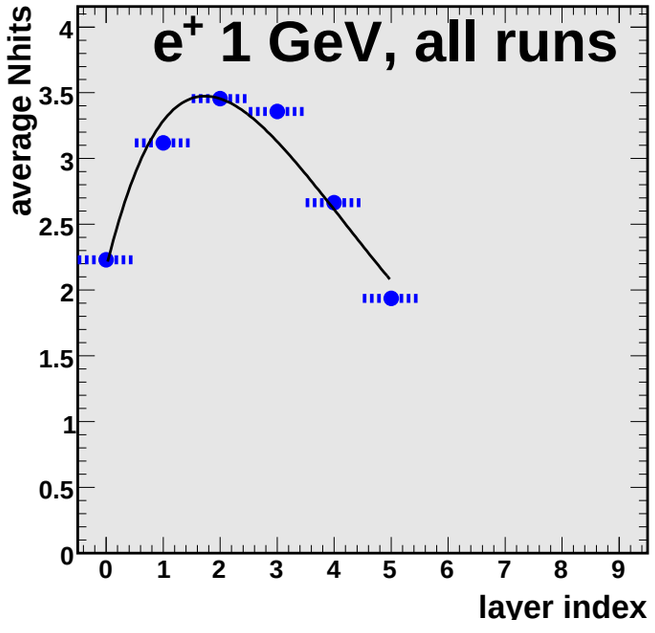


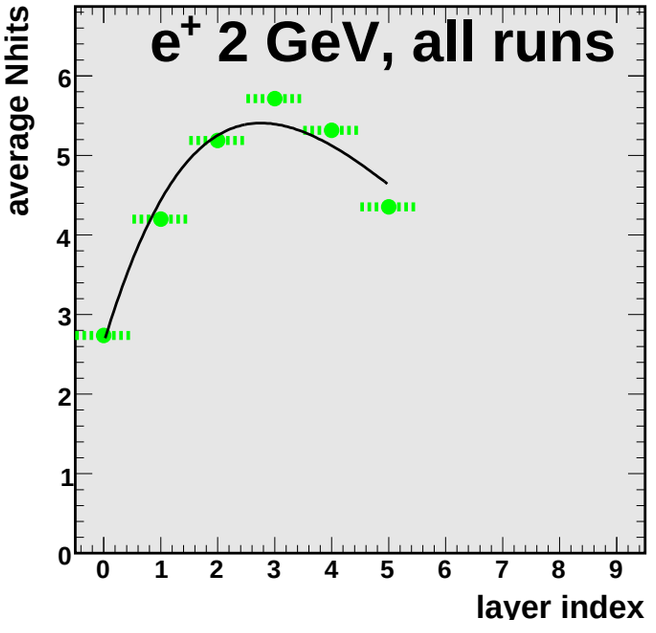
Shower maximum vs incident energy

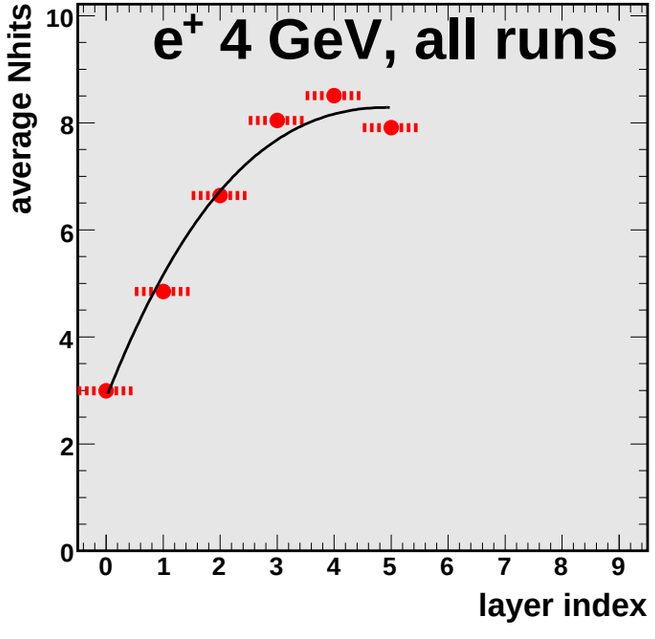


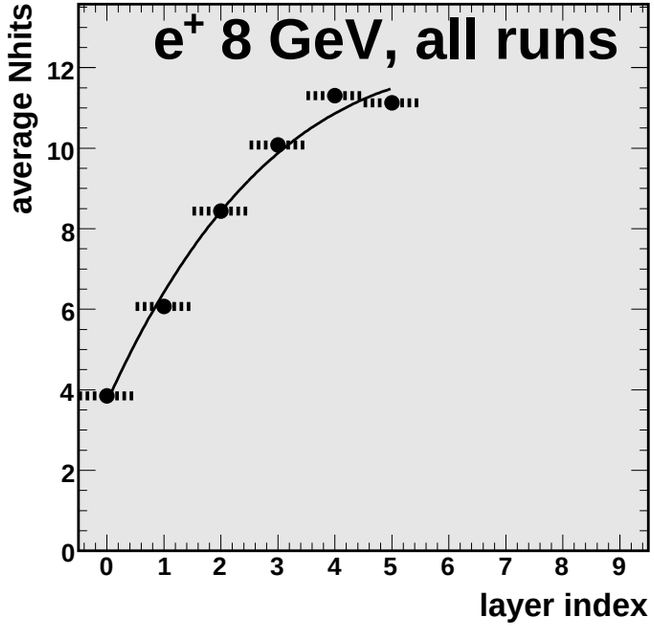
(one point per run)

Same energy runs combined

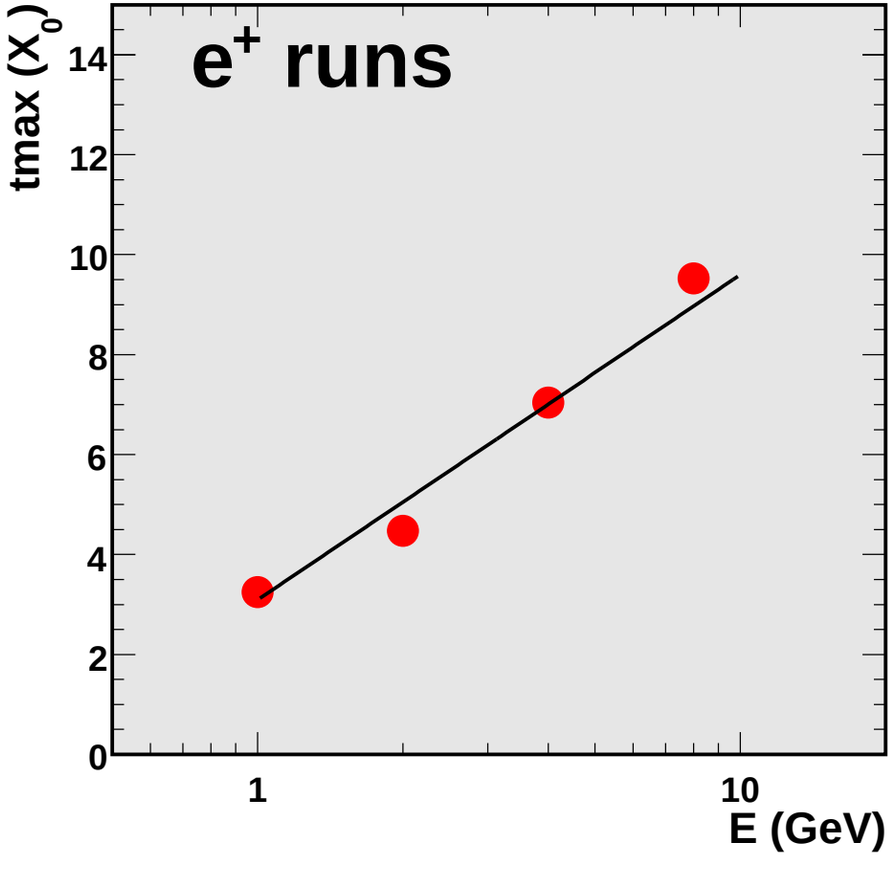








Shower maximum vs incident energy



(with same energy runs combined)