

Crystal Uniformity Effects

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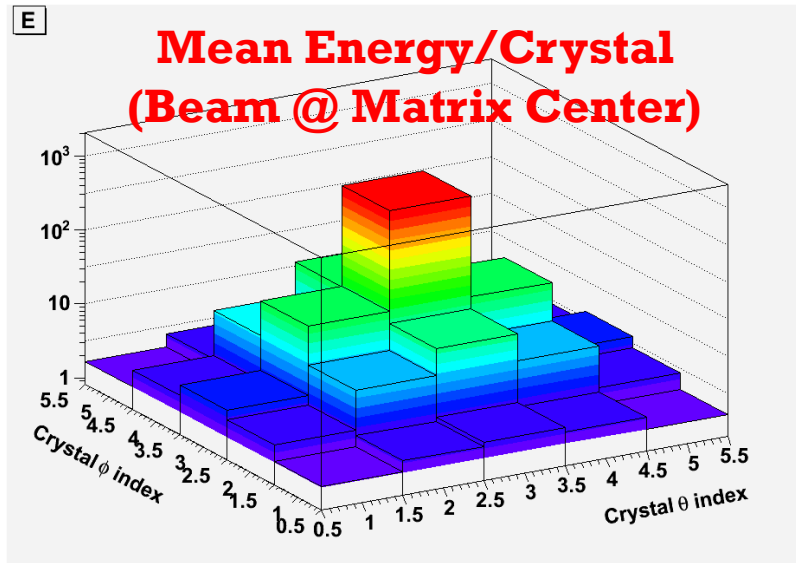
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Intro

- MC Study on the effect of the crystal non-uniformity effects on energy resolution
- Electrons at the center of the TB matrix
- Study with full EMC will be performed in the future
- All the results are **VERY PRELIMINARY**

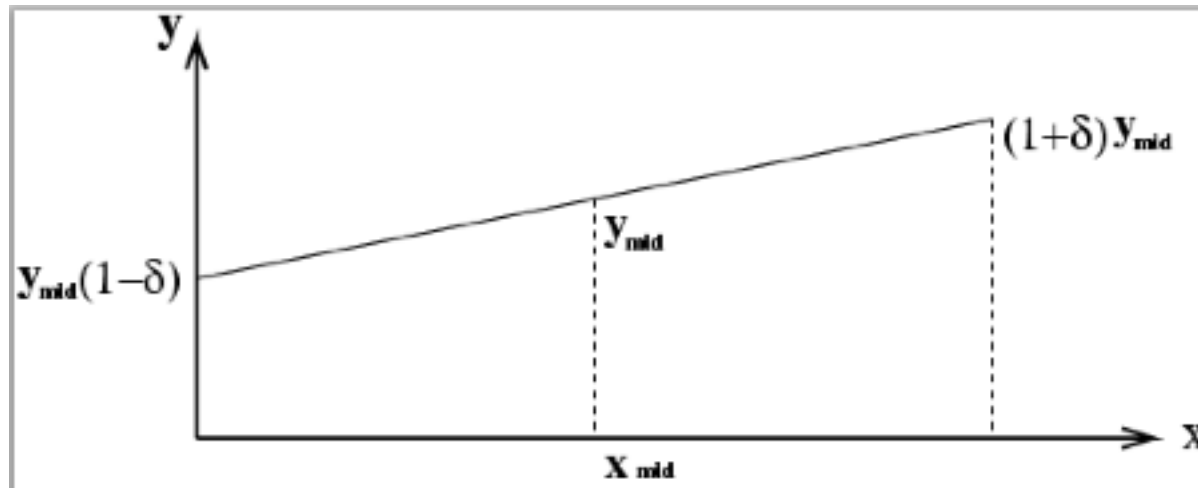
Beam Position and Energy



- **Beam:**
 - Monoenergetic pencil e- beam
- **Beam Energy:**
 - 0.1 - 1 - 5 GeV
- **Beam Position:**
 - Matrix Center

Non Uniformity definition

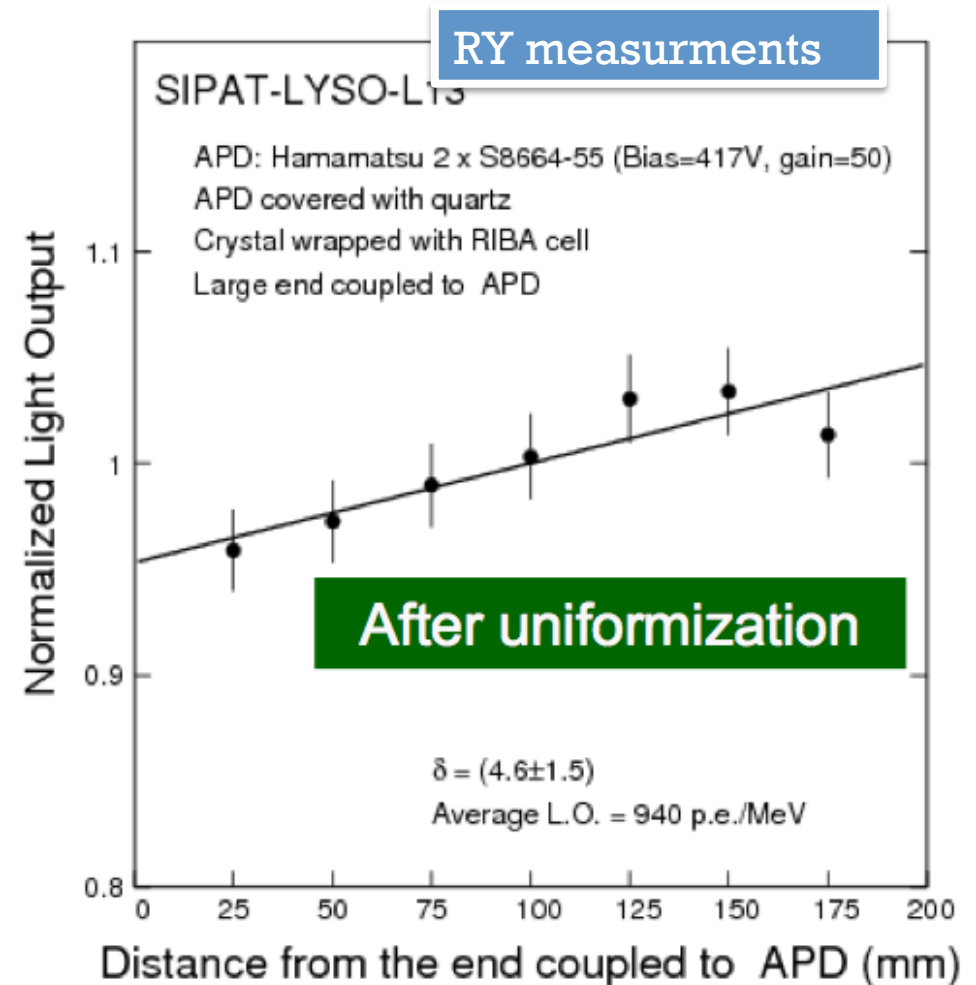
- Use the definition from RY uniformity measurements



$$\frac{y}{y_{mid}} = 1 + \delta(x/x_{mid} - 1)$$

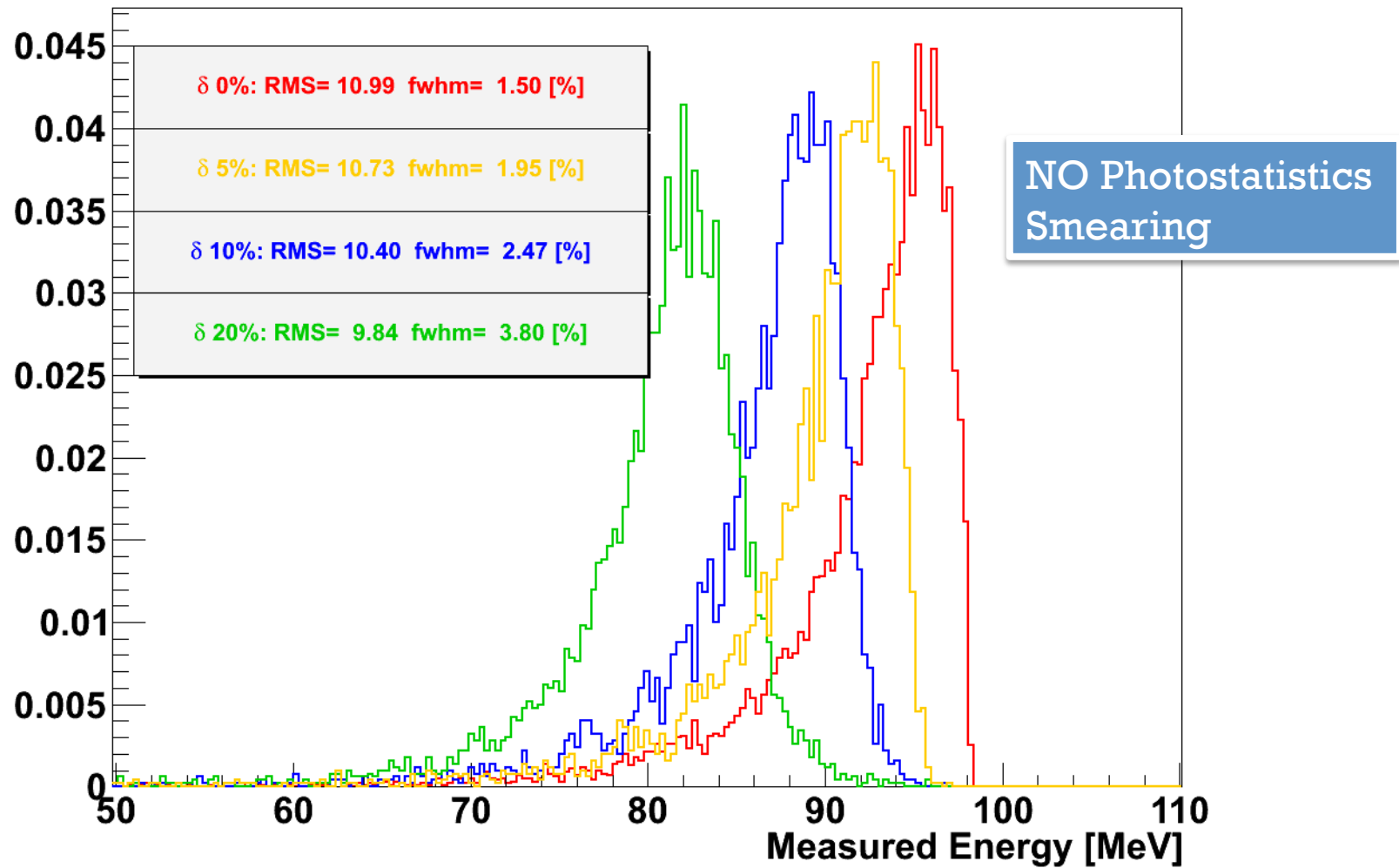
Simulation Method

- Uniformity simulations performed scaling the energy deposit as a (linear) function of the position in the crystal (Step level in G4)
- Photostatitic smearing with 900 p.e./MeV on the whole energy deposit
- More complex functions of the position will be studied in the future
- Simulated δ : 0 , 5, 10, 20 [%]
- Resolution Parametres:
 - RMS
 - FWHM/2.36 form fit using Crystal Ball function



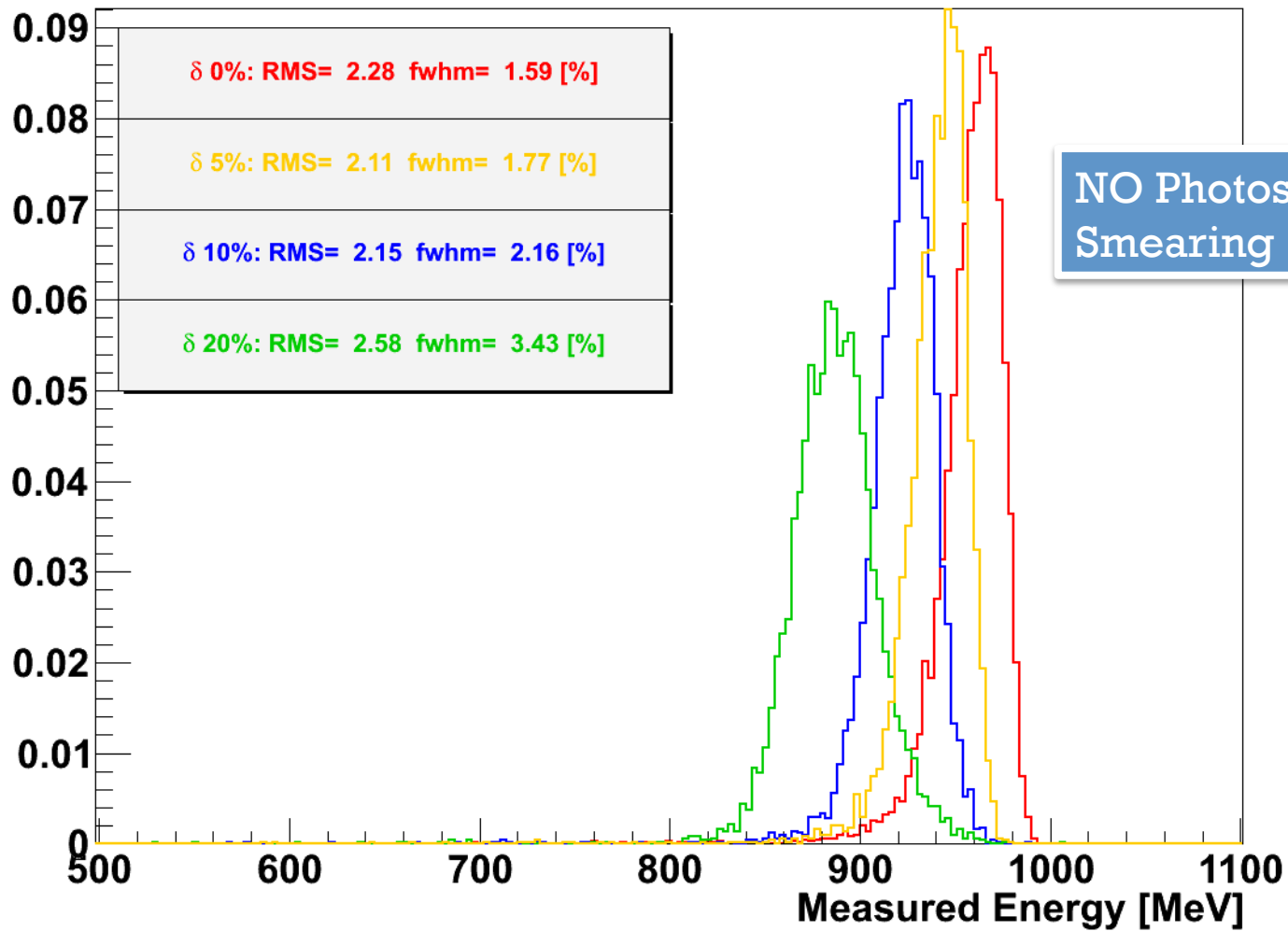
Uniformity Effect @ 100 MeV

Uniformity Effect



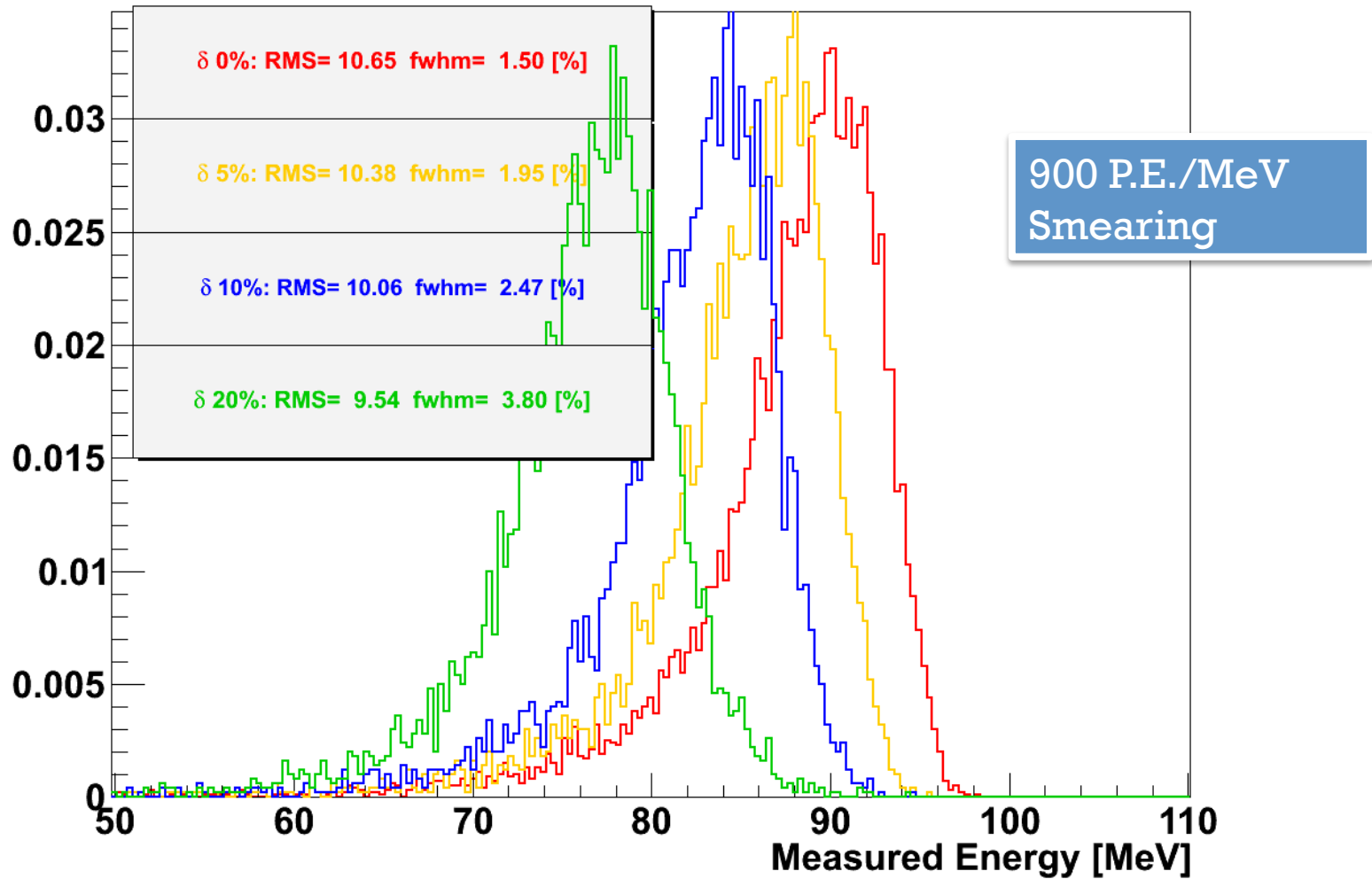
Uniformity Effect @ 1 GeV

Uniformity Effect



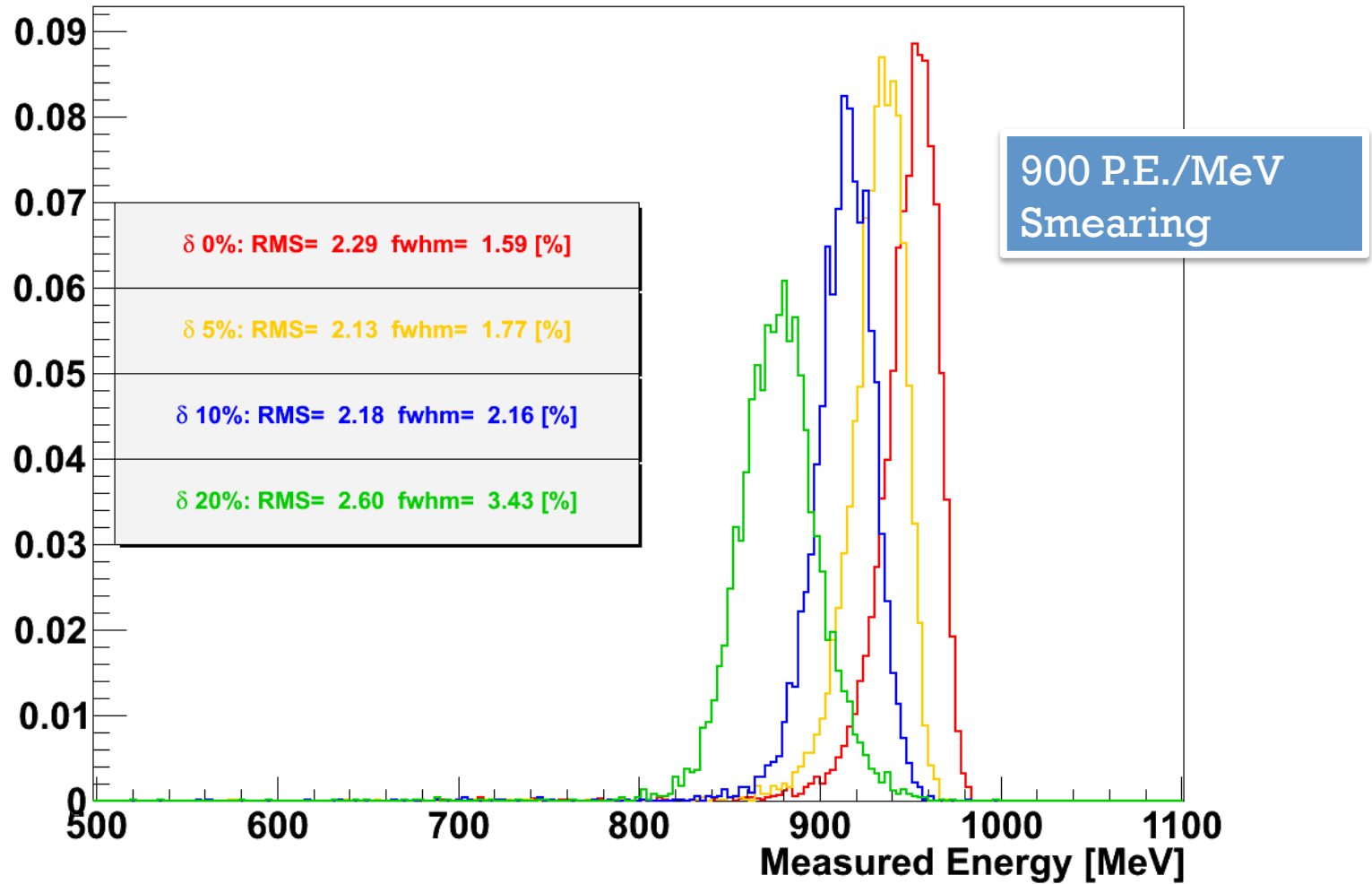
Unif.+Photostatistics Effect @ 100 MeV

Uniformity+Photostatistics Effect



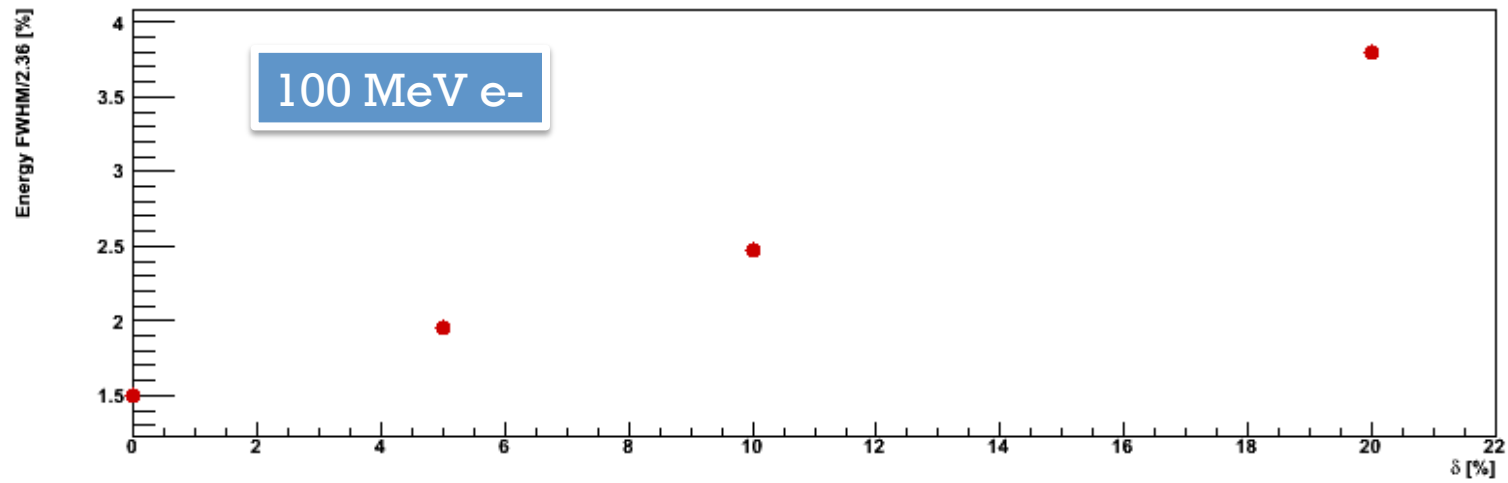
Unif.+Photostatistics Effect @ 1 GeV

Uniformity+Photostatistics Effect

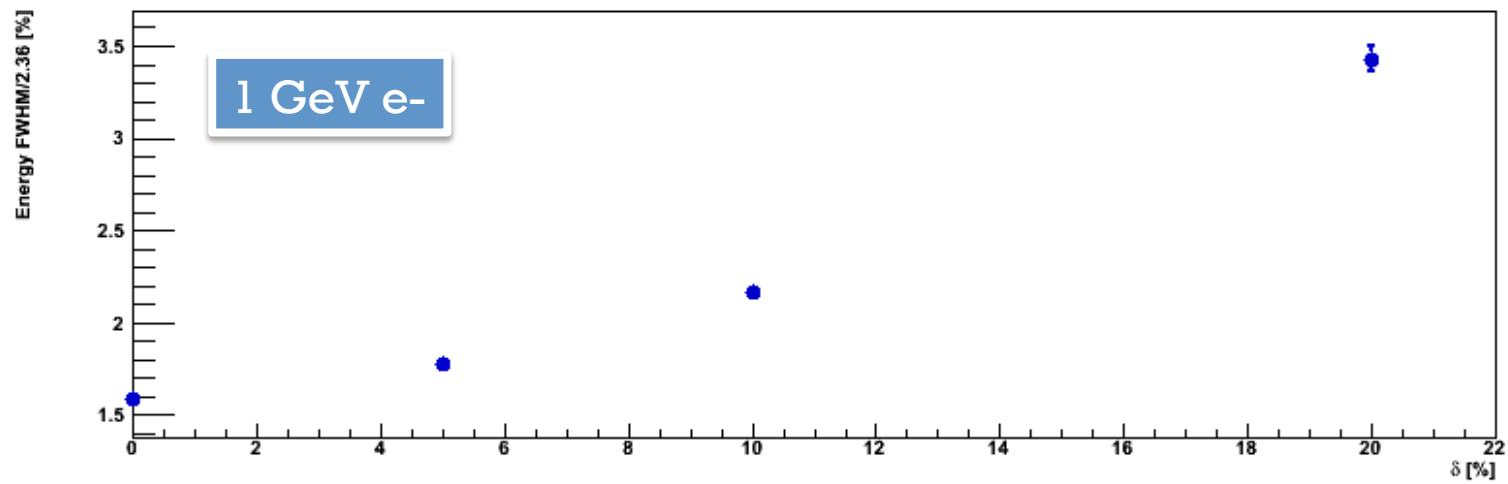


Resolution vs δ

Graph



Graph



Conclusions

- Effect of crystal non-uniformity LO on energy resolution is clear both at low and high energies
- The effect at $\delta = 5 \%$ seems to be not completely negligible
- More detailed studies at smaller non-uniformities is needed $\delta = [0 \rightarrow 7]$