



# Hadron Energy Resolution: Crystal ECAL vs SiW ECAL

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# Digitization Parameters

- Threshold for a channel: 0.1 MIP
- Crystal ECAL
  - Light yield: 300 p.e. per MIP (1 MIP yields 10.16 MeV energy)
  - Front-end electronics:
    - SiPM Gain main = 15 ADC tics per p.e. , sigma = 3 ADC tics per p.e.
    - ADC main =  $N_{pix} \times$  SiPM Gain main, sigma =  $\text{Sqrt}(N_{pix}) \times$  SiPM Gain sigma
- SiW ECAL
  - 1 MIP yields 0.143 MeV energy in the silicon
  - Front-end electronics:
    - ADC main = 200 per MIP, sigma = 15 per MIP
- Scintillator HCAL
  - Light yield: 20 p.e. per MIP (1 MIP yields 0.467 MeV energy)
  - Front-end electronics:
    - SiPM Gain main = 16 ADC tics per p.e. , sigma = 4.36 ADC tics per p.e.
    - ADC main =  $N_{pix} \times$  SiPM Gain main, sigma =  $\text{Sqrt}(N_{pix}) \times$  SiPM Gain sigma



# Calibration & Reconstruction Method

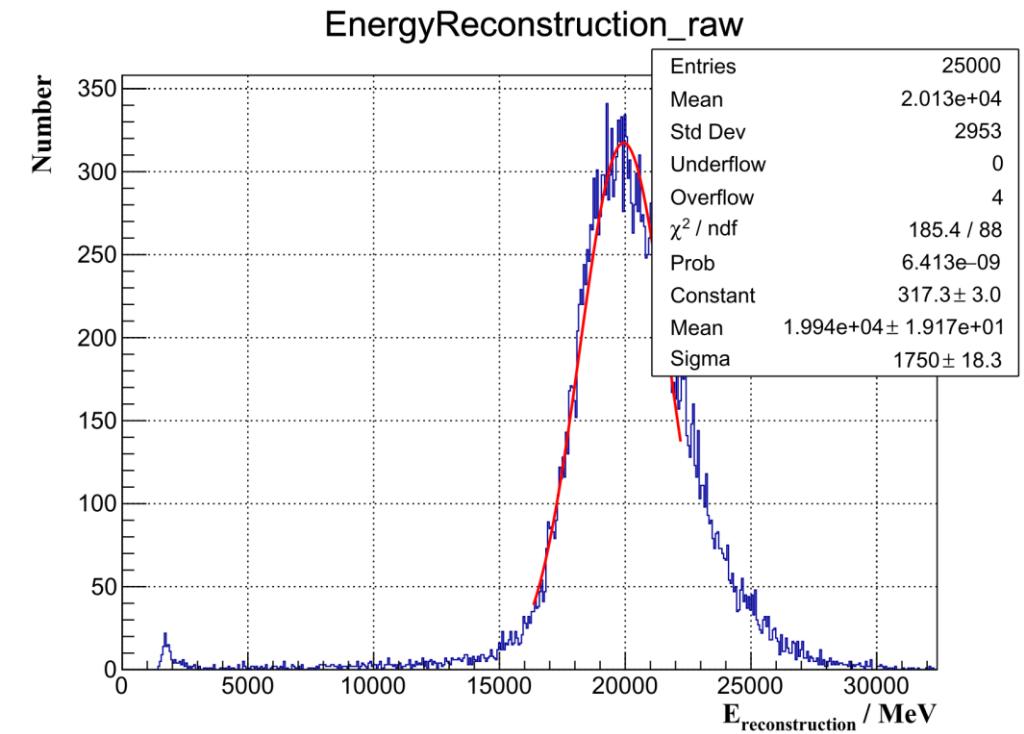
- Minimize chi-square with pion+ MC sample
- Find optimal calibration parameters: a & b

$$\chi^2 = \sum_{E_{beam} \text{ events}} \sum \frac{(aE_{ECAL} + bE_{HCAL} - E_{beam})^2}{E_{beam}}$$

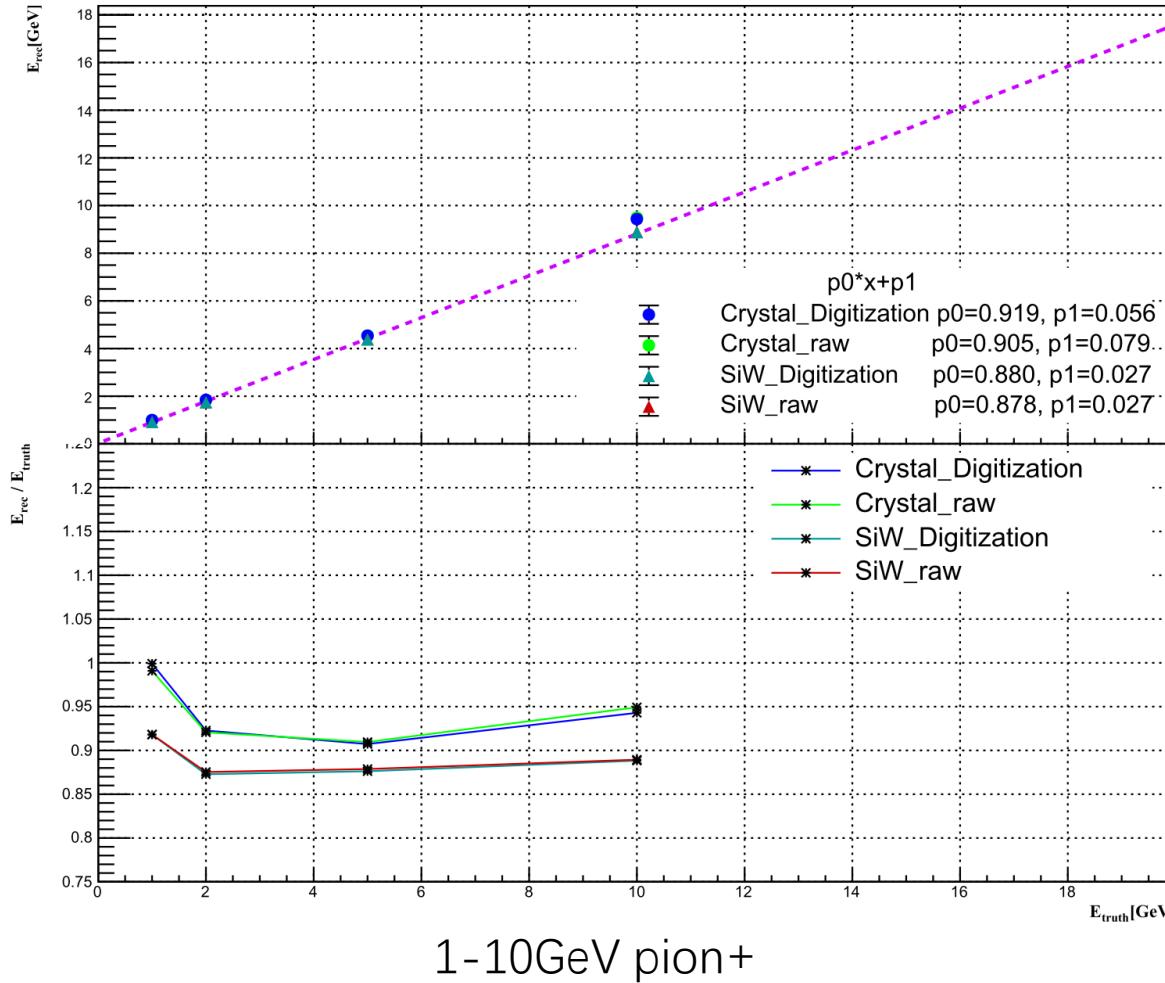
- Energy reconstruction:

$$E_{rec} = aE_{ECAL} + bE_{HCAL}$$

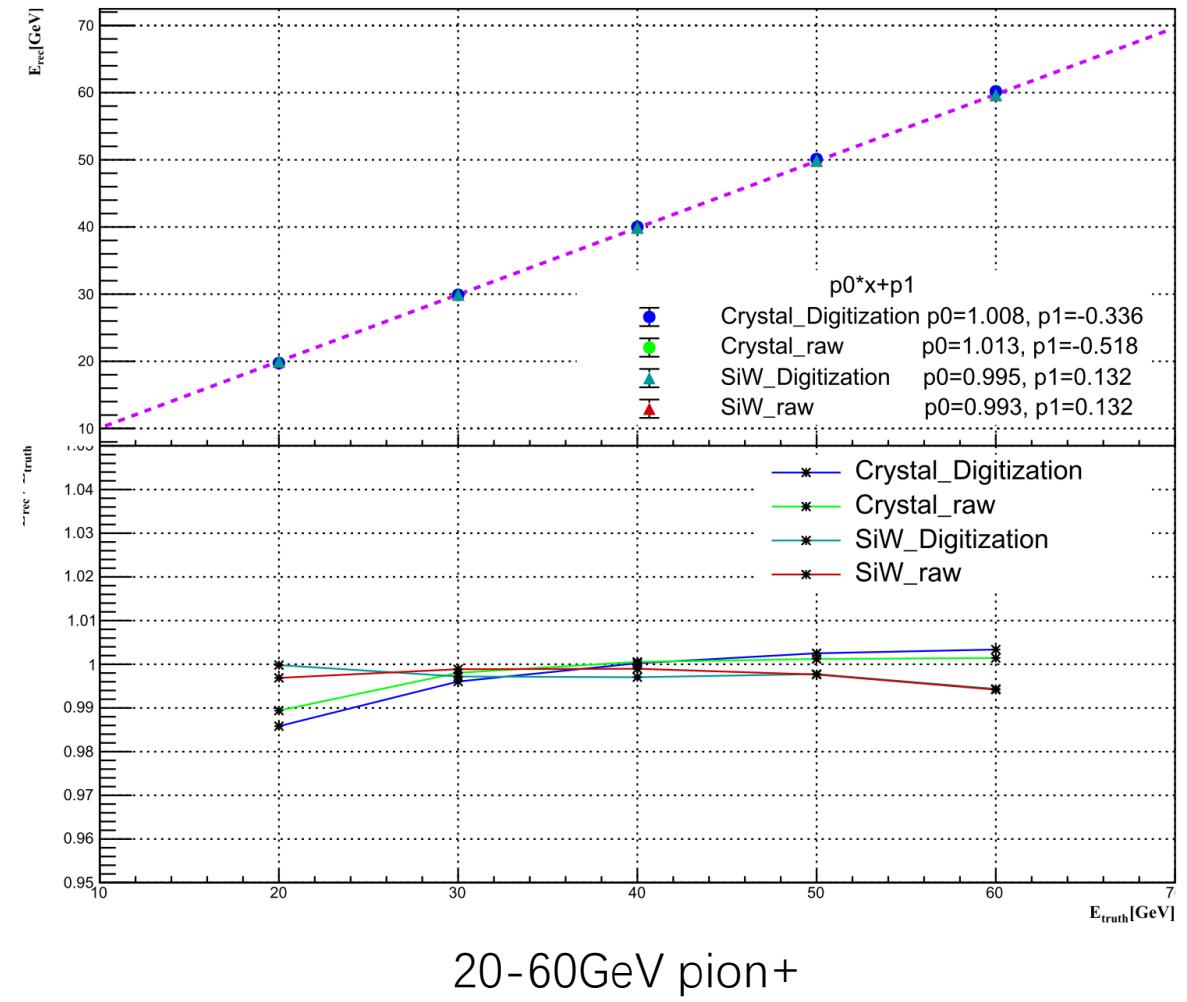
- Energy resolution: Gaussian fit sigma of the reconstructed energy



# Energy Linearity



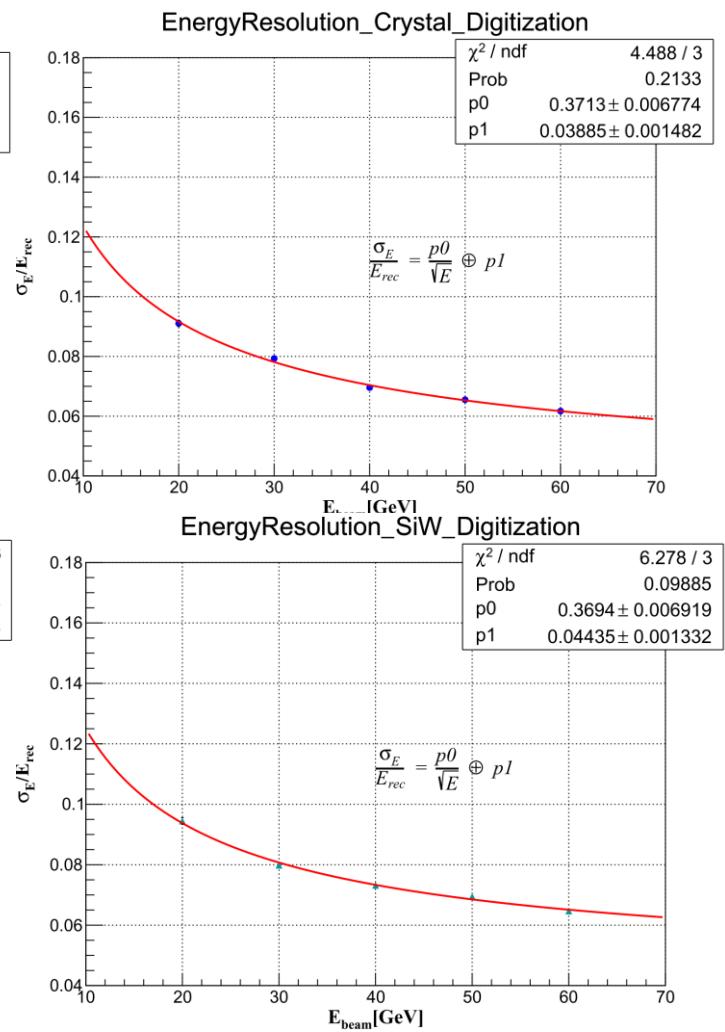
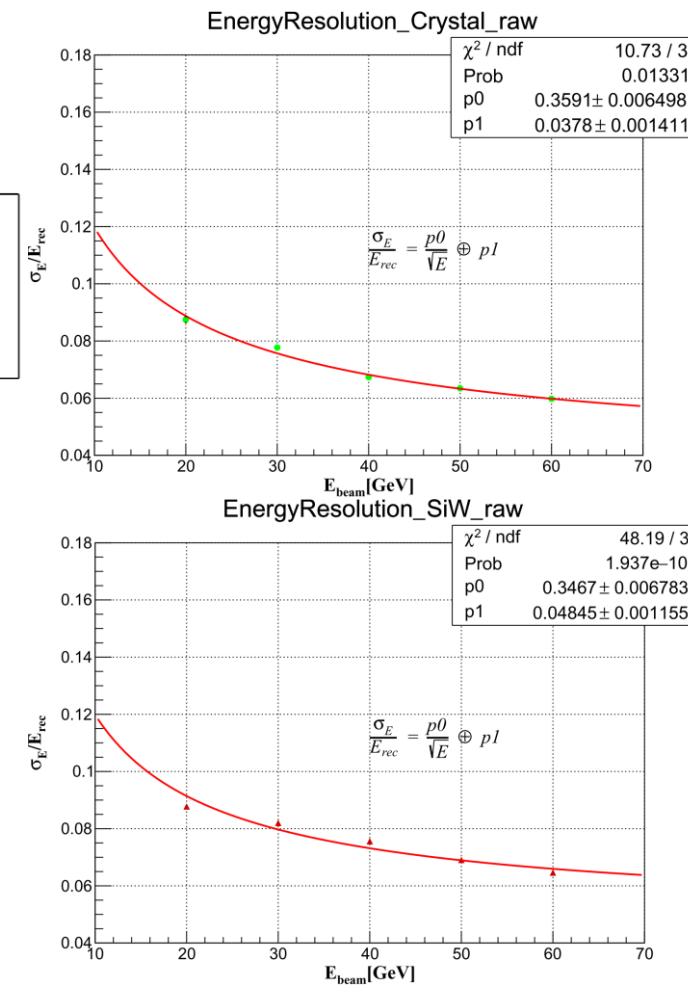
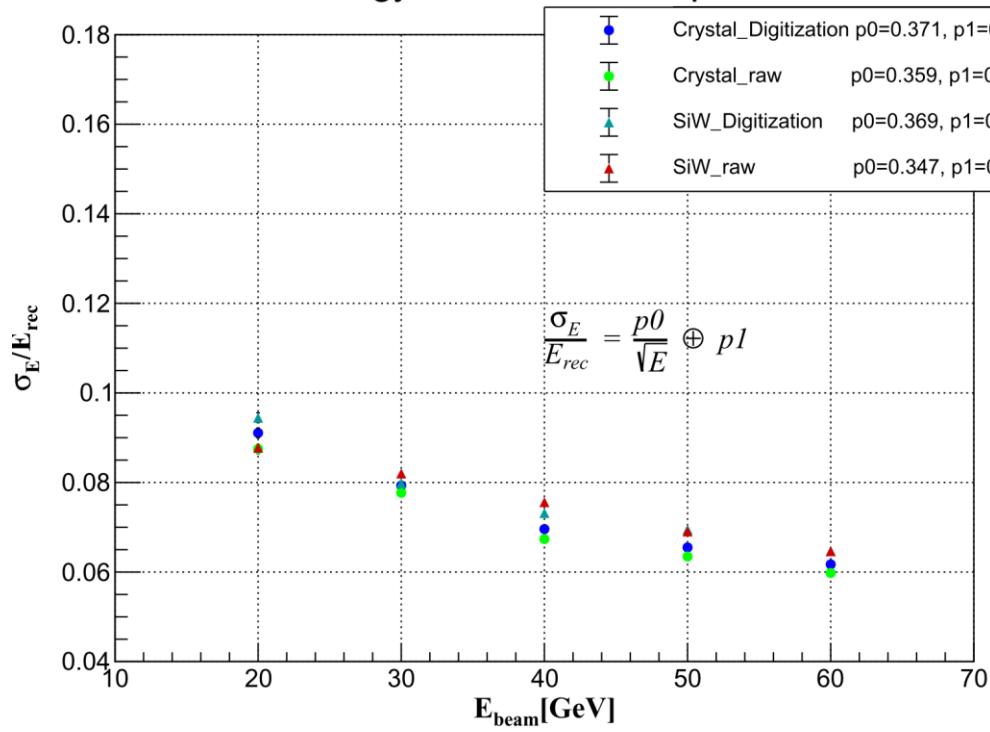
1-10GeV pion+



20-60GeV pion+

# Hadron Energy Resolution: Crystal vs SiW ECAL (20-60GeV pion+)

Energy Resolution Comparison



# Hadron Energy Resolution: Crystal vs SiW ECAL (1-10GeV pion+)

