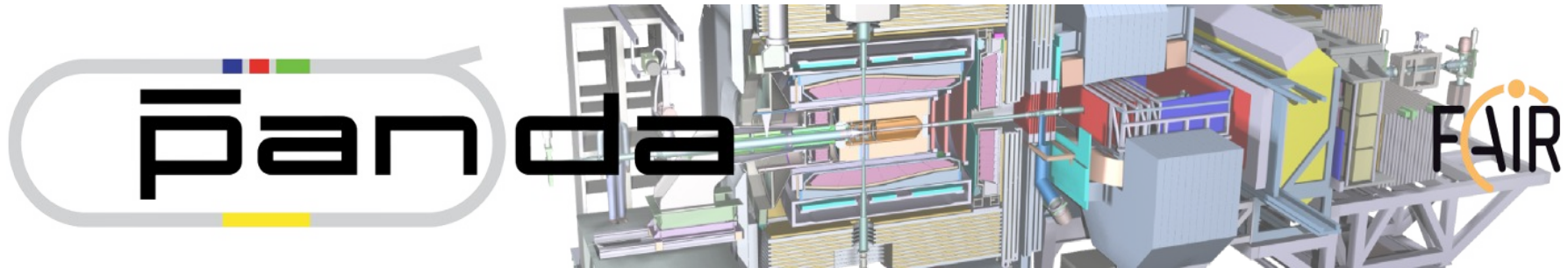


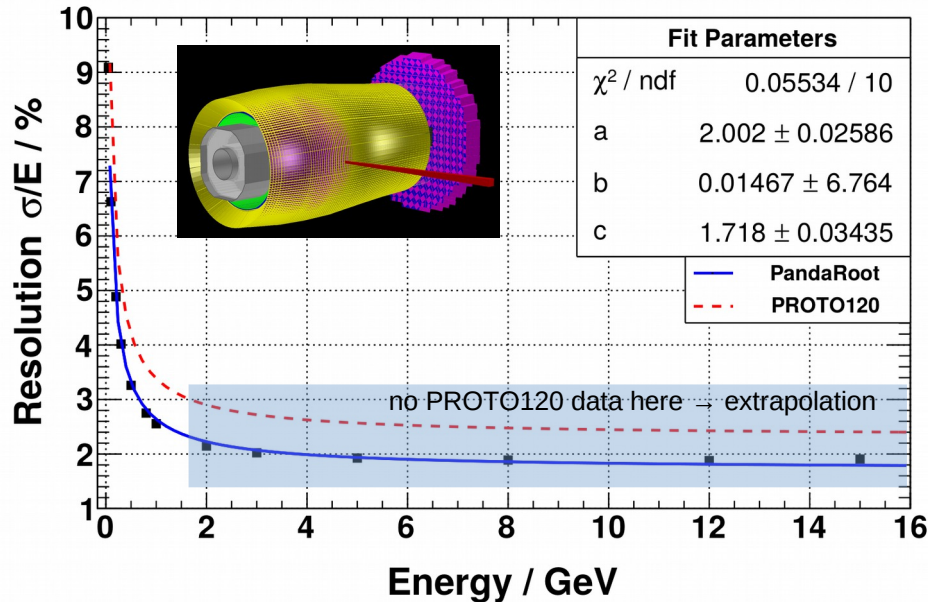
# Response Improvement of the PandaRoot Calorimeter Model



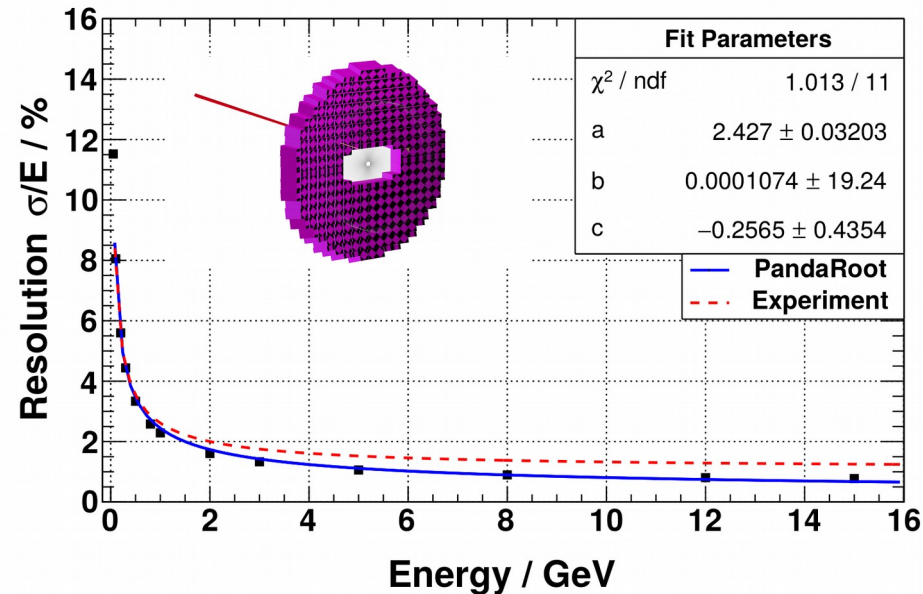
Markus Moritz, 2nd Physics Institute, JLU Giessen

PANDA CM, June 2019

## Barrel



## ForwardEndcap

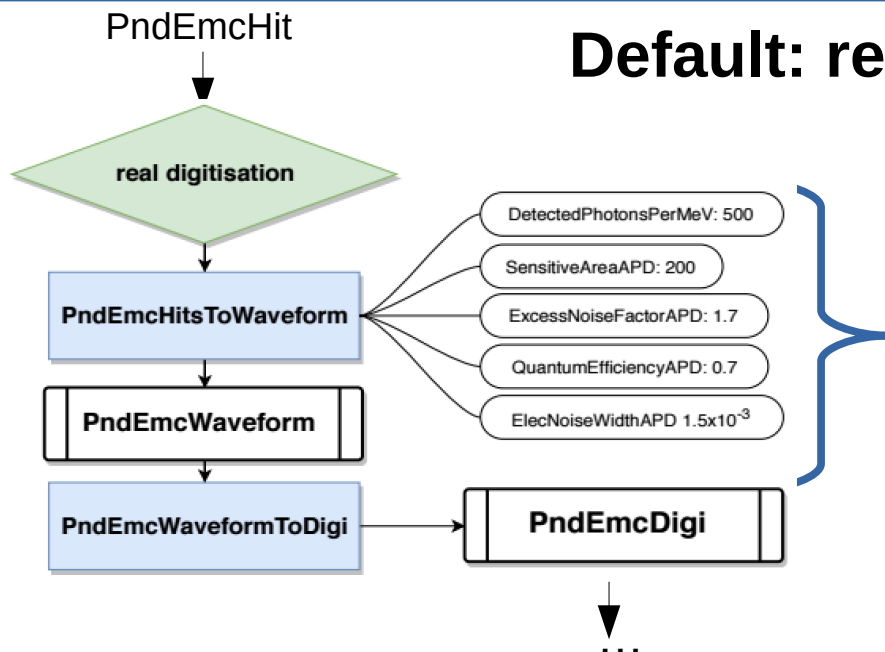


- PandaRoot release dec18p1
- Only EMC
- Particle gun into crystal front face center



**PANDARoot dose not match experimental data**

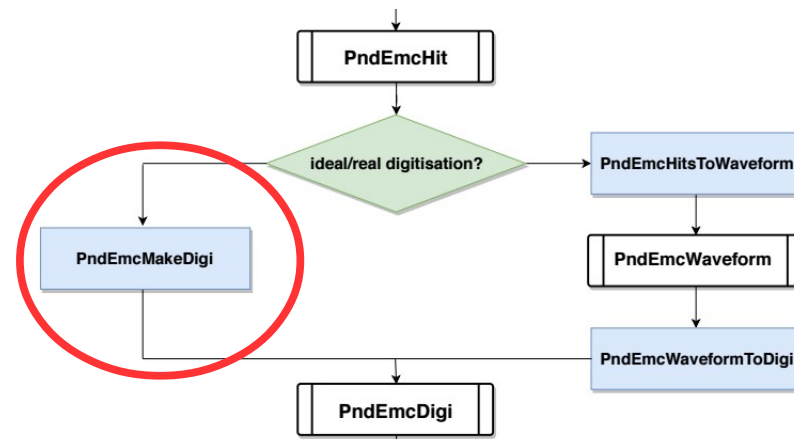
## Default: real digitization model



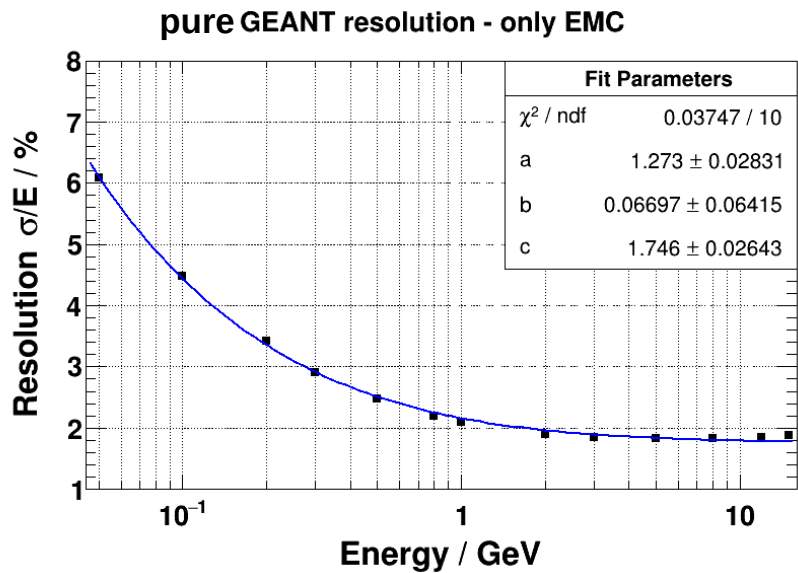
- Smearing happens in many steps
- All variables reasonable
- Vary within “error-bars” not sufficient to reproduce exp. Data
- Names sometimes misleading

## Idea: ideal digitization model

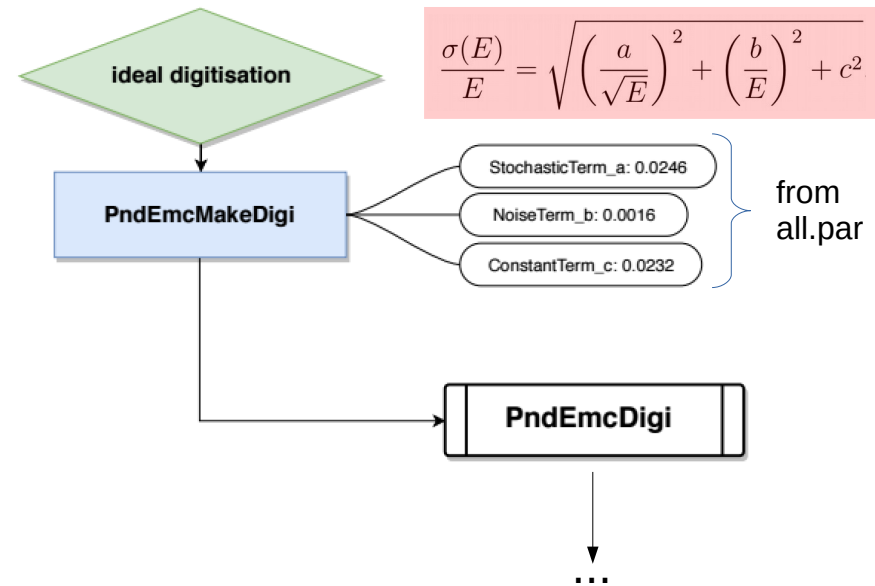
- ➔
- Simplified Model
  - One smearing function to match experimental data



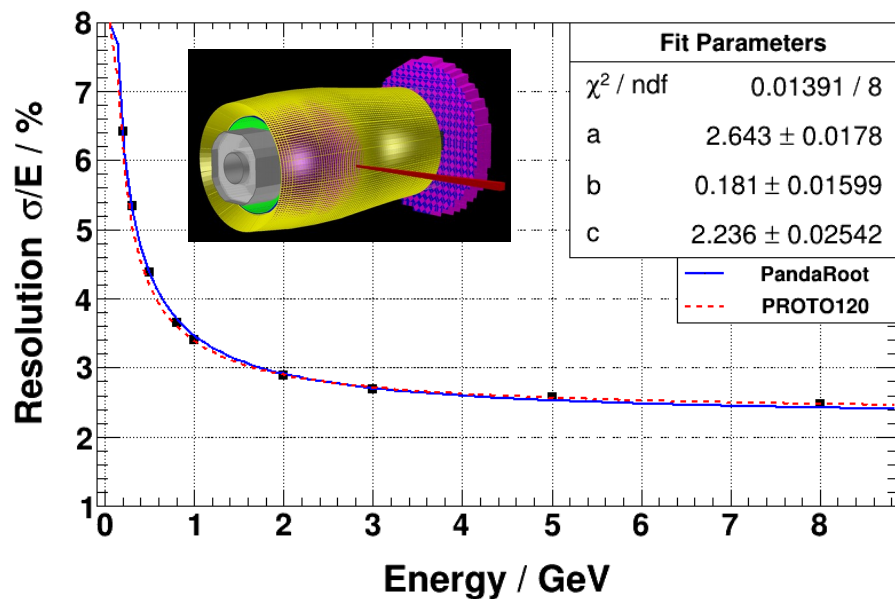
- Put experimental specified values (a,b,c) in all.par
- GEANT gives an geometry intrinsic resolution which has to be taken into account in digitization model
  - No other detectors in front for prototype experiment conditions



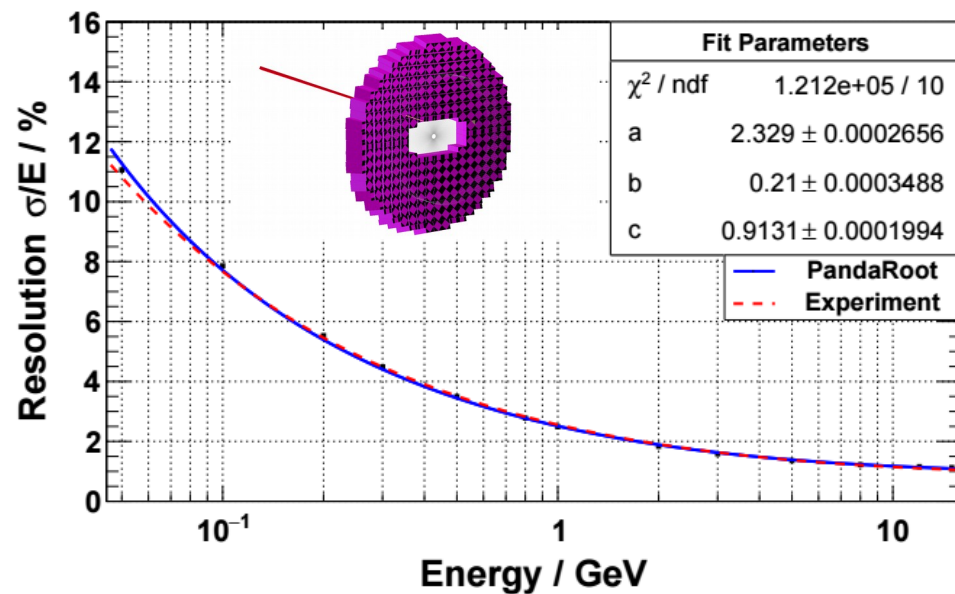
$$\left(\frac{\sigma}{E}\right)_{\text{digitisation}} = \sqrt{\left(\frac{\sigma}{E}\right)_{\text{PROTO120}}^2 - \left(\frac{\sigma}{E}\right)_{\text{GEANT}}^2}$$



## Barrel



## FWEndcap



No other detectors in front

- PANDARoot does not reproduce experimental energy resolution of EMC Prototypes
- Current digitization model includes a lot of parameters for smearing
  - Adjusting those within certain tolerances not sufficient
- Very simplified (ideal) digitization model reproduces experimental data via  $\left(\frac{\sigma}{E}\right)_{EMCSIM} = \sqrt{\left(\frac{\sigma}{E}\right)_{PROTOTYPE}^2 - \left(\frac{\sigma}{E}\right)_{GEANT}^2}$
- For time-based simulations not (yet) applicable
- Current proposal: make both digi models parallel available

**Thank you  
for  
your attention**

Acknowledgments:  
Maximilian Rokuss

# FWEndcap

- Trouble determining the intrinsic GEANT resolution
- Especially the lower energies not reasonable fitable
- 50 MeV photons:
- Sharp peak at 50 MeV for photons with a multiplicity of 1
  - shower containment only in one crystal (?)
- Problem did not occur in barrel because of implemented *non linearity light collection*
- Approach to fix this was simulating with a pre smearing which was later subtracted

