# Energy resolution for quartz fiber calorimeter

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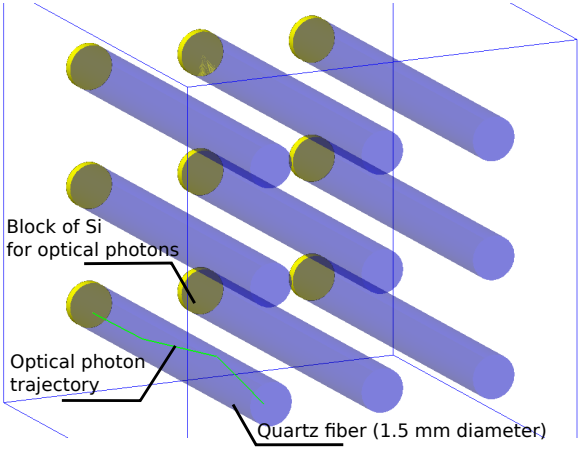
# Geometry for quartz fiber calorimeter

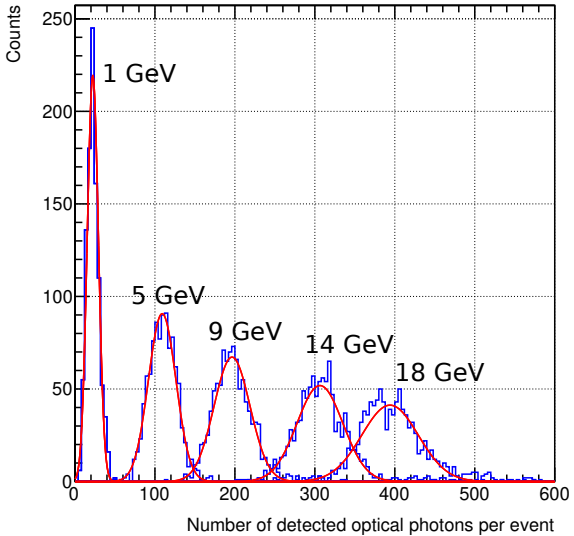
- Quartz fibers in absorber, full light transport
- Previous results on validation against ALICE prototype were shown on Nov. 15 [link here]
- Results on timing characteristics and light yield were shown at collab. meeting (coincidence program) [link here]
- Fibers of 1.5 mm diameter, 0.04 mm cladding layer, mutual distance between the fibers is 4 mm
- Absober material is Copper (left same as was in ALICE geometry for now)
- Each fiber ends with a piece of Si to count optical photons arriving there (acting as SiPM)
- Total size is $168 \times 168 \times 350$ mm$^2$




Fiber arrangement in calorimeter model

# Signals by optical photons

- Incident gammas are generated at small angle to prevent channeling (/gun/direction 0.000913 0.052328 -0.99863)
- Number of optical photons arriving at the end of the fibers is counted for each event (detected photons in the Si pieces)
- Distribution in number of detected optical photons is made for each incident energy and fitted with Gaussian
- Incident gamma energies (1 – 18 GeV) are indicated in the plot



# Energy resolution

- Gaussian width/mean from fits to number of detected photons at each incident energy
- Fit to the resolution by stochastic and constant terms
- Resolution is about $30\%/\sqrt{E}$ with Copper absorber
- With Pb absorber (same geometry and procedure otherwise) the resolution is $40\%/\sqrt{E}$ (the shower is more narrow)
- We can work with fiber layout to gain better light yield but it is unlikely the resolution can be better than $30\%/\sqrt{E}$ with Cherenkov fibers