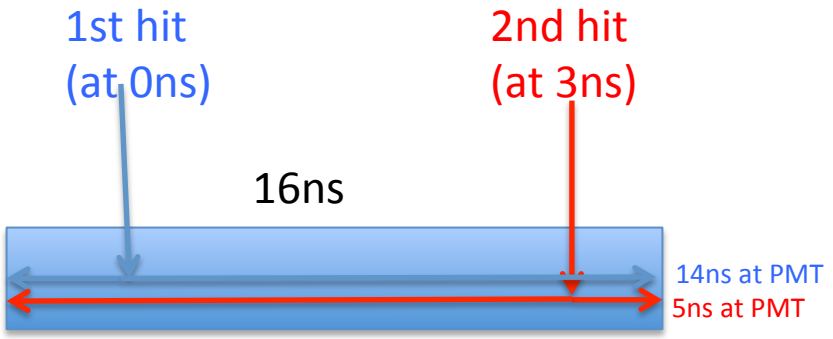
HANUL brief meeting

160901

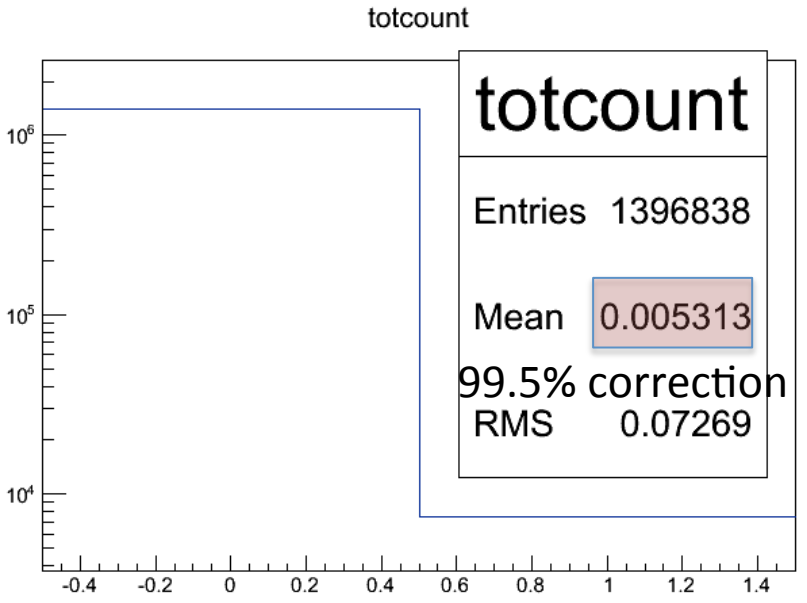
Inner Barrel Hit selection

- Hit
  - Upstream data && downstream data (>0.5MeV at PMT)
- 500MHz data
  - Cache multi pulse (multi Hit)
  - Hit swapping correction
    - Timing difference
      - Require hit position to be in detector geometry + resolution(< 16+@ns)
    - Attenuation correction
      - From hit position, energies which is corrected by attenuation length are same between upstream && downstream
    - in cosmic-ray data, just 1st hit is selected
    - In physics data, select hit which has highest energy deposit in trigger timing window



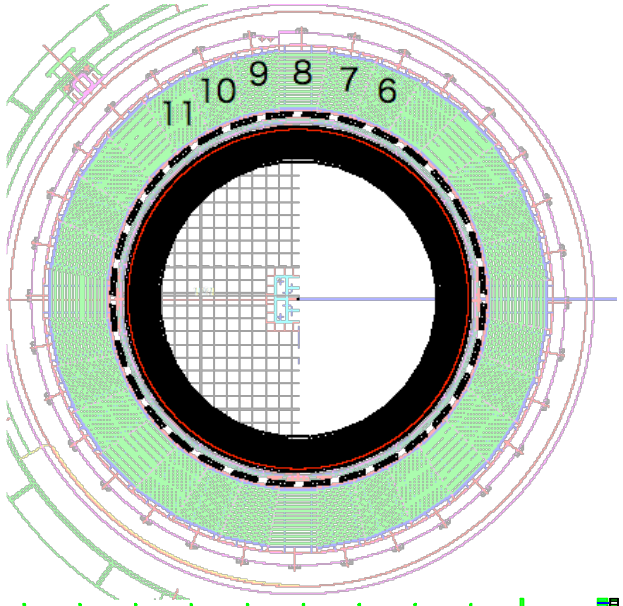
1st hit at IB : (2ns,5ns) swapped
2nd hit at IB : (17ns,14ns)

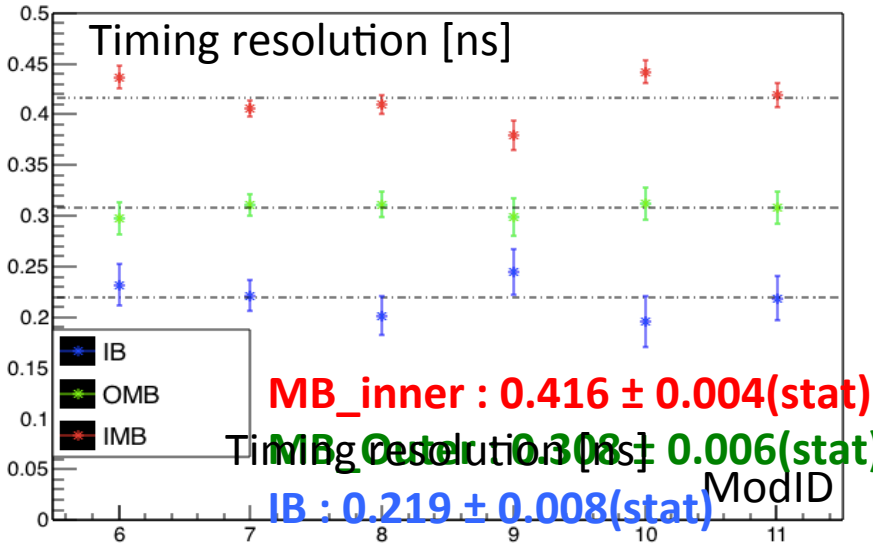
Hit swapping



inner barrel timing resolution.

At 2016 July PAC meeting

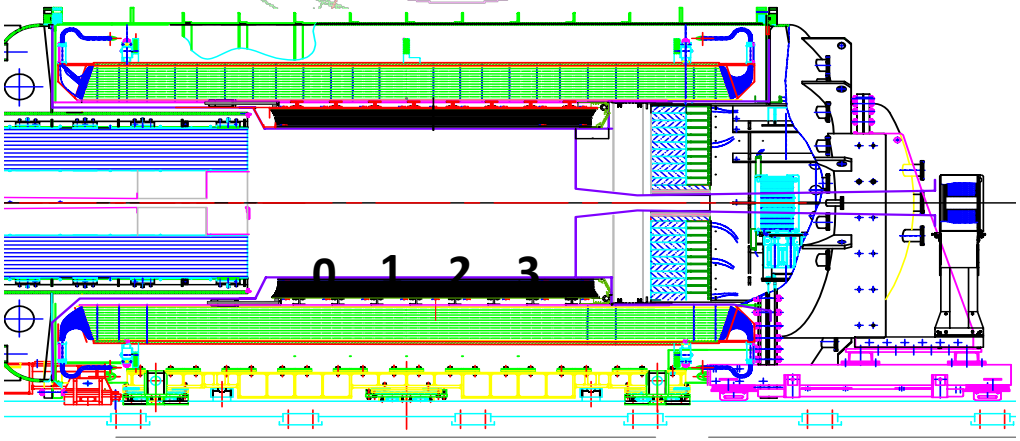


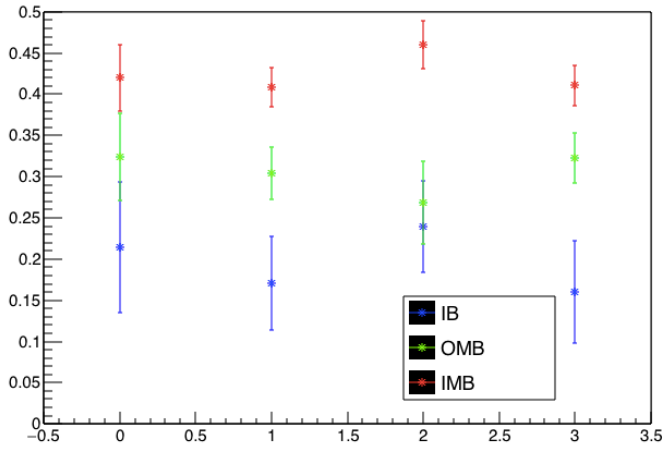


MB_inner : 0.416 ± 0.004(stat)

MB_outer : 0.308 ± 0.006(stat)

IB : 0.219 ± 0.008(stat)



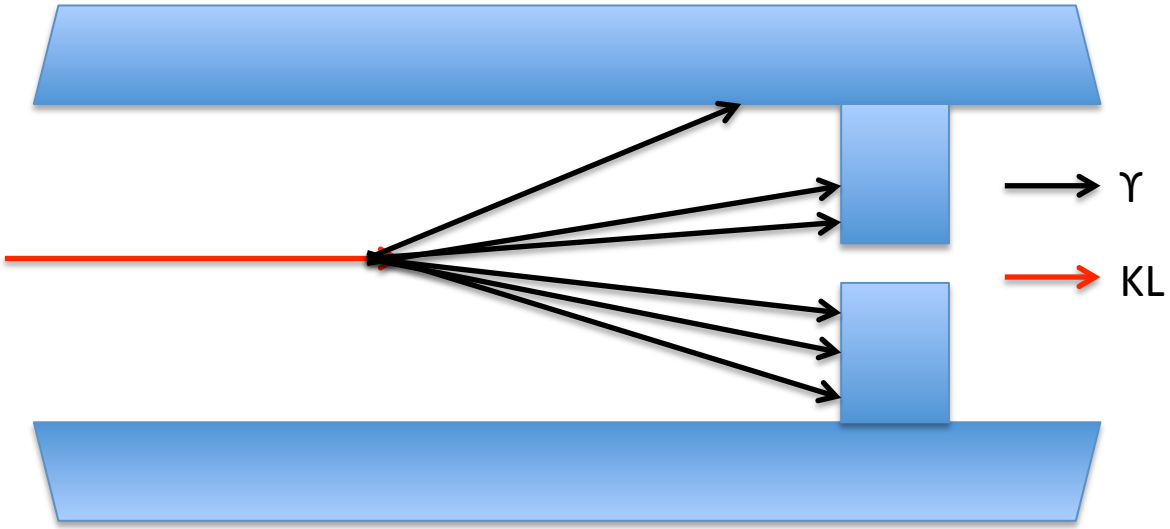


Kl3pi0 reconstruction using barrel detector and CsI calorimeter for checking resolution of inner barrel and main barrel

E_s, P_s : Energy and momentum of gamma which is not associated with 2pi0

E_r, P_r : Energy and momentum of 6th gamma which is detected on barrel

Vertex reconstruction using 4gamma from 5gamma on CsI
-> 5 klong candidates, select klong which has minimum vertex chi2

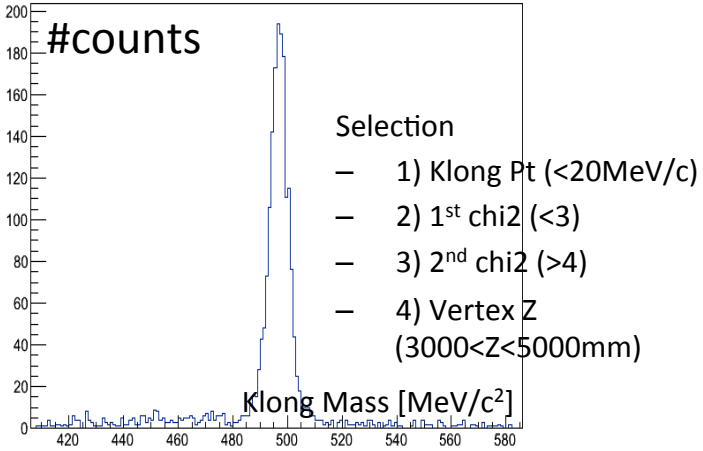


$$2(E_s E_r - \vec{P}_s \cdot \vec{P}_r) = m_\pi{}^2$$

$$\vec{P}_s \cdot \vec{P}_r = E_s E_r cos\theta$$

$$E_r = m_\pi{}^2/(2E_s(1 - cos\theta))$$

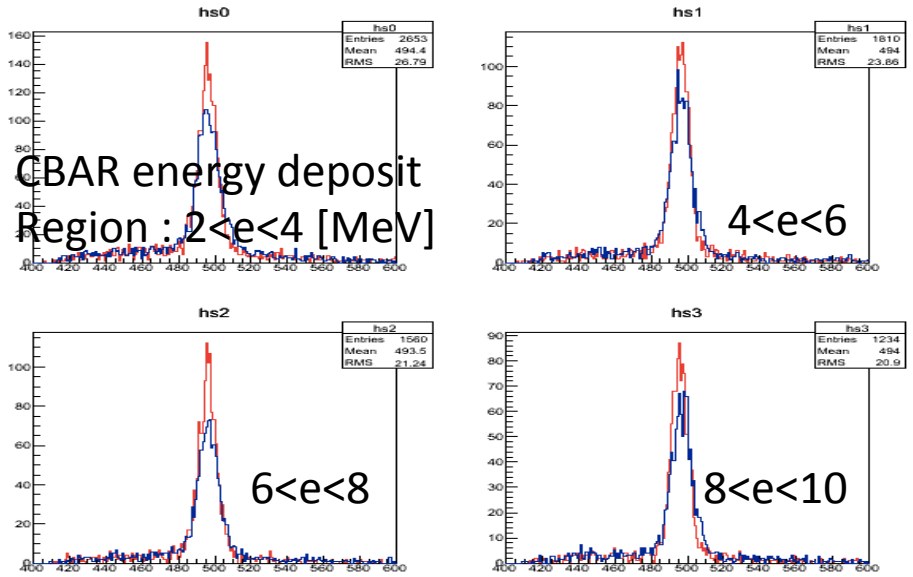
$$M_{KL}{}^2 = (\sum_{i=1}^{5} E_i + E_r)^2 - (\sum_{i=1}^{5} \vec{P}_i + \vec{P}_r)^2$$



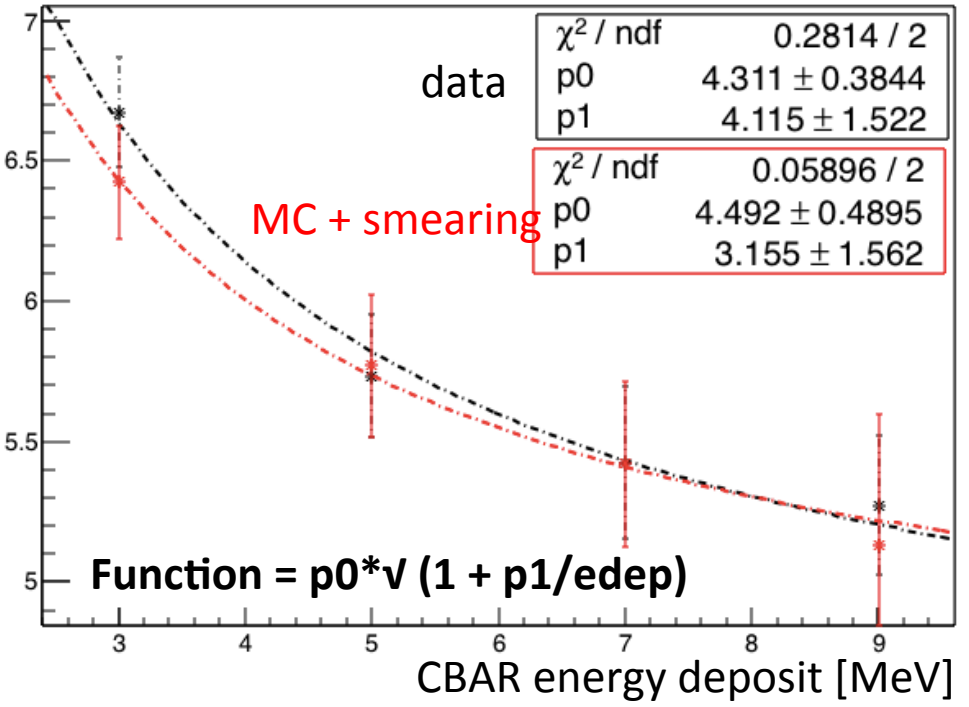
Klong mass distribution

Red : MC

Blue : data



Sigma of gaussian



- More energy deposit in barrel gives better position resolution.
- Better position resolution gives better mass resolution
  - sigma of gaussian

About inner barrel

- Inner barrel has better timing & position resolution from result of cosmic-ray data analysis.
  - Inner barrel will give shaper mass distribution than main barrel
  - Need to check quality of inner barrel calibration.
    - Module by module, run by run.
  - Comparison data with MC
    - MC will be produced by togawa san.
      - Kl3pi0 + accidental overlay