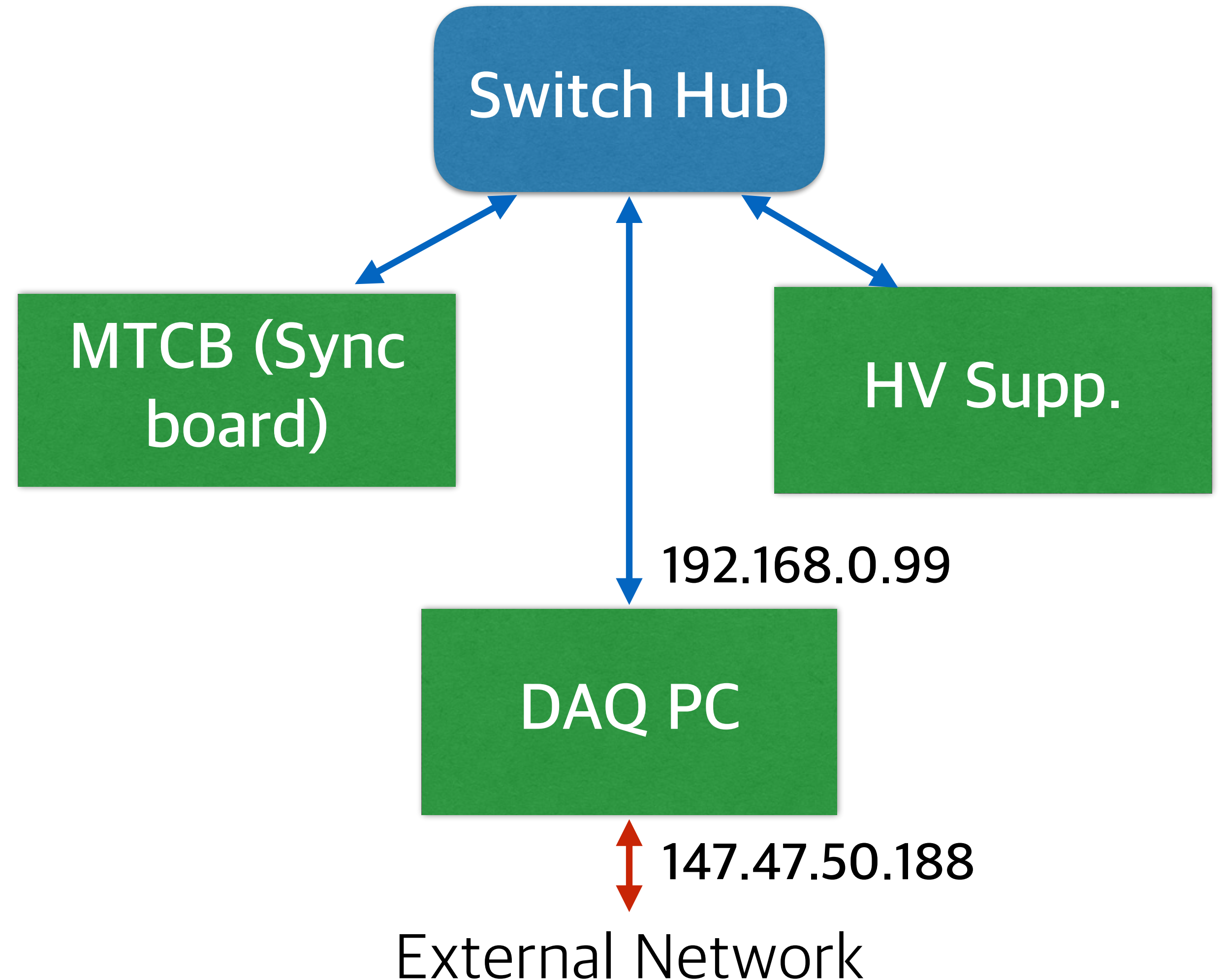


Status report (17 Aug. 2016)

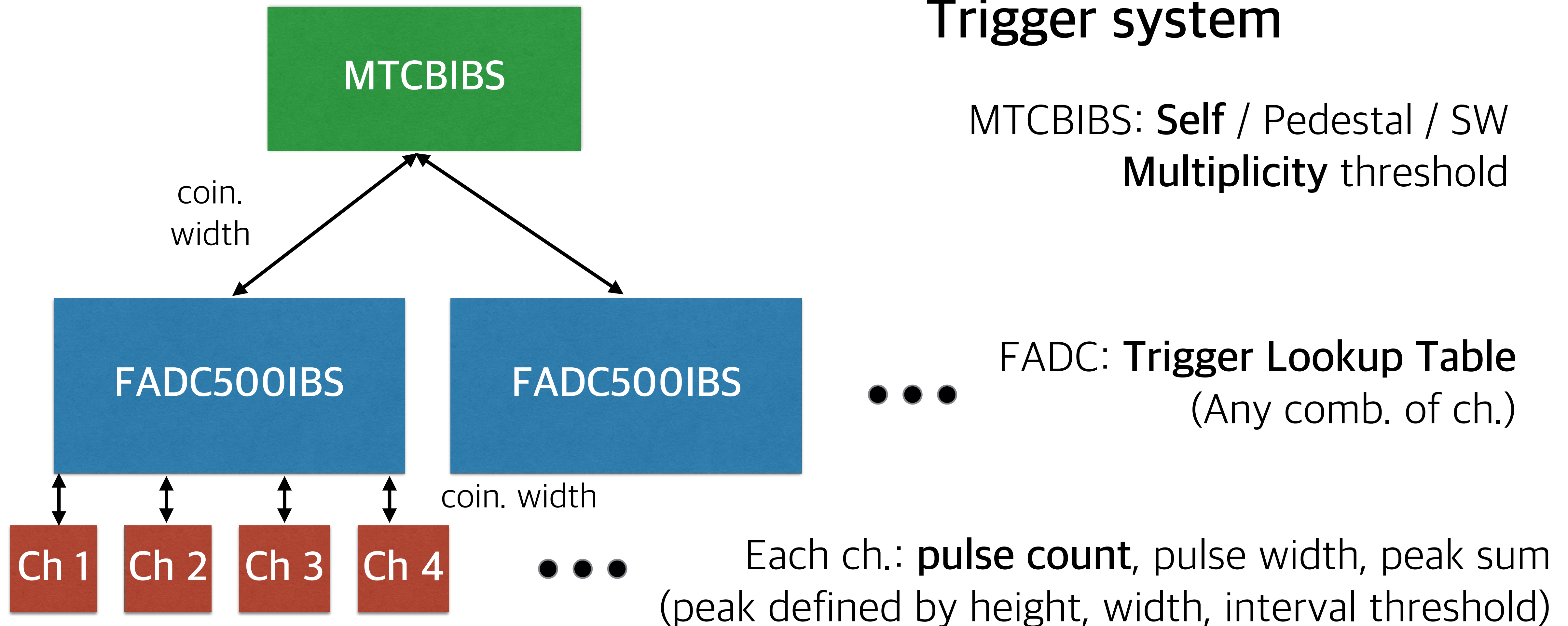
Jongwon Hwang

Network changed

- Use 2 LAN card on DAQ PC
- DAQ PC:
External: 147.47.50.188
Internal: 192.168.0.99
- DAQ PC is always connected to both the external network and the internal network.

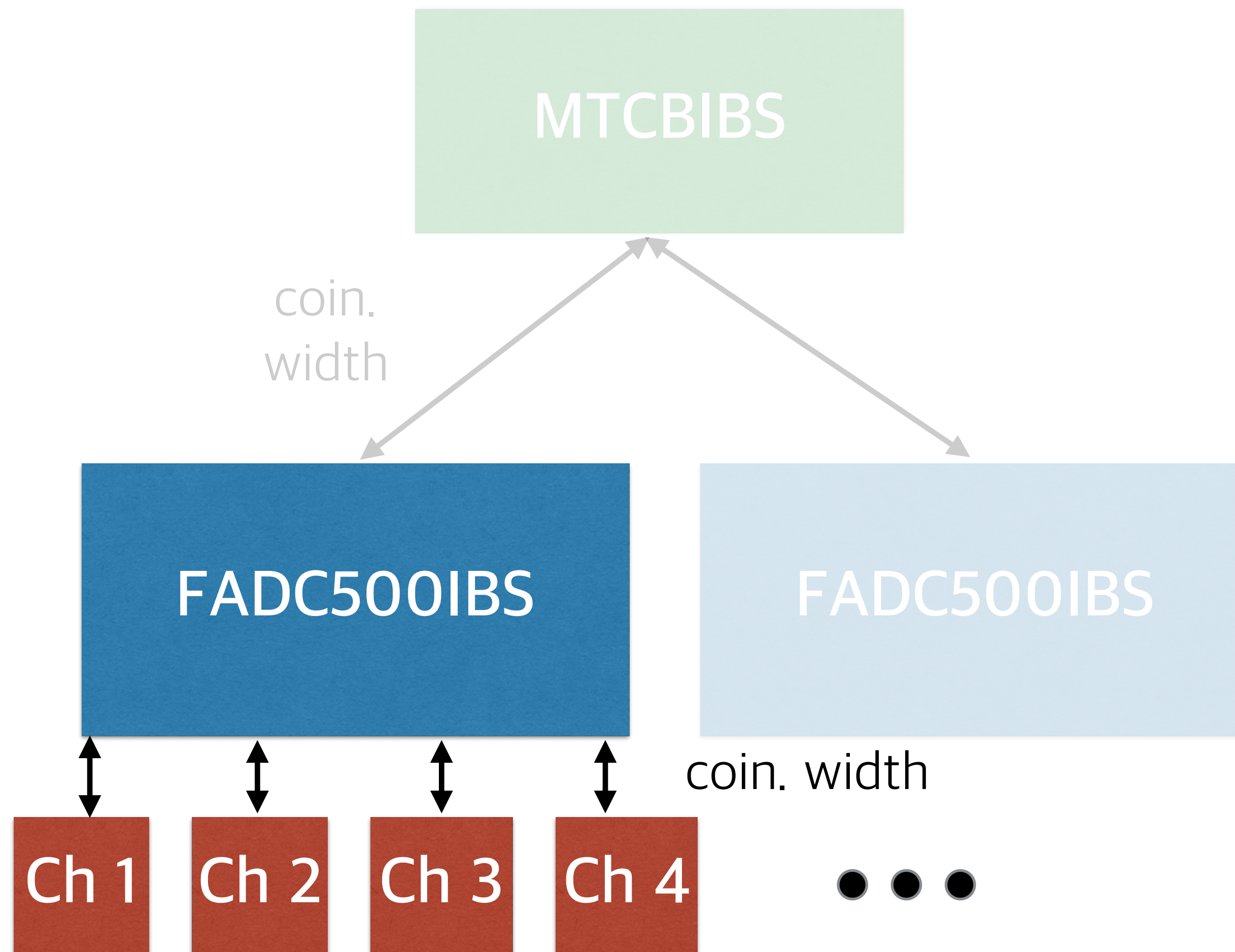


DAQ system study



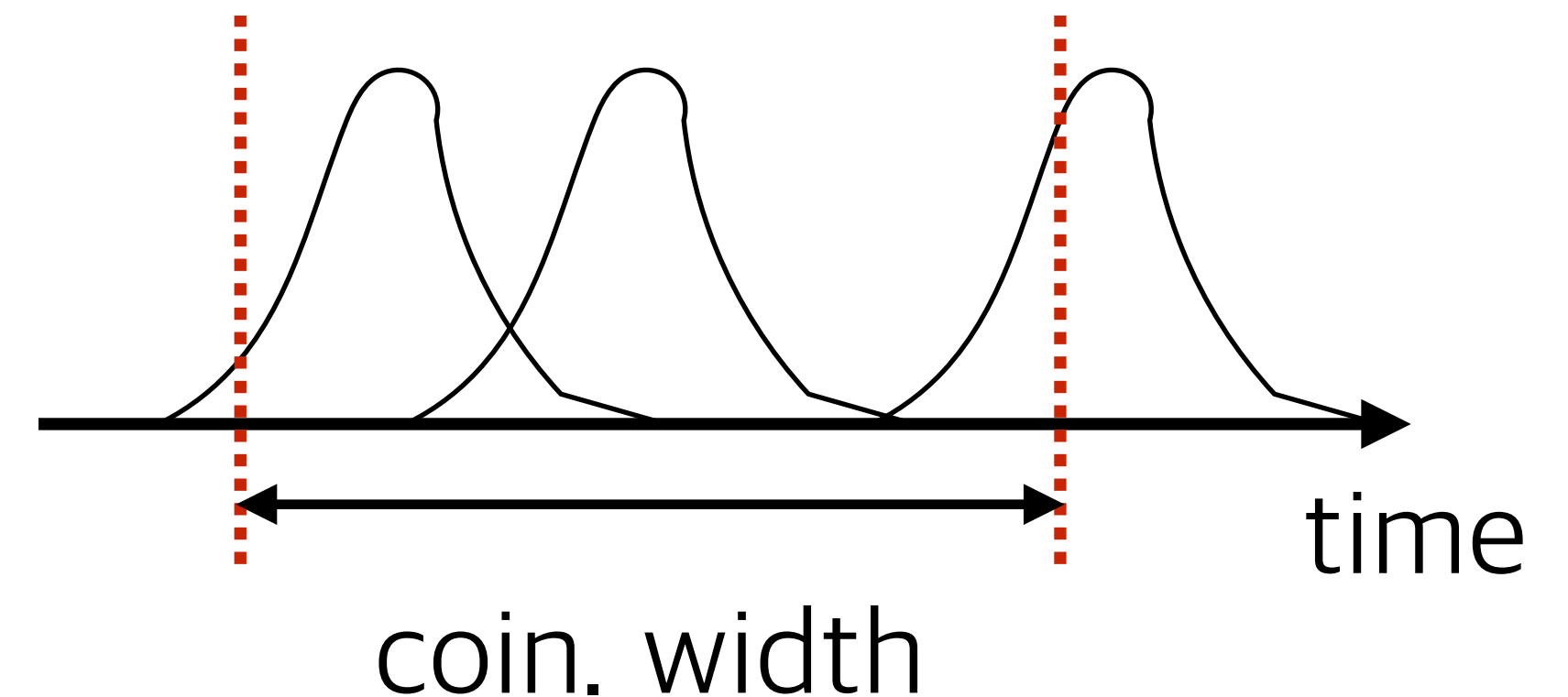
DAQ system study

Trigger system

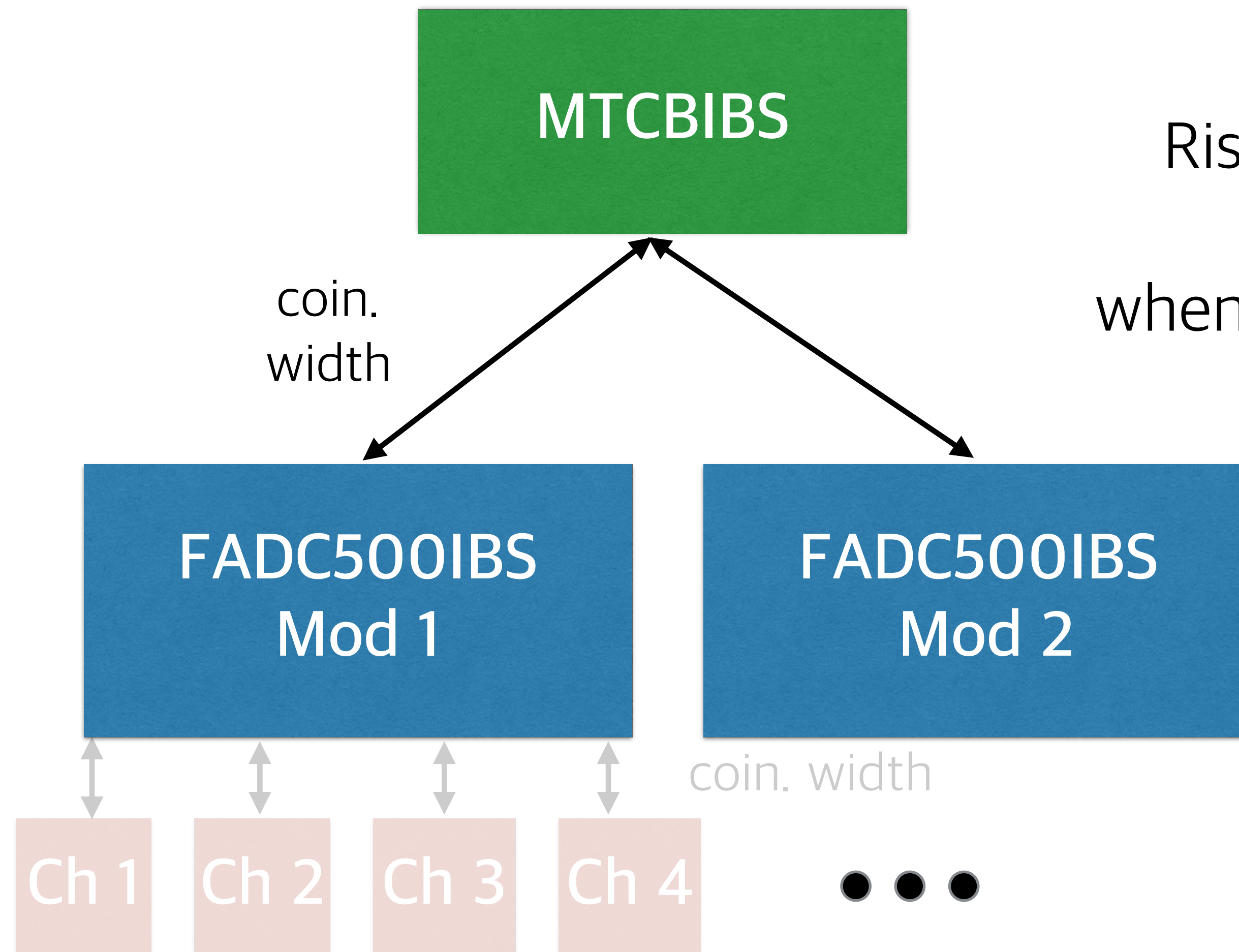


Rising timings of all channel indicated by Trigger Lookup Table should locates within coin. width.

...

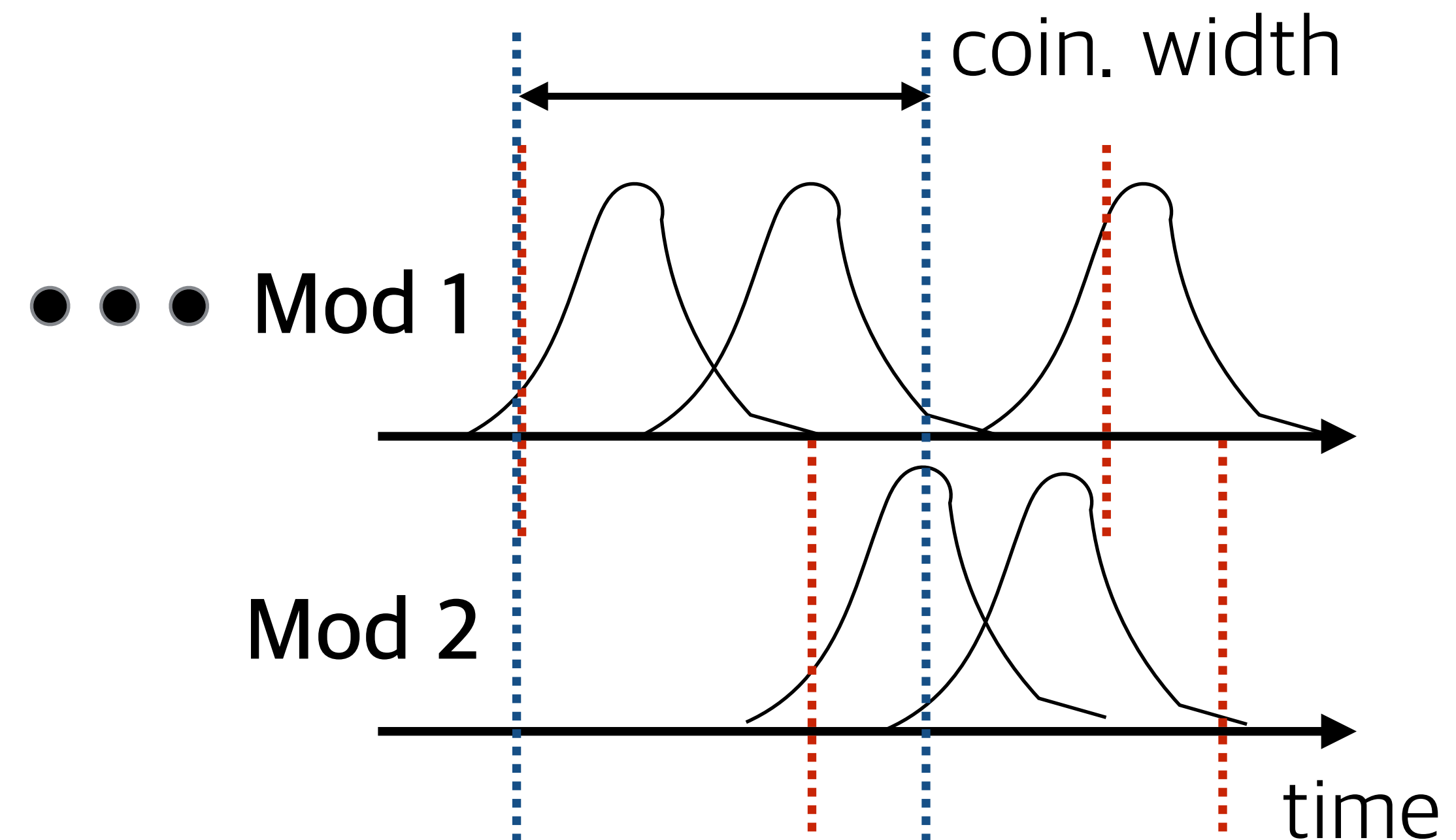


DAQ system study



Trigger system

Rising timings of the first peak of all modules should locates within coin. width when the total number of peaks $\geq$ mult. thres.

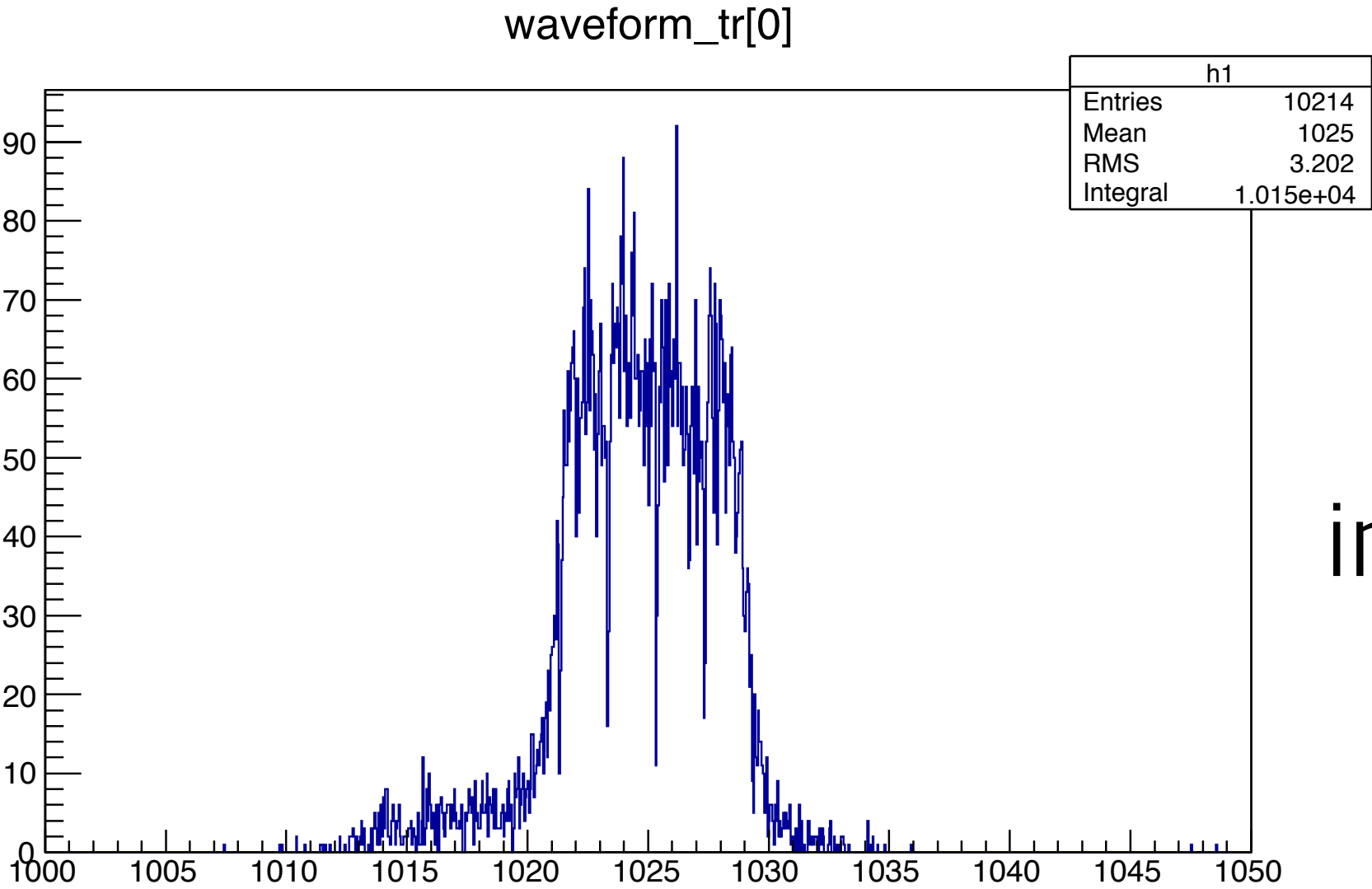


Timing extraction

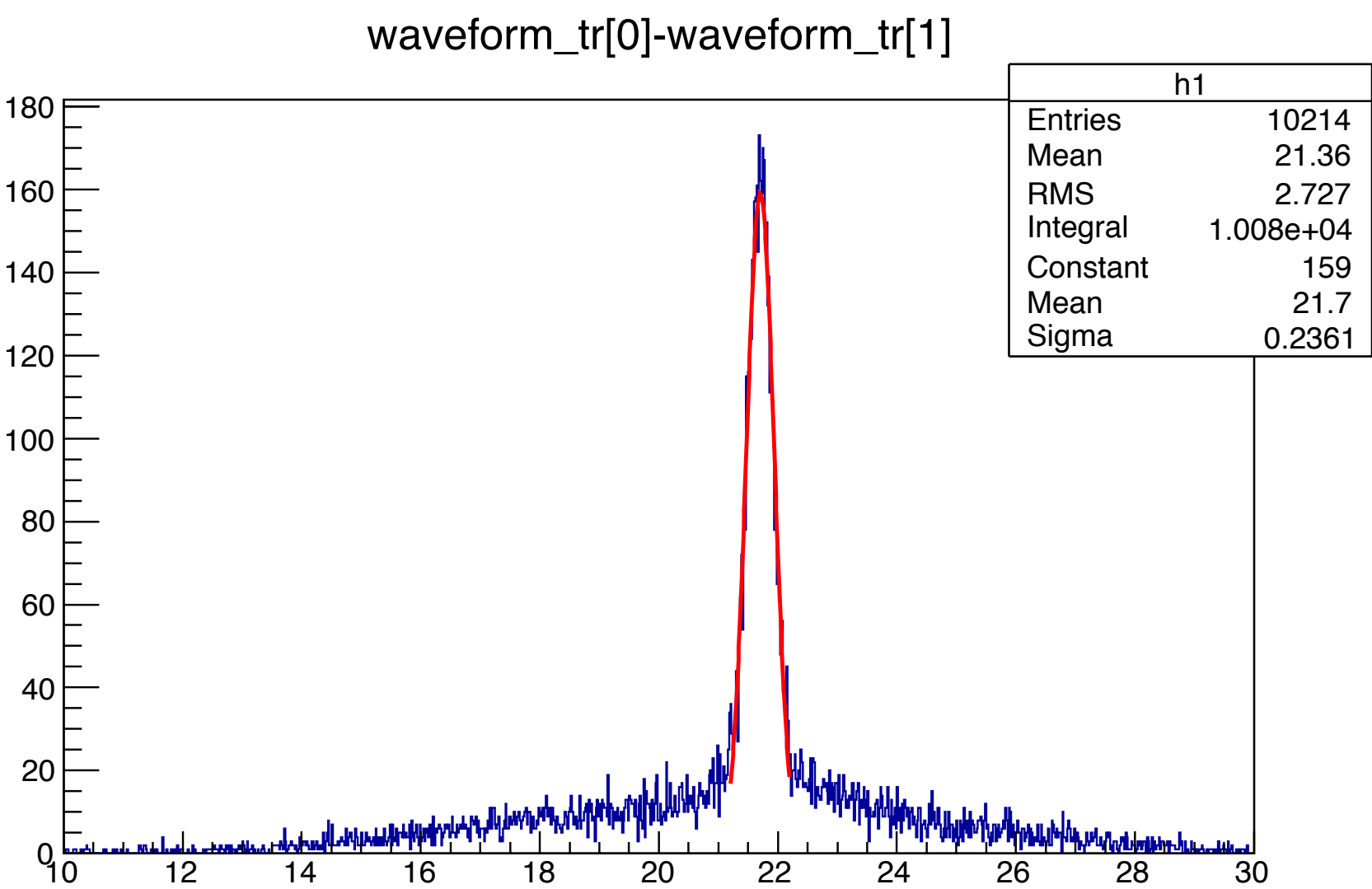
- Change the interpolation method
 - Previous: 2-point linear interpolation
 - Now: Inverse interpolation using Bessel's formula
 - $y = f(t)$, find a t when $y = y_0$: **INVERSE** interpolation
 - Use 6 points nearby.
 - Samuel S. M. Wong, "Computational Methods in Physics and Engineering" (pp. 106)

Timing extraction

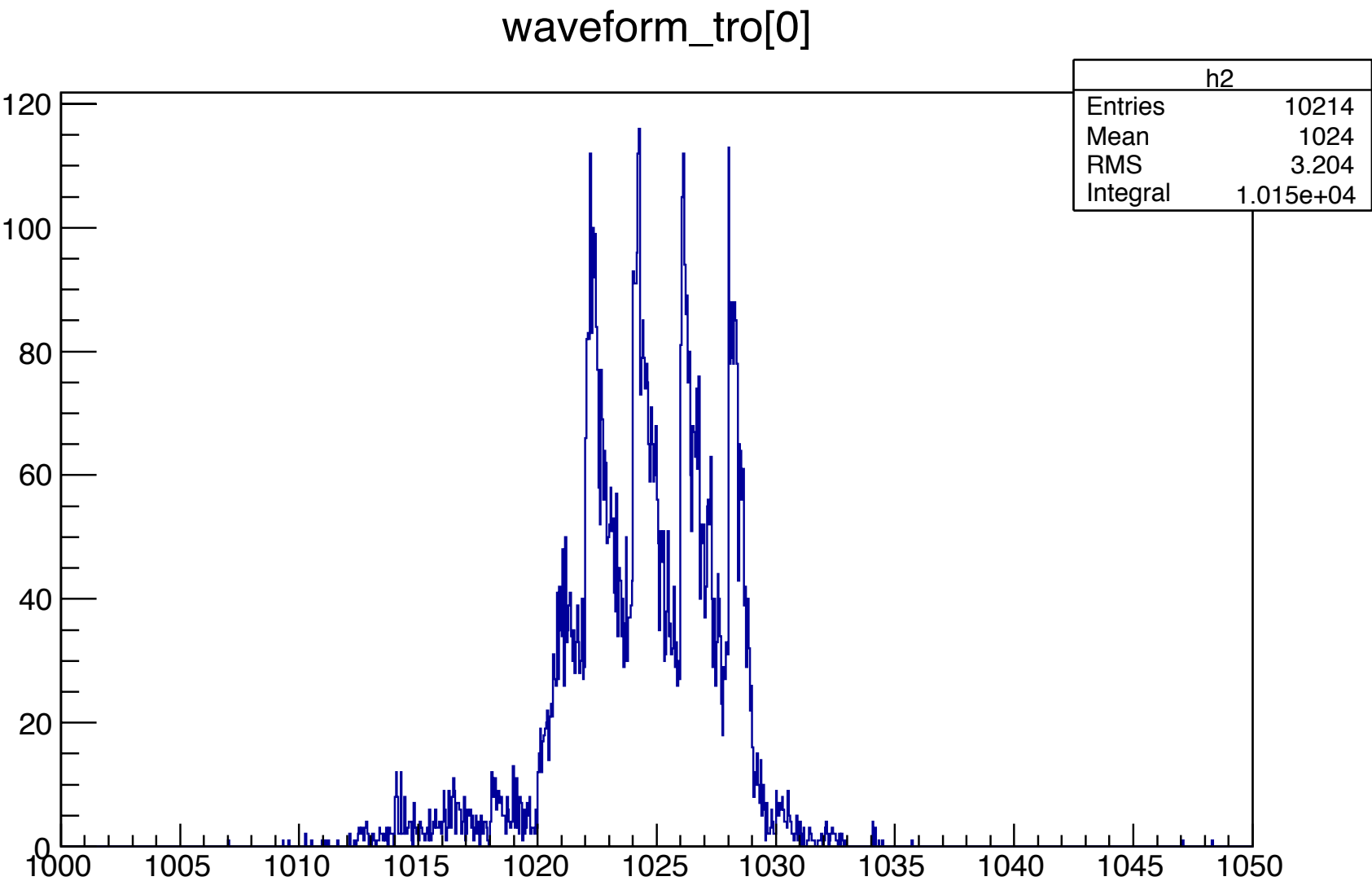
bar1 TL



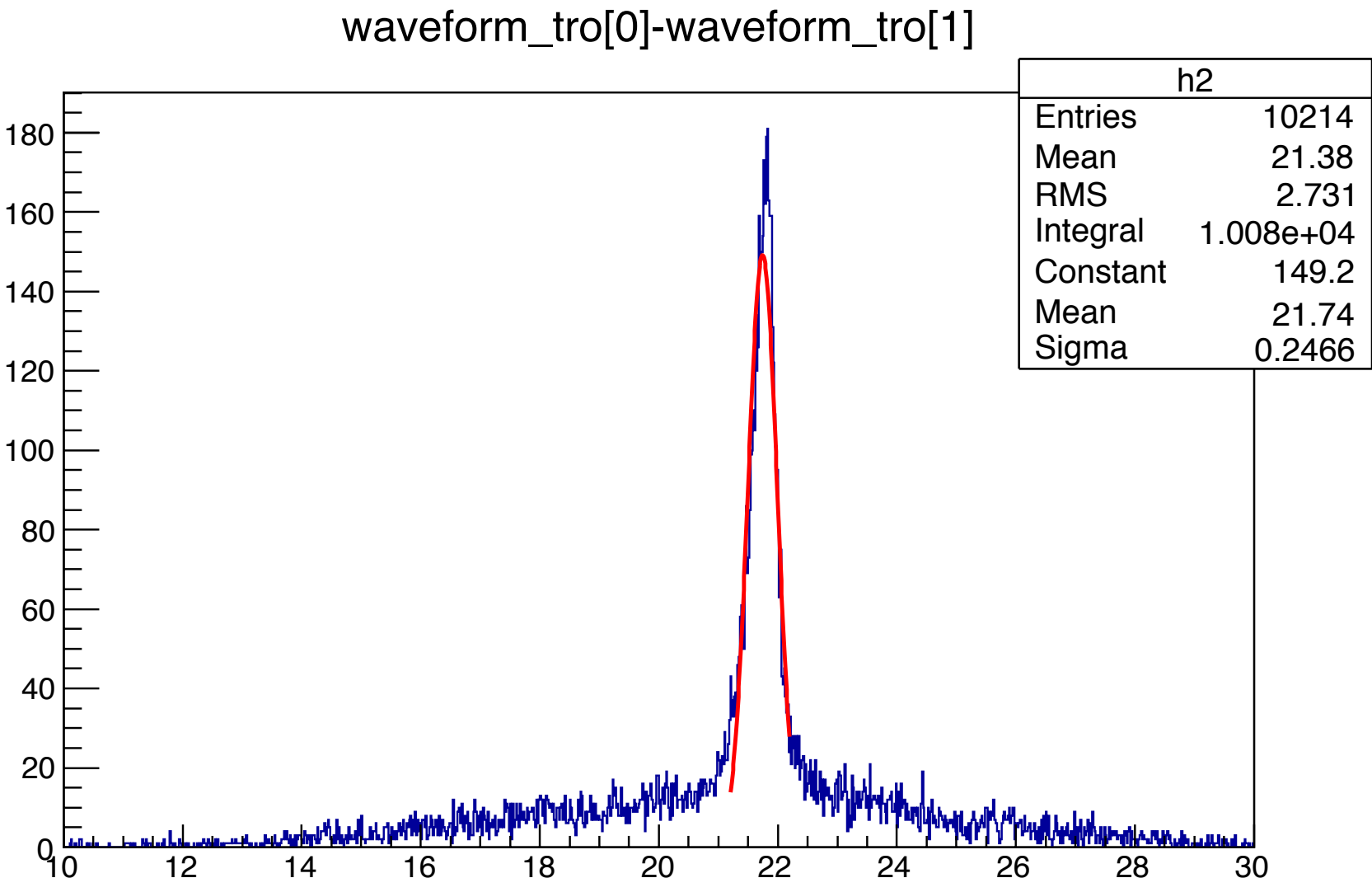
bar1 dT



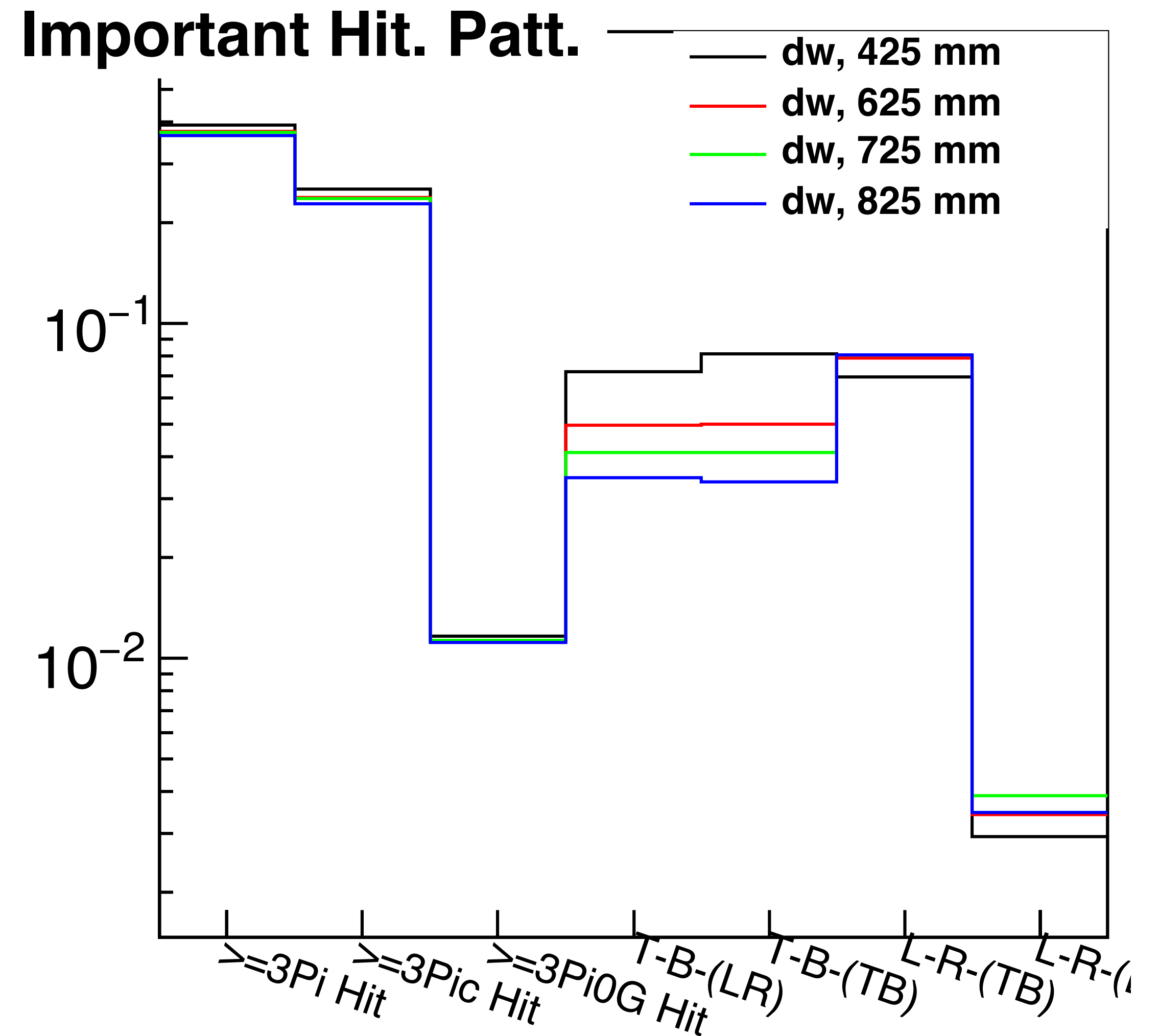
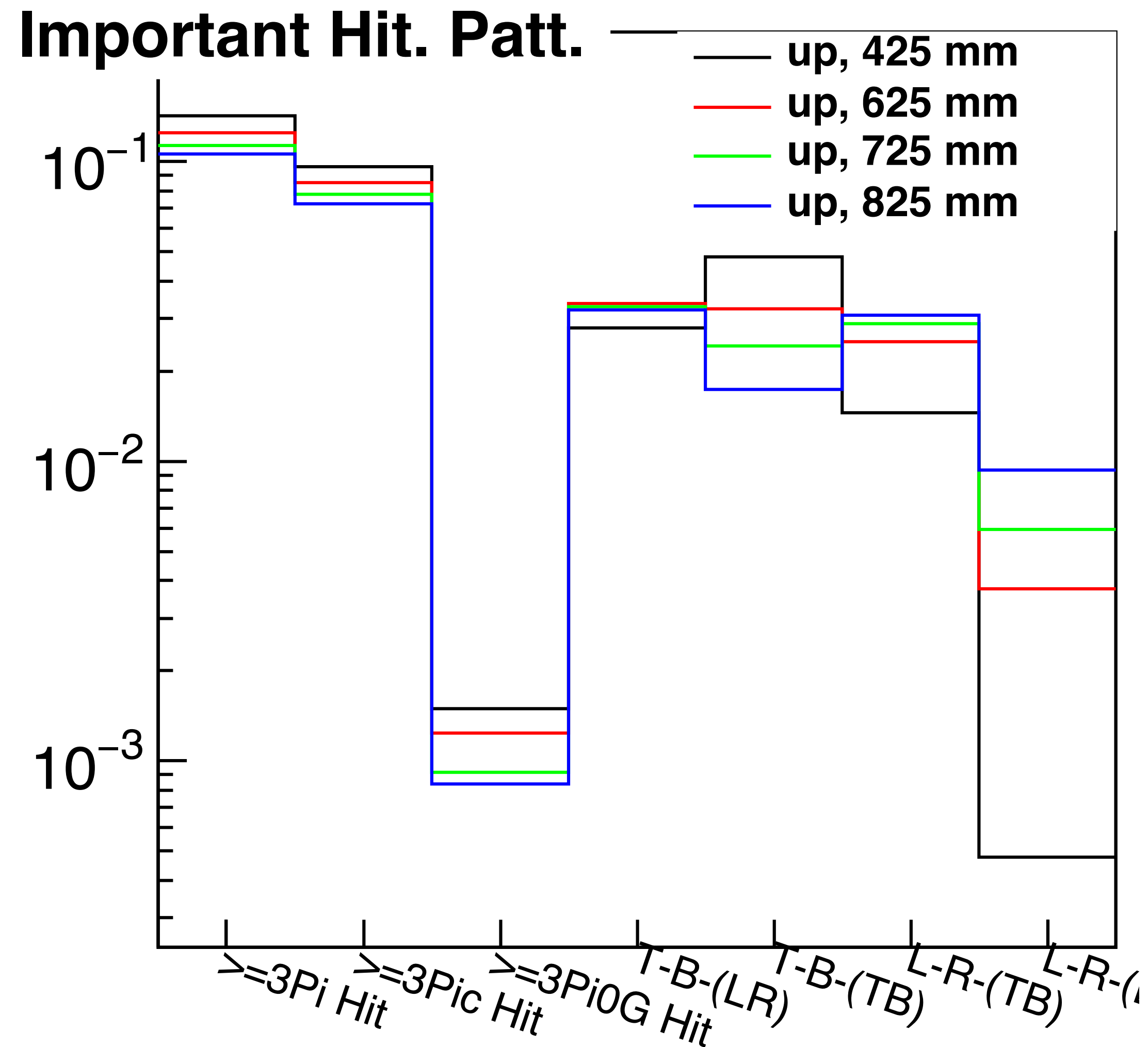
Inverse
interpolation



2-pt linear

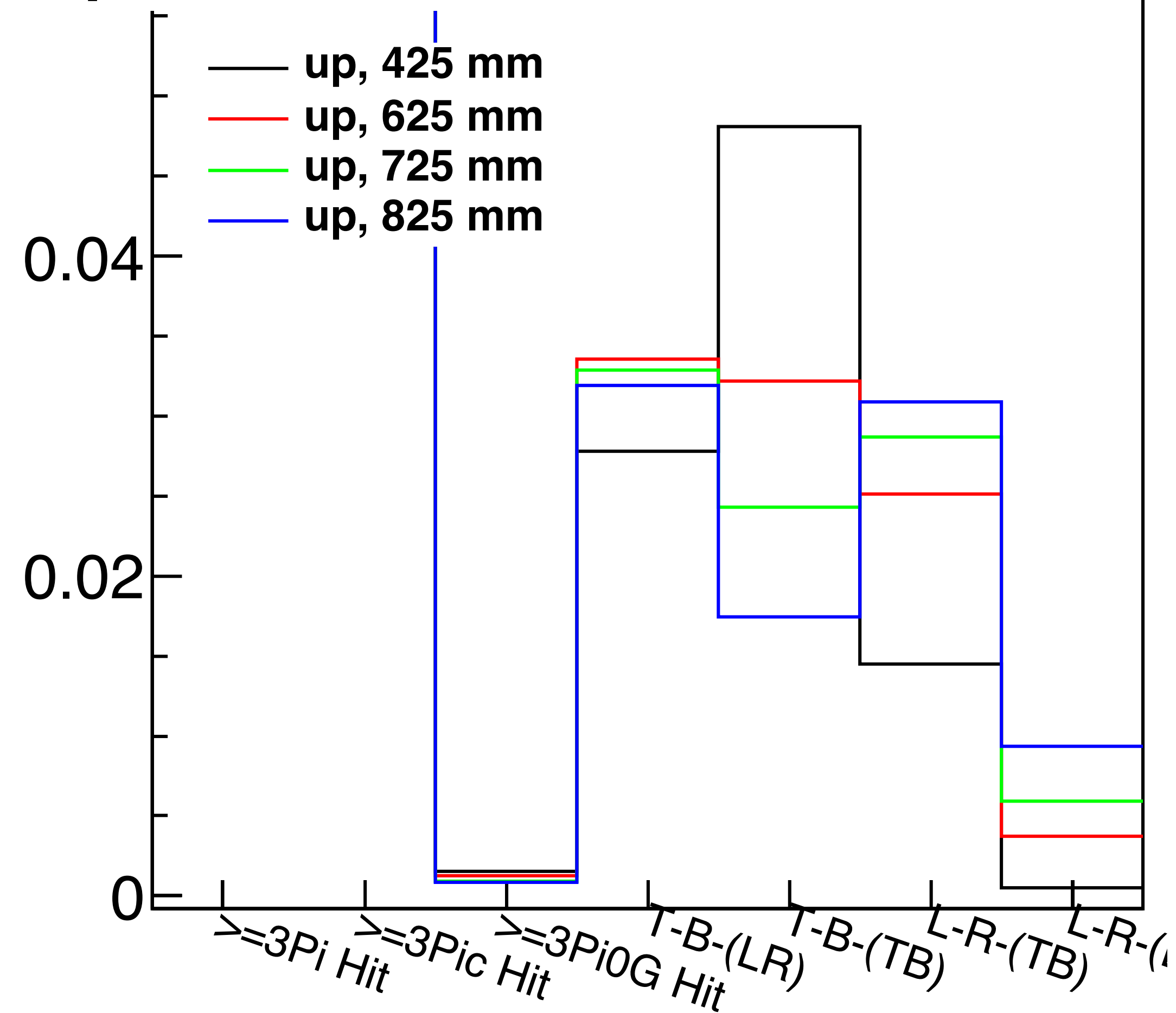


Simulation: Hit Ratio ($\pi^\pm$ & γ from π^0)

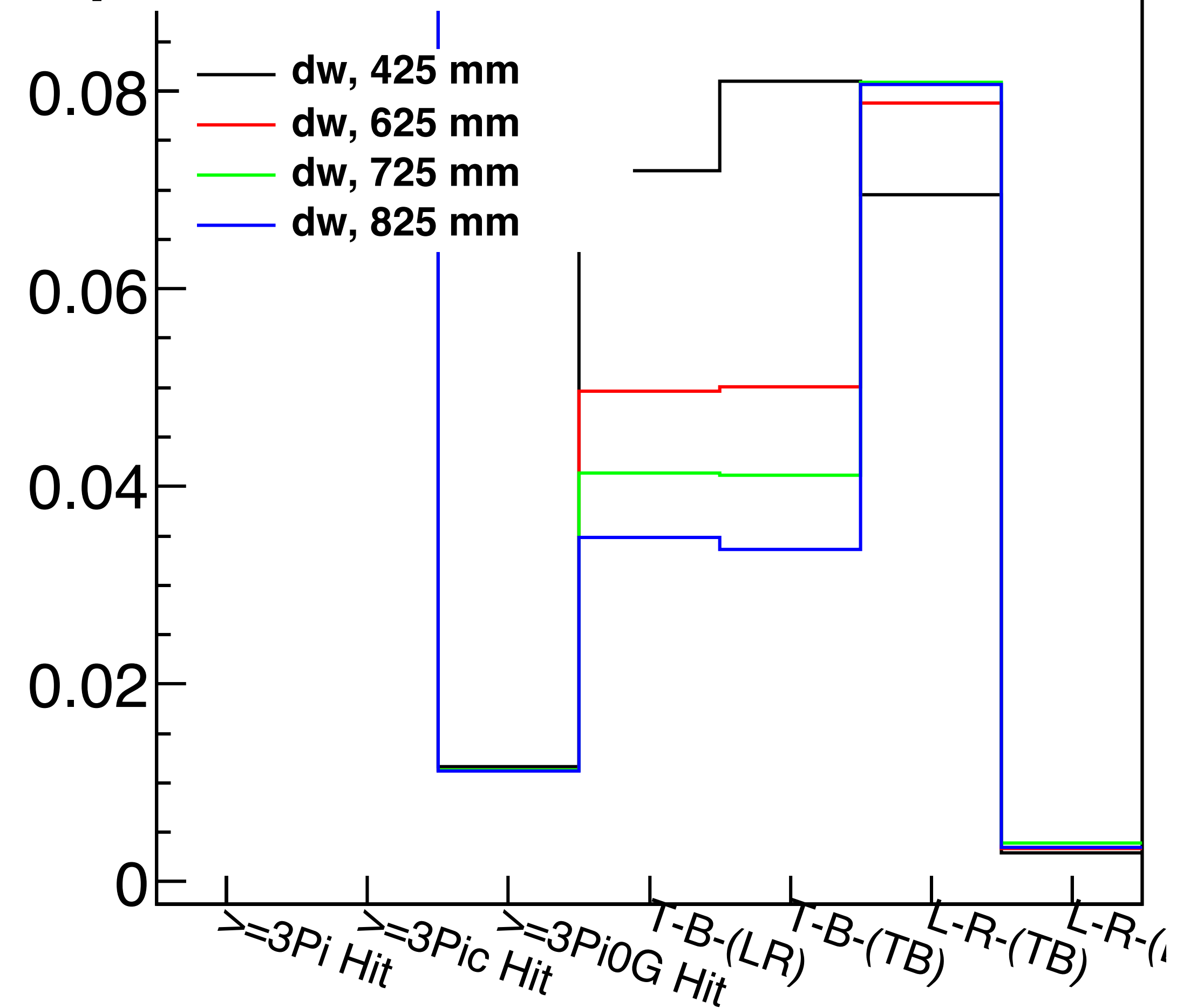


Simulation: Hit Ratio ($\pi^\pm$ & γ from π^0)

Important Hit. Patt.

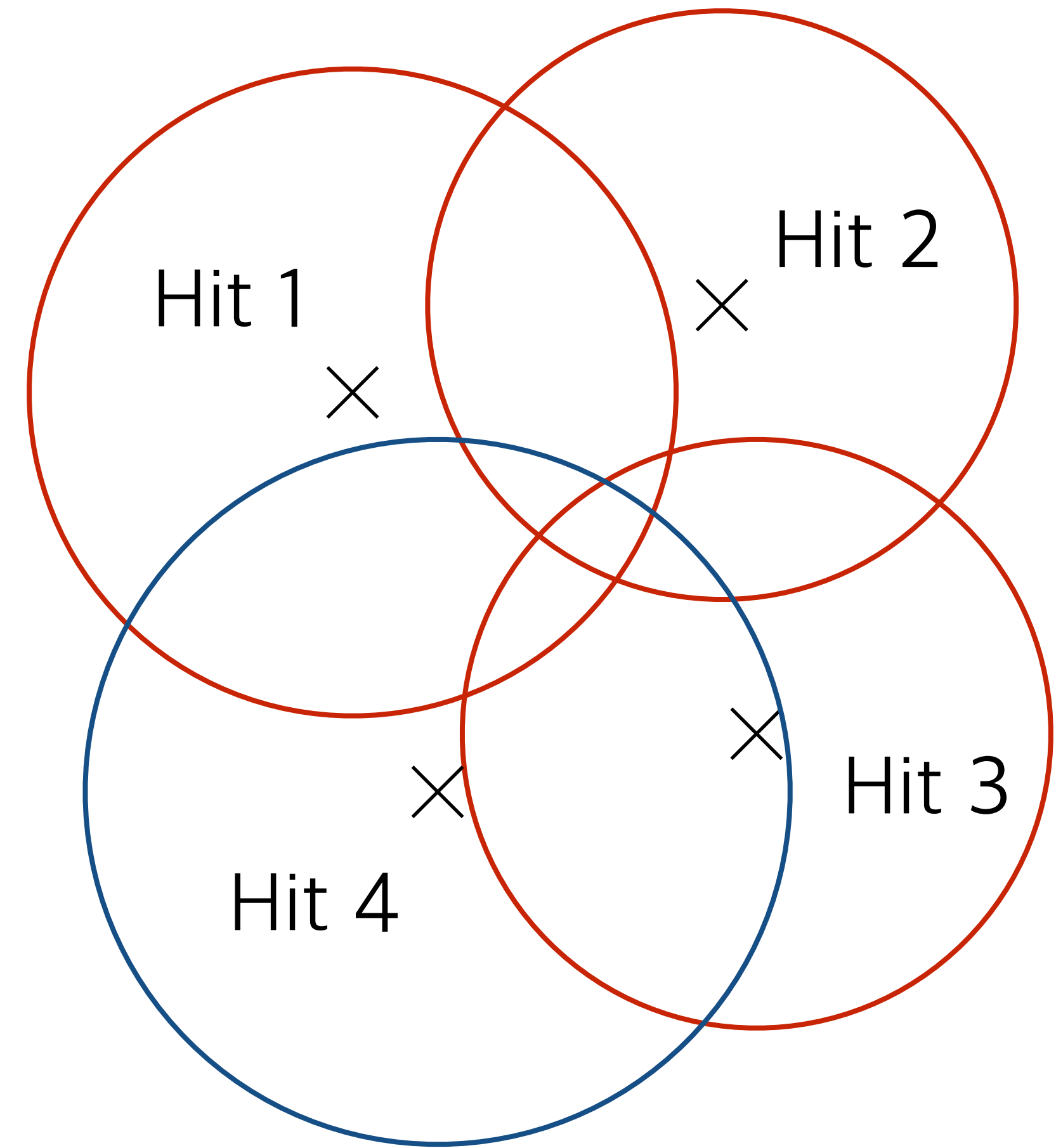


Important Hit. Patt.



Simulation: Trilateration

- Trilateration (삼변측량)
 - Finding the intersection among three spheres.
 - Application: GPS, ...
- Reconstruction of an annihilation point
 - More than 3 hits:
 - 3 hit: two solutions / no solution
 - 4 or more: can be estimated (with error)**
 - Estimated flight length



Simulation: Trilateration

- Using the minimization of the error
 - e.g.: 4 hits at p_i with estimated length r_i
 - Error of estimated lengths

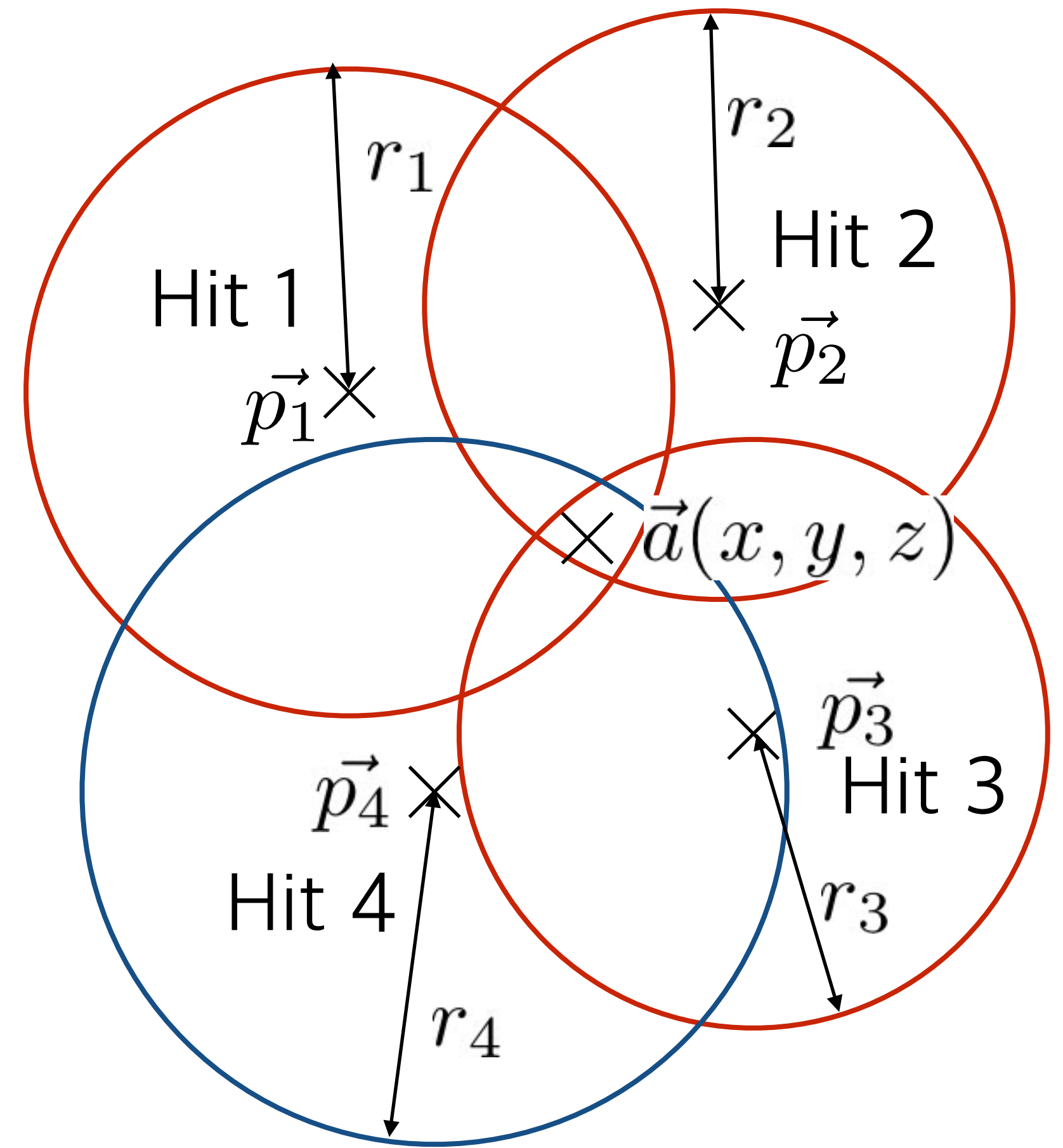
$$\Delta r_i = |\vec{p}_i - \vec{a}| - r_i$$

- Minimizing the square sum of the errors

- Total Error :

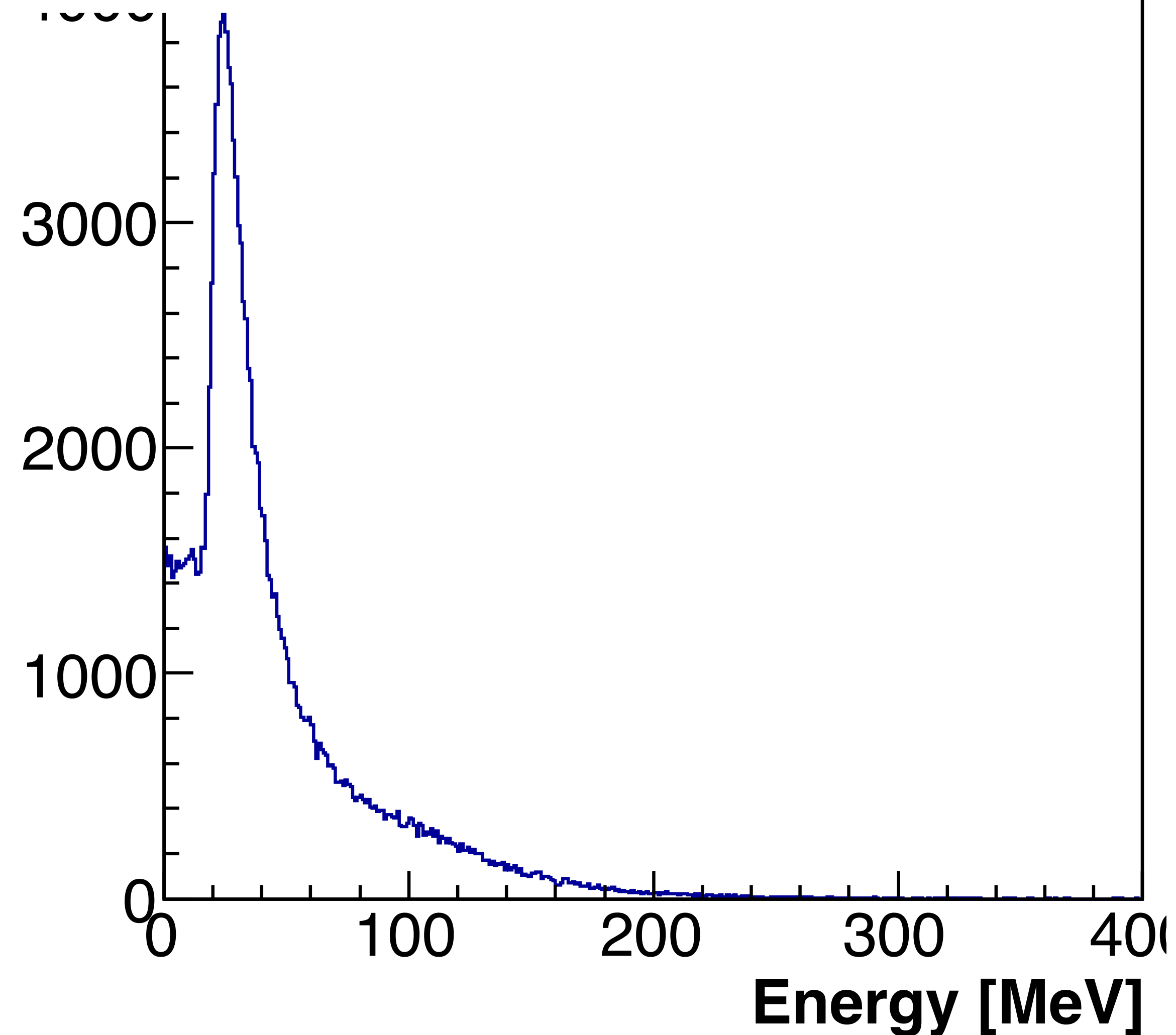
$$(\Delta r)^2 = \sum_{i=1}^4 (\Delta r_i)^2 = \sum_{i=1}^4 (|\vec{p}_i - \vec{a}| - r_i)^2$$

- Using 'Minuit2' minimizer in ROOT

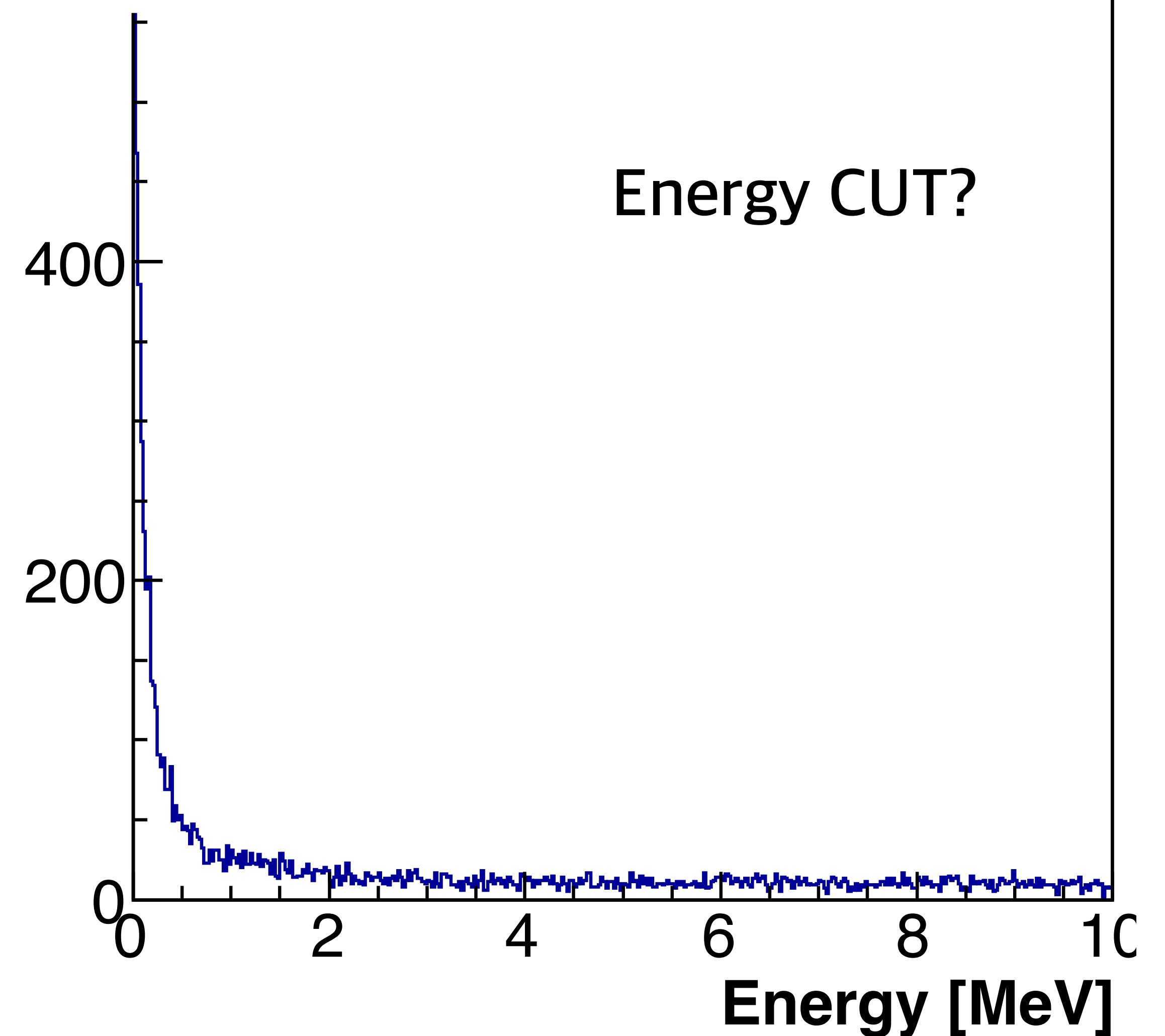


Simulation: Eloss in Plastic

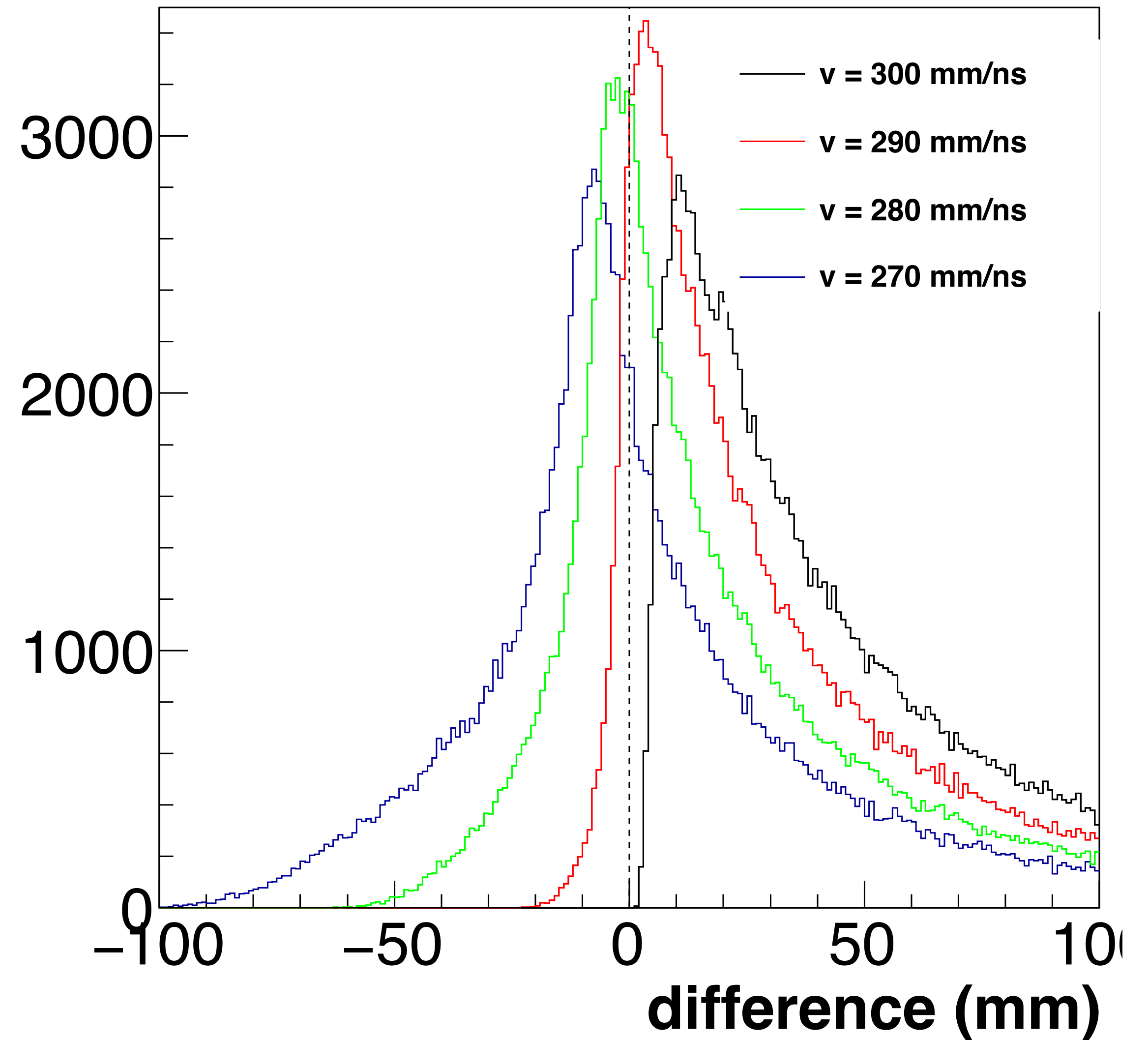
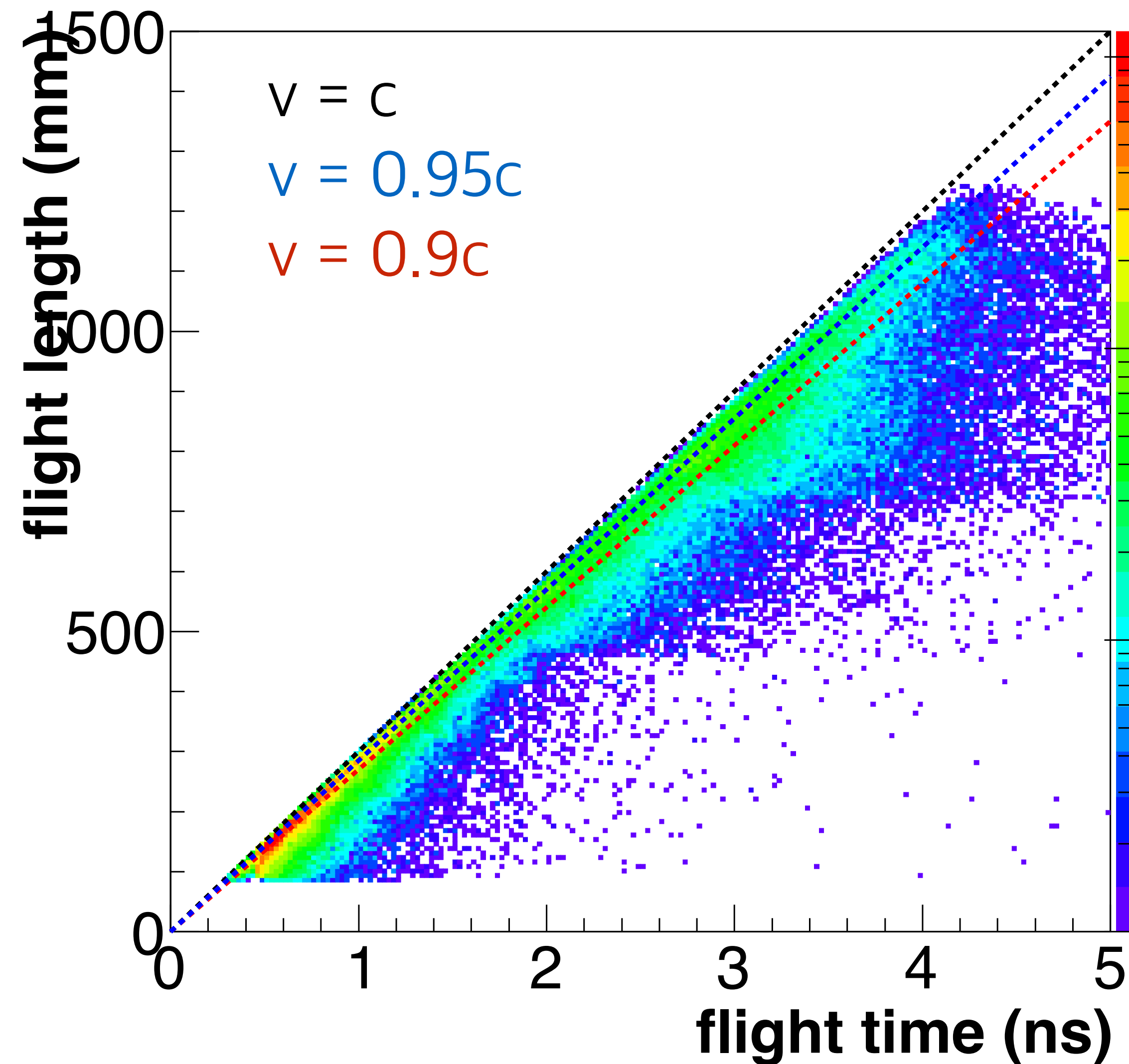
Pi+- Eloss



Gamma Eloss



Simulation: Flight Length vs Flight Time



Simulation: Test the trilateration algorithm (using real flight length)

