Beam Test
of Background from Pb-Glass

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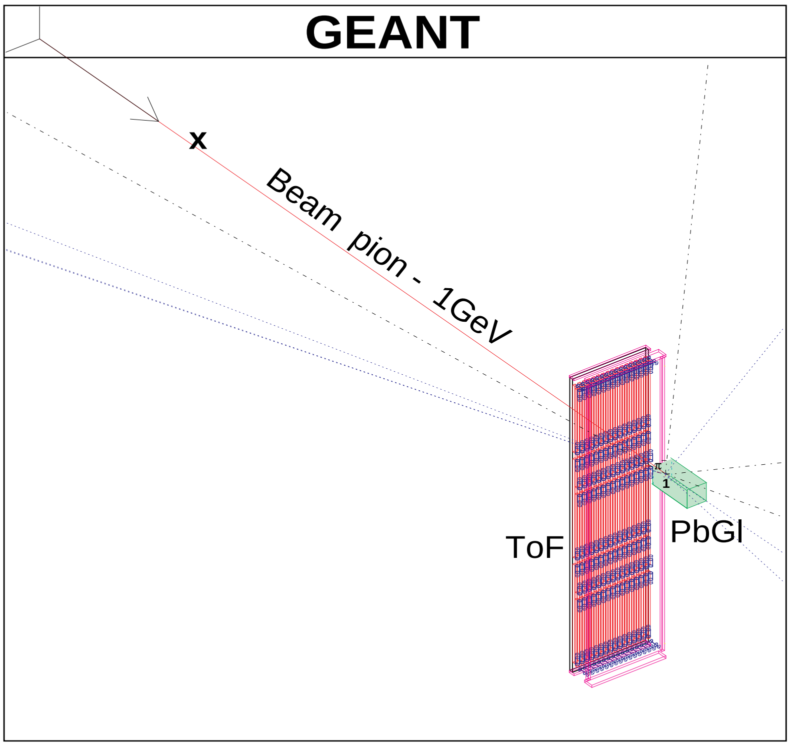


For the operation of TOF, keeping the occupancy low is important because the timing information will be lost if two particles hit the same slat.

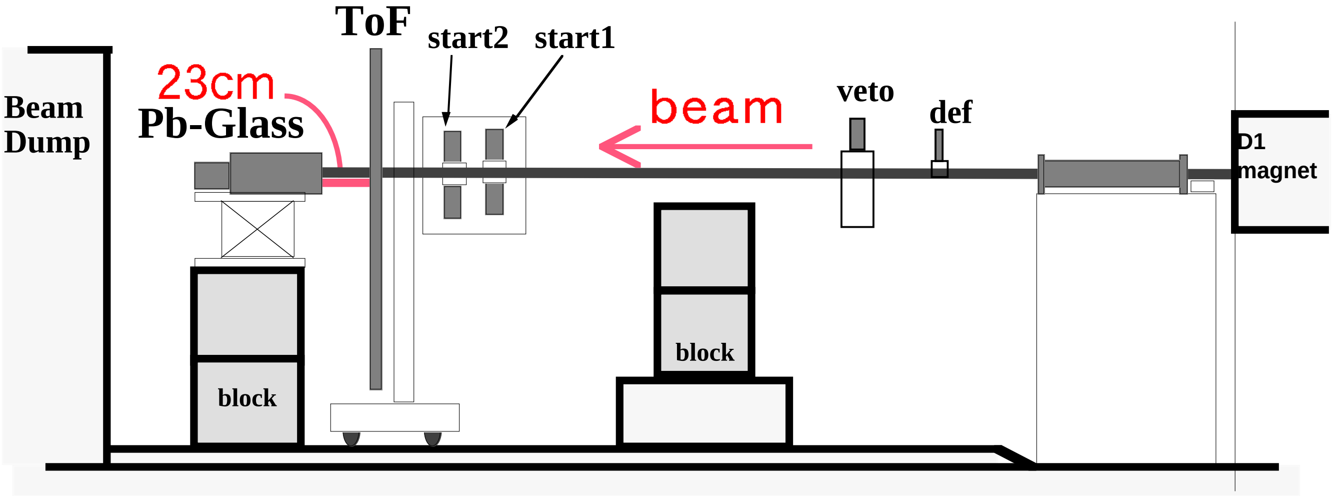
Segmentation of TOF is designed as occupancy ~10% for dN_{ch} /dy ~1500 with GEANT calculation.

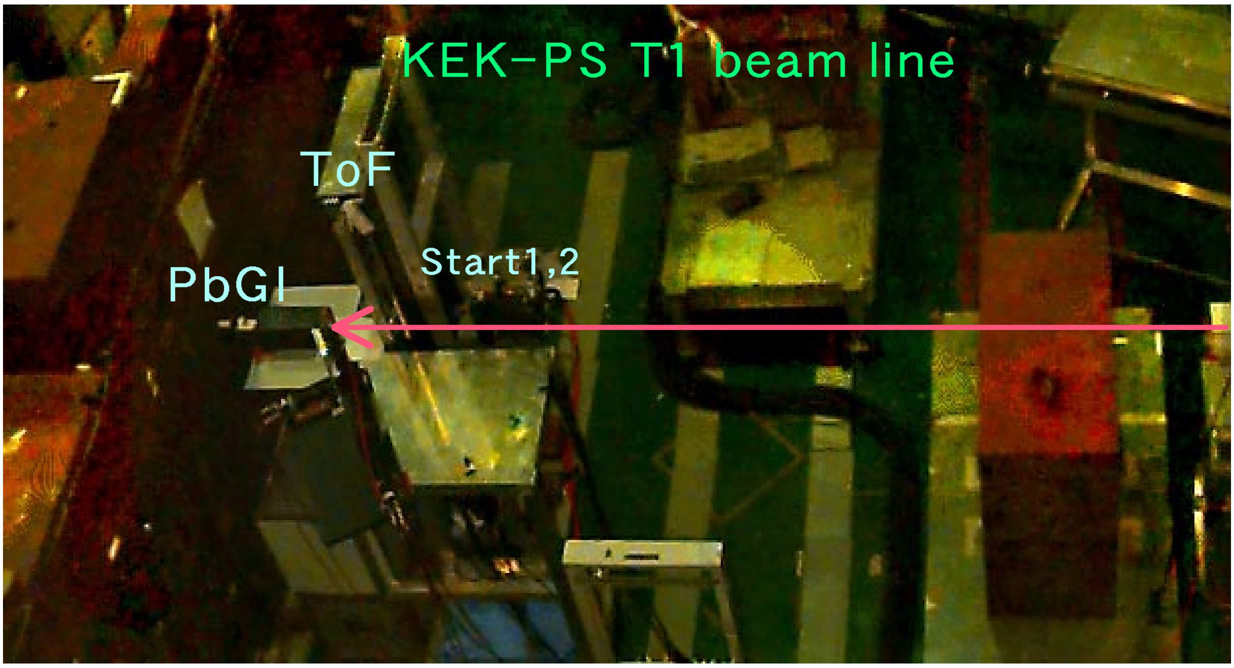
Our concern is reliability of GEANT calculation for background particularly from PbGl.

To confirm GEANT calculation, we have done a beam test at KEK.

Setup for the beam test (at KEK-PS)

in Oct. 23 – 30, 1996





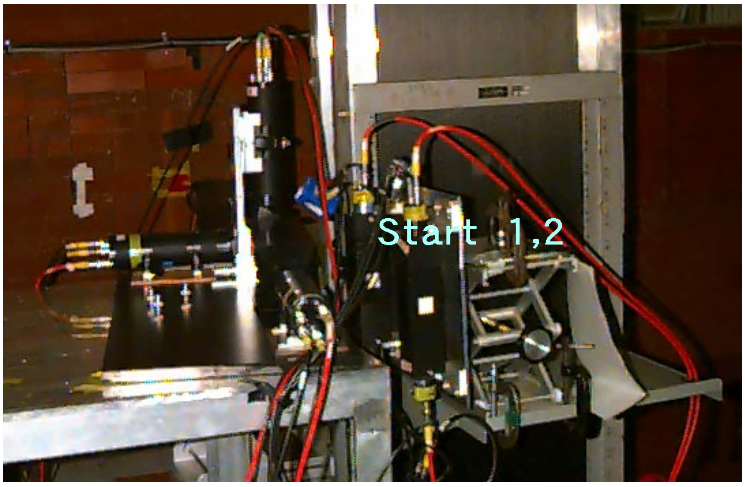
As PHENIX, TOF panel was installed 23cm upstream of a Pb-Glass block.

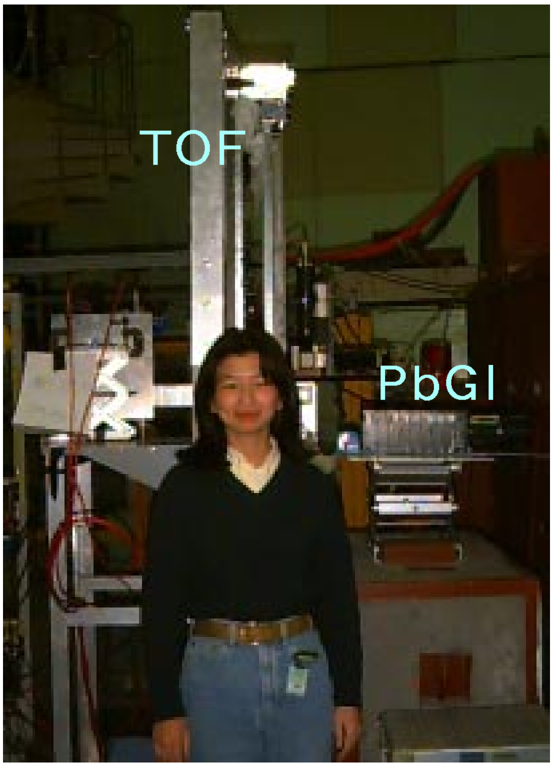
Trigger was defined as Def*Veto*ST1*ST2

Projectile particles were 1GeV/c negative, secondary beam.

Selected slats of TOF panel were read out.

Photo

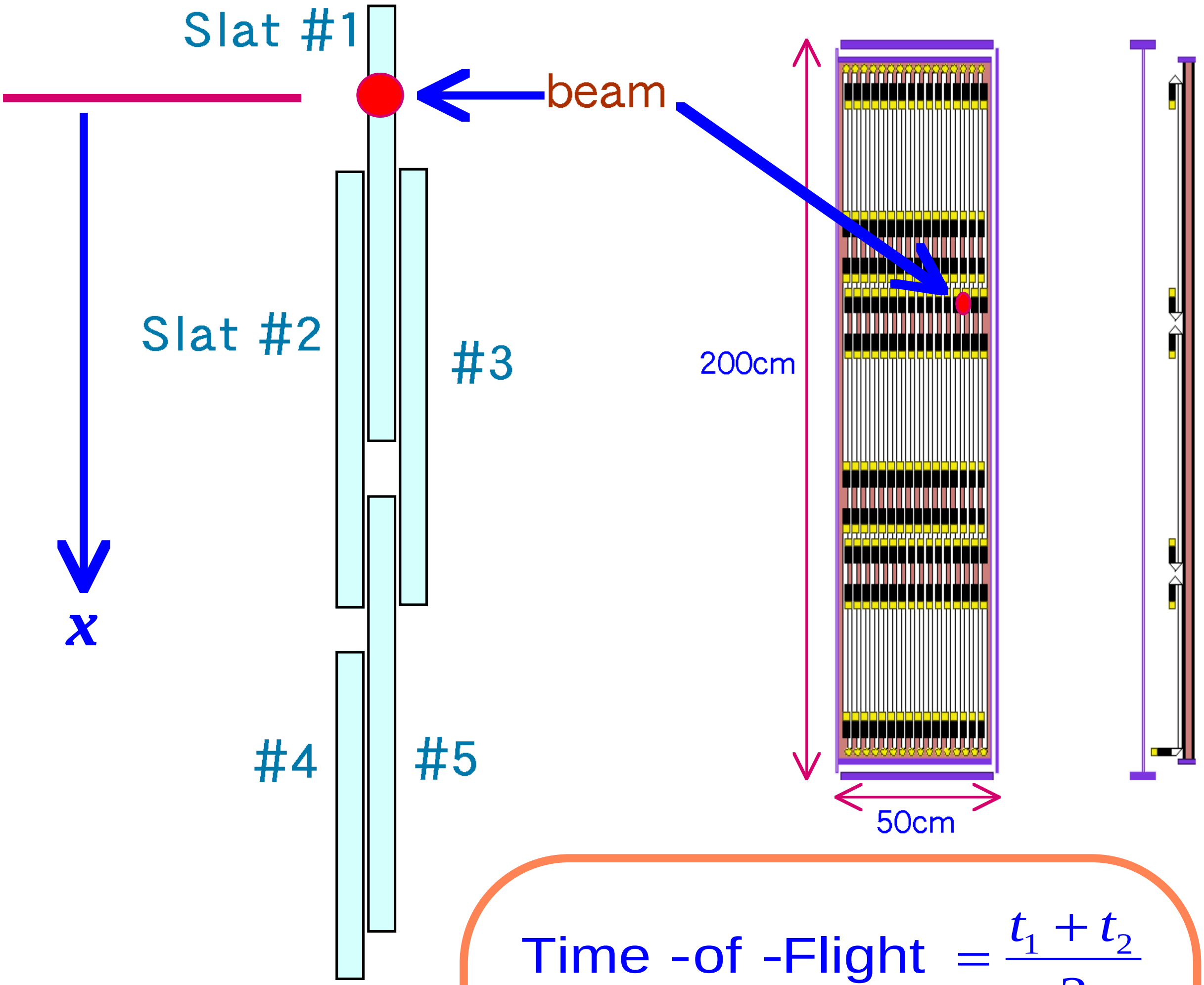




Test crews at KEK

Slat Configuration

View from down stream



$$\text{Time-of-Flight} = \frac{t_1 + t_2}{2}$$

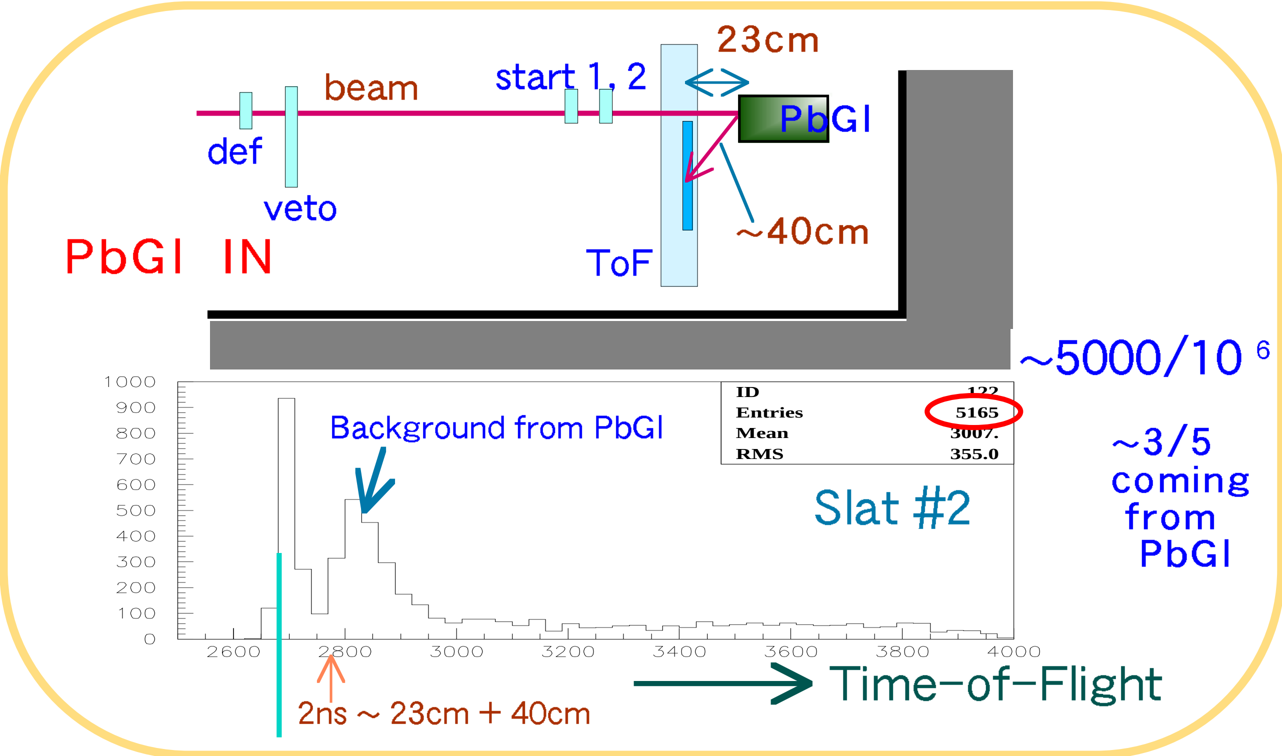
$$\text{Position} = \frac{t_1 - t_2}{2}$$

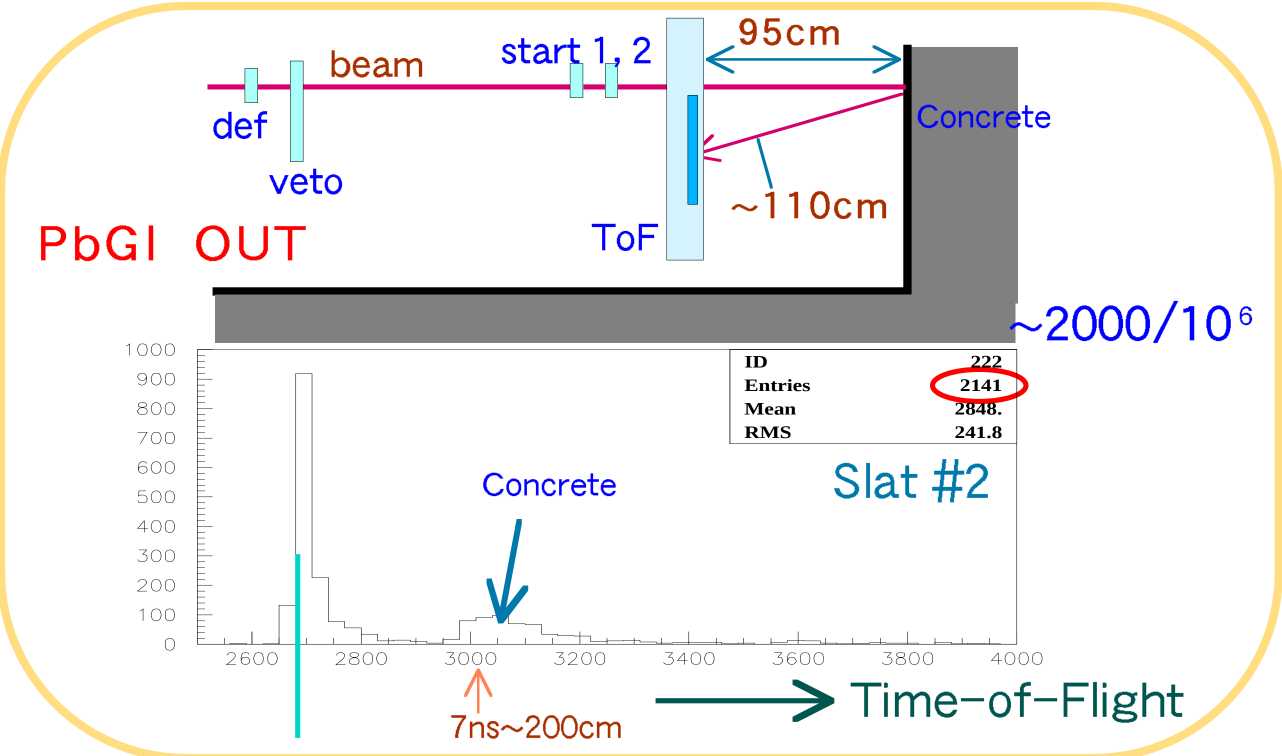
$$\text{Energy Loss} = \sqrt{a_1 \times a_2}$$

5slats were read out for every trigger.

TOF, position and energy loss were measured for each slat.

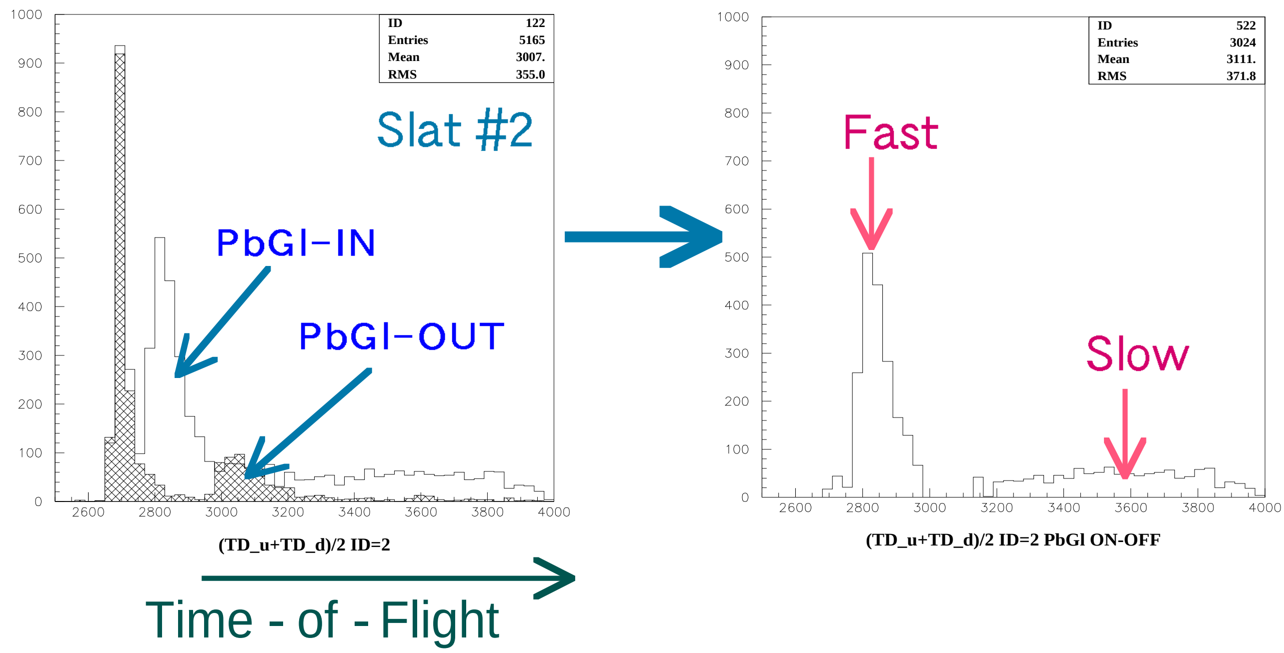
PbGl IN vs OUT





Difference between PbGl IN & OUT gives the background originated from PbGl.

Time-of-Flight



$$= \frac{t_1 + t_2}{2}$$

~3000 hits for 10^6 beam

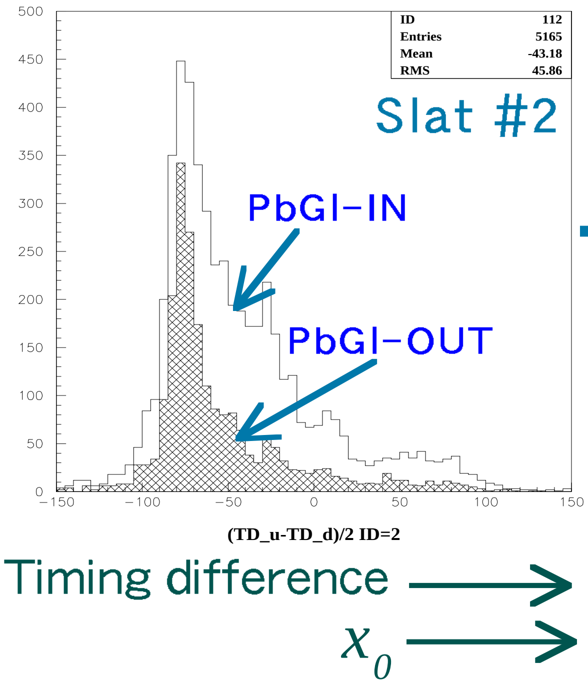
Two components are seen

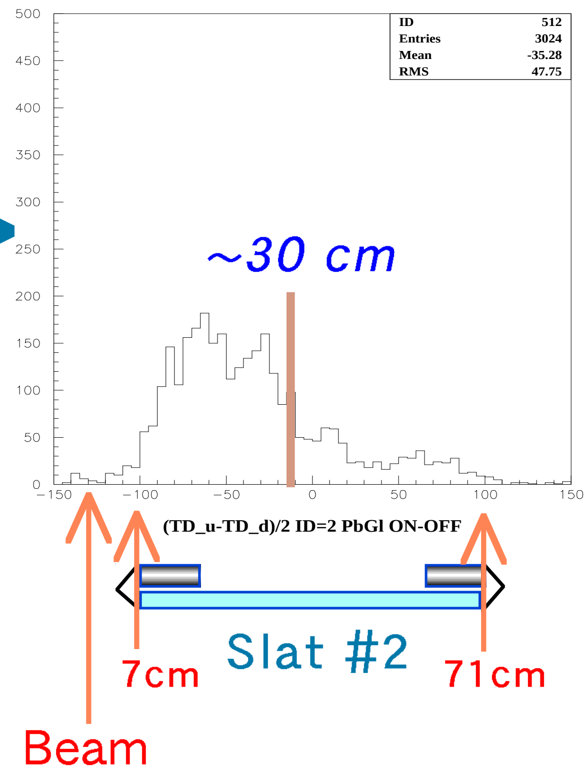
Fast ~65%

Slow ~ 35%

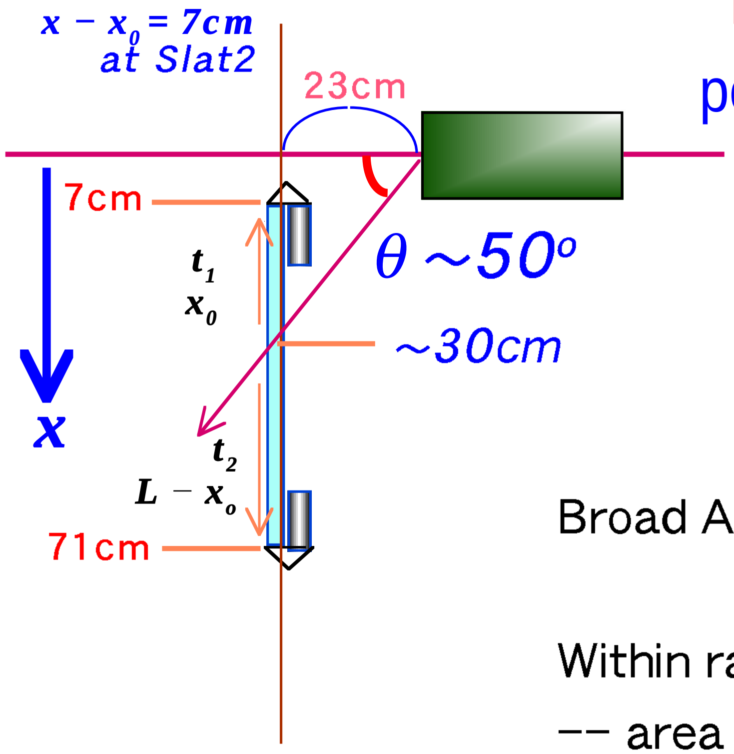
Time of Flight of "fast" is consistent with the flight path between TOF and PBGL.

Position





$$\text{position} = \frac{t_1 - t_2}{2} = \frac{x_0 - L/2}{v_{light}}$$

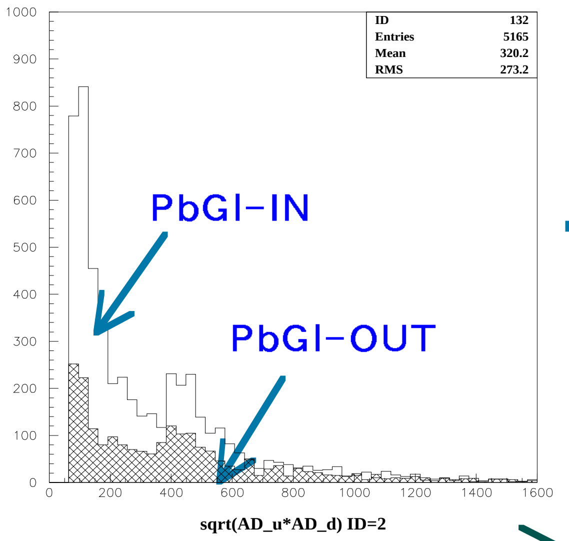


Broad Angular Distribution

Within radius of 30cm

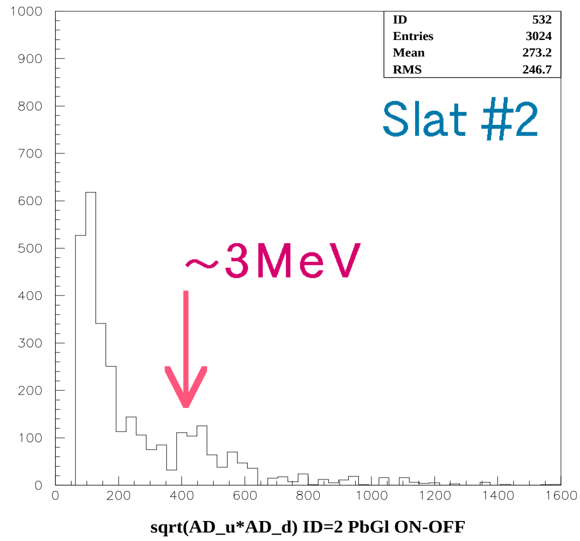
-- area : ~30 slats (~3000cm^2)

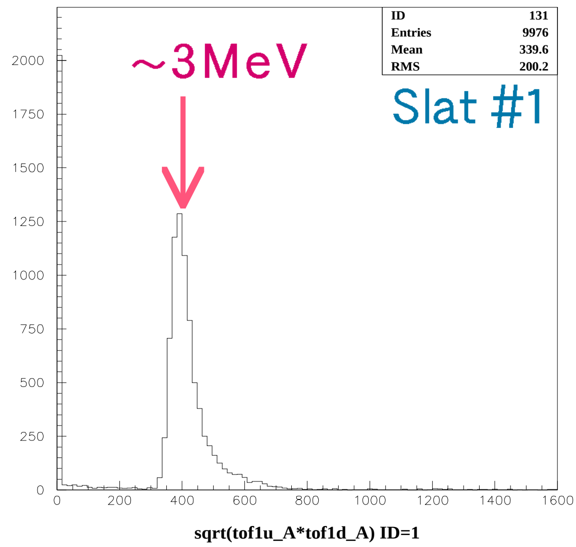
Energy Loss



Energy Loss

$$= \sqrt{a_1 \times a_2}$$





Scintillator is 1.5cm thick.

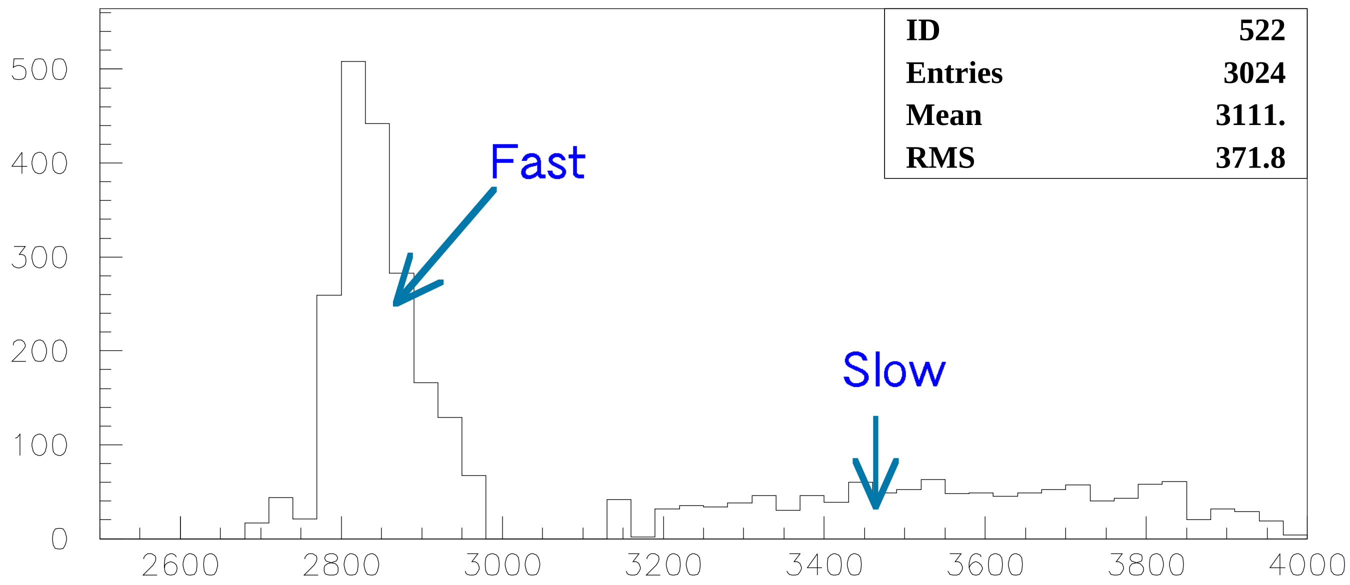
↓

Energy loss : ~3MeV
(by Min. Ion. particles)

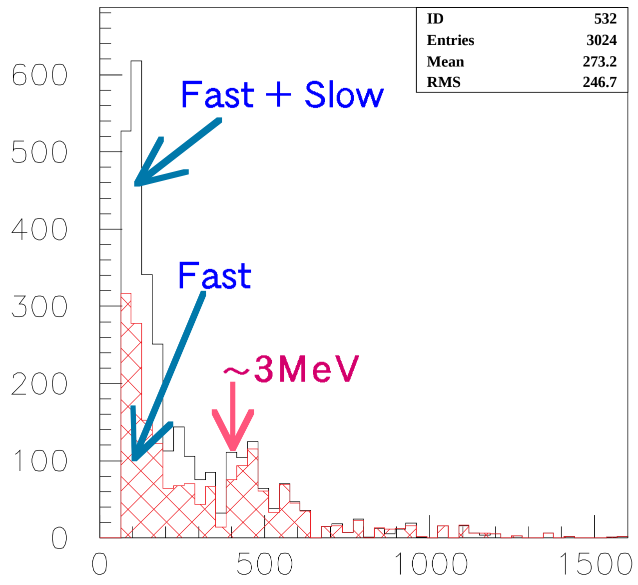
Background particles give the energy loss in the scintillator < 1MeV

Background rejection is possible with energy loss cut!

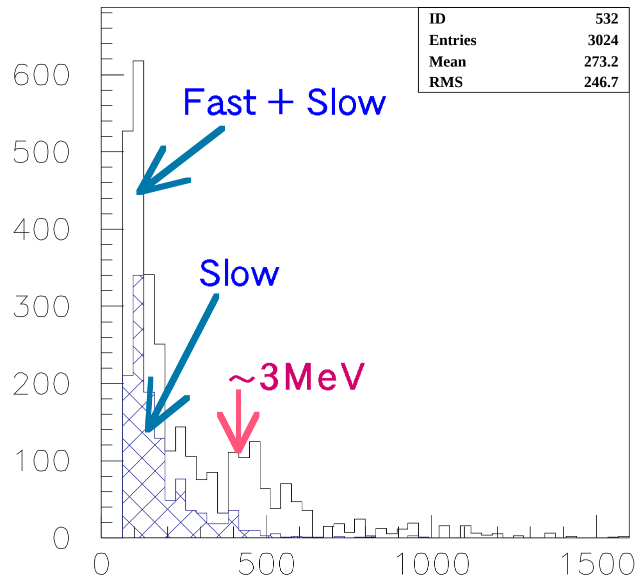
Fast & Slow particles



(TD_u+TD_d)/2 ID=2 PbGl ON-OFF

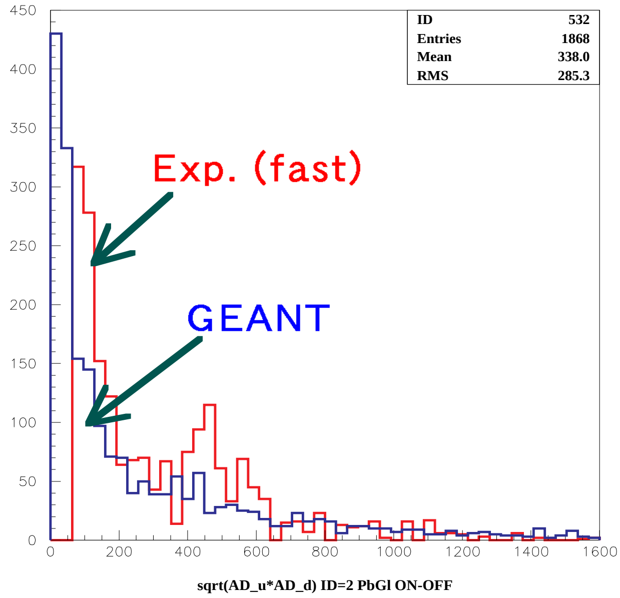


sqrt(AD_u*AD_d) ID=2 PbGl ON-OFF

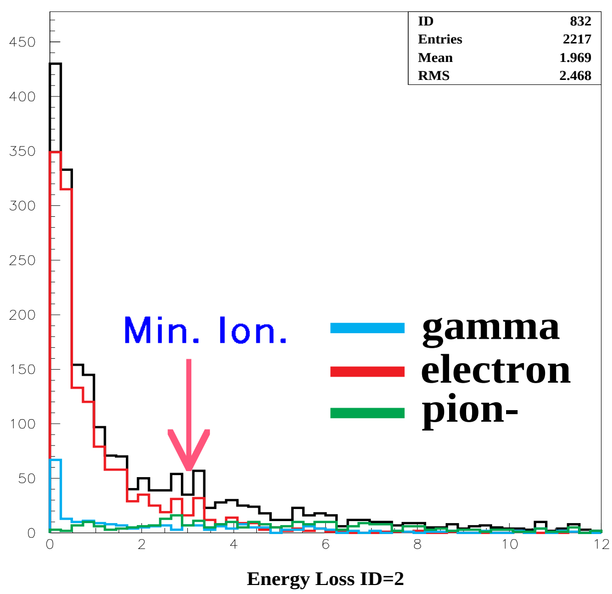


sqrt(AD_u*AD_d) ID=2 PbGl ON-OFF

Comparison with GEANT



	No. of hits	
exp. (fast)	~2000	
all(GEANT)	2217	100 %
gamma	272	12 %
electron	1384	63 %
pion−	303	13 %



Parameter in GEANT

CUTGAM = 100keV

CUTELE = 100keV

Scint. & PbGl materials quoted from PISA.

Tracking particle is pion−

1000000 event

Background particles are mainly low energy β.

Rate is consistent with GEANT.

Summary

- o Segmentation of TOF is designed for

    $dN_{ch}/dy \sim 1500$

    Occupancy ～ 10%

  with GEANT calculation.
- o To confirm the reliability of GEANT calculation, particulary background from PbGl has been experimentally investigated at KEK in Oct. 23 - 30,1996.
- o Background from PbGl for 1GeV/c negative is consistent with low energy β and the background rate agrees with GEANT calculation.
- o Further data analysis will be done.

    500MeV/c beam

    dE-E counter hodoscope