Test Beam preliminary results

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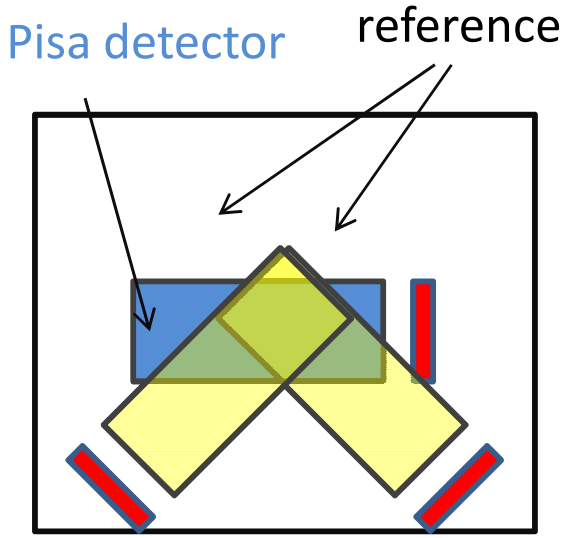
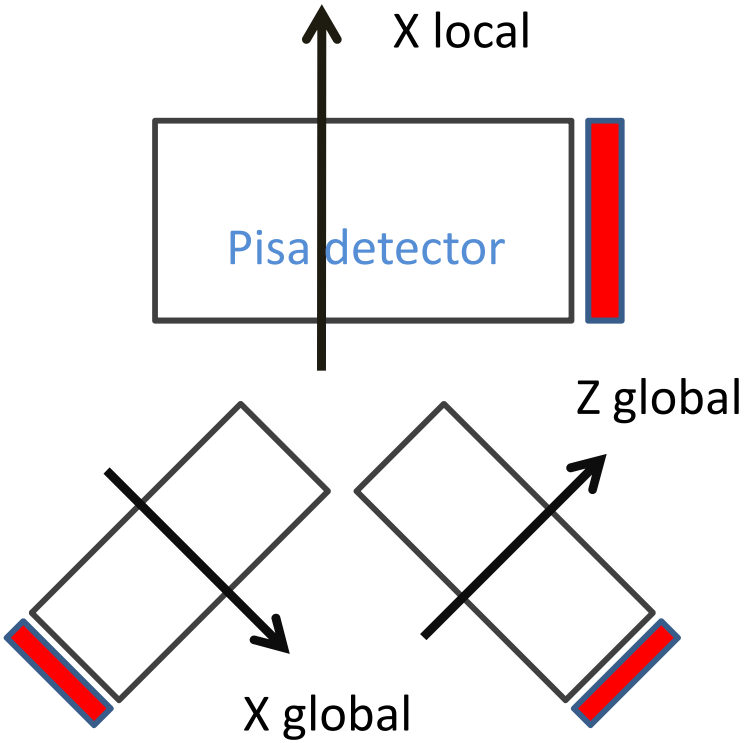
Introduction

- In December 2010 we had a Test-Beam with doublet prototypes
- 3 different modules tested:
  - ***Module A, 80 um (strips connected to adiacent FE channels)***
  - ***Module B 80um and 120 um (strip connected to same FE channel)***
- 4 different angular orientations w.r.t beam direction (0°, 5°, 10°, 20°)
- The CW and the distance of clusters in the two sensors studied as a function of the incidence angle

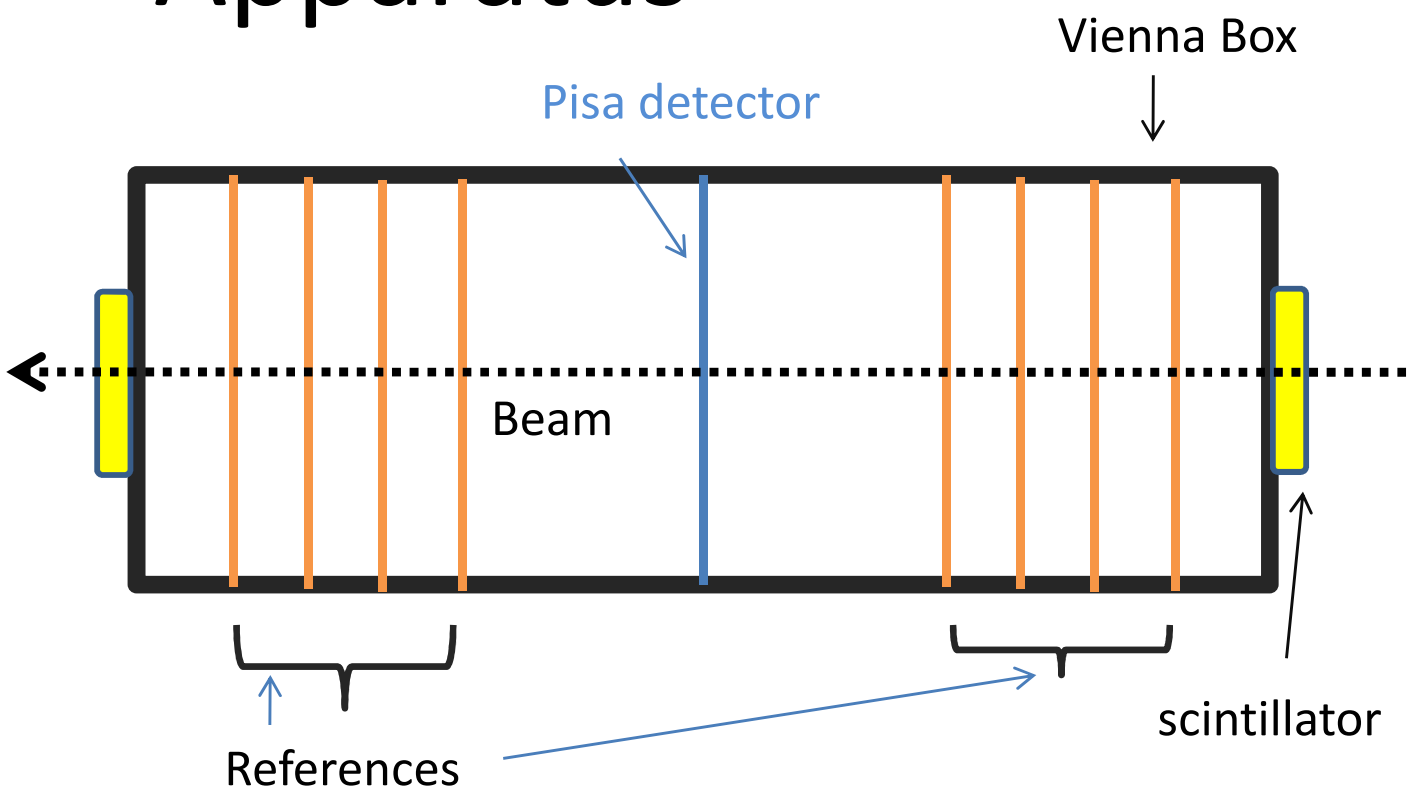
Apparatus



Transverse view

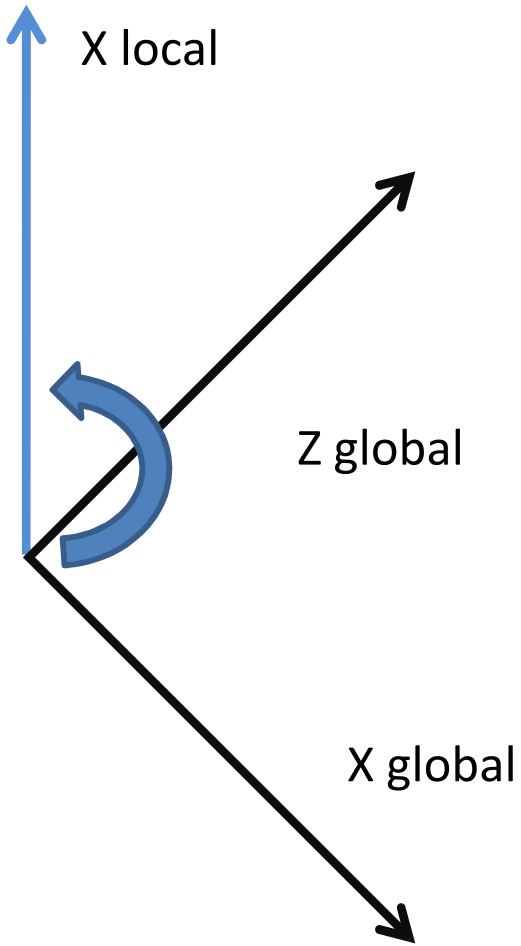


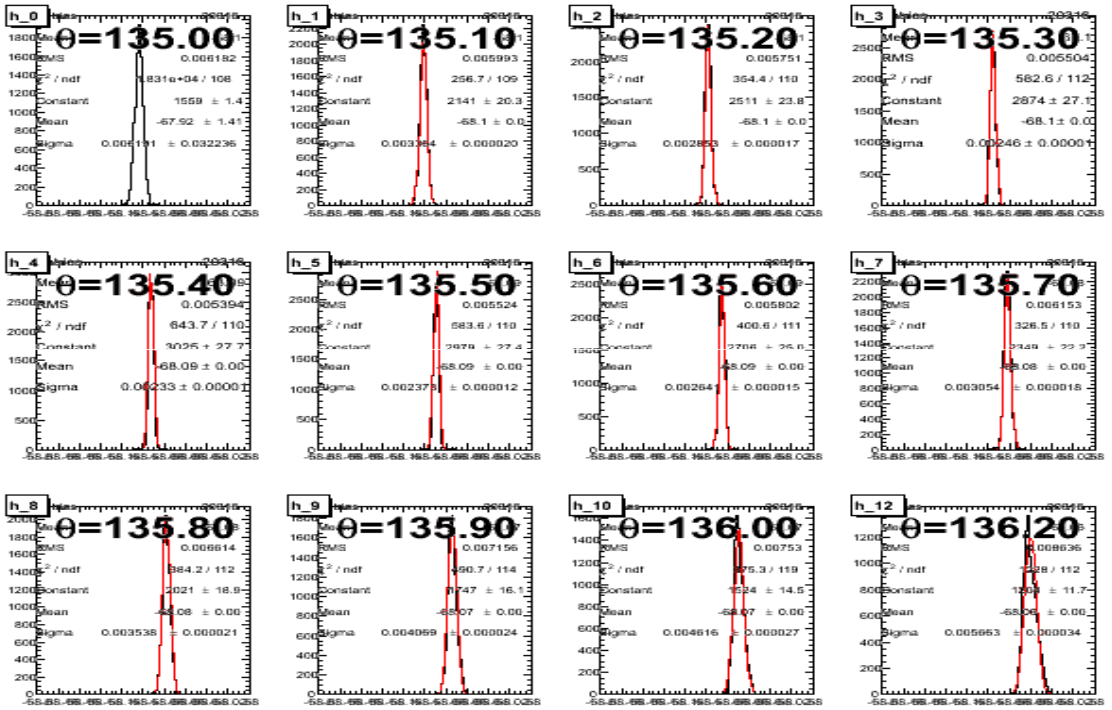
Y global going into the screen



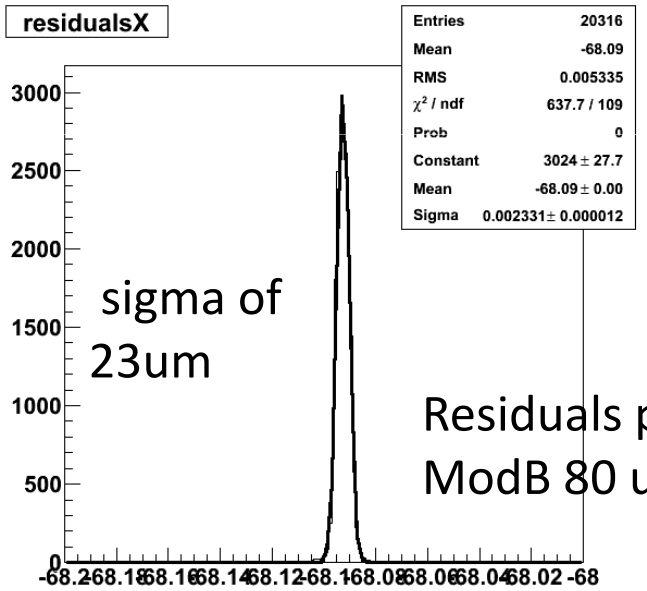
- 8 reference planes (SiStrip detectors 50 um pitch)
- Trigger made by coincidence of two scintillators
- Alignment and cluster (track) reconstruction on references provided by Finnish collegues
- Only tracks with all the 8 hits in the references and no more than 13 hits are reconstructed
- We have to align our module to their reference frame ...

Alignment





$$\theta \approx 135.4°$$

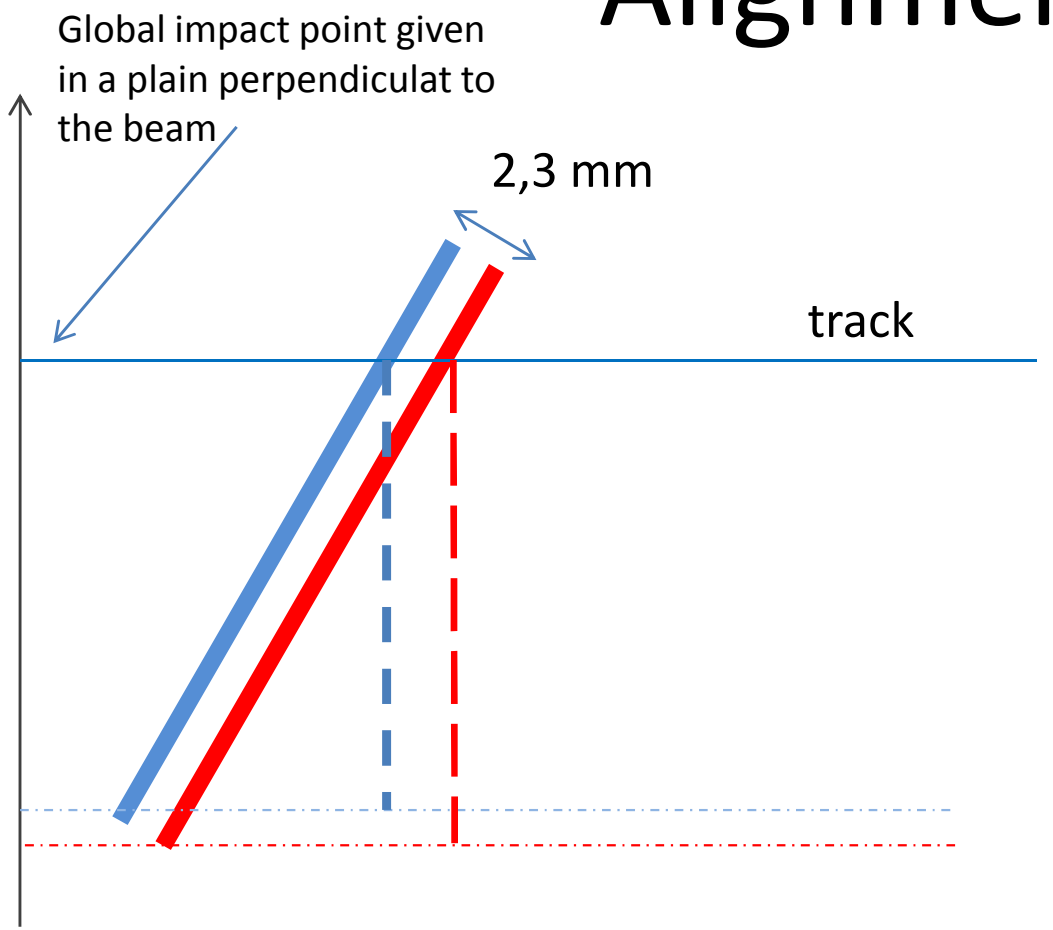


To align the global X is rotated to find the minimum of the residulas, all the sensors seem to be aligned for the same angle

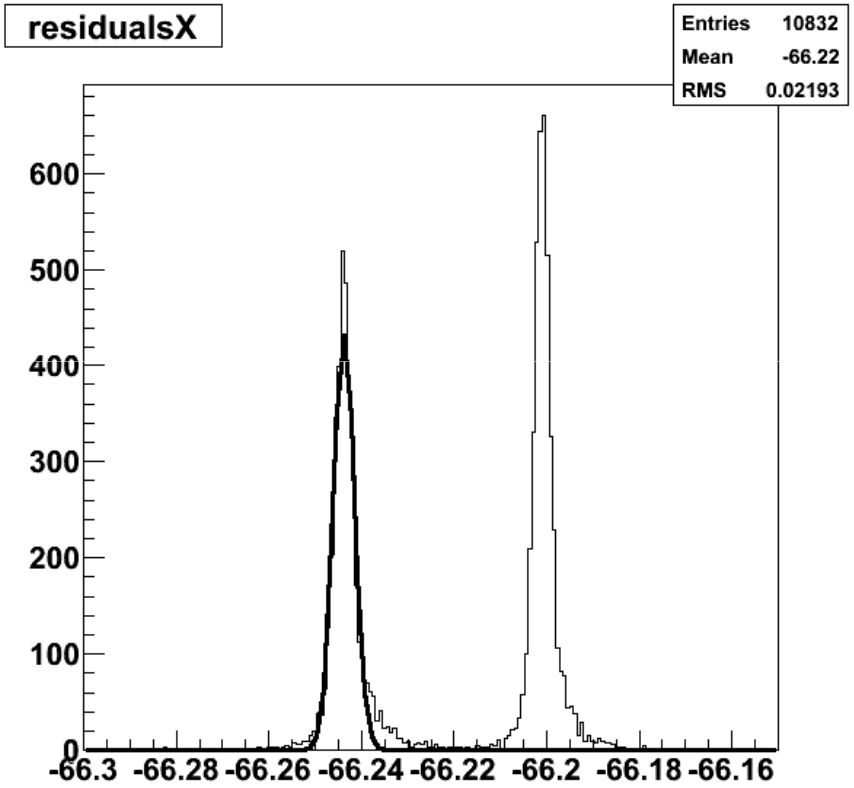
sigma of 23um

Residuals plot for ModB 80 um at 0°

Alignment (II)

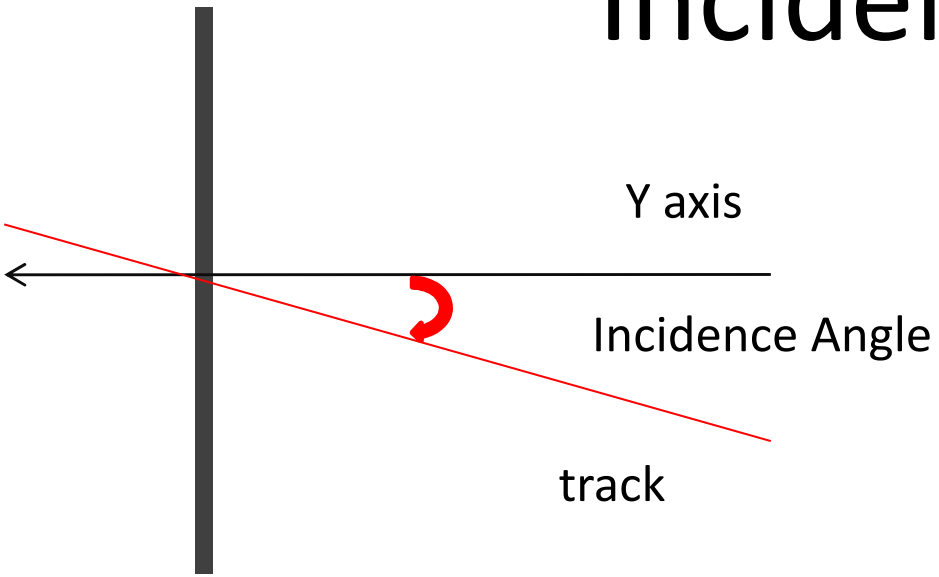


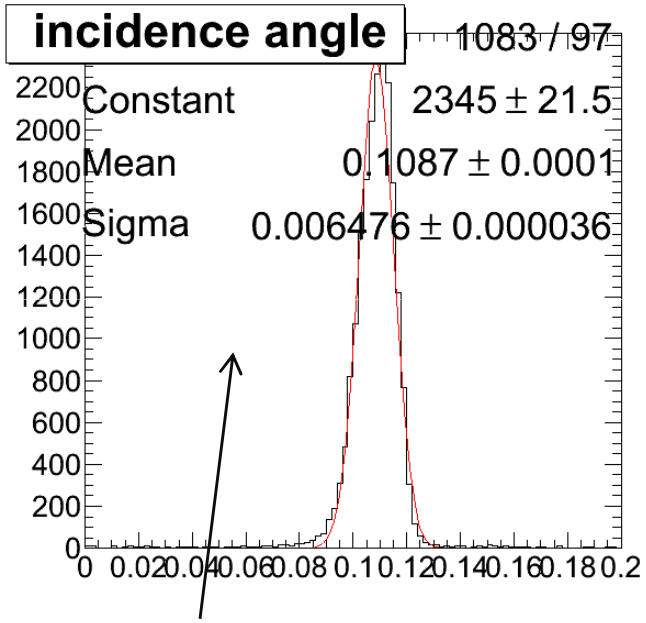
If the doublet is inclined enough to have always 2 reconstructed clusters, there is an ambiguity (we have only one reference point and two different cluster positions), so I get two peaks in the residuals.



This is the case ModB 80 um at 10°, the distance of the two peaks is about 0.4 mm
This can be calculated simply as:
2.3/tan(80°) = 0.4 mm
The positions of the peaks is an handle to control the real inclination of the doublet.

Incidence angle





Typical distribution of the incidence angle in degrees, the beam seems well collimated

Given the unity vector of the track direction: (Vx,Vy,Vz) , the x and z coordinate are rotated by the alignment angle to obtain the new unity vector (V'x, Vy, V'z). The incidence angle, in the direction ortogonal to the strips is then defined as:

$$\theta_{inc} = \mathrm{atan}(V'_x / V_y)$$

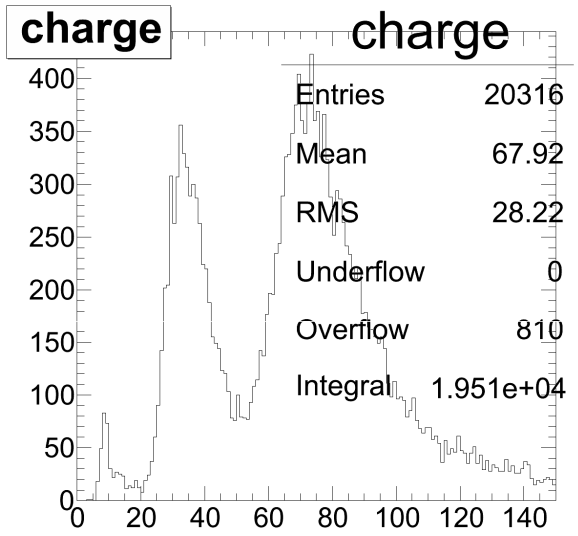
Where V'x is:

$$V'_x = V_x \cos(\theta_{align}) - V_z \sin(\theta_{align})$$

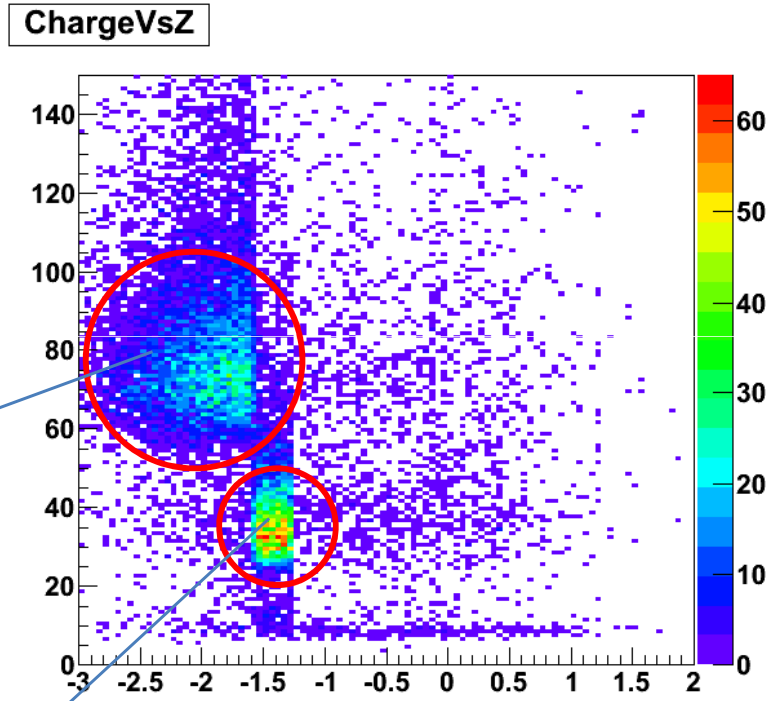
It is also possible to define an angle along the strip direction:

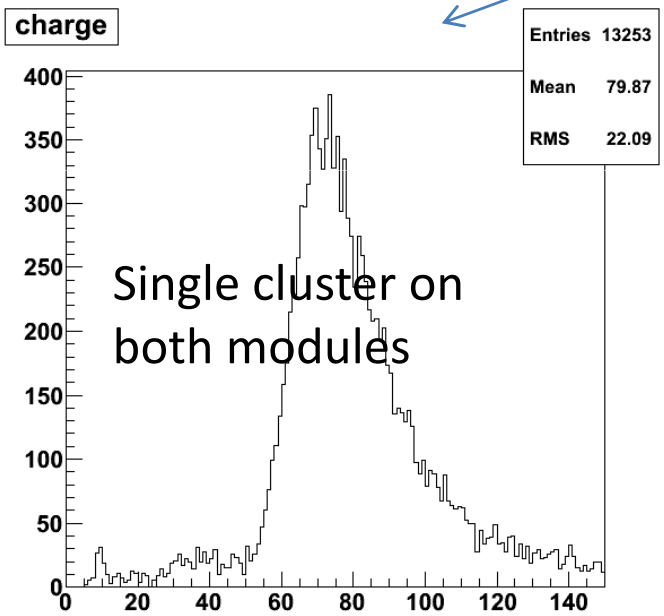
$$\theta_{inc} = \mathrm{atan}(V'_z / V_y)$$

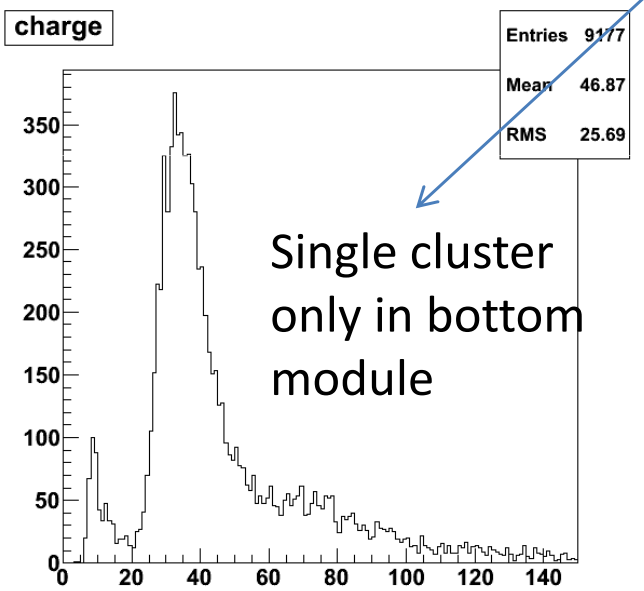
Mod B 0° Distributions

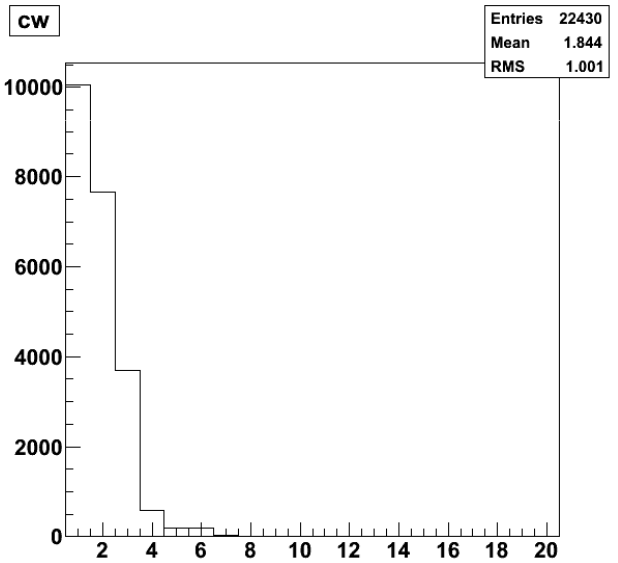


This is puzzling, we expect events only single clusters with double charge, the first peak should be invisible. however this doublet has the two sensors shifted of about 2 mm to permit bonding, for the particular configuration of the 0° setup the beam hits this transition region, so there are many traks that hits only one sensor (it doesn't happen for angles different from 0°)

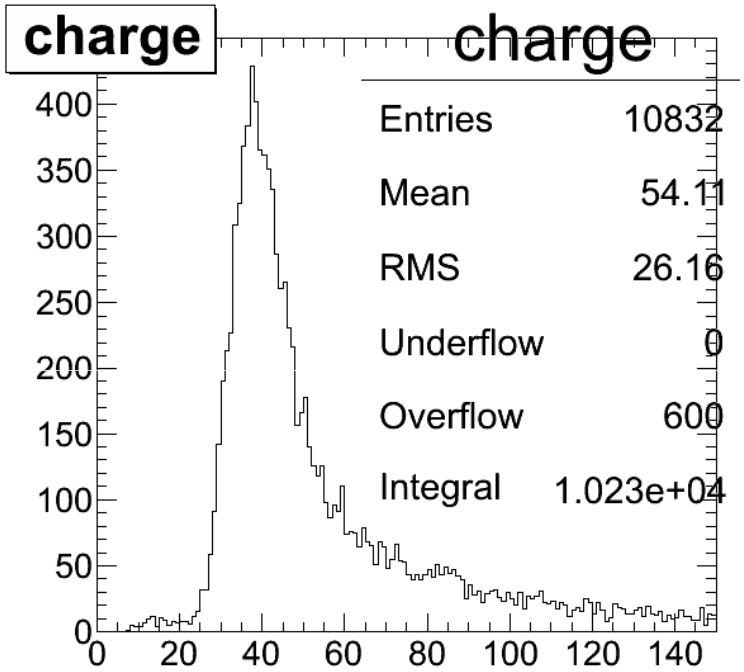


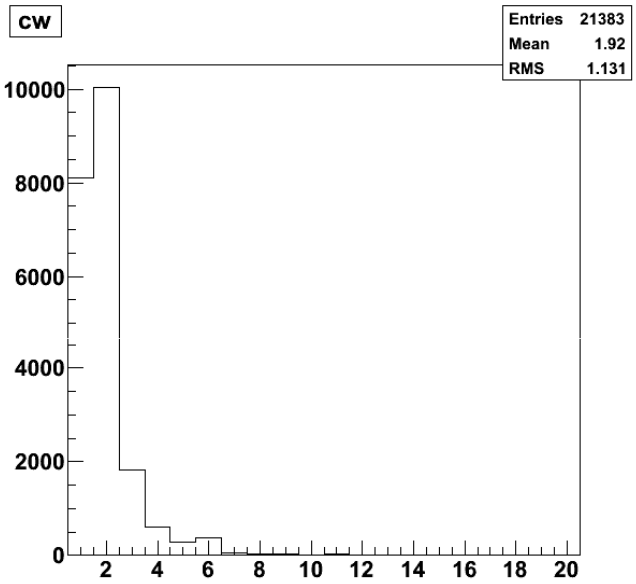


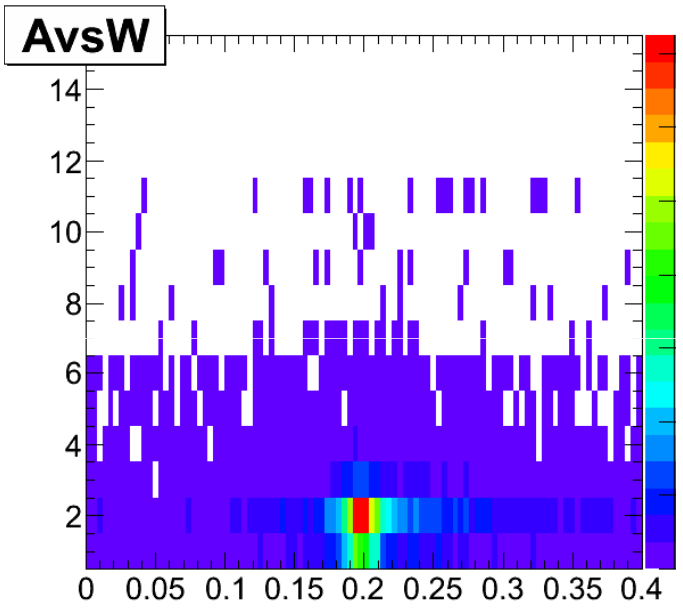


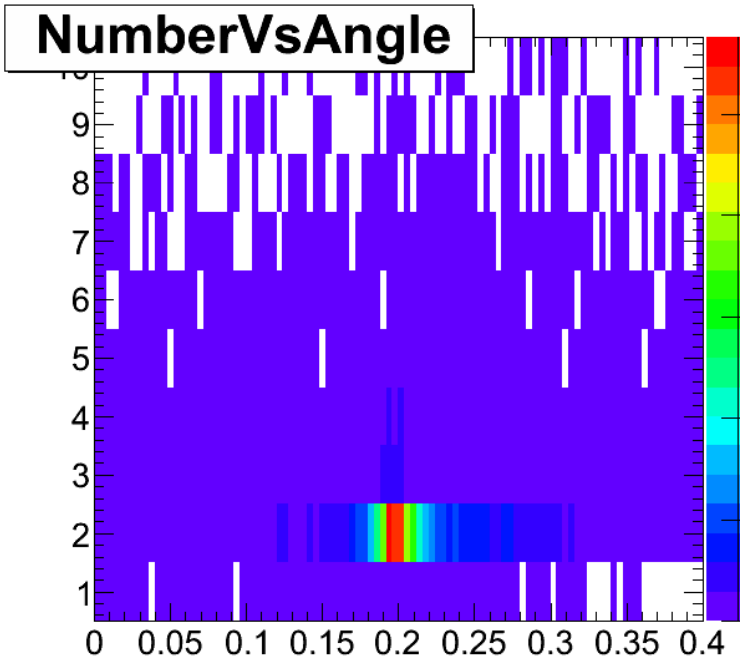


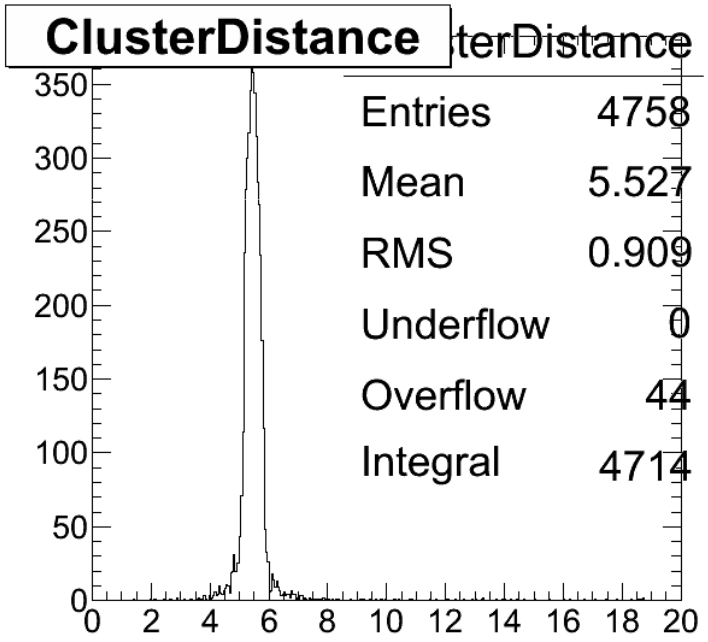
10° Distributions



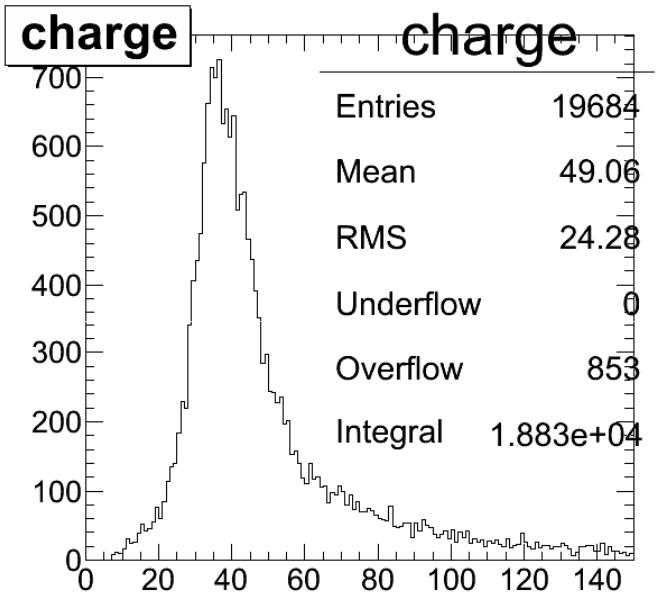


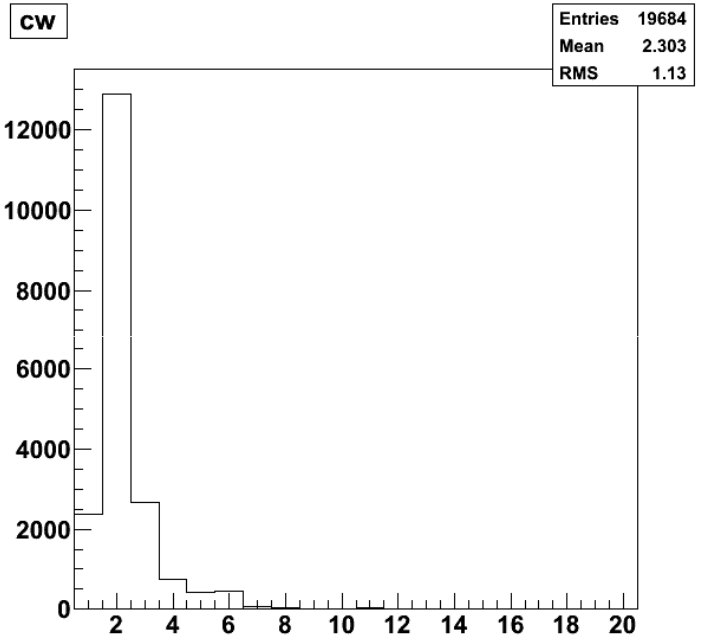


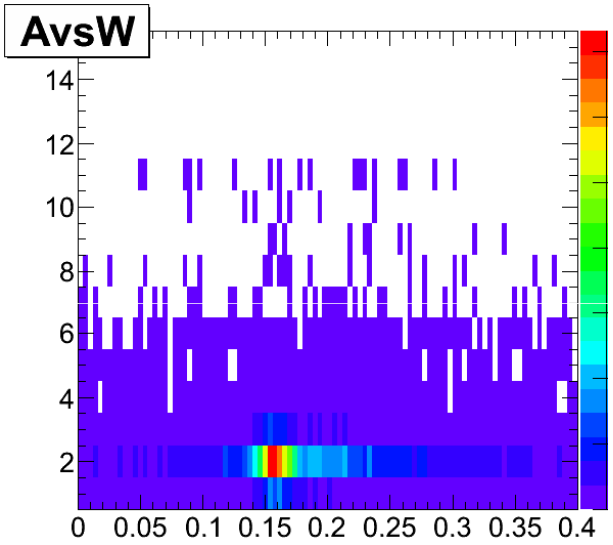


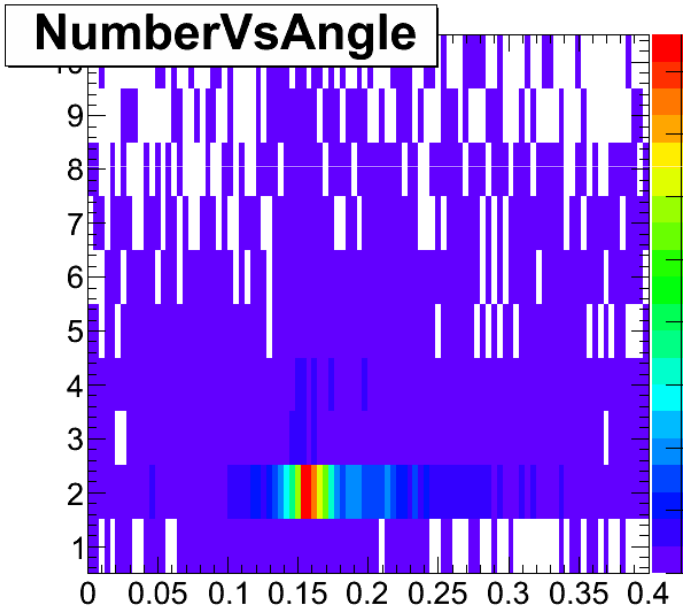


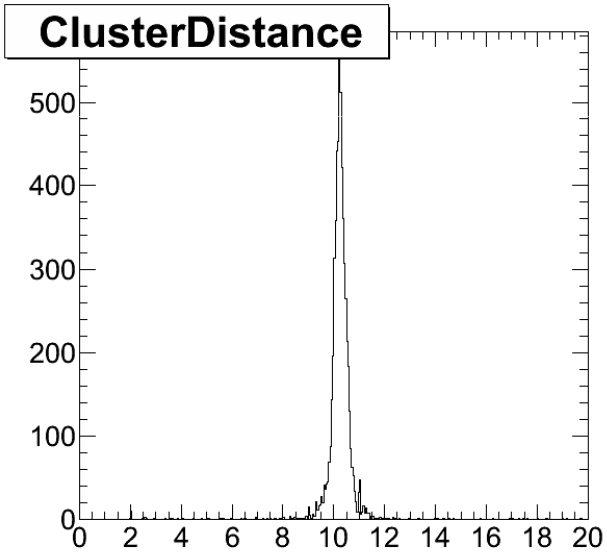
20° Distributions



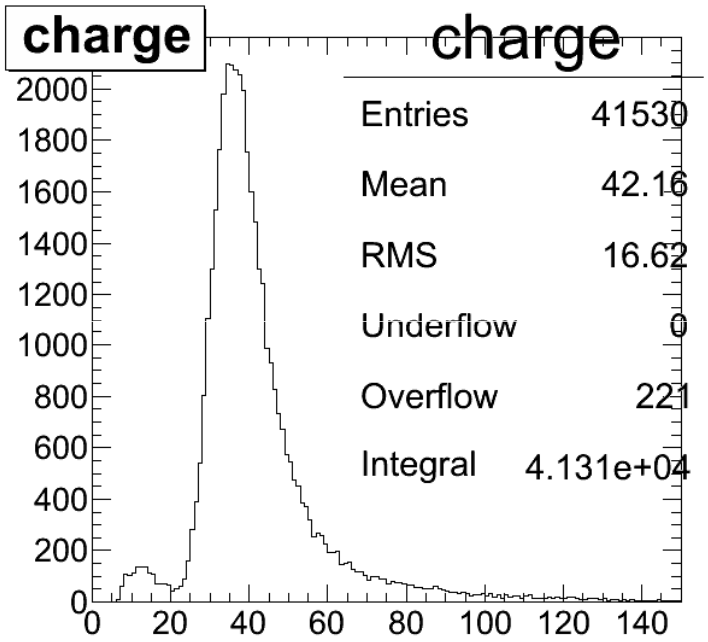


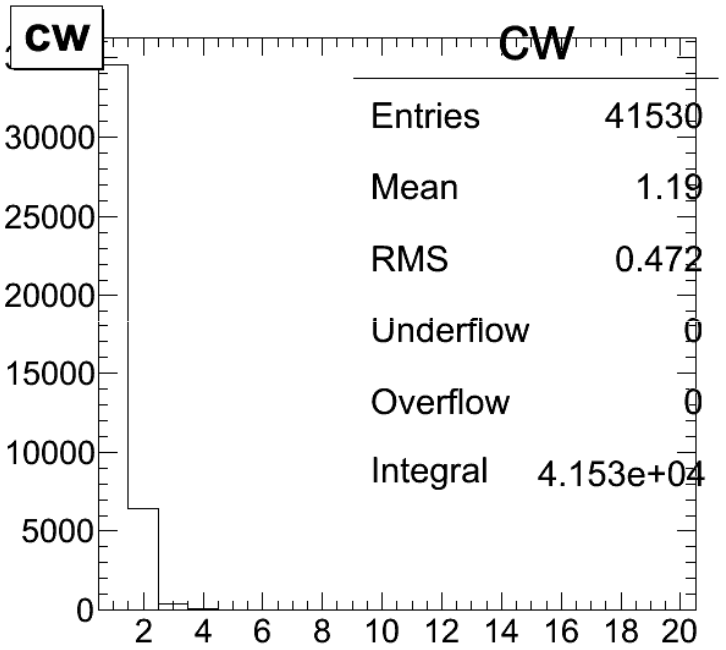


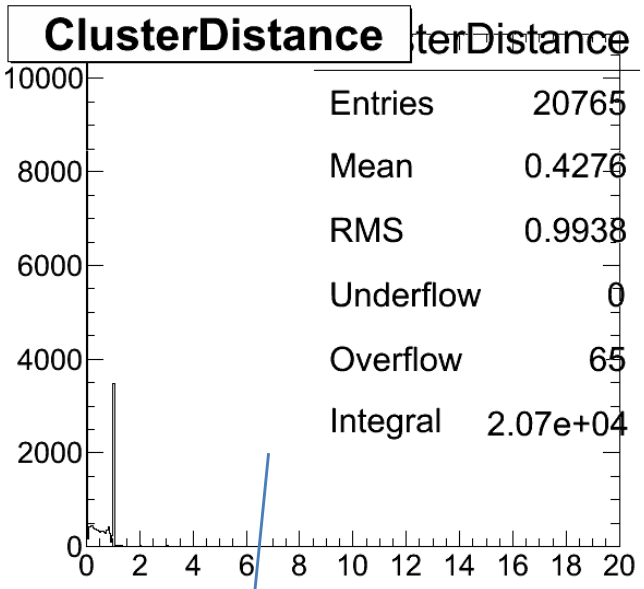


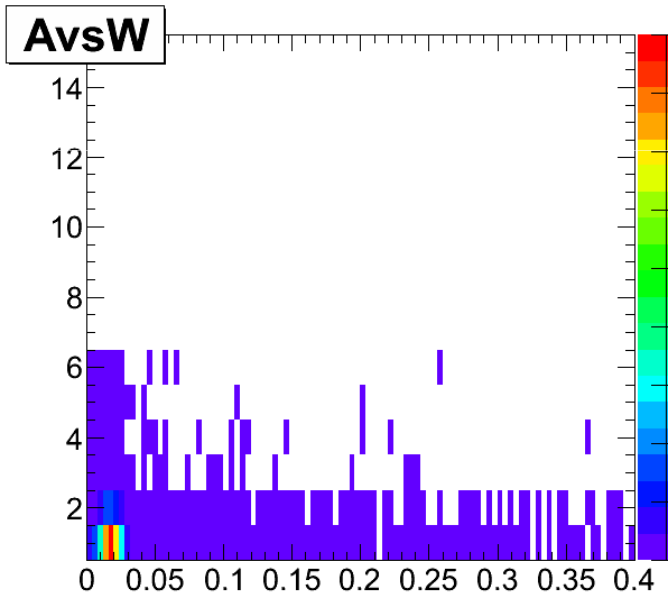


Mod A 0° Distributions



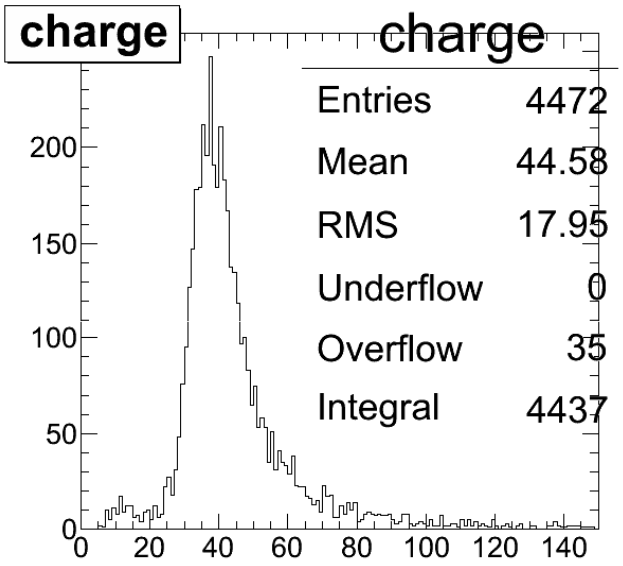


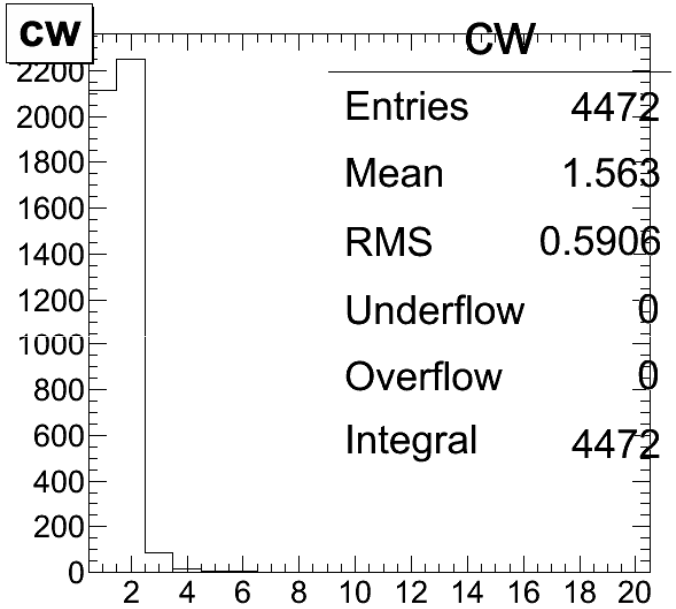




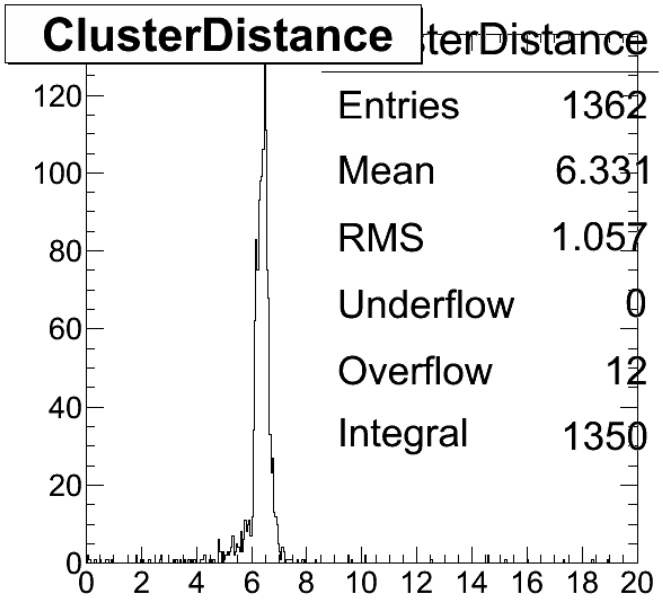
Tutto piccato a 0 con un picchetto a 1 (ci piace)

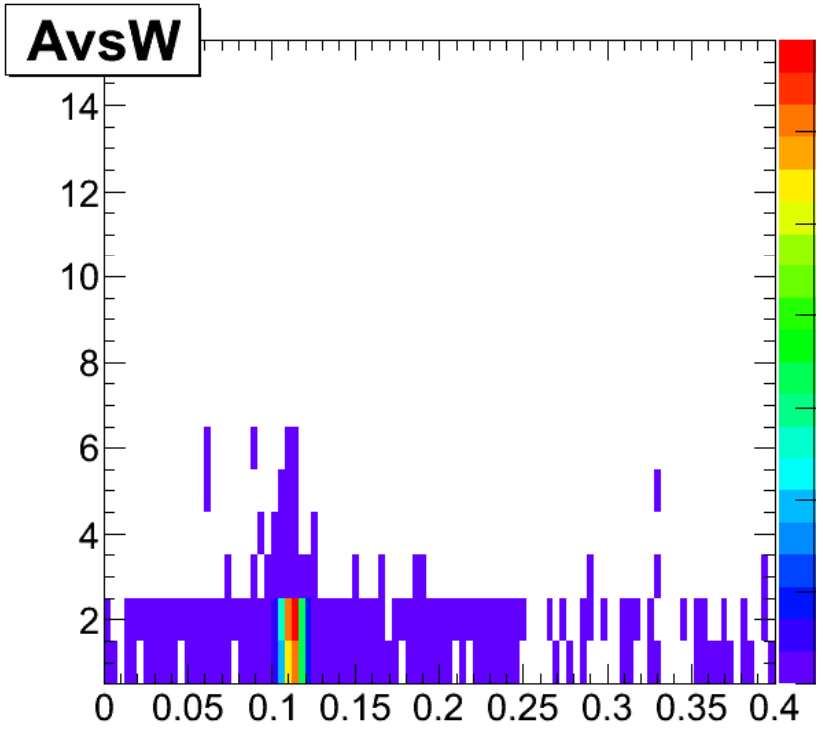
10 °Distributions



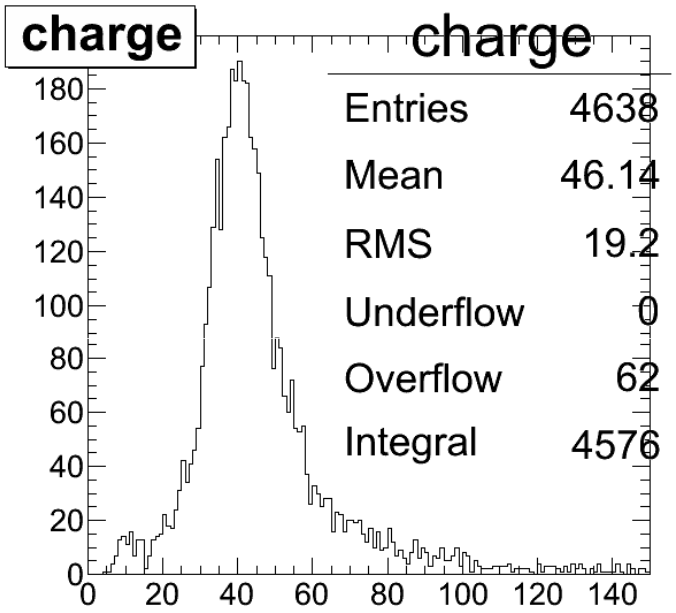


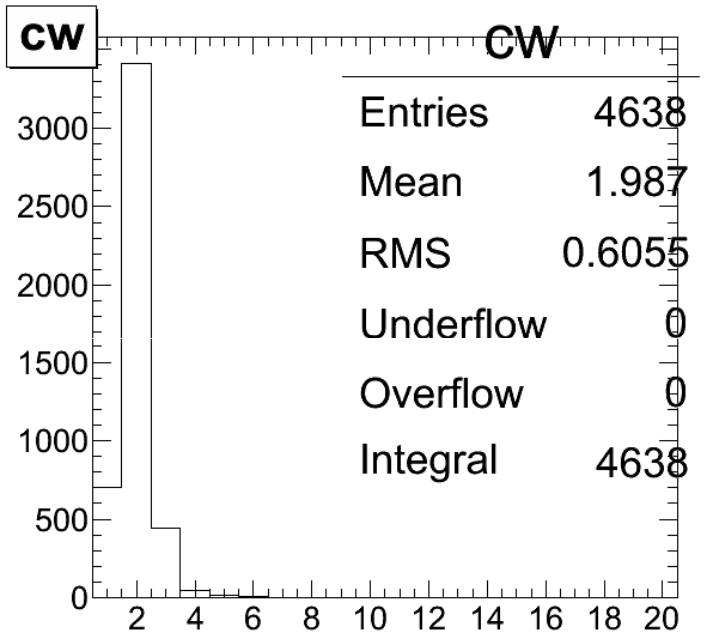
Il picco a 6 sappiamo che è dovuto ai clusters di una sola strip

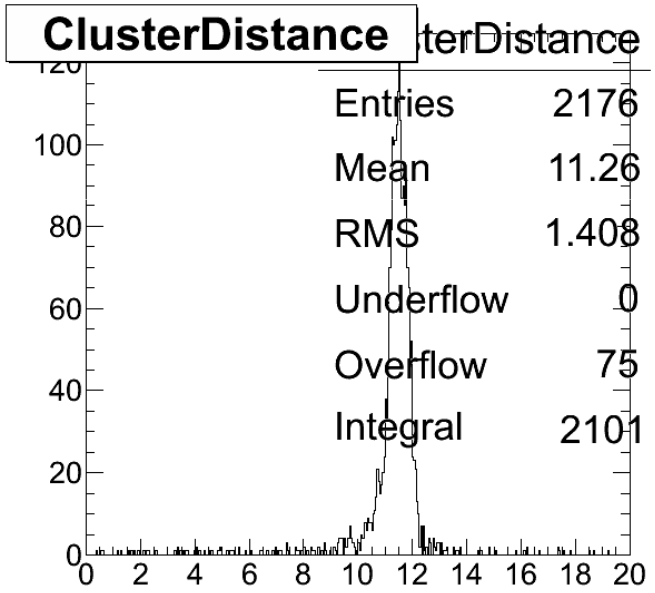


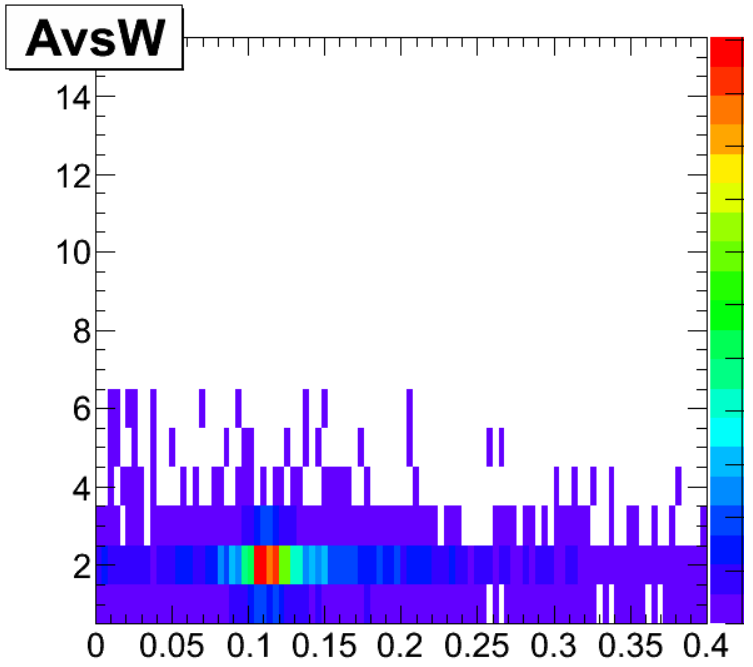


20° Distributions

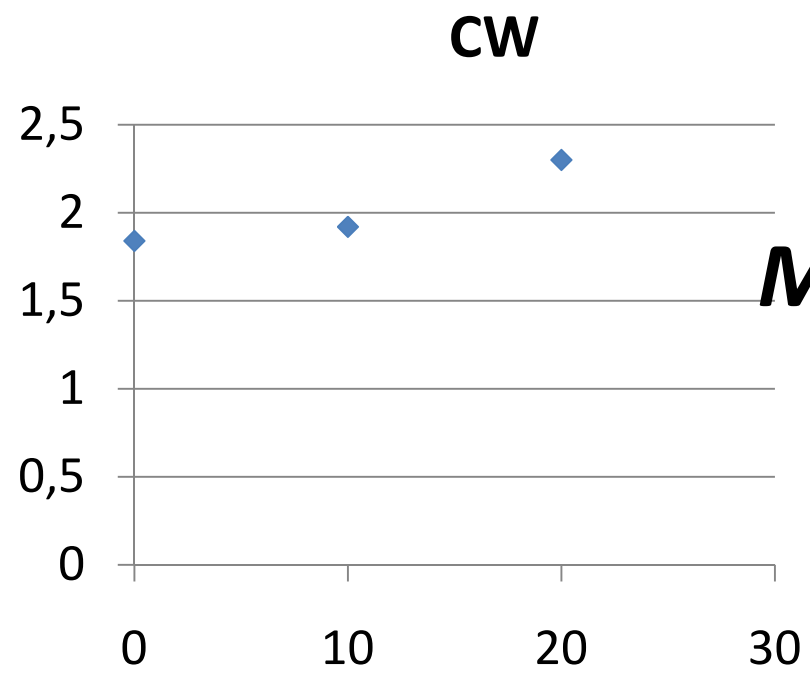




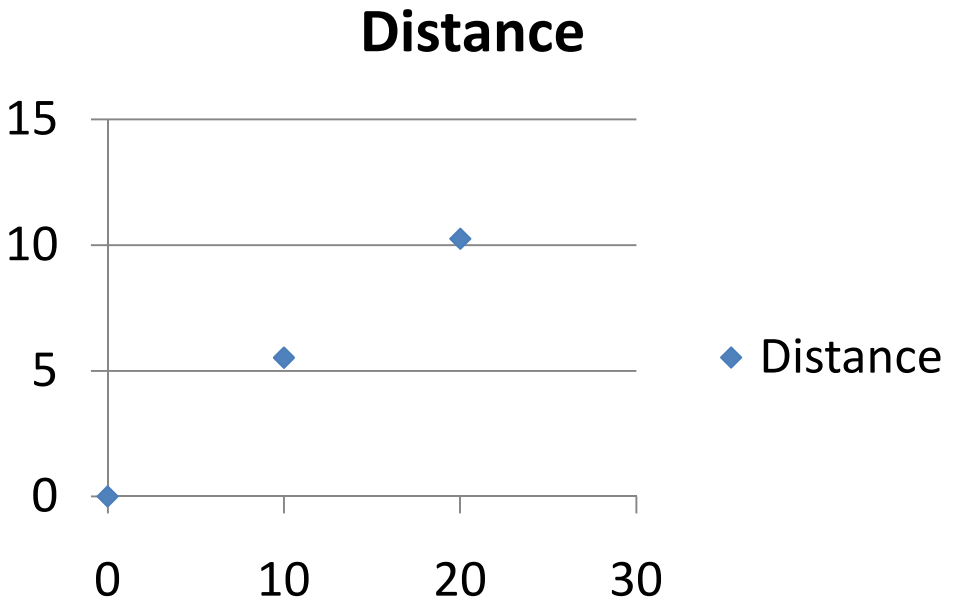


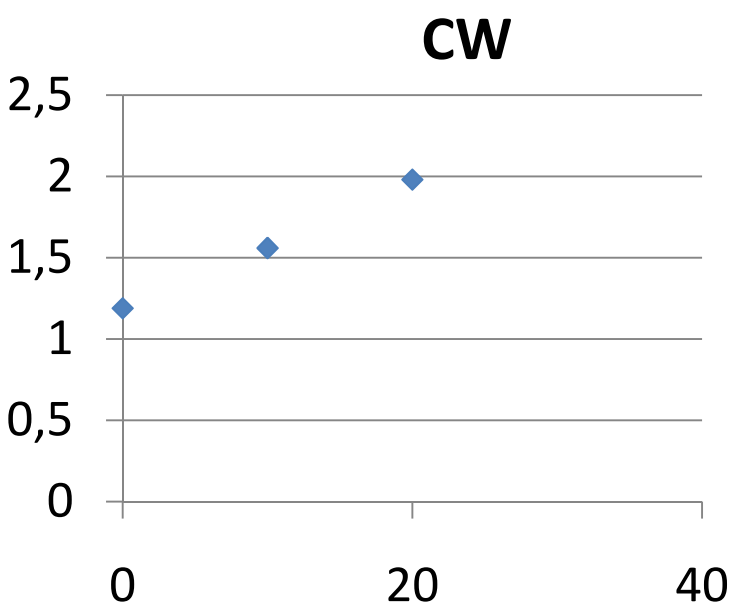


Distance and Width Vs Angle

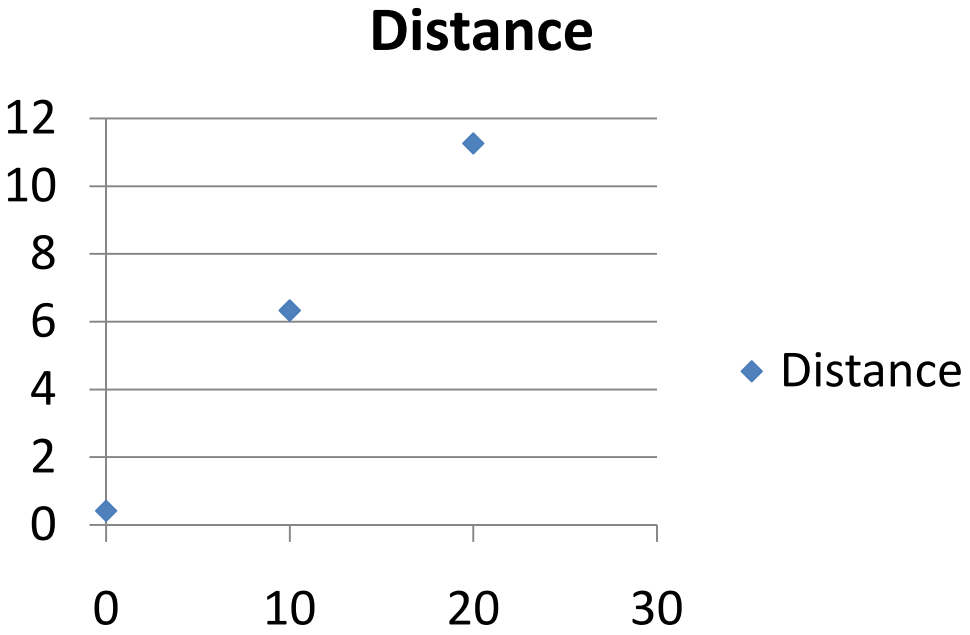


Mod B





Mod A



Conclusions and to do

- After a long fight with finnish software we managed to analyze test beam data
- Preliminary studies seems to be consistent with expectations
- We have to solve some minor software but to analyze the 120 um sensor
- Still missing the point at 5°
- Some work still to do on Module A
- No quality cuts applied so far, there is room to improve much ...