Telescope data analysis

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We considered:

Event – current number of event
T0:   first plane of telescope
T1:   second plane of telescope
T2:   third plane of telescope

nr Hits0 = number of hits in first telescope plane
nr. Hits1 = number of hits in second telescope plane
nr. Hits2 = number of hits in third telescope plane

Track reconstruction using:
1. CogX[n][m] – Calculation position on X of hits by center mass method
(n -> number of the plane of telescope; m -> number of hits)
 CogY[n][m] – Calculation position on Y of hits by center mass method
(n -> number of the plane of telescope; m -> number of hits)
Where: *n = 0,1,2* and *m = 10;*
2. DigX and DigY –

TELHits000347.root

Event = 800 (Reading some quantities event by event)
CogX
T0:   11512.8857 11512.8857 18739.0293   18909.1816   18909.1816   18909.1816   18909.1816 -1   -1   -1
T1:   19276.7988 19276.7988 19276.7988   19276.7988   19276.7988   19276.7988   19276.7988 -1   -1   -1
T2:   18503.3457 18503.3457 18503.3457   18503.3457   18503.3457   18503.3457   18503.3457 -1   -1   -1
nr Hits0 = 7
nr. Hits1 =7
nr. Hits2 =7

CogY
T0:   18008.1699 18008.1699 21893.3457 -1   -1   -1   -1   -1   -1   -1
T1:   16759.9922 16759.9922 -1   -1   -1   -1   -1   -1   -1   -1
T2:   16515.1172 -1   -1   -1   -1   -1   -1   -1   -1   -1

CogX after
11512.8857   18739.0293   18909.1816 -1   -1   -1   -1   -1   -1   -1
19276.7988 -1   -1   -1   -1   -1   -1   -1   -1   -1
18503.3457 -1   -1   -1   -1   -1   -1   -1   -1   -1
nr. Hits0 =3
nr. Hits1 =1
nr. Hits2 =1

Event = 89
CogX
16652.2578   16652.2578 -1   -1   -1   -1   -1   -1   -1   -1
14475.7646 -1   -1   -1   -1   -1   -1   -1   -1   -1
14349.9512 -1   -1   -1   -1   -1   -1   -1   -1   -1
Nr Hits0 = 2
nr. Hits1 =1
nr. Hits2 =1

CogY
17956.3613   17956.3613 -1   -1   -1   -1   -1   -1   -1   -1
18083.3359   18083.3359 -1   -1   -1   -1   -1   -1   -1   -1
17970.6367   17970.6367 -1   -1   -1   -1   -1   -1   -1   -1

CogX after
16652.2578 -1   -1   -1   -1   -1   -1   -1   -1   -1
14475.7646 -1   -1   -1   -1   -1   -1   -1   -1   -1
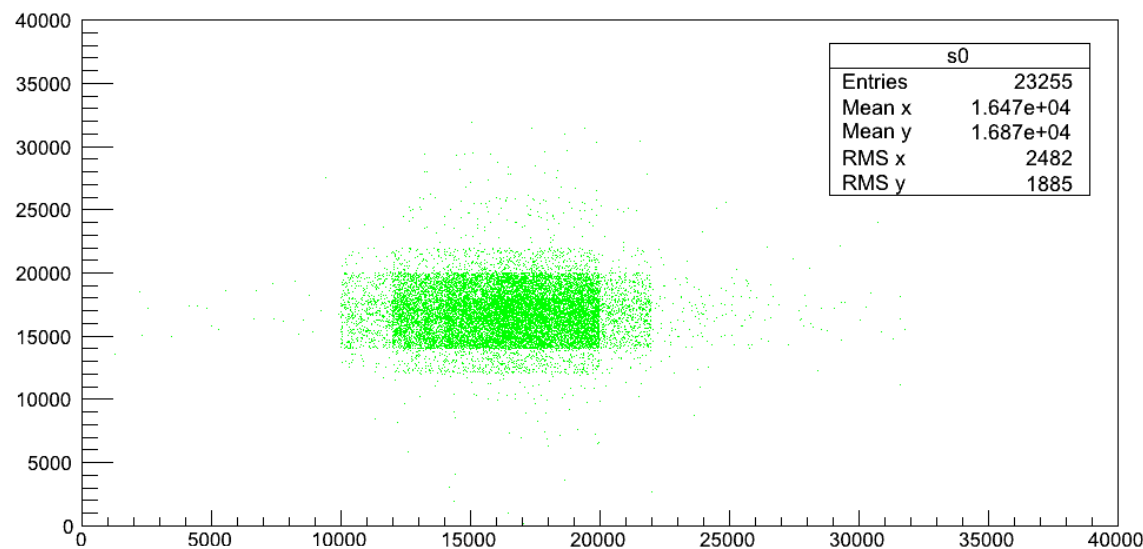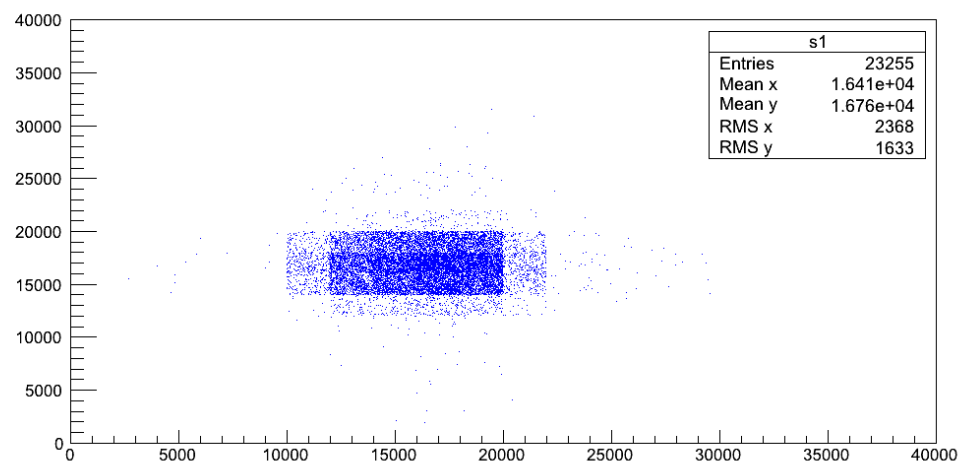**14349.9512 -1   -1   -1   -1   -1   -1   -1   -1   -1**
nr. Hits0 =1
nr. Hits1 =1
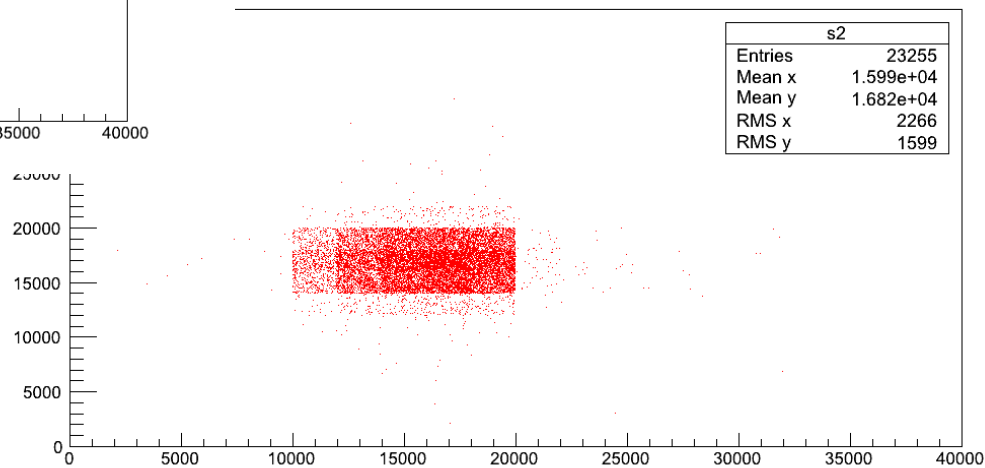**nr. Hits2 =1**

Results

tel.CogX vs tel.CogY

s0	
Entries	23255
Mean x	1.647e+04
Mean y	1.687e+04
RMS x	2482
RMS y	1885

tel.CogX vs tel.CogY

s1	
Entries	23255
Mean x	1.641e+04
Mean y	1.676e+04
RMS x	2368
RMS y	1633

Number of events: 50000

One hit in each plane of telescope

Pad 22, run number 347

tel.CogX vs tel.CogY

s2	
Entries	23255
Mean x	1.599e+04
Mean y	1.682e+04
RMS x	2266
RMS y	1599

Attempts for track reconstruction

1. Reconstruction of the line so that the distance to measured points (x1,y1,z1), (x2,y2,z2) and (x3,y3,z3) is minimum (it is an approximate method for our task). The method was developed and applied when (X,Y) hit coordinates are evaluated with
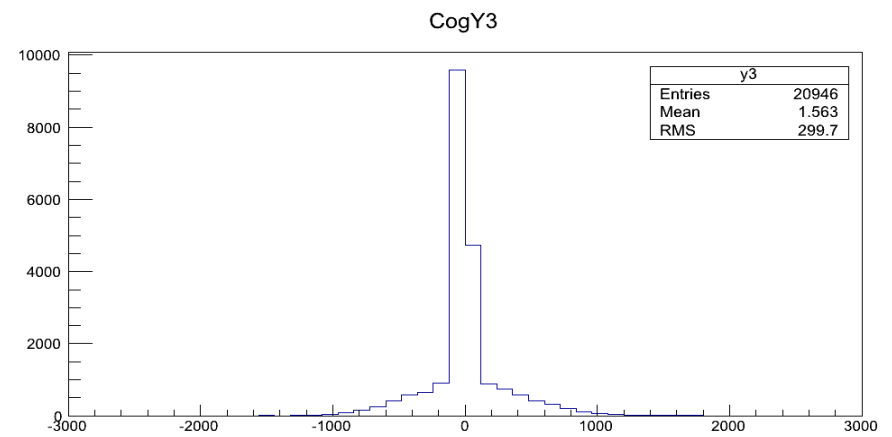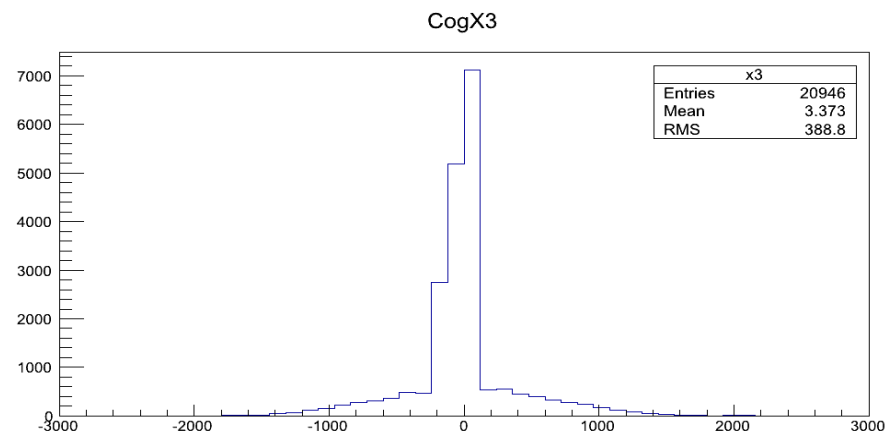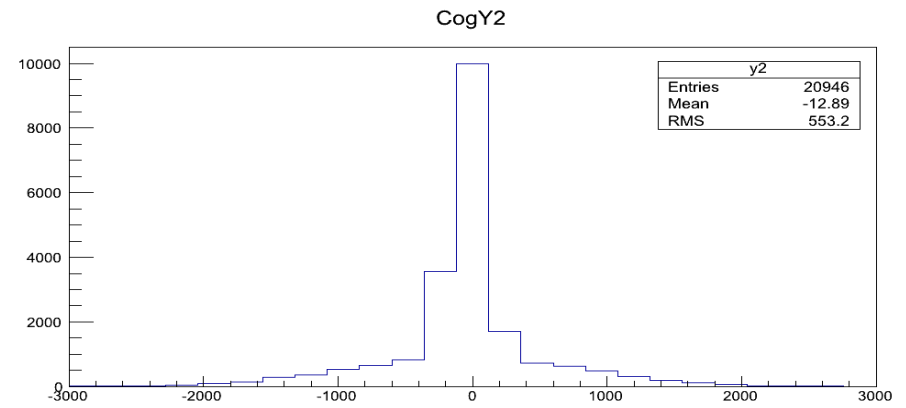
   a) CogX and CogY

   b) DigX and DigY

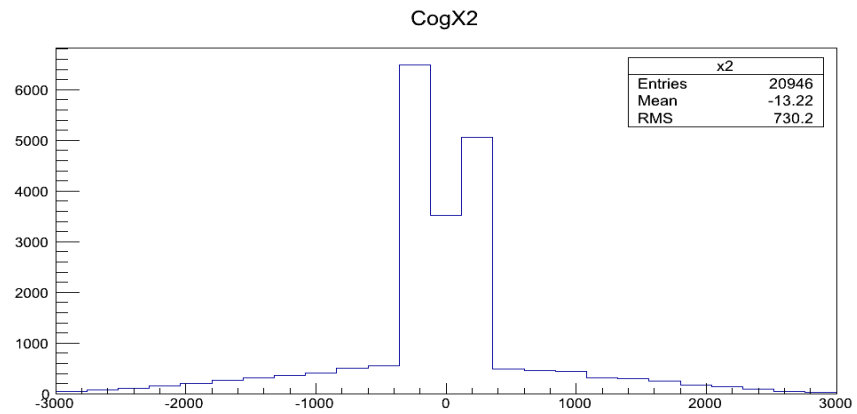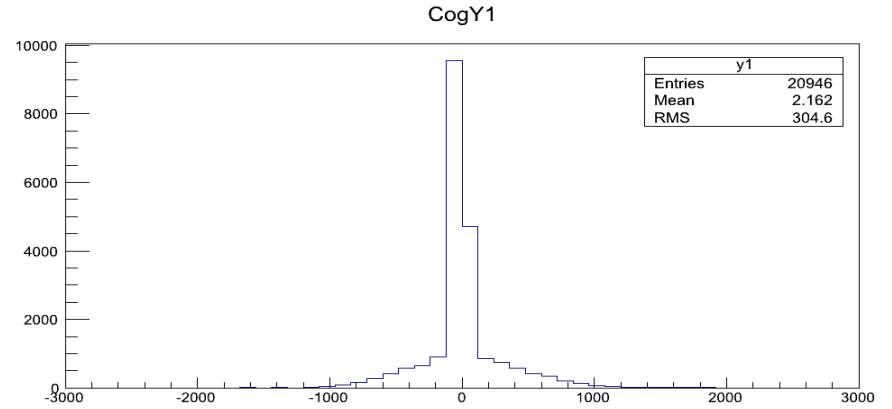   Results:

   It was evaluated the (predicted – measured) for x and y and applied for aliment.
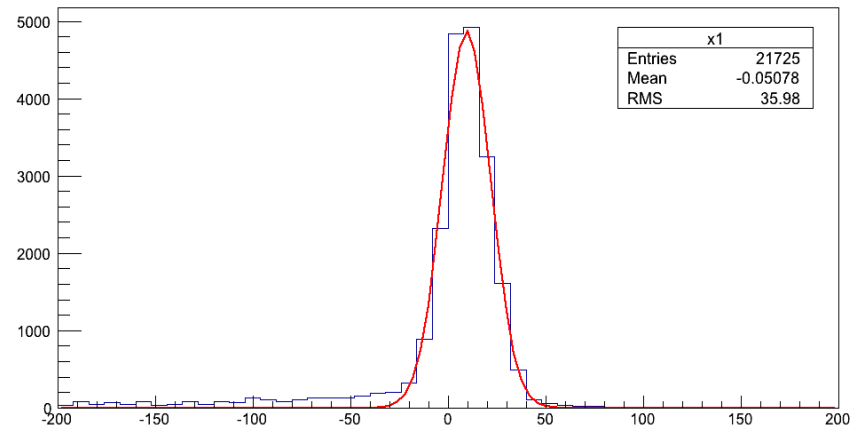
2. Track reconstruction by two telescopes.

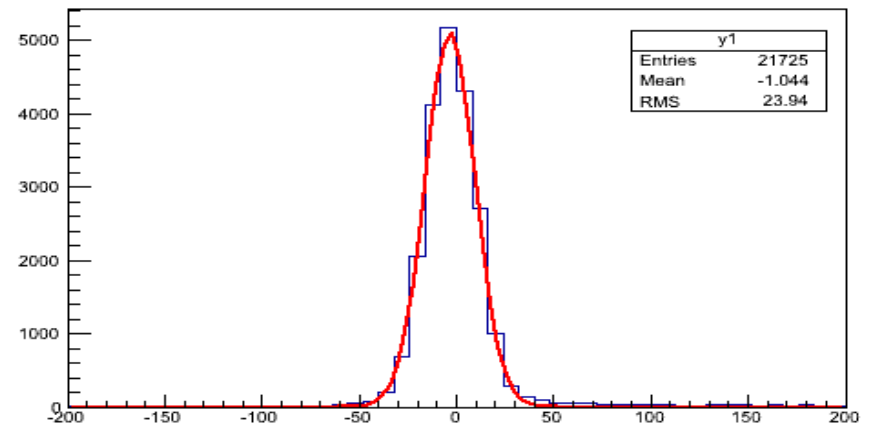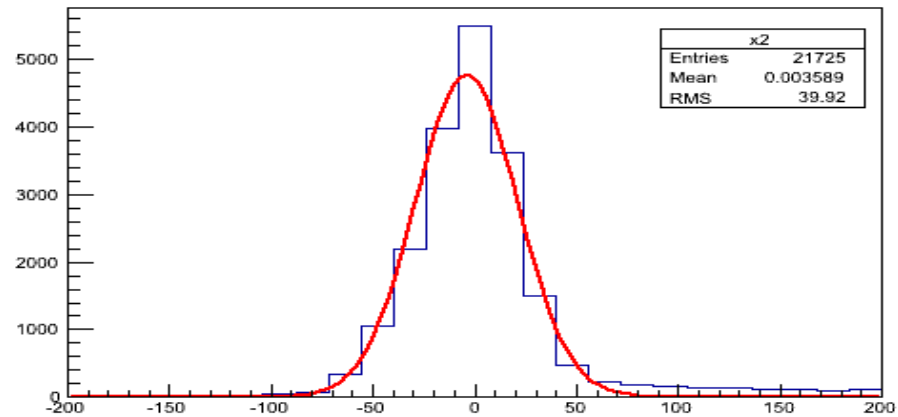# CogX[0][0], CogX[1][0], CogX[2][0]

CogX1

x1	
Entries	20946
Mean	3.96
RMS	397.5

CogX2

x2	
Entries	20946
Mean	-13.22
RMS	730.2

CogX3

x3	
Entries	20946
Mean	3.373
RMS	388.8

CogY[0][0], CogY[1][0], CogY[2][0]

CogY1

y1	
Entries	20946
Mean	2.162
RMS	304.6

CogY2

y2	
Entries	20946
Mean	-12.89
RMS	553.2

CogY3

y3	
Entries	20946
Mean	1.563
RMS	299.7

DigX1

x1	
Entries	21725
Mean	-0.05078
RMS	35.98

DigY1

y1	
Entries	21725
Mean	-1.044
RMS	23.94

DigX2

x2	
Entries	21725
Mean	0.003589
RMS	39.92

DigY2

y2	
Entries	21725
Mean	1.664
RMS	29.97

DigX3

x3	
Entries	21725
Mean	-0.8722
RMS	36.68

DigY3

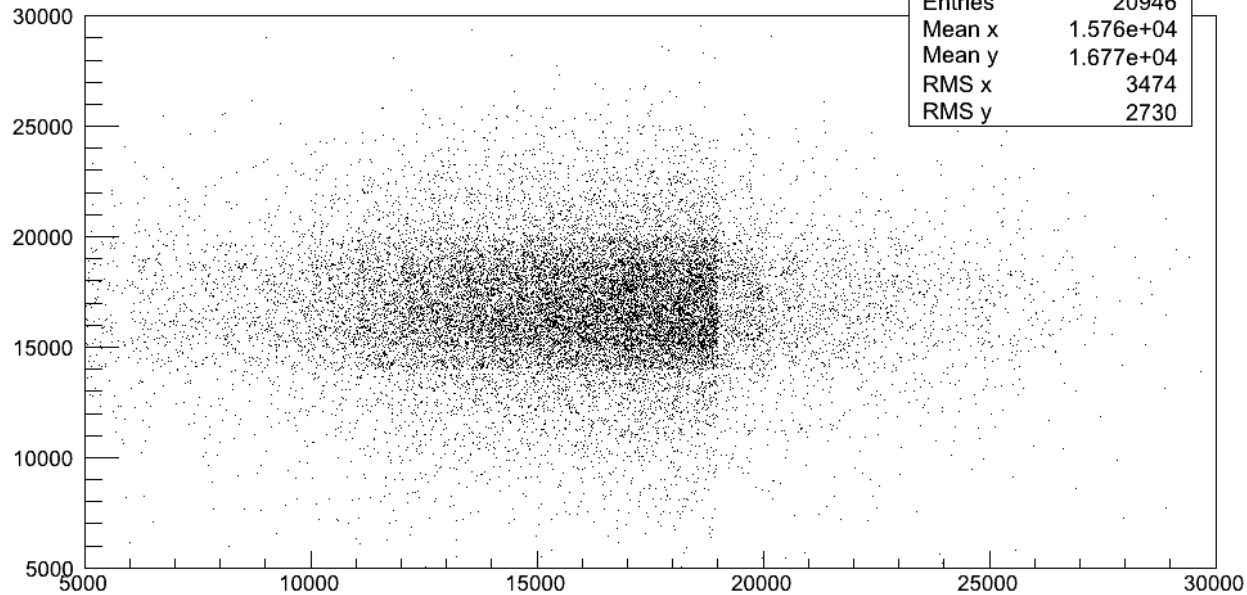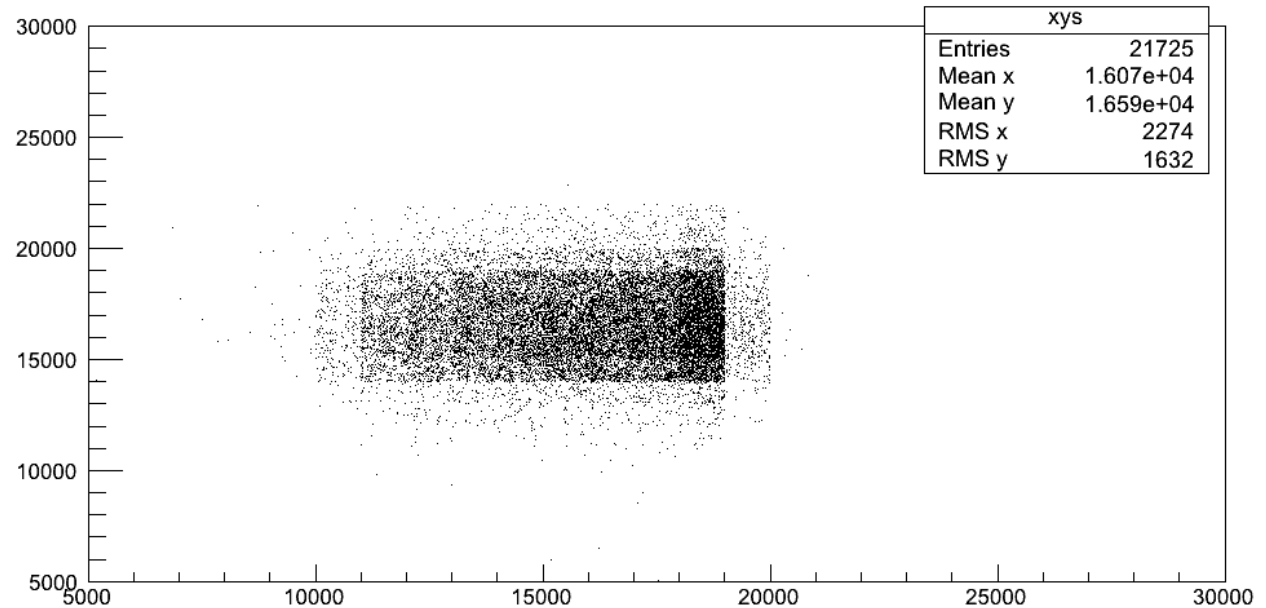| y3	
Entries	21725
Mean	-0.6095
RMS	23.7

Few conclusions

1. Resolution for (predicted - measured) points is more than 300 microns for CogX and CogY

2. Resolution for (predicted - measured) points is about than 40 microns for DigX and DigY

3. No difficulty to make aliment so that mean values to be of about few microns

4. More things to learn

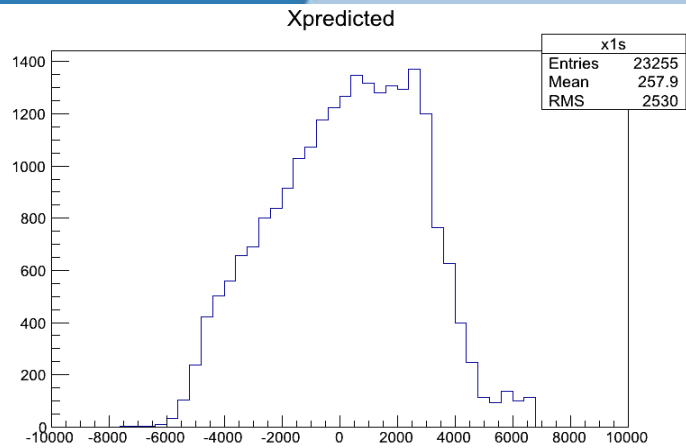Fascicle projection on sensor without sensor trigger using Cog

xys	
Entries	20946
Mean x	1.576e+04
Mean y	1.677e+04
RMS x	3474
RMS y	2730

Fascicle projection on sensor without sensor trigger using Dig

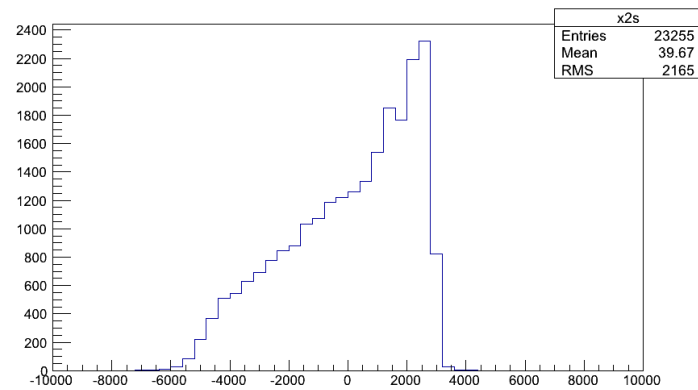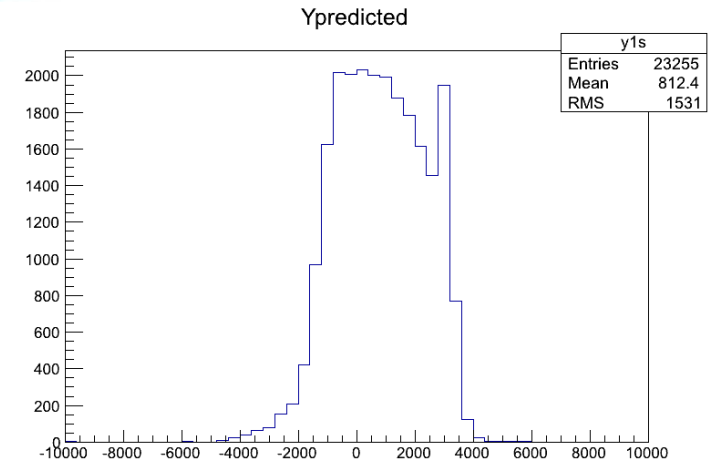| xys	
Entries	21725
Mean x	1.607e+04
Mean y	1.659e+04
RMS x	2274
RMS y	1632

- **We are using a method witch reconstruct tracks by fitting a straight line to the hits in the consecutive planes.**

- **We obtained the fascicle projection on sensor by intersection on the straight lines with sensor plane**
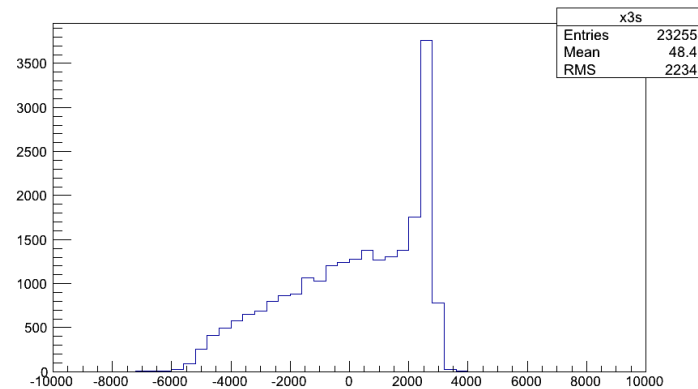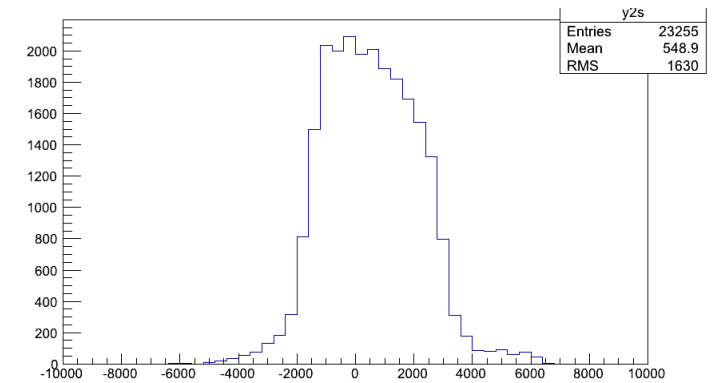
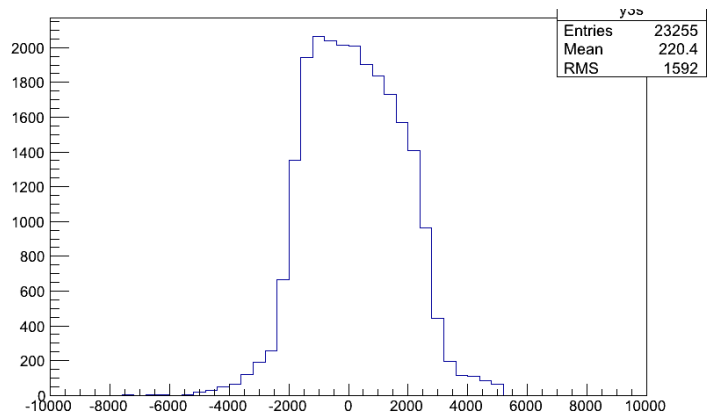# Track reconstruction from 2 points (planes)
X, Y beam projection on the DUT

Xpredicted

x1s	
Entries	23255
Mean	257.9
RMS	2530

Ypredicted

y1s	
Entries	23255
Mean	812.4
RMS	1531

Reconstruction T0&T1

x2s	
Entries	23255
Mean	39.67
RMS	2165

y2s	
Entries	23255
Mean	548.9
RMS	1630

Reconstruction T1&T2

x3s	
Entries	23255
Mean	48.4
RMS	2234

y3s	
Entries	23255
Mean	220.4
RMS	1592

Reconstruction T0&T2

Predicted hits for Sensor_T0
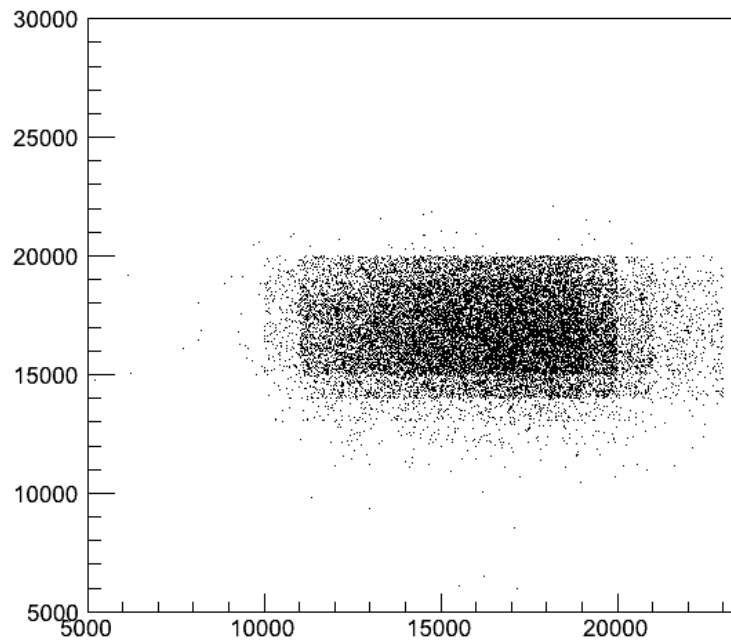
xy1S	
Entries	23255
Mean x	1.626e+04
Mean y	1.681e+04
RMS x	2531
RMS y	1532

2 points reconstruction

Predicted hits for Sensor_T1
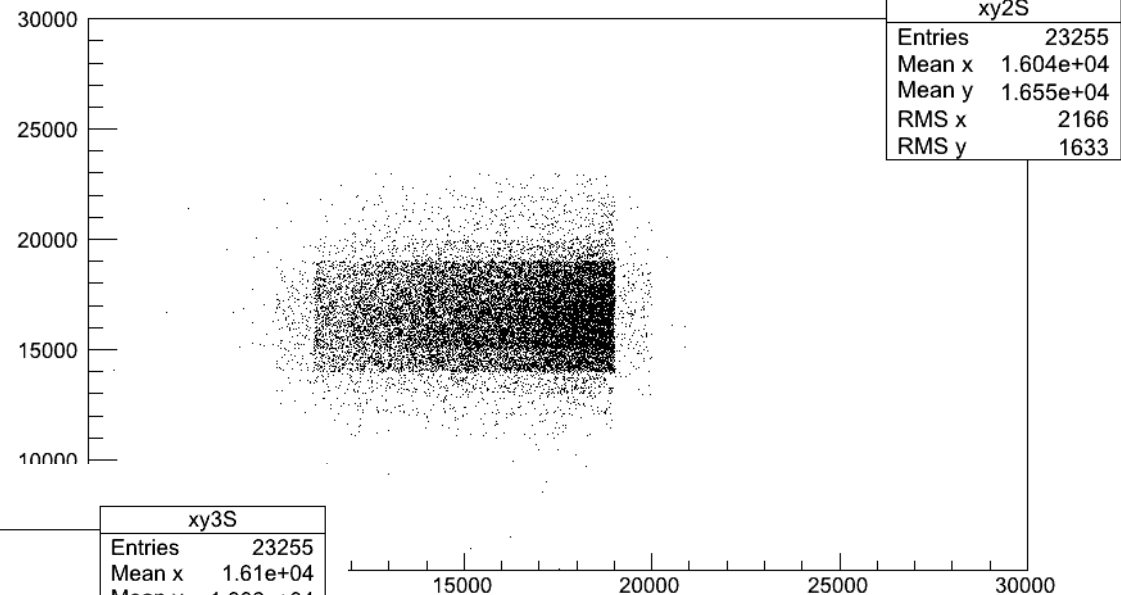
xy2S	
Entries	23255
Mean x	1.604e+04
Mean y	1.655e+04
RMS x	2166
RMS y	1633

Predicted hits for Sensor_T2
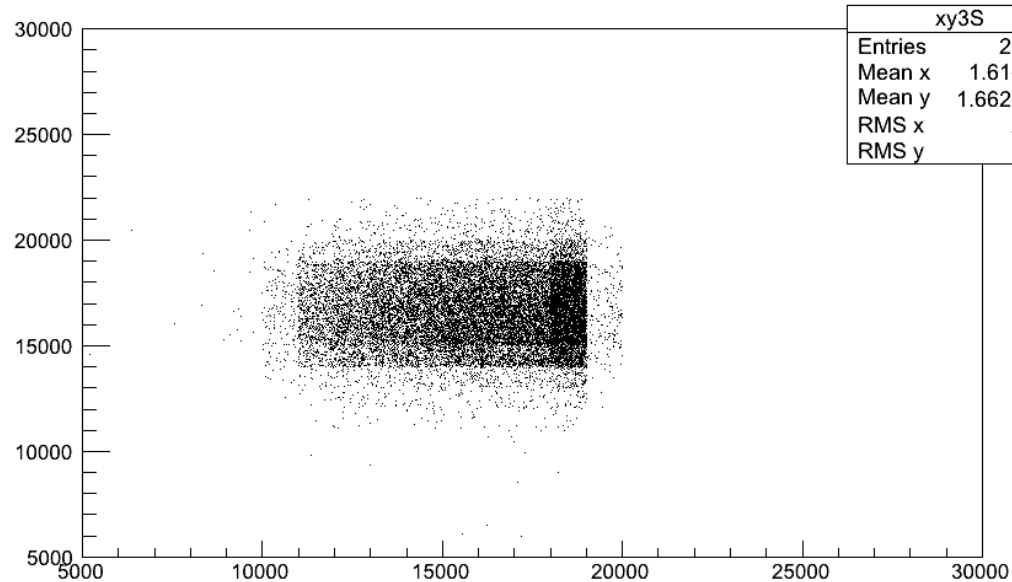
xy3S	
Entries	23255
Mean x	1.61e+04
Mean y	1.662e+04
RMS x	2235
RMS y	1596

Shifts on X and Y were about 16mm

Configure
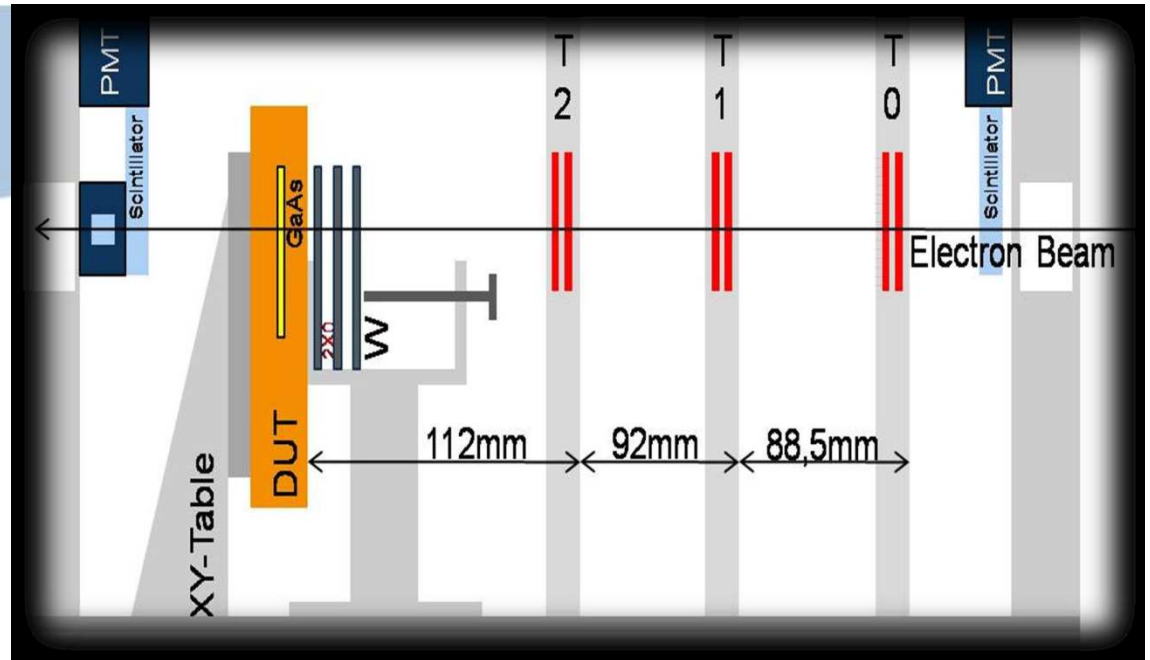
config files for DUT analysis for Run 000347

Energy = 2
[Telescope1]
TELOffsetZ = 0.0

[Telescope2]
TELOffsetZ = 88500.0

[Telescope3]
TELOffsetZ = 180500.0

[DUT]
DUTOffsetZ = 292500
DUTThickness = 500.0

Do you agree this values?

Conclusions

- the number of hits for each plane of telescope;

- position on X of hits by center mass method;

- position on Y of hits by center mass method;

- RMS values are ~ 10 times smaller for DigX and DigY;

Future plane: Development for alignment (shifts);