

# BEAM-TEST STRIPLET DATA ANALYSIS

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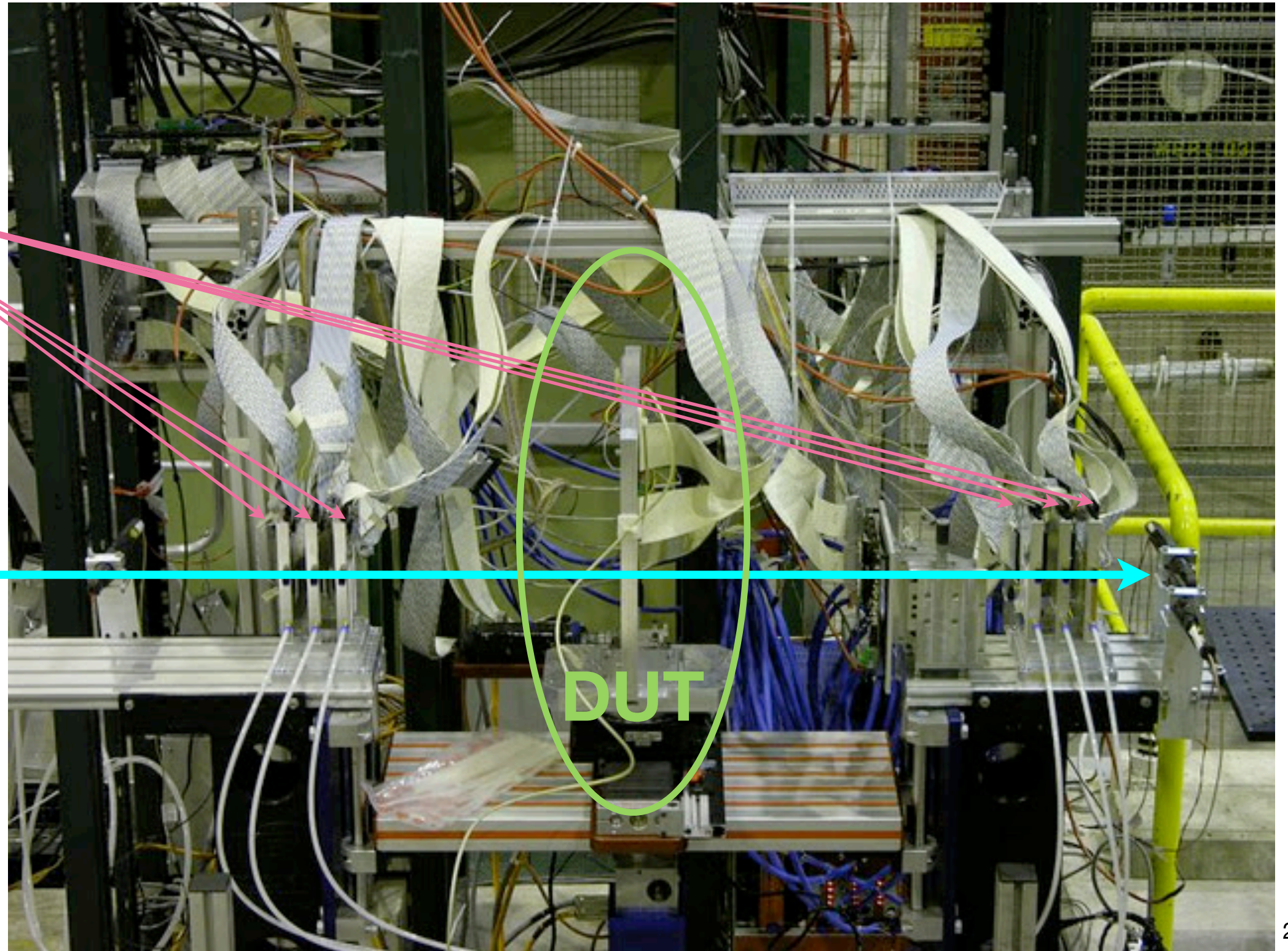


# BEAM TEST SETUP

SPS@CERN

telescope

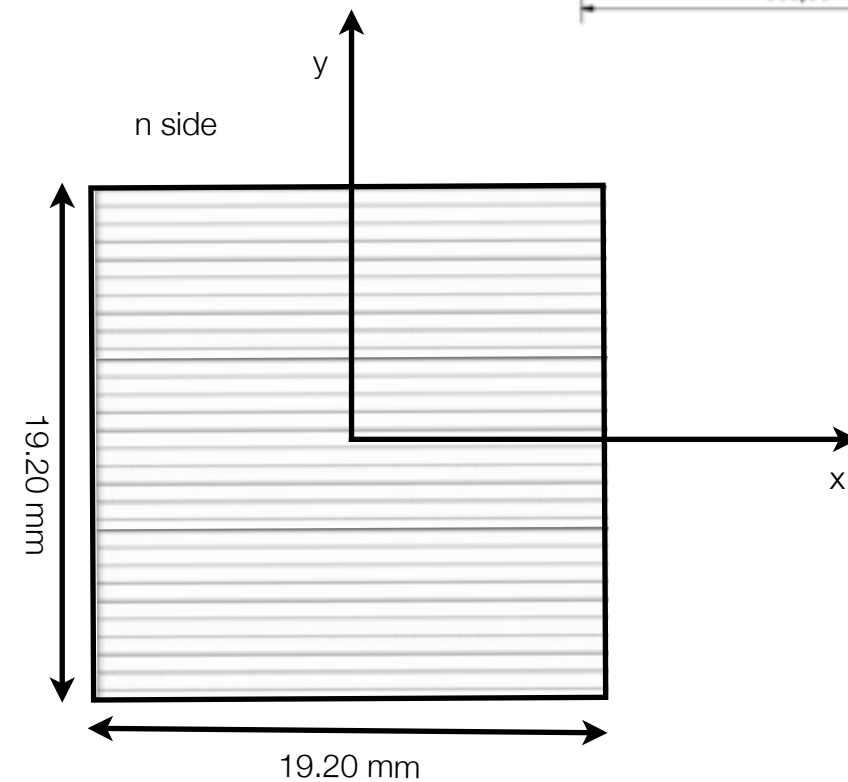
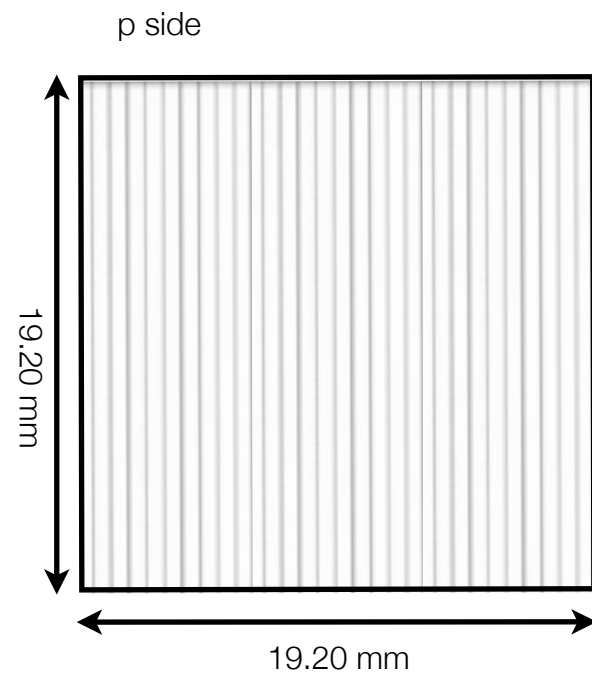
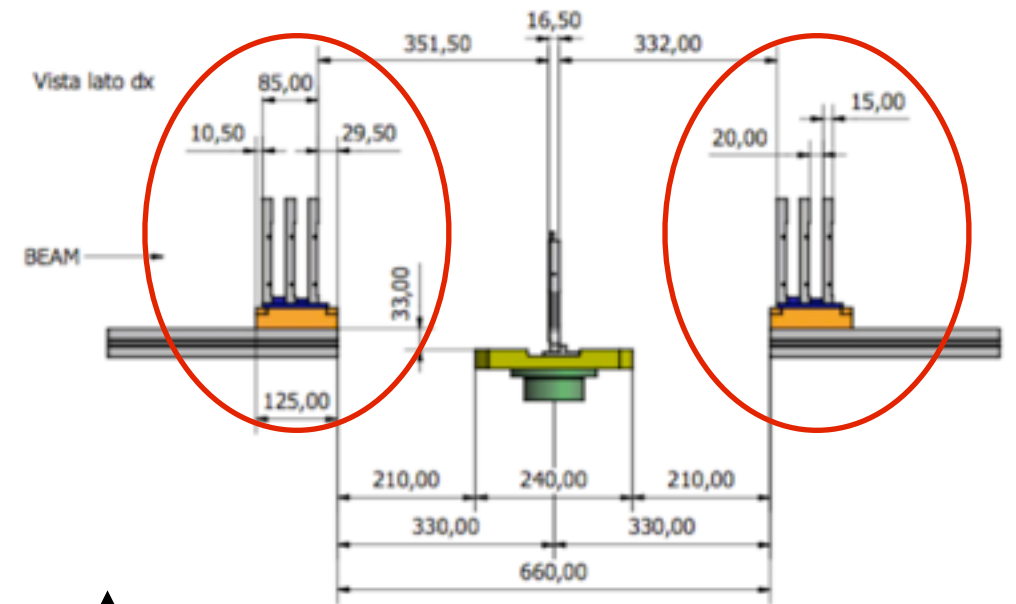
120 GeV  $\pi^{+/-}$





# TELESCOPE DETECTORS

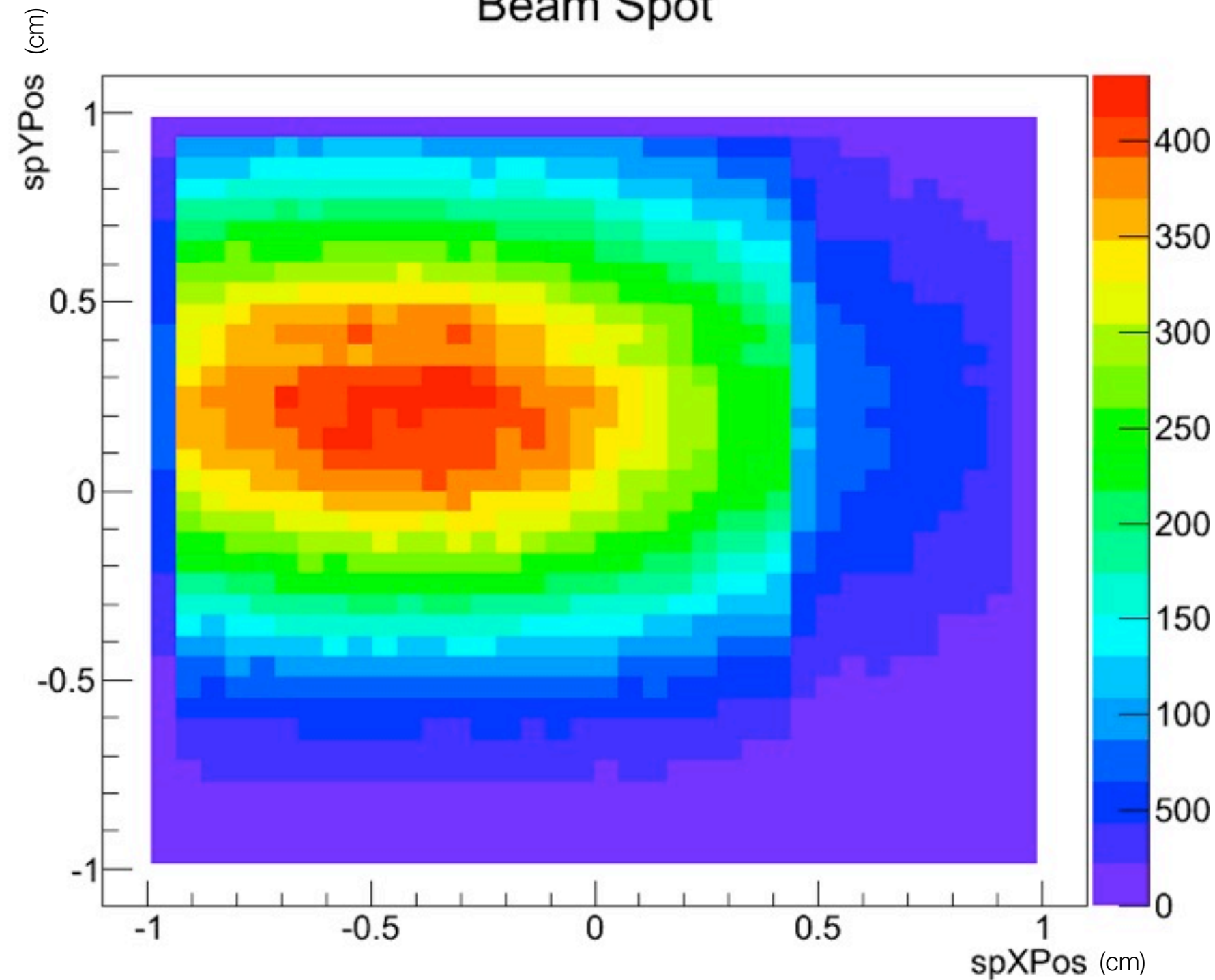
- 6 double-side strip modules
- pitch = 50  $\mu\text{m}$
- $19.20 / 0.050 = 384$  channels per side



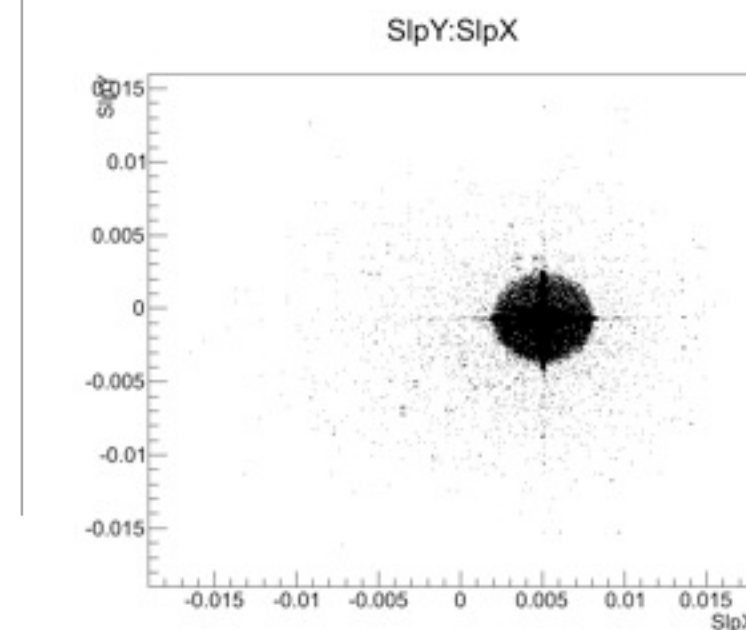
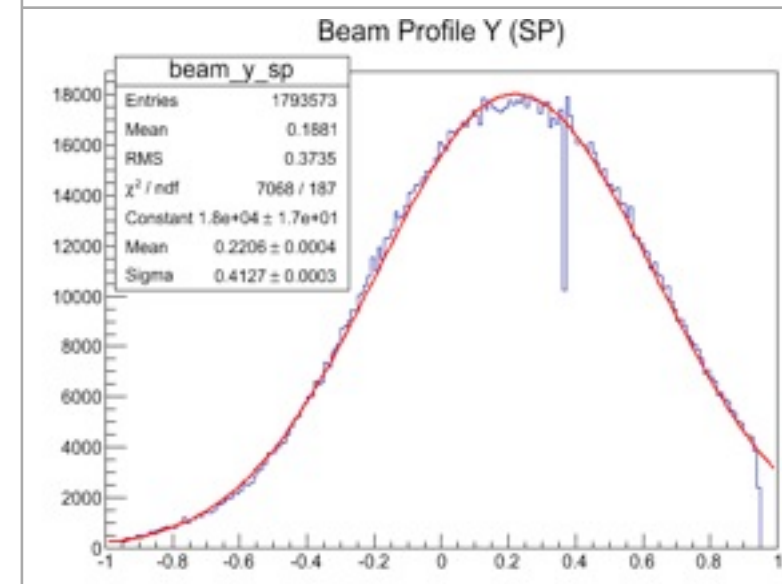
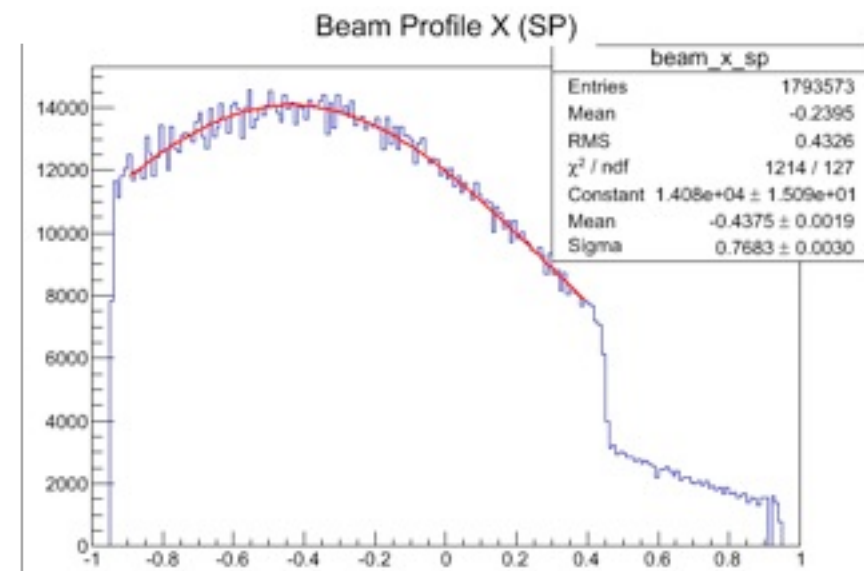
# BEAM SPOT AND DIVERGENCES

run 2277

## Beam Spot

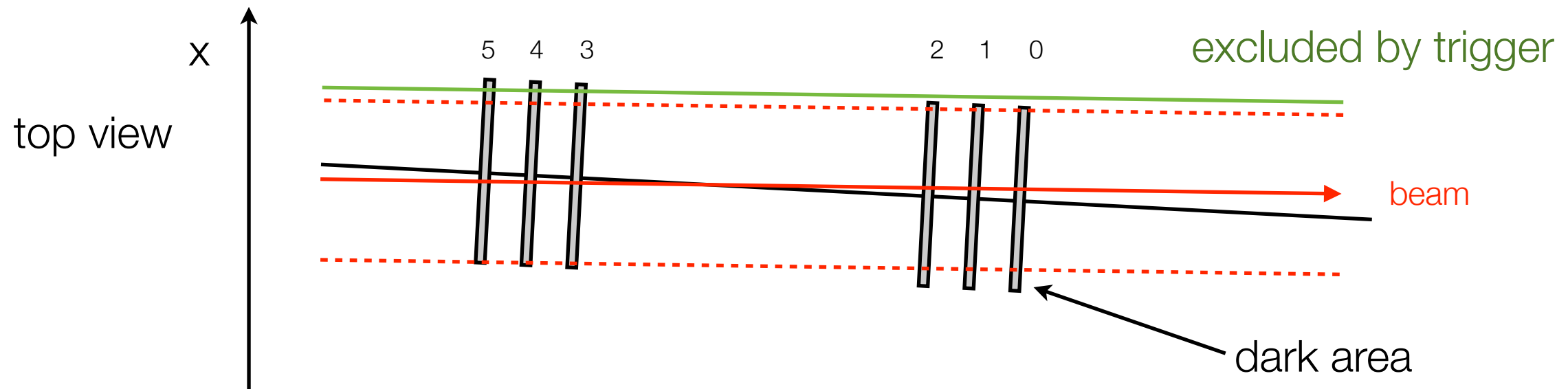


first layer of telescope

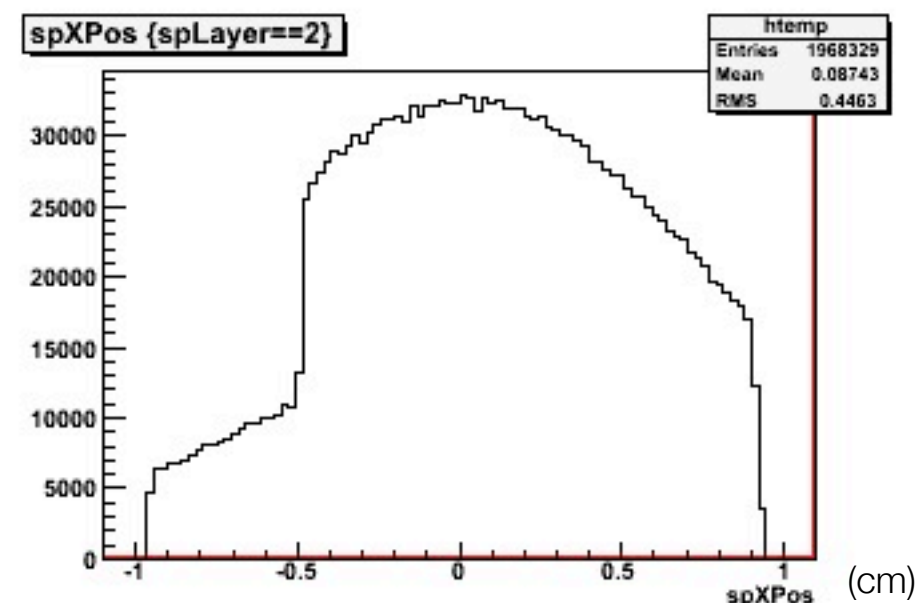
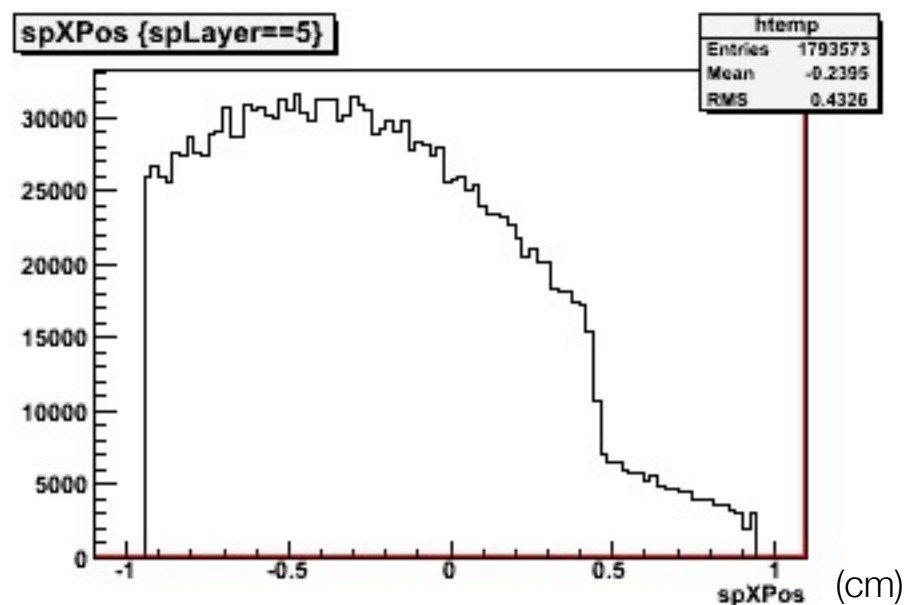


# MISALIGNMENT OF TELESCOPE wrt BEAM AXIS

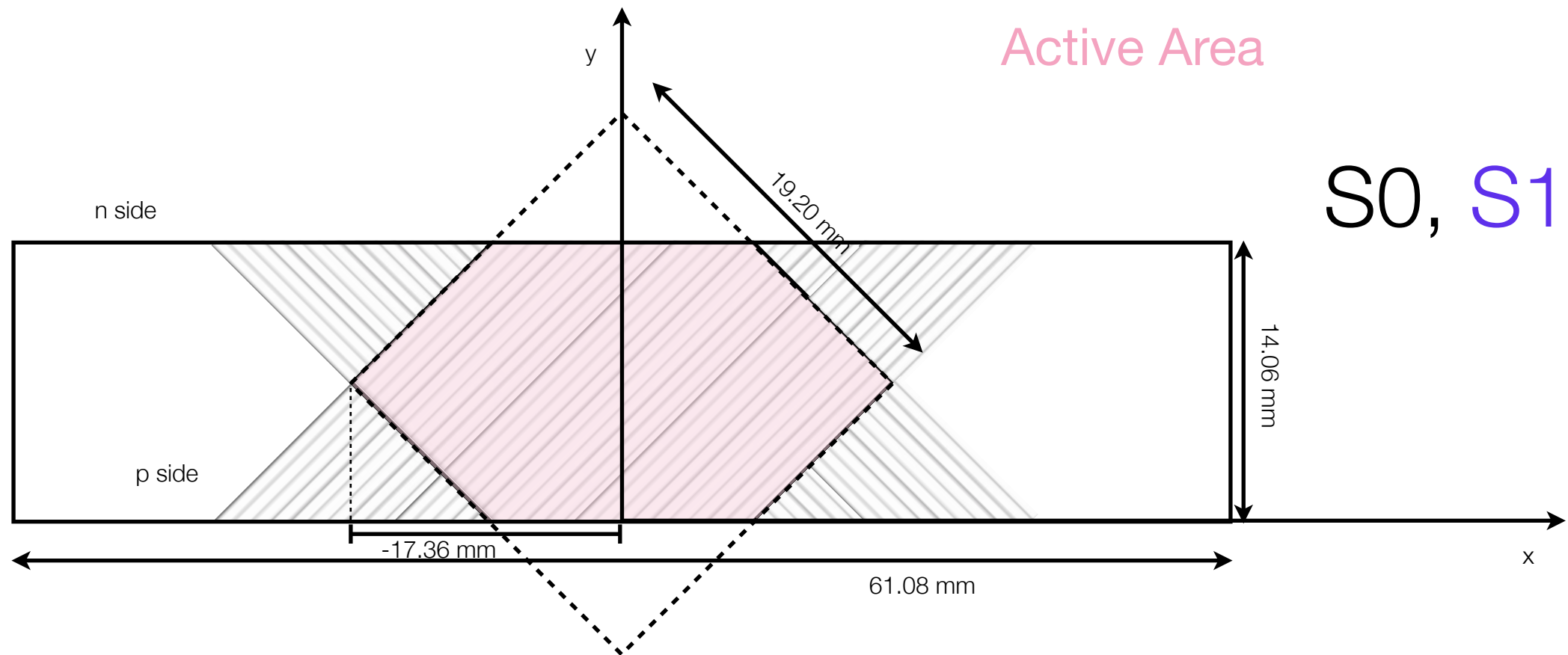
trigger: 1-8-8 => beam hit at least 4 layer



the dark area is in the positive x region for the first three layers and in the negative region for the latter.



# STRIPLETS DETECTOR UNDER TEST

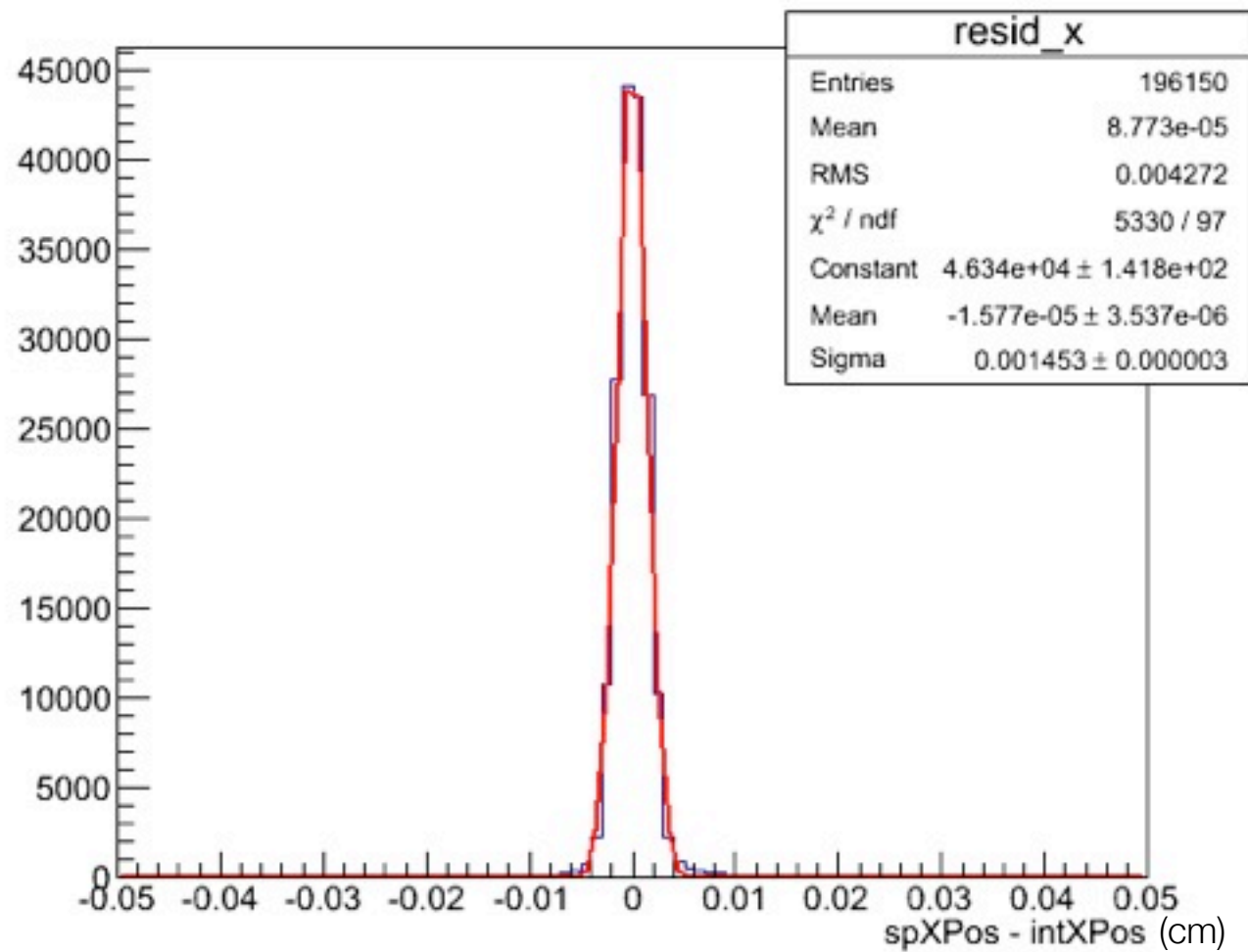


- pitch = 50  $\mu\text{m}$
- $19.20 / 0.050 = 384$  channels per side
- U and V orientation ( $+45^\circ$ ,  $-45^\circ$ )
- thresholds = 20 or 15

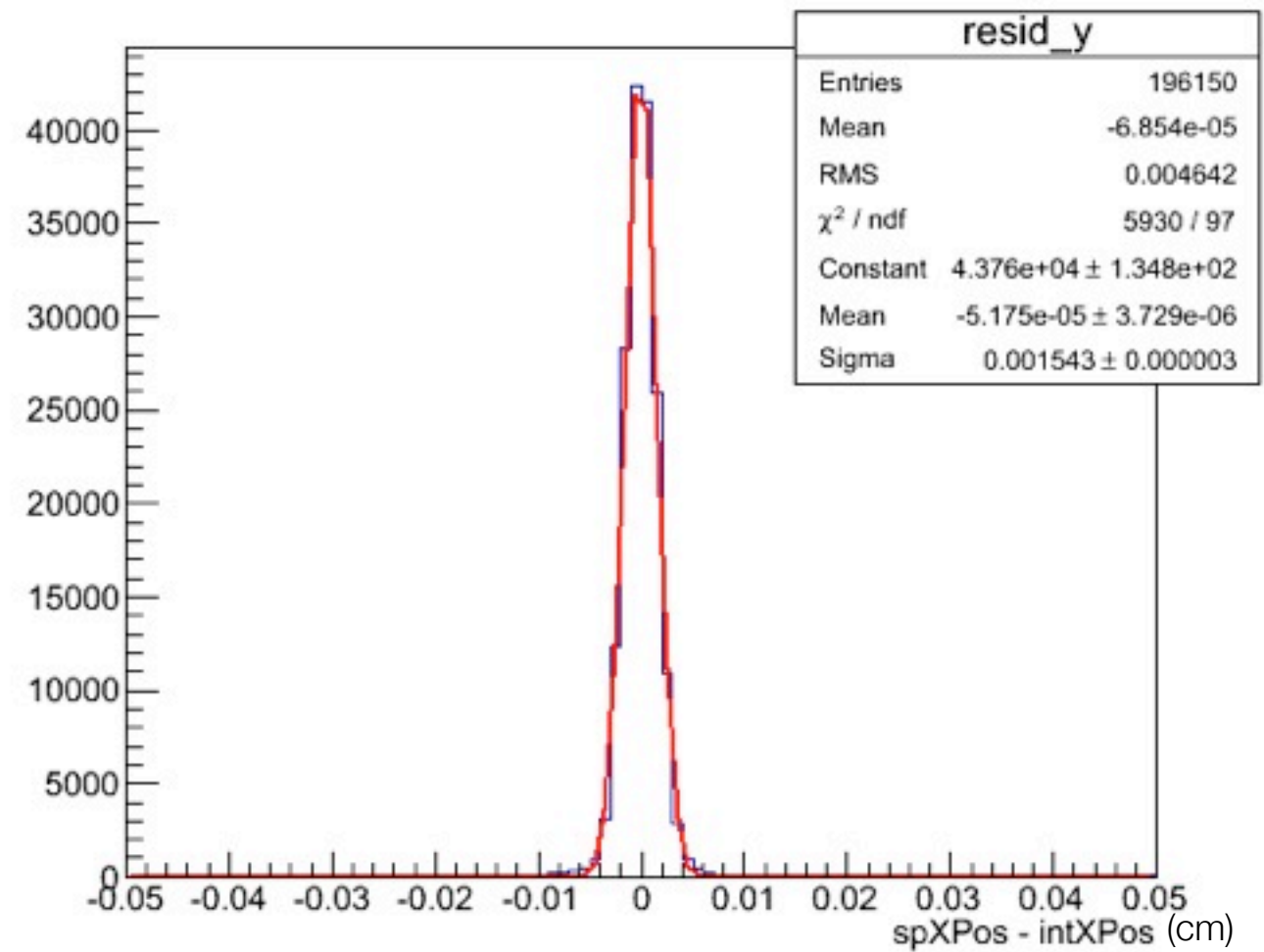
# RESIDUAL AFTER ALIGNMENT

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S1 residual X



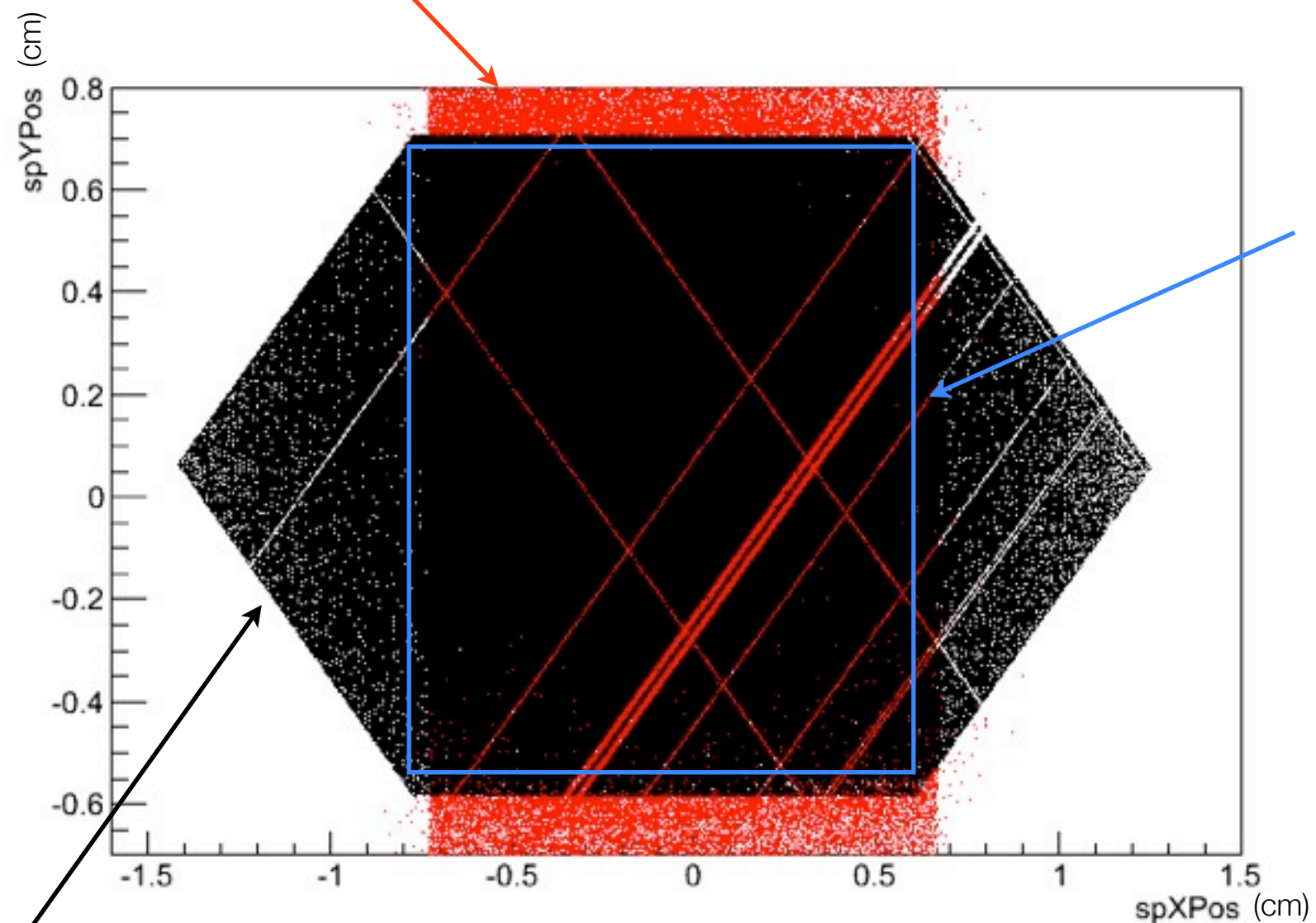
S1 residual Y



# EFFICIENCY: TRACKS SELECTION

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Telescope acceptance



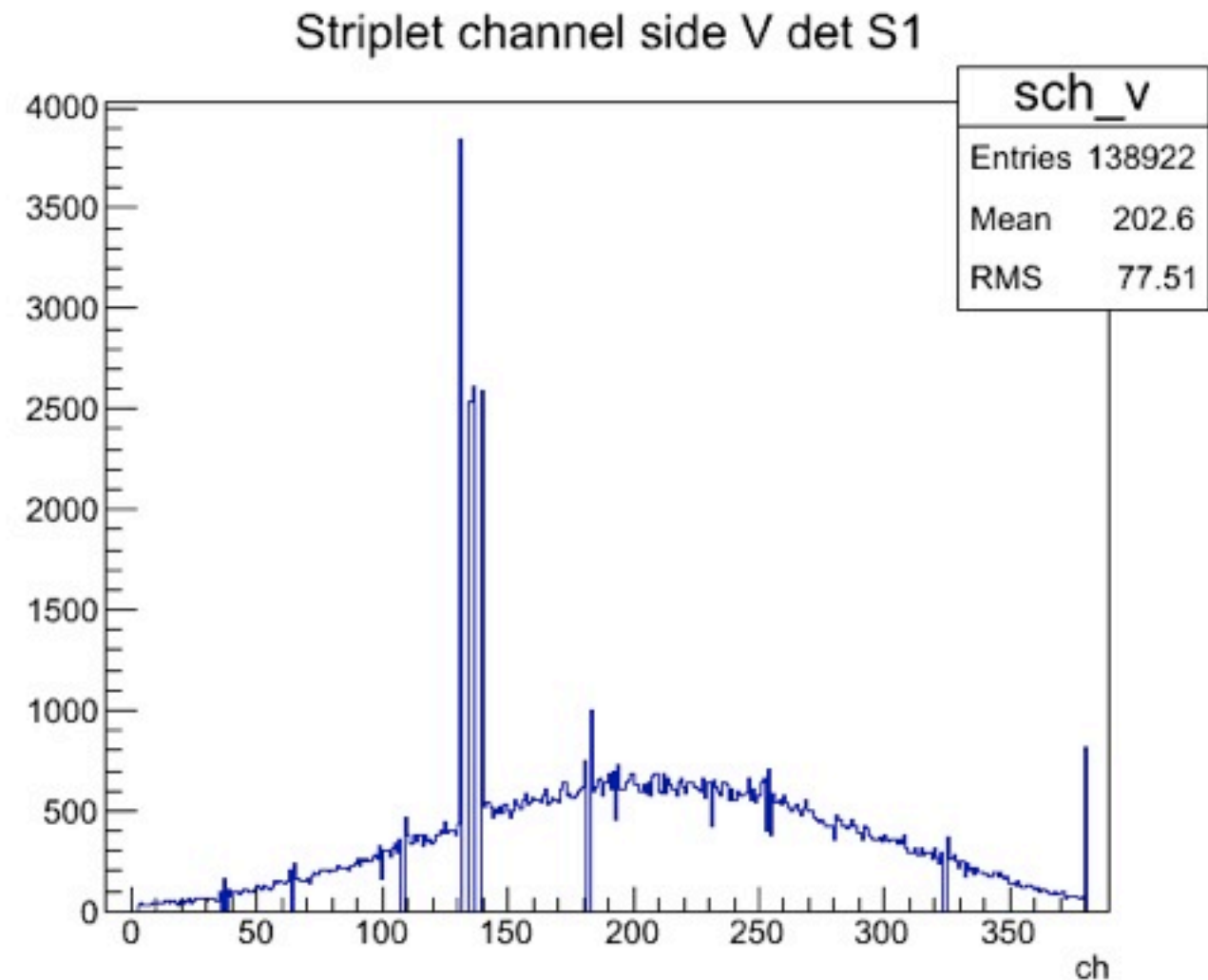
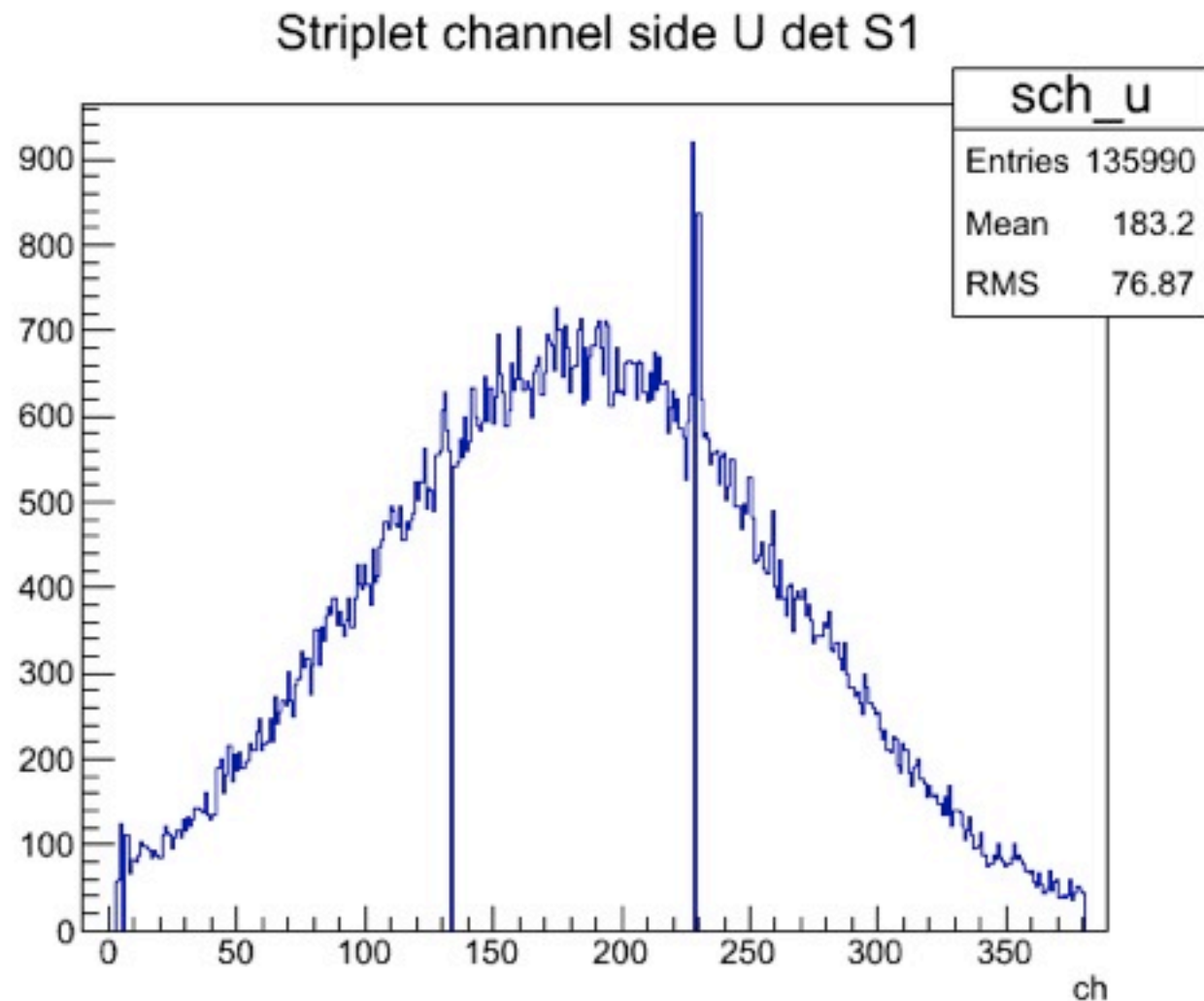
fiducial cut

striplets space point  
(global coordinates after alignment)



# STRIplet CHANNELS OCCUPANCY

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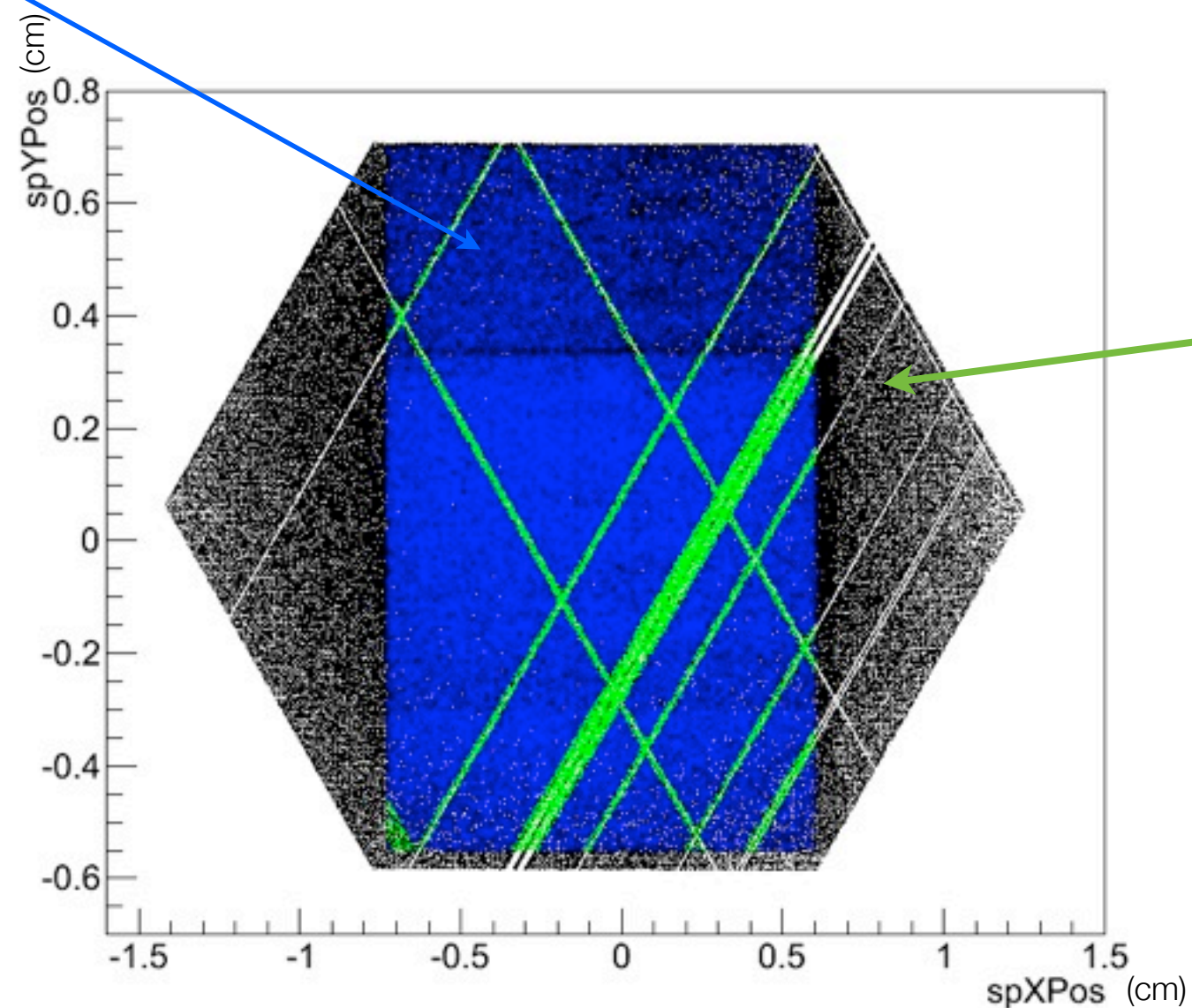
S1 inactive channels:

- **Side U:** 0, 1, 2, 6, 134, 229, 381, 382, 383
- **Side V:** 0, 1, 2, 36, 38, 64, 108, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 182, 324, 381, 382, 383

# INACTIVE CHANNELS EXCLUSION

run 2277

- Inactive strips and their closest channels are excluded by selection in efficiency computation



excluded  
tracks

# EFFICIENCIES: SIDE U, SIDE V AND COMBINED

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$$\epsilon_u = \frac{n_{\text{clusters}} \mid |\text{clustUpos-intUpos}| < 56\mu\text{m}}{n_{\text{int}} \subset \text{active U region}}$$

$$\epsilon = \frac{n_{\text{clusters}} \mid |\text{clustUpos-intUpos}| < 56\mu\text{m} \ \& \ |\text{clustVpos-intVpos}| < 56\mu\text{m}}{n_{\text{int}} \subset (\text{active U region} \cap \text{active V region})}$$

run	2276	2277	2278
# entries	96 820	1 072 699	1 075 580
# trks	~20k	~200k	~200k
$\epsilon_u$ (%)	99.40 $\pm$ 0.06	99.50 $\pm$ 0.02	99.50 $\pm$ 0.02
$\epsilon_v$ (%)	99.97 $\pm$ 0.01	99.977 $\pm$ 0.003	99.976 $\pm$ 0.004
$\epsilon$ (%)	99.39 $\pm$ 0.06	99.48 $\pm$ 0.02	99.48 $\pm$ 0.02

# ANGULAR SCAN

Preliminary

Six positions between  $0^\circ$  and  $-70^\circ$

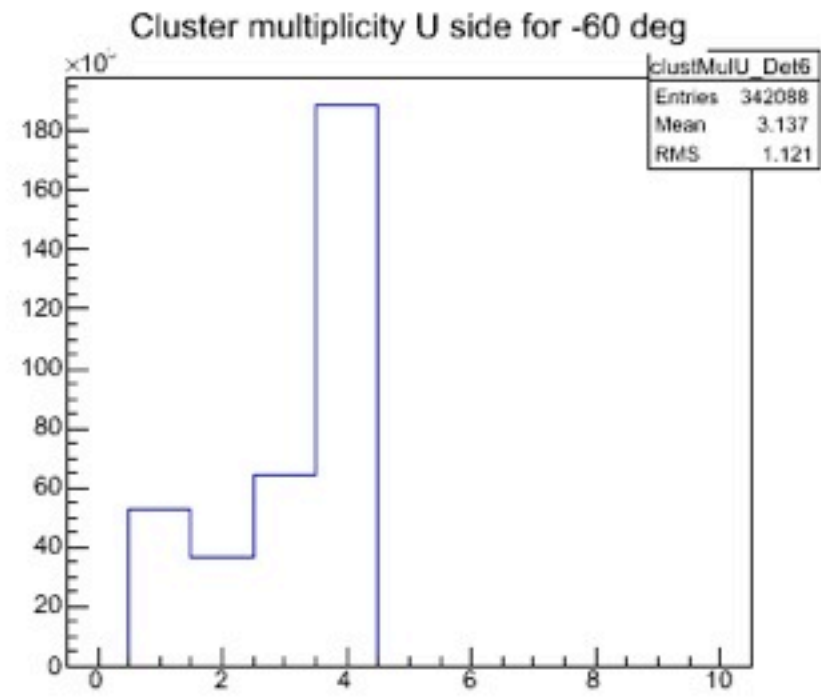
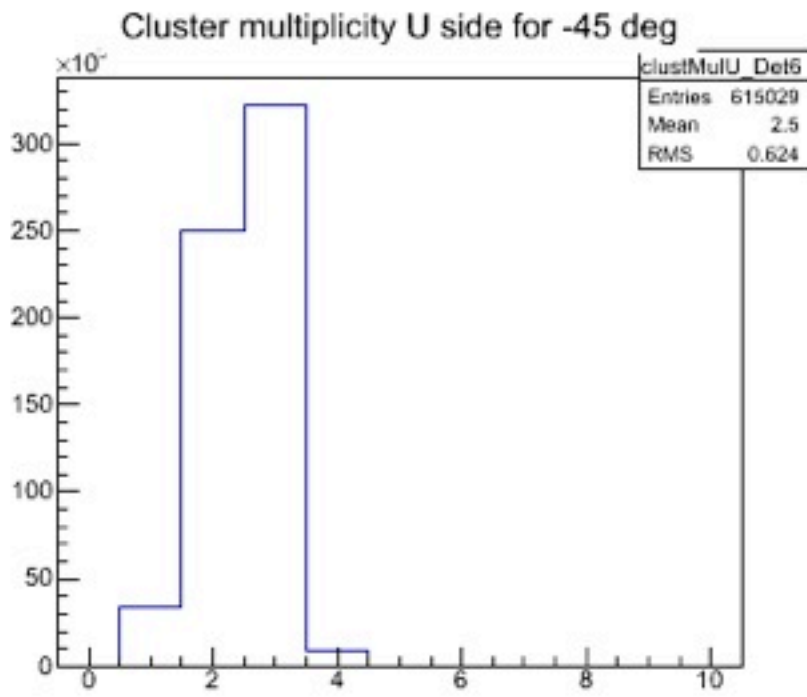
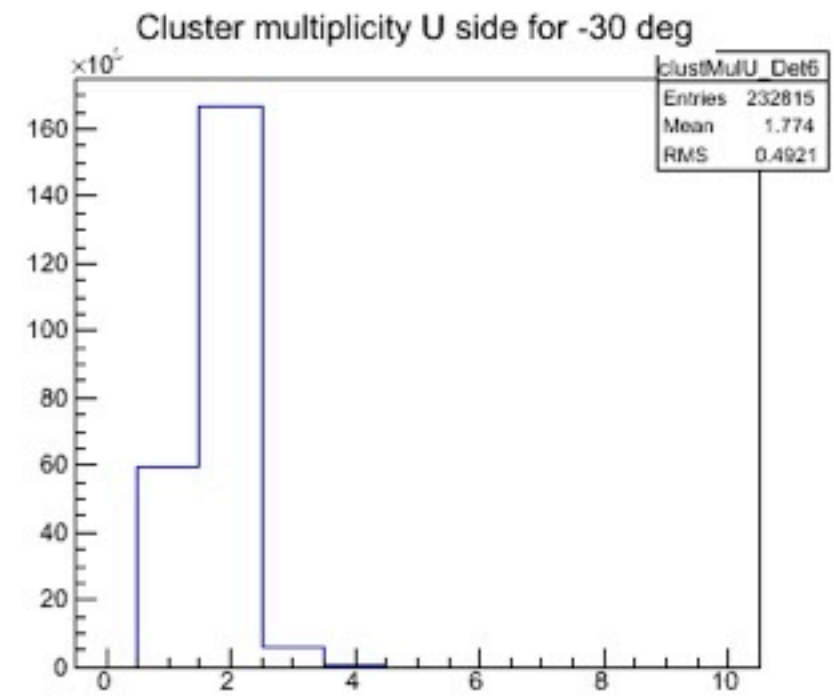
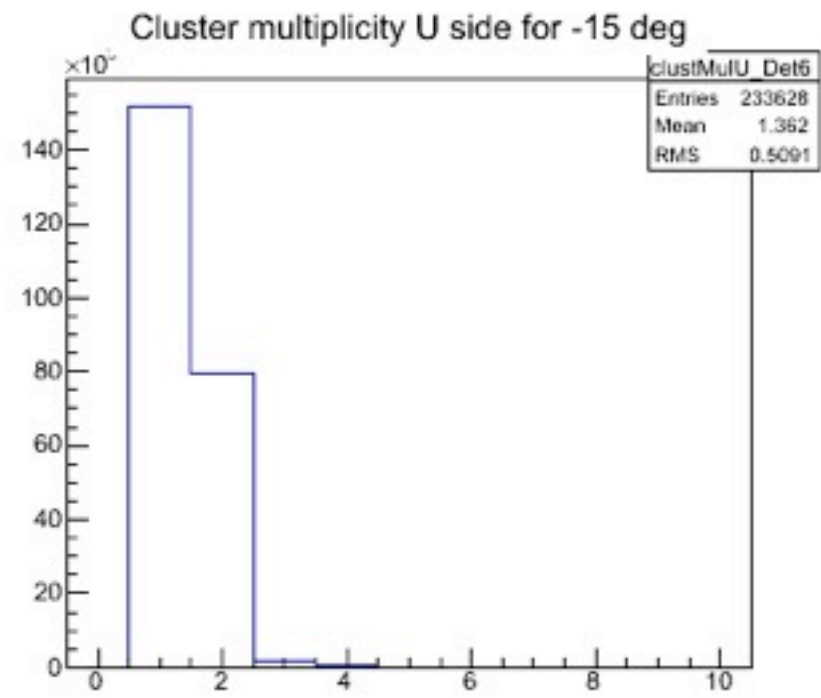
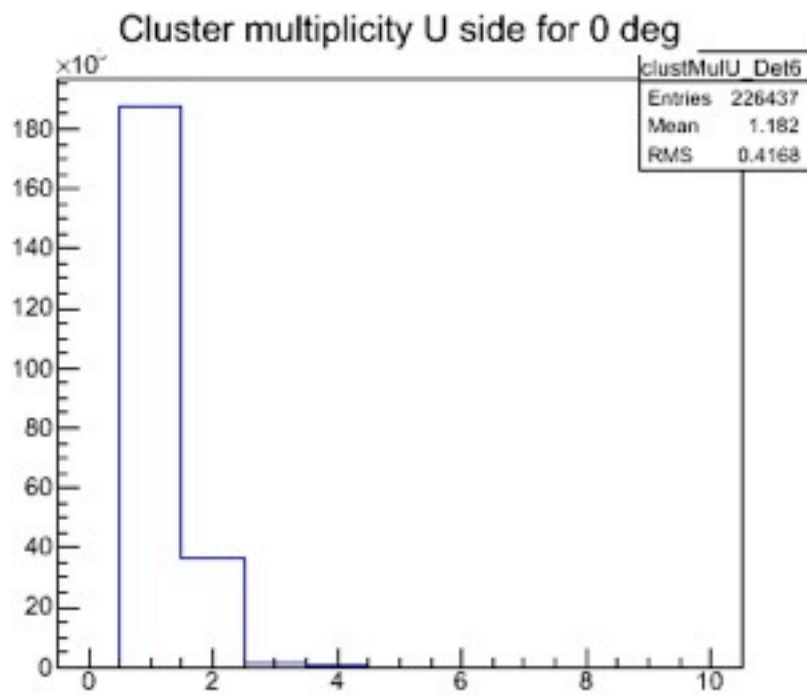
- thresholds = 20

run	angle
2278	$0^\circ$
2279	$-15^\circ$
2280	$-30^\circ$
2281	$-45^\circ$
2282-2283	$-60^\circ$
2284-2285	$-70^\circ$

still not aligned

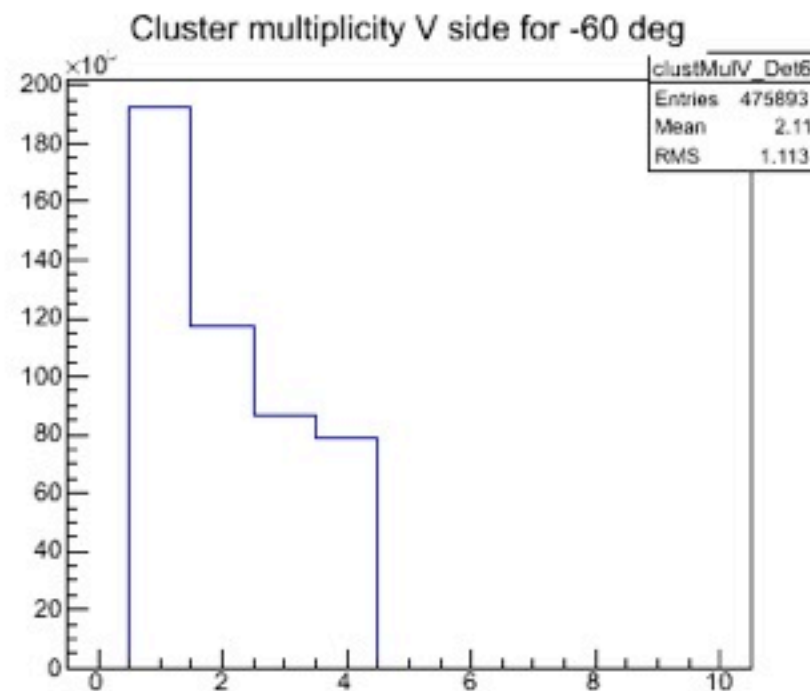
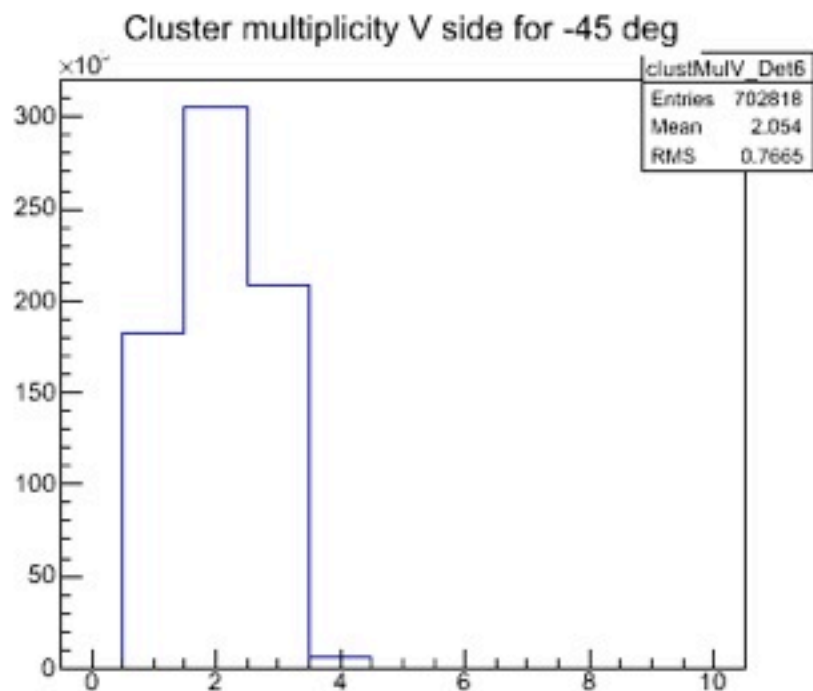
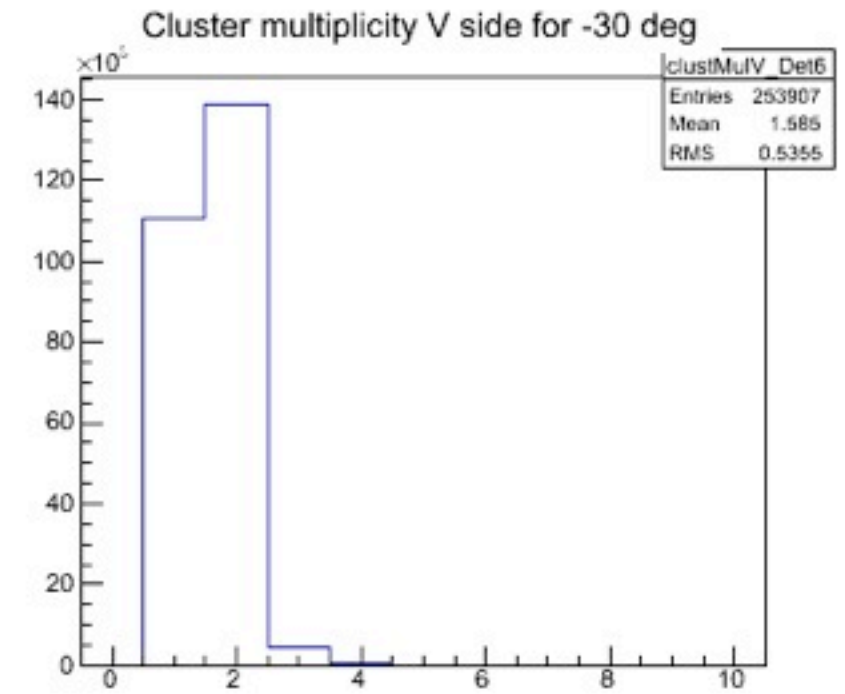
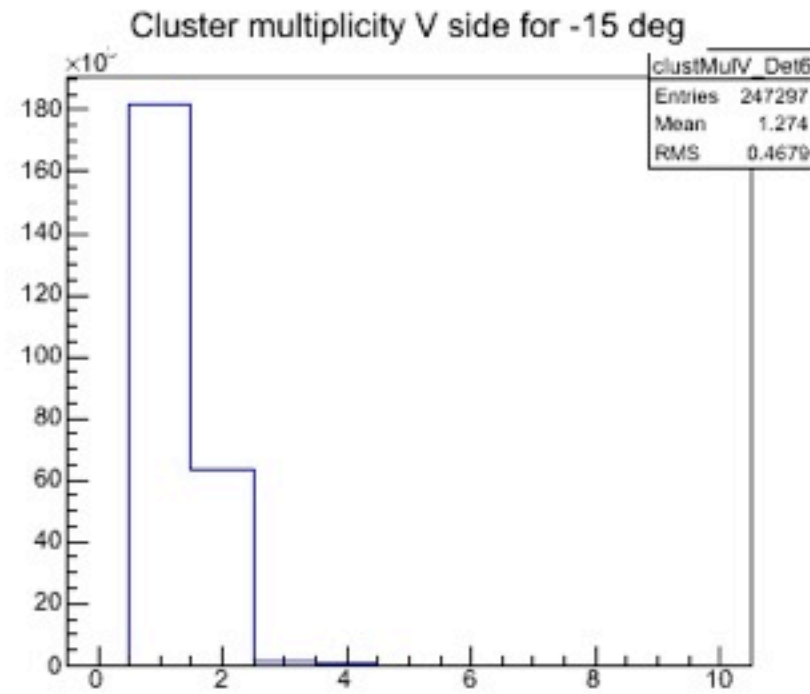
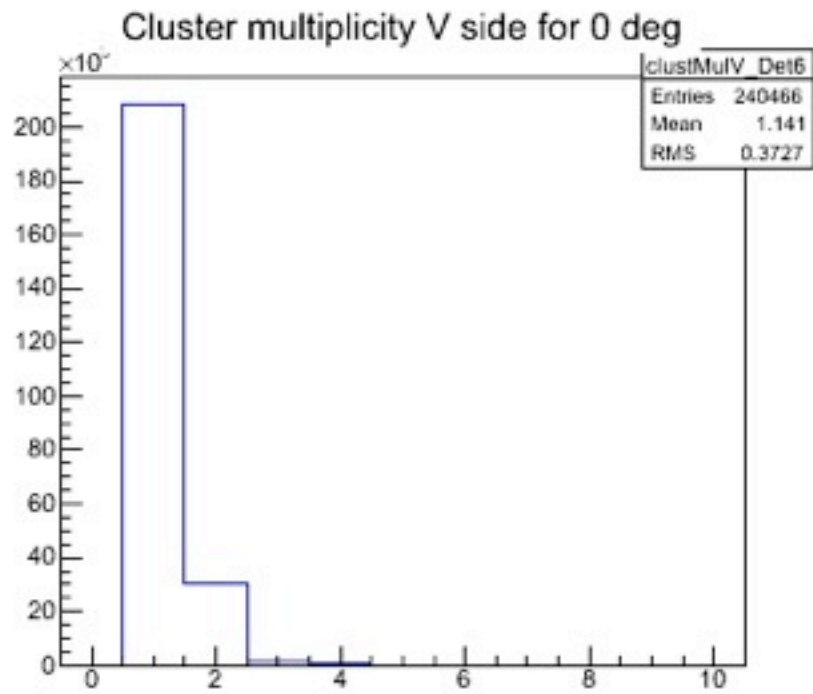


# ANGULAR SCAN: CLUSTER MULTIPLICITY



SIDE U

# ANGULAR SCAN: CLUSTER MULTIPLICITY



SIDE V

# ANGULAR SCAN: EFFICIENCIES

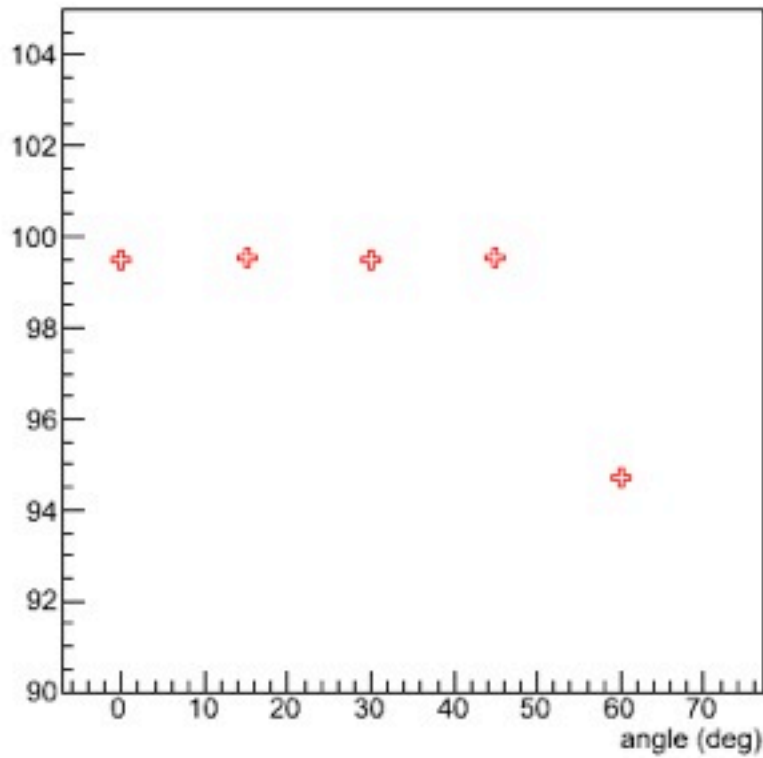
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angle	$\epsilon_u$ (%)	$\epsilon_v$ (%)	$\epsilon$ (%)
0	$99.50 \pm 0.02$	$99.976 \pm 0.003$	$99.48 \pm 0.01$
-15	$99.54 \pm 0.02$	$99.978 \pm 0.003$	$99.52 \pm 0.02$
-30	$99.50 \pm 0.02$	$99.982 \pm 0.003$	$99.48 \pm 0.02$
-45	$99.54 \pm 0.01$	$99.989 \pm 0.002$	$99.54 \pm 0.01$
-60	$94.69 \pm 0.05$	$99.967 \pm 0.005$	$94.66 \pm 0.06$
-70	-	-	-

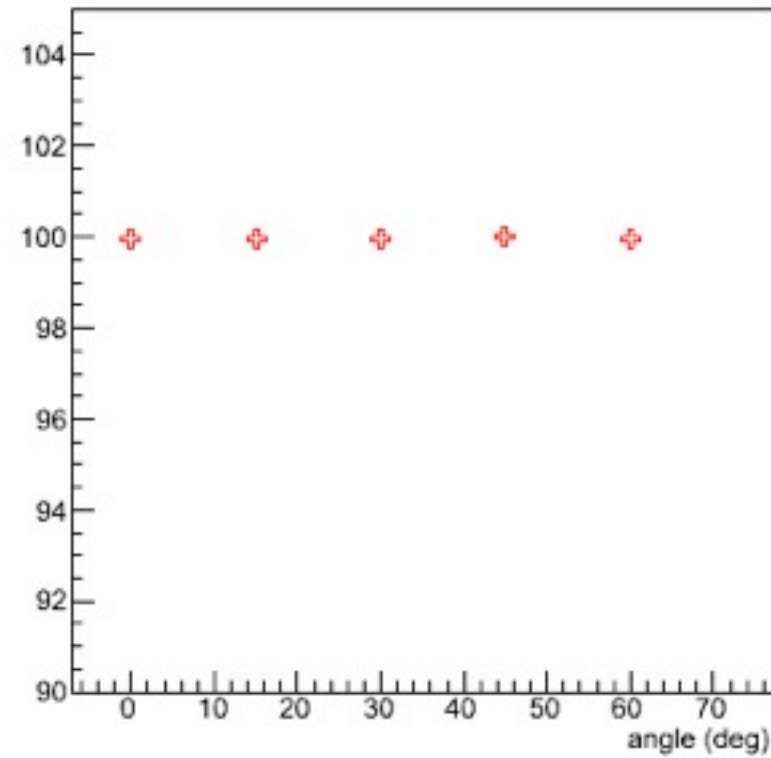
# ANGULAR SCAN: EFFICIENCIES

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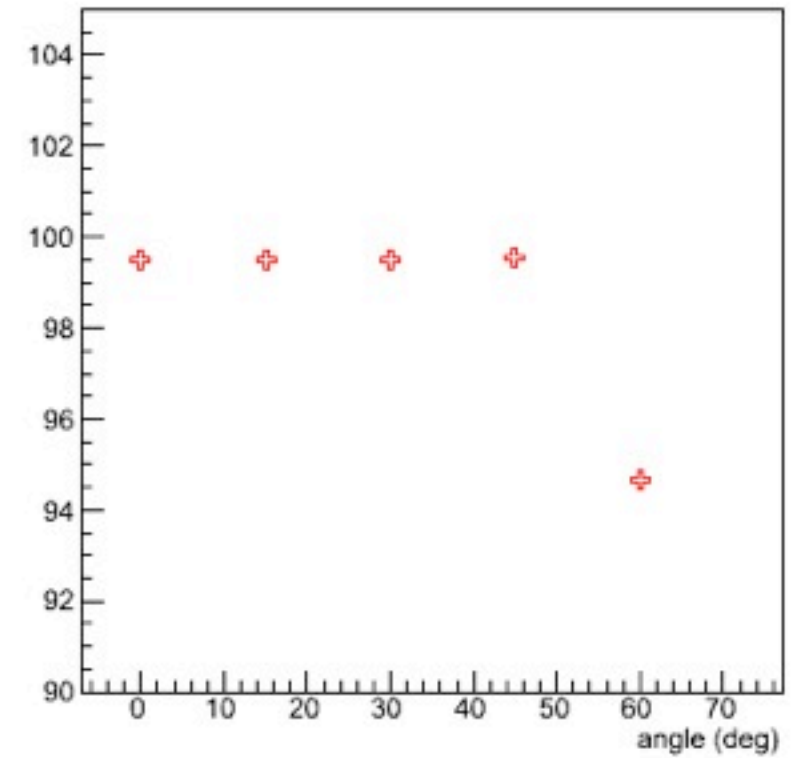
Eff side u



Eff side v



Total Eff



Preliminary



# CONCLUSIONS

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- Triplet detector S1 at **nominal threshold** is considered;
- Single side and combined efficiencies up to 60° wrt beam axis are measured

$$\varepsilon_v > 99.9\% \text{ up to } 60^\circ$$

## NEXT STEPS

- ▶ perform alignment at 70° and measure efficiencies
- ▶ study low threshold runs
- ▶ study detector S0

# STRIPLETS ALIGNMENT

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config/config11\_run2276.dat

```
# ID 6
# detector type (ID of DetectorType) 3
# xpos, ypos, zpos -.389 0. 43.40
# phi, theta, psi (Eulero rotations) 0. 0. 0.
# u, v orientation -1 1
# the next line is the tag
```

alignment/alignment11\_run2276.dat

```
# Alignment Parameters extracted from data
# number of detectors 1
# detElem ID 6
# phi, theta, gamma (deg) -0.136354 0 -0
# deltaX, deltaY, deltaZ (cm) 0.302637 0.060754 0
```

testDataAlignment reported the DUT in the central position

config/config11\_run2276.dat

```
# ID 6
# detector type (ID of DetectorType) 3
# xpos, ypos, zpos 0. 0. 43.40
# phi, theta, psi (Eulero rotations) 0. 0. 0.
# u, v orientation -1 1
# the next line is the tag
```

alignment/alignment11\_run2276.dat

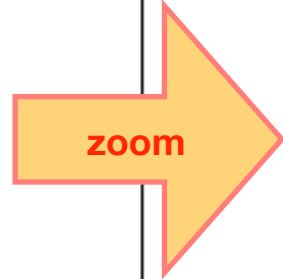
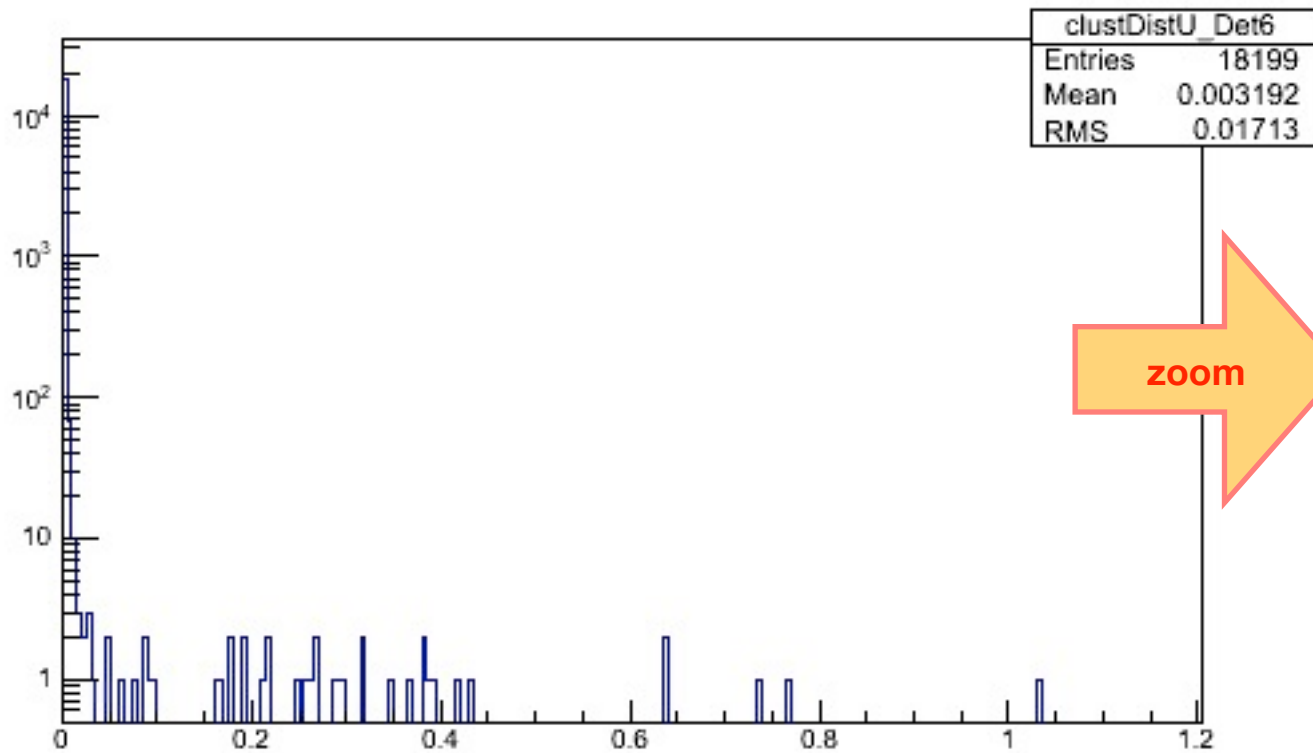
```
# Alignment Parameters extracted from data
# number of detectors 1
# detElem ID 6
# phi, theta, gamma (deg) -0.13765 0 -0
# deltaX, deltaY, deltaZ (cm) -0.0862852 0.0607445 0
```

$-0.389 + 0.3026 = -0.0864$   
same result

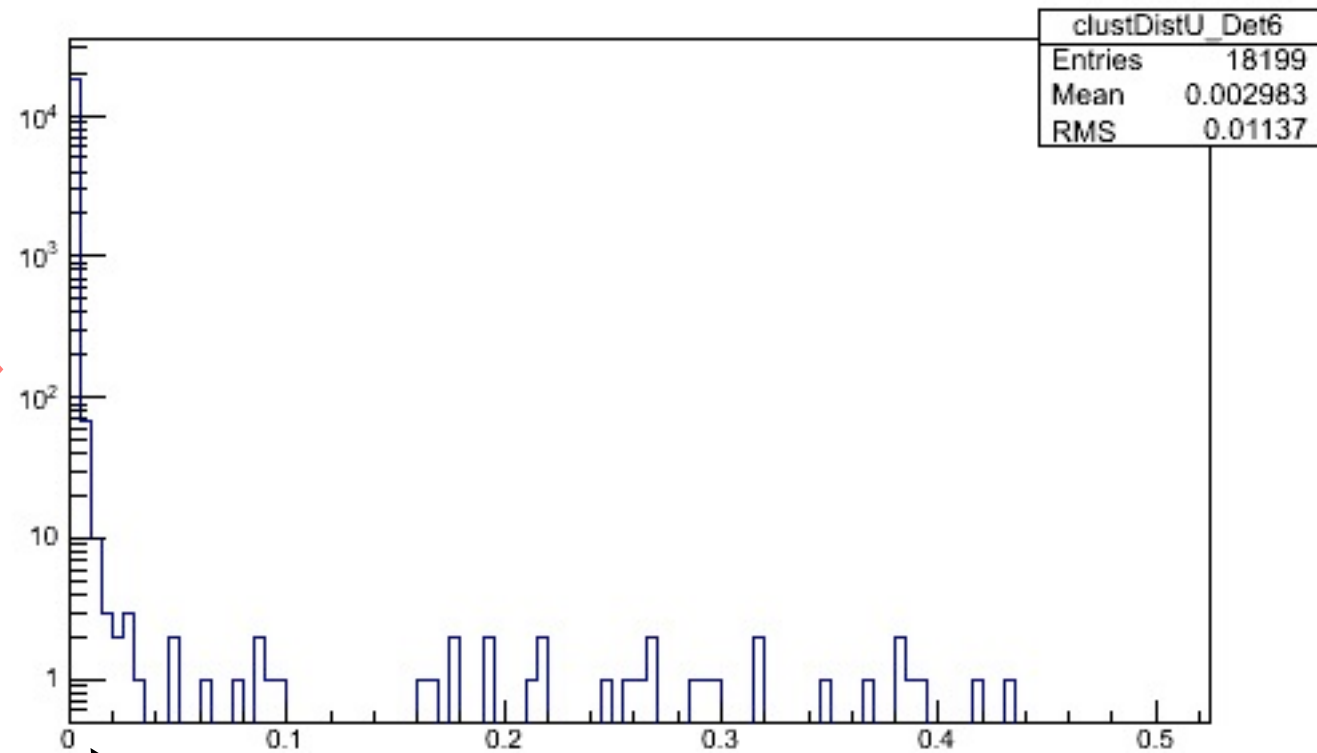
# Cluster - Intersection distances

run 2276

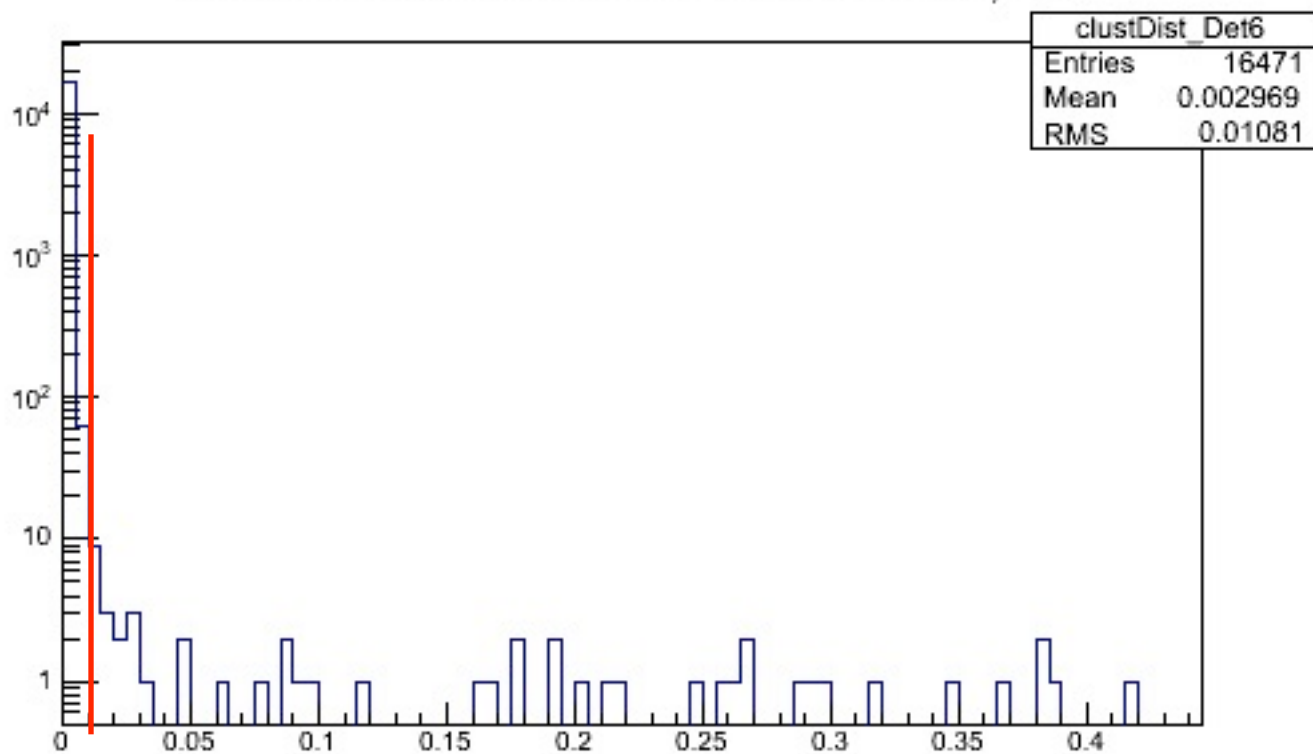
Distance between cluster and track inside fiducial on side U, Det6



Distance between cluster and track inside fiducial on side U, Det6



Distance between cluster and track inside fiducial, Det6



bin = 50  $\mu\text{m}$