

# BEAM-TEST STRIPLETS DATA ANALYSIS

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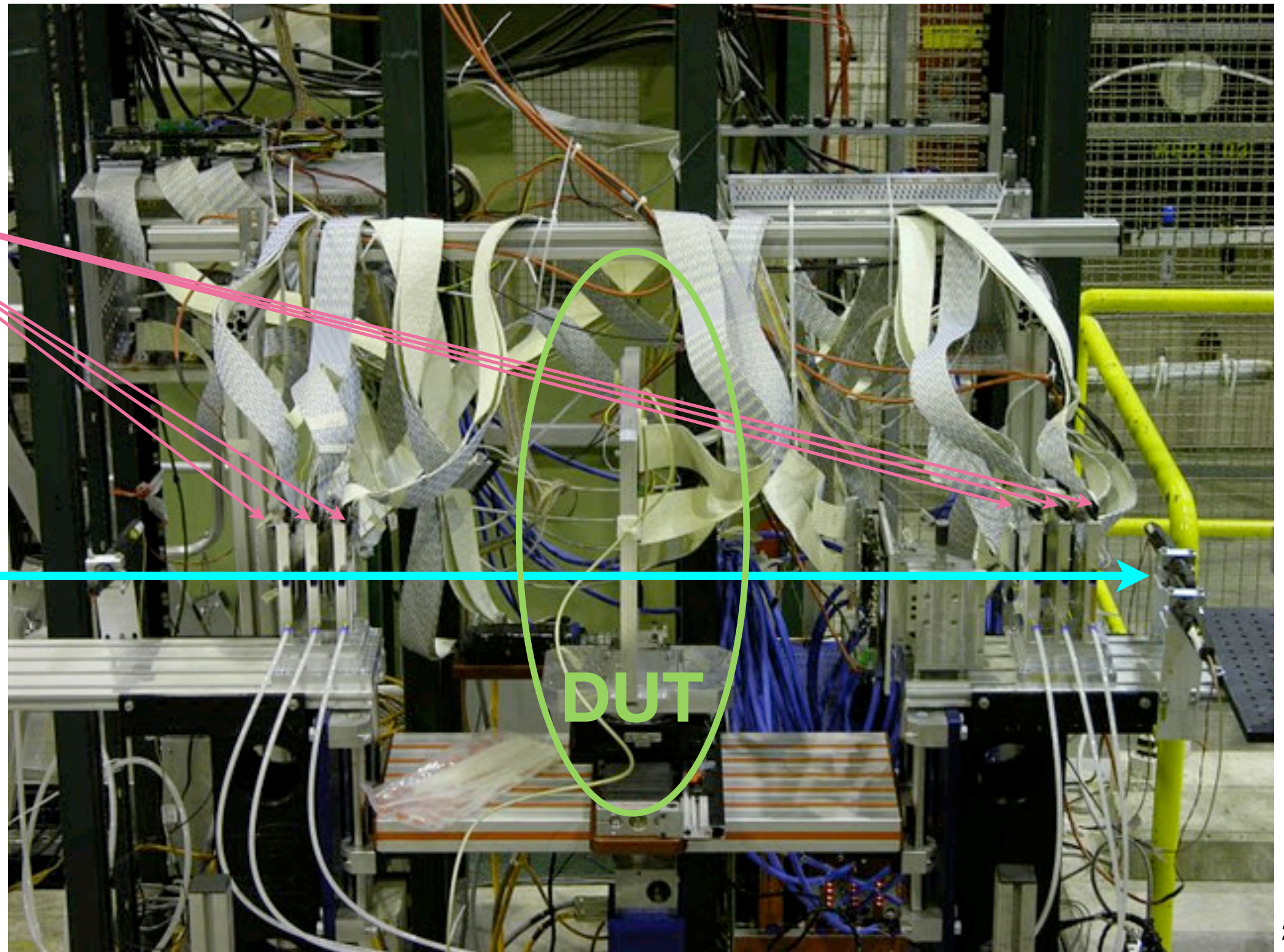


# BEAM TEST SETUP

SPS@CERN

telescope

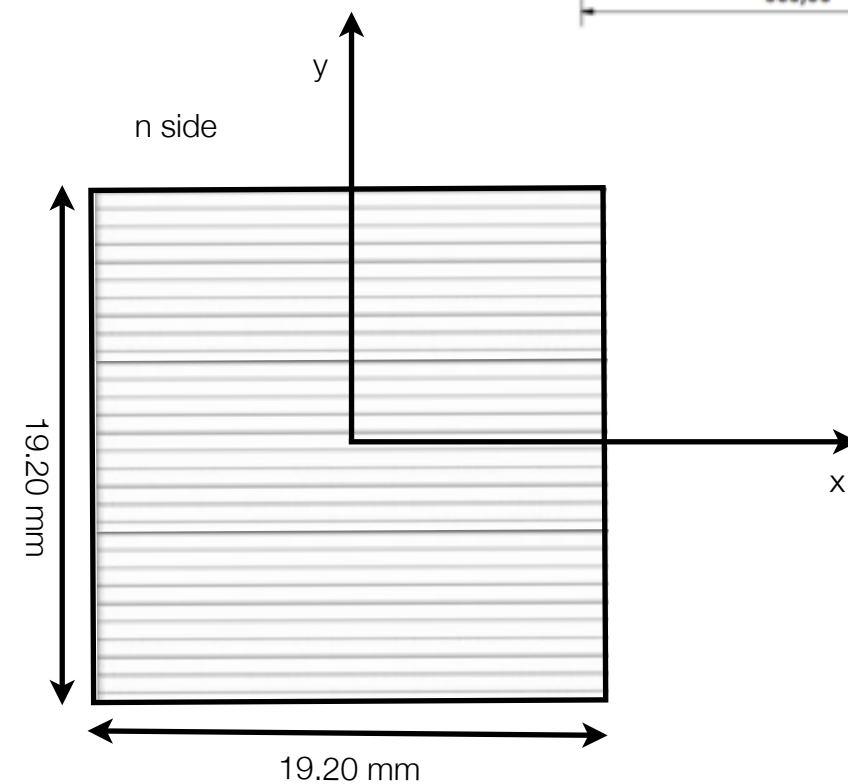
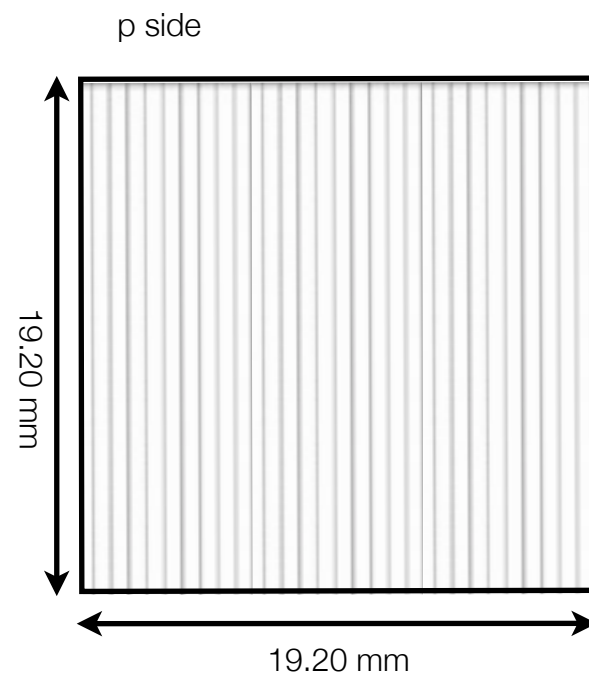
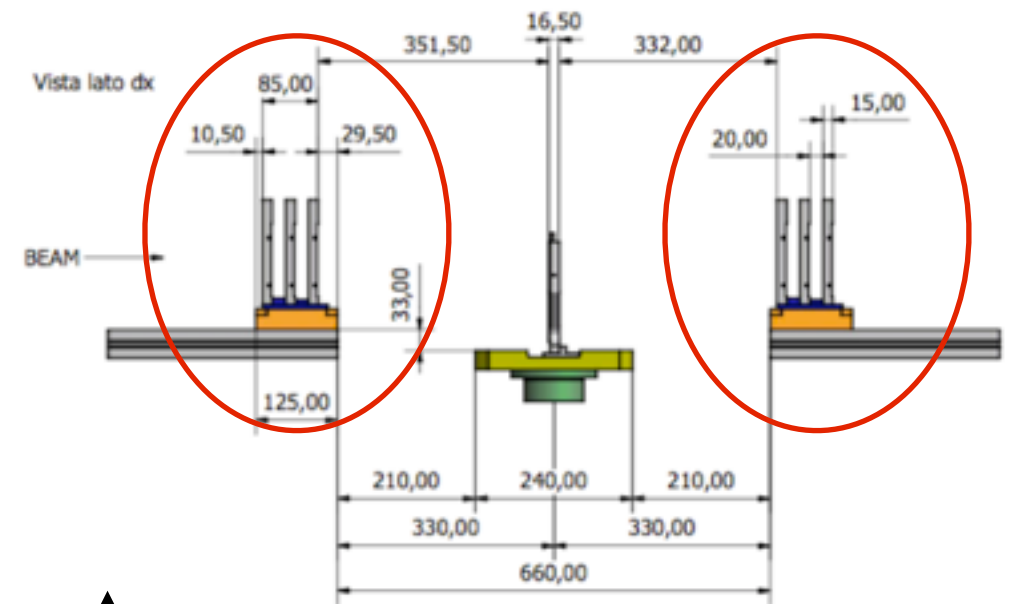
120 GeV  $\pi_{+/-}$





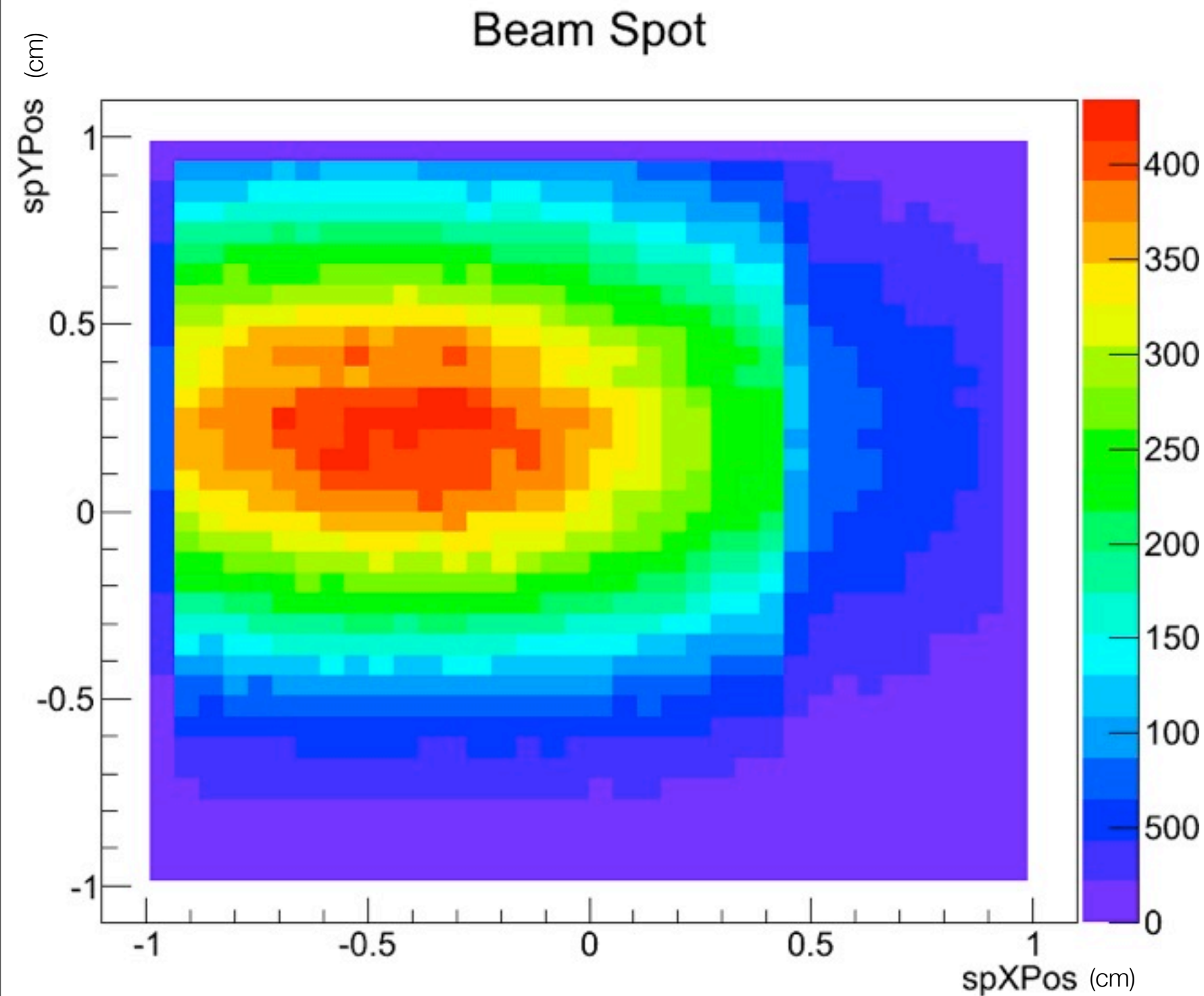
# TELESCOPE DETECTORS

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

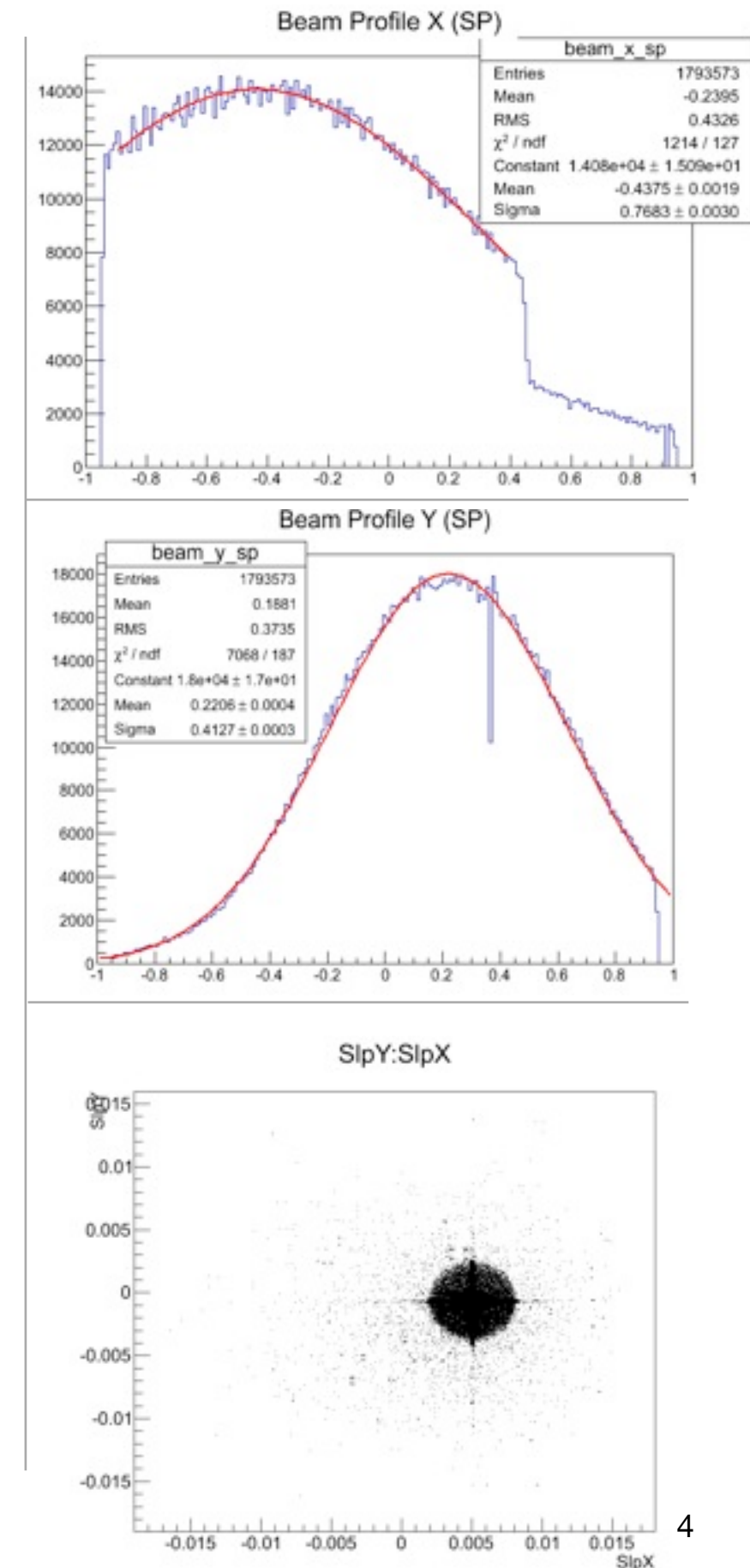


# BEAM SPOT AND DIVERGENCES

run 2277

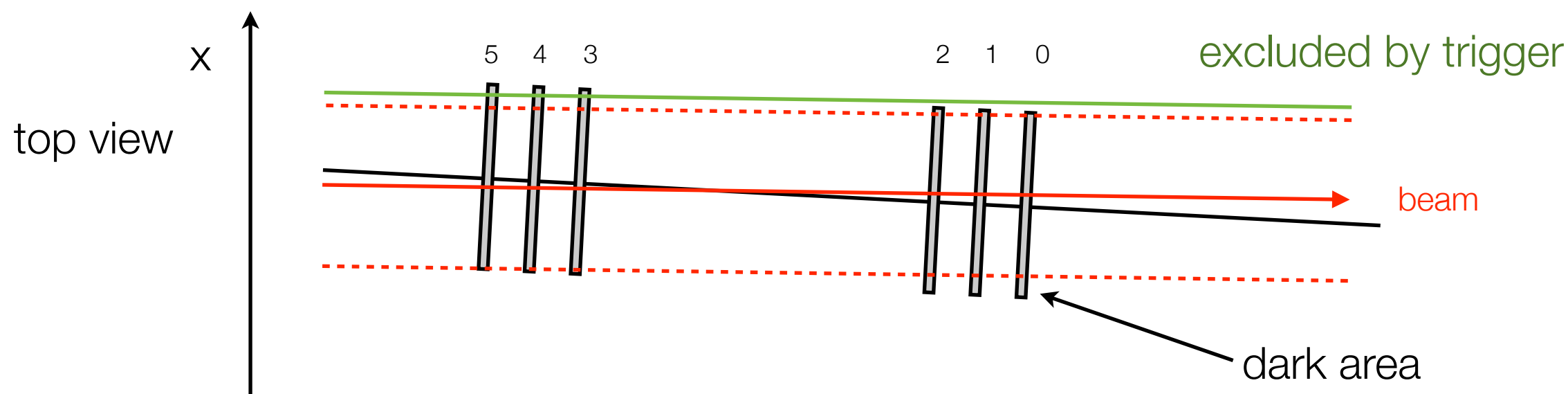


first layer of telescope

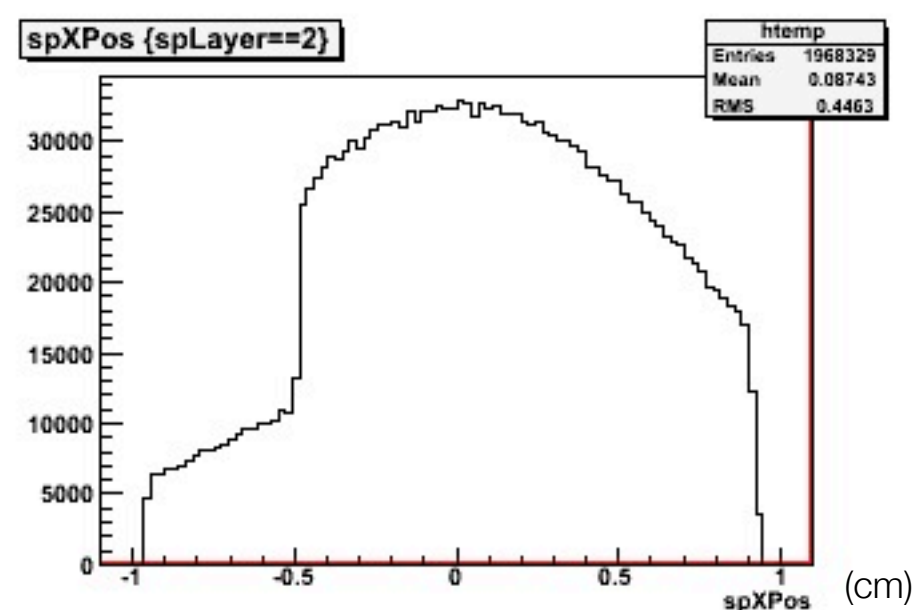
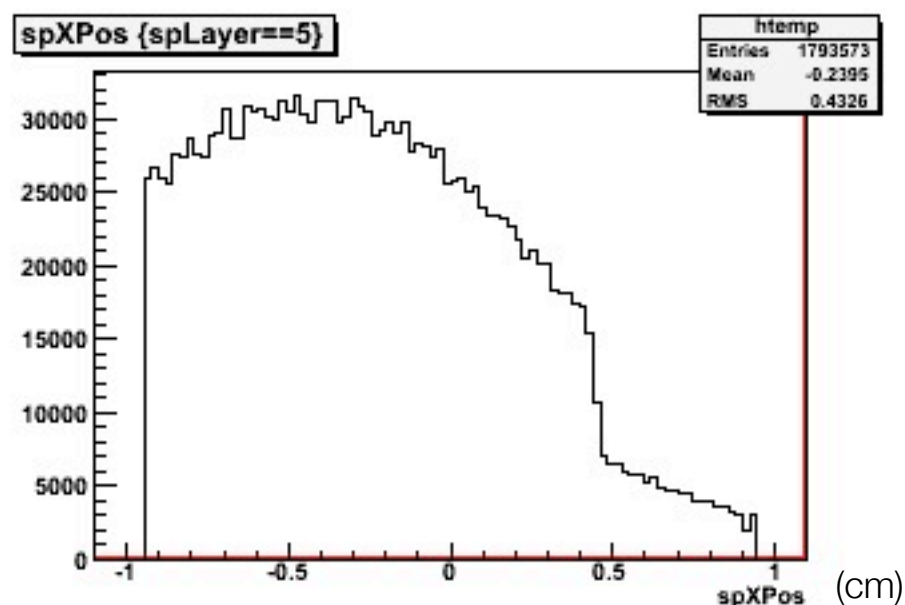


# MISALIGNMENT OF TELESCOPE wrt BEAM AXIS

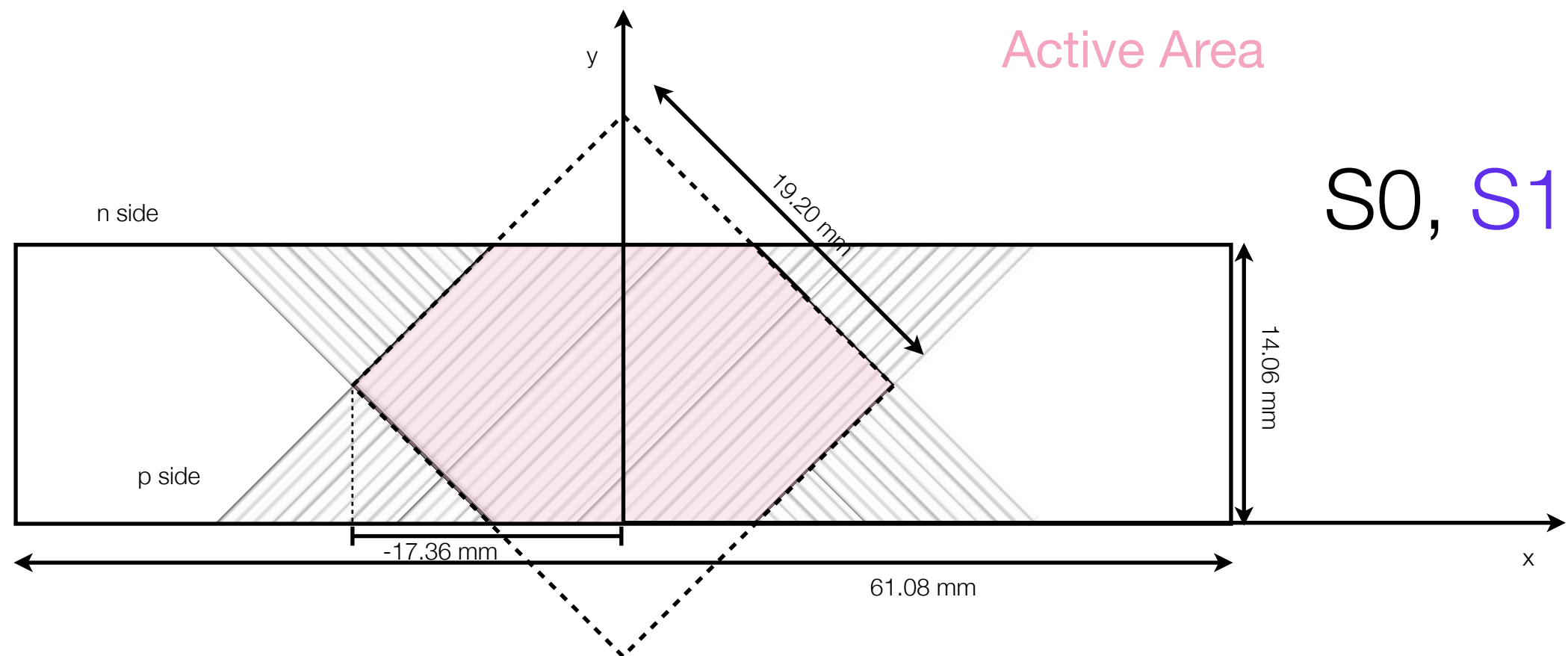
trigger: 1-8-8 => beam hit at least 4 layer



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

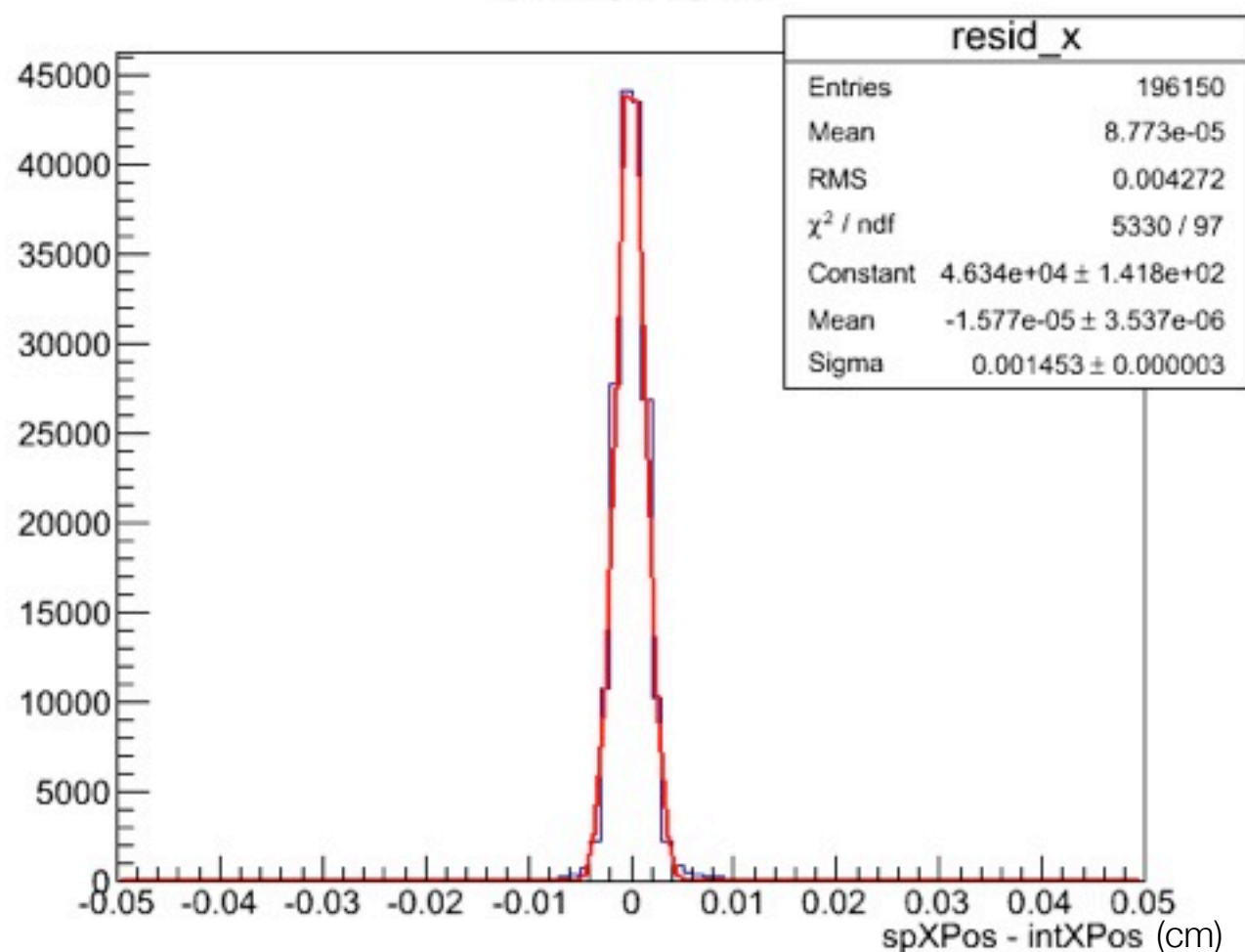


- pitch = 50  $\mu\text{m}$
- $19.20 / 0.050 = 384$  channels per side
- U and V orientation (+45°, -45°)
- thresholds = 20 or 15

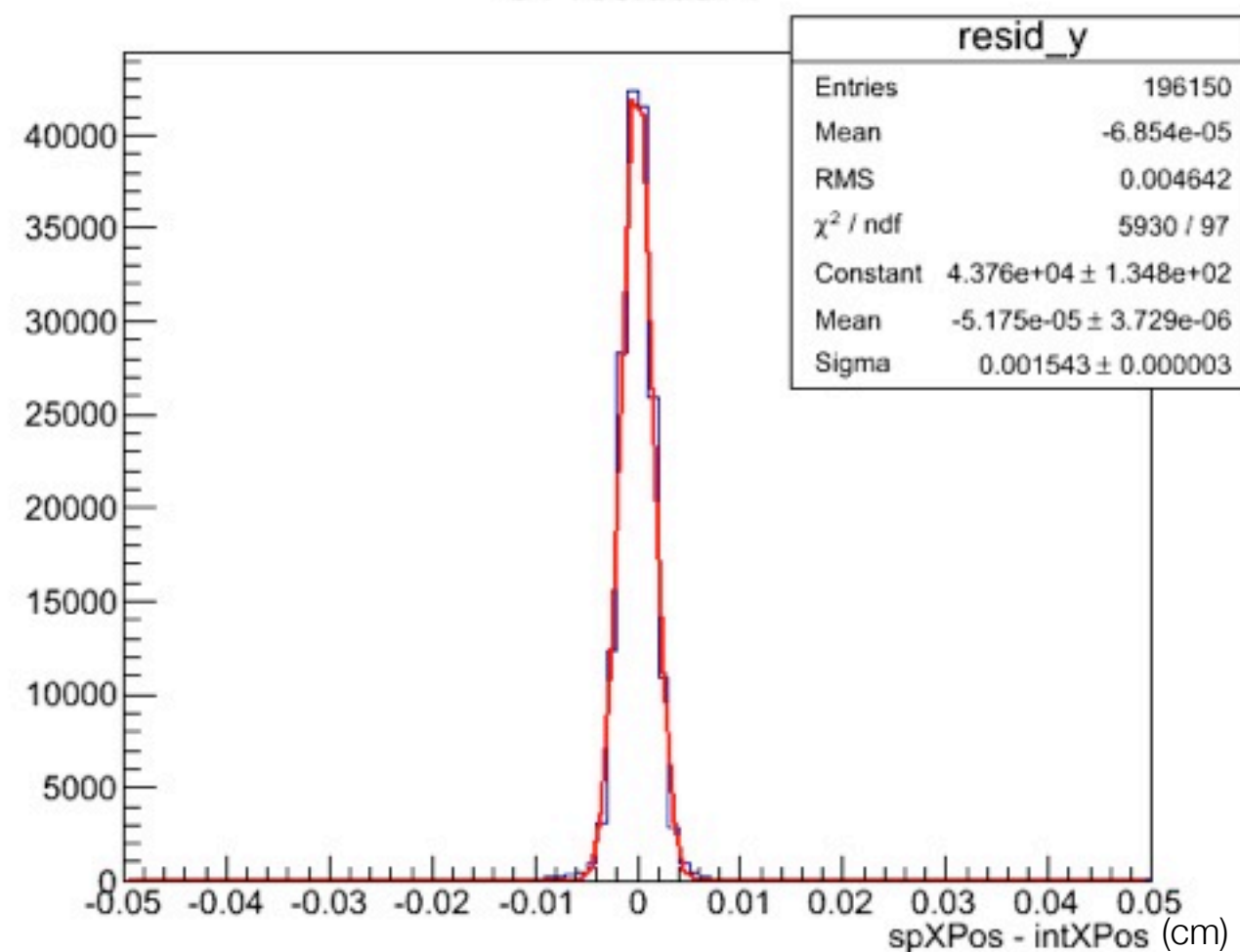
# RESIDUAL AFTER ALIGNMENT

run 2277

S1 residual X



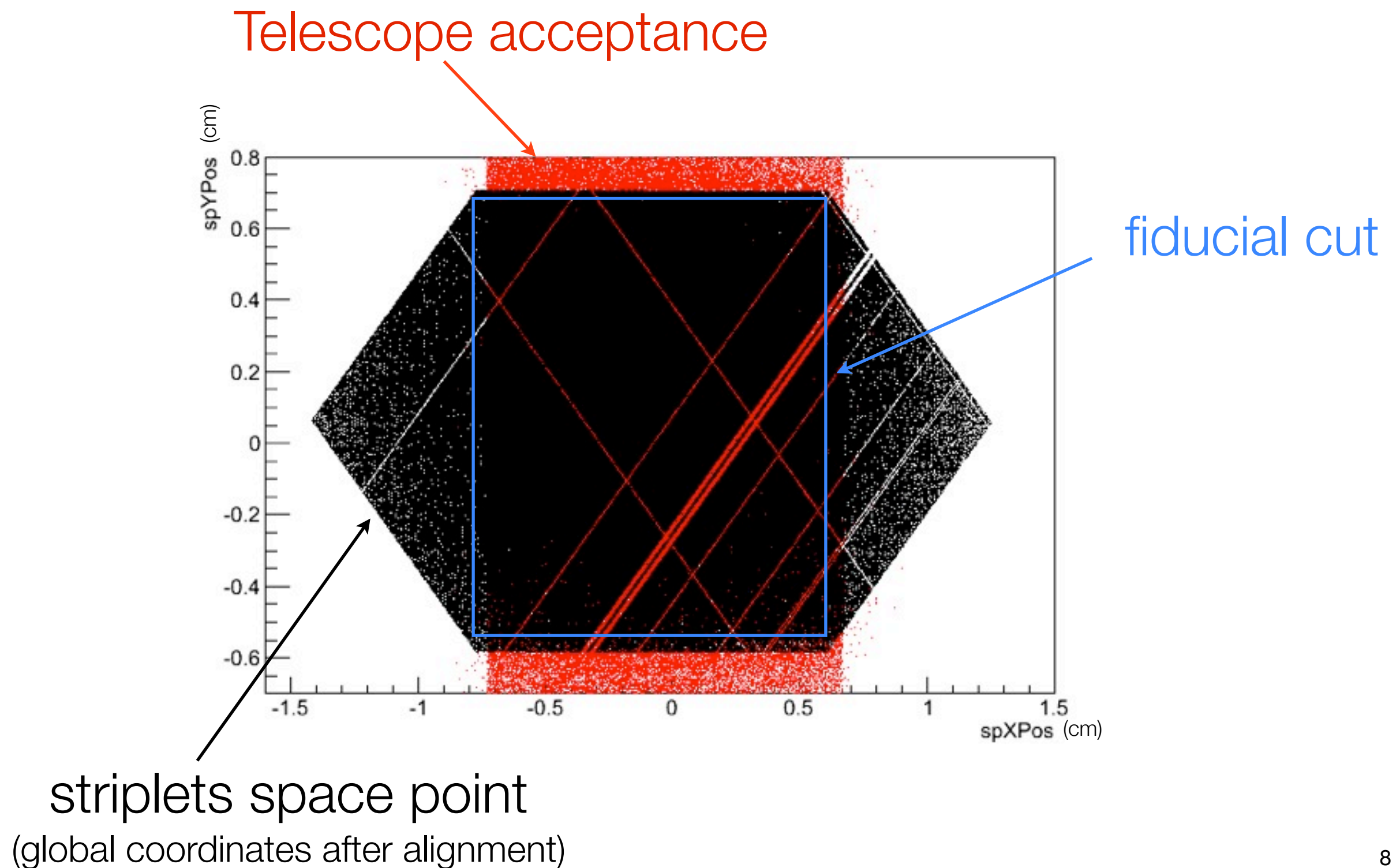
S1 residual Y





# EFFICIENCY: TRACKS SELECTION

run 2277

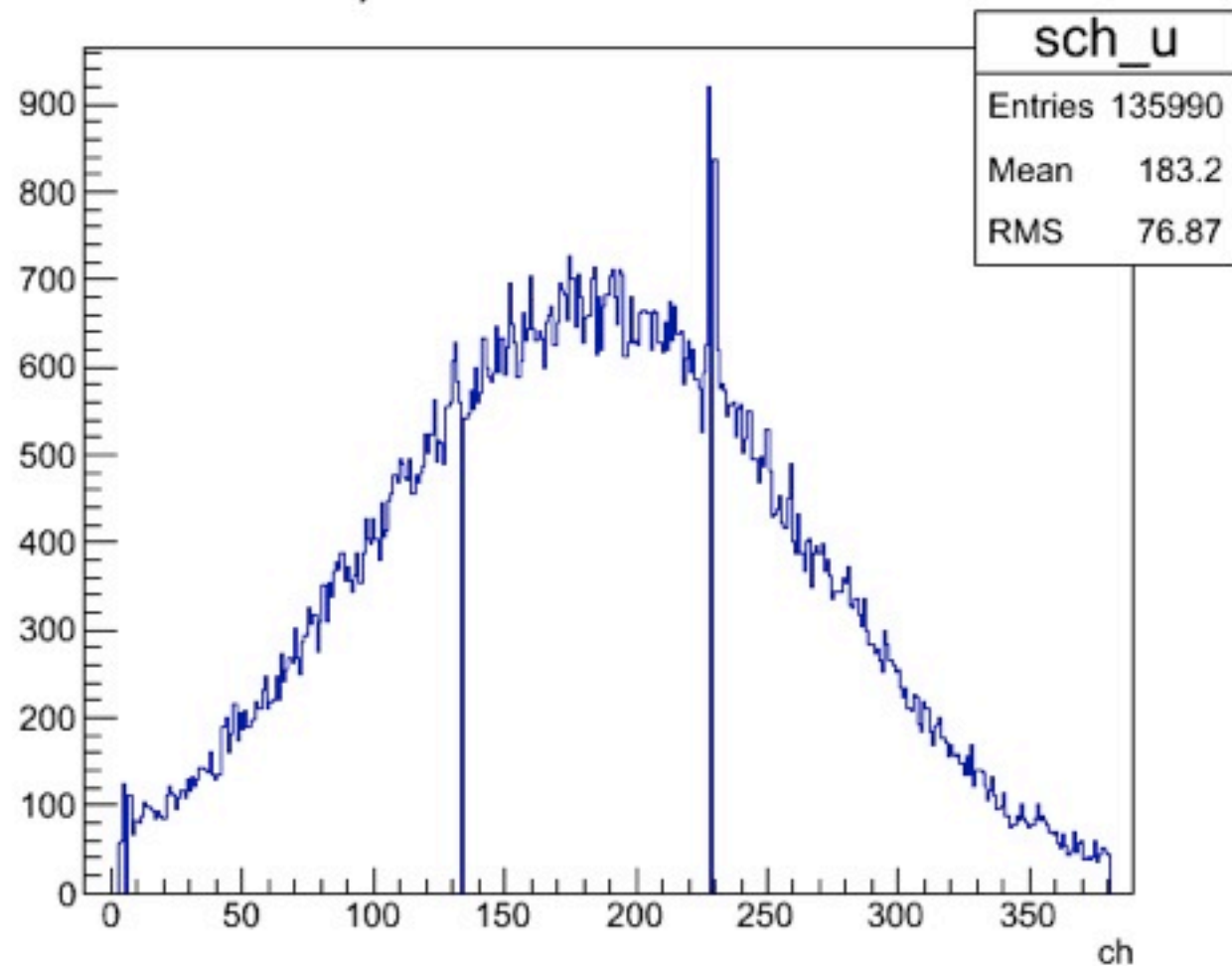




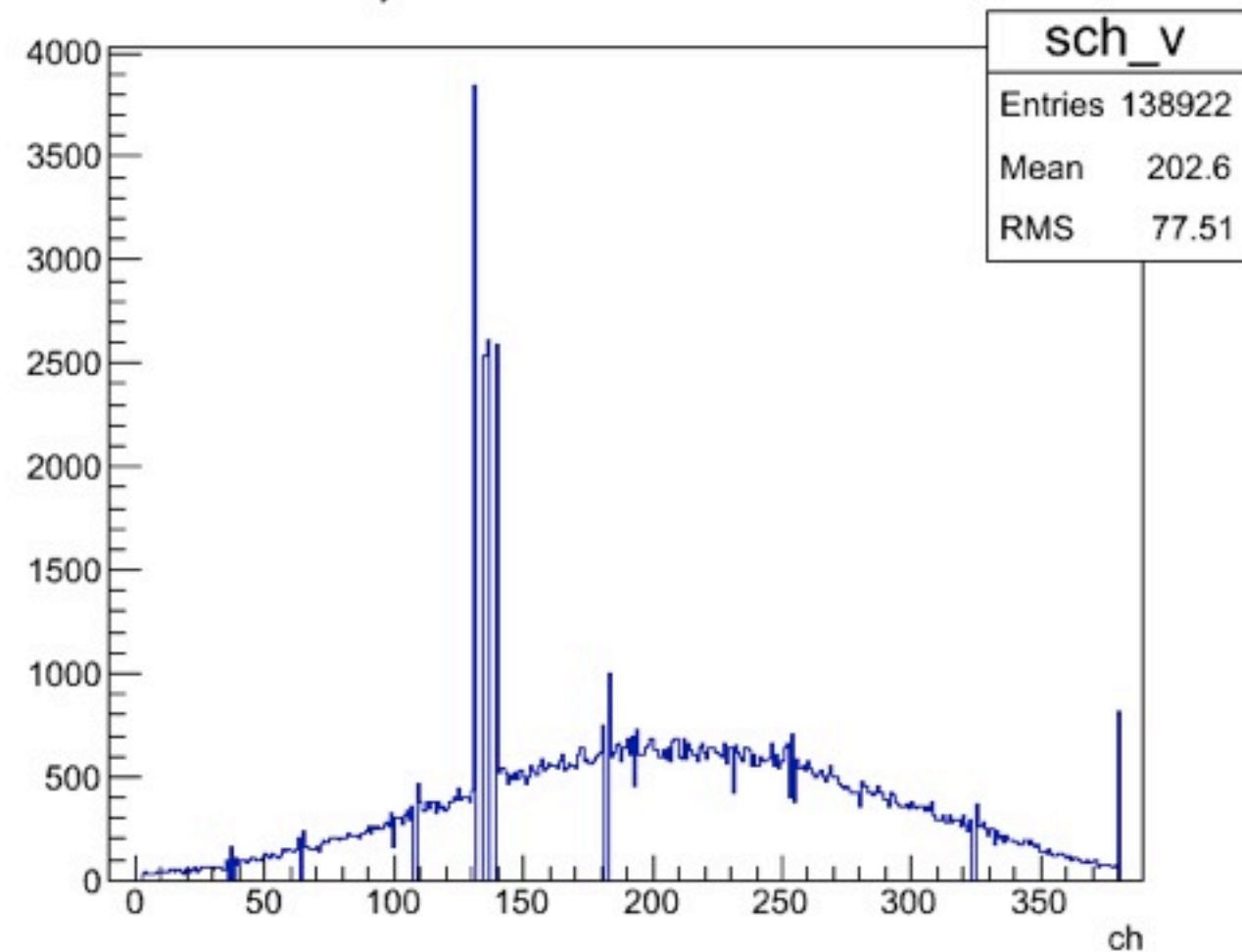
# STRIplet CHANNELS OCCUPANCY

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Striplet channel side U det S1



Striplet channel side V det S1



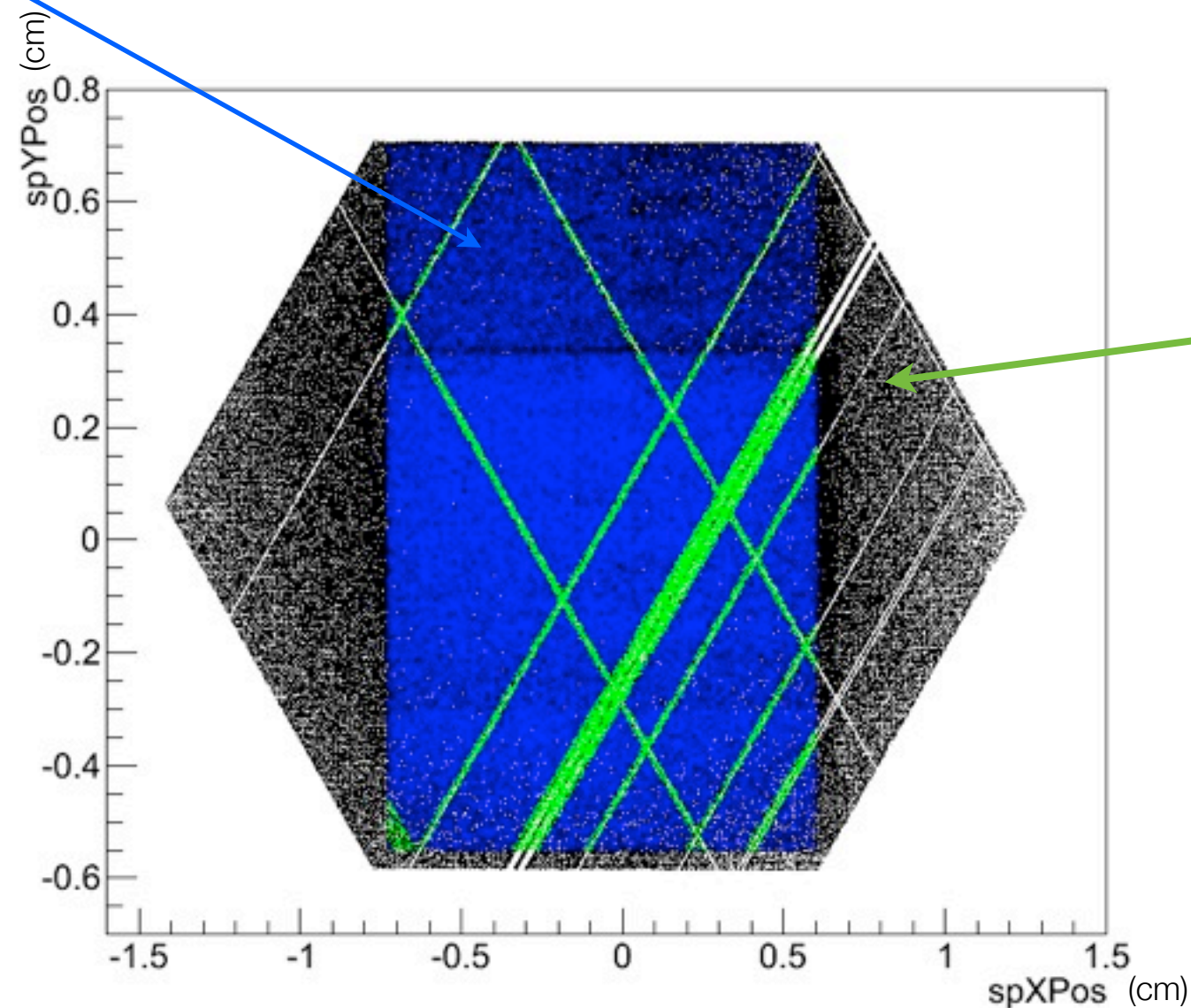
S1 inactive channels:

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

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

run	2276	2277	2278
# entries	96 820	1 072 699	1 075 580
# trks	~20k	~200k	~200k
$\epsilon_u$ (%)	$99.30 \pm 0.06$	$99.37 \pm 0.02$	$99.37 \pm 0.02$
$\epsilon_v$ (%)	$99.26 \pm 0.06$	$99.22 \pm 0.02$	$99.23 \pm 0.02$
$\epsilon$ (%)	$98.92 \pm 0.08$	$98.92 \pm 0.02$	$98.95 \pm 0.02$

# ANGULAR SCAN

Preliminary

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

- thresholds = 20

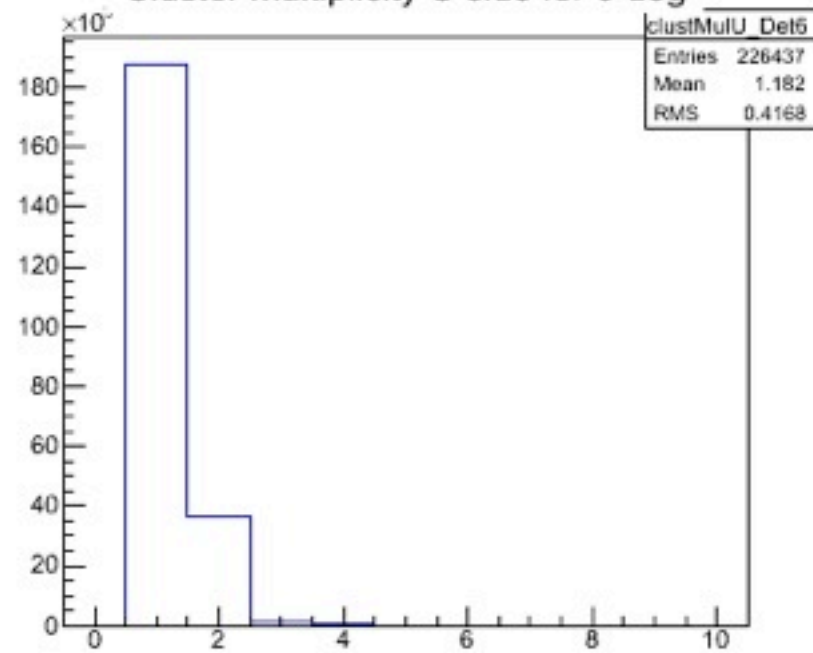
run	angle
2278	$0^\circ$
2279	$-15^\circ$
2280	$-30^\circ$
2281	$-45^\circ$
2282-2283	$-60^\circ$
2284-2285	$-70^\circ$

still not  
aligned

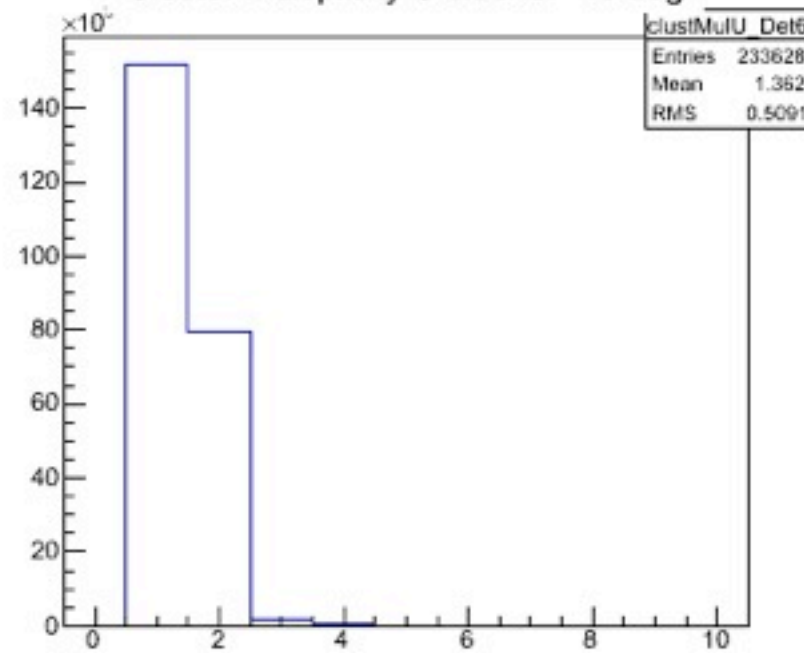


# ANGULAR SCAN: CLUSTER MULTIPLICITY

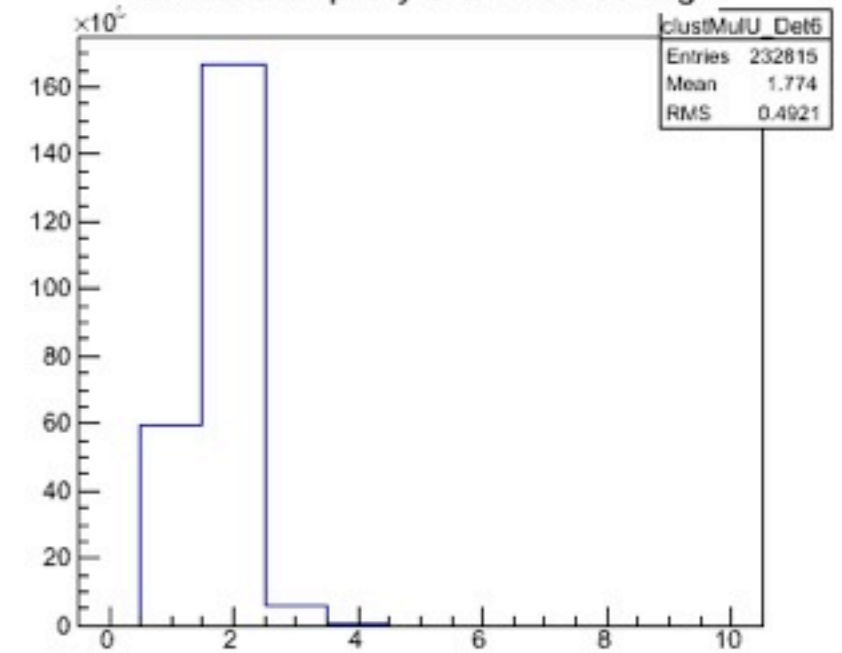
Cluster multiplicity U side for 0 deg



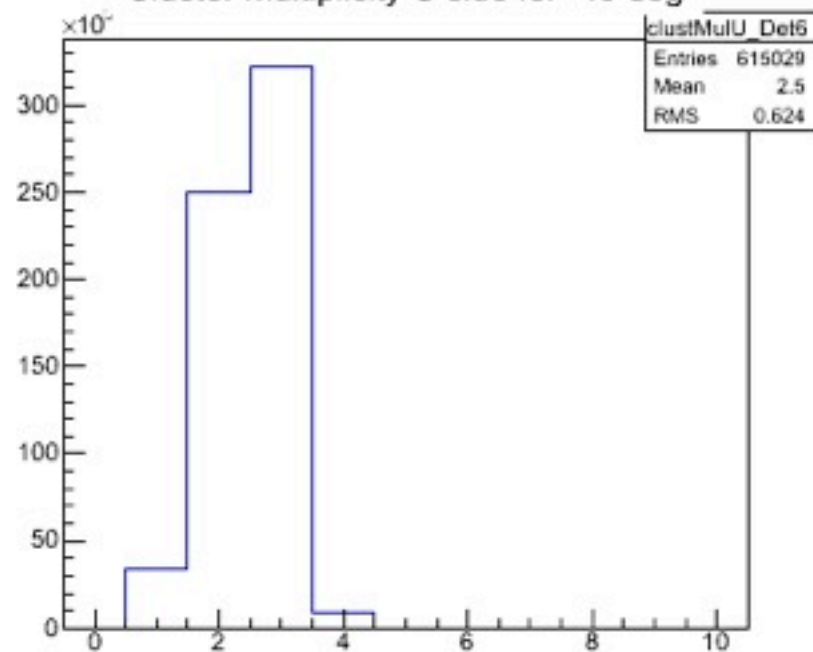
Cluster multiplicity U side for -15 deg



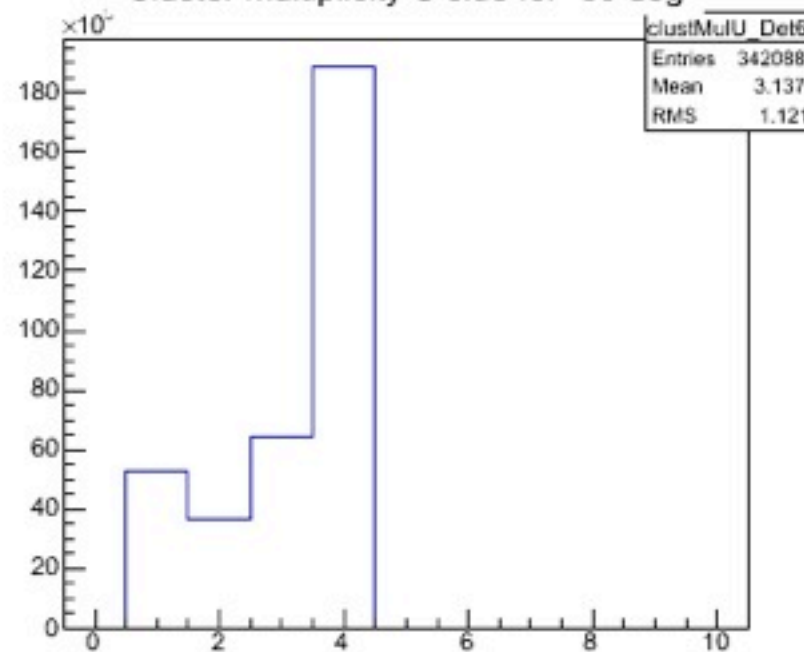
Cluster multiplicity U side for -30 deg



Cluster multiplicity U side for -45 deg



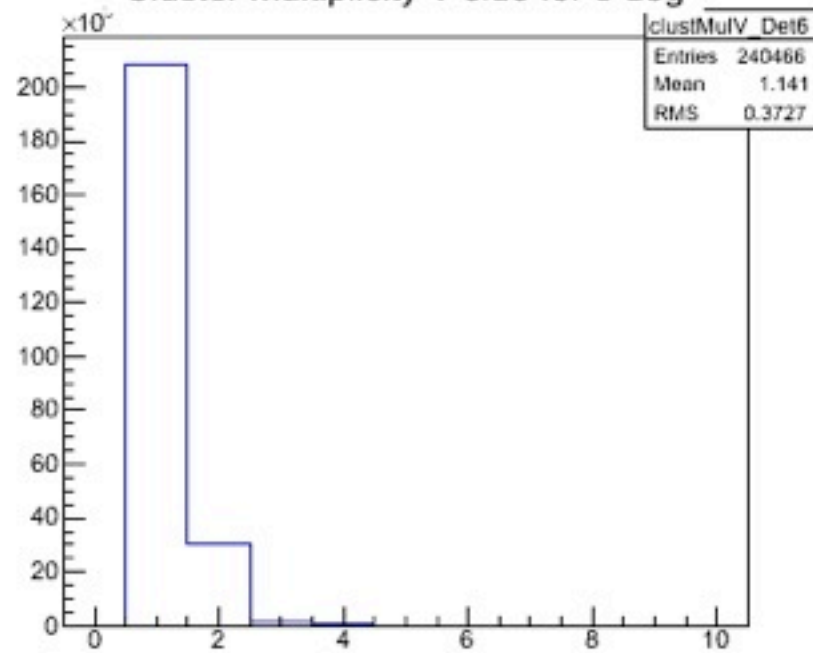
Cluster multiplicity U side for -60 deg



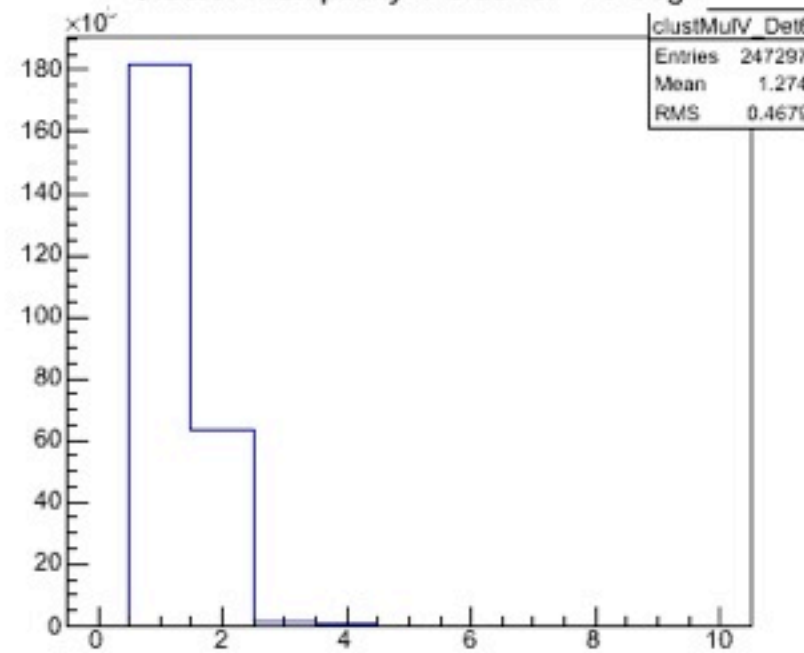
SIDE U

# ANGULAR SCAN: CLUSTER MULTIPLICITY

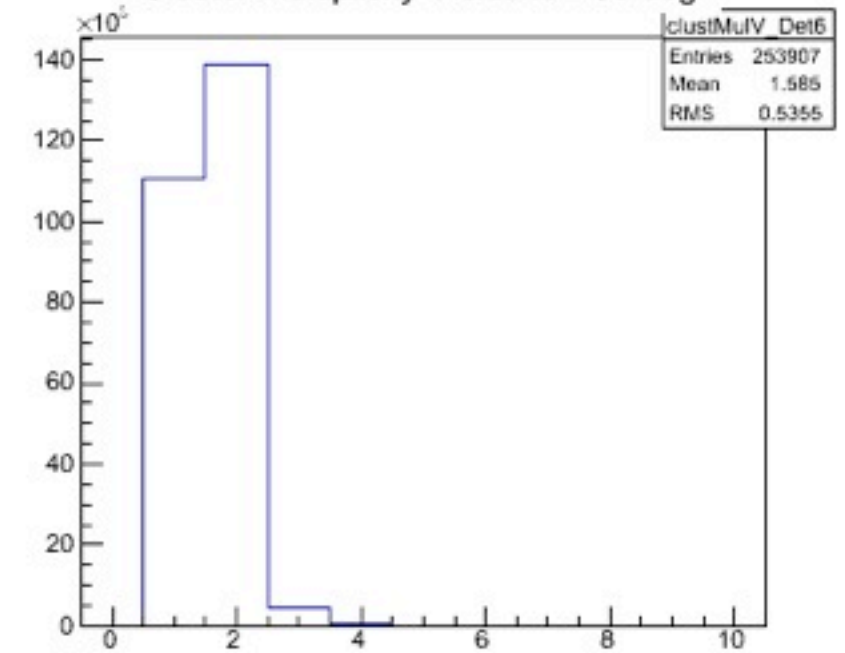
Cluster multiplicity V side for 0 deg



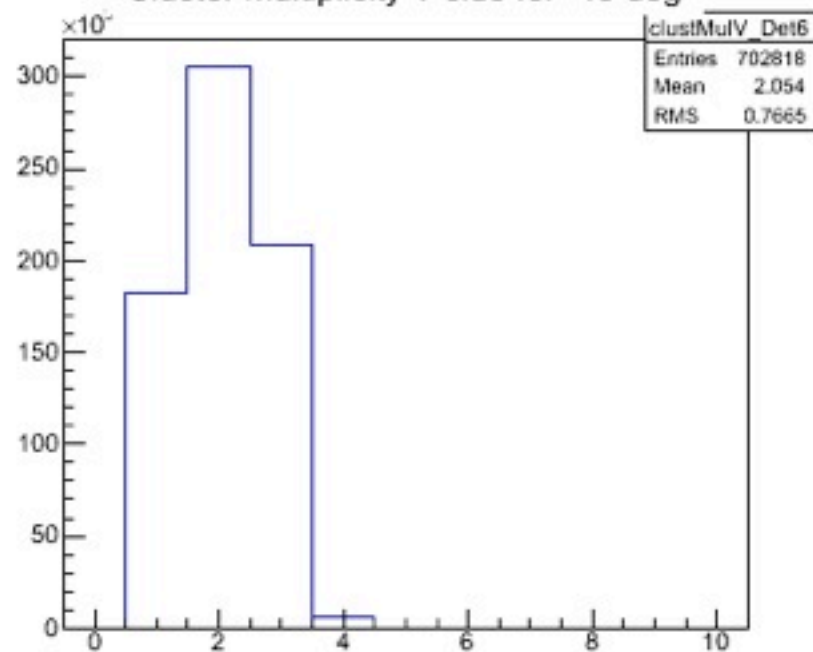
Cluster multiplicity V side for -15 deg



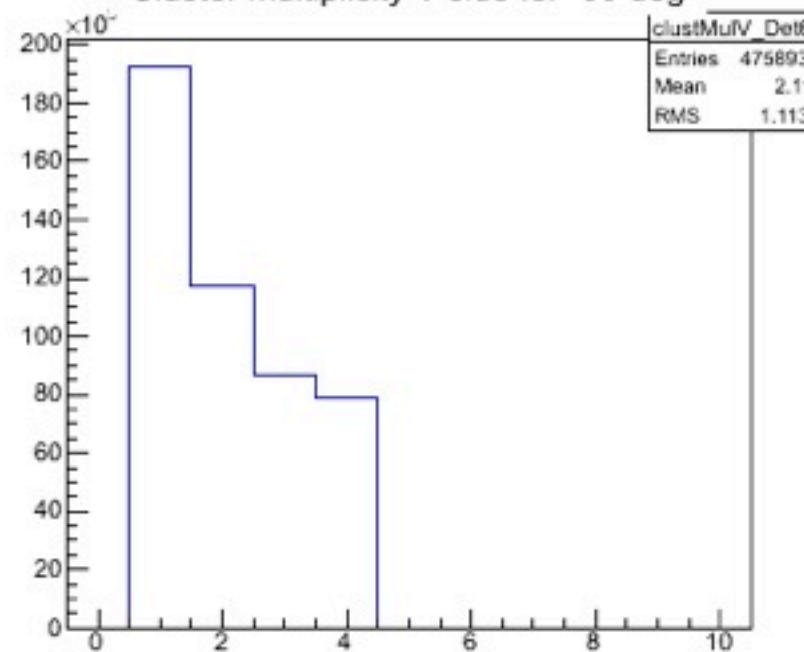
Cluster multiplicity V side for -30 deg



Cluster multiplicity V side for -45 deg



Cluster multiplicity V side for -60 deg



SIDE V

# ANGULAR SCAN: EFFICIENCIES

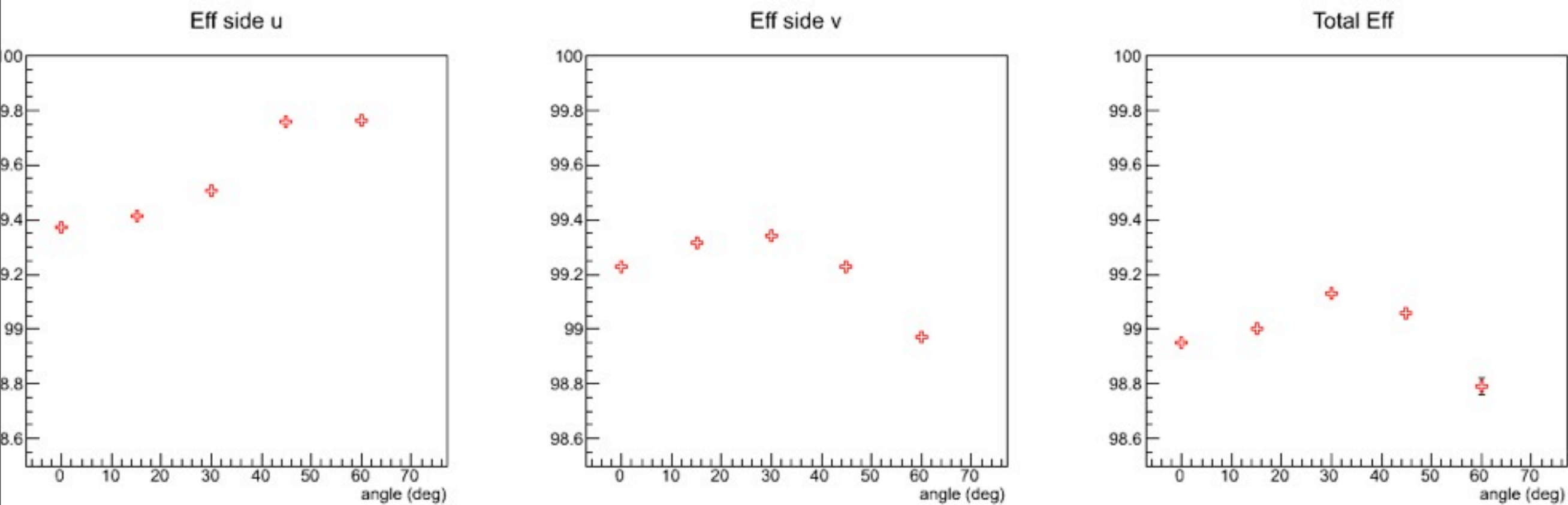
$$\epsilon_u = \frac{n_{\text{clusters}} | \text{clustUpos-intUpos} | < 56 \mu\text{m}/\cos(\text{angle})}{n_{\text{int}} \subset \text{active U region}}$$

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

angle	$\epsilon_u$ (%)	$\epsilon_v$ (%)	$\epsilon$ (%)
0	99.372 ± 0.018	99.23 ± 0.02	98.95 ± 0.02
-15	99.416 ± 0.017	99.314 ± 0.019	99.00 ± 0.02
-30	99.505 ± 0.017	99.34 ± 0.02	99.13 ± 0.02
-45	99.757 ± 0.008	99.226 ± 0.014	99.057 ± 0.015
-60	99.764 ± 0.012	98.97 ± 0.02	98.79 ± 0.03
-70	-	-	-

# ANGULAR SCAN: EFFICIENCIES

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# 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

$$\varepsilon_v > 98.8\% \text{ up to } 60^\circ$$

## NEXT STEPS

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

# STRIPLETS ALIGNMENT

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

