

## First analysis results

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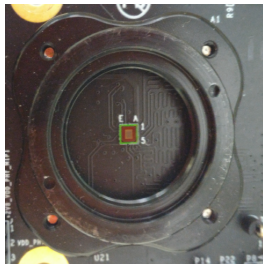
**Source:**  $^{90}\text{Sr}$ ,  $\beta^-$  emitter

$t_{1/2}$  (half-life)  $\sim$  29 years,  $A_0$  (nominal activity)=35.7 kBq

no collimator -  $r=12.5$  cm

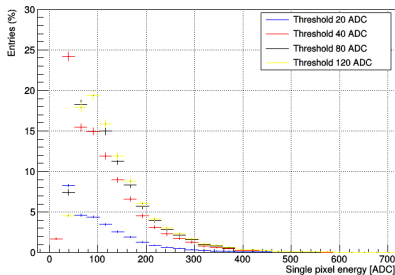
integration time=200 ms  $\times$  2000 frames

**Sensor:** MT9V115

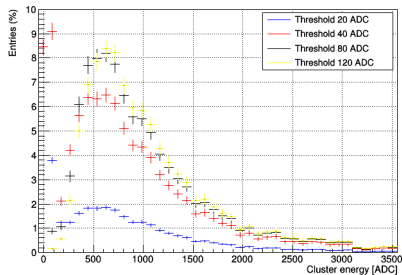


# Pixel/Cluster energy at different primary thresholds

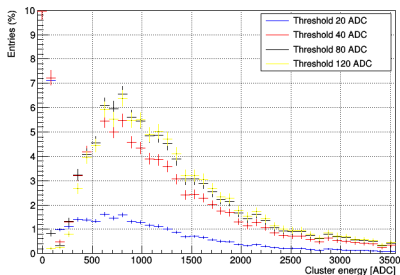
### Single pixel energy



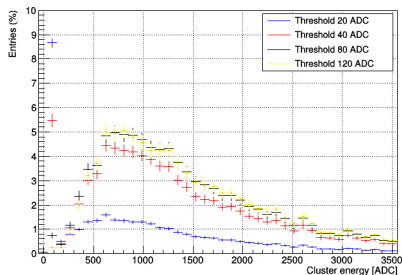
### Cluster 3x3 energy



### Cluster 5x5 energy

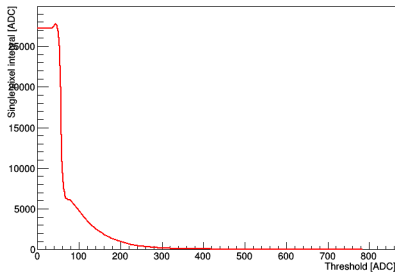


### Cluster 7x7 energy

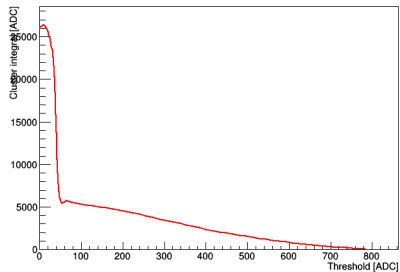


# Pixel/Cluster energy integral VS primary threshold

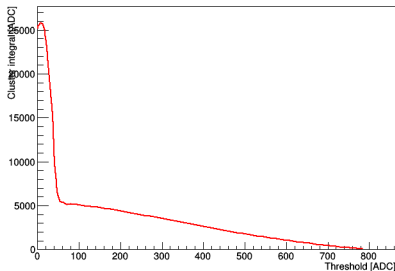
### singlePixelIntegral VS thres



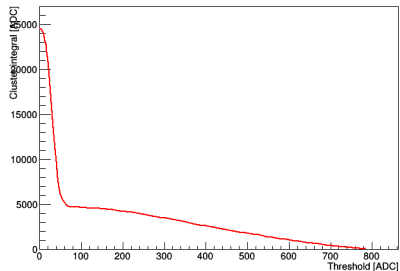
### Cluster3x3Integral VS thres



### Cluster5x5Integral VS thres

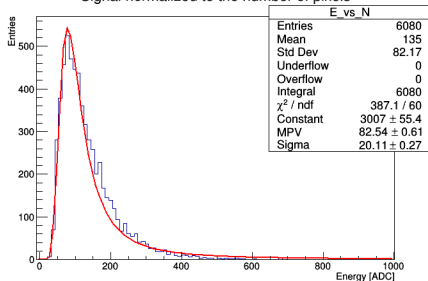


### Cluster7x7Integral VS thres

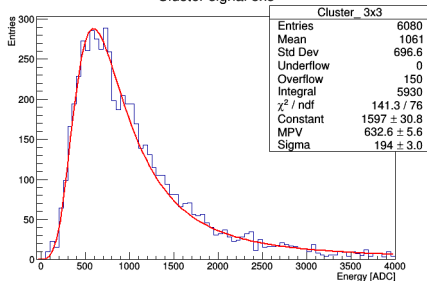


# Pixel/Cluster energy at 1thres=100 ADC - Landau fit

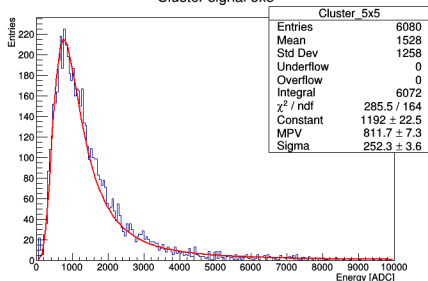
Signal normalized to the number of pixels



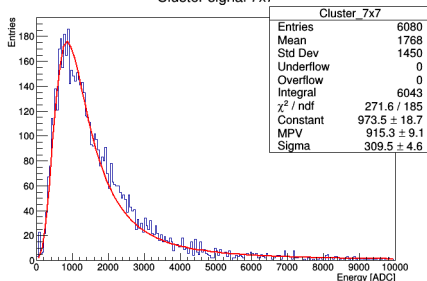
Cluster signal 3x3



Cluster signal 5x5



Cluster signal 7x7



## Pixel/Cluster energy at 1thres=100 ADC - Landau fit

	MPV	Sigma	$\chi^2/ndf$
Single pixel	83	20.1	6.5
Cluster 3x3	633	194	1.9
Cluster 5x5	812	252	1.7
Cluster 7x7	915	310	1.5

### Primary threshold=100 ADC

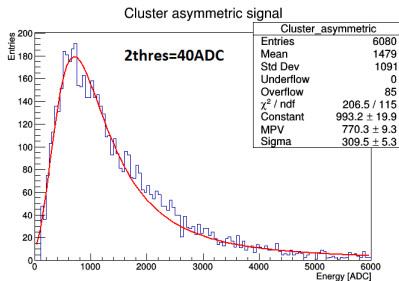
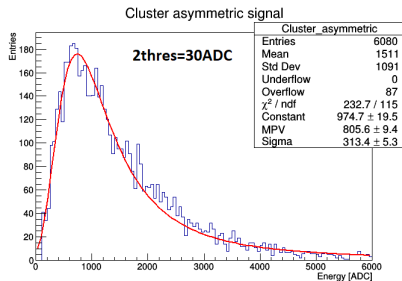
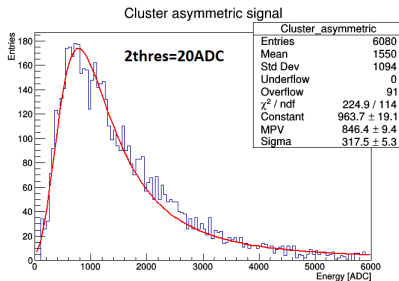
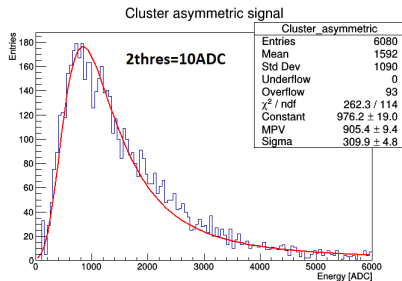
Reasons:

- maximizes S/N ratio in the cluster energy distribution
- after 100 the integral distribution curve varies its slope

Results:

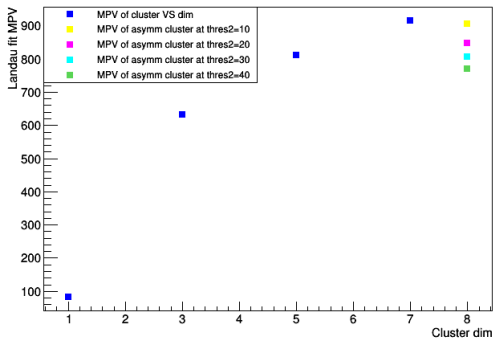
- Good Landau shape for clusters ( $\chi^2/ndf < 2$ )
- MPV and Sigma increasing with cluster sub-matrix dimension, as expected (more captured signal but more noisy pixels)

# Asymm. cluster energy, 1thres=100 ADC, four 2thres- Landau fit



# Asymm. cluster energy, 1thres=100 ADC

2thres (ADC)	MPV	Sigma	$\chi^2/ndf$
10	905	310	2.3
20	846	318	2.0
30	805	314	2.0
40	770	310	1.8



**secondary  
threshold=30 ADC**

- MPV comparable with 5x5 cluster
- good Landau shape ( $\chi^2/ndf = 2$ )



**Source:**  $^{90}\text{Sr}$

**Measure:** position scan of step = 1 mm

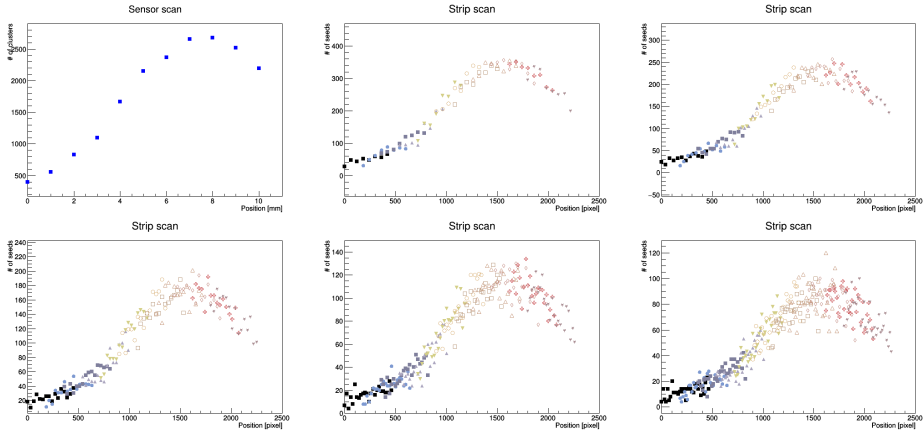
Cu collimator featuring  $d=1$  mm

sensor-source height  $z=8$  mm

**Sensor:** MT9V011

# Position scan at different num of strips per sensor

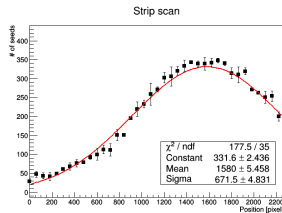
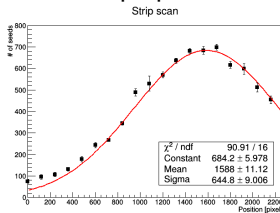
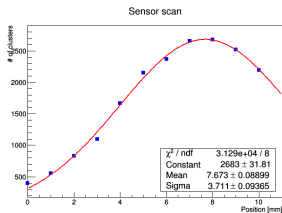
1, 8, 12, 16, 24, 32 strips per sensor



Possible increasing the spatial resolution (hole diameter measure) dividing the sensor in strips?

# Position scan at different num of strips per sensor

1, 4, 8 strips per sensor



	$\sigma$ [pixel]	$\sigma$ [mm]
1 strip	660 $\pm$ 16	3, 71 $\pm$ 0, 09
4 strip	645 $\pm$ 9	3, 65 $\pm$ 0, 05
8 strip	672 $\pm$ 5	3, 76 $\pm$ 0, 03

**Geometrical simulation:**

2-dimensional circular source

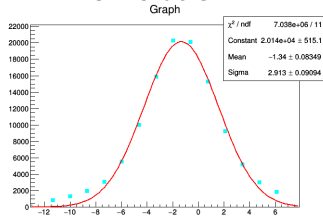
variable parameters: activity, source radii ( $r$ ) and sensor-source height ( $z$ )

**Data:**  $^{90}\text{Y}$  in agar agar and  $^{90}\text{Sr}$

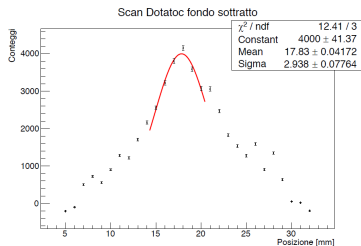
## Simulation/data comparison

Spot - radius = 2.5 mm

simulation:

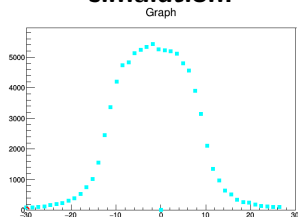


data:

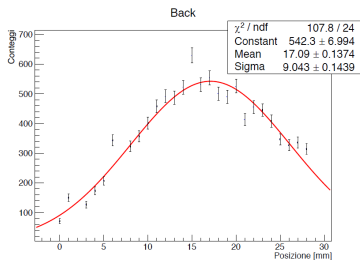


Background - radius = 11 mm

simulation:



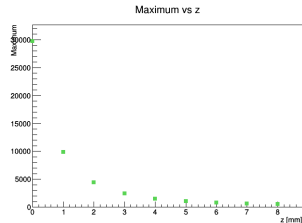
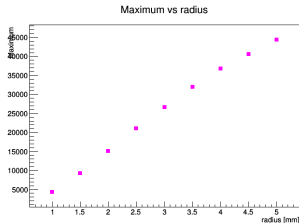
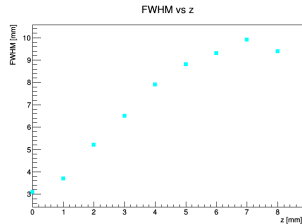
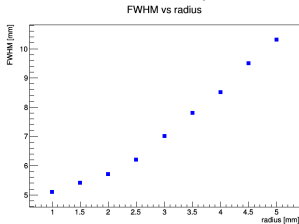
data:



# Simulation

Geometrical simulation: 2-dimensional circular source, variables: radius ( $r$ ) and sensor-source height ( $z$ )

FWHM and maximum are the parameters of the resulting scan graph (counts VS sensor position)



# Simulation/data comparison

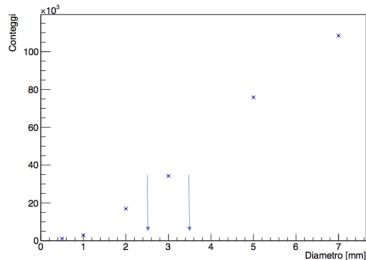
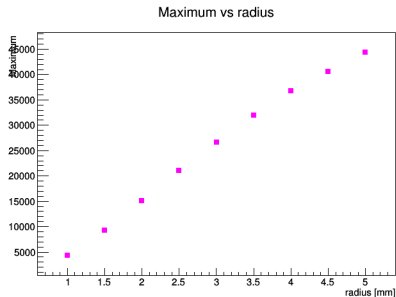


Figura (7.6). Misure di flusso al picco per vari diametri del collimatore di Cu; le frecce indicano la zona in cui le dimensioni del sensore diventano confrontabili con le dimensioni della sorgente.

Source bigger then sensor:

$$\phi = \alpha \Omega d^2$$

$\alpha$  constant,  $\Omega$  acceptance,  $d$  source diameter.

$$\text{approx} : \Omega \sim 1/d \rightarrow \phi \sim d$$

## Simulation/data comparison

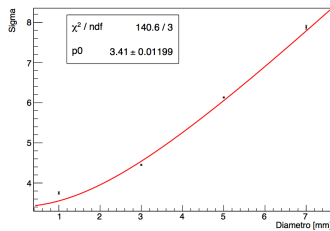
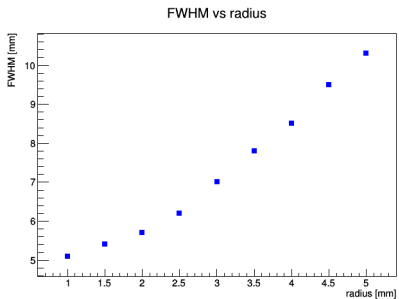


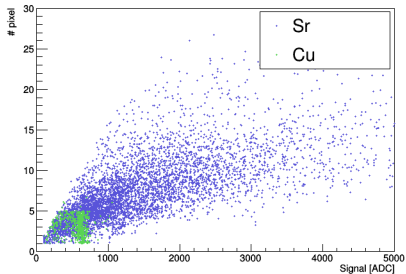
Figura (7.13). Parametrizzazione dell'andamento della  $\sigma$  del fit gaussiano della scansione in posizione in funzione del diametro della sorgente.



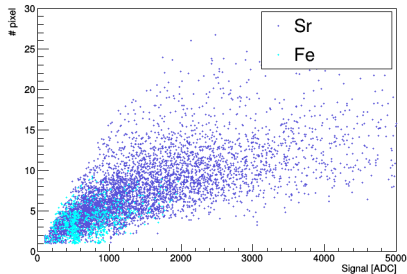
Photon/electron discrimination  
 $\beta^-$  (Sr),  $\gamma$  (Cu, Fe, Mo, Sn)

# $\beta$ and $\gamma$ source comparison

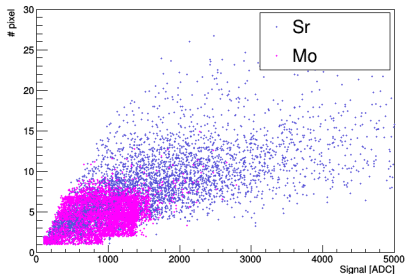
# of pixel VS signal in a cluster



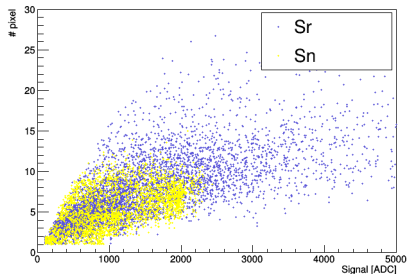
# of pixel VS signal in a cluster



# of pixel VS signal in a cluster

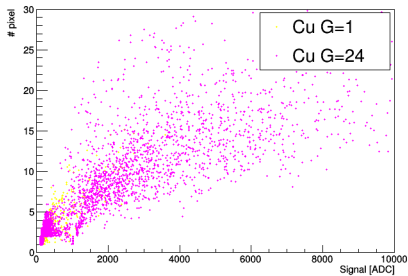


# of pixel VS signal in a cluster

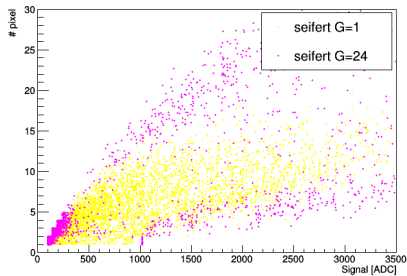


$\gamma$  source at different gains

# of pixel VS signal in a cluster



# of pixel VS signal in a cluster



# of pixel VS signal in a cluster

