

EPSI

Discussione 27/03

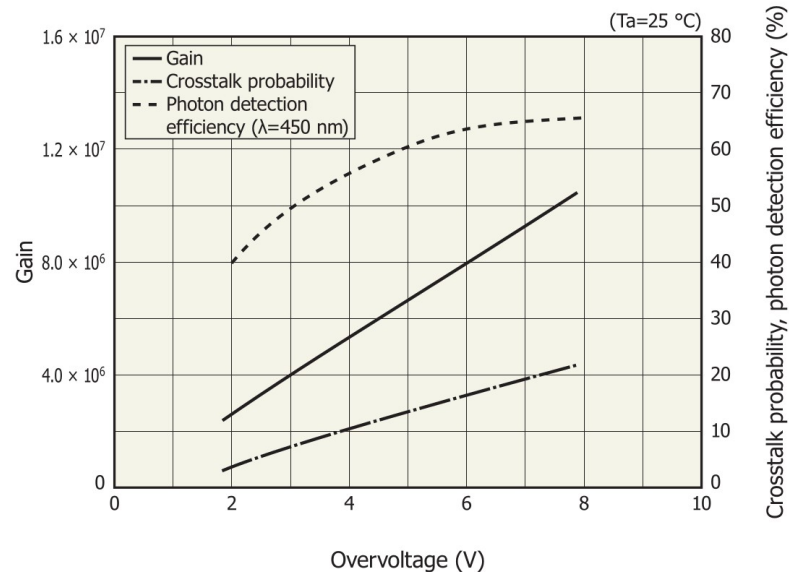
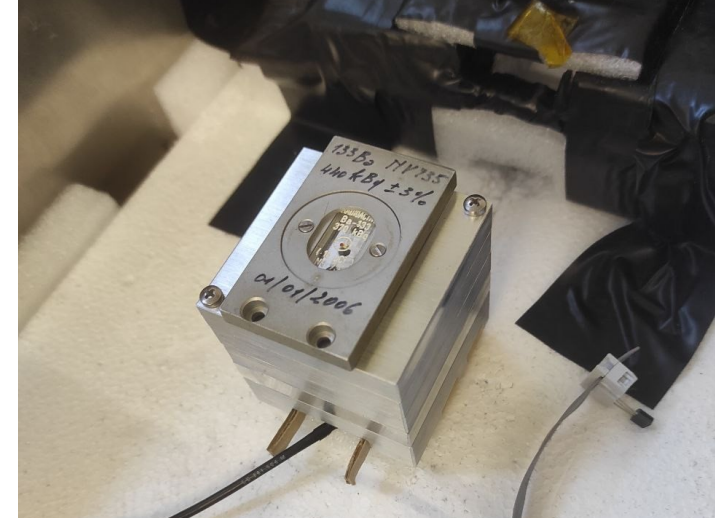
Misure in laboratorio

Unità minima

Cristallo CsI:TI otticamente accoppiato con colla ottica a un SiPM (MPPC)

HAMAMATSU MPPC
S13360-6075PE (75 μm)

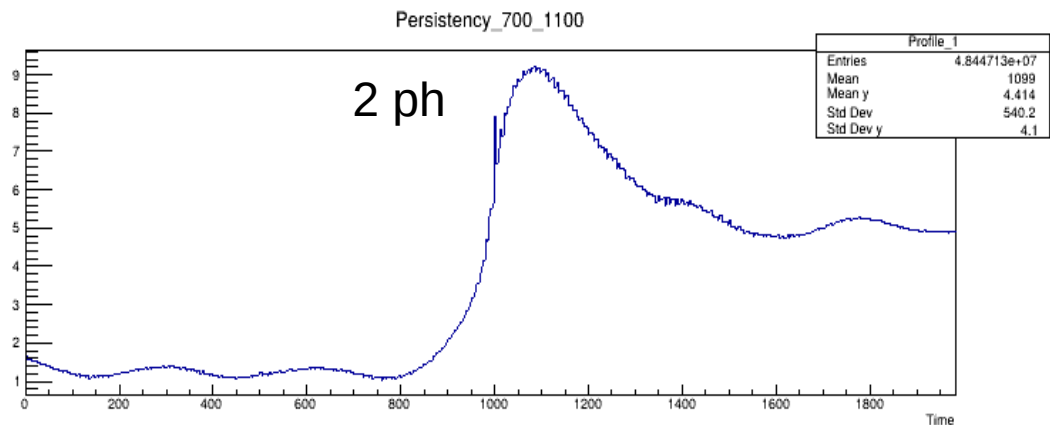
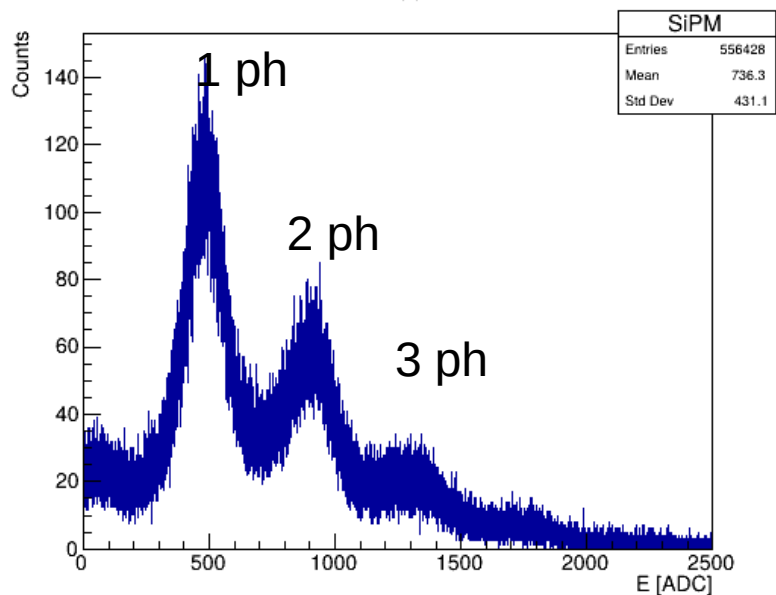
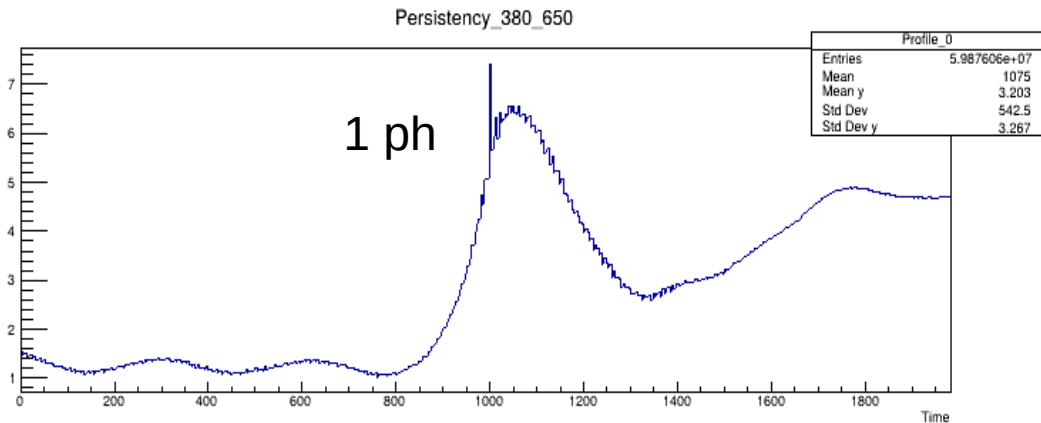
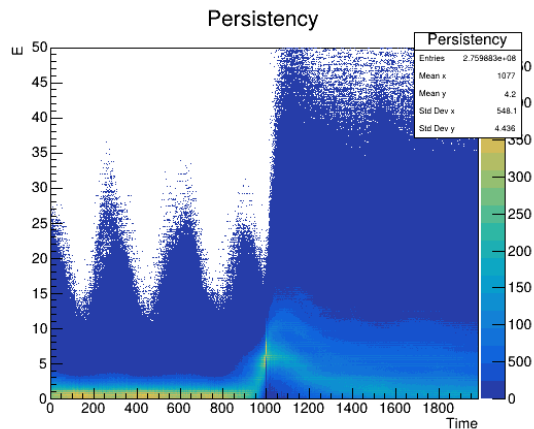
- 6400 pixel
- $6.0 \times 6.0 \text{ mm}^2$ area fotosensibile
- Photon detection efficiency (PDE) a lunghezza d'onda di picco (450 nm): 50%
- Voltaggio operativo raccomandato:
 $V_{\text{BR}} + 3 \text{ V}$



Csl

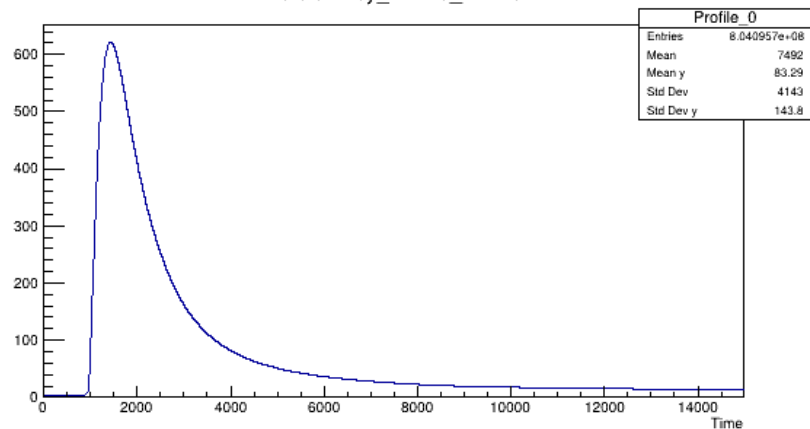
Gate:
700 ns

Pre-gate:
100 ns

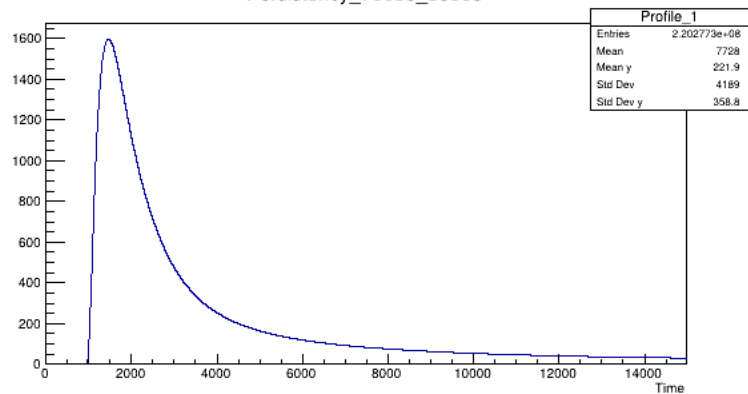


CsI

Persistency_200e3_400e3



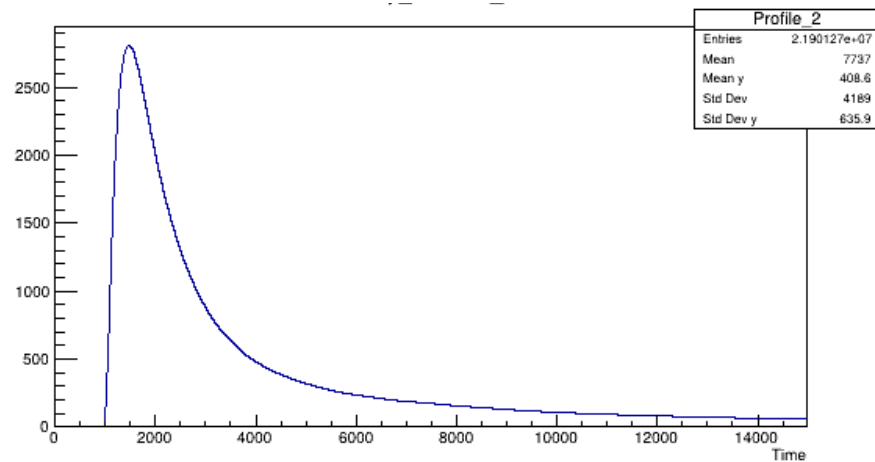
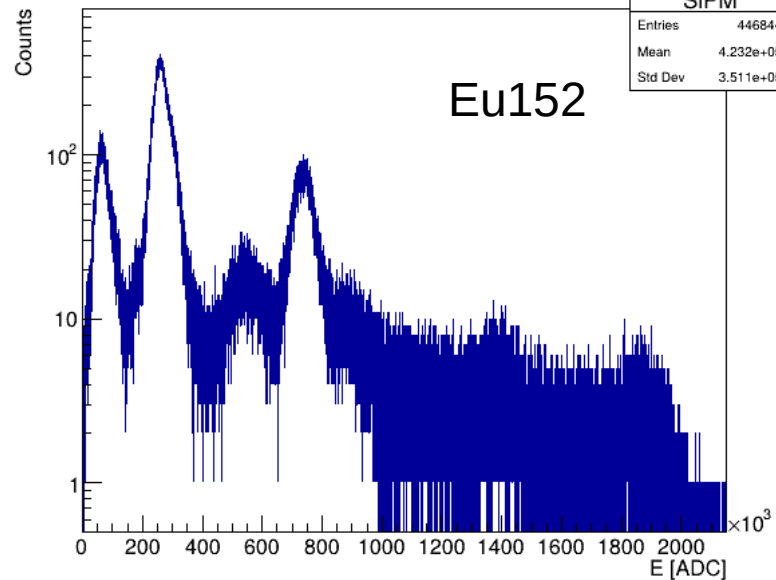
Persistency_700e3_850e3



Gate:
9200 ns

Pre-gate:
200 ns

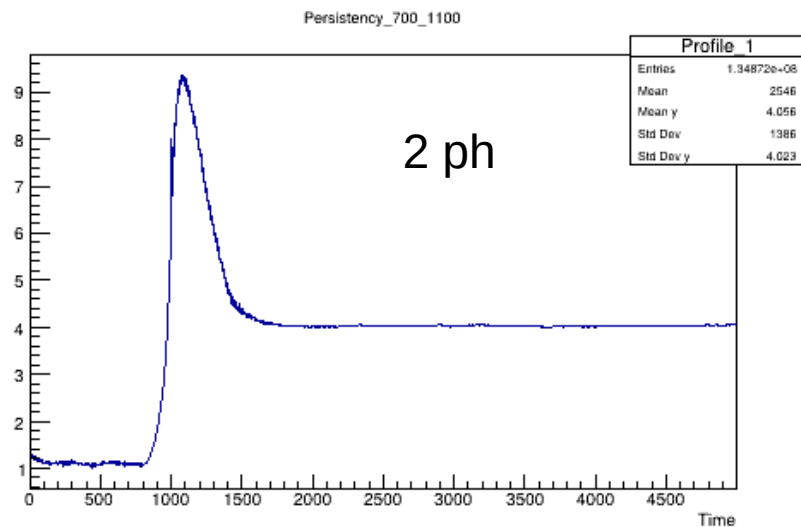
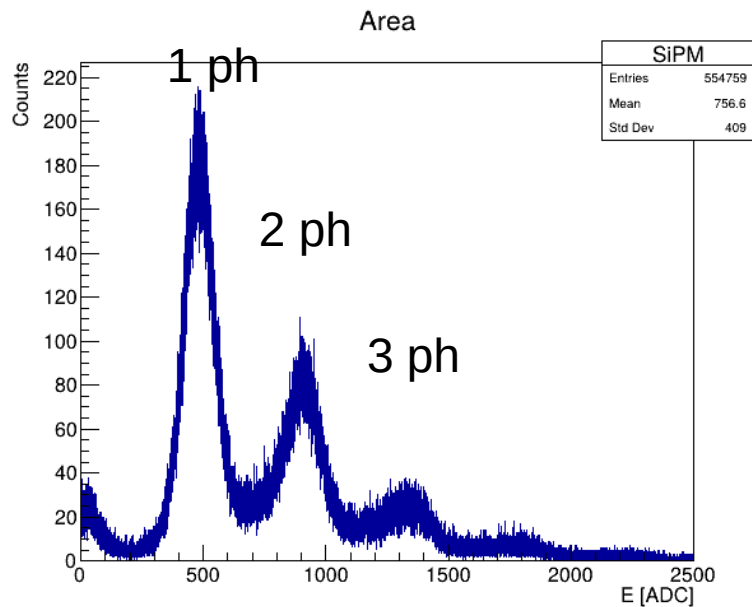
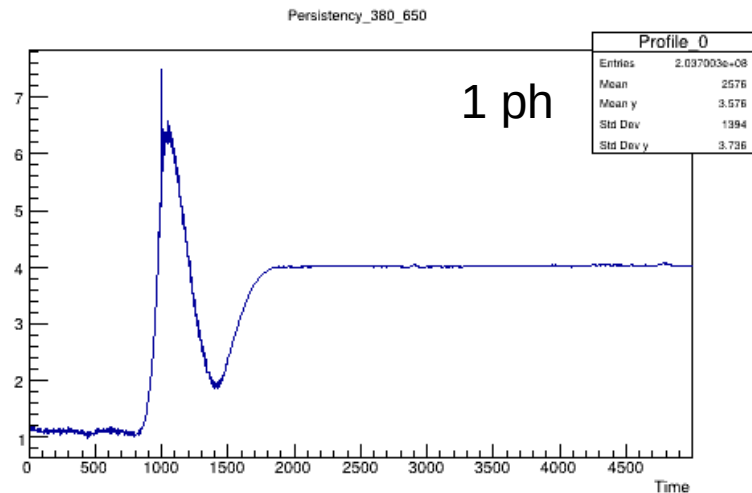
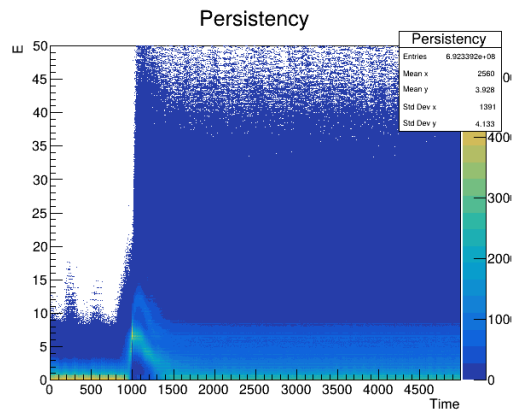
Area



GAGG

Gate:
700 ns

Pre-gate:
100 ns



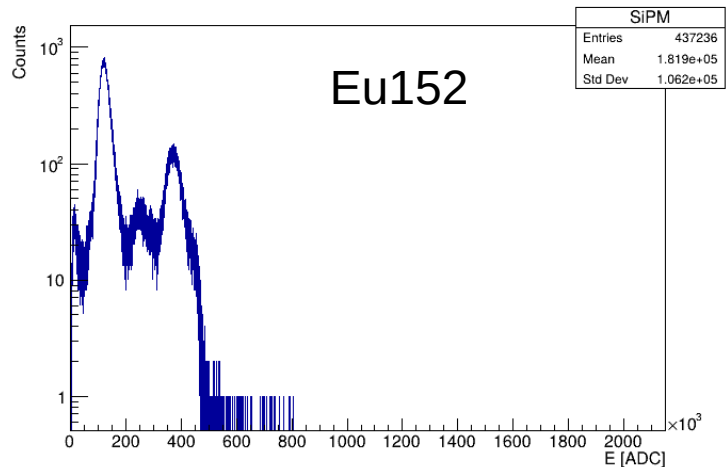
GAGG

Gate:
2000 ns

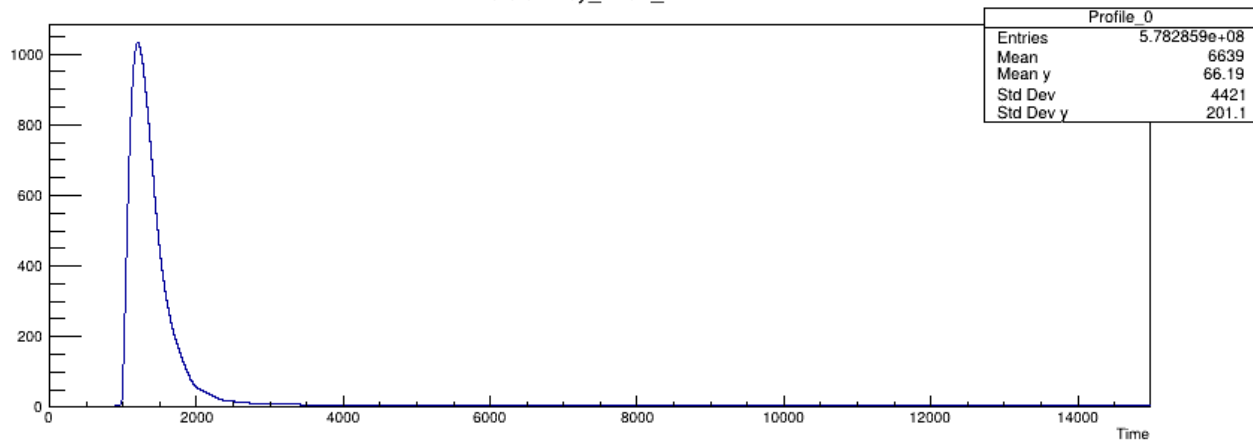
Pre-gate:
200 ns

Area

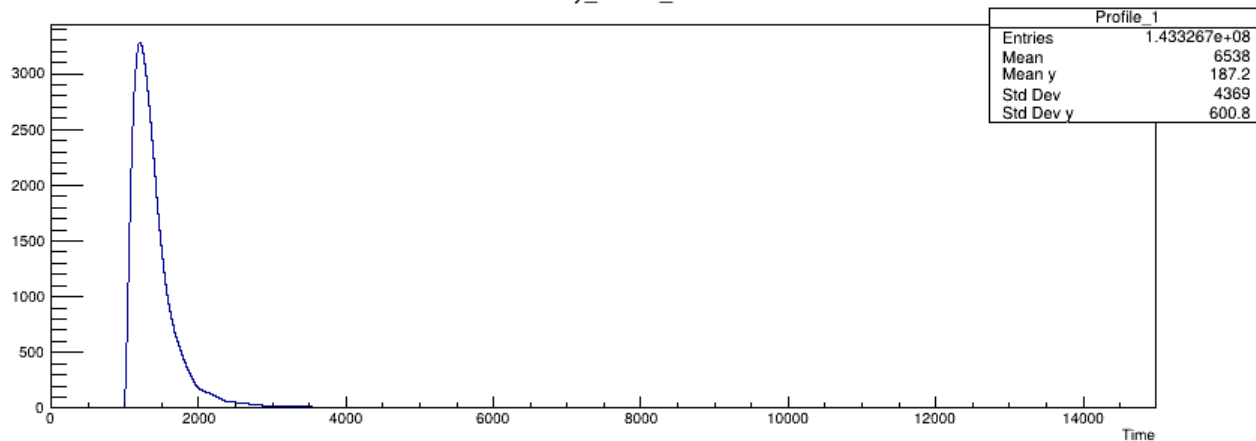
Eu152



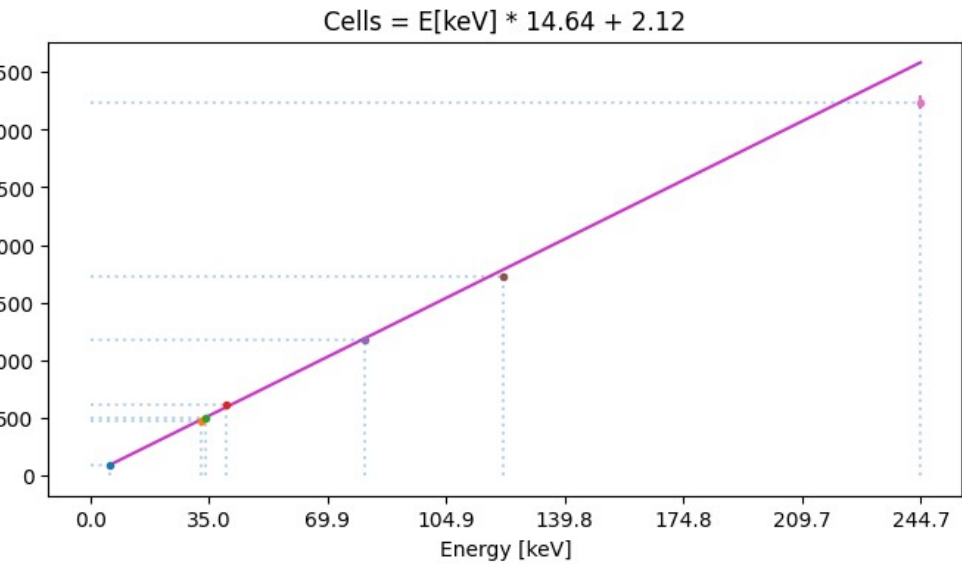
Persistency_80e3_160e3



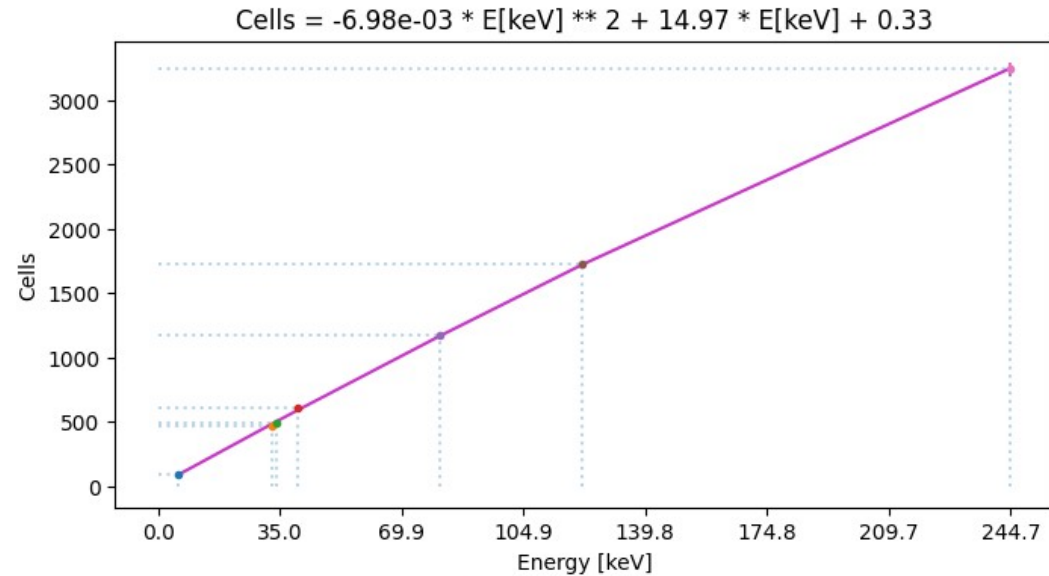
Persistency_350e3_450e3



Calibrazione CsI:SiPM_003

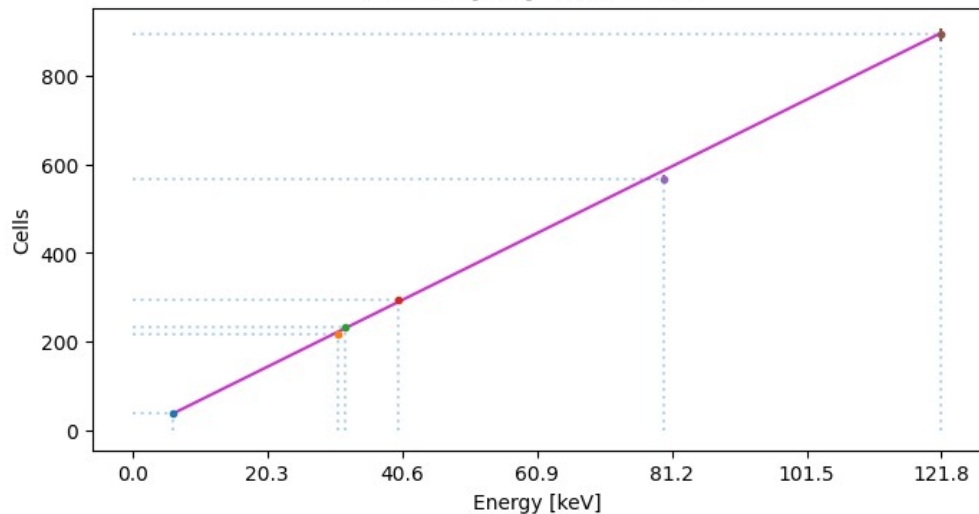


14.64 +/- 0.32 rel: 0.02
 2.12 +/- 3.79 rel: 1.79
 /ndf: 6.15/2

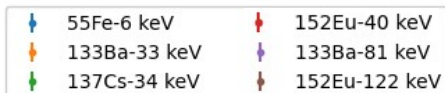


a: -0.006976 +/- 0.001845 rel: 0.26
 b: 14.97 +/- 0.27 rel: 0.02
 c: 0.33 +/- 2.92 rel: 8.92
 Chi2/ndf: 7.12/4

$$\text{Cells} = E[\text{keV}] * 7.44 + -8.07$$

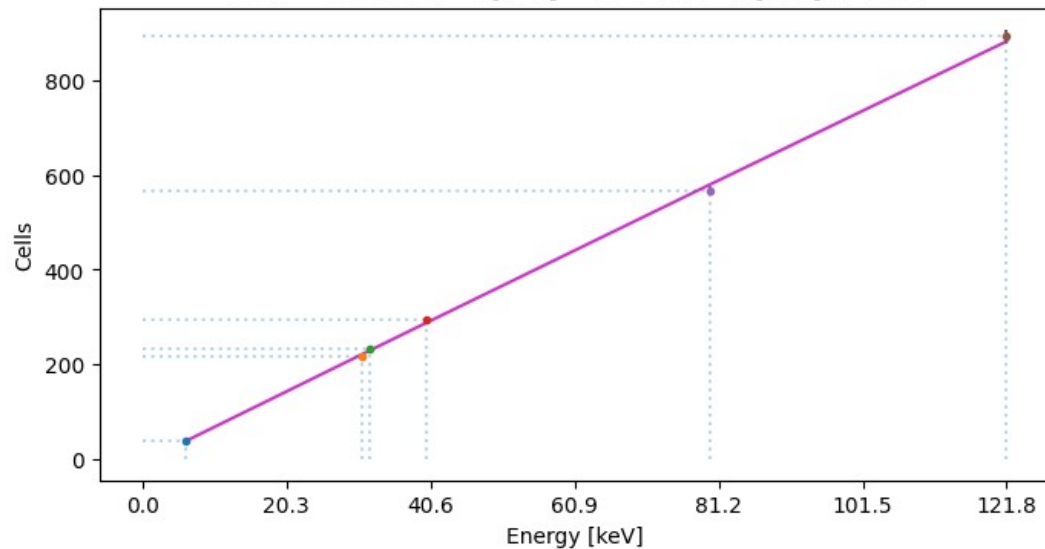


m: 7.44 +/- 0.10 rel: 0.01
 q: -8.07 +/- 1.09 rel: -0.13
 Chi2/ndf: 2.56/2



Calibrazione GAGG:SiPM_001

$$\text{Cells} = -8.86\text{e-}04 * E[\text{keV}] ** 2 + 7.43 * E[\text{keV}] + -7.93$$



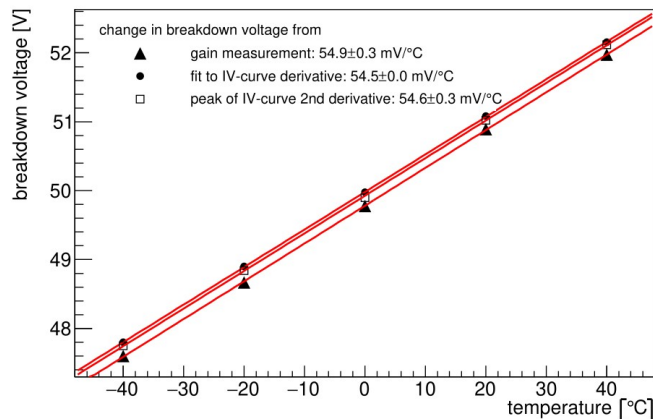
a: -0.000886 +/- 0.002363 rel: 2.67
 b: 7.43 +/- 0.19 rel: 0.03
 c: -7.93 +/- 1.55 rel: 0.20
 Chi2/ndf: 5.43/3

Temperatura

Dipendenza dalla temperatura:

- $V_{BD} = V_{BD}(T) \approx$ lineare con T
- $V = V_{BD} + V_{OV}$

Per mantenere il regime di lavoro a un dato V_{OV} è necessario adattare la tensione applicata al variare di V_{BD}



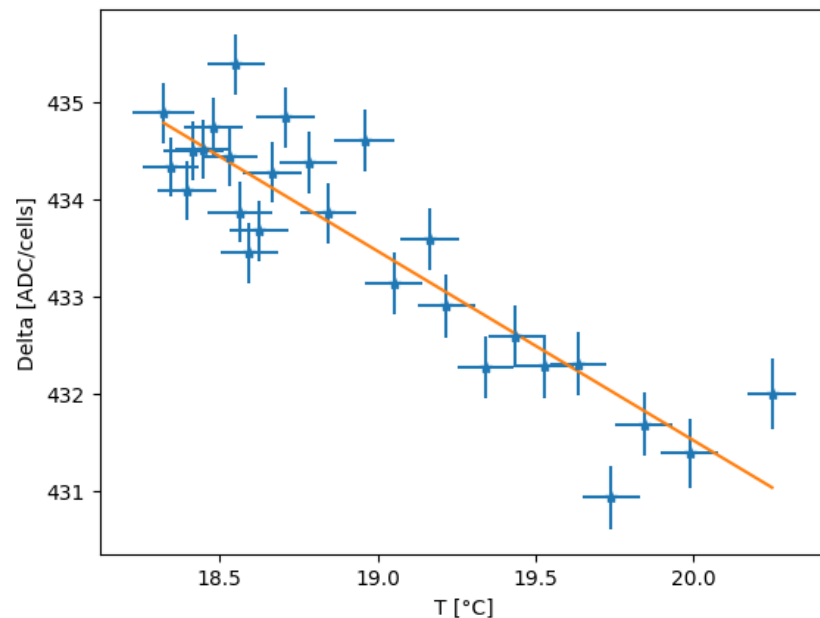
(b) Hamamatsu S13360-3050CS

Otte et al. (2016)

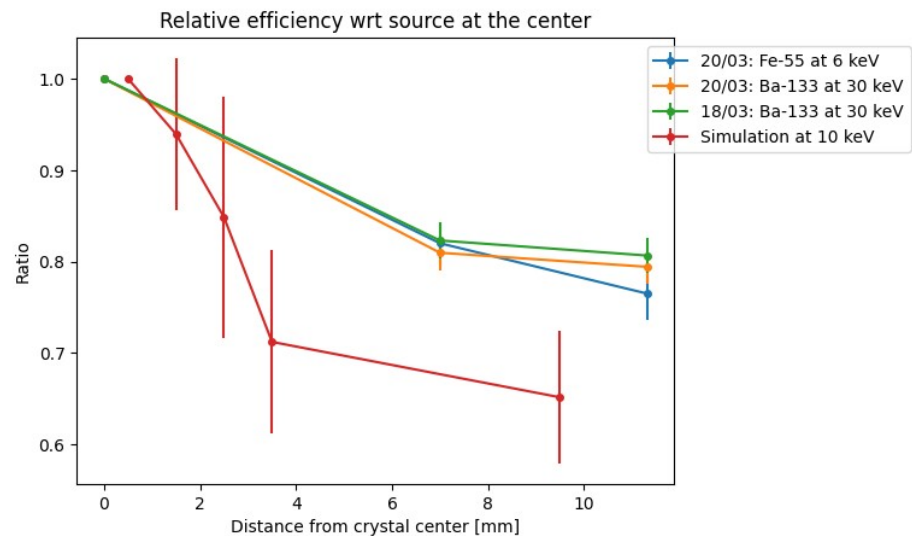
Controllo temperatura

Funzione fittata:

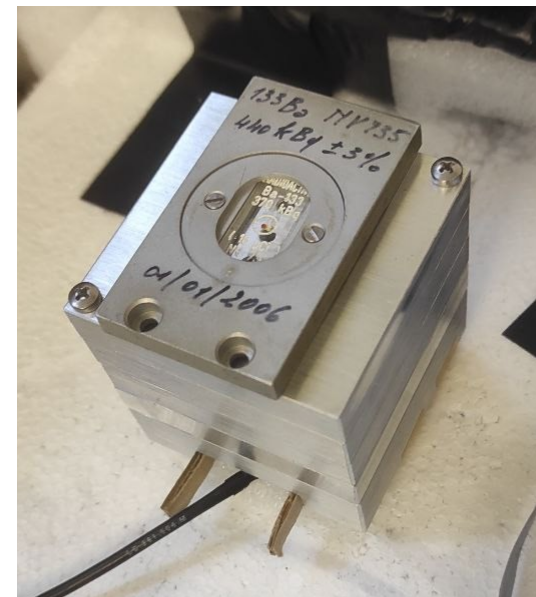
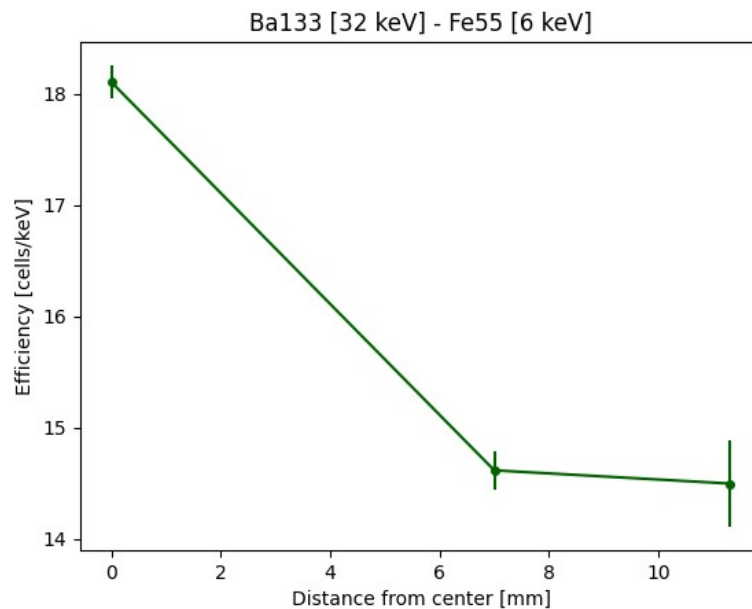
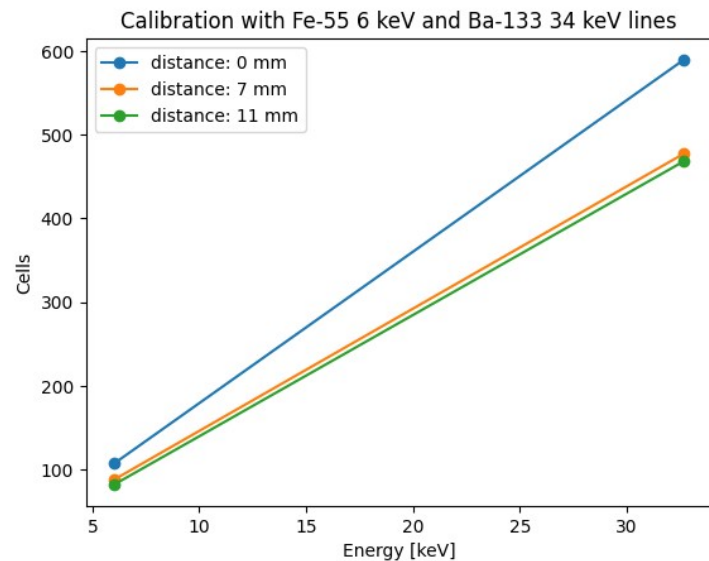
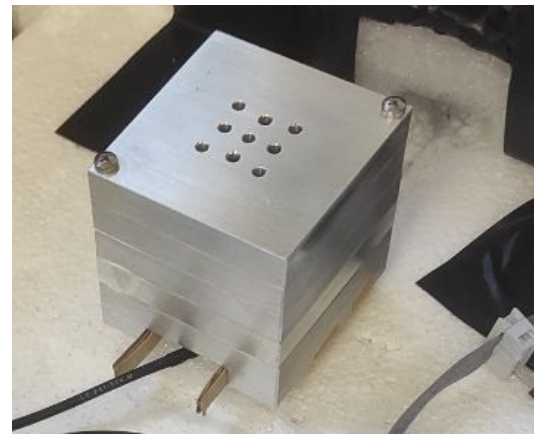
$$\Delta = k [V_{BIAS,0} - V_{BD,0} + V_{BD,0} \cdot (\beta^{\text{nominal}} - \beta^{\text{real}}) \cdot \Delta T]$$



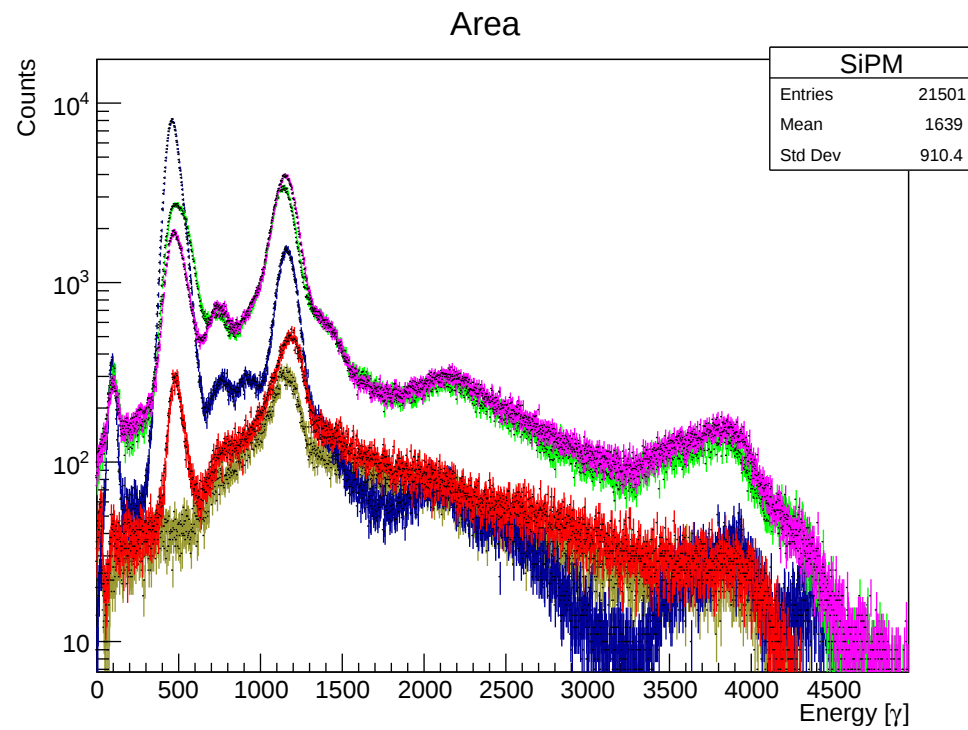
k:	140.60	+-	0.40
beta_real:	0.05425	+-	0.00003



Misure con collimatore

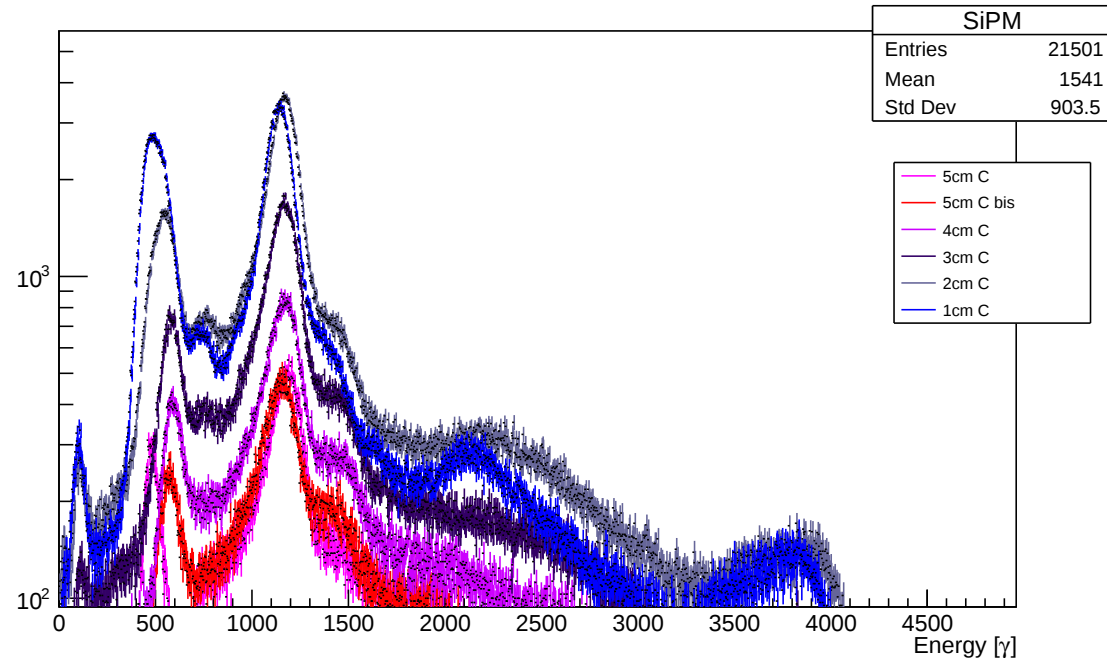


Misure con collimatore Ba-133

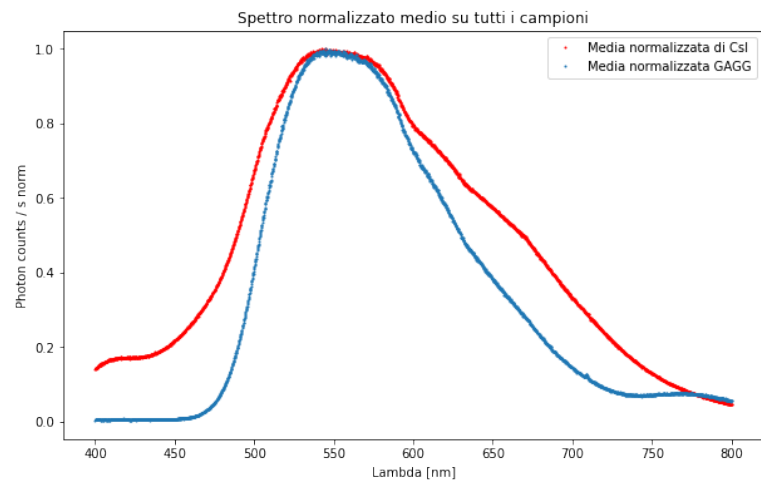


Variazione in distanza

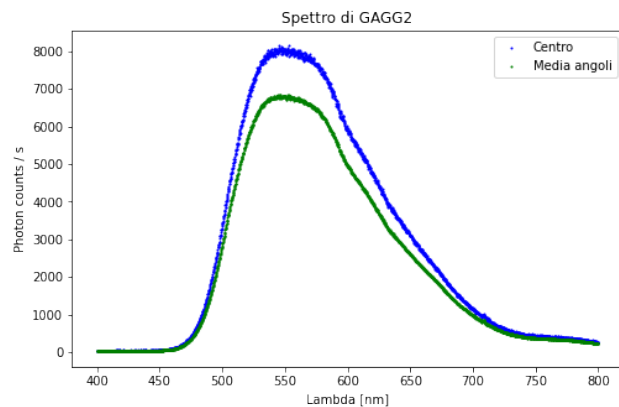
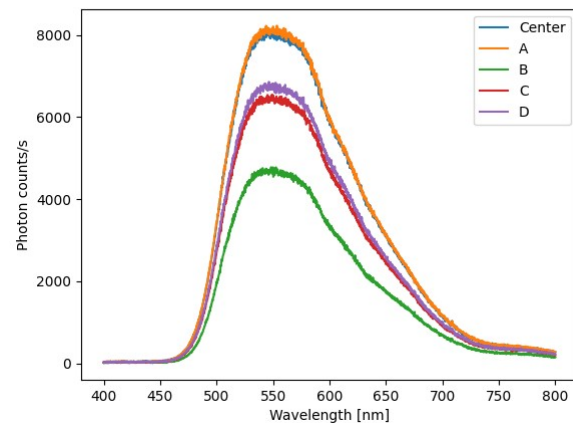
← Collimato – non collimato



Misure di scintillazione in laboratorio

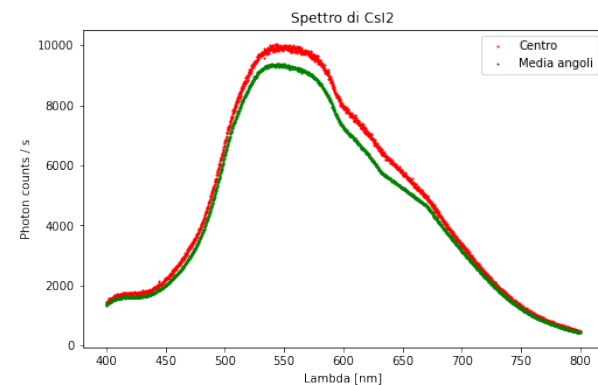
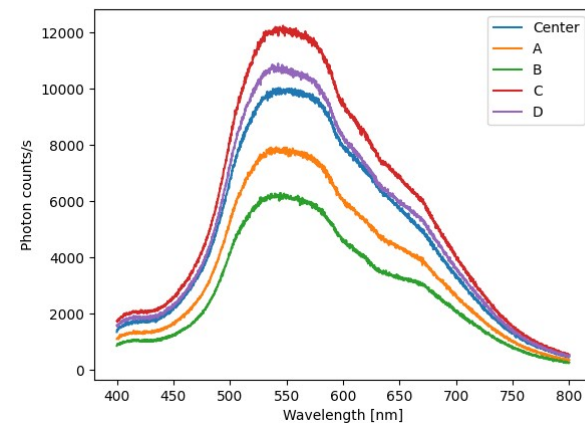


GAGG



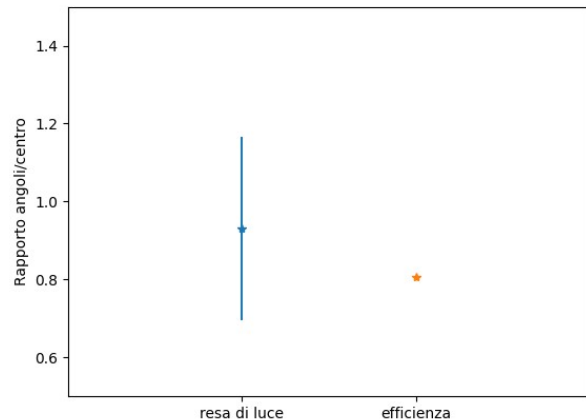
Plaser = 500 uW

CsI

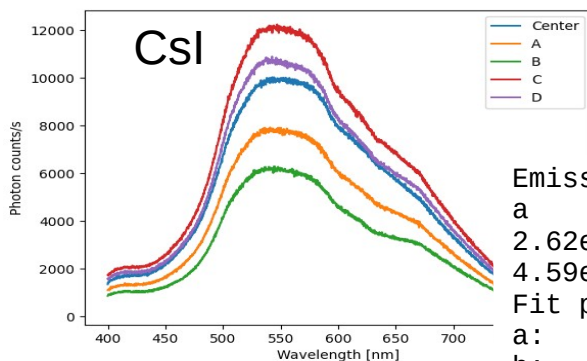
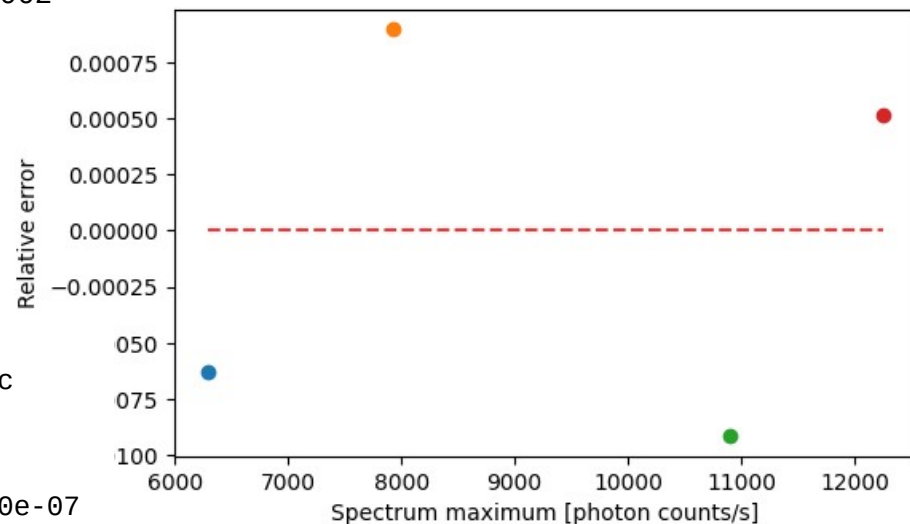
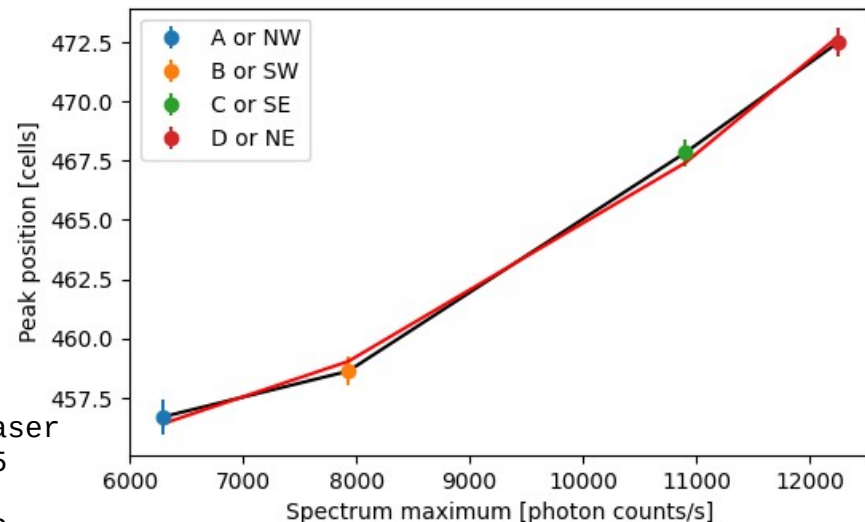


Plaser = 180 uW

Confronto resa di luce - efficienza



Misure di scintillazione con laser
 $\langle \text{Edge} \rangle / \text{Center} = 0.931 \pm 0.235$
 Efficienza con sorgenti
 $\langle \text{Edge} \rangle / \text{Center} = 0.807 \pm 0.002$



Emission to efficiency

$a * x^2 + b$
 $2.62e-07 * x^2 + -2.12e-03$
 $4.59e+02$

Fit parameters:

a:	$2.620e-07$	+/-	$1.095240e-07$
b:	$-2.118e-03$	+/-	$2.059934e-03$
c:	$4.594e+02$	+/-	$9.202180e+00$
Chi2/ndof:	1.31/1		