

URANIA: misure e simulazioni

Meeting on micro-RWELL &
resistive detectors activity

LNF, 21/06/2022

Rispetto al passato test

- PCB ridimensionato per non interferire con il diametro di HOTNES
 - Canali HV ridisegnati
 - RO con una sola pad 10 x 10
 - FEE CREMAT con guadagno 4 mV/fC; lo scorso test era di 10 mV/fC
 - Scheda elettronica disegnata ad HOC
 - 2 canali analogici (top e RO)
 - 2 canali digitali
 - 1 AND
-
- PCB prodotti da RUI e consegnati con catodo chiuso
 - Camere riaperte per installare il catodo corretto
 - Alcune camere hanno avuto bisogno di un ricondizionamento in forno

$$750 \text{ Hz/cm}^2 * 100 \text{ cm}^2 * 30\text{s} * \boxed{2/100} = 45000 \text{ cont.}$$

Efficienza del 2%

Rispetto al passato test

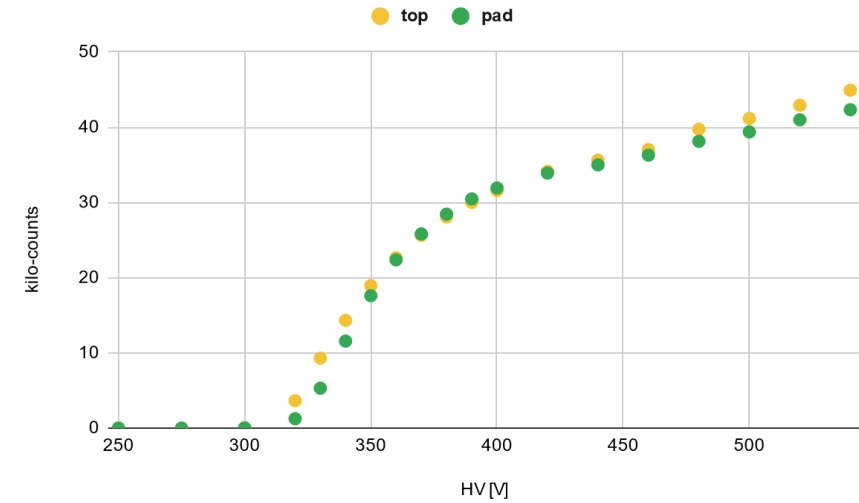
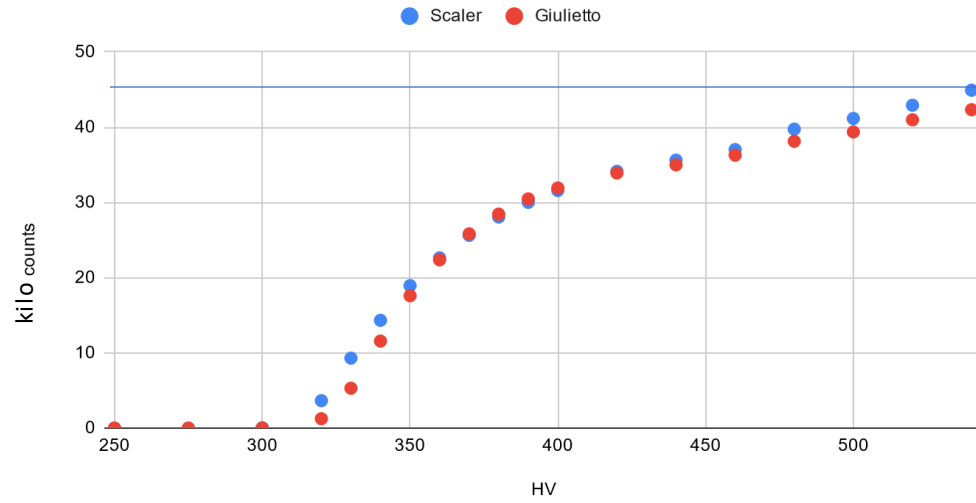
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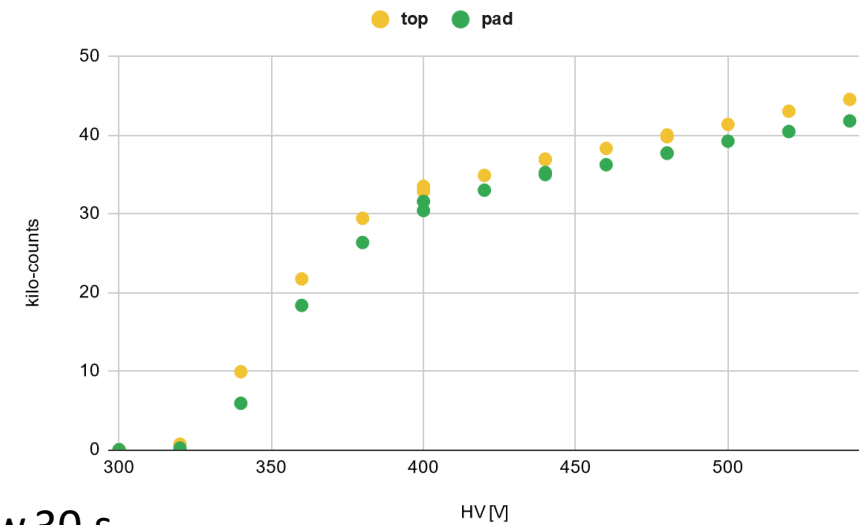
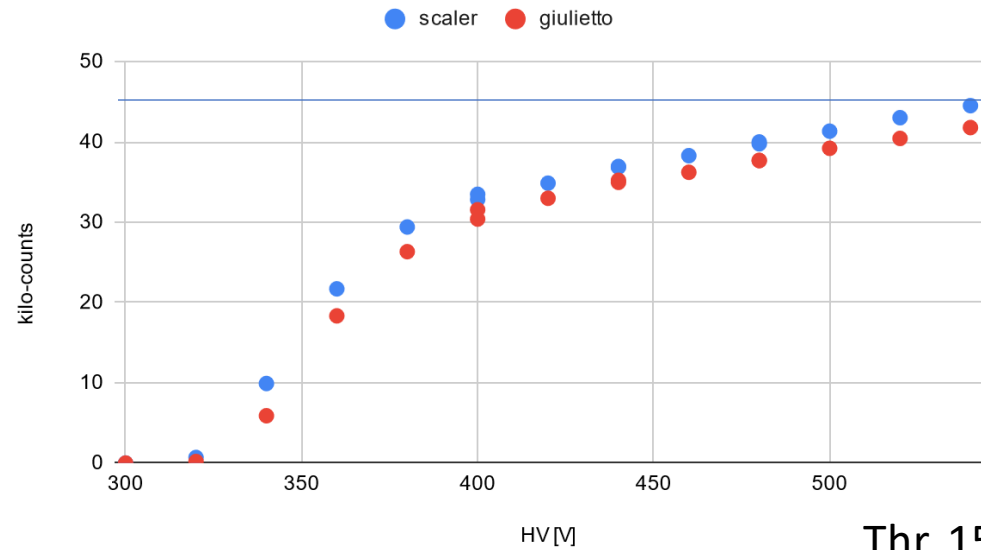
Catodo planare di riferimento, HV scan

Confronto scaler-software acquisizione, GIULIETTO = AND



Hv

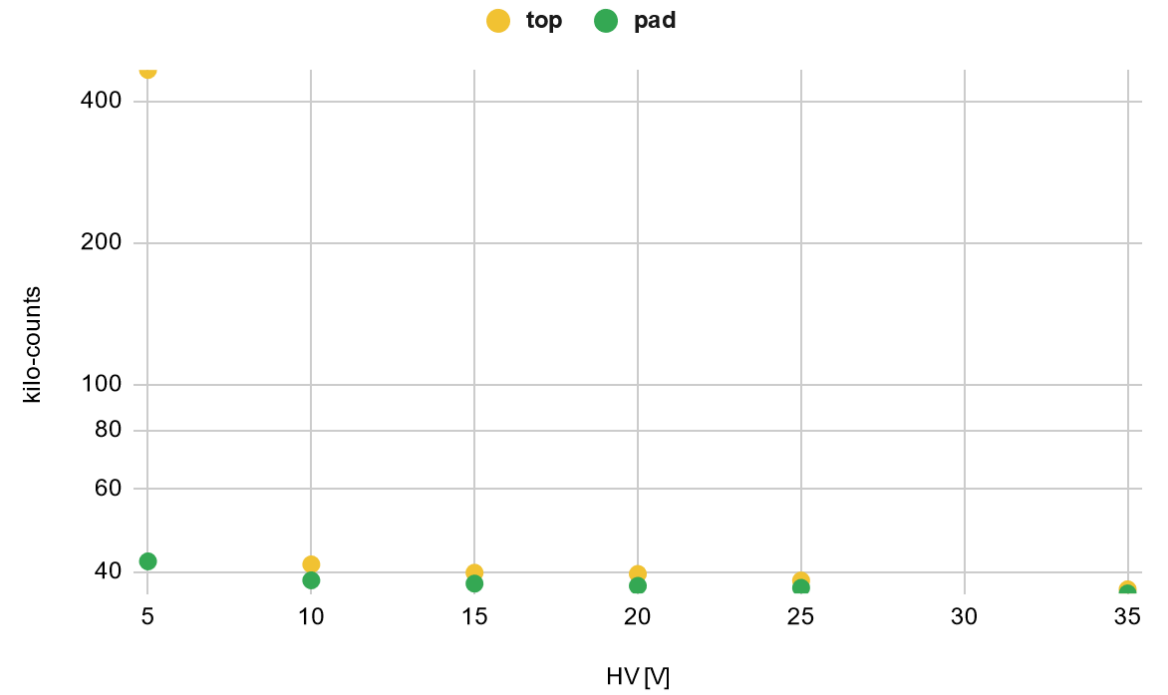
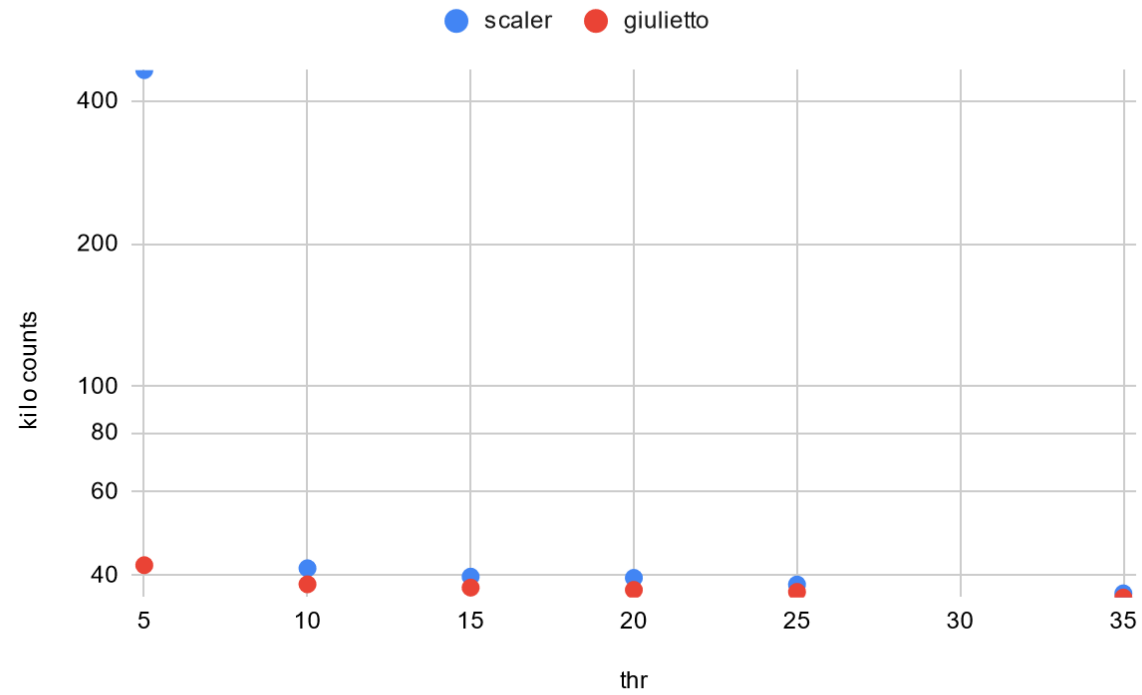
Cambio di discriminatore



Thr. 15 mV, Time window 30 s

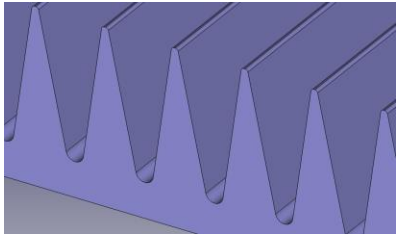
Catodo planare di riferimento, HV = 480 V

Thr. Scan

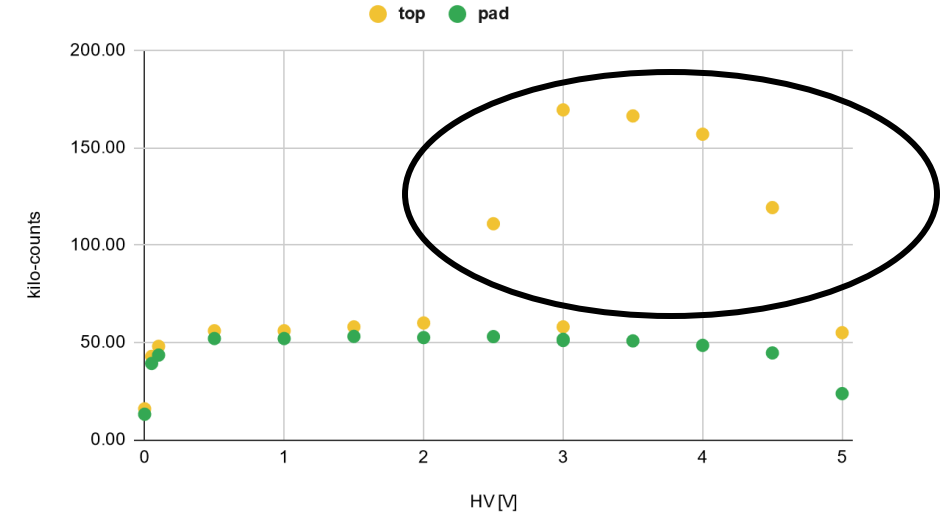
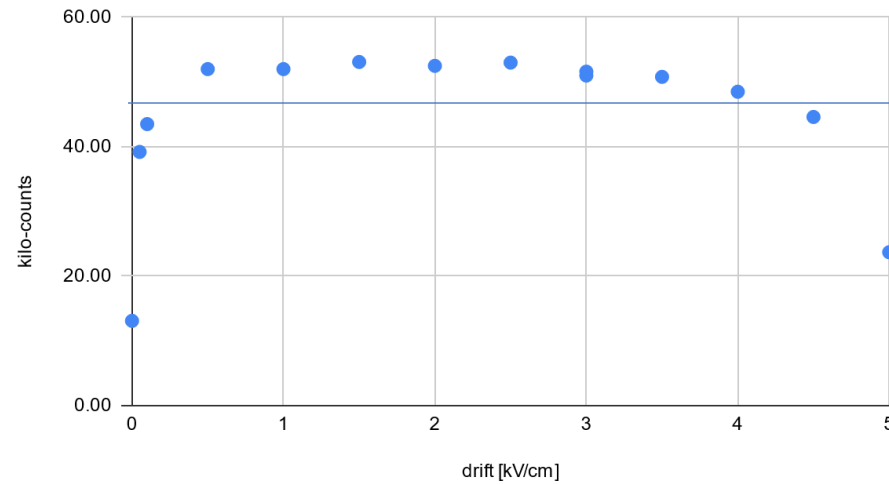


Sotto i 10 mV i conteggi esplodono

Catodo grooved 0.25 mm



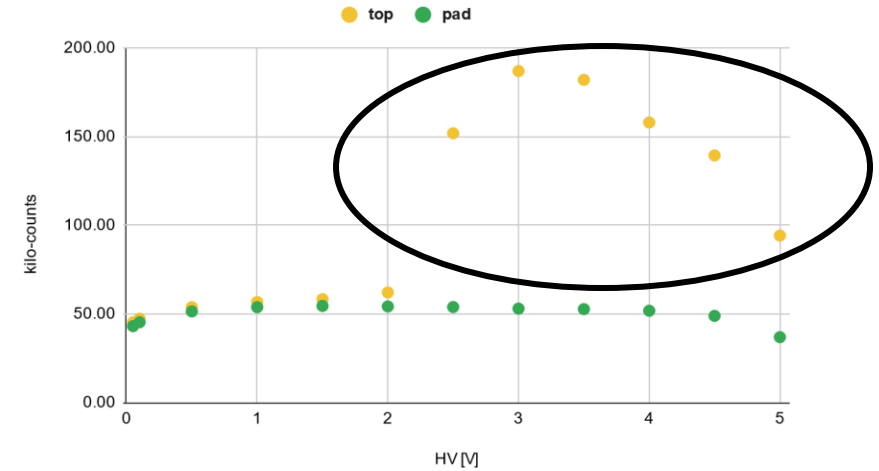
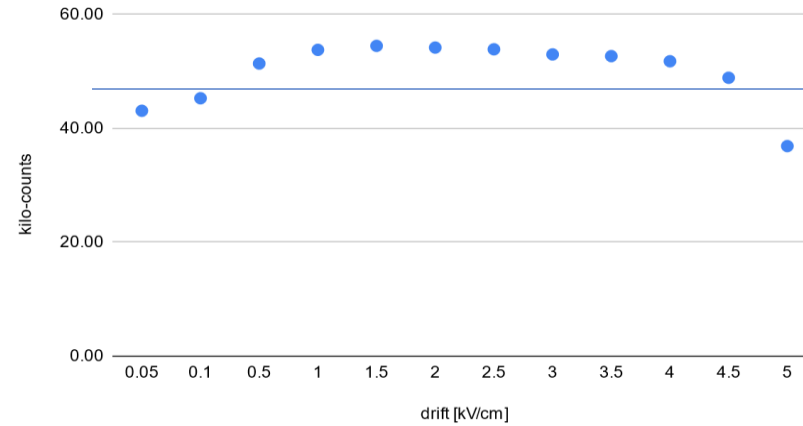
drift scan (460 V)



Thr. Top 13.4 mV
Thr. Pad 13.8 mV

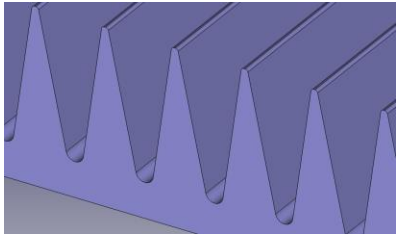
DRIFT DELLE
SOGLIE?

drift scan (480 V)



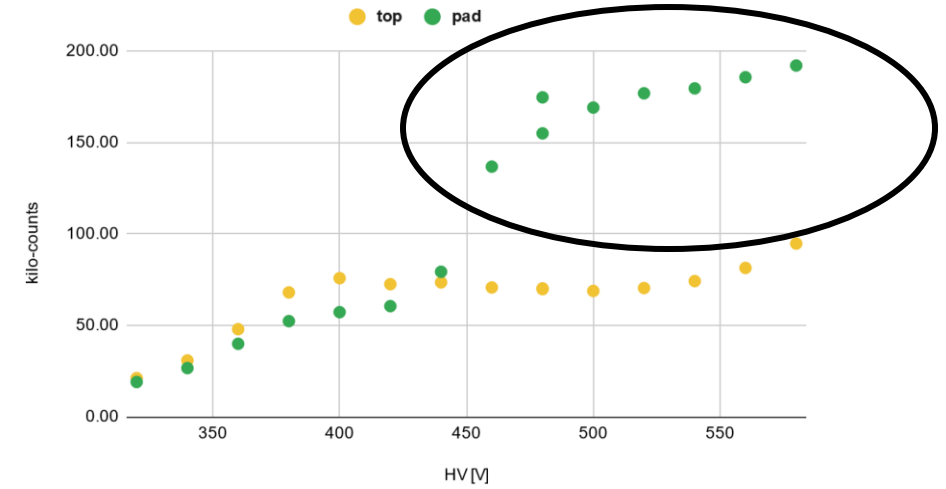
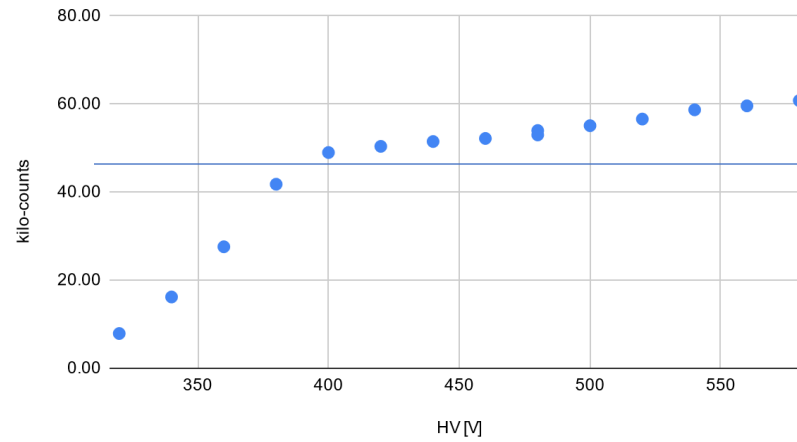
L'AND ripulisce il numero di eventi

Catodo grooved 0.25 mm

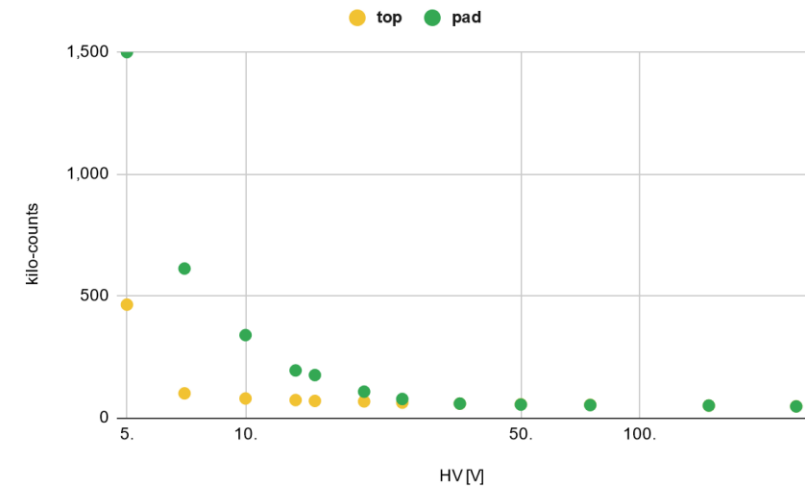
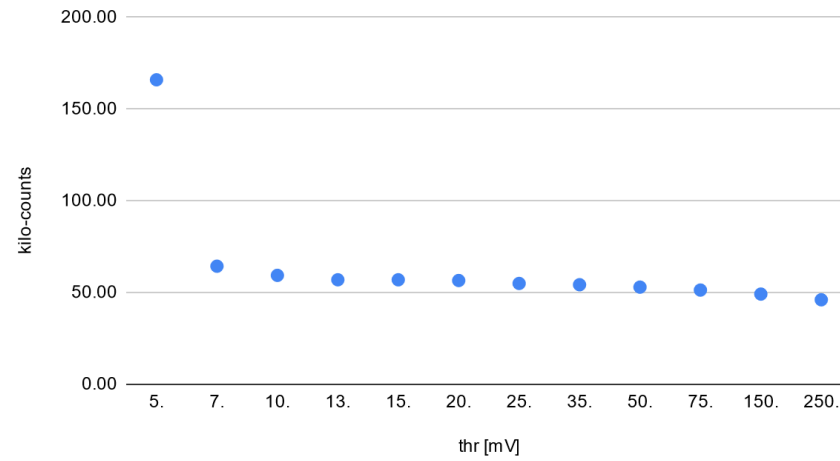


Thr. Top 13.4 mV
Thr. Pad 13.8 mV

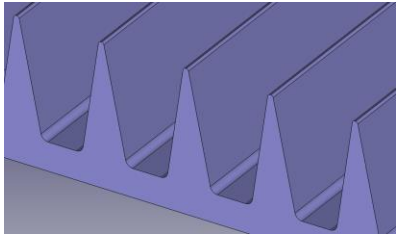
HV scan (2.5 kV/cm)



threshold scan (540V, 2.5 kV/cm) and

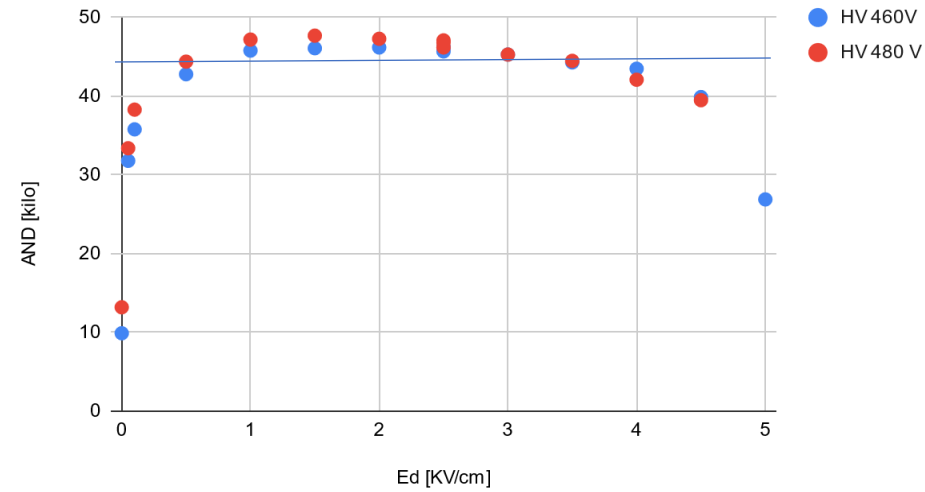


Catodo grooved 0.5 mm

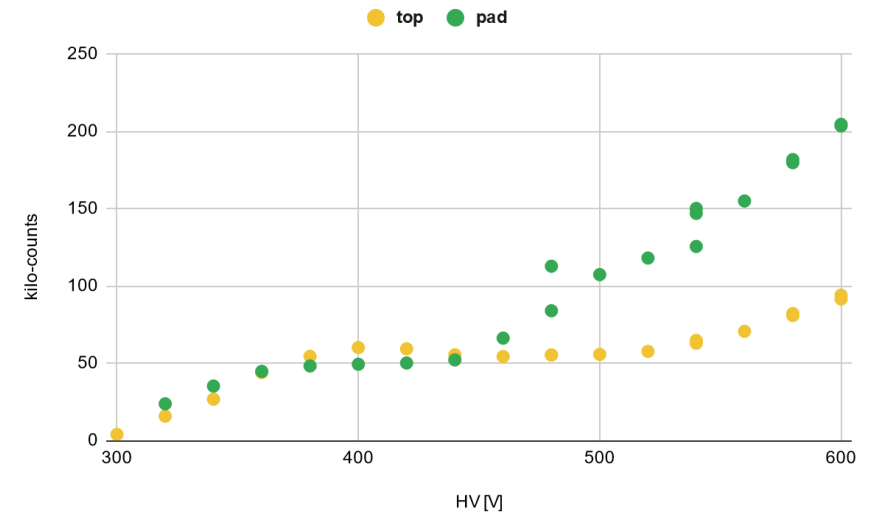
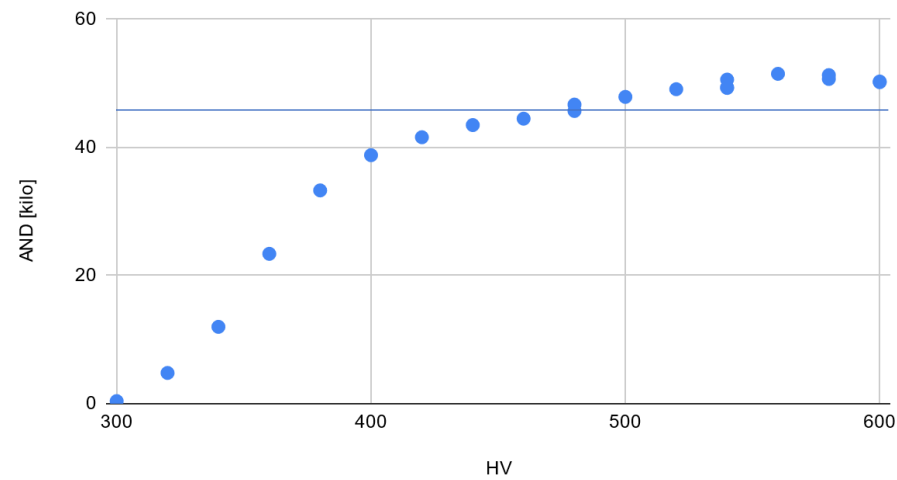


Thr. Top 15 mV
Thr. Pad 15 mV

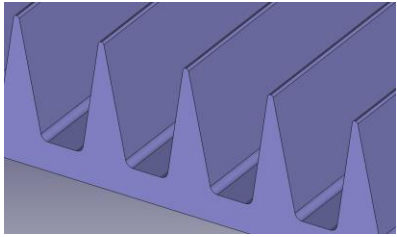
Comparison scan in ED



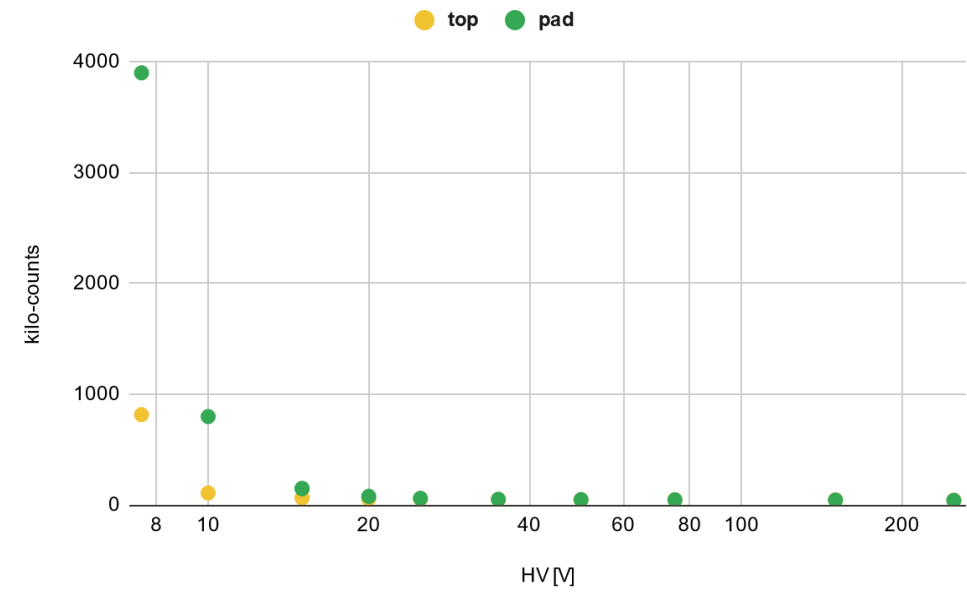
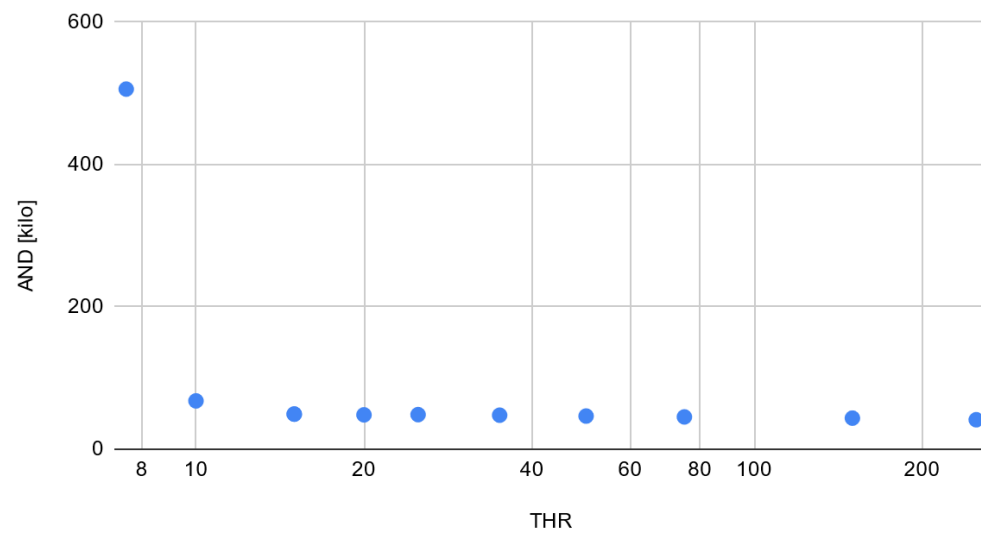
HV scan Ed = 2.5 kV/cm



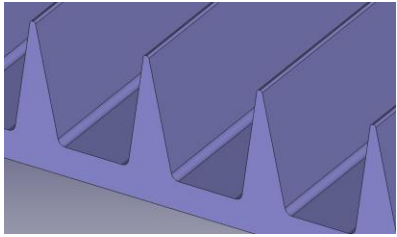
Catodo grooved 0.5 mm



THR scan @ 540 V and $E_d=2.5$

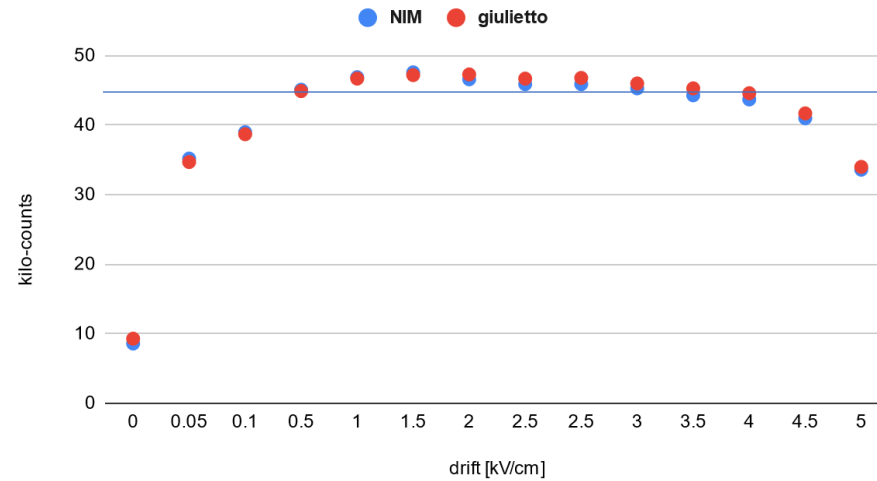


Catodo grooved 1 mm

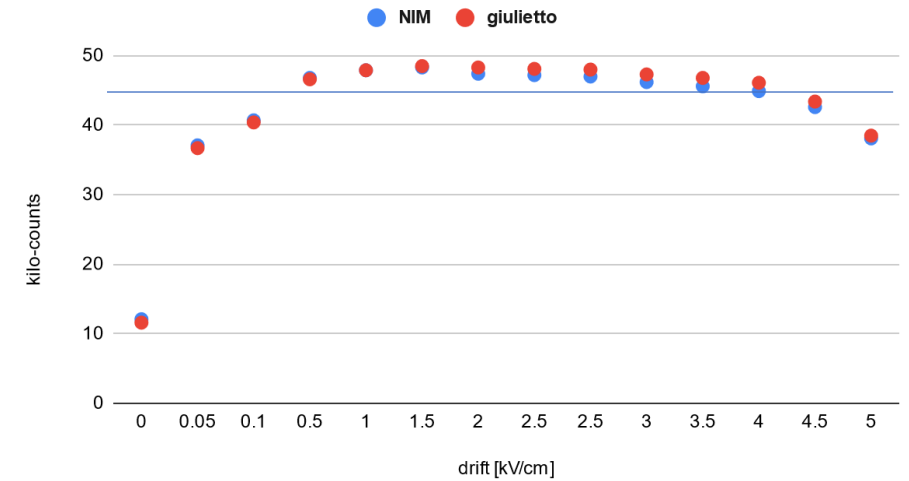


Thr. Top 15 mV
Thr. Pad 15 mV

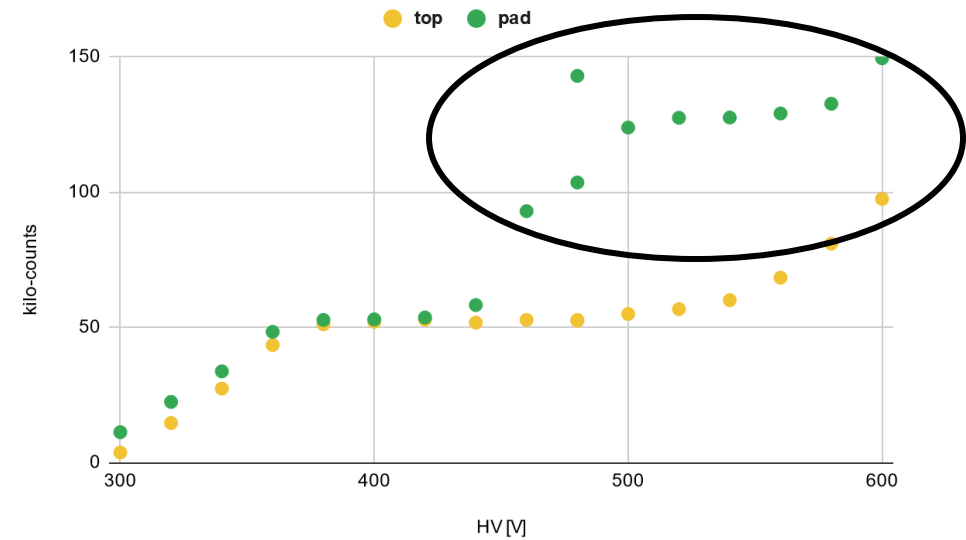
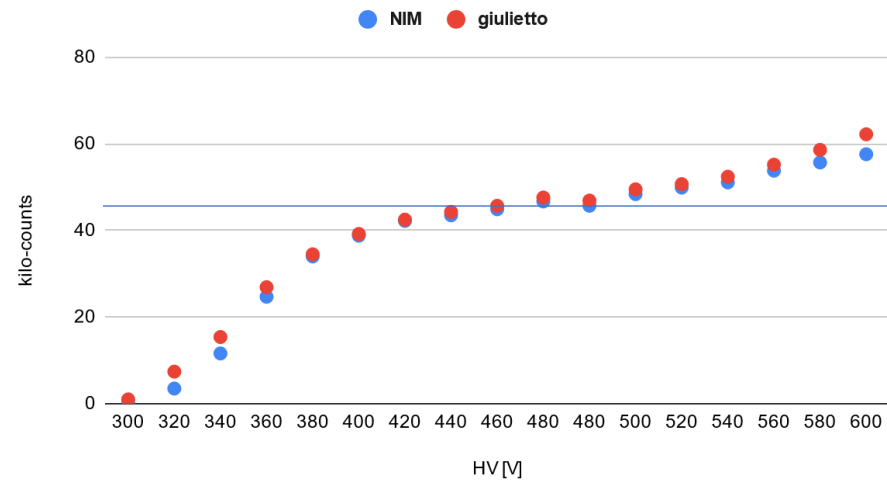
drift scan @ 460V



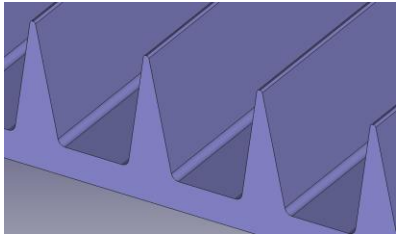
drift scan @ 480V



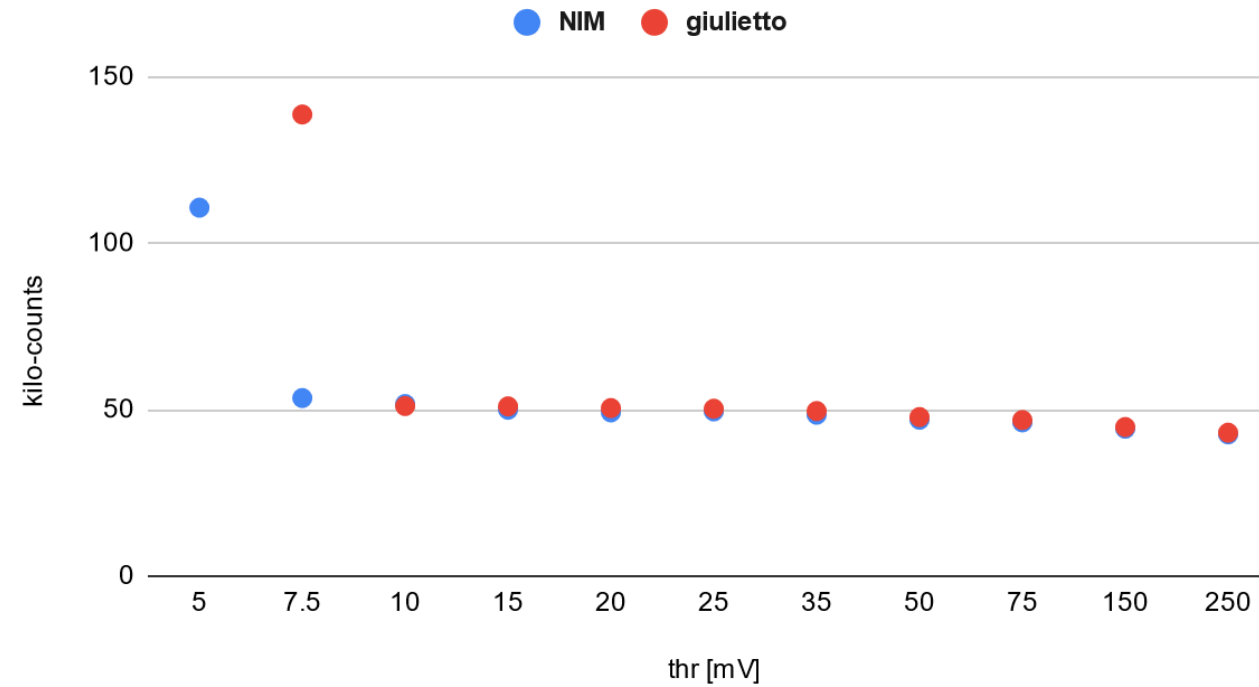
HV scan @ drift = 2.5 kV/cm



Catodo grooved 1 mm

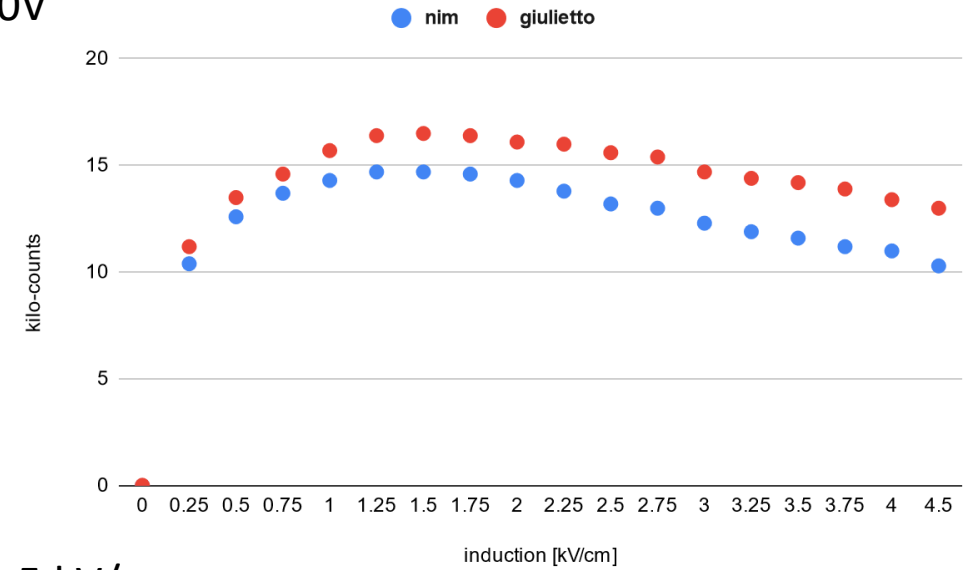
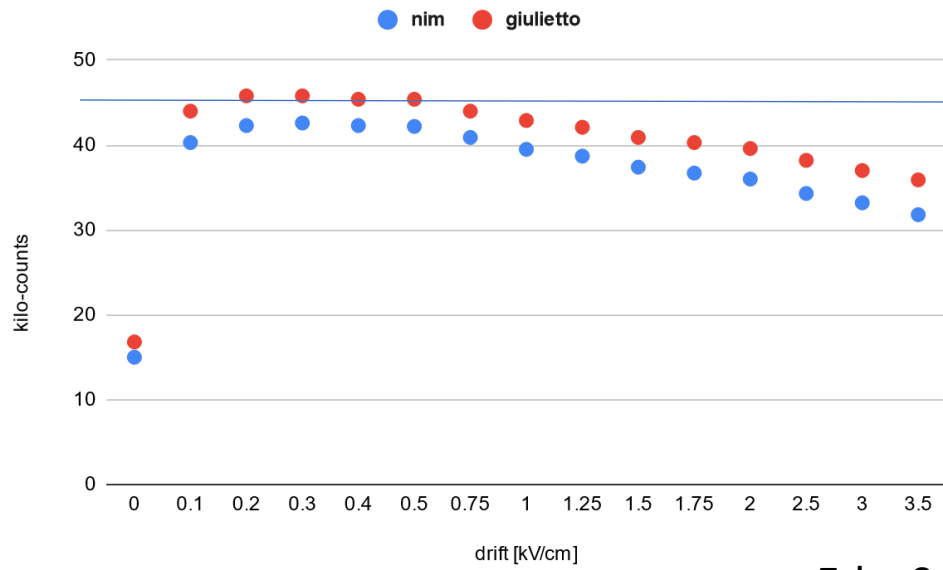


threshold scan HV 540 V, $E_d = 2.5$ kV/cm

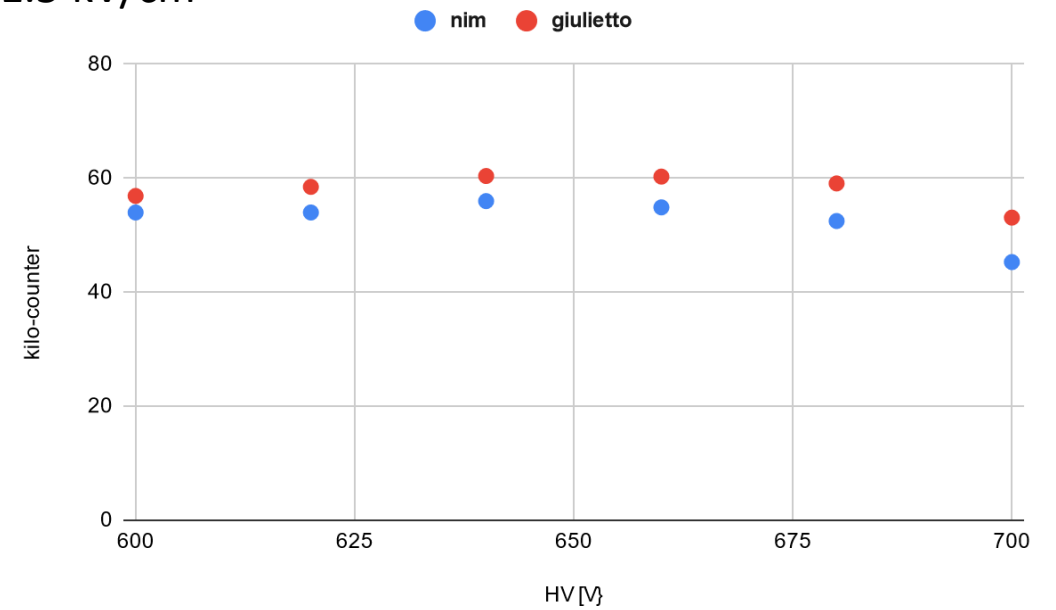
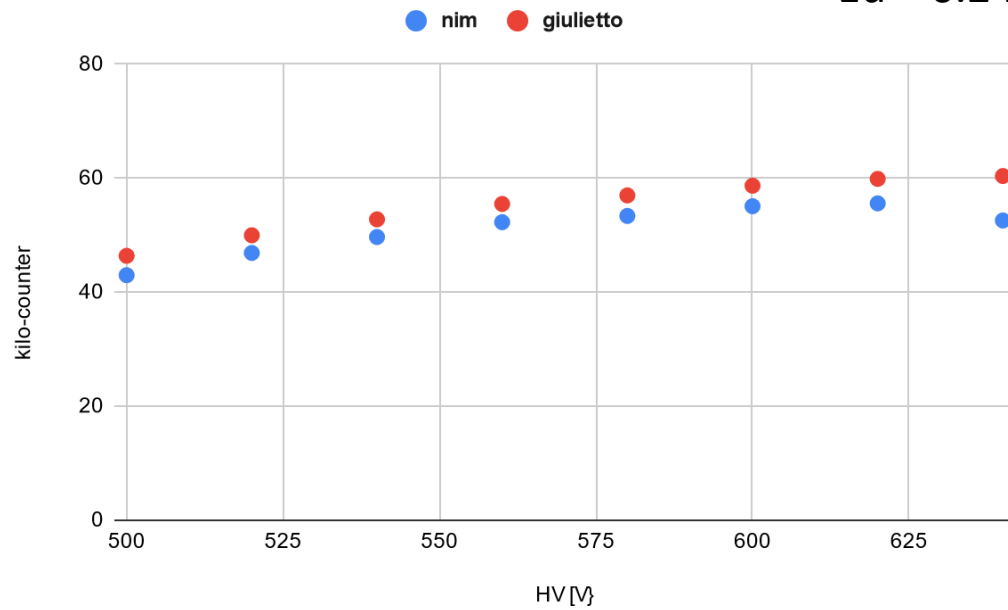


Mesh Cu, 66% trasparenza ottica

HV = 500V



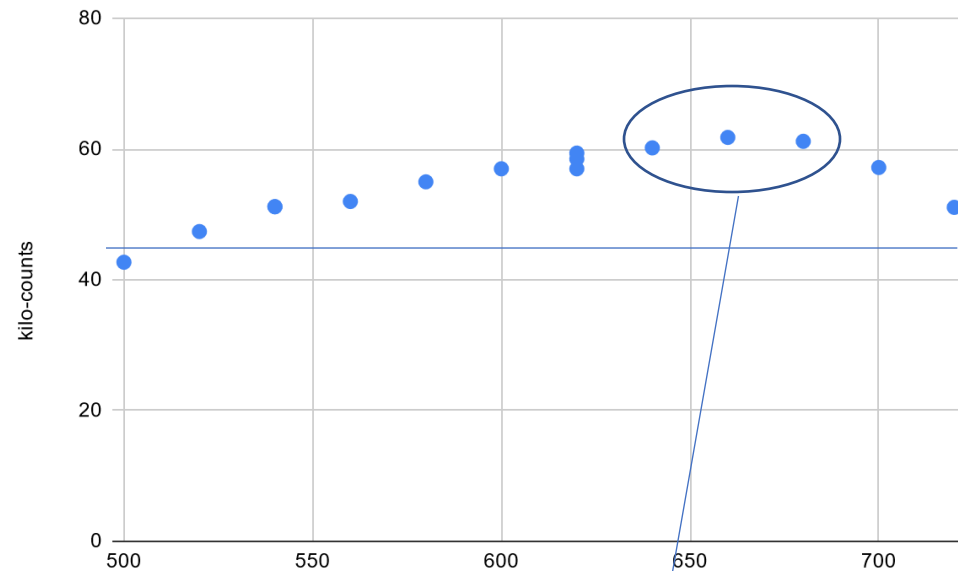
Ed = 0.2 kV/cm, Ei = 1.5 kV/cm



Mesh Cu, 66% trasparenza ottica

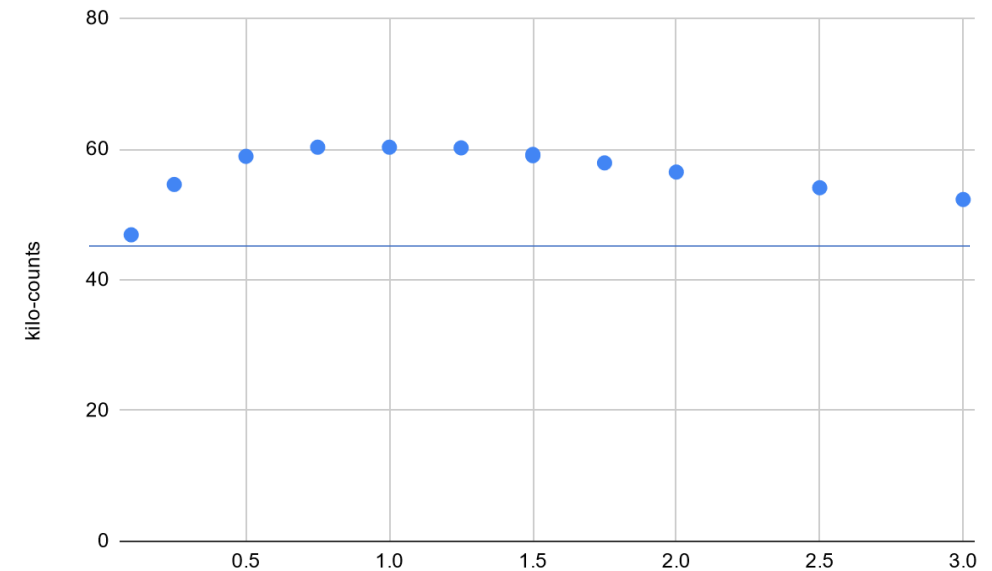
Misure prese dopo l'isolamento dei filtri HV.

Thr. top = 15-30 mV; Thr. Pad = 15-40 mV
Ed = 0.2 kV/cm; Ei = 1.5 kV/cm



3% ?

HV (640 V). Thr. pad = 20 mV; thr. top = 15 mV

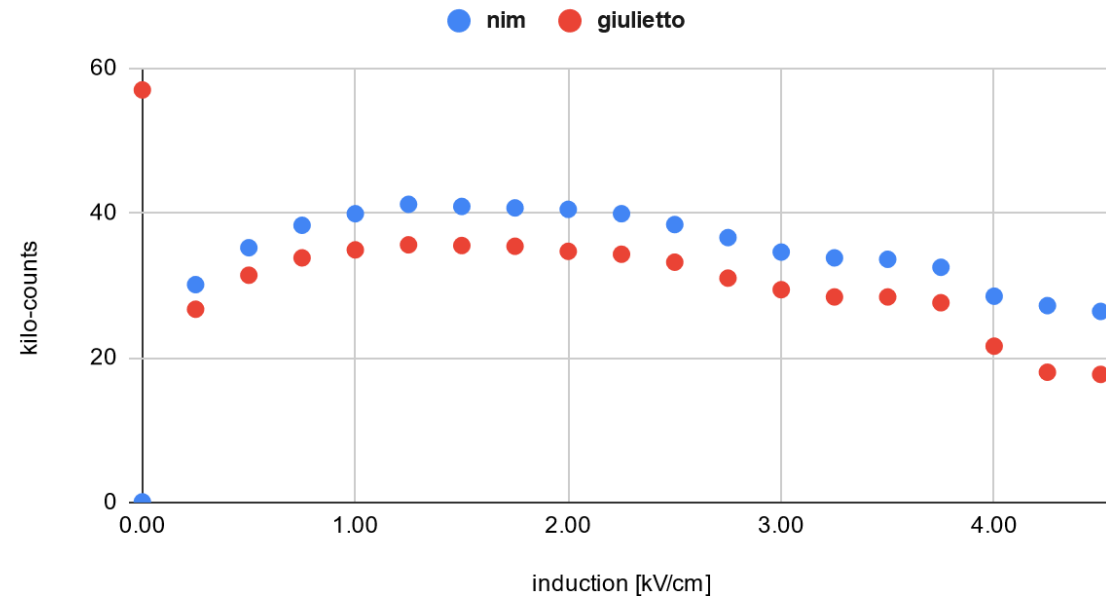


Mesh Cu, 33% trasparenza ottica

Portata al test dopo la cura "Giulietto" per l'isolamento dei filtri HV

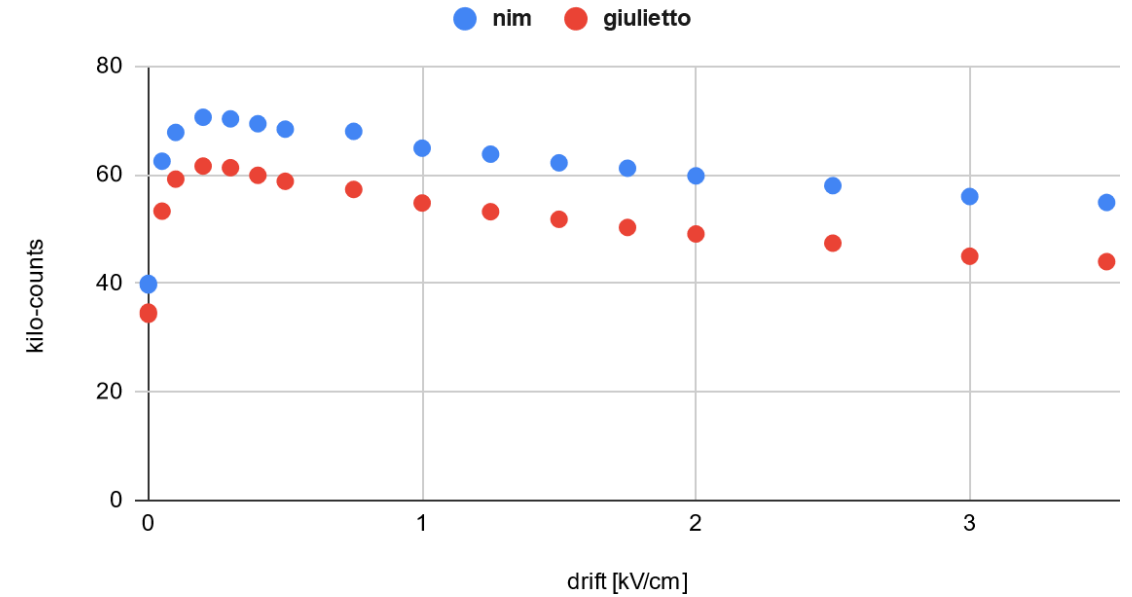
thr = 13.5/13.5 mV nim, 15 mV giulietto; HV 500 V

induction scan



$E_i = 1.5 \text{ kV/cm}$

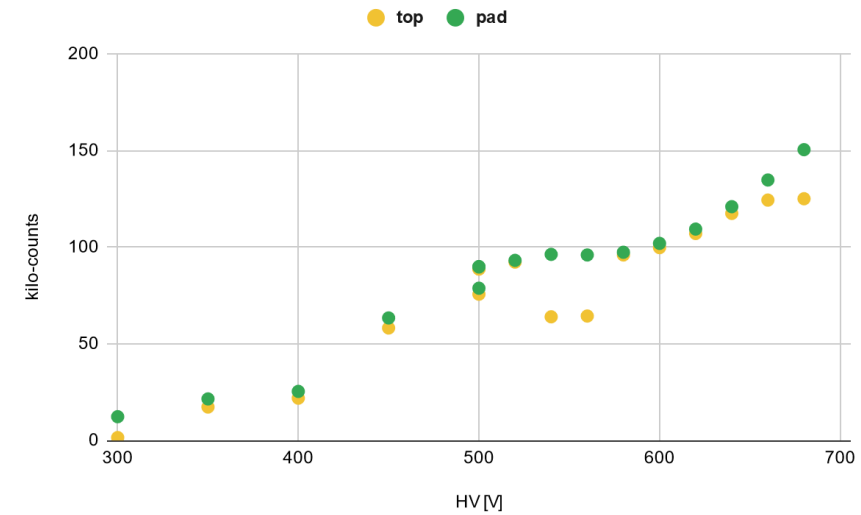
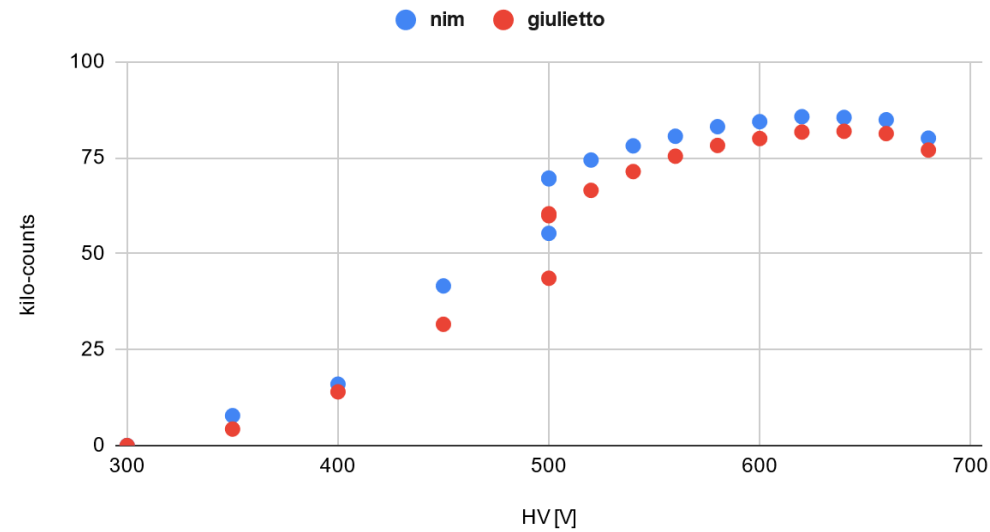
drift scan



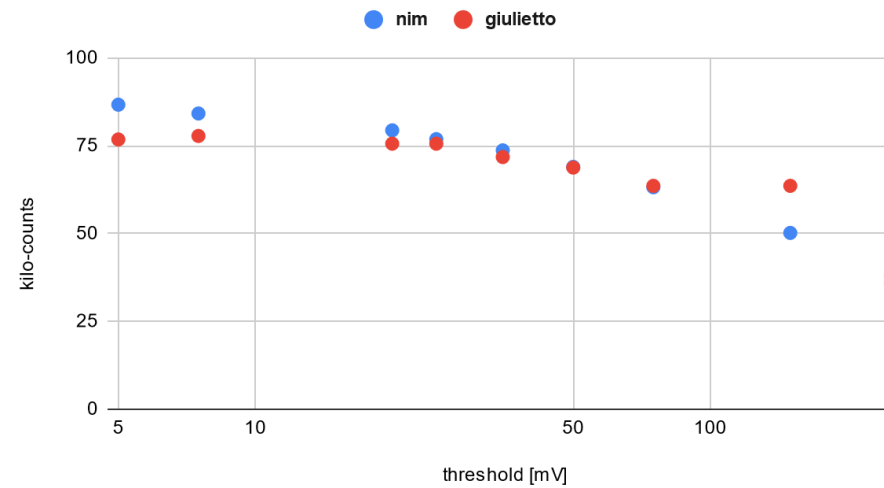
Mesh Cu, 33% trasparenza ottica

Ei 1.5 kV/cm, Ed = 0.3 kV/cm, thr = 13.5/13.5 mv nim; 15 mV giulietto

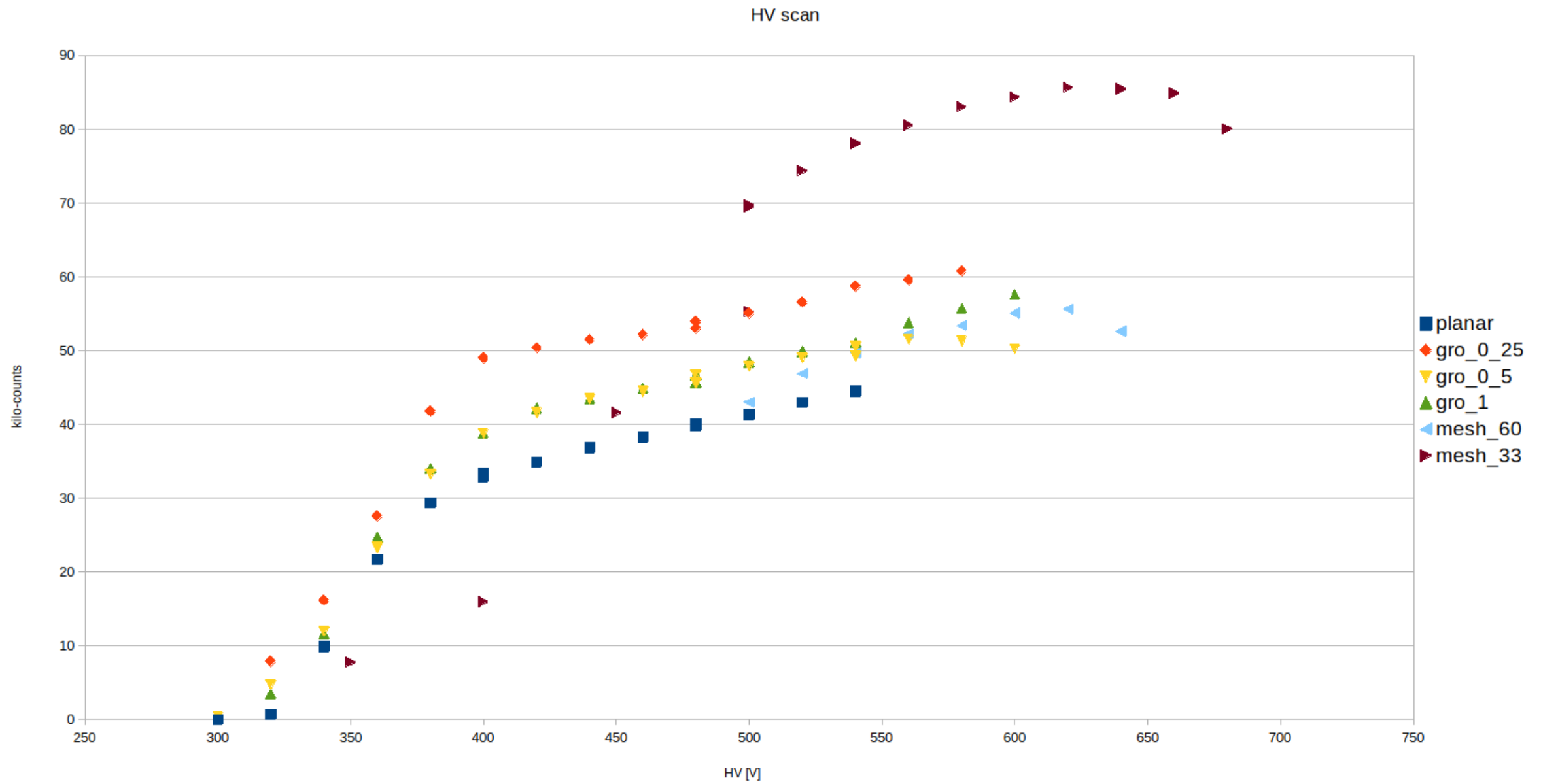
HV scan



threshold scan

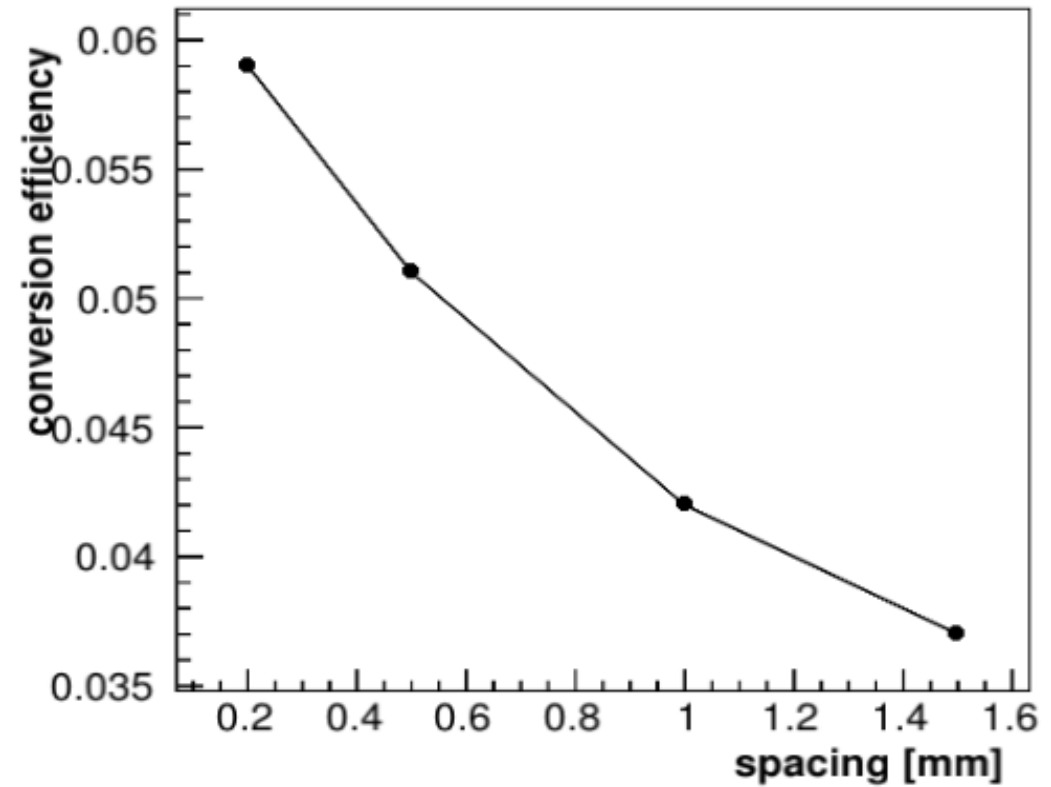
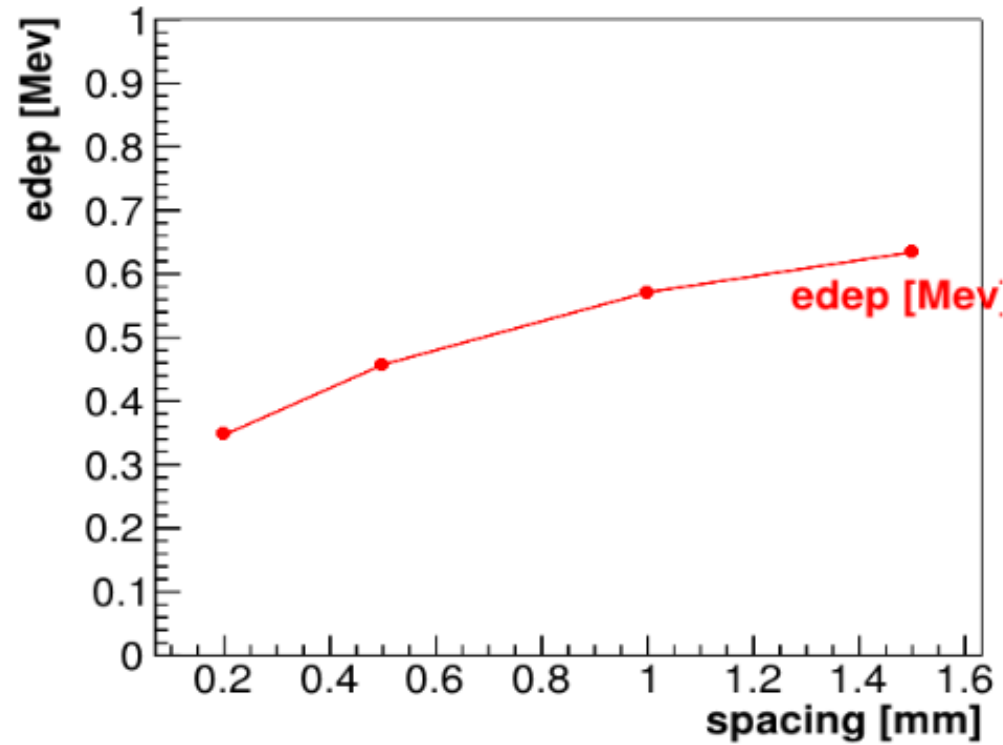


cath=1680 V,
mesh=1500 V,
top=600 V



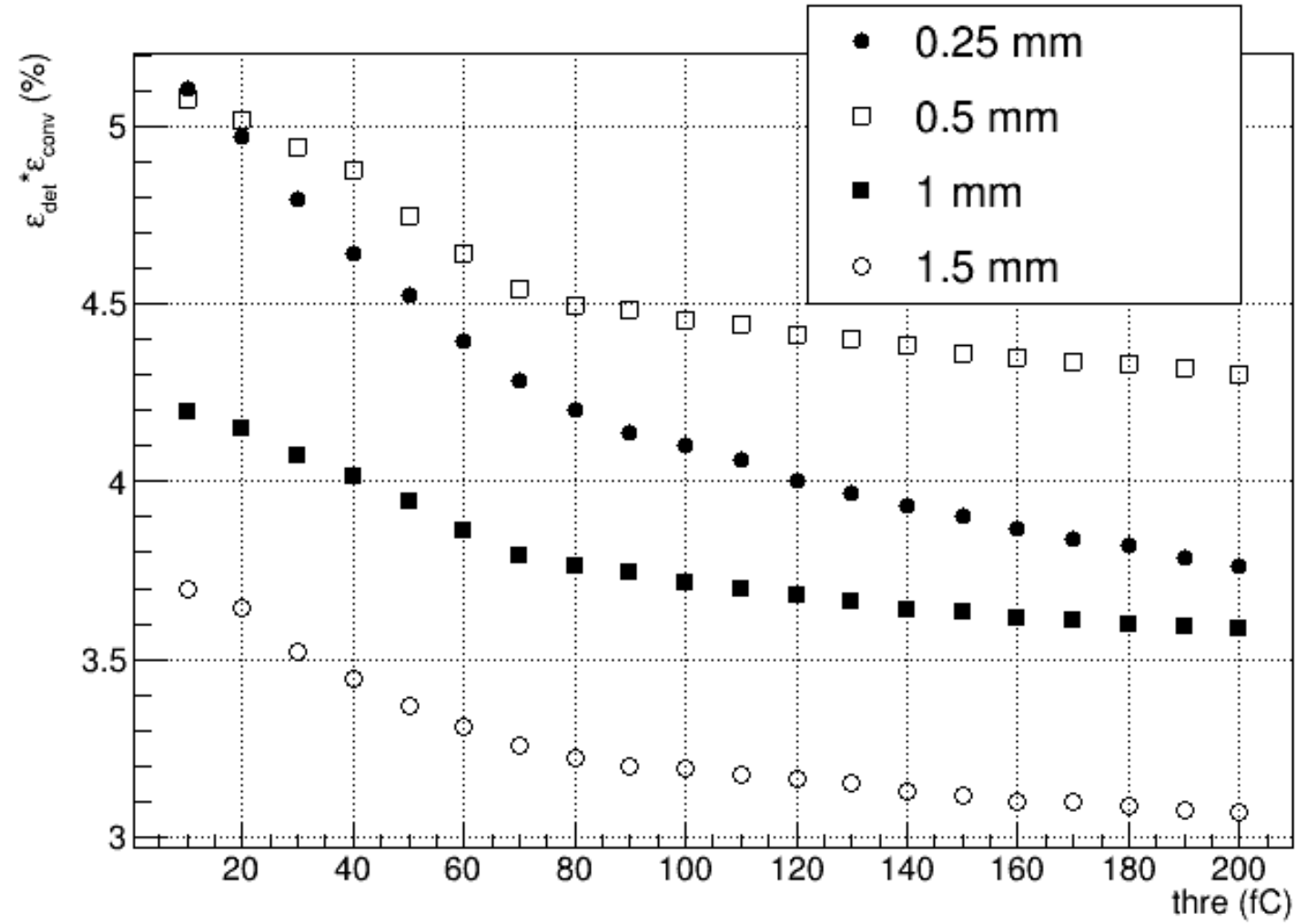
Simulazioni (grooved)

1. Mesh 33%
2. Grooved 0.25 mm
3. Grooved 1 mm
4. Mesh 66%
5. Grooved 0.5 mm



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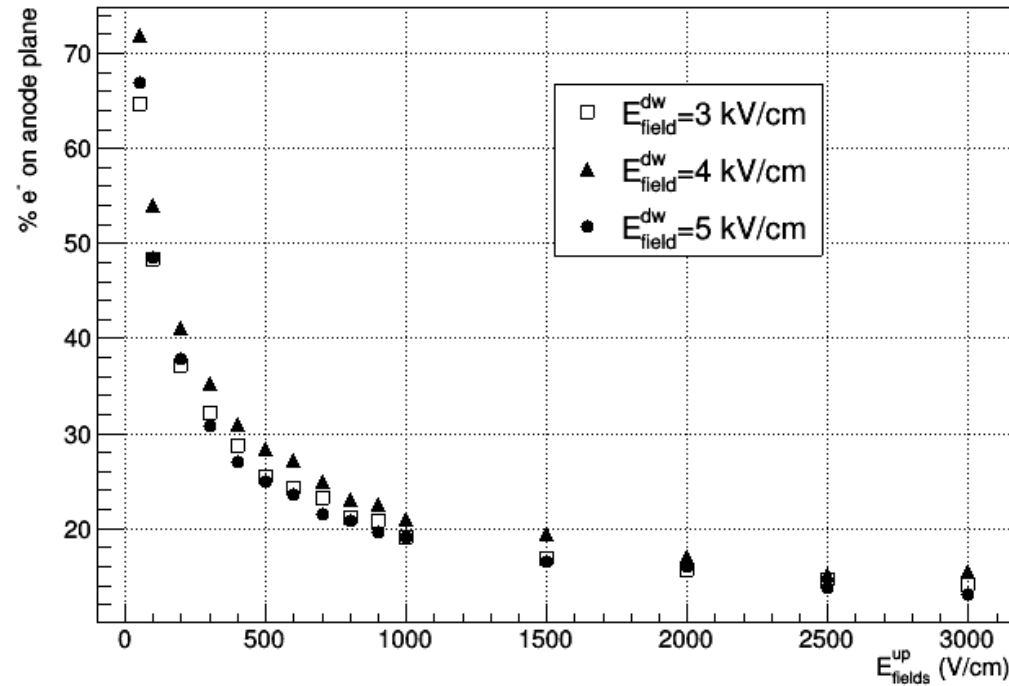


Simulazioni (mesh)

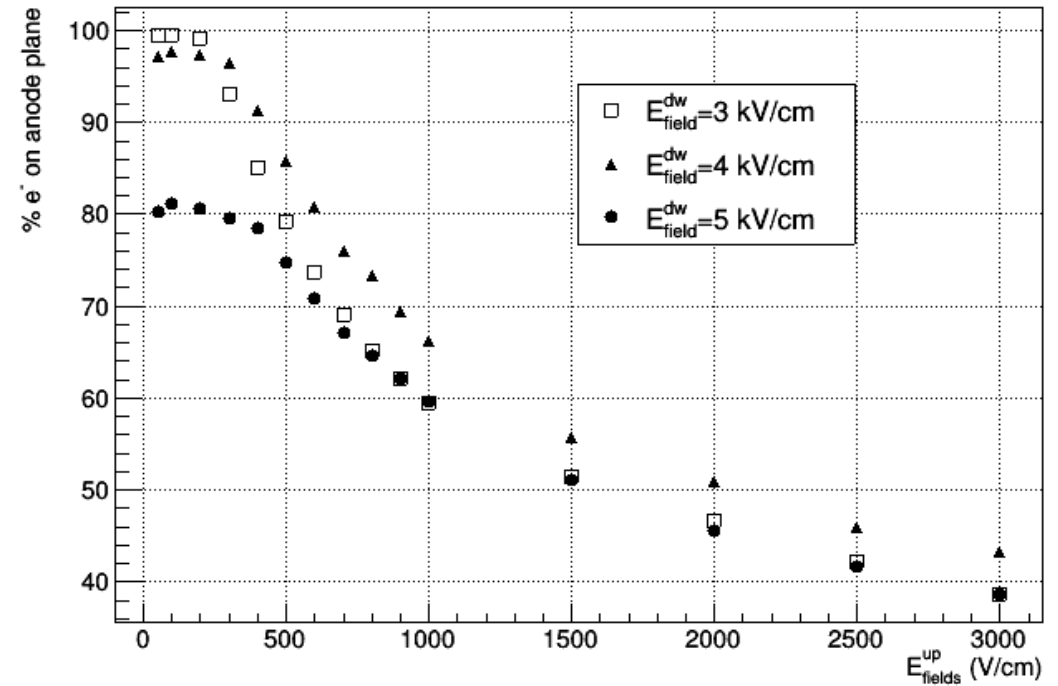
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SOLO TRASPARENZA. NON C'È CONVERSIONE

Al mesh 0.0021/200 (53 μm \varnothing , 127 μm pitch)



Cu mesh 0.0022/100 (56 μm \varnothing , 254 μm pitch)



Grooved:

Distribuzioni angolari e di energia delle tracce da GEANT4 -> Simulazione tracce con GARFIELD++, drift degli elettroni e moltiplicazione à la Parsifal

Geometria in Garfield HA il catodo seghettato (ANSYS), MA la cella è 6+3 (a differenza del 6+6 utilizzato) e NON HA lo stadio di amplificazione perché altrimenti ANSYS impazzisce.

Cose da fare (secondo me):

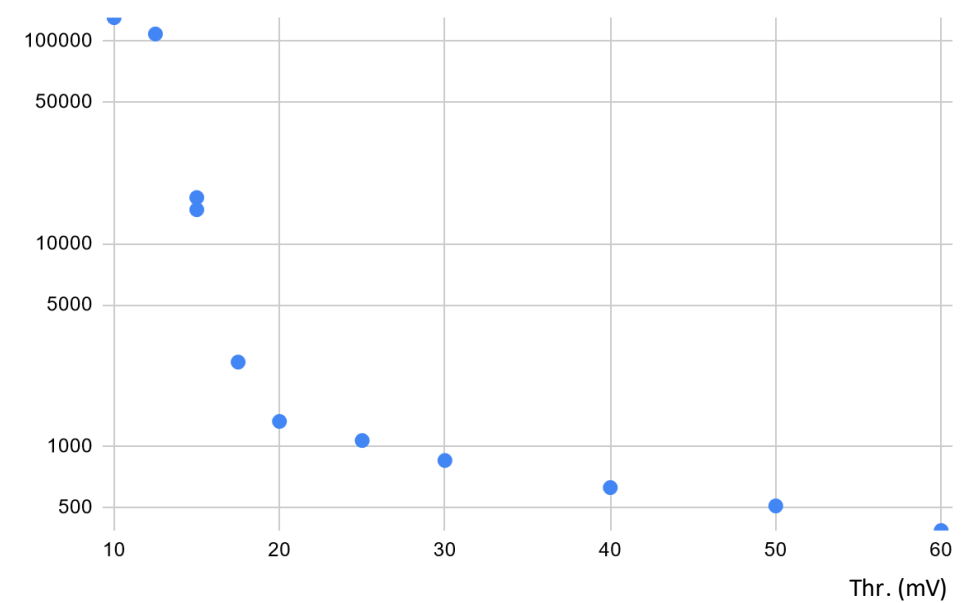
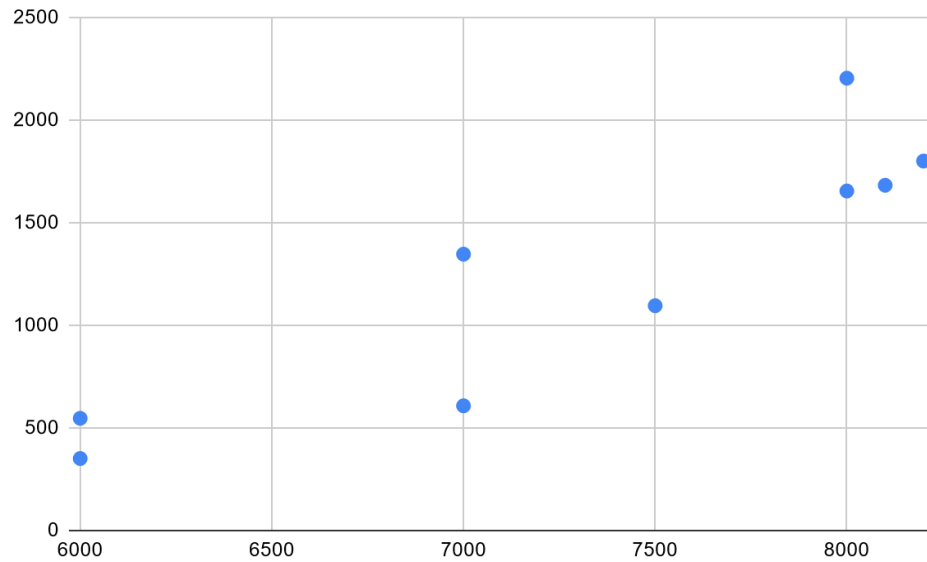
- Geometria GEANT4 da CAD
- Controllo dei file SRIM usato da Garfield per la ionizzazione da parte di ioni lenti
- Controllo generale del codice Garfield++
- Conversione delle soglie in mV nei grafici
- Inserire una valida parametrizzazione del guadagno in funzione dell'HV (-> misure di guadagno)

Mesh:

- Distribuzioni angolari e di energia delle tracce da GEANT4 anche per conversione sulla mesh
- Controllo generale del codice Garfield++
- Altre cose attinenti che ora non mi vengono in mente

Un RO adattato per non interferire con HOTNES
CREMAT semplice: un solo canale analogico, 6 strip in OR
Lettura solo sull'anodo

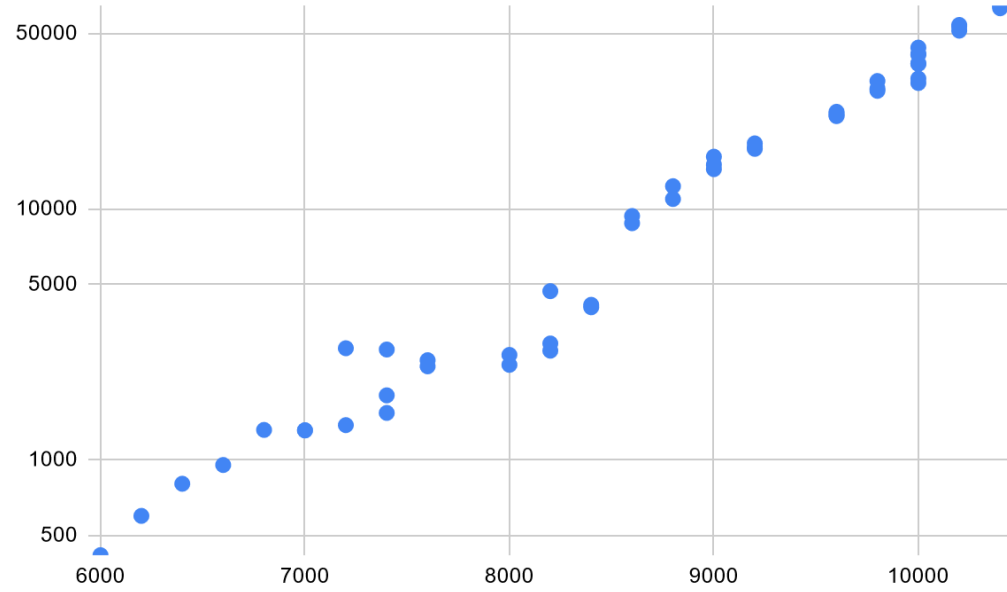
Versione 1: Lycron DLC- B4C (anodo)
Primo giro di presa dati (30 s)



SRPC (Lycron DLC – B4C on anode)

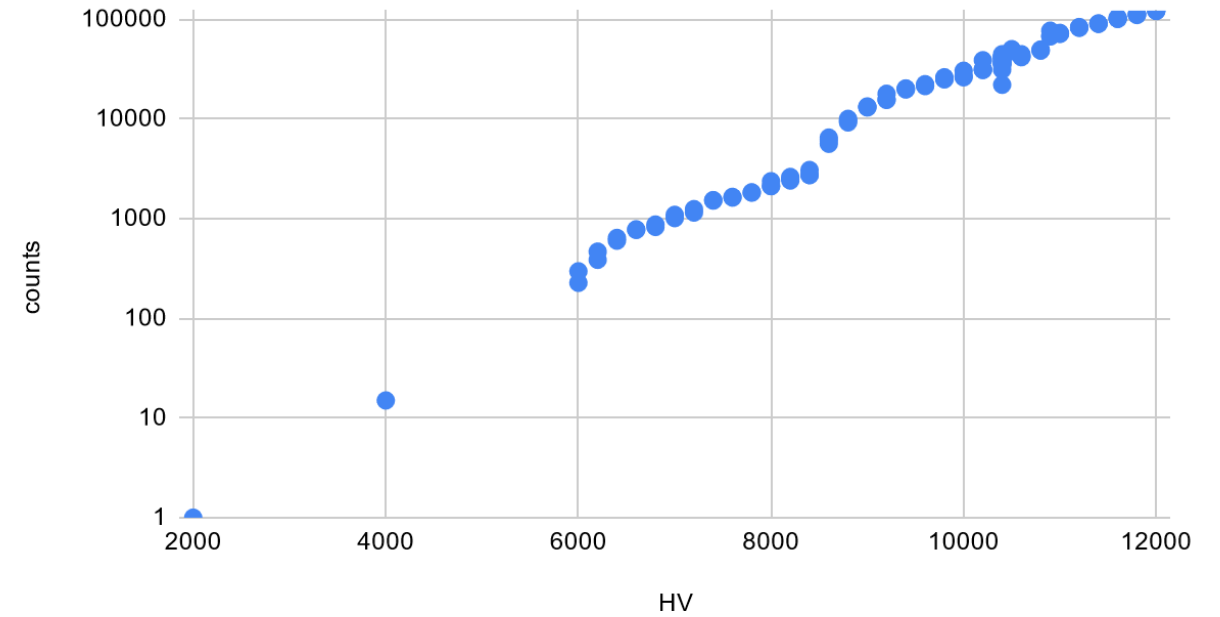
Time window 30 s

thr = 25 mV new gas, veto at 10us - 30us



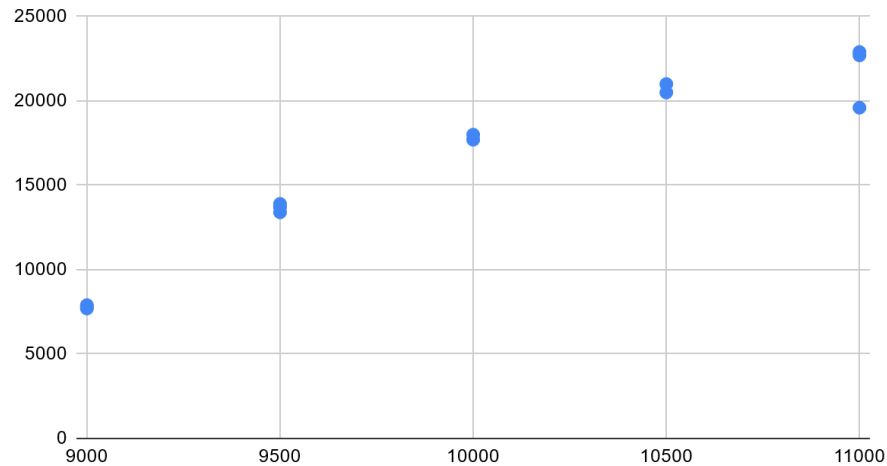
thr = 30 mV, new data taking after noise fix

counts vs. HV

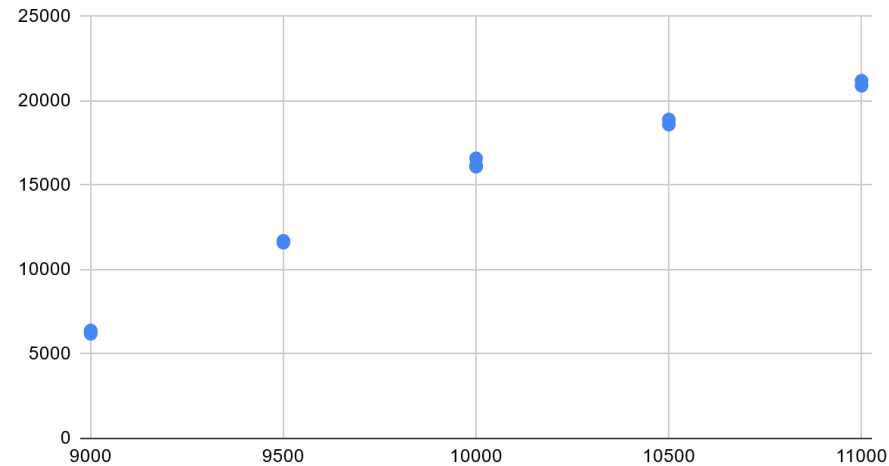


SRPC (Lycron DLC – B4C on anode)

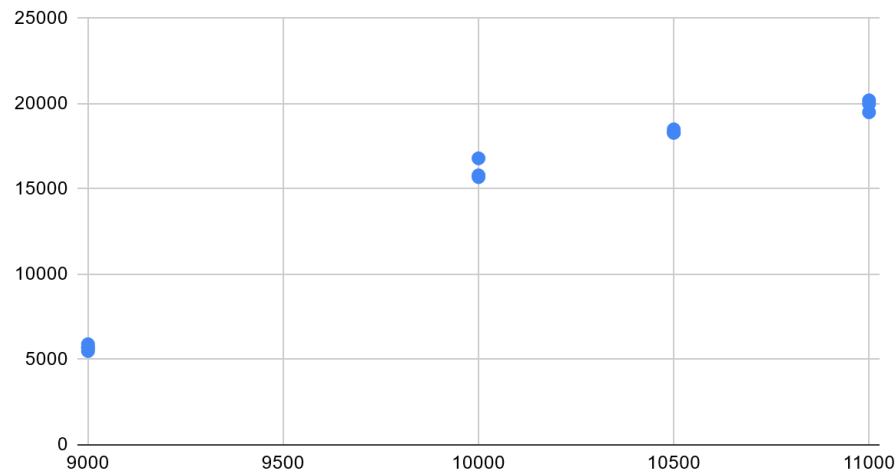
HV scan @ thr = 50 mV



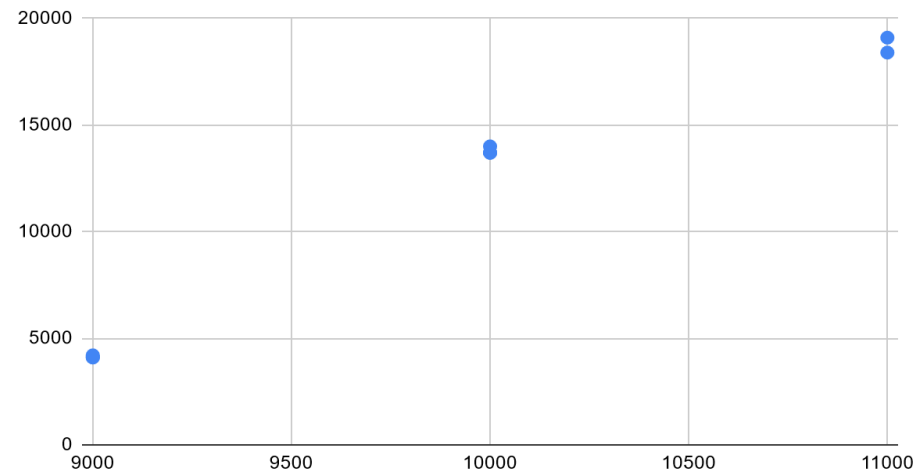
HV scan @ thr = 70 mV



HV scan @ thr = 100 mV

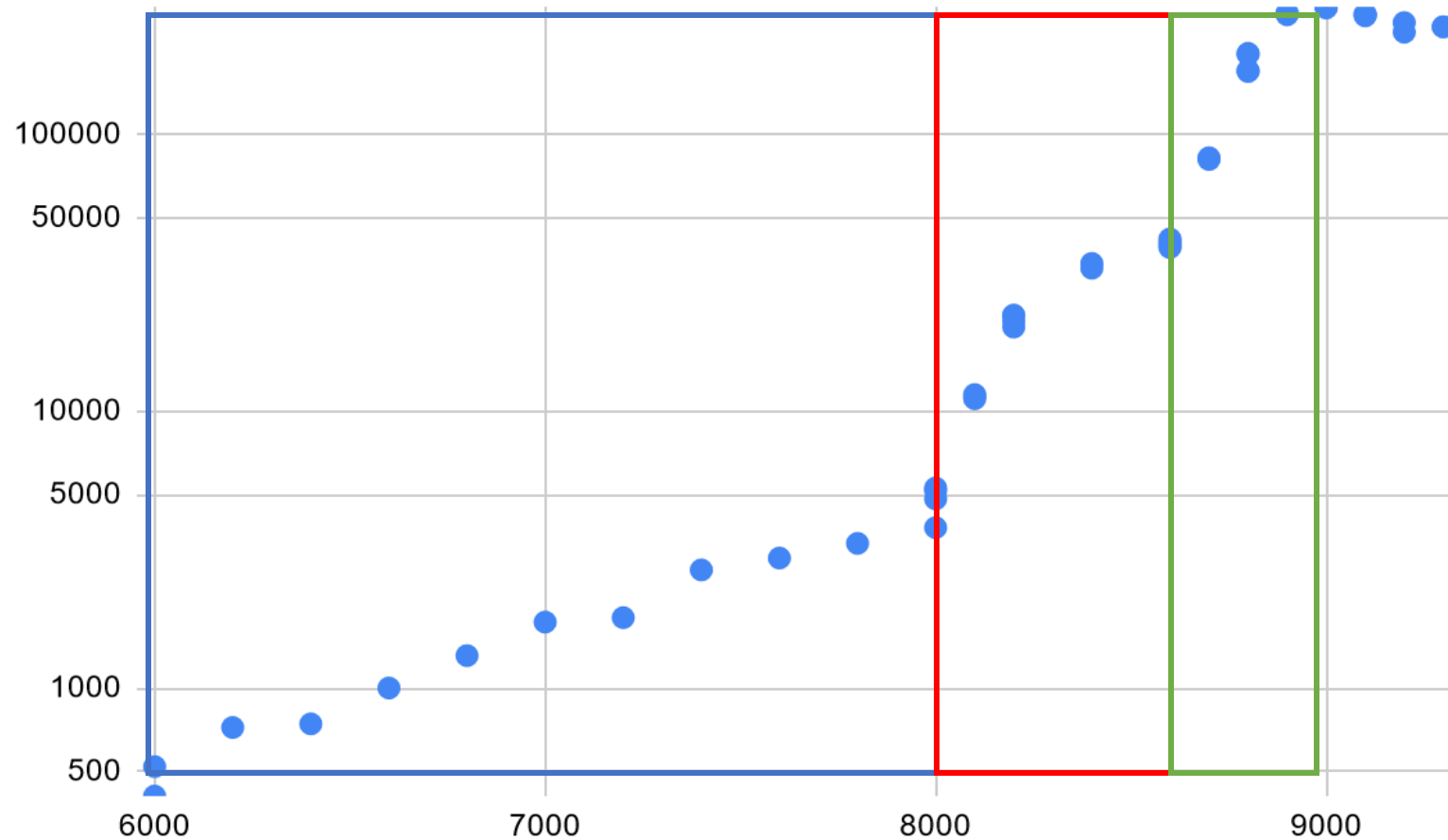


HV scan @ thr = 150 mV



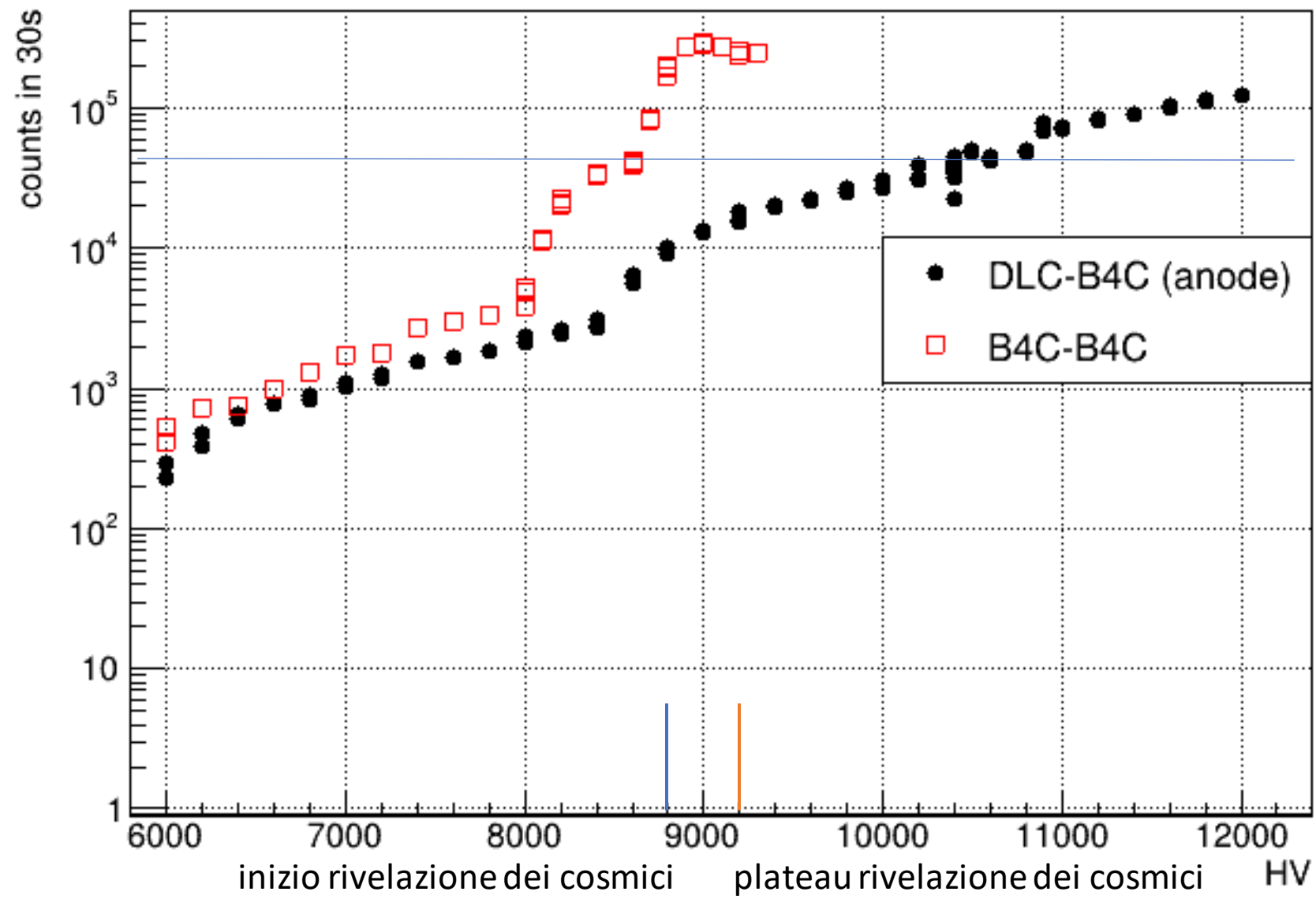
Notata un'isteresi.
Fissato un valore di tensione, se lo scan è fatto a HV decrescenti occorre attendere circa 6 minuti prima di rivedere i conteggi registrati durante lo scan a HV crescente

SRPC (B4C – B4C)



Diversi regimi visibili, anche la forma del segnale cambia in queste regioni:
da segnale simil-gaussiano a quasi onda quadra (saturazione)

SRPC in sintesi...



Lycron-B4C sull'anodo

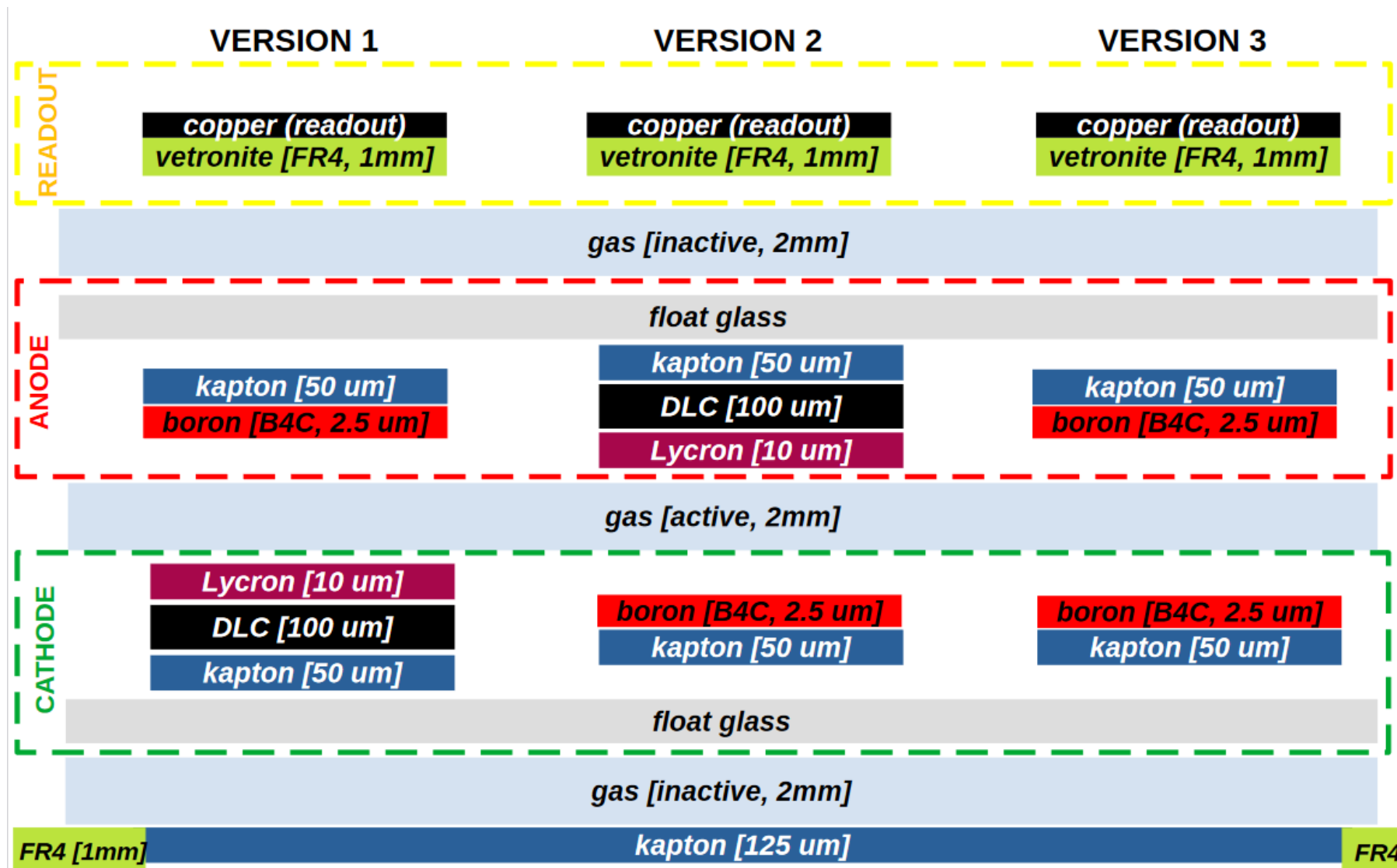
- Isteresi
- Rumore presente e in seguito ridotto
- Mancanza di un plateau
- Ci saremmo aspettati di vedere l'effetto di una grande carica di ionizzazione

B4C-B4C

- Tre regimi diversi (perché?)

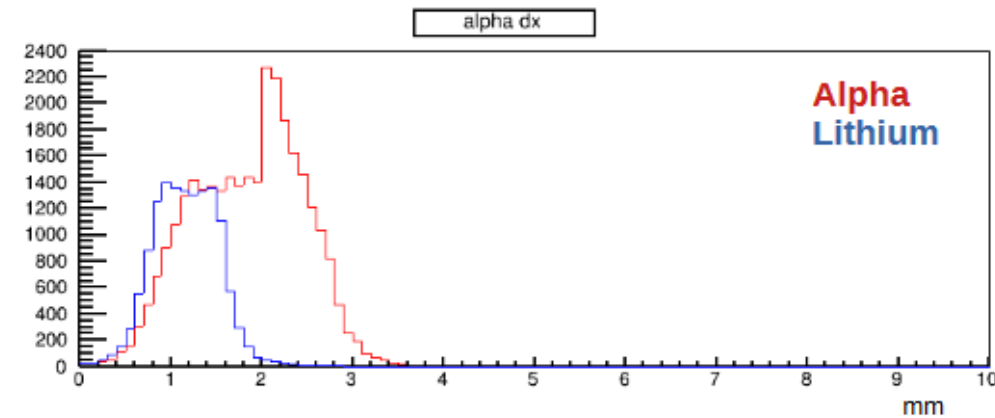
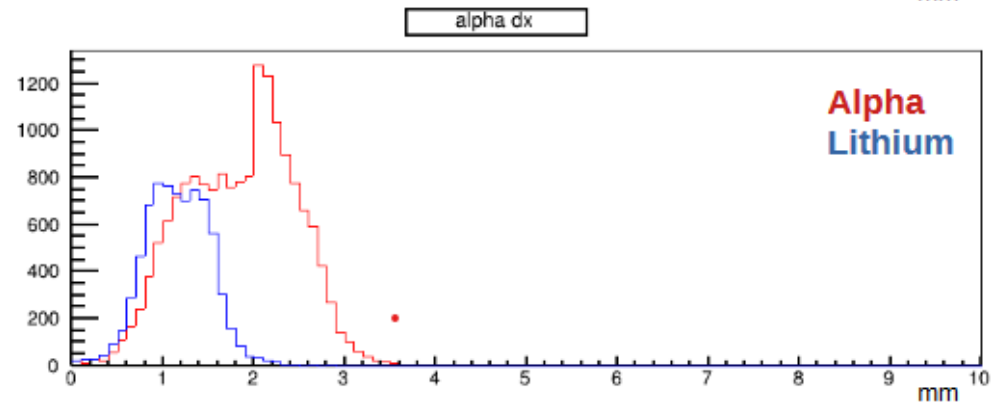
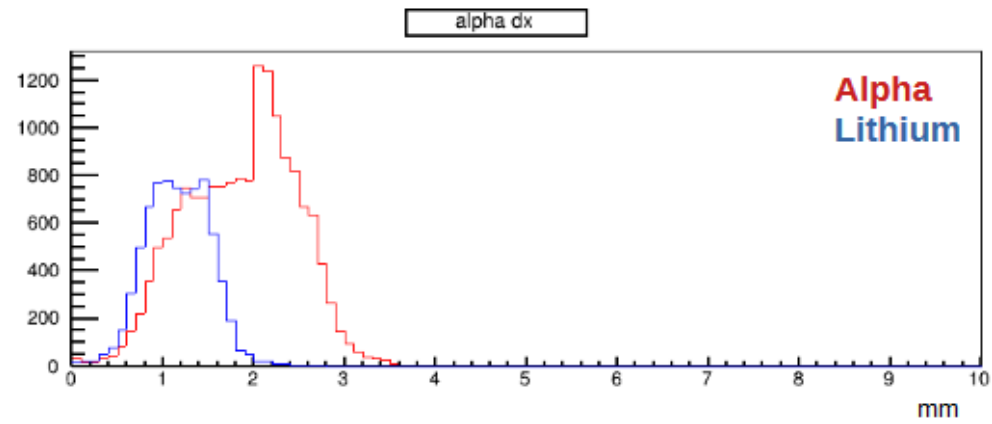
Richiesta per un altro test

SRPC stato delle simulazioni (solo GEANT4)

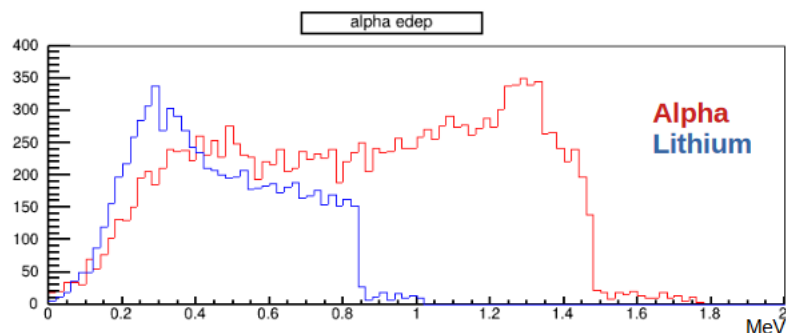


SRPC stato delle simulazioni (solo GEANT4)

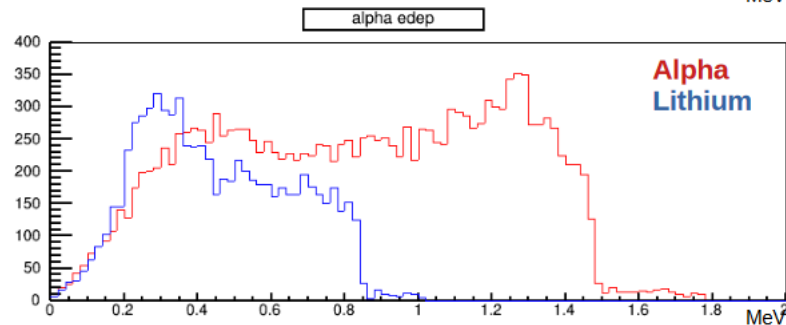
Track length



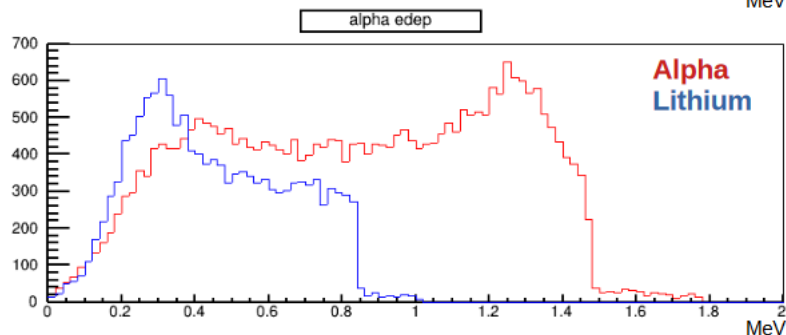
Edep in gas



version 1



version 2



version 3

Almost the same

Conversion efficiency

PRELIMINARY	VERSION 1	VERSION 2	VERSION 3
# alpha FWD	0	16732	15854
# alpha BWD	16324	(11)	14121
# lithium FWD	0	7444	7136
# lithium BWD	7666	(17)	6633
# total	23990	24176	43744
# impinging neutrons	964450	964406	963932
conversion efficiency	2.49 %	2.51 %	4.54 %

Why this is not 2.5+2.5?

Controllo generale delle simulazioni. Introdurre Garfield++?