SEP fluxes and simulations analysis

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Urbino University – INFN Florence

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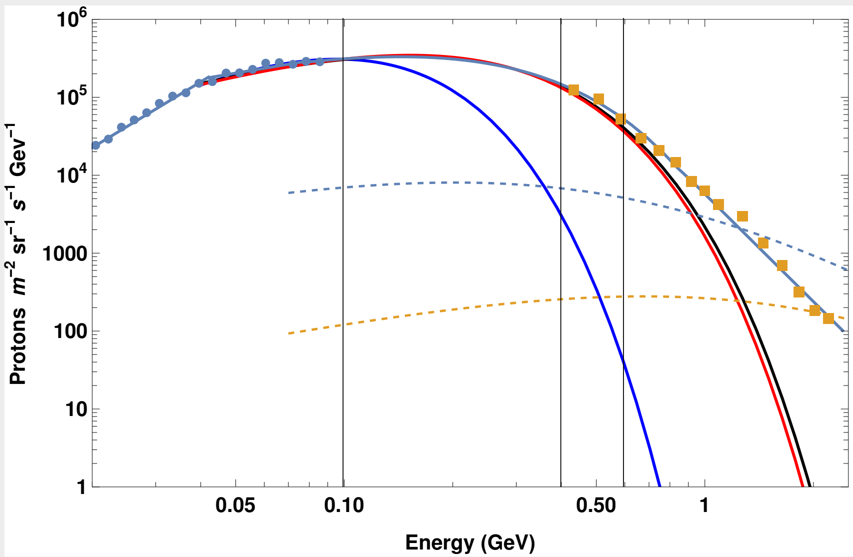
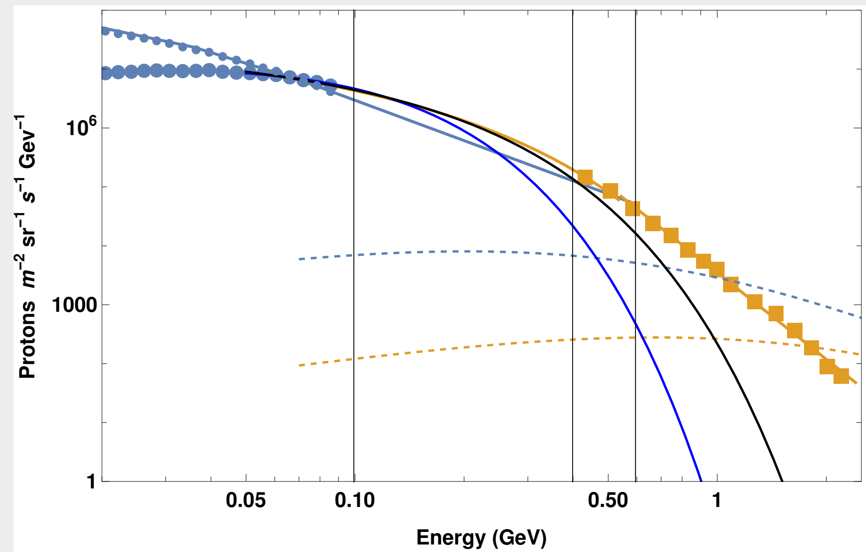
ONSET



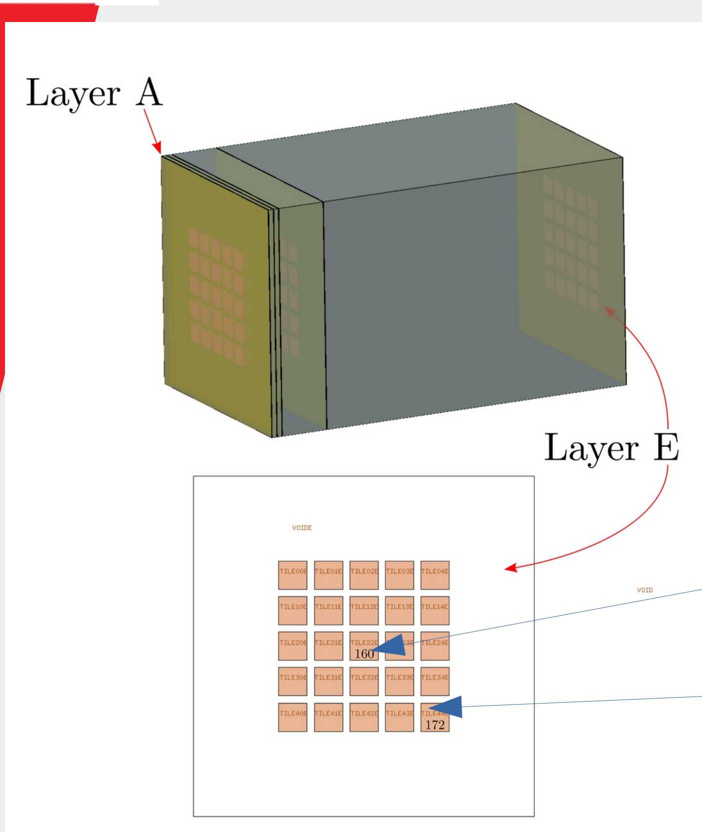
PEAK



Blue line: fit with low energy data
Light blue line: fit with high energy data
Black line: fit up-to 400 MeV

With low-energy data only, it is not possible to determine the high-energy portion of the curve

Protons simulation – 2.0 cm



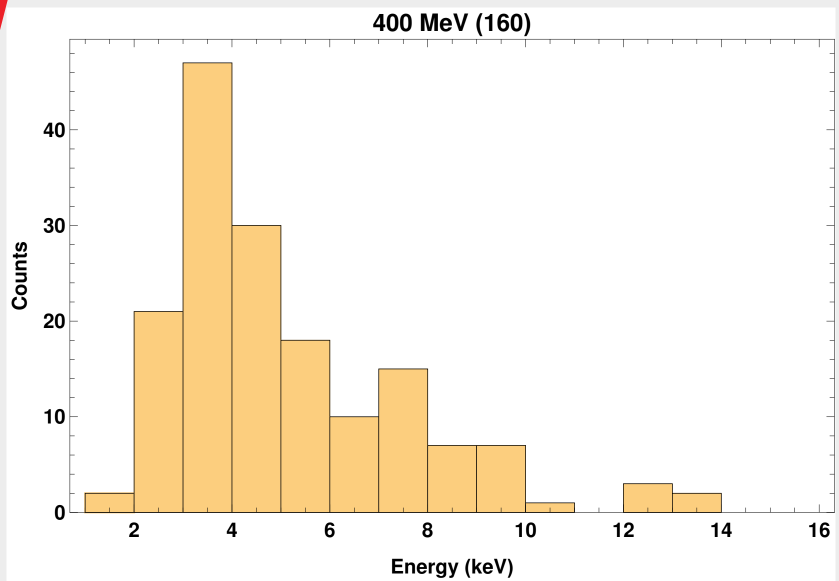
Region	400 MeV		600 MeV	
	Mean (keV)	RMS (keV)	Mean (keV)	RMS (keV)
160	3.1	11.2	2.3	6.3
172	3.2	9.9	2.1	4.7

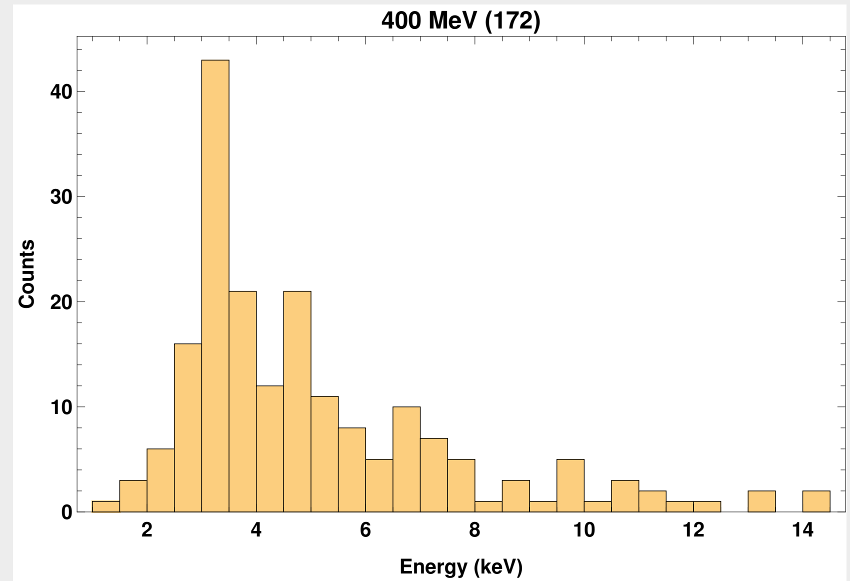
Stopped all protons up to 200 MeV

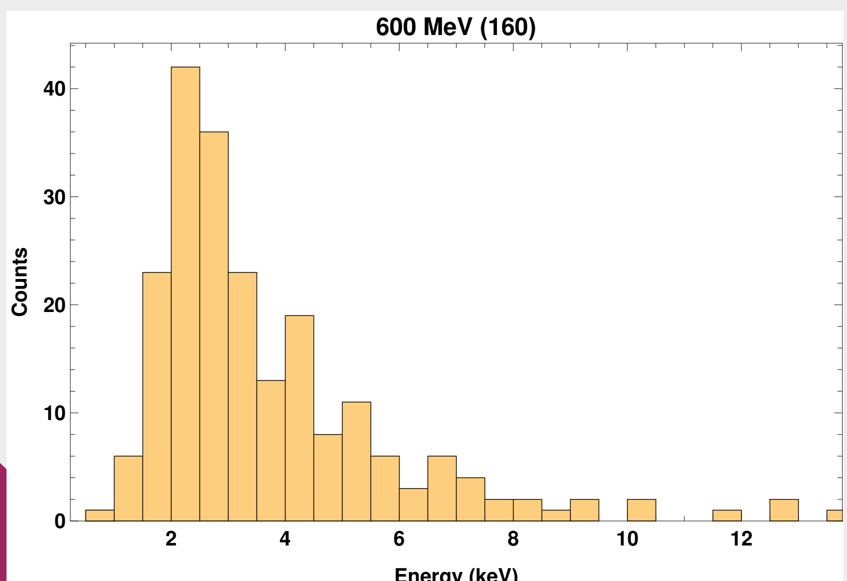
Stopped 35% protons @ 400 MeV

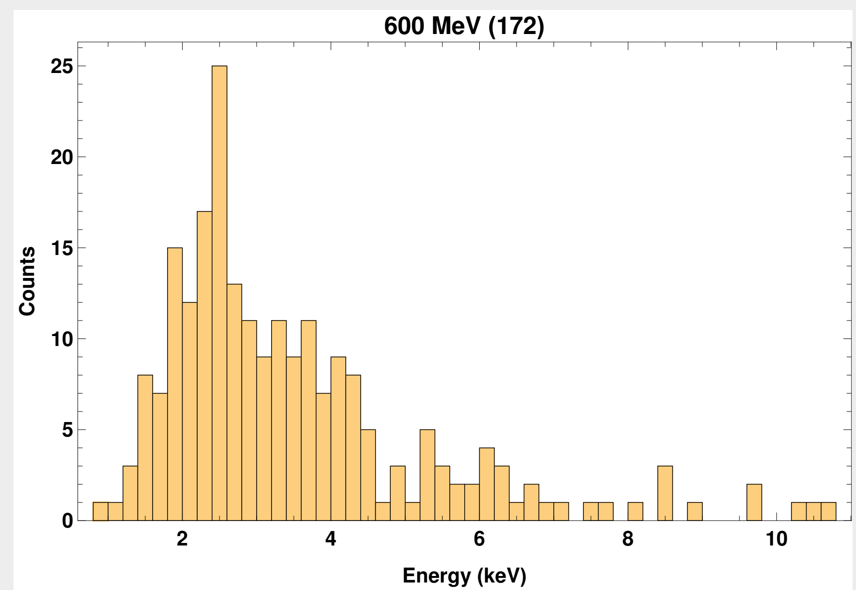
It is not possible to have a bin at 400 MeV without hard simulation work

Protons simulation – 2.0 cm

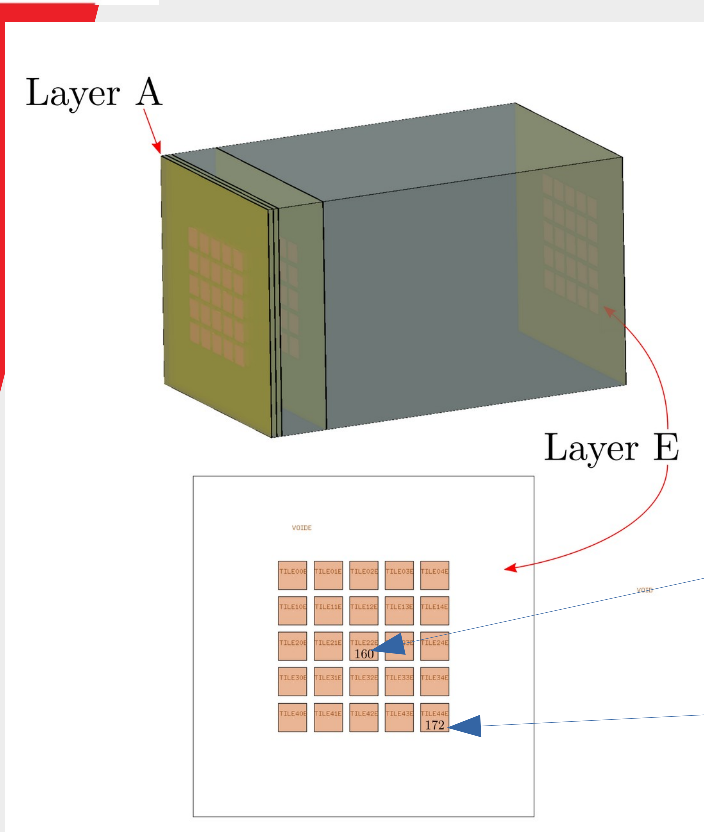








Protons simulation – 6.8 cm

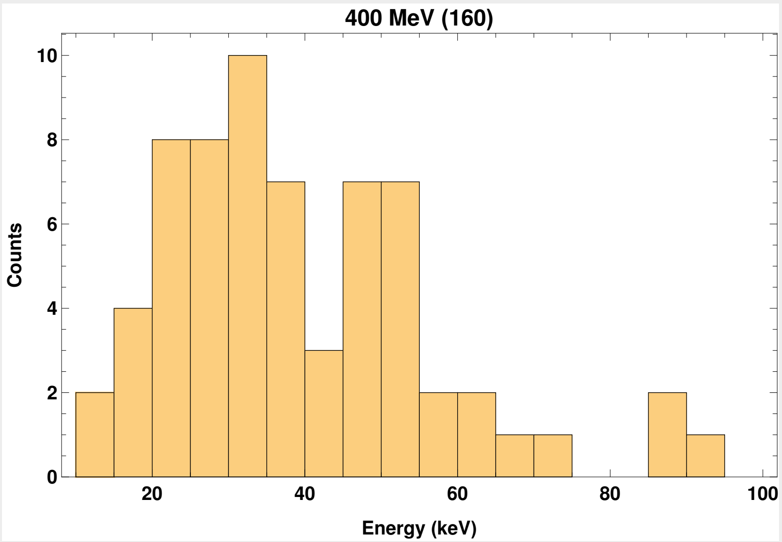


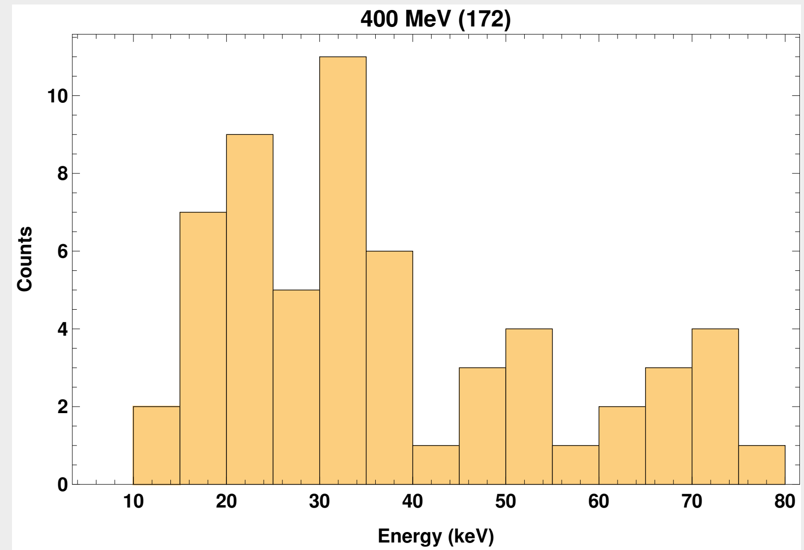
	400 MeV		600 MeV	
Region	Mean (keV)	RMS (keV)	Mean (keV)	RMS (keV)
160	11.7	26.4	4.2	26.1
172	16.1	36.1	2.1	5.0

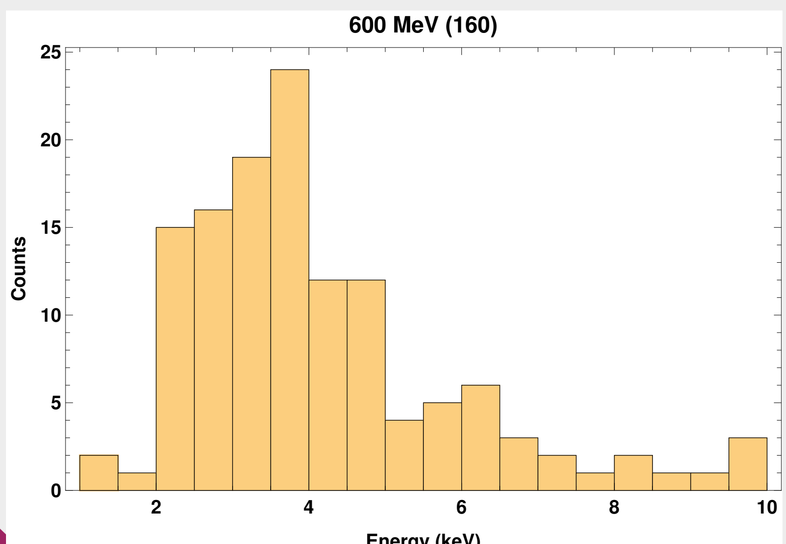
Stopped 75% protons @ 400 MeV

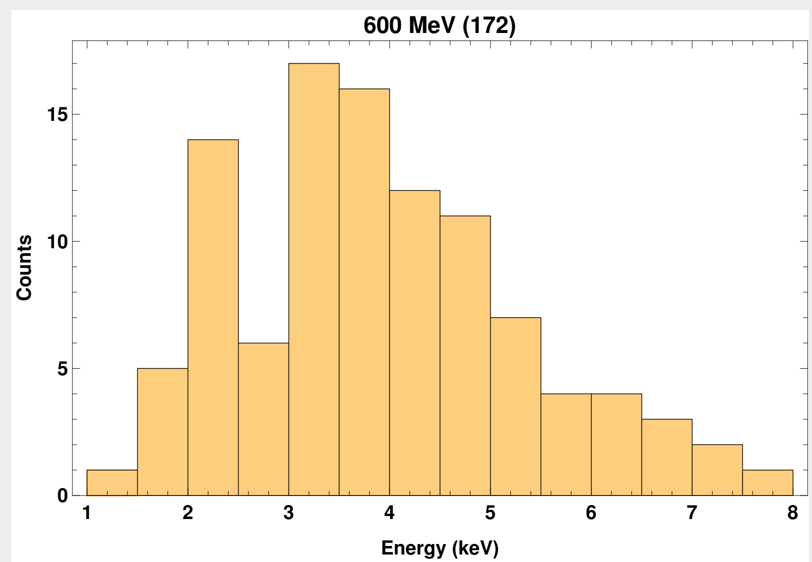
It would be possible to have a clear bin at 400 MeV

Protons simulation – 6.8 cm

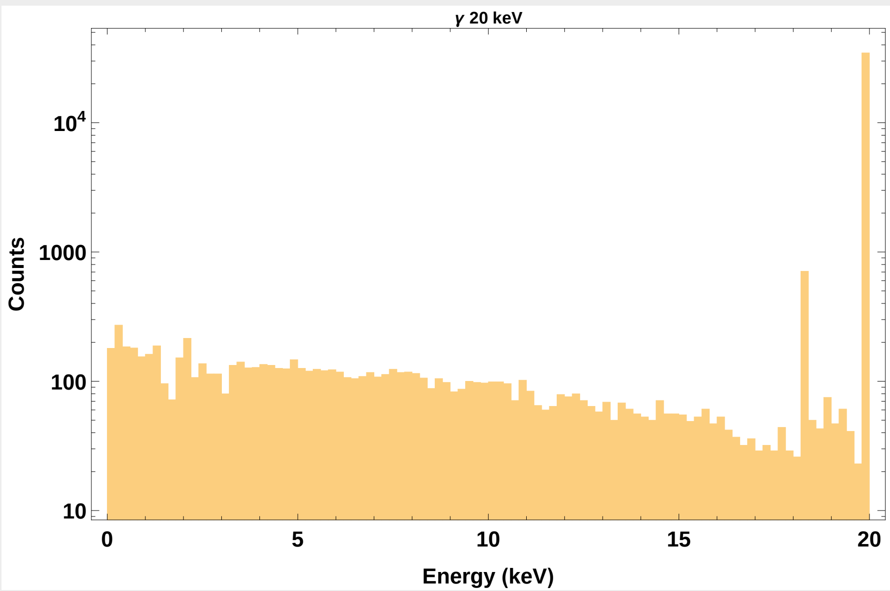


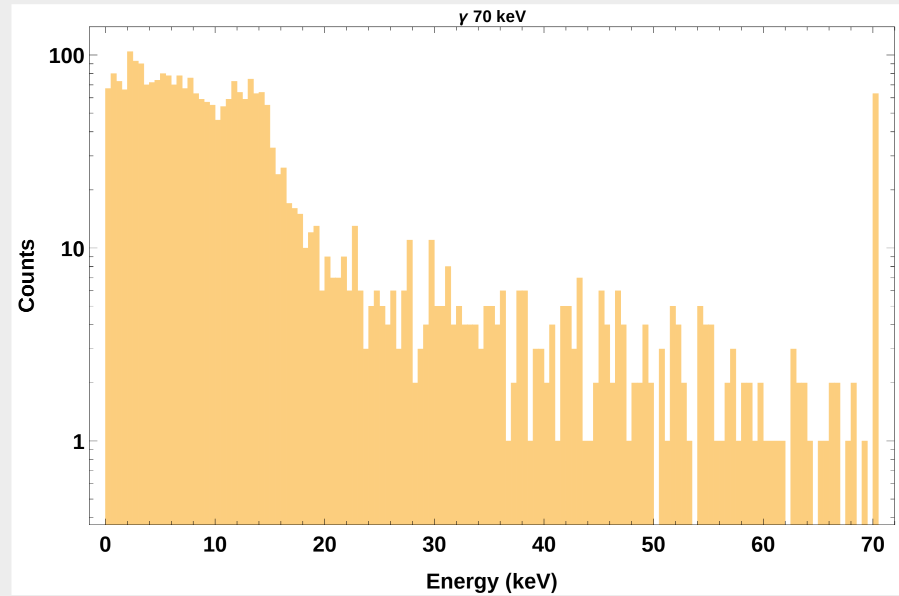






Gamma simulation
Simplified geometry



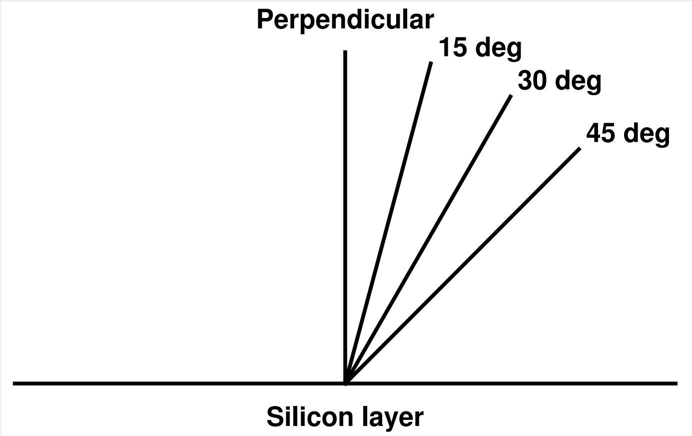


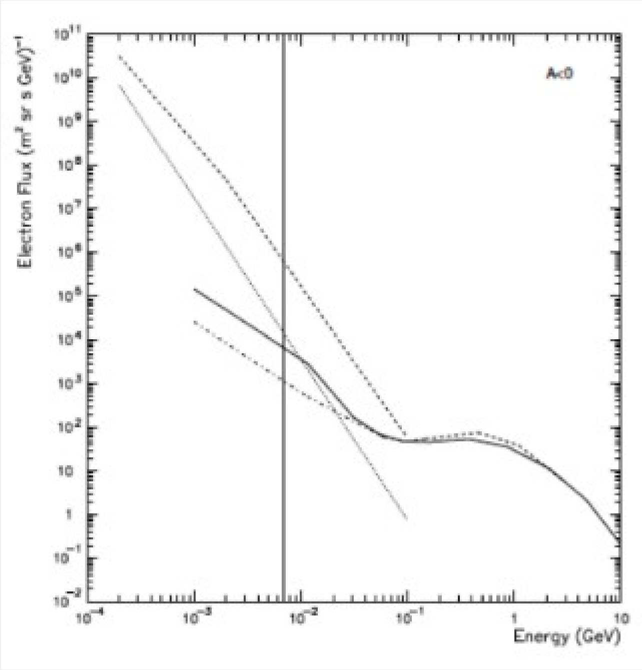
DEPOSITED ENERGY			
20 keV		**70 keV**	
Mean (keV)	RMS (keV)	Mean (keV)	RMS (keV)
0.15 (17.3)	**1.72** (18.3)	**0.007** (13.0)	**0.45** (19.7)

Solar Electrons simulation

Single layer

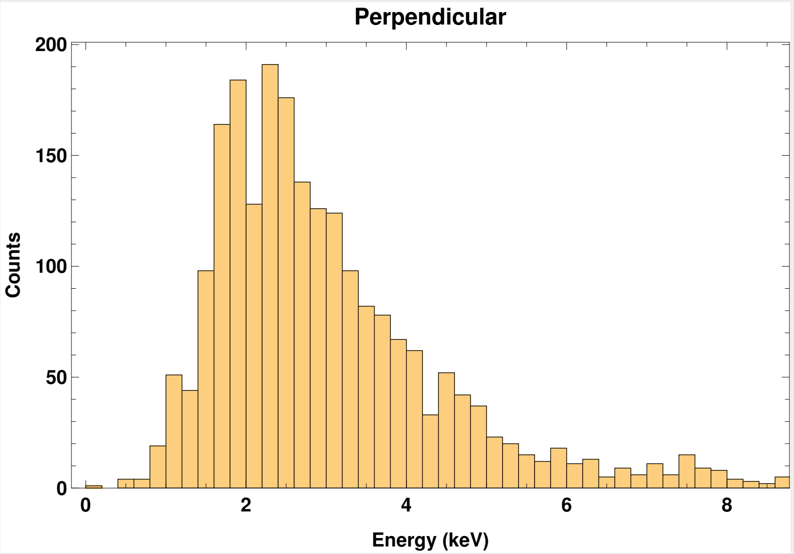
Perpendicular		15 deg		30 deg		45 deg	
Mean (keV)	RMS (keV)	Mean (keV)	RMS (keV)	Mean (keV)	RMS (keV)	Mean (keV)	RMS (keV)
4.0	9.7	4.2	7.4	4.8	8.6	6.7	13.7

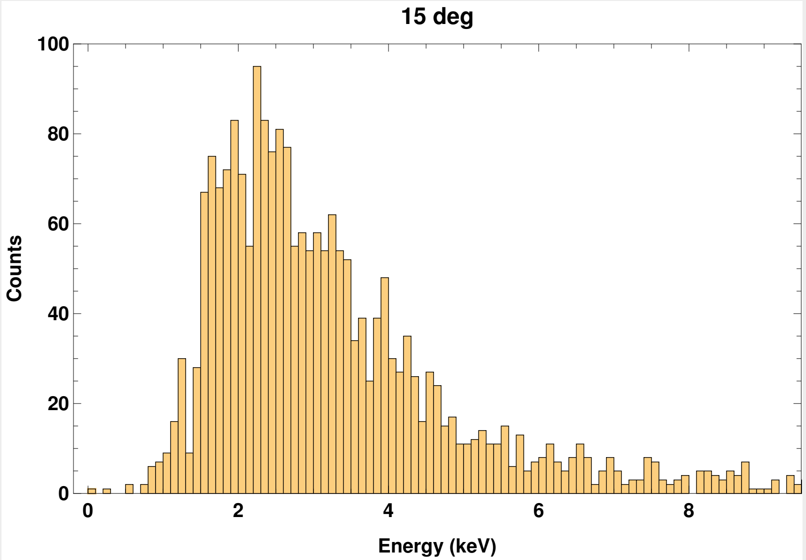


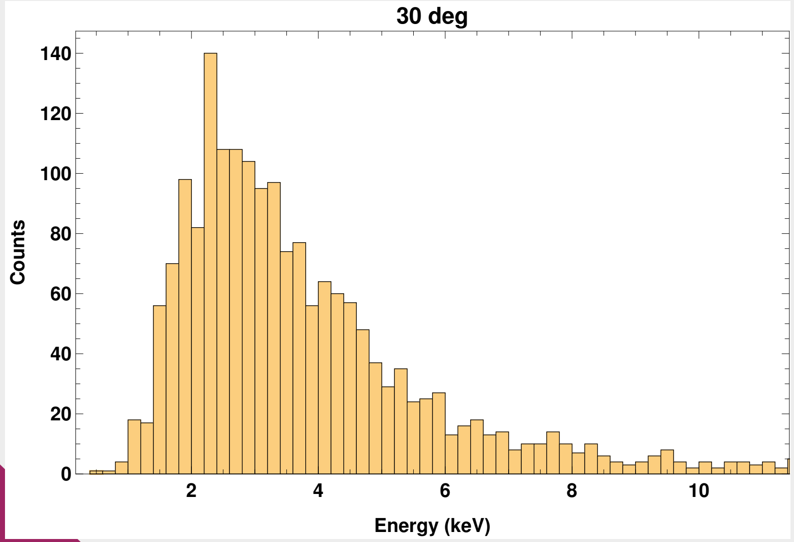


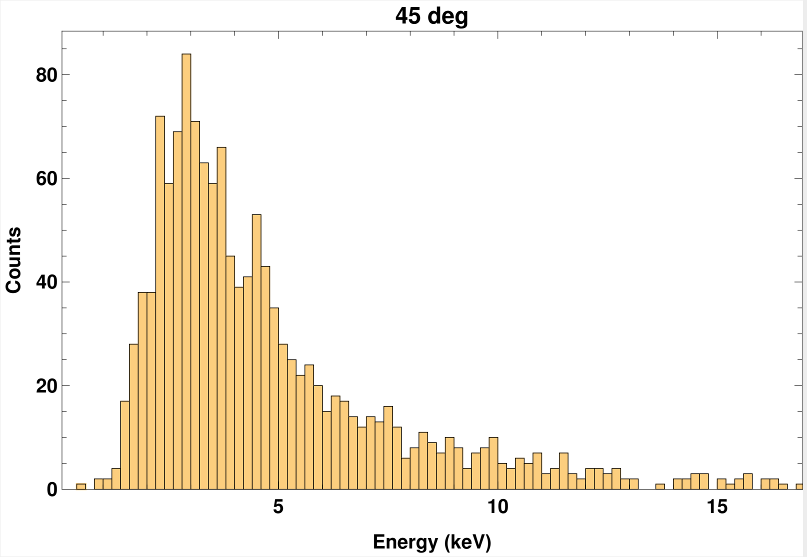
Solar Electrons simulation

Single layer









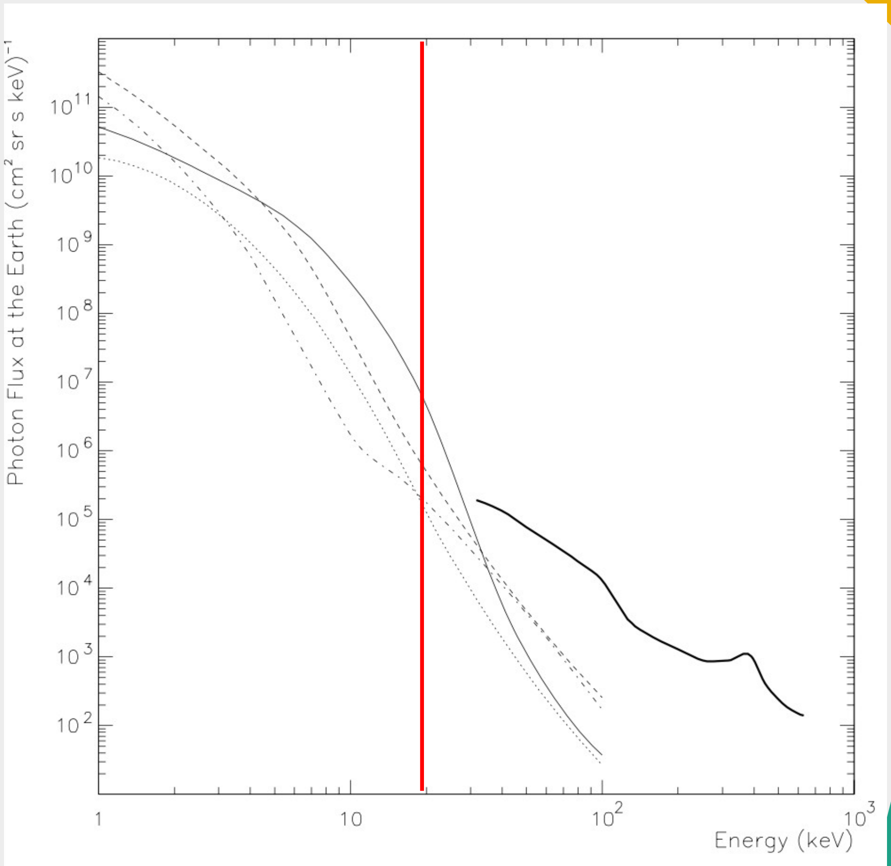
Back up slides

Detector performance

Photons

Detection limits at 5σ for monochromatic photon fluxes

Photon Energy [keV]	Minimum detectable flux [$\gamma/(cm^2$ sr s)]
3.0	$2.4 \cdot 10^3$
5.0	$3.8 \cdot 10^3$
10.0	$10.2 \cdot 10^3$
15.0	$20.2 \cdot 10^3$
20.0	$33.0 \cdot 10^3$
25.0	$47.8 \cdot 10^3$
30.0	$79.8 \cdot 10^3$
35.0	$150.0 \cdot 10^3$
40.0	$237.0 \cdot 10^3$



Thick line: Flare magnetar @ 1 kpc
Other lines: Solar X flare @ 1 AU

Detector performance

Protons

Detection limits at 5σ for monochromatic protons fluxes

Proton Energy [MeV]	S/N = 1 Flux [p $(cm^2\ sr\ s)^{-1}$]
5.0	$0.4 \cdot 10^3$
10.0	$0.5 \cdot 10^3$
20.0	$1.0 \cdot 10^3$
50.0	$1.5 \cdot 10^3$
70.0	$3.0 \cdot 10^3$
100.0	$3.5 \cdot 10^3$
200.0	$5.0 \cdot 10^3$
400.0	$10.0 \cdot 10^3$

One has to keep in mind that tungsten layers will reduce protons energy:

this means that in the last layer more energy will be deposited wrt the first.