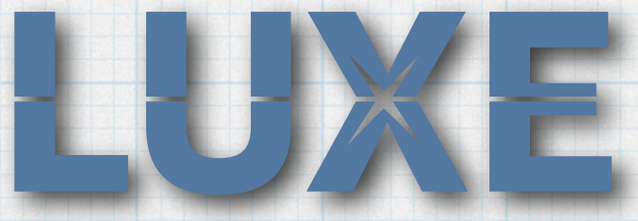
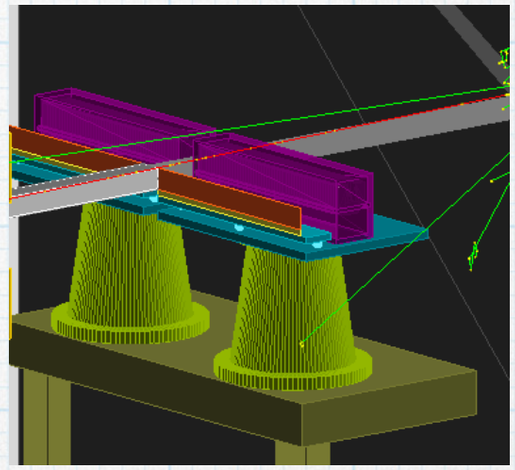
Photon flux measurements

Borysova Maryna
2/11/20
LUXE analysis meeting

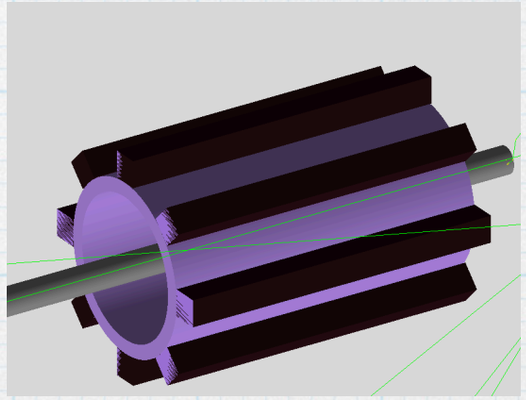


Tasks

To measure total flux of photons above some threshold (~MeV-GeV)



- the technologies:
  a) conversion detector

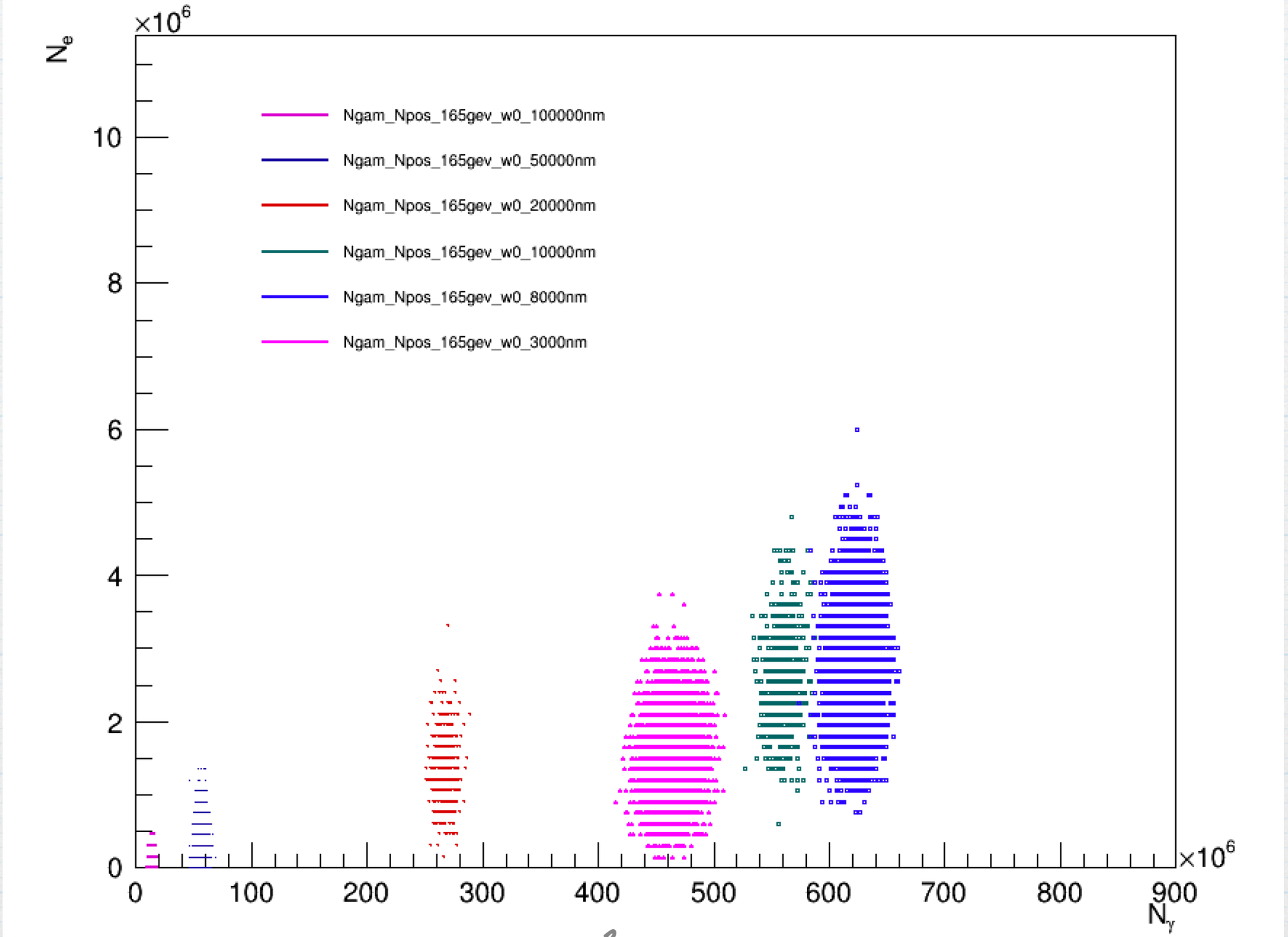


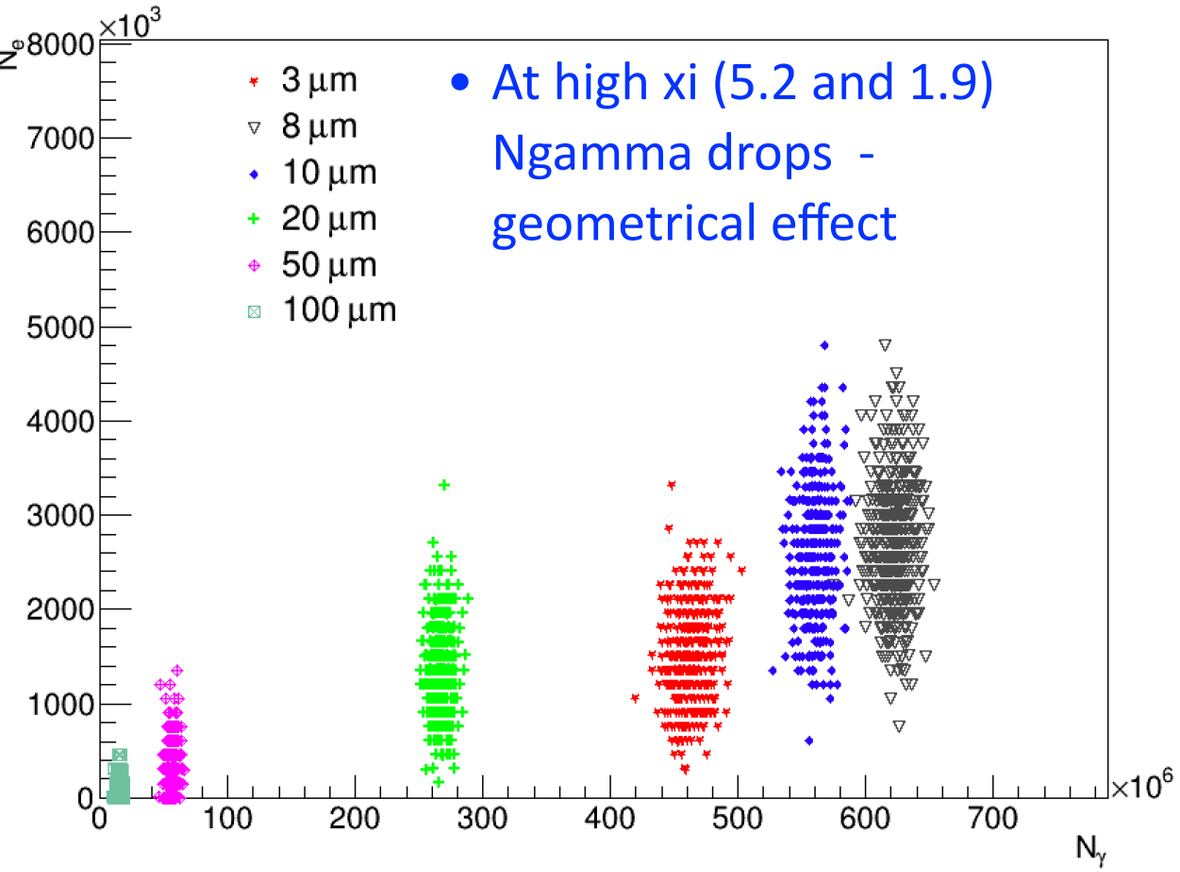
b) backscattering calorimeter

For the CDR
a) quantify how well a) and b) can measure the flux and above which threshold =>
 show relative resolution on photon flux of the two technologies as function of number of photons

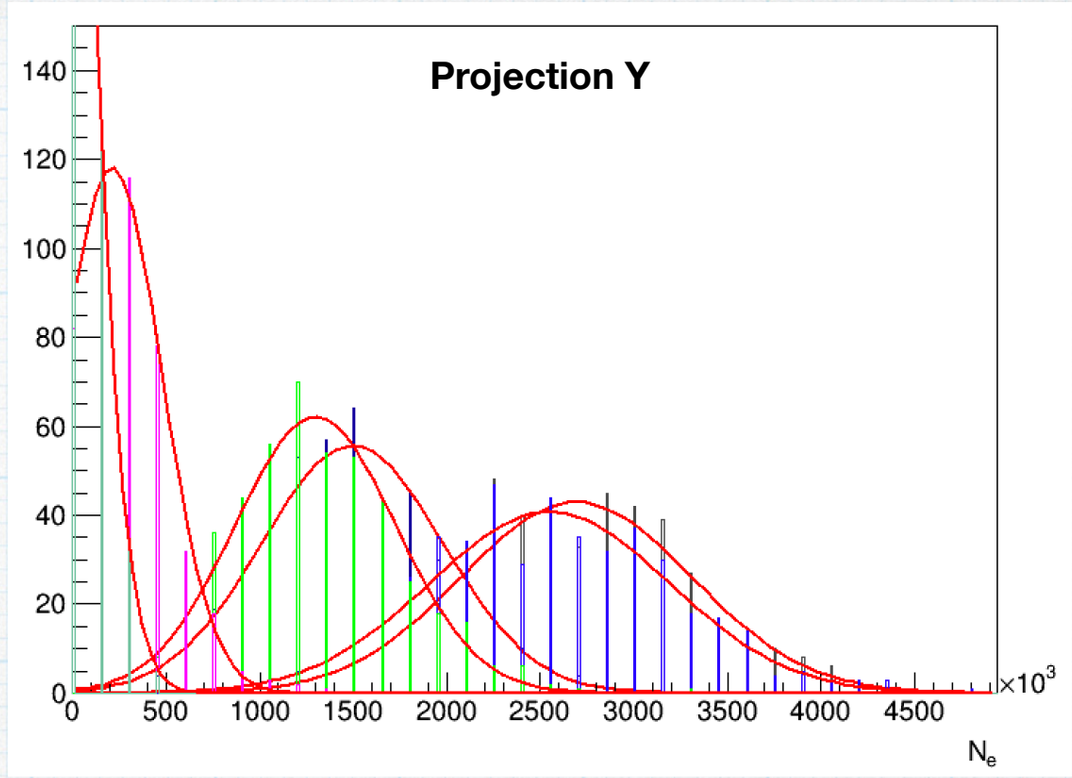
number of pairs vs number of photons per BX for different xi in Lanex scrteens (setup w/o beam pipe)

JETI40, 16.5 GeV, 50 um

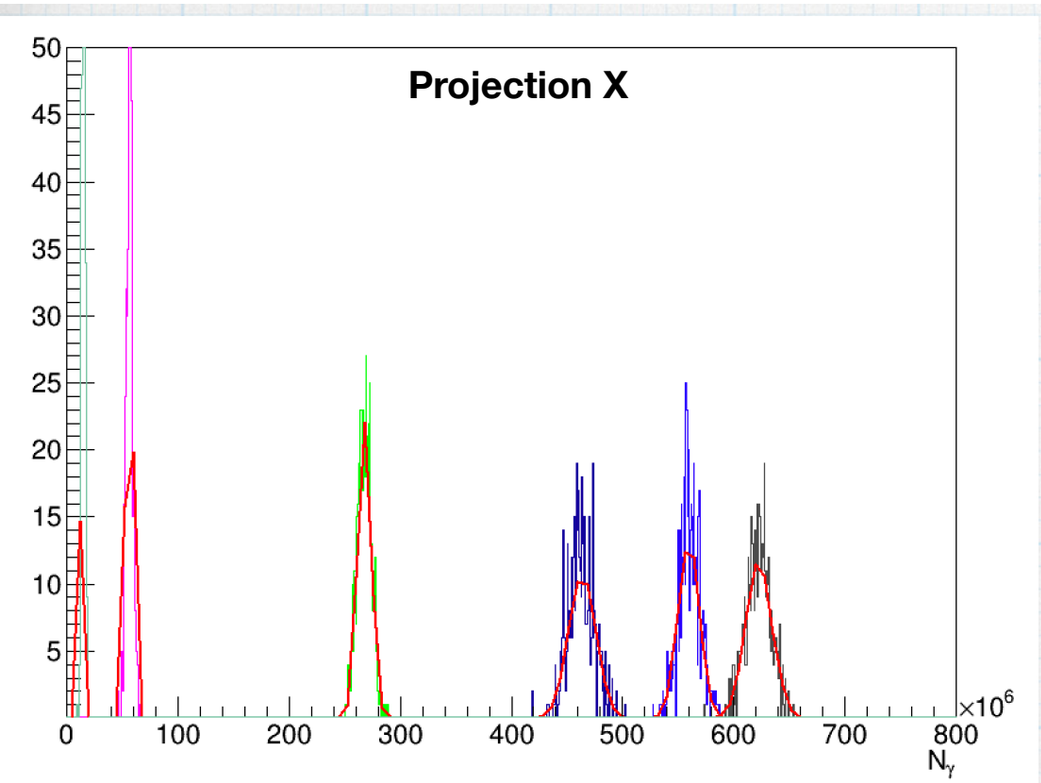




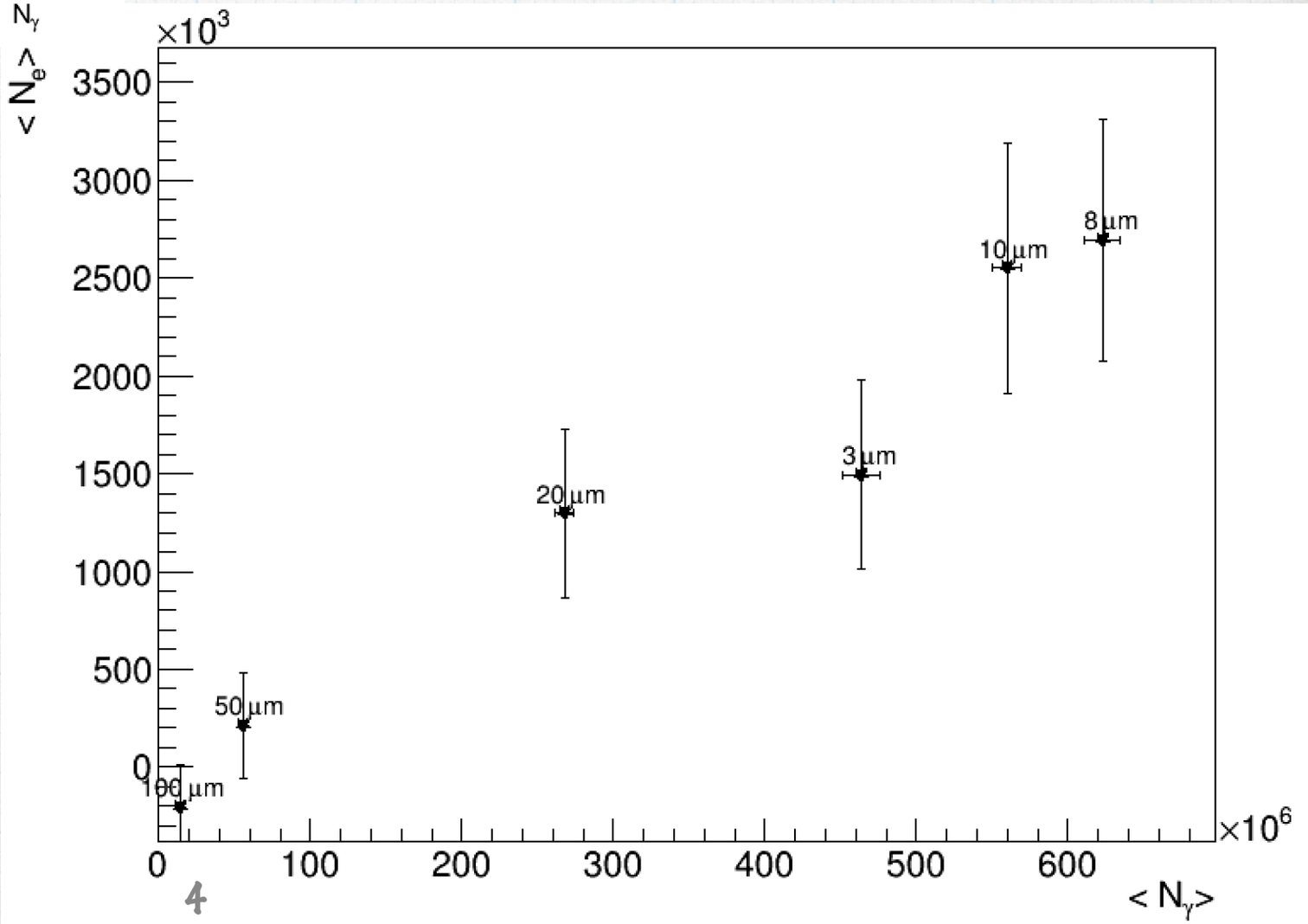
- At high xi (5.2 and 1.9) Ngamma drops - geometrical effect



460 BX



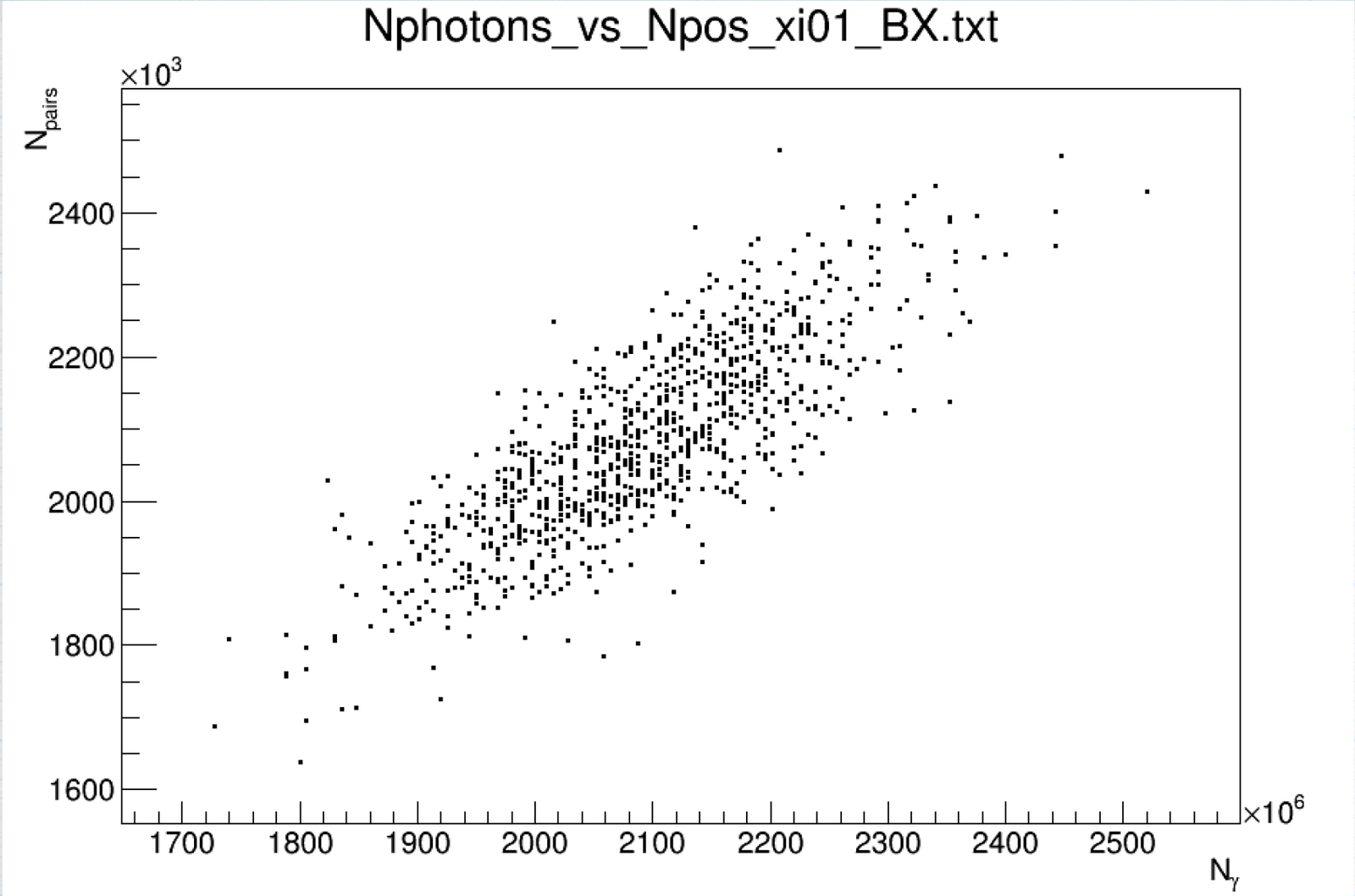
- Spread in number of electrons is substantial ~ 25-30%



Summary

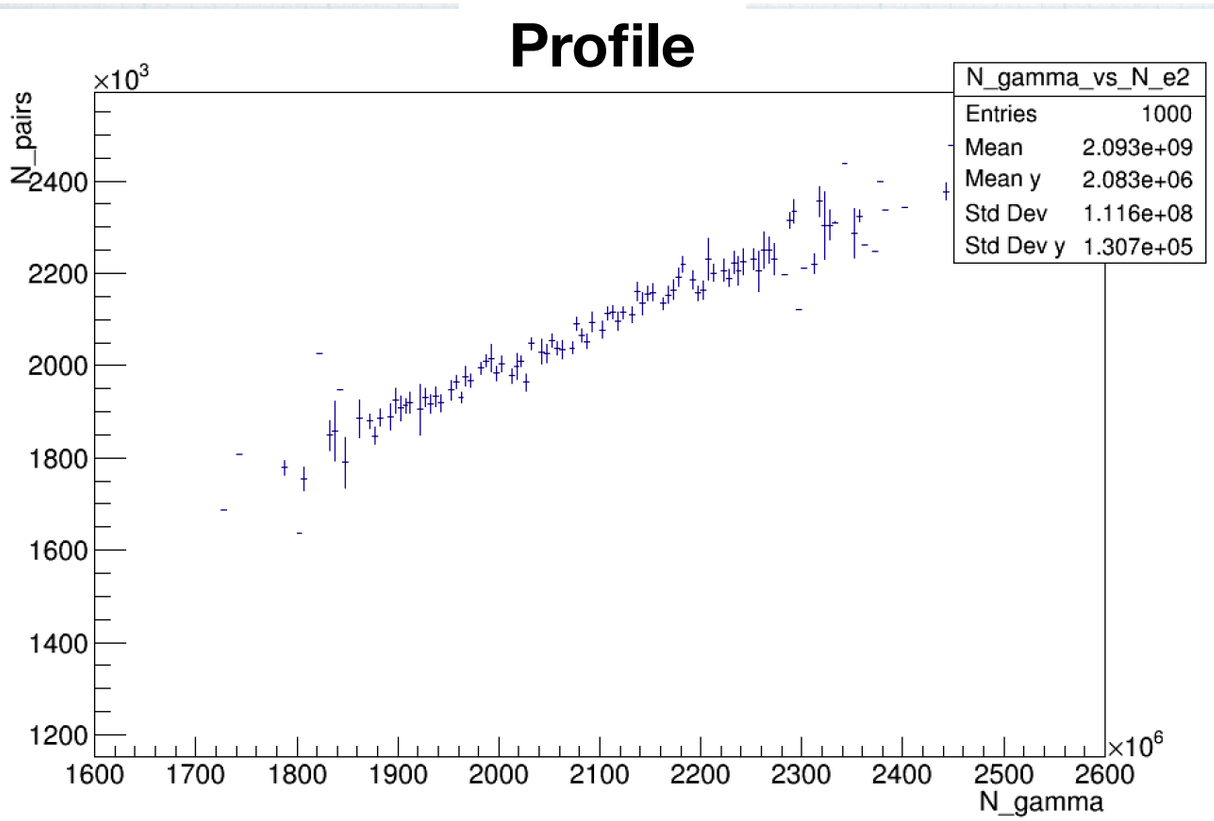
* To estimate relative resolution on photon flux for the Lanex screens as function of number of photons for new MC and updated G4 setup

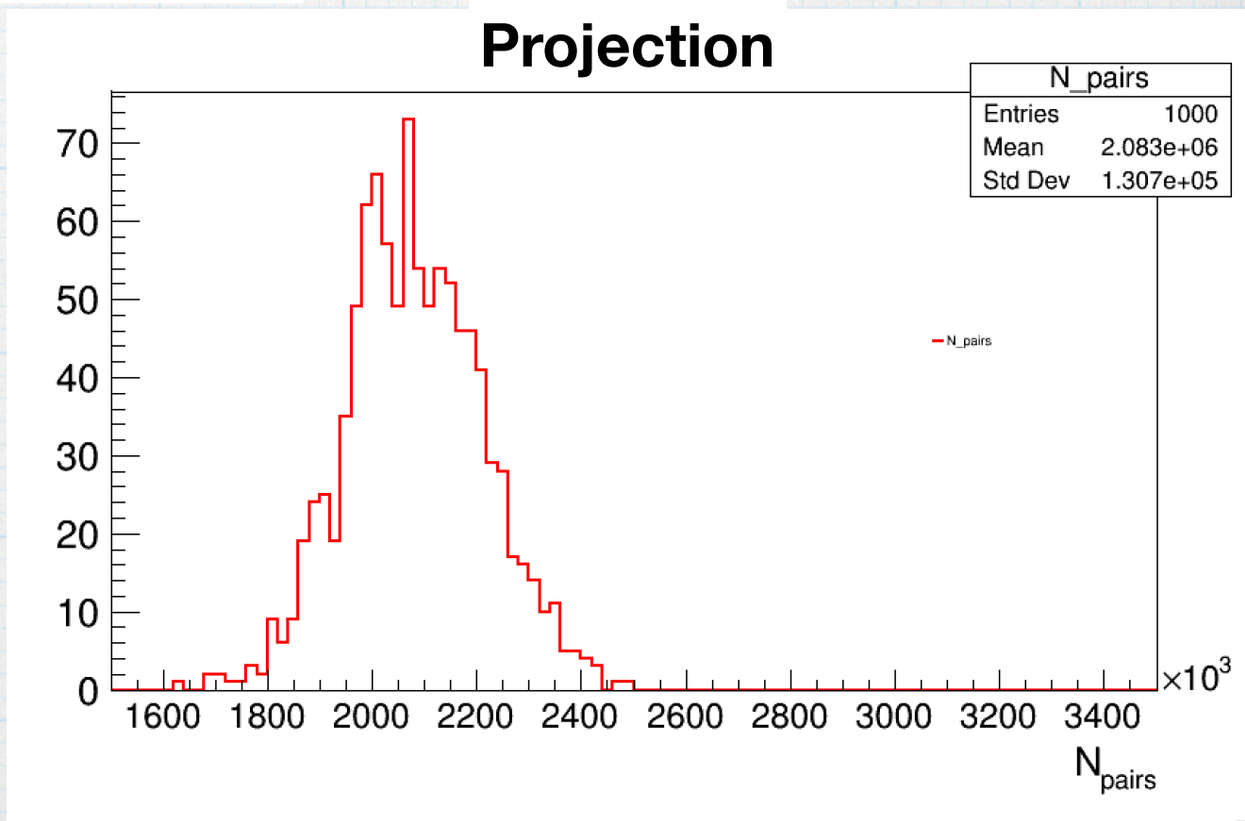
Back up



To estimate relative resolution on photon flux:

number of pairs vs number of photons per BX for xi=0.8 (0.1 J)



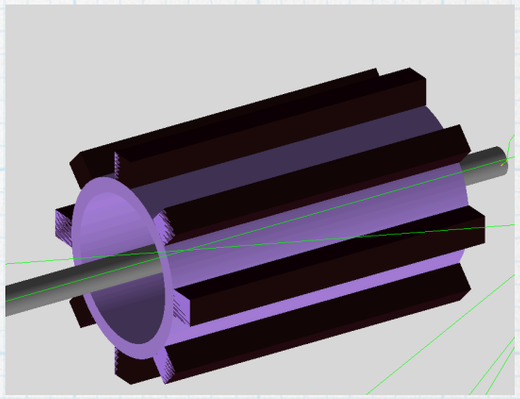


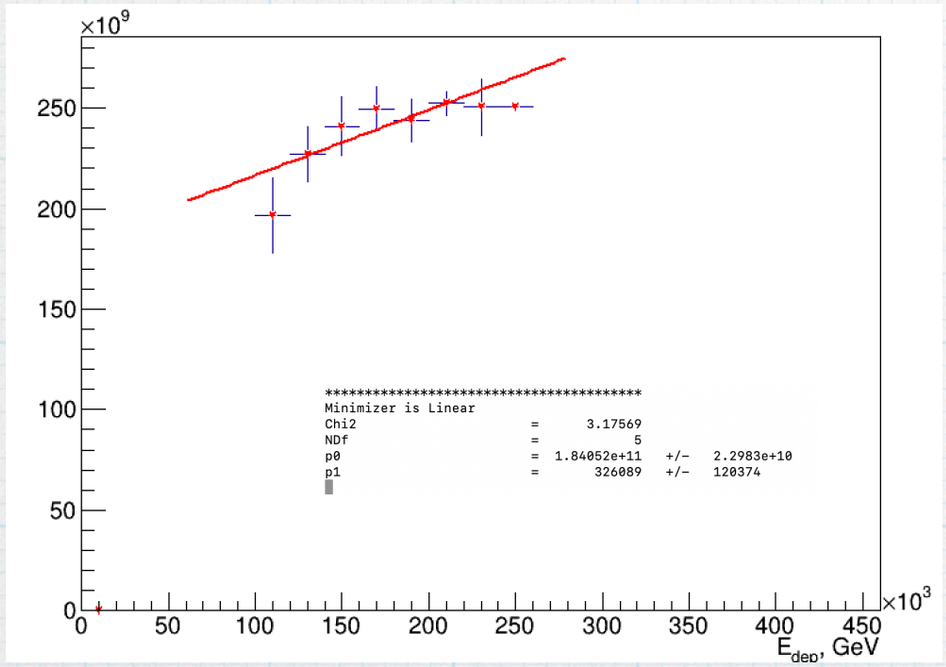
To estimate relative resolution on photon flux

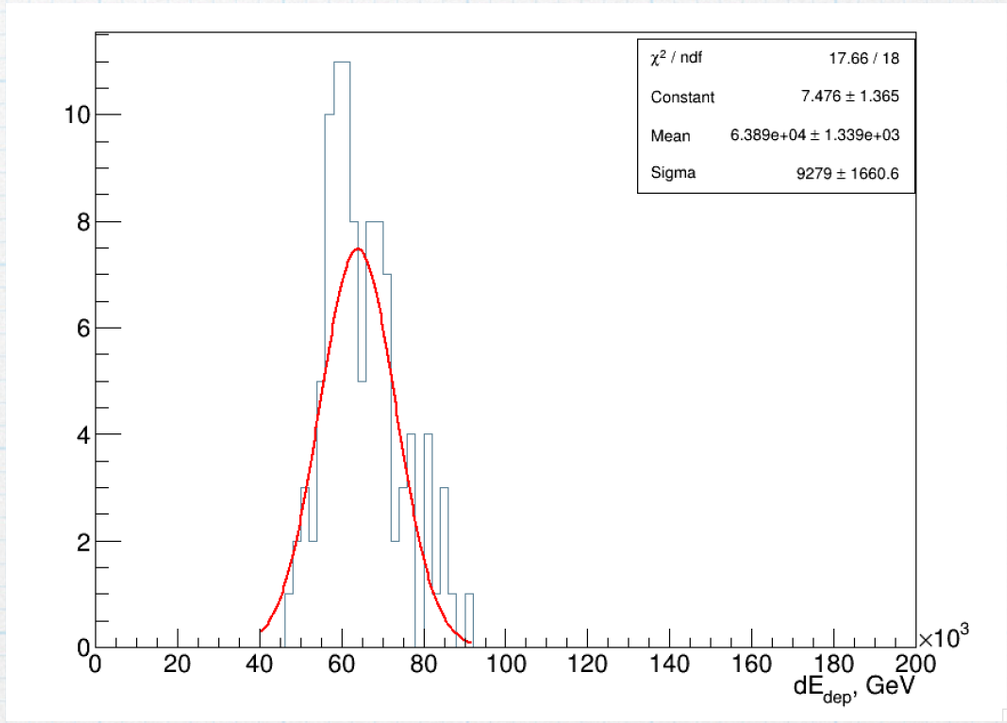
N(E) number of photons

$$\Delta N = \frac{\partial N}{\partial E}\Delta E \quad \Rightarrow \quad \frac{\Delta N}{N} = \frac{1}{N}\frac{\partial N}{\partial E}\Delta E$$

- ξ = 2.0







ξ = 2.0 : ΔN/N=9.3*10³*3.3*10⁵/4.3*10¹⁰ =7.1*10⁻²

ξ = 2.6 : ΔN/N=3.3*10⁴*3.3*10⁵/2.5*10¹¹ =4.4*10⁻²

the uncertainty on number of measured photons will be ~ 3.5 *10^{-3} - 7.1 *10^{-2}.

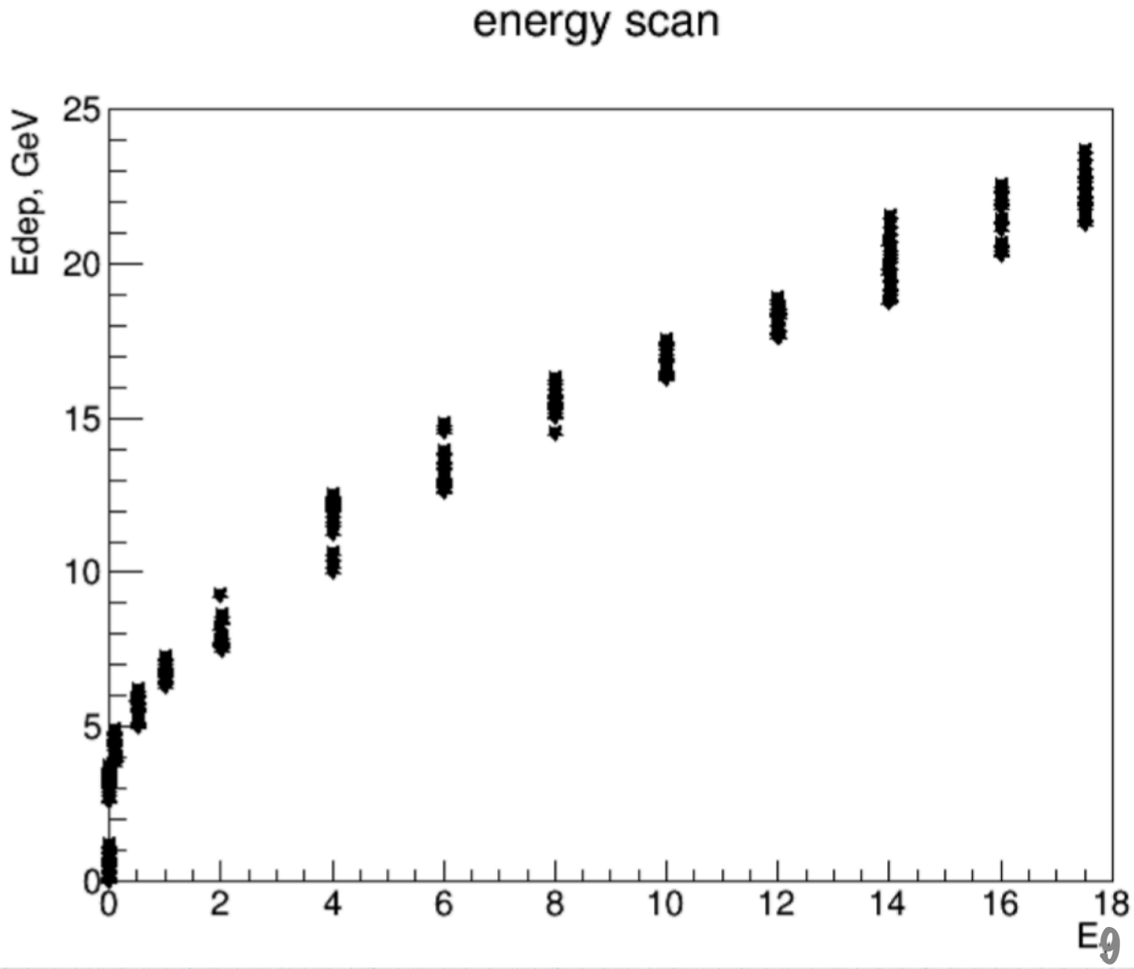
To estimate above which threshold detector is sensitive

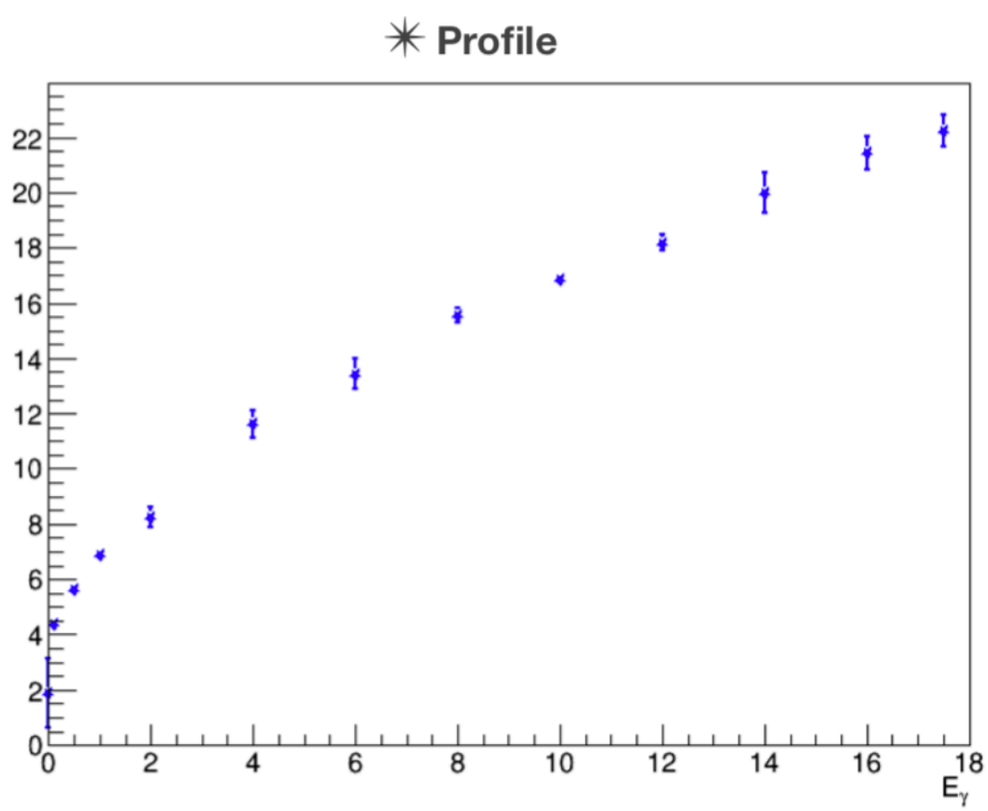
backscattering calorimeter with 48 blocks, running now for the configuration with 8 blocks

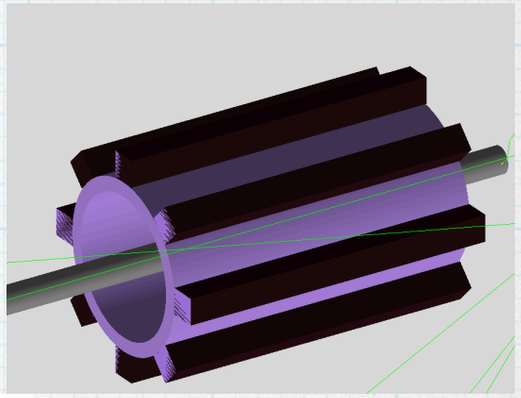
Energy dependence of deposited energy in Gamma monitor

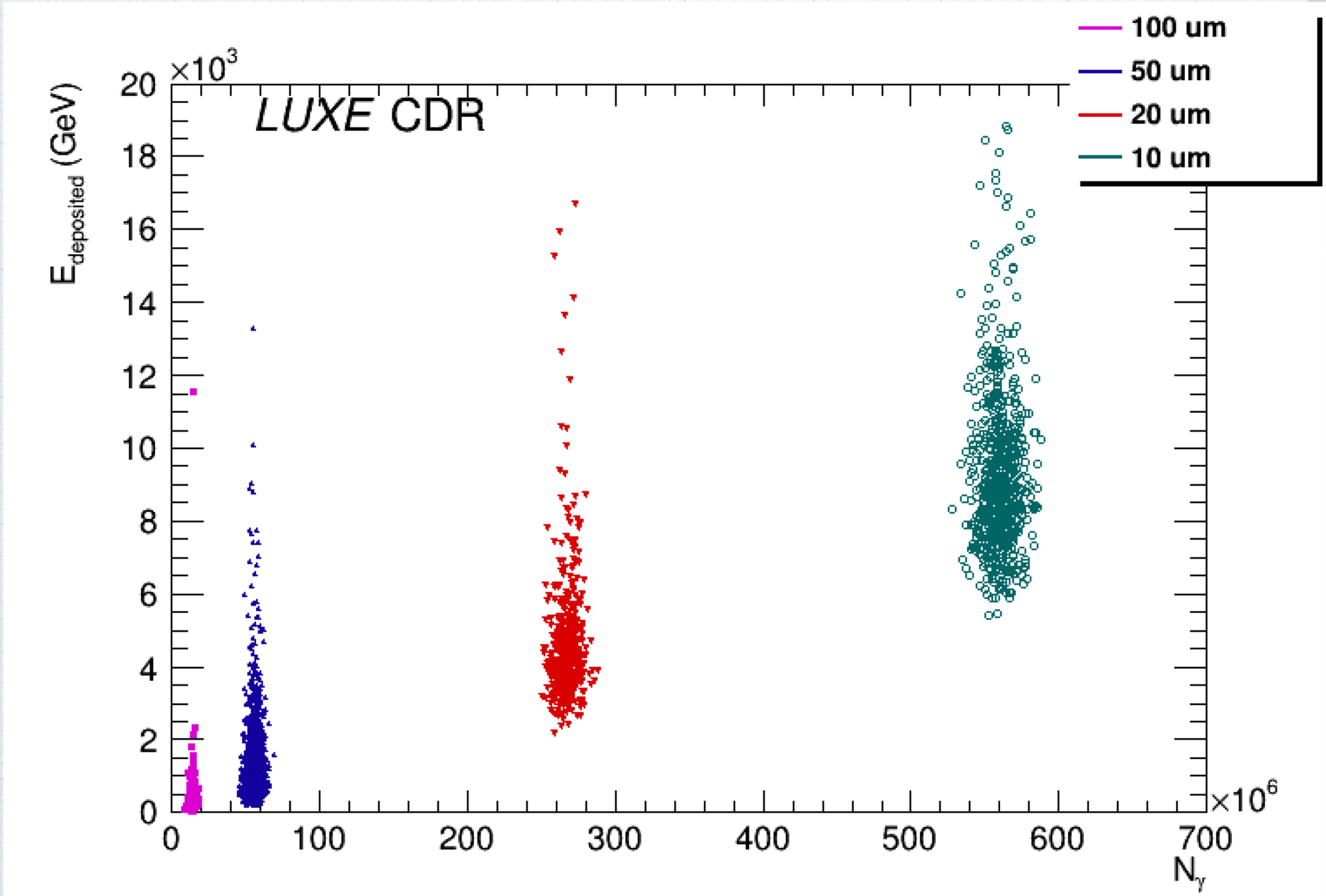
20 Runs* 100000 photons with mono energies: 1,2,4,6,8,10,12,14,16 and 17.5 GeV

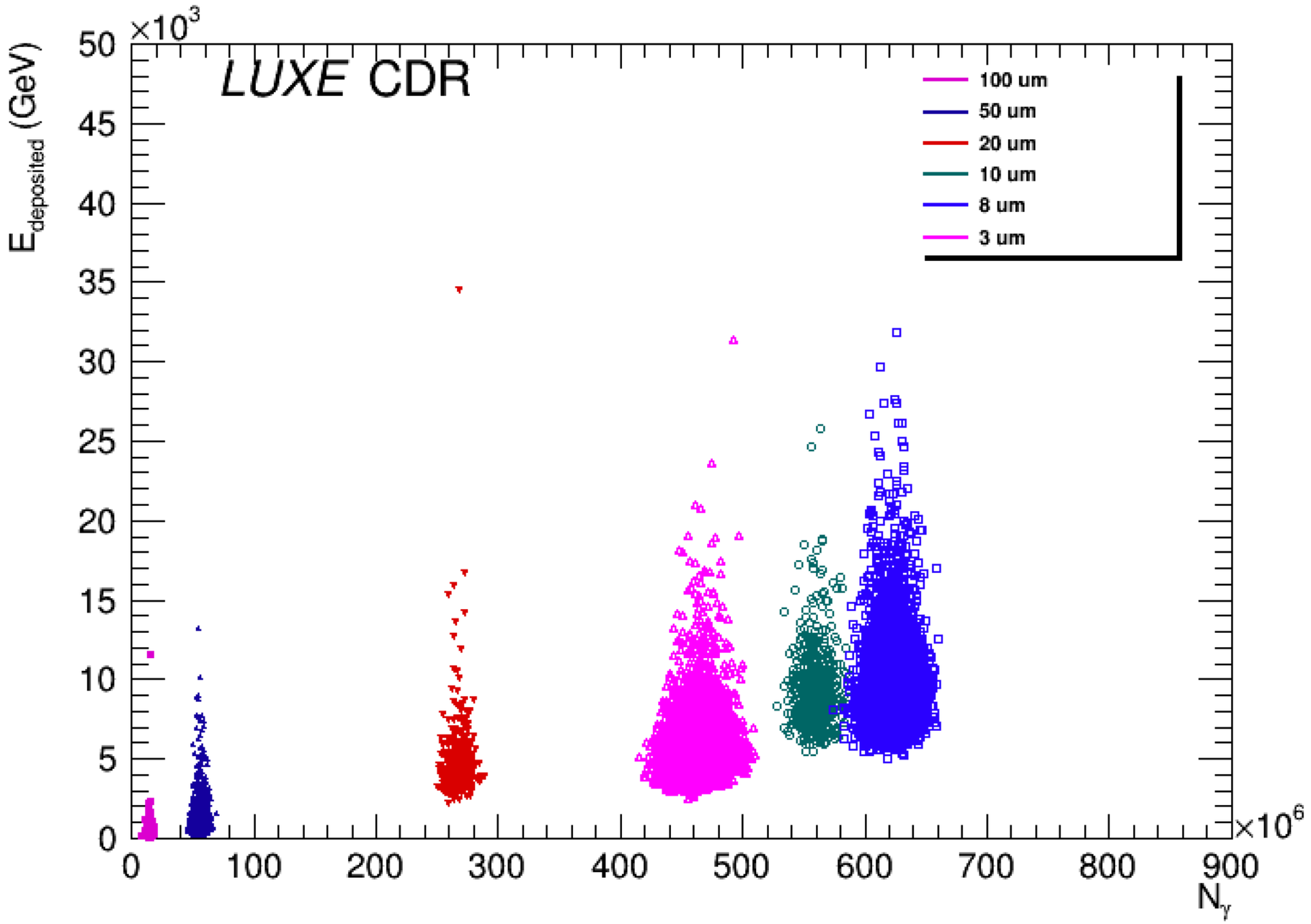
Added lower energies 0.0001, 0.1, 0.5 GeV








LUXE CDR
100 um
50 um
20 um
10 um
$E_{deposited}$ (GeV)
$\times 10^3$
20
18
16
14
12
10
8
6
4
2
0
0
100
200
300
400
500
600
700
$\times 10^6$
N_γ


LUXE CDR
$E_{deposited}$ (GeV)
$\times 10^3$
50
45
40
35
30
25
20
15
10
5
0
0
100
200
300
400
500
600
700
800
900
$\times 10^6$
N_γ
100 um
50 um
20 um
10 um
8 um
3 um