G4LhARA_ES

End-station considerations

Must be an enclosed system to allow controlled environment

*** temperature**

*** humidity**

*** hypoxia / CO2 levels**

Sample handing must be fast, simple, and not impact the environment to avoid issues with cells

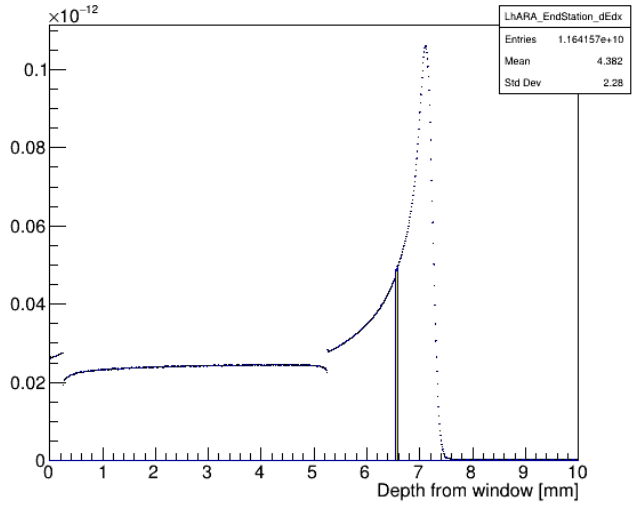
15 MeV is not a lot of range to play with.

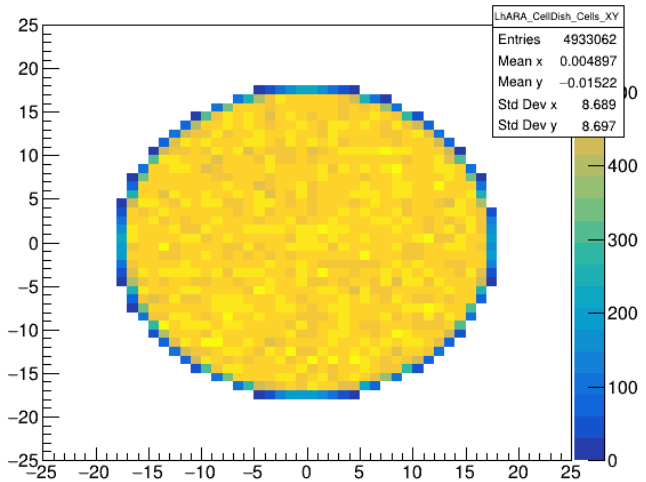
Stage 1 End-station [Pre-CDR]

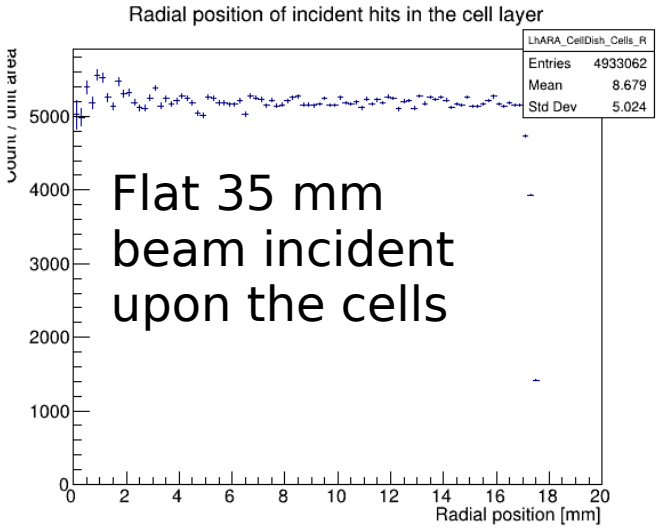
Simulation setup to closely match that of the Pre-CDR.

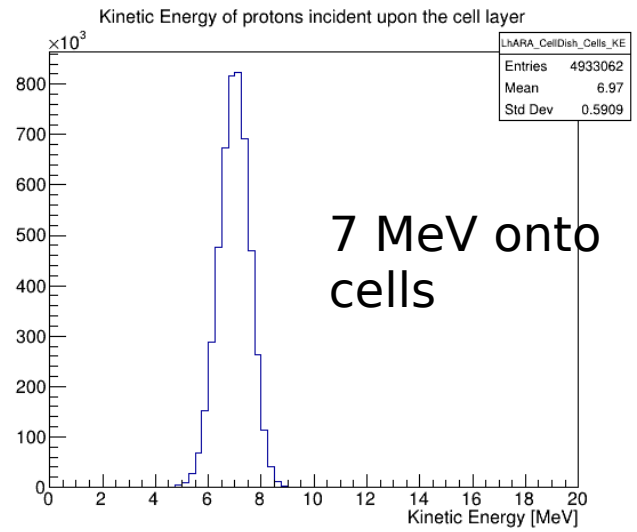
* **25um Ti vacuum window**
* **100um end-station plastic window**
* **250um plastic beam monitor**
* **5mm air gap**
* **1.3 mm cell dish base**
* **30um cells**
* **2mm water (or Marcus chamber for dose)**

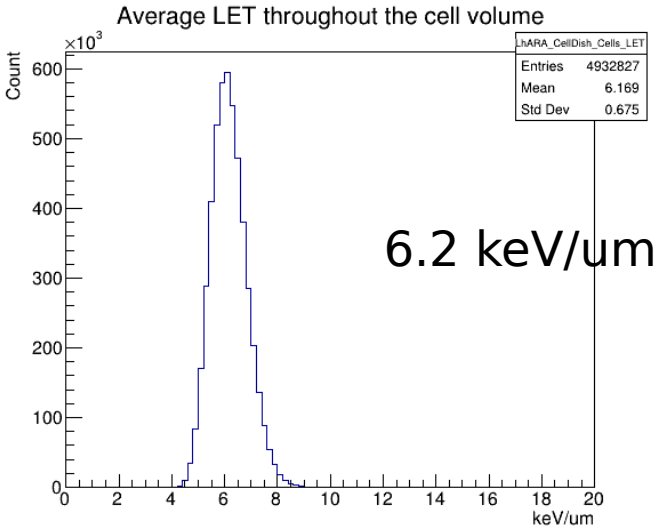
Presented at Consultation Meeting 2

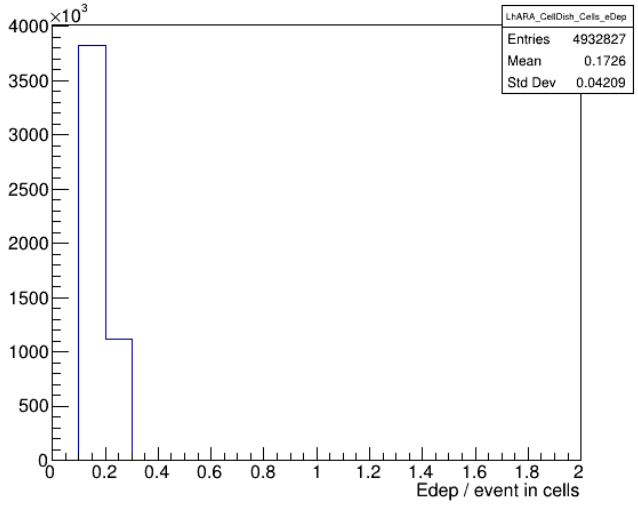












Cell dish base thickness

Discussed at length during the ConMs

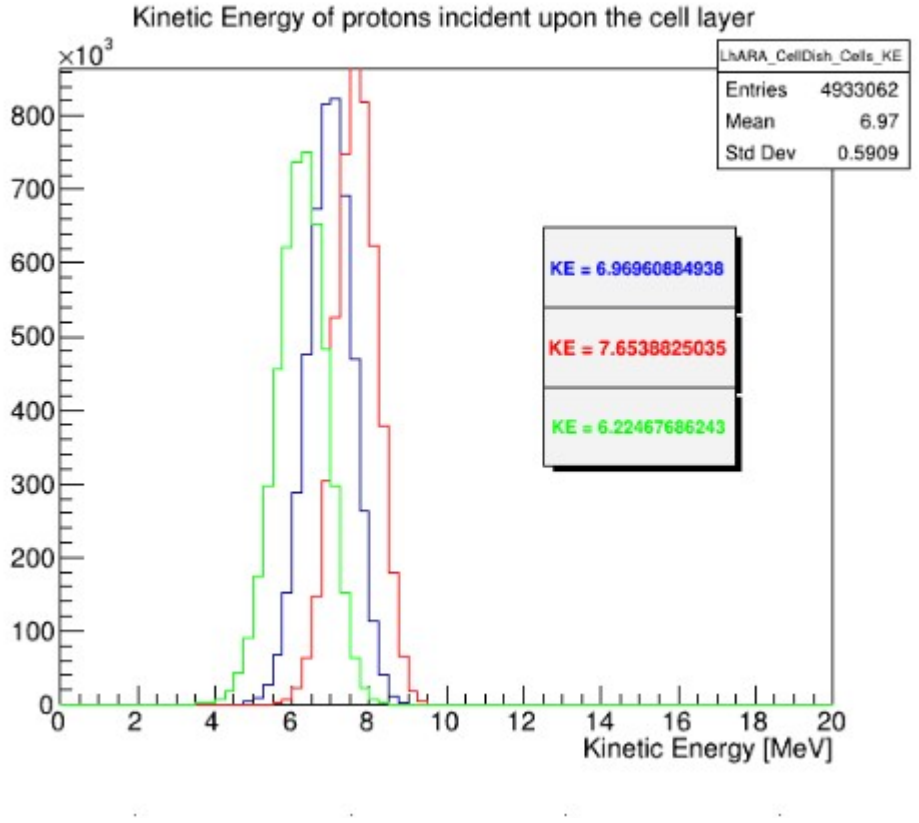
Standard cell dishes have a range of +/- 100um on the thicknesses

Measurements by Aran Colder (UoB summer student) showed that these group into distinct groups of 1.2, 1.3, 1.4mm of a few micron width

Variable material in the beam will have impact on the cell irradiations.

Energy and LET change. JP says still low LET so should be OK

Implications if energy of beam reduced to do high LET work!



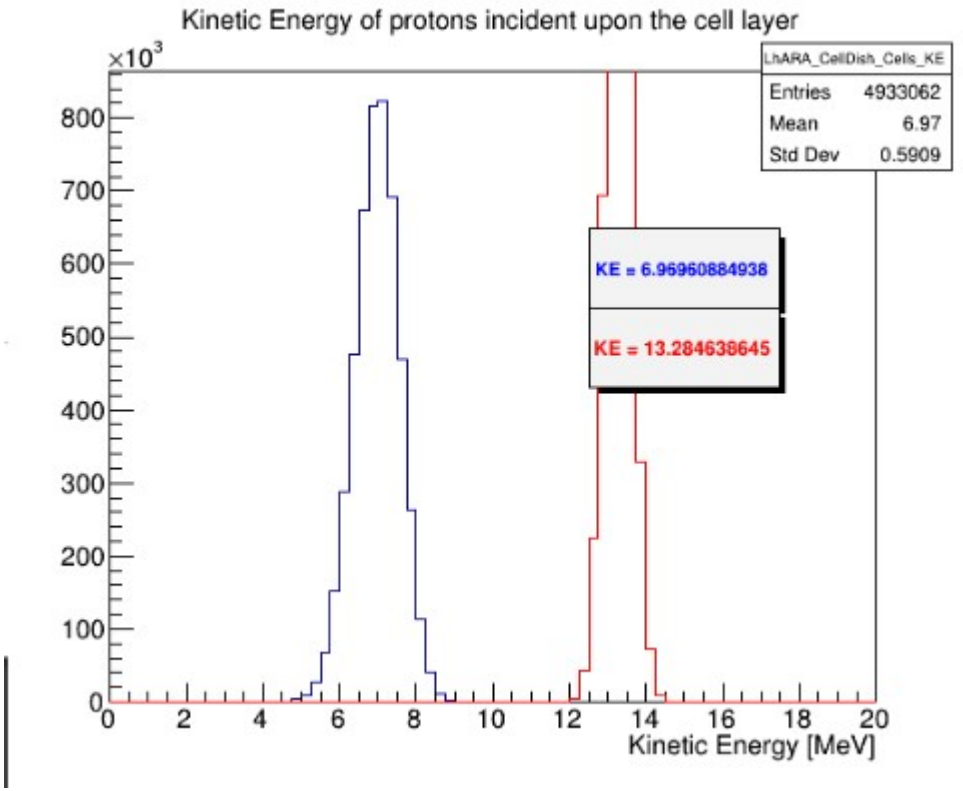
Mylar Cell bases

Input from Mark Hill of Oxford.

They use Mylar cell bases of a few microns thick to grow cells for their alpha irradiations

Allows higher energy onto samples

Larger overheads for energy changes



Material considerations

Materials are very important!

Pre-CDR and Will Shields using Polystyrene

I was using Perspex (as we do at UoB)

Dose calculations did not match into the Marcus Chamber

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Poly
 The total dose deposited in the MC / proton into the BM = 1.44096e-08 Gy
Dose per pulse of 1e+09 protons = 14.4096 Gy

Perspex
 The total dose deposited in the MC / proton into the BM = 1.83268e-08 Gy
Dose per pulse of 1e+09 protons = 18.3268 Gy
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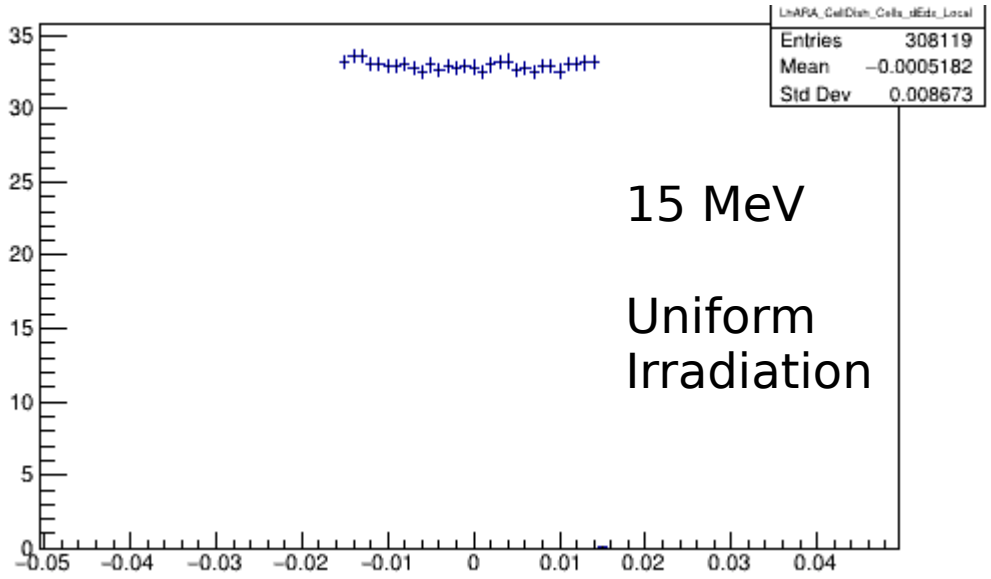
Biological End-points

In addition for certain biological studies cells must be grown on glass coverslips.

These are ~0.16mm of glass (roughly 0.3mm WET)

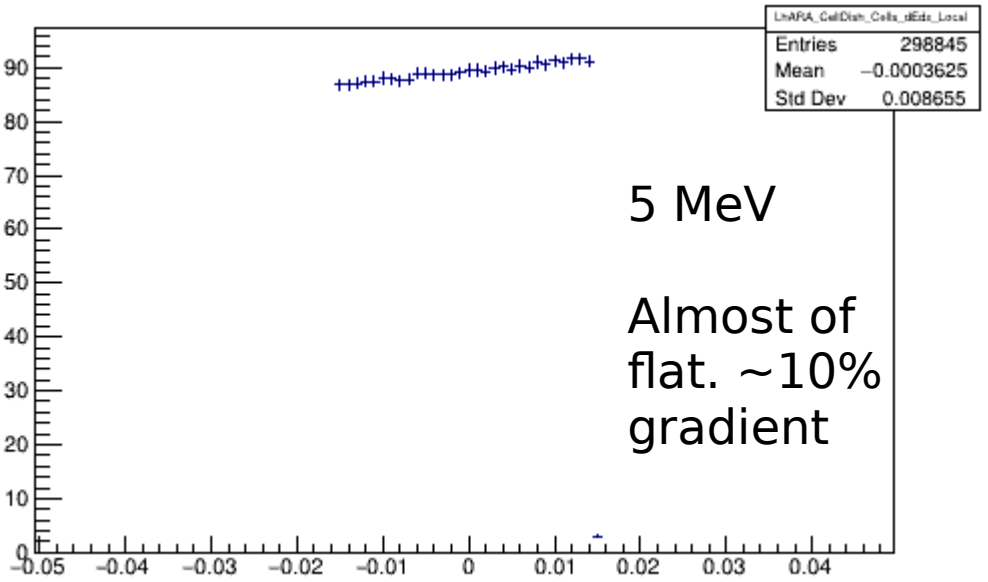
Significant amount of material, impacts dose rate, energy onto sample, and minimum energies that could be used for PoP

25um Ti 3um Mylar
Energy deposited in 30um Cells



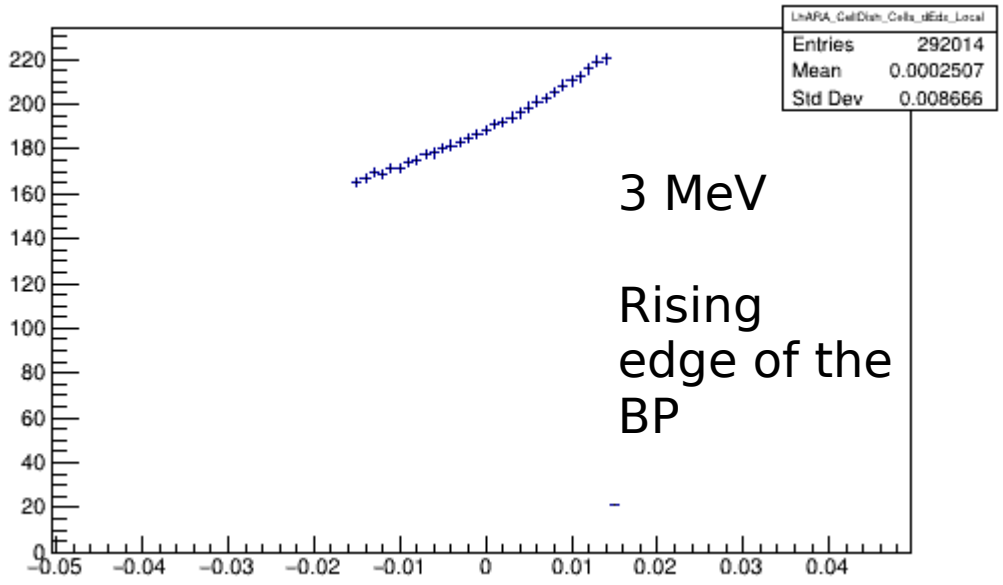
15 MeV

Uniform Irradiation



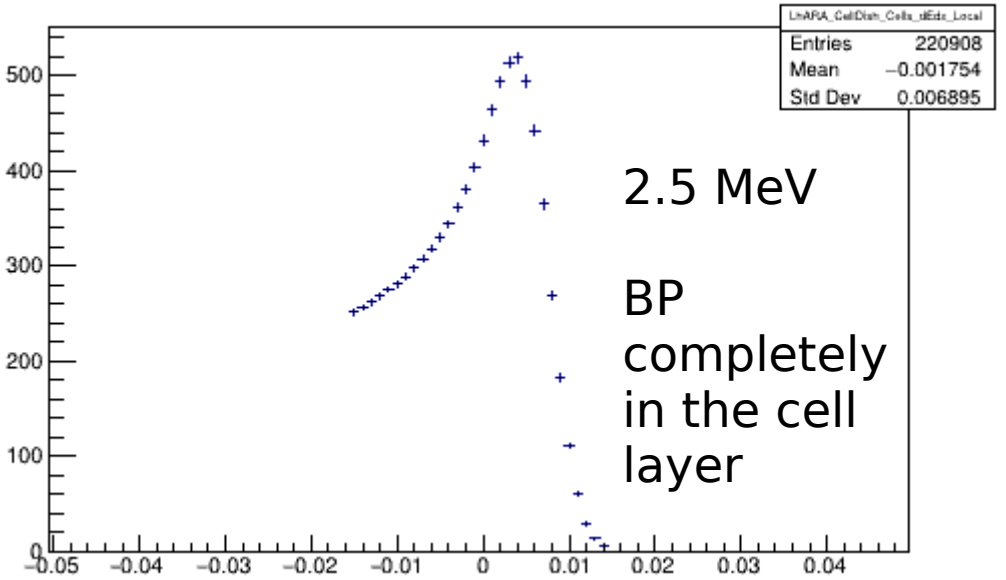
5 MeV

Almost of flat. ~10% gradient



3 MeV

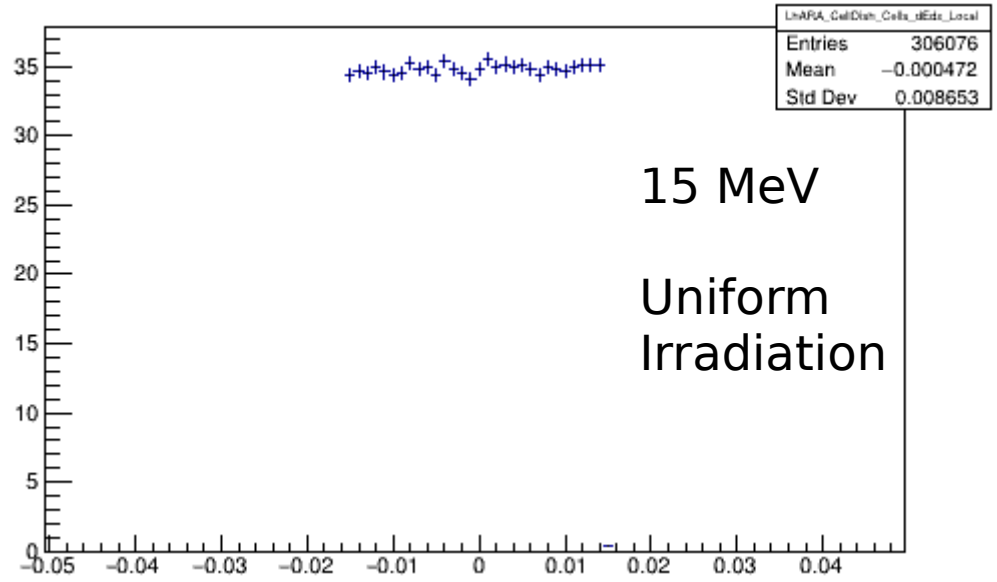
Rising edge of the BP



2.5 MeV

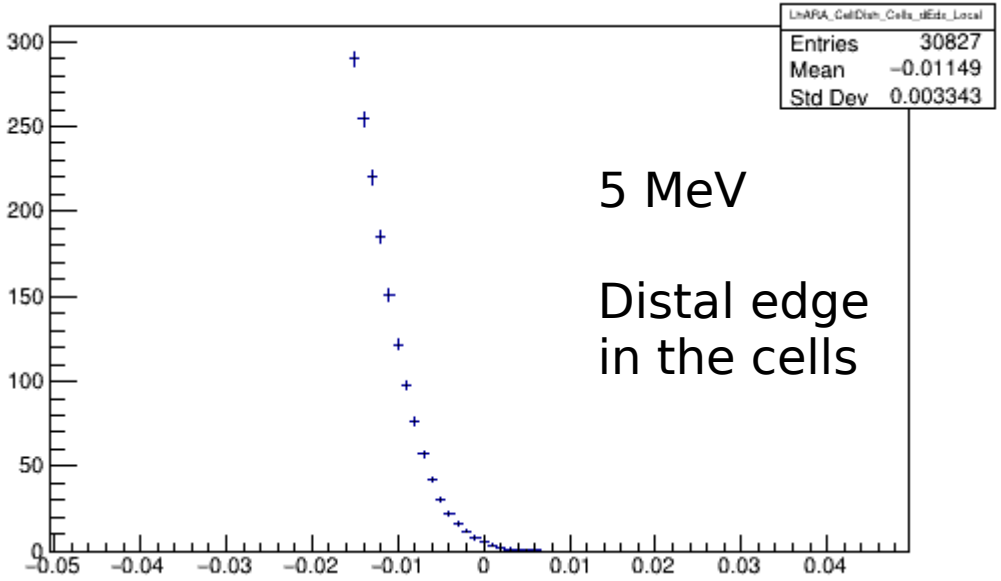
BP completely in the cell layer

25um Ti 3um Mylar 0.16mm Pyrex_Glass Energy deposited in 30um Cells



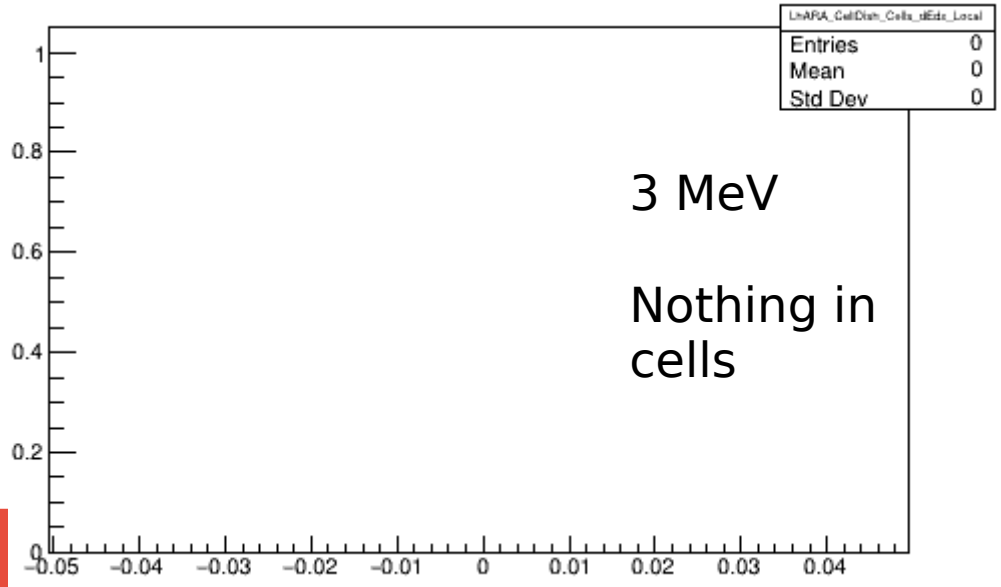
15 MeV

Uniform Irradiation



5 MeV

Distal edge in the cells



3 MeV

Nothing in cells