UFABC

ColdBox & PDS (LArSoft) Simulation for Module-1 Run

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FD2-PDS Longevity qualification and Stability test Workshop
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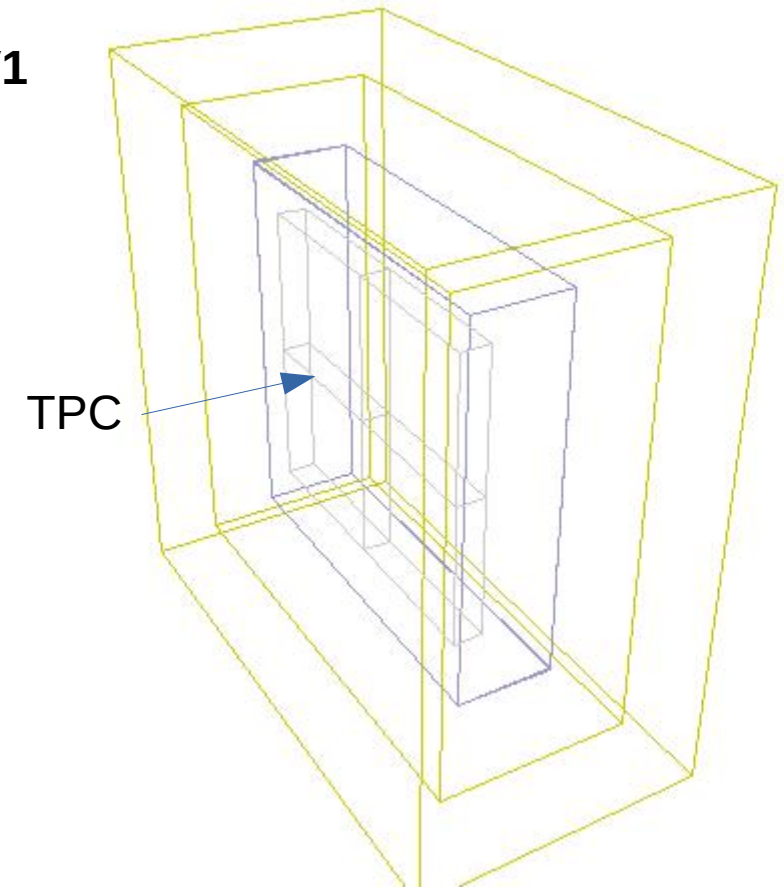
PDS ColdBox Photon Simulation

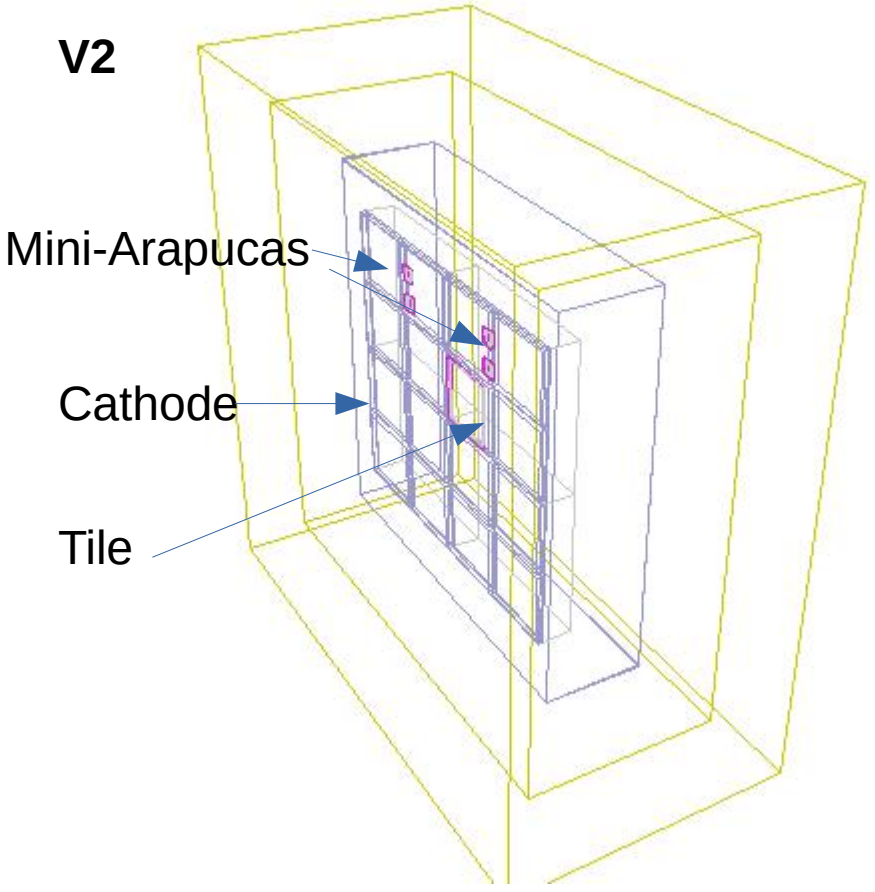
- Goals
  - Evaluation of PDS in a small system
    - PD Efficiency
    - Calibration
    - Electronics parameters in simulation
- Constraints
  - Geometry and input physics parameters need to be well set

Previous experience: ColdBox 1

V1

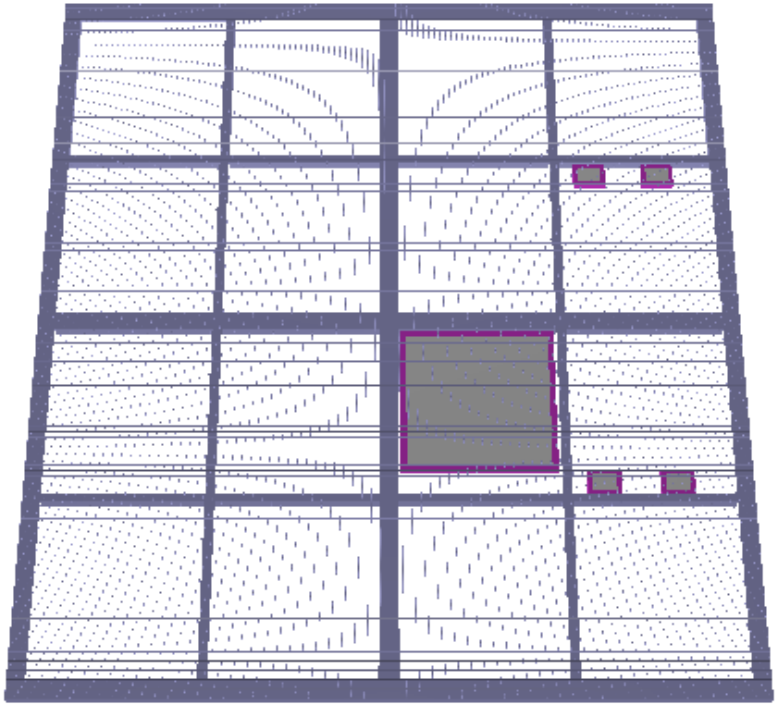


V2



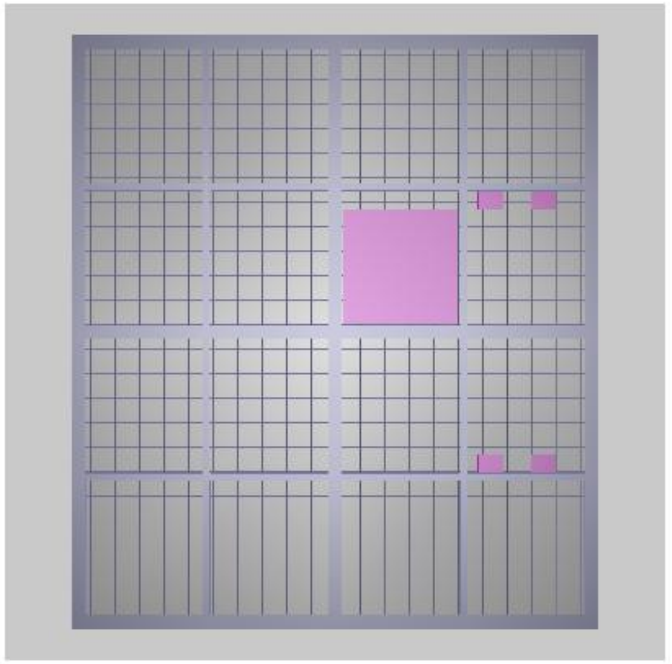
Previous experience: ColdBox 1

- Cathode and cathode mesh in sim



Previous experience: ColdBox 1

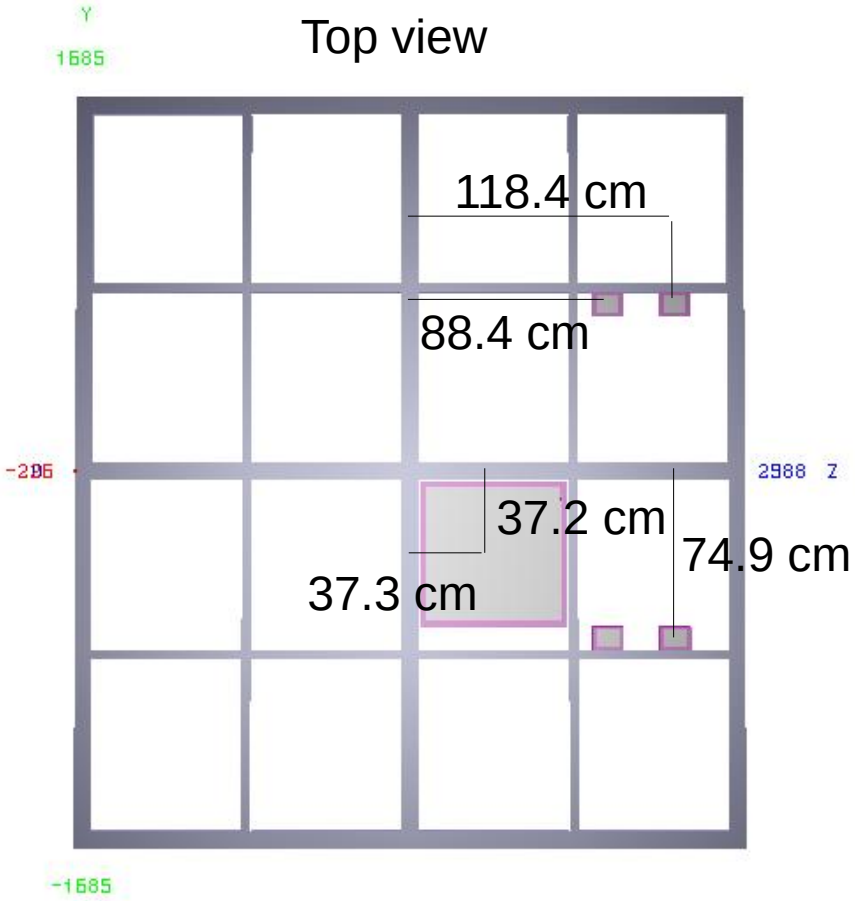
Bottom view



<u>Mini-Arapuca</u>
Optical window
10 x 7.7 cm^2

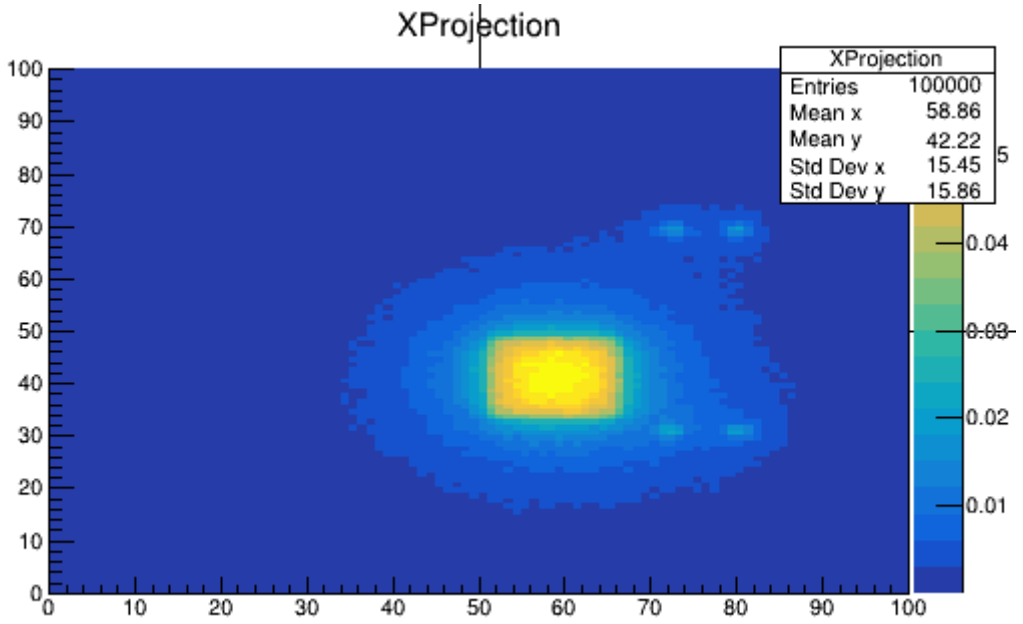
<u>Tile</u>
Optical window
60 x 60 cm^2

Top view

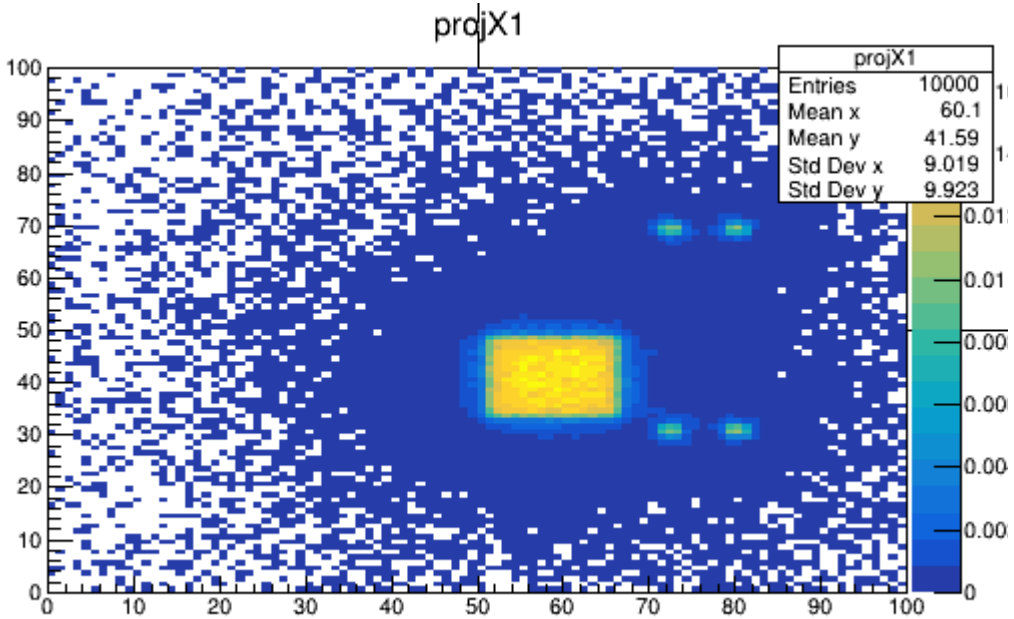


Previous experience: ColdBox 1

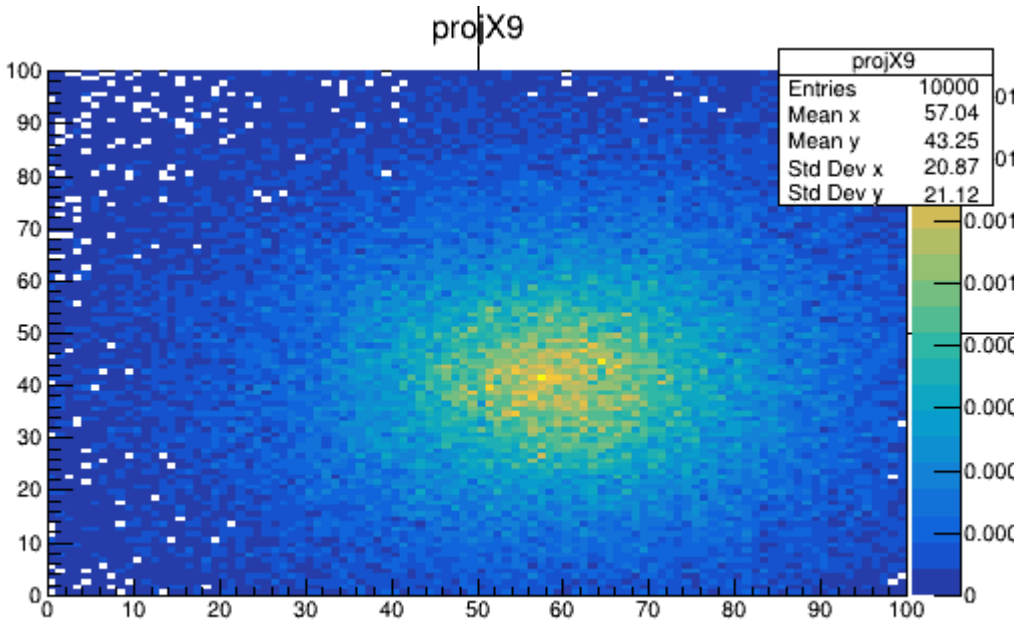
- Photon Library: stores the visibility of each PD as a function of the position of the energy deposit (voxels)
  - Number of voxels: 10 x 100 x 100
  - Photons/voxel: 200k



ColdBox 1 Photon Library



Very close to cathode



Far from cathode

Summary

- A very detailed geometry can be employed
- A high-statistic, high-granularity Photon Library can be created
- All machinery already developed in LArSoft
- LY map from simulation can be compared with LY map from calibration with neutron source (see Ajib's presentation)
  - Can be used to define experimentally the cathode X-ARAPUCA quantum efficiency
  - Can be used to constrain the uncertainties in our physics results using the simulation
- Great opportunity to test simulation and calibration together

Backup

Position of PDs in v2 geo

- Cryo Boundaries
  - Xmin: -28.54 Xmax: 71.7 Ymin: -194.62 Ymax: 194.62 Zmin: -46.12 Zmax: 344.922

Optical Channel	X (cm)	Y (cm)	Z (cm)
0	-15.887	74.9	267.801
1	-15.887	-74.9	267.801
2	-15.887	74.9	237.801
3	-15.887	-74.9	237.801
4	-15.887	-35	184.401