

Updates on PD-VD geometry

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ProtoDUNE PDS Sim/Reco Working Group Meeting

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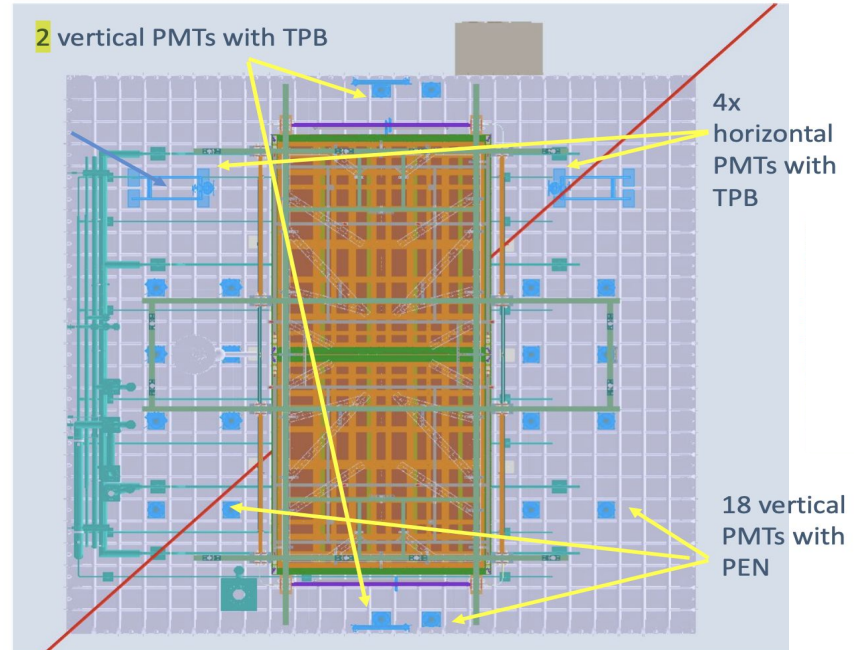


Motivation

Improvement of several components of ProtoDUNE-VD version-3 to perform optical simulations in a more realistic detector.

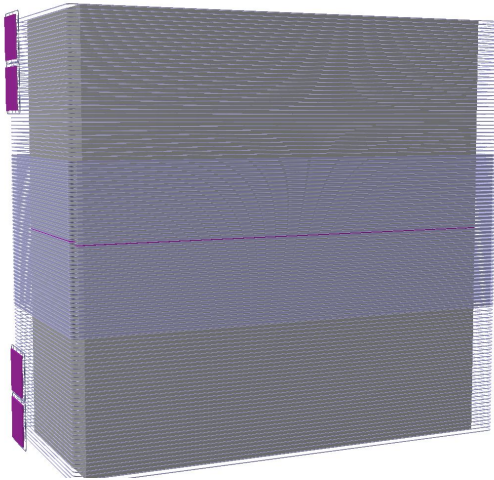
Main targeted elements were:

- Field cage profiles.
- Cathode frame optical properties.
- X-ARAPUCAs.
- PMTs in cryostat.

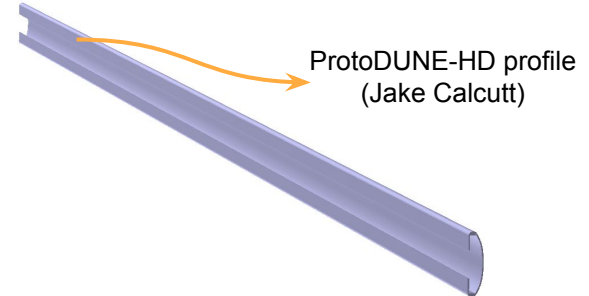
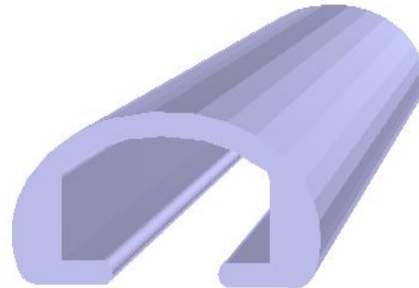


Modifications

- Profiles length was also modified to fulfill with expected spacing among detector components, such as PDs, cathode frame...



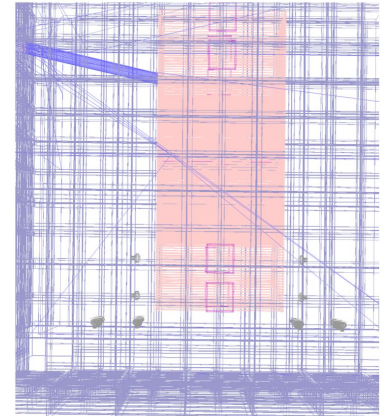
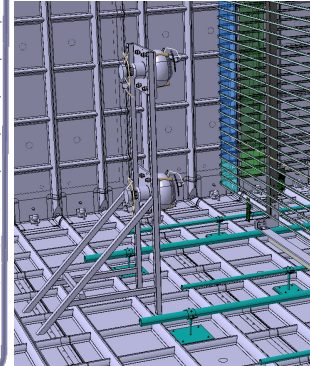
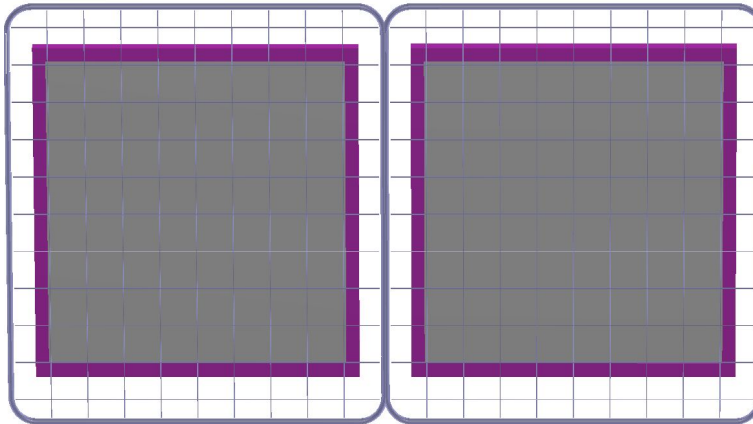
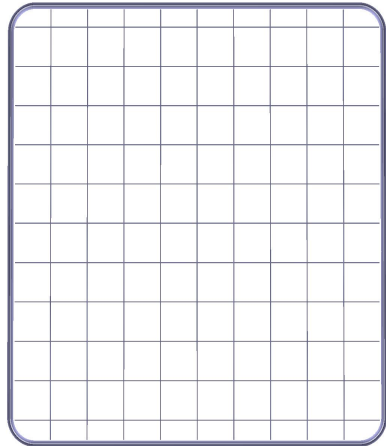
	v3	v4
Field cage		
Material	$\text{Al}_2\text{O}_3 \rightarrow 0\%$ reflectance	Al
Shape	Unrealistic	Realistic, excepting corners
# Field shapers	104 50 slim & 54 thick	114 72 slim & 42 thick
Cathode		
Material	Stainless steel	G10 $\rightarrow 0\%$ reflectance



Modifications

- PMTs on inner cryostat wall. The same used for ProtoDUNE-DP. (**Pablo & Clara**).

	v3	v4
X-ARAPUCAs		
Vertical spacing (cm)	85.3	75.8
Mesh (cathode & mem.)	No	Yes, with switch to turn off.
PMTs		
PMTs	No	Yes



Pending tasks

- Add a copper anode plane to consider the perforated copper PCB, as in FD2-VD for optical simulations.
- Possible migration of some PMTs due to the beam pipe.
- Check and correct possible overlaps.
- Pull request for v4, due in late September.
- Full optical simulation to check the difference between v3 & v4 versions.

If no issue arises:

- Develop the *Computable Graph* (fast optical simulation) for the new geometry (Shuaixiang Zhang).
- Perform Physics & Detector simulation prior to filling with LAr (expected in January 2024).