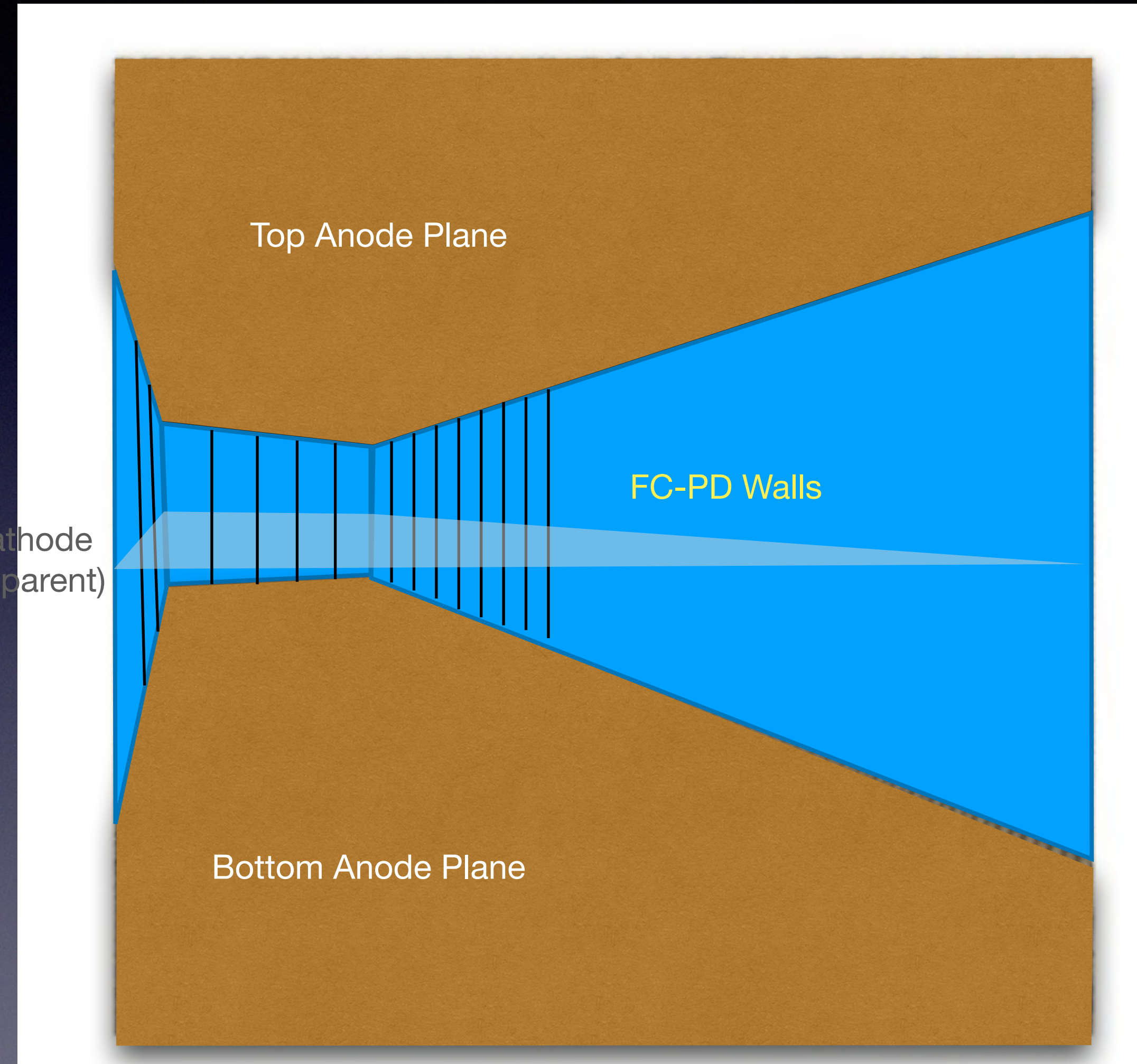


“VD Optimized FD3” w/ enhanced PDS Update after SBU WS

Central Cathode
(semi-transparent)



DUNE Phase II FD R&D Goals

- *Pursue possible enhancements that make use of recent technological breakthroughs and are well motivated by unique additional physics capabilities.*
- Enhancements are mainly driven by 1) better energy resolution 2) lower energy thresholds, and 3) lower intrinsic backgrounds,
- Possible expanded physics scope
 - Supernova Neutrinos and Solar Neutrinos in the LowEnergy range
 - Possible BSM Physics in the LowEnergy range

New/Novel Technical Elements for FD3 are being identified (after MoO and FD3 WS at SBU)

Only Few of these are CRITICAL (CTEs - Critical Technical Elements)

(the others are optional/incremental wrt to FD2 demonstrated solutions)

Technical Readiness assessment (TRLs) for the Critical Elements (among the New/Novel Elements) under evaluation

Path toward Technical Readiness defined based on a realistic Prototyping Staged program

(assuming availability of funds both from EU and US sources)

Perspectives for DUNE Physics Scope Expansion well identified

(LowEn UG Physics [5 MeV-500 MeV]

and Background Rejection (to be demonstrated)

For each (WBS) element:

- Assessment of the criticality to the program
- New or novel criteria

If the technology is both critical to operations and employs a new/novel concept, then it is declared as a CTE.

TRL=3 $\Leftarrow \Rightarrow$ Proof of principles for a critical function (active R&D initiated, tech. components identified and available, not yet integrated in system)

TRL=4 $\Leftarrow \Rightarrow$ Basic tech. components integrated in “ad hoc” hw (sub)systems for laboratory scale tests (first step from scientific research to engineering, supports individual components into integration in system)

TRL=5 $\Leftarrow \Rightarrow$ Laboratory scale (almost “prototypical”) system successfully tested in relevant environment (basic tech.components integrated in system similar to final, and test results interpreted)

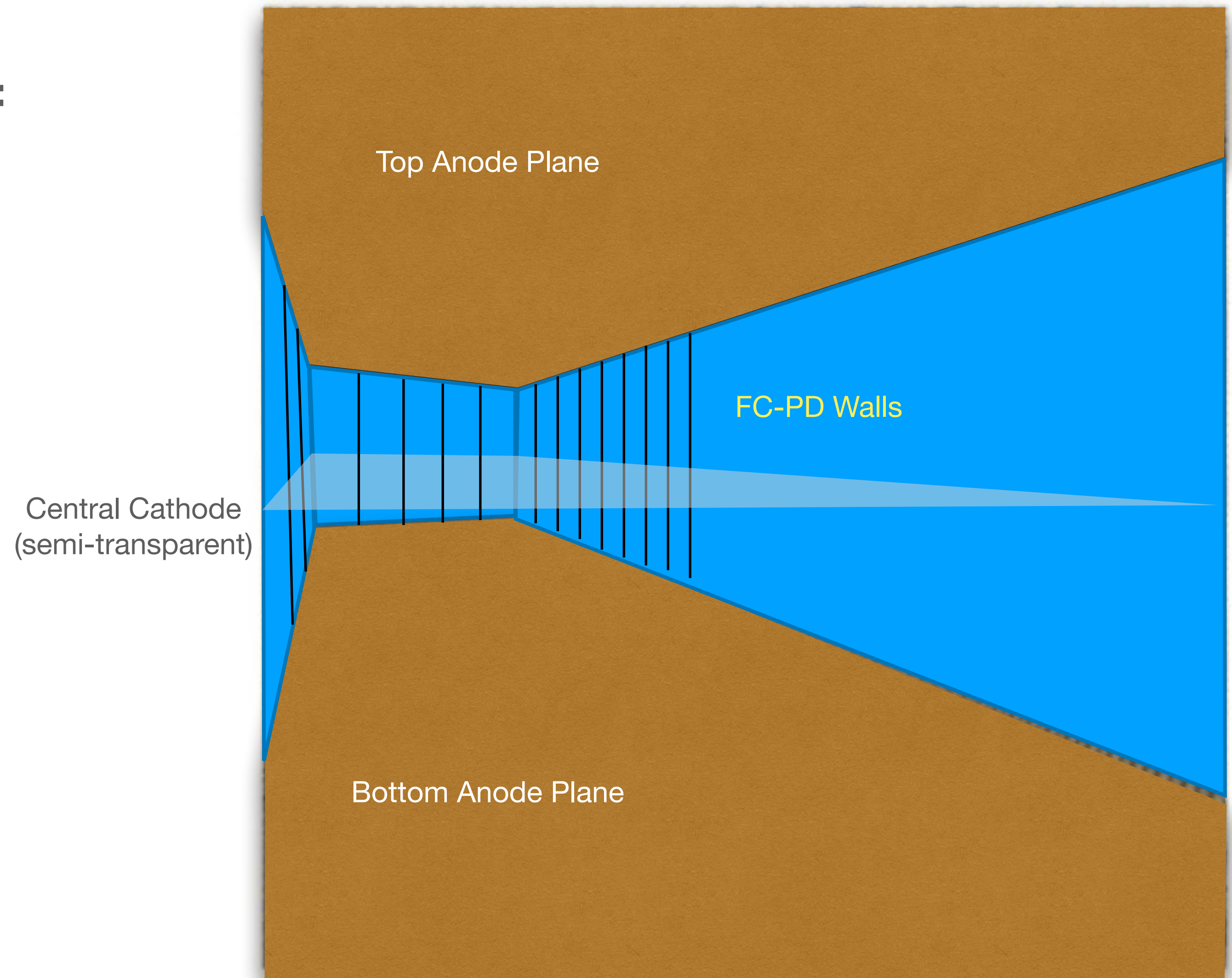
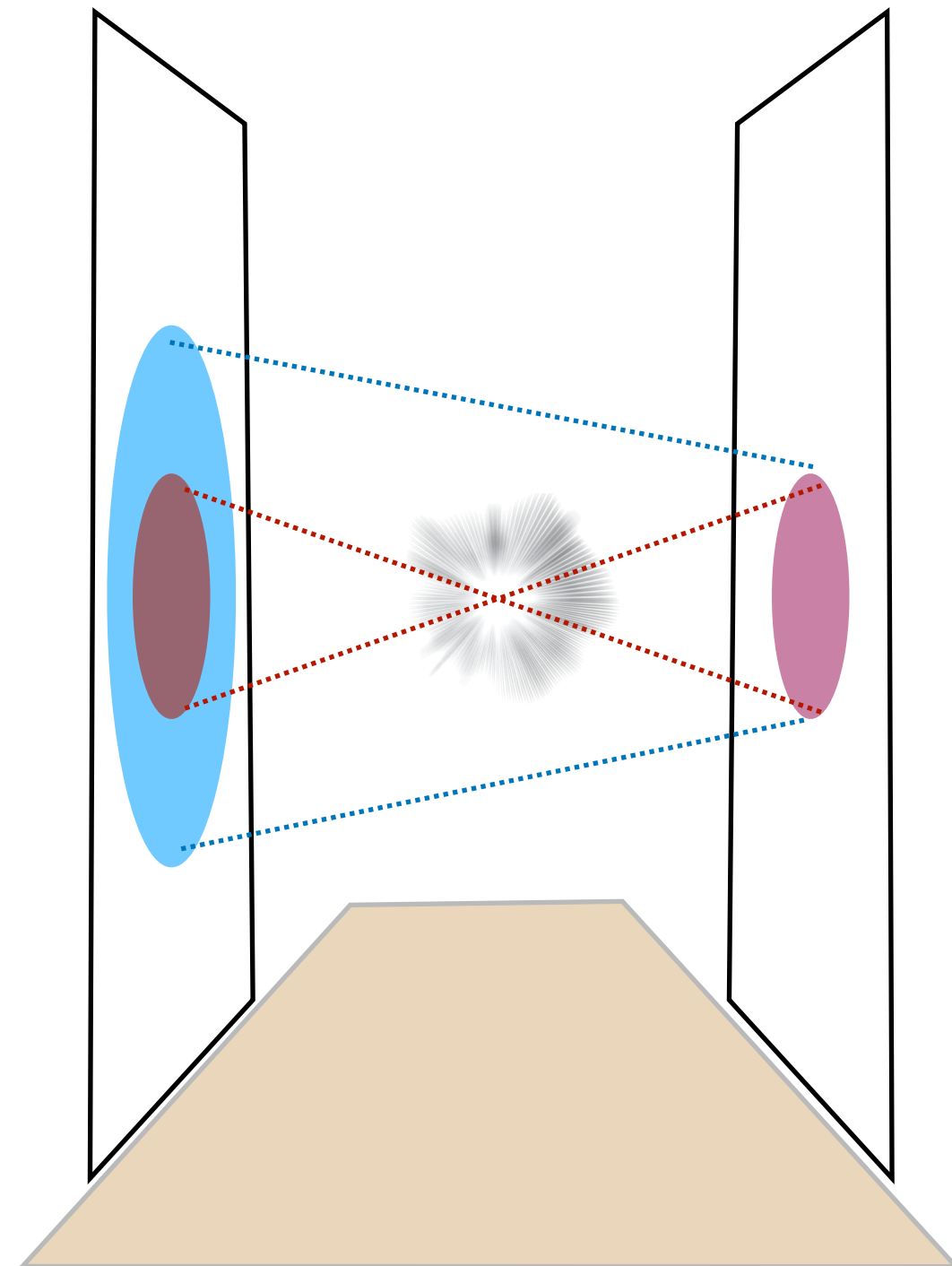
TRL=6 $\Leftarrow \Rightarrow$ Pilot-scale “prototypical” system validated in relevant operating environment (performs all functions required by the operational system, major step-up in tech.readiness, starts the engineering scale enabling final design)

TRL=7 $\Leftarrow \Rightarrow$ Full scale “prototypical” system demonstrated in final operating environment (final design virtually completed)

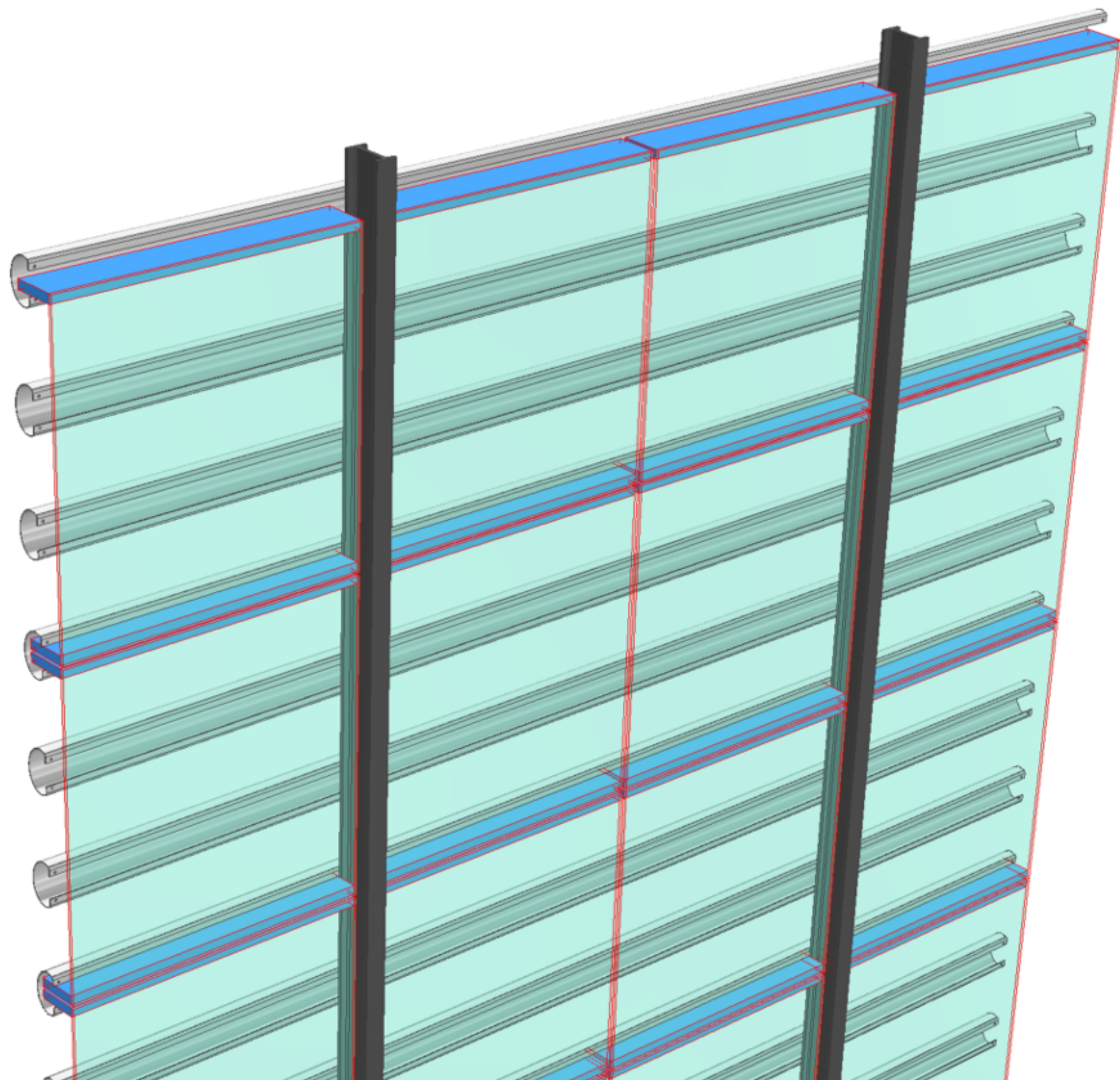
Striking feature of the extended optical coverage:

backward emitted WL-shifted light
from a FC wall
collected on opposite FC wall

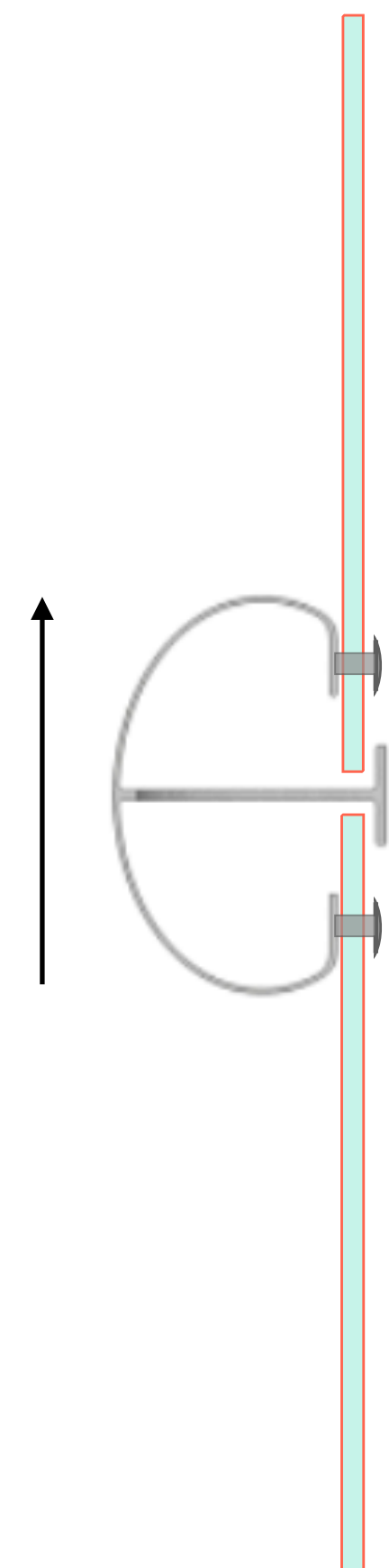
For an ideal $\rightarrow 100\%$ ($\rightarrow 4\pi$) Opt.Coverage
 \Rightarrow PCE $\times 2$
(or can reduce n. of SiPM by 1/2)



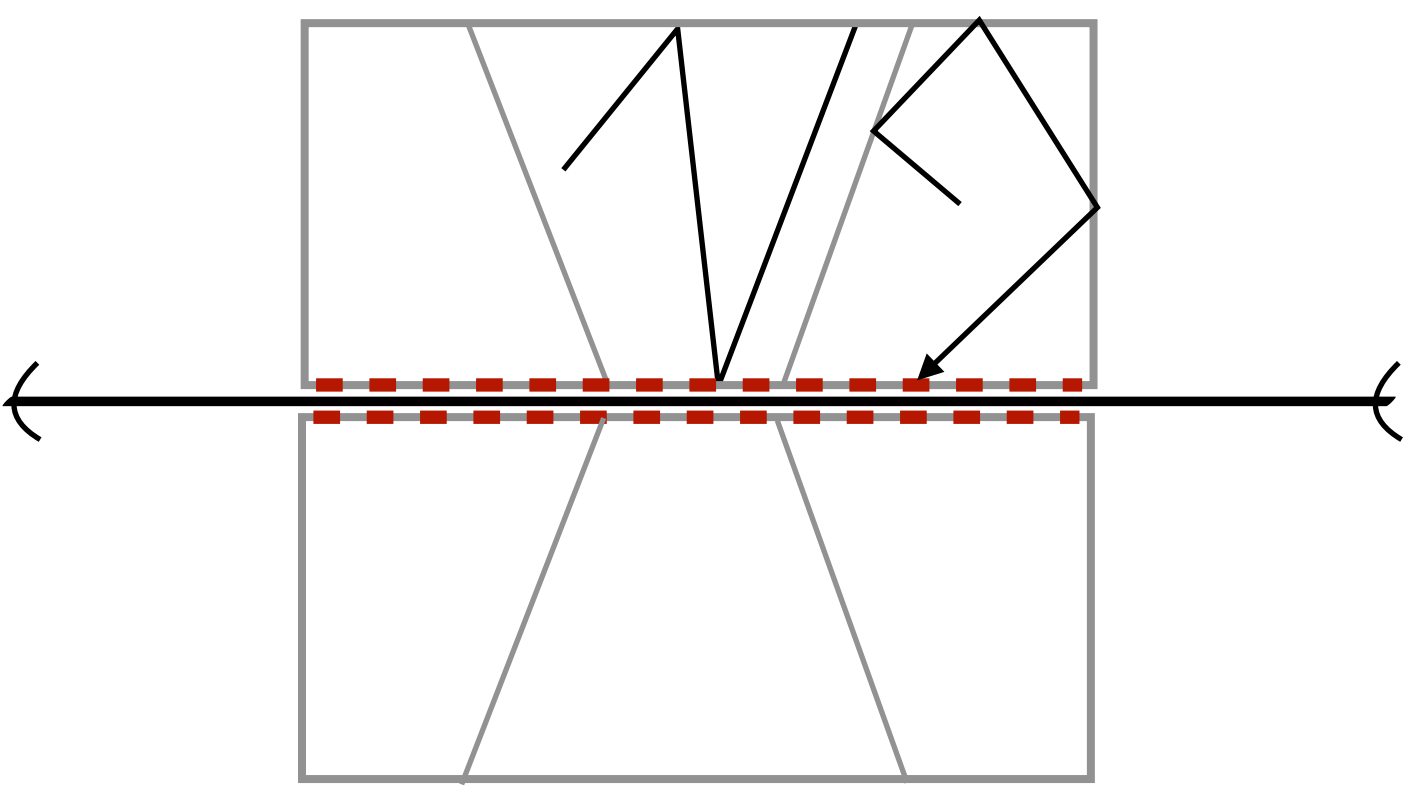
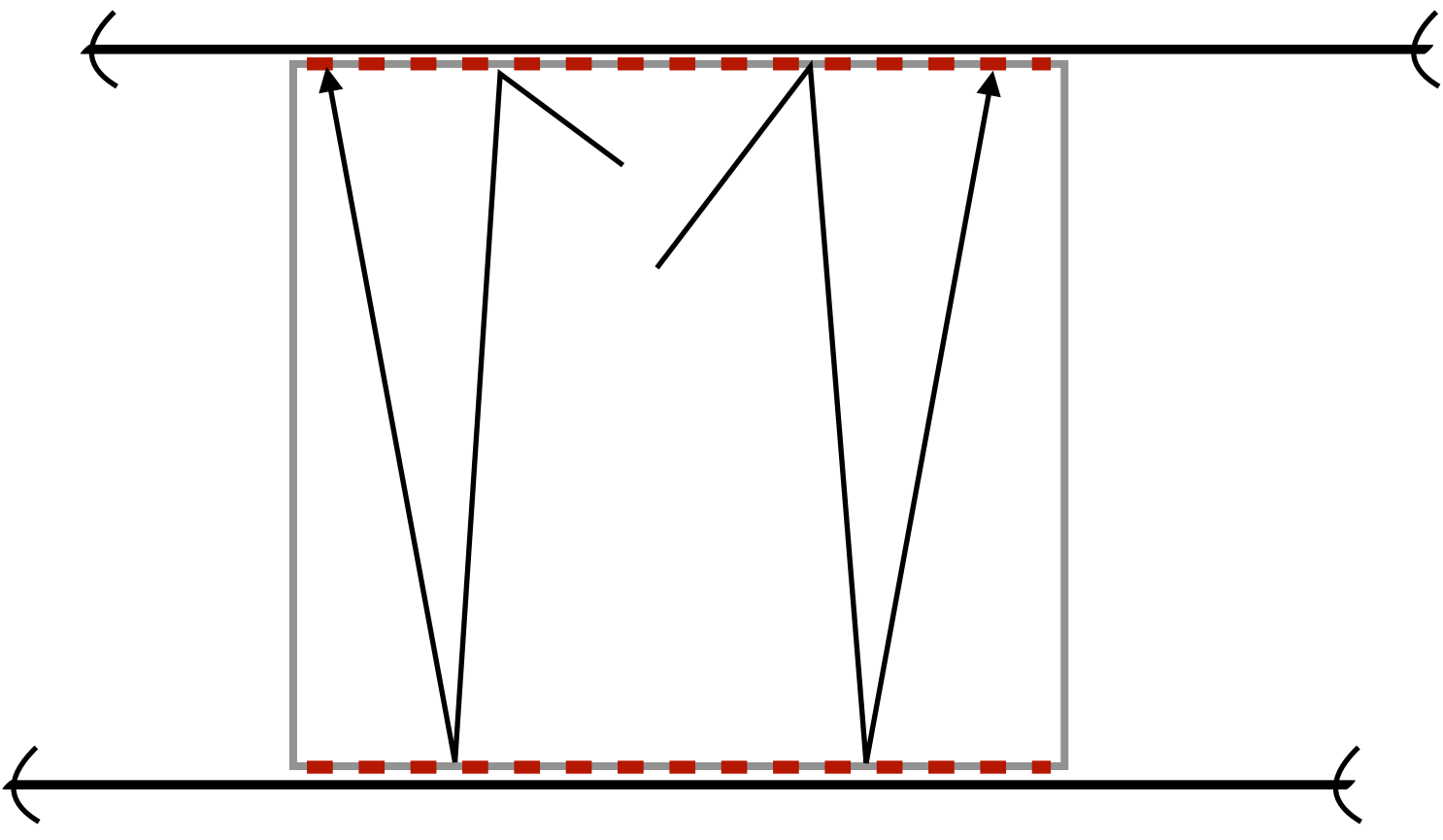
Larger oval shaped FC profiles at 20cm pitch



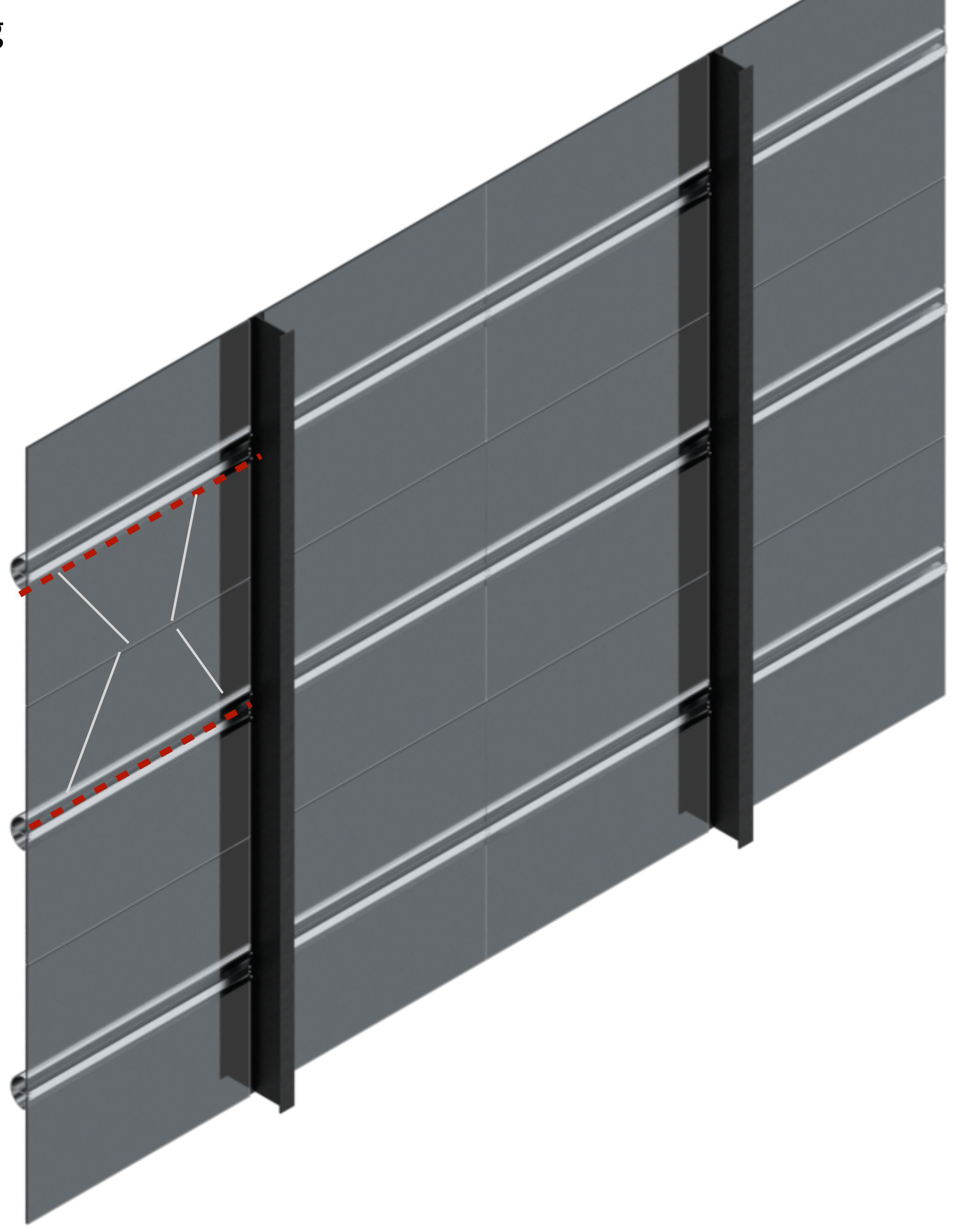
(0.6m x 0.6m) PD module with SiPM/SoF/PoF boards along top and bottom edges



(0.6m x 0.6m) PD module with SiPM/SoF/PoF PCBs along top and bottom edges on two different CH-profiles



2x(0.3m x 0.6m) PD module with SiPM/SoF/PoF PCBs along top and bottom edges on same CH-profile (i.e add a gap w/ reflectors in the WLS)





**More pictures from 3D Model to
be added - (available .stp)**