Vertical Drift Photon Detector Tile Design

David Warner for the Photon Detector Consortium

May 20, 2021

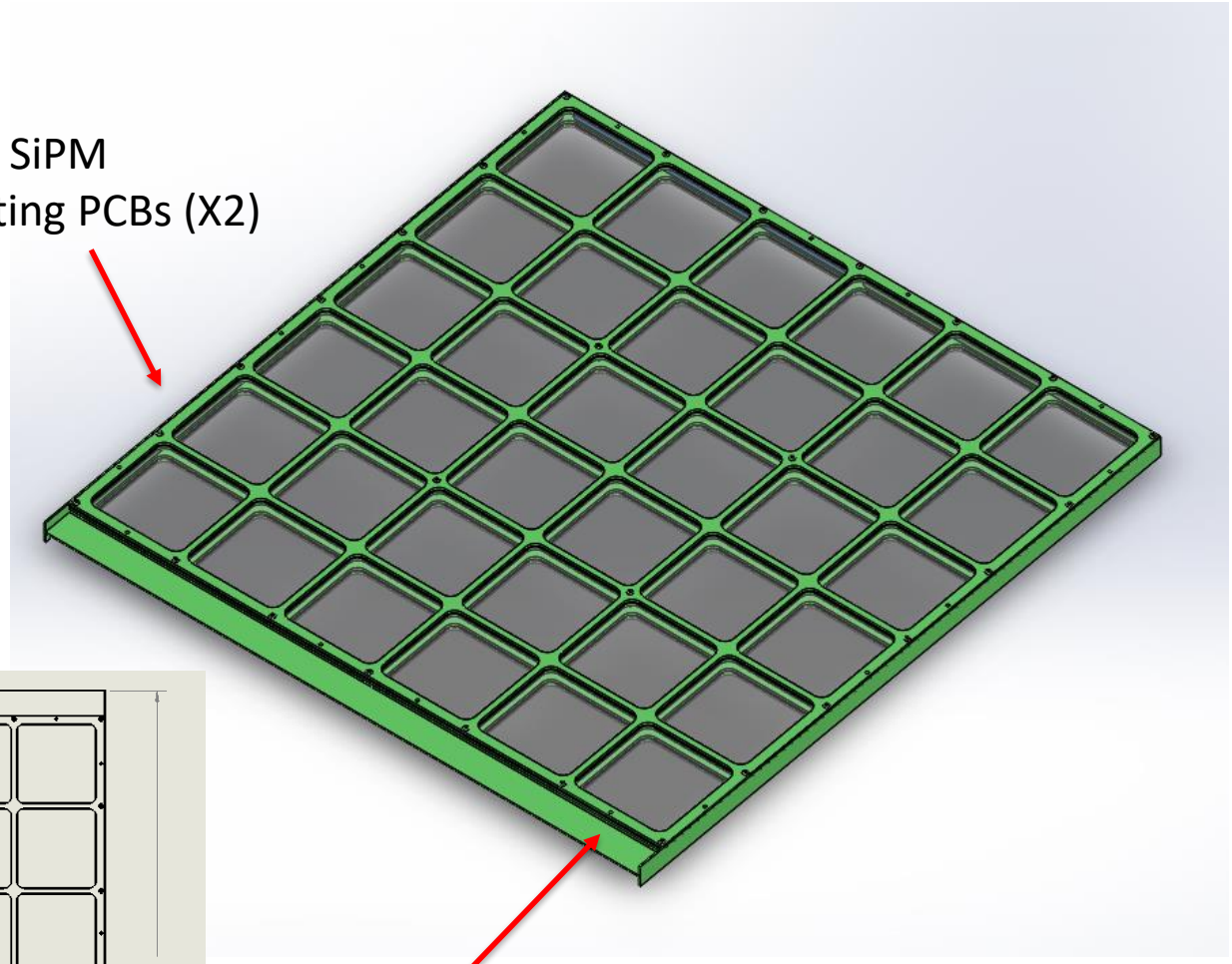
Outline

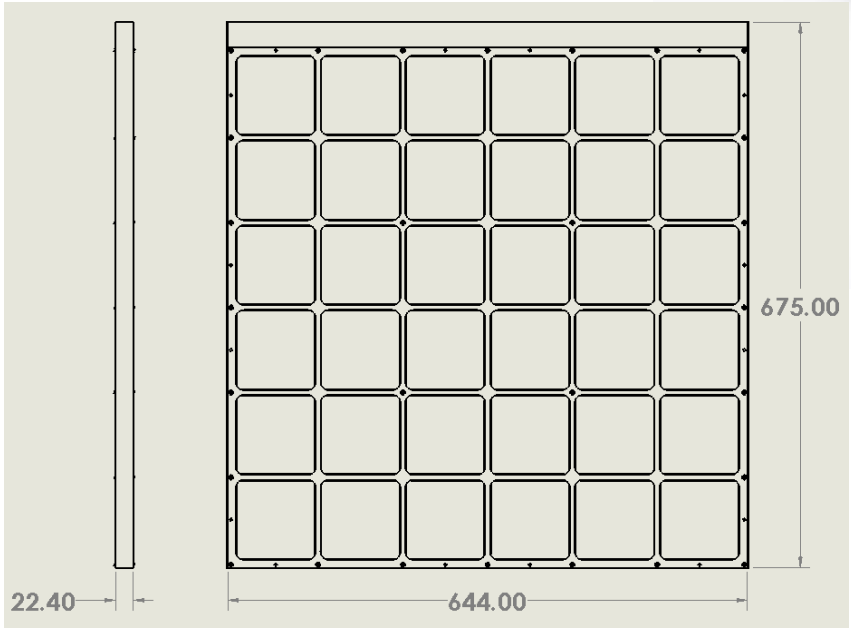
This PD module concept allows us to develop costing for a VD-PD system, and to begin to schedule an R&D program for the system.
Many people have contributed to this work (I am just collecting ideas!). I wish particularly to call attention to the contributions of Heriques Frandini at UNICAMP.

- Module design concept
- Frame mounting concept
- Key upcoming development

Mechanical Frame (Concept)

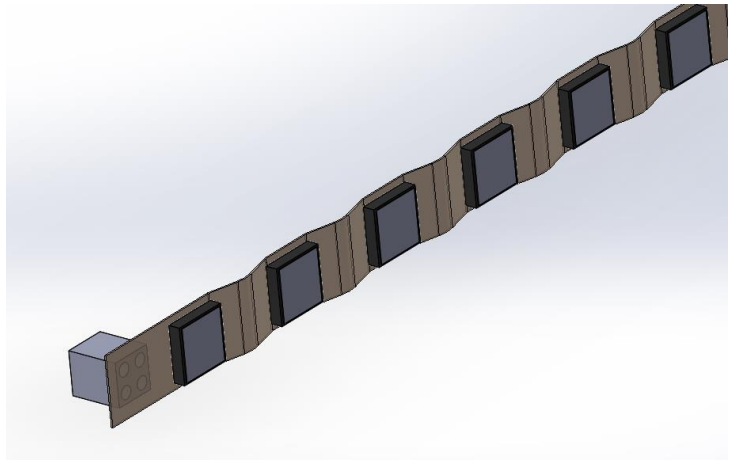
- Total module area ~675 X 644 X 22.4 mm^3
- Total active area ~3380cm^2 (X2 sides)
- Estimated mass ~5.5kg per tile
- 160 SiPMs (40 per side)
- FR-4 G-10 Frame components

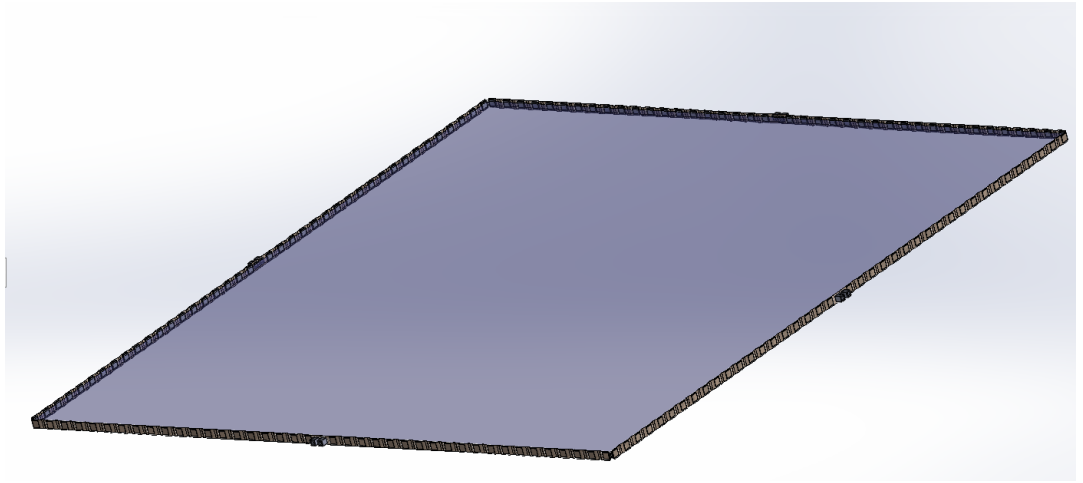


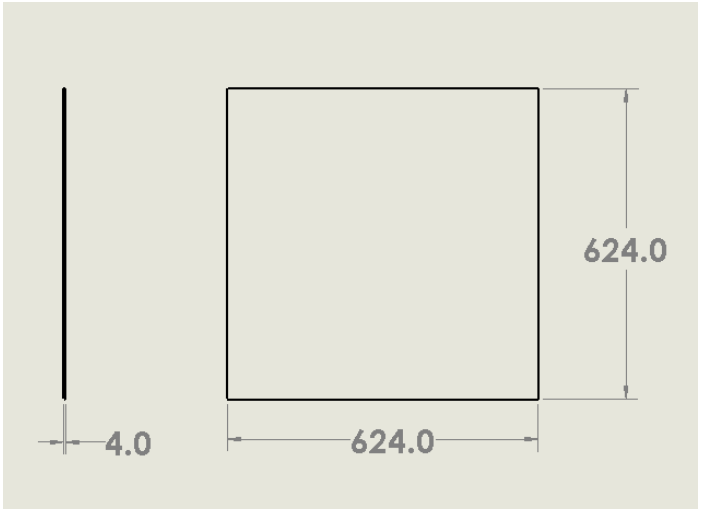


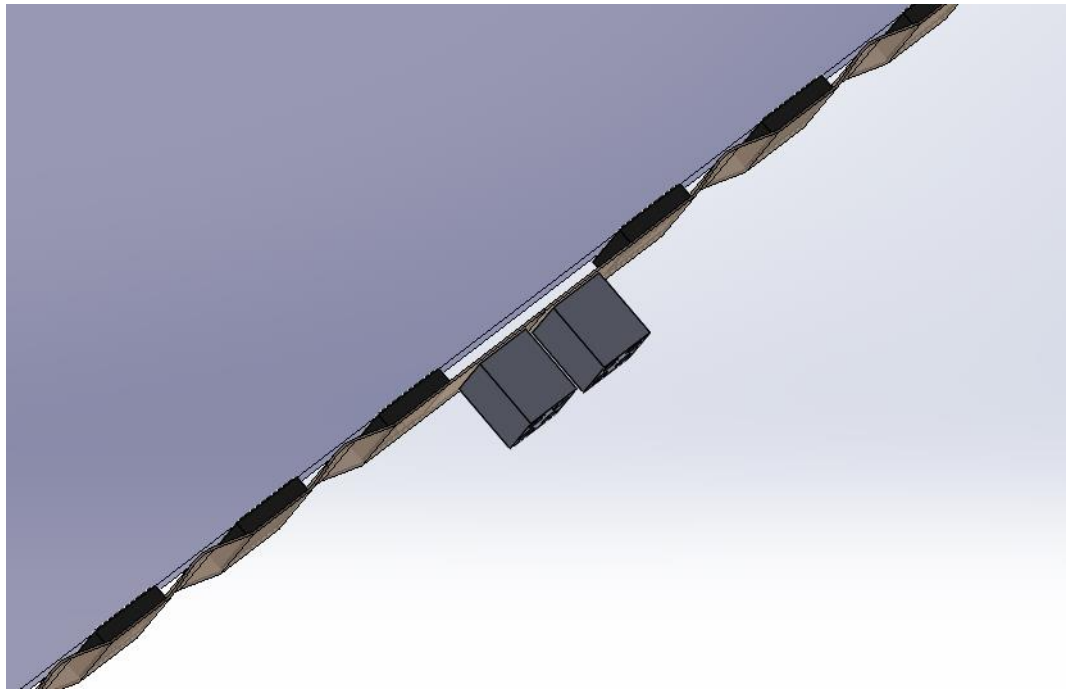
WLS Plate Assembly

- 160 SiPMs (40 per side)
  - Glued to WLS Bar for improved performance
- SiPMs mounted on Kapton flexi-PCB
  - Addresses relative thermal contraction of WLS plate/frame.
- Power-to-Glass FB-118 WLS plate (Milano) (Note: May use 600 X 600 X 3.8mm)
- Concept new to VD PD-- under development



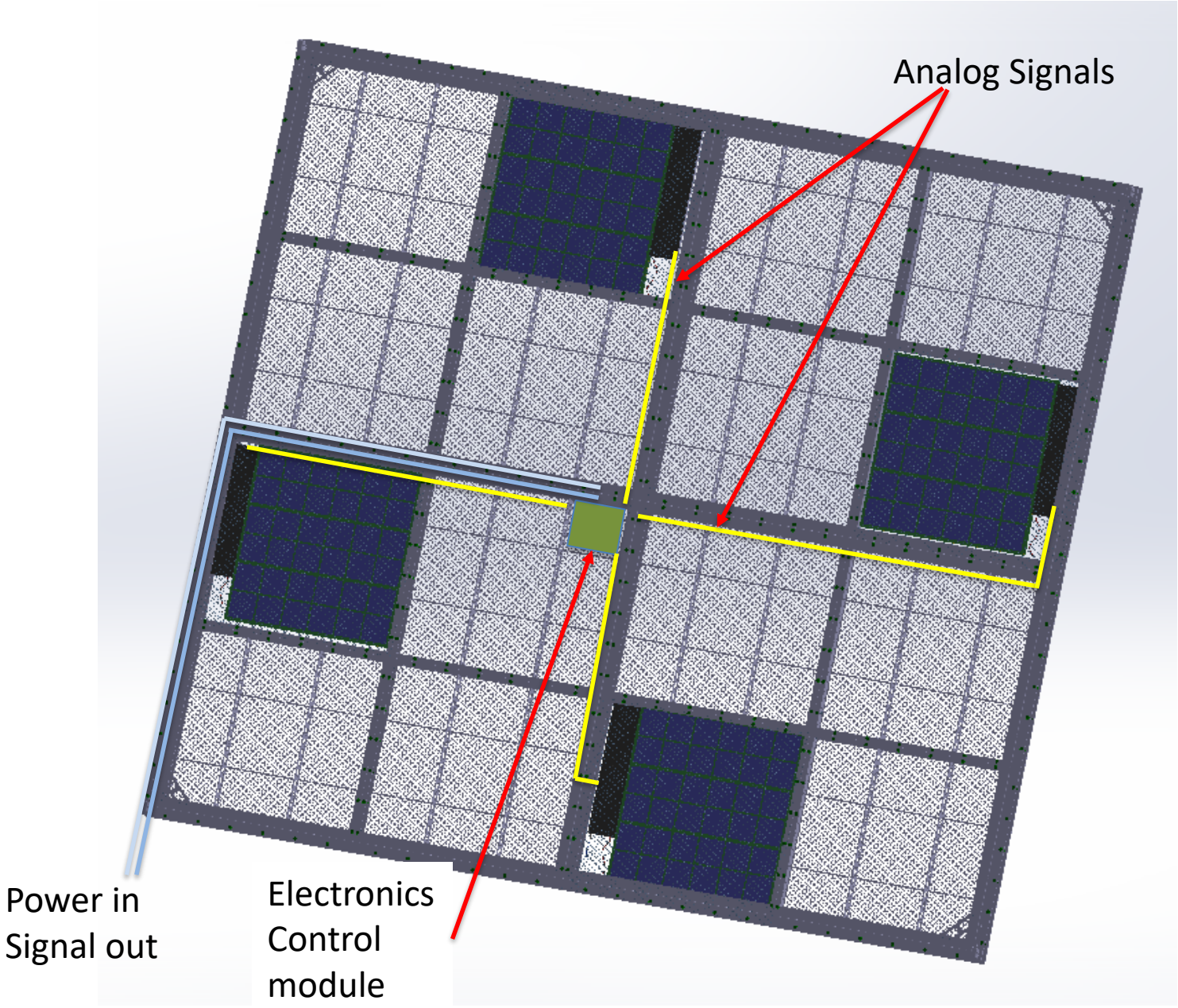






Frame mounting

- 4 modules per cathode module
- One readout electronics assembly per module
  - ~200mm^
  - Two PCBs in vertical stack: One analog board with amplifiers, (4 ADCs?) one digital board with signal readout, power, slow control



Upcoming (CY-21) Module Mechanics R&D

- Complete preliminary cathode tile frame design
  - Procure dummy filter plates/WLS bars for initial test (Late May 21)
  - Procure frame mechanical components (early June 21)
  - Assemble frame prototype and test in LN2 (early June)
  - Revise mechanical design (July)
  - Fabricate 2 modules for cold box test (Late summer 21)
  - Cold test (CSU? FNAL?) (Fall 21)
  - Cold box test CERN (October 21?)

BACKUP