dRICH Sensors and Services in DD4hep
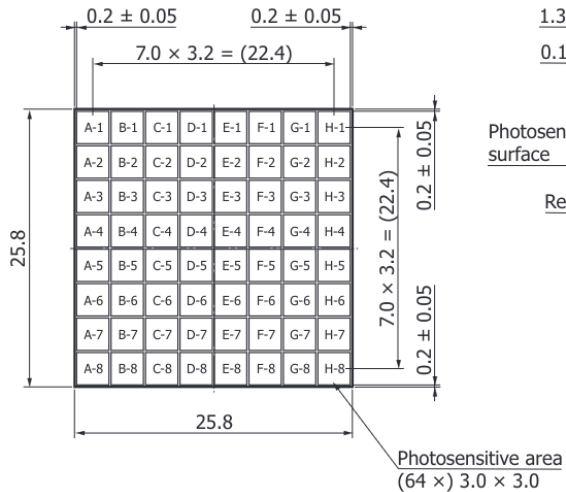
Christopher Dilks
dRICH Meeting
15 June 2023

SiPM Model in DD4hep
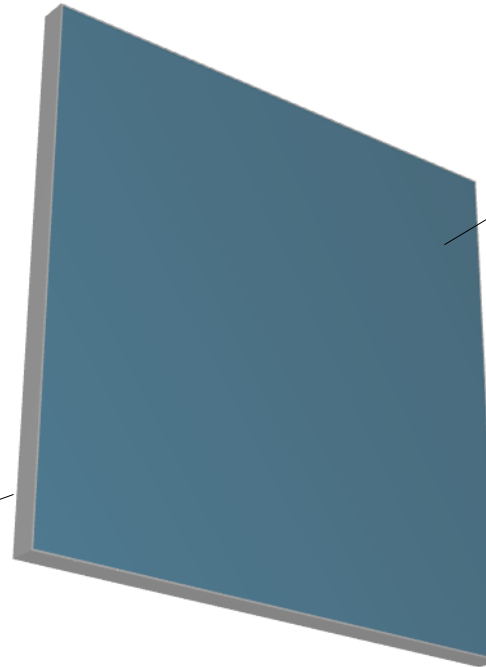

S13361-3050AE-08

[Top view]   [Side view]
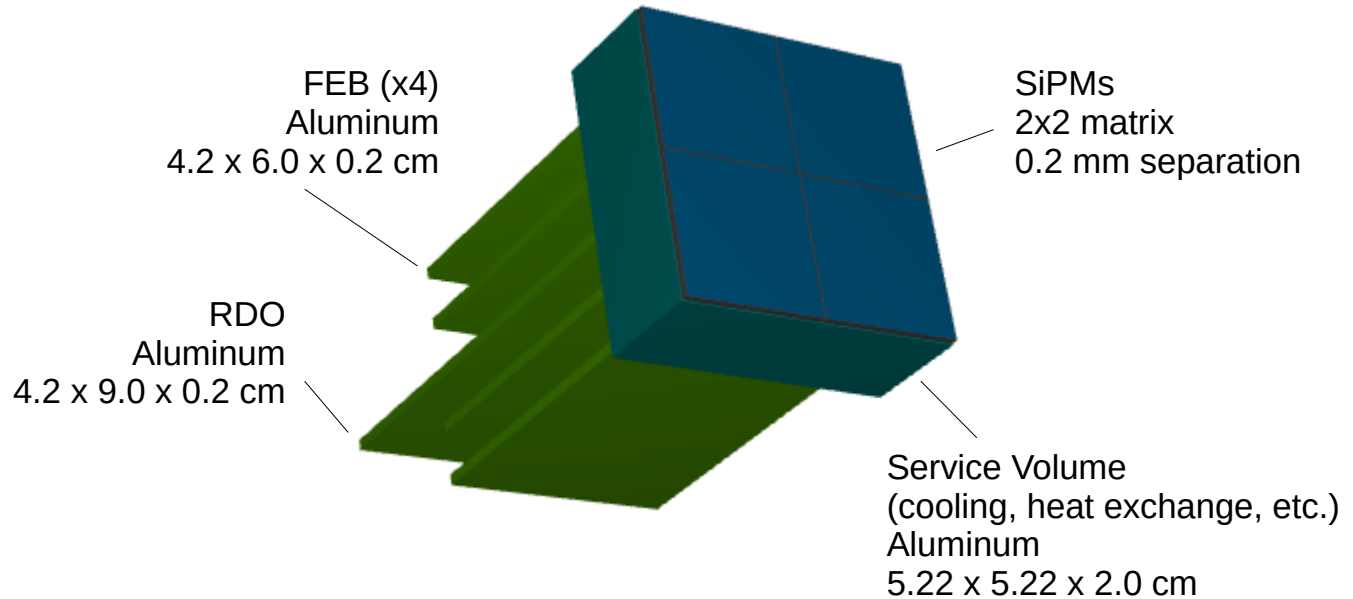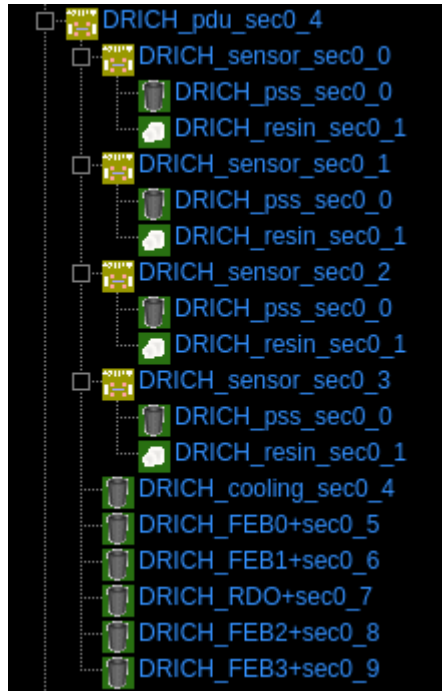
- Photosensitive Surface (PSS)
- 25.6 x 25.6 x 0.1 mm
- Material: 'AirOptical'
- 3.2 x 3.2 mm pixels (includes gaps) implemented as DD4hep Cartesian Segmentation
  - 8 x 8 pixel matrix
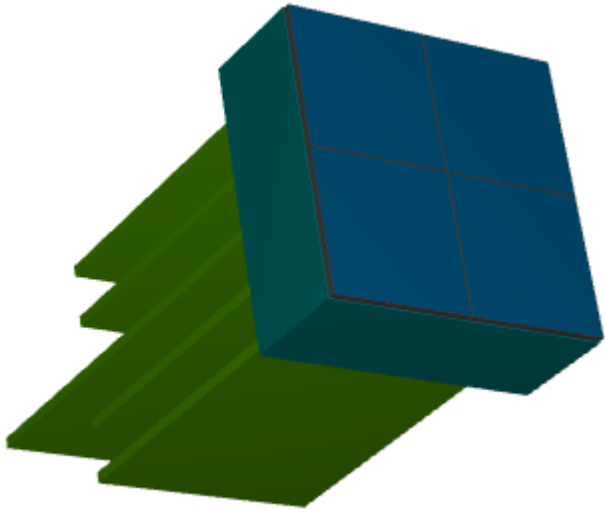- 0.2 mm gaps between pixels masked in the reconstruction, so effective pixel is 3x3 mm

- Resin
- 25.8 x 25.8 x 1.35 mm
- Material: 'Epoxy'

PDU Model in DD4hep

PDU geometry tree

FEB (x4)
Aluminum
4.2 x 6.0 x 0.2 cm

SiPMs
2x2 matrix
0.2 mm separation

RDO
Aluminum
4.2 x 9.0 x 0.2 cm

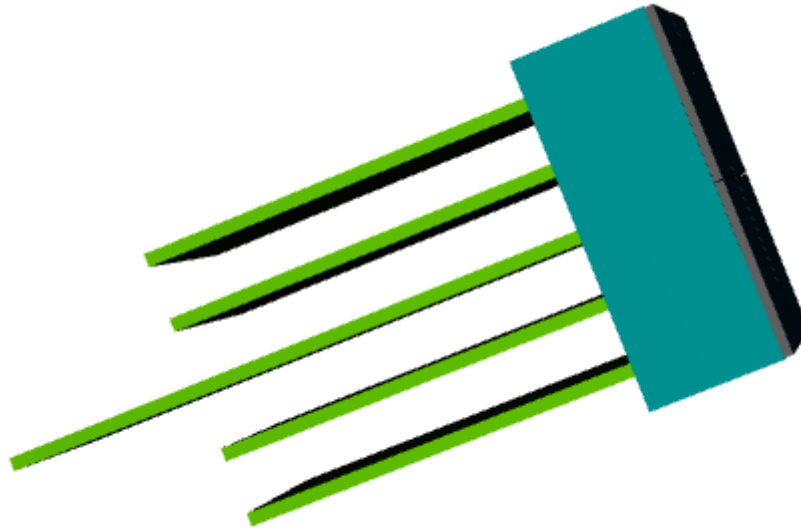Service Volume
(cooling, heat exchange, etc.)
Aluminum
5.22 x 5.22 x 2.0 cm

PDU Model in DD4hep

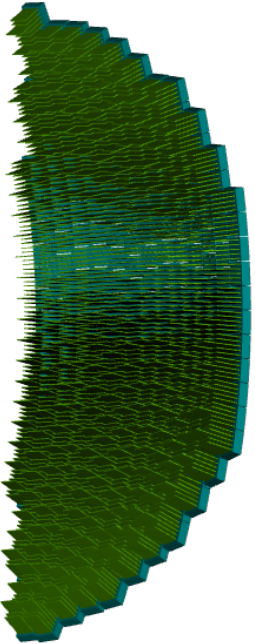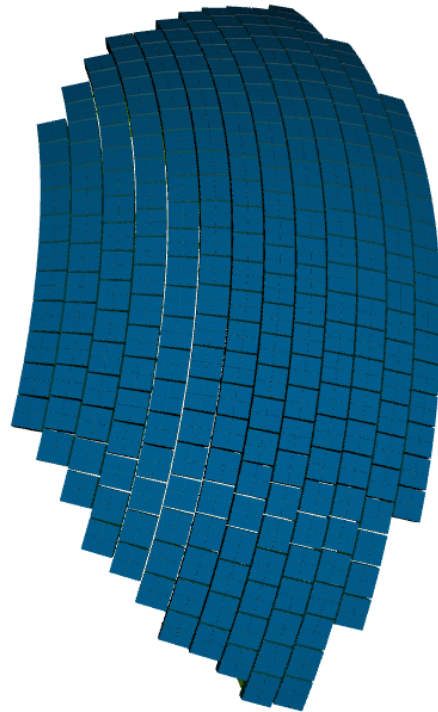Angled view

Side view

Front view

C. Dilks   dRICH Sensor Services
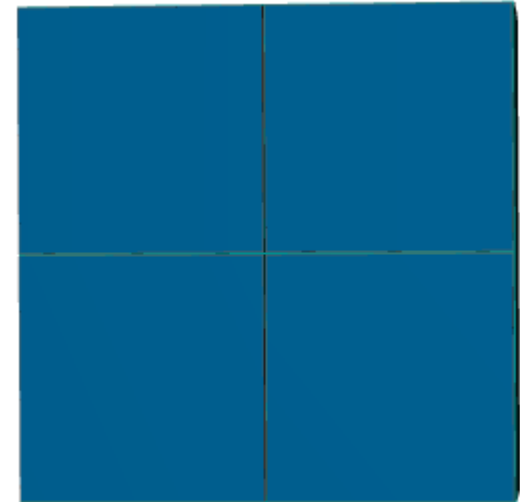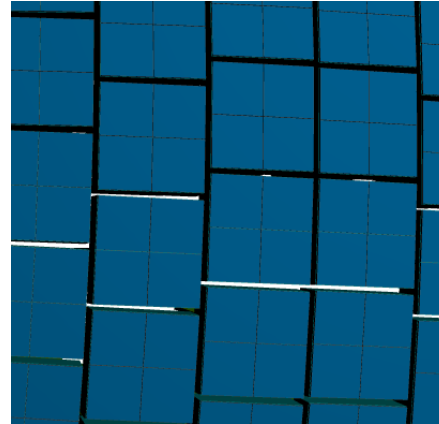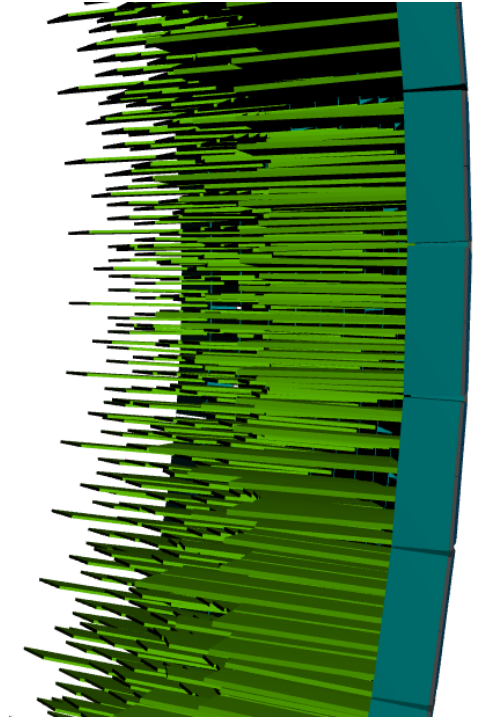
PDUs in One dRICH Sector

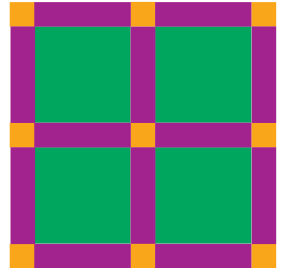Back view

Front view

Zoom

Side view

Backup: Notes on Gaps Between the Pixels

- **Current Implementation**
  - Mask the gaps in digitizer algorithm (PhotoMultiplierHitDigi)
  - CON: requires some geometry knowledge in the digitizer algorithm (not preferable)
- **Alternate Implementation 1**
  - Use boolean solids and generate gaps in geometry
    - CON:
      - booleans map 2 solids → 1 solid, so we cannot do a finite union over N solids
      - such booleans tend to reduce simulation performance
- **Alternate Implementation 2**
  - Generate very thin gaps in geometry, and place them on top of the photosensitive surface
    - CON: can our photons penetrate such thin gaps?
    - CON: either requires booleans of vertical and horizontal strips, or we need to make a small strip for each horizontal and vertical gap between sensors, and a square for each diagonal gap