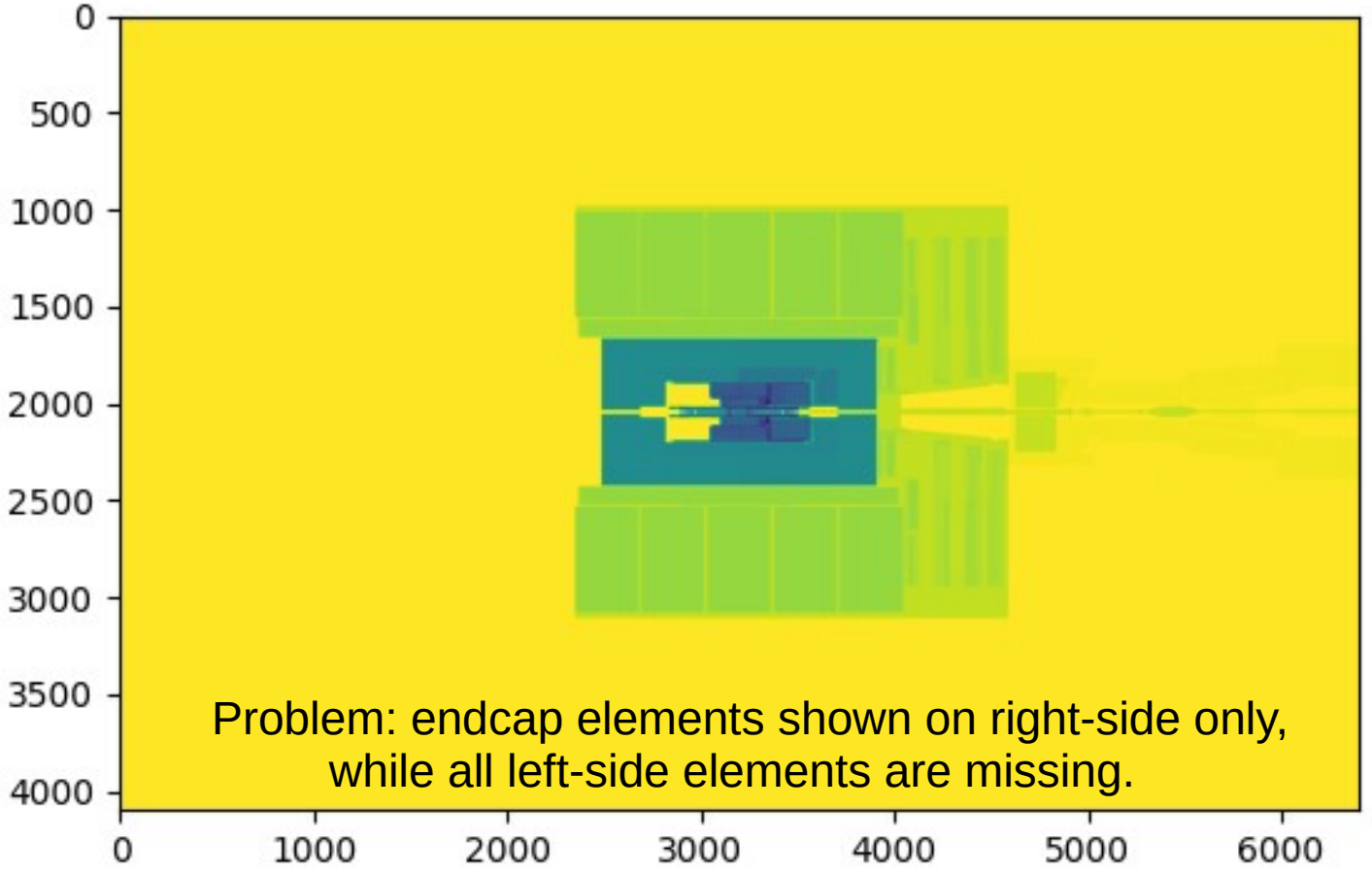
Celeritas – geometry validation

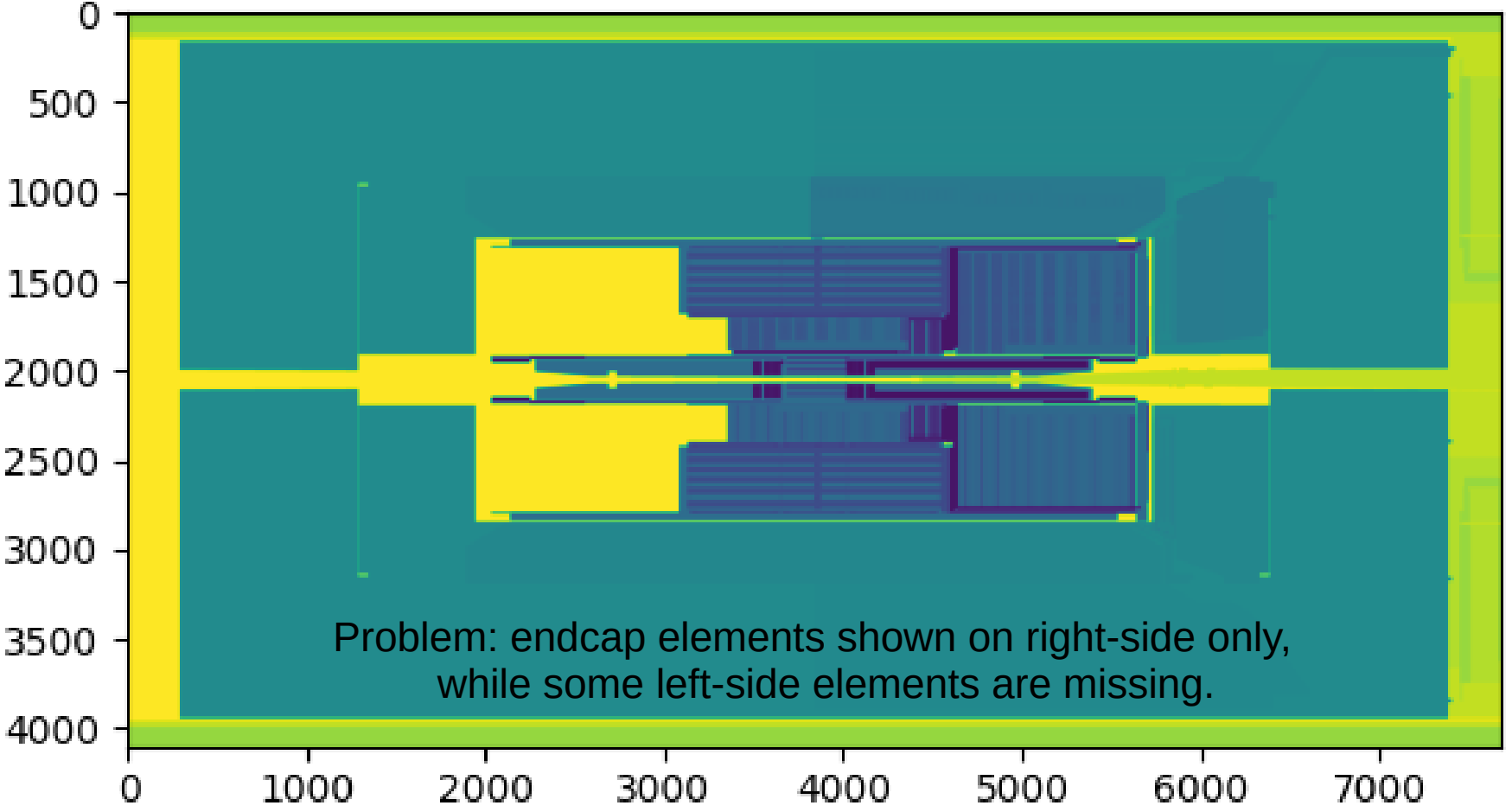
- Celeritas uses VecGeom for geometry and navigation
  - VecGeom GDML parser for geometry input
- Geometry validation: rasterizer
  - detector view across a plane (e.g. xy)
  - define dimensions by lower + upper-corner plus an axis for scanning and track spacing
  - tracks initialized along one edge, and propagated by pixel dimensions.
  - color coded by volume ID
  - result: a colored 2D image of detector elements

Example: an xy-view (end view)

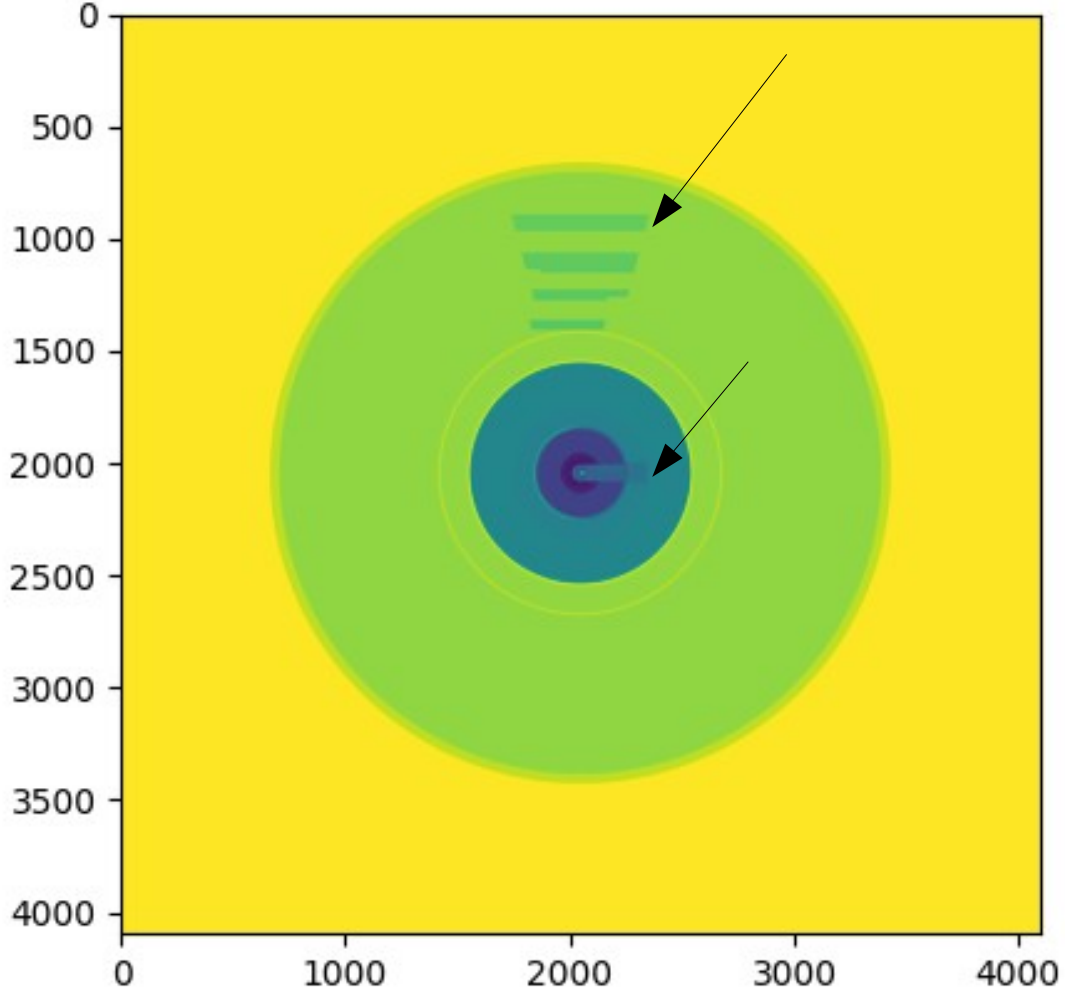
```
{"image":
    {"lower_left": [-2230,-1230, 0],
     "upper_right": [2230, 1230, 0],
     "rightward_ax": [0,1,0],
     "vertical_pixels": 4096},
 "cuda_stack_size": 65536,
 "input": "../test/geometry/data/cms2018.gdml",
 "output": "cms2018-xyview.bin"
}
```

Rasterizer validation – CMS2018 top view



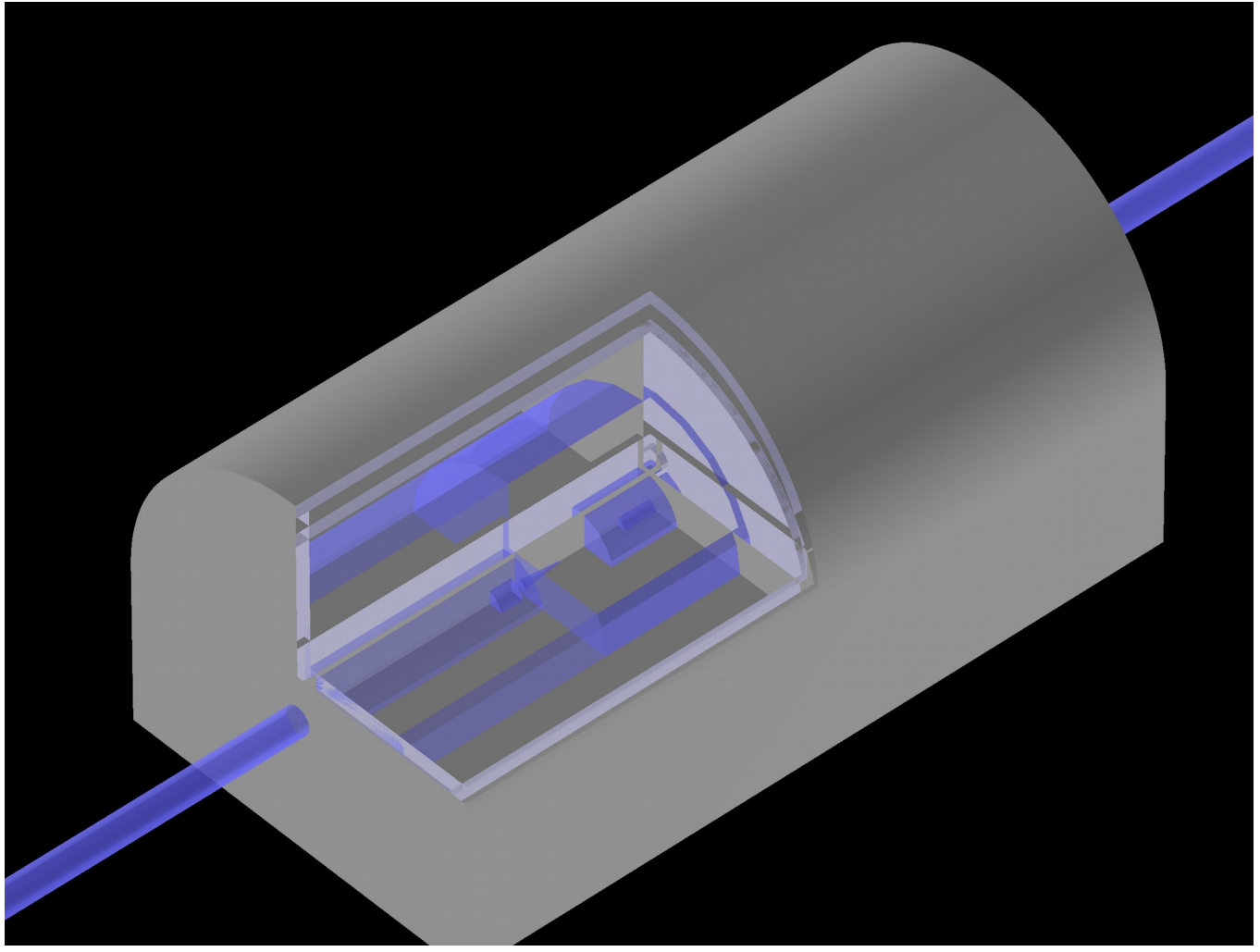

0
500
1000
1500
2000
2500
3000
3500
4000
0
1000
2000
3000
4000
5000
6000
7000
Problem: endcap elements shown on right-side only,
while some left-side elements are missing.

Rasterizer – cms2018 – end view

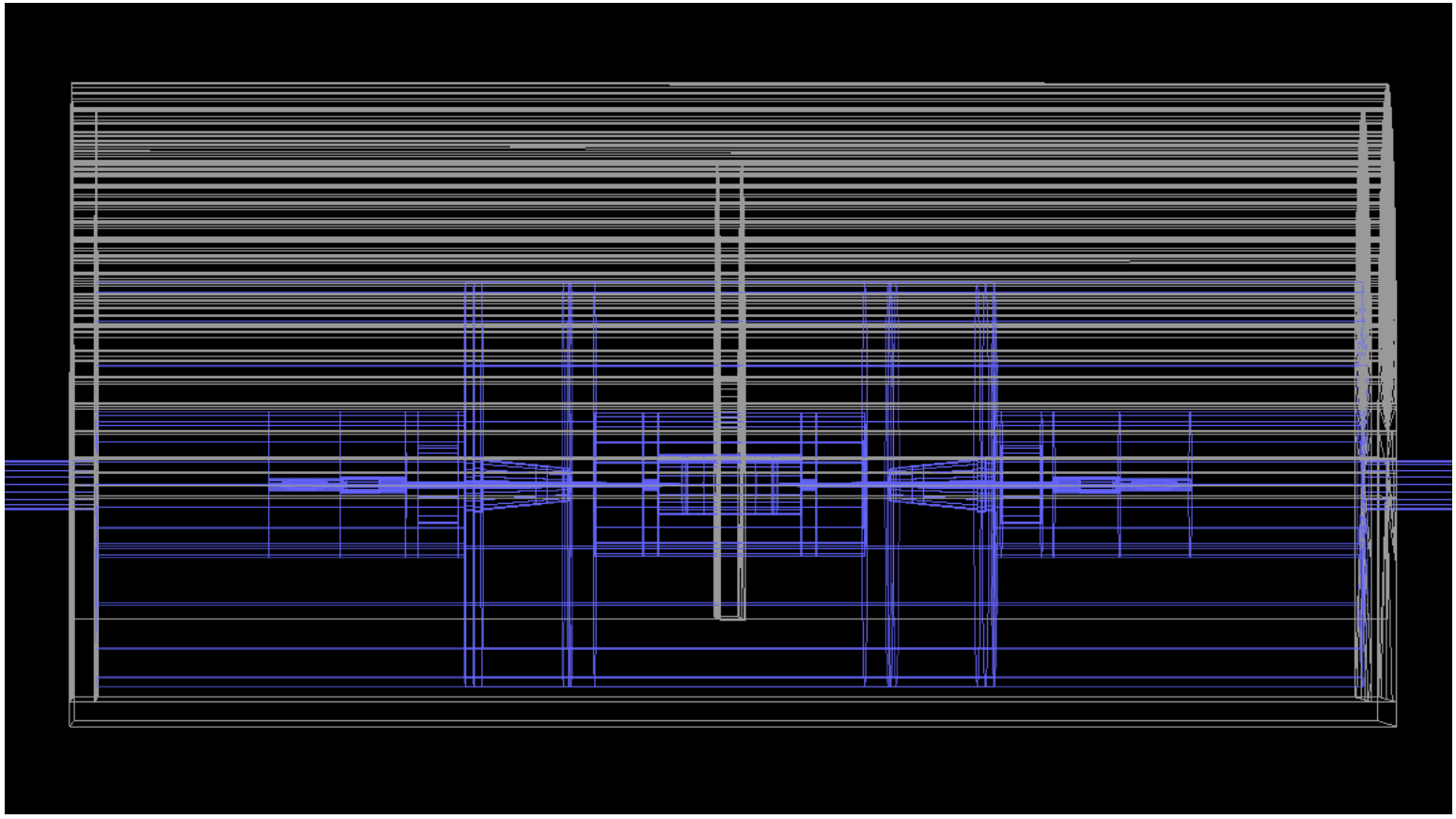


Some rectangular features seem to be elements of a phi-replicated structure, which is not shown.

Celeritas EvtDisplay – Root-based GDML parser



Celeritas EvtDisplay – Root-based GDML parser



The Root-based GDML parser does not see those problems.

Current status

- Some rasterization crashes understood
  - due to the upside-down U-shape of the CMS world volume
  - still get infinite-loop on the yz-view
- Try the Root GDML parser instead, for a test
  - could not build root yet on our GPU master node
- Run some VecGeom tests on the cms2018.gdml geometry
  - Root geometry: #shapes=4608, #vols=3815
  - VecGeom volumes: logical=4921, placed=20279, #nodes=2104795
  - Geant4 volumes: logical=4257, physical=20137