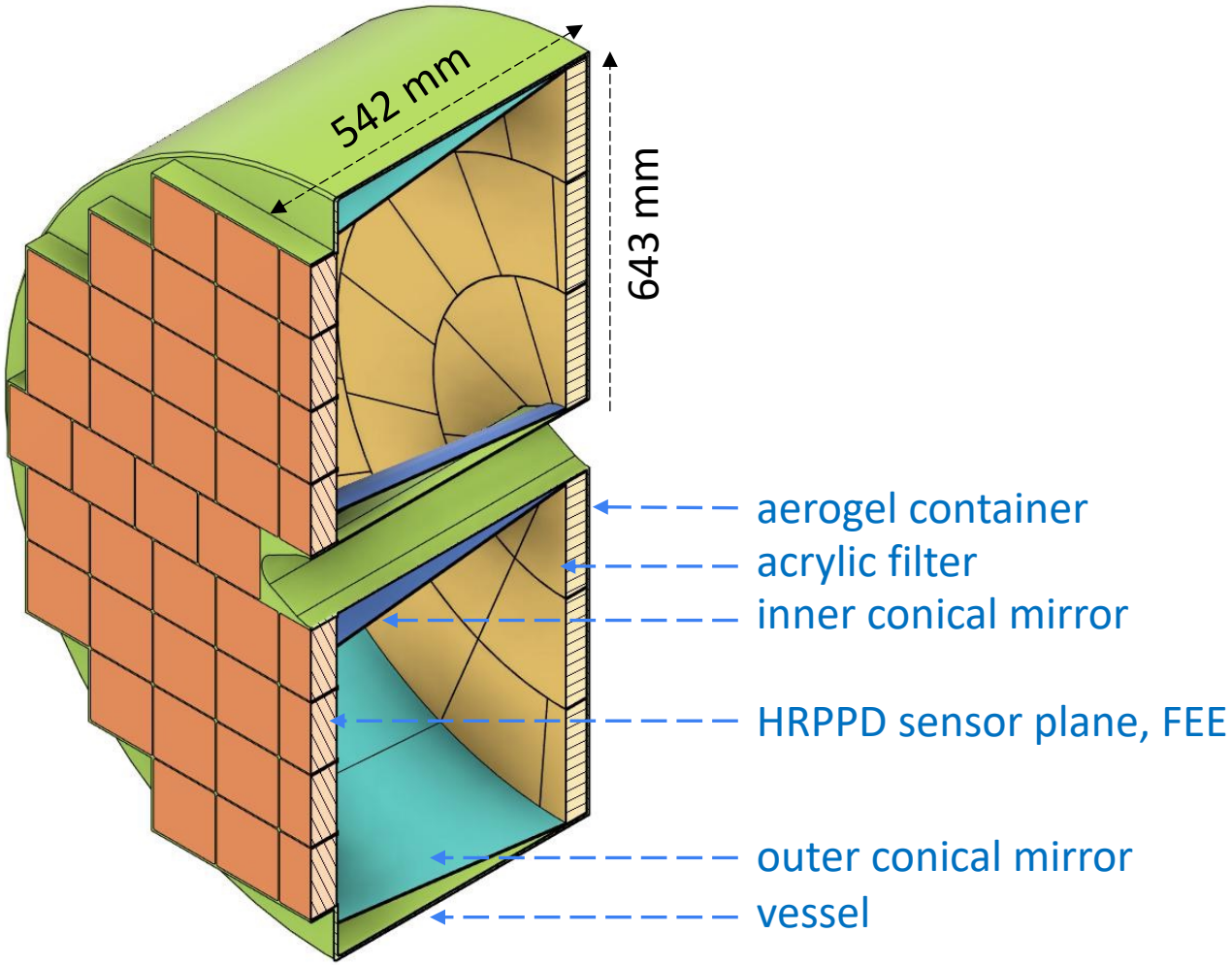
# (pf)RICH prototype construction & beam test




- Timelines
  - May 2023: no sensors, aerogel, FEE, …
  - Fall 2024: Final Design Review
- Beam test goals
- Participants
  - Modeling, proposal writing
  - Construction
  - Beam test
  - Offline data analysis afterwards
- Scope
- Construction site Stony Brook
- Budget Can be fairly modest
- Ingredients

**What realistically can we build? Fallback strategies?**

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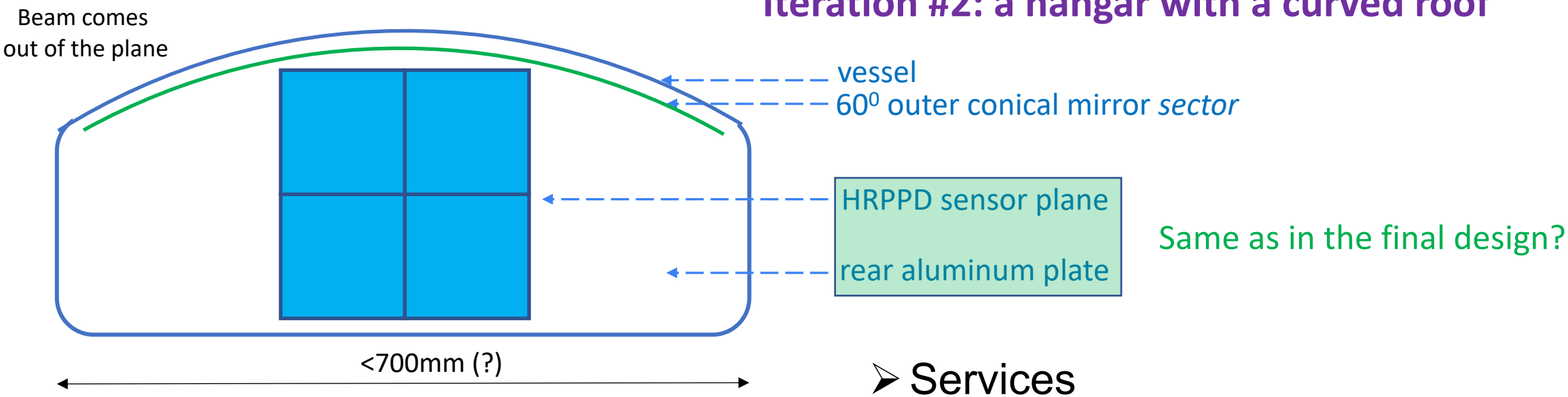
- Aerogel — Temple / Brookhaven
  - EIC Project is ordering new tiles from Chiba
  - Their performance will be quantified in advance
- HRPPD photosensors — BNL / INFN / Glasgow / Yale
  - A 2x2 matrix should become available (EIC project)
  - A separate short beam test ~January 2024?
- Vessel — Purdue / Stony Brook
  - A "sector test" version, see next slide
    - Front plate with aerogel compartments
    - Aluminum rear plate
- Mirror mockup — Purdue / Stony Brook
  - Order a full-size sector from CMA? $$$$
  - *Is this prototype test an opportunity window for a Stony Brook mirror option?* YES
  - What about pyramid mirrors?
- Readout
  - Build a 4096ch HGCROC3 version?
    - ASICs will be available, < $10k
    - Oak Ridge / Orsay & JLAB help with the engineering as part of the eRD109 FY24 request
    - Incom / BNL / Techtra to solve the integration problem Getting there
  - *BNL 512ch DRS4 is always a fallback option*
- Services Brookhaven / INFN / ..?
  - HV -> a scaled down "final" version: < $20k
  - LV -> a scaled down "final" version: < $10k
  - Gas system -> a final version would be <$10k
  - Cooling -> since chiller & circulator can be borrowed, the rest is by far < $10k

# Relevant timelines

| | |
|---|---|
| EIC Project Detector R&D FY24 call deadline | July 7, 2023 |
| FY24 R&D funding availability | October 1, 2023, the earliest |
| Aerogel availability | Starting September 2023 or so |
| Work on HGCROC ASIC integration | TBD |
| HRPPD manufacturing (first five tiles) | September 2023 – March 2024 |
| HRPPD (and aerogel?) beam test opportunity | Beginning of 2024 ? |
| (pf)RICH prototype beam test | May – June 2024 |
| ePIC Final Design Review readiness | Mid Fall 2024 |

# (pf)RICH prototype construction & beam test

## Iteration #2: a hangar with a curved roof



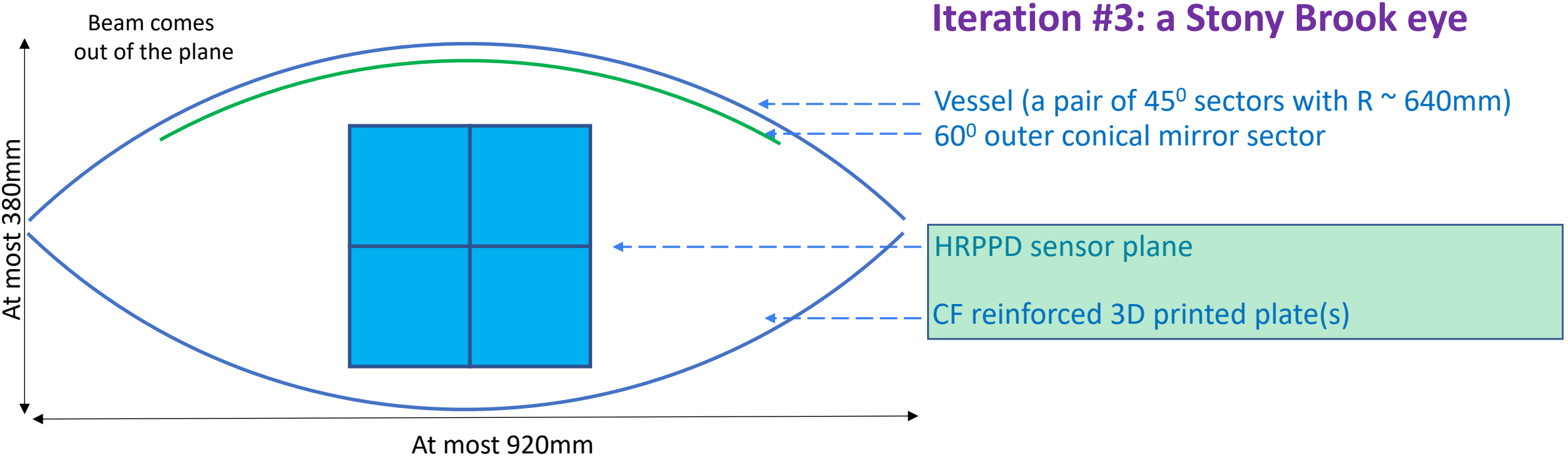

Same as in the final design?

- Vessel
  - Build as a “single HC/CF piece” or not?
  - Will it be manageable in the beam test?
  - Will it be “representative enough”?
    - Sturdiness overall, given a smaller size
    - Reinforcement ring material and layout
    - Aluminum rear plate with HRPPD slots
    - Aerogel tile integration
- Services
  - Can pack and test as much as the EIC project agrees to fund this time
- Readout
  - Develop HGCROC ASIC solution, but use it at Fermilab only if 100% sure we are not wasting a beam test debugging it
- Mirrors
  - ?

**Slide as shown at Temple last week**

# (pf)RICH prototype construction & beam test

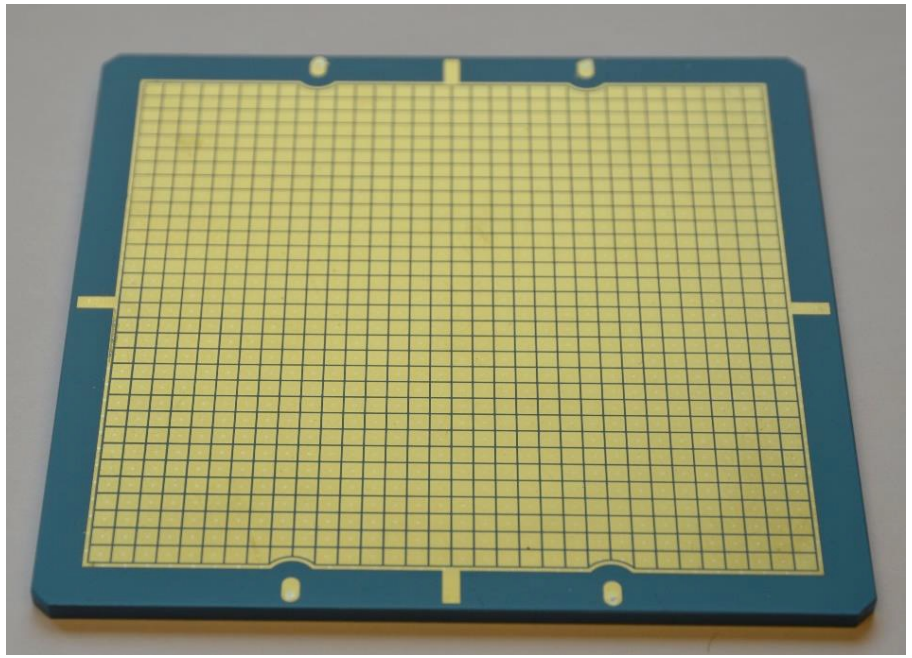
## Iteration #3: a Stony Brook eye

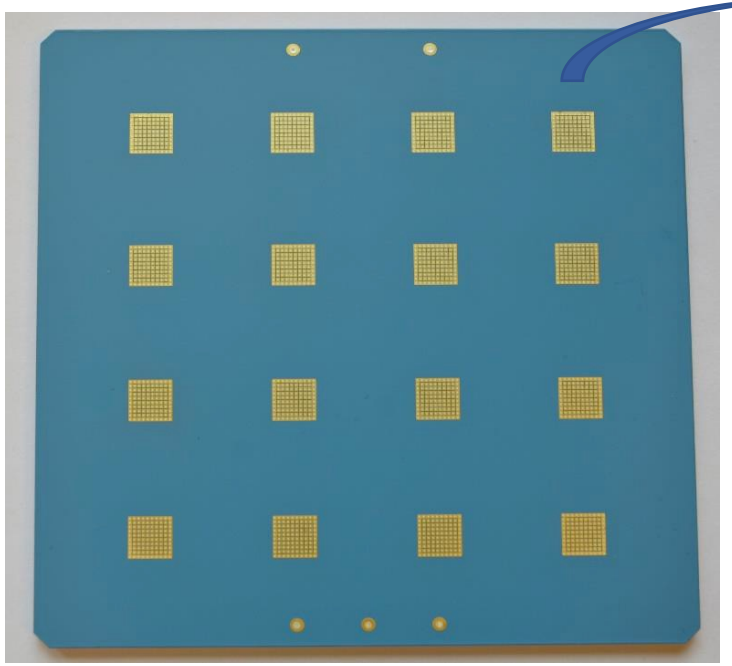


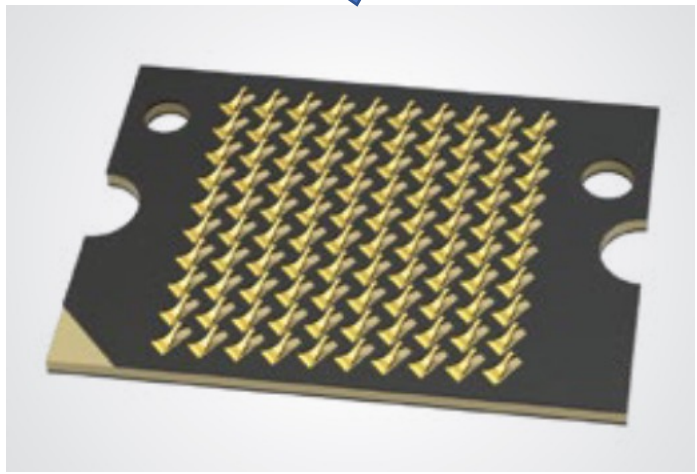

- Vessel
  - Build as a full HC/CF cylinder & cut out two $45^0$ sectors — Stony Brook
    - Use aluminum reinforcement rings and ribs?
  - Bind them by 3D printed front and rear plates — Purdue / [Temple]
    - Front plate with aerogel compartment(s)
    - Rear plate with HRPPD slots
- Mirror — Purdue / Stony Brook
  - 3D printer CF-reinforced substrate
  - Aluminum coating

**Overall design & integration: Alex**

# Update on HRPPD integration



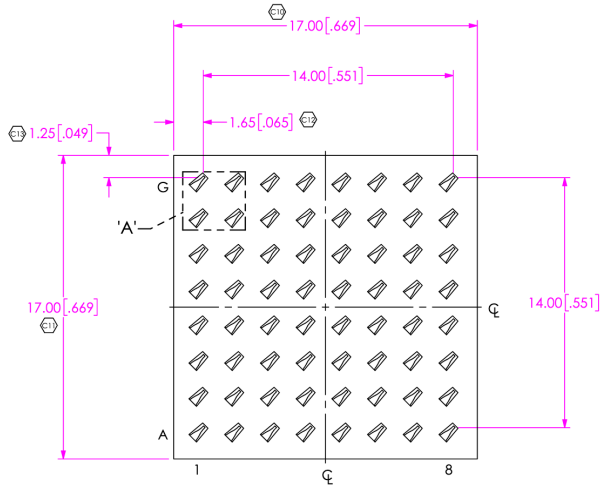




Stock interposer with 800 μm pitch

Full size (120mm) HRPPD anode plate by Techtra

- Techtra anode plate prototype
  - Looks fine, but a lot of shorts inside -> specs are relaxed for next iteration
  - Seem to be outrageously expensive in mass production
  - A matching readout PCB and stock Samtec interposers are delivered
    - Will check integration once the anode plate gets shipped to the US
- Custom Samtec interposers with a 2mm pitch
  - Got a quote; they will add ~$500 per tile in mass production




Custom interposer with 2mm pitch