Some thoughts/updates

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eIC RNC meeting

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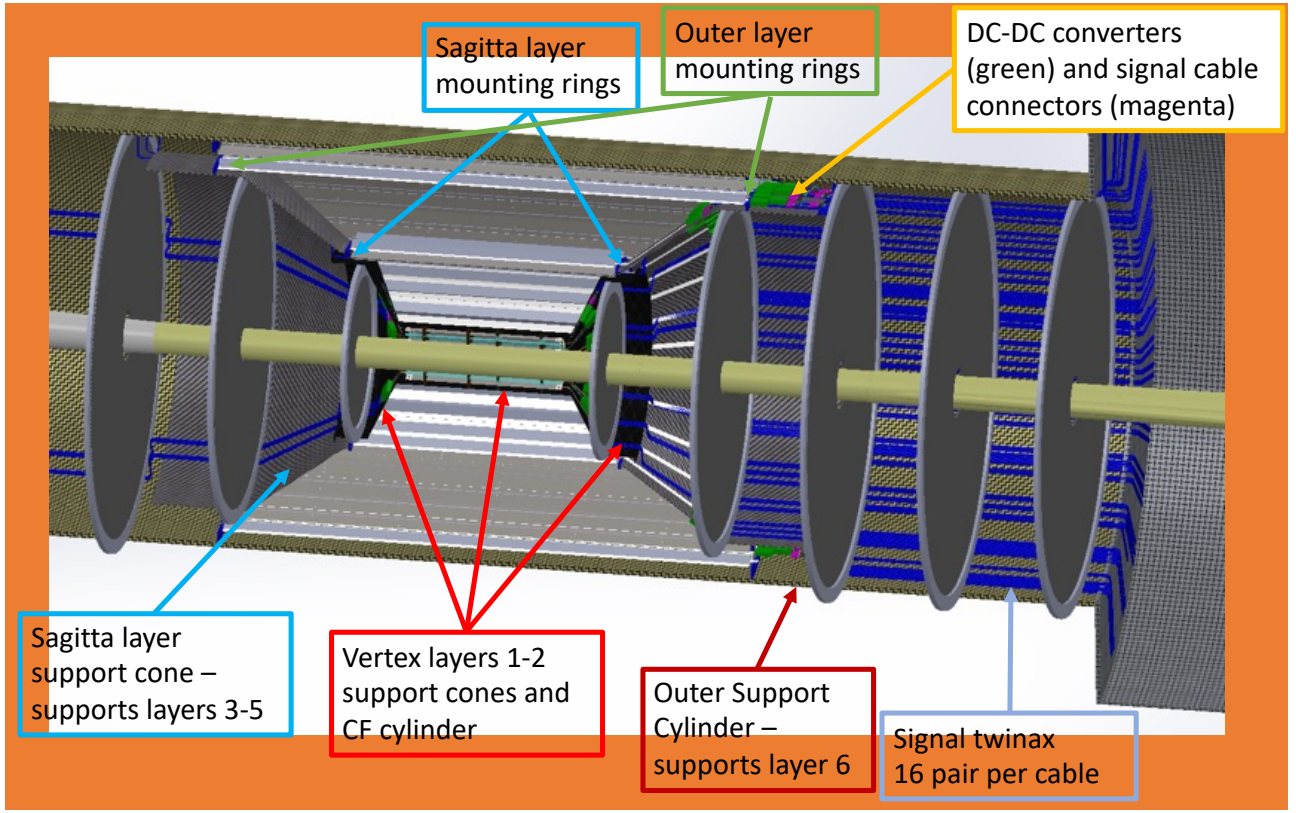
EIC Silicon Considerations

Vertex layers vs reticle size

Some considerations for tiling disks



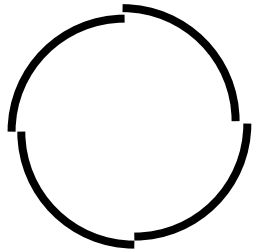
Jim Fast (JLab)

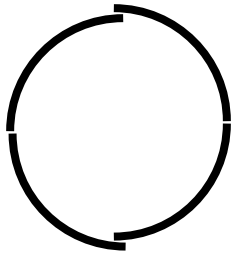
Vertex layer radii vs reticle width

- For curved silicon with a reticle width, *w*, the radii, *R*, of the vertex layers must be:
  - $R=n*w/\pi$, where n is an integer (I have imposed an even split of halves around beampipe)
- ER1 sensors are planned to have *w=14 mm*
  - Well matched to ALICE desired radii (*n=4,5,6* provide R=17.8, 22.3, 26.7 mm)
- EIC L0 target is 33 mm (this is also lower limit)
  - *n=7* implies *R=31.2 mm* – too small for EIC
  - *n=8* implies ***R=35.7 mm* – smallest radius possible for EIC L0 using ER1 sensor width**
- Optimized reticle width for EIC: *w=17.6 mm*
  - CORE/ECCE-like layout: *R=33.6, 50.4, 84.0 mm* for *n=6,9,15*, respectively.
    - Note that these are all diced 3-wide with m=2,3,5 pieces in ϕ per half shell.
  - ATHENA-like layout: *R=33.7, 44.9, 56.1* mm for *n=6,8,10*, respectively
    - Note that these are all diced 2-wide with m=3,4,5 pieces in ϕ per half shell.
- ALICE with *w=17.6* mm reticle width (target radii are 18, 24, 30 mm)
  - *R=16.8, 22.4, 28.0* mm for *n=3,4,5;* I suspect *R=16.8 mm* is too small for ALICE beam pipe
- Joint EIC/ALICE optimization requires narrower sensors, e.g. *w=9.5 mm*
  - For ALICE, *R=18.1, 24.2, 30.2 mm* for *n=6,8,10*
  - For EIC, *R=33.3, 45.4, 54.4 mm* for *n=11,15,18* or *R=33.3, 48.4, 84.7 mm* for *n=11,16,28*
    - *Having a large prime number is not ideal as it implies multiple dice width in L0, e.g. 4+3+4 = 11*

Reticle width cont.

- Simulations needed?
  - Physics implications with the larger radii
  - Physics implications with a small overlap in some regions





Staves – how to do dicing

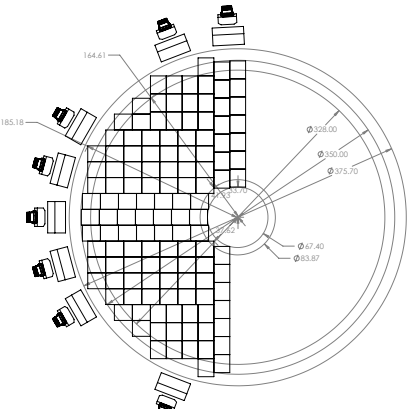
- Assuming *w=17.6 mm* reticle (optimized for EIC)
- For CORE/ECCE, dice stave sensors 3-reticle wide (52.8 mm dice)
  - Build all staves at this width
    - CORE 10, 16, 22 per half cylinder
    - ECCE 12, 13 per half cylinder
- For ATHENA, dice stave sensors 4-reticle wide (70.4 mm dice)
  - 5, 6, 8 staves per half cylinder
  - Could dice 2-reticle wide and use 10, 12, 16 staves per half if more cylindricity is desired
- In Z, dicing is going to be driven by yield. If yield is very high

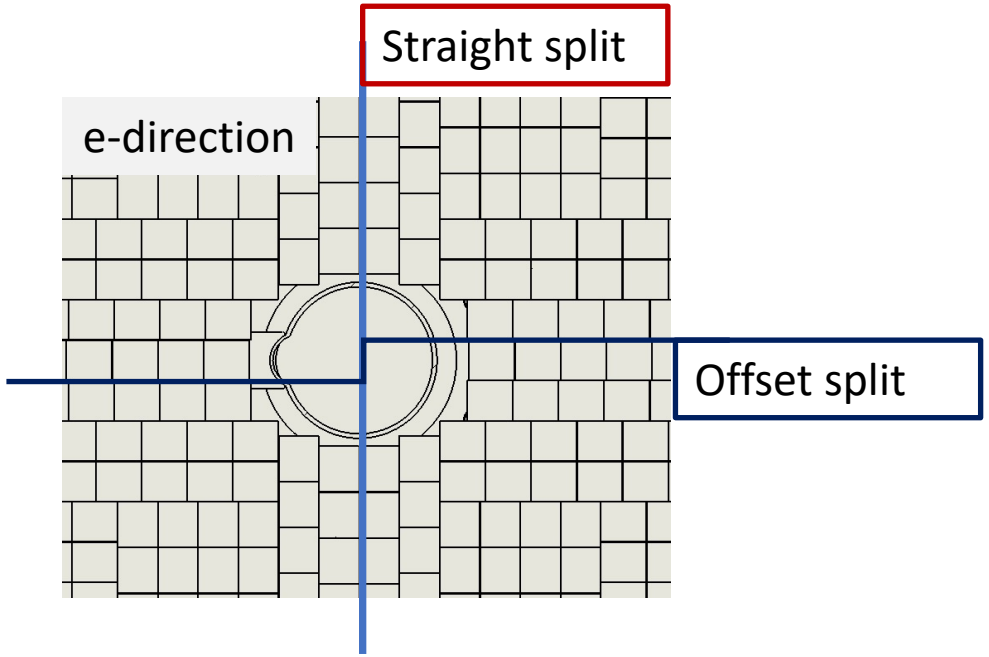
To do: Stave dicing with the 14 mm reticle size?

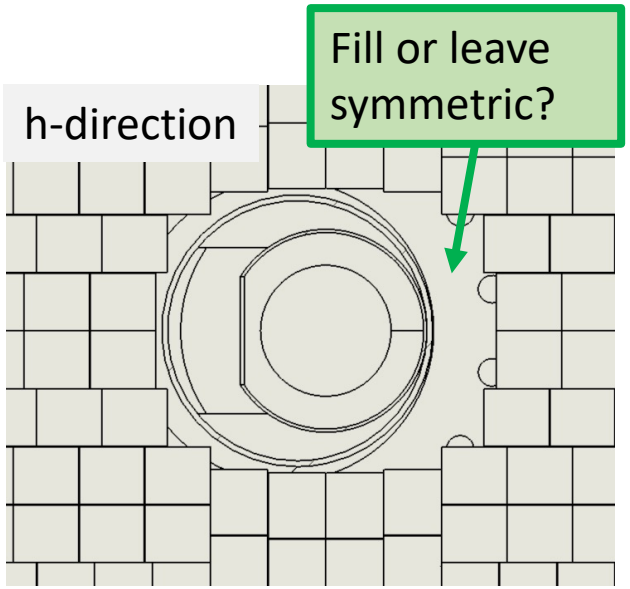
Simulations with these large width staves → is more cylindricity needed?

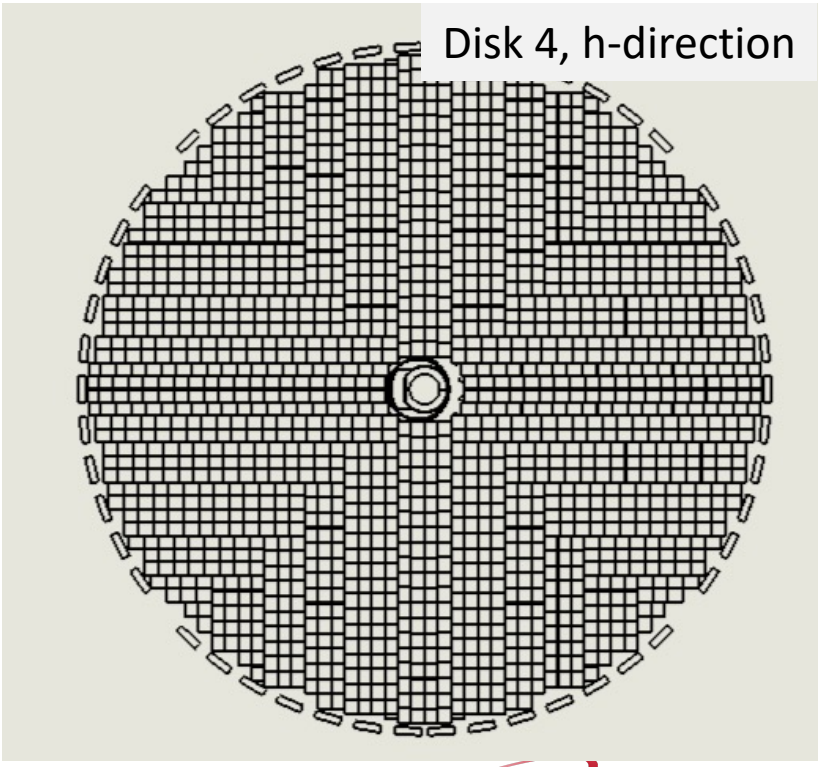
Disks – a bit of a mess

- I have taken a crack at this and frankly don't see a great path here
- For each disk, given the unit sensor (reticle) size:
  - Start around beam pipe opening to try to minimize gaps
    - There are two basic configurations: straight split or offset split
  - Stitch outwards, ideally to edge of disk, in vertical and horizontal directions
  - Use "herringbone" pattern to fill in sectors at 45 degree angles
  - Significant edge effects for smaller disks (perimeter gaps)



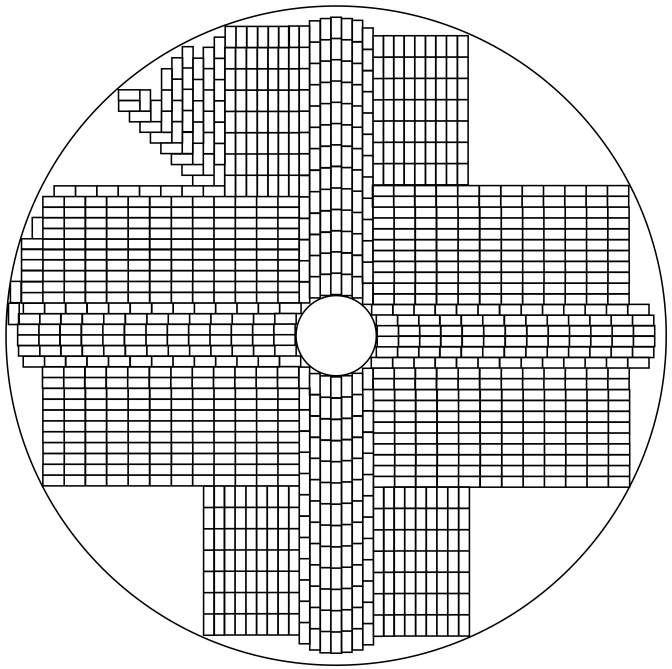


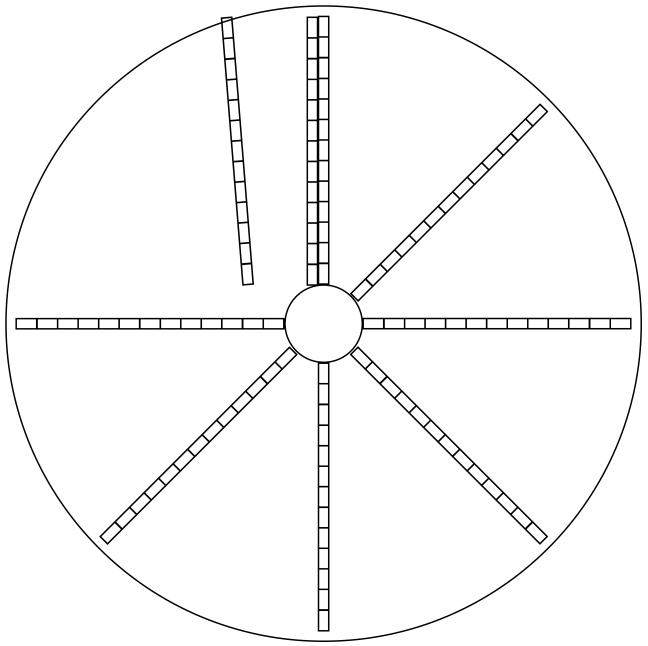


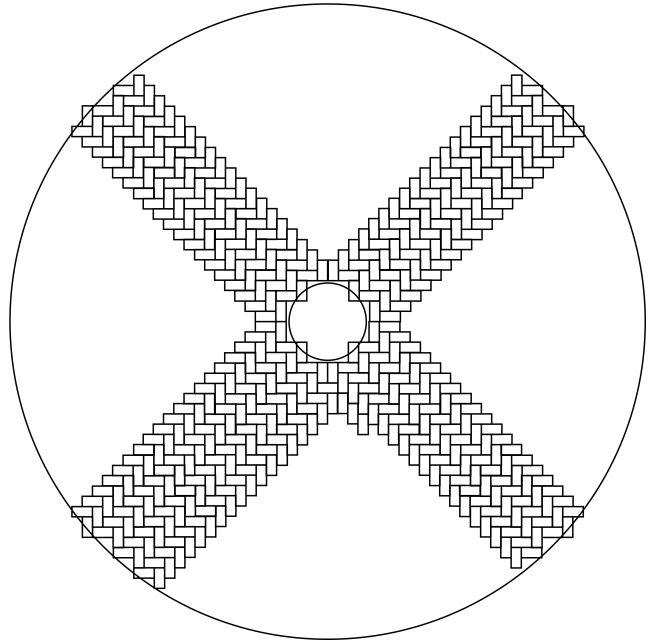


Discs – very much a mess

- I took a stab w/the 14 mm width and 28 mm length
- As I described to my kids, I am trying to make a circle out of rectangles







Next steps/other

- Stave dicing options with 14 mm size
- More disc layouts
  - Double sided?
- Simulations
  - Vertex layers: overlap, larger radius
  - Stave layers: cylindricity
  - Disc: overlap regions, dead areas
- Meeting with the engineers next week
  - Short term & long term plans

- ALICE ITS3
  - Positive response from Alex & Magnus
    - Still some planning on their end
  - Working under ALICE, eICSC, or both? (I believe we fall under both)