
bTOF Mechanics Update

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30 July 2026

Previous design

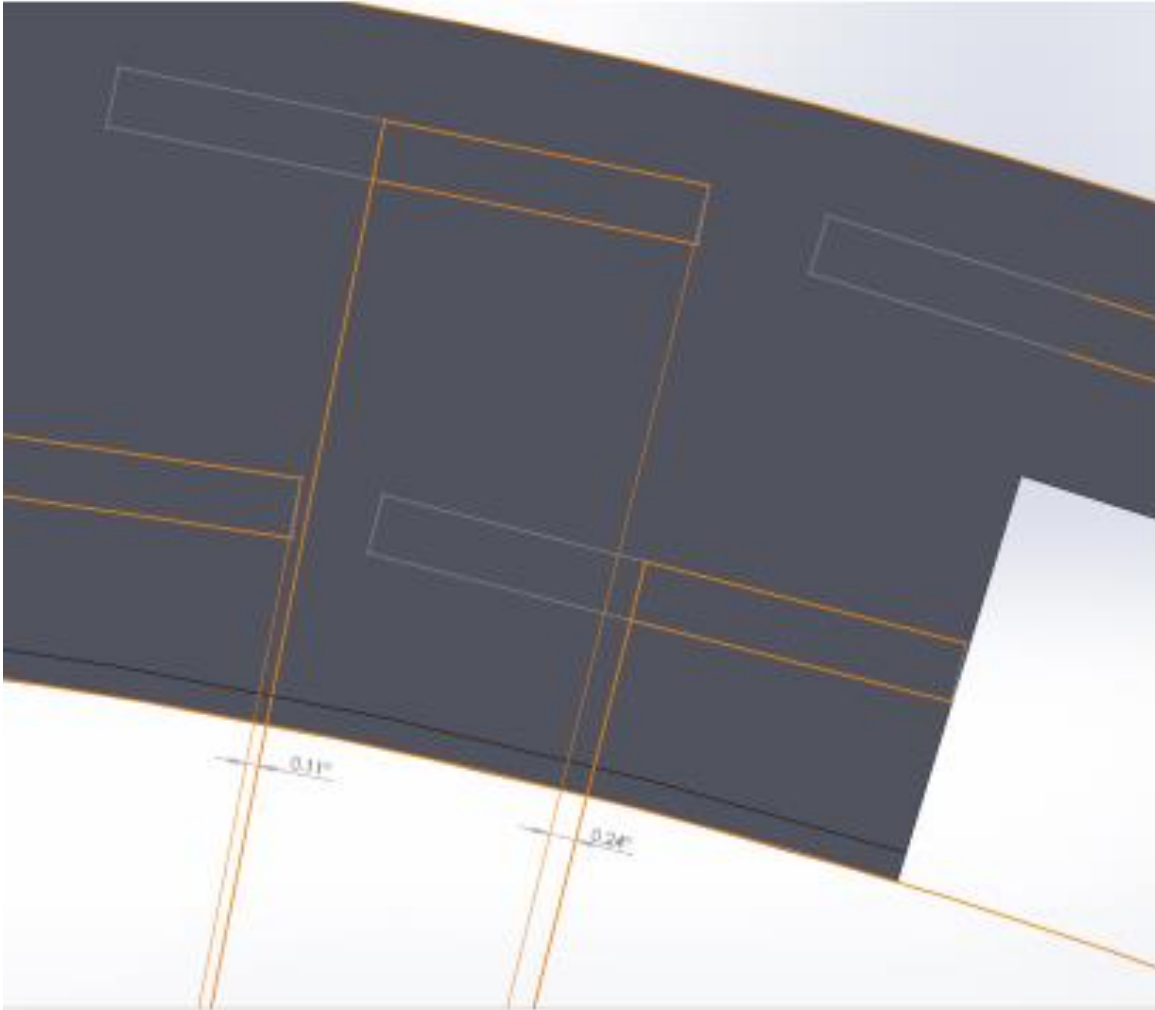
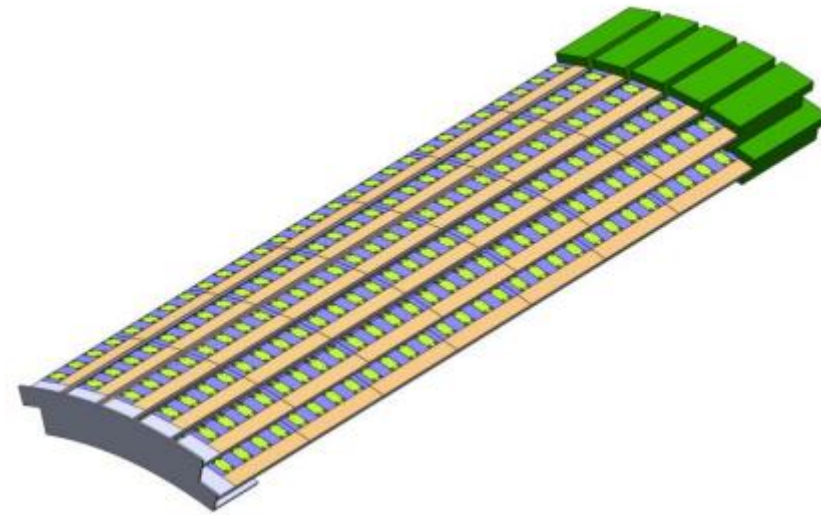
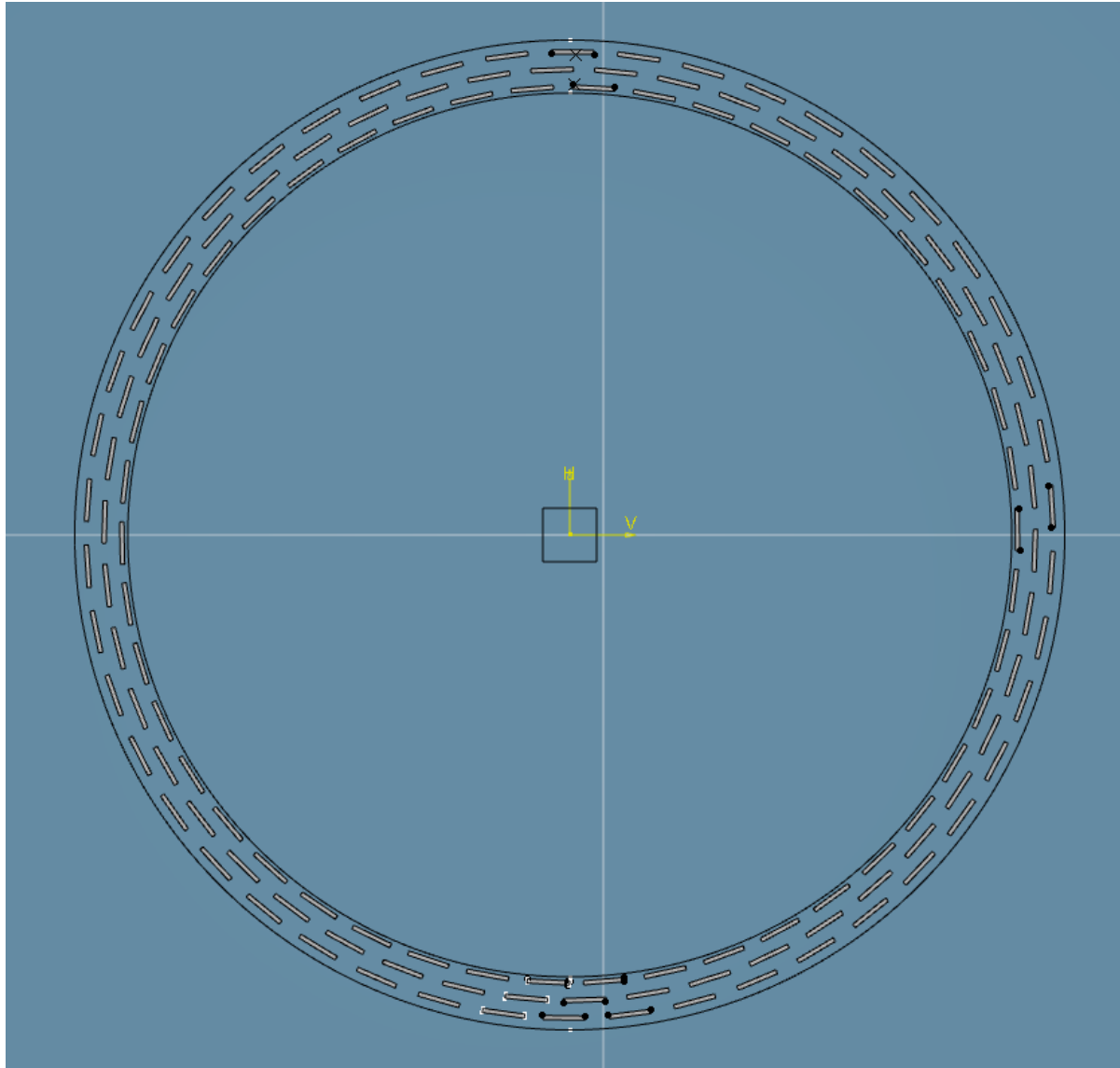


Image borrowed from a presentation by Han-Sheng Li

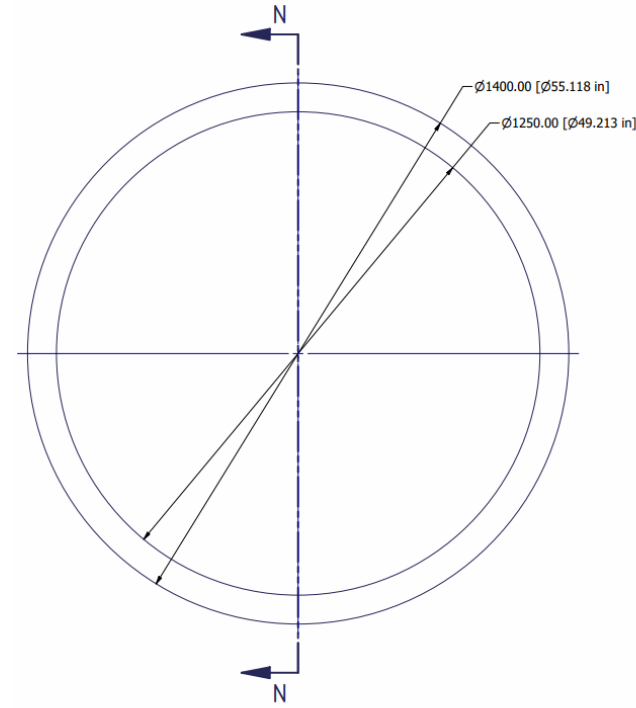
- ⬡ We realized that there is no full coverage of ϕ , given a sensor size of 33 x 21 mm.
- ⬡ The previous design had 144 total staves with 12 in each tray



bTOF Envelope and New Stacking



- Utilizing the full bTOF envelope of R625 to R700 (D1250 to D1400)
- Creating a three layer stave stacking arrangement instead of a two layer
- 144 staves on one side



Stave Stacking Scheme Details

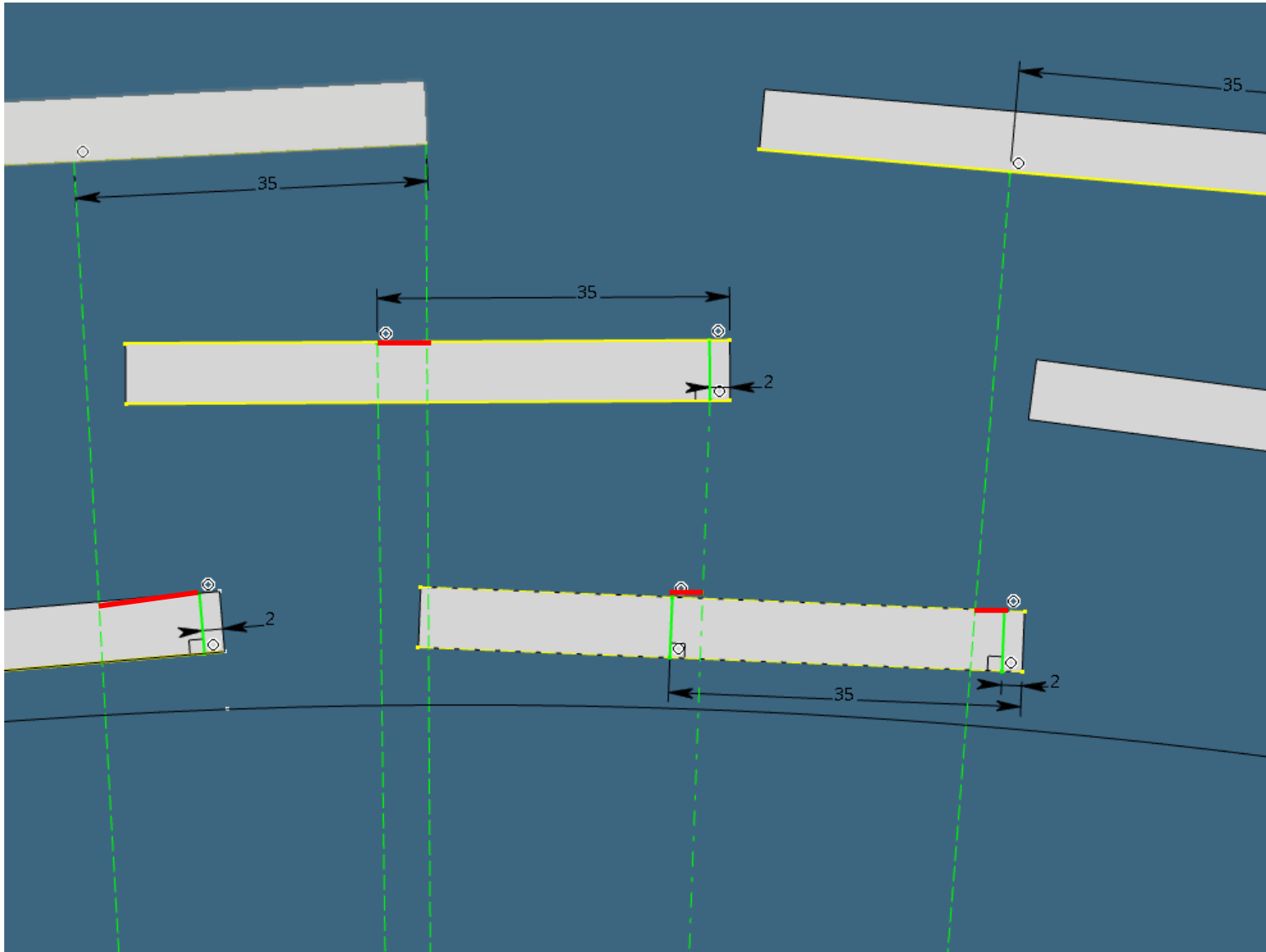
- 46 staves in each row → 138 total staves
- Staves are placed tangentially with contact to the pitch circle at the bottom midpoint.
- Pitch circle diameters for the rows are:
 - Row 1: D1260
 - Row 2: D1290
 - Row 3: D1320

GST Support Rails

3 layers of staves

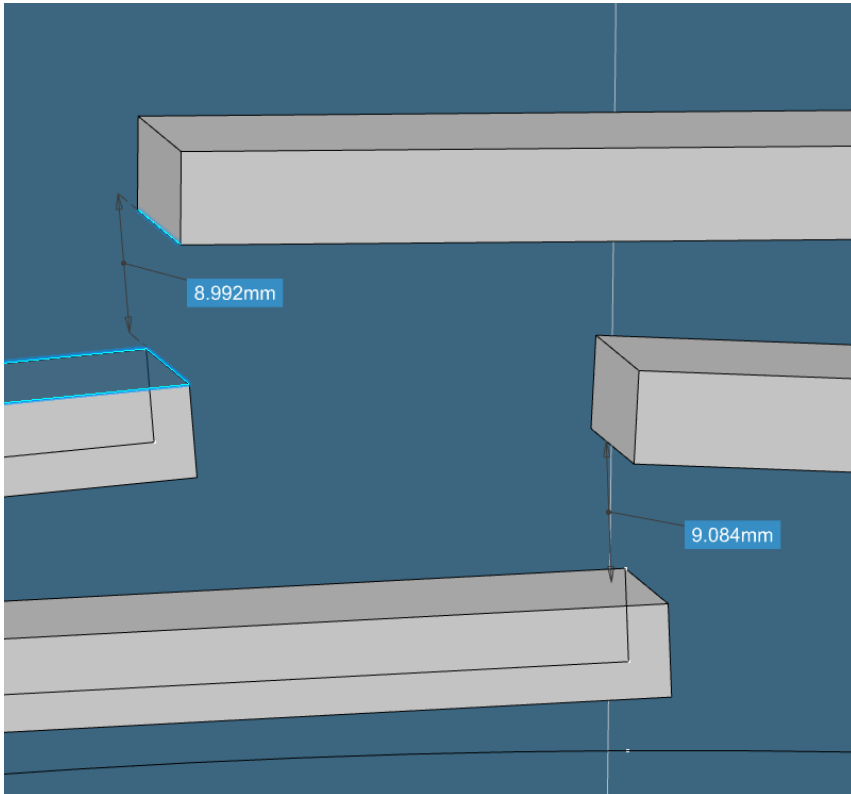
Global Support Tube (GST)

Overlap Checks

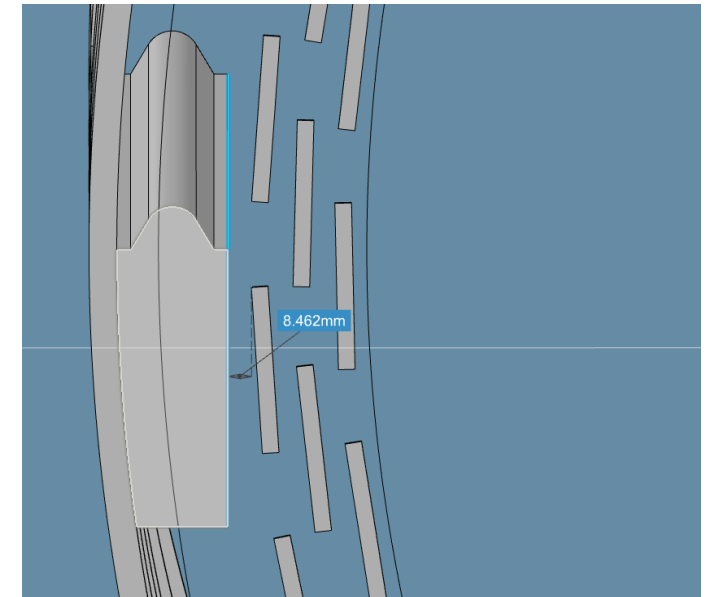
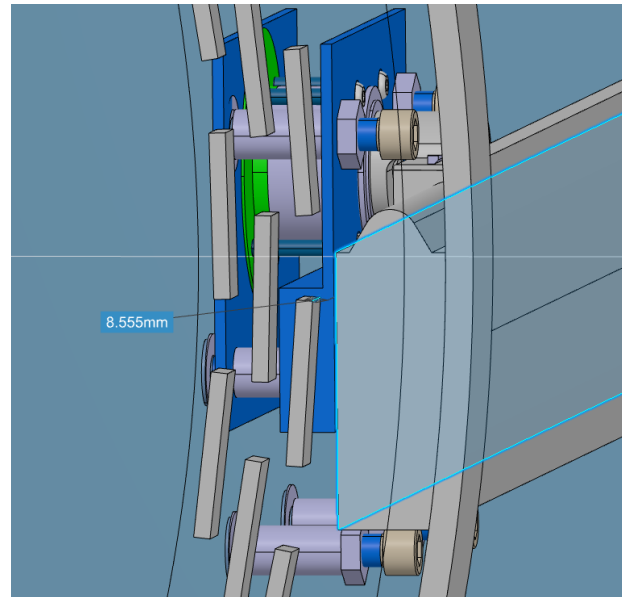


- There is a minimum overlap of 3mm in R-φ (overlap in red)
 - 3mm based on the very first bTOF design
- The staves are placed in 3 rows/layers each being 25mm above one another
- The angular spacing is of 7.84° between each staff of each row
- All the staves are tangent to the pitch circles, hence reduction in complexities

Clearances

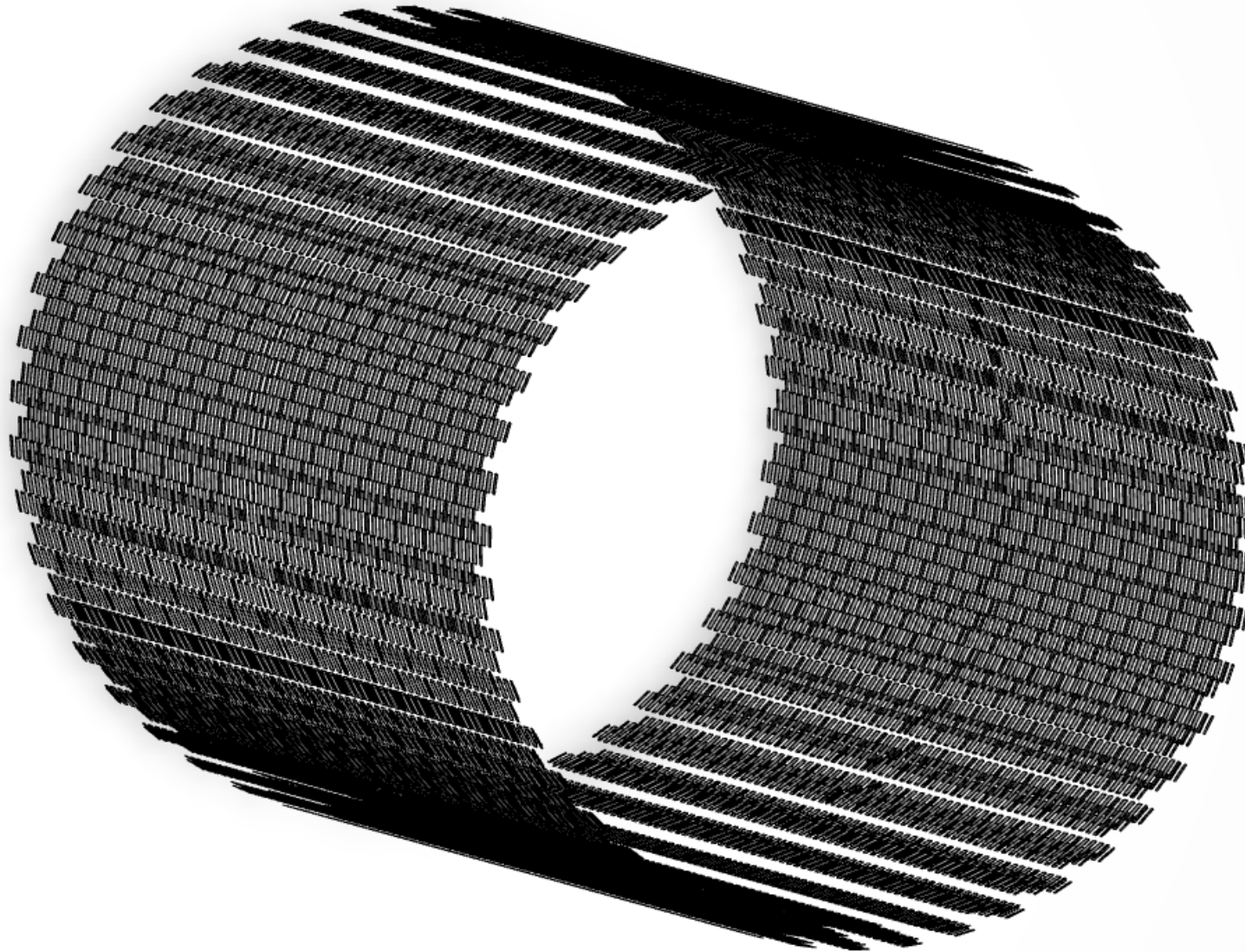


- Approximately 9mm clearance between the closest features of staves in different rows
- Full insertion envelopes to come

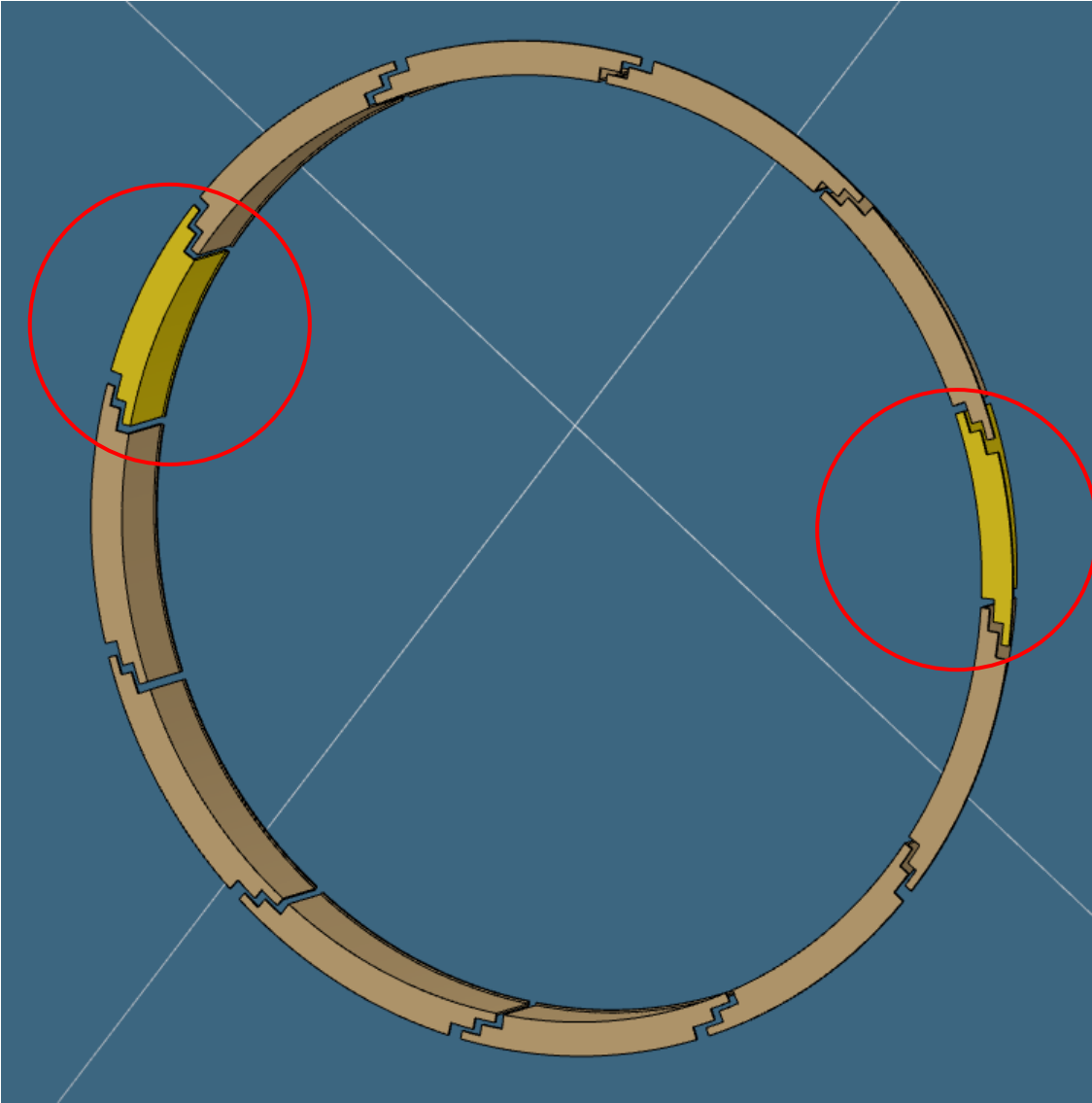


- Approximately 8.5mm clearance between the rails and outer layer staves at the closest features

Silicon Sensor Coverage Image

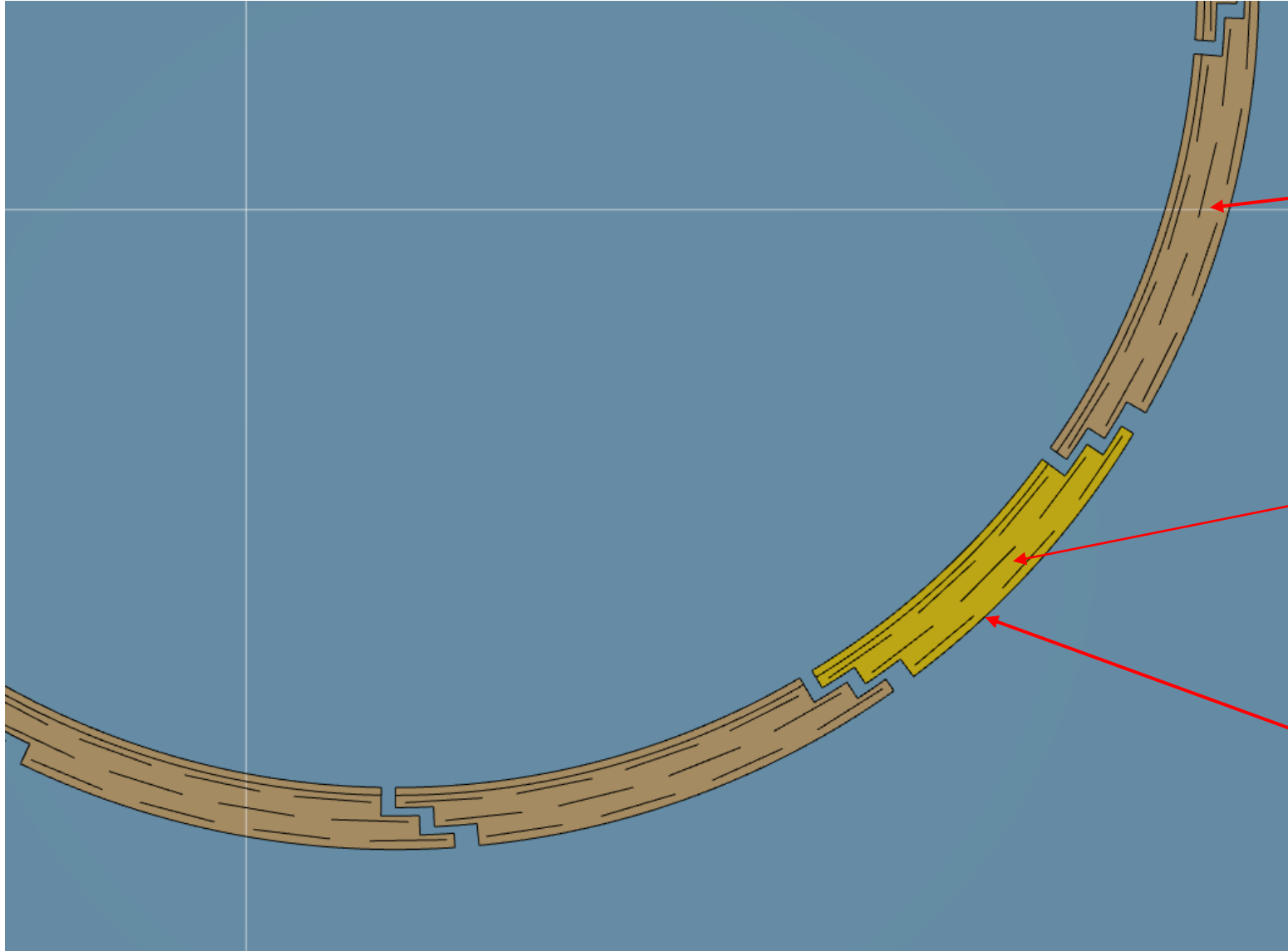


bTOF Tray Segments



- There are 12 total trays containing 138 total staves.
- 10 trays each having 12 staves & 2 trays each having 9 staves (encircled in red).
- Each tray has angular spacing of 1°
- The two 9 stave capacity trays are located near the 3 & 9 o'clock positions

Image

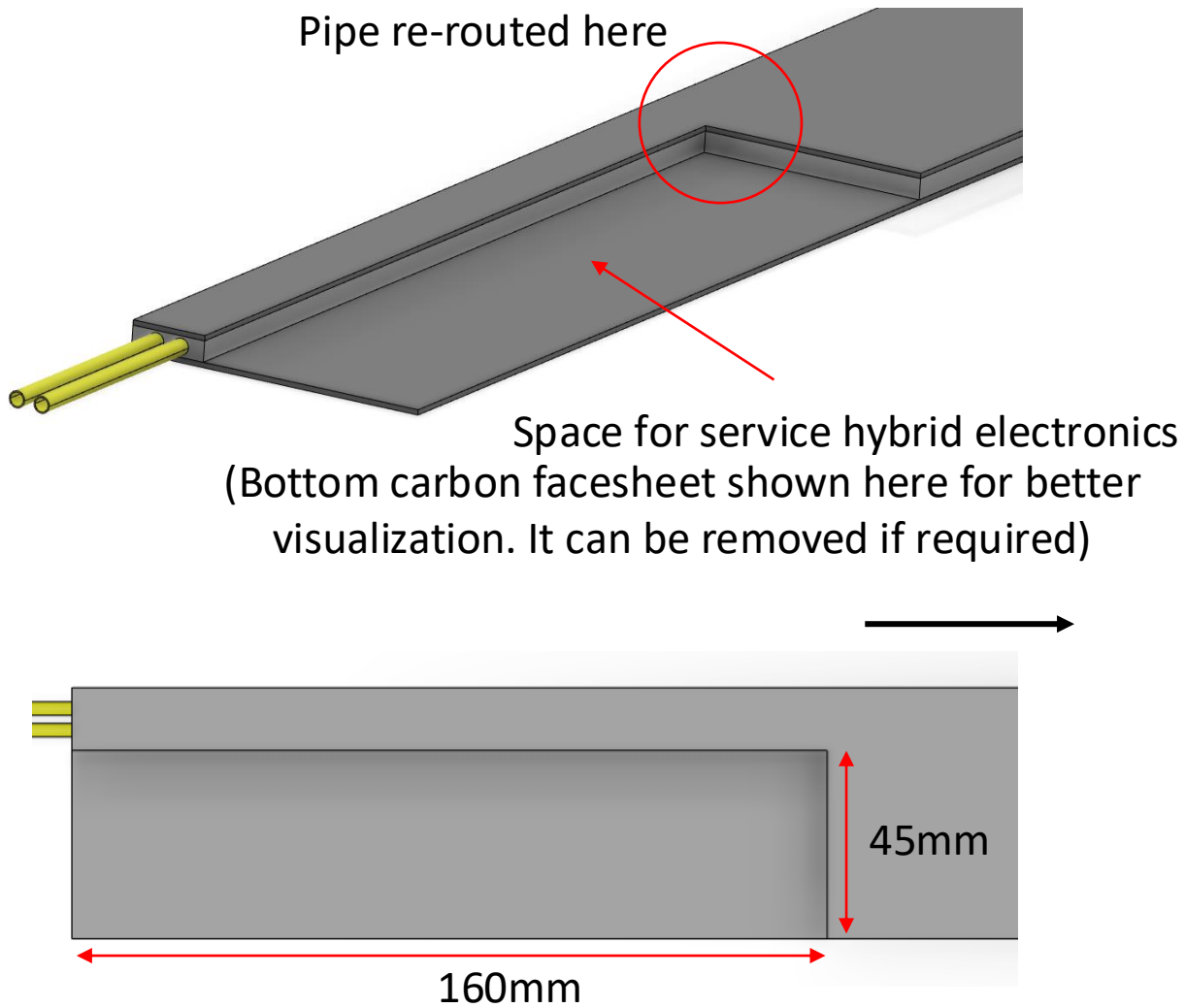


12 stave capacity tray

Staves (represented as lines
in this image)

9 stave capacity tray

Stave with Service Hybrid – Concept



- ⬡ A proposed concept for placement of service hybrid to reduce the overall stave thickness and maintain radial clearance in bTOF.
- ⬡ Cooling pipe can be re-routed to ensure space for electronics at the end of the stave.
- ⬡ Need input from Service Hybrid team in terms of space requirements needed!

Summary

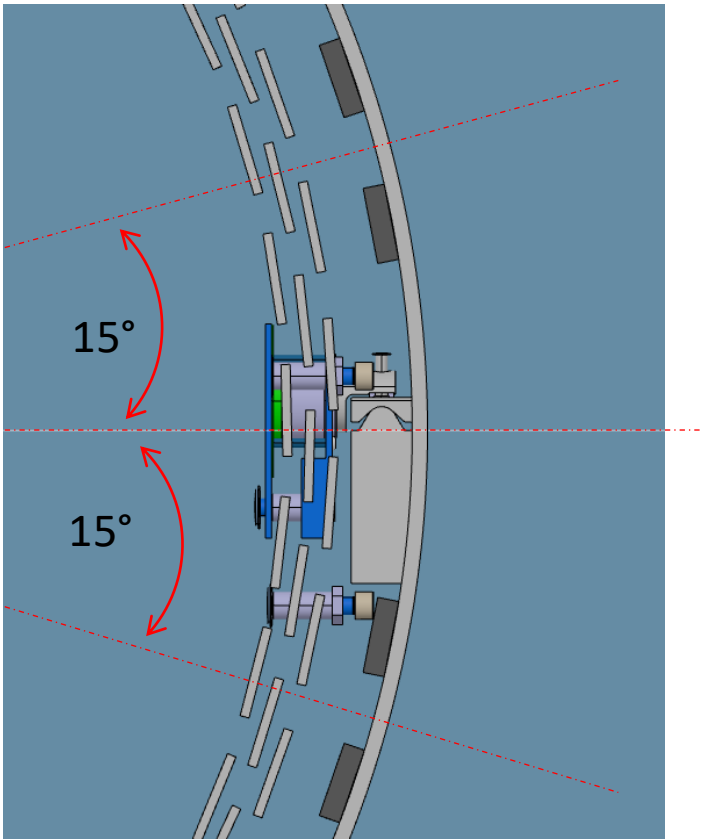
- ❖ Old bTOF stave stacking scheme had the problem of sensors not overlapping. New scheme was required to meet the 3mm minimum sensor overlap.
- ❖ New scheme has 3 rows, each having 46 staves (138 staves in total). Sensors have 3mm minimum overlap.
- ❖ Staves are divided into 'trays' – 10 trays with 12 staves each and 2 trays with 9 staves each.
- ❖ A concept is shown for accommodating service hybrid on the stave to reduce radial space: needs discussion and agreement with service hybrid team!

Next Steps:

- ❖ Individual stave thermal FEA's to ensure new mechanical layout works, if OK move to full tray thermal FEA to determine "heating" impact for other detectors (Cymbal)
- ❖ Designing mechanism to mount staves on the trays, and prototyping.

Backup Slides

TOF Support Rails



- ⬡ bTOF support rails of dimensions is 50x14mm are projected onto the GST with it's corners coincident on the GST ID.
- ⬡ bTOF rails are placed such as they avoid the 3 & 9 o'clock positions, there are 12 rail segments at 30° angular separation.
- ⬡ Near the GST rails, the clearance is around ~9.1mm

