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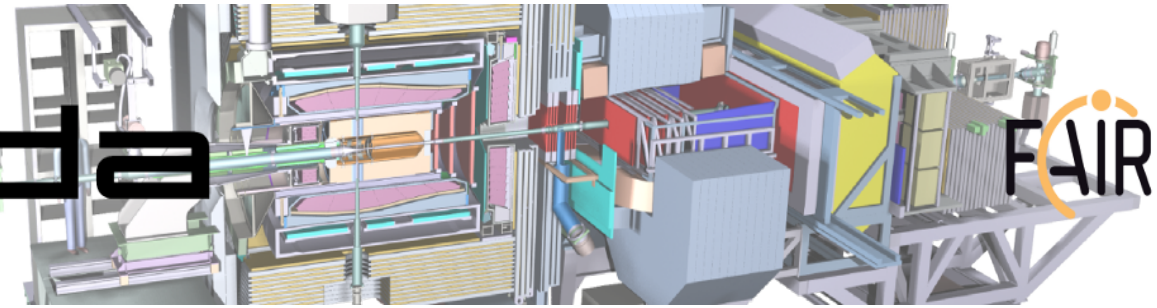

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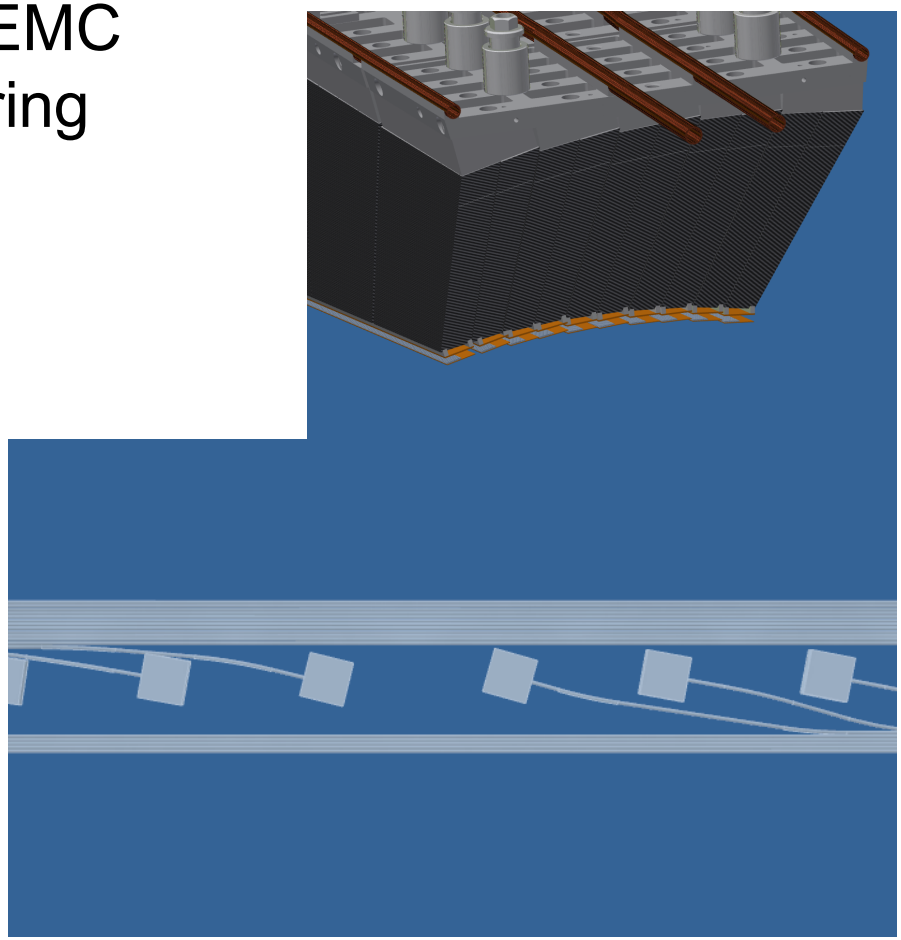
CM 1/2021 – Barrel EMC Slice Cooling and Monitoring update

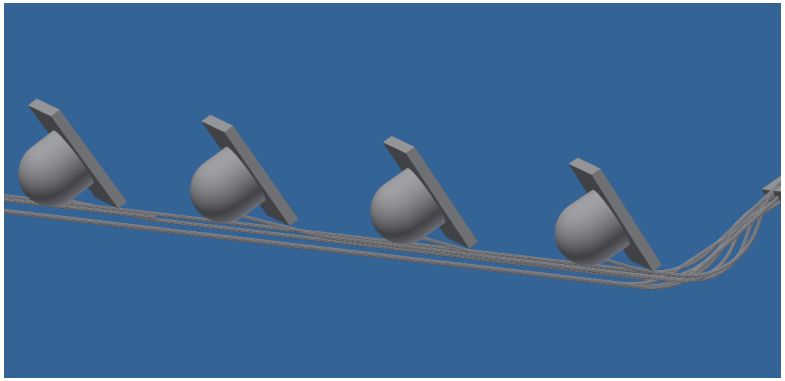
New CAD designs for the EMC Barrel Cooling and Monitoring Systems

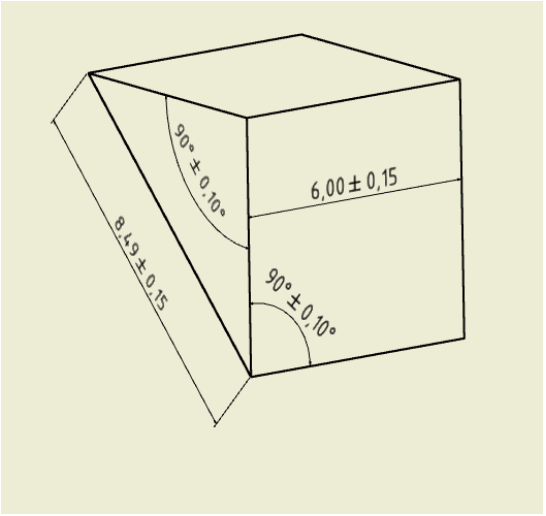
- Fiber routing
- Coupling to crystal fronts
- Sealing Box



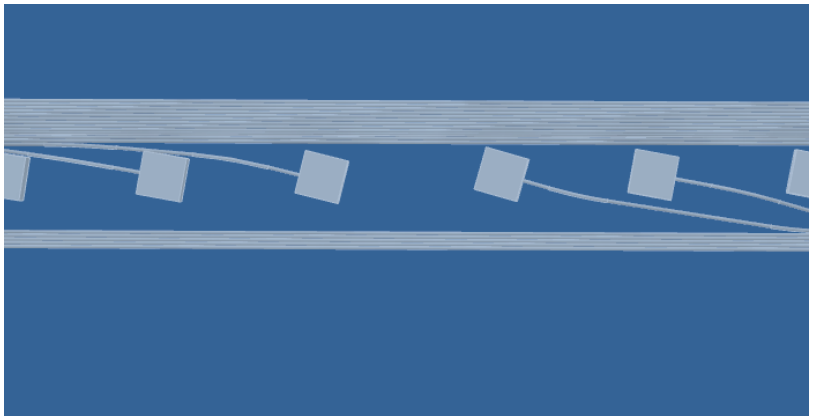
CAD Fiber Routing

- Difficulty: Fiber minimal bending radius is 33 mm
- Total space from keep in volume to crystal surfaces is 30 mm (min)
- Approach so far: Route fibers to 710 crystals from downstream and use reflective domes to get light into the crystals – proofed ineffective





CAD Fiber Routing - new

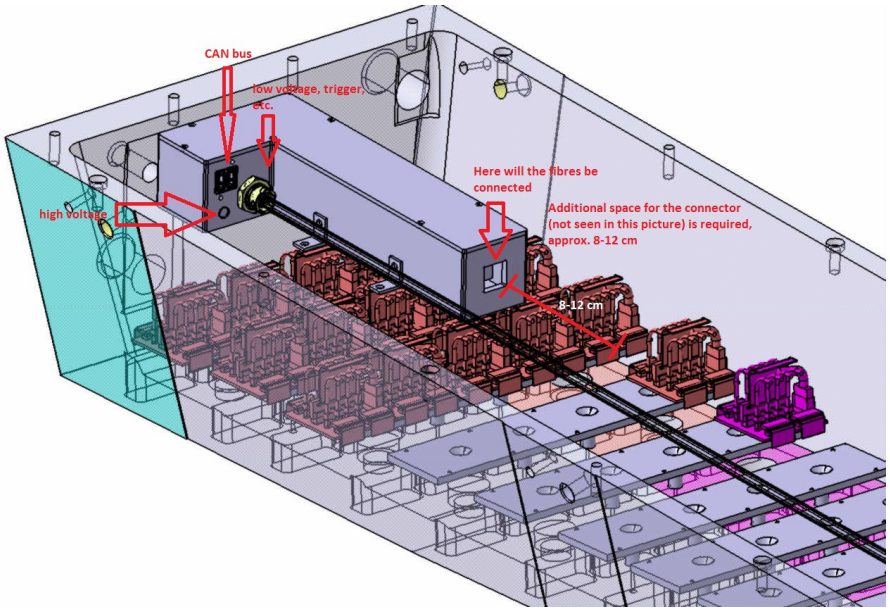


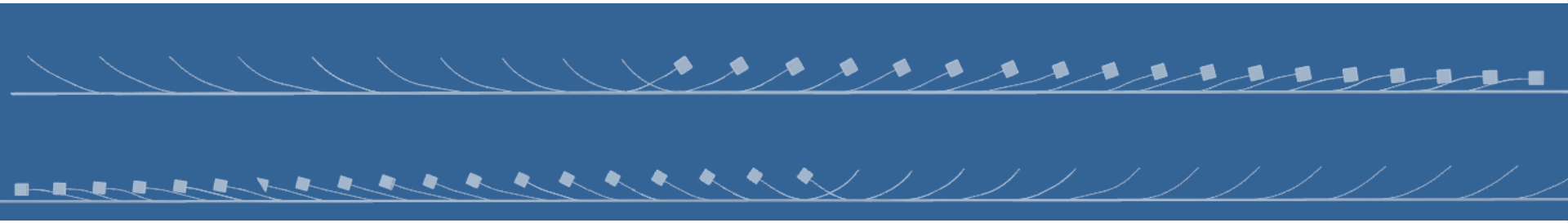
- 420 fiber bundles from downstream

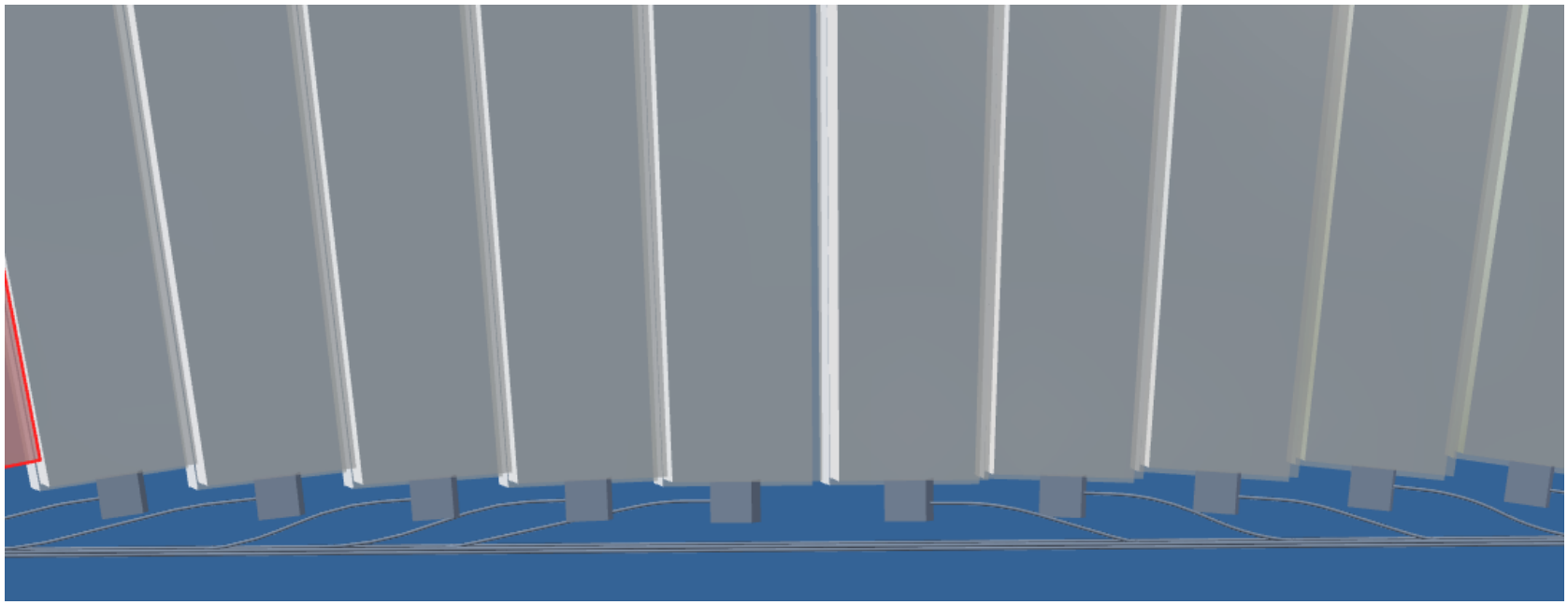
  290 fiber bundles from upstream
- Positions that could be reached are coupled via 90° prisms (6x6x6 [mm])
- Preliminary positions for light pulsers

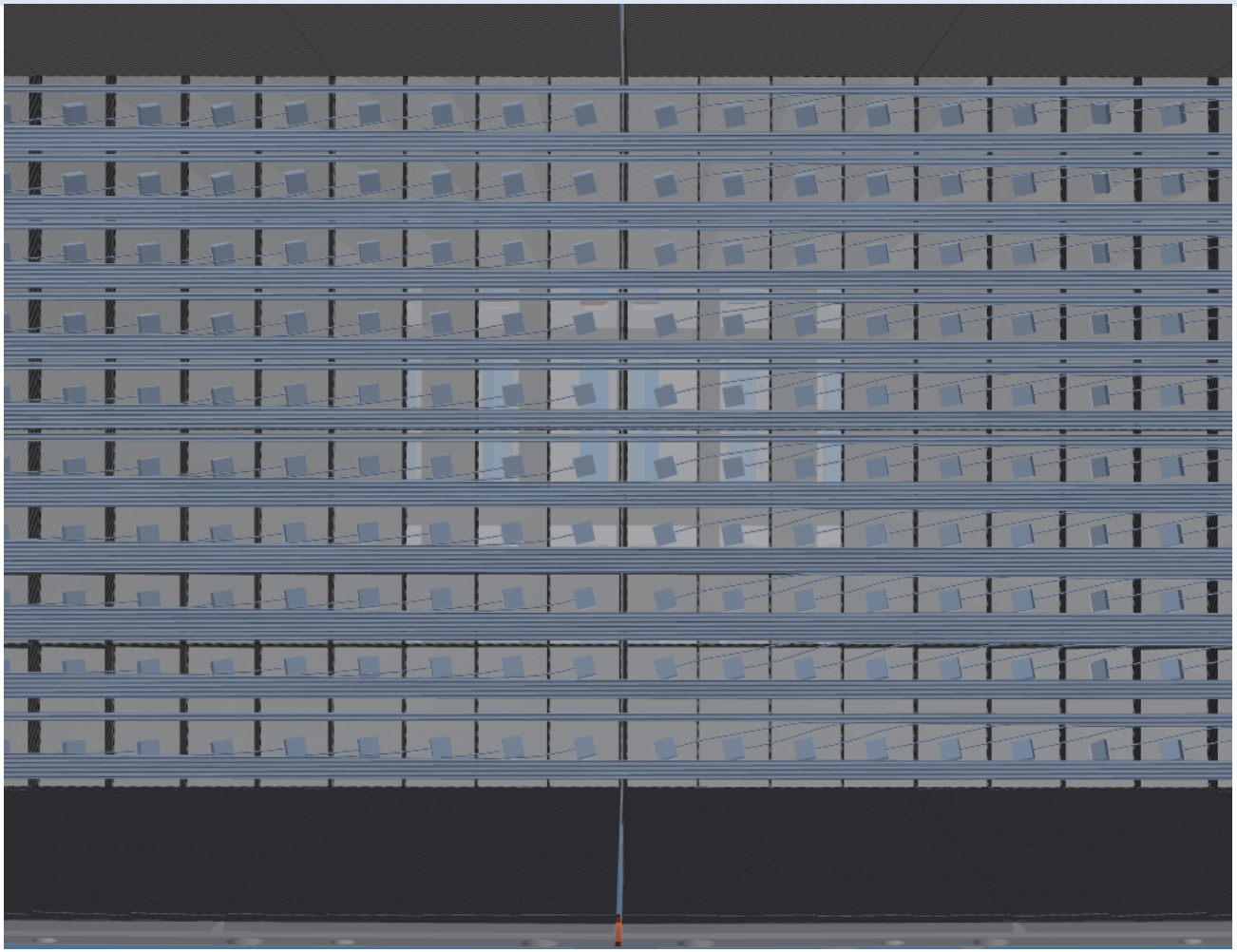
  #1 Inside the Support beam

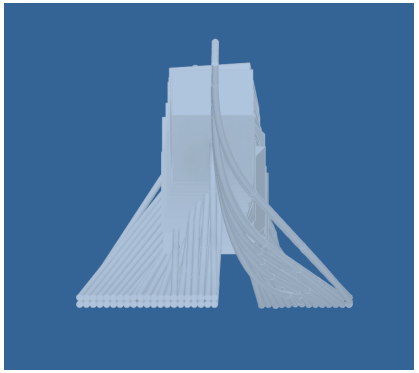
  #2 Outside the slice (SADC Crate)





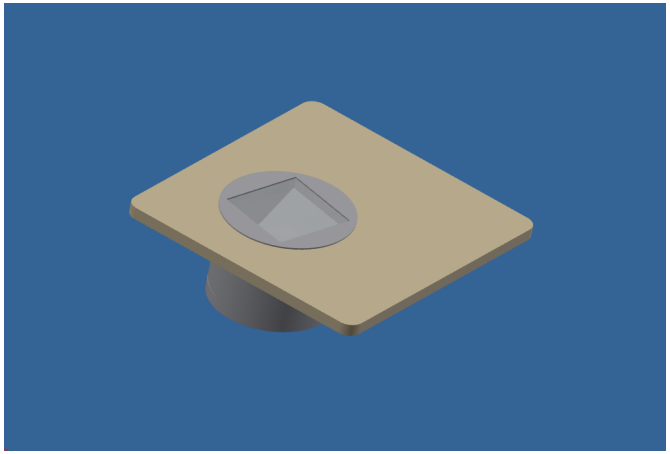


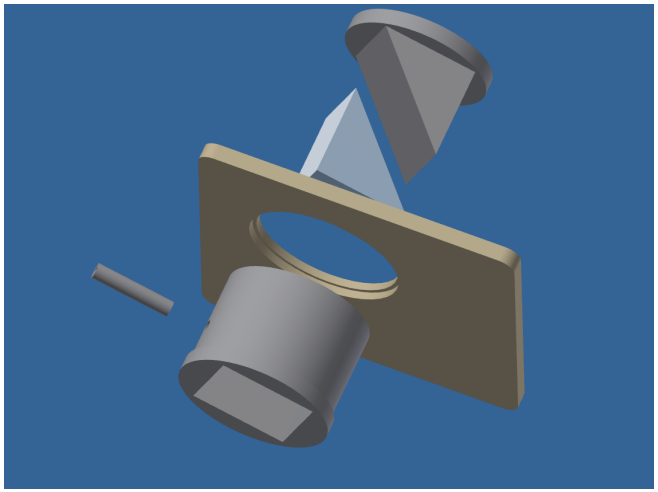


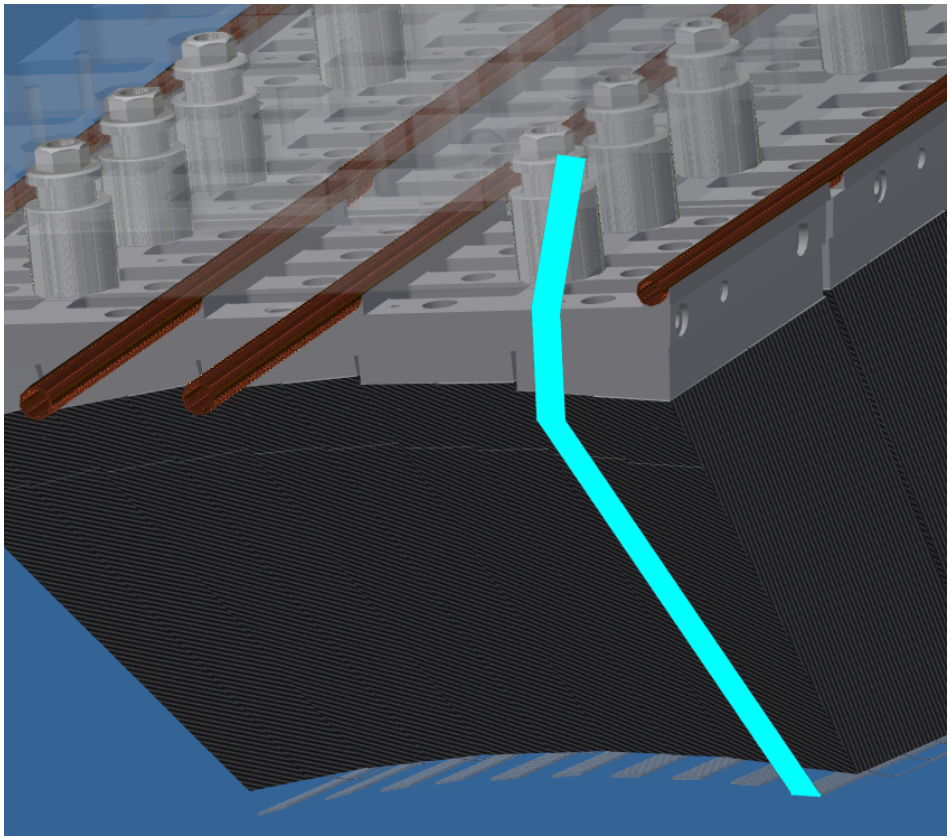


Coupling fiber to the crystal fronts

- Production method: Resin SLA 3D Printer – mass production needs to be outsourced with a purer material that can be machined
- Mechanics need to be glued and fibers stress relieved to prevent changes in the coupling over time and temperature cycling
- Number of fibers per crystal increase light input and can heal loss from fiber length, insufficient coupling and bending – will be tested with a complete readout chain

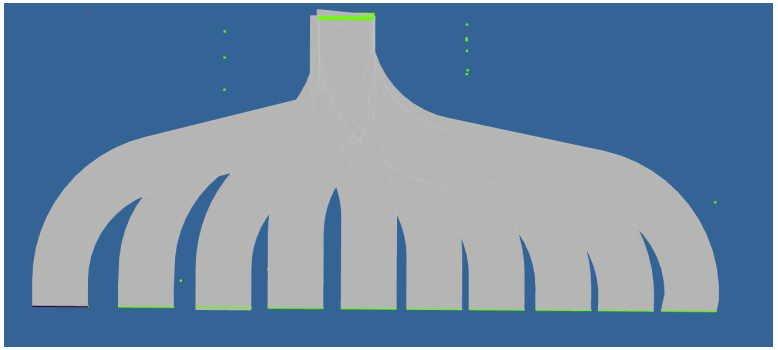


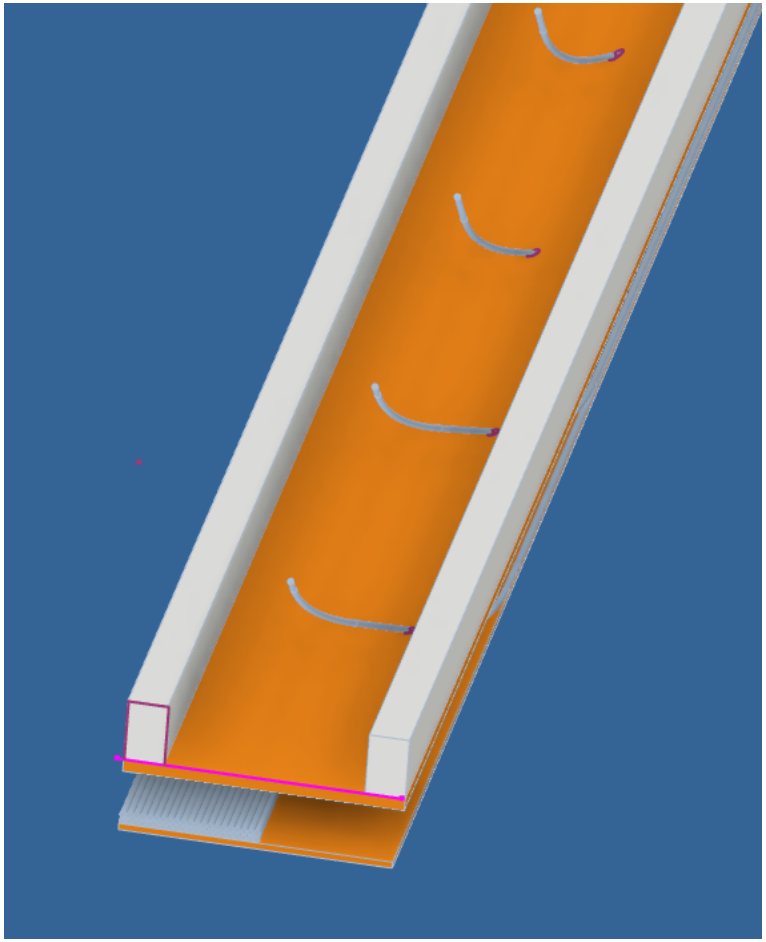




Fiber to Light Pulsers

- Run 10 flat bundles individually for the internal Light Pulser
- Run a collector that combines fibers to connect to the external LP



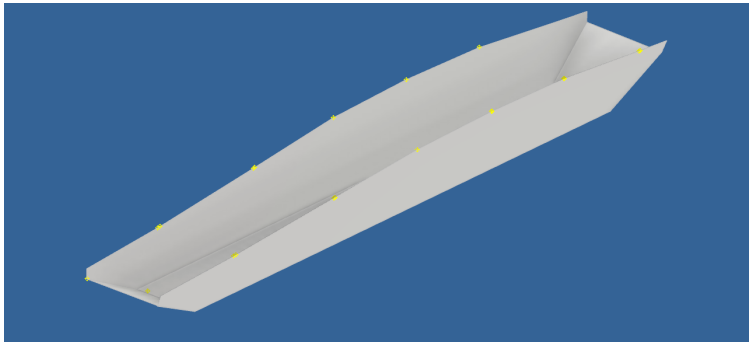


CAD Holding Structure

- Run all fibers between two plastic (PP, Silicone, PE..) guides
- Lower guide supports and hold fibers
- Upper layer with waterjet cut holes will allow fibers to be fed through individually
- Modular approach, 4 crystals per module

Sealingbox for slice

- The cold volume of EACH slice has to be separated from ambient air to prevent condensation and air exchange
- There is little room in all directions (1-2 mm)
- Using metal connected to the warm volume introduces unnecessary heat transfer and potentially harms detector performance (metal between crystals)
- Promising contact to company, willing to create this large of a part, in a low volume in deep drawing process
- Material samples for selection have been shipped and will be radiated and approved in tension testing



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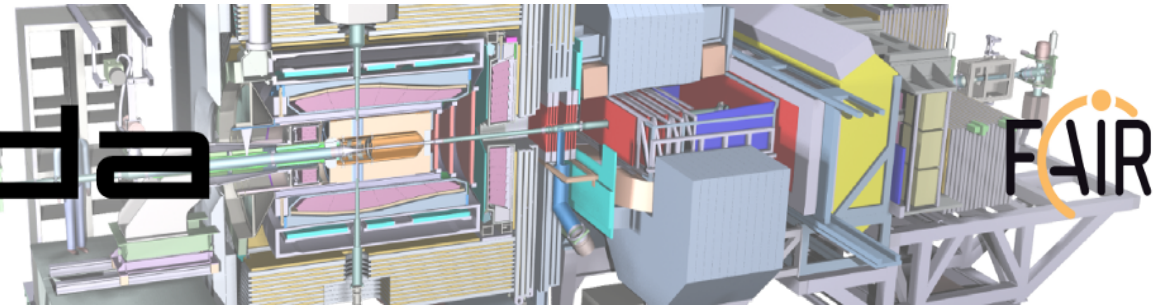

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