Mechanical design of the Disc DIRC
-
discussing current status

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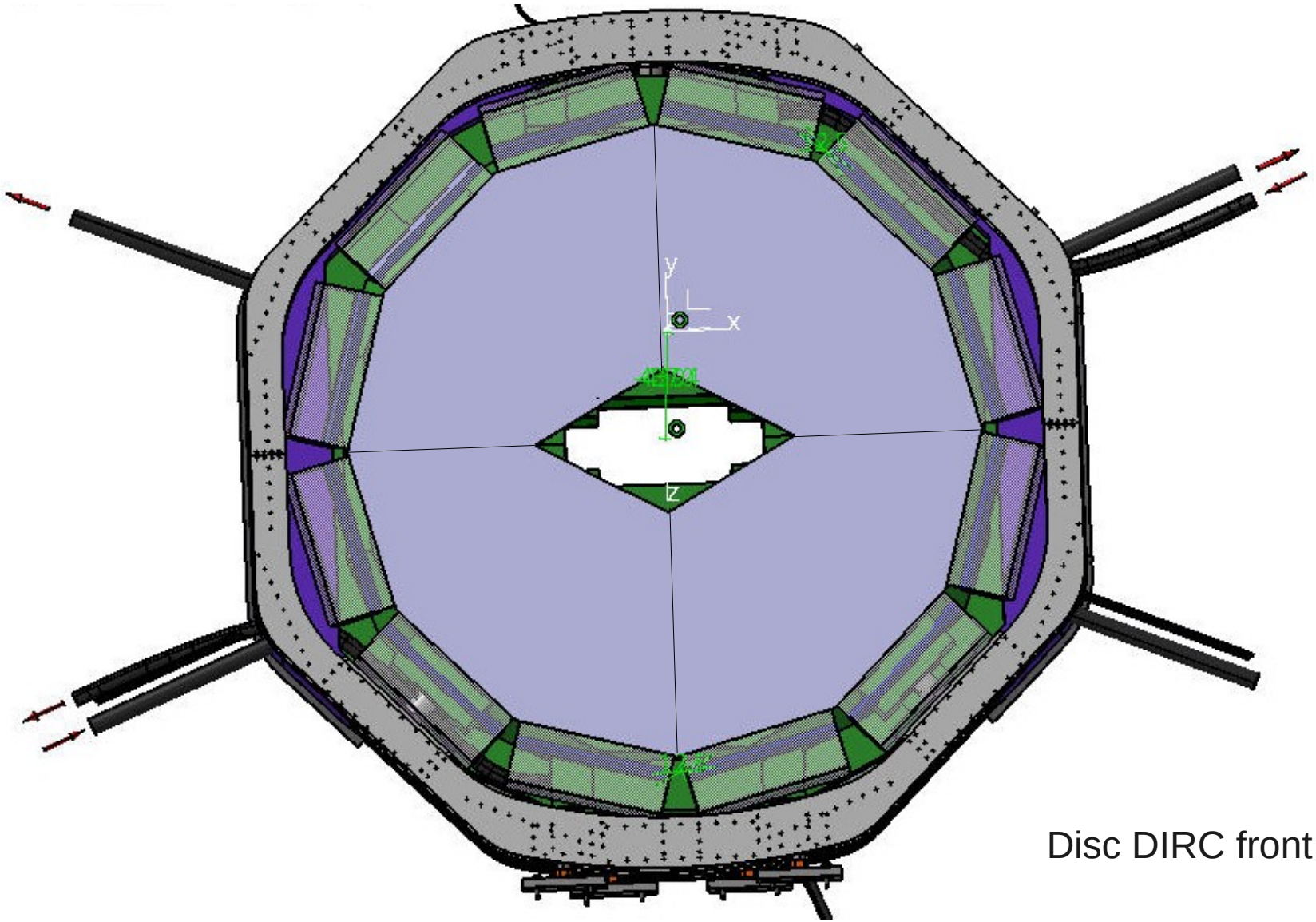
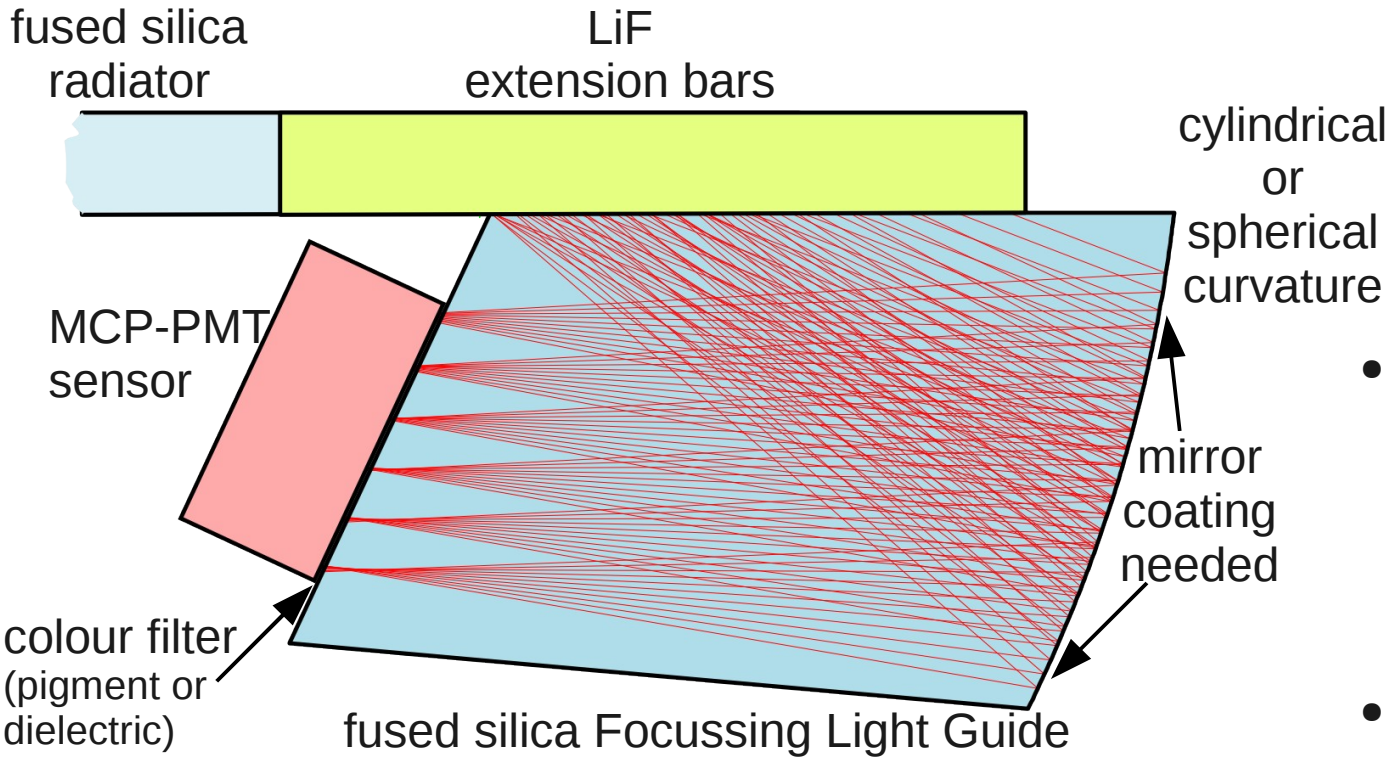
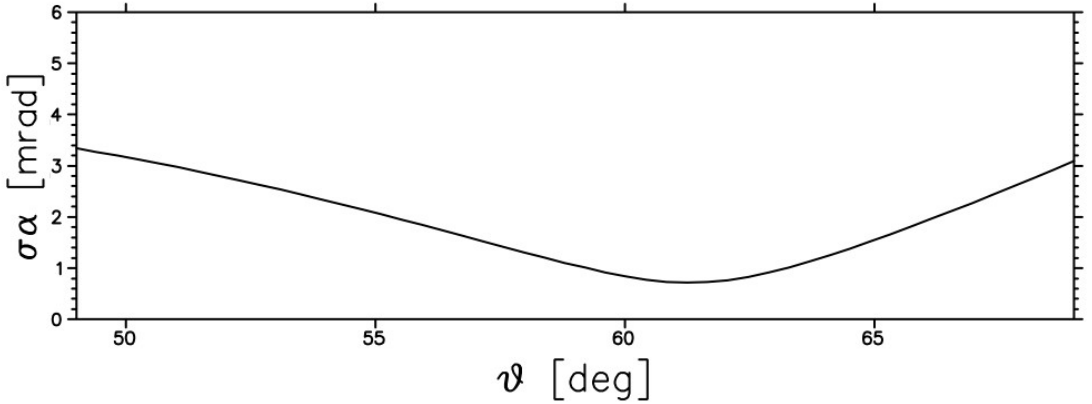
most recent status



Disc DIRC front view

most recent status – FLG element

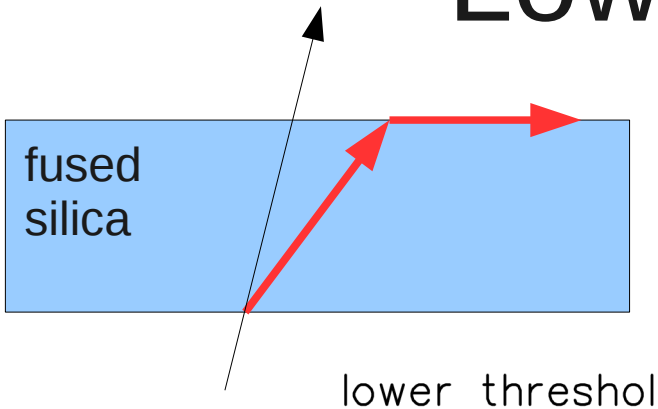




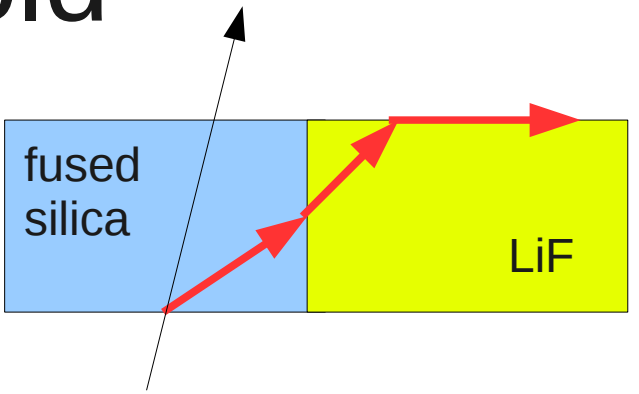
performance curve for **cylindric** curvature

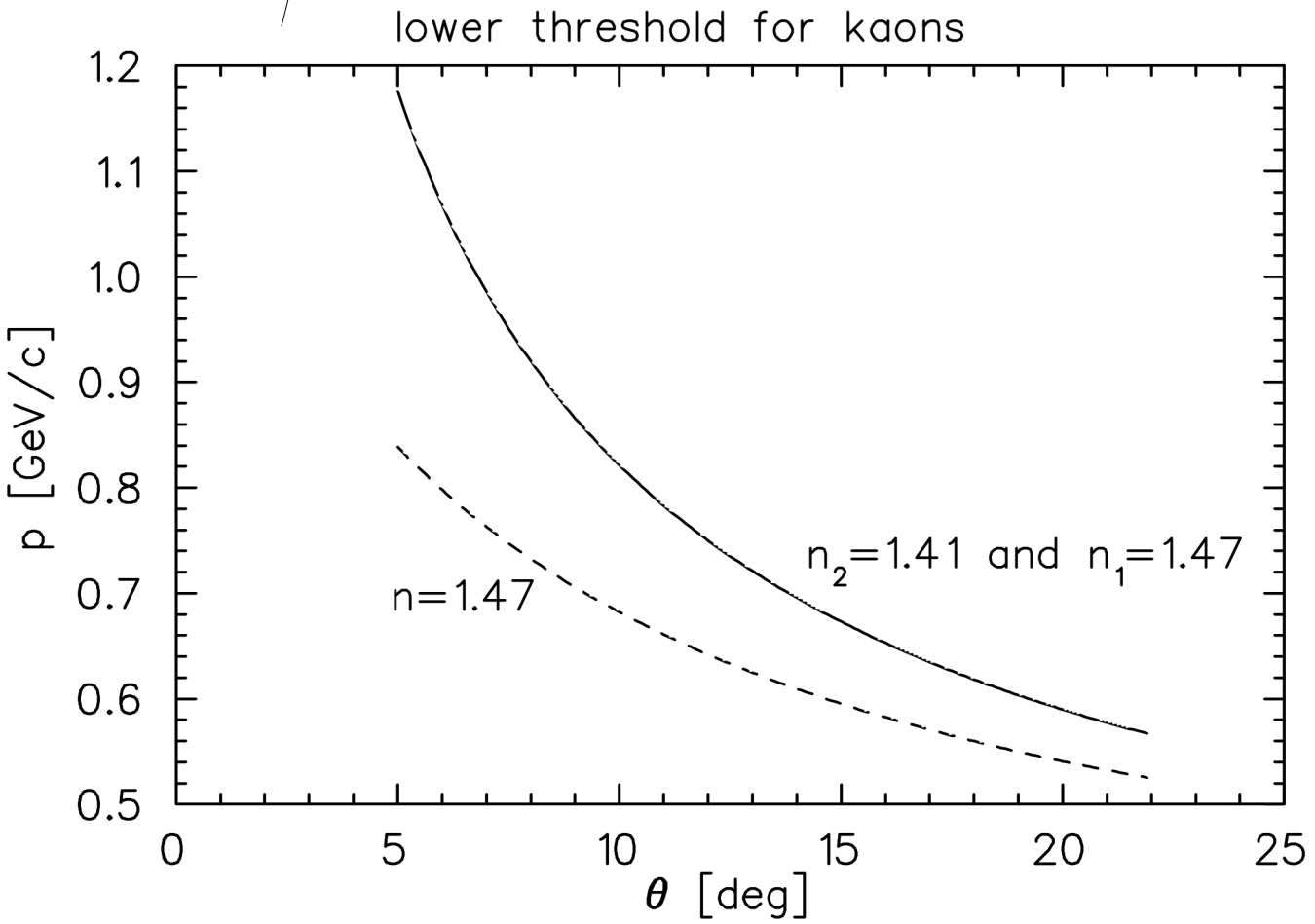
- LiF doubling as extension and dispersion-correcting piece
- cylindrical or spherical surface possible
- colour filter to adjust photon rate to MCP allowable light photon dose

Lower p threshold



limit angle for photon
total internal reflection



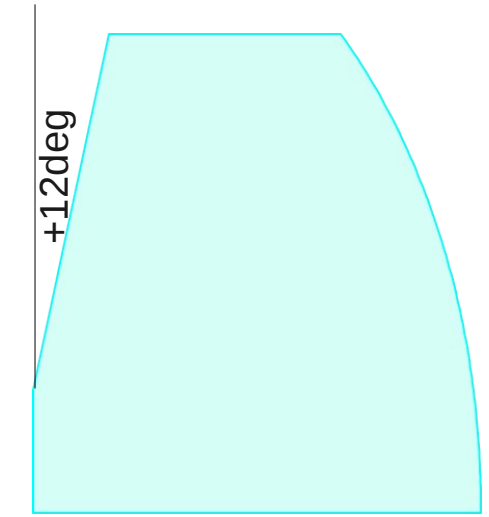


limit Cherenkov angle
for DIRC light transport
larger because

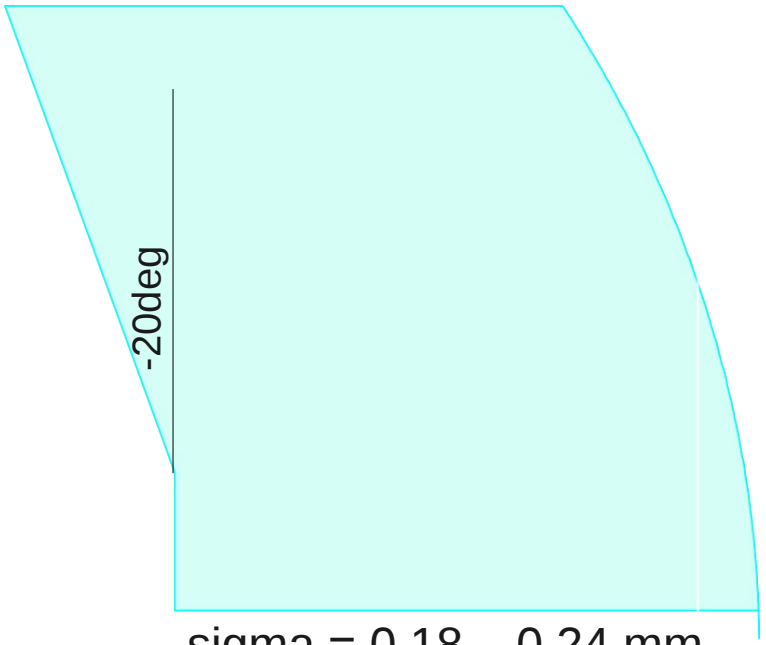
1) n(LiF) < n(SiO2)
internal transmission

2) Cherenkov light
produced in SiO2
and then entering LiF

FLGs – typical sigma resolutions

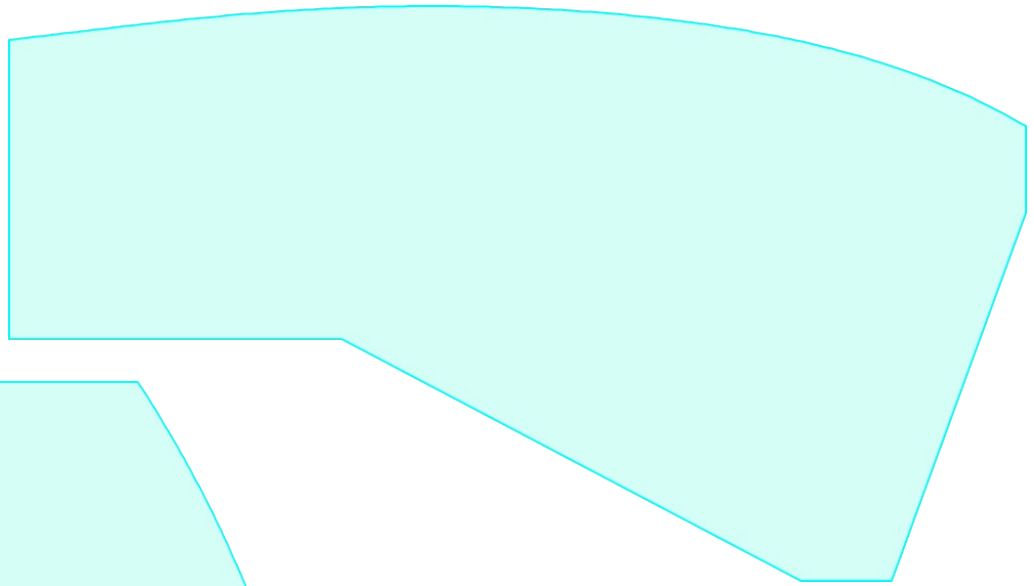


sigma = 0.015 – 0.03 mm



sigma = 0.18 – 0.24 mm

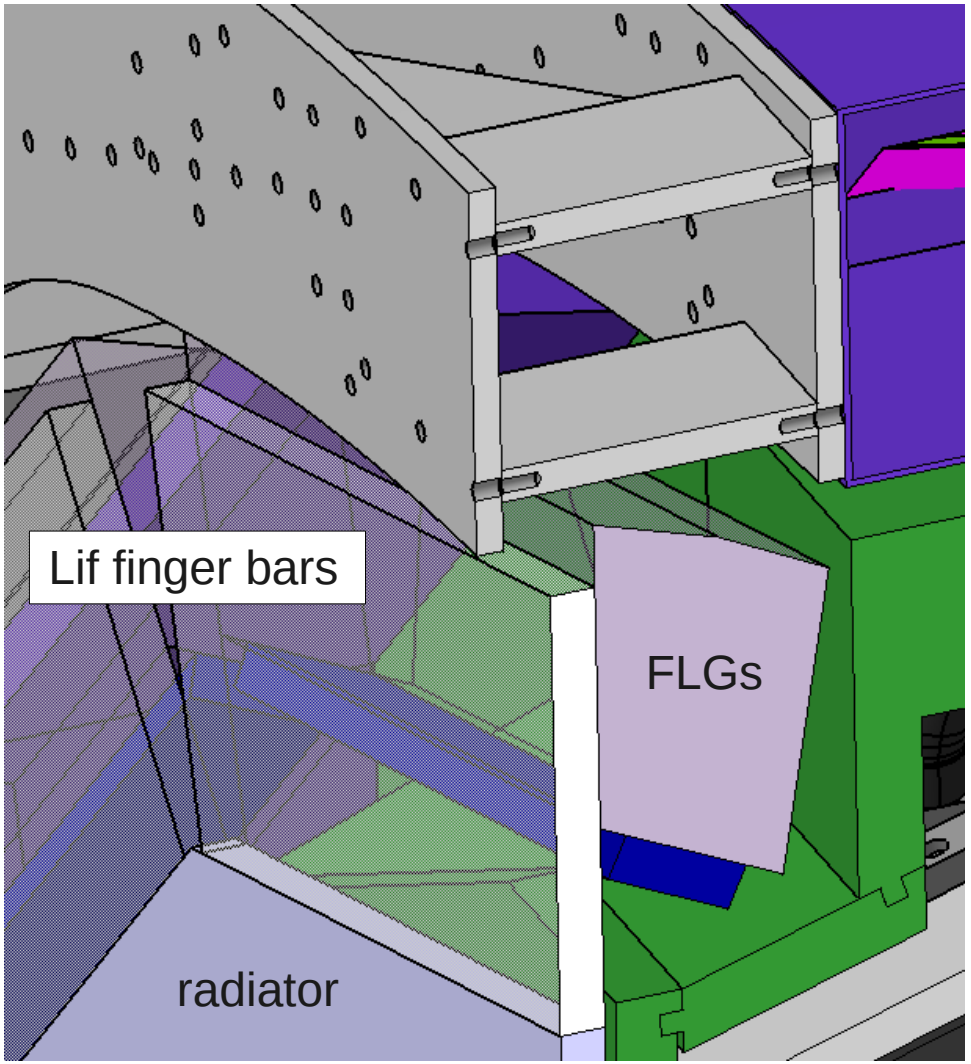
with added 2nd curvature
sigma = 0.07 – 0.13 mm



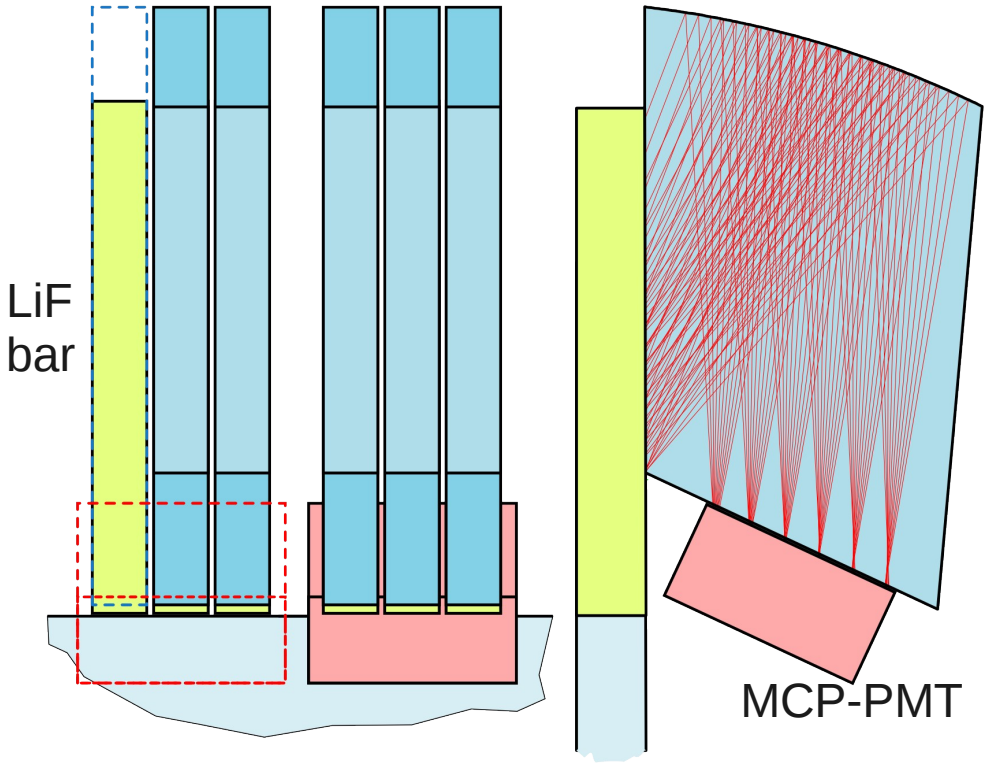
sigma = 0.2 – 0.7 mm

with added 2nd curvature
sigma = 0.2mm

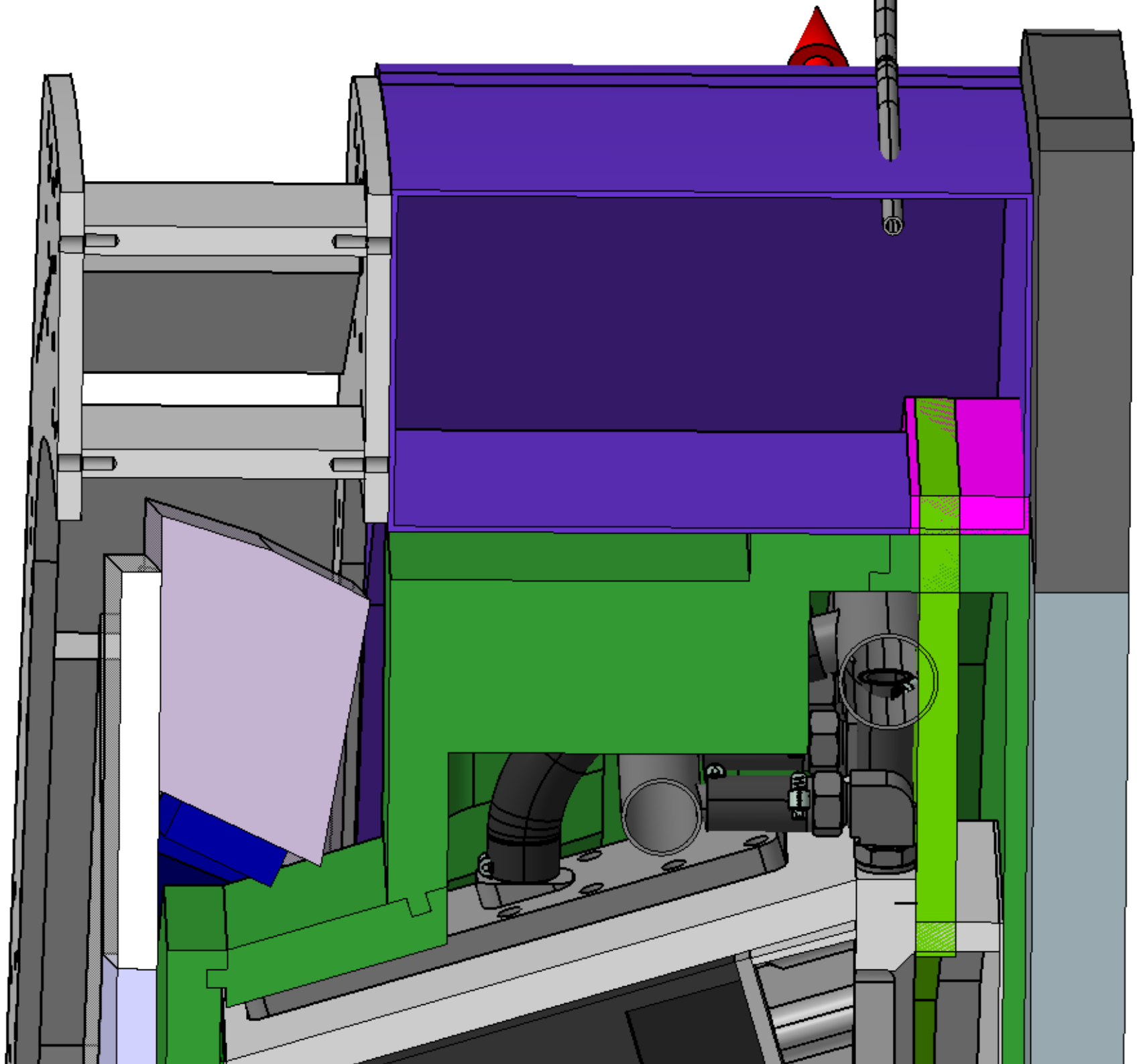
most recent status - positioning



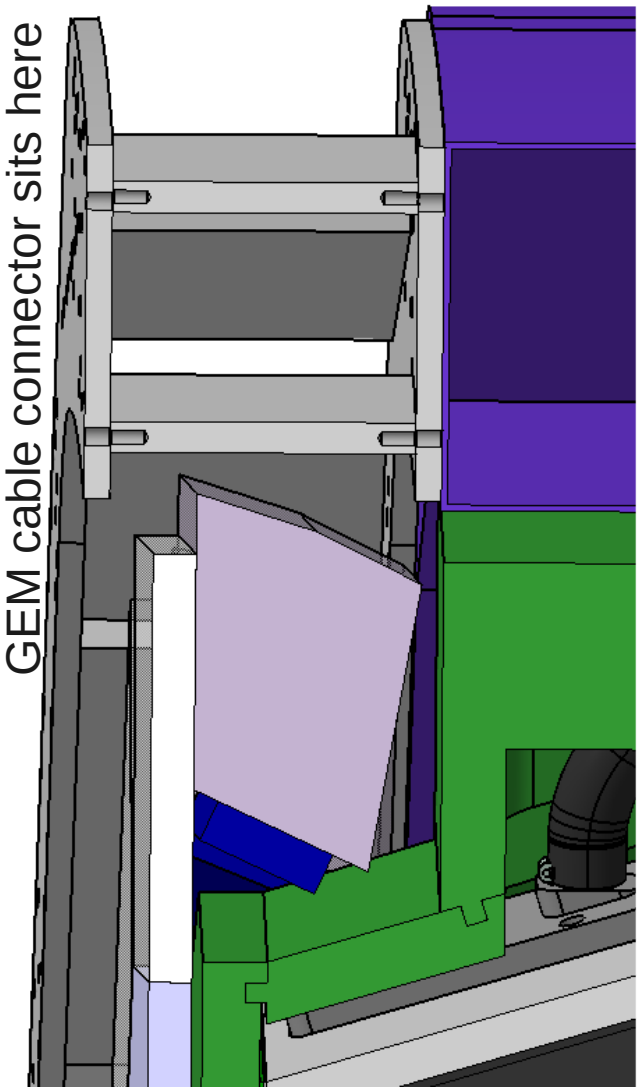
Endcap EMC



synthetic amorphous fused silica
radiator disc



Side view



- rather recent work
- less than generous space
- a few volume clashed
- individual MCP blocks movable
- space on upstream side of radiator disc currently not used
- size of focussing element can possibly be fine-tuned

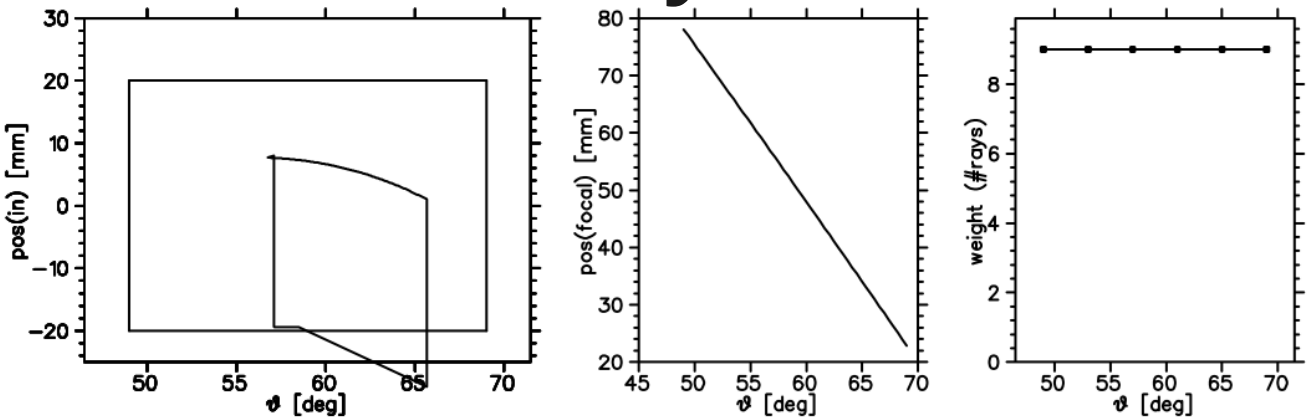
Short summary

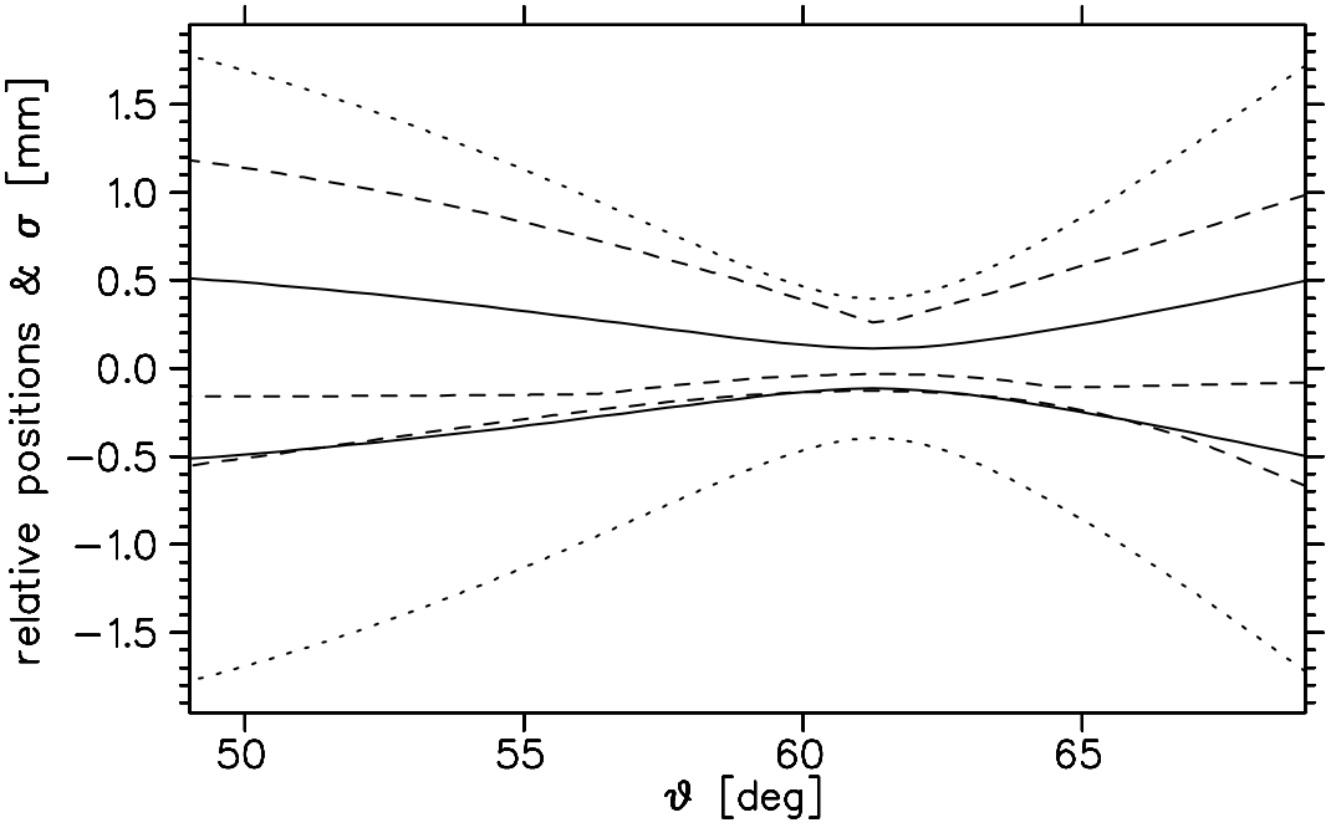
- using LiF for light transport raises the lower momentum threshold (low momentum low theta particle most affected)
  - could be avoided with mirror coating on LiF → then less photon overall
- focussing degraded by one order of magnitude due to limited range of allowable MCP-PMT orientations in the magnetic field
- with optically “mis-oriented” focal plane the polynomial, cylindrical and spherical shapes have similar performance → go for cheapest
- revisit radiator parameters
  - i.e. radiator thickness 20mm or 15mm
- choice of dielectric filter bandwidth depends on MCP photon lifetime values (and prospective PANDA integrated luminescence)
- combination of LiF bars “prism” and filter are an optimal combination to address Cherenkov chromatic dispersion

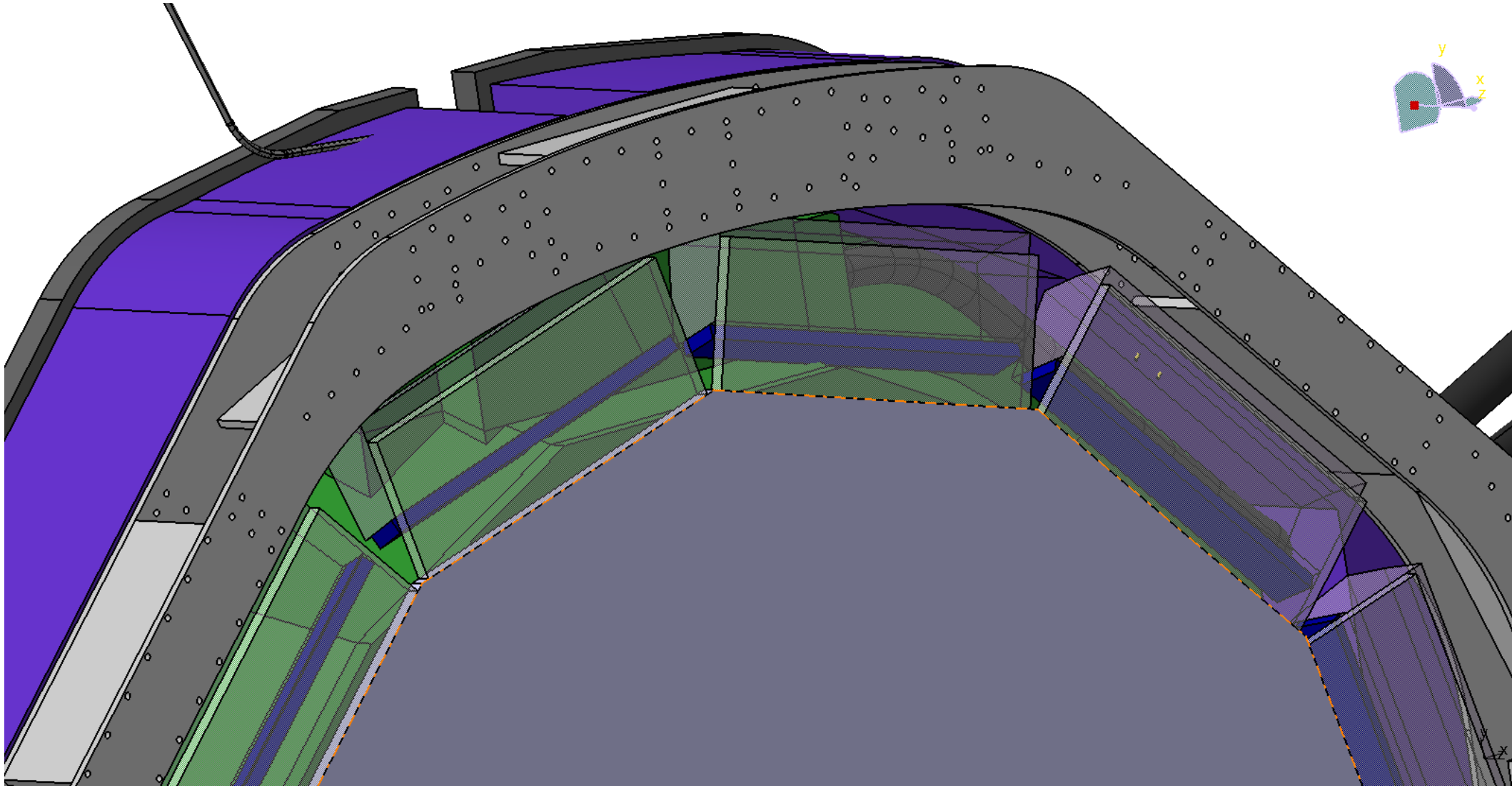
still a wee bit of work ahead

backup-Folien
drafts

Performance – cylindrical surface



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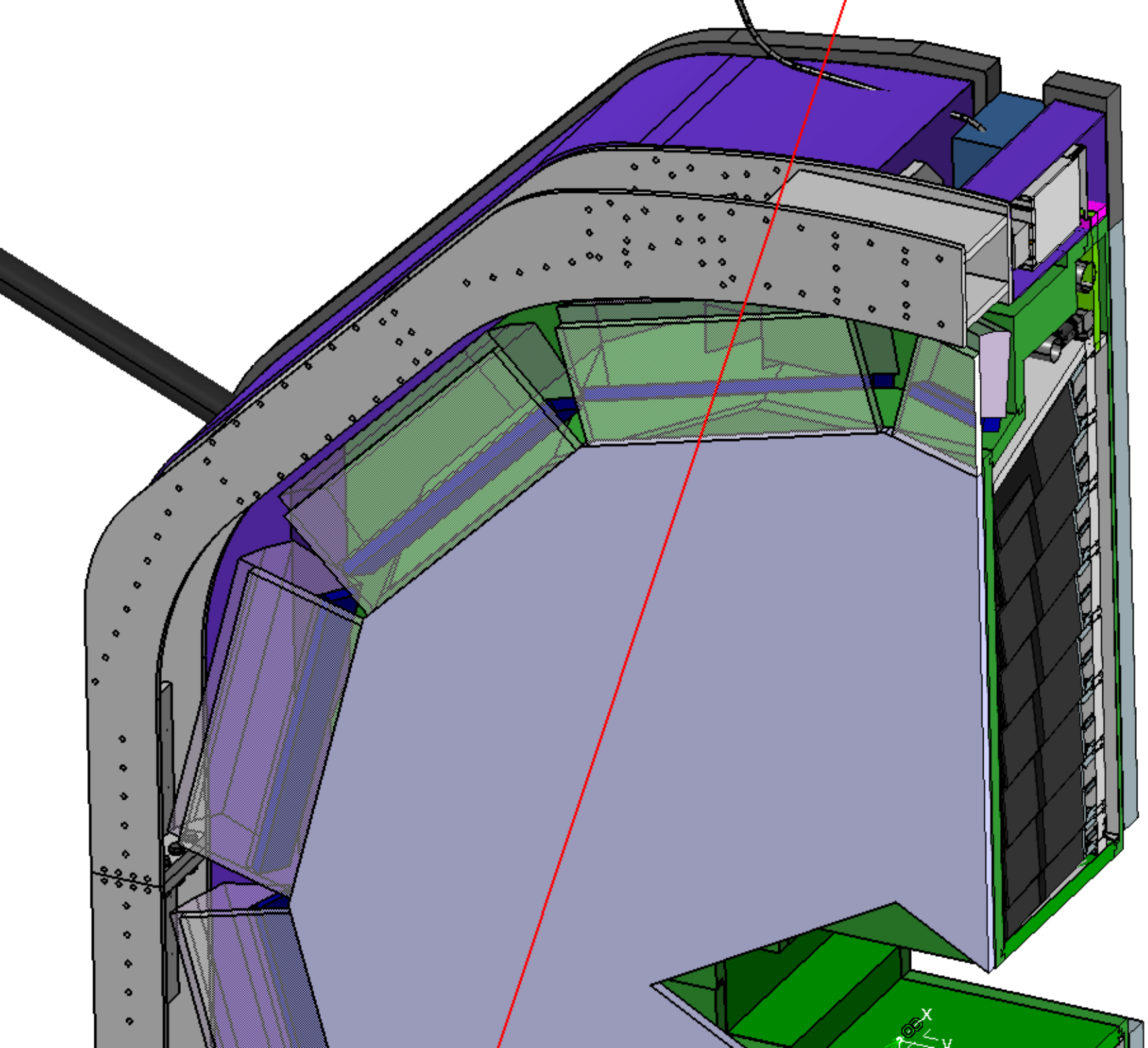
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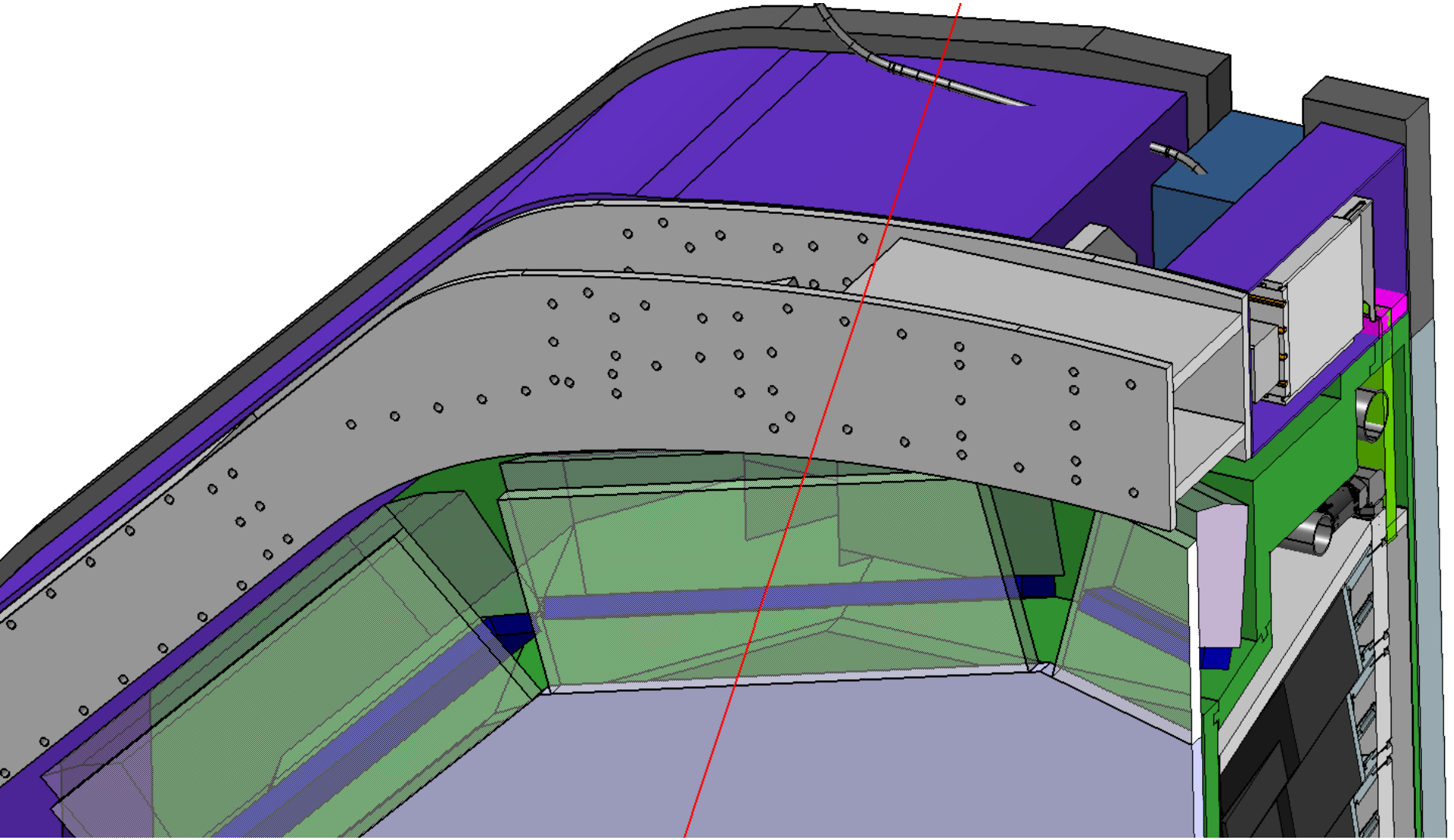
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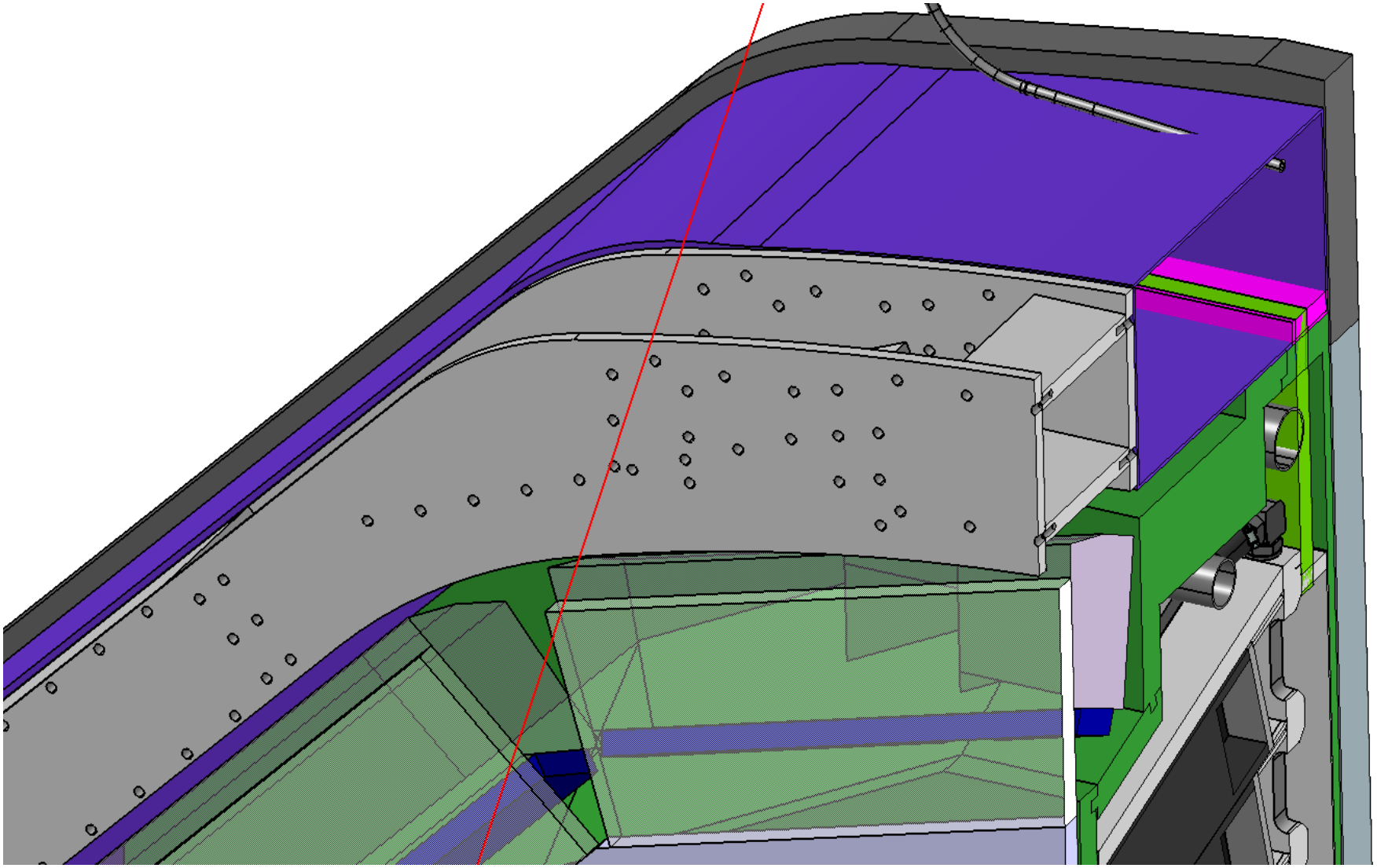

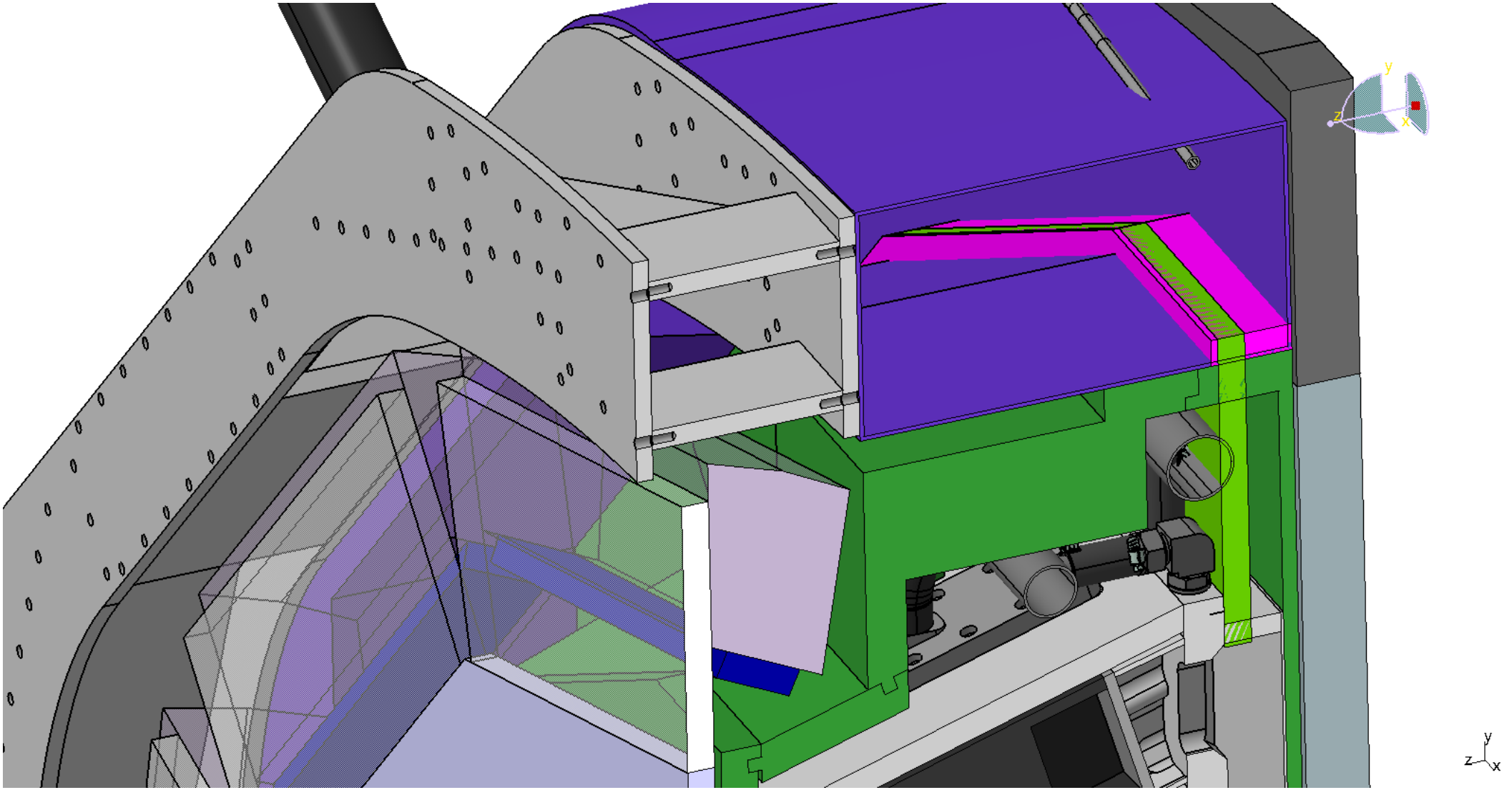
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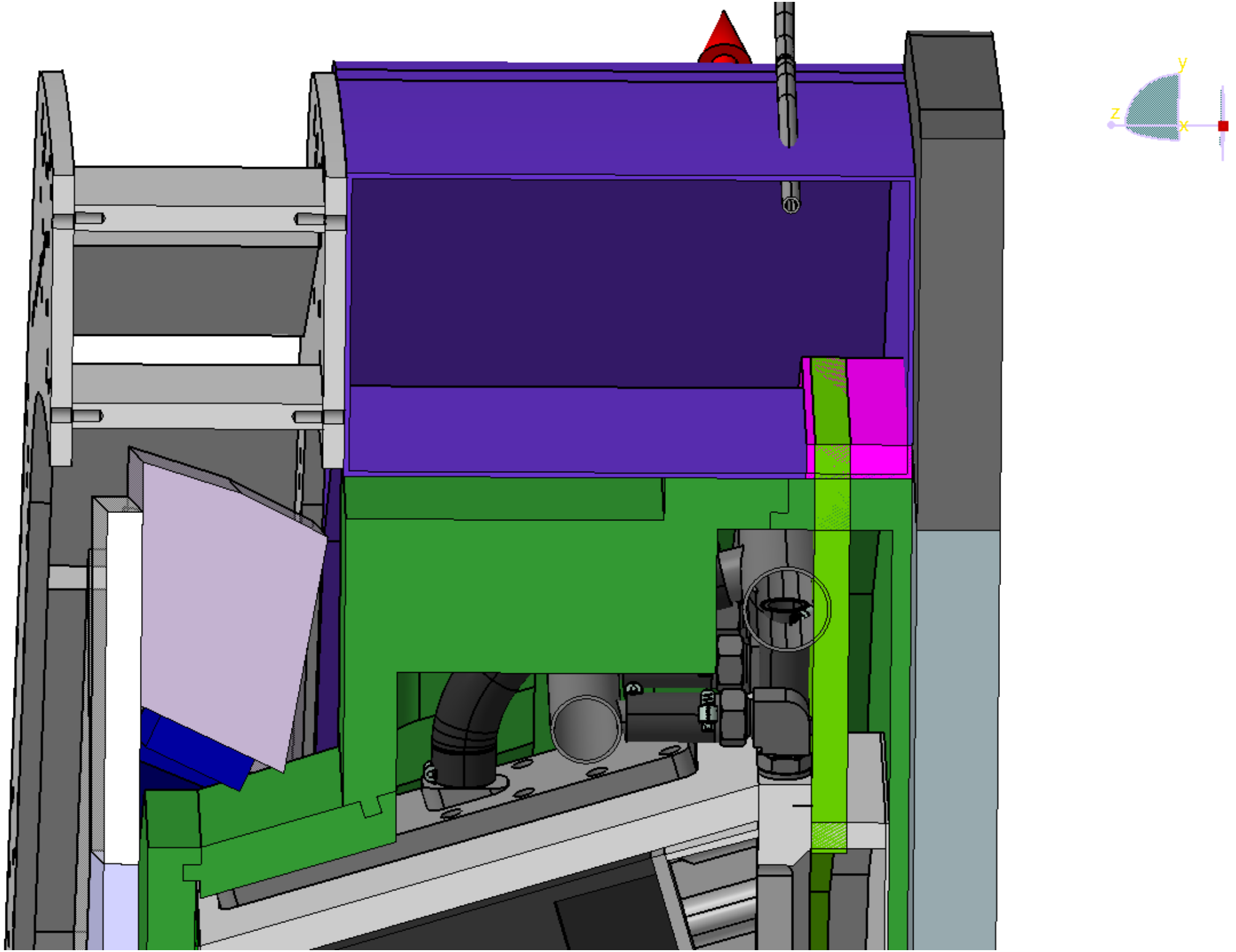
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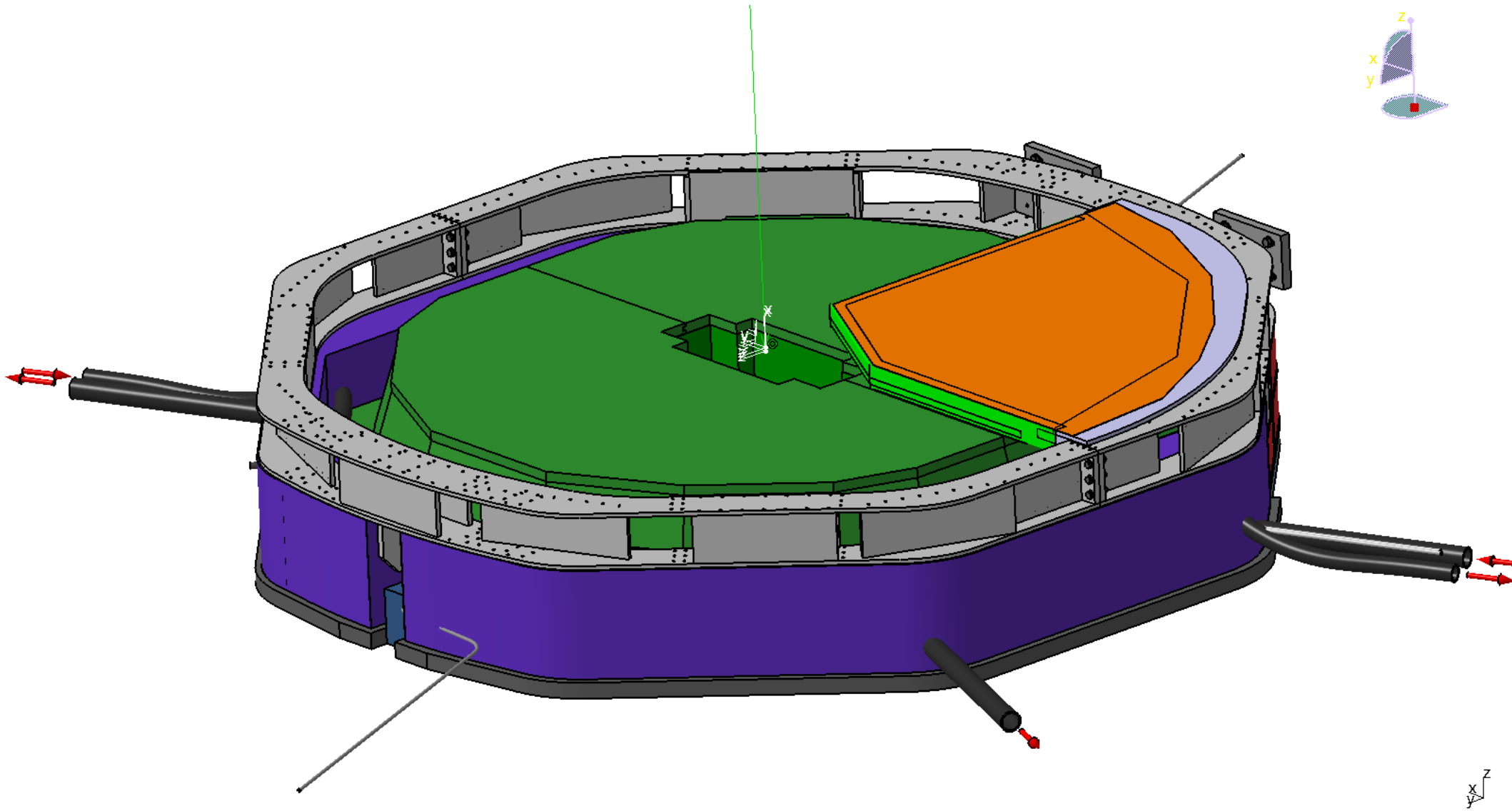
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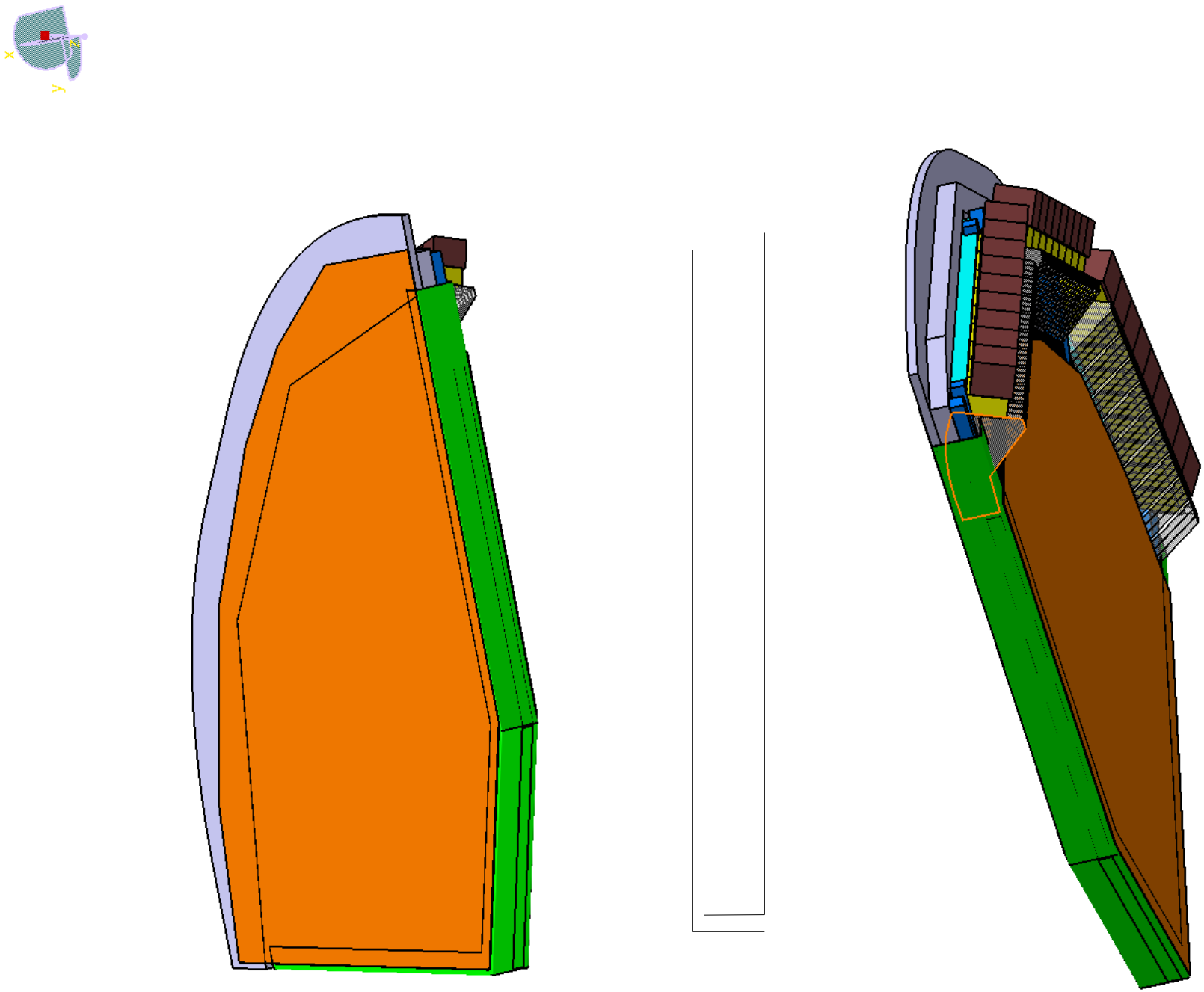
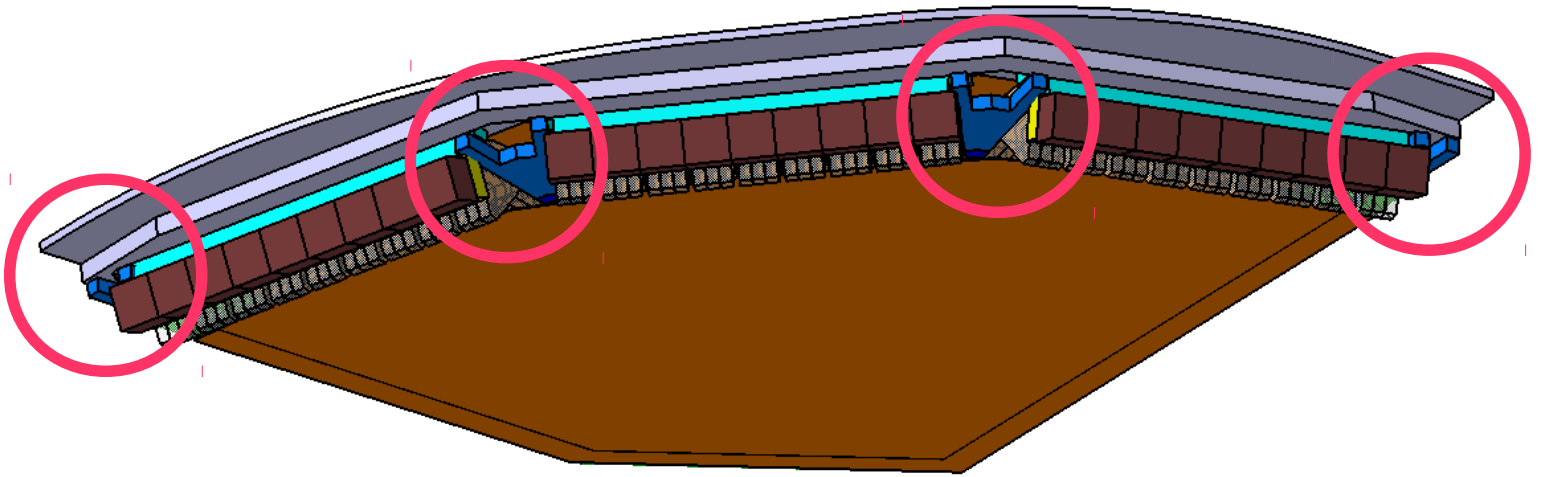
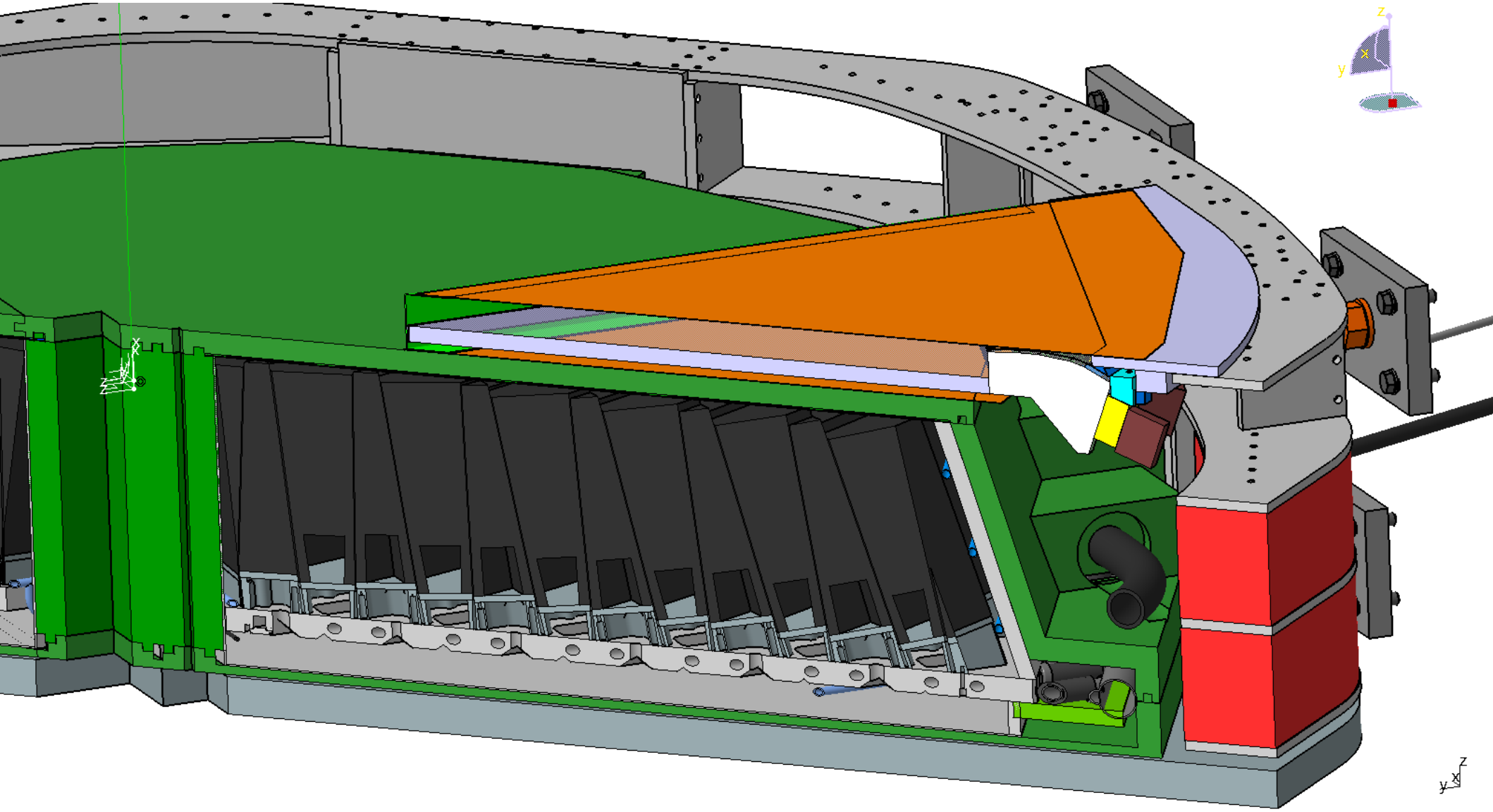


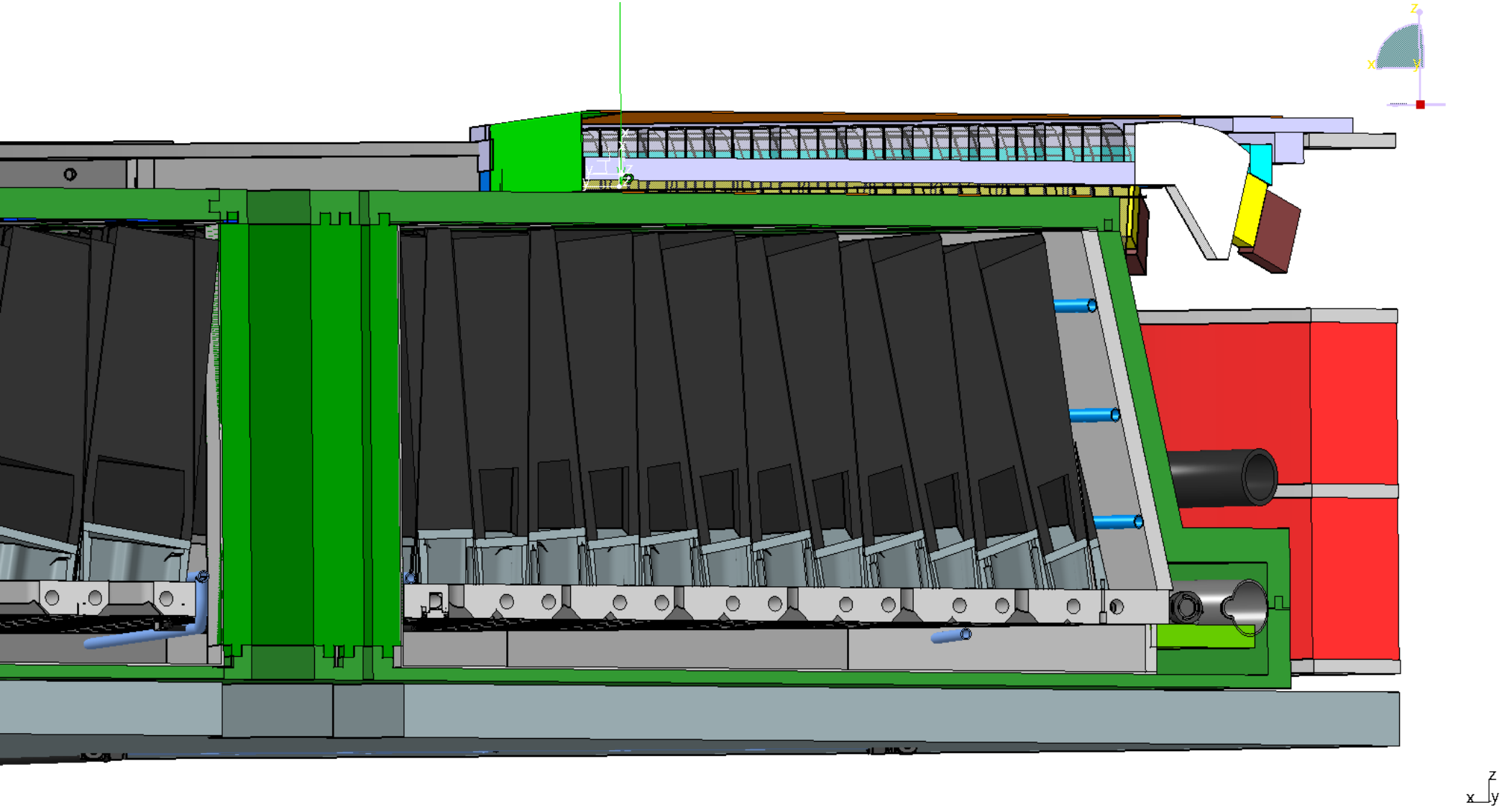
creasing aluminium covers, 0.5mm to mm Al sheet thickness
supporting radiator discs in the two upper quadrants

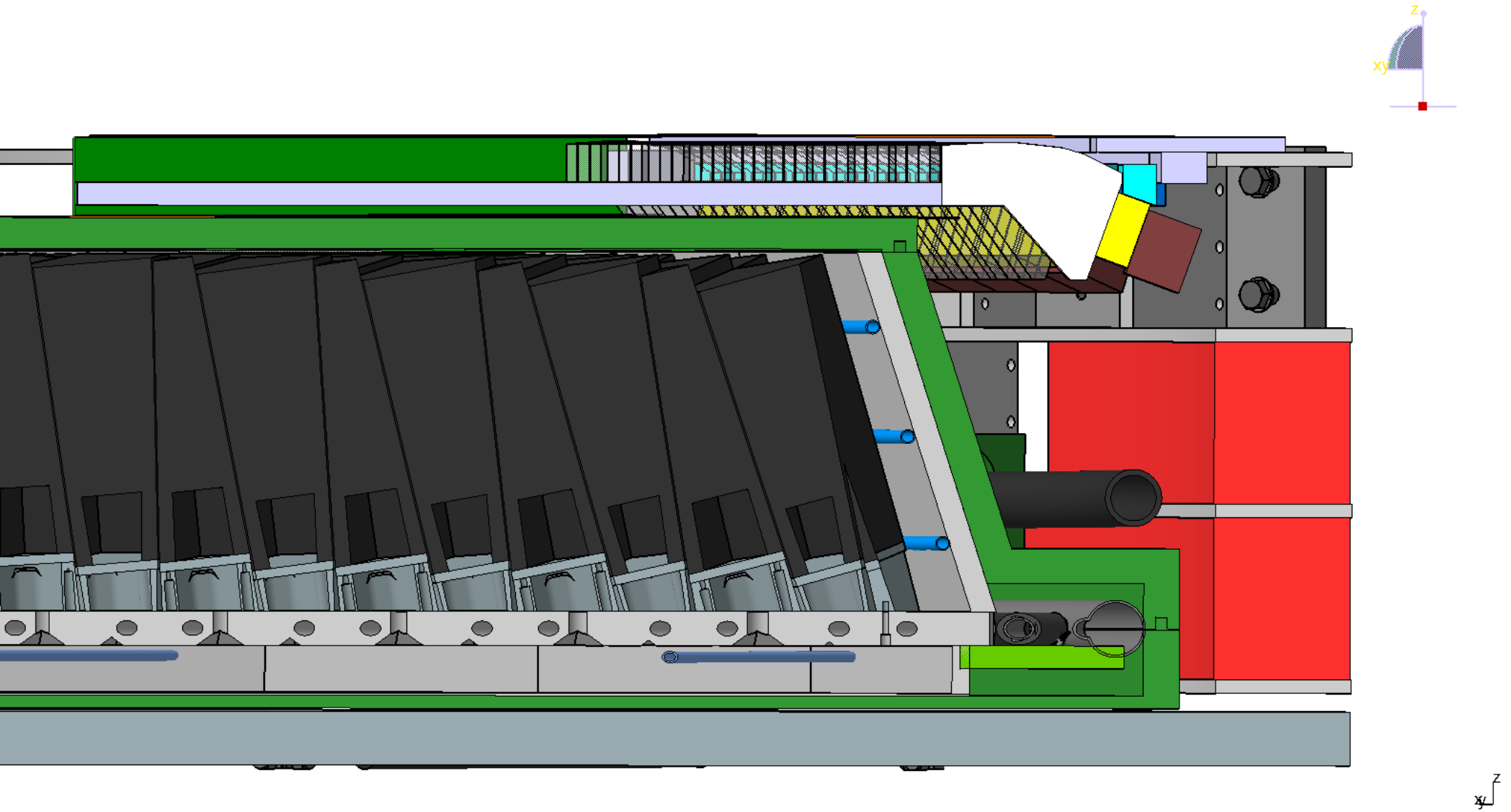
possible supports for lower two quadrants





leave space for flushing gas circulation

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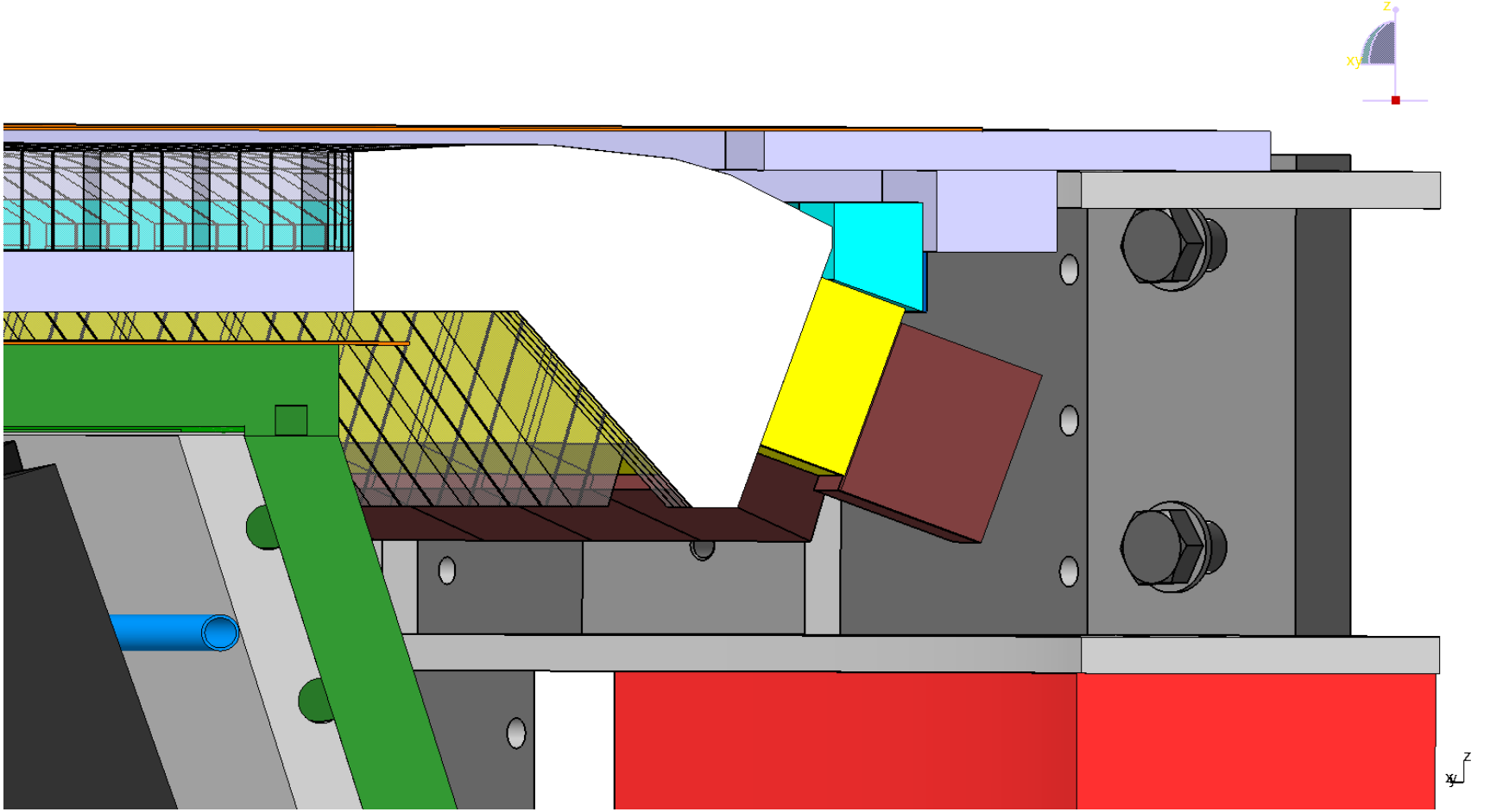
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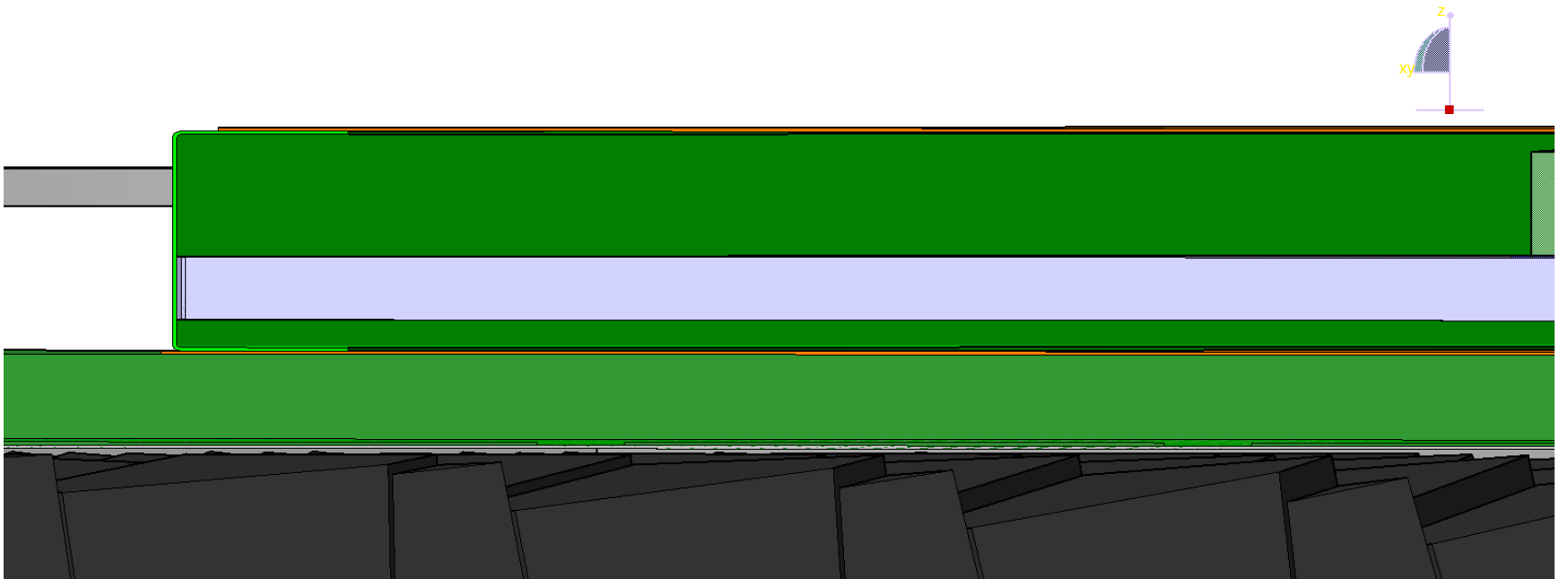
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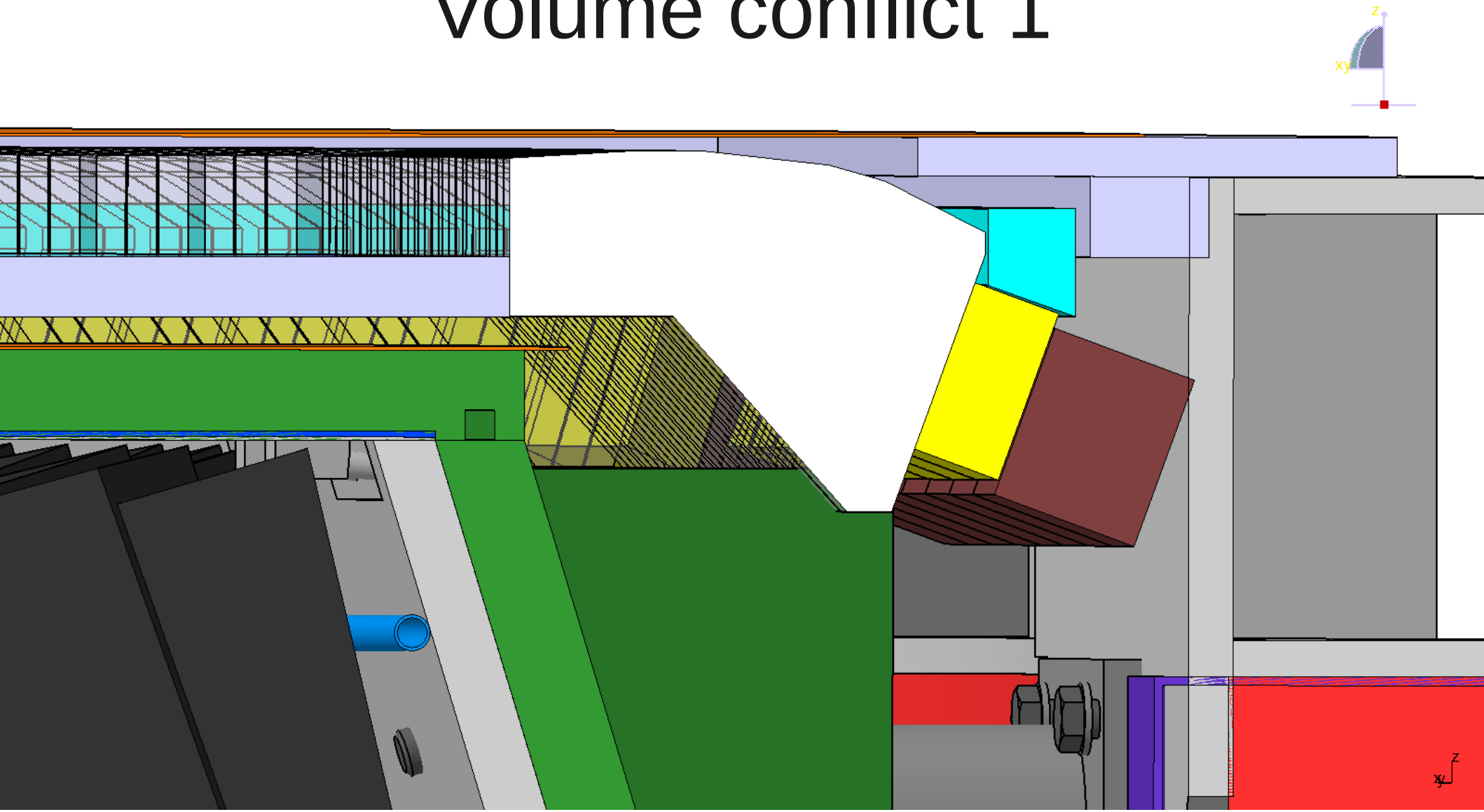
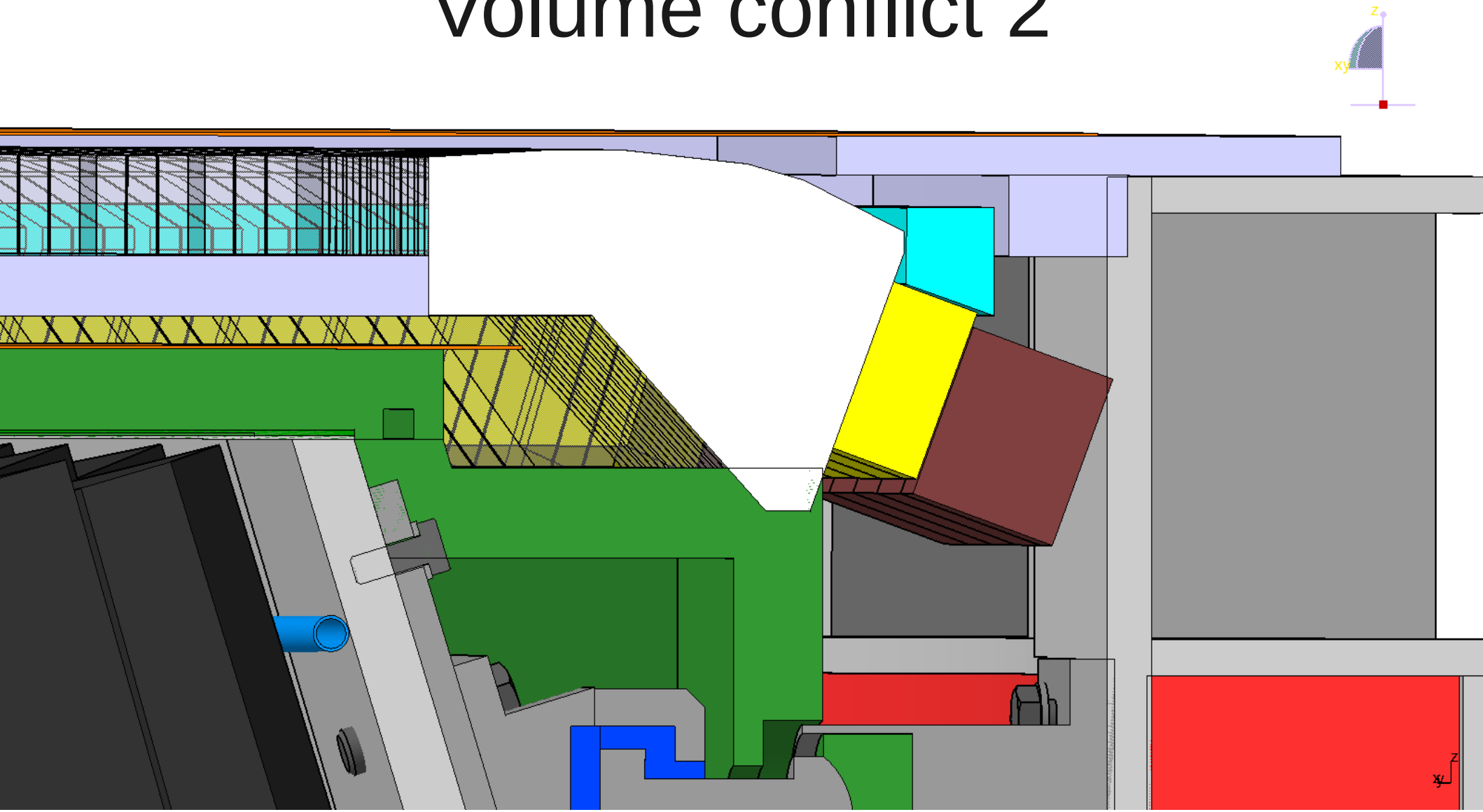
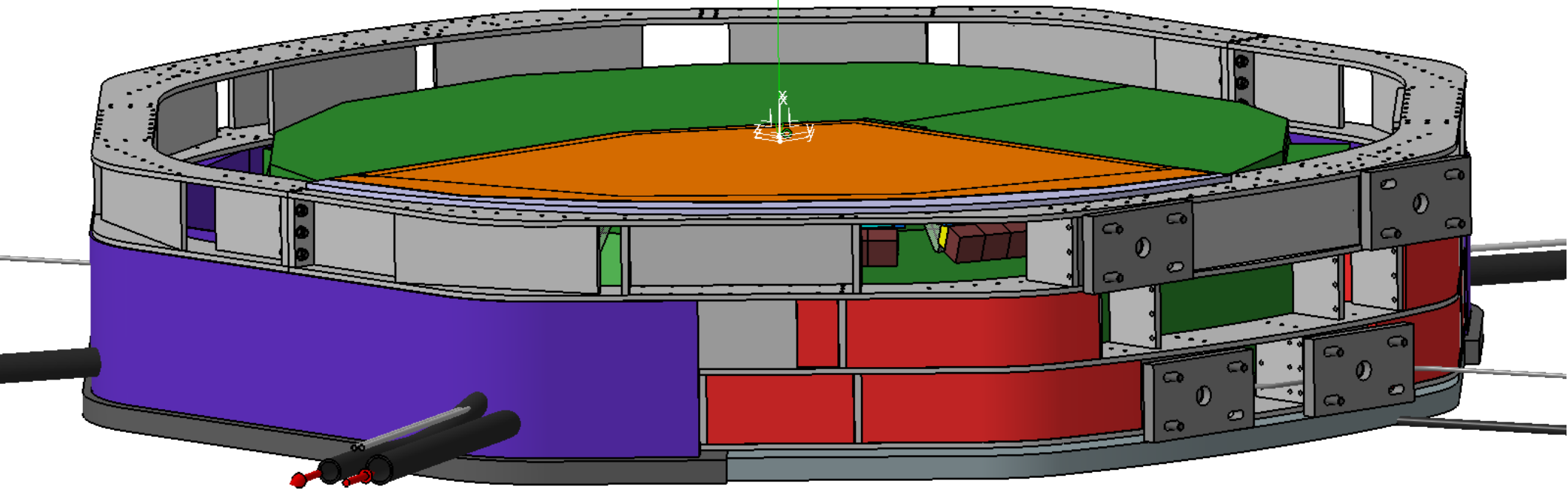
Volume conflict 1



Volume conflict 2



EMC insulation could be placed more closely to support arm



- circular support plate attaching to EMC frame
  - apparently enough space upstream of grey frame (TBC)
- creased aluminium sheet forming pocket
- aluminium sheet pocket supporting radiator
  - also providing light-tight cover and gas-tight volume
- electronics volumes undercut grey EMC frame
- cabling routes to be specified (through vs around)