hpDIRC Mechanical Design and Integration

Collaboration meeting
hpDIRC
July 25

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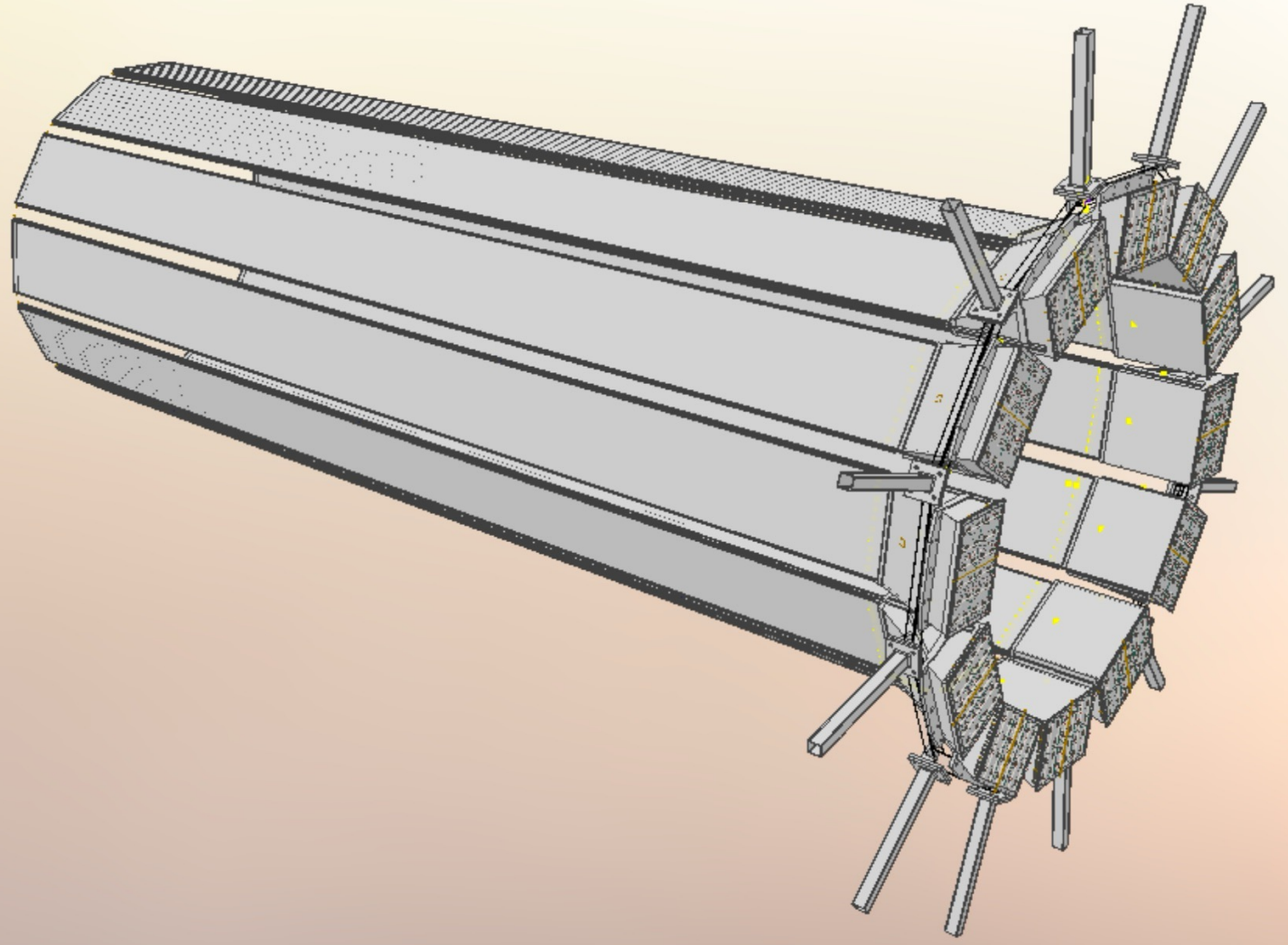
Kris Cleveland (JLab)
Joe Schwiening (GSI)



1. Introduction.
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3. hpDIRC Subassemblies.
4. Design overview.
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6. ePIC integration.
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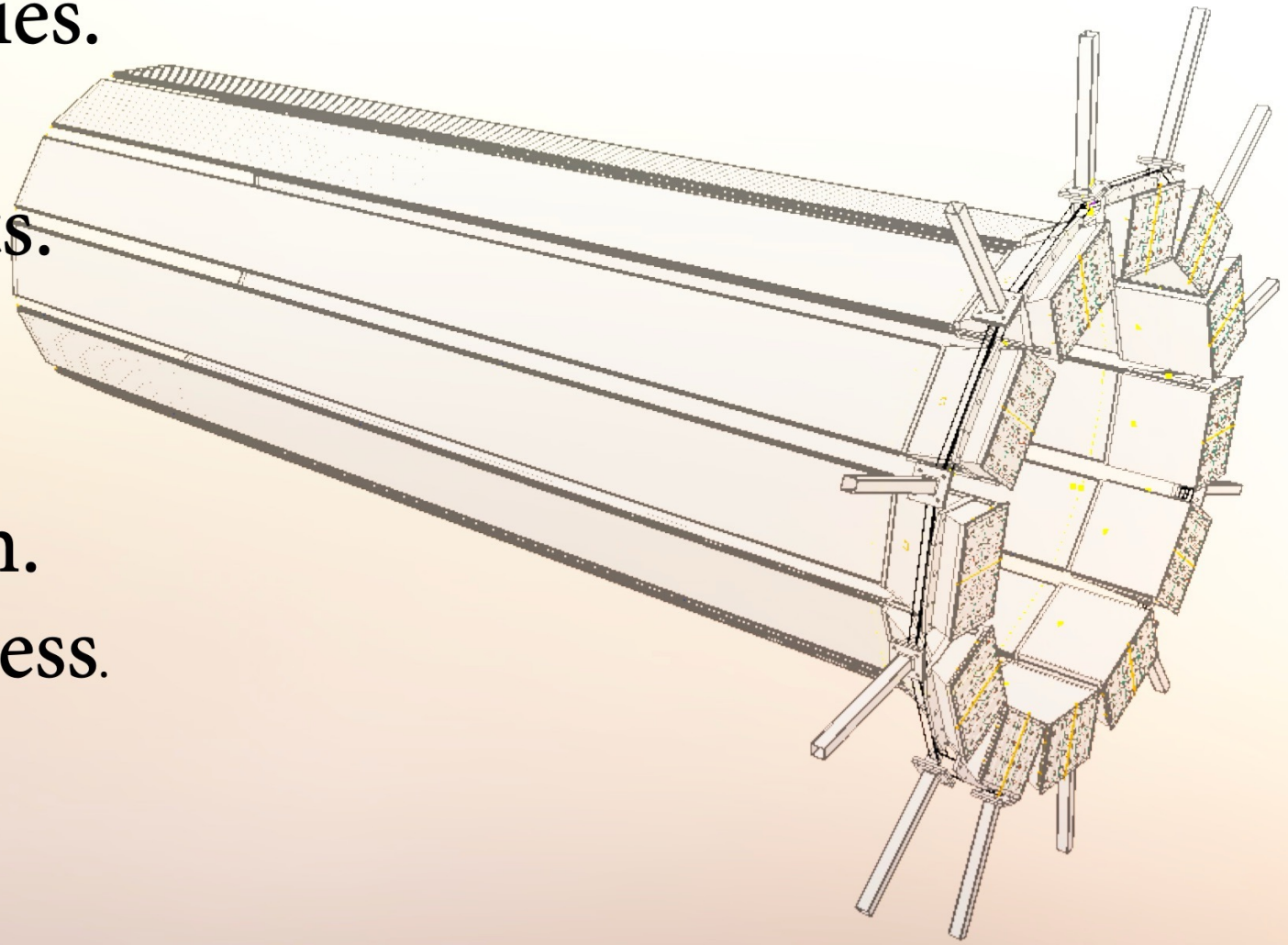
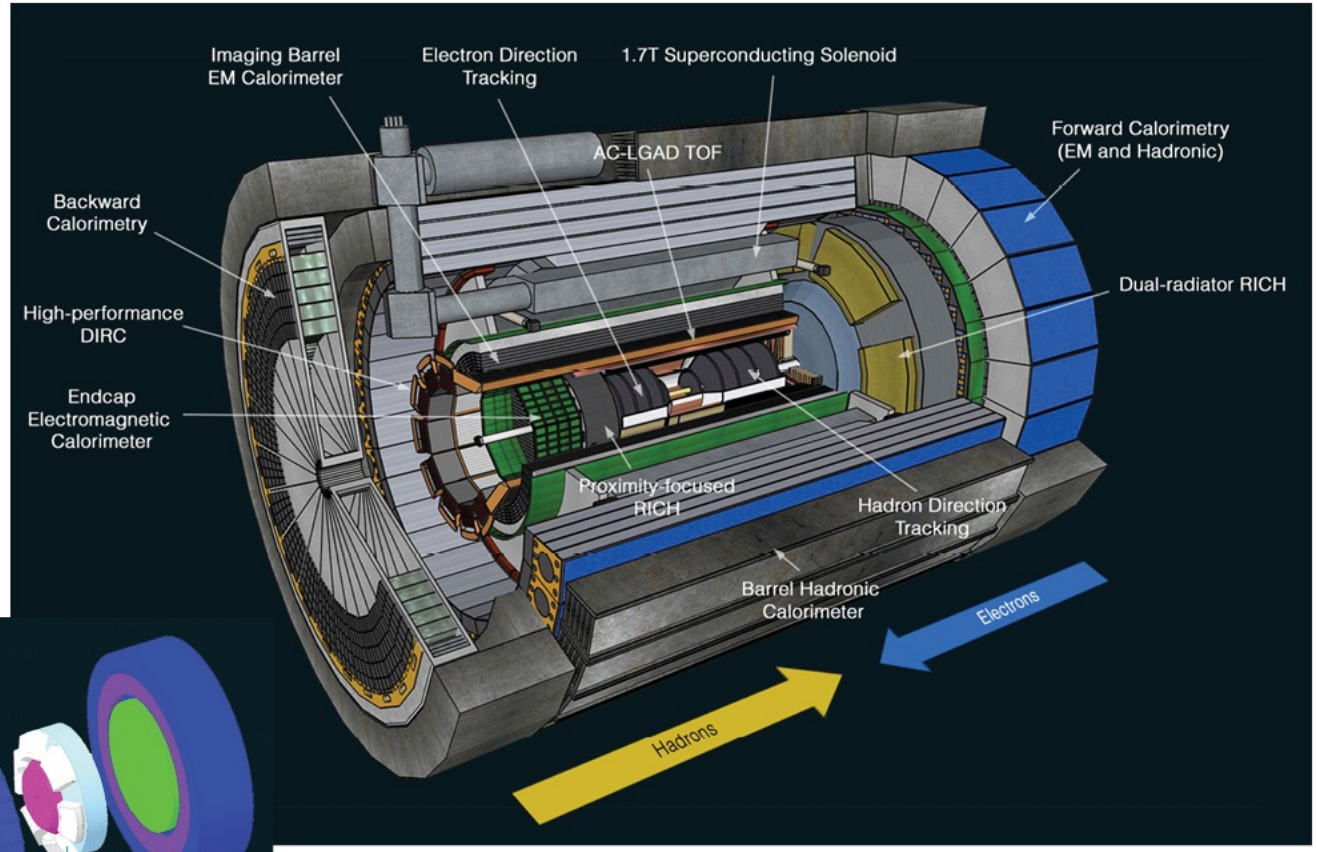
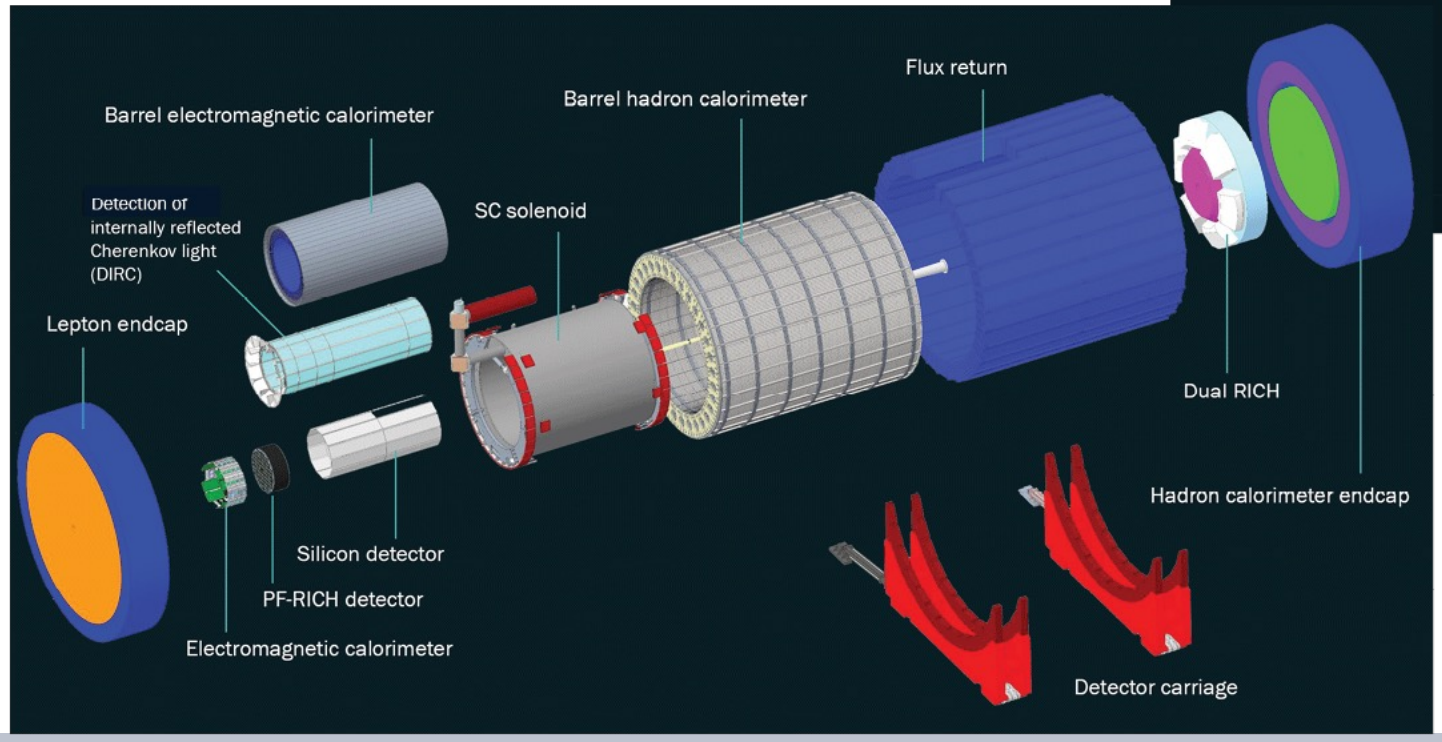
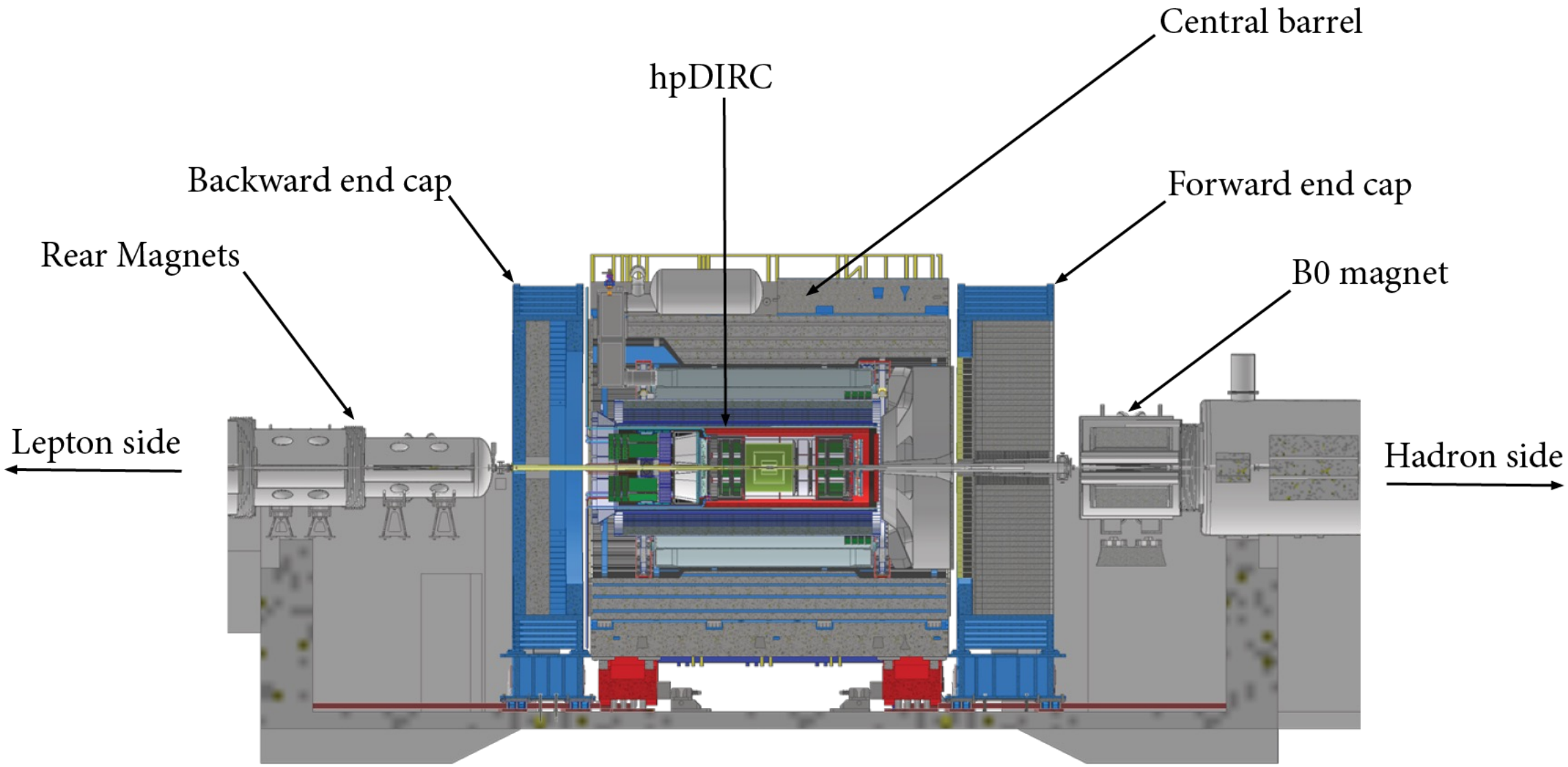


1. Introduction.





2. Overall integration.



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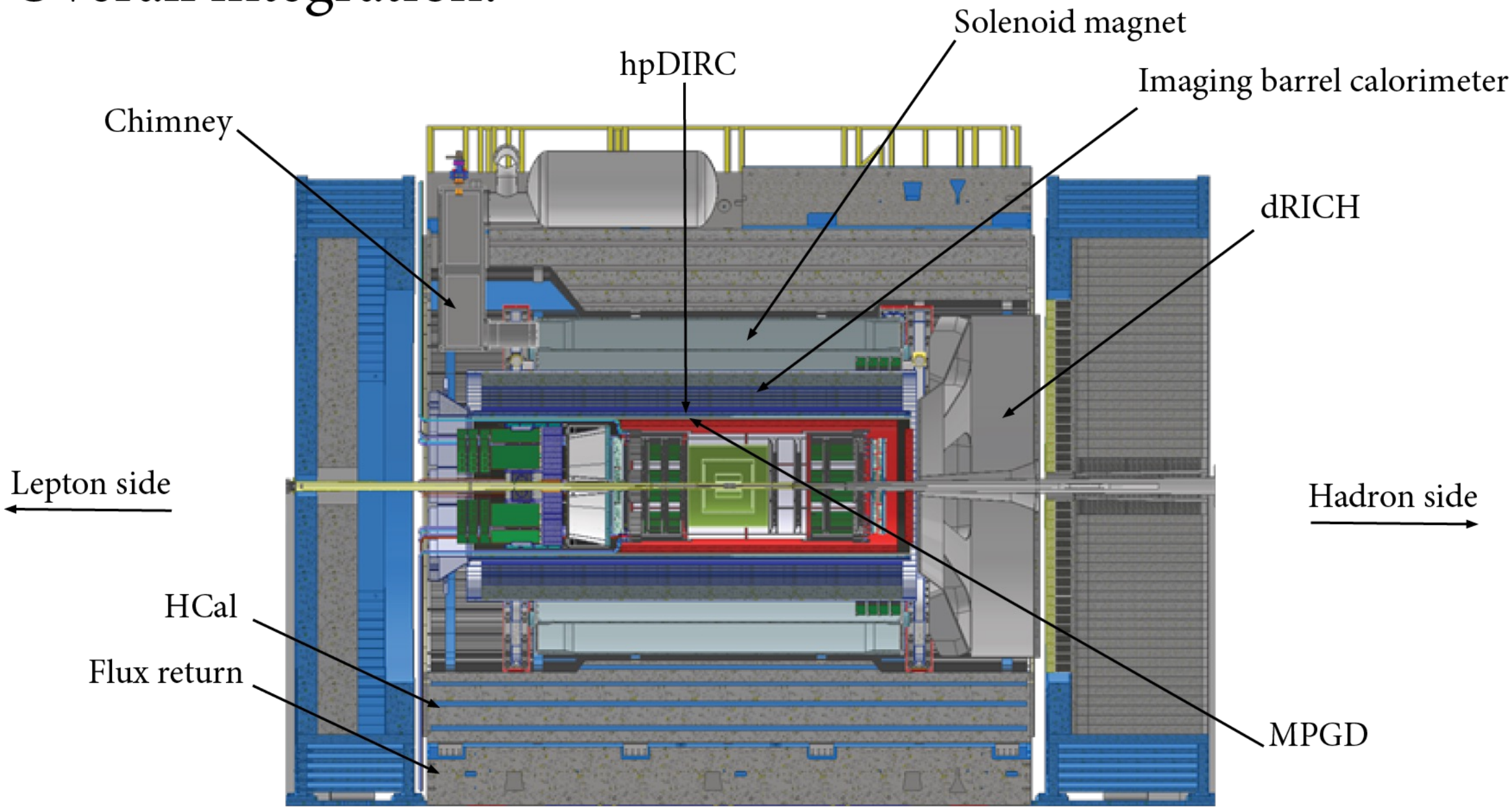
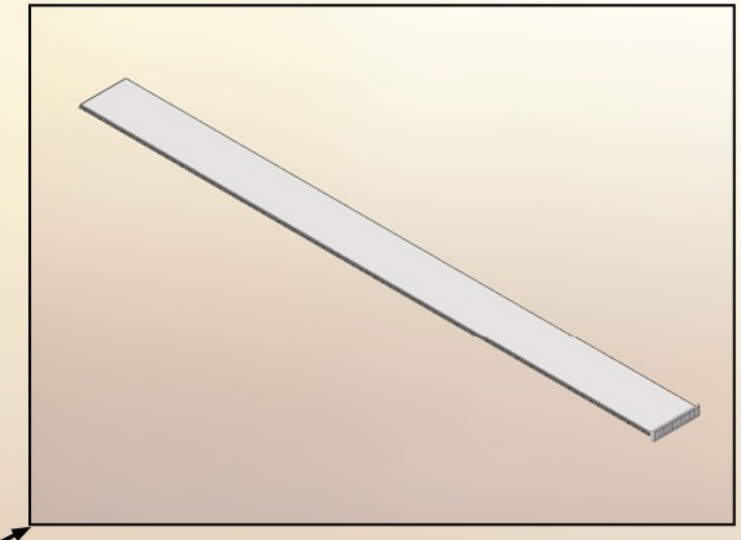
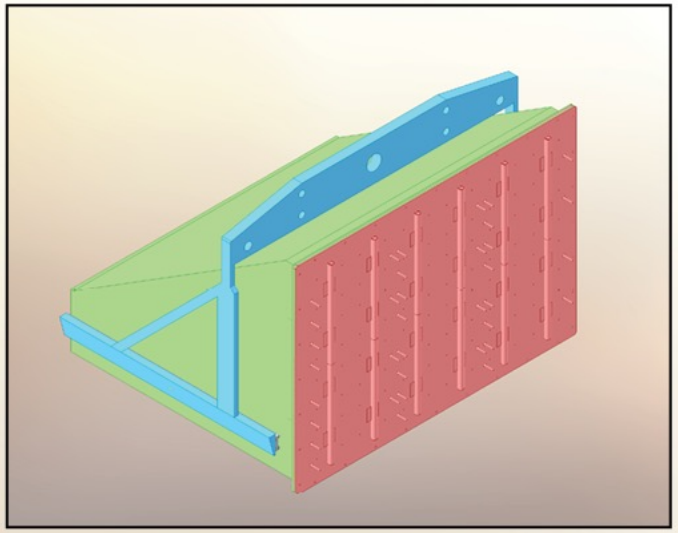


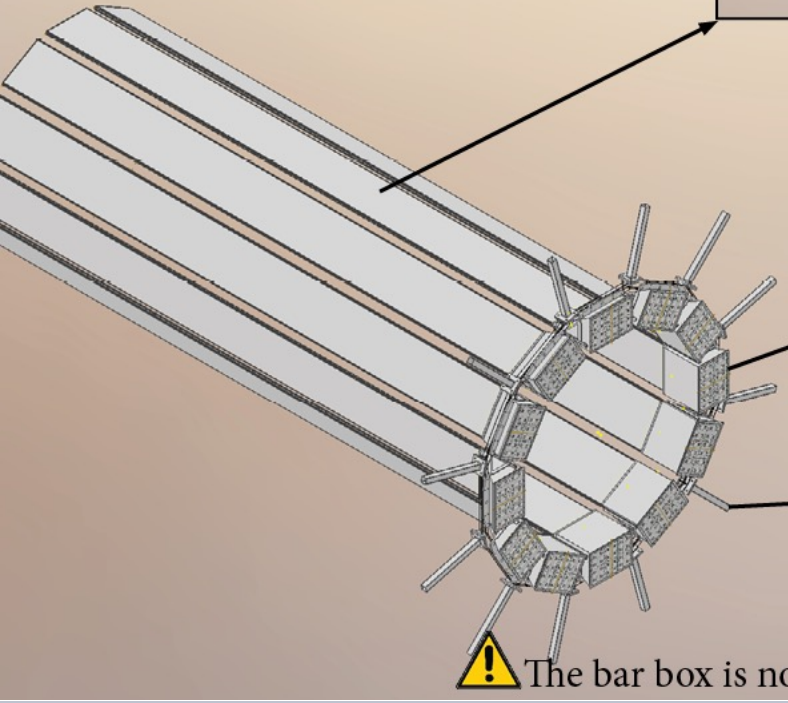
3. hpDIRC Subassemblies.

Bar box

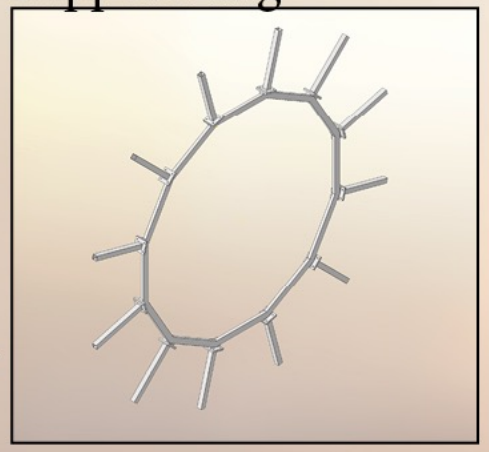


Prism box





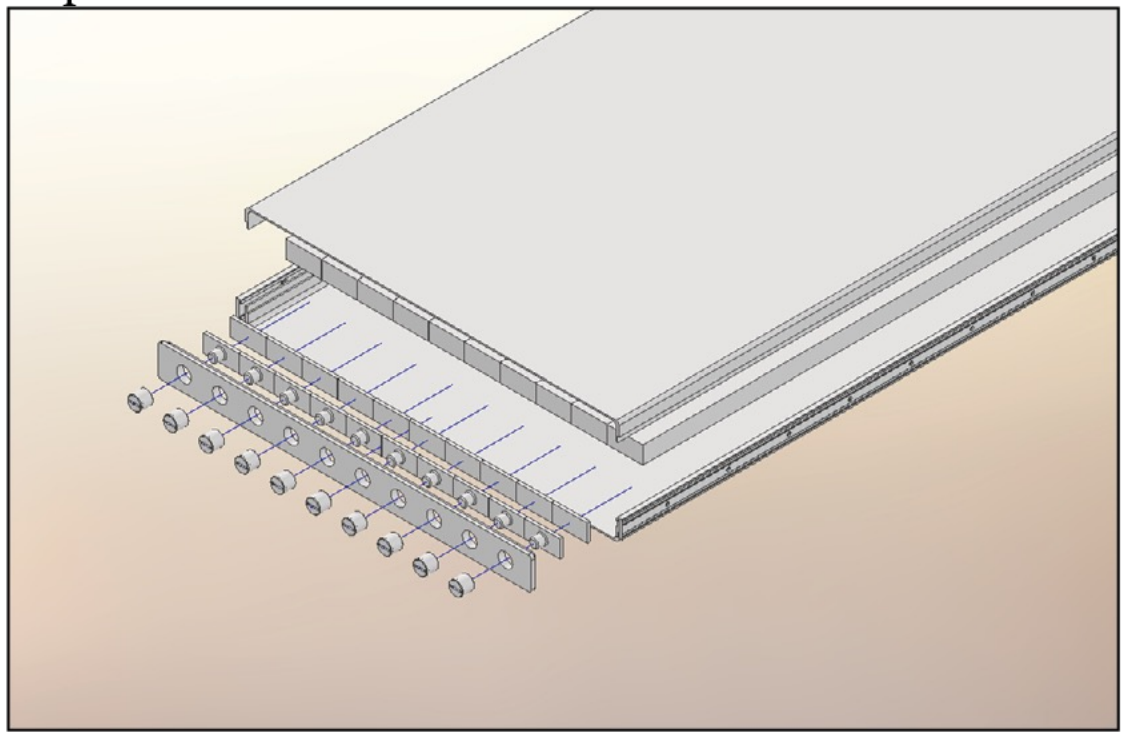
Support ring



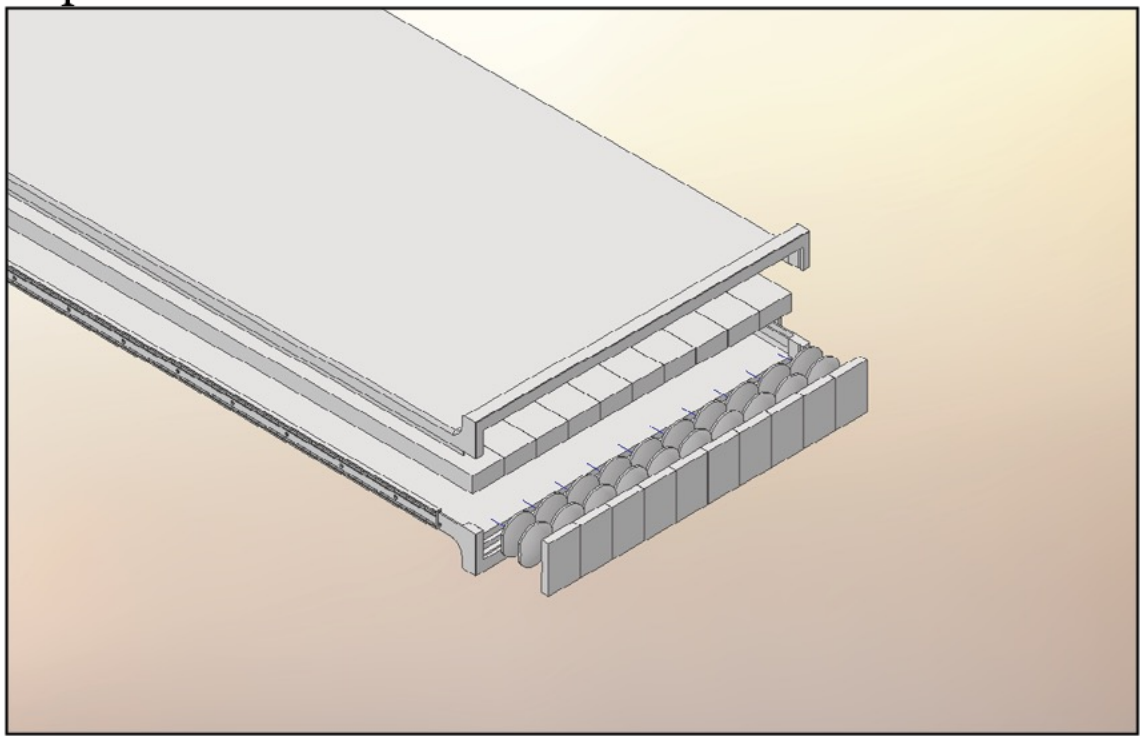
⚠ The bar box is not designed to be pulled out, but if necessary, the prism box will be detached for the needs of other detectors.

4. Design overview

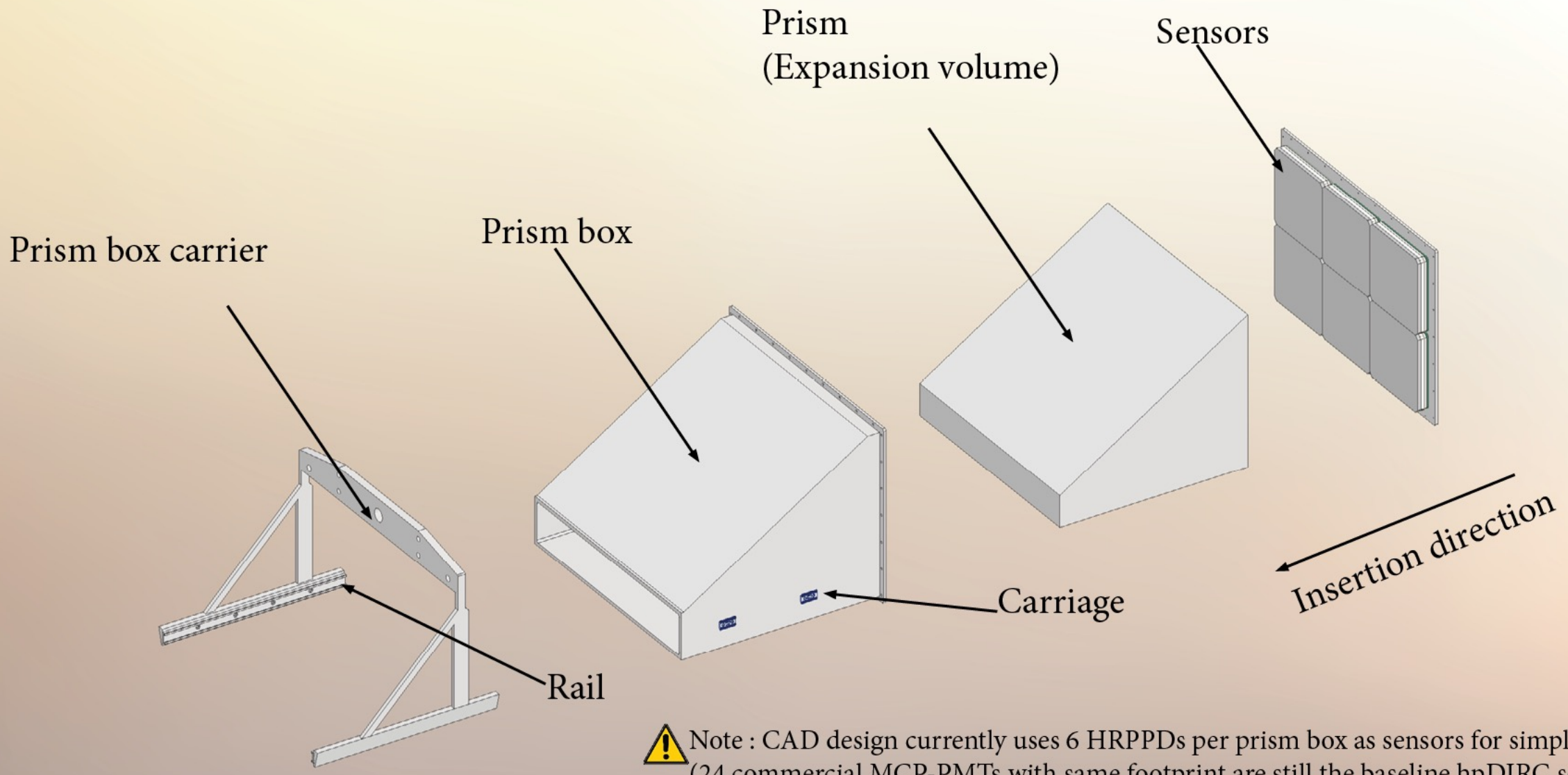
Exploded view mirror mechanism



Exploded view lens mechanism

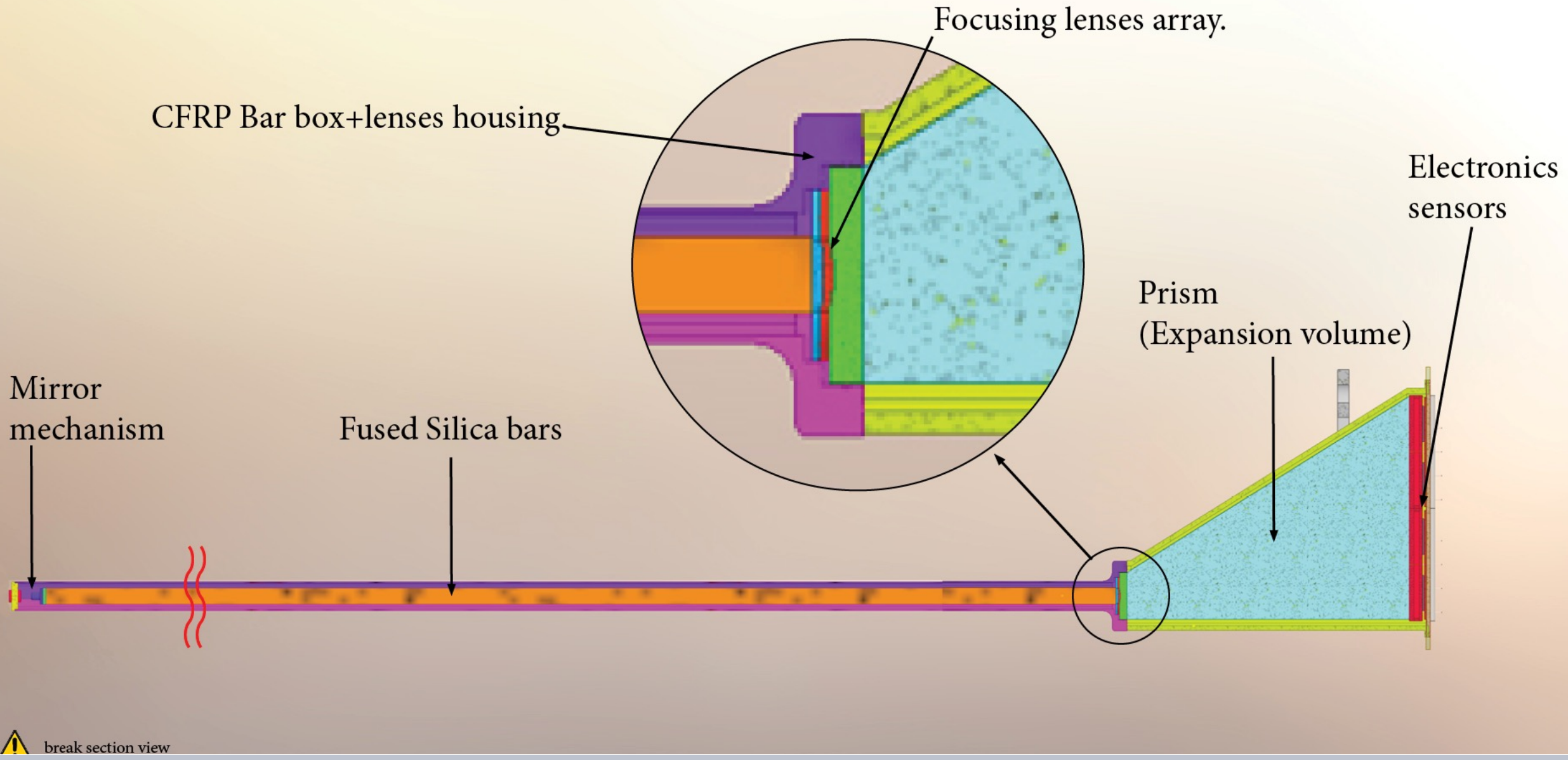


4. Design overview

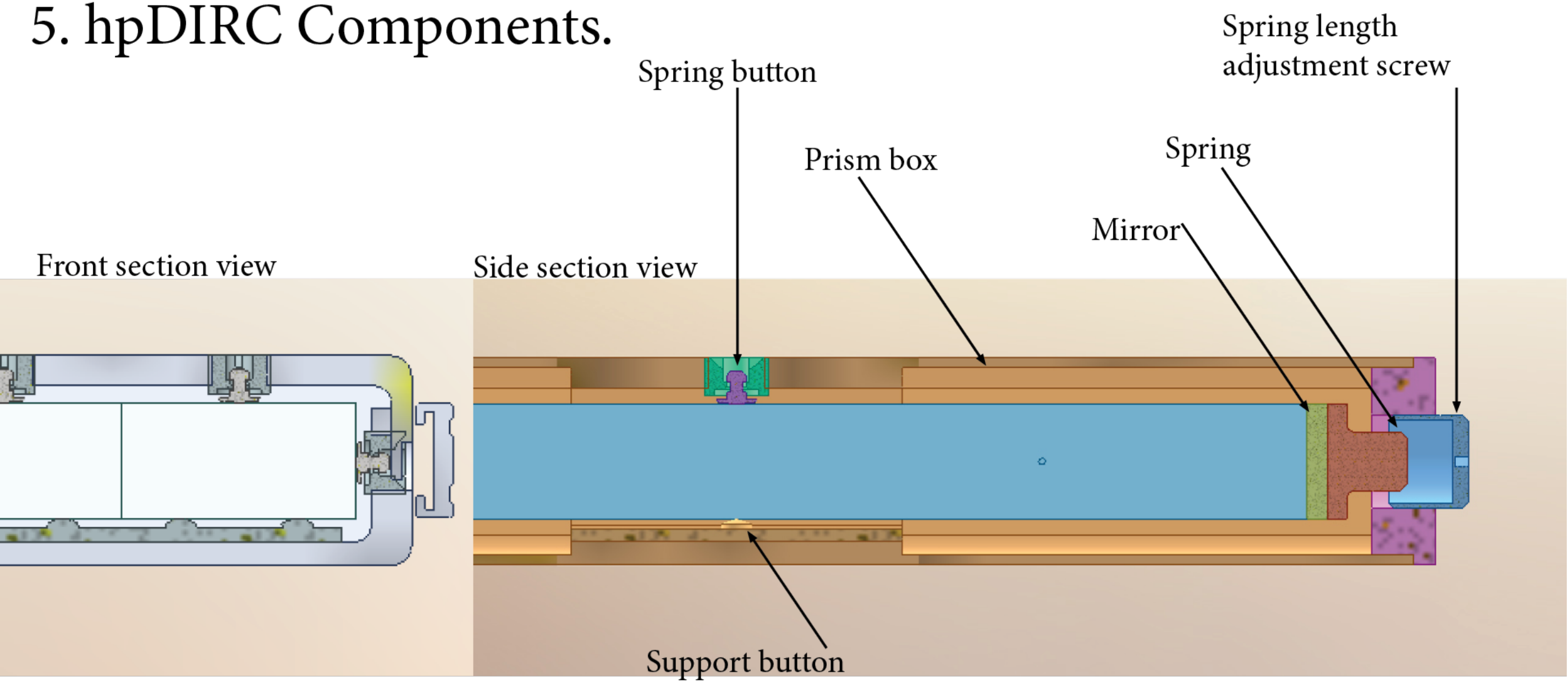


⚠ Note : CAD design currently uses 6 HRPPDs per prism box as sensors for simplicity
(24 commercial MCP-PMTs with same footprint are still the baseline hpDIRC sensor

5. hpDIRC Components.



5. hpDIRC Components.

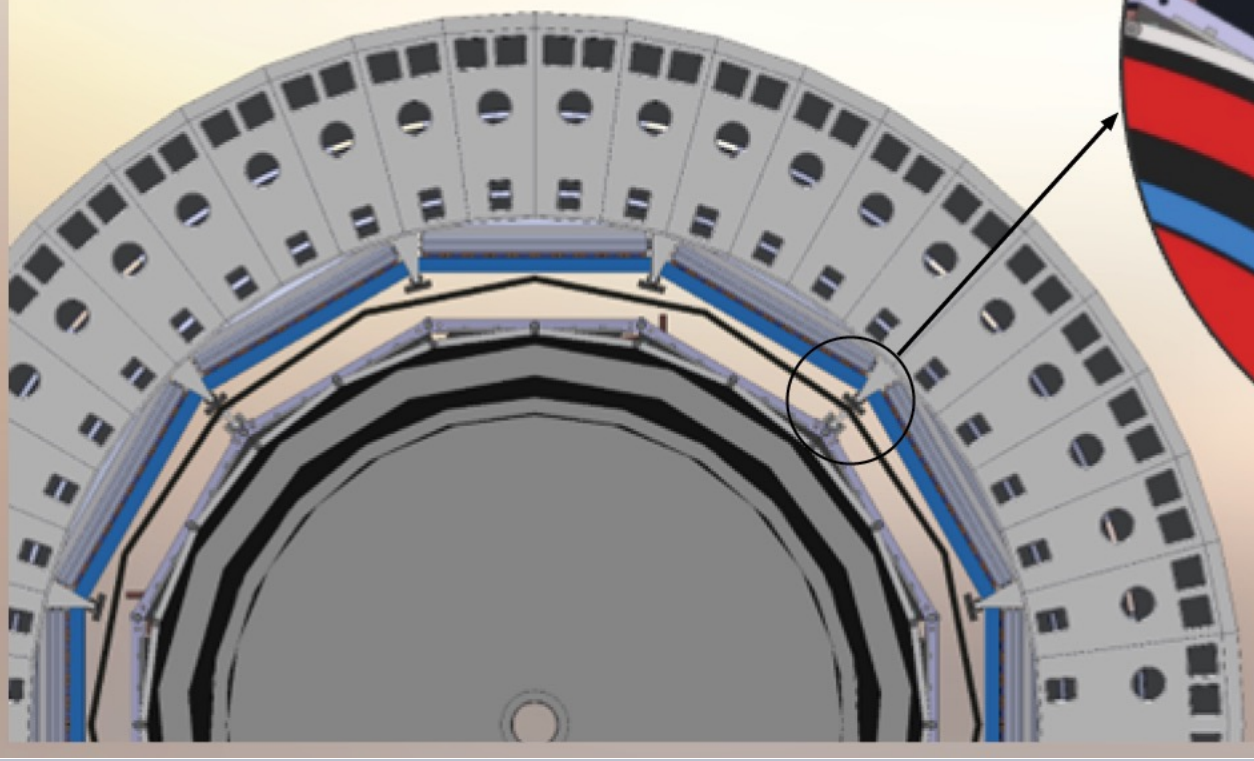


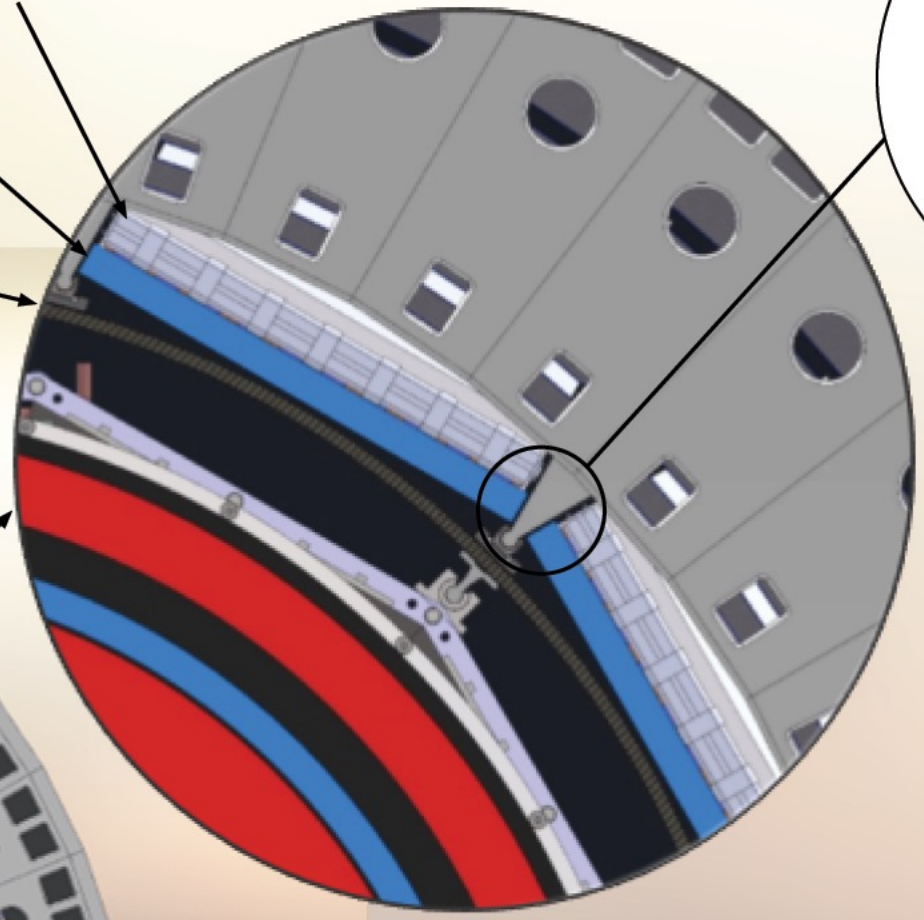
6. ePIC integration.

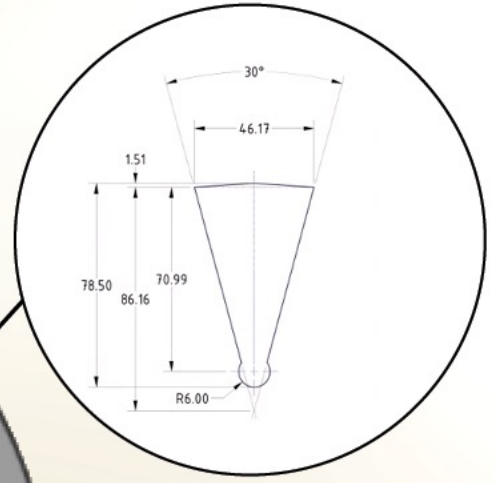
hpDIRC

MPGD

CFRP support stracture (cylinder) carries the weight of the internal detectors







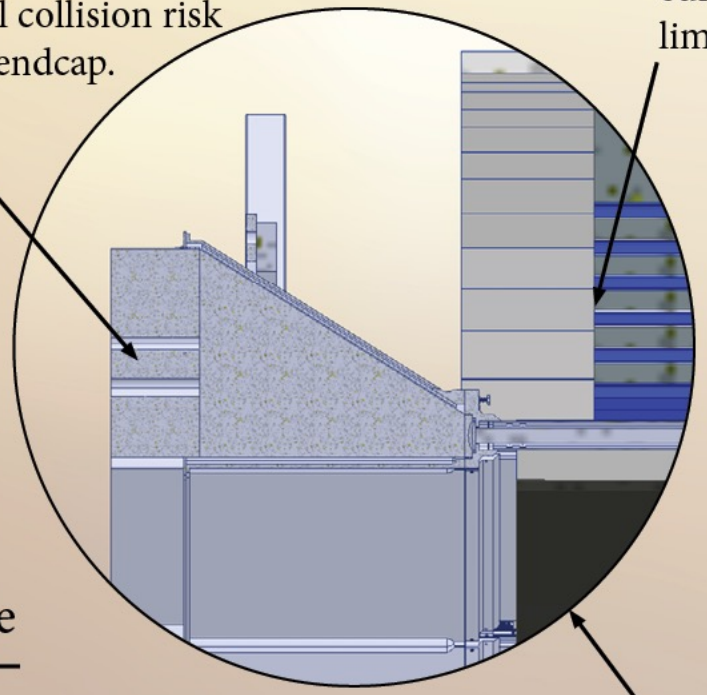
In the initial design, the hpDIRC was planned to share a support frame with internal detectors. However, due to deformations caused by the weight of the EEEMCAL, it was decided to separate the hpDIRC and the MPGD. Now, both components are directly connected to the barrel calorimeter.

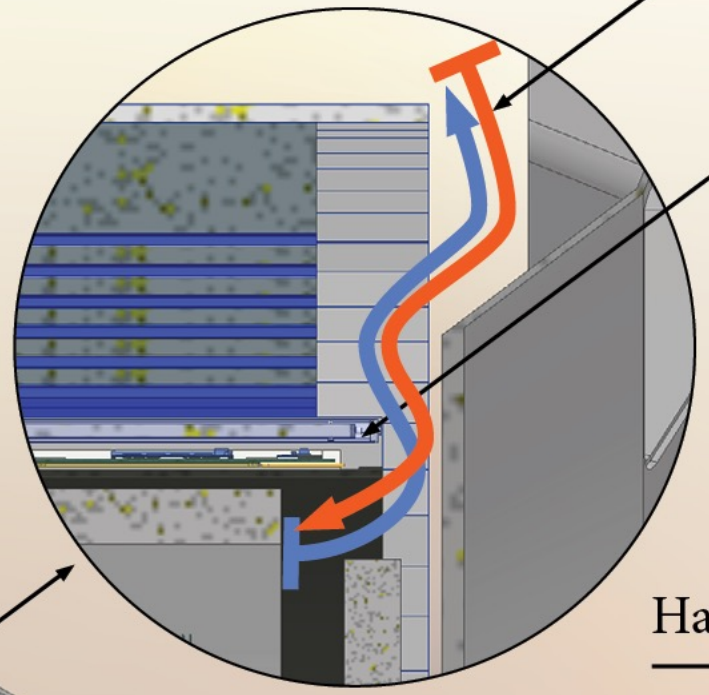
7. Integration issues.

We've allocated a 10 cm space for reading electronics. However, there's a potential collision risk with the Lepton endcap.

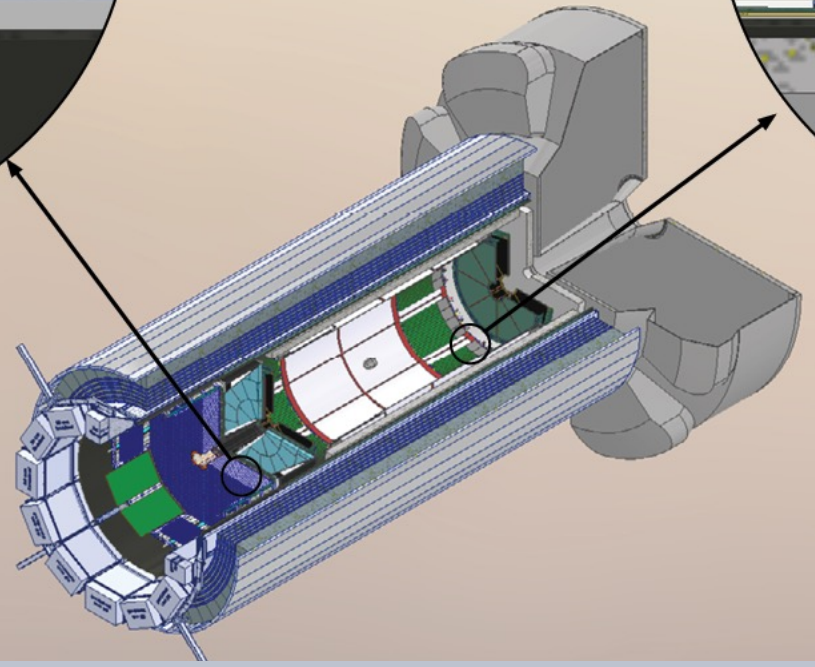
The imaging barrel calorimeter currently lacks a set position limit along the Z-axis.

A requirement to make the service line of the internal detectors as straight as possible.





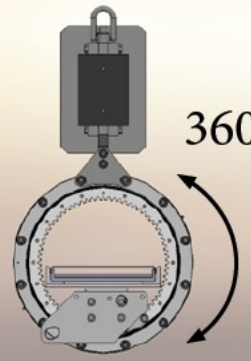
hpDIRC Mirrors



Lepton side

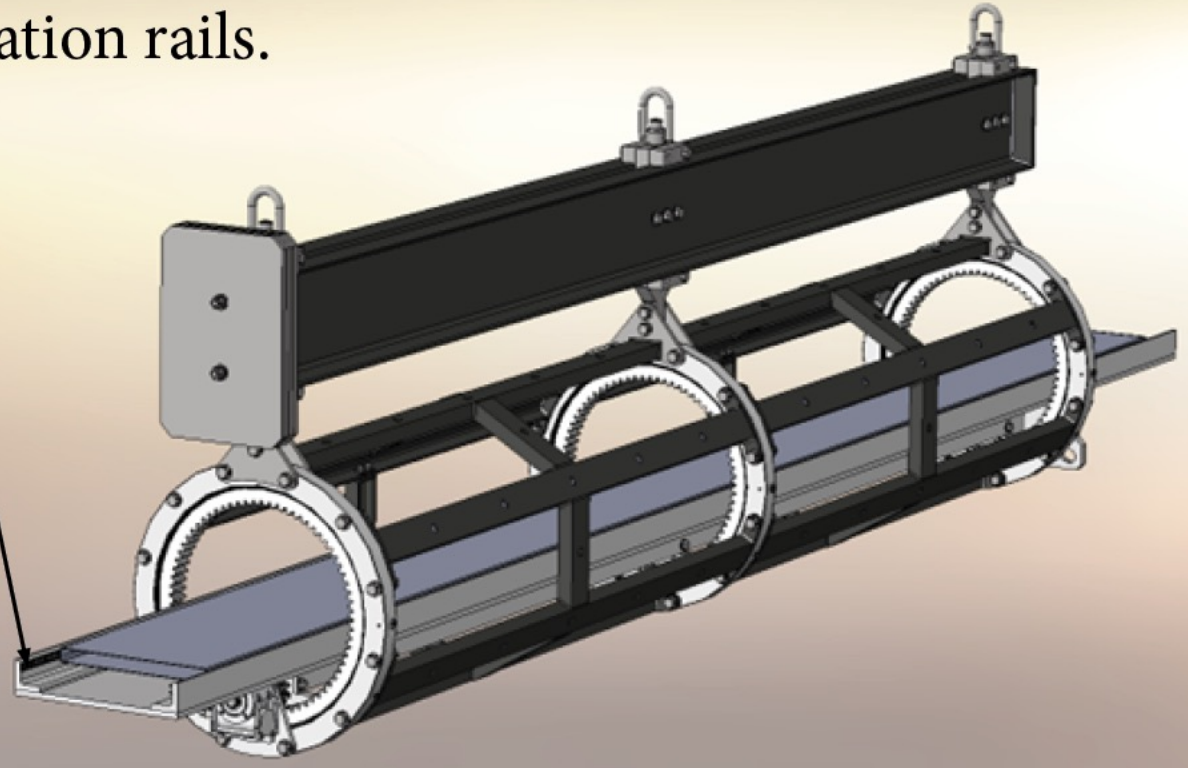
Hadron side

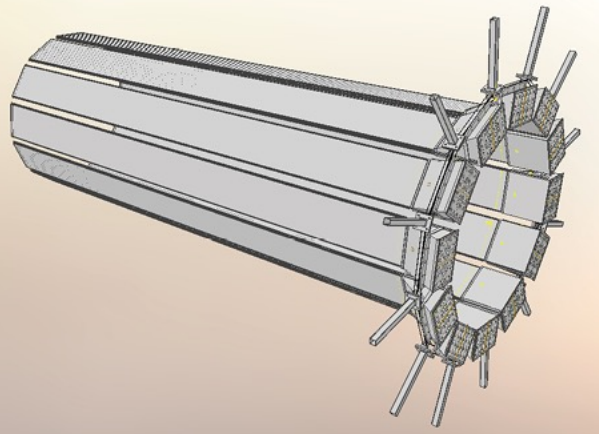
8. Installation operation.



360 deg rotation

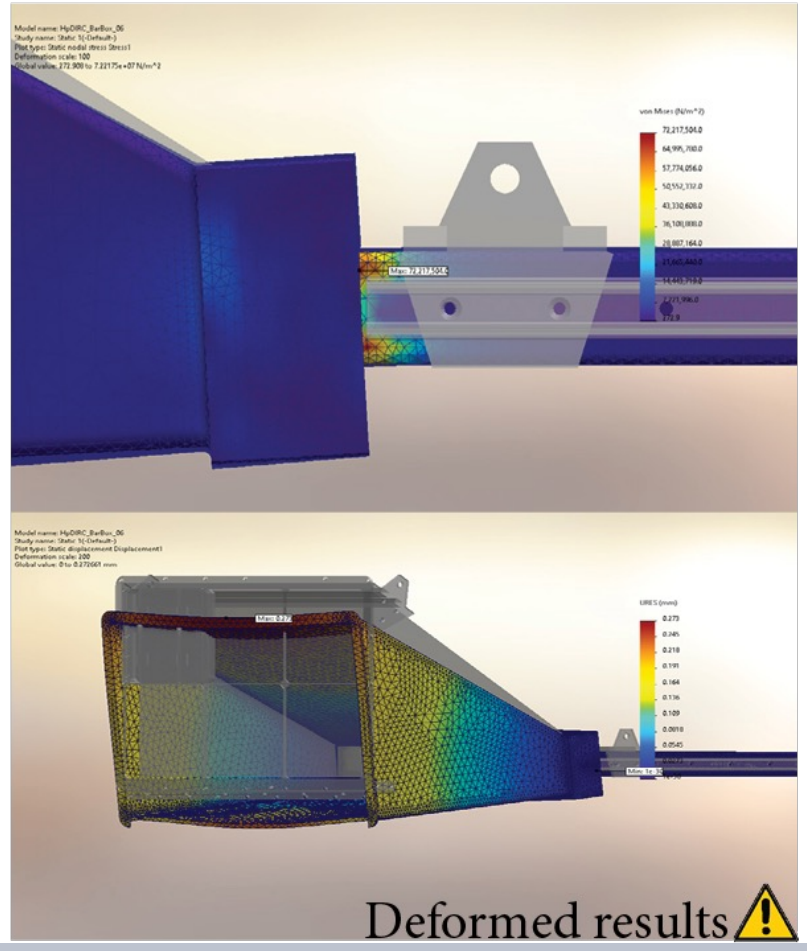
Insertation rails.





9. FEA. Studies in progress

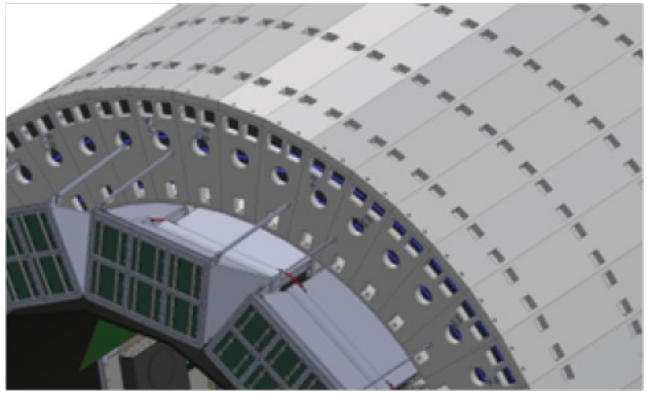
Self supporting Prism box with a separate lens housing that can hold the prism load.

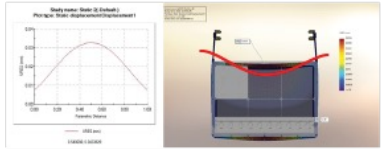


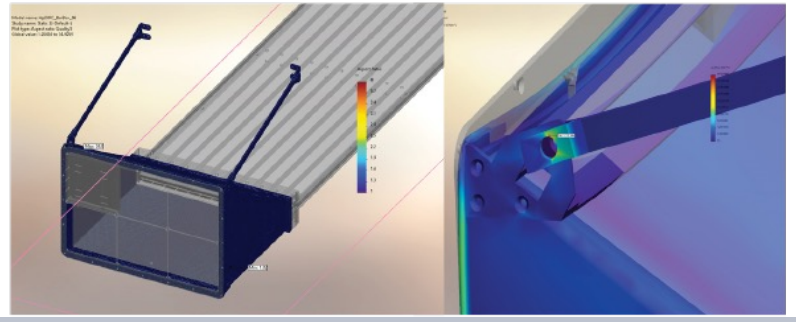
Deformed results ⚠

Disqualified due to higher deflection than allowed

A prism-to- the barrel calorimeter connection that was rejected for not meeting requirements.

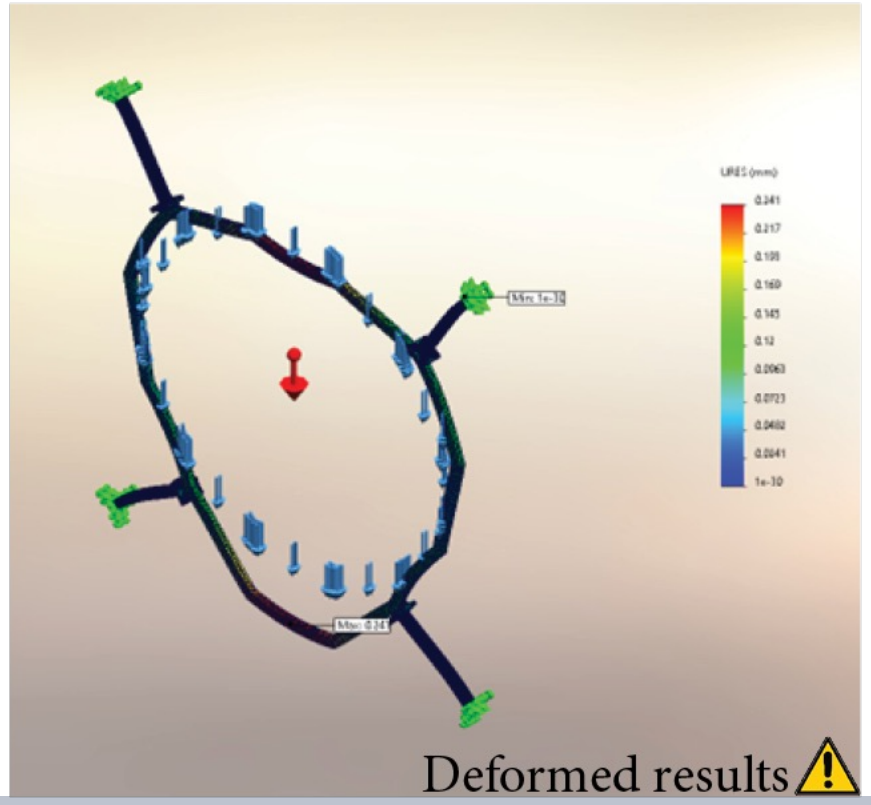






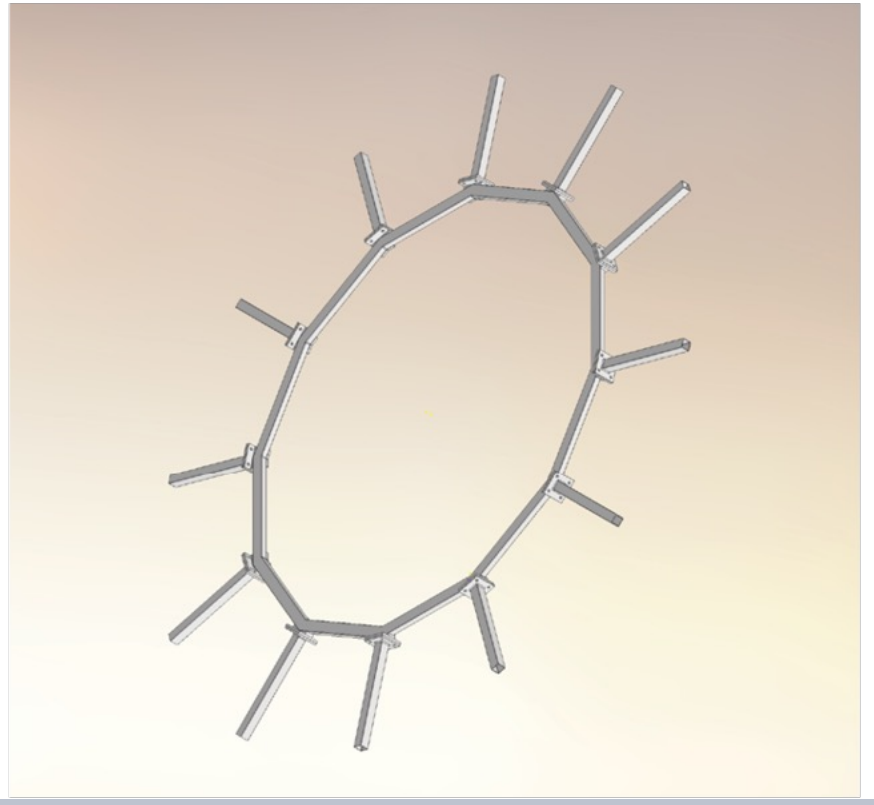
9. FEA. Studies in progress

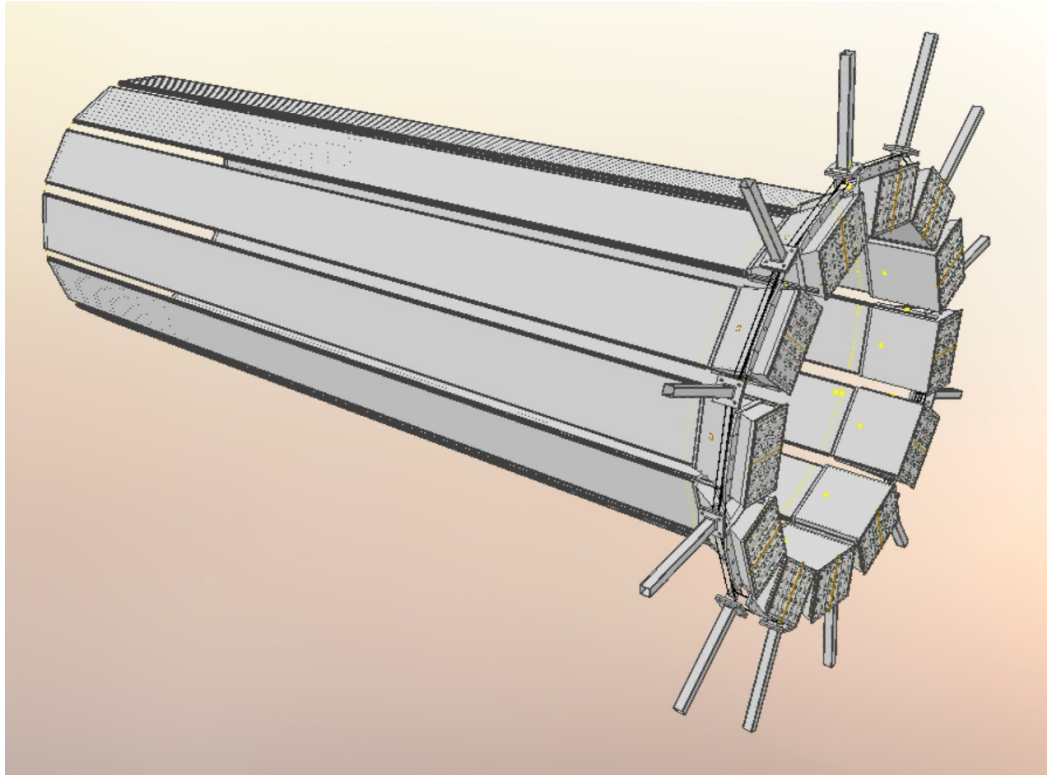
Incorporated a support ring to stabilize the prism, utilizing a four-legged design.



Deformed results ⚠

Our ongoing testing aims to determine the optimal leg configuration.





10. Next steps/ to do list.

1. Nitrogen purge system design and sealing.
2. Designing the prism removal method.
3. Optimising forces of spring loaded screws.
4. Readout box and services design.
5. Buttons design and placement optimization.
6. Evaluate thermal expansion behavior for all levels of the system.
7. Reiterating deflection studies for updated design.