Fission target handling system

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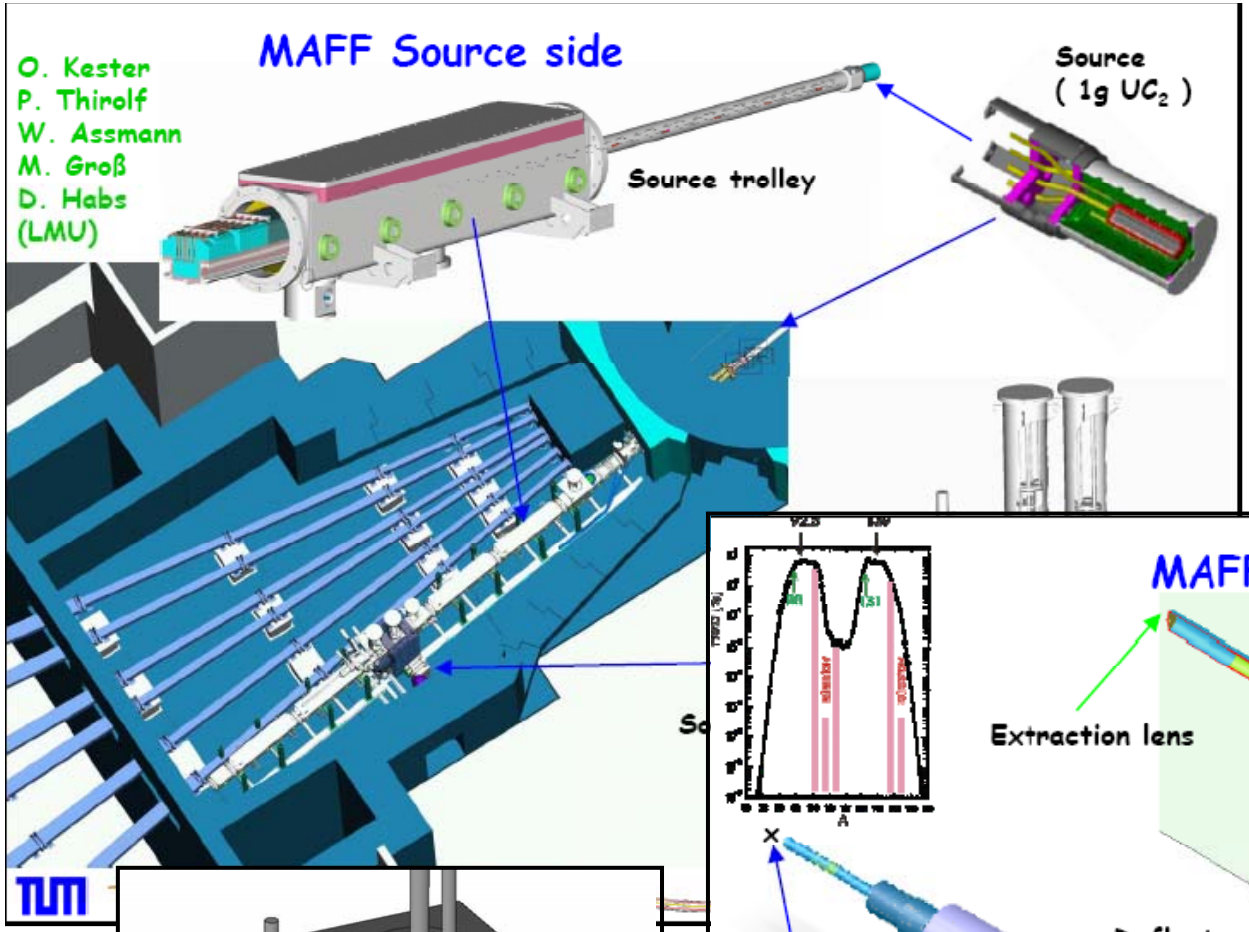
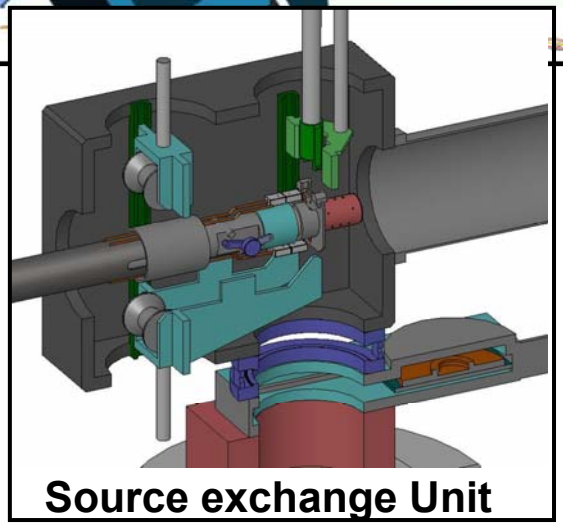
EURISOL Design Study

MAFF Concept

MAFF Source side

O. Kester
P. Thirolf
W. Assmann
M. Groß
D. Habs
(LMU)

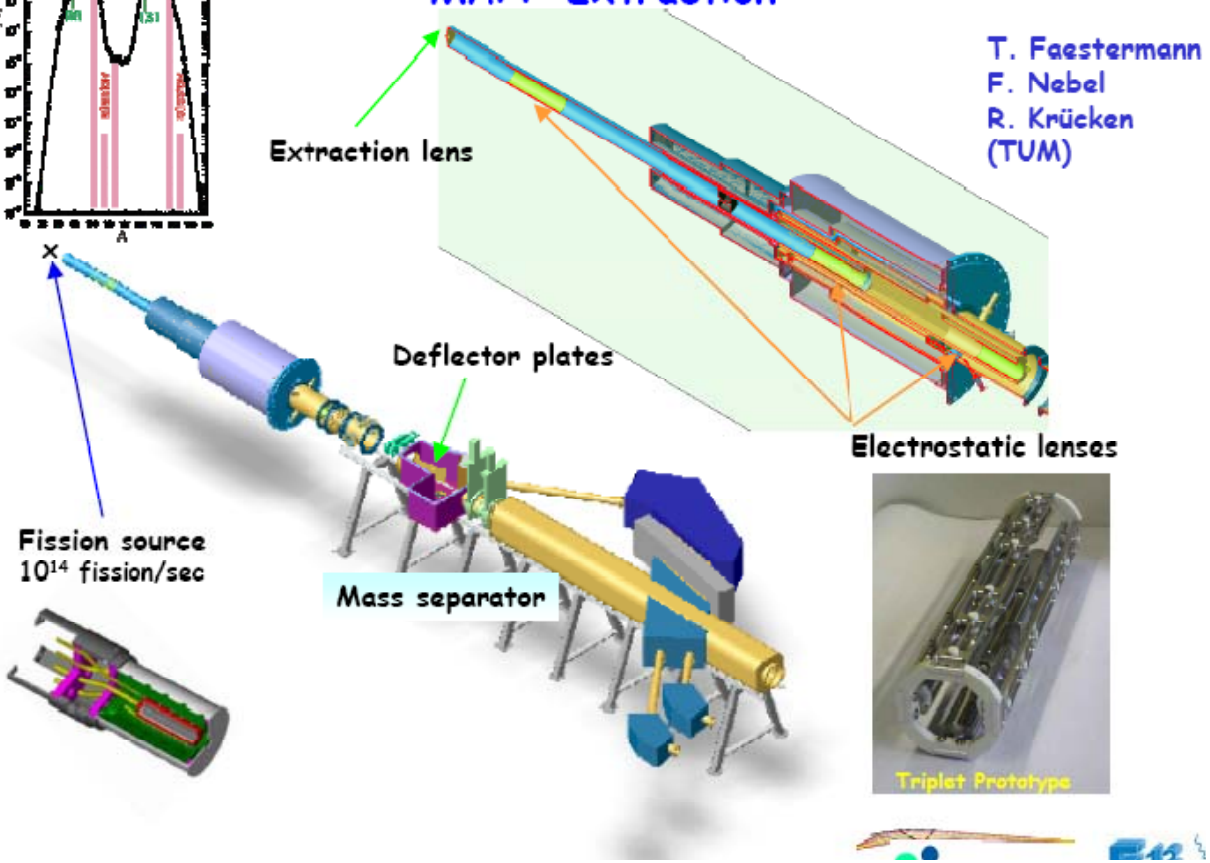




Source exchange Unit

MAFF Extraction

T. Faestermann
F. Nebel
R. Krücken
(TUM)



PIAFE Concept

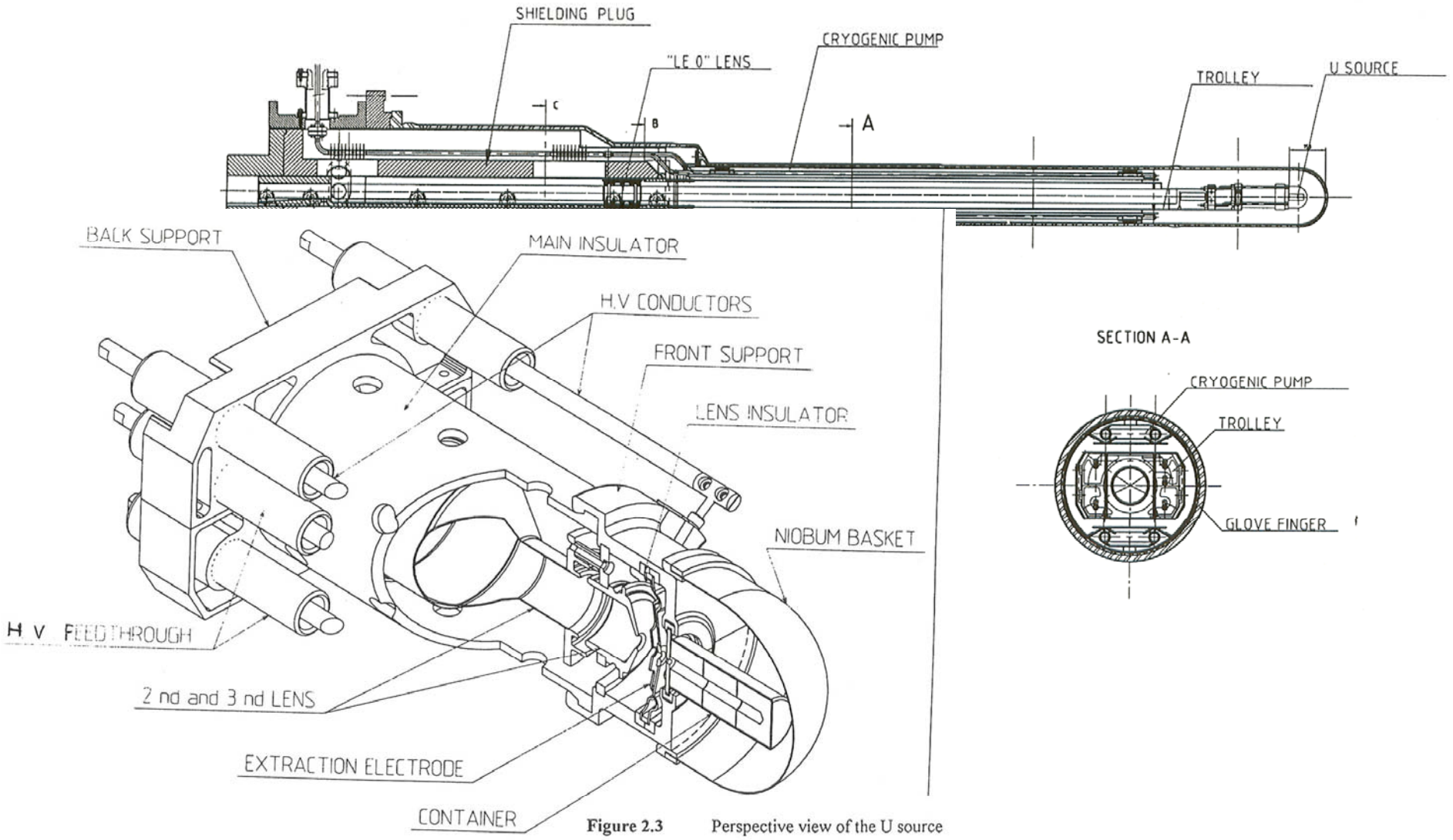


Figure 2.3 Perspective view of the U source

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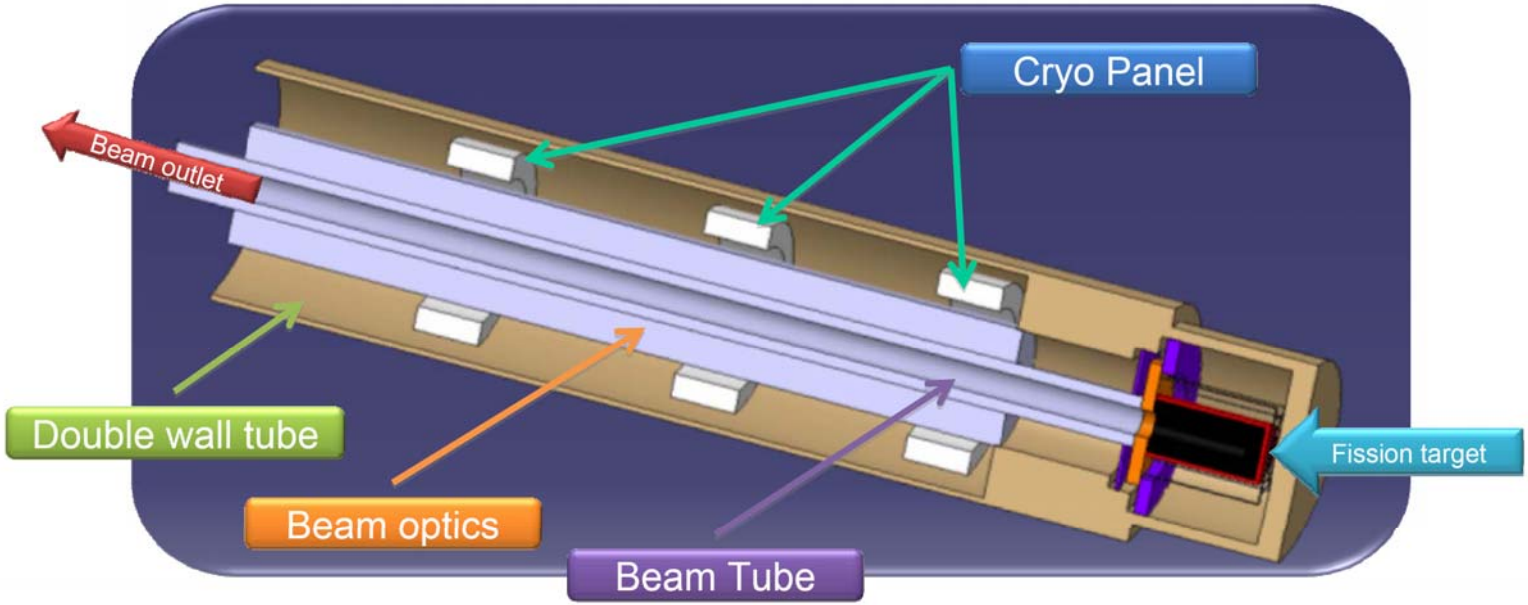
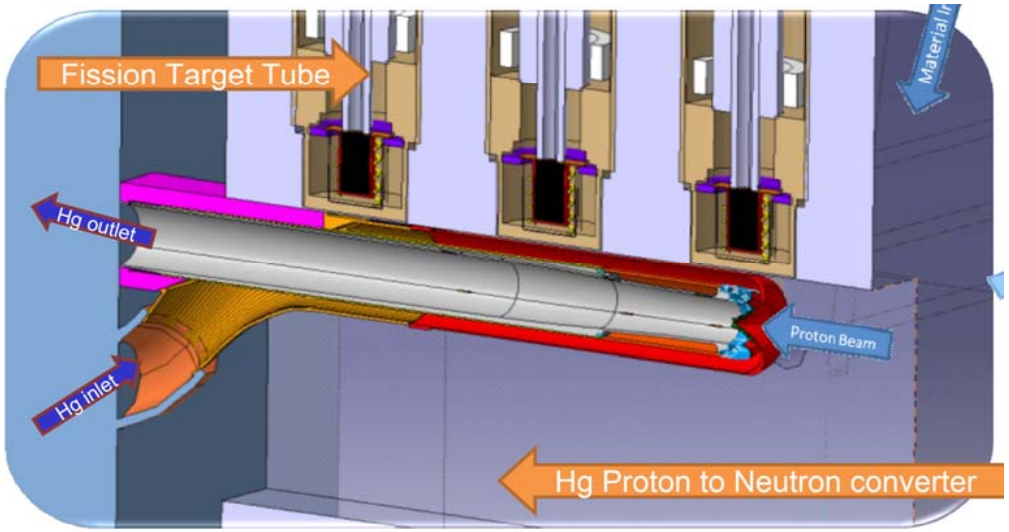
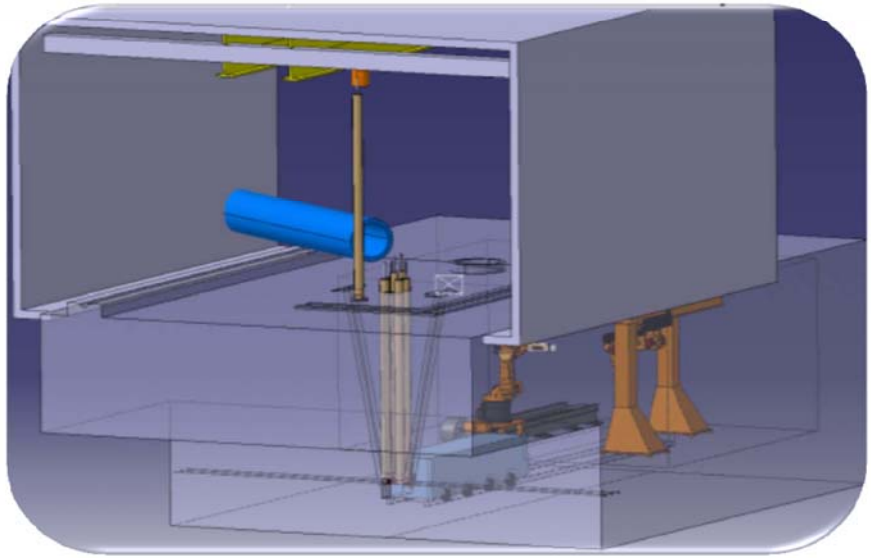
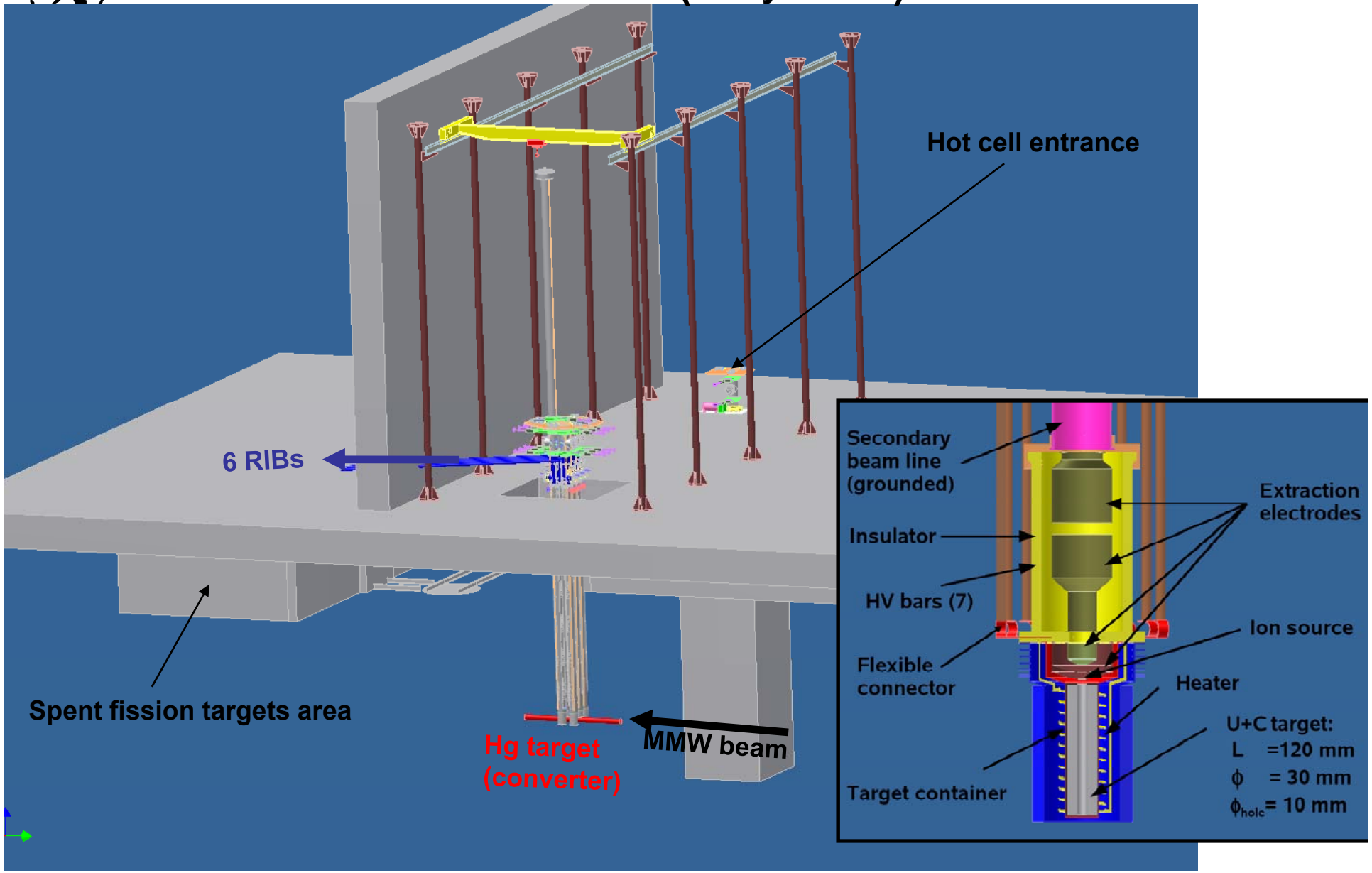
Integration of MAFF Concept







Assembly view of previous design (one year old)



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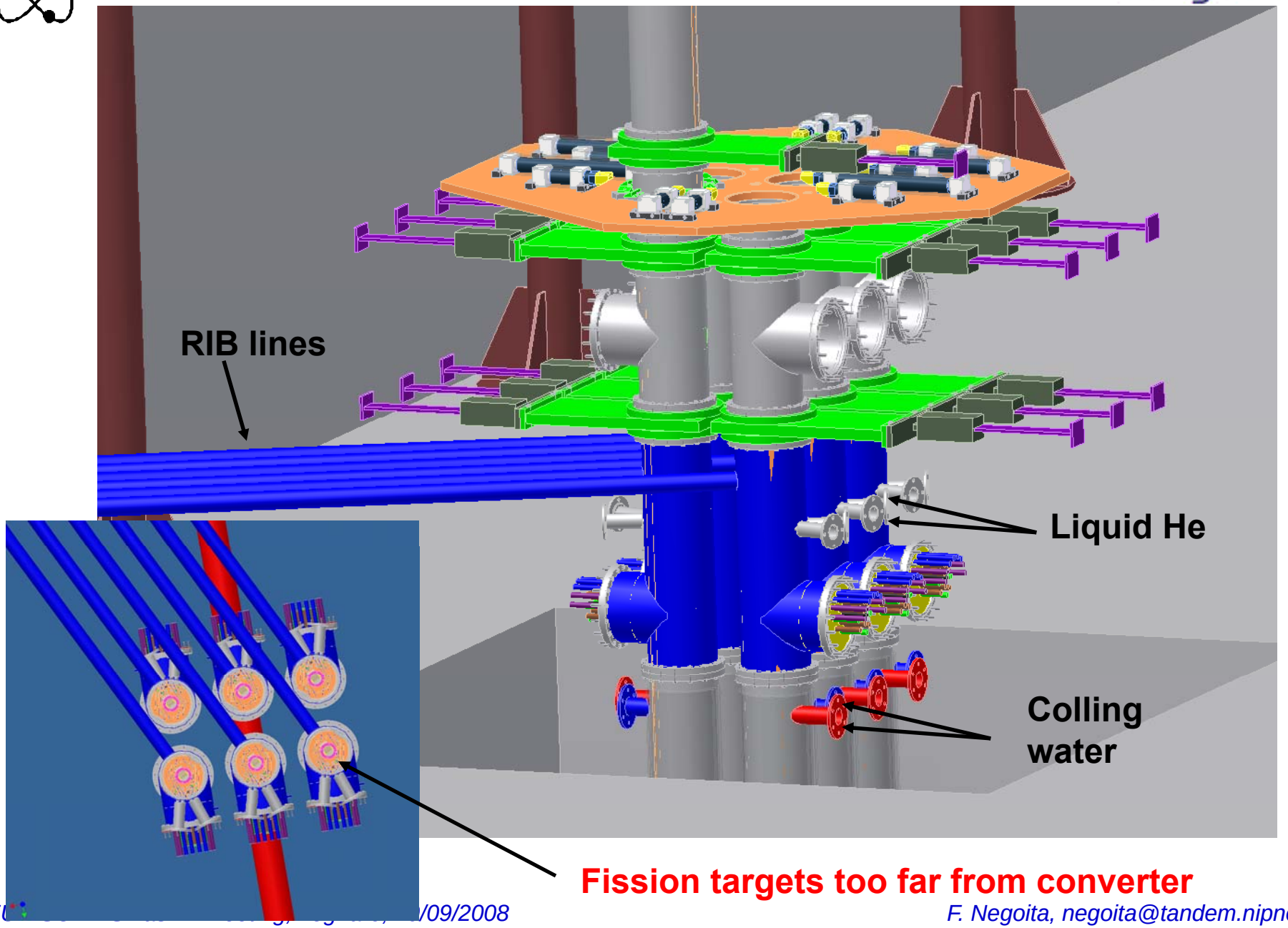
Details of previous design



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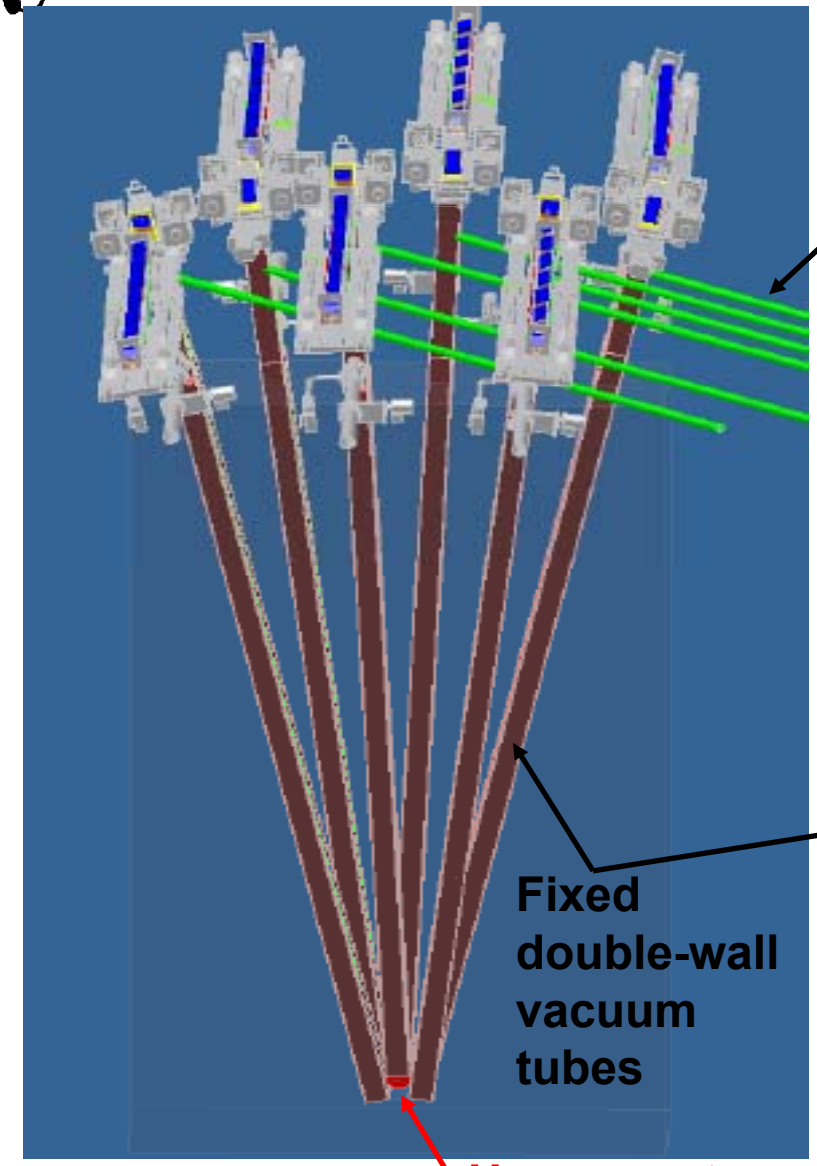
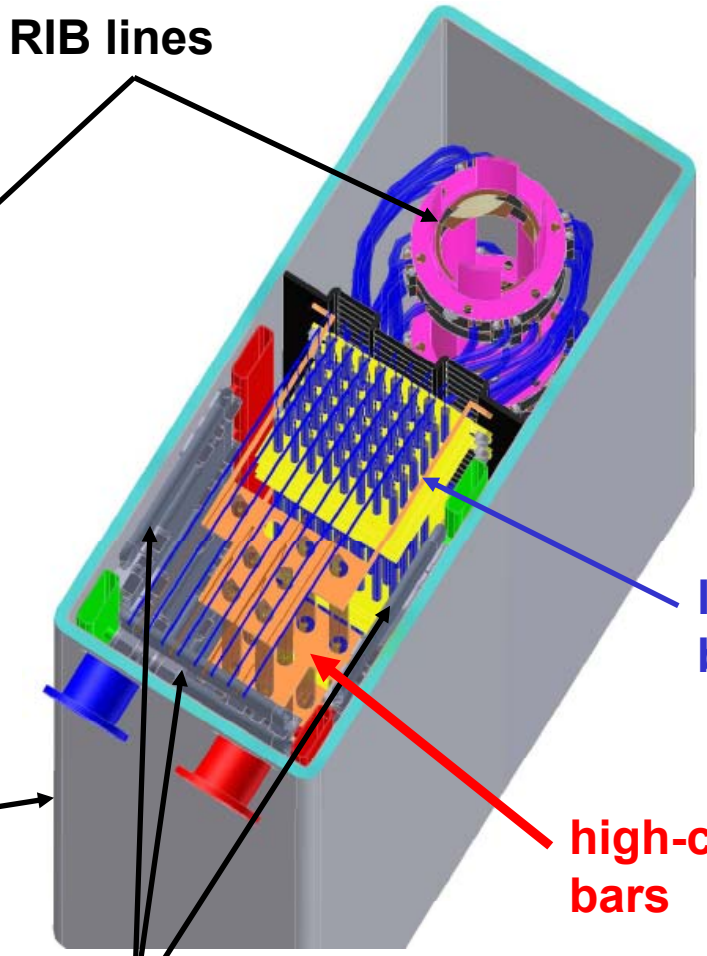
Current design: tilted rectangular tubes





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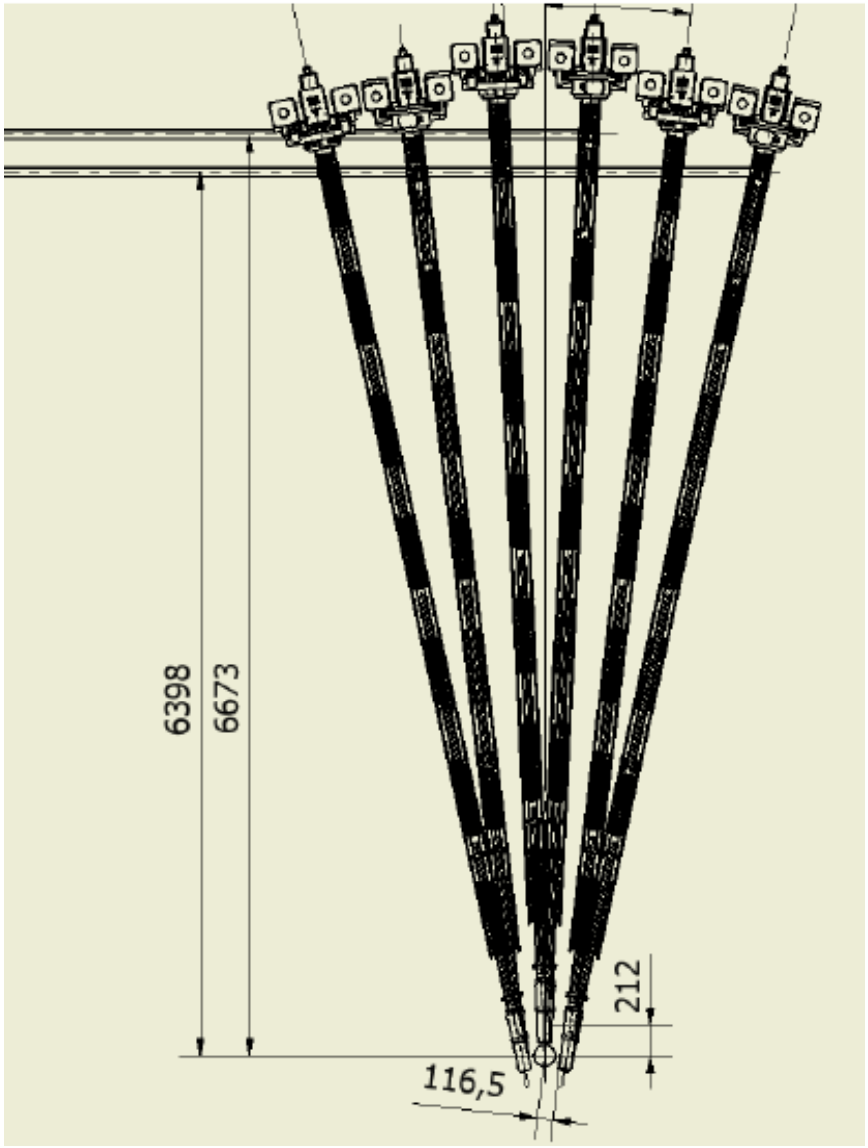
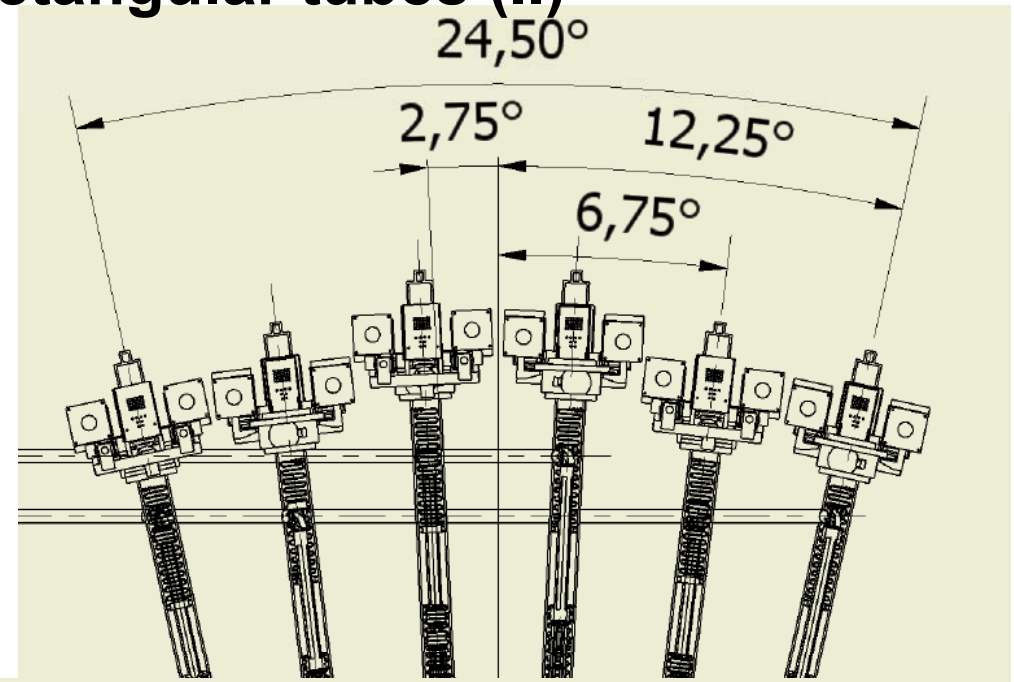
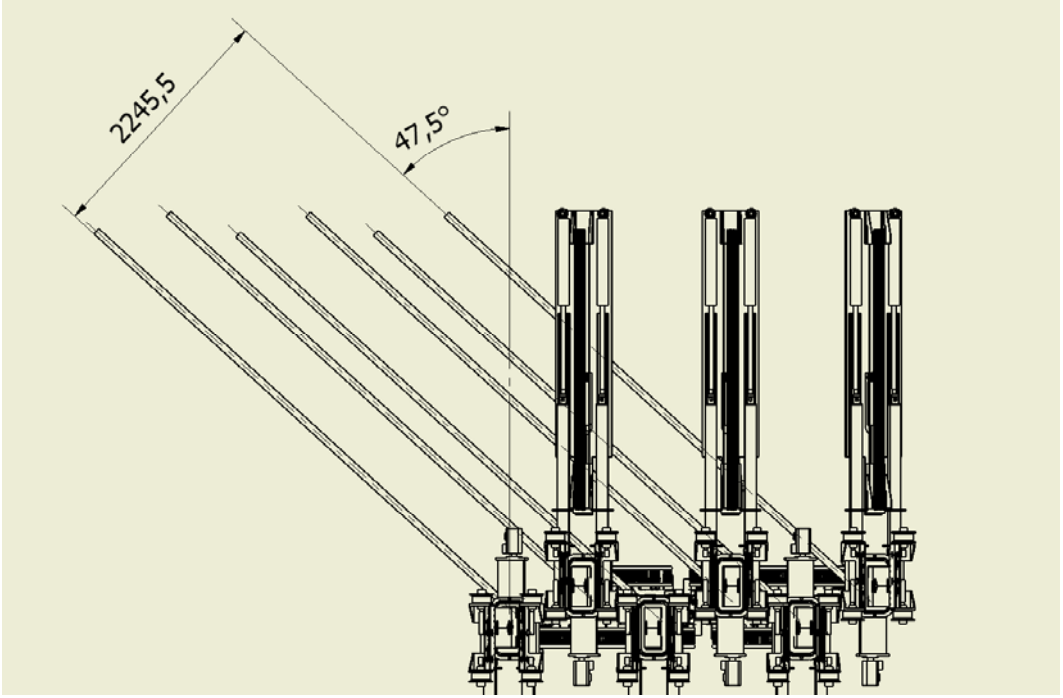
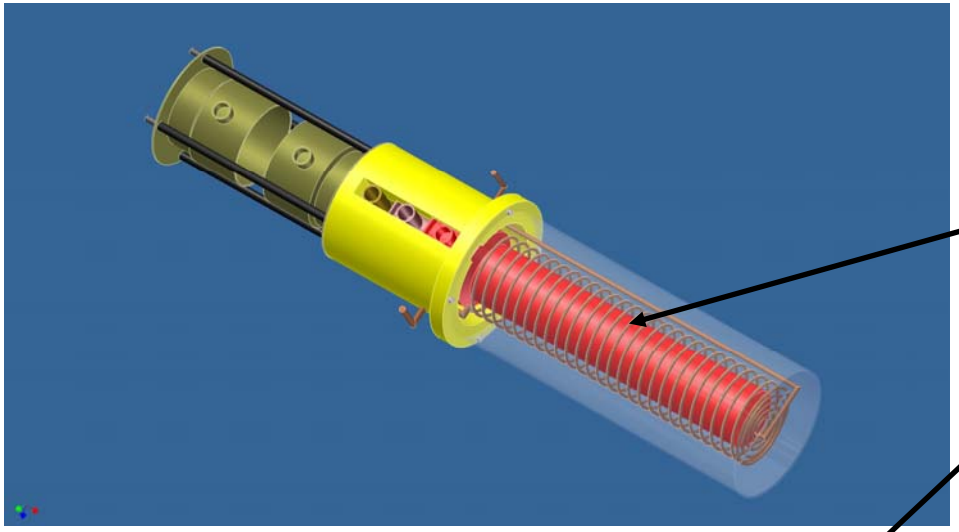
Current design: tilted rectangular tubes (II)



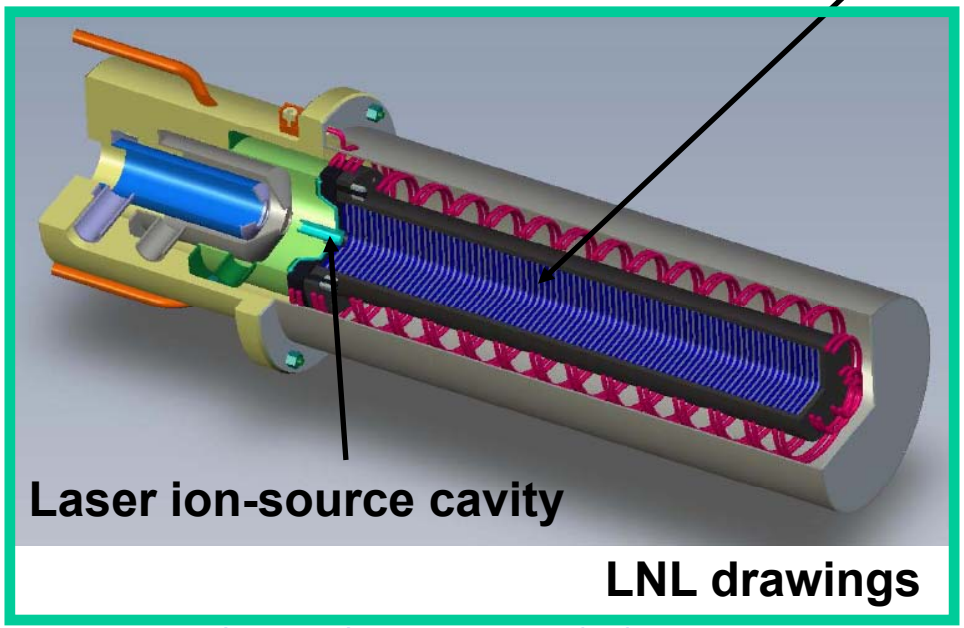




Slight modifications at the level of fission target - ion source - extraction



U+C target:
L=200 mm
Φ = 30 mm
Φhole=8 mm



LNL drawings

Heating spiral extended on bottom side become diagnostic tool for target break or failure:

if $R_{spiral}=\infty$
or $R_{spiral\text{-}inner\ container}=0$
or $R_{spiral\text{-}outer\ container}=0$

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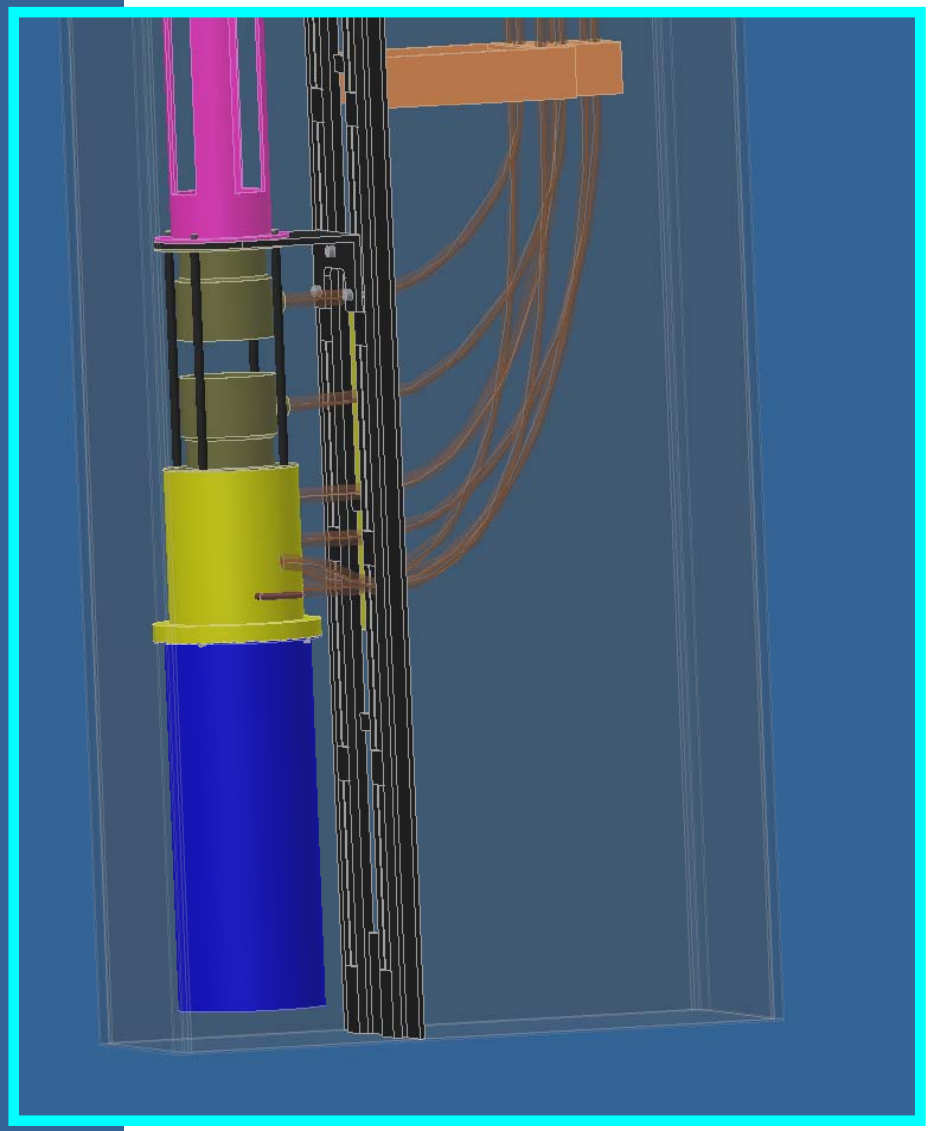

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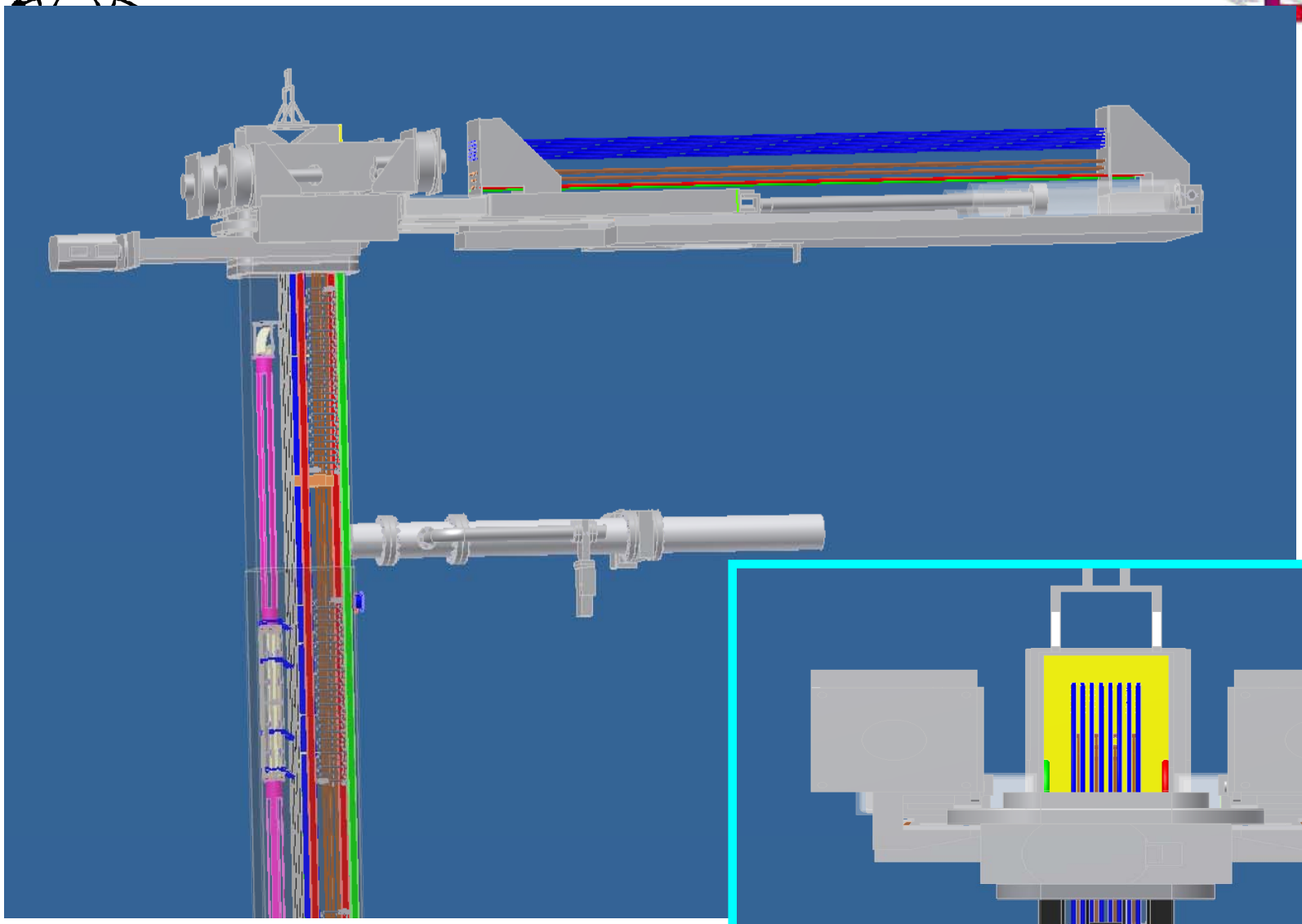
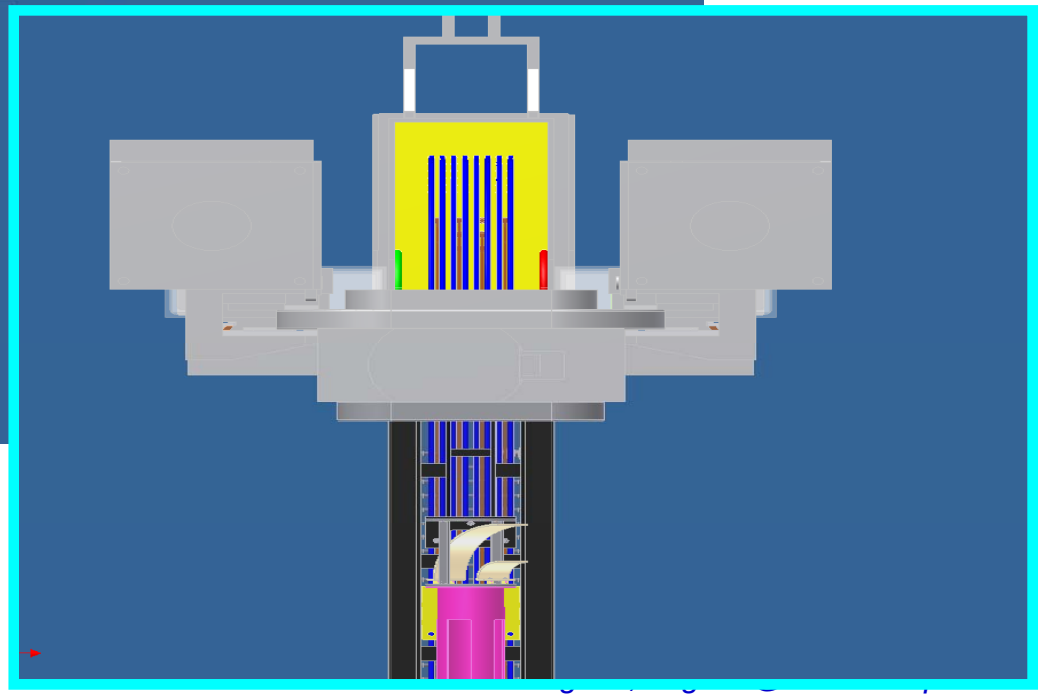
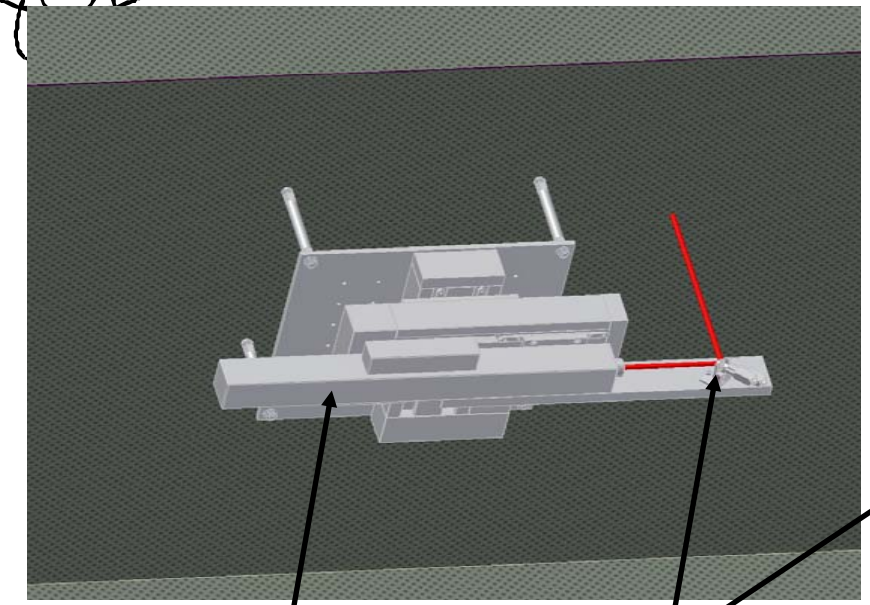
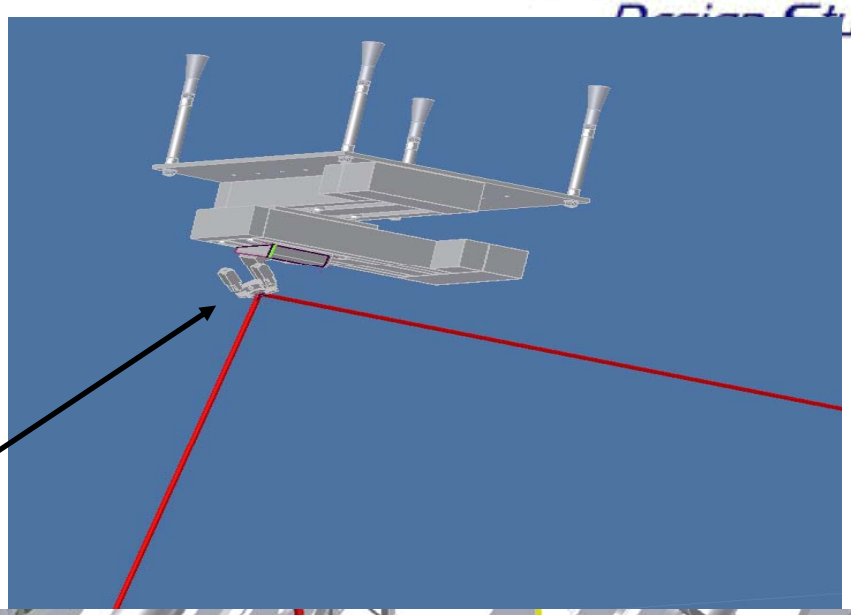




Laser beam path

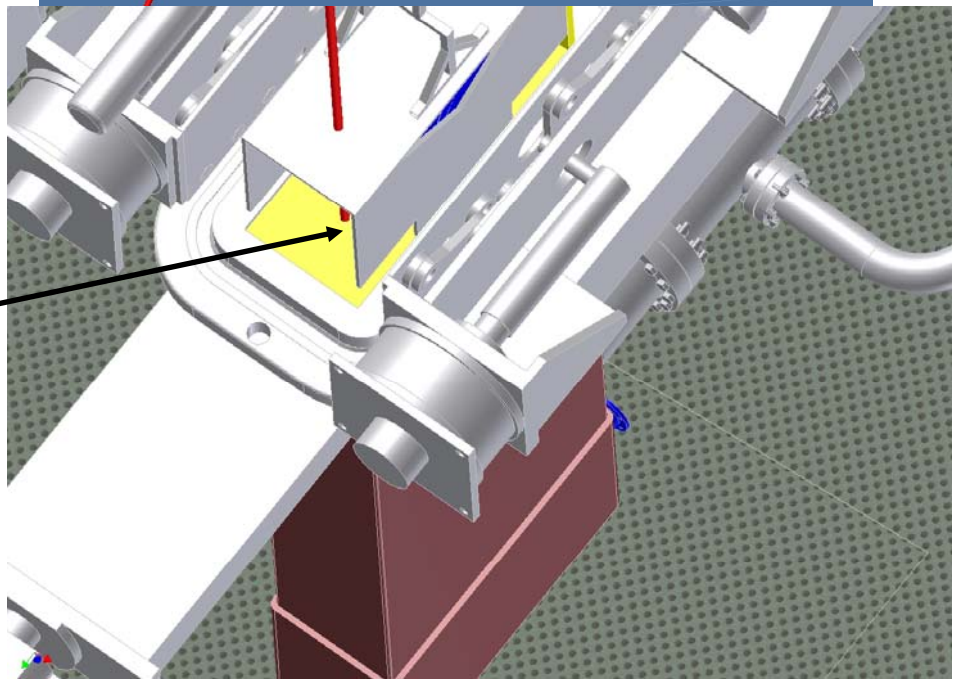




Laser

Mirrors

An window
to be added



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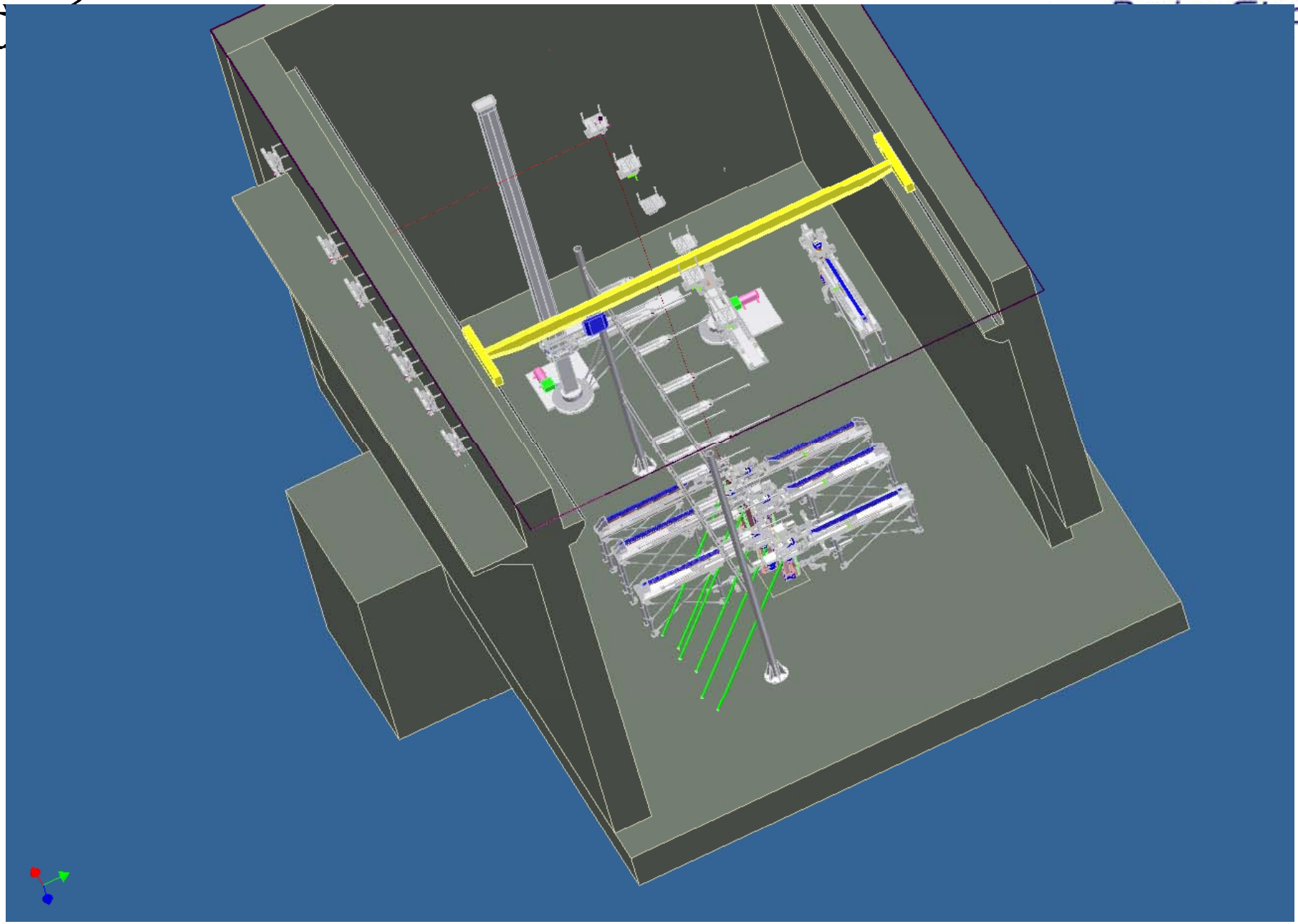
Assembly view of new design



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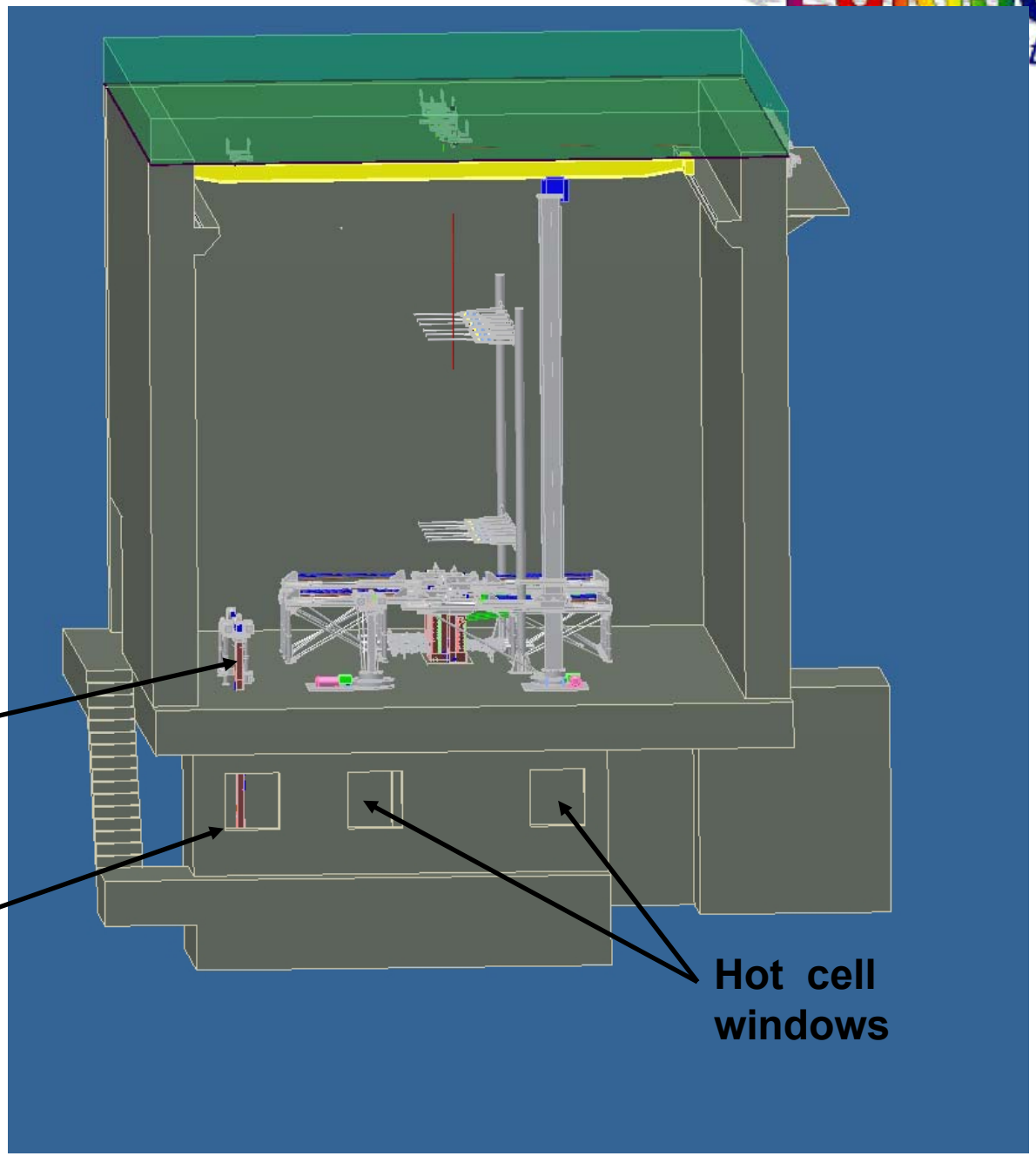

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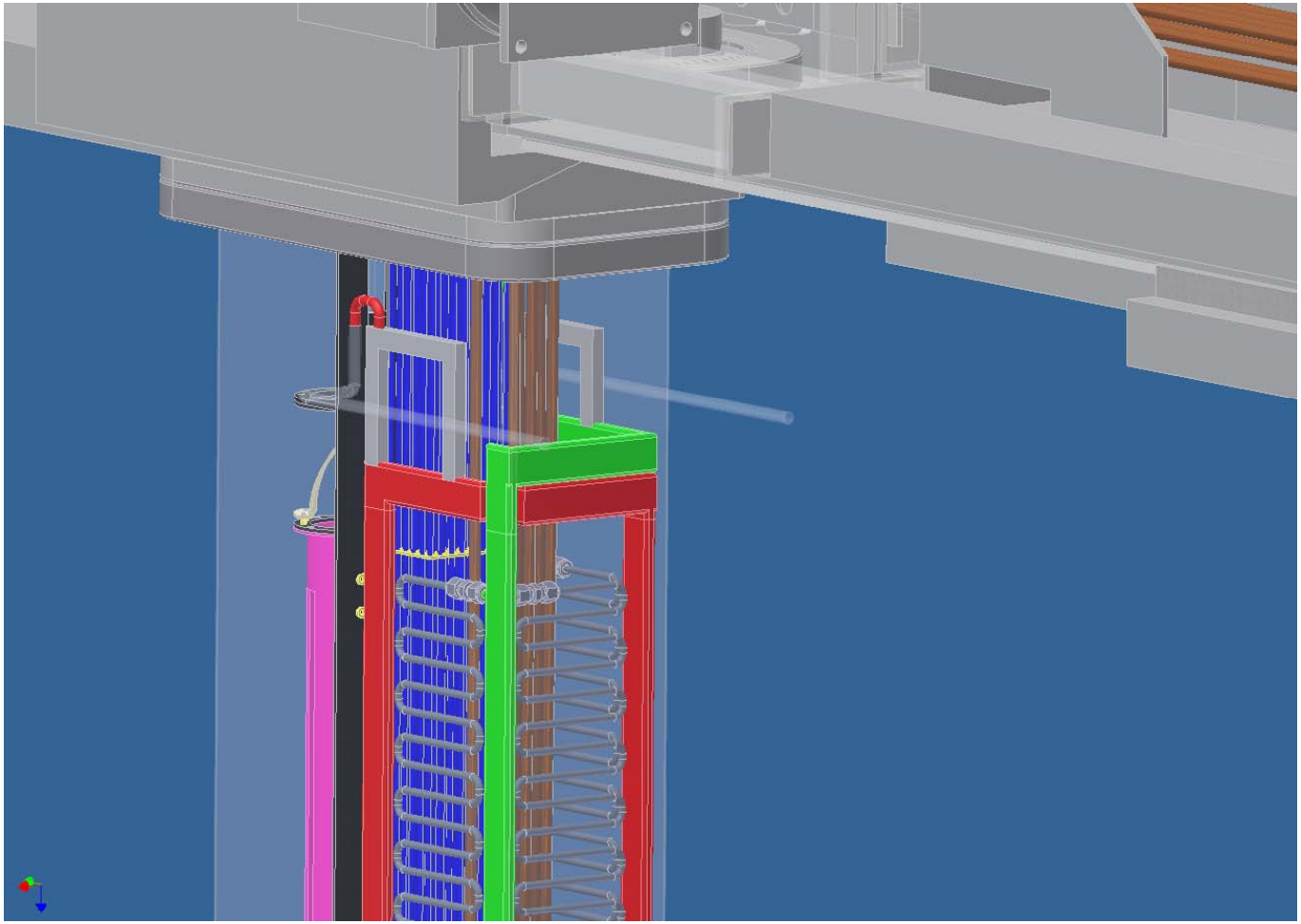
Remove cryopanels independently on target ?



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Fission target exchange procedure

1. Disconnect air connectors (electricity + water)
2. Move mobile tube above a fixed tube using the crane
3. Vacuum tide fixing of mobile tube on top of a fixed tube
4. Pump out air inside mobile tube
5. Open gate valve on mobile tube and continue to pump
6. Lower the catcher inside mobile tube, catch the target and pull it
7. Close gate vales on mobile and fixed tubes
8. Disconnect mobile tube => some contaminated volume is open to air
9. Move the mobile tube on top of a hot-cell
10. Break vacuum in mobile tube
11. Open gate valve on mobile tube and hot-cell entrance
12. Lower the fission target in hot-cell
13. Disconnect with telemanipulators spent target
14. Move spent target in storage area
15. Bring new target in hot-cell and install it
16. Pull new target inside mobile tube
17. Close the gate valve and hot-cell entrance
18. Disconnect the mobile tube=> some contaminated volume is open to air
19. Move and fix mobile tube on top of a fixed tube
20. Pump air, open valves and lower the target in working possition
21. Break vacuum in mobile tube (air could enter inside fixed tube. Problem if cryopanels are colled down)
22. Disconnect mobile tube => some contaminated volume is open to air

TODO - List to be discussed

- Add reflector (and moderator?) with cooling
- Integration of ion-source: IRENA? ECR? or just foreseen space and feedings
- Add cooling of feeding bars and insulators of extraction
- Two stages of cryopanels liquid-N closer to target and liquid-He farther inside mobile
- Add a mobile hat for connectors in the air: see points 8, 18 and 22 on previous slide (Think to change laser window. Is it needed ?)
- Find solution not to warm cryopanels at each charge exchange (see point 21)
- Work out some details related to “in hot-cell” manipulation (see points 12-15)
- Add pump on mobile tube
- Optimize target exchange hall and surrounding areas
  (think to power supplies on high-voltage platforms, 2nd circuit for water + heat exchanger, cabling, etc)

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