Remote Handling of ILC Target

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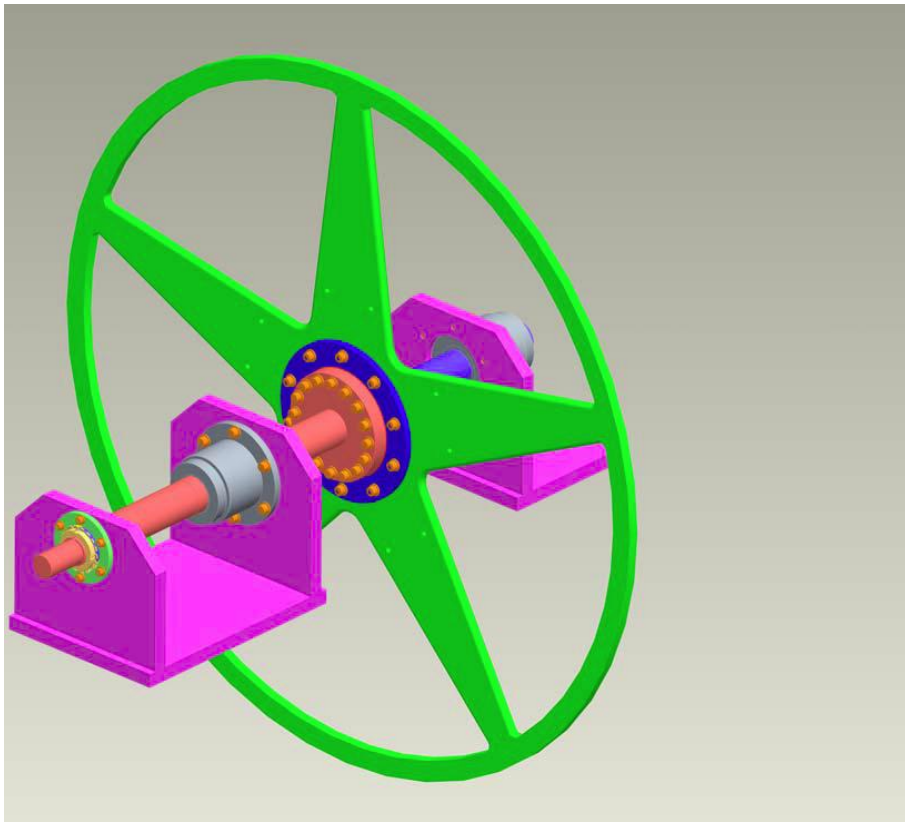
Target Wheel



Titanium Alloy

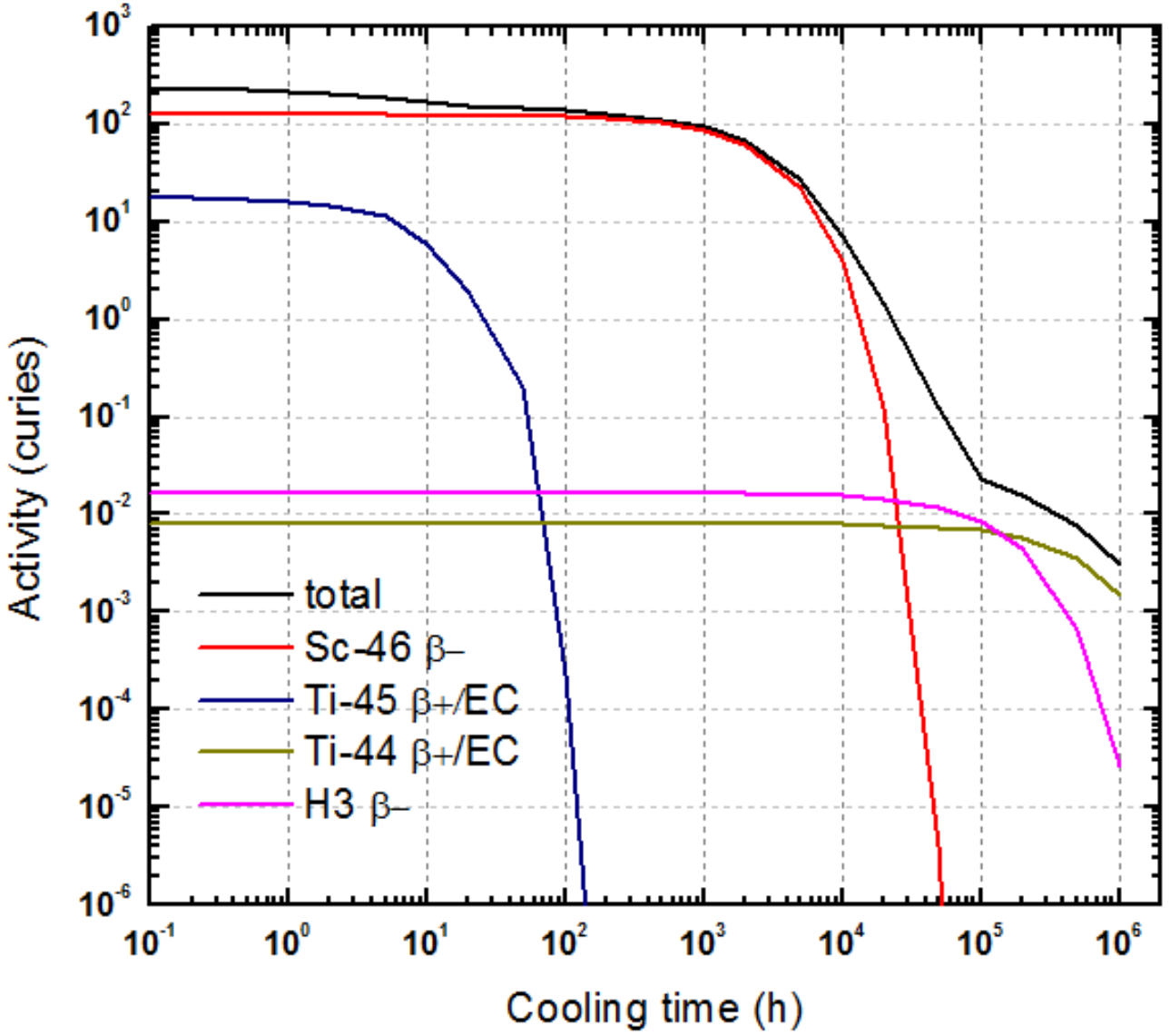
Rotates at 100m/s at rim

Cryo-cooler, cryostat and vacuum pump

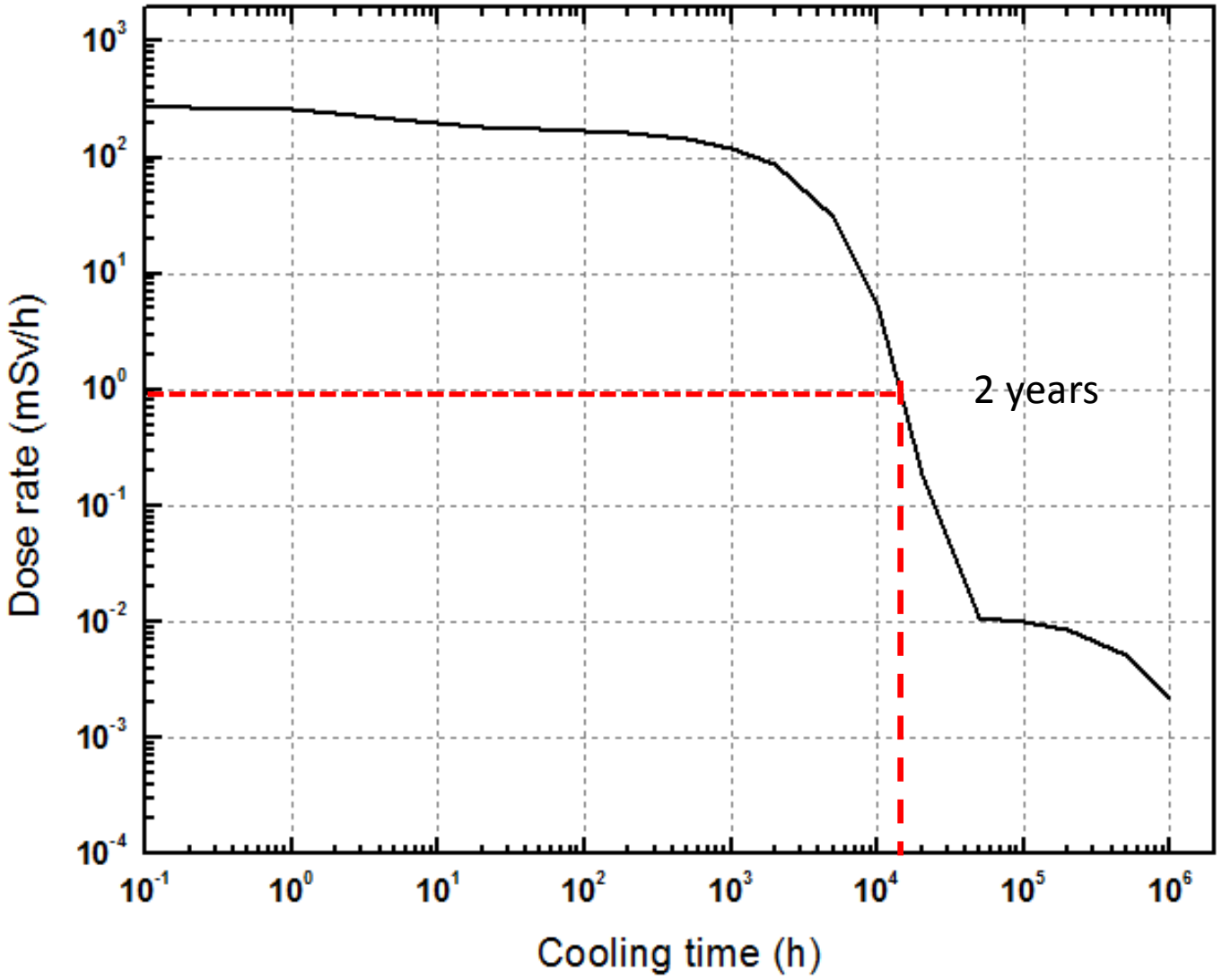
If can be immersed in strong magnetic field then capture more positrons

Strong Eddy current effects

Target Activity (150kW, 5000h)

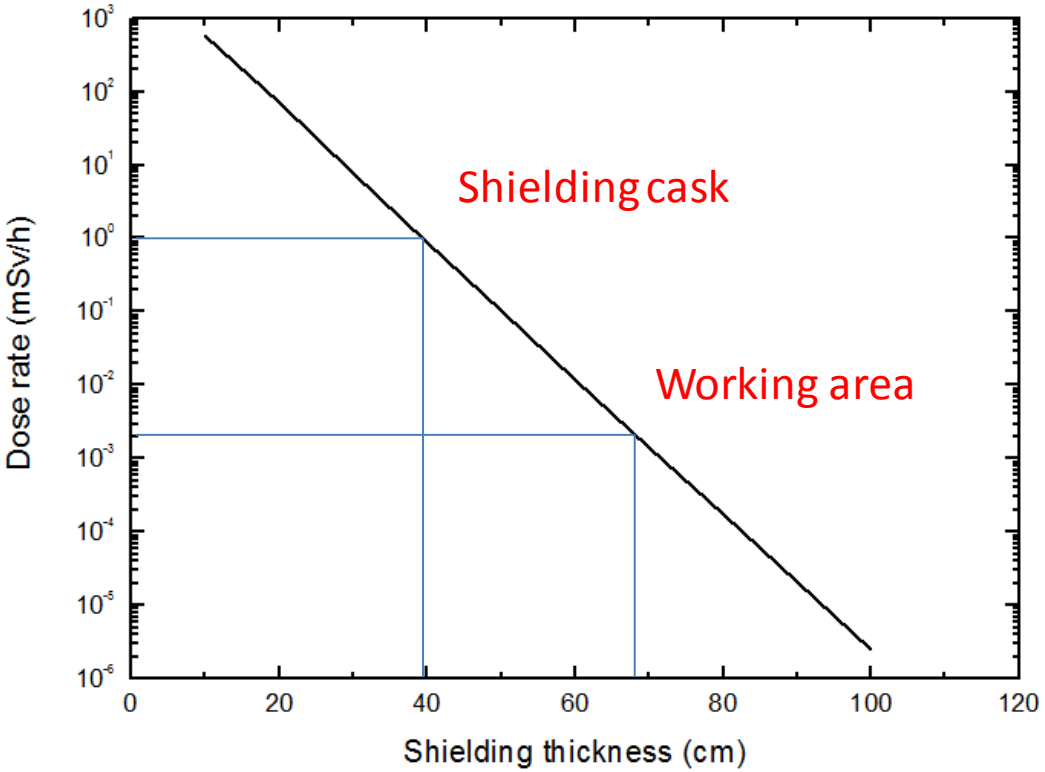


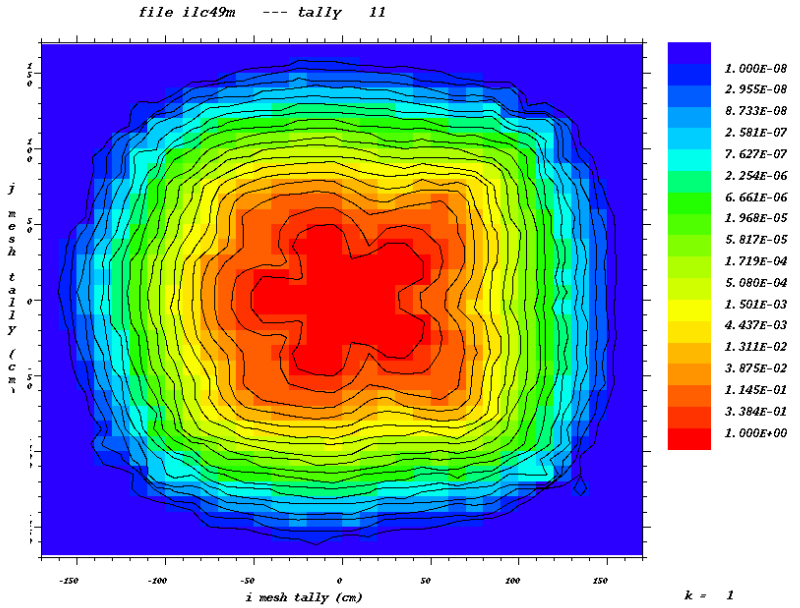
Dose rate of used Target (mSv/h@1m)

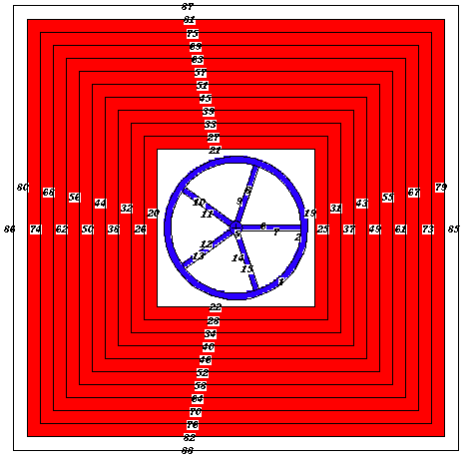


Shielding calculation

Codes and libraries
MCNPX2.5.0, CINDER90,
libraries:mcplib04, e103, endf60
Target: Ti-6%wtAl-4%wtV, density 4.5g/cc
Magnetite concrete: density 3.53 g/cc

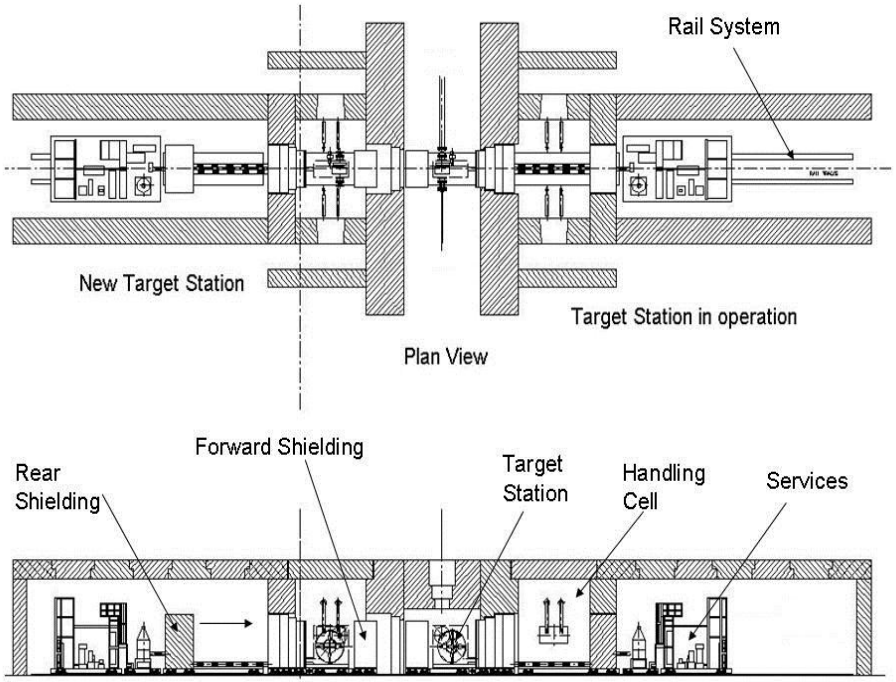


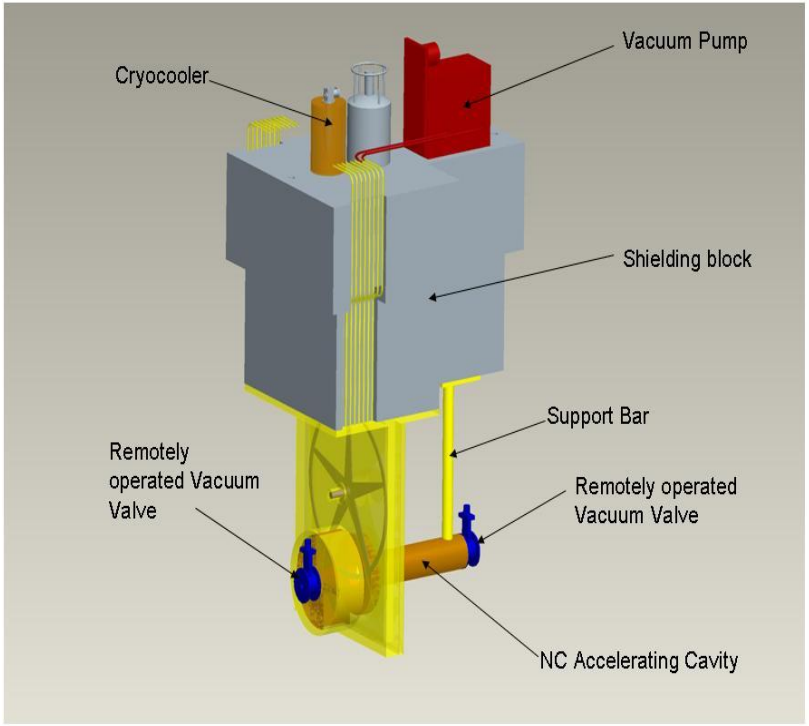




Remote handling concept

Horizontal or vertical?





Horizontal

ISIS target concept

Hot-cell Very Expensive

Complicated hydraulics, interlock systems

Long period requirement

Difficult to engineer

vertical

Whole plug replacement

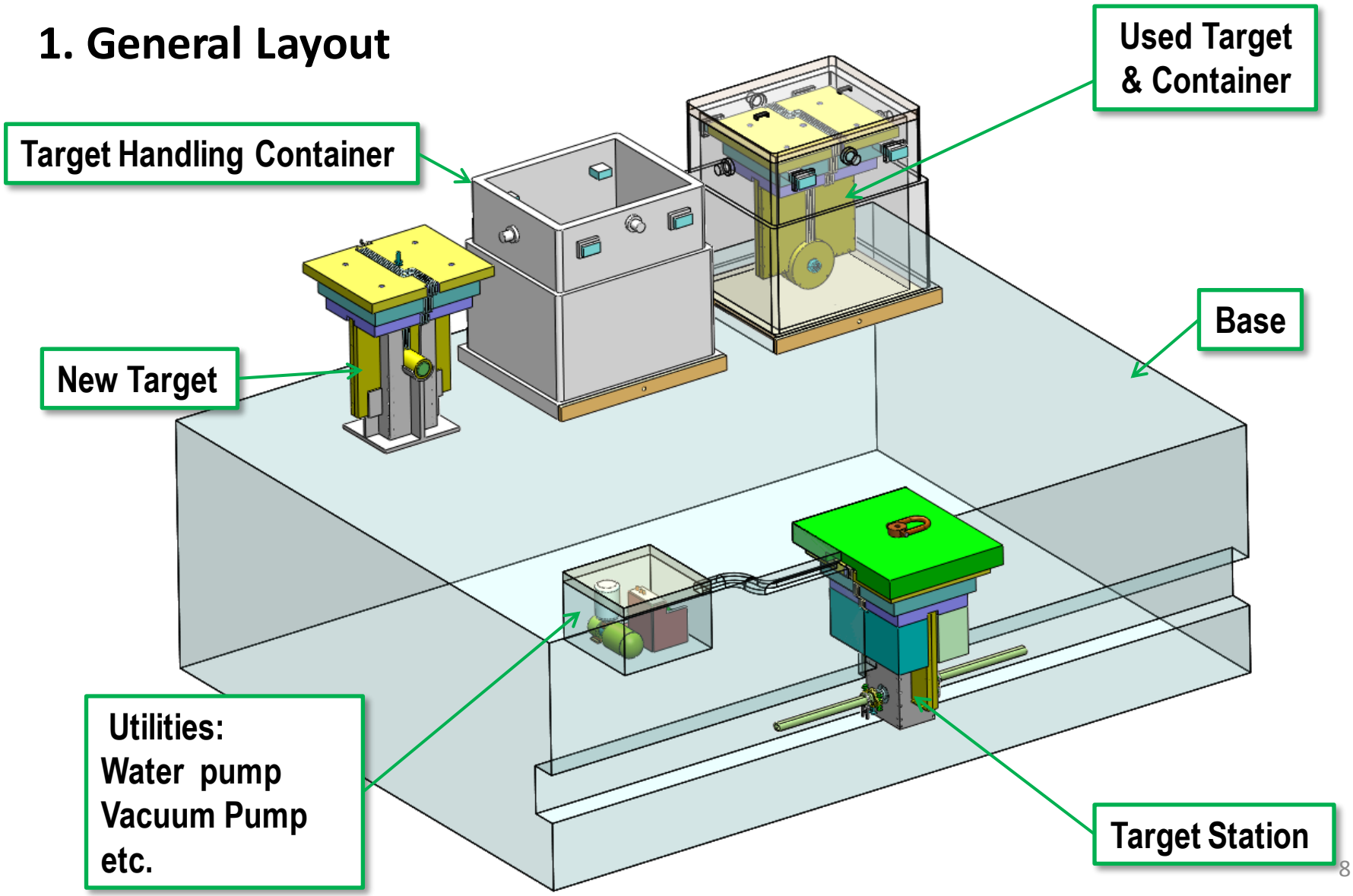
Not hot-cell, but plug storage pit (or area)

Short period requirement

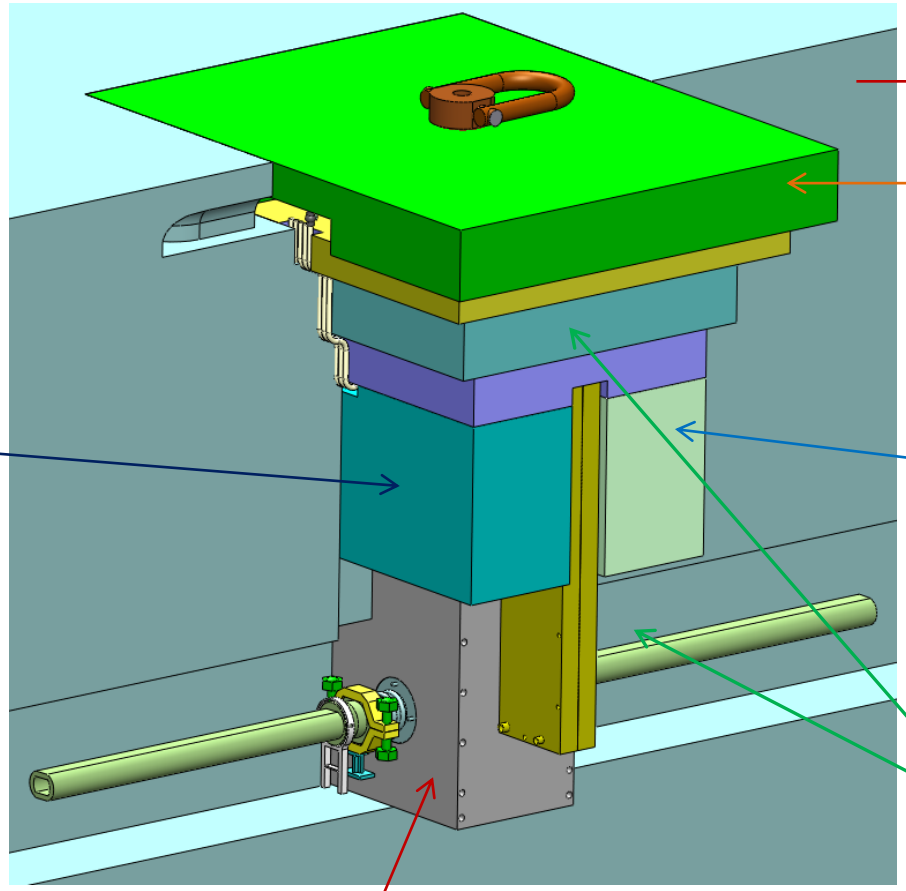
Less shielding, less tunnelling

All connections hands-on

1. General Layout



2. Components of the Target Station Assembly



Base

Shield blocks

Providing access to Target Module

Support Block

Target Module

Shield blocks

Providing access to Clamp

Target Box

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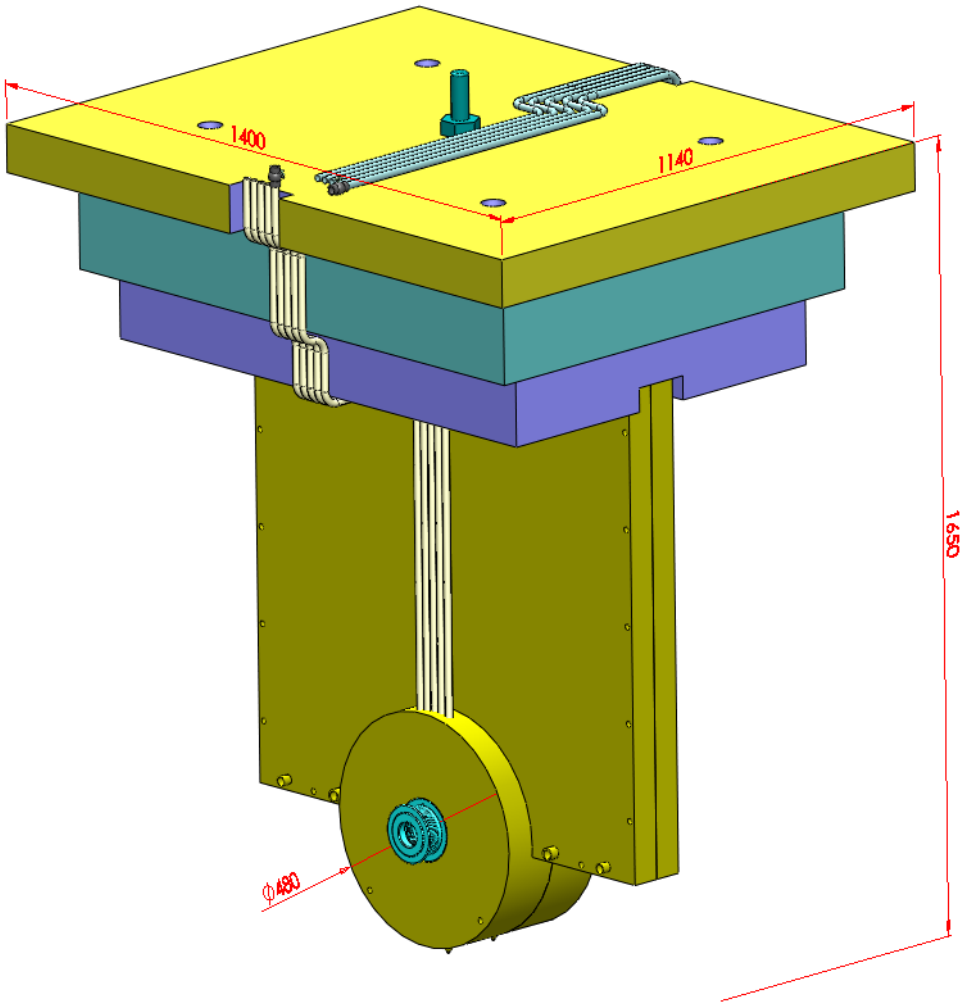

Target Module

Size:
1400×1140×1650mm

Weight about 5 tons

Target shielding cask:

Cast steel plus concrete

Weight about 10 tons

Crane capacity: 20 tons,
hook height: 3.5 m

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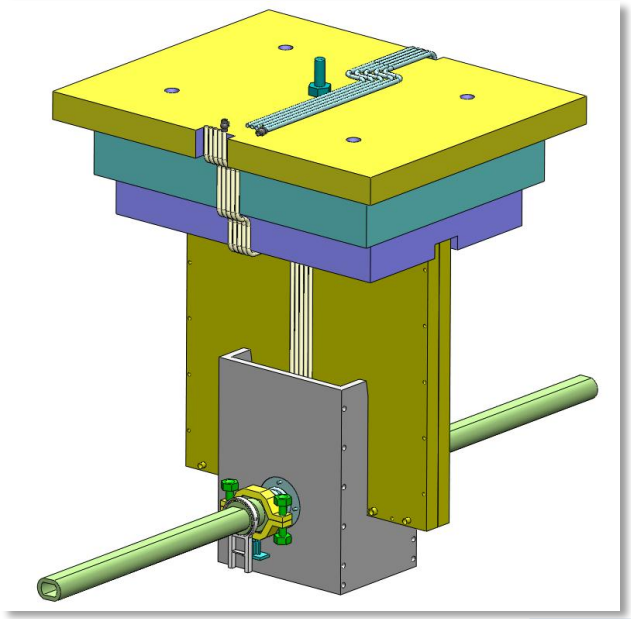
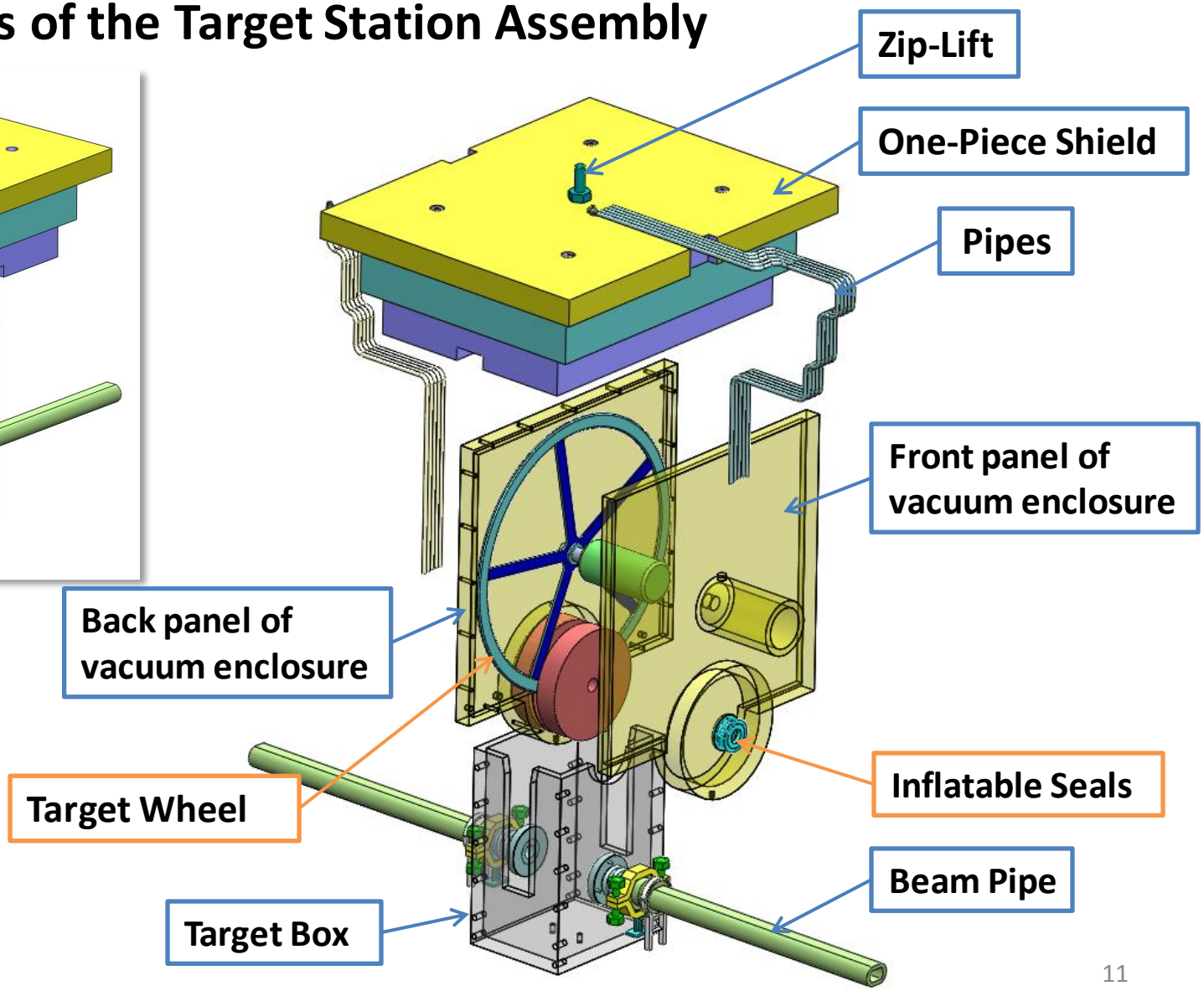


Target Module



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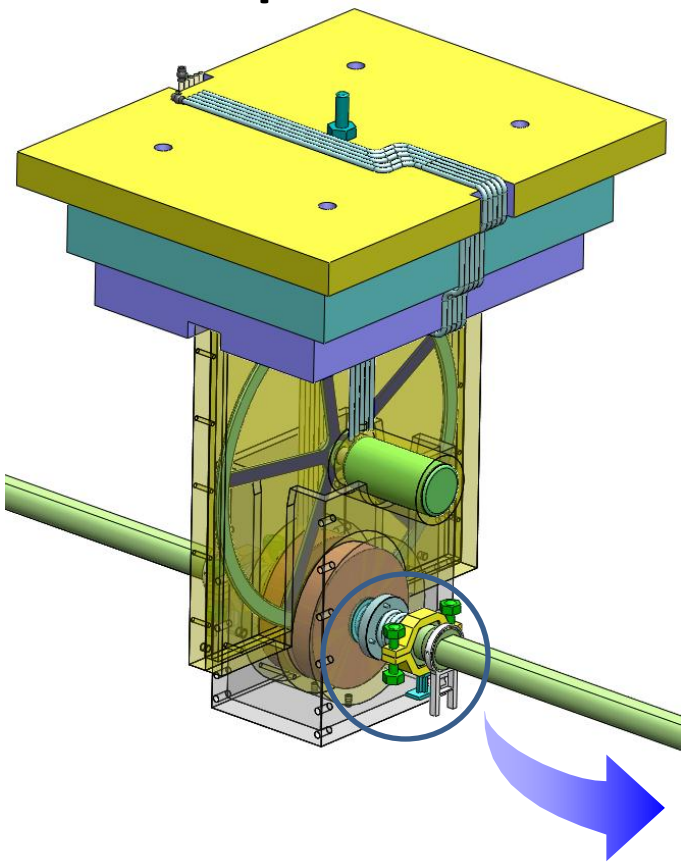

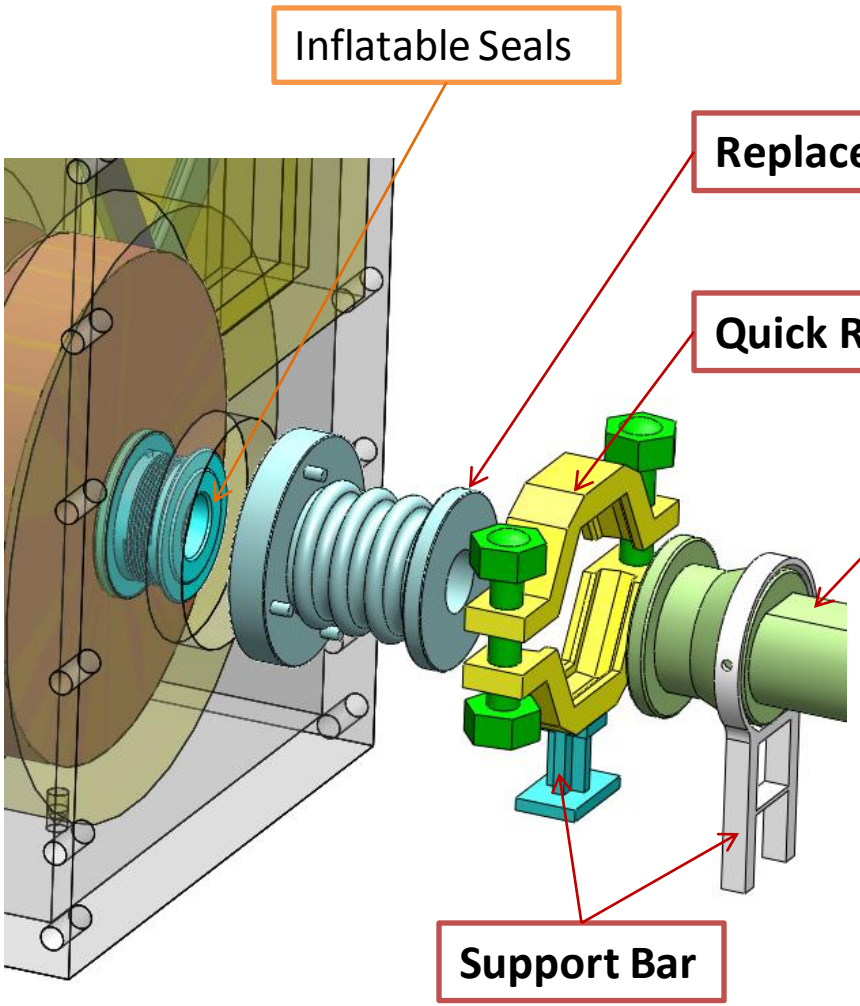

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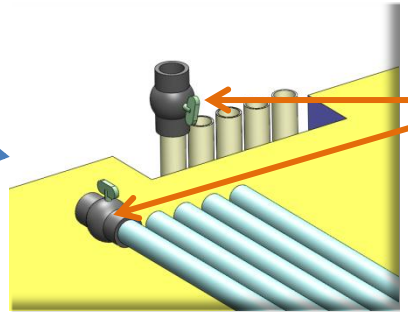
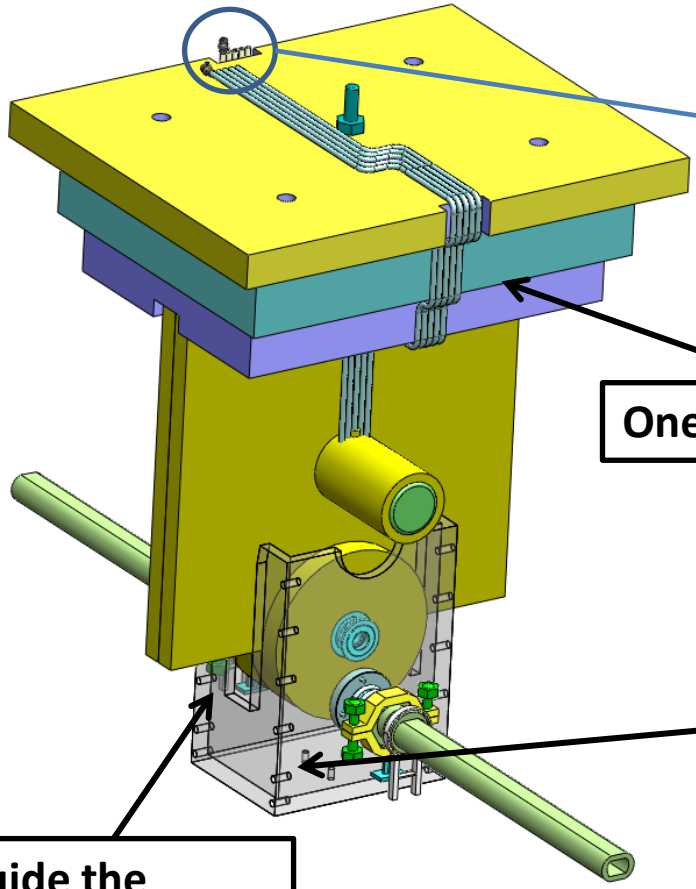


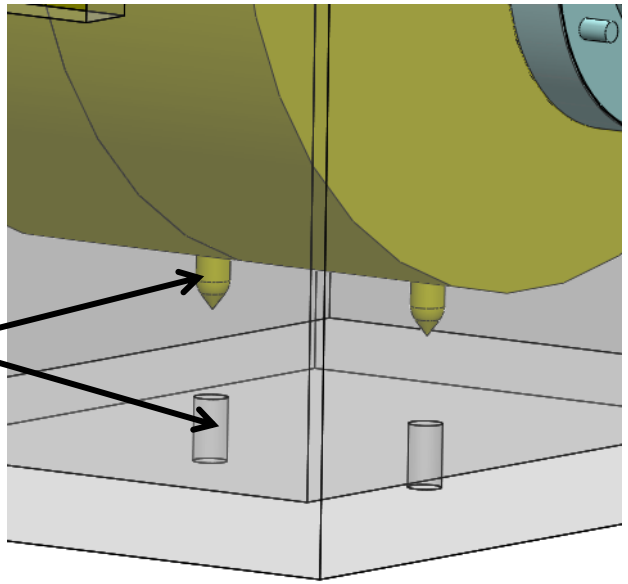
Vacuum Valve

Shutdown the valves and keep vacuum



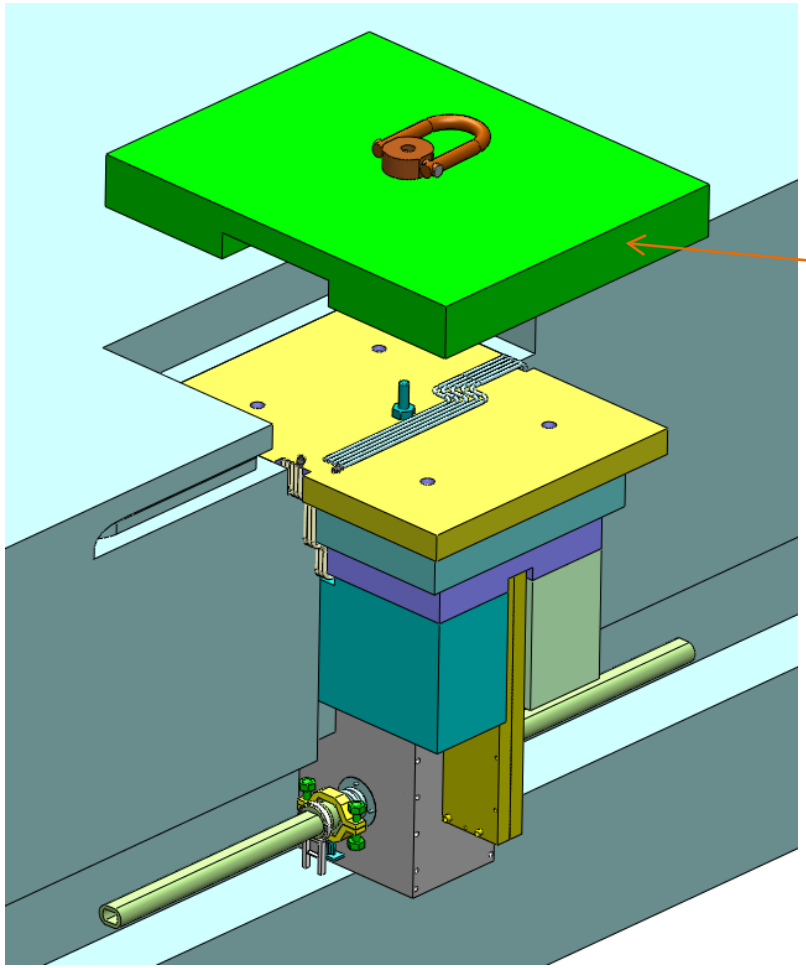
One-Piece Shield

Fix the Target Module



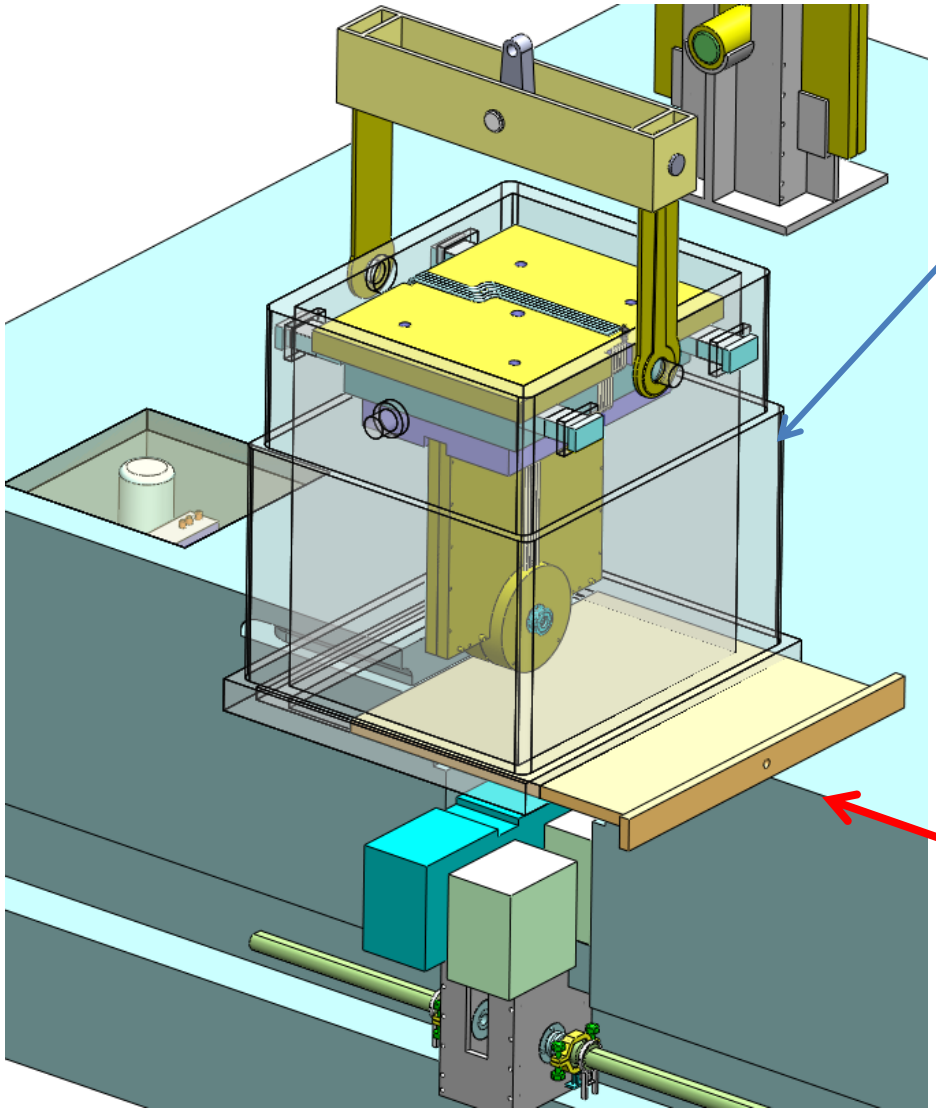
Guide the Target Module

3. Replacement of Target Station



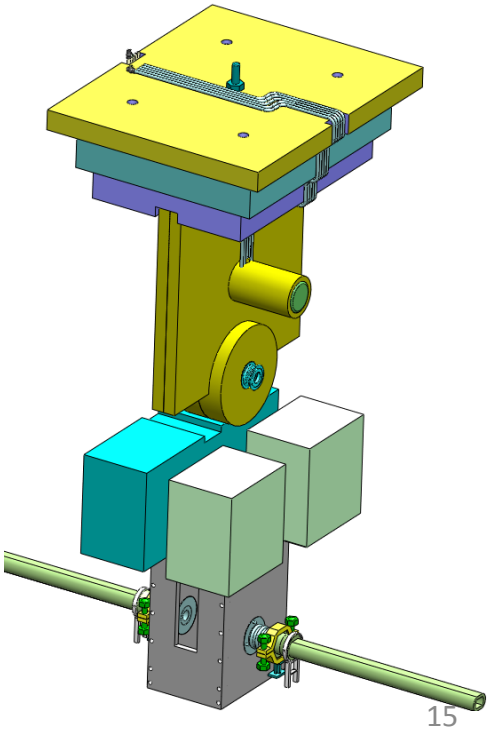
1st
Remove top shield blocks

3. Replacement of Target



2nd
Place the handling container and take out the target mould

Close the shield door



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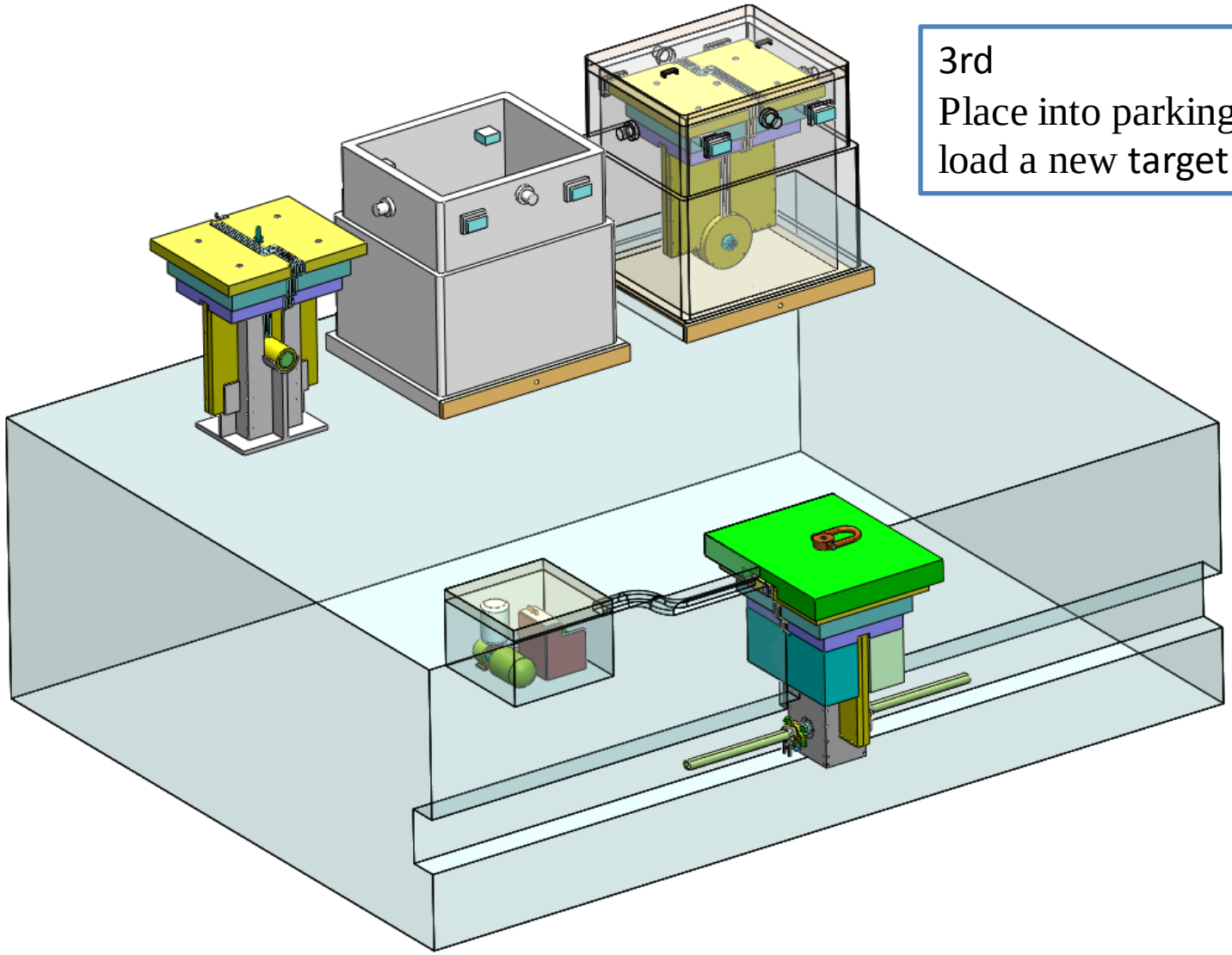
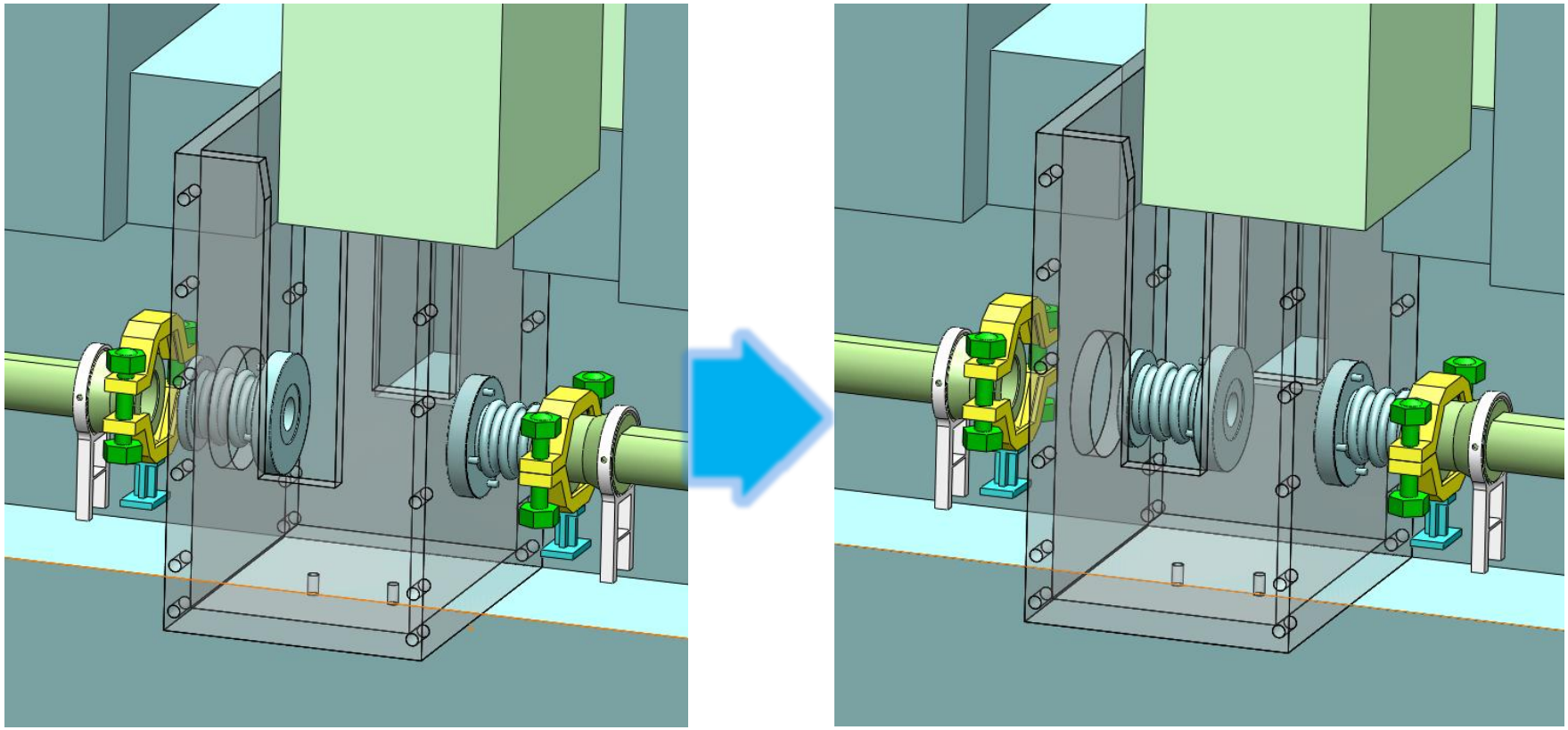


3rd
Place into parking enclosure and load a new target module.

4. Removal of Replaceable Seal Face (If needed)



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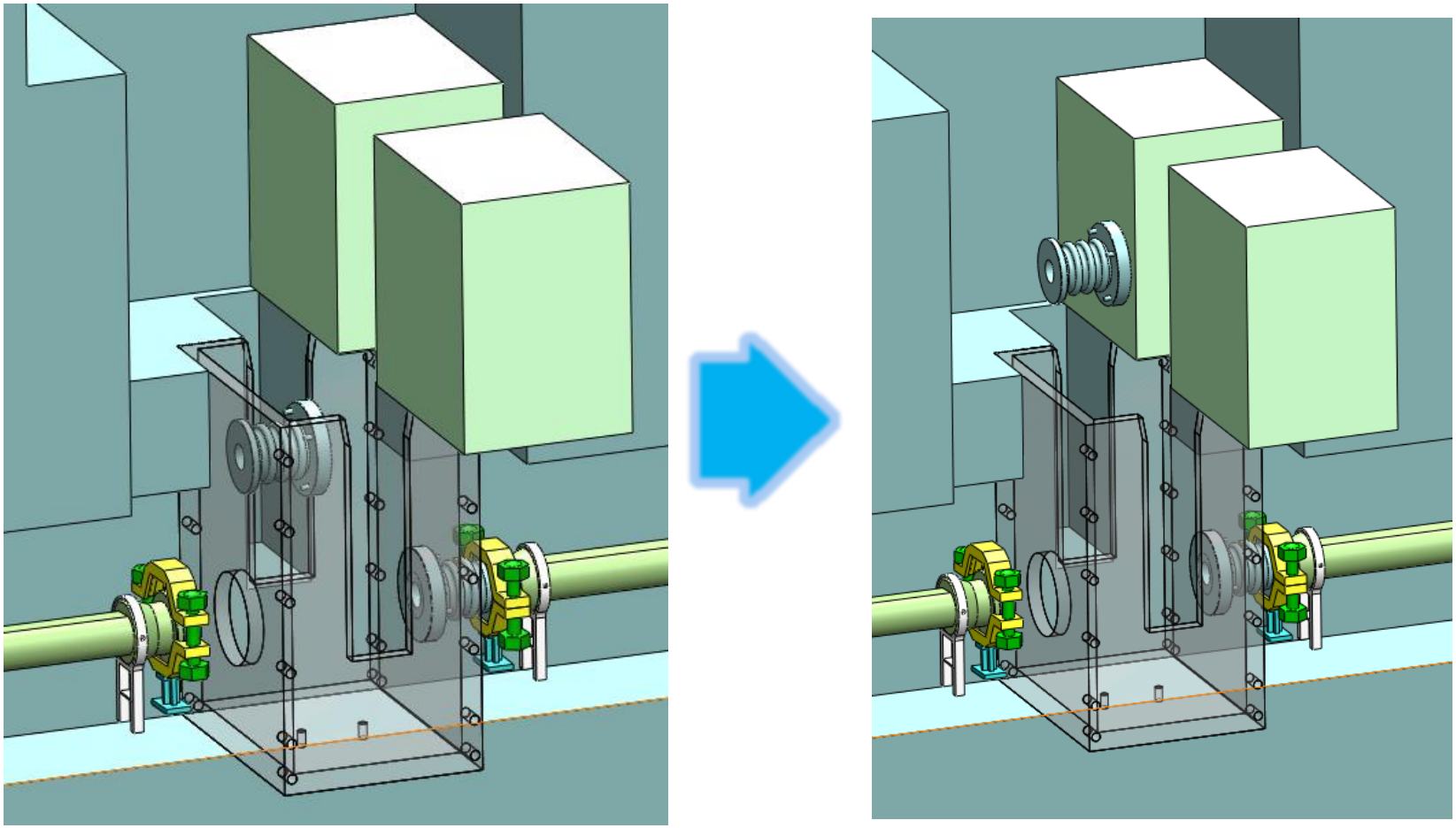
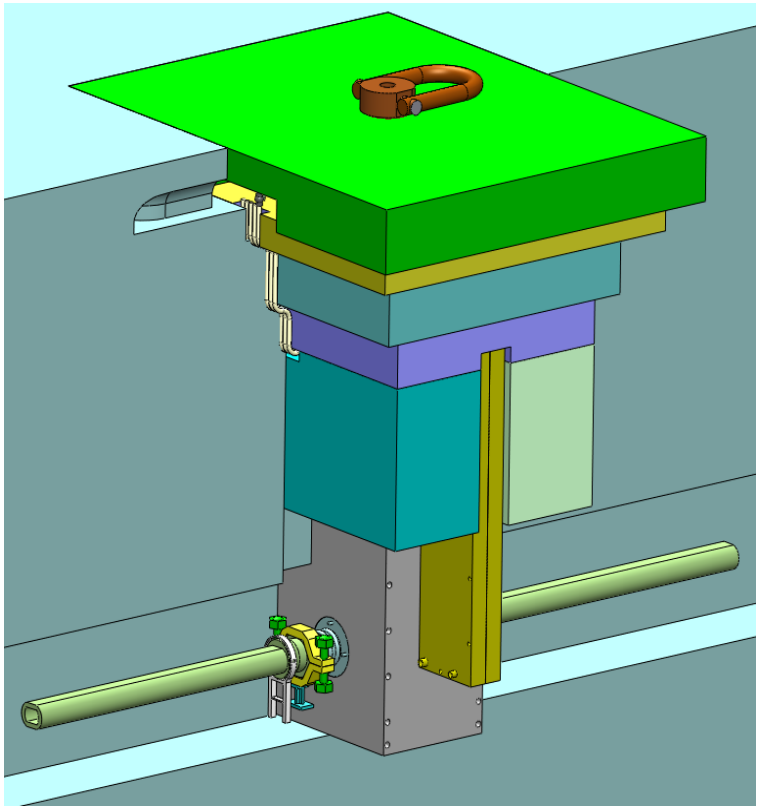
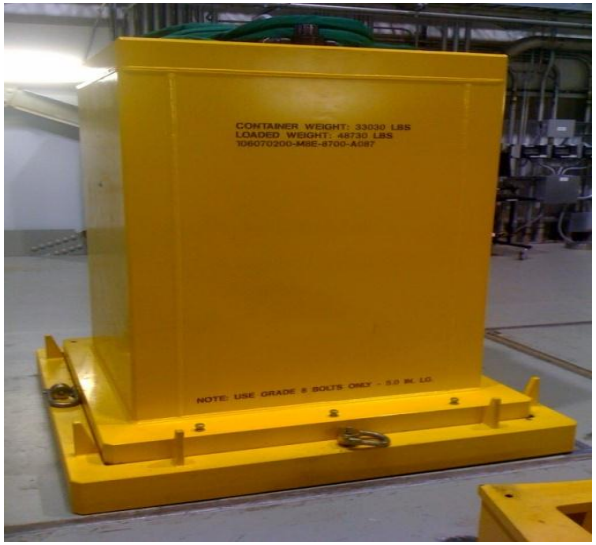


ILC TARGET STATION – REMOTE HANDLING

Replacement of target involves the following basic operations: (12 hours ?)

- Switch off and isolate electric power to magnets, Target Wheel
- Stop Target Wheel coolant pump, Drying
- Remove/disconnect water ,vacuum supply
- Close actuated vac valves on beam line and AMD side each side of target station.
- De-pressurise both inflatable seal
- Attach lifting rods, withdrawal of target plug into shield container with vac valve closed.
- Installation of new target plug
- Connection of utility piping (water, power)
- Leak testing of inflatable seals and piping connections





Estimated cost

- Pillow seal: 2X100k
- Supporting structure, alignment : 150k
- Replaceable seal : 2X 50k
- Zip-lift, Remote handling tools: 200k
- Transfer cask and supporting : 300k
- Utilities: 50k (?)
- Crane : 100k (20tons)
- Required storage area : ≈30 - 40 m2

Many Thanks!