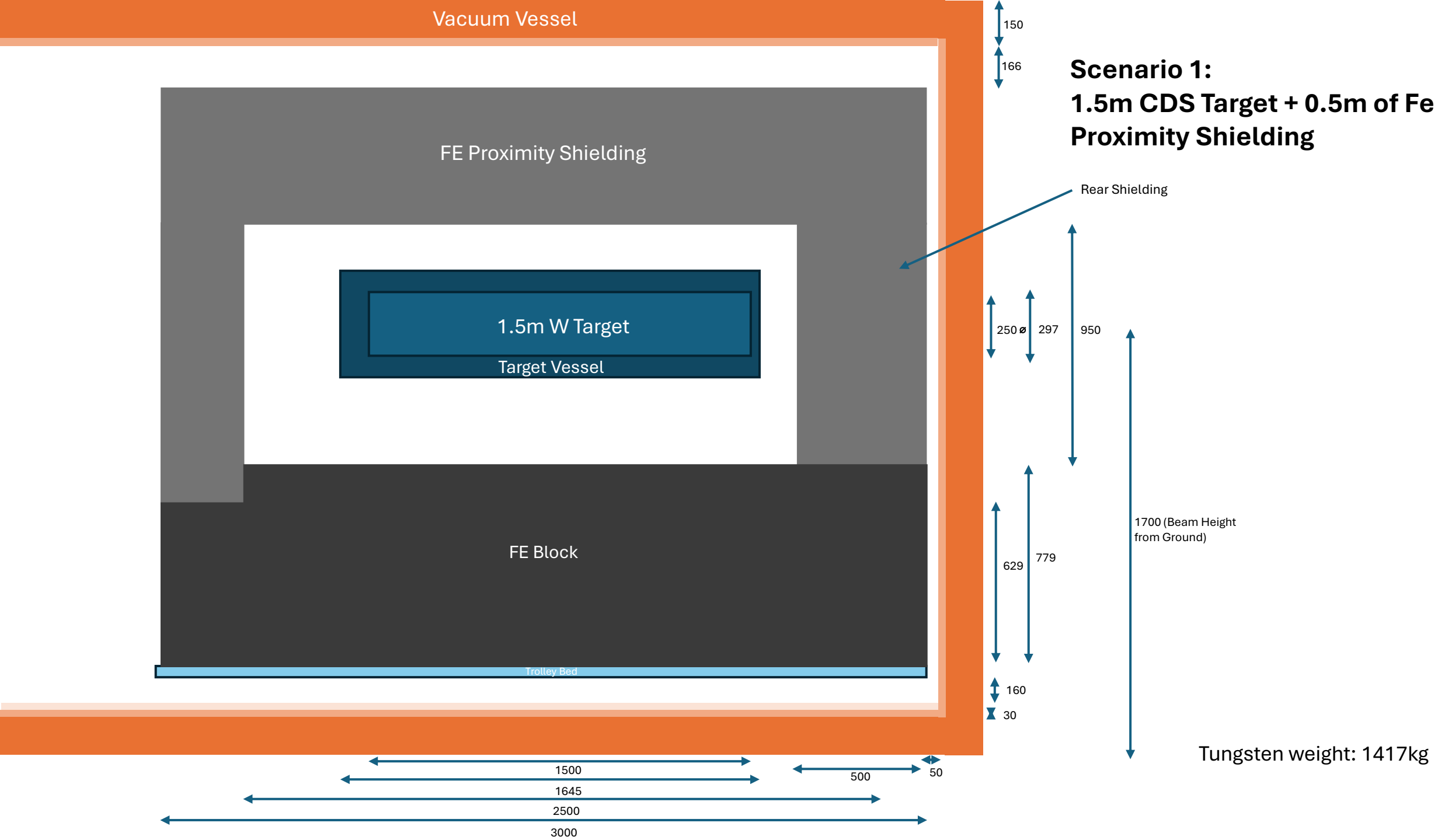
Target Scenarios Follow Up Discussion

24/01/2025

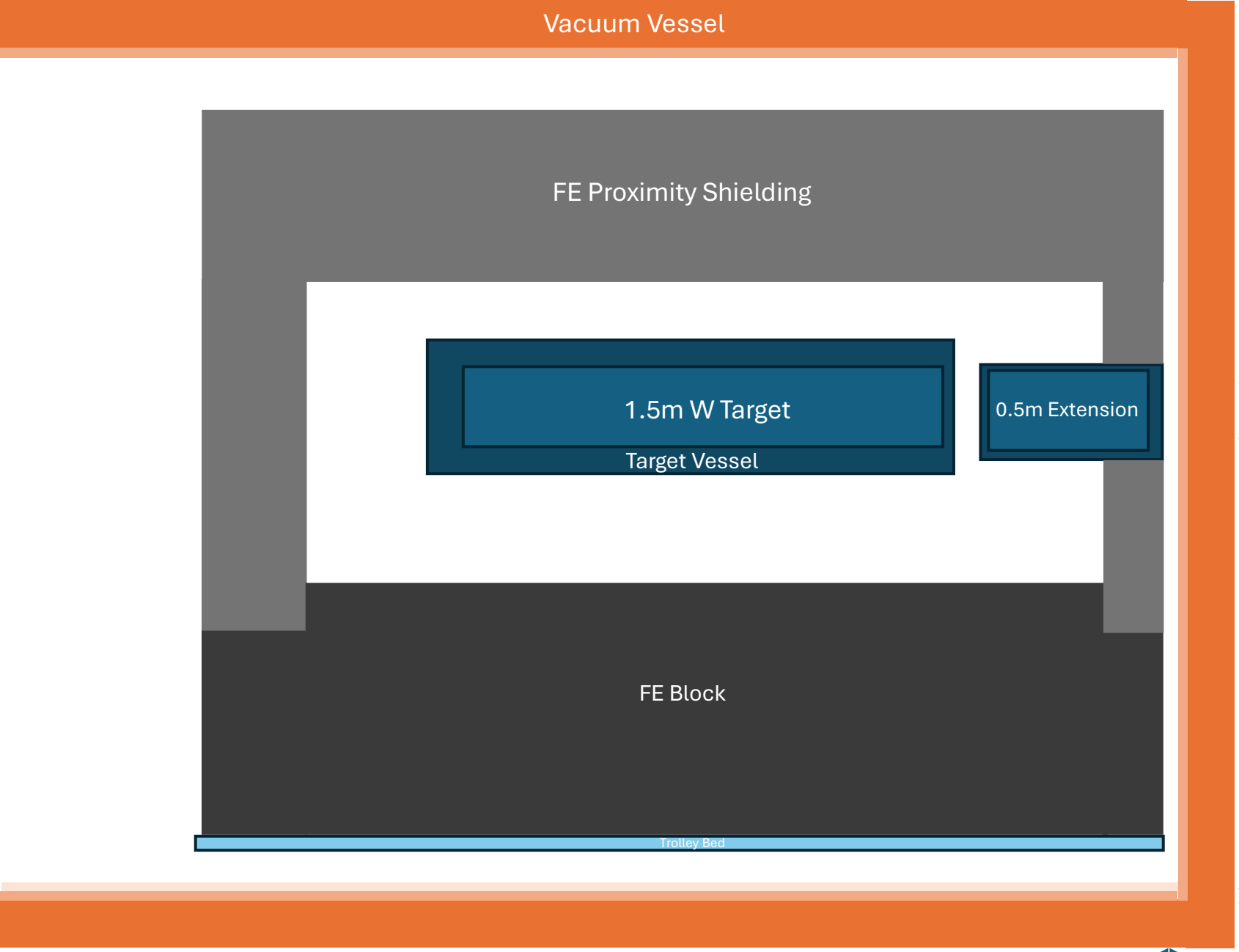
Points From Previous Meeting and Developments this Week

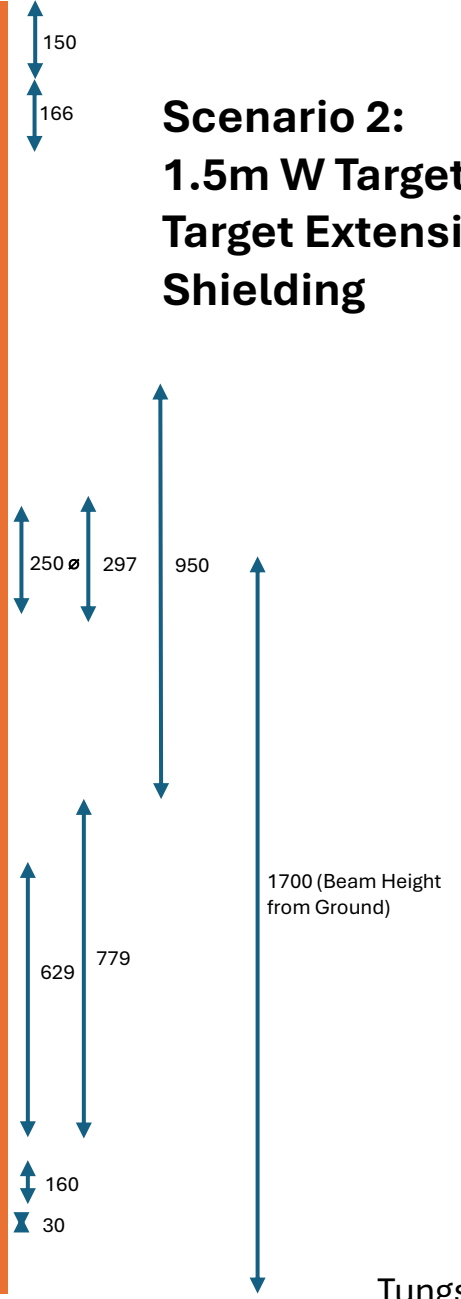
- Initially concluded scenario 1 was the preferred solution, looking further into this
- May now be preferred to have a 500mm thick W alloy plug in the rear shielding with a 1.5m W target.
- Begin to look at optimising between the length of the target and the thickness of the rear shielding
- Assess potential of using copper vs cast iron for rear shielding to reduce thickness of shielding required
- Target complex assembly has been adjusted to display 2.24m gap from front of W target to front of hadron stopper.
- W alloy plug has been integrated into rear shielding

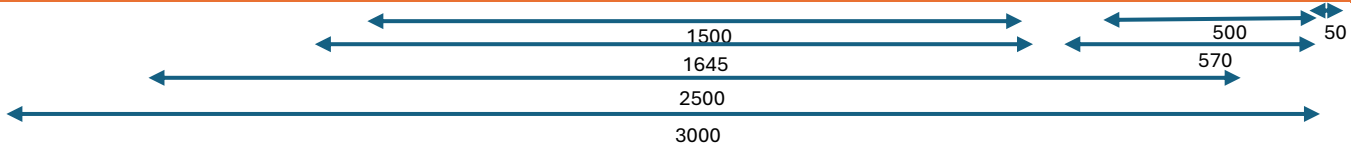
Scenario 1:
1.5m CDS Target + 0.5m of Fe Proximity Shielding



Tungsten weight: 1417kg



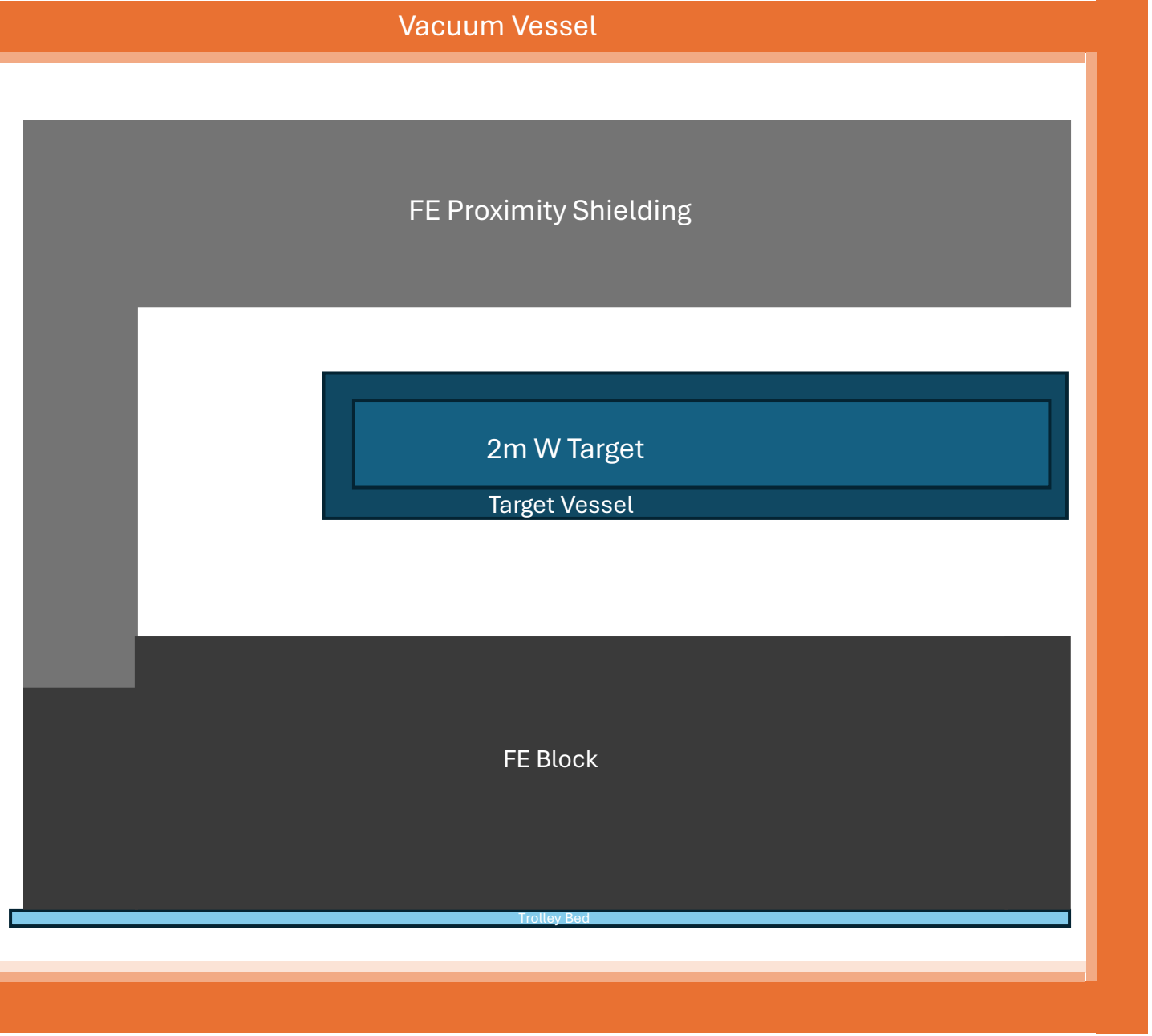


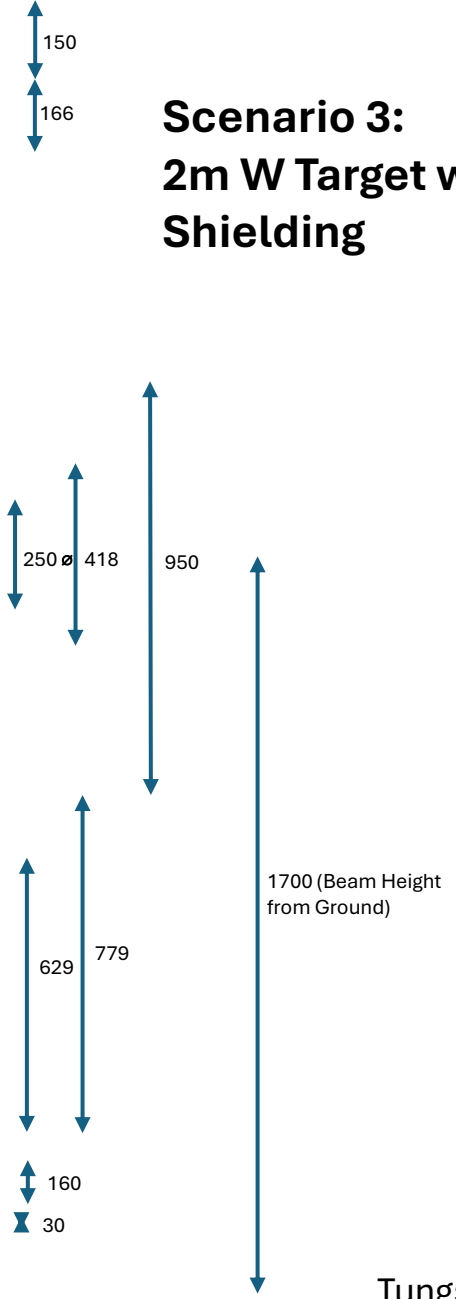


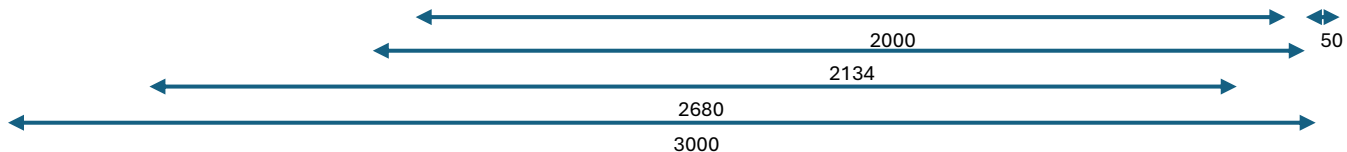
Scenario 2:
1.5m W Target + 0.5m of W Target Extension with Proximity Shielding

Tungsten weight: 1890kg

Scenario 3:
2m W Target with No Proximity Shielding

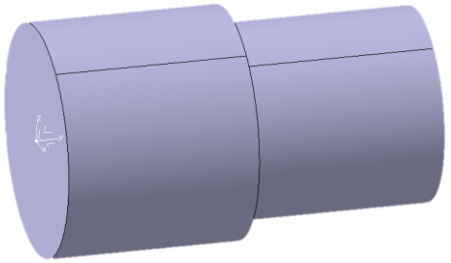


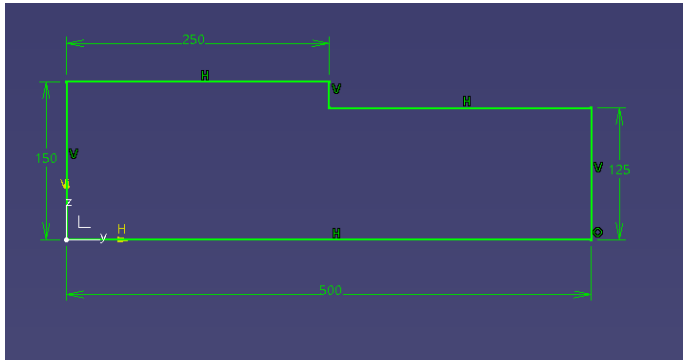


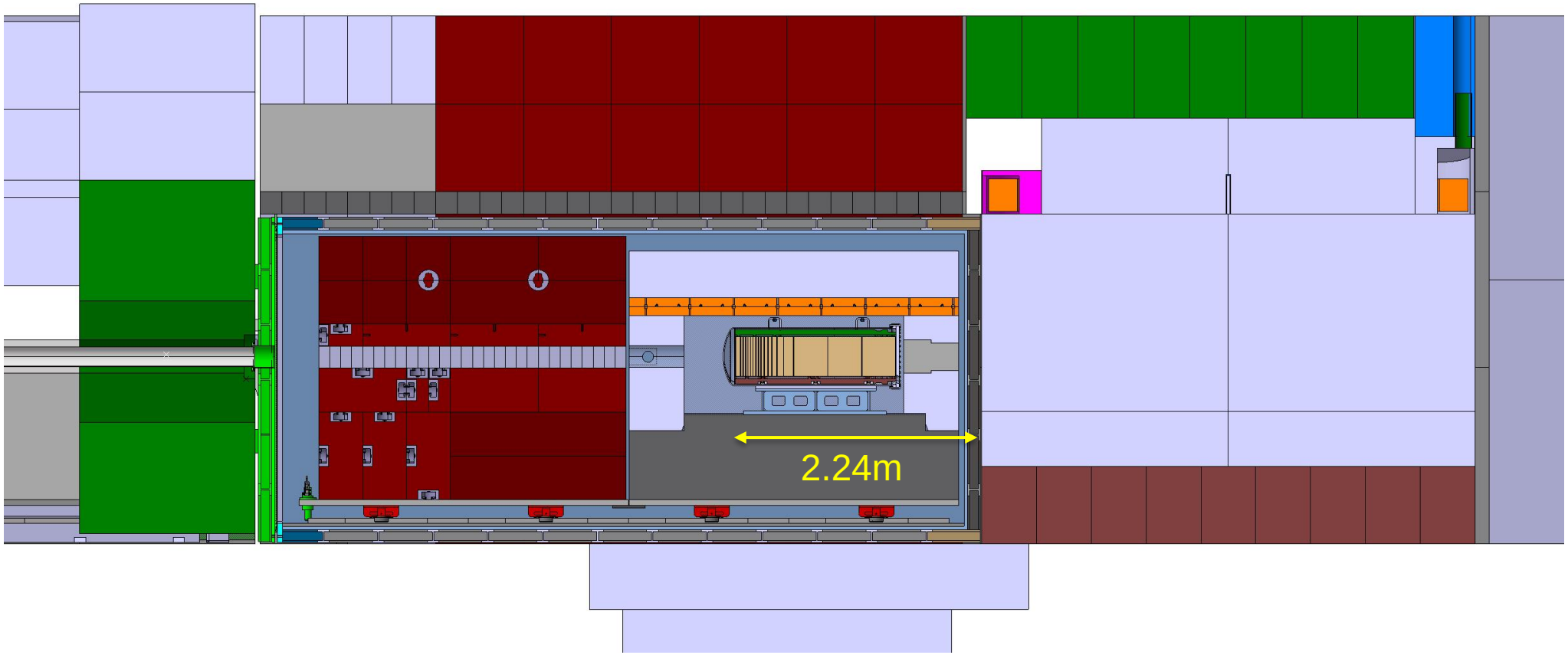


Tungsten weight: 1890kg

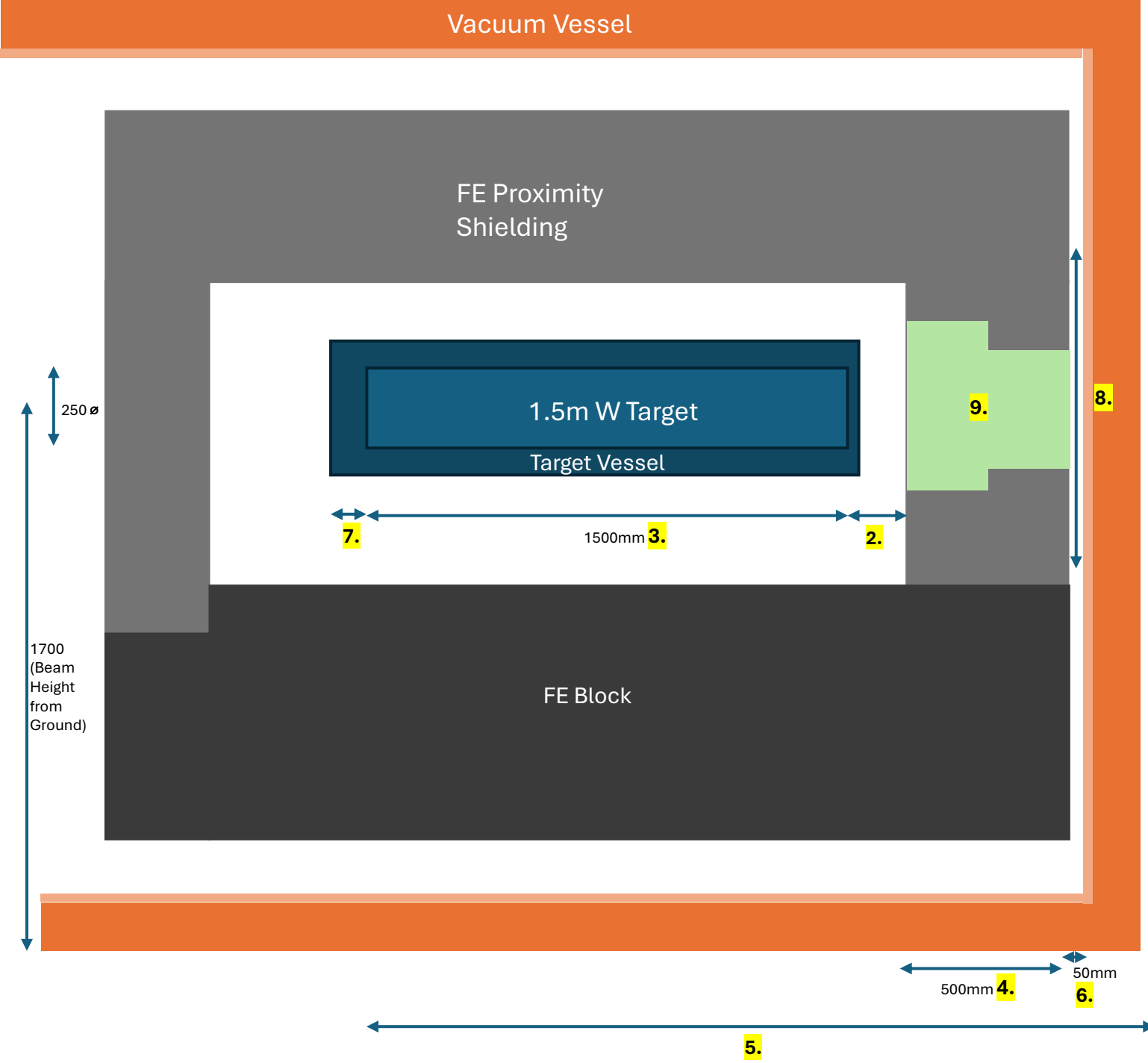
CAD Model Update







- 2.24m from front of W to front of hadron stopper
- W alloy plug integrated into shielding



Hadron Stopper

1. Need to optimise between skin thickness and height of I beams.
2. Need to specify a distance between rear of W and start of shielding.
3. Need to investigate an optimisation between length of the target and thickness of proximity shielding – additionally need to assess how many slices of W the target will be made up of and how long this will make target overall after leaving gaps between the slices.
4. Investigate material choice for the rear shielding.
5. Specify a maximum distance between the reference face of W and face of hadron stopper.
6. Specify a distance required between rear of shielding and start of vessel.
7. Need to determine the tank size around the target.
8. Assess if the $1m^2$ box surrounding the target still the correct size.
9. Assess if a W alloy plug be used to make up the additional 0.5m of W requested

Pros and Cons

Scenario 1		Scenario 2		Scenario 3	
Pros	**Cons**	**Pros**	**Cons**	**Pros**	**Cons**
• Rear shielding preventing vessel activation. • Only need 1 support and cooling system.	• Smaller tungsten amount. • Shielding limits how close target can be to hadron stopper.	• Rear shielding preventing vessel activation. • 2m total tungsten. • Less cutting operations than scenario 3.	• Need to develop another set of supports for extension. • May need additional cooling system for extension. • Creates complexities with integrating within shielding. • More material to dispose of end-of-life.	• Larger amount of tungsten. • Only 1 support and cooling system. • No rear shielding so can be closer to hadron stopper.	• Harder to handle due to size. • No rear shielding could result in activation of vessel. • More material to dispose of end-of-life.

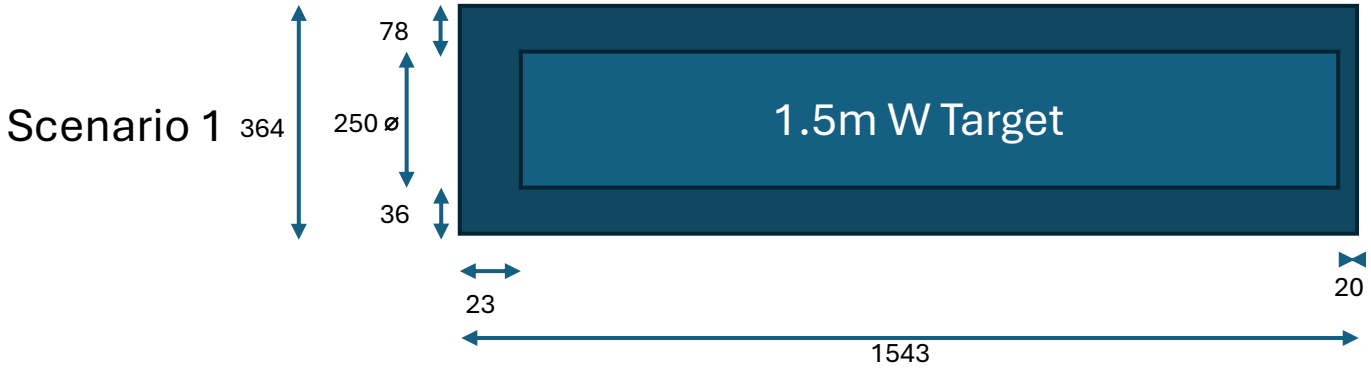
General Questions

Question	
How many slices should the W target have and how big should the gap between each slice be?	
How should the slices be joined together?	
What can be behind the target e.g. I-beams before hadron stopper?	
Should the shadow of the vacuum vessel be filled with more tungsten?	
How precise would extension need to be aligned with main target?	
How thick does cast iron around extension need to be, should there be more behind the extension?	
What is the temperature expected on the extension block – does block need cooling?	
Is the extension block subjected to oxidation if there isn't any surround cooling?	
Could W extension be integrated within proximity shielding as 1 block?	
What material could the rear shielding for scenario 2 be made from?	
How much gap needs to be left between target and target vessel?	
How much radiation could the internal vacuum vessel rear wall be exposed to?	
How much heat can the vacuum vessel be exposed to?	
Would the entire length of the 2m target need to be cooled?	

Things to Define as Limits

Parameter	Definition
Size of gap between target and extension	
Gap from shielding to vacuum vessel	
Shielding thickness required behind the target	
Allowable amount of radiation internal vessel skin is exposed to	
Allowable temperature internal vessel skin is exposed to	
Beam height	1700mm from ground
W Target diameter	250-350mm
W Target length	
Maximum allowable distance from rear of last W block to front of hadron stopper	

Target Casing Sizes



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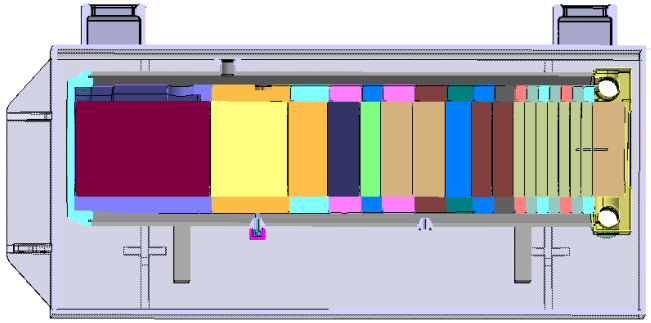

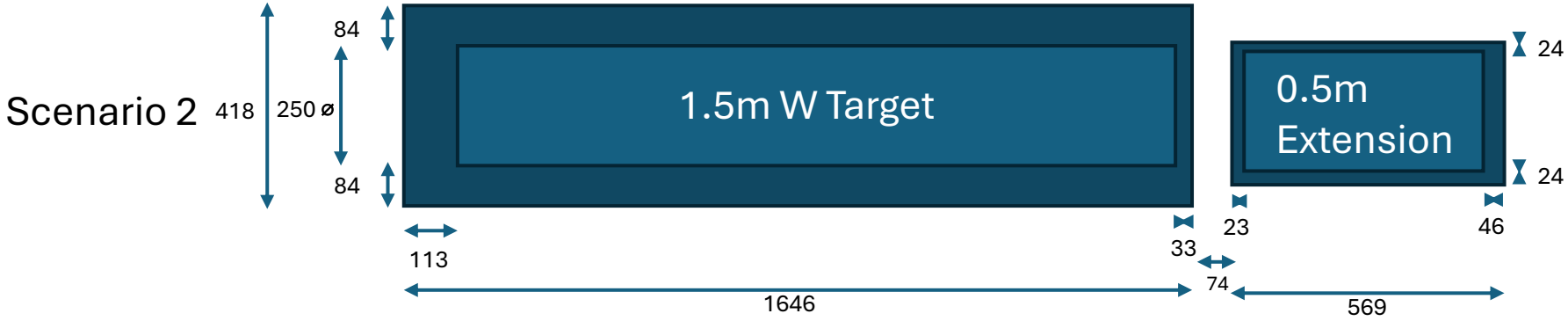

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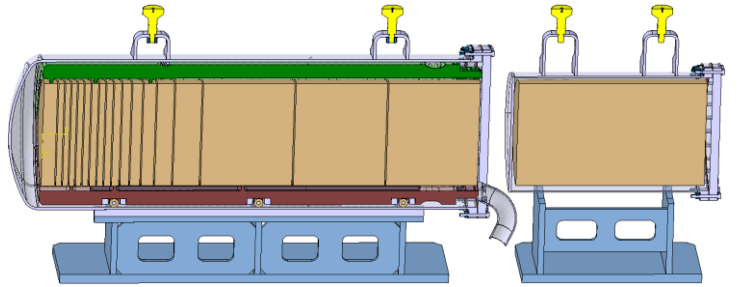

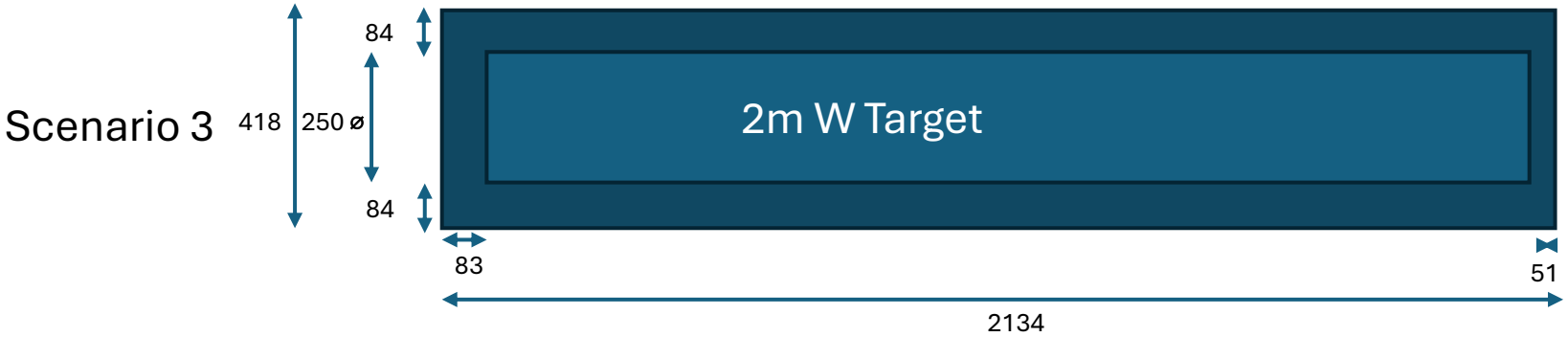

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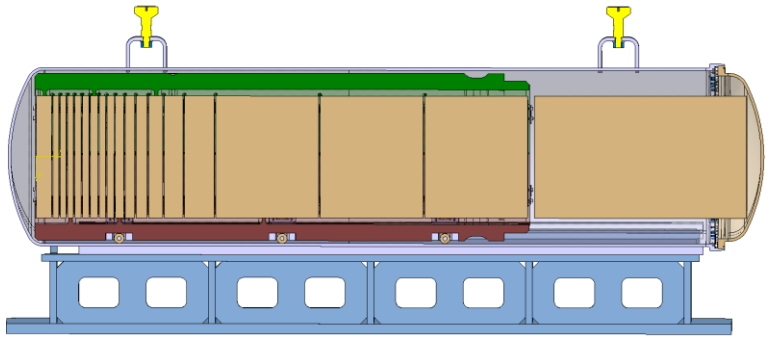
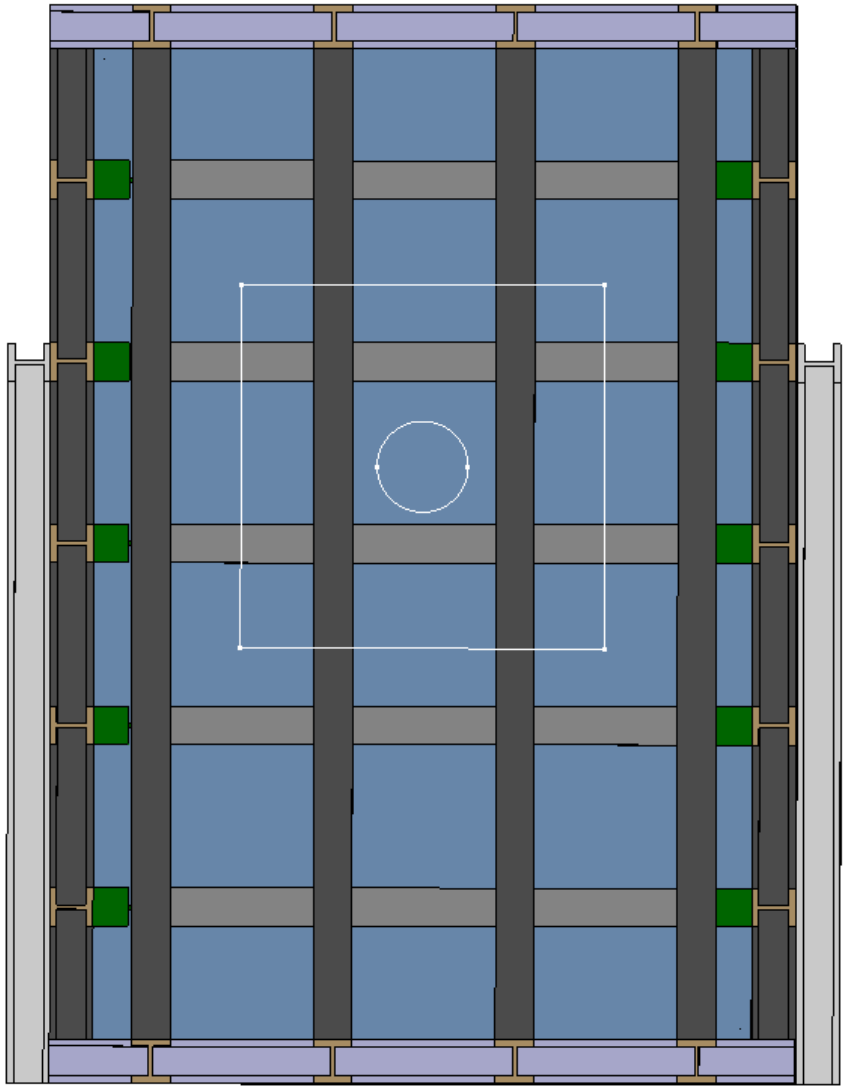


Measurements to be taken in reference to the front of the W target

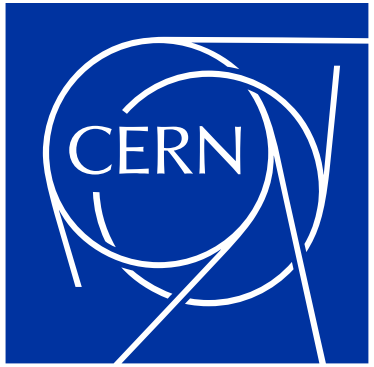
Dimensions are based upon current Catia models

Target Positioning



Positioned in respect to beam line

- 250mm diameter target
- 1m^2 box
- 33.5mm clearance from target to lower I beam



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