

FETS-FFA Magnet Prototype

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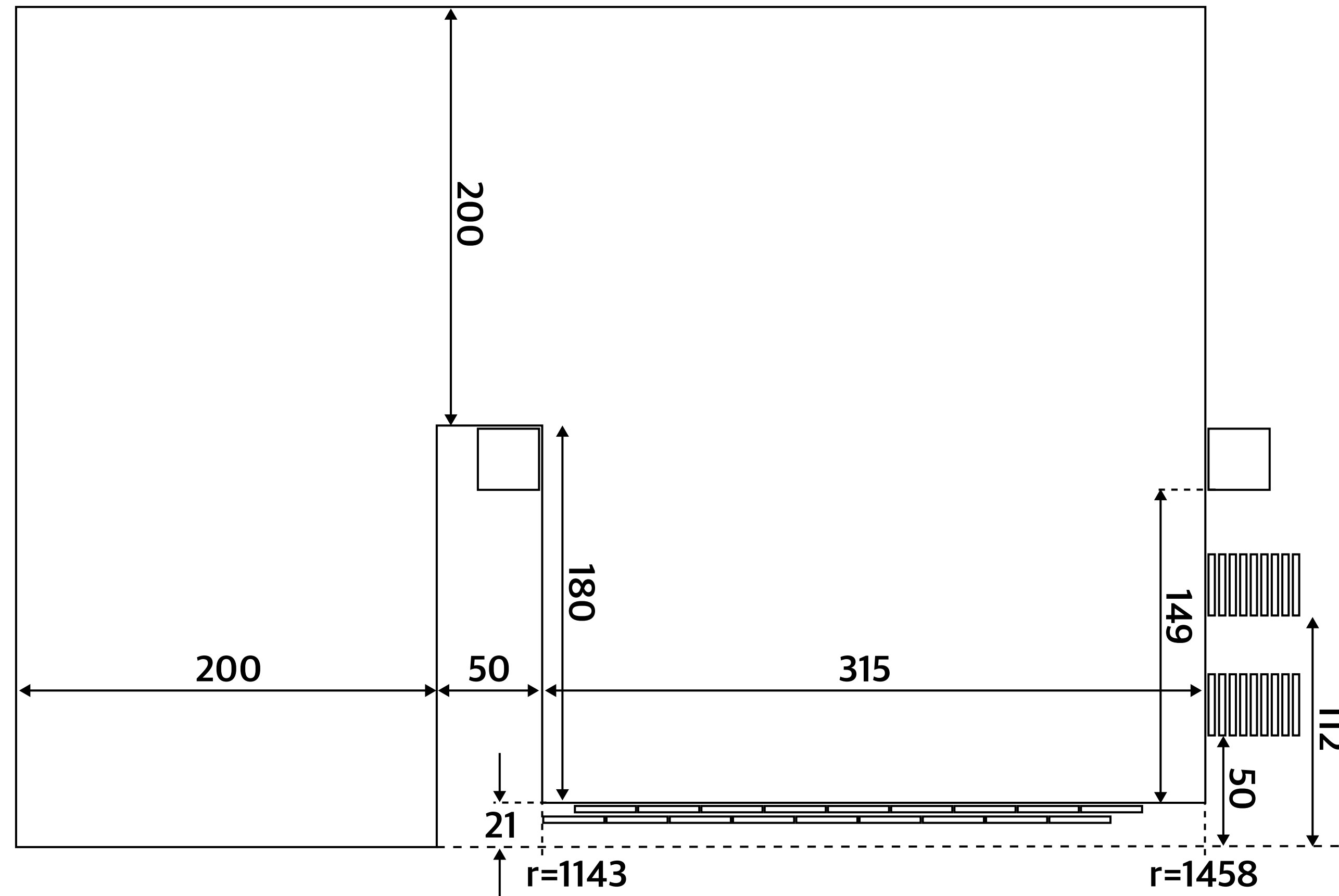
Magnet prototype scope

- Develop skills internally to design and build FFA magnet.
- Design and build spiral hFFA magnet suitable for high intensity operation:
 - zero-chromatic operation (tune constant during acceleration).
 - adjustable tune as a function of intensity (variable FD ratio and adjustable k -value).
 - Large gap with large dynamic aperture to accommodate beam without uncontrolled losses.
- Investigate correction scheme.

Scale down prototype

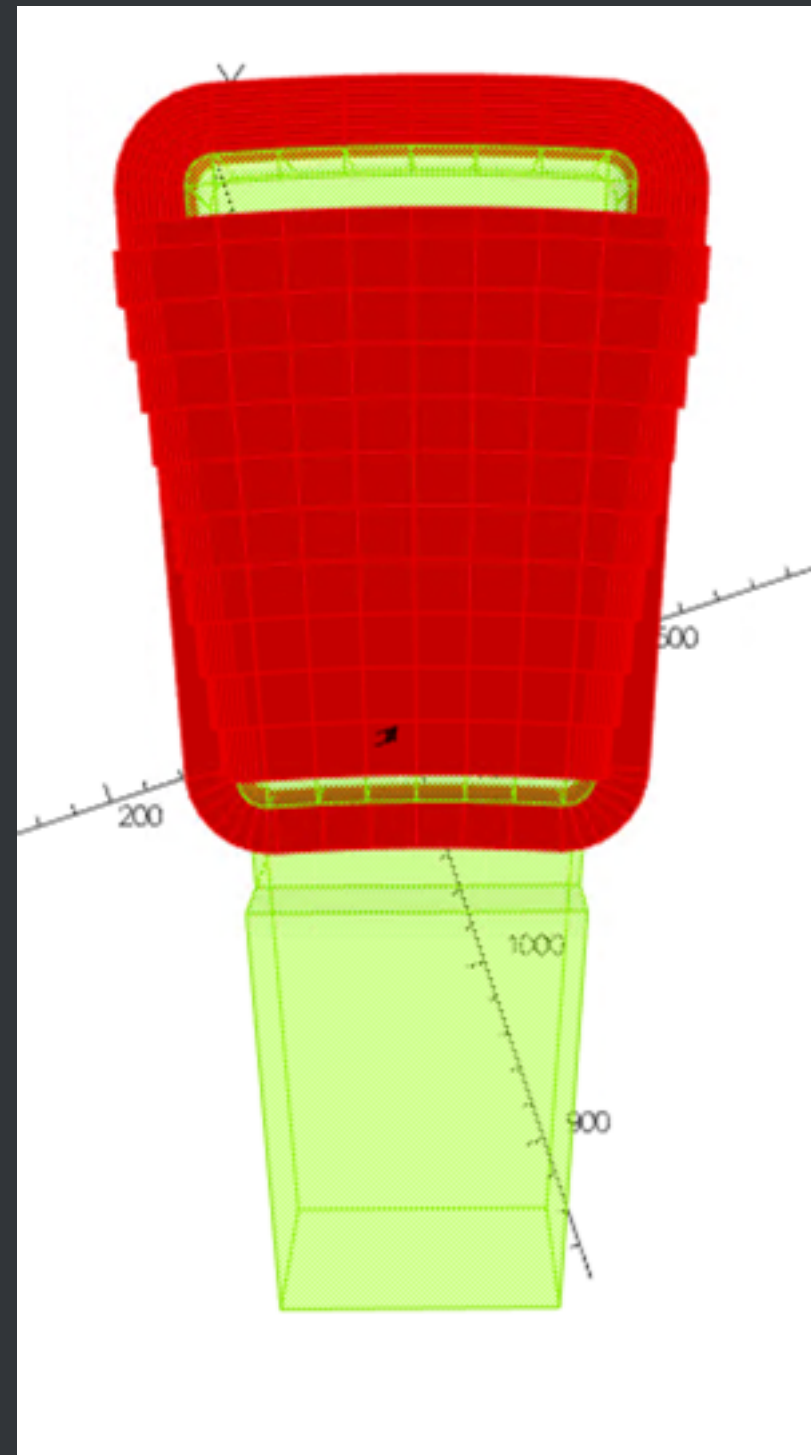
	FETS-FFA	Scale down
Magnet type	Doublet	Single
Shape	Sector spiral C-shape (30°)	Sector radial C-shape
GFR	4.26 m to 3.54 m (720 mm)	1.189 m to 1.411 m (222 mm)
Momentum excursion	x2	x2
Full Iron gap	112 mm	42 mm
Length/ gap	1.4 (D), 2.7 (F)	5
Field strength	~1.4 T	1 / 3 scale
Iron weight	19 t	<1 t
Field gradient	Flat pole with overlapped trims	Flat pole with overlapped trims
Number of trim coils	80 (doublet)	36
k-value	6 — 9	6 — 9

2D model

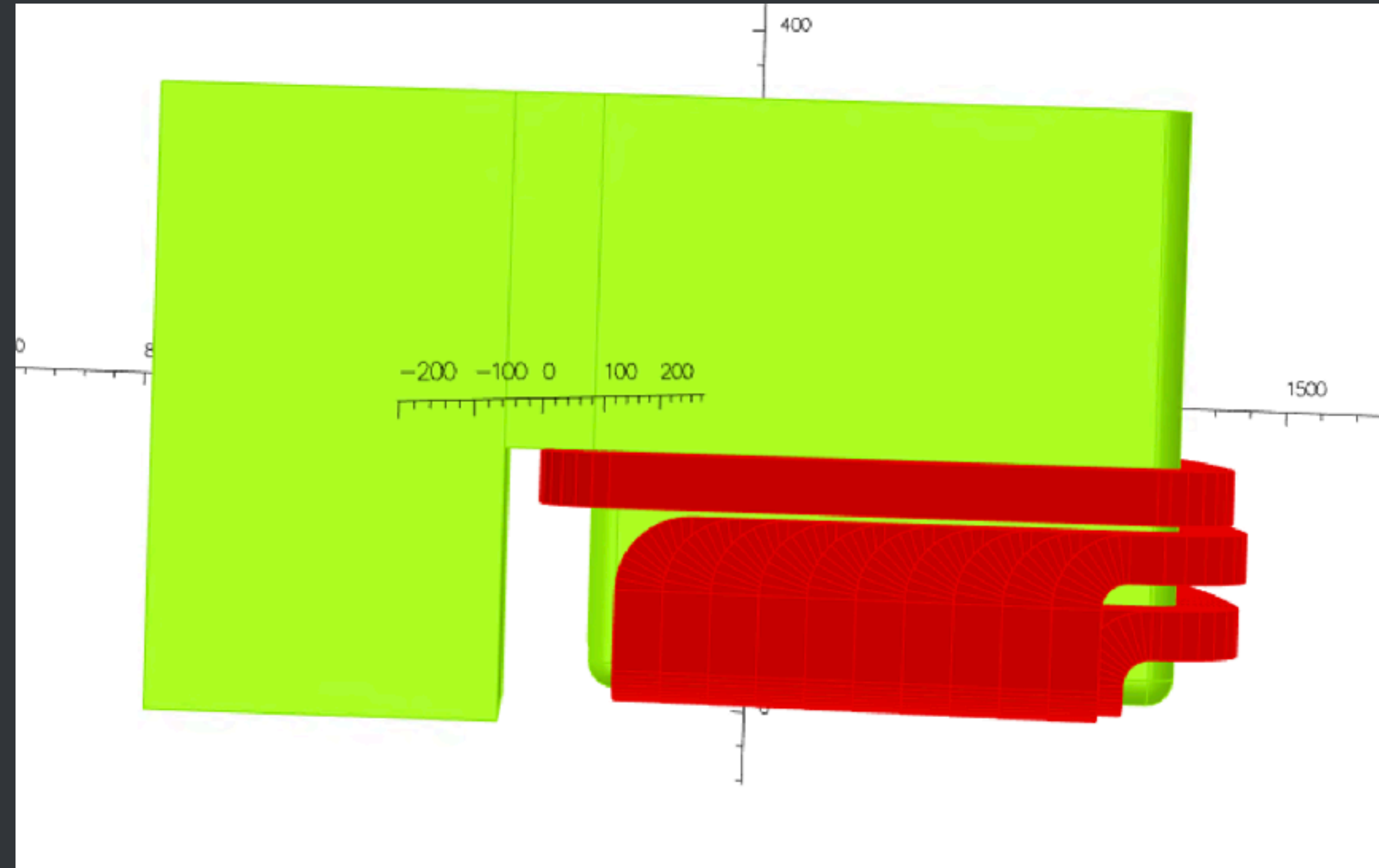


(Dimensions in mm)

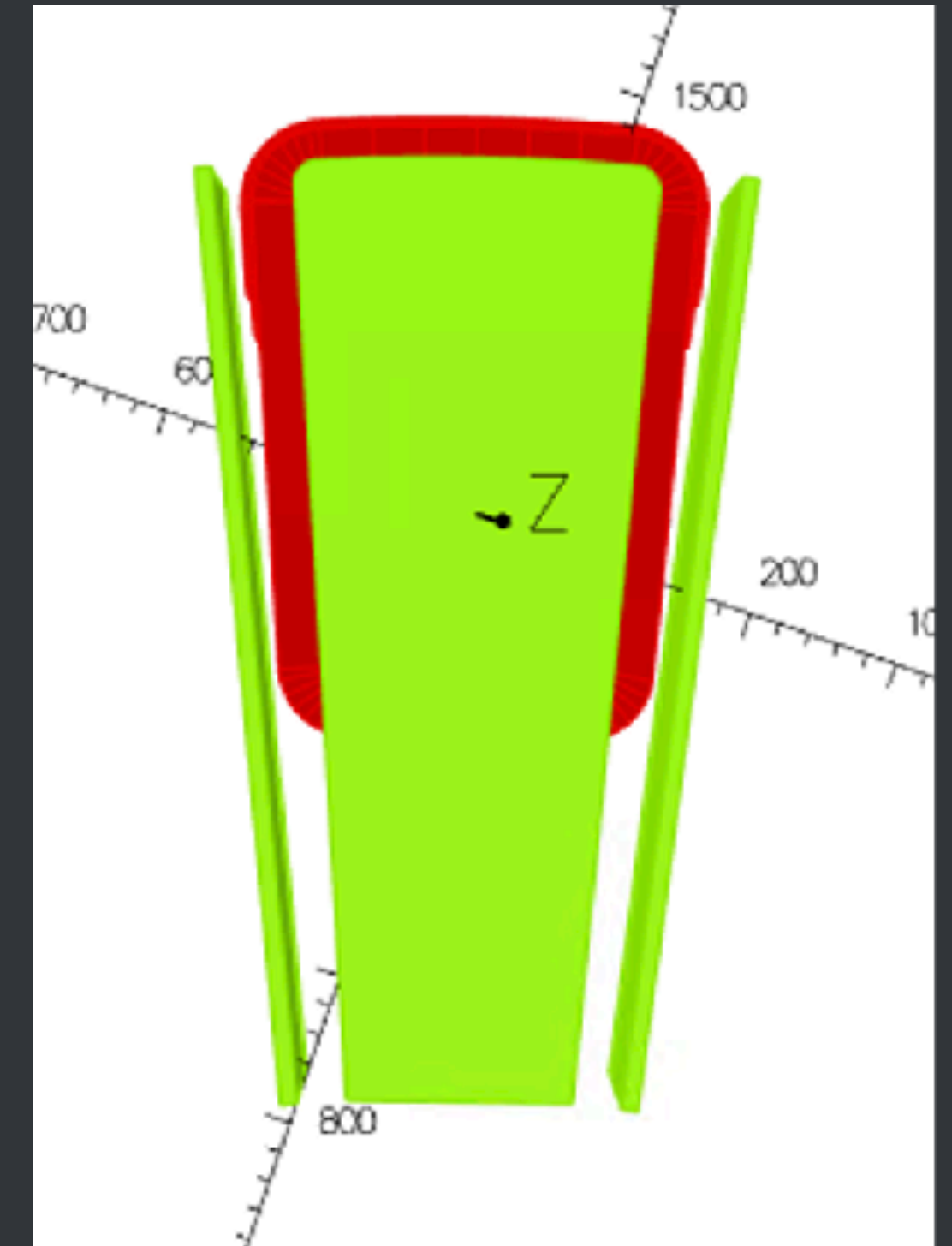
Opera model



Bottom view

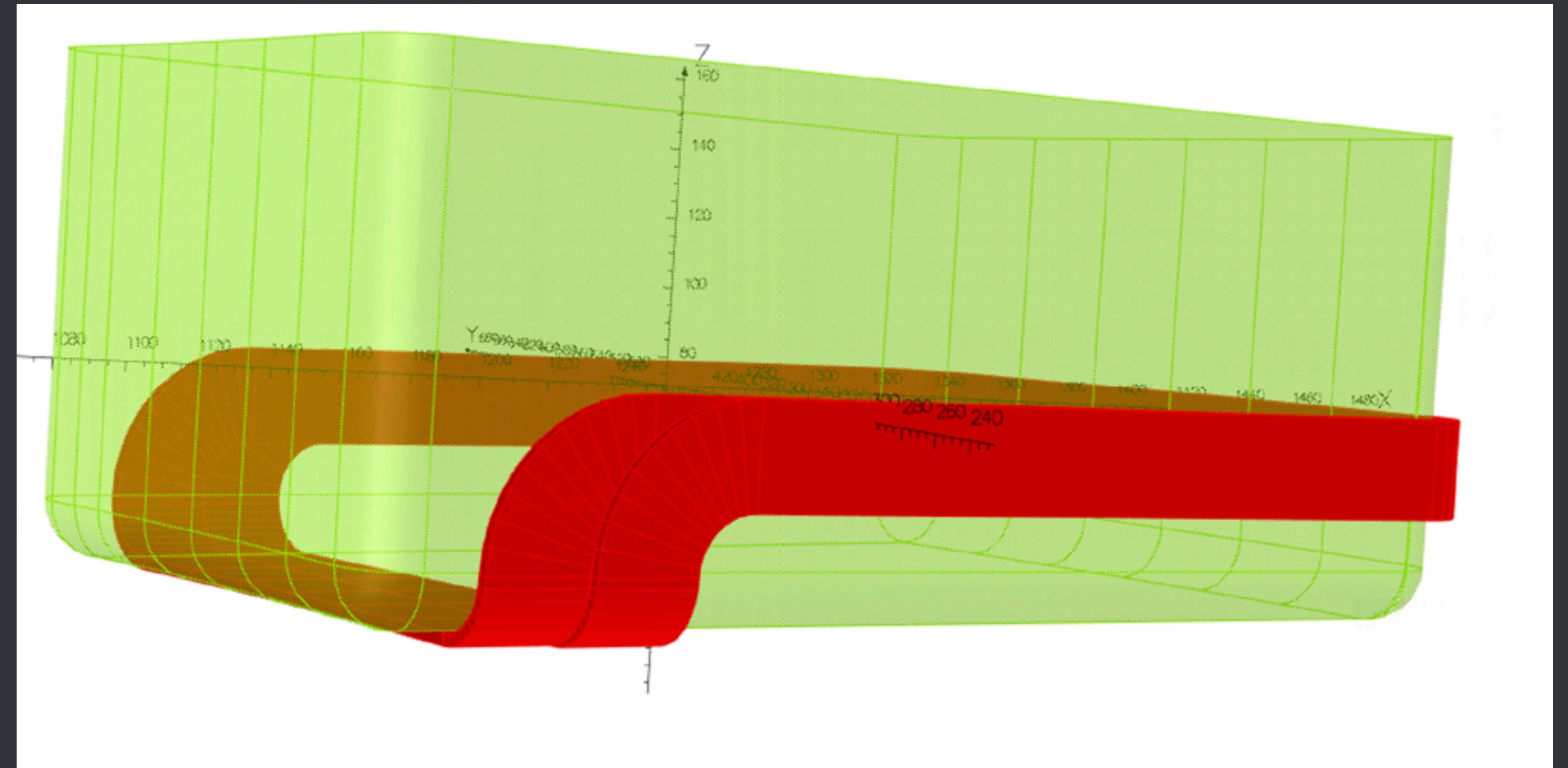
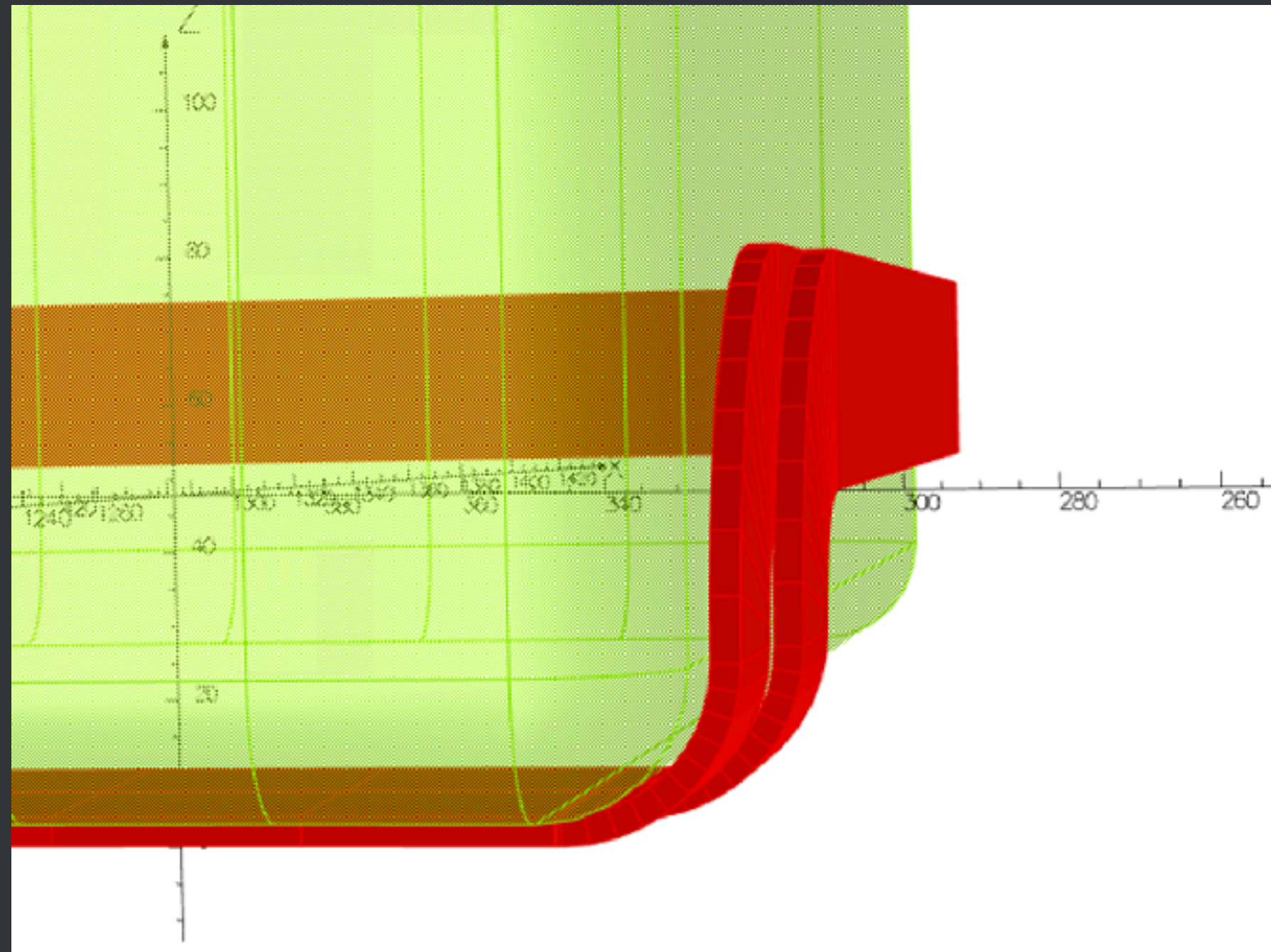


Side view

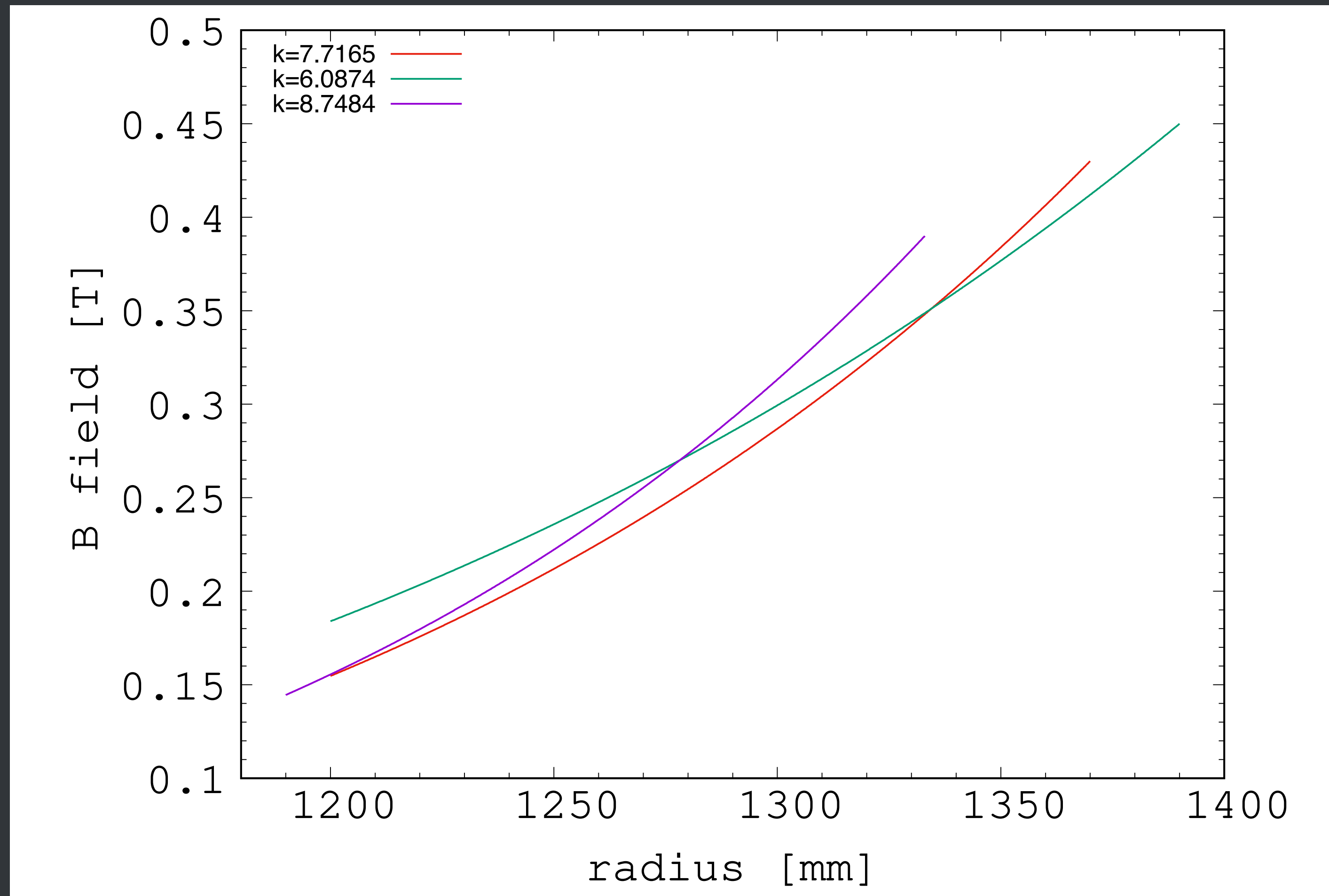


Top view
with clamps

Trim coils details



Field for different cases



Power supplies

- Contact with ISIS PS group (Martin Hughes and Andy Black)
- 10 old Danfysik PS available by March 2025 (free)
- Water-cooled PS
- Specific racks needed for these PS, quote from Danfysik (£14k!), or cheaper racks (£6k) with challenging adjustments

Magnetic measurement system

- Contacted Stephen Milward (Diamond), since they have a system bought for Diamond II and not used at the moment.
- System installed in R79 with 2 benches (3m and 6m long), water cooling in the building (to be tested).
- Positive response, schedule seems manageable in the coming years (only 1 magnet at a time, in 6 months and 9 months for the moment).
- Risk assessment and method statement in preparation.

Current situation

- Several manufacturers contacted, Tesla Eng. chosen, contract signed in July 2024.
- All materials have been secured.
- Final CAD model under way.
- Several sets of trim coils already wound.
- Pole already flame cut.
- Delivery planned in April 2025.

