



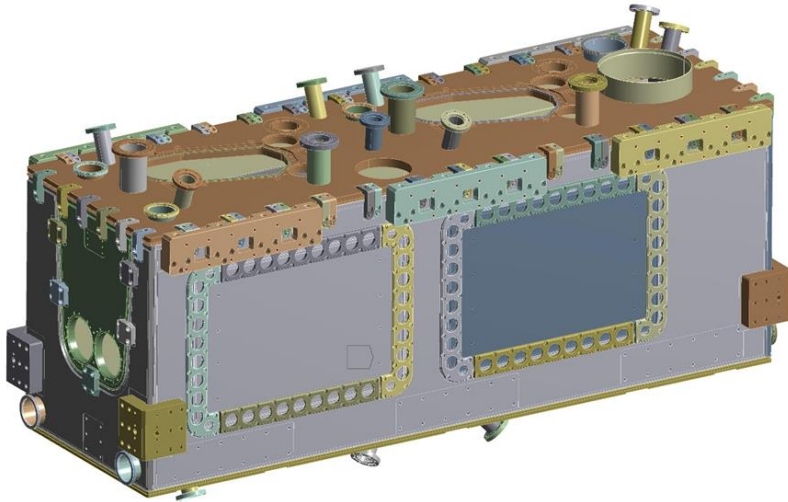
# RFD Vacuum Vessel – Castor Wheels

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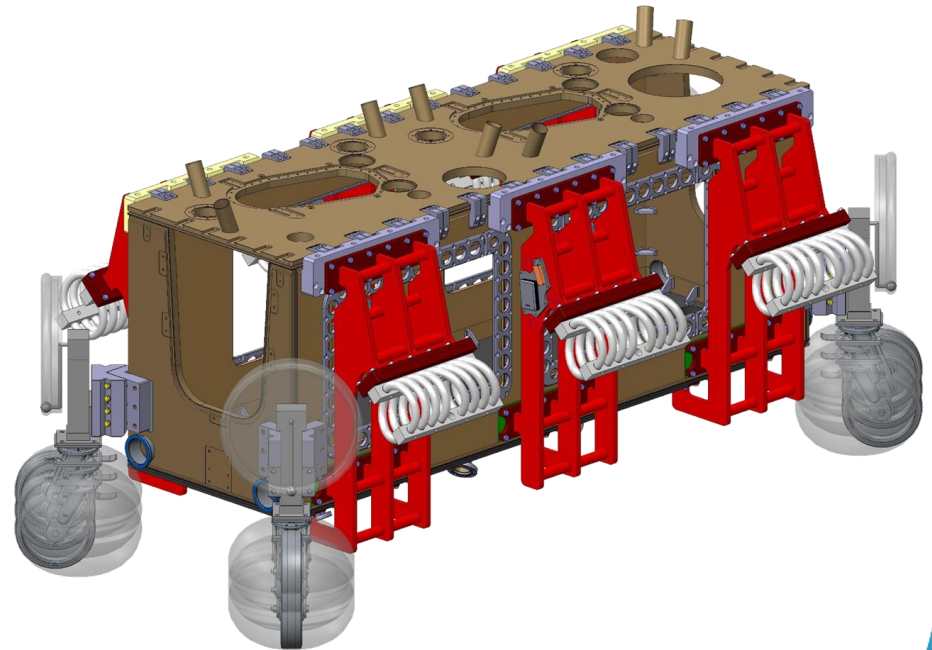


# Introduction

- This analysis has the purpose to study the effects of the short transport loads (i.e. cryomodule on castor wheels) on the RFD cryomodule.

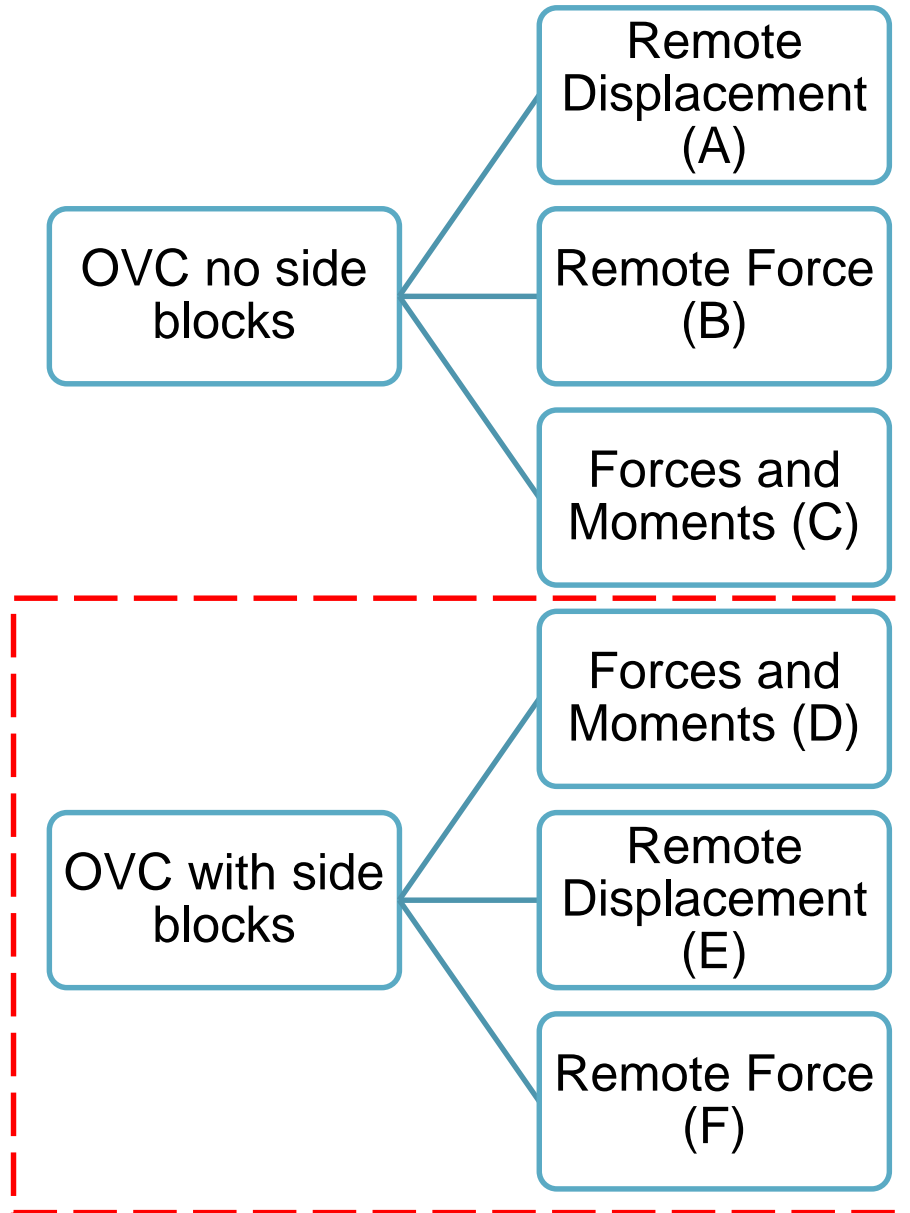


3D model



RFD Cryomodule castor wheel configuration

# Simulations



# Boundary Conditions - Forces and Moments (D)

- Boundary Conditions: Weight of components, bolt preloads, 2xGravity (Handling), remote displacement (all locked) and moments on side blocks.

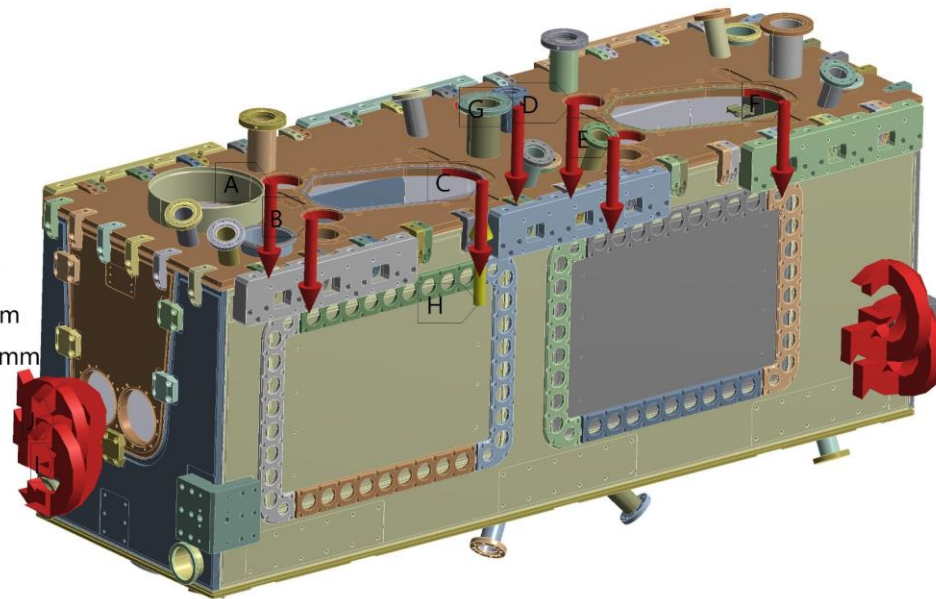
## I: Forces and Moments

Force

Time: 1. s

Items: 10 of 17 indicated

- A** Force: 833.3 N
- B** Force 2: -833.3 N
- C** Force 3: 1233.3 N
- D** Force 4: 833.3 N
- E** Force 5: 833.3 N
- F** Force 6: 1233.3 N
- G** Force 7: 300. N
- H** Acceleration: 9806.6 mm/s<sup>2</sup>
- I** Moment: 2.2812e+006 N·mm
- J** Moment 2: 2.5452e+006 N·mm

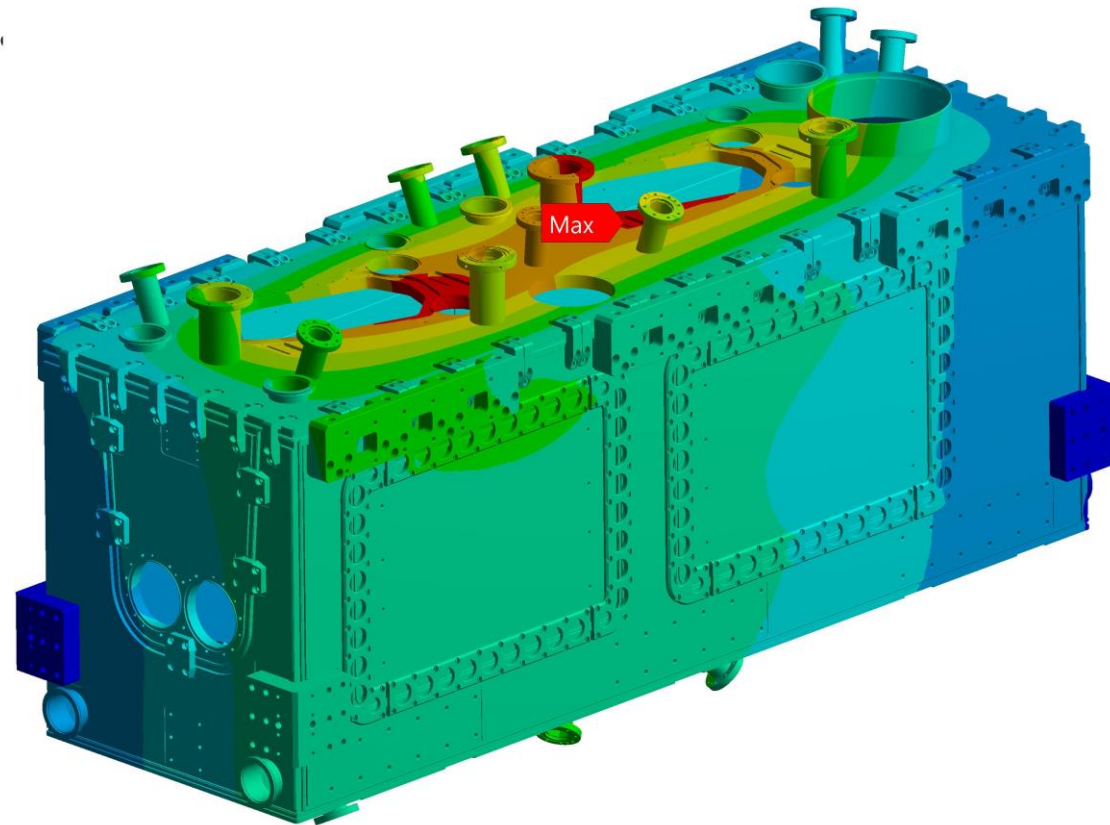
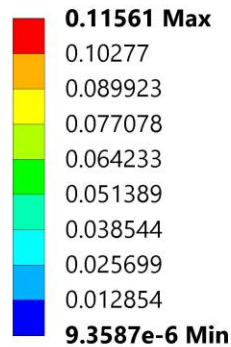


# Analysis Results – Forces and Moments (D)

- Maximum deformation: 0.12 mm
- Location: Top Plate

**J: Forces and Moments - 50% Preload - M10 A4-100 - 2g - Only Arms Transport**

Total Deformation  
Type: Total Deformati  
Unit: mm  
Time: 2

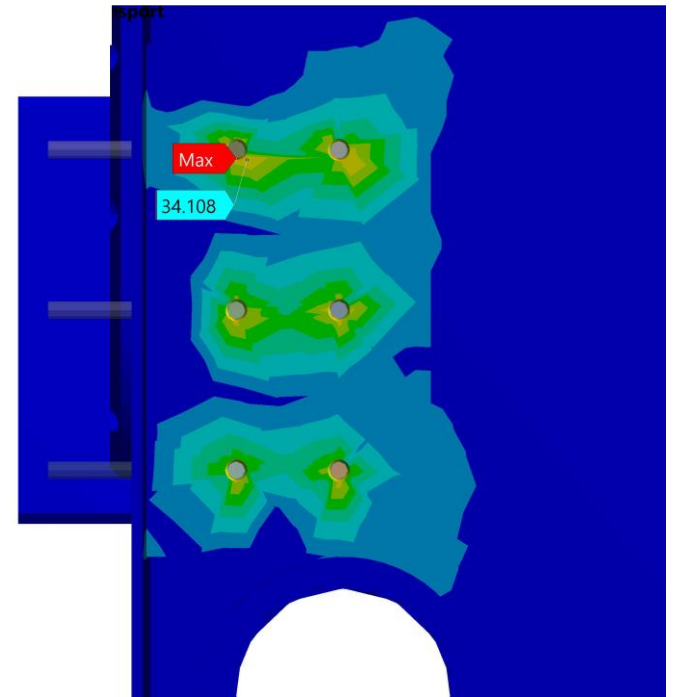
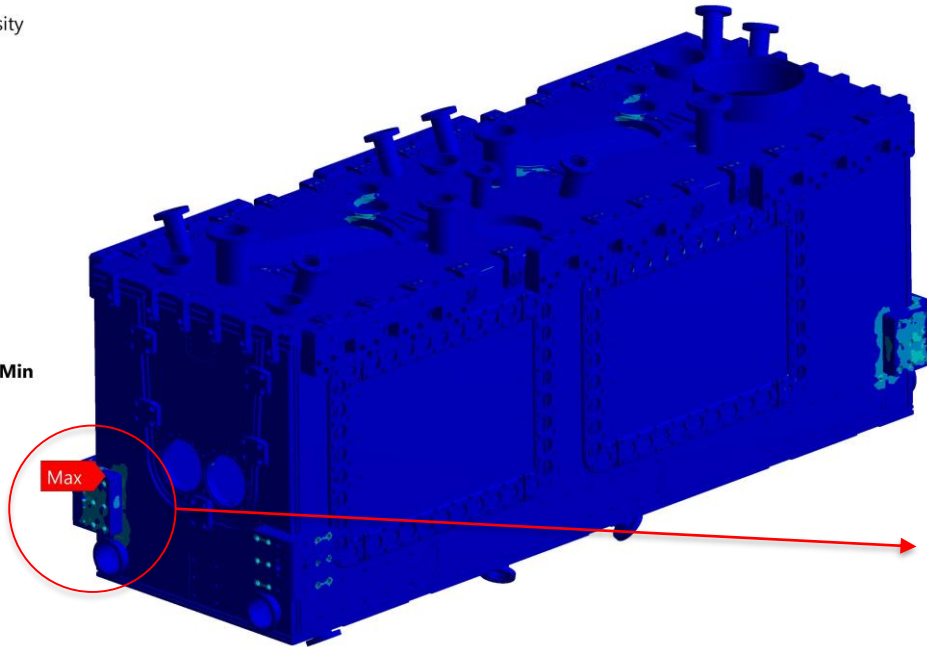
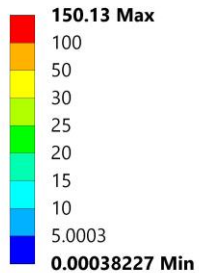


# Analysis Results – Forces and Moments (D)

- Maximum stress: 150 MPa (Peak Stress Bolt connection). Generally, stress level on cryomodule < 40 MPa.

J: Forces and Moments - 50% Preload - M10 A4-100 - 2g - Only Arms Transport

Stress Intensity  
Type: Stress Intensity  
Unit: MPa  
Time: 2

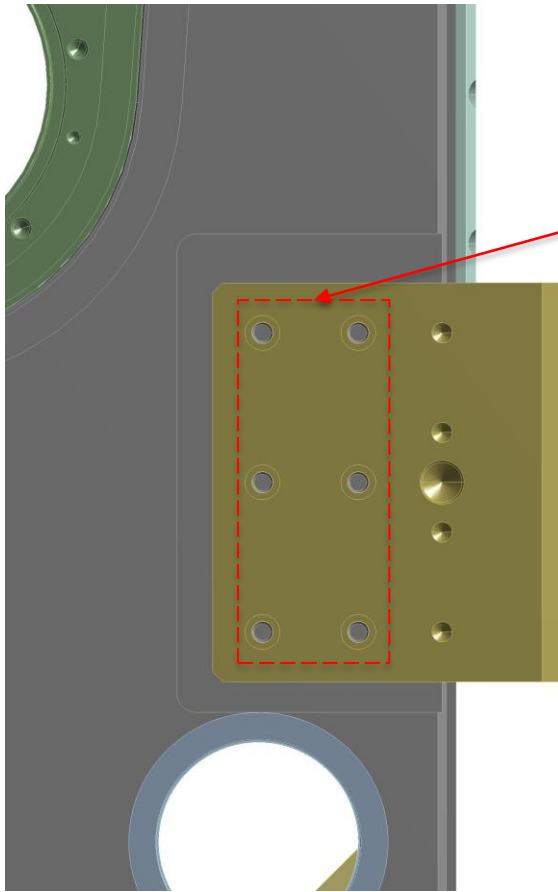


Detail stress contour plot



# Analysis Results – Forces and Moments (D)

- Currently, castors are connected to the cryomodule using six M10 bolts.



| Bolt Grade | Size | Preload | Safety Factor |
|------------|------|---------|---------------|
| A4-80      | M10  | 50%     | 1.89          |
| A4-80      | M10  | 65%     | 1.56          |
| A4-100     | M10  | 50%     | 2.10          |
| A4-100     | M10  | 65%     | 1.64          |

As a result, the proposed solution will be to increase the bolt size and number to eight M12 A4-100 bolts.



***Thank you for your attention!***

