

PANDA Fw Endcap EMC: insertion and cooling

Herbert Löhner, Ganesh Tambave

Henk Smit, Riemer Bergsma

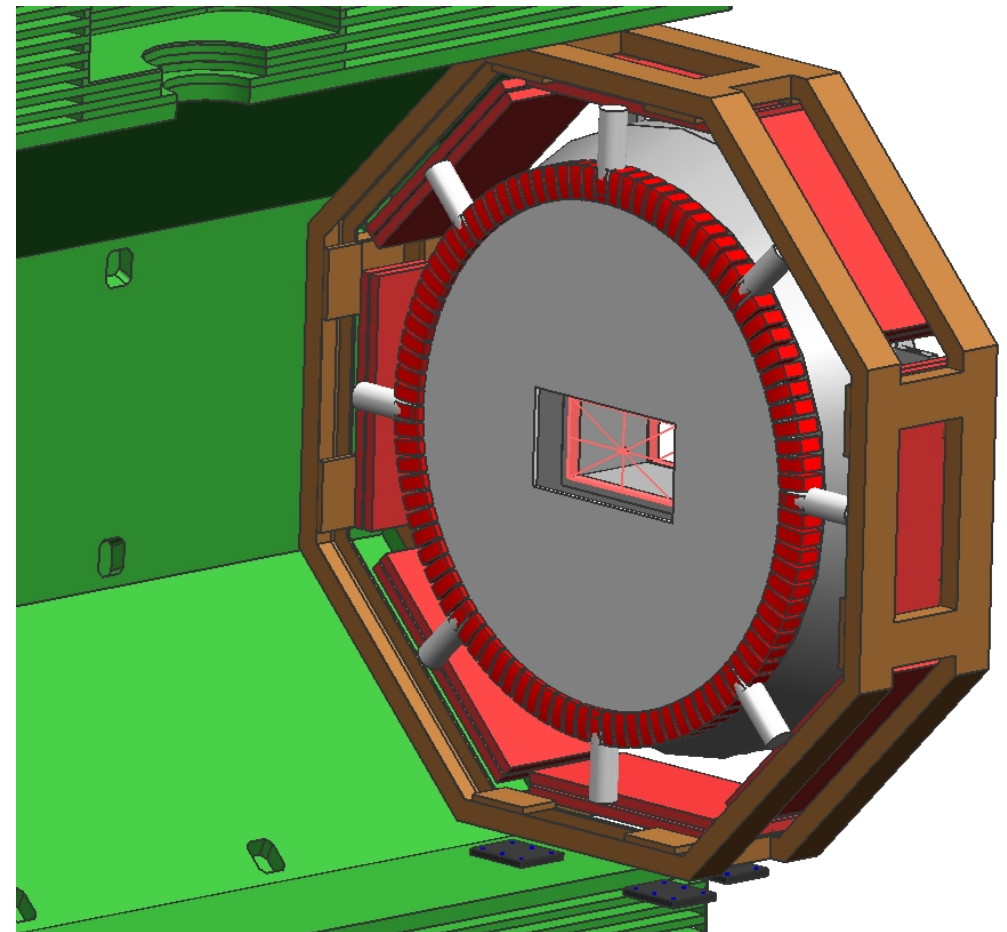
(mech. engineering),

Annelie Kluttig (research engineer),

KVI Groningen

model for inserting endcap into
solenoid

Unigraphics FEM implementation:
thermal insulation and cooling
by dry N₂

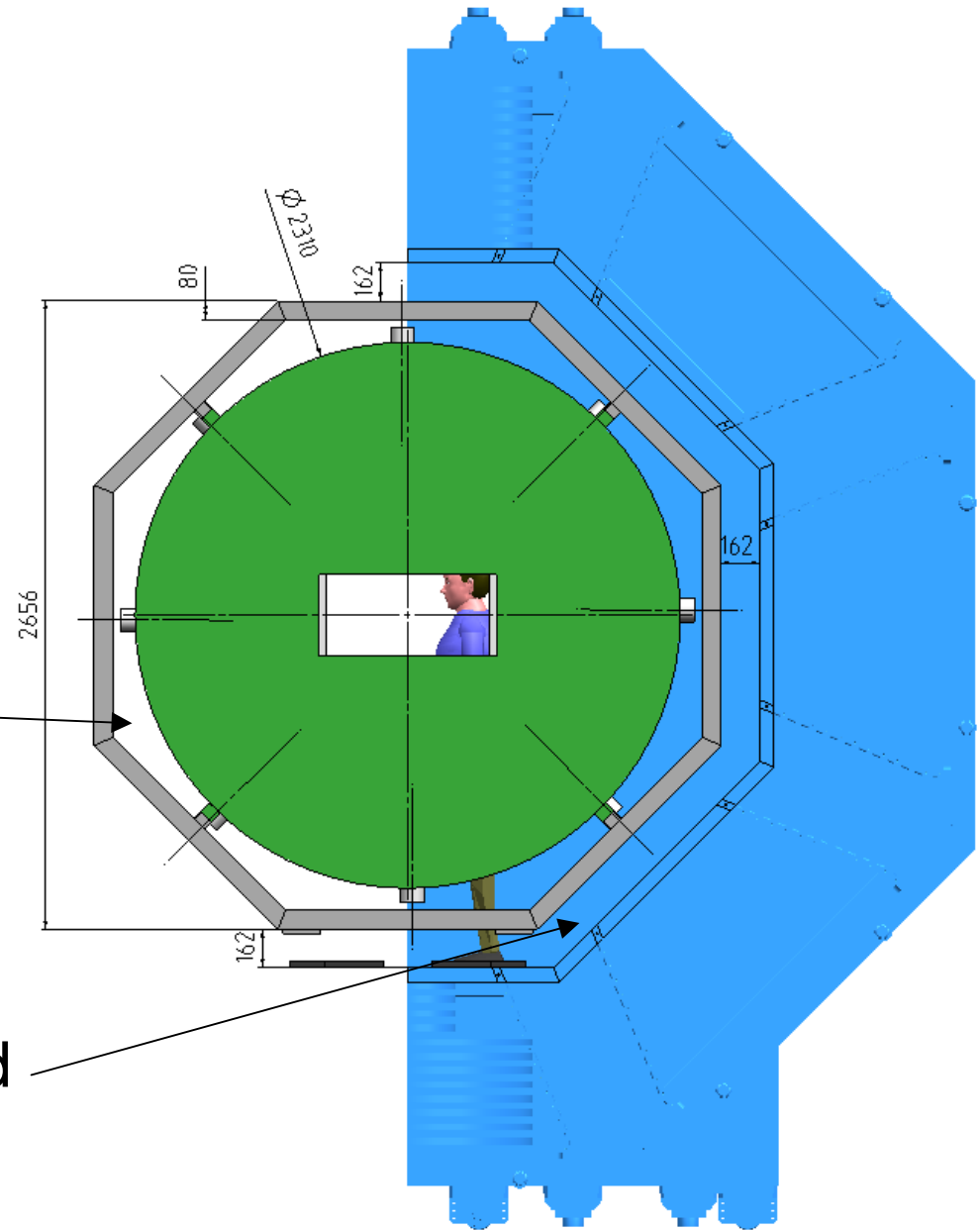


current frame size

with space available for

electronics
between endcap and
mounting frame

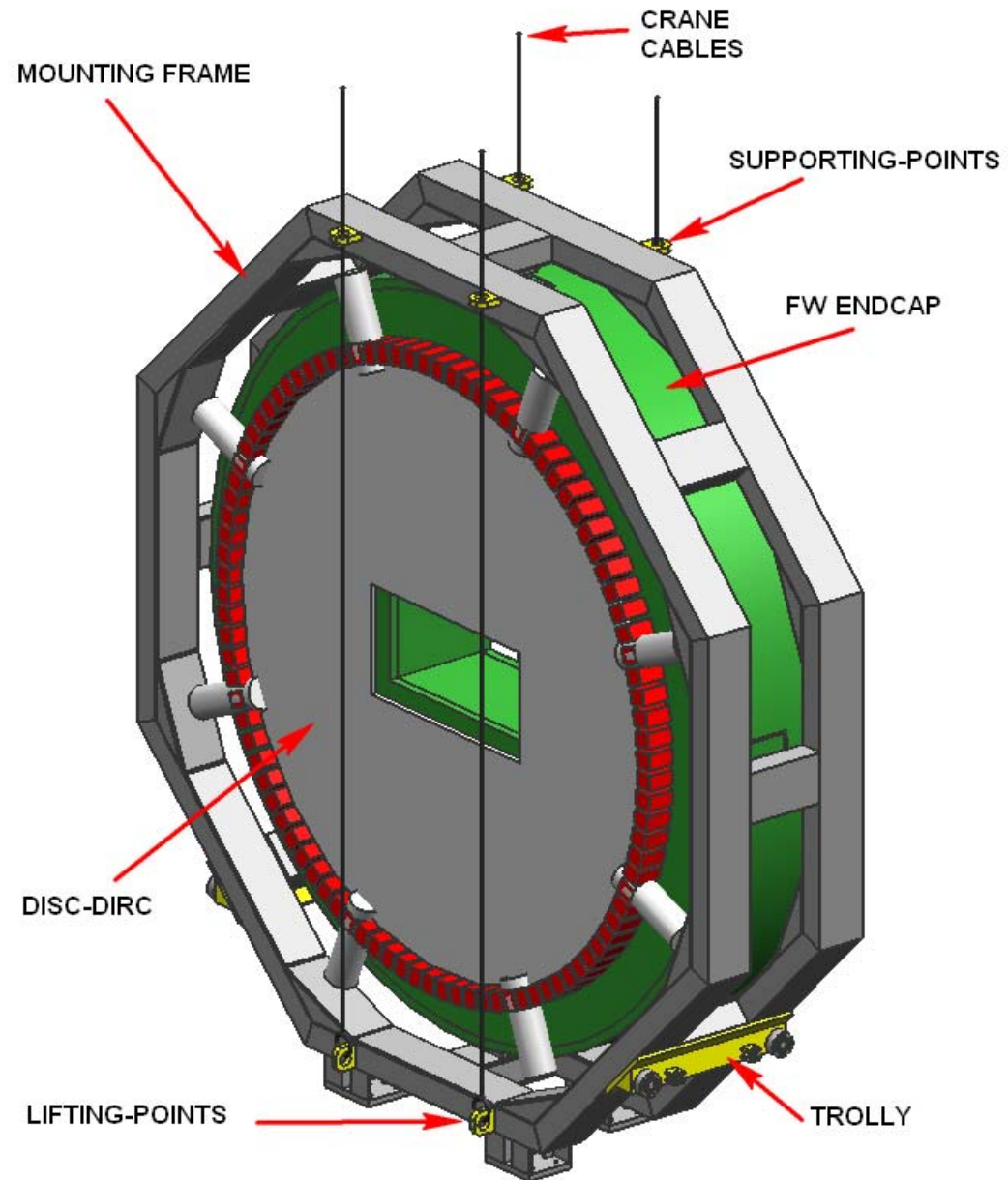
and mounting frame and solenoid



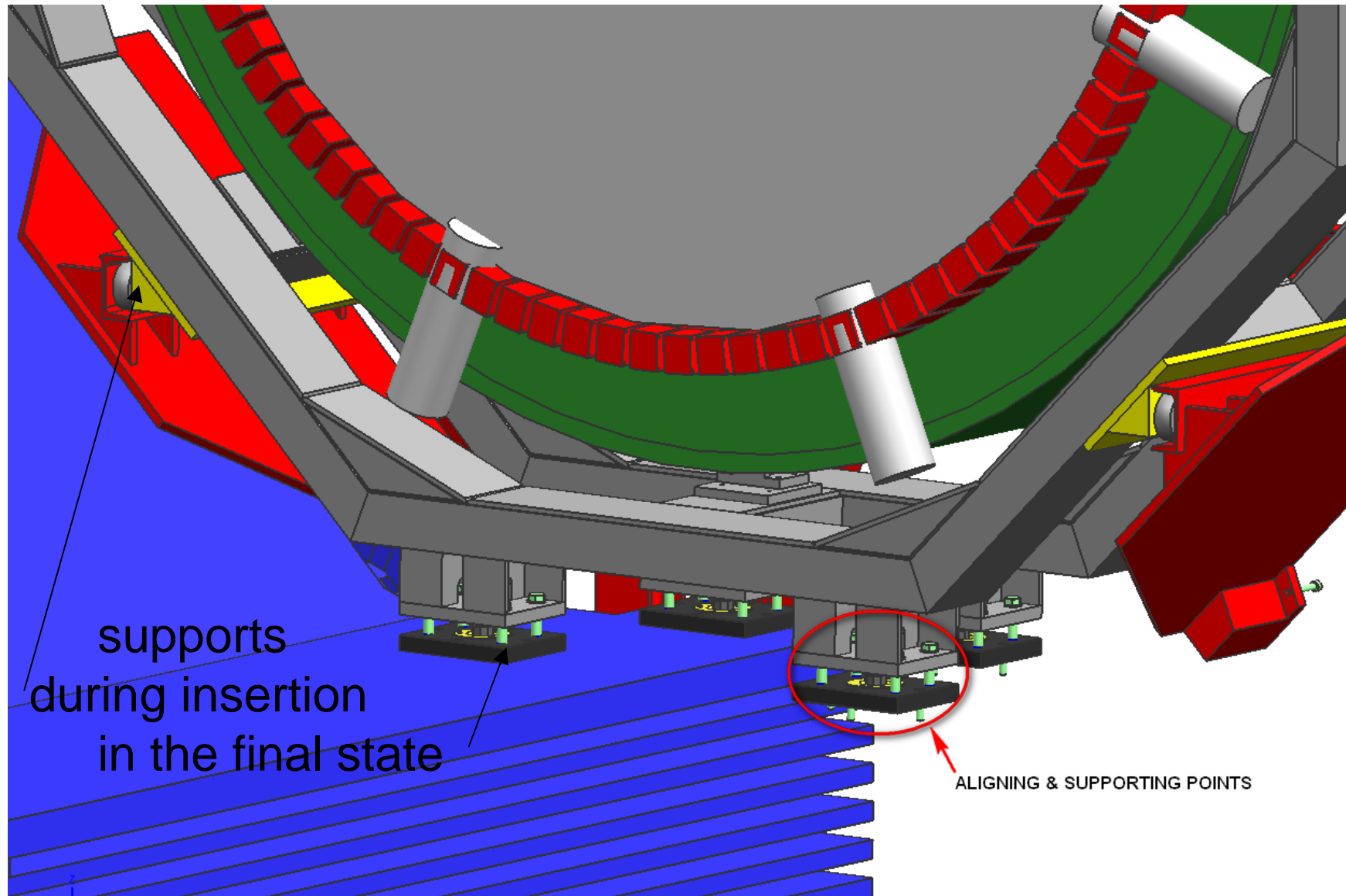
transport

by crane
using lifting points
on the bottom of the frame:

maintaining stability of the frame
during transport

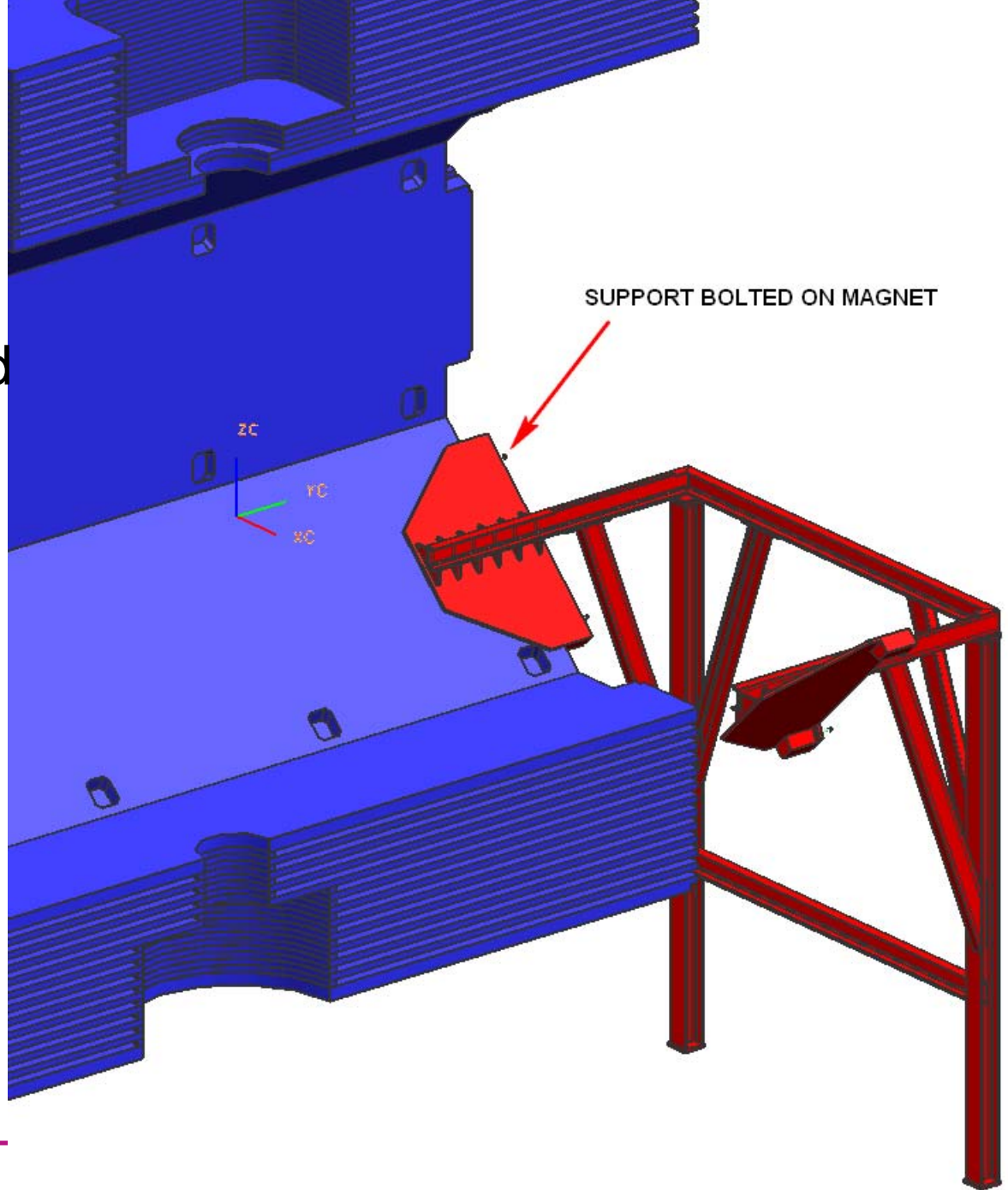


alignment and supports

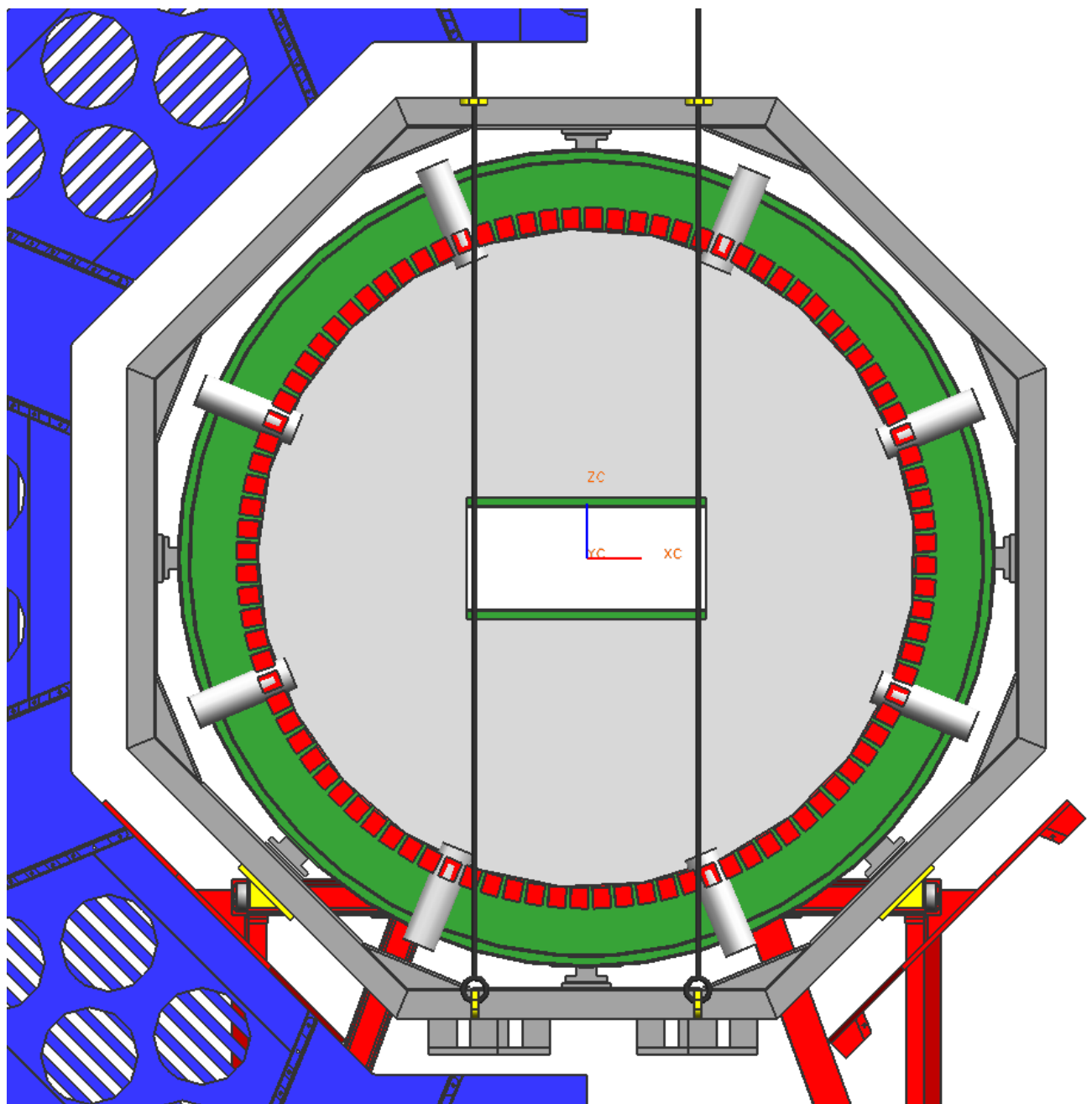


frame for
insertion:

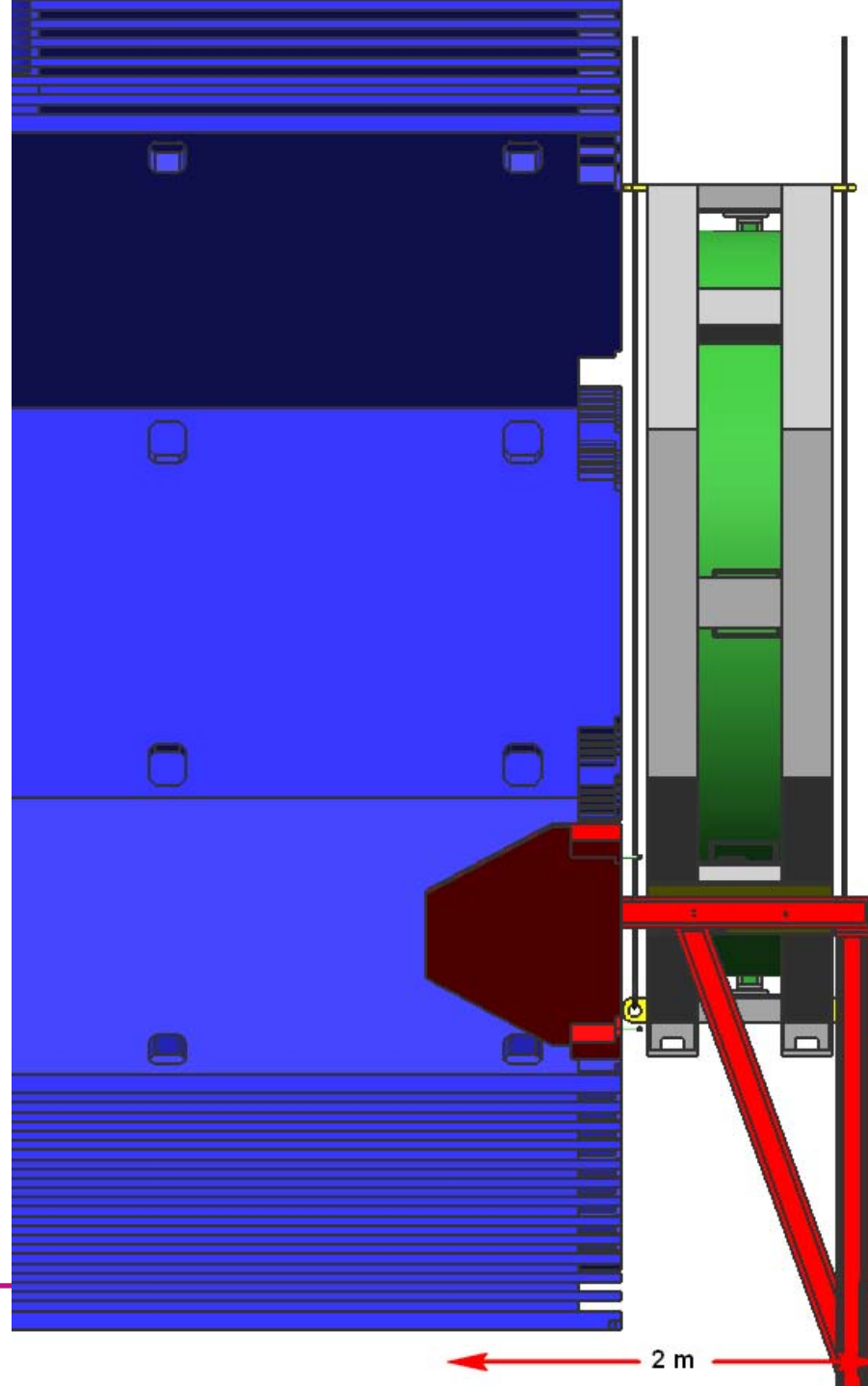
temporarily
attached to the solenoid



rolling-in

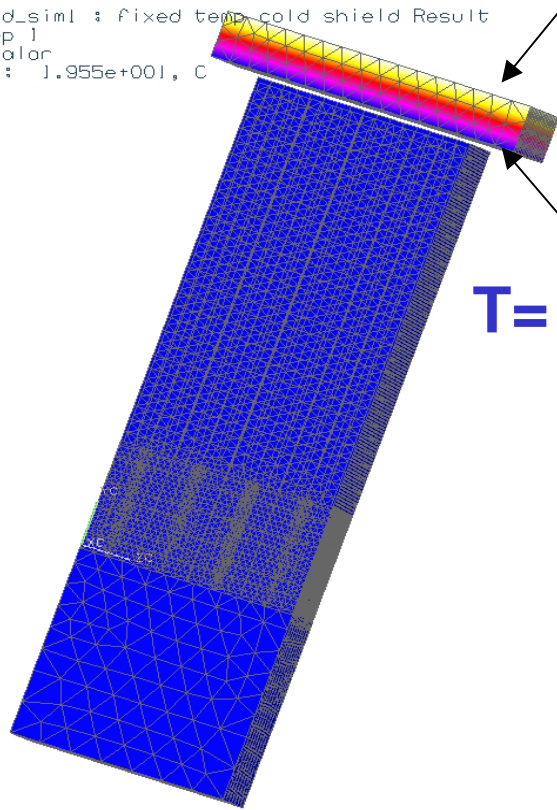
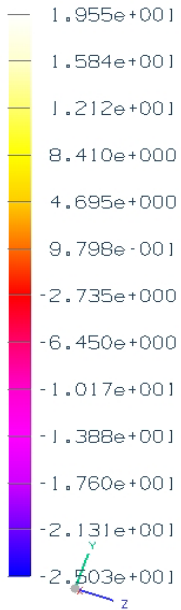


space required



front cooling

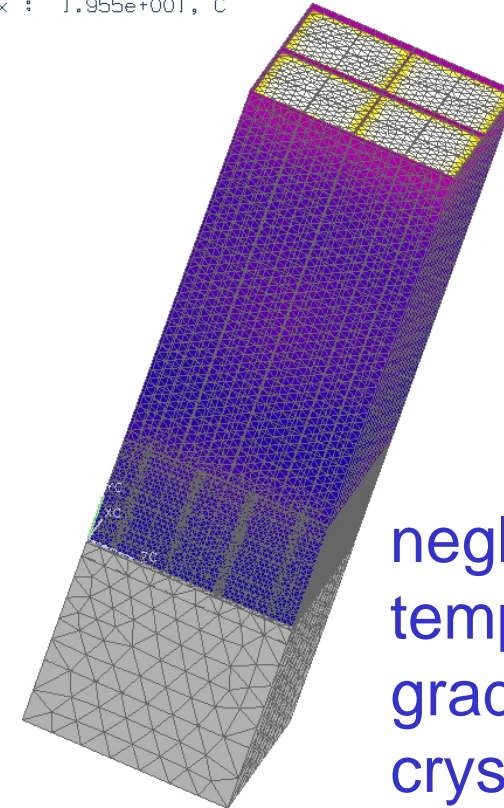
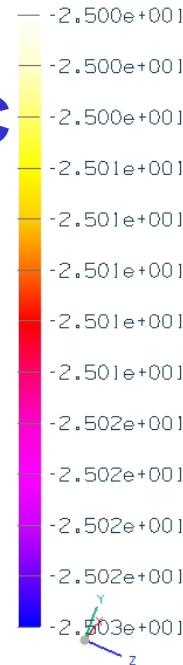
Thermal Henk plus shield_sim1 : fixed temp cold shield Result
Load Case 1, Static Step 1
Temperature - Nodal, Scalar
Min : -2.503e+001, Max : 1.955e+001, C



$T = 20^{\circ}\text{C}$

$T = -25^{\circ}\text{C}$

Thermal Henk plus shield_sim1 : fixed temp cold shield Result
Load Case 1, Static Step 1
Temperature - Nodal, Scalar
Min : -2.503e+001, Max : 1.955e+001, C



negligible
temperature
gradient in
crystals

shield facing the crystals kept at -25°C

how can we achieve this?

composite shield

lightweight polymethacrylimide low density rigid foam
 $k=0.03 \text{ W/(K m)}$

25 mm Rohacell

1 mm Al

3 mm N₂ at T=-25°C

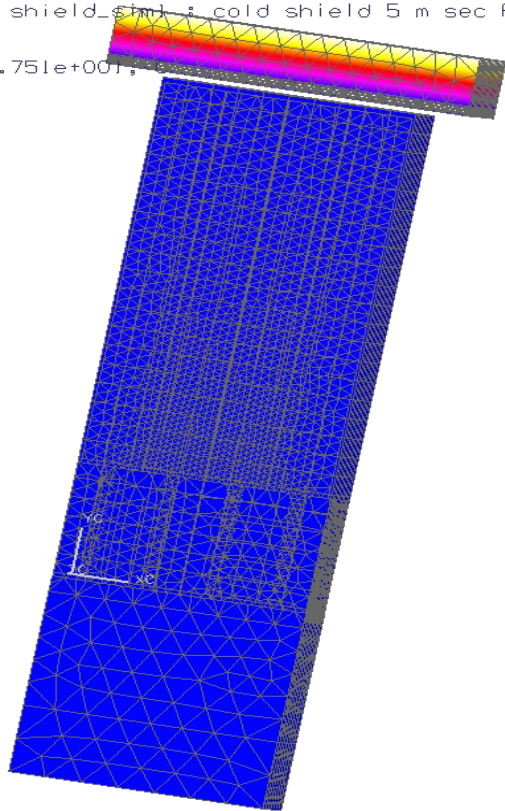
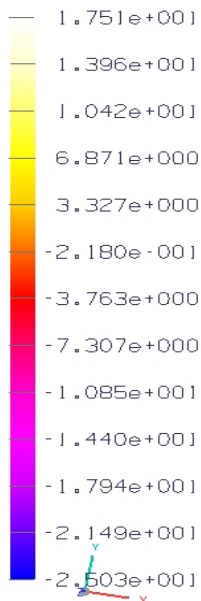
1 mm Al

no contact yet!

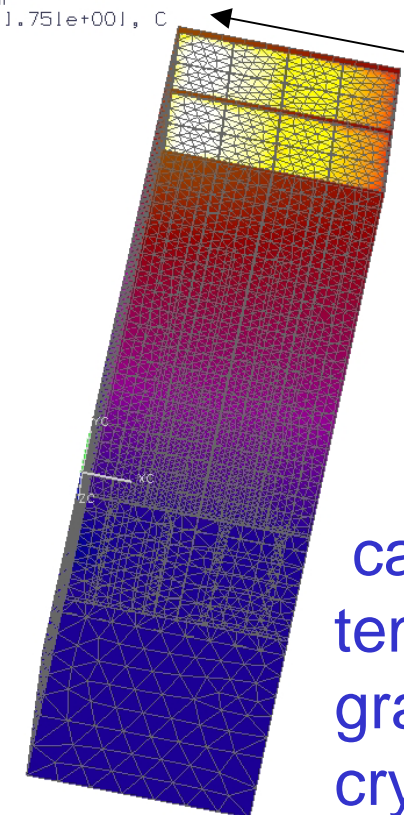
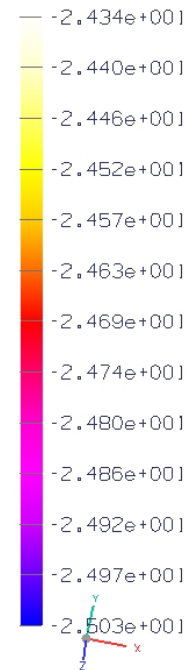
moderate dry N₂ flow in 3 mm gap: 5 m/s

composite shield + front cooling

Thermal Henk plus composite shield_sim1 : cold shield 5 m sec Result
Load Case 1, Static Step 1
Temperature - Nodal, Scalar
Min : -2.503e+001, Max : 1.751e+001, C



Thermal Henk plus composite shield_sim1 : cold shield 5 m sec Result
Load Case 1, Static Step 1
Temperature - Nodal, Scalar
Min : -2.503e+001, Max : 1.751e+001, C



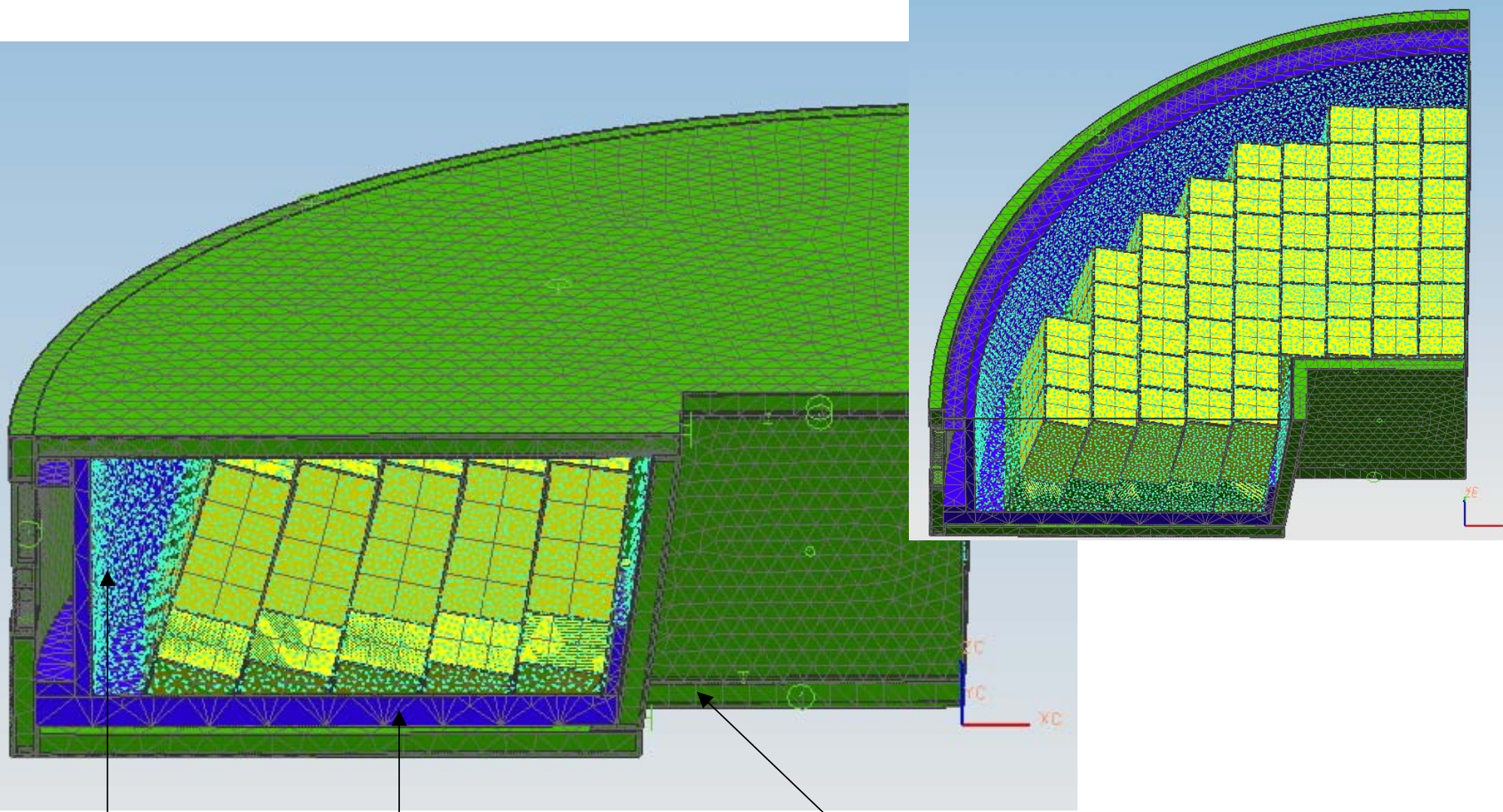
N2 flow

ca. 1 K
temperature
gradient in
crystals

composite thermal shield:

25 mm Rohacell, 3mm dry N₂ at T=-25°C between 2x 1mm Al

FEM implementation in quarter endcap



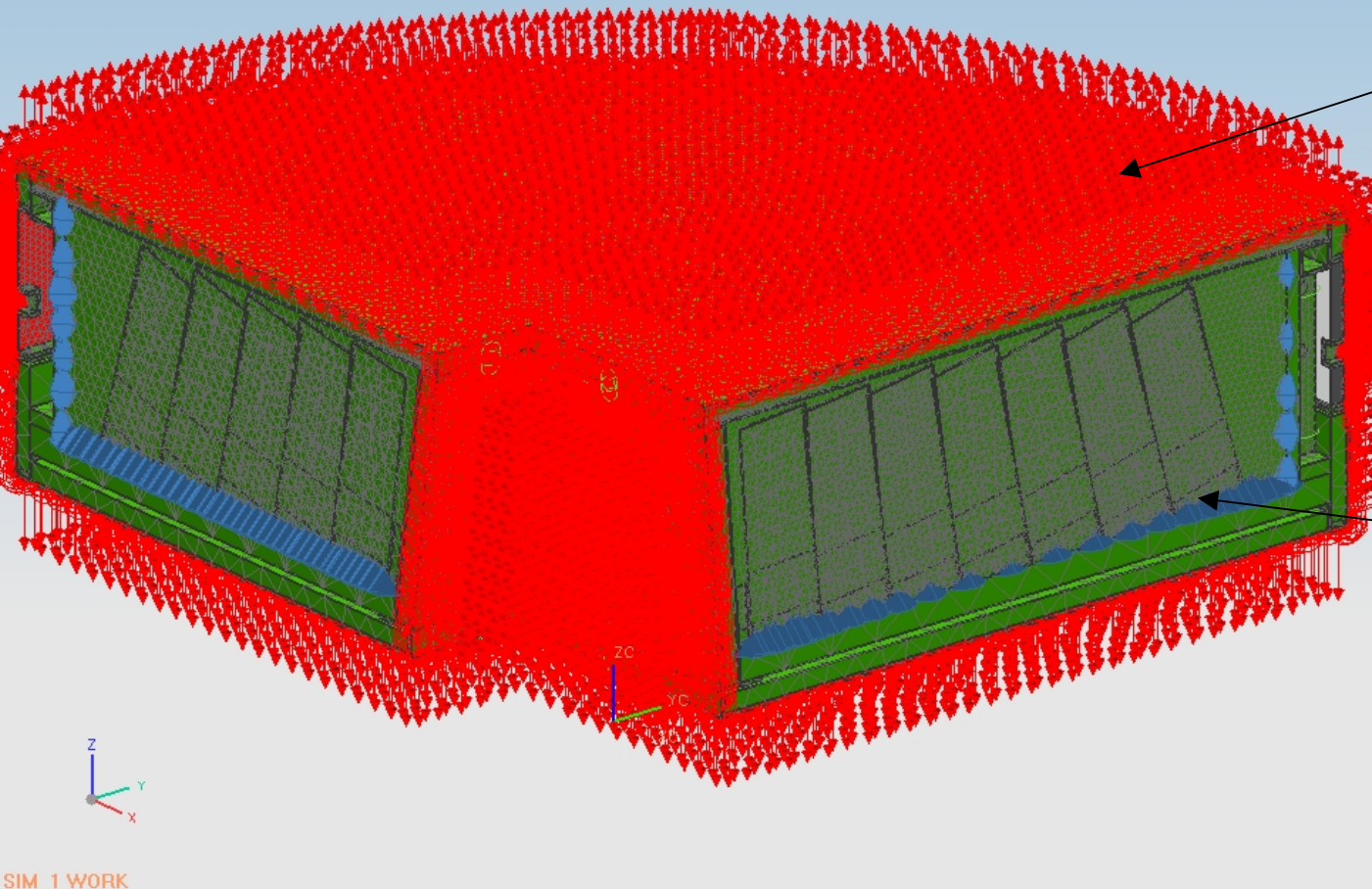
dry N2

mounting plate

insulation

loads applied to FEM

ambient temperature of 35°C



free convection
to the environment

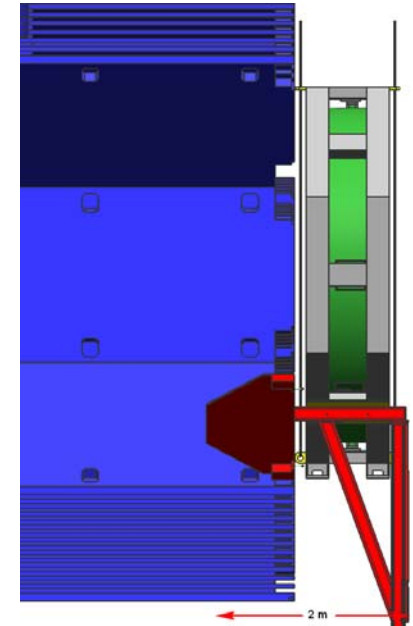
heat sink at -25°C
mounting plate
with pipes
flowing cooling liquid

SIM_1 WORK

summary



insertion of FwEndcap EMC (+DiscDIRC)
requires
2m space in front of solenoid,
a crane,
a frame attached temporarily to the solenoid



FEM implementation of FwEndcap EMC
with cooling supported by N₂ flow:
FEM structure is ready,
calculations need to be done

