

CLIC workshop, 16-18 October 2007

*Working group “ Two beam
hardware and integration”*

**Test module in the
two beam test stand**

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17.10.2007

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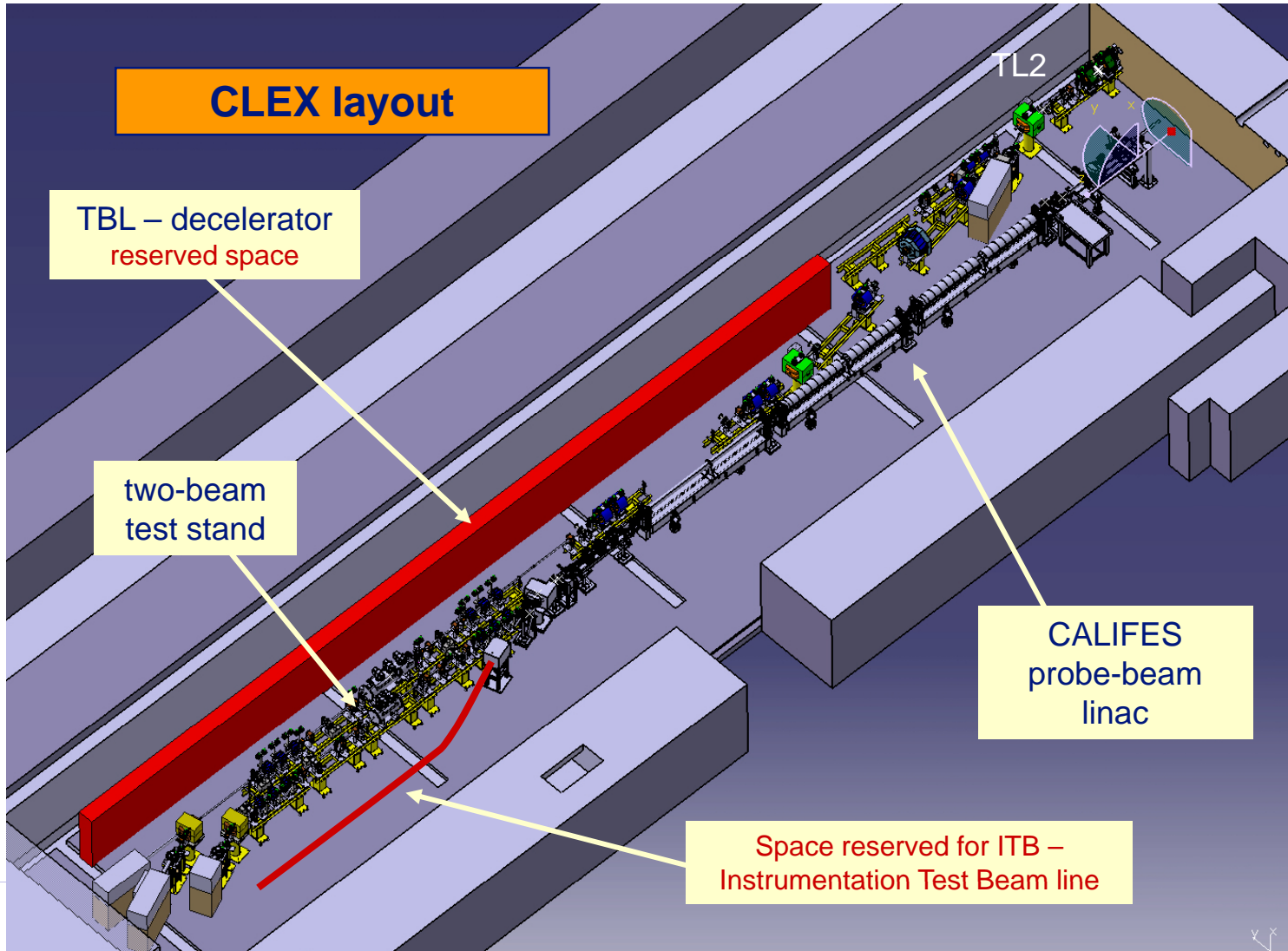
Location

- Two-beam test stand in CLEX building

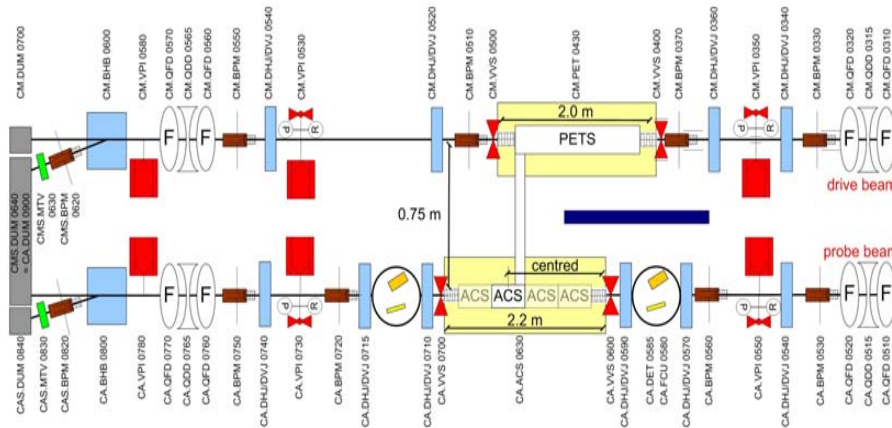


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Location



Two-beam test stand



Two Beam Test stand
comprises one of
modules of CLIC

Principle objectives of two-beam test stand:

High-power test of PETS - first full pulse length tests of CLIC (lengthened) prototypes

12 GHz high-power test of accelerating structures

Measurement of kick from rf breakdown

High-power test of PETS on/off mechanism

Operation of CLIC module

Must be built to be flexible and easily reconfigured

Organisation for the 2bts module

- CERN: RF Design
- CERN: mechanical design of PETS and ac. structures + rf components
- CERN and Pakistan, HMC-3, National Centre for Physics:
 - design of the overall layout and integration,
 - design, fabrication, installation and commissioning of the experimental vessels and related subsystems

Components/sub-systems

- PETS
- *RF components (loads, hybrids, directional couplers, attenuator, waveguides,...)*
- Tanks (PETS tank and Acc. Structure tank)
- PETS External Assembly support
- PETS Internal Support inside the tank
- ON-OFF Mechanism of PETS
- Under Slung Crane

- Other sub-systems
 - Cooling system
 - Vacuum system (10^{-8} mbar)

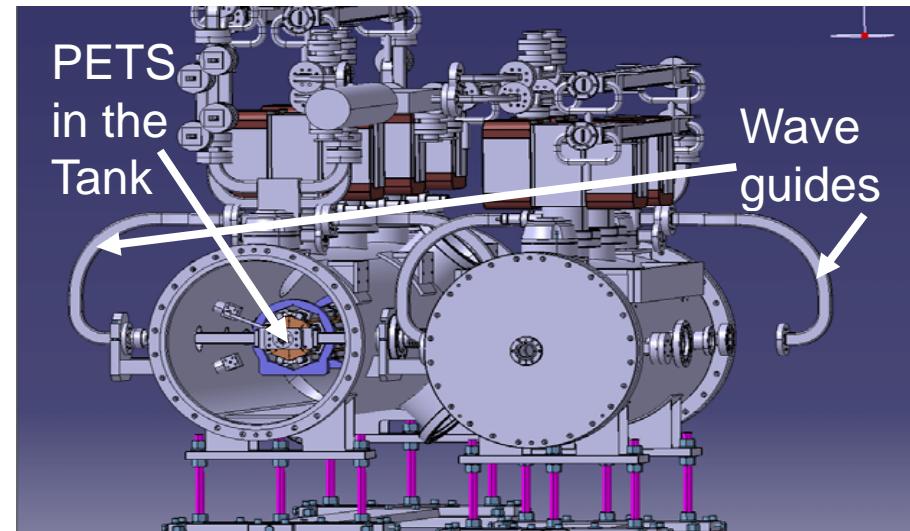
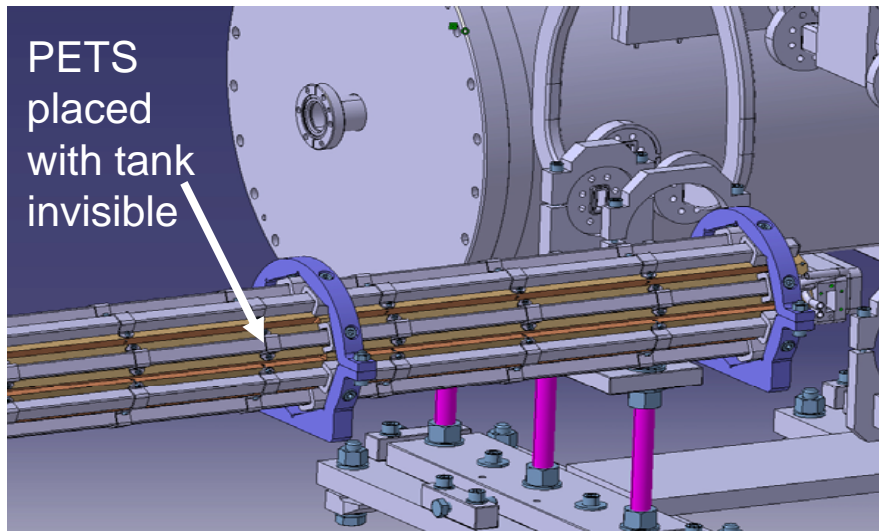
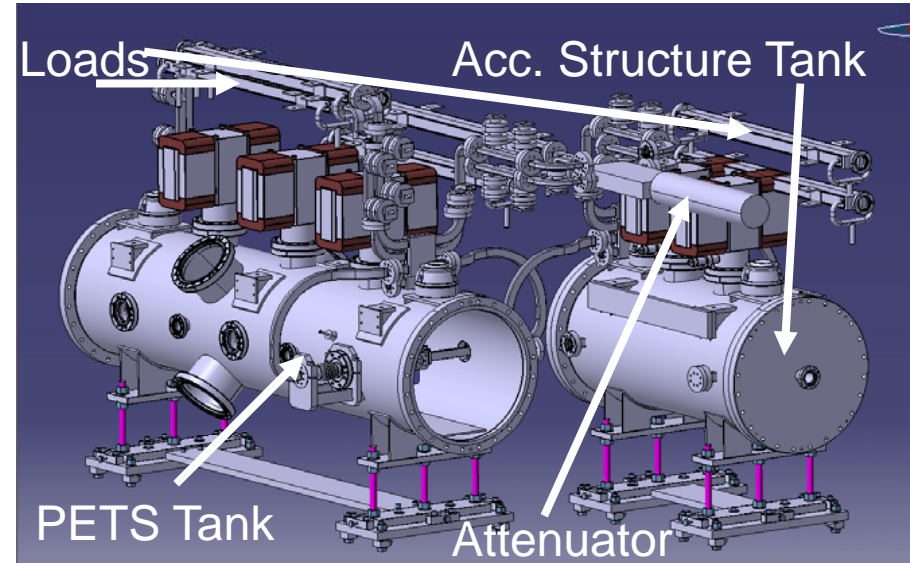
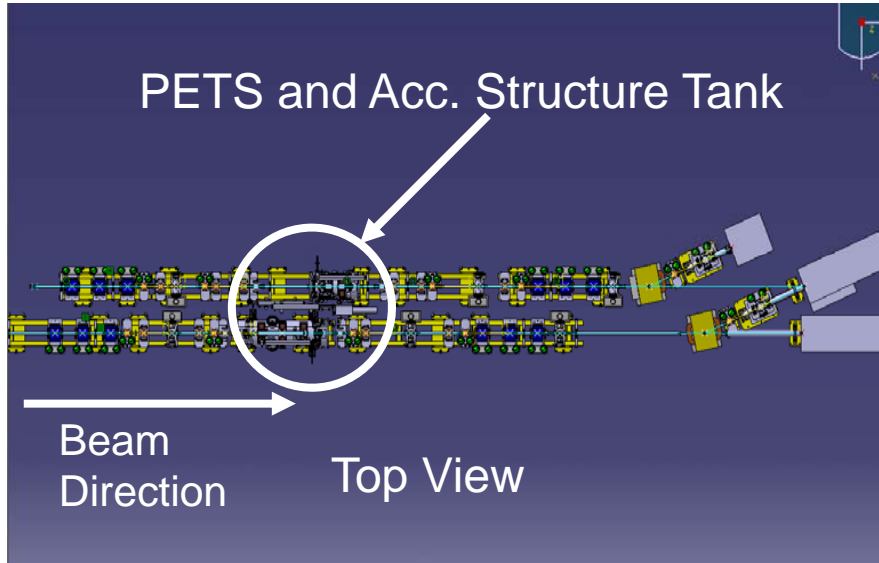
Main Tasks

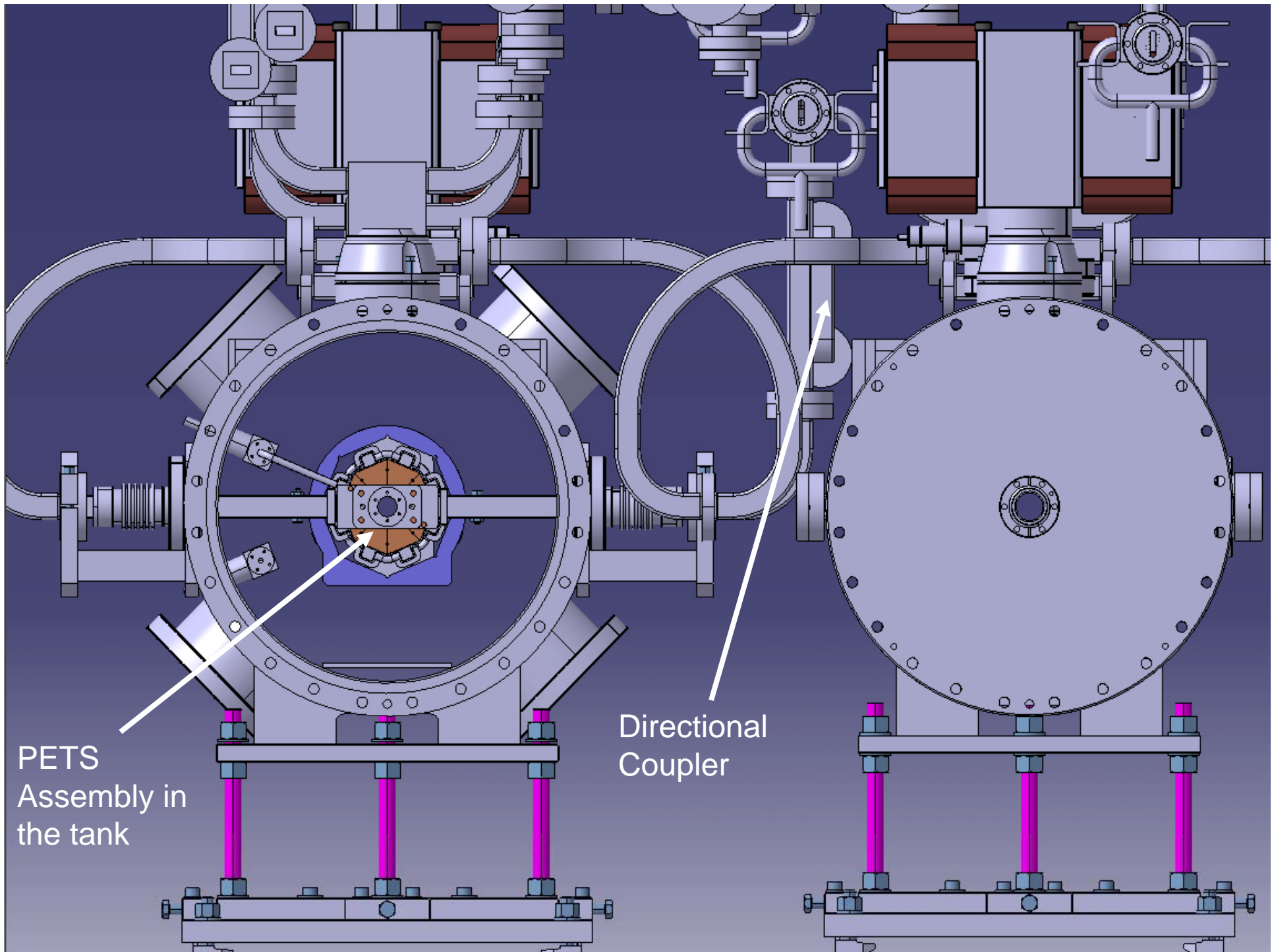
- Fabrication of the structures
- Layout design suiting best RF performance.
- PETS assembly within +/-15 microns
- Construction of External PETS assembly stand
- Construction of Internal PETS assembly stand
- Construction of tank with a base plate welded inside
- Design and construction of PETS On-Off Mechanism.
- Design and construction of an under slung crane to handle the equipment of 2BTS module.

Phases of Layout

- Phase 1: PETS and loads (no accelerating structures) → mid 2008
- Phase 2: PETS and one accelerating structure → end 2008
- Phase 3: PETS and a series of accelerating structure (towards clic module) → 2009

Layout



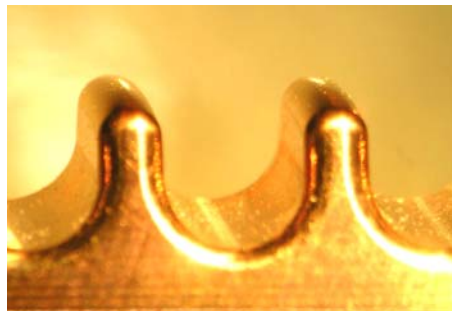


PETS
Assembly in
the tank

Directional
Coupler

PETS

In its final configuration, PETS comprises eight octants separated by the damping slots.
Each of the slots is equipped with HOM damping loads.



Sample (200 mm) successfully fabricated.

Next step: fabrication of a 1 m bar

PETS Assembly

PETS assembly is to be done in two stages.

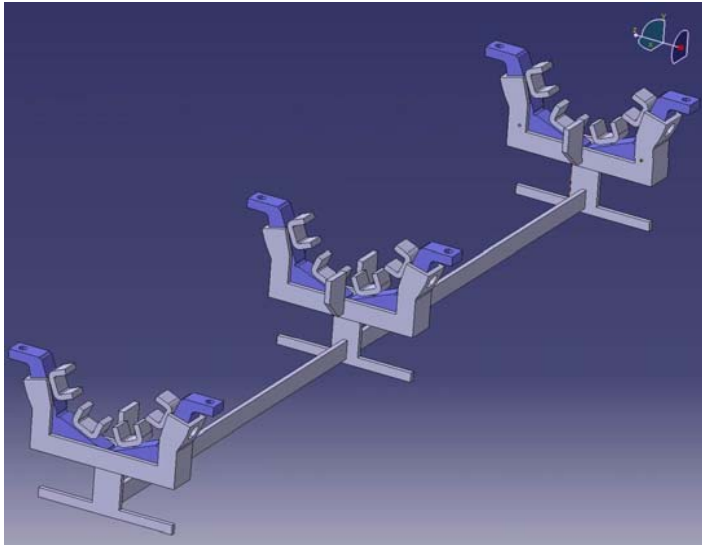
Stage-1

In stage one PETS are to be assembled on the external assembling support stand along with cooling circuit. The PETS are to be assembled in +/-15 microns.

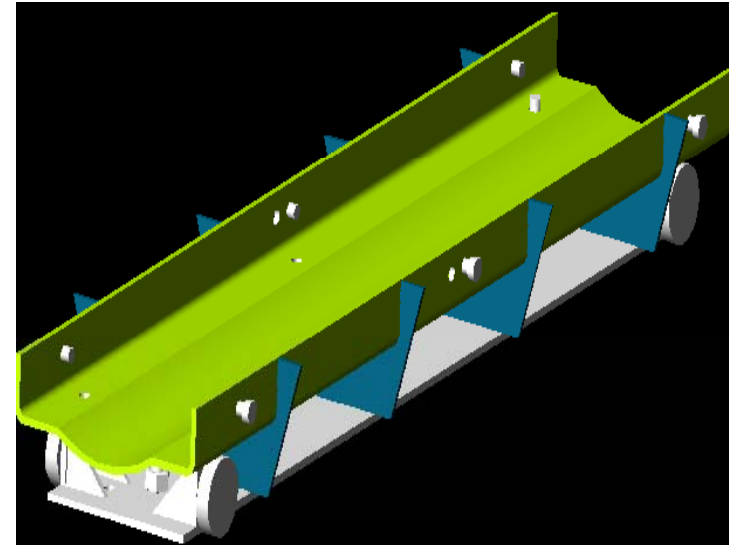
Stage-2

In this stage the PETS assembly is to be assembled on the internal support and then the whole structure is to be rolled inside the tank by 04 Nos. of bearings present at the 04 corners.

External and Internal Supports

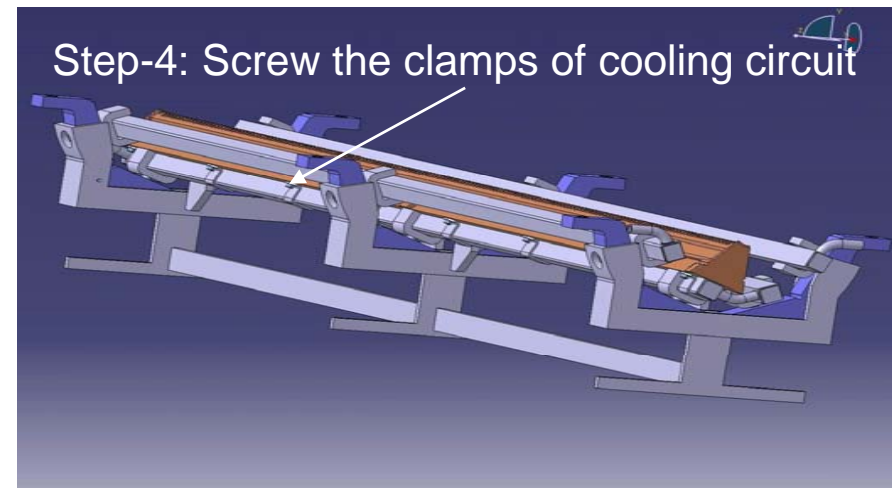
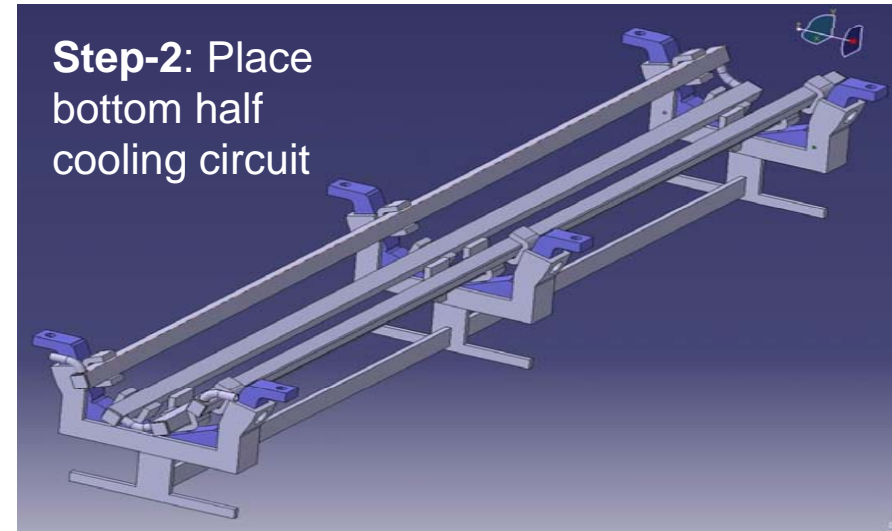
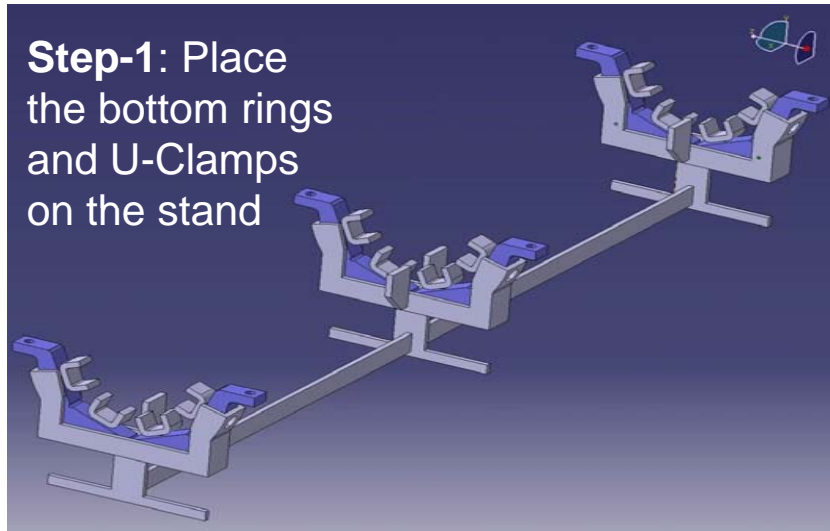


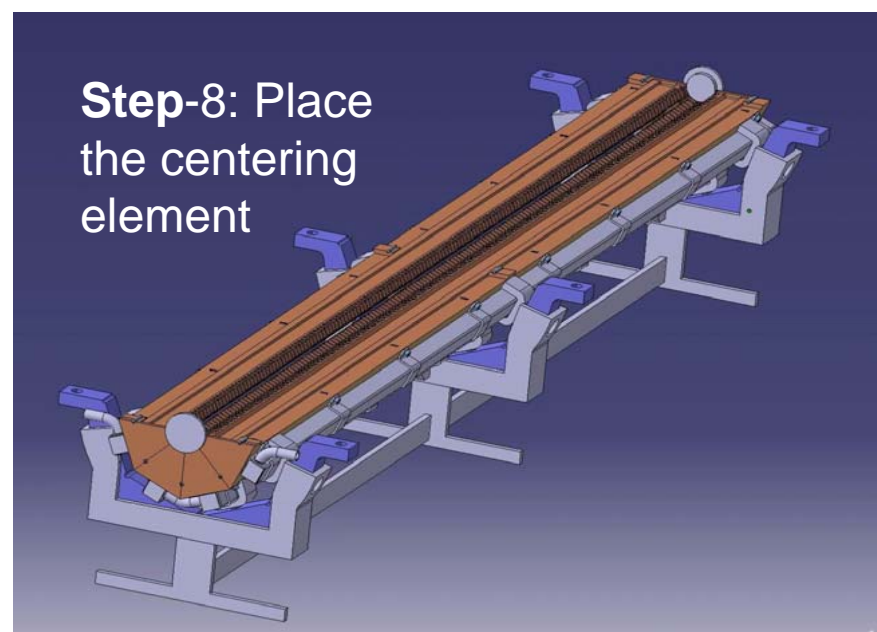
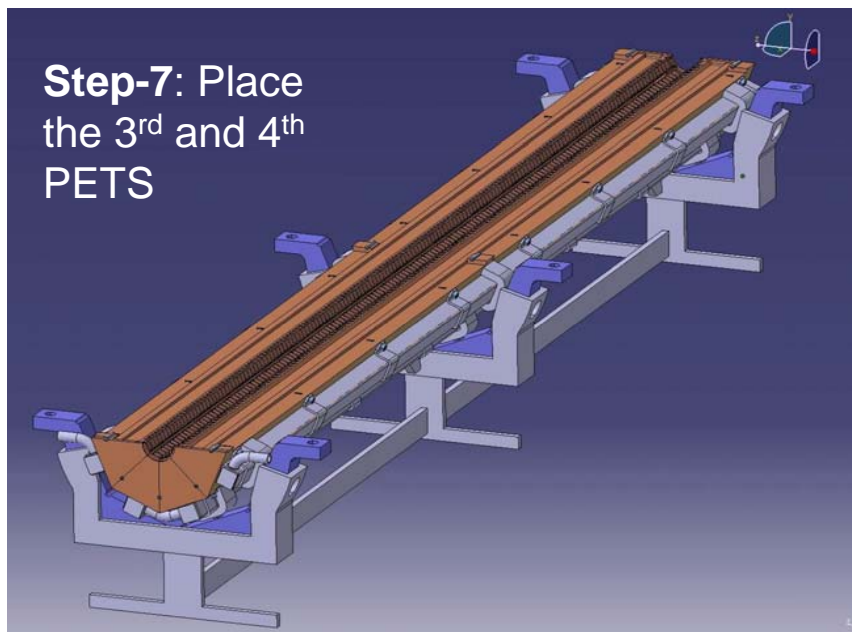
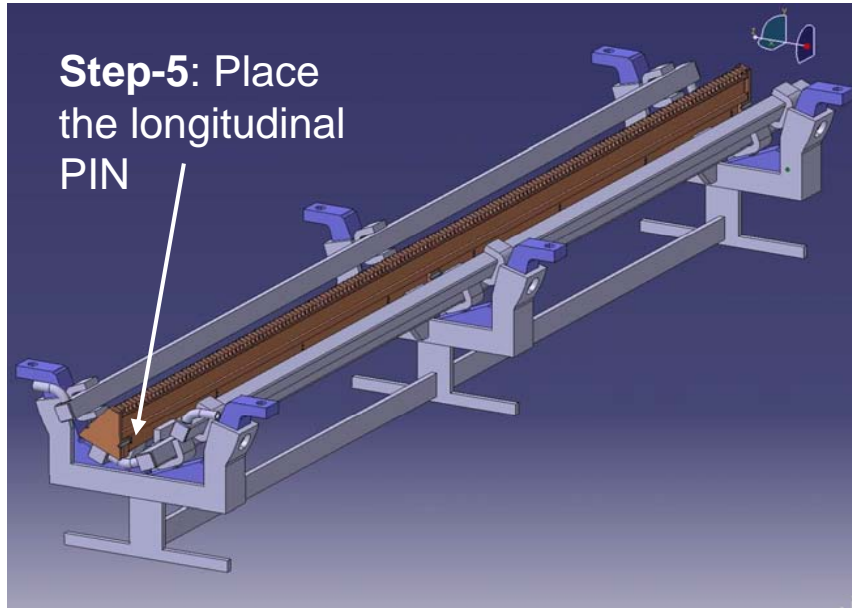
External PETS assembly support (temporary)



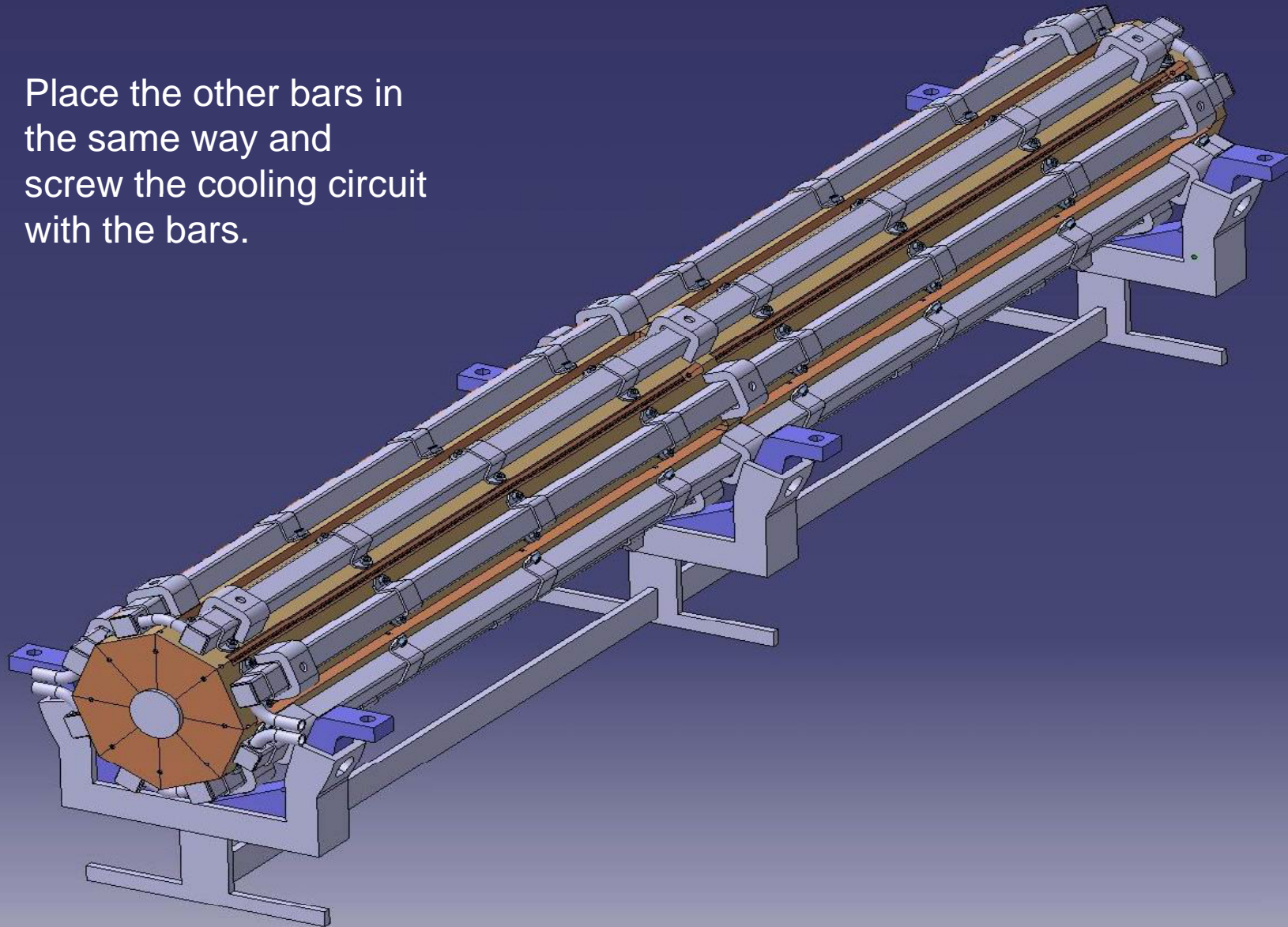
Internal PETS assembly support (permanent in the tank)

External Assembling of PETS





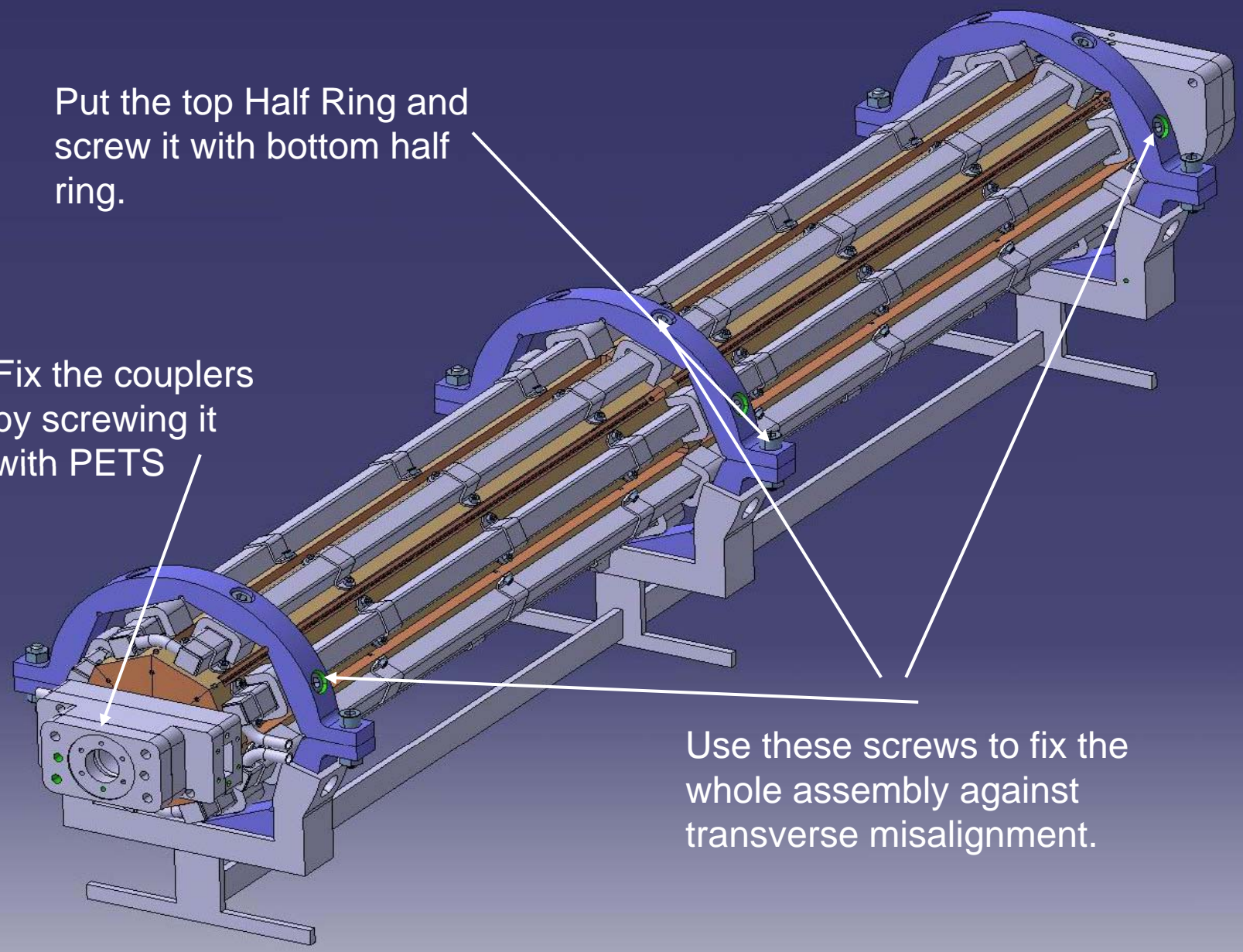
Place the other bars in the same way and screw the cooling circuit with the bars.



Put the top Half Ring and screw it with bottom half ring.

Fix the couplers by screwing it with PETS

Use these screws to fix the whole assembly against transverse misalignment.

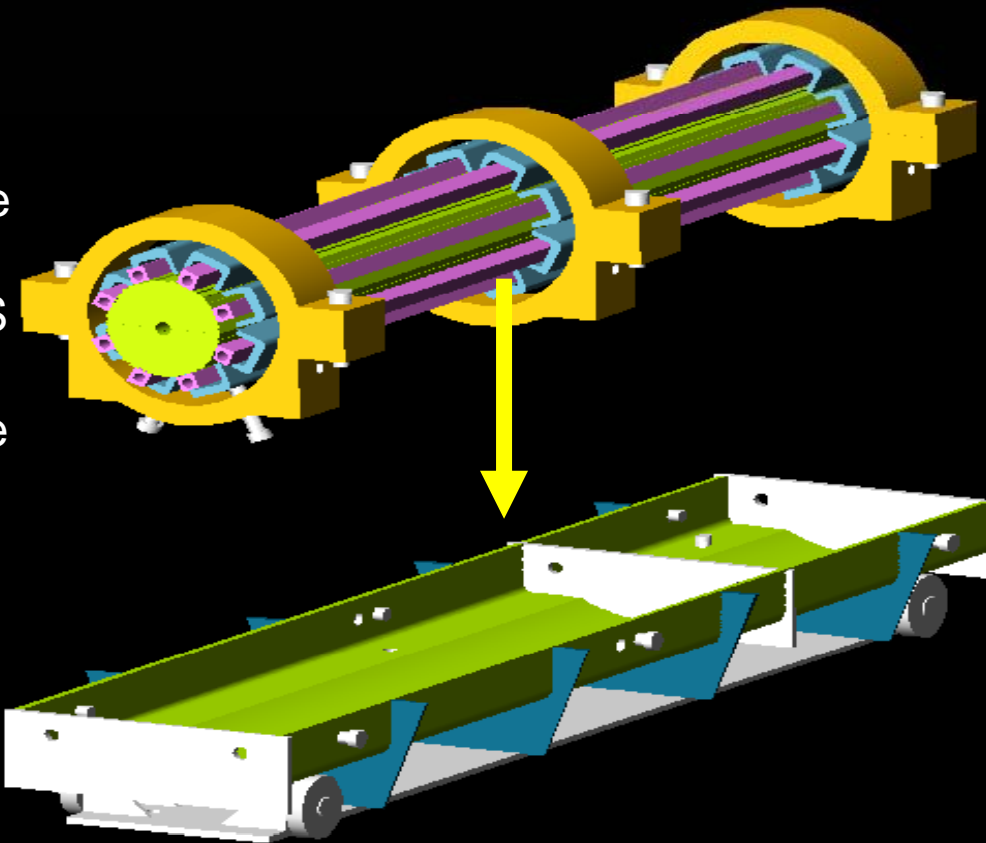


PETS assembly on Internal Support

Step-1

STEP-1

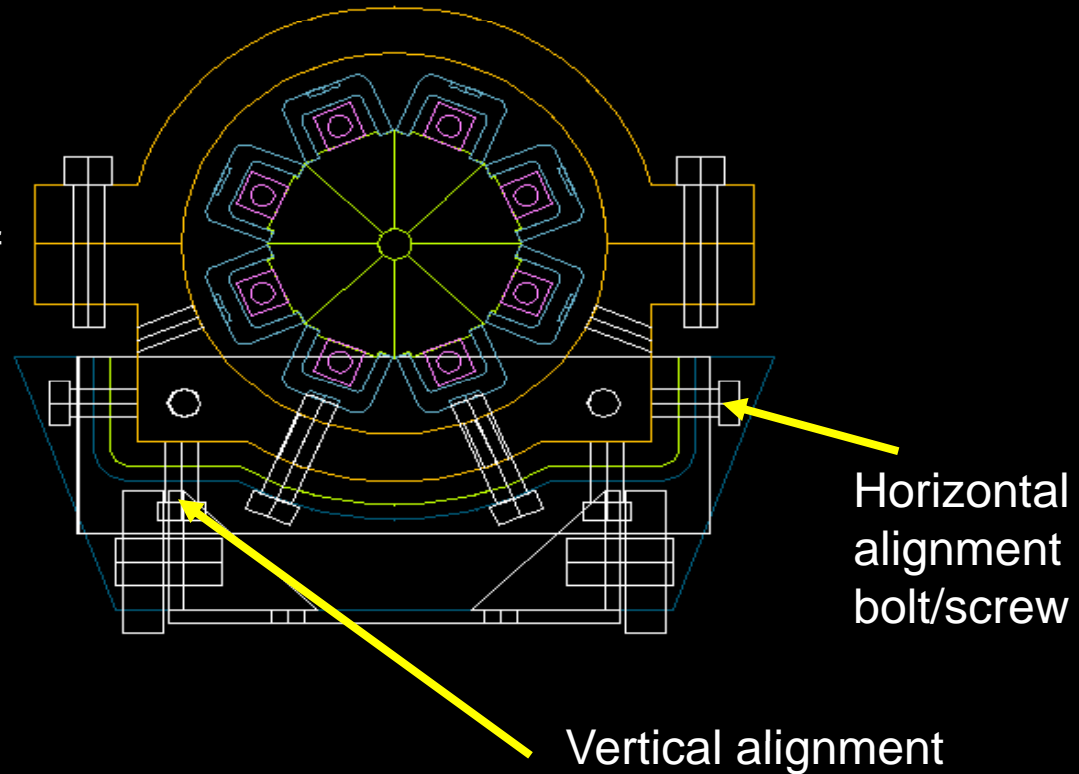
When the assembly of the PETS is done place the PETS assembly vertically on the support as in the figure.



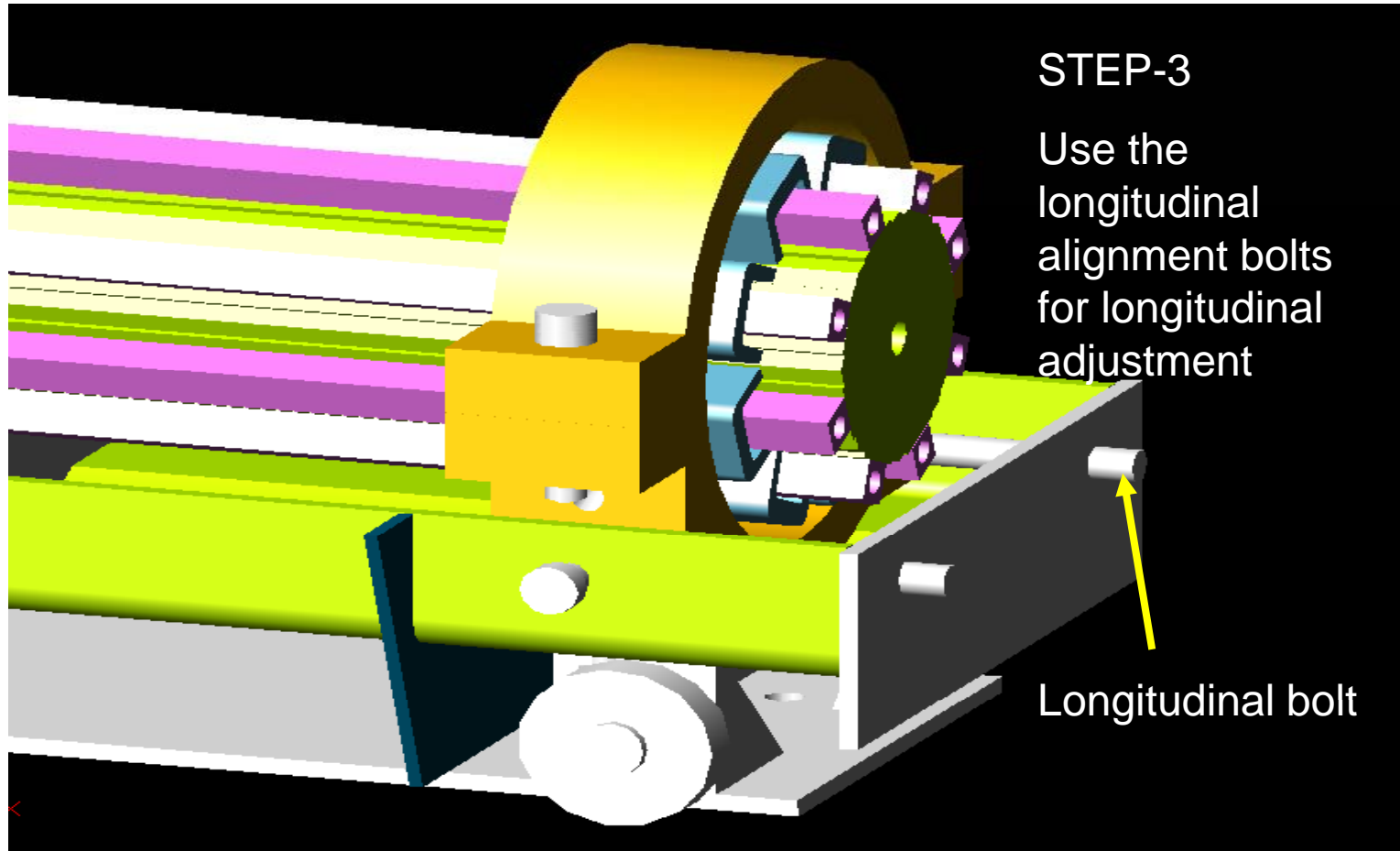
Step-2

STEP-2

When placed on the adjustment bolts, then check if it is properly placed, if not then use the adjusting bolts for the alignment, for the horizontal and vertical alignment as well.

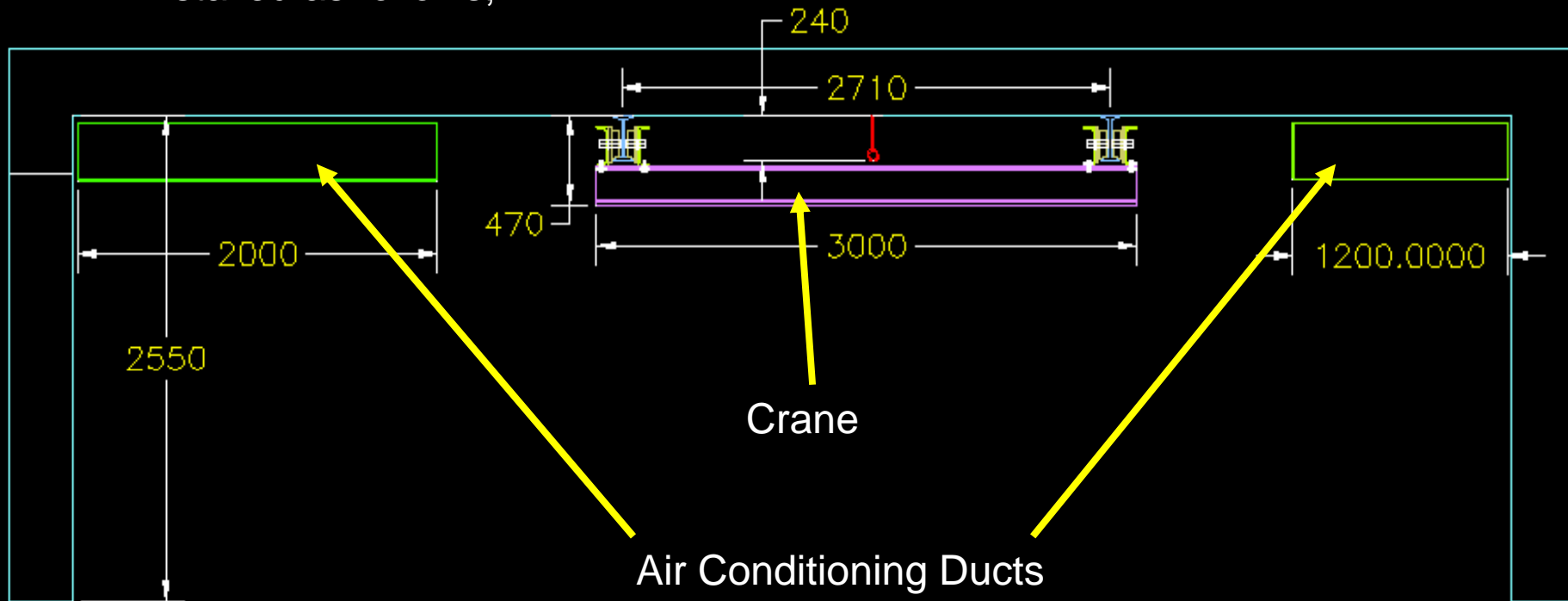


Step-3



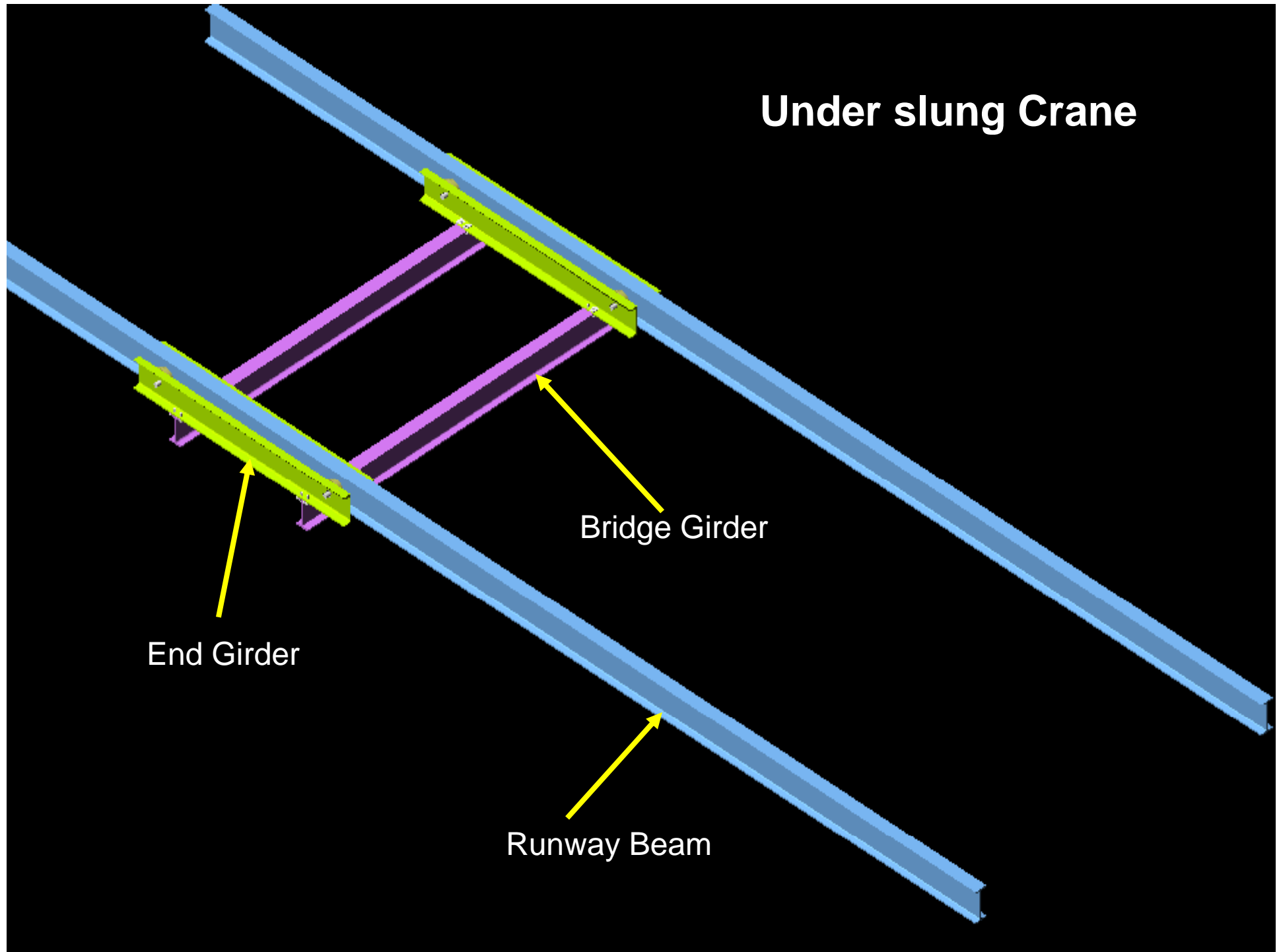
Under Slung Crane

An under slung crane is required in the building where 2BTS is to be installed as follows;



Cross-Section View

Under slung Crane

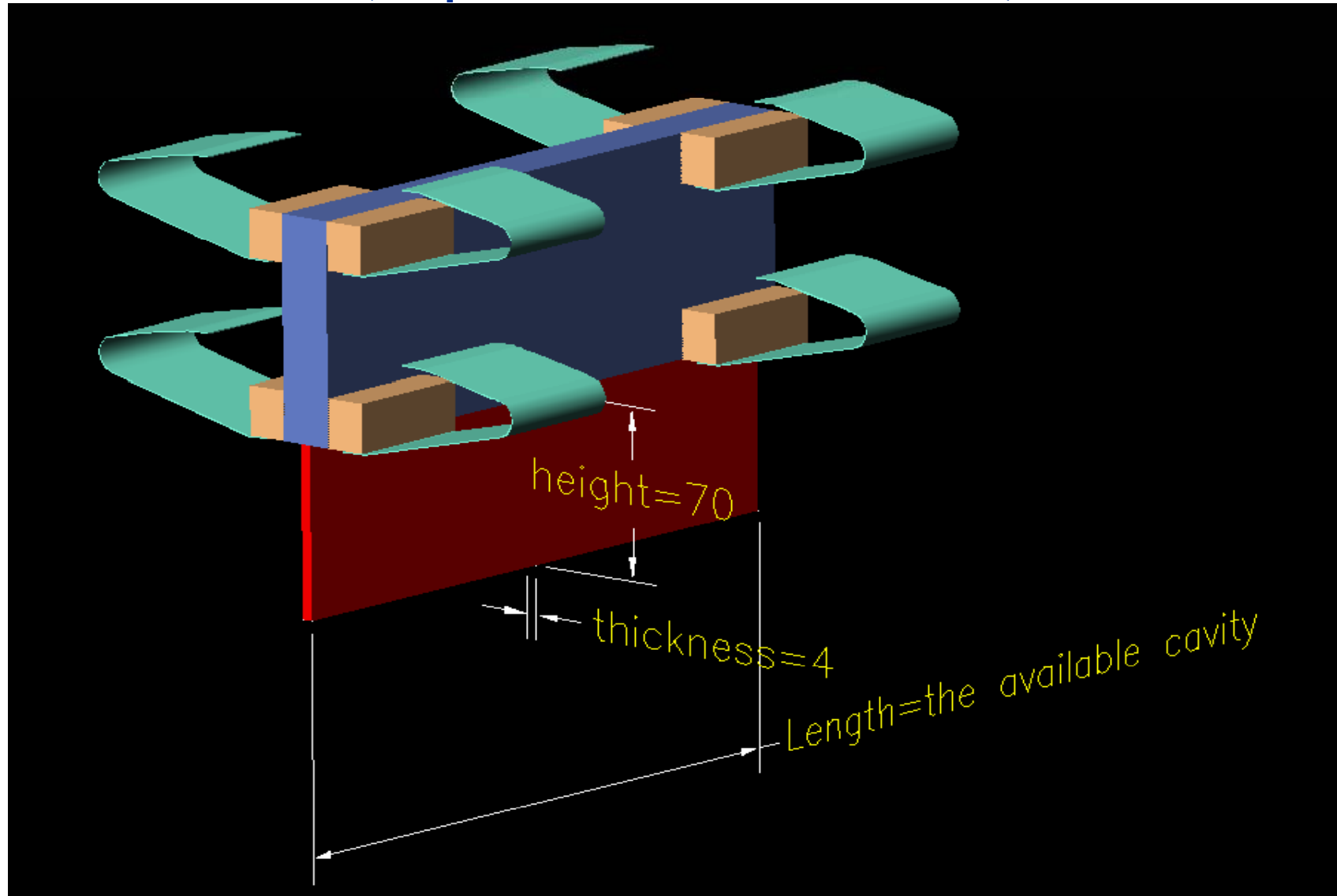


End Girder

Bridge Girder

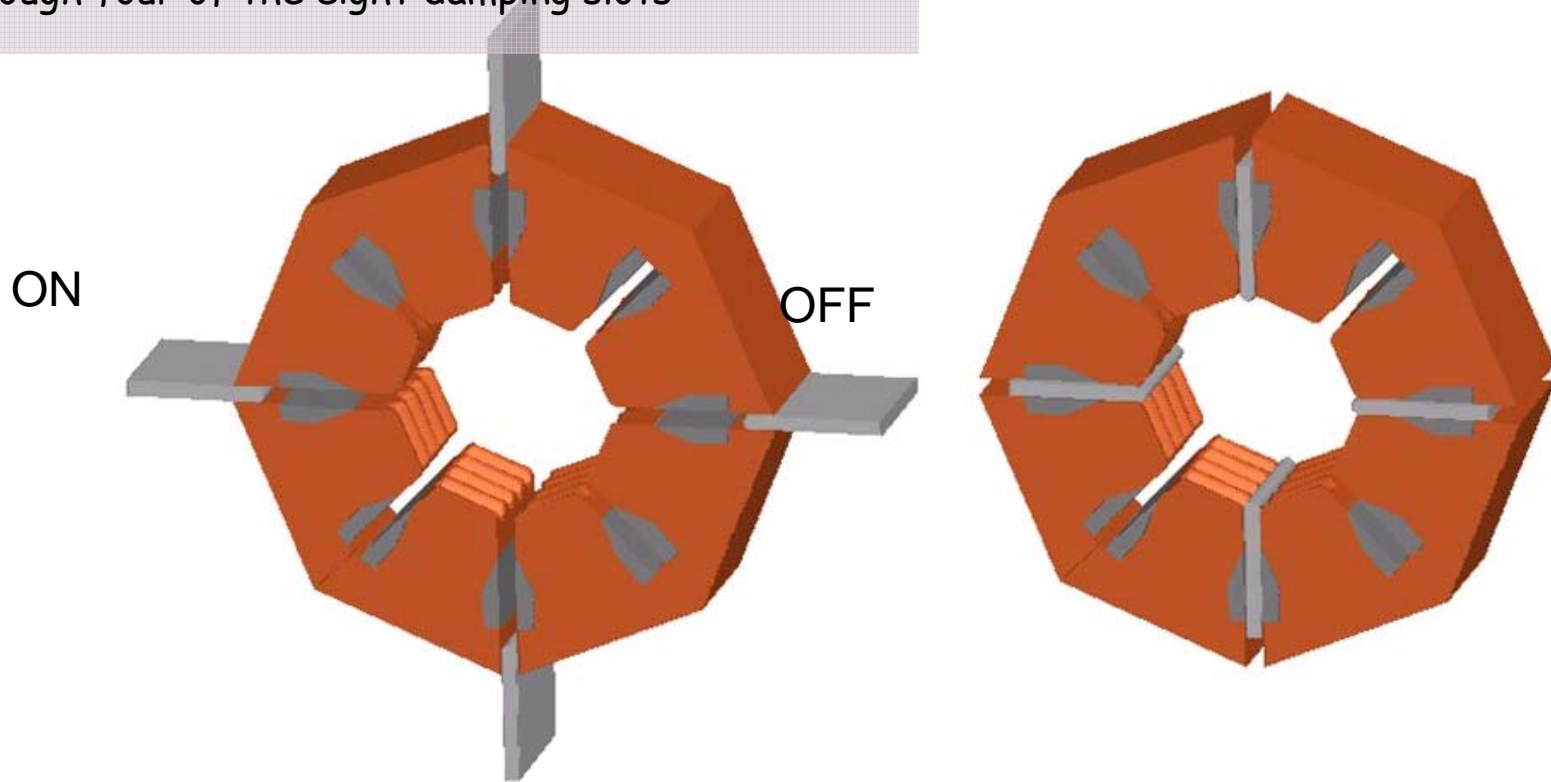
Runway Beam

On-Off Mechanism of PETS (a possible solution)

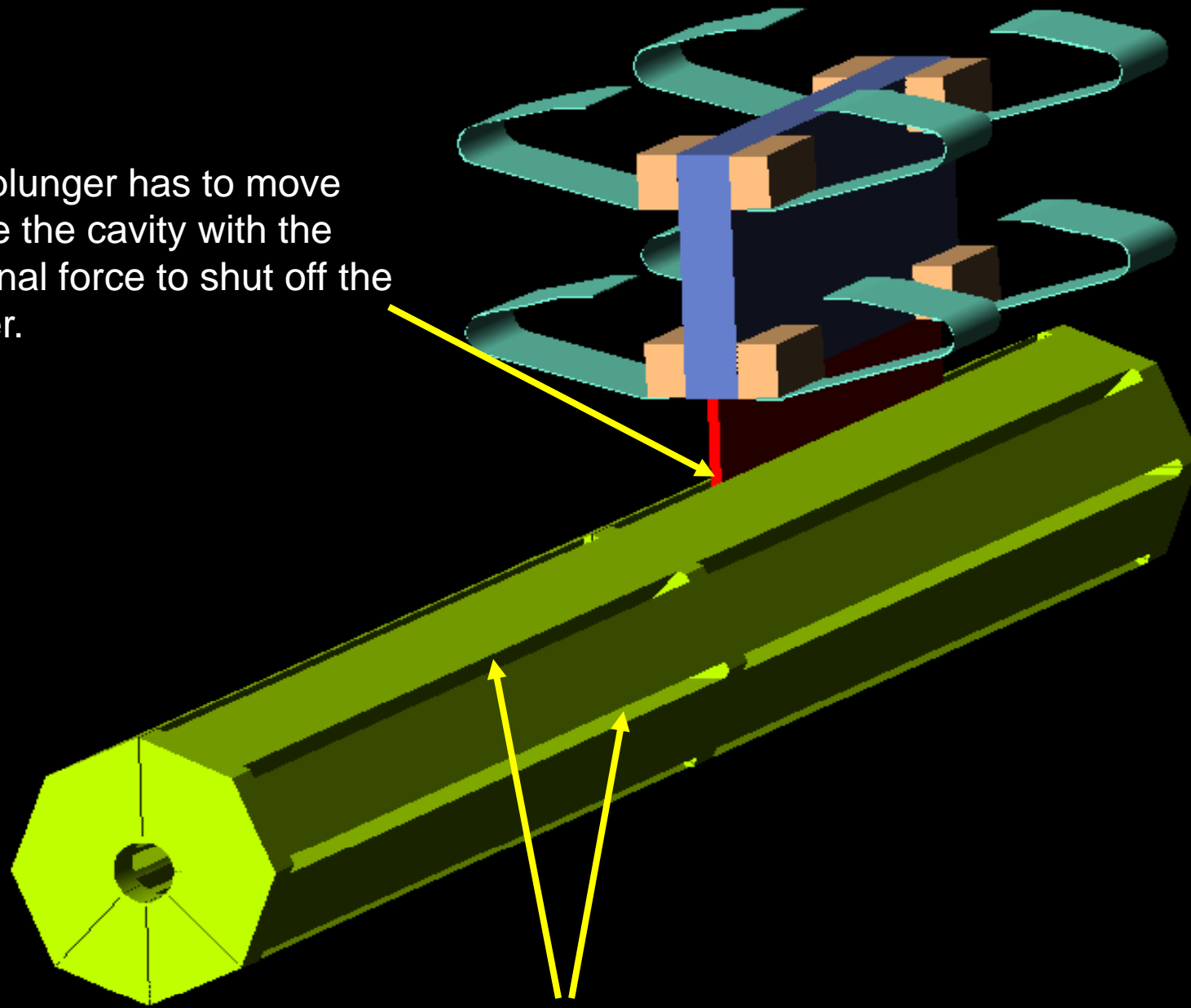


PETS On-off mechanism

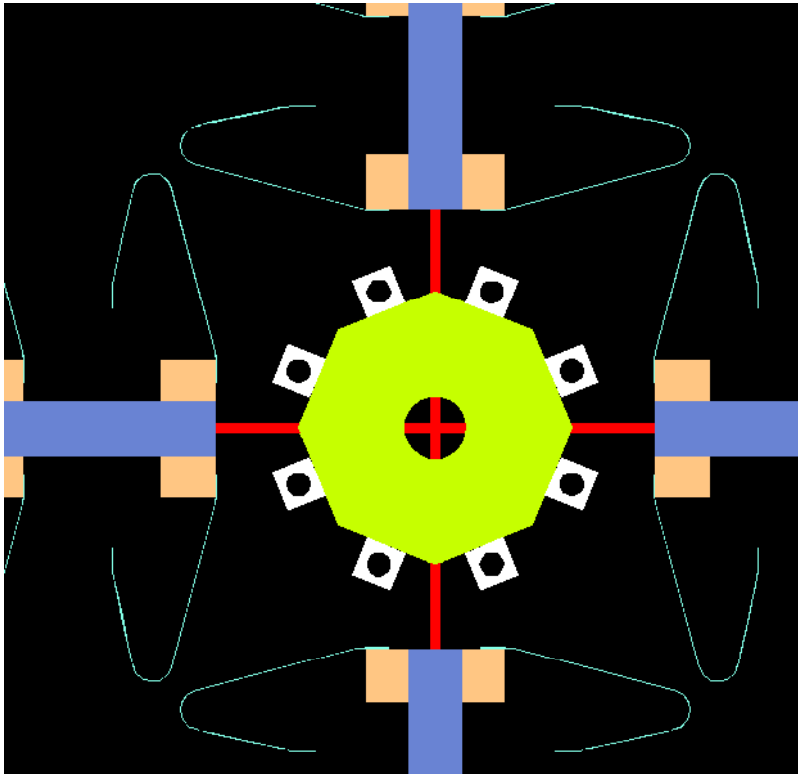
During machine operation, it will be necessary to locally turn the RF power production OFF when either PETS or an accelerating structure fails due to breakdown. We have found that power production can be terminated by inserting four thin wedges through four of the eight damping slots



The plunger has to move inside the cavity with the external force to shut off the power.

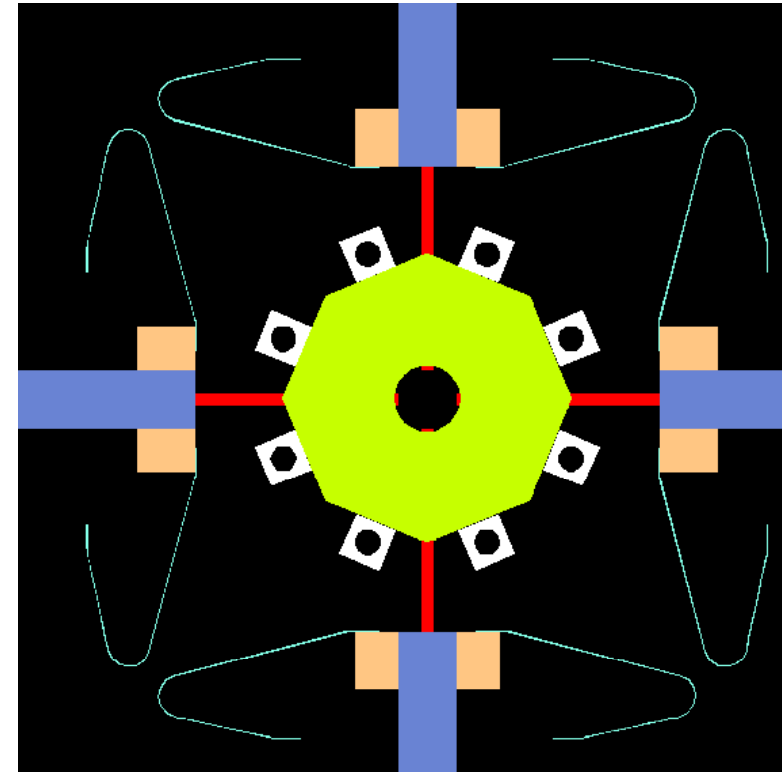


Cavity along the PETS



The power gets off when all the 8 Nos. of plungers move inside the circular longitudinal cavity as shown above.

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When the power is on, all the 8 Nos. of plungers are in the transverse cavities but don't interfere with the circular longitudinal cavity as shown above.

Static Structural

Time: 1. s

10/9/2007 9:40 PM

A Fixed Support

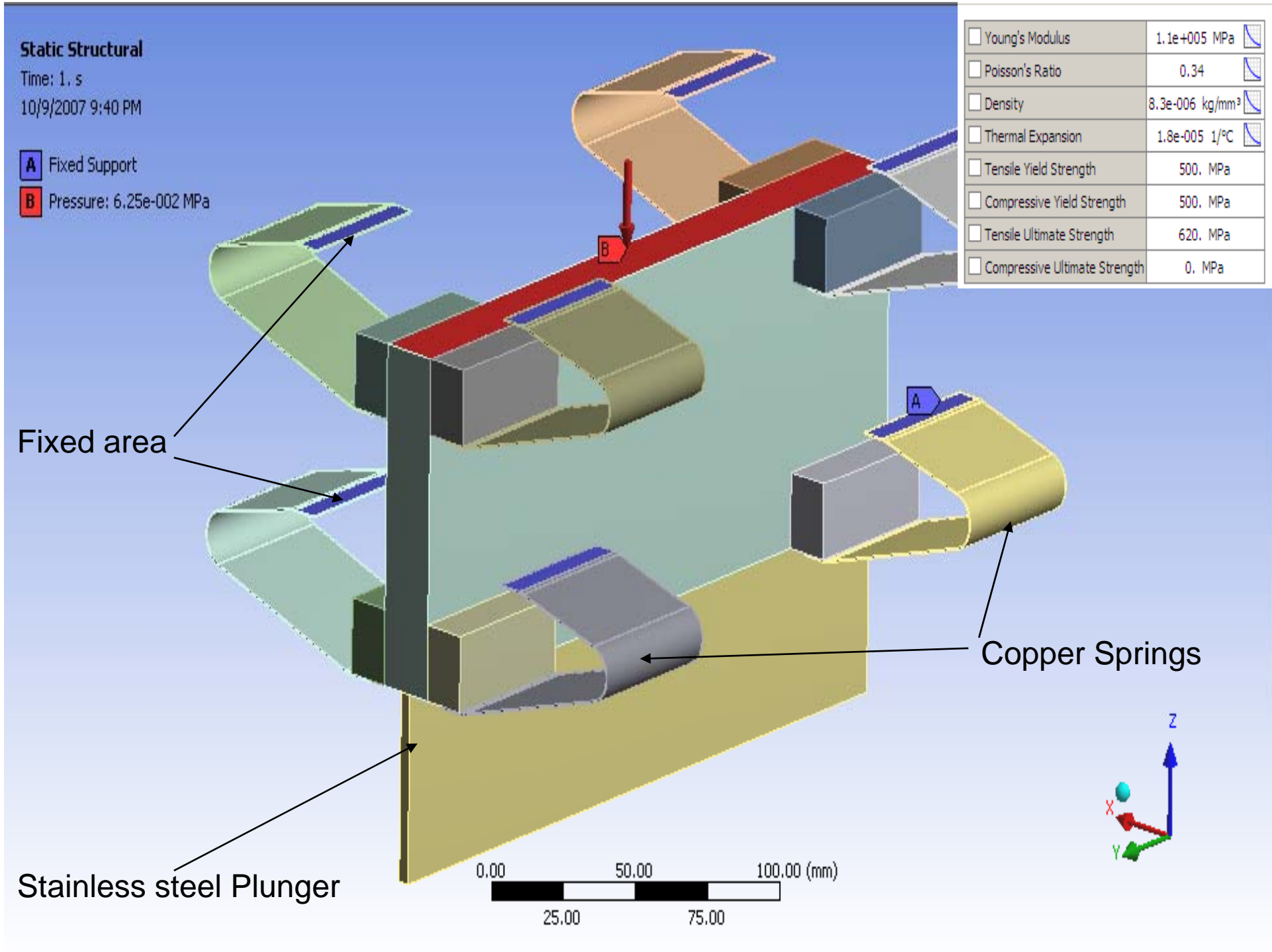
B Pressure: 6.25e-002 MPa

<input type="checkbox"/> Young's Modulus	1.1e+005 MPa	
<input type="checkbox"/> Poisson's Ratio	0.34	
<input type="checkbox"/> Density	8.3e-006 kg/mm³	
<input type="checkbox"/> Thermal Expansion	1.8e-005 1/°C	
<input type="checkbox"/> Tensile Yield Strength	500. MPa	
<input type="checkbox"/> Compressive Yield Strength	500. MPa	
<input type="checkbox"/> Tensile Ultimate Strength	620. MPa	
<input type="checkbox"/> Compressive Ultimate Strength	0. MPa	

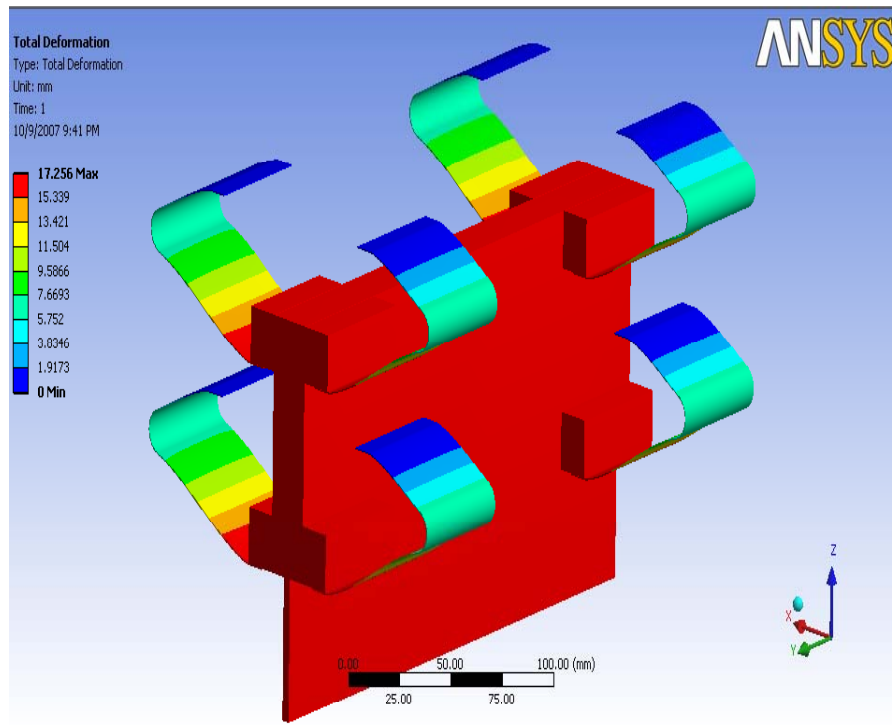
Fixed area

Stainless steel Plunger

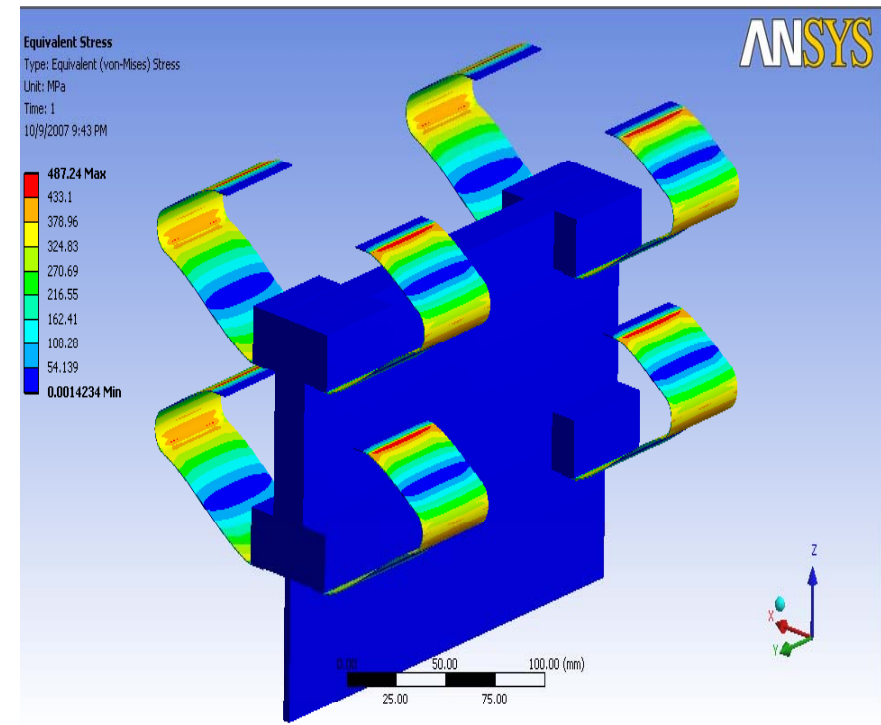
Copper Springs



Deflection results



Stresses results



Conclusions

- Progress on the test module in agreement with the schedule
 - PETS assembly strategy will be tested at the end of 2007
 - tank and components needed for phase 1 will be delivered to CERN in march 2007
- Main beam:
 - tank is under study
 - closer CLIC module configuration to be studied (alignment and stabilization features to be integrated)

CLIC module

