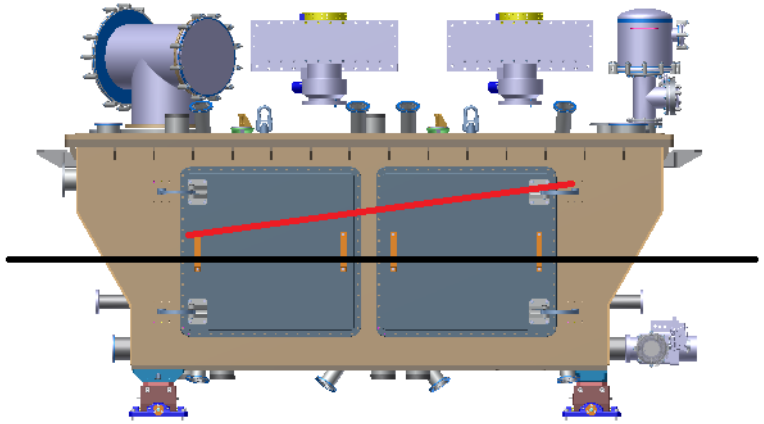
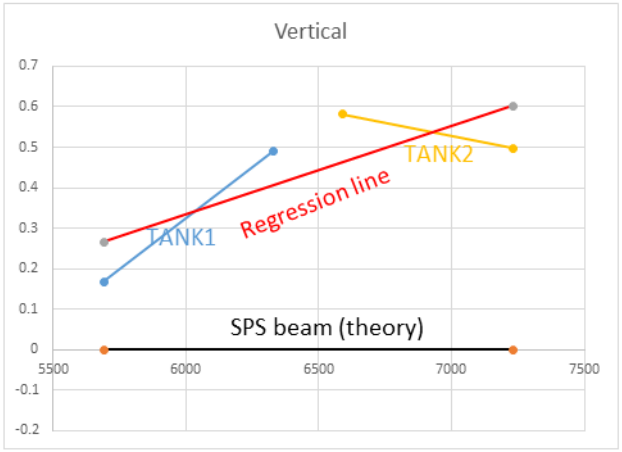
Alignment of the cryomodule

Report on the discussion 5th March 2018

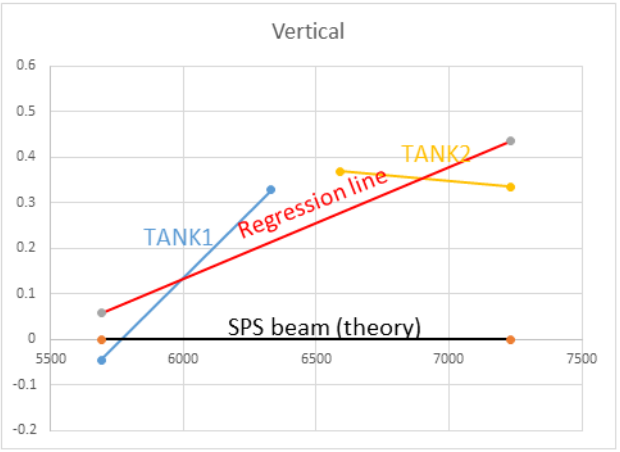
Cryomodule survey before cooldown

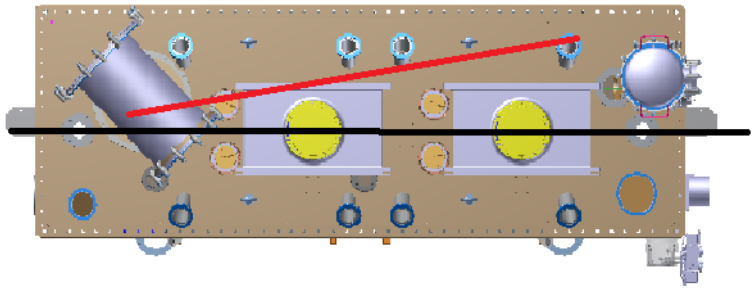


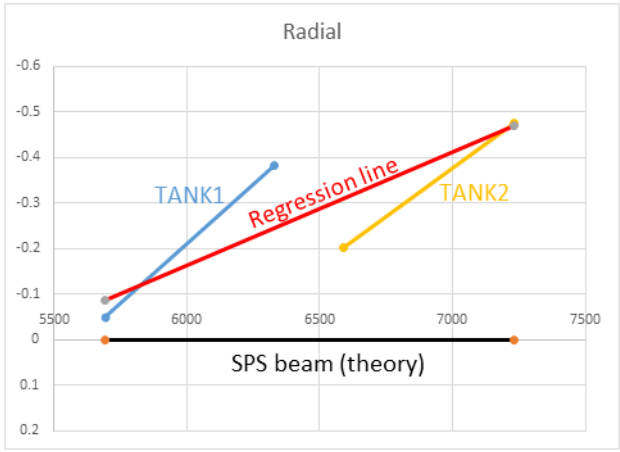
Including contraction corrections based on SM18 BUNKER measurements:



Including contraction corrections based on theoretical calculations:



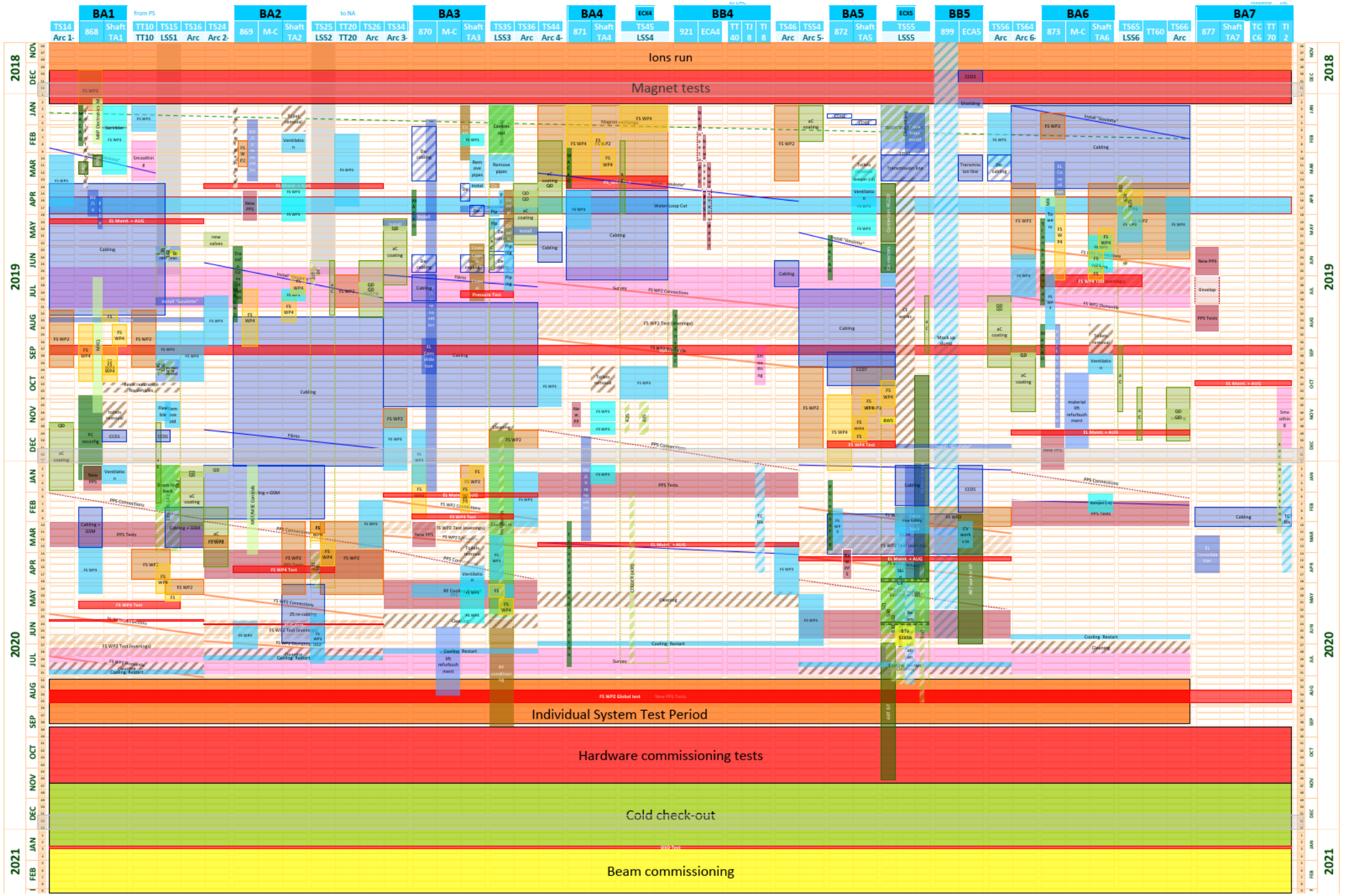




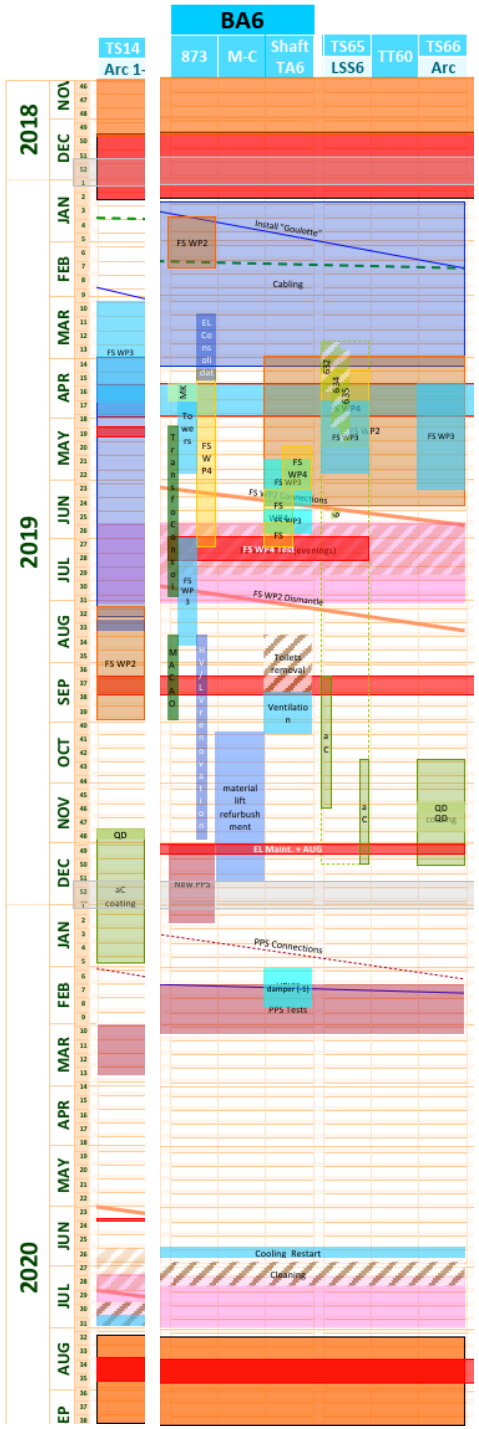
According to spec, max allowable misalignment should be within +/-250µm w.r.t. beam

- Insufficient data on effect of vacuum cycling
- No FSI observation during initial alignment
- Successive cycles on insulation vacuum

SPS General planning



SPS BA6 Planning



Cabling :

- momentarily displace table to give way behind the module (1 week)
- Then 3 weeks with cabling coactivity

Installation of Fire Safety systems:

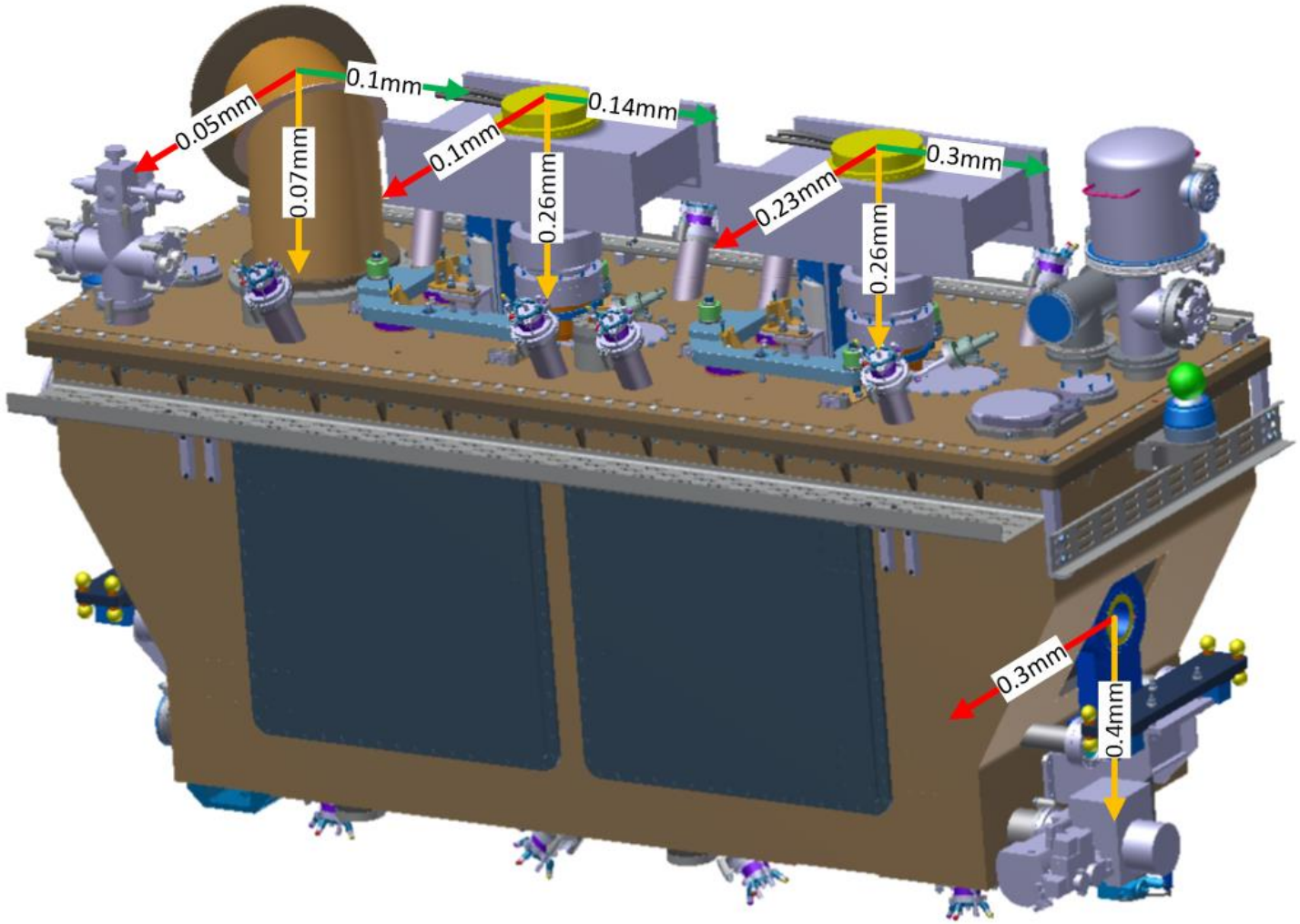
- Integration still to be confirmed

Cryogenics:

Remove Y-chamber, VB2 and flexibles	Feb-Apr 2019
Repair on surface	9 months
Re-install	from fall 2019 to winter 2020

Crab region rather free from heavy coactivity

Re-alignment movement



Downstream side of cryomodule

- lowered 400μm
- shifted radially toward corridor side by 300μm

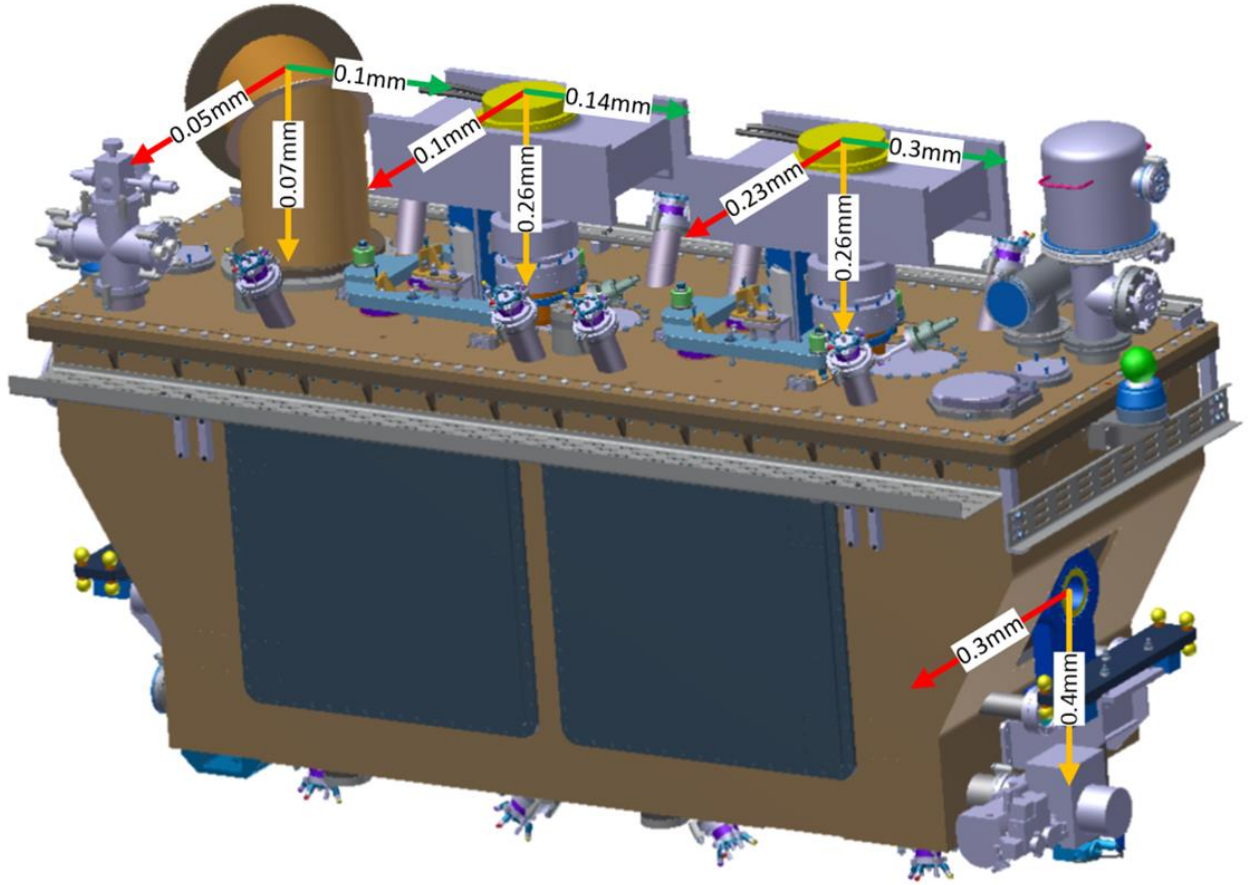
Re-alignment movement

Using **jack below the jumper as the pivot point**, we expect local shifts:

Jumper: 50μm in Radial, 70μm Vertical, 0.1mm in Longitudinal;
RF connection left: R0.1mm, V0.26mm, L0.14mm;
RF connection right: R0.23mm, V0.26mm, L0.3mm
Shifts only in radial-vertical directions – no expected twisting of vacuum bellows.

Shear expected:

- Cryogenics jumper
- RF bellows



Systems

SPS Beam:

Alignment is not required for taking beam, beam orbit (black line) shifted to go through the average center such that both cavities share the misalignment.

Vacuum:

no expected issue, but VSC should be present if we go for realignment

RF:

No problems expected for RF bellows, but moving them puts stress on the FPC window.
Proposed procedure: unbolt the waveguides from the CM, re-align, bolt them back.
Movement should remain 0.5 mm total, i.e. less than 0.2 mm per FPC, all axis.
With vacuum on the module, movement on FPCs is already 0.2-0.3 vertically, due to deformation of the top-plate, but waveguides can absorb 0.2+ 0.2mm