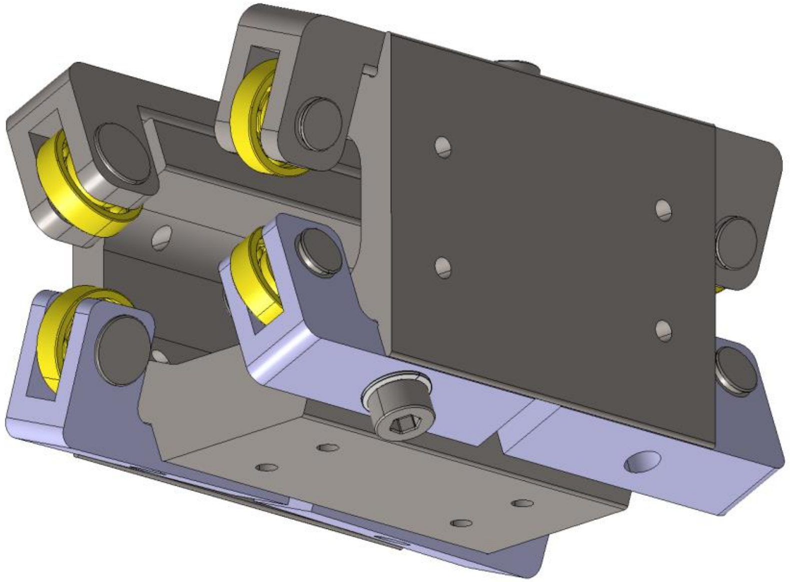
Linear wire scanner mechanics update

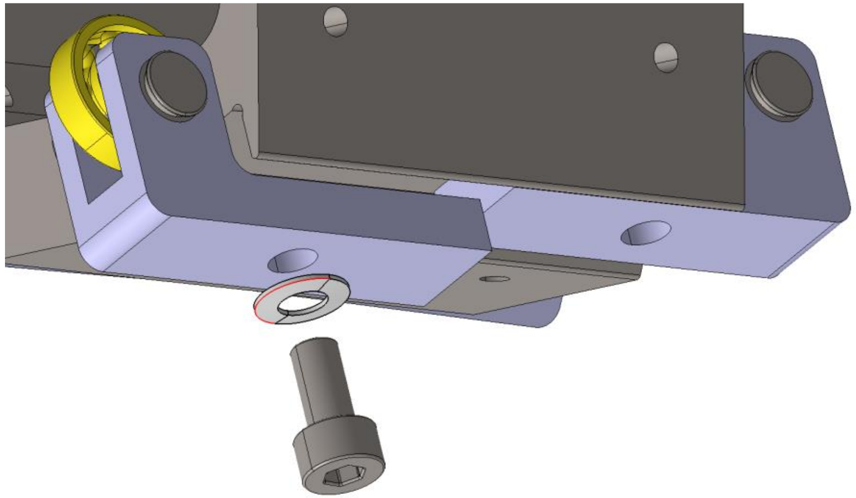
Project team meeting

14th October

Carriage improvements

1. 2nd iteration – for testing
   - **Working principal**
     - New solid arm pieces + disc springs allow the carriage to be preloaded to desired extent
     - Carriage is preloaded when positioned on the rail
     - Maximum deflection of springs is 0.6mm
     - Force to reach maximum deflection of each spring is 192 N
     - Total force required to max out and flatten springs is **384 N vs 30 N** force to yield on previous design
     - Horizontal force required to produce this magnitude reaction force = > 1 kN
     - Peak measured magnet attraction force = 150N @ 1mm gap
     - At this max force the springs will not yield, further movement is just stopped
     - Max attraction force on one side is
     - Springs should return then to original shape
     - Rail straightness is +-0.002mm – low preload can still be applied

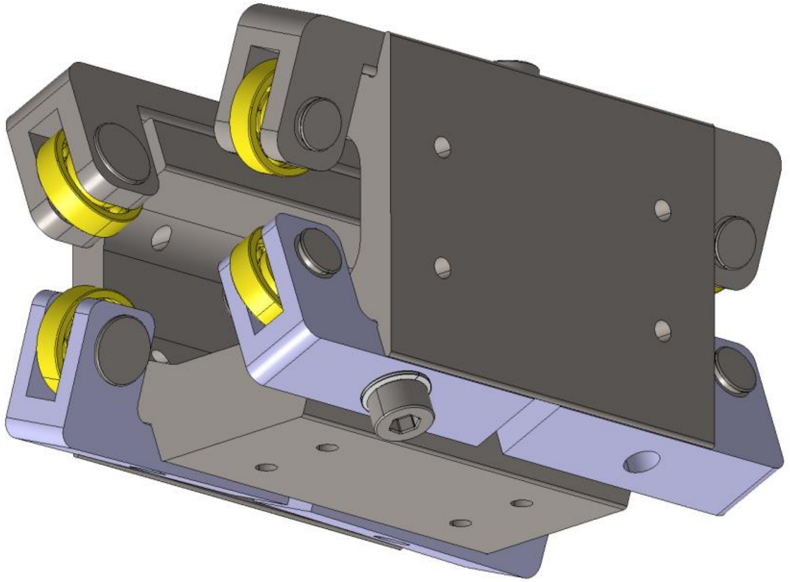


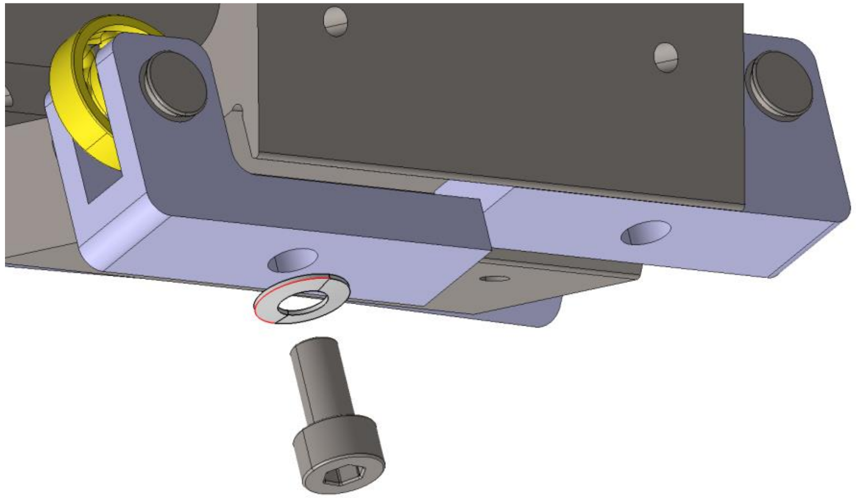


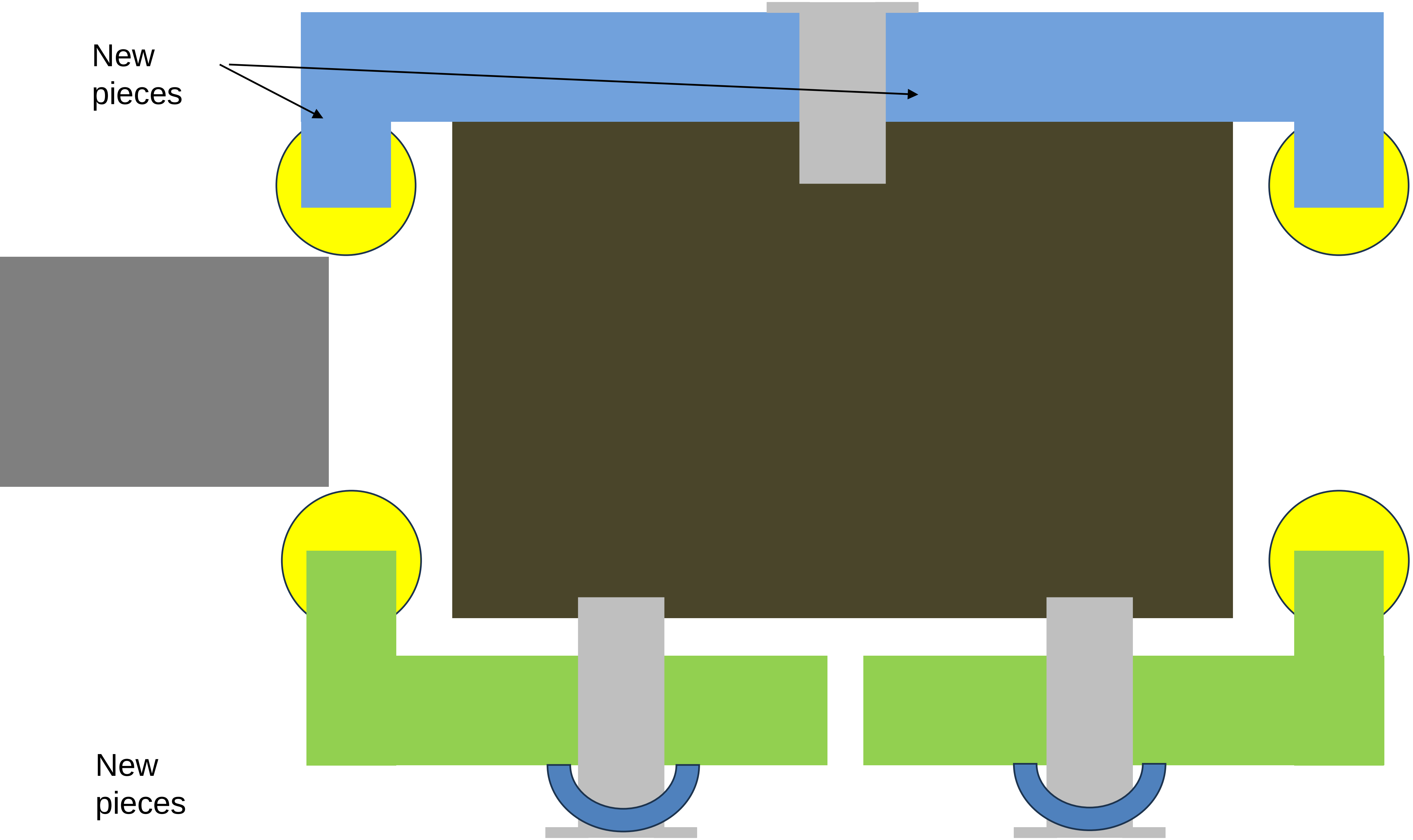
Carriage improvements

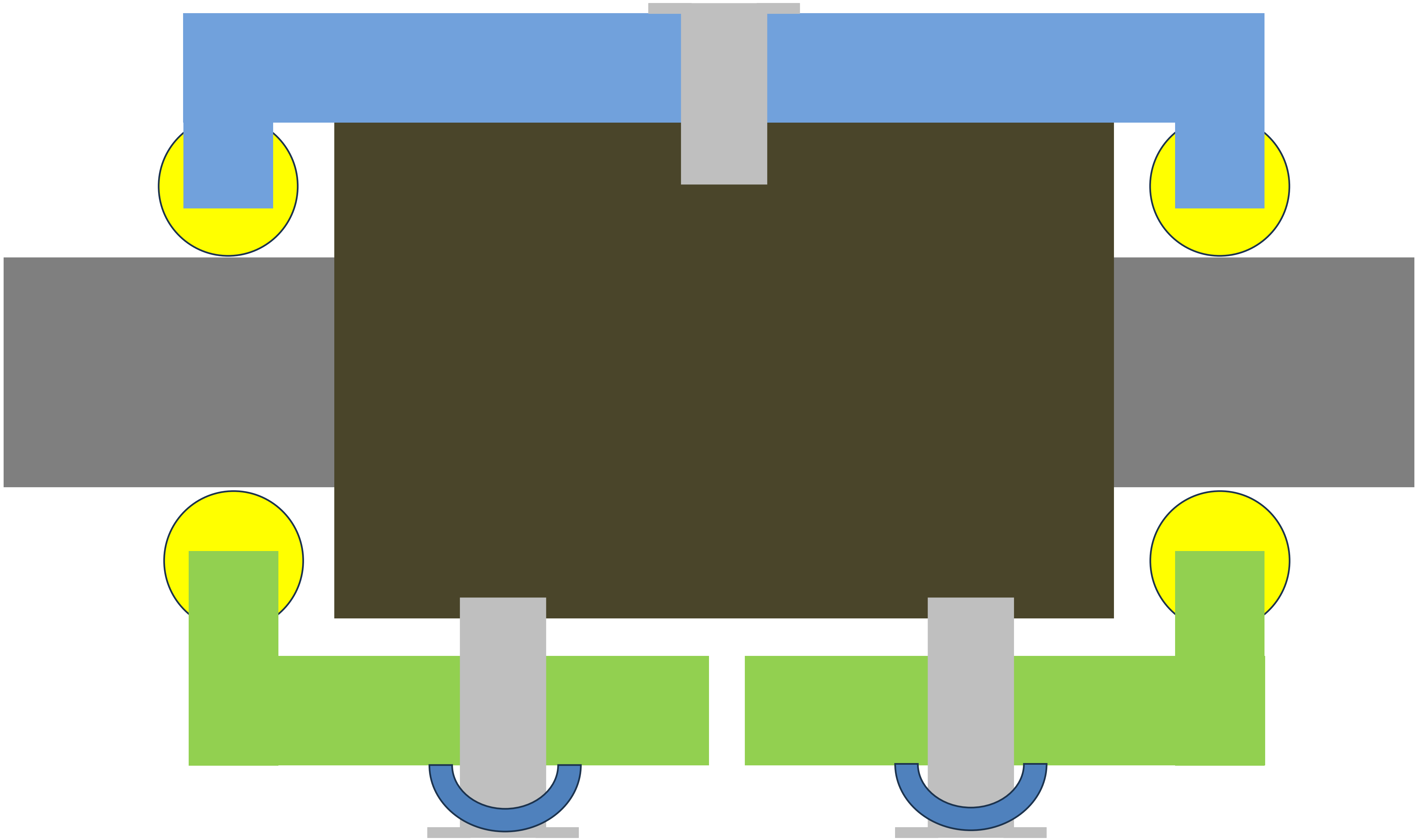
1. **2nd iteration – for testing**
   - **Required work**
     - Machine additional pieces shown in house – SS 316
     - Drill and tap 4x additional holes in center piece
     - Procure disc springs (Bossard) and new bearings (SMB Bearings - optional)
   - **Testing**
     - Estimate 2 weeks until assembly is complete ready for testing
     - Magnet coupling slack test can commence at reduced (stronger) magnet gap
     - Lifetime test can be run in this configuration to approve the bearings for +80k cycles

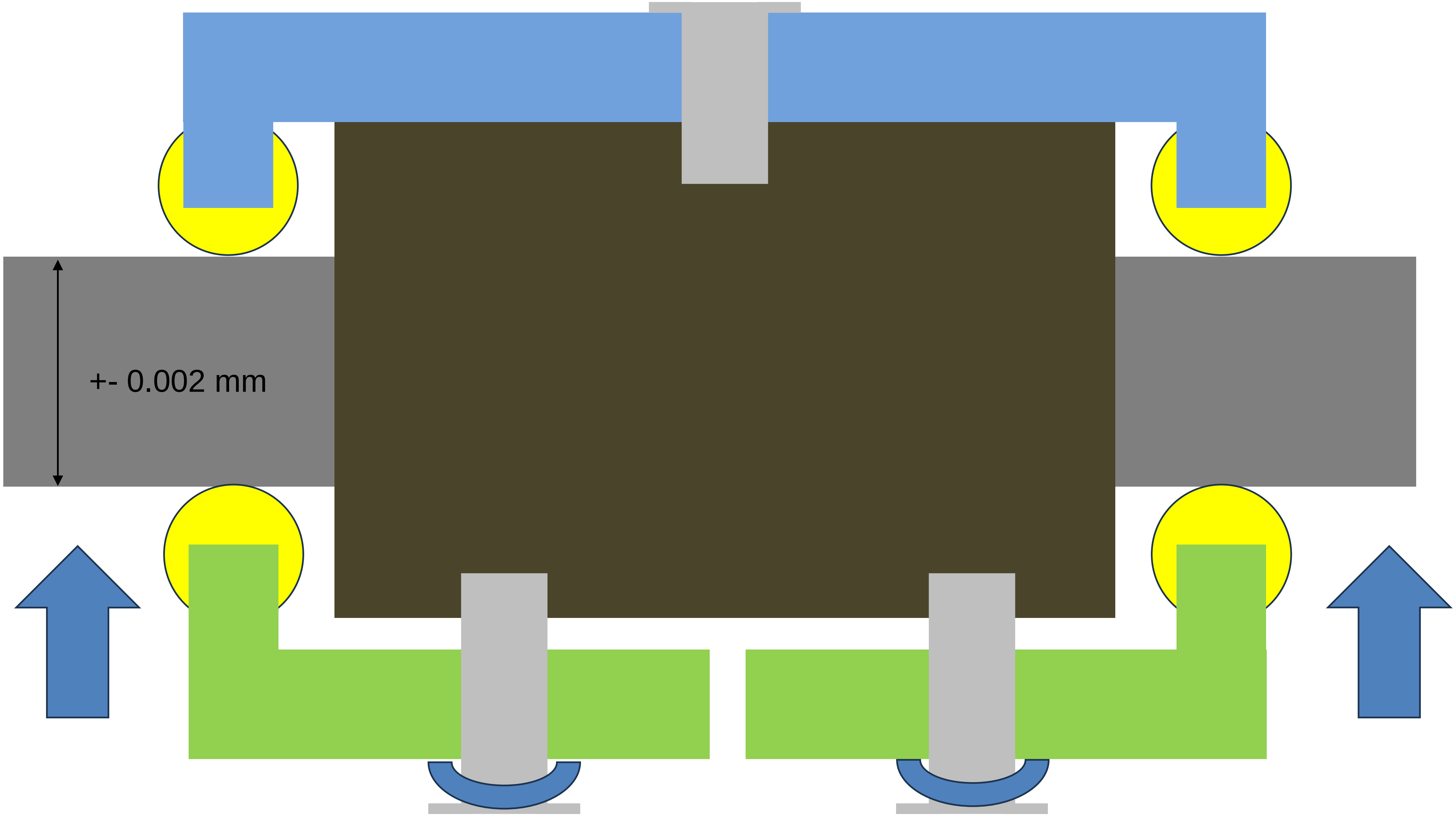
2. **Final iteration**
   - During testing final iteration can be designed - based for this configuration (if test is successful)
   - Optimised to worst case loading scenarios – e.g. vertical with moment load + peak acceleration
   - Decision required whether we then want to design/produce final iteration with them or in house

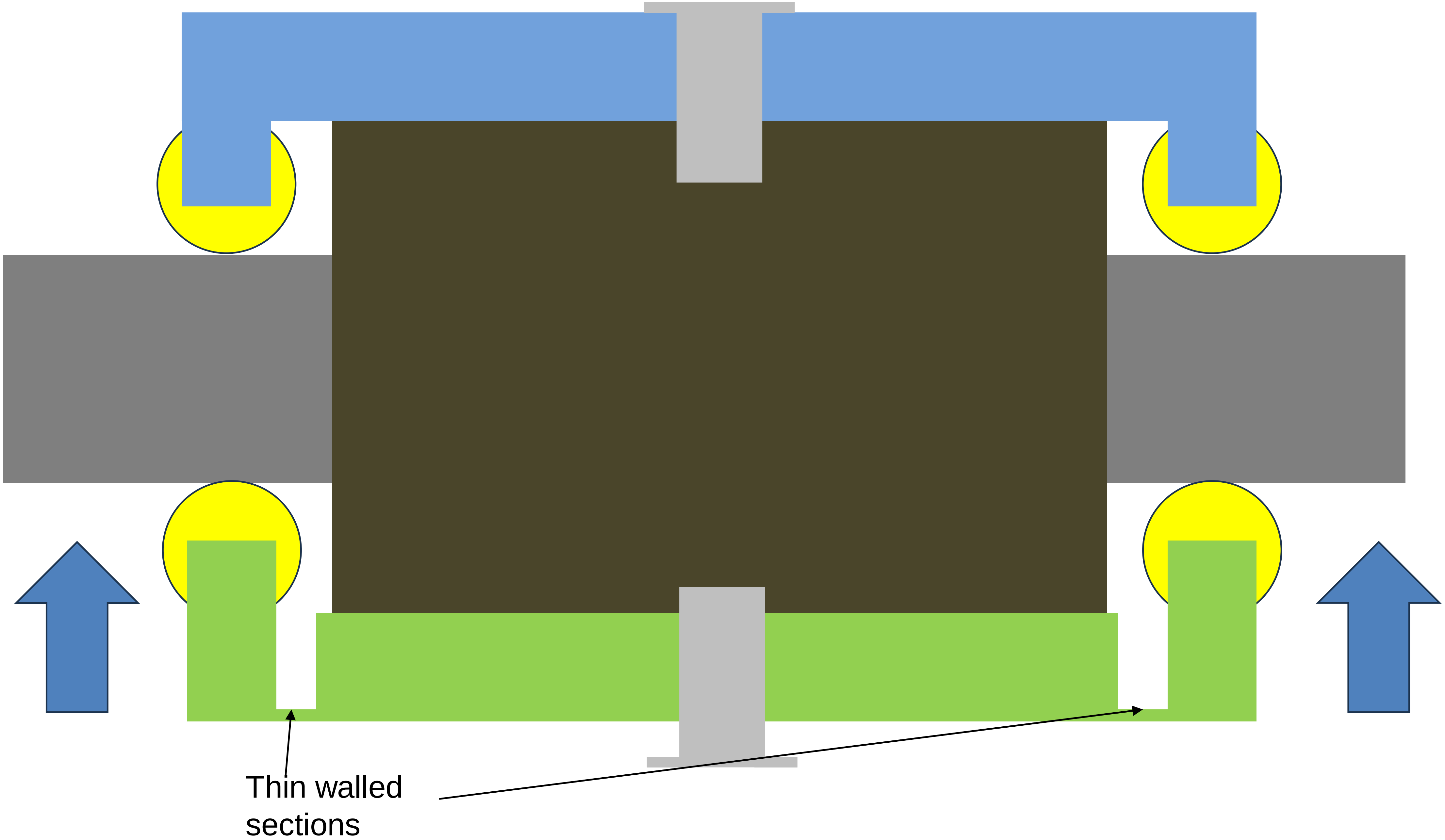




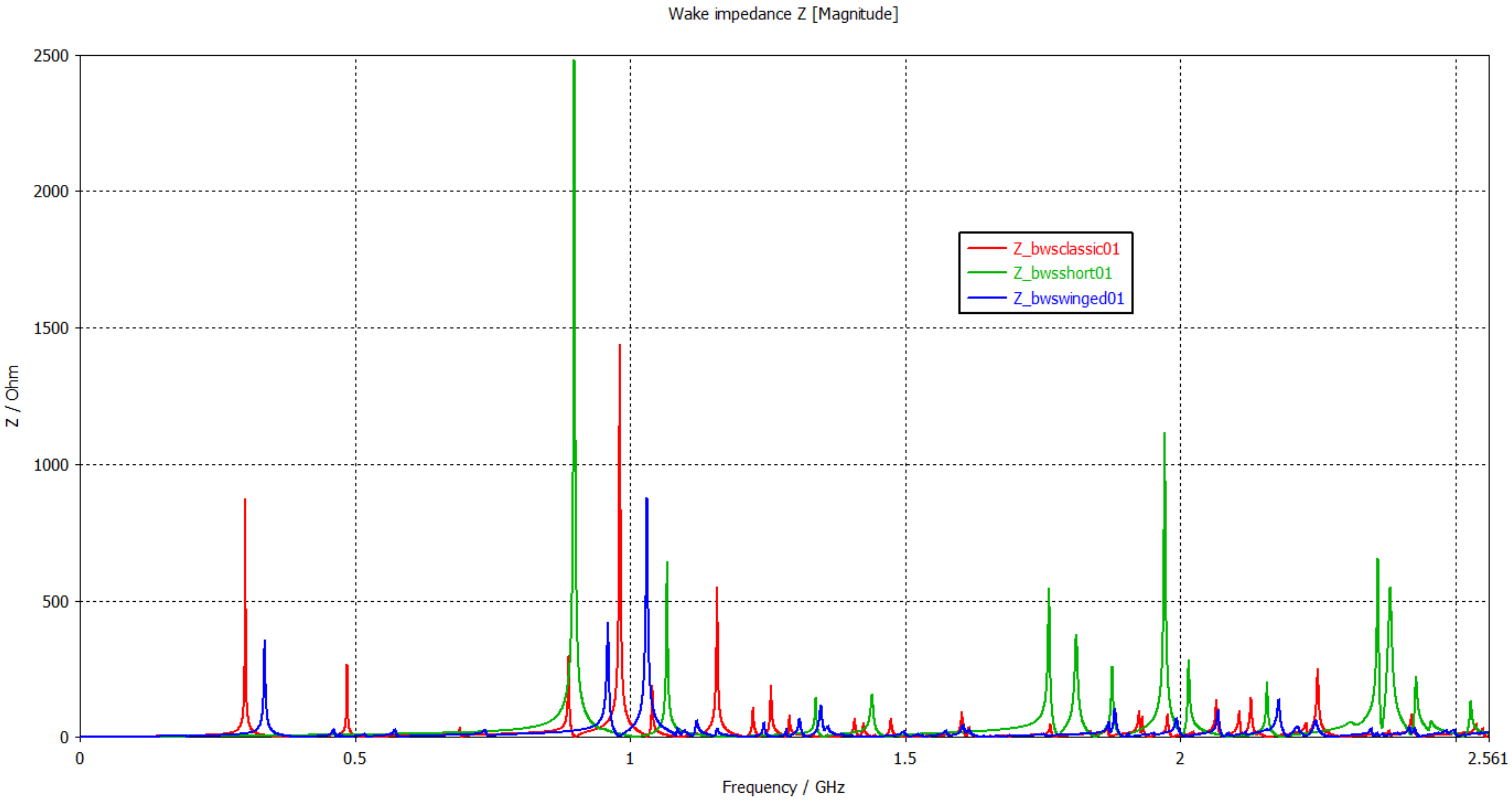

New pieces
New pieces



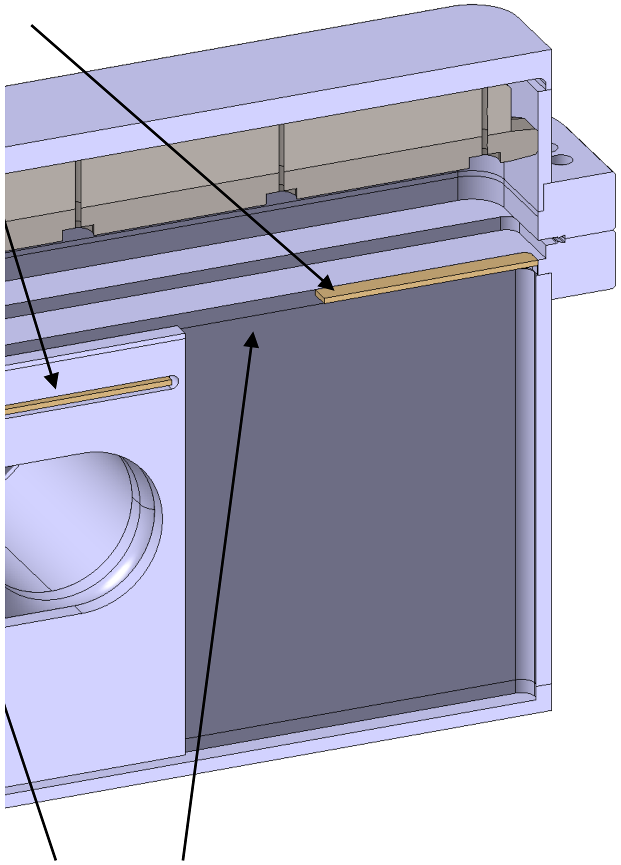

+- 0.002 mm


Thin walled
sections

Impedance investigation



Metal panels close the gap



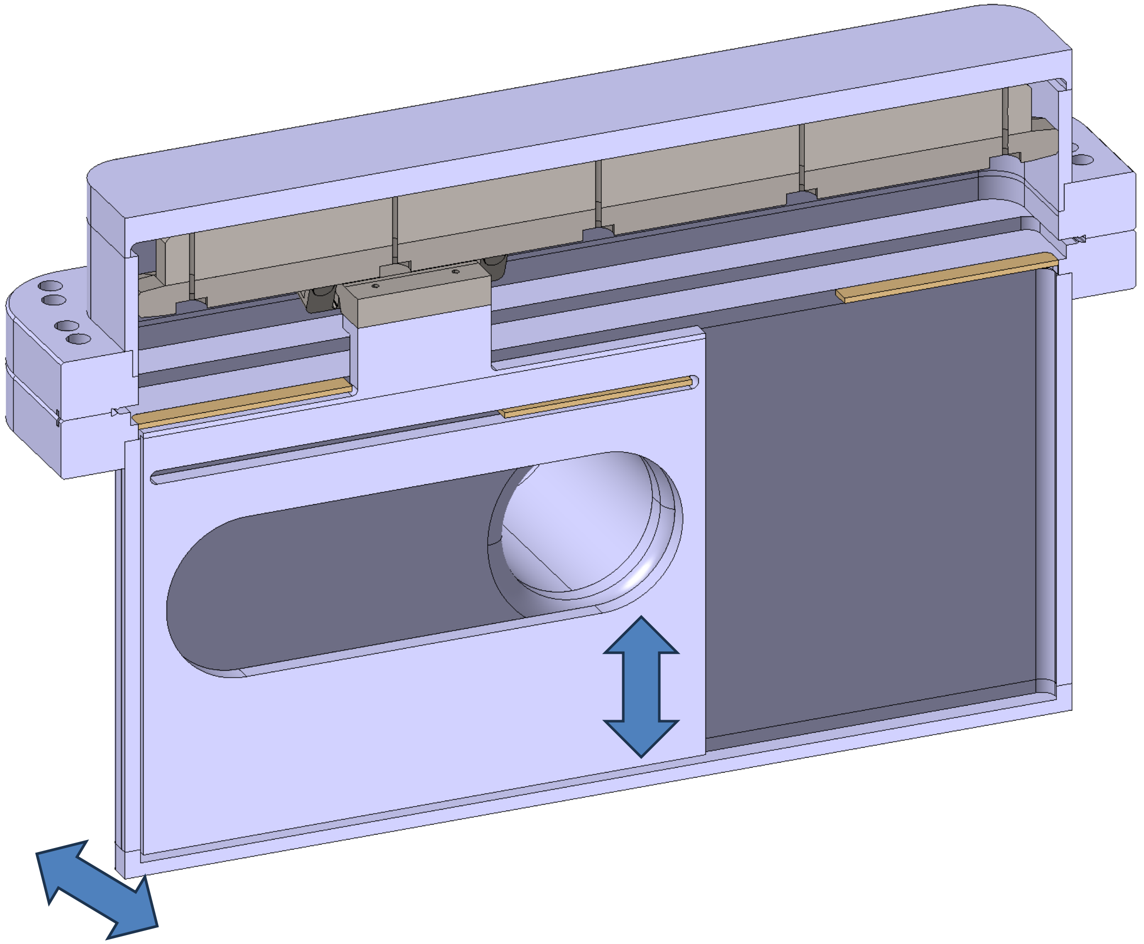
aining gap

Impedance investigation

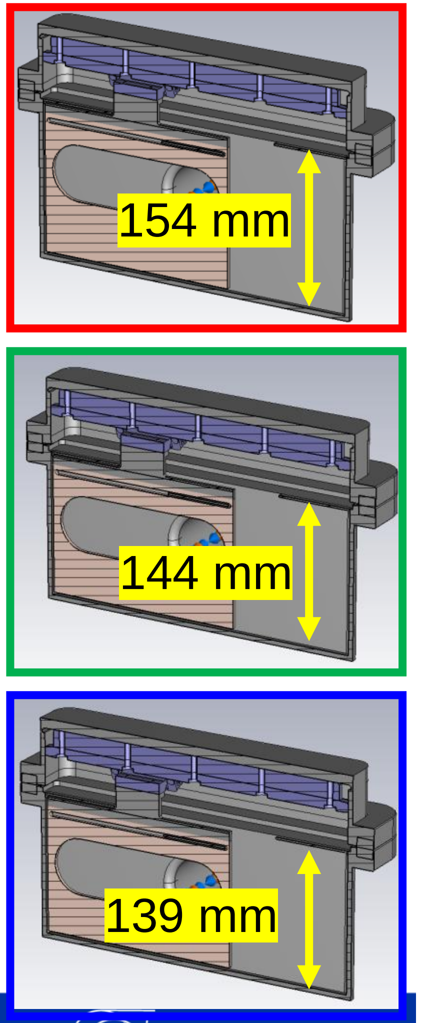
Option 1 – metal panels

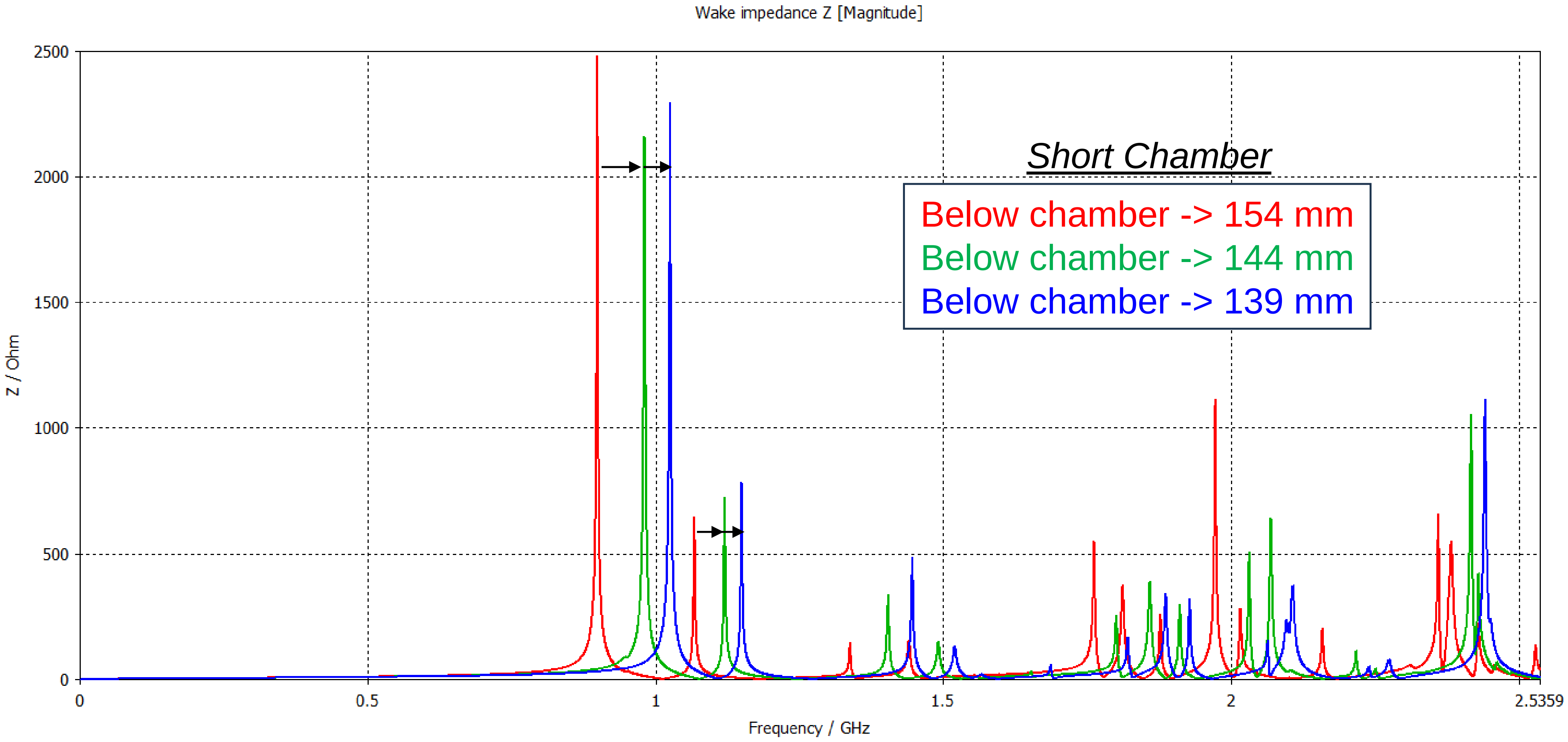
- Frequencies can be pushed higher by reducing lower area as much as possible

- Magnitude can be reduced by reducing the chamber width and/or installing absorbers

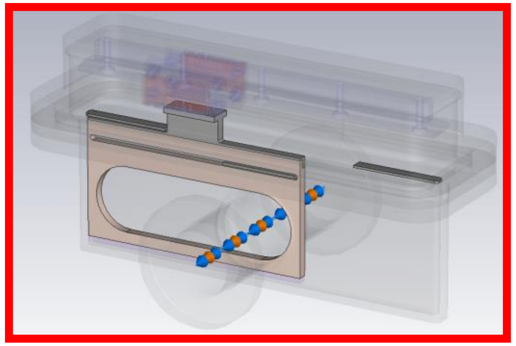


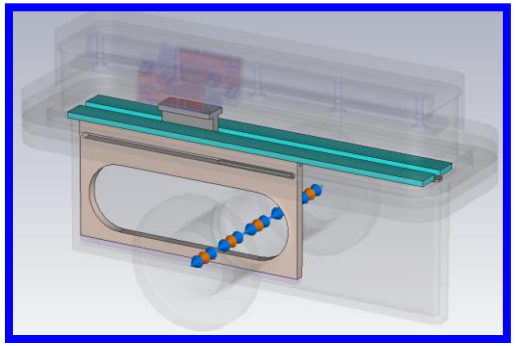
Tried Modifications – Short Chamber (2)

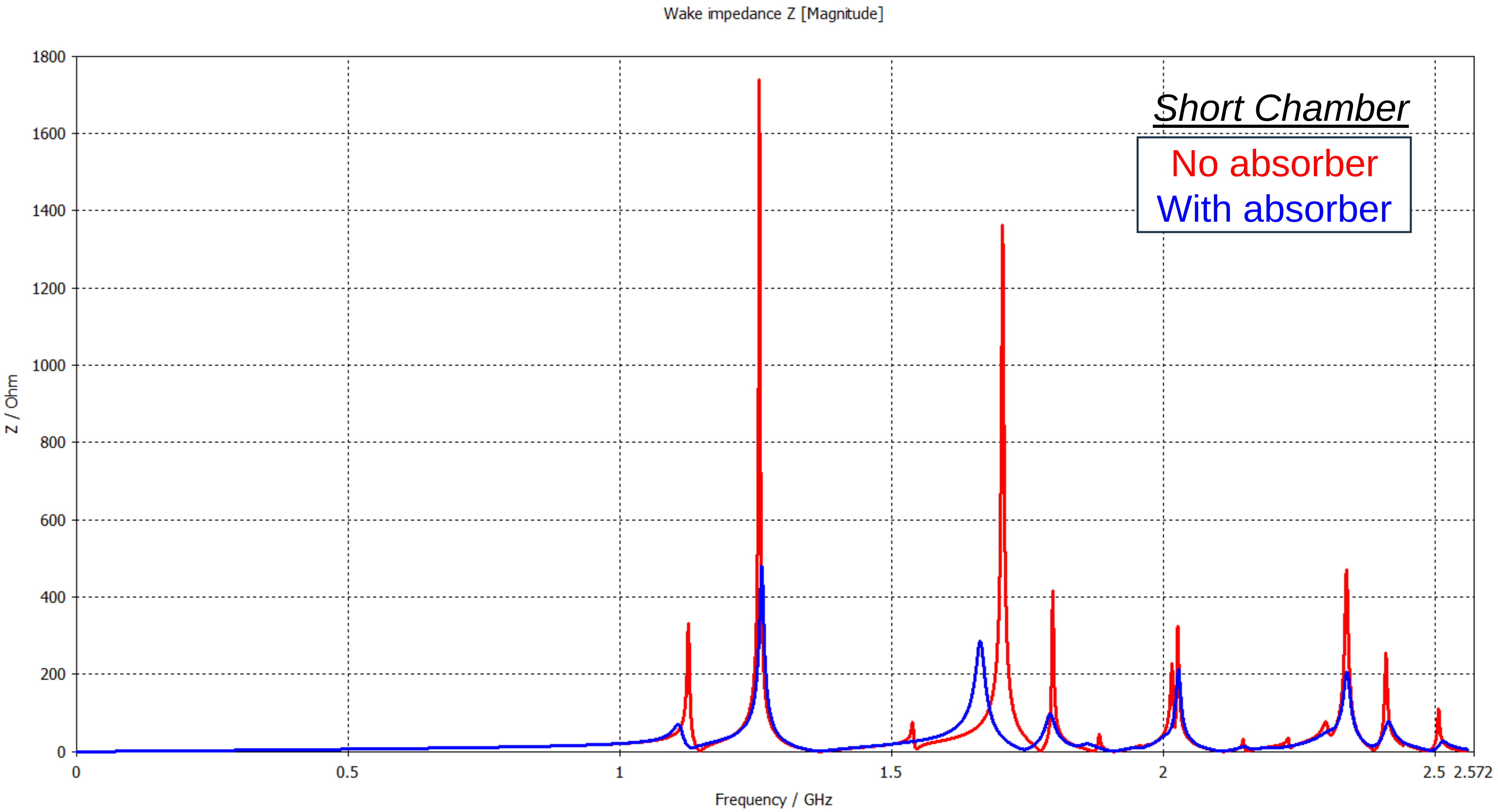




Tried Modifications – Short Chamber (3)



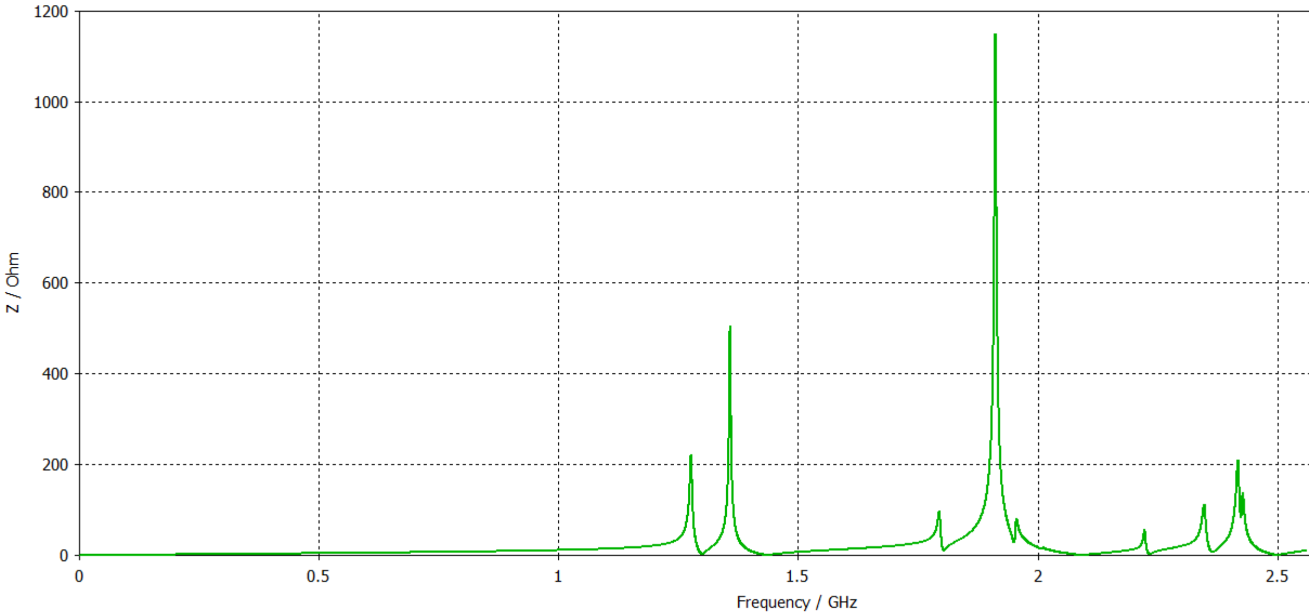


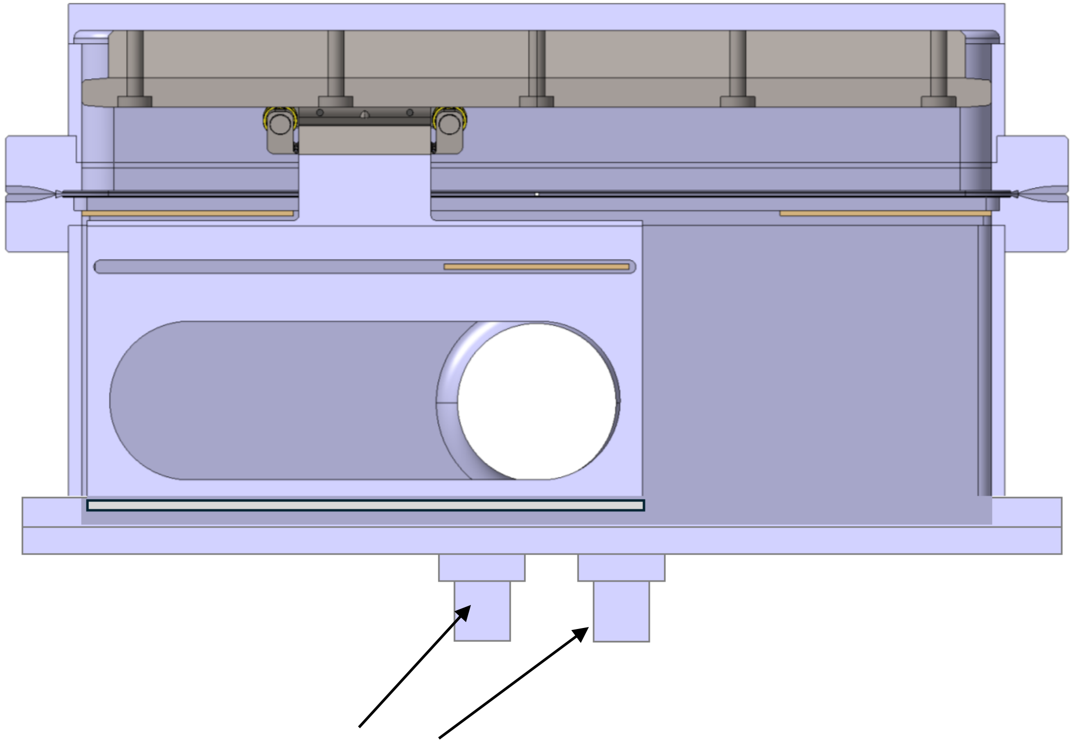


Impedance investigation

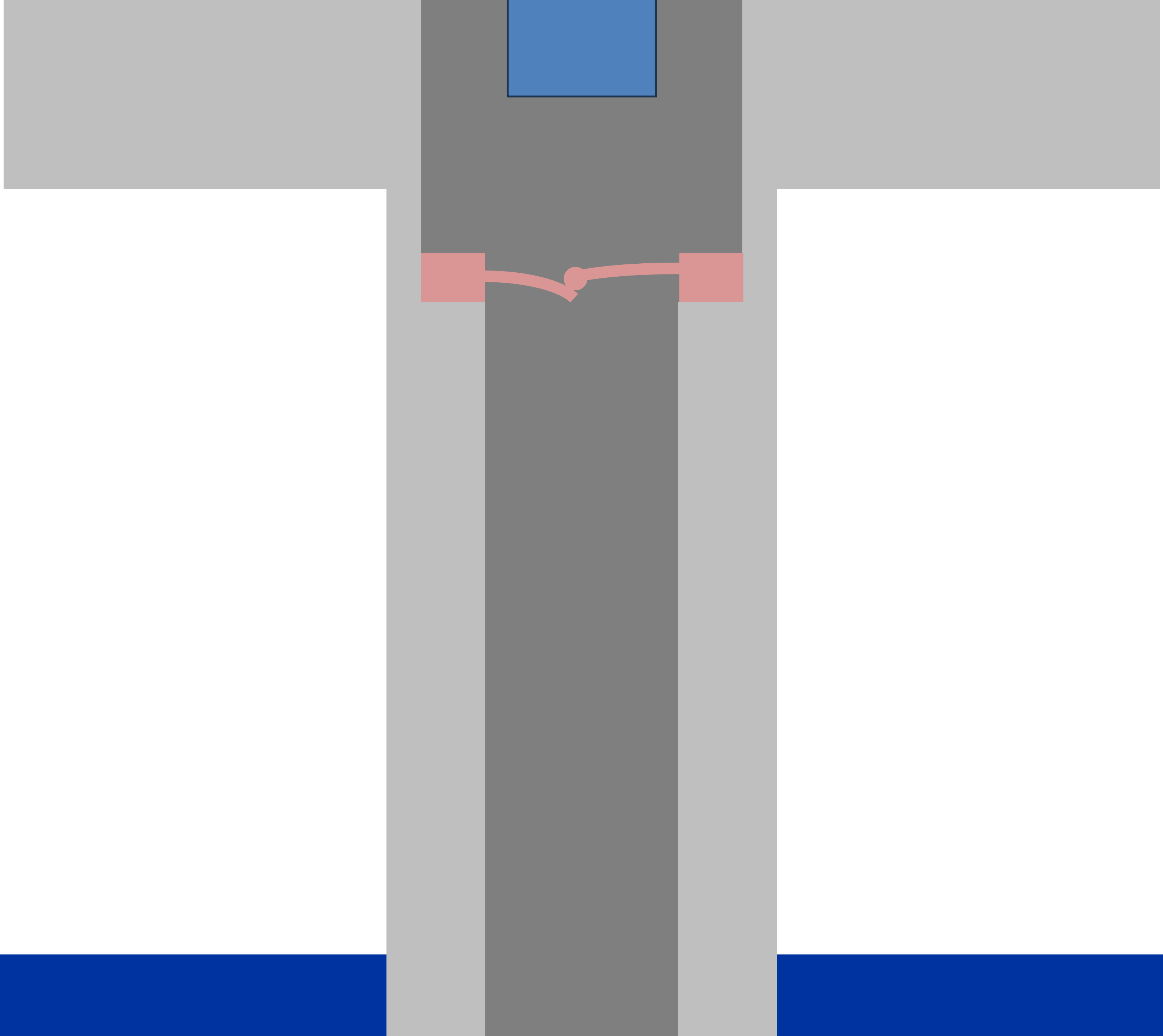
Option 1 – metal panels

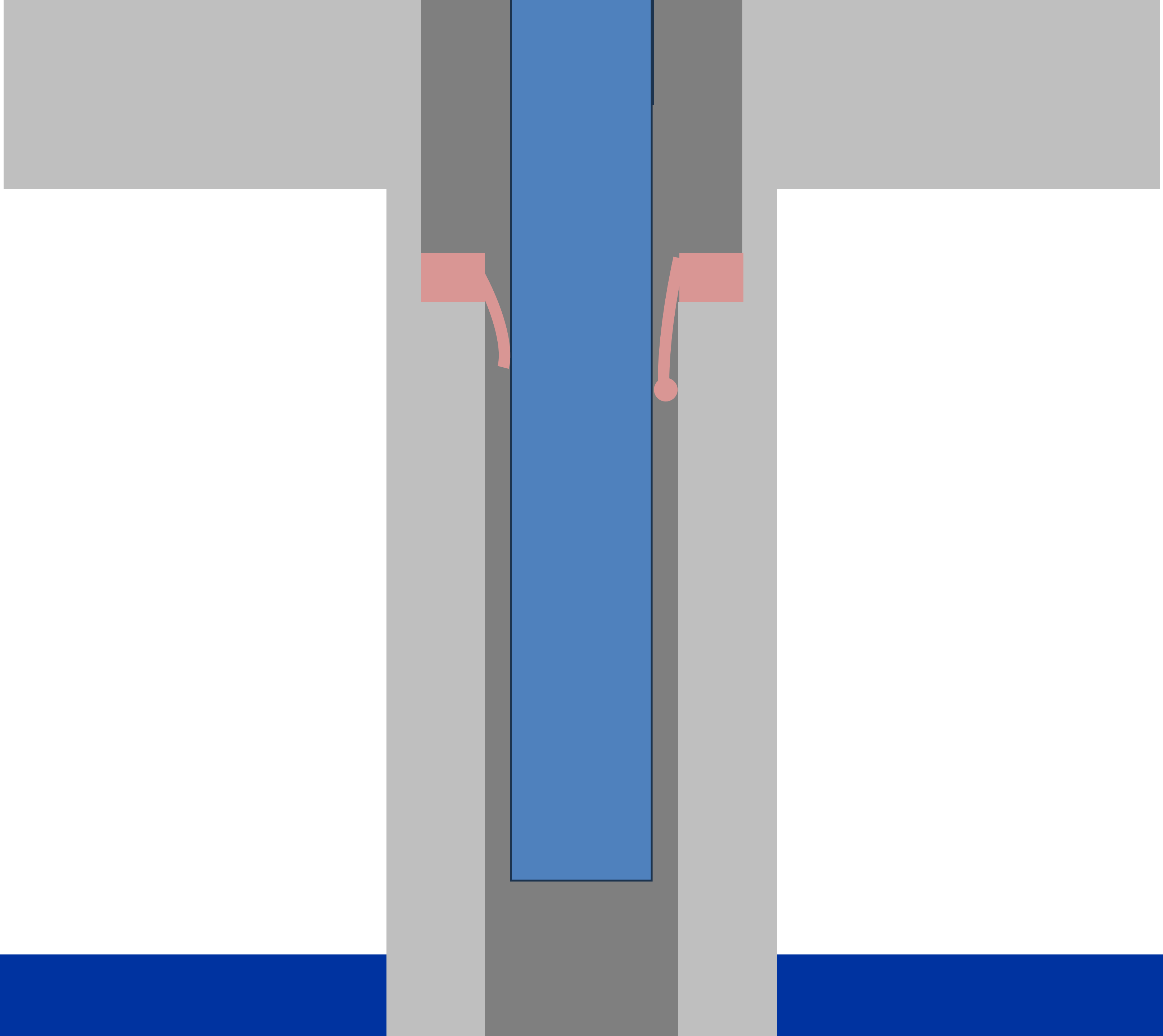
- Reduced height and width – no absorbers

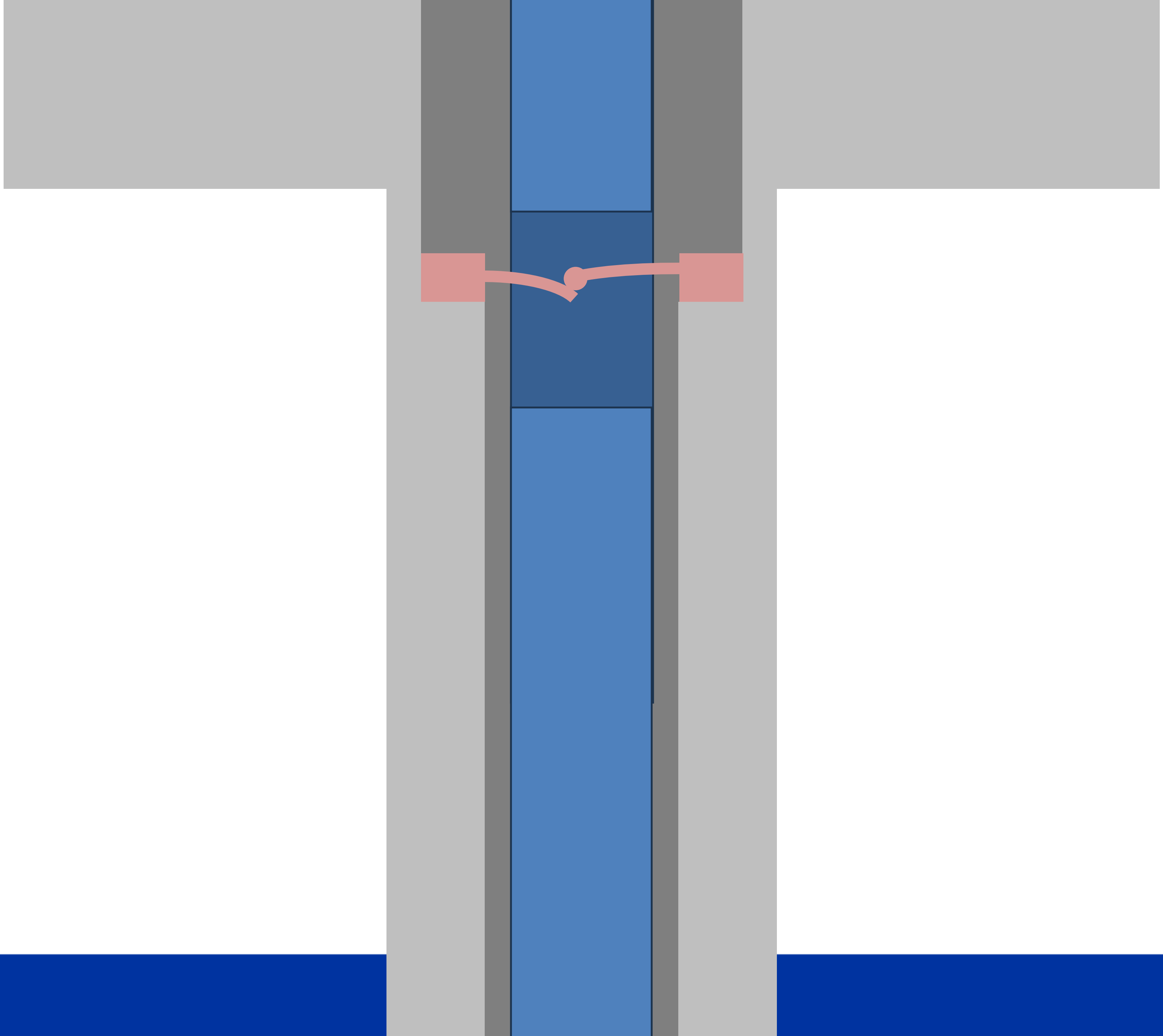




Port holes moved to underside

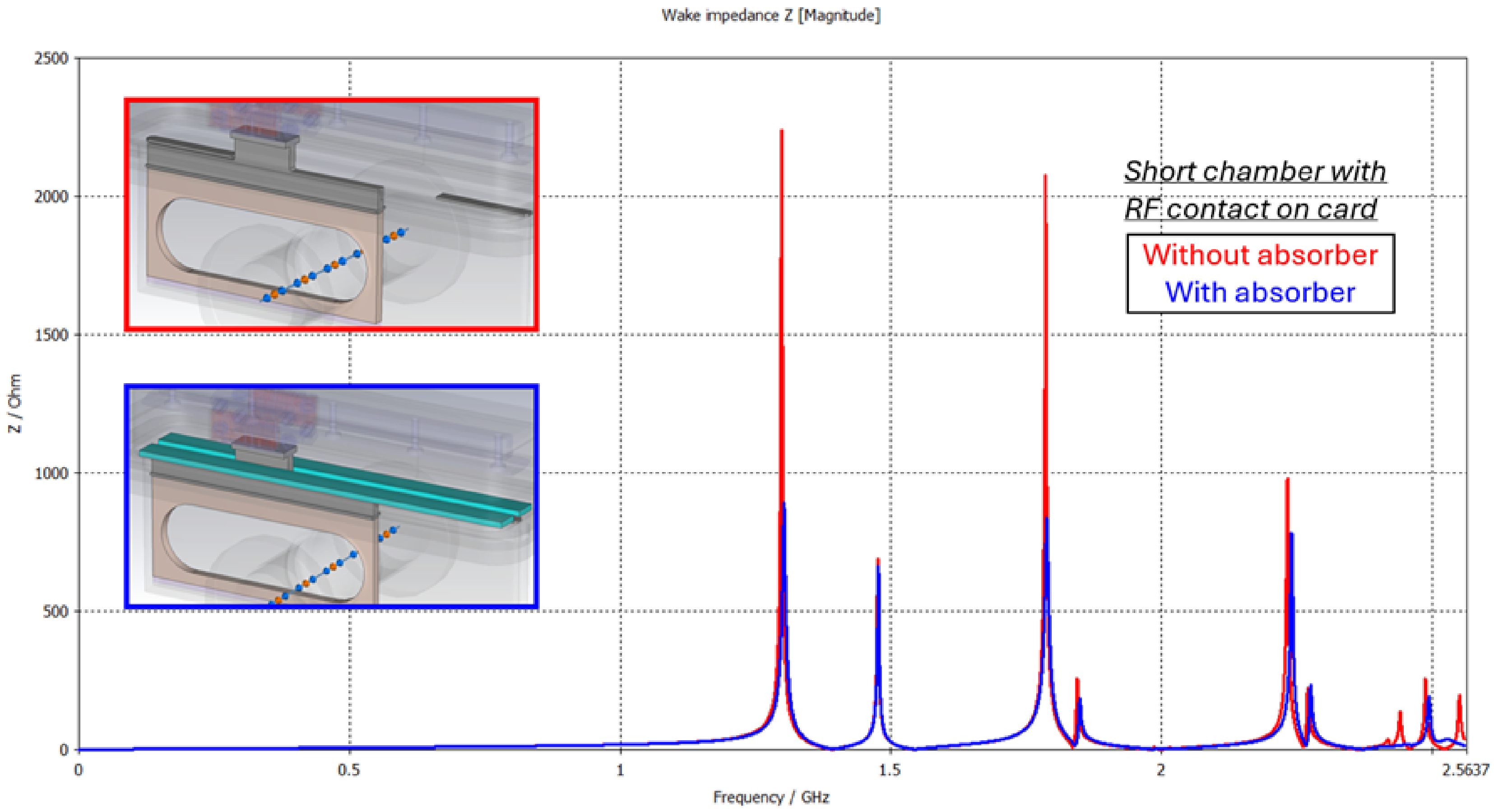


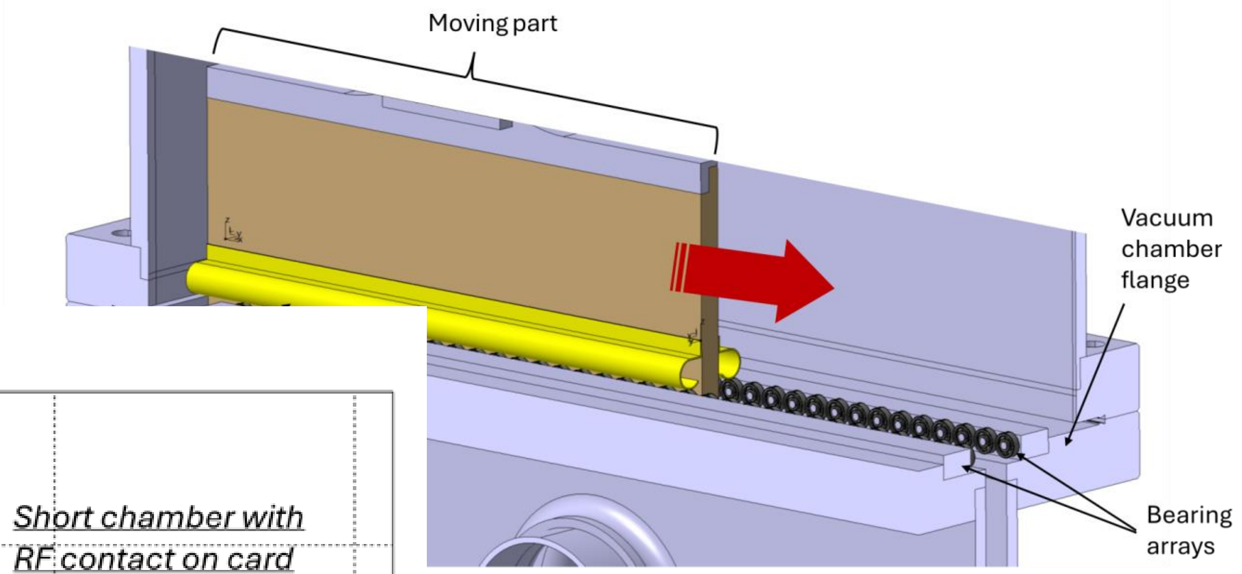


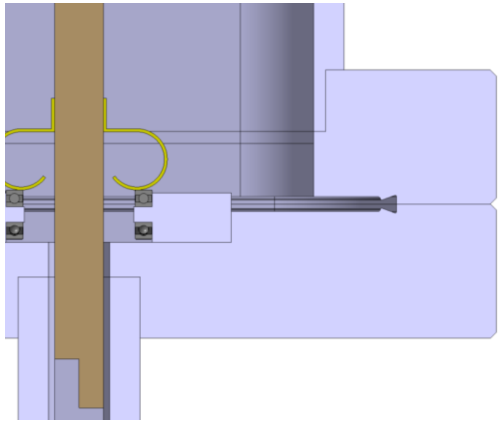


Impedance investigation

Option 2 – Metal rolling contact



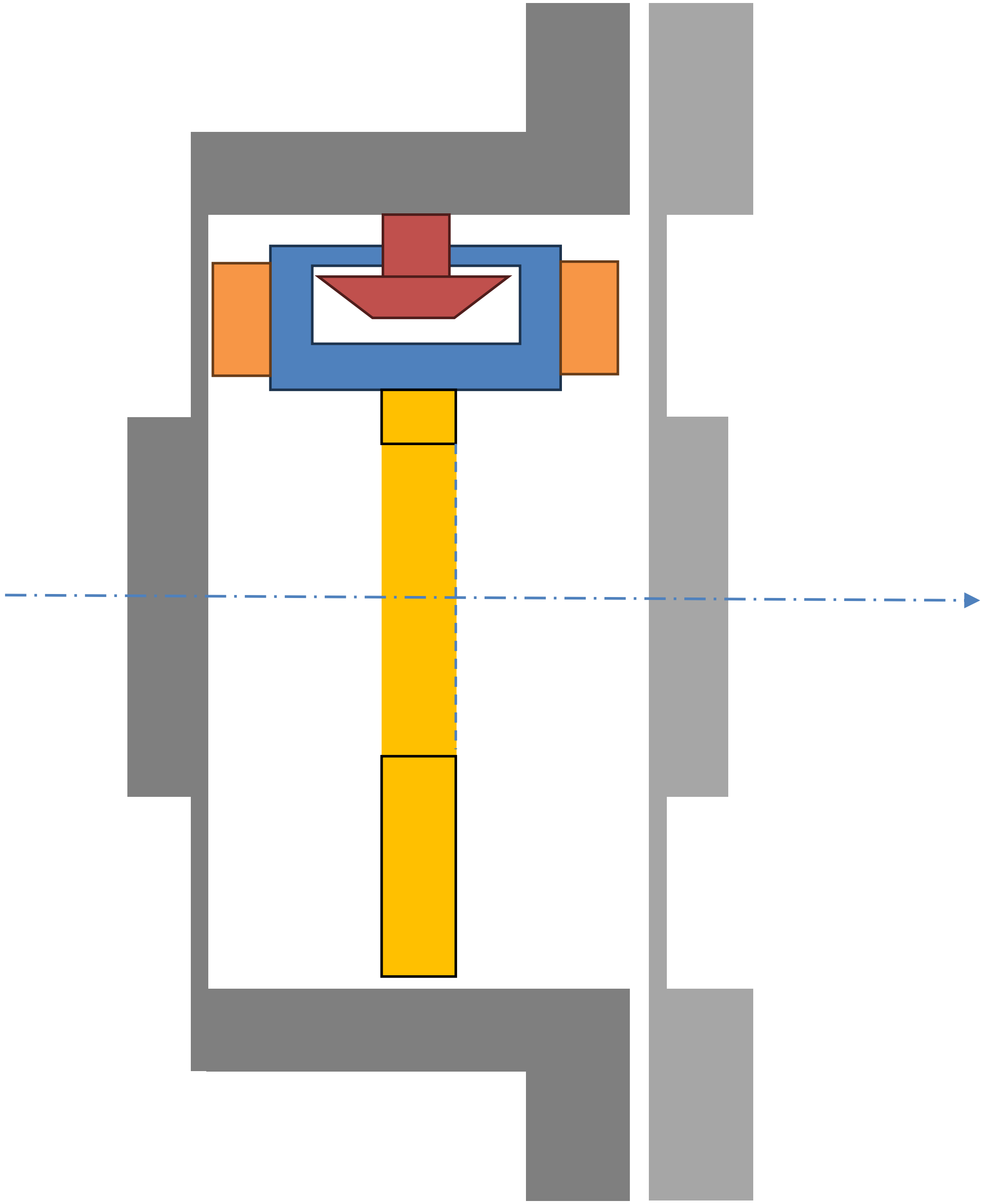


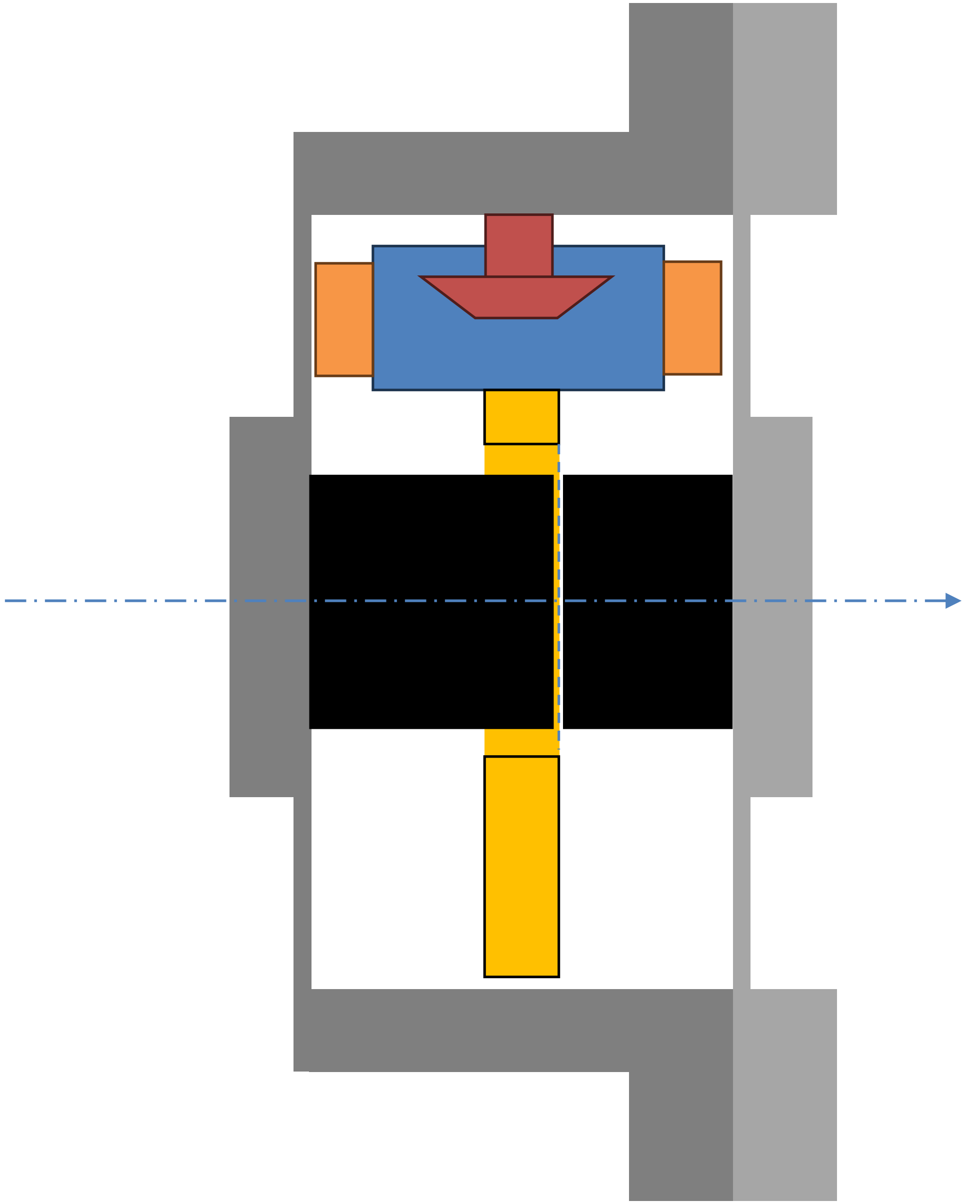


Impedance investigation

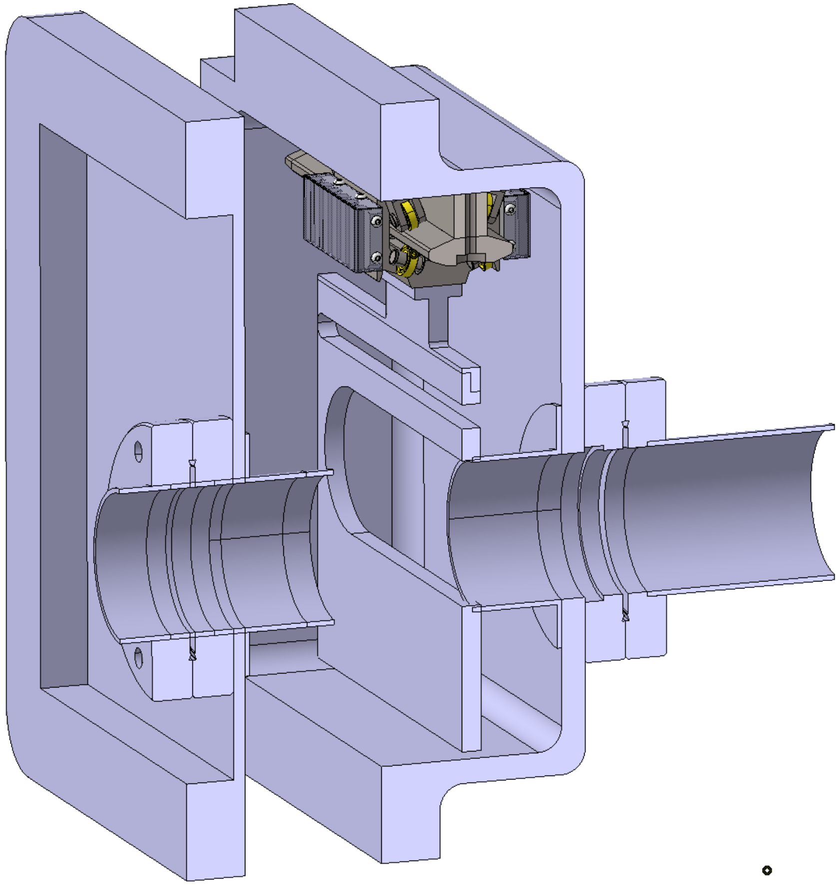
Alternative solution explored

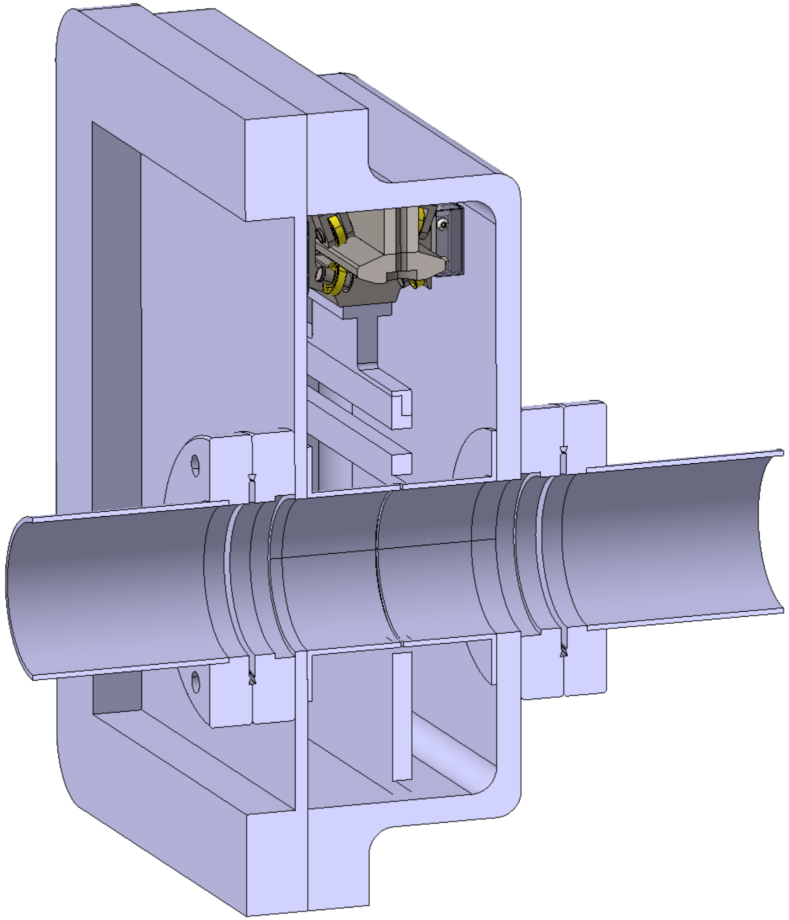
- Could still be considered if installing central plate becomes too challenging +

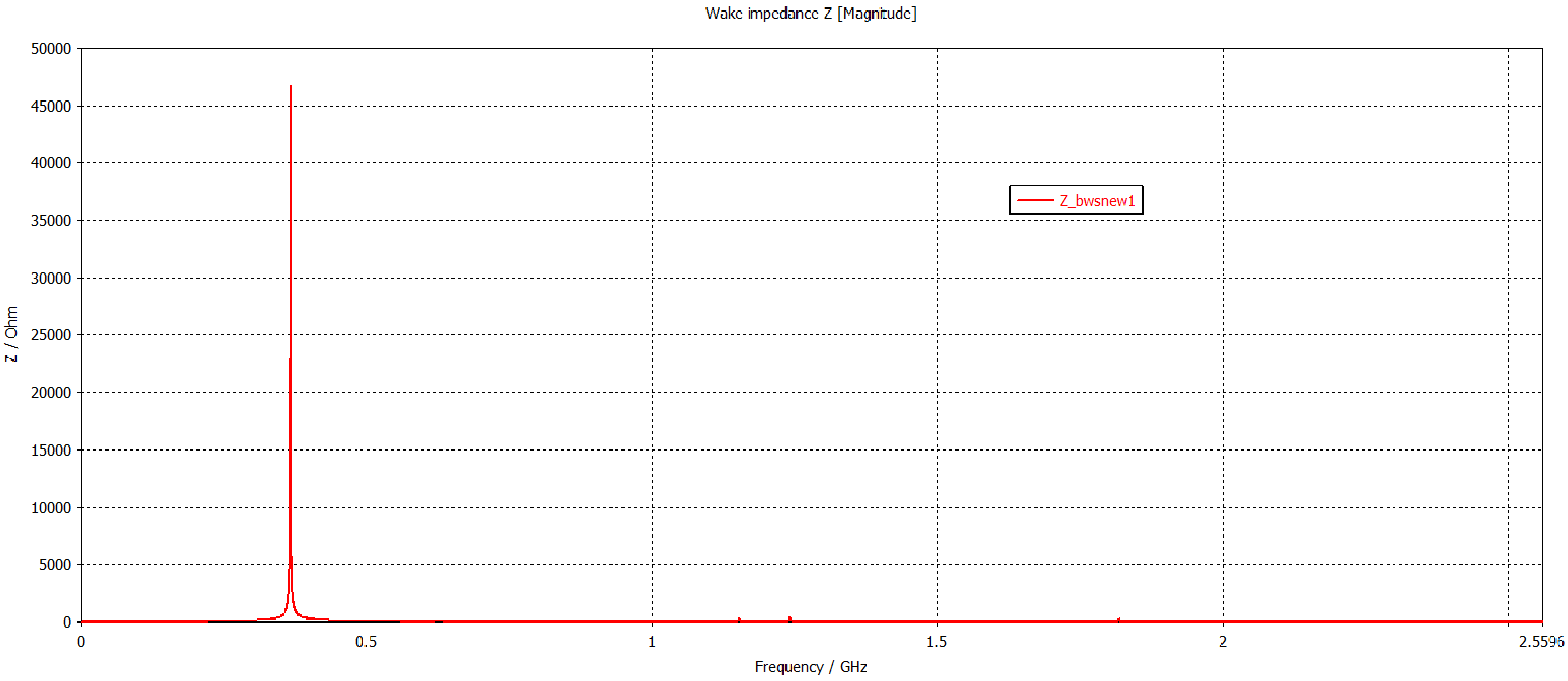




Impedance investigation






Wake impedance Z [Magnitude]
Z_bwsnew1
Z / Ohm
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
0.5
1
1.5
2
2.5596
Frequency / GHz

Planning

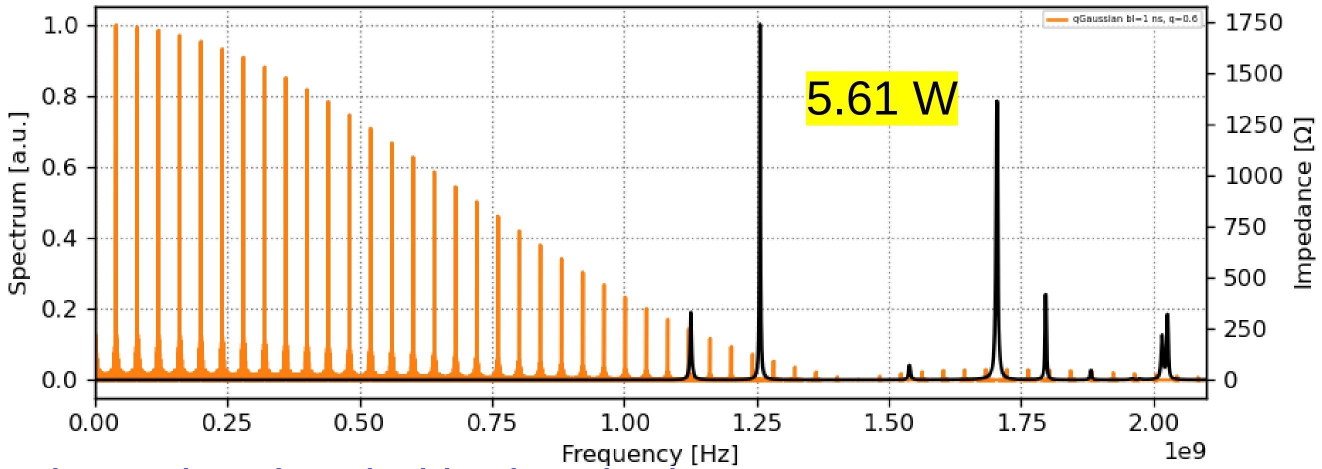
- Meeting with main workshop to discuss RF contact feasibility Thursday
- RF contact concept design chosen
- Chamber detailed design can start
- Kick off meeting scheduled with MME 5th November

- Selba contacted for optical ruler detailed design

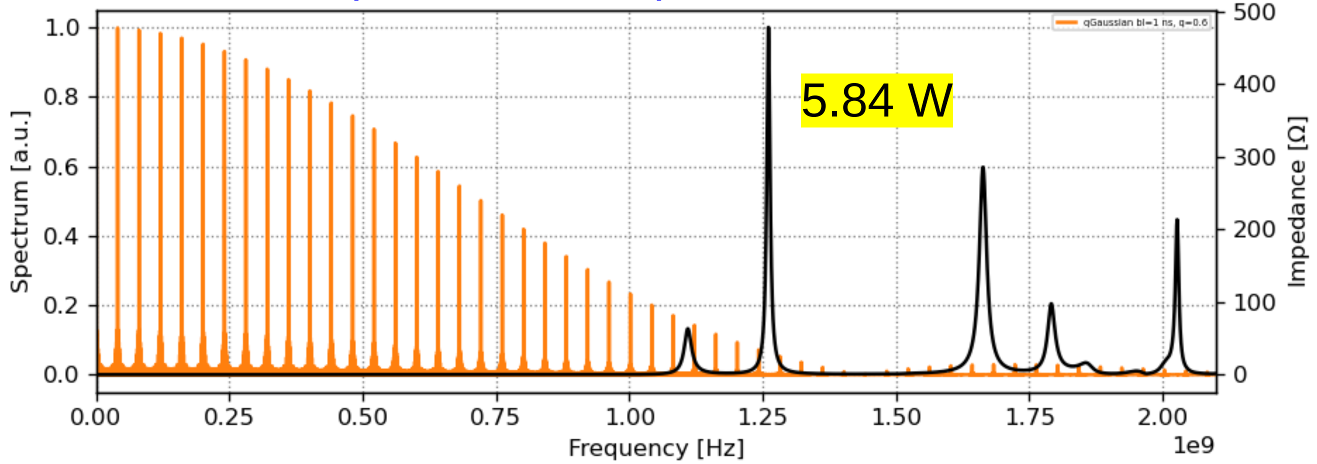
- Next iteration carriage to be produced and tested

Beam-induced RF Power Loss

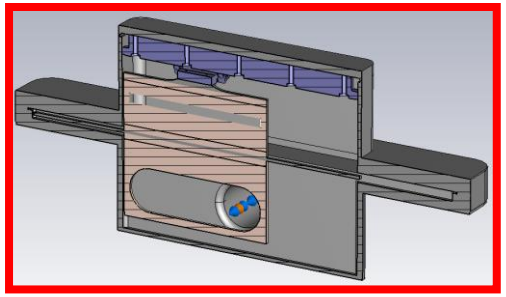
Short Chamber (No absorber)

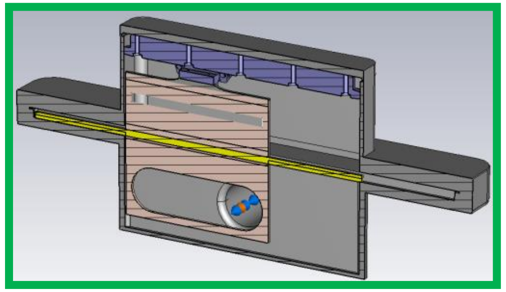


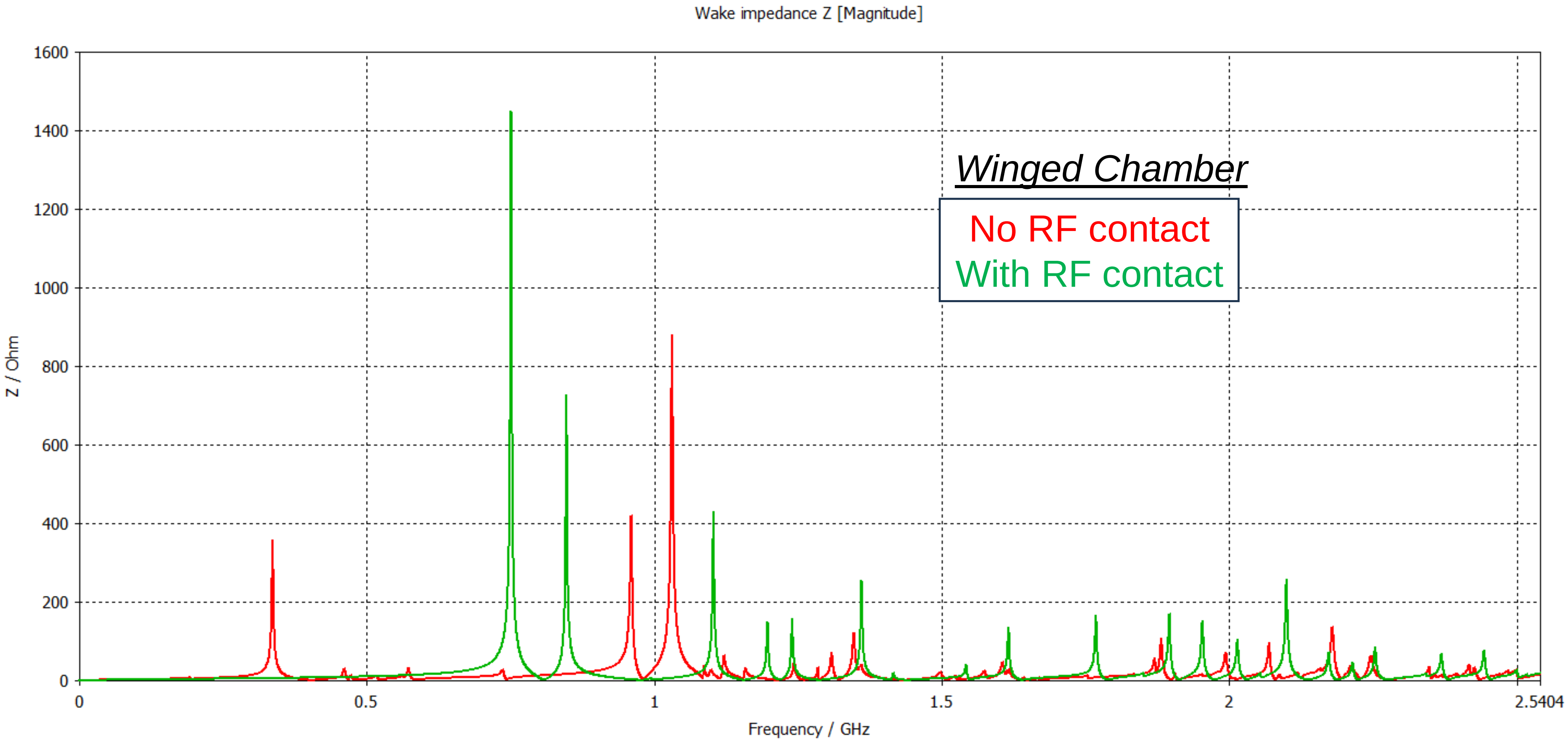
Short Chamber (With absorber)



Tried Modifications – Winged Chamber







Tried Modifications – Classic Chamber