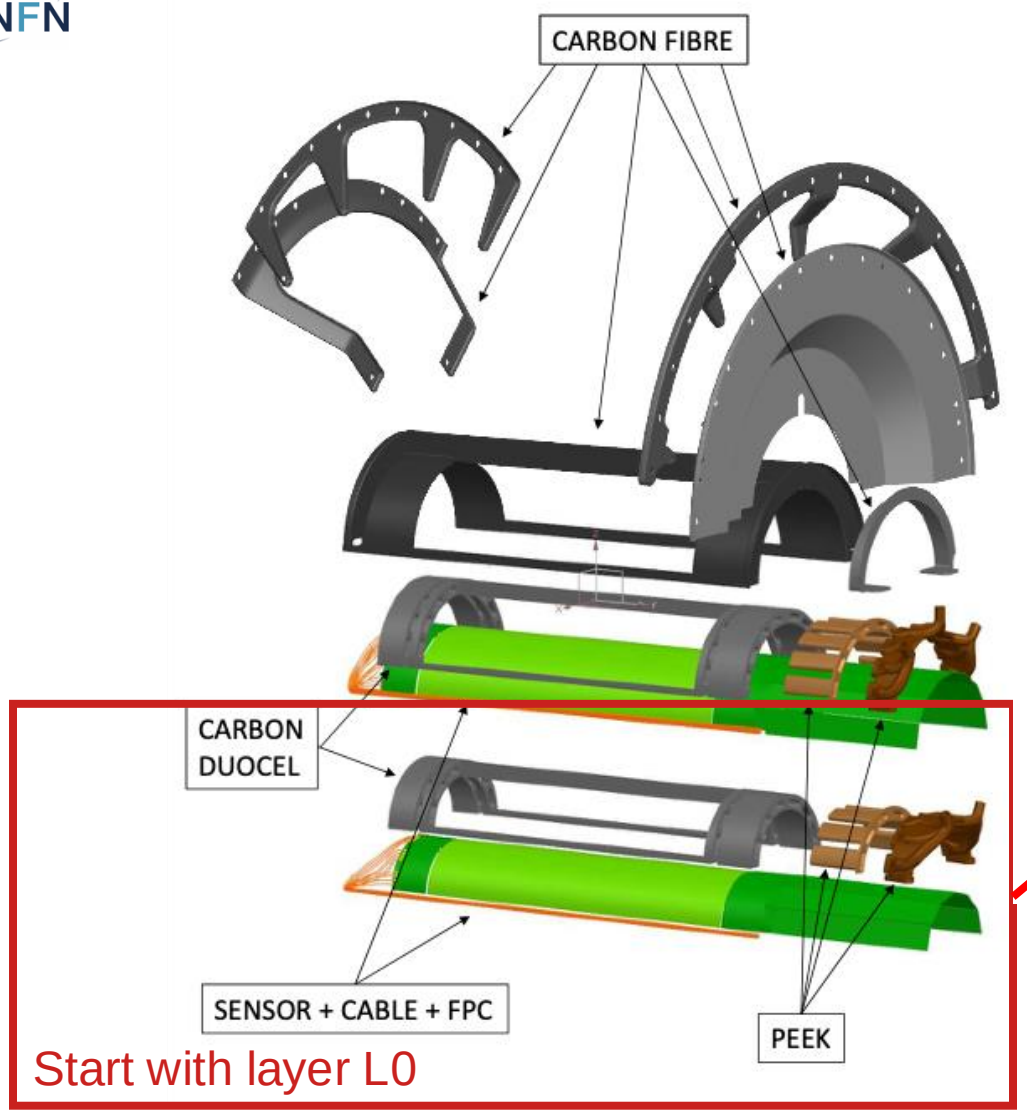
Vibrational/Thermal analysis of L0-L1

Material properties derived from ALICE-TDR-021

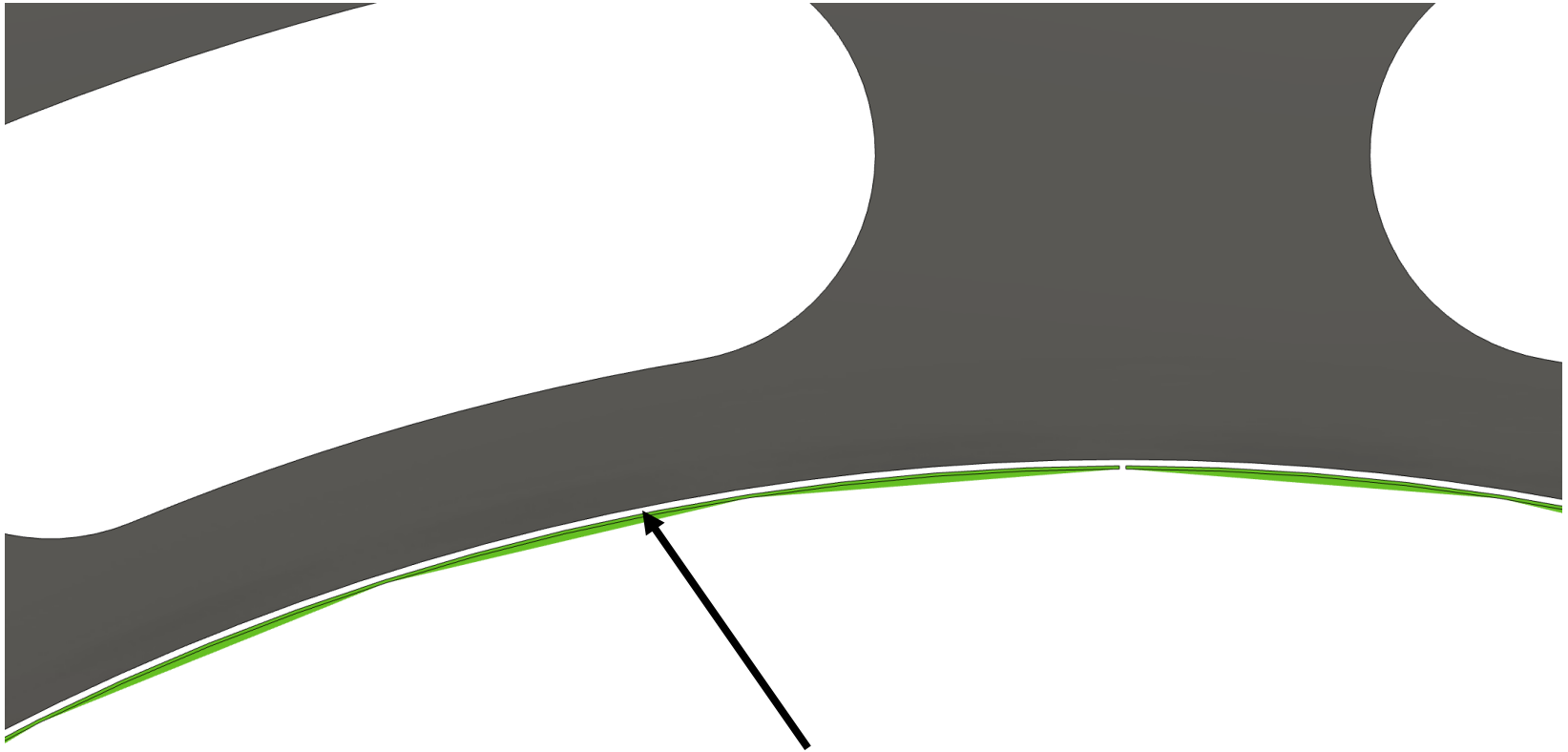
Uniform isotropic silicon foil of 50 um

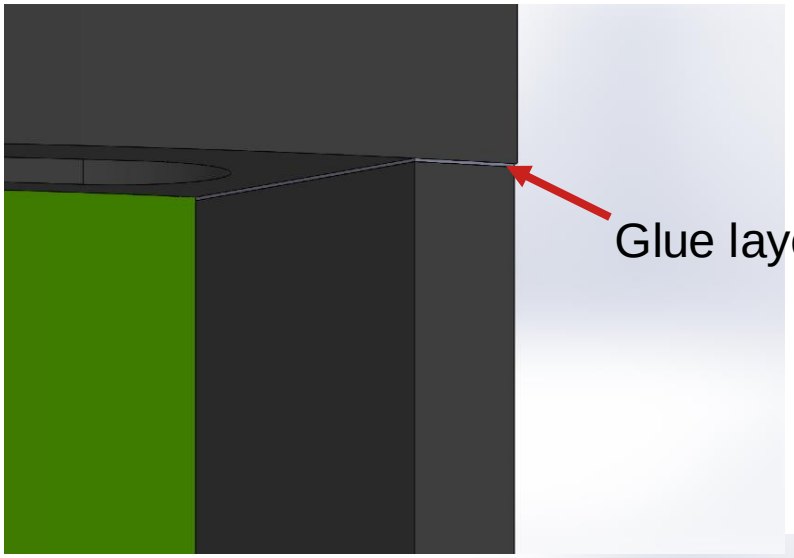
Bonded contact is considered and the glue in between

INFN- TIFPA


CARBON FIBRE
CARBON DUOCEL
SENSOR + CABLE + FPC
PEEK
Start with layer L0

L0 model


Intermediate glue layer

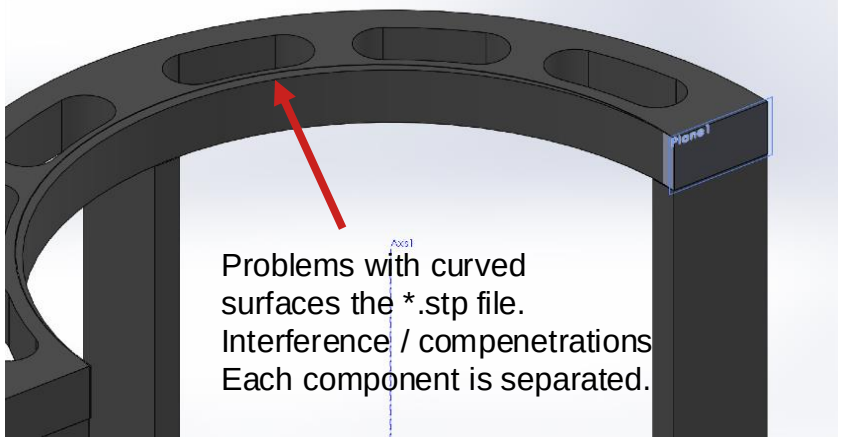


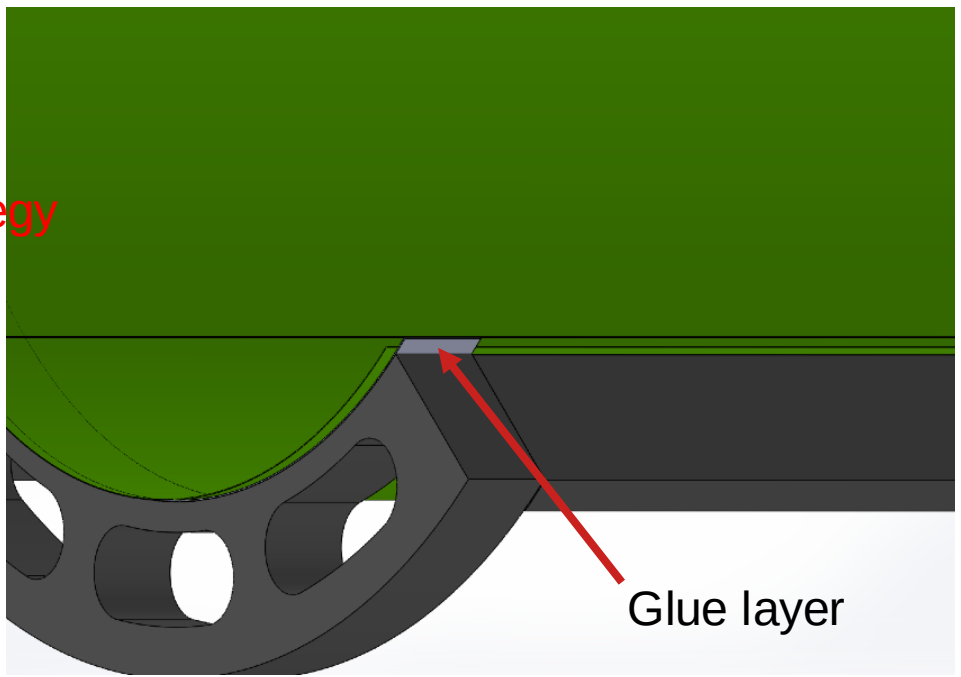
The overall mesh shoud be connected.
Use of solid elements also for thin layers.

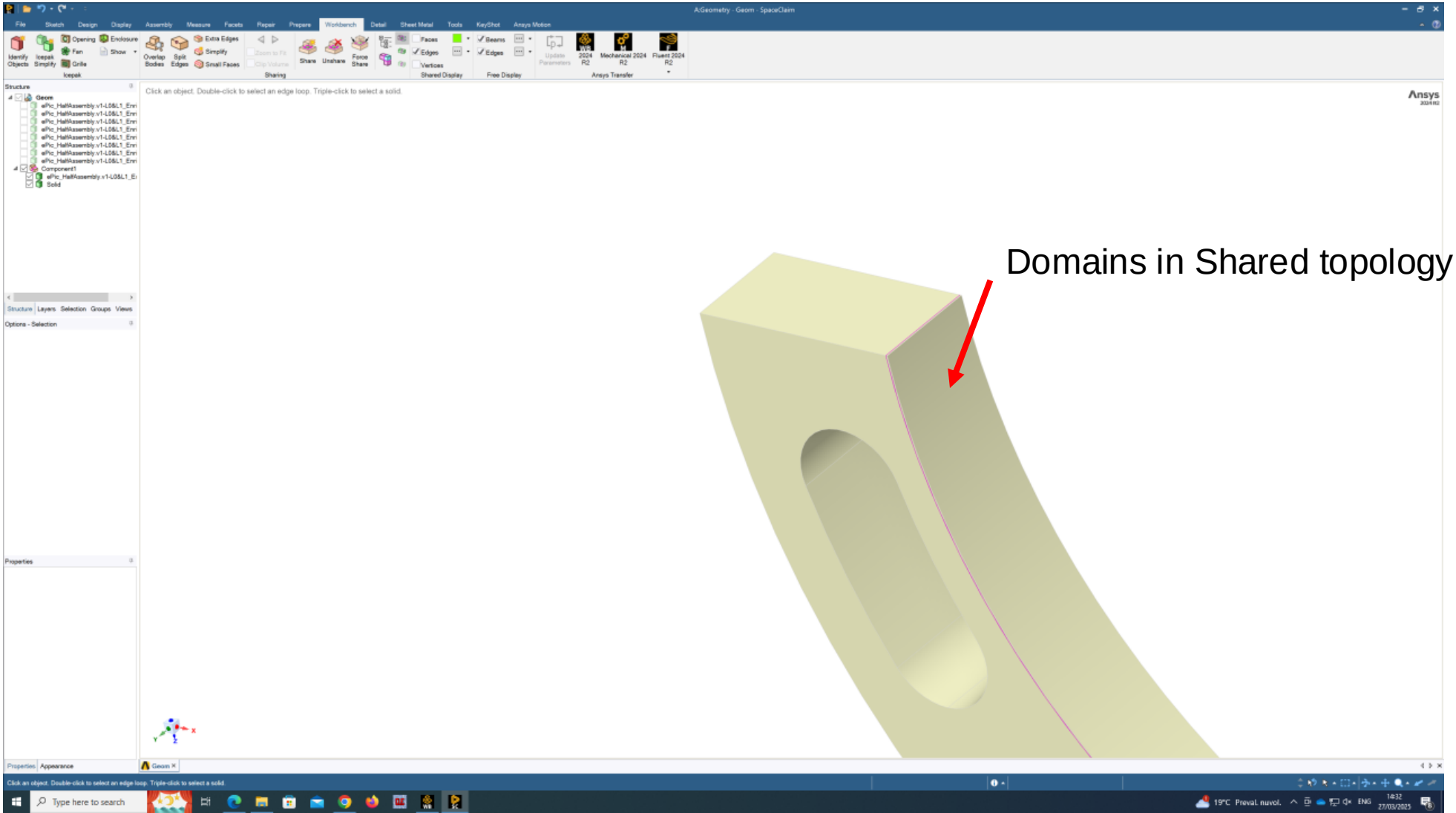
How to include a glue layer to build a connected mesh

Maybe a reconstruction of the geometry in FEA is needed.

To be solved in the SpaceClaim enviroment
Available in Ansys with a Shared Topology strategy



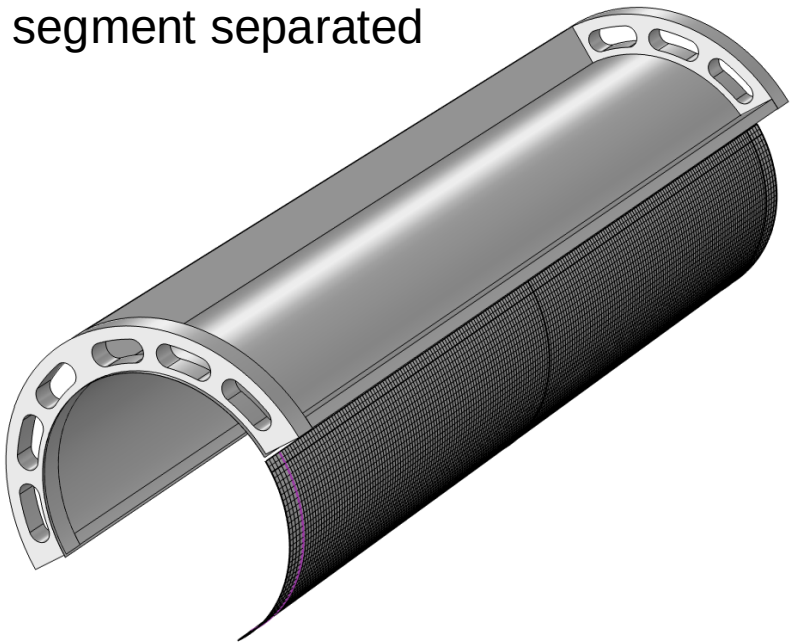


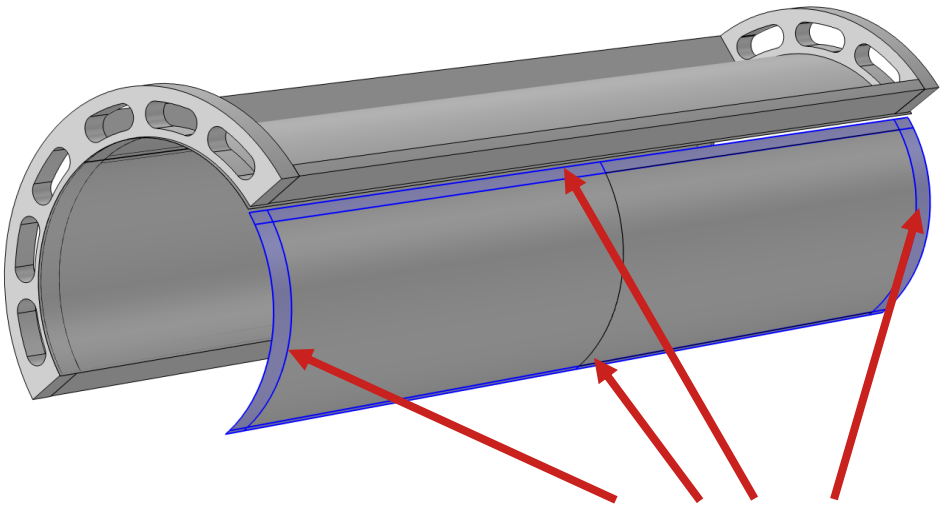

Domains in Shared topology

Modal analysis of a bent silicon foil

Fixed boundary conditions BCs.
Projection of the H-rings and
Longeron surfaces.

Mesh and simulation
of ¼ of silicon layer.
4 segment separated



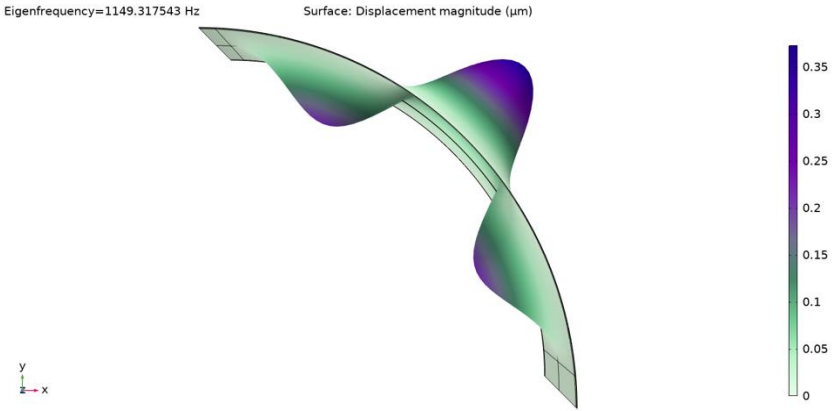


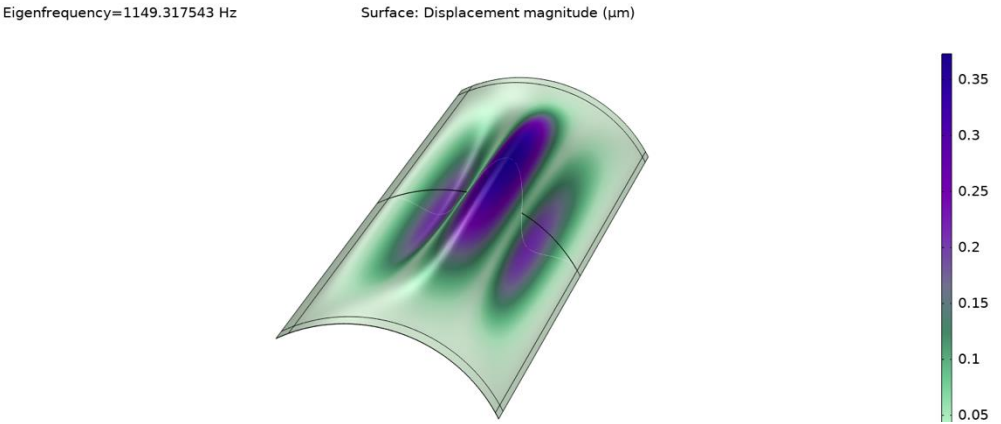
Glued parts BC

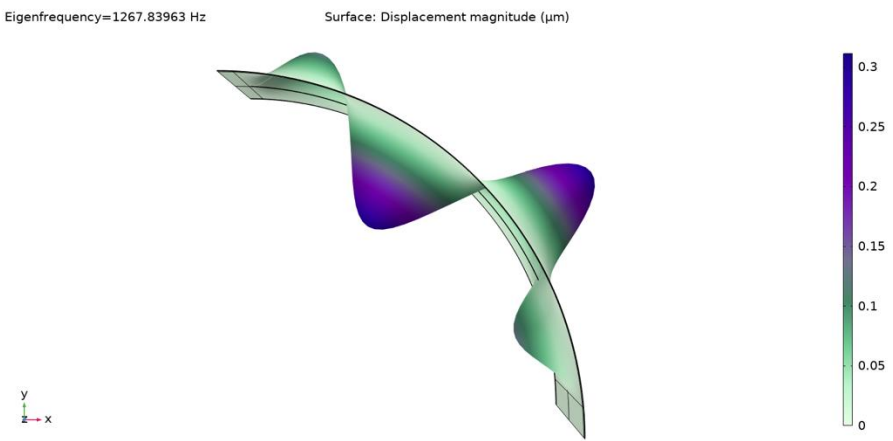
Bending stress is not taken into account.

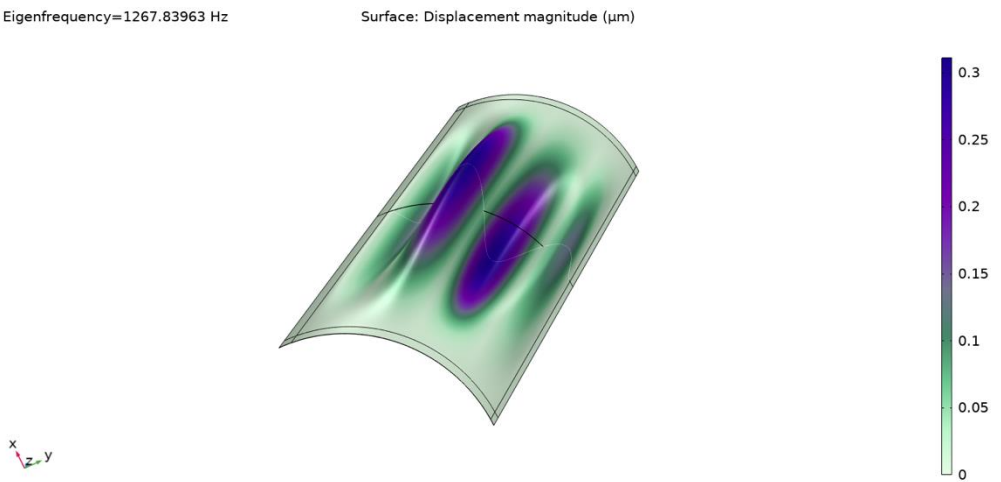
Modal analysis of the silicon foil

Modes above 1k Hz - BCs too rigid?



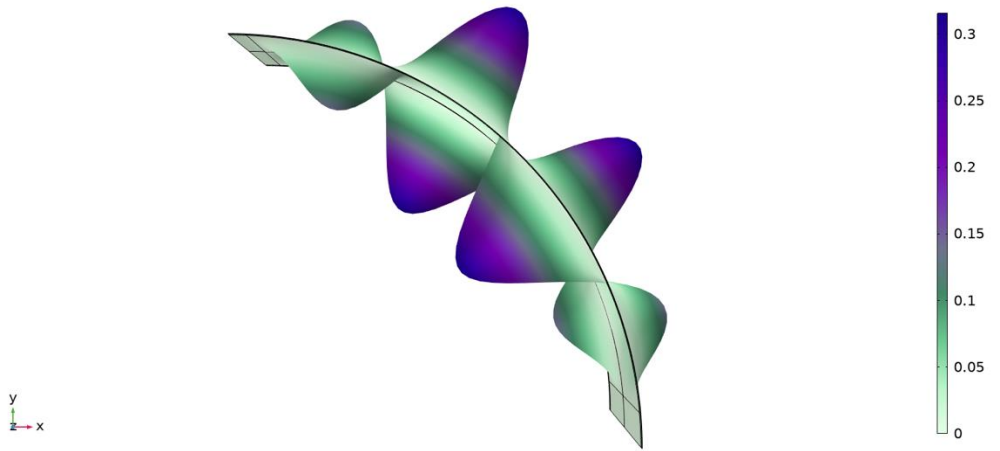






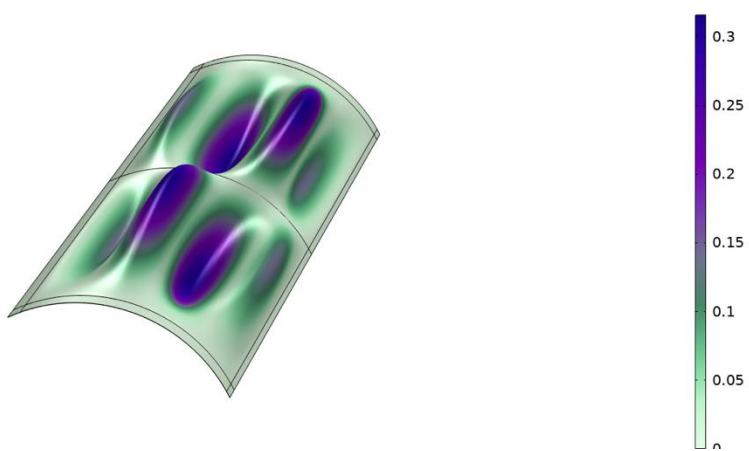
Eigenfrequency=1599.232594 Hz

Surface: Displacement magnitude (μm)



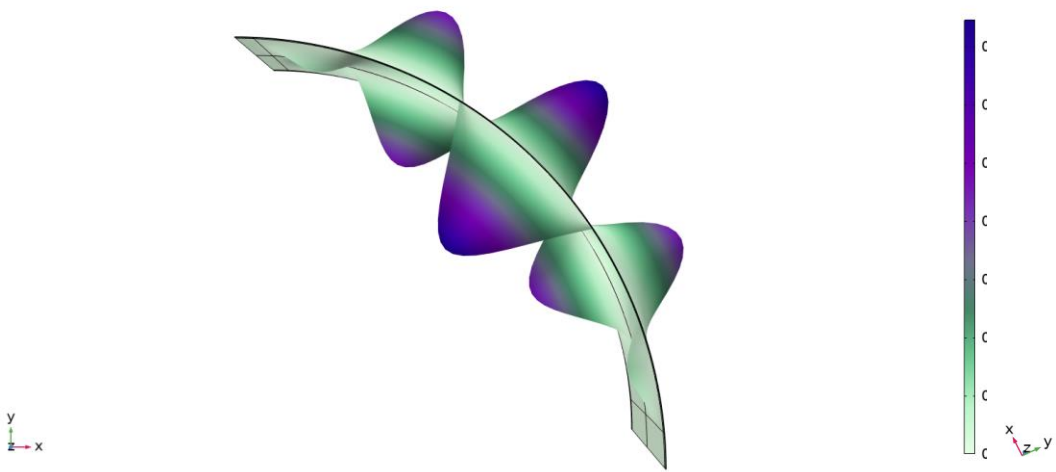
Eigenfrequency=1599.232594 Hz

Surface: Displacement magnitude (μm)



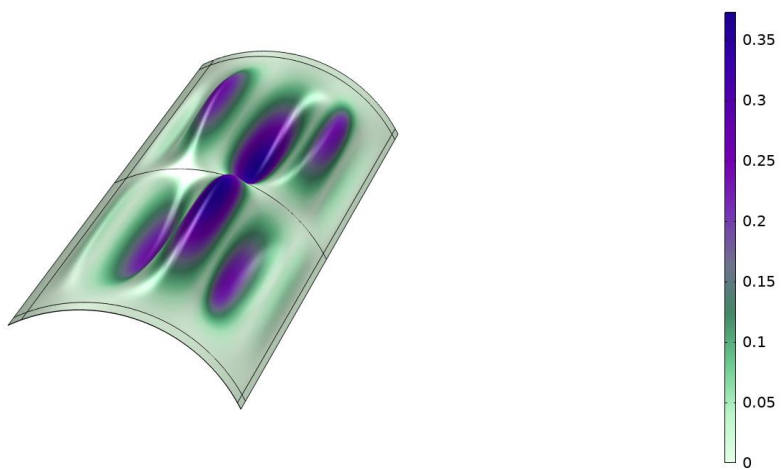
Eigenfrequency=1763.641803 Hz

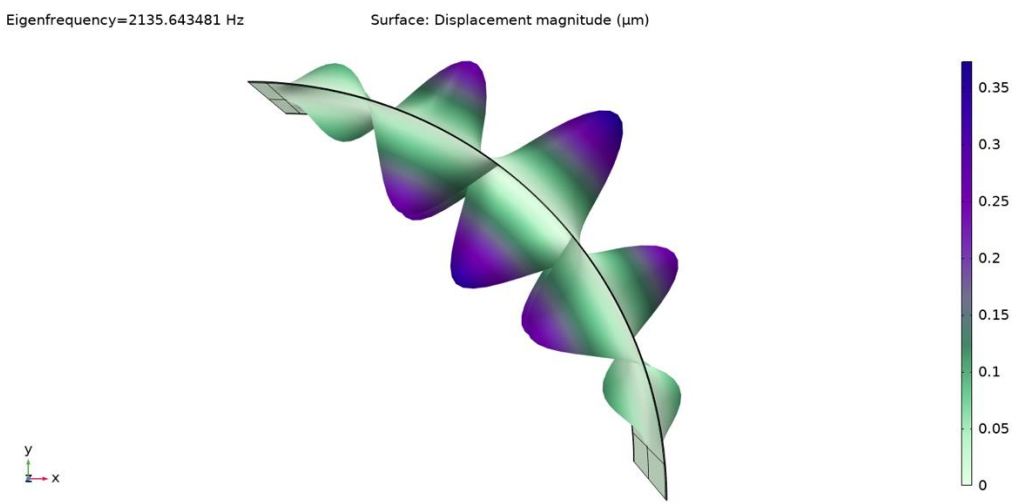
Surface: Displacement magnitude (μm)

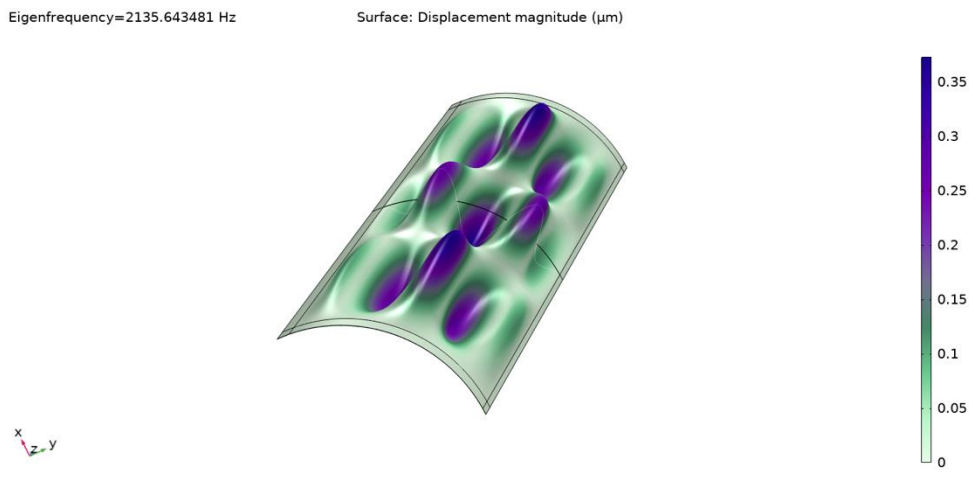


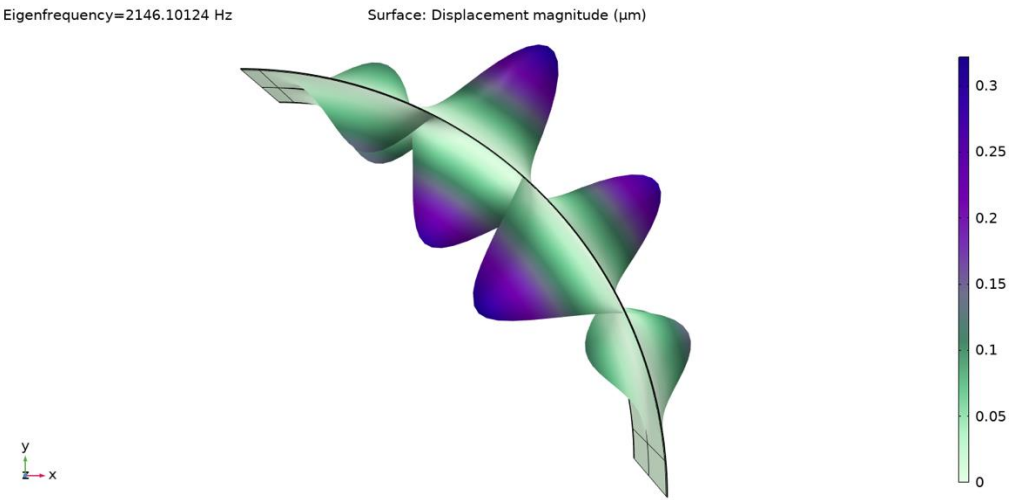
Eigenfrequency=1763.641803 Hz

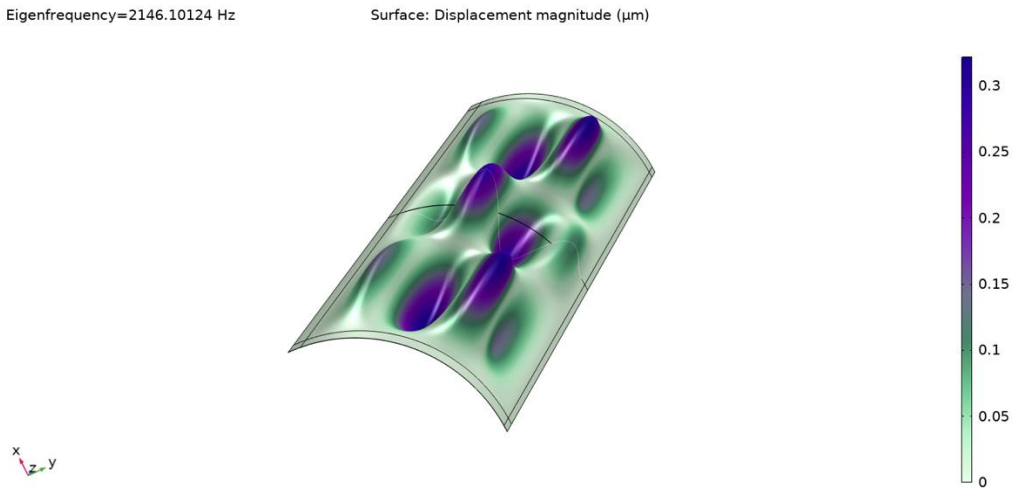
Surface: Displacement magnitude (μm)



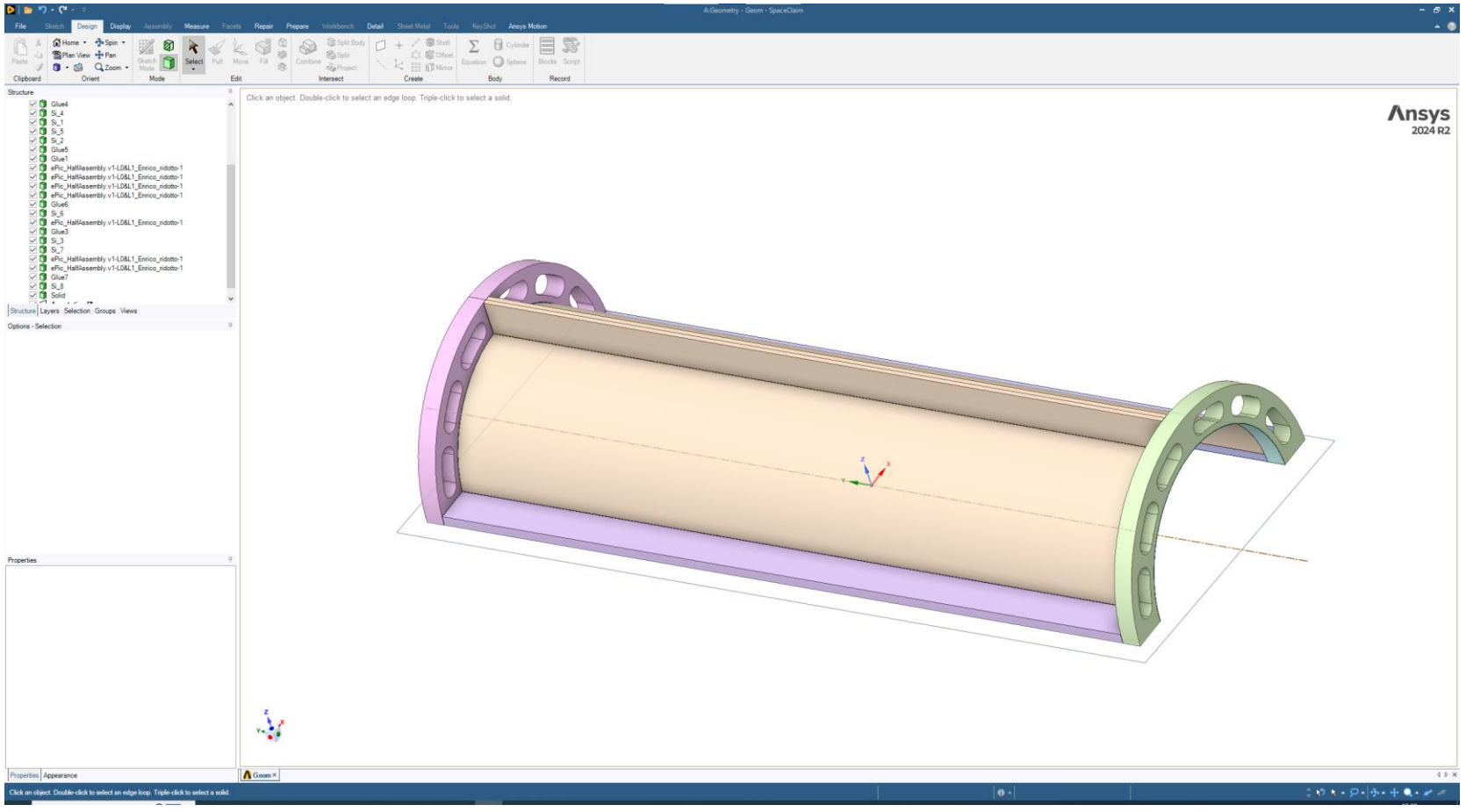

Eigenfrequency=2135.643481 Hz
Surface: Displacement magnitude (µm)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
y
z
x

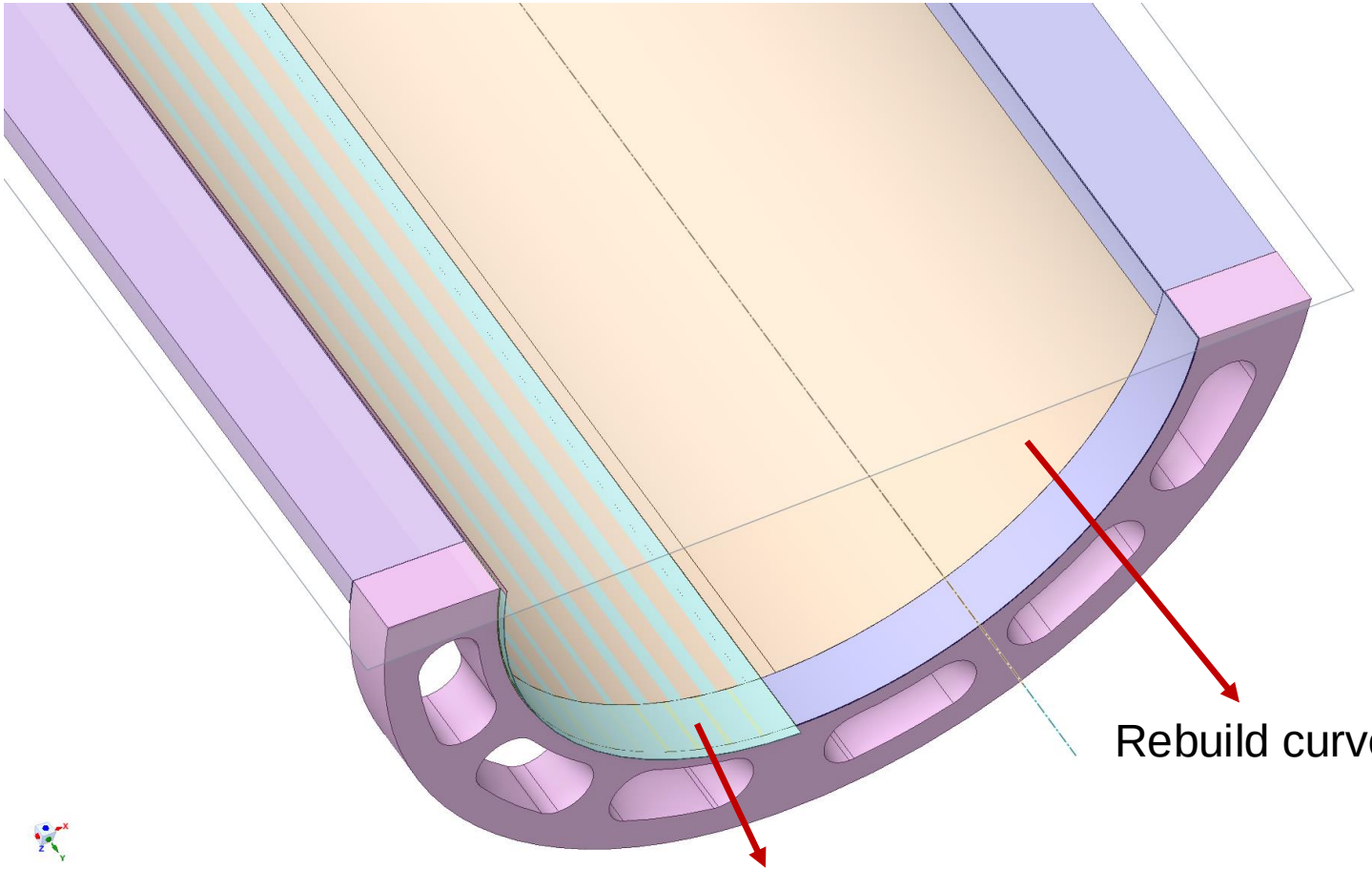

Eigenfrequency=2135.643481 Hz
Surface: Displacement magnitude (µm)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
x
z
y


Eigenfrequency=2146.10124 Hz
Surface: Displacement magnitude (µm)
0.3
0.25
0.2
0.15
0.1
0.05
0
y
z
x

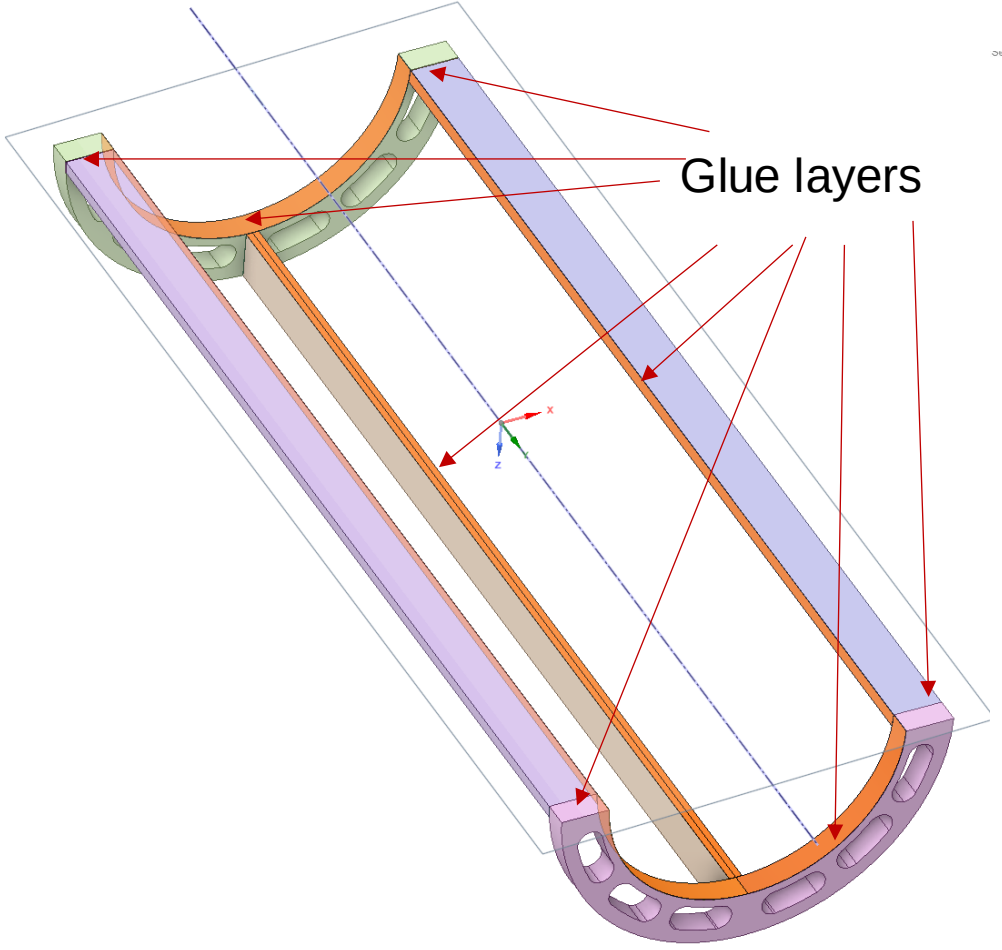

Eigenfrequency=2146.10124 Hz
Surface: Displacement magnitude (µm)
0.3
0.25
0.2
0.15
0.1
0.05
0
x
z
y

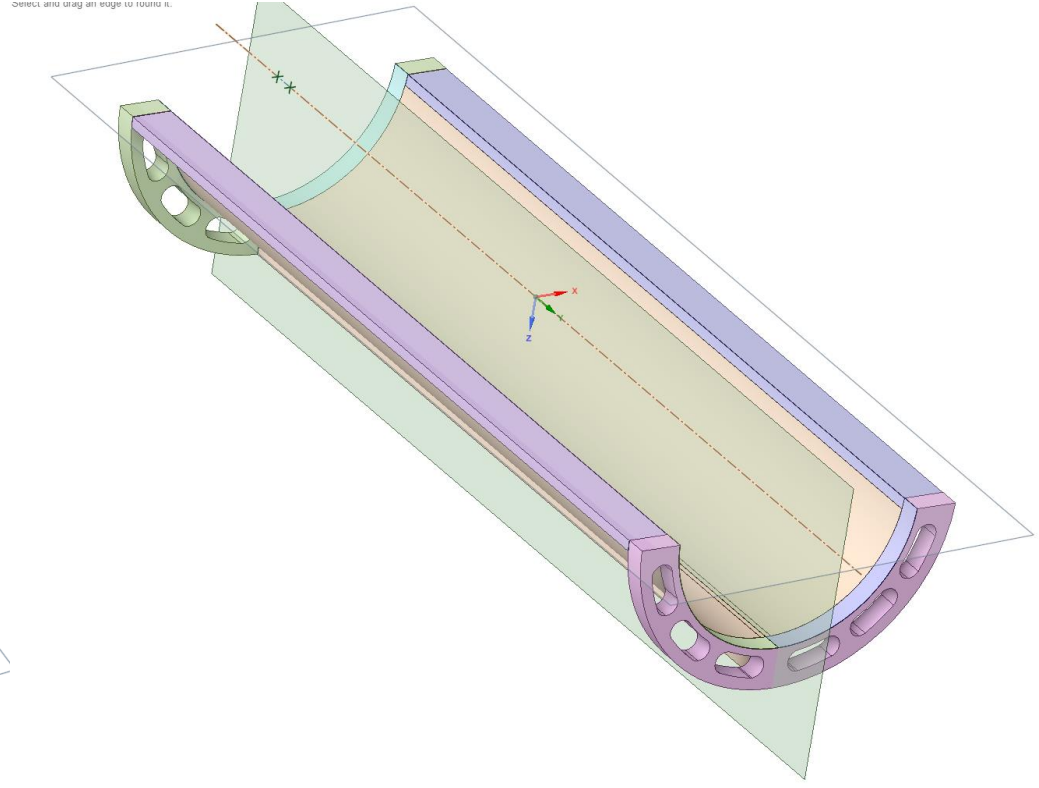
Modal analysis ½ L0



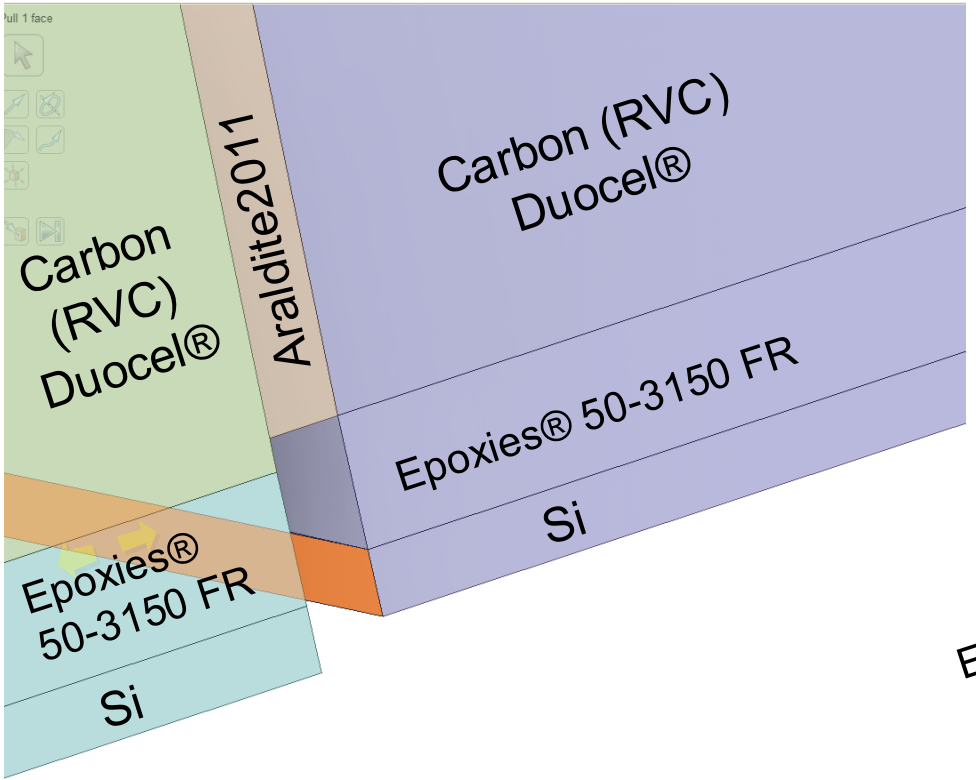

Rebuild curved surfaces
Original surface from *.stp file
– topological problems

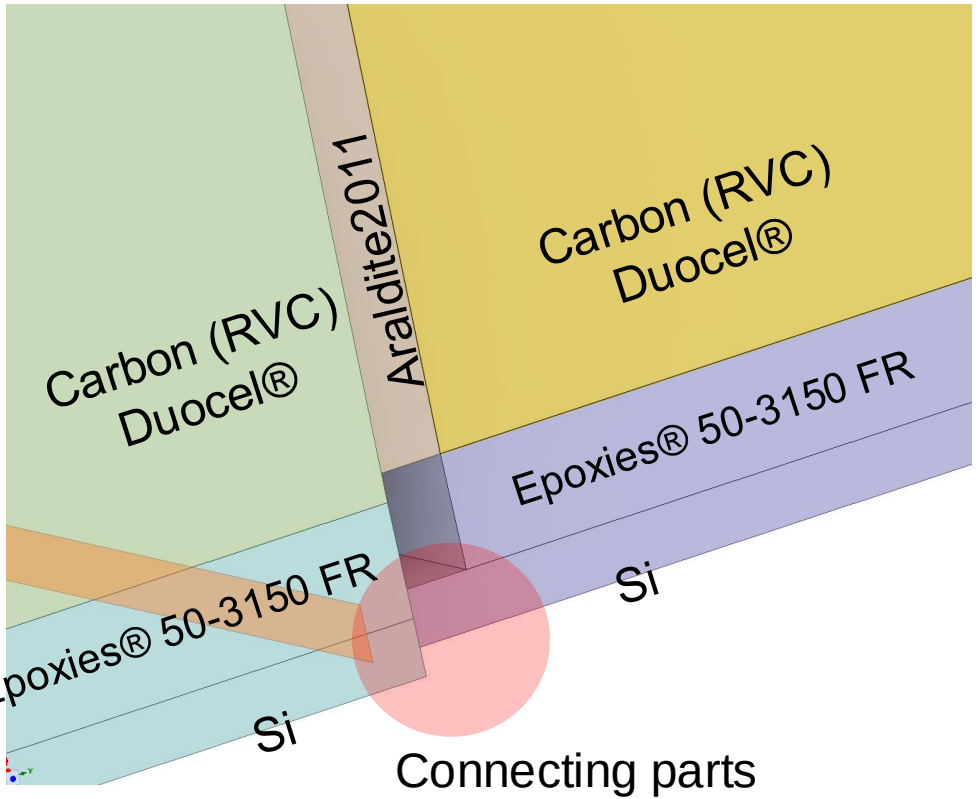
Grow of silicon layers





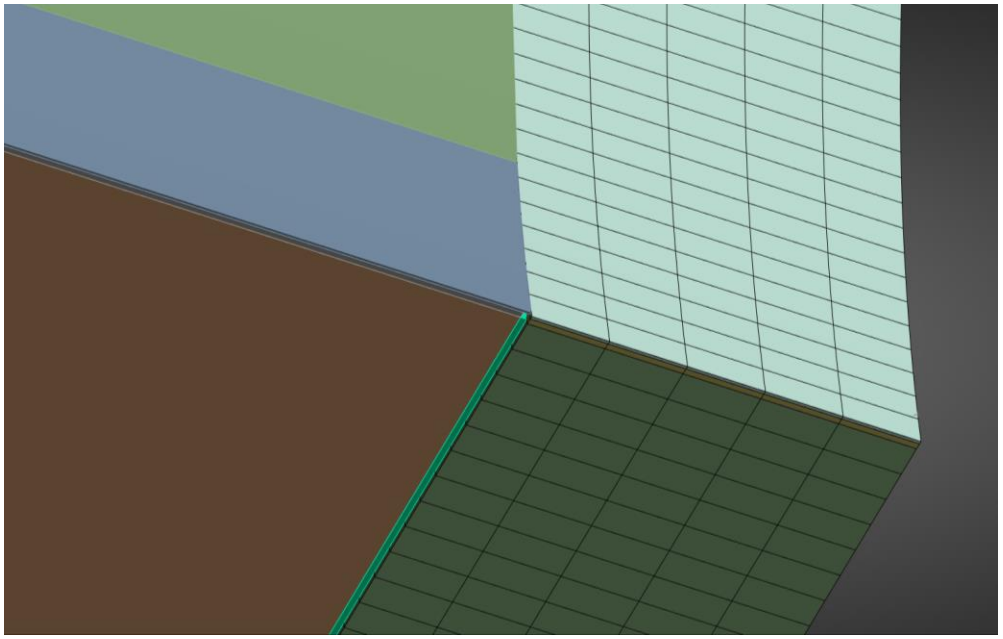
Modelling strategy

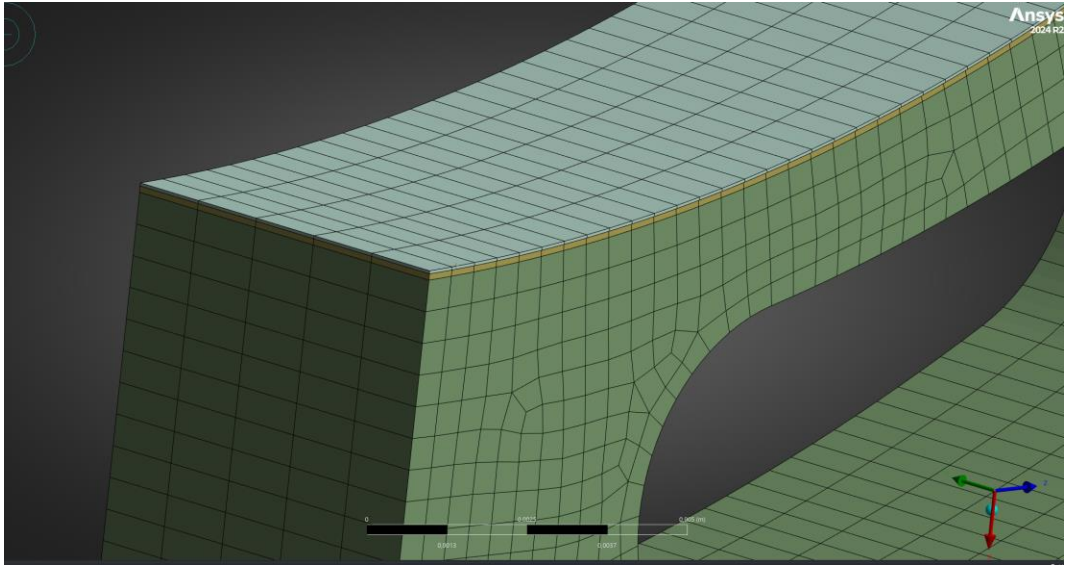




Connecting parts

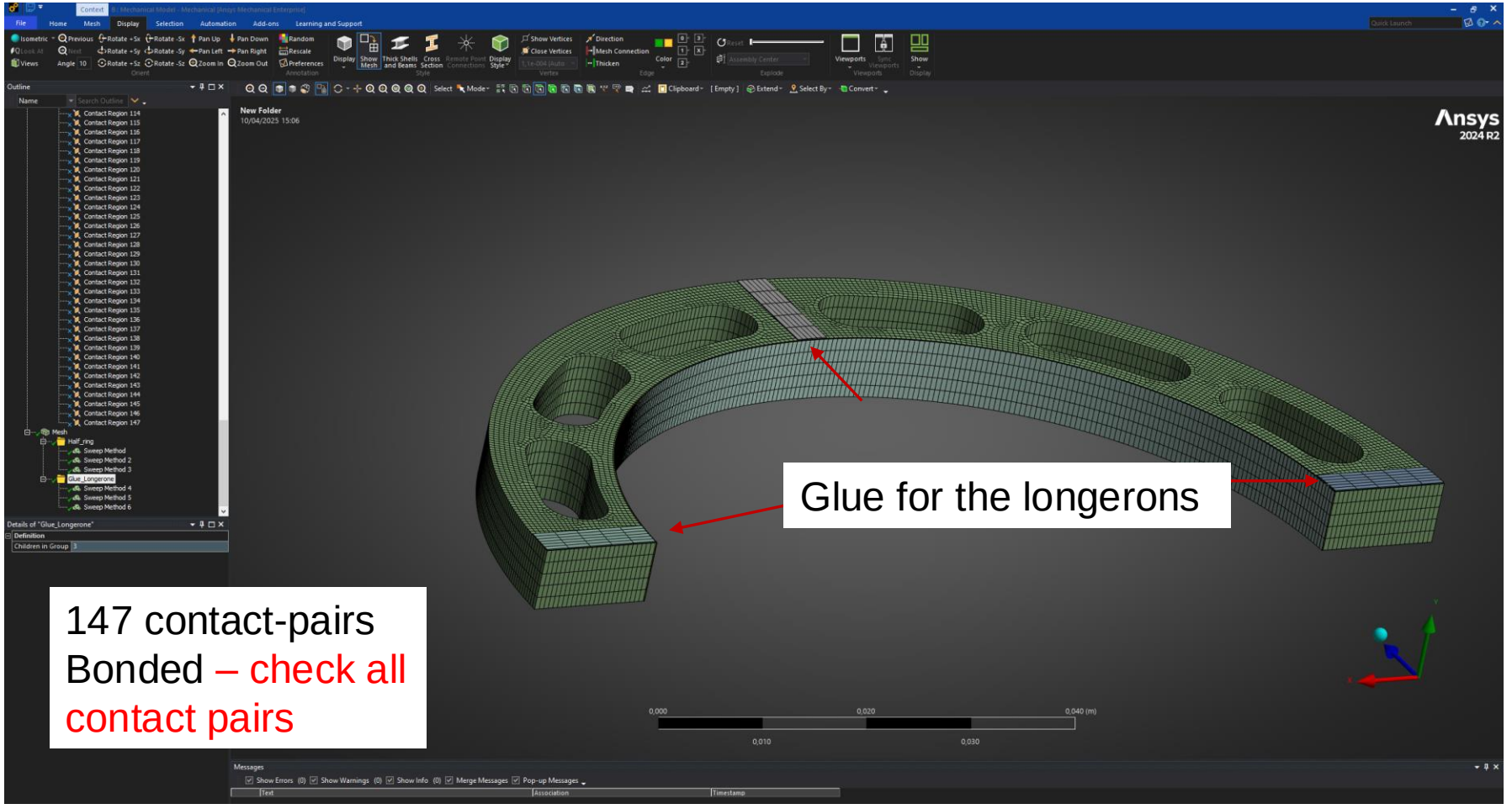
Meshing strategy

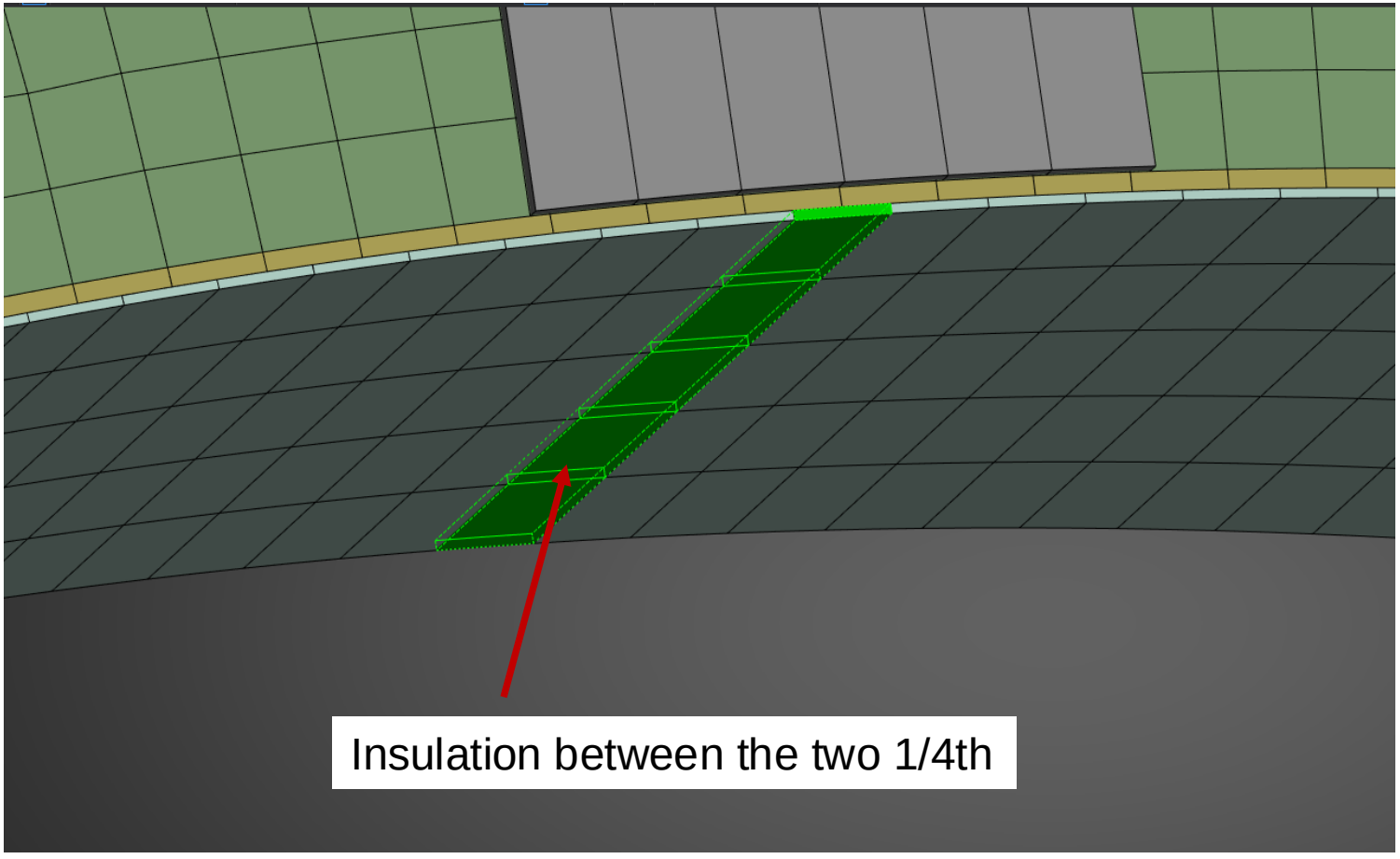




Mesh sweeping to obtain a regular mesh

Half-ring


Glue for the longerons
147 contact-pairs
Bonded – check all contact pairs
Ansys
2024 R2


Insulation between the two 1/4th

Modelling 1/4th reduce the