



Simulations for Satellite Engineering and Integration

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9. ročník Konference COMSOL
Multiphysics

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SPACE
FOR HUMANKIND

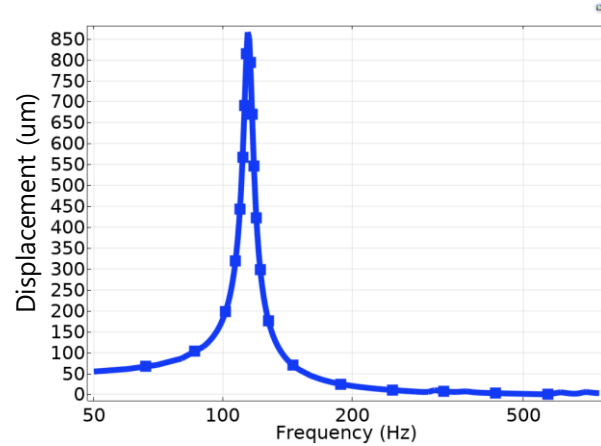


ESA Space Rider

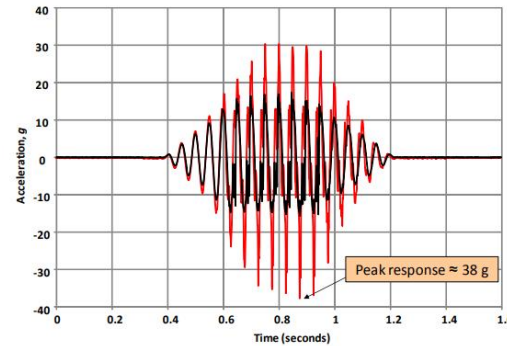
COMPACT OPTICAL HYPERSPECTRAL CAMERA FREYA FOR CUBESAT MISSIONS

Mathematical modelling and CubeSats

Natural frequencies



Sine-Burst test

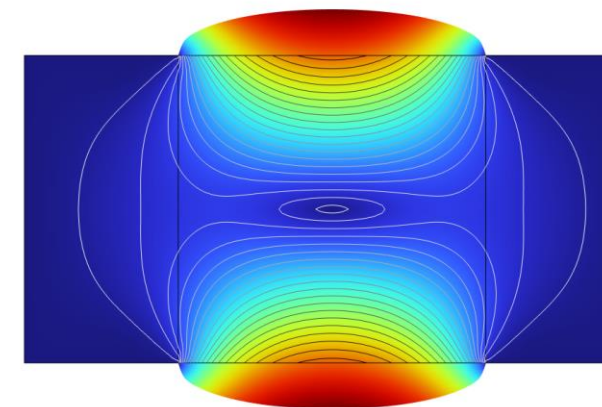
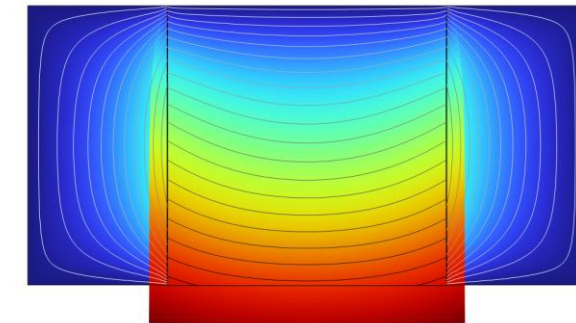
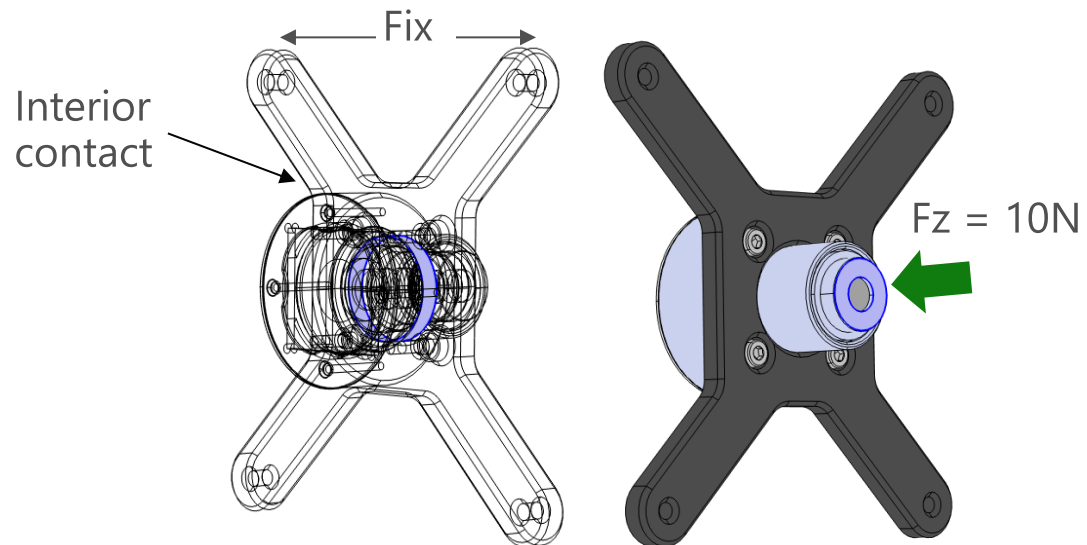
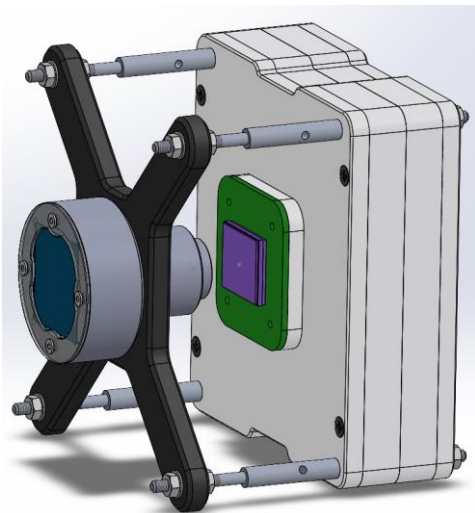


Temperature exposure during flight

Internal fairing pressure



Static study - definition



Geometry level

Physics level

Interior contact

Form a union

Form an assembly

Identity/Contact pair

Auxiliary slit

Interior contact

Contact

Continuity

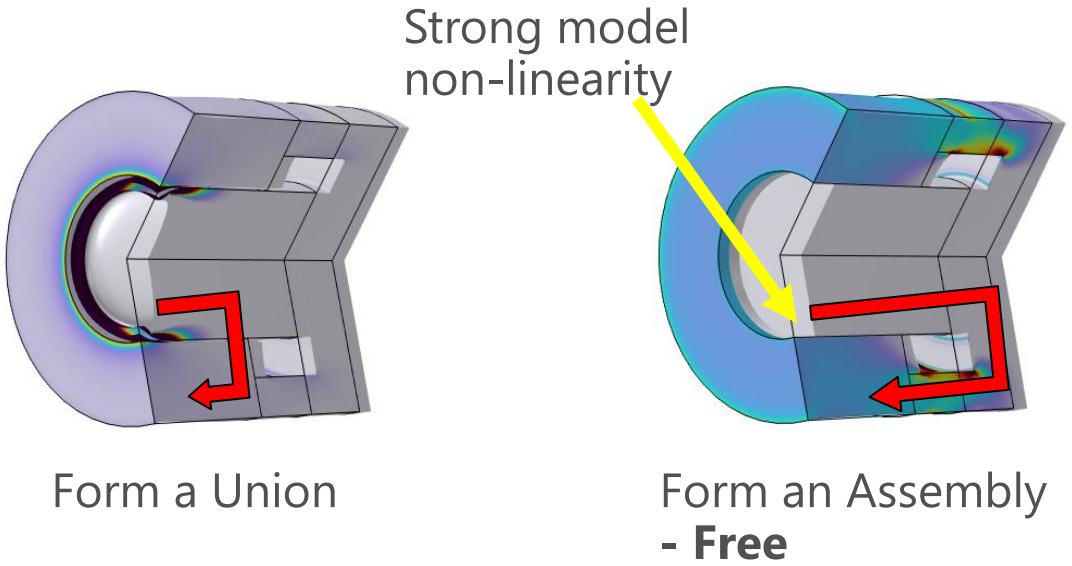
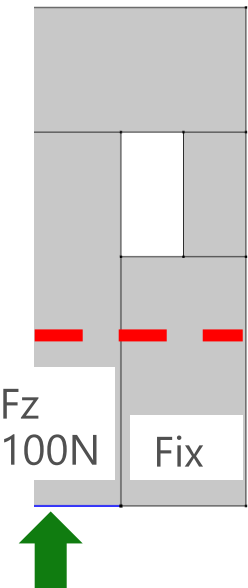
Free

Friction

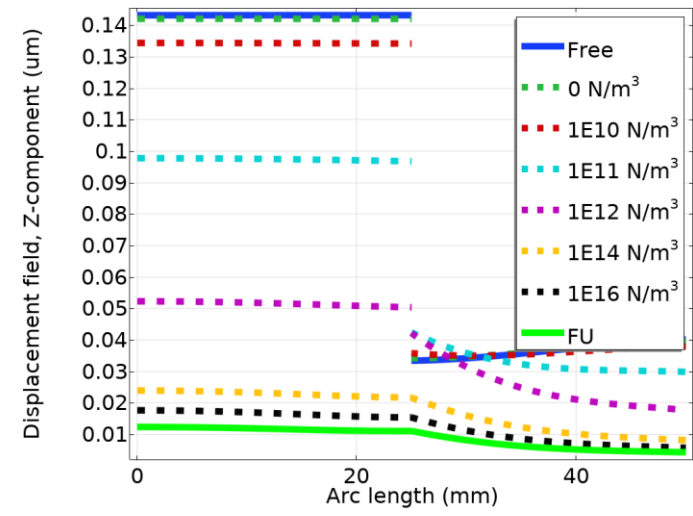
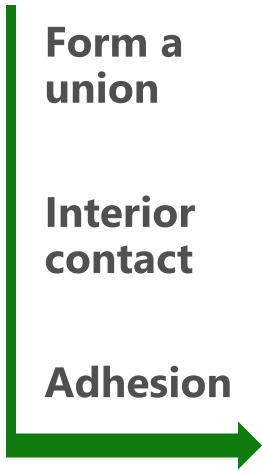
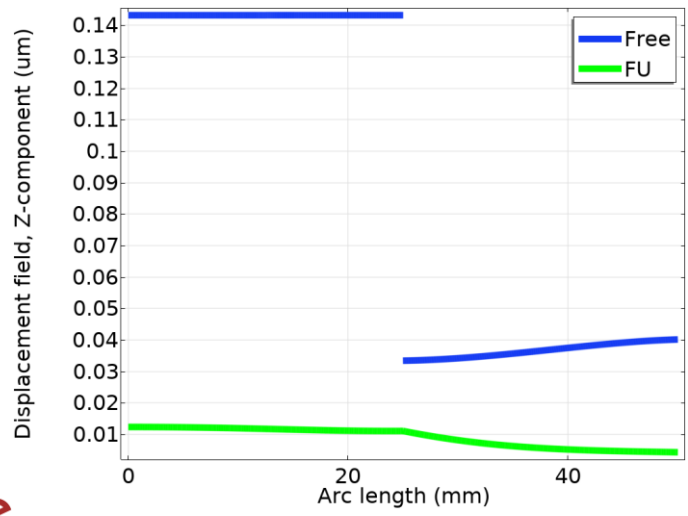
Adhesion

Penalty factor

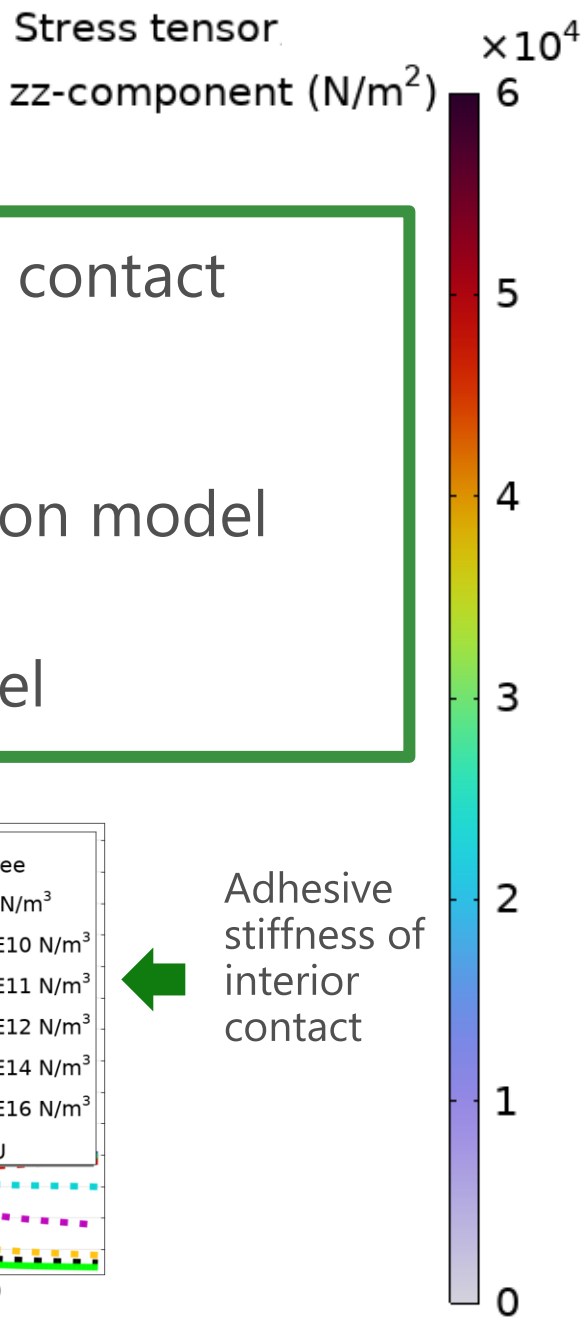
Static study – contact surfaces



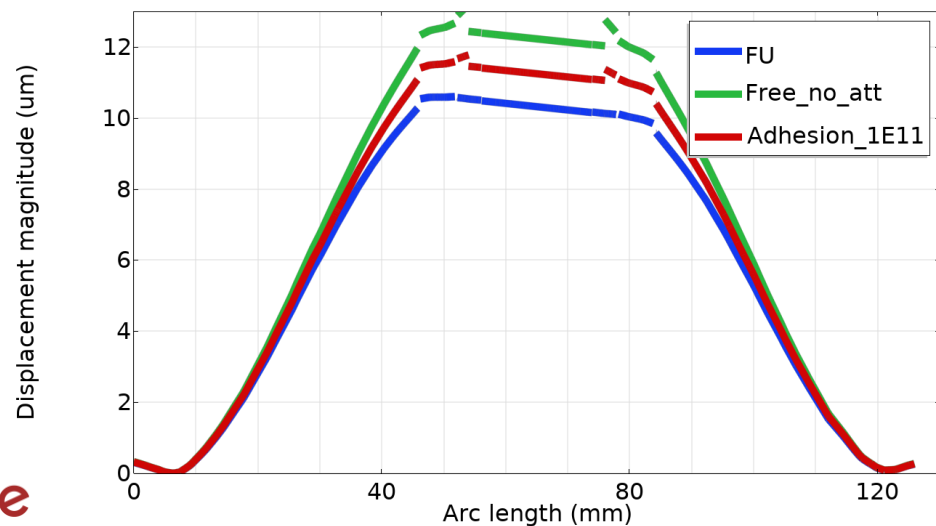
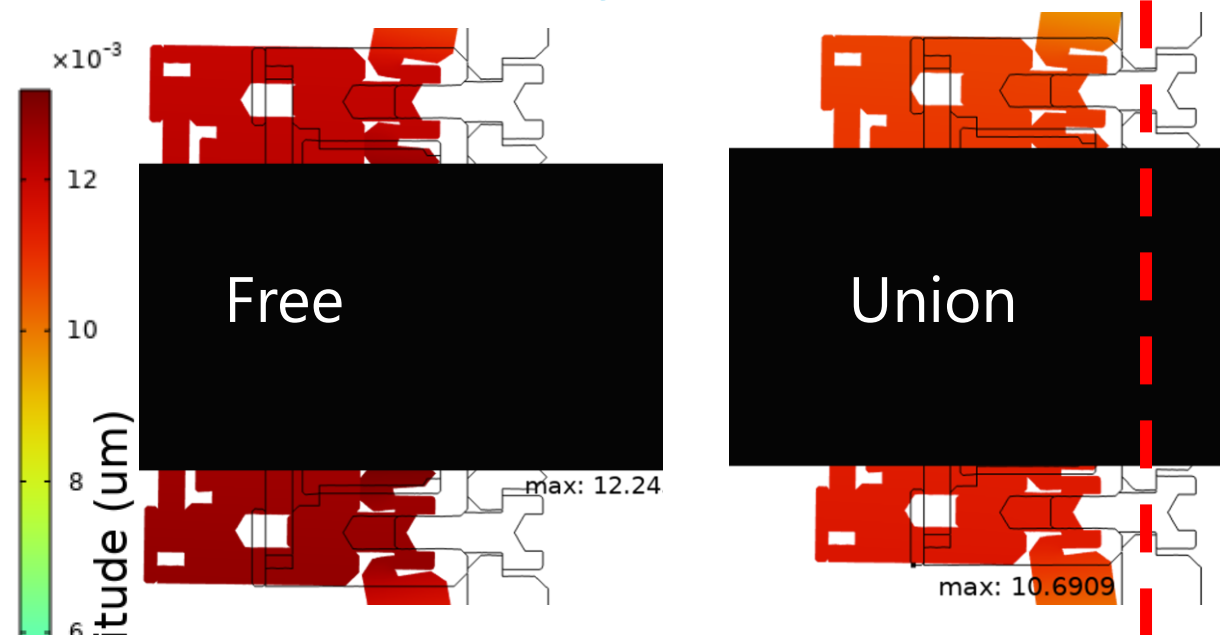
- Penalty / other contact method
- Coulomb Friction model
- Adhesion model



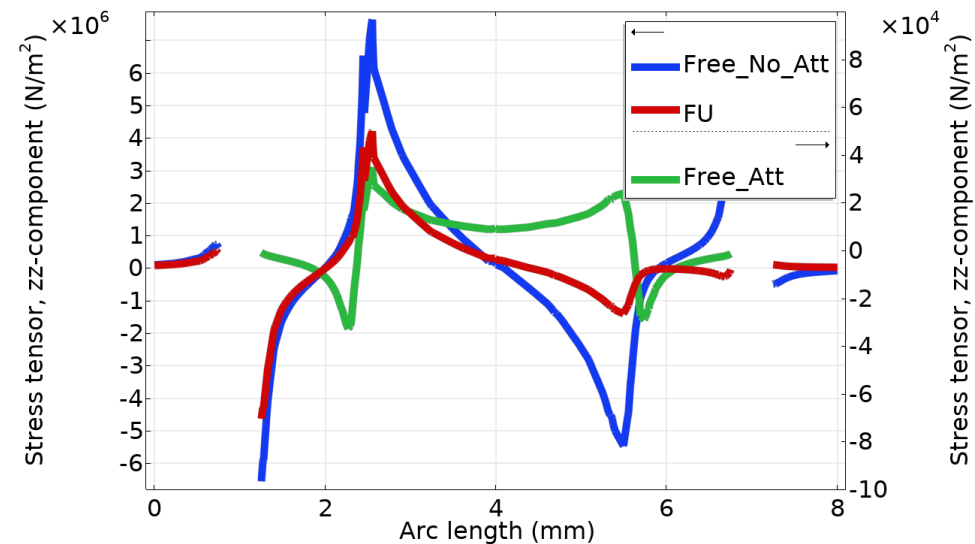
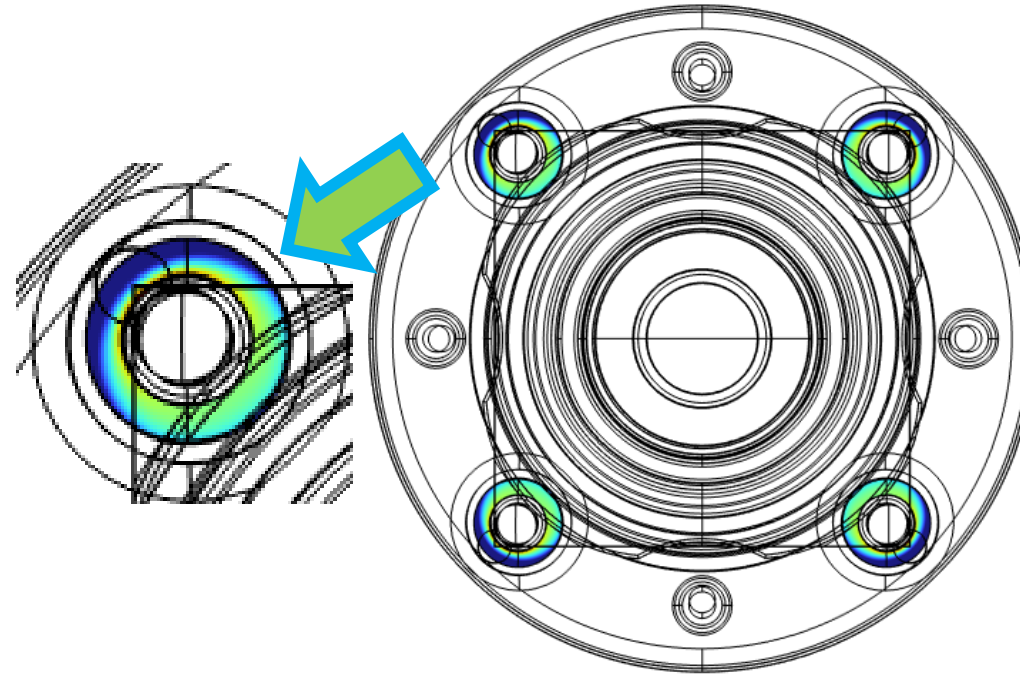
Adhesive stiffness of interior contact



Static study – results

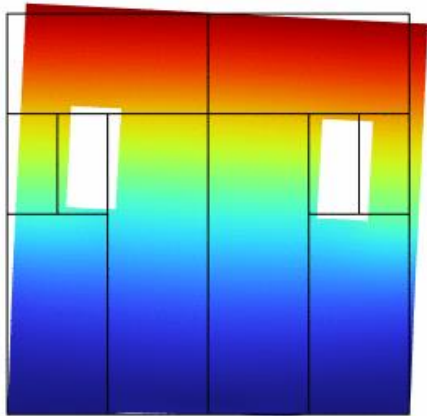


Evaluation of Stress on the Bearing Surface of the Screw



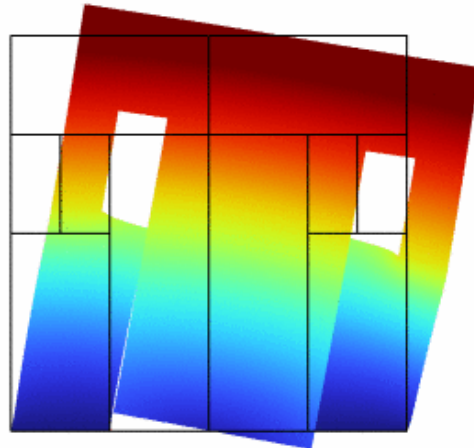
Natural frequencies

Union

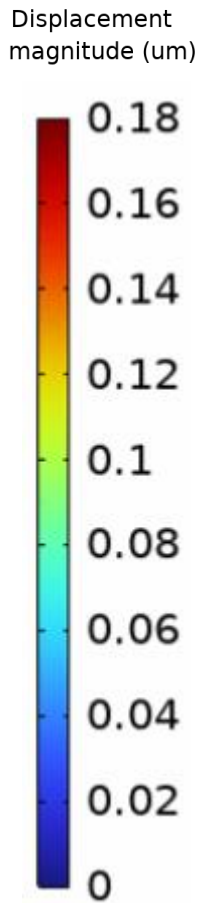
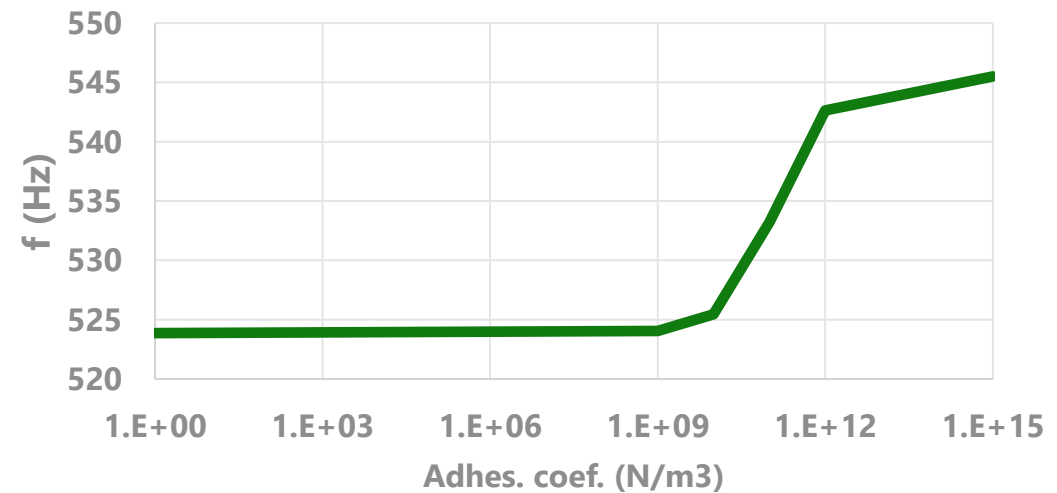
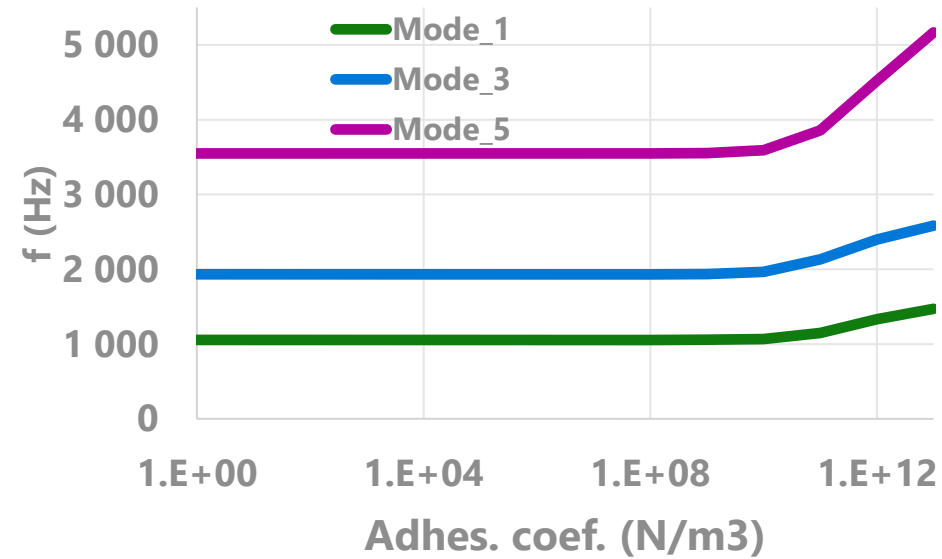
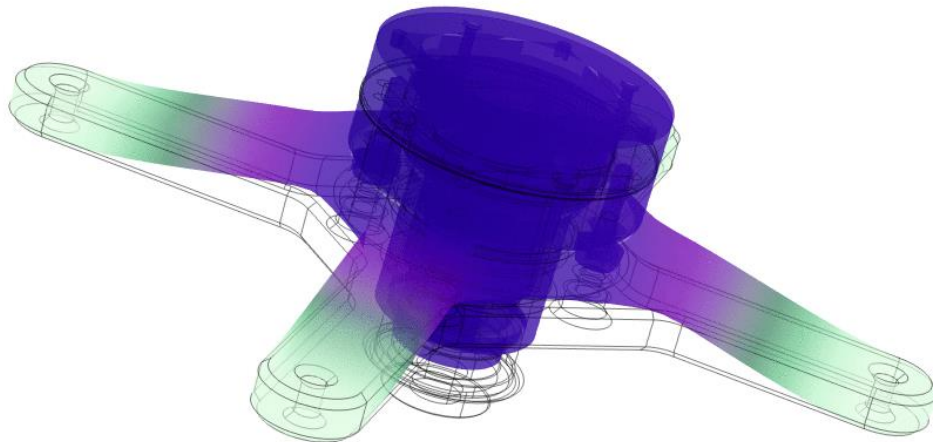


$f = 1\,816\text{ Hz}$

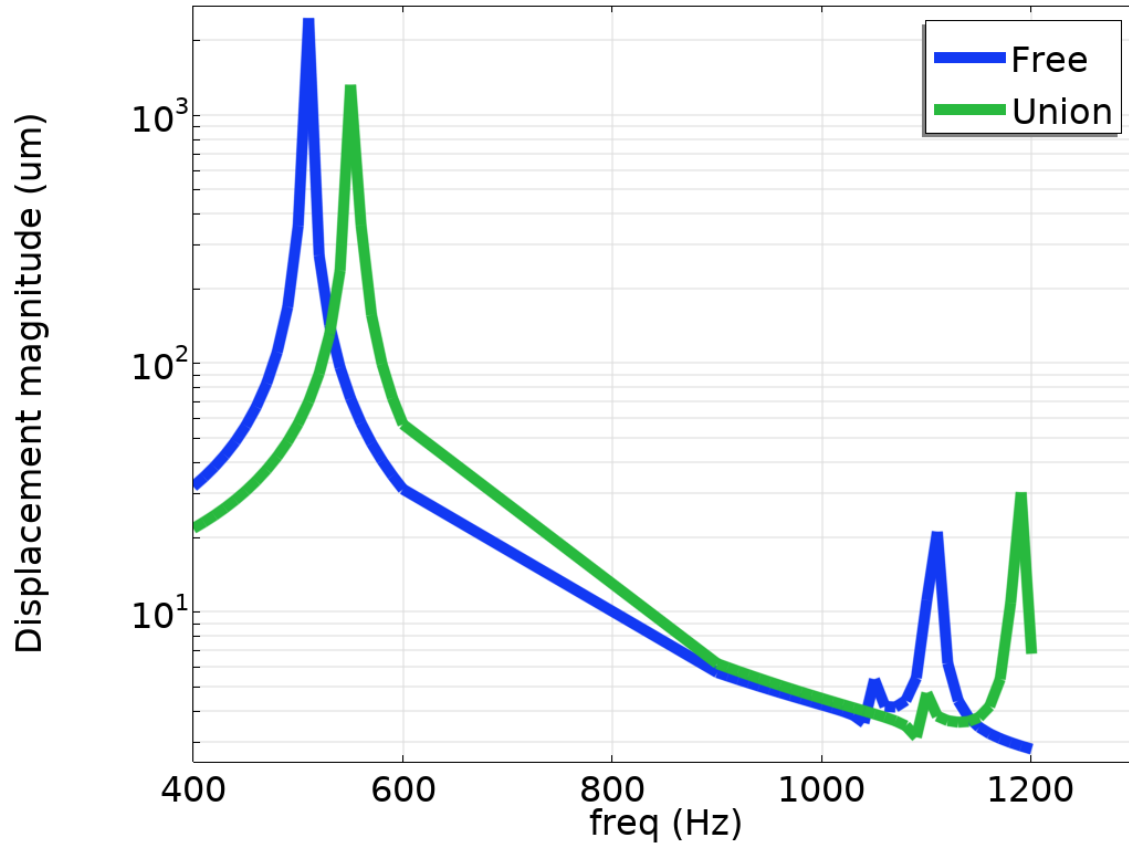
Free contact



$f = 1\,055\text{ Hz}$



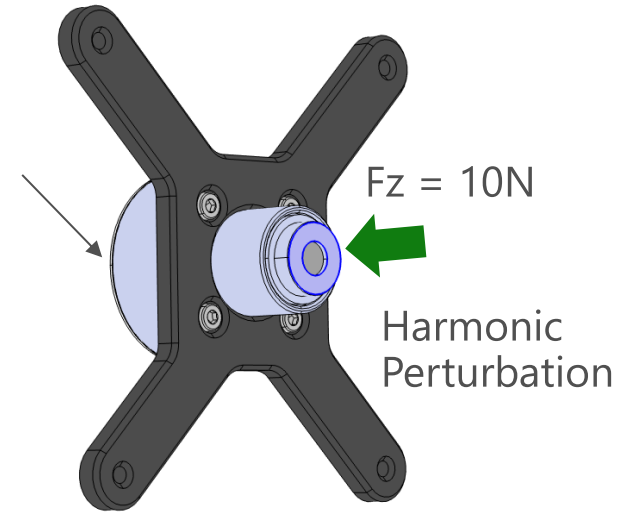
Frequency response



Deformation of optical setup

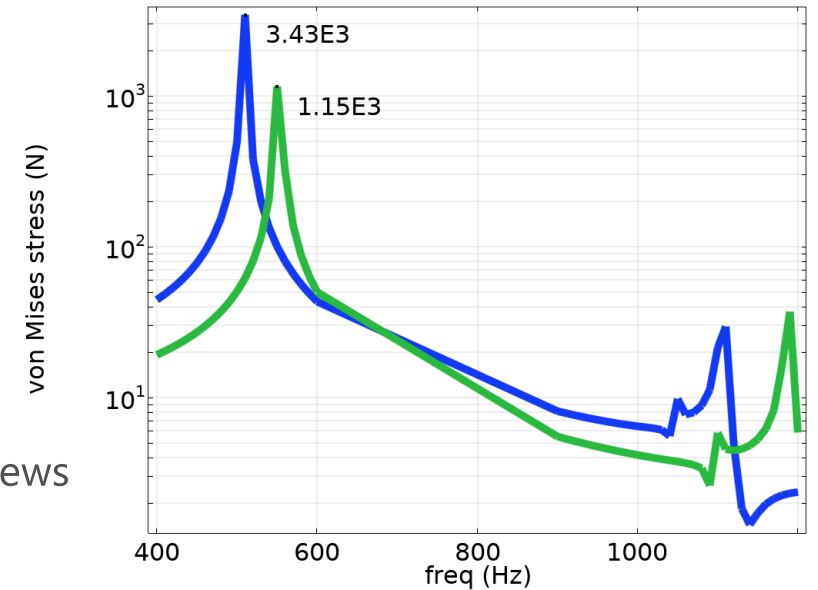


Evaluating point for displacement



Geometric nonlinearity vs. Frequency Domain solver

Force acting on screws



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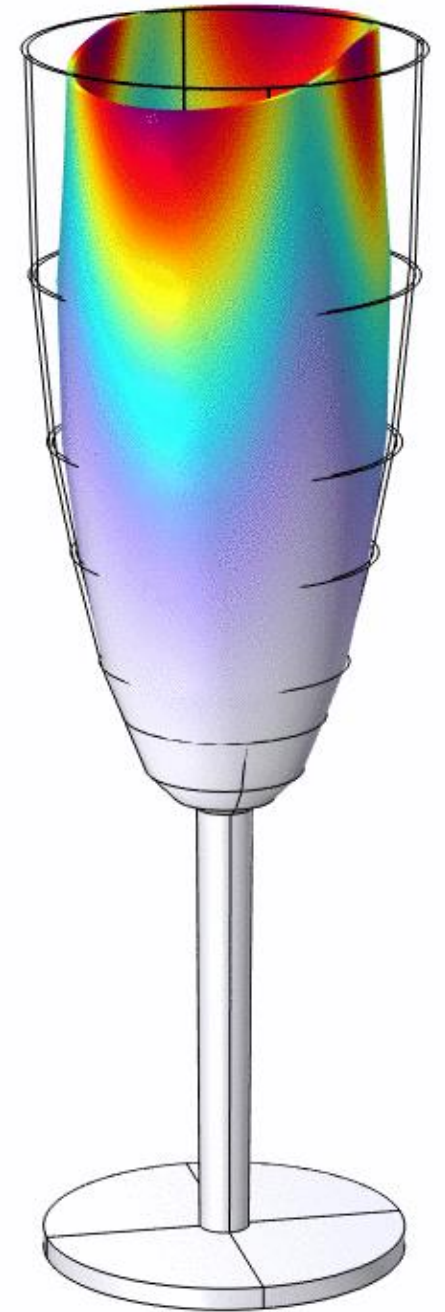
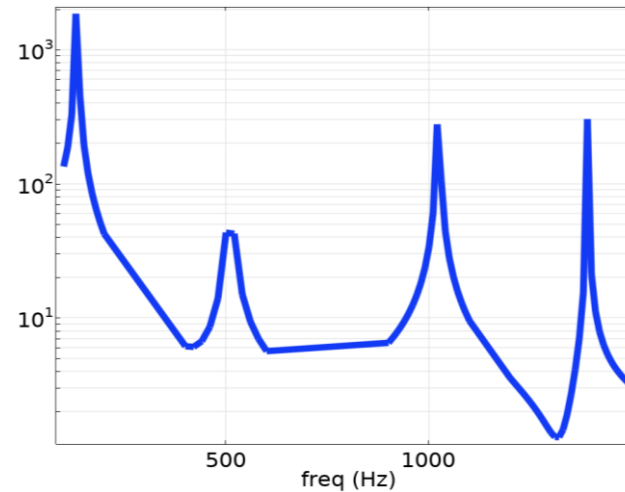
Contact in structural analysis

Geometry level

Physics level

Impact of mechanical contact in frequency domain

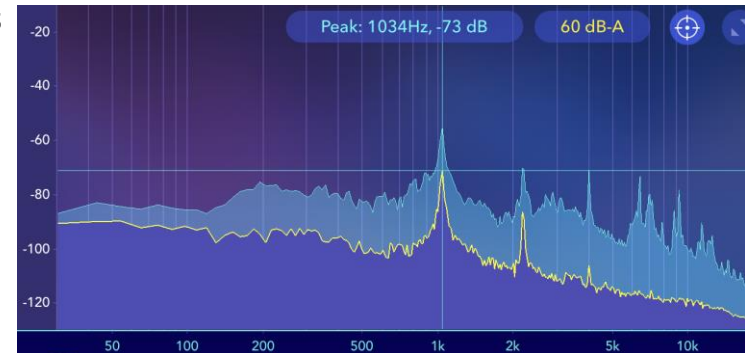
Displacement magnitude (um)



<https://www.comsol.com/video/simulating-structural-contact-with-comsol-multiphysics>

<https://www.comsol.com/support/learning-center/article/83831>

<https://www.comsol.com/blogs/how-to-evaluate-stresses-in-comsol-multiphysics>





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