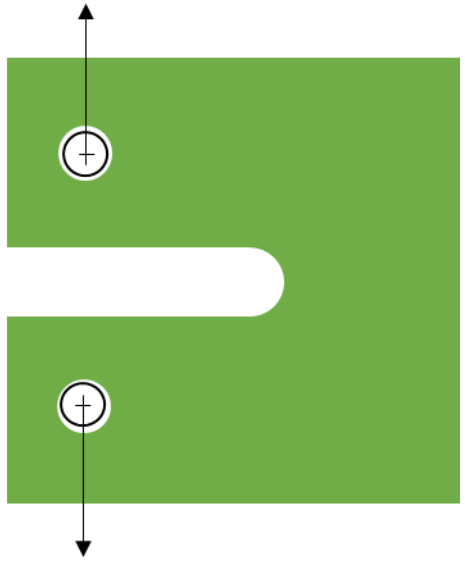
3D MODELLING A C-BRACKET

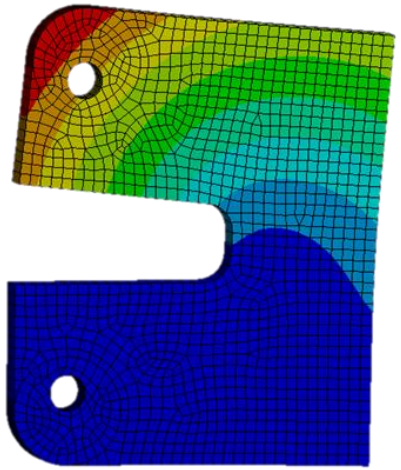
by Jared, Victoria, Kilian and Carla

Pictures used from Markus and Matthew

OUR WORKPLACE

- supervisors Markus and Matthew
- devided into team Delta and team Omega
- same task
- friendly competition

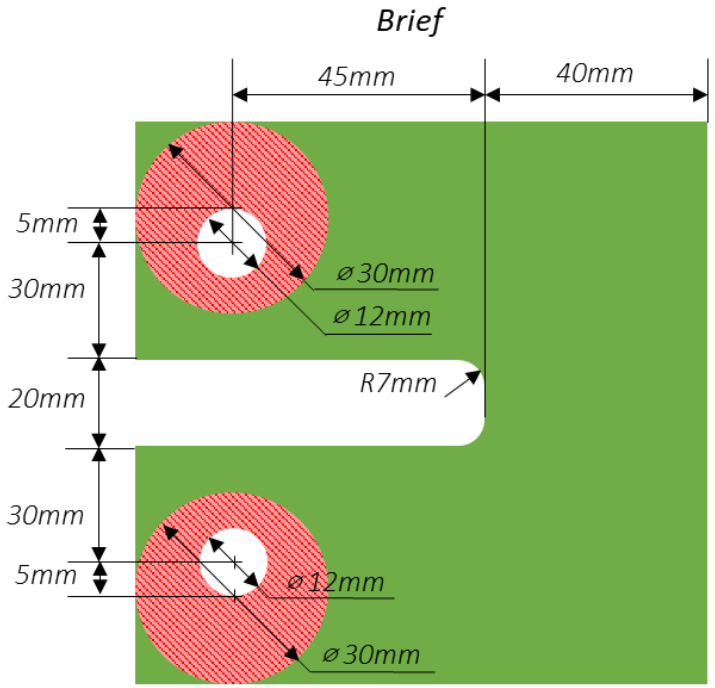




- design and optimize a C-lifting bracket
- using Ansys as CAD software and finite element analysis software to analyse design
- 3D print the final design of each group and test it

- aim: minimize stress AND volume (105 cm^3 → 42 cm^3)

THE TASK

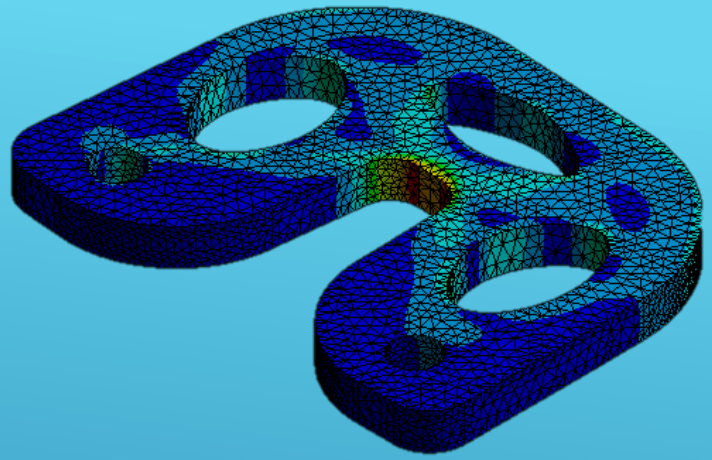


Overall Dimensions:
100mm x 120mm x 10mm

- red: not allowed to change
- green: allowed to change
- material can‘t be added around the green area
- the force is applied to the holes in the bracket and pulls them away from each other
- material: *Visijet M2R-WT*

ABOUT THE BRACKET

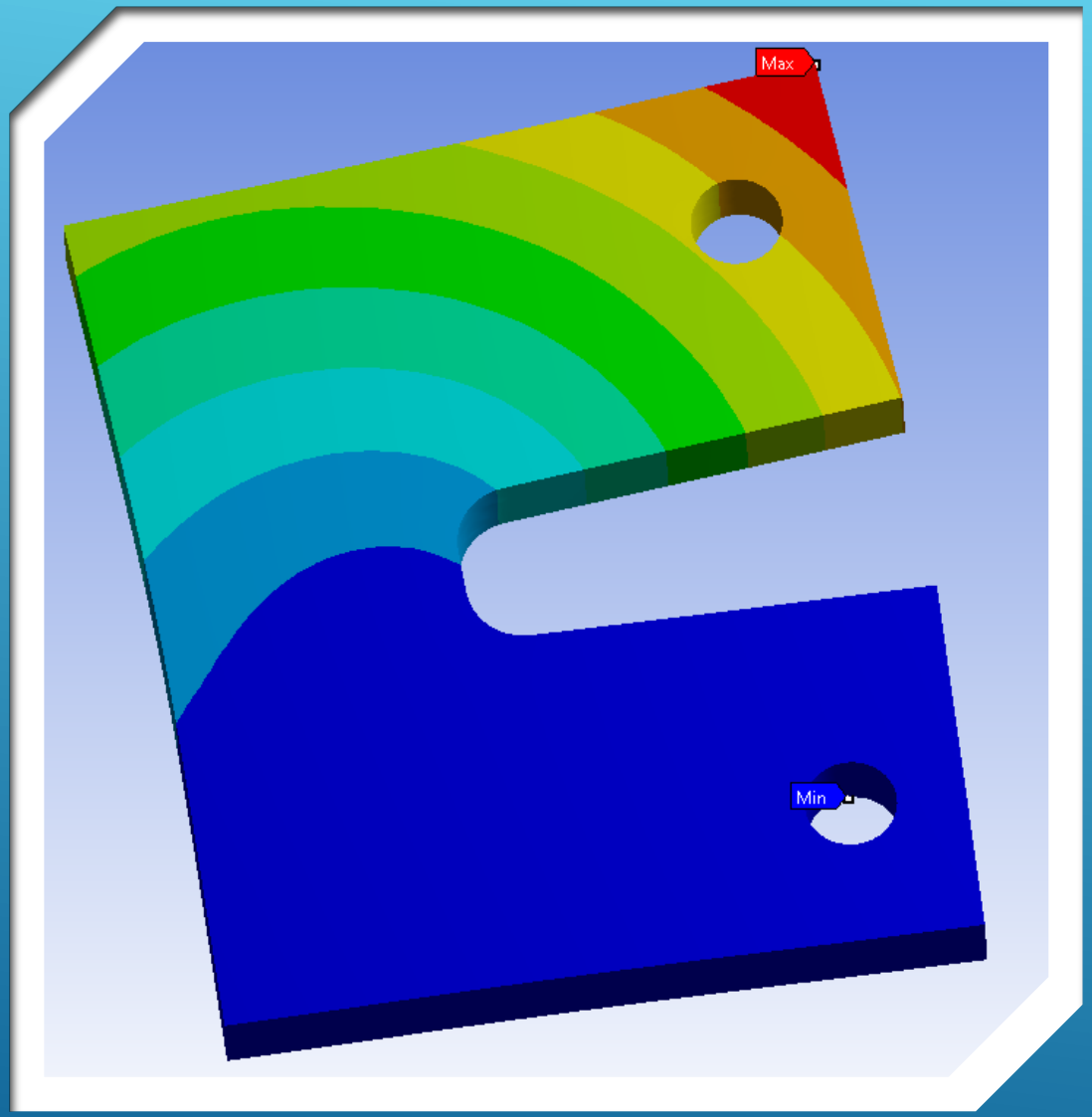
COMPARISON OF THE MODELS



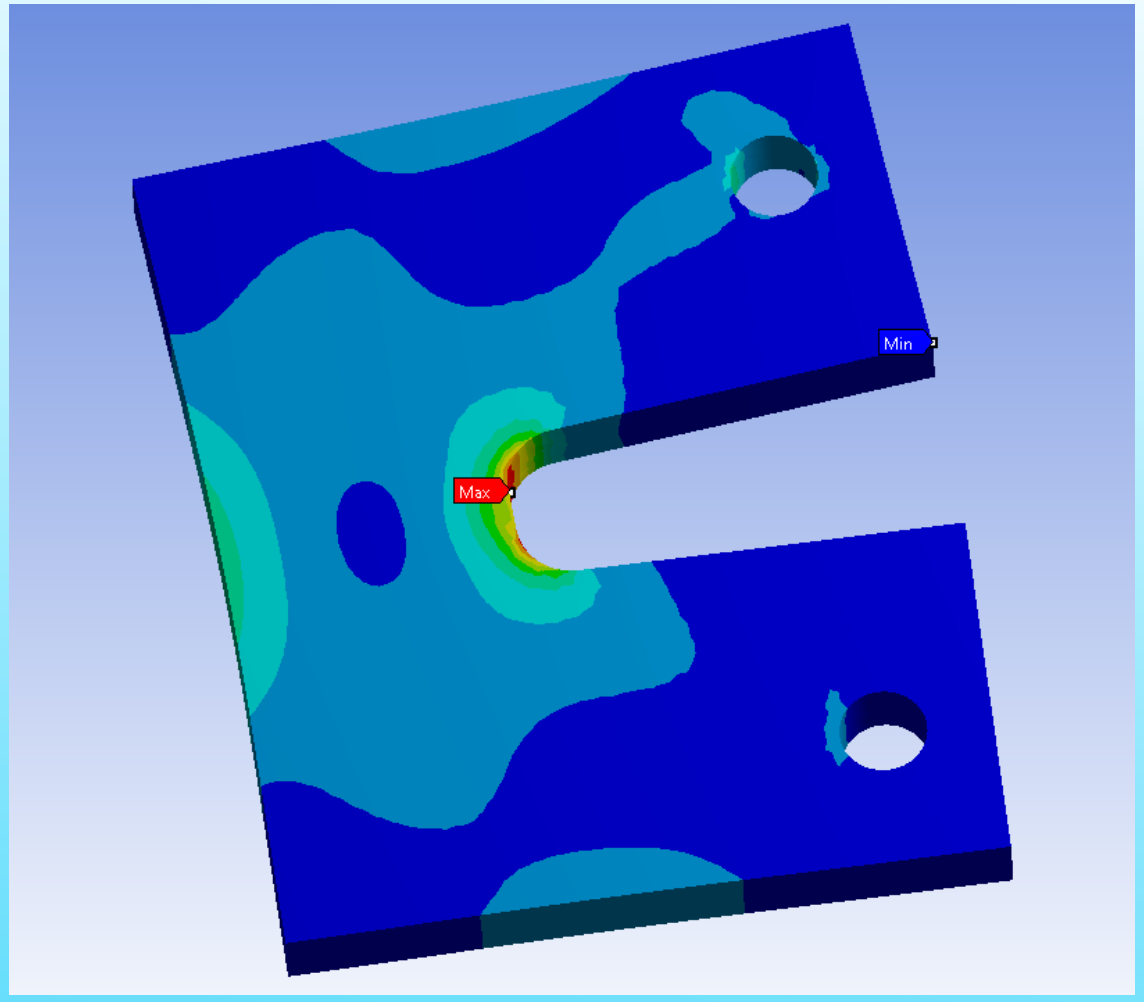
Mesh 1,5e-3m

100N

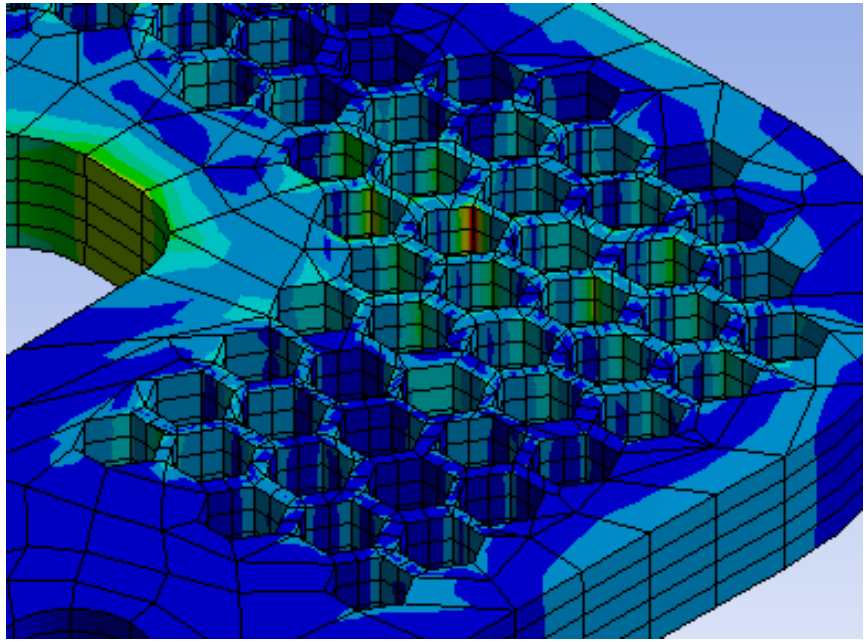
material: structural steel

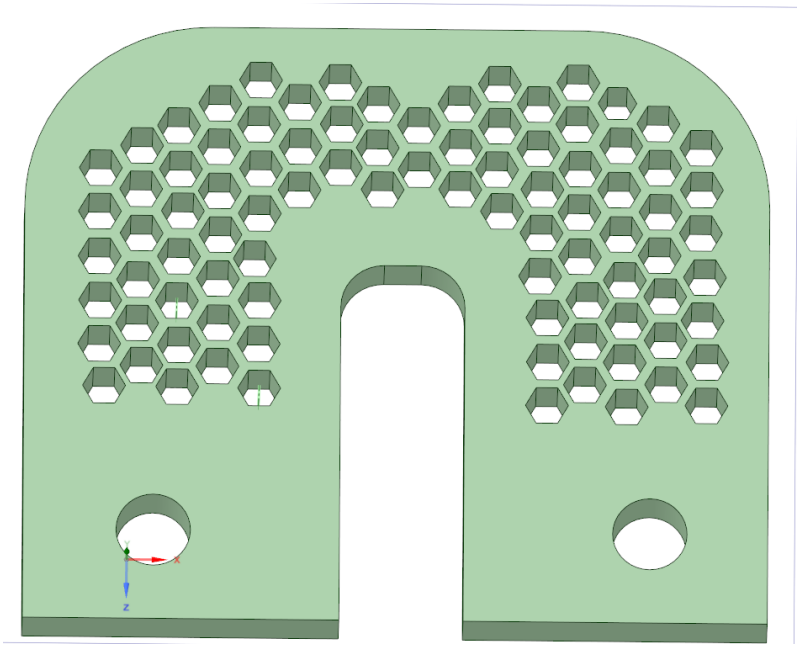


MAX. DEFORMATION: 4,17e-6 m



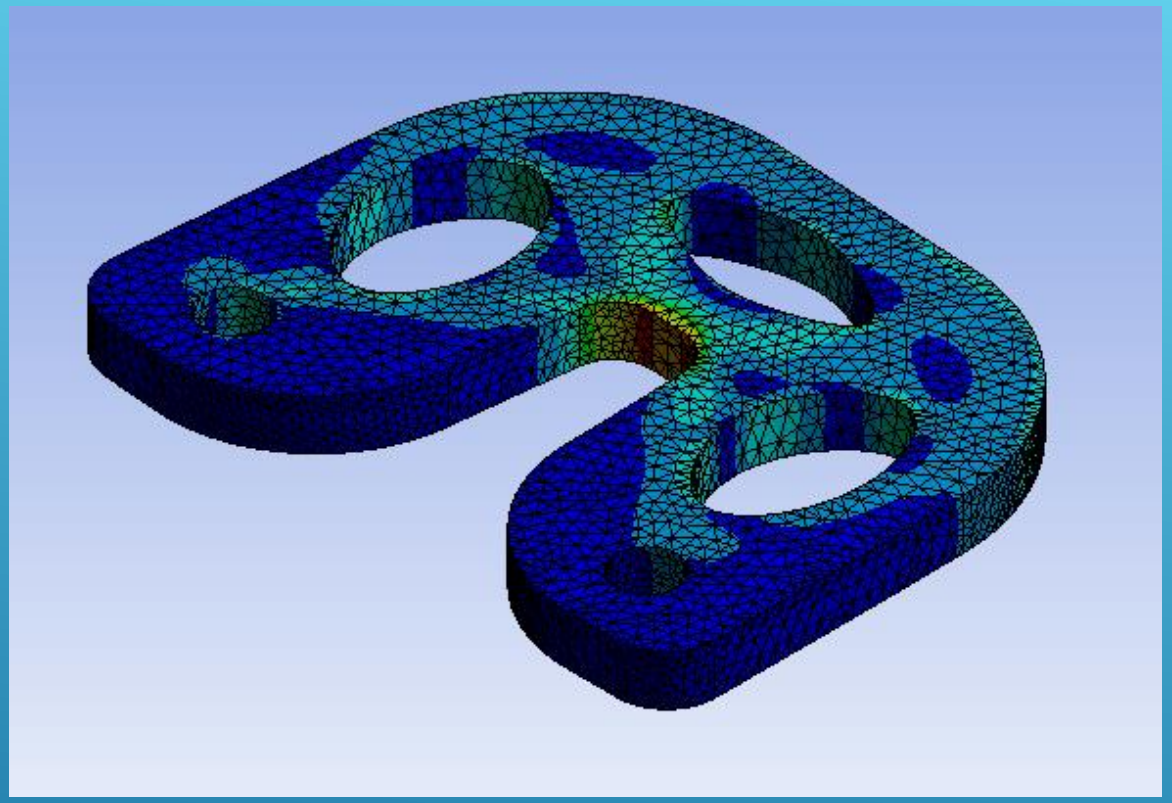
MAX. STRESS: 4,97e6 Pa

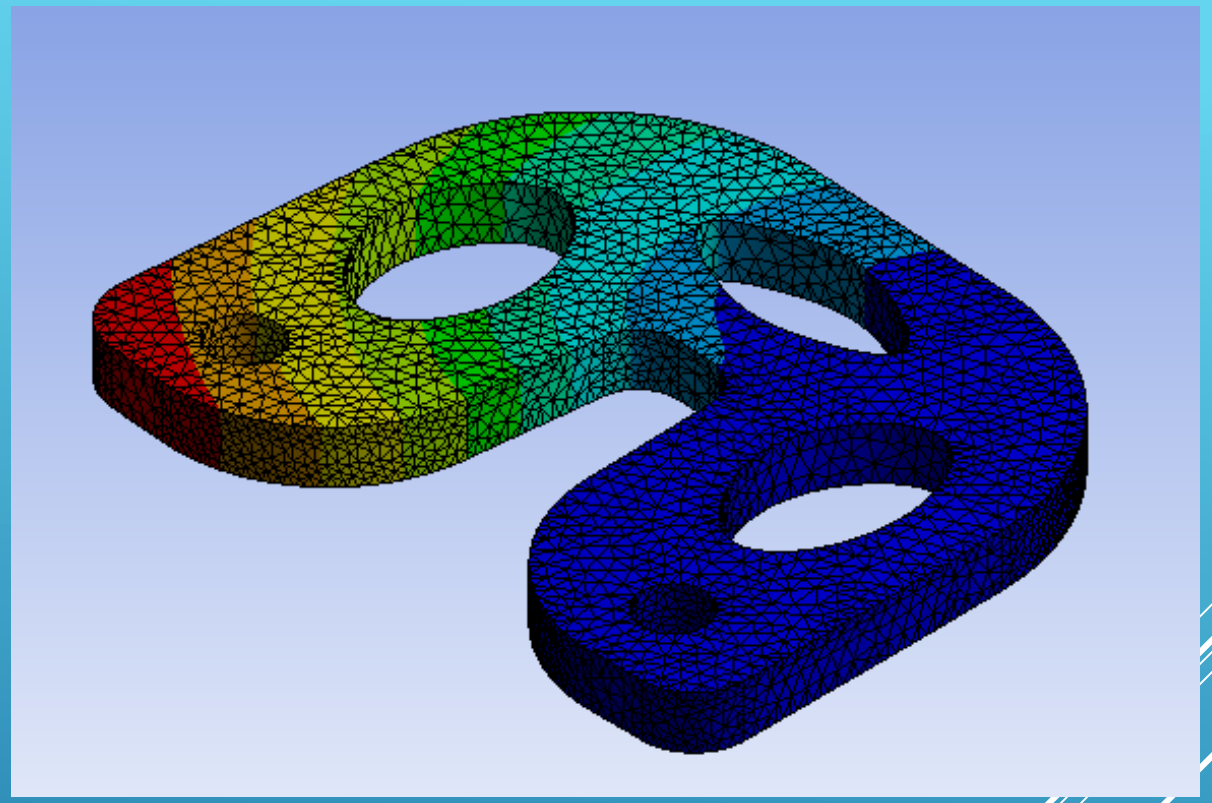




FIRST IDEAS TEAM DELTA

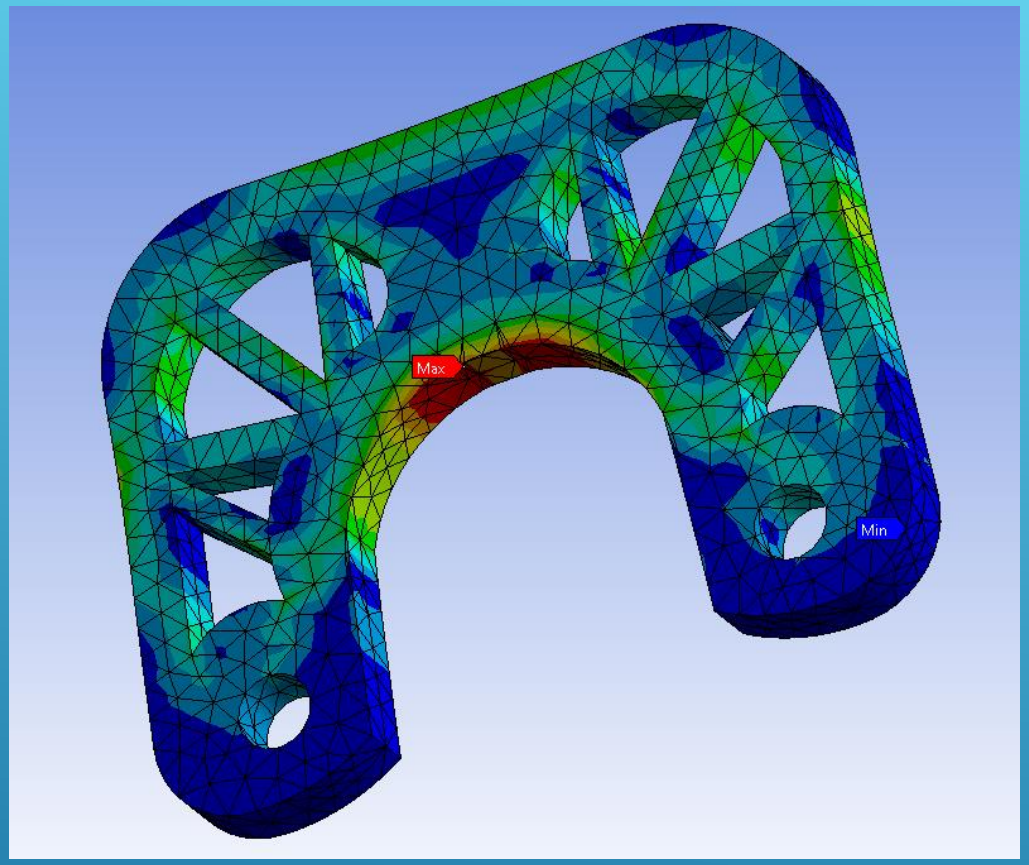
Volume: 56,5 cm³
Max. Stress: 1,34 e7 Pa
Max. Deformation: 1,55 e-5 m

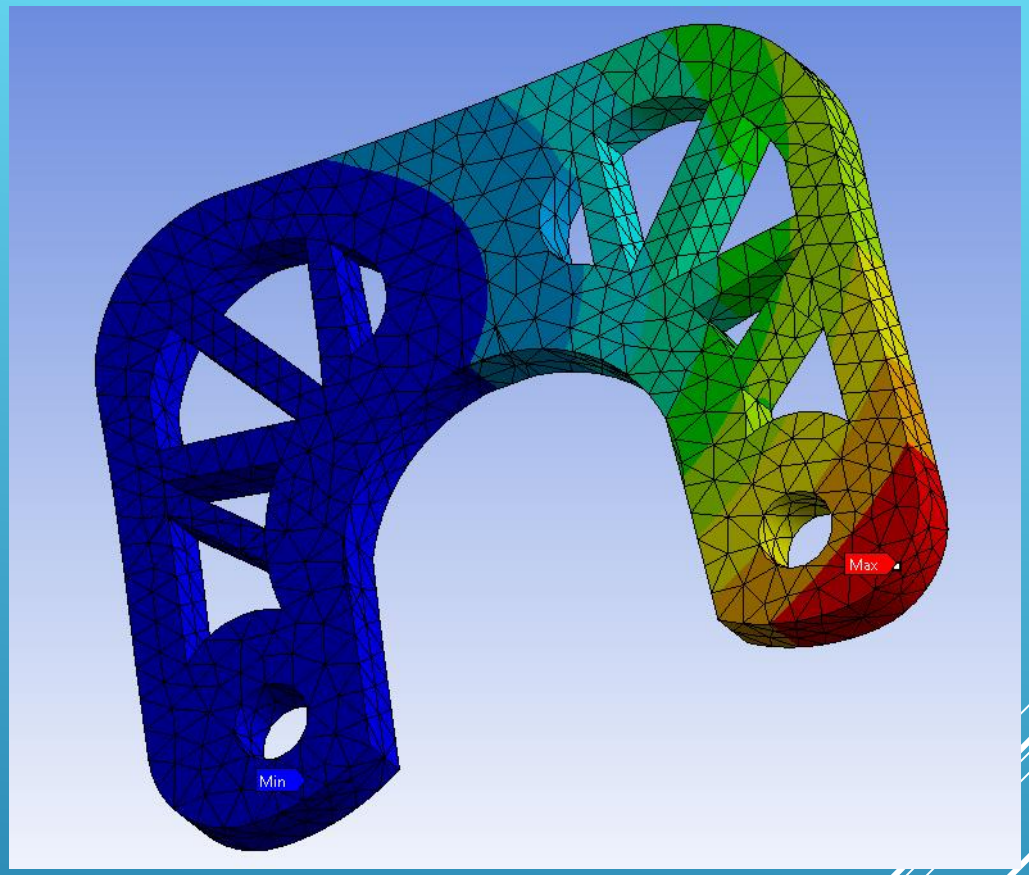




FIRST IDEAS TEAM DELTA

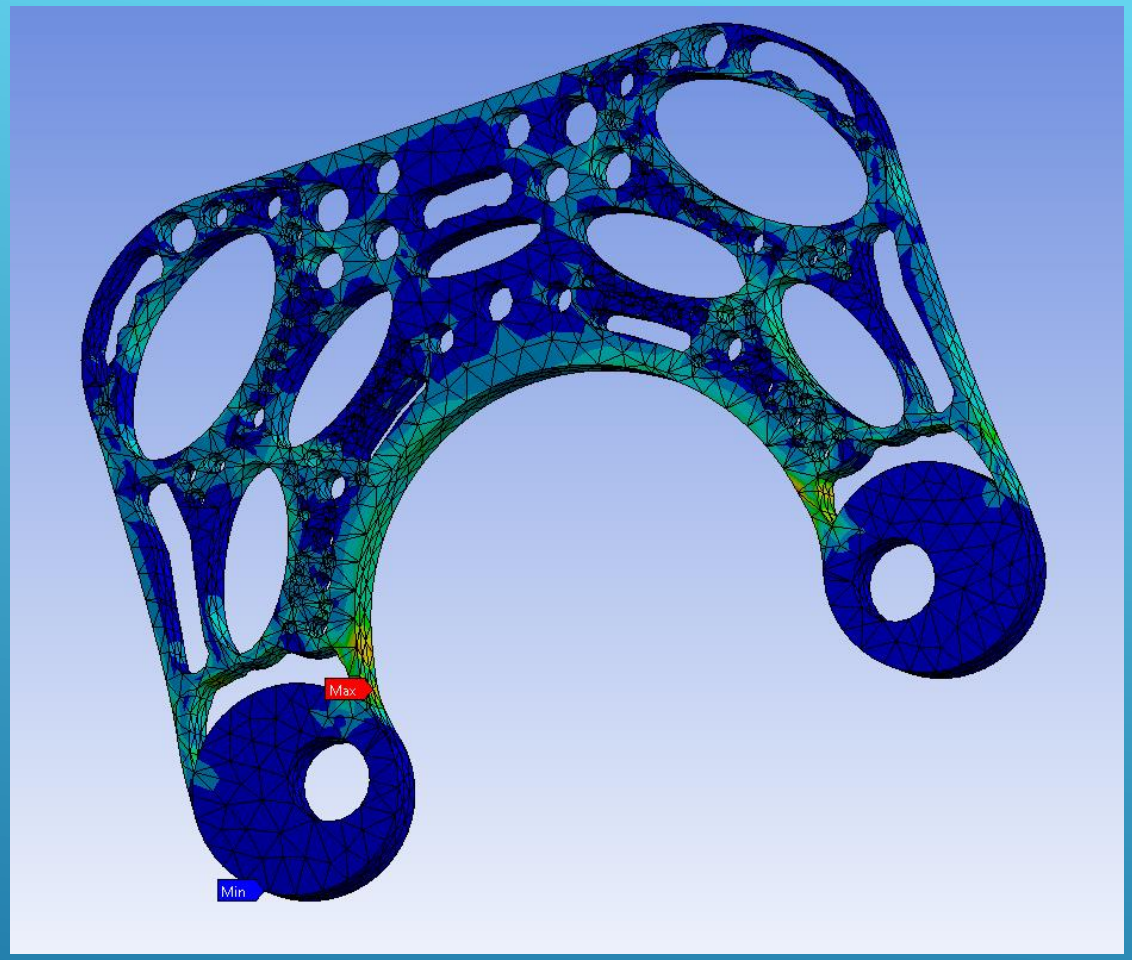
Volume: 75,07 cm^3
Max. Stress: 7,04 e6 Pa
Max. Deformation: 6,45 e-6 m

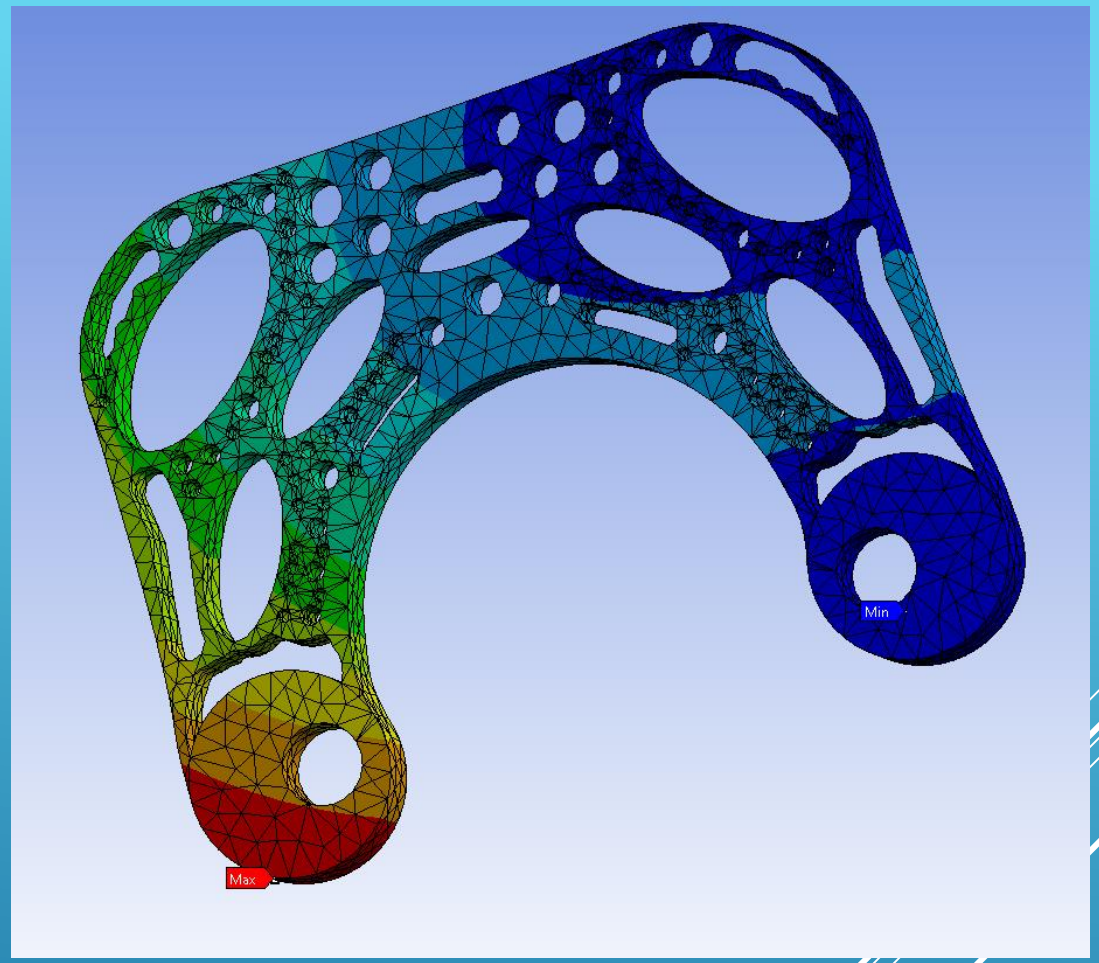




FIRST IDEAS TEAM OMEGA

Volume: 67,71 cm³
Max. Stress: 4,84 e6 Pa
Max. Deformation: 8,4 e-6 m



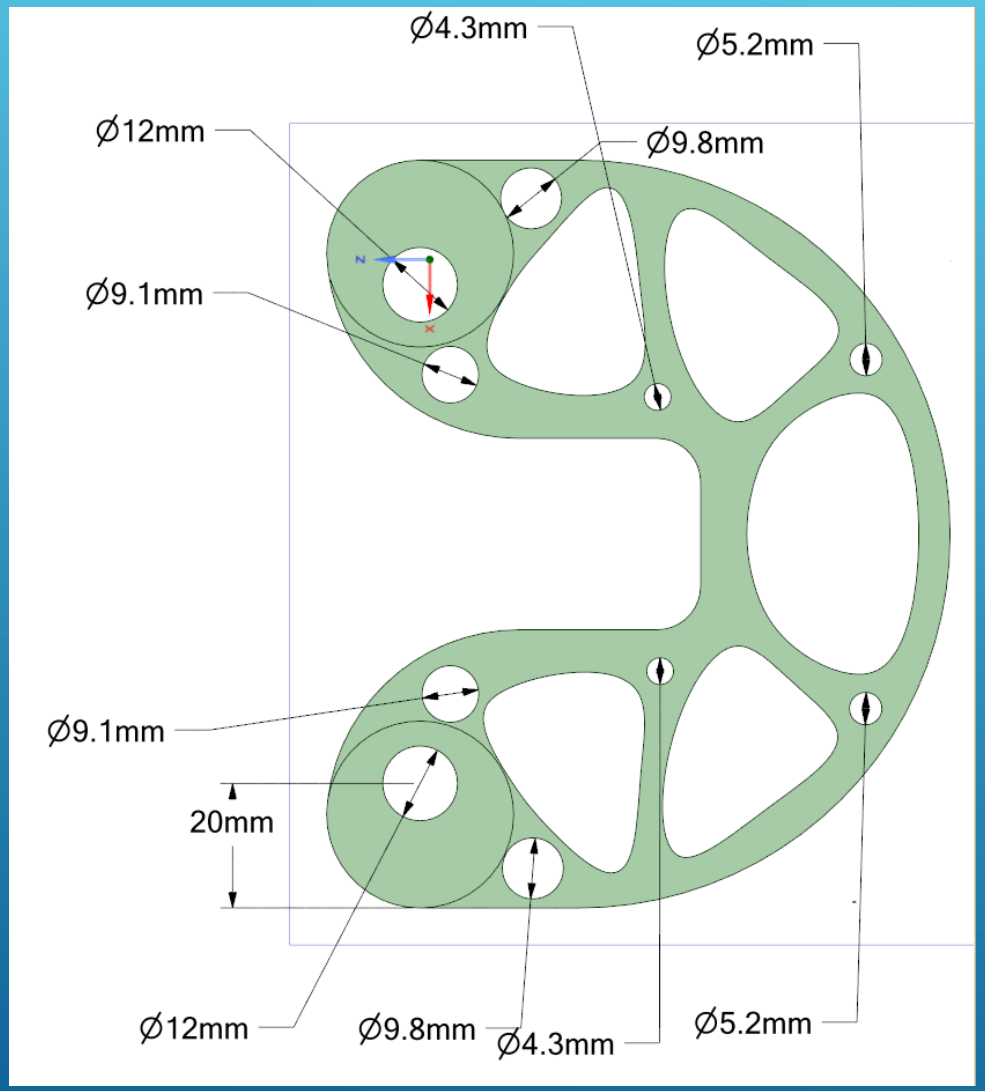


FIRST IDEAS TEAM OMEGA

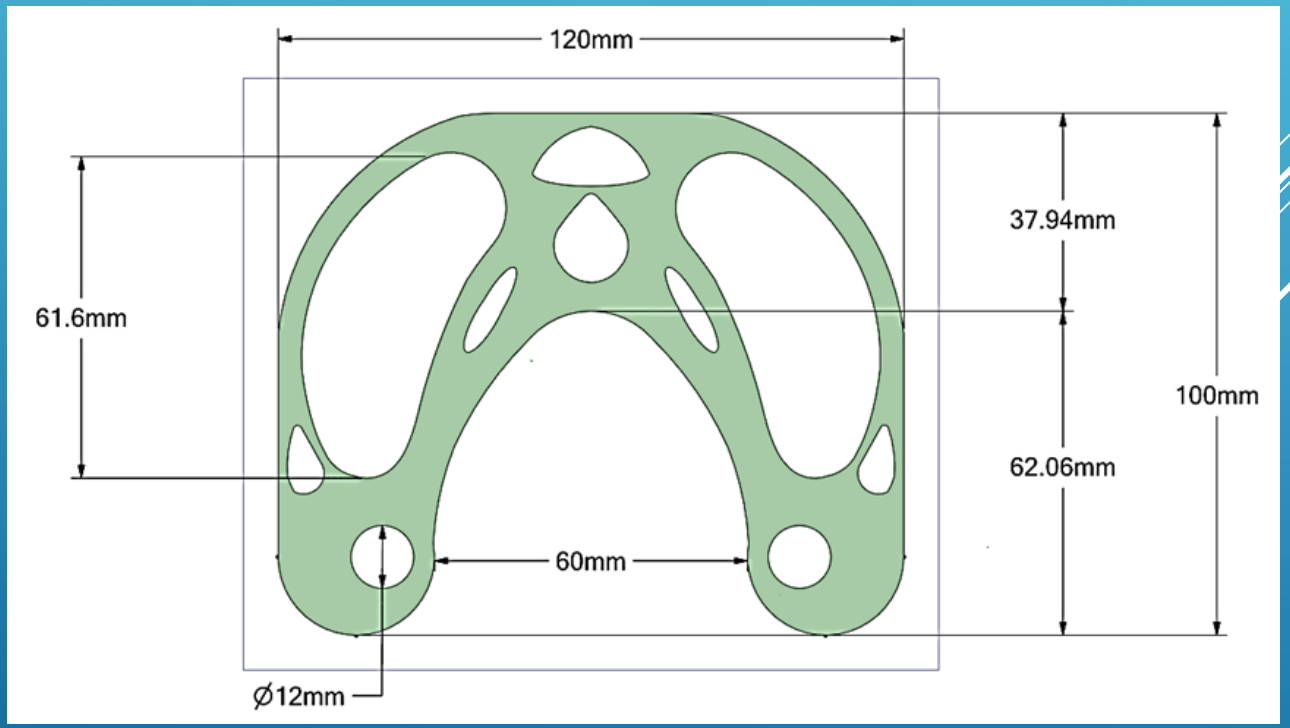
Volume: 41,92 cm^3
Max. Stress: 2,18 e7 Pa
Max. Deformation: 3,04 e-5 m

FINAL DESIGNS

SKETCHES

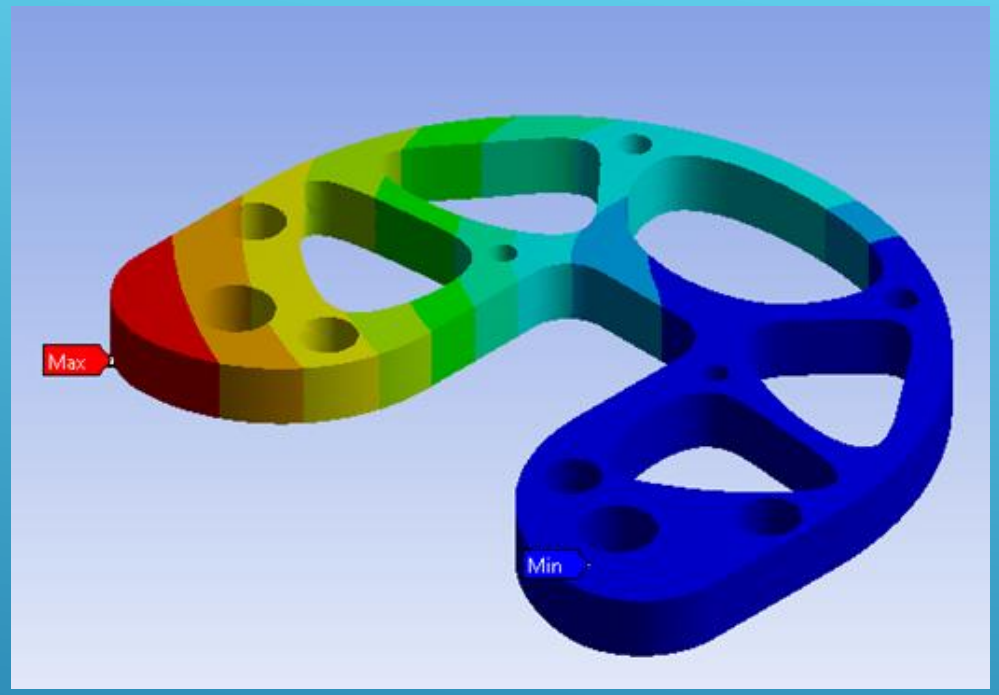


team delta



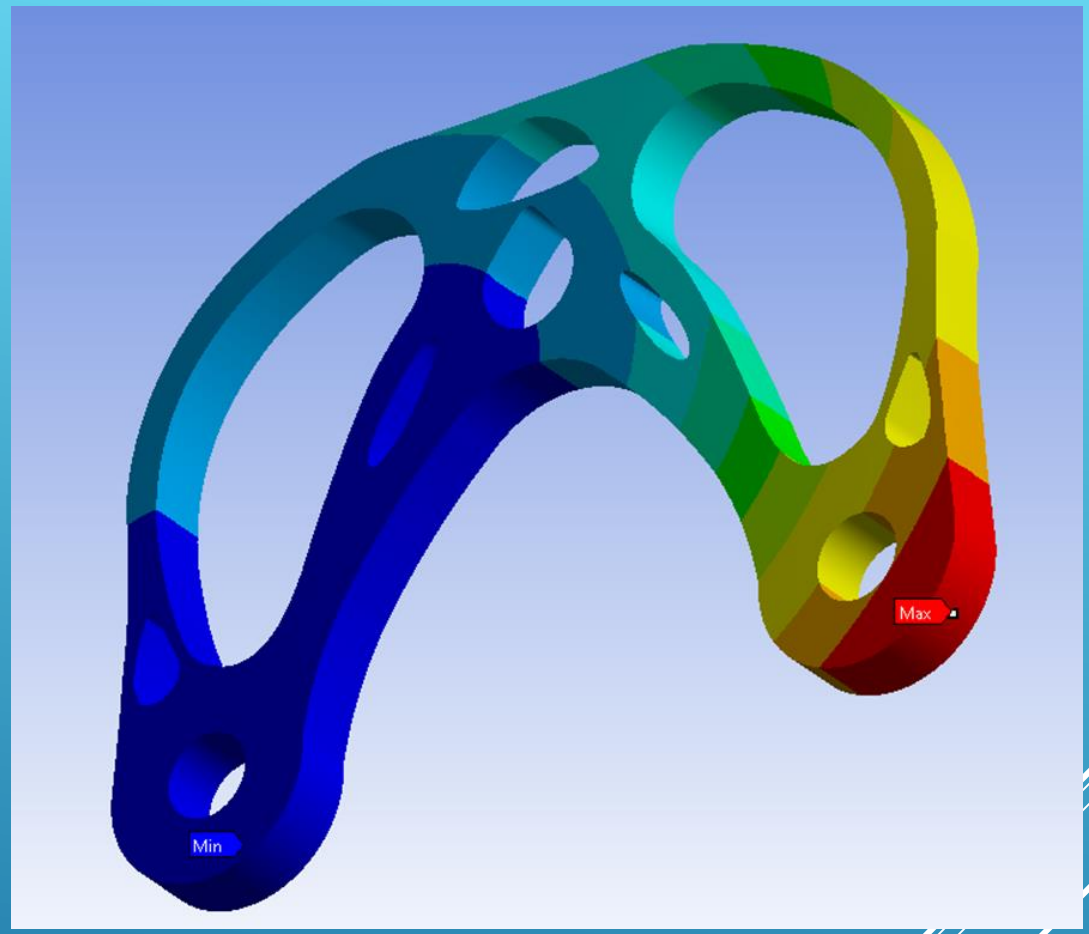
team omega

DEFORMATION



delta

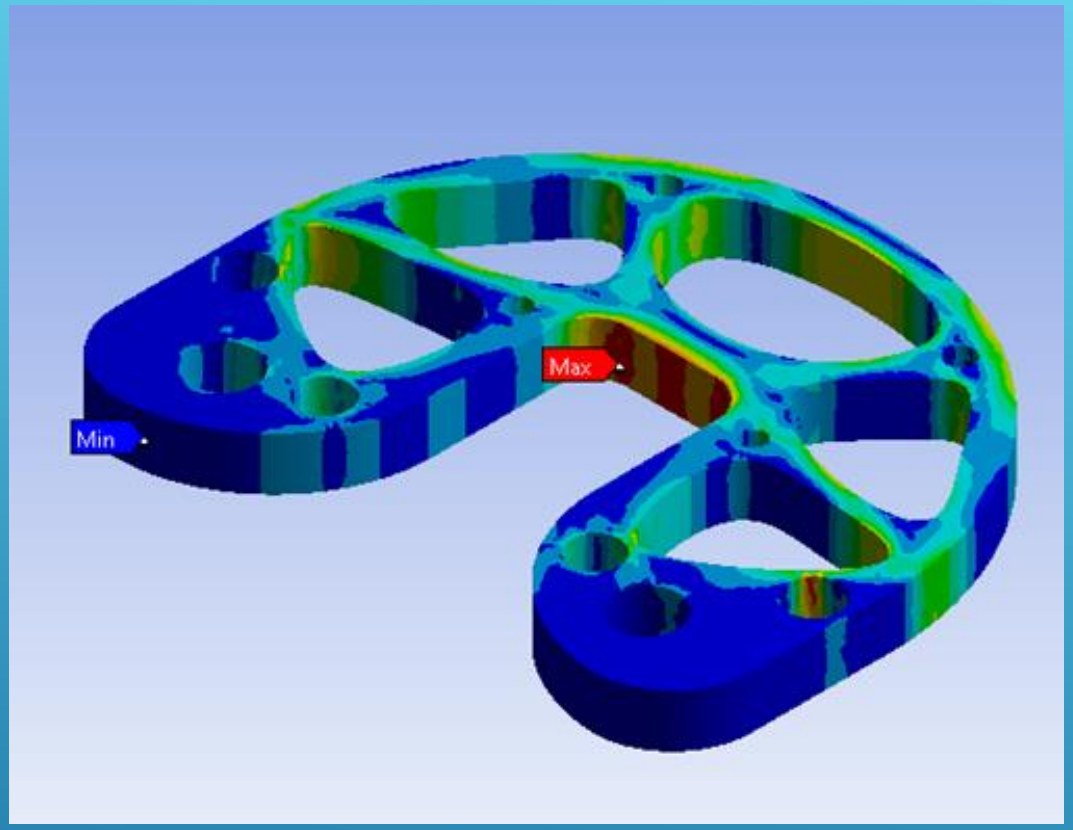
Max.: 2,03e-5m



omega

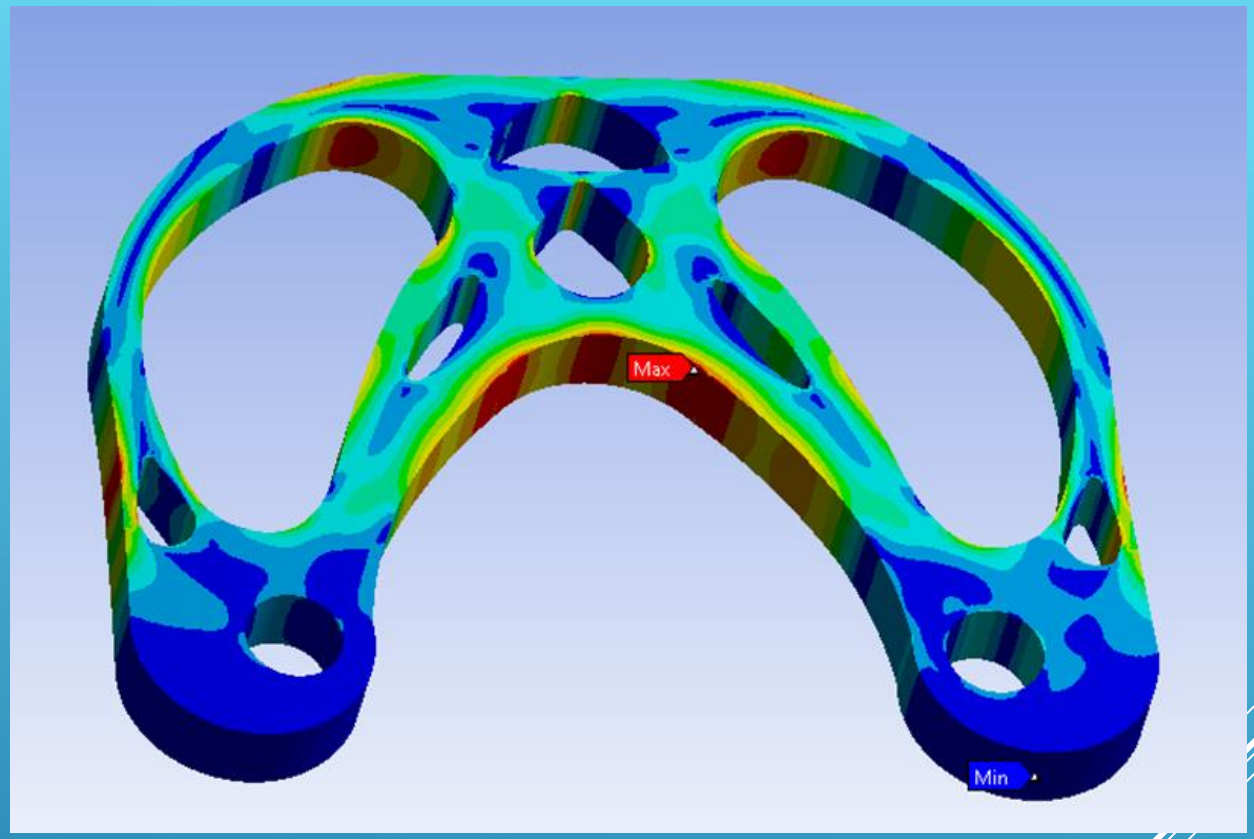
Max.: 3,46e-5m

STRESS



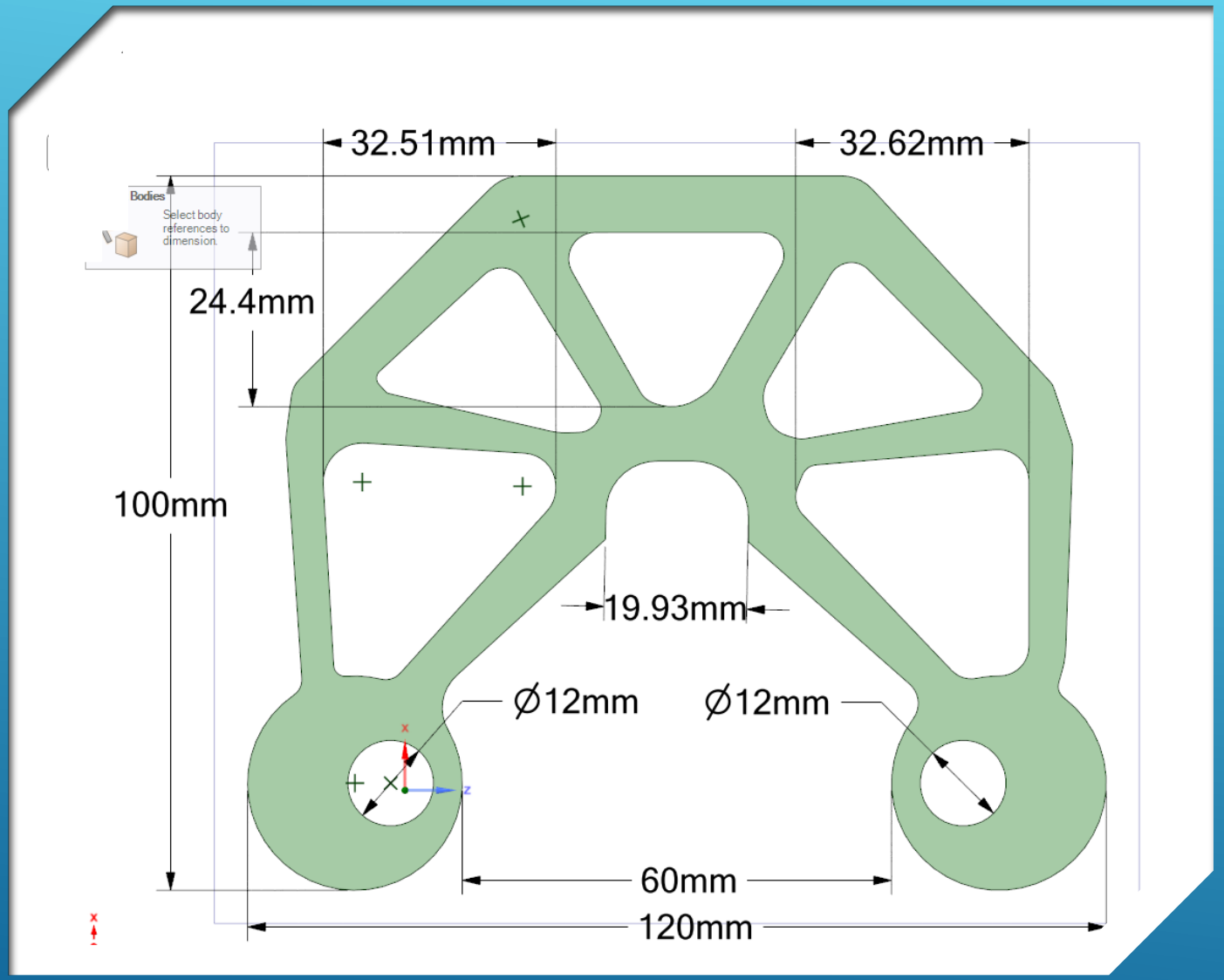
delta

Max.: 1,11e7 Pa

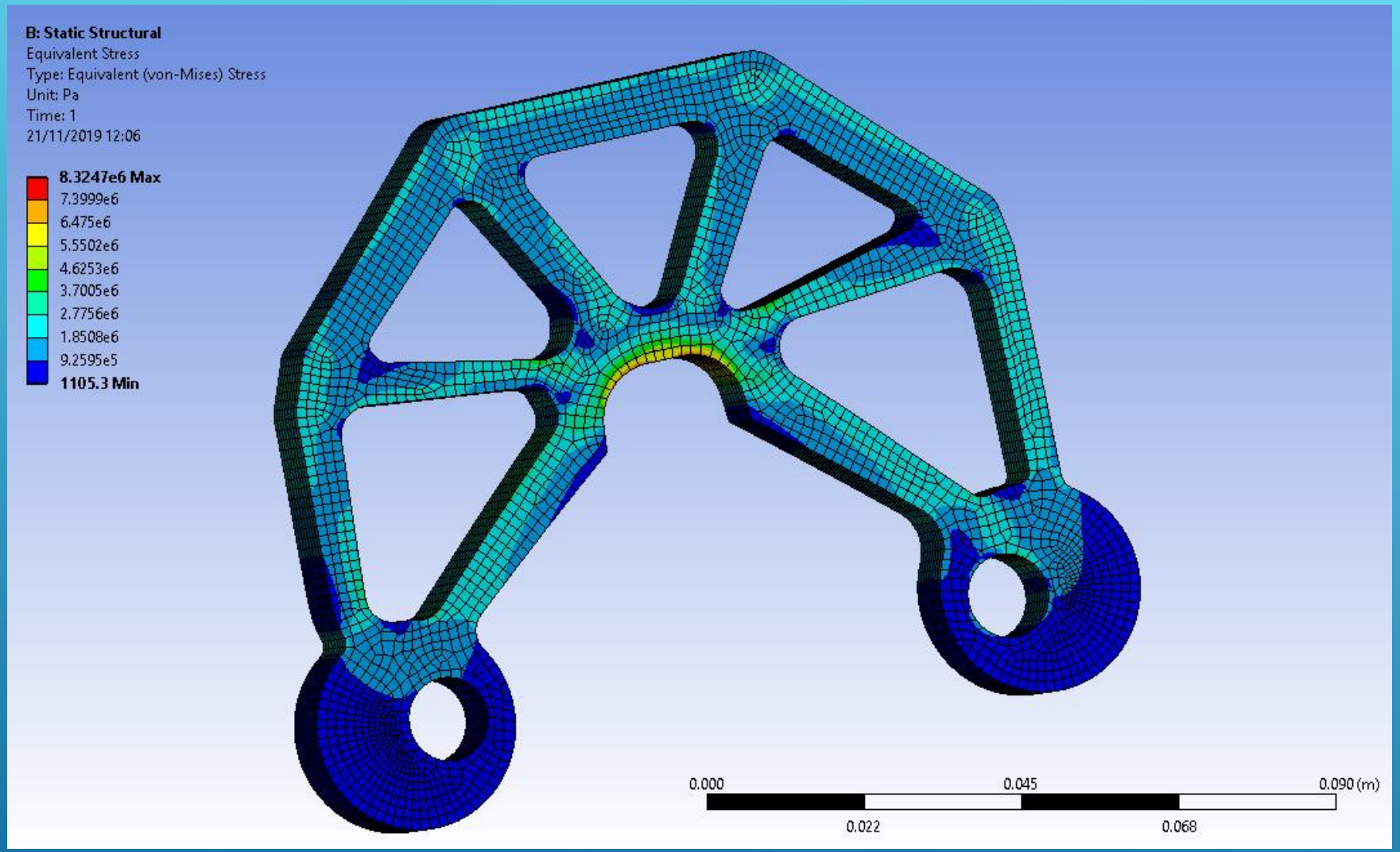


omega

Max.: 1,09 e7 Pa



COMPARISON TO TOPOLOGICALLY OPTIMIZED MODEL



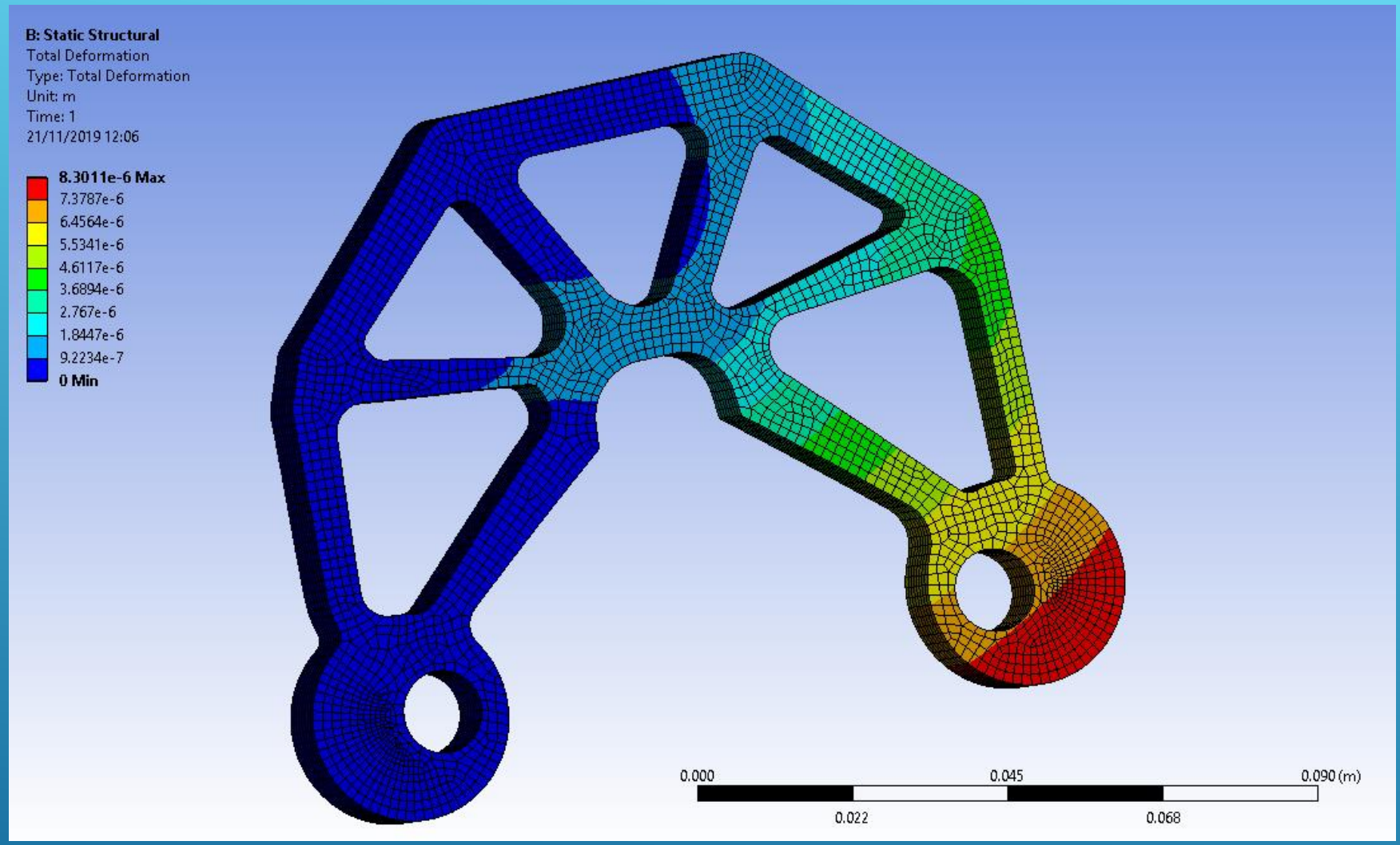
Max. Stress: 0,832e6 Pa

delta

Max.: 1,11e7 Pa

omega

Max.: 1,09 e7 Pa



delta

Max.: 2,03e-5m

omega

Max.: 3,46e-5m

Max Deformation: 8,3e-6 m

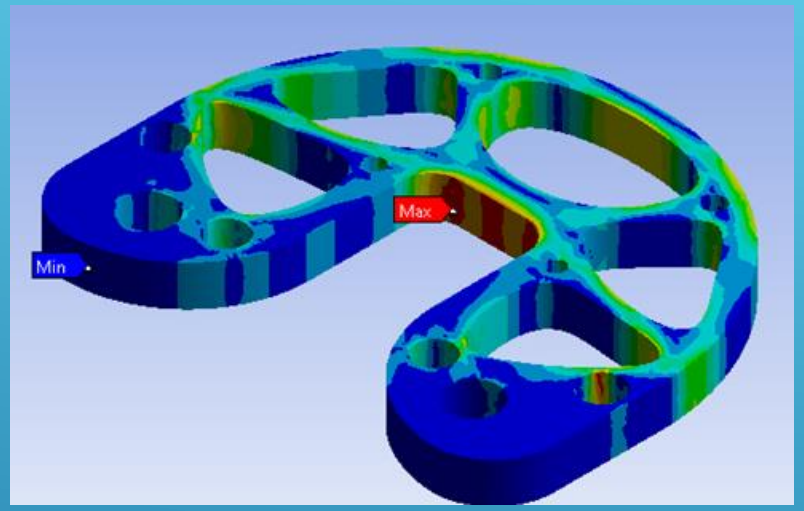
ANALYSIS

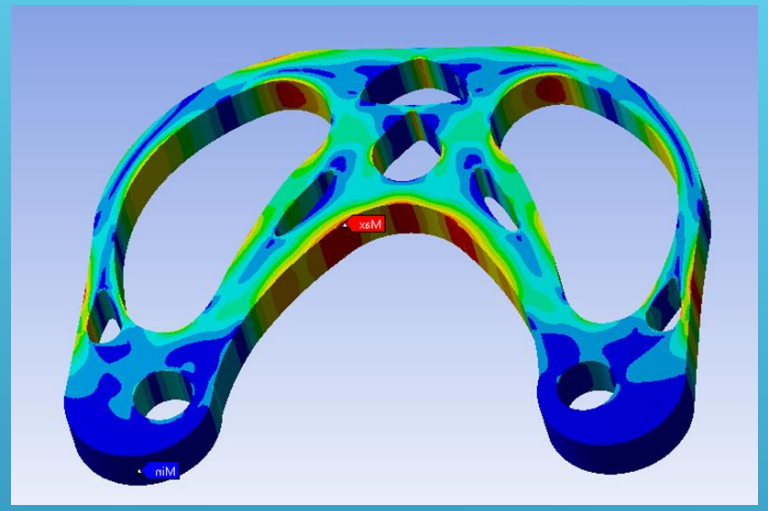
- arches bend easier than straight lines→ buckling → less stiffness
- most material at the stress center
- direct connection from holes to most stressed area
- supports (connections) between most stressed area and outer ring
- round corners → stress distribution/no stress centers

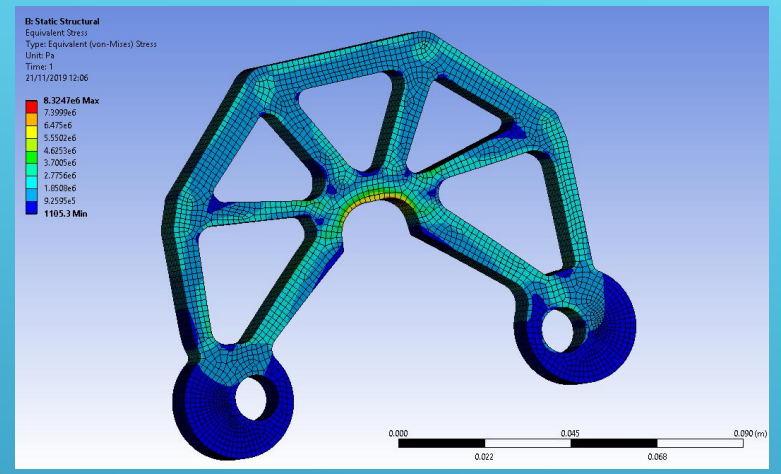
Team Delta

Team Omega

topology optimization





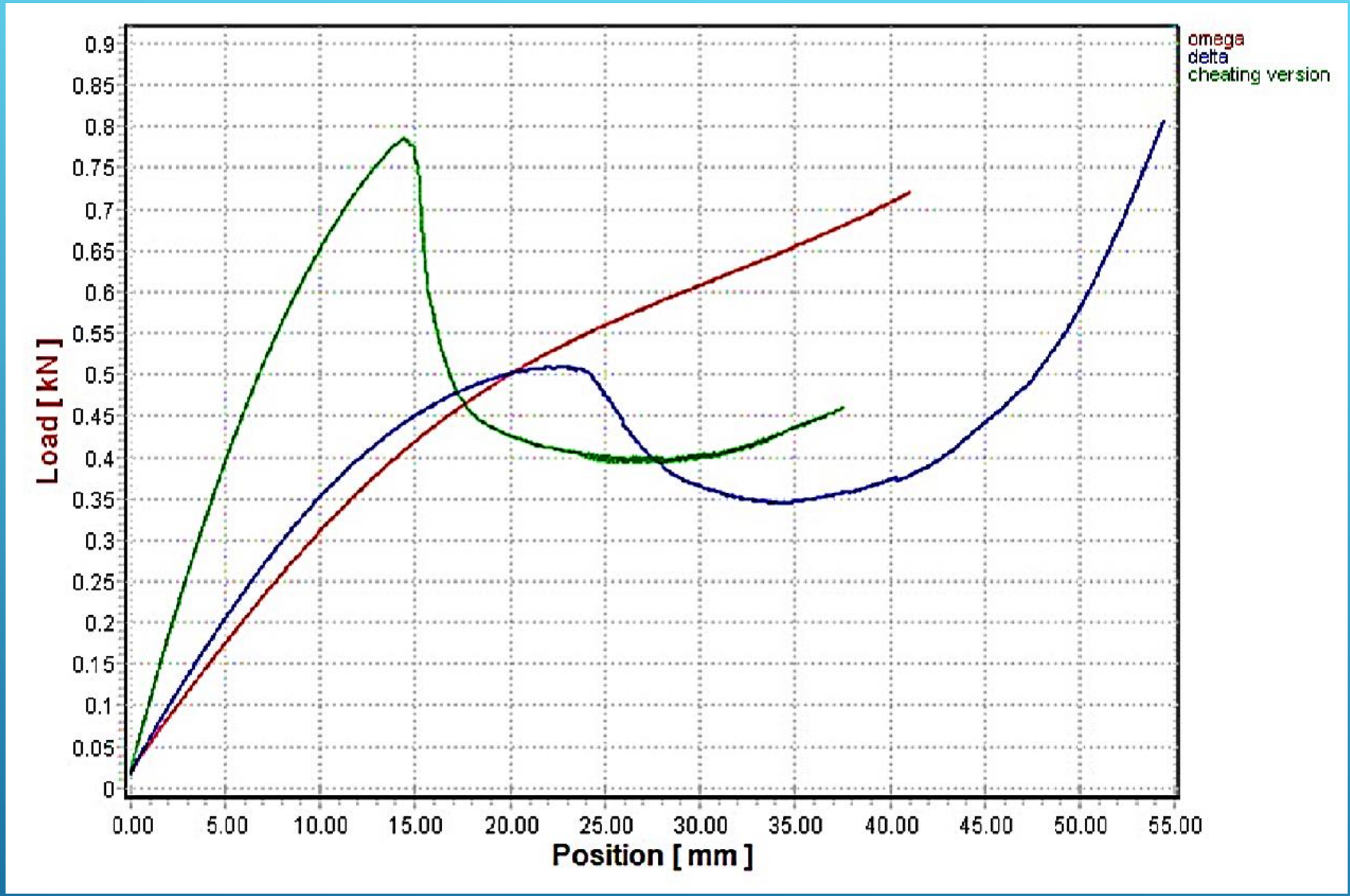


Team delta

Team omega

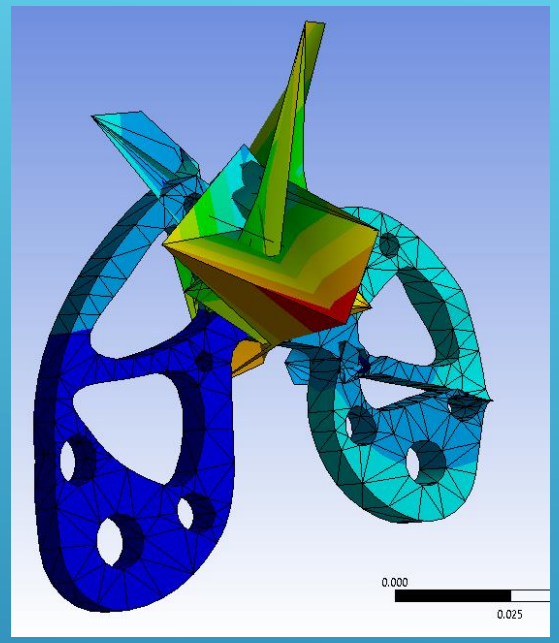
topology optimization

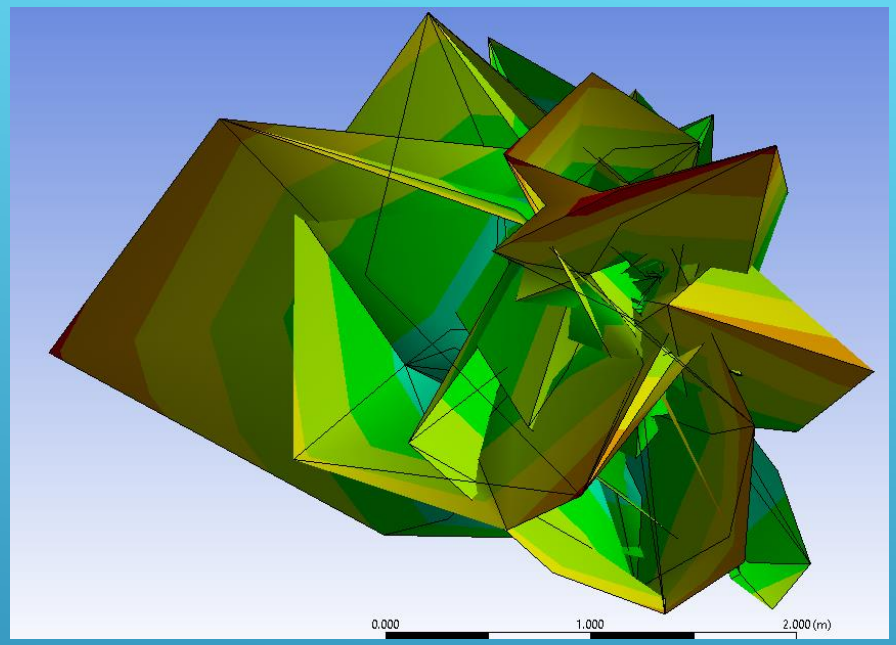
- filme

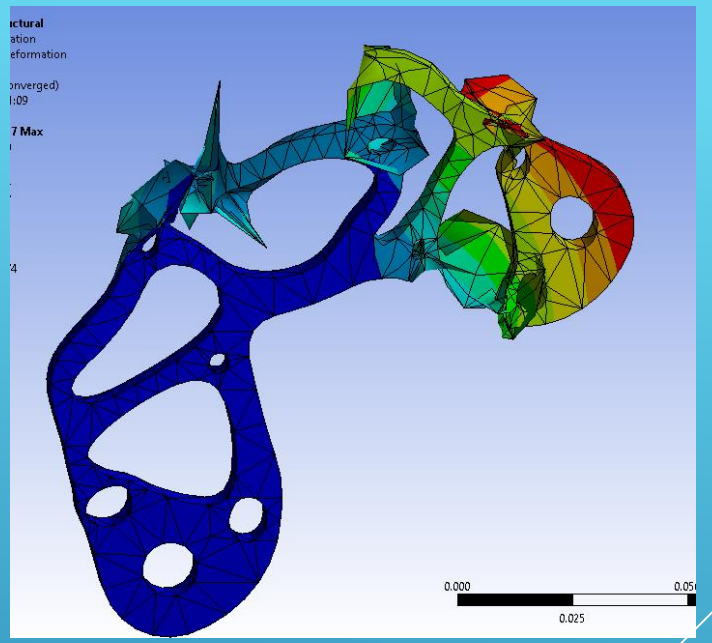


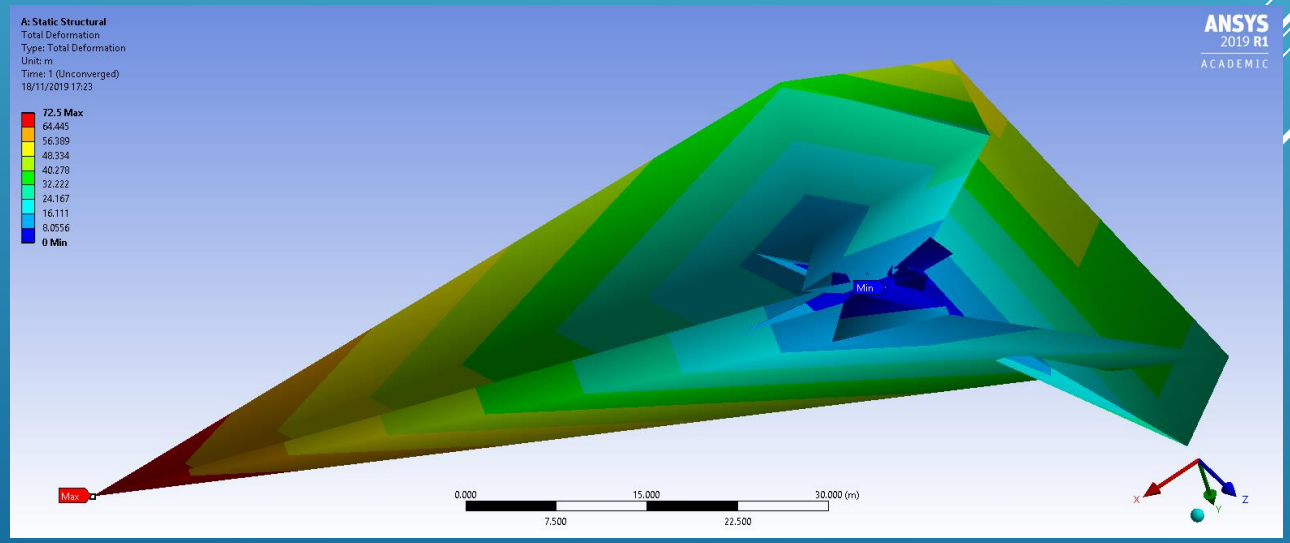
INTERPRETATION

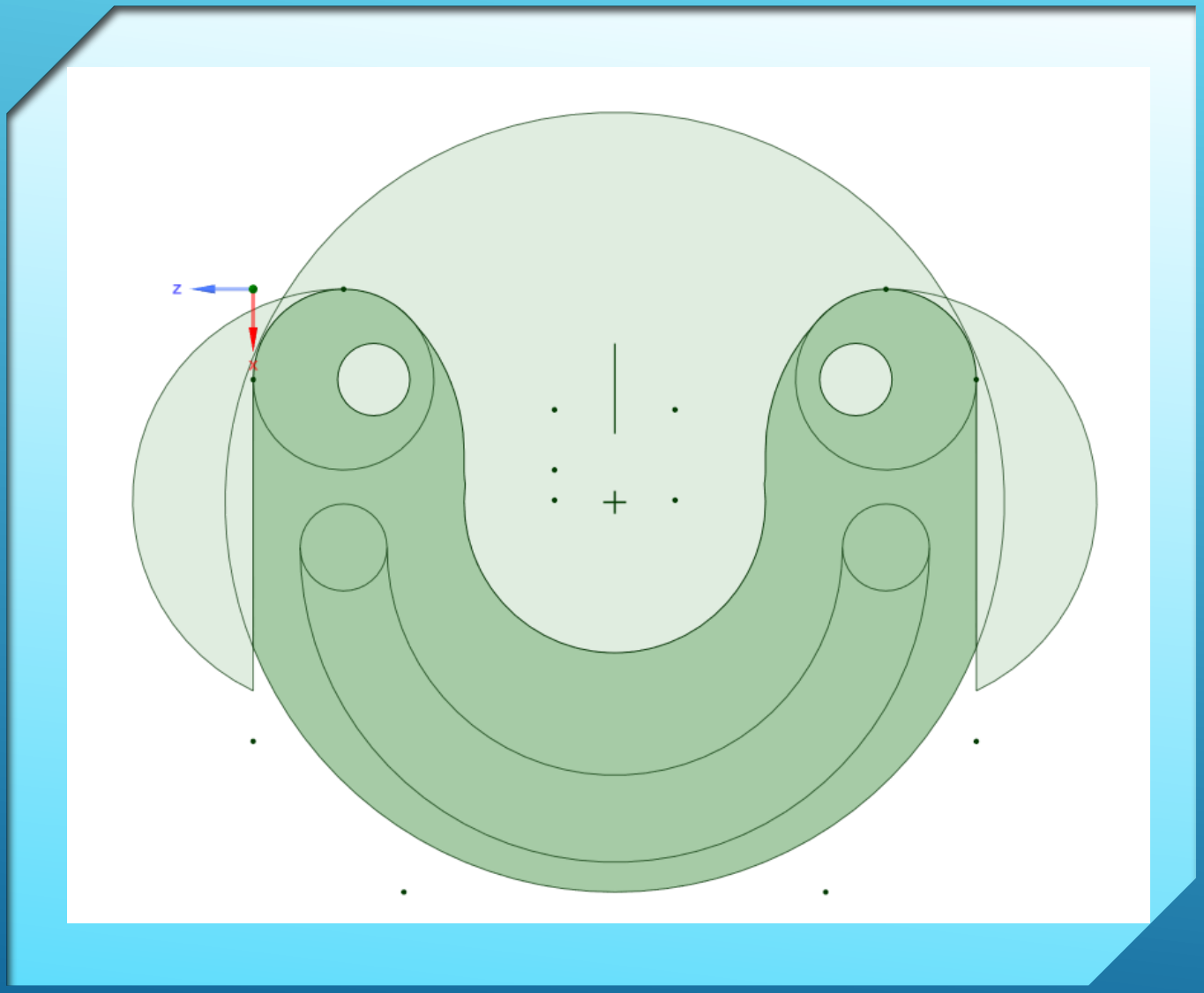
SOME GIMMICK











THANK YOU FOR YOUR ATTENTION