

Novel Clamping for Orthopedic Implants

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Background and Approach



The first implant is the Distal Radioulnar Joint (DRUJ). Which has two components that we will be machining.



The second implant is for dental implants. The company MACK has already been doing dental machining successfully, so their knowledge went into how this project was approached.



Research on products was completed, onto CAD models. Once a couple versions were completed in CAD, Static and Dynamic Simulations were run in ANSYS.



After those were done, strain gauge application and practice was done before actually 3D printing a simple model to simulate physically.

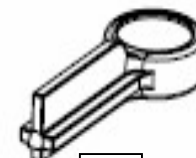
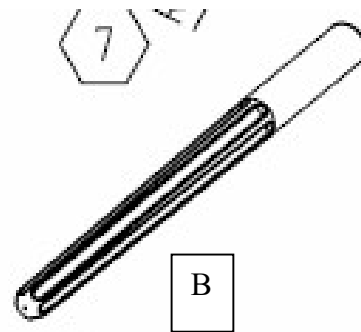
Implants

Distal Radioulnar Joint Implant (DRUJ)

- A: Implanted DRUJ
- B: DRUJ Rod
- C: DRUJ Cruciform

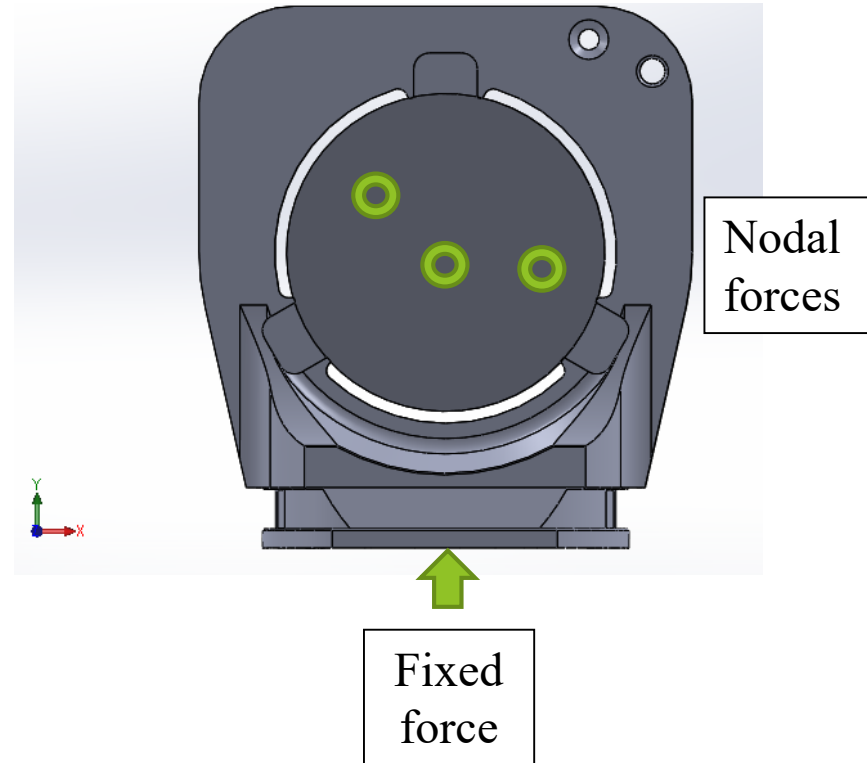


MACK dental implant

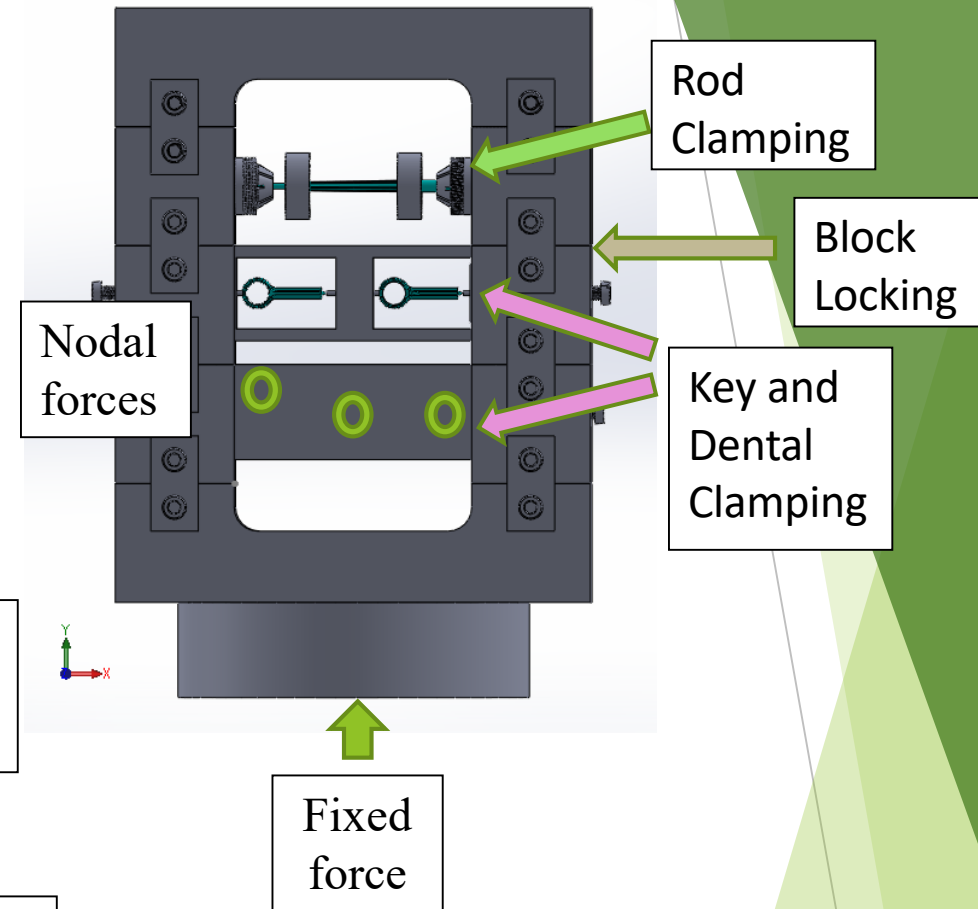
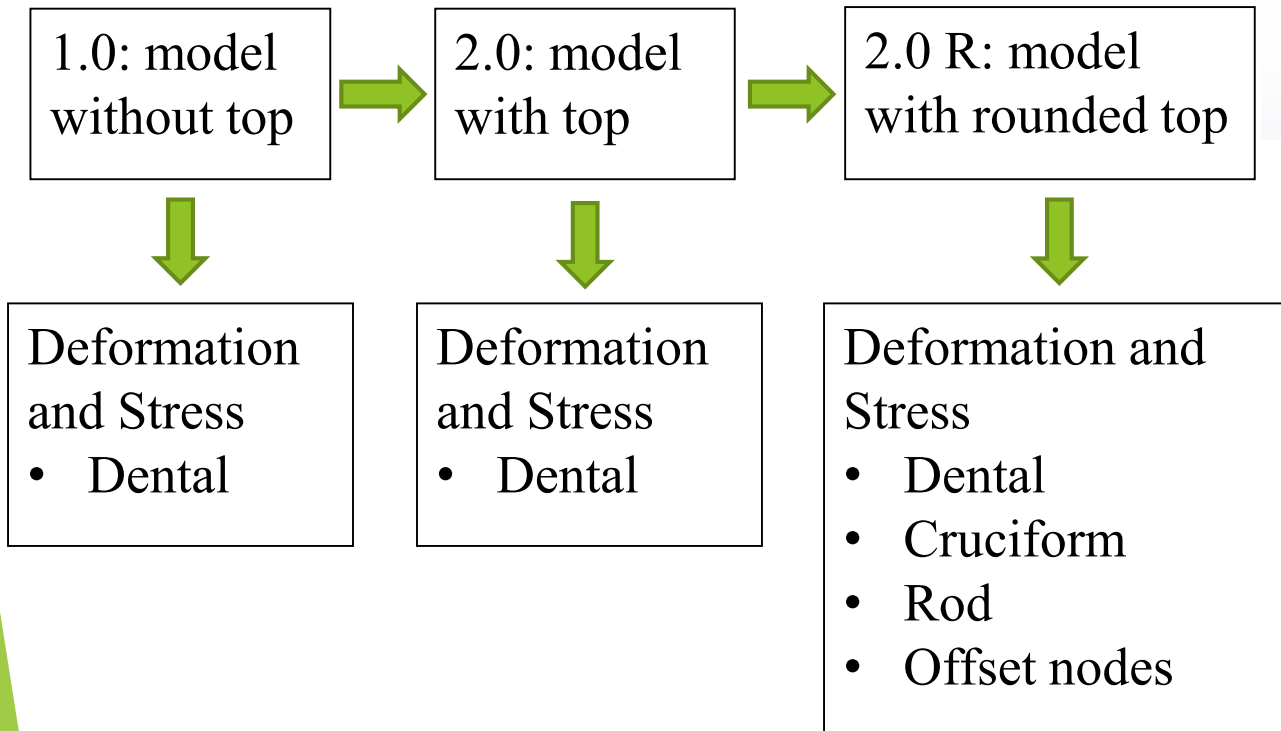


State of the Art

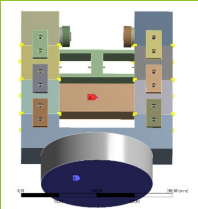
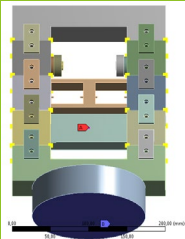
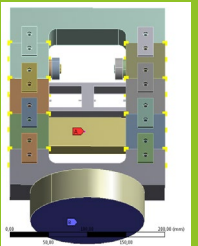
- ▶ Objectives for new model
 - ▶ Stability
 - ▶ Static
 - ▶ Dynamic
 - ▶ Modular
 - ▶ DRUJ components
 - ▶ Dental implant



Process outline

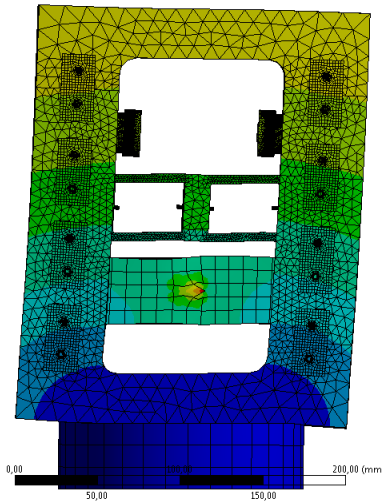


Model Comparison

	Stiffness (3)	Flexibility (1)	Accuracy/ Repeatability (3)	Time (2)	Efficient use of material (1)	Result
 <p>1.0</p>	*	*	*	*	*	36
	*	*	*	*	*	
	*		*		*	
	*		*		*	
 <p>2.0</p>	*	*	*	*	*	36
	*	*	*	*	*	
	*		*		*	
	*		*		*	
 <p>2.0R</p>	*	*	*	*	*	36
	*	*	*	*	*	
	*		*		*	
	*		*		*	
 <p>MACK</p>	*	*	*	*	*	28
	*	*	*	*	*	
		*	*		*	
		*	*		*	

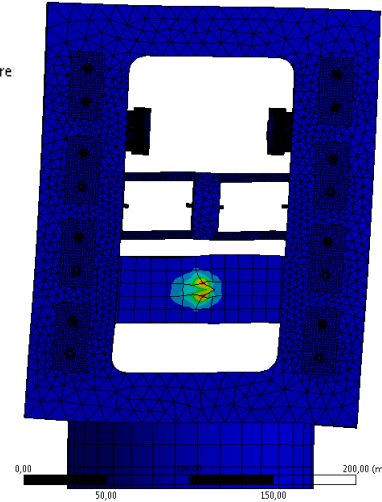
A: Static Structural
 Total Deformation
 Type: Total Deformation
 Unit: mm
 Time: 1
 20.06.2019 10:25

3,769e-6 Max
 3,3502e-6
 2,9314e-6
 2,5126e-6
 2,0939e-6
 1,6751e-6
 1,2563e-6
 8,3755e-7
 4,1877e-7
0 Min



A: Static Structural
 Equivalent Stress
 Type: Equivalent (von-Mises) Stre
 Unit: MPa
 Time: 1
 20.06.2019 10:26

0.02513 Max
 0,022338
 0,019546
 0,016754
 0,013961
 0,011169
 0,0083768
 0,0055845
 0,0027923
0 Min



Results, Conclusions, and Outlook

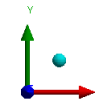
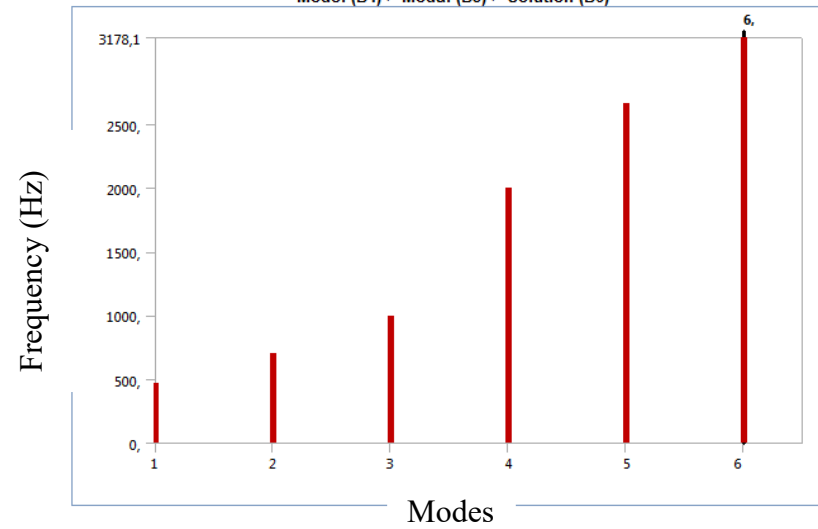
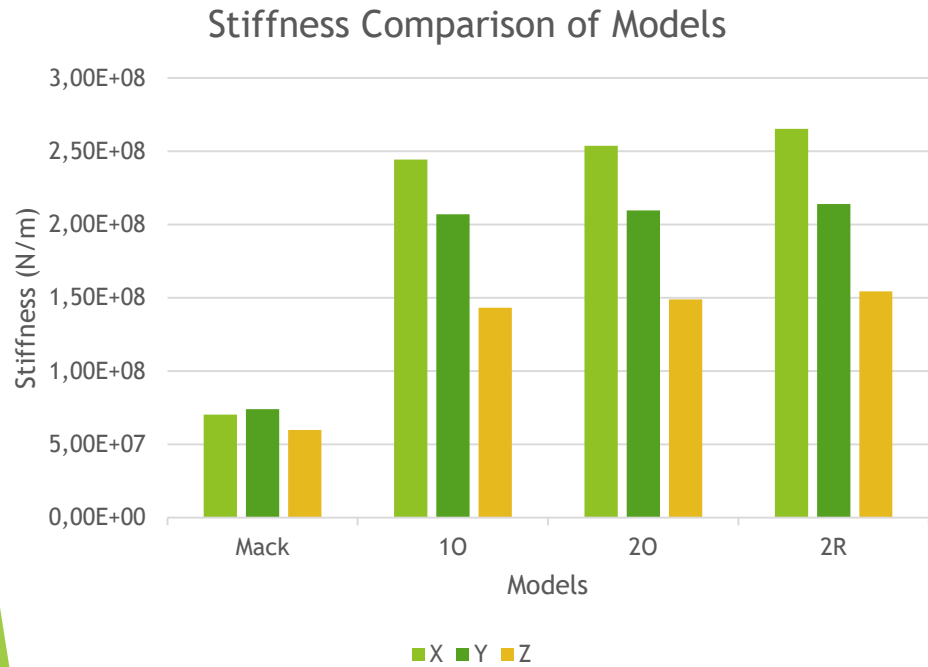


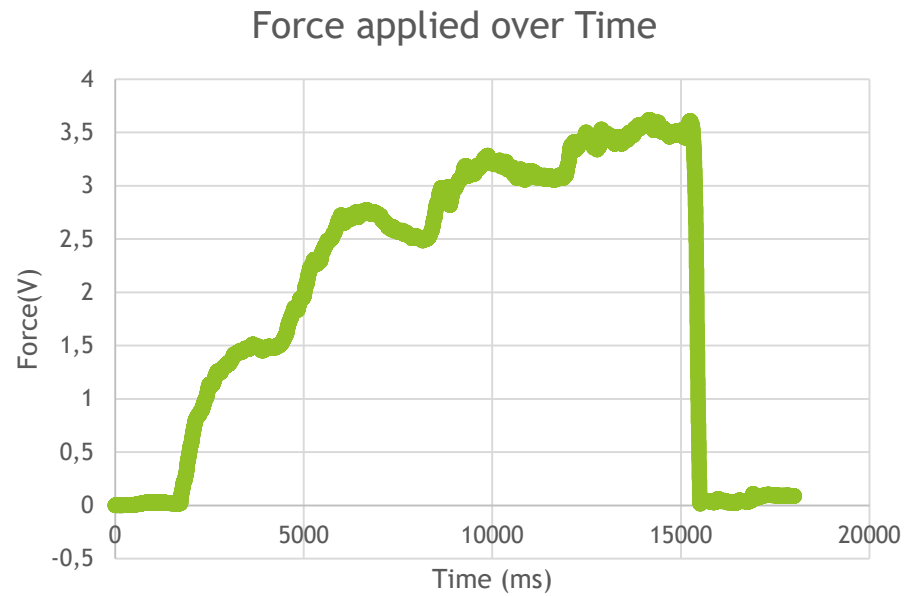
FIGURE 1
 Model (B4) > Modal (B5) > Solution (B6)



Model (B4) > Modal (B5) > Solution (B6)

Mode	Frequency [Hz]
1,	465,76
2,	704,94
3,	990,32
4,	1994,4
5,	2663,2
6,	3178,1

Strain gauge Measurement and 3D model



$$y = 2.647 * 10^{-3}x + 7.289$$



Conclusions about Project and working at LUH



OUR MODEL STILL HAS A LOT
TO BE DONE, BUT IT'S OFF
TO A GOOD START, NO
DEFINITE CONCLUSIONS YET



AT IFW IT'S A LOT MORE
MECHANICAL/MACHINE
ORIENTED THAN
ANTICIPATED



VERY HELPFUL,
APPRECIATIVE I GOT TO GO
AS FAR AS I DID IN THE
DEVELOPMENT PROCESS



Hannover/Germany experience

- ▶ What I liked
 - ▶ Independence of people
 - ▶ Greenery
 - ▶ Drinking culture
- ▶ What I didn't like
 - ▶ Smoking
- ▶ What was different
 - ▶ Small talk/interactions
- ▶ What was crazy
 - ▶ Public drinking
 - ▶ Amount of multi-lingual people