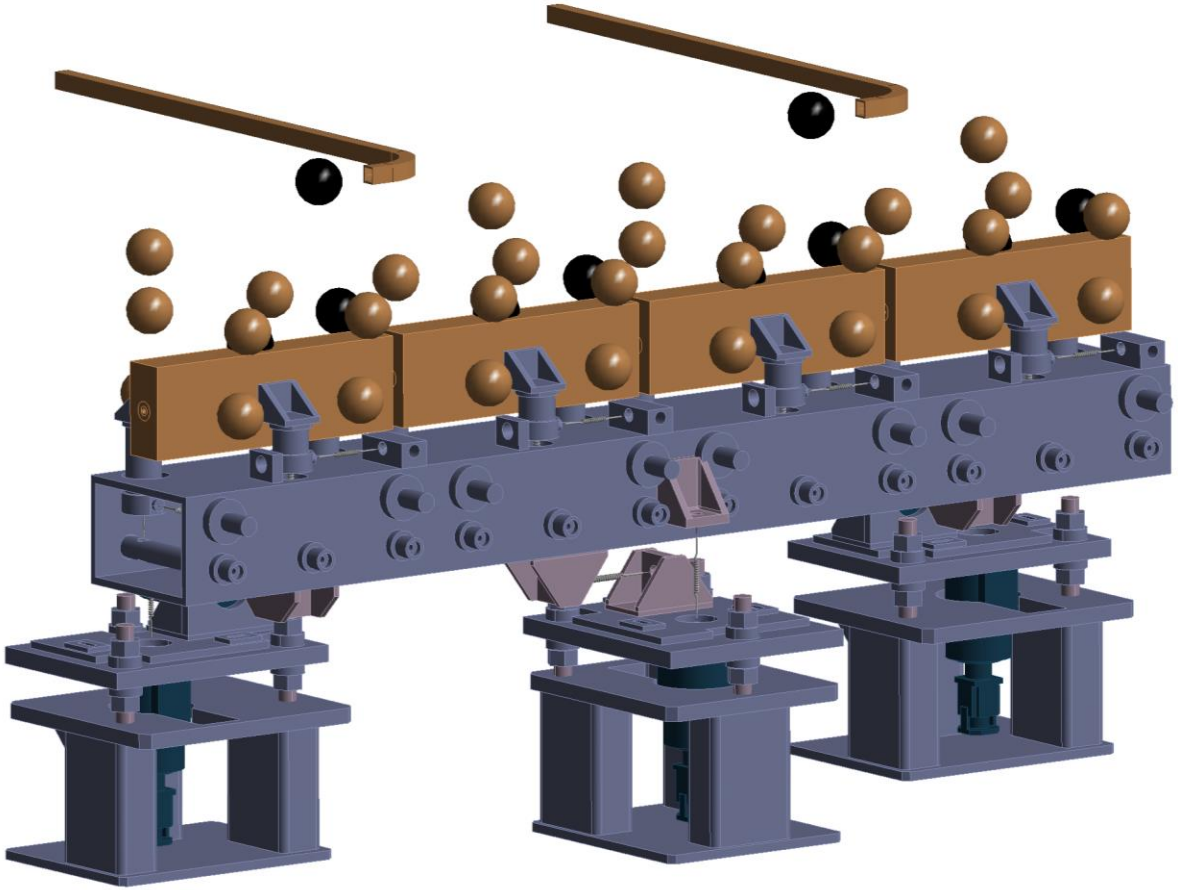
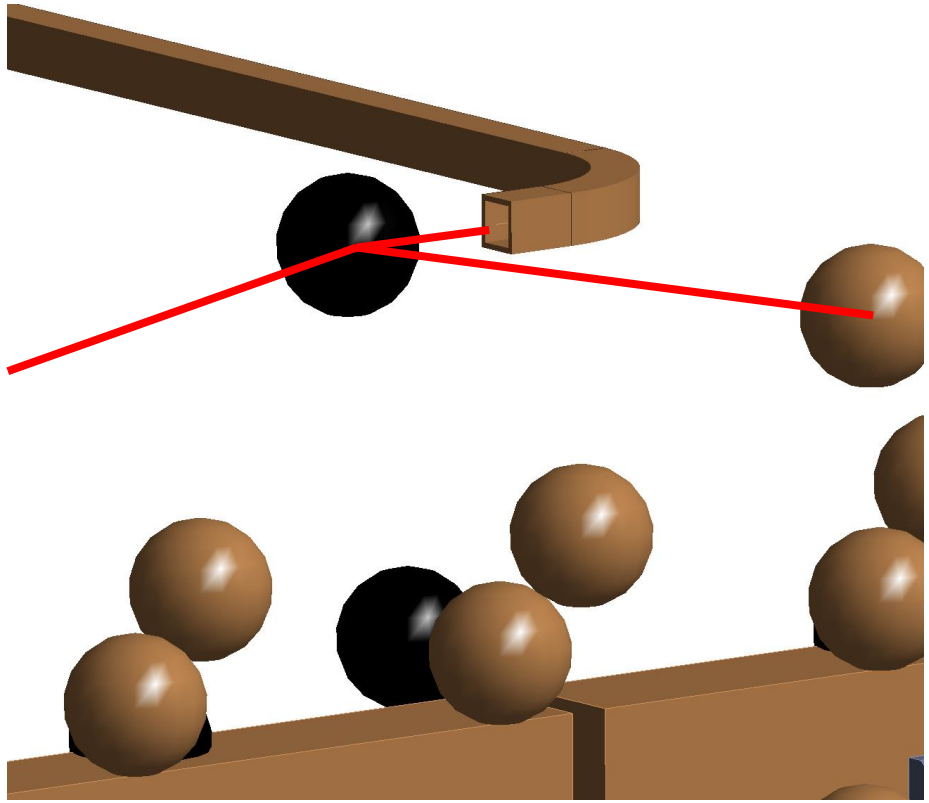
Module Waveguide Impact on Vibrations

Matthew Capstick

14-12-2022

Simple Waveguide Model

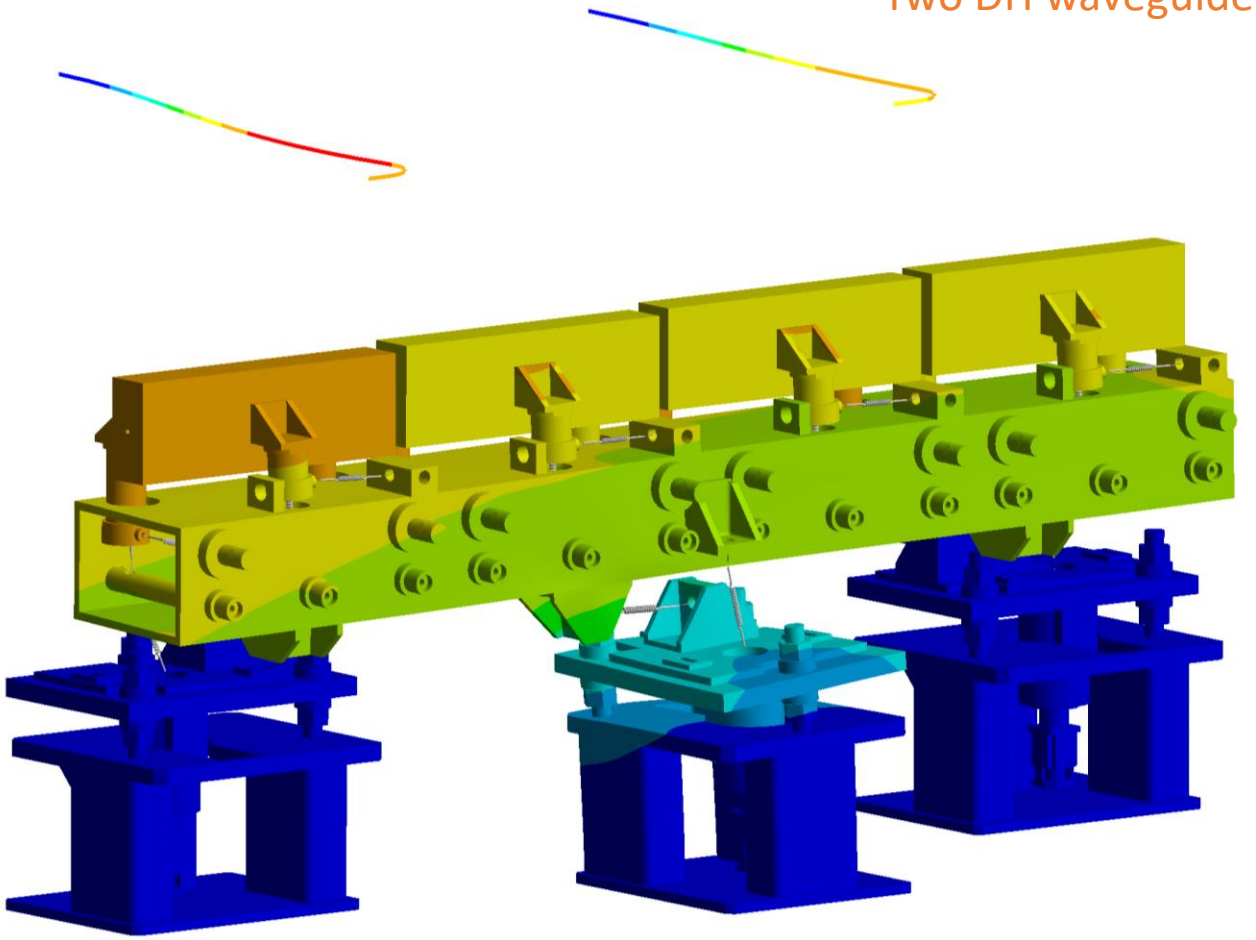




Simple Waveguide Model

Slightly increases the stiffness.
Increases the fundamental frequency.

Two DH waveguides

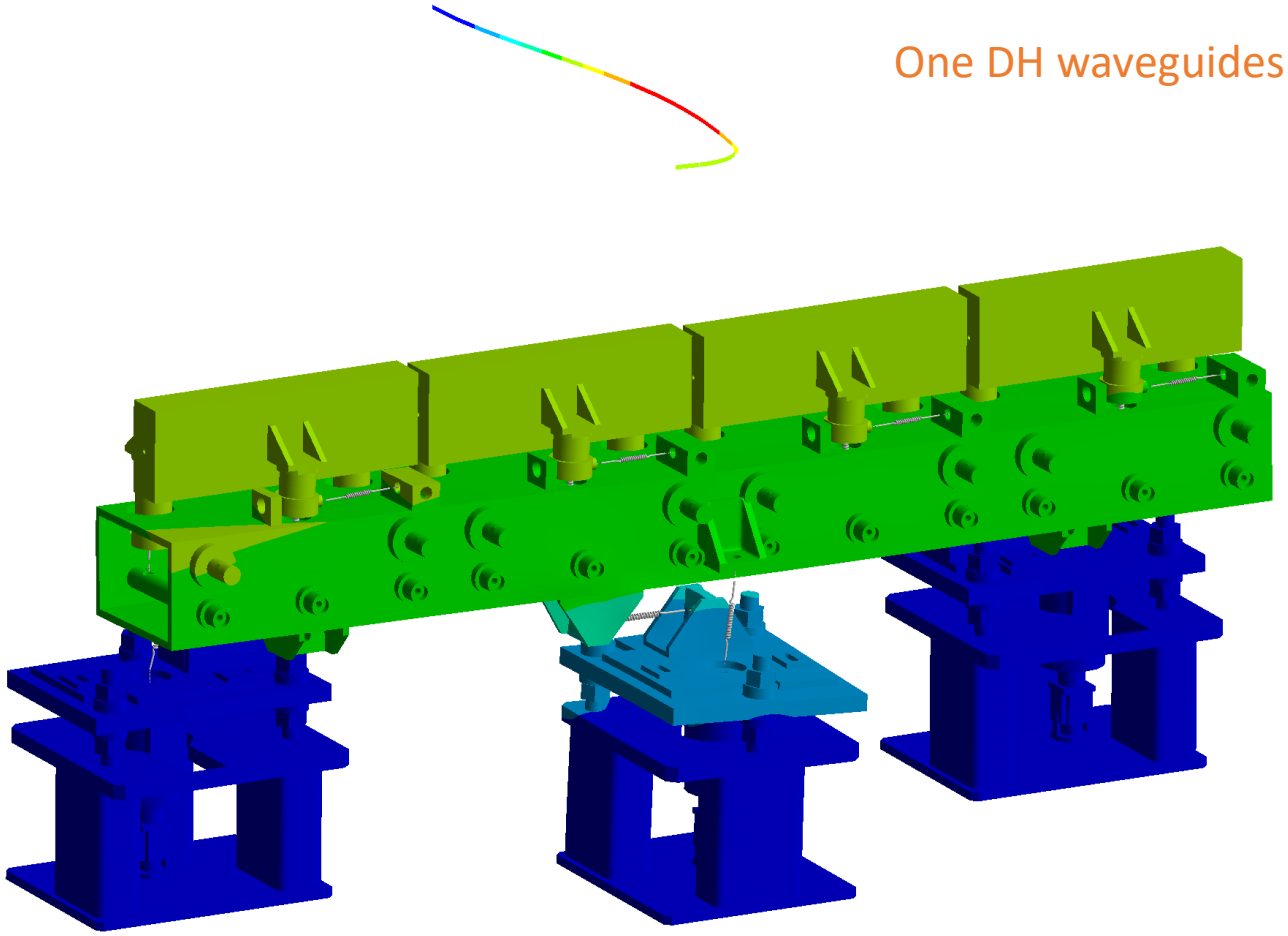


	Mode	Frequency [Hz]
1	1.	60.389
2	2.	63.657
3	3.	82.994
4	4.	100.3
5	5.	111.66
6	6.	112.47

Simple Waveguide Model

Slightly increases the stiffness.
Increases the fundamental frequency.

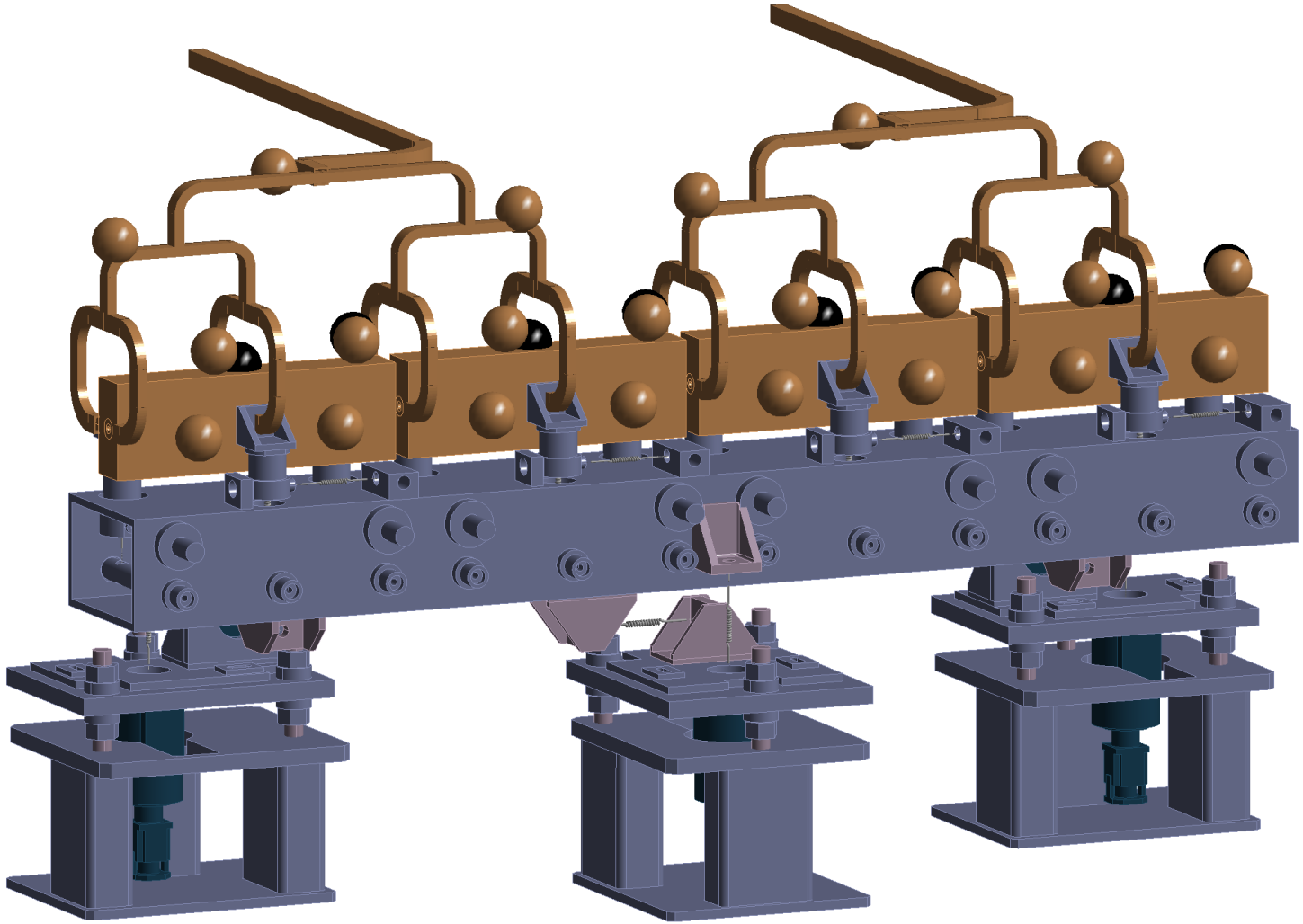
One DH waveguides



	Mode	Frequency [Hz]
1	1.	60.389
2		
3		
4		
5		
6		

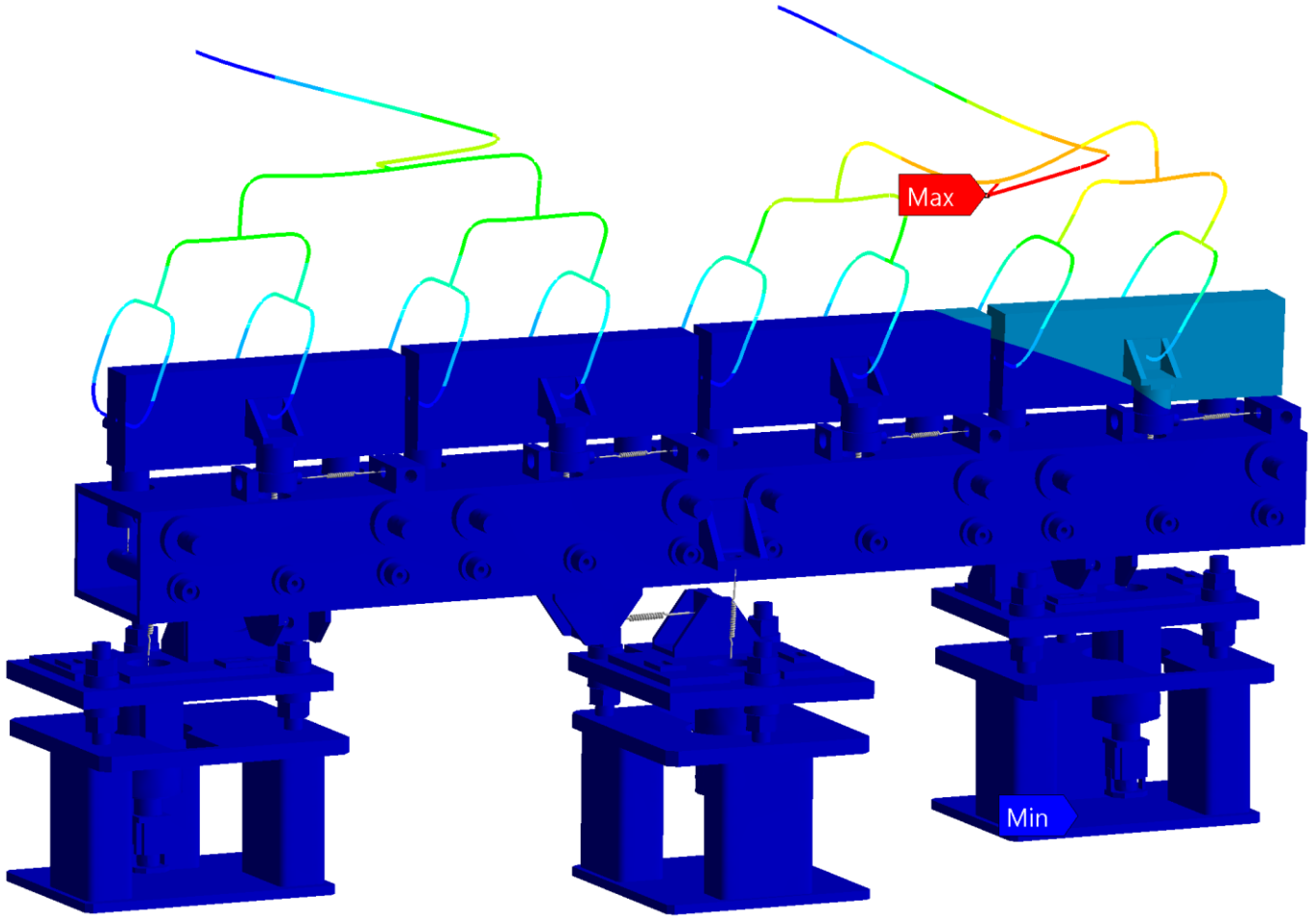
	Mode	Frequency [Hz]
1	1.	60.373
2	2.	60.855
3	3.	82.638
4	4.	100.73
5	5.	111.96
6	6.	120.12

Waveguide Network Model



Waveguide Network Model Modes

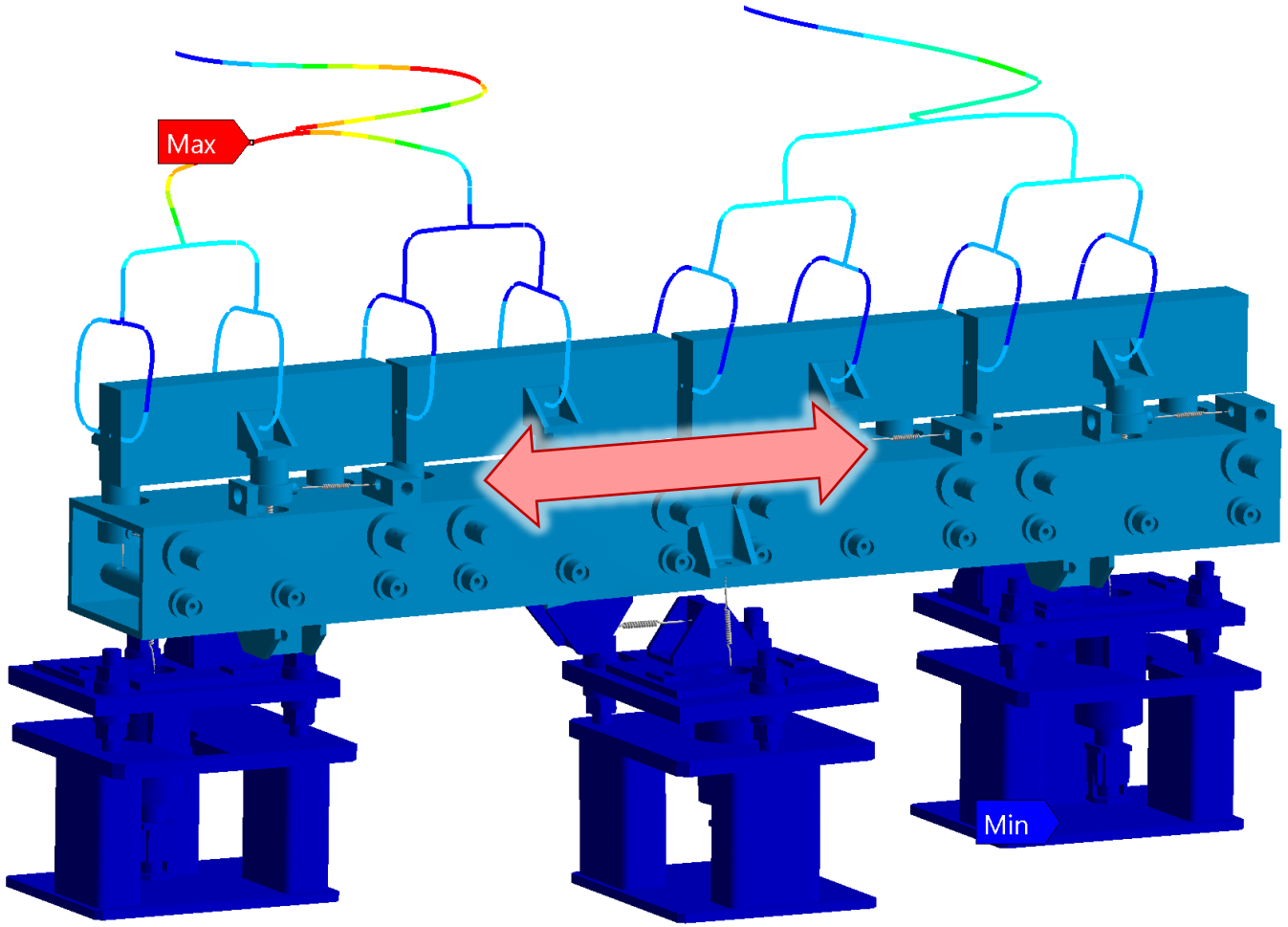
Lower frequency harmonic modes are dominated by the deformation of the waveguide network.



	Mode	Frequency [Hz]
1	1.	39.937
2	2.	47.991
3	3.	50.283
4	4.	50.354
5	5.	51.178
6	6.	57.812
7	7.	64.505
8	8.	68.197
9	9.	72.657
10	10.	74.164

Waveguide Network Model Modes

Higher frequency modes show the expected motion of the girder.



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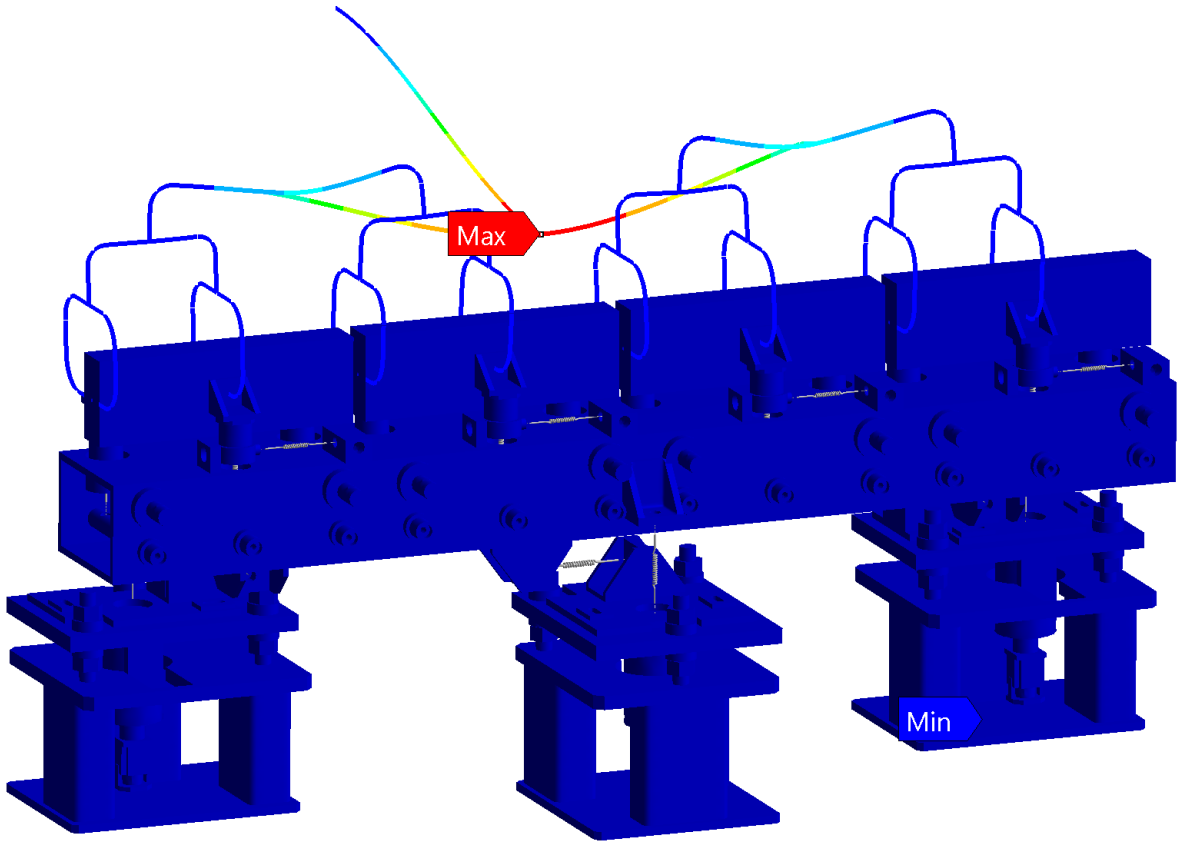
Waveguide Network Model Modes

Assumed a single waveguide and added mass for the ‘extra’ hybrid.

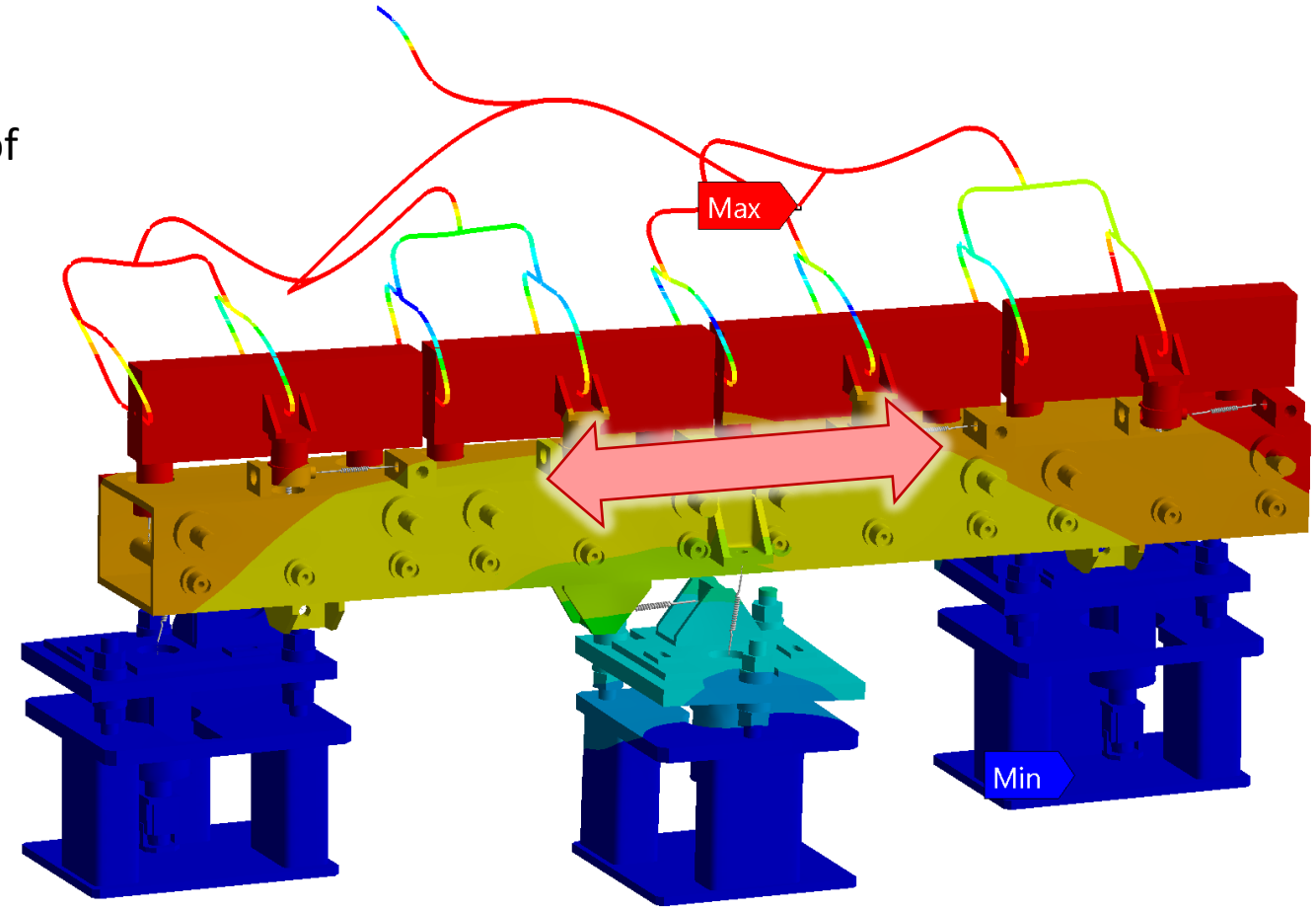
Lower frequency harmonic modes are dominated by the deformation of the waveguide network.



	Mode	Frequency [Hz]
1	1.	29.67
2	2.	38.658
3	3.	42.686
4	4.	49.561
5	5.	53.293
6	6.	62.116
7	7.	62.757
8	8.	68.419
9	9.	71.291
10	10.	83.751

Waveguide Network Model Modes

Higher frequency modes show the expected motion of the girder.



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Girder Topological Optimisation

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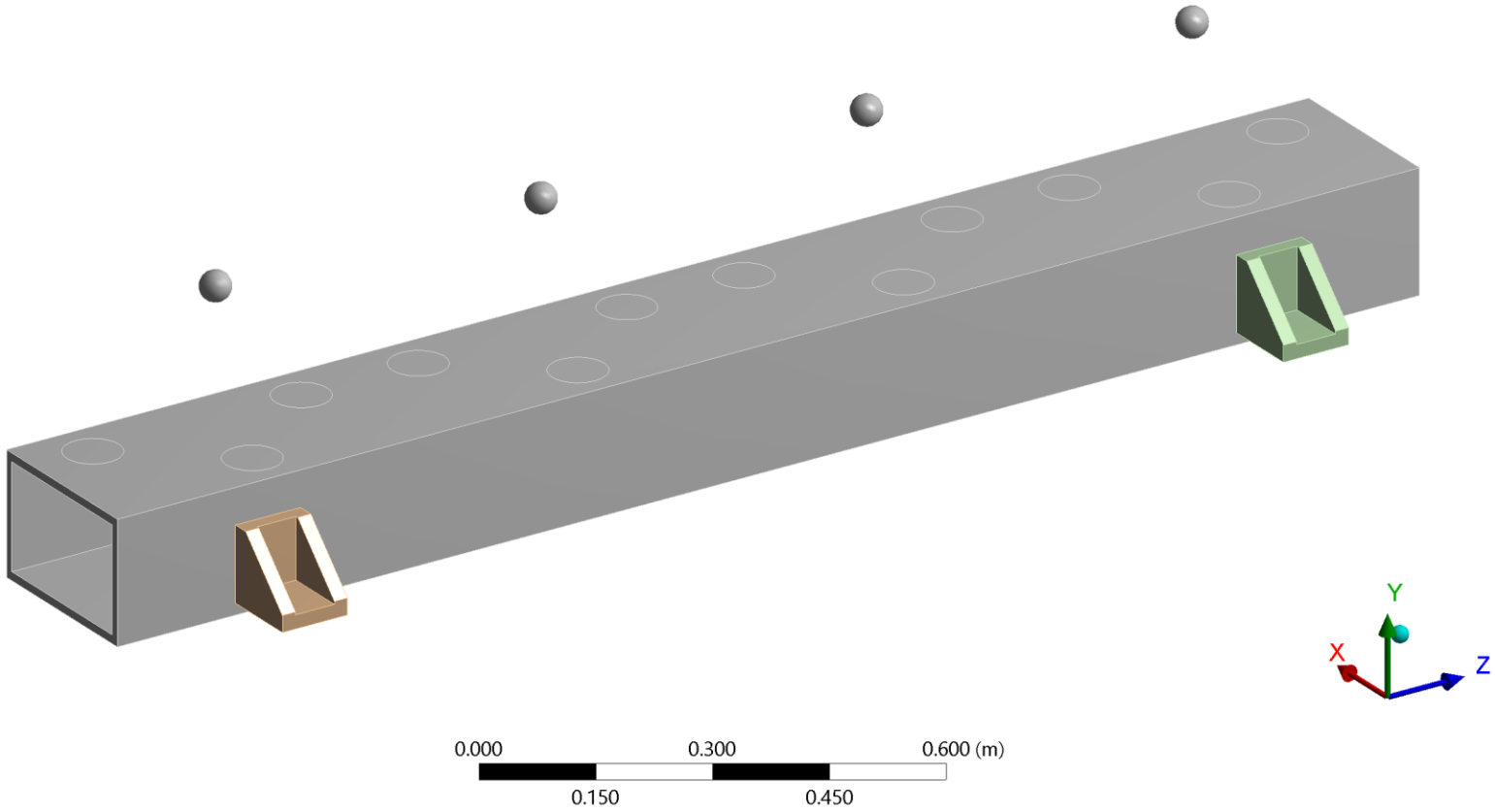
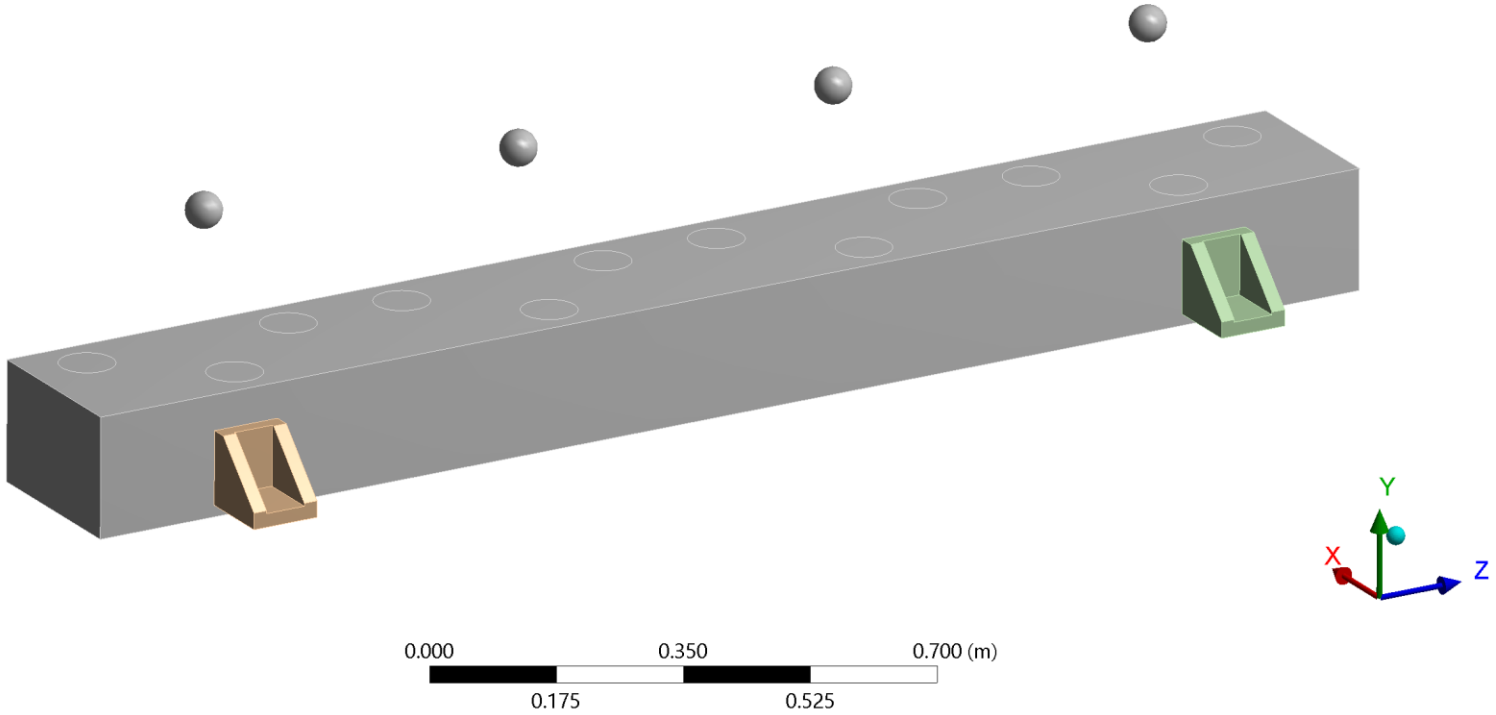


Girder Topological Optimisation

Mass constraint:
Reduce to equal the
standard hollow girder.



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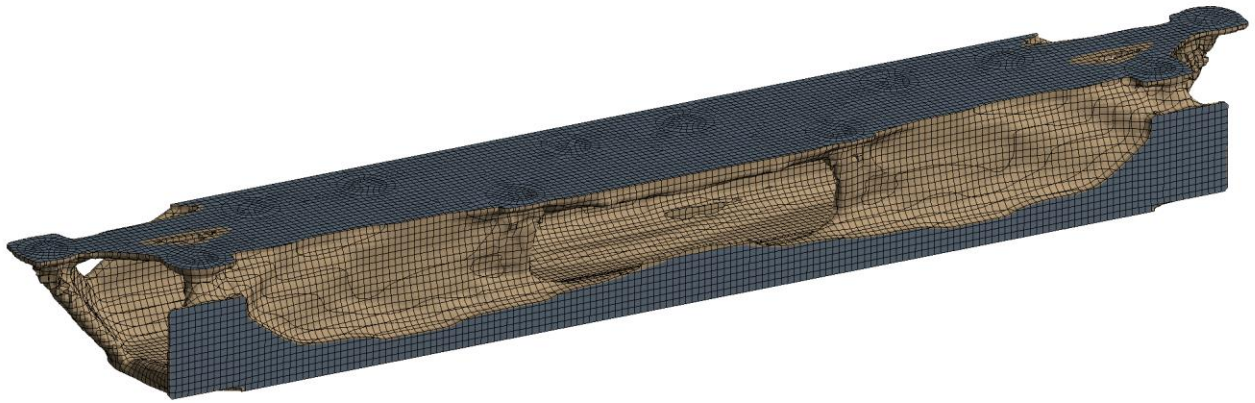

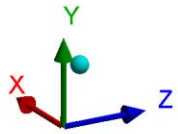

Girder Topological Optimisation

Mass constraint:
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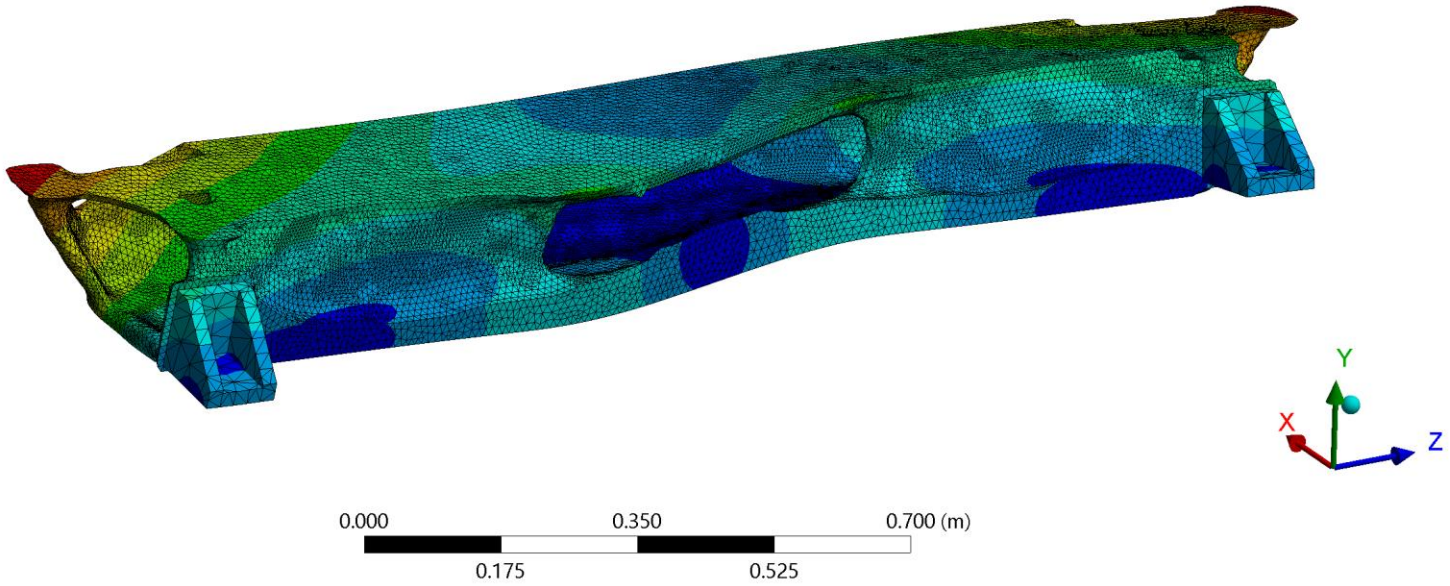
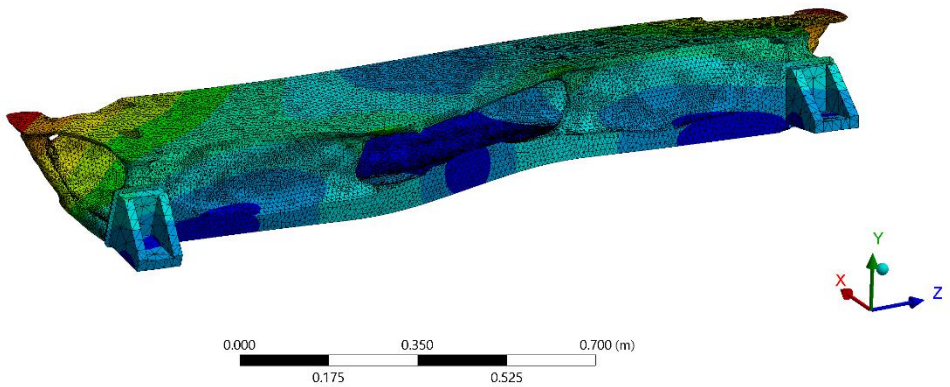
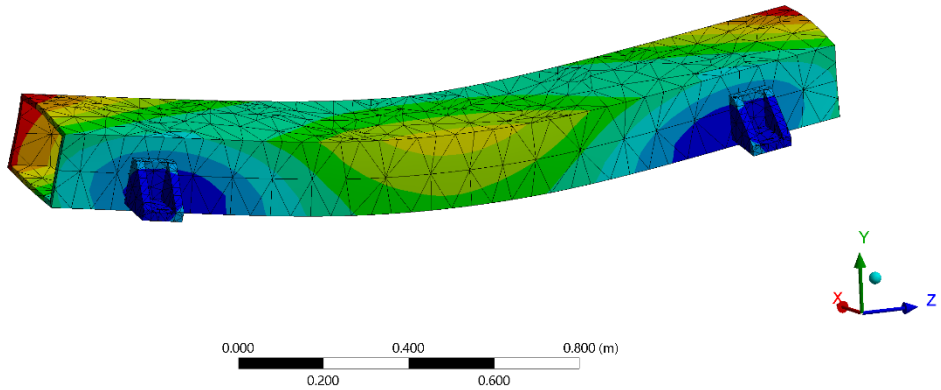


Girder Topological Optimisation

Same mass, higher fundamental frequency.



1	1.	93.395
2	2.	106.2
3	3.	166.44
4	4.	237.68
5	5.	244.25
6	6.	255.21



	Mode	Frequency [Hz]
1	1.	84.642
2	2.	122.35
3	3.	169.99
4	4.	242.28
5	5.	256.62
6	6.	259.25