

# Calculation result check for the calculation function of natural frequency on Milling Maniac

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# How to compare calculated natural frequencies

Calculated 1st natural frequency of Milling Maniac is compared with those of FEM and another theoretical equation.

## 1. Compared with FEM

Calculation results are obtained with FreeCAD + Calculix.

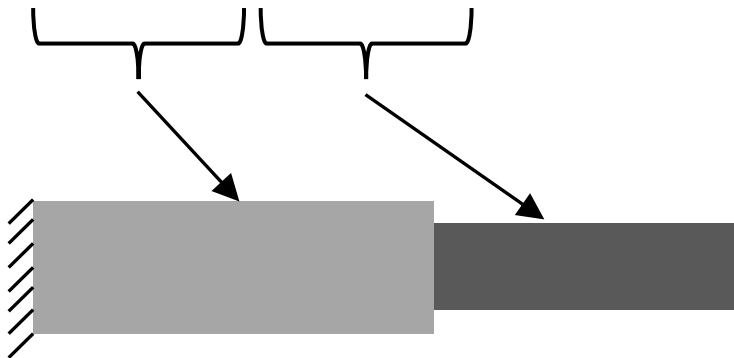
## 2. Compared with another theory

There are other theoretical equations for natural frequency. In this report, the equation for a cantilever with a lumped mass at the tip is used for comparison.

## 3. Summary

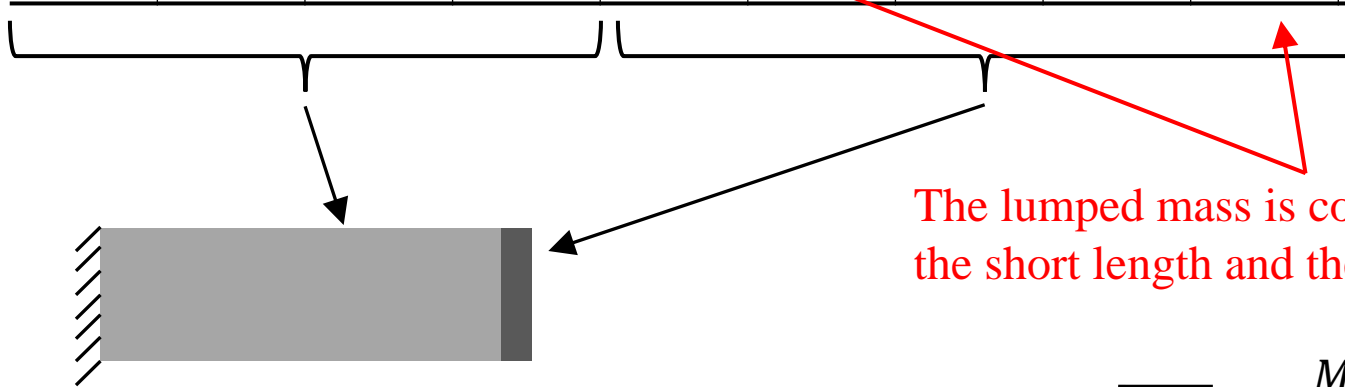
# 1. Compared with FEM

L1 [mm]	d1 [mm]	L2 [mm]	d2 [mm]	Young's modulus [GPa]	Density [g/cm <sup>3</sup> ]	1st natural frequency [Hz]	
						CalculiX on FreeCAD	Milling Maniac
150	40	100	20	210	7.85	720.69	737
			30			576.64	582
			40			460.90	464
			50			378.25	381
			60			319.03	322



## 2. Compared with another theory

L1 [mm]	d1 [mm]	Young's modulus [GPa]	Density [g/cm <sup>3</sup> ]	L2 [mm]	d2 [mm]	Young's modulus [GPa]	Weight [kg]	Density [g/cm <sup>3</sup> ]	1st natural frequency [Hz]	
									Theory	Milling Maniac
150	40	210	7.85	0.1	40	210	2	15915	545	503
							5	39788	344	334
							10	79577	243	240
							15	119366	199	197
							20	159154	172	171



The lumped mass is considered by inputting the short length and the large density.

Cantilever with a lumped mass at the tip

$$f_n = \frac{1}{2\pi} \sqrt{\frac{3EI}{L_1^3 M}}$$

$M$ : Lumped mass

$$I = \frac{\pi d_1^4}{64}$$

1st natural frequency of the cantilever with a lumped mass at the tip

### 3. Summary

There are a little differences between calculated results of Milling Maniac and those of others.

However, calculation results are approximately good.