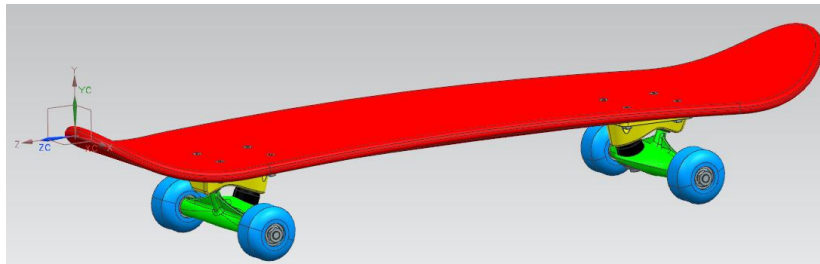


Analysing structures for natural frequencies

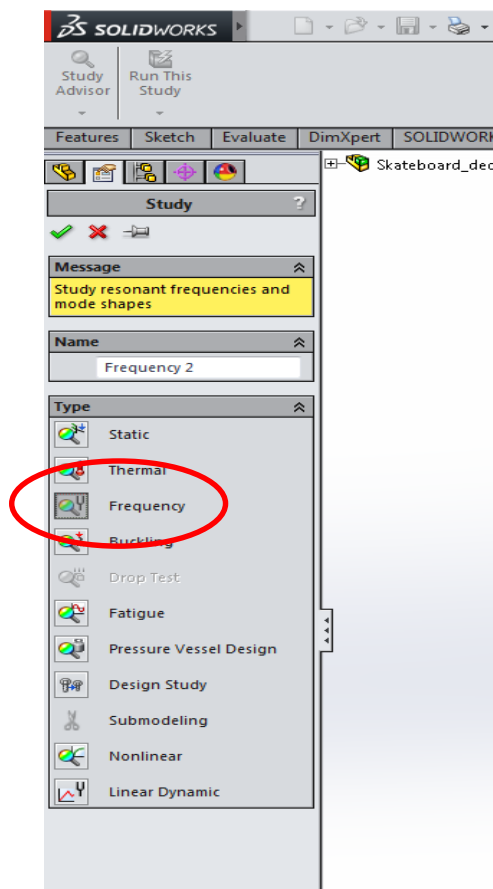
During this exercise we will take an epoxy skateboard and establish what the natural frequencies of the board are.

The geometry of this component can be seen below;

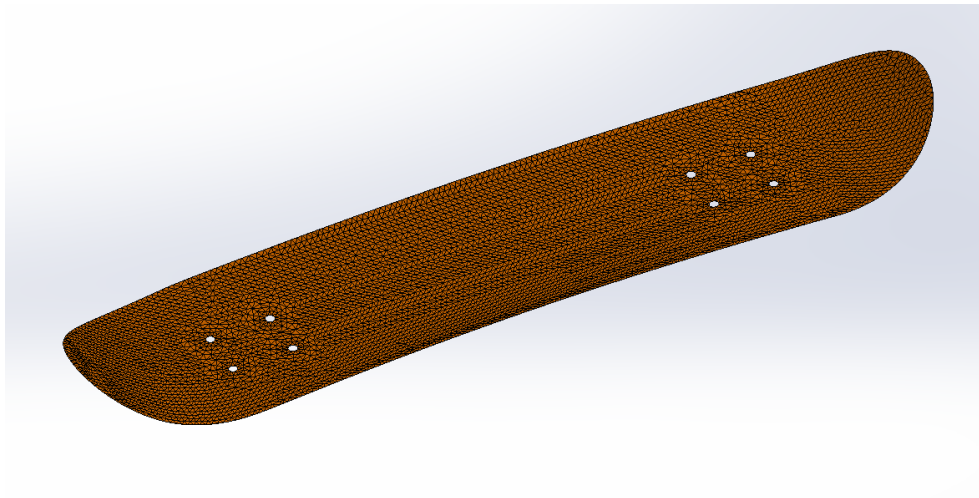


The deck of this board is made from 5mm epoxy. We will assess the board to understand the vibrational response of this component.

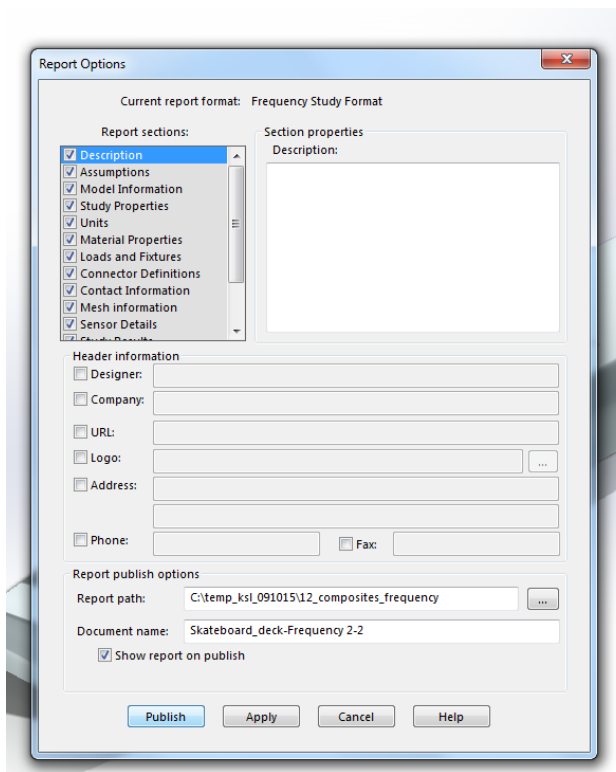
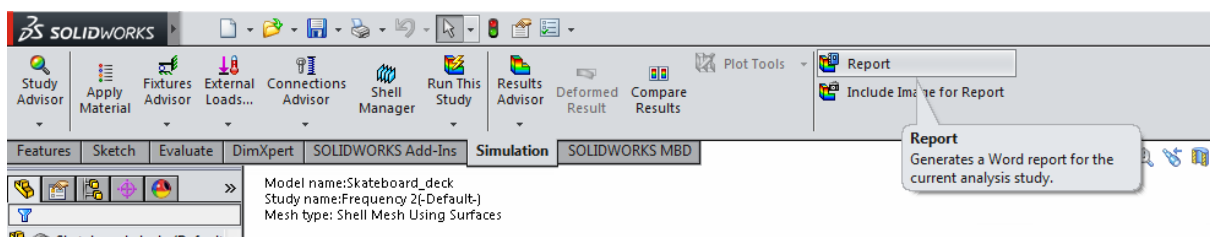
Open Skateboard_deck.sldprt. However when you choose new study, create a “Frequency” study as opposed to “static”. OK.



Create a 5mm thick shell mesh using epoxy as your material in the same way that you would for a “static” analysis. Your part will now look something like the following;

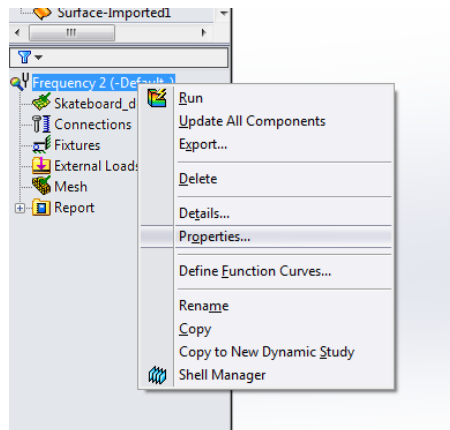


We can check the weight of this part by publishing a “report”.

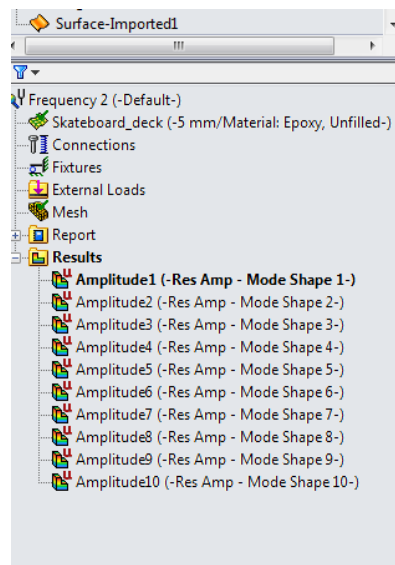


Now examine the word document that has been generated and you should see that the fe model is 0.72kg. If not check your material properties and your thickness. You will also see in the report that by default Solidworks generates the first 5 modes.

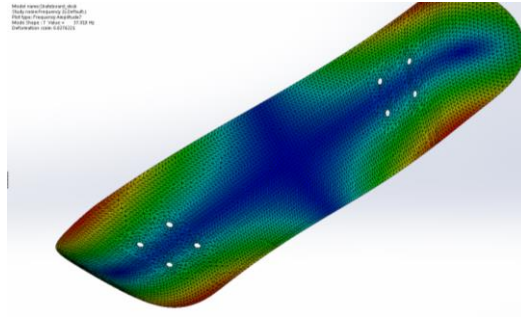
Due to the fact that this model is going to be unrestrained we would expect to see 6 zero hertz modes (one for each dof), thus in order to see the natural frequencies of the board we are going to assess the first 10 modes. (Hence we will see the first 4 modes of the structure).



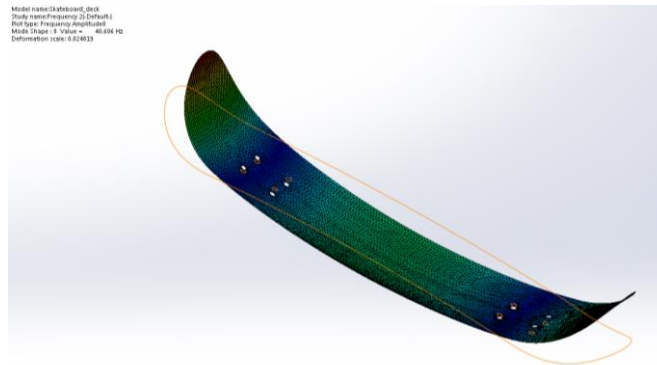
Go into properties and change “number of frequencies” to 10. OK. Run this study. You should see the following results generated.



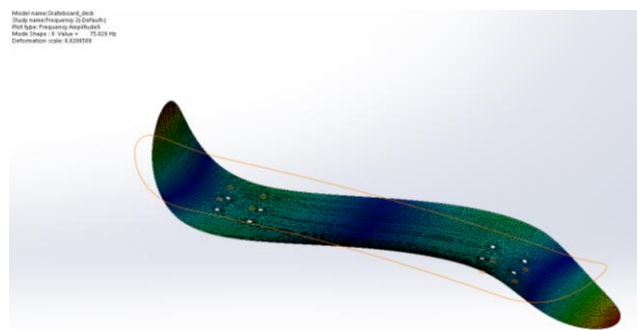
Scroll through each of these results and animate them to investigate the frequency and the mode shape of each of them. You should see that the first 6 modes are zero (or very close to) hertz. The next four modes should look as follows.



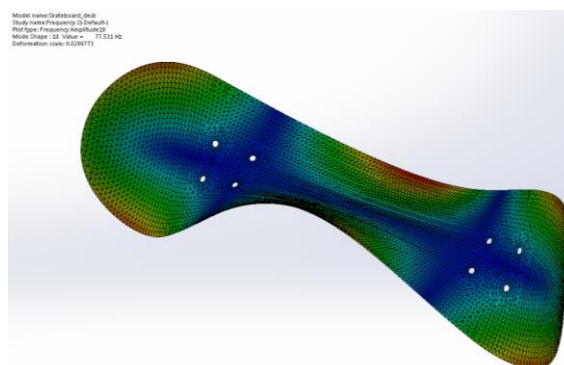
The first structural mode is a first order torsion mode at 37.0 Hz.



The second structural mode is a first order bending mode at 40.6 Hz.



The third structural mode is a second order bending mode at 70.8 Hz.



The fourth structural mode is a second order torsion mode at 77.5 Hz.