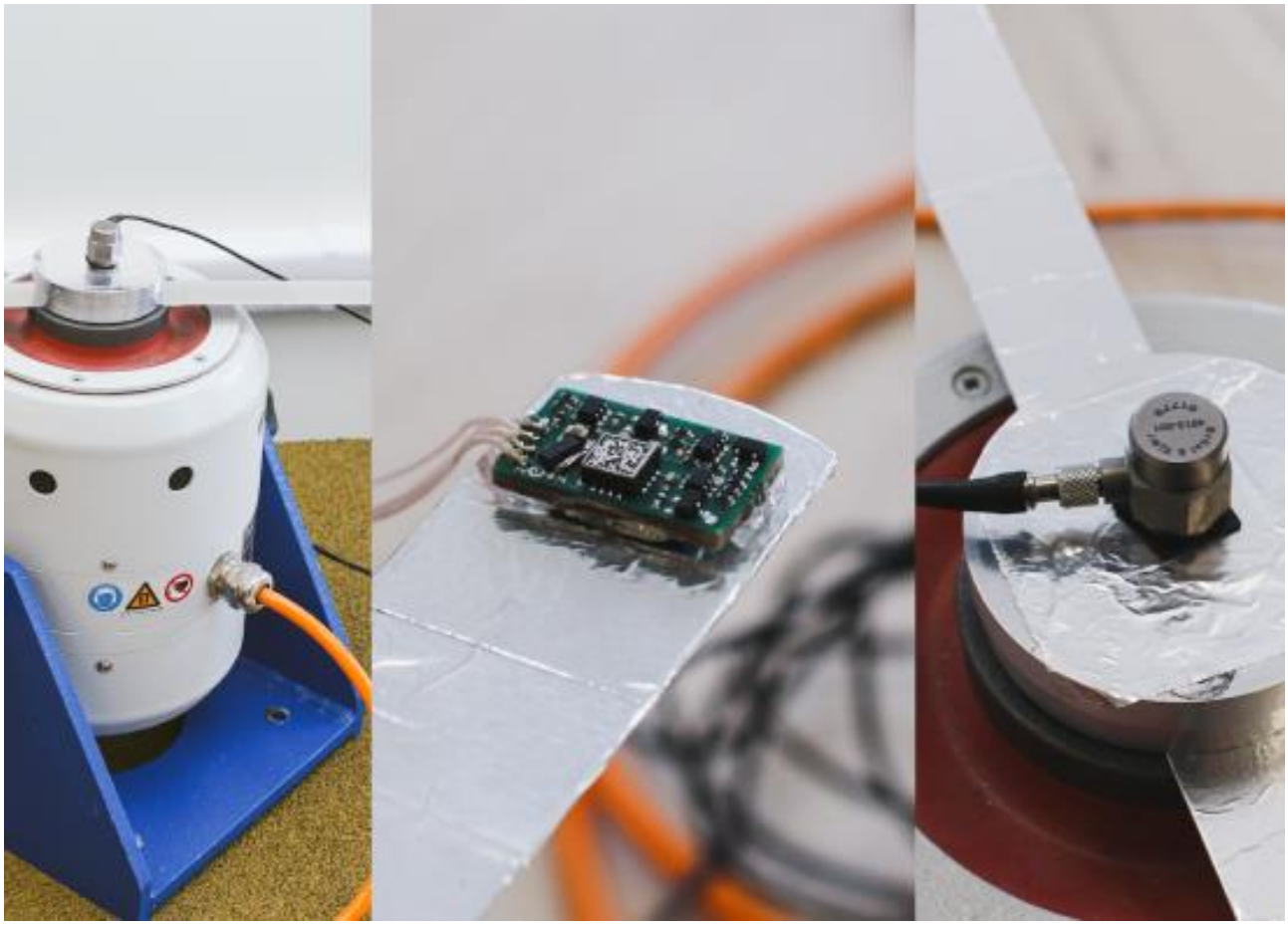
Article

RULA The Harmony of Solutions

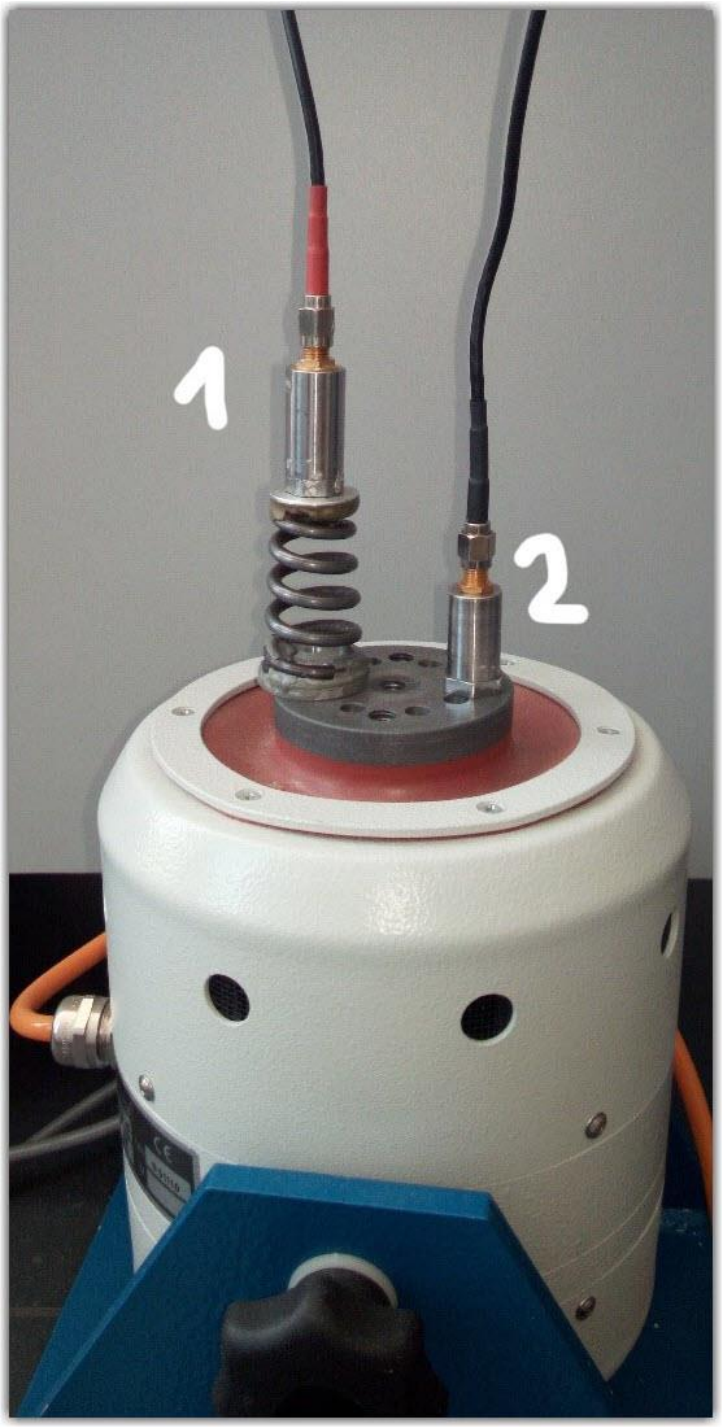


Notching Control and Why You Should Use It

Imagine you are testing a satellite with solar panels. It is crucial to prevent the destruction of solar panels due to resonances during the test. Notching is a tool that helps you avoid all resonances on a particular frequency by limiting the acceleration values.

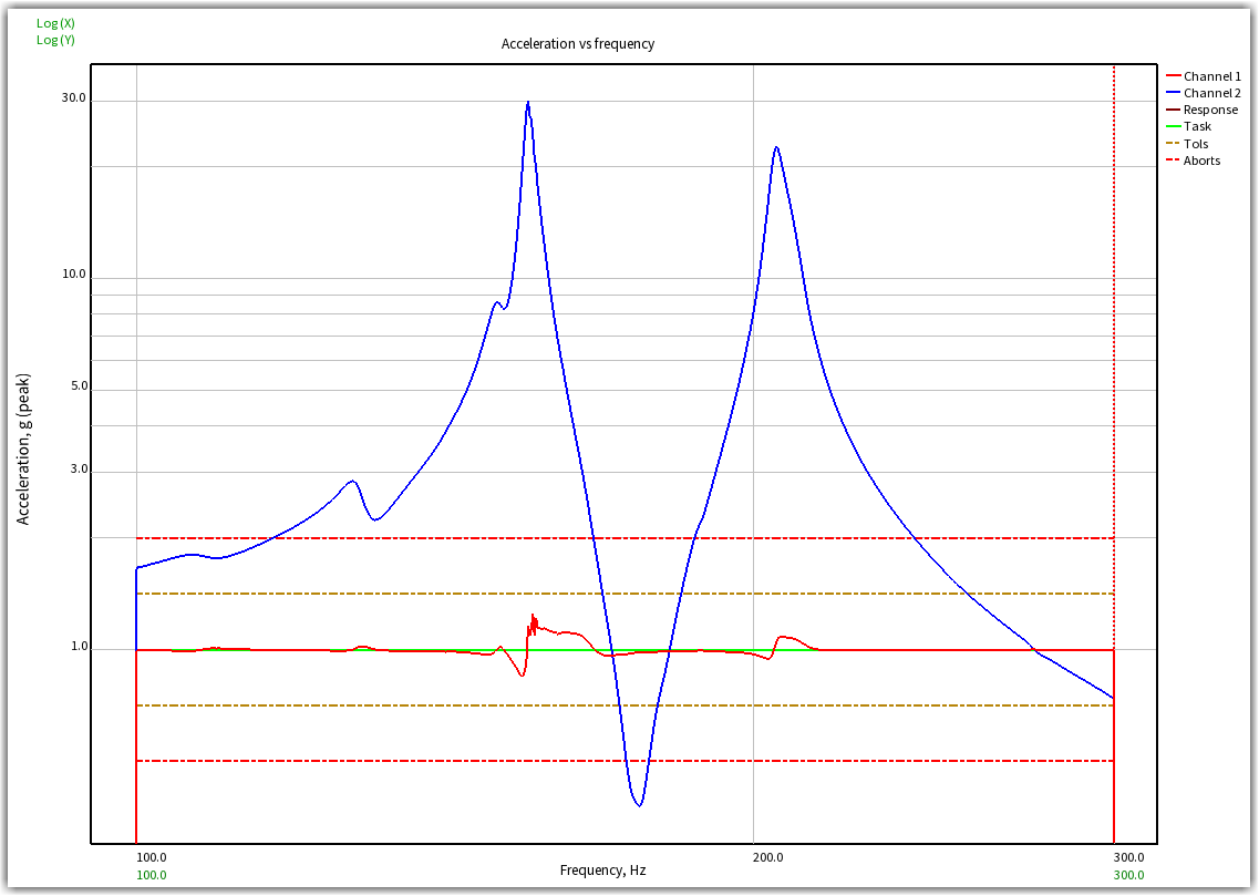
Notching control allows you to run tests with limits set on the PSD or acceleration on channels.

The quickest way to get started is to place sensors on the panels and set notching limits on them. Consider the test setup shown on the photo below:



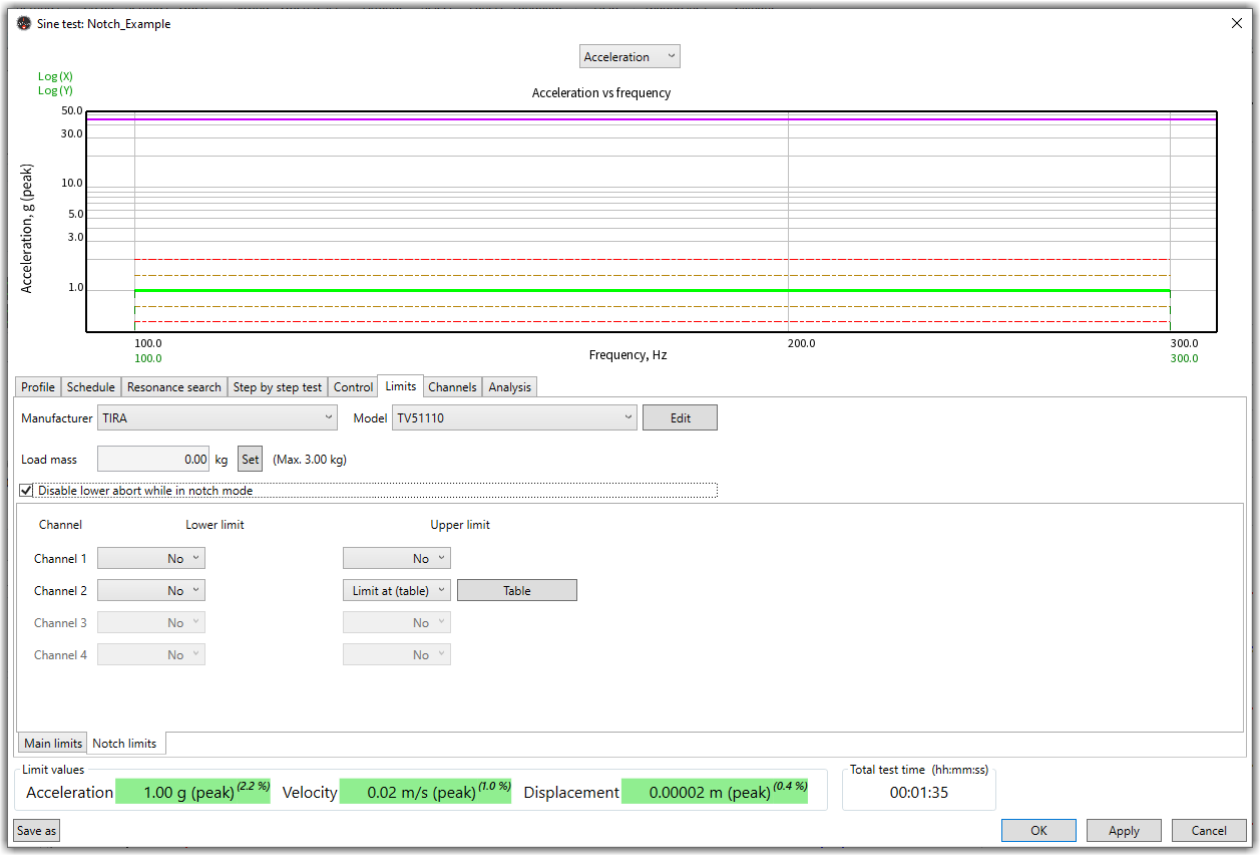
The construction consists of a shaker, a spring and two sensors. Sensor 1 is connected to the top of the spring; sensor 2 is placed directly on the shaker. Sensor 2 is connected to the first input of the RL-C21 device, and sensor 1 is connected to the second input.

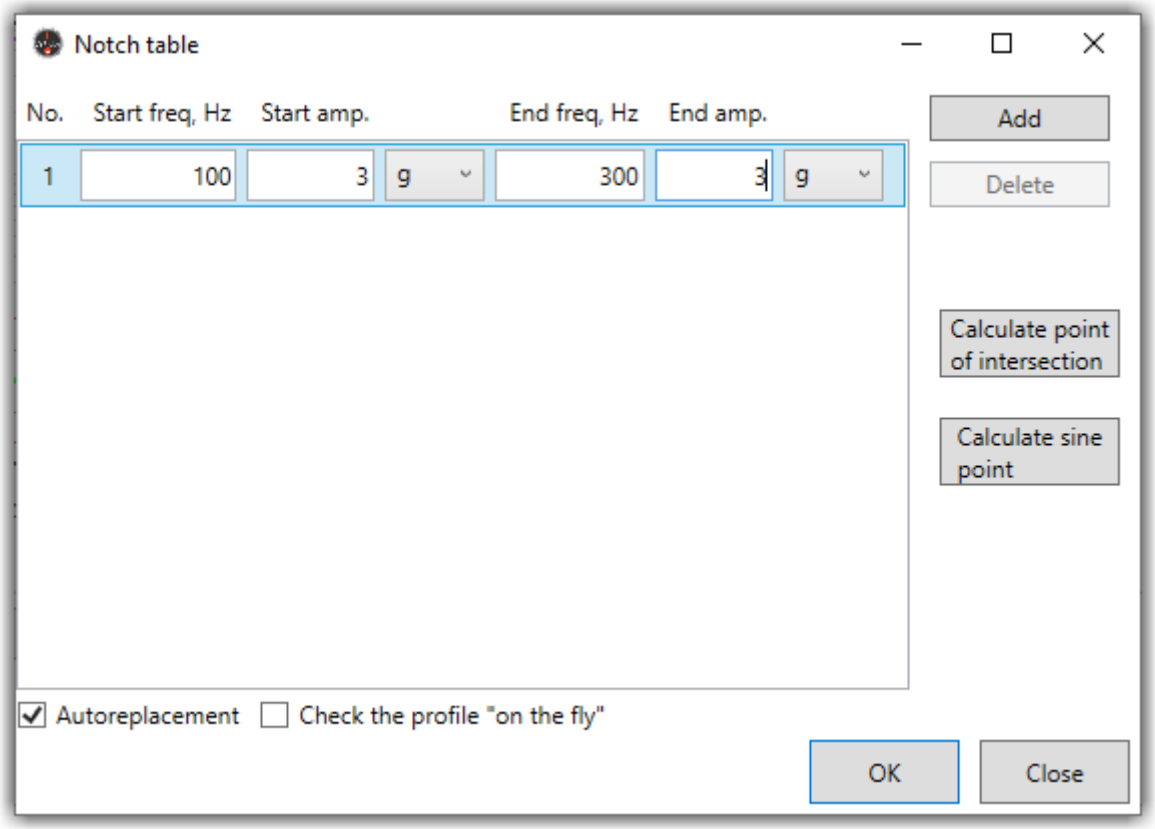
We begin the test with a linear. There are two peaks with acceleration about thirty times higher than acceleration at the top of the shaker.



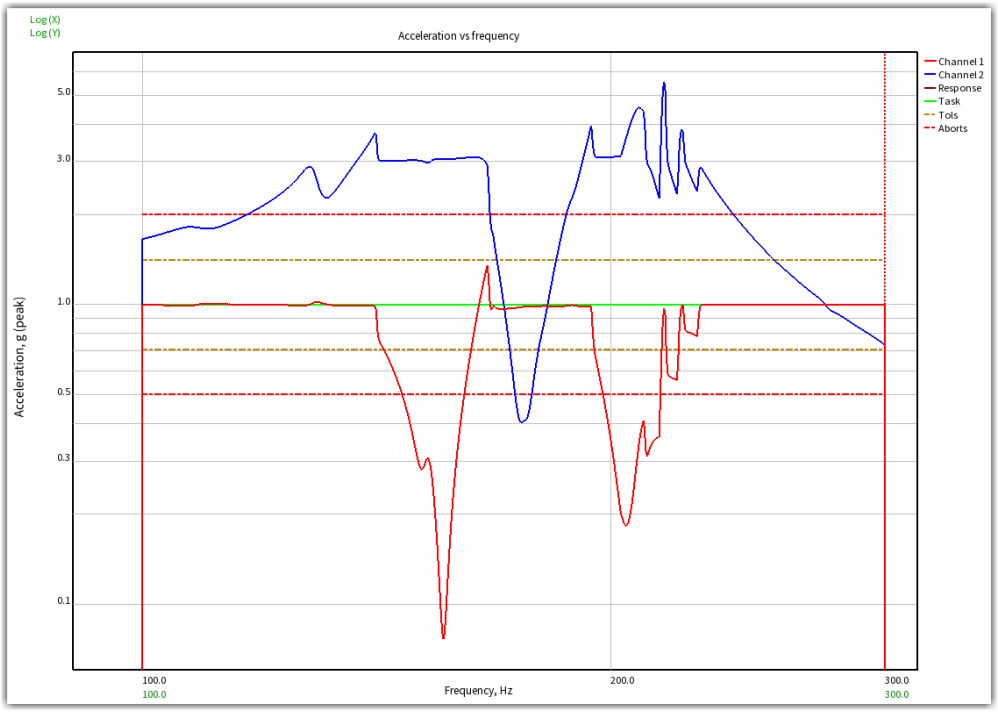
If you apply acceleration this high to a sensitive part of a device, it will suffer significant damage.

To avoid this, we will now specify notch limit for the second channel at 3 g level:

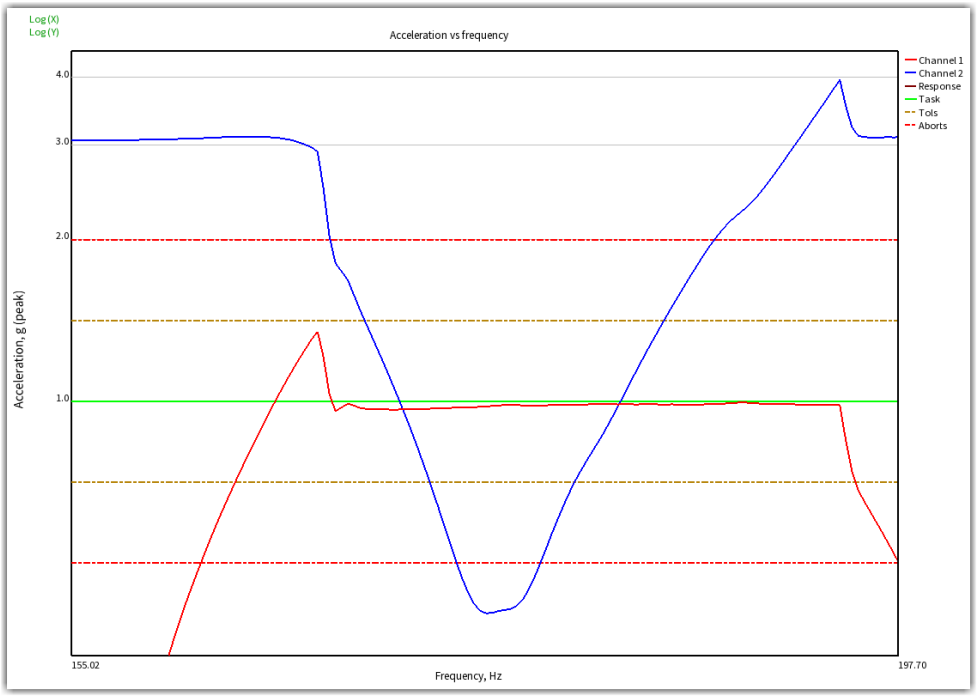

Sine test: Notch_Example
Acceleration
Log (X)
Log (Y)
Acceleration vs frequency
Acceleration, g (peak)
50.0
30.0
10.0
5.0
3.0
1.0
100.0
100.0
200.0
300.0
300.0
Frequency, Hz
Profile
Schedule
Resonance search
Step by step test
Control
Limits
Channels
Analysis
Manufacturer
TIRA
Model
TV51110
Edit
Load mass
0.00
kg
Set
(Max. 3.00 kg)
Disable lower abort while in notch mode
Channel
Lower limit
Upper limit
Channel 1
No
No
Channel 2
No
Limit at (table)
Table
Channel 3
No
No
Channel 4
No
No
Main limits
Notch limits
Limit values
Acceleration
1.00 g (peak) (2.2 %)
Velocity
0.02 m/s (peak) (1.0 %)
Displacement
0.00002 m (peak) (0.4 %)
Total test time (hh:mm:ss)
00:01:35
Save as
OK
Apply
Cancel


Notch table
No.
Start freq, Hz
Start amp.
End freq, Hz
End amp.
1
100
3
g
300
3
g
Add
Delete
Calculate point of intersection
Calculate sine point
Autoreplacement
Check the profile "on the fly"
OK
Close

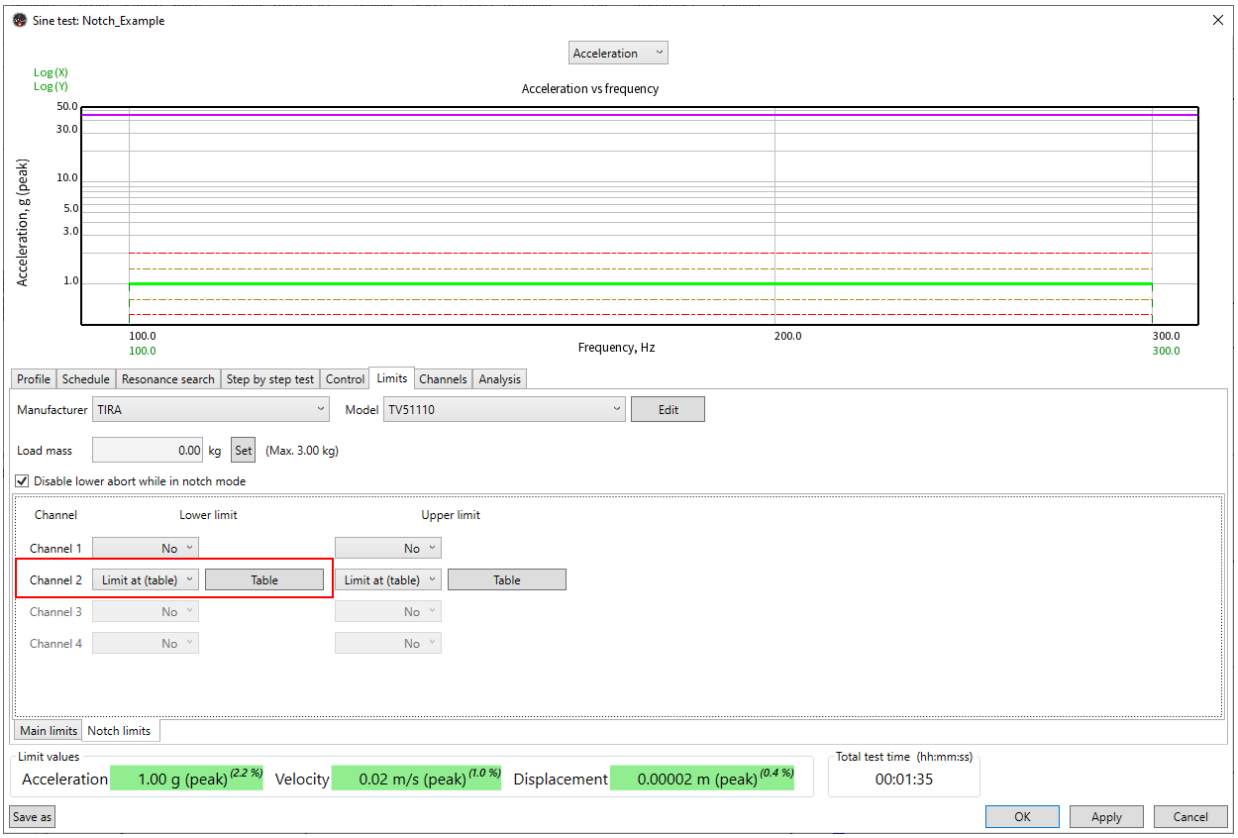
With the notching limits set, we now see that acceleration on the second channel is now limited to about 3 g instead of 30 g, and that there is resonance on the frequencies.



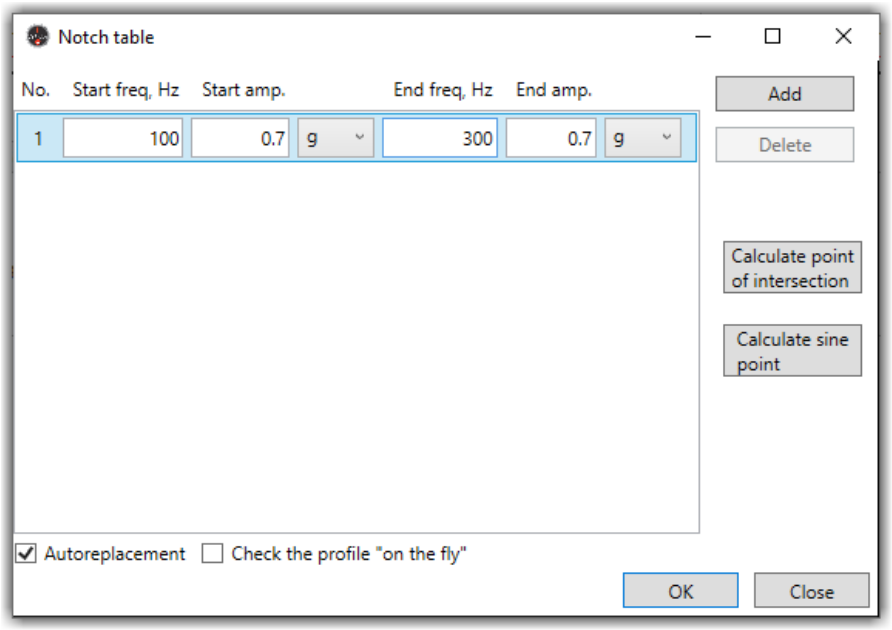
However, there is also a small gap where the acceleration on the second channel is below the limit.



In some cases, it is necessary to make the acceleration on the channels be above some level to avoid undertesting. To do so, we will specify the lower notch limit:

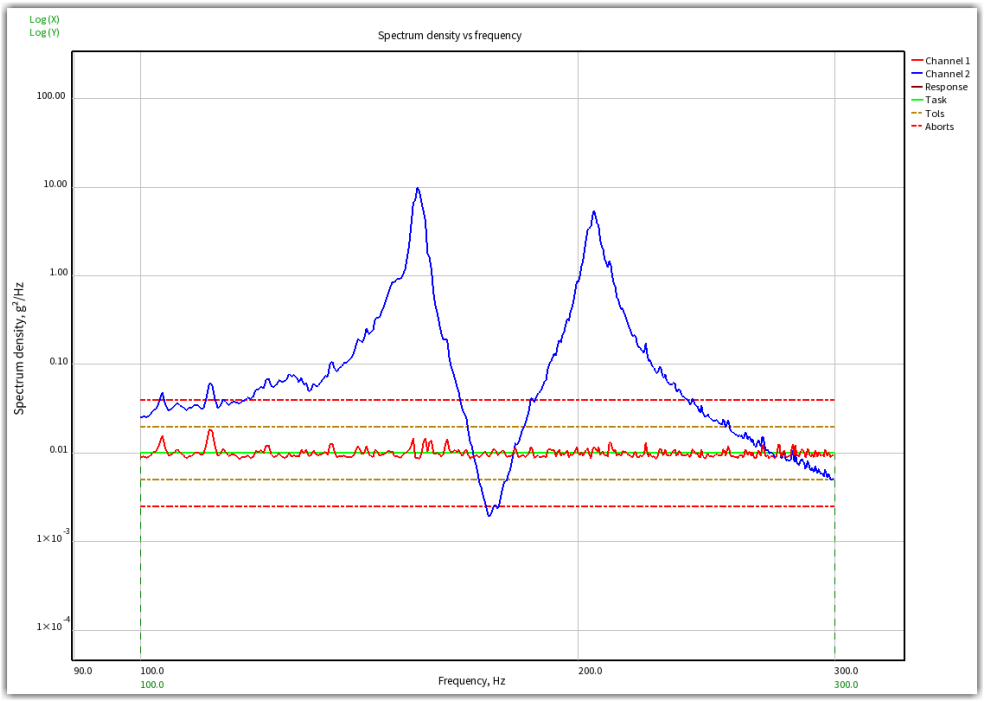


In this test, we've set the lower limit to 0.7 g:



Now the acceleration on the second channel is limited to the range from 0.7 to about 3 g:

The same principle can be also applied to a Random test. Here is a picture of a Random test with a linear profile run with the same setup.



Now let us specify the upper limit of 0.1 g2/Hz and the lower limit of 0.007 g2/Hz. The resulting PSD plot is shown in the picture below:

The PSD of the second channel is limited to the specified borders.

Notching is a tool that helps you avoid all resonance on a particular frequency, especially on complicated structures. However, in the case when only control channels are used, there is no need to set notching, because the drive signal accomplishes the same goal as the notch on the control channel.