Shock and transport response of the pickup

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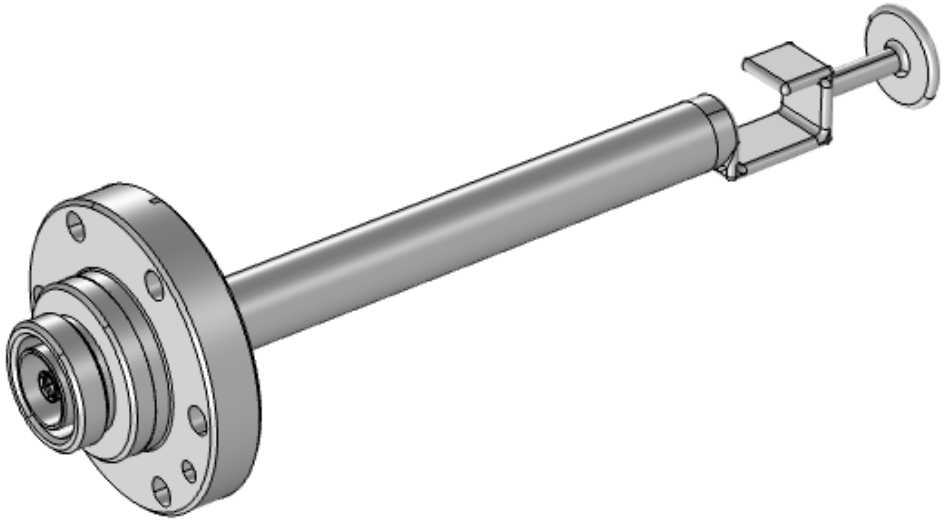
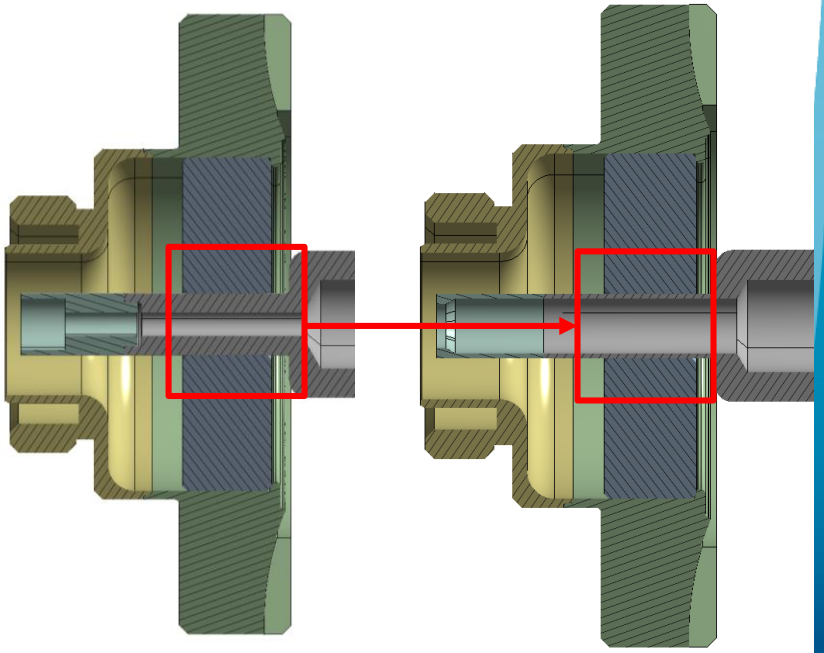
CERN – 27/02/2019

Introduction

- **Shock** – Represented as half sine wave.
- **Random vibration** – Response Power Spectral Density (RPSD)
    - Effect of the change of the diameter of the alumina window
        - 4 different diameters, 7 mm (current), 9 mm, 11 mm and 15 mm
    - Effect of the shock time: 5 ms, 10 ms, 20 ms
    - Effect of the shock intensity: 5g, 10g, 20g
    - Evaluation of the effect of the thickness of the copper wall
        - Copper wall of 0.5 mm





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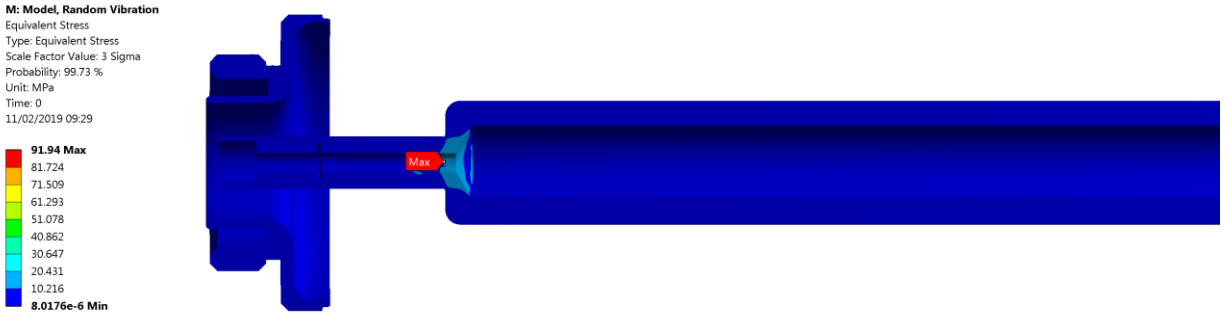
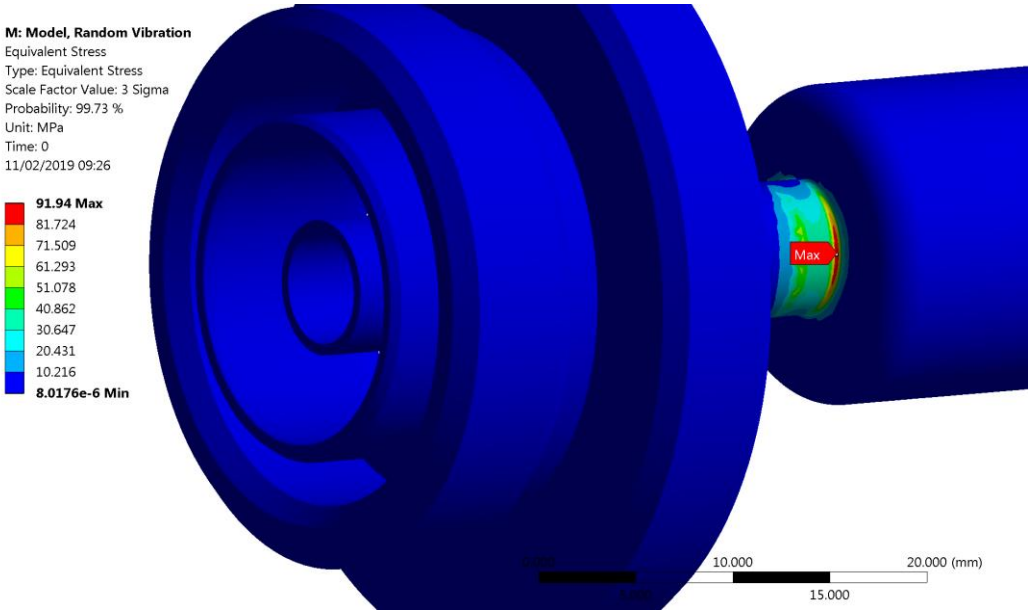
Results - Response

- The maximum stress takes place in the copper and is typically very localized, both for the shock analysis and the random vibration.





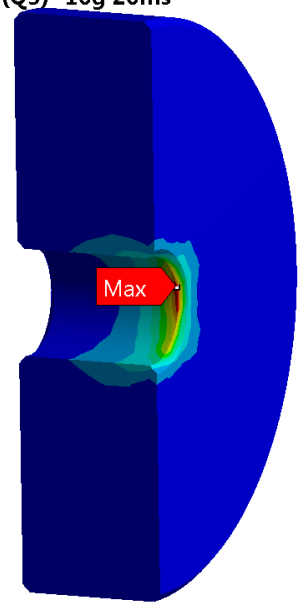
Results - Response

- The stress in the alumina window is smaller than in the Cu for the shock analysis and the random vibration

Shock- 10g 20 ms

L: Model, Response Spectrum 2 (Q5) -10g 20ms
Equivalent Stress 2
Type: Equivalent Stress
Unit: MPa
Time: 0
25/02/2019 10:06

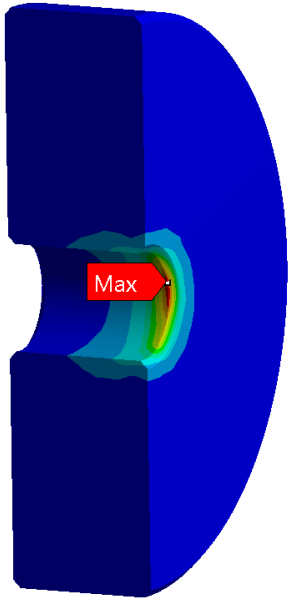
74.441 Max
66.173
57.905
49.637
41.369
33.101
24.834
16.566
8.2978
0.029911 Min



Random vibration

M: Model, Random Vibration
Equivalent Stress 2
Type: Equivalent Stress
Scale Factor Value: 3 Sigma
Probability: 99.73 %
Unit: MPa
Time: 0
25/02/2019 10:06

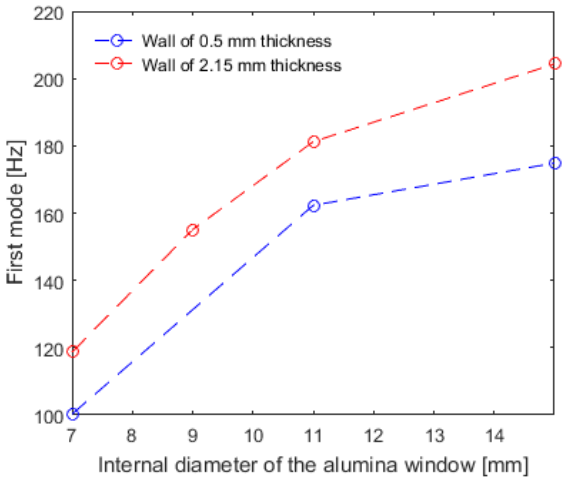
42.083 Max
37.409
32.735
28.061
23.387
18.713
14.039
9.3645
4.6905
0.016389 Min



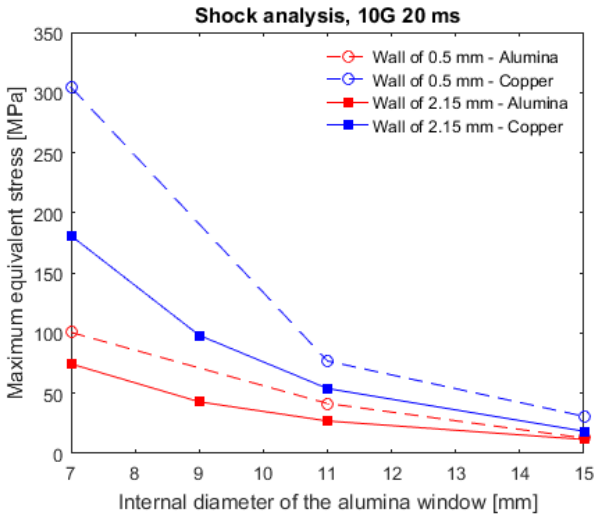
Results – Diameter of the alumina window

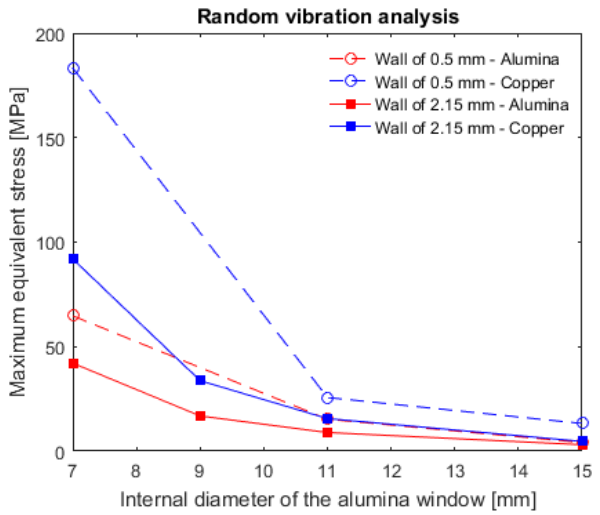
Maximum stress and deformation for different durations diameters of the alumina window – Case 10G, 20 ms

First mode



Maximum equivalent stress



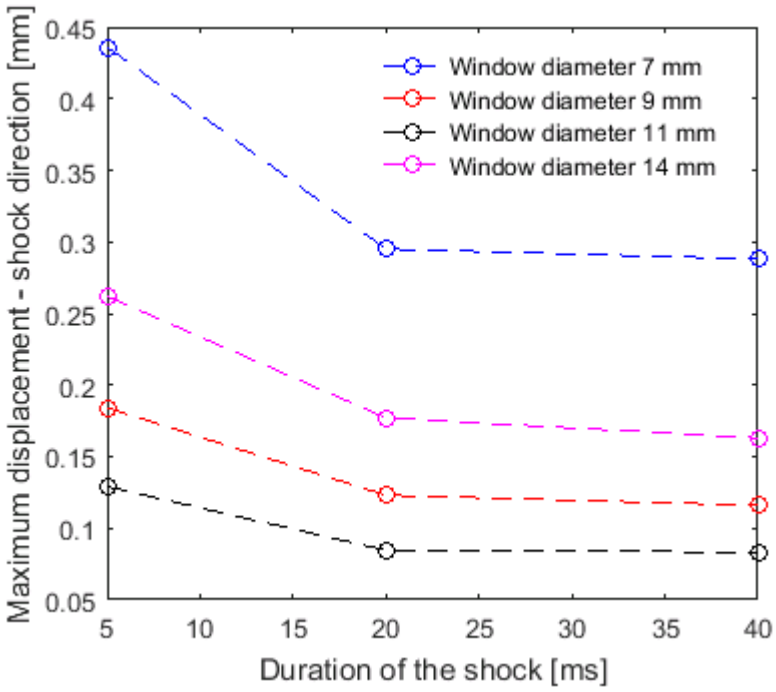


- **Decreasing the thickness:**
  - **Decreases** the **frequency** of the first mode
  - **Increases the maximum stress** in both the shock and random vibration analyses
  - Same trend of the results with the inner diameter of the alumina window

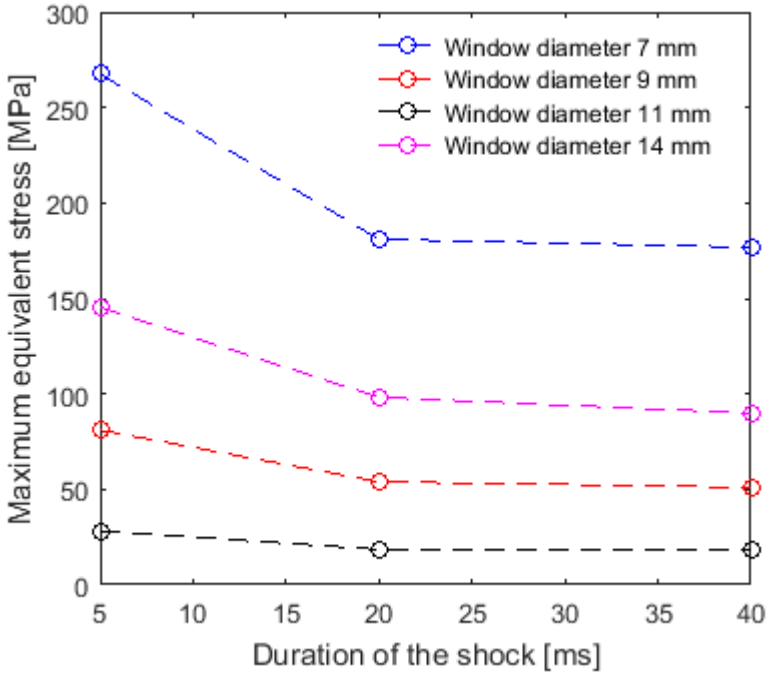
Results – Effect of the shock duration

Maximum stress and deformation for different durations of the shock

Maximum directional deformation



Maximum equivalent stress

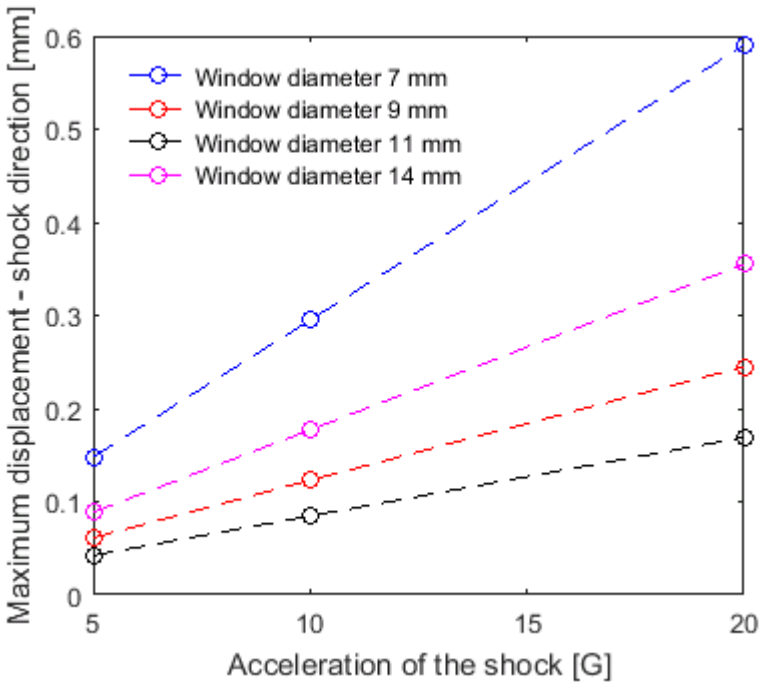


The deformation and stress decrease with the shock duration.

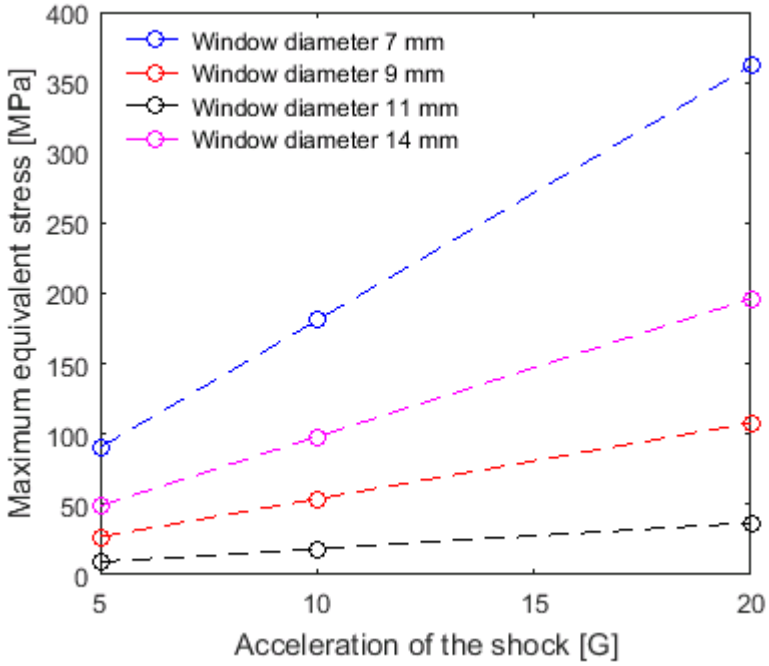
Results – Effect of the shock intensity

Maximum stress and deformation for different durations of the shock

Maximum directional deformation



Maximum equivalent stress



The deformation and stress linearly increase shock intensity.

Results – Comparison

- Note that a **linear** analysis was performed.
- **Increasing** the **diameter** of the alumina window **increases** the first **eigenmode** and **decreases** the maximum **deformation** and **stress** during a shock and random transport excitation.
- The maximum stress takes place in the **copper** and it is typically very localized.
- **Decreasing** the **thickness increases** the **stress** in both the copper and alumina. Same trend as in the original thickness
- Increasing the shock **duration decreases** the deformation and stress in the system.
- Increasing the **shock intensity** linearly **increases** the deformation and stress in the system.

Thank you for your attention!