

**Robust Project.**

**Deliverables D.3.4**

**New lightweight mounting block.**

**Natural frequencies measure**



*Author: Marco Anghileri*

*Dipartimento di Ingegneria Aerospaziale - Politecnico di Milano*

*34, via La Masa*

*tel: 02 23998316*

*fax: 02 23998334*

*e-mail: anghileri@aero.polimi.it*

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## Introduction

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To better understand the results of the test carried at TRL on November 17 2004 we performed some basic experiments installing the composite mounting block on a Peugeot 106 tunnel to reproduce the resonance problems shown by TRL data.

In this report a preliminary analysis of these tests is reported.

## First mounting.

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A first series of tests have been conducted using the installation procedures agreed by the consortium. The structure has been fixed on the tunnel of the vehicle using 4 bolts (8 mm diameter). To measure the frequency behaviour a standard technique for modal analysis has been adopted impacting the structure with a small hammer and measuring the output with piezoelectric accelerometers with high sensitivity.

In the following figures the test setup is reported:



*Figure 1: Test procedure*



Figure 2 Test procedure



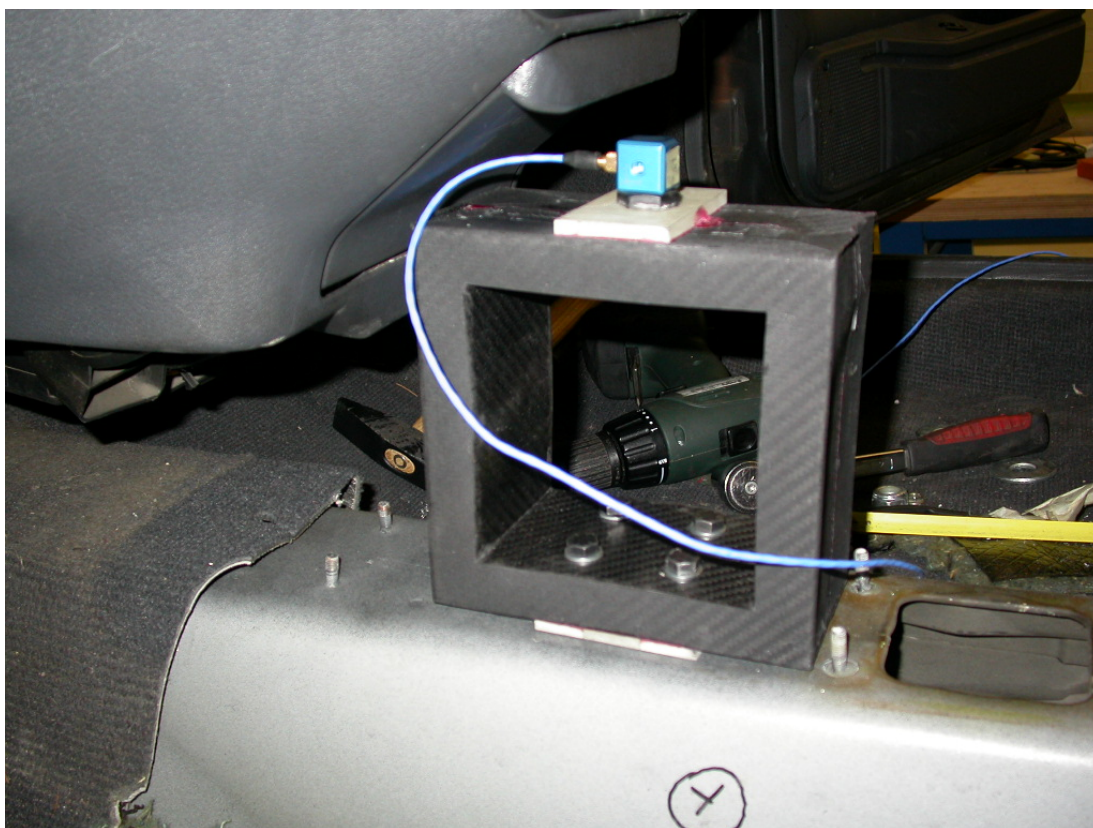


Figure 3 Test procedure

### **Frequency analysis:**

During these tests a triaxial accelerometer has been installed on the structure. The output of these accelerometers, together with the spectrum response showed a behaviour similar to the one seen at TRL even if the main frequency is here at about 85 hz. The difference between this frequency and the one measured at TRL (50 hz) is probably due to the different placement of the structure and the presence, at TRL, of the heavy structure used to release the cable that lowers all the natural frequency increasing the mass of the adjacent structure.

In the following figure the results of one of the test is reported. We conducted 10 tests with the same results.

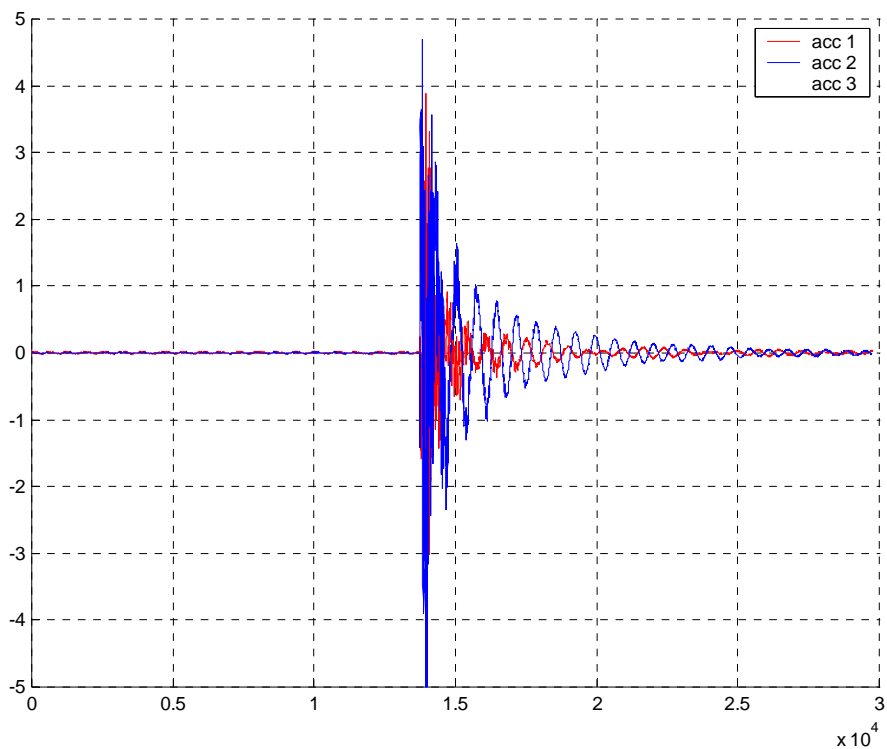


Figure 4: Accelerometer time history.

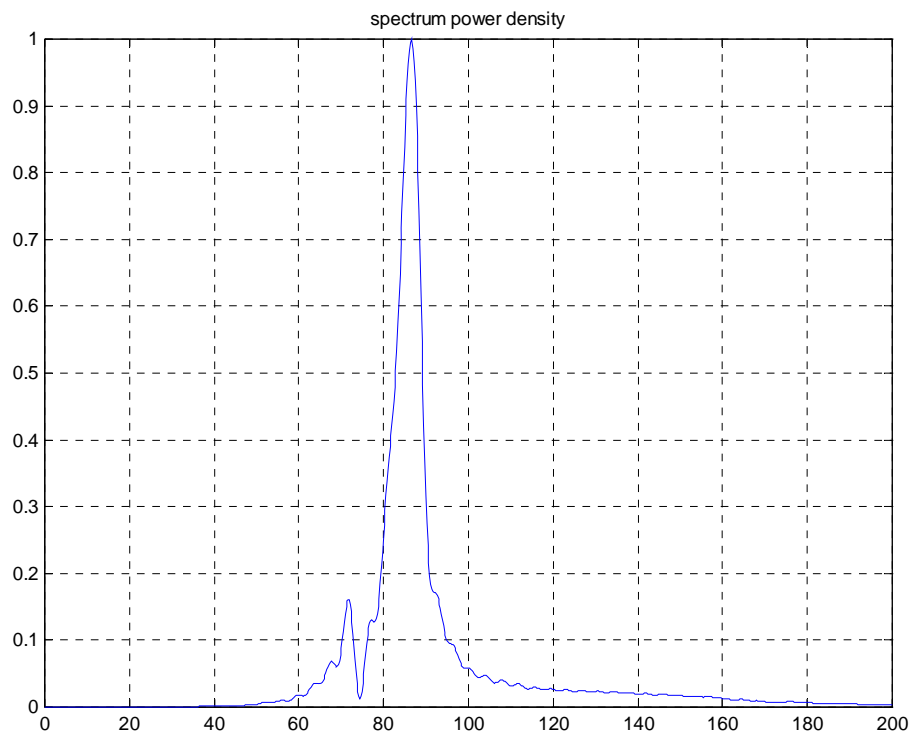


Figure 5: spectrum x direction

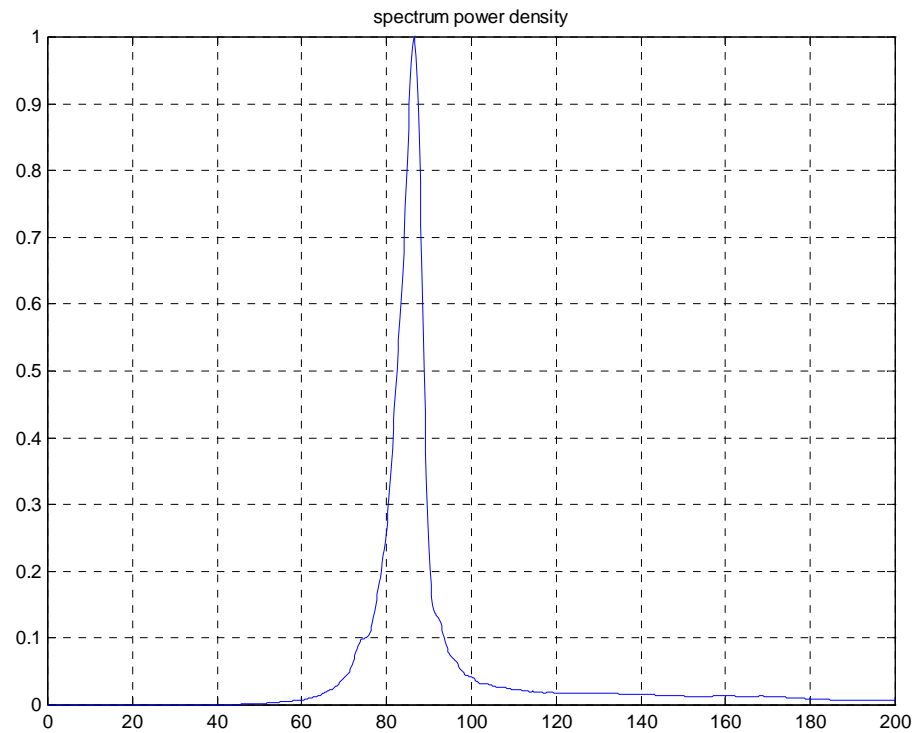


Figure 6: spectrum y direction

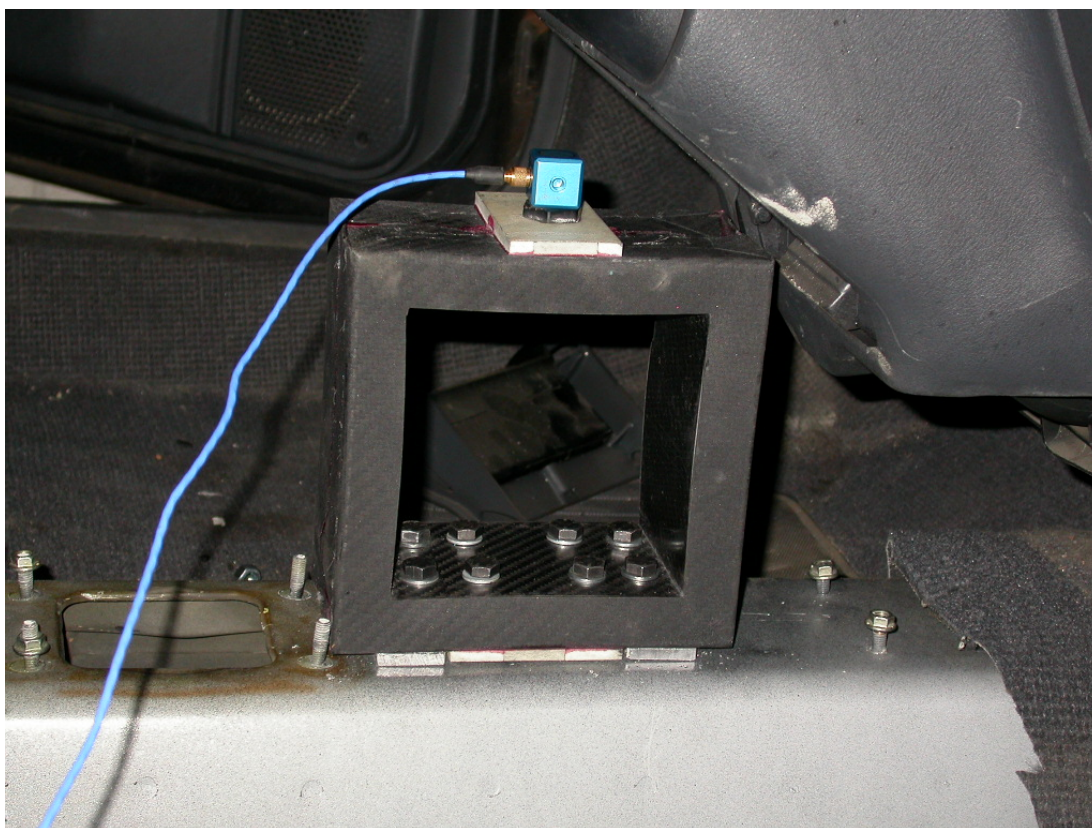
This figure shows these important results:

1. The behaviour shown during TRL tests has been reproduced even if the resonance frequency is at 85 hz
2. This is the only frequency present and if we are able to shift this frequency where severity indices don't work all the possible concerns related with these oscillation are removed.

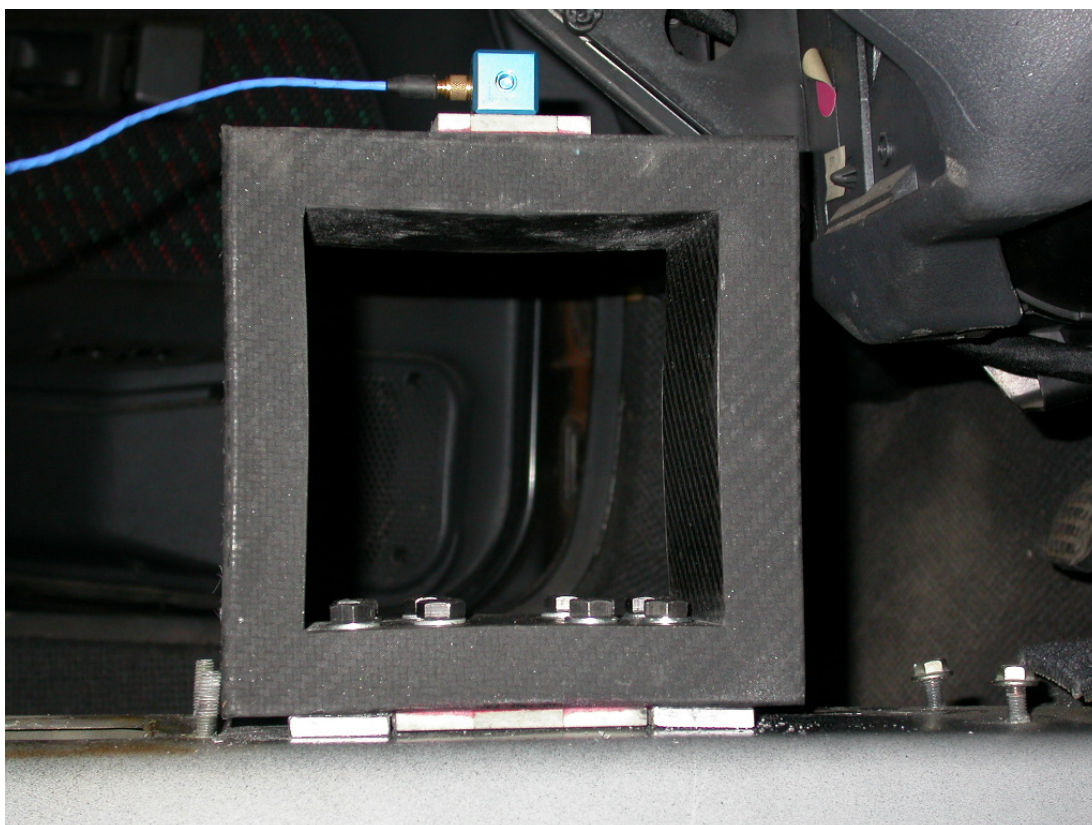
## New mounting

To overcome the above shown problem we simply added four more bolts and introduced spacers to fix the structure on a wider part of the floor. In the following photos this new fixture is shown





*Figure 7 New mouting*

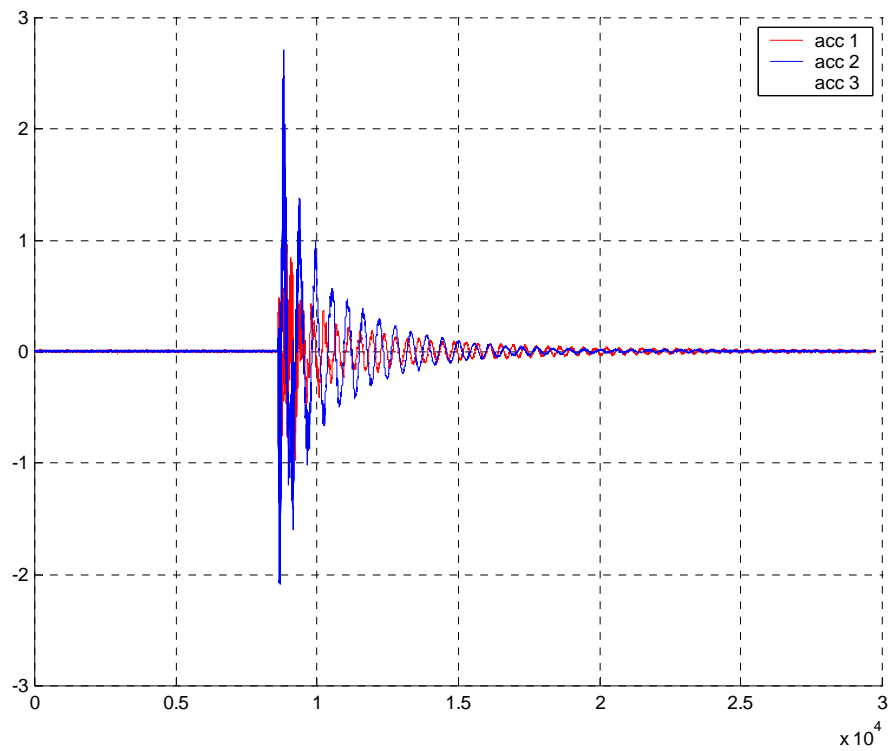


*Figure 8 New mounting*



### **Data analysis**

With the above shown new fixture the same tests described before have been performed. In the following images are reported the results of them:



*Figure 9:8 bolts accelerometers time history*

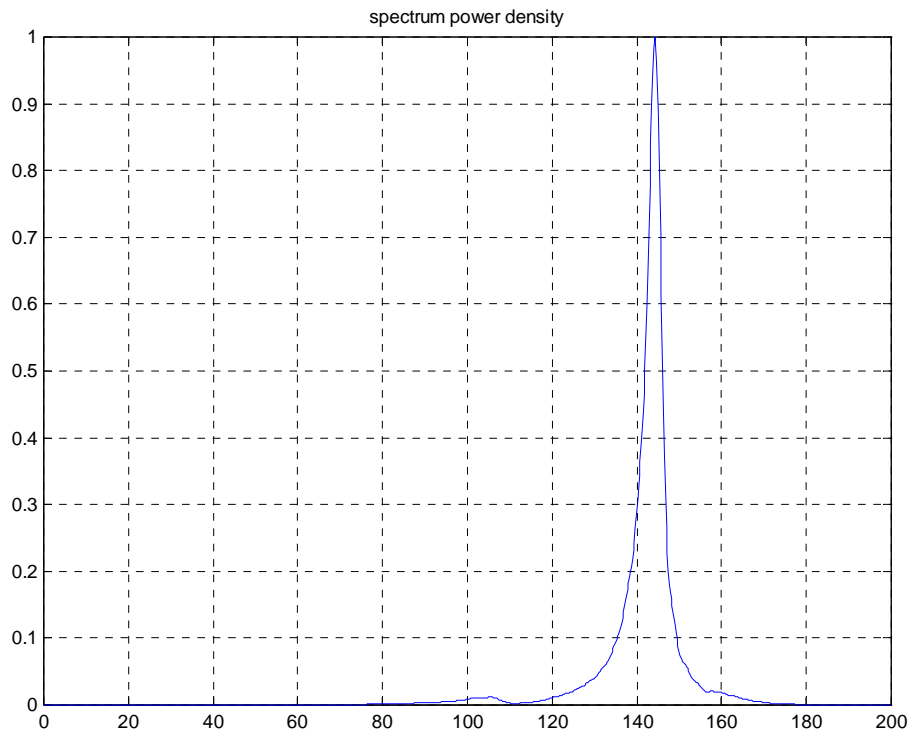


Figure 10 Spectrum x direction

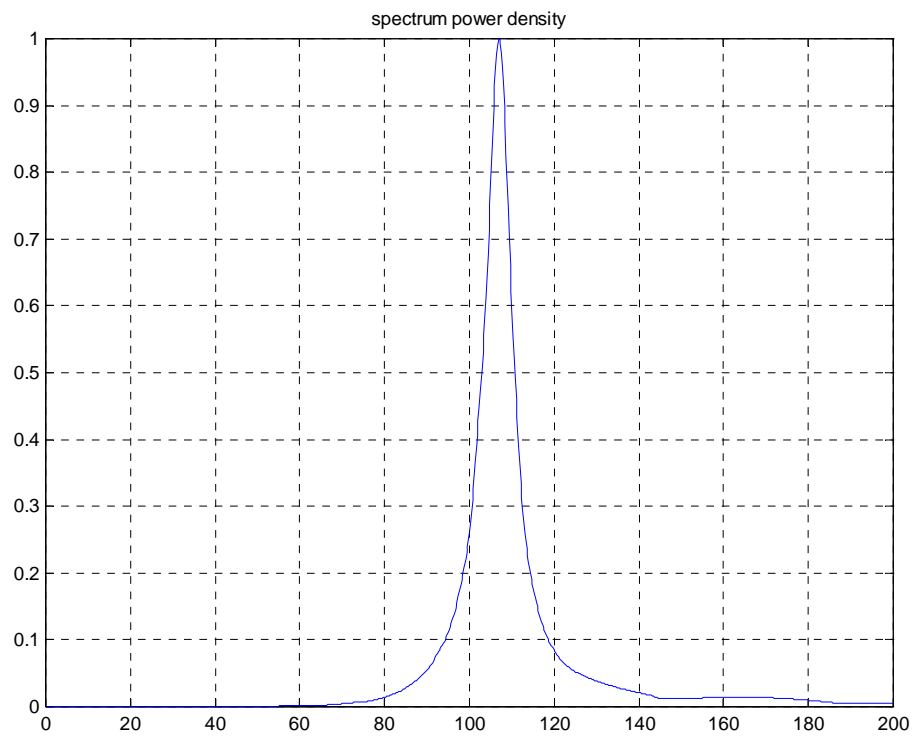


Figure 11 Spectrum y direction

These results show that this modification strongly modify the frequency response.

Comments:

With this modification the first natural frequency of the system is above 105 hz (y direction) ad 140 Hz (x direction) . These frequencies are far from the relevant for the severity indices evaluation. Further tests will be performed using also the metal plate between the carbon fiber and the bolts.