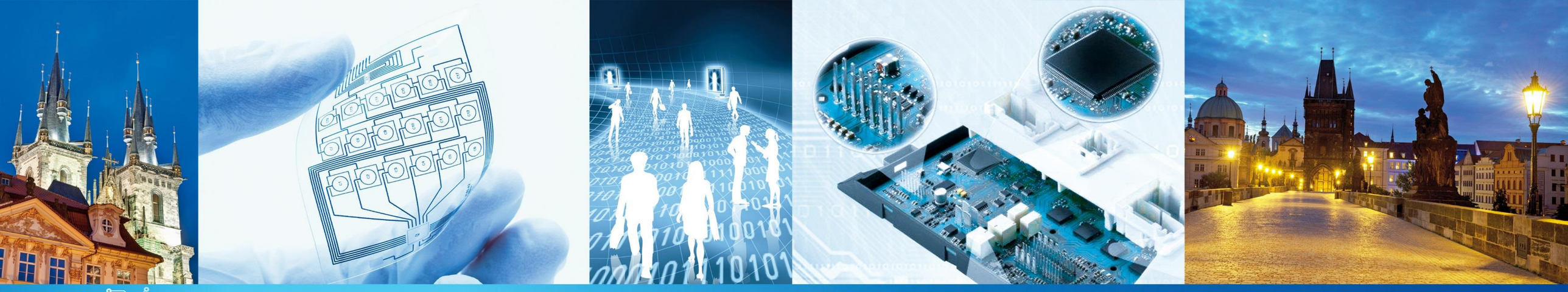

EURIPIDES² PRAGUE FORUM | 2014

# Board on Board Technology

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**Abstract:** This paper is related to EURIPIDES project “Board on Board” (BoB) supervised by Thales Communications. The aim of this project is to develop and validate an innovative solution for realization of high-density boards beyond the SMD limits found, remaining reliable and reparable. A part of each new construction is also mechanical and thermomechanical reliability. There is the fact that vibrations and shocks cause some tens of percent of the mechanical failures in the airborne electronics. Therefore each new solution asks for ensuring equipment survival in harsh environment a mechanical testing. Shock and vibration tests are also essential step to the assurance of relevant quality and reliability. There is described an approach to vibration testing of the new designed configuration including vibration simulations through software ANSYS.

## Introduction of BoB

Indeed, since it is impossible to make an electronic board with two very dense faces, in BoB is developed the concept of two assembled single-sided very dense boards. The goal is:

- to have a finished product with higher level of integration that solving reliability problems,
- the repair operation the two half boards should be separated,
- the interconnection means have to be very discreet in order not to penalize the place allocated for components as well as boards thickness, as is demonstrated in Fig. 1.

The main objective of this paper is to fulfill the vibration testing including simulations of the new PCB arrangement realized in 2,5/3 D configuration, as one part of the mechanical testing.

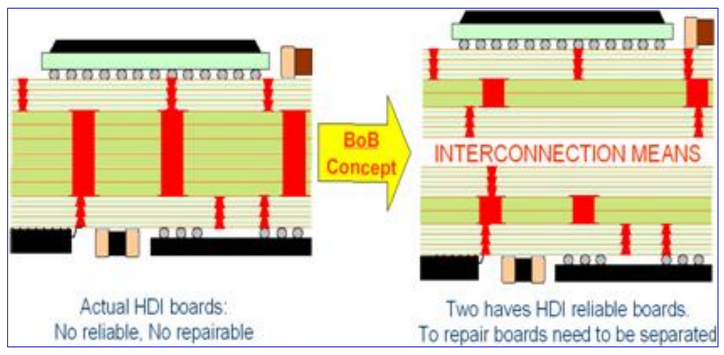


**Fig. 1:** Basic principle of BoB concept

## Resonance frequency investigation

Resonance frequency investigation was done trough the computer simulations in program ANSYS Workbench. Thanks to the computer usage we´ve get an overview about mechanical behavior of the system without spending much time with real testing. The virtual model was done according to the real one and resonant frequencies was determined for the Z axis, where are the largest deformations. Pictures below shows the first mode shape of the virtual assembly (Fig. 2), as well as amplitude frequency graph (Fig.) for such a.

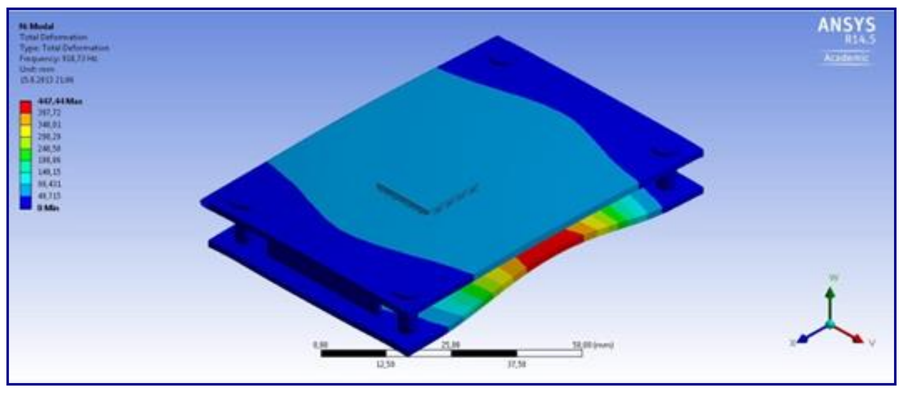


**Fig. 2:** Simulation for resonant frequency and deformation in Z axis

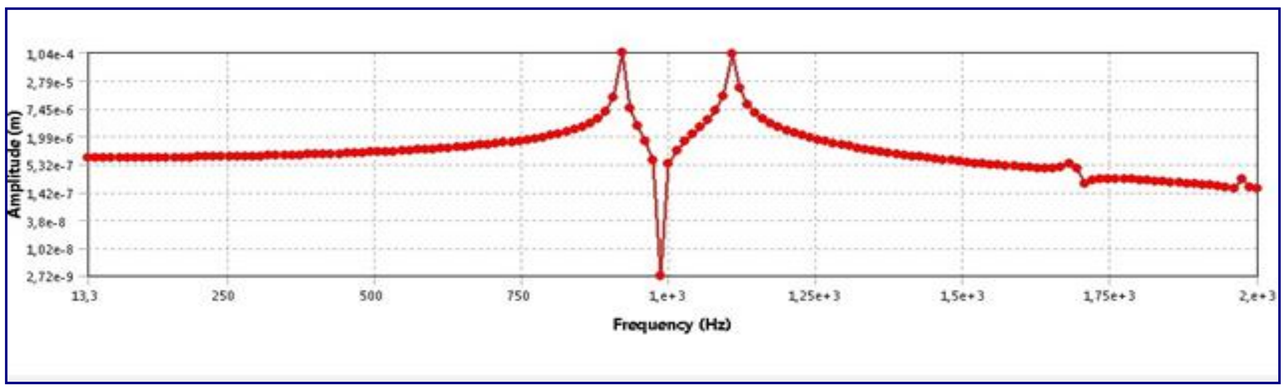


**Fig. 3:** Amplitude frequency graph

## Vibration test definition and performance

Regarding estimated application area for BoB project was decided, in the accordance with MIL-STD-810G, method 514.6, the first approach to proceed the following vibration testing:

- 3 shocks of 40g/11ms by side and face (test before and after test - no damage)
- Random vibrations - 0,1g^2/Hz (14 grms) from 10 to 2000Hz,
  - 60 minutes by axis.
- Sinusoidal vibrations - 5G from 10 to 2000Hz,
  - 60 minutes by axis.

(for both demonstrator continuously under test without degradation)

Otherwise, for general products testing serve the standards IPC-TM-650 (Test Methods Development Packet) and IPC-611 (Generic Performance Specification for Printed Boards).

On the base of main BoB project purpose and regarding to further possible applications were designed various configurations whereas one is shown in Figure 4. This arrangement consists in two PCB´s with the same dimensions in the configuration, where one is attached to other through special pins and interconnected by flexi substrate.

In the first step of BoB project, there will be measured reference cases of FR4 substrates. The example of measurement configuration of one case (plated FR4) for resonant frequency observation is shown on Fig. 5 and Fig. 6 shows measured amplitude frequency graph of this plated FR4.

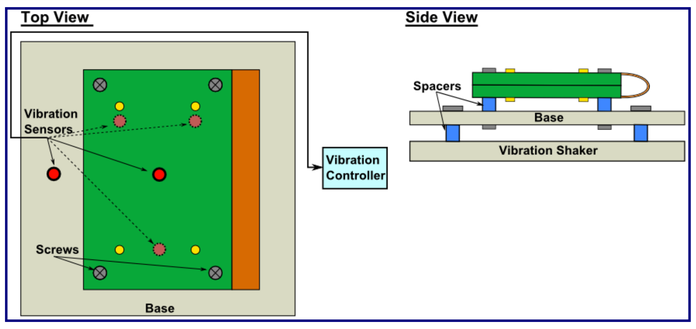


**Fig. 4:** Schematic configuration for measurement

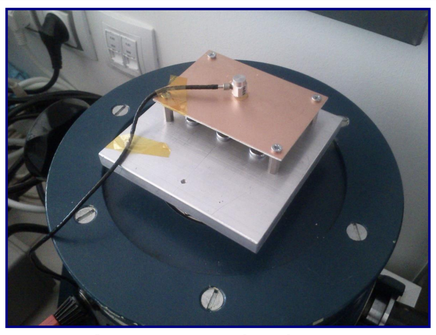

**Fig. 5:** Attached FR4

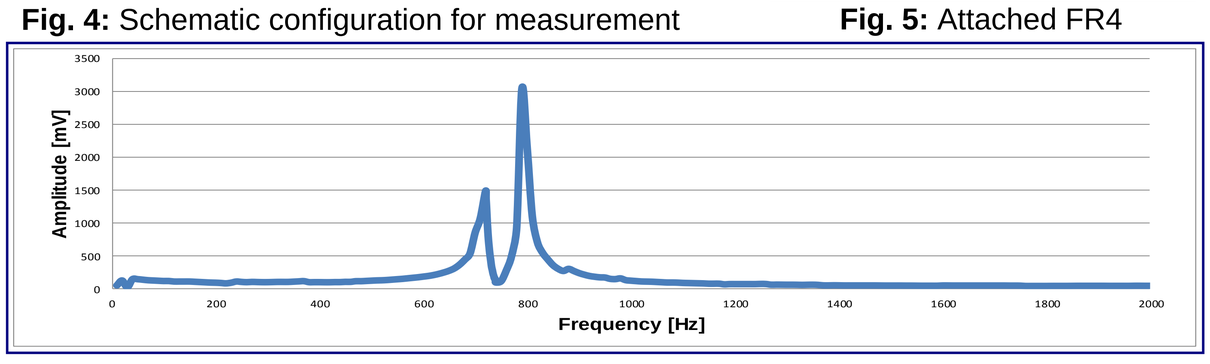


**Fig. 6:** Amplitude frequency graph

## Conclusion

In this paper are shown the first basic steps to realize the vibration testing, which makes inseparable part of reliability verification. In our case the testing is realized for new PCB arrangement known “Board on Board”. Sine vibration test in combination with an FFT Analysis (ANSYS) helps in the first approach to analyze the resonance frequency of the new type of BoB construction. This allows verify resonance dwell at the same time and so ensure that the construction is consistent enough to endure mechanical forces excited by the environmental vibration. This information is helpful for designers into know where are weak points of the structure to take corresponding modifications and improvements.

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