Frequency Response Analysis of a Printed Circuit Board

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Introduction:

During a practical course the students compare the measured frequency response of a assembled PCB with the simulated data out of Comsol. For this the whole PCB with all components are feed in the simulator and afterwards a eigenfrequency-analysis is carried out. To simplify the effort to do this, a app was created.

App:

Use of the app is done in following steps:

- Placing the components
- Select the material
- Calculation of the eigenmodi and eigenfrequencies
- Output of the results

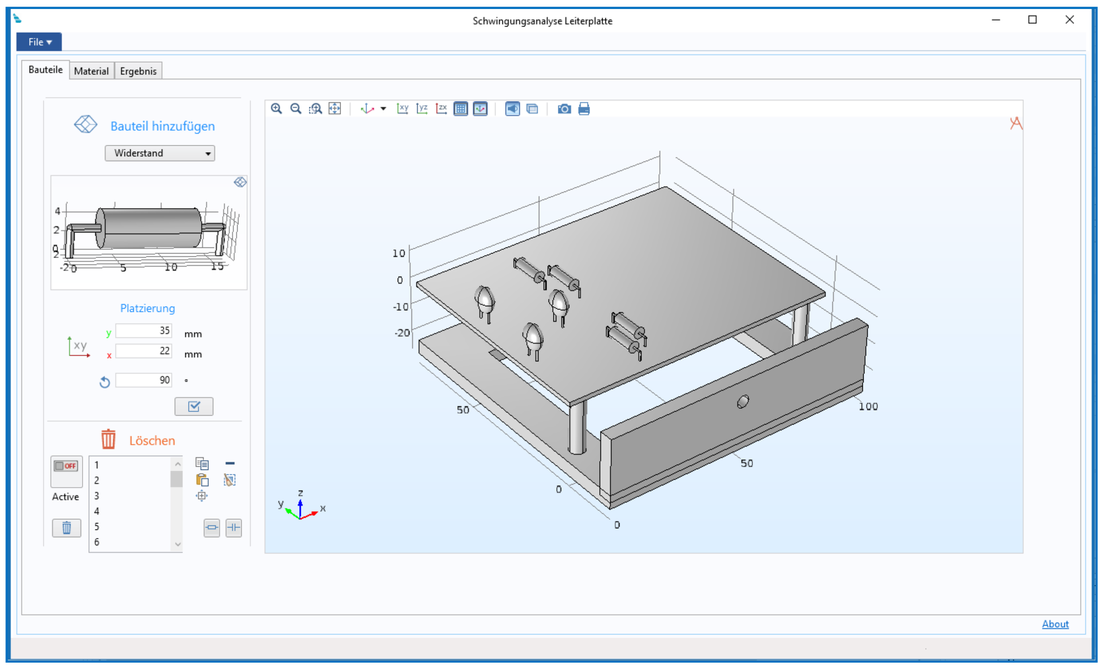

Fig. 1: Screenshot during the component placing

The used electronic components are content of a library. Following components are part of the library:

- Resistor (wired)
- Capacitor
- 14-pin IC
- Acceleration Sensor
- Adjustable Resistor

They can by freely placed and rotated. Furthermore a delete function for wrong placed components are implemented.

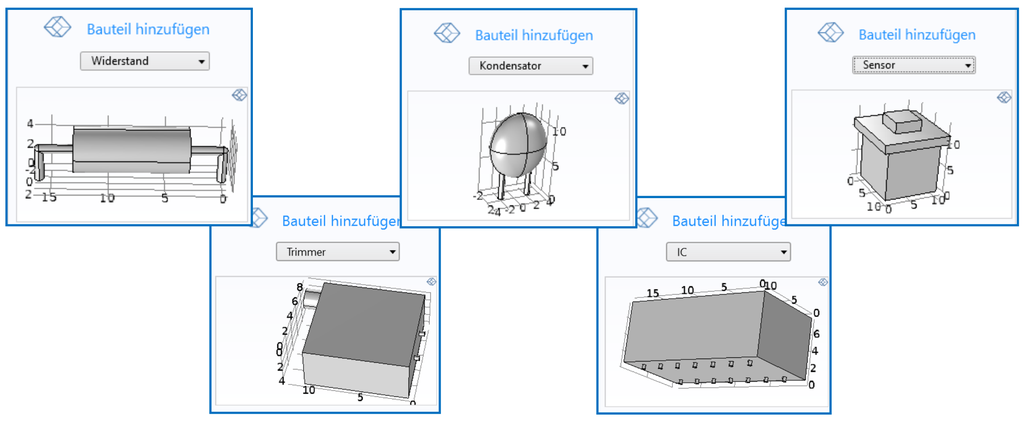

Fig. 2: Content of the component library

Results:

As result the user gets the eigenmodi and frequencies presented, which can be compared with the measured frequency response of the PCB.

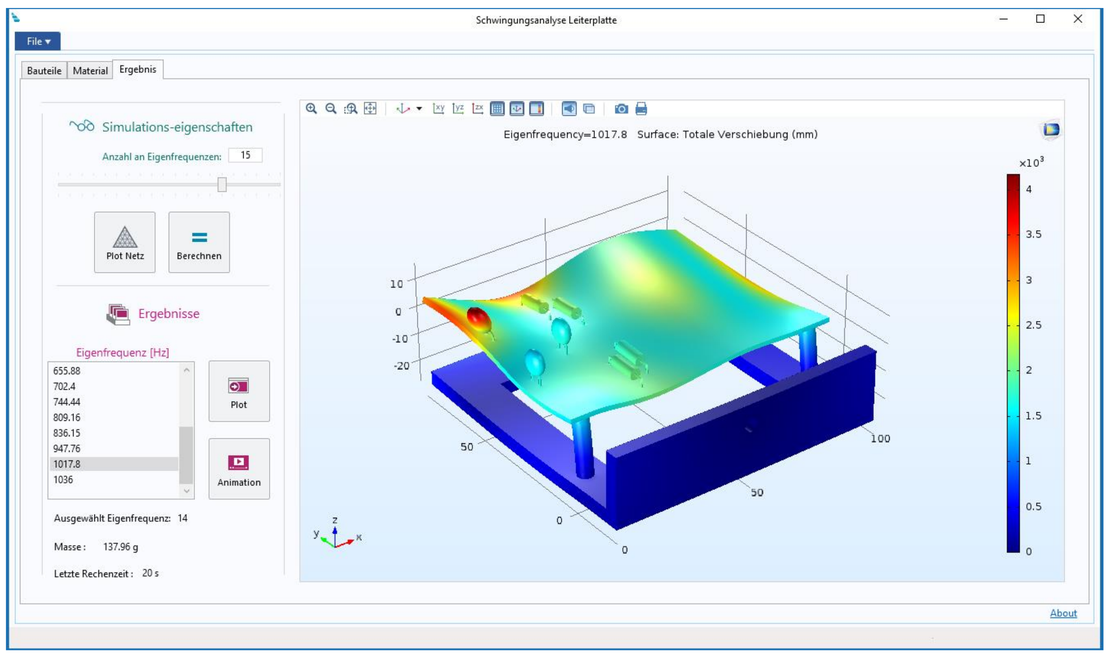

Fig. 3: Screenshot of the result presentation

The measurements are carry out on a shaker, which is drive through the interesting frequency range. The resonance phenomenon are detected by comparing a reference sensor and the acceleration sensor on the PCB.

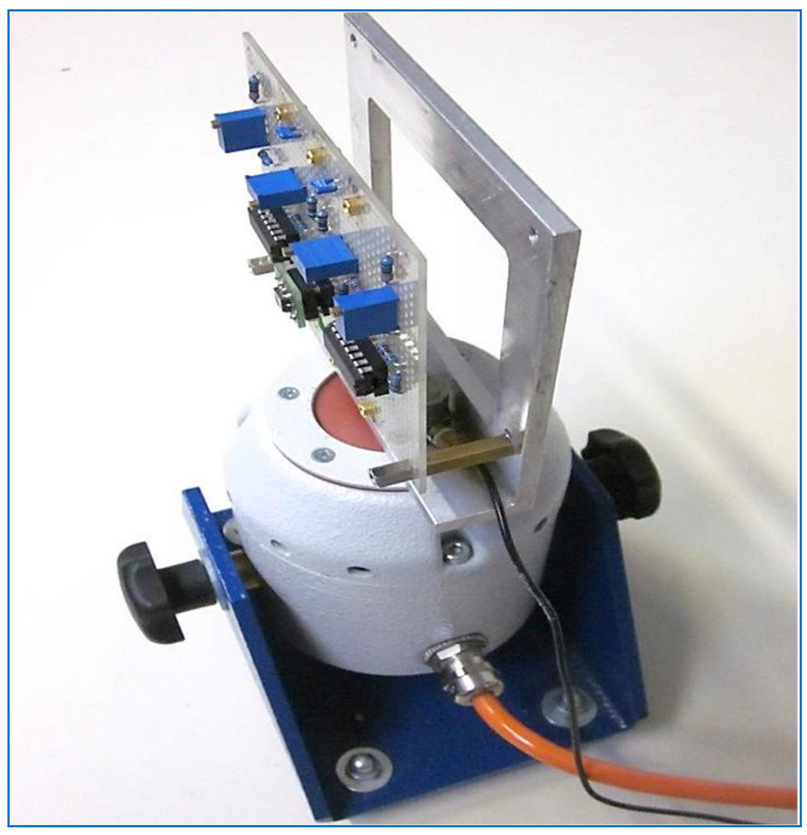

Fig. 4: Frequency response measuring unit

Conclusion:

The presented app shows the efficient use of COMSOL at a students practical course. It simplifies the input and configuration effort, but shows all parts of the work with a FEM-tool.

The app is modular constructed, so that the component library and the input functions can be extended.