

Communication Modules for IoT Applications

Antenna and High-Speed Design using ANSYS Electronics Solutions



Task

In the development of new home appliances the connection to the internet of things (IoT) plays a crucial role for BSH Hausgeräte GmbH in order to bolster its competitive advantage on the market. For this reason versatile and space-saving communication modules are designed which perform reliably in various assembly locations.

The dual-band WLAN antennas are integrated on the PCB. The bandwidth of the impedance matching has to be wide enough in order for the antenna to have an acceptable performance in many locations.

With increasing requirements on the information processing performance the clock and digital data rates are increasing. This has severe implications on the power delivery networks and signal integrity of high speed data buses on the PCB. It is hard to fulfill these requirements using traditional PCB design rules and trying to avoid over-design and long trial-and-error cycles.

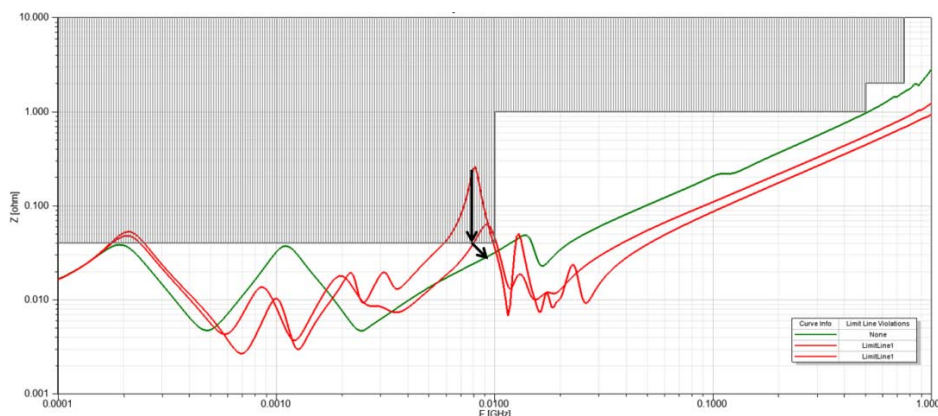


Figure 1: Top – Radiation characteristic of an antenna in an assembly location.
Bottom – The diagram illustrates how simulation helped reduce the number of decoupling capacitors and keeping the impedances of the power delivery network below a given limit.

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Solution

Using ANSYS HFSS and ANSYS optiSLang the influence of various geometry parameters on the antenna performance can be assessed. This allows optimization of the resonance frequencies, the bandwidths and the antenna gain and furthermore understanding the influence of manufacturing tolerances and varying assembly locations.

New layout concepts are investigated with ANSYS SIwave, especially the arrangement of the power and ground layers and the placement of decoupling capacitors are optimized. In this way capacitors are saved and new design rules are established. The signal integrity analysis using ANSYS SIwave shows saving potentials for termination resistors and assists the optimization of critical high-speed signal lines.

Crucial for an efficient analysis of PCB layouts is a streamlined EDA workflow from Mentor Expedition as layout tool to the ANSYS electronics tools, where apart from the geometry also part information is transferred to the analysis tool.

Customer Benefit

BSH Hausgeräte GmbH is driving innovation for the smart home even faster with the help of simulation using ANSYS electronics tools. New concepts are proven on virtual prototypes. The ANSYS electronics tools help the engineers to understand and quantify physical quantities and correlations which are very hard to measure on a real prototype. Examples are resonant structures on a PCB which interact with the integrated antennas or impedances of the power delivery network at pins in a large ball grid array.

Simulation enables a fast and targeted hardware development which avoids unnecessary and long trial-and-error cycles. Furthermore, simulation leads to a better design know-how, supports a proof of concept and helps establishing new design rules to accelerate the development process.

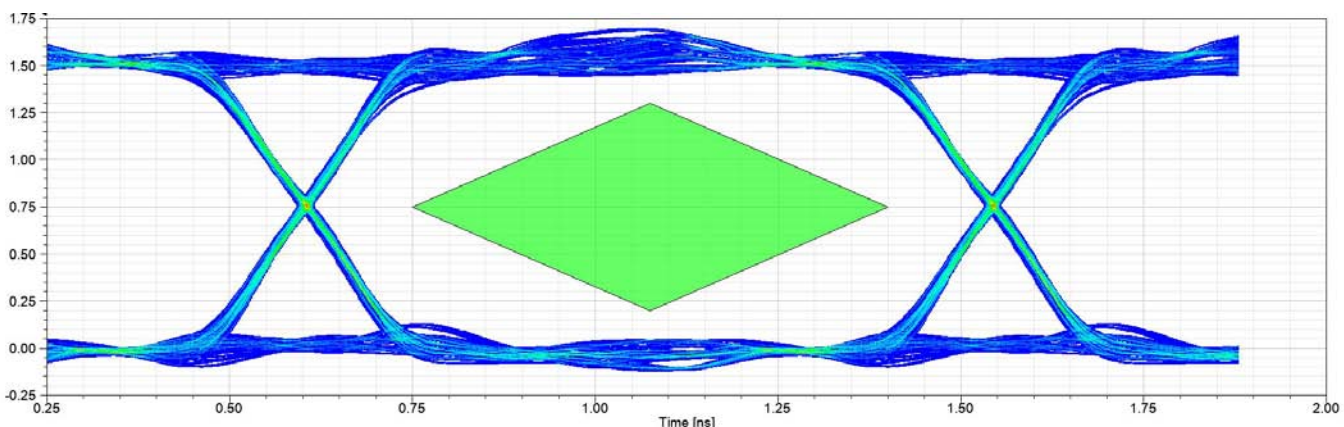


Figure 2: The eye diagram allows to assess the signal integrity.

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