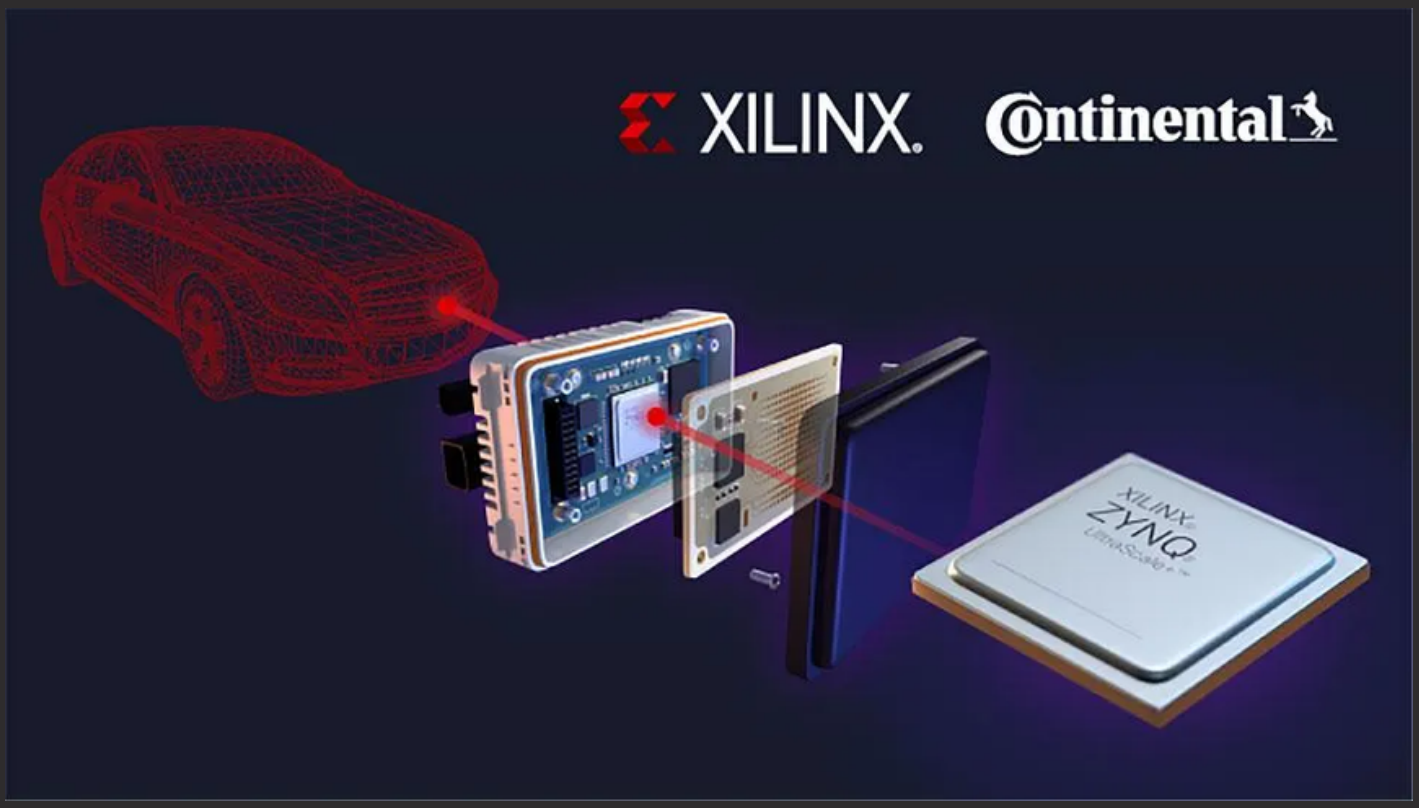
Autonomous Mobility, Continental Automotive Romania

Using OptiSLang to Determine PCB Effective Material Properties



Pic. 1: Zynq UltraScale+ MPSoC Powers Continental ARS540 4D Radar System

Description

High-performance computers for assisted and automated driving perform tasks required for perception, human vision, driving, and parking functions. Self-driving vehicle systems include some of the world's highest-performance electronic components.

The insertion of new, cutting-edge technology in the automotive industry increases the demands for virtual prototyping and reliability prediction to yield high quality and high-reliability products and systems.

Testimonial written by Iulia-Eliza Tinca

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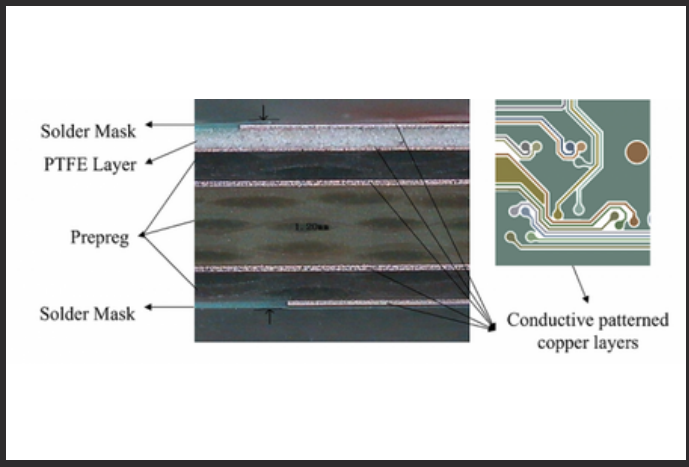
Solution

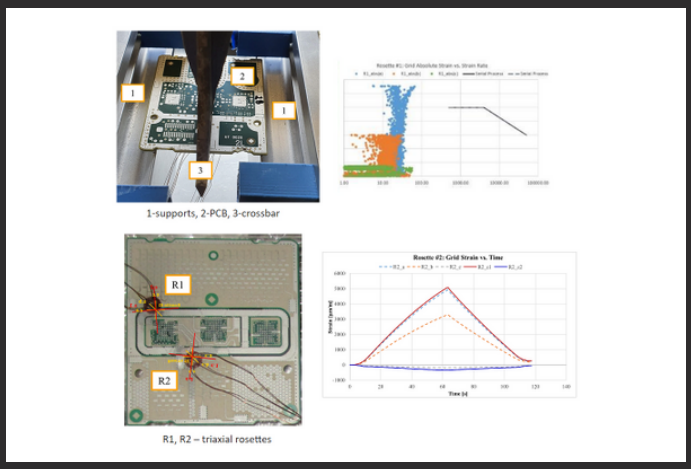
Each of these sophisticated sensors is an electronic device containing one or multiple Printed Circuit Boards (PCBs). A PCB is a multilayered assembly of patterned conductive copper traces between insulating sheets of resin-impregnated fiberglass fabric. From a mechanical point of view, the PCB is a nonhomogenous, anisotropic, viscoplastic material.
In the product development stages, the simulation engineers create the virtual prototype of the product. We combine finite element analysis, FEA, with life prediction methodologies to determine the products' robustness and reliability. However, for accurate assessments, we must input accurate material parameters. Modeling the PCBs' complex structure and behavior increases unreasonably the simulation task's cost, so we must look for simplfied alternatives. Current industry practices and literature guidelines advocate the assumption of a homogenous, orthotropic, or isotropic, linear-elastic material of the PCB.

Benefits

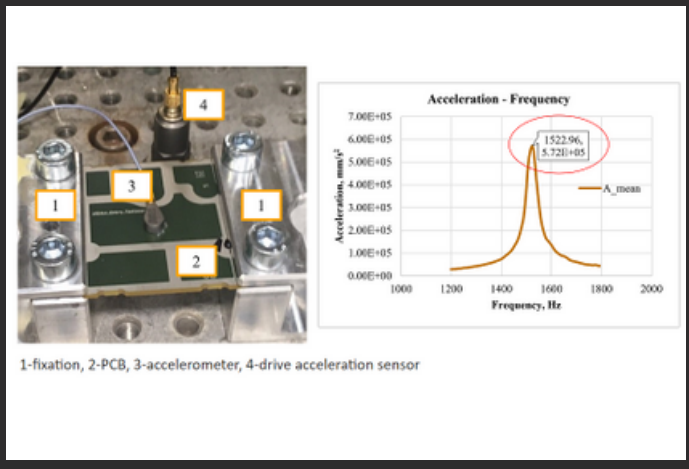
With relatively low-cost measurements and basic mechanical simulations, we are thus able to characterize the PCB material.



Pic. 2: Cross-section view of the layers in a PCB and an example of copper traces detail view



Pic. 3: Experimental setup and measurements, static



Pic. 4: Experimental setup and measurements, dynamic

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We aim to calibrate experimental frequency, acceleration, and strain measurements to an orthotropic material law.
We performed 3-point bending tests for strain and stiffness measurement and a harmonic vibration test for frequency and acceleration measurement.

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