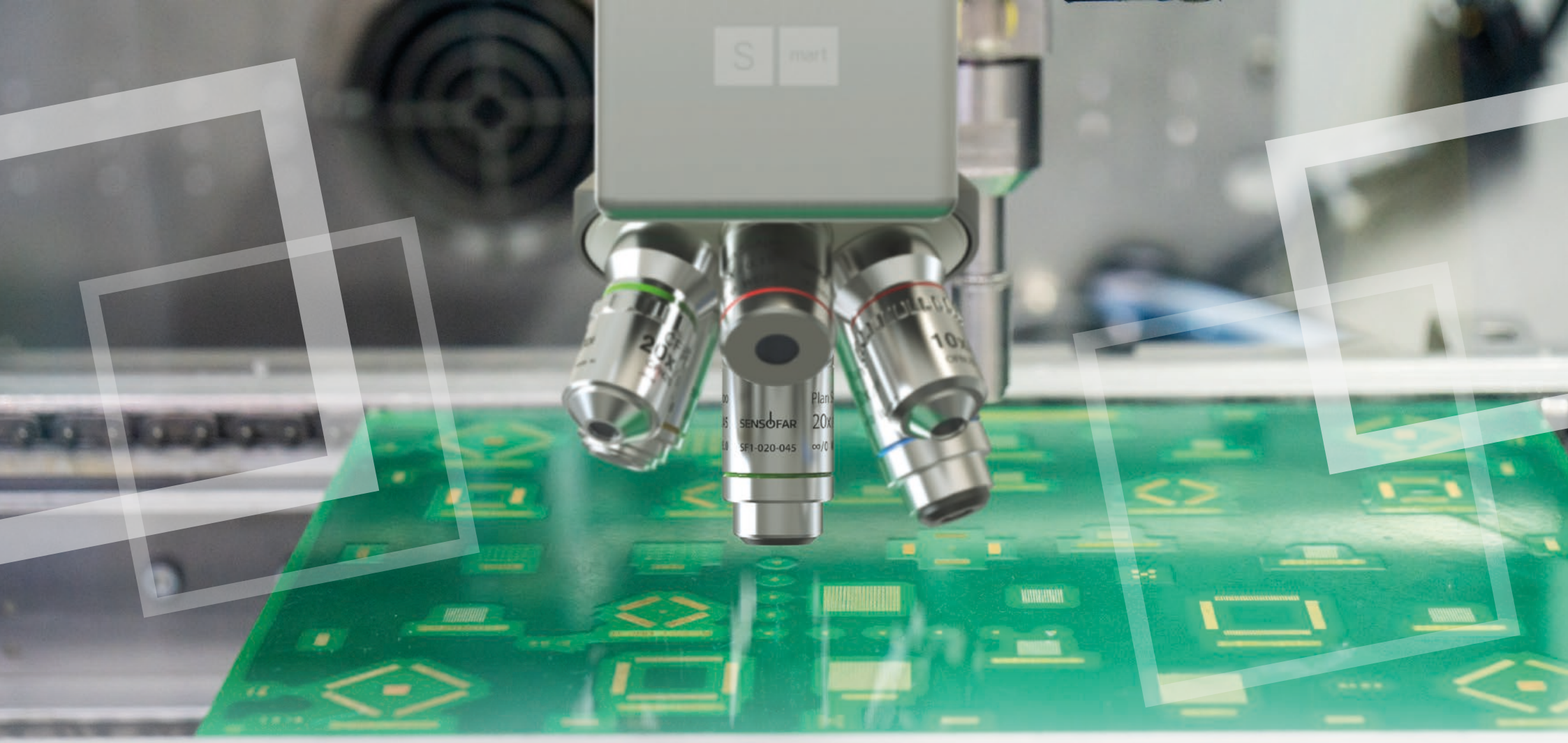


PCB characterization

Enhancing PCB Quality Control with Sensofar's 3D Metrology Solutions

SENSOFAR

PHOTOLITHOGRAPHY (IMAGING PROCESS)

PCB manufacturers typically employ a photolithography or plating process to produce the inner circuit of an IC substrate. In the photolithography process, a layer of photoresist is selectively deposited on top of copper foil, which is then exposed to UV light using a mask. The areas of the photoresist that were not exposed to UV light are removed during the development process, after which the exposed copper is either removed (photolithography process) or deposited (plating process), depending on the specific method.

This method is essential for accurately ensuring that the PCB matches the schematic blueprints. Before proceeding to the next step, an examiner carefully checks the inner circuit traces, alignment features, and circular pads to ensure everything is in order.

PHOTOLITHOGRAPHY

Imaging through the resin: monitoring etching and plating processes

Right after the deposition of copper in the plating process or the copper removal after the etching, it is essential for the manufacturers to assess the height and width of the resulting copper traces. This applies to PCBs and IC substrates, but Sensofar has focused on measuring the latter.

By measuring at this stage, manufacturers gain the flexibility to monitor the copper deposition or removal, depending on whether it is plating or etching, at any given time. This flexibility is highly beneficial because, at this point, the developed resin has not been removed yet, allowing them to continue with the etching or plating until achieving the desired outcome.

Traditionally, one Integrated Circuit (IC) substrate had to be cut from each panel to evaluate the produced circuit tracks. This waste can be avoided using a non-contact profilometer that enables imaging of the copper through the resin without causing any damage.

Interferometry or **Confocal** technologies within the **S neox system** can measure through optically transparent films, like photoresist resins.

Interferometry technology works best with PP photoresist material, while Confocal technology is better suited for dry films. The reason of that lies in the thickness typically deposited for each photoresist: dry film layers range from a few microns to tens of microns. In contrast, PP photoresist thickness often comprehends from tenths of microns to several mm.

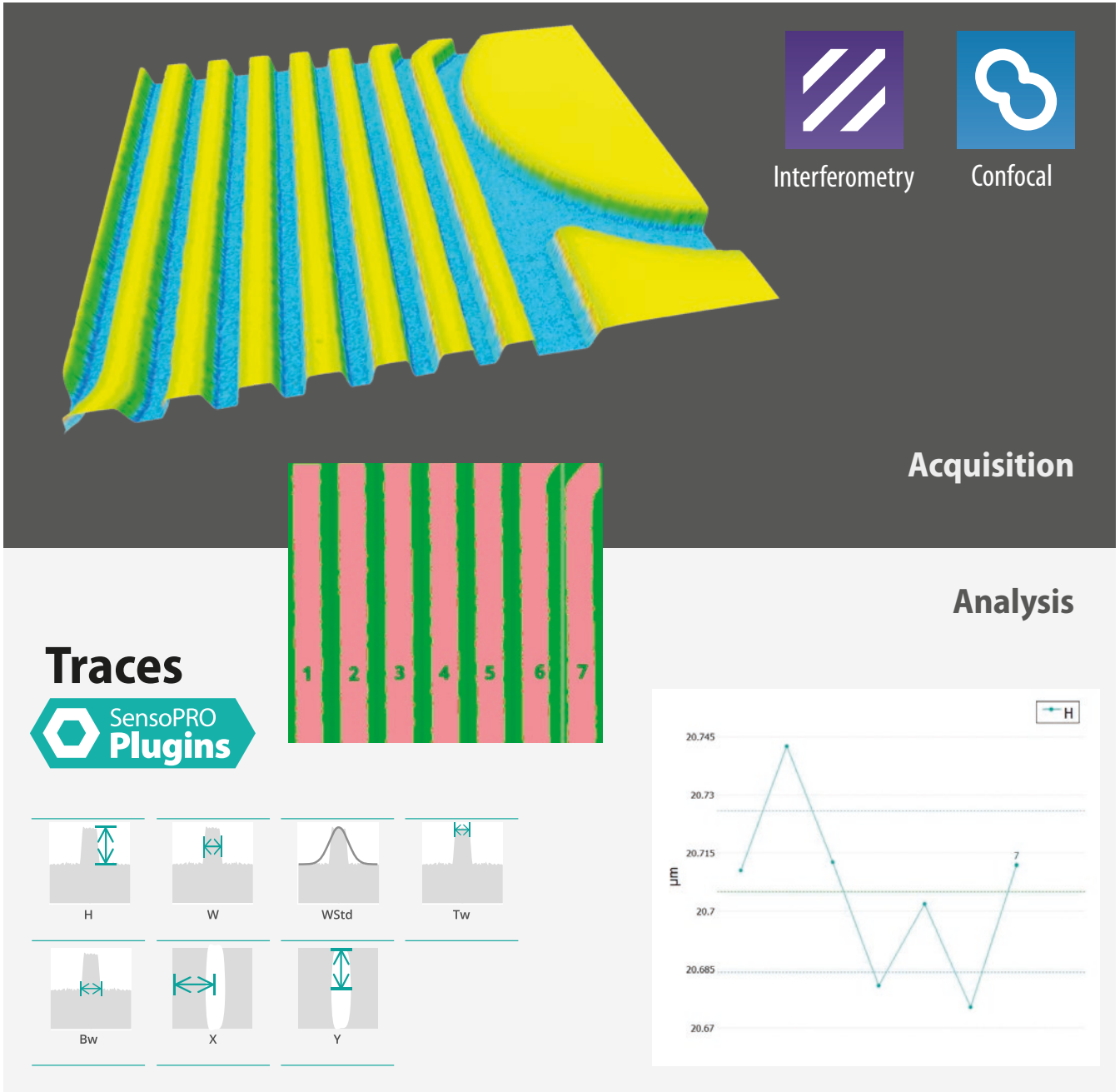
But that is not all. In this step of the process, where only half of the resin is developed, some areas of the copper are covered, while others are left uncovered. The uncovered area is where the copper has been deposited/removed.

Standard thickness algorithms can be confusing because they only image the covered areas of the topography, leaving out the data from the exposed copper. Both Sensofar's Interferometry and Confocal have a unique option to englobe the exposed and the unexposed regions, allowing us to characterize the height of the copper trace and achieve a better yield during the manufacturing process.

An interesting aspect to note is that resin suppliers also make use of optical profilometry to characterize the thickness of the resin to quantify it after the first development.

In terms of analysis, SensoPRO is a very powerful tool that provides rapid quality control software with plug-in-based data analysis algorithms that offer a high degree of flexibility and specificity.

SensoPRO's Traces plugin is designed to automatically detect traces and calculate parameters such as the height, width, and distance of the inner circuit tracks.

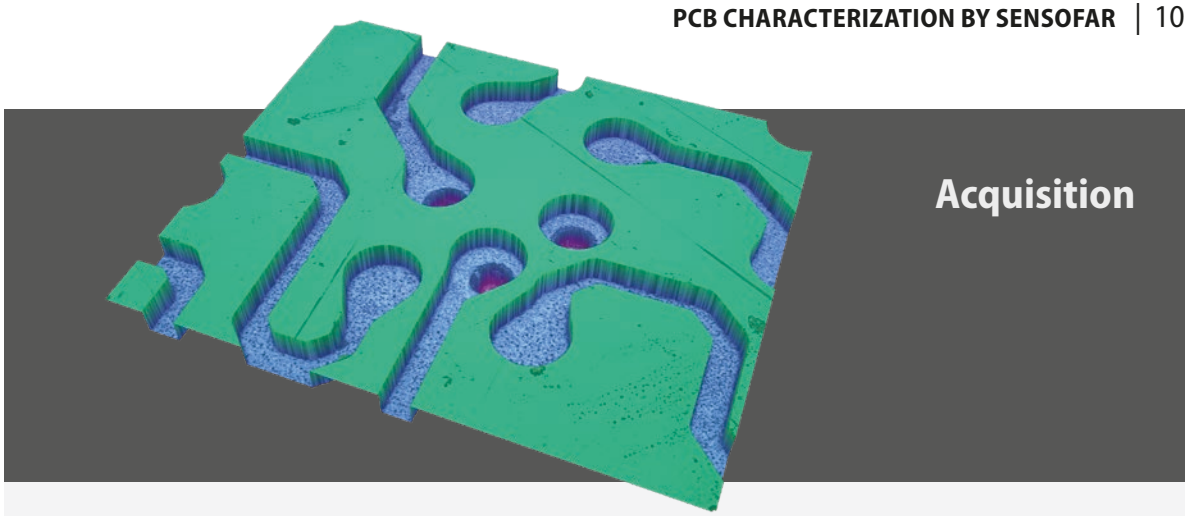


PHOTOLITHOGRAPHY

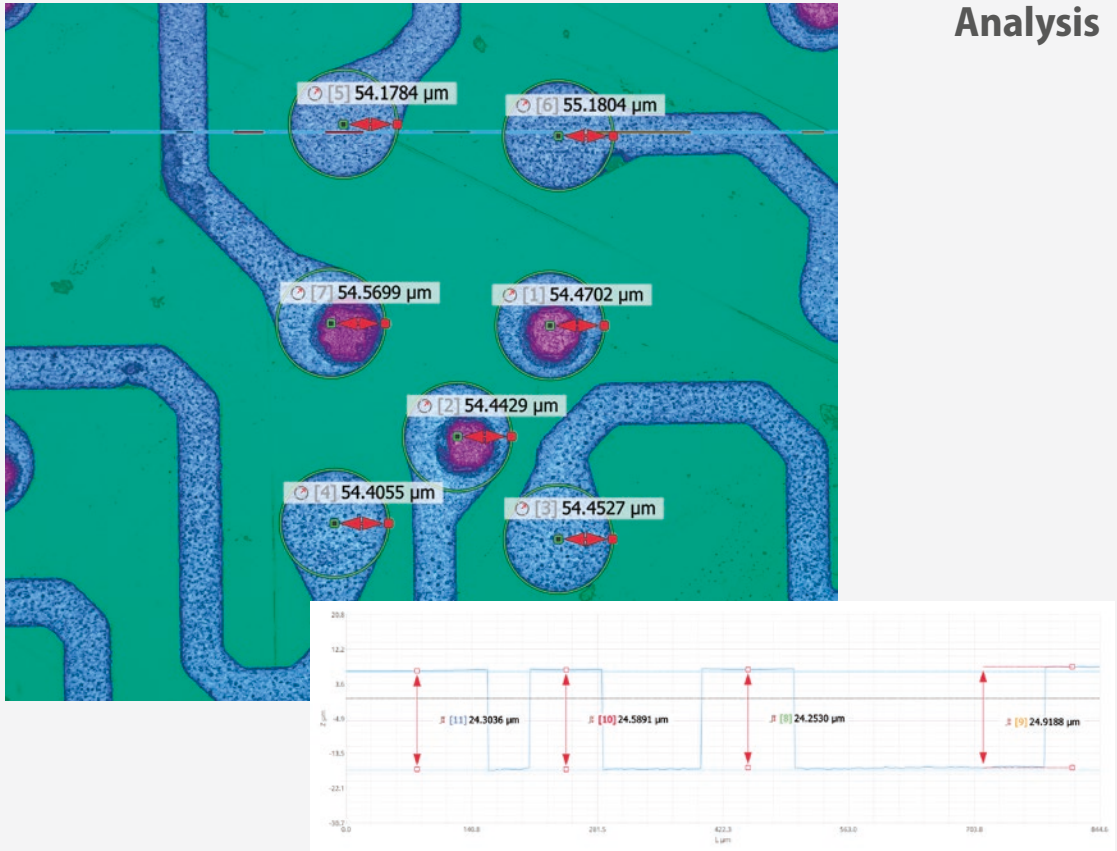
Final verification after resin removal

Removing the resin during the PCB manufacturing process can have potential risks and impacts on the copper. On one side, the resin stripping must be carefully controlled because it can affect the integrity and quality of the copper traces. On the other side, it must be carried out effectively to avoid residues or contaminants from the photoresist material remaining on the copper surface. These residues can affect the adhesion of subsequent layers, cause electrical issues, or lead to reliability problems in the finished PCB.

The circuit is then optically imaged again to verify that everything is in order. The width of the traces, the radii of the pads, or the depth of them all are measured with **SensoVIEW**, a software that comes with all Sensofar profilers, provides a suite of tools for roughness and dimensional characterization. Its assist tools for dimensional characterization allow for a quick and versatile check into the contour (2D image) and the profile (1D).



Acquisition



Analysis

SENSOFAR

METROLOGY

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