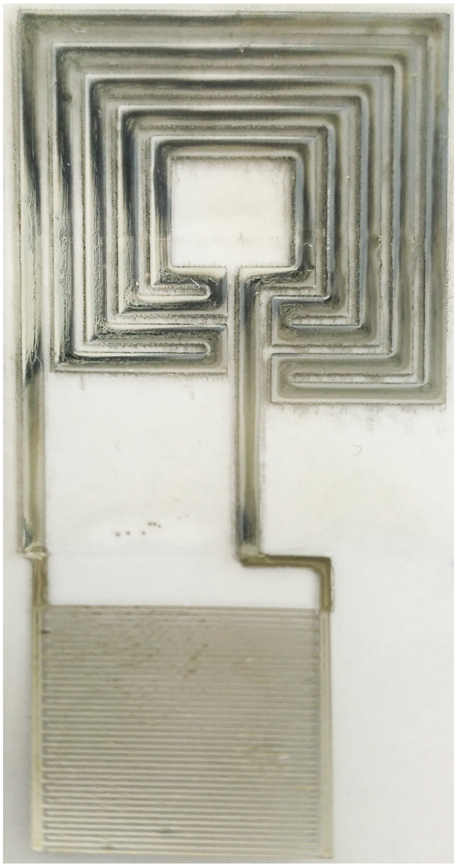
Verifying a mould's dimensions for a RF tag printed by inkjet



When using functional inks with inkjet technologies to create microelectronic devices, there's a need to verify any differences between the desired design and what's actually printed; the height and shape of the printed layers is integral to optimal device configuration and functionality.

Figure [1] *Antenna mould.*

The Barcelona Microelectronics Institute (IMB) is the National Microelectronics Centre (CNM)'s Barcelona location and a member of the Spanish Research Council. IMB-CNM focuses on basic and applied research and development, in addition to education and training in micro and nanotechnologies, components and systems. Our mission is to expand the knowledge available in this field and to contribute to the implementation of solutions and new products based in these technologies in order to resolve the challenges faced by society today. Project currently being undertaken by Mr. Roger Escudé.

Measurements

The antenna's mould has 4 tracks that create 5 valleys that are filled with silver ink. Each mould track is 600 µm wide and 15 µm high.

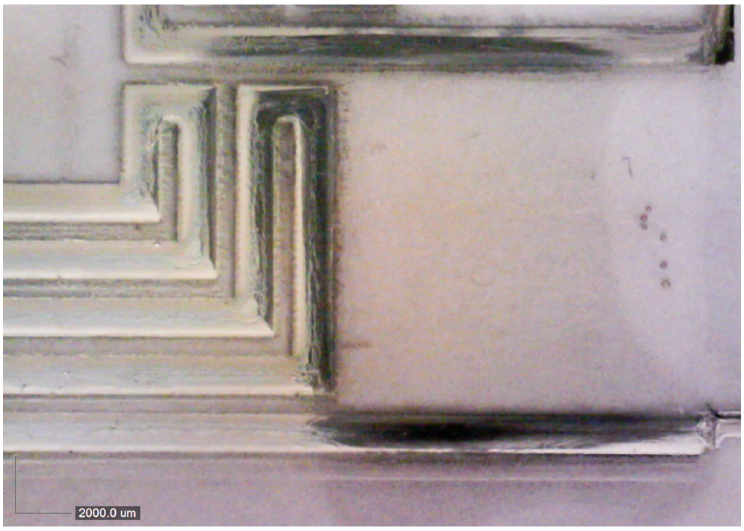


Figure [2] *Detail of the antenna mould filled silver ink to build up the antenna.*

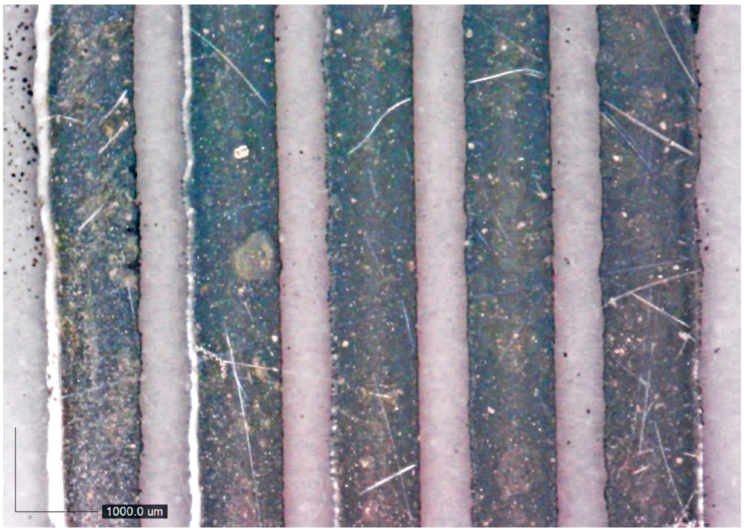


Figure [3] *Detail of the mould and antenna tracks.*

The device's purpose is measuring e-coli bacteria on a hand-paper dispenser where the tag is printed on the paper. The antenna is connected to an interdigitated capacitor that behaves like a bacterial sensor, when there are changes the capacitor's value affects the antenna resonance's frequency; these variables are easy to measure with a RF transceiver.

Currently, these kinds of devices tend to use contact profilometers that provide measures that aren't as precise as we need them to be.

With Sensofar's 3D optical profiler we are able to check the mould height and calculate if there will be a sufficient layer of silver bulk to achieve the desired conductivity for good performance.

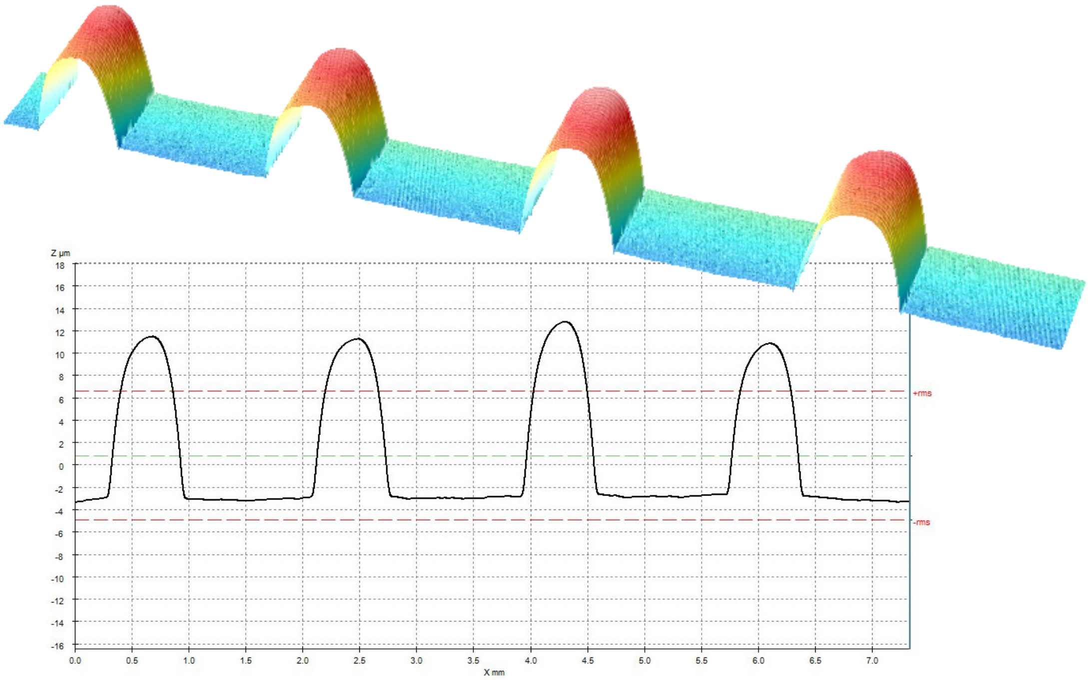


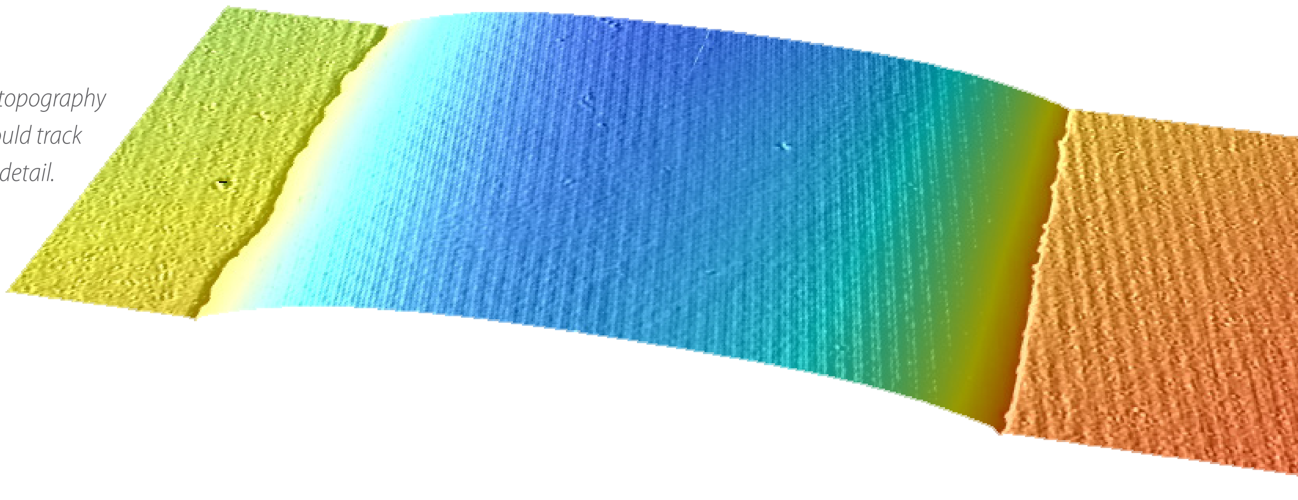
Figure [4] (a) *3D topoghraphy of the antenna's mould printed on PEN substrate.*
(b) *Profile of the antenna's mould.*

Conclusions

By verifying with a Sensofar Plµ neox using the confocal technique with a 20X brightfield objective that the RF antenna's shape was as desired and possessed an adequate silver layer, good conductivity was ensured.

The Sensofar equipment provided non-contact 3D surface profilers based on three technologies: Confocal, Interferometry and Focus Variation techniques and allowed us to obtain high-resolution measurements in a fast and non-destructive way, with user-friendly software for technical support.

Figure [6] *3D topography showing mould track detail.*



SENSOFAR is a leading-edge technology company that has the highest quality standards within the field of surface metrology.

Sensofar Metrology provides high-accuracy optical profilers based on confocal, interferometry and focus variation techniques, from standard setups for R&D and quality inspection laboratories to complete non-contact metrology solutions for in-line production processes. Sensofar Metrology offers technology that enables our customers to achieve real breakthroughs, particularly in semiconductor, precision optics, data storage, display devices, thick and thin film and materials testing technology fields.

The Sensofar Group has its headquarters in Barcelona, also known as Spain's technological heart. The Group is represented in over 30 countries through a global network of partners and has its own offices in Asia.

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