# Finite element analysis regarding the propagation of transient vibrations from handheld equipment

The sample measured is a replica of the skin on a fingertip. In this case, the difficulty of holding one's finger absolutely still during the measurement necessitates using the indirect method of measuring on replicas. The objective was to obtain information for simulation of microgeometry of skin to be able to create a simplified virtual model. The model was going to be used in finite element analysis (FEA) regarding the propagation of transient vibrations from handheld equipment, such as impact wrenches and chisel machines, through the skin to the nerves where damage occurs. These vibrations can cause a medical condition called "white fingers" which is a common work-related health problem.

Before this government-sponsored project, the microgeometry of skin had not yet been characterized for this specific purpose. This project's main objective was getting detailed information regarding skin's microgeometry over a large enough area to be able to draw general conclusions for use in further investigations.
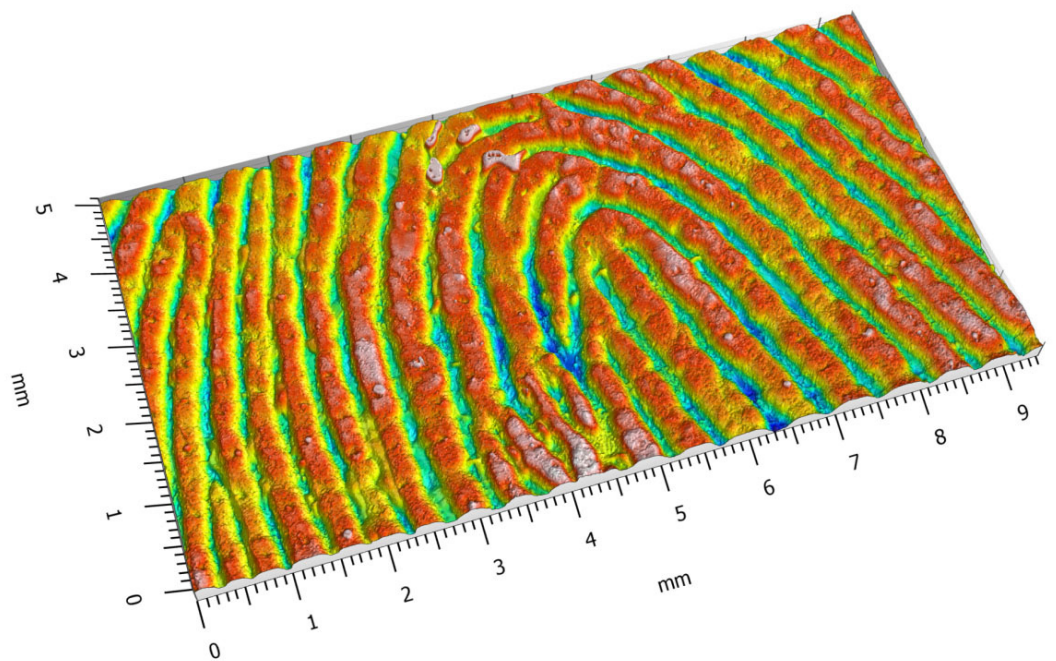
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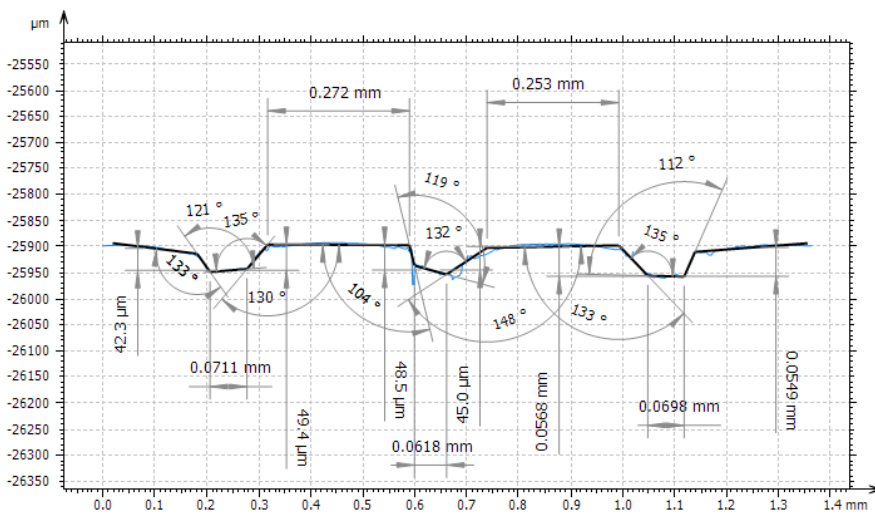
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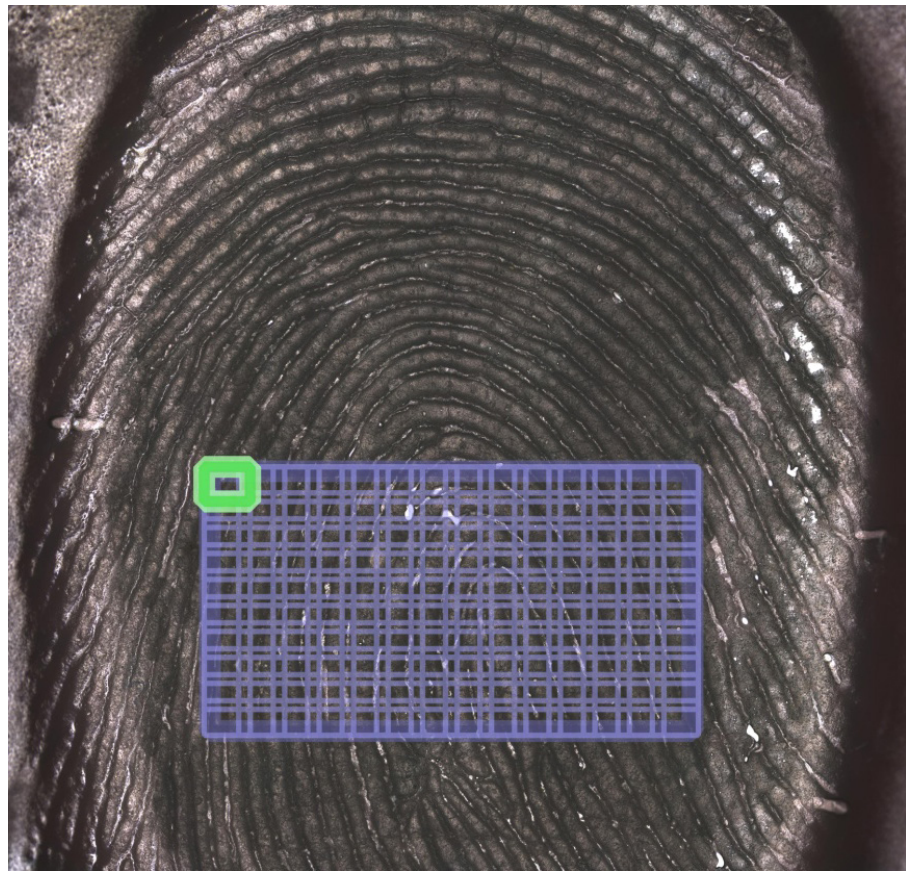
■ Measurements

Overview of skin with the measurement area depicted inside the rectangular blue grid.

CASE STUDY FINITE ELEMENT ANALYSIS REGARDING THE PROPAGATION OF TRANSIENT VIBRATIONS
FROM HANDHELD EQUIPMENT

5x9 mm Extended measurement.

Example of an evaluation of the sample's geometry using SensoMAP advanced contour module.

■ Conclusions

Using the confocal technique, the 20X brightfield objective lens, and extended measurements, we were able to measure the skin geometry with a high enough resolution and sufficient reliability to draw general conclusions regarding the size, height, and distribution of the ridges and lines of the skin. With this data, we were able to make a simplified model of the skin for successful use in FEA.

For more information, check the Attenuation of hand-held machine vibrations. Application of non-linear tuned vibration absorber.

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