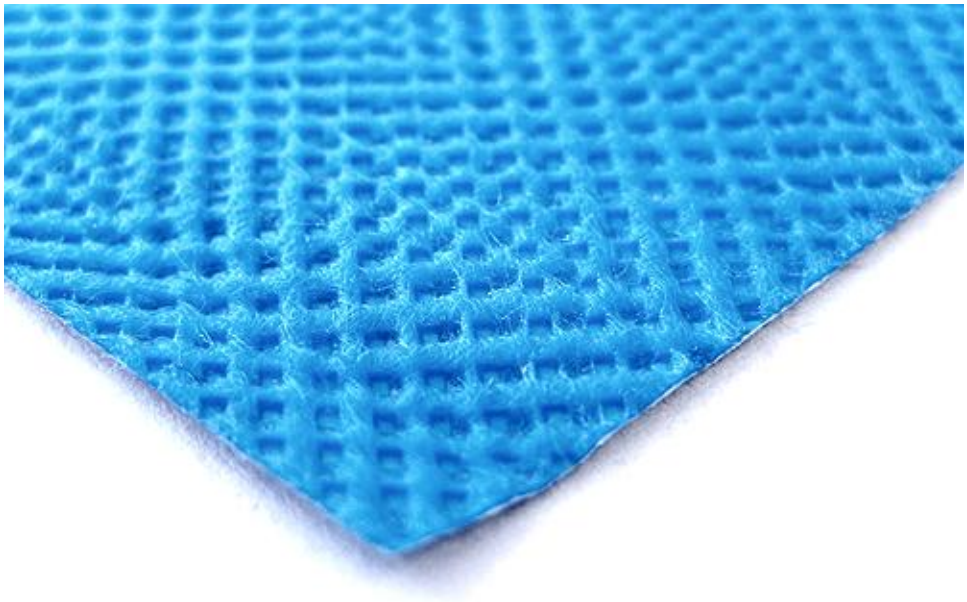
NANOVEA®
A Better Measure.

Surface Measurement of Nonwoven With 3D Metrology



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INTRO:

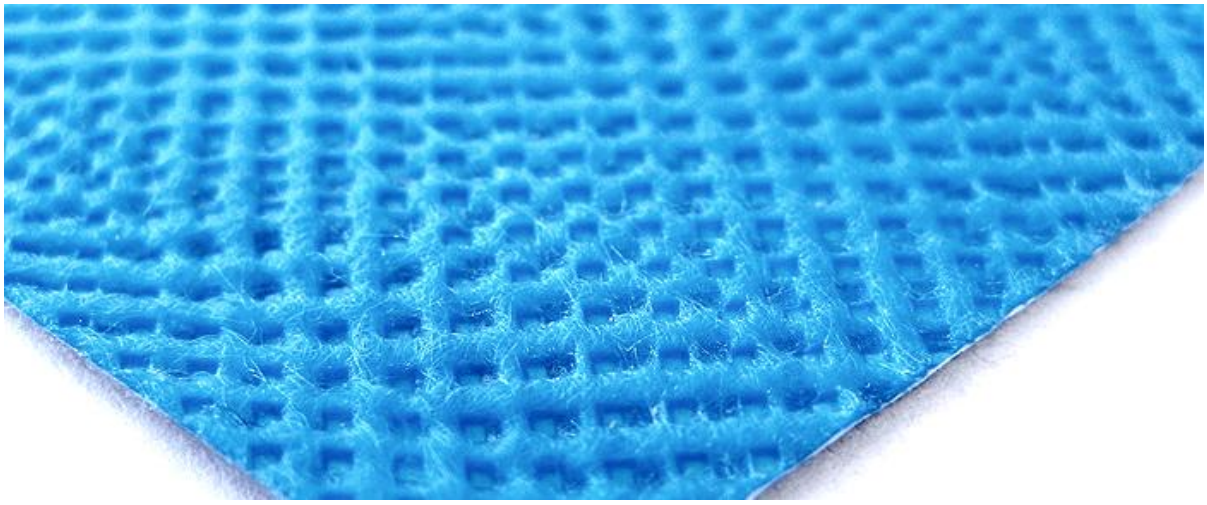
Nonwoven material is fabric like but made from long fibers bonded into sheets or web-like structures by entangling fiber or filaments through a mechanical, thermal or chemical process; unlike textiles that are woven or knitted. Nonwovens are most commonly produced as flat, textured and or porous sheets made from separate fibers, molten plastic or plastic film. The formula of fabrics and materials used to create Nonwoven materials are engineered for a range of intended purposes including biodegradability, single-use or durability while their surfaces are engineered for specific functions.

IMPORTANCE OF SURFACE MEASUREMENT INSPECTION FOR QUALITY CONTROL

The intended surface function of Nonwoven material (absorbency, repellency, resiliency, softness, strength, washability, filtering etc) require controlled surface characteristics such as roughness, texture and or dimensional consistency. As a result, accurate surface measurement and characterization are critical to the quality control of a Nonwoven material for their intended use.

MEASUREMENT OBJECTIVE

In this application, the Nanovea ST400 is used to measure the surface of the Nonwoven material shown below. The Nanovea ST400 provides superior non-contact measurement and zero influence to surface reflectivity making it an ideal instrument for nanometer measurement of Nonwoven surfaces.

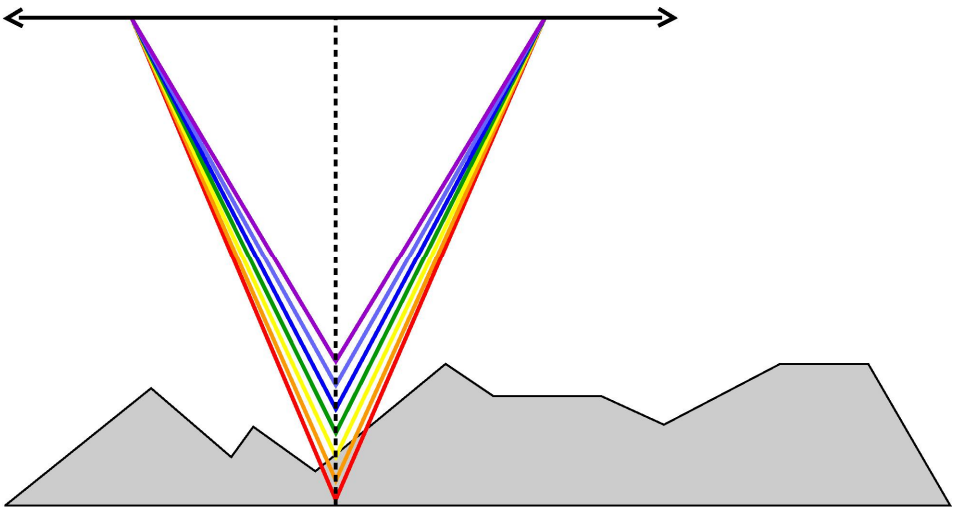


MEASUREMENT SET-UP & TIPS:

In this particular application, we have used a 3.5mm optical pen to obtain nanometer resolution during measurement of a Nonwoven surface. We have used a spatial resolution of 5microns, which will be suitable to provide details of the nonwoven surface.

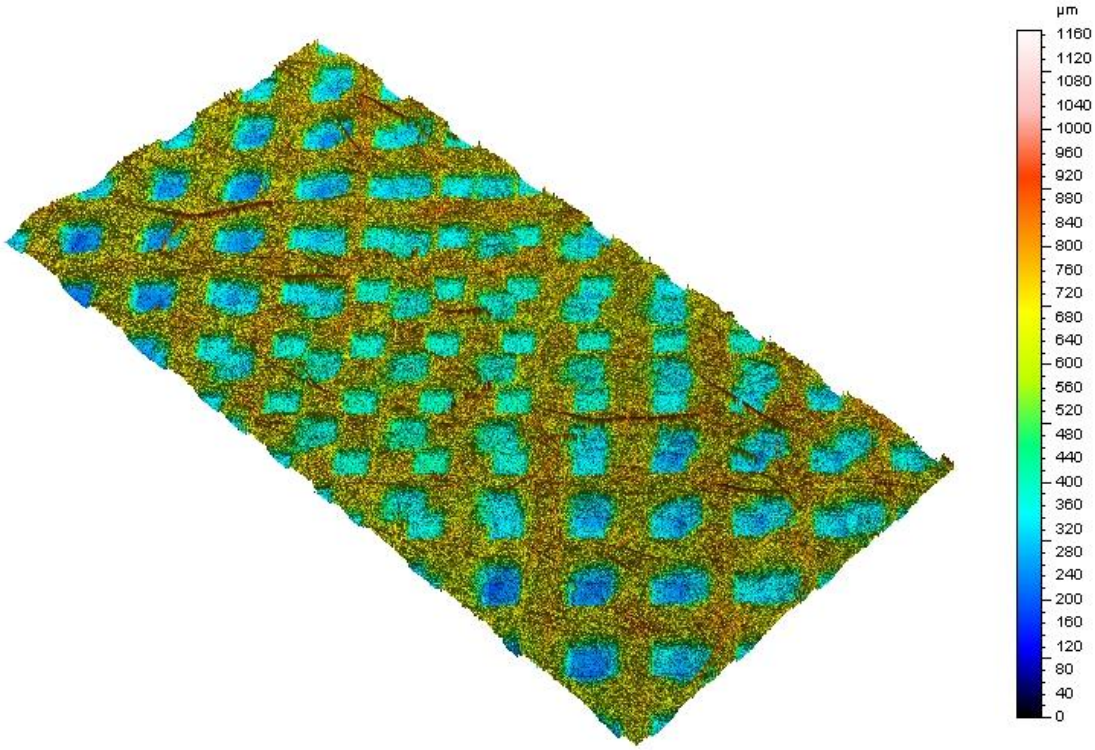
MEASUREMENT PRINCIPLE:

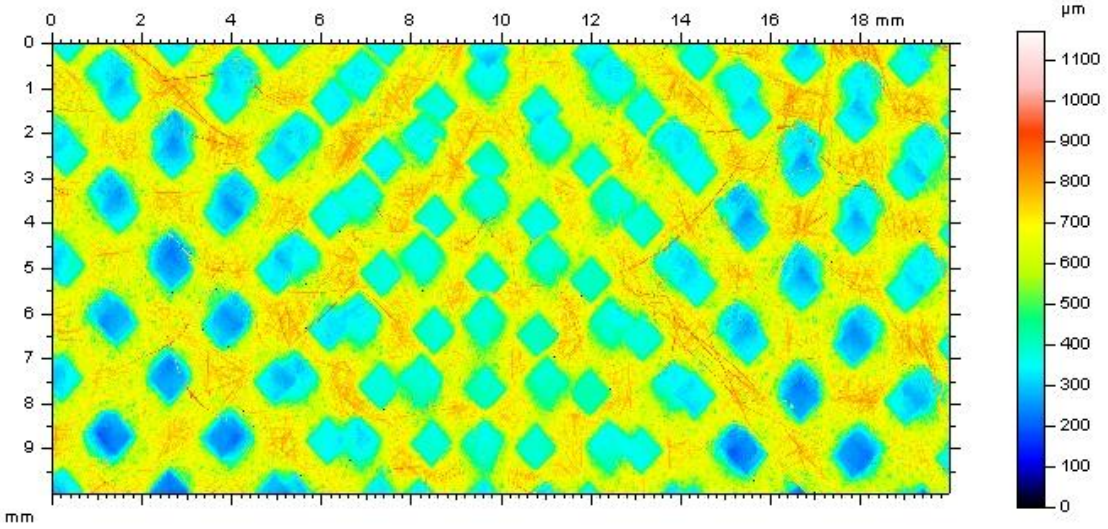
The axial chromatism technique uses a white light source, where light passes through an objective lens with a high degree of chromatic aberration. The refractive index of the objective lens will vary in relation to the wavelength of the light. In effect, each separate wavelength of the incident white light will re-focus at a different distance from the lens (different height). When the measured sample is within the range of possible heights, a single monochromatic point will be focalized to form the image. Due to the confocal configuration of the system, only the focused wavelength will pass through the spatial filter with high efficiency, thus causing all other wavelengths to be out of focus.



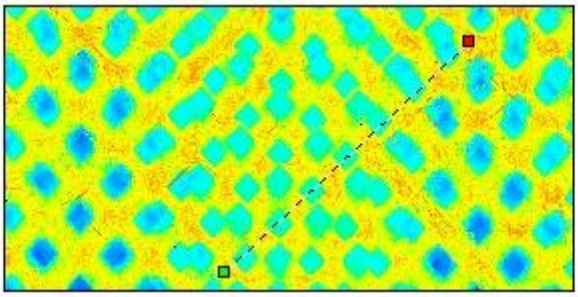
The spectral analysis is done using a diffraction grating. This technique deviates each wavelength at a different position, intercepting a line of CCD, which in turn indicates the position of the maximum intensity and allows direct correspondence to the Z height position.

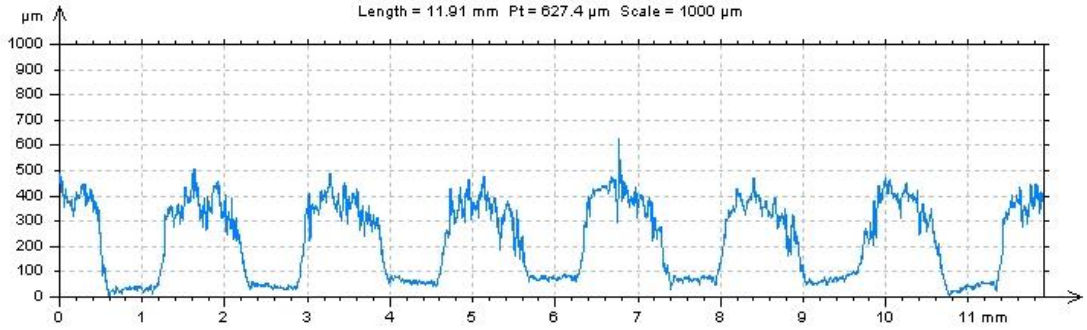
3D Image of Nonwoven Surface

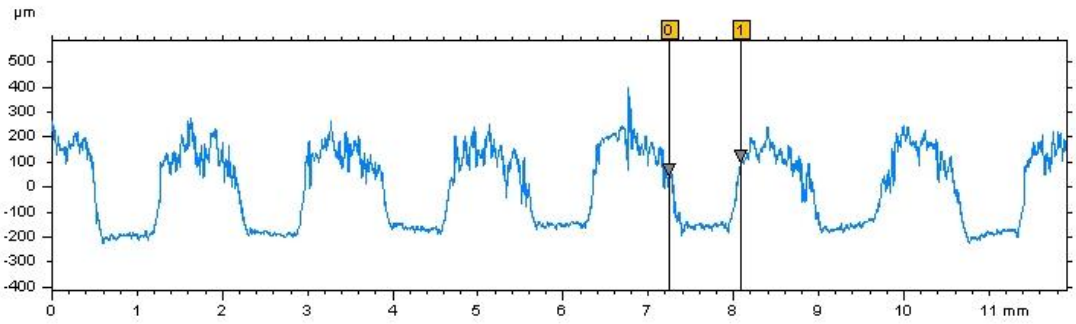




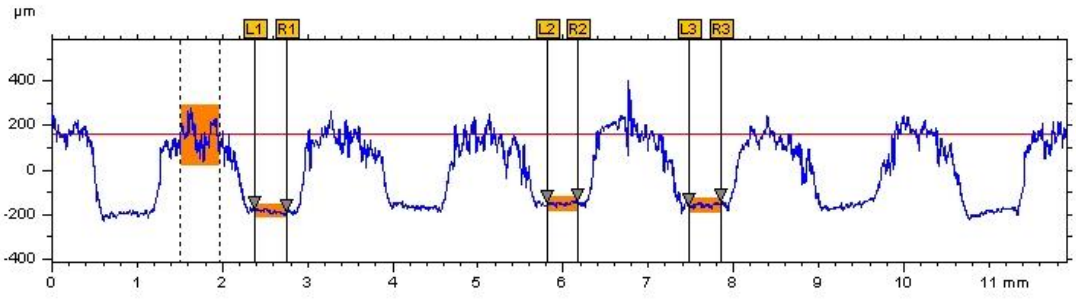
2D Cross Section







	0-1
Horizontal distance	0.8354 mm
Height difference	51.27 µm



	1	2	3
Mean height	347.5 µm	310.5 µm	316.7 µm

CONCLUSION:

In this application, we have shown how the Nanovea ST400 3D Profilometer with a 3.5mm optical pen can precisely characterize both the surface/shape and the nanometer details of the Nonwoven material. From the 3D image it can be seen that nonwoven pattern is not consistent and may or may not be an important factor for its intended purpose. To further view in detail a 2D cross section can quickly be chosen to analyze, at nanometer range, step height and coplanarity among others. Nanovea 3D Profilometers speeds range from 20mm/s to 1m/s for laboratory or research to the needs of hi-speed inspection; can be built with custom size, speeds, scanning capabilities, Class 1 Clean Room compliance, with Indexing Conveyor and for Inline or online Integration