

## Cell Phone Window Inspection

### Executive Summary

Optimet's NanoConoprobe with a 25mm lens at 3000 Hz was used in the application of cell phone window inspection. Optimet's NanoConoprobe is highly qualified for this application due to its ability to measure transparent objects. The measurements are performed at a rate of 3000 Hz without averaging.

The following parameters were measured in a single setup by the NanoConoprobe:

1. Window height difference: glass relative to the black coating frame at 4 points (bottom, top, right and left side), with accuracy of few  $\mu\text{m}$ .
2. Roughness ( $R_q$ ) of the glass and the black coating in different areas.
3. Glass thickness.

### 1. Optimet's Advantages over Other Technologies:

1. High measurement accuracy
2. High lateral resolution
3. High sampling rate with no need for averaging

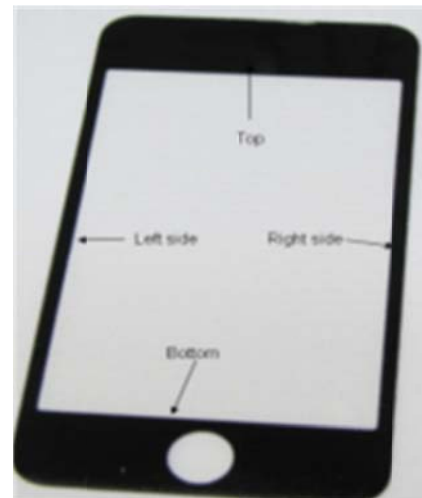
### 2. Application Description

The cell phone window was measured and inspected using Optimet's NanoConoprobe with 25mm lens at 3000 Hz.

A demo of the inspection set up is shown in fig.1. A sample of the inspected window is shown in fig. 2.



**Figure 1**-Object under measurement by the NanoConoprobe



**Figure 2**-Measurement regions of the inspected window



### 3. Results and Observations

#### Height Difference and Surface Roughness

The table below (table 1) shows measurements results at 4 positions as shown in fig. 2 above, for glass-coating height difference, glass roughness and coating roughness. All measurements were made by the same NanoConoprobe sensor and in one setup.

Window parameter	Region			
	Top	Bottom	Right	Left
Height Difference ( $\mu\text{m}$ )	4.3	3.0	5.5	5.3
Glass Roughness Rq ( $\mu\text{m}$ )	0.074	0.072	0.076	0.081
Black Coating Roughness Rq ( $\mu\text{m}$ )	1.3	1.2	1.32	1.8

**Table 1-Height and roughness measurements**

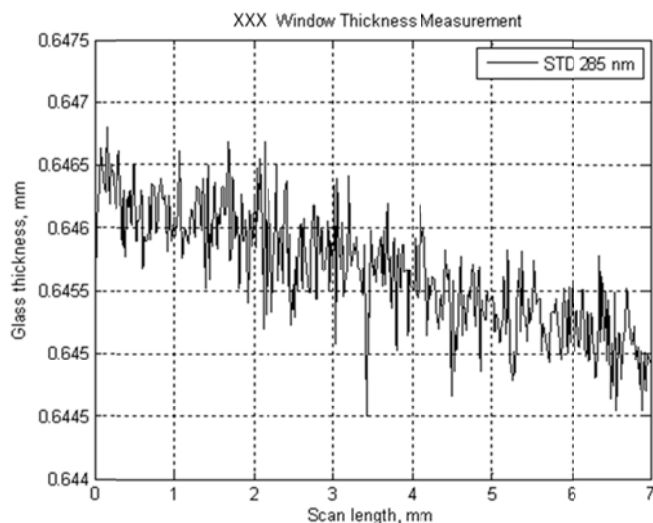
**Note** – Surface roughness is below 100 nm (0.1 $\mu\text{m}$ )

#### Glass Thickness

The glass thickness was measured in the middle of the window along 7mm. The measurements were done by the NanoConoprobe using the reflection from the top and bottom surface simultaneously, and thickness measurements.

The glass thickness (before calculating the refraction index of the glass) was 0.646mm with STD of 285nm (0.285 $\mu\text{m}$ ) and change in thickness (uniformity) along the 7mm of up to 1.5 $\mu\text{m}$ .

The thickness results are shown in figure 3 below.



#### **Observations (fig.3):**

The values given in figure 3 for the glass thickness need to be multiplied by the glass index of refraction (since we measured the reflection through the glass). After multiplying the measured thickness by the standard index of refraction of glass (1.54), the average thickness obtained is 0.995mm. This value was validated using micrometer.

**Figure 3 –Glass thickness measurements (mm) along 7mm in the center**

#### 4. Data:

<b>Parameter</b>	<b>Value</b>
Reflective/Diffusive/Transparent/Translucent	Transparent
Working Range (mm)	1
Precision ( $\mu\text{m}$ )	0.5
Stand Off (mm)	16
Max. Data Rate (KHz)	3
Lateral Resolution	-
Z Resolution	-
Application Category	-