Bending Test of Smartphone Glass Film

Smartphones are an essential part of modern life, but their screens are highly vulnerable to damage. **Tempered glass screen films** are designed to absorb impacts, creating a protective layer for smartphone displays. To ensure these films provide optimal protection, understanding their mechanical properties is crucial. In this case study, conducted in collaboration with our Japanese distributor NobbyTech, we used **3D DIC (Digital Image Correlation)** to analyze the bending behavior of smartphone glass films.

Objective

The aim of this study was to evaluate the full-field deformation of tempered glass film during a bending test using 3D DIC.

Description of the Case Study

The test specimen was a glass film measuring approximately **140 x 70 mm**, commonly used as a smartphone screen protector. The analysis required a **3D DIC setup** with two synchronized **Phantom T3610 high-speed cameras**, capturing at **1280 x 800 px** resolution and a frame rate of **2,000 fps**.

This setup allowed for high-precision tracking of surface displacements in all three axes (x, y, z), with cameras positioned at different angles to accurately capture out-of-plane deformations during bending. The resulting data provided detailed insights into the mechanical behavior of the glass film.

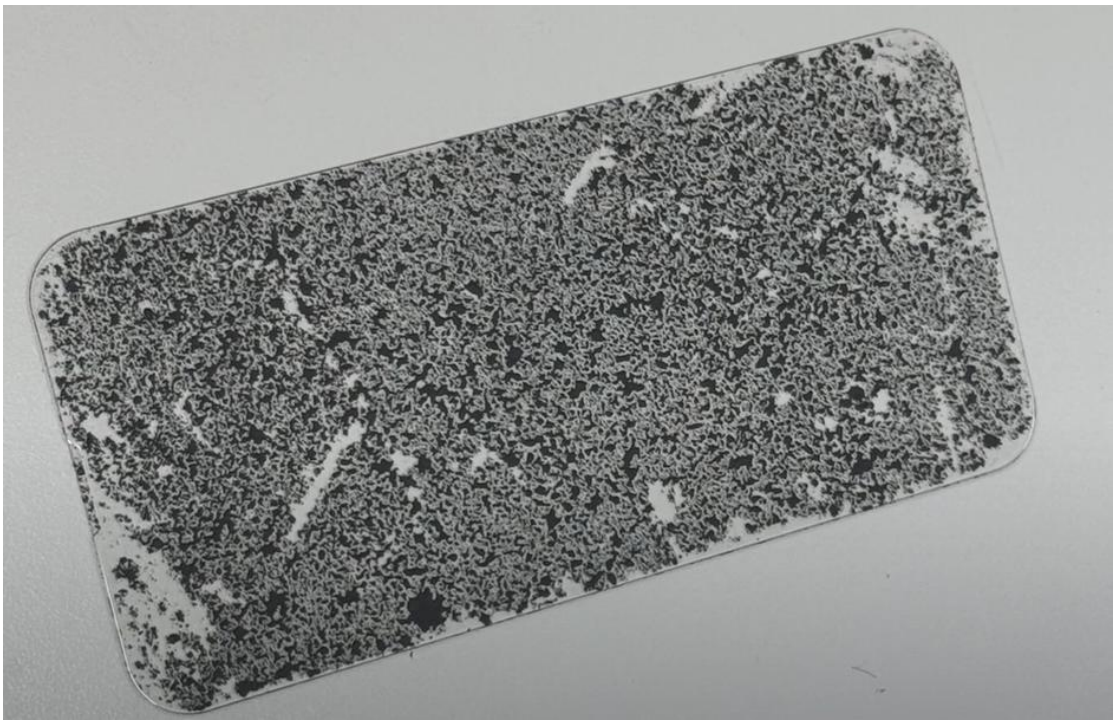


Fig 1: Glass Screen Protector

MERCURY RT

Step-by-Step Analysis

1. Used High-Speed Capture Tool

When using high-speed cameras, the **high-speed capture tool** records and downloads videos directly from the cameras. The video is then used to create a project in MercuryRT, enabling full-field deformation and displacement analysis with **3D DIC** through standard processing workflows.

2. 3D Visualization of Deformation

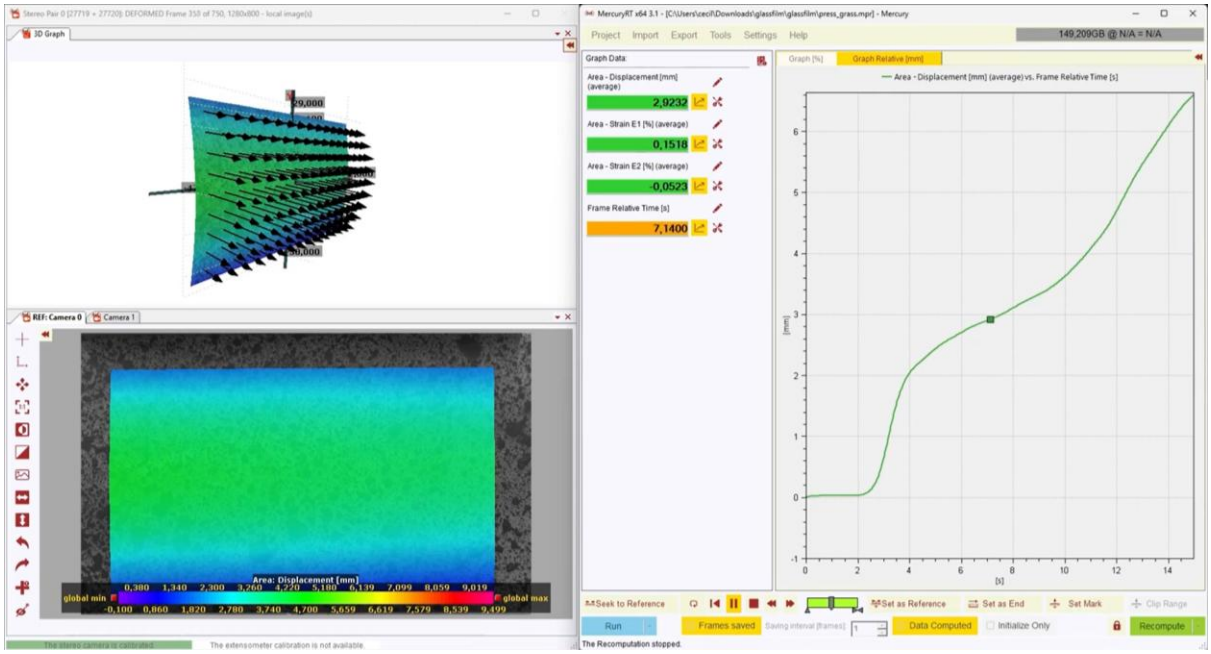
The captured data was processed to generate 3D graphs showing displacement vectors. These visualizations highlighted the directions and magnitudes of the deformations, providing a clear understanding of how the film responded to the applied load.

3. Full-Field Strain Analysis

Using MercuryRT's advanced analysis tools, strain distribution across the entire surface of the film was calculated and mapped. This step revealed areas of maximum deformation and stress concentration.

4. Graphical Representation

The analysis also produced detailed graphs, including displacement and deformation plots, which provided quantitative data to support the visual findings.



Benefits of 3D DIC for Material Testing

❖ **Accurate Full-Field Analysis:** 3D DIC enables precise measurement of displacements and strain across the entire surface of the specimen, including out-of-plane deformations.

❖ **3D Visualization:** Generate detailed 3D graphs with displacement vectors, offering a comprehensive view of deformation behavior.

❖ **In-Depth Mechanical Insights:** Identify stress points, understand material behavior, and validate design decisions with accurate data.