

# Diffraction Optical Element (DOE) Measurement System

## Technology Overview

A diffractive optical element (DOE) is a passive optical component containing complex micro-structure patterns, which can modulate or transform light in a predetermined way. Due to the highly-precise microstructure profile that has three dimensional features, any minor error in the design or fabrication of the DOE will result in a huge deviation from its desired optical function and performance. At present, there is a gap in the market to fulfil the measurement of DOE design verification and final product quality validation.

A Digital Holography Microscope (DHM) measurement system has been developed to measure DOE prior to and after fabrication, for the purpose of design verification and fabrication quality validation. This eliminates financial losses as errors in design can be ascertained before DOE fabrication. Some of the features include being non-invasive, low cost, real-time, high-resolution and full-field measurement for the entire effective area of DOE.

## Features & Specifications

- A fully-integrated Digital Holography Microscope (DHM) based optical measurement system
- High resolution:
  - Lateral resolution: 14 $\mu$ m
  - Axial resolution: 100nm
- Low cost and non-invasive
- Full-field effective area that can be measured: 4mm x 4mm
- Able to provide real-time measurements for different types of DOE regardless of its optical functionality, design wavelength and materials



**Real-time**  
measurement results with non-invasive, low-cost and high-resolution, full-field measurement for the entire effective area of DOE.



## Customer Benefits

Our DOE measurement system enables manufacturers and developers to establish a fully-integrated closed-loop DOE development process, because it provides DOE measurements not only after fabrication but also prior to fabrication i.e. during the design phase.

## Potential Applications

Diffractive optics are increasingly making their way into various areas of applications, ranging from biotechnology, materials processing, sensing, contactless testing and optical metrology.

Therefore, our DOE measurement system should experience strong demand from :

- DOE manufacturers or developers for DOE development or measurement
- research institutions for DOE prototyping and design verification

## Collaborators

- Nanyang Technological University