

The fabrication of 12" Liquid Crystal on Silicon devices

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Abstract

Two projects are currently being researched: the fabrication of 12" Liquid Crystal on Silicon devices (LCoS), and the investigation of Ferroelectric Liquid Crystal (FLC) materials to achieve a phase-only modulation.

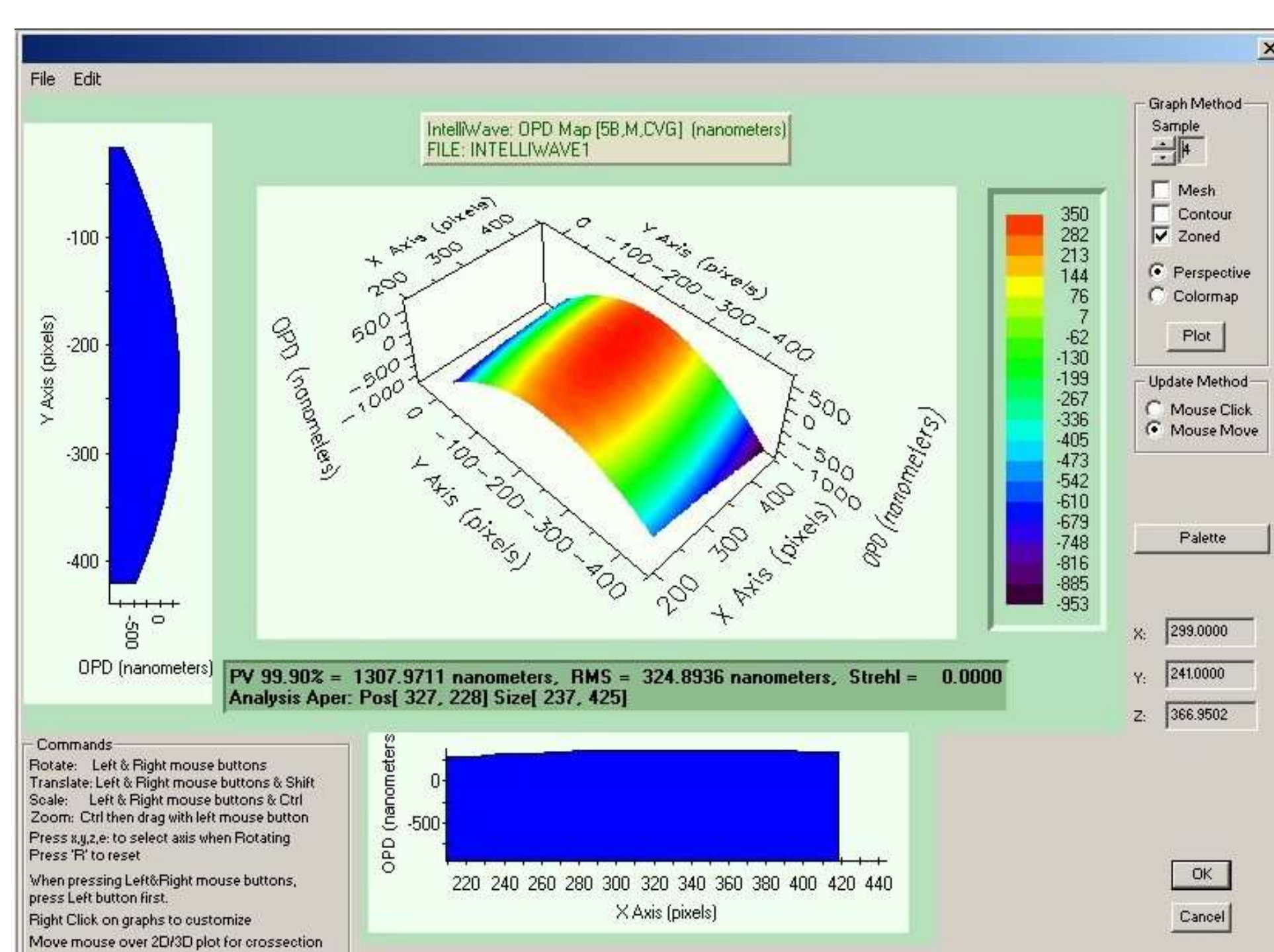
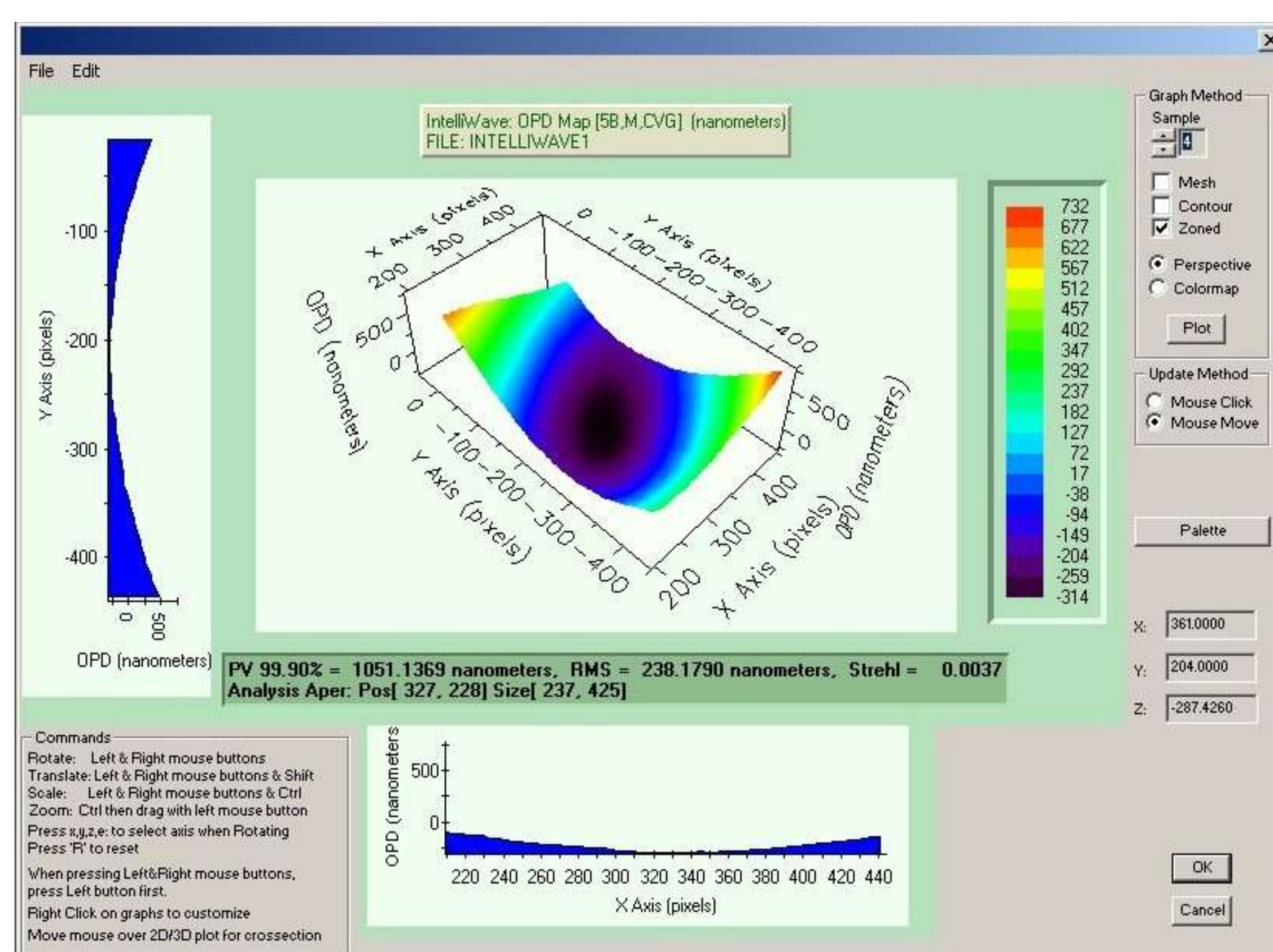
Introduction

Current assembly techniques are able to fabricate the LCoS devices with satisfactory outcomes in the class 1000 and class 100 clean rooms. The fabrication of larger-sized LCoS devices would be attempted based on similar procedures that were used in the fabrication of smaller-sized LCoS devices. The main challenge here is to ensure the flatness and the uniformity of the LCoS surfaces, so that the glass substrate wouldn't affect the optical response. Changes and improvements will be expected in the larger-sized LCoS device assembly.

Motivation

LCoS devices are able to control the phase of light at each pixel to achieve beam steering with continuous addressing capabilities. They are particularly attractive in the application of Wavelength Selective Switch (WSS), which is the core component in Wavelength Division Multiplexing (WDM) optical communication networks to route signals between optical fibres on a per wavelength basis. LCoS devices have been commercialized currently, however, larger sized LCoS devices are more captivating in terms of capability and resolution.

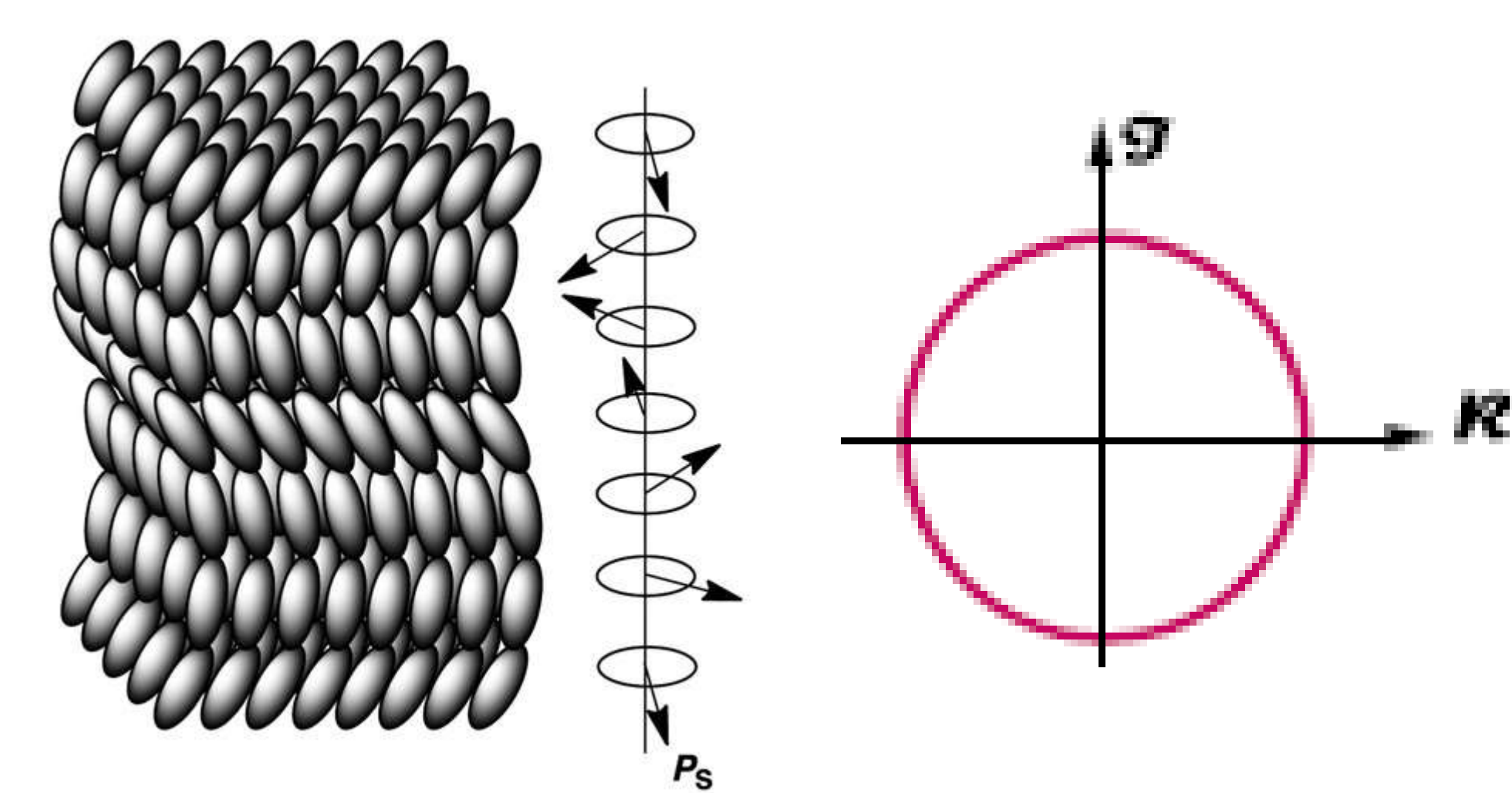
The second part of my research is the investigation of Ferroelectric Liquid Crystal (FLC) materials and its possibility of been phase-only modulated. FLC has attracted attentions from industry due to its fast switching speed and its potential application in holographic displays in virtual reality industry.



The surface flatness of Silicon substrate and glass substrate used in the current LCoS devices.



LCoS device produced by JASPER DISPLAY (JD4704)



FLC molecules and desirable phase-only modulation

Current procedures cannot be fully applied onto the fabrication of 12" LCoS devices due to the fact that the large surface tends to be more susceptible to distortions resulting from the stress and strains during the assembly process such as the curing and the liquid crystal injection process.