NIL for advanced AR displays

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Augmented (AR) and virtual reality (VR), are expected to be the next revolution after mobile phones in the consumer electronics industry. Virtual reality displays rely on using miniaturized LCD or OLED displays combined with motion tracking. In this case, viewer only sees the virtual environment. The technology behind VR is pretty mature because of the similarities with mobile phone technology. In an AR display, the image from a micro-projector is coupled to a partially transparent plate, and the light propagation is guided by mirrors or diffraction gratings. This enables the viewer to see the real world mixed with virtual objects. The material requirements and manufacturing tolerances are extremely tight making large scale manufacturing of these devices extremely challenging and costly. Therefore, there are only few AR products, mainly aimed for B2B, that can be purchased from suppliers. Mass manufacturing capabilities of these devices are currently being developed. Nanoimprint lithography is one of the most promising technologies in producing these displays in large quantities.

In this presentation, I will explain the main principles of AR displays based on waveguides. Moreover, I will explain the difficulties in manufacturing the waveguides for AR glasses. In particular, I will concentrate on the requirements for the grating-based waveguides from the manufacturing point of view. In addition, I will explain how nanoimprint lithography can be utilized for the manufacturing. I will explain the main concepts and limitations for nanoimprinted AR waveguides.

Dispelix AR waveguide is based on using one single plate for full color display (see Fig.1). The concept is unique as typically one or maximum two primary colors are propagated in one plate. Design of this kind of waveguide is extremely challenging, but large scale manufacturing is relatively straightforward compared to solutions where several plates are needed for a full color display. Our approach makes the Dispelix AR waveguide the thinnest, the most lightweight and the easiest to integrate AR displays on the market (see Fig. 2).

Reference:

[1] www.Dispelix.com

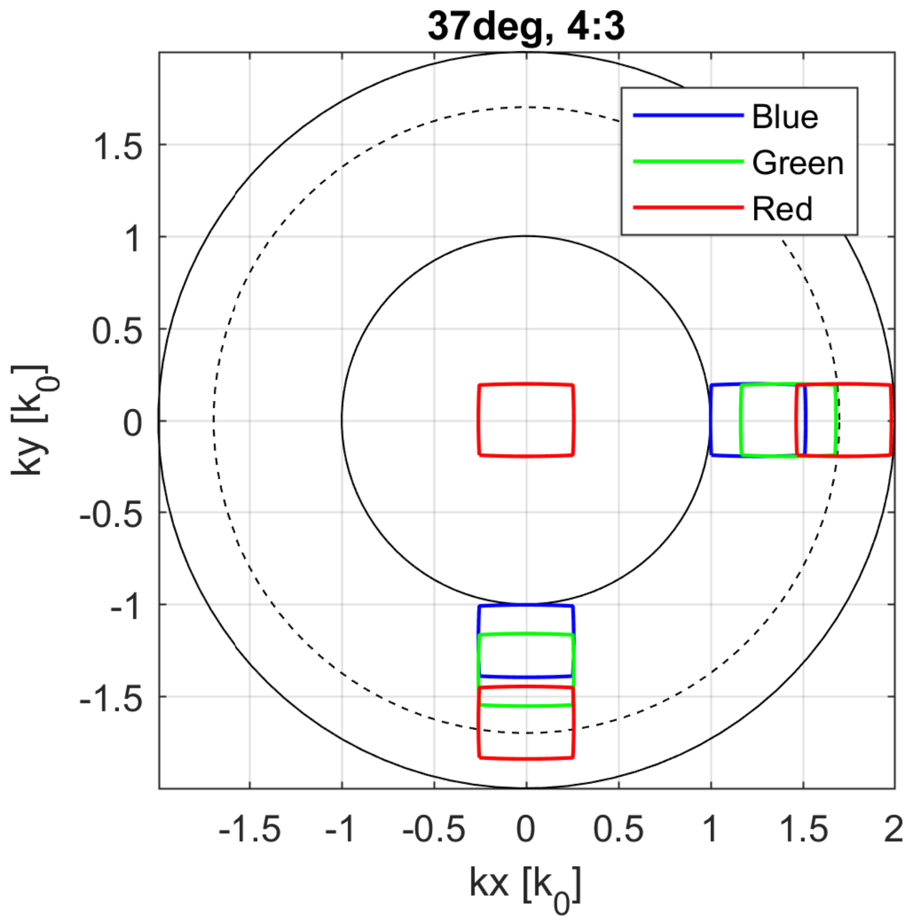

Figure 1. Light propagation for grating based full color waveguide.

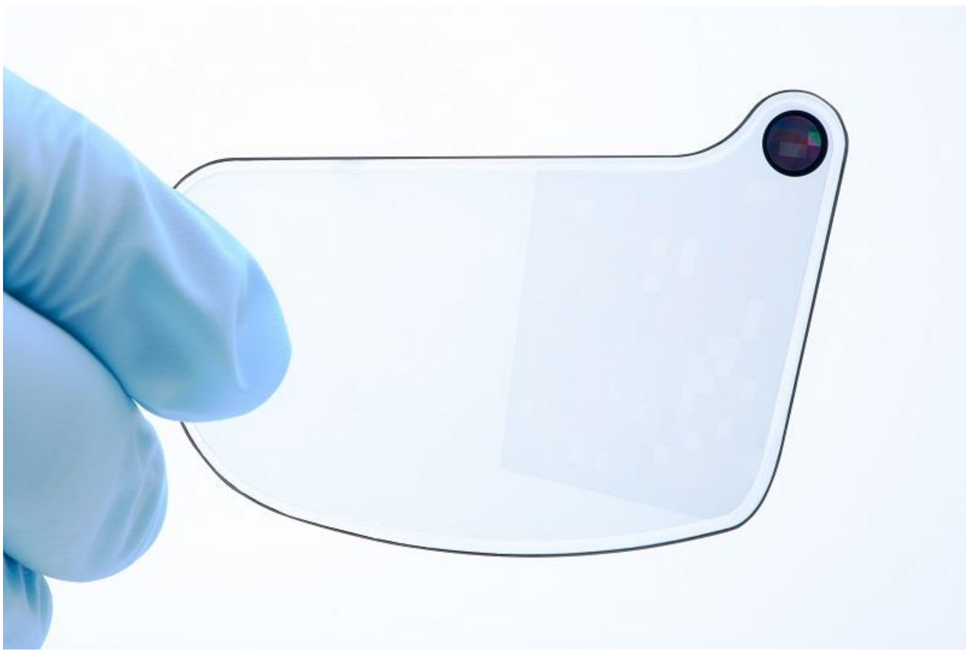
Figure 2. Dispelix DPX 30° display.