Numerical modeling and analysis of augmented reality optical system of Hololens

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In January 2016, Microsoft announces the AR(Augmented Reality) device 'Hololens'. It showed a new possibilities of AR devices. Fig.1.(a) shows the total system of Hololens device. Hololens provides augmented reality through thin diffractive light combiner without using conventional lens. To analyze the optical structure of the combiner, we developed numerical modeling of Hololens optics. Fig.1.(b) shows the combiner system of Hololens. The combiner grating structure of the hololens is designed with delicate shevron grating structures of hundreds of nm units. The hybrid analysis of using geometric optics modeling and electromagnetic analysis was employed to interpret the combiner grating structure precisely (Fig.2). The diffraction properties by the grating structure is analyzed by the Foureir modal method based simulation and the total light delivery and imaging mechanism were modeled based on the geometric optics (Fig. 2(b)).

Based on the study, we will propose a novel structure to improve yield of the grating process, FOV(Field of view) and light emitting efficiency.

(a)   (b)
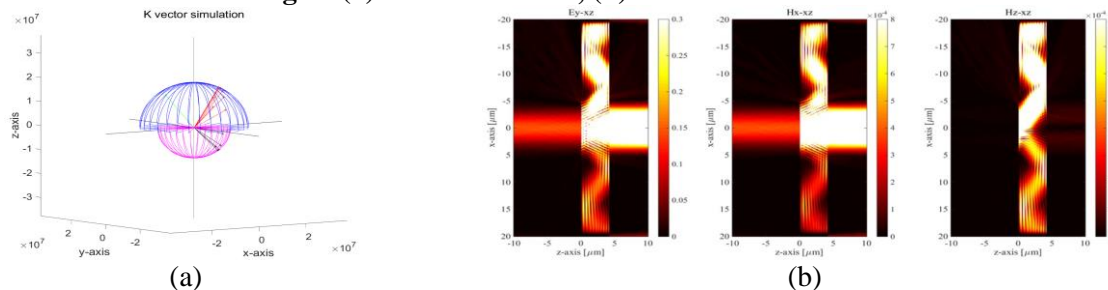
Fig. 1. (a) Hololens device, (b) Hololens combiner

(a)   (b)

Fig. 2. (a) K vector simulation, (b) Shevron model FMM simulation (Ey, Hx, Hz)

References
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