

Realisation of photonic Hilbert transformer with a simple planar Bragg grating

Chaotan Sima, J C Gates, B D Snow, H L Rogers, M N Zervas and P G R Smith
Optoelectronics Research Centre, University of Southampton, United Kingdom

Photonic Hilbert transformers (PHTs) are desirable for the direct processing of optical signals at high speeds and operation bandwidths, allowing optical networks to outperform current electronic technologies.

We practically demonstrate a photonic Hilbert transformer in planar geometry; utilising a π -phase shift planar Bragg grating with proper apodization profile. The device is fabricated by direct UV grating writing technology in silica-on-silicon [1].

The PHT has a π -phase shift at the zero point of the frequency response, whereas the amplitude remains constant. The π -phase shift in PHT is simply induced by placing a π -phase shift in the refractive index modulation. The constant amplitude is achieved by precise apodization of the grating coupling strength, while the apodization profile is given by [2].

With our current direct UV writing technology, the proposed grating can be fabricated in a much higher accuracy than the conventional fibre Bragg grating manufacturing technique. We will present our latest work on more complex apodized gratings to obtain the ideal realisable frequency and temporal responses for PHTs.

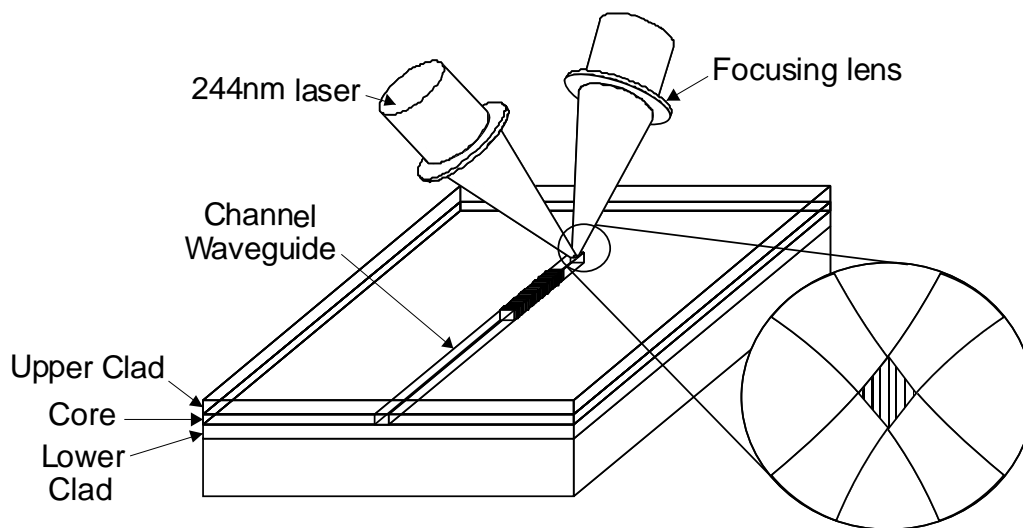


Figure 1 Illustration of the fabrication process with direct UV grating writing in silica-on-silicon

[1] G D Emmerson, etc.. *Fabrication of directly UV-written channel waveguides with simultaneously defined integral Bragg gratings*. Elec. Lett., vol. 38, pp. 1531–1532, 2002.

[2] M H Asghari and J Azaña. *All-optical Hilbert transformer based on a single phase-shifted fiber Bragg grating: Design and analysis*. Opt. Lett., vol. 34, pp. 334–336, 2009.