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Direct UV Written Optical Planar Devices

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The importance of optical technology is reflected by it being one of Malaysia's *Ministry of Science, Technology and Innovation* Strategic Research Areas. Analogous to the silicon chip, the impetus now is to achieve multi functionalities via high density integrated optical devices, with processing rates that are orders of magnitude faster compared to their electronics counterparts. These optical devices are generally based on light guiding channels in a multi-layer refractive index planar structure. They include optically passive structures/devices such as channel waveguides and multiplexers as well as active ones, such as planar waveguide lasers and amplifiers. They have wide ranging applications, from communications to sensing as well as defence.

Our work aims to design, fabricate and characterise novel optical devices via a technique called direct UV writing. The technique involves the 'writing' of a pre-designed waveguide structure by translating a photosensitive sample beneath a focused UV beam. Using this rapid prototyping method, tunable devices employing liquid crystal, gratings based sensors and rare earth doped lasers were produced. Our work on X-couplers presented here highlights the capability of UV writing, with the structures displaying stable operation over a wide input light wavelength range. Experimental and simulated data were compared showing excellent agreement.

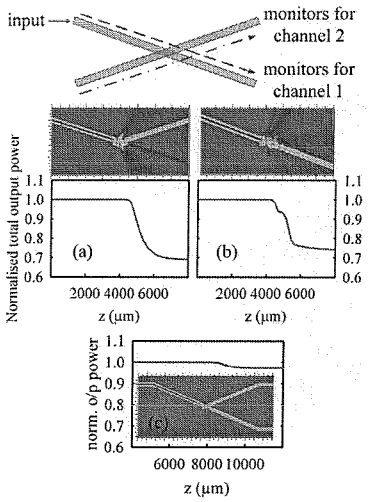

Fig. 1 Examples of BPM simulation of 1° crossing angle X-couplers with various waist index values. The topmost schematic shows the control case X-coupler and the locations of the launch field and the various power monitors. The solid line graphs are obtained using the Total Power monitor. Figs. (a) and (b) show at least 30% radiated power while case (c) corresponding to the ideal case show less than 5% radiated loss.