

Spatial Single Dimensional Mode Demultiplexer Based on Slab Waveguide

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Spatial multiplexing transmission technology is highly researched to enhance transmission capacity in single fiber [1]. LP (Linearly Polarized) mode based multiplexing, however, require MIMO processing due to its difficulty of mode de-multiplexing caused by the mode degeneration and the mode crosstalk [2]. In order to solve this problem, spatial multiplexing transmission using spatial single-dimensional mode has been proposed [3]. We are studying phase control type multiplexer / demultiplexer using slab waveguide that can multiplex / demultiplex single-dimensional spatial mode [4]. Figure 1 shows the schematic of our mode de-multiplexer. Our de-multiplexer is similar to AWG which is widely used in WDM, and is structurally composed of a strongly coupled waveguides part, a phase control part, and slab waveguide part. As shown in Fig. 2, the field profiles and phase profiles of coupled modes have a phase difference of π between v th order mode and $(v+1)$ th mode [5]. And as shown in Fig. 3, slab waveguide has a light focusing function. The focusing position is different if the light of equivalent wavefronts injected from the array waveguide. Based on this principle, we can realize mode de-multiplexing. As a preliminary study of a phase control type multiplexer / demultiplexer, it was confirmed that the focal position of single dimensional space modes with different equiphase planes are different and can be clearly observed in the slab waveguide.

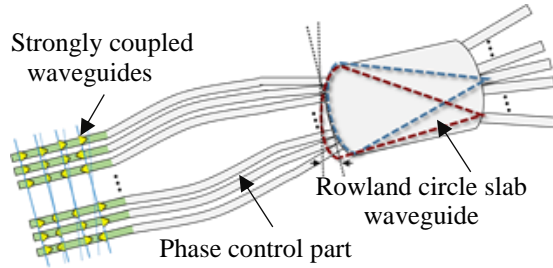


Fig. 1. The schematic of our mode de-multiplexer.

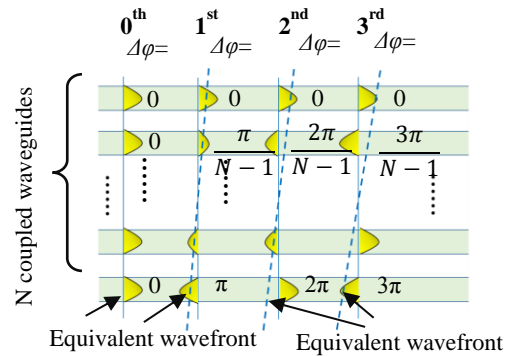


Fig. 2. Field profiles and phase profiles of coupled modes.

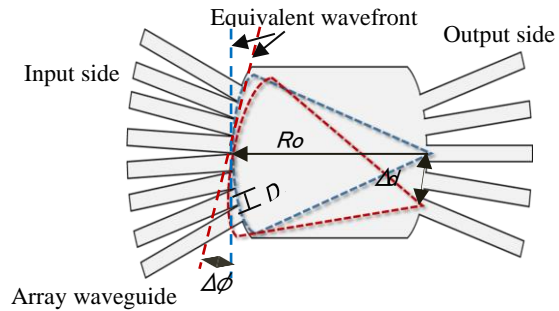


Fig. 3. Schematic of light focus using slab waveguide.

Reference

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