Chapter 5

Conclusions

The application of phasar-based devices is rapidly developing. AWG's have been proven to be flexible components that support realization of a broad class of functions for use in WDM networks. Silicon-based devices offer the best performance and are presently being most widely used. The planar lightwave circuits (PLC) technologies supported by continuous improvements in waveguide fabrication, circuit design and device packaging will proceed to a higher level of integration of optics and electronics aiming at the next generation of telecommunication systems. The AWG plays a crucial role in the realization of modern optical networks. According to the analysis of AWG SOI waveguide devices with computer-aided software mentioned in chapters 2 and 4, the conclusions are given as follows. In the chapter 2, we have found a value of waveguide separation (d_{PA} = 7.3μm) at junction between arrayed waveguide and free propagation region in the 1550nm wavelength region. With this searched parameter, we can get a better uniformity for 64×64

AWG channel output spectrum transmittance with considering of compromising value for insertion loss and crosstalk. Then, we apply tapered waveguide structure design at the junction between input/output waveguide and the FPR. This work successfully improved the transmittance spectrum and crosstalk reduction from 5dB and –20dB to 2.9dB and –33dB, respectively, for a 64×64 AWG based on SOI substrate with 50GHz channel spacing centered at wavelength 1550nm. It is believed that such a device can be applied in DWDM optical interconnection and communication systems. These results are quite useful for the experimental works in the future. In the advance research, we expect to realize the 64×64 WDM MUX AWG for applying in a DWDM high capacity metropolitan area optical communication networks.

In the chapter 4, we have investigated optical wavelength selective switch with a unique configuration which uses only one AWG and an array of electro-optical switches. Then, we have simulated a monolithically 2 × 2 large scale wavelength selective switch for thirty-two WDM signals in the 1.55μm wavelength region, in which a 64 × 64 AWG and an array of electro-optical switches.

We confirmed that signals at arbitrary wavelengths from among thirty-two WDM signals are selected independently by operating the corresponding electro-optical switches. It is believed that such a device with its high functionality and good performances, this wavelength selective switch will be widely used in all-optical WDM systems. These results are quite useful for the experimental works in the future.