

Chapter 5

Conclusion

We successfully proposed and analyzed compact SOI 2x2, 4x4, 8x8, 16x16 and 32x32 MMI photonic splitters access nanowire waveguide in chapter 2. The excess loss of all our designed splitters have been demonstrated less than 0.7dB and the uniformity of all our designed splitters have been demonstrated less than 0.9dB at wavelength 1.55 μ m. We successfully decreased the size of NxN MMI photonic splitters utilizing access nanowire=400nm, and the size of 32x32 MMI photonic splitter was demonstrated only 420 μ m x 38.4 μ m. We give a summary of MMI splitters in Table X.

We have proposed a novel wavelength demultiplexer based on MMI with photonic crystals inside and the optimum parameters of a novel device which the contrast ratio is -18.9325dB at input wavelength=1.3 μ m, the contrast ratio is 12.8096dB at input wavelength=1.55 μ m in Chapter 3. The proposed wavelength demultiplexers provide cost-effective and high-performance solutions for network systems.

With the understanding of the necessary condition of the distortion of high-speed signal transmission through MMI devices, high-speed data transmission at 40Gb/s is demonstrated in 2x2, 4x4, 8x8, 16x16 and 32x32 MMI photonic splitters. We have demonstrated our designed NxN MMI photonic splitters which had good BER values in the 40Gb/s optical transmission system. Our designed NxN MMI photonic splitters are very promising for the purpose of the 40Gb/s optical transmission system.

In the future, we hope our designed devices to integrate with other functional devices and to become multifunctional photonic integrated circuits applied in high speed optical network system.

Table X Summary of several MMI splitters and our design

Form	Size	Material	Year	Ref.
2x2	6 μm \times 150 μm	GaInAsP–InP	2001	[32]
2x2	4 μm \times 54 μm	SOI	2006	[33]
2x2	2.4 μm \times 29.3 μm	SOI	2007	Our design
4x4	15 μm \times 514 μm	Si	2003	[34]
4x4	50 μm \times 2565 μm	Sol-gel	2004	[35]
4x4	4.8 μm \times 55.4 μm	SOI	2007	Our design
8x8	30 μm \times 992.7 μm	Si	2003	[34]
8x8	9.6 μm \times 107.6 μm	SOI	2007	Our design
11x11	72 μm \times 2822 μm	GaAs–AlGaAs	1999	[36]
16x16	19.2 μm \times 212 μm	SOI	2007	Our design
32x32	38.4 μm \times 420 μm	SOI	2007	Our design