Chapter 5

Conclusions

In this thesis, we propose a novel and simple configuration using E/O switch which services both output and feedback functions and fiber Bragg gratings to observe four channel (multi-channel) SOA fiber lasers. From our experimental result, we can produce a very pure single mode laser, the SMSR can reach 33.2dBm, and the lasing power is very stable the ΔP can control under 0.3dBm. However, when we adjust bias voltage 3V of E/O switch, we can get the best condition for our asymmetrical resonator laser. Because when the bias voltage of E/O switch is 3V and the lasing position at $\lambda = 1310.92nm$, we can get lasing power is about –12dBm, SMSR is 36dBm, the linear range I_{sat}-I_{th} is 34mA and ΔP can be controlled under 0.05dBm. Besides, the position at $\lambda = 1308.2\text{nm}$, $\lambda = 1325.82\text{nm}$ and $\lambda = 1330.12\text{nm}$ we also can get best results when the bias voltage of E/O switch is 3V, the lasing power is about -13dBm, -14dBm, –17dBm and SMSR is 33dBm, 32 dBm, 28 dBm, respectively. Therefore, form above results we can find the best bias voltage of E/O switch.

The whole experimental structure is utilizing fiber gratings, a semiconductor optical amplifier (SOA) and a electronic-optical modulation to form an asymmetric resonator and produce a ring laser. This laser can be effectively stabled under 0.3dB. In this experimental structure we change the coupling ratio of E/O switch by control the bias voltage of E/O modulator. Finally, we find the best operate point with bias voltage equal to 3V. In this operate condition we can get a very pure single mode laser, it SMSR reach 36dBm and variation of polarization state is very small. However, our ring lasers have the following advantages: (i) without additional filters, two wavelengths can emerge separately from the two output ports of the WDM when reflecting fiber Bragg gratings are used (ii) this is the tunable resonator because we can control the bias voltage of E/O switch to modulate the coupling ratio in this cavity (iii) the two wavelength can be independently tuned and modulated (iv) the two lasing powers are very stable (v) the structure is relatively simple.

In chapter3, we know the compensate result is limited by the transmission distance. The reason of our compensator not compensated instantaneously is the control signal occur transmission delay in the control circuit. However, we improve the circuit and 8051 program of the first generation compensator. In the second generation compensator, the size of circuit be obvious minified and the phenomenon of transmission delay also be effective decreased. Beside, the performance of compensation result also raised. Under the 10°, 30° and 50°compensation range the value of DOP can be raised to 89%, 83% and 77% and variation of ellipticity can reduced to 10°, 7° and 3°.

However, we utilize this ring laser to transmission data and utilize homemade compensator to compensate the polarization state. Homemade compensator can increase the value of DOP, decrease the variation of polarization state and overcome the impairment caused by external environment. In chapter4, we effective compensate the A, B, C, D positions, respectively. From the experimental result, we know the homemade compensator can effective compensate the various polarization states in the optical system. The compensator can control the variation range of Ellipticity less than 3°. and raise the value of DOP to 78.94%.

After improve the compensator is more suit applied on the optical transmission. Besides, it also applied on the modulation system. In the future, we look forward to achieve integrated circuit (IC). Thus, the practical utility and complete miniaturization of the DPC will be used at commercial PMD compensator in the future.