Stabilization and Noise Reduction of DFB Laser by Incoherent Optical Feedback using FP-Resonator

1991 Fiscal Year Final Research Report Summary

Stabilization and Noise Reduction of DFB Laser by Incoherent Optical Feedback using FP-Resonator

Research Project

Project/Area Number

02650238

Research Category

Grant-in-Aid for General Scientific Research (C)

Allocation Type

Single-year Grants

Research Field

電子通信系統工学

Research Institution

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1990 – 1991

Keywords

Semiconductor laser / Optical feedback / Noise reduction / Frequency stabilization / Gain compression factor

Research Abstract

For the purpose of coherent optical communication system, semiconductor lasers should be frequency stabilized and its spectral linewidth should be narrowed. In our research plan, this is intended to achieve by loading a FP resonator having a high finess and by controlling its wavelength at a portion on the positve slope of the reflection curve of the FP resonator. This method has an advantage that amount of negative feedback is determined only by changing the refractive index of the active layer due to the carrier effect. So the system is free from the roll-off attributable to the parasitic capacitance and inductance.
However, it has been found that the above scheme has the following drawbacks ; a) there exists a tradeoff between a high sensitivity of FP resonator and the

corresponding bandwidth narrowing, b) there exists a considerable amount of light reflection from the input facit of FP resonator, and c) there exists a residual coherent light feedback due to the even order light reflections from FP resonator. In addition to these, it has been experimentally confirmed that employment of a FP resonator having a high finess does not exhibit a remarkable advantage as compared with other interferometer such as Michelson's. On the other hand, it has been reported that a number of studies are taking advantage of the effects of TM light injection in determining the dynamic parameters of semiconductor lasers, wavelength conversion scheme, picosecond pulse generation and polarization bistability. In relation to these circumstances, we turned our research issue to the fundamental properties of TM light injection. As results of that we have achieved a new method for experimental determination of gain compression factors in the presence of TM light infection, and analytical study of polarization bistability of DFB laser, which were accepted for publication in IEEE Photonics Technology Letters, and IEEE J. of Lightwave Technology, respectively.

Research Products (4 results)

All | Other

All | Publications (4 results)

[Publications] Tsuyoshi OGAWA,Yoshio IDA,and Ken-ichi HAYASHI: "Analysis of polarization bistability of phase shifted DFB laser due to TM light injection" IEEE Journal of Lightwave Technology.

[Publications] Tsuyoshi OGAWA,Yoshio IDA,and Ken-ichi HAYASHI: "Experimental determination of gain compression factors of a DFB laser in the presence of TM light injection" IEEE Photonics Technology Letters. vol.4,no.4. (1992)

[Publications] Tsuyoshi OGAWA, Yoshio IDA and Ken-ichi HAYASHI: "Analysis of polarization bistability of phase-shifted DFB laser due to TM light injection" IEEE Journal of Lightwave Technology.

[Publications] Tsuyoshi OGAWA, Yoshio IDA and Ken-ichi HAYASHI: "Experimental determination of gain compression factors of a DFB laser in the presence of TM light injection" IEEE Photonics Technology Letters. (1992)

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