
**5th International Conference on Nanotechnologies and Biomedical Engineering**
**Proceedings of ICNBME-2021, vol 87., November 3-5, 2021, Chisinau, Moldova,**
**Springer, Cham**

# Investigation of Dynamical Properties of a Laser with Incorporated DBR Section Under the Influence of External Optical Feedback

**Eugeniu Grigoriev, V. Tronciu**

https://doi.org/10.1007/978-3-030-92328-0_57

## Abstract

We report in this paper the results of theoretical investigations of the dynamical properties of a laser with incorporated Distributed Brag Reflector (DBR) section under the influence of external optical feedback . The adapted Lang-Kobayashi model was used to simulate and analyze the dynamics of the considered laser device. We have identified the nature of the bifurcations that occur in such a system. We plotted the Hopf bifurcation, responsible for instabilities, in the plane of different parameters. The conditions that are necessary for stable laser operation are identified. We also demonstrate the influence of the length of active region on the stability of devise emission, and show how this property is changed by variation of detuning of the mode of solitary laser.

*Keywords: lasers, optical feedback, distributed Brag reflectors, bifurcations, external cavity modes*

## References

1. Herschbach, N., et al.: Photoassociation spectroscopy of cold He (23S) Atoms Phys. Rev. Lett. **84**, 1874–1878 (2000)
Google Scholar
2. Sodnik, Z., Furch, B., Lutz, H.: Optical intersatellite communication IEEE. J. Sel. Top. Quantum Electron. **1**, 1051 (2010)
Google Scholar


**5th International Conference on Nanotechnologies and Biomedical Engineering**
**Proceedings of ICNBME-2021, vol 87., November 3-5, 2021, Chisinau, Moldova,**
**Springer, Cham**

3. Matsui, Y., Schatz, R., Di CheKhan, F., Kwakernaak, M., Sudo, T.: Low-chirp isolator-free 65-GHz-bandwidth directly modulated lasers. Nat. Photon. **15**, 59–63 (2021)
Google Scholar
4. Hofmann, J., Sahm, A., John, W., Bugge, F., Paschke, K.: Opt. Laser Technol. **83**, 55 (2016)
Google Scholar
5. Tronciu, V., Werner, N., Wenzel, H., Wünsche, H.-J.: Feedback sensitivity of detuned DBR semiconductor lasers. IEEE J. Quantum Electron. **57**(5), 1–7 (2021)
Google Scholar
6. Morthier, G.: Feedback sensitivity of DBR-type laser diodes. IEEE Photon. J. **13**(4), 1–8 (2021)
Google Scholar
7. Krauskopf, B.: Unlocking Dynamical Diversity: Optical Feedback Effects on Semiconductor Lasers. In: Kane, D.M., Shore, K. A. (eds.) pp. 147–183. Wiley (2005)
Google Scholar
8. Lang, R., Kobayashi, K.: External optical feedback effects on semiconductor injection laser properties. IEEE J. Quantum Electron. 347 (1980)
Google Scholar
9. Sieber, J., Engelborghs, K., Luzyanina, T., Samaey, G., Roose, D.: DDE-BIFTOOL manual - bifurcation analysis of delay differential equations (2016)
Google Scholar