Optical Injection Locking and Characterization for Optical Communication

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Thesis submitted in partial fulfillment of the requirements for the degree
Master of Philosophy

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Sri Lanka

May 2020

Declaration

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Abstract

The rise of demand for mobile and broadband communication has caused a worldwide requirement of sophisticated transmitters. High volume and low-cost manufacturing of semiconductor optoelectronic devices are playing an integral role in allowing for the deployment of high-speed communication links. Requirements of side mode suppression, reducing nonlinearities, reducing relative intensity noises and chirps, enhancing the bandwidth are key parameters that are leading for the enhancement of quality and the performance of fiber optic communication system. Optical injection locking (OIL) is one technique to overcome these limitations arising in developing better optical transmitters. Improved device performances can be achieved by locking the high-quality phase and frequency of the master laser to a low-quality slave laser. In this research, a proper optical injection locking system will be developed and characterized by the perspective of improving certain parameters in optical communication systems. A simulation model will be developed and then the characterization will be done for the locking range, bandwidth, amplitude, and phase noise transfer function. The anticipated output will be helpful for several applications like developing optical synchronization in phase-sensitive amplifiers which is useful for improving the transparent length and the operating margins of the optical network system. Also, it will build up a pathway to increase the speed of the optical communication system by the increment of the bandwidth.

Index terms— Optical injection locking, locking range, bandwidth, intensity and phase noise.

Acknowledgements

Firstly, I would like to express my sincere gratitude to my M.Phil supervisor Prof. L. W. P. R. Udayanga for the continuous support provided throughout the research, for his patience, motivation and immense knowledge. His guidance and support helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my M.Phil study.

Besides my supervisor, I would like to thank my co-supervisor: Dr. Y. A. Kumarayapa, and the progress review panel members Dr. V. R. Herath and Dr. T. N. Samarasinghe, for their insightful comments and encouragement, but also for the hard question which incented me to widen my research from various perspectives.

I thank my fellow research group members D. R. Munasinghe and S. E. Alahakoon for the stimulating discussions, for the sleepless nights we were working together before deadlines, and for all the fun we have had in the last two years. Also I thank my friends in the Department of Electronics and Telecommunication Engineering, University of Moratuwa.

Finally, I must express my very profound gratitude to my parents, to my two sisters and two brother in laws for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them.

Thank You...!
This is for you all....!

This research was conducted with the support of the grant (RG/2017/EA & ICT/03) of National Science Foundation of Sri Lanka (NSF).

Contents

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List of Abbreviations

Abbreviation	Description
OIL	Optical Injection Locking
RIN	Relative Intensity Noise
ASE	Amplified Spontaneous Emission Noise