University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

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BSc (University of Tehran, 2016)

"Design and Optimization of Avalanche Photodiodes"

Department of Electrical and Computer Engineering

Monday, January 14, 2019
2:00 P.M
Engineering Office Wing
Room 502

Supervisory Committee:
Dr. Tao Lu, Department of Electrical and Computer Engineering, University of Victoria (Supervisor)
Dr. Reuven Gordon, Department of Electrical and Computer Engineering, UVic (Member)

External Examiner:
Dr. Alexandre Brolo, Department of Chemistry, UVic

Chair of Oral Examination:
Dr. John Dower, School of Earth and Ocean Sciences, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Avalanche photodiodes are the primary choice for photodetection in optical access networks, due to their capacity to meet the current requirements of bandwidth and sensitivity introduced by NG-PON2. This work provides an effective tool for modeling and predicting the operation of an avalanche photodiode, paving the way to making better performing receivers. We employed Lumerical to obtain several steady state and transient parameters for a silicon germanium SACM waveguide avalanche photodiode, where close agreement is illustrated between our findings and measurements reported on fabricated devices. The utility of our work is further demonstrated by implementing and modeling a device, designed to meet certain fabrication specifications, where optimization guidelines are suggested afterwards. By providing an accurate approximation of the avalanche photodiode operation, we offer a cost-effective approach to address the problem of fabricating better devices in optical access networks. The introduced methods can be similarly used for other types of photodiodes, contributing to a vast range of applications.