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

of

ERADZH RAKHMATOV

BA (Lomonosov Moscow State University, 2017)

“Bright Upconverted Emission from Light-Induced Inelastic Tunneling”

Department of Electrical and Computer Engineering

Wednesday, January 8, 2020
10:00 A.M.
Engineering Computer Science Building
Room 660

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

External Examiner:
Dr. Devika Chithrani, Department of Physics and Astronomy, UVic

Chair of Oral Examination:
Dr. Caetano Dorea, Department of Civil Engineering, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Upconverted light from nanostructured metal surfaces can be produced by harmonic generation and multi-photon luminescence; however, these are weak processes and require extremely high field intensities to produce a measurable signal. Here we report on bright emission, 5 orders of magnitude greater than harmonic generation, that can be seen from metal tunnel junctions due to light-induced inelastic tunneling. Like inelastic tunneling light emission, which was recently reported to have 2% conversion efficiency per tunneling event, the emission wavelength recorded varies with the local electric field applied; however, here the field is from a 1560 nm femtosecond pulsed laser source. Finite-difference time-domain simulations of the experimental conditions show the local field is sufficient to generate tunneling-based inelastic light emission in the visible regime. This phenomenon is promising for producing ultrafast upconverted light emission with higher efficiency than conventional nonlinear processes.