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 (Beijing University of Technology, 2011)

"Power Line Communication Channel Models for Home Area Networks"

Department of Electrical and Computer Engineering

Monday, August 27, 2018
1:30 P.M.
Engineering and Computer Science Building
Room 468

Supervisory Committee:
Dr. T. Aaron Gulliver, Department of Electrical and Computer Engineering, University of Victoria (Supervisor)
Dr. Wu-Sheng Lu, Department of Electrical and Computer Engineering, University of Victoria (Member)

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Chair of Oral Examination:
Dr. Erin Kelly, Department of English, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Smart meters (SMs) are key components of the smart grid (SG) as they gather electrical usage data from residences and businesses. Home area networks (HANs) are used to provide two-way communications between SMs and devices within a building such as appliances. This can be implemented using power line communications (PLCs) on home wiring topologies. In this thesis, a HAN PLC channel model is designed based on a splitphase power system which includes branch circuits, a panel with circuit breakers and bars, a secondary transformer and the wiring of neighboring residences. A cell division (CD) method is employed to construct the channel model. Further, arc fault circuit interrupter (AFCI) and ground fault circuit interrupter (GFCI) circuit breaker models are developed. Several PLC channels are presented and compared with those obtained using existing models. PLC communication systems are affected by noise, thus a noise model is developed which is comprised of background and impulse noise. This noise model can be used to obtain the noise power spectral density (PSD) at receivers in the wiring topology.