University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

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BEng (University of Victoria, 2009)

"Time-Compression Overlap-Add (TC-OLA) for Wireless Communications"

Department of Electrical and Computer Engineering

Thursday, December 15, 2016
2:30 P.M.
Engineering and Computer Science Building
Room 660

Supervisory Committee:
Dr. Peter Driessen, Department of Electrical and Computer Engineering, University of Victoria (Supervisor)
Dr. Wyatt Page, Department of Electrical and Computer Engineering, UVic (Member)
Dr. George Tzanetakis, Department of Computer Science, UVic (Outside Member)

External Examiner:
Dr. Sarah Kate Wilson, Department of Electrical Engineering, Santa Clara University

Chair of Oral Examination:
Dr. Steve Perlman, Department of Biology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Time-compression overlap-add (TC-OLA) is presented as a novel method of communications over a (wireless) channel, which is shown to have benefits over other methods in some applications. TC-OLA is initially explored in an experimental context using a custom wideband software-defined radio (SDR) to gain insight into some of the possibilities of this method. Basic analysis is developed showing the processing gain, transmitted spectrum, and behaviour in fading channels. The method is considered as a candidate for low power wide area network (LPWAN) applications, highlighting the equivalent channel property, channel averaging, and ability to handle more simultaneous users in the uplink than other schemes in this application area. The method is then considered as an alternative to single carrier frequency domain equalization (SC-FDE) for ultrawideband (UWB) applications, where the ability to reduce or eliminate the cyclic prefix (CP) overhead while still using frequency domain equalization (FDE) techniques is highlighted. Additional application areas for this technology are briefly considered, including cognitive radio and radar. The process of patenting this technology is outlined in an appendix. The issued patent can be found through the United States Patent and Trademark Office (USPTO) as U.S. Patent 9,479,216.