Symposium on 5G Massive MIMO Research

September 26-28, 2017 – Quebec City, Canada

Venue: Hotel Quartier – 2955 Laurier Blvd, Quebec, G1V 2M2

Official Program

Tuesday September 26th

9:00 State of the SDR Technology – Tristan Martin, Director of Business Development, Nutaq

In my presentation, I will bring to light the fascinating story and circumstances behind Nutaq's first cellular product, the 2G LiteCell. I will discuss the issue of ICT in developing countries, with a cellular perspective. I will expose some of the companies' latest advancements in developing markets, with 2G and 4G technologies, and will follow with both the challenges and promises of 5G infrastructure and services delivery in rural areas. My presentation will end with an overview of Nutaq's innovation community and activities around 5G.

10:00 5G New Radio Evolution towards 2020 – Harpinder Matharu, Director of Communications Business, Xilinx

Market trends, lessons learnt in LTE/LTE-A/LTE-A Pro rollout, technical hurdles for commercialization of 5G NR and how to overcome them. Information on Xilinx advanced technology for 5G NR will also be presented.

11:00 RF Technology for Massive MIMO Systems – PhD Thomas Cameron, CTO Wireless Infrastructure, Analog Devices

Massive MIMO is clearly emerging as one of the foundational technologies for 5G systems. While providing significant spectral efficiency improvements, massive MIMO systems present designers with many challenges to meet the size, weight and power consumption requirements. In this presentation we will highlight some of these challenges in the RF domain. We will proceed to discuss how optimized radio architecture is required for the massive MIMO form factor and how the ADI CMOS transceiver technology

enables this optimized architecture. There are a number of areas for innovation within the massive MIMO system beyond radio transceiver such as filters size and power amplifier linearization that we will explore with possible solutions made possible by a combination of analog and digital innovations.

11:45 Unveiling of the demo area

- Demo #1: Uplink Massive MIMO – 32 antennas base station, 6 x single antenna UEs
- Demo #2: Digital Pre Distortion for Massive MIMO (DPD)
- Demo #3: Millimeter Wave Transceivers with Phase Shifters
- Demo #4: Millimeter Wave Transmission / Live OFDM transmission using SDR
- Demo #5: IoT Demo

12:00 Lunch & Visit of the demo area

13:00 Canada's Research Funding Programs and Collaborative Research Opportunities – Marc Quintin, PhD Paul Fortier, Nesrine Ouerghi & Maxime Clerk

Presentation of different research funding programs available in Canada, but also for international projects. Industrial Research Assistance Program (IRAP), National Reseach Council Canada, Mitacs, Natural Sciences and Engineering Research Council of Canada (NSERC), PROMPT, and the Research Support Program (PSR) - Component 4: Support for International Research and Innovation Initiatives (SIIRI).

14:45 Videotron Wireless Network – Road to 5G – Philippe Haurie, Director of Technology Evolution Planning & Eric Menu, Network Architect, Videotron

Videotron is an integrated communications company engaged in cable broadcasting, interactive multimedia development, Internet access services, telephony and wireless telephone services. In this presentation, we will discuss Videotron's mobile network, the evolution of the user's needs, the network evolution towards 5G and the challenges this poses.

15:45 Open Sky Laboratory for Smart Living – Jean-Marc Morlot, Senior Project Manager, Videotron & PhD Darine Ameyed, Postdoctoral Researcher, ETS

The Open Sky Laboratory for Smart Living is a project brought to life by Videotron in collaboration with Ericsson, the ETS and the Quartier de l'innovation (QI) designed for field-testing under real-life conditions concrete technological applications. In this presentation, we will discuss the mission of the Open Sky Lab, the ongoing projects, the process to submit projects and the selection criteria.

16:30 Cocktail Reception & Tapas at the Quartier Hotel.

Wednesday September 27th

09:00 5G Massive MIMO Research: From Theory to Prototyping – PhD Ahmed Ouameur, Radio System & Signal Processing Expert, Nutaq

Massive MIMO has been recognized by Next Generation Mobile Networks Alliance (NGMN) and 3GPP as one of the disruptive technologies for 5G to support the predicted capacity growth by a factor of 100+ compared to 4G. It has already made its way into the evolution of LTE in Release 13 in the form of FD-MIMO. While the theoretical researches shade the light on the enormous gains in spectral and energy efficiencies, prototyping is the only practical and convincing way to investigate to how extent such benefits can be harnessed. It is important to demonstrate if such gains will still be maintained under the contemporary hardware impairments and real propagation channels. The presentation is dedicated to the system design and analysis of a massive MIMO prototype using Nutaq's second generation SDR prototyping platform (TitanMIMO). The TDD frame structure, pilot assignment and the physical layer procedures (e.g., OFDM operation, frame synchronization, channel estimation, combining and pre-coding) are discussed. We will also show the latest simulation results of the newly patented NUTAQ's low complexity combining/precoding method while we leave the live UL demo for the workshop.

10:00 Radio Platforms for Sustainable Spectrum Management and mmWave Communications – PhD Francois Lefebvre, Communications Research Center Canada

The Communications Research Centre (CRC) is the Canadian federal government's centre of excellence with the mandate to perform wireless telecommunications R&D that advances the efficient exploitation of the radio spectrum, and to serve as the government's leading source of scientific knowledge and long-term technical advice on spectrum management, regulation and policy.

This presentation will provide an overview of CRC's main research programs and will describe the radio platforms, frameworks and tools that were developed, integrated and deployed as part of those programs.

Under its Spectrum Environmental Awareness program, CRC has developed a cloud-based spectrum monitoring system that relies on a wide range of spectrum sensors consisting of off-the-shelf radios, software defined radios, integrated vehicular radios and high-end radio frequency instruments. These sensors provide a mix of measurement capabilities: wideband spectrum scanning to analyze such parameters as channel occupancy and signal-to-noise ratio, to the analysis of specific wireless communications waveforms such as Wi-Fi and LTE. As these measurements are collected, the sensors upload the data to the cloud for later analysis and visualization by CRC's new Big Data Analytics Centre.

Under the Breaking the Frequency Barrier program, CRC is researching materials and surfaces to engineer the radio spectrum environment at mmWave frequencies. CRC is showing how these engineered surfaces can be used to improve mmWave propagation conditions and to optimize network deployments. To test

these materials and to demonstrate outdoor mobile communications at mmWave frequencies, radios were developed and deployed to conduct large-scale outdoor experiments at City Hall in downtown Ottawa during the summer 2017. These radios were integrated into CRC's mmWave base stations and user equipment prototypes for testing and demonstrations of CRC's engineered surfaces and pedestrian-speed mobility with LTE at 28GHz.

10:45 Real-Time MIMO Channel Sounder & Applications – PhD Pierre Laly, Research Engineer, University of Lille

A novel polarimetric multidimensional radio channel sounding equipment named MIMOSA developed by IEMN-TELICE (University of Lille, FRANCE) is presented in the framework of 4G and beyond mobile communication applications. The FPGA-based system measures 16x16 real-time radio frequency transfer functions within 200 micro-seconds over a 100 MHz bandwidth at 1.35 GHz. The architecture, capabilities, and evolution of the system will be presented and discussed. Furthermore, several ground-to-ground and ground-to-air measurement campaigns with MIMOSA will be introduced to highlight its potential for dedicated 5G applications such as mobile localization and geometry-based stochastic radio channel modeling.

11:30 Power Control and Precoding Strategy of Massive MIMO – PhD Wei-Ping Zhu, Professor and Graduate Program Director, Concordia University

The rapid growth in demand of smartphones and mobile data has created unprecedented challenges for wireless service providers to overcome a global bandwidth shortage. Development of massive MIMO enabled mmWave communication systems for the 5G wireless networks seems to be a promising solution, where the high path-loss at mmWave frequencies can be compensated by using large antenna arrays. However, the use of massive MIMO in mmWave communication faces some practical challenges, such as pilot contamination, accurate channel modelling and estimation, interference suppression, secure and energy efficient beamforming and power allocation etc. This talk will introduce some signal processing technologies for massive MIMO enabled mmWave communication, including sparse MIMO channel estimation, energy efficient power control of multiuser massive MIMO, secure and energy efficient beamforming use statistical CSI, hybrid precoding strategies for mmWave massive MIMO etc.

12:00 Lunch & Visit of the Demo Area

13 :00 Low Complexity Group Detection for Massive MIMO Multiuser Systems – PhD Francois Gagnon, École de Technologie Supérieure (ETS)

In the past years, we have performed extensive research into developing a combination of Heterogeneous Networks, MIMO and cognitive radio solutions for various scenarios: mobile ad-hoc for convoys, oversea

long range high rate communication, long range meshed fixed wireless… Massive MIMO technology, by its highly directional nature is particularly appealing to multi-user long range wireless applications. The possible use of a concentrated and geo-localized of antennas could be logistically appealing for emergency situations. By assuming that Radio Access Technologies and appropriate antennas become readily available, we are thus focussing on efficient signal processing schemes for Massive MIMO.

In particular, an efficient and low-complexity Sorted Signals Group Detection (SSGD) receiver for massive multiuser multiple-input multiple-output (MU-MIMO) system is proposed. Group detection (GD) technique consists of a zero-forcing (ZF) linear projection, after which the users' signals are split into groups. Maximum likelihood (ML) detection is applied to each group. To evaluate the proposed receiver, performance and complexity are compared with reported group detectors and linear receivers. Simulation results show proposed receiver obtains diversity order proportional to the size formed groups. Our data show that complexity of the proposed receiver converges to the ZF receiver for large numbers of users.

13:30 Massive MIMO in All-Spectrum Cognitive Networking – PhD Georgios Sklivanitis, Research Assistant at University of Buffalo

As the numbers of wireless mobile devices and data-intensive applications increase rapidly, there is an urgent need for developing efficient methods for spectrum utilization. Cognitive Radio (CR) has emerged as a promising technology for efficiently utilizing the available licensed radio spectrum. Even though CR paradigms for shared spectrum access have been extensively investigated in the literature, their hardware realization is yet quite challenging. In this talk we present an integrated complete hardware/software implementation of cognitive secondary radio users that operate in "gray spaces" and coexist with unknown narrowband or wideband primary spectrum licensees and discuss the potential benefits of massive multiple input multiple output (MIMO) in spectrum sharing. Cognitive channelization is achieved by jointly optimizing the transmission power and waveform of the cognitive secondary users. Particularly, we design and implement waveforms that span the whole continuum of device-accessible spectrum, while satisfying a peak power constraint for the secondary users and an interference temperature constraint for the primary users. The theoretical concepts of all-spectrum cognitive channelization are experimentally evaluated in a software-defined radio testbed in terms of pre-detection signal-to-interference plus noise ratio (SINR) and bit-error-rate (BER) at both primary and secondary receivers.

14:30 Towards Software-Defined 5G Networks – PhD Tommaso Melodia, Professor at Northeastern University & Director of Research at PAWR

This talk will discuss research challenges and solutions towards the development of highly programmable and reconfigurable 5G networks. The first part of the talk will provide an overview of the NSF Platforms for Advanced Wireless Research (PAWR) Program. In the second part, we will discuss ongoing research at the WiNES lab in Northeastern University. A radically different SDN approach will be discussed to control next-generation (i.e., 5G and beyond) cellular networks to go beyond existing SDN architectures to address the challenges brought by next generation wireless networks. We will showcase the new SDN approach by discussing an optimization-based operating system for infrastructure-less wireless networks

(e.g., D2D, ad hoc networks) and discuss open research problems. Finally, we will discuss key technologies to enable spectrally-efficient coexistence between LTE and Wi-Fi in unlicensed bands.

15:15 Shuttle from the Quartier Hotel to Old Quebec

16:00 Guided tour of Old-Quebec (on bus). You will be impressed by this UNESCO World Heritage site where fine old buildings and proud monuments line winding streets and picturesque places such as: the Château Frontenac, Dufferin Terrace, Notre-Dame-de-Québec basilica and Place Royale, the cradle of French civilization in North America.

18:00 Dinner at le Ciel! Bistro Bar. Located into an iconic part of Quebec City's skyline and overlooking the famous Grande-Allée, it is the only revolving restaurant in the city. *dinner is not included in the registration fees*

20:30: Shuttle back to the Quartier Hotel & Alt hotel

Thursday September 28th

9:00 Presentation of TitanMIMO & its Development Tools - Ahmed Kebe, Field Application Engineer, Nutaq

The aim of this lecture is to present Nutaq's SDR platform and its development tools, to move from simulations to over the air (OTA) experiments in a breeze, without worrying about the underneath hardware implementation. Attendees will learn how to program a FPGA with Nutaq Rapid Prototyping tool and create a host application to communicate with the SDR platform.

10:45 Phase & Gain Calibration – PhD Yu He, Field Application Engineer, Nutaq

Massive MIMO technology relies on phase-coherent but computationally very simple processing of signals from all the antennas at the base station. Nutaq has developed the phase and gain calibration algorithm on its TitanMIMO platform using Matlab scripts. With the phase and gain calibration, the channel difference of the TitanMIMO TRx can be controlled within only +/- 0.5 degrees in phase and 1% in gain. Researchers can easily implement their Massive MIMO algorithm on Nutaq TitanMIMO testbed without worrying about local TRx channel differences.

12:00 SDR Rapid Prototyping Tools: HDL Coder, the Comms Toolbox & LTE Toolbox – Darel Linebarger, Senior Manager Signal Processing & Communications, The Mathworks (Lunch & Learn Session)

Learn about tools that help you go from desktop simulation and prototyping of modern communications systems all the way to implementation on software defined radio using automatic code generation. We will touch on modeling of RF impairments and corrections, channel models, MIMO and phased arrays, as well as see reference designs for existing standards such as LTE-A, 802.11ac, ZigBee, etc.

13:30 Multiuser Massive MIMO Uplink – PhD Auon Muhammad Akhtar, R&D Developer, Nutaq

The demo provides an in-depth review of Nutaq's reference design for TDD based multiuser - Massive MIMO Uplink. We will walk through the hardware setup, the key software components and configurations, as well as the MATLAB mscripts for the Uplink waveform transmission and reception. The performance of the system will be analyzed by plotting the received signal constellation and BER in MATLAB.

15:15 Conclusion

Presenters

Tristan Martin, Director of Business Development, Nutaq

Tristan Martin holds a Bachelor's degree in Electrical Engineering (telecom profile) from University of Moncton, and a Master's degree in Computer Engineering from École Polytechnique de Montreal, with a research thesis focused on Digital Signal Processing. In 2011, he joined CAE as a software engineer where his responsibilities included the gathering of sound and vibration data on military aircrafts as well as supporting acceptance test procedures on flight simulators with Air Force and Royal Air Force pilots. Tristan joined Nutaq in 2013 as an application engineer, where he is currently the Director of Business Development.

Harpinder Matharu, Director of Communications Business, Xilinx

Harpinder Matharu is the Director of the Communications Business unit at Xilinx. He manages strategic marketing and growth initiatives for wireless business at Xilinx. He has more than 25 years' experience working in different capacities in the industry. At Xilinx, he has managed connectivity, radio, switching and packet processing products for the wireless infrastructure and backhaul. His current focus area is Cloud RAN, 5G, and SDN/NFV applications in the mobile networks. He has published many papers, spoken at industry events, and chaired standards technical/marketing bodies in the past.

Thomas Cameron, PhD & CTO Wireless Infrastructure, Analog Devices

Dr. Thomas Cameron is the CTO for the Communications Business Unit at Analog Devices. In this role he contributes to industry leading innovation in integrated circuits for radio basestations and microwave backhaul systems. He is currently working on the research and development of radio technology for 5G systems in both cellular and microwave frequency bands. Prior to his current role at Analog Devices he was Director of Systems Engineering for the Communications Business.

Dr. Cameron has over 30 years of experience in research and development of technology for telecom networks including cellular basestations, microwave radios and cable systems. Prior to joining Analog Devices in 2006, he contributed to the development of a broad range of RF systems and technologies over his career at Bell Northern Research, Nortel, Sirenza Microdevices and WJ Communications.

Dr. Cameron holds a Ph.D. in Electrical Engineering from the Georgia Institute of Technology. He holds 7 patents and has authored numerous papers and articles.

Philippe Haurie, M. Ing., Director of Technology Evolution Planning, Videotron

Mr. Haurie has been active in the telecommunication business for over 35 years. He graduated with a Masters of Engineering degree from École Polytechnique of Montreal and has held various senior engineering and management positions in Nortel Networks. He has worked in the fields of Optical Transmission and Microwave Radio, and has led multidisciplinary engineering teams for the deployment of Nortel products worldwide. Philippe was then president of a start-up company providing expert consulting services for telecommunication business opportunities. He has also been a project manager in R&D for Alstom, involved in the deployment of IP communication services for high-speed European trains. He has joined Videotron in 2006 and was responsible for the modernization of the Hybrid Fiber Coax network for the greater Montreal region as well as the creation of the standardization group. He is presently directing a group of network architects and engineers looking into the long term evolution of the network.

Éric Menu, M.Phy, Network Architect, Videotron

M. Menu has been active in the telecommunication business for 20 years. He graduated with a Masters of applied physics from “Joseph Fourier University” of Grenoble, France and with engineering diploma from “Telecom Bretagne” of Brest, France. He has started his career working for the French scientific international cooperation program as coordinator in an ionospheric measurement station in Korhogo, Ivory Coast Republic. Back in France Eric worked for Alcatel submarine Networks in the Paris area in the field of optical amplifiers tests and design before moving to Montreal Canada where he worked as test & measurement specialist at ITF optical technologies on passive fiber components, optical amplifiers and fiber lasers. He is now working at Videotron for almost 10 years and has been involved in various projects : modernization of the Hybrid Fiber Coax network for the greater Montreal region, operational procedures, new generation of video set-top-box, Docsis 3.1, FTTH, wireless operation documentation, etc.

Jean-Marc Morlot, Senior Project Manager, Videotron

Jean-Marc Morlot is a senior project manager of the Technology Development, Engineering Networks unit at Videotron. He manages the Open Air Smart Living Laboratory program in partnership with Ericsson, l'École de tehnologie supérieure (ETS) and the Quartier de l'Innovation. He has more than 19 years of experience in the telecommunications industry in both mobile service operators and equipment manufacturers. He worked on the implementation of several technologies from 2G to LTE in North America, South America and Asia.

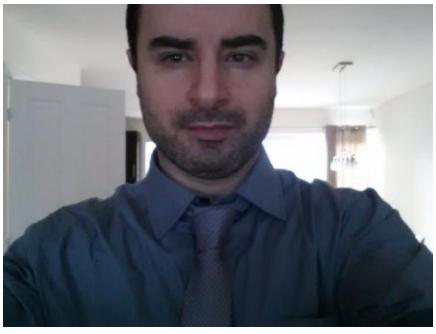
Darine Ameyed, PhD & Postdoctoral Researcher, École de Technologie Supérieure (ETS)

Darine Ameyed holds a Ph.D. in software engineering and Information Technologies. She is currently a postdoctoral at Synchromédia lab, École Technologie Supérieure (ÉTS), Montreal. At the same time, she is a liaison officer in Interdisciplinary research centre on sustainable development operationalization (CIRODD). In addition, she is the CEO and Co-founder of NYX-R, a start-up that offers an innovative solution for smart-grid air quality monitoring using big data and AI technologies.

Her research interests include: predictive modeling in context-aware system, ambient intelligence, user and crowd behavior in smart spaces, human centred computing, machine learning and activity recognition.

During her last year of Ph.D., Darine has been invited to many events as an expert in AI, smart-space and green ITC to discuss the future of the smart-cities. Additionally, she was involved in many other projects as creator, researcher and expert; such as, the project of smart Fab-Lab nation in Canada, the Open Air Laboratory for Smart Living and she is in charge of green ITC topic in CIRODD.

Ahmed Ouameur, PhD & Radio System and Signal Processing Expert, Nutaq



Dr. Messaoud Ahmed-Ouameur received a bachelor degree in electrical engineering from the *Institut national d'électronique et d'électricité* (INELEC) in Boumerdes, Algeria in 1998. In 2002 and 2006, he went on to receive masters and Ph.D degrees in electrical engineering from the *Université du Québec à Trois-Rivières (UQTR) in Trois-Rivières,* Canada. He also received a master's degree with honours in business administration (MBA) in 2000 from the Graduate School of International Studies at AJOU University in Souwan, South Korea.

From 2001 to 2006, Dr. Ahmed Ouameur worked for Axiocom Inc. as the Director of Research and Development. His research included wireless communications, spread-spectrum systems, iterative (turbo)

detection, channel estimation and real-time very-large-scale integration (VLSI). He holds two patents on the area of channel estimation and multiuser detection for CDMA systems.

Dr. Ahmed Ouameur joined Nutaq in November 2006. As a Nutaq radio system and signal processing technical leader, his tasks involve radio transceiver system design, prototyping and performance analysis in a variety of areas, including GSM, WCDMA and LTE, embedded signal processing algorithm design and implementation. His current focus are on power efficient radio design, software defined mmWave and massive MIMO systems design. He has recently filed a patent on an efficient implementation of a linear detection/precoding technique for massive MIMO.

François Lefebvre, Research Director, Communications Research Centre Canada

During his 18 years with the Communications Research Centre Canada, Mr. Lefebvre has participated and led several innovative research and development projects in multimedia broadcasting, wireless communication systems and emerging applications. Mr. Lefebvre currently leads CRC's Radio Technologies team as Research Director. Prior to this Mr. Lefebvre started his career in France and Germany where he worked for ten years as developer and project leader for research laboratories and as consultant. Mr. Lefebvre earned his bachelor's degree and master's degree in electrical engineering from Laval University, Québec, Canada.

Pierre Lally, PhD & Research Engineer, University of Lille – IEMN TELICE Group

Pierre Laly received the degree in Electronics and Telecommunications from the Institut Universitaire de Technologies (IUT) de Lille, Lille, Feance, in 1991, where he received the Licence degree in telecommunication network in 2002. From 1991 to 1999, he was with Micropuce Inc., Villeneuve dAscq, France. He joined the University of Lille 1 and the IEMN/TELICE Group in 2000, where he is currently an Engineer. He gained a Ph.D. degree in Electrical Engineering from the University of Lille 1, Villeneuve d'Ascq, France, in 2016. His research interests include the development of scientific equipment and measurement techniques for wire or wireless communication systems.

Wei-Ping Zhu, PhD, Professor and Graduate Program Director, Concordia University

Wei-Ping Zhu (SM'97) received the B.E. and M.E. degrees from Nanjing University of Posts and Telecommunications, and the Ph.D. degree from Southeast University, Nanjing, China, in 1982, 1985, and 1991, respectively, all in electrical engineering. He was a Postdoctoral Fellow from 1991 to 1992 and a Research Associate from 1996 to 1998 with the Department of Electrical and Computer Engineering, Concordia University, Montreal, Canada. During 1993–1996, he was an Associate Professor with the Department of Information Engineering, Nanjing University of Posts and Telecommunications. From 1998 to 2001, he worked with hi-tech companies in Ottawa, Canada, including Nortel Networks and SR Telecom Inc. Since July 2001, he has been with Concordia's Electrical and Computer Engineering Department as a full-time faculty member, where he is presently a Full Professor. His research interests include digital signal processing fundamentals, speech and statistical signal processing, and signal processing for wireless communication with a particular focus on MIMO systems and cooperative communication.

Dr. Zhu served as an Associate Editor for the IEEE Transactions on Circuits and Systems Part I: Fundamental Theory and Applications during 2001-2003, an Associate Editor for Circuits, Systems and Signal Processing during 2006-2009, and an Associate Editor for the IEEE Transactions on Circuits and Systems Part II: Transactions Briefs during 2011-2015. He was also a Guest Editor for the IEEE Journal on Selected Areas in Communications for the special issues of: Broadband Wireless Communications for High Speed Vehicles, and Virtual MIMO during 2011-2013. Currently, he is an Associate Editor of Journal of The Franklin Institute. Dr. Zhu was the Secretary of Digital Signal Processing Technical Committee (DSPTC) of the IEEE Circuits and System Society during June 2012-May 2014, and the Chair of the DSPTC during June 2014-May 2016.

François Gagnon, PhD & Professor, École de Technologie Supérieure (ETS)

François Gagnon holds a Bachelor of Engineering degree and a Doctorate in Electrical Engineering from the École Polytechnique de Montréal, and has been a professor in the Department of Electrical Engineering at the École de technologie supérieure (ÉTS) since 1991. He served as director of this department from 1999 to 2001. He has held industrial research chairs since 2001.

In addition to holding the Richard J. Marceau Industrial Research Chair for Wireless Internet in developing countries, François Gagnon also holds the NSERC-Ultra Electronics Chair in Wireless Emergency and Tactical Communication, the most prestigious industrial chair program in Canada. He also founded the Communications and Microelectronic Integration Laboratory (LACIME) and was its first director. He has been very involved in the creation of the new generation of high-capacity line-of-sight military radios offered by the Canadian Marconi Corporation, which is now Ultra Electronics Tactical

Communication Systems. Ultra-Electronics TCS and ÉTS have obtained the NSERC Synergy prize for this collaboration. Professor Gagnon serves on the boards of funding agencies and companies, he specializes in wireless communications, modulation, coding, microelectronics, signal processing, equalization, software-defined radio, mobile communication and fading channels. He is actively involved in the SmartLand project of UTPL, Ecuador, the STARACOM strategic research network and the Réseau Québec Maritime.

Georgios Sklivanitis, PhD & Research Assistant at University of Buffalo

Born in Athens, Greece, Georgios Sklivanitis received his Diploma degree in Electronic and Computer Engineering from the Technical University of Crete, Greece, in 2010. He is currently working toward his Ph.D. degree in electrical engineering at the State University of New York at Buffalo, and his research interests span the broad areas of signal processing, software-defined wireless communications and networking, cognitive radio, and underwater acoustic communications. In 2014, he was the first finalist and winner of the 2014 Nutaq Software-Defined Radio Academic US National Contest and in 2015 he received the 10th ACM International Conference on Underwater Networks and Systems Best Demo Award. Mr. Sklivanitis is a recipient of the 2015 SUNY Buffalo Graduate Student Award for Excellence in Teaching, the 2016 SUNY Buffalo Student Entrepreneur Fellowship and the 2017 SUNY Chancellor's Award for Student Excellence.

Tommaso Melodia, PhD, Professor at Northeastern University & Director of Research at PAWR

Tommaso Melodia received the Ph.D. degree in Electrical and Computer Engineering from the Georgia Institute of Technology, Atlanta, GA, USA, in 2007.

He is an Associate Professor with the Department of Electrical and Computer Engineering, Northeastern University, Boston, MA, USA. He is serving as the lead PI on multiple grants from U.S. federal agencies including the National Science Foundation, the Air Force Research Laboratory, the Office of Naval Research, and the Army Research Laboratory. He is the Director of Research for the PAWR Project Office, a public-private partnership that is developing four city-scale platforms for advanced wireless research in the Uniter States. His research focuses on modeling, optimization, and experimental evaluation of wireless networked systems, with applications to 5G Networks and Internet of Things, software-defined networking, and body area networks.

Prof. Melodia is an Associate Editor for the IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, the IEEE TRANSACTIONS ON MOBILE COMPUTING, the IEEE TRANSACTIONS ON BIOLOGICAL, MOLECULAR, AND MULTI-SCALE COMMUNICATIONS, Computer Networks, and Smart Health. He is the

Technical Program Committee Chair for IEEE INFOCOM 2018. He is a recipient of the National Science Foundation CAREER award and of several other awards.

Darel Linebarger, PhD, Senior Manager Signal Processing & Communications, The Mathworks

Darel Linebarger joined MathWorks in May of 2000, where he now manages their Signal Processing and Communications System Design group. Prior to that, he was on the electrical engineering faculty of the University of Texas at Dallas for twelve years. While at UT Dallas, he consulted for Texas Instruments' wireless communications group on the topic of fixed-point modeling for communications systems. He has authored or co-authored numerous papers and patents and is a Senior Member of the IEEE. He holds an M.S. and Ph.D. from Rice University.