



Electrical and Computer Engineering

IEEE Distinguish Lecture

Title

Advances in Antenna Systems for Future Wireless Terminals

Thursday, November 14

4:00 – 5:00 p.m.

HEC-113

Abstract

A tremendous increase in the achievable data rates will be expected from the fifth generation (5G) wireless standard. This increase (almost x1000) will be spread between the antenna systems, network architecture, radio front ends, and signal structure. Multiple-input-multiple-output (MIMO) technology has been utilized heavily in 4G terminals and will continue to serve as a key technology in 5G ones as it provides data rate increase without power or bandwidth increase. In addition, backward compatibility with 4G dictates the use of MIMO in 5G enabled terminals. The use of millimeter-wave (mm-wave) bands is essential to provide high data throughputs due to the excess bandwidth they offer and has already been approved for 5G use. In this talk, technology trends and the features of 5G wireless standards will be presented. Then some of the major enabling technologies for 5G such as massive MIMO (MaMi) and mm-wave will be highlighted along with their features and applications. Challenges in the design of antenna systems for these enabling technologies will be discussed in terms of complexity, size, etc. Specifications and design guidelines will follow. Several metallic based mm-wave MIMO antennas, dielectric-resonator antennas (DRAs), active integrated and reconfigurable MIMO Antennas will be discussed. In addition, MaMi arrays with beam-steering capabilities will be presented. The concept and modeling of multi-functional antenna systems and integrated 4G/5G handset antenna solutions will be shown with real examples.



Dr. Mohammad S. Sharawi

Biography

Mohammad S. Sharawi is a Professor of Electrical Engineering at Polytechnique Montréal, Montréal, Québec, Canada. He is also a member of the Poly-Grames Research Center at Polytechnique. He was with King Fahd University of Petroleum and Minerals (KFUPM), Saudi Arabia, between 2009-2018. He founded and directed the Antennas and Microwave Structure Design Laboratory (AMSDL) at KFUPM. He was a visiting Professor at the Intelligent Radio (iRadio) Laboratory, Electrical Engineering Department, University of Calgary, Alberta, Canada, during the Summer-Fall of 2014. He was a visiting research Professor at Oakland University during the summer of 2013. Prof. Sharawi's areas of research include Multiband Printed Multiple-Input-Multiple-Output (MIMO) Antenna systems, Reconfigurable and Active integrated Antennas, Applied Electromagnetics, Millimeter-wave MIMO antennas and Integrated 4G/5G antennas for wireless handsets and access points. He has more than 250 papers published in refereed journals and international conferences, 8 book chapters, one single authored book entitled "Printed MIMO Antenna Engineering," Artech House, 2014, and the lead author of the recent book "Design and Applications of Active Integrated Antennas," Artech house, 2018. He has 19 issued and 15 pending patents in the US Patent Office. He is serving as the Associate Editor for the IEEE Antennas and Wireless Propagation Letters (AWPL), IET Microwaves, Antennas and Propagation (MAP), as well as Wiley Microwave and Optical Technology Letters (MOP). He served on the Technical and organizational program committees of several international conferences such as EuCAP, APS, IMWS-5G, APCAP, IWAT among many others.