

# Millimeter-wave Antennas for 5G Cellular Communications

## Abstract:

Nowadays, millimeter-wave antennas using advanced technologies are one of the advanced research topics, which have received much interest from many research and industrial groups worldwide. Using advanced design approaches, new mm-wave antennas can be developed and used as an enabling technology to improve the performance of future 5G cellular communication systems. These approaches are based on using advanced materials, including dielectric resonators, ridge gap structures and metamaterials. The objective is to design and implement new compact, low profile, and low cost mm-wave antennas with high performances in terms of gain, efficiency and bandwidth. With these features, they can be used to improve the performances of future 5G wireless communication systems. For instance, they allow saving energy, increasing the coverage area, and reducing interference, which lead to good transmission quality. In this topic, I will present a talk about three different antenna technologies: using dielectric resonators, ridge gap structure and metamaterials. In this talk, I will first give an overview of antennas and their applications in wireless communications. Next, I will present three different configurations of mm-wave antennas: mm-wave dielectric resonator antennas, mm-wave ridge gap based antennas and mm-wave metamaterial antennas. To show the performances of these antennas, some example of simulated and experimental results will be presented and discussed. Finally, concluding remarks and will be given.



**Tayeb A. Denidni** (M'98–SM'04) received M. Sc. and Ph.D. degrees in electrical engineering from Laval University, Quebec City, QC, Canada, in 1990 and 1994, respectively.

From 1994 to 2000, he was a Professor with the engineering department, Université du Québec in Rimouski (UQAR), Rimouski, QC, Canada, where he founded the Telecommunications laboratory.

Since August 2000, he has been with the Institut National de la Recherche Scientifique (INRS), Université du Québec, Montreal, QC, Canada. He found RF laboratory at INRS-EM, Montreal. He has a great experience with antenna design and he is leading a large

research group consisting of three research scientists, six Ph. D students, and one M.Sc. student. He served as a principal investigator on many research project sponsored By NSERC, FCI and numerous industries. His current research areas of interest include reconfigurable antennas using EBG and FSS structures, dielectric resonator antennas, metamaterial antennas, adaptive arrays, switched multi-beam antenna arrays, ultra-wideband antennas, microwave and development for wireless communications systems. From 2008 to 2010, Dr. Denidni served as an Associate Editor for IEEE Transactions on Antennas Propagation. From 2005 to 2007, Dr. Denidni served as an Associate Editor for IEEE Antennas Wireless Propagation Letters. Since 2004, he has been elevated to the grade of Senior Member of the IEEE. In 2012 and 2013, he was awarded by INRS for outstanding research and teaching achievements.