# Wideband Antennas for Modern Wireless Communications

**by Prof Luk Kwai Man**

**Abstract**

With the proliferation of cellular phones, wireless technologies have penetrated many aspects of our daily lives. In all wireless systems, the antenna is crucial in determining the overall system performance. New high-performance antennas are continuously demanded from wireless system designers. In particular, design of wideband antennas with stable radiation pattern and beam width, reconfigurable operating frequency range, and low fabrication costs for millimeter wave systems, is highly challenging.

Dipole antennas are simple in structure but poor in radiation pattern control. Microstrip patch antennas are low in profile but narrow in bandwidth. Although various methods are available to increase their bandwidths, the radiation pattern and gain of patch antennas vary undesirably over the operating frequency range. Recently, a new class of wideband antennas designated as the magneto-electric dipoles was proposed. These antennas were designed based on the complementary antenna concept. The basic structure consists of a planar electric dipole and a shorted quarter-wave patch antenna. These novel antenna elements have many attractive features, including wide impedance bandwidth, low cross polarization, low back radiation, nearly identical radiations in the two principal planes, stable radiation pattern, and constant antenna gain over the operating frequency range. They can be designed with linear polarization, circular polarization or dual polarization. In this talk, the operating principle of this antenna will be discussed and the latest development for various wireless applications, including 4G, cognitive radio, and the millimeter-wave 60 GHz system will be presented.

**Biography**

Prof Luk was born and educated in Hong Kong. He received his B.Sc.(Eng.) and Ph.D. degrees in electrical engineering from HKU in 1981 and 1985, respectively. He is currently Chair Professor of Electronic Engineering and was Head of Department of Electronic Engineering and Director of State Key Laboratory of Millimeter Waves at the City University of Hong Kong. His recent research interests include design of wideband patch antennas, dielectric resonator antennas, microwave and antenna measurements, and millimeter wave technologies. He is the author of 3 books, 9 research book chapters, over 315 journal papers and 220 conference papers. He was awarded 5 US patents and over 10 PRC patents on the designs of various printed antennas.

Prof Luk is a Fellow of IEEE, IET, CIE, FEA and HKIE. He received the Japan Microwave Prize at the Asia Pacific Microwave Conference in 1994, the Applied Research Excellence Award of City University of Hong Kong in 2001, the Croucher Award of Hong Kong in 2003, the Best Student Paper Awards (with his students) at the Asia Pacific Microwave Conferences

in 2005 and 2006, the Best Paper Award at the International Symposium on Antennas and Propagation in 2008, and the State Technological Invention Award of China (2nd Honor) in 2012.

Prof Luk was the chief guest editor of a special issue on “Antennas in Wireless Communications” for Proceedings of the IEEE. His is a deputy editor-in-chief of PIERS journals.