

An Engineering Approach Towards Creating Ubiquitous THz Applications

Dr Stepan Lucyszyn
European Microwave Lecturer and
Director, Centre for Terahertz Science and Engineering, Imperial College London
s.lucyszyn@imperial.ac.uk and stepan@ieee.org

Within the wider terahertz (THz) frequency range (ca. 0.1 to 10 THz), the sub-millimetre wave frequency band (between 0.3 and 3 THz) is still considered to be a largely unexplored part of the electromagnetic spectrum. This 'THz Gap', between conventional electronics and photonics, offers the real potential for both scientific and commercial exploitation. However, while the majority of THz groups around the world focus on the former, it is the latter that offers the key to bridging the THz Gap for creating ubiquitous applications. To this end, new engineering solutions are needed in modelling (mathematical & numerical), design (synthesis & analysis) and fabrications (precision & volume production). As ubiquitous THz applications emerge, the costs of associated passive components, active devices and metrology will fall, creating a positive spiral of growth in all areas; enhancing our modern day living and with the prospect of a huge societal and economic impact.

This lecture will examine the various facets associated with adopting an engineering approach towards creating ubiquitous THz applications. More specifically, for the many engineers currently working at microwave and millimetre-wave frequencies (below ca. 100 GHz), the challenges for working with shorter wavelengths and with more complicated carrier transport and molecular physics will be explained. The lecture will also give, by example, a unique perspective on THz engineering – with conventional approaches and new paradigm shifts – from nano structures, metamaterials and solid-state & vacuum electronics to complete systems level integration, ubiquitous applications and their impact.

Biography



Stepan Lucyszyn *PhD, DSc, FIEE, FInstP, FEMA*, is currently a Reader (Associate Professor) in Millimetre-wave Electronics and Director of the Centre for Terahertz Science and Engineering, at Imperial College London. For over 15 years, Dr Lucyszyn has been working on millimetre-wave electronics and, since 2004, investigating the behaviour of materials and passive structures operating at THz frequencies and ultralow-cost THz engineering for ubiquitous applications.

In 2010, he was awarded the DSc degree (higher doctorate) of Imperial College for his contributions to Millimetre-wave and Terahertz Electronics. From Oct. 2010, Dr Lucyszyn was on a one-year sabbatical at the Photon Science Centre of the University of Tokyo (Japan), within the Gonokami Laboratory (Department of Physics).

Dr Lucyszyn has (co-)authored approximately 140 research papers and 11 book chapters in applied physics and electronic engineering. In 2005, he was elected Fellow of the Institution of Electrical Engineers (UK) and Fellow of the Institute of Physics (UK), and in 2008 was invited as a Fellow of the Electromagnetics Academy (USA). In 2011, Dr Lucyszyn was the Chairman of the 41st European Microwave Conference, held in Manchester (UK). In 2009 he was appointed an IEEE Distinguished Microwave Lecturer (DML) for 2010-2012. Dr Lucyszyn is currently an Emeritus DML for 2013 and a newly appointed European Microwave Lecturer (EML) for the European Microwave Association.