

**WIRELESS MYTHS, REALITIES AND FUTURES:
FROM CLASSIC RADIO-FREQUENCY TO VISIBLE-LIGHT AND
QUANTUM-SOLUTIONS**

Lajos Hanzo

Southampton Wireless

School of Electronic and Computer Science

University of Southampton

SO17 1BJ, UK

<http://www-mobile.ecs.soton.ac.uk>

lh@ecs.soton.ac.uk

Abstract

Since Marconi demonstrated the feasibility of radio transmissions, researchers have endeavoured to fulfill the dream of flawless 'tele-presence' - at the touch of a dialling key relying on the future wireless solutions to be discussed in this inaugural.

Commencing with a light-hearted historical perspective on the generations of wireless systems, it is demonstrated that the demand for popular wireless communications services far outstrips the increase in system capacity. Hence the prevalent trend is to move to ever-higher carrier frequencies in the electromagnetic spectral domain. In this context a brief excursion is offered through the realms of optical wireless communications, before revealing another imminent limitation imposed by the on-going miniturization of the nano-electronics components obeying Moore's law. Indeed, this on-going miniturization will imminently lead to new types of impairments encountered by quantum-electronics components. It will also be demonstrated that the powerful parallel processing capability of quantum-search algorithms can be invoked for solving large-scale search problems often encountered in wireless communications.

In parallel to our four-decade tour of enabling techniques it is also demonstrated that the above-mentioned large-scale optimization problems require powerful multi-component optimization techniques, which necessitates a paradigm-shift from the classic single-component bandwidth- or power-efficiency optimization. A number of compelling application scenarios, such as vehicular *ad hoc* networks, aeronautical *ad hoc* networks and cooperative drone-networks will be used as our near-future applications. We will use radically new quantum-search techniques for solving a multi-component network-optimization problem.



Lajos Hanzo is a Foreign Member of the MTA, Fellow of the Royal Academy of Engineering, of the IEEE, of the IET and of the EURASIP. During his career in telecommunications he has held various research and academic posts in Hungary, Germany and the UK. Since 1986 he has been with the

School of ECS, University of Southampton, UK, where he holds the Chair in Telecommunications. He co-authored 18 Wiley - IEEE Press books and 1600+ research contributions at IEEE Xplore