

Department of Electrical Engineering  
Presents an online seminar on

**Programable Surface Wave: The Communication Autobahn**

by

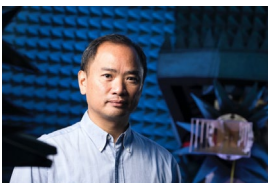
**Prof. Kenneth K F Tong**

*Professor of Antennas and Applied Electromagnetic  
University College London*

**Abstract**

Cabled communication, despite its high capacity, has limit in scalability because of its inherent point-to-point connectivity. On the other hand, wireless communications by contrast give the convenience of ubiquitous communication without the physical restrictions, which has completely transformed the way people live and interact with the world at anywhere anytime in the era of Internet of Everything (IoE). We have also witnessed a shift in research focus from outdoors to indoors since most data demand now tends to take place in indoor environments. Providing certainty in performance from dynamic media is the fundamental problem for wireless communications. Randomness due to channel fading and unpredictable interference makes it uniquely challenging. This has motivated the emerging concept of smart radio environment. In this talk, a new vision of smart radio environment that considers the use of surface wave propagation will be discussed. Different from free-space propagation, surface wave travels between the interface of materials with different permittivity and it is made to be confined on the surface. A unique advantage of surface wave communications over free-space communications is its much more favourable pathloss, which is proportional to the distance,  $d$ , instead of the squared distance, i.e.,  $d^2$  in the case of free-space communications. Also, confining the communication to the surface means that interference management becomes a lot easier since it can be managed on a particular pathway using software-controlled waveguiding surfaces. This concept can be further enabled by a software-controlled fluidic structure our team proposed recently. The outcome resembles a transportation network of surface wave communications superhighways on surfaces equipped with meta-atoms, providing various functionalities of a smart radio environment. Making possible exceptionally localized high-speed interference-free data access. An outline of the opportunities and associated challenges arisen from the SW paradigm will be introduced. We shall also attempt to shed light on several key enabling technologies that make this realizable. One important technology which will be discussed is a software-controlled fluidic waveguiding architecture that permits dynamic creation of high-throughput data highways. I believe SW can be a key technology which may impact the development of future wireless systems.

**Biography**



Prof Tong is a Professor of Antennas and Applied Electromagnetic at UCL. He has a strong track record in novel wideband antennas, circularly polarised patch antenna designs and microwave/mmWave techniques. His career aspiration is to make a real impact to our society through world-leading research activities and innovations, which is evident in his pathway to impact: from fundamental research to innovation, industrial collaboration, patents, commercialisation of technologies, and to engagement with policy makers, schools and the general public. He has published 3 book chapters, 67 peer-reviewed journals and 93 conference papers with an h-index of 27. He is active in knowledge transfer; his Innovate UK project was graded as “OUTSTANDING”, i.e., the top 5% among all projects. The project was reported in the Parliamentary Review of UK. He was the winner of the UCL Knowledge Transfer Business of the Year Award 2015, and the 2017 UCL Provost’s Spirit of Enterprise Award. He is a Chartered Engineer in the UK, a Senior Member of the IEEE and a Fellow of the Electromagnetics Academy (MIT, USA). He is serving as a Subject Editor for Antennas for IET Electronics Letters. He was the General Chair for the IEEE iWEM 2017. Currently, Prof Tong is also working actively in fluid antennas, surface waves and wideband mmWave transducers for future wireless communications systems.

Date : 23 August 2021 (Monday)  
Time : 5:00pm – 6:00pm  
Language : English  
Online Registration : Please register for the Zoom session [HERE](#)  
(\*Please register with [EID]@cityu.edu.hk for email address.)

**\*\* ALL ARE WELCOME \*\***