

## Distinguished Technical Seminar Series

# Advances in Microwave Metasurface Lens Antenna Research Based on Prior Knowledge-Guided Deep Learning Antenna Synthesis

by

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Time: 4:00 pm – 5:00 pm

Venue: G4702, Yeung Kin Man Academic Bldg., CityU

### Abstract

The lens is the oldest optical antenna. In microwave systems, flat and lightweight metasurface lenses (metalenses) based on PCB technology are rapidly advancing. As a new technology in this historical field, the improvement in metasurface lens performance relies entirely on the performance limits of metacells. This presentation first introduces how to use Prior Knowledge-Guided Deep Learning (PK-DL) for electromagnetic structure synthesis. Using the PK-DL synthesis method for metacell design breaks through the phaseshift limits of existing three-layer metacell designs and significantly enriches the metacell library. With the metacells designed using PK-DL, a broadband high-gain metasurface lens is designed. This not only improves the performance of existing lens antennas but also significantly expands the boundaries of metacell research. It provides a new case for how technical innovation and breakthroughs can be achieved. This research is highly forward-looking and innovative, particularly in the field of microwave systems and antenna technology. The combination of deep learning and prior knowledge provides powerful tools for solving complex electromagnetic structure problems, opening up new possibilities for future research and applications.

### Biography



**Prof. Zhi Ning Chen** received his BEng, MEng, and PhD degrees all in Electrical Engineering from the Institute of Communications Engineering (ICE), China and his second PhD degree from the University of Tsukuba, Japan, respectively. In 2012, he joined the Department of Electrical and Computer Engineering, National University of Singapore as a tenured Full Professor and now he is Provost Chair Professor and Director of Advanced Research and Technology Innovation Center of FoE. Dr Chen is the recipients of IEEE John Kraus Antenna Award (2021), International Symposium on Antennas and Propagation Best Paper Award in 2010, the CST University Publication Awards in 2008 and 2015, ASEAN Outstanding Engineering Achievement Award in 2013, Institution of Engineers Singapore Prestigious Engineering Achievement Awards in 2006, 2013 (two awards), and 2014, I2R Quarterly Best Paper Award in 2004, IEEE iWAT Best Poster Award in 2005, several technology achievement awards from China during 1990-1997 as well as more than 21 academic awards by the students under his supervision. Dr Chen was elevated the Fellow of Academy of Engineering, Singapore in 2019 and a Fellow of the IEEE for the contribution to small and broadband antennas for wireless applications in 2007. He has served IEEE

Council on RFID as a Vice President and a Distinguished Lecturer since 2015. He served IEEE Transaction on Antennas and Propagation as an Associate Editor and IEEE Antennas and Propagation Society as a Distinguished Lecturer.

~~~ All are welcome ~~~

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