香港大學 機械工程系
Department of Mechanical Engineering
THE UNIVERSITY OF HONG KONG

SEMINAR

Quantum-Inspired Inverse Design of Metasurfaces: From Beam Shaping to Near-Field Focusing

Date: 3 November, 2026 (Tuesday)
Time: 4:00 p.m.
Venue: Room 7-35
Haking Wong Building
HKU

Speaker: Professor Wei E. I. Sha
College of Information Science & Electronic Engineering
Zhejiang University
China

Abstract:

Metasurfaces and metamaterials offer unprecedented capabilities for manipulating electromagnetic waves, enabling applications ranging from beam shaping and wavefront engineering to near-field focusing. However, the inverse design of large-scale metasurfaces remains computationally challenging, particularly when discrete structural configurations, multiple design objectives, and practical fabrication constraints are involved. This talk introduces quantum-inspired computing as an efficient approach to addressing these challenges. By mapping electromagnetic optimization problems onto Ising models and quadratic or higher-order unconstrained binary optimization (QUBO/HUBO) formulations, quantum-inspired algorithms, particularly simulated bifurcation, provide an alternative framework for exploring large combinatorial design spaces. Several representative examples will be presented, including programmable metasurface beam shaping, sidelobe suppression, space-time wavefront control, and multi-target near-field focusing. The talk will also discuss how physics-based modeling and quantum-inspired optimization can be integrated into metasurface inverse design, with particular attention to discrete unit-cell configurations, design scalability, and practical implementation. Finally, opportunities for bridging computational optimization, metamaterial design, and experimental realization will be highlighted.

Biography:



Wei E. I. Sha (Fellow, IEEE) received his Ph.D. degree in electronic engineering from Anhui University, Hefei, China, in 2008. From 2008 to 2017, he was a Postdoctoral Research Fellow and subsequently a Research Assistant Professor with the Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong. In 2017, he joined Zhejiang University, Hangzhou, China, through a national young talent program. From 2018 to 2019, he was a Marie Skłodowska-Curie Individual Fellow at University College London, London, U.K. He is currently a tenured Associate Professor with the College of Information Science and Electronic Engineering, Zhejiang University, where he also serves as Deputy Director of the Institute of Electromagnetic Information and Electronic Integration.

Dr. Sha has authored or co-authored two books, 12 book chapters, and over 230 peer-reviewed journal articles. His publications have received over 14,800 citations, with an h-index of 64. His research interests include theoretical and applied electromagnetics, with a focus on computational electromagnetics, quantum electromagnetics, electromagnetic information, and multiphysics simulation. He has served as an Associate Editor for the IEEE Journal on Multiscale and Multiphysics Computational Techniques, the IEEE Open Journal of Antennas and Propagation, and Electromagnetic Science. He received the ACES Technical Achievement Award in 2022, the Second Prize of the Science and Technology Award of the China Institute of Communications in 2024, and the Second Prize for Science and Technology from the Anhui Provincial Government in 2015.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. W.D. Li at 3917 8982.