

Seminar On

From RF Energy Harvesting and Wearable Antennas to Self-Powered IoT-Based Smart Healthcare Systems

Professor Minh Thuy Le

Hanoi University of Science and Technology, Vietnam

Date : 26 November 2025 (Wednesday)
Time : 11:00 am – 12:00 nn
Venue : Room 15-202, 15/F, State Key Laboratory of Terahertz and Millimeter Waves, Lau Ming Wai Academic Building, City University of Hong Kong

Abstract

The increasing demand for continuous health monitoring and the rapid growth of low-power IoT devices are driving the search for sustainable power solutions that extend beyond conventional batteries. Among emerging alternatives, radio frequency (RF) energy harvesting (RFEH) has attracted significant interest due to its ubiquity and round-the-clock availability. However, the inherently low density of ambient RF energy poses a fundamental challenge to realizing fully self-powered systems.

This talk presents recent advances in wearable antennas and RFEH technologies aimed at developing self-powered IoT-based healthcare systems. We introduce compact, efficient dual-band antennas integrated with Electromagnetic Band Gap (EBG) structures to reduce electromagnetic absorption and ensure user safety by maintaining low Specific Absorption Rate (SAR) values. A fully functional prototype demonstrates real-time monitoring of SpO_2 , heart rate, and body temperature, combining adaptive sensing algorithms with energy-efficient communication. Experimental results show an improved signal-to-noise ratio (3–9 dB) and energy savings of up to 80%, highlighting the feasibility of sustainable and scalable health monitoring platforms.

Through the co-design of antenna, rectifier, and control circuits, along with optimized RF/DC combining strategies, the proposed systems achieve a high energy conversion efficiency of up to 55% from ambient RF sources.

By bridging RF energy harvesting, wearable antenna innovation, and IoT intelligence, this work paves the way for next-generation wireless, self-powered, and safe healthcare systems capable of autonomous operation while ensuring user comfort and reliability.

Biography



Assoc. Prof. Dr. Minh Thuy Le is a Senior Lecturer and Head of the Radio Frequency (RF) Research Group at the Sensor Laboratory, School of Electrical and Electronic Engineering, Hanoi University of Science and Technology (HUST), Vietnam. She received her Engineer (2006) and M.S. (2008) degrees in Electrical Engineering from HUST and her Ph.D. (2013) in Optics and Radio Frequency from the Grenoble Institute of Technology, France.

She has conducted research at the mmWave Laboratory, Nagoya Institute of Technology, Japan, and has served as a Visiting Professor at the University of Poitiers, France, and the University of Technology Sydney, Australia. Her research interests include antennas, metamaterials, energy harvesting, wireless power transfer, and smart sensing systems. She holds four patents on antenna and RF technologies.

Dr. Le actively leads in the scientific community, having served as a Track Chair for IEEE conferences and a reviewer for leading IEEE journals. She also served as TPC Chair for AWAP 2025 and ISCIT 2025, and is currently an Associate Editor of Microwave and Optical Technology Letters.

She has received numerous honors, including the Hitachi Research Fellowship (2016), the APEC Australia Women in Research Fellowship (2022), and the Hitachi Global Foundation Asia Innovation Award (2023). She was also recognized by Vietnam's Ministry of Education and Training with the Outstanding Lecturer and Researcher Award (2020, 2024) and the Women in Technology & Innovation Award (2025). She has also received several Best Paper Awards, including at ATC (2020, 2023), INISCOM 2021, WPTC 2020, and ICSSA 2024. As a Senior IEEE Member, she is active in the IEEE AP-S SIGHT (since 2024) and the IEEE Women in Microwaves (WiM) Committee (since 2025).

*** ALL ARE WELCOME ***

Enquiries:

Prof. Kwok Wa Leung, Department of Electrical Engineering, City University of Hong Kong
Email: ekleung@cityu.edu.hk