SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: https://cde.nus.edu.sg/ece

Area: Microwave & Radio Frequency

Host: Associate Professor John Ho S Y

TOPIC	:	**Research on the Application of PT Circuits for Pulse Monitoring and Communication**
SPEAKER	:	**Ms. Li Chenhui** **Graduate Student, ECE Dept, NUS**
DATE	:	**Thursday, 8 June 2023**
TIME	:	**11:00AM to 12.00PM**
VENUE	:	**Join Zoom Meeting:** **https://nus-sg.zoom.us/j/83090591578?pwd=WXljYXJoQ0s4cldpTDdFUWRxMGtDQT09** **Meeting ID: 830 9059 1578** **Passcode: 507392**

ABSTRACT

In recent decades, a range of characteristics arising from the presence of exceptional points in non-Hermitian systems, particularly in parity-time symmetry systems, have been extensively studied in various fields. Here, we highlight two aspects of applying PT circuits in wireless sensing and communication, emphasizing their exceptional properties.

In wireless sensing systems, a key challenge is the limited sensitivity of the system to changes in passive circuit parameters (resistance or capacitance), which restricts the range and robustness of the sensors. In this regard, we demonstrate that operating the system near an exceptional point enhances the wireless readout sensitivity of resistance-based flexible sensors. By utilizing a parity-time-symmetric circuit operating at approximately 13.56 MHz, we show that our system exhibits significantly higher sensing coefficients compared to circuits with Dirac points. Furthermore, the operating frequency of this circuit can be adjusted, offering broad application prospects such as combining it with near-field communication. We also successfully demonstrate wireless pulse monitoring using this circuit.

Furthermore, we propose a system based on a nonlinear parity-time-symmetric circuit. By adjusting the loss of the passive oscillator, the system can still operate near the exceptional point even when the coupling changes. Experimental results demonstrate the robustness of the output signal's signal-to-noise ratio to variations in wireless coupling coefficients while maintaining exceptionally high sensitivity. Compared to the commercial envelope detector sensing method, the output signal's signal-to-noise ratio can be improved by up to 14 dB under minimal coupling conditions.

BIOGRAPHY

Ms. Li Chenhui is currently pursuing a Ph.D. degree in the School of Electrical and Computer Engineering at NUS. Her supervisors are Prof. John S. Ho and Prof. Qiu Chengwei. Her research focuses on exploring the exceptional properties of nonlinear non-Hermitian parity-time (PT) symmetric circuits.