

Lecture by

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Ambient Backscatter Communication with Frequency Diverse Array

Ambient backscatter communication (AmBC), whose passive tags transmit information to readers through radio frequency (RF) signals in the air, has attracted much attention due to its promising prospects in green internet of things (IoTs). However, AmBC detection has faced a new challenge at the reader because the received signal is mainly a hybrid signal from direct link and backscatter link, which makes it difficult to detect symbols of the backscatter tag. To address this problem, frequency diverse array (FDA) is utilized to transmit ambient signal, we first propose an AmBC model with FDA, and analyze its channel capacity and detection performance. Closed form expressions for the mutual information between the receiver and the tag, the closed morphological expression and bit error rate (BER) of the AmBC using the FDA RF signal source are derived. Numerical results show that the proposed AmBC using FDA signal source enhances the channel capacity and improves the BER performance, while compared with traditional phased-array (PA) AmBC communication. Then, to further improve the detection performance, we propose an adaptive dual-threshold detector by employing the time-variant characteristic of FDA RF signal, which is based on the position of the boundary backscatter tag defined. Specifically, the closed form expressions for maximum likelihood (ML) threshold and adaptive thresholds are derived, respectively, together with their computational complexities are analyzed. Finally, numerical results are presented to show that the proposed adaptive dual-threshold detector achieves better bit error rate (BER) performance than conventional ML detector.



Hui Chen (M'09) received the Ph.D degree from University of Electronic Science and Technology of China (UESTC) in 2013. From November 2011 to May 2013, she was a visiting scholar at Columbia University, NY, USA. Since January 2014, she has been with the School of Information and Communication Engineering, UESTC, where she is currently an Associate Professor. Her research interests include array signal processing, wireless communications, artificial intelligence and so on. She has published more than 50 academic papers, including more than 30 SCI papers. She is a member of The Institute of Electrical and Electronics Engineers (IEEE), and permanent member of Precision Measurement Radar System Technology Key Laboratory of Sichuan Province.

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