ICICN2026 Track 4

Basic Information:

专栏题目 Title	中文：反向散射通信赋能的环境物联网：基础理论、系统设计与关键创新 英文：Backscatter Communication-Enabled Ambient IoT: Fundamentals, Design, and Innovations

专栏介绍和征稿主题
Introduction and topics

中文：面向 6G 网络演进，物联网正迈向规模化、可持续与智能化的新阶段，超低功耗、极低成本和大规模连接的通信技术成为支撑未来物联网发展的关键。为此，3GPP 提出了环境物联网，旨在显著降低终端复杂度与功耗的同时，实现远超传统物联网技术的设备接入规模，从而支撑海量终端实现免维护、可持续的泛在连接。与此同时，3GPP 指出反向散射通信是实现环境物联网的关键技术，其可利用环境射频信号实现能量自供给和低功耗的被动信息反射，从而显著降低物联网终端成本与能耗。然而，在反向散射通信赋能的环境物联网中，由于双重路径损耗、复杂环境干扰、较低调制速率等因素，反向散射传输性能受限且在接收端符号检测等方面面临严峻挑战。因此，本专题聚焦于反向散射通信赋能的环境物联网，以期从基础理论分析、系统架构设计到创新技术方案等方面展开深入探讨，推动信号处理、资源管理、方案设计及标准演进等方向的研究进展，助力环境物联网的发展。

英文：With the evolution toward 6G networks, the Internet of Things (IoT) is entering a new era characterized by massive scale, sustainability, and intelligence. Communication technologies featuring ultra-low power consumption, extremely low cost, and massive connectivity have become key enablers for future IoT systems. To this end, 3GPP has introduced the concept of Ambient IoT, aiming to significantly reduce device complexity and power consumption while enabling a device density far beyond that of conventional IoT technologies, thereby supporting maintenance-free and sustainable ubiquitous connectivity for massive numbers of devices. In this context, 3GPP has identified backscatter communications as a key enabling technology for Ambient IoT. By leveraging ambient radio-frequency signals, backscatter communication systems achieve energy self-sustainability and ultra-low-power passive information transmission, thereby significantly reducing both cost and energy consumption of IoT devices. However, in backscatter communication-enabled Ambient IoT systems, due to the double-path fading, severe environmental interference, limited modulation rates, the backscatter performance is limited and reliable symbol detection at the IoT receiver remains challenging. Therefore, this issue focuses on backscatter communication-enabled Ambient IoT, aiming to provide a forum for in-depth investigations ranging from fundamental theoretical analysis and system architecture design to innovative technical solutions. We seek to promote advances in signal processing, resource management, system design, and standardization efforts, ultimately contributing to the development of Ambient IoT.

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Organizer's Brief Biography

中文：施丽琴于 2015 年获得四川大学学士学位，2020 年获得西安电子科技大学博士学位。2018 年至 2019 年期间，她作为联合培养博士研究生赴美国犹他州立大学电气与计算机工程系学习。自 2020 年起，她任职于西安邮电大学通信与信息工程学院，现为副教授。研究方向包括无线能量收集与移动边缘计算。迄今为止，她已在 IEEE Transactions/ Journals/Letters 及国际会议上发表论文 50 余篇。同时，她担任多个国际期刊审稿人，包括 IEEE Journals on Selected Areas in Communications，IEEE Transactions on Wireless Communications 等。

英文：Liqin Shi received the B.S. degree from Sichuan University, Chengdu, China, in 2015, and the Ph.D. degree from Xidian University, Xi'an, China, in 2020. She was a joint Ph.D. student with the Department of Electrical and Computer Engineering, Utah State University, Logan, UT, USA, from 2018 to 2019. Since 2020, she has been with Xi'an University of Posts and Telecommunications, Xi'an, where she is currently an Associate Professor with the Department of Communication and Information Engineering. Her research interests include wireless energy harvesting and mobile edge computing. She has published more than 50 papers in the IEEE Transactions/ Journals/Letters, and conferences. Dr. Shi is also a reviewer of multiple international journals, including the IEEE Journals on Selected Areas in Communications and IEEE Transactions on Wireless Communications.

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Organizer's Brief Biography

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英文：Shumei Liu received the B.S. degree in electronic and information engineering from Shanxi University, Taiyuan, China, in 2016, the M.S. degree in electronics and communication engineering from Northeastern University, Shenyang, China, in 2018, and the Ph.D. degree in communication and information systems from Northeastern University in 2022. She is currently an Associate Professor at the School of Information Engineering, Chang'an University, Xi'an, China. Her research interests include unmanned aerial vehicles (UAV), mobile edge computing, and wireless resource management. She received the Best Paper Award at the National Postdoctoral Academic Forum in China in 2018.

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Organizer's Brief Biography

中文：徐瑞于 2021 年和 2024 年分别获得西安工业大学学士学位以及西安邮电大学硕士学位。目前，她在西安邮电大学攻读博士学位。研究方向包括反向散射通信、中继网络以及流体天线系统。她担任期刊 Physical Communications 的审稿人。

英文：Rui Xu received her B.E. and M.S. degrees from Xi'an Technological University and Xi'an University of Posts & Telecommunications, Shaanxi, China, in 2021 and 2024, respectively. She is currently pursuing a Ph.D. degree at Xi'an University of Posts & Telecommunications. Her current research interests include backscatter communications, relaying networks and fluid antenna. She is also a reviewer of Physical communications.

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Organizer's Brief Biography

中文：叶迎晖于 2020 年获得西安电子科技大学通信与信息系统专业博士学位。自 2020 年起，他任职于西安邮电大学通信与信息工程学院，现为副教授。研究方向包括移动边缘计算、无线能量收集以及反向散射通信等。截至目前，他已在 IEEE Transactions/Journals/Letters 及国际会议上发表或合作发表学术论文 100 余篇。他曾获 IEEE Transactions on Communications、IEEE Wireless Communications Letters 以及 IEEE Communications Letters 等多个期刊优秀审稿人称号。他目前担任 Elsevier 期刊 Physical Communications 编辑，并曾担任 IEEE Internet of Things Journal 客座编辑。

英文：Yinghui Ye received the Ph.D. degree in communication and information system from Xidian University in 2020. Since 2020, he joined the Department of Communication and Information Engineering in Xi'an University of Posts and Telecommunications, where he is currently an Associate Professor. His research interests include mobile edge computing, wireless energy harvesting, and backscatter communications. He has authored/co-authored more than 100 technical articles in the IEEE Transactions/Journals/Letters, and conferences. He received the Exemplary Reviewer Award from the IEEE Transactions on Communications, the IEEE Wireless Communications Letters, and the IEEE Communications Letters. He currently serves as the Editor of Physical communications (ELSEVIER), and was a Guest Editor of IEEE Internet of Things Journal.