

DESIGN AND IMPLEMENTATION OF DEVICES, CIRCUITS, AND SYSTEMS



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The Design and Implementation of Devices, Circuits, and Systems Series plays an important role in today's communication landscape, where rapid technological progress has made circuits and devices increasingly complex and advanced. This series aims to shed light on the issues, challenges, and requirements related to the design and implementation that shape next generation systems. As information and communication technologies (ICT) have evolved over recent decades, they have enabled smarter environments and supported a broad range of modern applications. This July issue of the Series features four articles that focus on advances in design and implementation of wireless communication systems in the context of ultra-reliable low-latency communications (URLLC) for 6G, microwave communications, reconfigurable intelligent surface (RIS) based technologies, and Massive MIMO system for 6G.

The first article, "Turbo Product Code-Aided Spatiotemporal 2-D MIMO for URLLC" explores a spatiotemporal 2-D coded MIMO approach that applies turbo product codes to enhance low-latency, high-reliability communication in massive MIMO systems. It examines how improved decoding methods and coordinated design of encoding, interleaving, modulation, detection, and decoding can strengthen error-correction performance under short block-length constraints.

The second article, "Glide Symmetry Can Be Key to Enhance the Performance of Periodicity-Based Microwave Bandstop Filters", investigates how higher-order symmetries—especially glide symmetry—can improve the design and performance of planar microwave circuits. Through modeling, simulation, and experimental validation of various bandstop structures, the study shows that glide symmetry broadens bandgaps and strengthens common-mode rejection without adding design or manufacturing complexity. The findings highlight glide symmetry as a promising approach to improve common-mode rejection filters at microwave frequencies.

The third article entitled "RIS-Enabled Symbiotic Radio: From Idea To Prototype" introduces a practical RIS-enabled symbiotic radio prototype that merges primary and backscatter transmissions through specialized frame structures, joint constellation design, and multiple information stream signaling to achieve efficient, interference-free decoding. Experimental evaluations of the prototype demonstrate reliable symbol detection and throughput performance while maintaining low hardware and computational complexity. The work shows the feasibility of RIS-enabled symbiotic radio in real applications and also highlights open problems in this area of research.

The fourth article entitled "Evolution of UE in Massive MIMO Systems for 6G: From Passive to Active" presents how the user equipment (UE) is becoming an active element in massive

MIMO systems especially for 6G, linking evolving standards with practical device design to support more adaptive measurement, reporting, and beam management. It emphasizes that future performance will depend on coordinated UE-network co-design, supported by advances in multi-panel hardware, on-device intelligence, and energy-efficient processing.

The Series is open to contributions from a broad range of industrial sectors such as healthcare, automotive, energy, agriculture, smart manufacturing, consumer electronics, smart city, VR/AR/hologram, drone, consumer electronics, Microwave and RF design for communication systems, and more. Authors planning to submit an article are advised to consult with a Series Editor beforehand to ensure suitability to our Series. The articles aim to provide practical knowledge that is academically rigorous and relevant to industry professionals for improving communication products and services.

BIOGRAPHIES

JACOPO IANNACCI [SM] (iannacci@fbk.eu) received his MSc (2003) and Ph.D. (2007) from the University of Bologna, Italy, and is a Senior Member of IEEE since 2021. He holds national habilitations as Associate and Full Professor in Electronics, since 2017 and 2021. Since 2007, he has been a researcher at Fondazione Bruno Kessler, Trento, Italy. He worked at the Technical University of Delft, the Netherlands, in 2005-2006, and at the Fraunhofer Institute for Reliability and Microintegration IZM in Berlin, Germany, in 2016. His work focuses on modeling, design, integration, and testing of MEMS and RF-MEMS devices for 5G, IoT, 6G, and energy harvesting. He has authored over 200 publications and one patent. He serves as Associate Editor and Co-Editor in Chief for the Springer Microsystem Technologies and is a 2025-2026 Distinguished Lecturer of IEEE ComSoc. He has been active in leading roles at conferences including IEEE Sensors, 5GWF, SPIE Microtechnologies.

MOHAMMAD A MATIN [SM] (mohammad.matin@northsouth.edu) is a professor in the Department of Electrical and Computer Engineering at North South University (NSU), where he has been since 2008. He received his B.Sc. degree in EEE from BUET, Bangladesh, his M.Sc. degree in digital communication from Loughborough University, United Kingdom, and his Ph.D. in wireless communication from Newcastle University, United Kingdom. He has published over 170 peer-reviewed journal and conference papers. He is the author/editor of 21 academic books and 26 book chapters. He serves as a member of the Editorial Boards for several international publications including *IEEE Communications Magazine* and *IET Wireless Sensor Systems*. He has received a number of prizes and scholarships including the Best Student Prize (Loughborough University), Commonwealth Scholarship, and Overseas Research Scholarship (ORS) conferred by the Committee of Vice Chancellors and Principals (CVCP) in the United Kingdom.

VYASA SAI [SM] (vyasa.sai@ieee.org) received his Ph.D. in Computer Engineering from University of Pittsburgh, USA. Dr. Sai also holds a MS and BTech degree in ECE from the U.S. and India respectively. He has authored books, published numerous international peer-reviewed articles, and holds several US patents in the field of electronics and communications. He is the lead editor for the Design and Implementation of Devices, Circuits, and Systems Series. He also serves as a Technical Committee member for the IEEE Circuits and Systems for Communications, Editorial Board member for the Intl. Journal of RFID Technology & Applications, associate editor for IEEE Access, among others. His research contributions have won him many international recognitions that include AIM's 2018 Williams award, 2020 Sheth International Achievement award, among others.