

IEEE Open Journal of Vehicular Technology: Special issue on

Reconfigurable Intelligent Surface Empowered Wireless Communications in 6G and Beyond

From 1G to 5G, every wireless generation has been designed based on the assumption that the wireless environment is uncontrollable and often an impediment to be reckoned with. A plethora of modern physical layer techniques have been introduced to conquer its detrimental impacts (including severe signal attenuation, multi-path propagation, and uncontrollable interference induced by reflections and refractions from the objects). It is undeniable that a certain level of saturation has been reached in terms of various coding/modulation/precoding techniques and accordingly the maximum capacity. In other words, the existing physical layer techniques implemented at the endpoints may not be capable of supporting next generation wireless communication systems that integrate communications, sensing and computing in a single platform, demanding ultra-high reliability, low latency, and enhanced spectral and energy efficiency. Significant performance gains are expected to be achieved when regarding the wireless environment as an additional variable to be optimized. Therefore, it is imperative to develop a technology that can control the propagation environment to make it more stable, reliable and efficient in various application scenarios.

Thanks to the recent breakthrough on the programmable materials, reconfigurable intelligent surface (RIS) has been proposed as a promising technique that enables the intelligent control of the wireless propagation environment via integrated electronic circuits and software. Due to its appealing features of light weight and ultra-thin size, it can be readily installed on environmental objects at low cost and with low power consumption. By properly tuning the reflection amplitude and phase shift of the impinging radio waves, RIS enables telecom operators to provide full control of the wave propagation effects in a customizable way. The recent advances in programmable materials also demonstrate that RIS can be dynamically reconfigured such that the reflected signals can be adjusted in real-time in response to the sudden changes of the wireless environment, which makes it a potential candidate for 6G to overcome the inherent drawbacks of current wireless systems.

This special issue aims to solicit the most recent research advances in modeling, analysis, simulations, and hardware design of RIS-aided wireless systems, and to provide promising research directions in the emerging field of research. The topic of interest include, but not limited to

- Channel modelling for RIS-aided wireless networks
- Robust transmission design based on imperfect channel state information (CSI)/hardware impairment
- Communication-theoretic foundation of RIS-aided wireless networks
- Theoretical performance analysis for RIS-aided wireless networks
- Channel estimation for RIS-aided wireless networks
- Algorithms and protocol design for RIS -aided networks
- Deployment optimization for RIS-aided networks
- Integration of RIS into emerging wireless communication applications such as wireless power transfer, mobile edge computing, physical layer security, UAV communications, etc
- Cross-layer design for IRS-aided communications
- Radio localization/sensing with RISs
- Application of RIS in high-frequency communications, such as mmWave/Terahertz communication and visible light communication
- AI-empowered RIS-aided communication systems
- Resource allocation and interference management for RIS-aided networks
- Physics- and electromagnetic-compliant modeling of RISs
- Testbeds, experimental measurements in RIS-aided wireless communications

Important Dates

Manuscript submission: August 15, 2021

First review completed: September 30, 2021

Revised manuscript due: October 30, 2021

Final accept/reject decisions: November 15, 2021

Final manuscript due: November 30, 2022

Final publication: Quarter 4, 2021

Guest Editors

Cunhua Pan (Lead), Queen Mary University of London, UK

Marco Di Renzo, Paris-Saclay University, France

Alessio Zappone, University of Cassino and Southern Lazio, Italy

Qingqing Wu, University of Macau, China

Vincenzo Sciancalepore, NEC Laboratories Europe GmbH, Germany

Shi Jin, Southeast University, China

Octavia A. Dobre, Memorial University, Canada