

Workshop: Development of a full-duplex wireless system with self-interference cancellation

Workshop Organizers:

Djuradj Budimir, University of Westminster,
Mirshekar-Syahkal, Dariush, University of Essex,

Prof. Budimir received a PhD in Electronic and Electrical Engineering from the University of Leeds, UK. In March 1994, he joined the Department of Electronic and Electrical Engineering at King's College London, University of London, UK. Since January 1997, he has been with the School of Computer Science and Engineering, University of Westminster, London, UK, where he is now a professor of wireless communications and leads the Wireless Communications Research Group. He is also a Visiting Professor with the School of Electrical Engineering, University of Belgrade. He has published more than 365 papers in refereed journals and conference proceedings, four books/book chapters and software's (the book *Generalized Filter Design by Computer Optimization*, ISBN 0-89006-579-9, Atrtech House Books, March 1998, and the Software and User's Manual *EPFIL-Waveguide E-plane Filter Design* (Artech House, 2000) and a book chapter in *Encyclopedia of RF and Microwave Engineering* (Wiley, 2005 and 2024) over 20 Invited papers/lectures, 2 keynote presentations, over 24 Seminars/Workshops, over 3131 [Google scholar citations](https://scholar.google.com/citations?hl=en&user=mrZjv8AAAAAJ) (<https://scholar.google.com/citations?hl=en&user=mrZjv8AAAAAJ>),

one TV program (BBC World Service programme on Microwaves, 17 Nov. 2010: <http://www.youtube.com/watch?v=gTCSPTuO1Go>) in the field of RF/microwave and mmWave wireless systems and technologies, including 20 icp. He has an h-index of 26 and an i10-index of 85. His expertise includes the design of circuits from RF through uWave/mmWave to Terahertz frequencies for 4G, 5G, B5G, and 6G wireless communications, WLAN, WPT, wireless sensors, the Internet of Things (IoT), and biomedical applications.

Professor Dariush Mirshekar, Fellow IET, Fellow HEA and Life Fellow IEEE, Head of RF & Microwave Research Lab, has several seminal works in modelling, design, fabrication and measurement of microwave and mm-wave circuits and antennas. He has been collaborating with the UK and international communication companies in various capacities. He has developed a novel noise cancellation technique and a 1D probe array used in quantitative inspection of sensitive metallic components and structures in aircraft, offshore platforms and power plants. His current research embodies microwave and mm-wave full-duplex radio systems and NFC (near field communication) at mm-waves for 5G and beyond. He has been the recipient of 10 EPSRC/SERC grants and more than 10 industrial contracts and other fundings, holds five patents, has numerous (over 250) publications including a book (Spectral Domain Method for Microwave Integrated Circuits), two book chapters (entitled Advances in Crack Length Measurement with ACFM Technique, and Loop Antennas) and papers in IEEE Transactions, IET Proceedings and in the very prestigious Proceedings of the Royal Society.

A brief description of the technical issues addressed by the Workshop. State reasons why and how the Workshop would attract the RWW2027 audience.

The ongoing research into Full Duplex (FD) is driven by its significant potential benefits for future wireless generations, including 5Ga and 6G. If successfully implemented, FD could double the effective capacity of a given slice of radio spectrum and significantly reduce communication latency because data wouldn't need to wait for alternating transmit/receive slots. This technology is seen as a promising enabler for 5Ga and 6G wireless networks, particularly in applications such as intelligent transportation systems and fixed wireless access, where higher power and less-constrained form factors can make implementation easier. In this workshop, entitled **Development of a full-duplex wireless system with self-**

interference cancellation, several experts will present various approaches to cancel the inherent self-interference caused by their own transmitters. The presentations are organised around the workshop's overarching themes.

One presentation is dedicated to the Full Duplex for Narrowband Analog VHF/UHF radios: Challenges and Opportunities. Another presentation will examine the CMOS Simultaneous Transmit and Receive (STAR) Front Ends for Dual-Use Commercial and Defence Applications, with a particular focus on techniques such as antenna self-interference suppression, RF and analogue time-domain and frequency-domain cancellers, digital self-interference cancellation algorithms, and canceller adaptation algorithms. A subsequent presentation will examine the investigation and development of a wideband mmWave (same channel) full-duplex (FD) wireless system design with dual receivers, featuring all-analogue domain self-interference cancellation (SIC). Furthermore, the workshop examines on the use of full-duplex principles in wideband retrodirective arrays (RDAs).

Potential Speakers information:

Speaker 1. Alexander Ruderer, Chair of Integrated Electronic Systems, Otto von Guericke University Magdeburg, Germany

Title: Full Duplex for Narrowband Analog VHF/UHF radios: Challenges and Opportunities

Abstract: Analog communications represent an understudied area for full duplex research, characterized by narrow channel bandwidths and high transmission power levels. Consequently, full duplex systems face unique challenges in analog communication contexts, such as the need for higher levels of self-interference cancellation. However, full duplex also enables additional benefits specific to analog communications that will be explored in this talk.

Speaker 2: Harish Krishnaswamy, Department of Electrical Engineering
Columbia University, NY, USA

Title: CMOS Simultaneous Transmit and Receive (STAR) Front Ends for Dual-Use Commercial and Defense Applications

Abstract: There has been significant research in integrated self-interference cancellation techniques for full-duplex operation, with steady progress in transmit power handling, cancellation bandwidth, power consumption and noise-figure impact and cancellation adaptation algorithms. Techniques include antenna self-interference suppression, RF and analog time-domain and frequency-domain cancellers, digital self-interference cancellation algorithms, and canceller adaptation algorithms. These approaches are reaching the level of maturity required for deployment in commercial as well as defense applications.

Speaker 3: Djuradj Budimir, Uros Jankovic, Rawad Asfour and Dariush Mirshekar-Syahkal, University of Westminster, London, and University of Essex, UK.

Title: "Development of a wideband mmWave full-duplex radio system"

Abstract: This workshop will investigate and develop a wideband mmWave (same-channel) full-duplex (FD) radio system with dual receivers, featuring all-analogue-domain self-interference cancellation (SIC) and mitigation of hidden terminal problems.

Speaker 4: Songyi Yen and Dejan Filipovic, University of Colorado, Boulder, USA

Title: "On the Use of Full-Duplex Principles in Wideband Retrodirective Arrays".

Abstract: Retrodirective arrays (RDAs) are a subset of phased arrays that inherently operate in a full-duplex (FD) manner. The same framework used to discuss apertures of the latter classification can be naturally applied to aid in understanding the physics of operation. Furthermore, as RDAs are classically completely analogue systems, FD techniques are limited to the propagation and analogue domains, which simultaneously limits the scope of discussion while increasing the challenge of practical realization. This workshop will present an overview of the history of published RDAs, discuss common metrics of analysis and evaluation, and delve in detail about several recent advances in wideband retrodirective array technologies, inclusive of active enhancement. These include arrays of both linear and circular variants and their respective considerations.

Speaker 5. Kenneth Kolodziej, MIT Lincoln Laboratory Integrated RF & Photonics – Group 85781.981.4069, USA

Title: TBD

Abstract: TBD