

# CALL FOR PAPERS – SET INTERNATIONAL JOURNAL OF BROADCAST ENGINEERING (SET IJBE) – 1A. EDITION

This panel will highlight a selection of scientific papers submitted to the Call for Papers promoted annually by SET. The chosen studies will be published in the SET International Journal of Broadcast Engineering (SET IJBE), an international scientific journal dedicated to disseminating knowledge in communication engineering, especially in the areas of broadcast and new media. The SET IJBE aims to cover current research that represents the state of the art in these technologies.

Moderator: Cristiano Akamine, Researcher at the Digital TV Laboratory at Universidade Presbiteriana Mackenzie

## **Speakers:**

### **COEXISTENCE OF GAP FILLER SYSTEM AND 5G IN OPTICAL NETWORK**

**Speaker: Ramon Maia Borges**, Adjunct professor at UNIFEI. Single channel radiofrequency (RF) repeater systems, also known as “gap filler” and used for broadcasting, typically suffer from interfering wave (echo) at the repeater station. This work exploits a solution based on radio over fiber (RoF) to eliminate this problem and reports a coexistence analysis between gap filler system and the fifth-generation (5G) mobile communication in optical network. Experimental results show, after 25 km of fiber optic transmission, echo absence and modulation error ratio (MER) above 40 dB for the repeater system aimed for digital TV, as well as error vector magnitude (EVM<sub>RMS</sub>) below the limits established for a 5G New Radio signal at 3.5 GHz. The obtained results illustrate the potential of taking advantage of existing optical infrastructure to deploy RoF-based gap filler systems, coexisting peacefully with other technologies.

### **FEATURES AND APPLICATIONS OF ATSC 3.0 TRANSMITTER IDENTIFICATION (TXID)**

**Speaker: Bo-mi Lim**, Senior Researcher - ETRI (Electronics and Transmitter identification (TxID) is uniquely assigned to each transmitter to identify and control the transmitters in Advanced Television Systems Committee (ATSC) 3.0 broadcast networks, especially on a single frequency network (SFN). A transmitter also generates the TxID signal in addition to the ATSC 3.0 host signal but combines them, resulting in interfering with each other. This paper summarizes the TxID technique in ATSC 3.0 physical layer standard, including the detection performance, influences on the host ATSC 3.0 signal, and applications.

### **ROADS OF MIMO BROADCASTING: AN OVERVIEW OF VARIANT TECHNOLOGIES**

**Palestrant: Sung-Ik Park**, Principal Researcher and Project Leader - ETRI (Electronics and Telecommunications Research Institute) - South Korea  
This paper outlines ATSC 3.0 MIMO broadcasting technologies in terms of three variants: 1) Frequency Reuse-1 MIMO, 2) Backward-Compatible MIMO, and 3) Channel Bonding & MIMO. Through a brief discussion of their principles, features, and use cases, this paper sheds light on the diverse paths of MIMO broadcasting paved for the future of digital broadcasting systems. Furthermore, the paper discusses the implications and potential advancements of these technologies, emphasizing their role in achieving higher data rates and improved flexibility.

### **SYSTEM VERIFICATION OF ADVANCED ISDB-T**

**Speaker: Kohei Kambara**, Senior Research at NHK STRL

Advanced ISDB-T is the next generation DTTB system recently developed in Japan. In this presentation, the feasibility and maturity of the system are shown with an introduction of End-to-end verification tests using experimental transmitter station.

### **AMPLIFYING IN-VEHICLE DTV ENTERTAINMENT: ATSC 3.0 BROADCAST SIGNAL RELAY VIA WIFI GATEWAY**

**Speaker: Sungjun Ahn**, Senior Researcher - ETRI (Electronics and Telecommunications Research Institute)

This paper presents the relayed distribution of ATSC 3.0 broadcast signals to mobile users in moving vehicles. The gateway relay featured in this work seamlessly converts received ATSC 3.0 signals into a WiFi interface. This proposal exhibits the use of an ATSC 3.0-to-WiFi gateway to amplify broadcasting media in automotive, allowing personalized experience on individual seat positions.

### **ADVANCEMENTS IN DTT BROADCASTING SHOWCASING TV 2.5 AND TV 3.0 DURING THE FOOTBALL WORLD CUP 2022**

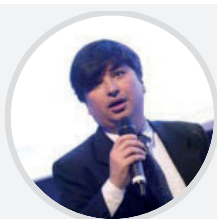
**Speaker: Simone Ferrara**, Senior Vice President of Technology and IP Strategy at V-Nova

A first showcase focuses on selected technologies adopted in TV 3.0, the next-generation TV broadcast standard set to be launched in Brazil from 2025, including

Versatile Video Coding (MPEG-I VVC), Low Complexity Enhancement Video Coding (MPEG-5 LCEVC) and MPEG-H Audio using Dynamic Adaptive Streaming over HTTP (DASH). These technologies were employed in an end-to-end live production, delivering 4K HDR video with immersive and personalized audio. The demonstration highlighted the rapid maturity of these technologies, implemented in both hardware and software solutions.

The TV 3.0 showcase, a collaboration between SBTVD Forum members and their partners, featured the first TV supporting VVC, LCEVC, and MPEG-H Audio, along with a user interface for interactive content and immersive sound experiences. This represents a significant step towards a better viewing experience, enabling the distribution of current and future formats, including 8K resolution, HDR, and Next-Generation Audio (NGA) through OTA and OTT streaming platforms.

The second showcase focused on the current TV 2.5 standard by adding backward-compatible technologies to serve legacy receivers while introducing new features for new receivers. The demo deployed for the first time MPEG-5 LCEVC to provide a live 1080p60 HDR enhanced channel starting from a legacy AVC 1080i30 SDR channel.



**Cristiano Akamine, Researcher at the Digital TV Laboratory at Universidade Presbiteriana Mackenzie**

He holds a degree in Electrical Engineering from Universidade Presbiteriana Mackenzie (1999), a master's degree and doctorate in Electrical Engineering from the State University of Campinas (2004/2011). He has been a researcher at the Digital TV Laboratory at Universidade Presbiteriana Mackenzie since 1998, completed an internship at the NHK Science and Technology Research Laboratories (STRL) and was a Visiting Specialist Professor at the Faculty of Technology at Unicamp. He is currently a professor in the Electrical Engineering course and the Postgraduate Program in Electrical and Computer Engineering (PPGEEC) at Universidade Presbiteriana Mackenzie and coordinator of the Digital TV Laboratory at Universidade Presbiteriana Mackenzie. He is a member of the deliberative council of the Brazilian Terrestrial Digital TV System Forum (SBTVD), Brazilian Society of Television Engineering (SET) and Associate Editor of IEEE Transactions on Broadcasting. He has several patents and several published articles and has experience in the area of Electrical Engineering, with an emphasis on digital TV, digital communication, channel coding, embedded systems, reconfigurable logic and software-defined radio.



**Ramon Maia Borges, Adjunct Professor at UNIFEI**

Ramon Maia Borges has a PhD in Electrical Engineering (2020) from the Federal University of Itajubá - UNIFEI, a Master's degree in Telecommunications (2015) and a degree in Electrical Engineering (2012) from the National Telecommunications Institute (Inatel). He worked as a researcher at Inatel linked to the Radiocommunications Reference Center and Optical-Wireless Convergence Laboratory between 2015 and 2021, the year in which he assumed the position of professor at the Institute. He is currently an adjunct professor at UNIFEI, working at the Institute of Systems Engineering and Information Technology. Its main research areas are: 5G networks, broadcasting, optical communications and microwave photonics.



**Bo-mi Lim, Senior Researcher - ETRI (Electronics and Telecommunications Research Institute) Korea**

Bo-mi Lim received her B.S. from Ajou University, Suwon, Republic of Korea, in 2008, and her M.S. from Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea, in 2010. Since 2010, she has been a member from the research team of the Media Research Division, Electronics and Telecommunications Research Institute. His research interests are in the areas of wireless communication systems design and digital transmission.



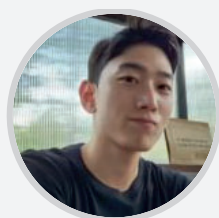
**Sung-Ik Park, Principal Researcher and Project Leader - ETRI (Electronics and Telecommunications Research Institute) - South Korea**

Dr. Sung-Ik Park (IEEE Fellow) joined the Broadcasting System Research Group of Electronics and Telecommunication Research Institute (ETRI) in 2002, and is responsible for terrestrial broadcast standardization, HW/SW implementations, and laboratory/field testing. Dr. Park is a principal investigator and leads several broadcast research projects. Dr. Park has more than 300 peer-reviewed journal and conference publications and multiple best paper and contribution awards for his work in broadcast technologies. Dr. Park currently serves as associate editor of IEEE Transactions on Broadcasting and ETRI Journal, and a distinguished speaker at the IEEE Broadcasting Technology Society.



**Kohei Kambara, Senior Research at NHK STRL**

Kohei Kambara joined NHK in 2001. Since 2019, he has worked for NHK STRL (Japan Broadcasting Corporation Science & Technology Research Laboratories). He is a senior research engineer in the Advanced Broadcast Systems Research Division and is involved in the development of next-generation terrestrial broadcast systems for UHDTV.



**Sungjun Ahn, Senior Researcher - ETRI (Electronics and Telecommunications Research Institute)**

Sungjun Ahn is a Senior Research Engineer at the Electronics and Telecommunications Research Institute (ETRI), contributing especially to the Media Research Division. His research group has led systems design, field verifications, standardization activities, and theoretical analyzes for ATSC 3.0 transmission and other wireless applications. He currently participates in research activities in the physical layer of ATSC 3.0 and 3GPP DTTs, with special interests in mobile media, interconnection between DTT and 5G, and DTT-related advancements for enhanced media distribution and beyond.



**Simone Ferrara, Senior Vice President of Technology and IP Strategy at V-Nova**

Simone Ferrara is the Senior Vice President of Technology and IP Strategy at V-Nova, with responsibility for technology, IP and standardization strategy, including enterprise-wide execution. Simone has been chair of the development committee for the latest MPEG standard, MPEG-5 Part 2 Low Complexity Enhancement Video Coding, and has contributed to many of the encoding tools included in the standard. Before joining V-Nova, Simone worked in the telecommunications industry, first as a researcher and then as Global IP Advisor for the Vodafone Group. He served as Board Member and Head of Education at the Chartered Institute of Patent Attorneys (CIPA). After

completing a Masters in Telecommunications Engineering at the Politecnico di Milano (Italy) and a Masters in Electrical Engineering at Washington University in St. Louis (USA), Simone subsequently qualified as a European and British patent attorney, and has used her experience to drive innovation and technological development in the video industry. Simone was awarded the "Talented Young Italians 2019 (Industry and Commerce)" award by the Italian Chamber of Commerce and Industry in the UK, in recognition of her outstanding contribution to the development of business between Italy and the UK.