

ABU Technical Bureau & Committee Meetings 2021

Engineering Awards Winners



Mr Fu Haibo, RTPRC-China

ABU Engineering Industry Excellence Award Winner



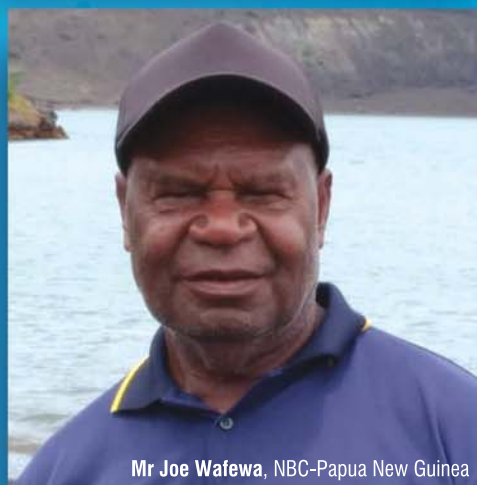
Dr Reza Alidadi, IRIB-Iran

ABU Broadcast Engineering Excellence Award Winner



Golden Eagle Broadcasting System, RTPRC-China

ABU Green Broadcast Engineering Award Winner



Mr Joe Wafewa, NBC-Papua New Guinea

ABU Developing Broadcasters' Excellence Award Winner

ALSO INSIDE

Full IP UHD Remote Production – A Full-Scenario Solution

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- 02 Full IP UHD Remote Production - A Full-Scenario Solution
- 06 How Can DVB-I Help Broadcasters to Get Prepared for Future?
- 09 ABU Engineering Awards 2021
- 12 ABU Technical Review Prizes 2021
- 13 Technical Bureau Annual Meeting
- 14 Technical Committee Elections
Scrutineers for the ABU Technical Committee Elections
- 15 Newly Appointed ABU Technical Bureau Members
- 16 ABU Technical Bureau 2022-2023
- 17 ABU Technical Committee Meeting 2021
- 24 DVB-T2 Matlab Simulink Simulation Model: A Training Toolkit for Broadcast Engineers
- 28 Production Topic Area Report
- 31 Transmission Topic Area Report
- 44 Training & Services Topic Area Report
- 47 Spectrum Topic Area Report
- 62 Webinar Series on Member Innovations
- 65 Technical Advisory Service support for VOV-Vietnam
- 66 ABU Takes Part in UNESCO Remote Radio Week
IBC 2021 Taking Place as Virtual Event
- 67 Inter BEE 2021
WBU-TC Year-end Meeting
- 68 Eurovision News Turns 60
- 69 News from the ABU Region
- 72 Digital Broadcasting Updates
- 75 Equipment Trends
- 78 Personalities & Posts
- 81 ABU Technical Team
Calendar of Events
- 82 In Memoriam John Bigeni
New Members



Cover: ABU Technical Bureau & Committee Meetings 2021

from the Editor

We are happy to bring to you the 4th quarter edition of 2021. Inside you will find detailed reports on the proceedings of our Technical Committee and Technical Bureau annual meetings which was organised as virtual sessions as part of the ABU's General Assembly and Associated Meetings 2021. One of the highlights of the annual Technical Committee is the announcement of the winners of the Engineering Awards and Technical Review Prizes. We would like to congratulate all the winners this year once again.

Three feature articles are included in this edition contributed by our members and industry experts. The article with the title "Full IP UHD Remote Production - A Full-Scenario Solution" contributed by our member NRTA-China investigates the use of IP standards for implementing a full IP remote production setup.

The second article, contributed by IRIB-Iran, titled "How can DVB-I help broadcasters to get prepared for future?" looks at how DVB-I technology can be used to offer enhanced services to the viewers. This combination of broadcast and broadband with technologies such as DVB-I could further broaden the services and interactive capability offered to viewers by broadcasters.

The third article on "DVB-T2 Matlab Simulink Simulation Model: A Training Toolkit for Broadcast Engineers" contributed by Mr Jeewa Vengadasalam and Ms Chong Woon Shing of UniTAR-Malaysia explains how the Simulink models can be used to simulate the different parameters of the DVB-T2 system to understand its performance in different scenarios. The DVB-T2 Simulink model details and simulation results are discussed within the article.

This edition also includes highlights from activities organised by ABU Technology during the last few months. It also includes the results of the Technical Committee elections which was conducted online.

We hope you will benefit from the information included with this edition.

Thank you for your support.

Ahmed Nadeem
nadeem@abu.org.my

The Asia-Pacific Broadcasting Union (ABU) is a professional union of broadcasting organisations in the Asia-Pacific area which aims to co-ordinate and promote the development of radio, television and allied services in the region. It is non-governmental, non-political and non-commercial.

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Full IP UHD Remote Production - A Full-Scenario Solution

Abstract: In this scheme, a new remote production mode is realised through IP link and IP technology, which is no longer limited by the distance between the event/programme site and the broadcast production system. IP standards of production domains such as SMPTE ST 2020/2110, AES-67 and Dante are used, combined with TICO, JPEG XS and other compression methods. At the same time, relying on Dark Fibre, OTN, 5G and other transmission means, as well as SRT and other transmission protocols, the programme solves all technical elements: camera signal, video signal, audio signal, call signal, control signal and data signal remote production problems. The scheme uses non-compression, shallow compression, deep compression and other methods to realise full IP remote production and broadcast capability in intra-city, inter-city and cross-country scenarios.

BACKGROUND

Since 2016, all kinds of events and activities in China and abroad have gradually explored full 4K production, including the Olympic Games, World Cup, national Games and so on. SMT took the lead in building the first 4x3G SDI full 4K broadcast OB Van in China in 2015 and participated in 4K broadcast production for the National Games, Chinese Super League football, PyeongChang Winter Olympics and other events. Based on the growth of 4K broadcast production, SMT has dedicated the technical architecture of a 4K broadcast system to full IP since 2017. Two sets of full IP 4K HDR super large broadcast systems based on SMPTE ST2022-6 and two sets of full IP 4K HDR super large broadcast systems based on SMPTE ST2110 have been built. Therefore, since 2018, we have gradually explored new application scenarios of IP systems, and gradually formed a new application for full IP UHD remote production.

We successfully completed the remote production of many super events, including the remote production of the military Pentathlon of the Wuhan Military Games in 2019, the remote production of LPL Final of E-Sports League of Legends in 2019, and the remote production of the S10 Global Final of E-Sports League of Legends, in 2020.

TECHNICAL SOLUTIONS

In recent years, the SMPTE has released the corresponding IP standards, and the IP products of traditional broadcast systems have been constantly improved, which has completely formed two full-coverage IP and SDI based product lines, making the structure of large broadcast systems more open, with more convenient management and more flexible adjustment. The attributes of an IP system make it very simple to realise remote production. All the signals (camera related signals, SDI video signals,

audio\ intercom signals, control signals, data signals, etc.) are converted into Internet protocols for transmission on IP routes, to achieve all the requirements of remote broadcast production.

- a) The camera is the most important part in the whole chain, so how we handle the camera signal, control, synchronisation, intercom and other signals, is a priority. This project uses SMPTE-2110 and SMPTE-2022 standards to package all signals into IP signal streams, which can be transmitted by IP lines without compression or TICO, JPEG XS and other shallow compression methods. The receiver only needs to unpack the IP signal to restore all the original signals and realise the camera signal transmission and control. In this process, the camera parameters are adjusted, and the output of all kinds of signals is carried out in the rear production centre, while at the front end the cameraman only manipulates the camera.
- b) Microphone, mixing console and commentary: In addition to video signals, the acquisition of audio signals is another key point in a broadcast. What we do is to convert all kinds of audio signals, microphone signals and commentary booth signals into standard IP SMPTE ST2110-30 signals or transmit them on IP routes using AES67, Dante, Ravenna or other special IP standards according to the characteristics of different products. At the other end the IP audio signals are received and restored.
- c) An intercom system includes intercom panel, wireless duplex, and a series of related accessories. Because the Fiber Optic Plate (FOP) is far away from the production base, the success of a broadcast will be directly affected by the efficacy of the intercom system. Our approach is: 1. Under the condition that the network bandwidth allows, the intercom signal is transmitted in a lossless mode by the standard IP SMPTE ST2110 signal or, 2. Under limited network conditions, IP transmission can be performed in VOIP or DANTE modes, according to the features of different products.
- d) SDI based signal: In order to transmit SDI video signals, the scheme also converts them for a corresponding standard IP signal transmission flow, and the receiver carries out the unpacking operation. IPG gateway equipment is used to convert all SDI based video into an IP standard for forward transmission and the reverse unpack operations, which will require the choice of unicast or multicast transmission mode. The scheme is selected according to the different system conditions, and also to facilitate PTP synchronisation.

e) Control and data: Remote production involves a lot of control signals; for example, the forward (sound, light, large screen, etc.) position needs a matrix panel for signal scheduling and monitoring, but the whole video matrix is in the rear production basement, which requires the front field matrix panel to control the rear matrix. In this way, the control protocol between matrix and matrix panels needs to comply with IP standards transmissible over IP routes. Also, if GPIO or TALLY transfers are required, the solution converts them to IP.



a) Group Venue: SMT M-hub Jing'an

f) The sync signal in traditional broadcast synchronisation is the reference for the whole system operation. It is even more important to maintain synchronisation of signals in IP remote. Therefore, we use the PTP synchronisation of SMPTE ST2110-10 as the reference for the entire remote production system. GPS signals are locked at both ends and converted into PTP signals for interlocking.

APPLICATION PROJECT

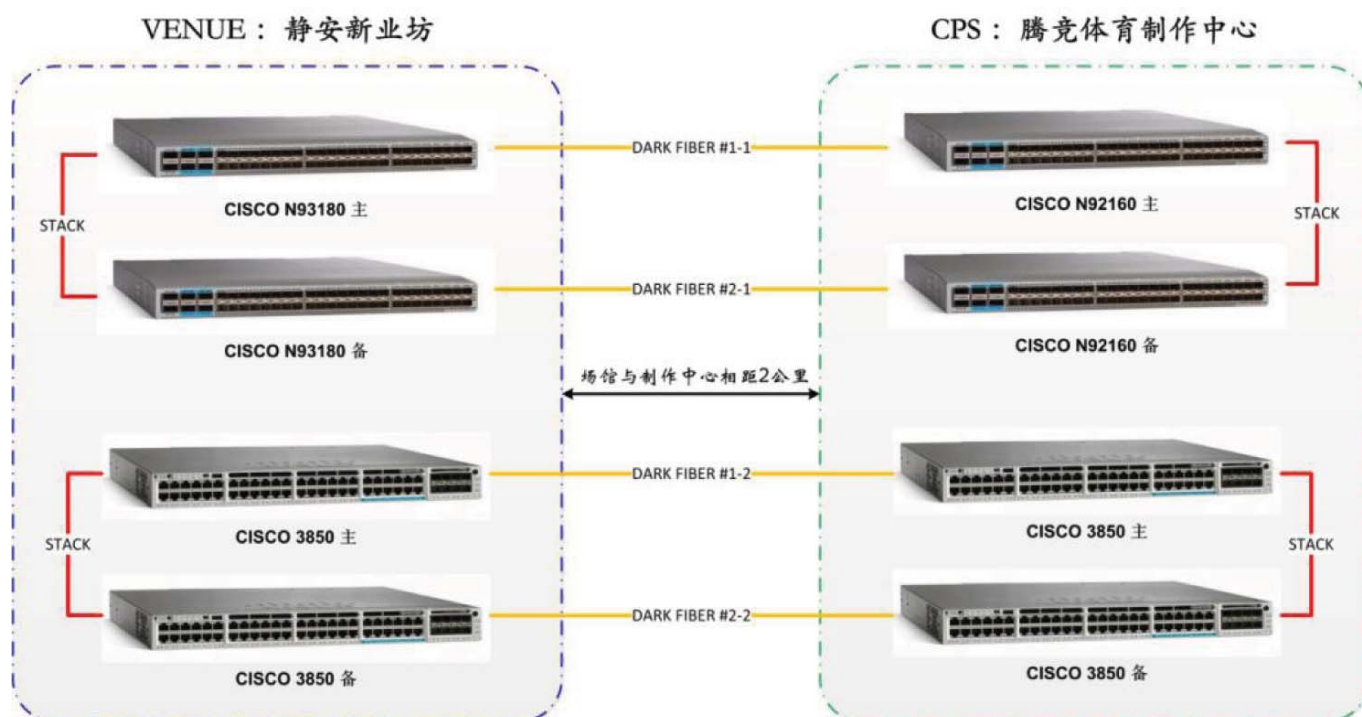
The League of Legends World Championship is the biggest annual competition in League of Legends. The global Championship is the highest honour, the highest gold content, the highest competitive level and the highest popularity among all league of Legends competitions. To date, the Finals have been held for ten seasons, between S1-S10.

For all S10 events, signals from all venues are sent back to the 'rear' Tengji sports production centre CPS for "IP remote production" live routing, and as the global live streaming network platform. In this full remote, IP production, a variety of transmission modes, including non-compression, shallow compression and deep compression, are used as core technical solutions. The most important

signals are transmitted in non-compression mode. A large number of production signals are transmitted in TICO shallow compression IP format, while the backup scheme is transmitted via a deep compression independent link. Dante, as the core IP audio system, is adopted in the audio system. A total of 128 audio tracks are transmitted by Dante as the main and standby audio system for the groups and final.

The venue for group competition is M-Hub Jing'an, which is 2 kilometres away from CPS as a straight line, while the actual optical cable transmission distance is less than 10 kilometres. In order to improve the efficiency of optical cable transmission and reduce transmission cost, bare optical cable is used to directly connect to the core switch for "Full IP remote production". Active and standby bare optical cables are connected through two different routes.

CISCO N93180 and CISCO N92160 core switches are used for remote transmission of about 36 video IP signals. The core control switch is CISCO 3850, which is used to transmit IP DANTE audio, VOIP calls, player first view remote control, IPG switch control, TALLY and other control protocols.



The Calrec mixing platform was used as the core audio matrix at the venue, and the two Dante cards of the mixing platform were connected to the Dante audio network of the rear production centre, through IP, for audio signal interaction. The backup transmission is Haivision H.265 deep compressed SRT protocol, which sends important audio signals back to CPS in embedded form.

In terms of security policy, cisco STACK WISE policy is implemented for the entire transmission switch network to ensure that an active/standby switchover can be completed automatically within 30 seconds. The backup solution is the HAIVISION H.265 deep-compressed SRT transmission, which transmits the most important four-channel video with 32 channels of embedded audio signal back to CPS.



b) Final venue: Shanghai Pudong football Stadium

The final venue is the SAIC Pudong football field, about 20 kilometres away from the Tengjing Sports Production centre CPS in straight-line distance, but the actual cable transmission distance is 30-50 kilometres. When the distance is more than 10 kilometres, in order to ensure the stability of transmission, OTN mode (Optical Transport Network) is adopted for "Full IP remote production".

For the final, OTN (Optical Transport Network) was adopted for "all-IP remote production", with Huawei OTN as the main route and China Unicom OTN as the backup route. Four 100G core switches CISCO N92160 were used to transmit 6+3 pairs of IPG board cards; a total of about 66 channels of video remote transmission. Four core control switches, CISCO 9300, are used for DANTE audio, VOIP calls, player first view remote control and IPG switching, and transport of the TALLY control protocol.

Saic Pudong Football Stadium, the frontend for the final, uses a NEXUS audio matrix as the core, based on a MADI

audio network, live broadcast car STUDER tuning platform, live PA DIGICO tuning and OB tuning platform connected to the NEXUS matrix in MADI form. NEXUS converts MADI signals into DANTE signals through YAMAHA RMio64 and accesses the DANTE audio network in the rear production centre through IP. The backup transmission is Haivision SRT transmission, which sends important audio signals back to CPS using embedding.

The intercom system for S10 is Riedel's Artist 128, Artist 64 and Artist 32. Riedel is the core for both the group stage and the final. Riedel's VOIP card and trunk-server connect the arena, CPS and headquarters in Los Angeles.

INNOVATION

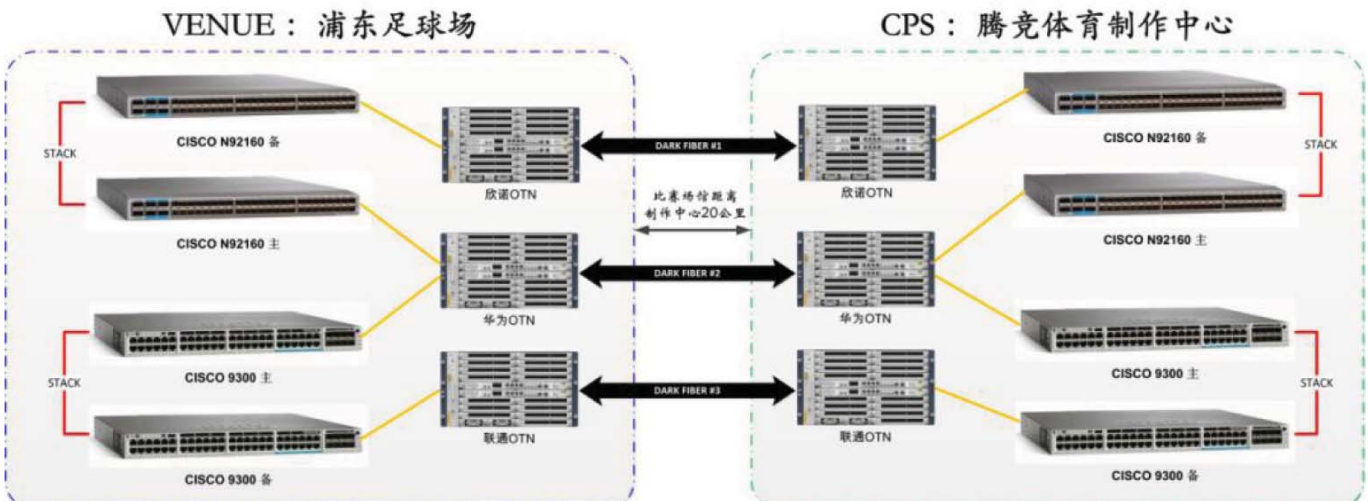
- a. This scheme fully embodies programme broadcast IP. The video compression efficiency, high speed and network transmission of high-definition technology, innovation and development, utilising uncompressed high-definition remote production, light compression, high-definition remote, or deep compression remote production scenario; solutions the user can choose according to prevailing conditions and environment.
- b. This scheme can combines IP technology with remote production, 5G technology and 4K UHD technology, making full use of the respective advantages of IP, 5G and UHD, and evolve remote production from a "wired" remote format to a "wireless" 5G, remote production mode.

ABOUT THE AUTHOR



Xie Qin is Senior Engineer and Senior Export of the Shanghai Media Tech (SMT). Xie Qin lead the team to complete a series of domestic and international large-scale sports broadcasting tasks, including the 2018 PyeongChang Winter Olympic Games, the 2021 Tokyo Olympic Games, the 2018 Jakarta Asian Games, the 2019 Wuhan Military Games, the China National Games, etc, and was the first Chinese expert to lead the domestic broadcasting system to complete the technical services of Olympic broadcasting overseas.

During his career, he participated in and completed many scientific and technological innovation award projects and lead the construction of key broadcasting projects from HD to 4K to 8K, baseband to IP to remote to cloud production and so on. ■



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How can DVB-I help broadcasters to get prepared for future?

INTRODUCTION

Growth of penetration of internet and connected devices, OTT content production and the viewing of Media over the Internet (OTT) are realities of the new age of media. On other hand, the COVID-19 pandemic has brought an unforgiving illness to the world and has changed the way people live. We see that OTT audience-time increased in lockdowns. The media age is changing and these changes are not hidden from broadcasters. Let's imagine days when people watch more and more content through their connected devices (TV, mobile phone etc.) and through internet, not broadcast signals. Of course this future is not far away in some countries, it has happened, and it will happen in other countries, too. Where will broadcasters stand in this future? How can broadcasters access their viewers? How can their services be discovered among the many other services on the internet?

DVB is preparing well for this future, Its standardisation activities like DVB-MABR, DVB-DASH, DVB-TA and DVB-I show that it understands this future and the necessity for evolution. Mr. Peter MacAvock made mention of this in DVB Scene 57, via his article 'Internet-centric, broadcast-bred – a challenging mix'. Over the last two years or so, DVB has shifted to promoting itself as internet centric. But what does this mean? It's about changing mindsets, shifting focus, revamping old working methods, and accompanying (encouraging? dragging?) industry stakeholders into the future, all while retaining their support.

DVB-I has been created to provide partial solutions to some of the needs in this future, when broadcasters want their services to be accessible on the internet as easily as via broadcast.

The commercial requirements of DVB-I were developed in 2016. The target devices were all connected devices including mobile phones, PCs, tablets and connected TVs. There were several questions in these first steps: There are many services over the internet, how should receivers discover Broadcaster's services over the internet? How should viewers trust these services? How can viewers access to the services over internet as easily as broadcast? How can viewers have an experience similar to broadcast, for service list, EPG, zapping between services, on broadband?

The DVB-I technical group's answers to these questions can be found in "Service Discovery and Programme Metadata for DVB-I". The specification has been published as DVB BlueBook A177 in 2019 and was standardised as TS 103 770 in 2020.

SERVICE DISCOVERY AND PROGRAMME METADATA FOR DVB-I

The DVB-I specification has been designed to bring the standard of linear TV delivered over the internet up to the level of the traditional broadcast experience both in video quality and user friendliness. A major focus lay in making the processes of search, discovery and navigation as straightforward as they are with leading broadcast services. This has led to development of components allowing linear TV services to be discoverable over the internet, involving delivery of suitable metadata.

The term "I" in DVB-I refers to 'internet' and DVB-I is going to be as same as DVB-T, DVB-C and DVB-S. DVB has standardised the interoperability between the client and the service provider for accessing services over internet.

The DVB-I Service Layer provides the mechanism for a client, which could be an application running in a smart TV set or any other connected devices, to discover service lists. DVB-I services can be a service that is delivered over broadcast or internet as DVB-DASH or both of these methods.

The service list provider prepares a service list of DVB-I services from all content providers. It may target a Service List of a particular platform brand, geographical region, language or other market segment, or none of these [see "DVB BlueBook A177r2:Service Discovery and Programme Metadata for DVB-I", 2021]

The service list provider registers the service list in Service List Registry. A Service List Registry is an HTTP endpoint made available at a known Service List Registry URL that can return a list of Service Lists and their Service List URLs. Service list registries can be operated by device manufacturers (for their specific service lists), by national or regional regulators, by operators for their specific clients, or by Central Service List Registry for all devices that implement DVB-I client and a third-party service list aggregator.

The DVB-I client may offer a specific service list just for a platform or several service lists to the users, who can select among them, or it can combine several service lists and create one list from them.

Note that for the purpose of accessing to the service list(s), DVB has defined a service list discovery method for the client.

SERVICE LIST DISCOVERY:

The client will send a query to a known service list registry for access to the address of service list(s). The user will

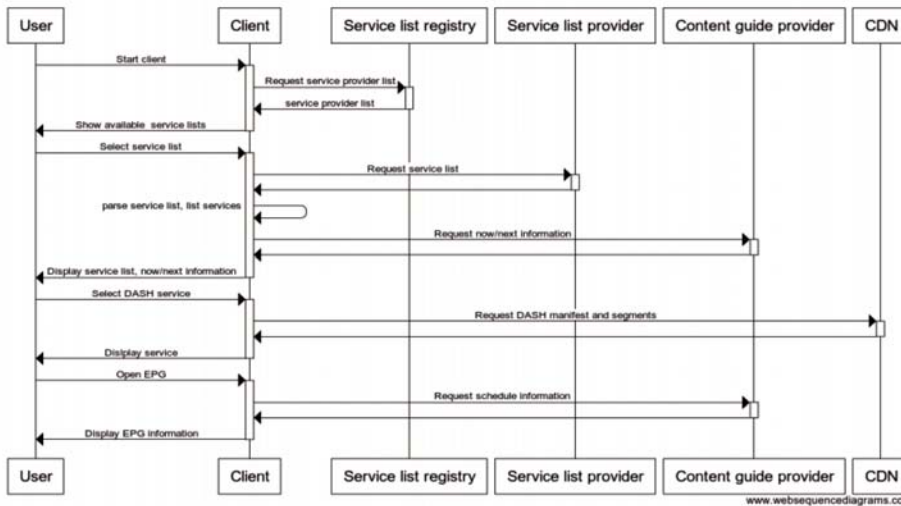


Figure 1: Sequence example

https://dvb.org/wp-content/uploads/2020/03/20200406_webinar_DVB-I_slides_FINAL.pdf

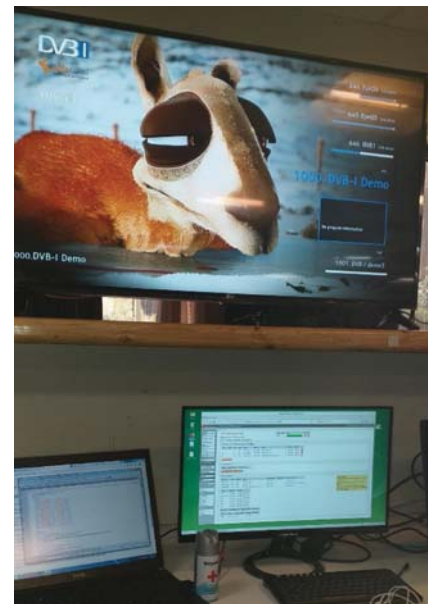


Figure 2: Laboratory setup for DVB-I and trial service list

select a service list and the client will display the service list on their device. **Figure 1** shows the sequence.

DVB-I can offer a common list of Broadcast and Broadband services and viewers can switch between services easily, no matter whether they are receiving through broadcast or broadband. In this way the broadcaster can offer a common list for its internet and broadcast services.

The DVB-I standard makes it possible to have a programme guide, related material, and linked applications for every service.

One of the main benefits of DVB-I is the possibility of offering UHD content over DVB-I. Lower quality content can be offered over broadcast and higher quality like UHD can be offered over internet. Services can be provided by both internet and broadcast delivery.

DVB-I REFERENCE CLIENT

DVB has provided DVB-I reference Client to assist DVB-I implementers. The project consists of backend and frontend parts. The frontend is an HbbTV OpApp implementation of a DVB-I compatible Client. It offers Service list navigation, selection/tuning of services, info

banner and a simple EPG. A separate client is offered for Android devices. The Android client is a PWA application, offering roughly the same functionality. The application is available in GitHub: <https://github.com/DVBproject/DVB-I-Reference-Client>

DVB-I IN IRAN

IRIB started laboratory test of DVB-I after a study phase in March 2020. As a first step, a service list, including services with DVB-T/DVB-DASH instances, was created. The service list was registered in IRIB's Service List Registry and the address of SLR was hard coded in the Client. All standards have many features and details and a laboratory trial can help to evaluate those features and potential benefits. The laboratory test helped IRIB to carry out its evaluation of different features of DVB-I and to assess how it could be applied to current and future IRIB services.

After the trialing of DVB-I in the laboratory, a new service list for the pilot phase was created, this new service list included 63 services :30 national and 33 regional IRIB services. The national services had DVB-T instances and regional services had DVB-T and DVB-DASH instances. LCN, created based on IRIB network LCN, are shown in the following code:

```

<?xml version="1.0" encoding="UTF-8"?>

<ServiceList xmlns="urn:dvb:metadata:servicediscovery:2019" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xmlns:tva="urn:tva:metadata:2019" version="1" xsi:schemaLocation="urn:dvb:metadata:servicediscovery:2019 ..
/dvbi_v1.0.xsd">
  <Name>IRIB DVB-I example service list</Name>
  <ProviderName>IRIB RD</ProviderName>
  <LCNTableList>
    <LCNTable>
      <LCN channelNumber="1" serviceRef="sid101"/>
      <LCN channelNumber="2" serviceRef="sid102"/>
      <LCN channelNumber="3" serviceRef="sid102"/>
      <LCN channelNumber="4" serviceRef="sid104"/>
      <LCN channelNumber="5" serviceRef="sid105"/>
      <LCN channelNumber="6" serviceRef="sid106"/>
      <LCN channelNumber="7" serviceRef="sid107"/>
      <LCN channelNumber="8" serviceRef="sid108"/>
    
```

Every service in IRIB service list has a unique identifier as below:

```
<UniqueIdentifier>sid109</UniqueIdentifier>
```

The service has two service instances, DVB-T and DVB-DASH. The DVB-T instance has higher priority in the service list so, as the first step, TV runs the service from DVB-T if a DVB-T signal is available. The DVB delivery parameter includes DVB Triplet of service as below:

```
<ServiceInstance priority="1">
  <SourceType>urn:dvb:metadata:source:dvb-t</SourceType>
  <DVBDeliveryParameters>
    <DVBTripId origNetId="3622" tsId="102" serviceId="109"/>
    <TargetCountry>IRN</TargetCountry>
  </DVBDeliveryParameters>
</ServiceInstance>
```

DVB delivery parameter includes DASH URI as following code:

```
<ServiceInstance priority="2">
  <SourceType>urn:dvb:metadata:source:dvb-dash</SourceType>
  <DASHDeliveryParameters>
    <UriBasedLocation contentType="application/dash+xml">
      <URI>http://live.trib.ir/mdash/abadan/manifest.mpd </URI>
    </UriBasedLocation>
  </DASHDeliveryParameters>
</ServiceInstance>
```

The service list was based on serving a need within the local audience for the reception of provincial services from elsewhere in the country. In this way, people could receive national TV and their own provincial TV channels through broadcast and other provincial TV channels through internet.

The service list was registered in IRIB SLR and the SLR address was hard coded in the client.

```
var PROVIDER_LIST = http://rd.trib.ir/servicelist\_registry.php
```

The client was customized for Android phone/TVs and also HbbTV receivers. **Figures 3** and **4** show the launch of service list on mobile and TV. Users can switch between TV channels easily no matter whether from broadband or broadcast.



Figure 3: Displaying DVB-I Service list on android phone



Figure 4: displaying DVB-I service list on HbbTV Receiver

DVB-I IN OTHER COUNTRIES

DVB DEMOS 2021 showed there is growing momentum around DVB-I. Several companies demonstrated early implementations of products based on the specification. In 2021, the new Italian receiver spec, UHD Book 2.0, foresees mandatory DVB-I support, post 2022. It considers some preconditions for the mandatory status of DVB-I in Italy: firstly, DVB-I should be ratified as an ETSI standard and the secondly, major Italian broadcasters should have successfully completed proofs-of-concept and trials showing end-to-end interoperability of all components. [see "UHD Book 2.0", HD forum Italy, 2020]

Dolby and TP Vision recently collaborated to show how DVB-I can deliver a UHD service complete with immersive audio to an off-the-shelf Philips connected TV running a prototype DVB-I client. This utilised an AC-4 audio stream, enabling fully immersive 360-degree audio reproduction with its built-in loudspeaker system, without requiring any additional speakers [see "Enabling enhanced linear TV experiences with DVB-I", DVB Scene 57, 2021]

DVB-I OVER 5G

In July 2021, the DVB Project approved commercial requirements for DVB-I service support over 5G networks and systems as DVB Blue Book C100. Work has already been assigned to DVB's Technical Module to provide extensions to the relevant existing specifications – including DVB-I service discovery and DVB-DASH – to address the use cases and requirements collected and agreed by the Commercial Module. [see "DVB Bluebook C100: Commercial Requirements for DVB-I over 5G", 2021]

The commercial requirements demand specifications to support different Rel-16-based 5G operation modes, 5G Broadcast, unicast-based 5G Media Streaming, concurrent delivery of the same service over both modes, and hybrid DVB-I services. In all cases it is expected that the specifications reuse existing DVB technologies to the full extent possible and provide commonalities with other IP-based DVB delivery means. AS DVB-I was designed to provide a TV service platform independent of access layer, many issues of technically-oriented requirements in different service operation phases and client related aspects are already covered by the existing DVB-I specification.

CONCLUSION

DVB-I offers a solution for broadcasters to launch new enhanced services, offer all their services (broadcast and broadband) in one service list and get them prepared for future. The opportunities with DVB-I, in terms of enhancing the user experience even further, are huge and user interaction for accessible and personalised content adds great value for consumers.

ABOUT AUTHOR



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Senior Project Manager, IRIB, Iran

Fatemeh Fallahi works as Researcher at IRIB. She received her MSc. degree in electrical engineering from Tarbiat Modarres university in 2009. In 2009, She joined IRIB R&D and established her career as a researcher on mobile TV, digital switch over and analogue switch off. She has many years' experience in DVB and HbbTV technologies. ■

ABU Engineering Awards 2021

The 2021 Technical Awards presentations were held virtually on 16 November during the ABU Technical Committee.

The Engineering Awards consist of the ABU Broadcast Engineering Excellence Award, the ABU Engineering Industry Excellence Award, the ABU Green Broadcast Engineering Award and the ABU Developing Broadcasters' Excellence Award.

The ABU Engineering Awards were judged by two panels of judges.

Mr Hamid D Nayeri chaired the Broadcast Engineering and Developing Broadcasters' awards panel and Dr Kong Bin chaired the Engineering Industry and Green Broadcast awards panel. The panel members were Mr Sunil, DD-India, Mr Masashi Kamei, NHK-Japan, Mr Dae Hoon Choi, KBS-Korea, Dr Fintan Mc Kiernan, Ideal Systems, Mr Charles Sevier, Dell EMC, Mr Asaad Sameer Bagharib, Thinking Tub Media, Mrs Putri Jolaina bin Yaacob, RTM-Malaysia, Mr Naoki Kashimura, Ikegami-Japan, Mr Peter Bruce, Elevate Broadcast-Singapore and Mr Alexander Zink, Fraunhofer-Germany.



Dr Reza Alidadi
Technical Vice President of the Islamic Republic of Iran Broadcasting (IRIB-Iran)

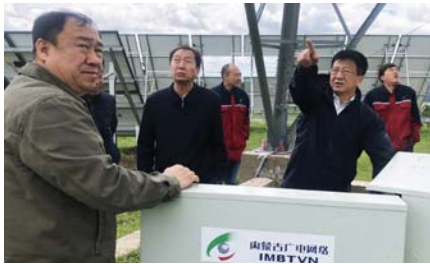


The **ABU Broadcast Engineering Excellence Award**, which recognises contributions of an outstanding nature in broadcast engineering made by an individual in a broadcasting organisation, was awarded to Dr Reza Alidadi, Technical Vice President of the Islamic Republic of Iran Broadcasting (IRIB-Iran). Dr Alidadi won the award for leading IRIB's migration from SD to HD and 4K-UHD as an important national project.



Mr Fu Haibo

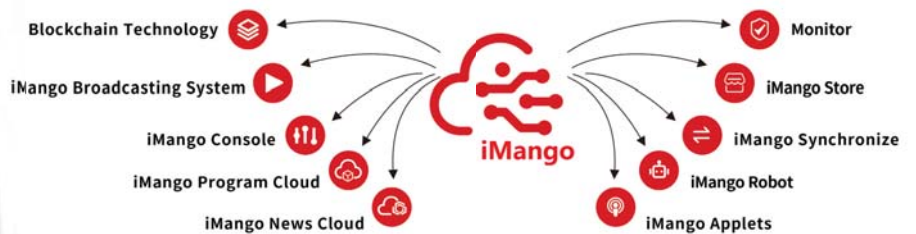
Chairman of the Board, Inner Mongolia
Broadcast and Television Network
Group Co., Ltd, RTPRC-China



The **ABU Engineering Industry Excellence Award**, which recognises the most outstanding engineering contribution made by an individual to the broadcasting industry in the region, was awarded to Mr Fu Haibo, Chairman of the Board, Inner Mongolia Broadcast and Television Network Group Co., Ltd, RTPRC-China. Mr Fu Haibo won the award for his outstanding leadership of Inner Mongolia Broadcast and Television Network Group including the provision of coverage in many remote areas.



5G iMango Radio System



The **ABU Green Broadcast Engineering Award** recognises outstanding contributions in developing, implementing and/or promoting green technology in the broadcasting industry. The 2021 winner was the Golden Eagle Broadcasting System, RTPRC Radio, Film & TV Design and Research Institute, China for developing the 5G iMango Radio system promoting environmental protection measures and other green initiatives.

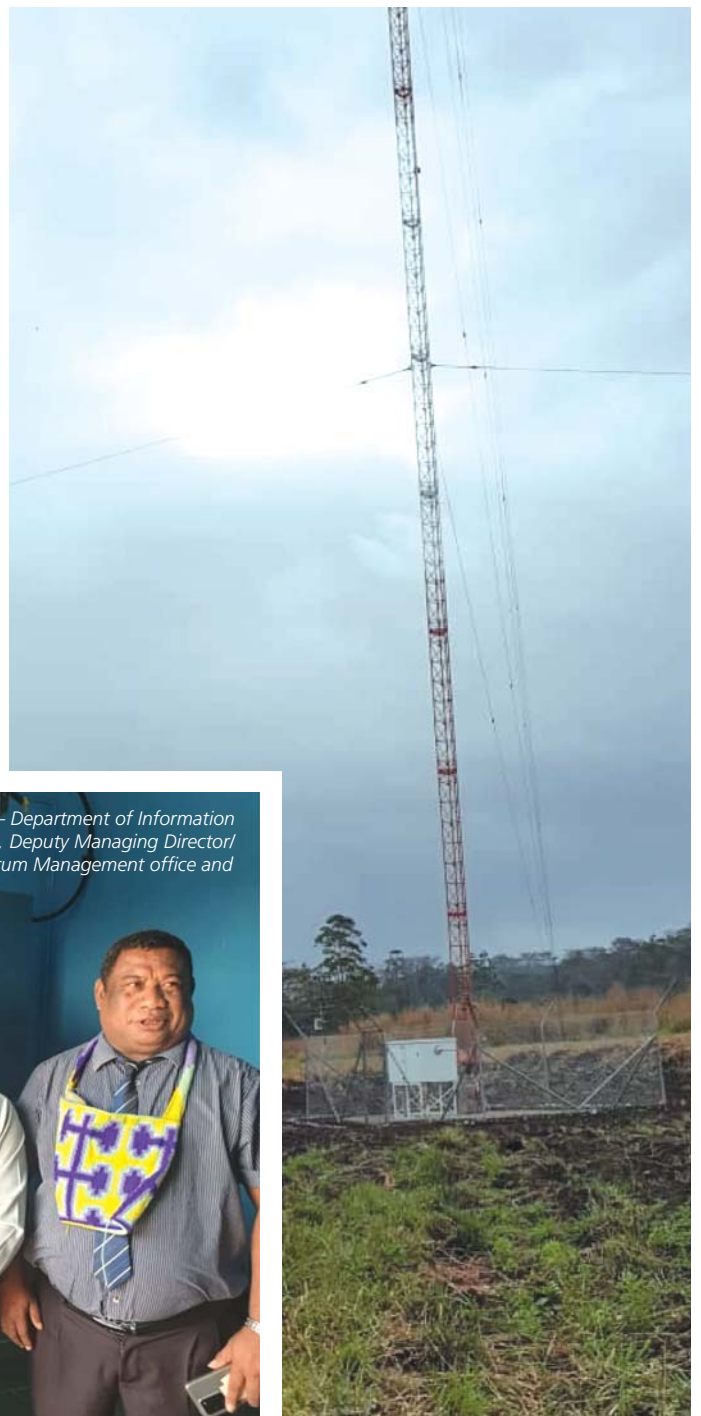


湖南广播影视集团有限公司
Golden Eagle Broadcasting System



Mr Joe Wafewa
Deputy CEO, National Broadcasting Corporation – Papua New Guinea

The **ABU Developing Broadcasters' Excellence Award** which is for contributions of an outstanding nature in broadcast engineering made by an individual in a developing broadcasting organisation was awarded to Mr Joe Wafewa, Deputy CEO, National Broadcasting Corporation – Papua New Guinea for leading the installation and commissioning of an AM transmitter in Goroka and bringing radio services to many remote areas.



From left: **Russel Woruba**, Deputy Secretary – Department of Information and Communication; **Joe Wafewa**, NBC-PNG, Deputy Managing Director/ Chief Engineer; **Bannie Popate**, NICTA-Spectrum Management office and **Kora Nou**, Managing Director NBC- PNG

ABU Technical Review Prizes 2021

The ABU Technical Review Prizes were awarded for articles contributed to the Technical Review from October 2020 to September 2021. The prizes were judged by the ABU Technical Committee Chairman and Vice-Chairmen.

Three prizes were presented, one each from the categories of Practical Implementation, Research and Case Studies.

The winner for the **Best Article on Practical Implementation** was Mr C W Leung, Head of Engineering, Radio Television Hong Kong, for the article titled Audio Description for communion of visually impaired and normally sighted persons which appeared in the Quarter 4 2020 ABU Technical Review.



Mr C W Leung
Head of Engineering,
Radio Television Hong Kong

The winner of the **Best Article on Case Studies** was Dr Les Sabel, Chair of the WorldDAB APAC Technical Group, for the article titled DAB Adoption Process Guide | Investigations and Trials which appeared in the Quarter 1 2021 issue of the ABU Technical Review.



Dr Les Sabel
Chair of the WorldDAB APAC
Technical Group

The **Best Article on Research** was co-authored by Mr Mohsen Shaban Moazam, Mr Seyed Hossein Alavi Soltani, Dr Mohieddin Moradi and Mr Maher Fatehpour. The title of the article was A Novel Approach for Evaluating Multi-Path Adaptive Video Streaming in IP Networks which appeared in the Quarter 1 issue of the ABU Technical Review this year. The authors are from the Islamic Republic of Iran Broadcasting R&D and IRIB University. ■



**ISLAMIC REPUBLIC of IRAN
BROADCASTING
(IRIB)**



Mohsen Shaban Moazam
Islamic Republic of Iran
Broadcasting R&D



Dr Mohieddin Moradi
IRIB University



Seyed Hossein Alavi Soltani
Islamic Republic of Iran
Broadcasting R&D



Maher Fatehpour
Islamic Republic of Iran
Broadcasting R&D



Dr Javad Mottaghi, ABU Secretary-General



Mr Hamid Dehghan Nayeri, IRIB-Iran



Dr Kong Bin, NRTA-China



Mr Sunil, DD-India



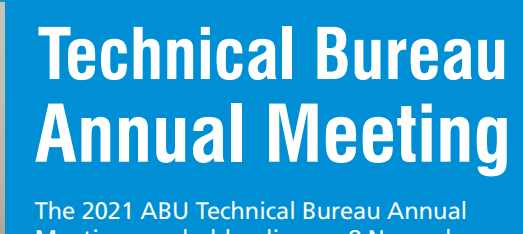
Mr Masashi Kamei, NHK-Japan



Ms Mika Kuroiwa, NHK-Japan



Mr NAGANO Kenichiro, NHK-Japan



Technical Bureau Annual Meeting

The 2021 ABU Technical Bureau Annual Meeting was held online on 8 November.

The current challenges faced by members amid the ongoing pandemic was the main topic for discussion.

The Bureau proposed two Decisions. The first was to support the WBU position on WRC-23 Agenda Item 1.5. The second was to replace the current ABU Green Broadcast Engineering Award with an award to recognise outstanding contributions made by organisations in adopting and implementing mechanisms in line with the United Nations 2030 Agenda on Sustainable Development Goals in all broadcast and related operations.

The meeting ended with the announcement of the results of the Technical Bureau elections. ■



Mr Kenichi Murayama, NHK-Japan



Mr Yuen Man, TVB-Hong Kong China



Mr Terence Yiu, Phoenix, Phoenix TV-Hong Kong China



Mr Dae Hoon Choi, KBS-Korea



Mrs Putri Joliana binti Yaacob, RTM-Malaysia



Mr Peh Beng Yeow, Mediacorp-Singapore



Dr Tharaka Mohotty, MTV-Sri Lanka



Mr Lasantha Samaranyake, EAP-Sri Lanka



Mr Kachan Kannika & Mr Rahut Udomwet, NBT-Thailand



Mr Kazim Pektaş, TRT-Turkey



Mr P Das, Prasar Bharati, India



Mr Nadeem Ahmed, Director ABU Technology & Innovation



Shree Bhadra Wagle, Manager Production & Delivery Technologies



Dr Veyssel Binbay, Senior Engineer - Broadcast Systems

Technical Committee Elections

The elections for the Technical Committee were held online for the first time this year. They were suspended in 2020 because of the pandemic and all members were given a one year extension.

The TC online election process began from 19 August and was completed on 12 October. A total of 60 Members registered for the online election process which was conducted using the ElectionBuddy.com system.

The results of the ABU Technical Bureau elections for the 2022-2023 term were announced during the ABU Technical Bureau Annual meeting on 8 November. The elected members were as follows:

ASSOCIATE MEMBERS IN THE ABU REGION

1. Phoenix TV-Hong Kong China (AM)
2. Walesi-Fiji (AM)

FULL & ADDITIONAL FULL MEMBERS | SUBSCRIPTION CATEGORY A-K

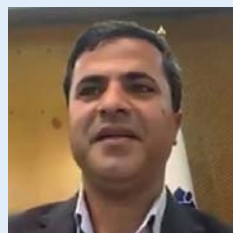
3. NTV-Nepal (FM)
4. PTNI-Philippines (FM)
5. MTV-Sri Lanka (AFM)
6. VOV-Vietnam (FM)

FULL & ADDITIONAL FULL MEMBERS | SUBSCRIPTION CATEGORY L-W

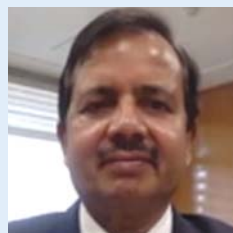
7. NRTA-China (FM)
8. TVB-Hong Kong China (AFM)
9. DD-India (FM)
10. RRI-Indonesia (FM)
11. IRIB-Iran (FM)
12. NHK-Japan (FM)
13. KBS-Korea (FM)
14. RTM-Malaysia (FM)
15. Mediacorp-Singapore (FM)
16. NBT-Thailand (FM)
17. TRT-Turkey (FM)
18. VTV-Vietnam (FM)

TC CHAIRMAN AND VICE-CHAIRMEN

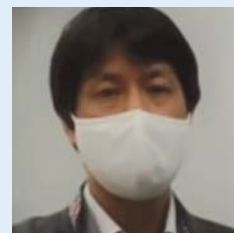
The election for the Chairman and Vice-Chairmen was held on 16 November during the ABU Technical Committee meeting.



Mr Hamid Dehghan Nayeri of IRIB-Iran was re-elected as the Chairman of the ABU Technical Bureau and ABU Technical Committee for a term of two years. Mr Nayeri is the Director, International Technical Affairs at IRIB and was appointed Chairman of the Technical Committee at the TC meeting in Ashgabat in 2018.



Mr Sunil of DD-India and **Mr Masashi Kamei** of NHK-Japan were re-elected as Vice Chairmen.



Mr Kazim Pektas of TRT-Turkey was elected as Vice-Chairman of the Technical Committee.

The ABU Technical Committee confirmed the appointment of Mr Kazim Pektas of TRT-Turkey as Topic Area Chairman for Production, Mr Kenichi Murayama of NHK-Japan as Topic Area Chairman for Transmission, Mr P Das of Prasar Bharati as Topic Area Chairman for Training & Services and Dr Li Leilei of NRTA-China for the Spectrum Topic Area. ■

Scrutineers for the ABU Technical Committee Elections

As per the Rules of Procedure, two Scrutineers were appointed from the Affiliate Members. Dr Kazuyoshi Shogen, Consultant, Broadcasting Satellite System Corporation, B-SAT, Japan and Mr Asaad Sameer Bagharib, Director, Thinking Tub Media, TTM-Singapore, kindly agreed to be the scrutineers for election of the TC Chairman and Vice-Chairmen. The ABU Technology would like to express their thanks to both Dr Shogen and Mr Asaad for their help during the online process. ■

ABU Technical Committee Online Elections 2021

Election Procedure

We have appointed two **Scrutineers** (from our Affiliate members) to monitor the online election.



Dr Kazuyoshi Shogen
BSAT-Japan



Mr Asaad S Bagharib
TTM-Singapore



Newly Appointed ABU Technical Bureau Members

Mr Sheng Zhifan, Vice President of the Academy of Broadcasting Science of NRTA has been appointed the ABU Technical Bureau member representing NRTA-China for the new term. Mr Sheng Zhifan replaces Dr Kong Bin who has served on the Bureau since 2016.



Sheng Zhifan, NRTA-China

The new members joining the Bureau are **Mr Sanjay Maharaj**, Chief Executive Officer of Walese Limited (WALESE-Fiji), **Mr Bishnu Ram Neupane**, Deputy General Manager of Nepal Television Corporation (NTV-Nepal), **Mr Alexander M Poncio**, OIC, Engineering and Provincial Network Division, People's Television Network, Inc. (PTNI-Philippines) and **Mr Do Anh Duc**, Assistant to Vice President, The Voice of Vietnam (VOV-Vietnam).



Sanjay Maharaj, WALESE-Fiji



Bishnu Ram Neupane, NTV-Nepal



Alexander M Poncio, PTNI-Philippines



Do Anh Duc, VOV-Vietnam

We extend a warm welcome to the new members of the Bureau.

We would also like to place on record our thanks and appreciation to the outgoing members, **Dr Kong Bin** of NRTA-China, **Mr Lasantha Samaranayake** of EAP-Sri Lanka, **Mr Solomon Finau** of Tonga Broadcasting Commission (TBC- Tonga), **Mr N Thiyagaran** of All India Radio (AIR-India) and **Mr Ayman Al Zahrani** of Saudi Broadcasting Authority (SBA-Saudi Arabia). ■



Dr Kong Bin, NRTA-China



Lasantha Samaranayake, EAP-Sri Lanka



Solomon Finau, TBC-Tonga



N Thiyagaran, AIR-India



Ayman Al Zahrani, SBA-Saudi Arabia

ABU TECHNICAL BUREAU 2022-2023



Chairman
Mr Hamid D Nayeri
IRIB-Iran



Vice-Chairman
Mr Sunil
DD-India



Vice-Chairman
Mr Masashi Kamei
NHK-Japan



Vice-Chairman
Mr Kazim Pektas
TRT-Turkey
Chairman Production
Topic Area



Mr Sheng Zhifan
NRTA-China



Mr Sanjay Maharaj
WALESI-Fiji



Mr Garry Kum
TVB-Hong Kong China



Mr Terence Yiu Shun Tat
Phoenix TV-
Hong Kong China



Mr Rahadian Ginging
RRI-Indonesia



Mr Dae Hoon Choi
KBS-Korea



Ms Putri Joliana binti Yaacob
RTM-Malaysia



Mr Bishnu Ram Neupane
NTV-Nepal



Mr Alexander M Poncio
PTNI-Philippines



Mr Peh Beng Yeow
Mediagroup-
Singapore



Dr Tharaka Mohotty
MTV-Sri Lanka



Mr Kachan Kannika
NBT-Thailand



Mr Nguyen Duc Tue
VTV-Vietnam



Mr Do Anh Duc
VOV-Vietnam



Dr Li Leilei
NRTA-China
Chairman Spectrum
Topic Area
Bureau Ex-Officio



Mr Kenichi Murayama
NHK-Japan
Chairman Transmission
Topic Area
Bureau Ex-Officio



Mr P Das
Prasar Bharati-India
Chairman Training & Services
Topic Area
Bureau Ex-Officio

ABU TECHNICAL COMMITTEE MEETING 2021

HELD VIRTUALLY ON 16 NOVEMBER 2021

OPENING SESSION



TC Chairman, Mr Hamid D Nayeri of IRIB-Iran

The Technical Committee (TC) meeting was, this year, again held as a virtual event and was chaired by TC Chairman **Mr Hamid D Nayeri**.

Mr Nayeri welcomed all participants and in his opening remarks stated that, given the difficulties of the pandemic, the mandate of broadcasters continues as it was before and that it had even created other opportunities to use existing digital technologies. Broadcasters ought to use the available technologies for offering quality services to their audiences. Advantages of such advanced technologies were obvious, and the members were getting more experience too. New and advanced technologies were also emerging and their adoption was the key to gaining a competitive edge. Media consumption was becoming more personal and so was the content offered. Broadcasters needed to be more agile.

Mr Nayeri lauded the outcome of the Annual Technical Bureau meeting on 8 November, which was well attended. Bureau members had discussed their in-house experiences and challenges faced during the pandemic. Members having gradually become accustomed to the online platform, the Bureau also discussed the possibility of adopting a hybrid approach for future activities to allow more members to join.

Expressing the wish that the Technical Committee would adapt itself to the imminent change, Mr Nayeri expressed the need to limit the TC meeting to one-day only as the General Assembly events are simplified.



ABU Secretary-General, Dr Javad Mottaghi

Dr Javad Mottaghi, ABU Secretary-General welcomed all delegates to the virtual session. It being yet another opportunity for members to get together. He informed the meeting that more than 600 delegates had registered for the General Assembly and associated meetings.

Dr Mottaghi noted that some countries were doing better while some were suffering during the ongoing pandemic. However, at the same time, the pandemic had amplified the role of broadcasters. More audiences had turned to public service media for trusted information through these difficult times.

The use of digital technologies by members has allowed them to create and harness easy solutions. However, the flip side of this is has been a spread of mistrust and fake news with social media being the principal means of this spread. Therefore ABU members needed to work together to safeguard their roles and keep public trust alive.

The Secretary General congratulated the Technical Committee for their important meeting agenda and their hard work. Emphasising that the committee should work to reduce the digital divide in the region, he concluded by thanking the newly elected Bureau Members and wished them success in the ongoing TC meeting.



ABU TECHNOLOGY ACTIVITY REPORT

Mr Ahmed Nadeem, Director of ABU Technology, briefed the meeting on the activities organised by ABU Technology for the benefit of members. He outlined the different activities undertaken since the TC2020 meeting.

A total of 26 webinar sessions on 38 topics had been organised, with about 90 participants attended each session on average. The DBS 2021 was run as a virtual event with a customised production and streaming platform. It attracted 70 speakers and over 1000 participants to the 5-8 April event. The symposium was produced in a Restream studio and streamed live via the ABU webpage.

The following activities were organised under capacity building initiative:

1. Webinar on OTT and IBB Technologies and Services, January 2021
2. Webinar on Satellite Technologies for Broadcasters, March 2021
3. Webinar on Video Compression Technologies and Applications, March 2021
4. DBS 2021 Virtual Event, 5-8 April 2021
5. Webinar on IP Infrastructure & Applications, May 2021
6. Webinar on Advanced Transmission and Delivery Technologies, June/July 2021
7. Training Course on Engineering Fundamentals for Broadcasters, July/Aug and Sept/Oct 2021
8. Central Asia Media Forum, July 2021
9. ABU Pacific Media Partnership Conference, Sept 2021
10. Webinar Series on Member Innovations, Oct/Nov 2021

Similarly, regarding international cooperation and partnership, the events partnered and participated in by the ABU were:

1. WBU-TC Conference Call, 7-June, Online,
2. HFCC A21 and B21 Coordination Process, Online
3. ITU Regional Radiocommunication Seminar, October 2021

A few initiatives under publications and other projects were indicated. First was the Technical Review magazine, published as an e-version over the last four issues. The ABU Secretariat has now taken the decision that all ABU publications will be made available only as e-versions in future, including the ABU Technical Review, the ABU News.

The Asia-Pacific View (APV) Platform which is managed by ABU Technology is a cloud based online content sharing network developed and operated by the ABU to combine the current content exchange services AVN, APX and ASN.

All the recorded sessions from all webinars organised since April 2020 are uploaded to APV and will soon be made available on-demand through a new website.

The TD's involvement was acknowledged, in identifying and setting-up the ElectionBuddy.com platform, used for the online elections of the Administrative Council and other Committees of the ABU.

BUREAU PROPOSALS

Mr Nadeem briefed the meeting on two Bureau proposals.

Decision 1/2021 on supporting the WBU position on WRC-23 agenda item 1.5

'The ABU Technical Committee decides to support the WBU position on WRC-23 agenda item 1.5 and agrees to the position that no further reduction in the UHF spectrum for broadcasting is acceptable for the Region.'

The meeting also approved that the ABU position be conveyed to the ABU members and also to the relevant regional and international organisations.

Decision 2/2021 on the ABU Broadcast Engineering Award on SDGs Implementation

'Recognising that among the 17 goals of the SDGs, some areas have been identified to be applicable in broadcast management and operations, the ABU Technical Committee decided to replace the current ABU Green Broadcast Engineering Award with a newly instituted award to recognise outstanding contributions made by organisations in adopting and implementing mechanisms in line with the United Nations 2030 Agenda on Sustainable Development Goals in all broadcast and related operations.'

It was also agreed that a set of guidelines be developed to address the areas applicable, and to govern the modalities for this purpose. Also, that the award be presented annually on the basis of an appropriate selection process. Soliciting comments and remarks on those documents, the session chair, seeing no objection, approved these proposals.

ANNOUNCEMENT OF TB ELECTION RESULTS

Mr Nadeem briefed the delegates on the results of the ABU Technical Bureau elections for the 2022-2023 term. These were also announced at the Technical Bureau Annual meeting on 8 November after completing all the steps in the due election process held from August-October. For more details see page 14.

The Chairman joined Mr Nadeem to congratulate new members, Walesi-Fiji, NTV-Nepal, PTNI-Philippines and VOV-Vietnam, and extended them a warm welcome to the Bureau. As per the regulations, the new Bureau would come into effect after the Annual Technical Committee Meeting on 16 November 2021.

The opportunity was taken to thank the outgoing Bureau members, AIR-India, SBA-Saudi Arabia, EAP-Sri Lanka and TBC-Tonga, for their contributions and outstanding support to the ABU Technical Bureau.

ELECTION OF TC CHAIRMAN

Mr Nadeem explained the election process to the meeting. He advised that the Chairman would be elected for a term of two consecutive years from among the Full Members represented on the Bureau and that the three Vice-Chairmen would also be elected for a term of two consecutive years, from among the Full Members and Additional Full Members represented on the Bureau.

Two scrutineers for the election process were appointed from the Affiliate Members as per the Technical Committee Rules of Procedure to monitor the process. These were, Dr Kazuyoshi Shogen from BSAT-Japan and Mr Asaad S Bagharib from TTM-Singapore.

After the election process, Mr Nadeem announced that Mr Hamid Nayeri from IRIB-Iran had won the election and congratulated Mr Nayeri on his re-election as Chairman of the Technical Committee.

KEYNOTE PRESENTATION



Mr C W Leung, Head of Engineering, Radio Television Hong Kong (RTHK-Hong Kong China) delivered the Keynote presentation titled, 'Audio Description (AD) service over DTT for communion of visually impaired and normally sighted persons'. He briefed the attendees on issues such as adopted technologies, technical challenges faced, key technical features, and modules of the AD system, along with details of its Implementation and steps to use the mobile version of its App.

Mr Leung noted that Audio Description renders TV services more accessible to visually impaired people by providing an explanation of what is happening on the screen, during the gaps in dialogue, making it easier for them to follow the programme. RTHK had been producing a series of audio description (AD) TV programmes, in which visual messages were turned into verbal expressions. The main objective of the project was extending the AD service to achieve communion of visually impaired and normally sighted people sitting together to enjoy TV programmes, allowing RTHK to further its audience reach and facilitate the building of a more inclusive and caring society.

Visually impaired people listen to the AD soundtrack on mobile apps and the original soundtrack on TV, while normally sighted people listen to original soundtrack. Technical challenges were, analysis of the timing difference between the two audio signals decoded from TV set and mobile device and in noisy environments, or when the sound level of TV was too low and the target pilot signal output from TV set was difficult to detect. Similarly, diverse use of mobile devices with different operating systems, headsets and system clock settings adds to the complexity

of consistent synchronisation. An important step had been to achieve synchronisation with the received sound signal from the off-air DTT signal, and later being able to achieve synchronisation between the streamed AD soundtrack and the off-air standard soundtrack via an embedded pilot signal inaudible to the audience. The mobile application can detect the pilot signal contained in the TV output sound, allowing it to align the AD soundtrack playing through the mobile application with the standard audio soundtrack transmitted via DTT.

The AD system is compliant with international and local accessibility standards, such as WCAG (Web Content Accessibility Guidelines), OGCIO's mobile application accessibility handbook and supports the most popular mobile devices such as Apple's IOS and Android's mobile devices. During implementation, special attention was given to technical trials and user trials for the prototype product, to ensure the developed solution was fully meeting the needs of target user groups. Modifications and fine tuning of the solution was done based on user feedback. The service was launched on 3 April 2021 after about two years of preparation. RTHK provided instructions to its audience on how to use Mobile App. About 350 hours AD programmes were produced and serviced in the first year of launch. RTHK is further working on second language communion among speakers of different languages.

A question was asked about public feedback on the service, to which Mr Leung said they had received better response from NGOs and other community groups. When it was introduced, greater interest from the public was observed. To a question as to whether there were any solutions for the hearing impaired, Mr Leung referred to the subtitles and sign language programme in service at RTHK, especially during Olympic games. RTHK was introducing a sign language service on a second screen rather than on the same screen in PIP mode. The preparation work on the project had been initiated with the production work assigned to a specific team, first, for scripting and then recording & post-production, with regular supervision from a specialised team.

The TC Chairman thanked Mr C W Leung for his presentation and urged other broadcasters to introduce such services.

SUMMARY REPORTS FROM TOPIC AREA CHAIRMEN



Mr Kazim Pektas, Chief Engineer, Studio Planning Department, TRT-Turkey, and Production Topic Area Chairman, began by thanking NHK for their three valuable contributions to the TC report.

Mr Pektas then briefed the meeting on two EBU documents. The first was **EBU R 153**, 'Parameters for Live Contribution of UHD-HDR programmes' (Geneva, September 2021), which recommends formats and parameters for live programmes where UHD-HDR content is exchanged between different partners. The

second document, **EBU R 154**, 'Parameters for UHD-HDR programmes exchanged as files' (Geneva, September 2021), recommends formats and parameters for programmes delivered or exchanged as UHD files between different partners.

The first contribution from NHK was a project about systems for people with special needs (P/SN). NHK has developed a physical sensation system that presents haptic information, synchronised with live sport broadcasts. The haptic stimuli improve accessibility to sport video and enhances the viewer's feeling of immersion. The second contribution was, "IT-based Production System and file-based workflows" and the third was "Automatic Transcription System that Adds Speaker Information". [For a full report, see page 24.](#)



Mr Kenichi Murayama, Senior Manager, Planning & Management Division, Engineering Administration Department, NHK, and Transmission Topic Area Chairman, reported on the projects under this topic area, Frequency Planning for Digital Broadcasting, Next Generation Terrestrial Broadcasting, Integrated Broadcast-Broadband and OTT, Satellite Broadcasting etc.

[For a full report, see page 27.](#)



Mr Padarabinda Das, Deputy Director General (Engg), National Academy for Broadcasting & Multimedia (NABM), Prasar Bharati and Chairman of the Training & Services Topic Area, mentioned that the ABU has been continuing its collaborative efforts with its members continuously and consistently to address their broadcasting needs and requirements.

[For a full report, see page 40.](#)



Dr Li Leilei, Professor, Academy of Broadcasting Planning, NRTA-China provided a summary of the Spectrum Topic Area. Dr Li Leilei observed that although there were many Agenda Items for WRC-23, only 8 of them were really relevant to broadcasters.

[For a full report, see page 43.](#)



Mr Xie Qin of Shanghai Media Tech made a presentation titled “Full IP UHD remote production Full-scenario solution”. In this scheme, a new remote production mode is realised through IP link and IP technology, which is no longer limited by the distance between the event/programme site and the broadcast production system. IP standards of production domains such as SMPTE ST 2020/2110, AES-67 and Dante are used, combined with TICO, JPEG XS and other compression methods. At the same time, relying on dark fibre, OTN, 5G and other transmission means, as well as SRT and other transmission protocols, the programme solves all technical elements: camera signal, video signal, audio signal, call signal, control signal and data signal remote production problems. The scheme uses non-compression, shallow compression, deep compression, and other methods to realise full IP remote production and broadcast capability in the scenarios of intracity, inter-city and cross-country.

Ms Imaliana Muzni, from Media Prima Berhad, Malaysia, presented “Hybrid Broadcast Broadband TV Implementation in Malaysia”. Hybrid Broadcast Broadband TV may be one of the value-added services for digital terrestrial television. HbbTV is meant to support and complement digital terrestrial TV, attempting to ensure that viewers remain within the DTT ecosystem. Ms Imaliana observed that ensuring better DTT reception in Malaysia is essential before HbbTV is implemented. Marketing and that promotion of DTT needs to be enhanced.

Guangxi's emergency broadcasting system realizes the "Last Step" in providing public services

Radio and Television Bureau of
Guangxi Zhuang Autonomous Region, China
Chief of Science and Technology Division, Lan Zhaohua



Mr Lan Zhaohua, from Radio and Television Bureau of Guangxi Zhuang Autonomous Region, China, made a presentation entitled "Guangxi's emergency broadcasting system realizes the "Last Step" in providing public services". The presentation introduced the features of Guangxi's emergency broadcasting system and its role in coping with public emergencies. It expounded the experiences and practices of Guangxi Radio and Television Administration in constructing and promoting the local emergency broadcasting system. By technological innovation, Guangxi has created a safe, stable and efficient emergency broadcasting system, which can safely realise coordinated actions and be reliable and available, both in normal times and in crisis, thus effectively realising the "last step" in providing a public service.

5G iMango Radio System

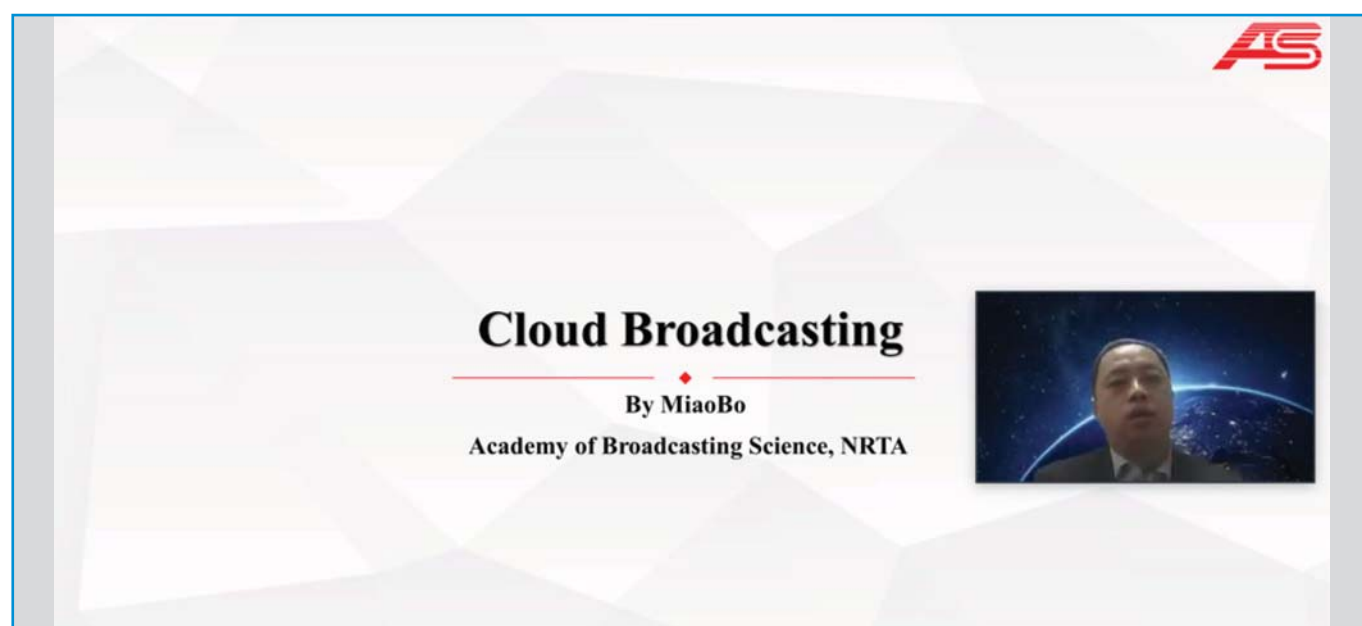
after installing the 5G iMango Radio system

"5G iMango Radio - Create a radio programme in 5 minutes" was presented by **Mr Huang Rong**, from iMango Radio (Golden Eagle Broadcasting System (Hunan Broadcasting Group) who said that 5G iMango Radio is a system integrating AI broadcasting technology + content of copyright + iMango smart broadcasting system. The 5G iMango Radio system ensures that "a radio station can be built in just 5 minutes." After installing the 5G iMango Radio system,

it could operate a 24-hour broadcasting radio station with high quality all year round, providing local news, road traffic, weather and other up-to-minute local information captured and edited by AI robot and broadcast by AI hosts with different sound and emotional characteristics. Through new technologies the 5G iMango Radio System saves costs of content production and operation and improves productivity and quality of radio content by freeing employees from repeated work and reducing digital resource wastage. This helps make it easier to start a radio station in less developed regions and contributes to the transformation of management patterns in the traditional broadcasting industry.



Mr Wang Yongqi, from NRTA, China, made the presentation “New broadcasting technologies are driven by Artificial Intelligence for communicational barrier-free”. NRTA’s Key Laboratory of 5G High Format and New Concept Video Multi-Scene Application and Hunan Changguang QianBo technology company has developed a sign language system based on artificial intelligence for the broadcasting media. It provides a technical solution for TV news programmes with sign language and offers the communicational barrier-free media service for deaf people. So far, this system has been implemented by 161 television stations in China and has contributed to the depth of integration of broadcast and television media and the barrier-free environment.



Finally, **Mr Miao Bo** of NRTA-China, made a presentation entitled “Cloud Broadcasting”. In the traditional broadcasting service scenario, many broadcasting devices, such as switchers and AV matrices, have to be moved to a site, or expensive outside broadcasting trucks need to be used, with many workers assigned to the site to participate in the programme production. This results in high personnel input and costs. However, with cloud broadcasting, a broadcast can be conducted in the form of cloud software service, the video signals are transmitted via IP, and the programme producers can conduct the site control and switching remotely. ■

DVB-T2 Matlab Simulink Simulation Model: A Training Toolkit for Broadcast Engineers

Abstract: Digital Video Broadcast-Terrestrial 2 (DVB-T2) utilises an advanced forward error correction technique with Low Density Parity Check (LDPC) coding that enable the transmission of modulated data up to 256 QAM over noisy and fading channels. HDTV delivery over terrestrial channels requiring high bit rates has become attainable. This paper uses Matlab/Simulink software to analyse the performance under different configuration modes. It also complements two previous papers on the satellite version, DVB-S2, which were published in the ABU Technical Review during 2010 and 2017. Both practitioners and academicians can conduct research in the laboratory in order to improve field performance.

Keywords: DVB-T2, AWGN, Rician, Rayleigh

INTRODUCTION

DVB-T2 incorporates an advanced Forward Error Correction (FEC) subsystem enabling reliable operation of higher level QAM constellations up to 256 QAM. DVB-T2 is a significant improvement from the first-generation DVB-T, which used Reed Solomon concatenated with Convolutional codes and 64 QAM constellations.

The advanced design has many selectable parameters and engineers have to comprehend the signal flow process and choose the correct specification in the field. Matlab/Simulink software can be used to augment the training courses of broadcast engineers. The trainer must have a working knowledge of both the DVB-T2 [See DVB-T2- ETSI 302 755 V1.4.1] standards and Simulink.

Previous papers published in the ABU Technical Reviews No 242 April-June 2010 and No 272 October-December 2017 focused only DVB-S2. Hence, a Simulink model has been configured based on DVB-T2 configuration parameters of 32K carriers and 256 QAM. The paper explains the signal processing of the Simulink software and relates it to the DVB-T2 parameters utilised in the field. The non-linearity performance of the High Power Amplifier (HPA) stage in the transmitter is taken into account by adding either the Saleh or Rapp model. The paper also focuses on the performance of DVB-T2 transmission over AWGN, Rician and Rayleigh propagation channels.

LITERATURE REVIEW

The Forward Error Correction subsystem consists of Bose Chaudhuri Hocquenghem (BCH) code concatenated with Low Density Parity Check Code (LDPC), which has error correction capability close to the Shannon limit. The increase in BER performance enables the extension of constellation order from 64 QAM to higher modulation order of 256 QAM. Till now, there has been no Simulink analysis of DVB-T2 performance with 32K carriers over various propagation channels. A proper analysis is needed

as there is fixed as well as mobile reception of DVB-T2 signals. In addition, there are hardly any papers published on the HPA performance based on Saleh or Rapp models.

PROBLEM STATEMENT

Simulink models based on simulating DVB-T2 can provide an inexpensive method of researching the performance of its various system configurations. The model has been designed to record the response of the DVB-T2 under different code rates and constellation modes. Past research was mostly confined to 2K and 8K carriers. Thus, the Simulink model has been modified to simulate system behaviour using 32K carriers.

METHODOLOGY

The research strategy undertaken is based on the simulation of DVB-T2 system under various configuration modes and measuring the performance with various tools such as Spectrum Analysers and Constellation Diagrams. The Simulink programme consists of an end-to-end transmitter receiver chain with a switchable HPA representing either the Saleh or Rapp model. The technical parameters measured are Signal to Noise Ratio (SNR) and Bit Error Rate (BER).

DVB-T2 SIMULINK MODEL

The Simulink model capable of simulating the various configurations is illustrated by **Figure 1**. For clarity, the transmitter chain is shaded in cyan and receiver chain is shaded in yellow. The data from the transmitter and receiver are compared for Bit Error Rate (BER) calculation.

At the transmitting front end, a Random Integer Generator, acting as video/audio data source, delivers 1504 integers which can be regarded as an MPEG-2 Transport Stream. The 1504 integers are converted into 31584 bits and padded to 32220 bits which act as the data field for the formation of the Baseband Frame. Samples per frame = 50000 and the sample time = $2 \times 1.385e-08s$, setting the spectrum at 5MHz, which is the transmission bandwidth of the DVB-T2 signal in this region.

The Baseband Frame of KBCH = 32220 bits that was formed, is processed by the Forward Error Correction (FEC) subsystem with a code rate = 1/2. It consists of an Outer Coder which is a BCH (Nbch = 32400, Kbch = 32220) encoder concatenated with an Inner Coder comprising a LDPC (Nldpc = 64800, Kldpc = 32400) encoder. The data are time, frequency interleaved and modulated with a 256 QAM constellation order. The combined signal is then processed by the 32K IFFT which acts as the OFDM modulator. The OFDM signal is passed to the HPA which can be based on Saleh or Rapp models. The resulting signal is transmitted over a propagation channel which can be selected from Additive White Gaussian Noise (AWGN),

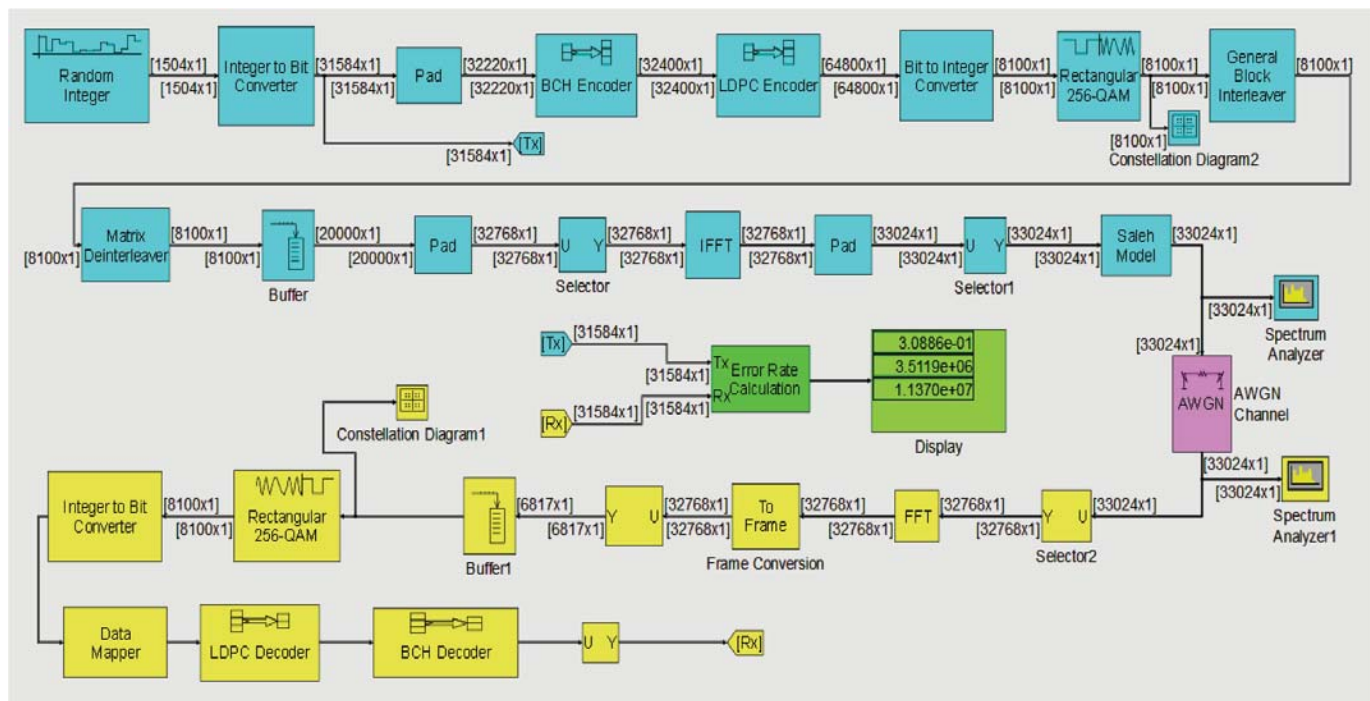


Figure 1: Block diagram of the DVB-T2 Simulink Model

Rician or Rayleigh channel. The AWGN channel represents the direct path from the transmitter station to the home. The Rician channel represents a combined direct and reflected path from the transmitter to the receiver. The Rayleigh channel usually represents a mobile channel, where there is no direct path from transmitter to receiver but only reflected paths or multipath. The receiver decodes the error corrected signal and retrieves the data.

SIMULATION RESULTS & DISCUSSION

The selection of AWGN, Rician and Rayleigh propagation channels, as well choice of Saleh or Rapp HPA models, affects overall performance. **Table 1** shows the result obtained using the 3 different propagation channels and both HPA models.

Table 1: Performance of 32 K DVB-T2 256 QAM with High Power Amplifier based on Saleh and Rapp model over AWGN, Rician and Rayleigh channels

Signal to Noise Ratio	High Power Amplifier - Saleh model			High Power Amplifier -Rapp model		
	Rayleigh Channel	Rician Channel	AWGN Channel	Rayleigh Channel	Rician Channel	AWGN Channel
SNR (dB)	Bit Error Rate (BER)	Bit Error Rate (BER)	Bit Error Rate(BER)	Bit Error Rate (BER)	Bit Error Rate (BER)	Bit Error Rate (BER)
0	1.9832e-01	1.9831e-01	1.9832e-01	1.9832e-01	1.9833e-01	1.9833e-01
10	1.9827e-01	1.9825e-01	1.9825e-01	1.9831e-01	1.9830e-01	1.9821e-01
20	1.9814e-01	1.9805e-01	1.9802e-01	1.9826e-01	1.9822e-01	1.9821e-01
30	1.9769e-01	1.9736e-01	1.9730e-01	1.9808e-01	1.9795e-01	1.9792e-01
40	1.9629e-01	1.9543e-01	1.9522e-01	1.9748e-01	1.9705e-01	1.9696e-01
50	1.9437e-01	1.9407e-01	1.9403e-01	1.9583e-01	1.9499e-01	1.9477e-01
60	1.9407e-01	1.9407e-01	1.9407e-01	1.9435e-01	1.9426e-01	1.9426e-01
70	1.9411e-01	1.9412e-01	1.9412e-01	1.9431e-01	1.9435e-01	1.9436e-01
80	1.9410e-01	1.9409e-01	1.9409e-01	1.9426e-01	1.9416e-01	1.9414e-01
90	1.9409e-01	1.9409e-01	1.9409e-01	1.9411e-01	1.9409e-01	1.9409e-01
100	1.9409e-01	1.9409e-01	1.9409e-01	1.9409e-01	1.9409e-01	1.9409e-01

Figure 2 below illustrates the graph plotted from the data obtained from **Table 1**. DVB-T2 performance over the three different propagation channels decreases in the following order from AWGN, Rician to Rayleigh. The decrease in performance over the Rayleigh channel shows mobile TV reception is not as good as fixed reception. The Rapp class of HPA model considers only AM/AM distortion whilst the Saleh class considers AM/AM as well as AM/PM distortion. It should be noted that slight distortion occurred, and pre-distortion techniques were introduced to correct the signal. It can also be deduced that HPA based on the Saleh model performs better than the Rapp model because the Saleh model represents the non-linearity of the Solid State HPA more accurately.

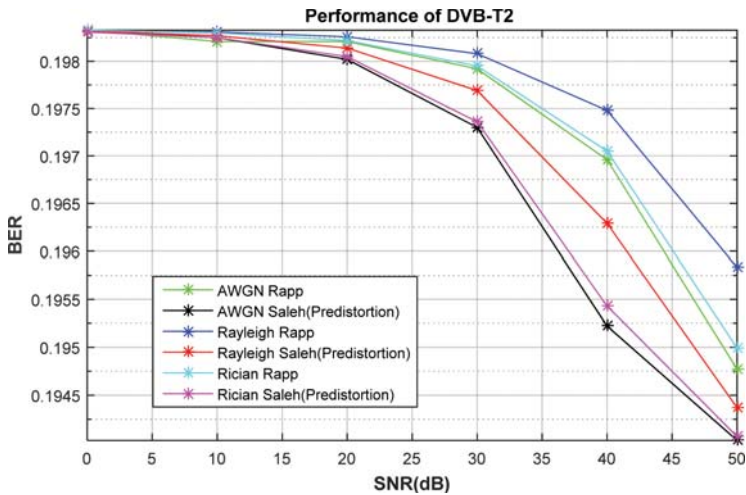


Figure 2: Performance of DVB-T over various propagation channels

Figure 3 below shows the 256 QAM constellation taken at the transmitter and whilst **Figure 4** shows the display taken at the receiver. Although slight distortion is evident, the FEC subsystem has corrected for most errors.

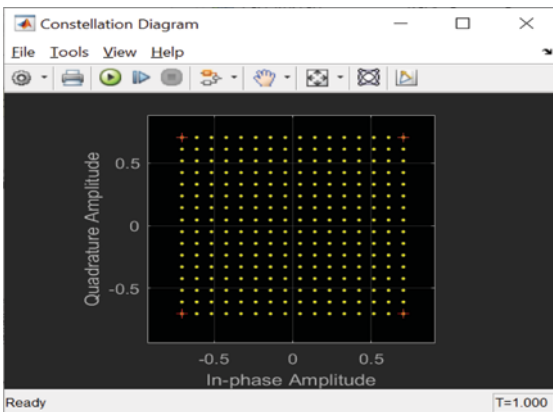


Figure 3: 256 QAM display at Transmitter

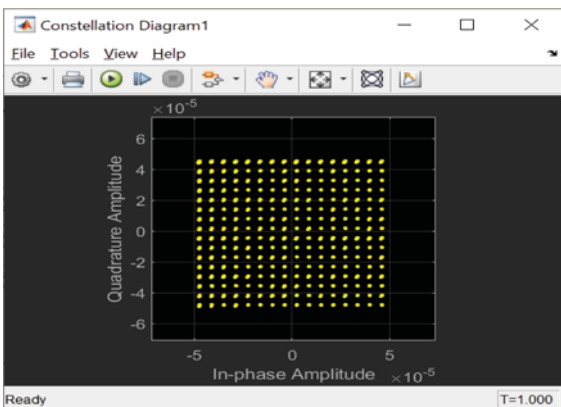


Figure 4: 256 QAM display at Receiver

The OFDM spectrum with a bandwidth of 5 MHz is shown by **Figure 5** for the transmitter output and by **Figure 6** for the receiver input. Results from AWGN and Rician channels are not shown as space is limited. As expected, there is a loss of amplitude of the OFDM signal as it propagates along the Rayleigh channel.

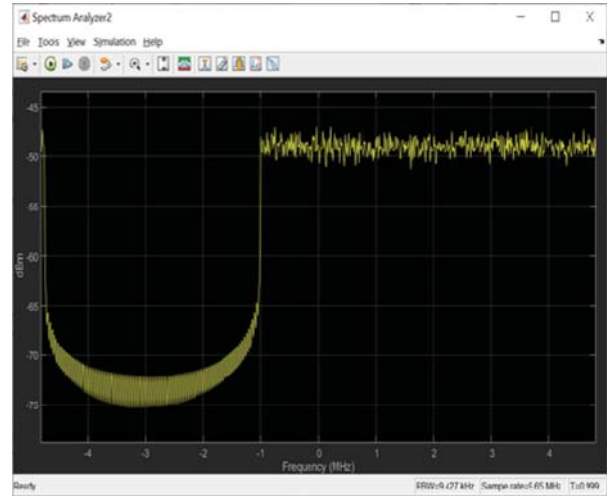


Figure 5: OFDM spectrum at Transmitter

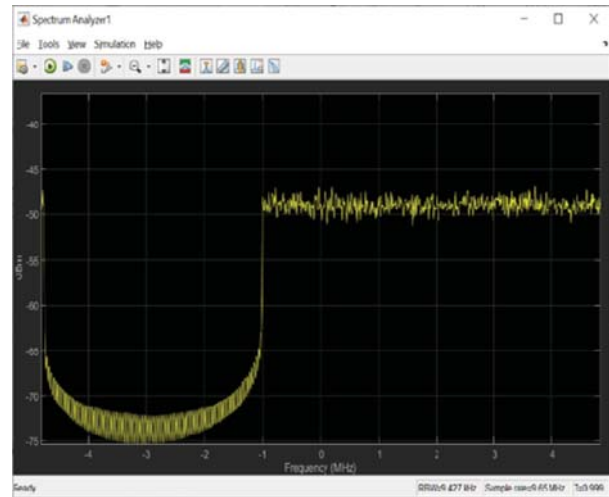


Figure 6: OFDM spectrum at Receiver

CONCLUSION

The Simulink model programme can be used during training sessions in the field of Digital Broadcasting. It is essential that engineers comprehend the advanced FEC subsystem and the theory behind Shannon's Theorem, relating the maximum capacity that can be achieved over a given channel with certain noise characteristics and bandwidth. Since DVB-T2 can cater for both fixed and mobile reception, engineers should comprehend the different performance of DVB-T2 over AWGN, Rician and Rayleigh channels. High Power Amplifiers also introduce non-linearities into the signal and hence suitable classes of models such as Rapp or Saleh should be studied.

Overall, the performance of DVB-T2 is remarkable, as low BER is achieved even at low signal to noise ratios, making the use of 256 QAM a feasible choice. HDTV services require much higher bitrates compared to SDTV and cannot be successfully implemented using the present 64 QAM mode. Therefore, communication engineers have to incorporate higher constellation modes in their designs.

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Jeewa Vengadasalam was appointed as a Broadcast Engineer to Radio TV Malaysia in 1979. He has served the Malaysian Government for more than 35 years and the last post he held before retiring was Deputy Director, Tun Abdul Razak Broadcast & Information Institute, Ministry of Communication & Multimedia. He is now attached to the Lee Kong Chian Faculty of Engineering and Science, University Tunku Abdul Rahman, Malaysia as part of the academic staff holding the post of Specialist II/Senior Lecturer.

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We will be happy to consider publishing any article you contribute. This could be a paper on research your organisation is conducting, details of any new technical developments, or any other article you feel will be of general interest to TR readers.

As you may be aware, the Technical Review is a quarterly publication distributed to all ABU members and industry partners.

It is available to the technical staff in each member organisation and in international organisations such as the ITU and other broadcasting associations, as well as in universities.

The Technical Review is aimed at engineers but also carries general interest news stories. It contains articles on new technologies, developments in broadcasting, innovations by members and other material of interest to engineers.

An article can be any length and written in any style you like. If you have photos to accompany it, they should be high resolution (at least 2 megapixels).

Although we cannot offer payment, we will offer a free half-page advertisement for some articles, particularly those covering technical research. This will be placed after your article, bringing publicity for your organisation.

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If you need more information, please contact nadeem@abu.org.my ■



REPORT OF CHAIRMAN PRODUCTION TOPIC AREA

By **Kazim Pektas**, TRT-Turkey

A total of five projects are under the Production Topic Area, as below.

1. Radio & Television Archiving including Metadata for International Programme Exchange (P/RTA)
2. Ultra High Definition TV (P/UHDTV)
3. Systems for people with special needs (P/SN)
4. IT-based Production System and file-based workflows (P/ITPS)
5. Big Data, Personalisation and Artificial Intelligence (P/BDAl)

For this reporting period (March 2021 to November 2021) we have received three new contributions from NHK, Japan: One from the project (P/SN), one from project (P/ITPS) and the other one from project (P/BDAl). The following is the compilation of these three updates reports from these three projects.

REPORTS FROM PROJECT MANAGERS IN TOPIC ON PRODUCTION:

1. SYSTEMS FOR PEOPLE WITH SPECIAL NEEDS (P/SN)

Project Manager: **Dr Masaki Takahashi** (NHK, Japan)

Project on Haptic Perception System Synchronized with Live Broadcasts

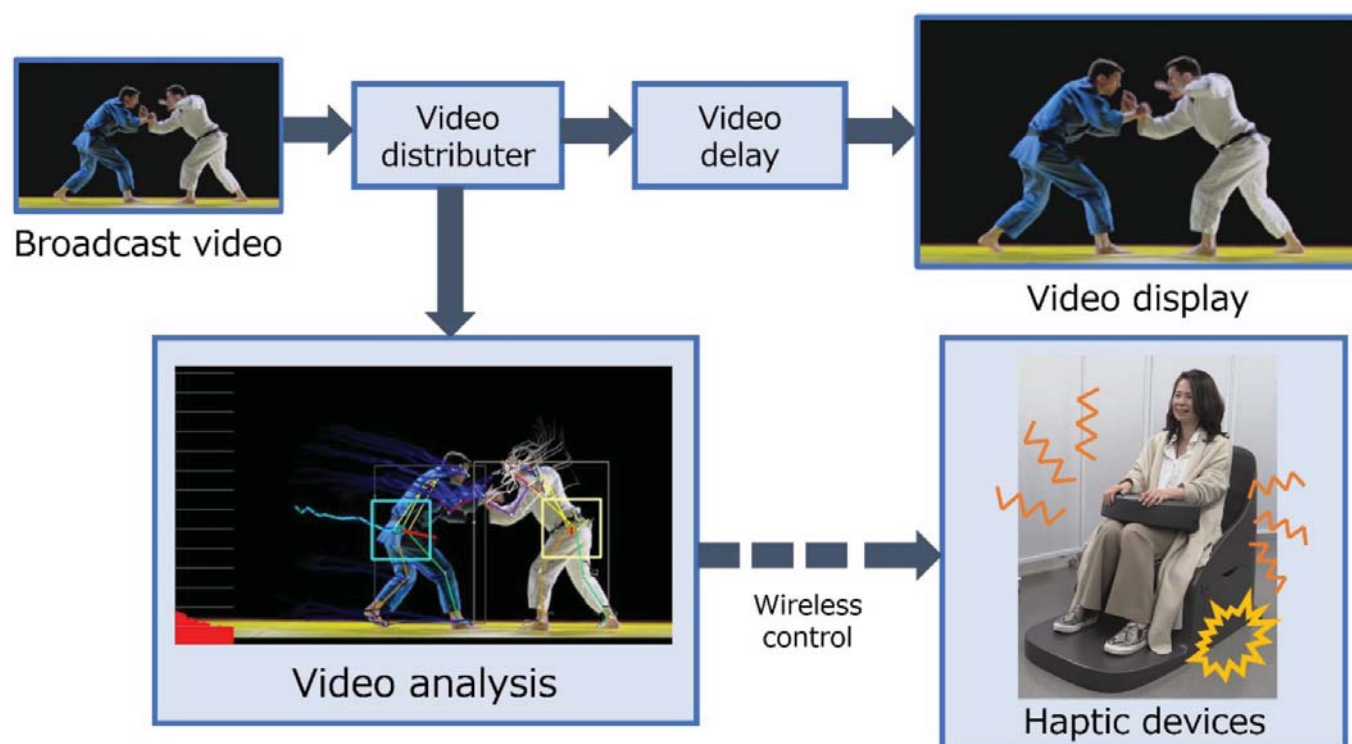
NHK has developed a bodily sensation system that presents haptic information synchronized with live sports broadcasts. The haptic stimuli produced from haptic devices improve accessibility for sports video and enhance viewers' feelings of immersion.

Features:

- Video of live sports broadcast is analyzed, and haptic stimuli synchronized with the video are supplied to viewers in real time.

- The type and timing of haptic stimuli, which are related to game situations, are automatically measured using a video-analysis module.
- Haptic handheld and chair devices, which viewers hold and sit in, supply haptic information synchronized with video content on the basis of a trigger from the video-analysis module.

They implemented their developed system in a live-sports public-viewing space. Although the public event was cancelled because of the COVID-19 pandemic, many people tried the devices. The system aided viewers in understanding the match situation and improved their sense of immersion when watching video.



Automatic Transcription System that Adds Speaker Information

Exploration of basic technologies for program production to rapidly disseminate information



2. PROJECT P/BDai (BIG DATA, PERSONALIZATION AND ARTIFICIAL INTELLIGENCE)

Project Manager: **Dr Byunghee Jung** (KBS, Korea)

NHK has been conducting research and development of a system that efficiently produces transcripts of speech content from video footage. They have developed a function that adds speaker information through integrated speech and face recognition. The result is a system that strongly supports the production of broadcast programs and digital contents.

Why is Automatic transcription needed?

At broadcast stations, reporters and directors transcribe video to text for TV scripts and video editing. Transcribing video makes it easier to search the information and for multiple people to check the content. However, until now transcribing has been a very time-consuming process. They have developed a transcription system that automatically converts video to text, reducing the time required for transcription.

They compare the time it takes to produce error-free transcription of a 10-minute video by hand and by using

the new system. In the experience, transcribing manually and correcting errors manually takes about 60 minutes, or six times the length of the video. On the other hand, transcribing using this system and correcting errors manually reduces the time needed to 36 minutes. Using the transcription system can therefore reduce the amount of time spent on manual work by about 40% and improve the efficiency of TV program production.

Add speaker recognition module "Transcripts linked with speakers"

Their newest development automatically distinguishes speakers by using voice feature classification technology and face recognition technology that can identify about 10,000 people. The transcription system can automatically display the speaker's name from the video footage. And the automatic transcribed texts are assigned an ID that is classed according to the speaker's voice. By simply dragging the speaker's name recognized by the system once onto the transcribed text, the speaker's name will be reflected in all the transcribed text. By tagging the speaker of the transcribed text, TV scripts and video editing tasks become more efficient.



田中二郎 (Tanaka)



鈴木太郎 (Suzuki)

Speaker's name
(Face detection result)

00:00:00

close お問い合わせ サマー フェスティバル

b: それで、**b:** ことしの砦サマーフェスティバルに向けて企画会議を開始します、**a:** よろしく願います、**c:** よろしく願いいたします。

b: 早速ですが、**b:** ことしは新型コロナの影響もあるので密集を避けたイベントをしなくてはなりません。

b: 密集を避けて開催できるような案はありますか。

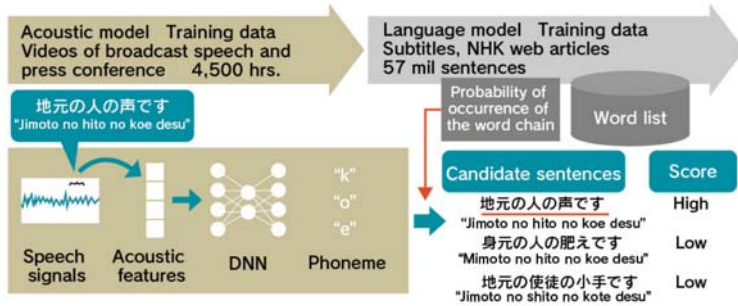
a: きめたサマーフェスティバルは毎年2万人集まる一大イベントですね。

a: Speaker ID
b:
c: (Clustering the speaker's voice)

Features of AI technologies in Automatic Transcription

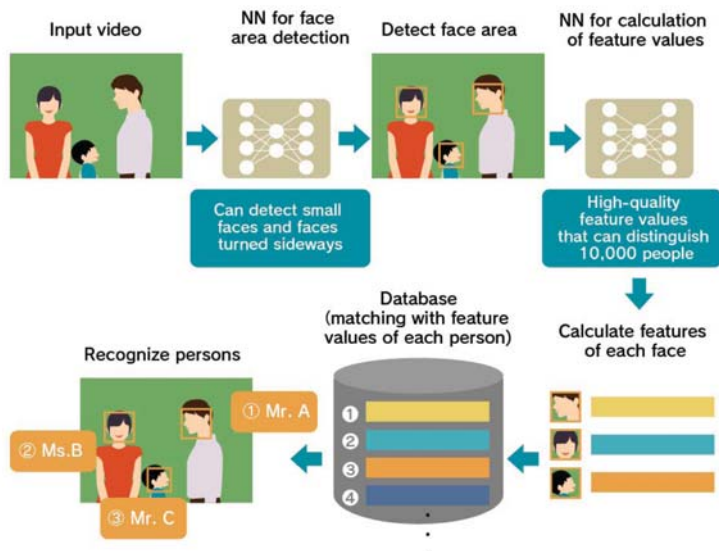
Speech Recognition

By building appropriate training data for AI technology, they are now able to recognize not only read speech and reports in news programs, but also audio that was previously difficult to recognize, such as press conferences.



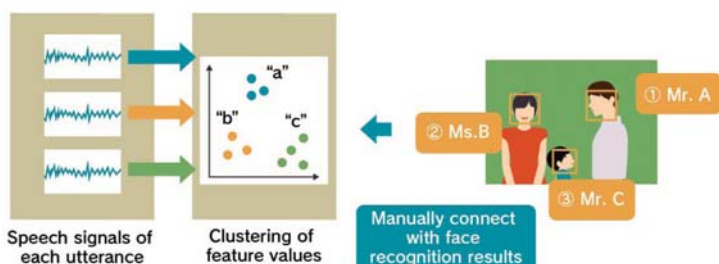
Face Recognition

By using face detection technology that is not easily affected by changes in face size or orientation, and by using "high-quality face feature values" extracted from a neural network that has learned the differences between about 10,000 faces, they have achieved highly accurate face recognition for images taken under various conditions.



Speaker Identification

By clustering the speaker feature values calculated from the speech utterances, a tentative speaker name such as [a][b][c]... is assigned to each utterance. Then, by manually linking the tentative speaker's name with the person's name obtained from face recognition, it is possible to automatically assign a speaker name to every utterance.



3. IT-BASED PRODUCTION SYSTEM AND FILE-BASED WORKFLOWS (P/ITPS)

Project Manager: **Mr Okan Salman** (TRT, Turkey)

Latest topics for remote production in NHK

NHK examined IP remote production for live program of the 2021 Peace Memorial Ceremony in Hiroshima again. This year, we built a backup link by using millimeter-wave wireless link and IP/TS converter.

Fig. 1 shows system outline. They used two millimeter-wave wireless links to build a bidirectional communication line. The millimeter-wave wireless link uses 42G radio wave and transmit at a bit rate of 444 Mbps. Since the interface of the device is DVB-ASI, we use IP/TS converter to connect this system with IP-based production system. They transmitted three compressed videos (multiviewer and vision mixer's output from the venue, and video return from the control room), 64ch audio, tally, communication sound, and device controls via the backup link. Normally eleven uncompressed videos are transmitted from the venue via dark fibers and the vision mixer in the control room is used, but in case of using this system, the vision mixer in the venue is controlled remotely from the control room.

This IP-enabled wireless system makes it easy to do remote production in environments where it is difficult to install optical fiber. ■

Table 1: Specification of millimeter-wave wireless link

Technical Standard	ARIB STD-B43 (Full-mode, MIMO-OFDM)
Center Frequency	Ch. 1 (41.0625 GHz), Ch. 3 (41.3125 GHz)
Channel Bandwidth	125 MHz
Number of Subcarriers	1721
Symbol Duration	16.74 μ s (Guard interval 0.98 μ s)
Transmission Rate	Total 444 Mbps

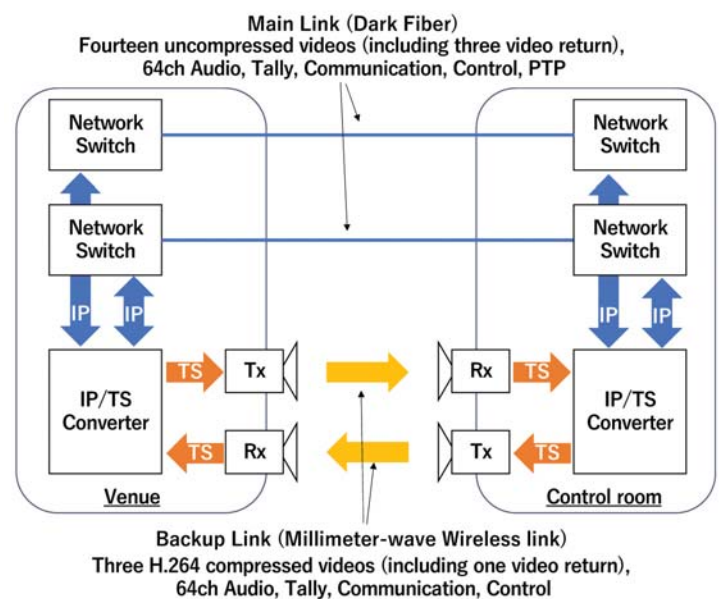


Fig. 1: System outline of remote production for 2021 Peace Memorial Ceremony in Hiroshima



REPORT OF CHAIRMAN TRANSMISSION TOPIC AREA

By **Kenichi MURAYAMA**, NHK-Japan

INTRODUCTION

Transmission topic area comprises five projects. The matters concerning digital terrestrial television broadcasting, digital satellite broadcasting, digital sound broadcasting and these frequency planning are studied or investigated by these projects. This topic area also covers research on IBB and OTT, including platforms and standards, etc.

This document has been submitted for this Technical Committee Annual meeting.

1. Frequency Planning for Digital Broadcasting (T/FPDB)

Project Manager:

Mr Yuji Nagata (NHK, Japan)

Co-project Manager:

Mr Yuen Man (TVB, Hong Kong, China)

Mr Rajeev Kumar (DDI, India)

Reports from the project managers and the contributor are as follows:

- 1.1 ITU-R text related to DTTB coverage and frequency planning
- 1.2 Latest ASO situations in the region
- 1.3 Latest topics over frequency policies in the world

The reports for T/FPDB are attached as Annex 1.

2. Next Generation Terrestrial Broadcasting (T/NGTB)

Project Manager:

Mr Masahiro Okano (NHK, Japan)

Co-project Manager:

Mr LEE Jae Kwon (KBS, Korea),

Mr Chen Delin (ABS, China),

Mr Halil Us (TRT, Turkey),

Mr M S Duhan (DDI, India)

Mr Rajesh Meena (India)

Mr A K Mangalgi (DDI, India)

Mr Zhang Yu (ABS/China)

Mrs Xiao Jingting (ABS, China)

Reports from the project managers and the contributor are as follows:

- 2.1 Investigate efforts toward the realization of next-generation terrestrial broadcasting in Japan
- 2.2 ATSC 3.0 based UHDTV terrestrial broadcasting in Republic of Korea

The reports for T/NGTB are attached as Annex 2.

3. Integrated Broadcast-Broadband and OTT (T/IBBOTT)

Project Manager:

Dr Go Ohtake (NHK, Japan)

Co-project Manager:

Mr Yuji Nagata (NHK, Japan)

Dr Yuto Komatsu (NHK, Japan)

Mr Kinji Matsumura (NHK, Japan)

Mrs Zhang Dingjing (ABS, China)

Zhang Yu (ABS, China)

Xhang Wei (ABS, China)

He Jing (ABS, China)

Wang Lei (ABS, China)

Mr A K Mangalgi (DDI, India)

Mr A K Srivastava (India)

Reports from the project managers and the contributor are as follows:

- 3.1 Standardization of multimedia coding for UHDTV in Japan
- 3.2 Studies in ITU-R
- 3.3 Studies in ITU-T
- 3.4 Cyber Security in Australia

The reports for T/IBBOTT are attached as Annex 3.

4. Satellite Broadcasting (T/SB)

Project Manager:

Dr Masashi Kamei (NHK, Japan)

Co-project Manager:

Mr KK Rao (India)

TBD (TRT, Turkey)

TBD (IRIB, Iran)

Reports from the project managers and the contributor are as follows:

- 4.1 ITU-R documents related to satellite broadcasting systems
- 4.2 Latest topics on satellite broadcasting

The reports for T/SB are attached as Annex 4.

5. Digital Sound Broadcasting System (T/DSBS)

Project Manager:

Mr Shabib Hyder (AIR, India)

Co-project Manager:

TBD (IRIB, Iran)

TBD (RRI, Indonesia)

TBD (TRT, Turkey)

Project: Frequency Planning for Digital Broadcasting (T/FPDB)

Project Manager:

Mr Yuji Nagata (NHK, Japan)

Co-project Manager:

Mr YUEN Man (TVB, Hong Kong, China)**Mr Rajeev Kumar** (DDI, India)**1.1 ITU-R text related to DTTB coverage and frequency planning****1.1.1 Recommendations (<http://www.itu.int/rec/R-REC-BT/en>)**

- BT.1306 "Error correction, data framing, modulation and emission methods for digital terrestrial television broadcasting"
- BT.1368 "Planning criteria, including protection ratios, for digital terrestrial television services in the VHF/UHF bands"
- BT.1877 "Error-correction, data framing, modulation and emission methods for second generation of digital terrestrial television broadcasting systems"
- BT.1895 "Protection criteria for terrestrial broadcasting systems"
- BT.2033 "Planning criteria, including protection ratios, for second generation of digital terrestrial television broadcasting systems in the VHF/UHF bands"
- BT.2036 "Characteristics of a reference receiving system for frequency planning of digital terrestrial television systems"
- BT.2052-1 Planning criteria for terrestrial multimedia broadcasting for mobile reception using handheld receivers in VHF/UHF bands
- BT.2136 Assessing interference into digital terrestrial television broadcasting from other services by means of Monte Carlo simulation

1.1.2 Reports (<http://www.itu.int/pub/R-REP-BT/en>)

- BT.2035 "Guidelines and techniques for the evaluation of digital terrestrial television broadcasting systems, including assessment of their coverage areas"
- BT.2140 "Transition from analogue to digital terrestrial broadcasting"
- BT.2209 "Calculation model for SFN reception and reference receiver characteristics of ISDB-T system"
- BT.2265 "Guidelines for the assessment of interference into the broadcasting service"
- BT.2294 "Construction technique of DTTB relay station network for ISDB-T"
- BT.2295 "Digital terrestrial broadcasting systems"
- BT.2302 "Spectrum requirements for terrestrial television broadcasting in the UHF frequency band in Region 1 and the Islamic Republic of Iran"
- BT.2343 "Collection of field trials of UHDTV over DTT networks"
- BT.2386-3 Digital terrestrial broadcasting: Design and implementation of single frequency networks (SFN)
- BT.2468-1 Guidance for selection of system parameters

and implementation of second generation DTTB systems

BT.2470 "Use of Monte Carlo simulation to model interference to DTTB"

BT.2485 Advanced network planning and transmission methods for enhancements of digital terrestrial television broadcasting

1.1.3 Handbook (<https://www.itu.int/pub/R-HDB-63>)

"Handbook on Digital Terrestrial Television Broadcasting networks and systems implementation"

1.2. Latest ASO situations in the region**1.2.1 Vietnam**

Minister of Information and Communications Nguyen Manh Hung yesterday chaired the press conference to announce the completion of the scheme 'Digitization of Terrestrial Television Broadcasting by 2020'. Beginning from December 28, 2020, Vietnam formally stopped providing analog television nationwide.

The scheme 'Digitization of Terrestrial Television Broadcasting by 2020' observes Decision No.2451/QD-TTg signed on December 27, 2011 by the Prime Minister. At that time, 90 percent of Vietnamese households owned a TV, yet the vast majority of the population had no experience on digital television.

However, until 2020, 16 million families in the country could enjoy cable TV, Internet Protocol TV (IPTV) and free satellite TV.

To carry out the scheme, since 2014, Vietnam has requested that all TV on the market must own the function of Digital Video Broadcasting – Second Generation Terrestrial (DVB-T2). Meanwhile, the Government support around 1.9 million poor households with a suitable set top box from 2015 to 2020.

Therefore, including 20 percent of satellite TV coverage, 100 percent of the Vietnamese population is able to access digital television in 2020.

In a press conference, Minister Nguyen Manh Hung enthusiastically reported that the scheme is successfully completed, fulfilling all 4 major assigned goals.

Source:

https://www.abu.org.my/2021/01/13/vietnam-officially-ceases-analog-tv/?doing_wp_cron=1634123808.8304300308227539062500

<https://english.mic.gov.vn/Pages/TinTuc/146147/Vietnam-completes-the-digitization-of-television.html>

1.3 Latest topics over frequency policies in the world**1.3.1 Hong Kong frequency planning status**

The Office of the Communications Authority (OFCA) published an Information inviting interested parties to join the auction of radio spectrum in the 600 MHz, 700 MHz, 850 MHz, 2.5/2.6 GHz and 4.9 GHz bands. A total of 325 MHz of spectrum, including 220 MHz of new spectrum in the 600 MHz, 700 MHz and 4.9 GHz bands, and 105 MHz of re-assigned spectrum in the 850 MHz and 2.5/2.6 GHz bands are for provision of public mobile services. The

release of the spectrum is expected to support further development of the fifth generation mobile (5G) services in terms of speed, capacity and coverage. The auction is being processed until end of this year.

Since 600 MHz and 700 MHz frequency band mentioned in above will be allocated to mobile service, two TV broadcasting channels (one MFN and one SFN) that located in these bands will use new transmitting frequencies from 1 December 2021 onwards. Two new SFN channels are Channel 27 and Channel 37. The TV broadcasting frequency now in Hong Kong is from 470 MHz to 614 MHz after frequency re-arrangement.

1.3.2 5G spectrum auction results in Canada

The government's Innovation, Science & Economic Development Canada (ISED) department announced the results of the country's 3.5 GHz 5G spectrum auction. Initially scheduled for June 2020, the process began on June 15, 2021, and raised 8.9 billion CAD (6 billion EUR) after 103 rounds of bidding.

The three largest carriers bid the most in the auction, but the Canadian government pointed out that, as intended, 50MHz were set aside for smaller and rural operators in markets where enough spectrum is available. 5G mobile broadband and fixed wireless access are the primary use cases for the frequency band.

The three main operators in Canada launched non-standalone 5G services in 2020 on their existing spectrum.

Source: <https://5gobservatory.eu/canada-completed-its-3-5ghz-5g-auction/>

1.3.3 5G spectrum auction results in USA

The largest mid-band auction in the USA to date ended on 17 February 2021 after a little more than 2 months. The 8 December 2020-15 January 2021 clock phase was followed by the assignment phase, which kicked off on 8 February 2021 and ended on 17 February 2021. Auction 107 net winning bids totalled 81.1 billion USD (66.3 billion EUR) for 280 MHz of spectrum (3.7-3.98 GHz). Twenty-one bidders won all of the available 5,684 licences on offer in PEAs (Partial Economic Areas). Verizon (Cellco Partnership) and AT&T (AT&T Spectrum Frontiers) appear to be the biggest spenders.

Verizon in particular spent approximately twice as much as AT&T. It paid 45.4 billion USD in bids for 3,511 licences while AT&T's bids totalled 23.4 billion USD for 1,621 licences won. T-Mobile ranked third far behind the two leaders with "only" 9.4 billion USD and 142 licences: T-Mobile did not rush in because it already owns a lot of mid-band spectrum thanks to its Sprint acquisition in 2020. Conversely, Verizon and AT&T 5G services cannot enjoy this competitive advantage with less prime spectrum for 5G. They majorly rely on millimetre wave spectrum and on low-band spectrum.

Satellite operators agreed to leave 3.7-4.0 GHz frequencies and use 4.0-4.2 GHz spectrum. The clearing of 3.7-3.82 GHz spectrum is expected by 5 December 2021. The clearing of the remaining spectrum plus 180 MHz from 3.82-4.0 GHz will end two years later by 5 December 2023.

Source: <https://5gobservatory.eu/highly-coveted-us-auction-for-3-7-ghz-spectrum-reached-81-1-billion-usd-after-2-months/>

1.3.4 5G spectrum auction results in Spain

Spain's 700MHz spectrum auction, first planned to take place in early 2020 but delayed because of the coronavirus pandemic and then delayed even further due to disputes over price and conditions related to the spectrum licences, was completed in late July 2021, raising over 1 billion EUR.

Vodafone, Orange, and Telefonica all acquired 2x10MHz blocks of 700MHz spectrum. Vodafone and Orange will both pay 350 million EUR, while Telefonica bid 310 million EUR, because of faster rollout obligations. The fourth mobile operator in terms of market share, Masmovil, opted out of the process earlier this month. Players did not bid for any of the 5MHz blocks of non-paired spectrum available and the auction did not reach the 2.1 billion EUR target set by the regulator.

All licenses will be valid for a period of 20 years and extendable for a further 20-year period. The operators are obligated to activate 5G services in 450 localities with populations above 50,000 by the end of June 2025, as well as covering the country's largest airports, train stations and motorways.

Source: <https://5gobservatory.eu/spain-raises-over-1-billion-eur-in-700-mhz-auction/>

1.3.5 5G spectrum auction results in India

India's Department of Telecommunications put up for sale a total of 2,308 MHz of airwaves across seven bands. The auction ended in early March, with the government getting 778.15 billion INR (9 billion EUR), well below the reserve price of 3.92 trillion INR (45 billion EUR) for the total available spectrum. Around two-thirds of the available spectrum was left unsold.

Reliance Jio Infocomm, Bharti Airtel and Vodafone Idea didn't bid for the 700 MHz band, considering the spectrum overpriced like in the 2016 auction. The operators also avoided the 2500 MHz band, while just 15 MHz of the 175 MHz available in the 2100 MHz band was sold.

According to Indian press, Jio purchased the most spectrum, paying 571.23 billion INR (6.6 billion EUR) for 488.35 MHz, focusing primarily on renewing its 800 MHz licenses alongside frequencies in the 1800 MHz and 2300 MHz bands. Airtel paid the next largest amount, with 186.99 billion INR (2.16 billion EUR) for a total of 355.45 MHz across the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2300 MHz bands. Vodafone Idea purchased just 11.8 MHz of spectrum in the 900 MHz and 1800 MHz bands for a total of 19.93 billion INR (230 million EUR).

With the high reserve prices set by the regulators and the substantial debt burden on the industry, bidding matched expectations, with the trio focused on renewals and consolidating their positions in the bands they already utilised. The operators also prepared the ground for 5G by adding spectrum in the 2300 MHz band.

Source: <https://5gobservatory.eu/spectrum-auction-raised-778-billion-inr-9-billion-eur-in-india-but-700mhz-spectrum-was-left-unsold-for-second-time/>

Project: Next Generation Terrestrial Broadcasting (T/NGTB)

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Co-project Manager:

Mr LEE Jae Kwon (KBS, Korea)

Mr Chen Delin (SARFT, China)

Mr Halil US (TRT, Turkey)

Mr M S Duhan (DDI, India)

Mr Zhang Yu (ABS, China)

Mrs Xiao Jingting (ABS, China)

Mr Rajesh Meena (India)

Mr A K Mangalgi (India)

2.1 Investigate efforts toward the realization of next-generation terrestrial broadcasting in Japan

2.1.1 Introduction

Next-generation digital terrestrial television broadcasting will be dominated by UHDTV applications. UHDTV broadcasts consist of a huge amount of data and therefore require large-capacity transmission paths.

Japan is conducting research on large-capacity transmission technology for next-generation digital terrestrial broadcasting systems that will provide large-volume content services such as 8K. In order to transmit the 8K signal, which has a resolution 16 times greater than HDTV, it will be essential to utilize new technologies that expand transmission capacity, such as higher order modulation (4096-QAM), orthogonal frequency-division multiplexing (OFDM), and dual-polarized multiple-input multiple-output (MIMO).

This experiment establishes parameters for maximizing transmission capacity. However, in actual implementation, these parameters will have to be decided taking link budget, the transmission network, the receiving environment, and other factors into account.

2.1.2 4K/8K-UHDTV field experiments with advanced system in urban area; Tokyo and Nagoya

2.1.2.1 Overview of advanced DTTB system

The objective of the advancement is to provide improved transmission performance compared to ISDB-T in terms of the increased transmission capacity and the reduced C/N required. The advanced system has been designed to inherit the feature of ISDB-T, i.e. it aims to provide a 4K or 8K UHDTV service for fixed reception and an HDTV service for mobile reception simultaneously by frequency division multiplexing (FDM) within a single channel. It also uses a frequency-segmented structure that allows partial reception.

The bandwidth per segment is reduced to increase the number of segments from 13 (for ISDB-T) to 35, allowing for flexible bitrate distribution between layers such as the mobile reception layer and fixed reception layer. The advanced system allows a higher spectral efficiency and/or a transmission robustness with multiple-input multiple-output (MIMO).

A prototype modulator and demodulator for the advanced system were developed and their performances were confirmed through laboratory experiments. The feasibility of the system is being verified through large-scale field trials in urban areas.

2.1.2.2 Transmission parameters

Field experiments were conducted with the parameters listed in **Table 2.1.1**. The occupied bandwidth was expanded by about 5% compared to that of ISDB-T to increase transmission capacity. The 31 and 4 segments out of 35 segments were assigned for UHDTV and HDTV services, respectively. As for error-correcting code and carrier modulation, low density parity check (LDPC) code and NUCs were used for both UHDTV and HDTV services to enhance transmission robustness.

Table 2.1.1 Parameters for field experiments of hierarchical transmission in urban area (Tokyo and Nagoya)

Modulation	OFDM	
Occupied bandwidth	5.83 MHz	
Reception scenario	Fixed (Rooftop)	Mobile (Car-mounted)
Number of segments	31	4
Carrier modulation	1024 NUC QAM	64 NUC QAM
FFT size (number of radiated carriers)	16k (15,121)	
Guard interval ratio (guard interval duration)	800/16384(126μs)	
Error-correcting code	Inner: LDPC, code rate = 11/16 Outer: BCH	Inner: LDPC, code rate = 7/16 Outer: BCH
Transmission capacity	31.4 Mb/s (SISO) 62.8 Mb/s (MIMO)	1.5 Mb/s (SISO) 3.0 Mb/s (MIMO)
Video coding	HEVC	
Video format	3840 × 2160/60/P (4K) 7680 × 4320/60/P (8K)	1920 × 1080/60/P (2K)
Video bit rate	SISO: 25 Mb/s (4K) SISO: 28 Mb/s (8K)* MIMO: 56 Mb/s (8K)*	SISO: 1.0 Mb/s (2K) MIMO: 1.0 Mb/s (2K)
Audio coding	MPEG-H 3D Audio LC level 4	
Audio bit rate	768 kb/s (22.2ch + 3 objects)	192 kb/s (2ch)

* Pre-processed before encoding by MPEG-H HEVC with a state-of-the-art software encoder offline taking plenty of time.

2.1.2.3 Field measurements

To evaluate the performance of the advanced system in different propagation environments, large-scale experimental environments were constructed. Two locations (in the Tokyo and Nagoya areas) were selected to have the same scale as the main stations currently used for terrestrial broadcasting. **Figure 2.1.1** shows the transmitter sites and assumed coverage areas for the experimental parameters in **Table 2.1.1**. **Table 2.1.2** lists the specifications of the transmission stations. Each transmission station is equipped with two transmitters and two antennas for horizontally and vertically polarized waves. The directional patterns of transmitting antennas at Nabeta relay station are designed to be selectable.

Figure 2.1.1 Experimental environments

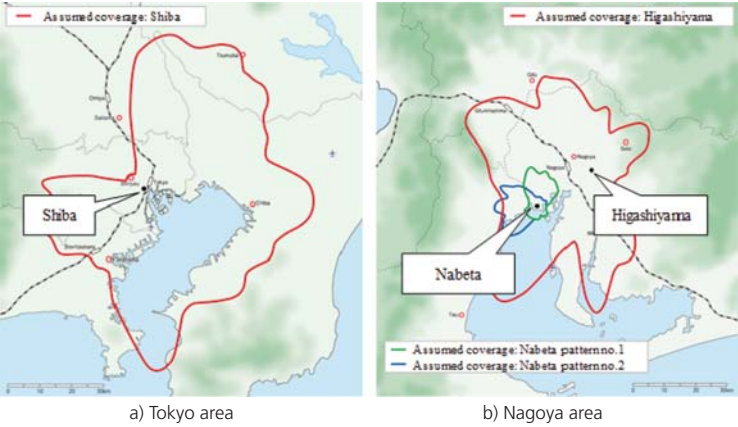


Table 2.1.2 Specifications of transmission stations

	Tokyo area	Nagoya area	
Transmitter site	Shiba (main station) (Minato Ward, Tokyo)	Higashiyama (main station) (Showa Ward, Nagoya, Aichi)	Nabeta (relay station) (Yatomi, Aichi)
Transmission frequency	563.143 MHz	605.143 MHz	
Polarization	Horizontal, Vertical		
Transmission power	Horizontal: 1 kW Vertical: 1 kW	Horizontal: 1 kW Vertical: 1 kW	Horizontal: 10 W Vertical: 10 W
Transmitting antenna height	280 m above sea level	203 m above sea level	42.5 m above sea level

Transmission experiments were conducted in the two experimental urban areas. Experiments were launched in November and December 2018 in the Nagoya and Tokyo areas, respectively.

The experiments involved field trials of hierarchical transmission of UHDTV/HDTV using a single channel based on the advanced DTTB system. The UHDTV (4K or 8K) content for fixed reception and HDTV (2K) content for mobile reception shown in **Table 2.1.1** were recorded in advance in a player, and the video and audio streams were played back at the experimental stations. The block diagram of transmitting and receiving system is shown in **Figure 2.1.2**. UHDTV and HDTV streams from the player are multiplexed by the remultiplexer (remux) into a single IP stream and input to the advanced DTTB modulator. The frequency of two output signals from the modulator are converted and power-amplified by the transmitter. The audio of UHDTV was an object-based audio that transmitted a 22.2 channel audio encoded by MPEG-H 3D Audio and three narration objects in Japanese, English, and French. For the HDTV content, the video was encoded by HEVC and the stereo audio signals were encoded by MPEG-4 AAC.

Figure 2.1.3 shows the locations of the transmitting and receiving points in the Tokyo area. The NHK Science and Technology Research Laboratories (NHK-STRL), which is approximately 12 km away from the Shiba station, was selected as the receiving point. On the receiving side, the received spectrum was observed by a spectrum analyser, and the delay profile was confirmed by a signal analyser. The UHDTV signal output from the demodulator was decoded in real time by the HEVC decoder and displayed on a 4K/8K LCD monitor. The 22.2 channel audio was decoded in real-time by MPEG-H 3D Audio decoder, converted to 7.1 channel audio, and reproduced using a commercially available sound bar. The HDTV signal was

Figure 2.1.2 Block diagram of transmitting and receiving system in Tokyo

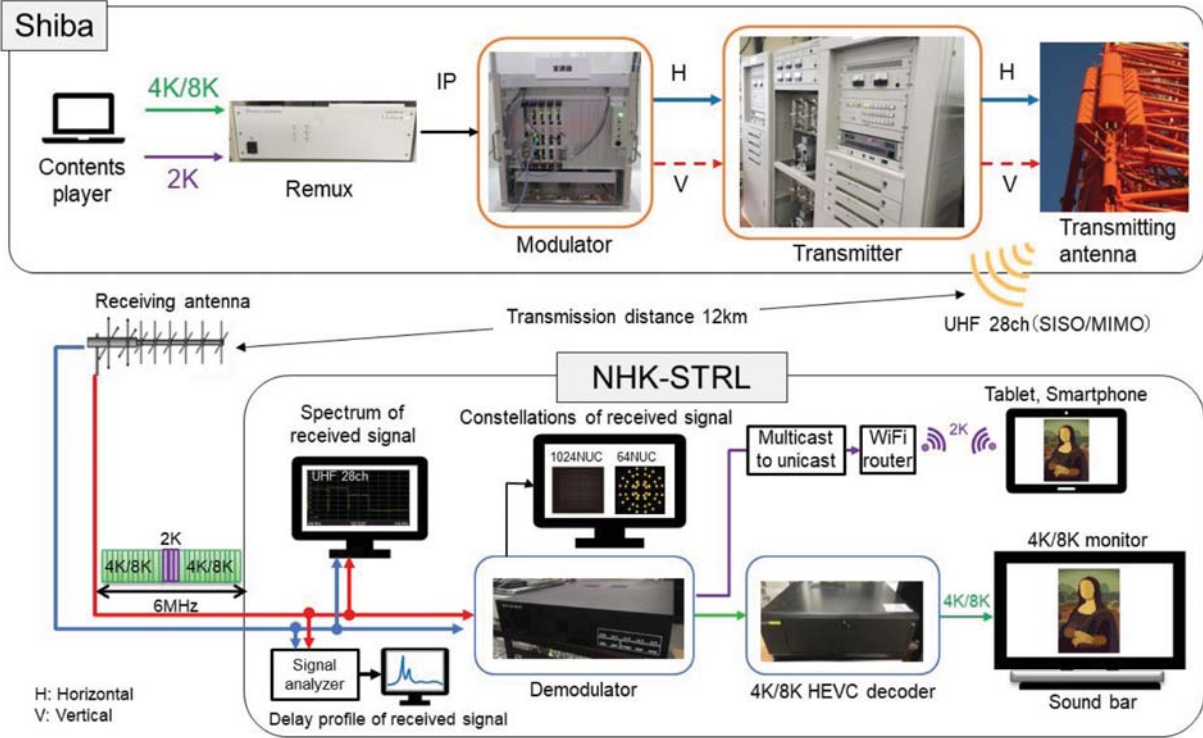


Figure 2.1.3 Locations of transmitting and receiving points in Tokyo

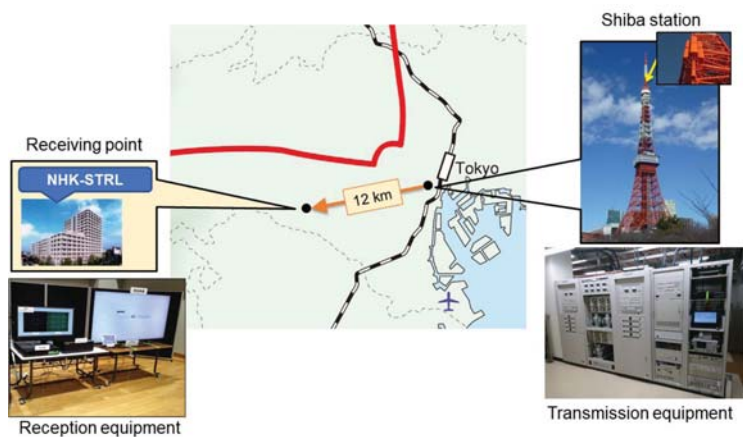
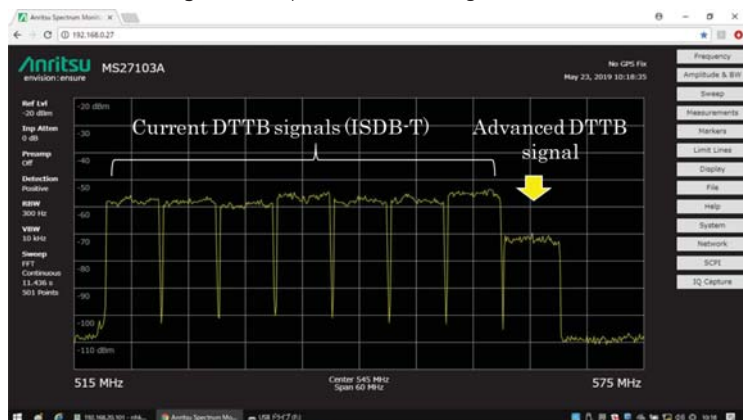


Figure 2.1.4 Spectrum of received signal at NHK-STRL (SISO)

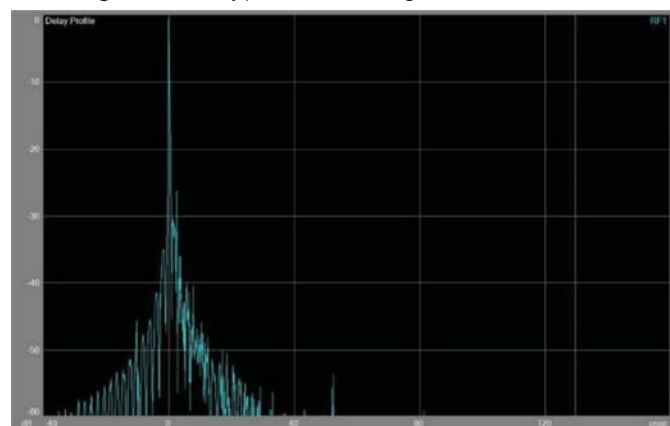


Note: The advanced DTTB signal was allocated upper-adjacent to the current DTTB signals. The difference in the received power between the advanced DTTB signal and the current DTTB signals is due to the different transmitting power and the transmitting points.

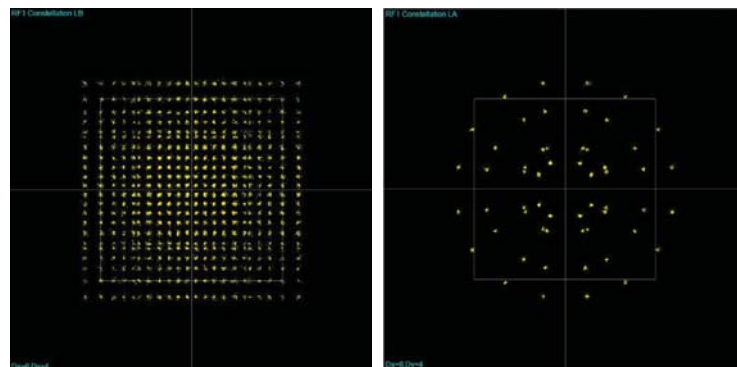
converted from multicast to unicast, then transmitted via WiFi router, and decoded by an MMT player installed on a tablet or smartphone. **Figure 2.1.4** shows the spectrum of the received signals.

Figures 2.1.5 and **2.1.6** show the delay profile and constellation of the received signal of SISO transmission using horizontal polarized wave. As for the delay profile, almost no reflected waves were confirmed as shown in Fig. 2.1.5 In this experiment, it was demonstrated that UHDTV and HDTV contents can be successfully received with the advanced DTTB system.

Figure 2.1.5 Delay profile of received signal at NHK-STRL (SISO)



The block diagram of transmitting and receiving system in Nagoya is shown in **Figure 2.1.7**. **Figure 2.1.8** shows the locations of the transmitting and receiving points in the Nagoya area. As a receiving point, the Nagoya port building, which is approximately halfway between



(a) 1024 NUC QAM for UHDTV

(b) 64 NUC QAM for HDTV

Figure 2.1.6 Constellations of received signal at NHK-STRL (SISO)

the Higashiyama and Nabeta experimental stations, was selected. The remultiplexer was installed at the Higashiyama station and the IP packet was sent to the two modulators installed at the Higashiyama and the Nabeta stations. A 200 Mbit/s bandwidth secured line was used as the IP line between the Higashiyama and Nabeta stations. The radio waves were emitted from the two stations to carry out the transmission experiments in a SFN environment. The modulated signals were generated at each transmission timing.

At the receiving point (the Nagoya port building), the receiving antenna was installed facing the Nabeta station. Additionally, the transmission power of the Higashiyama station was adjusted to demonstrate severe SFN reception conditions. As an example, the desired-to-undesired signal ratio (DUR) of 3.2 dB and 1.9 dB for horizontal polarization and vertical polarization between the Nabeta station (D) and the Higashiyama station (U) was demonstrated with the reduction in the transmission power of the Higashiyama station by 5 dB for both polarizations. Regarding the delay setting of the remultiplexer, the transmitting timings of the Higashiyama and the Nabeta stations were aligned at the same time. As the Higashiyama station is geographically 500 m closer to the reception point than the Nabeta station, it was expected that the transmitted signals from the Higashiyama station would arrive 1.6 μ s earlier than the signals from the Nabeta station. However, it was confirmed that the signals from the Higashiyama station arrived about 2 μ s later than the signals from the Nabeta station. The delay was caused by a feedback compensation circuit installed in the transmitters at the Higashiyama station.

Figures 2.1.9, 2.1.10 and **2.1.11** show examples of the spectrum, delay profiles, and reception constellations of the received signals for MIMO transmission using horizontal and vertical polarizations. For the reception spectrum, ripples caused by the undesired signals from the Higashiyama station were confirmed. For delay profiles, horizontal to horizontal, horizontal to vertical, vertical to horizontal and vertical to vertical components are shown in blue, green, yellow and pink, respectively. The Higashiyama station is located in the direction opposite to the main lobe of the receiving antenna; therefore, many reflected signals transmitted by the Higashiyama station were observed. The demonstration of UHDTV/HDTV reception with the advanced DTTB system in the SFN environment was presented to the press. It was confirmed that even under severe SFN reception conditions, the UHDTV/HDTV video and audio could be received without any transmission errors.

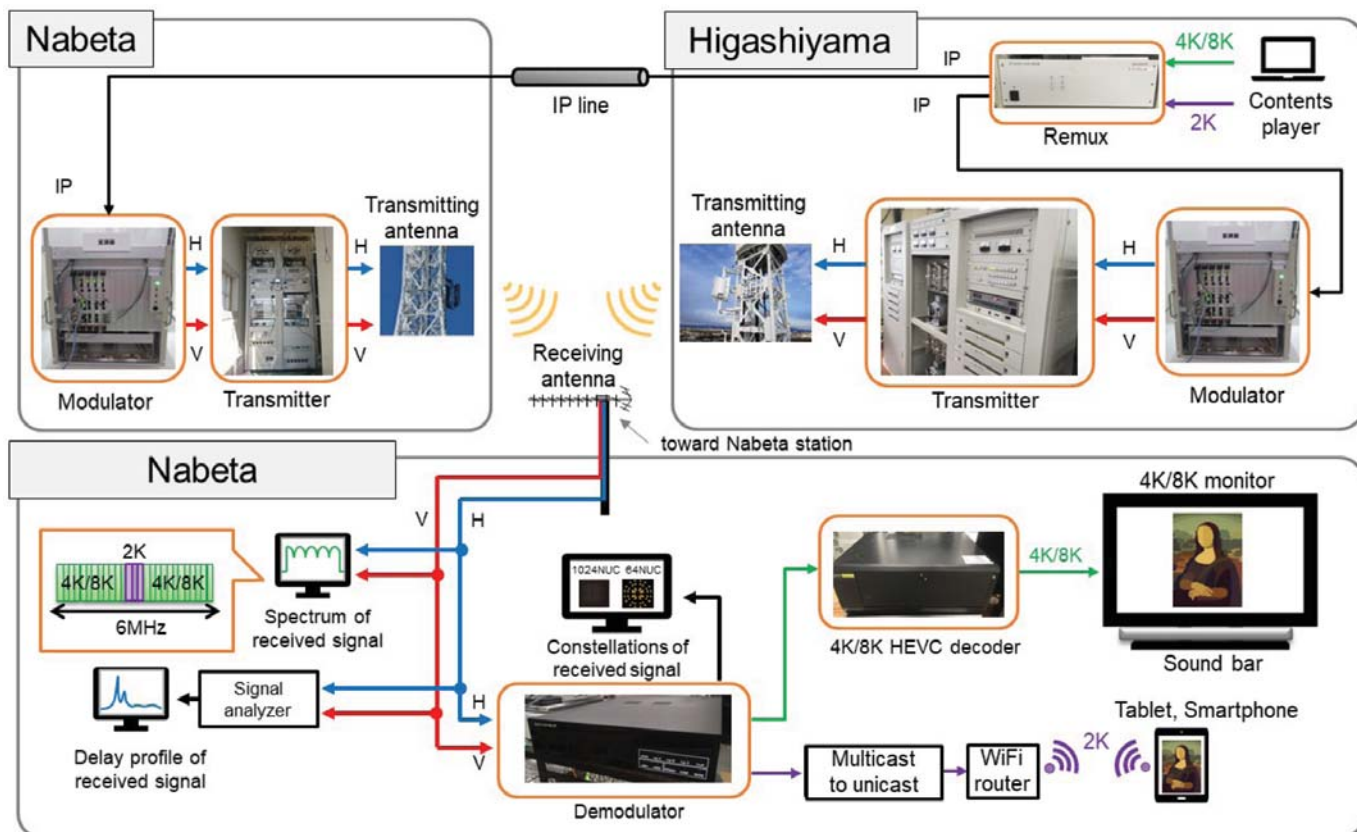


Figure 2.1.7 Block diagram of transmitting and receiving system in Nagoya

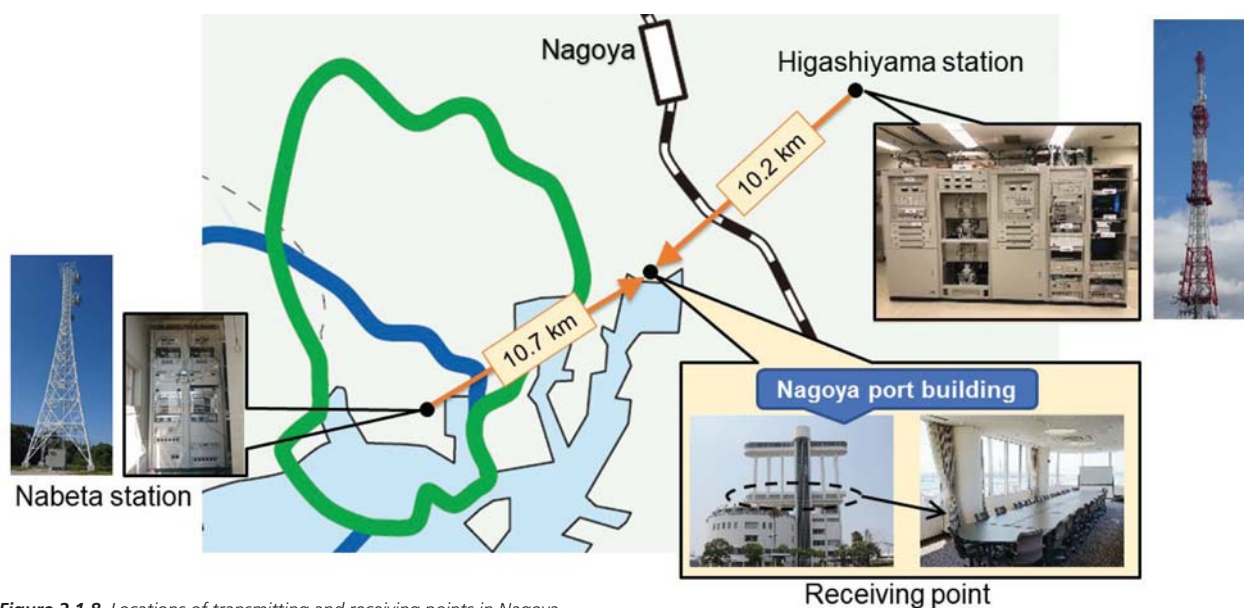


Figure 2.1.8 Locations of transmitting and receiving points in Nagoya

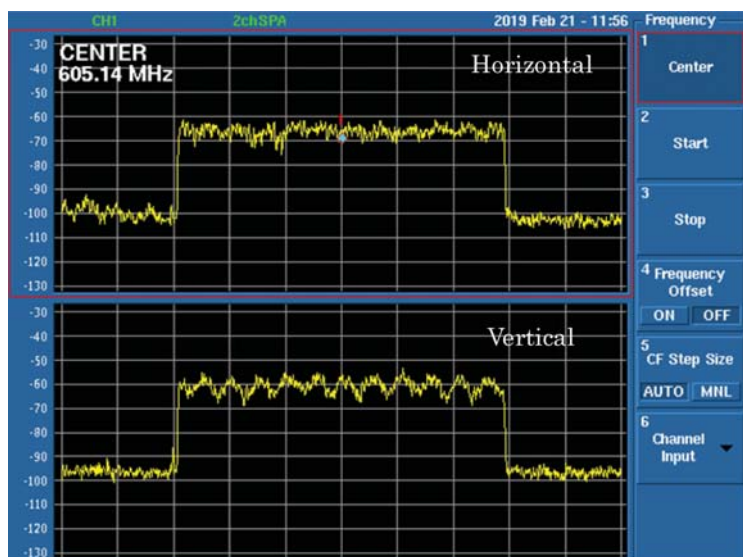


Figure 2.1.9 Spectrum of received signals at Nagoya port building (MIMO)

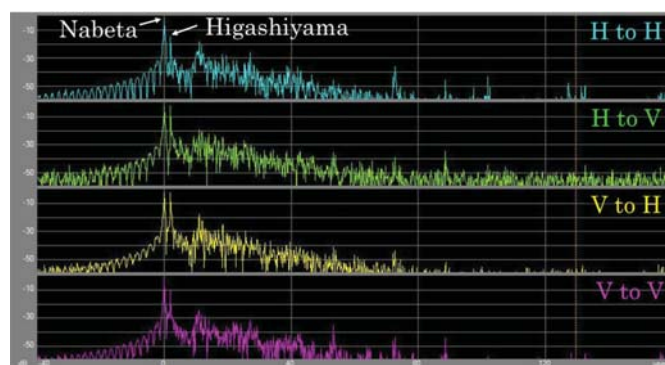
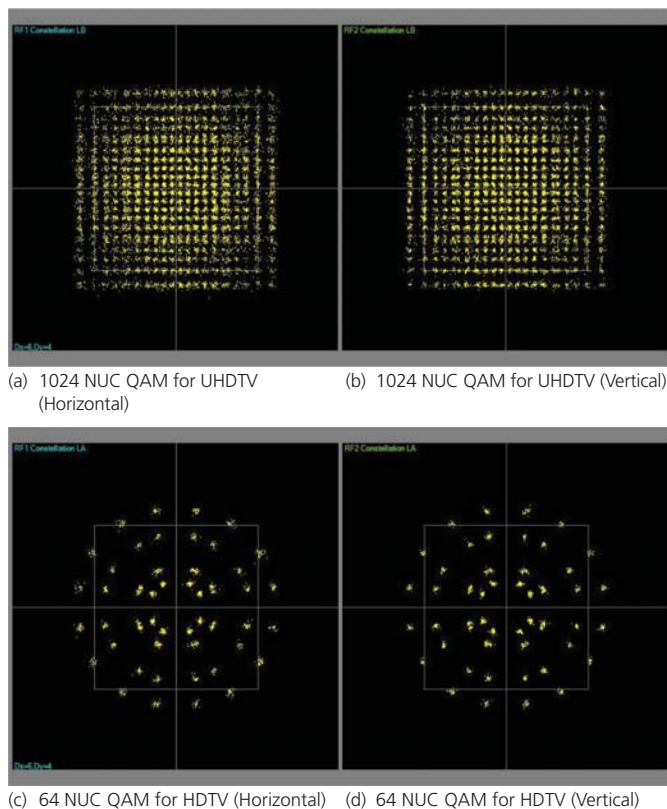


Figure 2.1.10 Delay profile of received signals at Nagoya port building (MIMO)

Figure 2.1.11 Constellations of received signals at Nagoya port building (MIMO)



Transmission performance of the advanced system is being verified assuming a fixed rooftop reception with a reception antenna at a height of 10 metres and a mobile reception with vehicular external aerials at a height of 2 metres in the Tokyo and Nagoya areas.

The plan is to evaluate the transmission characteristics not only of single-input single-output (SISO), but also MIMO to confirm the gain in the capacity and required C/N achieved with the advanced system in actual urban reception environments.

2.1.3 Overview of advanced ISDB-T specifications and evaluation of their transmission characteristics

With the aim of improving the quality and expanding the functions of digital terrestrial television broadcasting services, advanced transmission systems have been developed that inherit the key functions of integrated services digital broadcast-terrestrial (ISDB-T) systems, which employs hierarchical transmission based on frequency division multiplexing (FDM) and a segment structure. The advanced ISDB-T system has a new signal frame structure that enables bandwidth to be flexibly allocated to multiple services for different reception scenarios, such as fixed reception and mobile reception, compared with ISDB-T. Currently, verification of the transmission method is in progress.

The following are documents to help you get more information about the advanced ISDB-T:

[A Study on the Transmission System of an Advanced ISDB-T](https://ieeexplore.ieee.org/document/8971915)
<https://ieeexplore.ieee.org/document/8971915>

This report describes an overview of the transmission system for a next-generation DTTB called the advanced ISDB-T and its basic transmission performance.

[Transmission System Design of UHD-1/4K and UHD-2/8K Terrestrial Television Broadcasting and its Performance Proof by Large-Scaled Field Experiments](https://ieeexplore.ieee.org/document/9136826)

<https://ieeexplore.ieee.org/document/9136826>

This paper presents the concept and specifications of the proposed system. The verification results of a computer simulation, and laboratory and large-scale field experiments are also described.

[Fixed Reception Performance of FDM-based Transmission System for Advanced ISDB-T](https://www.set.org.br/ijbe/ed6/Artigo1.pdf)

<https://www.set.org.br/ijbe/ed6/Artigo1.pdf>

This paper provides a BICM selection guideline based on the simulation results for fixed reception scenarios toward the practical application of advanced ISDB-T.

2.1.4 Summary

In the field of broadcasting, UHDTV has the potential to succeed HDTV.

Japan has launched an R&D project aiming at developing an advanced DTTB system and evaluating its performance through field trials in large-scale experimental environments constructed in urban areas.

These field experiments will show the feasibility of terrestrial UHDTV transmission using several key technologies, including dual-polarized MIMO, 4096-QAM carrier modulation, LDPC code, and NUC. The UHDTV system to be used in Japan will be selected on the basis of further consideration and examination of various technical possibilities and future trends.

More information such as transmission parameters, experimental results was described in the Rep. ITU-R BT.2343-4. (<http://www.itu.int/pub/R-REP-BT.2343>)

2.2 ATSC 3.0 based UHDTV terrestrial broadcasting in Republic of Korea

The design and field experiments of a digital on-channel repeater for ultra-high-definition television broadcasting service.

2.2.1 Introduction

The terrestrial broadcasters of Korea launched the advanced television systems committee (ATSC) 3.0-based commercial UHDTV broadcasting service in May 2017 for the first time in the world. Since then, KBS has been deploying and operating single frequency network (SFN)-based UHDTV transmitters in the major metropolitan areas.

However, the UHDTV network may inevitably have one or more radio-shadowing areas due to nature-made and artificial objects (e.g. mountains, forests, buildings, tunnels, and so on). If a commercial receiver exists in the radio-shadowing area, it is challenging to provide normal UHDTV broadcasting service because of the low strength and poor quality of the signal received from the UHDTV transmitters. To minimize the radio-shadowing area of UHDTV network, digital on-channel repeater (DOCR) has been studied and considered as a cost-effective solution.

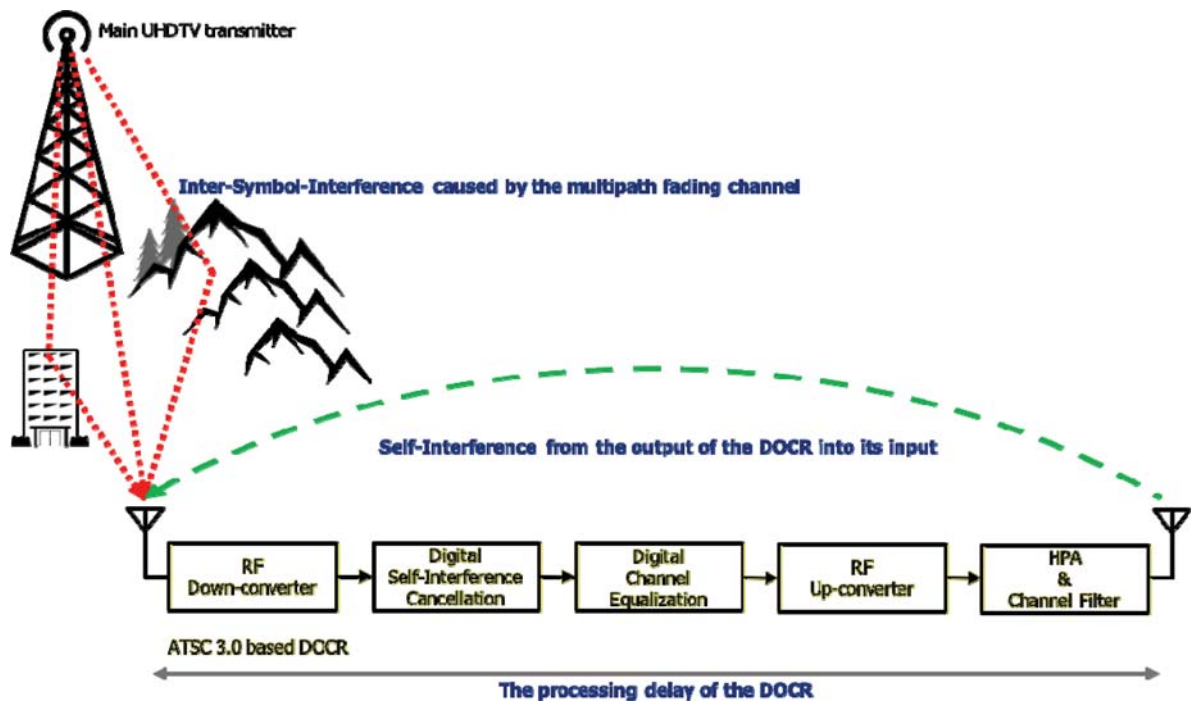


Figure 2.2.1 The simple block diagram of the DOCR

KBS is researching the ATSC 3.0-based DOCR to extend the UHDTV network efficiently. This report briefly describes the implementation and field evaluation results of the ATSC 3.0-based DOCR.

2.2.2 The implementation of ATSC 3.0-based DOCR

The simple block diagram of DOCR is shown in **Figure 2.2.1**. The DOCR receives a signal from the main UHDTV transmitter and retransmits an amplified version of it on the same radio frequency (RF) channel, so that an additional RF channel is not required. Thus, it is considered a good candidate for use in SFN deployment and to solve the lack of spectrum resources in the terrestrial broadcasting system.

Generally, the following three system requirements should be considered to design and implement the DOCR with adequate performance.

- Self-interference caused by antenna coupling effects should be reduced adequately. Since the transmitting and receiving antennas of the DOCR utilize the same RF channel, there can be a significant amount of unwanted self-interference from the output of the DOCR into its input. If the self-interference is not removed, it may result in the performance degradation and instability of the overall system. To resolve this issue, the digital self-interference cancellation technique is used for implementing the prototype DOCR.
- Inter-symbol-interference of a received signal should be reduced adequately. Until the signal from the main UHDTV transmitter is received on the DOCR, it suffers from severe multipath fading channel condition, which causes an inter-symbol-interference. Although the DOCR can be operated without removing these ISI, the output signal of the DOCR still remains distorted by the multipath fading channel condition. As a result, the output of the DOCR cannot provide a high-quality retransmitting signal. To address this problem, the

digital channel equalization technique is used for implementing the prototype DOCR.

- The processing delay should be minimized as much as possible. Since the ATSC 3.0 standard specification adopted an OFDM (Orthogonal Frequency-Division Multiplexing)-based waveform generation technique, all the transmitted signal should be arrived at the commercial receiver within the GI (Guard Interval). If the processing delay of the DOCR is longer than GI, it may inevitably cause performance degradation of the commercial receiver. In the prototype DOCR, the maximum allowed processing delay was set to be less than 25% of GI.

2.2.3 The implementation and field evaluation results

In order to verify the system functionality under real-world conditions, a prototype DOCR was implemented and tested through field experiments. The prototype DOCR consists of the proposed adaptive filter-based interference cancellation techniques to obtain high antenna isolation and SNR gain. Also, the prototype DOCR was installed at the UHDTV repeater site in Korea, and the overall system performance of the prototype DOCR was measured according to the inspection criteria approved by the Ministry of Science and ICT. **Figure 2.2.2** shows the information of the actual UHDTV repeater site.



Figure 2.2.2 The information of the actual UHDTV repeater site

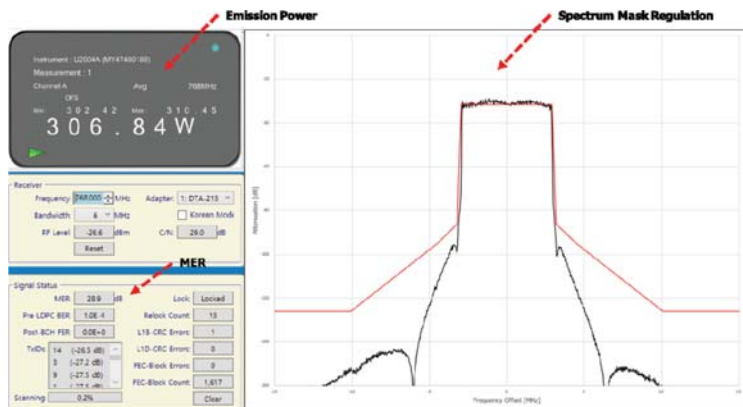


Figure 2.2.3 The system performance of the prototype DOCR

As shown in **Figure 2.2.3**, the prototype DOCR can achieve about retransmitting power level of 300W with satisfying other constraints such as MER and spectrum mask regulation.

Figure 2.2.4 shows the processing delay of the prototype DOCR. By employing the carefully designed adaptive filter-based interference cancellation techniques, the delay of the whole signal processing of the prototype DOCR is approximately 15.5 microseconds. Since the GI duration is set to 222 microseconds which is the same as the currently used UHDTV transmission parameter in Korea, the impact of the processing delay of the prototype DOCR is negligible at the commercial receiver.



Figure 2.2.4 The processing delay of the prototype DOCR

2.2.4 Summary

KBS has been conducting many kinds of research and field trials to design effective UHDTV network deployment since the beginning of the ATSC 3.0-based commercial UHDTV broadcasting service. This report considered the system requirements of the DOCR for use in SFN deployment and showed the implementation and field evaluation results of the prototype DOCR. The prototype DOCR applied the digital self-interference and inter-symbol-interference cancellation techniques so that it provided not only a high emission power level but also high-quality retransmitting capability. Also, it is fully compliant with ATSC 3.0 standard specifications. In conclusion, the prototype DOCR can be efficiently utilized to extend the UHDTV broadcasting service area and to fill the radio-shadowing area in the current UHDTV network.

Annex 3

Project: Integrated Broadcast-Broadband and OTT (T/IBBOTT)

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3. Status report

This clause describes recent updates on IBB and OTT standards and related technologies identified and studied by this project. And it describes also recent update on standards and technologies of information security for broadcasting services and cyber security in broadcasting industry for protecting the broadcasting systems.

3.1 Standardization of Integrated Broadcast-Broadband System in Japan

IPTV Forum Japan standardizes specifications of Hybridcast in Japan. Technical specification of Hybridcast is composed of two technical standards and an operational guideline listed below and the latest versions are published in November 2020.

- IPTVJ STD-0010 'Integrated Broadcast-Broadband System Specification', version 2.3
- IPTVJ STD-0011 'HTML5 Browser Specification', version 2.6
- IPTVJ STD-0013 'Hybridcast Operational Guideline', version 2.9

In the revision in November 2020 several new features were added to the Hybridcast technical specifications. Major updates are as follows:

- Addition of the new application type named "Broadcast-independent managed application" An application of this type runs in the state that no broadcast channel is being tuned so that service providers can offer application services regardless of their broadcasting area.
- Enhancement to the streaming video playback function The CMAF*1 is added as a supported container format of streaming video, including low-latency playback features. Support for stream event delivery mechanisms such as an 'event message' (emsg) box and an 'Event' XML element of MPEG DASH*2 are also added.
- Enhancement to the companion device function UHDTV broadcasting services, i.e. 4K and 8K satellite broadcasting in Japan, are added to the available channels for tuning from a companion device.
- Addition of the three-dimensional audio codec support

The enhanced AC-3*³ is added to the available audio codecs for video streaming.

*1 ISO/IEC 23000-19 "Multimedia application format (MPEG-A) – Part 19: Common media application format (CMAF) for segmented media".

*2 ISO/IEC 23009-1 "Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats".

*3 ETSI TS 102 366 "Digital Audio Compression (AC-3, Enhanced AC-3) Standard".

3.2 Studies in ITU-R

ITU-R WP6B is working for the study on IBB systems. The working party is now studying on harmonization of IBB systems by making comparison of Hybridcast (Japan), HbbTV2.0 (Europe), TOPSmedia (South Korea) and Ginga (Brazil).

At the meeting held in April 2019 in Geneva, the working party developed the comparison of application life-cycle and application transition of the IBB systems, and revised Report ITU-R BT.2267 "Integrated broadcast-broadband systems" to add a new part on the harmonization of Integrated Broadcast-Broadband (IBB) systems' applications. To allow the exchange of services covered by the IBB systems and to deploy these services in an area where other systems are used, it is important to harmonize the IBB systems, to ensure compatibility with the IBB applications and interoperability across systems.

At the meeting, the working party revised Report ITU-R BT.2342 to replace information on TTML Text and Image Profiles for Internet Media Subtitles and Captions 1.0 (IMSC1.0) with the updated IMSC1.1 and to update a list of current EBU specifications pertinent to the content of the Report.

At the meeting held in July 2019 in Geneva, the working party revised Report BT.2267 to add the companion application to execute the application on a receiver. The working party also developed the new use cases of IBB system which provides object-based sound services via MPEG-DASH streams.

The working party also developed the global platform. The working party revised Report ITU-R BT.2400 "Usage scenarios, requirements and technical elements of a global platform for the broadcasting service" to add the specific reference to the ATSC 3.0 standard and some examples to show its Internet Protocol-based capabilities to integrate broadcast and broadband services. New digital terrestrial transmission standards such as the ATSC 3.0 system can help effectuate a converged broadcast and broadband platform, which is an important aspect of a global platform for broadcasting services.

At the meeting held in October 2020, the working party revised Recommendation ITU-R BT.2075 "Integrated broadcast-broadband system" to update an application execution mechanism of Hybridcast, with which a companion device sends a command to a receiver to tune to a designated channel and launch a Hybridcast application.

At the meeting held in March 2021, the working party prepared a revised draft report of Recommendation BT.2075 by adding information regarding commonality among IBB systems and equivalency of their functions as described in Report BT.2267 Part 3. The working party also prepared a draft revision to report BT.2267 on IBB systems to align with Recommendation ITU-T J.208 on harmonization of applications between IBB systems.

3.3 Studies in ITU-T

ITU-T SG9 is also working for the study on IBB system applied to Cable Digital TV. At the meeting held in November 2018 in Bogota, Colombia, the Study Group started the work to revise IBB system Recommendation (ITU-T Recommendation J.207 "Specification for integrated broadcast and broadband digital television application control framework") to add the function of device collaboration with companion devices in Hybridcast. Recommendation J.207 is a twin of IBB system Recommendations in ITU; Recommendation ITU-R BT.2075 is another twin on this topic. So, the Study Group continue to work to revise the Recommendation according to revision of Recommendation ITU-R BT.2075. The Study Group is studying the work of smart TV operating system for hybrid cable Digital TV services including IBB DTV service provided by cable television operators and third-party providers. At the Bogota meeting, the study group make progress the work of the architecture of smart TV operating system. The study group consent the Recommendation of "The functional requirements of smart TV operating system" as ITU-T Recommendation J.1201.

At the meeting held in June 2019 in Geneva, the study group consent Recommendation J.207 to add the function of device collaboration in Hybridcast. The study group also make progress the work of drafting new Recommendation "Harmonization of Integrated Broadcast-Broadband DTV application control framework". As for the smart TV operating system, the study group consent the Recommendation of "The architecture of smart TV operating system" as ITU-T Recommendation J.1202. In addition, making a new Recommendation for the specification of smart TV operating system was started in the study group.

At the meeting held in July 2020, the study group reached the AAP consent for the draft new Recommendation ITU-T J.1204. It is now approved and is part of a set of already approved Recommendations as follows:

- J.1201: Functional requirements of a smart TV operating system
- J.1202: The architecture of a smart TV operating system
- J.1203: The specification of a smart TV operating system
- J.1204: The security framework of a smart TV operating system

The group also consent new Recommendation ITU-T J.208 “Harmonization of Integrated Broadcast-Broadband DTV application control framework” at its November 2020 meeting. The recommendation is created based on Report ITU-R BT.2067 which defines the methods to harmonize IBB systems by identifying commonalities across the IBB systems.

3.4 Cyber Security in Australia

In March 2021, A cyber-attack has disrupted live broadcasts on Australia’s Channel Nine TV network. Nine said it was investigating whether the hack was “criminal sabotage or the work of a foreign nation”. Australia’s parliament was also investigating a possible cyber-attack in Canberra on Sunday.

Nine, which also owns The Sydney Morning Herald and The Age newspapers, said its publishing and radio divisions were largely unaffected.

But its TV section was. At first, Nine said it was “responding to technical issues” affecting its live broadcasting.

Weekend Today, which runs from 07:00 to 13:00 local time (21:00 to 03:00 GMT) from Sydney, did not air.

Its online news site, 9news.com.au, was also affected.

On Sunday night, Nine confirmed there had been a “cyberattack on our systems”.

“Our IT teams are working around the clock to fully restore our systems which have primarily affected our broadcast and corporate business units. Publishing and radio systems continue to be operational,” the company said in a statement.

A later report by Mark Burrows, a senior journalist for the network, said the company was “under attack by hackers”. He said emails and editing systems had gone down.

“I’m not surprised,” Mr Hastie, the assistant defence minister, told Nine. “Last year alone we had 60,000 reports to Australian cyber-security of cyber-crime. That’s one every 10 minutes.”

Nine told all its staff to work at home until further notice. It was able to air its shows on Monday.

Source:
<https://www.9news.com.au/national/nine-network-hit-by-cyber-attack-threatening-news-services-nationwide/c653fe12-a5c4-4da8-9a33-b902f1325eed>
<https://www.bbc.com/news/world-australia-56554641>

Annex 4

Project: Satellite Broadcasting (T/SB)

Project Manager:
Mr Masashi Kamei (NHK, Japan)
 Co-project Manager:
Mr K. K. Rao (India)
TRT, IRIB

4. Objectives

This clause describes technologies on the latest satellite systems for UHDTV broadcasting and specifications of the latest satellite broadcasting systems. And it describes also the latest topics on advanced satellite broadcasting technologies using Ka-band, etc.

4.1 ITU-R documents related to satellite broadcasting systems

4.1.1 Radio Regulations

ARTICLE 23 Section 2 “Broadcasting-satellite services”

APPENDIX 30 “Provisions for all services and associated Plans and List for the broadcasting-satellite service in the frequency bands 11.7-12.2 GHz (in Region 3), 11.7-12.5GHz (in Region 1) and 12.2-12.7 GHz (in Region 2)

APPENDIX 30A “Provisions and associated Plans and List for feeder links for the broadcasting-satellite service (11.7-12.5GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3) in the frequency bands 14.5-14.8 GHz and 17.3-18.1 GHz in Regions 1 and 3, and 17.3-17.8 GHz in Region 2

RESOLUTION 506 “Use by space stations in the broadcasting-satellite service operating in the 12 GHz frequency bands allocated to the broadcasting-satellite service of the geostationary-satellite orbit and no other”

RESOLUTION 507 “Establishment of agreements and associated plans for the broadcasting-satellite service”

RESOLUTION 528 “Introduction of the broadcasting-satellite service (sound) systems and complementary terrestrial broadcasting in the frequency bands allocated to these services within the range 1-3 GHz.”

RESOLUTION 536 “Operation of broadcasting satellites serving other countries.”

RESOLUTION 548 “Application of the grouping concept in Appendices 30 and 30A in Regions 1 and 3”

RESOLUTION 552 “Long-term access to and development in the frequency band 21.4-22 GHz in Regions 1 and 3”

RESOLUTION 553 “Additional regulatory measures for broadcasting-satellite networks in the frequency band and 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this frequency band”

RESOLUTION 554 “Application of pfd masks to

coordination under No. 9.7 for broadcasting-satellite service networks in the band 21.4-22 GHz in Regions 1 and 3"

RESOLUTION 555 "Additional regulatory provisions for broadcasting-satellite service networks in the frequency band 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this frequency band"

RESOLUTION 557 "Consideration of possible revision of Annex 7 to Appendix 30 of the Radio Regulations"

4.1.2 Recommendations (<https://www.itu.int/rec/R-REC-BO/en>)

BO.1213 "Reference receiving Earth station antenna pattern for the broadcasting-satellite service in the 11.7-12.75 GHz band"

BO.1408 "Transmission system for advanced multimedia services provided by integrated services digital broadcasting in a broadcasting-satellite channel"

BO.1516 "Digital multiprogramme television systems for use by satellites operating in the 11/12 GHz frequency range"

BO.1659 "Mitigation techniques for rain attenuation for broadcasting-satellite service systems in frequency bands between 17.3 GHz and 42.5 GHz"

BO.1696 "Methodologies for determining the availability performance for digital multi-programme BSS systems, and their associated feeder links operating in the planned bands"

BO.1724 "Interactive satellite broadcasting systems (television, sound and data)"

BO.1774 "Use of satellite and terrestrial broadcast infrastructures for public warning, disaster mitigation and relief"

BO.1784 "Digital satellite broadcasting system with flexible configuration (television, sound and data)"

BO.1900 "Reference receive earth station antenna pattern for the broadcasting-satellite service in the band 21.4-22 GHz in Regions 1 and 3"

BO.2063 "Alternative BSS earth station antenna radiation pattern for 12 GHz BSS bands with effective apertures in the range 55-75 cm"

BO.2098 "Transmission system for UHDTV satellite broadcasting"

4.1.3 Reports (<https://www.itu.int/pub/R-REP-BO/en>)

BO.2007 "Considerations for the introduction of broadcasting-satellite service of high-definition television and ultra-high-definition television systems in the band 21.4-22 GHz"

BO.2071 "Broadcasting-satellite service system parameters between 17.3 GHz and 42.5 GHz and associated feeder links"

BO.2101 "Digital satellite broadcasting system (television, sound and data) with flexible configuration"

BO.2102 "Multiple-feed BSS receiving antennas"

BO.2397 "Satellite transmission for UHDTV satellite broadcasting"

4.2 Latest topics on satellite broadcasting

4.2.1 4K/8K Broadcasting in Japan

Japan has laid out a future vision for 4K/8K broadcasting roadmap and started providing 4K/8K programs via satellites, cable, IPTV. The launches of 4K/8K broadcasting via satellites are as follows:

2014 June 4K test broadcasting via communication satellites of 124/128E

2015 March 4K full broadcasting via communication satellites of 124/128E

2016 August 4K/8K test broadcasting via broadcasting satellites of 110E

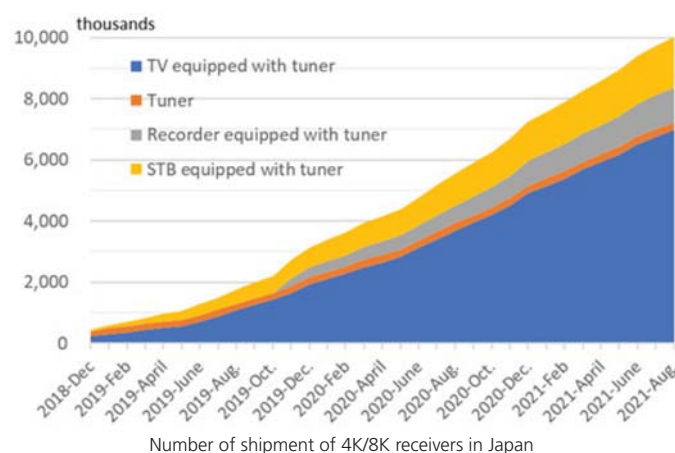
2018 December 4K/8K full broadcasting via broadcasting satellites of 110E

The technical specification of the transmission system called "ISDB-S3" for 4K/8K full broadcasting is shown in Rep. ITU-R BO.2397 as follows:

Technical specification of the transmission system for 4K/8K full broadcasting

Frequency	Uplink: 17GHz-band Downlink: 12GHz-band
Bandwidth	34.5 MHz
Symbol rate	33.7561 Mbaud
Roll-off factor	0.03
Modulation	16-APSK
Inner coding rate (LDPC)	7/9
Information bit rate	100.0 Mbps
Multiplexing	MMT
Video coding	H.265/HEVC
Audio coding	MPEG-4 AAC

4K/8K television ownership has been increasing. It reached to 7.8% in March 2019, 9.9% in July 2019, 14.4% in May 2020, and 18.0% in February 2021, respectively. The number of the shipment of 4K/8K receivers has been increasing to more than 10 million units as of August 2021. ■





REPORT OF CHAIRMAN TRAINING & SERVICES TOPIC AREA

By **Padarabinda Das**, Prasar Bharati, India

1. The ABU has been continuing its collaborative efforts with its members continuously and consistently to address their broadcasting needs and requirements. Through various conferences, seminars, workshops, etc., ABU provides an effective platform for exchange of information and knowledge benefiting its members immensely. The Training & Services Topic Area plays an important role in identifying technical training needs of its members.
2. Right from the beginning, this Topic Area was named as "Training & Services". However, it was renamed as "Capacity Building" in 2016. Then in the Technical Bureau Mid Year meeting March 2019, it was proposed to change the name of Topic Area as "The Training & Services". The other three Topics in ABU Technology and Innovation are Production, Transmission and Spectrum.
3. As decided in the Technical Bureau Mid-Year meeting, July 2020 the Training & Services Topic Area may carry out following activities:
 - i) Identifying training priorities and requirements of members
 - ii) Training Programmes and information on Managerial and Occupational Safety and Skills
 - iii) Explore third-party skill building and knowledge sharing and equipment exchange opportunities
4. Meanwhile, the ABU Technology and Innovation Department finalised the Terms of Reference (ToR) for this Topic Area and the same is provided in **Annexure-I**.
5. Details of activities/Tasks carried out by ABU under the Topic Area "The Training & Services" are elaborated below:

5.1 Technical Training Priorities and Members Requirements (TS/TTPMR)

Sl No.	TASKS	Action Taken Report/Present Status
i	Conduct surveys periodically to understand the requirements and priority areas of members	Completed-Survey on Members' Requirements-Prioritising Technical Activities (Survey Period: 8-22 October 2021) [Please refer to Doc TBA-21/6]
ii	Identify requirement of Technical Advisory Services for Members	TAS mission being conducted, case by case basis, upon the request of members Requirements list updated every year
iii	Work with ABU Media Academy(AMA) to develop: - curriculum-based training - a certification system with different levels - effective monitoring and assessing methods to evaluate how beneficial the training workshops/seminars	Collaboration with AMA in Progress for Training Course on Engineering Fundamentals for Broadcasters - Level 1 Certification Course completed in 2 batches (26 July-23 Aug 2021 and 08 Sept- 13 Oct 2021) - Certificates issued to successful participants after evaluation
iv	Collaborate with AMA and other established Media Training Academies	- Collaboration with AMA in Progress - Correspondence with Institutes (NABM-India, IRIB University-Iran, TRT-Turkey) for availing Resource Persons to Courses and Webinars

5.2 Skill Development Programme for Managerial, and Occupational Safety (TS/ SDPMOS)

Sl No.	TASKS	Action Taken Report/Present Status
i	Identify and develop training programmes for non-technical, managerial, financial and occupational safety and skills enhancement	- AMA conducts few such courses for ABU members* (approx 300 participated this year in those 5 courses listed below)
ii	Conduct surveys to study members requirements on these areas such as General management, Health & Safety considerations	- No updates
iii	Explore the best possible ways of delivery of such training and good practice methods within the industry	- No updates

* List of some courses ABU Media Academy for ABU members

1. Course on Train the Trainer
2. Corporate Innovation Management Course
3. Sales Management Training for Media Organizations
4. Digital Sales Training for Media Organizations
5. Authentic Leadership Management course

5.3 Technical Skill Building and Knowledge Sharing (TS/TSBKS)

[For reference, Pls refer to TD Activity Report – Doc T-21/4]

Sl No.	TASKS	Action Taken Report/Present Status
i	Work with industry partners and international events to identify applicable training opportunities available in broadcasting field eg: ITU, IABM, SMPTE etc.	- Continuous partnership with international event organizers such as BES India, BroadcastAsia, KOBA Korea, Inter BEE Japan, IMTC Iran, IBC - Partnership with ITU for Asia Pacific ITU events
ii	Explore and develop a staff exchange or short-term attachment programme among members. Explore easy ways how redundant or in excess equipment from members can be acquired and utilised by other members who can use them	- Draft Guidelines in progress
iii	Explore easy ways how redundant or in excess equipment from members can be acquired and utilised by other members who can use them	- Other Members are notified about the equipment offered to donate by a specific member. KBS-Korea offered to donate New HDV Tapes to ABU Members and the notice was circulated on Nov 09, 2020

In addition, ABU Technology is organizing Webinar Series on Member Innovations to share innovations and creative solutions developed and implemented by ABU member broadcasters.

6. Tasks proposed to be undertaken during the next year:

[Please refer to Calendar of Events- Doc T-21/12]

7. We are today in the midst of a broadcast media revolution in the Asia-Pacific region. The audiences, no longer satisfied with the traditional programme content, are demanding multichannel programming choices, versatile delivery system, content anywhere-anytime, interactivity, on-demand services and an insatiable appetite for multimedia content. In order to meet audience's expectations, broadcast industry has been bringing new developments and introducing innovative technologies quite rapidly. Digital technologies, new media services and social media platforms are being implemented progressively by broadcasters in this region.
8. Because of development of diversified technologies, wide variety of equipment and innovative services, broadcasters have now plenty of options to choose from. As a result, unlike decades ago when most of the broadcasters were using same technology and equipment, today the technical infrastructure varies from broadcaster to broadcaster. The technologies and equipment used by broadcasters are highly diversified. Further, these equipment are highly complex and sophisticated. Under such scenario, broadcasters are requesting for more no. of equipment specific training than to OEM based. Planning of such training, requires detail information on technology and equipment used by ABU member organizations.

9. Technology & Innovation Department of ABU may require to maintain a detail data base of all major broadcasting equipment/ product being used by it members including its model, make, etc. This information would help ABU planning specific equipment based training in respect of members who are actually using it.
10. Due to rapid development in broadcast media and obsolescence of technology and services, training needs of ABU members are changing from time to time. To identify or assess such needs, frequent survey, at least once in a year, is necessary. It would enable ABU to have better understating on Member's need and accordingly it can priorities them. The survey is also important to the ABU generally and the Technology department specifically so that it can continue to serve members better and correctly address the needs and requirements of members. ABU may develop a suitable questionnaire for the above proposed survey and may carry out the survey for identifying training need for the year 2022-23.
11. Further, in order to share the training load, ABU may plan more no. of collaborative training taking support from existing Training Institutes of member organizations. In this regard, it needs to develop a database of training academies and training programmes offered by them. A Database of Resource Persons who can deliver training on various subjects may help ABU for planning and implementation of desired training.

Annexure-I TOPIC AREA: TRAINING AND SERVICES (Updated)

Chairman: **Mr Mr Padarabinda Das**, Prasar Bharati, pdasdelhi@gmail.com

Secretary: **Shree Bhadra Wagle**, ABU-TD, shreebhadra@abu.org.my

PROJECT TOPIC	TASKS	DELIVERABLES	PROJECT MANAGER
1 Technical Training Priorities and Members Requirements TS/TTPMR	- Periodically conduct surveys among members to understand the requirements and priority areas by members and based on these suggest topics for training. - Identify requirement of Technical Advisory Services for Member organisations - Work with ABU Media Academy to develop: - curriculum-based training programmes - a certification system with different levels - effective monitoring and assessing methods to evaluate how beneficial the training workshops/seminars have been to members. - Collaborate with AMA and other established Media Training Academies of members	- Survey Report on Member requirements - List of Priority Areas, Topics and Program Schedule for training - Certification and Evaluation Template - Database of training academies and training programmes offered by them - Database of Production/ B'cast Technology/ equipment used by Members - Database of Resource Persons along with Topics Time period: Nov2021	(TBC) Co-Project Managers: Mr Devesh Kumar devesh@prasarbharati.gov.in Mr Rajesh Kumar Sharma rksharma@prasarbharati.gov.in Contributors:
2 Skill Development Programme for Managerial, and Occupational Safety TS/ SDPMOS	- Identify and develop training programmes for non-technical, managerial, financial and occupational safety and skills enhancement - Conduct surveys to study members requirements on these areas such as General management, Health & Safety considerations. - Explore the best possible ways of delivery of such training and good practice methods within the industry	- List of non-technical, managerial, financial Skills courses that can be organised. - Identify and suggest at least one such topic to be included in the TD training calendar annually based on member requirements - Find out Standard Operating Procedures (SOP) and best practice methods adopted by members on different situations and work environment in general - develop standard code of conduct and work ethics information manual - Develop a disaster recovery and response manual that can be used in technical areas Time period: Nov2021	(TBC) Co-Project Managers: Mr Devesh Kumar devesh@prasarbharati.gov.in Mr Rajesh Kumar Sharma rksharma@prasarbharati.gov.in Contributors:
3 Technical Skill Building and Knowledge Sharing TS/TSBKS	- Work with industry partners and international events to identify applicable training opportunities available in broadcasting field eg: ITU, IABM, SMPTE etc. - Explore and develop a staff exchange or short-term attachment programme among members. - Explore easy ways how redundant or in excess equipment from members can be acquired and utilised by other members who can use them.	- MoU with Industry Partners - Guidelines for staff exchange programme - Members' Information Exchange platform Time period: Nov2021	(TBC) Co-Project Managers: Mr Devesh Kumar devesh@prasarbharati.gov.in Mr Rajesh Kumar Sharma rksharma@prasarbharati.gov.in Contributors: ■



REPORT OF CHAIRMAN SPECTRUM TOPIC AREA

By Dr Li Lei Lei, NRTA-China

Introduction about scope of the work:

This report is on the Topic Area Spectrum Issues which including the related WRC-23 Agenda items concerning broadcasting service and ABU spectrum issues.

Project Topic 1: to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 245 (WRC-19) (WRC-23 AI 1.2)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to OCT.2021

The following tasks were considered for this project:

1. Follow developments of studies in WP 5D to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting service in Asia-Pacific Area.

This report was provided by **Mr Zhong Shenghong**.

1. Preliminary progress

The tasks of WP5D are as follows:

- to conduct and complete in time for WRC-23 the appropriate studies of technical, operational and regulatory issues pertaining to the possible use of the terrestrial component of IMT in the frequency bands listed below
 - 3 600-3 800 MHz and 3 300-3 400 MHz (Region 2);
 - 3 300-3 400 MHz (amend footnote in Region 1);
 - 7 025-7 125 MHz (globally);
 - 6 425-7 025 MHz (Region 1);
 - 10.0-10.5 GHz (Region 2).
- to conduct and complete in time for WRC-23 the sharing and compatibility studies, with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, and also, as appropriate, on services in adjacent bands, for the frequency bands.

The following relevant activities in ITU-R since NOV. 2019 have been identified.

2.1 Working Party 5D Meeting (19 - 26 February 2020)

1. Develop liaison statements to ITU-R contributing groups to request propagation models and characteristics of the existing services for the sharing and compatibility studies;
2. Develop a detailed work plan for WRC-23 agenda item 1.2;
3. Call for contributions in the WP 5D Chairman's Report

2.2 Working Party 5D Meeting (5 - 16 October 2020)

1. Develop first version of working documents on sharing and compatibility studies, based on input contributions;
2. Develop the first version of the draft CPM text;
3. Send liaison statements to contributing groups as necessary;
4. Review and revise the detailed work plan as necessary

2.3 Working Party 5D Meeting (22 February – 5 March 2021)

1. Update working documents on sharing and compatibility studies, based on input contributions;
2. Initiate methodology for sharing and compatibility studies, based on information from contributing groups and input contributions;
3. Update the draft CPM text based on input contributions;
4. Send liaison statements to contributing groups as necessary;
5. Review and revise the detailed work plan as necessary

2.4 Working Party 5D Meeting (7 - 18 June 2021)

1. Update working documents on sharing and compatibility studies, based on input contributions;
2. Discuss methodology for sharing and compatibility studies, based on information from contributing groups and input contributions;
3. Update the draft CPM text based on input contributions;
4. Send liaison statements to contributing groups, as necessary;
5. Review and revise the detailed work plan as necessary.

2.5 Working Party 5D Meeting (4 - 15 October 2021)

1. Update working documents on sharing and compatibility studies, based on input contributions;
2. Conduct sharing and compatibility studies, based on information from contributing groups and input contributions;
3. Update the draft CPM text based on input contributions;
4. Send liaison statements to contributing groups as necessary;
5. Review and revise the detailed work plan as necessary.

3. Progress made at the Working Party 5D Meeting (4 - 15 October 2021) was as follows:

[467] (Rev.1)	Working document on sharing and compatibility studies of IMT systems in the frequency band 3 300-3 800 MHz	SWG WRC-23 agenda item 1.2	5D/886 (Annex 4.14)
[468] (Rev.1)	Working document towards draft CPM Text on WRC-23 agenda item 1.2	SWG WRC-23 agenda item 1.2	5D/886 (Annex 4.13)
[469] (Rev.1)	Detailed work plan for WRC-23 agenda item 1.2	SWG WRC-23 agenda item 1.2	5D/886 (Annexes 2.24.13 & 4.17)
[480] (Rev.1)	Working document on sharing and compatibility studies of IMT systems in the frequency band 6 425-7 125 MHz	SWG WRC-23 agenda item 1.2	5D/886 (Annex 4.15)
[481] (Rev.1)	Working document for sharing and compatibility studies of IMT systems in the frequency band 10-10.5 GHz in Region 2	SWG WRC-23 agenda item 1.2	5D/886 (Annex 4.16)

3.1 Working document on sharing and compatibility studies of IMT systems in the frequency band 3 300-3 800 MHz

1. Sharing and compatibility of RLS and IMT operating in the frequency band 3 300-3 400 MHz
2. Sharing and compatibility studies of fixed-satellite service and IMT operating in the frequency band 3 600-3 800 MHz
3. Sharing and compatibility of FS and IMT operating in the frequency band 3600- 3 800 MHz

3.2 Working document on sharing and compatibility studies of IMT systems in the frequency band 6 425-7 125 MHz

1. Sharing and compatibility of the SRS operating in the frequency band 7 145-7 190 MHz and IMT operating in the frequency band 6 425-7 125 MHz
2. Sharing and compatibility of the SOS operating in the frequency band 7 100-7 155 and IMT operating in the frequency band 6 425-7 125 MHz
3. Sharing and compatibility of the fixed service and IMT operating in the frequency band 6 425-7 125 MHz
4. Sharing and compatibility of the Fixed Satellite Service (FSS) (Earth-to-space) operating in the frequency band 6 425-7 025 MHz and IMT operating in the frequency band 6 425-7 125 MHz
5. Sharing and compatibility of the Fixed Satellite Service (FSS) (space-to-Earth) operating in the frequency band 6 700-7 075 MHz and IMT operating in the frequency band 6 425-7 125 MHz

3.3 Working document for sharing and compatibility studies of IMT systems in the frequency band 10-10.5 GHz in Region 2

1. Sharing and compatibility of the radiolocation service and IMT operating in the frequency band 10-10.5 GHz
2. Sharing and compatibility of the Earth exploration-satellite service (active) operating in the frequency band 10-10.4 GHz and IMT operating in the frequency band 10-10.5 GHz
3. Sharing and compatibility of the Earth exploration-satellite service (passive) operating in the frequency band 10.6-10.7 GHz and IMT operating in the frequency band 10-10.5 GHz
4. Sharing and compatibility of the Fixed Satellite Service (FSS) (Earth-to-space) operating in the frequency band 6 425-7 025 MHz and IMT operating in the frequency band 6 425-7 125 MHz
5. Sharing and compatibility of the fixed service and IMT operating in the frequency band 10-10.5 GHz

4. Preliminary views

Australia's objective is to encourage improvements in IMT capabilities and economies of scale through increased spectrum efficiency and harmonisation, subject to coexistence with other services to which the frequency bands are allocated on a primary basis (and in adjacent bands, as appropriate), being technically feasible. Australia will consider the outcome of studies in developing its position on this agenda item. Australia supports the protection of existing primary services.

Lao P.D.R supports sharing and compatibility studies of ITU-R in accordance with Resolution 245 (WRC-19) toward identification the frequency band 7025 - 7125 MHz to achieve global harmonized frequency bands for IMT while ensuring the protection of incumbent services within the framework of ITU-R.

New Zealand has an interest in the development of new IMT use in the bands being studied for mid band capacity, noting that only the 7 025 -7 125 MHz frequency band is included or study for Region 3 (as a global identification), New Zealand supports studies on this Agenda Item with a view to enable new systems in the bands, where appropriate.

The Republic of Korea is of the preliminary view that the protection of existing primary services in the 7 025-7 125 MHz band as well as other services operating in the adjacent bands, as appropriate, should be ensured and any additional constraints should not be imposed on the existing primary services allocated in the 6 GHz band, in any potential decisions made at WRC-23.

Regarding other frequency bands for Region 1 and Region 2, WRC-23 decisions shall in no way adversely affect Region 3 frequency allocations and existing and future uses of the relevant frequency bands.

Japan supports conducting sharing and compatibility studies in ITU-R in accordance with Resolution 245 (WRC-19). Taking into account the results of studies, Japan supports global identification of the frequency band 7 025-7 125 MHz for the terrestrial component of IMT without imposing additional regulatory or technical constraints on incumbent services, provided that sharing and compatibility between IMT and those services in the frequency band are considered to be feasible.

China supports global identification of 7 025-7 125 MHz for IMT with the appropriate regulatory and technical conditions if any (protecting incumbent services) within the framework of ITU-R.

The Islamic Republic of Iran is of the preliminary view that the protection of existing services in the 7 025-7 125 MHz band as well as other services operating in the adjacent bands shall be ensured in such way that the services shall in no way be adversely affected by any potential decisions made at WRC-23. Due to long border to Region 1 countries, the Islamic Republic of Iran is of the view that:

a) any possible IMT identification in WRC-23 in the frequency band 6 425-7 025 MHz shall protect Region 3 services within this frequency band and shall in no way be adversely affected by any potential decisions made at WRC-23.

b) the amendment of Radio Regulations Article 5 footnotes under the frequency band 3 300-3 400 MHz should not undermine and reduce the degree of protection and ease the conditions of the protection of these services within this frequency band. Moreover, the protection of C band uplink of Appendix 30B as a worldwide treaty shall be fully ensured.

Project Topic 2: to consider primary allocation of the band 3 600-3 800 MHz to mobile service within Region 1 and take appropriate regulatory actions, in accordance with Resolution 246 (WRC 19) (WRC-23 AI 1.3)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to MAY.2021

The following tasks were considered for this project:

1. Follow developments of studies in WP 5A to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting service in Asia-Pacific Area.

This report was provided by **Mr Zhong Shenghong**.

1. Preliminary progress

The tasks of WP5A are as follows:

- to conduct sharing and compatibility studies in time for WRC-23 between the mobile service and other services allocated on a primary basis within the frequency band 3 600-3 800 MHz and adjacent frequency bands in Region 1, as appropriate, to ensure protection of those services to which the frequency band is allocated on a primary basis and not impose undue constraints on the existing services and their future development.

- based on the results of studies in resolves to invite the ITU Radiocommunication Sector, to consider possible upgrade of the allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile, service on a primary basis within Region 1, and to take appropriate regulatory actions.

The following relevant activities in ITU-R since NOV. 2019 have been identified.

2.1 Working Party 5A Meeting (July 2020)

- Consider input contributions;
- Develop initial work plan;
- Develop liaison statement to contributing groups;
- Create placeholder for draft CPM text

2.2 Working Party 5A Meeting (November 2020)

- Consider input contributions;
- Consider the work plan for this agenda item and suggest necessary changes based on input contributions;
- Prepare the compilation of parameters/criteria received in response to liaison statements and contributions to WP5A, if any;
- Analyse existing ITU-R Reports and/or Recommendations that may be relevant to the sharing and compatibility studies;
- Develop initial version of draft CPM text based on input contributions;
- Consider need for further liaison statements

2.3 Working Party 5A Meeting (May 2021)

- Consider input contributions;
- Continue the analysis of existing ITU-R Reports and/or Recommendations, and of any new parameters/criteria received;
- Initiate work on a working document on any additional sharing and compatibility studies, if necessary, based on input contributions;
- Further develop draft CPM text based on input contribution;
- Liaise with contributing Working Parties regarding characteristics and protection criteria for this agenda item, as and if needed;
- Revise the work plan, as necessary

3. Progress made at the Working Party 5A Meeting (May 2021)

The group continued this work in a SWG led by Mr. Cesar GUTIERREZ as established at the last meeting which met five times. The SWG discussed all input contributions, prepared a compilation of the technical characteristics and operational parameters of the land mobile service for sharing and compatibility studies under WRC-23 agenda item 1.3. **However, this document has NOT been agreed by the SWG.**

The working documents for the draft CPM text and the workplan as contained in the Chairman's Report from the previous WP5A meeting (documents 5A/221 Annex 4 and 5) were not updated at this WP5A meeting and are therefore carried forward to the next meeting unchanged.

During the discussion it was pointed out that the sharing and coexistence studies under WRC-23 agenda item 1.3 could be quite similar to those under WRC-23 agenda item 1.2 depending on what parameters are defined for the land mobile service systems and IMT systems in WP5A and WP5D respectively. It was also clarified that the current focus of the work is on gathering the relevant parameters for the work and a liaison statement had already been set to all contributing groups from the previous WP5A meeting. Discussion on the actual scope of the studies and whether these may be similar between WRC-23 agenda items 1.2 and 1.3 should be deferred to the next meeting once the parameters for the studies are available and the work on the studies has started. At that time, it could be further discussed whether some studies could be used for the work under both agenda items. It was also suggested that informal consultations between the relevant SWG/WG chairmen in WP5A and WP5D could then take place to facilitate such future discussions as needed.

4 Preliminary views

Australia supports harmonisation of international spectrum use. Australia notes that this is a Region 1 issue and does not have a position on this agenda item. ITU-R studies including adjacent band services in accordance with Resolution 246 (WRC-19) may assist to inform a decision on allocation of the 3.6-3.8 GHz band to the mobile, except aeronautical mobile, service on a primary basis within Region 1.

New Zealand notes that this is a Region 1 issue and that Region 3 has an existing primary allocation to the mobile service in the 3600 - 3800 MHz frequency band. New Zealand supports harmonisation in this band and notes that Region 3 countries have deployed stations in the mobile service in the 3600 - 3800 MHz frequency band.

Japan supports ongoing sharing and compatibility studies in ITU-R in accordance with Resolution 246 (WRC-19), which would be a basis to consider the primary allocation to the mobile service in the band 3 600-3 800 MHz in Region 1 at WRC-23.

The Islamic Republic has no objection on possible primary allocation of the frequency band 3 600-3 800 MHz to the mobile service within Region 1, however, any discussions on this agenda item shall not be mixed up on the discussions being followed / carried out under Agenda Item 1.2. Moreover, this Administration is of the strong view that such primary allocation for mobile service, needs to fully protect the services / system to which the band is allocated / operation.

Project Topic 3: to consider, in accordance with Resolution 247 (WRC 19), the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level (WRC-23 AI 1.4)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to OCT.2021

The following tasks were considered for this project:

1. Follow developments of studies in WP 5D to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting service in Asia-Pacific Area.

This report was provided by **Mr Li Leilei**.

1. Preliminary progress

Focus for scope and work of WP5D are as follows:

- To develop the draft CPM text for WRC-23 agenda item 1.4, as well as associated studies, in accordance with Resolution 247 (WRC-19), including:
 - Spectrum needs, usage and deployment scenarios, and technical and operational characteristics for the use of HIBS.
 - Sharing and compatibility studies.
 - Modifications of existing RR footnote No. 5.388A and associated resolution.
 - Definition of HIBS.
- And develop any other supporting documents, as appropriate.

2.1 Meeting WP 5D (19-26 February 2020, Geneva, Switzerland)

1. Develop liaison statements to ITU-R contributing groups to request propagation models and characteristics of the existing services for the sharing and compatibility studies;
2. Develop a detailed workplan for WRC-23 agenda item 1.4;
3. Develop first version of working documents towards any supporting documents;
4. Develop the framework of the draft CPM text;
5. Call for contributions in the WP 5D Chairman's Report.

2.2 Meeting WP 5D (23 June-9 July 2020)

Not in session.

2.3 Meeting WP 5D (5-16 October 2020)

1. Update working documents towards any supporting documents, based on input contributions;
2. Send liaison statements to contributing groups as necessary;
3. Review and revise the detailed workplan as necessary.

2.4 Meeting WP 5D (1-12 March 2021)

1. Update working documents towards any supporting documents, based on input contributions;
2. Update the draft CPM text based on input contributions;
3. Send liaison statements to contributing groups as necessary;
4. Review and revise the detailed workplan as necessary.

2.5 Meeting WP 5D (7-18 June 2021)

1. Update working documents towards any supporting documents, based on input contributions;
2. Update the draft CPM text based on input contributions;
3. Send liaison statements to contributing groups as necessary;
4. Review and revise the detailed workplan as necessary.

2.6 Meeting WP 5D (4-15 October 2021, [TBD])

1. Update working documents towards any supporting documents, based on input contributions;
2. Update the draft CPM text based on input contributions;
3. Send liaison statements to contributing groups as necessary;
4. Review and revise the detailed workplan as necessary.

2.7 Meeting WP 5D (8-17 February 2022, [TBD])

1. Finalize work on any supporting documents, based on input contributions;
2. Update the draft CPM text based on input contributions;
3. Send liaison statements to contributing groups as necessary;
4. Review and revise the detailed workplan as necessary.

2.8 Meeting WP 5D (14-23 June 2022, [TBD])

1. Consider input contributions;
2. Update the draft CPM text based on input contributions;
3. Send liaison statements to contributing groups as necessary;
4. Review and revise the detailed workplan as necessary.

2.9 Meeting WP 5D (11-20 October 2022, [TBD])

1. Consider input contributions;
2. Finalize the draft CPM text until 14 October 2022;
3. Send liaison statements to contributing groups as necessary.

3. Progress made at the Working Party 5D Meeting (June 2021)

The outcomes of the Working Party 5D June meeting related to WRC-23 agenda item 1.4 as Annexes to Document 5D/716:

- [716] Chapter 2 – Annex 2.24.12 – Detailed work plan for WRC-23 agenda item 1.4
 - [716] Chapter 2 – Annex 2.24.6 – Detailed workplan for working document on characteristics of terrestrial IMT for sharing and compatibility studies for WRC-23
 - [716] Chapter 4 – Annex 4.21 – Detailed workplan under Sub-Working Group WRC-23 agenda item 1.4
 - [716] Chapter 4 – Annex 4.20 – Working document towards sharing and compatibility studies of HIBS under WRC-23 agenda item 1.4 – Sharing and compatibility studies of high-altitude platform stations as IMT base stations (HIBS) on WRC-23 agenda item 1.4
 - [716] Chapter 4 – Annex 4.19 – Working document towards a preliminary draft new Report ITU-R M.[HIBS-CHARACTERISTICS]/Working document related to WRC-23 agenda item 1.4
 - [716] Chapter 4 – Annex 4.18 – Working document towards draft CPM text on WRC-23 agenda item 1.4
 - [716] Chapter 4 – Annex 4.17 – Meeting Report of Sub-Working Group WRC-23 agenda item 1.4
 - [716] Chapter 4 – Annex 4.6 – Working document towards a preliminary draft new Report ITU-R M.[IMT.AAS] – Measurements and mathematical modelling of Advanced Antenna Systems (AAS) in IMT-2020 systems
 - [716] Chapter 4 – Annex 4.4 – Characteristics of terrestrial component of IMT for sharing and compatibility studies in preparation for WRC-23
 - [716] Chapter 4 – Annex 4.4, Part 1
 - [716] Chapter 4 – Annex 4.4, Part 2
 - [716] Chapter 4 – Annex 4.2 – [Preliminary] draft revision of Recommendation ITU-R M.1036-6
- Available at: <https://www.itu.int/md/R19-WP5D-C-0716/en>

Working Party 5D's WG Technology Aspects had an E meeting for week 23rd to 27 August – https://www.itu.int/dms_pub/itu-r/oth/0a/06/R0A060000A90001PDFE.pdf.

Sharing and compatibility of HIBS and broadcasting services: EBU input 5D/834 pointed out that the A6 arrangement of M.1036(698-806mhz,TDD) may cause HIBS to interfere with the broadcasting service. Japan expressed that TDD's LTE will not be used in this band. Iran proposed that the non-use of TDD should be made clear in future resolutions.

Sharing and compatibility of HIBS and broadcasting satellite service(BSS): 5D/ 807Rev.2 (J), 832(IND) clarified that studies of sharing and compatibility of the related input documents. There is disagreement as to whether interference with BSS services by HIBS terminals (the same as IMT terminals) should be considered and will be discussed in subsequent meetings.

4. Progress made at the Working Party 6A Meeting (Oct. 2021)

WP 6A has decided not to continue the development of PR-HIBS but to provide additional information to Report ITU-R BT.2383-3 "Typical frequency sharing characteristics for digital terrestrial television broadcasting systems in the frequency band 470-862 MHz." It should be noted that these additional pieces of information have already been contained in Report ITU-R BT.2075-0 "Protection requirements for terrestrial television broadcasting services in the 620-

790 MHz band against potential interference from GSO and non-GSO broadcasting-satellite systems and networks,” which was indicated in Document 5D/363.

In the proposed liaison statement to WP 5D in reply to the liaison statement 6A/194, the following issues are highlighted.

- (1) Characteristics and deployment scenario of HIBS
 - To seek clarification whether TDD will never be used for HIBS in 698-806 MHz,
 - To mention a need of sharing/compatibility studies between broadcasting and HIBS.
- (2) Protection requirements for terrestrial broadcasting
 - PR-HIBS will not be progressed and Report ITU-R BT.2383 will be revised instead to address the following issues:
 - Applicability of the fixed antenna radiation pattern for terrestrial broadcast receiving antennas given in Recommendation ITU-R BT.419-3 for both horizontal and vertical planes,
 - Possible need of consideration of the tilt angle for terrestrial television receiving antennas in hilly environments,
 - Definition of mobile reception.

5. Preliminary views

At present, most countries supported the development study of AI 1.4, but the candidate frequency band is not decided.

Australia supports harmonisation of international spectrum use. Australia notes that this is a Region 1 issue and does not have a position on this agenda item. ITU-R studies including adjacent band services in accordance with Resolution 246 (WRC-19) may assist to inform a decision on allocation of the 3.6-3.8 GHz band to the mobile, except aeronautical mobile, service on a primary basis within Region 1.

Thailand supports the ongoing ITU-R studies for establishing a new globally or regionally harmonised regulatory framework for HIBS with a view to providing flexibility of spectrum usage for HIBS in certain frequency bands below 2.7 GHz already identified for IMT referred to in Resolution 247 (WRC-19), while ensuring protection of the existing primary services, to which the frequency band is allocated and in the adjacent frequency bands, without imposing any additional technical or regulatory constraints in their deployment including other IMT uses, existing systems and the planned development of primary services.

Indonesia is of the view to support the sharing and compatibility studies by ITU-R on certain frequency bands below 2.7 GHz already identified for IMT to be used by HIBS as provisioned by Resolution 247 (WRC-19) by ensuring the protection to the incumbent services, to which the frequency band is allocated on the primary basis.

The Republic of Korea is of the preliminary view that considering the growing demand for access to mobile broadband, HIBS has been considered as an approach for providing broadband connectivity and telecommunication services with minimal network infrastructure. However, existing and future uses of the relevant frequency bands under this agenda item including ground-based IMT systems should be protected based on the results of sharing and compatibility studies without imposing any additional technical or regulatory constraints in their deployment.

China supports ITU-R studies being conducted in accordance with Resolution 247 (WRC-19). China supports the consideration of the identification to HIBS, provided that the protection of the existing services are ensured, to which the frequency band is allocated on a primary basis, without imposing any additional technical or regulatory constraints in their deployment.

The Islamic Republic of Iran is of the view that existing services allocated in the frequency bands considered under this agenda item and the adjacent bands, particularly, when neighboring countries use terrestrial IMT base stations and mobile stations, shall be protected based on sharing and compatibility studies, with no additional technical or regulatory constraints on those existing uses and planned development.

Project Topic 4: to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution 235 (WRC 15)(WRC-23 AI 1.5)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to OCT.2021

The following tasks were considered for this project:

- 1. Follow developments of study results on WRC-23 AI 1.5 conducted in ITU-R TG 6/1
- 2. Possible impact on broadcasting service in Asia-Pacific Area.

This report was provided by **Mr Li Leilei**.

1. Preliminary progress

The Task of TG6/1 is to implementation of Resolution 235 (WRC-15) and the decisions of CPM23-1 as contained in Annex 9 to CA/251.

The following relevant activities in ITU-R since NOV. 2019 have been identified.

2.1 Establishment of Task Group 6/1

In accordance with the Decision of CPM 23/1, the February meeting of Study Group 6 established a Task Group 6/1 to conduct work as the Responsible Group for agenda item 1.5. SG 6 appointed Mr Sergey Pastuhk (RUS) as the Chairman of TG 6/1.

At its meeting in July 2020, also in accordance with the CPM 23/1 Decision, Study Group 5 appointed Mr Abdulhadi Abou-Almal (UAE) as its nominated Vice-Chairman of TG 6/1.

The disruption to meetings of the ITU-R due to the Covid-19 pandemic resulted in a delay to the first meeting of TG 6/1 (see Corrigendum to 6/LCCE/103). It had been scheduled to take place from 11-12 May 2020, but is now expected to be held from 19-23 October 2020.

2.2 Working Party 5D (Meeting 19-24 February 2020)

WP 5D's existing Working Group on Spectrum Aspects will continue, now under the chairmanship of Mr Michael Krämer (D). That group is responsible for WRC-23 preparations and has established a sub-working group on Sharing Studies which will coordinate work on agenda items where WP5D is a contributing group. This group will therefore define parameters for sharing studies under AI 1.5, and a drafting group under Mr Rauno Ruismäki (FIN) was established. A working document on this was started and attached to the Chairman's Report from the meeting.

2.3 Working Party 5D (Meeting 23 June - 09 July 2020)

Work continued on preparation of a document on parameters for IMT suitable for sharing studies in all bands under consideration for WRC-23 (agenda items 1.2, 1.3, 1.4 and 1.5). The latest working document is available as Attachment 4.8 to the Chairman's Report (https://www.itu.int/dms_ties/itu-r/md/19/wp5d/c/R19-WP5D-C-0222!H04!MSW-E.docx)

The workplan for work on Characteristics of Terrestrial IMT for Sharing and Compatibility Studies for WRC-23 was updated, and shows that work is expected to be completed at the February 2021 meeting of WP 5D.

2.4 Working Parties 5A & 5C (Meeting 10-20 July 2020)

Both WPs 5A and 5C considered matters related to PMSE (SAB/SAP), in relation to WRC-23 agenda item 1.5 and ongoing work on Resolution 59. No agreement was reached on sending a Liaison Statement to TG 6/1 on relevant items.

2.5 Working Parties 3K and 3L (Meeting 10-20 August 2020)

WPs 3K and 3M has mandated Correspondence Group 3K-4 (Chairman: Dr Richard Rudd, Contact: richard.rudd@plumconsulting.co.uk) to respond to any request for information from TG 6/1 addressed to WPs 3K and 3M.

Having considered the scope of AI 1.5, WPs 3K and 3M also provided TG 6/1, with a list of documents submitted to previous ITU Task Groups in charge of sharing studies between broadcasting and mobile services in the UHF band under agenda items of previous WRCs. This list is shown in the attachment to Document 6-1/7.

For the band 24.25-27.5 GHz, since there are several services are used in this band, including FSS, ISS,RAS, SRS and EESS, both sides (IMT and Satellite) can not reach an agreement. At the sub-working group level, the issue can not be resolved and will be discussed in the upper level meetings. Based on the discussion in the meeting, it is very difficult to identify IMT globally in this band. This band may be identified by IMT regionally and the limitations for protection of other services will be added in footnote.

2.6 Task Group 6/1 Meeting #2 (5-14 July 2021)

Task Group (TG) 6/1 held its second meeting from 5-14 July 2021.

Work continued in the three Working Groups established at the first meeting of the Task Group:

WG1	WG2	WG2
Spectrum Use and Needs Chairman: Darko Ratkaj (EBU)	Sharing Studies Chairman: Ronel le Grange (NMB)	Development of CPM Text Chairman: Adbulhadi AbouAlmal (UAE)

The Task Group sent no liaison statements to other groups, and attached 4 annexes to the Chairman's Report for consideration at the third meeting, due to take place from 27 October to 9 November 2021.

2.7 Working Party 5D (7-18 June 2021)

Work was completed on a document on parameters for IMT suitable for sharing studies under AI 1.5 and was sent to TG 6/1 (Doc. 6-1/28). Work was also concluded on a summary of administrations' spectrum use and needs for IMT in the band 470-960 MHz. (Doc. 6-1/29)

2.8 Working Parties 5A & 5C (28 April-11 May 2021)

Working Parties 5A and 5C considered information received from the membership relating to the use and needs of the band 470-960 MHz by other land mobile services. WP 5A submitted a compilation of information from some administrations in Region 1 regarding their spectrum use and spectrum needs of the Land Mobile Service within the frequency band 470-960 MHz (Doc. 6-1/33).

Further, because of lack of time in the WP 5A meeting, the Chairman of WP 5A sent the Task Group a compilation of information from some Administrations in Region 1 regarding Parameters and Studies related to the land mobile service within the frequency band 470-960 MHz (Doc.6-1/34).

3. Objectives of Task Group 6/1

• Meeting No. 1 (19-23 October 2020)

1. Consider the received contributions.
2. Develop structure of the TG 6-1 and appoint chairmen for the WGs.
3. Develop workplan for the TG 6-1 studies.
4. Develop structure of draft CPM text on AI 1.5.
5. Develop and send LS to the contributing Groups, if necessary.
6. Establishment of Correspondence/Rapporteur activity on Section 2 of the draft CPM text, on a purely informative basis and if necessary.

• Meeting No. 2 (5-14 July 2021)

1. Consider the received contributions.
2. Develop studies based on the input contributions and comments thereto at the meeting, if available.
3. Initiate the first draft CPM text on Section 2.
4. Develop and send LS to the contributing groups, if necessary.

• Meeting No. 3 (27 October-9 November 2021)

1. Consider the received contributions.
2. Continue development of studies by WGs 1 and 2.
3. Continue the development of the draft CPM text on Section 2 by WG 3.
4. Initiate the development of the first draft CPM text on Section 3
5. Initiate development of methods to satisfy the agenda item and developed first draft CPM text and update Sections 4 on Methods to satisfy the agenda item by WG 3.
6. Initiate the development of CPM text Section 5 on possible regulatory and procedural considerations, based on input contributions and comments thereto at the meeting, by WG 3.
7. Develop LS to the contributing group, if necessary, by WGs 1, 2 and 3 and send it to the contributing group by TG 6/1.
8. Establish Correspondence/ Rapporteur activities on a purely informative basis and if necessary, by WGs 1, 2 and 3.

• Meeting No. 4 ([28 February-11 March 2022])

1. Consider the received contributions.
2. Endeavour to finalize studies on sharing and compatibility.
3. Continue development of draft CPM text with focus on Sections 4 and 5
4. Develop and send LS to the contributing Group, if necessary.
5. Establish Correspondence/Rapporteur activities on a purely informative basis and if necessary.

• Meeting No. 5/6 (as contained in Annex 9 to CA/251)

To this effect, preliminary / provisional objectives of this / these meeting(s) is summarized below:

1. Consider the received contributions.
2. Update all sections of the preliminary draft CPM text based on input contributions.
3. Finalize draft CPM text to be submitted to the CPM23-2.
4. Finalize studies, if necessary.

4. Preliminary views

ASMG supports WRC-23 AI 1.5. RCC is opposed to WRC-23 AI 1.5 changing the rules and conditions of 470-694mhz band in Zone 1 due to the wide application of existing services. Iran is opposed to WRC-23 AI 1.5 due to broadcasting service.

France and the Netherlands hope to carry out IMT service on 470-694mhz band again after 2030. Germany and Switzerland plan to deploy 5G broadcasting in the 470-694mhz band. Austria, Ireland, Azerbaijan, Hungary and other countries have expressed their opposition to the IMT service on the 470-694mhz band. In addition, the positions of other zone 1 countries, including Russia, the UK, Turkey, Croatia, Latvia and Belarus, have not yet been determined or are under discussion.

Project Topic 5: to review Appendix 27 of the Radio Regulations and consider appropriate regulatory actions and updates based on ITU R studies, in order to accommodate digital technologies for commercial aviation safety-of-life applications in existing HF bands allocated to the aeronautical mobile (route) service and ensure coexistence of current HF systems alongside modernized HF systems, in accordance with Resolution 429 (WRC 19)(WRC-23 AI 1.9)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to OCT.2021

The following tasks were considered for this project:

1. Follow developments of study results on WRC-23 AI 1.9 conducted in ITU-R WP 5B
2. Possible impact on broadcasting service in the HF band

This report was provided by **Dr Li Leilei**.

1. Progress from Working Party 5B November 2020 meeting

Progress made at the Working Party 5B November 2020 meeting is as follows:

5B/225 Annex 5 – Draft work plan for WRC-23 agenda item 1.9

5B/225 Annex 4 – Working document towards draft CPM text for WRC-23 agenda item 1.9

Available at: <https://www.itu.int/md/R19-WP5B-C-0225/en>.

2. Developments since March 2021 meeting of Working Party 6A

Attention was drawn to developments since the March 2021 meeting of Working Party 6A.

Progress made at the Working Party 5B May 2021 meeting as follows:

[355] Annex 04	Working document towards a draft CPM text for WRC-23 agenda item 1.9
[355] Annex 32	Working document towards a preliminary draft Report ITU-R M.[AERO-WIDEBAND-HF] related to WRC-23 agenda item 1.9 – Aeronautical wideband HF

Available at <https://www.itu.int/md/R19-WP5B-C-0355/en>

An input contribution received by Working Party 6A was:

[192]	Liaison statement to Working Party 6A (copy to ICAO) – WRC-23 agenda item 1.9	WP 5B
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Specific information for WP6A was noted i.e. WP5B has updated the working document dealing with agenda item 1.9 (WRC-23), which would consider both the technical and regulatory studies for the introduction of new aeronautical wideband HF systems into Appendix 27 of the Radio Regulation in accordance with Resolution 429 (WRC-19).

Document 6A/192 is a Working document towards preliminary draft Report ITU-R M.[AERO-WIDEBAND-HF] (Annex 32 to WP5B Chairman's Report 5B/355) embedded. Also provided for reference were the WP 6A liaison statements to WP 5B–Documents 5B/06 and 5B/254.

3. Preliminary views

Australia supports international arrangements through the Radio Regulations that are consistent with the rational and efficient use of Australia's sovereign assets in the radiofrequency spectrum. In line with this, Australia supports sharing studies to ensure compatibility between the proposed digital technologies and the incumbent primary services within the frequency bands under Resolution 429 (WRC-19) and adjacent bands. Australia supports ensuring studies and changes proposed are technology neutral.

New Zealand supports studies in accordance with Resolution 429 (WRC-19) with a view to enable new systems that improve the utility and efficiency of the HF bands (e.g. for modern digital wideband applications that can be used for long range, beyond line of sight communications). New Zealand supports proposed changes that are technology neutral.

The Republic of Korea supports reviewing RR Appendix 27 to accommodate digital technologies for aeronautical wideband HF systems, while ensuring compliance with safety requirements and protection of other primary services in band and in adjacent bands.

Japan supports studies with a view to identify any necessary modifications to RR. Appendix 27 to accommodate wideband HF technologies for the aeronautical mobile (route) service (AM(R)S) between 2 850 and 22 000 kHz in accordance with Resolution 429 (WRC-19) with the need to avoid harmful interference to Primary services in the same band and adjacent bands in particular existing AM(R)S HF systems. Japan recognizes that there are differing Wideband HF technologies and are of the view that changes to RR. Appendix 27 should allow new digital wideband HF systems taking into account technology neutrality.

Project Topic 6: Co conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution 656 (Rev.WRC 19) (WRC-23 AI 1.12)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to OCT.2021

The following tasks were considered for this project:

1. Follow developments of study results on WRC-23 AI 1.12 conducted in ITU-R WP 7C
2. Possible impact on broadcasting services

This report was provided by **Dr Li Leilei**.

1. Background

This AI was first proposed by WMO and promoted by the United States. At the WRC-19 meeting, France and CEPT proposed and supported the establishment of this AI as WRC-23. They hope to add EESS services in this band as the primary service. CITELE proposed that secondary service should be given.

2. Preliminary progress

- Progress made at the Working Party 7C April 2020 meeting was as follows:

[22] Annex 11 - WRC-23 agenda items to which WP 7C should be added as contributing group

[22] Annex 10 - Draft elements for a reply liaison statement to Working Party 5D - WRC-23 agenda item 1.2

[22] Annex 09 - Principles for studies relating to WRC-23 agenda items

[22] Annex 08 - Possible elements for a draft new Question ITU-R XX/1 (For information only) - Protection of EESS (passive) remote sensors against interference caused by radiation from broadcasting-satellite receiving equipment

[22] Report of the meeting of Working Party 7C (E-meeting, 21-24 April 2020)

- Progress made at the Working Party 5B July 2020 meeting was as follows:

7C/ [29] Draft reply liaison statement to Working Party 7C - Preparation for WRC-23 agenda item 1.12 - Radiodetermination and aeronautical characteristics in or adjacent to the frequency band 40 50 MHz

- Review of input contributions to October meeting of Working Party 6A

Number	Source	Title	Review	Proposed Action
[61]	WP 5A	Liaison statement to Working Parties 7C (copied to Working Parties 5C and 6A for information) - Preparations for studies under WRC-23 agenda item 1.12	Working Party 5A provides Working Party 7C with Recommendations and Reports relevant to the 40-50 MHz range that provide some technical and operational characteristics of mobile systems operating in the frequency range.	For information – note this document.
[60]	WP 5C	Reply liaison statement to Working Party 7C (copied for information to Working Parties 5A and 6A) – WRC 23 agenda item 1.12	WP 5C informs information on the characteristics of fixed service systems in the frequency range 40-50 MHz can be found in Document 7C/154 (2015-2019) with follow up technical comments in Documents 7C/213 and 7C/298 (2015-2019). WP 5C informs WP 7C that it has received no additional fixed service system characteristics in the 40-50 MHz frequency range in the time since these last reply liaison statements were sent.	For information – note this document.
[48]	WP 7C	Liaison statement to Working Parties 5A, 5B, 5C and 6A - Preparations for studies under WRC-23 agenda item 1.12	WRC-23 agenda item 1.12 proposes to conduct, and complete in time for WRC-23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution 656 (Rev.WRC-19) . WP 7C invites Working Party 6A to provide their relevant technical and operational characteristics and protection criteria (which may include any methodology on how to apply it or performance objectives, as appropriate) in relation to this agenda item that could be used for sharing and compatibility studies.	For action. Develop a reply liaison statement to WP 7C

- Output documents from Working Party 7C September 2020 meeting
Progress made at the Working Party 7C September 2020 meeting is as follows:
7C/105 Annex 5 – Working document towards a preliminary draft revised Report ITU-R RS.2455-1–Preliminary results of sharing studies between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the 40-50 MHz frequency range.
- Progress made at the Working Party 7C April 2021 meeting is as follows:

[186] Annex 06	Preliminary draft revised Report ITU-R RS.2455-1 - Results of sharing studies between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the 40-50 MHz frequency range
[186] Annex 05	Draft CPM text for WRC-23 agenda item 1.12

Available at <https://www.itu.int/md/R19-WP7C-C-0186/en>

An input contribution to Working Party 6A was:

[177]	Liaison statement to Working Parties 3K, 3L, 3M, 5A, 5B, 5C and 6A (copied for information to Working Parties 7A and 7D) – WRC-23 agenda item 1.12	WP 7C
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3. Preliminary views

Regional organizations CEPT and CITEC support this AI. USA, France and Switzerland also support this AI.

In Region 3, China and Pakistan are using about 45 MHz band for terrestrial TV broadcasting.

Australia supports studies which assess the compatibility between spaceborne radar sounders and incumbent services around 45 MHz. If the study results are in support of a secondary allocation to EESS around 45 MHz, Australia supports enabling a secondary allocation, while ensuring protection of existing services and not imposing any additional restrictions onto these services.

Indonesia is of the view of the importance of studies by ITU-R relating to the preferred frequency band selection rationale, the typical technical and operating characteristics of the secondary allocation to the Earth exploration-satellite (active) service (EESS) for spaceborne radar sounders taking into account the protection of incumbent services including those in band and adjacent bands.

The Republic of Korea is of the view that a possible new secondary allocation could be considered to the Earth exploration-satellite service (active) for spaceborne radar sounders within the range of frequencies around 45 MHz if ITU-R studies show that the protection of in-band and adjacent band incumbent services could be ensured while not imposing any additional restrictions on these services.

Japan is of the view that a possible new secondary allocation could be considered to the Earth exploration-satellite service (active) for spaceborne radar sounders within the range of frequencies around 45 MHz if ITU-R studies show that the protection of in-band and adjacent band incumbent services could be ensured while not imposing any additional restrictions onto those services.

Project Topic 7: In accordance with Resolution 657 (Rev.WRC 19), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services (WRC-23 AI 9.1a)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to OCT.2021

The following tasks were considered for this project:

1. Follow developments of study results on WRC-23 AI 9.1a) conducted in ITU-R WP 7C.
2. Possible impact on broadcasting services.

This report was provided by **Dr Li Leilei**.

1. Preliminary progress

- Progress from Working Party 5D October 2020 meeting

Progress made at the Working Party 5D October 2020 meeting is as follows:

[247] (Rev.1)	Draft liaison statement to Working Party 7C – Work to be conducted by Working Party 7C under WRC 23 agenda item 9.1, topic a)
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- Progress at Working Party 7C September 2020 meeting

Progress made at the Working Party 7C September 2020 meeting is as follows:

7C/105 Annex 6 – Work plan for WRC-23 agenda item 9.1, topic a

7C/105 Annex 7 – Preliminary draft revision of the Report ITU-R RS.2456 - Space weather sensor systems using radio spectrum

7C/105 Annex 8 – Working document towards a preliminary draft new Report ITU-R RS.[SPEC_REQTS_RX_SPACE_WEATHER] - Spectrum requirements and applicable radio service designations for receive only space weather sensors that provide data critical for predictions and warnings

7C/105 Annex 9 – Working document towards preliminary draft new Report ITU-R RS.[SW_INTERF_CRITERIA] - Interference criteria of receive-only space weather sensors

- Progress made at the Working Party 7C April 2021 meeting is as follows:

[186] Annex 13	Preliminary draft revision of Report ITU-R RS.2068-1 - Current and future use of the band 13.25-13.75 GHz by spaceborne active sensors
[186] Annex 12	Preliminary draft revision of the Report ITU-R RS.2456-0 - Space weather sensor systems using radio spectrum
[186] Annex 11	Elements regarding agenda item 9.1 topic a) - Update for contributing working parties under agenda item 9.1, topic a)
[186] Annex 10	Working document towards a preliminary draft new Report ITU-R RS.[RXSW_SHARING_STUDIES] - Compatibility issues relating to the operation of receive-only space weather sensors
[186] Annex 09	Working document towards a preliminary draft new Report ITU-R RS.[SPEC_REQTS_RX_SPACE_WEATHER] - Spectrum requirements and applicable radio service designations for receive only space weather sensors that provide data critical for predictions and warnings
[186] Annex 08	Working Document towards preliminary draft new Report ITU-R RS.[RXSW_INTERF_CRITERIA] - Interference criteria of receive-only space weather sensors
[186] Annex 07	Work plan for WRC-23 agenda item 9.1, topic a)

Available at: <https://www.itu.int/md/R19-WP7C-C-0186/en>

2. Preliminary views

Australia supports studies addressing space weather sensors with a view to ensuring the Radio Regulations include appropriate recognition and future protection for space weather sensors. These studies should ensure that additional constraints are not placed on incumbent services.

Indonesia is of the view to support studies by ITU-R relating to the technical and operational characteristics, spectrum requirements, interference criteria, as well as appropriate radio service designations of space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services.

The Republic of Korea is of the view that space weather sensors, their technical and operational characteristics, spectrum requirements and appropriate radio service designations need to be studied in ITU-R for protection by appropriate and the potential regulatory provisions should not place additional constraints on incumbent services.

Japan supports ITU-R studies on space weather sensors being conducted concerning appropriate recognition and protection thereof. For the recognition, Japan considers it necessary to develop appropriate recognition of the space weather sensors in the Radio Regulations (RR) and determine the appropriate radio service for space weather sensors. For protection, Japan supports further study on spectrum requirements and the relevant interference criteria for passive space weather sensors, especially those that are highly used and operational for space weather monitoring/forecasting.

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Project Topic 8: Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC 19)(WRC-23 Agenda Item 9.1 c)

Project Manager:

Co- Project Manager:

Time Period: NOV. 2019 to OCT.2021

The following tasks were considered for this project:

1. Follow developments of study results on WRC-23 AI 9.1c) conducted in ITU-R WP 5A.
2. Possible impact on broadcasting services.

This report was provided by **Dr Li Leilei**.

1. Preliminary progress

- Progress made at the Working Party 7C April 2020 meeting was as follows:

[22] Annex 11 - WRC-23 agenda items to which WP 7C should be added as contributing group

[22] Annex 09 - Principles for studies relating to WRC-23 agenda items

[22] Annex 08 - Possible elements for a draft new Question ITU-R XX/1 (For information only) - Protection of EESS (passive) remote sensors against interference caused by radiation from broadcasting-satellite receiving equipment

[22] Annex 07 - Working document towards a preliminary draft new ITU-R Report - Analysis of interference received by EESS (passive) sensors [in the 18.6 18.8 GHz band] [caused by surface water reflections]

[22] Annex 06 - Working document towards a preliminary draft new Report ITU-R RS.[GROUND_PASS_SENSORS] - Technical and operational characteristics of ground-based passive sensors operating in 22 to 1 000 GHz frequency range

[22] Annex 04 - Preliminary draft new Report ITU R RS.[EESS_SAR-RNSS] - Representative system characteristics and examples of evaluating interference into receiving earth stations in the radionavigation-satellite service (space-to-Earth) from spaceborne synthetic aperture radar sensors in the Earth exploration-satellite (active) service in the 1 215-1 300 MHz band

[22] Annex 02 - Preliminary draft revision of Recommendation ITU-R RS.1166-4 - Performance and interference criteria for active spaceborne sensors

[22] Report of the meeting of Working Party 7C (E-meeting, 21-24 April 2020)

- Progress made at the Working Party 5A July 2020 meeting was as follows:

Not issued Draft liaison statement to Working Party 5D for the work on WRC-23 agenda item 9.1, Topic 9.1 c) (Copy to Working Party 5C) - Study the use of IMT systems for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis

Not issued Draft liaison statement to Working Parties 1B, 4A, 4C, 5D, 6A, 7B, 7C, and 7D regarding WRC-23 agenda item 9.1, Topic c) - Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC-19)

5A/85 Workplan/Report for WRC-23 agenda item 9.1 Topic C

5A/85 Working document towards preliminary Draft CPM Text for WRC-23 agenda item 9.1 Topic C

- Progress made at the Working Party 5C July 2020 meeting was as follows:

Not issued Draft liaison statement to Working Parties 1B, 4A, 4C, 5D, 6A, 7B, 7C, and 7D regarding WRC-23 agenda item 9.1, Topic c) - Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution 175 (WRC-19)

- Progress made at the Working Party 5A November 2020 meeting is as follows:

221 Annex 09 - Work plan/Report for WRC-23 agenda item 9.1 topic c) - Study the use of International Mobile Telecommunication systems for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis, in accordance with Resolution 175 (WRC-19)

221 Annex 08 - Working document towards preliminary draft CPM text for WRC-23 agenda item 9.1, topic c)

Available at: <https://www.itu.int/md/R19-WP5A-C-0221/en>

- Progress made at the Working Party 5A April / May 2021 meeting is as follows:

[359] Annex 12	Working document towards a preliminary draft revision of Recommendation ITU-R M.1450-5 – Characteristics of broadband radio local area networks
[359] Annex 09	Work plan/Report for WRC-23 agenda item 9.1, topic c) – Study the use of International Mobile Telecommunication systems for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis, in accordance with Resolution 175 (WRC-19)
[359] Annex 08	Working document towards preliminary draft CPM text for WRC-23 agenda item 9.1, topic c)

Available at: <https://www.itu.int/md/R19-WP5A-C-0359/en>

• **Outcome from Working Party 5C May meeting related to WRC-23 agenda item 9.1 Issue c)**

[192] Annex 16 - Report of the meeting on WRC-23 agenda item 9.1, topic c) - Study the use of International Mobile Telecommunication systems for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis, in accordance with Resolution 175 (WRC-19)

Available at: <https://www.itu.int/md/R19-WP5C-C-0192/en>

2. Preliminary views

Australia supports the modification of existing or, if required, the development of new ITU-R Recommendations, Reports and/ or Handbooks as a result of these studies, but does not support changes to the Radio Regulations being made under this topic.

Australia is of the view that the term “fixed wireless broadband” is understood to mean fixed wireless access supporting broadband applications. The use of IMT as a technology for the deployment of fixed wireless broadband is no different to the use of any other radio interface technologies for fixed wireless broadband in bands allocated to the fixed service on a primary basis provided that such use is in accordance with the Radio Regulations.

Thailand supports APT Preliminary View on agenda item 9.1 topic c) reached at APG23-2 Meeting. The on-going studies shall take into account the protection of primary services in the frequency bands currently allocated for fixed service. Thailand does not support changes to Radio Regulations under agenda item 9.1 topic c).

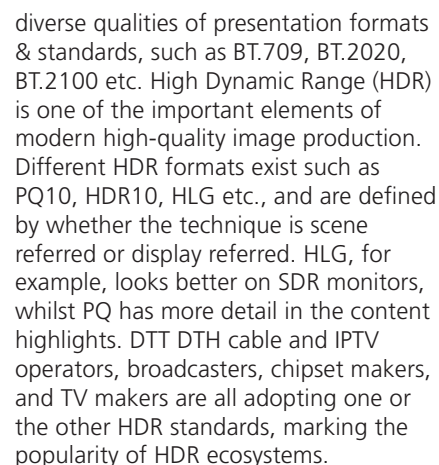
New Zealand supports the ongoing ITU-R studies and is of the view that agenda item 9.1 topic c) should be addressed by reviewing the existing ITU-R Recommendations/Reports and Handbooks and make necessary modifications to implement FWA/FWB systems using IMT technology. The development of new ITU-R Recommendations or reports should only be considered if necessary. New regulatory provisions in the Radio Regulations for FWB applications using IMT technology should not be considered. Any topic under agenda item 9.1 should not lead to the Radio Regulations changes, this view is aligned with the scope of Resolution 175 (WRC-19).

The Republic of Korea is of the view that IMT technology within the capability of IMT systems would be utilized to support for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis based on no change to the Radio Regulations (RR).

China supports studies currently carried out by ITU-R in accordance with Resolution 175 (WRC-19). China also supports the modification of existing or, if required, the development of new ITU-R Recommendations, Reports and/ or Handbooks as a result of these studies.

The Islamic Republic of Iran is of the view that the use of frequency bands having a frequency allocation for primary fixed service by IMT-type Fixed Wireless Broadband systems, (using IMT technologies) shall not change existing and future sharing and compatibility situation of the in-band and adjacent frequency bands. Such use shall also fully respect the current operational conditions of the fixed and other radiocommunication services as well as systems. Furthermore, this Administration is of the view that this agenda item does not require any regulatory change in Radio Regulations. ■

..... 26 October & 2 November 2021



There are in total, 72 TV channels and 83 radio channels, carrying national, provincial and overseas broadcasts in Iran. And in the digital domain, the DTT network carries 21 national digital terrestrial television channels and 18 national radio channels. Since the launch of its DTT service in 2009, IRIB has come a long way, with 21 SDTV channels in DVB-T mode, 12 HDTV channels in DVB-T2, and one UHDTV/HDR channel in DVB-T2/HEVC Main 10.

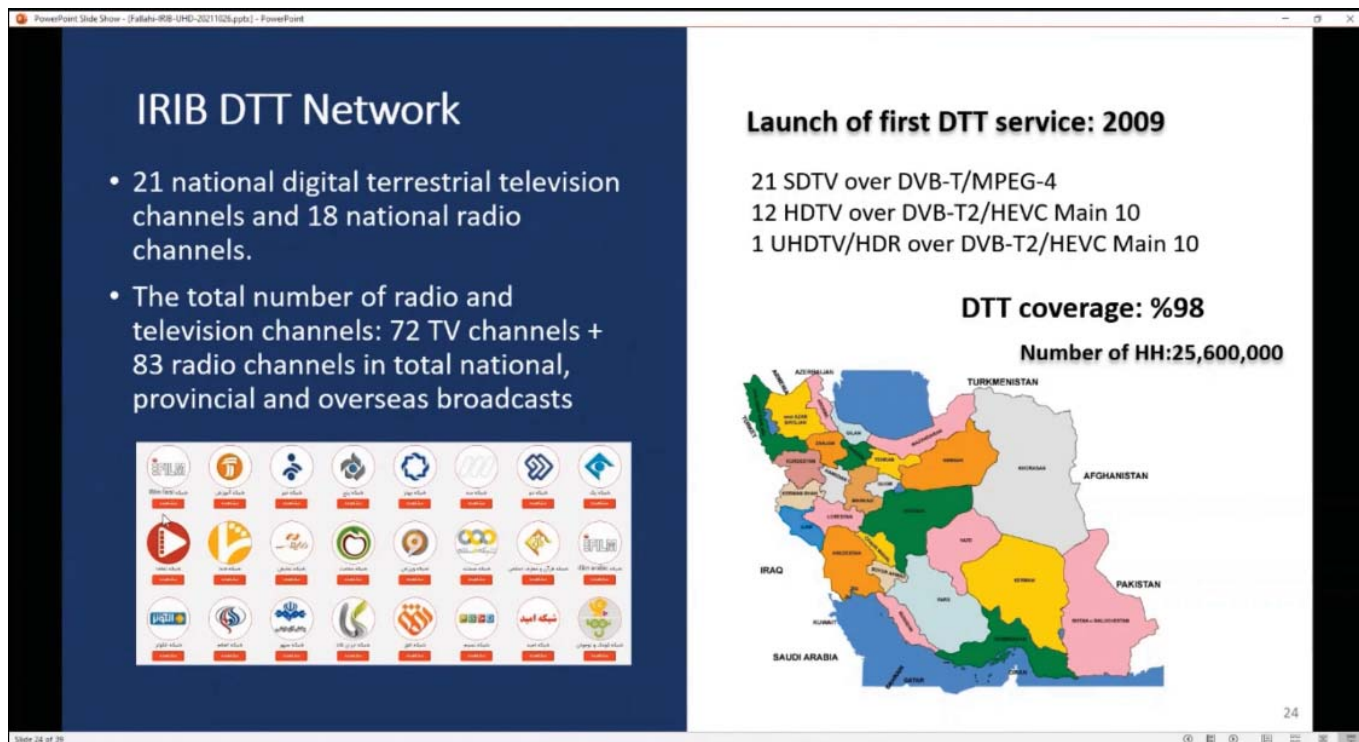
Broadcasting of UHD content by IRIB attempts to offer its viewers the best TV experience, with increasingly higher quality and interactivity. IRIB's UHD TV journey started in September 2018, with the publishing of the specification for shooting and delivering Ultra High Definition (UHD) programmes. In May

Our webinar series on member innovations provides the member broadcasters with a platform to share their stories, case studies and advancements in broadcasting. During the webinars, members also share their experiences in customising existing technologies and in some cases how they developed creative in-house solutions to meet their specific requirements. In the last two episodes of the series, experts from IRIB and Prasara Bharati shared innovative and creative solutions developed and implemented by them.

The 26 October session on 'Broadcasting UHD/HDR content in Iran' was delivered by **Ms Fatemeh Fallahi** from IRIB. Introducing major elements of high-

quality image production and an HDR ecosystem, described preparations for UHD broadcasting, live production and distribution workflow within IRIB. Additionally, standard file formats for the DVB-UHD broadcasting chain, the equipment test process, interactivity, and receiver issues were highlighted by the speaker. The IRIB presentation attracted over 70 participants, representing about 39 organisations from 23 countries. High-quality image production deals not only with more pixels, but with better pixels. It means reproducing a video experience on a user's display device as close as possible to that which a person would perceive by eye, when observing the same scene in nature. TV content production has been evolving, with





2020, the trial of UHD TV broadcasting began in Tehran and the UHD TV broadcasting pilot channel launched in November 2020. Parameters chosen for UHD TV broadcasting are BT.2020 version with wide colour gamut, HLG mode of high dynamic range with bit depth of 10 bits, frame rate of 50 fps, and a 5.1 surround audio system. IRIB opted for HLG mode as it was more compatible with existing in-house production workflows than, PQ-based, HDR.

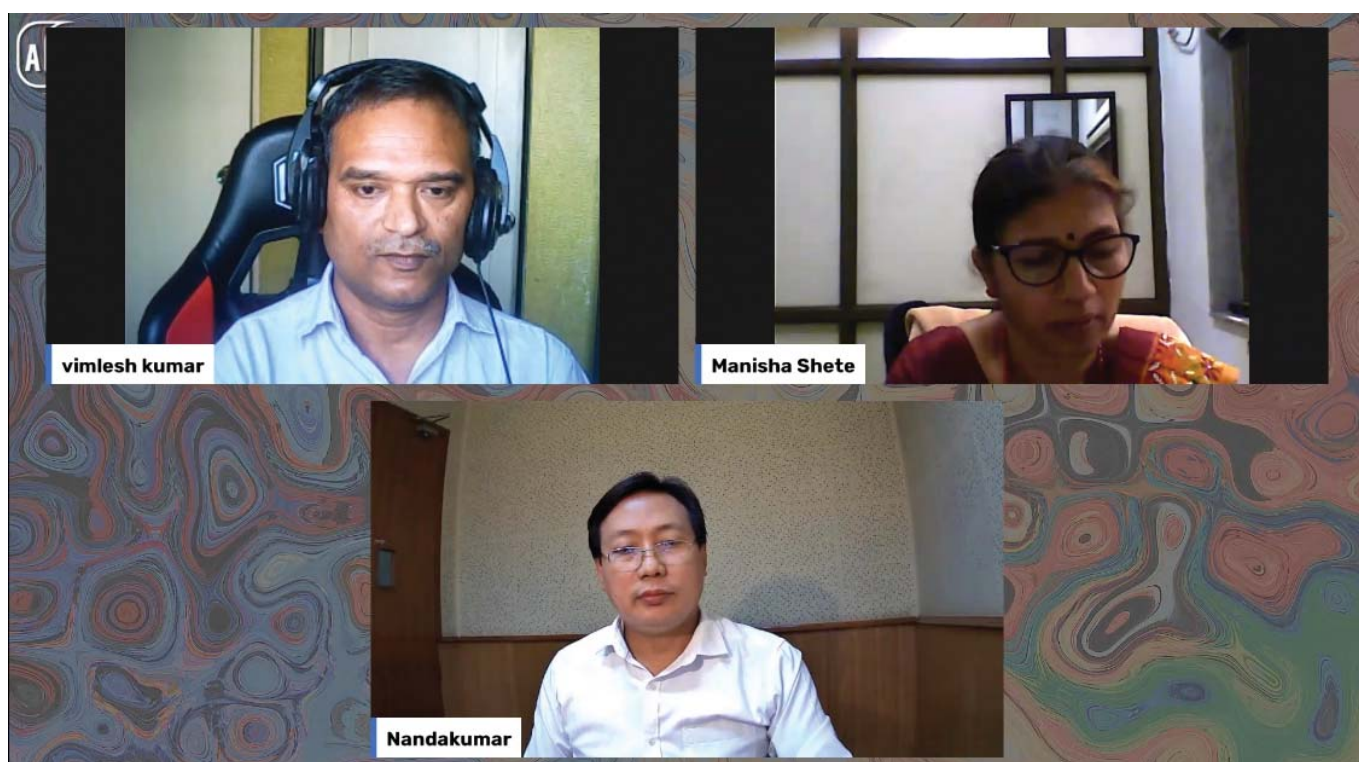
The initiatives took off with the setting up of content production and postproduction workflows, upgrading of the SDI link in the studio and the introduction of HEVC encoders. The

production network was interfaced with the delivery network for signal flow from the head-end, via the terrestrial sites, to the consumer display sets.

Equipment testing is carried out using EBU HDR bars as a test pattern for the processing of UHD TV video signals. It further ensures that correct settings are applied in hardware, highlights errors in transmission chains, and ensures that transforms from ITU-R BT.2100 HLG to ITU-R BT.709 are correct. For interactivity and a better viewing experience, the IRIB Plus red button launcher is used, based on local HbbTV platform (HbbTV 2.0.1). The launcher extracts additional information such as EPG, weather, traffic, market, games etc. Some general

issues observed on the receiver side were washout and dark images on the screen, as a result of inappropriate and inaccurate pre-setting of brightness gamma factor and other picture parameters, and wrong tone mapping. IRIB UHD's team was cooperating with TV manufacturers to solve these receiver issues.

On 2 November 2021, a session on TV studio applications using the open-source CasperCG platform was presented by speakers from Prasar Bharati-India. **Shri Nandkumar Singh** from All India Radio Imphal and **Shri Vimlesh Kumar** from DoorDarshan Kendra Mumbai discussed, in detail, various application software packages they had developed.



The open-source software handles the day-to-day requirements of TV channels, like playback automation, graphics, slow-motion, Off-Air logger etc. This broadcast quality playout software supports many hardware ports and processes graphics.

The two speakers, as the developers of the software package, briefed participants on different topics and applications associated with CasparCG. These applications are video server graphics scheduler, for graphics automation; transcoder, for transcoding foreign codec to required codec; news scroller and breaking news, for news and other programmes; watermarking, for content ownership information games software; streaming software, for live streaming on YouTube and Facebook; off-air logger, for recording of DD channels; CasparCG based playout system, the indigenous slow motion, mobile based remote monitoring. Through visual demonstration and screenshot displays, participants got the opportunity to navigate the functionalities and features of this software, as developed and customised by Prasara Bharati for its broadcasting functions.

The session highlighted common challenges faced by broadcasters & broadcast entrepreneurs. These are, limited budget, skilled manpower and hardware resources; lack of professional playout systems. It also pinpointed the need for extensive training of operational staff and the replacement of existing hardware & NLEs. Common

features required in a basic playout system are, playing media files as per schedule, user-friendly interface and reliable software, ability to handle the insertion of commercials. Other optional functionalities available are insertion of channel logo, lower-third graphics, characters, and event titles on the screen.

The playout system developed in the organisation is the automated video playout software. CasparCG installation is on a server-client configuration. The DD Playout software is reliable, free Windows software with a user-friendly interface. It is a tested solution with huge storage space and media files and works with large numbers of events in the playlist. Its database is robust, using MySQL and fail-safe features are incorporated.

The DD Ingest implementation of file-based workflow include two channel ingestion in SD format, NLE systems, centralised server with XDCAM recorder mapped for direct file transfer. Designed as CasparCG client software, it comes with preview and trimming features with a network speed feature to avoid bandwidth choking. The team is working on future upgrades of the DD Playout system with HTML based templates, auto backup database and easy installation, with 1 + 1 redundancy and multi-channel playout.

Another functional component of CasparCG is the DD Slowmo. This too is free software and utilises a cheap hardware controller, compatible with EFP/ ENG cameras deployed in field events.

Professional slow-motion solutions like EVS and LSM are highly expensive and need specialised operators.

Multiple units are essential to cover mega sporting events. Next is a graphics and video playout server software developed by SVT (The Swedish public broadcaster). It is used for various broadcasting applications. Other CasparCG client applications are playout server, recorder and trimmer.

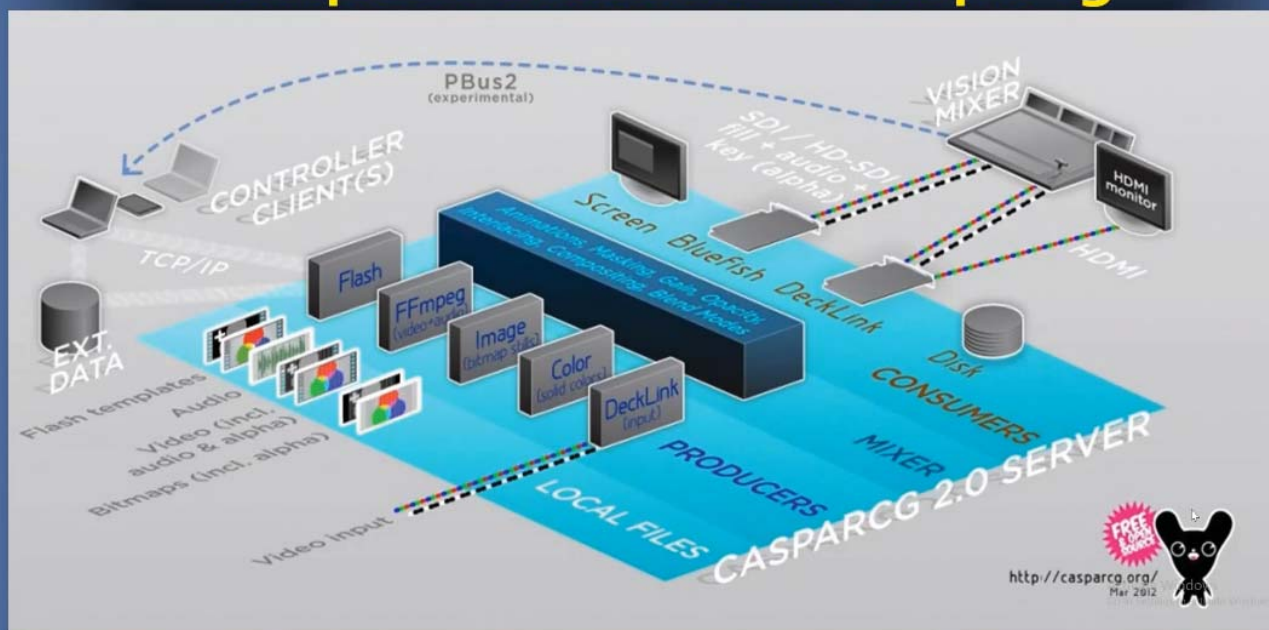
Other CasparCG functionalities exploited are applications related to graphics automation, PowerPoint to CasparCG, scroll, breaking news and clock, vertical scroll for credit captions, watermarking, timers, election client, subtitle player, streaming, play from anywhere, vision mixer, slow-motion, on-screen drawing, and games client, for football cricket etc. Other broadcast applications are the trimming and transcoding applications made in-house by DDK Mumbai.

The developer walked through these functionalities and features using visual demonstration and screenshots displays.

Ms Manisha Shete, Director of Engineering at NABM-India, informed that her organisation was willing to offer the open source software to ABU members for customised broadcast applications.

Close to 60 participants representing about 33 organizations from 20 countries attended the webinar session. ■

Complete workflow of Casparcg



12:10

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Technical Advisory Service support for VOV-Vietnam

The ABU Technology provided a Technical Advisory Service (TAS) to the Voice of Vietnam who had made a request for assistance in drafting its Digital Transformation Plan.

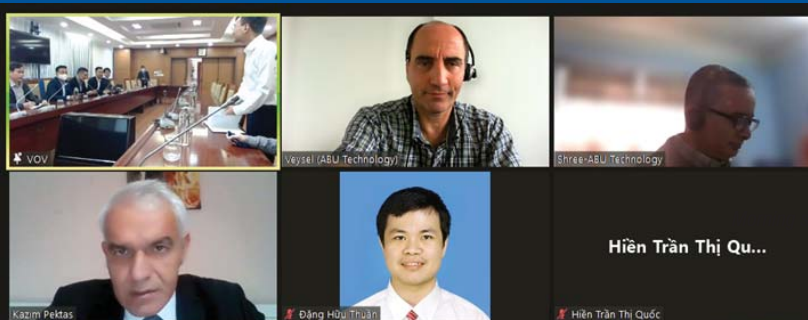
The Vice President of VOV-Vietnam, **Mr Vu Hai Quang**, welcomed all participants and speakers to the event.

Two sessions were held on 15 December. The first was presented by Mr Aale Raza, Director, Whiteways Systems Singapore, who gave his perspectives on digital radio broadcasting. The second session was presented by Mr Kazim Pektas, ABU Technical Committee Vice-Chairman and Chief Engineer of TRT-Turkey, who discussed details of TRT's digital services and latest technologies.

The TAS was hosted online by ABU Technology and was attended by 20 participants including VOV's top management, senior officials and engineers. ■



Mr Vu Hai Quang, Vice President, VOV



ABU takes part in UNESCO Remote Radio Week



Bala Murali Subramaney of Malaysia's Astro Radio and Steve Ahearn of the ABU Media Academy were among panellists taking part in UNESCO's Remote Radio Week, a week devoted to helping radio stations broadcast remotely.

They spoke at a session entitled "How to Manage Audio Contribution from Home" on 3 November, on day 3 of the event.

The session looked at managing live connections and offered advice on how to prepare for future emergency situations, including connectivity tips, broadcasting live on air remotely and the importance of finding a balance between quality and content.

Mr Bala is the ABU Technical Liaison Officer for Astro, Malaysia. ■



**EMPOWERING
CONTENT
EVERYWHERE**

IBC 2021 taking place as virtual event

The media technology trade show IBC 2021 is taking place online. Rebranded as IBC Digital, it began on 21 October and will run until 13 March 2022.

The organisers had hoped to hold it as a hybrid event on 3-6 December but were forced to cancel the in-person show in Amsterdam amid concerns over a rise in COVID-19 cases in the Netherlands.

A number of regular IBC exhibitors and visitors had told the organisers they would not be traveling to Amsterdam for the show because of the continuing pandemic.

The event has gone ahead virtually, providing key information about attending companies and their products.

It offers one-to-one meetings with exhibitors online as well as panel discussions and other events and enables participants to watch the latest industry content live and on-demand.

The last in-person IBC took place in 2019. The 2020 event was cancelled because of the pandemic. IBC 2022 is scheduled to take place in Amsterdam on 9-12 September. ■

Broadmedia & Entertainment

Inter BEE 2021

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The Japan Electronics and Information Technology Industries Association (JEITA) announced that Inter BEE 2021, a comprehensive media event held at Makuhari Messe (Chiba City, Chiba Prefecture) from 17 to 19 November, attracted 18,308 visitors.

Inter BEE is widely recognized by industry professionals as one of Japan's largest comprehensive media events, bringing together not only professionals related to audio, video, broadcasting, communications, professional writing, and distribution, but also technicians, creators, and stakeholders in the video and media industries. With "content" at its core, Inter BEE provides a media and entertainment business space that encompasses all aspects of content creation (production), delivery (transmission) and reception (experience).

The next Inter BEE will be held from 16 to 18 November 2022. ■

World
Broadcasting
Unions



WBU-TC YEAR-END MEETING

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Spectrum and cybersecurity issues continued to be key topics on the agenda when the Technical Committee of the World Broadcasting Unions (WBU-TC) met online on 6 December 2021.

The meeting took place online and was chaired by John Lee of the North American Broadcasters Association, NABA.

Reports on WRC-23 Working Group Activities and 6 GHz Update and Unlicensed RLAN Submission to ITU were presented by John Lee and R Weller of NAB/NABA respectively.

A 5G MAG Update was heard from A. Arcidiacono, EBU (Vice-Chair).

The group brings together senior broadcasting staff from media research and development laboratories. They share insights on possible future technologies that may be part of, and help shape, the media experience in the coming years.

The WBU represents all the world's major regional broadcasting unions. The ABU was represented at the meeting by Mr Ahmed Nadeem, Director Technology & Innovation at the ABU. ■

Eurovision News turns 60

The European Broadcasting Union's daily television news exchange, Eurovision News, has celebrated its 60th anniversary.

More than 70 EBU members and partners exchange around 120 news items online a day – an average of nine hours of daily news coverage.



To mark the anniversary, the EBU Director General, Noel Curran, called for the protection of transparent and trusted news, reflecting a range of opinions and views.

“Anyone can ‘report’ breaking news by uploading footage and gaining a global audience in seconds,” he said.

“This has transformed news consumption but brings with it a prevalence of misinformation and deliberate fake news. The results can have dreadful repercussions for stable, elective democracies.”

Mr Curran said the need for strong public service media had never been greater.

“Investment in public service news is an investment in democracy. From the beginnings of the EVN in 1961 to innovative and transformational digital news services, PSM has been promoting core news values – independence, accuracy, transparent and trusted journalism, the free flow of information and ideas.

“These values must be protected at all costs. Our democracies depend on it.”

After a series of tests, the EBU's Television Committee decided on 28 September 1961 to make European News permanent.

Over the decades it has transformed from distributing news film by plane to the sophisticated digital services it provides today.

For more see <https://www.ebu.ch/eurovision-news> ■

News from The ABU Region

MEDIAGENIX

MEDIAGENIX OPENS OFFICE IN SYDNEY

MEDIAGENIX has opened an office in Sydney to serve growing demand and strengthen its market position in Australia and New Zealand.

The company has described the move as another step in its commitment to the Asia-Pacific region.

Johan Vanmarcke, Managing Director MEDIAGENIX APAC, manages the offices in Bangkok, Singapore and Sydney as one team and heads business development in the whole APAC region.

"The decision to open an office in Sydney came naturally as we continue to expand our business operations in the Australia and New Zealand region," he said. "The timing is right as the Australian and New Zealand

media industry is transitioning to Digital First and MEDIAGENIX has a proven track record in helping media companies in this digital transformation journey."

Fabrice Maquignon, CEO of MEDIAGENIX, said: "This new office is the continuation of our strategy to serve every market as global leader in the field of innovative content supply chain management solutions."

MEDIAGENIX is the company behind the market-leading media business management platform WHATS'ON.

It says over 150 media companies across the globe rely on WHATS'ON to achieve a lean content supply chain with streamlined content, rights, and planning workflows that are unified for all delivery platforms, including VOD and linear.

GLOBAL TREKKER JOINS MEASAT'S HD VIDEO NEIGHBOURHOOD

MEASAT Satellite Systems Sdn. Bhd. ("MEASAT") has announced an agreement with Rock Entertainment Holdings for the distribution of Global Trekker HD via MEASAT-3a satellite.



The channel joins MEASAT's HD video neighbourhood at 91.5°E for viewers across the Asia-Pacific.

Global Trekker is a premium channel which features a broad range of content that broadens one's mind, heart, and soul. Here viewers get to explore the world, bringing them closer to nature and giving them

insights to business success and how technology improves everyday lives.

"Since 2017, MEASAT has proudly served Rock Entertainment Holdings with its distribution of ROCK Entertainment, ROCK Extreme, ZooMoo and Smithsonian HD channels," said Ganendra Selvaraj, Associate Vice President, Sales, MEASAT.

"The addition of Global Trekker HD on MEASAT's platform will further enhance the variety of our HD channel bouquet, making us the preferred satellite operator for HD channel distribution in the region."

The 91.5°E prime video hot slot is home to the MEASAT-3a and MEASAT-3b satellites, forming the region's strongest video neighbourhood.

From 91.5°E, MEASAT supports broadcasters and DTH operators to distribute UHD, HD and SD channels to audiences across Asia, Australia, East Africa and Eastern Europe.

The MEASAT fleet will be further strengthened with the addition of MEASAT-3d in 2022.

WIRELESS TRANSMISSION SYSTEM FOR IP REMOTE PRODUCTION USED IN PRACTICAL PROGRAM PRODUCTION

The wireless transmission system for IP remote production developed by NHK STRL was used to provide live coverage of the Hiroshima Peace Memorial Ceremony, broadcast on NHK. To provide live coverage more efficiently, IP remote production has been used in recent years. Using IP lines via optical fibres between the venue being covered and the broadcasting station, the broadcasters transmit audio and video signals from the venue to the station and control equipment on-site remotely from the station. However, the optical fibre cables have to be prepared for each site being covered.

NHK has developed a millimeter-wave FPU which is capable of high-capacity wireless transmission and an "IP Multi-box" which converts signal formats so that IP signals can be transmitted by the FPU. By combining them, we have built a wireless system for IP remote production and used it successfully for the first time as a backup system of a practical IP remote production. This will eliminate the need to prepare optical fibre cables, making it easier to use IP remote production.

In the future, it will continue to use NHK STRL research results in programme production, to use the knowledge gained in operation in further research, and to advance R&D to further expand programme production technology. [\[NHK STRL\]](#)

ASTRO LAUNCHES ADDRESSABLE TV ADVERTISING SERVICE

Malaysian satellite operator Astro has now claimed a regional first with the debut of the first addressable TV advertising service in South East Asia, using Synamedia's Iris new solution. Through the new service, advertisers will be able to show different ads to different households while they are watching the same programme, based on data including location and demographics. Advertisers from local small businesses to big brands can target their ads to specific audiences, independently of whether they are watching broadcast TV or streaming services.

In essence, Iris is both server side and client-side, both OTT and set-top box, including STBs with one-way connectivity. Synamedia told CSI that it has delivered an advertising technology solution to Astro that consists of a unique combination of several server side components designed to work with existing as well as new client-side infrastructure to create a unique setup. This will bring an addressable TV solution to as many as 50% of Malaysian households. Addressable advertising will initially be available on the Astro GO streaming service in late 2021, followed by linear TV progressively on all set-top boxes through 2022.

Astro, a long-time Synamedia customer, is Malaysia's leading content and entertainment company, serving 5.7 million homes or 73% of Malaysian TV households. Delivered as a service, Synamedia Iris is a complete platform that supports ad management, targeting, ad decisioning and seamless insertion in broadcast and streaming content. Its audience measurement service includes ad measurement, impressions reporting, and performance tracking. [\[csimagazine.com\]](http://csimagazine.com)

SBS TO LAUNCH FREE-TO-AIR MULTILINGUAL NEWS CHANNEL IN 2022

Multi-cultural broadcaster SBS has announced that it will further expand its multilingual services in 2022, with the launch of a new free-to-air television channel providing news from around the world to Australian audiences. The new channel, to be called SBS WorldWatch, will feature an extensive line-up of bulletins from leading international broadcasters in more than 30 languages, and will also be the free-to air television home to new 30-minute Arabic and Mandarin language TV news programmes, to be produced locally by SBS, and broadcast in prime time every weeknight.

These new services will provide Australia's large and diverse Arabic and Mandarin-speaking communities with trusted coverage, context and insight into the major national and international stories of the day. Produced and presented by SBS journalists for an Australian audience,

they will premiere on SBS On Demand in January ahead of the new channel launch. These new initiatives build on SBS' commitment to providing comprehensive news and information across its network – in English, through SBS World News, and in more than 60 languages across SBS Radio services, podcasting, and digital platforms – and the multilingual services it has been delivering for more than 45 years.

When launched, the new free-to-air channel will become a destination for the SBS Arabic and SBS Mandarin TV news services, in addition to many of the television news bulletins in languages other than English from around the world currently broadcast on SBS and SBS VICELAND. SBS is also adding more bulletins to its already extensive collection, with all programmes to be available on SBS On Demand. SBS WorldWatch will be SBS's sixth free-to-air television channel, joining SBS, National Indigenous Television (NITV), SBS VICELAND, SBS Food and SBS World Movies. SBS will share further details about the new channel in the new year, and in the lead up to its launch will also be providing audiences with more information about how to access news in their language. [\[SBS News\]](#)

DVB-I AND NATIVE IP TO THE FORE AT DEMOS 2021

The second edition of the online DVB DEMOS event in October provided ample evidence that DVB's new IP-centric solutions are well placed to drive the future of media delivery. Fifteen DVB Member companies showcased their latest products and services based on new or forthcoming DVB specifications, including several multi-vendor demos. DVB-I was at the heart of more than half of the demos, while the event also included the first examples of the DVB-NIP (Native IP) specification, which is on track for finalization before the end of the year.

Demos from TPV Technology, Kineton, Dolby and Huawei showed how DVB-I can be used to address the full range of device types and viewing contexts with enhanced features and services; Qualcomm provided a first glimpse of DVB-I over LTE-based 5G Terrestrial Broadcast; and DVB-I also provided

the service layer for the universal service delivery demo from the NESTED consortium (which includes ATEME, ENENSYS Technologies, Orange and Viaccess-Orca).

Another multi-vendor demo, from Broadpeak, ST Engineering iDirect, EKT and EasyBroadcast, showed how DVB-NIP will enable the B2C delivery of live OTT video content over satellite. Native IP was also the focus of the demo from ENENSYS Technologies, showing OTT delivery over both satellite and terrestrial networks.

The need for interoperability was another strong message delivered during the event, with demos from both Eurofins Digital Testing (showing test suites for DVB Targeted Advertising and CI Plus 2.0) and DTG Testing (unveiling the DVB-I test suite). Wrapping up the event, DVB Head of Technology Emily Dubs explained how the different internet-centric solutions from DVB that were showcased by the exhibitors fit together. She stressed the central role of DVB-I as a common service layer that allows any type of service to reach any type of device, regardless of the network. [\[DVB\]](#)

VIETNAM'S VTV9 BOOSTS PLAYOUT WITH ETERE

Vietnam's national television broadcaster, VTV9, has boosted its playout and distribution efficiencies with Etere playout technology that streamlines and integrates with the end-to-end workflow including automation, graphics, master control and media asset management.

Etere has extended its long-running relationship with Vietnam's national television broadcaster, VTV, with a fully redundant playout automation setup for VTV9. The channel screens curated content for TV viewers in Southern Vietnam. The installation helps the station to streamline its playout automation workflows and achieve new efficiencies in its daily operation. The Etere Ecosystem framework also provides opportunities for future upgrades without disruptions to the daily operations, making it a system that would match the needs of the station even as it evolves.

Pivotal to the installation is the Etere Automation which allows VTV9 to manage their playout operation with smart customization functionalities and workflow automation. In addition, Etere Automation features real-time device control for an integrated management. [etere.com]

BROADCAST REFORMS BY PRASAR BHARATI TO PAVE WAY FOR NEW TECHNOLOGIES NEW CONTENT OPPORTUNITIES

Rolling-out broadcasting reforms at Doordarshan and All India Radio over last couple of years, Prasar Bharati has been swiftly phasing out obsolete broadcasting technologies like Analogue Terrestrial TV Transmitters, paving way for a paradigm shift to emerging technologies and new content opportunities. Taking note of misinformation being published in certain media outlets, Prasar Bharati has clarified that broadcast reform steps to phase out obsolete analogue terrestrial TV transmitters was being misrepresented.

Recently, such false reports about DD Silchar, DD Kalaburagi etc have been noticed. Prasar Bharati has made it clear that these DD Centres shall continue to generate programme content for broadcasting on the satellite channels of Doordarshan dedicated to their respective States, apart from maintaining their presence on digital media via YouTube and on social media. For instance, programme content generated by DD Silchar and DD Kalaburagi shall now be broadcast on DD Assam and DD Chandana respectively. Analogue Terrestrial TV is an obsolete technology and phase out of the same is in both public interest and national interest as it makes valuable spectrum available for new and emerging technologies such as 5G apart from reducing wasteful expenditure on power. So far, almost 70% of all analogue Transmitters have been phased out. Rest are being sunset in a phased manner while ensuring appropriate measures are taken for re-deployment of manpower. With the exception of around 50 analogue terrestrial TV transmitters in strategic locations, Prasar Bharati will be phasing out the rest of the obsolete analogue transmitters by 31st March 2022.

Prasar Bharati has also entered into a MoU with IIT Kanpur, India to develop Next Gen Broadcast solution/roadmap for Digital Terrestrial Broadcasting consistent with emerging standards such as 5G Broadcast to enable new applications such as Direct to Mobile Broadcasting and to create new Content Opportunities through the use of Artificial Intelligence Algorithms. [prasarbharati.gov.in]

ASIASAT TAKES A STRATEGIC STAKE IN LEADING LIVE STREAMING SERVICE 'ONE CLICK GO LIVE'

Asia Satellite Telecommunications Company Limited (AsiaSat), Asia's premier satellite solutions provider, has acquired a strategic stake in One Click Go Live Limited (formerly known as HERMES Live Technology Limited), a company incorporated in Hong Kong and specialised in video live streaming services and solutions.

'One Click Go Live' offers video live-streaming solutions that provide professional, broadcast-grade video streaming for live events. Its stable and scalable platform, built on patented video technologies, has delivered more than 300 live events across a geographical footprint of over 50 countries, reaching an audience of more than 20 million. It also offers customised low latency live streaming solutions, which are particularly ideal for broadcasting content types, such as sports streaming, live auctions, allowing viewers to watch the events on any devices in close to real-time. 'One Click Go Live' can be offered independently or as part of AsiaSat's end-to-end media solution offerings to its blue-chip full time and occasional use customers for linear TV and occasional feed distribution.

The extensive client portfolio of 'One Click Go Live' has included customers from entertainment and media sectors serving mega-events such as concerts, award presentations and sports matches; enterprise and business clients for conference and education events such as global meetings and summits, auctions, webinars and workshops; corporate activities from shareholder meetings, town hall meetings to recruitment and staff training. [AsiaSat]

VIETNAM COMMITS TO NATIONAL, REGIONAL DIGITAL TRANSFORMATION

As co-host of ITU Digital World 2021, the Southeast Asian country marks 50 years of ITU Telecom events and aims for inclusive tech-driven prosperity. The government, co-hosting a flagship conference with the International Telecommunication Union (ITU), has pledged to harness innovation to improve people's living standards substantially by 2030.

The ceremony marked the 50th anniversary of the first ITU Telecom, the forerunner of this year's largely virtual conference and exhibition. In a formal opening ceremony livestreamed across the globe, ITU Digital World 2021 welcomed high level participants from the public and private sectors and across the information and communication technology (ICT) industry.

Last year, ITU accepted Viet Nam's initiative to rebrand from ITU Telecom World to ITU Digital World, reflecting the accelerating convergence of telecommunication and digital technology. The three-month sequence of discussions highlights a timely theme: "Building the digital world. Together."

Viet Nam's national digital transformation plan aims to harness private domestic entrepreneurship in tandem with efficient e-government. Hosting Telecom parallels the country's ambitions for rapid, inclusive digital transformation that can illuminate viable socio-economic development options for the whole ten-member Association of Southeast Asian Nations (ASEAN).

This year's programme of ministerial roundtable discussions explores the role of policy and regulation in driving digital transformation. In opening sessions, government ministers, telecom regulators and top-level industry representatives examined how cutting costs can help accelerate digital transformation; how governments can work with manufacturers to incentivize cheaper plans for customers; and which new policy, regulatory, and public-private cooperation models work best to reduce end-user costs. [ITU News] ■

DIGITAL BROADCASTING Updates

FBC SHUTS DOWN ANALOGUE TRANSMITTERS

The Fijian Broadcasting Corporation has shut down its analogue free-to-air television transmitters in Sabeto and Nakobalevu following the government's decision that the broadcaster move from analogue to the digital platform, Walesi.



WALESI

This means that people in the affected areas will only be able to access the FBC TV signal via a Walesi set-top box connected to their home television set with a UHF antenna or through the Walesi app or via a Walesi satellite dish connected to the set-top box.

People in the affected areas can no longer access the FBC TV signal via an antenna connected to their television set.

FBC CEO Riyaz Sayed-Khaiyum said the switchover was good for the people as the picture and sound quality would be better.

He said because of the work that Walesi had done, more Fijians in these areas would get better access to television.

ATSC OPENS REQUEST FOR PROPOSALS FOR BROADCAST CORE NETWORK TECHNOLOGIES

The Advanced Television Systems Committee, Inc. (ATSC) announced the release of a new Request for Proposals (RFP) for Broadcast Core Network technologies to enhance the ATSC 3.0 broadcast standard. The project is on

a fast track, with initial responses of interest due by December 31, 2021. ATSC President Madeleine Noland said ATSC members are the stewards of the ATSC 3.0 Platform, evolving and expanding the system's capabilities over time. This new development will move the technology forward and unlock innovative business scenarios for the broadcast ecosystem.

ATSC is in the process of specifying Standards for a Broadcast Core Network. ATSC envisions that the addition of core networking capabilities can be an integral part of the ATSC 3.0 broadcast system architecture. The aim is to facilitate efficient interconnect between broadcast towers to form one or more service networks, enabling new business opportunities that require efficient regional or national data delivery options. Sourcing content from multiple data networks, a Broadcast Core Network holds potential to broaden the range of addressable use cases beyond those defined for linear television program delivery and extend the utility of the ATSC 3.0 broadcast facilities to untapped market areas, such as Broadcast (Virtual) Network Operator (BNO, BVNO), Regional or National Datacasting, enhanced Interactivity, and Data/Content Offload.

Interested organizations may submit an intent-to-respond by December 31, 2021. Details of the response requirements and schedule can be found in the RFP. [\[ATSC News\]](#)

IBC2021 AWARDS CELEBRATE THE SPIRIT OF COLLABORATION AND INNOVATION

IBC announced the winners of the highly coveted IBC2021 Innovation Awards, held exclusively on IBC Digital. This year's awards celebrated collaboration and innovation within the content and technology industry, where organisations identified a market challenge and worked together to create a solution. The IBC2021 International Honour for Excellence, IBC's highest accolade, was presented to Barbara Slater, BBC Director of Sport. She is the first woman to hold the post and a pioneer for women in sports broadcasting worldwide.

Barbara was appointed BBC Director of Sport in 2009, and one of her first challenges was to develop the remarkable multi-platform coverage of the 2012 London Olympics. Today, she works closely with other broadcasters and sports bodies, including advising the International Olympics Commission. In 2014 she was made an OBE for her services to sports broadcasting.

IBC SPECIAL AWARD

IBC2021 chose to present a special

award to NBCUniversal for its technical work around bringing the Tokyo Olympic Games to its audience and offering them the chance to enjoy live action in Ultra HD: 4k resolution, high dynamic range colour and Dolby Atmos sound. While production processes for recorded, scripted content in Ultra HD are now well established, NBCUniversal has led the way in developing the necessary technology for single-stream production workflows in sport.

NBCUniversal covered the whole content pipeline, from acquisition and management of 4k content in the HLG colour space to a new version of its Skypath distribution system, that distributes to more than 200 local TV stations. Just in time for the Tokyo Games, this provided the means to send localized, full 4k, HDR, Dolby Atmos Ultra HD to 70% of the US, without the need for expensive technology upgrades in each facility.

BEST TECHNICAL PAPER

The IBC2021 Award for Best Technical Paper goes to a large team from BBC Research & Development, for their contribution Stronger together: cross-service media recommendations. The aim of the paper is to present consumers with a single portal to multiple media sites, with intelligent references between services. If a consumer frequently listens to a particular singer on Spotify, for example, the service will also send notifications when that performer is available on BBC radio and television content, available online.

The team tackled the legal, commercial and ethical challenges of securing consumer data and maintaining each services business goals, while maximising the benefit to the user. This involved using the latest thinking on public data storage and protection, as well as developing a demonstrator smartphone app. [\[IBC\]](#)

DVB RELEASES FIRST SPECIFICATIONS FOR 8K UHD VIDEO SERVICE DELIVERY

The DVB Steering Board has approved specification updates that introduce capabilities to deliver 8K UHD video services for the first time. These updates, extending existing support for the HEVC codec, are the first step in a series of key additions planned for the DVB video coding specifications. These will ensure that DVB continues to provide the most comprehensive and flexible toolbox for the delivery of next generation television services via broadcast and broadband.

HEVC (High Efficiency Video Coding), also known as H.265, is a standard that offers from 25% to 50% better data compression at the same level of video

quality compared to its predecessor MPEG-4/AVC. It is already used in several markets around the world. Until now, DVB specifications included HEVC conformance points only for up to 4K resolution.

The recent DVB specification updates encompass delivery of 8K UHD via both broadcast (transport stream) and broadband (DVB-DASH). Approved for publication as DVB BlueBooks, the updated documents are DVB's specification for video and audio coding, the DVB-DASH profile for video streaming, and the DVB-SI specification for delivery of service information. All three updates also include some bug fixes.

In the longer term, scaling 8K video delivery to end users will benefit from even more efficient video codecs. This is a goal of current DVB work on Next Generation Video Coding, which is expected to lead to further additions to the DVB specifications in 2022. The early availability of a HEVC conformance point, supporting 8k video now, will enable flexibility for deployments and maximize service interoperability across device ecosystems. [\[DVB\]](#)

INDIAN CAR INDUSTRY ACHIEVES FASTEST DIGITAL RADIO ADOPTION

The Indian automotive market has achieved the fastest digital radio adoption, with 28% of new cars on the road currently being equipped with a DRM digital radio receiver.

This achievement was recorded while most of the public broadcaster AIR's transmissions are in simulcast mode (DRM and a legacy analogue signal), with the pure DRM transmissions slowly gaining ground. The figure of 28% within this short time frame after launching digital radio services is unparalleled in the world. The market share is similar to what has been achieved in the US for the domestic digital radio standard, but in a time span of over 20 years, and with a proportionally much higher investments by commercial companies.

Today there are more than 4.2 million cars on the road in India equipped with DRM receivers as a line-fit feature and at no extra cost to consumers. The domestic automotive eco-system around DRM includes chipset manufacturers such as NXP, tier-1 receiver manufacturers, and car brands including Maruti-Suzuki, Hyundai, Toyota, MG Motors, Mercedes Benz, and others.

Major worldwide operating companies (with Indian and global presence) are part of the Indian car industry, including NXP, RF2digital, Harman (Samsung), Visteon, LG Electronics, Mobis, Hyundai,

Fraunhofer IIS, StarWaves, Gspell, Inntot, Cambridge Consultants/CML Microcircuits, Ittiam, and organisations like the not-for-profit international DRM Consortium. These companies have invested millions of dollars in developing and building DRM related technology and know-how in and for India as well the global automotive industry.

According to the DRM India Automotive Group, there is a strong request by the whole Indian automotive industry for innovative content available via DRM, accompanied by clear communication by the broadcasters towards the public. These measures along with a firm decision on adopting DRM also for the local FM services will give the market stability and certainty, resulting in a continued strong growth of DRM receiver availability as a default feature in Indian cars. Practically every automotive company and manufacturer of DRM receivers today has a solution to support DRM in all frequency bands, including digital FM, as most of the serious investment in R&D and testing has already been done, and there is only a single IP royalty for DRM receivers irrespective of the supported bands. [\[RadiInfo Asia\]](#)

90% OF CAR BUYERS SAY BROADCAST RADIO SHOULD BE STANDARD IN EVERY VEHICLE

Broadcast radio continues to dominate as the most preferred source of in-car entertainment across the globe, according to a new international study released today by Edison Research. Almost all (90%) of the survey respondents say a broadcast radio tuner should be standard equipment in every car, a trend that is consistent across age groups, indicating strong demand among current and future car buyers.

The survey also reveals that the availability of radio has a major impact on consumers' vehicle purchasing decisions: 82% of potential car buyers say they would be less likely to buy or lease a vehicle that is not equipped with a built-in radio tuner. The survey – commissioned by WorldDAB in partnership with Radioplayer and sponsored by The National Association of Broadcasters, Commercial Radio Australia, and Xperi – interviewed those who had recently purchased or leased a new car, or plan to do so in the near future. The study included interviews in Australia, France, Germany, Italy, the UK and the U.S.A.

When considering the most valued standard-fit audio features in a new car, having a broadcast radio tuner ranks highest for the respondents (rated 'important' by 89%), ahead of USB ports (rated 'important' by 86%) and the availability of Bluetooth (rated 'important'

by 85%), and well ahead of smartphone mirroring technology (Android Auto is rated 'important' by 65% and Apple CarPlay by 54%). Consumption of broadcast radio remains very high among today's car buyers, with 89% saying they have listened in the last week, and 76% saying they listen at least once per day.

The car remains the most popular location for listening to radio, cited by an average 89% of respondents, followed by 75% who listen at home and 39% who listen at work. [\[WorldDAB\]](#)

LATENCY, CONTROLLING COSTS TOP THE LIST OF STREAMING TECH CHALLENGES

A new survey of video developers by Bitmovin highlights a number of ongoing tech challenges facing streaming services, with 41% of those technologists citing live low latency as a challenge, followed by controlling costs for such things as bandwidth and storage (33%), playback on all devices (32%), consistent monitoring and analytics (31%) and ad insertion (31%).

Bitmovin's fifth annual "Video Developer Report" also found that 41% of developers cited low latency streaming as an important tech opportunity for innovation at their service, followed by live streaming at scale (33%), viewer engagement and consumption (28%), media delivery and distribution (26%) and content protection and security (26%).

In terms of the adoption of AI and machine learning, the survey found that 43% of respondents said they were using AI and machine learning in their audio transcription and speech-to-text efforts, followed by tagging and categorizing video (35%), personalization (34%), identifying scene or shot boundaries (34%), video quality optimization (33%), object detection (33%) recommendations (30%) and quality of service (24%). Only 12% said they had no plans to use AI or machine learning.

In terms of other technologies, the survey found growing interest in commercial encoders, with 54% saying they used them versus 37% using open-source encoders. [\[TV Technology\]](#)

ASIA-PACIFIC IMPLEMENTS RADIOCOMMUNICATION UPDATES

Countries across Asia and the Pacific need fair, transparent, and predictable spectrum policies to accelerate equitable digital transformation across the region, according to radiocommunication experts convened by the International Telecommunication Union (ITU). Regulators, industry experts and academics met between 11 and 22

October to discuss future Asia-Pacific radio-frequency spectrum requirements following Radio Regulations updates at the last World Radiocommunication Conference, WRC-19, held in Sharm-el-Sheikh, Egypt.

Participants at the ITU Regional Radiocommunication Seminar 2021 for Asia and the Pacific (RRS-21 Asia-Pacific), held in collaboration with the Asia-Pacific Telecommunity, reviewed the last updates to the Radio Regulations, the key international treaty governing radio spectrum management.

The regional seminar, convened entirely online, covered the regulatory framework for both terrestrial and space services and the procedures for filing and recording frequency assignments in the Master International Frequency Register (MIFR). Participants discussed the current regulatory framework for international frequency management, ITU Radiocommunication (ITU-R) Recommendations, and best practices for spectrum use by both terrestrial and space services.

RRS-21 Asia-Pacific also included basic training to prepare for technical examinations and gain familiarity with ITU tools to produce frequency notices. Various tutorials enabled participants to familiarise themselves with ITU notification procedures, as well as with key software and electronic publications available to ITU Member State Administrations and ITU-R Members. RRS-21 Asia-Pacific concluded with a forum: “Radiocommunication trends: Opportunities and challenges for the Asia-Pacific region”, in which telecom industry representatives shared their insights with ITU Member States to help accelerate radiocommunications development.

Panel sessions in the forum spanned trends in digital broadcasting, broadband satellites (GSO, non-GSO and small satellites), national plan frameworks for emergency telecommunications, an update on the International Mobile Telecommunications-2020 (IMT-2020) standard, and the agenda for regional contributions to the next World Radiocommunication Conference (WRC). [\[ITU News\]](#)

MEDIA ACCESSIBILITY TECHNOLOGY PROVIDING RICH SPORTS COVERAGE

Research and development is being extensively conducted on technologies related to media accessibility that can make information accessible to all people including those with visual or hearing disabilities, the aged, and people from other countries in NHK STRL. In this study, the technologies developed previously are applied to implement a service that

automatically generates CG animation sign language commentaries for live sports programs, without using a human sign language interpreter. Additionally, an automated commentary service using a speech synthesizer is implemented that does not require a human announcer for play-by-play sports commentary. Both services are delivered over the internet.

SIGN LANGUAGE CG COMMENTARY

Sign language CG commentary is a technology that generates CG animation of sign language automatically to convey the play-by-play conditions of a sporting match to people with hearing disabilities. Every Japanese word, proper noun, numeral and some common phrases and sentences used in sports commentary are first translated into sign language by native signer, and the results are recorded as motion data. These were further used as components to create customized commentary templates for each sport in sign language. Subsequently, the game data, including the current score, and shots made, were obtained from the sporting organization associated with the game and applied to the prepared templates to automatically generate sign language CG that could describe the progress of the game in detail. When using sign language, not only the movement of the hands and fingers, but also subtle movements of the line of sight, eyebrows and the expression of the mouth, are important to understand the intended meaning correctly. Therefore, a photo-realistic CG animation was generated in real time, which is rich in facial expressions. Furthermore, certain functions were implemented to enable those with hearing disabilities enjoy sports coverage more than before; this includes a function that provides explanations of the relevant rules in sign language CG when the play stops due to a foul, and a function that can visually display the volume of the sports video to replicate the same excitement as at the venue.

AUTOMATED VOICE COMMENTARY

Automated voice commentary is a technology that gives the voice commentaries of a sporting competition using a speech synthesizer instead of a play-by-play human announcer. Similar to the sign language CG commentaries, customized Japanese commentary templates were created for each sport beforehand. These templates were used in combination with the live game data to generate commentary scripts in real-time, which were further conveyed vocally using a speech synthesizer. To synthesize speeches suitable for sports commentaries, the speech synthesizer was trained with plenty of previously recorded play-by-play-style human voices. Future studies will include further research on sign language CG and automated voice commentary

technologies, working to expand universal services. [\[NHK STRL\]](#)

THE WBU SUPPORTS CALL TO ACTION ON A COMMON GLOBAL EMERGENCY PROTOCOL

The World Broadcasting Unions (WBU) strongly endorses the “Call to Action on Emergency Alerting”, which supports the implementation of the international standard alerting format Common Alerting Protocol (CAP). Broadcasters play an essential role in communicating the key facts of an emergency, mindful that everyone in harm’s way must understand what is happening and what actions to take. This is why broadcasters embrace the CAP standard.

The “Call to Action” requests a scale up of efforts to ensure that, by 2025, all countries have the capacity for effective and authoritative emergency alerting that leverages the CAP, suitable for all media and all hazards. CAP makes public alerting faster, easier, less error-prone, and more understandable. CAP helps a broadcaster be certain that an alert is authentic and authoritative, and to cross-check alerts from diverse sources. CAP alerts can also be compiled on a map to show how different aspects of the emergency are evolving. [\[WBU News\]](#)

SONY LICENSES MPEG-H 3D AUDIO DECODER SOFTWARE FOR DVB AND ATSC 3.0 BROADCASTS

Sony Corporation has licensed MPEG-H 3D Audio Baseline Profile Decoder software from Fraunhofer IIS and joined the MPEG-H Trademark Program. MPEG-H 3D Audio is described as the leading Next Generation Audio system used for immersive music streaming and TV broadcasts. It is also specified in TV broadcast standards such as Digital Video Broadcasting (DVB) and ATSC 3.0. Several major sports events have already been broadcast using MPEG-H 3D Audio in many European countries.

According to Fraunhofer, the MPEG-H 3D Audio Baseline Profile enables maximum interoperability with devices that have implemented that particular profile while at the same time significantly reducing the implementation and testing effort. Sony also intends to use the software in its object-based 360 Spatial Sound technology, 360 Reality Audio. It places individual sounds such as vocals, chorus, piano, guitar, bass and even sounds of the live audience in a 360-degree spherical sound field.

ATSC 3.0 has specified the MPEG-H 3D Audio Baseline Profile as the audio standard for NextGen TV in Korea, while Dolby AC-3 is the audio standard for ATSC 3.0 in the United States. [\[TV Technology\]](#) ■

Equipment Trends

MBC CHOOSES LAWO'S IP FOR DUBAI STUDIO CITY

MBC Group recently upgraded its audio infrastructure with AES67/Ravenna-compliant Lawo IP equipment for two control rooms and studios located in Dubai Studio City.



SONY UNVEILS VENICE 2 DIGITAL CINEMA CAMERA

Sony has introduced its new flagship model VENICE 2, with 8.6K full-frame image sensor and 16 stops of exposure latitude.

The camera builds upon the strength of the original VENICE with new features including a compact design, internal recording and the option for two different sensors: the newly developed full-frame 8.6K sensor or the original 6K VENICE sensor.

The VENICE 2 also inherits popular features from the original VENICE including colour science, Dual Base ISO and 8-stops of built-in ND filters.

VENICE 2 features simple menu navigation and connectors arranged to make life easier on set. With a durable, compact build, the camera is fast to set up for handheld or mounted shooting, so operators can focus on filming, not the camera.

For more information, please see https://pro.sony/en_SG/products/digital-cinema-cameras/venice2

ORBAN ANNOUNCES XPN-ENTERPRISE FOR CENTRALIZED PROCESSING

Orban has released its new Optimod XPN-Enterprise ecosystem – a customizable Linux-based processing platform for multiple broadcast stations or streaming services, with centralized control. It provides OptiCloud processing for up to eight FM and eight HD/ DAB+/streaming processing channels in a 1 RU package, and supports AES-67/SMPTE-2110 protocols using an enterprise-class SoftGear server and the appropriate Optimod XPN- Enterprise Nodes.

According to Orban, national broadcasters approved the system after extensive field- testing. "Broadcasters worldwide are realizing the benefits of moving operations to centralized – and ideally, virtualized – environments. Many of these customers have high-density needs, with many signals that need to be managed," said David Day, Orban president. "With XPN- Enterprise, those needs are easily met."

With the new system, content via any of the most common methods of audio transport – AES3, AES67, SMPTE-2110-30, Dante or Livewire+ – arrives in one place. It is then individually processed for the necessary outputs (FM Composite, DMPX, µMPX, and DAB+HD) using the appropriate Orban XPN-Enterprise Nodes for distribution to each transmitter site. The XPN-Enterprise server also handles the processed channels destined for streaming by sending those outputs to the appropriate streaming devices.

Info: www.orban.com
[RedTech Magazine]



According to MBC, flexibility was important – both control rooms needed to serve either studio floor in a variety of I/O combinations.

The installation involved two 48-fader Lawo mc256 production consoles and shared I/O for the IP networked system, set up as a mix of A stage64 and modular Dallis stagebox devices.

Lawo's V pro8 8-channel video/audio toolbox embeds and de-embeds the audio video feeds. While AES67/Ravenna (IP) exchanges most audio streams, Madi receives others. For continuity, a Nova73 HD router provides a four-port Dante card, thus allowing the audio engineers at Studio City to leverage a variety of formats in any authorized combination.

The new system handles open-standards AoIP streams, Madi signals and even Dante sources – in any combination and at a high channel count.

MBC operators can use the remote capability to control on-location stageboxes during high- profile events.



Another advantage of the IP-based approach is the ability to use select operators for back-to-back productions – they no longer need to travel onsite.

Similarly, compact flypacks eliminate the need for OB trucks or lorries at on-location events. [RedTech Magazine]

UEI GIVES VOICE TO ASTRO REMOTE

Universal Electronics Inc. (UEI), the provider of wireless universal control solutions for home entertainment and smart home devices, has begun providing voice-enabled remote controls to Malaysian subscription operator Astro for its latest generation Ultra set-top box.

The voice-enabled remote control is powered by UEI's chip technology with Bluetooth Low Energy and Infrared control capability. The remote offers automated setup and universal control of the Ultra set-top box and connected television through UEI's QuickSet® platform which helps facilitate self-installation.

Ultra offers a redesigned user interface, improved search and content discovery capability allowing customers to stream and record a wide variety of content and watch it in crystal clear quality. This durable and powerful remote



complements Ultra's vibrant, modern set-top box design with shortcut keys providing quick access to apps, movies and sports.

"UEI has been a trusted partner for more than a decade, and we are excited to work with them to bring the most advanced remote control technology and the best user experience to our customers with our next-generation Ultra set-top box," said Shahrul Sultan, Director, Product Engineering at Astro.

"As the industry leader in voice control, UEI is proud to be a supplier to Astro, the number one operator in Malaysia, to help improve users' control and search experience on their new platform," said Kuldip Singh Johal, UEI's Vice President of Sales, Subscription Broadcast for Europe, Middle East and Asia.

Visit www.uei.com [Content+Technology]

FUJINON 4K UA107 FULFILLS AFL'S DESIRE FOR FAN ENGAGEMENT

The Fujinon UA 107 lens has been used to shoot Australian Football League matches at the Melbourne Cricket Ground.

MKTG Sports + Entertainment, a global integrated agency, is operating scoreboard control at the Melbourne Cricket Ground (MCG) sports stadium as part of its in-venue coverage of the Australian Football League (AFL) on two big screens separate from the normal broadcast coverage.

The match coverage is provided primarily

through two fixed-stand cameras, a tight shot provided by an 87x lens and a 40x lens for wider shots, and an AFL-owned portable RF camera that completes the production.

MKTG's GM of Operations and Technology, Mike Lewis, explained, "The two stand cameras need to be very agile and closely follow or anticipate the play. While the existing Fujinon 87x lens had served us well during its 15 years of service, they required replacement.

"MCC, the equipment owner, agreed that replacement was required, and asked MKTG to facilitate options for replacement."

The lens's requirements needed must be future-proof – and, according to Lewis, the Fujinon 4K UA107 was the right choice for the application.

He added, "Fan engagement and brand activation are essential considerations in entertaining crowds before matches or during breaks in play. The Fujinon UA107 allows the operator to shoot very tight, keep up with the play, and easily single out spectators for big-screen coverage.

"The MCC asked us to provide options for them that would be best in class and ensure that they were future-proofed with compatible 4K capability. The UA107 lens met that requirement, and feedback from the operators and producers has been excellent." [APB+]

ADDERLINK INFINITY 2102 (ALIF2102)

Adder has released its latest addition to the ADDERLink Infinity range – the



The Fujinon UA 107 lens has been used to shoot Australian Football League matches at the Melbourne Cricket Ground.



Part of the ALIF2000 series, the ALIF2102 is available as a transmitter and receiver, and delivers a "keyboard, video, and mouse (KVM) powerhouse for the most demanding customer requirements."

ADDERLink Infinity 2102 (ALIF2102) that offers a small form factor transmitter and DisplayPort connections.

Part of the ALIF2000 series, the ALIF2102 is available as a transmitter and receiver, and delivers a "keyboard, video, and mouse (KVM) powerhouse for the most demanding customer requirements", according to Adder Technology.

John Halksworth, Senior Product Manager, Adder, said, "The ALIF2000 series has been a trusted and proven IP KVM solution for our customers for many years. It is at the heart of thousands of KVM systems around the world.

"Our customers expect connectivity choice and migration options that reflect the ever-changing landscape of their networks and workflows, and the ALIF2102 solution does just that.

"Not only that, but the new ALIF2102 is compatible with the existing ALIF2000 series products, which means customers can migrate at their own pace."

In addition to the current DVI version, the ALIF2000 series now has native DisplayPort connections. With support for video resolutions up to 2560 x 1600, users can visualise their data with pixel-perfect image quality while multiple audio configurations provide greater implementation options.

The ALIF2102 transmitter has also been redesigned to reduce excessive rack-space use. The new and compact form factor means that three ALIF2102 transmitters can fit into one 'U' of rack space, while the ALIF2012 uses up to 50% less power than its predecessor. [\[adder.com\]](http://adder.com)

NETWORKS DEPLOY SONY'S 4K CAMERA SYSTEM FOR SPORTING EVENTS

Sony's HDC-F5500 35mm 4K camera system has been deployed by Fox, CBS and ESPN for recent live sporting events, creating a cinematic effect for coverage of baseball and football games.

The cutting-edge imaging technology provided a shallow depth of field to heighten the passion and provide new cinematic looks of the action on and off the baseball diamond and football field.

In its broadcast debut, the HDC-F5500 camera was used during Fox's coverage of baseball's American League Championship Series between Boston and Houston. It was equipped with a long box lens and positioned behind the first base dugout during games 3, 4 and 5 of the series. Several replays showcased the camera's creative capabilities.

CBS employed the HDC-F5500 during the NFL game Chicago and Tampa Bay on October 24, capturing Tom Brady's emotionally charged 600th career touchdown pass. It was used throughout the game both in a handheld configuration on the near sideline, as well as in a live application, providing an

engaging cinematic look.

ESPN also incorporated the system camera into the "Monday Night Football" matchup between Kansas City and New York on November 1, where the camera was integrated into the key sideline cart position.

Highlights of the new HDC-F5500 camera system include a highly sensitive Super 35mm, 4K CMOS global shutter image sensor that enables lush images with several available color gamuts, as well as the use of PL mount 35mm lenses. The camera also features a high frame rate capability of up to 120fps, making it a valuable tool for sports production. A motorized 8-step ND filter allows for the precise selection of focus depth and works with a flexible shutter system for capture of fast-moving subjects. Combined with the highly sensitive imager, the HDC-F5500 makes stunning pictures, in bright lighting or during night games.

"The HDC-F5500 camera was designed specifically for live event production, with feedback from the industry, so it's fitting that its first public uses allowed it to capture some of the most anticipated sporting and broadcast events of the year," said John Studdert, Vice President, Media Solutions, Sony Electronics. "With the implementation of the HDC-F5500, FOX, CBS and ESPN continue their commitment to amplifying audience engagement through artistic and innovative uses of technology. The emotion and competition of these games were elevated by the camera's cinematic storytelling abilities. In addition, it seamlessly integrated with all of the other Sony cameras in use at these events, to enable new forms of expression for the production and viewers alike."

"The F5500 captured cinema-grade images which matched the tone and quality of the main broadcast seamlessly with an interface that our operators use daily," added Brad Cheney, Fox Sports VP Field Operations & Engineering. [\[www.newscaststudio.com\]](http://www.newscaststudio.com)



NHK's Masagaki Satoru elected new ABU President



NHK's Executive Vice President, **Masagaki Satoru**, has been elected the new President of the ABU. Mr Masagaki's election took place at the ABU General Assembly on 24 November. He has been Executive Vice President of Japan's public broadcaster since February 2020.

He told the virtual assembly he would listen to the voices of all ABU members, encourage more cooperation and build the value of the Union as the world moves into a post-Covid era.

Mr Masagaki was born in 1960 in Sendai city, Japan and graduated from the School of Political Science and Economics of Waseda University.

Since joining NHK in 1983 as news reporter, he has mainly covered political news. After serving as news editor for more than 10 years, he became Head of the Political News Division in 2010, Editorial Controller News Department, Director of Osaka Station in 2015, Director of the News Department in 2016, and Director of the Public Relations Department in 2017.

Mr Masagaki joined the NHK Executive Board as Senior Director in April 2019. He will serve as ABU President until the end of 2024. ■

NHK appoints new ABU Technical Liaison Officer



Mr Nagano Kenichiro has taken over as the new ABU Technical Liaison Officer for Japan's public broadcaster, NHK. Mr Nagano is Senior Manager, Global Strategy Division, NHK World Department.

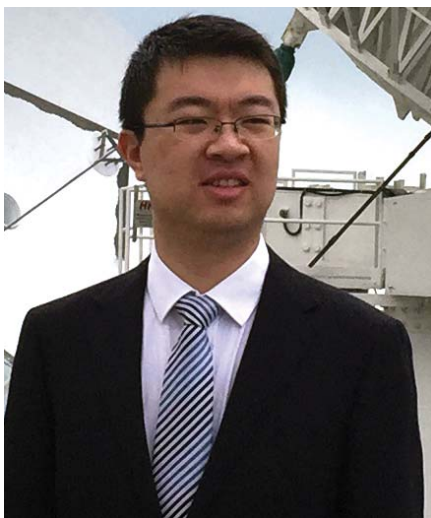
He joined NHK in 1989 and became Technical Manager for Production, Field Operations, covering major sports including the Olympics, football and Major League Baseball.

From 2002 to 2006, he served as Vice President (Tech) of NHK Enterprises America, Inc. In 2006 Mr Nagano returned to Japan and worked in News Engineering until 2014, developing and providing communication satellite uplink trucks and satellite farms to NHK's branch offices in Japan.

From 2014 to 2021, he was assigned to the Tokyo Organising Committee of the Tokyo Olympic and Paralympic Games. He held a senior position in the International Broadcast Centre.

Mr Nagano replaces Mr Negishi Akira, to whom we express our sincere thanks for his excellent work as TLO. We would also like to thank Ms Kuroiwa Mika who took on the role of interim TLO after Mr Negishi in early July. ■

NRTA appoints new ABU Technical Liaison Officer



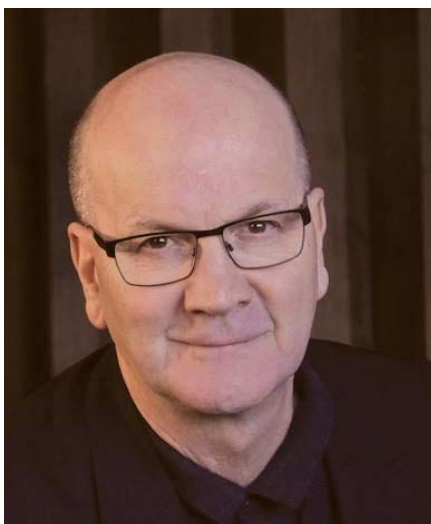
Mr Sun Ke has been appointed the new ABU Technical Liaison Officer for the National Radio and Television Administration, P. R. China.

Mr Sun Ke has nearly 10 years' experience in management of satellite broadcasting, technical innovation and application of radio and television in China.

He is currently acting as Deputy Director of Science and Technology Management Division, Science and Technology Department, NRTA.

Mr Sun Ke holds a Master's Degree in Engineering from the Communication University of China. ■

Peter Herbert appointed TLO for AFTRS



Peter Herbert is the new Technical Liaison Officer for the Australian Film Television and Radio School (AFTRS).

A writer, producer and executive producer for many national and international companies, Mr Herbert is currently Head of Screen Business and Producing at AFTRS.

In addition to writing and producing for many classic television shows, he has taught at a number of universities in screen business, creative industries and producing.

His list of credits includes Cop Shop, The Sullivans, The Flying Doctors, The Comedy Company and Acropolis Now.

He also produced the 34th Annual TV Week Logies and has created or co-created a number of series, among them Skirts, The Comedy Sale, The Agency, Parties, FAQ, and The Big Wig for Sky1 in the UK. ■

New TLO for ABS-CBN-Philippines



Ms Biena Magbitang has taken on the role of ABU Technical Liaison Officer for ABS-CBN. Biena is a multi-awarded journalist with over a decade of experience in broadcast and online media.

She is currently the Digital Head of the ABS-CBN News Channel and the Asia Manager of Climate Tracker.

She is a member of the International Press Institute and the International News Media Association. ■

Palitha Gallage retires from SLRC-Sri Lanka



Mr Palitha Gallage, Deputy Director General (Engineering) at SLRC-Sri Lanka, has retired after a long career with the broadcaster.

Mr Gallage was active in ABU activities for many years, including serving as SLRC's Technical Liaison Officer.

He held the position of Deputy Director General (Engineering) from March 2019 until his retirement in November 2021. He was responsible for SLRC's overall engineering and technical operations, heading a team of nearly 250 people.

Mr Gallage joined SLRC in August 1997. He worked as Engineer (Maintenance) until 2000 and Engineer (Transmission) from 2000 to 2005, when he won promotion to the post of Director Engineering (Transmission). ■

ABU farewells Faten and Hafiz

The ABU said goodbye to **Faten Amira binti Rahmat**, our Finance & Administration Officer, and to our IT Systems Support Officer, **Muhammad Hafiz Samsudin**.

We will surely miss Faten's charm, humour and professionalism and Hafiz's helpful and efficient manner.

We wish them the very best in their future adventures. ■



ABU TECHNICAL TEAM

Once again, the ABU Technical Team went beyond our expectations and delivered the online events for all departments at the ABU Secretariat.

Well done to Mr Ahmed Nadeem and the GA Technical Team. ■



Dr Veyssel Binbay and Shree Bhadra Wagle



Ahmed Nadeem



Siva Kumar



Muhammad Hafiz Samsudin



Saravana Kuma Ramalingam

ABU TECHNOLOGY CALENDAR *of Events*

2021

21 OCTOBER - 13 MARCH 2022 **ONLINE**
IBC Digital

2022

JANUARY **ONLINE**
Satellite Technologies for Broadcasters | Webinar

JANUARY **ONLINE**
Webinar Series on Member Innovations

FEBRUARY **NEW DELHI**
BES 2022

FEBRUARY **ONLINE**
Training Course on Engineering Fundamentals for Broadcasters (Level 2)

22-24 MARCH **ONLINE**
ABU DBS 2022 | Virtual Symposium

APRIL **ONLINE**
Workshop on IP Infrastructure & Applications | Webinar

MAY **KUALA LUMPUR**
Workshop on OTT & IBB Systems for Broadcasters

8-10 JUNE **SINGAPORE EXPO**
Broadcast Asia 2022

JUNE **SINGAPORE**
ABU Technical Bureau mid-year Meeting

JULY **TBA**
Workshop on Archiving and Media Management

AUGUST-SEPTEMBER **ONLINE**
Annual Webinar Series 2022 | Webinar

9-12 SEPTEMBER **AMSTERDAM**
IBC 2022

TBA **TBA**
ABU Technical Bureau Annual Meeting

TBA **TBA**
ABU Technical Committee Meeting

TBA **TBA**
ABU General Assembly

16-18 NOVEMBER **JAPAN**
Inter BEE 2022

In Memoriam John Bigeni



Mr John Bigeni, a former Chairman of the ABU Technical Committee, passed away in Australia in July 2021 at the age of 80.

He had a long and close relationship with the ABU and was Chairman

of the Technical Committee for seven years until 1996.

Mr Bigeni received the ABU Lifetime Achievement Award in 2009 for his commitment and contribution to the development of digital television in the Asia-Pacific region.

The presentation took place at the ABU Digital Broadcasting Symposium 2009 in Kuala Lumpur.

During a long career, Mr Bigeni was Director of Engineering at SBS-Australia and Head of Engineering at ABC-TV. He was involved in

many industry engineering activities and was the chairman of the Broadcast Industry Technical Advisory Group within Australia.

Mr Bigeni's final position was Asia-Pacific Representative of the Digital Video Broadcasting Project (DVB), a consortium committed to developing open technical standards for delivery of digital television and data services worldwide.

Soon after his retirement, the DVB Project made him the DVB ambassador for the Asia-Pacific region. He was instrumental in the Australian decision to adopt DVB-T and then extended his activities to other countries in the region, many of which opted for DVB technology.

In 2013, Mr Bigeni was awarded an Honorary Fellowship of the DVB Project for his sustained and substantial contributions to DVB over the years.

The award is the highest honour that can be bestowed upon a participant in the work of the DVB Project. ■

New Members

AFTRS

AFTRS-Australia joins ABU

The Australian Film Television and Radio School (AFTRS) has joined the ABU as an Affiliate Member. AFTRS is the country's leading screen arts and broadcast school – the only Australian education institution to consistently make The Hollywood Reporter's annual list of the top film schools in the world. ■



shekhinahPR

SHEKHINAH PR joins ABU

Shekhinah PR is a new ABU member. A public relations and branding agency, it services local, regional and international clients across Asia. Its business relationships have been guided by one simple premise; to help clients communicate who they are to the people whose opinions matter most. Shekhinah's awards include being named one of the finalists in the 'Best Engagement to Targeted Communities' at the the PR Awards 2015 South-East Asia in Singapore on 5 March 2015. ■



SPACELABS
Creating the Future with You

SpaceLabs Technology joins ABU

SpaceLabs Technology Sdn Bhd has joined the ABU as a member. It was incorporated in 2019 but has more than two decades of business involvement in its core business in providing large-scale systems including Flight Information Display Systems (FIDS), LED Display Technology for Stadium Public Scoreboards and a fully Integrated Sports Management System for multi-sports meets in the region. SpaceLabs Technology has been globally recognised as being a world-class standard in providing technology. ■

Broadmedia & Entertainment



Inter BEE 2021

Nov.17 (Wed.) ▶ Nov.19 (Fri.) Makuhari Messe

Nov.17 (Wed.) ▶ Dec.17 (Fri.) Online

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