



5TH ABU MEDIA SUMMIT ON CLIMATE ACTION AND DISASTER PREPAREDNESS

Media Solutions for Sustainable Future -
Saving Lives, Building Resilient Communities

25-26 April 2019 | Kathmandu, Nepal



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Administering IP-Based UHD Studio

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5th ABU Media Summit
on Climate Action and
Disaster Preparedness
which was held in
Kathmandu on
25-26 April 2019.

From the Editor's Desk



This issue of the TR focuses on the 5th ABU Media Summit on Climate Action and Disaster Preparedness which was held in Kathmandu on 25-26 April 2019. With the theme "Media Solutions for Sustainable Future – Saving Lives, Building Resilient Communities", the summit focused on many aspects of climate change and how the media and broadcasters can play a key role in preparing for and mitigating the effects of disasters.

There are two technology related articles in this issue contributed by our members KBS-Korea and DD-India. The first one by KBS focuses on one of the key technologies that the industry is closely following: the developments and implementation cases in "IP-Based UHD Studio". The article details the concept of IP-based studio and migration to all IP infrastructure. It shares the experience of KBS in setting up their IP-based studios for the UHD operations currently in operation. The second article titled "Critical Spectrum Evaluation & Monitoring in Multi-Carrier Satellite Uplinks" presents the case of interference issues within the use of satellite uplink systems and also the interference caused by terrestrial relays. The article explains a few cases and argues the importance of having a carrier monitoring facility to ensure that the links are operating properly within their limits and do not cause interference to other co-channel and cross-channel services on a given satellite. Both articles provide extensive knowledge in the stipulated areas and share useful information for those involved and interested in such fields of work.

The reports from the Production, Transmission and Spectrum study topic areas are also included in this issue. These cover the updated reports from the various study projects that were reported at the mid-year meeting of the Technical Bureau.

As usual this issue also carries highlights from some key activities organised for members, including a half-day seminar on Digitising of Audio Video Archives which took place during the BroadcastAsia2019 event in Singapore. Also, a report on a technical advisory mission to our member Radio Nepal to help in their approach to digitising their archives. The issue concludes with our regular highlights of industry news, digital updates and the latest in equipment trends. We also hope you will enjoy the changes in the layout, which is a work in progress to further improve the look and feel of the Technical Review magazine.

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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Administrrating IP-Based UHD Studio

by **Kim Hae Jung**
Korean Broadcasting System

KBS started operating IP-based UHD studios in July 2018. Two IP-Studio control rooms were designed to control five studios.

Now two daily information programmes are being broadcast live and another daily information programme is recorded, Occasionally an IP studio also acts as a relay studio.

Beginning in July 2019, we are going to produce three more programmes in the IP UHD studios. I am going to share some of the considerations and difficulties that I have experienced in implementing IP studios.

1. Network Design

1-1 Three kinds of network (media and control and data)

First, let me explain how an IP network system is designed. IP network systems consist of a **Media Network**, a **Control Network** and a **Data Network**.

The **Media Network** is a network that replaces the traditional SDI-based production system. In other words, it is responsible for transmitting and receiving VOIP and AOIP signals that are needed for broadcasting production

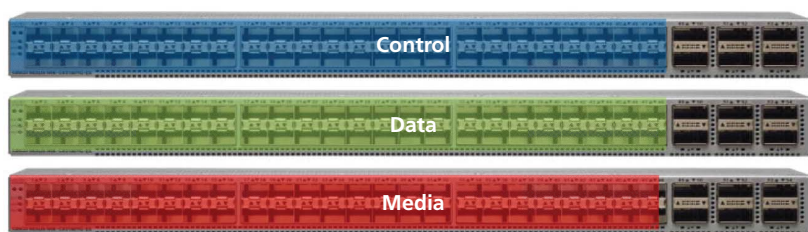
The **Control Network** is a network that is used to operate broadcast production equipment such as VMU, AMU, OCP, cameras and FS.

The **Data Network** is a network used to import and export files that link to Post-Production. It is also used to send TV programmes to YouTube and FaceBook.

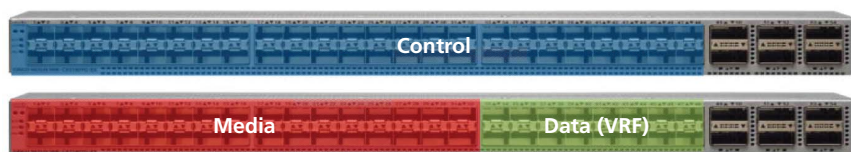
From a safety point of view, it would be better to purchase a dedicated switch for each purpose, but that would require more expenditure. To reduce the cost burden, we can choose logical segmentation methods using VRF on one physical switch. The VLAN (Virtual LAN) is logical segmentation on layer 2 and it has typically been used a lot. VRF (Virtual Routing and Forwarding) is logical segmentation on Layer 3 but it has not been commonly used in broadcast stations.

From my experience, the media switch's OS tends to be relatively unstable. Bugs are often found because it has not been used in many places yet. So media switch OS upgrades are sometimes needed for bug patches.

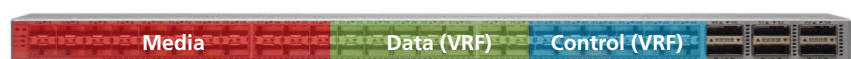
If you use VRF on a physical switch, whenever you upgrade the switch OS, you have to suspend all functions, such as data transfer, media transmission and device control.



switch assignment 1: dedicated switch for control and data and media network



switch assignment 2: dedicated switch for control and shared switch for media and data



switch assignment 3: shared switch for control and data and media by using VRF

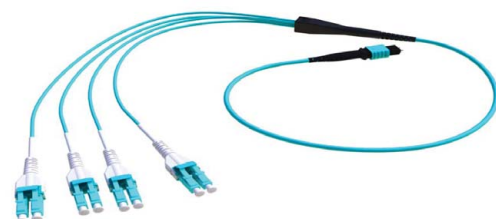
While you are sending files to post-production after recording a programme, you have to wait until the file transfer is complete. After completion you can upgrade the network switch's OS. If you recorded a TV program for 10 hours, you need to wait that long.

If you're thinking about UHD, it is recommended that you choose a media switch which supports the 40G/100Gbps, and a data switch which supports 1/10/40Gbps port and a control switch which supports up to 1Gbps.

Control traffic is generally very small and 1Gbps is sufficient. In the Data switch, end devices are usually connected to 1G/10Gbps port and interlink is recommended to be configured at 40Gbps for the future.

In the media network, End devices using compression (TICO, LLVC) are usually connected to a 10Gbps port and interlink is recommended to be configured at 100Gbps. MPO (Multi-fiber Push ON) is usually used to create 10Gbps ports on switches that only support 40G/100Gbps.

Using MPO QSFP is the same as using 4 * 10Gps ports.

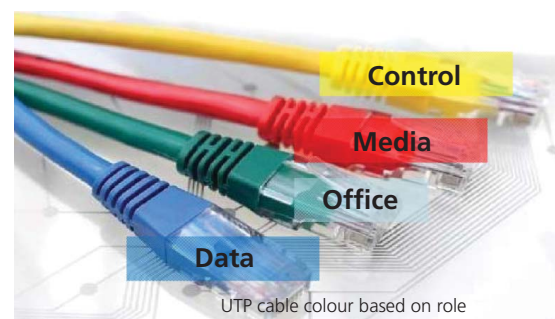


MPO Break out cable

1-2 Cabling

Since there are three kind of networks, it is important from the outset for the administrator to distinguish cable roles by the colour of the cable.

When selecting an UTP cable, always differentiate the colour by use.

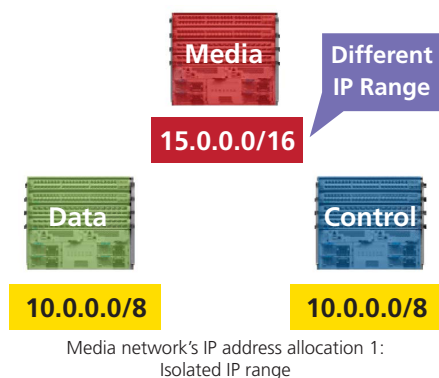


UTP cable colour based on role

1-3 IP address Design

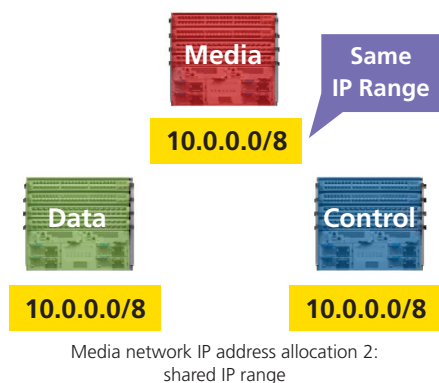
Generally, private IP address ranges such as 10.x.x.x and 172.x.x.x and 192.x.x.x are commonly used within the company. When designating IP addresses for control and data networks, you can use the remaining private IP address ranges. But, the IP address range of the Media Network needs careful thought.

The first way is to assign an isolated IP address range as if the SDI system had previously been isolated.



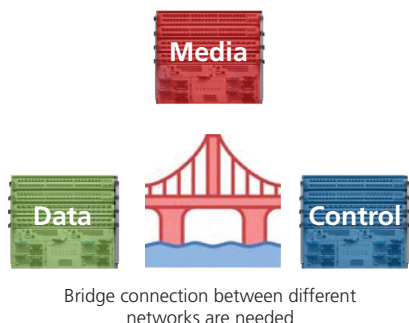
The second way is to use the remainder of the existing private IP range.

KBS divided control and data and media network separately and assigned isolated IP addresses to media networks.



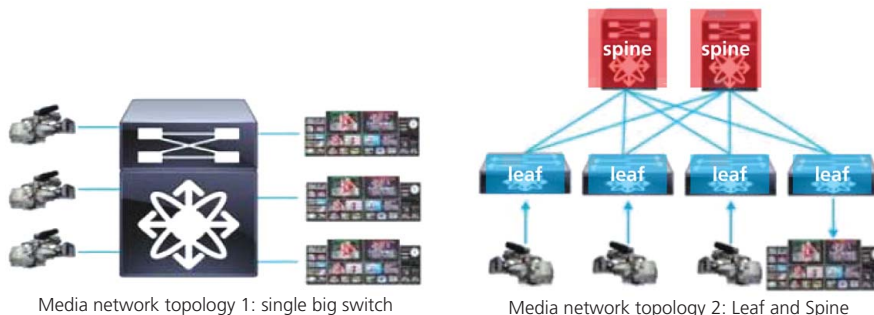
1-4 Bridge connection between different networks

Most end devices have independent media and control ports. But some devices do not have separated control ports, so you may need to set up the equipment through the media port. As a result, a bridge connection between the control network and the media network should also be considered.



1-5 Media network topology

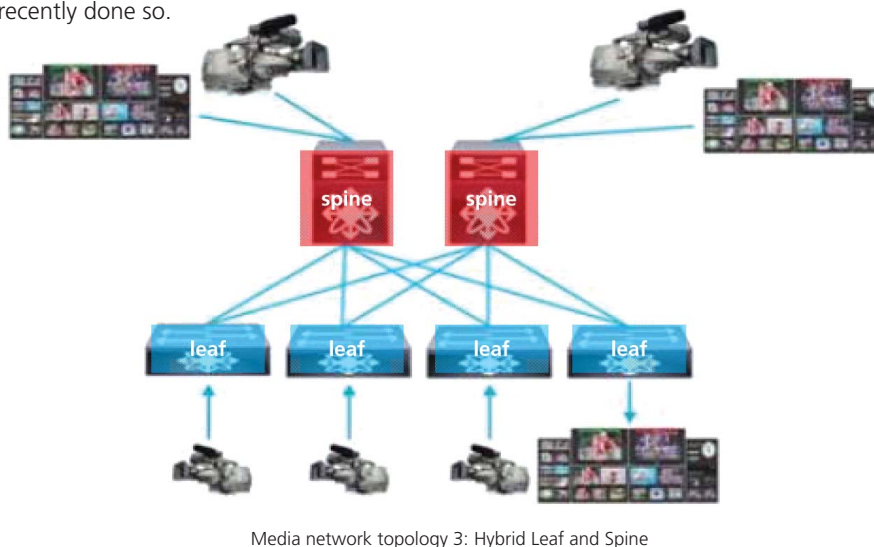
The simplest structure is that all broadcasting equipment is connected to a single switch. This is suitable for OB vans, where all the broadcast equipment is assembled in one place.



The following is a leaf and spine structure that is commonly used in the data centre network. Leaf switches connect to the broadcast equipment and the spine switches connect the leaf switches. This is suitable for distributed studios and has the advantage of scalability. Whenever you expand the studio you can add leaf and spine switches. From a management and operation point of view, the one big spine switch with multiple leaf switches is much better than multiple spine switches with multiple leaf switches.

Cisco supports multi-spine architecture, but Arista currently does not recommend multi-spine architecture.

The last is a mixture of the two designs described above. It also supports connecting the end device to the spine switch. Cisco did not initially support this approach but has recently done so.

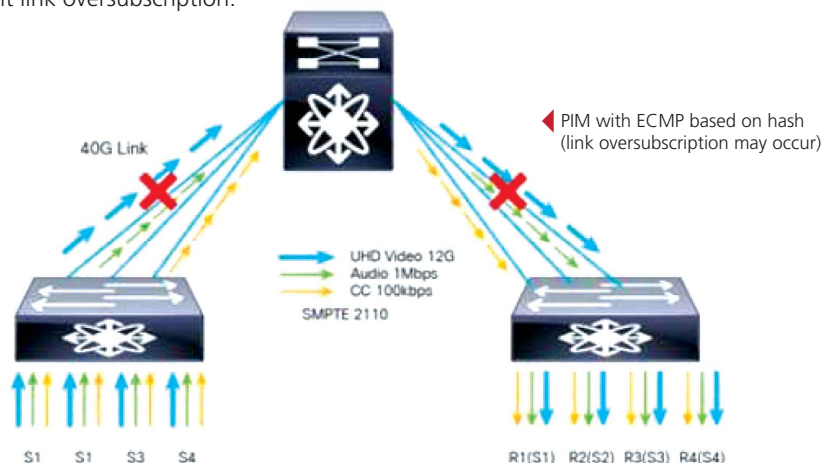


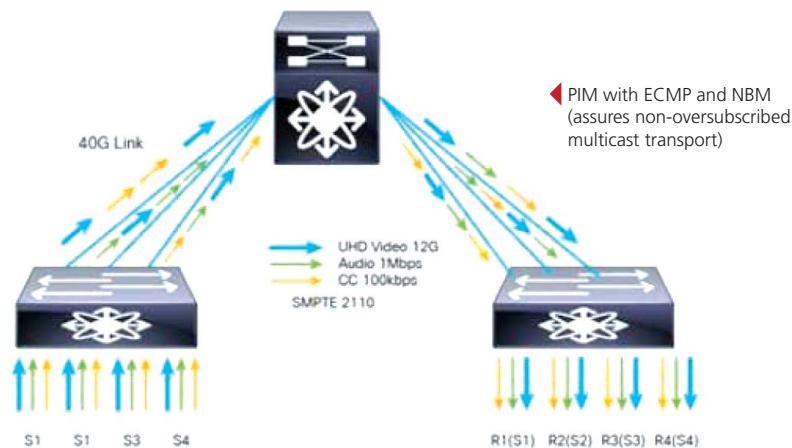
1-6 Media network load-balancing

In the SDI environment, VDAs (Video Distribution Amplifiers) and ADAs (Audio distribution Amplifiers) were used to distribute signals. but in an IP network environment, multicast technology replaces the need for such distribution of signals.

PIM (Protocol Independent Protocol) is a widely used multicast routing protocol. In native-PIM, when connected by multiple links between switches, multicast is load-balanced based on the hash. As a result, there is a problem that over-subscription may occur in a particular link. Link over-subscription can cause video and audio packet drops.

To overcome link over-subscription, Cisco switches apply a non-block-multicast (NBM) feature to each network switch. NBM allows traffic to be spread evenly across links to prevent link oversubscription.



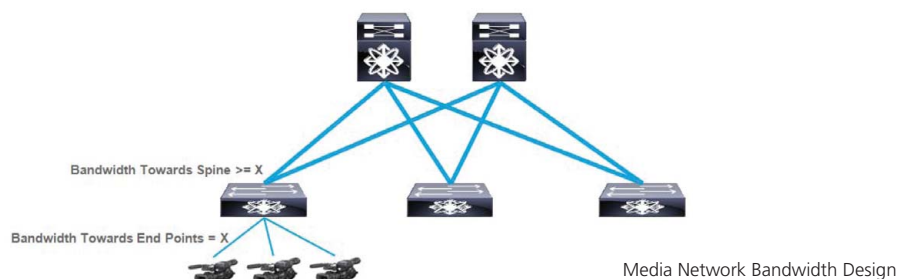


1-9 Media network Bandwidth design

Generally, broadcasting equipment uses dedicated FPGA to make packets linearly. But for safe transmission it is recommended to consider a margin of about 5% for each flow. For example HD is about 1.5Gbps but when configuring bandwidth setup, KBS allows 1.6Gbps for the HD signal.

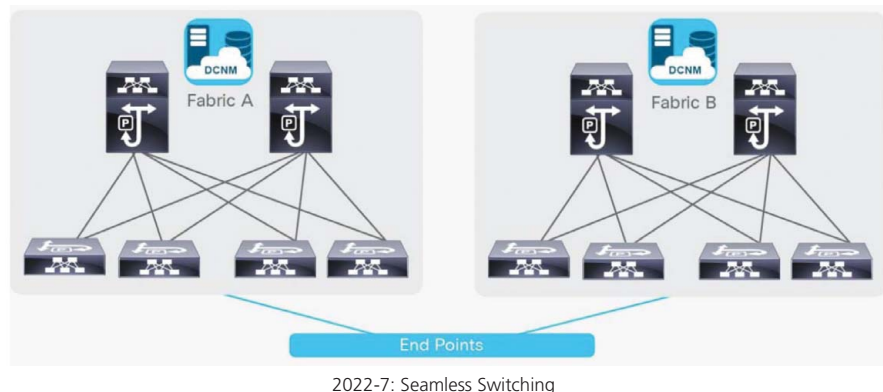
Note that you can check the interval of the packet using the Tektronix measuring instrument (PRISM).

In the leaf and spine architecture, bandwidth of all senders connected to a leaf must be less than the aggregate bandwidth of the links going from that leaf to each of the spines. Bandwidth of all receivers connected to a leaf must be less than the aggregate bandwidth of all links going to all spines from that leaf.



1-10 2022-7

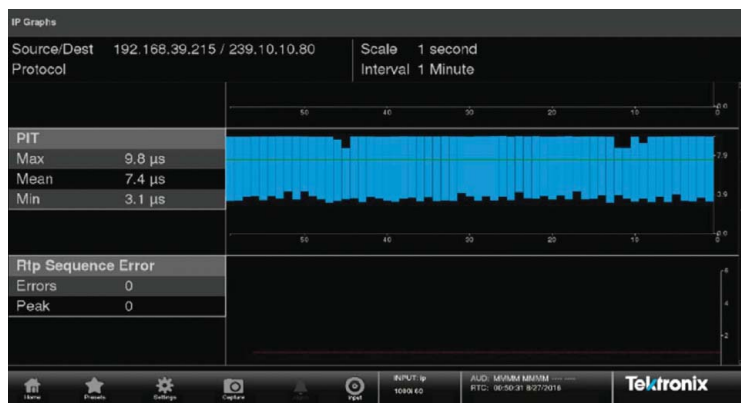
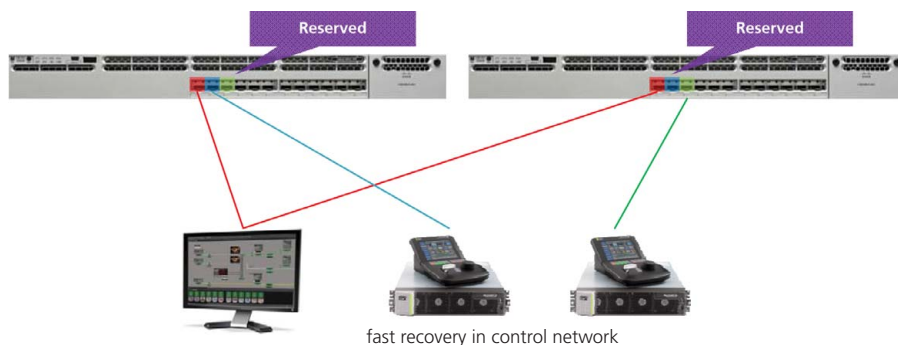
As most deployments utilise network redundancy and hitless merge on destinations, the same network is replicated twice, and the endpoints are dual-homed to each network.



1-11 Control network recovery

Typical COTS servers have multiple network ports, so they can configure and implement teaming. but most broadcast equipment still has one control port. As a result, in the event of a network switch failure, the equipment cannot be used. In order to reduce disruption, broadcast equipment connection needs to be distributed among several switches.

In KBS, for fast recovery, the network port of the opposite switch is intentionally reserved. In the event of a network switch failure, the UTP cable which is connected to the failed network switch can be moved to a reserved port on the other switch, without the need to look up switch port information.



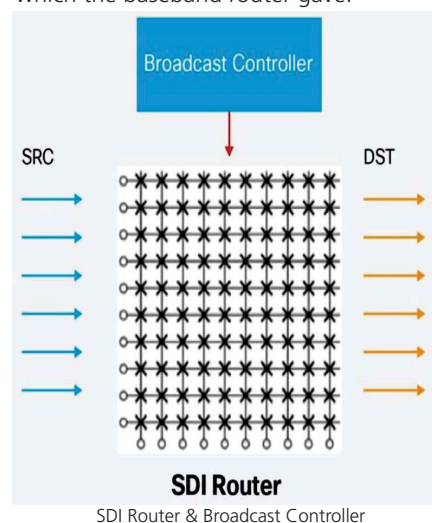
IP measurement device shows packet interval time

2. VOIP (Video over IP) Design

2-1 Routing and clean switching in IP environments

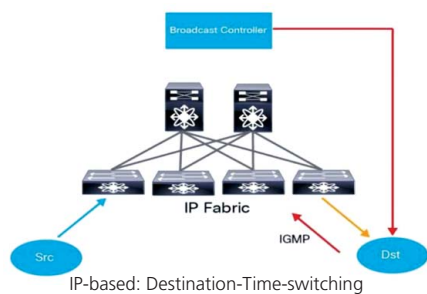
In SDI environments, the cross-points of the SDI router were controlled through the exclusive controller software of each router manufacturer.

When the operator changed the source of a specific destination from A to B through the router control panel, the cross-points inside the router were changed. In this case the destination equipment didn't have to do anything. they just had to accept the source signal which the baseband router gave.

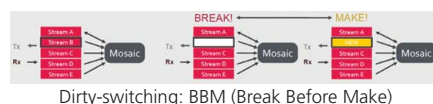


However, in an IP environment, the existing SDI router is replaced by the network switches. When the operator changes the source of the destination from A to B through the router control panel, broadcast controller orders the destination equipment to change source signals. So the destination equipment sends an 'IGMP Leave' message to no longer receive old source (A). After that, it sends an 'IGMP Join' message to acquire a new Source (B) Signal. This process is called Destination-Time-switching because switching occurs in the destination equipment. It is also called BBM (Break before Make) because after disconnect first, made a new connection.

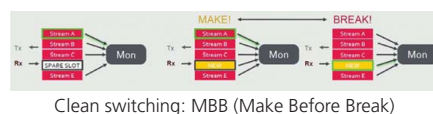
Unlike an SDI environment, it is necessary to act actively on the destination equipment. In the destination equipment, active behaviour (IGMP) that express which source signals is wanted is required.



Due to the time deviation between the IGMP join and IGMP leave, Whenever the source signal is changed, 'dirty-switching' occurs for a period of time, so we can see a black video signal and hear audio popping noise. Even though, each network vendor provides IGMP immediate leaves to reduce switching time, clean switching is not performed. Also, destination-timed-switching takes a lot more time, about (5 frames ~ 1sec) than SDI.



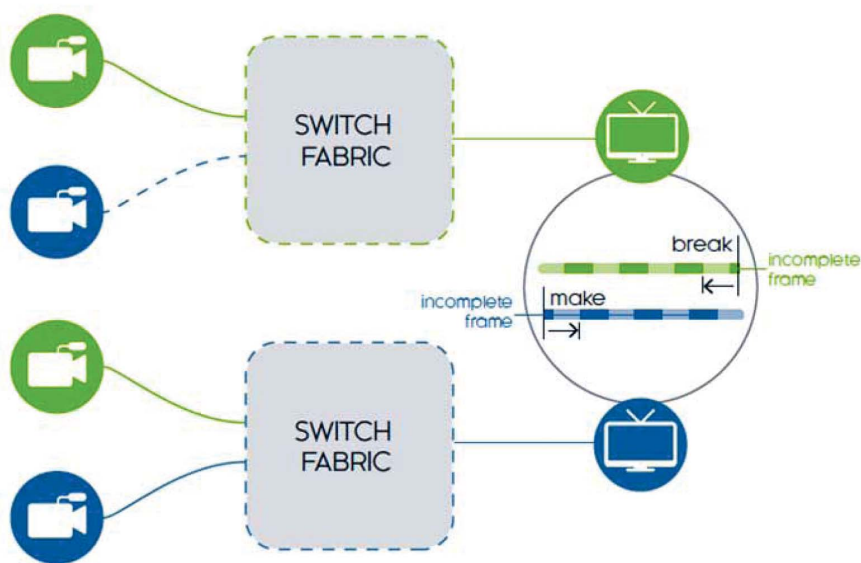
So how can we implement clean switching? You can achieve clean switching by using MBB (make-before-break). First the destination equipment sends an IGMP Join message and gets a new source (B) signal. After that, it sends the IGMP leave message to no longer receive old source (A). But, MBB requires twice bandwidth, when switching sources and we have to purchase equipment that supports MBB.



When designing IP studios, KBS counted destinations that require clean switching to be done. By default, most destinations were designed to use BBM (break-before-make), while destinations requiring clean-switching were designed to use MBB (make-before-break).

The industries have different ways to overcome dirty-switching. Let me introduce them briefly. The first is BBM (break-before-make) with concealment. Before disconnecting the old source, its last frame is stored in a buffer and the audio signal is muted. So, we can avoid black video signals and audio popping noise, during switching. Of course, this is not a perfect solution.

The second is that the vendor, Nevion, implements clean switching using BBM (break-before-make) and fabric switching. In other words, the source signal is changed finely in the network switch, rather than switching in the destination equipment. This way, you can overcome the need for double bandwidth that MBB requires.



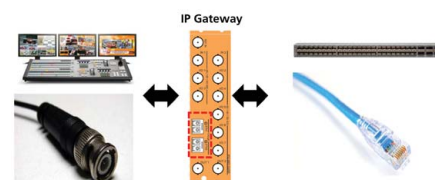
Nevion's Clean switching: Break and Make & Fabric switching

2-2 IPG (IP Gateway)

Most UHD equipment still uses SDI I/O with the rest using native IP I/O. So, we need a lot of IP Gateways (IPG) that convert SDI signals to IP.

When KBS operates UHD IP Studios, IPG has been where frequent failures occur. HD signals were accurately converted to IP, but when converting QUAD signals to compressed IP using TICO, sometimes IPG would show a black signal.

Whenever it didn't work, the IPG module was removed from the frame, and after reconnection it operated normally.



IPG (IP Gateway): Bridge between SDI and IP

2-3 Multiview

When KBS was preparing for UHD, IP-based multiview products were offered up to only 1.5G and 3G. Until now, few IP multiviews support 12Gbps due to processing limitations.

When KBS first designed multiview, KBS thought that operators would just see small mosaics from multiview, so that HD quality in multiview was enough. So, the UHD signal from the source equipment was used for broadcast production and the HD signal was used for monitoring in multiview.

After live broadcasts, we found some problems. If the UHD output of the source equipment was faulty and the HD output was normal, choosing the faulty source in the VMU generated a black signal. So, although it looked normal in multiview, changing the source in the VMU resulted in a black signal.

In other words, this was a problem, because signals used for broadcasting production and monitoring were different. In particular, when IPG failed to convert QUAD signals to IP, we experience this problem.

A 65-inch TV monitor showed a certain level of quality up to 3*3 PIP in multiview but in 4*4 PIP, we could see quality degradation.

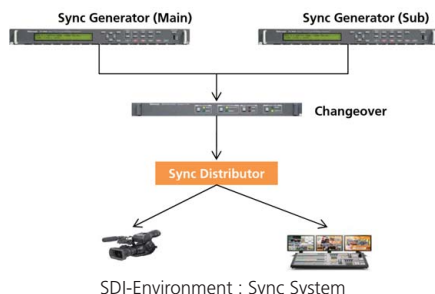


How to design IP Multiview

3. PTP (Precision Time Protocol) Design

3-1 Sync system in SDI environments

In the SDI-based system, the general equipment of the sync systems consists of sync generator, change-over and sync distribution amplifier. For past decades, it has been seen that the legacy sync signal is extremely reliable and most broadcast engineers have used baseband sync signals with few worries.



3-2 PTP (Precision Time Protocol) in IP environments

Maintaining synchronization in an IP-based system requires PTP. The legacy sync signal such as black and burst is also still used for SDI equipment using IPG. Network Time Protocol (NTP) is still required for the exact time of log files and server clustering in the control systems.

After the GPS receiver module in the sync generator has locked the GPS, it creates a pulse per second (PPS) signal and a time-of-day (UTC with leap second equalization) signal.

In most places where IP Studio was deployed, PTP was the most difficult, problematic and frustrating part. This was because there were bugs in the network switches and end-devices, which didn't work according to the PTP standard. I have briefly put together some things that I have experienced with regard to PTP, I hope they will be helpful.

3-3 PTP problems which occurred in the network switches

- 1) Wrong PTP configuration due to human error.
- 2) Network switches caused wide ptp offset because of OS and FPGA Bug
- 3) Network switch which had small PTP COPP (control plane policing) value
 - In general, switches have a built-in COPP to protect the control plane.
 - Initial value is very low (280kbps) and if there is a lot of end-device equipment, this should be set to more than 512Kbps

3-4 PTP problem which occurred in end-devices

- 1) Equipment which always chose ptp message from specific a port in 2022-7

- 2) Equipment which showed ptp lock and unlock repeatedly when receiving the same ptp message from same GM in 2022-7
 - Exact behavior of PTP over an 2022-7 is not defined in standards. In other words, current standards do not define exact behavior
- 3) Equipment which did not send or receive PTP messages at a certain point in time
- 4) Equipment which showed ptp lock and unlock repeatedly, when received ST 2059 Management packet
- 5) Equipment in which the PTP parameter reverted to initial value, after reboot
- 6) Equipment which needed a long time to lock to ptp, after losing PTP lock
- 7) Equipment which remained in ptp unlock, even when everything else returned to normal after it lost ptp lock.
- 8) Equipment which didn't support a change of PTP domain.

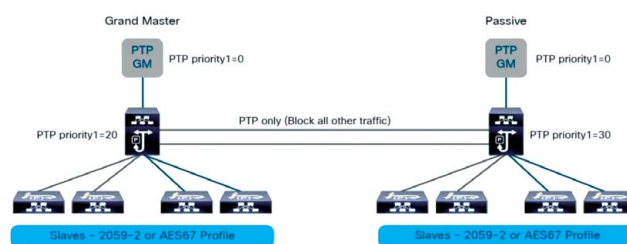
3-5 PTP TIP

- 1) Give PTP GM(GrandMaster) as low priority as possible.
- 2) Recommend multicast in PTP communication mode by default.
- 3) Recommend same ptp parameter in all devices
 - recommends sync-interval (-3: 8hz), announce interval (0:1hz), announce time out (3) from my experience,
- 4) Must use PTP-aware switches, and BC (boundary clock) is recommended for scalability
- 5) If you consider Dante, must use PTP v1.
- 6) If the PTP offset exceeds 1000ns, there is a problem and must be checked.
- 7) Legacy reference signal is still important
 - IPG still uses Legacy reference signal

3-6 PTP summary

In conclusion, the perfect PTP design requires a perfect match between PTP generator, network switch, and end device. There is still no perfect PTP design because the equipment used varies from place to place, and the design is done according to each situation.

At the time of initial deployment, after PTP design implementation, it is really important to observe it for 1~2 months to make sure there are no problems.



[Recently recommended PTP design from many vendors, it is always not correct]

4. AOIP (Audio over IP) Design

4-1 Various AOIP

AOIP (Audio over IP) was used much earlier than VOIP. Many audio console vendors suggested their own AOIP transmission. The current AOIP can be largely divided into AES67 (ST2110-30), DANTE, and Ravenna and there are interoperability issues between them, so you have to choose what to use.

KBS chose the AES 67 standard for compatibility between all equipment. Even though KBS had decided to use AES 67, there were several AES 67 profiles.

KBS selected Profile A, which all AOIP receivers supported, to solve the compatibility problem.

	AES67	Ravenna	Dante
Discovery & Control	Layer 2, Layer 3	Layer 2, Layer 3	Only Layer2
PTP	V1 & V2	V1 & V2	Only V1



RAVENNA



Level (profile)	Sampling Frequency	Max Channel	Packet Time	Supported By receiver
A	48Khz	8	1ms	Mandatory
B	48Khz	8	125us	Optional
C	48Khz	64	125us	Optional
AX	96Khz	4	1ms	Optional
BX	96Khz	8	125us	Optional
CX	96Khz	32	125us	Optional

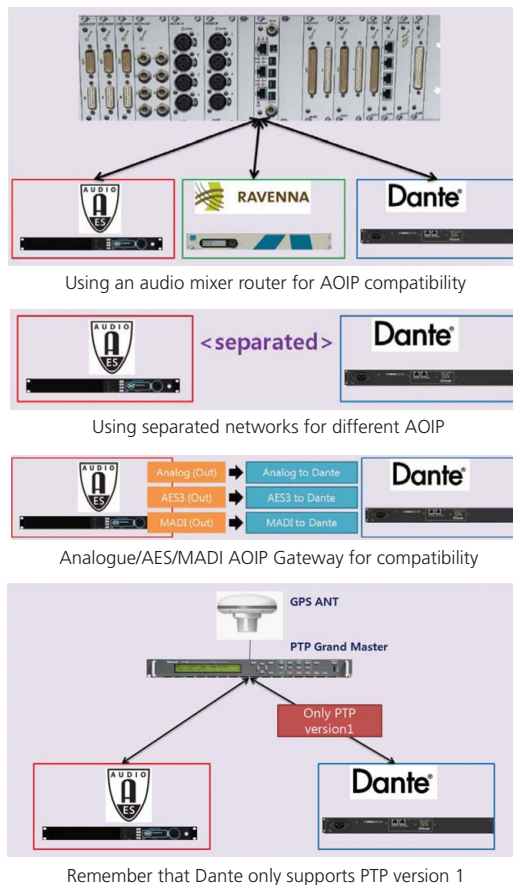
AES67/ST 2110-30 Profiles

4-2 Interoperability in AOIP

If you need to use different AOIP (Dante, Ravenna, AES 67), there are several methods. The first way is to purchase audio mixer router which supports different AOIP modules. In the audio mixer router, different AOIP signal can be converted. The disadvantage is that your system becomes more complex and you have to purchase a dedicated audio router for AOIP conversion.

The second method is to use separated networks for each AOIP. If communication is required between different AOIP networks, it is possible through Analogue/AES/MADI AOIP gateways.

Please remember that Dante does not support PTP version2 (SMPTE 2059) and only supports version 1.



4-3 Bandwidth in AOIP

The traffic of the AOIP is much smaller than that of VOIP. 1Gbps bandwidth is sufficient for AOIP. About 2~3Mbps is required for 2 channels and about 10Mbps is required for 8 channels.

4-4 Consideration when choosing AMU

When selecting AMU (Audio Mixer Unit), equipment that directly supports AOIP modules exhibits more stable performance. If the AMU does not have an AOIP module, it can also support AOIP through the AOIP Gateway, which converts the Analog/AES/MADI signals to IP.

4-5 AOIP Resilience

Video Devices generally support the 2022-7 standard, but a lot of audio devices have different resilience implementations. One AOIP device may not support implementations like 2022-7, another may support it; yet another may support a method of implementation unlike 2022-7.

At the moment, the biggest problem is that there is no available measuring device to monitor AES67, ST2110-30. At present, the Tektronix PRISM shows only the volume level of received AOIP, but it does not provide other information, so there are difficulties in solving AOIP problems.

CONCLUSION

From an operator's perspective, the IP Studio is not much different from a conventional SDI environment, but from an administrator's point of view, it is very different, and a lot of changes are required in the way administrators work.

Administrators need to learn more about IP-based technologies, as well as how to use new IP-based software. It is no longer meaningful to separate broadcast engineer from IT roles. The company needs to consider how to train broadcast engineers who administrator IP studios.

Until now, KBS has experienced more problems than with SDI-based studios and sometimes it has been difficult to determine the cause of these problems. Through trial and error, the ability to cope with problems is improving little by little.

In the event of a problem, KBS is focusing on whether it is a bug in the equipment or whether it is caused by human error. There are many times when vendors still show technological immaturity, and there are compatibility problems between different equipment. Some of these are still ongoing.

PTP is probably the most problematic area and in the event of a PTP failure, you will experience video black and audio mute. Therefore, when preparing RFPs, I recommend you write up PTP in more detail.

IP-based equipment refresh cycles are probably shorter than that of SDI-based equipment and maintenance contracts are required every year. This may impose a big burden on the company.

However, IP studios gives you the advantage flexibility to share all the signals easily within your company. It supports new ways of working with more dynamic assignment of resources and allows IP studio systems to be scaled up more easily.

So far, the focus was on migration from SDI to IP. Gradually we need to consider accepting software-based product based COTS equipment to maximise flexibility

Let's dive into the IP-studio!!

REFERENCE & ACKNOWLEDGEMENTS

1. www.cisco.com
2. www.arisa.com
3. www.smpte.org
4. www.ipshowcase.org
5. www.ciscolive.com
6. www.ravenna-network.com/
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11. www.tektronix.com

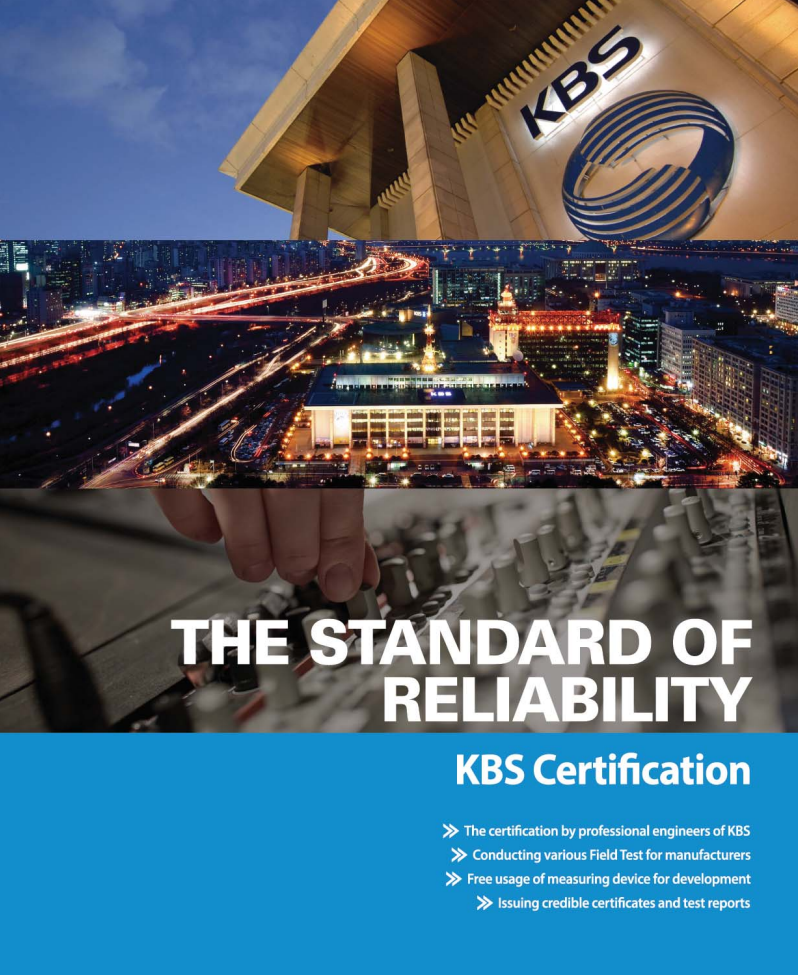


Author

Kim Haejung
received his Bachelor of Electronics and Computer Science from Kyung-book National University.

After joining KBS in 2007, he worked in the TV Production Technology and Transmission Technology Departments of the DAEGU station of KBS. He was transferred to the head office in 2012, where he operated news studios and administered the DNS (KBS Digital News Room) and was in charge of KBS's Network Datacenter.

Now, Kim is administrating the UHD IP studios of the TV Production Technical Department.



THE STANDARD OF RELIABILITY

KBS Certification

- » The certification by professional engineers of KBS
- » Conducting various Field Test for manufacturers
- » Free usage of measuring device for development
- » Issuing credible certificates and test reports

The representative of public broadcasting services in Korea.
KBS Broadcasting Equipment Certification Center

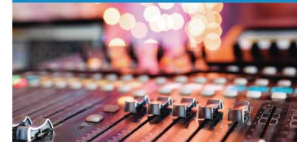
Main business of KBS Broadcasting Equipment Certification Center

Broadcasting Equipment Certification, Tests



- Improve performance by testing equipment at the actual broadcasting site of KBS
- Securing reliability of equipment quality through KBS certification
- Issue test certificates required for the broadcasting equipment manufacturer's R&D business.

Free technical support for equipment manufacturers



- Give an idea about developing equipment suitable for broadcasting sites
- Technical consulting support including KBS expert's know-how of developing equipment
- Free use of measuring equipment and facilities

Free Promotions for equipment certified by KBS

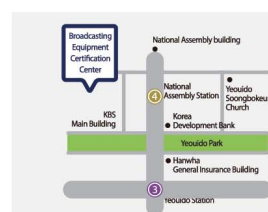


- Promotion at domestic and overseas exhibitions and conferences such as KOBA Show and NAB Show
- Place advertisements on websites and magazines

Provide broadcasting field experience for the industry people



- Give an opportunity to visit the actual broadcast site, experience production and transmission process
- To encourage quality improvement, provide operational highlights and key specifications for each equipment



KBS Broadcasting Equipment Certification Center

4, Gukhoe-daero 62-gil, Yeongdeungpo-gu,
 Seoul, Republic of Korea
 TEL : +82 2 781 5381~7
 Website : <http://office.kbs.co.kr/certi/>

New Judges Appointed for ABU Engineering Awards

The two judging panels are usually reviewed every three years. Each is composed of three members of the ABU Technical Bureau, three external judges representing the industry, and the ABU Secretary-General.

The new judges are Mr Hamid D Nayeri, IRIB-Iran, Dr Kong Bin, RTPRC-China, Mr Sunil, DDI-India, Mr Masashi Kamei, NHK-Japan, Ms Hong, Young-Kyung, KBS-Korea, Dr Fintan Mc Kiernan, Ideal Systems, Mr Charles Sevier, Dell EMC, Mr Asaad Sameer Bagharib of Thinking Tub Media, Mr Jamel bin Seman, RTM-Malaysia, Mr Naoki Kashimura, Ikegami-Japan, Mr Peter Bruce, IABM, APAC and Mr Alexander Zink, Fraunhofer-Germany.

The ABU expresses its thanks to Mr Masakazu Iwaki of NHK-Japan, Dr Tharaka Mohotty of MTV-Sri Lanka, Mr Sahin Demir of TRT-Turkey and Mr Rahadian Gingging of RRI-Indonesia for their contributions as judges for the past several years.



Masakazu Iwaki, NHK-Japan



Dr Tharaka Mohotty, MTV-Sri Lanka



Rahadian Gingging, RRI-Indonesia



Sahin Demir, TRT-Turkey

ABU ENGINEERING EXCELLENCE AWARDS

PANEL OF JUDGES

ABU BROADCAST ENGINEERING EXCELLENCE AWARD

ABU DEVELOPING BROADCASTERS' EXCELLENCE AWARD



Panel Chairman

Mr Hamid Dehghan Nayeri
Director, International Technical Affairs, Islamic Republic of Iran Broadcasting and Chairman ABU Technical Committee. Appointed a member of the panel in June 2015.



Mr Sunil
Additional Director General (Engineering) & Head International Relations, Doordarshan and ABU Technical Committee Vice-Chairman. Appointed a member of the panel in March 2019.



Ms Hong, Young-Kyung
ABU Technical Liaison Officer, Technology Management, Korean Broadcasting System, appointed a member of the panel in June 2018.



Fintan Mc Kiernan
Chief Executive Officer – South East Asia, Ideal Systems Singapore, appointed a member of the panel in June 2014.



Charles Sevier
CTO (APJ), Dell EMC, Data Lake Scale Out Storage. Appointed a member of the panel in June 2015.



Asaad Sameer Bagharib
Director, Thinking Tub Media Pte Ltd, Singapore, appointed a member of the panel in June 2018.



ABU ENGINEERING INDUSTRY EXCELLENCE AWARD

ABU GREEN BROADCAST ENGINEERING AWARD



Panel Chairman

Dr Kong Bin
Operation, Director/Senior Engineer, Academy of Broadcasting Planning, NRTA, Radio and Television of the People's Republic of China (RTPRC-China) and ABU Technical Committee Vice-Chairman. Appointed as Panel Chairman in March 2019.



Mr Masashi Kamei
Senior Research Engineer, Nippon Hoso Kyokai (NHK-Japan) and Vice-Chairman ABU Technical Committee. Appointed a member of the panel in March 2019.



Mr Jamel bin Seman
Deputy DG (Broadcast Operation), Radio Televisyen Malaysia (RTM-Malaysia). Appointed a member of the panel in March 2019.



Peter Bruce
Director APAC, IABM. Appointed a member of the panel in June 2018.



Alexander Zink
Senior Business Development Manager Digital, Radio, Fraunhofer. Appointed a member of the panel in July 2018.



Naoki Kashimura
Director of the Board, Managing Director, Product Strategy & Marketing Division, Research & Development, Ikegami Tsushinki Co Ltd, Japan, appointed a member of the Panel in 2008.



Critical Spectrum Evaluation & Monitoring in Multi-Carrier Satellite Uplinks

Authors: Anuradha Agarwal, ADG(E) and Navneet Kaur, DDG(E)

Abstract

With the extensive expansion in satellite communication and with the installation of numerous Earth Station terminals and mobile DSN deployments it is pertinent to consider the impact of the interference and spurious emissions, on account of interaction among various independent uplinks. This article provides an outline of the critical radio frequency carrier monitoring and explores the problems encountered in satellite communication, attributed to nonlinear characteristics of the amplifiers, intermodulation products generated by the virtue of multiple carriers on the same transponder and the terrestrial interference caused by radio relays in the satellite network. The article also contemplates co-channel and the cross-channel interference in a satellite link and brings out the need for real time spectrum monitoring to resolve the issues in uplinking.

Key Words

Interference, Intermodulation Products, Nonlinearities, Spurious

1. INTRODUCTION

Prasar Bharati the Indian Public Service Broadcaster is the leader in Radio and Television Service Broadcasting with Content relay in almost all the Indian languages, along with support for Foreign Language services. With the increase in the deployment of radio frequencies for various services in addition to the broadcast service, issues of interference, nonlinearities and spurious uplinks have been reported. With 18.92 transponders of 40 MHz each, amounting to more than 755MHz spectrum bandwidth in C and KU band, it is crucial to resort to real time spectrum monitoring and control. Spectrum monitoring paves the way for resolving issues pertaining to power back-offs, spectrum re-growth and unauthorised uplinks in assigned bandwidth. It further provides a mechanism for the service operator to optimise uplink antennas and resolve polarisation errors in scenarios where multiple uplinks in single channel and

multiple channels have to be maintained. The article provides insight into the role of Radio Frequency Carrier Monitoring in ensuring uninterrupted and secure links.

The intricacy of the present satellite communication systems is governed by the architecture and the circuit parameters along with the milieu in which the system components are made operational. Television transmission for broadcast applications and as Digital Satellite News Gathering (DSNG) uplinks constituting the contribution carriers, operate at high data rates. In the present scenario the satellite link is established with complex digital modulations with information equipped with error handling capabilities. As the signal is not transmitted with data handshake, forward error protection mechanism and pulse shaping is incorporated, which increases the complexity of the transmitted signal. The transmission of the processed modulated signal is constricted by the limitations imposed by the available bandwidth and operational power.

The high data rate television signal which is to be transmitted via the satellite link is confined to operate at defined effective isotropic radiated power (EIRP). EIRP is limited by the power back-off conditions imposed by the satellite service provider. Back-off is an essential requirement

to contain the spectrum re-growth on account of inter-modulation products in multicarrier uplinks on the same transponder.

Due to increase in the terrestrial radio networks and associated data traffic, the uplink systems have to be designed to be operational in critical environments. The noise added to the link for link-budget is generally presumed to be Gaussian in nature which is not the case in the real world. Further an uplinking terminal has to ensure that no spurious emissions or any out of assigned band spurious interference is added to the radio frequency (RF) carrier being uplinked. It is essential to ensure that terrestrial microwave relays do not contribute to interference and spurious in the signal being uplinked.

The responsibility of the earth station operator essentially includes not only the desired power uplink for error free signal reception, but also measures to contain the uplink within prescribed limits. With a view to regulate and monitor the RF carriers it is essential for a broadcaster with multiple uplinks to develop a carrier monitoring facility which encompasses the basic requirement of the uplink confirming to the limits of power and bandwidth besides ensuring spurious emissions are not added to satellite links by the uplinks.

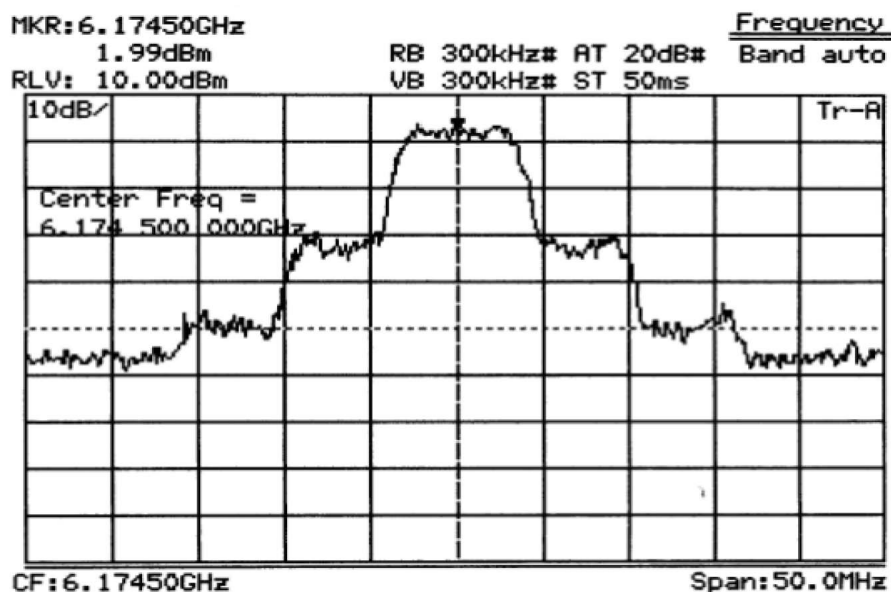


Figure 1, Observed Nonlinearity in a 400W TWTA

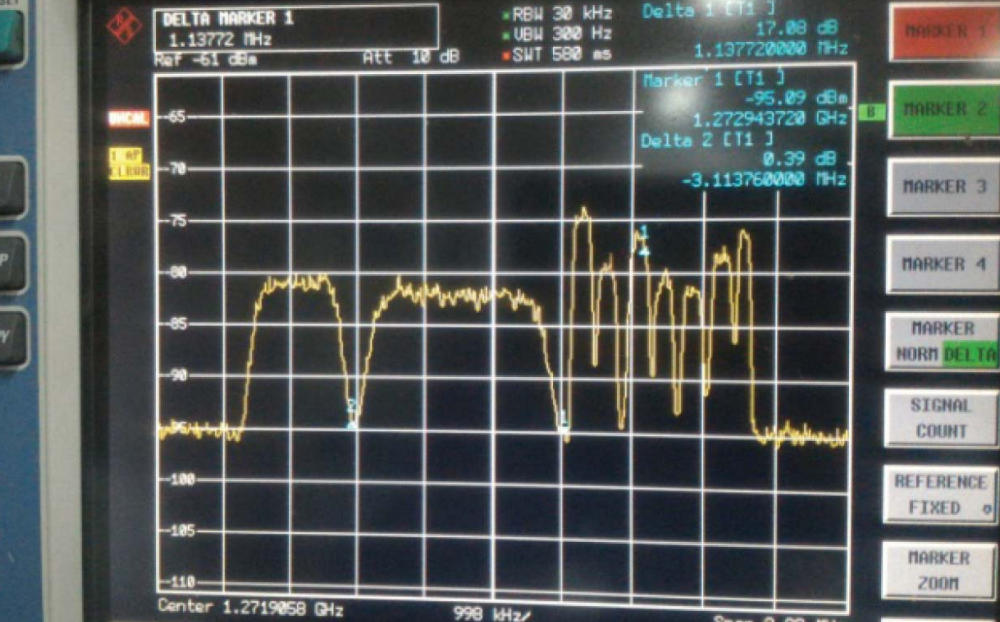


Figure 2, Multi Carrier operation on GSAT 18, with evident adjacent channel interference.

2. CO POLE INTERFERENCE

Co-pole interference is attributed to the signal on the same polarisation as the carrier frequency under consideration. This can be on account of nonlinearities generated in the uplink system, nonconformity with the back-off defined for the transponder or spurious interference generated on account of pickups or inherent causes. Any interference thus generated becomes a cause of degradation of the reception parameters of any service. It is essential for any satellite service operator to examine such interference, analyse and take remedial measures.

3. ADJACENT CHANNEL INTERFERENCE

When any uplink terminals operate near saturation for the HPAs, spectrum re-growth on account of nonlinear behaviour of the amplifiers is observed. Spectrum re-growth is a main cause of

interference in adjacent channels being uplinked on the same transponder. Variation in the noise floor beyond the defined signal bandwidth is attributed to such uplinks. The adjacent carriers require to operate at a higher power level to compensate for this degradation and to achieve their predefined link margin. Such deviation for the adjacent carrier then causes nonlinearities to affect the carrier of concern. **Figure 1** illustrates the effect of nonlinear operation for a 400W TWTA when driven to operate near saturation.

Variation in the noise floor and the interference in adjacent uplink slots is a cause of concern. Real time spectrum monitoring is an essential element for error free operation of a satellite network.

When multiple carriers operate on the same transponder additional cause of concern is the generation of the

intermodulation products. These drain the main carrier of primary power and generate interfering carriers in the close vicinity of the main uplinks leading to degradation in the link performance. The intermodulation products are contained within limits by operating the uplink RF signal at sufficient input back-off for the satellite on-board amplifier. These restrictions are imposed by the satellite service provider to ensure that the devices and the uplinked services do not exhibit nonlinearities and re-growth. Microwave applications require multiple carrier operation over the defined bandwidth. The power level at the output of each stage in the transmission chain requires being restricted in a manner that the output of the subsequent stage is not driven into saturation. It is also pertinent that the input stimuli for all equipment in the chain be decided, not in isolation, but after taking into consideration the generated spectrum at the output of the complete chain.

Any one carrier entering the nonlinear segment will cause degradation of the service carried by the adjacent carriers. The affected carrier, in order to establish link with sufficient link margin, would increase power, further adding to the nonlinearities.

The solution is discipline imposed on the uplinks in terms of defined power back-off and allotted bandwidth. Regular monitoring of the complete spectrum space can provide a real-time insight into the cause of the problem, essential for remedial measures. The **Figure 2** indicates multicarrier uplink with evident adjacent channel interference requiring power management.

4. PICKUP FROM TERRESTRIAL RELAYS

Another major cause of interference in the adjacent transponders of a given satellite is the pickups leading to spurious interference from FM Radio and other such terrestrial radio frequency relays.

The output of the modulator is standardised at 70MHz for a 40MHz transponder with 36MHz operational bandwidth. Terrestrial FM Radio relay frequencies are in the vicinity of this frequency. As the power of the relay is to a large extent more than the upconverter input, any spurious pickup at the modulator-upconverter link causes interference in the adjacent uplinks, spaced at a frequency difference which is equal to the difference between the modulator output and the frequency of the terrestrial radio relay. The added interference gets amplified in the uplink chain along with the main carrier. **Figure 3** provides an insight into the terrestrial FM radio pickup observed on the uplink on INSAT 4B.

Effect of performance variation observed for the link parameters with multicarrier uplink on a transponder is also an integral part of the carrier monitoring services so as to ascertain any nonlinear behaviour being exhibited by any earth station or DSNG in the network.

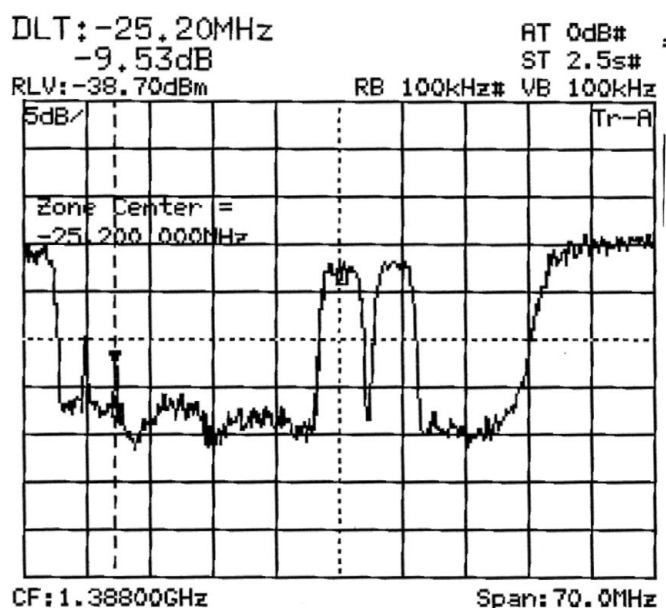


Figure 3, Observed FM radio interference on Transponder C#2 of INSAT 4B at a frequency offset of 25.2MHz from the QPSK modulated 6MHz carrier at L-band frequency 1.388GHz

5. CROSS POLE INTERFERENCE

The Earth station to Satellite interface is achieved by virtue of an uplink antenna. The need for optimum utilisation of the natural resource has lead to frequency reuse. The uplinks are defined with either linear or circular polarisation.

Any antenna polarisation errors give rise to interference in the opposite polarisation. Polarisation errors also appear as variation in the noise bed observed on the spectrum analyser. For the assessment of any service being uplinked to a satellite, the observed spectrum for the co-pole and the cross-pole has to be reviewed to take into account any interference on account of polarisation errors.

A link budget analysis for a given uplink also provides a comparison between the required power for the link attainment and the actual EIRP for the uplink terminal. Any increase over the required power indicates unaccounted losses in the system. In a majority of cases the loss with single carrier over the transponder in clear sky conditions is on account of the polarisation errors.

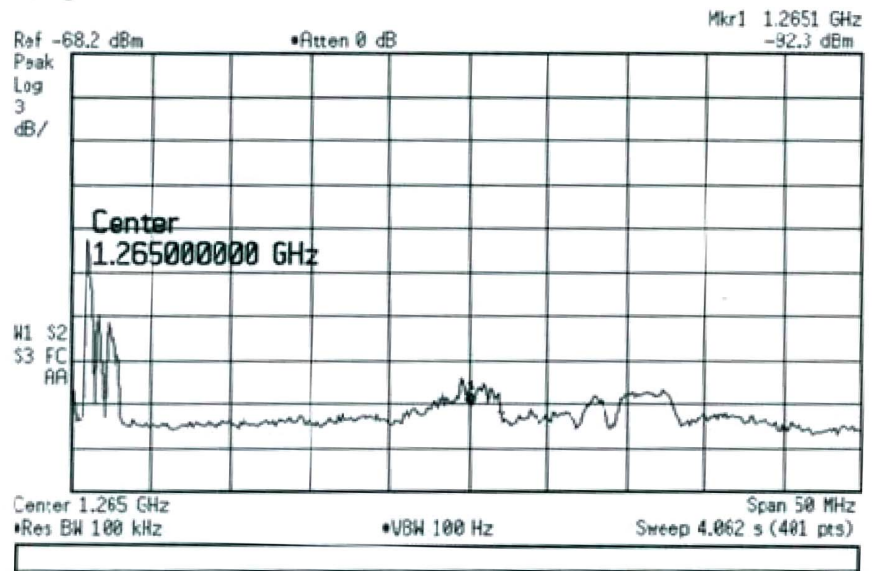


Figure 4, GSAT-10 downlink for C#5 Transponder, with no uplink

Such uplinks not only require the amplifiers to operate beyond the prescribed limit but also contribute towards spectrum re-growth, co-channel interference apart from the cross-pole interference generated. Polarisation error compensation is not only essential at the uplink terminal, but also at the receive node.

Observing the C#5 Transponder of GSAT-10 Satellite indicated that there is a bed-noise variation of around 2dB suggestive of cross-pole errors with the transponder appearing linear for operations as projected in **Figure 4**. Such cross-pole errors also require additional power to establish the link.

6. SPURIOUS INTERFERENCE

The Transponder of GSAT 8, when observed for suitability of operations for contribution carrier of Prasar Bharati, indicated excessive random spurious emissions varying in amplitude over a period of time. This dynamically varying noise, over the allotted transponder can drastically affect the DSNF Feeds and can cause a complete loss of signal due to excessive interference. Block errors will occur with digital data

transmission in forward error correction mode for broadcasting.

This transponder has issues with link reliability and data security and detection over noise is severely affected.

There is no improvement observed in the transponder downlink. The reported spurious interference observed over the transponder K#10 and the

adjacent transponder still persisted during extended period of observation. As already reported the nature of the spurious signal is random in nature when observed over a period of time.

The Downlink observed for K#10 transponder projects high level of spurious interference and random noise spikes of dynamic nature. The spectrums recorded are detailed herein under **Figure 5** and **6**.

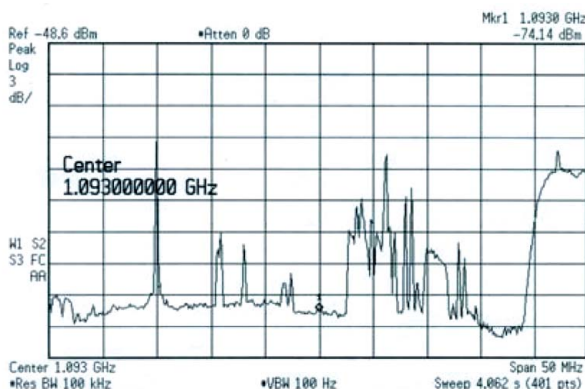


Figure 5, GSAT-8 downlink for K#10 Transponder

7. UNAUTHORISED UPLINK

Another cause of grave concern for a satellite link operator is the unauthorised uplinking on the idle frequency slots allotted to a service operator. Such a case was observed in the **K#15** transponder of INSAT 4B, interfering with the Doordarshan Uplink. A similar case has been observed on the of **K#17** transponder of the same satellite. The Space segment in the Ku-band spectrum allocated for the uplink from Todapur Earth Station for DTH services of Doordarshan is on **the INSAT 4B satellite, parking slot 93.5°E**. 2 MBPS carriers operating in the guard band between the transponder with nonlinearities hamper the main carrier operations. Prudent monitoring and decoding of the uplink are the only solution to check such problems. **Figure 7** delineates the unauthorised uplink.

* Agilent 11:02:18 45, 6665

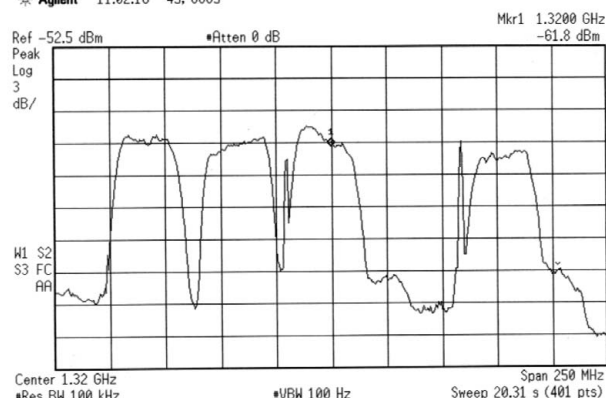


Figure 7, INSAT 4B downlink for K#13, K#14, K#15, K#16 & K#17 Transponder Interference observed in K#15 and K #17

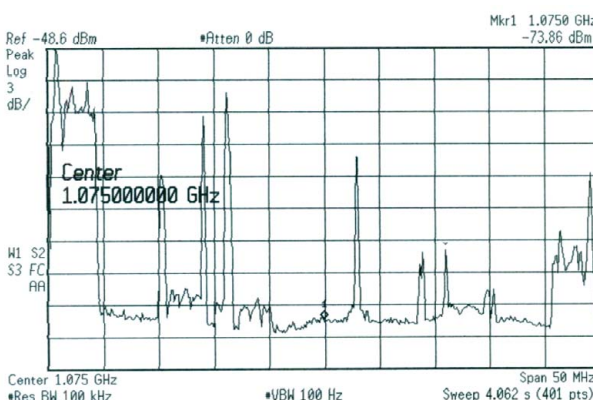


Figure 6, GSAT-8 downlink for K#10 Transponder

8. CONCLUSIONS

The role of a carrier monitoring facility in a satellite network with multiple uplinks is essential to ensure that any service being uplinked is within the prescribed limits and does not cause any interference to the co-channels and the cross-channels being uplinked on a given satellite.

Doordarshan India, the National Broadcaster is providing satellite television channels in all the major regional languages of the country and has ensured that the uplinks are monitored in the real time to avoid any interference and signal quality degradation. Site assessment to overcome any terrestrial pickup is ensured to avoid any spurious interference being contributed in the network. The facility assists in Antenna optimisation, link budget calculations and in the elimination of any RF interference.

Authors

Anuradha Agarwal, ADG(Engg.), DDI



Anuradha Agarwal, a member of the Indian Broadcast (Engineers) Service is currently Additional Director General (Engineering) in Doordarshan India (DDI), Research Department AIR & Doordarshan, and Technical Wing, Prasar Bharati Secretariat, New Delhi, has contributed immensely in the introduction of new technologies in broadcasting and technical inputs to International Conferences on Sound and Television Broadcasting. She has been closely associated with development of DTH Radio and DVB-T,2 Radio, as well as Telemetry System for MW/FM transmitters and reception surveys of various transmitters for AIR & TV.

Navneet Kaur, DDG(Engg.), DDI



Navneet Kaur, a member of the Indian Broadcast (Engineers) Service is currently Deputy Director General (Engineering) in Doordarshan India (DDI), Research Department AIR & Doordarshan, N Delhi, has specialized in Digital Communications. She has been part of the installation team for the first experimental Earth station in India for Direct to Home (DTH) Television services. She has designed and installed News Video contribution links over Dial-up ISDN circuits and has been associated with the Installation, Operations & Maintenance of Earth Station equipment. She has contributed towards the development of the Satellite Earth Station Carrier Monitoring facility of Doordarshan.



THE CHANNEL OF INDIA

Capturing the rich and diverse culture of India for the last 6 decades, Doordarshan has not only emerged the preferred choice of information and entertainment for over 1.2 billion Indians, but also a global leader in digital telecasting services offering over 34 channels.

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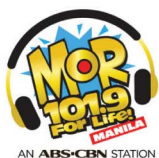


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Director of Engineering,
Beasley Media Group Detroit



This GV60 transmitter broadcasts HD Radio at MOR 101.9 For Life! Manila, an ABS-CBN station in the Philippines.

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PRODUCTION

There are a total of five projects 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. **Cyber Security**

For this reporting period (October 2018 to March 2019) we have not received any contributions from the projects. The following is the compilation of updates that are related with the project groups.

Topic Chairman:

Mr Kazim Pektas, Chief Engineer, Studio Planning Department, **Turkish Radio Television Corporation (TRT-Turkey)**



Period of Report:

October 2018 to March 2019

Date of Report:

8 March 2019

1. Project P/RTA (Radio & Television Archiving including Metadata)

New publications that are related to Metadata in EBU since last meeting:

Document: **EBU Tech 3293**

Title: **EBU Core Metadata Set v.1.9**

Release: **January 2019**

Summary: **EBU Core is the flagship of EBU metadata which provides a common set of metadata for describing TV and Radio content**

What's new in EBUCore 1.9? - EBUCore 1.9 provides a solution for dynamic acquisition metadata, a unique representation of the ITU BS2076 Audio Data Model (ADM). Now 'props', 'costumes', 'timed text', 'actions and emotions' (among others) can be associated with scenes, people or characters. High Dynamic Range static technical metadata and Virtual Reality flags have been added to the videoFormat element.

Document: **EBU Tech 3351**

Title: **EBU Class Conceptual Model (EBU CCDM) Ver. 2.1**

Release: **January 2019**

Summary: **EBU CCDM is an ontology defining a basic set of classes and properties as a common vocabulary to describe business objects, e.g. programmes, articles and other types of content, and their relations in the business processes of media enterprises.**

Another update concerns the FIMS project. FIMS is being continued in the EBU Media Cloud and Microservice Architecture (MCMA) project with a current focus on Artificial Intelligence. (MCMA-AI). MCMA is concentrating on REST interfaces, combined with the production of open source libraries to facilitate the wide range of workflows developed under the FIMS project.

2. Project P/UHDTV (Ultra High Definition TV)

Two publications have been released by EBU that are related to UHD. One of them concerns next generation audio and the other one concerns HDR:

Document: **EBU R 151**

Title: **Recommended Strategy For Adoption Of Next-Generation Audio (NGA) Technology**

Release: **December 2018**

The EBU, of the view:

- 'Next-generation Audio' (NGA) is the future of sound for many services, such as OTT, television and for other services, both accompanying television and for stand-alone applications;
- NGA offers creative and commercial opportunities for programme makers and a considerably enhanced Quality of Experience for consumers;
- NGA technology, if decided upon today, will be in use for many decades. It is therefore critically important to make careful technical and economically-sound choices now, for the sake of today's media and for future generations;

Document: **EBU TR 047**

Title: **Testing HDR Picture Monitors**

Release: **January 2019**

Scope: **The main goals of the testing exercise were to verify the parameters in EBU Tech 3320 [1] and the test methodology described in EBU Tech 3325 [2]. The tests also provided an impression of how well first generation high-end HDR picture monitors perform.**

3. (P/ITPS) Project IT-based Production System and file-based workflows

Document: **EBU TECH 3371**

Release: **December 2018**

Scope: **The Technology Pyramid for Media Nodes - (Minimum user requirements to build and manage an IP-based media facility).**

SPECTRUM

Introduction to the scope of the work:

This report is on the Topic Area Spectrum Issues which includes the related WRC-19 Agenda items concerning broadcasting service and ABU spectrum issues. The spectrum topic area covers 10 project topics, but we focus on the 6 most important topics.

Project Topic 1:

To consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution 766 [COM6/8] (WRC-15) (WRC-19 AI 1.3)

1. INTRODUCTION

WRC-15 approved agenda item 1.3 for WRC-19 is, "to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution 766 (WRC 15)".

Resolution 766 (WRC-15) resolves to invite WRC-19:

- i) to conduct and complete, in time for WRC-19, sharing and compatibility studies to determine the feasibility of upgrading the meteorological-satellite service (MetSat) (space-to-Earth) allocation to primary status, and the addition of a primary EESS (space-to-Earth) allocation in the frequency band 460-470 MHz, while protecting the primary fixed and mobile services to which the frequency band is already allocated and maintaining the conditions contained in No. 5.289;
- ii) to complete the studies, taking into account the present usage of the frequency band 460-470 MHz by incumbent services, to determine the appropriate pfd limit to be placed on MetSat (space-to-Earth) and EESS (space-to-Earth) to protect the existing primary services to which this frequency band is already allocated, provided that, if the studies conclude that a less restrictive pfd limit than that contained in considering further a) can protect incumbent services, then the pfd limit shall apply.

2. BACKGROUND

Frequency band 460-470 MHz is allocated to fixed and mobile services on a primary basis; meteorological-satellite service in this band is the secondary service. However, in accordance with Nos. 5290,

the allocation of the band 460-470 MHz to the meteorological-satellite service (space-to-Earth) is on a primary basis (see No. 5.33) in Afghanistan, Azerbaijan, Belarus, China, the Russian Federation, Japan, Kyrgyzstan, Tajikistan and Turkmenistan subject to agreement obtained under No. 9.21. Meanwhile, earth exploration-satellite service applications, other than the meteorological-satellite service, may also be used in the bands 460-470 MHz and 1 690-1 710 MHz for space-to-Earth transmissions subject to not causing harmful interference to stations operating in accordance with the Table, which is specified by Nos. 5.289.

WP 7B is responsible for this item and WP 4C, 5A, 5B, 5C, 5D, 6A are related parties. The last meeting was held on 14-18 May 2018 in Geneva and WP 7B completed the draft CPM text on WRC-19 Agenda Item 1.3 as Annex to the Chairman's Report. Based on the draft CPM text, the preliminary new draft Report ITU-R SA.[460 MHz METSAT-EESS] was updated without too many modifications due to the time limit.

The draft CPM text resulted in the development of pfd limit for non-GSO satellites and a separate pfd limit for GSO satellites that would protect the incumbent in-band and adjacent channel service operations.

3. STUDY PROGRESS

The draft CPM text report presented a pfd limit for non-GSO satellites and a separate pfd limit for GSO satellites that would protect the incumbent in-band and adjacent channel service operations, which was more stringent than 152 dBW/m²/4kHz.

The studies determined that the pfd limit for the downlink emission of non-GSO and GSO satellites as a function of the angle of arrival (α) are:

For non-GSO satellites:

$$pfd \text{ (dBW/(m}^2 \cdot 4\text{kHz))} = \begin{cases} -157 & 0^\circ \leq \alpha < 5^\circ \\ -157 + 0.5(\alpha - 5) & 5^\circ \leq \alpha < 15^\circ \\ -152 & 15^\circ \leq \alpha \leq 90^\circ \end{cases}$$

For GSO satellites:

Option 1:

$$pfd \text{ (dBW/(m}^2 \cdot 4\text{kHz))} = \begin{cases} -162 & 0^\circ \leq \alpha \leq 15^\circ \\ -162 + 0.5(\alpha - 15) & 15^\circ < \alpha < 35^\circ \\ -152 & 35^\circ \leq \alpha \leq 90^\circ \end{cases}$$

Option 2:

$$pfd \text{ (dBW/(m}^2 \cdot 4\text{kHz))} = -156 + 0.033 \times \alpha \quad 0^\circ \leq \alpha \leq 90^\circ$$

Chairperson:

Dr Leilei Li, Professor of Engineering, Academy of Broadcasting Planning, National Radio and Television Administration (NRTA-China)



Period of Report:

October 2018 to March 2019

Date of Report :

March 2019

There are two options for GSO satellites, and further studies are needed to conclude on a single mask.

It should be noted that some of the existing satellite systems, including those for which complete notification information or coordination requests were received by the Radiocommunication Bureau prior to the end of WRC-19, in 460-470 MHz band do not meet the above pfd limit masks. An appropriate arrangement is necessary to ensure that they can continue their operation in compliance with the provisions adopted at WRC-19. The CPM19-2 meeting was held in Geneva, Switzerland, 18-28 Feb. 2019. The CPM text for WRC-19 agenda item 1.3 has been completed.

There are three methods to satisfy the agenda item. Method A is 'No Change'. Method B proposes pfd limits to protect terrestrial services and a new resolution to provide the transitional measures for the existing Metsat/EESS frequency assignments. Meanwhile, Method B proposes to suppress RR No. 5.290. The difference between Method C and Method B is that whether pfd limits for both non-GSO and GSO MetSat/EESS satellites is included in a new Resolution or not.

For Regulatory and procedural considerations, both Methods modify the footnote 5.A13 as following: In the frequency band 460-470 MHz, earth stations in the meteorological-satellite service (space-to-Earth) and Earth exploration-satellite service (space-to-Earth) shall not cause harmful interference to, nor claim protection from, stations of the fixed and mobile services, and **shall not claim protection from broadcasting service in the adjacent bands.**

4. PRELIMINARY VIEWS

Item 1.3 was jointly proposed by CEPT and CITEL, with NOAA of the United States and French space agency CNES as the main drivers.

A number of broadcasting system types are widely used worldwide in the adjacent 470-862 MHz band. More detailed characteristics, parameters and protection criteria of the broadcasting system need to be reviewed and updated. The adjacent band analysis needs to be further studied for the sake of fully protecting the broadcasting system.

Project Topic 4:

to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 238 [COM6/20] (WRC-15) (WRC-19 AI 1.13)

1. INTRODUCTION

We are witnessing the rapid development of mobile broadband applications of International Mobile Telecommunications (IMT) systems and other mobile broadband systems in recent years. Therefore, Res. 233, "Studies on Frequency-related matters on IMT and other terrestrial mobile broadband applications" was modified on the 2015 World Radiocommunication Conference (WRC-15), and the studies were decided to be carried forward to next meeting as WRC-19 Agenda item 1.13 for further consideration and to develop the associated contributions.

The research of Agenda item 1.13 includes following issues:

- conduct and complete in time for WRC-19, the appropriate studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, taking into account;
 - technical and operational characteristics of terrestrial IMT systems that would operate in this frequency range, including the evolution of IMT through advances in technology and spectrally efficient techniques;
 - the deployment scenarios envisaged for IMT-2020 systems and the related requirements of high data traffic such as in dense urban areas and/or in peak times;
 - the needs of developing countries;
 - the time-frame in which spectrum would be needed;
- conduct and complete, in time for WRC-19, the appropriate above sharing and compatibility studies, taking into account the protection of services to which the band is allocated on a primary basis, for the frequency bands:
 - 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
 - 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

Since agenda item 1.13 is involved with ITU-R Study Groups 4, 5, 6 and 7, TG 5/1 was established to take charge of the research for this agenda item on CPM19-1 held in Geneva from 30 November to 1 December 2015.

2. DEVELOPMENTS OF TG 5/1 RESEARCH

As invited by CPM19-1, SG5 formed TG 5/1 at its first meeting on 9 June 2016 and adopted the Terms of Reference as provided in Annex 9 of Administrative Circular CA/226. TG 5/1 is tasked with conducting the sharing and compatibility studies for WRC-19 agenda item (AI) 1.13 and developing the draft CPM text of this agenda item.

The sixth/last meeting of ITU-R Task Group (TG) 5/1 was held in Geneva, Switzerland, 20-29 August 2018. The main objectives of the last meeting was to finish the draft CPM text for WRC-19 agenda item 1.13, while continuing to update the results of all sharing and compatibility studies. A total of 30 output documents were generated during the last TG 5/1 meeting which included the draft CPM text for WRC-19 agenda item 1.13. The apportionment of interference between services, which are subject to the TG 5/1 studies, were determined on a case-by-case basis based on the relevant information on interference protection criteria and apportionment provided by the corresponding expert Working Parties. Each study result indicates what level of apportionment was applied, together with the underlying rationale. At the same time, the following system parameters were discussed in detail during drafting the CPM text, such as IMT network loading factor, IMT protection criterion, application of the antenna pattern of the FSS space station, averaging of parameters in the simulations, application of Ra and Rb in the simulations, etc.. Of course, the sharing and compatibility studies were fully addressed at this meeting for IMT systems in all relevant frequency ranges, with services to which the bands are allocated on a primary basis. The CPM19-2 meeting was held in Geneva, Switzerland, 18-28 Feb. 2019. The CPM text for WRC-19 agenda item 1.13 has been completed.

3. PRELIMINARY VIEWS

After the last TG 5/1 meetings, there are no clear positions to be developed on the priority of candidate frequency bands. But, as in the preceding meeting, it is palpable that the sharing and compatibility studies on frequency range below 42GHz were addressed more than those above 40GHz, between IMT systems and other service, such as 24.25-27.5GHz and 37.5-42.5 GHz frequency bands. We need to focus on Item D: Frequency band 40.5-42.5 GHz, which is allocated to BROADCASTING and BROADCASTING-SATELLITE services. APT Members support identification of the frequency band 40.5-42.5 GHz, or portions thereof, for IMT, through Methods D2 in the draft CPM Report taking into account that protection of the incumbent services in these and adjacent frequency bands should be ensured by selecting an appropriate Option for each Condition under Methods D2 in the draft CPM Report.

Project Topic 6:

to consider the results of studies in accordance with Resolution 557 [COM6/9] (WRC-15), and review, and revise if necessary, the limitations mentioned in Annex 7 to Appendix 30 (Rev.WRC-12), while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and the List and the future development of the broadcasting-satellite service within the Plan, and existing and planned fixed-satellite service networks; (WRC-19 AI 1.4)

1. INTRODUCTION

WRC-15 approved agenda item 1.4 for WRC-19, to conduct studies on, review, and identify possible revisions to, if necessary, the limitations mentioned in Annex 7 to Appendix 30 (Rev.WRC-15), while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and in the List and the future of BSS networks in the frequency bands 11.7-12.2 GHz in Region 3, 11.7-12.5 GHz in Region 1 and 12.2-12.7 GHz in Region 2 and existing and planned FSS networks mentioned in the frequency bands 12.5-12.75 GHz in Region 1, 11.7-12.2 GHz in Region 2 and 12.2-12.75 GHz in Region 3.

BSS and FSS networks from different Regions may coexist, operate simultaneously and share orbit resource in their respective Regions.

Annex 7 to Appendix 30 (Rev.WRC-15) imposes limitations on the use of orbital positions by BSS assignments subject to Appendix 30 of different Regions and limitations on the use of the orbital arc between 37.2° W and 10° E by BSS Plan and List assignments of Regions 1 & 3 in order to preserve access to the geostationary-satellite orbit by the Region 2 fixed-satellite service in the band 11.7-12.2 GHz. Annex 7 to Appendix 30 contains no provisions concerning protection requirements/criteria related to BSS assignments subject to Appendix 30 in Regions 1 & 3 or Region 2.

WRC-15 adopted a new Resolution (Resolutions 557 (WRC-15)) to study possible revisions of the limitations mentioned in Annex 7 to Appendix 30 (Rev.WRC-12).

2. BACKGROUND

The content of this item has been discussed during the 2012-2015 study cycle and there is an Annex on this topic in the WP 4A Chairman's Report from last study cycle. That Annex contained a preliminary new draft Report ITU-R S.[FSS/BSS] "Review of the inter-regional sharing provisions contained in Annex 7 to RR Appendix 30." The topic needs to be further reviewed and revised in this study cycle.

3. STUDY PROGRESS

Last month, the CPM19-2 meeting was held in Geneva and the CPM Report to WRC-19 is approved.

There are two methods proposed under agenda item 1.4. Method A is No Change and Method B removes certain orbital limitations from Annex 7 of RR Appendix 30. The removal of limitations A1a) and A2a) is based on a compromise regulatory framework under which the Bureau would examine the coordination threshold with FSS pfd masks of Annex 4 of RR Appendix 30, at the BSS test points, for FSS and BSS orbital separations of less than 4.2 degrees, and at the BSS service area, for orbital separations greater than or equal to 4.2 degrees. Such compromise solution has no impact on Region 3. Views were expressed that the orbital separation of 4.2 degrees, should be larger to ensure the new Region 2 FSS is not negatively impacted, while others expressed the view that the orbital separation should be smaller to provide new Region 1 BSS more flexibility. However, it was agreed to propose the 4.2 degrees as a very delicate compromise between 2 and 10.57 degrees of FSS/BSS orbital separations. The document presents several scenarios of current limitations shown below:

TABLE 1 ANNEX 7 TO APPENDIX 30 (REV.WRC-12) LIMITATIONS

Annex 7 Limitation	Region and Service of interfering assignments	Region and Service of impacted assignments	Frequency band	Limitation description	Associated regulatory text
A1 (part a)	Region 1 BSS	Region 2 FSS (Atlantic)	11.7-12.2 GHz	No assignments in the Region 1 List further west than 37.2°W	Section A 1)
A1 (part b)		Region 2 FSS (Pacific)		No assignments in the Region 1 List further east than 146°E	
		Region 3 BSS subject to Appendix 30			
A2a	Region 2 BSS	Region 1 FSS (Atlantic)	12.5-12.7 GHz	No modification in the Region 2 Plan further east than 54°W	Section A 2) a)
A2b		Region 1 BSS subject to Appendix 30	12.2-12.5 GHz	No modification in the Region 2 Plan further east than 44°W	Section A 2) b)
A2c		Region 3 FSS	12.2-12.7 GHz	No modification in the Region 2 Plan further west than 175.2°W	Section A 2) c)
		Region 1 BSS	12.2-12.5 GHz		
		Region 1 FSS (Pacific)	12.5-12.7 GHz		
A3 (part a)	Region 1 BSS	Region 2 FSS	11.7-12.2 GHz	No assignments in the Regions 1 & 3 List outside specific allowable portions of the orbital arc between 37.2°W and 10°E	Section A 3)
A3 (part b)				Max. e.i.r.p. of 56 dBW for assignments in the Regions 1 & 3 List at specific allowable portions of the orbital arc between 37.2°W and 10°E	
A3 (part c)				Max. power flux density of -138 dB(W/(m².27 MHz) at any point in Region 2 by assignments in the Regions 1 & 3 List located at 4°W and 9°E	
B	Region 2 BSS	Region 2 BSS	12.2-12.7 GHz	Required agreement of administrations having to space stations in the same cluster when an administration may locate a satellite within this cluster	Section B

Method B: Deletion of some limitations of Annex 7, addition of draft new Resolutions [A14-LIMITA3] (WRC-19), [B14-PRIORITY] (WRC-19), [D14-ENTRY-INTO-FORCE] (WRC-19) and application of draft new Resolution [C14-LIMITA1A2] (WRC-19) with revised criteria for protection of new BSS networks with respect to limitations "A1a" and "A2a"

This method proposes to delete the following limitations of Annex 7 to RR Appendix 30:

- limitations "A1a" and "A2a" and the application for cases of certain orbital separations between new FSS and new BSS networks of draft new Resolution [C14-LIMITA1A2] (WRC-19) with revised criteria for protection of new BSS networks;
- limitations "A2b", "A3b", "A3c";
- limitations "A3a" accompanied by draft new Resolution [A14-LIMITA3] (WRC-19) to guarantee the protection of frequency assignments with earth

station receiving antenna size smaller than 60cm (40cm and 45cm), in accordance with the criteria of RR Appendix 30 (Rev.WRC-15).

This method proposes to retain limitations "A1b", "A2c" and "B". This method also proposes the application of draft new Resolution [B14-PRIORITY] (WRC-19) after the removal of the relevant limitations in Annex 7 to RR Appendix 30 (Rev.WRC-15), giving priority to national assignments in the Regions 1 and 3 Plan with equivalent downlink protection margin values equal or below -10 dB.

Considering the importance of this draft new Resolution [B14-PRIORITY] (WRC-19) to help administrations to improve equitable access to satellite orbit resources by providing priority to administrations with a degraded reference situation, this method proposes to apply as of 23 November 2019 the revised Annex 7 of RR Appendix 30. To this effect, a revision of RR Article 59 and a draft new Resolution [D14-ENTRY-INTO-FORCE] (WRC-19) are proposed.

In addition, this method proposes suppression of Resolution 557 (WRC-15).

A special procedure is proposed for some administrations in Regions 1 and 3 with:

- a) no frequency assignments included in the List or for which complete Appendix 4 information has been received by the Bureau in accordance with the provision of § 4.1.3 of Appendix 30; and
- b) an assignment in the Regions 1 and 3 Plan of Appendix 30 when the equivalent downlink protection margin (EPM) value corresponding to a test point of its national assignment in the Regions 1 and 3 Plan is equal or below -10 dB for at least 50% of the total number of EPM values of the assignment in the Regions 1 and 3 Plan in Appendix 30.

These administrations have the priority to send submissions at an orbital position of orbital arcs for which the Annex 7 to Appendix 30 (Rev.WRC-15) limitations were suppressed by WRC 19 and the special procedure is applied as of 23 March 2020 and for a period until 21 May 2020.

As of 23 November 2019 and for a period until 21 May 2020, other submissions which not meeting the specified requirements of special procedure at an orbital position within orbital arcs for which the Annex 7 to Appendix 30 (Rev.WRC 15) limitations were suppressed by WRC 19 shall be considered as received by BR on the 22 May 2020.

4. PRELIMINARY VIEWS

The scenario of the orbital position limitation is limited in Region 1 and 2, as well as within the orbital arc of the geostationary-satellite orbit between 37.2° W and 10° E in Region 3.

The compatibility studies between BSS assignments subject to RR Appendix 30 within Regions 1 and 3 were discussed in the meeting, so we should follow developments in ITU-R WP 4A in respect of the revision of Annex 7 to AP30 and assess possible impact on BSS in Region 3. It should be noted that “the compromise solution (in Method B) has no impact on Region 3” is present in CPM report.

Project Topic 8:

Compatibility of International Mobile Telecommunications and broadcasting satellite service (sound) in the frequency band 1452-1492 MHz in Regions 1 and 3 (WRC-19 AI 9.1.2)

1. INTRODUCTION

Pursuant to Resolution 761 (WRC-15), the regulatory and technical studies between International Mobile Telecommunications (IMT) and the broadcasting-satellite service (sound) (BSS (sound)) in the frequency band 1 452-1 492 MHz in Regions 1 and 3 were conducted by ITU-R, taking into account IMT and BSS (sound) operational requirements.

The purpose of the studies is to respond to the resolves to invite ITU-R as contained in Resolution 761 (WRC-15) in order to enable WRC-19 to decide on the matter, as appropriate.

Currently, RR No. 9.19, inter alia, applies with respect to the coordination for potential interference from IMT systems into the BSS (sound) receivers across the border between different countries within the satellite network service area. At the same time, RR No. 9.11 applies currently with respect to the coordination for potential interference from a BSS (sound) space station into IMT receivers. In addition, associated Resolutions 33 (Rev. WRC-15), 507 (Rev.WRC-15) and 528 (Rev.WRC-15) apply. On this basis, the coordination and power flux-density limit solutions are currently in consideration,

noting that maintaining the status quo (i.e. no changes to the Radio Regulations) is also a solution.

2. BACKGROUND

The frequency band 1 452-1 492 MHz is allocated to the fixed service (FS), mobile service (MS), broadcasting service (BS) and broadcasting-satellite service (BSS). Based on the outcome of WRC 15, the frequency band 1 452-1 492 MHz is identified for use by Regions 1 and 3 administrations wishing to implement IMT in accordance with Resolution 223 (Rev.WRC-15) and Resolution 761 (WRC-15) (see RR Nos. 5.346 and 5.346A).

Based on the ITU BR database, there are many satellite network filings submitted for coordination in the frequency band 1 467-1 492 MHz in which the orbital positions of the space stations are distributed globally in the GSO. Some of these satellite networks are operational and their frequency assignments are already recorded in the Master International Frequency Register (MIFR). To this effect, in order to avoid retroactive impact on the BSS (sound), necessary transitional measures are required to be decided by the conference.

On the other hand, for the protection of IMT, as indicated in recognizing c) in Resolution 761 (WRC 15), the application of RR No. 9.11 does not provide long-term stability for the operation of IMT due to the fact that only the IMT systems that would come into operation within the next three years would be protected if their coordination is agreed, and only for those three years. This situation implies that IMT systems may not be protected appropriately in those countries planning to deploy them in future, if the territory of those countries were covered by a satellite network service area provided by another country's BSS (sound) system(s).

3. STUDY PROGRESS

Last month, the CPM19-2 meeting was held in Geneva and the CPM Report to WRC-19 is approved.

During the ITU-R studies, it was agreed that the I/N ratio of -12.2 dB be used as the protection criteria for BSS (sound) receiver, and can be treated as the BSS (sound) receiver protection requirement from IMT single-entry interference across national borders. With respect to the characteristics of IMT systems to be used for sharing and compatibility studies, the parameters of IMT base stations and mobile stations are defined in the Report ITU-R M.2292 in which the I/N of the protection criterion for IMT base stations and mobile stations is -6 dB, respectively. In the sharing and compatibility studies, Recommendation ITU-R M.2101 - Modelling and simulation of IMT networks for use in sharing and compatibility studies may be used.

There are nine actions proposed under agenda item 9.1 issue 9.1.2.

Possible action 1:

Maintain status quo (i.e. no changes to the Radio Regulations)

This action proposes to maintain the status quo (i.e. no changes to the Radio Regulations) since the current regulations and technical conditions to ensure compatibility of IMT and BSS (sound) in the frequency band 1 452-1 492 MHz in Regions 1 and 3 are sufficient and change is not required.

Possible action 2:

Maintain status quo (i.e. no changes to the Radio Regulations) for those countries for which the frequency band is not identified for IMT

This action proposes to maintain the status quo (i.e. no changes to the Radio Regulations) with respect to the countries for which the frequency band is not identified for IMT. With respect to the countries where IMT is identified the modifications to current provisions can be applied in the Radio Regulations appropriately.

Possible action 3:**Maintain status quo (i.e. no changes to the Radio Regulations) for the protection of BSS (sound) and stipulate pfd limits for the protection of IMT in Regions 1 and 3**

This action proposes to maintain the status quo (i.e. no changes to the Radio Regulations) for the protection of the BSS (sound) receivers and to stipulate pfd limitation to BSS (sound) space stations for the protection of IMT in Regions 1 and 3. Alternatives 1 and 2 stipulate the pfd limit(s) in RR Table 21-4 under RR No. 21.16, taking into account protection of IMT, pursuant to Resolution 761 (WRC-15).

In addition, alternative 3 stipulates the pfd limit(s) in a new footnote, taking into account the operational requirement of BSS (sound) system pursuant to Resolution 761 (WRC-15).

Possible action 4:**Maintain status quo (i.e. no changes to the Radio Regulations) for the protection of BSS (sound) and stipulate pfd limits for the protection of IMT in some countries of Regions 1 and 3**

This action proposes to maintain the status quo (i.e. no changes to the Radio Regulations) for the protection of the BSS (sound) receivers and to stipulate pfd limitation to BSS (sound) space stations for the protection of IMT in some countries of Regions 1 and 3, specified in RR Nos. 5.346 and 5.346. Alternatives 1 and 2 stipulate the pfd limit(s) in RR Table 21-4 under RR No. 21.16, taking into account protection of IMT, pursuant to Resolution 761 (WRC-15).

In addition, alternative 3 stipulates the pfd limit(s) in a new footnote, taking into account the operational requirement of BSS (sound) system pursuant to Resolution 761 (WRC-15).

Possible action 5:**Maintain status quo (i.e. no changes to the Radio Regulations) for the protection of IMT and stipulate pfd limits for the protection of BSS (sound) in Regions 1 and 3**

This action proposes to maintain the status quo (i.e. no changes to the Radio Regulations) for the protection of IMT stations and to stipulate pfd limitation to IMT for the protection of the BSS (sound) receivers by modification of RR Nos. 5.346 and 5.346A.

Possible action 6:**Stipulate pfd limits for the protection of both IMT and BSS (sound) in Regions 1 and 3**

The protection of IMT stations is the same as that in possible action 3. The protection of BSS (sound) receivers is the same as that in possible action 5.

Possible action 7:**Stipulate pfd limits for the protection of both IMT and BSS (sound) in some countries of Regions 1 and 3**

The protection of IMT stations is the same as that in possible action 4. The protection of BSS (sound) receivers is the same as that in possible action 5.

Possible action 8:**Stipulate a new coordination threshold for the protection of both IMT and BSS (sound) in Regions 1 and 3**

This action proposes to stipulate a coordination threshold for RR Nos. 9.11 and 9.19 based on new pfd values to reach coexistence for protection of BSS (sound) and IMT in Regions 1 and 3.

Possible action 9:**Stipulate a new coordination threshold for the protection of both IMT and BSS (sound) in some countries of Regions 1 and 3**

This action proposes to stipulate a coordination threshold for RR Nos. 9.11 and 9.19 based on new pfd values to reach coexistence for protection of BSS (sound) and IMT in some countries of Regions 1 and 3, specified in RR Nos. 5.346 and 5.346A.

It should be noted that the possible action 2/4/7/9 is causing a dispute as to whether the countries for which the frequency band is not identified for IMT, can implement IMT or not.

4. PRELIMINARY VIEWS

We need to follow developments in ITU-R WP 4A and WP 5D in respect of compatibility of International Mobile Telecommunications and broadcasting-satellite service (sound) in the frequency band 1 452-1 492 MHz in Regions 1 and 3 before WRC-19 meeting.

Project Topic 10:

Assess the impact of WPT for electric vehicles on radiocommunication services and study suitable harmonised frequency ranges of WPT for electric vehicles which would minimise the impact on radiocommunication services (WRC-19 Agenda Item 9.1, Issue 9.1.6)

1. INTRODUCTION

The impacts of WPT-EV charging applications were not sufficiently known, and in particular, the use of high transmission power was thought to potentially create disturbances that would affect existing radio systems or services. In order to examine any possible impact of WPT-EV charging on radiocommunication services, WRC-15 decided, via its Resolution 958 (WRC-15) Annex item 1 a) and b), that ITU-R should study this impact and suitable harmonised frequency ranges to minimise it. This was deemed one of the urgent studies required in preparation for the World Radiocommunication Conference 2019 (WRC-19). As such, CPM19-1 identified this item as issue 9.1.6, to be considered under WRC-19 agenda item 9.1.

2. BACKGROUND

WPT technologies are being developed to support the easy and fast transfer of power wirelessly. WPT-EV is becoming an important charging technology, which aims to reduce the size of vehicle batteries and consequently improve their practical driving distance. Recommendation ITU-R SM.2110 addresses WPT technologies in general. Due to the necessary power and capacities of the batteries, low-power WPT will not be relevant for WPT-EV charging purposes.

Project Topic 9:

to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention (WRC-19 AI.10)

The CPM19-2 meeting was held in Geneva, Switzerland, 18-28 February 2019. The CPM text for WRC-19 agenda item 10 has been completed. There are two following preliminary agendas we need to pay attention to:

- 2.2** to conduct, and complete in time for WRC-23, studies for a possible new 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, in accordance with Resolution 656 (WRC-15); Resolution 656 (WRC 15): Possible allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders in the range of frequencies around 45 MHz.

This agenda is related to the frequency band of broadcasting service.

- 2.5** 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); Resolution 235 (WRC 15): Review of the spectrum use of the frequency band 470-960 MHz in Region 1.

Although it is only related to Region 1, we need to pay attention to, and track this proposal because of the neighboring countries in Region 3.

Throughout all Regions, some administrations have already implemented national approaches to allow for WPT-EV charging. Notably, the power level required to charge the battery of an electric vehicle depends on the vehicle's use case. The power categories and frequency ranges studied for WPT-EV are summarised in Table 1.

Table 1 : Frequency bands and power levels studied for WPT-EV

Categories	Power Level	Frequency band	Applications
High Power WPT	22 kW – 120 kW	19-25 kHz	Specific heavy-duty electric vehicles (e.g. Bus, Tram, Truck)
High Power WPT	22 kW – 120 kW	55-65 kHz	Specific heavy-duty electric vehicles (e.g. Bus, Tram, Truck)
Medium Power WPT	3.3 kW – 22 kW	79-90 kHz	Generic light-duty electric vehicles

These frequency bands are allocated to the following services: Fixed, Maritime Mobile, Standard Frequency and Time Signal (SFTS), Radionavigation, Maritime Radionavigation, and Radiolocation. Other services such as sound broadcasting may also be affected by unwanted emissions, including harmonics, and receiver blocking from WPT-EV.

3. STUDY PROGRESS

Last month, CPM19-2 meeting was held in Geneva and the CPM Report to WRC-19 is approved. A number of studies were undertaken to assess the possible impact of WPT-EV transmissions on existing sound broadcasting services.

These studies entailed conducting analyses based on the protection criteria for AM broadcast reception and on possible separation distances in the case of WPT-EV chargers used for generic light-duty electric vehicles. The studies considered that it is likely that WPT-EV would be located at minimum separation distances of 1 and 3 meters from an AM broadcast receiver. The studies also found that mitigation would be required to protect AM broadcasting in cases where the unwanted emissions would need to be reduced and/or WPT-EV would need to operate, with enhanced stability and purity, on specific frequencies such that the corresponding harmonics fall in frequencies that reduce the impact on AM broadcast reception, taking into account the AM channel rasters.

Other studies - including a field interference test, a theoretical analysis, and Monte Carlo simulations - were performed in some urban areas with high levels of the both wanted broadcast signal and environment noise floor. They showed that higher levels of WPT-EV emissions may be tolerated by AM receivers in such environments. For other scenarios, such as suburban and rural areas, mitigating the interference would require increased separation distances between the WPT EV equipment and the AM broadcast receiver.

More precisely, 2nd to 21st order harmonics of WPT-EV systems may fall in the frequency range of LF and MF sound broadcasting services. Two approaches for compatibility between WPT-EV systems and sound broadcasting systems are described in Report ITU-R SM.2303-2. The first approach is based on existing ITU-R - protection criteria for AM broadcasting signal. The second approach is based on the criteria that WPT-EV harmonic emissions falling in the LF or MF broadcasting bands should be kept below the environmental noise levels.

Based on the provisions of Recommendations ITU-R BS.703 and ITU-R BS.560, the first approach derives tolerable interference levels of -44 dBμA/m in the LF broadcasting band (148.5-283.5 kHz) and -51 dBμA/m in the MF broadcasting band (526.5-1606.5 kHz) at the location of the receiver. If the interferer (including harmonic emissions) is a plain, un-modulated sinusoid with good spectral purity and is accurately co-incident in frequency (within +/- 50 Hz) with the victim radio service, these levels can be relaxed by 38 dB.

Based on the environmental noise levels derived from Recommendation ITU-R P.372-13, the second approach derives tolerable interference levels of -25.5 dBμA/m in Cities, -30.5 dBμA/m in residential areas, -34.5 dBμA/m in rural areas, and -48.5 dBμA/m in quiet rural areas, at 500 kHz, at the location of receiver. The results of some measurements show that environmental noise levels in some cities and residential areas are significantly higher than the above levels.

ITU-R is developing recommendations on limits required for the protection of radiocommunication services from WPT, including WPT-EV.

Methodology and guidance to administrations are/will be included in several ITU-R documents:

- appropriate bands are specified in preliminary draft revision of Recommendation ITU R SM.2110-0;
- limits on unwanted emissions, including harmonics, are expected to be specified in a new ITU-R Recommendation; and
- results of related studies and examples of existing national implementations throughout the Regions are provided in Report ITU-R SM.2303-2 and WDPDN Report ITU-R SM.[WPT-SPEC-MNGM].

4. PRELIMINARY VIEWS

Consequently, there is no activity related to WRC-19 to amend the RR in CPM report. The exact limits and mitigation techniques, as well as potential other matters, still need to be defined through further studies. The ITU-R will need to continue to closely collaborate with SDOs. This is to ensure that appropriate frequency ranges and technical limits are incorporated into standards to protect radiocommunication services, especially sound broadcasting.

TRANSMISSION

Introduction

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

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

Project Manager:

Mr. Kazuhiro KUMAMARU (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"

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"

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

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

Chairperson:

Mr Kenichi Murayama,
Senior Manager, Planning
& Management Division,
Engineering Administration
Department, **Nippon Hoso Kyokai**
(NHK-Japan)



Period of Report:

October 2018 to November 2019

Date of Report :

8 March 2019

1.2. Latest ASO situations in the region

1.2.1 Singapore

Singapore transitioned from analogue to digital television (DTV) at midnight on 1 Jan 2019, paving the way for better quality pictures, superior sound, multi-language subtitles and electronic programme guides. Singapore is among the latest countries to go digital, joining the likes of the United States, Canada, Japan and South Korea, as part of a global trend.

The Infocomm and Media Development Authority (IMDA) said that over 90 per cent of Singapore's households were DTV ready.

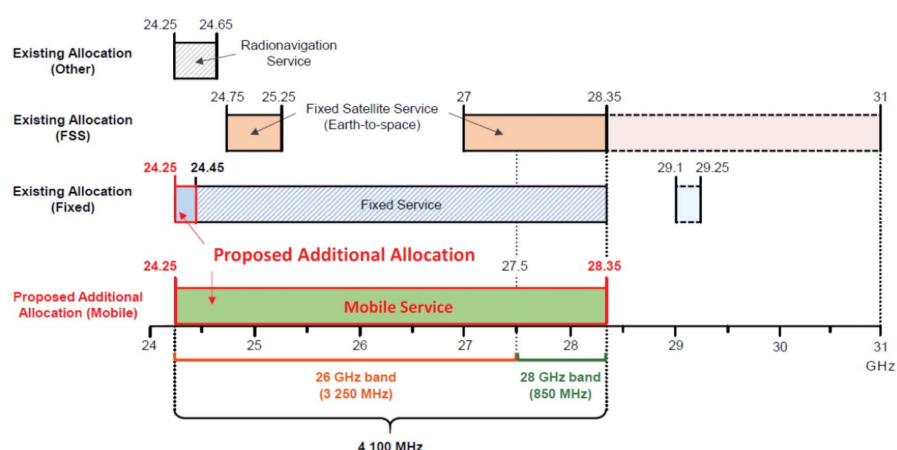
Source: https://www.abu.org.my/Latest_News-@-Analogue_TV_signals_in_Singapore_turned_off.aspx

1.3 Latest topics concerning frequency policies in the world

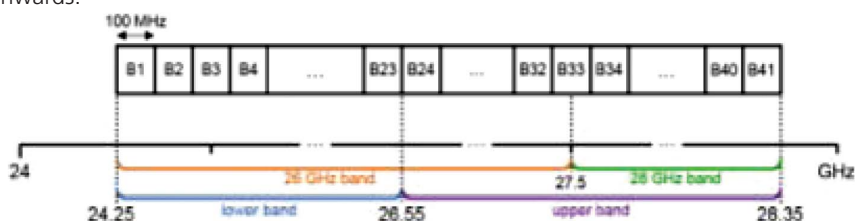
1.3.1 Hong Kong frequency planning status

1.3.1.1 26 GHz and 28 GHz band

The Communications Authority (CA) and the Secretary for Commerce and Economic Development ("SCED") jointly published a statement in December 2018 to promulgate the decisions of the CA on allocation of the 4100 MHz of spectrum in the 26 GHz band (24.25 - 27.5 GHz) and the 28 GHz (27.5 - 28.35 GHz) band for provision of large scale public mobile services and the related spectrum utilisation fee after conducted a public consultation in August 2018. Details of 4100 MHz bandwidth band plan was as below:



The application was now in progress. The successful applicants would be granted a Universal Carrier Licence to effect the spectrum assignment for use from 1 April 2019 onwards.



1.3.1.2 3.3 GHz and 4.9 GHz band

For 5G spectrum below 6 GHz, CA and SCED also promulgated the arrangement of an extra of 200 MHz in 3.3 GHz bands (3.3-3.4 GHz) and 4.9 GHz bands (4.83-4.93 GHz) for in-door and territory-wide usage, which further extended coverage due to constraints of 26/28 GHz and 3.5 GHz. To match this arrangement, CA decided to amend the 3.3 GHz and 4.9 GHz bands to mobile services on a co-primary basis, in addition to the respective existing uses, with effect from 1 January 2019. CA targeted to conduct the auctions of the 3.3 GHz and 4.9 GHz bands in around July/August 2019.

1.3.1.3 3.5 GHz band

For assignment of the spectrum for 3.5 GHz band (3.4-3.6 GHz), a total of 200 MHz bandwidth would be divided into 20 frequency blocks, each of 10MHz. In line with the existing licensing regime for the provision of public mobile services, new entrant or incumbent operators who successfully bid for the 3.5 GHz spectrum would be granted a new Unified Carrier Licence to effect the assignment of the successfully acquired frequency blocks of the 3.5 GHz spectrum from 1 April 2020, with a validity period of 15 years. CA decided that each successful bidder should be required to provide a minimum coverage of 45% of the population, within five years from the granting of the licence. An auction for assignment of the 3.5 GHz spectrum would targeted for around July/August 2019.

Source: Information courtesy of OFCA press release

1.3.2 5G spectrum auction results in Italia

The Italian government recently completed its sale of wireless spectrum earmarked as suitable for future 5G services. The auction ran for 14 days and saw 171 rounds of bidding, raising over €6.55 billion. This was more than €4 billion higher than the government's minimum target and the high prices paid for frequencies raised eyebrows - and not just in Italy.

Spectrum was made available in the 700MHz (694MHz-790MHz), 3.7GHz (3.6GHz-3.8GHz), and 26GHz (26.5GHz-27.5GHz) bands. Two blocks of 80MHz and two of 20MHz were sold in the 3.7GHz band, with a spectrum cap of 100MHz per operator. In the 700MHz band, six paired 5MHz blocks were on offer, with two paired blocks (2x10MHz) reserved for a new entrant. The 26GHz spectrum was split into five lots of 200MHz. Licenses are valid until 2037, although the 700MHz frequencies won't be opened until July 2022. Seven firms pre-qualified for the auction. This included cellular operators Telecom Italia

(TIM), Wind Tre, Vodafone, and Iliad, as well as ISPs Fastweb and Linkem, plus wholesale network operator Open Fiber. At the start of bidding in September, only the four cellcos and Fastweb remained as auction participants. TIM was the highest bidder, offering a total of €2.41 billion for 700MHz, 3.7GHz, and 26GHz spectrum, while Vodafone submitted a bid of €2.40 billion for frequencies in the same three bands.

Band	Winning Bidder	Price (€m)	Spectrum Won
700MHz	Vodafone	683.2	20MHz
	TIM	680.2	20MHz
	Iliad	676.5	20MHz
3.7GHz	TIM	1694.0	80MHz
	Vodafone	1685.0	80MHz
	Wind	483.9	20MHz
	Iliad	483.9	20MHz
	TIM	33.0	200MHz
26GHz	Iliad	32.9	200MHz
	Vodafone	32.6	200MHz
	Wind	32.6	200MHz
	Fastweb	32.6	200MHz

Source: <https://blog.telegeography.com/italian-5g-auction-causes-concern>

1.3.3 5G spectrum auction results in Sweden

The Swedish Post and Telecom Agency (Post & Telestyrelsen, PTS) has announced that Telia and Net4Mobility have won frequencies in its sale of 700MHz spectrum for future 5G services. The auction raised a total of SEK2.82 billion (USD311.9 million). Telia agreed to pay SEK1.38 billion for 2x10MHz blocks of spectrum, with its concession including a minimum

coverage requirement. Net4Mobility, the infrastructure joint venture (JV) of Swedish cellcos Tele2 and Telenor, offered SEK1.44 billion for two lots of 2x5MHz with no coverage obligations. The licences are valid until December 2040.

The smallest of the country's mobile network operators (MNOs), Hi3G Access (Tre), participated in the auction but did not win spectrum. The operator, which is 60% owned by Hong Kong-based group CK Hutchison, had previously complained that the terms of the auction favoured its larger rivals.

The second stage of the auction will see the winning bidders go head-to-head to determine their final frequency allocations, while four 5MHz lots of unpaired supplemental downlink (SDL) spectrum will also be up for grabs.

Telenor and Tele2 say they will begin rolling out their joint 5G network in the second half of next year, with plans to launch commercial services in 2020. The deployment will initially concentrate on Sweden's main cities and tourist resorts. Telia is also looking at a 2020 launch date.

Band	Winning Bidder	Price (SEK Billion)	Spectrum Won
700MHz	Telia	2.82	20MHz (2x10MHz)
	Net4Mobility	1.44	10MHz (2x5MHz)
			10MHz (2x5MHz)

Source: <https://www.telegeography.com/products/commsupdate/articles/2018/12/11/swedens-700mhz-5g-auction-raises-usd312-million/>

Project: Next Generation Terrestrial Broadcasting (T/NGTB)

Project Manager:

Mr. Masahiro Okano (NHK, Japan)

Co-project Manager:

Mr. LEE Jae Kwon (KBS, Korea)

Mr. Halil US (TRT, Turkey)

Mr. M S Duhan (DDI, India)

Mr. Chen Delin (SARFT, China)

Mr. Ozgur COSAR (TRT, Turkey)

2.1 Investigate efforts toward the realisation 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 utilise new technologies that expand transmission capacity, such as higher order modulation (4096-QAM), orthogonal frequency-division multiplexing (OFDM), and dual-polarised multiple-input multiple-output (MIMO).

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

2.1.2. 8K-UHDTV field experiments in Hitoyoshi(2x2 MIMO transmission system)

Japan has installed an experimental transmitting station in Hitoyoshi city, Kumamoto prefecture that uses dual-polarised MIMO and ultra-multilevel OFDM technologies in January 2014. Two 8K field experiments were conducted there: a transmission test and field measurements around Hitoyoshi.

Here, Japan reports the results of these experiments, including the required field strength when using 4096-QAM carrier modulation and a channel response analysis of dual-polarised MIMO transmission.

Figure 2.1.1 is a block diagram of the modulator and demodulator used in the experiments. The input signal is coded with BCH code and low density parity check (LDPC) code, bit interleaved and mapped onto the constellation. After that, the signal is divided into two signals (one for horizontal polarisation and the other for vertical) with 3D interleave (time, frequency and inter-polarisation). The signals are then converted into time domain signals by inverse fast Fourier transform (IFFT) and guard intervals (GI) are added.

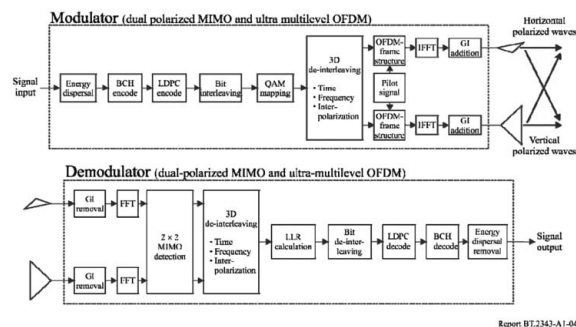


Figure 2.1.1
Block diagram of 8K experiments

2.1.3. 8K-UHDTV SFN field experiments in Hitoyoshi (2x2 MIMO STC-SFN transmission system)

In February 2015, Japan conducted 8K-UHDTV single frequency network (SFN) field experiments using two transmission stations to form a 2x2 MIMO Space Time Coding (STC)-SFN system. In this field experiment, the STC method was employed to improve the reliability of high data rate transmission.

Figure 2.1.2 shows the outline of a 2x2 MIMO STC-SFN system formed by two experimental stations, namely, the Hitoyoshi and Mizukami stations. The distance between the two stations is 38 km. Both stations use dual-polarised space division multiplexing (SDM) MIMO. The Mizukami station became operational in 2015 and was connected to the Hitoyoshi station by a transmitter link (TTL) in the super high frequency (SHF) band.

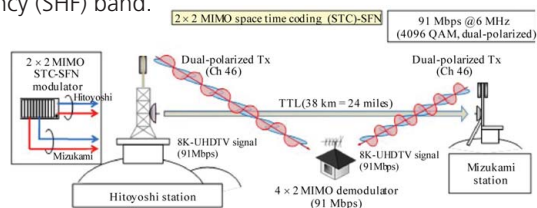


Figure 2.1.2
Outline of a 2x2 MIMO STC-SFN system

2.1.4. Terrestrial 8K UHDTV public viewing of the Olympic games in Rio de Janeiro

During the Rio de Janeiro Olympics in August 2016, TV Globo and NHK (Japan Broadcasting Corporation) provided 8K UHDTV Public Viewing (PV) of the Olympic Games for the local viewers. This PV at Museum of Tomorrow was carried out by transmitting 8K UHDTV signal through a terrestrial network in UHF band, from Mt. Sumaré station, using multiple-input multiple-output (MIMO) orthogonal frequency division multiplexing (OFDM) transmission technologies, utilizing the dual polarisation technique which was developed by NHK. The transmission parameters of the 8K UHDTV PV service are shown in **Table 2.1.1** and **figure 2.1.3** shows the transmission station antenna and images of the viewing session.

Table 2.1.1 Transmission parameters of the 8K UHDTV PV service

Modulation method	COFDM
Occupied bandwidth	5.57 MHz
Transmission frequency	569,142,857 MHz (UHF channel 30 in Brazil)
Transmission power	Horizontal polarised waves: 100 W, ERP: 660 W Vertical polarised waves: 100 W, ERP: 660 W
Carrier modulation	4096-QAM
FFT size (number of radiated carriers)	32k (22,465 carriers)
Guard interval ratio (guard interval duration)	1/32 (126 µs)
Error-correcting code	Inner: LDPC, code rate = 3/4 Outer: BCH
Transmission capacity	91.8 Mb/s
Video coding	HEVC
Audio coding	MPEG-4 AAC
Transmitting station	Mt. Sumaré
Height of transmitting antenna	830 m above sea level
Receiving station	Museum of Tomorrow (approx. 8.5 km from the test transmitting station)
Height of receiving antenna	30 m above sea level (30 m above ground level)

2.1.5. Summary

In the field of broadcasting, 8K-UHDTV has the potential to succeed HDTV. Japan has set up an experimental station for 8K-UHDTV transmissions at Hitoyoshi city, Kumamoto prefecture, using dual-polarised MIMO and ultra-multilevel OFDM technologies. The field experiments performed there in January 2014 were the world's first 8K-UHDTV terrestrial transmissions (91 Mbps) over a long distance (27 km) using a single UHF channel (6 MHz). This paper reported the results of those field experiments specific reference to the required field strength of the 256-QAM, 1024-QAM, and 4096-QAM carrier modulation and the channel response analysis of dual-polarised MIMO transmission.

Japan added another experimental station for 2x2 MIMO STC-SFN in the same city in 2015. The new field experiment, so configured, showed significant improvement over conventional SFN.

It is noted that this experiment show the feasibility of terrestrial 8K-UHDTV transmission using several key technologies, including dual-polarised MIMO, 4096-QAM carrier modulation, and the 2x2 MIMO STC-SFN method. The 8K-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.2343-1. (<http://www.itu.int/pub/R-REP-BT.2343>)

2.2. UHDTV terrestrial trial broadcasting in Republic of Korea

2.2.1. UHDTV terrestrial trial broadcasting based on ATSC 3.0

The Republic of Korea conducted trials based on ATSC 3.0.

On January 17, 2016, the experimental broadcasting using ATSC 3.0 transmitter was initiated. The experiment was conducted with a multiple frequency network (MFN) using only one transmission station at Kwan-Ak Mountain. Through the experimental broadcasts, the technical feasibility of the ATSC 3.0 standard was examined in depth.

In March 2016, the first field test for ATSC 3.0 broadcasting was conducted and terrestrial broadcasters and TV manufacturers participated in the measurement campaign for three weeks, supported by the government. On February 2017, the trial broadcast based on ATSC 3.0 systems was begun, and the entire broadcasting system was verified.

More information is provided in Rep. ITU-R BT.2343-3.

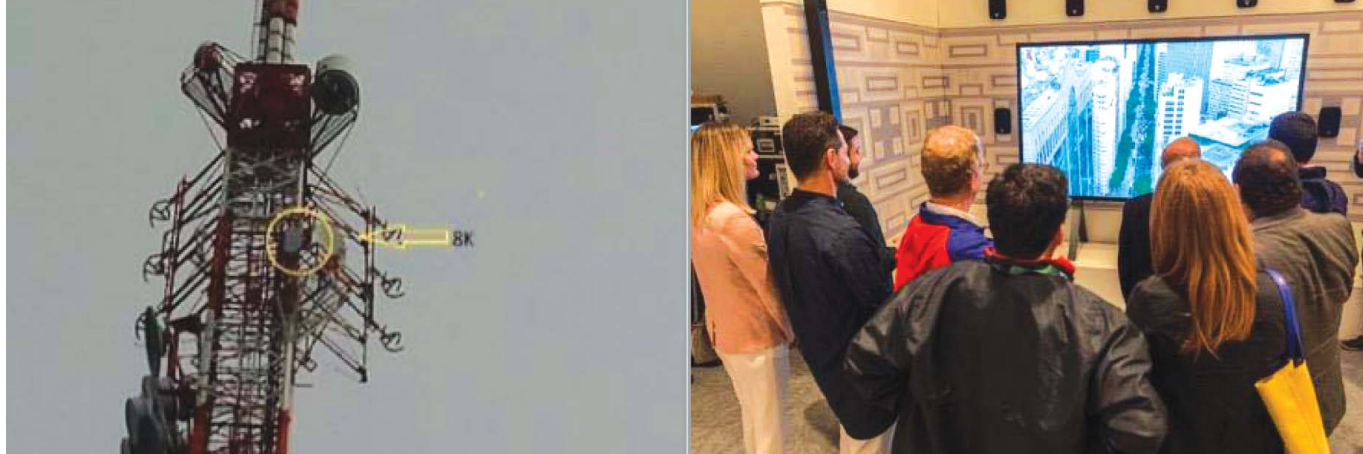


Figure 2.1.3 transmission station antenna and Public viewing at Museum of Tomorrow

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

Project Manager:

Mr. Shinya TAKEUCHI (NHK, Japan)

Co-project Manager:

Dr. Go OHTAKE (NHK, Japan)

Mr. A. K. Mangalgi (DDI, India)

Mr. Kazuhiro KUMAMARU (NHK, Japan)

STATUS REPORT

ABU-AIBD Regional Workshop on OTT and IBB Technologies & Services was held in Kuala Lumpur from October 23rd to 25th 2018. Various aspects and technologies related to IBB and OTT systems are discussed. Advanced topics are addressed such as ad-insertion by MPEG DASH based player and operator application.

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

3.1 The launch of UHDTV Satellite Broadcasting

UHDTV satellite broadcasting service started in December 1st, 2018 in Japan. This broadcasting service includes one 8K-channel and eight 4K-channels. The multimedia and data service for the UHDTV satellite broadcasts is operated according to the standard which the project has reported.

The broadcasting system adopts Mpeg Media Transport (MMT) as a media transport scheme. MMT multiplexes all the audio and visual signals, multimedia application data, closed captions and signaling information. These are transferred over the same broadcast channels and broadband networks as the video and audio streams. So, the broadcast system is designed as the Integrated Broadcast-Broadband system. In addition, the applications of the data service are described in HTML5 and the coding method of application is upward compatible with the Hybridcast specification.

Closed caption data is encoded using ARIB-TTML based on TTML (Timed Text Markup Language). Fig.3-1 shows the example of presentation of closed caption on the UHDTV satellite broadcasting. ARIB adopts UCS (Universal Coded Character Set, ISO/IEC 10646) as a character encoding format. ISO/IEC added symbols used for Electronic Programme Guide (EPG) such as "Squared twenty-two point two" to character set. These characters are transmitted and presented on a screen (Fig.3-2).

3.2 Standardisation of multimedia coding for UHDTV in Japan

The ARIB (Association of Radio Industries and Businesses) Standard Assembly approved the revision of the standard, ARIB STD-B62 "Multimedia Coding Specification for Digital Broadcasting (Second Generation)" for UHDTV satellite broadcasting in October 2018.

The revision of the standard was made for following purposes:

- Addition of the function of the coordinated operation of the receiver with companion devices. This defines the model of the coordinated operation of the receiver with companion devices and APIs between the application on the receiver and those on the companion device for device collaboration.
- Addition of the scheme of compression of closed caption data in transmission. This defines the compression scheme by Efficient XML Interchange (EXI) format (defined by W3C) when compressing a TTML document coded as closed caption data.

3.3 Standardisation of Integrated Broadcast-Broadband System in Japan

The IPTV Forum Japan standardises specifications for Hybridcast in Japan. New APIs for Hybridcast were defined in October 2018. These APIs control the TV receiver by applications on a companion device. The function and protocols of



Figure 3-1 Example of closed caption

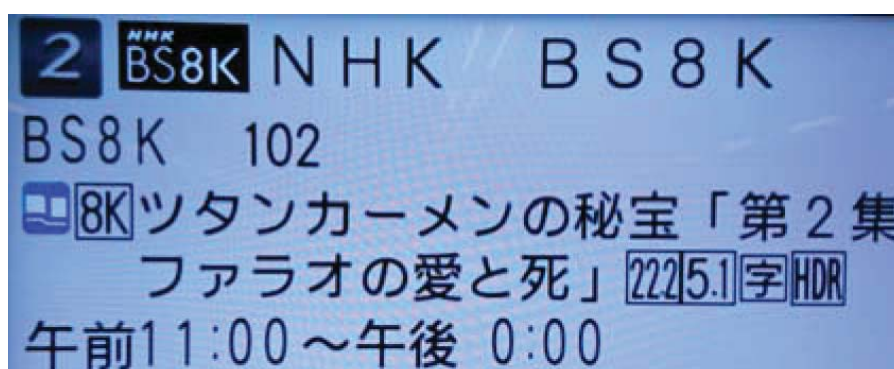


Figure 3-2 Example of characters for EPG

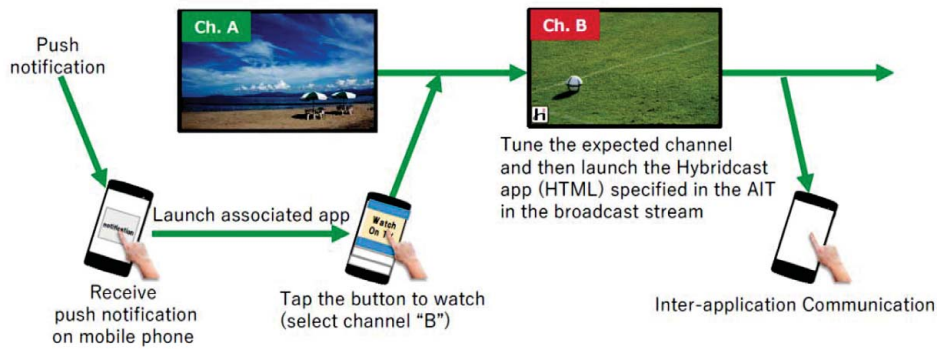


Figure 3-1 Example of use of guide from mobile service to select broadcast programme

device collaboration with companion devices in Hybridcast has been already defined, as described in Section 3.4.

Figure 3-3 shows an example of the use of a mobile service to achieve a smooth transition of the broadcast programme on a TV receiver, applying these new APIs to select a channel from a guide on a companion device.

3.4 Studies in ITU-R

ITU-R WP6B is working on the study of IBB systems. At the meeting held in October 2018 in Geneva, the working party revised Recommendation ITU-R BT.2075 "Integrated broadcast-broadband system" to add the function of device collaboration with companion devices in Hybridcast (called "Hybridcast connect"), to update the function to support new format such as HDR in HbbTV, and to add new profile for HTML5 API in Ginga. The working party also revised the report of IBB system (Report ITU-R BT.2267 "Integrated broadcast-broadband systems") to add the use cases of multi-resolution video services with MPEG-DASH player using the Hybridcast system.

The working party is now studying on harmonisation of IBB systems. The working party has the work of comparison of Hybridcast2.0, HbbTV2.0 and TOPSmedia, standardised by Republic of Korea, with respect to application behaviours and additional objects. At the October meeting, the work progressed the comparison of three systems and Ginga.

The working party is studying 'Technical realisation of signing in digital television'. At the October meeting, the working party developed a system where signer video is displayed on a TV screen together with a TV programme on an IBB receiver without a secondary screen device.

Report ITU-R BT.2342 "Production, Emission and Exchange of Closed Captions for all Worldwide Language Characters Sets (latin and non-latin)" describes information on closed-captions of digital broadcasting. At the October meeting, the working party developed the character encoding format for use of the Variation Selector and Variation Sequence defined in ISO/IEC 10646:2014 for the variants of the subset of character repertoire which is defined in ARIB STD-B62. The detail of the

technology was described in the Report of Topic Chairman Transmission Topic Area in 2017 (ABU).

The working party is also studying the global platform. The transmission and reception of various broadcast programmes are now archived via not only terrestrial, satellite and cable but also broadband networks. And the audiences enjoy broadcast programmes on computers, smartphones and tablets in addition to traditional TV receivers and radio receivers. The global platform is a delivery platform to facilitate distribution of broadcast content to end-users with various receiving devices in multiple reception environments using both broadcasting and non-broadcasting (e.g. broadband) technologies. The work progresses the user cases of multi-resolution video services with MPEG-DASH player on multi devices using the Hybridcast system.

3.5 Studies in ITU-T

ITU-T SG9 is also working on the study of IBB systems applied to Cable Digital TV. At the meeting held in November 2018 in Bogota, Colombia, the Study Group started 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 a twin of this topic. So, the Study Group continues 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 systems 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 made progress on work on the architecture of smart TV operating systems. The study group consent the Recommendation of "The functional requirements of smart TV operating system" as ITU-T Recommendation J.1201.

3.6 Cyber Security

In January 2017, radio stations across the US were hacked and made to play the

uncensored version of a rap song taking aim at the President. The song reportedly repeated for at least 15 minutes by accessing equipment which broadcasters use for STL (Studio to Transmitter Link), remote broadcast, and similar audio connections. It is said that part of the problem is because the licensee fails to set a password for devices without a default password, or to re-set default passwords on the devices.

As this hacking incident shows, although broadcasters do not deliver internet protocol-connected services directly to the public, broadcast programming services rely heavily on Internet and IP-related technologies for on-air operations. Thus, broadcasters are as vulnerable to cyber damage as every other telecommunications carrier.

In Japan, "ICT-ISAC Japan" was established in 2016 to contribute to the formation of a safe ICT society toward the coming of the 2020 Tokyo Olympics and Paralympics. It has been operating on a basis of collaborating with business operators from a wide range of fields including ISP, such as telecommunications carriers, broadcasters, software vendors, information providing service operators, and information-related equipment manufacturing operators. NHK and five commercial TV broadcasters in Tokyo has been a member since its inception and participating in the 'Cyber Attack Measures for Broadcast Facilities-WG, diverse group of operators aiming to share cyber security information. The task of formulating the "Broadcast Cyber Defence Guideline" (BCDG) is also assigned as an indicator when installing broadcast facilities for strengthening the security of broadcast facilities.

NHK researched which equipment is critical to maintain transmitting and receiving systems and stipulated security guideline in May 2018. The guideline prioritised availability in a well-known CIA (Confidentiality, Integrity and Availability) triad because of its highly demanded stability in broadcasting services.

The scope of this guideline covers the following equipment:

1. Transmitting and receiving equipment (Transmitter, STL/TTL, Antenna, Remote Controller and Monitoring system)
2. Network (Program transmission network and Monitoring network)
3. The other IT equipment (PC, Hub and Router)

To mitigate security risks, it is also stipulated to check compliance with the guideline on a regular basis. Besides, we must work diligently on updating standardised security measures in reference to the latest cyber-attack incident.



ABU assists RNE-Nepal with Digital Archiving



The key objective of the consultancy was to ensure that RNE's archival process was going the right way and to suggest steps for moving forward.

Mr Aale Raza provided training for RNE staff working in the technical, programme, tape library, news and music areas. He recommended steps to improve the archival process, including hardware and software specifications, and offered a cost estimation.

The ABU nominated him for the mission after receiving a request for assistance from RNE. The broadcaster and the ABU shared the costs of the mission.

A mission to help Radio Nepal (RNE) improve its audio archive system has taken place under the ABU Technical Advisory Service.

A Singapore-based expert, Mr Aale Raza of Whiteways Systems, spent two days at the public broadcaster in February, assessing its audio library and archiving system, and looking at ways to streamline the service.





ABU holds Seminar on Archiving at BroadcastAsia

Four experts from Asia and Europe spoke at an ABU seminar on Management and Digitisation of Audio-Video Archives at BroadcastAsia in Singapore in June.



The half-day seminar took place on 18 June. It featured presentations on managing existing archives, choosing the right formats and deciding what and how to archive.

It also included two case studies, looking at such issues as best practice methods, avoiding common mistakes, and the lessons learned from a five-year digitising project.

The presenters were Mr Aale Raza of Whiteways Systems, Dr Marc M Batschkus of Archiware, Mr Bruno Burtre of NOA-Archive and Ms Punam Sharma of MediaGuru. Media specialist Mr Sharad Sadhu moderated the seminar.

BroadcastAsia included a trade show and a conference. Held on 18-20 June, it was part of the ConnectTechAsia event, which also included CommunicAsia, an ICT trade event, and NXAsia, which looked at emerging technologies.



It focused on such issues as the future of broadcast media, advertisement innovation, 5G, IP broadcast applications, 4K and HDR, immersive technologies and the business of sports entertainment.

The three events making up ConnectTechAsia comprised separate conferences and exhibitions running in parallel across two exhibition centres at Suntec and Marina Bay Sands.

The ABU had a booth at the BroadcastAsia exhibition, using video clips and printed material to highlight the services the union offers its members.



ABU Media Summit

calls for more action on climate change

An ABU Media Summit in Kathmandu has drawn up an action plan that calls for broadcasters to produce quality radio and television programmes on climate change.

The Kathmandu Action Plan was approved by delegates to the 5th ABU Media Summit on Climate Action and Disaster Preparedness. It took place in the Nepalese capital on 25-26 April 2019.



▲ Dr Mahendra Bista, Executive Chairman, NTV

The action plan urges broadcasters to commit themselves to producing creative programmes to address the ever-evolving issues of climate change. It says this will seek to encourage the mitigation of potentially catastrophic implications for societies and lifestyles.

The plan reaffirms science as a basis for further actions on climate change, including media coverage that should be guided by the best available knowledge from the natural and social sciences.

Among other things, it also requests the ABU and its international partners to help broadcasters to establish specialised, fully-staffed environmental units within their organisations.

The summit was hosted by Nepal's Ministry of Communication and Information Technology, Nepal Television, and Radio Nepal. It attracted more than 230 participants from 17 countries.

The summit featured 10 sessions, with broadcasters and representatives of international organisations addressing a range of climate change and disaster risk reduction issues, and the role of the media.

These included a masterclass presented by Japan's public broadcaster, NHK, on its experiences in preparing people for disasters (see separate story).



▲ Shivane Thapa, Nepal Television



▲ Hon Minister of Communication & Information Technology, Mr Gokul Prasad Baskota

Another highlight was a Nepalese perspective on the role of media during disasters. Senior Nepalese journalists described the challenges they faced in covering the earthquake of 25 April 2015 and its aftermath.

The quake killed nearly 9,000 people and injured more than 22,000, as well as destroying or damaging hundreds of temples and monuments.

In another session, UNESCO's Representative to Nepal, Christian Manhart, praised the media for its "extremely helpful" role in helping restore the country's heritage in the wake of the earthquake.

The summit also looked at how climate change is affecting other countries in the region, from Thailand to Bangladesh and from Fiji to Pakistan.

In a written message to the meeting, Nepal's Prime Minister, K P Sharma Oli, said he hoped the ABU, through the summit, would energise its member broadcasters to cover climate action and disaster preparedness with a renewed interest.

In a keynote address, Nepal's Minister of Communication and Information Technology, Mr Gokul Prasad Baskota, said the melting of snow and glaciers in the Himalayas, brought on by global warming, had unleashed a series of tragedies in Nepal, including avalanches, floods and landslides.



▲ Mahendra Man Gurung, Secretary, MoCIT



▲ Dr Javad Mottaghi, ABU Secretary General

He said the media were at the forefront in times of natural disaster, with tremendous power to educate and influence people in all phases of disaster management, from mitigation to recovery.

The Executive Chairman of Nepal Television, Dr Mahendra Bista, said the media had many lessons to learn from the 2015 earthquake. "The time has come now for us to be more prepared for such times," he said.

The ABU Secretary-General, Dr Javad Mottaghi, said disasters did not recognise national borders or distinguish between rich and poor nations.

"As broadcasters, it is our duty to highlight to our viewers and listeners the challenges which can affect them and their families, not only in known areas of danger, but also where emergencies could occur in the future."

Before the summit, UNESCO held a workshop on 24 April to introduce its new handbook for journalists, 'Getting the Message Across'. The ABU facilitated the workshop.

The 106-page handbook focuses on reporting on climate change and sustainable development in Asia and the Pacific.



Akinori Hashimoto



Akira Hombo

Japan's public broadcaster, NHK, has held a masterclass in Kathmandu on its experience in preparing people for disasters.

The 90-minute session at the ABU Media Summit on Climate Action and Disaster Preparedness on 26 April focused on the steps NHK takes to provide early warnings and real-time news coverage, as well as producing programmes to look at the lessons learned.

In a live video link from Tokyo, Akinori Hashimoto, Executive Controller, General Broadcasting Administration, said the risks of disaster in Japan were bigger than ever, and that experts believed climate change could be a reason.

He said NHK was constantly looking at ways to improve its coverage. It now had a fleet of 15 helicopters at 12 airports, equipped with sophisticated cameras and ready to take off within 15 minutes of a disaster.

It also had 700 robot cameras across Japan to record disasters.

In addition to its TV, radio and online coverage, Mr Hashimoto said NHK was monitoring user-generated mobile phone content on social media around the clock, and was using important items after verifying them.

He said other countries in the region with fewer resources could use different tools to construct their early warning systems.

He stressed the importance of training. "We can't improve disaster reporting without the training of staff," he said.

Speaking at the conference itself, Akira Hombo, NHK Senior Executive Producer, and Rajib Shaw, a professor at Keio University, spoke about disaster awareness and the Bosai culture.

Bosai is a Japanese word for reducing the risk of disaster damage. 'Bo' means prevention, and 'sai' means disaster. Another speaker, Midori Kusagaya, Senior Producer in the Multilingual Media Division of NHK WORLD, described how NHK interacts with local communities, both in Japan and abroad, to spread the Bosai culture more effectively.

NHK uses quizzes to test people's risk reduction knowledge and holds drills with residents' associations. It also suggests how people can make important items such as beds, stretchers, toilets and ponchos out of material readily at hand, such as blankets and garbage bags.

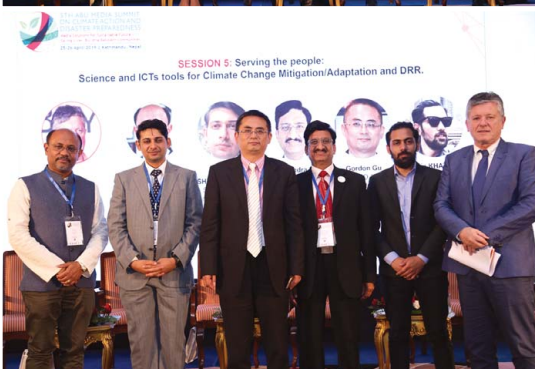
It arranges events for foreign residents in Tokyo and for people overseas through its foreign language services. Ms Kusagaya suggested the results of these events be shared with all ABU members.

NHK shares experience in

COVERING DISASTERS



Midori Kusagaya



Special thanks to the Ministry of Communication and Information Technology, Government of Nepal, Nepal Television and Radio Nepal





DISASTER REPORTING

A KEY MISSION, says Japan's NHK

A senior journalist from NHK has briefed an international forum in Geneva on how the Japanese public broadcaster is working to raise awareness on disaster risk reduction.

Mr Akinori Hashimoto, Executive Controller, NHK, was speaking at the Global Platform for Disaster Risk Reduction in May, a five-day meeting of countries that have signed the Sendai Framework for Disaster Risk Reduction.

He said disaster reporting was one of NHK's main missions, and spoke of the three stages of providing disaster information:

**real time gathering,
multimedia
dissemination and
creating awareness
for the future**

At the same forum, the ABU Director Technology and Innovation, Ahmed Nadeem, raised the possibility of the ABU introducing a certification system for emergency broadcasting.

He said receiving a certificate would show a radio or TV station had a resilient

network infrastructure, a working emergency broadcast plan and staff well trained on how to operate in times of emergency and disaster.

Thai PBS described the practices it has put in place to bring more awareness and prepare people to cope with disaster risk.

The forum, on 13-17 May, featured a high-level dialogue on national and local disaster risk reduction strategies, early warning systems and the role of cities in achieving climate and disaster resilience.

Ms Mami Mizutori, Special Representative to the UN Secretary-General for Disaster Risk Reduction, called for urgent action to build more resilience against increasing weather related disasters and extreme events.

"Media outlets and global agencies play a critical role in alerting, informing and educating populations on disaster risk and we cannot afford to be dysfunctional at a time when this information is most needed," she said.



**global platform for
disaster risk reduction**

Geneva, Switzerland, 13-17 May 2019





IBC2019

IBC is the world's most influential media, entertainment & technology show. Bringing together over 55,000 professionals from over 150 countries spanning the creation, management and delivery of electronic media and entertainment.

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It's where business is done. It attracts over 1,700 exhibitors from all around the world and more than 1,000 of the world's top media technology journalists. The flagship IBC Conference features a curated programme including over 400 of the world's leading industry influencers and experts providing an authoritative and independent view and helping to shape the future of the industry.

IBC is hosted in the heart of Europe's start up technology scene in Amsterdam from 13-17 September 2019.



ABU takes part in Chinese technology forum

A Belt and Road Innovation Forum on 5G+4K Communication took place in Beijing on 22 April.

The forum, co-hosted by China Media Group and the Belt and Road Media Community, attracted more than 150 representatives of about 50 media organisations from 25 countries and regions.

It promoted cooperation to achieve communication innovation and encourage deeper integration of cutting-edge technologies in the internet era. It included a media technology exhibition.

The Director Technology & Innovation, Ahmed Nadeem, represented the ABU at the forum.



Iran's IRIB hosts International Radio Festival

Iran's public broadcaster, IRIB, held its **14th International Radio Festival** in Tehran on 23-25 April 2019.

It took place along with Iran's 6th World Audio Summit and was held at The IRIB International Conference Centre.

The Director Technology & Innovation, Ahmed Nadeem, represented the ABU and spoke at the closing ceremony.

The festival featured a radio programme competition that attracted entries from many countries. The audio summit included a series of workshops and panels.



Broadcasting Unions

take Collective Approach on Spectrum

The WBU-TC meeting was held on 11 June and the 25th EBU Technical Assembly was held on 13-14 June in Cavtat, Croatia. The meetings were hosted by Hrvatska Radiotelevizija (HRT).

The ABU was represented at the meetings by Mr Hamid Dehghan Nayeri, IRIB and Chairman ABU Technical Committee, Mr Masashi Kamei, NHK and Vice-Chairman, ABU Technical Committee, and the Director ABU Technology & Innovation, Mr Ahmed Nadeem.

The unions agreed to take a collective approach to issues to be discussed at the World Radiocommunication Conference 2019 (WRC-19) in Egypt on 28 October to 22 November.

Among them are spectrum issues, including efforts by the unions to safeguard C-band for use by broadcasters in the future. All the unions agreed that they need to work further to garner more support to their position.

In addition, the ABU introduced a recommendation related to satellite broadcasting in the Ku-band. It calls for a review of the regulation on Ku-band broadcasting satellites to increase the power limit, to allow higher bitrates that can help with UHD TV broadcast signals over satellite.

This recommendation has already been approved by the ABU-TC. The WBU-TC requested further technical details to support the position, and NHK will compile and share these details soon.



News from The ABU Region

Strategic move by Mediacorp

Mediacorp, Singapore's leading transmedia platform, has formed a strategic partnership with iflix, an OTT platform for emerging markets, to pave the way for regional streaming of locally produced content. This is in line with the shift from star-studded contents to hyper-local originals.

Mediacorp's premium content will be streamed on both iflix VIP and iflix FREE. By leveraging a hybrid of SVoD and AVoD model, this will increase accessibility for local viewers and also lead to higher viewership from around the region. Through this collaboration, Mediacorp plans to see similar success in Indochina markets by further expanding its footprint especially in countries such as Indonesia, Myanmar and the Philippines.

Iflix offers a wide range of content programming: TV shows, hyper-local originals, premium live sports and near-to-live news from Malaysia, Indonesia, the Philippines, Thailand, Brunei, Sri Lanka, Pakistan, Myanmar, Vietnam, Maldives, Cambodia, Nepal, and Bangladesh. These markets are aligned with Mediacorp's plan to enlarge its regional foothold so as to widen the distribution of its locally produced premium content.

From April 2019, all iflix subscribers in Asia gain access to popular Singapore dramas, variety shows and movies. For instance, the award-winning drama, *The Little Nonya*, that showcases the rich culture of South-east Asian Chinese. Apart from its Chinese catalogue, viewers will be able to stream its English classics such as *Phua Chu Kang* and *KIN*, which will be simulcast through to Season 2. [APB News]

Akash DTH service starts in Bangladesh

Direct-to-Home (DTH) satellite service provider 'Akash' is set to enter the market with a total of 115 satellite television connections to cater to the need of the entertainment seekers. Beximco Communications Limited is to launch Akash, powered by the country's pride project, Bangabandhu Satellite (BS)-1, said officials of the company. Beximco Communications Limited is a sister concern of Beximco Group.

Beximco Communications Limited officials confirmed there will be a total of 115 satellite television connections initially and out of these 20 will be of high definition (HD) quality. Bangladesh Communication Satellite Company Limited (BCSCL), the operating organisation of BS-1, has already completed all necessary arrangements with the Beximco Communications Limited (BCL) for the DTH service.

BCSCL Chairman Dr Shahjahan Mahmood said BS-1's commercial service starts from May 19 with 'Akash'. Beximco Communications Limited has taken five transponders of BS-1 dedicated for its DTH brand Akash for smooth and quality service. [theindependentbd.com]

CCTV buys 16 AEON-TX 4K transmitters

As China starts embracing 4K technology with open arms, its national broadcaster CCTV decided to purchase from DTC Broadcast, a UK wireless technology supplier, 16 complete sets of AEON-TX 4K transmitters, PRORXD-AEON receivers, antennas and ancillaries. IDEAL Systems – a leading systems integrator in Asia – has been assigned to take delivery on behalf of CCTV.

According to DTC, a company dedicated to designing 4K-centric products, the AEON 4K encoder efficiently leverages the HEVC algorithm to take a 12G signal and compress it to a bitrate that can be transmitted over an RF link. For high-profile live events, the AEON-TX is equipped with dual-pedestal capability to provide reliability and robust quality – and it can enable 32Mb of data to be sent over a 16-QAM channel. By doing so, the AEON-TX empowers operators to live-broadcast in 4K securely and over long distances. [APB News]



Malaysian public will enjoy digital television by October 2019

Digital television broadcasts or Digital Terrestrial Televisyen (DTT) is set to be fully implemented throughout the country by October this year, said chairman of myFreeView Johan Ishak. He said, so far, 15 television channels and six radio channels can be accessed through myFreeView and he expects to add four more channels soon.

The myFreeView coverage was now up to 98 percent with 44 transmitting stations built throughout in the country. Broadcasts on myFreeView are free, with no hidden costs. Consumers need only pay once to buy the decoder (iDTV or MYTV DVB-T2 Decoder) and pay the installation fees if one wants the UHF external aerial.

Meanwhile, MYTV Broadcasting Sdn Bhd vice-president (monitoring) Shamsul Najib Mohtar said, as of March 2019, MYTV had distributed two million free decoders to different B40 households. With digital television broadcasts, Shamsul Najib said the public will enjoy better quality broadcasts and sound and the digital divide would be narrowed, with the same information provided to rural and urban folks. [New Straits Times]

DD Free Dish to carry Bangladesh TV in India

India's public broadcaster Prasar Bharati has made a reciprocal agreement with Bangladesh TV to carry the channel on its DD Free Dish direct-to-home (DTH) satellite platform. The Doordarshan channel will be carried from India on a soon-to-be launched DTH platform in Bangladesh in return. Prasar Bharati has waived the carriage fees for Bangladesh TV on DD Free Dish. The agreement was announced during a meeting between Indian officials and a delegation from Bangladesh led by Dr Gowher Rizvi, adviser to the Prime Minister of Bangladesh, at India's Information & Broadcasting Ministry.

The meeting also discussed the co-production of a feature film on the life and works of Bangabandhu Sheikh Mujibur Rahman, announced earlier by the Indian and Bangladeshi Prime Ministers. The movie will be directed by acclaimed filmmaker Shri Shyam Benegal and written by Atul Tiwari. Cooperation between radio networks All India Radio and Bangladesh Betar was also agreed by the two nations, starting from June 2019. [RapidTV News]

SK Telecom unveils in-vehicle 5G-ATSC 3.0 broadcast

Leading South Korean operator SK Telecom has announced a successful demonstration of next-generation TV broadcasting combining an ATSC 3.0-based broadcast network and its 5G infrastructure. The demo was created in partnership with Sinclair Broadcast Group and in-car connected technology provider Harman International Industries.

The partnership is intended to take advantage of ATSC's and 5G's fundamental characteristics that enable more advanced media and data services including targeted advertising, map updates and multi-view service through two-way data communication. The ATSC 3.0 suite of broadcast TV transmission standards is designed to enable not only the delivery of Ultra HD video and improved audio, but targeted advertising and advanced emergency alerting.

The demo showed different kinds of advertisements playing on each of the three in-car screens while the car was running. The 5G network is the enabler of highly-targeted advertising as it can recognise the user of each screen. In addition, upon entering a specific zone, the vehicle automatically received live traffic and popular restaurant information updates via the ATSC 3.0 network.

Now that it claims a successful demonstration, the aim is to provide the ATSC 3.0 solution to 191 broadcasting stations of Sinclair Broadcast Group, and the joint venture company will first provide the solution to 32 Sinclair broadcasting stations by 2020. [RapidTV News]

29th KOBA Show Held in Seoul Korea

The International Broadcast Audio & Lighting Equipment Show (KOBA) was held in the Convention & Exhibition Center Hall, Seoul, on 22-25 May. It showcased the next generation broadcast services and the future of the image, sound and lighting industry. In particular, during the KOBA Show, international broadcasting technology conferences were hosted by KOBETA (The Korea Broadcasting Engineers & Technicians Association) and the sound-related technical expert seminar was organized by KASA (Korea Association of Sound Artists) and the Acoustical Society of Korea.

It also featured a Personal Media Pavilion & Seminar, HiFi Audio Show, Media Contents Creation Zone and Underwater Drone Zone. The show organisers said 906 companies from 35 countries took part in KOBA 2019. In total, 43,905 participants visited KOBA 2019 over the 4 days. [KOBA]

DAB+ Digital Radio Goes up the Charts in Australia

Australia's demand for DAB+ digital radio continues to surge with more than 4.21 million people, or 30% of the population, listening to the platform each week. The total number of DAB+ radios in Australia, including those in cars, rose to 4.73 million at the end of 2018, a 24% increase from 3.80 million at the end of 2017.

The latest research from Commercial Radio Australia found that the number of DAB+ digital radio consumers across in the five metro capital cities is up from 3.62 million compared to 2017. Meanwhile, GfK radio surveys report that sixty-five per cent of all new vehicles sold in Australia were factory-fitted with DAB+ radio in 2018.

CRA chief executive officer Joan Warner said the growth figures were pleasing and would open the way for further commercialisation. More than 930,000 DAB+ radios were sold in 2018, including 745,000 in new vehicles while the number of DAB+ portable and home receivers in the market totalled 2.56 million at the end of 2018, and the number of vehicles with DAB+ reached 2.17 million. [Whatech.com]

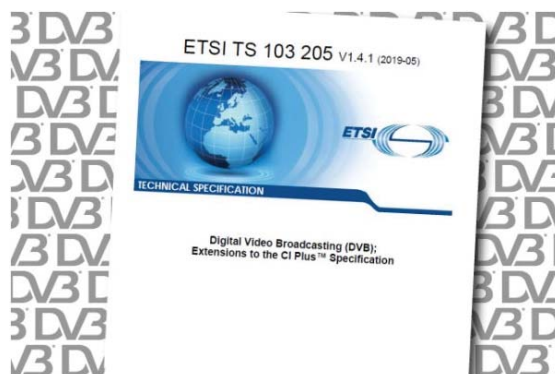
Update to CI Plus extensions published by ETSI

The European Telecommunications Standards Institute (ETSI) has published TS 103 205 V1.4.1, DVB Extensions to the CI Plus Specification. The most significant change is the addition of a new overt watermarking feature.

A key enabler for pay-TV services around the world, the DVB Common Interface (CI) specifications describe a system whereby a removable Conditional Access Module (CAM), given the appropriate rights, unscrambles protected content and routes it back to the host over the same interface. These were subsequently extended by CI Plus LLP to provide common methods for mutual authentication of the CICAM and host, and link encryption over the return interface from the CICAM to the host. The aim was to enable a horizontal market for trusted CI Plus hosts and modules which can receive pay-TV services.

The CI Plus Forum comprised a set of companies, CE Manufacturers and Common Interface Module Manufacturers, with a shared interest in extending the existing DVB Common Interface Standard to support additional security and features that would give the Pay TV Value Chain the confidence to deliver Pay-TV Services to a wide range of consumer electronics devices equipped with the new extensions.

DVB has, since 2014, published extensions to CI Plus V1.3, which was produced and continues to be published by CI Plus LLP. The overt watermarking feature that has been added to the latest version is an optional feature that provides a secure protocol to display a line of text over video from a scrambled service. Its main purpose would be to display subscriber identity over the video. The solution is supported for both broadcast and IP-delivered content. TS 103 205 V1.4.1 also incorporates some changes that had originally been published as BlueBook A173-2. [DVB]



Equipment Trends

Three free software tools for 4K production

Magewell – a China-based company specialising in video solutions – has chosen to provide three free software tools to help broadcasters integrate 4K into their workflow. The company is offering Magewell Bridge to enable users to convert source video into NDI streams for live and IP-based production. The software supports all types of resolutions and frame rates, including 4K/UHD. Users are also able to generate NDI's input source in its native format and specify the output resolution, frame rate and colour space.

Its free version 3.0 of Capture Express, an alternative preview tool, can empower broadcasters to capture 4K videos at up to 60fps. Other newly enhanced features include: GPU-accelerated H.264 encoding; single-click snapshots of one or multiple still frames; a 'borderless' mode for seamlessly previewing video spliced across multiple sources; audio level adjustments; and the ability to run up to nine concurrent instances of the software in support of multi-channel cards or multiple devices on one host system.

The third free offering is a plug-in for Adobe Premiere Pro CC that allows editors to access Magewell devices directly from popular non-linear editing software. Indeed, the dawn of 4K era will be an impetus to broadcasters to quickly adopt IP solutions and be more NDI-centric.

Founded in 2011, Magewell designs and develops hardware and software for video and audio capture, processing, streaming and playout. Distributed globally, Magewell products are used in professional video applications including live event streaming, broadcast, medical imaging, lecture capture, surveillance, video conferencing, gaming and more. [APB News]



AWS accelerates video transcoding by up to 25x

Amazon Web Services, a subsidiary of Amazon that provides B2B and B2C cloud solutions, unveiled its accelerated transcoding technology on the first day of the 2019 NAB Show. The new feature within AWS Elemental Mediaconvert enables broadcasters, OTT distributors, and other premium content providers to complete video transcoding process 25 times faster than the traditional process. As the range and resolution of multi-screen diversifies, more complex video encoding methods are needed which require more time in processing the video content. The long processing time presents challenges for cable networks and streaming content providers: a full-length 4K/HDR using traditional video workflow could take more than a day to transcode to all the other formats.

The accelerated transcoding can reduce the turnaround time of video processing and allow customers to meet market requirements for various forms of output – for TV or mobile devices at varying resolutions. AWS Elemental Mediaconvert includes Quality-Defined Variable Bitrate (QVBR) control which can reduce file size by up to 50% by automatically adjusting bitrate on a frame-by-frame basis. Both QVBR and Accelerated Transcoding are available in AWS Elemental MediaConvert at no additional cost. With no upfront investment required on equipment, customers can look to reducing Capex and simply pay based on the duration of video processed. [APB News]

VITEC Offers Market Leading High Density 4K/UHD/HD HEVC & H.264 IPTV Encoding Blade

Featuring the highest density available on the market, VITEC's 4K/UHD/HD HEVC & H.264 IPTV 8-input blade offers real-time hardware encoding of 4K/UHD, high definition and standard definition video. MGES-7000 is best in class for flexibility, and with the increased density of blade-server configurations, it supports both HEVC (H.265) and H.264 codecs. This includes advanced features such as secondary channel, integrated resolution and frame-rate scaling, AES 256/128-bit encryption and low latency mode.

MGES-7000 is the ideal multichannel blade encoder for in-house broadcast applications, real-time high-quality sport events, low delay encrypted FMV distribution and any IPTV application. It's a future proof encoder solution that meets the current IPTV demands of H.264 and HD encoding with the advanced capabilities of HEVC encoding, 4K/UHD and HDR. This allows for technological growth and supports market trends, including variety of video sources inputs such as SDI, HDMI and SFP fibre connectors based on SMPTE2110.

The MGES-7000 offers best-in-class density with four 4Kp60 or eight 3G/HD/SD inputs ports for live sources of SDI, HDMI or IP (SMPTE2110) video. The blade uses hardware-based encoding chips supporting 4:2:2/4:2:0 10 & 8 bit H.264 and HEVC codecs for maximum flexibility and future proof solutions including secondary video streams up to 1080p60 for each input.

The MGES-7000 Blade's advanced H.264 and HEVC tools make it flexible and suitable for a variety of markets that demand high quality IPTV distribution, low latency applications, and require support for legacy H.264 players as well as cutting edge new 4K HEVC endpoints. This can all be managed with an easily configured web UI.

Coupled with the Media Gateway MGW family of carrier-grade IPTV platforms, IPTV providers can serve up to 208 IPTV channels from the MGW 5100 (10-RU), up to 96 IPTV channels from the MGW 1100 (4-RU) and up to 16 IPTV channels from the MGW 1100 (1-RU). VITEC's Smoothing™ algorithm guarantees low jitter for flawless IP over any network - LAN and WAN. MGES-7000 is fully supported by the VITEC Cluster Manager (CM) System, which provides global system monitoring and control, as well as automated N+K redundancy to ensure high availability operation. [VITEC Video Innovations]



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CALENDAR OF EVENTS

8-12 JULY	ABU-ASBU WorldDAB DIGITAL RADIO WORKSHOP	KUALA LUMPUR
AUGUST	REGIONAL WORKSHOP ON RADIO STUDIO AUTOMATION	TBC
15 AUGUST- 13 SEPTEMBER	ABU TECHNOLOGY WEBINAR SERIES	ONLINE
13-17 SEPTEMBER	INTERNATIONAL BROADCASTING CONVENTION 2019	AMSTERDAM
24-26 SEPTEMBER	REGIONAL WORKSHOP ON OTT AND IBB TECHNOLOGIES & SERVICES	KUALA LUMPUR
9-10 OCTOBER	ABU-DRM REGIONAL WORKSHOP ON DIGITAL RADIO 2019	KUALA LUMPUR
21-25 OCTOBER	WORKSHOP ON IT INFRASTRUCTURE FOR BROADCASTERS	KUALA LUMPUR
13-15 NOVEMBER	INTER BEE 2019	JAPAN
17 NOVEMBER	ABU TECHNICAL BUREAU ANNUAL MEETING	TOKYO
18-19 NOVEMBER	ABU TECHNICAL COMMITTEE MEETING	TOKYO
21-22 NOVEMBER	ABU GENERAL ASSEMBLY	TOKYO
11-13 NOVEMBER	16TH IRAN MEDIA TECHNOLOGY CONFERENCE	TEHRAN
2-6 DECEMBER	ABU TRAINING COURSE ON ENGINEERING FUNDAMENTALS FOR BROADCASTERS 2019	KUALA LUMPUR

NEW MEMBERS

FULL MEMBER



The Australian Broadcasting Corporation (ABC) is Australia's national broadcaster founded in 1929. It is currently principally funded by direct grants from the Australian government, but is expressly independent of government and partisan politics. The ABC plays a leading role in journalistic independence and is fundamental in the history of broadcasting in Australia.

ASSOCIATE MEMBER



Walesi Limited is a state-owned entity which is responsible for the deployment of Digital Television Broadcasting platform in Fiji together with other initiatives in line with the Fijian Government's digital IFJI strategies.

Fiji is officially transitioning to digital TV, in an exciting move to ensure the future will be brighter for Fiji. Walesi is a new digital TV service that will be available to everyone. From 20 December 2017 digital TV will be available to everyone in Fiji via aerial or satellite.

AVN Senior Editor Tan Hockguan retires



Asiavision's Senior Editor, **Tan Hockguan**, retired in June after 18 years of service with the ABU.

A Malaysian and a career journalist, Hockguan joined the ABU's daily news exchange in July 2001 as a Coordinator, based at the AVN Centre in Kuala Lumpur.

He was promoted to Senior Editor in November 2006, taking charge of AVN's daily operations.

Asiavision had only recently gone fully digital when Hockguan joined the team, and he helped steer it through some of its most momentous years.

He played a major part in Asiavision's coverage of the Indian Ocean tsunami of 26 December 2004 and its aftermath. The countries of several AVN members - including Indonesia, Sri Lanka, Thailand and India - were among the hardest hit. Their national broadcasters fed AVN with outstanding coverage of the tragedy day after day.

Less than five months later, in May 2005, Hockguan was closely involved in the launch of Asiavision's second daily satellite feed, to handle the growing number of offers from members. Ensuring its success became one of his key goals - and succeed it did.

After being promoted to Senior Editor the following year, Hockguan oversaw another important step in AVN's growth, the launch of a file transfer system in October 2009 for exchanging news online, alongside the satellite feeds.

A strong believer in innovation, he embraced the new system with enthusiasm and was instrumental in encouraging members to use it. Under his lead, the number of news stories

exchanged by members continued to grow steadily in the years that followed.

At the same time he worked hard to overcome technical problems, particularly with the reception of the satellite feeds, and took it upon himself to find solutions to these problems.

In the following years, Hockguan continued to lead AVN operations as a more sophisticated file transfer system was introduced and the satellite feeds were phased out, making AVN a wholly online exchange of news.

He also represented the ABU at international news meetings, including the annual meetings of news coordinators of the Eurovision news exchange.

Throughout his time with Asiavision, Hockguan earned a reputation as a team player. He demonstrated a sure grasp of news events in the region and an ability to work easily with senior journalists from many countries.

Before joining the ABU, Hockguan was a senior journalist at Bernama, Malaysia's national news agency.

He was Asiavision's second-longest serving member of staff. Only his predecessor as Senior Editor, Humayun Choudhury, spent more years at the news exchange, from before its launch in 1984 until retiring in 2006.



Nguyen Thanh Nam returns to VOV

ABU Technology's Senior Engineer, **Nguyen Thanh Nam**, said farewell in April when he returned to the Voice of Vietnam after serving the ABU for six years.

Nam was diligent, organised, quiet and showed great skill in carrying out his duties while at the ABU.

One of his main tasks was putting together the ABU Technical Review which he did meticulously.

Nam worked with all members in his unfailingly even-tempered, polite and soft-spoken manner, even under pressure, and demonstrated the ability to get on well with everyone.



Morwen Williams named new IMCG chair

The World Broadcasting Unions International Media Connectivity Group (WBU-IMCG) has appointed **Morwen Williams**, Head of UK Operations for BBC News, as its new Chair.

Ms Williams took up the post on 1 July. She succeeds John Ball of WarnerMedia, who had served as Chair since 2016.

"We are all thrilled to see Morwen in this leadership position," Michael McEwen, Head of the WBU Secretariat, said.

"She has been a vital member of the WBU-IMCG since 2015 and has contributed deeply to our IMCG forums, most recently taking on the hosting responsibilities of our upcoming forum in November. I very much look forward to her leadership."

"I'm hugely honoured to have been invited to do this and look forward to working to take the IMCG to even greater successes," Ms Williams said.

The WBU-IMCG works with broadcasters, satellite and fibre service providers and vendors in providing global solutions to common exchange of content and operational problems on any platform.

It organises forums held twice a year that allow open dialogue from an international perspective on key collection and delivery issues.



Andrew Jones of IABM

Andrew Jones, Head of Training at IABM - the International

Association for Broadcast & Media Technology Suppliers - has died after a long battle against leukaemia.

Mr Jones worked for the BBC for 21 years as a broadcast engineer, lecturer in engineering and training manager for its broadcast engineering and technical operations before joining the IABM in 2016.

He was a speaker at the ABU Digital Broadcasting Symposium in March 2018 as well as at many other international conferences.

As Head of Training at IABM, Mr Jones led initiatives to develop the next generation of talented people in the broadcasting industry. He was also responsible for IABM's university forum and initiatives to deliver technical skills certification.

"Andy had a major impact on IABM's knowledge and educational capability and that will make up part of his huge legacy to us and the industry," Peter White, CEO of IABM, said.

"His mantra was 'Never stop learning' and he inspired many with his passion for knowledge and its communication."

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