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- 02 Cloud Interview for News Production – Phoenix TV
- 05 How Will Media Technology Influence Our Future Lives?
- 09 Rai Virtual LIS: An Avatar for Sign Language Applications
- 12 Cognition of Radio Waves; Compendium of Signals & Field Survey Datum
- 20 AM Transmitter Installed in Goroka, Papua New Guinea
- 24 The DAB Adoption Process, Part 2: Formal DAB+ Standard Adoption
- 28 Ingest and Transcoding of Legacy Media for TV6 Trial Transmission at Radio Televisyen Malaysia (RTM)
- 30 IRIB Easycaster
- 31 Radio Station Audio Transport and Routing Using A TDM Routing Matrix with DANTE/AES67 Connectivity
- 34 Technical Bureau Mid-Year Meeting  
How to Contribute to the Technical Review
- 36 ABU Technical Bureau 2019/2021
- 37 ABU Central Asia Media Forum Addresses Wide Range of Topics
- 40 Webinar on Advanced Transmission and Delivery Technologies
- 46 ABU Engineering Fundamentals 2021 Training Course
- 48 ABU Takes Part in BroadcastAsia 2021  
WBU Calls for End to Violence Against Journalists
- 49 ABU Engineering Excellence Awards Winners To Be Announced 16 November
- 50 ABU Engineering Excellence Awards Panel of Judges
- 51 ABU Technical Committee Meeting Schedule
- 52 News from the ABU Region
- 55 Digital Broadcasting Updates
- 59 Equipment Trends
- 62 Personalities & Posts
- 65 IBC2021 to Take Place on 3-6 December



**Cover:** AM Transmitter installed in Goroka, Papua New Guinea

## from the Editor

Hope all of you doing well and keeping safe. The third quarter edition of the Technical Review is packed with information and updates from our members and the industry and we hope you will enjoy them.

We have four feature articles in this edition in addition to many information documents and updates contributed by our members and industry partners. The four feature articles have been contributed by our members Phoenix TV-Hong Kong, DD-India and RAI-Italy, and David Wood from the EBU.

The first one titled “Cloud Interview for News Production” by Phoenix TV details how they have made use of existing technologies and online solutions to implement an innovative method for news interviews with guests and experts to be integrated with the production system.

The second by David Wood, titled “How will Media Technology Influence our Future Lives?” looks at how the evolving media technology, better quality, increasing content that is becoming easier to access and the way media consumption is changing could influence our lives in the future.

The third one titled “Rai Virtual LIS: An Avatar for Sign Language Applications” by RAI presents their innovative Virtual LIS solution which users several software modules and algorithms that can translate messages to sign language and present it through a virtual actor.

The article titled “Cognition of Radio Waves; Compendium of Signals & Field Survey Datum”, contributed by DD-India, looks at the use of radio waves and limited frequency spectrum available for radio and television and how to effectively use them for the required application with various example cases.

In addition to the above articles, the included case studies, technology implementation examples and information documents include a plethora of information for broadcast engineers, professionals, and technology enthusiasts.

Also inside you will find a report on the key points discussed at the mid-year meeting of the Technical Bureau which was held as a virtual meeting. There are also highlights of the activities and webinars organised in recent months.

Like last year, the Annual Technical Committee Meeting and the General Assembly will be organised as virtual events commencing from 9 November. The Technical Committee meeting will take place on 16 November; please refer to the included meeting agenda.

As usual this edition concludes with our regular highlights of industry news, digital updates and the latest in equipment trends. We hope you will benefit from the informative articles and other materials included. Take care and stay safe.

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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# Cloud Interview for News Production – Phoenix TV

Terence Yiu and Edward Ng – Phoenix Satellite Television Co. Ltd.

## Abstract

Due to the Coronavirus pandemic, news interviews with the guests and experts have become a challenge. Because of city lockdowns and limited flights, it has become more difficult to reach guests to do the required interviews. Traditionally, it also requires the journalist to be together with the EFP crew to set up for an interview on site. To overcome this challenge, our engineering team has introduced an IT solution, 'Cloud Interview' integration, into our production studio. During 2020 and 2021 we have successfully undertaken several cloud interviews with guests overseas and in mainland China, for different kinds of major event. Workflows and technical details of Cloud Interview cases are introduced and discussed below.



Figure 1 : Cloud Interview Environment

## Cloud Interview for CPPCC & NPC 2021 for News Production

The Chinese People's Political Consultative Conference (CPPCC) and National People's Congress (NPC) are two major political conference events in China every year. They are a focus for all Chinese news media. All news media need to make quick responses to different type of topic. There are many interviews with different representatives and experts to analyse new policies and different political situations. Before COVID-19, we could easily do that by sending crews for the interviews.

Currently, both interviewer and interviewee will have health concerns about an on-site interview because they want to maintain social distance. Now, with recent internet conference software technology, quick response and flexibility can be achieved. We can even schedule

the interviews after the representatives return to their hotels at night. We can also invite the representatives and experts to discuss different policies from different time zones.

## Choice of Conference Software Platform

There are several popular Conference software platforms available in the market. Zoom and Microsoft Teams have become popular in the US and Europe since the outbreak of coronavirus pandemic, and VooV (騰訊會議) is very popular in the China market. Considering geographic and user preferences, Phoenix TV adopted VooV for China news interviews during **CPPCC** and **NPC** in 2021.

## Integration of Conference Software with existing Production Studio

A small conference room is set up for the interview. The

journalist (interviewer) will sit in the conference room and host the interview with the remote guests. There is no need to have supporting crews. The journalist can handle the whole process, alone. The interview arrangement can be very flexible and may take place any time, whenever required, and the interview signal despatched for live or recorded programme production.

An iMac with the VooV app is used for the interview. In order to have good quality video and audio, an external professional camera and microphone are used to embed the video and sound for the interview.

The N-1 interview audio is mixed with independent host audio as programme sound and associated with VooV conference video for live or recorded production. The N-1 interview audio is also extracted to the host earpiece for monitoring.

The embedded VooV video and programme sound is fed to the in-house production router for live studio production or recording. So, the signal is required to time with frame sync.

Other than the interview camera signal, a separate studio camera is provided for an environment or beauty shot.

The host, or guest, can be selected as individual video shots only, or included in a multi-window view with other participants.

The conceptual system deployment is shown below:

## Technical Considerations and Practice

Some considerations have to be taken into account for the implementation.

### Signal Quality

Unlike a normal internet conference call, TV production needs video and audio of higher quality, and built-in computer webcams and microphones cannot satisfy these requirements. Professional cameras and microphones are instead used as external visual and audio sources for the meeting. In this way, broadcast signal quality is achievable.

### Audio Delay

Lip sync problems can occur because of signal conversion and processing delays. Hence, adjustable audio delay is added to allow compensation.

### Frame Sync

In order to enable integration of interview signals with studio live production, they need to be timed before feeding to production router. So, frame sync is required.

## Equipment & Application

The equipment employed for Cloud Interview and their relative applications are listed below:

- iMac Pro – Meeting platform
- VooV meeting software – Meeting App
- Handheld camcorder – Interview host camera
- EFP Camera – Environment & Beauty Shot
- Lavalier microphone – Host mic
- Audio mixer – Host and guest audio mixing
- Audio delay – Lip Sync
- Thunderbolt to SDI converter – Convert meeting video

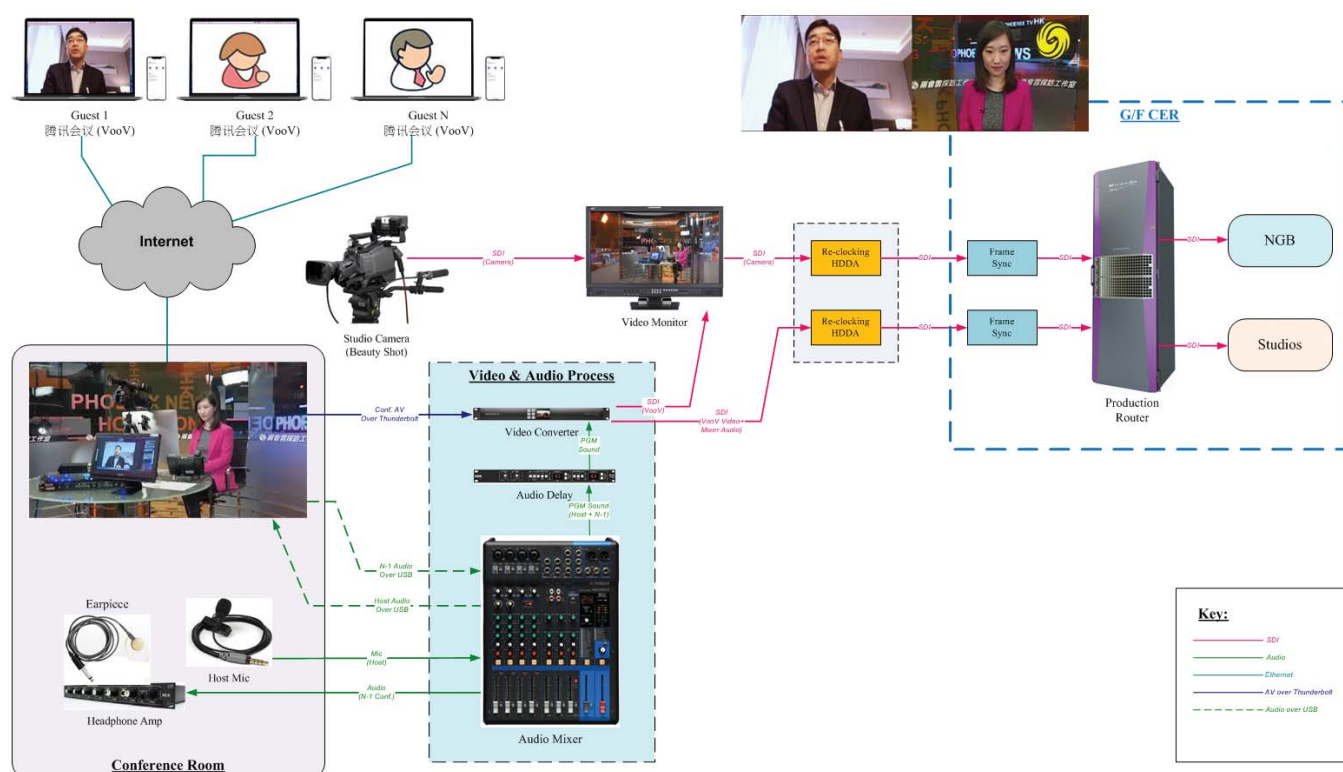


Figure 2 : Conceptual System Diagram





Figure 3 : News Program Output

and embed audio

- Headphone amplifier – Adjust host earpiece audio level
- Earpiece – Host listening
- Video monitor – Meeting video and camera video monitoring
- Frame Sync – Meeting signal synchronized with station system timing

### Advantages and Benefits

The conference app and its operation has become more popular during the pandemic, and nowadays almost anyone can join an interview with a simple setup. With WIFI, mobile 4G/5G or internet connected, participants can connect to meetings, anytime or anywhere, on different OS platforms and devices (PC, Mac, iPad/Android Pad, mobile phone, etc.).

For news programmes, response time is a crucial factor for success and, once an interview appointment is fixed; a single or multiple guest conference format is instantly available. This convenience and ease of operation have helped us to make quick news interviews successfully.

### Limitations and Problems Encountered

Internet speed has a major impact on conference signal quality. Nowadays, broadband, WIFI and 4G/5G infrastructure is very common, so internet speed can be guaranteed. Commonly, lip-sync issues are an annoyance due to video and audio processing via different paths. Though this is not so critical, it is good to have audio delay equipment to allow compensation. If the signal is to be integrated with an existing studio system, video synchronisation is also required. Timed signals can be put on air immediately if there is a need. So, frame sync is required in such cases.

### Conclusion

After testing with different setups and performance, Phoenix TV has applied VooV/Zoom meeting applications for our major internet online interviews. For the purpose of the conference software, there should be no limit on the number of users or meeting duration. Therefore, the

'Enterprise' edition is preferable in both cases. Due to its ease to use and short setup time, Cloud Interview has proved to be a useful tool for news programme interviews during the pandemic. In coming years it may well provide a cost-effective alternative to sending crews overseas for interviews, even after the pandemic is over.

An instance about the Phoenix TV Cloud Interview can be found from the Link below: <https://www.youtube.com/watch?v=K05pSyCmBwA>

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# How will Media Technology Influence our Future Lives?

David Wood, Consultant, EBU Technology and Innovation

*"It's not the news that's got so much worse, it's the news coverage that's got so much better"*  
G.K. Chesterton 1874-1936

Our lives are changed by media and media technology. We are influenced by the experience of radio, television, movie theatres, Internet and its applications. These experiences change the way we live out our lives. Can we examine the trends in media technology seen so far and what they have led to, and estimate from that how media technology may change the way we will live even further in future years? This article is an introduction to this complex subject. It may encourage you to think more about the issues. We are all interested in the future - we will spend a lot of time there.

## Technological Determinism

Social scientist Marshal McLuhan coined the phrase 'Technological Determinism' (TD) in the 1960s to describe the relationship between media and society. The term 'determinism' suggests that society moves forward in a series of steps that occur in sequence. One step leads to another. Events and actions have a cause that precedes them.

McLuhan's central idea in TD is that it is media technology itself that has a larger and longer-term influence on our lives than any specific content it carries. In years gone by, for example, it was the advent of the printing press that changed the world, more so than any items printed. Today, we might say that it is the presence and availability of broadcasting and/or wireless or wired Internet, more than any specific programme, email or website that has changed our lives. If this is true, should engineers take the blame or glory for the way we live today?

## Symbiotic Determinism and Chaotic equations

Other social scientists have argued that this 'technological determinism' is a simplification, and that the impact technology has depends on the context in which it is developed and introduced. To be successful, and have an impact on our lives, new media technology must be needed, be easy to use, be affordable, and have many other attributes. In other

words, there are variables and (using the engineer's term, where part of the output influences the input) 'feedback loops', which influence the success of media technology, and the consequent influence it has on lives. The way we live, and the development of media technology, are inter-related. So, the situation is not entirely the engineers' fault. Maybe we could term this closer-to-reality situation as 'Symbiotic Determinism'?

If we wanted to deduce the experiences of the future as they will occur, we might look for a mathematical model of what happens. This could be an equation for 'Future Outcomes' with 'time in the future' as a major variable in the equation. Time would not be the only variable - there would be many others. The 'Outcome' would be influenced by many aspects of context, some of which are inter-related and 'non-linear'.

Mathematicians term equations with many 'non-linear variables' and 'feedback loops', such as is the case here, 'Chaotic Equations'. This may not be a simple concept to grasp. It is worth looking into the texts on it if you have time. It is applicable in much of what happens in our lives. In this article, we can only outline some elements of the theory, hoping to carry you with us.

The first thing to say is that the word

'chaotic' here does not mean the same as it does in normal English, when "no one seems to be in charge". Here it is a type of equation. Chaotic equations have many solutions and solving them, even when they are sufficiently limited in the number of variables, needs heavy computational power. So, we cannot expect to be able to precisely predict what will happen in the future. This would still be the case even if we were able to identify all the variables and feedback loops - the equations would be just too complex and have too many solutions. In simple terms here, there are too many possible 'Tomorrows' for us to be certain what will happen.

## Finding 'Attractors'

However, we can still draw meaningful conclusions - all is not lost. Chaos might be called 'the science of the not completely unpredictable'. Chaotic equations exhibit characteristics that are termed 'Attractors'. These are areas where solutions are likely to occur, and to which solutions are 'drawn'. To understand why this is so, I am afraid you will have to go to the textbooks.

If we can identify the 'Attractors', for our equation, we will have guidance on our future world. They are also present in other chaotic equations. For example, the Universe is a 'chaotic' system, yet there are Attractors. The spiral 'galaxies' are the Attractors of the universe. For

the 'chaotic' weather, the seasons are the Attractors. Attractors are areas of likely areas of solutions, trends, or tendencies. If we can identify the Attractors of the effects of future media technology, even though we cannot be precise, we will have an idea of the future, despite its complexity.

What we would like to find are the Attractors for the way we will live out our lives tomorrow, conditioned by the evolved media technology.

### Today's media germinated 20 years ago

The media technology today includes HDTV, UHDTV, smart TVs, smart phones, voice activation, VR and others. They were all in a germination phase 20 years ago or earlier and were reported to be so at the time. There were also systems predicted then that eventually did not meet all the criteria needed for success, such as 3DTV, so prediction is not always a sure thing, but those successful were among those predicted.

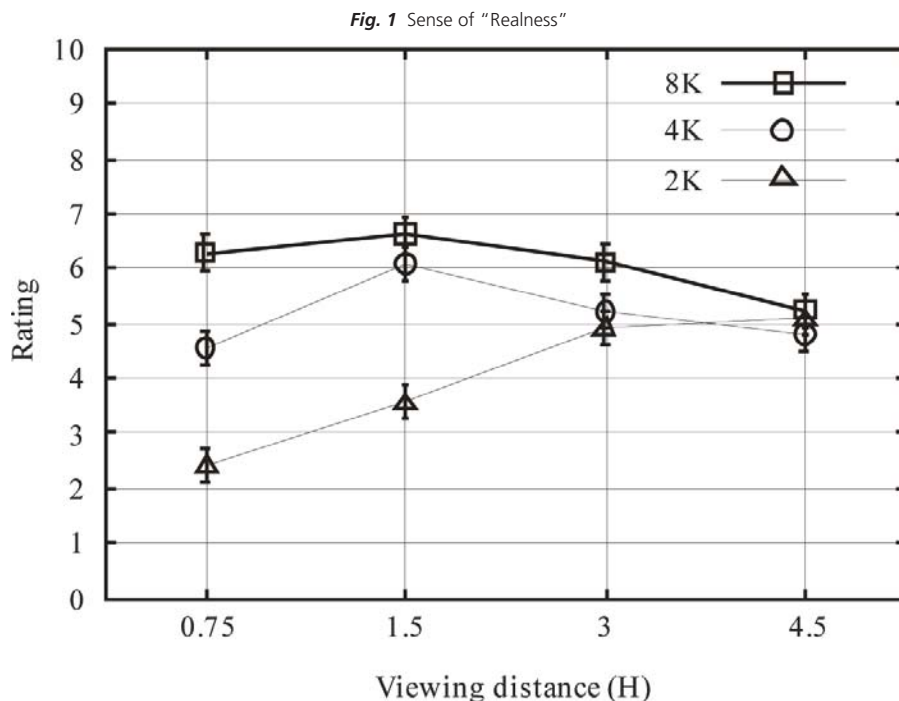
If we examine the options in a new media technology germination phase today, and look hard at potential success factors, we should be able to identify the media technologies that will find their place in the future world. We know the effect that media technology is having on our lives now. By extending how media technology has changed our lives until now, maybe we can deduce how the new media technology will continue to affect our lives in future

Let us look first at the influences the media technology so far introduced have had.

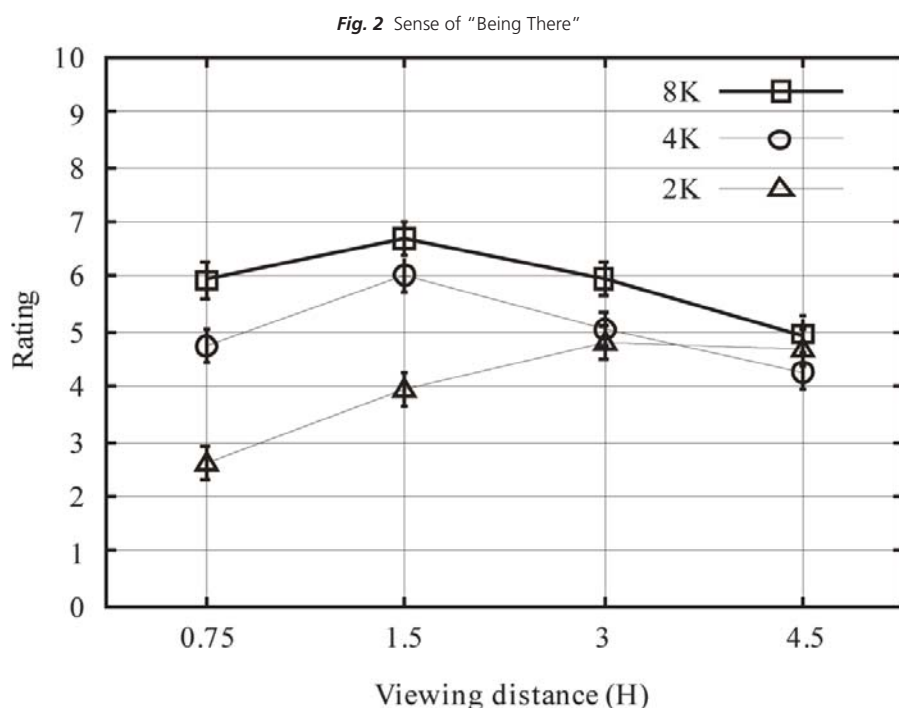
### The impact of increasing technical quality

The image and sound quality available to consumers over the last half century has moved from a black and white screen and monophonic audio to standard definition colour television, to high-definition television and, most recently, to some ultra-high-definition television 4K UHDTV1, and some 8K UHDTV2. Sound has also improved in technical quality and immersiveness.

The studies of NHK STRL - The R&D



Report BT.2246-06a



Report BT.2246-06b

Source: NHK STRL and ITU-R BT 2246-7

laboratory of NHK in Japan - in **Fig. 1** and **Fig. 2** above showed that from HDTV (2K) to 8K UHDTV the 'sense of realness' and 'sense of being there' of an image increases with technical quality, coupled with dependency on the screen-to-viewer distance. The improvement in perceived quality is found to be approximately proportional to the square-root of the increase in resolution. Logarithmic relationships such as this are usual in the science of psychophysics.

What happens to the 'viewing experience' as the technical quality

increases? I first asked myself this years ago when helping with the EBU's Eurovision Song Contest streaming. I found that there was a definite relationship between the time the on-line audience watched the stream and the technical quality we provided. It seemed likely that, all other things being equal, the higher the technical quality of the video stream, the longer the time people will watch.

A study made in France in 2008 reinforced this conclusion and added to it. They examined what happened



to the viewing experience when moving from standard definition to high-definition television with the same content. The results were striking. There was a 25% increase with the HDTV versions in the time viewers watched a given programme, before changing to another channel (the time until 'zapping'). At the same time there were physiological changes such as reduction in viewers' pulse rate. HDTV viewers remembered more about the content after viewing HDTV than after viewing SDTV. HDTV had a subliminal calming effect and brought greater emotional involvement. It was as if the higher technical quality allowed the brain to concentrate more on the substance of the content, rather than working out what was in the image. Moving from SDTV to HDTV, a greater sense of reality and presence precipitated an enlarged and deeper experience.

### The Digital Divide

For another aspect of new technology, two decades ago, in EBU discussions, there were projections of the scenarios we could be facing in the next decades. One of them was that the media would lead to a 'digital divide'. At that time, it seemed that mastering digital media would be beyond the ability of a sizeable portion of the population, and possibly become largely the province of the young and those with higher education. There may still be those who find digital technology unfriendly but, by and large, what was feared then has not happened. Digital equipment and services have become ever more user friendly and are ever more within the grasp both of old and young.

### The Quantity of Media Available

Furthermore, the volume of available

media has increased dramatically. We have moved, in much of the world, from a handful of broadcast channels to many hundreds of channels. The number of web sites has grown astronomically. The age of OTT (media services delivered via Internet) has arrived, with vast amounts of video-on-demand content and some live content. The television set has become the 'smart TV' which includes processing power, and services are available via software applications that run on the TV set. The TV set often now accesses both broadcast and broadband.

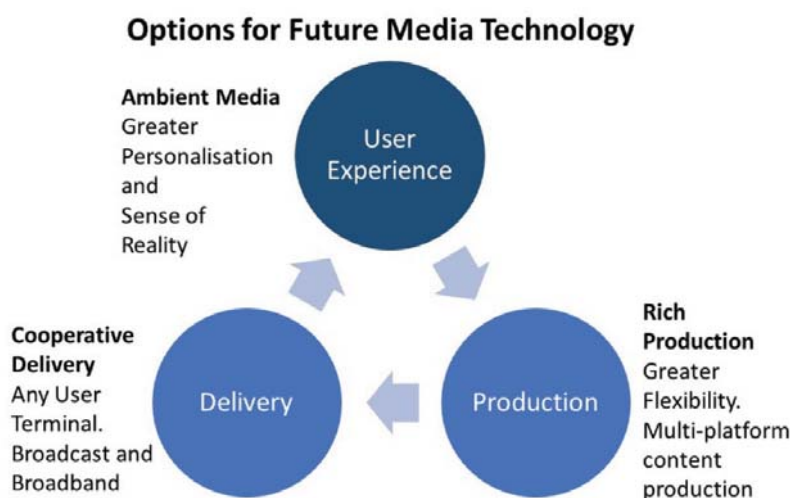
Media consumption has risen, though not by the same proportions on different platforms. Overall, total media consumption is said to have increased by up to 20% over the last ten years. In some developed countries average consumption is now 11 hours per day. The largest growth in consumption by far has been in consuming media via smart phones.

### The Overall Picture

We could sum up what has happened as: 'increased technical quality; more available media and content; content easier to find and use'.

### What will Tomorrow's Media Technology Bring?

The EBU Broadcast Technology Futures group includes major broadcasters' R&D laboratories, who recently examined the options for potentially available media technology in the next five to twenty years. They analysed the options in three areas: the evolution of the 'user experience'; the evolution of the 'creation of content'; the evolution of the 'delivery of content'. Their broad conclusions are given in the diagram below.



The full report is available here:

<https://tech.ebu.ch/strategy-btf-group-report-2020>

The options for tomorrow's user experience can be summarised as collectively providing 'ambient media'. The two trends here are, firstly greater personalisation – giving the user greater choices in the material available, making use of Artificial Intelligence (AI), and secondly a greater sense of reality – higher technical quality. Overall, media becomes an experience that surrounds and envelops the user to a greater extent. There are other important aspects covered in the EBU report, such as accessibility services and sustainability measures.

The options for content creation/production in the report are to allow Rich Production. These are essentially the measures that will allow the content for the user experience above to be available on all appropriate platforms. Production will make ever more use of the available technology such as 'Clouds', to make it possible and more economic to prepare content for multiple delivery platforms – the target in summary might be termed COPE ('Create Once Publish Everywhere').

The options for delivery are measures that move us towards Cooperative Delivery. This is the delivery of content on a range of different platforms, terrestrial, satellite, wired and wireless broadband, which complement each other. The content is delivered on the platform, and at the time, that is convenient for the user.

### Projecting Forward

As a rule of thumb, psychophysical laws do not suddenly stop or change in nature. Thus, if the reported jump from SDTV to HDTV resulted in a 25% increase in programme viewing time, and the jump from HDTV to UHDTV 2 (8K) is a perceived improvement of about the same magnitude as that from SDTV to HDTV, we could expect that there could also be a matched jump in viewing time.

Equally, there should be a jump in the degree of content material that we retain, as the viewer frees up ever more mental energy and space to

store information about the content.

The personalisation of the content, aided by AI, will lead the viewer to more interesting and attractive content.

The cooperative delivery systems will make media access more available and findable.

The continued development of user interfaces and user control tools should make the content more accessible, particularly for those who may find the way digital media works not entirely comprehensible today.

All these elements, all these Attractors, point in roughly the same direction - greater media consumption, greater experience, and greater dependency on the media. This allows us to postulate how these will change the way we live in the years ahead. The future is something we cannot know for certain. One of the complications is that a simple 'projections from today' approach does not consider developments that do not follow the currently perceived media technology Attractors. These could be termed 'Disruptors' - new and attractive and currently unforeseen experiences, that have enough strong success factors to be commercially successful. These are always possible. But our simple approach here does at least allow us to begin a thought process and discussion about the way media technology will affect the way we live in future.

It is also important to note that the same media technology developments do not occur at the same times in different parts of the world. There will be different factors that affect media developments in different countries. But, taken overall, technology developments tend to begin to be adopted in the most developed countries, and then, over time, the same developments spread to the rest of the world.

### So how could our lives be changed?

In the list below are a series of lifestyle changes that may take place in developed countries in the coming decades, and that may be followed by the developing countries. They are simply a 'list for discussion' and are

given in the hope that readers will consider them, accept or reject them, and add their own potential changes to our lifestyle.

- We will spend ever more time engaging with media technology. On its present course, soonest in the developed world, media consumption may eventually consume an average of over half the total day, and up to two thirds of our waking hours.
- The use of Artificial Intelligence will make media technology equipment appear more intelligent and apparently caring of our needs and wishes. We will tend to personify our personal media technology access equipment that uses AI. They will seem 'companions in life'.
- People who so wish will be able to become better informed about, and close to, events and issues from around the world.
- AI should be able to identify Fake News, which will therefore diminish in impact, though this, and areas such as privacy and piracy, may be areas where unforeseen 'disruptors' may appear.
- For those people who wish, the media experience will become more enjoyable and stimulating, and more of the content will be absorbed and mentally retained by users.
- Different types of drama call for different relationships with viewers while they are watching, including escaping from 'conventional lives'. Viewers must put to the back of their mind for that moment that what they see are really sets, actors, and that there is a production crew behind it. Will the greater image and sound realism in the years ahead alter relationships, and make what is termed 'suspension of disbelief' more difficult to achieve? Initially it may, but eventually the relationships will stabilise. Just as with the changes from black and white to colour in the 1950s and 1960s, given enough exposure, humans will mentally educate themselves to higher quality, and accept the higher quality images and sound for drama.
- We will become personally dependent on media technology. We may suffer psychologically if we are deprived of it for any length of time.
- The media content industry will

probably become collectively the world's largest industry.

- Travel will be reduced as remote working becomes more usual. Different places will be able to be experienced and made more real by viewing high technical quality media.
- We will spend more time at home, which will in turn give us more time to consume media.
- There will be a repeating cycle whereby more media consumption begets more media consumption.

### Conclusions

Predicting the effects of media technology on our future lives precisely is not possible, because it will be influenced by many non-linear variables and feedback loops, and there may be yet unforeseen 'Disruptors'. Nevertheless, indications of future technology can be found by assuming that the tendencies in technology predicted today will become reality. History has shown that media technology predictions can be accurate; and what may seem like surprising new media technology, has usually been predicted. Examining the impact of media technology on our lives today can then lead to conclusions about the general tendencies or 'Attractors' of the equation of the future. Using the conclusions of several broadcast technology research laboratories, the report has drawn up a short list of some of the changes to our lives that emerging technology may bring in the coming years. Our future lives will provide new and exciting media experiences but will also increase our dependency on the media and create a world with less real person-to-person contact.

Media Pioneer David Sarnoff wrote in 1939: *"The television observer today watches the stage from the back row of the second balcony. We want to give him a seat in the front row of the orchestra"*. Eighty years and counting...



**David Wood** is a past recipient of the ABU award for Outstanding Technical Achievement and the SMPTE Progress

Medal. He worked for the BBC and ITV in the UK before joining the EBU. He has since worked with the ITU and the world's Broadcasting Unions since the beginning of time. He has a particular interest in new media technology and media sociology. ■

# RAI VIRTUAL LIS: AN AVATAR FOR SIGN LANGUAGE APPLICATIONS

**Gino Alberico, Andrea Del Principe, Carmen Marino, Mauro Rossini**

Rai – Centro Ricerche, Innovazione tecnologica e Sperimentazione

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## INTRODUCTION

Rai, the Italian Public Broadcaster, operates on the basis of a public service mandate, provided by the Italian Ministry of Economic Development, which establishes a set of objectives, guidelines and quality standards for the Rai Group. The service contract also includes specific objectives aimed at “enhancing the offer related to people with disabilities” and “to support digital literacy, to reduce the cultural and social gap in the use of new technologies”.

Technology and research activities are essential elements for the development of services aimed at improving the accessibility of Rai’s multimedia offering.

The Rai - Centre for Research, Technological Innovation and Experimentation (CRITS), based in Turin, has been contributing to the development of access technologies since the eighties, when for example,

the first teletext decoder with Braille bar was designed.

In synergy with other company departments, CRITS developed several projects, some of which have already become services for the public, such as the “Slow TV” option, available on the Rai on demand platform (Rai Play) or the “Beethoven Project” at the Rai Auditorium in Turin and Rome, aimed at providing a clean sound listening service for hearing impaired people with cochlear implants.

Other research projects aim to identify new methods for production and use of television content readjusted for people with aphasia and autistic spectrum disorders. In addition, there is a research project on automatic speech transcription, with the goal of extending subtitling on regional news programmes.

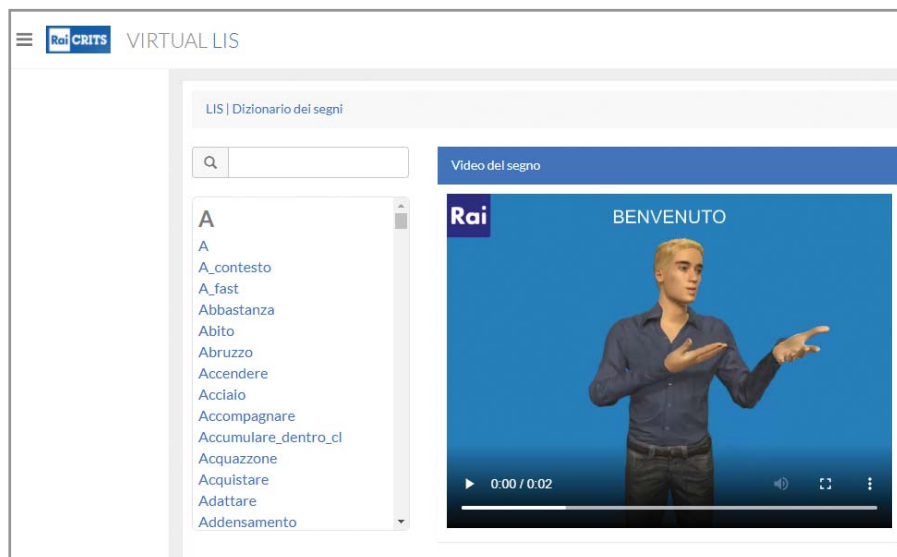
One of the most important projects of the accessibility team at CRITS,

presenting wide technical and scientific challenges, is the virtual LIS project, which is based on a platform able to express messages and translations into Sign Language (SL) through a virtual actor (avatar). The avatar has already been used to create accessible museum itineraries at the RAI Radio and Television Museum in Turin and collaborations are underway with the Ministry of Cultural Heritage to use it for the purpose of expanding the offer of cultural content available in Italian Sign Language (LIS).

## THE VIRTUAL LIS PLATFORM

The virtual LIS platform is based on several software modules and allows the production of SL content for contexts where human LIS interpreters may not always be available. Four virtual interpreters and a database of animations, corresponding to about one thousand signs, were created. The result in terms of fluidity and intelligibility was evaluated positively by the experts and deaf community.

The platform is based on a real-time graphics engine derived from the world of gaming, while the virtual characters and animations were created through the use of open source tools. A first application is on display at the Radio and Television Museum of Turin, where the virtual actor explains the artefacts of the museum in Sign Language. Other applications under development are: weather forecasting and teaching in SL. The first is based on an algorithm developed and patented by CRITS that allows an automatic translation of weather reports into







Italian SL while the second involves the creation of a web portal through which it is possible to carry out translations in SL using the platform's virtual characters.

### THE PLAYER: FEATURES AND TECHNOLOGY

The player, one of the main elements of the virtual LIS platform, is a real-time rendering system with 3D virtual characters capable of reproducing a single sign, a sentence or a sequence of sentences. The player offers the possibility to play the animations in real time and to export the corresponding video.

The production chain is based on an open source software architecture that can cope with the many problems of a complex system which requires real-time performance.

The platform selected for the player is based on "Unity", an open source architecture software widely used in the world of real time gaming. The system allows management of complex shapes and offers the possibility to modify lighting and rendering parameters in real time. The tool chosen for animating signs is "Blender", a powerful open source 3D modelling suite.

The player allows the viewing of animations with one of the four available virtual actors (two men, a woman, and a child). The characters look different but are based on a common set of kinematic joints that form the skeleton. The animations were created using inverse kinematics, by following the video of the signs recorded from a human

interpreter. The similarity among the characters' skeletons allows, with small adaptations, the use of the same animations for all the characters. For example, in the case of the ten-year-old boy avatar, the animations have been scaled back, through a script written in "Python", to better fit the smaller skeleton. To make the transition between signs as natural as possible, a morphing routine has been developed that interpolates the end of one sign with the beginning of the next.

The animation files are stored in the internal database of the player in the form of both .xml and .lis files (for example: Sign.xml, Sign.lis). The two files contain the same information but the .xml file is a text file, used for review/editing of the sign, while the .lis file is in binary format and can be used for real-time playback.

The player allows the setting of the speed of animation, the position and size of the interpreter, the background, and other useful parameters, to manage the appearance of the final animation and finally get a completely customised video.

The input file to the player is of .xml type (for example "phrase.xml") and can contain the sequence of signs, parameters such as speed, duration, transition time between one sign and another, and Italian text for subtitles synchronised with signs.

### SL WEATHER FORECAST

The project is based on a CRITS patent which allows the translation of weather reports into sign language

through a deterministic algorithm. The translation from an Italian text into the equivalent in LIS has many similarities with the translation from one spoken language to another. Currently the translation among different languages is carried out with machine translation techniques, based on machine learning. Google translate, DeepL and Bing are reference standards in this field. These translators are based on the ability of AI systems to "learn" from given examples. The dataset for training requires a parallel corpus: a collection of hundreds of thousands sentences translated in the traditional way. The result of this type of translation is based on statistical correlation and is not error free. Furthermore, corpus of this size is not available for sign language and the resources needed to create meaningful data set would be huge and incompatible with the budgets typically available for accessibility projects.

In our specific case, the source language is the teletext weather forecasts, which have a peculiar morphological, syntactic and lexical structure which is somehow predictable, despite having a wide variability. The aim of the project is to create an automatic system capable of generating weather forecasts through a virtual actor, for the various areas of Italy (North, Centre and Sardinia, South and Sicily, temperatures, winds and seas). The method can be adapted for other languages.

### SL "TEACHING"

With the goal of extending the offer of SL content in contexts where an interpreting service is not always available, a web application has been developed to allow the generation of sign language content through the virtual actor. The "Teaching" application is divided into two sections: "Dictionary", which allows to view all the signs in the database and "Translation" which is dedicated to the generation of content in LIS. The corpus of signs can be expanded incrementally and the procedure to create a new sign requires a video of a human LIS interpreter. All movements and facial expressions of the virtual character

are manually animated by computer graphics experts. The collaboration with associations for deaf people and with SL interpreters, as well as the future activation of new projects, will contribute to the enrichment of the vocabulary managed by the platform. Rai intends to make the "Teaching" application available free to associations, museums, schools and universities wishing to produce content or services in SL through the virtual actor, provided that the results are made available free-of charge, for non-commercial use, to the deaf community.

### CREDITS

The Virtual LIS Teaching application allowed Rai to win the "Digital Diversity Brand Awards 2021", a prestigious recognition that rewards

attention to technological innovation in the field of accessibility and social inclusion. Rai has also been finalist at the EBU Technology & Innovation Awards 2021 and is among the candidates for the Japan Price 2021.

### CONCLUSIONS AND FUTURE DEVELOPMENTS

A research area of Rai - Centre for Research, Technological Innovation and Experimentation is aimed at designing new services for people with sensory and cognitive disabilities, to improve the accessibility of Rai multimedia content.

Particular attention is paid to the tools developed in recent years for sign language for deaf people, with the aim of expanding the offer of

content in the Italian Sign Language. The Rai virtual LIS platform allows the generation of content in sign language using an avatar that can be applied in various contexts, especially where the "traditional" LIS interpreting service is not provided. Future developments could include the evolution of the player and characters and the use of Artificial Intelligence and low-cost motion capture technologies to create the signs and animations. These activities will involve SL interpreters, associations and deaf people.

The platform is currently based on Italian sign language but can be extended to include other sign languages in order to create an international sign language platform.

### Authors:



**Gino ALBERICO**

Gino ALBERICO joined RAI Research Centre in 1988 where he has been involved in projects ranging from the programme distribution over broadcasting and broadband platforms, to OTT services for connected TVs, accessibility services and personalized services in Digital Hybrid Radio. Since January 2020 he has been appointed Director of RAI R&D. He is member of the EBU Technical Committee since 2012 and he is also Head of the Working Group in the HD Forum Italia Association, which deals with the editing of HD-Books, the technical specification of digital receivers for DTT, satellite and IP platforms in Italy.



**Mauro ROSSINI**

Mauro ROSSINI graduated in Electronic in 1986 and, the following year, joined RAI Research Centre in the Telematics Group where he was involved in a study of new services of databroadcasting in the analogic TV transmission. He was involved in the RAI Project of Accessibility of Cultural Spaces RAI which sees assisted by assistive technologies for the Museum Itineraries at the Museum of Radio and Television and for listening to the Concerts at the Auditorium A.Toscanini for deaf people with the cochlear implant. Currently involved in the management of the intellectual property rights and in the promotion of research projects of the Rai Research Center.



**Carmen MARINO**

Carmen MARINO graduated in Telecommunications Engineering from the Polytechnic of Turin in 2008. She has been working at Rai Centre for Research, Technological Innovation and Experimentation since 2008 in the research area dedicated to accessibility and social inclusion projects. She is co-author of the patent on the algorithm for the automatic translation of weather reports into the Italian sign language. Thanks to the experience gained in the field of accessibility of television products and cultural spaces, she is also engaged in a collaboration project with the Ministry of Culture and The National Research Council of Italy aimed at the publication of the "Technical-scientific design manual for accessibility in the places of culture".



**Andrea Del PRINCIPE**

Andrea Del PRINCIPE joined RAI Research Centre in 1992. He has been involved in various projects ranging from early HDTV research and development (1250 rows standard), HD MAC and MPEG projects field test, to 3D television. He has been working for the development of Access Services technology and for many research projects aimed at reducing the digital divide and making Rai multimedia offer more accessible for people with disabilities. He also supervised the development of a virtual interpreter for Italian Sign Language (LIS). He teaches in Rai Academy and has given lectures and lessons in many Italian Universities. ■

# Cognition of Radio Waves; Compendium of Signals & Field Survey Datum

– M. S Duhan, DDG(E), DDI

## ABSTRACT:

Communication has been one of the inmost needs of the human race throughout documented history. Radio and Television consumption is undergoing a fascinating change. Radio waves are used to transmit television and radio programmes. The use of radio wavelengths has continued to change, through short wave, medium wave to FM, and now digital radio and Digital Terrestrial TV (DTT). The limitations of the radio frequency spectrum are mainly due to the propagation characteristics of different types of radio waves, availability of technology and the suitability of frequency bands for specific applications. This article delineates the planning constraints, signal strength requirements, and survey contours of various types of radio waves for Radio and TV.

## 1. INTRODUCTION

The radio wave journey has been really fascinating, and has put its mark firmly on the history of information and entertainment. Today, the use of radio waves has developed much further than Maxwell, Hertz, Tesla, JC Bose, or Marconi could have ever imagined. Although Guglielmo Marconi was the first to put the theory of radio waves into practice, the groundwork for his feat had been laid in the 19th century by great scientists like James Clerk Maxwell, Heinrich Hertz, and Nikola Tesla.

Even in the presence of a huge number of DTH and Cable TV Channels, a strong Digital Terrestrial platform is critical to healthy competition in the TV and Radio market. It is also critical to the realisation of a wide range of social and cultural benefits, and most essentially an all-weather reliable platform for distribution of Radio and TV Signals.

A fundamental requirement is to minimise impairments to the audio and video content. This article is causatum of an extensive signal survey of various radio and Digital Terrestrial Television (DTT) systems and the investigation of the electromagnetic shielding effectiveness and penetration loss due to building walls and vehicles. Attenuation in outdoor applications is based on straightforward and basic free space, but in contrast, indoor applications can be very complex to calculate.

## 2. SPECTRUM

The RF spectrum is a multi-dimensional concept and its dimensions include radio frequency bandwidth, time span, geometrical volume and polarisation. Generally, the Radio Regulations are built around a frequency allocation table that traditionally differentiates between frequency bands and administrative regions. The radio spectrum of frequencies is divided into bands, with conventional names identified by the International Telecommunications Union (ITU). Just as with the bands of colour in a rainbow, there are no precisely defined boundaries between the

bands of the electromagnetic spectrum, rather they dissolve into each other. The Radio Regulations (RR) are one of the instruments of the ITU which contain a set of international rules on the use of spectrum and orbit for radio communications. The Rules of Procedure (RoPs) is a regulatory document which incorporates the results of meetings of the Radio Regulations Board. ITU has defined regions in Radio regulations, with the whole globe divided in three regions, and the frequency bands allocated to specific services in each. Use of the radio spectrum is regulated; access is controlled and rules for use are enforced because of the potential for interference between uncoordinated uses.

FM & TV (VHF or UHF) is line of sight communication and Medium Wave (MW) is ground wave propagation. Under the right conditions refracted ionospheric rays will curve back to the ground, establishing so-called "sky-wave" (Short Wave) links beyond the horizon.

## 3. HISTORICAL PERSPECTIVE

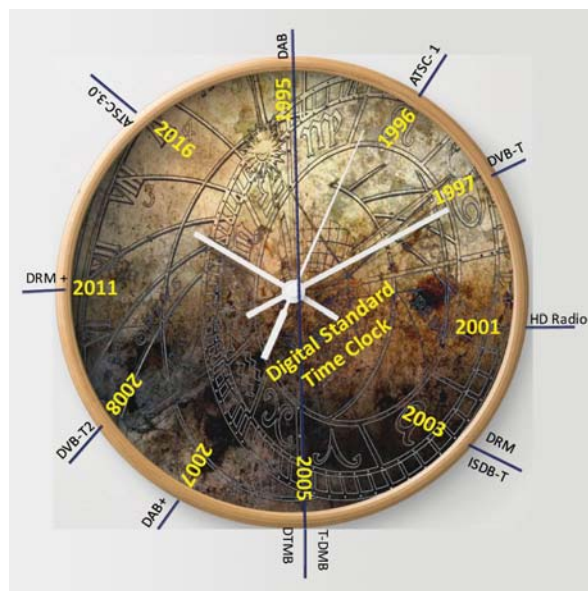


Fig.1 : Timeline of Digital Radio & TV Standards



While radio transmission started in 1920s, Television transmission started in 1940s. Digital TV's development has closely shadowed that of high-performance computers. But the real possibility started in the 1990s. Various TV standards evolved, including ATSC (USA), DVB-T (Europe), ISDB-T (Japan), DTMB (China) etc. Similarly, Radio Standards like HD Radio, DAB+, DRM+ etc. The diversity among various Digital Terrestrial TV (DTTs) standards includes varying data capacity, capability for mobile TV, varying degrees of resilience to interference, etc. To portray the growth of digital Radio and TV standards, the historical trajectory is depicted in **Fig.1**.

#### 4. PLANNING CONSTRAINTS

In order to plan channel allotments for radio and television some assumptions need to be made. Key transmission parameters need to be assumed in advance of the detailed service planning, so that interference levels between services can be assessed. The various planning objectives are as below:

- Avoid or minimise interference and disruption to existing radio and television reception and other services.
- Identify the technology; Analogue or digital; type of standard, fixed or mobile; indoor or outdoor services channels that can be used to broadcast services at sufficient ERP levels to achieve the desired coverage.
- Plan the most efficient use of the spectrum: SFN or MFN
- Define expected location and time variations
- Minimise the cost to viewers and broadcasters.
- Determine the suitability of existing transmission facilities.

The regulations and procedures promulgated and adopted by the national spectrum management authority should include steps for legal appeal against some decisions and should cover areas such as, procedures for obtaining and renewing a license, technical standards, equipment authorisation procedures, channelling plans, and operational requirements. Every country has its own spectrum allocation entity.

#### 5. IMPORTANT PARAMETERS

Some of signal parameters are as noted below:

- Protection ratio, PR [dB] – The required difference in dB between the level of the wanted signal and the level of the interfering signal to achieve the required quality of reception. Protection ratios are used in the planning of terrestrial television and radio services to reduce the likelihood of unacceptable interference to a wanted service from other signals generated in the same area, in neighbouring areas or, under certain circumstances, in quite distant locations. The protection ratios for digital terrestrial television systems refer to the centre frequency of the wanted

digital terrestrial television system and apply to both continuous and tropospheric interference. Because a digital television receiver needs to operate successfully in the presence of high level analogue signals on nearby channels, a high degree of receiver front-end linearity is required. And an accurate protection ratio values are required in order to permit the planning of terrestrial television services and Radio Services in an effective manner. Protection ratios are defined in Rec. ITU-R BT.655-7 for analogue TV and in ITU-R BT.2254 for DVB T2. The 90th percentile for the protection ratio value corresponds to the protection of 90% of receivers measured, with respect to the given frequency offset and parameter; whereas the 10th percentile for the overload threshold should be used to protect 90% of receivers measured.

- Usable field strength,  $E_u$  [dB $\mu$ V/m] – The required field strength of a wanted signal to achieve the required quality of reception, considering multiple interfering signals and their corresponding protection ratios.
- Nuisance field strength,  $E_n$  [dB $\mu$ V/m] – The equivalent required field strength of a wanted signal to achieve the required quality of reception, considering a single interfering signal and its corresponding protection ratio.
- Interferer field strength,  $E_i$  [dB $\mu$ V/m] – The field strength of a single interfering signal. Permissible value of interference Margin = Wanted signal – Interference signal – Protection Ratio.

#### 6. SIGNAL STRENGTH REQUIREMENTS AND COVERAGES

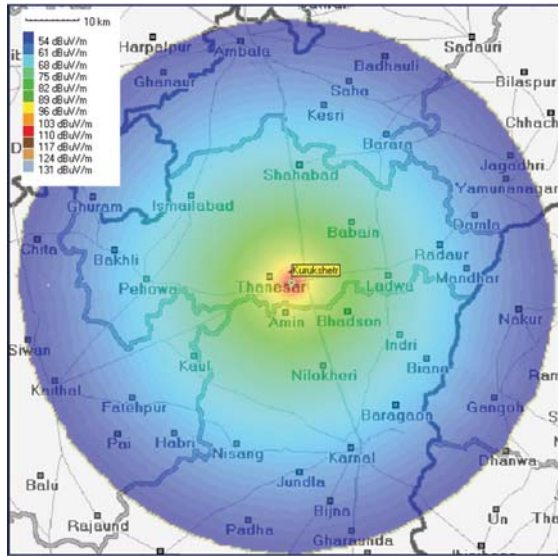
Minimum signal strength required for faithful reproduction by the receivers of prevailing platforms of Radio and TV can be computed by mathematical modeling as by computer programming. These have been compared with physical measurements in various locations, directions, days/nights etc.

##### 6.1 FM Radio

As per recommendations of ITU-R BS.412-9, for Frequency Modulation, in the presence of interference from industrial and domestic equipment a satisfactory service requires a median field strength (measured at 10m above ground level) not lower than the values given below in **Table 1**.

Area	Monophonic (dB $\mu$ V/m)	Stereophonic (dB $\mu$ V/m)
Rural	48	54
Urban	60	66
Large Cities	70	74
<b>Table 1: FM Minimum Signal requirements</b>		

In the absence of interference from industrial and domestic equipment, the field strength values (measured at 10m above ground level) given in **Table 1** can be considered to give an acceptable monophonic or stereophonic service, respectively. These field strength values apply when an outdoor antenna is used for monophonic reception, or a directional antenna with appreciable gain for stereophonic reception (pilot-tone system, as defined in Recommendation ITU-R BS.450. For Rural areas, the FM Signal requirement will be 34 dB $\mu$ V/m for monophonic and 48 dB $\mu$ V/m for Stereophonic system. FM Coverage Area of a 10kW transmitter with 100m Radio Tower at Kurukshetra (Haryana) is shown in **Fig. 2**.



**Fig.2 :** Coverage area for a 10 kW FM Tx

The variance of FM signal w.r.t distance from Transmitter and AMSL is exhibited in **Table 2**.

10kW AIR FM Signal Vadodara (Freq = 93.9 MHz)		
AMSL	Distance from Tx	dBuV/m
49m	18.58	43.26
57m	23.00	48.19
65m	27.65	44.46
101m	37.70	42.28
92m	39.87	30.76
78m	43.40	30.99
100m	33.13	47.37
67m	28.36	43.06
<b>Table 2: FM Signal Variance</b>		

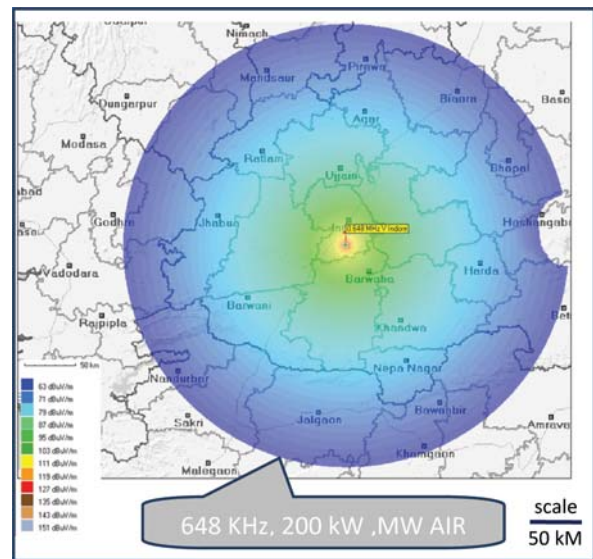
## 6.2 Medium Wave

A minimum intensity of 25 mV/m is desirable to provide a Medium Wave (MW) broadcast service to the business/factory areas of a city; a minimum field intensity of 5 mV/m is normally required for residential areas. In AM the field-strength limited contour is defined by a field strength of at least 66 dB $\mu$ V/m for commercial radio services and is at least 76 dB $\mu$ V/m for community

radio services measured 1.5 meters above ground. The interference-limited contour is defined by a co-channel protection ratio of 27 dB, and an adjacent channel (9 kHz separation) protection ratio of 3 dB; for synchronous services a co-channel protection ratio of 7 dB is used.

The most important property of groundwave propagation is that it propagates parallel to the ground. The attenuation will depend strongly on the terrain constants (conductivity and permittivity), as well as other factors like polarisation, antenna height, distance and frequency. Over non-homogeneous paths, the use of vertical polarisation is the only practical approach, because the ground quickly absorbs horizontally polarised signals. Even vertical polarisation suffers high attenuation over poor ground. Paths over the sea or including the sea have diminished losses because of increased sea conductivity.

Radiation over a smooth spherical surface is a radio electrical problem that has an analytical solution. The radiated field can be expressed as a sum of terms with amplitudes in function of frequency, terrain constrains, polarisation, distance and antenna height. The electrical characteristics of the ground along the path vary as per soil conductivity. Soil conductivity changes from 10 mS/m to 1 mS/m near Hoshangabad (Madhya Pradesh) and accordingly the coverage changes as shown in **Fig.3**.



**Fig.3 :** Coverage map of 200kW MW

Further, there will be variations of signal during day and nighttime. A signal survey of a 1000 kW MW Transmitter at 1130 kHz, operating at Mogra near Kolkata, was carried out some time ago and the variation of field strength at sunrise at Mandalay in Myanmar is plotted in **Fig.4**. There was no change in signal from midnight to 04:30 AM. However, signal gradually started declining about 1-1½ hours before sunrise. Similarly with measurements at sunset at a frequency of 590 kHz, it was observed that signal started gradually rising about half an hour before sunset as shown in **Fig.5**. Experimental results are found to agree with the theoretical models.

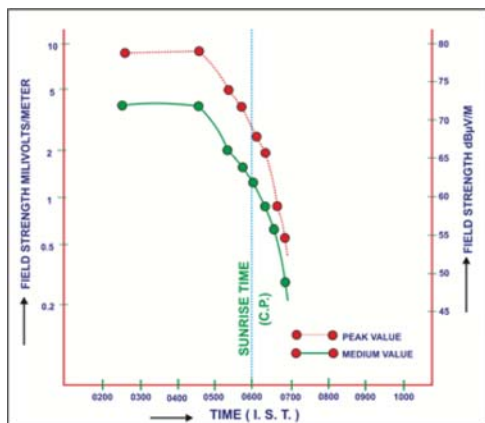


Fig.4 : Signal at Sunrise Time

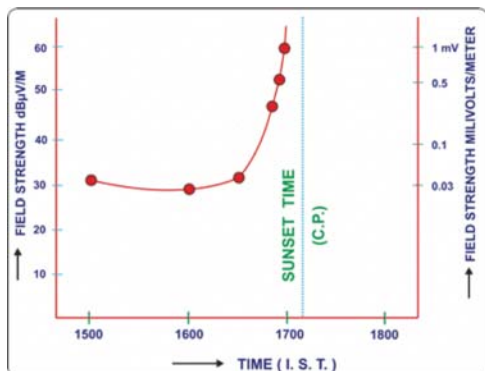


Fig.5 : Signal at Sunset Time

### 6.3 DRM Signals

DRM Technology is based upon COFDM for better reception with low bit rates. Based upon ITU Recommendation ITU-R BS 1615-1, the minimum signal strength requirement for robustness mode A, used for medium wave transmission, lies somewhere between 40 to 45 dBuV/m depending upon spectrum occupancy type. A signal analysis of the DRM Transmitter at Delhi(Khampur), in simulcast mode with 5 kW DRM Power, was carried out with the following parameters: -DRM Mode A, MSC 16QAM, SDC 4QAM, FAC 4QAM, Audio Coding XHE-AAC, Frequency- 810 kHz, Spectrum occupancy- 9 kHz. The Potomac P14200 field strength meter was used along with Avion make receiver DRM-AV-DR-1401.

The resulting measurements of signal strength and MER are tabulated in **Table 3**.

SN	Distance From TX	Signal Strength (dBuV/m)	MER (dB)
1	1 km	113.3	32.5
2	5 km	98.2	31.8
3	10 km	91.5	26.7
4	15 km	83.2	26
5	20 km	81.7	25.5
6	25 km	83.0	25.5
7	30 km	78.9	23.4
8	35 km	78	22.1
9	40 km	75.9	20
10	45 km	75.8	18
11	50 km	73.2	16

Table 3 : Signal Strength & MER

Fig.6 depicts MER variations against distance from the transmitter.

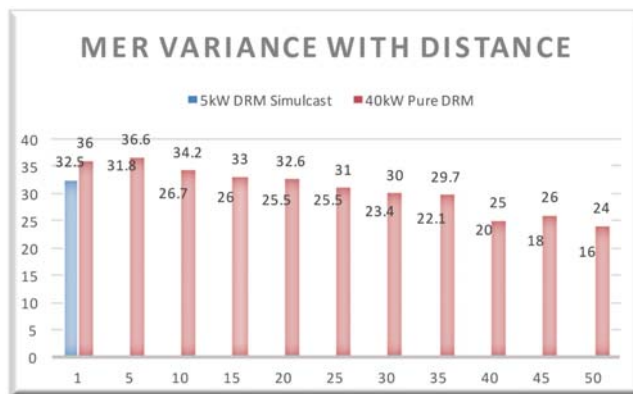


Fig.6 : DRM Signal variance

### 6.4 Analogue Terrestrial TV

For an analogue terrestrial television service the recommendations of ITU-R BT.417-5 for the minimum signal strengths for which protection may be sought in planning is shown in **Table 4**.

Band	I	III	IV	V
dB(μV/m)	48	55	65	70

Table 4 : Analogue TV Signals

These values refer to the field strength at a height of 10m above ground level. For other channels in Bands IV and V, for systems using 8 MHz channel raster, the minimum field strength value should be derived as follows:  $E_{min} (dB(\mu V/m)) = 62 + 20 \log (f/474)$ , with  $f$  being the channel centre frequency expressed in MHz.

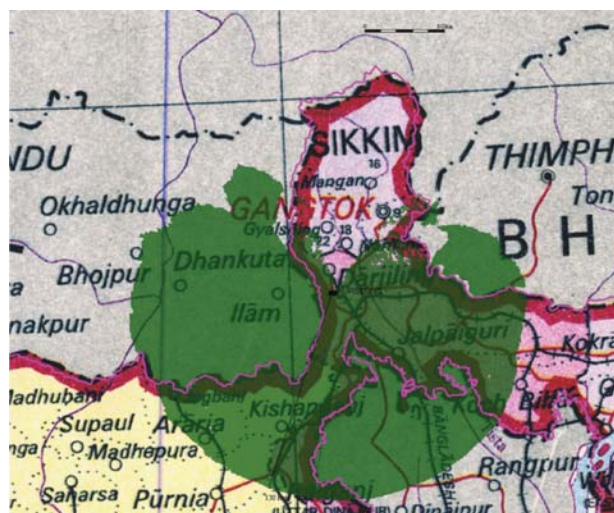
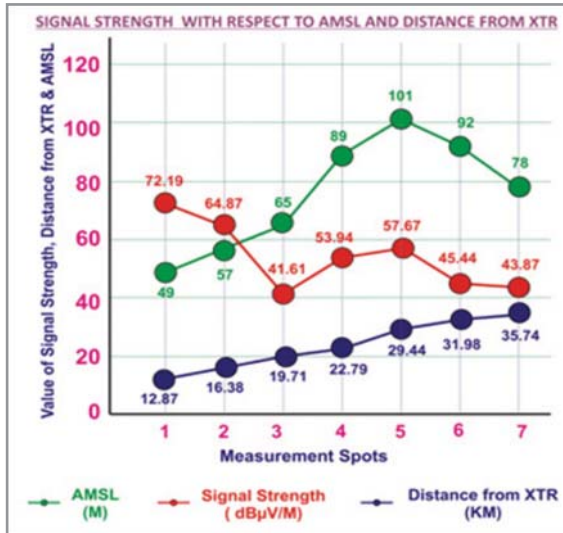


Fig.7 : Coverage from HPT Kurseong

One of classic attributes of RF radiation of Radio and TV transmitters, is that they are not restricted by regional or national boundaries. Kurseong (West Bengal) High Power TV Transmitter of Doordarshan relays live phone-in programmes originated from DDK Jalpaiguri. The phone calls are received from Bangladesh, Bhutan, Nepal and of course India. The TV signals vary depending upon topography and distance from the transmitter. The variance



of 10 kW UHF TV signal of HPT Vadodara (India) w.r.t distance from transmitter and AMSL is shown in **Fig.8**.



**Fig.8** : DRM Signal variance

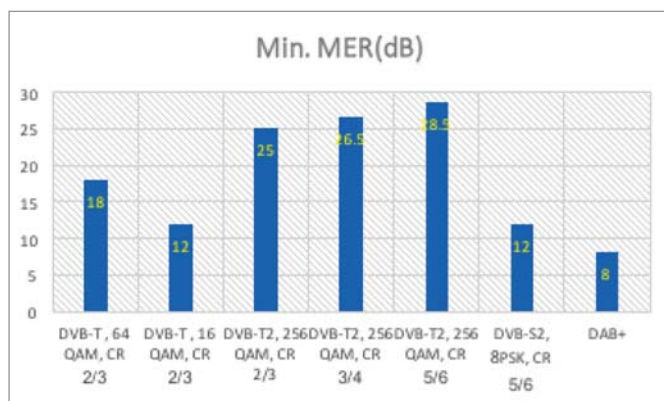
## 6.5 Digital Terrestrial TV

6.5.1. In digital broadcasting the conundrum of the “digital cliff” effect needs to be ironed out. The term refers to a sudden drop from normal reception to a complete lack of content. Operation at the boundary is the reason why the picture may appear to freeze, or display like a mosaic. Typical values for DVB-T2 signals for various modulation parameters are as listed in **Table 5**.

Modulation Parameters	256 QAM, CR 2/3	256 QAM, CR 1/2	64 QAM, CR 2/3	64 QAM, CR 1/2	QPSK, CR 2/3	QPSK, CR 1/2
Signal strength	51.2 dBμV/m	46.7 dBμV/m	47 dBμV/m	43.4 dBμV/m	36.7 dBμV/m	34.4 dBμV/m
C/N <sub>Gauss</sub> -raw (dB)	17.8 dB	13.2 dB	13.5 dB	9.9 dB	3.1 dB	1 dB

**Table 5** : DVB-T2 Signals Vs Modulation parameters

Modulation Error Ratio (MER) is another important parameter in digital links. MER affects the ability of a digital receiver to recover data bits and is a useful metric which help to gauge the end-to-end health of a network. If a constellation diagram is used to plot the landing points of a given symbol over time, the resulting display forms a small “cloud” of symbol landing points rather than a single point. The Peak minimum MER is important, not mean MER. Minimum Receiver MER for some Digital TV/Radio networks for stationary outdoor reception is as depicted in **Fig.9**:



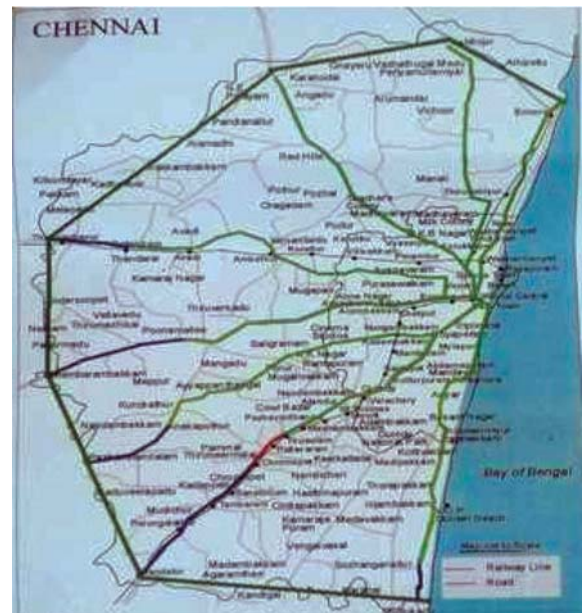
**Fig.9** : MER for various standards

### 6.5.1 DVB-T TV Signals

The noise limited sensitivity of receivers drives key considerations in designing the network and manufacturing of receiving devices. So, in order to ensure perfect system working and quality of service, minimum signal levels are essentials which need to be protected against interfering noise. The DVB-T transmitter coverages from the Transmitters at Chennai, Mumbai, Kolkata and Delhi provided examples, as detailed in **Table 6**. About 45-50 Kms is the reach of signals from the Tx site.

Modulation	FEC	Data capacity (mbps)	Maximum Vehicle speed (Km/Hr)
64QAM	2/3	23.4	25-40
16QAM	2/3	15.6	80-90
QPSK	1/2	5.8	90-100

**Table 6** : DVB-T Offerings



**Fig.10** : A 6kW DVB-T Signals

### 6.5.2 DVB-H Transmitter Signals

Transmission Parameters were set as: 5 kW DVB-H Transmitter with Antenna at 100 M Tower, Channel 26 (514 MHz), Video format: QCIF (352x144), Frame rate: 15 fps, Video data rate: 384 kbps, Audio data rate: 64 kbps, Modulation: QPSK, 16 QAM, Mode: 8K, FEC: 1/2 Guard Interval (GI): 1/8, MPE-FEC. 25%. The summary of results for the DVB-H Transmitter is as below:

- With QPSK modulation, very good reception was observed up to 6 Km. The reception quality was observed to be perfect up to 5 Km but with intermittent freezing of signal from 5 Km to 12 Km.
- With 16 QAM modulation, very good reception quality was observed up to 3 Km. The reception quality was good with intermittent freezing of signal from 3 Km to 6 Km. Beyond 6 Km, the reception quality was highly inconsistent.

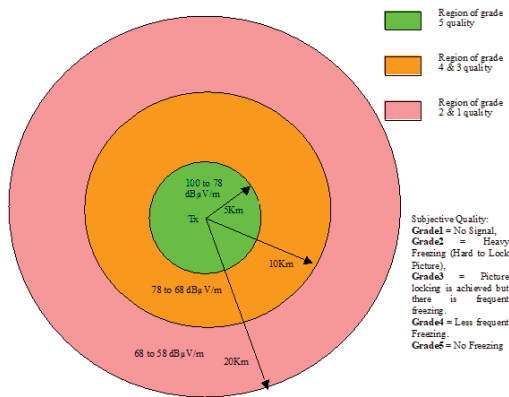


Fig.11 : DVB-H QPSK Signal

In case of QPSK, beyond roughly 12 Km, the field strength came down to 55 dBµV/m. The reception quality can be graded either 2 or 1 in this region. Reception of grade 4 quality was also experienced beyond 12 Km and up to 20 Km, provided the signal is received in open area like Noida Expressway and GT Road. Fig.6 pictorially depicts the various regions (shaded with different colours) of field strengths and different reception qualities with QPSK modulation.

### 6.5.3 DVB-T2 Signals

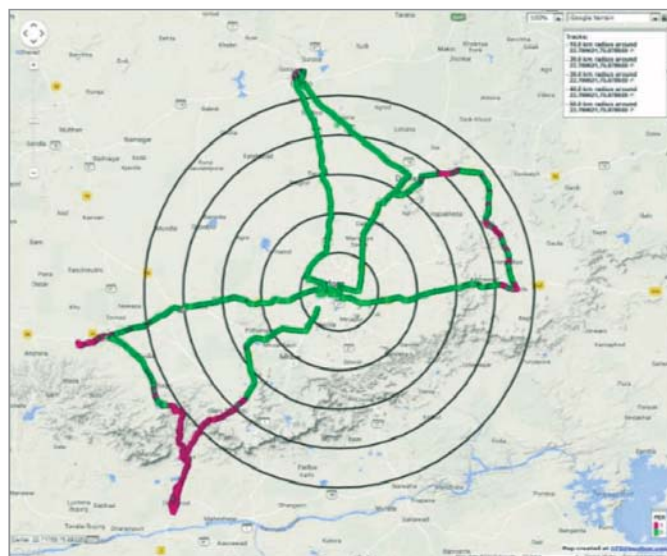
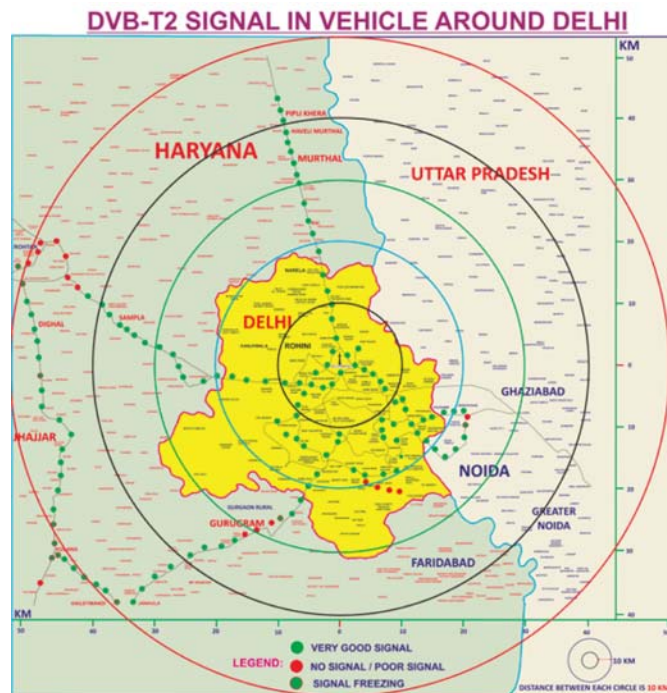


Fig.12 : Coverage of DTT at Indore & Delhi (Each circle 10 kms apart) .

A 6 kW DVB-T2 transmitter was tested using various RF profiles, like modes VV3 (256QAM), VV4 (64QAM), VV11 (16QAM) and VV10 (QPSK) with horizontally polarised antenna of gain about 11 dB, mounted at 235 m tower height, and the signal was observed to be very satisfactory to around 60 Km.

The experiments were carried out for fixed, portable and mobile. While coverage for fixed reception was satisfactory up to 60 Km around TV Tower situated at Pitampura (Delhi), the mobile reception was up to 40 Km - 45 Km, using two way diversity car receiver model HR-400 for DVB-T2 using QPSK and FEC 1/2, the signal reception was uninterrupted in the vehicle, starting from India Gate up to Murthal (Haryana).

There was heavy traffic and there were high rise buildings in the busy market of Daryaganj (Old Delhi) and still there was clear signal without any freezing. Outside Delhi the vehicle speed was increased up to 120 Km/Hr and the reception remained normal. Thus DTT on the move is now reality in various towns of India.

Mobile reception at 6 kW, DVB-T2 with QPSK and FEC 1/2, was tested in various cities and found satisfactory. Two example coverage maps are shown for 6 kW HPT Indore and Delhi.

### 6.5.4 Market Opportunity and Viewer's recourse

The main conclusion reached is that changing the DTT operating mode will change both the geographical Coverage and the Mobile and Portable Coverage of the DTT service. The case study of signal survey of DVB-T2 signal with COFDM code rate 1/2, is encouraging for receiver manufactures and viewers as well. As shown above, with double diversity receiver, moving vehicle can receive the DTT signal in almost whole of Delhi and some surrounding areas.

The commuters can be highly beneficial and equipment manufacturers may eye an opportunity for device manufacturing for moving and portable receiving systems.

### 6.5.5 Building penetration loss

The field strengths were measured outside and inside (ground floor corridor) a multi-storied commercial building and found to be 80 dBµV/m and 61 dBµV/m respectively. Thus the building penetration loss was about 19 dB.

### 6.5.6 Height loss

It was observed that as one goes from higher to lower floors the signal strength decreases. Some measurements were taken in corridors of the multi-storied commercial building. The measurements were taken on 3rd, 2nd, 1st and ground floors and found to be 80, 68, 66, 61dBµV/m respectively.



### 6.5.7 Vehicle penetration loss

Vehicle penetration loss was measured and calculated to be 6 to 7dB. First, sets of field strength measurements were taken with the antennae on the roof of the vehicle. Then, second sets of measurements were taken with the antennae inside the vehicle. The difference gave the penetration loss. Such loss may vary from vehicle to vehicle.

### 6.5.8 Indoor reception predicament

The major challenge for digital signals is indoor receptions. The different type of walls causes different attenuations from 10-15 dB and double walls may attenuate it further 15-18 dB. The doors may contribute attenuation of 5-8 dB. So, the high gain active antenna is useful element in deep indoor reception.

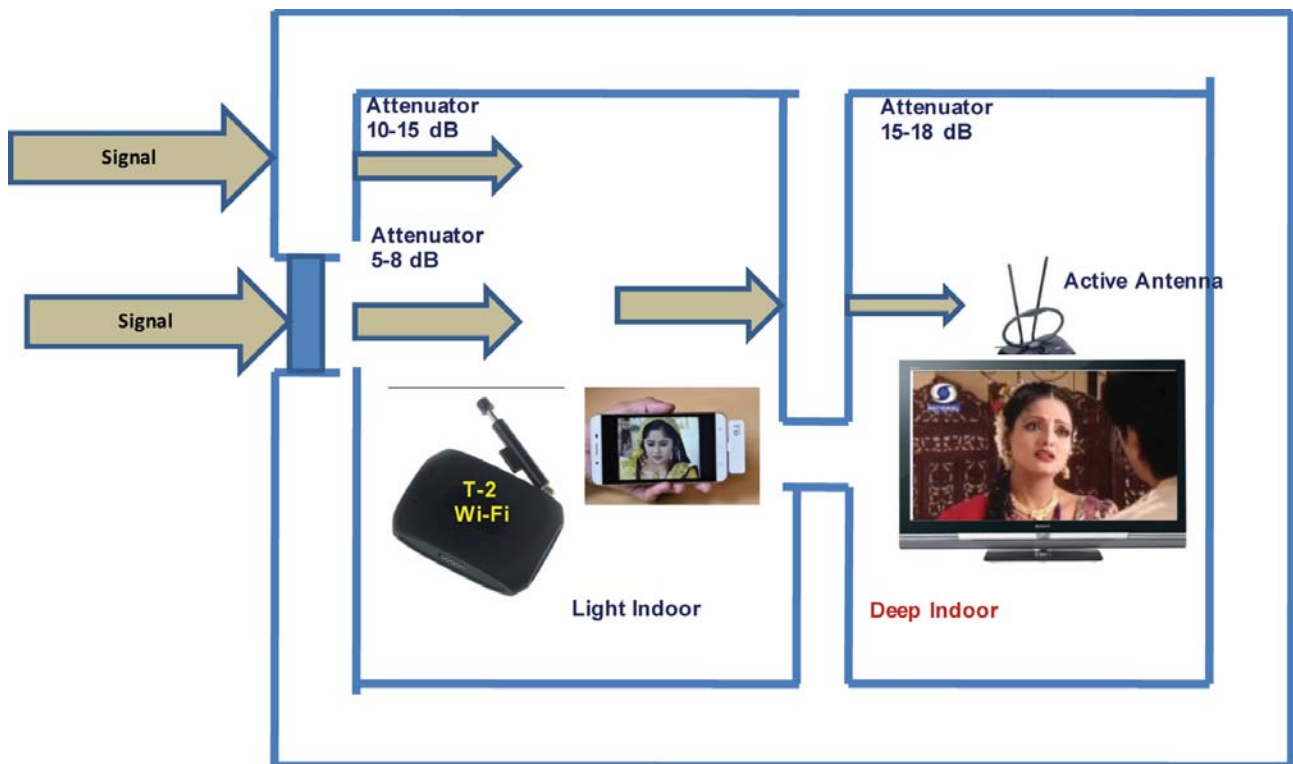
There are some DTT wi-fi routers which facilitate the signals in light indoor as well as deep indoor areas. Such routers may be placed near to window and as such indoor reception is enabled.

## 7. CONCLUSION

Signal analysis is a critical aspect for broadcasters and viewers/audiences alike. The various planning objectives include: To avoid or minimise interference and disruption to existing radio & television reception and other services; Identify the technology, analogue or digital, type of standard, fixed or mobile, indoor or outdoor services channels, minimum cost to viewers & broadcasters, and suitability for existing transmission facilities.

The attenuation of radio signals from outdoor to indoor has great variability, depending on the nature and thickness of walls and on the presence of apertures, such as windows. A compendium of signal analysis data helps in cognition of radio waves for Radio and TV, both analogue and digital.

Radio waves need to be regulated for the interference-free co-existence of various users. Receiver manufactures benefit hugely from such a compendium. In mixed urban scenarios, where modern and ancient buildings are simultaneously present, it can sometimes be difficult to provide good radio coverage for mobile phones.



### AUTHOR:



**M. S Duhan**, DDG(E), DDI

As an exponent in broadcasting system design, Sh. M. S Duhan is a true target achiever, having proved his mettle in managing a wide range of activities across the network of AIR and Doordarshan, encompassing Studios, Earth Stations and Transmitters. He has over three decades of experience in broadcasting sector with a predominant focus on digital terrestrial technologies, eco-system and solutions. With his extensive experience in conceptualising and

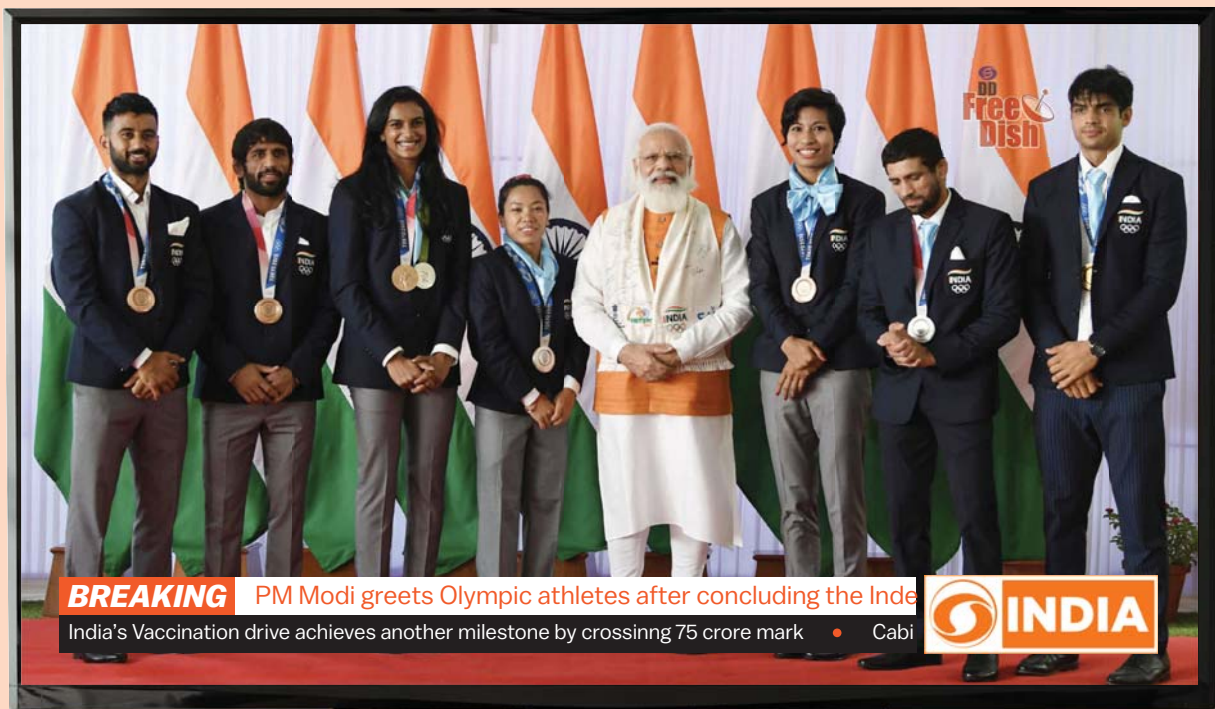
implementing strategic plans, he has played a crucial role in accelerating engineering activities, like digitalisation of the DD Terrestrial Network and the implementation of the FM Transmitter Plan. He possesses a degree in Electrical Engineering, MBA and Master of Mass Communication. Sh. Duhan is a contributor to various industry forums, events, journals and TV Talk shows. He is a recipient of numerous honours and awards conferred by ABU, BES and DD. He has published many papers/articles in national and international journals, on issues related to terrestrial TV and Radio Transmission and usage of RF Spectrum. He was a resource person for the 'AIBD/RTM in-country Workshop on DVB-T2 technology' organised in Kuala Lumpur by ABU in May 2015. Currently he is posted at Prasar Bharati Secretariat and is in charge of DDG (HR & LM). ■



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D/L-11550, Pol.-V  
S.R.-29.5 MSps  
FEC - 3/4



Scan To Downlink



Scan To Watch

# AM Transmitter installed in Goroka, Papua New Guinea

## NATIONAL BROADCASTING CORPORATION, PAPUA NEW GUINEA



### BACKGROUND

Papua New Guinea is the largest island nation in the South Pacific region. It has the main island where most of the population lives and lots of smaller, far-flung islands. It's a country of great natural beauty. With a population approaching 10 million people, this nation has more than 800 languages and numerous tribes. The terrain has rugged mountains, lush valleys, thick jungles, numerous islands, river plains, a long and beautiful coastline and the most diverse flora and fauna.

Papua New Guinea achieved independence from Australia its colonial master on 16 Sept 1975. Since then it has been a proud and free nation.

After independence, PNG established its own national Broadcasting network. It is known as National Broadcasting Corporation of Papua New Guinea (NBC PNG).

In the beginning, it was radio that was the mainstay of NBC PNG. However, once television became the norm all over the world, TV was added. Quickly, TV became an important medium of communication.

In 2018, the Information and Broadcasting Ministry decided to extend the radio coverage by setting up a series of AM transmitters. The ministry went ahead and allocated sufficient funding for this important decision. This was to ensure that people residing in small population centres in far-

flung places could get easy access to radio services. In many places, radio is still the only way to access the outside world, the only mass media reaching these far-flung places.

NBC PNG – under the leadership of MD, Mr Kora Nou, and Deputy MD, Mr Joe Wafewa – took up the challenge. They planned the entire project plan and set it in motion.

### TECHNOLOGY

They decided to go with the world leader in AM transmitters, Nautel. Nautel is one of the oldest and most respected companies manufacturing AM transmitters. Though the Nautel transmitter was considered expensive, it has unbeatable features. Among the most impressive features are great quality, long life and the ability to function in extreme conditions.

### About Nautel

Nautel invented the modern solid state broadcast transmitter over 40 years ago. Five generations of transmitter design know-how have been applied to the NX Series resulting in the most modern and reliable high-power transmitters available today.

Broadcasters can choose from surprisingly compact standalone transmitter designs with outputs from 3 kW to 400 kW. These discrete transmitters can be combined to achieve power outputs of up to 2 MW.

### Nautel Innovation:

- AM precorrection, unmatched linearity
- Industry's top efficiency: 90 percent on 100+ kW transmitters
- 1.8 MHz direct digital modulation (NX300: 2.7 MHz)
- 17" touch screen on 25+ kW transmitters
- 100 percent remote web access to the user interface
- RF and audio spectrum analyzer
- Trimode: Analogue, HD Radio®, all DRM modes
- The new standard in compact MW design





### The System Integrator

Once the technology was decided, the next decision was to pick the right system integration partner. The SI partner had to be a local company used to operating in the local conditions and able to provide service and support locally. Obviously, the one chosen had to provide the lowest price. After a series of negotiations, the project was awarded to a local company, South Pacific Systems Private Ltd. This company was located in Port Moresby a stone's throw away from the NBC PNG head office.

After a long and tough negotiation process, the orders were placed. NBC PNG decided to be careful and split the bigger project into smaller orders. This was to ensure that the system integrator delivered one set before being given the next order. This way, the risk would be minimised and NBC would get the most benefit.

However, disaster struck when COVID-19 engulfed the world. The whole world came to a standstill. All travel ground to a halt. The world's airports shut down and the project looked to be doomed. However, regardless of the problems, the NBC PNG team just kept moving. The lockdowns, factory closures and airlines closures meant that the time line of the project had to be extended. The product delivery was postponed. However, after this delay the AM transmitter was finally ready for delivery. The transmitter was shipped by sea to PNG.

Once the transmitter was shipped, the attention shifted to all the accessories. Most of the accessories were sourced from Kintronic Labs in the US. Kintronic Labs, led by Mr Tom King, are a pioneer in manufacturing transmitter accessory products. They were chosen because of their great reputation and their wide range of products.

The right kind of accessories were ordered after a detailed discussion on the site survey and other requirements. Once the products were ready, the goods were shipped to PNG.

The original plan was that a team of people would arrive on-site and help the NBC team to install the transmitter

on site. However, by now, the second wave of COVID had engulfed the world. The PNG government decided to close the borders. This posed a big challenge. However, the NBC technical team under the able leadership of Deputy MD Mr Joe Wafewa took up the challenge. With the help of the system integrator, the team set about installing the accessories and the transmitter.

It was hard and took a lot of work. The system integrator produced a detailed booklet full of drawings and list of things to check. The on-site team kept in touch and work progressed.

Finally, the accessory systems were installed and the transmitter was tested. The tests were conducted repeatedly over time to ensure that the transmitter was working. The signal strength, distance and other parameters were taken into account. After repeated testing, it was decided that the installation was a success.

Finally, the day came for the inauguration. The Minister for Communications & Information Technology, Mr Timothy Masiu, inaugurated the AM transmitter on 15 July 2021.

Minister Masiu, a former NBC Broadcaster, said the installation of the new transmitter would substantially increase the national radio service in the Highlands provinces, as well as Morobe, Madang, and the Gulf Provinces.





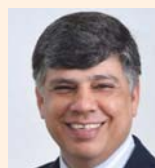


From left to right: **Russel Woruba**, Deputy Secretary, Department of Information and Communication; **Joe Wafewa**, NBC-PNG, Deputy Managing Director/Chief Engineer; **Bannie Popate**, NICTA- Spectrum Management Office; **Kora Nou**, Managing Director, NBC- PNG



Now that the new AM transmitter is operating, people living in the Central highlands, the Eastern highlands all the way to Morobe province, Madang and the Gulf province will benefit. Radio will bring news, entertainment, knowledge, religion and a host of other benefits. In times of a natural disaster, radio is sometimes the only mass medium working. It can deliver vital information that can save lives. Radio is the only mass medium that can reach long distances with a minimum investment. NBC PNG working together with the Ministry of Communication will work hard to provide radio services to each and every individual in Papua New Guinea.

#### Author:



#### Aale Raza

Chief Executive Officer  
Whiteways Systems Pte Ltd

Aale is a founder and Director of Whiteways Systems Pte Ltd, Singapore. Whiteways has become one of the leading system integrators in the Asia Pacific region. Whiteways is focused on providing cutting edge solutions to Radio and TV stations. Whiteways is a leading supplier and systems integration company focused on providing solutions to broadcast houses, television channels, professional video production/post production and teleports. ■

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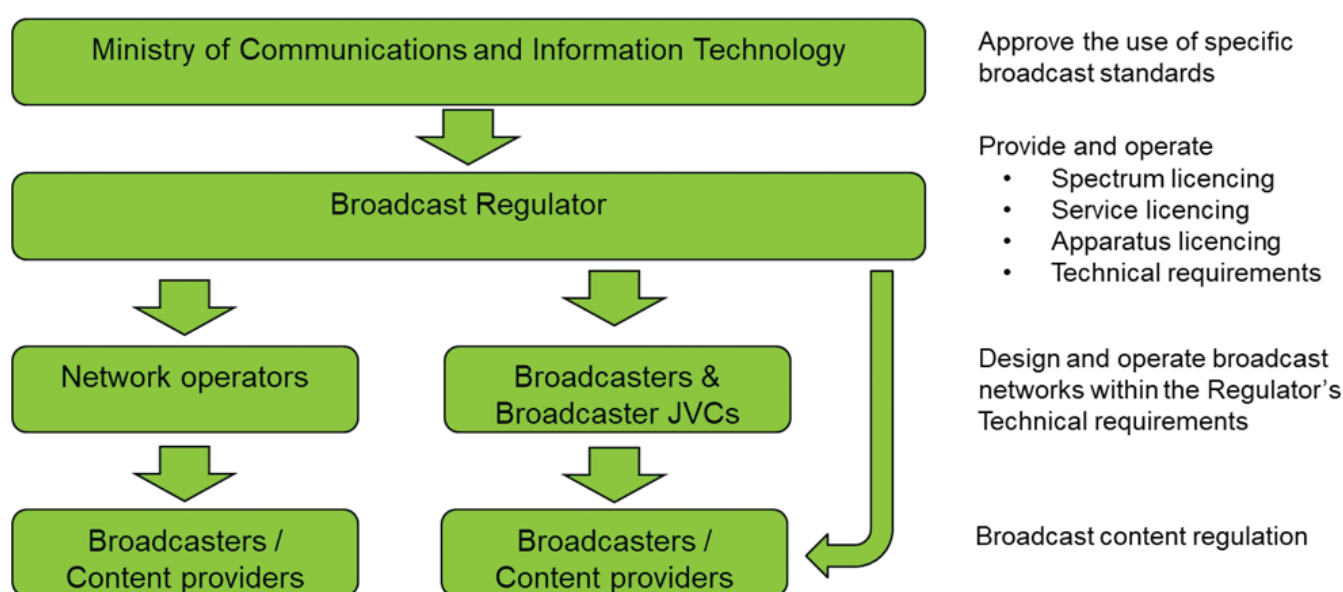




# The DAB adoption process, Part 2: Formal DAB+ standard adoption

**Dr Les Sabel**, *Chair of the WorldDAB APAC Technical Group*

**ABSTRACT:** The adoption of DAB+ as a national broadcasting standard requires a number of formal steps, including legislation that supports licensing of the use of radio frequency spectrum. We discuss the roles of the various stakeholders in the adoption process, including Regulators, broadcasters and network and transmission providers, noting that each country has its own preferences. We discuss the various activities which need to be undertaken and the interaction and outcomes including the formation of industry bodies and committees, business case analysis, licensing options and public consultations. We conclude with some discussion of the licensing of initial markets and incentive schemes which can help the industry move forward.



*Figure 1: Typical regulatory structure*

## STRUCTURE AND CONTROL

In most countries there is a top down approach to the licensing and regulation structure. A typical structure is shown in **Figure 1** where the responsible government department is at the top, typically the Ministry of Communications and Information Technology (or similar). The Ministry is responsible for the establishment of legislation which controls the issuing and use of radio frequency spectrum, e.g. in Australia the Broadcast Services Act 1992 (as amended) or in the United Kingdom the Communications Act 2003 (as amended) and the Broadcasting Act 1996 (as amended). The Acts are the principal legislation that set out the bulk of the regulatory environment and can be amended from time to time to accommodate new technology, political environments and business evolution.

## STAKEHOLDER ROLES

### Regulator responsibilities and approaches

The regulations are usually developed by “The Regulator” which is a government authority with powers to grant or remove spectrum and service licences; examples include the Australian Communications and Media Authority (ACMA) in Australia, Office of Communications (Ofcom) in the UK, and the National Broadcasting and Telecommunications Commission (NBTC) in Thailand. The Regulator is responsible for ensuring that radio spectrum is used efficiently and maximises the overall socio-economic benefit to society.

Regulators regularly undertake planning activities regarding the future use of radio spectrum given ongoing changes in technological use, public and commercial demands, and international trends. Regulators also participate in international spectrum planning activities such as the forthcoming World Radio Conference (WRC), which is conducted by the International Telecommunications Union (ITU) every four years, with the next conference to be conducted in 2023. In that conference there is Agenda item 1.5 – “Review of 470 – 960 MHz in Region 1 and possible regulatory actions in 470 – 694 MHz in Region 1”, which is a topic on broadcast spectrum use in the UHF band; one which is used for UHF Digital Terrestrial Television (DTT). The 600 MHz band in the USA, which is in ITU Region 2, specifically 614 – 698 MHz, is now assigned to Mobile communications on a primary basis under the 2nd Digital Dividend (DD), forcing the “repack” of the DTT services into lower frequency bands, see **Figure 2**. The Asia-Pacific is in ITU Region 3 and will not be directly impacted by any resolutions coming from WRC Agenda item 1.5, however they are likely to have significant ongoing influence on the use of the 600 MHz band for DTT in future WRCs. Any pressure on the 600 MHz band for DTT is likely to then apply pressure to VHF Band III, which is used for DAB+, due to increasing likelihood of DTT moving back into that band (see <https://www.youtube.com/watch?v=BWxgTqRc3r4> for the initial 2021 WRC discussions on this topic).



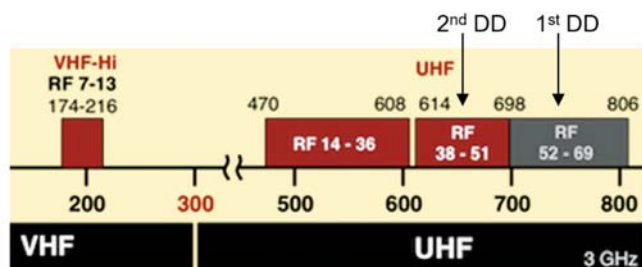


Figure 2: 600 MHz band in the USA

Regulators will generally be involved in planning and reviewing new transmissions to ensure that they will provide fit-for-purpose coverage without causing excessive interference into other services. They are also responsible for setting the operating guidelines for broadcast transmissions, including maximum and minimum field strengths, coverage expectations and interference Protection Ratios (PRs). For DAB+ these technical planning parameters are provided through recommendations and guidelines such as the EBU Tech 3391 and the ITU BS.2241. While these documents provide recommendations, it is common to find that individual Regulators will provide their own adjustments to the base-level technical parameters with the result of slightly different required minimum median field strengths for different classes of service and coverage area types.

Modern Regulators will generally undertake public consultations and industry discussions to ensure that they have a clear understanding of the positions of various broadcasting industry sectors. To resolve conflict situations Regulators will sometime setup industry committees to work through the issues and arrive at mutually acceptable conclusions. An example of such a process was the Australian Digital Radio Planning Committee, which was tasked with determining how to plan DAB+ frequency allotments in Australia. The task was complicated by the availability of only 2 VHF Band III television channels resulting in only 8 DAB+ frequency blocks being available for the entire country. To complicate matters further the Public Service Broadcasters (PSBs), the ABC and SBS, required that they have their own ensemble, with no sharing of multiplex ensembles with the Commercial and Community broadcasters, who do share capacity. The outcome was the formulation of a set of Planning Principles which defined the number of frequency blocks to be provided to the PSBs and the Commercial and Community broadcasters, and the technical parameters which would be used to determine the allotment of frequency blocks to commercial licence areas. Such an approach can be used by other countries to resolve cross industry issues and allow the broadcasting sector to move forward.

### Network and transmission service providers

Transmission providers come in two basic forms:

1. Purpose based companies that provide transmission facilities. These can be either public or private organisations. They can, but don't always, own the spectrum licence for transmissions and may simply lease tower space to broadcasters. They often provide transmission services to broadcasters (content creators) and charge for their services based on the DAB+ multiplex capacity used and the power and site provided. Typically, the charges are competitive and based on demand. Example network operators include Telenor in Norway, Arqiva in the UK and Sentech in South Africa.
2. Broadcaster based DAB+ transmissions are usually either for the Public Service Broadcaster or for commercial/community broadcasters via a Joint Venture Company (JVCs). In Australia the commercial and community broadcasters have formed

JVCs in the populous metro cities and some large regional centres where they lease facilities from site owners.

The network and transmission service providers have specialist knowledge to help ensure that the technical basis of DAB is correctly established by the Regulator. They can provide input to the Regulator on planning and operations aspects such as coverage field strength requirements particularly in difficult terrain and urban environments and protection ratios to avoid interference.

### Broadcasters

Broadcasters are at the core of broadcasting as they create the content. The broadcasters must produce content which conforms to the country's broadcasting content regulations.



Broadcasters who operate their own transmission systems are subject to transmission and apparatus licences, as are 3rd party transmission service providers.

Broadcasters have critical input to the regulation process as they will provide context for the digital broadcasting scheme as a whole. They should provide input to the digital radio regulation process in the form of the number of services required in each area, as this will impact spectrum requirements, the types of content, as this can impact licensing types, and coverage and overspill allowances and preferences. Without this input the regulator may inadvertently assign too little spectrum or define requirements which make implementation overly expensive.

### IMPLEMENTATION

The formal adoption process has a number of activities which are inter-related but can also run in parallel. When implementing the adoption process there are roles for all stakeholders in the radio ecosystem. An example Gantt chart is shown in **Figure 3**, the time periods for each activity are indicative only.

### Stakeholder discussions and industry committees

The Regulator may ask the stakeholders, including the broadcasters, to suggest their preferred operating model in terms of transmission provisions and spectrum licensing. It is important to ensure a clear connection between the broadcasters, network operators and the Regulator through a clear and transparent decision making process. The formation of an Industry Committee will allow broadcasters' opinions to be heard as well as inputs from the greater radio ecosystem.

Gaining initial agreement on the "shape" of the licensing system and the timelines to rollout are critical to success. This process is strongly influenced by the availability of VHF Band III spectrum as limited spectrum will also limit the number of services that can be delivered. The timing of the availability of spectrum will also strongly influence the ongoing timing of a DAB rollout, and in some cases then influence the overall time available to develop licensing policies. The regulator

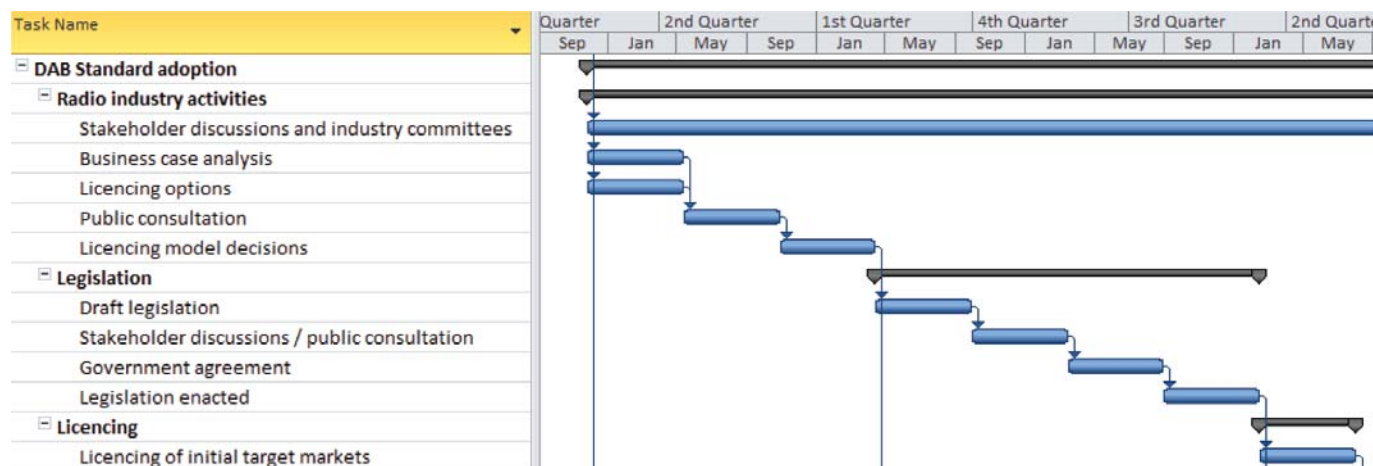


Figure 3: Example Gantt chart for formal DAB adoption

should ensure that society gains the maximum benefit of the introduction of digital broadcasting and the ability to receive additional content and features.

The Industry Committee often has a long term role in ensuring the success of digital radio broadcasting and may itself turn into a not-for-profit support organisation. Examples of such organizations are Digital Radio UK in the UK, DigiMig in Switzerland, The Digital Technical Advisory Committee (DTAC) and Digital Radio Planning Committee (DRPC) in Australia, and the Southern African Digital Broadcasting Association (SADIBA) in South Africa.

### Business case analysis

The business case for DAB has many facets. As with all new systems that are introduced there need to be clear advantages for both the providers and the users. In the case of DAB+ there are many compelling factors, all of which have differing impact depending on the state of radio broadcasting in the individual country.

Most countries consider that spectral efficiency and the ability to expand the number of available services through cost effective digital broadcasting to be beneficial to society. Regulators also need to be aware of the potential impact that digital streaming giants such as Spotify, Apple and Google can have on the viability of local broadcasting.

Within the business case analysis, the service requirement assessment is critical. It has been shown over the last decade in Europe, that when DAB+ is introduced to a country the number of services typically increases by between 3 and 6 times. Other countries may already have very large numbers of active FM transmissions in an area, many of which interfere with each other causing coverage limits and reception difficulties. In this case DAB+ offers increased coverage areas and interference free reception and usually results in an increased number of services that can be received in a particular location.

DAB+ has been demonstrated in numerous articles to have as much lower cost than AM and FM (see the EBU article by Marcello Lombardo at [https://tech.ebu.ch/docs/techreview/EBU\\_Tech\\_Review\\_2017\\_Cost-benefit\\_analysis\\_of\\_FM\\_DAB\\_and\\_Broadband.pdf](https://tech.ebu.ch/docs/techreview/EBU_Tech_Review_2017_Cost-benefit_analysis_of_FM_DAB_and_Broadband.pdf)).

The bigger issue is the amount of time that analogue and digital services are simulcast. Without a deadline for the switch-off of analogue services there is also a reduced incentive for the public to purchase new receivers.

In Europe the European Electronic Communications Code (EECC) has been introduced to ensure that all radio receiver products include DAB, for home, portable and vehicular use (see <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L1972>). This initiative is of particular

value to new country adopters, as DAB receivers are now required in all vehicles destined for Europe. In some cases, it can be more expensive to remove DAB+ functionality than simply leave it in vehicles destined for non-European countries. This is potentially a way to have reception capability well before the first full time DAB+ transmissions, and which provides an instant receiver base to assist broadcasters to build their DAB listening audience more quickly.

All broadcasters need to be aware of the threats to their business, so a risk analysis of not implementing DAB+ to secure their future as a digital radio service provider is essential. This is particularly the case considering the rise of multi-national digital streaming giants and also the increasing value and delivery of metadata such as logos, images and interactivity (see WorldDAB metadata explainer video <https://www.youtube.com/watch?v=f7BqIC2NGLU>).

DAB provides an Emergency Warning function which can automatically switch from the currently selected service to the Emergency Warning service thereby providing very rapid warning information for fast moving disaster situations such as bushfire, tsunami and floods (see [www.worlddab.org](http://www.worlddab.org) for the Emergency Warning factsheet).

### Licensing options

When formulating licensing options there are a number of aspects to be resolved.

#### 1. The technical basis of planning

This provides the basis for acceptable and unacceptable transmissions. It is important that DAB+ is able to be received in the required areas, e.g. for commercial broadcasters their licensed coverage areas. To do that the transmission design needs to fulfil specific field strength targets in the coverage area. The EBU and ITU publications provide a good starting point for the establishment of network planning requirements, however it is usual for individual countries to customise the field strength requirements based on their own needs, e.g. due to different in-building entry losses and man-made noise issues.

#### 2. Licence types

There are a number of different licence types which are related to the type of content that is transmitted and the type of broadcaster. Typical licence 'classes' include:

- PSB licenses which are often wide area or country wide and may be subject to limited commercial activity.
- Commercial broadcasters who are often limited to specific areas and allowed to transmit commercial content such as advertising.
- Community broadcasters who are focused on specific areas, community groups or content types.
- Narrowcast broadcasters who are restricted to specific

content types, e.g. only sports radio and who usually also have coverage area limits.

- Other broadcast types such as international or subscription based services.

Commercial Radio licence

Public Service Broadcaster  
radio licence

Community Service  
Broadcaster radio licence

Narrowcast Service  
Broadcaster radio licence

Low Power Broadcaster  
radio licence

All of these licence types have their own specific legal definitions which are defined by the Ministry in conjunction with the Regulator.

### 3. Periods and costs

Each licence type will attract a different cost due to the different nature of the broadcaster, however we generally see that in most countries DAB licensing is either associated with existing AM or FM licences or is a low fee which is basically for administrative costs. Each licence type has its rules of operation which are usually established in the "Broadcasting Services Act" for each country and which requires the broadcaster to conform with the content and transmission rules in order to maintain their licence to operate (for example for Australia see the Broadcasting Services Act 1992, <https://www.legislation.gov.au/Details/C2021C00042>).

### 4. Content

The content that is allowed to be broadcast has two basic aspects, the actual licensed content types e.g. commercial advertising, but also the content itself in terms of the norms of society. Different countries have different requirements for the content itself in terms of religious, political, language and the content itself (e.g. profanity limits).

Some countries also require specific amounts of locally generated content to ensure that local industries are supported, this particularly applies to music.

#### Public consultation

Once the licensing framework has been developed the Regulator will usually hold a Public Consultation to request feedback from the stakeholders. This provides the broadcasters and other stakeholder businesses with the opportunity to formally state their preferred options and give the reasons why those options are beneficial to both themselves and the community in general.

In some cases, Public Consultations may be supplemented with public hearings, industry briefings and industry working groups.

Feedback from the Public Consultation can be used by the Regulator to refine the licensing structures and the technical basis to best balance the benefits to both the public and the broadcasters' businesses, including the PSB(s).

### Legislation

The Regulator will discuss their preferred licensing framework with the relevant government departments who have the responsibility to develop the actual legislation that will enable DAB+ to be formally licensed and deployed.

It is likely that the development of the legislation will take a few iterations to reach agreement within the political system before being passed into law.

#### LICENSING THE INITIAL MARKETS

Once the formal legislation is passed into law the Regulator has the authority to issue licenses which may be allocated under a pre-arranged scheme or to be acquired through a selection process e.g. an auction or beauty contest.

In some countries incentives are provided to encourage broadcasters to establish DAB broadcasting services and protect those that have invested in the development of the DAB systems from premature competition. These incentives are due to the common situation where there are no, or at least few, receivers in the market and hence the listener market needs to be established. Due to the EEC there are now many car models with receivers fitted as standard which will flow on to other countries.

Other incentives include free spectrum allocations, e.g. DAB ensemble capacity assigned based on existing analogue transmissions (for example in Australia existing AM/FM broadcasters were allocated 128 kbps of capacity for each existing AM/FM service), minimal if any initial fees, and financial inducements such as the waving of licence fees for analogue services for participants that invest in the new infrastructure and service developments. For example, in Australia existing AM/FM broadcasters were allocated 128 kbps of DAB ensemble capacity for each existing AM/FM service.

#### CONCLUSIONS

The process of formal adoption covers many stakeholders. When the industry stakeholders have clear and common agreed objectives the overall process can be smooth and facilitate the introduction of DAB+ in a timely fashion.

In our next article we will cover the planning activities that are needed to establish DAB+ broadcasting systems.

#### Author:



#### Dr Les Sabel

S-Comm Technologies, and  
WorldDAB Technical Committee

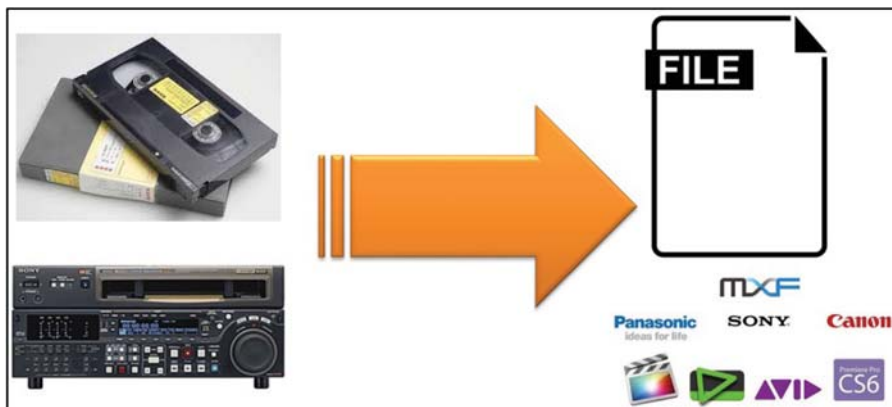
Les has over 30 years of experience in communications systems, including broadcast digital radio (DAB/DAB+/DMB and DRM), mobile communications,

wireless broadband and satellite communications. Les founded S-Comm Technologies Pte. Ltd. in 2008 to work with the radio industry on DAB+ digital radio. S-Comm has provided services to many Australian and international companies and currently provides on-going independent engineering consultancy to Commercial Radio Australia, WorldDMB, the ITU and various commercial radio networks and regulators in Australia and South East Asia. His expertise covers the development of state-of-the-art communications infrastructure and receiver equipment, business development, product and project management. ■



# Ingest and Transcoding of Legacy Media for TV6 Trial Transmission at Radio Televisyen Malaysia (RTM)

As part of the 11th Malaysia Plan (RMK), 'TV Broadcast Systems Engineering' incorporates the fields of computer engineering and information technology related to TV Broadcast Engineering, Radio, New Media, and Media Archives. A component of the National KPI for Radio Televisyen Malaysia (RTM) is to improve the digital Infrastructure by widening broadband coverage and its capacity, in order to meet the demands of the digital economy. This has presented a challenge that must be met in the interests of the country and the public. Through the TV Broadcast Engineering System, creative industry content, including official government announcements, will be delivered to the audience over various platforms, while maintaining the audio, visual, and graphic quality. Watching television, listening to the radio, surfing the internet, or retrieving media materials via systematic storage methods can be enjoyed by all.



Picture 1: Conversion from Betacam to File-based

Radio Televisyen Malaysia began broadcasting TV6, a new Channel based on a retro broadcast concept, on a trial basis from 1 March 2021. This channel has been well received by both youth and people who feel young at heart.

For RTM engineers the challenge faced in the realisation of this aspiration is the sourcing of content from legacy formats and storage

media. There are some broadcast materials, composed of analogue Betacam and digital Betacam, which are approaching their end of life. Fortunately, RTM is still able to use players like Sony DVW-M2000 and Sony DVW-A500 for playback and recording.

The ingest process of this material for broadcasting requires new methods, as the modern system is

## Format Conversion

Betacam Machine M2000	Independent Content Repurpose (ICR) Software	Non Linear Editing System
SMPTE 259M SD-SDI-270 Mbit/s	16-bit, Stereo (L R), 48.000 kHz (AES3)	Format : XDCAM HD 422
Format : PAL	Format : PAL	Wrapper : MXF
Width : 720	Width : 720	Wrapper Profile : OP-1a
Height : 608	Height : 608	Resolution : 1920 x 1080 pixels
Aspect Ratio: 4:3	Aspect Ratio: 4:3	Aspect ratio : 16:9
Frame rate: 25	Frame rate: 25	Bit Rate : 50 Mbps (CBR)
	Video Bitrate: 30Mbps	Frame Rate : 25 frames per second (50 fields) interlaced (1080i/25)
	Bitrate Mode: CBR	Interlaced Field Order : Upper field first
	Codec Type: MPEG 2 Video (IMX-30)b	Chroma sampling : 4:2:2
	Interlacing: Yes	



Picture 2: Conversion process



Picture 3: SD- SDI Capturing Process

now more aligned to file-based and high-definition products. Therefore, the Interactive Digital Engineering Section introduced a new process, called Beta Migration.

In Beta Migration, materials are restored and digitised, then converted to another format, using a non-linear system, to produce High Definition (HD) files. The ingest process is then performed with a digital Betacam recorder/player and IMX30 codec in an MXF wrapper, in Standard Definition format. Next, the file is inserted into the timeline for non-linear editing, to convert it to

High Definition format.

Standard Definition (SD) with a 4:3 Aspect Ratio must be converted into High Definition (HD) with great care, since the Transmission Operation Centre (TOC) broadcast format of RTM uses full High Definition (1080i) format and the AVC Intra HD Codec.

Third-party software, such as Independent Content Repurpose (ICR) software, is used to convert the digital content into Standard Definition (SD) PAL format, with a 4:3 aspect ratio. This is then converted into XDCAM HD 422 format, using

non-linear editing tools, before being transcoded to the final broadcast format, AVC Intra HD.

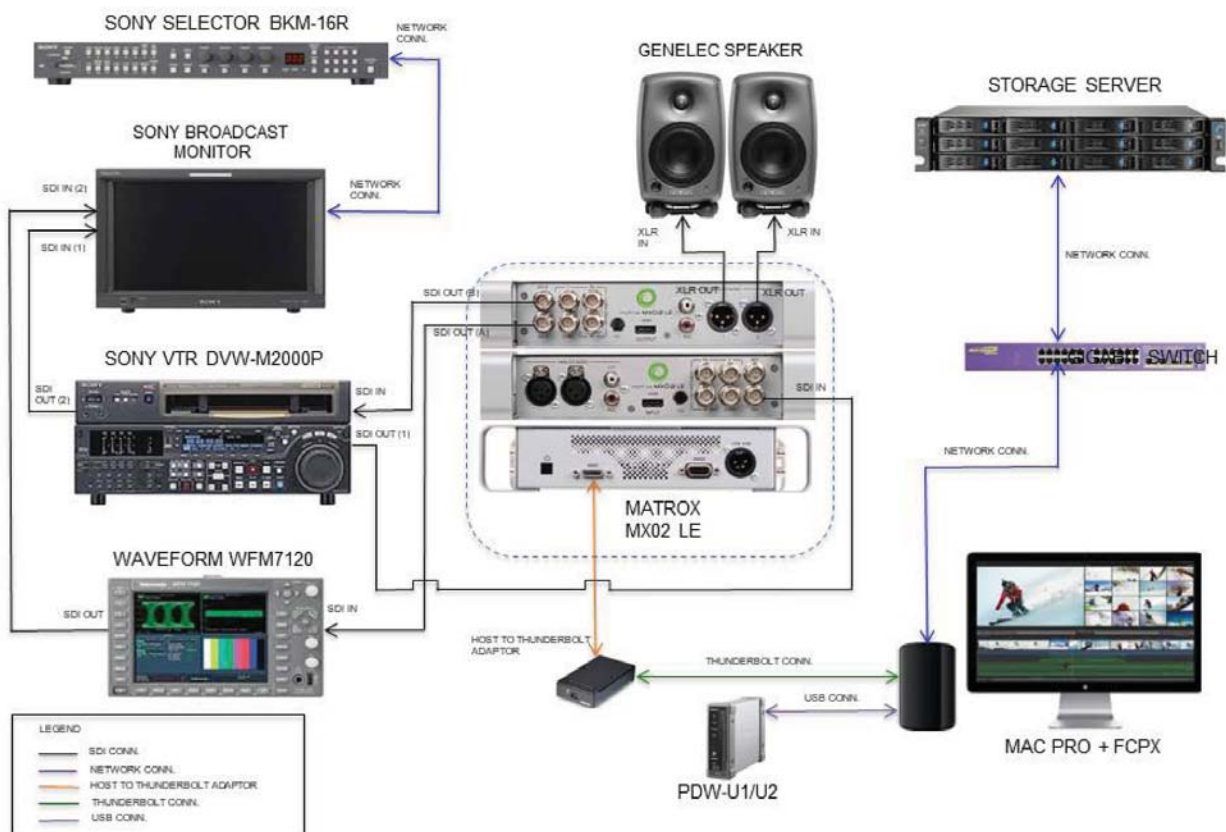
#### Author:



**Zaidi Zainon** is a Senior Broadcast Engineer at Radio Televisyen Malaysia (RTM), where

he has worked for more than ten years. He graduated in 2009 from Universiti Teknologi Malaysia, majoring in Electrical Engineering. In his broadcast career to date he has been a Transmission Network Engineer at ASTRO, a Project Engineer at TV Alhijrah, and is now an Assistant Director of Interactive Digital Engineering at RTM.

At RTM, Zaidi is one of the engineers responsible for the planning and implementation of the new Production Operation Centre under the Media City Project, in the capacity of system development and design advisor. His specialties and responsibilities include, creation and transcoding of media, ingest of media assets, management of media assets for broadcast and the duties of officers in the media assets management field. ■



# Easycaster



Mobile Version

Currently, IRIB uses methods such as FM waves, Scoopy, satellite transmission, telephone or mobile communication, etc.

To send voice, these methods sometimes have low audio quality, high cost and are time consuming. Considering the role of IP in the broadcast industry and, of course, its sending and receiving of audio and video on this platform, small and large companies have long designed various products based on IP, leading to the release of the technical standard AES67 in 2014. This standard is the basis for designing audio products for the field of broadcast in order to exchange information and content between devices and different brands of equipment.

The Easycaster product has the required speed, high quality, low cost and ease of use and has been used in real IRIB applications.

Easycaster is one of the best tools for live Audio Streaming, simple, fast, cheap, and high-quality audio without interruption of voice. Reporters can stream via a telecommunication network, mobile Internet modems and mobile data, with minimal equipment and without the use of systems such as FM or SNG transmitters.

The interactive two-way audio, text communication and display of the reporter's geographical location are unique features of this system.

- Live Audio and two-way text Interactive communication
- Excellent sound quality
- Easy-to-use platform, built for live audio streaming for reporters
- Cost savings of hardware and software
- Ability to send the geographic location of the reporter via GPS
- Low battery consumption
- Determination the sensitivity of the microphone
- Permanent monitoring of the communication status
- Real-time data volume report
- System connection status code
- Permanent monitoring of the communication status
- Displays real-time sound level
- Ability to Save audio files
- Rename audio files by time
- Ability to Customise according to needs
- Includes Support
- Ability to use External Microphone



Window Version



- Live Audio and two-way text Interactive communication.
- Excellent sound quality.
- Easy-to-use platform built for live audio streaming for reporters.
- Cost savings of hardware and software.
- Automatic detection of audio device.
- Ability to change output audio settings.
- Determination the sensitivity of the microphone.
- Permanent monitoring of communication status.
- Real-time data volume report.
- System connection status code.
- Display real-time input sound level.
- Ability to save audio files.
- Rename audio files by time.
- Ability to customise according to needs.
- Includes Support.

For further details, contact [easycastermail@gmail.com](mailto:easycastermail@gmail.com)



# Radio Station Audio Transport and Routing using a TDM Routing Matrix with DANTE/AES67 connectivity

An application note describing the particular installation at Tank FM in Australia, undertaken by Broadcast Components using AEQ equipment.



Tank FM – or 2WET – is a radio station located in Kempsey, in New South Wales, Australia. Founded in 1992, this community FM Radio station has strong ties to the community and businesses in the Macleay Valley.

Broadcast Components, AEQ's local partner in Australia, works closely in collaboration with Tank FM in all broadcast projects. As a supplier and systems integrator, from the microphone through to transmitter, Broadcast Components offers 'choice, with value'. For the studio programme, Tank FM tasked Broadcast Components to design around Dante Audio over IP (AoIP) based on its ease of use, flexibility, and cost effectiveness. The stations' technical team, led by Ross Delaforce, identified the need to introduce a

future-proofed, robust system that also was easy to use by presenters with varying technical capabilities. To ensure seamless interoperability with existing infrastructure Broadcast Components completed thorough demonstration and trial periods for new equipment during the multistage project, with rigorous testing conducted by the team at Tank FM on their mission critical infrastructure.

*"We needed a system that could, through programming, offer a lot of functionality while maintaining the confidence levels of all presenters during both training and ongoing operations," Mr Delaforce said.*

A key aspect in the selection of AEQ equipment was the team at Broadcast Components. Tank FM

were looking for an experienced company who offered local customer service and a high level of technical support. These factors were critical in selecting Broadcast Components as their technological partner and the supplier of the Dante enabled AEQ platform. The two-studio installation utilises the highly flexible Forum IP 12 fader mixing console due to its modular design, which allowed Tank FM to design a console perfectly suited to their needs.

In addition to the custom module selection of microphone, analogue and AES line inputs/outputs, telephone hybrid modules and Dante input/output, Tank FM selected the Forum Virtual software package which replicates all functions available on the mixing console with a PC interface. The factory terminated cable harness from AEQ was another value-added service ensuring high quality audio from third party devices which are not Dante enabled. The multi-core cable is well shielded and fully tested prior to shipment by the highly skilled AEQ engineering team who design and manufacture everything leaving their factory, including hardware, firmware, and software. The complete control of all systems has allowed AEQ to deploy custom firmware for Broadcast Components based on feedback from the Australian and New Zealand markets.

The backbone of the Dante enabled Tank FM network is the Netbox 32 AD MX with Real Time Control (RTC). This SQL database management

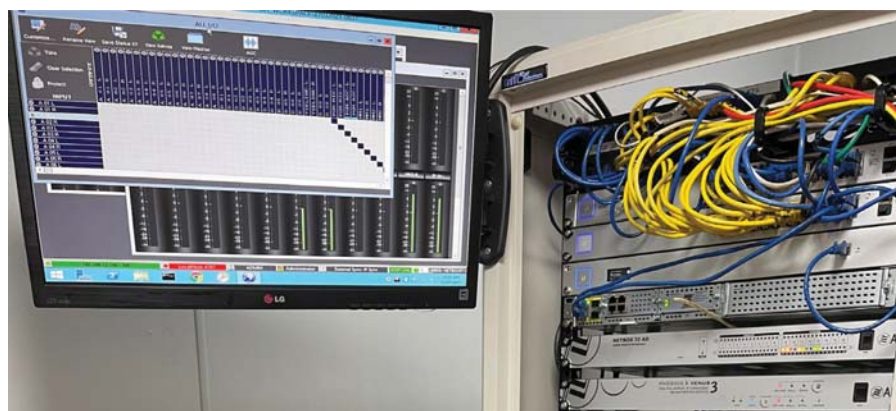
platform turns the 32 input/32 output Netbox 32 Dante interface into a complete matrix system including audio routing, AGC, silence detection, channel summing with VU monitoring of input/output sources or buses.

As seen on the picture, the audio routing control application is not the Dante Controller application, it is Netbox RTC software. In the AEQ audio over IP system, the Dante controller is used as a "cabling system", making the local interconnections in IP among the different equipment (in this case the Forum IP consoles, the Venus 3 audio codec and the broadcast stations on PC) and the Netbox 32 AD MX audio routing matrix.

IP network is used as a set of multi-pair audio snakes, and the Dante controller as a set of patch panels and audio distributors. It is very convenient to be able to wire simple Ethernet cables over a pair of switches, as well as route from a PC and send audio input and output from consoles, audio codecs and DAWs to the Netbox32 ADMX router without getting up from your chair, but this is all available in the AoIP Dante network, because it has been designed for this and nothing else.

But audio routing for a radio station requires other functions; for example:

- Logical line grouping into stereo pairs. At a radio station you have



to manage the broadcast in stereo - or mono, with mono or stereo sources. This function is carried out by audio mixing consoles, but it is very convenient to be able to separate circuits without being forced to pass them through the console.

- Input and output level adjustment, because there are external sources and destinations with levels that we do not control and might not be aligned to our internal off-set or nominal levels.
- Signal mixing to any output on demand, with no limitations.
- Customised view of the inputs and outputs that affect each studio, and a general view and control for the supervisor's workstation. Vu-meters of all the signals of interest at each workstation.
- Macro, Salvo and configuration views management. Task scheduling, executed by clock, alarm or external triggering. Critical lines protection, because there is not always a person at the station to make a configuration, or to confirm and correct a failure in operation or an interruption of the audio source being broadcast.
- Talkback or Multiplex, N-1 based, group creation, because

sometimes we work with several correspondents and contributors that intervene in programmes simultaneously.

- Physical and virtual GPIO management between different devices. Because sometimes it is necessary to automate the operation and change parameters of the audio sources as per the programmable buttons on the consoles, or to notify other operators regarding situations concerning the broadcast.
- AGC (automatic gain control) on AoIP inputs and outputs. It is a very practical tool: the device will adjust the signal so that in the medium term its level is around the target, preventing the signals from being too low or very high.
- Flexible vu-meters and test-tone generation. To measure and normalise audio levels.

Netbox 32 AD MX is a 64 X 64 circuits audio mixing and distributing matrix that performs all these functions just described. It is non-blocking, so the NETBOX 32 AD MX can route any or all of its 16 analogue, 16 digital and 32 audio-over-IP inputs to any of its 64 outputs (including 16 analogue, 16 digital







and 32 AoIP).

Outside Broadcast (OB) is a critical factor in the ongoing success of Tank FM, which has leveraged AEQ codec technology to develop a presence in the Macleay Valley via live news gathering, event coverage and sports broadcasting. OBs are conducted using the AEQ Phoenix Alio and AEQ Talent depending on the scope and requirements of each event. For a single reporter or commentator, the Talent is used as a fast and readily deployable solution. Alternatively, the Alio can support up to 4 microphones directly, with additional capacity via the stereo line input channel. Tank FM have installed the AEQ Phoenix Venus 3 Dante enabled, dual channel codec which allows simultaneous broadcast (with crosstalk) of both the Talent and Alio. In concert with the Netbox RTC, these OB solutions have the added benefit of safe broadcast continuity during the challenges of COVID.

*"The nature of the DANTE audio network meant that adding new services and resources was as simple as getting the device on the network and configuring the input, outputs and advanced options via software," Delaforce said. "It was almost a plug and play deployment and a 'no brainer' for us to expand our DANTE network to connect other AEQ and PC devices."* Ross Delaforce regarding the choice of AEQ and Dante Audio over IP.

AEQ FORUM IP digital consoles can be easily adapted to control-booth, TV production controls, sound production, mixed configurations, integration in large installations, etc. thanks to their modular design. The Forum family of consoles includes the Forum Lite and Forum Split, to cover a range of budgets and applications. The discrete engine and fader design improves speed and ease of wiring with the control surface connected by a single Ethernet cable. Simplicity and efficient control are at the heart

of the Forum to ensure scalability from more basic operations through to very complex system architectures starting with a minimum four-fader control surface expanded up to 24 freely assignable channels in the Forum Split.

*"Integrating the second Forum IP during phase two of the project was incredibly easy, almost a drop in! the routing and set up took a few minutes using the existing set up for studio 1 as a reference for the programming."* Ross Delaforce reflecting on the second stage of their upgrade.

For further details, contact Broadcast Components General Manager Sean Pritchard who is the key contact for Tank FM and Antonio Perez who is the company's Sales Area Manager for Asia-Pacific at AEQ. Also Visit <http://www.aeq.es> and <https://www.broadcastcomponents.com.au> ■



# Technical Bureau Mid-Year Meeting

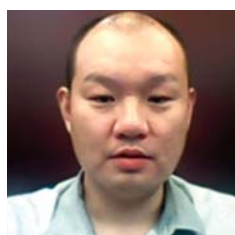
## 27-28 July 2021

Members of the ABU Technical Bureau shared their experiences of working during the pandemic at the bureau's mid-year meeting on 27-28 July 2021.

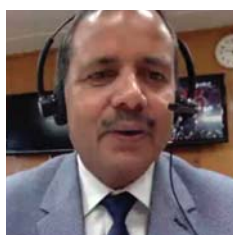


**Mr Hamid D Nayeri**, IRIB-Iran, TC Chairman

The two-day virtual meeting was chaired by the bureau's Chairman, **Mr Hamid D Nayeri** of IRIB-Iran. The meeting was attended by the three Vice-Chairmen, **Dr Kong Bin** of NRTA-China, **Mr Sunil** of DD-India and **Mr Masashi Kamei** of NHK-Japan.



**Dr Kong Bin**, NRTA-China, TC Vice-Chairman



**Mr Sunil**, DD-India, TC Vice-Chairman



**Mr Masashi Kamei**, NHK-Japan, TC Vice-Chairman

Other members taking part were from KBS-Korea, AIR-India, RTM-Malaysia, Mediacorp-Singapore, NBT-Thailand, TRT-Turkey, TVB-Hong Kong, Phoenix TV-Hong Kong, RRI-Indonesia, EAP-Sri Lanka, MTV-Sri Lanka, VTV-Vietnam, NHK-Japan and TBC-Tonga.



**Dr Javad Mottaghi**, ABU Secretary-General

**Dr Javad Mottaghi**, the ABU Secretary-General, in his welcome remarks stressed the need for more online activities and advisory services to connect with members. He highlighted the online activities organised by the ABU this year. He said the crisis had brought members

together and strengthened ties.

Mr Nayeri supported a plan to conduct a new Technology Department activity survey as raised by the Secretary-General.

The meeting began with updates from all members on the current situation, the steps taken during the pandemic and the projects they have within their organisation.

This provided a great opportunity for members to learn from each other the kind of steps taken in view of the ongoing pandemic. Some of the highlights:

- Most of the broadcasters being able to continue their broadcasting operations as usual though not in full capacity
- Increased use of software in the cloud and cloud based applications
- Activation of remote monitoring and inspection of technical facilities
- Continuation of remote production and limited field production



**Mr Ahmed Nadeem**, Director ABU Technology



**Mr Shri N Thiyagarajan**, AIR-India



**Mr Karim Sadiran**, RTM-Malaysia



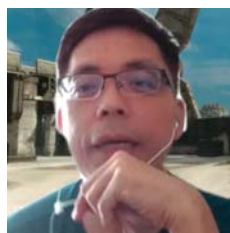
**Mr Dae Hoon Choi**, KBS-Korea



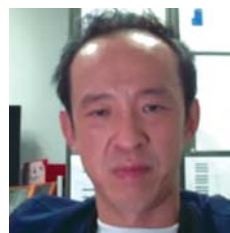
**Mr Rahut Udomwet**, NBT-Thailand



**Mr Kazim Pektaş**, TRT-Turkey



**Mr Peh Beng Yeow**, Mediacorp-Singapore



**Mr Terence Yiu Shun Tat**, Phoenix TV-Hong Kong



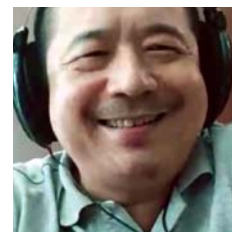
**Mr Rahadian Gingging**, RRI-Indonesia



**Mr Garry Kum**, TVB-Hong Kong



**Dr Tharaka Mohotty**, MTV-Sri Lanka



**Mr Nguyen Duc Tue**, VTV-Vietnam



**Mr Lasantha Samaranayake**, EAP-Sri Lanka



**Mr Kenichi Murayama**, NHK-Japan



**Ms Mika Kuroiwa**, NHK-Japan



**Mr Solomon Finau**, TBC-Tonga



**Mr Shri P Das**, Prasar Bharati-India



**Mrs Anuradha Agarwal**, Prasar Bharati-India

- Adoption of an e-office system, online activities, tools and techniques to support the regular operation
- Increased use of file based workflow and automation software to achieve redundancies in production studios, transmitters and other technical facility
- Revitalising digitisation of archives and putting these archived programmes on-air
- Initiation of new services like UHD production, mobile broadcasting, IBB services
- Coverage of the Tokyo Olympic Games by broadcasters where NHK used sign language and technology assisted and automated commentary using data generated during the games
- Digitalisation delayed but pilot activities for speeding up the digital TV transition and UHD services,
- Some broadcasters engaged in reserving 5G frequency spectrum and MFN switch-off
- Shift based operational schedules to continue the operation and maintenance work and allowing about half of the staff to work from home
- Ensuring maximum safety of the office staff engaged in group activities in-office and on-field by having SOPs for different kinds of operational scenarios
- Broadcasters engaged to assist in governmental society welfare programs

Members found this information sharing helpful, giving them an opportunity to learn from each other.

As usual, the Secretariat presented a report on TD activities since the last bureau meeting. These included six webinars along with the Digital Broadcasting Symposium 2021 and the Engineering Fundamentals Course.

The online webinars covered various aspects of technology implementation and applications. They included a total of 21 webinar sessions with 32 topics being presented, with an average of 90 participants per session.

Members welcomed this as a good achievement, allowing more staff from member organisations to join these sessions and benefit from them.

Other activities undertaken by the Secretariat were a revamp of the Technical Review magazine and the trial launch of the Asia-Pacific View (APV) Platform.

Among other issues, the bureau discussed two new proposals. The first was for online elections for the ABU Technical Committee office bearers and the second a proposal to introduce an award related to sustainable development goals in place of the green broadcast engineering award.

The bureau also discussed building up a database of training institutes and resource people and agreed on the importance of conducting an activity survey this year to understand the change in requirements and priority areas among members.

It reviewed the schedule for the annual ABU meetings that would take place virtually in November.

Mr Nayeri wished everyone good health and stressed the importance of keeping in touch. He thanked all colleagues for their contributions to the meeting. ■

# How to contribute to the Technical Review

Would you like to contribute an article to the ABU Technical Review? Anybody is welcome to do so.

It's an excellent way to highlight the work your organisation is doing and bring it to wide attention.

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

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

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

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

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

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

In addition, articles written by ABU members on Case Studies, Research and Practical Implementation will be considered for the annual ABU Technical Review Prizes which consist of a cash prize and certificate.



Previous issues of the Technical Review can be viewed at the ABU website main page and at: <https://www.abu.org.my/technical-review/>

If you need more information, please contact [nadeem@abu.org.my](mailto:nadeem@abu.org.my) ■



# ABU TECHNICAL BUREAU 2019/2021



**Chairman**  
Mr Hamid D Nayeri  
IRIB-Iran



**Vice-Chairman**  
Dr Kong Bin  
NRTA-China



**Vice-Chairman**  
Mr Sunil  
DD-India



**Vice-Chairman**  
Mr Masashi Kamei  
NHK-Japan



**Honorary Vice-Chairman**  
Mr Nguyen Nang Khang  
VOV-Vietnam



Mr Garry Kum  
TVB-Hong Kong



Mr Terence Yiu  
Shun Tat  
Phoenix TV  
-Hong Kong



Mr N Thiyagarajan  
AIR-India



Mr Rahadian  
Ginging  
RRI-Indonesia



Mr Dae Hoon Choi  
KBS-Korea



Ms Putri Joliana  
binti Yaacob  
RTM-Malaysia



Mr Ayman Al Zahrani  
SBA-Saudi Arabia



Mr Peh Beng Yeow  
Mediacorp-  
Singapore



Dr Tharaka Mohotty  
MTV-Sri Lanka



Mr Lasantha  
Samaranyake  
EAP-Sri Lanka



Mr Kachan Kannika  
NBT-Thailand



Mr Solomon Finau  
TBC-Tonga



Mr Sahin Demir  
TRT-Turkey



Mr Nguyen Duc Tue  
VTV-Vietnam



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



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



Mr Kazim Pektas  
TRT-Turkey  
**Chairman Production  
Topic Area**  
Bureau Ex-Officio



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



# ABU Central Asia Media Forum addresses wide range of topics

The 4th ABU Central Asia Media Forum took place online on 15 July 2021, with broadcasters from the region and beyond sharing ideas and strategies.

The two-hour forum featured four sessions on topics including successful content marketing, cybersecurity, OTT and using social media to reach wider audiences.

Broadcasters from Belarus, Kazakhstan, Russia, Uzbekistan, Sri Lanka, Turkey and the UK and were among those taking part, along with speakers from service providers Skyline Communications and UniQCast.

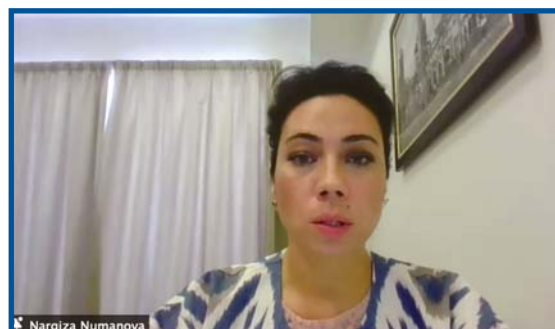
In a welcoming speech, the Chairman of MTRK-Uzbekistan, **Mr Alisher Khadjaev**, described the forum as a platform for cooperation and the exchange of views on the development of broadcasting.

He noted that the forum was to have taken place last year in the Uzbek capital, Tashkent, but had been rescheduled and moved online because of the pandemic. He offered to host it in Tashkent in the future.

The ABU Secretary-General, **Dr Javad Mottaghi**, said it was inspiring to see how Central Asian members were continuing to provide excellent services to their audiences despite the extraordinary challenges of the pandemic.

These included timely, accurate and lifesaving information, he said.

**Ms Nargiza Numanova** of the ABU served as MC.

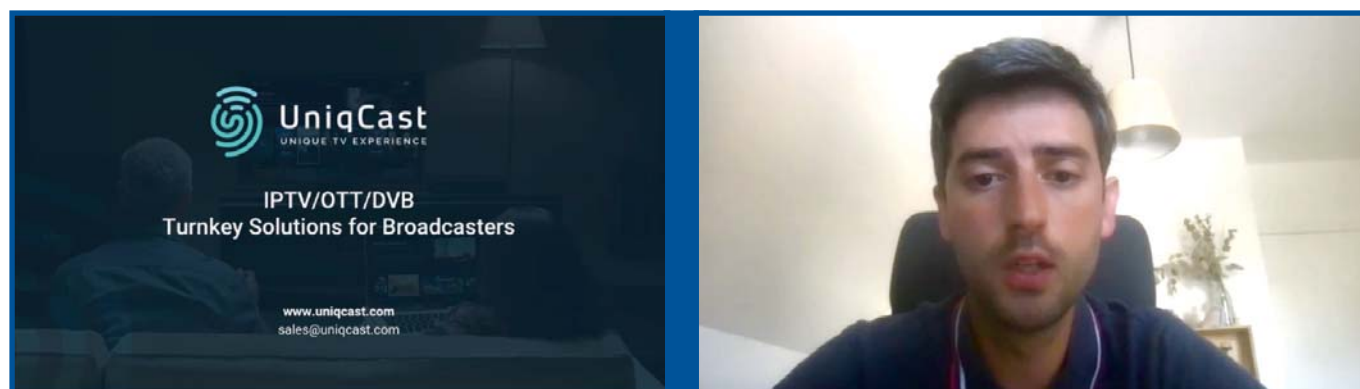


**Mr Ben Vandenberghe**, CEO of Skyline Communications, spoke on media supply chain security. He said cyber threats to broadcasters could come from state-sponsored organisations, terrorist organisations, campaign groups, hacker collectives or a lone wolf.



Security must be omnipresent and part of one's company culture, not just the ICT team, he said.

**Mr Nino Pirtovšek**, Sales Manager of UniqCast, spoke on IPTV/OTT/DVB turnkey solutions. He said broadcasters could improve their offering and monetise their networks by using Over The Top (OTT), a streaming media service offered directly to viewers via the Internet.



**David Hayward**, Digital News Consultant, BBC Media Action, addressed the topic of whether social media was a friend or foe of traditional media. His conclusion: broadcasters should consider it a friend.



"Social media is where our audience is," he said. But they also needed to be wary of it because it could lead to misinformation and fake news.

**Mr Dmitry Leontiev**, Executive Content Producer at RT-Russia, also spoke about social media and how broadcasters could use it to reach larger audiences.





**Ms Aise Dilara Arslan**, Head of VOD, TRT-Turkey, looked at how broadcasters could best market their content. She addressed three key questions on content marketing: who is the target audience, what content do broadcasters want to market and where do they want to market it?



**Mr Chandana Sooriyabandara**, CEO of Stein Studios, MBC/MTV-Sri Lanka, spoke on the power of international co-production. He gave examples of the co-productions his organisation was engaged in and described how franchised productions had helped it broaden its horizons towards a new way of thinking.

The final session enabled Central Asian broadcasters to present their content for exchange and sale. They were given the opportunity to showcase their content and see what other broadcasters were offering. It featured speakers from Khabar TV, MTRK, Qazaqstan TV, BelTV and Russian Television and Radio.

Closing the forum, Ms Numanova announced plans to set up a network for continuous collaboration among Central Asian broadcasters. ■



ABU  
VIRTUAL EVENTS  
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# ABU TECHNICAL COMMITTEE 2021

16 NOVEMBER 2021

**REGISTER NOW**



# Webinar on Advanced Transmission and Delivery Technologies

29-30 June; 1, 6-7 and 12-14 July 2021

ABU Technology hosted a webinar series on Advanced Transmission and Delivery Technologies during June and July 2021. Fourteen different webinar sessions were presented and these looked into recent advancements in different digital transmission standards. The webinars also discussed some of the advanced features used in modern transmitter and antenna systems and modern delivery, and contributing technologies that focus on broadcast applications. Well-known speakers from advanced broadcasters NHK-Japan, NRTA-China; from standards development organisations DVB, ATSC, DRM and WorldDAB; and other industry players; Nautel, Rohde & Schwarz, Gates Air, Kathrein, LiveU, Aviwest and VYPA, shared insights, developments and features of digital broadcast standards and transmission and media delivery systems. In total, 634 attendees participated over the eight days, representing more than 165 organisations from 54 countries in Asia-Pacific and elsewhere.

## Second Generation DVB Specifications for Satellite and Terrestrial Transmissions



**Frank Herrmann,**  
Panasonic, DVB TM-T Chair

The second generation of digital terrestrial and satellite television broadcasting transmission systems is broadly understood to encompass systems offering

higher bit rate capacity per Hz and better power efficiency than first-generation systems.

First generation satellite system, DVB-S, was standardised in 1993 and DVB-S2 in 2003. DVB-S2 was specified for different application scenarios such as HDTV broadcasting and for professional systems like DSNG, Internet, cable feeds with interactivity. At the core of DVB-S2 are variable rate LDPC codes concatenated with BCH for FEC elements; four different formats of modulation optimised to operate in non-linear transponders; and two levels of framing, at baseband and physical layer level, for high flexibility. In the baseband frame, the header carries a variety of signalling bits to configure

the receiver flexibly. Highly protected signalling bits at physical layer provide robust synchronisation and signalling to match different weather conditions.

DVB-S2X, with enhanced features and performance at physical and higher layers, reuses a powerful modulation and coding structure and an LDPC FEC scheme in combination with BCH FEC as outer code and APSK constellations. More granularity in terms of modulation and FEC combinations is offered i.e., from 28 MODCODs in DVB-S2 to 116 in DVB-S2X. Lower roll-off functions, support for very low SNR applications, additional scrambling options and channel bonding of up to 3 satellite transponders, favour high data rate services, such as UHD. All-IP streaming capability is allowed with generic stream encapsulation (GSE) protocols.

A multi-spot beaming and beam hopping feature is supported, and these overcome the limitations of dynamic reallocation and limited throughput and capacity of the earlier system. HTS multi beam GEO, MEO and LEO satellites are used in broadband bi-directional traffic applications, maritime, and airborne in-flight communications to be accessed by low power user terminals. DVB is also working on satellite and terrestrial standards to benefit from Native IP, enabling transmissions of NIP streams in a more integrated manner e.g. in linear OTT and IP based media. The DVB Single Illumination System (SIS) is the next evolution for joint satellite feeds of terrestrial transmitters and DTH receivers. In other words, SIS allows the derivation of content and metadata from delivery path A (e.g. satellite) for re-delivery via path B (e.g. terrestrial).



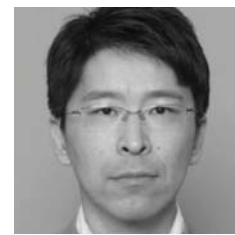
**Vittoria Mignone,** RAI,  
DVB TM-S Chair

DVB-T2 is another standard in the DVB family of standards to deliver digital television over satellite, cable, terrestrial and IP networks. It consists of different building blocks, such as input processing, bit-interleaved coding and modulation

(BICM), frame building & frequency interleaving, and OFDM generation. The baseband input takes the form of multiple physical layer pipes (PLPs) which are composed of individual modulation, FEC code rate, time interleaving. The baseband frames are the container format for carrying data as a transport stream or GSE packets. After cell & bit interleaving, another frame is constructed with cell mapping and frequency interleaving. The result is an orthogonal frequency division multiplexed (OFDM) signal with multiple carriers occupying a spectrum of about 8 MHz.

In terms of system performance, the higher capacity DVB-T2 mode with code rate 2/3 gives 40.2 Mbit/s while the highest capacity DVB-T mode had a maximum data rate of only 27.1 Mbit/s. A VBR encoded channel of 2160p50 video takes 10Mbps for HD/UHD mixed content with HEVC coding, while the data rate reduces to 6.5Mbps with the next generation codec.

## A Study on the Transmission System of Advanced ISDB-T



**Kohei Kambara,** Senior  
Research Engineer

NHK has adopted the Advanced ISDB-T standard as an advanced technology for terrestrial broadcasting. The standard is used for a transmission system that

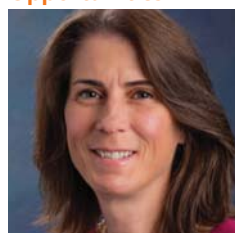
can provide UHDTV (4K/8K) for fixed reception and HDTV (2K) for mobile single channel reception. Enhancements over its predecessor, ISDB-T, include increased transmission capacity, improved flexibility and improved transmission performance.

Increased transmission capacity is achieved through a modified OFDM structure, high-order modulation scheme and MIMO. 35 narrower segments of adjustable bit rate occupy about 5.83 MHz spectrum. Transmission capacities support 30–38 Mbps for SISO systems and 60–76 Mbps for MIMO systems. For reception on mobile devices a minimum of four segments are used.

Improved transmission performance

has been achieved by using LDPC concatenated code, and non-uniform constellation (NUC). The forward error correction scheme uses LDPC & BCH codes. Carrier modulation employed is 64 QAM for mobile reception and higher order 1024-4096 QAM for fixed reception. LDPC codes achieve a capacity nearer to the Shannon Limit. Compared with the operating parameters of ISDB-T, transmission capacity is increased by 10 Mbps with the same required C/N. In other words, required C/N is reduced by 7 dB with the same transmission capacity. Other features of the advanced standard are the MPEG media transport (MMT) protocol, single-frequency networking (SFN) and low-latency transmission for emergency information.

### ATSC 3.0 and Convergence Opportunities



**Madeleine Noland,**  
President of the ATSC

ATSC is the U.S. standards development organisation for digital television.

Besides a number of broadcasting standards, global data delivery standards such as

WiFi, LTE / 5G, Bluetooth etc. have been proven to be very successful. As broadcast technology fragmentation continues, so does the need for convergence among the major DTT technologies. It also facilitates convergence with other data networks as these DTT broadcasters operate in a global ecosystem of data delivery networks. Next Gen DTT systems (ATSC 3.0, DVB T2 etc.) are the most efficient physical layers for one to many data deliveries in the world for TV and non-TV, fixed and mobile uses.

Key advancements of ATSC 3.0 include:

- Near Shannon Limit performance and one to many DTT at the Physical Layer
- Transport layer protocols like IP based protocol via MMPT and ROUTE/DASH
- Audio/Video presentation formats such as UHD, HDR, WCG, HFR, scalable video coding via HEVC H.265 video and immersive audio via Dolby AC4, MPEG-H Audio.

Other features are web based apps and interactivity via HTML5, CSS, JavaScript and Web socket APIs, accessibility technologies for enhanced capabilities for visually and hearing impaired audiences, advanced emergency messaging features with new rich media capabilities and receiver wake up. It has a datacasting ability to deliver data to IoT devices and is designed to easily interoperate with other IP data delivery networks.

South Korea deployed ATSC 3.0 systems for 4K UHD digital TV in May 2017. Its coverage reaches more than 70% of the population, including those in major cities. Brazil has launched a project to implement a new next gen television system called TV 3.0. ATSC 3.0, ARIB advanced ISDB T2, DTMB 2 and enTV-feMBMS are among the proposed technologies. Indian public broadcaster Prasar Bharati is considering ATSC 3.0, with planning under way.

In the U.S., broadcasters are targeting to reach 75% viewers, served through the Next Generation TV services. A consumer technology association (CTA) market survey in the U.S. estimates that about 31% of DTV sets will feature Next Gen TV capabilities by 2024. An ATSC project is underway to test and validate an inter tower communications network (ITCN) in a single frequency and mesh network scenario. These converged core networks for broadcast can be a RAN agnostic technology that can bridge broadcast networks to non-broadcast networks.

### TVOS, its Application and the High-quality Development of China DTH



**Sheng Zhifan,** Vice  
President, ABS, NRTA

Media convergence had led to explosive service innovation which required rapid deployment of innovated services, and either a total software

upgrade or replacement of STB in China. Furthermore, fragmentation in cable TV terminals also fuelled calls for the introduction of an intelligent OS, such as TVOS, which evolved from TVOS 1.0 through TVOS 2.0 and TVOS 3.0 to its current version, TVOS 4.0, in the Chinese market. TVOS is an intelligent media terminal operating system deployed in the cable TV, terrestrial wireless TV, DTH TV, IPTV and Internet TV fields. It is software for an intelligent operating system running on digital TV receiving terminals, and is used to manage all the resource control programme operations, improve the human-computer interface, and provide support for other application software.

TVOS architecture consists of the layered framework formed by five functional software layers namely, kernel, hardware abstraction layer, functional component, execution environment, and application framework. The TVOS software architecture and security mechanism is enhanced by relevant basic security components, such as hardware security, software security, network security,

data security and application security. It supports web, Java and Python applications. In terms of services, it supports digital TV broadcast, VOD, DVB, OTT and the interconnection of intelligent IOT devices across different screens. It also supports UI interaction via mouse and keyboard, and different kinds of remote controls such as infrared, Bluetooth, voice, mobile app etc. Typical application cases include the OS embedded terminals in Chinese Cable, DTH and OTT markets.



**Zhang Xinqiang,** Deputy  
Director, Administrative  
Center for the DTH Service,  
NRTA

China successfully launched its first direct broadcast satellite Chinasat 9 in 2008. China DTH is an exclusive satellite direct to home platform with over 147 million subscribers, of

whom 28.2 million receive HD. National Radio and Television Administration China has approved 32 sets of HD channels for simultaneous broadcasting through the Chinasat 9 satellite. Other DTH enabled services include the DTH On the Move Project and satellite-classroom project with live classrooms covering the whole country, to realise the sharing of high-quality educational resources. At present, there are more than one million China DTH subscribers using TVOS, all of whom have pre-set customised apps. These STBs are either smart basic terminals, converged terminals or educational terminals.

### DRM – Smart Radio for All and Every Situation



**Ruxandra Obreja,**  
Chairman, DRM Consortium

DRM is the global ITU standard for terrestrial digital radio for all coverage scenarios in AM & FM/VHF broadcast bands. On a single AM/FM frequency, up to three audio

services and multimedia broadcasts are possible in either digital only or simulcast operation with AM or FM analogue signals. Upgrades to DRM are also possible for existing AM/FM infrastructure.



**Guido Leisker,** Consultant  
Engineer, DRM Consortium

Multimedia applications include text messages, Journaline, slideshow, service programme information, and traffic information.

Other features include 5.1 surround sound capability, radio schooling/distance learning, traffic and travel information and public signage services.



**Yogendra Pal**, Hon  
Chairman, DRM India  
Chapter

DRM is flexible for different spectrum situations using VHF Band I, II and III. The RF signal needs less spectrum bandwidth compared to FM. As existing FM

services are 700 or 800 kHz apart, up to 2 DRM blocks may be inserted per license allotment. Transmitter sharing for all DRM blocks is possible, to accommodate up to 6 DRM signals side-by-side from the same transmitter. In AM bands, DRM offers FM like sound quality with large area coverage, and no more fading & crackling sounds. It covers large areas using a single frequency network (SFN). DRM signals with either 9, 10 or 18, 20 kHz bandwidth options are available with useful content bit rate up to 72 kbps.



**Simon Keens**, Business  
Development Manager,  
Ampegon

Recently All India Radio (AIR) conducted trials on single pure digital DRM, simulcast (FM and DRM) and multi DRM in FM white spaces operation. AIR also carried out

tests of EWF on DRM MW transmitters in Delhi, in association with the National Disaster Management Authority (NDMA).

Globally, countries rolling out or planning to launch DRM include India, Indonesia, Bangladesh, Pakistan, Russia, South Africa and Brazil.



**Radu Obreja**, Marketing  
Director, DRM Consortium

DRM radio is the integrator and universal provider of education, information and emergency warning alerts (EWF). In schools, lessons and textbook content may be received

via Journaline, and this configuration can be accompanied by live teacher audio services at specific times. There are options for student interactivity via Journaline quiz, Q&A rebroadcast etc. Recently, the DRM energy efficiency calculator was released as a user friendly tool that allows the calculation of the amount of energy that can be saved by

switching transmitters from analogue to digital DRM operation.

Different makes of receiver are already available in the market such as professional monitoring receivers, stand alone or desktop receivers, DRM line-fit, in-car dashboard radios, mobile phone radio receivers etc.

### DAB: System Overview, Features, Global Updates and Future Roadmap



**Les Sabel**, Founder,  
S-comm Technologies

Drivers of DAB+ radio growth are that it offers greater choice, six times as many services as FM, with clearer sound and significantly less energy consumption

than FM. Regarding DAB+ in cars in the EU markets, the EEC recommends that all new car radios in the EU should have digital terrestrial radio. The new WorldDAB APAC technical support group has been set-up; dedicated to assist the broadcast industry in the APAC region to implement DAB+.



**Rosemary Smith**, Project  
Manager, WorldDAB

DAB+ is firmly established as the future core platform for radio in Europe. It is already on air in Germany, Norway, Netherlands, Italy, Slovenia, Belgium, Austria,

and others are on the move or in trials. SRG SSR in Switzerland will switch off its FM transmitters in August 2022. Major automotive markets continue to expand Android Automotive with voice assistants. The worldDAB is embracing hybrid radio (DAB+ and IP) with potential for personalisation and localisation.



**Nick Piggott**, Project  
Director, RadioDNS

A research project on user experience and functionality received suggestions for, more support for station logos over DAB, remote updating of station logo

databases over the air and increased functionality. Almost all receivers display all DAB stations together in a single list, have on screen and physical buttons to navigate between stations, and show visual images. More broadcasters could take advantage of dynamic label (DL+),

improve their visual services and provide their logos using DAB SPI and RadioDNS.



**Gregor Pötzsch**, Product  
Owner, Cariad

New initiatives, Android Automotive and NAB Pilot, are ongoing. Android Automotive is the car version of Android. It adds car related functionality like cabin climate

control, and broadcast radio. Additionally, it supports Google's app store or third party app stores. NAB Pilot is a joined effort of WorldDAB and NAB, supported by broadcasters, car manufacturers and platform providers. Currently only very simple radio interface is a feature of Android and work is in progress to make radio have a similar rich experience to other media apps.



**Alessandro Sponchioni**,  
Regional Sales Manager,  
GatesAir

Concerning transmission, Gates Air design includes all power levels, broadband, compact designs, low heat dissipation and easy maintenance

features. Available in low power are 15W– 130W range DTV transmitters. Those in medium power range are 250W-1900W versions. High power air & liquid-cooled transmitters range from 1,200W to 13,000W.

Emergency warning functionality is activated in DAB receivers. This functionality uses the alarm function of the announcements feature to force receivers from their current service to a predefined service which prioritises the emergency warning messages.

### Modern Broadcast Transmitters: Functions and Technology Features - NAUTEL

Nautel invented the solid state broadcast transmitter over 50 years ago. Five generations of transmitter design expertise have been applied to its range of products, resulting in the most modern and reliable high power transmitters available today. Since 1969, customers have put over 17,000 of Nautel transmitters to use in the field, for AM MW and FM broadcast, communication applications, navigation applications and warning systems.

The early years saw very big & less efficient AM transmitters. Modern ones have up to 90% efficiency with





**John Abdnour**, India  
Territory Manager, NAUTEL

space saving dimensions. The updates in Tx features are pluggable power amplifiers, serviceable power modules, reduced cooling

requirements, reduced size, reduced noise in operation, easier maintenance, enhanced energy savings with MDCL, advanced control and monitoring etc. Modulation dependent carrier level (MDCL) is an energy saving technique in which the power of the transmitter's carrier signal is reduced when the audio level is low, saving up to 30% in energy supply costs. For example, the building block of the NX Series is an integrated RF amplifier/modulator with a carrier power capability of 2,500W. Rather than large blowers and water cooling, smaller fans on pull out trays are used. Power savings of between 36% and 72% have been brought to FM by using LDMOS devices.



**Joe Cheong**, Sales  
Manager, Asia Pacific,  
NAUTEL

Transmitters today come with many standard features, such as broadband amplifiers, high AC-in to RF-out power efficiency, multi-standard capability, RDS Generators,

powerful pre-sets, automatic schedulers, spectrum analysers, MOD Monitors, UPS interfaces, built in stereo generators, remote monitoring/control via IP, hot swappable power modules, hot swappable power supplies, redundant exciters, built in audio processing, N+1 capability for FM, and MDCL in AM Transmitters. Nautel has GV, NV, VS series FM digital transmitters and DRM & HD Ready NX series MW Transmitters, in its portfolio, with 1kW-2 MW power range in AM & 300W-88kW in FM.

A control system can be used from the transmitter, PC, smartphone, etc. Sophisticated tools are available via TCP/IP with the ability to diagnose problems and to maintain performance and competitiveness. As the move continues toward digital broadcasting, it provides dramatically improved sound, additional channels, programme associated data, emergency alert services, single frequency networking, traveller information, specialised services and cloud scaled future technologies. These allow for future planning to compete in an IP broadcast world, putting the web and IP technology to work in managing costs, complexity and maintenance, and staying on top of the operation of remote sites.

Nautel has extensive experience in delivering major projects and high volume deployments on schedule. A few of the projects recently completed, include 400 kW high power medium wave for Voice of Vietnam, 2000 kW DRM MW System for Antenna Hungaria and deployment of 33 NX Series MW transmitter systems to compliment AIR's AM infrastructure.

### Modern Broadcast Transmitters - Rohde & Schwarz



**Nils Ahrens**, Head of Sales  
& Marketing in ANZ & SEA,  
Rohde & Schwarz

Common factors to be considered by broadcast and network operators are energy costs in operation, cost of space occupation on site, penalties for downtime, maintenance

costs to ensure service quality, changing requirements and equipment lifetime. Rohde & Schwarz offers different products: low power single-box UHF transmitters and gap fillers, medium power air-cooled VHF/UHF transmitters and high power liquid-cooled UHF/VHF transmitters ranging from 1W to 100kW.

Major factor impacting coverage is the modulation error rate (MER) in the digital domain. In the case of DTV networks for stationary outdoor reception using DVB-T2 with 256 QAM or DVB-T with 64QAM and code rate 2/3, receiver MER should be more than 18 dB. For stationary indoor reception using DVB-T2 with 64/16QAM or DVB-T with 16 QAM and code rate 2/3, it should be little more than 12 dB. In case of DAB+ networks for mobile and stationary indoor reception, the figure required is greater than 8 dB. As MER impacts coverage, coverage may be expanded by increasing the RF power or, alternatively, increasing the number of transmitters.

Another functional parameter is energy efficiency, which is the ratio of energy output to input. There are different ways of calculating transmitter efficiency. Efficiency improvement techniques employed by Rohde & Schwarz are a mix of Doherty technology, transistor voltage regulation, and crest factor reduction. Other noteworthy techniques are separate amplification for main and peak signals and adaptive efficiency optimisation. Doherty technology allows for broadband operation mode and in adaptive efficiency optimisation, intelligent algorithms optimise amplifier parameters for specific transmission scenarios.

For performance improvements, low loss combiner structure is used, with fewer RF interconnections. Also, multiple

transmitters are built into a single rack depending on the number of amplifiers per transmitter. Backup batteries are integrated into the exciters to provide maximum transmitter availability. Likewise, rapid channel switching, fully redundant exciter switching, intuitive and user-friendly GUI with direct access to specific parameters of transmitter components are other new techniques deployed.

Rohde & Schwarz deploys future-proof ATSC3.0 support with purely software-based implementation, supporting the new standard ATSC 3.0 with an advanced feature set and unique capabilities to adopt standard evolutions. Other recent advancements are the infrastructure for 5G Broadcast as R&S Overlay solution and SDL solution with THU9evo TX series.

### Modern Broadcast Transmitters - GatesAir



**Oscar Hu**, Regional Sales  
Manager, GatesAir

GatesAir has been a pioneer in over-the-air broadcasting for nearly 100 years. It provides end-to-end terrestrial transmission solutions. A survey shows that 92% of

Americans, aged 12 years and above, listen to the radio every week and radio has the highest reach among all media. Differences between different radio transmission systems such as DAB+, DRM+ over FM were highlighted in the session. While a DRM+ signal carries up to four audio programmes in a 96kHz channel, typically 9 to 24 programmes are embedded in a 1.5MHz wide DAB+ channel. The transmitters operate with increased efficiency, reduced power consumption and reduced energy wastage. A typical calculation shows 50 times less power consumption than that of FM over 10 years of operation. When compared to FM opex savings, DAB+ savings are 4.1m USD while that of HD Radio and DRM+ are 3.9M USD.

GatesAir high efficiency transmitters support multichannel TV and radio delivery across all power levels and standards. Its contribution and distribution solutions transport audio, video and data over any IP or legacy connection.

The Intralex product family are used in AV & data transport in both RF and IP networks. In radio, Flexiva and Maxiva product families are used for DAB, AM and FM transmissions over low, medium, high power air cooled and high power liquid cooled transmitters. The Maxiva product family is preferred for VHF & UHF

Television. GatesAir has redefined how modern broadcast TV transmitters can be deployed as a compact, non-rackmount multi transmitter system. PMTX-1 is a complete "Transmitter in a box" model for cellular base station and power pole mounted 5G sites. The IMTX-70 desktop transmitter is used as an intra-mast transmitter or gap filler for DVB-T/H, ISDB-T and it has support for T2, DAB/ DAB+/T-DMB, ATSC modulations.

Other advanced Radio Implementations are SFN Intraplex IP Link SynchroCast systems. RF simulcasting or single frequency networks use multiple, geographically disperse RF transmitters operating on the same carrier frequency, modulating the same programme material. To combat signal delay, the excitors must produce constant processing delay and have the ability to lock the carrier and pilot with a GPS reference. Gates Air's Flexiva line of excitors satisfy this requirement. To keep audio alignment, the SynchroCast system will maintain a constant, precise, and user settable STL signal delay from studio ingest to output at each transmitter site.

#### Advances in Broadcast Antenna Systems - Kathrein



**Prasanna Meemaduma,**  
Head, Melbourne Office,  
Kathrein Broadcast APAC

The antenna is an adaptor between free space and transmission line, guiding electromagnetic waves. Components of a broadcast antenna system include main feeders from

transmitters into the radiators mounted on a tower. Main terminologies associated with antennas are power, electric field strength, radiation pattern, polarisation, isotropic radiator, equivalent radiated power, voltage standing wave ratio, antenna directivity and gain.

To concentrate the radiated power into the area defined by the horizon, half wave dipoles are arranged vertically and combined in phase. With every doubling of the number of dipoles, the gain increases approximately by 3 dB in the main direction. The polarisation of an antenna is defined as the direction of the electrical field vector of the electromagnetic wave. Polarisation refers to the alignment of the wave's electric field. Linear polarisation is commonly referred to horizontal or vertical polarisation; and circular or elliptical polarisation can be left or right handed depending on the antenna system. In circular and elliptical polarised transmission, reflected waves have different characteristics which will not

create interference caused by phase difference between the original wave and reflected wave. Adaptive polarisation is a concept to adjust the polarisation if a dual polarised antenna panel is necessary and for each channel you can have separate different polarisations transmitted from the antenna. Tx and Rx antennas must be aligned to transfer maximum power.

An antenna pattern can be traced in a few steps, the first being, to determine the coverage potential of the transmitter and the design of an optimal and desired theoretical pattern. Then there is the creation of a practical pattern with a realistic and a precast antenna. Panel antenna can be set up in typical arrangements for square, triangular and round masts with customised HRP design and optimisation. Normally used in VHF Band II are linear polarised antennas, or circular polarised antenna systems; in VHF Band III usually vertically polarised antenna are used for DAB+ along with horizontally polarised antenna for DTV; while in UHF for DTV, elliptical or circular are highly recommended. 5G TV trials were carried out with circular polarised antennas. 5G TV today is where broadcast meets mobile and is adapted from LTE Broadcast. Implemented in HPHT and LPLT configuration, eMBMS uses supplemental downlinks within the LTE mobile network. 5G broadcasts are technically known as FeMBMS. So far, they are in trials in Germany, Italy, Finland and China.

Some of the common types of antennas are Single Dipole, Panel, X or Bent Ring, Yagi Uda, Logarithmic Periodic, Turnstile and Superturnstile antenna. For RF signal measurement, a typical Kathrein signal analyser operates in a way in which the receiver digitises the received signal and through its software, delivers samples via Ethernet to the measurement controller. Kathrein signal analyser (KSA) is a complete measurement and analysis solution for FM, DAB, DAB+, DMB, DRM, DRM+, DVB T, DVB T2, LTE and 5G Broadcast.

#### Transforming Live Broadcasts with IP Bonding: LiveU's Solutions



**Toby Liu,** Sales Engineer,  
LiveU China

availability and is optimised for 5G resilient, low delay transmission. It works throughout the chain, encompassing

LiveU Technology is the industry standard for reliable live video streaming over unreliable networks. It is a patented cellular bonding technology for high reliability,



**Hagai Zisser,** Director,  
Sales Engineering APAC,  
LiveU

production. The users of LiveU's solutions range from traditional TV stations & sports to brands & online media.

Cellular bonding supports multiple 5G connections, real-time network monitoring, adaptive forward error correction, fast and reliable transport protocol, QoS-based routing and load balancing. The spring festival gala showed a case of remote production over IP where a top Chinese star needed to find a way to transmit his picture from HK to Beijing, and dance with the other two stars. The challenge was to get synchronised dancing with low delay and superior video quality. LiveU's remote production solution was used to stream directly from HK to Beijing. Only two people were assigned on both sides (1 in Beijing and 1 in HK) to monitor the whole workflow.

#### How 5G Simplifies the Live Remote Production- Awiwest



**Frederic Parbey,** VP Sales  
APAC, Awiwest



**Samuel Fleischhacker,**  
Senior Product Manager,  
Awiwest

field acquisition, field production and multiple distribution connections, through to physical or cloud servers for final distribution and

Remote Production is a workflow where live content is captured from a remote location while production is managed from a central control room. Usage can be for scenarios such as live sports, news and entertainment, with potential benefits. Production normally works in two architectures: editing in the studio or editing

at the venue, for either single venue multi venue events.

Awiwest's solution, deployed for such a remote production, includes set-up for safe transport of streams to the editing site. Cameras at the venue are remotely controlled, with video return capability for monitoring. In a way, it is a mix of live, control and video return functions. The transport ensures network aggregation, packet retransmission, high rate FEC, automatic data balancing and network priority policies. Typical equipment used are PRO3 series and

AIR series, integrated with 5G modems supporting multiple 5G bands. 5G brings benefits in terms of better bit rate, latency and quality. Aviwest's CyanView solution works for multiple camera control and is camera vendor agnostic, with ultra-speed reactivity and simple and fast setup.

Such a setup was used by COSMOTV for the first time in Greece for live TV broadcast of the 2021 Greek cup final. It used an AIR320-5G terminal and PTZ P400 camera, interfaced with StreamHub over 5G connections. The PGA tour in the U.S. also used both Pro3 and Air320 setups for its sports production. Aviwest will be announcing a PRO460 set with Full HD and 4K UHD capability soon.

### DVB's New IP-centric Solution and DVB-I a Universal TV service Layer



**Thomas Stockhammer,**  
Lead, DVB task force on  
DVB-I over 5G networks  
Qualcomm

DVB has developed a number of standards in broadcast television, addressing interactivity & personalisation, security, service discovery & metadata, coding & transport etc. DVB's focus is now shifting from distribution to service, to simplify the chaos of hybrid & fragmented networks, platforms, devices, consumer demands, content offerings, and object-based approaches. New challenges are on the horizon for broadcasters to reach diverse connected devices, to compete with streaming platforms and to ensure prominence of their services. DVB-I is at the core of DVB's IP-centric solutions that focuses on service discovery & metadata. It defines the mechanisms for the discovery of service lists and to retrieve EPG over the internet. It also offers a common service layer across networks: Broadcast, Broadband, 5G and Native IP over Broadcast.

Native IP solutions supports media streaming over broadcast. The Native IP system promises broadcast quality served to all consumer devices, media preparation and distribution using a single converged platform, with content personalisation made easier. Native IP leverages existing DVB solutions. Main decisions made by the Native IP working group are for the solution to be based around an operator-independent Native IP gateway and DVB-I clients and for all chosen technical approaches to be applied to a DVB-T2-based implementation. In the transport domain, DVB-GSE was selected as the data link layer solution, in particular the GSE-Lite profile; MPE was selected for



**Emily Dubs,** Head of  
Technology, DVB Project  
Office

adaptation of DVB-I, MABR and DASH signalling to a channelised broadcast network. For security, protected content can be supported in connected use-cases. Similarly, DVB-DASH is the optimised streaming format defined for the delivery of DVB-I services over the internet.

It is speculated that a 5G-based system design will transform digital TV broadcasting. Currently broadcasters are facing challenges to address multiple media formats, newer devices & access, and mass audience behaviour. So, a viable approach for media providers and broadcasters would be to focus on services that rely on global media and access technologies. 5G will be a global unified platform for access, delivery and a platform for innovation for the next decade.

5G is the key for broadcasters and media service providers as video continues to be the major traffic driver of all networks, it brings innovation opportunities across the whole TV broadcasting value chain. The 5G system will be a unified and standardised media delivery framework for broadcasters, content providers, mobile operators, service providers, device manufacturers. Digital TV delivery with 5G broadcast is ready with standalone broadcast 3GPP release 16 standards, multi band spectrum, low deployment cost, service layer integration and continued enhancements. Release 16 5G standalone broadcast is designed to improve coverage in various reception scenarios and continues to evolve the end-to-end design for 5G standalone broadcast.

5G media streaming (5GMS) is a framework aligned with today's OTT media distribution practices, to supplement MNO and third-party media services in its easy access. 5GMS is viewed as the value added service. DVB-I is foreseen as service layer for 5G. It creates interfaces and APIs to distribute DVB-I services over 5G for TV services. Key requirements are laid out for DVB-I services over 5G Broadcast and 5G Media Streaming besides for hybrid DVB-I service using 5G delivery networks. These DVB specifications should align with industry practices, for example those developed in 3GPP, 5G-MAG. DVB-I reference app shall be identified and developed in order to enable 5G-based media distribution. DVB is thus establishing it as end-to-end

the MPEG2-TS backward compatible solution. Signalling will be made flexible and dynamic and will provide a coherent

platform for horizontal services, common access technologies, interoperable media formats and standardised APIs.

### Virtual Media Centre: The Art of Real Time Broadcast- VYPA



**Dr Ahmad Moradi,** Chief  
Science Officer, VYPA-  
Netstairs.com

A multi-event solution called virtual media centre (VMC) was presented at the session. Virtual Media Centre, made for journalist interviews was built as a part

of sports and event branding. During the Covid-19 pandemic, many events rely on virtual crew, studio, streamers, and production teams. The VMC components include a main event stream connected to AI for real time routing, fed intelligently to journalists; a multi-venue feed live stream includes multi live streams, and the interview booth to watch interviews by invited journalists on-site or online. Functionalities, such as social media accounts e.g. twitter Facebook Instagram, VMC chat for info desk and moderator help and few third party apps are available. A typical Virtual Media Centre (VMC) was built by Netstairs as a part of the European Aquatic- Budapest 2021 event. The interactive and layered layout includes lobby room with logo, login details at the top bar, interview room and live stream feature in the left bar, with audio video controls, source feeding, file sharing and other functions and with social media publishing and chat box in the right navigation bar. Here a lounge was made for registered and approved journalists waiting to interview athletes. The sports moderator's role builds on 3 layers, as general or chat supervisor, booth manager for interviews and as controller to stream or transcode to a multitude of devices or platforms.

On the delivery side, after years of exhaustive tests with different Cloud solutions, Google data centres were selected for their robust delivery service and diversity of use and technology. iCDN (interactive content delivery network) supports leading Cloud services. It is built on Google Cloud with AI and ML capability. Connected to the leading CDN services, iCDN brings interactive real time communication via multiple CDN cloud services to inform, inspire, immerse, educate, and entertain the target audience. Another integral capability is the iCPT that supports featuring and displaying sponsored logos, brands and Ads. Each Booth may display common or its own Ads. All Ads or sponsored logos are seen for the duration of the event. Placeholders for advertising and event logos are set in place too. ■



# ABU Engineering Fundamentals 2021 Training Course

The ABU's annual course on Engineering Fundamentals for Broadcasters is being held for the first time this year on the Moodle platform, an open-source online learning platform. This year's course consists of three levels. The first level took place from 26 July to 23 August. It was repeated from 8 September to 14 October.

The course aims to provide basic engineering fundamentals for broadcast engineers and technicians who are at the beginning of their careers. It focuses on fundamentals of audio, video, IT and communication systems, engineering techniques and applications. Participants who successfully complete each level will receive a certificate.

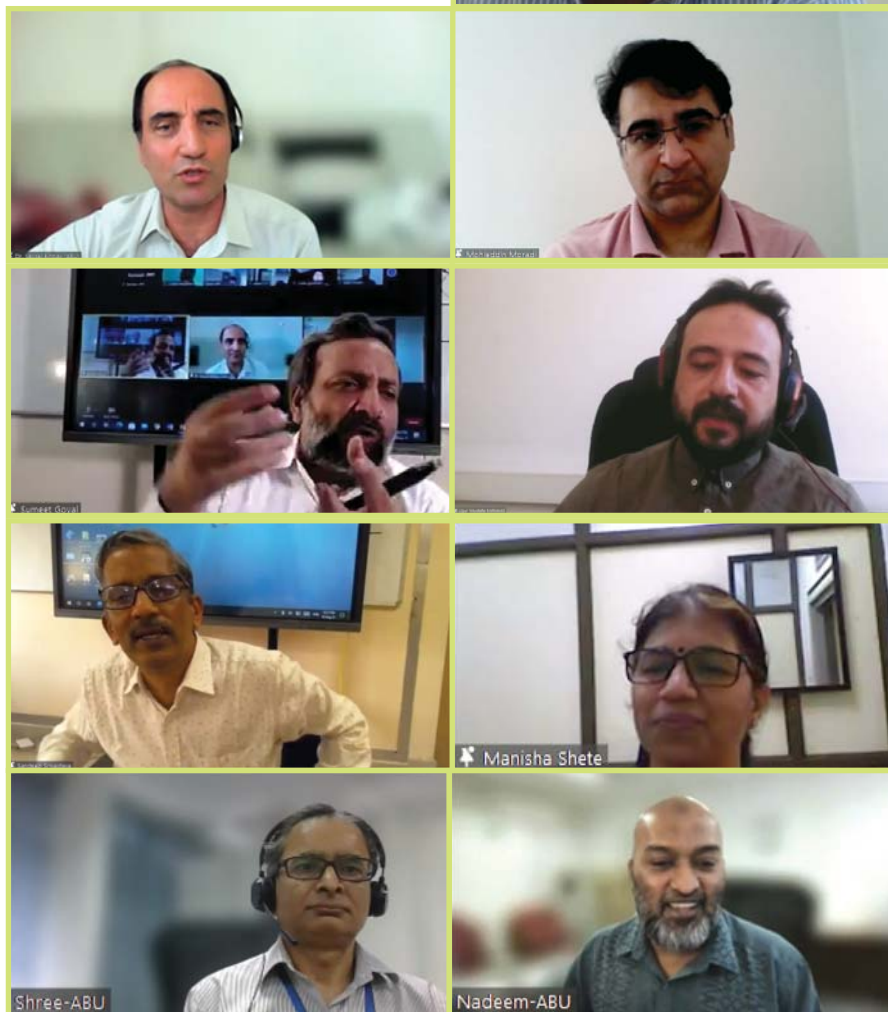
Pre-recorded lectures and other course material such as books and notes were uploaded to the Moodle platform for the first level. This material is an on-demand asset and participants can interact with the platform and access the material whenever they are available. As they are all working professionals, they can choose the times that suit them best to take the course. The second and third levels are also expected to take about one month each.

Level 1 consists of 10 modules: Video Basics, Audio Basics, Digital Video and Audio, Analogue Communication Fundamentals, Digital Communication Fundamentals, Signals & Mediums, Satellite Communications Fundamentals, Networking & IT Basics, Signal Measurement and Quality Analysis, and Overall Broadcast Chain.

The lecturers include experts from IRIB-Iran, TRT-Turkey and NABM-India, as well as ABU technical staff. After each module, live online Q&A sessions take place with the lecturers. This course is available only for ABU members and the participation process managed by nominations only.

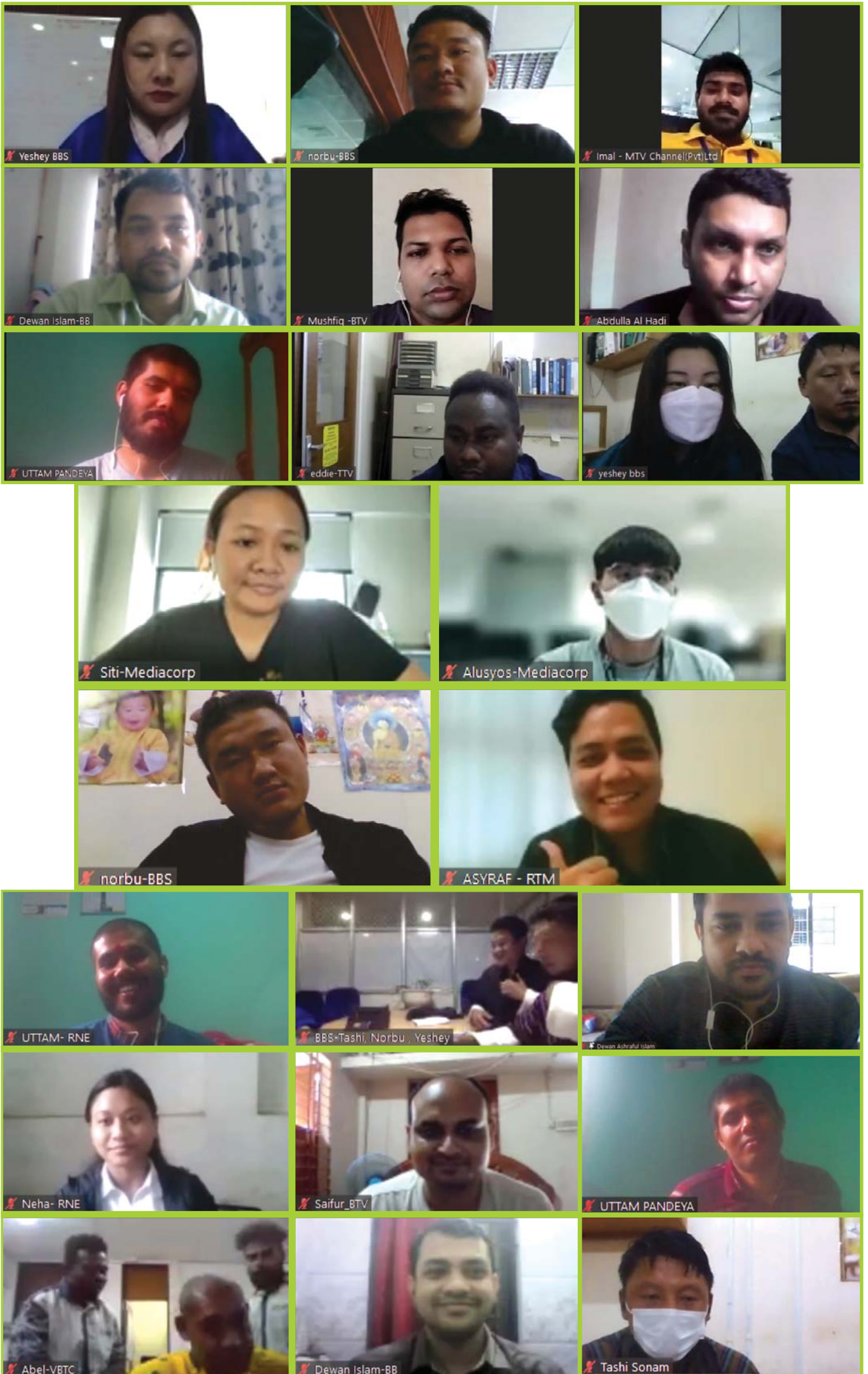
Around 40 participants were selected for the first level in July-August. The others repeated the course in September. ■

## Resource Persons & ABU Technology



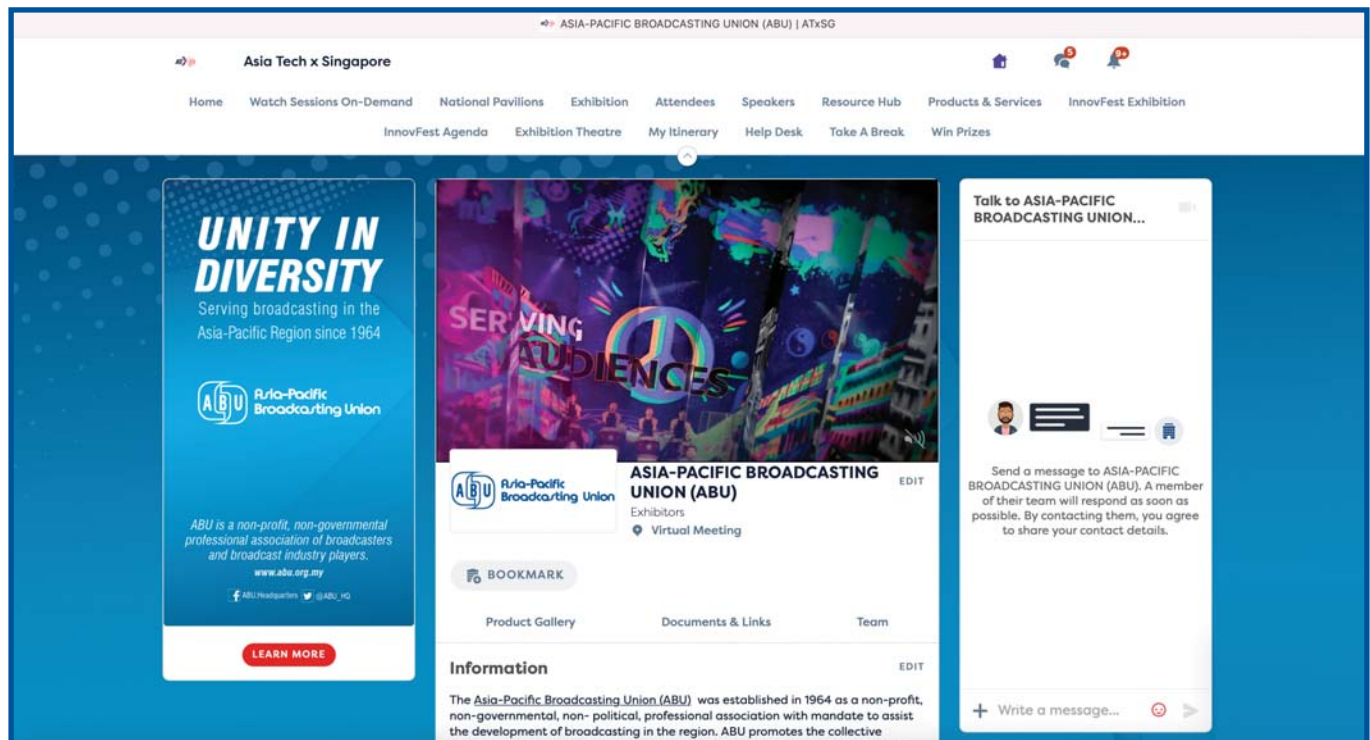
## Participants







# ABU takes part in BroadcastAsia 2021



The ABU took part in BroadcastAsia 2021, held as a virtual event on 14-16 July 2021.

The ABU's virtual booth at the exhibition highlighted the union's services, particularly those run by the Technology Department. It attracted many visitors. A major trade show for the broadcasting industry, BroadcastAsia usually takes place annually in Singapore. This year's event included live content covering Opportunities in the Business of Gaming and eSports, Real life 5G Applications in Asia and other topics.

The content is available on-demand until 30 September 2021 at <https://www.connectechasia.com/broadcast-asia/>

BroadcastAsia 2022 is scheduled to be held in Singapore on 8-10 June. ■

## WBU calls for end to violence against journalists

World  
Broadcasting  
Unions



The World Broadcasting Unions (WBU) has called for concerted efforts to combat threats and violence against journalists and other media professionals, which it described as an attack on democracy.

At its annual meeting on 19 July, it said the safety of journalists and media professionals had deteriorated over recent years and the COVID-19 pandemic had aggravated the situation in many countries.

"Attacks are getting more severe and include online harassment and threats, but also physical violence."

"Broadcasters' journalists and production crews are confronted with increasing hostility and violence when they are simply doing their job, reporting from important events, giving balanced information, and putting facts in context."

"This intimidation has a chilling effect on media freedom and the ability of journalists to support the public with trusted and reliable news and information which has been so vital during the pandemic."

Women journalists were particularly targeted, the WBU said, with UNESCO research pointing to a sharp increase in online violence against them that often turned into online violence.

"Numerous standard-setting statements and practices adopted at international levels recognise off- and online threats and attacks as a serious danger to media freedom, which is a cornerstone of informed, healthy democracies."

"The intimidation of journalists can interfere with the right to freedom of expression and with the right of the public to receive information."

"These internationally agreed statements give guidance in areas of prevention, protection, prosecution, promotion of information, education and raising awareness of the potential threat to media freedom."

The WBU called on the authorities to guarantee rights and put into practice international principles and measures to protect journalists online and in the field.

This would help ensure journalists and other media professionals could continue to provide a critical service to society at all times.

The WBU serves as a coordinating body for the world's regional broadcasting unions including the ABU. ■



# WINNERS TO BE ANNOUNCED 16 November



## **ABU Broadcast Engineering Excellence Award**

For outstanding contributions in broadcasting engineering and related disciplines.

## **ABU Engineering Industry Excellence Award**

For outstanding engineering contributions made by an individual to the broadcasting industry.

## **ABU Green Broadcast Engineering Award**

For outstanding contributions in developing, implementing and/or promoting green technology in the broadcasting industry.

## **ABU Developing Broadcasters' Excellence Award**

For contributions of an outstanding nature in broadcast engineering made by an individual in a developing broadcasting organisation.

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# 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.



Mr Dae Hoon Choi, ABU Technical Liaison Officer, Project Manager, International Relations, Korean Broadcasting System (KBS-Korea). Appointed a member of the panel in April 2021.



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



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



Mr 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, 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.



Puan Putri Joliana binti Yaacob, Director, Radio Engineering Division, Radio Television Malaysia. Appointed a member of the panel in August 2020.



Mr 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.



Mr Peter Bruce, Director of Business Development at Elevate Broadcast Pte Ltd. Appointed a member of the panel in June 2018.



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





## ABU TECHNICAL COMMITTEE MEETING SCHEDULE

### Online | 16 November 2021

Time/Date	16 November, Tuesday
2:00 – 2:30 pm	<p>OPENING SESSION</p> <p><b>ABU Engineering Awards &amp; Technical Review Prizes Announcements &amp; Presentation</b></p> <p>ABU Technology – Activity Report</p> <p>New Recommendations &amp; Decisions of the Technical Committee</p>
2:30 – 3:00 pm	<p><b>Announcement of TB Election Results</b></p> <p><b>Election of TC Chairman</b></p> <p>Keynote Presentation</p>
3:00 – 3:30 pm	<p><b>TC Chairman Election Results</b></p> <p><b>Election of TC Vice-Chairmen</b></p> <p>Summary from Topic Area Chairmen: <b>Production, Transmission, Capacity Building and Spectrum</b></p>
3:30 – 4:00 pm	<p>Updates from Status Reports</p> <p><b>Information Exchange Session</b> Presented by ABU Members</p>
4:00 – 4:15 pm	<p><b>TC Vice-Chairmen Election Results</b></p> <p>Any other matters</p> <p>CLOSING</p>



# News from The ABU Region



## AUSTRALIAN COMMERCIAL RADIO AD REVENUE RISES

Commercial radio ad revenue in Australia remained in positive territory in the month of July despite the impact of lockdowns, with revenue up 19.3 percent compared to July 2020, according to data released by industry body Commercial Radio Australia.

Ad revenue for the five major Australian capital city markets totalled A\$48.571 million (US\$35.7 million) in July compared to \$40.724 million a year ago.



"The extension of lockdowns has taken some momentum out of the recovery but it's encouraging to see growth for radio being sustained at a double digit level," said CRA chief executive officer Joan Warner.

The figures include agency and direct ad revenue and were compiled by media data analytics company Milton Data, which took over responsibility for industry revenue reporting from Deloitte from 1 July 2021.

Melbourne stations reported a 30 percent year on year increase in ad revenue to \$16.408 million in the month of July, while Sydney was 11.3 percent higher at \$13.874 million.

Brisbane was up 21.6 percent to \$7.654 million, Perth rose 18.4 percent to \$6.296 million and Adelaide increased 8.2 percent to \$4.339 million.

Metropolitan radio ad revenue had rebounded by 72.6 percent year on year in the month of May and by 40.9 percent in June before the most recent COVID-19 outbreaks.

## MEASAT INVESTIGATES SATELLITE ANOMALY

MEASAT Global Berhad ("MEASAT") announced on 17 July that while MEASAT has maintained continuous telemetry and command control of the MEASAT-3 satellite since the previously reported anomaly on 21 June, an in-depth investigation is still being conducted with Boeing Satellite Systems ("BSS") to determine the root cause of the anomaly.

To date, almost all customer services on MEASAT-3 have been restored onto backup satellite capacity on other co-located MEASAT satellites and third-party satellites serving the region. Migration and service restoration for broadcast services was immediate,

affirming the resiliency of the MEASAT fleet at 91.5°E orbital hotspot.

All the MEASAT-3 transponders have been deactivated to prevent interference with other satellites. MEASAT has also informed Combined Space Operations Centre (CSPOC) via Space-Track to track the MEASAT-3 satellite and notify other operators of the satellite's orbital location, while the full investigation is being conducted by MEASAT and BSS. A report on the outcome of the investigation will be released in due course.

For latest updates, please visit [www.measat.com](http://www.measat.com)

## MTRK ENHANCES VIEWER- FRIENDLY OPTIONS: OTT PLATFORM LAUNCHED

Television has the largest viewer audience in Uzbekistan and its role in up-to-date coverage of events and raising public awareness is invaluable. Information and communication technologies are transforming quickly and television remains the most popular way to address the needs of the public to receive information. Amid global developments with the telecommunications sector advancing rapidly, cutting-edge technologies are implemented into TV production and radio broadcasting systems. New media concepts such as digital, mobile and internet television are being introduced, and all this requires keeping up with processes.

For the comprehensive development of the country, and in particular to deliver on the Actions Strategy of the Republic of Uzbekistan along Five Priority Development Areas in 2017-2021, is the creation of favourable ICT infrastructure that supports software development and secures wide-ranging assistance for that purpose. The issues of improving the system of "e-government", in particular, the development of mobile and digital television are also priorities.

The National Television and Radio Company of Uzbekistan has completed a step-by-step transfer to the digital broadcasting format of hardware-

studio facilities, news studios and main television complexes of other technological facilities in the system, and in the meantime carried out research integrated with the internet services on the basis of IP technology to build more amenities for consumers. [ABU News]

## KBS TAPS ATEME TO ENABLE MULTISCREEN VIDEO QUALITY

Korea's largest broadcaster KBS has selected ATEME's Kyrion encoders to update its legacy infrastructure, enabling broadcasting in high-quality MPEG-2 HD. KBS operates a wide range of platforms to deliver nationwide terrestrial service including four terrestrial and two satellite channels, plus seven radio and four DMB channels. For KBS, providing a reliable broadcast service is particularly crucial due to its position as the most trusted media brand in Korea and its audience's reliance on its news service during times of emergency.

ATEME says that KBS's infrastructure update brings several benefits. First, it enables what it claims as outstanding video quality and a surround-sound audio experience thanks to multi-channel audio support. Second, ATEME said that it would enable KBS to streamline its video/audio flows as well as its operations by combining three pieces of legacy equipment into just one encoder. Third, the technology provider claimed the deployment of its kit would bring the stability and

reliability introduced by SMPTE-310 configuration, while remaining compatible with KBS' existing ATSC system and moreover ensure the best live broadcasting experience for Korea's viewers with the lowest latency possible. [Rapidtvnews]

#### **MINISTER FAWAD URGES IMPLEMENTATION OF PTV, PBC'S JOINT UPGRADING PROJECTS**

Minister for Information and Broadcasting Chaudhary Fawad Hussain says the state-run Pakistan Television (PTV), Pakistan Broadcasting Corporation (PBS) and Associated Press of Pakistan (APP) are being transformed to meet contemporary requirements in a fast-changing world.

The Minister stressed the need for early implementation of joint projects between Japan and Pakistan pertaining to modernisation and technical upgrade of PTV and Pakistan Broadcasting Corporation. He said government is determined to turn APP into a premium digital news agency on the pattern of well-known leading international news agencies. He added that 11 modern studios would be established in major cities of the country with an aim to create and strengthen a state of the art and flourishing video news service of APP. [ABU News]

#### **CCTV OVER THE MOON WITH NEW 4K VFX PRODUCTION STUDIO FROM ROSS VIDEO**

CCTV built a 4K mixed reality, real-time digital VFX production studio for the second series of the Mission to The Moon documentary series with the help of Ross Video. In 2019, Chinese broadcaster CCTV created the Mission to The Moon series of documentaries, which was commissioned to coincide with China's lunar exploration mission that saw the Chang'e 4 spacecraft land on the far side of the moon.

To beam images to audiences in China, CCTV created what they call the world's first 4K UHD Immersive Mixed Reality (IMR) production environment for broadcast. For series two, China Media Group (CMG) turned to Ross Video to build a 4K mixed reality, real-time digital VFX production studio. Besides creating a number of original 3D productions that underpinned the series, the new studio also helped to create the innovative AI astronaut character who was a regular feature of the series and guided the audience around the lunar environment. The bulk of the visuals for the series were rendered using Ross Video's Voyager

graphics platform. [APB News]

#### **ASIASAT 5 PROVIDES COVERAGE ON FRANCE 24 NEWS DISTRIBUTION SERVICE**

The AsiaSat 5 satellite provided extensive C-band and Ku-band coverage across the Asia-Pacific region. France 24 has signaled its commitment to bring more international news programmes to Asian audiences by renewing a multi-year service agreement with AsiaSat, who will continue to distribute France 24's HD and SD TV services in the Asia-Pacific region on its AsiaSat 5 satellite.

The partnership of France 24 and AsiaSat began with the successful launch of the former's English-language news channel on AsiaSat 5 in 2009, and subsequently extended to the distribution of a French channel in 2010 and English HD service in 2016. Today, France 24 is reaching out to more than 88 million TV households via free-to-air TV networks and pay-TV platforms, and over 675,000 hotel rooms in 27 Asia-Pacific countries. [APB News]

#### **VTVCAB VIETNAM BOOSTS OTT WITH ETERE**

Etere has extended its relationship with VTVCab, one of Vietnam's largest pay-TV players. The station has boosted its OTT capabilities to double the number of channels, driven by Etere technology. Etere's Over-the-Top (OTT) solutions enable VTVCab to manage the end-to-end OTT delivery workflow. Etere has been working with VTVCab since 2014. With the increasing demand for digital content, VTVCab has doubled its OTT channels with Etere as viewership increases and the broadcaster needed a highly efficient system to manage the complete distribution workflow. After a series of evaluations, Etere was selected for its efficient, unified and modular approach to managing multi-format OTT deliveries across platforms.

Etere empowers content distributors to build a strong foundation with a fully managed service spanning the end-to-end workflow including content rights management, encryption, transcoding, transfers, workflow integrations, dynamic ad insertions, subtitling and closed captions. Etere Over-the-Top (OTT) Delivery is driven by smart workflow technology that provides automated transfer and transcoding capabilities to ensure media files are compatible to the requirements of any OTT video delivery platform. [content+technology]

#### **ASTRO MALAYSIA INTRODUCES 4K HDR FOR UEFA EURO AND TOKYO OLYMPICS**

Sports fans in Malaysia are set to enjoy the ultimate viewing experience when Astro debuts its live sports broadcast in stunning 4K HDR (High Dynamic Range) and Dolby Atmos on the Ultra Box.

These features are a first in Malaysia and make this year's biggest sporting events - UEFA EURO 2020™ and Olympic Games Tokyo 2020, even more immersive and exciting for sports fans. With all UEFA EURO 2020™ matches in 4K HDR, every moment comes to life with brighter and more accurate colour; and better contrast. Live matches beyond the quarter finals also feature Dolby Atmos, to bring the audio realism of being at the stadium right into the living room.

Fans watching UEFA EURO 2020™ matches on the go via Astro's streaming app, Astro GO, can also expect an enhanced viewing treat with an all-new Interactive Mode. Astro GO's new experience, designed specifically for live sports, displays interactive overlays for fans to access instant highlights, match statistics, player statistics, fixtures of upcoming matches, and more. Over time, the company plans to introduce 4K HDR, Dolby Atmos and Interactive Mode to the football leagues currently being broadcast on Astro. [Astro News]

#### **THAILAND'S NBT TAKES ON HD WITH PHABRIX**

Test and measurement solutions provider PHABRIX has announced that 12 of its SxE handheld instruments have been purchased by National Broadcasting Services of Thailand (NBT). Headquartered in Bangkok, NBT is a national public television station, operated by The Government Public Relations Department (PRD), a division of the Thai Government. PHABRIX Distributor, Strong Brothers 1961 Company Limited, supplied the equipment. The SxE devices replace NBT's legacy SD test and measurement equipment, delivering HD video and audio Generation, Analysis and Monitoring with advanced Physical Layer Analysis.

SxE offers an extensive video toolset, with support for SMPTE compliance testing of over 350 different formats. An extensive array of video and audio instruments includes a signal generator with moving test patterns, a high-performance waveform, and ANC/VANC inspector. The SxE also offers 16

channel audio generation and metering with support for Dolby E, Dolby Digital and Dolby Digital metadata and bitstream analysis. Its instant, RTE (Real-Time Eye) technology speeds physical layer testing and delivers automated measurements and logging for key parameters such as: rise time, fall time, delta, overshoot and cable length. The Jitter analysis instrument enables quick analysis of the nature of jitter using a graph of jitter versus time. [\[content+technology\]](#)

### TELSTRA MEDIACLOUD OFFERS APAC BROADCASTERS PRODUCTION OPTIONS

Telstra Broadcast Services (TBS) is expanding its cloud-native services for the broadcast industry by entering into a sales partnership with UK-based BASE Media Cloud (BASE), a leading provider of cloud services for the digital media industry. Telstra MediaCloud Services (TBS) has decided to enhance and expand its cloud-native services to woo the broadcast industry by entering into a sales partnership with UK-based BASE Media Cloud (BASE), a leading provider of cloud services for the digital media industry.

These new services, said TBS, will allow the newly established Telstra MediaCloud to provide a complete end-to-end cloud-native workflow from ingest, cloud storage, file transfer and asset management through to virtual post production and file delivery. The new services will be initially rolled out to the Australian industry, with plans for expansion to the rest of APAC following soon after, said the companies. TBS is leveraging BASE's expertise to provide a production proven suite of tailored remote working services.

These include cloud storage, file transfer, transcoding, and cloud-native asset management through to virtual Adobe editing, custom artificial intelligence (AI), and content distribution software-as-a-service (SaaS) services. All of these will be offered as part of the Telstra MediaCloud package to Telstra customers. [\[APB News\]](#)

### ACMA OPENS APPLICATIONS FOR LOW BAND 5G SPECTRUM AUCTION

The Australian Communications and Media Authority (ACMA) has opened applications for the upcoming 2021 auction of 5G spectrum in the 850/900MHz band. Low band spectrum forms the backbone of 5G connectivity in Australia. Spectrum in the sub-1GHz bands can carry signals

across longer distances and is essential to the deployment of wide-area networks, such as mobile services and fixed wireless internet. The ACMA will auction 70 MHz of paired spectrum in the 850/900MHz band across all of Australia. The application period runs from the 1st of September 2021 to the 21st of September 2021 with the spectrum auction scheduled to commence in late November/early December 2021.

The spectrum auction is an opportunity for interested parties to bid for spectrum that will accommodate the deployment of 5G services in Australia. The ACMA has prepared an applicant information package (AIP) for interested parties, which provides a detailed auction guide, information on the spectrum available and starting prices. The auction forms part of the Australian Government's plan to make 2021 the Year of 5G. The ACMA auctioned high-band spectrum in the 26GHz band in April this year for a total revenue of \$647 million. [\[content+technology\]](#)

### PSI BROADCASTING BUYS LATEST CIAB SERVERS FROM PLAYBOX NEO

Thai broadcaster and playout service provider PSI Broadcasting has expanded its investment in PlayBox Neo equipment with the purchase of latest-generation Channel-in-a-Box (CIAB) servers. Each CIAB server includes an AirBox Neo-20 playout software plus TitleBox Neo-20 graphics and Capture Suite ingest management controller.

Centred on a scalable multi-format parallel output playout/streaming engine, AirBox Neo-20 allows media files of various kinds to be combined into a single transmission playlist, and supports simultaneous multiple SDI/IP streaming UHD/HD/SD outputs. TitleBox Neo-20 provides total control of titling, graphics generation and text management in advance of transmission and live on-air. The feature set includes horizontal crawling text, vertically rolling credits and messages, still and animated logo graphics, analogue and digital clocks, banner slideshows and chat text with automated horizontal or vertical scrolling.

In addition, PlayBox Neo's Capture Suite enables TV station management staff to control multiple ingest channels across multiple servers via a single graphic interface. Functions such as input selection, ingest pre-sets, file naming, file assignment and auto-transfer can be performed with a single

click. Capture Suite integrates closely with AirBox Neo-20 or can be used as a standalone to support the production workflow at any media publishing house, post-production facility or playout service provider. [\[APB News\]](#)

### TV ASAHI DEPLOYS TVU NETWORKS SOLUTION FOR COVERAGE OF THE OPEN CHAMPIONSHIP

TVU Networks recently announced Japanese broadcaster TV Asahi supplemented the host broadcaster's world feed coverage of The Open Championship using two TVU Remote Production Systems (RPS). Synchronised signals from the venue were sent over IP networks for production at the TV Asahi studios in Tokyo.

Using two TVU RPS systems, TV Asahi was able to deliver unique coverage, catered to the specific tastes of its audience. A total of 12 synchronised signals were sent from the U.K.'s Royal St. George's golf course to the TV Asahi studios. The signals included coverage such as: wireless cameras from the golf course; locally switched signals of Japanese players in action; multiple camera angles from each hole; and the host broadcaster's world feed backup and world feed preview.

With each signal synchronised, frame-accurate switching between the live feeds was easy. TV Asahi was able to produce scenes that easily transitioned from golfer to golfer and hole to hole – a critical element of live golf production.

Using the public internet instead of satellite or dedicated fibre saved considerable expense for the broadcaster. The production also required less crew and equipment than that needed with a typical mobile truck scenario. TVU RPS leverages existing studio infrastructures and the public internet to synchronize multi-camera live remote production. It is available in four- and six-channel versions. Feeds are synchronised from the venue, sent to the broadcaster's studio for on-air delivery, while a bi-directional IFB maintains communication between locations. While it delivers broadcast-quality production standards, personnel and equipment requirements are minimised, and it eliminates the need for a mobile truck on location.

[\[content+technology\]](#) ■



# DIGITAL BROADCASTING *Updates*

## DVB PREPARES THE WAY FOR ADVANCED 4K AND 8K BROADCAST AND BROADBAND TELEVISION

The DVB Project has endorsed commercial requirements for next generation video codecs to pave the way for advanced 4K and 8K services. Work will now commence to investigate the technical compliance of the candidate codecs with the commercial requirements and to develop draft specifications. The compliance of the proposed solutions with the IPR policy of the DVB Project is also being examined.

The new three candidate codecs that have been initially identified as candidates for addition are AV1, AVS3 and VVC. The three codecs can potentially extend the market reach of DVB solutions and bring new features and efficiencies. For maximum flexibility, DVB will also extend its existing profiling of the HEVC codec to 8K applications.

By specifying how to use next generation video codecs, DVB hopes to enable new video experiences such as 8K, as well as improved accessibility and personalisation options. The greater efficiency promised by the new codecs will, for example, enable an increased UHD service offer on terrestrial broadcast networks and greater reach coupled with lower distribution costs for broadband delivery. More flexible distribution is also a goal, taking advantage of alignment across both broadcast and broadband delivery.

Support for 8K video is one of the key requirements defined, with resolution up to 7680x4320 pixels. High dynamic range (HDR) and high frame rates (HFR) are also to be supported. To improve delivery models for 4K video, it is required that new codecs provide a data-rate saving of at least 27% compared to the existing HEVC codec in 4K broadcast applications, and of at least 30% for 4K in broadband applications. It is also required that new codecs can improve compression efficiency for lower resolutions, which could potentially reduce the environmental impact of

## IABM TO SET UP GROUP TO PROMOTE DIVERSITY

IABM, the international trade association for broadcast and media technology suppliers, is to form a group to promote diversity and inclusion in the industry.

The industry-wide group, Diversity Action, will provide a forum for IABM members to share knowledge, experiences and best practices to drive change and equal opportunity for all.

The decision to form Diversity Action follows the Big Debate session that closed the recent IABM BaM Live! event, where leaders from a number of national and international diversity organisations debated 'Getting to grips with diversity in Broadcast, Media & Entertainment'.

During the session, it became clear that the sharing of ideas and best practice could accelerate diversity and inclusion initiatives across the industry.

IABM CEO Peter White said: "Almost as soon as the Big Debate started, I could sense a shared 'lightbulb' moment where it became obvious to all the participants that collaboration between their organisations would be immensely beneficial in accelerating diversity and inclusion globally.

media services when delivering to devices where 4K or 8K resolutions are not required.

To enable flexibility in distribution, the requirements include specifications for both transport stream delivery and DVB-DASH streaming. To assist convergence in workflows and implementations, it is required that the codec conformance points chosen for broadcast and streaming should be as similar as possible. Additionally, to facilitate the interoperability of DVB-I streaming services with mobile devices, there should be alignment with conformance points adopted by other relevant industry organisations. [DVB]

## NHK RESEARCH ON PRESENTATION OF SOUND THAT LEAPS TO THE FOREGROUND

NHK has been doing research on wave field synthesis technique as a means of presenting 3D sound to match 3D images rendered for multiple points of view. One topic of research at STRL is 3D TV, which enables naked-eye viewing of realistic 3D images. An acoustic presentation that makes sounds appear to originate at the location of objects in a 3D display would create a realistic sense of presence never experienced before in the enjoyment of



"With its international reach and membership, and commitment to connecting and informing the entire global industry, IABM is ideally placed to be the fulcrum of that collaboration – the champion of diversity."

IABM's Lucinda Meek, CFO and chair of diversity action, and Lisa Collins, Head of Membership Engagement, will be instrumental in setting up and running Diversity Action.

"Collaboration is key, and IABM is already working with many organisations on a global basis," Ms Collins said.

"So it is well placed to raise awareness of the message on diversity, to share experiences and best practices, and drive the change that will make our industry a better place.

"Working together through Diversity Action we can enhance the health, vibrancy and equality of our industry and raise standards on a global basis."

3D images. It is working toward achieving such a sound presentation with research on wave field synthesis technique using a loudspeaker array.

In wave field synthesis, the desired sound field is calculated in advance and used to control the amplitude and delay of sound production by each loudspeaker in a loudspeaker array. In that way, the calculated sound field is synthesised in the space in front of the loudspeaker array. By reproducing the sound field so that sound appears to be coming from a position where there is no sound source, a person who is listening to the sound presentation while viewing 3D images at the same time will experience the feeling that the sound is leaping out to the space in front of them.

NHK is also working on synthesis of complex wave fields to achieve various types of sound presentation. Synthesis of the sound field generated by a moving sound source would enable presentation of not only the moving sound object but also the Doppler effect resulted from the motion of sound source. To achieve that result, methods developed are: one for calculating the sound field of a moving sound source and another for using the calculated sound field to drive a

loudspeaker array to synthesise the sound field. [\[NHK STRL\]](#)

## COUNTRIES RAMP UP CYBERSECURITY STRATEGIES

ITU released fourth edition of the Global Cybersecurity Index. The latest Global Cybersecurity Index (GCI) from the International Telecommunication Union (ITU) shows a growing commitment around the world to tackle and reduce cybersecurity threats.

Countries are working to improve their cyber safety despite the challenges of COVID-19 and the rapid shift of everyday activities and socio-economic services into the digital sphere, the newly released 2020 index confirms. According to GCI 2020, around half of countries globally say they have formed a national computer incident response team (CIRT), indicating an 11 per cent increase since 2018. Rapid uptake of information and communication technologies (ICTs) during the COVID-19 pandemic has put cybersecurity at the forefront.

Some 64 per cent of countries had adopted a national cybersecurity strategy (NCS) by year-end, while more than 70 per cent conducted cybersecurity awareness campaigns in 2020, compared to 58 per cent and 66 per cent, respectively, in 2018. Yet, despite notable improvements, gaps in cyber capacity persist.

Many countries and regions lag in key areas. These include:

- Cybersecurity skills training, which must be tailored to the needs of citizens, micro-, small-, and medium-sized enterprises (MSMEs);
- Finance, healthcare, energy, and other key sectors, which require dedicated measures to close cybersecurity gaps;
- Critical infrastructure protection, which requires enhancement to meet new and evolving cyber threats;
- Individual data protection, which requires continual reinforcement as online activity expands.

Growing reliance on digital solutions necessitates ever stronger, yet also accessible and user-friendly, data protection measures. GCI 2020, the index's fourth iteration, measures the cybersecurity commitments of 193 ITU Member States and the State of Palestine. It aims to identify gaps, serve as a roadmap to guide national strategies, inform legal frameworks, build capacity, highlight good practices, strengthen international standards, and foster a culture of cybersecurity.

Amid interconnected commerce and

communication, cybersecurity risks are increasingly borderless, with no single entity or stakeholder able to guarantee the security of the global cyber ecosystem. Countries with high cyber capabilities may therefore need to support others, such as Least Developed Countries (LDCs), Small Island Developing States (SIDS), and Landlocked Developing Countries (LLDCs).

Each country's level of development or engagement is assessed based on five pillars of the ITU Global Cybersecurity Agenda – legal measures, technical measures, organisational measures, capacity development, and cooperation. Country commitment was assessed through online surveys for each pillar, which further facilitated the collection of supporting evidence. [\[ITU News\]](#)

## SWITZERLAND WILL SWITCH OFF FM END 2024

Swiss radio broadcasters have decided to shut down FM as originally planned on 31 December 2024, according to a press release published by Digimig, the Swiss broadcaster working group on digital migration. On the same date, FM radio licences expire. From that date onwards, radio programmes will no longer be broadcast via FM. With the return to the original switch-off date, consumers have more time to switch technology.

In 2014, Swiss radio broadcasters agreed to stop broadcasting on FM by 2024 at the latest. At the end of 2020, almost three quarters of radio listening was digital, and the radio industry decided that an early and staggered shutdown of the FM stations in August 2022 (SRG) and in January 2023 (private radio) would be responsible. 42 out of 44 of Switzerland's radio broadcasters and the public broadcaster SRG agreed on this.

The latest market figures indicate that listeners need more time for the switchover. By reverting to the original date for FM switch off, consumers, including those driving a car, will have more time to switch technology. Since 2020 almost 100 percent of new vehicles are supplied with DAB+ as standard, in line with EU legislation. There is a particular need for retrofitting in older cars that do not have any reception options via DAB+ or other digital channels. DAB+ retrofit receivers are available on the market at various price points.

The radio industry is aware that there is no future for FM after 2024. The existing FM licences will expire at the end of 2024, and beyond that point, FM radio can no longer be broadcast in Switzerland. Digimig notes that the

framework conditions for DAB+ will have further improved by the end of 2024. The digitalisation of radio will continue to increase until the switch-off date, there will be even more devices on the market, and the retrofitting of cars will make further progress.

Digimig noted further that the postponement of FM switch-off to the originally planned date of 31 December 2024 is associated with costs in the tens of millions for radio broadcasters, remarking that no radio broadcaster can afford to broadcast programmes twice over both FM and DAB+ in the long term, and furthermore, it also makes little sense from an ecological point of view. [\[WorldDAB\]](#)

## HARMONISING BROADCAST TV AND CELLULAR: DVB APPROVES COMMERCIAL REQUIREMENTS FOR DVB-I OVER 5G

The DVB Project has approved commercial requirements for DVB-I service support over 5G networks and systems. Work has already commenced in DVB's Technical Module to provide extensions to the relevant existing specifications – including DVB-I service discovery and DVB-DASH – to address the use cases and requirements collected and agreed by the Commercial Module.

Earlier, the DVB Steering Board approved the publication of the commercial requirements, now available for download as DVB BlueBook C100. The document not only provides a set of 70 technical and procedural requirements, but also introduces key elements of 5G networks and systems related to media distribution including 5G Broadcast, 5G Media Streaming and other ongoing activities in 3GPP. In particular, LTE-based 5G Broadcast provides all functionalities to operate classical TV services including receive-only, free-to-air and high-power high-tower network infrastructures. The commercial requirements were developed based on six guiding use cases, all documented in an annex to BlueBook C100.

5G-based technologies promise to enable content and service providers to access mobile devices, typically interfacing with installable apps. 5G-based distribution to other types of receiver, such as moving vehicles, devices connected to roof-top mounted antennas or 5G-based home gateways, is not excluded. A particular benefit of DVB-I services over 5G is the ability to support integrated DVB-I hybrid services, i.e., services for which the basic broadcast distribution is augmented with unicast for extended service coverage, lower distribution costs, improved quality and additional user experiences.

The commercial requirements themselves are structured in technical and procedural aspects. Generally, the requirements ask for specifications to support different Rel-16-based 5G operation modes, namely 5G Broadcast, unicast-based 5G Media Streaming, concurrent delivery of the same service over both modes, and hybrid DVB-I services. In all cases it is expected that the specifications reuse existing DVB technologies to the extent possible and provide commonalities with other IP-based DVB delivery means.

The technically-oriented requirements are clustered in different service-operation phases, namely provisioning, announcement and detection, components, distribution and delivery, quality and monitoring, as well as client-related aspects. While the requirements are extensive and detailed, for example also including security-related aspects, it is expected that many are already covered by the existing DVB-I specification or would only demand minor extensions. This is a benefit of the original DVB-I design to provide a TV service platform independent of the access layer.

Updates to relevant DVB specifications to fully support DVB-I over 5G are expected to be completed in Q3, 2022. However, with expected continuous extensions of 5G technologies in upcoming releases, the first release of DVB-I over 5G may be only the starting point in a long-lasting endeavour to enhance DVB-based TV services by also leveraging 5G-based distribution systems. [\[DVB\]](#)

### NEW FM FREQUENCIES TO EXPAND RADIO'S REACH IN AFRICA

African countries are working together with international radiocommunication experts to avert interference between different services and ensure coordinated growth of sound broadcasting services between 87.5 megahertz (MHz) and 108 MHz. Organised by the International Telecommunication Union (ITU) and the African Telecommunications Union (ATU), the meeting brought together national broadcasters and regulators from across Africa and its neighbouring countries to coordinate their spectrum use and identify new frequencies to avoid harmful interference as services expand.

Discussions focused on the process needed to make sure national frequency plans are compatible for smooth FM broadcasting in the 87.5-108 MHz band. Participants also considered general criteria for assignable channels, such as the acceptable level for nuisance field strength (NFS), how best to share information, optimal numbers of layers, polarisation discrimination, and proposed timelines for frequency assignment and

planning.

The meeting took place as part of the GE84 Plan Optimisation, which promotes more efficient use of the 87.5-108 MHz (FM) band for analogue sound broadcasting and strives to identify additional frequencies for FM broadcasting stations across Africa. Frequency coordination is key to prevent harmful interference, promote effective and harmonised use of spectrum, and safeguard current and future national frequency plans.

ITU and ATU launched the project to enable African governments to cope with the increasing demand for FM stations and prepare for the introduction of digital radio. The project is expected to conclude by January 2022, with a frequency coordination meeting and a regional compatibility analysis using software and tools developed by the ITU Radiocommunication Bureau. [\[ITU News\]](#)

### RADIO IS THE MOST LISTENED TO AUDIO PLATFORM IN MALAYSIA: GfK STUDY

GfK recently conducted its yearly GfK Radio Insights study to investigate the appeal of radio to listeners in today's digital era, as well as during the Movement Control Order (MCO) in Malaysia. According to the findings, radio has a huge role to play in music discovery with 74 percent of listeners rely on radio for music discovery more than Facebook / Instagram / TikTok (41%) and Spotify (33%).

The study also demonstrated that radio still has a firm hold on the market today. More than half of total listeners have at least one official Malaysian radio station app installed on their devices (53%). This is more than other streaming apps such as Spotify (42%), JOOX Music (33%) and Apple Music (14%). According to findings, the popularity of radio station apps is driven by the availability of the variety of choices of playlists or radio stations (91%), and also the fact that they don't incur any subscription charges (76%).

Despite the competition for ear-time from listeners' own music collections as well as streamed music services, live radio remains the most popular form of audio entertainment, in terms of listening hours, in a week. The report revealed that live radio accounts for a 43 percent share of total weekly listening hours, compared to a 26 percent share clocked by streaming services, and 20 percent by owned music. Podcasts and audio books recorded an 11 percent share.

Homebound Malaysians continue to

listen to radio, making it one of the topmost consumed media in the country, on a daily basis. The survey highlighted that almost 9 in 10 radio listeners are listening to radio for the same or even longer duration as under MCO (full lockdown). In fact, over three in five (63%) indicated that they now listen to more radio at home.

In addition, radio listening occurs across multiple devices and platforms, which allows listeners to tune in to their favourite stations whenever and wherever they want. Findings reported a surge in radio listening via portable devices, with 62 percent tuning in more frequently via mobile phones and 38 percent listening more via computer or tablet. [\[RadiInfo Asia\]](#)

### DAB+ RADIO AS STANDARD IN NEW EUROPEAN CARS

In the second half of 2020, over 80% of new cars in key European markets came with DAB+ radio as standard - a dramatic increase on the same period in 2019. This step-change reflects the impact of the European Electronic Communications Code (EECC), which, from December 2020, requires all new car radios in the EU to be capable of receiving digital terrestrial radio. These figures were revealed in WorldDAB's latest market report.

DAB+ is now in over 80% of new cars in key European markets, driven by the impact of the European Electronic Communications Code which came into force end 2020, as well as the expansion of DAB+ in key markets such as Germany, France and Switzerland where preparations are ongoing to switch off FM in 2022-2023.

The EECC requires all new car radios in the EU to be capable of receiving digital terrestrial radio. UK, Switzerland and Norway have 97-100% DAB+ as standard, and in Italy, The Netherlands, Belgium, France and Germany over 80% of new cars sold have DAB+ fitted as standard. In Australia, 77% of new cars sold now have DAB+ fitted as standard (up from 60% in 2018).

The growth in receiver sales has also been driven by market forces: France will launch national DAB+ services in October 2021, Germany launched a second national DAB+ multiplex for commercial radio in October 2020, and the UK has seen DAB listening overtake FM for the first time. Several EU countries – including Germany, France, United Kingdom and Italy – have already introduced regulations to implement the EECC directive into national legislation, while other countries – including The



Netherlands, Belgium, Denmark, Sweden, Austria, Greece, Czech Republic, Poland, Spain, Slovakia and Malta – have initiated procedures to implement the EECC into national legislation. [WorldDAB]

### DRM ANNOUNCES NEW ENERGY EFFICIENCY CALCULATOR

The DRM Consortium has just developed a comprehensive and user-friendly calculator tool to determine how much energy can be saved by switching transmitters from analogue to digital DRM operation.

The DRM Energy Efficiency Calculator (<https://energyefficiency.drm.org>) has been created using typical performance data from transmitter manufacturers. It then calculates total expected energy usage for up to ten transmitters by considering operational mode, time on-air, and broadcasting technique assessing the energy consumption and electricity costs, based upon local market information. By comparing data sets for both analogue and DRM digital operations, it can estimate the potential (and often huge) savings broadcasters might expect from switching over to DRM.

This not only benefits broadcasters by reducing their electricity bills by double-digit percentages but proves specifically how DRM supports broadcasters' efforts to become more sustainable though green technology significantly reducing requirements for energy produced in large parts of the world from fossil fuels. [DRM]

### NEXTGEN TV BEING USED TO DELIVER REMOTE LEARNING

The new TV broadcast technology, known as NextGen TV or ATSC 3.0, is being used to deliver remote learning services to kids in Washington D.C., who might not have access to traditional broadband. SpectraRep, an education technology company, said it is working with Sinclair Broadcast Group's tech company One Media 3.0 and its D.C. station WIAV-CD to deliver EduCast. EduCast is SpectraRep's broadcast internet product for K-12 and college learners without broadband internet services at home.

The TV industry, including Sinclair, has been rolling out ATSC 3.0. In addition to providing viewers with better picture and sound quality and additional channels, ATSC 3.0 is able to deliver internet content and data services such as EduCast, within a station's broadcast footprint, to both fixed and mobile receivers.

SpectraRep worked with a company called DigiCAP to create an in-home

receiver that can operate using both the current ATSC 1.0 standard as well as the NextGen TV standard ATSC 3.0. The DigiCAP receiver connects to a TV antenna that receives the broadcast signal digital content it carries. The receiver establishes a Wi-Fi hotspot in the home that students connect to with their tablet, laptop, or smartphone. The receiver stores up to 128 gigabytes of content such as videos, presentation slides, worksheets, interactive documents, and images. SpectraRep said that EduCast is operational and available in 12 states using ATSC 1.0. It has procured tens of thousands of in-home receivers and it hopes to expand in to more ATSC 3.0 markets. [nexttv.com]

### RAPID GROWTH PREDICTED FOR BROADCAST SCHEDULING SOFTWARE MARKET

A new report is predicting that the global broadcast scheduling software market size is set for rapid growth, with a CAGR of 18.5% between 2021 and 2028 when the sector will produce \$4.06 billion in revenue, according to Grand View Research, Inc. Key drivers of the growth are an increase in implementation of cloud-based solutions and the growing complications in broadcast media scheduling, the research company explained.

Like many other segments of the broadcast tech business, widespread disruption of traditional business models and the pandemic, prompted broadcasters to shift from the on-premise approach to the cloud-based approach. In addition, an increase in the adoption of smart devices and the rising popularity of multimedia streaming applications encouraged broadcasters to adopt broadcast management and scheduling solutions, Grand View Research found.

Broadcast scheduling software helps broadcasters in automating their workflows, along with reducing complexities across entire management teams. The report noted that the service segment is likely to register the highest CAGR over the forecast period, thanks to increased demand for broadcast management and automation solutions from radio and TV broadcasters. The growing demand for integration and hosting services is also expected to fuel the growth of this segment, the report noted.

The digital platforms segment is expected to emerge as the second-largest segment in the market for broadcast scheduling software and is expected to register the highest growth rate over the forecast period, the report explained. The growth of this segment can be attributed to the

growing demand for national as well as global content from all age groups, and the impact of the pandemic, which caused higher rates of adoption and viewing of VOD content.

Asia Pacific is expected to witness the highest growth over the forecast period, in terms of the adoption of broadcast scheduling software, primarily due to factors such as a large customer base for linear TV and radio across countries such as Japan, China, India, and other neighbouring countries and the growing demand for OTT services. [tvtechnology.com]

### NEWSONAIR RADIO LIVE-STREAM GLOBAL RANKINGS

In major changes in rankings of top AIR streams globally (excluding India), AIR Kodaikanal has made a comeback, after displacing AIR Ananthapuri from top 10. While AIR Chennai Rainbow and AIR News 24\*7 have climbed up the ladder to 6th and 7th spot respectively, AIR Thrissur has nosedived from 6th to 10th position.

In the latest rankings of top countries in the world (excluding India) where All India Radio Live-streams on NewsOnAir App are most popular, New Zealand has toppled Germany to take the 8th position, while United Kingdom has pulled down Fiji to 4th position, reinstating itself in top 3.

In ranking of countries (excluding India) for the Top AIR streams, AIR Tamil is quite popular in the Southeast Asian countries, Malaysia, Philippines and Singapore. Vividh Bharati National, FM Gold Delhi and FM Rainbow Delhi are favourites in the island country, Fiji, located in Oceania. More than 240 Radio Services of All India Radio are live-streamed on NewsOnAir App, Prasar Bharati's official App.

These All India Radio Streams on NewsOnAir App have a large number of listeners not just in India, but globally, in more than 85 countries and 8000 cities across the globe.

These rankings are based on fortnightly data, from August 16 to August 31, 2021. [pib.gov.in] ■

# Equipment Trends



Source: Press release



## ELEVATE BROADCAST PICKS CUSTOM CONSOLES FOR APAC TV AND RADIO PROJECT

System integrator Elevate Broadcast has chosen Custom Consoles control room and studio desks as part of a large-scale project for an APAC free-to-air television and radio network.

"Custom Consoles' technical furniture has always proved a good investment, appreciated by operators and engineering-support staff as well combining good styling with a long working life," says Russ Jones who supervised the project on behalf of Elevate. "The project included nine desks to be installed among five television studios and two radio studios. All nine are based on the Module-R series which allows us to specify exactly what is needed both from an operational perspective and to fit the available space. A crucial factor for every desk is being able to accommodate relevant equipment, power cables and signal feeds while ensuring access from front and rear for routine maintenance. We specified and integrated a total of five TV studio control desks, two audio control desks and two radio studio control desks, plus a music studio desk, two transmission control desks and two studio interview tables."

"We normally install Module-R on site," adds Custom Consoles' sales manager Gary Fuller. In this instance, we shipped the various preassembled elements for integration by the Elevate team. That is routine for our EditOne and EditOne-Radio series, which are shipped as flat-packs, but was a first time for Module-R. Russ and his colleagues handled the build very professionally, as we were confident they would, guided by our reference documentation."

All of the control desks in the project have unified styling, including dove grey Marmoleum worktop surfaces, grey front and side surfaces, back-tilted desktop equipment pods, Ergotron user-adjustable video monitor support arms and silver anodised extruded aluminium legs with black floor skids. Maintenance access doors are located at the front and rear of each knee-level equipment bay.

TV studio galleries 1 and 2 are configured as almost identical 13-bay-width in-line Module-R desks with 8U equipment pods above each of two camera operations bays and 3U pods further to the right. Both desk worktops were pre-cut to accommodate the control panel of a vision mix/effects switcher. Shared between the TV studio galleries is six-bay audio control desk with an inset audio mixer, a 13U-high floor-to-desktop equipment pod and three 4U desktop pods.

Elevate specified an eight-bay inline Module-R desk with 4U-high equipment pods above bays 1, 5, 7 and 8 for the third TV studio. A 13U-high pod is located below the right-hand bay. Audio mixer and vision switcher control panels are integrated into the worktop. Two additional TV studios are equipped with 7-bay inline Module-R desks, again with 13U supporting pedestals at each end. Both desks are fitted with four 4U equipment pods, a freestanding audio mixer and an IP-interfaced vision switcher.

Radio Studio 1 has a six-bay inline Module-R with a 13U supporting level pedestal at each end and three 4U-high desktop equipment pods. The Radio Studio 2 desk is a four-bay variant with an inset audio mixer and a supporting floor-to-desktop equipment pedestal. Largest of the audio-related desks is a 10-bay inline music studio unit with 13U supporting pedestals at each end four 4U-high desktop pods. A four-module digital audio workstation panel is mounted on the worktop. Also included in the project were two four-bay wide transmission control desks with left and right supporting equipment pods and four 4U-high back-tilted equipment pods, plus two studio interview tables with acoustically treated worktops. [\[content+technology asia-pacific news\]](#)

## SONY INTRODUCES 'CINEMA LINE'

Sony has announced the launch of Cinema Line, a series of new camera products for content creators which will bring together the company's expertise in image quality, attention to detail, technology and passion in digital cinema. According to Sony, Cinema Line will deliver not only the coveted cinematographic look cultivated through extensive experience in digital cinema production, but also the enhanced operability and reliability that

meet discerning creators' various needs. The new series will extend beyond basic cinema camera and professional camcorder form factors.

In 2000, Sony released the HDW-F900, the world's first 24p digital cinema camera. VENICE and other products followed in response to countless dialogues with cinematographers and image creators. Existing products in the Sony range forming part of the Cinema Line include VENICE and FX9. VENICE has become a first choice for digital movie production, and the FX9 has an outstanding track record in documentary production. The next step is a new model that will appeal to a wide spectrum of visual creators. Sony will be releasing and shipping this next addition to the range, the FX6 camera by the end of 2020.

Each of the Cinema Line cameras will evolve with user feedback: The FX9 Version 3 upgrade, available in 2021, will see the addition of the S700PTP allowing remote control of Sony's camera, a Centre Scan mode for Super 16mm lens and B4 Lens support with its adaptor as well as other features. In parallel, as of November 2020, the VENICE camera will see a couple of additional features in its V6.0 version which will improve its operability in broadcast and live environments.

[\[content+technology asia-pacific news\]](#)

## MARSHALL ELECTRONICS TO INTRODUCE NEW 12G-SDI CAMERA AT NAB 2021

Designed for a wide variety of broadcast and professional A/V workflow capable applications, Marshall Electronics' new CV420-30X 12G-SDI camera provides 12G-SDI, HDMI and IP (HEVC/SRT) simultaneous outputs.

The CV420-30X is equipped with a Sony Exmor-R sensor to capture crisp 4K (UHD) video up to 3840x2160p at 60fps through a long 30X optical zoom range. Its straightforward design and ease of use make this a valuable camera for live broadcast, houses of worship, sportscasts, newscasts, reality television, concert production, corporate video, courtroom capture, government assembly, education, social media streaming and more, said Marshall Electronics.



Source: Press release

The camera's long 30X optical zoom lens offers an extended zoom range from 4.6- to 135-mm, starting at just under 70° all the way out to 3° horizontal angle-of-view for maintaining image crispness from ultra-wide to ultra-long telephoto shots. The CV420-30X also operates with exceptional low-light sensitivity, ensuring a clear picture in variable and challenging lighting conditions.

Tod Musgrave, Director of Cameras for Marshall Electronics, said, "Marshall is getting more and more requests for 12G SDI as 4K becomes more widely adopted. "The CV420-30X is suitable for use in networked UHD and HD workflows with one-cable to camera ease of setup while leaving the 12G SDI output available to plug into video switching or uncompressed video capture." Marshall Electronics will be introducing the CV420-30X at NAB 2021, which will be taking place at the Las Vegas Convention Centre from October 9 to 13. [APB+ News]

#### ARRI HI-5 PROVIDES UNINTERRUPTED ON-SET CONNECTIVITY FOR FILM CREWS

The new ARRI Hi-5 replaces ARRI's previous top-end hand unit, the WCU-4, and will be a key component to the fifth-generation ecosystem of ARRI's Electronic Control System (ECS). To provide reliable wireless camera and lens control in demanding situations on set, ARRI has released its "most sophisticated" hand unit on the market. The new ARRI Hi-5 replaces ARRI's WCU-4, and will be a key component to the fifth-generation ecosystem of ARRI's Electronic Control System (ECS). Together with a new radio system, new intelligent batteries, smart focus rings, and an iOS app, the Hi-5 will modernise on-set connectivity and simplify complex tasks for film crews.

ARRI Hi-5 features swappable radio modules, a feature that had previously not been available on a hand unit, according to the company. With an often congested 2.4 GHz ISM band and different frequency regulations in different countries, the new ability to exchange radio modules is a huge advantage, allowing crews to choose the module that best suits each shooting location, ARRI added. ARRI will release three radio modules in the 900 and 2400 MHz ranges, using direct sequence and frequency-hopping spread spectrum technology to cut through interference. Together, they cover a multitude of



Source: Press release

shooting situations with an improved, robust and long-range radio link, while ensuring backwards-compatibility with existing camera equipment.

Other notable features include smart pre-marked focus rings, which communicate directly with the Hi-5 hand unit to become instantly recognised and mapped to the lens focus scale. Batteries for the Hi-5 are ARRI products based on the NP-L interface, and can be hot-swapped without powering the unit down. [APB+ News]

#### ORBAN OPTIMOD-PCN 1600 BRINGS AUDIO PROCESSING VIRTUAL

Orban's Optimod-PCn 1600 is a solution for server-based audio processing. Complementing its hardware processor product portfolio, the software offers all Orban audio processing via a PC/server and can be used in full virtualization. The number of audio processors can be selected as needed, and factory presets are available to help find the perfect sound.

Optimod-PCn 1600 can be used for live Internet streaming, DAB/DAB+, HD Radio or TV broadcasts. The software performs phase skew correction, stereo

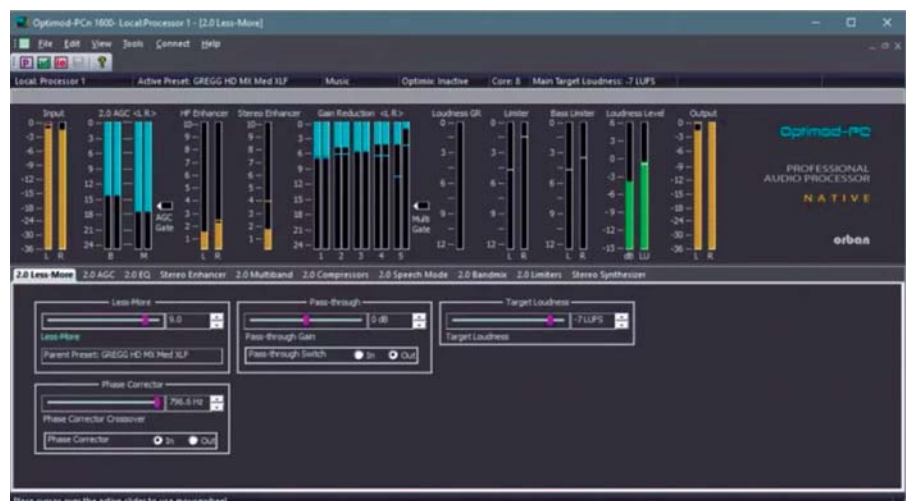
enhancement, intelligent automatic gain control, equalization, multiband gain control, peak level control and intelligent automatic loudness control. It runs on Windows, starting automatically and working reliably in the background, noted Orban.

The setup, metering, and subjective loudness control incorporate contemporary target volume concepts, including those specified in EBU R128 and ATSC A/85 and the latest ITU-R BS.1770 loudness measurement algorithm, as well as Orban-CBS Labs' proprietary third-generation Loudness Meter and Loudness Controller algorithm. According to the company, Optimod-PCn 1600 is suitable for customers looking for a flexible and scalable audio processing solution.

#### RedTech International INTERSTELLAR

Ross Video's Interstellar is a browser-based remote production platform that enables content creators to blend traditional working methods and onsite personnel with remote talent and contributors. It is available in three editions based on the number of remote studios, concurrent users and SDI inputs.

The heart of the platform is the 1RU Interstellar Streaming Gateway that provides connectivity between SDI and WebRTC transports. Once configured, the Streaming Gateway is controlled by the Interstellar UI. Supporting 720i, 1080i and 1080p, the Gateway can receive







and decode four WebRTC streams, sending these out over SDI, receiving and distributing one incoming SDI stream to the four contributors. The hardware can manage up to 16 audio channels per stream and supports the OPUS and H.264 codecs. <http://www.tvtechnology.com>

#### PANASONIC AW-UE100 4K/50P PTZ



The AW-UE100 4K/50P PTZ camera has been developed to meet the ever-increasing demand for high quality video content from cameras that can be operated remotely, with flexible and cost-effective operation. It supports a wide variety of IP transmission protocols, including high-bandwidth NDI, high-efficiency NDI|HX, Secure Reliable Transport (SRT) and FreeD protocol. The UE100 supports a wide variety of outputs such as 12G-SDI, 3G-SDI, HDMI and IP. The 12G-SDI and the HDMI can output either 4K or HD signals, supporting a simultaneous 4K and HD output that can be easily managed from the camera menu. The 4K sensor allows two wide-angle shots out of the camera plus an HD cropped shot.

The UE100 features a 1/2.5-type 4K MOS sensor, and a horizontal angle of view of 74.1° that enables a wide area to be shot from a limited installation space. This along with a 24x optical zoom opens up even more shooting opportunities, especially when paired with a powerful Optical Image Stabilisation (OIS). The new 'Direct Drive' mechanism ensures both responsive and low-noise pan and tilt movement. In addition to OIS, Electronic Image Stabilisation (EIS) has been added for the roll direction, providing stable video shooting even at locations utilising robotics and rail systems.

The newly-designed and compact body weighs only 2.2kg, which makes it easy to handle and to install in any kind of setting, especially when positioning the camera

on trusses or ceilings. It comes with power supply, mounting plate and cable today and contains a brand new web GUI for simple control over a network, allowing you to get started straight away.

#### SONY REMOTE CAMERA RANGE TO SUPPORT FREE-D PROTOCOL

As part of ongoing efforts to help productions work in remote and safe ways, as well as create engaging broadcast experiences, Sony is upgrading its BRC camera range with a new set of features.



Designed for remote production and efficient operations, the v2.1 firmware upgrade to BRC-X1000 and BRC-H800 will allow producers and operators to simplify their VR/AR production workflows. Through this update, the BRC cameras will output tracking data over IP, using the industry standard Free-D protocol. This enables the cameras to directly feed the pan, tilt, zoom, focus and iris, as well as the position of the BRC cameras in real time, making VR/AR production simple and cost effective without the addition of other tracking devices or systems. Further, this new feature will allow productions to easily incorporate VR/AR into their live content, such as expanded sets or scenery, live animations, e-sports and graphic overlays, thus enriching their production.

Free-D protocol is an industry standard protocol, supported by major AR/VR solutions providers. BRC-X1000 and BRC-H800 are currently under verification with The Future Group (Pixotope), Reckeen, Vizrt and Zero Density, and plan to support integration with other partners supporting Free-D data in the near future. In the context of social distancing and reduced operational crews allowed, the update will also improve the pan/tilt/zoom operations of the BRC-X1000 and BRC-H800. A reduced minimum speed allows the camera to track more accurately an object on the set and facilitate shot framing. The output will therefore be more realistic and smoother, even with non-professional operators.

What's more, the cameras will now start to focus as soon as the pre-set recall is done, at the same time as the PTZ function, so that the camera movements look more natural. Control when using a physical remote controller such as a pan-bar one will also be supported. [\[content+technology asia-pacific news\]](#)

#### GATESAIR INTEGRATES AOIP TRANSPORT WITHIN RADIO TX

GatesAir has announced two new Intraplex IP Link Audio over IP innovations. The IP Link 100e is the Intraplex family's first modular plug-in card built for integration within radio transmitters, while the IP Link 100c is a new compact hardware codec built for remote contribution and standard STL IP connections. The IP Link 100e is purpose-built to receive FM and digital radio content directly within GatesAir Flexiva transmitters.

The module is added to Flexiva FAX excitors to reliably receive and feed AES67 and other Audio over IP formats direct to the exciter. The smaller, integrated form factor reduces the cost of using Intraplex Audio over IP transport at the transmitter site since no separate hardware codec is required, and frees a 1RU equipment rack slot for auxiliary equipment. The module retains all functionality associated with IP Link codecs. In addition to GatesAir's traditional robust connectivity, the IP Link 100e builds GatesAir's industry-first Dynamic Stream Splicing (DSS) software into the module.

DSS software sends multiple identical streams over the same network or two separate paths, and each stream borrows data from companion streams to avoid service interruptions from packet loss. The IP Link 100e also supports the SRT (secure reliable transport) protocol and provides failover service to Icecast or locally stored audio for optimal reliability. The module also provides storage for program content and full duplex capability, allowing engineers to monitor signals off-air.

The IP Link 100c also adopts a cost-reducing strategy but within a standard hardware codec. GatesAir has halved the form factor to better serve portable applications, providing a half-rack-unit footprint ideal for remote broadcast and studio-to-studio applications. The codec design includes a DC power supply, allowing broadcasters to quickly plug in and stream program audio for sports contribution, live remotes and news coverage, for example. The IP Link 100c is also suitable for STL service, particularly as an affordable backup for primary STL connections, or for delivery to Icecast streaming servers. As with the IP Link 100e, this codec integrates standard Intraplex features such as Dynamic Stream Splicing software, SRT protocol support, and three separate network ports.

[\[content+technology asia-pacific news\]](#) ■



# Personalities & Posts

## New ABU Technical Liaison Officers Radio Television Malaysia



Zainal Zakaria

ABU Technical Bureau Member for RTM-Malaysia, **Mrs Putri Joliana binti Yaacob**, has taken on the role of ABU Technical Liaison Officer.

Mrs Putri, Director, Radio Engineering Division, replaces **Mr Zainal Zakaria**, Assistant Director - Broadcast Operation Dept.

Mr Zainal has served as ABU Technical Liaison Officer since February 2017. Mr Zainal has been involved in ABU activities for several years now having represented RTM at the ABU Administrative Council meeting in Istanbul in 2015 and numerous events organised by the ABU.



Putri Joliana binti Yaacob

We wish to thank Mr Zainal for his contributions and support to the ABU Technology. ■

## All India Radio



**Mr Raman Kumar** been appointed the new ABU Technical Liaison Officer for All India Radio.

Mr Kumar is Director (Global Outreach) at India's public broadcaster Prasar Bharati, which comprises All India Radio and Doordarshan television network. He has held the post since 2019. In addition to many years of service with Prasar Bharati, he had more than five years of diplomatic service in the Foreign Affairs Ministry. He steered the different security projects in the ministry including the cyber security audit of various embassies.

Mr Kumar also spent more than two years in the Indian defence electronics company Bharat Electronics Limited. In his present position at Prasar Bharati, he is responsible for managing the international relations of both All India Radio and Doordarshan. ■

## MNL-EMTV



**Mr Barry Ilaitia** has been appointed the ABU Technical Liaison Officer for MNL-EMTV, Papua New Guinea.

Barry has 10 years' experience in television broadcast and ICT skills including design, implementation, installation, maintenance and operations of the broadcast and IT network. ■

## Bangladesh Betar



**Mr Md Towhidur Rahman** has been appointed the ABU Technical Liaison Officer for Bangladesh Betar, the only state owned radio broadcasting organization of Bangladesh. Mr Rahman is currently the Senior Engineer at the Research & Receiving Centre of Bangladesh Betar.

Mr Rahman has over 25 years of experience in the Engineering Section of Bangladesh Betar and holds a Bachelor's Degree in Electrical and Electronic Engineering and an MBA in Human Resources Management. ■



## Norzihan M Salleh appointed RTM Deputy-General of Broadcast Operation

**Mrs Norzihan M Salleh** has been appointed Deputy Director-General of Broadcast Operation leading the Engineering Division of Radio Television Malaysia (RTM). She was formerly Director of TV Engineering before she took up this new position on 20 May 2021.

With 35 years of experience in broadcast engineering as Regional Radio Engineer, Project Manager, Head of News Engineering Facilities and Director of TV Production and Transmission Operation, she is now holding a principal post in leading the Engineering Division to the New Era of digital broadcasting.

We congratulate Mrs Norzihan M Salleh on her appointment and look forward to working with her. ■



## Jean Philip De Tender appointed EBU Deputy Director General

**Jean Philip De Tender**, EBU Director of Media, has assumed the additional role of Deputy Director General, effective from 1 July 2021. He continues to oversee the EBU's Media Department alongside his new responsibilities. As Deputy Director General, Mr De Tender will support Noel Curran, EBU Director General, in key management aspects of the organisation, with a focus on strategy development, strategic implementation and an increased focus on knowledge exchange. In addition, Mr De Tender will deputise in the absence of the Director General by being his

representative with internal and external stakeholders and at events as needed.

Mr Curran said: "I am pleased that the EBU Executive Board has fully endorsed my proposal for Jean Philip De Tender to take on this new role as Deputy Director General, in addition to his role as Media Director. "He will support me in driving implementation of our strategy across the organization as well as representing the EBU at those events and opportunities where we can continue to advocate for public service media and defend the interests of our members."

Mr De Tender has been Director of Media for six years, joining the EBU from VRT in Belgium, where he was Director of Television, with a brief to oversee the long-term strategy and vision of VRT's television portfolio. He will continue to head up EBU Media, a department that encompasses a significant service portfolio across News, Music, Radio, TV, Young Audiences, and Digital. His new title will be Deputy Director General, Director of Media.

De Tender said: "As both a broadcaster and member of EBU senior management, I have been an advocate for public service media throughout my career. I am delighted that, in my new role as Deputy Director General, I will be able to support both the Director General and our members in intensifying this at a time when the need to promote the values of public broadcasting is more important than ever." ■

## MEDIAGENIX appoints new independent board member



MEDIAGENIX has announced the appointment of **Aksel van der Wal** as new non-executive Director.

The company said the appointment of Mr van der Wal, a former senior executive of Turner/WarnerMedia, would support MEDIAGENIX in its strategy of strong global growth in the field of innovative content supply chain management solutions for media companies.

"We are very pleased to welcome Aksel van der Wal to the Board of Directors," said Dirk Debraekeleer, Chairman of the Board. "I strongly believe having Aksel on board will be of great added value for MEDIAGENIX. His background and extensive knowledge of the media business – with a clear vision of its digital future – will be invaluable to MEDIAGENIX as we continue our global growth and expansion. His network and his personality, too, will strengthen the efforts of

this board to lead with passion and give the right support and direction to the company."

Mr van der Wal said: "I am very excited to join the MEDIAGENIX team. It is a first-class team with a market-leading product. It is also an exciting time to join the team, due to the continuously changing media landscape. My focus will be to support the global expansion and innovation ambitions of the company."

Mr van der Wal was COO International DTOI at Turner/WarnerMedia in London before he decided last year to move back to Amsterdam. He earlier held senior executive roles at Turner International, including EVP Digital Ventures & Innovation, CFO International and SVP Finance EMEA. ■



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# IBC2021 to take place on 3-6 December



IBC has confirmed that the annual media technology trade show will take place in Amsterdam on 3-6 December 2021.

IBC2020 was cancelled because of COVID-19. It will take place this year at its usual venue, RAI Amsterdam convention centre.

The announcement followed a decision at an IBC Partnership Board meeting to move the event from its usual September slot.

Organisers said health and safety were highlighted as key factors behind the decision, with the IBC operations team focused on creating a safe environment that participants could trust.

"Following a period of industry consultation, the IBC Partnership Board has agreed that December is the best date in terms of safety and industry readiness to engage," said IBC chief executive Michael Crimp.

"Our conclusion is based on the results of the recent IBC exhibitor and visitor surveys and macro evidence of Europe opening up for business."

"We really value the feedback and candid input of our community — we have always been 'By the industry, For the industry', and this ethos continues to guide our daily decision-making process."

"We did not shift from September lightly. However, as the evidence was gathered and considered, there was a shifting sentiment towards December from both exhibitors and visitors."

"Clearly, IBC will be safest when attendees are vaccinated, and shifting to December allows us to implement the most appropriate safety protocols. In turn, this will enable us to maximise the audience."



The conference and exhibition will both take place on 3-6 December.

The IBC organisers said a survey had shown two thirds of respondents already felt they were ready to travel, and a vast majority expected any corporate travel restriction policies to be updated by the end of the summer.

IBC2021 will feature a hybrid digital platform, combining the show floor with online interaction. Organisers say it will deliver new opportunities for exhibitors, speakers and show attendees to share information and experiences.

For more information, see <https://show.ibc.org/welcome> ■





**IBC2021**

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TOGETHER  
AGAIN**

**3-6 DECEMBER '21  
RAI, AMSTERDAM**

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