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Broadcasters And Content Producers Address 'Sustainability' – See stories on p. 6 and 18

BTS   ◆ **IEEE**

Fourth Quarter 2023

President's Message

Paul Schulins, BTS President

Greetings fellow BTS Members! As we approach the holidays, I want to wish everybody the absolute best for health and prosperity. In a world with so much uncertainty and turmoil, more than ever I appreciate friends, family, and professional relationships that have proven to bring comfort and knowledge, and optimism. It is hard to believe it is December, and as I wrap up my first year as your society president, I am grateful for the opportunity to serve, as well as the chance to work with some of the best broadcast engineers in the business.

It is such an exciting time to be a part of broadcasting. The introduction of the new ATSC 3.0 TV standard is clearing the way for completely new business opportunities for TV broadcasters, and there's also the merging of Internet-based services with both radio and television broadcasting that allows broadcasters to interact with their audiences in ways never imagined just a few years ago. Ratings metrics are more accurate and immediate today, giving advertisers more information to make better decisions, and broadcasters to get a better idea of how to serve their audiences.

Attendance at this year's September IBC show was up 16 percent from that in 2022, demonstrating that these important conferences and face-to-face meetings are still an important part of what we consider critical to moving our industry forward. Aside from being a longtime partner in the IBC, we were pleased to provide an afternoon session on sustainability that featured prominent broadcasters and engineers discussing how the issue of sustaining our planet is front and center with so many large broadcast companies. There were many demonstrations of how broadcasters around the globe are being creative to save energy, and at the same time increase profitability. A special "thank you" goes to Bill Hayes, who continues to represent BTS on the IBC Board of directors, and was an MC at this session.

BTS is continuing to partner with other organizations to further educational opportunities for our members. We are looking forward to the NAB Show in Las Vegas in April 2024, where we will continue to provide an educational program concurrent with the BEIT conference, as well as a new award program for Best Student Paper to be presented at the opening ceremony of the show. This will undoubtedly give IEEE BTS great visibility, and encourage students to submit papers to a conference that has traditionally been led by industry.

In November, we experienced our first in-person Ad-Com meeting in more than three years, and I was excited to be able to shake hands with so many members that I have not seen in a long time. Even though our teleconference AdCom meetings have been surprisingly effective and successful, there is no substitute for the interactions and understandings that are possible when people are able to travel and get together.

"We planned this meeting to be held at the National Association of Broadcasters' headquarters in Washington, D.C., with our second signature conference of the year (the Annual Broadcast Symposium) conveniently taking place during the two days following the AdCom meeting. Our conference chair, Jim Stenberg, lined up a great program with some notable keynote speakers including the IEEE president-elect, Tom Caughlin.

BTS continues to introduce innovative programs and ideas to better serve our members. It is no secret that we need to attract more younger professionals and students to join BTS. One of the new ways we are communicating with younger engineers and students is through podcasts. These short audio

Inside

Cover: **David Ostmo, Sinclair Broadcast Group's regional engineering director (left) and Mike Guerrero, director of engineering at San Antonio, Texas television stations WOAI-TV and KABB (right) inspect new energy-efficient transmitter installed at WOAI-TV.**
Cover photo courtesy of David Ostmo

From The Editor

Sustainability And A 'Hail and Farewell'

By James E. O'Neal, Editor-in-Chief, BTS Life Member

If you attended the BTS's IBC "Unlocking Sustainability: Innovating a Greener Future in Broadcast and Media" session you may have come away with a better understanding of this topic—one that I might add is vital to our industry and others as well. Although the topic of sustainability is not new, now that we're almost a quarter of the way through the 21st century, the concept of working together to create a sustainable environment seems more critical than ever.

I was born into a post-World War II environment, where shortages in many areas—automobiles, housing, tires, appliances, gasoline and even many food items—had been a way of life for the duration of the war. A peacetime economy and production schedule couldn't happen overnight and many such items remained in short supply for several years following the declaration of peace. These wartime shortages and rationings, coupled with coping through a worldwide economic depression before WWII broke out, shaped the thinking and lifestyles of my parents and grandparents, and that of many others who had lived through these traumatic events. As a result, I, along with many of my generation, was brought up with some measure of parentally-instilled thinking (and acting) about conservation of resources and "making do" with what we had. I recall—in that era of returnable soft drink and beer bottles—scrounging with my pals for such bottles along the roadside. I believe that we were paid the royal

sum of two cents for each reusable bottle that we returned to the grocery store, but we were glad to get it. My little town—then with a population of only about 8,000—sported several tire "recapping" shops that allowed motorists to get extra use out of tires that would have been otherwise discarded. We had at least three shops that did nothing but repair shoes to extend their useful life. Such practices even extended to the rebuilding of television picture tubes—CRTs, with one appliance repair shop setting up such a "high-tech" operation in a garage behind the main business operation.

As we moved into the 1960s and beyond, such conservation practices seemed to "go out the window," with more and more disposable and one-time use articles coming on the market, and practices and businesses such as these becoming fewer and fewer.

Although, this "throwaway" mindset still continues, I am encouraged by a lot of what I see around me in terms of conservation and recycling, with the goal of creating a better and more sustainable environment. I am especially gratified when I see a positive movement toward such goals within the broadcasting and content creation sphere.

We have to remember, though, that sustainability is not just about reducing electrical power demands or utilizing second-hand clothing and other items in a television sitcom series. The concept extends into the realms of society and the economy as well. Indeed, sustainability is really something of a balancing act among all three areas. We have a long way to go, but it is heartening to see interest in and actions being taken on behalf of achieving sustainability in our business models. Let it continue unabated!

A Changing Of The Guard

And in speaking of sustainability, this editorial

This is what our society's publication looked like 12 years (and 51 issues) ago.

marks the 51st time I've put together a commentary or a musing for these pages. This is also the last time I will be doing this, as after 12+ years of editorship, I decided that it's time to let someone else take the reins for a while. As I mentioned in an earlier editorial, that person is Bill Hayes, an individual who is very familiar to BTS members and many others, as he has held, and continues to hold, leadership positions within our organization. I want to thank Bill for agreeing to assume editorship of **Broadcast Technology**, as it's a demanding job, and like marriage, is "not something to be entered into unadvisedly or lightly," to echo the words spoken in many wedding ceremonies.

Also, as I've mentioned, I'm not disappearing entirely from the scene, as I pledged to support Bill in his new role in whatever way that I can, and will continue to make editorial contributions to the publication by covering events involving, or of interest to BTS members. (If you attended the BTS Symposium, I'm sure that you saw me furiously taking notes on the proceedings and snapping pictures in preparation for a story on the event that will be published in the next issue of **Broadcast Technology**.)

In reflecting back over the past 12 years of my editorship, I have to say that even though it's been a lot of work, it's also been a learning experience and an opportunity to get to know many BTS members and to learn a lot more about what we so embrace and stand for as a professional society. Yes, it's been frustrating at times when a story or report is late or doesn't appear, but the satisfaction that comes with the completion of an issue of **BT**, and the knowledge that it will exist as a permanent record of our organization's activities and broadcast industry news is more than enough to compensate.

In looking at the first issue of the society's publication for which I was responsible (Summer 2011—the quarter issues then were identified by season rather than an ordinal number), the change in its appearance is quite striking. It was known at that time as "**The Broadcast Technology Society Newsletter**," was printed in black and white with some red overprinting thrown in to liven up headlines and page markers, and consisted primarily of society news. The page count was fairly low—the inclusion of the program for the upcoming fall IEEE Broadcast Symposium and several pages of pictures from the Erlangen, Germany BMSB event helped to swell the size of that particular issue. My initial editorial reflected the encouragement given me by my good friend and former boss, Ted Kuligowski, in taking over the editorship from then-BTS president Bill Meintel. Ted, who unfortunately is no longer with us, had served as "Newsletter" editor until health issues forced him to step down. I also noted the then very recent East Coast earthquake—an event that people still talk about today—and the immediate impact that the tremblor had had on cell phone service, as cell sites were totally overwhelmed by the amount of traffic the quake spawned, and no one's calls were getting through. The over-the-air, one-to-many, broadcasting infrastructure proved it-

self much more resilient, and got the news out without so much as a hiccup. Broadcasters certainly proved their worth in that time of crisis, living up to the doctrine established for them when this industry was establishing itself in the early 1920s—"to serve the interest, convenience and necessity" of the public. This dedication to service has not changed in the past dozen years, nor in the past 100 years.

A lot of things have changed, however, not the least of all this publication. With the blessing of the BTS Adcom (and with the help of you the reader), I've been able to grow it into a full-color magazine format, change the layout and type font to be more readable, add more and more broadcast industry stories, and in the process, greatly increase the size of the publication—we've exceeded 100 pages on several occasions. We also reached out to representatives from various global organizations to make the publication more inclusive and less North American-centric. The name was also officially changed to **Broadcast Technology** to better reflect the scope of news that we try to present in each issue. I'm glad to have been part of these changes.

In looking back at other changes within the past 12+ years, there have been many. Perhaps the greatest have come from the broadcast television arena, with the United States and most of the rest of the world finally converting to digital transmission (the last analog contiguous U.S. low-power TV stations ceased its transmissions on July 13, 2021. (A waiver did allow some legacy Alaskan TV translators to continue operating in analog until early 2022). Ultra-high-definition television premiered, as did high dynamic range and higher and higher frame rates. A 21st century effort to get 3D television off the ground came and went. Work on a new and much-improved DTV transmission system (ATSC 3.0) was also completed and its implementation begun. More of the U.S. TV broadcast spectrum was auctioned off, and stations underwent another large-scale facility changing exercise or "repack." There's also been a growing change in the way consumers get television content, with a downturn in cable subscriptions, and an uptick in video streaming. OTA antennas are also once again beginning to appear on homes and sets. The global Covid pandemic also changed things above and beyond lifestyles, with remote production and "segmentation" of talent and production and engineering personnel rapidly becoming the norm. The pandemic also greatly accelerated the use of the pubic cloud by broadcasters. The FCC made another attempt to "revitalize" AM radio, with the revision of some long-standing regulations and modification of daytime and nighttime community coverage standards. The Commission also eliminated the so-called "ratchet rule" that had discouraged some operators from making transmission facility changes and relaxed its antenna efficiency standards. Rules changes also became easier for a standalone AM operator to add an FM translator. The FCC also gave its blessing to AM stations that wished to "flash cut" to all-digital transmission, with no requirement for maintaining an analog service. Greatly enhanced technology for emergency alerting

has been developed and implemented…I could go on and on, but much of this history from the last decade plus two has been covered within these pages.

In the words of the ancient Greek philosopher, Heraclitus, "There is nothing permanent except change."

A Great Deal Of Thanks And Appreciation Is In Order

I could not have accomplished these 12 or so years of editorship alone. I am eternally grateful to all of those who have taken time out from their normal routines to provide stories, prepare fresh columns for each issue of **BT**; assist me in locating story leads, industry contacts, photos and more. The list of names would fill several pages, and I'm sure that there would be someone that I forgot to include in such a lengthy list, so I won't attempt it. However, I will call out two very special individuals by name. The first is BTS staffer, Jenn Barbato, who is responsible for tracking and getting all of the edited copy for this publication into layout, and in the process, exchanging "gazillions" of emails and phone calls with me during the years of my editorship. The other individual is my very understanding wife of nearly 50 years, Pamela, who has interrupted countless of her activities to help me in one way or other in making each issue of this publication come together. She has also served a voluntary proofreader, scanning and correcting all of the raw copy before it goes to layout, and then reading every page of each finished issue before it's distributed. I am also deeply indebted to Pam for her unrelenting support and assistance in support of all my other activities (including erection of large ham radio antennas and the moving of numerous TV and radio communications-related "boat anchors" that I've acquired during our marriage).

Moving On

I titled this final editorial "A Hail and Farewell," referring to an ages-old military custom and ceremony in which someone leaves the organization and someone else comes in to take their place. This is my "farewell" and also my "hail" to Bill Hayes, who is replacing me. I wish him all of the best, and ask everyone who reads this publication to offer their assistance in whatever way may be needed. I can speak from much experience that help is always appreciated in making each issue of **Broadcast Technology** come together.

In departing, I'd like to repeat something that I said in my first editorial in the summer 2011 issue:

"Interesting times these. I'm glad to have spent my life in broadcasting, and look forward to editing a publication that tracks the latest technical developments in this wonderful field of endeavor."

These are still interesting times, and I'm still very glad (and fortunate) to having had the opportunity for a career in broadcasting, and in being involved with a publication and an organization that is deeply involved in this field of endeavor.

James O'Neal
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President's Message

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podcasts are designed to inform young engineers about career experiences, and to convey the excitement and advantages of pursuing a career in broadcast engineering. Marta Fernandez and Marisabel Rodriguz are leading the charge on getting interviews with interesting, seasoned professionals who can relate to students and younger engineers the advantages of broadcast engineering and how serving the public interest can be such a rewarding career choice! Thanks to both of these individuals for their hard work on this project, and please stay tuned for more information on how to access these programs once they are published.

Once again, our ExCom team has been meeting monthly to discuss our strategic plan for moving BTS forward and growing our membership and benefits. A big "thank you" goes out to the officers and ExCom members for contributing their time during the last 12 months. We have made substantial progress, and with continued teamwork we will extend our value to our members in 2024 and beyond.

I hope you are aware of our member services. Please check back often at our website, *https://bts.ieee.org*, for valuable information, our resource center, links to video reports, and our calendar of events.

Thank you for your time, your membership, and your participation. I want to know how we can improve BTS and serve our members better. Please reach out to me at any time to provide feedback and suggestions.

Happy and safe holidays to you and your families! Stay in touch.

Paul Shulins
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BTS IBC Program Addresses Broadcast Sector Sustainability

Presenters share ideas and perspectives on going and staying 'green'

By James E. O'Neal

AMSTERDAM

The IEEE's Broadcast Technology Society provided an in-depth look at achieving and maintaining sustainability within the broadcasting arena during the 2023 IBC show. The special Sept. 17 program was open to all IBC attendees and began at 2:00 p.m. local time.

After opening remarks and an introduction by the BTS's Bill Hayes, the curtain officially rose on the special "Unlocking Sustainability: Innovating a Greener Future in Broadcast and Media" program, with Barbara H. Lange, principal and chief executive officer of the Kibo121 consulting firm, emceeing the three-hour-long series of presentations and panel discussions. She set the scene for the session in noting that "by emphasizing sustainability, the BTS is helping to amplify awareness, mobilize action, and drive meaningful change to a greener, more sustainable future.

"I'm sure that I don't need to mention to you the environmental impact of climate change that we're seeing nearly every day," said Lange. "From wild fires in Maui to flooding in Libya we are reminded why we need to address these issues with urgency."

She added that the concept of sustainability also includes economic and social concerns, as well as environmental issues.

"Sustainability is about a holistic message that inspires individuals in organizations to adopt more mindful practices with lasting impact."

Broadcaster Sustainability In Brazil

After providing this background on sustainability, the first of the afternoon's presenters, Manuel Belmar from Grupo Globo, a large private mass media organization based in Rio de Janeiro, Brazil, provided a look at what his organization was doing in terms of sustainability. The session was moderated by Lisa Collins from Dovetail Creative.

Belmar recalled that when he first joined Grupo Globo, the topic of sustainability wasn't especially big.

"We didn't use to discuss that openly and publicly, but it was in our content. In 2021, we decided that it was about time that we addressed this issue. The power and reach of Globo operations in Brazil is huge. That's why we came up with a very strong agenda for this purpose."

He described the methodology for launching this agenda, which included attention to a number of tenets, including content, the well-being of our collaborators and their development environmental awareness, attention to governance, and education.

In describing what was done in terms of governance, Belmar stated that his organization established "a very robust

Barbara Lange, principal and chief executive officer of the sustainability-focused consulting firm, Kibo 121, emceed the Sunday IBC BTS session.

compliance internal agenda to make sure that we have a very safe environment for our people."

As to education, he noted that "it's not just about speaking about diversity and inclusion; we've got to act."

He stated that his company had implemented "a very strong approach to make sure that we are prompting diversity and inclusion in hiring,"

"In order to achieve diversity, inclusion is the first step to a much broader strategy," said Belmar.

On the environmental side, Belmar said that the focus of Grupo Globo is centered on the intelligent use of energy, water resources, and waste management.

"Globo has been carbon-neutral since 2018—four years now," said Belmar, adding that the most recent focus is on achieving a "zero emissions" condition.

"Right now, 98 percent of (our) energy is renewable," said Bemar. "We're going to be 100 by 2030; that's for sure."

He stated that "Globo, in its energy consumption, is the equivalent to a city of 300,000," adding that there were only a very small number of municipalities in Brazil with a population of 300,000 or more.

"If all the cities that size in Brazil were committed to (such a policy as Grupo Globo has adopted), that would benefit the entire country."

Belmar noted that Grupo Globo was even committed to sustainability in the area of clothing, as it produces all of its talent wardrobes.

In another area, he stated that in 2021, 75 percent of all of Grupo Globo's waste was headed to landfills. "We have this goal to become 'zero landfill' by 2030. Now we are actually just sending 25 percent (to landfills)."

To learn more about Grupo Globo's policy and practices related to sustainability, Belmar invited those interested to visit the company's "Globo Investor Relations" website, *https://globoir.globo.com*.

He concluded by stating that Grupo Globo was committed to ensuring that the practices that had been implemented would endure into the future.

A European Content Producer/Distributor's Perspective On Conservation

Larissa Görner, the chief technology officer at Belgum's Proximus Media House, which is an affiliate of the Proximus Media Group, and provides production and broadcasting services, as well as content editing and media asset management, provided the next view in sustainability.

Görner began with an overview of her organization, noting that a team had been established to explore the implementation of more sustainable operating practices

She was asked by moderator Barbara Lange to describe a large-scale live event coverage that was planned a few weeks after the IBC show, and was being showcased as a sustainable initiative.

"We took one of the productions we are doing—a 12-hour music show, with 12 different moderators stretched across the country," said Görner. "And we asked how can we leverage this to reduce transport?"

She stated that as a starter, everyone involved in the production of this live event would be traveling by public transportation, rather than individual automobiles. Proximus also decided to shift away from the use of conventional large mobile production trucks.

"How can you (do this coverage) and not have an OB van in the center of Antwerp, for example?" she asked rhetorically. "There won't be an OB van. There will be just a small kit that will arrive in (a single) electric-powered car."

"We then talked with our creative people; we asked them 'what else can we do?'"

Görner said that one of the suggestions that is now being followed to purchase used costume and decoration items, rather than having them made new.

"Everything is secondhand now," she said.

Görner admitted that perhaps the largest "green" measure was in having personnel ditch individual cars in favor of public conveyances.

"Instead of 50 people traveling individually just for one event, they are now coming by public transport," she said, noting that the rest of the production crew would be operating

Gripo Globo's Manuel Belmar discussed what his large Brazilian media organization is doing in terms of sustainability with Lisa Collins from the Dovetail Creative agency.

from a centralized location rather than from an outside broadcast truck.

In speaking about this planned sustainability initiative, Görner said that it would likely become a model for future Proximus live event coverage.

"This is something that we will really start to measure, and probably take it into our approach for any of the productions we do," she said, citing the coverage of regularly scheduled sporting events that occurs most weekends.

Larissa Görner (left), who represented Belgum's Proximus Media House, talked with Barbara Lange about measures being taken by Proximus to ensure a greener and more sustainable future.

When asked by Lange about the reaction of Proximus production personnel concerning the implementation of energy-conserving practices, Görner responded that it had been quite positive.

"When we started, I was a little afraid this might be too much," she said. "We talked to the production guys who had been there (for a long time) and told them (that now) it's going to be all sustainable. It's going to be more complicated. It's not going to be the same—you've got to think about it."

Görner said that during the planning phase for the special event, the conversations "got a bit crazy," with people involved asking how they could accomplish what they were doing in new (and more energy-efficient) ways."

One outcome from these discussions was a large reduction in personnel and equipment involved when televising commentary at a remote live event.

"Before, you needed three technicians to fly somewhere to set up a commentary camera," she said. "Now the stuff is in a suitcase and the commentator is the only person involved. So instead of having four persons flying, you now only have only one person flying."

She noted that her organization's reinventing itself in terms of sustainability was tightly focused on reducing remote broadcasting gear form factor and moving away from the practice of transporting personnel and equipment in individual cars and large OB vans.

"We asked how can we reduce the impact of creating news (broadcasts) or sports (coverage) with a smaller crew and a smaller amount of travel? That was our goal."

Görner observed that one of the greatest challenges in this "downsizing" operation was in breaking away from old established "norms" and moving—sometimes uncomfortably—to new methodologies and platforms.

She noted that this was especially true when a fast-breaking event needed to be covered.

"On certain days we have to produce (coverage) in a hurry, and nobody will care if you order this or order that," she said.

"(People) will just jump in a car and do it."

Görner stated that for any organization that is following the lead of her company, a really big challenge is ensuring that employees adhere to a plan or policy once it is developed.

"When you are in the pressure of a daily business and you need someone (at a remote location in a hurry), are you going to ask about a (corporate) policy? How do you get them to all understand what it means for their departments and areas? You can't just say 'read this or read that' in every circumstance," she said, noting that putting policies into daily practice is something that has to be developed over time.

In concluding the discussion, Lange asked Görner what her organization was doing in terms of attracting a new generation of employees in light of all of the other career opportunities now available.

"It's harder for the older generation to adapt to this change," said Görner. "The younger generation is more adept at changing and they can inspire others." She cautioned, though, that we as broadcasters need to make the industry attractive to younger people.

"We need young people to stay in the broadcast sector and not go somewhere else to work. We need to make it attractive to them."

How Digital TV Standards Organizations Fit Into The Equation

Following Görner's report on sustainability in connection with content generation and asset management, the forum shifted to a look at sustainability in connection with both over-the-air and hybrid broadband/OTA content distribution. The next presentation was a discussion on sustainability in broadcasting by the DVB's Elfed Howells and the ATSC's Madeleine Noland. The discussion was initiated by BTS member and former executive director of the DVB project office, Peter Siebert.

Siebert initiated the discussion by noting that although the Earth is very important to all of us, but mankind is not really taking care of its nurturing ecosphere.

"This planet gives us air, water, food, a cozy environment, but we are not good to this planet," said Siebert. "We are overusing the resources. We are not taking care of our environment. We have to become better, and this brings us to the topic of sustainability, and sustainability is something that has to involve all industries. This also includes broadcasting."

Siebert observed that standards form the basis for all of the technology used in broadcasting, and therefore, standards

organizations play a critical role in sustainability as concerns broadcasting.

The DVB's Howells was invited to speak first, and he began by noting that "we listen to our members…and they are concerned about sustainability. But interestingly, for the last 10 or 20 years, it's always been for bigger, better, bolder, brighter (images), moving from standard definition to high-definition, 4K, 8K, high dynamic range, more content, more channels, faster switching. This is what was driving the broadcasters."

Peter Siebert

"That's still the case, but now (we have to ask) can we do all that and keep an eye on sustainability? Nobody is saying 'let's go back to SD because maybe it's a bit more sustainable." No, that's not what we're talking about. We don't want to go backwards, but we want to make sure that sustainability runs through everything we do. (This is) not coming from DVB; it's coming from our membership."

Howells said that in connection with this, a group to investigate energy awareness was launched about a year ago, and this was focused on the area of transmitting content to the end users.

"We came up with four main conclusions or recommendations," said Howells. "(These) are: (1) measurements. It's key that there are good measurements, and this is something that needs more work. The second one is exposure. If you're delivering a scene from 'A' to 'B,' there needs to be some way to tell if…this is a green production. How do we have data within the (content delivery) stream that gives some kind of indication to the user that this is green or not? How do you carry this sort of measurement?"

Howells said that the third such conclusion reached by the group was centered around the quality of the content delivered to the user.

He observed: "There might be an alternative criterion that says: I'm not really watching; I'm doing my email, so just put on the sustainable version, or 'I have the whole family watching, so put on the best quality'."

He said the fourth conclusion involved new technologies, "is new technology needed to make sure we can deliver these things?"

In summary, Howells noted that in connection with these conclusions, the DVB might possibly consider establishing some guidelines or setting up a group to move them forward.

He added that this could involve the transmission of different versions of content, depending on audience size, with unicast being the choice for small groups and the broadcast mode selected for large groups.

He said that his organization was also looking into object-based media, with only the "objects" needed being delivered.

"If you don't need to deliver audio in German, you only deliver English."

Howells concluded, by stating "It's not about TVs; it's not about the broadcast center; it's about the whole thing."

Siebert then invited the ATSC's Noland to discuss what her organization was doing in the area of sustainability. She began by stating that there was a global commonality which revolves around using existing broadcasting over-the-air television transmission, regardless of the television standard.

"Terrestrial broadcast television broadcast towers reach roughly 82 percent of the world's population and we should be thinking about these towers for any one-to-many data delivery," she said. "It doesn't matter if you're trying to update every Xbox in a country. It doesn't matter if you're trying to deliver the international premier league of cricket. It doesn't matter if you're trying to deliver map updates to a fleet of rental cars. Broadcast is the most sustainable way to get big piles of data to unlimited numbers of devices. It's that simple."

Noland observed that it made a lot more sense to broadcast content to mass audiences than to stream it.

"If three people are watching, maybe you don't want to put it on the big tower, but if three million people are watching, you definitely want to put it on the big tower," she said, adding that streaming certainly had its place in delivering content to limited audiences, but that high-power/high-tower broadcasting platforms excelled in mass delivery of media and data alike.

"If the world thinks that their high-power/high-tower television infrastructure is for 'I Love Lucy' reruns, (it's not); it's for everything—media and data," observed Noland.

Noland noted that in connection with this, the ATSC had recently established a sustainability team, and that it would be studying the benefits of broadcast data delivery (media and data), as it relates to sustainability and energy usage.

She remarked that there was an "80/20 rule," which refers to "20 percent of content that 80 percent of people are going to watch."

"If you can get that in a one-to-many delivery method, you're going to save a lot of energy."

Noland observed that over-the-air television is available to much of the world's population, and that "…in the United States, antenna usage is going up right now, coming in around 20 percent or higher. That's also very positive."

Madeleine Noland

She asked rhetorically, "how is this going to translate into standards? Are there recommended practices that say if you configure your broadcast chain this way, it's going to be the most sustainable way to do it. So, we really want to translate that into standards and recommended practices as much as possible."

Noland said that in connection with this, education was needed about the concepts involved, along with identification of the opportunities that might be available with the ATSC and other organizations. She added that promotion of such an initiative was also key to its success, and that adding a symbol such

as a "green leaf" as previously suggested to program guides for viewers consuming content on cellphones indicating viewing options would be useful.

"If you're there with your smartphone and here is the version with the 'green leaf' next to it, and here's the other version, and the 'green leaf' happens to be coming over a multicast rather than over a unicast, you don't need to know or care if that might be the case, but 'hey, there is a greener version; cool!'"

In concluding her remarks, Noland stated that moving sustainability forward was "definitely a group effort" involving the ATSC and all such standards organizations.

Where The Energy Is Going And What's Being Done to Reduce Consumption

The program then shifted to a somewhat different perspective, that of the electrical power being taken out of the grid to fuel content production and its dissemination to mass audiences.

In this "Navigating The Power Puzzle" session, issues in this area of concern were addressed by panel members Vincent Grivet, an independent consultant who advises broadcasters and technology players in Europe and the United States; Will Pickett, a senior partner at Carnstone Partners Ltd., an organization that specializes in sustainability; Dan Schien, a computer scientist involved in the field of sustainability in the areas of information and communications technology; Dom Robinson, the founding director of "Greening Of Streaming," a media streaming research organization; Erik Reinhard, a scientist at France's InterDigital Cesson-Sévigné and also involved with the ITU-R's work on energy awareness in broadcasting; Tom Moran, the senior lead technology strategist and sustainability strategy lead at Lumen Technologies, a U.S. telecommunications company; and Kristan Bullett, the chief executive officer and founder of Humans Not Robots, a U.K. developer of AI-powered supply chain platforms designed to reduce the environmental impact of media organizations. The panel's moderator was Andy Quested, an international consultant in the area of production and accessible media standards.

The dialog got underway, with Quested posing the question "what are you trying to measure (in terms of energy utilization) and how?"

Vincent Grivet was first to respond, stating "If you watch one hour of TV using a terrestrial network in Europe, you are using an average of 14 Watthours of electricity, if you watch one hour of OTT, it's 109 Watthours, and if you're watching IPTV, you are using 153 Watthours. So, there is a big difference." He noted that some of these numbers "are elastic and some are inelastic."

Grivet added that these figures were only for the transport of content, not its production. They also did not figure in energy consumption of the consumer's TV set either.

"This transport is significant," he said, noting that if you add in all of the 450 million Europeans watching television, the combined carbon production amounted 5 million tons of CO_2, or 50,000 gigawatts of electricity.

"This is probably the output of three nuclear reactors working fulltime to deliver signals to TV sets," observed Grivet. "There two takeaways: (1) any time it's possible, you

A highlight of the session was a panel discussion on sustainability issues featuring a number of experts in the field. (Left-to-right) Vincent Grivet, an independent consultant; Will Pickett, from Carnstone Partners Ltd., an organization specializing in sustainability; Dan Schien, a computer scientist working on sustainability issues; Dom Robinson, from the 'Greening Of Streaming' media streaming research organization; Erik Reinhard, with InterDigital Cesson-Sévigné and also ITU-R; Tom Moran, from Lumen Technologies; and Kristan Bullett, with Humans Not Robots, a firm that specializes in reducing the environmental impact of media organizations. Andy Quested (right) moderated the discussion.

should broadcast, not stream. (2) Is it really necessary to stream everything? Probably not."

He opined that any content that is watched by millions of people should be broadcast, and not streamed.

In discussing carbon footprints, Moran added that "I'm not a fan of carbon, because carbon is a waste product of the energy system. The waste product of IT systems is data."

He observed that "most of this is out of date or never gets touched. The other waste products are heat and electronic waste."

Moran added that "the demand signaling function, which needs to be a part of broadcasting or any critical infrastructure system, (has been piggybacked) with virtue signaling in the world of carbon, meaning Google will try to get you to think the most important sustainability issue for their business is the carbon footprint of their data centers, but really the most important issue of their business (is that) 75 or 80 percent of their revenue comes from an advertising business that's driving consumer need. That's how someone avoids context and avoids authenticity.

"It's really important for us to recognize that energy proportionality—the rate at which energy is consumed to the rate at which useful work is done needs to be the primary measure for everything we do in our industry and the secondary measure of carbon, which is very important to the energy system. This is something we can influence through demand signaling and doing it right.

"We should not be using anything related to carbon for the virtue signaling, because that's what's distorting people's perception of what is important."

Panelist Pickett observed that "(some) countries don't talk about carbon for exactly that reason." He noted that "something felt uncomfortable about the correlation with carbon to me. I just don't build CDNs that way. There's nothing elastic in there. The caches are full; they stay full because they just dial in the old content (and) don't fill up with new content."

"Let's take the World Cup; let's take this big sporting event. Can we correlate an energy bump that correlates with this massive spike, and we can't. I get why these reports are complicated. I've built dozens of CDNs and I didn't know how to get energy data out of them (or) how academia, (and) how observers have gotten information about energy. Please come and tell me. We've been trying really hard."

He observed that "an engineer can't program on guesswork. We need to get some data, because we can't make decisions about everything else from guesswork."

Pickett also opined that there is something of a grey area when it comes to quantifying the amount of energy used in connection with television display devices, as some of these are "on" all the time and not subject to peaks such as that experienced in a mass audience event such as the World Cup.

In offering his comments on the "carbon" situation, panelist Reinhard reflected "We started to look at the carbon offset to see if it could be the basis of a sustainability program. We quickly decided that it cannot.

"If you don't use the energy to begin with, you're better off than having to offset. The problem is that you offset in the wrong places. We prepared (a document) and it basically says that carbon offset could be used for the remainder (of instances) that you can't solve anyway else, but be careful about it."

Asked for his thoughts on using carbon as a metric, panelist Bullett responded: "We're trying get some traceability making sure that at least the larger companies are very clear what carbon offset project they're investing (in). This is what I care about. (We want to) push the agenda by getting a good strong commitment from the Googles and Amazons."

In the discussion, it was pointed out that a carbon offset is not just as simple as saying "look, we made 100 tons of carbon and we're offset 100 tons, so we're even."

It was also noted that additional work needs to be done to fully understand the dynamics of energy consumption in distribution of content.

The discussion examined a number of areas, including data distribution, as distribution networks are always connected and switched on, but consumer devices are frequently switched off when not in use, so this too is an area in which more study is necessary. There was a general agreement that more work should be done in connection with lowering the power consumption of equipment when it's not in use, possibly by some sort of "expanded automatic standby" mode of operation.

In commenting on this, moderator Quested opined that "perhaps we need to make smart devices smarter."

He stated that this would initially make a small difference in energy consumption, but when even a tiny reduction is multiplied over a very large number of households, there would be a noticeable difference.

"So, would this mean one power station less over a year, would it mean one coal train less?" asked Quested.

The enormous power consumption from data centers was also a topic of discussion, with it being noted that a typical data center requires the combined output of two 150-megawatt power stations, and this was becoming a real problem, as constructing large power-generating stations is not a trivial matter in this day and age of "not in my backyard." As summed up by one panelist, "it's an exponential challenge."

In connection with this, it was noted that there is currently something of a moratorium on constructing data centers, as there is insufficient electrical grid capacity for supplying such demands. Commenting on this, panelist Moran noted:

"We have all these companies projecting 20 percent in AI and data centers and 20 percent EV growth in our cities, and sustainability is about infrastructure.

> 'This is probably the output of three nuclear reactors working fulltime to deliver signals to TV sets.'

"People talk about net zero in 2050 or targets for 2030. The energy problem is right here right now, and we need to have a much greater sense of urgency on fixing that than targets five or 20 years out."

Moran noted that there is an "obfuscation and perverse incentive" of focusing on carbon. "You can basically be 'carbon neutral' and buy certificates, but no power is being added to the grid."

Quested then directed the conversation to the IBC show itself, asking if panelists were aware of show exhibitors proposing new ways for lowering power consumption by "thinking outside the box" in terms of content production and transmission methodologies.

Panelist Reinhard stated that "when you look at where energy is spent in the transmission chain and you arrive at the conclusion that a large proportion of the energy used by television stations is used in producing light, and producing light is expensive."

He observed that if it were possible to analyze the image before transmission, it could be possible to make a new image that required less energy for transmission.

Reinhard explained that broadcasters could perform an analysis of the image to be transmitted, make the necessary reductions and send instructions to consumers' television sets to use to restore the normal characteristics of the image.

"It seems that we can (gain) about 10 percent or so of the energy on top of what the display is doing by itself," he said. "But we need some standardization for this."

The television receiver itself was also identified as an indirect part of the energy problem, as more and more broadcasters are informing viewers about content that is available for streaming to the detriment of content that is available viable via broadcast.

"The TV is more and more a machine that is geared or organized to use the least efficient content sources," observed Bullett.

"We need to change the paradigms we use to think about these systems," said Moran. "The incremental gains that everyone is talking about are actually super important because over time they build up."

He likened the current infrastructure to that of a highway system in a large metropolitan area, which is built with sufficient traffic lanes to accommodate rush hour peaks, but is comparatively empty during other times of the day, and such excess capacity may encourage consumers to go out and buy cars and create additional traffic.

"The network, when it's transmitting 20 percent of its maximum, consumes almost as much energy as when it's transmitting 100 percent,"

said Moran. "We need to level things in terms of what we do through time-shifting and geo-shifting to spread the load across the system as best we can. That requires perceptual changes on the part of consumers about how they consume."

He stated that such changes would not necessarily be "green," as consumers may not care about this, but rather changes that make it convenient for them to spread the load across the system.

"Consumers have a role (in this), but we as an industry are the ones who really need to figure this out."

In concluding the discussion, panelists were invited to offer suggestions leading to better sustainability. These included a methodology for dealing with data center servers storing content that is very rarely or never accessed, and providing education for end users about these issues, as "they're the ones who drive change." Other suggestions called for moving away from the misleading term "carbon neutral," and replacing it with "carbon balanced," as well as accepting the fact that there is no "magic pill" for solving the energy problem, but there are many "little things" that can be done in this regard. There was also a call for "silos" that impede the change of information among players need to be broken down.

What Is Happening On The Consumer Side Of Things?

In wrapping up the event, conversation shifted away from the content production and distribution side of the equation to that of energy efficiency in the devices used by consumers for consuming this content, with a presentation ("Energy Efficiency And Consumer Tech: Lessons From 15 Years In The Field") from the vice president of emerging technology policy at the U.S. Consumer Technology Association (CTA). Session emcee, Barbara Lange, got things underway, by asking Johnson about what his organization had been doing in terms of helping to move the consumer product industry into a greener existence.

He began by recalling how he and the CTA embarked on its present-day focus on conservation on the consumer product side of things.

"Milestones that stand out to me (are) certainly the energy efficiency space where I worked for 15-plus years," said Johnson, observing that in the late 2000s, his office was looking at energy policy proposals, but realized that the data being used in these assessments was out of date, having been compiled in the last decade or so of the 20th century.

The three-hour sustainability forum wrapped up with a presentation bt the CTA's Doug Johnson on what was being done to help curb energy usage and encourage conversation by his organization. Session emcee Barbara Lange introduced Johnson and initiated a dialogue about the CTA's efforts in these areas.

"(It) just wasn't right to make judgements about where we were in 2008 or 2009," said Johnson. "So, we had a challenge, and also a responsibility, to provide that data (and) we did it a few years later."

He termed the compilation of such data "an important milestone."

Recycling Consumer Devices Is Important

In examining other consumer-side areas where changes have been necessary in terms of sustainability, he noted that a big one was the recycling of consumer electronic devices, rather than just reconciling them to landfills.

"We found that at least for some device categories that in two-thirds of the cases, (consumers) are not just getting rid of their devices—putting them into a waste stream—but giving them to a friend or relative, which is a great example of reduced (waste)."

In dealing with what he termed "e-waste," Johnson said that such refuse could be reduced with such reuse as well as physical recycling.

"But you have to have systems set up so that consumers know where to go and what to do," said Johnson. "The way we've gone about recycling, at least at the local level, has varied across the country."

He noted that education was necessary on best practices in the area of recycling.

"We've created recycler locaters (as an aid to consumers)," said Johnson. He also noted that the CTA was constantly involved in researching the consumer side of the energy and sustainability equation.

He also discussed the CTA's establishment or revision of standards for power consumption in consumer devices, including television sets, DVD products, and set-top boxes and in small network equipment such as Wi-Fi routers.

"Standards are a very important contribution that industry can make," said Johnson, noting that in setting such standards, a variety of stakeholders needed to be included such as government agencies, engineering groups, and private sector representatives.

In speaking about television receivers, Johnson said that the evolution of products was really "wonderful" in terms of energy consumption and environmental impact.

"Going from CRTs to flat panels was an important evolution that supported more sustainable operations," he said, noting that such a change had even impacted transportation of new products to dealers.

"Trucks can now carry more TVs because they're flat."

Johson also cited the development of other devices such as compact fluorescent lights and LED lighting devices, noting that their development, just as that in developing flatscreen TVs, was driven by innovation.

"You should have innovation driving energy efficiency," he stated. "We're out there advancing environmental sustainability, but along the way, it's very important to protect innovation, to protect consumer choice, and protect competition. Without those, we're not much of an industry."

Johnson noted that "helping consumers make informed choices" was another part of the CTA's mission.

"In the United States there are energy disclosures required which tell you the operating cost of that television."

He observed too that his organization had helped to develop a U.S. standard concerning TV power consumption measurements, with such connected products required to operate in low power "standby" mode. He said that in connection with this, different methodologies for measuring power consumption were necessary.

"It's all about driving efficiency," he observed, adding that "it's helps to have current numbers and it's definitely beneficial to share these with consumers."

In another area of waste reduction, Johnson mentioned a trend in some countries to migrate away from physical paper labels and tags, and to replace these with electronically generated information.

"China is a leader in this with their energy labels moving to a QR code several years ago," he said, noting that some devices now provided such information to be displayed on their viewing screen, rather than on a printed label.

He also advocated the upgrading of consumer devices, rather that simply replacing them with newer models with more features.

"We need to make sure (products) are somewhat upgradeable," he said." Software updates are easier than hardware, of course. It's a challenge and an opportunity."

He stated that sustainability regarding consumer devices was not just confined to North America, but rather was a global matter, noting that communication with various European commissions and other stakeholders in Europe about what the CTA was doing was very important.

In concluding his presentation, Johnson stated that he relished the opportunity he'd been given for sharing his ideas and viewpoints on stainability, and that those in the audience should move out in their own way to develop such plans and practices.

"I hope that what I've shared can be helpful," he said. "We're all in this for the cause, my industry and broadcasting and media likewise. We can learn from one another. We already have in some cases."

Concluding Remarks

In offering his thanks to all participants and others for making the sustainability event possible, the BTS's Peter Siebert observed that the forum had served an important purpose and provided several takeaways.

"The session showed us very clearly that sustainability in broadcast is an important topic, that it is a difficult and controversial topic, and it's also a sensitive problem," said Siebert. "We've looked into production and delivery, and we've looked into the consumption at home. These are all aspects that need to be considered, and I'm very happy that we had this session today where all of these came together.

"I'm proud that we could do this."

ATSC Insider

By Madeleine Noland and Jerry Whitaker,
Advanced Television Systems Committee

Domestic And International Activities Ramp Up

International Activities

Since the last column, the ATSC has been around the world and back. President Madeleine Noland went to Busan, South Korea for the Global Digital Terrestrial Transmission (DTT) Workshop there in July. The event brought together leading Korean and international organizations focused on DTT, and unpacked the status and future of global DTT, regulatory and policy frameworks, innovative use cases, sustainability, and much more. She was joined by a number of ATSC members from Korea and around the world. We would like to especially congratulate Korea's Electronics and Telecommunications Research Institute (ETRI) for spearheading the event, as well as the Korea Maritime and Ocean University (KMOU), Cleverlogic, AGOS, LowaSIS, Sinclair/ONEMedia, Saankhya Labs, and the IEEE BTS Daejeon Chapter for their support of the workshop. President Noland had the opportunity to speak about the genesis of ATSC 3.0, the status of implementations around the world, and the ongoing work to improve and build upon the standard, such as current work on the Broadcast Core Network, VVC codec, inter-tower communication network, and other projects.

During the first week of August, President Noland went to São Paulo, Brazil, for SET Expo, the largest media and entertainment technology and business event in Latin America. ATSC Member Mirakulo exhibited at SET, showcasing demos of TV 3.0 apps for Brazil, including integration with NextGen Audio features and the SmartTV app-based user interface that are planned for TV 3.0. The Fórum Sistema Brasileiro TV Digital Terrestre (SBTVD Forum) has recommended to the Brazilian government the selection of several technologies proposed by ATSC for Brazil's next-generation terrestrial digital television standard. Testing and evaluation will continue in 2023–24 on the over-the-air physical layer and portions of the application layer (i.e., interactive) elements of the TV 3.0 system. ATSC recently learned that our proposal for the ATSC 3.0 physical layer was one of two technologies selected to move onto field trials. This is exciting news for ATSC and our members who have been working diligently in Brazil. The testing is expected to last through the second quarter of 2024.

In mid-August, Noland and ATSC ccommunications director, Amy Lodes, traveled to the island nation of Antigua for the 54th Annual General Assembly of the Caribbean

2023 ATSC international activities included the July Busan, South Korea Global Digital Television Transmission Workshop. The three-day event attracted some 80 participants.

Broadcasting Union (CBU). The CBU is an association of public service and commercial broadcasters in the Caribbean, reaching more than 4.8 million people. ATSC was a proud sponsor of the event. The CBU Annual General Assembly included members from Barbados, Jamaica, Belize, Trinidad & Tobago, Turks & Caicos, Antigua & Barbuda, Guyana, and the United States. Noland spoke on the topic of "NextGen TV and Opportunities in Developing Countries," while Lodes staffed the ATSC booth.

In September, President Noland traveled to Amsterdam for the IBC show there. Many delegates from ATSC's ranks, including ATSC board chair Richard Friedel and several board members, also attended. More than 40 ATSC members exhibited at the show. Noland joined a panel at the IEEE BTS Sustainability Session to talk about ATSC's newest Planning Team, PT9-Sustainability. The IBC offered a valuable forum for colleagues to share ideas and exchange solutions to common challenges.

ATSC continues to have opportunities to share our work on the global stage. Thanks to our member organizations and their tireless efforts, the ATSC 3.0 standard is state-of-the-art and is getting recognized (and deployed) around the world.

ATSC Participates In The FCC's 'Future Of TV Initiative'

As previously announced, the U.S. Federal Communications Commission (FCC) has launched the "Future of TV Initiative" in partnership with the National Association of Broadcasters. The FCC and NAB kicked off the public-private initiative in June 2023 to set the roadmap for completing the transition to ATSC 3.0, with the consumer experience taking center stage. Discussions are slated to extend into the summer of 2024. The topic has been divided into three discussion groups, one focusing on backward compatibility and consumer experience, another on the path to an ATSC 1.0 sunset, and a third on the post-transition regulatory environment. ATSC welcomes this active discourse and is honored to serve on the consumer experience group.

Planning Team And Implementation Team Updates

Walt Husak of Dolby Laboratories has been named as the new Chair of PT4, the Planning Team on Future Broadcast Ecosystem Technologies. Following in the legacy of "Chair Emeritus," Glenn Reitmeier, under Walt's leadership the group will continue to investigate and discuss important new technologies and to be a valuable place for collaboration among stakeholders in the ATSC community.

PT9, the Planning Team on Sustainability in Media and Data Delivery Services, has begun regular meetings. Established during the summer, PT9 is led by Robin Hérin of ATEME and Bill Redmann of InterDigital. PT9 will study the benefits of broadcast data delivery as relates to sustainable energy usage in a world increasingly dependent on data delivery. The team will be considering delivery of both linear and file-based media and data. Recent meetings have focused on sustainability efforts already underway in related industries. PT9 will report the results of this work to the Board. If technical work in the ATSC is recommended, PT9 will further document the rationale for the work and ideally also document possible architectural approaches and requirements.

A new Implementation Team has been formed to provide a central point for communication to and from Caribbean nations and ATSC regarding ATSC 3.0 adoption and implementation. The Caribbean Implementation Team, IT7, is led by Mark Corl of Triveni Digital. Now through the end of the year, the ATSC is offering its members with an interest in the Caribbean the chance to join IT7 at no cost. The ATSC is also inviting more than 15 Caribbean nations the opportunity to join IT7 through March 31, 2024, without having an ATSC membership. With our attendance in August at the 54th Annual General Assembly of the Caribbean Broadcasters Union (CBU), we know that interest is high but there are barriers to entry for a number of island nations. It is our hope that participation in IT7 will provide value and a path for many of those who are interested in ATSC 3.0.

At its October meeting, the ATSC Board of Directors approved formation of an

Attendance at the August 54th Annual General Assembly of the Caribbean Broadcasting Union in Antigua was also part of the ATSC's 2023 global activities.

Automotive Applications Implementation Team, IT8, at the recommendation of Planning Team 5 – Automotive Applications. Planning Teams are typically formed to study a particular topic and create reports or recommendations. Implementation Teams offer a forum for team members to get "hands-on" with the technology. PT5 concluded that the automotive vertical presented a good opportunity for broadcasters using ATSC 3.0, and that next steps would best be done under an I-Team structure. This team assesses opportunities and challenges related to delivery of ATSC 3.0 services (including video, audio and other data) to vehicles. They will consider technical and market requirements for both B2B and B2C applications including but not limited to robust broadcast updates for telematics and navigation, sensors for autonomous vehicles, and in-car infotainment systems, along with infotainment content.

Third-Quarter ATSC 3.0 Deployments

There have been four new U.S. deployments in the third quarter of 2023, including the nation's largest TV market, New York City.

NextGen TV broadcasts were launched in New York City on Oct. 16, making ATSC 3.0 signals available in the nation's top market for the first time. As part of the launch, public television station WLIW of the WNET Group converted to the ATSC 3.0 standard and is hosting NextGen TV broadcasts for six local channels. The launch means that viewers in New York are now able to receive NextGen TV broadcasts from WCBS-TV, WLIW, WMBQ-CD, WNBC, WNET, and WNJU.

NextGen TV broadcasts were launched in Minneapolis, Minnesota on Aug.14. Minneapolis is the 15th largest market in the United States, and is home to the headquarters of both the Best Buy and Target retail store chains. A large-scale event was held Aug. 22 to commemorate the day, hosted by the Minnesota Broadcasters Association, the University of Minnesota's Hubbard School of Journalism and Mass Communication, and Pearl TV. Retailers, broadcast executives, government officials, and university students were present as the stations switched on the new transmission standard. The launch means that viewers in Minneapolis are now able to receive NextGen TV broadcasts from WUCW, KSTP-TV, WCCO-TV, KMSP-TV, and KARE.

NextGen TV broadcasts were launched in Philadelphia on August 10, the fourth largest market in the U.S., and home to Comcast headquarters. The launch means that viewers in Philadelphia are now able to receive NextGen TV broadcasts from KYW-TV, WPSG, WPVI-TV, WCAU, WTX-TVF, and WUVP-DT.

NextGen TV broadcasts were launched in Reno, NV, on July 25. KNSN is serving as the ATSC 3.0 host for five participating stations in the market. The launch means that viewers in Reno are now able to receive NextGen TV broadcast from KOLO-TV, KTVN, KRXI-TV, KRNV, and KNSN-TV.

Help Shape The Industry With An ATSC Membership

ATSC membership offers the opportunity to shape the industry through standards development, educational opportunities,

The ATSC participated in activities in several U.S. cities in connection with the launch of ATSC 3.0 broadcasting. One of the new NextGen TV markets are the 'Twin Cities' of Minneapolis and St. Paul, Minnesota, and a special commemoration event to celebrate the launch was held at the University of Minnesota's Hubbard School of Journalism and Mass Communication.

Taking part in the Aug. 14 inauguration of ATSC 3.0 service in St. Paul and Minneapolis, Minnesota were (left-to-right): Charlyn Stanberry, NAB Government Relations vice president; Wendy Paulson, Minnesota Broadcasters Association president; Amy Klobuchar, Minnesota U.S. Senator; Elisia Cohen, director of the Hubbard School of Journalism and Mass Communication; and Anne Schelle, Pearl TV's managing director.

and networking with peers, business partners, and leaders across the globe. Membership includes access to members-only activities, including Technology and Planning Team meetings, and documents and projects in development. These include:

- Involvement in developing and approving Standards and Recommended Practices for the digital terrestrial transmission industry
- Involvement in Planning Teams exploring new technologies and verticals that are emerging in the broadcast industry
- Developing and sharing information on the implementation of ATSC Standards and Recommended Practices

- Coordination/harmonization with standards-setting bodies around the world
- Access to the flow of information through the ATSC members-only workspace
- Monitoring activity around the world that can impact the global digital terrestrial
- Developing strong relationships with fellow members across the broadcast ecosystem

Members are the driving force behind not only the ATSC, but also the thriving television and tech community. It is their innovation, energy, and pursuit of success for the broadcast ecosystem that fuels everything ATSC does. Visit *www.atsc.org* for details.

About The Authors

Madeleine Noland is president of the, Advanced Television Systems Committee (mnoland@atsc.org). Widely respected for her consensus-building leadership style, she chaired the ATSC technology group that oversees the ATSC 3.0 broadcast standard before being named ATSC president in May 2019. Previously, as a representative of LG Electronics, she chaired various ATSC 3.0-related specialist groups, ad hoc groups and implementation teams since 2012. A 15-year industry veteran, Noland held key technology management and standards roles at Backchannelmedia Inc., Telvue Corp. and LG. She received **TV NewsCheck's** "2019 Futurist" Women in Technology Award and was named one of 2018's "Powerful Women in Consumer Technology" by **Dealerscope** magazine. In 2016, she received ATSC's highest technical honor, the Bernard J. Lechner Outstanding Contributor Award. She graduated cum laude from the University of Massachusetts.

Jerry Whitaker, Vice President for Standards Development, Advanced Television Systems Committee (jwhitaker@atsc.org). Whitaker supports the work of the various ATSC technology and specialist groups and assists in the development of ATSC Standards and related documents. He currently serves as secretary of the Technology Group on Next Generation Broadcast Television, and is closely involved in work relating to educational programs. He is a Fellow of the Society of Broadcast Engineers and a Life Fellow of the Society of Motion Picture and Television Engineers. He has served as a board member and vice president of the Society of Broadcast Engineers.

From Over-The-Air To Over-The-Top, Sustainability Plays Ever-Greater Role

TV transmission and streaming media tackle sustainability

By Phil Kurz

The world is inching towards the 10-year anniversary of the United Nations' *Sustainable Development Goals*, a 17-point roadmap laid out in 2015 that points the way to a cleaner, climate friendly world that's more equitable and aims to remove poverty from the human condition—all by 2030.

Broadcasters and other media and entertainment (M&E) concerns are beginning to look at how they can contribute to this sustainability effort, particularly when it comes to their use of electricity. The basic concept revolves around efficient use of power.

The greater the efficiency, the less that's needed, and the less that's needed, the lower the carbon emissions of the power plants supplying broadcasters and other M&E businesses. While handy, this linear relationship may be overly simplistic—but more on that later.

With the clock ticking, some governments around the world have instituted policies to bring sustainability goals within reach. The European Union, for example, adopted its *Corporate Sustainability Reporting Directive* (CSRD) in October 2022.

On its website, multinational accounting firm *Ernst & Young* describes the CSRD as "a set of policy measures intended to combat the climate crisis by transforming the EU into a modern, resource-efficient and competitive economy, with no net emissions of greenhouse gases by 2050."

In the United States, some are advocating a "Green New Deal," a policy proposal calling for net-zero emissions of greenhouse gases around the world by 2050 and earlier sooner than that in the United States.

For over-the-air broadcasters, the focus of efficiency naturally centers on the transmitter—a television station's biggest single power consumer. More broadly in the M&E industry, many sustainability efforts have focused on distribution of content via the internet to feed the seemingly insatiable appetite of consumers for over-the-top (OTT) content.

Photo courtesy of Synamedia

Synamedia lead software engineers Nicolas Rochat (left) and Nicolas Cocaign (right) work on increasing energy efficiency in connection with content production and its distribution.

Broadcast Sustainability

In the aggregate, the biggest drivers behind sustainability for U.S. broadcasters may ultimately prove to be the Middle Class Tax Relief and Job Creation Act of 2012, which authorized the Federal Communications Commission's *Broadcast Incentive Auction* to clear 600 MHz spectrum dedicated to UHF television transmission for wireless industry use and deployment of 5G service.

The resulting repack of television broadcasters cleared from the band to new channel assignments was massive. Nearly 1,000 full-power and Class A TV stations were assigned new channels. Most required new RF infrastructure—antennas, waveguide, combiners, filters, and most importantly from a sustainability perspective, transmitters—paid for by a portion of the 600 MHz auction proceeds.

Those replacement transmitters are far more efficient than the rigs they replaced, according to Joe Turbolski, vice president of sales and marketing at Hitachi Kokusai Electric Comark.

"If you go way, way back in the time machine, the solid-state efficiency was a function of the device used in the amplifier—the transistor," he said. "As time has progressed, the device manufacturers have continued to introduce newer and newer efficient, higher-power devices to the marketplace."

The first generation of solid-state transmitters used during the analog-to-DTV transition—those replaced in the repack—typically used less efficient power supplies. "Today's devices are able to put out more power—more Watts—more efficiently now than they did when solid state was first introduced for digital television 20-plus years ago," said Turbolski.

Joe Turbolski

As a result, the modern generation of digital, solid-state TV transmitters that replaced first-generation solid-state, inductive output tube (IOT), and multi-stage depressed-collector (MSDC) transmitters provide more than 40 percent efficiency.

"Frequency does matter," said Steven Rossiter, TV systems application engineer at GatesAir. "If I look at older transmitters and I look at low-band (VHF), FM, high-band (VHF) and UHF, the efficiencies for all of those are different."

For example, an FM transmitter efficiency today can be as great as 70. Twenty years ago, a comparable transmitter would be 30 percent efficient, according to Rossiter.

"If we look at some of the older Class AB amplifiers used in UHF TV, those were anywhere from 12 to 19 percent efficient because of the type of amplifier," he said, adding comparable

Steven Rossiter

solid-state UHF transmitters today are more than 40 percent efficient, taking into account the whole system.

"With a liquid-cooled transmitter, for instance, I've got cooling pumps, heat exchanger fans, the transmitter itself and all of the other equipment that goes with it, like the modulator," he said. "When I start looking at a whole system, I am looking at anywhere from 38 percent to 43 percent efficient, and that depends on the channel, too."

As GatesAir looked to maximize efficiency, other amplifier technologies were considered, such as envelope tracking. However, when cost was factored in, the Doherty design won out for transmitters sold into the United States and European markets—whether they were for FM radio or UHF TV, he added.

With the EU's CSRD sustainability policy goals of 2050, it should come as no surprise that Munich, Germany-based Rohde & Schwarz also is focused on the pursuit of greater transmitter efficiency, according to R&S product manager Maurice Uhlmann.

With its latest generation of liquid-cooled UHF transmitters achieving an average of 44 percent efficiency, the company is helping broadcasters to reduce their carbon emissions and power bills.

Maurice Uhlmann

"If you replace a 20 percent or 21 percent average efficiency transmitter (which is encountered in some installations today) with one that has an average efficiency of 44 percent, you cut down on your power costs by more than 30 percent and you reduce your carbon emissions by more than 50 percent," said Uhlmann. "This is a very big impact."

Putting real-world numbers to these efficiency percentages illustrates just how big the cost savings on power can be for broadcasters. For example, a 20 percent efficient transmitter would consume 200 kilowatts to provide a 40-kilowatt output power—or some 144,000 kilowatt hours per month, according to Uhlmann.

A transmitter with a 44 percent efficiency, however, would only require 65,505 kilowatt hours per month, ultimately saving the hypothetical station more than half on its power bill and handing the environment less than half the carbon load.

Uhlmann also pointed out that advancements in transmitter cooling systems—such as liquid cooling—are decreasing the AC power load at transmitter sites, further cutting the power requirements and carbon footprint.

Streaming Sustainability

There's much more to the sustainability issue than transmitters when the M&E industry at large is considered. The growth in the number of hours people stream online video content worldwide each week via the internet reached 19 hours

last year and returned to an anticipated pre-pandemic trajectory this year of 17 hours, according to figures from *Statista*, an online data-gathering platform.

That level of streaming requires a massive technological infrastructure, including countless routers, switches and servers, all requiring electrical power, which in turn generates a carbon footprint. Although, just how much carbon created is still a matter of debate.

While a variety of press reports have equated the generation of carbon emissions in viewing 30 minutes of Netflix with driving four miles, the Paris-based *International Energy Agency* disputes the comparison, pointing to flaws in the research the claim is based upon and saying the actual carbon footprint of streaming is far smaller.

Regardless, efforts are underway to address the impact of streaming on the environment. A leader in this movement, the Greening of Streaming forum, is focused on finding greater power efficiency throughout the streaming ecosystem.

The forum counts among its members many of the leading companies in the streaming ecosystem, including Intel, Ateme, AMD, Microsoft and others.

"By zeroing in on wattage, we feel we can make a real difference," said Dom Robinson, spokesman for Greening of Streaming. "Focusing on wattage, kilowatt hours and average watts per 15 minutes, we as engineers can absolutely directly reduce our wattage, and we can do that in a way we can measure."

That is an important part of the group's effort to dispel a mistaken notion about streaming from a sustainability point of view.

Dom Robinson

"A lot of people believe a direct reduction in data has a direct reduction in power, and a direct reduction in power equals a reduction in carbon," he said. "It doesn't work like that. There is no linear relationship between them.

"Don't get me wrong. We're not in the climate denier camp, but by focusing directly on reducing wattage we can give that information to the abundance of climate scientists, consultants and groups out there to try to get a handle on how that might be impacting the environment."

Forum member AMD, for example, is focused on greater power efficiencies, especially in data center infrastructure, including Hyperscalers, CDNs and on-premise data centers.

"There are many areas AMD is working on enhancing sustainability," said Girish Malipeddi, director of product management and marketing at the company. "In 2021, the company announced a goal to deliver a 30-times increase in energy efficiency for AMD EPYC CPUs and AMD Instinct accelerators in AI

Girish Malipeddi

training and HPC applications running on accelerated compute nodes by 2025. We're also seeing an increase in domain-specific computation, or solutions custom-focused on solving specific workloads."

The company's Alveo MA35D Media Accelerator is an example. The accelerator was custom-built to enable a "many-fold" power reduction per stream and maximize the number of video streams for any given power budget," said Malipeddi.

Finding these types of efficiencies gets at the heart of the sustainability challenge, which compounds as the number of streams grows, said Adrian Herrera, chief marketing officer of Varnish Software.

"[M]edia companies are often expected to deliver and scale increasingly data-heavy content to the demands of thousands, if not millions, of consumers, who are using a broad range of different devices and platforms," he said.

Adrian Herrera

"When quality can't be compromised and downtime must be avoided, many turn to additional servers to handle the increased load. This means more energy-consuming infrastructure racking up emissions as well as power bills."

Software offers an attractive "low-cost" alternative to a "rip and replace" hardware strategy, he said. "For instance, software can be utilized to increase cache performance, enabling organizations to process data much more efficiently—or, ideally, only one time," said Herrera.

While an important factor on the road to a more sustainable future, these solutions address only a few of the ecosystem-wide challenges that must be overcome.

"There are many different actors involved. There are no standards to actually measure the energy [used]. The whole point is really to consider the problem as an end-to-end problem, rather than focusing on small parts [of the streaming ecosystem]," said Marc Baillavoine, video networks chief technology officer at Synamedia, and former chief executive officer and co-founder of Quortex, which Synamedia acquired last year.

"The whole point is to make sure that you consider the problem as an end-to-end problem, rather than focusing on a small, small part. At Synamedia, we are trying to address the parameters as a whole, and that implies being more efficient on the transporter side, using fewer watts per pixel as we say, being more efficient on the CDN side and making sure that when you make a decision on one portion of the system it doesn't impact the other parts."

High dynamic range (HDR) is a case in point. Enabling HDR "brings a very limited" increase in encoding complexity; however, offering content with HDR can account for an increase in electrical consumption by the television of 50 percent to 70 percent, said Baillavoine.

DAB Radio News And Views

By Les Sabel, S-Comm Technologies

Report On Thai DAB+ Progress: A Public DAB+ Seminar

Les Sabel

A June 10, 2023 public seminar was conducted in Bangkok, Thailand in connection with the Thailand national DAB+ planning project undertaken by Thammasat University and led by Sanya Mitaim, along with Maythapolnun Athimethphat, on behalf of the National Broadcasting and Telecommunications Commission of Thailand (NBTC). The seminar summarized a recent four-day DAB+ training workshop for NBTC and Public Service Broadcasters MCOT, TV5 and PRD, where the results of the planning project were presented.

The public seminar was attended by some 120 delegates from across the radio ecosystem; including major and local FM radio broadcasters; the Thai regulator, NBTC; Network Providers; and the members of the public.

The Seminar

The seminar was opened by Anupon Tajawanno, representing the Thammasat University team, who introduced speakers for the seminar. His remarks were followed by Parita Wongchutinat, executive director of the Broadcasting Technology and Engineering Bureau of the NBTC, who summarised the topics of interest for the day.

Session One was provided by Kiatanantha Lounkaew, who has developed a demand forecast model for DAB+ in Thailand. The analysis is based on the diffusion model developed by researchers such as F. M. Bass, on the likely progress of new technology products when they are introduced to the consumer ecosystem. The analysis is based on the results of broadcasters' surveys undertaken as part of the project regarding their interest in DAB+. Lounkaew elaborated on the details of the Bass diffusion model, how it can be applied to estimating the expansion of DAB+ in Thailand, and the resulting economic and social impacts.

He also explored impact on the Thai gross domestic product (GDP), showing that under a range of scenarios of investment into the deployment of DAB+, the expected results will have a positive impact on the GDP.

The DAB+ Feature Set Described

Session Two was presented by Patrachart Komolkiti of the King Mongkut's University of Technology. He first offered a summary of the features of DAB+, including audio

Figure 1. The June Thailand seminar attracted near-capacity audiences.

and program-associated data features, and then went on to discuss emergency warning systems and car radios before providing a general overview of how the DAB+ multiplexing system works.

This presentation was followed by a comprehensive summary of the transmission plan developed by the Thammasat University team, which was led by Mats Ek of Progira Radio Communication. The transmission plan is designed to provide 95 percent of the Thai population with mobile vehicle coverage and resulted in 330 transmission sites. The transmission plan includes three layers of coverage, with national, regional and local layers. An allotment plan was also developed, which will provide typically six DAB+ frequency blocks for each of the 34 sub-regions in 10 regions of which one frequency block in each sub-region is reserved for the national layer. A rollout plan spanning seven years was also presented, with initial emphasis on the 10 major cities, including the capital Bangkok, as well as major motorways.

The transmission plan was followed by a summary of the multiplexer network design and cost analysis aspects, which was led by Les Sabel of S-Comm Technologies. The results of the analysis indicated that the most cost-effective multiplexer network architecture in terms of the total cost of ownership (TCO) was the centralized system, where all multiplexers are provided at a single centrally-located site, along with a physically separated disaster recovery site. Interestingly, the distributed architecture where each sub-region hosts its own multiplexer systems has only a marginally higher TCO.

Session Three was presented by Supatrasit Suansook, the director of the Television Engineering, Broadcasting Technology and Engineering Bureau of the NBTC,

Paneda's Lars Peder Lundgren shows off the specially designed receiver module used in connection with his company's emergency warning system technology.

The demonstration area featured several DAB+ receivers, including this Sangean model with Thai language-capability.

who outlined the various activities in the project and how they fit together. He also recapped the shared nature of the DAB multiplex.

Suansook provided a discussion on the position of NBTC, along with possible implementation options that are being considered for future deployment approaches, including a single national ensemble and five local ensemble approaches to accommodate the numerous smaller commercial FM broadcasters. He reiterated the need for large numbers of transmission sites to provide wide area coverage, with some 100 sites needed to cover 63 percent of the Thai population, increasing to 330 to reach 95 percent of the population.

He elaborated on a new approach to providing services at province level inside each sub-region (each sub-region consists of between one and five provinces), as Thailand has 77 Provinces within the 34 sub-regions. The concept involves gradual expansion of ensembles from provinces to the whole sub-region, allowing the initial DAB+ transmissions to cover the existing FM areas first, and to expand outwards later on.

Technology Demonstrations

The public seminar was supported by demonstrations of DAB+ equipment and receivers. Paneda provided a full demonstration of their multiplexing system as well as a live demonstration of the Paneda emergency warning system, while TV5 showed a range of different DAB+ receivers, including home, portable and automotive products.

The demonstrations were well attended, with much discussion around the provision of alerts, including the emergency warning through the DAB+ announcements system. The emergency warning

is provided via an alarm announcement, which is mandatory in all DAB+ receiver products.

Summary

The public seminar was very well attended, with all sessions having a near capacity audience. There were many questions from the audience across the day, as broadcasters inquired about different aspects of the DAB+ system, including the benefits and costs as well as the proposed way forward.

There was clear interest from small and large broadcasters alike, with one commercial broadcaster in Hau Hin keen to get involved at local level, and another with more than 100 FM transmitters interested in the potential of national services.

The seminar highlighted the interest in DAB+ in Thailand, and provided a perfect platform for the next steps of DAB+ network, a detailed design and regulatory licensing regime. We look forward to more activities to move DAB+ forward in 2024.

About The Author

Dr. Les Sabel's involvement with DAB started when he joined Radioscape, London U.K. in 2002 as vice president of engineering when they were pioneering DAB receivers using Software Defined Radio which was "cutting-edge" at that time. They also produced multiplexing and monitoring systems, also as software platforms, and among his responsibilities were standards development where he participated in the development of the DAB+ standard in 2005 that is commonly used today.

Today Les is the principal consultant at S-Comm Technologies Pty. Ltd. and regularly assists WorldDAB, and broadcasters and regulators around the globe with the introduction of DAB digital radio and other aspects of radio communications technologies. He may be contacted at Les.sabel@scommtech.com.au.

From Over-The-Air To Over-The-Top, Sustainability Plays Ever-Greater Role

The reason for the increase is that the task of decoding HDR video typically is passed over to the CPU in the set or other consumer device such as a set-top-box for decoding in software.

"Software decoding in the CPU is much less efficient and effective," explained the forum's Robinson. "It just uses more energy."

Responsibility All Around

When it comes to ensuring a more sustainable future for society, few could argue that it's the responsibility of everyone to do his or her part.

It appears the same is true of sustainability when it comes to broadcast and streaming. In fact, it may be the case that the greatest energy savings can be found in the home, not in the data center, CDN or transmitter building.

"What would happen," Robinson asked, rhetorically, "if TVs actually automatically defaulted to the most energy efficient display they could?"

Imagine television sets of the future being equipped with "gold" and "green" buttons—the former to enable UHD, HDR and high frame-rate video, and the latter to enable the greatest energy savings. Imagine a future when an engineer could ask the marketing department if it's really necessary to include some incremental picture improvement that can only be measured with a meter, observed Robinson.

"Don't take away consumer choice," he said. "Consumers can still press the 'gold' button on a program-by-program basis, but when they're watching a TV in the kitchen, do they need 16K UHD, HDR and 120 frames-per-second?" he asked.

"Let's change that paradigm and put the intellectual capital of the industry into a focus on energy efficiency."

5G MAG

By Jordi J. Gimenez

A Report On 5G-MAG's IBC Presence

Jordi Gimenez

5G-MAG participated at the IBC event this year with a combination of demos, events, and social gatherings. Anybody interested or curious about global internet and 5G-based access technologies connected to media services and applications had a chance to meet us and engage.

The 5G-MAG "Meet & Greet," with coffee and croissants available for members and partners, was the kick-off of a journey around the activities of the association during 2023, and was followed by three dedicated meet-ups.

The 5G Broadcast meetup provided attendees with a status update from stakeholders around the globe. These included Frank Copsidas (Xgen Network LLC), Johann Mika (ORS Group), Vittoria Mignone (RAI CRITS) and Raimundo Barros (Globo) explaining their involvement in the development and testing of the first 3GPP standard for broadcasting, which—different from the way regional standards normally work—is evolving and improving release-by-release. From the European perspective, the fact that none of the traditional broadcast standards has seen adoption at scale (there is no single phone in the market with a DAB or DVB chipset despite the success of such technologies in vertical markets) triggers the opportunity to focus on a totally different technology ecosystem. Pioneering trials in the United States have now demonstrated the ability of using 5G Broadcast at local scale, and in adapting it to the needs of different markets and individual stations. Brazil is another market with an eye on not missing the opportunity to play with a global standard to face the future challenges of media delivery.

The 5G Media Streaming meet-up offered a totally different topic, as it was all about driving effective collaboration between mobile media applications and mobile networks, nothing to do with broadcast but with a potential to link both the broadband and broadcast world from a provisioning and client perspective. Richard Bradbury (BBC) and Daniel Silhavy (Fraunhofer FOKUS and 5G-MAG Reference Tools development co-ordinator) went through a deep dive into 5G Media Streaming, pointing out the status of the technology in 3GPP, with the world's first demo of this technology taking place at the 5G-MAG booth.

Finally, the 5G media production meetup offered a panel discussion moderated by Thibaud Biatek (Nokia), with panelists Rüdiger Hnyk (Smart Mobile Labs), Josh Arensberg (Verizon), Ronan Poullaouec (Haivision), Thorsten Lohmar (Ericsson) and Ian Wagdin (BBC). The discussion centered around non-public networks, exposure of APIs, network slicing, uplink streaming, the role of smartphones and COTS equipment—all topics being developed within 5G-MAG to make live contribution and remote production move beyond just connectivity.

Beyond the meet-ups, which attracted good-sized crowds, the main highlights for 5G-MAG at the show were the two demos on 5G Media Streaming and 5G Broadcast.

The 5G Media Streaming demo introduced for the first time the set of technical specifications defined in 3GPP, with the aim of achieving a better media streaming quality of experience (QoE) by effective collaboration between content providers and mobile networks. The key features under development include:

- Content Hosting: CDN deployed inside/outside the mobile network
- Dynamic network QoS policy: Automatically tracking representation switching during a streaming session
- Quality of Experience metrics reporting: Supporting non-real-time performance auditing
- Network Assistance: Throughput estimation (bitrate recommendations) and temporary delivery boost
- Consumption reporting, including exposure of CDN access

The BBC's Richard Bradbury and John Elliott offer the world's first 5G Media Streaming demonstration.

Kudos go out to the BBC's Richard Bradbury and John Elliott for bringing the demo on site, and to all the contributors involved from Fraunhofer FOKUS (Daniel Silhavy, Vuk Stojkovic), Qualcomm (Shilin Ding), Dolby Laboratories (Kurt Krauss) and the BBC (Richard Bradbury, David Waring, John Elliott, Dev Audsin), and again to Fraunhofer FOKUS's

DRM News

By Radu Obreja
DRM Consortium Marketing Director

Digital Radio Mondiale Makes Big Strides In Asia

The beginning of autumn 2023 was fantastic for DRM specialists, stakeholders and users, as three major announcements related to the global digital radio standard were made by large Asian countries almost at the same time.

DRM, as a global, open digital radio standard, has attracted the attention of radio professionals for some years now, because of its capability to reach large, medium sized and small geographical areas; it can thus cover without gaps entire countries of any size or even continents. This makes it extremely attractive to both public, commercial and community stations broadcasters. The graph below just illustrates DRM's coverage capabilities since the standard can be used in all frequency bands below and above 30 MHz delivering the same features throughout.

Indonesian Digital Radio Mandate

Recognizing the benefits of digital radio, Indonesia's Ministry of Communication and Information (Kominfo) made public their regulation for terrestrial radio broadcasting services. The country thus adopts DRM in MW, FM and VHF-III (in the frequency range 174 MHz to 202 MHz) and DAB+ in VHF-III (frequency range 202 MHz to 230 MHz). Public, commercial and community radio stations will therefore be able to start planning the rollout of digital radio in a country of some 275 million people inhabiting more than 18,000 islands.

Indonesia's president, Harliantara Harley Prayudha, stressed in a press article recently that "the world of radio broadcasting is slowly but surely transforming towards digital." After very successful trials in DRM medium wave and FM, the public broadcaster Radio Republik Indonesia (RRI) has already implemented DRM in the FM band at several key Indonesian sites on the Java Island using it also for emergency alerts (Emergency Warning Functionality), vital for a region often prone to natural disasters.

Chinese Digital Radio Initiative

Almost at the same time with the Indonesian announcement in late summer, a *joint recommendation* from the Chinese National Radio and Television Administration, the Ministry of Industry and Information Technology and the State Administration for Market Regulation was making mandatory the in-car radio digital reception, recommending the

Where DRM fits – Serves all Coverage Needs
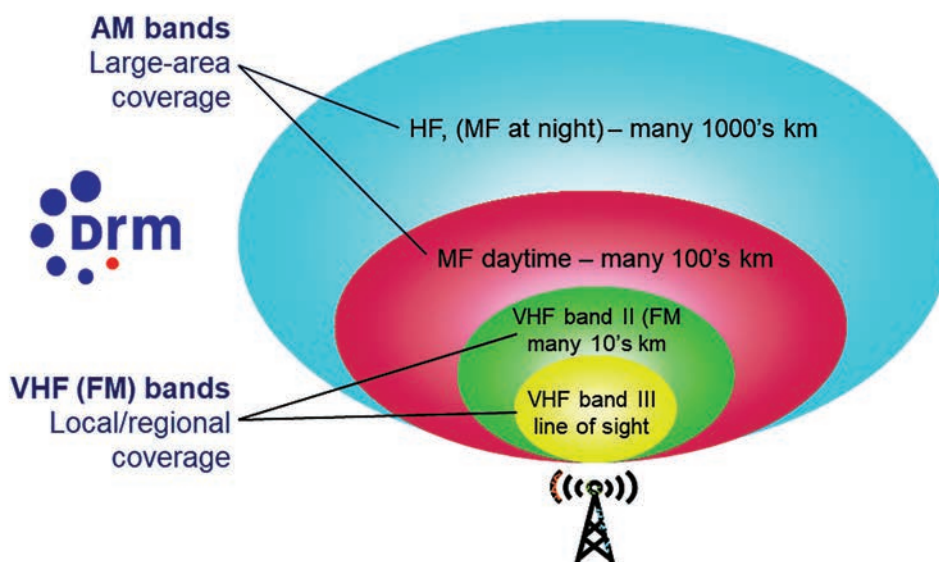
installation of DRM receivers in vehicles and asking for a speedy installation of DRM by domestic broadcasters. In effect, the DRM standard becomes the Chinese digital standard in the AM bands, thus covering the country's huge geographical territory and its 1.4 billion people.

The DRM standard, capable to cut operational costs by 40 percent and ensure energy savings of between 50 to 80 percent, was one of the reasons Pakistan, a country of some 231 million people, has chosen this system for both AM and FM broadcasts. At the IBC exhibition and conference in September, the Pakistani Minister of Information and Broadcasting, Murtaza Solangi, in a live address at the main DRM IBC event, stated that Radio Pakistan is achieving already significant milestones in its digital migration by using DRM. As of July this year, *Radio Pakistan started* a massive DRM project, by ordering a new 1,000 kW transmitter that will ensure the broadcaster's reach over thousands of kilometers.

These key announcements by Asian countries embracing the DRM standard are in line with the significant development of DRM digital radio in other parts of Asia, like India. This was the first big country (of 1.4 billion people) to adopt DRM in the AM, (medium wave) bands. More than 900 million Indians are in the coverage area of All India Radio (AIR) DRM broadcasts from 35 DRM medium wave transmitters working in both simulcast and pure DRM mode. Six more high-power medium wave transmitters are planned for DRM services soon. Three shortwave transmitters also use the DRM standard.

DRM Testing In Nepal

Another Asian country which is considering the roll-out of DRM is Nepal which is trialling it in the FM band at present. New Zealand is broadcasting already in DRM to the Pacific islands. And Australia was working closely with the DRM Consortium for a very successful trial in both AM and FM last year.

In other parts of the world, South America and Brazil have been interested in the DRM standard for some time. This interest is
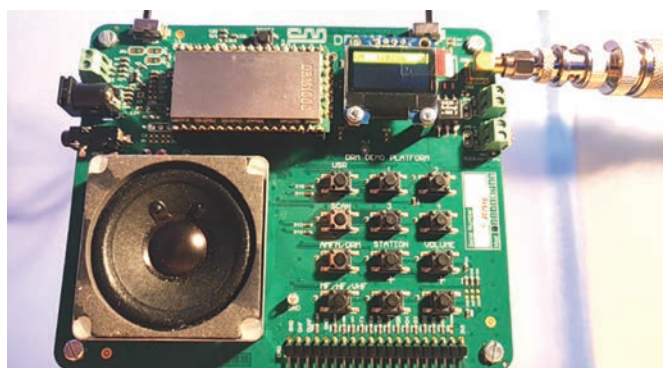
The CML Micro/Cambridge Consultants DRM receiver module.

Gospell Digital Technology's two new DRM receivers.

peaking again after a period of stagnation. On the African continent South Africa was the first country to have mandated the full DRM standard together with DAB+ as its digital broadcasting systems. DRM broadcasts are also aired from Europe to other parts of the world, such as Asia, using shortwave and some transmissions are aimed at Europe Itself.

Digital radio is an inevitable development, and a lot of effort has been put into making the DRM standard even more attractive to broadcasters. Simple upgrade solutions of older analog AM and FM transmitters to DRM were unveiled at the 2023 IBC show. Such upgrades can reduce upfront digital transmitter costs.

In parallel, the question of availability of receivers has always been on the agenda of DRM stakeholders. Receiver manufacturers already offer a series of models which retailers in countries where DRM is being rolled out should order in big volumes. Therefore, the question of receivers is not as acute at present as it was before. Recently CML Micro, the global chipset manufacturer, in partnership with Cambridge Consultants, has unveiled the world's lowest-cost, lowest-power and smallest sized DRM "antenna to speaker" DRM receiver module (DRM1000) containing all hardware, software, IP and patent licenses required for a DRM digital as well as analog-capable receiver (*https://www.drm.org/cml-new-module-drm1000-released/*).

Using the new module (from China), Gospell Digital Technology showcased at IBC two new, very small-sized receivers. One is a portable desktop radio with a rechargeable battery, and a much smaller pocket receiver, which is powered by just two AAA batteries.

The launch of this ground-breaking and cost effective CML Micro DRM digital radio module should incentivise many receiver manufacturers around the world to get it and produce affordable DRM radio-sets in their own countries.

As it is already recognised that cars are the drivers of digital radio, the announcement by China that vehicles must be

equipped with digital radios is more than welcome. India is also a good example for the use of DRM digital radios in cars where in a relatively short period of time some six million new cars have a line-fit DRM receiver.

DRM is on the crest of the Asian digital wave, and this will have a great influence worldwide, proving that by being a global, flexible and economic solution, DRM can really offer the kind of coverage and services unavailable on other platforms.

About The Author

Radu P. Obreja *is the marketing director of the DRM Consortium. He has extensive experience in business development, marketing and public relations. He has worked for large international companies in various industries, including Visa International and Visa Europe, where he also held the position of vice president. Obreja is a member of the DRM Steering Board and is actively promoting the rollout of the DRM standard in Asian, African, South American, and some European countries.*

5G MAG

Daniel Silhavy, as he was also showing a demo on 5G Media Streaming at Fraunhofer's booth.

The 5G Broadcast demonstration provided a look at the 5G-MAG Reference Tools for 5G Broadcast running on commercial research devices (CRDs).

Key features under development include:

- End-to-end demo of 5G Broadcast including 5G Broadcast core, transmitter and CRDs for reception
- Seamless switching between 5G Broadcast and broadband: uninterrupted video experience if the distribution path changes from 5G Broadcast to

Fabian Bottesch and Stefan Babel (ORS) provide a demonstration of 5G Broadcast operating with 'pre-commercial' devices.

broadband (Wi-Fi) and vice-versa

- Integration of broadband and 5G Broadcast functionalities in Android devices and applications
- Demonstration of emergency warning sent from a 5G Broadcast transmitter to CRDs.

In connection with this, kudos go out to Bitstem GmbH's Klaus Kuehnhammer and the ORS Group's Johann Mika for bringing the demo on site, as well as to all the contributors from Fraunhofer FOKUS (Daniel Silhavy), Qualcomm (Shilin Ding), and the ITEAM Research Institute (Jaime Sánchez Roldán).

FOBTV Technical Committee Meeting Provides Updates On Global TV Initiatives

By James E. O'Neal

AMSTERDAM

The FOBTV (Future of Broadcast Television Initiative) Technical Committee meet in a hybrid in-person/virtual setting during the 2023 IBC show here, with representatives from a number of international television broadcasters and standards organizations providing updates on their activities since their last meeting in April.
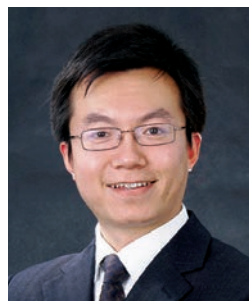
The Sept. 17 meeting was brought to order by Yao Wang, the group's secretary general and acting chair, at 8:00 a.m. U.S. Eastern Daylight Time. After a role call and review of the meeting agenda, Wang recognized the DVB's Emily Dubs as the first presenter.

Yao Wang

What's Happening At DVB

Dubs began with an overview of DVB projects currently active, including an update of the organization's "bluebook" to reflect progress being made in the DVB-I specification, which describes the delivery of linear television via the Internet to conventional TV sets, smartphones, tablets and media streaming devices.

She noted progress in the support of the European AVMS (audio-visual media services) directive that now requires devices to "ensure the appropriate prominence of such audiovisual services of general interest," and a new interoperability point based on "common profile" input from recent trials held in Germany and Italy. Dubs also described the development of additional features to support direct satellite tuning and noted the planned release in October of a new DVB document (A177r6) which adds the availability of HibbTV applications to provide enhanced accessibility, additional support for DRM, and applications signaling. She

Emily Dubs

noted that a joint task force had completed its work in connection with "DVB-I over 5G."

Dubs concluded her presentation by providing information on the 2024 "DVB World" event, which is scheduled for March 19-20 in Munich, Germany.

ATSC Updates

Chairman Wang next recognized the president of the ATSC, Madeleine Noland, who provided an update on that standards organization's activities.

Noland began with a reminder that complete information about the ATSC projects she would be describing could be found on the organization's website (*https://www.atsc.org*).

In her presentation, she noted the differences between broadcasting and unicasting modes of transmission, and then described how OTA broadcasting could be used to augment unicast delivery.

Madeleine Noland

"When you add broadcast and unicast together, then you get scale," said Noland. "When you think about doing a datacasting service, you need to provide coverage to a large area—all of the U.S. and Europe. One tower is not enough. You connect multiple towers together to reach everyone. This is a cellular core network, which routes data to towers based on receiver location."

She noted that this concept of a cellular core network could be used to advantage by terrestrial broadcasters.

"Even with 75 percent ATSC 3.0 coverage in the U.S., this is not enough," she said, describing how a nationwide broadcast core network, or BCN, could greatly enhance broadcaster coverage, allowing coverage of all significant markets. Noland noted too that a BCN is evolvable, providing flexibility to reach future traffic areas, as well as enhancing resiliency to failure.

She also described the concept of inter-tower communication, saying that it could cut broadcasters' operating costs by relaying programming to main or single-frequency network (SFN) tower sites without the need for conventional studio-to-transmitter linkage. Noland noted that the ATSC

booth at this year's NAB Show included a demonstration of this inter-tower communications concept, and concluded her presentation by observing that SFNs will greatly aid broadcasters in gain data capacity and reaching indoor receivers and those in "shadow" areas of coverage.

News From The National Association Of Broadcasters

Lynn Claudy, the NAB's senior vice president of technology, provided an update on that organization's recent activities, beginning with an update of the deployment status of ATSC 3.0 in the United States, which is now available in some 70 television markets. Claudy stated that the current goal is to reach 75 percent of U.S. holds with NextGen TV by the end of 2023.

"In the top 10 U.S. markets, eight are now on line" said Claudy, noting that the two "holdouts" were New York City and Chicago, and stating that service was supposed to commence in Chicago "in the very near future."

Lynn Claudy

Claudy observed that four set manufacturers are now shipping ATSC 3.0-capable receivers to the United States, and he expected that by 2025 "about a third" of new TV sets sold will be able to receive NextGen TV broadcasts. He added that 3.0 converter boxes for existing ATSC 1.0 sets are now becoming available for those who don't want to purchase a new TV receiver at the present time.

Claudy also discussed FCC actions regarding ATSC 3.0, describing the current mandate for stations electing to add 3.0 transmissions to maintain a "substantially similar" 1.0 service. He stated that in June an FCC rulemaking action has now set a date for cessation of this "dual standard" broadcasting.

"This simulcast requirement will only have to last until July 17, 2027," said Claudy. He added that the NAB had requested the FCC to establish a taskforce to address the transition to ATSC 3.0-only broadcasting, and that the Commission had responded with a plan to partner with the industry to set up working groups to address issues associated with an eventual cessation of ATSC 1.0, including development of plans to minimize the impact of such a transition on consumers, provide information to consumers about how to continue to receive OTA TV broadcasts, the labeling of NextGen TV equipment in retail outlets, and post-transition matters such as whether to maintain a "nightlight" station in TV markets, carriage of 3.0 signals on satellites and cable systems, accessibility issues, and privacy and security.

"These are the kinds of things we are working on," said Claudy, noting that meetings on these issues began in June 2023, with the current schedule calling for work to be completed within one year.

Report From Japan's AIRB

Chairman Wang next recognized Ryoichi Nakai, the director of research and development at Japan's AIRB (Association of Radio Industries and Businesses) organization.

Nakai begin with a description of a recently-completed review of advanced terrestrial TV broadcasting in Japan, stating that 2023 is the final year in a five-year initiative for studying and evaluating such items as audio/video coding, multiplexing, conditional access, broadcast transmission systems, and technical standards, all leading to a final report on recommendations for an advanced terrestrial broadcasting system.

Ryoichi Nakai

He stated that the "target resolutions" for the proposed advanced broadcast system are 2K and 4K, with 8K available at a future date.

News From Japan's NHK

Following the AIRB report, Chairman Wang introduced Masakazu Iwaki, an executive research engineer with the Science & Technology Research Laboratories division of Japan's NHK Broadcasting Corporation.

Iwaki began his presentation with a review of progress being made in connection with the country's Advanced ISDB-T (Integrated Services Digital Broadcasting) broadcasting standard, noting that NHK has created test stations in both Tokyo and Nagoya for evaluating VVC and MPEG-H 3DA coding, and also the MMT IP-based transport layer to provide a number of functions, including service for tuner-less devices and personalized consumer services.

Masakazu Iwaki

He also described the standard's advanced physical layer that's intended to allow selection of a wide variety of bitrates and signal robustness parameters along with a hierarchical transmission methodology.

Iwaki also reported on the verification testing of the Advanced ISDB-T system that took place between December 2022 and January 2023, and involved four Japanese cities—Fukuoka, Osaka, Tokyo, and Nagoya. He stated that this was "a long journey" test and it assessed the system's ability to handle "high-quality and multifunctional broadcasting services as well as integrated broadcast and broadband services."

Iwaki also reminded in-person FOBTV meeting attendees of the demonstrations being offered at NHK's IBC pavilion, which included a system for automatically generating sign language to facilitate the relaying of emergency alerts to the hearing impaired, and also a "gamut rings" methodology for easily visualizing color gamut ranges.

Television News From South Korea

Sung-Ik Park, principal researcher at the South Korea's Electronics and Telecommunications Institute (ETRI) next provided an update on activities within his organization.

Sung-ik Park

He began with information about on-going research in MIMO (multiple-input/multiple-out) antenna systems in connection with ATSC 3.0, describing in detail a demonstration using dual-polarized antenna systems in connection with LDM (layer-division multiplex) and TDM (time-domain multiplex) transmissions.

Park explained that the demonstration had involved the transmission of four 4K UHD streams within 6 MHz, the demonstration of backwardly-compatible MIMO for existing television receivers, and the transmission of massive amounts of data (as much as 200 mbps) by utilizing MIMO technology along with channel bonding. He explained that this demo of massive data handling was in connection with the projected transmission of six or seven UHD TV and other services within a limited amount of spectrum.

"This is our ultimate goal, he said. "This is why we're developing the massive data transmitting system."

Park also described research efforts in a comparison of ATSC 3.0 and 5G Broadcast transiting modalities, noting that in a comparative test conducted during the past June and July with a variety of data rates, and that ATSC 3.0 outperformed 5G Broadcast. Park stated that 5G may be of value in reaching mobile phones, and that his group had been "looking for some ideas to converge this into a single RF channel."

He stated that since ATSC 3.0 supports a TDM-base future extension for accommodating future technologies, this it is possible to combine two different technologies within a single channel, and that experimentation with this concept that took place this past July, with both ATSC 3.0 and 5G Broadcast video and physical layer data transmitted and received simultaneously

He concluded his presentation with a description of work in another area of ATSC 3.0, noting that more than 60 percent of the Korean population lives in apartment buildings, and in moving ATSC 3.0 forward it is necessary to provide master antenna systems that can deliver both 3.0 and ATSC 1.0 signals to residents in the buildings with legacy 1.0 TV receiver.

"We have developed a system for receiving 3.0 and transcoding this to 1.0," said Park. "This MATV system has been tested at several sites in South Korea," He added that work is still underway to improve the performance of the system and increase its stability.

He ended his presentation by providing information on a "Global Digital Transmission Workshop" that was hosted by ETRI and took place in Busan, South Korea this past July 19-21.

"It attracted more than 150 persons from countries all around the world," said Park. He added that workshop presentation materials were available at *https://drive.google.com/drive/folders/1Mn2Emy394ONWKH7oty4lNqiMprDvd3nK?usp=sharing.*

Perspective From A Broadcasting Group

Mark Aitken, senior vice president of advanced technology at the Sinclair Broadcast Group and president

Mark Aitken

of ONEMedia, was next on the program and began by providing an overview of current activities within his organizations.,

He noted that the Sinclair Broadcast Group in concert with another large U.S. broadcast group, *Nexstar* Media Group, has been very instrumental in moving NextGen TV forward within the United States.

"Through partnership with Nexstar, we have been responsible for 40 of the 70-odd (ATSC 3.0) launches in the United States," said Aitken.

"We are also involved with most of the international activities going on," he continued. "We have been heavily involved and engaged in India where we've got a number of trials. We converted a station in Delhi to ATSC 3.0, and in India they typically designate that activity with digital mobile. There's a lot of activity going on within government sectors, bureaucratic sectors, political sectors around establishing a national norm for direct mobile."

He then moved to the topic of core networks, stating that in order to provide another avenue for monetization, U.S. television broadcasters needed to ban together to create a broadcast distribution platform for distributing data on a national, regional, and local basis.

"We see tremendous opportunities for growth," said Aitken. "This is really a large focus of ours."

Aitken observed that such a data distribution network involving ATSC 3.0 had been demonstrated in India across eight transmission sites.

"I would say that one of the most engaging areas of activities for us is automotive," said Aitken, stating that his organization had been in discussion with "three of the top-tier automotive manufacturers.

"The first (objective) is in introducing them to the notion and understanding that there's another wireless distribution platform in the works," he said, underscoring that such a broadcast data distribution platform is not yet a reality, but it would be a resource that the automotive industry "could tie into."

"There are a huge number of opportunities that could open up," said Aitken. "And it's just in time from the standpoint of the automotive industry, as it's beginning to think of automobiles as moving software platforms."

He noted that ATSC 3.0 was designed for mobile transmission, was compatible with existing networks, and could open up many new services.

"We see it as a huge value proposition for the automotive guys," said Aitken, observing that a ATSC 3.0 data distribution system was ideally suited for software updates, entertainment (both TV and radio), along with enhanced GPS.

Reports From China

The next presenter was Yin Xu, a researcher at China's Shanghai Jiao Tong University and the country's NERC-DTV national engineering research center) organization.

Xu began by noting that video now dominates mobile communication network traffic, stating that "the cellphone has become the primary vehicle for video consumption, and now this has resulted in the convergence of cellular unicast and broadcast technologies, and compatibility with 5G Broadcast."

Yin Xu

He noted that Release 16, along with the previous version, of the FeMBMS (Further evolved Multimedia Broadcast Multicast Service) standards governing 5G Broadcast has added some new numerologies, increasing the distance between stations to some 100 kilometers (about 60 miles), and also the maximum vehicle speed for satisfactory reception of signals to 250 kilometers-per-hour (155 miles-per-hour).

Xu said that his team had submitted more than 20 proposals to 3GPP on FeMBMS, with two of these governing pilot patterns for rooftop and mobile reception, having been adopted by that organization.

"We also have proposed (a methodology) to improve encoding efficiency of the system and (with others) have proposed interleaving to improve performance of the physical layer," said Xu. He also noted that his team had designed a prototype system for FeMBMS Release 16, which included transmission and reception equipment.

"We used this equipment in a field trial in China at the end of last year," he added. "The site of the transmitter was a mountain called Wutongshan, which is 800 meters (2,600 feet) high. The transmitting frequency was 682 MHz. We drove around the city of Shenzhen and we tested different modes. If we used the 2 bit/s/Hz (MCS20) the receiving success was very low. If we used MCS14, with 1.5 bit/s/Hz, the receiving success became a little bit higher. If we transmitted the 1 bit/s/Hz rate (MCS9), the success rate was very high.

Xu noted that in comparison with DTV transmission standards being used in Europe and the United States (DVB and ATSC 3.0), there was considerable gap in performance. (About 30 percent lower in transmission capacity compared to DVB-T2 and about a 1 to 2.5 dB difference in transmission performance as compared to ATSC 3.0.)

"If you hold this simulation in a mobile scenario, then you can see a huge gap exists," he said.

In summarizing this part of his team's work, Xu stated that FeMBMS had taken into account independent network construction of broadcast operators, and had made improvements, but there was still a gap in spectral efficiency and performance when compared to "traditional broadcasting technology such as ATSC 3.0."

He also stated that while NR MBS (New Radio Multicast-Broadcast Services) broadcasting could easily be achieved with the upgrade of cellphone software, and was backwardly-compatible in that respect, "it cannot support independent network construction by broadcast operators, has low spectral efficiency, and has obvious shortcomings in wide area coverage."

Xu went on to describe methodologies for FeMBMS enhancements and improvements, which include improvements in the physical layer and channel coding and modulation, as well as in the area of time and frequency interleaving. He noted that Release 19 of the FeMBMS standard might take into consideration such paths to improvement.

He also mentioned collaboration with 5G Broadcast to ensure serviceability, and discussed such collaboration in connection with the application layer.

In concluding his presentation, Xu discussed a future research project in China which would involve the design of a broadcast core network (similar to ATSC proposals) to provide additional functionality. He also mentioned work that taken place with regard to the FeMBMB Release 19.

The World Of Ultra-High-Definition Television

Following Xu was a presentation by the secretary general of the UHD World Association (UWA), Wengang Zhang, concerning new developments in the area of ultra-high-definition television.

He began by providing some background information about the UWA, stating that it consists of nearly 300 members who represent a number of nations, with 30 of those members from 17 different countries and regions outside of China. Zhang stated that the UWA was officially registered as an organization on Jan. 26, 2022.

Wengang Zhang

"Our goal is to build a UHD industrial ecosystem around core standards," said Zhang, noting that this involved the areas of video and imaging standards, audio standards, industrial application standards, as well as metaverse, 3D and 8K video standards.

"The UWA has released 41 standards, and has 12 standards in development," said Zhang. "UHD technologies can bring about the ultimate audiovisual experience, and that HDR Vivid technology can maximize the restoration of content creators' intentions through improved brightness, color, and other attributes."

He stated that his organization has also developed a standard for the world's first audio codec based on artificial intelligence. Zhang also noted the on-going work in China on HDR Vivid and Audio Vivid technologies, as well as a project for capturing an preserving the history and geographic features of world heritage sites through the use of technologies based on UWA technologies

He observed that other UWA initiatives include standards development in the area of enhancing user experiences in mobile/automotive "intelligent cabin" environments.

Zhang concluded by providing information on standards development in the metaverse computer imaging arena, and a description of possible future business opportunities in connection with ultra-high-definition technologies.

Report On Brazil's Movement To A New TV Platform

Luiz Fausto, chair of the technical module a Brazil's SBT-VD/TV Globo, provided an update on the progress in the ongoing program to move to the next phase of his country's over-the-air television broadcasting which is scheduled to be finalized by 2025.

Fausto began with an overview of the overall project that's known as "TV 3.0," noting that the name indicated the third phase in evolution from Brazil's "first generation" of analog television.

Luiz Fausto

He then moved to a description of some of the goals of the TV 3.0 initiative, which include frequency reuse through geographic separation of transmitter sites and immersive and customizable audiovisual content in formats suitable "for consumption on any device at any time." Fausto noted too that due to the prevalence of apartment buildings without master antenna systems, "the requirement of receiving with indoor antennas is of high importance."

He stated that the television standard under development will not support standard-definition video, nor will it recognize such legacy holdovers as standard dynamic range and interlaced scanning.

Fausto described TV 3.0 as "a merging of TV and broadband delivery," as well as "app-based TV," with "broadcasters no longer being identified by (channel) number, but rather by app."

He stated that a lab test report on the assessment of the three candidate technologies—advanced ISDB-T, ATSC 3.0 and LG-based 5G Broadcast—would likely be published in October 2023, and would contain a recommendation to narrow the field to two of these candidates.

Fausto noted that the advanced television system project is being driven by a presidential decree and that there existed the possibility of obtaining additional spectrum for OTA use in Brazil.

With regard to the possibility of additional spectrum, Fausto said "This may be of interest to other countries that are more or less struggling to find spectrum to introduce new technologies."

He said that an investigation is under way to determine if it would be possible to utilize spectrum in Brazil between the current high-band VHF and UHF channels.

"This is more or less 'greenfield' spectrum…and it would facilitate the implementation of a new system." He observed that there's been no firm decision made yet as to obtaining any addition broadcast spectrum allocation.

Fausto concluded his presentation by reminding FOBTV members to check his group's website for the latest information about the TV 3.0 project, noting that the laboratory testing report on the candidate standards should be available in October, and would identify the two standards that would advance to field testing.

Report On 5G-MAG Activities

Jordi Gimenez, head of technology at 5G-MAG/EBU Europe, followed Fausto with an update of his group's activities.

Gimenez began by providing a description of the 5G-MAG organization's goals and objectives, noting that one of these is" the leveraging of global Internet, 5G-based access and APIs for multimedia applications."

He then proceeded to outline current areas of concentration within the 5G-MAG group, noting especially a focus on live and on-demand media streaming over 5G networks and the opportunities that are being provided for collaboration between service providers and system operators for enhancing such streaming services and applications beyond OTT.

Jordi Giménez

Gimenez observed that there's also a focus in the areas of management of features, quality of service (QoS), enhanced unicast streaming, the collection and reporting of metrics on content consumption and associated QoS.

In connection with 5G-MAG streaming work, Gimenez noted that the "key takeaways" are a global mobile standard for 3GPP devices, alignment with Internet and OTT distribution of content, and the integration of emergency alerting capabilities.

Gimenez mentioned an on-going collaboration with the DVB organization in connection with transmission of DVB-I services via 5G systems, stating that a joint task force had been established with a number of goals, including the mapping of use cases and commercial requirements for DVB-I over 5G into a set of deployment guidelines, and to identify any gaps that might be present in existing specifications.

He also called attention to some proposals by the 5G-MAG group, one of which is the coexistence of digital terrestrial television broadcasting and 5G Broadcast within the

same carrier in the United States due to the scarcity of spectrum in that county.

Gimenez concluded by encouraging IBC attendees to check out several technology demonstrations involving 5G technology that were being hosted by the DVB organization at their booth, and directed FOBTV members to visit the 5G-MAG website for detailed information on the topics he had been describing.

An Equipment Manufacturer's Viewpoint

The meeting's final presentation came from Thomas Stockhammer, the senior director of technical standards for Qualcomm Technologies, who provided a slightly different look at the changing landscape of broadcasting—that of someone who builds the devices that must operate within these landscapes.

Thomas Stockhammer

In beginning his presentation— "5G Broadcast Technologies-Standards And Production"—Stockhammer stated that he would be discussing 5G Broadcast technology from a somewhat different viewpoint than that of others.

"I'd like to give the perspective from someone who builds the devices and understand what it means," he said. "I'm from the standards department at Qualcomm, and the standards department is quite important, as we are a "filter" for the many technologies being proposed, A standard is a pre-condition for us to go into a product. Without a standard (there is) no product.

"After the standard is approved, there is a lot of work to be done to move the standard into commercialization. In 5G Broadcast, we're in a phase where we basically have a standard and I'll give our view on what is happening."

He observed that the 5G standard defines two different modes for addressing broadcasting. The first is "broadcasting" in a unicast mode (downlinking only) within the spectrum allocated for regular broadcasting and is used in conjunction with high-power transmitters for delivering content in a linear fashion. The second is mixed-mode multicasting which takes place in operator spectrum and is integrated with a unicast network. This mode provides more efficient delivery of multicast/broadcast content than unicasting, and depends on use of an existing cellular infrastructure with its associated low power levels of operation.

"5G Broadcast borrows on existing broadcast infrastructure," said Stockhammer, and emphasized that even though 5G Broadcast had been standardized by 3GPP, it is a broadcasting technology, one that is intended for use by broadcasting operators in broadcasting spectrum. He added that 5G Broadcast is independent of unicast transmissions.

"There is no need to support a unicast network," he said. "5G Broadcast does not have anything to do with unicast."

"The main target and reason for being" for 5G Broadcast is that it operates as a broadcast network where the receivers are hardware-compatible with cellular."

Stockhammer stated that 5G Broadcast brings with it a lot of attractive features, including "SIM-less" reception with a simplified architecture, the ability to fit within existing infrastructures, the ability to be received with high-velocity receiver movement (as great as 250 kilometers per hour), and that it can be combined with existing 4G and 5G feature sets.

Stockhammer concluded with the observation that 5G Broadcast has gained a lot of interest and traction in many areas of the world, especially as its implementation does not require the creation of a multitude of integrated circuit sets specific to various regions and system operators.

"There's not a chip set for the U.S.; there's not a chip set for here," he stated. "We build a chip set once. It a single technology across the globe That's what makes it successful."

The next Future of Broadcast Television meeting is scheduled to take place in Las Vegas, Nevada in conjunction with the April 14-17, 2024 NAB Show being held there.

RF Report

SRD's For ATSC 3.0 And HD Radio; Field Strength Measurement Script Update

By Doug Lung

I've had a chance to test the latest GNU Radio software-defined transmitters (SDRs) for HD Radio (NRSC-5 standard) and ATSC 3.0. Both installed fine on my Fedora 38 laptop following the instructions the projects' Github pages, so my focus will be on the software and my test results. On another topic, I'll present some updates to my field measurement script that allows it to function with a USB GPS receiver and display less confusing output during measurements.

Build An HD Radio Transmitter In GNU Radio

Just like me, I'm sure other engineers built and experimented with simple FM radio transmitters when they were young and getting interested in electronics and communications. Today, well over 50 years since I built my first FM transmitter, experimenters are no longer limited to simple analog FM radio transmitters. They can build an HD Radio digital transmitter based on NRSC-5 specifications using GNU Radio software and an Ettus B200 or HackRF One SDR.

Clayton Smith has created an NRSC-5-compliant FM transmitter in GNU Radio that includes both analog and digital audio, as well as digital data. The GNU Radio Companion Flow Diagram is shown in Figure 1. I would expect the software to work with any UHD/USRP-compatible software defined radio capable of generating a signal in the FM radio band. Other radios may work if a GNU Radio "Sink" block is available for them.

Figure 2 shows the HD Radio signal viewed in the GQRX SDR spectrum display. You can see the two HD Radio sidebands. GQRX played the analog audio fine, but it does not have an NRSC-5 demodulator. I didn't have an HD Radio handy—the radio in my 2008 Toyota pickup is a simple AM/FM radio—but I was able to receive it with the nrsc5 software available at *https://github.com/theori-io/nrsc5/* and an RTL-SDR dongle. This software is useful because it displays the characteristics of the NRSC-5 signal, including data, BER, SNR, etc. Portions of the log from nrsc5 are shown in Figure 3.

This transmitter may be useful in testing a phenomenon that James O'Neal reported on recently in the **Radio World Engineering Extra** publication. This can happen when an HD Radio-capable receiver is tuned to an FM station not transmitting an HD Radio signal and there is a weaker co-channel station transmitting HD Radio. In such cases, the HD Radio

receiver may ignore the analog FM signal and play the NRSC-5 signal. A conventional analog receiver would play audio from the stronger analog signal, due to the FM capture effect.

Details on the HD Radio GNU Radio transmitter and the GNU Radio blocks and flow diagram are available at *https://github.com/argilo/gr-nrsc5*. This page provides a good explanation of how NRSC-5 signals are generated and links to the specifications. This transmitter is also capable of transmitting an AM NRSC-5 signal when used with an SDR such as the HackRF One which can generate a signal in the AM band.

GNU Radio ATSC 3.0 Transmitter Updated

Ron Economos (DrMpeg) has added Low Level Signaling (LLS) to his GNU Radio ATSC 3.0 transmitter project. I don't have a ATSC 3.0 TV set—I can only receive one ATSC 1.0 translator at my home, so there's little use for it here, but I was able to test it using my Airwavz Redzone receiver.

Examining the signal in Airwavz TVXplorer 2.1 software, L1-Basic showed "LLS Present" as "False", but looking further down in the software's HTML report showed the LLS data. Including BSID and service info and the service name. Figure 4 is a screenshot of the TVXplorer display. It was not able to display the video, which was sent as transport stream rather than ROUTE, the same as the previous version of the GNU Radio transmitter. However, with LLS, TVXplorer showed the "call sign" on the default color bar display.

The HDHomerun ATSC 3.0 software is able to decode and display the transport stream video and audio, as I showed in an earlier column describing the software in detail. It would be interesting to see if any other ATSC 3.0 set-top boxes are able to decode the transport stream now that LLS is present. I would not expect it to work with TV sets looking for ROUTE or MMT packets. Ron is looking into a way to create a ROUTE or MMT service that would work with conventional ATSC 3.0 receivers. If any readers are able to help with this, Ron Economos' github page is at *https://github.com/drmpeg/gr-atsc3*.

Simple Approach For Adding GPS Location To Field Measurements—Revised

In a previous column, I described how to grab location data from a smartphone using Bluetooth to mark field strength measurement sites. I found the location was usually within a few feet of where the phone was actually located. Unfortunately, when setting up the field measurement software on a new Orange Pi 5B for tests in South Florida, I
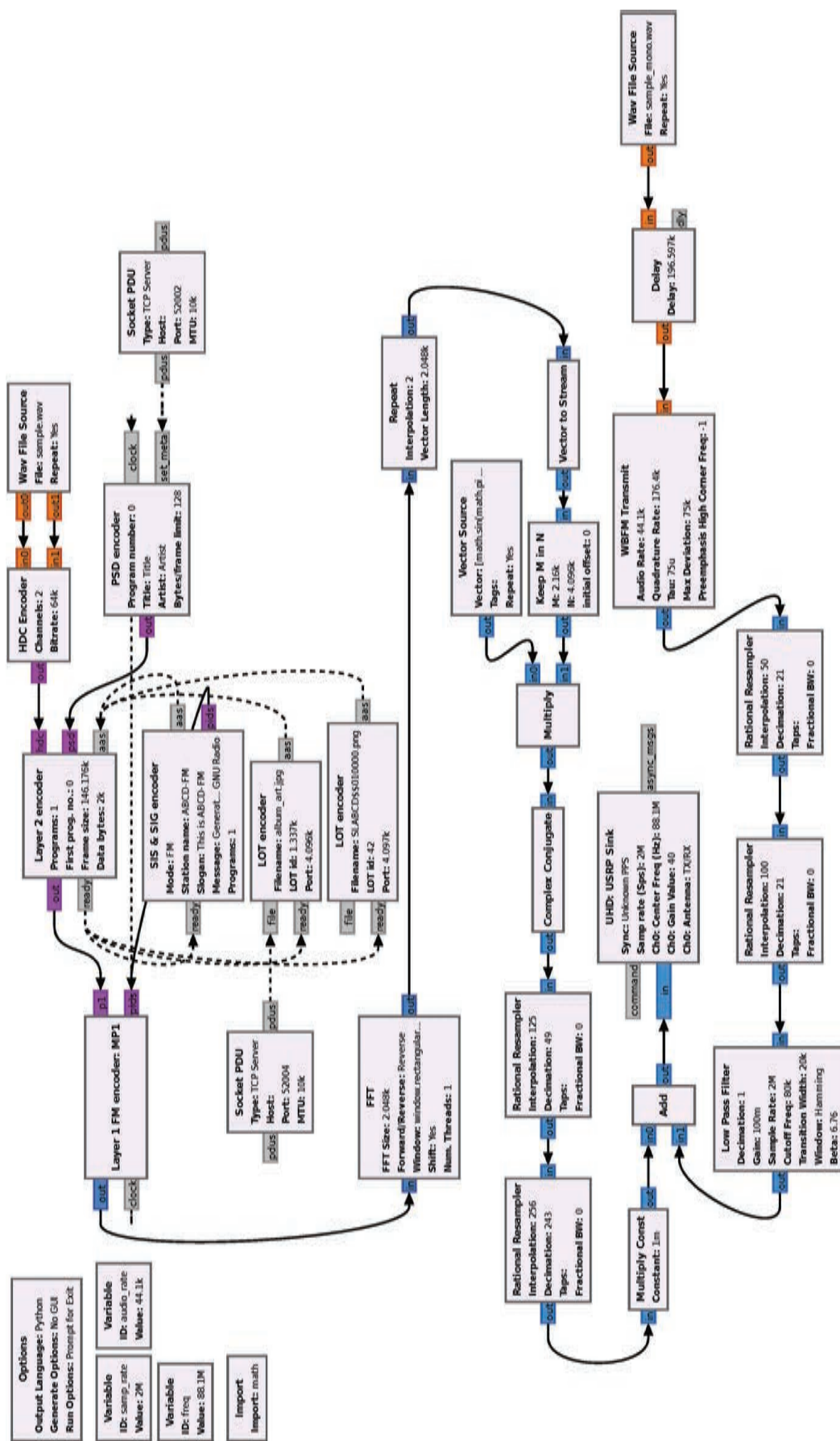
Figure 1. NRSC-5 Transmitter Flow Diagram.

```python
# Simple program to convert dvbtee scan output to
# a "zap" format channel list for use with dvbv5
# programs. Change file names as required.
# dlung@transmitter.com
dvbchannels = open("channels.dvb","r")
zapchannels = open("channels.zap","w")
for line in dvbchannels :
    line = line.strip()
    if (":" in line) & (line.find("github") == -1) :
        start = line.find('-') + 1
        line = line[start:]+"\n"
        zapchannels.write(line)
dvbchannels.close()
zapchannels.close()
```

Figure 2. NRSC-5 Transmitter Spectrum.

found that while I could connect the phone to the Orange Pi and use SDP to discover the services available, serial data was not one of the services listed. I suspect this is due to updates to the Linux Bluetooth utilities, as I had to install an older "compatible" version on other computers to get it working the first time.

I'd used a USB GPS receiver for measurements in the past, so that seemed like a good alternative. I discovered that GPS reception quality varies greatly between units! I bought a GPS receiver from eBay that looked like a GlobalSat receiver, but when I tested it I found it took a very long time to acquire satellites, and even after acquiring them had poor accuracy due to the small number of satellites received. When looking for something better, I found many similar looking units, and realized these were copies of an older Globalsat USB GPS, similar to the one I'd bought before. Buyer beware! I found a genuine Globalsat BU-353N3 from a company in Las Vegas that offered fast shipping and a price that was about the same as the Globalsat impersonators on Amazon and eBay. It worked perfectly, with precise locations even in congested areas like downtown Miami. Accuracy matters in locations with buildings or rough terrain.

Adding it to the field test script was simple. Instead setting up a Bluetooth connection, I used gpsd (loaded by systemd) to communicate with the GPS receiver and gpspipe to provide an output that can be used the same way as the Bluetooth data. I had to change the post-processing software to recognize a NMEA header that included different GPS constellations.

```
16:21:19 Audio bit rate: 63.7 kbps
16:21:20 Country: US, FCC facility ID: 0
16:21:20 Station name: ABCD-FM
16:21:20 Message: Generated by GNU Radio
16:21:20 Station location: 40.689209, -74.044556, 96m
16:21:20 Audio program 0: public, type: News, sound experience 0
16:21:20 MER: 32.1 dB (lower), 32.0 dB (upper)
16:21:20 BER: 0.000000, avg: 0.000000, min: 0.000000, max: 0.000000
16:21:20 Title: Title
16:21:20 Artist: Artist
16:21:20 XHDR: 1 BE4B7536 -1
------
16:21:25 SIG Service: type=audio number=1 name=HD1
16:21:25    Audio component: id=0 port=0000 type=1 mime=4DC66C5A
16:21:25    Data component: id=1 port=1000 service_data_type=265 type=3 mime=BE4B7536
16:21:25    Data component: id=2 port=1001 service_data_type=265 type=3 mime=D9C72536
------
16:21:34 LOT file: port=1001 lot=42 name=SLABCD$$010000.png size=4949 mime=4F328CA0
------
16:21:40 LOT file: port=1000 lot=1337 name=album_art.jpg size=9667 mime=1E653E9C
```

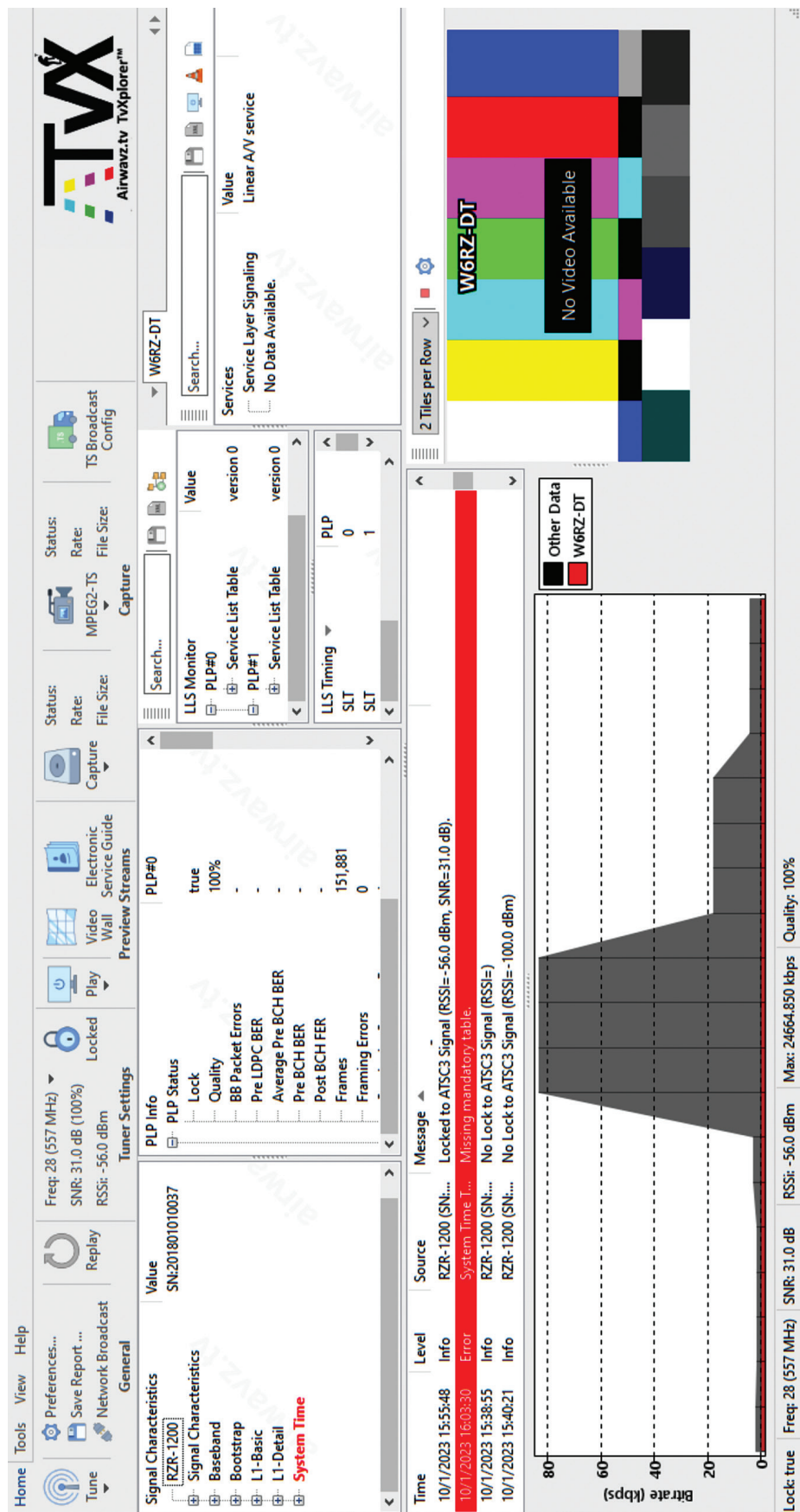Figure 3. NCSC-5 Receive Log Extracts.

Figure 4. TVXplorer Display of GNU Radio ATSC 3.0 Transmitter.

Figure 5 shows the modifications I made to the field test script described in a previous column. In addition to changing the location function to work with the USB GPS, I modified the portion of the script that grabs the field strength data to remove the PID data so the echoed readings only include the SNR and signal level data.

```
echo "Begin readings for WBFS"
(dvbv5-zap -a 1 -I zap -c channels.zap "581000000" \
-m -t $RT 2>&1 | tee $DT.wbfs-dBm.txt | grep "Lock")
echo "End WBFS readings"

echo "Get location"
gpspipe -r -n $SAMPLES | grep G.GGA > $DT.location.txt
less $DT.location.txt | grep G.GGA
```

Figure 5. Field Measurement Script Modifications.

Figure 6 shows the Python function used for extracting the time and location from the GPS data. The two variables passed to the function are "mpath," the path to the location files saved by the field measurement script, and "mdate," the date in YYYYMMDD format that's is part of the file-name of the location file generated by the measurement script. The function returns a Python dictionary with filename time as a key and the GPS latitude, GPS longitude, a Google Maps URL for displaying the location on a map, and the GPS time (useful if the measurement computer's time is off).

I'm continuing to refine the script and the processing program. If you're interested in using either of these, please email me and I'll be happy to send you the latest version and help with configuration.

Comments and questions are welcome. Contact me at *dlung@transmitter.com*.

```python
1   def gpsparse(mdate,mpath) :
2       LocDict = {}
3       files = os.listdir(mpath)
4       for file in files:
5           a = file
6           b = (a.split("."))
7           LocTime = b[1]
8           if (re.search('location.txt',file) != None) & (b[0] == mdate) :
9               locFile = mpath + "/" + file
10              with open(locFile,'r') as gpsfile :
11                  gpsdata = gpsfile.readlines()
12              url = "Not available"
13              time = "N/Ax"
14              for item in gpsdata :
15                  if "$GNGGA" in item :
16                      rawdata = item.split(',')
17                      try:
18                          if int(rawdata[7]) > 3 :
19                              gpstime = rawdata[1]
20                              gpsrawlat = rawdata[2]
21                              gpslat = rawdata[3] + gpsrawlat[0:2] + ' ' + gpsrawlat[2:]
22                              gpsrawlong = rawdata[4]
23                              gpslong = rawdata[5] + gpsrawlong[0:3] + ' ' + gpsrawlong[3:]
24                              gpsloc = gpslat +', ' + gpslong
25                              time = gpstime[0:2]+ ':' + gpstime[2:4] + ':' + gpstime[4:]
26                              url = "https://www.google.c om/maps/search/?api=1&query=" + rawdata[3] + gpsrawlat[0:2] \
27                                  + '%20' + gpsrawlat[2:] + '%2C' + rawdata[5] + gpsrawlong[0:3] + '%20' + gpsrawlong[3:]
28                      except:
29                          gpsloc = "Corrupted"
30              gpsfile.close()
31              LocDict[LocTime] = [gpslat,gpslong,url,gpstime]
32      return(LocDict)
```

Figure 6. Python function for GPS data.

Women In Broadcast

BTS Features Sustainability Program At IBC Show

By Samina Husain, Vice President, Broadcast Technology Society

A successful IBC 2023 is behind us, where exhibitors showcased innovative solutions and attendees experienced the latest from industry. In addition, BTS held its "BTS@IBC" session, "Unlocking Sustainability: Innovating a greener future in broadcast and media."

In this edition of **Broadcast Technology** our first article is by Barbara Lange, chief executive officer of Kibo121. Barbara was the organizer and chair of the BTS@IBC thought-provoking session. In her article she stresses the impact of sustainability and the relevant role of the broadcast industry; adopting sustainable practices in the broadcast industry is essential. Read her outline of the session and watch the on-demand video, which is now available at *https://www.ibc. org/video/unlocking-sustainability-innovating-a-greener-future-in-broadcast-and-media/9982.article*

Our second article is by Marisabel Rodriguez, Global Services Delivery Manager at Google. She tells us about her experiences in the broadcast industry, data centers and the advancements in broadcast technologies. Her positive outlook suggests the future is bright and filled with opportunity.

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Thank you for all your support and contributions, the articles address interesting topics, motivate young professionals and engage women in broadcast. Tell us your stories, please reach out and share your thoughts on women in engineering/broadcast, recognizing their extraordinary contributions and achievements: email: *bts@ieee.org.*

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Unlocking Sustainability:
Innovating A Greener Future In Broadcast And Media

By Barbara Lange
Chief Executive Officer
Kibo121

The broadcast and media sector is a dynamic industry with a significant environmental footprint. While that footprint may not be as large as that coming from other industry sectors—energy, transportation, agriculture—it must grapple with the environmental challenges posed by energy-intensive data centers, electronic waste, and the carbon footprint associated with content production, manipulation, and distribution. Understanding and mitigating the industry's environmental impact is crucial in addressing global climate change concerns.

IEEE BTS tackled the topic of sustainability at the IBC 2023 event. The media tech sector can serve as a catalyst for innovation. By encouraging sustainable practices, from AI-powered energy management to blockchain-based supply chain transparency, the media tech sector will continue to push the boundaries of what is possible, ultimately advancing sustainability across the entire tech ecosystem.

My dedication to sustainability is rooted in the understanding that the media tech sector wields immense power and influence. With our lives increasingly intertwined with digital media, this industry has a unique capacity to shape public opinion and behaviors. It carries a profound responsibility to champion sustainability as a core message.

It is important to note that sustainability is not just about the E in ESG. It is also very much about social and economic concerns, too. Through social awareness among co-workers, as well as the community in which they work, and transparent governance with the right economic incentives, sustainability is about a holistic message that inspires individuals and organizations to adopt more mindful approaches having lasting impact.

The BTS session on sustainability program was designed to highlight a few case studies as well as to present some issues that are keeping us from a full understanding of the energy costs associated with media tech and broadcasting.

Case studies came in the form of presentations from a few broadcasters representing Grupo Globo, PMH, and the CBC, with each of these organizations on varying degrees of their sustainability journey. Grupo Globo's Manuel Belmar is the driver behind the Brazilian media company's big push on ESG initiatives. He told moderator Lisa Collins and the audience about how the company is embracing these initiatives in all aspects of the business from running green productions to giving back to the community through various educational initiatives.

Larissa Goerner, the chief technology officer of Proximus Media House, spoke with me about her group's approach to sustainable productions and how they will be conducting its first green broadcast production of an upcoming live music event in Antwerp. Thinking green means looking at all aspects of the production from how the staff arrive on set to what food and how much is ordered to understanding the best green tech to deploy. In addition to laying the foundation for ongoing green productions, she remarked about how excited the team is to incorporate sustainability in this new way.

Lisa Clarkson, the director of sustainability at the CBC, presented via a video highlighting the Canadian Broadcasters for Sustainability, a new initiative brought together by 22 Canadian broadcasters from across the country to promote and foster sustainable productions and content. This is the first time such a broad and diverse group of Canadian public and private broadcasters from different linguistic and regional markets have come together for a common cause.

The ATSC's Madeleine Noland and the DVB's Elfed Howells spoke with BTS's Peter Siebert on their respective organizations' sustainability efforts. ATSC recently formed Planning Team 9 on Sustainability that will study the benefits of broadcast data delivery as relates to sustainable energy usage. Howells spoke on the recent research conducted by the DVB in a study mission on "Energy Aware Service Delivery and consumption (EADS)". The study mission concluded that energy efficiency in DVB specifications shall be improved without placing unreasonable restrictions on functionality and ultimate technology choices.

One of the challenges that the media tech sector is tackling is in exactly understanding its true energy costs from production to distribution. Many have referenced terrestrial television as having the smallest carbon footprint among distribution methods. But when one considers the full infrastructure required to deliver a broadcast signal, is it still the lowest carbon footprint? Understanding the full picture of the media workflows and their carbon emissions impact is just one of the hurdles that the industry needs to overcome. Coming to consensus and standardizing around the methods and measurement boundaries is essential as next steps.

Andy Quested, most recently of BBC, moderated a lively session called, "Navigating the Power Puzzle." Among the large panel, there were plenty of opinions on what is true and what is hype and in what areas research is needed. Speakers included Vincent Grivet from LoCAT, Will Pickett from Carnstone for DiMPACT, Dom Robinson from Greening of Streaming, Erik Renhard from ITU-R), Tom Moran from Lumen and Kristan Bullett from Humans Not Robots.

The three-hour session concluded with a discussion with Doug Johnson, of the Consumer Technology Association. As it turns out, the CTA has been working on sustainability in some form for more than 15 years, so it was great to gain insights.

I was grateful to having been invited to produce this session, which I believe is in the essential quest for a better and more sustainable world. By emphasizing sustainability within the media tech sector, IEEE BTS is helping to amplify awareness, mobilize action, and drive meaningful change toward a greener and more sustainable future.

The Evolution Of Broadcast Technologies In Data Centers

By Marisabel Rodriguez
Engineering Manager
Global Services Delivery Manager

I started my career as an infrastructure engineer, and this gave me the opportunity to participate in different industries, like the chance to start working in broadcast and then participate in many changes of paradigms in television distribution. In this article I would like to explain how data centers are related to broadcasting, and how this relationship is evolving.

Broadcasting is a communication service that has been around for centuries. In the early days, broadcast technology was analog, meaning that signals were transmitted as continuous waves. This required specialized equipment and infrastructure, and it limited the quality and reach of broadcast signals.

In the 1980s, digital broadcast technology began to emerge. Digital signals are discrete, meaning that they are represented by a series of numbers. This makes them easier to transmit and process, and it allows for higher quality and more efficient use of bandwidth.

The adoption of digital broadcast technology has led to a number of changes in the broadcast industry. One of the most significant changes is the rise of data centers. Data centers are facilities that house computer systems and associated infrastructure. They are used to store, process, and distribute digital content, including broadcast signals.

The use of data centers in the broadcast industry has a number of advantages. First, data centers can provide a more scalable and reliable infrastructure than traditional broadcast facilities. Second, data centers can be located closer to end users, which can improve the quality and reliability of broadcast signals. Third, data centers can be used to distribute broadcast signals to a wider range of devices, including smartphones, tablets, and computers.

The evolution of broadcast technologies in data centers is still ongoing. As new technologies emerge, data centers will continue to play an increasingly important role in the broadcast industry.

Here are some specific examples of how broadcast technologies have evolved in data centers:

Video transcoding: In the past, broadcast signals were transmitted in a single format. However, with the rise of streaming services and other new devices, there is now a need to transcode broadcast signals into multiple formats. This can be done in data centers using specialized hardware or software.

Asset management: Data centers can also be used to manage broadcast assets, such as video files, graphics, and audio files. This can help broadcasters to organize and store their assets more efficiently, and it can also make it easier to find and use the assets when needed.

Video streaming: Data centers are also playing a major role in the growth of video streaming. By hosting video streaming servers, data centers can help broadcasters to deliver high-quality video content to a global audience.

The evolution of broadcast technologies in data centers is opening up new possibilities for broadcasters. By using data centers, broadcasters can improve the quality, reach, and efficiency of their broadcast services. They can also reach new audiences and create new revenue streams.

The future of broadcast technology is likely to be even more data-centric. As new technologies emerge, such as virtual reality and augmented reality, broadcasters will need to use data centers to deliver immersive and interactive experiences to their audiences.

The field of broadcast technology is constantly evolving. If you are interested in a career in this field, it is important to stay up-to-date on the latest trends. You can do this by reading industry publications, attending conferences, and networking with other professionals.

Broadcast technologies offer an almost infinite number of possibilities for highly-qualified jobs all around the world, but these are not very well advertised, as the younger generation tends to have more interest in content creation than in creating technologies. I wish that younger people would realize that working in the development of new technologies can also be interesting and exciting, and can have fun like I have had all these years.

BTS Distinguished Lecturer Addresses DTT Workshop Audience

Topics include content delivery, A-to-D transitions, and sustainability

BUSAN, SOUTH KOREA

Amal Punchihewa, BTS Distinguished Lecture (DL) provided a presentation on the current state of digital television on July 21 as part of the Global Digital Terrestrial Transmission Workshop held here July 19–21. The event's program was organized by Sung-Ik Park, chair of the BTS Daejeon Chapter, and attracted more than 80 persons, including many IEEE-BTS members.

In his presentation, Punchihewa offered a look at the current broadcast and media climate, delivery methods, a description of the Asia-Pacific Region (APAC) with respect to the region's composition, diversity, current digital terrestrial television (DTT) adoption progress, as well as the opportunities and challenges facing this region of the world. He also discussed sustainability for the broadcast and media sector, the future of broadcast TV, online-only content delivery, the concept of "digital-first," broadband connectivity and spectrum issues.

Punchihewa noted that in the current broadcast and media climate, technologies are advancing at a rapid pace and that broadcasters face fierce competition today, as well as ever-changing audience consumption patterns. He observed too, that audiences are experiencing many challenges and are being harmed because of difficulties associated with regulation of content delivery, and high inflation with its associated increasing cost for services. He stated that, additionally, supply chain and manufacturing services have yet to recover from the global pandemic, and there is now a gap in accessing information.

He stated that the complete value chain from capture to receiver needs to be digital in order to realize the full advantage of this delivery technology, noting that in most cases video is being acquired via high-resolution digital cameras; however, some countries are still transmitting this content in a lowered-resolution analog format.

Punchihewa explained that there are several forms of digital television delivery available, including terrestrial, satellite, cable, IP-based (managed IP and over the Internet), a mixture of these, and hybrid with seamless integration with broadband (IBB) technologies such as HbbTV, Hybridcast, and Ginga.

"Transmission needs a carrier, either guided or unguided," said Punchihewa. "Terrestrial or ground-based and satellite direct-to-home (DTH) services are over-the-air (OTA) as unguided delivery methods. Cable television (CATV) is a guided transmission."

He noted that over-the-broadband (OTB) services can be described as using a virtual "pipe" to provide online, IP-based media services, with any of those either free-to-access (FTA) or pay-to-access.

Punchihewa observed that there are four digital television transmission standards recognized by the International Telecommunication Union (ITU), and that some of those standards have all three forms of delivery, (terrestrial, satellite and cable). He noted also that these standards have evolved over several generations—two generations of terrestrial broadcasting, three generations of satellite broadcasting, and two generations of cable transmission.

He stated that the ITU has recognized 5G broadcasting as a DTT option, and some countries such as Austria have already added 5G broadcasting to the 470 MHz to 694 MHz terrestrial broadcast spectrum region, along with DVB-T and DVB-T2.

"5G broadcasting trials are being done in some countries," said Punchihewa. "The European Broadcasting Union's 5G MAG (Media Action Group) initiative has been collaborating with 3GPP (the third-generation partnership project).

"Previous attempts to introduce Mobile Broadcasting failed due to not having devices, a business case or both. All of these earlier mobile broadcasting technologies, including MediaFLO, DVB-H, DVB-T2Lite, ATSC-MH and ISDB-Tmm, were very capable at the time of development. NOTTV of mmbi was the only service that at least ran for two years, beginning in 2014 and ending in 2016 due to poor profitability."

Amal Punchihewa

Punchihewa added that India is currently exploring an ATSC direct-to-mobile (DTM) service, and prospective mobile broadcasters need to investigate the availability of broadcast frequencies in addition to devices and use cases.

Analog-To-Digital Transitions In The Asia-Pacific Region

"The Asia-Pacific Region consists of East Asia, Southeast Asia, and Oceania which border the Pacific Ocean," stated Punchihewa. "South Asia, Mongolia, Myanmar, and the Russian Far East could include 49 countries. In the APAC, there are 38 countries in Asia and 11 countries in the Pacific. There can be sub-regions such as ASEAN (an intergovernmental organization of 10 Southeast Asian countries, including Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam) and SAARC, which comprises eight member states, including Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

"Based on my research and study, 12 countries have completed the analog switch-off (ASO). However, 37 APAC or Asia-Pacific countries have yet to do so. The countries that have completed analog switch-off are; Japan (2011), South Korea (2012), Australia (2013), New Zealand (2013), Mongolia (2015), Singapore (2019), Malaysia (2019), Vietnam (2020), Samoa (2020), Brunei (2020), Thailand (2020), and India (2022)."

Punchihewa then described several challenges associated with migration to a fully digital environment.

"The first of these," he stated, "is the cost involved and the enormity of the task. For certain countries with larger geographies and a widespread population, the deployment of the transmission networks is capital intensive. Having a large transmission network—from hundreds to, in some cases over a thousand analog transmitter sites—the conversion of these to digital in a reasonable time is seen as a challenging task. Not only (is there) the establishment of infrastructure for digital, but also the (requirement for maintaining) a simulcast service for a given period. This involves a lot of money and resources. Added to these difficulties is also the burden of providing set-top boxes to the masses."

He observed that another impediment to moving digital-to-analog conversions forward is that these are not viewed as a priority by some governing bodies.

"Many governments still do not see the move to digital as a priority, hence the move is not fully endorsed or supported by the necessary authorities and the necessary initiative and push is not available," he said.

Punchihewa also cited a lack of cooperation among various stakeholders as a factor in rollout of fully digital services.

"In many countries, the move to digital is not initiated as a collective effort by all the stakeholders involved," he said. "This includes public, as well as private, broadcasters, regulators and others. This is also partly connected to the previous point on government priority areas."

He noted too the issues associated with developing technology standards and ever-evolving technologies.

"The technologies are evolving at a rapid pace," he said. "However, digital terrestrial transmission technologies are mature, with several providers and supporters readily available. There are still cases, however, where some still feel it may be better to wait for the next technology or the next standard. Many of the experts have already shared their views that a major change or upgrade is not possible as current standards are providing performances close to the theoretical limits in current form. In some countries, there is still debate on which digital terrestrial television broadcasting (DTTB) standard to choose from DVB-T2, ISDB-T, ATSC3.0, DTMB or 5G."

Punchihewa observed that while lack of broadcast spectrum is an issue in many countries, availability of spectrum is not necessarily an incentive to move to digital broadcasting.

"(Having spectrum available) means that the benefits of digital can immediately be initiated," he stated. "Broadcasters do not need to vacate the spectrum for government to explore these benefits. This leads to (a lack of) drive or initiative from policymakers and authorities."

Another factor in sluggish adoption of OTA DTV service is the availability of content delivery from sources other than terrestrial television broadcasts.

"In certain countries, direct-to-home services from satellite and cable services have gone digital and are readily available, especially in main cities and population centres at reasonable costs," said Punchihewa. "These options provide many of the benefits that digital media could offer to viewers. Hence, there is little demand for digital terrestrial from the public which makes digital terrestrial propositions delayed."

Achieving Sustainability In Content Creation And Distribution

Sustainability was also a part of Punchihewa's presentation. He stated that such a practice influences broadcast operations and needs to be a part of the core business.

"The broadcast industry needs to address climate change issues, minimize carbon footprints, work on 'net zero,'" he

said. "Broadcasters need to start using carbon calculators, and implement certification schemes. We have been talking about those for too long, now it is the time to 'walk the talk'. We should combine the digital transformation of media and broadcast operations with the organization's sustainability journey."

Broadcasting Continues To Improve And Evolve

Punchihewa next provided an update on some of the more recent initiatives in the area of content distribution to mass audiences.

"Industry is improving streaming performance to optimize quality of experience (QoE), resource requirements, scalability, and other factors compared to over-the-air (OTA) broadcasting services," he stated. "The switchover of radio to digital platforms is also still in progress in many countries. There was an announcement from BBC about online-only delivery."

He also noted that in November, WRC23 will be discussing 2030 spectrum issues in ITU Region 1.

"Some broadcasters have decided to offer 'world services' online only," he said. "Those may relate to the digital-first strategy of their organizations.

Some Of The Challenges Ahead

"A key role of future broadcast distribution technologies is to unify both broadcast/media delivery and discovery in a converged broadcast/broadband environment.," said Punchihewa. "Broadcast and media suffer from the fierce competition from other media and platforms that are quick to publish. The broadcasters, especially public service media, have to adapt to compete and succeed in a fiercely competitive broadcast market while maintaining the values that have underpinned them for decades.

"Broadcast in digital-first refers to the strategy of prioritizing digital channels over traditional broadcast channels. This strategy is used by media organizations to reach audiences through digital platforms such as apps, social media, websites, and mobile apps. The goal is to provide content that is easily accessible and shareable on digital platforms. Digitization and digitalization stages of digital evolution have little value today and we need a new mindset to start a digital transformation journey keeping sustainability at its core."

Punchihewa noted, though, that such a digital transformation will not be possible without universal broadband access.

"Online or IP-based delivery needs connectivity," he said. "However, 2.7 billion people are unconnected globally. The diversity in APAC amplifies problems. Current DTT deployment levels are not acceptable to provide universal services to ensure access to information."

Punchihewa underscored the need for sustainability models in concluding his presentation.

"There is diversity in APAC across many facets and dimensions. DTT deployment has not progressed widely enough in the region. Future television delivery would be hybrid, converged and multiplatform. Sustainability is a core consideration as we are heading to the next decade."

Editors Note: This article was prepared from information supplied by Amal Punchihewa.

Participants at the July Global Digital Terrestrial Transmission Workshop.

The Downward Path To Broadcast Engineering—No. 33

What part of "aberration" isn't clear to you?

By James Snyder

In 2008, I was required to design a video transport system to carry all of the video feeds of the United States Congress to the Library of Congress' National Audio Visual Conservation Center (NAVCC) in rural Culpeper, Virginia for recording and preservation. The Library of Congress (LOC) had agreements with the U.S. House and Senate recording studios to preserve the video outputs provided by the House and Senate chambers. (Some may think of this as "C-SPAN", although the actual cameras and video feeds are produced by the House and Senate themselves.)

At the time, the House was still recording their feeds on videotape, while the Senate had moved to a production-quality, lossy-compressed video format. Both of these still had to be converted to the LOC's JPEG2000 mathematically-lossless MXF video archive file format. If both the House and Senate video feeds could be directly encoded to the JPEG2000 archive file format, it would allow the LOC—in the case of the House video feeds—to eliminate the physical transport, handling, storage, and playback of the videotapes being produced. And in the case of the Senate's lossy compressed videos, it would eliminate the cost of the servers required to receive these files, and the equipment and time necessary to transcode them to JPEG2000 lossless files.

After investigating the feasibility of doing the JPEG2000 encoding on location at the Capitol Hill locations of the House and Senate recording studio, it was determined that there wasn't enough physical space, power, and air conditioning that

Photo courtesy of Wikimedia Commons

could be made available to house the equipment. The only really cost-effective option was to transport the feeds via fiber to the Library of Congress's off-site NAVCC facility in Culpeper, some 70 airline miles (about 110 kilometers) distant. There the feeds would be recorded directly to the Library's moving image archive file format.

There would also be a side benefit in doing this, as the NAVCC would be able to send and receive audio and video to and from various Washington, D.C. Library of Congress and U.S. Capitol locations where events were routinely held (such as the LOC's Coolidge Auditorium). The NAVCC facility could also send video from its own event spaces to other Library of Congress and Congressional facilities, such as the Capitol Hill cable TV systems that feed the House, Senate and Library of Congress buildings.

Once the requirements and budget were approved by LOC management, we began the implementation of the system. The necessary DTM-over-SONET switches and support equipment were acquired, and the dark fibers that were needed to handle connections were assigned by the Library's and Architect of the Capitol's networking teams.

We determined that the best design would be to use long-haul lasers to make a direct connection all the way from Capitol Hill to Culpeper, Virginia, with about 100 route miles (160 kilometers) of fiber involved. We got the specs from the vendor as to what type of fiber they were using along the route, ascertained what type of chromatic correction was needed for the type of fiber installed, determined the correct type and wavelengths of the SONET lasers that would be required to operate over the Library's existing DWDM system, and after all of the necessary acquisitions were done, we set about to test the equipment. This was where the "fun" began.

'It Seems To Be Working, But Where's The Video"

While the switches at each end of the fiber circuits detected acceptable light signal levels, we could not get a usable video signal out of the switches. The bits looked right, but the payload just wouldn't show up. The DTM-over-SONET switch vendor, which had been involved from the beginning, checked all their systems, and we also had the Library's dark fiber vendor look into the fiber route from downtown Washington to the Culpeper campus. Despite these efforts, we still did not have a usable fiber link between the venues.

It took several weeks of conference calls and examining switch interfaces to finally determine what was wrong. It should have been obvious, but was not. As we discovered, the dark fiber feed that ended up in Culpeper was different than the fiber that started out on the Capitol Hill end of the circuit. However, that's not that unusual in the world of fiber optic interconnectivity, as different fiber segments are sometimes installed at different times. But what was odd in our situation was that we found that while we could get a usable signal at the midpoint of the circuit running from Culpeper to Capitol Hill, the fiber segment from Capitol Hill to the midpoint was providing numbers that just didn't make any sense.

We checked everything. The light intensity was correct. The light wavelengths were correct (they weren't somehow getting jumbled on between the start and end points). However, the light signal showed degradation that the type of fiber involved wasn't supposed to exhibit, and further, did not fit any manufacturers' specifications for known fiber types!

Troubleshooting High And Low

To get to the bottom of the problem required the dark fiber vendor to go into the field, and climb poles and enter the manholes leading to the underground cableways and conduits containing the fiber run.

A younger (and pre-fiber mismatch experience) James Snyder sets up an early high-definition camera in connection with the Harris/PBS DTV Express 'road show.' (The specially-built truck provided many with their first look at digital and high-definition television during its 40-city tour in 1998.)

After a lot of time, the vendor finally found the problem—a different type of fiber had been hot-spliced in between two segments matching the specifications in the vendor's documentation. Although this "oddball" fiber amounted to only some 1,300 feet (about 390 meters), or less than 0.2 percent of the overall 100 mile fiber path, it totally skewed the overall circuit parameters. While this "hybrid" fiber passed the laser transmitter light very readily, the mismatch threw all of the specifications completely out the window, resulting in a physical link that didn't match any known operational characteristics.

Chromatic Dispersion Matters A Lot

The "fix" took the form of a custom-engineered chromatic dispersion correction device inserted into the problematic fiber link. (The vendor decided that this was a more expedient solution than to physically remove and replace the different type of fiber.) Once the chromatic aberration was properly corrected, the link worked as expected.

There were several "lessons learned" for me from this adventure:

(1) Always ask your dark fiber vendor for the exact type or types of fiber being used along your custom communication link, and be sure to do this early on in the project.

(2) Always test your links, both primary and backup, to make sure everything works right well before the connectivity is needed.

(3) Never assume network documentation is correct. Expect the unexpected, plan for it, and, most importantly, budget for it. It's always better to have funds available to handle the unexpected than not have them available and delay the project. (Fortunately, we had budgeted for such contingencies and had funding available to correct them.)

This experience provided a key lesson in my more than 40 years of experiences gained over the fascinating and varied journey in my telecommunications career. Such "lessons learned" aren't going to be found in textbooks, and can ultimately prove to be of immense value in our overall store of knowledge as we move forward, and hopefully, my particular "lesson" may prove of value to others.

About The Author

James Snyder is a consultant in media engineering and preservation technologies with 43 years of experience in television, radio, and associated technologies. His current projects include developing multispectral and low-cost, high-quality film scanners, mass migration, metadata, and dataset design, along with telecommunications and production systems design and construction. Snyder served as seniors systems administrator for the Library of Congress' NAVCC Culpeper, Virginia facility from 2009 to 2023 following work on the design and construction of the facility while employed at Communications Engineering Inc. (CEI). He is a SMPTE Fellow and a manager of the Washington, D.C. SMPTE Section. Snyder was the recipient of the 2007 Emmy award in connection with the ATSC digital television standard, and was presented SMPTE's James A. Lindner Archival Technology Award in 2020. He is a member of the AES, AMIA, HPA, IASA, IEEE, NATAS and SMPTE.

ITU Report

By David Guerra Pereda, BTS Member

This Is A Wrap!

As I explained in the previous issue of **Broadcast Technology**, I am continuing (and wrapping up) my overview of the most significant ITU Reports that I've prepared during my authorship of this column. These also are the ones that I enjoyed writing the most, as I bid everyone farewell and end my participation with this publication.

One particularly surprising subject for me was the one dealt with in the column that ran in the first quarter of 2017—"Worldwide Broadcasting Roaming." This was a very positive surprise for two reasons: (1) the magnitude of the challenge on the one hand, and (2) the requirement of worldwide collaboration on the other. The proposal presented aimed at receiving radio, multimedia, or television programs worldwide using a single receiver, allowing for fixed and mobile reception, and including Internet interactivity. The first step was to study system requirements in order to create a list of functionalities for future consumer receivers.

The scope of such functionalities included coverage of the HF, VHF, and UHF spectrum bands, and it posed several challenges. A big challenge is that broadcasting services operate on diverse frequency bands worldwide, and with different source-coding and channel-coding systems. Standards, as well as legal restrictions, vary from country to country. In addition, this universal receiver should be compact, lightweight, and operate with low power consumption. It should incorporate flexibility for adding decoders for emerging or less common systems, as well as be user-friendly with such features as selection of language options through standardized metadata. The development platform should be based on software-defined radio. Hopefully this line of work will be on the agenda at the next convening of the WRC.

Communications In Times Of Emergencies

Also in 2017—this time in the fourth-quarter issue of BT, I described the active work of the ITU in creating a consistent framework for emergency communications. The ITU-R plays a critical role in relief communications for delivering information to disaster-affected populations, with such communications provided by both fixed and mobile satellite services, maritime radio systems and, last but not least, established terrestrial broadcasting services. The unique qualities of shortwave radio, including long-distance propagation and gratuity of its services, were highlighted, showing that it is indispensable in reaching regions where other platforms may be unavailable. The ongoing work, involving frequency coordination and the use of emergency transmission vehicles, is expected to improve emergency communications through redundant and free-of-interference broadcasting systems, enhancing overall disaster response and relief efforts. The column in the second-quarter issue of 2018 completed the picture with the International Radio for Disaster Relief (IRDR) project, emphasizing the inclusion of Emergency Warning Systems (EWS) in broadcasting receiver equipment, so that receivers are automatically activated when an alert is issued, along with area and time codes to prevent fake alerts. Digital Signage (DS) was introduced as a system for delivering visual alert messages through broadcast networks.

'Unintentional Emitters' And The Potential Problems They Present

Among the "black-swan" subjects, the first-quarter 2020 column clearly stands out with its discussion of wireless power transmission (WPT) systems as potential interferers to radiocommunication services. WPT systems are not part of radiocommunication services, and thus have no designated frequency allocation. However, most of these systems generate RF energy through switching-mode techniques, resulting in unwanted radiated emissions, including harmonics. Non-beam type systems, which use near-field inductive, resonant, and capacitive coupling, are non-directive, so they are more prone to leaking RF energy. Radiocommunication services operate near their reception performance limits, making them susceptible to interference from WPT harmonics, with this affecting quality and reliability. Administrations should classify WPT under a specific spectrum category in order to protect radiocommunication services by setting emission limits for WPT equipment, considering factors like operating frequency, power, and distance from potential interfered radio receivers. Additional measures, such as synchronization of WPT systems to broadcasting raster frequencies and the filtering of RF unwanted components, should be considered, depending on WPT system types and interference avoidance requirements.

Another special subject was featured in the 2020 second-quarter issue. This explained the countermeasures proposed by the ITU in reducing photosensitive epilepsy seizures

caused by TV images, with this initiative in collaboration with the World Health Organization.

The Global Pandemic

Covid-19 and the issues and lifestyle changes that it came with it could not be ignored in this compilation of columns. In the ensuing period of pandemic-driven confinement, every-day life and activity could continue to a great extent mainly due to information and communication technologies (ICT). I noted that, unfortunately, in such critical circumstances the digital divide that still persisted within and between coun-tries. The fourth-quarter 2020 ITU Report summarized ac-tions undertaken by this organization to expand and improve ICT services worldwide, in general, and more specifically at such critical points such as hospitals, and even within the ITU itself. Through cooperation and the achievement of sustain-able development goals, the ITU established some initiatives that involved broadcasting services, such as community radio stations for educating hard-to-reach populations in their lo-cal language. At the same time, the ITU, in collaboration with partners such as the World Bank, World Economic Forum, and Global System for Mobile Communications, launched a short-term action plan to enhance digital connectivity during and after the pandemic, providing best practices for govern-ments and regulators.

Broadcast-Related Standards Examined

There has also been a prolific series of columns devoted to commenting on emerging broadcasting systems or sub-systems. The Real-Time Audio-Visual Information System was introduced in the column appearing in the 2019 first-quarter issue of **BT**; the renewal of sound broadcasting practices in the era of ultra-high definition, and enabled the AC-4 and MPEG-H 3D Audio Low Complexity Pro-file systems was treated in the following issue. The 2019 last-quarter column included a set of advanced transmis-sion and reception methods for broadcasting, such as the concept of Distributed Input Distributed Output and the use of orbital angular momentum. Convergent Digital Radio was introduced in in the first-quarter 2021 col-umn, and the virtues of the ATSC 3.0 DTV transmission standard were commented on in the fourth-quarter 2021 issue of **BT**.

In summary, for more than 10 years I have been given the opportunity to write this column, for which I am eternally grateful to IEEE Broadcast Technology Society. I greatly ap-preciate James O'Neal's assistance, guidance and suggestions in preparing this column for all of these years. Thank you very much!

Finally, as I am writing the end of this column, two neigh-bors are excelling at performing atrocities against each other in the Middle East. In a column about Telecommuni-cation and International Union I can only say that only by talking can we come to an understanding. I suppose it must be very difficult to consider your enemy a valid interlocutor but as someone once said, "we only make peace with our enemies". We'd better when the only alternative to talking is death.

Upcoming Events

of Interest to BTS Members

- **Jan. 9–12, 2024** – CES Show and Exhibition – Las Vegas Convention Center; Las Vegas, Nevada
- **Jan. 23–26, 2024** – AES International Acoustics & Sound Reinforcement Conference – Le Mans University; Le Mans, France
- **Feb. 19–22, 2024** – HPA Tech Retreat – The Westin Mission Hills; Rancho Mirage, California
- **April 14–17, 2024** – NAB Show – Las Vegas Convention Center; Las Vegas, Nevada
- **May 17–19, 2024** – Dayton Hamvention – Green County Fair and Expo Center; Xenia, Ohio
- **May 21–23, 2024** – CABSAT – Dubai World Trade Center; United Arab Emirates
- **May 29–31, 2024** – BroadcastAsia – Singapore Expo; Singapore
- **June 15–17, 2024** – AES EU International Convention – Universidad Politécnica De Madrid; Madrid, Spain
- **June 19–21, 2024** – IEEE International Symposium on Broadband Multimedia Systems and Broadcasting; Toronto, Canada
- **June 26–28, 2024** – Communications & Broadcasting Week – Koto-Tokyo Big Sight International Exposition Center; Tokyo, Japan
- **Sept. 13–16, 2024** – IBC Show 2023 - Amsterdam RAI; Amsterdam, Netherlands
- **Oct. 9–10, 2024** – NAB NY Show - Jacob Javits Center; New York City, New York
- **Oct. 21–24, 2024** – SMPTE Media Technology Summit – Los Angeles, California

(IMPORTANT NOTE: Event dates and locations listed above are subject to change. When making plans to attend any of these trade shows, conferences, or meetings, *always* confirm details with event organizers first.)

If you have information on broadcast-related events that may be of interest to other Broadcast Technology Society members, please submit them at least three months in advance to the Broadcast Technology editor at BTSeditor@ieee.org.

What's New

Broadcast Technology presents new product releases from broadcast equipment manufacturers

Loudness Meter Plug-In

Nugen Audio's latest audio loudness metering plug-in, the VisLM 3, supports up to 22.2 channels of audio and provides integrated, short-term, and momentary loudness measurements, as well as LRA (loudness range), dialog LRA and true peak indications. The software tool includes a full set of international and regional metering presets, covering all common loudness standards for television, cinema, and streaming, and may be configured for a user's legacy, internal, or station-specific specifications.

The VisLM plug-in also allows users to include time-stamped notes, annotations and comments associated with an audio project using Nugen Audio's "Jotter" functionality. It also features a loudness history graphing function that is locked to timecode, to provide a permanent record of audio levels.

For additional information, please visit Nugen Audio at *www.nugenaudio.com.*

Hybrid OTA/Internet Radio System

The RadioDNS system combines over-the-air radio with the Internet to provide listeners with an enhanced user experience, providing logos, radio station information, and other visual material. The hybrid system operates with both analog FM and HD Radio OTA broadcasts, and operates from a standardized platform to allow a station to reach many different kinds of RadioDNS-compliant devices.

RadioDNS is the not-for-profit membership organization that sets standards for hybrid radio, allowing broadcasters and set manufacturers free access to this hybrid delivery standard. RadioDNS is not a service provider or a content database, so all station-transmitted content goes directly to receiving devices. The system is now on-the-air at stations in North America and Europe, and is being incorporated into car radios by several vehicle manufacturers.

For additional information, please visit RadioDNS at *https://radiodns.org.*

Television Signal Generator

Leader Instruments' new LT4670 synchronous signal generator is designed to aid television broadcast and production operations in transitioning from SDI to IP-based infrastructures, and provides six independent analog signal outputs along with digital audio and word-clock signals sources.

The signal generator features both genlocked blackburst and tri-level synch outputs, a compact 1-RU form factor, both a "stay-in-sync" function that maintains output stability in the event of a genlock signal error or failure, hot-swappable power supply and fan units, a range of preset and memory functions, linear timecode input/output, and more. A number of options are available, including a lip-synch pattern output for measuring audio/video timing inconsistencies, and a PTP

(precision time protocol), function allowing the unit to serve as a grandmaster.

For additional information, please visit Leader Instruments at *www.leader.com*.

JPEG-XS To HDMI Signal Conversion

Cobalt Digital's new Sapphire BBG-2110-H/S single-channel mini-converter provides an easy and cost-effective way to display JPEG-XS content on HDMI video monitors. The small format device is designed to mount behind the monitor and provides both HDMI and SDI conversions from the received JPEG-XS signal. It also supports audio and data delivery via SMPTE ST 2110-30 and ST 2110-40.

The mini-converter features quiet fan-less cooling; user control via a web interface or through the company's Dash-Board control system; support for 720p, 1080i and 1080p video; support for both in-band and out-of-band NMOS IS-04/IS-05, along with in-band PTP support; dual power supplies for enhanced reliability; and operation via either 10G or 25G Ethernet through SFP 28 fiber interfaces

For additional information, please visit Cobalt Digital at *www.cobaltdigital.com*.

Studio Camera Platform

Grass Valley has announced the release of a new compact version of its LDX 150 studio camera platform, the LDX

C150, that's designed to help ease the transition from SDI to native IP/SMPTE 2110 content acquisition. The camera is engineered to provide exceptional picture quality in both 4K UHD and 1080p HD, with high dynamic range and wide color gamut capabilities. It's small size and low price point make it ideal for live sports and event coverage.

The camera's features include a new six-times shooting speed, an updated shading control panel and tablet application, both locally- and remotely-adjustable color grading, a viewfinder with both SDI and HDMI inputs, and more.

For additional information, please visit Grass Valley at *www.grassvalley.com*.

5G Bonded Cellular Transmitter

TVU Network's new ONE bonded cellular transmitter utilizes the most up-to-date antenna design, Sub 6GHz, 3GPP Release 16, and 5G embedded modem to provide broadcasters with an enhanced coverage area, increased data transfer rates, and ultra-reliable connectivity. In addition, it provides synchronized frame-accurate live event coverage, with switching for up to four video sources. It's advanced antenna system provides multiple antennas for each of the unit's modems and supports MIMO linking with supported carriers.

ONE has the most advanced antenna array on the market featuring multiple antennas per modem, including the ability to support MIMO uplink with supported carriers. The transmitter weighs in at less than 4 pounds (1.79 kg) and aggregates with all available wireless and wired data paths for transmission, including Starlink and 5G modems.

For additional information, please visit TVU Networks at *www.tvunetworks.com*.

Beltpack Wireless Intercom

Pliant Technologies has announced a new addition to its MicroCom wireless intercom product lineup, the MicroCom

863XR wireless beltpack. This latest model is designed for use in Europe with operation in the 835 to 865 MHz ISM frequency band, where unlicensed devices are permitted in most European countries. The intercom provides two channels of communication and operation with as many as six full duplex users and is ideal for use in a range of field and indoor applications.

The 863XR features rugged construction, a operation with a battery that's field replaceable, operation without a base station, an easy-to-read OLED display. Options include a drop-in battery charger and a four-wire input/output interface.

For additional information, please visit Pliant Technologies at *www.plianttechnologies.com.*

4K Camera

Blackmagic Design's new Micro Studio Camera 4K G2 is the latest version of the company's ultra-small form factor 4K UHD television camera, and is equipped with a new sensor providing 13 stops of dynamic range and an ISO of up to 25,600 to allow high-quality shooting in low light conditions. The new model also adds 12G SDI operation for generating 2160p60 imagery and is ideal for use in applications with insufficient space for conventionally-sized studio cameras.

It features a USB-C expansion port for recording Blackmagic RAW files to external storage drives; networked control via Ethernet adapters; an MTF lens mount that's compatible with a wide variety of lenses from Olympus,

Panasonic, Sigma and others; an HDMI output that supports tally, control functions, an input for return video, and more.

For additional information, please visit Blackmagic Design at *www.blackmagicdesign.com.*

Robotic Camera Trolley

Telemetrics has introduced its fifth-generation robotic camera trolley, the TG-5. The new trolley can be installed flush with a studio floor, allowing it to blend with set designs with no visible robotic camera track visible. It incorporates a number of safety features, including laser scanners at each corner of the unit to sense human intrusion across the track and automatically stop motion.

The TG-5 features an ergonomic design, a very compact electronics package, backward compatibility with all of the company's Televator elevating column products and S5-series robotic pan/tilt heads, operation on both curved and straight tracks, enhanced speed control and more.
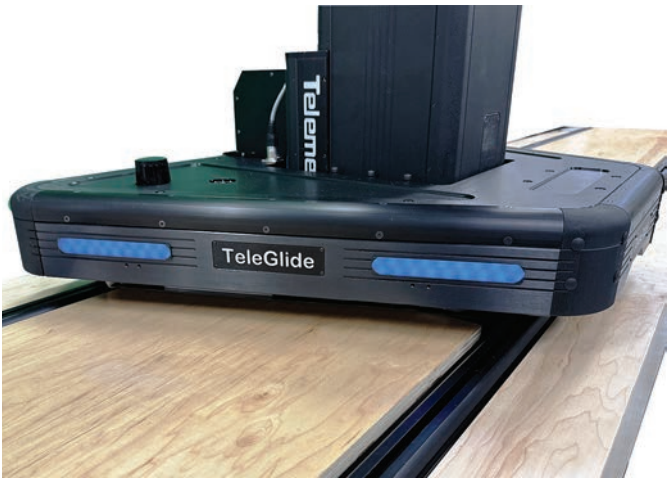
For additional information, please visit Telemetrics at *https://telemetricsinc.com.*

Editorial Deadlines

Broadcast Technology welcomes contributions from its members. Please forward materials you would like included to the editor at BTSeditor@IEEE.org. Here are our editorial deadlines for upcoming issues:

Issue	Due Date
Quarter 1	Jan. 10, 2024
Quarter 2	Apr. 3, 2024
Quarter 3	June 28, 2024
Quarter 4	Oct. 31, 2024

Calling all Chapter Chairs

The IEEE Broadcast Technology is interested in your chapter activities, but have you ever wondered how to write a chapter report. Below are some directions that can help you get your chapter noticed.

Information for submitting Chapter Reports:

• Chapter Reports ideally should run approximately 200 to 500 words. (If a really newsworthy or unusual event is being described, we can accept slightly longer Reports, but nothing greater than 800 words.) We are looking for a summary of the event program or presentation. Please keep Reports straightforward and focused on the event. When someone is mentioned in a Report, it is very important that we receive the person's full name, title or position, organization they are affiliated with, and their connection with the story.

- Please identify all recognizable persons in your photos. We need their names, with title or position and affiliation. (Example: Mr. John Smith, vice president of consumer electronics production, Ajax Corporation.) If there is more than one person in a photo, please clearly identify everyone from left-to-right; please do not assume that we know persons depicted and will be able to fill in this blanks.

•This need for complete identification also applies to place and building names. Please make sure to provide the complete location of the event. (Don't just say the meeting took place in Smith Hall, as readers will likely not know that Smith Hall of part of the School of Engineering at Jones University.) Provide complete information about meeting venues.

• Very important—submit your Report as a straight Word file with no embedded logos, pictures, etc. Please do not send PDFs.

• Pictures are a very important part of every Report; however, they need to be good quality and tell a story; i.e., if a presentation is made at your meeting, your photograph should show the presenter standing at a podium, or at a chalkboard, etc. Group photographs are nice, but we really need at least one good photo of the lecturer making his/her presentation. Image size is very important too. An image that is acceptable on a Website is not necessarily large enough for publication in a printed magazine. Images must be at least 250 kb in size (one to two MB preferred). These must be sent as .jpg file attachments—no PDF— and PLEASE DO NOT EMBED IMAGES IN REPORTS.

• Please include answers to all of the following questions in your first paragraph: **Who** was involved? **What** happened? **Where** did it take place? **When** did it happen? **Why** (what was the reason?). Further, if the event you are describing was facilitated by an institution (university, company, etc.) that provided a meeting room, refreshments, etc.. Please include this information in every Report.

• Also, when submitting a Report, please provide complete identification about yourself, including your title or position and the name of the organization that you are affiliated with.

• Lastly, Reports must be timely. They need to be received by the **Broadcast Technology** staff no later than two to three weeks after the meeting or event took place.

If these items are not received in the required order, the Editorial Assistant will contact you for a revision. The **Broadcast Technology** editorial staff thanks you for your cooperation. We look forward to receiving and publishing your Reports. If you have any questions please send an email to btseditor@ieee.org

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