

FUTURE



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For Radio, It's Wait and See About 5G

Still plenty of guesswork involved when asking how next-gen wireless will play out

BY RANDY J. STINE

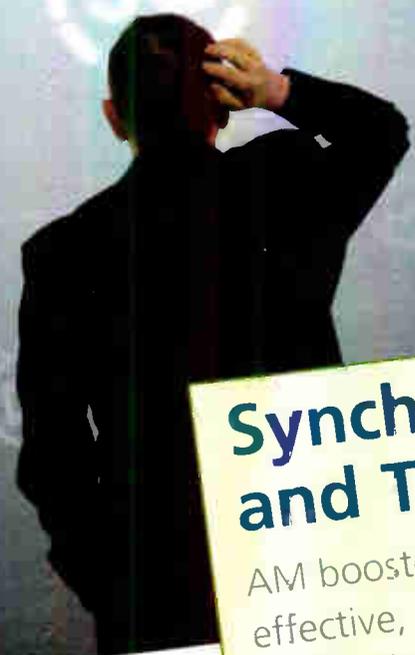
The problem facing broadcasters trying to capitalize on 5G-fixed-wireless is they don't know what it is or isn't yet.

Prior to this month's CES show, Gary Shapiro, president/CEO of the Consumer Electronics Association, assessed the state of 5G for the Jacobs Media blog: "In 2019, 5G moved from trials to commercialization, with commercial launches in the U.S., Europe and Asia. By 2022, the majority (76%) of smartphones shipping in the U.S. will be 5G enabled," Shapiro said.

"This year, 5G is capable of significantly greater data capacity for video and telepresence applications, significantly more connections at a time and ultra-low latency. The U.S. is now in a global race for 5G leadership, and connectivity — delivering anytime/anywhere access and information — and it is one of the driving trends of our time."

And 5G's potential content delivery powers continue to tantalize radio technical experts.

(continued on page 3)



Synchronous AM's Long and Tortuous History

AM boosters repeatedly have been proven effective, but the FCC consistently has declined to allow their wide use

BY JOHN F. SCHNEIDER

With AM improvement on the radars of broadcasters and the FCC, there has been renewed talk in recent years about the subject of AM "boosters,"

the carrier frequency synchronization of multiple transmitters. The commission opened a comment period on AM boosters in 2017.

It wasn't the first time the FCC has

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CONTENT

Managing Director, Content Paul J. McLane,
 paul.mclane@futurenet.com, 845-414-6105
Senior Content Producer — Technology Brett Moss, brett.moss@futurenet.com
Content Manager Emily M. Reigart, emily.reigart@futurenet.com
Technical Advisors Thomas R. McGinley, Doug Irwin
Technical Editor, RWEE W.C. "Cris" Alexander
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Contributors: Susan Ashworth, John Bisset, James Careless, Ken Deutsch,
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Production Manager Nicole Schilling
Managing Design Director Nicole Cobban
Senior Design Director Karen Lee

ADVERTISING SALES

Senior Business Director & Publisher, Radio World
 John Casey, john.casey@futurenet.com, 845-678-3839
Publisher, Radio World International
 Raffaella Calabrese, raffaella.calabrese@futurenet.com, +39-320-891-1938

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5G

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Though the phase-in of 5G networks has begun, the full technical evolution is three to five years off, experts say. This leaves radio broadcasters time to think about ways to take advantage of the next-generation of cellular networks.

The new wireless platform will be superior to earlier generations of mobile systems, with significantly greater throughput and considerably lower latency, according to those who follow the sector.

Fifth-generation cellular technology is expected to have a transformative effect on multiple industries, including audio and video delivery. 5G is initially being deployed in mobile broadband networks alongside 4G/LTE, with stand-alone 5G deployments following at a later stage.

Technical experts say 5G — which was also the theme of several NAB Show sessions last year, and presumably will be again this spring — has the potential to transform how radio broadcasters operate, with enhanced wireless data transmissions and more data-intensive applications, and even point-to-point links.

It's difficult to answer the question about how radio as an industry may take advantage of what 5G has to offer. It's an emerging technology, and geographic availability is yet to be defined.

— Michael Beach, NPR

The FCC continues to conduct 5G spectrum auctions, recently reallocating part of the C-Band spectrum for its use, which will be critical to the deployment of 5G services and applications. And broadcast equipment suppliers like transmitter manufacturers and codec makers reportedly are experimenting with 5G in order to explore the potential of next-gen wireless, even though industry standards have yet to be set.

The point-to-point communication capabilities of 5G could someday eliminate the need for traditional STLs and other high-capacity data circuits for broadcasters.

Much has been written about the implications on video, including virtual reality and e-sports, but the end game for radio depends on the timing of 5G full implementation, since the adoption curve for 5G is a few years from completion.

Observers say broadcasters need to approach 5G from both the standpoint of what it means for consumers and for how stations acquire and deliver content.

"As 5G networks become more ubiquitous, wireless technologies will be incorporated into more consumer devices, expanding the availability of streaming services beyond even where it is today," said Ari Meltzer, a partner in the telecommunications, media and technology practice at Wiley Rein LLP.

"And because 5G signals have more bandwidth



Getty Images/diyun Zhu

than traditional AM or FM signals, radio broadcasters should anticipate having to compete against the almost limitless variety of programming that will be available over 5G networks."

Radio broadcasters would be wise to incorporate 5G into their long-term planning, Meltzer said, even if some guesswork is involved.

"Radio broadcasters need to analyze how listeners are consuming their content and how that is likely to change as consumer adoption of connected devices continues to grow at an exponential pace. While this may create challenges for the traditional linear programming model, it also creates opportunities for radio broadcasters to provide expanded interactive services and to reach listeners in new ways with new content," he said.

The European Broadcasting Union's project group 5G Deployments is addressing technical and non-technical issues related to business arrangements, deployment models and regulatory conditions for 5G mobile systems, according to Darko Ratkaj, EBU senior project manager for technology and innovation.

"Where available, 5G will provide improved connectivity with high speed and low latency, which would improve the user experience with audio streaming," Ratkaj said. "However, streaming of audio services is already possible over 4G networks and WiFi, and this is increasingly popular. Therefore, the impact of 5G will be incremental, rather than revolutionary. Much will depend on the availability and performance of 5G-enabled user devices."

In addition, one of the main benefits that 4G and 5G bring to broadcasters, Ratkaj said, is the "possibility to deliver content and services to personal devices, in particular mobile phones, which cannot receive signals via terrestrial or satellite broadcast networks."

He added, "Content distribution over mobile networks such as 4G and 5G may require different commercial arrangements compared to conventional broadcasting."

The connected car is expected to make use of 5G next-gen technology as the service rolls out; indeed the connected car is likely to hog a lot of its capacity.

(continued on page 4)



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5G*(continued from page 3)*

A radio working group of the North American Broadcasters Association notes that 5G is often cited as the primary path forward for vehicle connectivity. "It is believed by many in the automotive space that 5G video application and vehicle-to-vehicle communication will use the majority of 5G's capacity," the committee wrote in its report "The Value Proposition of Radio in a Connected World," published last year.

TOO SOON TO SAY

Technical observers say it is too early to begin architecting radio's future with 5G but acknowledge the need for the industry to consider all opportunities to share audio and metadata in a better connected world.

"It's difficult to answer the question about how radio as an industry may take advantage of what 5G has to offer. It's an emerging technology, and geographic availability is yet to be defined," said Michael Beach, VP of distribution at National Public Radio.

Milford Smith, principal with Smith, Khanna and Guill Inc., said while 5G is being rolled out by various carriers, some more aggressively than others,

he thinks it's going to take nearly ubiquitous availability before broadcasters explore new applications.

"One thing is for sure, it's unlikely that there will be much need much longer for heritage wired pathways for out-of-studio events," Smith said.

handoffs. This remains a limitation. The back end structure required to make this work will still struggle, I believe."

As the small cell infrastructure in high-density areas for 5G is built out, the 5G canopy will expand, McCoy said.

"The new spectrum will linearly

The impact of 5G will be incremental, rather than revolutionary. Much will depend on the availability and performance of 5G-enabled user devices.

— Darko Ratkaj, EBU

Another veteran engineer said how media is consumed will affect the efficiencies of using 5G next-gen services. "Audio is mostly consumed while mobile, whether jogging through the park or commuting to the office," said Frank McCoy, CE at Salem Media Chicago. "Video is delivered more often to stationary devices. It's a lot easier to maintain smooth connectivity through a single path than through an environment that requires regular system

expand throughput per cell, but that's it. To exponentially gain throughput requires more and smaller cells, so this isn't a problem that's easy to solve."

There are technical implications of 5G adoption, too, McCoy said. "I expect 5G will look a lot like 4G but with more bandwidth. It's still physics-limited to about 3.7 data bits per spectrum Hertz, though. And it may come without support for IPv4. Better study up on IPv6."

McCoy said he is unaware of any 5G planning done by Salem Media, though fixed, point-to-point services should benefit from more bandwidth. "Then again, the Silicon Valley folks seem to come up with new, better consumer tools that require ever more bandwidth to function. And free connectivity may emerge, driven by ad content, as radio is," he said.

There will be investment costs for broadcasters to be ready for the 5G world, said Richard Engelman, a technical consultant with Wiley Rein LLP.

"Given the variety of ways in which radio broadcasters can adopt 5G technologies, the range of required investments will vary tremendously," he said.

"At one extreme, because 5G is a network technology that can be used to distribute a variety of content, radio broadcasters can invest in IP-based content distribution and take advantage of 5G without any incremental cost for 5G itself. At the other extreme, building new point-to-point links or equipping studios and remote facilities to take advantage of 5G technology will require both an upfront capital investment and, potentially, investments in the spectrum required to deliver the signal," Engelman said.

See related story, page 5.



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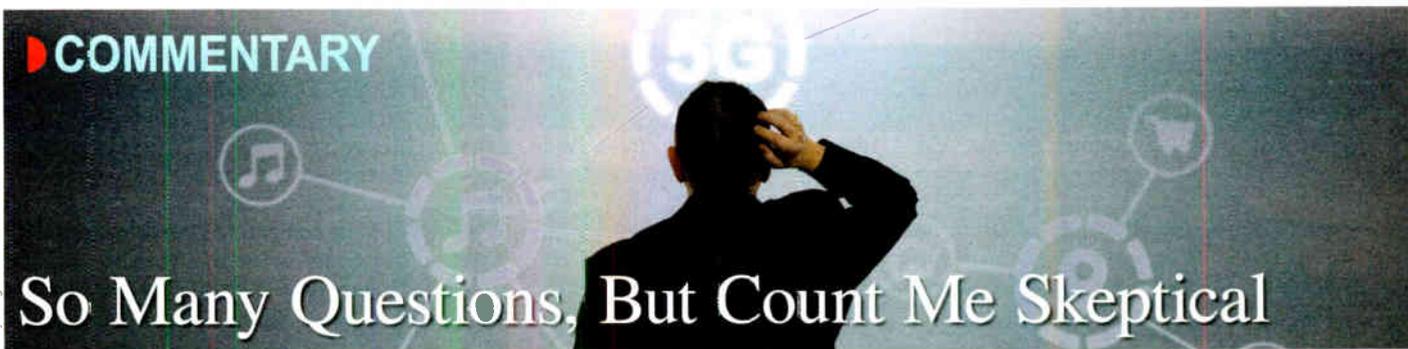
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We asked one of our resident tech thinkers to muse on whether 5G will be a big deal

BY MICHAEL LECLAIR

Where might 5G lead for radio? Radio World shared the article you just read (page 1) with Michael LeClair, chief engineer of Boston's WBUR and former tech editor of Radio World Engineering Extra, who has watched 5G's development with interest, from a distance, and invited him to comment.

There are so many questions raised by 5G that it's almost impossible to know where this will lead. We don't yet have a clear direction defined for what 5G is and isn't.

From what I'm reading, there are multiple implementations of 5G. What was initially promoted was the concept of using SHF band licensed channels (3 to 30 GHz) where they could fit them in. Those of us using licensed microwave links in broadcasting are familiar with 6, 11 or 23 GHz. These are allocated in bands of 10 to 20 MHz (you can combine adjacent bands for more bandwidth if

you need it), which are like communication channel building blocks. Based on the distance you need and what can be done without interfering with other licensed users, you can build out links capable of doing 100 Mbps or greater. At the higher speeds, dynamic QAM is used to achieve very high modulation rates; but the tradeoff is the number of errors that will occur due to signal strength, weather conditions and the size of dishes.

But the promise was 1 Gbps for 5G. Bidirectional. And mobile.

The simplest way to increase the data rate is to increase the channel size. For example, to get 1 Gbps data with a very robust QPSK modulation scheme similar to what we already use in 4G, you would need channels 500 MHz wide. This one channel would utilize more spectrum than the entire radio and TV broadcast bands combined (plus the unlicensed 2.4 GHz band to boot!). It's more than all the spectrum currently licensed for all wireless carriers combined.

The only place where this kind of

spectrum is still available is in spectrum above 30 GHz, or EHF. Lots of spectrum for sale up there. There has been discussion of displacing satellite communications operating in the 4-6 GHz range with mobile data services. If they absorb those frequencies there would be four channels of 500 MHz bandwidth in every city of the U.S., enough to handle the largest cell carriers today (Verizon, T-Mobile, AT&T and Sprint).

But that spectrum is already largely in use. That is causing Ph.D.s and engineers to look at what can be done with transmissions at EHF (30-300 GHz). EHF attenuates in atmosphere very rapidly. The usable transmission distance might be 100 feet or so. To build cell service across one square mile would require 2,500 transmitters per square mile. Even a smaller city would require tens of thousands of transmitters, each with a dark fiber connection to some kind of central (or networked) router. Initial trials of this kind of 5G have taken place in Boston and have been found to only work on street corners at the moment. Once you move inside a building or any physical structure they fail.

(continued on page 6)

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With Consoles, It's All About Connectivity

Palmer: We'll see analog boards for a long time yet, but with growing cohesion between digital and analog

Ben Palmer is the sales manager and engineer for Arrakis Systems.

Radio World: What role does the console play today when planning a broadcast studio?

Palmer: The radio console is the main hub and foundation for your studio. It is where any engineer should start for their design, and should meet the current and future needs of your buildout. Considerations should be made for what a studio will need five to 10 years down the road. But don't stress about this. Realize that you can start with what is needed today, knowing that expandability is very feasible while utilizing AoIP.

Radio World: So what is the top trend in consoles for radio studios?

Ben Palmer: The broadcast radio market

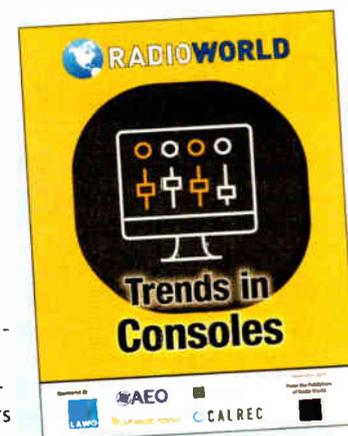
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The DARC Virtual is a software-based board, and it is becoming more and more common for studios to use touchscreens. Yet we are finding that an equal portion are wanting a physical surface, which is why the DARC Surface does so well.

We feel like software consoles will become more and more affordable, and will add to the flexibility of the modern radio studio. The hardware interfaces also will become more and more



This article is from Radio World's ebook "Trends in Consoles." We've now published more than 50 ebooks on a wide range of topics that are of interest to the broadcast technologist or manager including AoIP, next-gen codecs, cloud technology, digital radio, RDS, DRM, translators and more. All are free to read. Find recent editions by clicking the ebooks section under the Resources tab at radioworld.com.



New boards are now future-proof. You can easily start off with a smaller system, but then expand using AoIP.

is becoming more and more competitive every day. As such, stations are needing equipment that is more innovative, flexible and cost effective. The tools need to make the staff's life easier but more dynamic. All the while, the installation needs to be user- and engineer-friendly.

Our ARC series analog boards broke the price barrier years ago. And adding features like USB, Bluetooth, Cat-5 wiring ... it has continued to meet most studios' needs. The ARC series has continued to be feature-rich, and helped keep new installation costs down.

AoIP has been a great step forward in our industry. It has simplified wiring, and has amplified flexibility. Our personal focus has been to make AoIP more affordable, and available to all. We introduced Simple IP over four years ago,

affordable, as we continue to innovate the manufacturing process and development. It is an exciting time in radio.

RW: What demands do you hear from potential buyers?

Palmer: Connectivity. People want to connect themselves and their devices easily, while being inside and outside the studio. When we introduced Bluetooth to our boards, we found that the majority of our users want the ability to wirelessly connect their devices. It made it so simple to pair a phone, a tablet or a recording device. It was much the same with the USB channel on our ARC boards. Connect your Windows or Mac PC, and play anything you want. No need to mess with complex wiring or switches.

Owners, along with their talent, are also wanting to be able to reach their studio from anywhere. We are seeing this with the software consoles, such as the DARC Virtual. With it, you can sit at home and manage your studio's board remotely. People want their devices to easily connect, but also want to control their board from anywhere.

RW: How vibrant is the marketplace for analog consoles? How long will

manufacturers of analog consoles support them?

Palmer: Analog consoles and equipment will be around for a long time. The beauty of AoIP is that you can connect any analog equipment to your network using nodes, such as Simple IP. So if you buy an analog board today, and expand your studios tomorrow, you can easily utilize AoIP with any existing analog studio. As it stands, you'll need analog interfaces for your mics, headphones, etc. And even though touchscreens have helped foster the use of software consoles, there are still many who prefer the feel of a physical interface.

I believe that we will see analog boards for a long time, but we'll continue to see a growing cohesion between digital and analog, such as with Bluetooth, USB, AoIP, etc.

RW: Any other thoughts for someone who is setting out to make a console system buying decision?

Palmer: Don't put off replacing your old board, or buying that new studio. We often hear of stations nursing 30-year-old boards, or getting used boards off Ebay. The cost of your time, stress and energy maintaining old equipment adds up fast. Whereas, high-quality brand-new boards are extremely affordable today.

The best part is, new boards are now future-proof. You can easily start off with a smaller system, but then expand using AoIP. For example, you purchase an ARC-10 console today. A couple years down the road you add a couple new studios and want the DARC Virtual console while utilizing AoIP. Just add a Simple IP (or Dante AVIO) node which connects your ARC-10 sources to the Dante network. With a simple ethernet network, you just connected multiple studios and your audio is accessible anywhere.

With the affordability of new equipment, and it being future-proof, there is no reason to wait. Don't be intimidated, and make the move.

NEWSWATCH

JOHN PORAY TO RETIRE

After nearly three decades of service, Society of Broadcast Engineers Executive Director John L. Poray will retire at the end of this year.

Society President Wayne Pecena will work with the board of directors to find a new leader for the organization but said in the announcement, "John has been a fixture of the SBE since 1992 who cannot be replaced. We can only seek to find a successor!"

The SBE was founded 56 years ago, and Poray has been with the society for almost exactly half of its existence. He was its first full-time executive director. Under his leadership, it increased membership to more than 5,000 members and 115 chapters across the U.S. and Hong Kong, as well as members in 25 other countries. During Poray's tenure, SBE also added to its certification, education and frequency coordination programs.

Poray said he looks "forward to a busy 2020" and says he will assist the board during the transition.

Prior to SBE, Poray spent more than a decade in other nonprofit organization management roles. He is a certified association executive. Poray began his career in with the Boy Scouts of America's Central Ohio Council and went on to work for Kiwanis International, The Apartment Association of Indiana and The Columbus Apartment Association.



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Avoid Battery Contamination on Circuit Boards

Also, Dan Slentz shares an amazing Ethernet cable organizing product

WORKBENCH

by John Bisset

Email Workbench tips to johnpbisset@gmail.com

Clay Freinwald, a principal in Clay Freinwald Technical Services, enjoyed reading “A Dead Battery Can Ruin Your Station’s Day” (Workbench, Nov. 13, 2019). Clay tells us that in his opinion, batteries are ticking time bombs waiting to attack their surroundings chemically. The losses and frustrations caused by this problem can be significant.

As for the BE transmitters with a 9 volt power set-point memory system, Clay is familiar with this approach; he said someone on a design team must have loved the idea, for it was used across a number of BE products. Not only did the designer place the battery right on the circuit board, they used a mechanical fastening system that Clay found frustrating. The battery was then hidden away, out of sight, behind a panel. The result, he feels, was a trap for an engineer who had no clue it was there.

Clay is not one merely to complain; he offers a solution to this problem. Pictured in Fig. 1 is a fix that Clay has deployed over the years. He constructed this “jumper” easily out of a couple of retired 9 volt batteries.

Peel back the metal case with needle-nose pliers or a pair of diagonal cutters (dykes) and remove the contact board. Observing the polarity, connect the two connector boards with a chunk of Belden 9451. Then plug the jumper into the socket on the printed circuit board. The other end of the jumper connects to the battery.

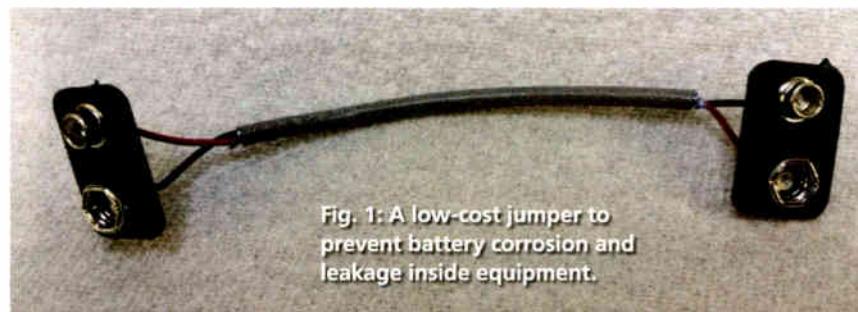


Fig. 1: A low-cost jumper to prevent battery corrosion and leakage inside equipment.

Clay’s design accomplishes a couple of things. First, it keeps the battery away from the circuit board. Second, you no longer have to deal with the frustrating battery clasp. If you construct one of these jumpers, as mentioned, be sure to watch the polarity as you solder the wires!

Further, in some cases, Clay has placed his battery assembly inside an empty plastic pill bottle; there is usually room in the BE rigs to hold this. Should the battery go bad or be forgotten, your loss is minimal; you can throw away the

whole corroded thing.

Using “dead” 9V batteries to provide the contact board reduces the cost of this jumper assembly to nearly zero.

When I maintained these transmitters and other gear with “memory-keep-alive” batteries inside, I added a label on the front of the equipment labeled “BATTERY INSIDE,” and left space

to mark when the battery was last changed.

Jay Melnick works for ColoRadio Communications Group. He has been following what has become a series of suggestions on keeping rodents out of your transmitter sites.

Jay offers a great resource for a variety of traps: YouTube! Particularly a channel named “Mousetrap Mondays.” The site has been around for a few years, and all kinds of traps for unwanted guests are tested. Some of the

solutions are do-it-yourself.

Charles Cooper provides engineering services in West Africa, where they too have rodent issues at transmitter sites.

Chuck reminds us not to forget to add pieces of charcoal along the rodent “Super Highway,” better known as the intersection of vertical walls to the floor, where mice usually travel. Chuck has found the charcoal will repel the rodents — maybe the smell of impending barbecue?

To keep the charcoal in place, drop a couple chunks in the toe of a woman’s old nylon stocking and knot the end. The smell still permeates the room, but the stocking reduces the chance that bits of charcoal or dust will dirty your site.

Dan Slentz sent me a really neat link for engineers who are turned on with orderly wiring.

Especially in this day of audio over IP, you usually end up with a cabinet or rack full of cable spaghetti — Cat-6 Ethernet cables of differing lengths, with no easy way to lace them up to make the bundles look orderly.

Dan’s “find” is a product called the Patchbox Plus+ from Austrian company Patchbox. Its retractable cables provide the perfect length cable every time. Network cable installation is also faster; you’ve got to see the video of their Patchbox Speed Challenge and how quickly interconnect wiring is installed. The company offers a number of pictures showing “traditional wiring” versus Patchbox Plus+ wiring. You’ll be amazed.

Here’s the website: <https://patchbox.com/patchbox-plus>.

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John Bisset has spent 50 years in the broadcasting industry and is still learning. He handles western U.S. radio sales for the Telos Alliance. He holds CPBE certification with the Society of Broadcast Engineers and is a past recipient of the SBE’s Educator of the Year Award.

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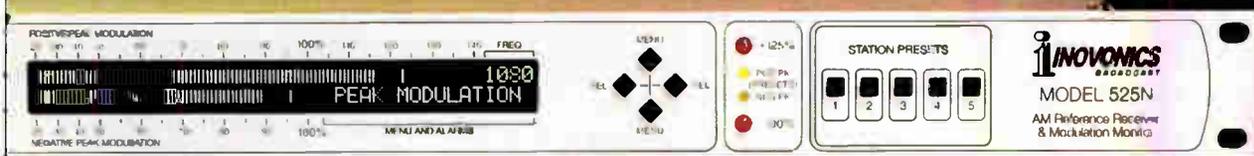
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SYNCHRONOUS

(continued from page 1)

explored this topic and failed to act on it. In fact, AM boosters have been proposed and tested dozens of times since the early days of radio. But even though the technology has repeatedly been proven effective, the commission consistently has declined to allow the operation of AM boosters on anything more than an experimental basis, for a variety of reasons.

Let's take a moment to look back at the history of this beleaguered technology.

BOSTON REPEATER

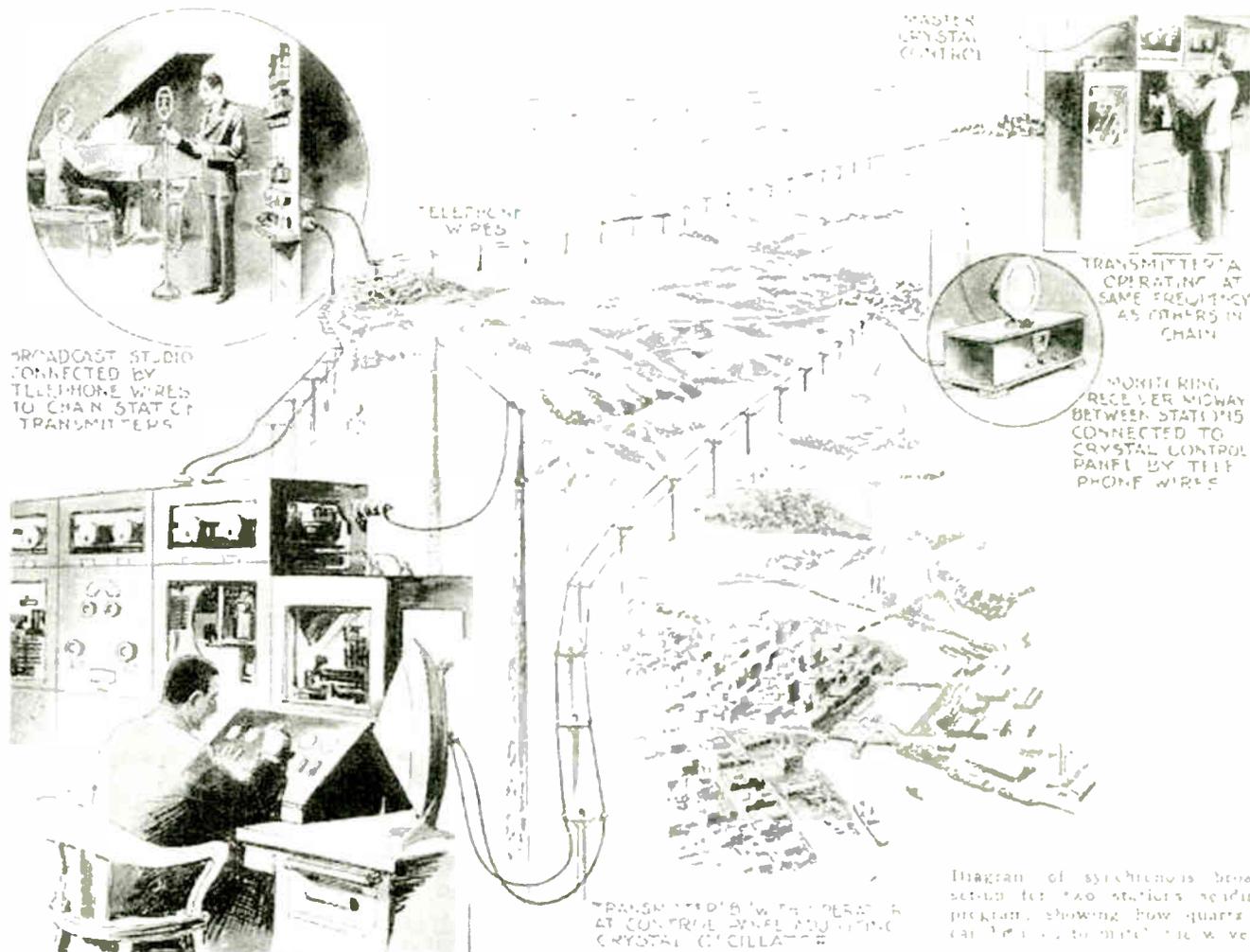
In 1930, crystal control of transmitter frequencies was still an emerging technology, and the allowable frequency tolerance of a broadcast transmitter was +/- 500 Hz. Two stations operating on the same channel, even if widely geographically separated, could generate a heterodyne beat note of up to 1 kHz, a disconcerting annoyance to listeners.

Consequently, only a few stations were allowed to operate nationwide evenings on any one channel at the same time. Further, there were 40 clear-channel stations, each one having exclusive nationwide use of its frequency. As most of these clear-channel stations were network affiliates, many channels were wastefully duplicating the same programs.

In 1929, the respected radio engineer Frederick Terman proposed that, if all stations of the two networks (NBC and CBS) could synchronize their carrier frequencies within +/- 0.1 Hz to eliminate the heterodyne beat notes, they could all coexist on a single channel per network, freeing up dozens of channels for new stations.

Synchronization was first proved successful by the Westinghouse station WBZ in Springfield, Mass. Broadcasting from the roof of the Westinghouse factory, WBZ failed to cover Boston, so WBZA was opened as a Boston repeater. The two stations were synchronized on the same frequency beginning in 1926, using a tuning fork as a frequency reference.

Synchronization improved coverage in some areas, but also created interference zones with distortion and fading wherever the two signals were roughly equal in strength. After a year of experimentation, a successful technology was



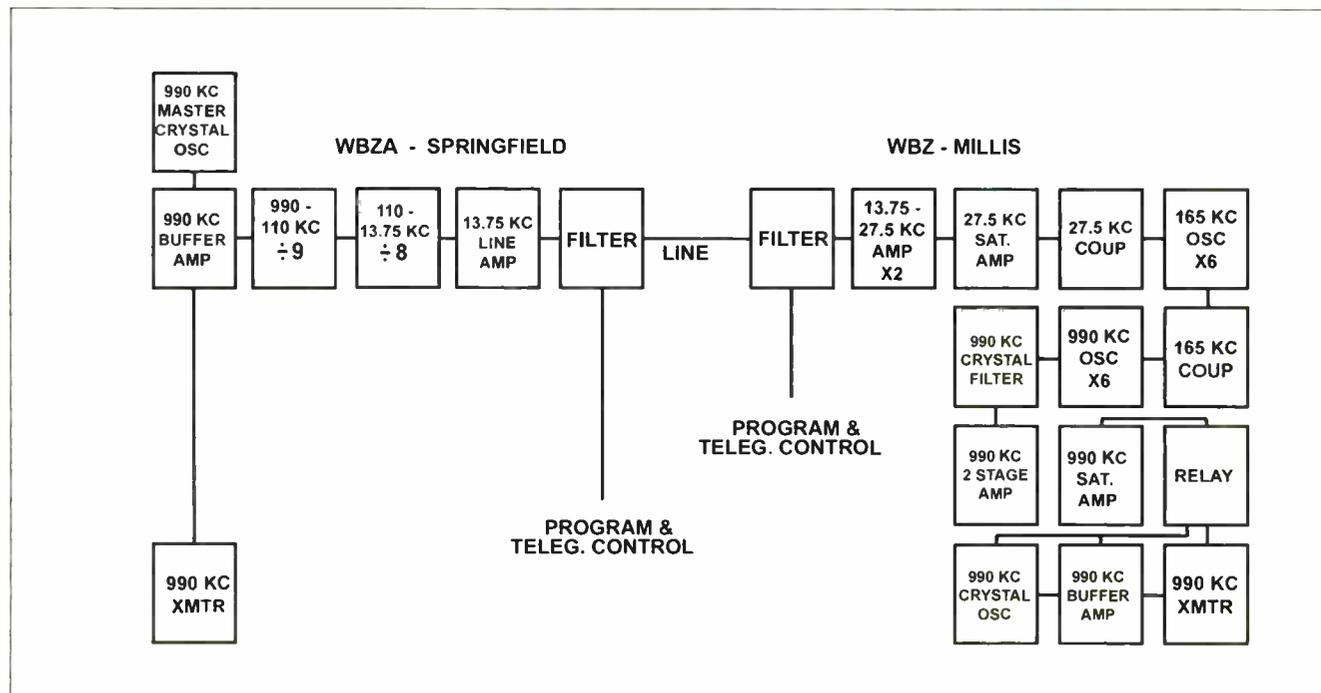
A graphic in the April 1931 issue of Popular Science explained the concept.

found: a master crystal oscillator in Springfield set the frequency for both transmitters. Its output was divided down to the audio range and sent by phone line to Boston, where it was multiplied back upward to drive the WBZ

transmitter.

Meanwhile, pressure was building on the networks to test synchronization, and in October, 1930, the Federal Radio Commission administered an overnight test on a single clear-channel

frequency, 660 kHz. Three NBC 50 kW stations, WEAJ, KDKA and WGY, broadcast the same program on the channel. It worked remarkably well. Long-distance skywave reception was greatly improved; fading was virtu-



WBZ in Boston synchronized its frequency with booster station WBZA in Springfield, Mass., beginning in 1926. The dual station operation — first on 900 kHz, then 990 and finally on 1030 — lasted until 1962, when Westinghouse was forced to shut down WBZA in order to purchase WINS in New York.

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ally eliminated. Whenever one station's signal faded, the others continued to provide clear reception.

Although NBC couldn't deny that the technology had worked well, it resisted. Its true reasons were not technical, but economic. It had become common practice to feed different network programs to different parts of the country to serve advertisers who only wanted regional coverage. With synchronization, such "split network" operation would no longer be possible. Also, NBC feared that giving up its clear channels would lead to the creation of competitive networks using the same system.

Nonetheless, NBC encouraged synchronization in the cases of several affiliate stations that shared time on clear-channel frequencies, thus allowing them to operate full time.

In 1931, NBC synchronized its New York flagship station WEFW with WTIC in Hartford. However, the stations were too close together, causing objectionable interference. Attempts at synchronizing WJZ in New York with WBAL in Baltimore had better results, and that operation continued until 1937.

Another successful synchronization experiment involved WHO in Des Moines and WOC in Davenport, Iowa, starting in 1930. B. J. Palmer owned both stations and operated them on 1000 kHz under the dual call sign WHO-WOC. Synchronization was accomplished using a new Bell Labs technology: An operator at a monitoring station halfway between the two transmitters monitored the beat note between the stations and remotely adjusted WOC's crystal oscillator every 10 minutes.

Although the system was successful, the operation ended in 1933 when WHO raised its power to 50 kW.

A similar technology developed by Western Electric synchronized WBBM in Chicago with KFAB in Lincoln, Neb. The two CBS stations had been time-sharing their 770 kHz frequency since 1928. In January 1934, they synchronized their carriers, broadcasting separate programs during the daytime and the same CBS program at night. A highly-accurate 4 kHz signal was delivered to both stations by phone line, multiplied up to the carrier frequency and compared with the transmitter, where a motor-driven variable capacitor adjusted its crystal oscillator. A unique part of this system was an audio delay line that retarded WBBM's programs by 20 milliseconds to compensate for the phone line delay between Chicago and Lincoln.

The combined nighttime coverage of these two stations was excellent, with almost no fading, and it continued in operation until KFAB changed frequencies in 1944.

Synchronization experiments were

not limited to high-powered stations. In 1936, WLLH in Lowell, Mass., received permission to operate a booster nine miles away in the city of Lawrence. This was the first time synchronization was authorized on a local channel, using 250 watts in Lowell and 100 watts in Lawrence. WLLH's special temporary authority became permanent when a license was issued for the booster in 1941, and it continues in operation today.

EVOLVING ATTITUDES

The FCC's attitude towards boosters began to change in 1939, apparently for

political rather than technical reasons.

That year, during an FCC oversight hearing, Rep. William Connery of Massachusetts declared his opposition to booster stations. He felt they represented new stations in new communities, and claimed they diverted advertising from local newspapers while providing no local employment. He named several boosters operating in his own district.

After that, the FCC began opposing boosters that added coverage in a new community instead of filling holes in a station's existing coverage. About a

dozen applications were denied for this reason.

In 1941, necessity created an exception to this policy for WBT in Charlotte, N.C. When the NARBA Treaty frequency shifts caused KFAB to move onto its frequency, WBT was forced to operate with a nighttime directional antenna to protect KFAB. To mitigate its loss of coverage, the commission allowed WBT to build a 1,000-watt nighttime booster in Shelby, N.C.

During and after World War II, the FCC's attitude towards boosters was

(continued on page 14)



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SYNCHRONOUS

(continued from page 13)

inconsistent. Powel Crosley's WSAI in Cincinnati was allowed to feed a 100-watt downtown booster from 1942 to 1945, but only during daytime hours. In 1944, a new booster was authorized to WRBL in Columbus, Ga., to cover Fort Benning. Then in 1944, the FCC approved two boosters in its own city of Washington. WWDC was allowed to install a 50-watt booster in Silver Spring, Md., and WINX was granted a 250-watt booster in Arlington, Va.

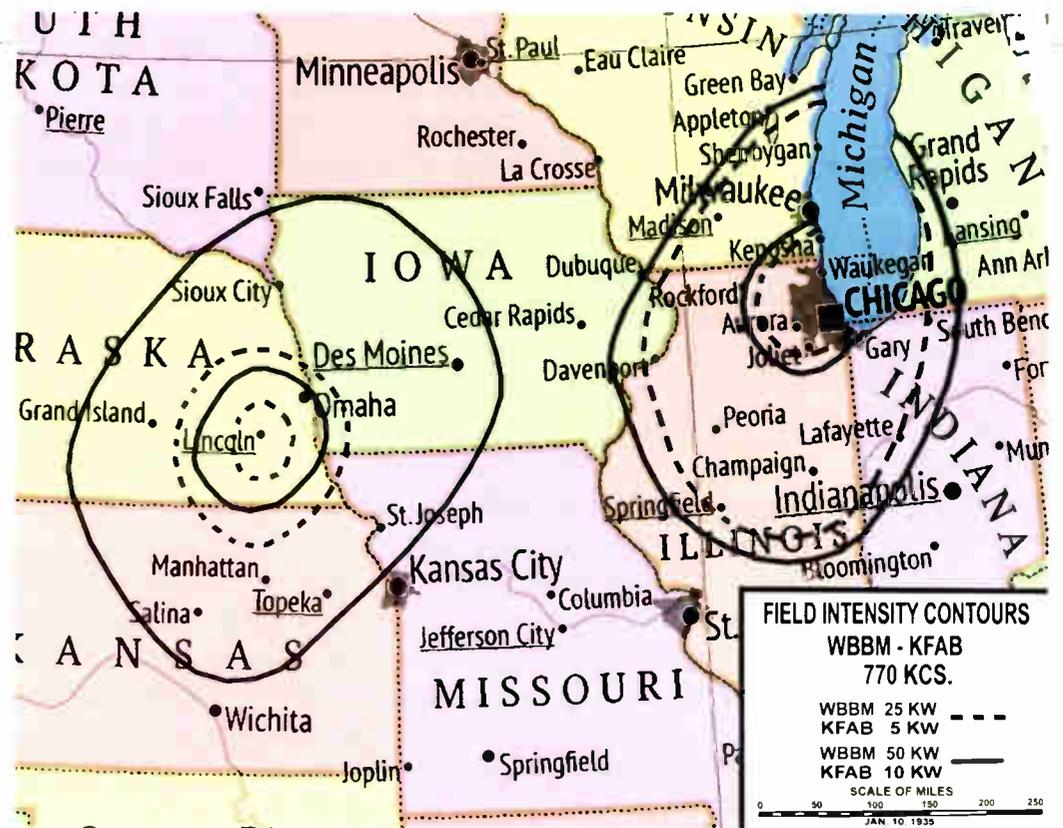
However, many other booster applications were rejected during this same time period.

By the 1950s, the FCC seemed to have set an internal goal of eliminating AM boosters, and it consistently pursued policies that resulted in the elimination of existing installations. This, plus the changing economics of AM radio in the face of competition from television, caused the shutdown of most of the boosters still in existence.

In 1954, the FCC ruled that Class IV (local) stations could not use boosters to extend their coverage areas because it was against the purpose of a local station license. WWDC's booster renewal was set for hearing in 1954 and subsequently abandoned by the station. And when WINX proposed to move its booster to a new site, the application was denied "since commission rules do not provide for such operation."

Yet another factor in the elimination of boosters was the FCC's "7-7-7" rule, adopted in 1953. It prohibited any station group from owning more than seven AM, FM or TV stations in the country, and the commission was counting booster transmitters as one of the seven stations.

(continued on page 16)

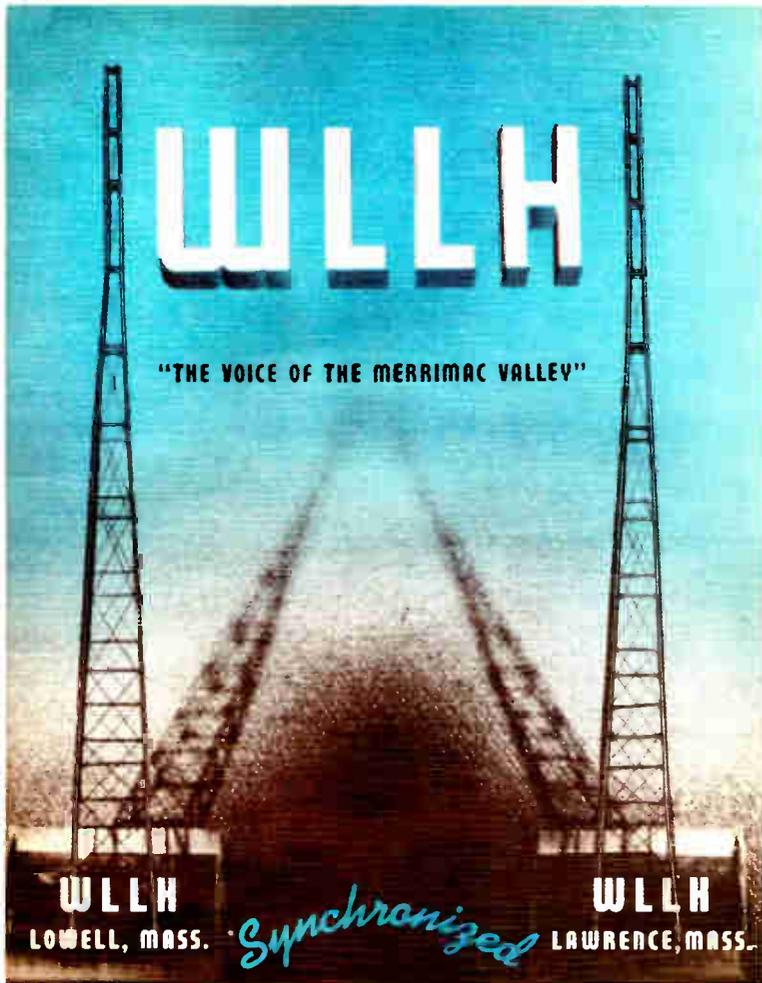


WBBM in Chicago and KFAB in Lincoln, Neb. (later Omaha) synchronized operations on the 770 kHz clear channel frequency from 1934 to 1941. This map showed their respective groundwave coverage areas. At nighttime, both stations broadcast the same CBS network programs, generating what was essentially a single received skywave signal.

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For more on this topic, readers may be interested in sources used in preparation of this article:

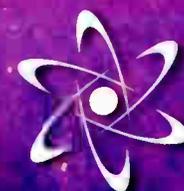
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The cover of a 1940s promotional booklet for WLLH in Lowell, Mass. The station began operating a synchronous booster in neighboring Lawrence in 1937. The booster received a license from the FCC in 1941, the only known case of a booster receiving anything more than experimental authorization. WLLH continues to operate with two 1 kW transmitters on 1400 kHz today.

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World Radio History

Listen to These on a Midnight Dreary

"Poe Theatre on the Air" productions interpret terror classics for podcast audience

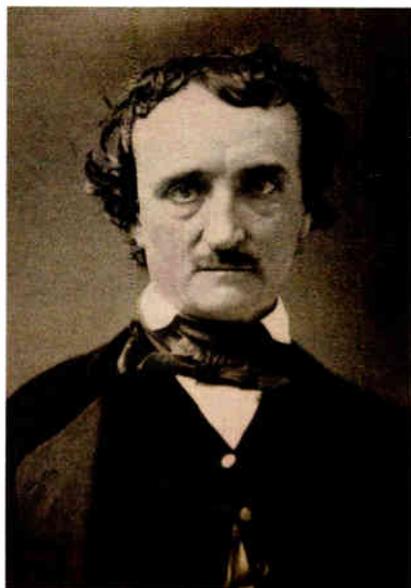
PODCASTING

BY JAMES CARELESS

"Very well, I admit the deed! Tear up the planks! Here! Here! It is the beating of the old man's hideous heart!"

This is the climax to Edgar Allan Poe's horror classic "The Tell-Tale Heart." And like many a classic, it's a familiar tale that becomes fresh again when the retelling is new and different.

This is why the National Edgar Allan Poe Theatre's podcast production of "The Tell-Tale Heart" is such a worthwhile listen. Hosted online by Baltimore NPR station WYPR 88.1 FM, "Tell-Tale Heart" is one of a series of Poe-based podcasts being produced by the company's "Poe Theatre on the Air" initiative.



Edgar Allan Poe

"Poe Theatre of the Air is based on the 'theater of the mind' approach to radio drama, which uses actors, music and sound effects to conjure up vivid stories in the listeners' imaginations," said Alex Zavistovich, the founder and artistic director of the National Edgar Allan Poe Theatre.

Orson Welles' famous 1938 "War of the Worlds" broadcast is based on the theater of the mind approach. The dark stories of Edgar Allan Poe lend themselves well to this audio production style, even though his 19th century tales were written long before radio came to be.

WHY POE?

An experienced actor and director as well as a former editor of Radio World, Alex Zavistovich is no stranger to radio drama. Previous to creating the National Edgar Allan Poe Theatre, Zavistovich founded and managed Lean & Hungry Theater, which performed radio adaptations of Shakespeare and other English literary classics. These adaptations have



been aired on NPR affiliate stations in Austin, Texas; Tampa, Florida; and Washington, D.C.

Although Poe was born in Boston in 1809 and then lived in Richmond, the indisputable Father of American Horror did much of his writing in Baltimore, where he died at age 40 after being found incoherent in Ryan's Tavern.

Poe's ties to Baltimore appealed to Zavistovich when he moved to this city.

"I learned that there was no national theater dedicated to the works of Edgar

(continued on page 18)

SYNCHRONOUS

(continued from page 14)

Thus, in 1953, CBS was forced to shut down its booster at WBT Charlotte to comply with the FCC's ownership limits. And in 1962, when Westinghouse wanted to purchase WINS in New York, it was forced to close WBZA in Springfield, even though it had operated successfully for nearly 40 years.

REVITALIZATION BOOST?

The FCC's Jekyll-and-Hyde attitude towards boosters hasn't changed in more recent times.

In 1987, the FCC showed renewed interest in the technology, accepting comments under Docket 87-6. Several stations built and operated successful boosters at that time.

One of these was KKOB in Albuquerque, N.M., whose new 50 kW nighttime array placed a major null squarely over the state capitol in Santa Fe. As KKOB was the primary emergency station serving the capitol, the FCC allowed construction of a 230 watt nighttime-only booster in Santa Fe, which continues to operate to this day. Another was KLSQ in Laughlin, Nev., who operated a Las Vegas booster from 1986 to 1995.

But in the end the FCC opted to continue its policy of authorizing boosters on a case-by-case experimental basis.

Beginning in about 2000, WISO in Ponce, Puerto Rico, was allowed to operate synchronized boosters in Aguadilla and Mayaguez under experimental authority. But in 2011, the FCC denied WISO's request for an additional booster station in Guayama, and in 2017 it abruptly cancelled all of WISO's experimental permits, without a clearly-stated reason and despite letters of protest from government authorities in Puerto Rico.



This is a view of the WLLH two-transmitter operation in the 1940s. At left was the station's main antenna in Lowell. At right was the 150-foot tubular steel tower on the roof of the Cregg Building in Lawrence.

In 2017 the FCC once again opened a rulemaking proceeding to consider permitting AM boosters, part of its AM Improvement initiative, under Docket RM 11779. As of this writing, the FCC again has failed to take further action. Will this be the time that the commission finally takes positive action on AM

boosters, or will Lucy once again pull the football away from Charlie Brown in the final seconds?

John Schneider is a lifetime radio historian; author of two books and dozens of articles on the subject; and a Fellow of the California Historical Radio Society.

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POE

(continued from page 16)

Allan Poe,” he said. “So I have set about to raise Poe’s profile, and Poe Theatre on the Air is one way I’m doing it.”

As for hosting these podcasts on WYPR’s website? “Being affiliated with an NPR station instantly gave us a credibility and a reach that we wouldn’t have if we did this on our own,” said Zavistovich.

THE NITTY-GRITTY

To date, Poe Theatre on the Air has produced five dramatic podcasts based on Poe’s works. As described by the theater’s web page, a sampling:

The Tell-Tale Heart: “A housekeeper takes a job caring for an old man, and it seems like a dream for them both. But the dream becomes a nightmare when the housekeeper’s obsession with the man turns deadly — with a truly heart-pounding ending.”

The Black Cat: “A man brings home a cat for his animal-loving wife, to replace a cherished pet. When the new family addition becomes too annoying for the man, it leads to a dark secret that the cat reveals at the worst possible time — for the man.”

Morella: “A man’s love for his scholarly wife fades as her fascination turns to morbid themes. On her deathbed, she gives birth and curses the man to ensure that he will never be freed from her memory.”

Posted more recently are episodes “The Cask of Amontillado” and “Berenice.”

In a nice touch, the stories are tied together by the device of the listener visiting an insane asylum. Each cell they visit contains a deranged inmate directly related to the Poe tale about to be told.

The scripts, drawn from Poe’s own works, are created by Zavistovich and Professor Richard Hand, a professor of media practice at the UK’s University of East Anglia. The actors are from the Poe Theatre on the Air’s company, with production being handled in Baltimore by long-time audio engineer and producer Ty Ford, another Radio World alum.

Teaching theatrical actors to do radio drama wasn’t easy, Ford said. “We do the show in my 25- by-35-foot custom-tuned basement studio, and it took a while for some of them to get used to working with microphones rather than projecting to an audience from the stage,” he said. “But they’re getting the hang of it now.”

To make these Poe podcasts more compelling, Ford uses a mix of original music that he and Zavistovich compose/perform on the fly, plus recorded sound effects, and actual “real” effects that he creates as required.

“For instance, when we needed the sound of a trowel being used to brick a victim into a wall, I grabbed one of my own and rubbed across the terra-cotta saucer of a flower pot,” Ford said.

bring to them through the tales of Edgar Allan Poe.”

And if the living Poe podcasts transport their listeners into a world of deadly fear and trepidation, so much the better. As the Father of American Horror wrote in “The Premature Burial”: “The boundaries which divide Life from Death are at best shadowy and vague. Who shall say where the one ends, and where the other begins?”



Above: Actor Brian MacDonald at work. Find the episodes at www.wypr.org/programs/poe-theatre-air.

Left: Alex Zavistovich

Below: Ty Ford prepares a microphone for Jennifer Restak.

CLASSICS FOR THE PODCAST GENERATION

In creating theater of the mind audio productions, Zavistovich and Ford are aiming for the pinnacle of Golden Age radio dramatic production, a genre made popular by long-running radio series like “Gunsmoke” and “Suspense.”

Judging by the quality of Poe Theatre on the Air, they have hit this mark. These podcasts feature a lively mix of solid voice acting, convincing sound effects, and suitably eerie music that underlines Poe’s emphasis on pervasive, insistent unease; a sense of discomfort that begins by gently unsettling the listener at the outset, and building to a tsunami of terror by the end.

“We recently heard from WYPR that we have had 6,000 downloads for the first three shows,” said Ford, “not just streams, but downloads. They were excited by that and are planning even more promotion for the show.”

If all goes to plan, Alex Kavistovich hopes to keep producing new Poe podcasts on a monthly basis. “There’s a whole community of podcasts listeners who are deeply interested in radio drama and complex storytelling,” he said. “This is what we are trying to



Poe was originally buried in an unmarked grave but is remembered today with this marker in Baltimore.



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Project MARCONI Brings Stations Closer to Listeners

EU-backed program aims to automate and increase listener engagement

The hand-drawn cardboard Project MARCONI booth at IBC2019



BY WILL JACKSON

AMSTERDAM — Visitors to the main radio area of the recent IBC exhibition may have noticed a striking hand-drawn white cardboard stand in the adjacent “Future Zone.”

This was the home of Project MARCONI [Multimedia and Augmented Radio Creation: Online, iNteractive, Individual] and HRadio, both funded by the European Union’s Horizon 2020 research and innovation program.

The project consortium includes public broadcasters NPO in the Netherlands, and Belgium-based VRT, alongside technology companies and academic partners. Together, they aim to improve radio experiences by enabling fully interactive and personalized radio solutions, integrating broadcast radio with digital and social media.

PERSONALIZED RADIO SOLUTIONS

In a live demonstration at IBC,



MARCONI highlighted the technologies behind the project: different software tools integrated in a dashboard, using AI-powered chatbots and content analysis. The project showed engagement with listener content by replying to messages, dragging and dropping them into the radio program, and playing their footage on a screen on the other side of the stand.

Rik Bauwens, lead developer for VRT Innovation, describes how the project came about.

“MARCONI was preceded by the ICOSOLE project, which focused on user-generated content during live events. For MARCONI, we narrowed this down to music events, such as festivals, in a radio context. Together with some of the ICOSOLE partners, additional technical companies, radio software provider Pluxbox, and radio teams from VRT and NPO, we drafted the MARCONI project.”

Bauwens explains that matching novel technological solutions such as face detection and chatbots to a contemporary radio workflow was the biggest challenge for the project.

“To address this, we started by organizing co-creation workshops with both radio content producers and their listeners. Subsequently, we held observations with radio teams at VRT and NPO to get to know their current tools. We adopted an agile development process

with week-long sprints and a stand-up with project partners every Monday, to continually evaluate and adjust our prototypes.”

EXPERIMENTATION

The EU funding has also been helpful, he adds.

“First, it allows us to experiment next to a live radio production; it gives us the freedom to start over very quickly if

needed. Second, it allows us to organize open piloting with other radio stations in Europe, to get even more feedback.”

VRT is involved in both Project MARCONI and HRadio. “The use cases are different but complement each other very well,” said Bauwens.

“MARCONI focuses on creating tools for radio-makers to handle novel ways of interaction with their audience. HRadio offers an end-user experience for radio listeners, such as rewinding live radio, participating in polls via DAB+ using a radio webview and so on.”

The aim for MARCONI is to offer a new toolset to radio stations by the end of the project in March 2020, with open pilots taking place until then. “Possibly, MARCONI gets a sequel in the years to come,” VRT’s Bauwens says.

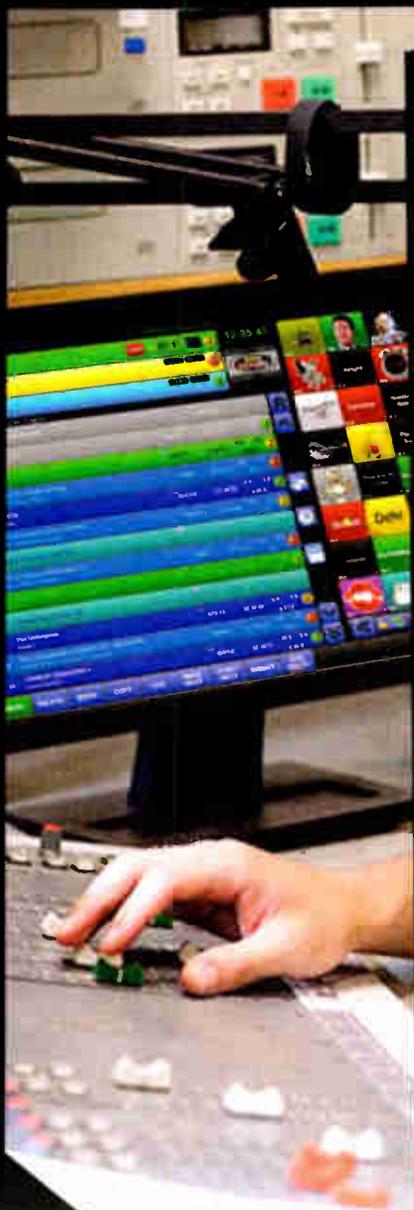
“Aside from interaction, visualization and extensive automation would be important topics for us.”

Will Jackson is a London-based freelance journalist covering the radio industry and events.



At IBC in Amsterdam, Rik Bauwens, right, demonstrates Project MARCONI tools.

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USERREPORT

BY LARRY WOOD, CPBE
Chief Engineer
KQED(FM)

SAN FRANCISCO — KQED(FM) recently began a project to remodel and expand our studios in San Francisco. The plan is two-phase. The first was to move the station's operations to a temporary facility, followed by a transition back to our newly remodeled original complex.

Shaun Dolan was above and beyond helpful. Many configuration pieces of the VXE system had to be worked out on-site, such as the network configuration using non-Cisco switches for the phones and programming the Asterisk server and VXE for the new SIP trunk.

The new SIP trunk provided by TPx had a few temporary numbers — actual KQED numbers would not be available until the studio moved. With Shaun's help we were able to reprogram all of the numbers we would eventually be using. At cutover time, the training I



Caroline Smith, producer, Forum, uses the Telos VSet 12 handset and Broadcast Bionics' XScreen (her left screen) at the KQED temporary studios.

I set up a VSet-12 phone at my workbench and pre-programmed multiple "Shows" to include all of the numbers expected in the SIP trunk.

I created an initial plan so that the system could be configured well in advance of our move. Then the team at the Telos Alliance took my plan, checked that it made sense from a technical standpoint and added a few important modifications to achieve a modern and highly reliable on-air telephone system, one befitting a 24-hour news and information operation that is often the number one station in the San Francisco market.

Good hardware with a good plan is still lacking without good implementation. To this end, we also opted for on-site configuration and training by Telos Alliance Support, and the experience that we received from team member

received came in handy. I set up a VSet-12 phone at my workbench and pre-programmed multiple "shows" to include all of the numbers expected in the SIP trunk. As TPx moved the numbers one at a time, I was able to test them immediately. Some of the numbers didn't work, and thanks to my training I knew where to look for problems and make the necessary corrections to a few typos that I had made during the process. All the talk show lines, including the toll-free number, worked as expected. I believe the SIP trunk provider, TPx, was pleasantly surprised at how quickly the KQED cutover went.

Programming the VXE system

phones to work with the many studios and shows is a breeze. The lines are displayed clearly on the phones, and the users easily can understand which lines are available for different purposes. We set up the VXE system to flash a light in the control rooms instead of using the ringer. This ensures that the studio engineers never miss a call due to the ringer being turned off.

Our talk show people learned how to operate the new phones much more quickly than I expected. They are happy with the new phones operation and information filled displays, as well as the overall quality of the VSets. They were used to the old Telos producer/talent software, but quickly came to like the Broadcast Bionics xScreen software. They especially like that, through xScreen, they can see how many times someone has called into the show. They

know the show is really popular when the regular callers are crowded out by a bunch of new callers. Broadcast Bionics worked with KQED to optimize xScreen for our needs. We really appreciated their willingness to listen to our suggestions for their product and improve it for our needs. The transition to the new studio was so smooth, our listeners and callers were unaware that anything had changed.

People are now used to the new equipment and work flows at our new studio location. But of course, this new location is only temporary while the old studio complex facility is being fully remodeled and expanded.

Early 2020 we start the planning for reconstructing the newly rebuilt facility. For the move back I expect we will get another new VXE and Asterisk phone system and make the one we are using today a backup in a fully redundant system. After our last experience, I'm sure we will get Telos back out for another configuration.

For information, contact Cam Eicher at The Telos Alliance in Ohio at 1-216-241-7225 or visit www.telosalliance.com.



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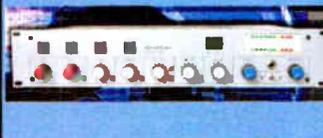
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TECHUPDATES

AEQ ADDS TO SYSTEL PHONE SYSTEM

Systel IP is AEQ's broadcast telephone and multiconference solution, operating on VoIP phone lines. The system is based on a digital matrix designed to manage IP lines.

The company says the interface offers a dynamic and flexible workflow for various scenarios including radio, television or corporate. Systel IP can be operated through dedicated software on PC, or through the Systelset+ handset, a touchscreen IP phone with an intuitive interface to manage the incoming calls.

The new Systel IP Basic engine version recently was released. It is a 19-inch, single-rack unit able to work as a multi-line IP phone with SIP signaling protocol. The basic version features eight IP phone lines and four additional hidden for Systel Set + handsets. The engine features four digital audio inputs and outputs as well as two analog audio inputs and outputs.

It also offers 32 AoIP inputs and outputs based on Dante protocol/AES67- compatible, so it can be integrated into an AoIP net and route the calls inside the IP network.

The Systel IP Basic can be upgraded to Systel IP 16, through a software license. This allows expansion to a bigger system in the future, either to attend more studios or to put more simultaneous calls on air.

For information, contact AEQ Broadcast International in Florida at 1-800-728-0536 or visit www.aeqbroadcast.com.



CLOUD-BASED CALL IN FROM CALL IN STUDIO

Call in Studio is virtual, cloud-based that allows broadcasters and podcasters to accept calls in a call-in talk show format.

The company says that this robust system can be connected with almost any broadcasting, live-streaming or recording setup.



Call In Studio says that in the past year it has rolled out several new features including: more accurate "auto screen" transcriptions for computer screened calls, phone number and carrier info lookups for callers, "Last Called" feature with past calls info from callers, and more robust caller blocking as well as white-listing numbers, including bypassing call queues when all lines are "full."

It offers professional billing options for medium- to high-volume customers.

User Marcus Constantino, director of "Basketball Friday Night in West Virginia," says: "Call in Studio has enabled our live state-wide radio/TV production to manage 20-30 live calls per night while enabling our talent, production team, social media team and screener to all have instantaneous access to caller data — even when working remotely. Our production has realized huge cost savings because of Call in Studio's pay-as-you-go model — we no longer have to pay a premium during each of the eight months our show is out of season and off the air."

For information, contact Call In Studio at mail@callinstudio.com or visit www.callinstudio.com.

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Broadcasting Experts Connect to Clients With Opal

IP audio gateway enables guests to connect to the studio by simply clicking a link

USERREPORT

BY THOMAS LIPSCOMB
AND STEVE SEDAHL
Production Directors
Broadcast Experts

RALEIGH, N.C. — Broadcasting Experts is a production house. We work with financial advisors, lawyers and other professionals who are interested in sharing their knowledge over the radio. We produce their programming and guide them through the process of recording and creating their shows. Most of our clients are not professional broadcasters, so it's up to us to help them understand the equipment and the steps to making great-sounding radio.

Our programming is "flash frozen," as we like to say. Our clients connect with us from wherever they're located and we record live; then we edit after the fact. We had been using Comrex BRIC-Link units for this, because they're ubiquitous at radio stations, and many of our clients could go to those locations to do their shows. We had also developed a BRIC-Link kit that we sent out to clients; they would set it up at their location and broadcast from there. But we're working with folks who are

often on Wi-Fi, or who are in conference rooms in hotels, so it can get fairly complicated.

Then we learned about Opal. It is an IP audio gateway that enables guests to connect to the studio by simply clicking a link. It provides HD-quality audio from consumer-grade equipment, like a cellphone or a computer with a microphone. It's effectively a phone interface that uses an Opus codec through a web browser, as opposed to a traditional phone line.

It's effectively a phone interface that uses an Opus codec through a web browser, as opposed to a traditional phone line.

We switched to Opal for ease of use. It's amazing that now, when we work with guys who aren't tech-savvy, they can just plug a USB headset into their computer, go to a website and click connect. It's much easier than teaching them how to check the gain on their mixing board, or check mix minuses, etc. It makes that side much simpler.

We usually record a dozen shows



per week, and we use Opal for 10 of them. In the past, we sometimes had to patch interviews into our system over the phone, but Opal has eliminated that. That terrible phone quality is a thing we no longer have to deal with. If our client is using a good microphone and the room is set up correctly, it really can sound like you're sitting next to them.

Opal also helps our clients feel more

comfortable. Because they're not radio professionals, if there's a minor technical glitch or if there's some complication that needs to be ironed out, it can fluster them, and affect the ultimate product. Now, when we actually go to record the program, they're not thinking about the technical elements — they can just focus on recording. They're much more secure going into the show, and they perform better as a result.

Opal has resulted in several customers referring colleagues to us. We've picked up several new clients who choose our production house because it's so easy for them to connect.

For information, contact Chris Crump at Comrex in Massachusetts at 1-978-784-1776 or visit www.comrex.com.

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TECHUPDATES

SONIFEX DHY-04 HYBRID HAS HIDDEN FEATURES

The DHY-04 telephone hybrid is a longstanding part of the Sonifex family of telephony products. The company highlights its ease of use and its features such as auto-answer, auto-ducking, auto-line hold and auto-disconnect.

It has configurable settings for each country, giving line impedance and a simulation circuit to match most countries in the world. Sonifex says it's particularly popular in the Middle East, where there are a variety of impedances to account for. It adds that its predecessor, the DHY-03, was the first broadcast hybrid to offer >70 dB typical line balance rejection.

Additional features include DTMF dial tone recognition for reporter remote access, so a journalist can dial into the unit, which can recognize a preprogrammed DTMF numeric password to automatically connect the journalist on-air. It can generate SNMP Traps for to allow remote sensing and management by SNMP management systems. It has a web GUI for remote access, remote dialing and remote setup. It also has built-in conferencing for two hybrids, so that a single telco channel on a mixing desk can receive two calls.

The DHY-04 is ETSI approval compliant with European PTT specifications and is compliant with the ACMA requirements for use in Australia and New Zealand.

For information, contact Sonifex/Independent Audio in Maine at 1-207-773-2424 or visit www.sonifex.co.uk.



NEOGROUPE'S GDPR-COMPLIANT NEOSCREENER GOES MOBILE

NeoScreener is a set of call screening applications that allow screeners and hosts to be in different locations while sharing instant information on calls that are available for broadcast.

With the NeoGroupe smartphone/tablets application, the company says that one of its clients, for example, regularly screens calls in Washington D.C. while the host airs them in London.

The applications also offers full user control, even based on Active Directory if necessary. Thus, specific rights to studios and shows, action tracing, authentication and data encryption are now included.

NeoScreener works with Telos VX and NX as well as AEQ System. It has a comprehensive winner, giveaway, promo and script companion module. It's also now now fully GDPR compliant.

For information, contact NeoGroupe in France at +33-9-72-23-62-00 or visit www.neogroupe.com.

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TECHUPDATES

BIONIC TALKSHOW EASES TALK SHOW TASKS

Broadcast Bionics says its Bionic Talkshow SIP phone system makes even complex radio and television talk/contribution shows "hassle free."

Suitable for studio complexes of any size, the system can be used by radio staff at a single site, networked across the country or at a remote broadcast. The company highlights its simplicity of use but says it can scale to take care of complex workflows. It's compatible with all line types and integrates with integrated Skype TX for Radio, Codec Control and Anywhere, Broadcast Bionics' own portable IP codec contribution software.

Bionic Talkshow is part of the Bionic Studio line of products, which also includes Social, a social media aggregation, filtering and interaction system; Director, an automated visual radio solution; and Contest, an integrated prize management system. The company says that combining these modules provides a "powerful all-in-one communication tool."

For information, contact Broadcast Bionics in England at +44-1444-473999 or visit www.phonebox.com.



AVT MAGIC PHONERSET EASES TELEPHONE HYBRID OPERATION

AVT says its new touchscreen telephone, Magic PhonerSet, lets users easily control Magic TH2plus, Magic TH6 and Magic THipPro talk show systems. It's possible to use the system in parallel to the Windows PC software or independently without a PC.

The Magic PhonerSet uses the caller lines of the used telephone hybrid system so an additional registration to a SIP server is not necessary.

Operation is based on respective PC software of the telephone hybrid system. Magic PhonerSet manages telephone functions such as call acceptance,

hang up, redial, call forwarding, pretalk, hold, on air (single-fader or two-fader mode) and line-blocking separately for each available caller line. Further functions, like lock/unlock all lines, hang up all lines and a call list, are available via the function key.

In addition, the unit displays status and caller information of each line via line cards. It also displays number/SIP display name, caller name and city (only if database is activated), depending on the number of lines implemented. Finally, also supports unicode characters (UTF-8), so that, for example, Cyrillic or Arabic caller information can be displayed without problems.

The HDMI interface also enables parallel output of the user interface on an external screen. Magic TH2plus allows the simultaneous use of up to two, Magic TH6 and Magic THipPro of up to six Magic PhonerSet workplaces.

For information, contact AVT in Germany at +49-911-5271-0 or visit www.avt-nbg.de.

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I'm selling between 150 and 200 cassette tapes that consist of old-time radio shows, sports shows, some local New York radio talk shows, etc... Must take entire collection and the price is negotiable. Please call me for details and, my phone number is 925-284-5428.

Radio broadcasts of Major League Baseball, NFL, and some college football games that are on cassette tapes, approx 100 to 125 games, time period of entire collection os from the 1950's - 1970's, BO. Must purchase entire collection. Contact Ron, 925-284-5428 or ronwtamm@yahoo.com

WYBG 1050 Messina, NY, now off the air is selling: 250' tower w/building on 4 acres; 12' satellite dish on concrete base; prices drastically slashed or make offer. 315-287-1753 or 315-528-6040

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Wanted: ITC interconnect cables between ITC cart machine and record amp. Manual and idlers for Harris CB-1201 turn-

tables. Don, k8drs1@gmail.com

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I'm looking for KFRC radio special of Elvis Presley which aired on January 8, 1978. I'd

be willing to pay for a digital copy. Ron, 925-284-5428.

I'm looking for KTIM, AM, FM radio shows from 1971-1988. The stations were located in San Rafael, Ca. Ron, 925-284-5428.

I'm looking for the Ed Brady radio show in which he did a tribute to Duke Ellington, the station was KNBR, I'd be willing to pay for a digital copy. Ron, 925-284-5428.

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Looking for a broadcast excerpt of a San Francisco Giant's taped off of KSFO radio from 1959, interviews with Willie Mays, Dusty Rhodes & some play by play excerpts, also features a homerun by Willie Mays and Felipe Alou stealing second base, running time is 18:02, also looking for SF Giants games and/or highlights from 1958-1978 also taped off KSFO Radio. Ron, 925-284-5428 or ronwtamm@yahoo.com.

Looking for KFRC signoff radio broadcast from 1930 Andy Potter, running time is 0:22 & also the KLX kitchen the program guest is Susanne

Caygill, a discussion of women's affairs with a long promotion for Caygill's appearance at a local store. Anne Truax, Susanne Caygill, running time is 13:44. Ron, 925-284-5428 or email ronwtamm@yahoo.com.

Looking for KSFY radio shows, Disco 104 FM, 1975-1978. R Tamm 925-284-5428.

RECEIVERS/TRANSCIEVERS

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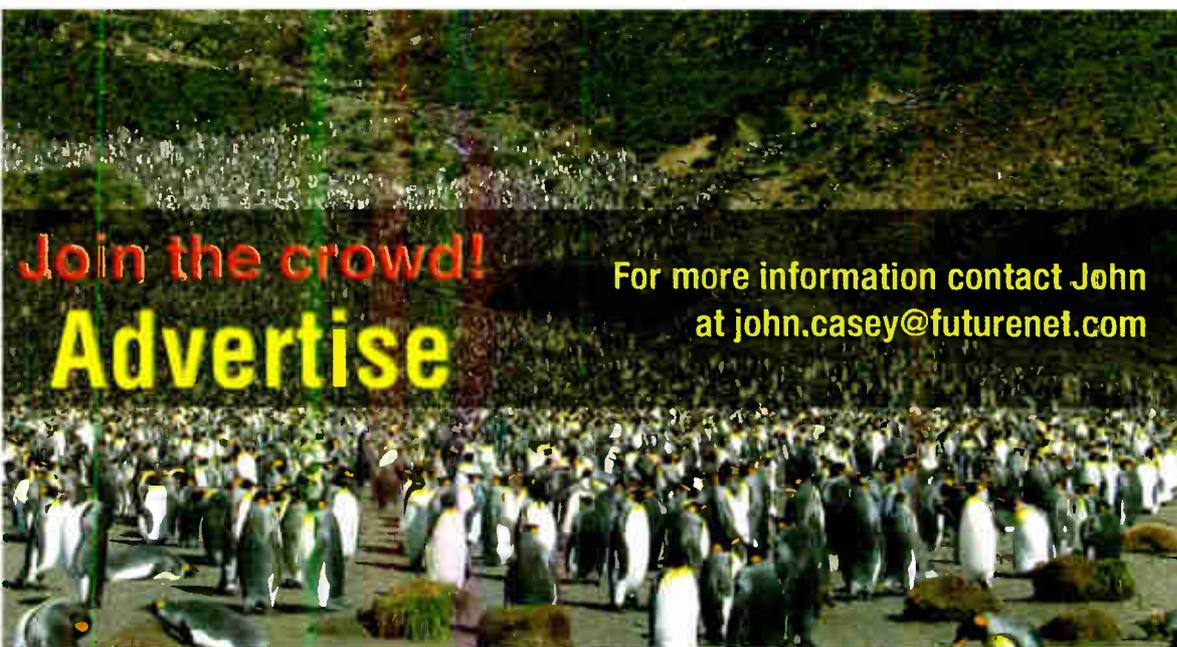
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Allow DRM for Digitizing the AM Band

Digital Radio Mondiale lays out why it should be chosen over (or alongside) HD Radio

DIGITAL RADIO

The FCC recently adopted a Notice of Proposed Rulemaking that recommends giving AM stations in the United States the flexibility to adopt all-digital broadcasting voluntarily, based in part on the experimental experience of Hubbard station WWFD in Frederick, Md. The commission then asked for comments: one of the first was filed by Digital Radio Mondiale. Its filing is below, with minor edits for clarity. For background about DRM, see www.drm.org/what-is-drm-digital-radio/summary/.

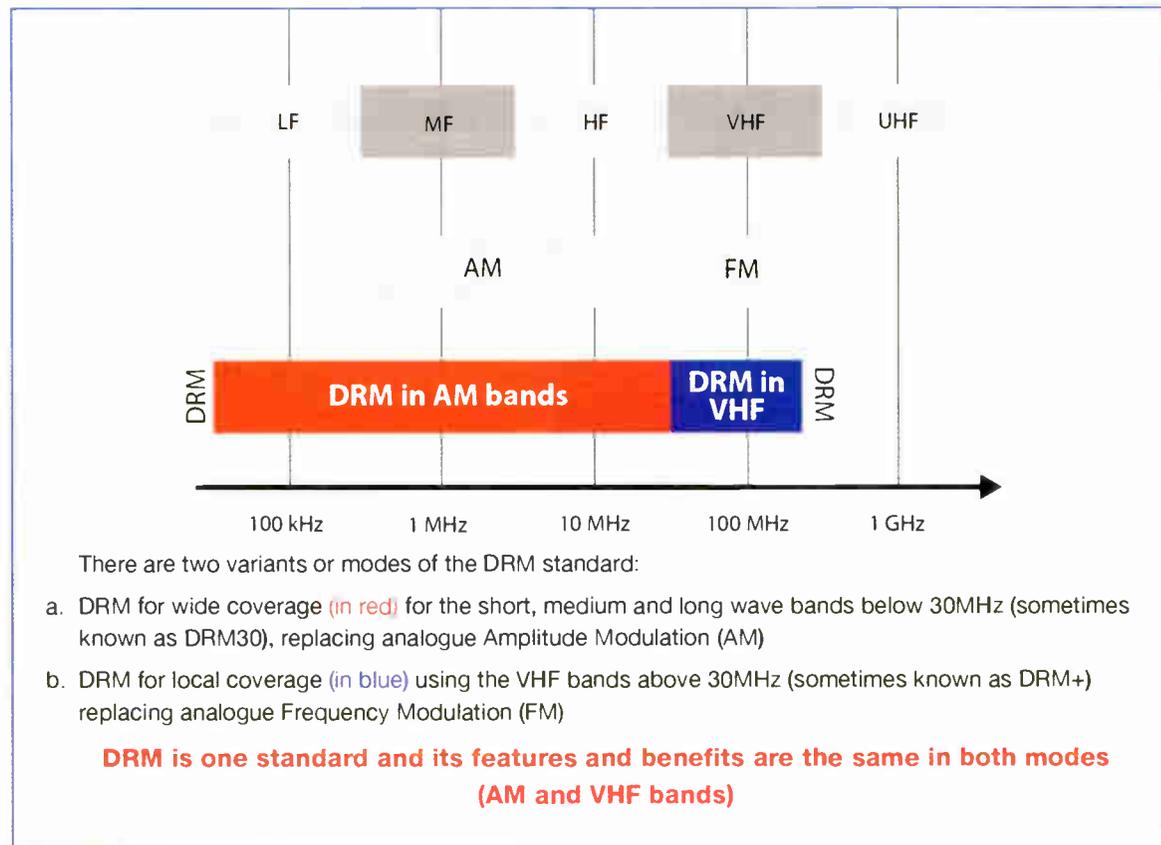
In your document (FCC 19-123) you rightly highlight the great advantage of AM broadcasts, primarily the ability to cover large areas and number of listeners, while the band itself is losing popularity because of a variety of issues to do with propagation, interference [and] environmental changes. At the same time, digital audio broadcasting is no longer the new platform it was in 2002. At that time [the] FCC mandated a proprietary system (IBOC, "HD Radio") as the only system to be used in the USA, with the possibility of applying DRM for HF.

Since then DRM (the ITU recommended, only digital audio broadcasting for all bands, open standard) has been tested and used all over the world on all bands, shortwave, medium-wave and FM.

So while you are recommending now pure digital HD, based on the NAB tests and [WWFD's] not completely convincing trial, we would urge the FCC to consider opening the straightjacket of 2002 and allow DRM to be used as a sure, tested, efficient way of digitizing the AM band.

There are several reasons for this. DRM digital radio delivers, in the AM bands, significant benefits:

- Audio quality that is on par or better than FM. DRM, of all recognized digital standards, is the only one using the ultra-efficient and compressed xHE-AAC audio codec that delivers, at even very low bit rates, exceptional audio quality for speech, but music as well (www.drm.org/listen-compare/).
- Record Data: DRM has been tested in medium-wave all over the world in both simulcast and pure digital. A list of the main tests (some of which have become ITU adopted documents) are included in Annex 4 of the DRM Handbook (www.drm.org/wp-content/uploads/2019/02/DRM-Handbook.pdf). At the moment, 35 MW transmitters are on air in simulcast or pure DRM in India (<http://prasarbharati.gov.in/R&D/>).
- Auxiliary Data: DRM is the newest, most complete, open standard for digitizing radio in all frequency bands, and is recommended by ITU. DRM has been devised as a direct heir to analog



There are two variants or modes of the DRM standard:

- DRM for wide coverage (in red) for the short, medium and long wave bands below 30MHz (sometimes known as DRM30), replacing analogue Amplitude Modulation (AM)
- DRM for local coverage (in blue) using the VHF bands above 30MHz (sometimes known as DRM+) replacing analogue Frequency Modulation (FM)

DRM is one standard and its features and benefits are the same in both modes (AM and VHF bands)

This image from a DRM information packet shows the frequency bands where DRM operates.

AM (SW, MW). It uses 9/10, 18/20 kHz bandwidth and has a useful content bit rate of up to 72 kbps. It carries up to three programs on one frequency and one data channel, while data can be carried on each of the audio channels as well. One of the great advantages of DRM is that alongside excellent audio, the receiver screens will display visual information of any kind required (album titles, singer photos, maps, visuals of any sort, data of any kind). The Journaline application allows for extra information from the internet or the RSS feeds of the broadcaster to be captured and displayed. Currently broadcasters like the BBC, All India Radio [and] KTWR in Guam are using this extra facility that clearly differentiates digital [from] analog as a superior option.

- Power/energy efficiency. Using SW or MW in DRM can reduce the power used up to 80%. As per calculations made by Ampegon, a medium-wave transmitter can cover an area of 235,000 square kilometers with a 100 kW transmitter. The DRM ERP of such a transmitter is about 50 kW and the coverage area is the same, while instead of one analog program, up to three digital channels and one data channel can be broadcast, all in excellent audio quality.
- Spectrum efficiency (more programs can be broadcast on one single frequency used for one program in analog) as explained above.
- DRM, unlike analog, offers enhanced and stable

audio quality that is FM-like (mono or stereo). DRM also offers multiservice data enabled by applications like Journaline (the enhanced text services, more information captured as RSS feeds or from other internet source), slideshows, multilingual text (practically being able to show any characters of any language, not just Latin script), and the Emergency Warning Functionality (EWF) in case of disasters.

- Interference. This has not been noted, as the DRM signal will always be lower than the analog one. AIR has not noted any interference in its operation of DRM transmitters. The mask values required for an optimal functioning of DRM transmitters [are] clearly stipulated in the ITU documents and as long as the network planning is correct and the mask is respected, there should not be any issue of interference in digital-analog or digital-digital DRM transmissions.
- Receivers. Currently there are several receiver models and SDR options for the reception of DRM in AM. India has almost 2 million new cars fitted with DRM receivers, at no cost to the buyers, that are capable of and are receiving DRM medium-wave signals. The audio quality is excellent and a sure benefit to the users.
- DRM is in direct succession to the analog AM (and FM) services, not owned or controlled by

(continued on page 29)

(continued from page 28)

any single company, and immediately available with full know-how and technology access by the transmitter and receiver industry.

- As HD in medium-wave is a bit of a necessary step but still a leap in the dark, it would make sense from the practical aspects and even receiver solution availability to allow DRM as the best, clearly proven solution of digitizing the AM band (in preference or alongside HD) in the U.S.

In short, the salient advantages of DRM are:

1. The audio quality offered by DRM is equally excellent on all the transmission bands: MW, SW or VHF
2. Robust signal unaffected by noise, fading or other forms and interference in all bands
3. Clear and powerful sound quality with facility for stereo and 5.1 surround
4. More audio content and choice: Up to two and even three audio programs and one data channel on one frequency
5. Extra multimedia content: Digital radio listeners can get multimedia content including audio, text, images and in future even small-scale video, such as:
 - a. Text messages in multiple languages
 - b. Journaline – advanced text-based information service supporting all classes of receivers, providing anytime-news for quick look-up on the receiver's screen; interactivity and geo-awareness allowing targeted advertising
 - c. Electronic Program Guide (EPG), showing what's up now and next; search for programs and schedule recordings
 - d. Slideshow Program accompanying images and animation
 - e. Traffic information
6. Automatically switch for disaster & emergency warnings in case of impending disasters in large areas, automatically presenting the audio message, while providing detailed information on the screen in all relevant languages simultaneously. Great potential to become the surest and widest means of alerting the population to emergencies.

Therefore, we urge [the] FCC to take a wide view and consider all options including DRM, if AM is worth future-proofing in the USA.

Comment on this or any article. Email radioworld@futurenet.com with "Letter to the Editor" in the subject field.

The DRM Consortium describes itself as an international not-for-profit organization composed of broadcasters, network providers, transmitter and receiver manufacturers, universities, broadcasting unions and research institutes. Its aim is to support and spread a digital broadcasting system suitable for use in all the frequency bands up to VHF Band III.

READER'S FORUM



AM IN DIGITAL: A TECH SOLUTION TO THE WRONG PROBLEM

Dave Kolesar sees digital transmission as the salvation of the AM band (Dec. 4, 2019 issue), but AM problems are more social than technical. There are perhaps 20 times as many AM stations as there were in the 1950s, but far fewer listeners. Receivers haven't improved: in fact on the whole they have got worse. Much of the problem is sheer overcrowding.

The one major benefit of AM, where AM shines over all other possible delivery methods, is long-distance reception over skip and the ability to deal with severe multipath on rugged terrain. Any digital system for AM broadcast that cannot contend with skip reception or degrades reception in mountainous areas is destroying the one advantage that AM has.

Yes, it's possible that IBOC MA3 is a great improvement over MA1, in that MA1 not only was inaudible over skip but made adjacent-channel stations unlistenable. MA3 is much less likely to destroy reception of distant stations, but the digital carrier is still destroyed by Faraday rotation.

If your station is not audible on skip, and you're not in a mountainous area where FM is problematic, you probably shouldn't be on the AM band. I know a lot of AM stations realize this and would like to move to the FM band but cannot. The FM band is too crowded too.

But we need to sit down and face the real truth that there are too many stations on the AM band broadcasting junk programming that people are not actively listening to. It is time for some weeding out, so that stations that can take advantage of the actual advantages of AM are able to do so.

The NAB doesn't want to talk about this. The FCC doesn't want to talk about this. All anybody wants to do is promote technical solutions to the wrong problem.

I would be strongly in favor of digital systems that were able to cope with skip transmission, such as DRM. But there's an easy way to dramatically improve listenable-ability of the band, it's just that nobody wants to talk about it.

Scott Dorsey
Kudge Audio
Williamsburg Va



Write to RW

Email radioworld@futurenet.com with "Letter to the Editor" in the subject field. Please include issue date and story headline.

READER'S FORUM

WHERE'S THE DIGITAL?

Good article about a good radio ("C. Crane Offers Up a Premium Portable," Dec. 18, 2019 issue). But why doesn't the new CCRadio-EP receive HD channels? The good journalists at Radio World should have at least asked "Why not HD?"

I realize station managers and sales reps see no profit in HD Radio, but that is the same thing they said about FM in the 1950s. Some even tried to kill FM because they didn't think people would buy it. Smart stations persisted in marketing FM. Those that stuck with FM eventually had the last word.

It is a "chicken or egg" thing with HD Radio and receivers. People aren't interested in HD because stations don't promote it and receivers are not available. I would have been a lot more excited about this new radio if it was future-proofed and promoted HD Radio.

Kevin Ruppert
Madison, Wis.



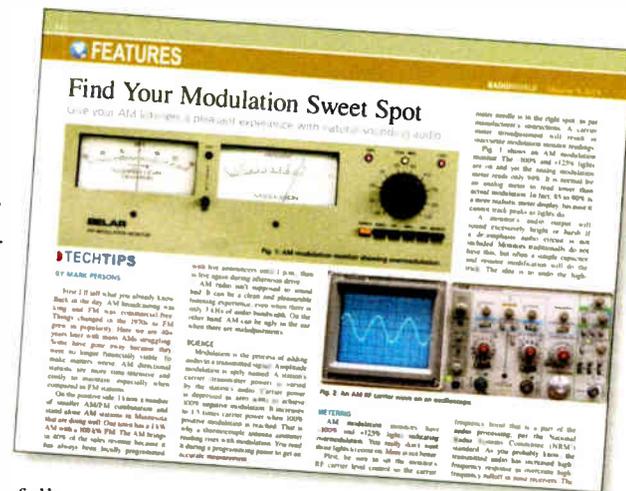
CORRECTING A DISTORTION

I found Mark Persons' article "Find Your Modulation Sweet Spot" (RW, Oct. 9, 2019 issue) very informative and helpful. Distortion is a turn-off. And I had never considered the distortion inherent in the garden-variety AM envelope detector in the home receiver. Shame on me. Hopefully, this will lead to better-sounding AM.

One nit to pick: The peak power for a 100% modulated AM signal is four times carrier power, not 1.5 times as stated in the article.

James K. Thorusen
Chief Engineer
Central Coast Electronics
Lincoln City, Ore.

Mark Persons replies: Average power is what I was thinking of when writing the article. Mr. Thorusen is correct in saying that peak power is four times unmodulated power.



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EAS HOSTAGE?

Once again we have a great example of how unreliably the EAS system is implemented. At least one major supplier of equipment recently sent out emails requiring all stations to upgrade software within a week or be unable to run the system. On top of that, in what feels like an extortion scheme, they required each station, including LPFMs and small markets that are barely getting by, to just find \$350 from somewhere.

The units cost a considerable amount, and I think it is obscene to hold the users of this product hostage for software upgrades. I thought that was the reason it cost so much to buy.

I still maintain that if we want a truly functional emergency system we need to revisit the entire system in light of technology developments over the past years since the EAS was designed, and replace EAS with a more robust system that has hardware and software supplied and managed by the FCC.

This kind of haphazard process amplifies the obvious failings of EAS, it is unworkable, and cannot be made workable.

Michael Baldauf

LONG LIVE RADIO

I respectfully disagree with the person who wrote that radio is dead.

Having spent much of my career in electronic media, I fully understand how radio, TV, satellites, the internet, etc. all fit together to give us a remarkably flexible means of disseminating information.

Sitting here in my home office at my computer, I can "dial up" radio stations from all over the country (and the world). For example, I can listen to a station 900 miles away in my hometown. Five or ten minutes listening on my computer gets me up to speed on the late-breaking news from "back" home. If there is something really interesting, I can pick up the telephone on my desk and "connect" with someone involved in the story. If I am away from home, I can do the same thing on my laptop.

If the story is really "hot" I can pick up my cellphone and get connected to a real live human being who is involved in the story, regardless of where I am.

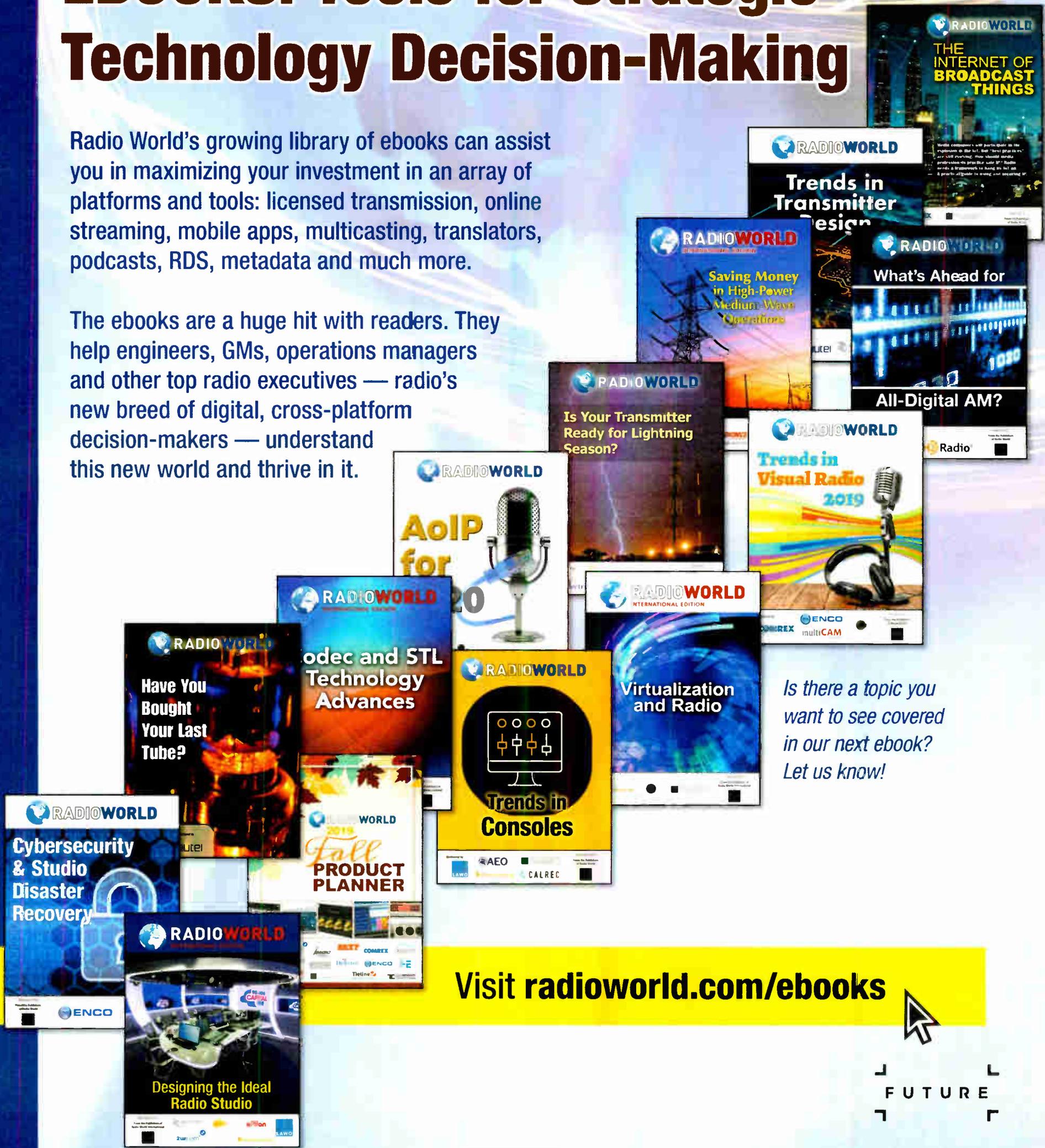
Long live radio! The "sound" medium.

Lewis D Collins
Peabody, Mass.

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