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# AMs Should Focus on VHF Migration

Skotdal thinks conversion costs and lack of incentives doom all-digital on AM

## COMMENTARY

BY ANDREW SKOTDAL

*The author is licensee of 50 kW AM stations KRKO and KKXA in the Seattle market, chair of the Washington State Association of Broadcasters and a former NAB board member. He participated in the recent NAB Labs driving tests of all-digital on the AM band.*

*In a Dec. 3 commentary, he wrote about the benefits of moving occupants of the band to abandoned VHF spectrum, the current Channels 1–6, rather than pursuing all-digital operation on the existing band. Radio World received so much reaction that we asked Skotdal to expand on his thoughts about the implications.*

The benefits of all-digital modulation on the AM band are real, and we'll hear more about them in April. But none of the discussions has explored how occupants of the band convert to digital.

**We should focus on VHF migration or we'll simply see more AM band operators go bankrupt over time.**

The reason: There are too many barriers. Practicality, cost and other factors conspire against digital implementation. These reasons further support migration to VHF spectrum as the preferred solution for occupants of the band.

**DIGITAL VS. TRANSLATOR**

Given a choice today between upgrading an AM station to digital and buying an FM translator, the choice is simple. A station owner will buy the translator, because it can be received by 100 percent of the radios in America, while AM digital can be received by maybe 5 percent; further, the translator offers an immediate improvement in sound fidelity.

Also, in many cases the FM translator costs less to operate than the AM signal it simulcasts; as a result, some AM owners are dropping AM power and relying on the translator.

AM owners have demonstrated they



Andrew Skotdal

want FM frequencies and have pushed the FCC to open spectrum and change existing rules.

Finally, FM cellular reception represents a consumption risk to AM radio in the way it trains new consumers. And several manufacturers are building FM-only radios. AM station owners will choose an FM frequency over a digital upgrade in order to maintain their ability to reach 100 percent of the population versus a portion of it.

VHF spectrum satisfies this demand.

**DIGITAL CONVERSION COSTS**

AM digital conversion costs also are a barrier, whether for hybrid or all-digital modes.

Consider a 10 kW AM station with a transmitter that can't be modified. The list price on a new 12 kW transmitter is approximately \$60,000. The HD Radio gear is \$18,000. The iBiquity license is \$10,000. Shipping, insurance and installation may be \$10,000. So the upgrade will be approximately \$100,000. If a station operates at 5 kW or 1 kW, the transmitter costs are lower.

So we can say that upgrade "list" costs would be \$50,000 to \$100,000 for stations of 1 kW to 10 kW. These ignore possible necessary antenna system modifications to make digital work, particularly for directional arrays; also, costs can be mitigated where an existing transmitter can be converted and some

discounts from list can be achieved.

Regardless, the numbers will be significant.

Given a choice between a digital FM upgrade and upgrading an AM, an owner with both types of frequencies will choose to upgrade the FM first because it is easier to upgrade, often costs less and affords additional channels if desired. AM digital conversion is hampered as a result.

And cost becomes a factor for other reasons.

In markets of fewer than 100,000 people, the digital conversion expense is likely greater than the value of an AM license. Even in larger markets, it may represent the entire net revenue for a group of stations for a year.

The odds of station owners laying out \$50,000 to \$100,000 for one AM radio station in markets where they serve fewer than 250,000 (or even 500,000) people are even lower when the technology is useful only to consumers with HD Radio technology. In a rural market, the receiver penetration with that technology is likely less than 5 percent, which is also the situation here in Seattle.

How many markets and counties have 200,000 people or less across America? Very few, if any, of the AM stations in these markets would upgrade unless forced to do so — and in being forced to do so, they might go bankrupt.

Every time I'm in a car on a trip and I pass an AM radio transmitter site, I stop by and say "hi" if the studio is also there. Based on my visits, I can say that the state of AM in America is disrepair. Tube transmitters are still in use across a broad swath of American AM radio.

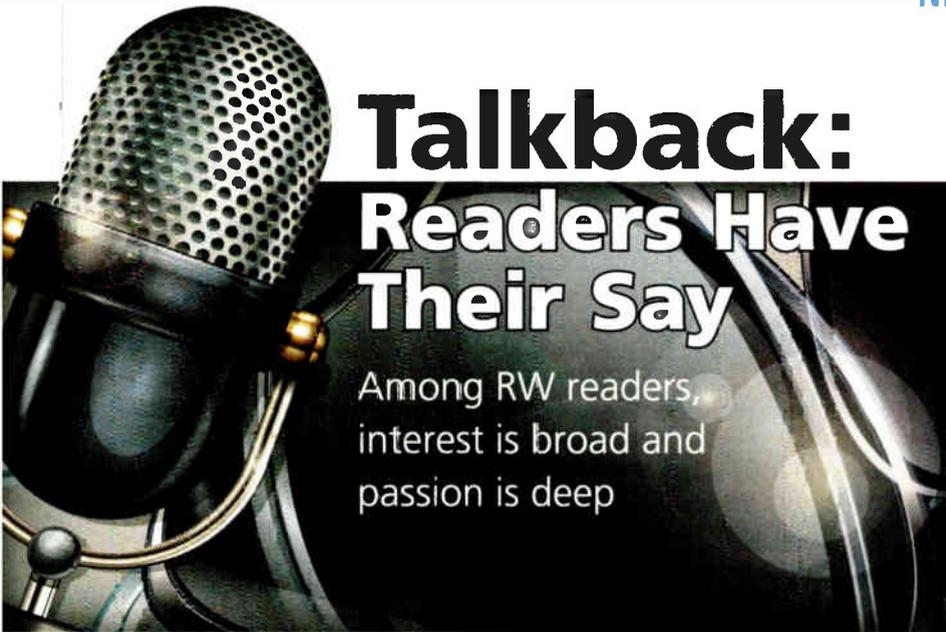
**DIGITAL SUNRISE QUESTIONABLE**

An "all-digital sunrise" for the band has been postulated as a means to speed digital adoption; but this doesn't work.

Let's say the FCC authorizes AM stations to go all-digital tomorrow if they wish; and that some go digital and some don't. Imagine half the AM frequencies in a market going all-digital while 85 percent of the existing receivers are analog. Consider the listener's perspective. Scanning the dial on an analog radio, you'd hear analog audio (Station #1), then a static hiss (Station #2), then analog audio (Station #3), then a static hiss (Station #4) as you scan up the dial. This is completely unacceptable, given that only 5 percent of the audience would hear a radio station at every stop.

In a "turn on all-digital when you want" scenario, the AM scanning experience will be worse for the consumer than the experience of tuning from political talk to Russian, to Spanish, to news, to

(continued on page 8)



# Talkback: Readers Have Their Say

Among RW readers,  
interest is broad and  
passion is deep

I love seeing reader reactions to our stories, whether their comments are critical, supportive or just thoughtful. The feedback tells me that managers and engineers are interested in what Radio World is writing about and engaged in the industry discussion.

The following is a sampling about a range of issues, as posted to our website. While stories about digital radio or the future of AM have generated much of the recent response, the range is far broader. I hope you find it as interesting as I do to

review these. Many of the comments came after readers saw the stories in our daily NewsBytes e-newsletter; you can sign up for that under *Subscribe* at the home page.

(To read the articles mentioned, type the headline into the Search field at [radioworld.com](http://radioworld.com).)

**About "Learn How to Add a Pad to a Punch Block":**

Just a reminder, O pads use one fewer resistor than H pads and values for typi-

cal attenuators are close to common 1 percent resistor values. On a punchdown block that reliably supports multiple wires per terminal, you can often build O pads directly. They could also be soldered to dual 66M test clips or punched into 66-type stacking clips.

**About "Clear Channel Satellite Services to Close":**

Could this be the time that true "local" radio will make a comeback? Has the day of satellite radio reached its peak?

CCSS has been extremely helpful and professional in helping us with our small regional network. I am already mourning this decision.

**About "Lots of Attention for Spotify/Uber Deal":**

How many riders will really care or take note of what's playing on the radio of their "cab" ride to the hotel, airport, etc.? I see a Spotify grab at some numbers to look as if they are gaining ground against Pandora, Slacker, etc.

**About "Patent Reform Is Senate Priority in 2015":**

All this talk about trolls and so called

## FROM THE EDITOR



Paul McLane

"patent reform" is just spin control by large infringers and their paid puppets to cover up their theft. If you tell a lie often enough and can dupe others to repeat that lie, eventually it is accepted as fact.

**About "Miami Will Get a Calvary Chapel LPFM Radio Station," responding to another reader's comment:**

The Calvary Chapel churches are independent and have no common board members or financial interdependence, they just have similar doctrine and worship. And they, like other broadcasters, have a passion to share their message with their neighbors.

**About "AFCC Symposium Explores Broadcast Antennas":**

I agree that C-Quam is a *much* better technology than HD Radio for AM broadcast. About seven years ago a

*(continued on page 6)*

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**NEWSROUNDUP**

**NEXTRADIO:** Emmis came up some \$350,000 short in its latest payment to Sprint in December. Its NextRadio business, on behalf of the industry, paid \$3.4 million of the required \$3.75 million quarterly bill due. Emmis revealed in its quarterly SEC filing that it's "in discussions with other radio broadcasters and companies involved in the radio industry to effect a long-term funding solution." The shortfall comes as sales for in-app advertising are still ramping up. Sprint agreed to pre-load the NextRadio app in a minimum of 30 million FM-enabled wireless devices on the Sprint wireless network over a three-year period. In return, NextRadio LLC agreed to pay Sprint \$15 million per year in equal quarterly installments over the three-year term and to share with Sprint certain revenue generated by NextRadio. So far no revenue has been generated from the app, according to the filing.

**NASH ICON:** Cumulus Media has started syndicating Nash Icon country music programming through its Westwood One syndication division. Cumulus said its "Icon" extends its country formats by including music from the 1980s through the early



2000s. This approach allows non-Cumulus stations to pick up programming without committing anything more. In syndication, Nash Icon will be offered as a Westwood One Local product "using the company's patented delivery system to add localized content to the national channel," according to Cumulus.

**ESPN AUDIO:** In 2014, streaming of ESPN Audio content generated some 7.8 billion total listening minutes, an increase of 8 percent over 2013, according to the company. Streaming numbers include all online listening to live ESPN Audio programming including talk and events. ESPN On Demand podcasts totaled about 302 million downloads in 2014. In the fourth quarter of 2014, ESPN Audio programming was streamed for 1.9 billion minutes and ESPN podcasts were downloaded 95 million times.

**PLAY.IT:** CBS Radio and CBS Local Digital Media launched a podcast network. "Play.it" is available online and through a website optimized for streaming across devices. "With the launch of Play.it, we aim to bring consumers a unified, easy-to-use platform featuring the best podcasts from not only CBS brands but other major brands, personalities and publishers as well," stated Ezra Kucharz, president of CBS Local Digital Media. Podcasts are available to stream or download. Play.it series are also available across CBS Local Digital Media's properties and are distributed across TuneIn's site and apps, as well as on iTunes. The Play.it podcast network will also be available on CBS Radio's HD Radio stations in certain markets. Play.it is advertising supported and uses dynamic ad insertion technology.

**PODCASTONE:** PodcastOne named Kris Smith as its chief technology officer. CEO Norm Pattiz, founder and former chairman of Westwood One, credits Smith with a decade of experience designing and developing digital products. Smith replaces Rob Greenlee who, after a year in the job,



will start his own consulting firm — with PodcastOne as its first client. Smith will be based at PodcastOne's Beverly Hills offices and studios. PodcastOne is ad-supported and hosts approximately 200 podcasts.

**M&A:** Broadcast radio station merger and acquisition volume rose 48 percent from \$1.02 billion in 2013 to \$1.51 in 2014, according to SNL Kagan. In total, 258 AM and 501 FM stations were sold, vs. 219 AMs and 419 FMs the year before. The average price for an FM rose from \$2 million in 2013 to \$2.5 million in 2014; average prices for AM stations rose slightly from \$760,000 to \$860,000. The top radio deal of the year was a 19-station swap between CBS Corp. and Beasley Broadcast Group, Inc., worth an estimated \$300 million. Seventy percent of radio stations sold were in markets smaller than rank 75 or in non-rated regions, said SNL Kagan.

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## TALKBACK

(continued from page 4)

friend and I set up a C-Quam transmitter into a dummy load. We ran a lot of different music through it for about an hour. It was, for lack of a better word, magical! No digital artifacts and clean audio out to 10 kHz.

### About "Station's Automation 'Hijacked?'":

The danger is not in using Windows in general, but rather in using a no-longer-supported version such as Windows XP. Windows 8.1 Professional is approximately as secure as either Linux or OS X, although I would strongly recommend using a good third-party anti-malware suite instead of the default applications that come with Windows.

### About "Goodbye BNC, Hello 8P8C":

I knew that the B is for Bayonet. Most likely because I knew that the T is for Threaded in the TNC connector. ... However, I thought that the NC part was for N (as in Type N) Compact. So, does the N in Type N perhaps stand for Neill? And what about SMA connectors? Curious about RJ45 being inaccurate. Is it only supposed to be called RJ45 when it is used on a PBX? (RJ7, RJ11, RJ45)

### About Andy Skotdal's commentary "AM Band Needs Drastic Change":

We are not getting our money's worth from the FCC. We pay annual fees based on our 2 mV/m coverage contour. Yet we are not getting protection from these devices within that area. ... We need relief and quick.

Andy hits the nail on the head: Migration to VHF is the only long-term solution for the AM band.

I'd like to commend Mr. Skotdal for actually thinking outside of the digital box, both with regard to Digital Radio Mondiale ... and a full-on migration to FM.

Andrew, are you trying to put many

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small-town AMs out of business? You're out of your mind to say out of 4,000 AM signals, including mine, pull the plug on them to 700? ... I love my AM station, it's what I wanted all my life, and you are *not* taking it away from me.

### About "Seattle Listeners Take Note of All-Digital AM Tests" and other stories on that topic:

The thing that bothers me ... is that all these tests are hush hush, as if they are part of some super-secret government activity.

Test HD on a directional AM in Kansas, Florida, or Ohio and see how long it takes to reacquire digital audio after every lighting crash.

I know most of the FM stations don't want us guys to survive and unless some folks step up to the plate, we are a dying breed. Please give us some type of hope.

### About Mark Persons' commentary "Adjust Rules for NRSC Measurements":

I agree the NRSC measurements are somewhat of a pain but I disagree with the commentary; [solid-state] transmitters are equally prone to spurious emissions and should *not* be exempted from annual NRSC measurements.

### About Tom Ray's "Shopping for a Car With HD Radio":

The HD Radio works flawlessly with excellent audio quality. Bottom line is to never purchase a new vehicle that lacks HD Radio. It's that good.

To my delight, two new Tesla "showrooms" have just opened, to make three close by. Superchargers too! And the Model S radio embedded in the 17-inch glass cockpit has HD Radio! Sitting in the Decatur, Ga., location I was amazed that well over half of the Atlanta FM station had HD-1, 2 or 3s. Now to conquer the finances of getting one of these toys.

I have been looking at cars and ask about HD Radio. Most salespersons have no idea. In my small sample, all 2015 Subaru Impreza and 2015 Mazda3 levels have HD. That is an improvement from 2014 when only the top lines had HD standard. 2015 Honda Fit has HD only if you get navigation and traffic.

HD Radio number one priority in selecting a new car? That's like selecting a compost heap as the number one priority when looking for a new house.

Delete the "HD Radio" jargon and explain that we have "I-D Radio" and

let the listener know that it stands for iBiquity Digital Radio. Then explain that audio quality is noticeably better on the primary "channel" and that there are other "channels" on most "I-D Radio" stations providing more variety.

### About my interview with Mark Ramsey, "A Chat With an HD Radio Skeptic":

Mark Ramsey says that we should forget about "HD Radio"? Should I forget that my car radio cannot always get WRR(FM) in stereo? ... Should I forget how harsh and extremely irritating the audio of KRLD is without their digital signal? ... Should everyone listen to Pandora while driving instead of listening to a local station that can tell them about the tornado coming?

Everything Ramsey says is or should be well known in the industry, consumers couldn't care less where the content comes from if it is good and sounds OK.

Finally someone has the guts to say what I have been saying to anyone who will listen for over 10 years. The problem is the content not the technology. ... Radio is doomed unless the owners understand this and act on it.

### About "Field Observations of Elevated FM HD":

No mention is made of self-interference between elevated IBOC levels and analog reception of the host signal. Does this exist or is the analog audience now considered superfluous?

### About John Garziglia's story "Let's Talk About FM Translators":

I hope the next article will talk about rebroadcasting HD subchannels on a non fill-in translator. For example, let's say I lease a subchannel from a nearby station, but my translator is three or four miles outside the service grade (60 dBu in this case) of the nearby station. Would such a setup be permitted?

### About "NAB Labs: FM in Smartphone Availability 'Complex' for Consumers":

It's clear that the mobile carriers are not interested in enabling a feature that provides free content that competes with their own services. Until they get some incentive to do so, like subsidies or sufficient competition from other

(continued on page 8)

## NEWBAY NAMES PRODUCT INNOVATION AWARD WINNERS

NewBay Media announced the winners of the second annual Product Innovation Awards, honoring outstanding product introductions that serve TV, professional video and broadcast/online radio users.



The PIA program recognizes excellence in manufacturing of products to serve the TV, professional video and broadcast/online radio markets. Nominations were submitted by manufacturers, who paid a fee to enter. Winners were selected by a panel of professional users and will be featured in TV Technology, Digital Video, Creative Planet Network, Government Video, Video Edge, Radio World and Radio magazines.

The winners are:

#### Radio:

RCS — RCS2Go

#### TV/Video:

Aspera — FASPStream API

Bitcentral — CORE: News

Elemental Technologies — Delta

Frontline Communications — VIP Vehicle Integrated Power System

Grass Valley — K2 Dyno Replay System

Harmonic — VOS

Kessler Crane — Kessler Second Shooter

Multidyne — SilverBACK Fiber Transport Solution

PESA — XSTREAM C22

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Triveni Digital — Digital StreamScope MT-50 HDT

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## MIGRATION

(continued from page 3)

sports, to regional Mexican music as you do here in Seattle. Scan an analog radio up the dial today; at least you know there is a radio signal when you can hear foreign languages and foreign music.

### ALL-DIGITAL X-BAND QUESTIONABLE

What if you could isolate the expanded band and simply start with all-digital there?

That's an improvement from the listener side; at least analog listeners would learn that the upper end of the band was unlistenable from their perspective, and they would know to avoid it. They wouldn't know why it's static, but they'd know it wasn't for them.

Expanded-band licensees would first need a way to keep their analog signals going if their part of the band is designated digital.

Then there would be "haves" and "have nots." The "haves" in this scenario are big groups and capital-flush independent owners with \$70,000–\$100,000 to upgrade each of their expanded-band stations. They're likely in big markets.

The "have nots" are those in markets smaller than 500,000, or small broadcasters in markets of any size, who scraped together every penny they had to get their expanded-band station on the air but still kept their old signal hoping for a little incremental revenue.

My friend in a major market, a minority broadcaster, just crowdfunded a campaign in his community to make his \$64,000 balloon payment on his loan. He'd laugh if someone asked him if he'd invest in HD Radio on his AMs. Then he'd reach for his gun.

Similarly, it's one thing for big-market operators like CBS Radio to upgrade with HD on AM. It's another for operators like BiCoastal Media in a market like Hood River, Ore.

### IS THERE A DIGITAL CONVERSION PATH?

So the question really does boil down to this: What is the incentive to convert AM radio stations to HD Radio?

If the goal is making the AM band all-digital, receiver penetration has to lead way ahead of transmitter upgrades, and get above 75 percent quickly, which won't happen; or you can try to jump-start it by setting a regulatory conversion date for the FM band and have the FCC require receiver manufacturers to implement AM HD chipsets with FM.

Even in a scenario where FM conversion is mandated and AM receiver chipsets come along for the ride, you still have the AM transmission conversion cost and impossible to resolve implementation issues illustrated above.

As an alternative, if the goal is to achieve a digital version of today's AM

band, operators have to be incentivized somehow, e.g. tax breaks that might cause corporations to buy signals and shut them down for the tax benefits or FM migration/AM surrender as outlined in my December commentary.

### TOO LITTLE TOO LATE?

There are many benefits of HD Radio: You enjoy the same level of signal quality at a distance as you have at the transmitter site. It's a robust technology

over time. With 14 to 17 percent of the total radio audience using the band in many areas (according to the FCC in its 2013 revitalization Notice of Proposed Rulemaking), operating in today's environment is too challenging for many AM radio operators in America.

We would be better as an industry waiting three decades for new FM receivers with VHF band capability to simplify the listener experience to one band, than spend three decades waiting for AM HD

## Regardless of the benefits, of which there are many, HD is too little, too late for AM.

capable of overcoming interference from power lines and bridges while maintaining reception quality. It's a technology that gives AM music better sound fidelity than Sirius/XM allocates to its music channels — close enough to FM that music on AM is a competitive alternative to FM.

But regardless of these benefits, HD is too little, too late for today's AM stations. From a timing perspective, there is no functional model to convert the band to digital radio. We have too many licensees, too few receivers, too much expense, and no mandates or other tools to encourage adoption.

That is why we should focus on VHF migration. Or we'll simply see more AM band operators go bankrupt

receiver penetration to reach 85 percent. VHF migration affords everyone an equal shot at targeting cell phone radio receivers; more importantly, migration sidesteps AM interference issues.

AM radio is still a massive-reach platform, and stations continue to prove that their content can keep AM relevant; but digital technology on AM can't improve the fortunes of the stations using the band while the receiver base is so low. In the meantime, the rise of the electromagnetic tide will continue to erode the AM band.

VHF migration is the only way to truly solve that problem.

*What do you think? Comment via email to radioworld@nbmedia.com with "Letter to the Editor" in the subject field.*

## TALKBACK

(continued from page 6)

carriers, they could remain aloof.

**About "WCIS(AM) Owner Hopes to Return to Air Next Week" after being hit by copper thieves:**

Prior to Reagan's presidency, the commission's rules included provisions for federal prosecution of criminals who damaged licensed radio equipment. ... [T]he federal code provided for two years imprisonment and a \$10,000 fine for willful damage to licensed communication facilities. ... If these thieves are caught, I would suggest the station owner attend the sentencing hearing, and request a heavy fine, at least two years (no early release) and restitution.

**About "The Future of Car Radio":**

Nowadays, one needs a copilot to operate the instrument panel as you pilot the car. How times have changed.

**About "FCC Cites Production House for Misusing EAS Tones":**

"Alerting authorities and the commission don't want the public to become inured to hearing the tone." If that is the

case, NOAA, who is the biggest user of the tone, should knock off announcing "the tornado will be near" all the time basing their judgment on a radar image.

**About "Wheeler Confirms FCC Reviewing 'Redskins' Name":**

According to Federal Election Commission records, the Redskins' owner, Dan Snyder, donates most to the Republicans, and little to the Democrats. That may be the real reason behind this; if and when Dan reverses this, the heat and outrage will magically diminish. The First Amendment says the government can enact "no law" which abridges freedom of speech or the press. "No" means "no." (The commission later said the name Redskins does not violate broadcast indecency rules, and it approved a license renewal for a station owned by Snyder.)

**About Michael LeClair's story "Does 4G LTE Have a Problem?" in Radio World Engineering Extra:**

Bottom line: A poorly engineered system created by the IT guys who know little about RF. However, the wireless industry has more money to throw around than broadcasters. They paid a lot of money for this spectrum so now the FCC jumps when they call.

*Post your own comments below any story at radioworld.com, or email me at radioworld@nbmedia.com.*

## NEWS ROUNDUP

**CPB:** After eight journalists were killed at the French satirical publication Charlie Hebdo in January, the Corporation for Public Broadcasting announced a total of \$7.5 million in grants to several of U.S. public media's flagship journalism organizations. Among them, NPR received \$1 million to help the network increase its international coverage; and CPB earmarked \$750,000 to help fund Public Radio International's syndicated "The World." CPB said the grants were in the honor of the slain and in support of freedom of the press and freedom of expression.

**BEASLEY:** A broadcast group has dropped a legacy term from its name. Radio owner Beasley Broadcast Group is now Beasley Media Group. The various entities that previously held the company's 53 stations (33 FM and 20 AM) have merged into one entity. The company believes the new name reflects the reach of on-air, digital and collateral radio products that are available to its listeners and advertisers. The publicly-traded parent company, headquartered in Naples, Fla., remains Beasley Broadcast Group Inc. and continues to trade as "BBGI" on NASDAQ.

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## NATE

(continued from page 1)

as well as an educational program with a heavy emphasis on safety.

"The safety culture doesn't change overnight," Schlekeway says. "It has been a challenge with this buildout cycle we're currently in to have enough qualified workers in the industry."

### SAFETY FIRST

The NATE Unite schedule contains several intensive training programs for tower workers, including a 10-hour



All smiles on the exhibit floor at NATE Unite 2014 in San Diego.

OSHA course, an RF awareness course and a competent rigging/signaling course. It will also bring together members of NATE's wireless industry task force, which is working on creating a national wireless safety training standard, in part to head off an OSHA proposal for new federal tower safety standards.

"The industry believes strongly that we can address the challenges ourselves outside of the government regulating it," Schlekeway says.

At the same time, NATE has been actively participating at several regulatory levels, including filing comments in the FCC's rulemaking proposal to repack the UHF television spectrum. The group opposes what it says are arbitrary deadlines for stations to install new antennas, warning that a rushed schedule may lead to untrained workers being pressed into dangerous work atop taller towers than those with which they're familiar.

"One thing we're watching from a

of Paxson Communications Corp. began his career at 14 as a DJ in upstate New York. As an adult, he bought WACK(AM), Newark, N.Y. Paxson is credited with sparking the idea for direct-to-consumer on-air marketing and took the concept to TV, creating the Home Shopping Club, which became the Home Shopping Network. He sold HSN and started religious network PAX TV, which eventually was bought by NBCUniversal and renamed Ion Television. NAB President/CEO Gordon Smith stated: "Broadcasters have lost a friend and a legend in the passing of Bud Paxson, who was a tenacious advocate for over-the-air radio and television. Bud's support for program carriage rules as part of the 1992 Cable Act helped sustain diverse voices on the airwaves and allowed free and local broadcasting to remain a competitive force in today's multichannel world."



Above: Representatives of the California Wireless Association conduct an educational session on "Future Trends in the Wireless Industry" at NATE Unite 2014.

Right: Todd Schlekeway, Executive Director of NATE



wireless broadband network.

"We have their director of public affairs giving a session," Schlekeway says. "That's going to be a good opportunity for a lot of contractors out there."

NATE officials and vendors alike acknowledge that today's industry is heavily focused on the shorter towers that serve wireless broadband and cellular customers, more so than on the taller towers that serve broadcasters.

"Broadcast is kind of a specialty product," says Terry Zarnowsky, director of business development at tower lighting provider Unimar. "Most of our

growth is in telecom and wireless," where growing clients, such as tower owner VerticalBridge, provide a constant stream of projects that are smaller in budget but more numerous than the big-ticket, high-intensity lighting Unimar sells for tall towers.

### BUSY SEASON

"We're hopeful, optimistic" about business growth in 2015, says Tim Rohn,

### IF YOU GO

What: NATE Unite

Who: The show is billed as "the premier event of the year for the tower erection, service and maintenance industry."

When: Feb. 23-26

Where: Disney's Coronado Springs Resort, Lake Buena Vista, Fla.

How: <http://natehome.com/annual-conference/>

How Much: \$149 for members, \$449 for non-members (until Feb. 13); one-day and exhibit-only rates available



safety perspective, if there's a shortage, you're going to have workers migrating to [broadcast] towers that are much taller than your typical cellular tower," Schlekeway says.

The NATE Unite conference will include an early look at FirstNet, a new government initiative to create what's being billed as the first public safety

sales manager at tower maker Rohn LLC, which exhibits at both NATE Unite and the NAB Show. While NAB draws more of the industry's decision makers, Rohn says NATE Unite is a good opportunity to meet many of the small contractors who actually do the bulk of the industry's tower work.

The February timing of the NATE Unite conference is no accident; Schlekeway says it's timed to the industry's traditional slow season, when weather keeps many tower crews grounded.

"But as busy as we've been in the last couple of years," he says, "it isn't easy to pull crews out, even in the dead of winter, because there's been so much demand for their services."

NATE Unite will be back in warm weather again in February 2016, when the 21st convention is scheduled to take place in New Orleans.

Veteran broadcaster Scott Fybus is editor of *NorthEast Radio Watch* ([www.fybus.com](http://www.fybus.com)) and has written for *Radio World* since 1999.

## NEWSROUNDUP

**SPOTIFY:** Spotify says it surpassed 15 million customers paying for its premium music subscription service by the end of 2014. The Internet pure-player also said that it now counts 60 million active listeners, evidence that plenty are listening to the free, ad-sponsored tier. Spotify last provided an update on its subscriber count in November. Back then, Spotify had just crossed 12.5 million paying customers. That compares to May 2014, when the company said it had 10 million paid customers with 40 million active listeners.

**BUD PAXSON:** Radio and television station entrepreneur Lowell "Bud" Paxson died Jan. 9; he was 79. The founder

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# Tame the Fire-Breathing Transmitter

Troubleshooting tips can save you time — even save your life

## WORKBENCH

by John Bisset

Read more Workbench articles online at [radioworld.com](http://radioworld.com)

**P**resent-day transmitters practically can repair themselves, with all their diagnostics. But if you have an older tube transmitter, repairs can take time.

There are two main reasons. First, the original manufacturer may no longer support that model; second, you may be missing the instruction manual and schematics. Older transmitter documentation can be found on the Web, but another source is an older engineer who may have cut his teeth on these rigs. Check with local contract engineers, as they need to have knowledge on a variety of models and power levels.

Whenever the transmitter fails, it's important to consider all evidence obtained by meters, tripped breakers or burned components. This is a good reason to visit your sites regularly. If the transmitter has a blower fan, is it running? Is it making noise? The absence of normal sounds, like that blower motor, or the clack of relays and contactors when restarting the rig, can help you diagnose where the problem is.

When troubleshooting, take someone with you. In a contract situation, I'd ask the GM, owner or PD to accompany me. We all know what kind of respect is earned when the plate ON switch is greeted by flames shooting out the top of the transmitter and accompanied by a terrific bang. Engineers have told me they prefer to restart their rigs using their cell phone dialed into the remote control — so they're not right next to the fireworks.

In working on a particularly troublesome Collins Power Rock, we'd often use a wooden broom pole to push the ON button, just so we weren't right on top of the rig when it exploded.

If you're new to the industry, understand that this is dangerous stuff. No station is worth dying over. Some straightforward safety steps are in order.

To begin: *Never* work on a transmitter when you are tired. And its corollary: *Never* work alone. Should something happen, you want someone to be there who can call 911.

Most transmitters are controlled by remote control systems. Make sure the remote control is disabled or in maintenance mode, so no one back at the studio accidentally turns the transmitter on while you're inside it.

Then we get to the AC breakers. It's important that *all* are identified, and turned off. Again, this is so you can make your internal inspection safely.

As you open the back, check that the power supply shorting interlocks, as well as the control interlocks. They should be working. What you want to inspect is that the interlock wiring is intact. Sometimes engineers will defeat the interlock switch with a clip lead and forget to remove it. Before reaching inside, take the shorting stick and short out all components.

If your transmitter doesn't have a shorting stick, construct one. I've seen folks use a yardstick or broom handle about three feet long — nothing fancy. Screw a bolt into one end and sandwich the ground cable lug between two nuts. At the other end of the ground cable,

affix a large spring clamp — like an oversized alligator clip. The ground clip is attached to the transmitter chassis, and the business end of the shorting stick is used to touch all components. This ensures they are de-energized.

The first time you encounter a live component and hear the crack and see the arc, just remember that could have been your hand! Safety components, like interlocks, are supposed to keep you safe. The shorting stick is akin to wearing a belt *and* suspenders. Working around gear like this, one can never be too safe.



Fig. 1: Can anyone claim this station studio?

Keep your camera-phone handy to snap pictures of anything suspicious. Use your nose, as well as your eyes, to spot burned or overheated components. A bright trouble lamp is a must-have, and your big box hardware stores have LED versions that won't burn out. If you are using a traditional trouble lamp, the next time your tower lights are changed, tell the rigger to give you the old bulbs. This is a neat way to recycle the side light bulbs, as they certainly will enlighten the subject.

Let's say nothing obvious is visible. Button things up, turn the breakers on and try again to bring the transmitter up. Before touching any controls on the transmitter other than PLATE ON, grab a pad and a pen, and write down what you see. Are overload lights lit? These indicators will point you to the section of the transmitter that's at fault.

Does the transmitter come on but quickly shut down? That's usually a sign of a short somewhere. What do the meters read? If there is no indication of plate voltage,

suspect the high-voltage power supply (HVPS).

Check the filament voltage meter — no filament voltage means no tube emission. Depending on the environment, I've seen the leads to the tube filaments corrode. These cables carry a lot of current, that's why they are the diameter of your finger. Clean, tight connections are imperative.

This is just a start, and we'll continue in future columns. Some of our sage readers will have other things to check, and we'll include them. (For more about tubes, see page 18.)

**B**ruce Roberts is the director of engineering for Apex Broadcasting in Charleston, S.C. Bruce shares a picture of a station he thinks was near New Albany, Miss., shown in Fig. 1. He inferred the location

from the poster hanging on the wall.

This was typical of small market stations in the '50s and '60s. A very low-budget build, and the equipment just lasted forever. Bruce wonders if *Workbench* readers can identify the specific station, and share any stories.

He concludes by pointing out those turntable remote start switches down where your left knee would be ... gee, they look like light switches! Surprise, they are!

Email your thoughts (and high resolution pictures) to [johnpbisset@gmail.com](mailto:johnpbisset@gmail.com).

Contribute to *Workbench*. You'll help your fellow engineers and qualify for SBE recertification credit. Send *Workbench* tips to [johnpbisset@gmail.com](mailto:johnpbisset@gmail.com). Fax to (603) 472-4944.

Author John Bisset has spent 45 years in the broadcasting industry and is still learning. He handles West Coast sales for the Telos Alliance. He is SBE Certified and is a past recipient of the SBE's Educator of the Year Award.

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# Can I Put My Antenna in a Tree?

LPFM beginners are asking a lot of questions; they could use your help

## **LPFM**

BY DAN SLENTZ

I'm in a number of online low-power FM groups; and with the recent expansion of the LPFM service, I have been seeing a lot of queries from people with little experience in engineering and broadcasting. Some questions are excellent, but others are almost frightening in their lack of understanding.

Below is a sampling, plus my observations based on my experience in noncommercial low-power FM stations. My comments here assume a bare-bones operation. There are many levels of possible complexity to building and managing your station. And to help answer questions, we've also tapped industry experts including attorney John Garziglia, LPFM consultant Michi Bradley, and engineers Michael LeClair, Cris Alexander and Tom Osenkowsky, the three of whom also contribute to Radio World.



**LPFM broadcasters are shown unloading a Collins transmitter during a workshop. From the website of the Prometheus Radio Project.**

## **RF energy is a science and not an experiment.**

For all questions regarding technical performance or legal liability, I strongly recommend that you talk to a broadcast engineering consultant or licensed broadcast lawyer with expertise in the LPFM area. By doing it right the first time — seeking experienced engineering and assistance with choosing the right gear — you can save a lot of money (and potential fines).

Here are some questions I've seen recently.

*If I combine a 5/8-inch vertical antenna with a circular polarized antenna, what kind of pattern will be produced and what kind of coverage should I expect?*

Combining different styles of antennas is a no-no. RF energy is a science, not an experiment. Antennas work with or against one other to produce proper

signal. In some cases, this can create useful "gain," but in others it might produce a "null" or void in the signal.

LPFMs generally are not licensed to be directional FMs, i.e. they are not aimed in certain directions while suppressed in others; you must use proper antennas and not experiment with different types/polarities. But some may be directional if they are public safety stations or it is necessary to protect second-adjacent stations.

Also, in many cases a specific transmitting antenna make and model, along with the number of bays and spacing, were specified in the construction permit application to obtain a second-adjacent channel waiver. An applicant in that instance must use the specified antenna or an antenna with the same radiation characteristics. Finally, the FCC's license application itself asks for the make and model of the transmitting antenna used, and any changes after the filing of the license application requires that either an amendment or an application for a modification of license be filed.

*What will my power utility bill be?*

A starting point is to ask a local electrician to perform a site study on your power usage. Knowing how much power

a transmitter uses is relatively simple, but power rates change according to location and provider, and you will use power in other ways as well. In general, LPFM transmitters are all low-power units that draw a few hundred watts at most. Most of your facility's power will likely be consumed by your studio equipment and studio lights, plus the air conditioning and heating systems. For more advanced LPFM owners, a rough monthly estimate for electrical use is:

$$0.001 \times 2 \times \text{TPO (watts)} \times 24 \times 30 \times \text{price per kWh}$$

The estimated local price per kWh can be found by Googling the town/state name and electricity rate. Or look at a residential bill to get a +/-10 percent estimate.

*Should I run my library through software and save all my audio files with the audio processing embedded into each file?*

Keep in mind that when an audio file is "doctored" in any way (compressed, expanded, etc.) by an audio processor in Adobe Audition or other software, the modification becomes part of the song and can't easily be undone.

General practice is to perform no processing to the audio file. There are varying opinions about MP3s, but I would suggest this: Don't use them if at all possible! Stick with WAV files. They take up more hard-drive space, but that's very cheap nowadays.

If you are stuck with using an MP3,

try to insist on a minimum bit rate of at least 192 kbps. Anything lower can create bad sounding radio. MP3-128s and lower can produce degraded audio with strange-sounding sonic artifacts when used for over-the-air-broadcasting. When a song is compressed, it cannot be uncompressed, at least audibly and sonically. You can turn an MP3 into a WAV file; that doesn't put back what was taken away.

The only safe bet for "fixing audio" is a process often called normalizing. This simply takes the peak level and brings it up or down to 100 percent so every song basically has about the same "volume." It does not take quiet passages and makes them louder. It simply looks at the entire song to make sure that songs recorded at a hot level are brought down to "normal" or quiet songs are brought up to "normal."

Your station's overall audio should be processed live and in real time, just prior to being transmitted. This allows you to "sweeten" or increase the levels at the transmitter. If you decide that you really want a "punchy" on-air sound, you can apply more processing; if later you decide you want music to maintain the original dynamics, this will still be possible, through adjustments at the on-air processor.

*How many computers do I need to run my LPFM radio station?*

It depends.

You need one for on-air playout (and automation, if you plan to use it). I would keep production on a different computer, even though today's systems can handle multitasking. I also recommend having another computer as an office system for Internet functions, logs, etc. So I'd go with at least three, though production and office work could be multitasked onto one.

This brings up networking. I recommend keeping your on-air machine off the Internet or at least behind a firewall and second NIC (Ethernet port). The main point to consider here is protecting your on-air automation machine from harmful and destructive attacks coming in from the Internet.

*My tower guy tells me that a tower in a residential neighborhood is going to be "frowned upon" and is mounting my antenna in a tree.*

This comment raises myriad concerns. Yes, a "poor guy's station" can use a telephone pole or a roof chimney mount with a 2-foot pole to support an antenna. But a tree is a living thing. It grows; it has a root and water distribution system. It may distort your RF energy. Seasonal changes may affect your coverage. It may tempt a youngster or other person to climb into harm's way. How are you going to allow your run of



# PEOPLE NEWS

## Rob Morris

CBS Radio Miami

was chosen as vice president of programming

## Kent Dunn

Beasley Broadcast Group—Tampa-St. Petersburg

has been named vice president and market manager



## John Holt

Washington NPR affiliate WAMU(FM)

has retired from his position as director of engineering and operations

## Ann Gallagher

Federal Communications Commission

Association of Federal Communications Consulting Engineers has named her as the recipient of its E. Noel Luddy Award

## Mark McDonald

Washington NPR affiliate WAMU(FM)

left to pursue other opportunities

## Bill Cate

Media Services Group

has joined the media broker



## Chris O'Kelley

Beasley Broadcast Group—Augusta

was promoted to operations manager



## Tee Gentry

Beasley Broadcast Group—Tampa-St. Petersburg

was chosen as operations manager



## Joshua Rush

Audinate

tapped as VP of marketing

## Dave Milner

Cumulus Media

will serve as SVP for West Coast Markets

Send information to radioworld@nbmedia.com with People News in the subject field.

coax to change as the antenna structure grows each year? Are you going to file with the FCC each year as you have a new height (or maybe every few years).

Keep in mind that the LPFM authorization specifies an exact set of geographic coordinates, and exact height, at which the antenna must be installed. Moving an antenna by more than a just a few feet in location, or more than 2 meters higher or 4 meters lower in height, will require that a modification application be filed with the FCC. Finally, the location must comply with the FCC's radio frequency radiation guidelines. The FCC regards RFR non-compliance as a serious matter.

*Is it true that if my transmitter is at least 8 feet above the floor, it will transmit farther?*

No. Someone may have told you "an FM transmitter gets out further when it's higher." They were talking about the antenna, not the transmitter. Your transmitter will be mounted in a rack, and it's a reasonable idea to keep it a few feet off the floor, no higher than eye level. But this is just for access and ease of service.

The above are but a sample of dozens of questions from new and pending LPFM broadcasters being posted every day. In many cases, the answer is really a matter of opinion: but others are cause for concern for technical performance, safety or legality.

If you have a construction permit for an LPFM, I invite you to reach out to your local radio stations (as well as TV) and introduce yourself to start

creating your own network of broadcast support contacts. Join the Society of Broadcast Engineers and attend local chapter meetings. Your local engineers and maybe used gear. Sign up for free subscriptions to broadcast engineering, programming and management magazines. Look for resources that are reliable for information, like the Radio World eBook "LPFM 2014" available for free at [www.radioworld.com/ebooks](http://www.radioworld.com/ebooks).

Meantime, a qualified broadcast engineering consultant or licensed broadcast lawyer with expertise in LPFM is invaluable.

And if you are a broadcast engineer, please consider reaching out to LPFM stations. I know sometimes "new guys on the block" ask questions that are, to put it mildly, interesting; but your experience and helpfulness might save both them and you some headaches. LPFM folks are excited about radio in a way that reminds us of the medium's true appeal — and your next assistant engineer might just be cutting his or her teeth at that little LPFM on the other side of town. Responsible LPFMers are not trying to cause interference or make your life difficult; they're here because they have the same broadcasting bug that bit you years ago. They're eager, excited and chomping at the bit to play in this world of radio.

My thanks to Michi Bradley, Cris Alexander, Michael LeClair, Tom Osenkowsky and John Garziglia for their input.

*Comment on this or any story. Email radioworld@nbmedia.com with Letters to the Editor in the subject line.*

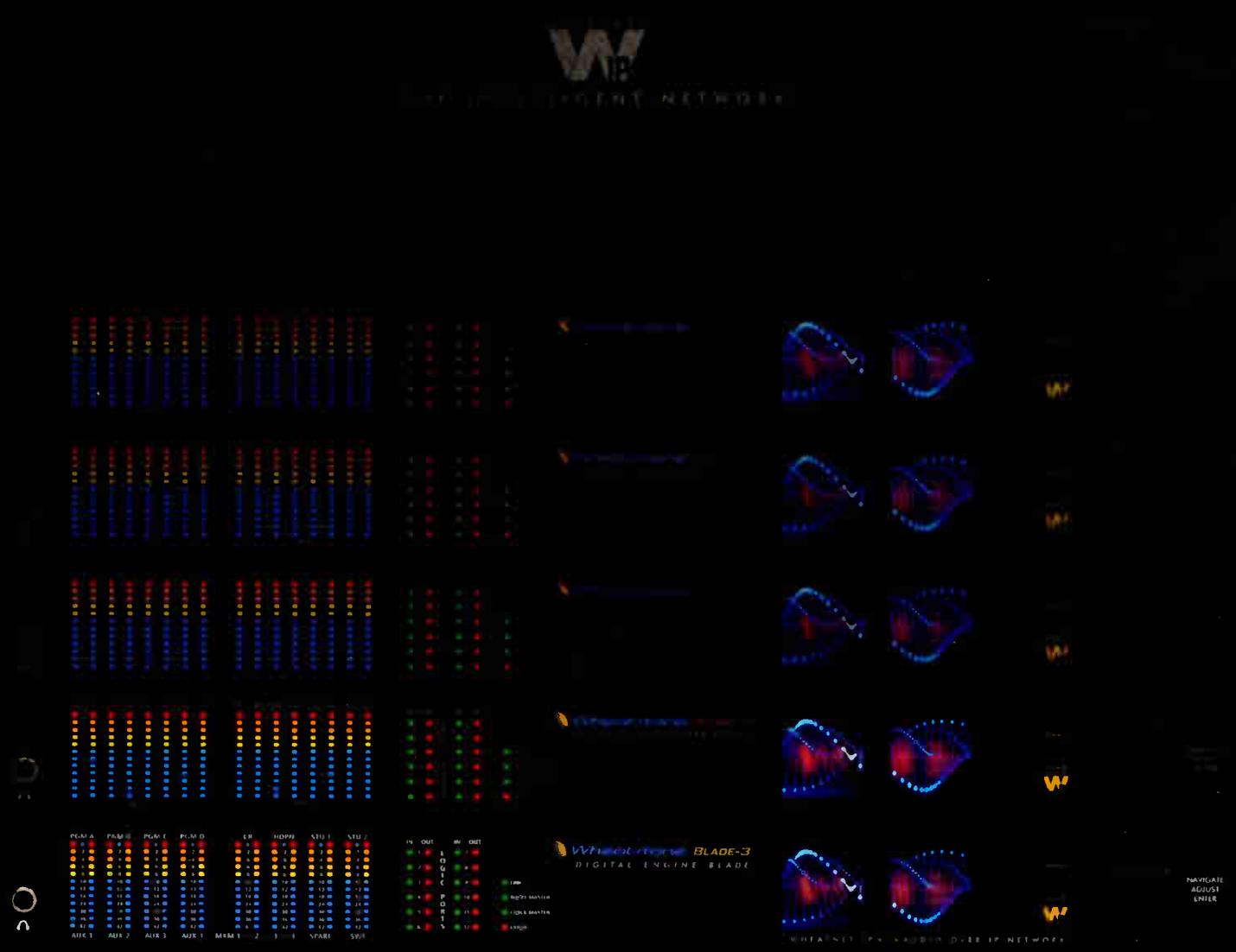
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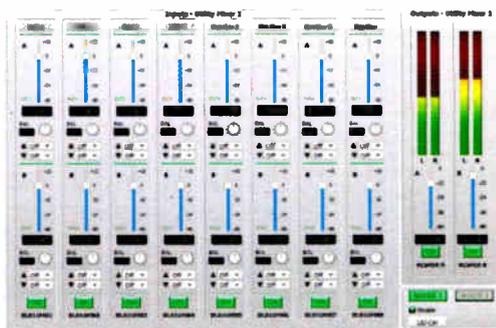
### • Gigabit Connectivity

All BLADE-3s use Gigabit Ethernet. This makes all the difference in network capacity, near-zero latency, throughput, reliability – in short, everything.



### • Virtually All Audio Formats

BLADEs are built to handle and convert native analog, microphone, AES/EBU, SPDIF, AOIP, MAD1, SDI and AES67.



### • Two 8x2 Utility Mixers

Each BLADE has two 8x2 utility mixers that can be configured in many different formats. Two 8x2, four 4x1, etc. These internal mixers are full featured and include panning, channel ON/OFF, fader levels, and access to any source signal in the system. They also include a full ACI (Automation Control Interface) allowing remote control, ducking, auto fade, channel on/off, levels, source assign, etc.

### • Audio & Control Routing Matrix

### • Source & Destination Control

Each BLADE has the ability to route any system source to the destinations on that BLADE.

### • Front Panel Logic Indicators\*

### • 12 Universal GPI/O Ports

### • 128 Software Logic Ports\*

Used to interface with software switches, indicators, and control functions throughout the system.

### • Built-in Audio Clip Player\*

### • Silence Detection

### • Dual OLED Displays\*

### • LIO/SLIO Logging\*

### • Aliases\*

Allows the same source to be identified by different names. Multiple aliases can be used so different operators can share logic functions, source feeds, routing, etc.

### • Auto Mono Summing

### • Signal Splitting

### • Gain Control on Every Input & Output

### • Balance Control

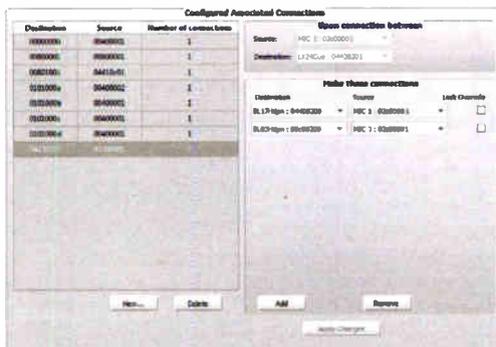


### • Stereo Audio Processor\*

Each BLADE-3 has a stereo multiband processor with the following: 4-band parametric equalizer, 3-way crossovers, 3 compressors, 3 limiters, and a final lookahead limiter. This is a "routable processor," meaning it is not limited to the local I/O on the BLADE – it can be considered a network resource.

### • Onboard Intelligent OS

Each BLADE has its own intelligence/operating system that allows it to be a powerful standalone router, part of a larger system or control the entire routing system.



### • Associated Connections\*

This is a great feature in BLADEs for callers, codecs, networks, remote broadcast & live talk shows that require a mix-minus. You can create a predetermined back haul, IFB feed or mix-minus for each device based on its location in the system or on a fader. If you have a shared resource connected to your system, such as a codec, the software will "automagically" give the proper return feed to the codec based on its destination. When a base connection is made, up to ten additional connections can be made. This significantly helps streamline studio routing, phone and codec selection.

### • 44.1 or 48K Sampling Rates

### • Flexible Signal Configuration

Signal can be defined as up to 16 mono, 8 stereo or any combination of mono and stereo totaling 16 channels.

### • AES67\*

Ability to support AES67 compliant devices. Allows WheatNet-IP system to synchronize to IEEE1588 from a PTP grandmaster clock and ingest /stream AES67 compliant packets.

### • 44.1, 48K, External Sync or AES67 Operation\*

### • Clock/Sync and Alarm Indicators\*

### • Automation Control Interface

This is a "tool box" that every BLADE has that allows full control of the BLADE's functions such as routing, ducking, panning, full logic control, mixing and silence detection. Each BLADE supports up to 20 ACI connections which can be used with devices like Talent Stations, GP panels, SideBoards, etc. It also allows control of our partners'/third party equipment.

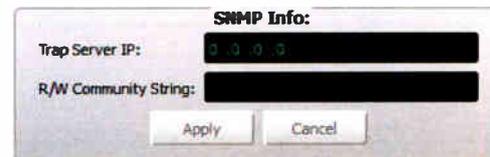
### • Front Panel Headphone Jack and Source Selection

### • Salvos/Macros

### • Studio Bypass

### • Front Panel Input and Output Metering

There is metering for every input and output on the system – 12-segment, multi-color LEDs that can be used for metering inputs and outputs as 8 pairs or 16 mono signals.



### • SNMP

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### • Connection Choices

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### • Full Info Screen

Each signal has a new info screen allowing the user to add text to signals such as wire numbers, termination locations, etc.

### • LIO Test

### • Automatic Backup

### • Alarm Notification

### • NTP

### • Front Panel Locking

### • Version Checker

### • Crosspoint Save

### • Debugging Tools

### • No Cooling Fans Needed



\* indicates features available only in BLADE-3s

# Stay Tuned for More

About the ins and outs of transmitter tubes

## TECHTIPS

BY MARK PERSONS

Do you know or have you wondered what is inside a transmitter tube? There is a huge base of tube transmitters out there, and you might be tasked with repairing or maintaining one. The job of tuning and keeping a tube transmitter working will be a lot easier if you know what is inside.

### HISTORY

Electron tube technology dates back to about 1910. The British called them valves because that term is an apt

description of what tubes do.

Today, a typical 20 kW FM broadcast transmitter uses about 400 watts of RF drive to a single tube. That tube has a gain of about 50 (34 dB) to develop 20 kW of RF at the output. It is RF drive that controls emission in a tube, like a valve would in a water pipe.

Radio transmitter tubes today use a coaxial design. That is to say, the tube elements are arranged in concentric circles or cylinders around a central axis.

It was the team of Bill Itef W6UF and Jack McCullough W6CHE who developed power tubes starting in 1934. Their company became Eimac, now known as CPI, which folks today recognize as the premier power tube supplier.

Initially, tubes used glass as an insulator between working elements of the tube and the outside world. Much like a standard incandescent light bulb, electron tubes need a complete vacuum or the tube's filament will burn up (oxidize) in short order.

### NAMING

The numbering scheme describes what is going on.

Many know the 4CX250B tube. It was preceded by the 4X150. The "4" means it is a four-element tube.

The X separates the elements from the 150, which is the maximum power in watts that the tube can dissipate (turn into heat) safely under CCS (Continuous Commercial Service) conditions. In other words, the tube can do this 24 hours a day provided there is adequate cooling.

Another rating is ICAS (Intermittent Commercial and Amateur Service). The tube can withstand higher dissipation for a short period of time under that definition. Then there is the 4CX tube. The "C" indicates ceramic is employed as the insulator instead of glass and

can withstand higher temperatures. A 4CX250B can be used as a direct substitute for a 4X150 because they are the same tube, but with different insulators.

So that brings us to the suffix.

An A, B or C is the original tube with design changes. If it has an F1, that means "flying leads." These are heavy filament wires that make it possible for a transmitter manufacturer to design and build a transmitter that does not have an expensive tube socket. The leads often connect directly to a filament transformer. There will be a lead on a control grid too. These are found in AM, but not FM transmitters, because the leads would be too long for 100 MHz circuits.

Common tube types in use today include 4CX15,000A, and five flavors of 4CX20,000 with an A, B, C, D or E suffix. Each is slightly different and usually not compatible with another.

Some tube types have a number after the suffix letter signifying another variation on the tube design. Newer numbering schemes came from military naming, for example: YU-148. They are often a second number for the same



Fig. 1: Two well-used 4CX5000A tubes, one with its bottom concentric contact rings showing.



Fig. 3: A screen grid joined to a contact ring.

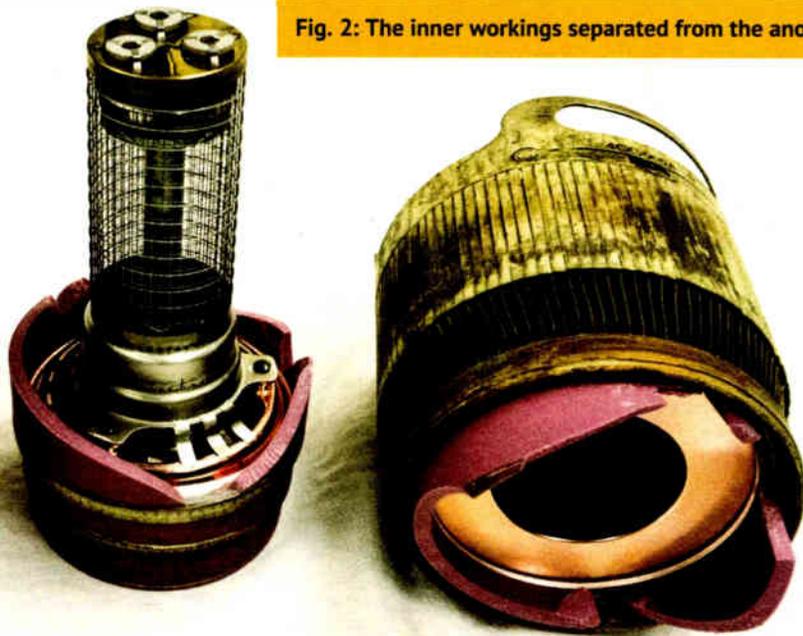


Fig. 2: The inner workings separated from the anode.



Fig. 4: Filament, control grid and screen grid, from left.

tube. In this case, it is the 3CX6000A7. A bit confusing.

Air is pumped out of tubes when they are built or rebuilt. Each tube has a small metal pipe sticking out of the top. The tube is turned upside down and connected to a vacuum pump. The idea is for gravity to help air molecules fall out of the tube for the best possible vacuum while pumping. It is that critical! The metal pipe is pinched off providing a good metallurgic seal before a protective cap is added.

#### CERAMIC SEALS

There are many places where air can get into a tube. Ceramic insulators are bonded to metal rings, which are connections to elements within the tube. The ceramic to metal seals can develop a slow leak that is sometimes not detected at the factory.

Running a tube too hot can cause a seal failure. Poor cooling from plugged air filters or dirt on cooling motor squirrel cage fan cups will dramatically reduce cooling. A misaligned tube socket can put undue sideward pressure on tube seals causing failure too. When run right, tubes are very robust and reliable. Treating them poorly can result in early failure.

Fig. 1 shows two well-used 4CX5000A tubes, one with its bottom concentric contact rings showing. A 12-inch ruler is included to give readers a sense of size. Most ceramic tubes have white insulators. These are the Svetlana brand tubes from Russia. Their ceramic is pink in color. Anode, grid and filament contact rings are silver-plated copper. The idea is to make good electrical connections to a tube socket. The ones shown here are tarnished from several years of use.

Fig. 2 illustrates the inner workings separated from the anode. The filament, control grid and screen grid cluster is referred to as the "stem." Those parts are assembled and aligned before final assembly when the anode is added in production. The stem portion weighs in at just 2 pounds, while the anode, which is silver pated copper, tips the scale at 6 pounds in this case.

Fig. 3 shows a screen grid joined to a contact ring. This tube type has six ceramic seals. There are lots of places where a seal can leak.

Fig. 4 shows a filament, control grid and screen grid, lined up to show the small size difference between them. Once inside each other, there is not much room for things to go wrong. These elements are fragile, too. You can see that the filament came apart as I was disassembling the tube for this article. Don't try this at home! Sometimes a tube element wire will break during use and short to an adjacent element. Ouch, end of tube!

#### HOW DO THEY WORK?

It all starts in the center with the filament. Think of the filament as a light bulb, which gets hot and emits light.

In this case, it gets hot enough to emit electrons too. Those electrons will be attracted to the outermost element of the tube, known as the anode, often called the plate. There could be 10,000 volts or more difference between the filament and the plate. Those negatively charged electrons are attracted to the positively charged plate, aided by being boiled off the filament at high temperature. It isn't complicated once you

understand what is going on.

#### SHIPPING/STORAGE BOXES

Use pliers to safely remove metal staples from flaps in tube shipping boxes. Ripping a box open ruins the flaps, so shipping it out for rebuilding is difficult. Also, staples can tear your skin if they are still in part of a ripped box.

Keep the boxes on hand, even if they are empty. You will need them eventually. Boxes are engineered to safely cradle a tube in foam to keep it safe from damage. Shipping a tube without

a proper box is a bad idea.

Keep your hands off the ceramic too. Oil and dirt from your fingers can create the potential for an arc-over path.

In the concluding part of this article, we will discuss how to make a tube work correctly in a transmitter. Stay tuned. It makes perfect sense.

*Mark Persons W0MH is Certified Professional Broadcast Engineer by the Society of Broadcast Engineers and has over 30 years experience. He has written numerous articles for industry publications over the years. His website is [www.mwpersons.com](http://www.mwpersons.com).*



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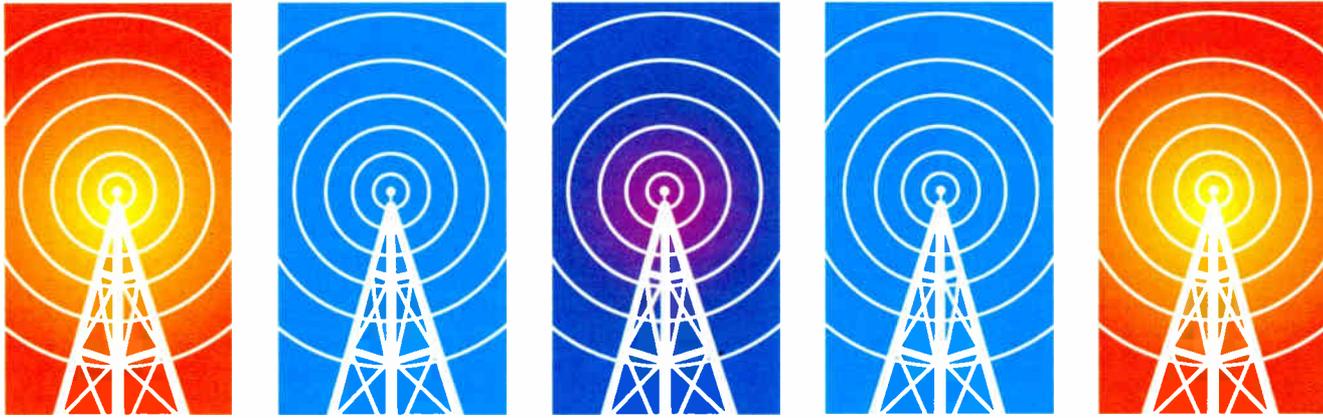
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**FEATURES**

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# Translator Challenges: Make Your Move

Let's consider the implications of the denial of the Tell City waiver request

## TRANSLATORS

BY JOHN GARZIGLIA

*In the first part of this series about translators, we looked at the basic regulatory aspects of FM translator stations. In the second, we approached translators from the perspective of the licensee and in particular, the licensee of an FM translator that is an in-contour fill-in translator carrying either an AM station or an HD sub-channel. Read those at radioworld.com/translators.*

*In this part, we look at some of the challenges faced by AM station licensees who wish to acquire an FM translator, either in the marketplace or in the proposed AM-only FCC filing window for FM translators.*

For an AM licensee, there are two potential paths to obtaining an FM translator: The purchase or lease of a currently authorized FM translator; or applying in the proposed AM-only FM translator window. The latter assumes the FCC will move forward with AM revitalization.

An FM translator re-broadcasting an AM station must be at a location in which the translator's 60 dB $\mu$  contour is within the AM station's 2 mV/m contour and does not extend greater than

25 miles from the AM transmitter site. Moving FM translators can be problematic. The FCC rules specify that there must be a 60 dB $\mu$  overlap between the existing and proposed translator facili-

ty translator site overlaps the opposite contour at the desired translator site (i.e., either the protected contour overlaps the interfering contour, or vice versa). The FCC will impose a four-

**Had the Tell City waiver been granted, AM revitalization benefits would have accrued to both AM stations and to the AM listening public.**

ties to qualify for a minor change move of an FM translator (a major change is prohibited except in filing windows, the last of which occurred in 2003). In the past several years, the FCC's Audio Division has imposed significant limitations on sequential FM translator transmitter site moves, putting many existing FM translators out of reach for AM broadcasters.

### EXCEPTIONS

If an FM translator is to be moved to serve an AM station, a Mattoon waiver may be requested to move a greater distance than the current rules allow. A Mattoon waiver grant requires, among other elements, that the protected or interfering contour at the authorized

year restriction that ties the translator to the primary AM station upon a grant of a Mattoon waiver.

### AM-ONLY

It may be equally problematic for an AM station to acquire an FM translator in the prospective AM-only FM translator window. The FCC has proposed limiting applications to one per applicant. The problem with limiting applications to one per applicant using the FCC's window filing system is that in areas where there may be more than one available frequency, the applicant is forced into a position of rolling the dice on the choice of a channel.

### GOOD LUCK

If an AM station applicant for an FM translator in the upcoming window is fortunate to choose a frequency for which no other AM station applies, a grant should be forthcoming quickly. If, however, an applicant is less lucky

and picks a frequency for which others apply, the applicant may be forced into an FCC auction where only the high bidder is awarded an FM translator construction permit. This is a poor way for an AM licensee to plan for the future acquisition of an FM translator.

An expansive proposal for an AM licensee to obtain and move an FM translator to a suitable location was recently denied by the FCC's Audio Division in its Tell City waiver decision. The waiver would have allowed AM stations to obtain FM translators in the marketplace and move the transmitter site a greater distance than now allowed by either the current minor change rules or the Mattoon waiver. Had the Tell City waiver been granted, AM revitalization benefits would have accrued to both AM stations and to the AM listening public.

### APPEAL

The Tell City waiver applicant, in conjunction with the Minority Media and Telecommunications Council, has appealed the Tell City waiver denial. The National Association of Broadcasters filed in support of the appeal. (Full disclosure: I represented the proposed buyer of the FM translator in the Tell City waiver application, as well as the applicant in the Mattoon waiver decision.)

If the FCC appeal should be successful, the Tell City waiver would allow for far greater benefits than just about any other AM revitalization proposal currently pending.

Finally, as noted in the previous article of this series, the FCC's possible adoption of FM rule changes such as the proposed Class C4 category or assigning FM stations using only contour protection could be pernicious to continued FM translator service. Either could decimate a number of existing and future translators obtained by AM stations.

Next time, we will look at some issues full-service stations may have with possible interference from FM translators.

*Send questions about this series to radioworld@nbmedia.com.*

*John F. Garziglia is a veteran radio and television attorney offering assistance in all areas of Federal Communications Commission law in the Washington offices of Womble Carlyle. For other publications, see listings at www.linkedin.com/in/johngarziglia.*

## CORRECTION

### OHM, MY BAD

"Ohm's Formula One," in the Jan. 1, 2014 issue, incorrectly stated that Pieter van Musschenbroek's hometown was in Lieden, Germany. He was from Leiden, Holland.

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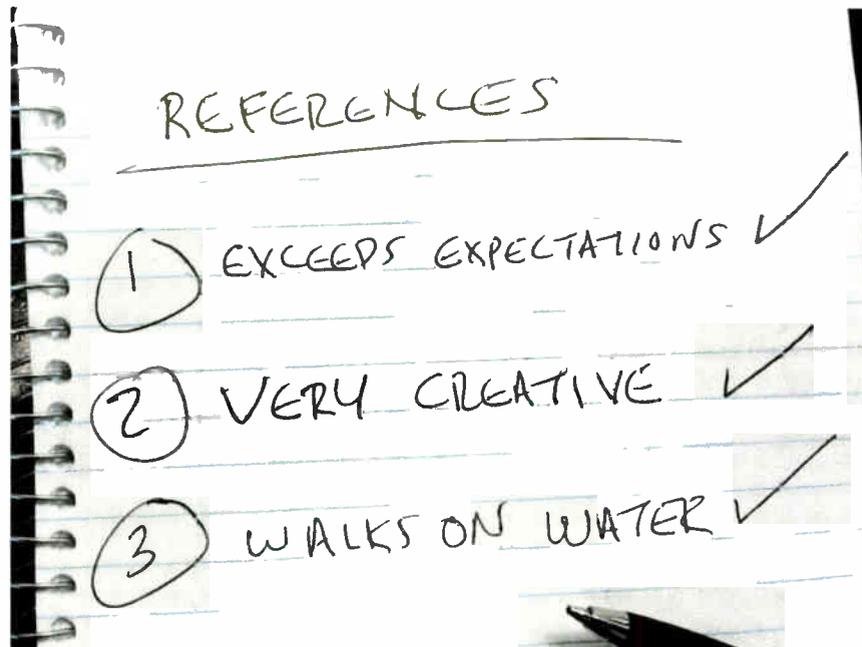
I'm not making this up. New Year's Eve, 2 a.m., a DJ who worked for me decided nobody was listening, so she signed the station off the air and left to go to a party. Yes, she actually turned off the transmitter. And at that point there was no automation at this station.

Perhaps she was correct about a lack of audience, because as the program director, I did not get a call until 5:15 a.m., when her relief arrived. He'd wondered what was wrong during his drive to the station because he'd heard nothing but static. Figuring there'd been a massive power failure, he was surprised when he could turn the studio lights on, so he knew something was amiss.

At first I thought it must have been a personal emergency. Perhaps she couldn't reach anyone, and she had no choice but to turn off the radio station and leave. But when I finally reached her later that afternoon, she actually expressed that she'd really, *really* wanted to go to that party; and what the hey, she was quitting anyway.

Then something even more amazing happened.

About six weeks later, she got a great job doing afternoon drive in another major market. How? Simple: Nobody from her new station ever called me for a reference.



Whether you're hiring on-air performers, sales talent, operations people or engineers, here are a few suggestions I've learned both the hard way and from interacting with peers.

### DO YOUR HOMEWORK

If you're a hiring manager and you don't check up on applicants prior to hire, you have only yourself to blame when bad history repeats itself. If you're convinced that checking references is a waste of time, you haven't spoken to enough former employers and co-workers.

Over many years of hiring people, I've come across those expected few occasions when references have been subtly negative about a former colleague's performance and behavior. I've

## PROMO POWER



Mark Lapidus

one person and not from another that I've called the first person back to try to make more sense of it. I've also had to ask a candidate for additional references in order to get a better perspective.

You should contact at least three references given to you by the candidate. Whenever possible, I also try to network my way to people we know in common in an attempt to dig out an honest review of a candidate's prior performance.

Is it fair to cold-call an applicant's former employer without their permission? No, it is not. However, if asked and the candidate doesn't give you permission to do so, I would seriously wonder

**If you're convinced that checking references is a waste of time, you haven't spoken to enough former employers and co-workers.**

also called references expecting to hear amazing things about the candidate, who said just the opposite. And then there are times I've connected with a reference only to discover that they do not have any interest in speaking about the candidate at all.

There have been a few occasions when I get something so negative from

why they don't want the connection to happen; I'd ask them to explain.

It is most certainly never cool to contact a current employer without permission.

It's typical to reach a reference by telephone. But why stop there? For a number of years now, I've Skyped with

*(continued on page 23)*

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## PROGRAMMATIC

(continued from page 1)

it should be understood, too, by managers in other departments of a media/radio enterprise.

One of the first panel discussions on programmatic trading in radio took place at Radio Show 2014 in Indianapolis. We talked with several industry leaders about the implications of this topic.

### IT'S HAPPENING

Programmatic ad buying, in which advertisers can use real-time applications to purchase inventory associated with audience segments and listener attributes, generated \$10 billion worth of revenue in the United States. That's according to Jelli, a programmatic ad platform for the global radio market.

Since the dawn of digital, premium inventory has been sold to clients via direct sales teams with guarantees surrounding placement and positioning. Today, premium inventory also is available through open exchanges and private market places meaning that a site's home page, or a popular and high-quality section of a website, is also likely available through programmatic.

an event where the publisher (in this case, the stations) restricts access to select buyers/advertisers via a Whitelist/Blocklist. It is important to note that it is a true auction where buyers will be expected to bid on inventory.

Finally, there is the "Open Auction," described by the IAB as the Wild West of auctions. A publisher usually will allow all buyers to participate. Typically there is no direct relationship between the buyer and seller. Publishers may use blocklists to limit access. Advertisers may not be aware of what publishers they are buying on.

### THE NEXT FRONTIER

Programmatic buying originated when Web publishers used it to sell lower-valued ad inventory. It worked so well it was then used to buy and sell premium inventory. Programmatic trading has now spread to cover advertising in all media, and radio is its next frontier.

Despite all the talk about programmatic, it is making slower inroads outside of the online environment. A poll recently taken by the Association of National Advertisers of 153 client-side marketers indicates that almost 40 percent have low or no awareness

**Programmatic trading** enables us to close the gap between audio and other digital media types.

— John Rosso

According to the Interactive Advertising Bureau, there are four types of programmatic trading.

"Automated Guaranteed" works like traditional direct sales, with a fixed price. The difference is that the campaign trafficking is automated.

The second type is "Unreserved Fixed-Rate." These function in an exchange environment, but have pre-negotiated fixed pricing (CPM, CPC, etc.) These types of deals usually come in at a higher priority than invitation-only or open auctions (see chart). A deal of this type happens because of advertiser demand for a more predictable offering within the exchange space.

"Invitation-Only Auction" refers to

of programmatic buying. A little more than half of the respondents have used programmatic buying in the last year. For the brokers and middlemen in the process, however, that is the good news.

"Terrestrial radio is the next big growth opportunity for programmatic trading," said Jelli CEO Mike Dougherty. He adds that it has some catching up to do on the technology side before it can reap the benefits of automated buying.

"Because they don't have the ad tech, they have fundamental problems that aren't issues in the online space, such as ensuring that an ad was delivered properly," said Dougherty, adding metaphorically: "Of 4 trillion ads run in radio, there are 100 billion and a half mistakes every year that require make-goods to redo the ad properly." (See related interview in our Jan. 14 issue, "Jelli: Programmatic Is Radio's Future.")

Another issue of terrestrial radio addressed by programmatic is proof of performance. Advertisers usually don't know if, or how much, a radio spot has impacted purchasing decisions until the next quarter, when they can match it with sales and conversion data.



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## PROGRAMMATIC AND AUTOMATION — THE PUBLISHERS' PERSPECTIVE



### SUMMARY

The terms "programmatic," "automation" & "RTB" evoke a lot of confusion in the marketplace, meaning different things to different people. This paper aims to provide clarity, from the publishers' perspective, by outlining four main ways of transacting "programmatically" today. It provides a clear framework for distinguishing between them and highlights other factors commonly associated with each "programmatic" transaction. Given how quickly the marketplace evolves, comments and feedback are welcome.

### WHAT IS PROGRAMMATIC?

Programmatic buying and selling of digital advertising inventory, including real-time bidding (RTB) has been growing over the past couple of years and has the potential to transform how we buy and sell ad inventory. While RTB has historically been associated with remnant inventory, this technology is now increasingly being applied to a wider range of inventory. The RTB pipes are now being used to conduct different types of transactions (for example fixed-rate deals) which creates misunderstanding. There has been confusion in the marketplace over terminology with a number of terms being used interchangeably such as: "programmatic," "RTB," "programmatic direct," "programmatic premium," "programmatic guaranteed," "automation," "e-business," and more.

This paper has identified four discrete types of "programmatic" transactions - **Automated Guaranteed, Unreserved Fixed Rate, Invitation-Only Auctions, and Open Auctions** (see pg. 3 for definitions).

|                                | Type of Inventory (Reserved/Unreserved) | Pricing (Fixed/Auction) | Participation (One Seller-One Buyer, One Seller-Few Buyers, One Seller-All Buyers) | Other Terms Used in Market  | Other Considerations  |
|--------------------------------|---|-------------------------|--|---|---|
| <b>Automated Guaranteed</b>    | Reserved                                | Fixed                   | One-One  | Programmatic guaranteed<br>Programmatic premium<br>Programmatic direct<br>Programmatic reserved |   |
| <b>Unreserved Fixed Rate</b>   | Unreserved                              | Fixed                   | One-One  | Preferred deals<br>Private access<br>First right of refusal                                     | <ul style="list-style-type: none"> <li>• Prioritization in the ad server</li> <li>• Deal ID</li> <li>• Data usage</li> <li>• Transparency to buyer</li> <li>• Price floors</li> </ul> |
| <b>Invitation-Only Auction</b> | Unreserved                              | Auction                 | One-Few  | Private marketplace<br>Private auction<br>Closed auction<br>Private access                      |   |
| <b>Open Auction</b>            | Unreserved                              | Auction                 | One-All  | Real-time bidding (RTB)<br>Open exchange<br>Open marketplace                                    |   |

Source: Interactive Advertising Bureau 2013

1. Reserved Inventory is advertising space on a publisher's site that is put aside for a specific advertiser for an agreed price.  
2. Fixed Price is any arrangement where the buyer & seller agree on a flat price that the buyer pays rather than the highest bidder in an auction environment.

UNDERSTANDING PROGRAMMATIC AND AUTOMATION 1

A chart from the Interactive Advertising Bureau ([www.iab.net](http://www.iab.net)) identifies four discrete types of programmatic transactions.

A programmatic platform addresses both of these problems through ad delivery and real-time reporting. The ad serving hardware is located at each affiliated station and tied into the station's automation and traffic systems. "After our gear is connected, that station lights up on our platform as being available to run ads," said Dougherty.

When a station goes into a commercial break, the ad server takes over, running whatever spots are on the log. The spots originate on the platform's cloud-based application.

"Currently, radio generates about \$16 billion of revenue," said Dougherty, "but zero percent of that is from programmatic trading. Our job is to bring radio into the equation." He adds that the current numbers and projections for programmatic trading in radio are very positive. "In 2014, \$10 billion has been spent in the U.S. on programmatics, although all of it is outside of the radio industry. That's an increase of 130 percent over 2013. The growth in the next 20 months is expected to be between

\$10 and 20 billion."

According to Dougherty, media buyers like to purchase a holistic media mix of digital channels. As it stands now, terrestrial radio must be purchased separately, meaning it is losing advertising dollars.

With programmatic, the playing field is leveled for terrestrial radio. Buyers can look at real-time data and match activity to sales on a dashboard, making it much easier to target audience segments, as well as more flexible than traditional methods of buying radio time.

### CHANGE IS INEVITABLE

As programmatic advertising becomes more integrated into terrestrial broadcasting, some changes can be expected in how the station's sales department works.

"The numbers of sales people probably won't change much," said Dougherty. "What will change is how they spend their time. A programmatic ad platform working with a station's automation and traffic systems pretty well

takes care of the 'back end' of placing and tracking ads. That will give sales people more time to focus on selling." He adds that programmatic trading may also result in a higher percentage of national ads running on stations, as well as more ads overall, since unsold spots may become a thing of the past.

Even the definition of the term "programmatic" has expanded from its original description of a one-to-one relationship where a targeted ad is delivered to a Web browser; and programmatic advertising with streaming and terrestrial radio work differently.

"Over the past two years, the term has been co-opted to mean supply-side automation, meaning that anyone in the supply chain can integrate to the rest of the chain," said John Rosso, president of market development for Triton Digital. "And that's how programmatic works with terrestrial radio." He adds that streaming media are different in that they provide the ability to target ads to specific listeners.

A programmatic ad platform for streaming media, for example, enables real-time bidding and programmatic buying of targeted online and mobile audio inventory for advertisers, which enhances the ability to manage, buy and sell third-party advertising campaigns. The platform's automated, exchange-driven method of buying and selling ad impressions facilitates rapid and precise transactions, eliminating waste and resulting in the highest price for publishers and the greatest efficiency for advertisers.

"Programmatic trading enables us to close the gap between audio and other digital media types," said Rosso. "Right now, there are a number of people with digital ad budgets who are not buying radio."

Some of the buzz about programmatic emphasizes the globalization of advertising, but as Rosso sees it, that's a bit of a misconception.



John Rosso, Triton Digital

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| Paid      | 34.3M        | 34.2M        | 99.8%        | 27.208        | 27.161        | 99.8%        |
| Bonus     | 744.0K       | 745.4K       | 100.2%       | 0.591         | 0.592         | 100.2%       |
| Make Good | 202.9K       | 202.9K       | 100.0%       | 0.161         | 0.161         | 100.0%       |

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"Some people believe that there's a pool of global advertising dollars that they can tap into with programmatic, and that's not true. Ad campaigns are always localized to target regions and cultures. What will happen is that someone listening to the stream of a Turkish radio station while in New York City, for example, may soon hear commercials for New York businesses, rather than the Turkish ads that are playing on that stream locally."

Rosso concludes that this is a trend that cannot be ignored. "Programmatic is the fastest-growing segment of advertising globally, and most digital media run on programmatic."

While programmatic brings a larger pool of advertising dollars to radio, there are some who wonder if it might have a detrimental effect on the price per ad.

Jeff Haley, CEO of Marketron, elaborated: "There is justifiable concern within the radio industry that introducing automated buying technology

could lead to 'cost per mille' declines as broadcasters seek to cut the price on unsold inventory. These price declines have occurred on the Web with the advent of programmatic. However, inventory is finite, and controls can be more disciplined.

"I believe that if the right platform and right information is maintained, radio should see new revenue streams from this improved information flow."

He adds that so far, 1,500 stations have signed a letter of intent to come on board with Marketron. The beta of its new system for programmatic trading was set to roll out after Jan. 1 of this year and should be fully operational by the second quarter.

On the station side, the outlook seems to range between pragmatism and resignation. Since the landscape is still in a state of flux, many groups were unwilling to speak on the record to RW.

"We can no longer ignore what is coming," said Saga CEO Ed Christian, discussing programmatic trading in a recent post on Facebook by brokerage/consultancy Seeger Media. "We will need to find ways to work in both worlds, and to possess the tools to work on a level playing field."

The most troubling aspect of pro-

grammatic for the Saga CEO seems to be the "unreserved fixed-rate open auction," where buyers and sellers have no direct contact, and the advertisers may not even know what stations they are buying. One of the ways that stations can protect themselves with open auction is to blacklist certain advertisers from participating.

The plan at Saga is to maintain the "core competencies in broadcast sales" and graft programmatic on to it. The question of whether to release both the restricted and non-restricted inventory from the Saga stations remains unanswered, according to a post on Seeger Media's Facebook page.

*Comment on this or any story. Write to radioworld@nbmedia.com.*

## REFERENCES

(continued from page 21)

a few of them if they're game. It's amazing how much more one can read from facial expressions and body language.

What about background checks on a finalist prior to an offer? Sometimes you learn things about candidates that, while not truly relevant to past performance, can speak to integrity. For example, you may learn that a candidate was convicted of shoplifting many years in the past.

Ask a candidate this key question directly prior to a background check: "Is there anything in your past that's

going to come out of a background check that you'd like to tell me about now?" If they say "yes" and you wish to ask about it, you may hear how happy or grateful they are to have changed. If they say "no" and you later learn that they were convicted of check fraud, you'll have to decide if you feel comfortable hiring someone who is less than truthful.

Finally, turnaround is fair game. I've always invited final candidates to check out my past by talking to former or current employees of mine. Few do, but they should, because accepting a job has life-changing consequences.

*The author is president of Lapidus Media and a long-time contributor. Find more of his Promo Power column at radioworld.com/promopower.*

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# KTEQ Is Back on the Air

A labor of love for Radio World contributor Mario Hieb as he helps his alma mater

## FIRSTPERSON

BY MARIO HIEB

KTEQ(FM), the campus radio station of the South Dakota School of Mines and Technology in Rapid City, S.D., has returned to the air after a 14-year hiatus. Although the station was programming via Internet streaming during that time, it has returned to the air on its original FM frequency of 91.3 MHz and with the original call letters KTEQ.

The engineering school operated its original campus radio station in 1922 as WCAT (Wildcat Radio), making it one of the first college radio stations in the United States.

My introduction to radio and a career in broadcasting was at KTEQ. In the early 1970s, as a local high school student, I would fill in during the summer months. Actually, the station was off the air most of the summer, and because a friend and I had our FCC operators licenses, KTEQ would let us come in, turn on the transmitter and spin LPs as long as we filled out the logs properly. I received my Bachelor of Science degree in electrical engineering from the school in 1982 while working locally in commercial radio.

Fast forwarding to the year 2000, the school hired me to help them get their license back, which had been lost due to a series of unfortunate events the year previous. Luckily, an NCE window opened up in 2007, and we received a construction permit in May of 2011 to operate on the original frequency with the original call letters. The school then had three years to complete the construction. So we went to work.

### RESURRECTION

The first step was to find a good location for the 500-watt station. Because it had been off of the air, operating funds were low and local tower space was priced at a premium. The school did own some land on a centrally located hilltop known as "M Hill" because of the large, concrete letters "SMD," which stood for "South Dakota Mines." These giant letters go back to the 1930s and were constructed, by hand, by engineering students. Upperclassmen recruited underclassmen to carry, in buckets, the water for the concrete from Rapid Creek at the base of the hill and up a trail to the top. Apparently, more water would slosh out of the buckets than make it to the summit and a long, steep, muddy slide would be created.

Each year on Homecoming Day, the freshman class polishes the completed letters and the graduating class places a bronze plaque in the concrete, memorializing the class and the graduating seniors. As it turns out, there are 50-foot lighting monopoles at the base of M Hill for lighting the concrete letters at night. Further inspection revealed that there was room for a two-bay FM antenna at the top of one of the monopoles.

So we had our transmission location.

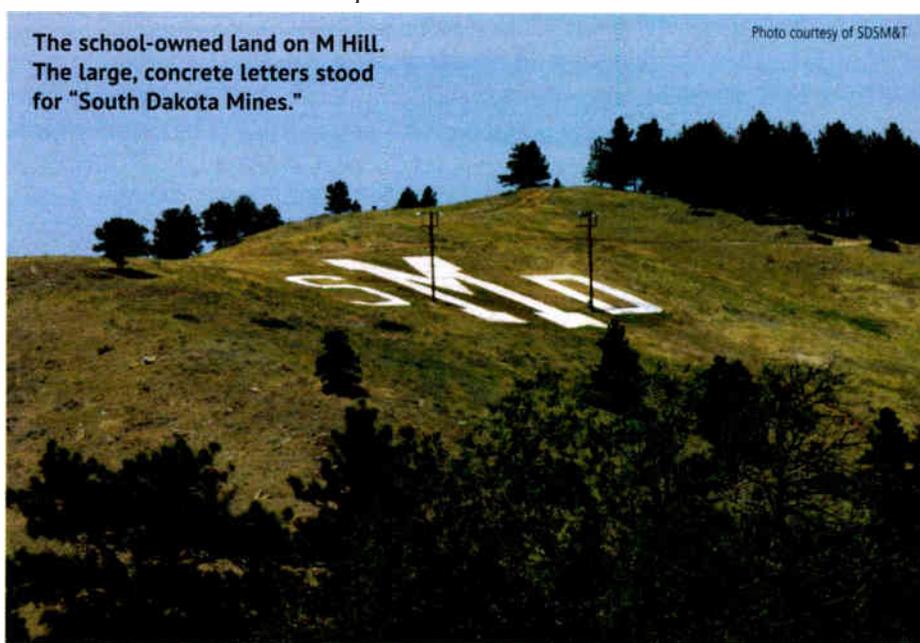
Though a relatively small project, this was planned and executed like a big-budget one. The transmitter would be contained in a 4-foot tall stainless steel DDB Unlimited enclosure that was equipped with an optional HVAC system. The enclosure was bolted to a concrete pad just a few feet from the lighting monopole. Because I wasn't on-site for the construction, I created a design package including plan and elevation

drawings in AutoCAD showing precise locations of the pad and enclosure, electrical conduit and the FM antenna. The package also contained "I-line" drawings showing signal flows, a wire-run list and a master equipment list. Equipment was ordered by the school and shipped to their receiving department. A storage room also doubled as a marshaling and prep area where equipment was installed in the racks. I prebuilt wiring harnesses based on the rack elevation drawing.

The equipment included an existing Crown FM-500 FM transmitter and an SWR FMEC/2 two-bay antenna. New gear included a Bird Wattcher wattmeter, Inovonics 531 FM modulation monitor, Orban 5500 audio processor, Broadcast Tools Site Sentinel 16 remote control and a Comrex BRIC-Link codec. The Crown is fed with a composite stereo signal from the Orban audio processor. A Fostex RM-1 1 RU stereo audio

The school-owned land on M Hill. The large, concrete letters stood for "South Dakota Mines."

Photo courtesy of SDSM&T



KTEQ antenna and STL/IP link mounted on a lighting monopole.



monitor makes a nice quality assurance monitor and it even has a headphone jack.

The station STL path is about three miles and consists of a Radwin IP bridge that allows for both stereo programming and IP for remote access to the remote control, audio processor and anything else with an IP port. All of this fits in the small DDB enclosure ... there is no transmitter building. Time will tell if this enclosure will provide adequate protection from the harsh South Dakota climate, but I am impressed with the workmanship of the enclosure.

The campus streaming studio required some modification to allow for "over the air" broadcasting. The audio console fed an Aphex 320 (for audio leveling), followed by an audio distribution amplifier, which provided numerous analog stereo feeds. Next in line was a Sage Alerting Systems EAS encoder and the Comrex BRIC converted the stereo analog audio to an IP stream. The campus IT wizards took the IP stream and ran it across campus to the electrical engineering/physics building. On the roof, a Radwin IP bridge transceiver was mounted on a pre-existing tower and aimed to M Hill; instant STL with no frequency coordination or licensing required.

Once on the air, KTEQ faced an unusual situation for a radio station: Few of the student DJs had ever been on the air, rather than the Internet. Every one of the volunteer DJs had to learn how to operate the EAS

## STUDIO SESSIONS

President Wilson also has a unique credential: she is a former U.S. representative who served on the House Telecommunications Subcommittee. "I can imagine that schools can easily find themselves cross-wise with the FCC," she related.

Ironically, she sat on the subcommittee at the time the KTEQ license was revoked by the commission.

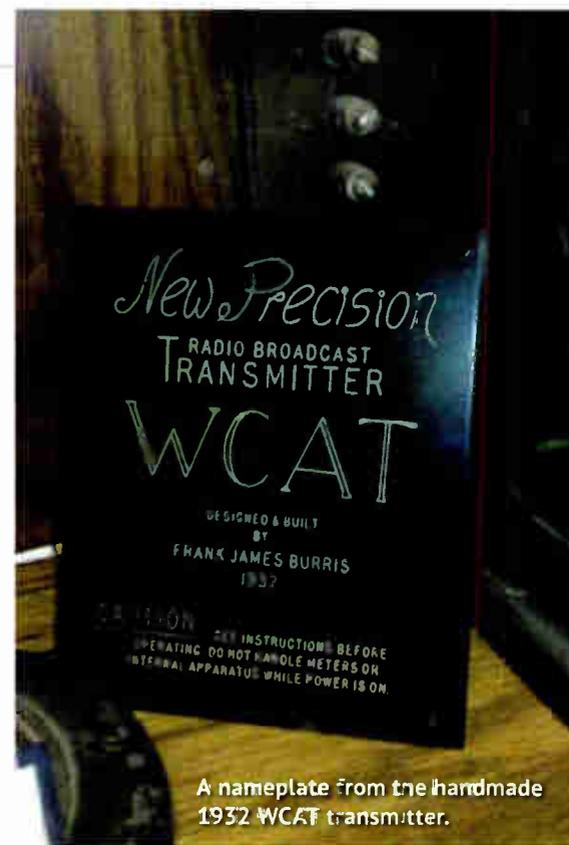
### A LITTLE HISTORY

As an electrical engineering student at the South Dakota School of Mines, I used to walk by a display case in the EE/physics building that contained ancient radio gear from the school's first campus radio station.

In 1911, with their first public broadcast nine years away, the physics department at the School of Mines and Technology in Rapid City was experimenting with radio and obtained the most modern equipment available. A wireless set was constructed by Physics Professor C.C. Van Nuys and Superintendent of Buildings and Grounds William Coursen. Their radio station was licensed as a "land" radio station and given the call letters 9XA.

The first regular radio communication in the area was established with the northern Black Hills mining town of Lead, S.D. The School of Mines radio station became the main link in a network with two other northern Black Hills stations that were owned and operated by the Homestake Mining Co. Communication was somewhat less than reliable; the stations had to notify each other by mail before radio communication was attempted.

In the years that followed, the scientists and engineers at the School of Mines increased the range of the station. With the addition of a long-range receiving set in 1917, the school began to pick up signals from Germany, but in the following February, the United States



A nameplate from the handmade 1932 WCAT transmitter.

entered World War I and an order was issued for radio stations nationwide to be shut down. Coursen himself had the sad task of dismantling 9XA.

So a new use was found for the school's broadcast facilities, training radio operators for the war. When the armistice was signed in November 1918, the station we immediately reactivated.

By 1922, radio became a national obsession. That year, J.O. Kammerman became head of the electrical engineering department, which became immersed in new technology by building a two-tube voice transmitter.

In July, the station became WCAT, the first licensed wireless station in South Dakota and a format consisting mainly of weather forecasts. As listenership grew, a regular Wednesday night broadcast was arranged —

*(continued on page 26)*



Part of the new KTEQ transmission facility.

unit, give legal IDs and avoid certain words. School President Heather Wilson notified the student radio board and station management that, before they went on the air, she would like each of them to make a presentation to her.

"It's not often students get to start up and operate a business," she told me. "They will certainly learn things."

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**KTEQ***(continued from page 25)*

college lecture. Then came news, local talent and music broadcast by holding a microphone close to the horn of a Victrola phonograph. The AM station WCAT, or "Wildcat Radio," operated from September 1922 to 1952. It was licensed to broadcast at a wavelength of 485 meters at a power of 750 watts. A frequency and power change came later with the station operating on 1200 kHz, at a power of 100 watts.

Originally, the studios were located in the basement of the campus administration building.

One interesting early event featured a Native American, Chauncey Yellow Robe. He was interviewed about his life in South Dakota before the white man came. At the end of the program, Yellow Robe let out an earsplitting war whoop that blew out a vacuum tube in the equipment. Operations were suspended until a replacement could be found.

In 1927, about 40 miles up the road from the School of Mines, sculptor Gutzon Borglum began a carving on a mountain known by locals as Mount Rushmore.

Its first play-by-play football broad-

cast came in 1935. An imaginative sports announcer, C.M. Rowe, positioned himself and his equipment on a wooden platform at the top of a 10-foot pole overlooking the field. A heavy snow set in on the unfortunate Rowe and electric heaters were sent up to keep him from freezing. Despite the weather, broadcasting continued until just before the

## My introduction to radio and a career in broadcasting was at KTEQ.

— Mario Hieb

end of the first half of the game when the equipment failed. Upon inspection it was discovered that vapor from Rowe's breath had frozen the microphone. The mic was thawed out in front of an electric heater and broadcast was resumed for the rest of the game.

After World War II, many soldiers returned to the School of Mines and



**Mario's Class Plaque. He's in there!**

become students. Some were interested in radio and many had been trained, licensed operators in the military. This was WCAT's heyday. The broadcasting day became longer, with better programming than before. A weekly quiz show was initiated. Several radio plays were written and performed for WCAT and a technology program fostered.

But the good times ended when the ex-G.I.s began to graduate and replacing technicians became difficult. The excellent equipment became worn-out and outmoded. Funds were no longer available for improvements, program quality slipped. In 1950, WCAT was placed under student supervision. A handful of students fought all that year and the next to keep WCAT on the air. Faculty members, burdened with academic duties, provided little help. Fellow students were too busy to be concerned with saving WCAT.

When the FCC no longer allowed the operation of their 100-watt transmitter, a 250-watt transmitter was needed. But the administration ruled no funds would be provided until program quality improved. In desperation, a new series of informative programs was launched. But the tired 25-year-old transmitter kept breaking down, hampering production. The FCC issued a final ultimatum to WCAT to install a new transmitter or go off the air. The \$500 needed to save WCAT just wasn't there, nor were the full-time technical and studio workers. To the horror of the few students left who cared, the FCC informed the School of Mines their license was canceled and the call letters WCAT deleted. Wildcat was dead.

Efforts to launch a new SDSM&T campus radio station, KTEQ, started in 1969. With the assistance of announcer



Greg Carey, student body President Jim McGibbney formed the Tech Educational Radio Council, the governing body of KTEQ. The first studio of KTEQ was located at Surbeck Center, the campus student union. Tower space for the transmitter originally was donated by KBHE(FM), a Rapid City public radio station.

The first broadcast by KTEQ occurred on Aug. 7, 1971, opening with the famous opening fanfare of Richard Strauss' "Also Sprach Zarathustra." The first voice to be heard on KTEQ was that of Gary Brown. Initially, KTEQ(FM) broadcast at 88.1 MHz with a power of 10 watts.

Mario Hieb, P.E., is a Salt Lake City-based consulting engineer and a longtime contributor to Radio World.

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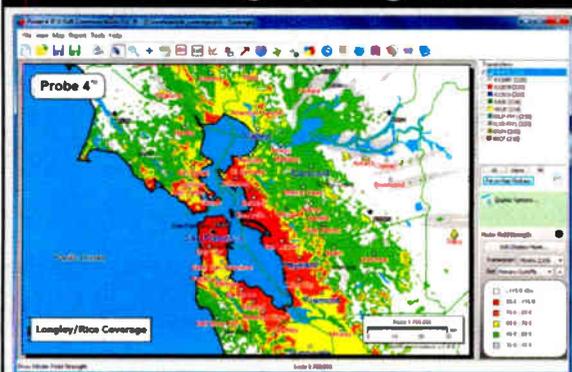
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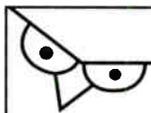
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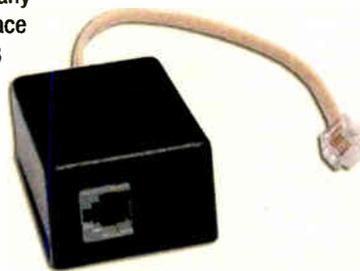
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# “Doers” Support Community Radio

Brown Paper Tickets initiative aids LPFM

## COMMENTARY

BY SABRINA ROACH

I agree with Zane Ibrahim, founder of Bush Radio in South Africa; I see community radio as being “90 percent community and 10 percent radio.”

Like our public libraries and community centers, community radio offers hands-on access and connection, education and entertainment that feeds and strengthens us all. Community radio adds another dimension to public services; it acts like “community glue” — building bridges among unlikely groups of people representing different interests and demographics.

I’ve worked in public and community media for almost 15 years. While at a station near Seattle in 2010, I met with the CEO of Brown Paper Tickets, which is a ticket trading and events company. He asked what I’d do to strengthen communities, if I were paid full-time to do it. I told him I was passionate about equitable community development through a media lens. With that goal in mind, I would focus on strengthening nonprofit media, communications policy and municipal broadband.

I thought he might become an underwriter. Instead, he offered me a job as a “doer.”

### NOT-JUST-FOR-PROFIT

The Doer Program is an expression of the Brown Paper Tickets’ not-just-for-profit business model that goes above and beyond corporate citizenship.

Doers, like myself, are hired to create positive change, with no metrics for sales of any kind. My work is just one of many demonstrations of Brown Paper Tickets’ commitment to prioritizing social responsibility over making the highest profit.

It’s a humbling and exciting experience to be able to do this work across a spectrum of public interest media, including NPR/PBS, volunteer community radio, public access and government TV, and independent online media. Over the last four years, I’ve developed several projects related to how we pay for public media, how those institutions turn outward and do community engagement and how we strengthen communications infrastructure. This last one is why I spend time on advocacy for an open Internet, municipal broadband and the build-out of low-power FM.

In 2013, I created the National Make Radio Challenge, as part of our contribution to the community radio movement — a campaign to educate and inspire as many nonprofits as possible about their opportunity to apply for low-power FM radio licenses. In some cities, with crowded media markets, this would be a

Radio Project, Common Frequency, supportive engineers and volunteers.

### MEDIA ECOSYSTEMS

Now that construction permits are being granted, I’m encouraging the new stations to be digital first, to develop a strong identity and to think of their terrestrial signals as magnets that excite their communities and pull them in.

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|  |   |
|--|---|
| 1 Seattle University Radio / 102.1 FM (First Hill/Capitol Hill/Central District) | 7 Sand Point Arts & Cultural Exchange / 101.1 (Magnuson Park)                     |
| 2 Voice of Vashon / 101.9 FM (Vashon Island)                                     | 8 SouthEast Effective Development’s Rainier Valley Radio / 105.7 (Rainier Valley) |
| 3 UWave Radio at UW Bothell / 104.9 (Bothell)                                    | 9 KMIH Booster Club / 101.1 (Mercer Island)                                       |
| 4 OneAmerica / 106.5 FM (SeaTac)   | 10 Fab-5 / 95.3 (Tacoma)  |
| 5 Make.Shift / 94.9 FM (Bellingham)  | 11 Radio Duwall / 103.1 (Duwall)  |
| 6 Hollow Earth Radio (Central District) / 100.3                                  | 12 City of Kent / 101.1 (Kent)  |

**AWAITING FCC APPROVAL**

|   |
|---|
| 13 Earth On-the-Air Independent Media / 105.7 (University District) |
| 14 Fulcrum Community Communications / 107.3 (NW Seattle)            |

once-in-a-lifetime chance. My team created resource guides to show applicants how to find local funding that would help them to fuel their growth. I conducted individual coaching sessions and connected interested groups to several organizations offering technical assistance and leadership, such as Prometheus

I’m encouraging them to assess and to reimagine their local public media ecosystems. This could take the form of building strength through partnerships with mission-aligned media and libraries, or creating multi-platform community media hubs.

I’m helping applicants to build orga-

nizational capacity and supporting them with knowledge, connections and wisdom gleaned from other committed and passionate community media advocates I’ve met by co-producing workshops for the National Federation of Community Broadcasters and the Alliance for Community Media. As a result, we are experimenting with pilot projects for outreach, digital storage and other initiatives that can be replicated across the country.

I’ve never seen this much excitement about community media.

For example, here in Seattle, I’ve created a Puget Sound Neighborhood Radio Cohort, the nation’s first support network for regional LPFM radio applicants to pool resources and foster a learning community and a network for sharing resources for these tiny-but-fierce stations. It’s working.

Some stations I’m working with are shown on this map (at left). You can see that they will cover most of the Puget Sound area, which is why we called it the “Sound of Tomorrow.” Ha!

Community radio is in transition as more than 1,400 low-power FM applicants already have their construction permits and are building their stations; it’s a massive infusion of new energy and ideas. Through LPFM, anyone can become part of the voice of their community, whether that takes the form of starting conversations, sharing health and emergency response information or featuring local musicians, artists and other forms of local culture.

Brown Paper Tickets is producing an ongoing series of videos to spotlight people who, like the doers, have found a way to do what they are passionate about.

The latest video in the series is about those who love free-form radio, called “Indy Radio DJ Love.” Watch it, here: <http://bit.ly/IBALY9h>.

If you have any questions about the Doer Program, any of my initiatives in public media and municipal broadband, or the Not-Just-For-Profit business model, give me a shout. And if you would like access to resources to help build your LPFM station, you can find contact information here: <http://bit.ly/IKezLw>.

There’s a wide net of support for all kinds of public media. I’d love to be your tour guide, and to hear your insights!

Sabrina Roach was recruited to the Brown Paper Tickets Doer Program after 11 years in public radio. She now focuses on exploring financial models, deepening community engagement practices and researching methods for measuring the impact of public media. She has worked at KBCS(FM) Community Radio and KUOW(FM) Puget Sound Public Radio.

# READER'S FORUM

## EAS AIR CHAIN

I just read the article on EAS ("No, Really, This Is Not a Test," Nov. 19 issue). Mr. Fybus is promoting the idea of EAS distribution out of band so that listeners aren't desensitized by all the weekly and monthly tests.

The problem I see is that when an actual and very critical alert is originated, how would we know it will make it to the air chain in a timely manner?

At our eight stations I maintain five EAS units. My RWT and RMT filters are programmed to play a pre-recorded message before the squawks that says, "This is a test of the emergency alert system, only a test." The entire air chain needs to be tested to know it works.

*Marlin Jackson, CSTE  
Chair, Inland NW LECC /  
Member, Washington State SECC  
Assistant Chief Engineer, RF Systems  
The KXLY Broadcast Group  
Spokane, Wash.*

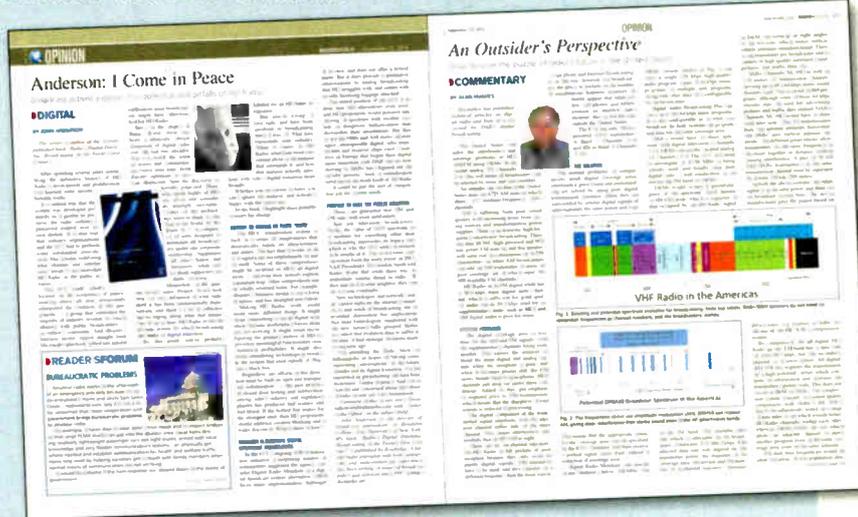
## DRM VS. HD RADIO

I seldom ever comment on any articles, but I felt compelled to comment on two articles in the September issue: John Anderson's "I Come in Peace," about HD Radio, and Alan Hughes' "An Outsider's Perspective."

These two men make more sense than anything I have seen about digital. From what I have read about Digital Radio Mondiale, it looks to me like it would be the best route for AM to take.

I operate a 1 kW AM with a translator in a small community. I just don't see any way that HD Radio would ever be feasible for me. Hopefully someone will see the light and come up with a viable solution.

*Sam Thomas  
WJTH Radio  
Calhoun, Ga.*



## REGULATORY REACTIONS

About time ("All AMs Must Now Pay Regulatory Fees," *radioworld.com*, Sept. 2)! The original station shutdown and fee exemptions should have ended much more quickly — after, say, three years.

*Robert Lee  
Owner/President  
Lee MediaWorks LLC  
Abilene, Texas*



At this stage, it would appear that there is little or no coordination between agencies in notifying broadcasters of any proposed regulations ("Environmental Agency Regulates Testing," Nov. 5 issue).

While this could result in yet more burdens for stations, there seem to be some justifiable reasons for inspections and maintenance of polluting (diesel) generators. Would this not also raise the possibility of less emissions by installation of other types of generating equipment — such as propane fueled generators, etc.?

*Dave Bull  
Retired Engineer  
Virginia*

## HAM INTERFERENCE

I believe I was one of those receiving some of this interference ("FCC Snares Ham Operators," *radioworld.com*, July 24). Even if it were not them, it gives me a good deal of pleasure to see this, knowing they were even warned repeatedly yet persisted in this juvenile behavior.

I am also glad to see that the FCC was willing to warn first before dropping the boom on them. This indeed was handled well by the FCC. So I say thank you, FCC, for helping us amateurs keep our frequencies clean.

*Brian Heise  
Freelance Broadcast Radio Engineer  
Heise Broadcast  
Sherman/Denison, Texas*

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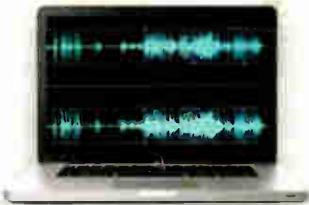
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