



# RADIOWORLD



## AM All-Digital: **READY TO GO**

The FCC gave the green light.  
What's next?

January 2021

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of Radio World

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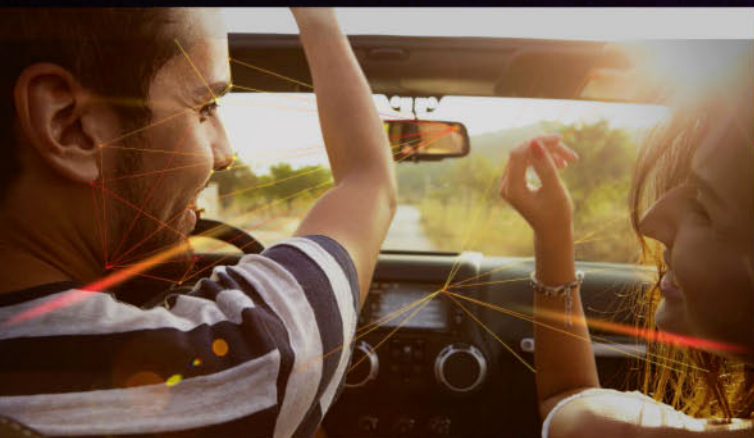
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# All-Digital AM: READY TO GO



**Paul McLane**  
*Editor in Chief*

The Federal Communications Commission has given the green light for U.S. AM radio stations to turn off their analog signals and switch on all-digital HD Radio if they wish. In the commission's words: "While we are mindful of the possibility of some consumer disruption, we conclude — based on the record evidence before us — that all-digital service represents a significant and perhaps singular opportunity to preserve the AM service for future listeners."

## WHAT'S NEXT?

What do experts expect to happen in the coming months? Which broadcasters might implement the technology? What would *your* station need to do to convert? How can you estimate costs; what guidance can your transmitter manufacturer provide?

In the following pages, HD Radio parent company Xperi, co-sponsor of this ebook, first provides an overview including an assessment of the critical receiver landscape.

Then you'll find almost a dozen Radio World interviews with newsmakers who help you assess the situation.

They include representatives of three stations with firsthand experience of the MA3 all-digital mode: Neal Ardman, who flipped the switch at WMGG in Florida in January 2021; Brian Walsh of WIOE in Indiana, who conducted a four-month on-air trial in 2020; and Dave Kolesar and Mike Raide, who have been delving deepest into all-digital at WWFD in Maryland since 2018.

You will also read insights from David Layer of NAB, Gary Cavell of Cavell Mertz, Jeff Welton of Nautel, Ben Downs of Bryan Broadcasting, Cris Alexander of Crawford Broadcasting and Bud Walters of the Cromwell Group. Learn from them how they view the rollout and what kind of questions they're keeping an eye on.

Several RW ebooks have explained the concepts behind HD Radio's AM technology and modes, the problems with the hybrid mode and the results of various tests; so we do not restate them here. But if you are new to the topic and wish to catch up you'll find a helpful overview in the introduction of the [FCC's recent order](#).

But I will note that when referring to modes of AM HD Radio, the FCC and many others use the terms "hybrid" and "MA1" interchangeably, and similarly "all-digital" and "MA3."

As always let me know how Radio World can serve you better. Email me at [radioworld@futurenet.com](mailto:radioworld@futurenet.com).

# AM All-Digital — It's Time to Consider

The technology enables broadcasters to better compete in today's marketplace

by Ashruf El-Dinary

*The author is senior vice president, digital platforms at Xperi Corp.*

We are truly celebrating 100 years of radio.

Oct. 27, 1920 marked the start of commercial radio with the signing of the operational license for KDKA in Pittsburgh, Pa. Exactly 100 years later, on Oct. 27, 2020, the FCC adopted the Report and Order for AM all-digital operations signaling the digital sunrise and potential revitalization of the AM band.

Hubbard Broadcasting started this initiative a few years ago at CES when Dave Kolesar approached us asking, "What if I shut down my analog and went only digital?" That conversation started our four-year odyssey on installing and testing the system in a live market.

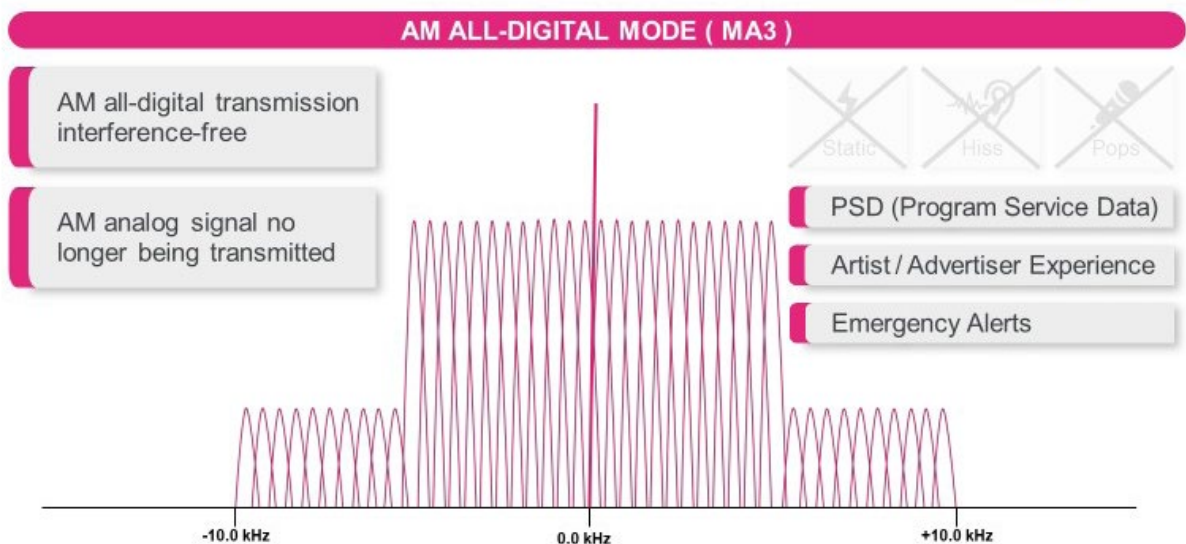
After years of attempting different formats and pro-

gramming changes, there was nothing left for that station to lose. They had no market share in the D.C. or Frederick, Md., area. So as an engineering experiment we all agreed to look into the "What if ..." question.

Since then, Hubbard and Xperi have compiled a wealth of knowledge and data to support the AM all-digital petition initiated by Ben Downs and Bryan Broadcasting. And Dave created a unique format and content for the station which got recognition in the Arbitron ratings! The combined efforts and support from NAB and other broadcasters resulted in that FCC Report and Order.

The order allows AM radio stations to operate using all-digital broadcast signals offering AM listeners significantly improved audio quality and more reliable coverage over a wider listenable area than analog or hybrid digital broadcasts. It also allows broadcasters to provide additional services to the public, such as song title and artist information.

## HD RADIO AM ALL DIGITAL



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Fig. 1: With the all-digital mode, more power is available for the digital carriers, increasing coverage and minimizing the impact of noise and interference.

## HD RADIO ALL DIGITAL AM



### AM ALL-DIGITAL EXPERIENCE



Fig. 2: All-digital provides your listeners with a better experience.

These enhancements will enable AM broadcasters to better compete in today's media marketplace. (Here are links to the [FCC's announcement](#) and the [full Report & Order](#).)

### IS AM ALL-DIGITAL RIGHT FOR ME?

The transition to AM all-digital operation is voluntary. As an owner or operator, you can determine if this service meets your business needs and is right for your market.

Xperi's HD Radio team knows that each market is unique, offering opportunities for diverse programming. With proper planning, a sound installation and the right content, you may see a boost in ratings similar to the first all-digital AM WWFD.

For 70+ million car owners with HD Radio equipped cars, the answer is a resounding yes, AM all-digital is right for me.

The dashboard continues to get more and more crowded with audio sources for drivers; but nothing compares to the ease of use, economics of delivery and connection with community that local broadcast radio delivers. All-digital AM HD Radio will delight your listeners with high-quality audio that is extremely robust and delivers the rich multimedia experience expected from

**All-digital AM HD Radio will delight your listeners with high-quality audio that is extremely robust and delivers the rich multimedia experience expected from today's modern digital services.**

today's modern digital services. Fifteen years of commercial production and distribution of "future-proofed" HD Radio receivers has resulted in a huge installed base of radios for you to target with your new AM all-digital HD Radio services.

HD Radio AM all-digital offers the benefits of digital broadcasting without all of the technical challenges of the hybrid service (analog + digital). The RF spectral bandwidth is reduced from +/- 15 kHz down to +/- 10 kHz, so you may not need to redesign your antenna system to pass a wider signal. With the all-digital mode, more transmitter power is available for the digital carriers, increasing coverage and minimizing the impact of noise and interference. (See Fig. 1.)

All-digital provides your audience with a better experience (Fig. 2). One thing our engineering and sales teams hear from carmakers is that

AM sounds better in HD. They like the experience of the digital audio on the hybrid stations. Metadata provides the song and artist information used to from other digital services. All-digital AM makes that user experience better.

Here are a few things AM all-digital offers:

- Digital audio experience — hi-fidelity audio (15

## HD RADIO FEATURES



WE'RE WORKING WITH OUR MANUFACTURING PARTNERS TO BRING DOWN  
THE COST OF HD RADIO-SPECIFIC EQUIPMENT

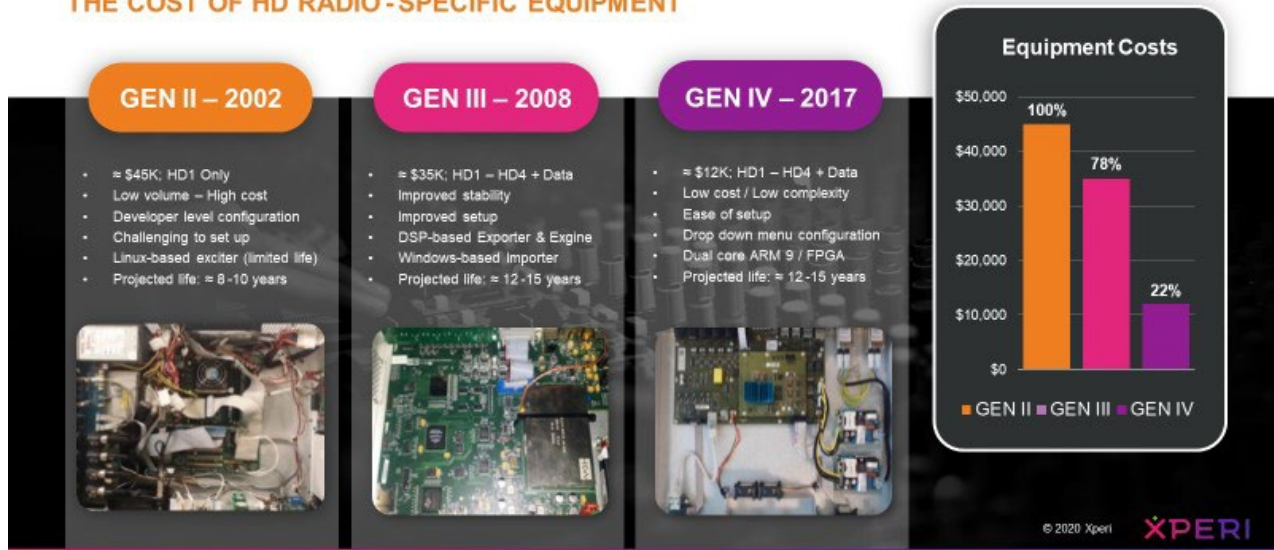


Fig. 3: The reliability of the Gen IV systems is greatly improved thanks to great engineering from our equipment partners.

- kHz, 60 dB dynamic range)
- Audio is free from static and interference
- Emergency alerting
- Upcoming service expansion will include Artist Experience
- Future data services such as digital traffic and weather, on par with current digital FM stations
- And Xperi is evaluating multicasting for AM, the opportunity for two HD audio programs

### HOW DO I MAKE THE DECISION?

Transitions in technology are complicated and it may appear difficult to start.

First, it is important to understand that transmission equipment currently supports the AM all-digital process and that receivers are on the market.

Broadcast equipment has been available since 2002. Our transmission partners are currently shipping fourth-generation HD Radio systems at a fraction of the cost compared to 18 years ago. Today an HD Radio system can be purchased for under \$15,000, a cost reduction of more than 75% from the first systems back in 2002. And thanks to great engineering from equipment partners, the reliability of the Gen IV systems is greatly improved (Fig. 3). Xperi is also currently waiving license fees for new AM all-digital stations that sign up with us

Stations that have migrated their analog AM audience to an FM translator have a simple path to all-digital AM.

through June 2021.

Xperi's HD Radio team has created a tremendous ecosystem within the automotive community to bring HD Radio products to market. Our work over the past 18+ years is evident in the fact that there are over 70 million HD Radio equipped vehicles on the road, over 22% of all cars in the United States! And they were designed to support the AM all-digital MA3 audio program from the very beginning. So the market is already seeded to use the new broadcasts (Fig. 4).

And the car market will continue to grow. Since the adoption of the FCC order, Xperi's HD Radio teams have been contacted by several car manufacturers and radio suppliers requesting technical guidance for implementing all-digital AM on their future products. The car industry understands

that digital radio in vehicles will be necessary to receive future broadcasts and programming. Unlike the European Economic Community (EEC) mandate for digital radio in all cars in Europe, the U.S. and North America can achieve a *de facto* mandate through continued expansion and adoption of the HD Radio system.

### ELECTRIC VEHICLES

Recent state mandates make it clear that electric vehicles are more than a trend. EVs are here to stay, and may soon



## HD Radio-Equipped Cars – National Overview

### ▪ Executive Summary:

- There are currently over 70 million HD Radio-equipped cars (HDEC) on the road nationwide.
- In 2020 Y-T-D, 22.4% of all the cars on the road in America had an HD Radio receiver.
- Currently, an HD Radio-equipped car is sold in the U.S. every 3 seconds – some 20 cars/minute.
- In 2020 Y-T-D, over 53% of all new cars sold came with factory-installed HD Radio receivers.
- 62% of the HD Radio-equipped car models offer HD Radio receivers as standard equipment.
- 41 major auto brands offered HD Radio technology on at least one model in 2020.
- 299 different models currently come with HD Radio receivers, 185 as standard equipment.
- More than 50% of those sell for under \$35,000\*; more than 75% for under \$50,000\*.



Fig. 4: The market is already seeded to enjoy your new broadcasts.

overtake the number of new cars sold with ICE (internal combustion engines).

And we all know that AM reception is a real issue for EV manufacturers. Many are left with the difficult decision to either remove AM functionality or spend significant resources in shielding and noise reduction.

Thankfully, the AM all-digital signal is much more robust, and we believe, delivers a much cleaner audio experience at a lower overall cost in the EV's of tomorrow. As commitment by the industry to AM all-digital HD Radio can help ensure AM radio's future in these platforms.

### CONSIDER YOUR MARKET

Stations that have migrated their analog AM audience to an FM translator have a simple path to all-digital AM. As nearly all their audience have moved off analog, it is easy to abandon the legacy analog signal as it has no listenership. For others, the shift to all-digital may be supported through the market penetration of HD Radio receivers.

Xperi's research teams are focused on tracking the HD Radio product rollout by market. We utilize IHS auto registration data by market from the car industry and apply take-rate percentage to the nationwide OEM sales number. This method gives us the number of HD Radio-equipped cars by brand and DMA. We can then study each market and share data with you.

Please reach out to us for detailed information about your market as you make your conversion decisions.

Vehicle penetration rates continue to climb even in these challenging times, and you'll be surprised to learn just how many vehicles will be able to benefit from your new all-digital AM signal.

We see that HD Radio receiver penetration in several major markets is over 25% with several markets exceeding 30% of cars on the road with HD Radio receivers. This translates into 157.6 million hours per week of in-car listening to digital stations. This installed base provides a great foundation of listeners to take to advertisers and bring them into your new digital radio revolution.

### MAKE A PLAN

The key to a successful transition will be your plan. There will be many things to consider, technically and programmatically. We hope this ebook will provide you with a guide on how to start. These industry experts are speaking from their experiences with WWFD, WIOE and other work over the past years.

- Evaluate the antenna system
- Work with your equipment suppliers
- File with the FCC
- Contact Xperi Corp.
- Communicate to your audience

*The author acknowledges Joe D'Angelo, Jeff Detweiler and Mike Raide for their contributions to this article.*

# A Few Essentials in the FCC Order

Before reading the following interviews, here are a few technical points in the FCC's recent decision. Details and other key points can be [found in the order](#).

- A station must notify the FCC 30 days in advance of going all-digital. One reason is to give local co-channel and adjacent channel stations time to gather baseline data on their existing coverage. Other changes can be reported 10 days after the fact including switching back.
- During that 30-day period the station must tell its listeners that the station will be converting to all-digital and will no longer be available on analog receivers. It left those details up to the station but suggested at least the amount of notice described in its local public notice rule.
- All-digital operation is allowed both day and night. Some observers worried about nighttime interference from skywave if a station's signal is well above the environmental noise level. "We accept the possibility of this additional interference in view of the larger public interest benefits at stake," the FCC said, saying that it's unlikely to be a problem. Xperi has said the skywave behavior of a digitally modulated signal will be comparable to that of an analog one.
- About prohibited interference in general, the FCC wrote: "We believe, based on the relative signal strengths of the stations concerned, that the risk of such interference is very small." If all-digital finds wide acceptance, it said, the uptake is likely to be gradual, so such issues can be resolved under existing rules.
- It set up a streamlined interference resolution procedure that allows voluntary power reduction of up to 6 dB of the all-digital secondary or tertiary sidebands to resolve interference. But licensees that want to reduce power in their primary sidebands must apply for an STA or request a waiver.
- The FCC requires each all-digital station provide at least one over-the-air digital programming stream that's comparable to or better in audio quality than an analog broadcast, and free to listeners. Beyond that, digital subcarriers can be used for broadcast or non-broadcast services, including song and title information.
- With an all-digital signal, two configurations are possible. The FCC will permit each station to select its mode. In the 10 kHz primary carrier-only configuration called "core-only mode," data throughput is limited to 20 kilobits per second, so the primary digital carrier can only support mono audio or parametric stereo. In the 20 kHz configuration using all-digital sidebands called "enhanced mode," data throughput is 40 kbps and the secondary and tertiary sidebands can provide full stereo and additional data. Both support metadata such as station ID, program information and emergency alerts.
- There are about 4,550 licensed AM stations in the United States, which among them have approximately 3,400 FM translators (some have more than one). Another 800 or so are pending construction. The FCC wrote, "In many cases, this [digital] transition will be eased by the fact that listeners will still be able to receive programming on the AM station's FM translator, thus minimizing any disruption in service."
- The commission is approaching the idea of using AM digital multicasts to feed FM analog translators with caution. "We will evaluate requests to rebroadcast multicast channels on an FM translator on a case-by-case basis until a more fully developed record is available on this subject."
- Each digital station must participate in the Emergency Alert System and make sure others that monitor it can still receive and decode an all-digital EAS

*FCC continues on page 9* »



# “The Sound Is Incredible”

Ardman: The MA3 is the great equalizer in terms of audio quality

A Florida AM station is now on the air full-time with all-digital HD Radio transmission, committing its 1470 signal strictly to listeners who have digital receivers.

WMGG switched on a new transmitter in MA3 mode on Jan. 12. The station, which airs Spanish music programming, has an FM translator that continues to serve analog listeners.

This is believed to be the first station to take the step since the Federal Communications Commission said it would [allow AM owners to deploy all-digital](#) under normal operational rules rather than under special temporary authority. Hubbard's WWFD has been operating for several years under an STA.

WMGG is a Class B station in Egypt Lake, near Tampa, airing a directional signal via a diplexed array. It has 2.8



Neal Ardman

kW power by day and 800 watts at night.

**Radio World:** From an operational standpoint, what did you have to do?

**Neal Ardman:** We purchased a new Nautel NX3 capable of both MA3 and analog — not at the same time! We re-did the antenna tuning unit and part of the phasor cabinet to make sure that everything on the antenna side was kosher.

**RW:** Walk me through your thinking from a business proposition. Why did this excite you?

**Ardman:** I am a firm believer that content, at the end of the day, is everything. With that said, if you can't hear it, it doesn't matter how good the content is.

The MA3 is the great equalizer in terms of audio quality. When we flipped the switch, the sound is incredible.

» FCC continued from page 8

alert, or adjust their monitoring assignments.

- The FCC agreed to use average power of the digital signal to determine whether the station is complying with nominal power limits. This was a change from its original plan, based on NAB Labs experiments and WWFD's experiments. The FCC said this should enable more stations to use existing transmitters for all-digital and also result in lower operating power for stations, which will be less likely to cause interference with analog signals.
- The FCC imposes the same carrier frequency tolerance used for analog and hybrid stations ( $\pm 20$  Hz); it left open the possibility of imposing a tighter standard on all AM stations down the road.
- It did not put in place stricter spectral emissions limits, as had been proposed. It said the consensus

is that existing emissions limits will adequately protect stations on adjacent channels.

- Stations can choose any reliable method to measure operating power and power spectral density rules. Section 22 of the FCC order explains why in more detail, noting the different ways that NAB Labs, Hubbard and others have done measurements.
- It noted that the MA3 mode does not support modulation-dependent carrier-level (MDCL) technology, transmission algorithms that are used to reduce power consumption by AM stations.
- And on the subject of costs, the FCC wrote: "The cost of conversion for AM stations that are already broadcasting in hybrid mode is likely to be minimal. For facilities requiring a major overhaul to accommodate all-digital transmissions, however, the costs will be considerably more."

The station sounds like an FM.

We know that penetration for HD Radios is in the mid-30 percent, but it's growing. More and more cars have HD Radio, more and more tabletop radios have HD. Our thinking is, would we rather be in a third of the cars sounding phenomenal, or in all of the cars sounding sketchy and marginal? We chose to be in the cars sounding great.

My gosh, when was the last time something good happened for AM radio?

**RW:** *Some have said that converting will be particularly appealing at first to stations that basically have nothing to lose. Did the station have very low listenership? Are you worried about blowing off a lot of analog listeners?*

**Ardman:** WMGG certainly qualifies as one of the stations that has very little to lose. There is no question about that.

I do think, and I hope, that other stations will follow suit in the market. If a preponderance of the AM station is in Tampa, follows suit, then the listeners will come.

We saw it with the FMs' takeover of AM in the '70s.

Nobody had FM radios. FM stations were on street corners giving away convertors. We gave away thousands of them so people could hear us. At the end of the day, even though the content was arguably the same most of that time as the AM, the [FM] quality was better, so people migrated.

Now we have a chance with these AMs to even the playing field a little bit, as a lot of the AMs have gone off the air, whether it's stations selling their real estate and turning in the license or lowering their power because they want to pay the power bill, and they're relying solely on their translators to help.

There becomes an opportunity for those that are left to increase their facilities, and have their facilities do better because there's less noise and demand. We have a thinning of the herd going on, if you will. Add to that the quality that's available, and add content to the mix, I think you have something that can have a shot at competing.

**RW:** *What about your coverage? Have you experienced any change in that or is it too soon to tell?*

**Ardman:** It's probably too soon to tell in the coverage. Where I have personally listened and driven, the coverage has been great.

There are places that yesterday, before we went into this full-time mode of HD, within two or three miles of the AM site where the noise was sufficient to make it not listenable, or uncomfortable to listen. Now in those same spots, it's crystal clear. Because again, it's digital. There is

no blending, there is no analog components. It's either off or it's on right now, and it sounds good.

When the listener experiences it, you get the title and artist on the screen, just like with FM. It's a leveling of the playing field.

More and more cars will have the HD radio, and as that progresses, if the content is there and you're in your car and you have a choice between this or that, it's not going to matter any more than it mattered once the quality problems were overcome whether it was a UHF station or VHF. For years UHF was subpar to VHF, now it's the other way around. For years, the AM had the listeners and the FM took it over.

We've gone through these things before, and it's time to level the playing field.

What it's going to take is a lot of operators buying in, and it's going to have to be more than one HD station in Tampa for it to work. So I'm hoping some of the other operators will follow suit. I suspect the Beasleys of the world will come first, followed by the iHearts and the Cumuluses. But I think it will happen.

And if we have any success, it will happen very quickly.

**RW:** *What kind of investment have you had to make? And do you do your own engineering?*

**Ardman:** For this particular station, the out-of-pocket to date is under \$60,000. That includes a brand-new Nautel transmitter.

I do a good deal of it, and I have a full-time engineer as well.

**RW:** *Have you done anything public-facing — announcements or branding around this?*

**Ardman:** We did the legal announcements that were required by the FCC, but that's been it so far. We want to get through this soft opening of making sure that there's no glitches before we go too loud and too wide with it.

**RW:** *There are broadcasters wondering if the FCC would allow AM digital multicasting to be fed onto analog FM translators, another version of the old analog FM signal play. Do you think that's part of your planning and do you think that matters at this point?*

**Ardman:** No. I don't. I could be wrong.

**RW:** *What else would you want a fellow broadcaster to know about this experience?*

**Ardman:** It's a lot easier than I thought it was going to be. Other than that, there's not much to share yet, until we have some real data.

My gosh, when  
was the last time  
something good  
happened for AM  
radio?

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# Achieve Technical Parity With FM

Downs: MA3 resolves disadvantages, goes further, without noise, in FM quality

*Ben Downs is vice president and general manager of Bryan Broadcasting in College Station, Texas. A broadcaster for 52 years — “Obviously I began broadcasting from the maternity ward” — he filed the petition for rulemaking in 2019 that led to the FCC’s approval of optional use of the MA3 all-digital mode of HD Radio by AM stations.*

**Radio World:** *As a particularly interested observer, what do you expect fellow broadcasters to do in the coming months now that the FCC has allowed all-digital operation?*

**Ben Downs:** When we look at digital AM, the important thing to remember is the word *voluntary*.

There are some stations that are happily churning along with solid numbers and revenue so they have no need to take this step. But most AM stations aren’t in that position.

We have 70 million cars sold that have an AM digital HD Radio in the dash. And more are sold every day. If an AM station wants to compete with mass appeal music formats, it will have to provide the same quality of a product that the best FM stations do.

This is the pathway to that. It’s not magic; you still have to run a good radio station. But it is absolutely a way to achieve technical parity with your FM and digital competitors.

Of course there are some stations that converting to digital won’t be a good choice to make. Daytime stations will have to closely evaluate the ROI from this technical investment.

**RW:** *Will you convert? On what timetable?*

**Downs:** In addition to our FM stations and digital products, we have four AMs.

One station I will absolutely convert. It has a translator to back up the analog listeners and covers a lot of territory.



Ben Downs

Another is the top-rated and top-billing station in the market; I will leave it just as it is. I run the digital hybrid mode on it so people with HD Radios get the benefit of a sound that rivals any other source.

My daytimer has no pre/post sunrise authority, so I’m exclusively promoting the FM translator and generally making sure the AM is on and off at the right time.

I have a popular sports station that I’ll probably convert. It has a very good audience and they take advantage of the FM translator when atmospheric noise gets high.

As far as a timetable, the COVID economy pulled the rug from under my cap-ex plans, but we’ll get back on target.

**RW:** *Is translator deployment sufficient to allow a significant number of AMs to go all-digital while sustaining analog listenership?*

**Downs:** Not in Houston or Dallas.

In medium-sized markets, the FM translator is a perfect nightlight. People will love the sound and artist/title information and song art that goes along with their new digital AM, while the FM translator is a lifeboat for the analog-only listeners.

But the major markets have spectrum for very few FM translators. If I were in a major market without a translator, AM digital would be my first step to resurrect an AM sitting at .1 or 0.0 in the ratings. For the first time, you can compete with a music format and not compete with the other three sports talk stations. And HD Radios in dashboards are “preset oriented” to change to a digital AM with one button push.

**RW:** *For someone coming new to this topic, briefly summarize the central advantages to going all-digital on AM.*

**Downs:** I drive a Toyota. For five years, when I tune to

a satellite channel or an HD FM, I see artist and title information and a picture of the artist — love that Lorrie Morgan pic! The forecast scrolls, EAS alerts display and advertiser logos appear.

But on the AM stations, you might get the dial position. It just screams “Old Tech” to anybody still listening. And when driving under a power line, the hash is painful.

Now we have a tool that solves that competitive disadvantage. In addition, your signal goes further without noise from phone chargers, LED monitors or power lines. In stereo. With FM quality.

Other than that, I dunno!

**RW:** What role should the FCC play now that it has given the green light for optional conversion?

**Downs:** Daytimers are in a rough spot. If the FCC could come up with a way to protect FM translators and full-power stations, it would make sense to clean up the AM band by allowing daytimers to turn in their AM license if they want to. There are 850 AM stations that have less than 25 watts at night. That’s a lot of interference that would go away, voluntarily. In the case where the translator covers the community 24/7 it will become the actual information source that the community chooses to listen to.

**RW:** Why should an AM broadcaster deciding to undertake this transition go straight to MA3 without first implementing MA1?

**Downs:** MA1, the hybrid digital, would appear to be the better choice, but the reception is fragile, and a band full of hybrid stations would be full of sideband noise.

I’m one of the few in the U.S. running the MA1 hybrid digital. It has noisy sidebands and it drops out more than I like. But when it kicks in, you have the sound you’ve always wanted on your AM. It’s as good as the finest FM audio.

The all-digital is robust and actually has extended the coverage area in the NAB’s tests. The MA1 allows analog reception, but that’s the problem. Analog reception on AM is not competitive in any format other than talk or a very narrow niche music format.

When you go to MA3, you can compete against any station with any format.

**RW:** What programming options might this open for broadcasters? For instance, many AM stations are based on talk.

**Downs:** To be completely accurate, most AM stations

are talk.

With all-digital you can compete with any format; talk or music. Most markets have a format hole for EDM because it doesn’t attract enough advertising support. But if you have a 0.1 rated AM station, you can take a chance on the format. Done well and promoted, a unique music format is all upside. WWFD’s all-digital eclectic format proves that you can grow music formats on AM.

But as I’ve always said, all-digital isn’t magic. If you run a bad operation with lousy music selection you will absolutely still fail.

**RW:** WIOE experimented with it, mostly at night, as described elsewhere in this ebook. But it then turned it off, saying its local market wasn’t ready.

**Downs:** If it were me, I wouldn’t do a half-and-half analog/digital format, especially if the station is successful. But if an AM needs help, I would pick a new format that was underserved, rebrand the station as a new station and market the cutting edge of the technology.

The two most powerful advertising words

are free and new. This would be both. To the extent we get anybody’s attention with a new radio station, rolling out a “Digital 1550” will get early adopters sampling. And maybe good things will happen.

**RW:** If the technology were to allow multicasting on the AM, would it make a difference?

**Downs:** I can think of 10 friends who would convert tomorrow as long as they were able to use a second translator as a safety net for the new multicast channel. Unlike AM digital, a second AM channel isn’t included in every HD Radio sold. So it will take a number of years for the software to be introduced and market uptake. Xperi would have to put some expensive designs into the new chip and then market this enhancement to the manufacturers.

**RW:** What else should we know?

**Downs:** We are reading the trades telling us that there are new car manufacturers that don’t include AM radios in the dashboard of electric cars due to noise. And electric cars are coming. If we want AM to be in the dashboard, we need to give the carmakers comfort that the stations we operate won’t embarrass their customers with buzzes, pops, snaps and general hash. Instead of going to the carmakers and saying “Pleeeeeease put AM back in,” we can approach them and say, “We fixed the problem; your customers want us in the dash.”

If I were in a major market without a translator, AM digital would be my first step to resurrect an AM sitting at .1 or 0.0 in the ratings.

# Smaller Markets Are Likely to Start First

Cavell cites “absolute quiet nature of the signal,” expects gradual adoption

*Gary Cavell, the president of Cavell, Mertz & Associates, is a 40-year veteran of the broadcasting industry, editor in chief of the 11th Edition of the NAB Engineering Handbook, and recipient of the NAB Engineering Achievement Award for Radio and the IEEE BTS Jules Cohen Award for Outstanding Broadcast Engineering.*

**Radio World:** You’ve participated in the experimental operation of all-digital at WWFD. What was your role in that project?

**Gary Cavell:** I assisted with the initial FCC request for experimental authority, and provided telephone support to the station regarding aspects of antenna system adjustment.

**RW:** What are your key takeaways about all-digital?

**Cavell:** The absolute quiet nature of the signal, the lack of interference, the all-digital signal’s apparent superior (to analog) range, and its overall quality really impressed me. Having the ability to also see album art and program information on the radio display was an added bonus.

**RW:** Briefly summarize the central advantages to going all-digital on AM.

**Cavell:** Having a quiet, noise-free signal with excellent fidelity allows an AM station to once again offer music to an audience. The experience of WWFD showed how people independently discovered the station without benefit of publicity or promotion to the general public.

**RW:** What do you expect to happen now that the FCC has allowed all-digital operation?

**Cavell:** I suspect that we will see gradual adoption of the MA3 system over the next few years, likely starting in the



Gary Cavell

middle and small markets where you often see the exploration of new ideas, and greater flexibility seems to exist when it comes to adapting and making changes.

**RW:** Where would an AM owner start, in order to assess whether to switch?

**Cavell:** I’d look at the penetration of HD-Ready radios in your market (in cars, in particular), the listening patterns and tastes in your region, the age of cars in your area, and the predictions your local dealers have regarding the timing of folks transitioning out of their older cars that probably do not

have HD Radio.

**RW:** Why should an AM broadcaster deciding to undertake this transition go straight to MA3 without first implementing MA1?

**Cavell:** I would absolutely go right to MA3. I see no need to transition across modes.

**RW:** How can a station best publicize a switchover, what tactics should they use?

**Cavell:** I feel that broadcasters are not very good at telling their own story. We can sell virtually anything over the air, but we do not sell ourselves very well.

In particular, I feel that we do a poor job of generating excitement in our audiences and educating them when technology shifts happen. I base this on my memories from the early days of FM, the increase in TV stations on UHF channels, HD radio, and the DTV transition.

We need to let people know about the product, remind them of what we do (without beating them over the head), teach them about the new technology on our stations, and teach them how to listen to us (in MA3).

I suspect that we will see gradual adoption of the MA3 system over the next few years, likely starting in the middle and small markets where you often see the exploration of new



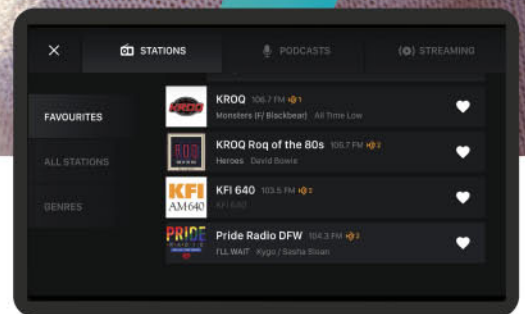
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# “When the Market Is Ready, So Is WIOE”

Brian Walsh was blown away by the coverage but says education and promotion are crucial

Brian Walsh is an engineer; he's also the owner of several radio stations. In 2020 he ran the all-digital MA3 mode of HD Radio on AM station WIOE in Fort Wayne, Ind., the second U.S. radio station to conduct such an experiment.

WIOE, which normally also uses AM stereo, is a Class C AM at 1450 kHz with 1 kW of power and a non-directional antenna daytime and nighttime. It used a Nautel NX 3 transmitter during its all-digital operations.

Walsh experimented with all-digital in the daytime hours for just a few days in the spring, but he used it at night for about four months to gauge audience reaction. Two FM signals including a translator at 104.3 continued to serve listeners in analog.

The experiment concluded in September. Walsh expressed enthusiasm for the quality and coverage by both day and night, 20 miles out from his site. But he was disappointed by the lack of interest from listeners.

“I was ready to provide an improved service to clients and listeners more than they were ready to accept the MA3 AM HD,” he told Radio World last fall. “I overestimated a bit. When the time is right and the Fort Wayne market is ready, so is WIOE.”

We contacted him again in January and asked him to expand on his experience.

**RW:** *If you sat down with a fellow broadcaster, what would you tell them about whether it makes sense to go all-digital on the AM band?*

**Walsh:** The technology is wonderful. It's what AM needs. It's the boost that it needs.

The downside that I found out with WIOE AM 1450 in Fort Wayne was the radios. People didn't have the radios — or the interest, in that market at least, to pursue finding the radios.

We tend to have a more mature audience, being an oldies-formatted radio station. However, our time spent listening is very well. The summer Nielsen book, we had a 1.1 share. And we do transmit in AM stereo; I've had

people from as far away as Toledo, Ohio, send me emails, “Hey, I'm going to drive through Fort Wayne on my way to Indianapolis just so I can listen to AM stereo.”

That seems to be where they're coming from. There seems to be a lot of AM stereo listeners. Even though it's 35-year-old technology, we have a lot of people who say they appreciate that.

**RW:** *Digital proponents have said the growing number of HD Radio receivers, which all have the ability to pick up an all-digital AM signal, seeds the ground for a successful AM expansion in digital.*

**Walsh:** I think in time, and if you throw enough money at the problem, you'll have it.

We have very good penetration in the vehicle, as you point out, with HD receivers now.

The home front? It's like finding a needle in a haystack. I have toured so many ... national [retailers] looking for these HD home radios, clock radios, that you read about in the trades; and they are just not in those stores.

There has to be education. The TV industry did a wonderful job. Everybody knew if you were going to watch over their television, you needed new hardware. On the radio side, that has not happened.

There's been good promotion saying, “Oh, HD Radio,” and other companies have put it on their own airwaves. However, I haven't seen that on the television. I read it in the trades; for the masses though, we haven't done a good job of letting them know that opportunity is available.

Somehow we have to get that out to the masses so they know it's there.

**RW:** *What do you say to a broadcaster who asks, “How much is it going to cost me to make this conversion?”*

**Walsh:** In my situation, I put \$58,000 into it. It's a 1 kW

You definitely won't be disappointed [in the quality]. It sounds perfect. ... [But] will the listeners even notice it?



Brian Walsh

day-and-night AM radio station.

I would say if you have a directional antenna, similar to our counterparts [WWFD] in Washington, I'm sure they had a greater investment. You have to look at the numbers versus the return on investment, if it works out for you.

Another broadcaster in the area, South Bend, reached out to me, they were considering HD, and theirs is a directional AM. I invited them to come to Fort Wayne. "We'll turn it on for a couple of hours. You guys drive around and see what you think. You won't be disappointed. You definitely won't be disappointed. It *sounds* perfect. The album art, everything works as it was promised or advertised."

However, again, we go back to: Will the listeners even notice it?

**RW:** *Let's talk about the metadata aspect. It sounds like your experience was positive, the way it looks on the dashboard.*

**Walsh:** Yes, it looks great.

I made one call to Xperi when we were setting it up because we were having difficulty getting the clip art to work; we've learned that the pixel rate that we were sending exceeded what the encoder, the importer, was capable of reproducing. Once we got that figured out, our IT guy wrote a nice little script; and anything that was sent to it, it automatically formed it to what the HD importer needed. So that took care of that problem.

But it was tight — it looks as good as some of the

other media outlets out there when they put up their Artist Experience as well.

**RW:** *That's part of the pitch, of course — that broadcasters who are competing in the dash with other metadata-equipped stations or platforms will be able to hold up their end visually.*

**Walsh:** Exactly. The only ones in Fort Wayne that I've stumbled across was us, at that time. We are no longer doing the full Artist Experience [and] the stations that I surveyed in the Fort Wayne market haven't upgraded yet.

It was kind of ironic that we were doing it on a 75-year-old AM radio station, and it worked so well.

**RW:** *We assume that an AM broadcaster who's going to seriously look at all-digital has an FM translator; it would allow a marketing approach to point your analog listeners to find the content elsewhere on the radio. Is that how you think it would work?*

**Walsh:** I would agree with that, but I'm going to tell you a story that just happened yesterday.

We had an ice storm roll through here last Friday, so 101.1, our 6 kW Class A, had to reduce power until the ice melted; then it came back up Wednesday.

This gentleman in Fort Wayne calls me up and says, "Boy I'm glad I can hear you again." I said, "Oh, was there a problem?" "Yeah," he says, "I couldn't pick up 101."

I said, "Oh, well, we're also on one 104.3 and 1450 in Fort Wayne." We've been there for two years, but the guy didn't know! He said, "Well, I'm going to go check it out."

I received an email at 7:30 this morning, and he says, "I had no idea. This is great. I can hear it on 104.3." [But] every song, there's imaging — we call it the "WIOE trip-lets" — that gives the frequencies.

If you look at the ratings — this is just WIOE's particular circumstance — but the 101.1, which is 36 miles *outside* of the Fort Wayne market, has a higher rating share than the [104.3] translator does. The AM at 1450 in the summer book had a 1.1 share, and the translator had a 0.9.

What we think in the industry is, "Oh, they're gonna listen," but it's not always the case. 101 has been around for 18 years; it's that old habit of, "Oh, I listen to WIOE on 101." In our situation, they haven't discovered the translator aspect of it yet.

But they discovered the AM stereo. So I don't know. Funny how it works.

**RW:** *Would you expect that an AM that switches to all-digital would publicly emphasize to listeners, "You can still find us on this FM frequency"? You had a billboard along those lines?*

**Walsh:** We did. Promotion is key, and we announced



over the radio for a while that we were going to be doing this, probably three weeks, maybe even a month before. Then we put the billboard up; and it was in the newspapers; and I know one of the television stations did a feature on it. So it was pretty well out there. Plus the to-of-the-hour IDs changed, and it was “HD this” and “HD that.”

Well, after so many months of people saying, “Wow, why can’t I hear your station at night like I do during the daytime? I just hear static or I hear white noise,” I figured I had to cut my losses, at least at this time.

I’m not throwing the whole concept out; but in my market of Fort Wayne, Indiana, how many more months do you want to keep throwing all of this at it? And the Nielsen ratings came out with the 1.1 share, and we were messing with it. So there’s an audience there for analog AM, or in our case stereo AM.

**RW:** And your strategy position at present?

**Walsh:** I’m in a wait-and-see attitude. I have a couple things I want to do on the back burner. I sent an email to Jeff Welton [at Nautel] about maybe converting it over to MA1 mode; then we’d have to do the relicensing with Xperi.

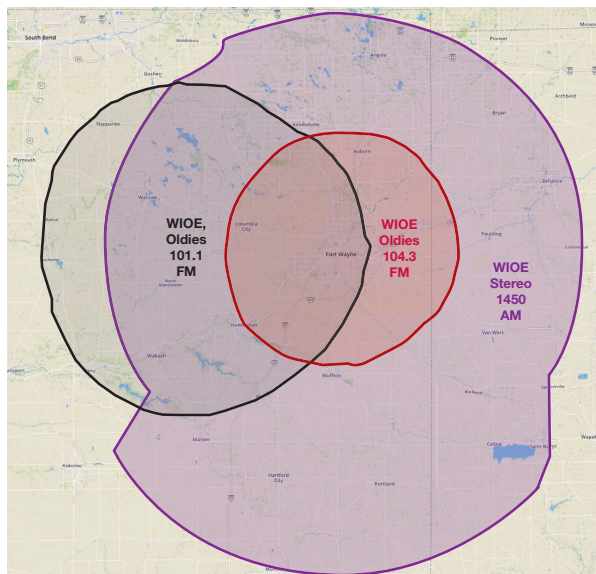
I don’t know if we can do MA1 in AM stereo. I’m pretty sure we can’t, but I’m looking at putting it back in some form of digital. If not MA3, I might try the MA1 and see how it is.

There is an MA1-formatted station in the market; but the MA3 is just as good as an HD1 on an FM when it came to the audio quality. And I’m a real stickler for audio quality.

I’m a little reluctant to try the MA1, yet I’m thinking, “Well, let’s see what we gain with that experiment and see if maybe that might be a way to bring people into HD slower,” rather than turning off analog altogether and going with the MA3 mode, which we found out didn’t benefit anybody. And maybe bring them in a little bit slower and re-promote it that way; then if we see that it’s really working, we can always transition back to the MA3.

Just some scenarios I’m tossing around right now.

## BROADCAST COVERAGE AREA



The “WIOE Triplets.” The 104.3 signal is an FM translator of 1450.

**RW:** What was your experience with technical performance of the MA3 signal and what you heard driving around.

**Walsh:** Well, the coverage is excellent. It is what AM radio needs to expand your coverage. I just cannot believe the difference.

There are signal areas that [AM stations] all have, where they’re less, performance wise, than what we’d want them to be. I have those areas with 1450, even though the transmitter is almost smack dab in the middle of downtown Fort Wayne.

At 1 kilowatt on HD, in the full MA3 mode, those areas were gone.

There are areas [in analog] where you drive under a high-power tension line, 10, 15, 20 miles away from Fort Wayne, you couldn’t even understand any station — and the HD cuts right through it.

The best experiment, I took a portable HD receiver with me into Glenbrook Mall. My kids didn’t want to be around me. My 16-year-old daughter said, “I’m not going to stand around with you, walking around with headphones on. It’s embarrassing,” so they went shopping and left Dad alone.

But I rocked [the receiver] back and forth. The analog signal, there’s places in the mall you can hear it fine, but there’s also interference around some of the stores that have neon and displays. But you go to those same areas with the MA3? You’re walking through and it’s crystal clear.

I’m not saying everybody is going to benefit like that. Not a lot of people have their AM transmitters in the downtown area like we do. But in that particular location, we’re six miles south of Glenbrook, with a full 1 kilowatt AM signal; and I could walk through the mall with that tuner, and it never dropped out once. No interference. Everything was there.

I don’t know about the Artist Experience because the tuner didn’t display that, but the audio quality was unbelievable.

It’s definitely what AM radio needs to alleviate the problems with analog signal reception.

**RW:** What else should we know?

**Walsh:** I think more people need to get involved.

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# Stations Will Wait for a “Critical Mass”

Alexander: A few will get started early; Crawford is considering one at present

*Cris Alexander is director of engineering for Crawford Broadcasting Co. and tech editor of Radio World Engineering Extra.*

**Radio World:** What do you expect to happen in the coming months?

**Cris Alexander:** I suspect that not much will happen. A very few will make the conversion, likely AM stations that are completely duplicated by FM signals, either full-power or translator, and for which HD Radio transmission equipment is already in place. That really limits the possibilities. Others will continue to wait for a “critical mass” of receivers before considering making the change.

**RW:** You engineer numerous AM properties. Will you convert?

**Alexander:** We are considering converting one station that meets the criteria noted above — 100% FM duplicated and with existing HD equipment in place. The station is already transmitting in the hybrid mode, so technical changes will be limited to a few taps on a touch screen to change the operating mode. There should be no additional capital costs, although we may well see some increased utility costs as a result of all-digital operation. The station currently operates with MDCL, and those cost savings will go away with all-digital.

**RW:** What particular technical questions will you want to address, to make this a success?

**Alexander:** I believe this will be an easy conversion, just a few taps on a touchscreen. The antenna is already optimized for the greater demands of hybrid AM, and the transmitter is a new Nautel NX5.

**RW:** How can other AMs estimate cost?

**Alexander:** Start by talking to your engineer. Is the current transmitter HD-capable, or can it be made HD-ca-



Cris Alexander

pable? If it is already HD-capable, the list of additional equipment required will be short, and the costs for that can be ascertained by talking to the manufacturer.

If the transmitter is not HD-capable but can be converted, the manufacturer can provide a quote that will include everything needed, including exporter and HD exciter.

The other major cost is licensing from Xperi, and that would be the next call. There may well be promotions in place to reduce or eliminate licensing costs. [Xperi currently waives licensing fees for early adopters. — Ed.]

**RW:** Why should an AM go straight to MA3?

**Alexander:** The MA1 hybrid mode is significantly more demanding on antenna systems and will likely require more engineering work to make it work — and it may not work.

I would think that the MA3 mode will work with most antenna systems that are working well in analog. If the station sounds good in analog, chances are the antenna is in good shape for MA3, although it might be necessary to make some adjustments to the matching network or even add some components to properly orient the load for the transmitter.

Starting in the MA1 mode will likely require considerable antenna work and expense, which will have little benefit for MA3 when the switch is eventually made to that mode.

**RW:** Is translator deployment sufficient to allow a significant number of AMs to go all-digital while sustaining analog listenership?

**Alexander:** The answer to that question is totally situation-dependent. For an AM with an FM translator that covers the entire market well, listenership can easily be maintained, but for those with spotty or limited FM coverage, loss of analog AM service could well result in a hit to the listenership.



# Watching for the Business Case

Walters: It won't pay until we figure it out, but someone has to start

Bayard "Bud" Walters is president of the Cromwell Group, licensee of 23 small- and medium-market radio stations in Illinois, Kentucky and Tennessee.

**Radio World:** What do you expect will happen in the coming months?

**Bud Walters:** I have not heard much discussion among my peers about going 100% AM digital. COVID has obviously diverted attention from a lot of opportunities in many industries. That may be the case in ours.

**RW:** Will you convert?

**Walters:** We have six AMs. Two of them — Nashville and Owensboro, Ky. — have Nautel transmitters that can easily convert with an investment of about \$10,000 each. We're open to doing that but there are other higher-priority projects.

**RW:** Is translator deployment sufficient to allow a significant number of AMs to go all-digital while sustaining analog listenership?

**Walters:** We have 29 translators. All of our AMs have two translators, and a few have three covering different areas. Thus we do have enough translators to provide service and allow our AMs to convert to 100% digital.

My sense is that most (but not all) of our AM listeners have converted to listening on the FM translator.

**RW:** Where would an AM owner start, in order to assess whether to switch?

**Walters:** At the moment I cannot figure a business case to do it. For us, as we have done on translators and other projects, it will be a decision of "let's do it" and see what we can figure out gathering the experience of others.

**RW:** How can stations estimate how much it would cost?



Bayard "Bud" Walters

**Walters:** In our case, two of six can be converted for a total of about \$20,000. The other four will take an investment of about \$30,000 each. The real question will be "why."

**RW:** What programming options might this open?

**Walters:** Music quality will be equal to or better than FM, thus it becomes an option.

**RW:** WIOE in Indiana experimented, mostly at night, and the owner decided that Fort Wayne "just isn't ready for all-digital AM at this point." How does that affect your thinking about the outlook?

**Walters:** There are always early adopters. That's where we are now. It won't pay until we figure it out, but someone has to start.

**RW:** Dave Kolesar, who has led the work at Hubbard's WWFD, said drive tests showed that MA3 can provide album art, artist information and other data throughout a station's coverage area. Do these features make you more likely to go all-digital?

**Walters:** They are essential in this competitive world, especially in major markets — not as essential in the early stages in smaller communities.

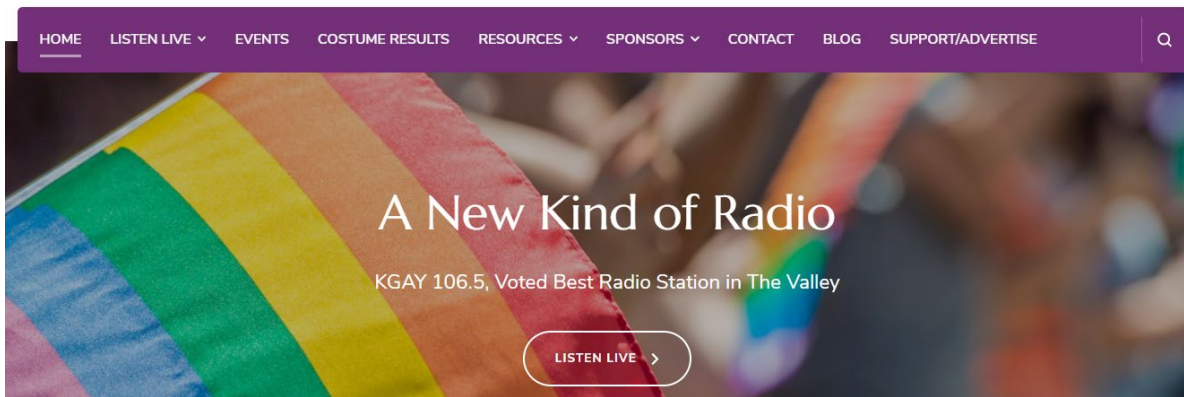
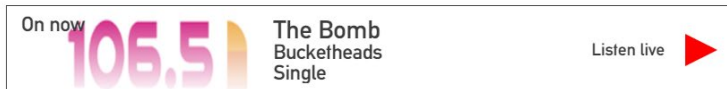
**RW:** If the technology were to allow multicasting on the AM, would it make a difference?

**Walters:** At this point, more signals is not what we need, but multicasting options are always desirable.

**RW:** Other thoughts?

**Walters:** It really is at an early stage.

To make a difference, receivers need to be continuous-dial. If a listener needs to switch from FM to AM to get the station, it makes the road a lot tougher.



Sunnylands Broadcasting emphasizes its FM in its branding, mentioning the analog AM only in station IDs.

## An Eye on Improving Station Coverage

Smith: Broadcasters will wait to see what economy looks like post-pandemic

*Gregory Smith has been part of the ownership of several groups of radio stations on the West Coast, starting in 1983. He was part of a [joint filing by 17 broadcast groups](#) last year that encouraged the FCC to allow the all-digital option. Sunnylands Broadcasting has KGAY(AM) and two FM translators in Thousand Palms, Calif., as well as KHCV(FM) in Mecca, Calif.*

**Radio World:** What do you hear from fellow broadcasters about who and how many might convert?

**Gregory Smith:** From the few radio broadcasters I have spoken with, most are waiting to see what the economy will look like after COVID-19 before committing to a large capital outlay. All of those I have spoken with own a mix of AM and FM signals in their markets.

In my opinion, and in conversations with others, with the limited number of HD receivers in use, all-digital AM will be a niche product.

If the ownership caps for AM signals in a single market were removed, there might be more operators willing to devote some of their AMs to all-digital.

**RW:** Will you convert? What technical changes and costs will

be involved?

**Smith:** We currently operate one AM, which is simulcast on two translators in the Palm Springs market with a music-intensive format. Conversion of that AM to all-digital is a future possibility depending on economic conditions. If we do convert, I don't see it happening for several years.

**RW:** For someone coming fresh to the topic, what would you say are the central advantages to going all-digital?

**Smith:** I cannot answer for others, but for us it would be the audio quality that the AM would give us over a larger geographic area than the translators currently provide.

**RW:** An important element in this has been the fact that many AM owners now have FM translators.

**Smith:** Without the analog translators simulcasting the AM, we would not consider all-digital on the AM. In our particular case, all-digital AM would be additive to the analog FM translators. Our AM signal would cover a broader geographical area than the two translators currently simulcasting the AM programming.

# Research Continues in Advanced Services

Layer lists additional areas of research to keep an eye on

*David Layer is vice president, advanced engineering for the National Association of Broadcasters. He replied by email.*

**Radio World:** As a close observer, what do you expect to happen in the industry now that the FCC allows all-digital on AM?

**David Layer:** I don't have any inside information into how slowly or quickly broadcasters are going to embrace all-digital AM. My expectation is that the pickup will be slow in the coming months and increase over time, as the penetration of HD Radio receivers in the marketplace continues to increase.

Having said that, I am certainly hopeful that we will have early adopters that have a successful transition, as did WWFD, the Hubbard station in Frederick, Md.

**RW:** Summarize the takeaways of the research and testing in which NAB has been involved.

**Layer:** Since 2012, NAB has been actively involved in the testing of all-digital AM radio using the Xperi HD Radio MA3 mode of operation. This testing resulted in a technical record of MA3-mode performance in both laboratory and field environments, which was submitted to the FCC and appears to have factored prominently in the both the all-digital AM NPRM and the Report & Order.

Our test program demonstrated excellent daytime coverage and acceptable performance from a first-adjacent channel perspective. Not surprisingly, the nighttime coverage was found to be more limited but was consistently found to exist out to a station's nighttime interference-free (NIF) contour as defined by the FCC.

**RW:** What further research and testing is being done now, or planned?

**Layer:** NAB is following closely, and



David Layer

**Our test program demonstrated excellent daytime coverage and acceptable performance from a first-adjacent channel perspective.**

in some cases working with Xperi and Hubbard to conduct a number of investigations as outlined in WWFD's Request for Extension of Experimental Authority, filed with the FCC on June 29, 2020, and including:

- Expanded testing of the use of an HD2 multicast audio service, creating a second audio service in addition to the main program services. Plan is to experiment with different audio bitrate sizes used, and audio formats (parametric stereo);
- The addition of different data services, alongside current data services already deployed now;
- Testing of Emergency Alerts services and new advanced alerting services;
- Testing the performance of MA3 vs. analog in different all-electric vehicles;
- Testing changes to the MA3 waveform by reducing the power level of the unmodulated pilot carrier level;
- Conduct building penetration tests of the MA3 all digital system vs. analog, and the MA1 hybrid system.

**RW:** Where should an AM owner start, in order to assess whether to switch and estimate costs?

**Layer:** Perhaps it goes without saying that broadcasters will need to be committed to and believe in an all-digital AM future to go down this road. Listenership will likely be

low at first, but will grow as HD Radio receiver market penetration increases and listeners discover all-digital AM stations. Broadcasters able to offer compelling content will always have an edge. I don't have any information on the cost but Xperi and the equipment manufacturers will be able to inform on that.

*LAYER continues on page 31*



# The View From a Manufacturer

Welton says the ability to hear a clear signal with no static is significant

*Jeff Welton is central U.S. sales manager for transmission manufacturer Nautel.*

**Radio World:** What is Nautel's message to customers about all-digital on AM right now?

**Jeff Welton:** Only you can determine whether or not it is a good fit for your station. Speak to Xperi about receiver count for your market, decide if you have content that could benefit from the features, give us a call and we will work with you on what is required in the transmission system to achieve maximum bang for the buck.

**RW:** What do you expect will happen now that the FCC has allowed this option?

**Welton:** Well, my crystal ball is out for calibration, so this is a bit trickier than usual! I think, as with most new tech, that there will be the usual bell curve of early adopters, followed by a lull while folks wait to see what happens, then another uptick.

As to who will convert, the ones who stand to benefit the most are the stations who would have the hardest time of it, financially speaking. This is tech that could really help a low-power daytime station overcome traffic light noise, power line insulators, etc., but those are the stations with the least ability to obtain the equipment required in a lot of cases.

I expect we will see the initial curve made up of entrepreneurial small-market owners, probably in the 2.5 to 10 kW range. Perhaps cases where they needed to upgrade an old tube rig anyway, so the bulk of the cost was already expected.

In those situations, the significantly higher efficiency of the new transmitter could go a long way toward making the payments on the new gear.

**RW:** What do you see as the most important potential benefits of the MA3 mode?

**Welton:** Coverage is still somewhat location-dependent



Jeff Welton

— but the ability to hear a clear signal with no static, even if over the same area, is significant.

Metadata is a chance to bring in the younger folks who are used to seeing graphics on the dashboard — it brings AM stations up to par with FM, with respect to dashboard positioning.

During a recent webinar, I half-joked that I could envision an infotainment system where you just had a series of logos/format types and you choose the one you wanted, with no distinction between AM/FM/satellite, etc. I was half joking,

but it wouldn't be that big a stretch, and it might go a long way toward bringing in some young ears, as they wouldn't necessarily know they were listening to "radio."

**RW:** What are your customers telling you or asking you?

**Welton:** The bulk of the calls are related to how much it will cost and what equipment is required.

I've had a few folks express interest in it where they already have a translator and figure that will pick up the slack where people don't have HD receivers. I've had one who did the upgrade and discovered that there were a lot more listeners to the analog AM than they had realized, which was a good thing/bad thing, situation — but now they have the gear and are ready to roll, when their listeners are ready. We are also discussing other options that might work for them in the interim, so it has been an interesting conversation.

The good thing is that, in the process of optimizing for HD, they are now positioned to deliver an incredible AM stereo signal!

**RW:** How concerned are you about interference issues, on-channel or otherwise?

**Welton:** It is always a concern, but less so with MA3 than with MA1 (hybrid), at least with respect to second adjacent interference, since the MA3 signal, even in enhanced

mode, drops sharply at 10 kHz from carrier. In the far field, first-adjacent interference could potentially still be an issue if a station is running enhanced mode and using their full 10 kHz bandwidth, but even then, the secondary and tertiary carriers are at a nominal 1% of the main. Within the primary and probably secondary contours, it should be less an issue — but certainly, especially at night, there'll be some issues with on-channel interference, I'm sure.

My suspicion is that it will be a bigger issue for DXers than anybody — but it might be an opportunity for them to pick up a Sangean or Sony tabletop and experiment with HD DXing, also!

**RW:** *What technical questions must an owner or engineer answer, in order to determine their path to digital?*

**Welton:** Definitely antenna system is still important — to be honest, it was important in the analog world also, it just tended to get ignored since everything mostly functioned regardless.

The comparison I draw is to a home stereo ... your antenna is the speaker to the amplifier that is your transmitter. The best transmitter in the world is not going to perform ideally into a poorly tuned and matched antenna system, whether analog or HD. Also processing — because this is low bitrate audio, no matter how good the codec may be, it requires a light touch on the compression knob and some attention paid to the source. Those things will go a very long way toward making the signal as good as it can be.

Transmitter compatibility is going to be an issue; as it stands, there are not a lot of boxes out there that will handle a full-featured enhanced mode MA3 signal, including a lot of our legacy gear. Some of these systems can do core mode MA3, some might only be able to handle hybrid MA1 and still others are going to be analog only.

Speak to your manufacturer to see what is possible with your gear, as part of sorting out the budget you will need to allocate.

**RW:** *How much money can a typical AM station expect to pay?*

**Welton:** As I told a customer who asked me a similar question a few weeks ago, you're asking me how much a car costs, without providing any of the information required to answer!

If a station has one of our NX series transmitters, they are looking at the HDMC+ HD generator and the plug-in

Exgine board for the transmitter, so around \$16K to \$17K. If they have a tube rig in the 5 kW range, probably closer to \$50K, give or take a bit.

This all assumes they have a well-optimized antenna system — and again, that could be anywhere between not much and a whole lot to get set up properly. As I mentioned, it should be done regardless, but it certainly can hit the pocketbook hard.

**RW:** *Why should an AM broadcaster deciding to undertake this transition go straight to MA3 without first implementing MA1?*

**Welton:** The really big reason at this point is that Xperi is waiving the license fee for MA3 implementation, but not for MA1 — so there's a \$10,000 benefit to just going to MA3 without the interim step.

Again, if you've got an AM that has an FM translator, with nobody listening to the AM at the moment, it might

be beneficial and a way to give the AM some presence again, with the folks in the market who have HD receivers.

I do not work for Xperi so definitely reach out to the folks at [www.hdradio.com](http://www.hdradio.com) and get the current status.

**RW:** *Is multicasting on all-digital AM going to be an important part of this discussion?*

**Welton:** At some point, I suspect it will. Even now, the precedent has been set. The FCC has approved it for experimental purposes for a station already.

In that case, the station was hoping to get permission to drive a translator with it, to offset the costs of the upgrade; however, that was denied for valid reasons (no receivers; experimental technology).

In their decision, the FCC made it clear — and they reinforced this in the R&O in October — that they would certainly be willing to entertain future applications.

So it will probably be a part of the discussion, but I do think it will require receivers to exist first, at least to some extent. As it stands, none of the roughly 65 million HD receivers out there today can decode an AM HD2, and more study would need to be done on whether broadcasting one would impact these receivers, with respect to their ability to receive the primary HD1 signal.

It's way too early to make any definitive statements, but it would be an awesome feature, for sure!

**RW:** *Do you think broadcasters might be looking at AM digital multicasts as another path to adding more FM*

*WELTON continues on page 31*

I expect we will see the initial curve made up of entrepreneurial small-market owners, probably in the 2.5 to 10 kW range.

# “You Have to Have the Long Game in Mind”

Dave Kolesar and Mike Raide share insights from WWFD’s long-term trial

*Few people have been as involved in all-digital on AM in the United States since 2018 than Dave Kolesar and Mike Raide.*

*Kolesar, senior broadcast engineer at Hubbard Broadcasting, led the effort to experiment with all-digital on WWFD in Frederick, Md., a station with an eclectic music format near Washington. He has been a vocal advocate for the technology. Raide, senior manager for broadcast technologies at HD Radio’s parent company Xperi Corp., has worked closely with Kolesar on that project.*

**Radio World:** Dave, what do you think is likely to happen over coming months, as far as uptake and interest?

**Dave Kolesar:** I think the early adopters are going to jump on it fairly quickly. A couple of station owners have expressed interest in starting.

There are probably owners interested in music formats on AM. Some may have translators; they could use their FM translator to build or to maintain their analog audience while building a digital audience — [and] with a larger geographic footprint, in most cases, with their MA3 signal.

A number of broadcasters visited the WWFD transmitter over the past couple of years, or just got in a rental car and drove around listening to us.

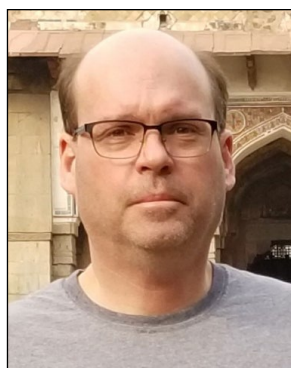
Some are going to be watching with interest to see how an MA3 station performs in the real world. It’ll probably change some minds, especially people who think it’s going to perform similar to the hybrid mode of HD Radio. Our experience is it performs lot better than that.

**RW:** Mike, have you heard broadcasters articulate a commitment to Xperi?

**Mike Raide:** We certainly are seeing an uptick in people



Dave Kolesar



Mike Raide (on the road in India).

getting the licenses. Currently we are offering the license, which is normally \$7,500, free of charge for people who make the jump from analog to the MA3 all-digital mode in a reasonable period of time.

We’ve [also] had several inquiries about people who want to dip their toes in the water and want to turn on the hybrid for MA1, but we are really encouraging them to go directly to MA3. It’s a really powerful service mode and with close to 70 million cars on the road that support it, it is really worth the effort. And the license is good in perpetuity.

**RW:** Dave can you state briefly the overarching benefits of going all-digital? Would you start with audio quality?

**Kolesar:** Audio quality would be one.

For me, it looks and sounds just like any other audio broadcast service in a vehicle dashboard. It looks and sounds just like any stream — FM, HD, SiriusXM. You’ve got audio and visual metadata, and that’s just what consumers are expecting in this time.

Analog AM provides no metadata and terrible audio quality, compared to every-

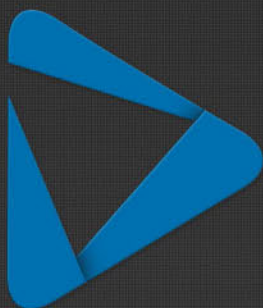
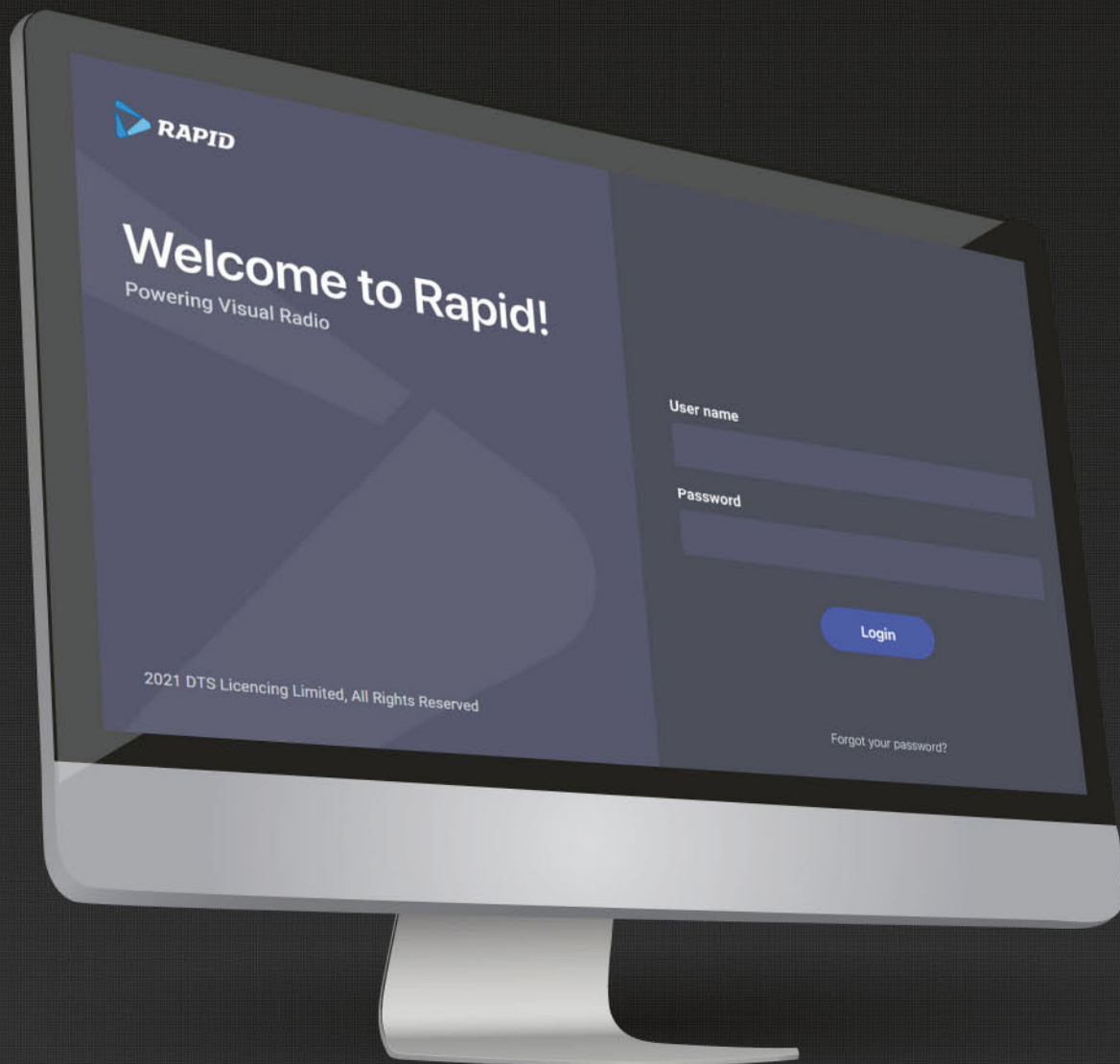
thing else in the dashboard; so this gives broadcasters parity.

In-vehicle entertainment systems are converging towards tuning by visual metadata. You push a button with a station’s thumbnail logo and, boom, the program starts. It may not be obvious whether you’re listening to AM or FM, [and] it doesn’t matter, it’s just a program; and digital makes it happen.

In terms of coverage, you’re going to gain back some of the analog coverage you’ve lost over the years, given the increased noise; digital makes it better.



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**RW:** *What have you learned when testing coverage, by day and by night?*

**Kolesar:** By day, driving around in a car, in general, you'll pick up the full MA3 to about the half-millivolt daytime contour — the full stereo audio, the primary, secondary and tertiary carriers.

Beyond that, under ideal circumstances, you can receive it to the 0.1 mV/m contour, which is incredible. The analog is completely unlistenable at that point.

In terms of solid, reliable coverage, driving underneath power lines, in urban areas and thunderstorms, I find our signal is very difficult to break within the station's 2 mV/m contour.

That's during the day. At night, as any AM operator would know, your results may vary; but the limiting factor appears to be the half NIF contour.

Every station with some protected groundwave coverage at night has a nighttime interference-free contour, or NIF. For WWFD, that's calculated to be 10.8 mV, for example. The "half NIF" means that [despite] skywave interference and all of the nighttime propagation phenomena, the coverage never retreats further in than the 5.4 mV/m contour for us, which would be the half NIF.

So the half NIF contour is probably the map a consultant should draw up for a station owner and say, "This is your guaranteed coverage at night." Depending on conditions, it may be a lot further, but it never gets worse than that.

**RW:** *Mike many readers will be familiar with all the problems of the noise floor and noise interference.*

**Raide:** With the testing that we've done, the MA3 signal is almost impervious to noise.

There are some places where it simply can't make it up; but where with analog you would have noise in the background constantly, you don't get that with digital. As long as the receiver has a digital lock, you don't hear any of that noise in the background. It just works.

Once the receiver has got a lock, the receiver also knows that it's listening to a digital signal, so the blend decision on the receiver is going to be better. It's going to try to hold onto the station longer than, say, a hybrid would — where the receiver knows you're transmitting in a hybrid mode, which means there's an analog backup, and if there's any reduction in signal below the threshold, it blends back to the analog.

MA3 by design mitigates a lot of those noise issues. One, the digital signal is more impervious to noise, so the

receiver will not lose the digital signal; two, you certainly will not hear noise like you would in analog; and three, the receiver itself will keep the digital signal a little bit longer, because it knows that there is no analog backup.

**RW:** *Where does an owner start in order to assess the cost and process?*

**Raide:** The antenna system needs the most assessment.

There are stations that are still running C-QUAM AM stereo; chances are their antenna system will easily pass MA3, no further work would need to be done. If the station was or is running MA1, for that matter, no additional work would need to be done.

However, if the antenna system is less than ideal and a station owner knows that it's been neglected a consultant or an engineer would have to do a sweep of the antenna so it meets this current specification. For MA3 it is a VSWR ratio of 1.4 to 1, at a plus or minus 10 kHz.

Secondly, they need to contact their transmitter manufacturers to find out if their current transmitter is capable, and if it's not, they would need a transmitter upgrade, and more than likely an exporter to turn to tell the Exgine to modulate in MA3.

**Kolesar:** Because the MA3 system requires less RF bandwidth, antennas that were previously evaluated for the MA1 hybrid digital and found inadequate may not necessarily be out of the running for MA3.

**RW:** *Why should a broadcaster go directly to MA3 without first dipping their toe into MA1?*

**Raide:** The MA1 signal is not a representation of MA3 at all. They are completely different animals — still using analog OFDM, still using the 64QAM system; but in MA1 the sidebands, the primary carriers extend from plus or minus 10 to plus or minus 15 from the center frequency of the analog. Also, those carriers are 27 dB down from the analog, from the center frequency of the AM from the carrier.

In MA3, the primary carriers start from the center frequency and extend out to plus or minus 5 kHz. The secondary and tertiaries extend out to plus or minus 10. So it's smaller bandwidth; and the primary carriers are only 12 dB down from the center carrier of the AM signal. The secondary and tertiaries are another 15 dB down from that. So even then, the secondary and tertiary carriers still have a higher power level than the original AM1 carriers in a hybrid system.

Comparing the two, it is literally comparing apples

We're going to be converging towards tuning by visual metadata. You push a button with a station's thumbnail logo and, boom, the program starts.

to oranges. The MA1 signal is not going to be as robust because you're not packing as much power in the channel. MA3 is a modern, robust digital service while MA1 required certain performance tradeoffs to co-exist with the analog service. You have to hear MA3 for yourself.

It's going to knock your socks off; and you should not consider MA1 performance as representative of what you will get with MA3.

**Kolesar:** In MA1 you're trying to do digital and analog in a very narrow-bandwidth AM channel. MA1 does not do digital or analog well; so just go straight to digital and it'll work properly.

**Raide:** You've got to understand that when it's 27 dB down, that's two tenths of 1% of the total power. It's just not a good representation.

A lot of the stress testing we did with MA1 was in the southern New York area, northern New Jersey area, along New Jersey Route 17, along that Bergen area towards the Meadowlands — basically WOR. It's an urban environment and the terrain provided a lot of difficulties for a signal.

**RW:** *Some owners will swallow hard at the idea of just turning off their analog listenership. Would you accept the premise that this really only makes sense if a station has an FM translator?*

**Kolesar:** I would say yes, but another possibility might be an owner with a station that has nothing to lose, that has negligible analog audience and wants to try to build a new digital audience from scratch. An owner may think of an entirely new format that's not going to be dependent on an incumbent audience.

At WWFD, even though we had a translator, we only started showing up in the ratings [with "The Gamut" format] once we went digital. We built up a digital native audience from scratch; and while the translator probably has had some effect, most of our audience is likely on the digital AM.

**Raide:** One of the biggest deciding factors for a broadcaster who doesn't have an FM translator is the market size. If they happen to be in a larger market or the fringe of a metropolitan market with good [receiver penetration] —

**Kolesar:** I'd rather take my chances with the people who have HD radios in their cars, with that 30% in our market, than trying to convince people to listen to my music station on analog AM.

**RW:** *Brian Walsh in Fort Wayne tested it, mostly at night. He was enthusiastic about the coverage but ended up turning it off, saying the market wasn't ready; he didn't have a lot of positive feedback.*

**Kolesar:** An owner would have to evaluate whether enough radios exist in the market to support the demand. And if he's got FM translators that can hit all of his coverage areas, he might be able to use MA3 to drive some HD Radio adoption. But again, that's a decision for individual stations in individual markets. Maybe he tried it just a little too soon; but I don't think it's going to be too long before he's going to reevaluate and look at it again. That's just my gut feeling.

**RW:** *So what would you tell owners about making this decision?*

**Kolesar:** You will be saying goodbye to some analog-only listeners; but if you're looking to the future and looking

to build a new audience, or you're looking for a more long-term sustainable path where your broadcast is just as competitive as FM and streaming, this may be a technology you can use to build that up. You have to have the long game in mind rather than trying to hold on to a dwindling analog audience.

And this will give you more flexibility. All of a sudden, you're not restricted to a talk format, you're not restricted to your station just being a legal justification to keep your FM translator on the air. Your AM signal could actually

be a destination.

**RW:** *Is it fair to say the new audience is going to be entirely based on car listening?*

**Raide:** No, there are home receivers being built — not in the traditional sense, like the alarm clock. Our former CEO Bob Struble said it best: People aren't buying radios anymore, people are buying things with radios in them. He was saying it about the car, but you can take it to the home model as well. Home entertainment systems have radios in them, and they're putting HD Radios in those.

**Kolesar:** At WWFD, I think people are listening to the terrestrial signal in the car, then when they get home, they turn on their smart speakers or a streaming device, and they listen to our stream. That was how it was before we even went digital.

**RW:** *Does the topic of multicasting play an important role in this?*

The AM band is under growing pressure around the world as some markets begin to wind down services. This has begun to influence the product design decisions of receiver manufacturers.



**Raide:** I believe so. We know the capability is there, we have tested it briefly on WWFD, and we want to do more extensive testing for our supplemental broadcast on AM.

Think of traffic services or other data services that could provide another non-traditional revenue stream. But I think the main driver is going to be, "Can you get an HD2 on your MA3 signal?"

It wouldn't be retroactive to current receivers, but we have interest from a lot of the OEMs, a lot of the car manufacturers asking for that capability.

Eventually is it going to happen? Of course.

**RW:** *Urban One and Alfred Liggins wanted permission to try using the AM digital multicasts to feed analog FM translators.*

**Raide:** In that case, the commission pushed back; since there are no receivers to receive this HD2, you cannot put a translator on because you need to be able to decode that HD2. [The company] also wanted to do it under experimental authority, and the commission's argument was that they would eliminate that experimental authority anytime they see fit, especially if it's causing harmful interference to another service.

**RW:** *But is that going to be an end game in this, implementing the technology as a way to get additional analog services down the road?*

**Raide:** There are a variety of motivations for stations to convert to MA3 and that is certainly one, but we believe that the U.S. broadcast industry is firmly committed to a digital broadcast future. There will be opportunities to leverage the technology to support a variety of services through that transition time. The pace of adoption in cars continues to grow, and in five years the landscape and opportunities will be different than they are today.

**RW:** *And what do you tell those people?*

**Raide:** Exactly that. The technology and installed base is constantly evolving and at Xperi we are committed to a robust future for broadcast radio. To support that we plan on doing more signal testing, for robustness; and that interest we're getting from the receiver side is very promising as well. Is AM multicasting something that's going to happen? I believe so, but the timing is unclear today.

**RW:** *What other testing is going on?*

**Raide:** We just touched on the MA3 multicast HD2 capability. And secondly, diplexers ... We want to test

what happens when a station that is running a diplexer, and one is running analog and the other is running MA3, or if they're both running MA3 at the same time.

**RW:** *What else are you hearing from the receiver side?*

**Raide:** The AM band is under growing pressure around the world as some markets begin to wind down services. This has begun to influence the product design decisions of receiver manufacturers. Some have been seriously considering removing AM, both analog and digital, from their designs. This move by the FCC and AM broadcasters to embrace AM all-digital HD Radio has gotten their attention and, in many cases, has resulted in those decisions being reevaluated. There is still a risk of removal, but this is having an impact.

**RW:** *Are you referring to carmakers or the receiver manufactures?*

**Raide:** While the ultimate decision sits with the car manufacturer, Tier One suppliers do have influence and frequently provide recommendations on how to reduce cost and increase performance of the platforms they build. Both car companies and suppliers are wrestling with the question about AM and how to cost effectively

provide high-quality audio performance. AM all-digital HD Radio provides a real solution at a very reasonable cost.

**RW:** *You're not speaking here just about electric vehicles?*

**Raide:** No, not just electric vehicles, but EVs clearly represent a more challenging environment for AM radio.

The MA1 signal is not a representation of MA3 at all. They are completely different animals.

— Mike Raide

## TELL US WHAT YOU THINK



**Paul McLane**  
Editor in Chief

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» WELTON continued from page 25

*translators at some point?*

**Welton:** If it gets approved, I can almost guarantee that is how it would primarily be used. Remember that adding a multicast means splitting up an already low bitrate signal, so it is not going to be doing the received audio any favors. With mono audio of the right format, that will be less an issue — which comes back to my point early on, where the individual broadcast will need to decide what works best for their situation.

**RW:** *What else should we know?*

**Welton:** The big thing is Xperi is waiving the license fee for MA3. Even if a station doesn't plan on implementing it right away, there would be some benefit to getting the license in place, since that is a one-time process. Then, if they do decide to go ahead with it, that is taken care of — and if that waiver of fees ever

ends, the license is already done.

Beyond that, the big thing I tell folks is that this is not a magic bullet. If you are broadcasting something that nobody wants to listen to, they will not want to listen to it just as much when it is digital! However, properly implemented, it can result in significant benefits to product quality.

The big key is to promote it — work with the local box stores to find out what HD-capable receivers they have on their line cards, make sure they have some in stock, offer to educate their staff on what it is and what it can do. Repeat as required with the car dealerships. Otherwise, as we have already seen, somebody will walk into the store, ask for an HD receiver and get pointed to the satellite receivers. If you build it, they will come — but they need to know it's there, first!

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» LAYER continued from page 23

**RW:** *Why should a broadcaster go straight to MA3 without first implementing MA1?*

**Layer:** The transmission antenna bandwidth requirements for an MA1 installation are much more difficult to achieve than what is required for MA3. So, while putting an MA1 signal on the air first sounds like a logical step in implementing MA3, it would likely result in significant additional cost, and in some cases, older or run-down facilities might find this impractical.

**RW:** *What else should we know?*

**Layer:** Another question [to watch] is how the all-digital AM multicast channel configuration under development by Xperi will affect existing receivers, this is something the Xperi/Hubbard/PILOT testing may reveal.

I think the most important thing to be talking about isn't technical, it's how you get the listeners to switch over to all-digital AM. How do you publicize it? Do you make a change to your programs and your content?

I think one of the reasons WWFD is popular is because of its eclectic format. If there's content that people really want, they'll do what they need to do to get it.

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