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What's Ahead for



All-Digital AM?

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What's Ahead for All-Digital AM?

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Hubbard experiment prompts questions as headwinds stiffen for analog AM

By Paul McLane

Is there a “digital sunrise” in AM radio’s future? This Radio World ebook explores the prospects and questions raised by the idea of all-digital broadcasts on the AM band.

We contacted broadcast engineers, manufacturers and the FCC staff to ask: Why explore all-digital? What benefits might it bring? What technical issues would be raised, what regulatory steps? What do observers believe is the chance of it happening?

One U.S. AM station is currently operating in all-digital, under experimental authority. What can WWFD tell us about reception, listener reactions, the impact on advertising, as well as how to prepare an AM antenna and transmitter system?

A recent Nautel webinar explored this topic, and our ebook both summarizes that webinar and expands upon it in depth.

Among those quoted here are Mike Cooney of Beasley, Martin Stabbert of Townsquare, James Bradshaw of the FCC, Gary Cavell of Cavell Mertz & Associates, Dave Kolesar of Hubbard, Mike Raide and Juan Galdamez of Xperi, Robert Crane of C. Crane, Ron Rackley of duTreil Lundin & Rackley, Joshua King of Kintronic Labs and Philipp Schmid of Nautel. Other sources are quoted from our past news coverage.

(Throughout, references to all-digital AM should be understood as shorthand to mean all-digital broadcasts on bands currently used for amplitude modulated signals.)

While this discussion focuses largely on developments in the United States, where AM stations operate in the medium-wave part of the spectrum, we also note the use of Digital Radio Mondiale, a system intended for all broadcast frequencies up to 300 MHz, including the AM bands: longwave, medium-wave (as in the United States) and shortwave. See [page 20](#) for comments from Ruxandra Obreja of Digital Radio Mondiale.

And we conclude with a commentary from Ben Downs

of Bryan Broadcasting, one of the most active of broadcasters in debates over AM’s future, on [page 22](#).

We should note that there’s no assurance that an all-digital system deployed in the United States even would be HD Radio. Hatfield & Dawson President Ben Dawson has noted that Digital Radio Mondiale or even some other new system could be used; and at a trade show seminar several years ago, he said that some small-market clients were adamant that they would not pay a private technology company “for the privilege of going digital,” according to Dawson.

But the lead time to research and deploy a system not already in use in the United States or authorized by the FCC presumably would be much longer; and most discussions here about all-digital AM start with the assumption that it would be built around HD Radio and its “in-band, on-channel” footprint.

THE CENTRAL ARGUMENTS

Proponents say all-digital on AM, as it would be deployed in the United States, offers [several important benefits](#) and improvements over the legacy analog mode.

They say it offers:

- Significantly better audio quality, similar to analog FM stereo — good enough for more AM stations to return to music as a format;
- Coverage as good or better than the analog-only signal during daytime operation;
- Better immunity to noise and interference, including interference from power lines (though neither digital nor analog is totally immune to that);
- A potentially significant reduction in adjacent-channel interference;
- Potential support for data services;
- Potential support for multicasting additional audio channels;

(continued on page 4)

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- An existing base of digital receivers (a full digital signal is receivable today on new and existing HD Radio receivers).

Most industry leaders agree that HD Radio's hybrid AM digital MA-1 mode was a disappointment — used by relatively few stations, and subsequently turned off by some, because of issues like difficulty of implementation, adjacent-channel interference, excessive blending and dropouts in reception.

Digital proponents believe these challenges become far less of a concern with its MA-3 all-digital mode. That mode relocates the core digital carriers into the center of the channel, eliminating adjacent-channel interference risk and reducing the technical complexity, in particular where the antenna system is concerned. The absence of the analog signal also eliminates host interference concerns, proponents say, and thus stations that can't or don't wish to use the hybrid mode might benefit from all-digital operations. And the promise of increased coverage and robustness of the digital signal may better justify the capital investment needed.

All-digital, some think, could even be the change to truly "revitalize" the U.S. AM band, making previous technical "revitalization" improvements seem modest.

Consultant Glynn Walden, a former iBiquity Digital engineering executive and a "father" of HD Radio, has said that the current hybrid digital system was always intended to be temporary, meant to allow broadcasters to make a transition to all-digital when it made economic sense.

Citing the rising AM noise floor, Walden also said, "Offering digital service is imperative. Analog's time is past. It's time to move on."

He made [those comments](#) almost five years ago.

One objection usually raised is that all-digital signals would be useless to listeners using analog receivers, of which there are untold millions. Would AM license holders willingly say farewell to that audience, and spend money to do it? Even in today's environment, which is challenging for AM owners for both technical and market-related reasons, the answer has generally seemed to be "no" —

though as discussed later, the opening of FM translators to AM owners may change this dynamic.

Also, the time it takes for a receiver to acquire a digital signal is another problem cited by those we talked to, as is digital delay when watching sports events. And some observers question whether any change in technology could make AM more relevant again, especially with younger consumers.

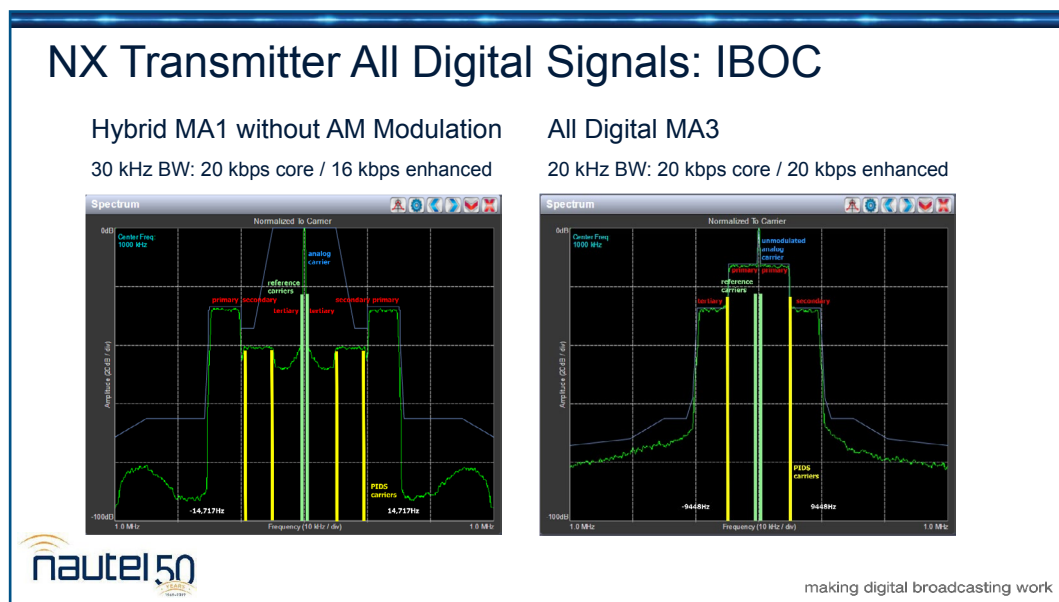
COMPLICATIONS

There are other complications to consider too.

Walden told Radio World in 2016, "Assuming we hit critical mass on [receiver] penetration ... there will still be a big field of AM stations unable to transition. HD can be implemented for any AM license, but implementation costs will be asymmetrical from one facility to the next. Licensees of directional AMs, in particular, are the ones who will be disproportionately impacted from a cost standpoint compared to licensees of omnidirectional sticks."

He also said the stations that would have the toughest time converting would be those with poorly maintained transmitters and antenna systems, which have a hard time fighting through the rising man-made noise level. "The cost of implementing HD Radio is going down, but the cost of fixing your antenna system hasn't," he said, adding later that the MA3 mode is less demanding on antenna systems than the hybrid, because it is only 10 kHz in bandwidth rather than 15.

It's hard to gauge what exactly would be required for any given station. Ashruf El-Dinary, vice president, engineering and radio for Xperi, told us, "What is needed or what AM broadcasters can do today will be somewhat



A slide from Nautel compares hybrid MA1 operation without AM modulation with all-digital MA3.

WHAT'S AHEAD FOR ALL-DIGITAL AM?

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station-specific, so we can't give a detailed answer at this time. However, those stations that are already broadcasting with HD Radio, or at least have digital-ready transmitters, will be in a better position to convert than those with analog-only equipment."

But there's one important element that has changed in recent years.

Today, thanks to the FCC, many U.S. AM station owners also reach their communities with FM translators. This means that AMs turning off analog service would be able to point analog listeners to an FM frequency to continue to hear that content. This could herald a willingness to experiment that didn't exist before.

(While few people are thinking farther ahead, at least one station owner has speculated that if the FCC did authorize all-digital, his strategy would be to begin by airing it only on weekend evenings and promoting that during the week.)

TESTING

Industry technologists have laid some of the groundwork.

Earlier this decade, NAB Labs (later renamed Pilot) led an all-digital HD Radio AM testing project consisting of several phases: field work to help demonstrate real-world signal coverage; lab work to establish interference behavior between stations; and allocation studies to understand the impact on FCC rules should all-digital be authorized. Companies involved included Hatfield & Dawson, Cavell Mertz, Nautel and several broadcast groups.

The field test portion of the project included stations in markets like Seattle, Tucson and Charlotte. Tests were done at both day and night; several employed complicated multi-tower directional antenna systems.

Generally speaking, the work found that the all-digital signal is significantly more robust and that coverage exceeds that of the hybrid digital signal during the day, with coverage dependent on co- and adjacent-channel interference.

NAB Vice President, Advanced Engineering David Layer was quoted in Radio World saying that the test stations exhibited impressive daytime performance in the all-digital mode, though nighttime performance was not as good and that additional work and study would be needed to assess how and when all-digital AM can best be used at night.

As an example of how the process worked, two 50 kW stations, KRKO and KKXA near Seattle, turned off their analog signals for periods of time and transmitted all-digital signals during day and night tests. The stations also aired promos, asking for listener input. Owner Andy Skotdal said they received listener comments as well as digital skywave reception reports from Montana, Oregon and provinces in Canada.

Generally, he said at the time, people with HD Radio receivers liked it. "Some said they heard the station with better clarity than with analog in the same location, some said they heard the station farther," Skotdal told Radio World. "Some said they had enough signal [that] they didn't have to monkey with their AM antenna to get us and that the fading went away for them."

Not all feedback was positive; a few listeners said they owned only analog radios, weren't about to buy new digital ones and worried that all-digital was inevitable anyway.

Pilot also conducted tests to see if all-digital would harm other occupants of the dial. [Its conclusion](#), in brief: "Interference concerns of all-digital signals into existing analog stations should not be an impediment to the roll-out of all-digital."

"The process for developing and approving hybrid mode digital radio provides an excellent example for the process we might expect to use for all-digital AM."

— James Bradshaw, FCC

Of the problems at night found by the testing, Glynn Walden believes the primary cause of failure at night is the analog carrier of a co-channel interferer.

"If the interferer were an all-digital station, then the carrier power is significantly reduced," he said. Since the band would presumably have both analog and all-digital stations for at least some time, nighttime coverage for the foreseeable future would vary from station to station depending on how much co-channel interference they receive, Walden said.

"Both the AM and FM stations reach their maximum potential in an all-digital world," he said.

COMMISSION INSIGHTS

Of course, all of this is theoretical until someone decides they want to do it for real.

As of mid-March 2019, the commission had not received any proposals for widespread approval or adoption of all-digital AM broadcasts in the United States, according to James D. Bradshaw, senior deputy chief of the Media Bureau's Audio Division (though one was filed after he made those comments, see [page 22](#)).

"The commission has recently authorized an AM

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station to conduct experiments of the all-digital AM system,” he said, referring to WWFD in Frederick, Md.

“We remain supportive of the digital transition for both AM and FM radio and welcome input from the industry on the results of those experiments and the industry’s future plans for adoption of AM all-digital,” Bradshaw said. “We also welcome input from industry on a formal standard for all-digital service.”

In past actions involving AM revitalization, the FCC has acknowledged that all-digital AM is at least a topic of interest. So what specific steps should we expect, if and when the idea moves forward?

“The process for developing and approving hybrid mode digital radio provides an excellent example for the process we might expect to use for all-digital AM,” Bradshaw told us.

“In that case, the system developer conducted a series of tests to demonstrate the viability of the technology. Those tests were validated by the National Radio Systems Committee on behalf of the broadcast and consumer electronics industries. The NRSC’s approval led to full standardization of the technology and an industry consensus to move forward with implementation of the HD Radio system. The test validation, standardization and industry support helped facilitate the commission’s decision to authorize digital broadcasts.”

And what about the idea of using the expanded AM band as a place to ease into broader use of all-digital on AM? That idea has been floated; and HD Radio parent DTS (now part of Xperi) [officially expressed support for it](#) three years ago. But Bradshaw said, “We have not seen significant industry support for this proposal.”

In general, he said the commission remains “highly supportive” of broadcasters and their efforts to compete with new sources of information and entertainment.

“Our media modernization efforts are designed to eliminate unnecessary regulatory requirements, to reduce station expenses and to provide stations with greater flexibility to serve the public,” he said.

“In particular, our efforts to expand the use of FM translators for rebroadcast of AM programming has helped provide new life for AM stations. We believe digital AM service could also be part of this process and can provide additional opportunities for AM broadcasters to enhance their ability to serve listeners.”

The subject is not unfamiliar to FCC insiders. Five years ago, when iBiquity Digital, predecessor to Xperi/DTS as owner of the technology, [encouraged the FCC to authorize all-digital broadcasts on a voluntary basis](#) and called the idea “one of the best-long term options for revitalizing the AM band,” the author of the comments was Albert Shuldiner, then senior VP and general counsel of iBiquity. Today he heads the Audio Division of the FCC Media Bureau.

Shuldiner does not speak publicly about the commission’s digital radio proceeding, nor has there been any indication that he’s pushing the idea internally. But it seems safe to assume he and other commission staff are well informed on the topic.

“CURIOSITY”

At this spring’s NAB Show, Pilot, Xperi and Hubbard Radio plans to demonstrate all-digital for AM in the Pilot booth in the North Hall of the Las Vegas Convention Center, said El-Dinary of Xperi.

“Our system has always been designed and advocated for digital conversion of both FM and AM. We believe that there are many advantages of an all-digital AM broadcast — audio quality, data capacity for other services, robust signal coverage — and are supportive of further experimental authorization for additional testing of all-digital AM. We would encourage the FCC to allow for voluntary transition for broadcasters that feel all-digital fits their business model.” He said several broadcasters have expressed interest in testing it in their markets.

Car companies could be an important voice in this debate, and Radio World reached out to several for comment without success. But in light of concerns about some new car models that lack AM receivers, we asked El-Dinary what the carmakers might think of the all-digital idea.

“We have received inquiries from several of our automotive partners who have expressed curiosity and an interest in understanding how all-digital AM will impact their current receivers,” he replied. “Additionally, there has been interest in understanding what other services AM can now deliver in an all-digital environment.” He reemphasized that all cars with HD Radio AM solutions will support the all-digital reception.

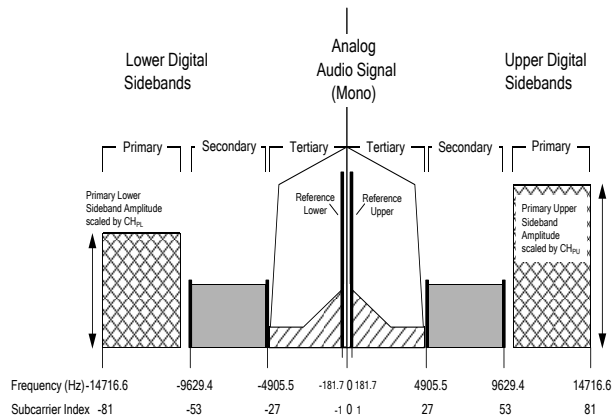
REAL-WORLD DIGITAL

Dave Kolesar, for one, believes broadcasters are willing to take innovative steps to keep “legacy” platforms such as medium-wave radio relevant and competitive.

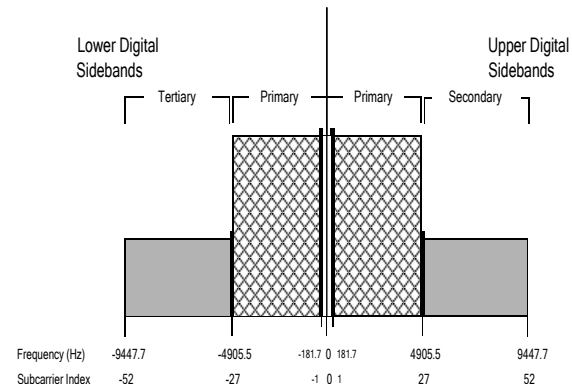
Kolesar probably knows more than anyone about what an all-digital operation on the AM band might look like. He’s a senior broadcast engineer with Hubbard Radio’s WWFD(AM) in Frederick, Md., which since July 2018 has been broadcasting an all-HD Radio digital signal rather than the usual hybrid analog/digital signal, under special temporary authority from the FCC. The station is one of 10 AMs owned by Hubbard Radio, ranging from Class A to Class D. WWFD is a Class B operating on 820 kHz with 4.3 kW (non-directional) during daytime hours, and 0.43 kW (directional) during nighttime hours.

According to a summary of the project published ahead of the NAB Show, technical issues that WWFD encountered included inadequate transmitters, a narrowband

• MA1 Waveform



• MA3 Waveform



WWFD is the first station to make full-time use of the MA3 mode of HD Radio, right. Analog receivers can no longer tune the station on 820, but can hear it on its FM translator.

nighttime directional array, electrically "short" towers with top-loading, an isocoupler and abandoned RPU antenna on one tower, a second diplexed station on the same array, and a pass/reject filter for a nearby station 110 kHz higher.

However, "The most obvious question is 'Why do this?'" Kolesar said during a recent Nautel webinar.

He started by listing familiar limitations of analog AM broadcasting: poor audio quality, noise and a lack of compelling metadata that modern media users have come to expect.

"The first step towards leveling the playing field for AM broadcasters was operation in the hybrid, which is also called the MA1 mode, of HD Radio," he said, summarizing the early days of the IBOC rollout. "This technology allows simultaneous transmission of analog and digital signals while providing backward compatibility with existing radios.

"However, it was accompanied by some disadvantages," he continued. The audio bandwidth of the analog signal had to be reduced 5 kHz and the primary digital carriers were restricted to 30 dB below the main analog signal to keep self-interference to a tolerable minimum. Kolesar said this compromise limited the range and robustness of the digital signal severely and degraded the quality of the analog, issues that prevented universal industry acceptance.

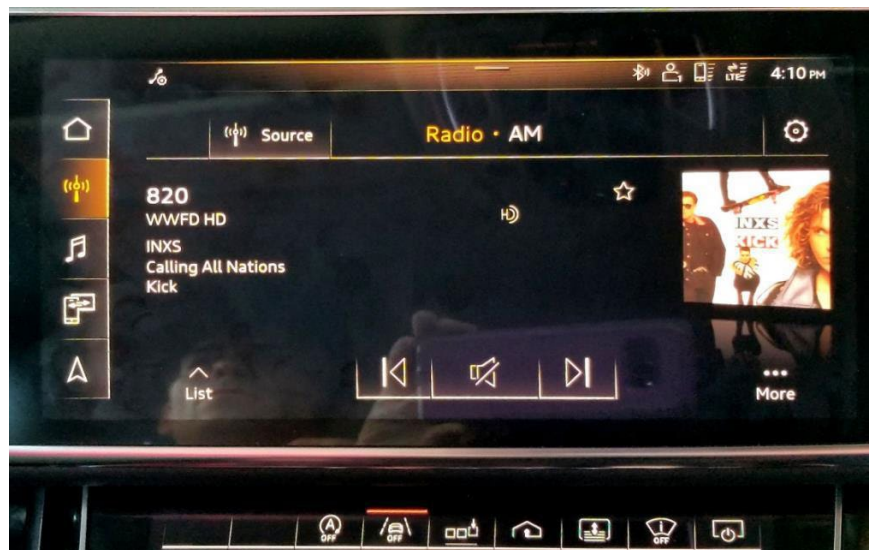
"An all-digital approach to AM broadcasting is appealing to a station such as WWFD for a number of reasons," he continued.

ing to a station such as WWFD for a number of reasons," he continued.

With the acquisition of an FM translator as now allowed by FCC rules, an AM licensee can still serve the core of its analog audience in its city of license. Also, he said, the higher throughput of the all-digital mode of HD Radio makes it useful for music transmission, such as WWFD's adult album alternative format The Gamut.

"Finally, the digital carriers of the MA3 HD mode are much higher in power. So signal robustness is drastically improved, making the transmissions viable for in-car listening for the duration of long commutes after the FM translator has faded."

Continued on page 8



A picture of off-air reception of WWFD. In addition to frequency, it displays call letters, artist, title, album and even art. "It is evident that AM broadcasters with MA3 mode achieve aural and visual parity with other services in the dash, such as FM HD satellite and streaming services," said Dave Kolesar.

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He said Xperi estimates that about 22 percent of cars on the road in the Washington, D.C., area have HD-capable radios.

"More listeners are likely to be counted from this percentage who can receive the signal with excellent sound quality and metadata, album art, titles, artists, than from the vast majority who can receive the analog transmissions but who would likely refuse due to the poor quality."

What were the facility implications for the station? According to the project summary, installation of new transmission equipment and an iterative approach to tuning the antenna system became necessary as the significance of each system issue became evident.

WWFD signed on in 1961 as a 500-watt daytimer on 1370 kHz and converted in 1987 to a full-timer on 820, a project that involved a phasor rebuild, tower reorientation and the addition of toploading. "There's been a lot of changes at this facility, and the transition to all-digital is a continuation of that," Kolesar said.

So for all-digital, the antenna system was the first area of focus; it was found to be inadequate, not having the required 1.4:1 SWR over the digital passband. The transmitters needed to be evaluated for all-digital operation; and the station needed to pursue the correct regulatory approach.

"Document everything' is the first step," Kolesar advised. The station updated schematic diagrams and measured component values and self and drive point impedances; with this data in hand, modifications were suggested. In addition to this redesign, the station suffered from some "sins of neglect" that he said will be found at many older U.S. AM transmission sites. These

had to be remediated and the day and night networks modified and tuned up.

As part of the conversion process, the transmitters used for analog broadcasting at WWFD were evaluated for digital capability.

"We determined that the main transmitter, a Harris Gates Five, could be modified for HD. However, some fairly extensive hardware changes would be necessary." WWFD replaced it with a Broadcast Electronics AM-6A with Nautel AM IBOC exciter, Exporter Plus and Multicast+ box in Importer mode; the Gates Five could then be modified for use as an auxiliary for the digital service. (The station this month installed a Nautel NX5 transmitter to examine the performance with a transmitter designed to handle MA3 operation out of the box.)

Kintronic Labs, Potomac Instruments and NAB Pilot helped on the project. WWFD's request for FCC experimental authorization was prepared with help from Gary Cavell at Cavell, Mertz & Associates and duly approved.

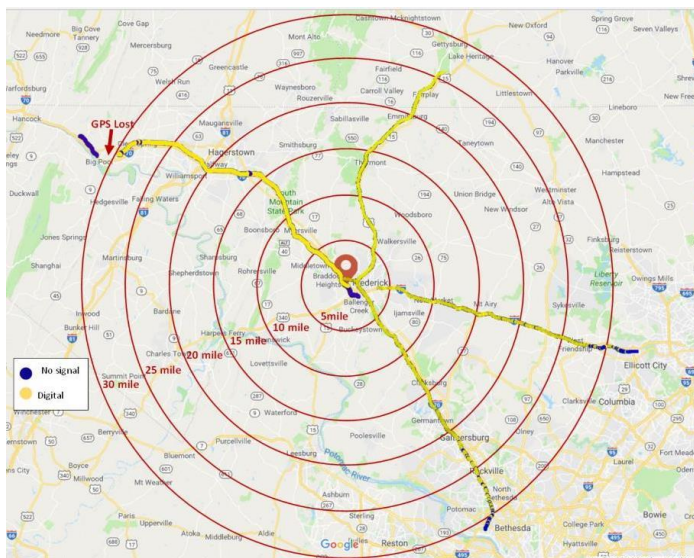
The station became the first U.S. medium-wave station to commence all-digital broadcasting on July 16, 2018; the first song was "Calling America" by Electric Light Orchestra.

"Spectral emissions were checked again, as well as base currents and directional parameters," Kolesar said. "Once we were satisfied that the station was operating within licensed parameters, it was time to evaluate the over-the-air performance with some automotive drive testing."

Kolesar said daytime drive testing revealed generally robust reception to the station's 0.5 millivolt per meter signal contour. "This is generally accepted to be the limit

MA3 Drive Testing

- Under ideal circumstances, MA3 core mode can be decoded down to the 0.1 mV contour in the daytime
- Reception reports at or near the 0.1 mV contour include Harrisburg, PA and Cambridge, MD
- Nighttime reception seems to be possible beyond the Nighttime Interference Free (NIF) contour, where C/No exceeds 20 dB



of useful analog coverage for a U.S. AM station.”

Under ideal circumstances WWFD found that digital reception out to the 0.1 millivolt contour is possible, well beyond any listenable analog signal.

“During critical hours, reliable reception may retreat back towards the 0.5 millivolt contour, even under ideal conditions. During both day and night operations, no dropouts were observed while driving through the urban core of Frederick, the station’s city of license. Such observations bode well for indoor reception in this area as well.”

Kolesar said the primary unresolved technical issue with the current transmitter configuration is the inability to generate sufficient carrier-to-noise ratio to allow the secondary MA3 carriers to be decoded reliably and properly by a receiver.

“We have much more work to do, and in my mind we are digital from here on out.”

— Dave Kolesar, WWFD

“While not severely impacting audio reception, it can affect the ability of the receiver to provide enhanced user data services, such as the display of album artwork,” he said. “The lessened carrier-to-noise ratio may also slightly increase the time required for an HD Radio to lock on to the MA3 signal.”

He said that the cause was being investigated by Xperi and the transmitter manufacturers.

Looking ahead, with the new transmitter, WWFC plans to provide album artwork and explore the enhanced capabilities of MA3 broadcasting. “The transmitter will have adaptive precorrection, so it will be interesting to see how that affects coverage, dropouts and receiver acquisition times,” he said.

“We do plan to transmit album art, stereo audio and even experiment with an AM HD2 signal, which is something that several broadcasters have expressed an interest in pursuing. An AM HD2 would allow a station to feed two translators, each with separate programming. Once the new transmitter is up and running, we will turn our efforts to more mundane (but just as important) efforts, such as methods of power measurement for MA3.”

Other future work includes more testing to document the useful coverage of the signal, especially when noisy environments are encountered.

As for listener reactions, shortly after the transition he received a number of messages from listeners who’d been listening to analog AM, saying the station suddenly sounded clear. “These people weren’t even aware that

they had HD Radios.”

Kolesar said there’s been no big impact on advertising, especially since the risk to the station was reduced with the addition of its FM translator.

“The translator covers the city of license very well, and much of the audience had migrated to the translator when we put it on the air. As a result we believe that the expanded coverage of the all-digital AM signal will actually help us increase our audience, because this audience will now be able to hear our music programming in a sound quality that they want to, rather than us fighting a losing battle of trying to convince people to listen to analog AM.”

His conclusion?

“A digital future for medium-wave broadcasting is on the horizon; and such a future will help ensure that services in this portion of the spectrum are both included and desirable in automotive receiver menus.”

The experimental authority lasts until July 2019; Kolesar hopes to see that extended. “We have much more work to do,” he said. “And in my mind we are digital from here on out. I believe that we should stay digital, and I believe as we continue to operate in this mode, more and more people are recognizing the benefits of this mode of broadcasting.” (Will the commission go along? The FCC’s James Bradshaw said only, “We will give full consideration to any proposal WWFD submits to us.”)

Xperi hopes to publish results of testing the WWFD signal and share them with the FCC by this summer.

Dave Garner, the VP/director of engineering of WWFD’s parent company Hubbard Radio, believes that to compete with other media today, “AM radio needs to be on-par with the sound quality of other audio distribution systems — FM, satellite, streaming etc. All-digital AM is that big step.”

POSSIBILITIES

Mike Raide, a senior manager of broadcast technologies for Xperi Corp., considers WWFD a pioneer, and he encouraged stations in similar circumstances to transition to all-digital. He said more than half of the AM stations in the United States have FM translators and thus can make this transition while still offering analog broadcast service.

Raide thinks the potential of the digital is breathtaking.

“First off, it’s stereo audio, free from fading and noise, no static. Secondly, program service data — analog mono AM has no way of conveying artist and title information. HD Radio, or for that matter any digital platform, has the ability to transmit title and artist information and album information.”

Further, AM stations could offer data services on par with those carried by FM HD Radio stations, Raide said.

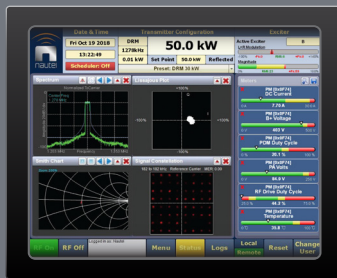
“You can run Artist Experience, you can run your station logo, even traffic and other data services that run in

(continued on page 12)

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An Xperi graphic lists advantages of an all-digital signal.

continued from page 9

the background. Also, AM radio's bread and butter is emergency communication; with MA3 the emergency alerts feature enhances that."

He said there are almost 60 million HD Radio receivers now in North America; all of those that are AM-equipped can receive the MA3 all-digital mode. He said HD Radios continue to penetrate automobiles in America's biggest cities; penetration in the top 10 U.S. markets ranges from 19 to 33 percent, with New York and Los Angeles leading the way.

Raide said pursuing all-digital AM would demonstrate to car and receiver manufacturers that the radio industry in North America is still innovating. "Broadcasters care very much and very deeply about the frequencies that they have, and they're willing to invest and innovate in their infrastructure."

BEHIND THE IDEA

So what do some other interested observers have to say? We asked quite a few.

"I believe that the time has come for the FCC to allow broadcasters, at their own election, to operate with all-digital operation if they so desire," said Gary Cavell. He's the president of Cavell, Mertz & Associates and the 2019 recipient of the National Association of Broadcasters Radio Engineering Achievement Award.

His firm assisted Hubbard with obtaining the experimental authorization at WWFD, helped with RF system adjustment advice and has been working with the NAB Pilot

investigations in field tests and in a lab Cavell Mertz maintains in its offices.

He cited the existing base of AM HD receivers and the potential impact of FM translators on this decision. And because Frederick is not far from Washington, he urged FCC commissioners and staff who work and reside in WWFD's coverage footprint to give a listen for themselves. "Other broadcasters should as well. The biggest issue is the lack of awareness in the broadcasting and regulatory community."

Cavell said that from what he has experienced thus far, all-digital provides a quieter listening experience with much improved fidelity, particularly at night.

"With FM radio and other program delivery methods like cell phones or MP3 players, most listeners simply do not have the tolerance for listening to noise or static. All-digital AM provides an alternative that can help broadcasters compete with these other program delivery

methods. Further explorations and tests will reveal its true potential and capabilities."

MIXED REACTIONS

Crawford Broadcasting, owner of 15 AM stations, has invested in HD Radio on both FM and AM.

"In just the last two months, we replaced several AM transmitters with new ones that have integral HD Radio exciters," said Director of Engineering Cris Alexander (who is also the tech editor of RW Engineering Extra). "We look forward to the day of all-digital



Gary Cavell

WHAT'S AHEAD FOR ALL-DIGITAL AM?

Radio World | March 2019

AM and would likely take some all-simulcast AM stations 100 percent digital if the FCC made that an option."

Alexander said Xperi data indicating that more than half of new cars in North America come with HD matches his experience with rental cars. "This tells me that we are headed toward a 'critical mass' of sorts."

He said it's way too early to think about switching AMs to all-digital at Crawford, "but we can certainly see a day out there somewhere, and we're making investments today in preparation for that."

However, another veteran engineering observer — who asked not to be named but works at a group with AM holdings — believes that at the root of the discussion is the underlying challenge AM is facing overall, and he was blunt about that.

"Whether it's digital or not," this engineer said, "no one is listening to it anymore. It's the old person's medium, like TV. Good content has moved to FM or the Internet. Not all, but most AM is running block programming or talk."

The younger generation is not seeking programming on TV or AM, he said; they're watching OTT services, cutting the cord and listening to podcasts and Spotify. And though HD Radio penetration in cars is growing, he doesn't think there's a sufficient argument to go to his company's leadership and say, "Let's turn off the analog and broadcast digital only." He also noted that the number of HD Radios in homes and offices remains small.

Still, he added, "I am curious to see how the all-digital signal performs and how it sounds. It could be a game-changer if it's done right."

WHERE'S THE DEMAND?

Mike Cooney has given the topic some thought in his roles as VP of engineering/CTO of Beasley Broadcast Group, which owns 19 AM stations, and as the chair of the NAB Radio Technology Committee.

He believes the FCC would consider the licensing of all-digital AM if stations showed zeal for it. "So far, very few broadcasters have shown interest due to the limited number of HD-compatible radios and due to the technical limitations," he said.

Members of the technology committee have discussed the idea at several meetings. "Sometime back, we took an informal poll and almost no one said they would consider putting an all-digital AM on the air if the rules allowed."

That doesn't mean sentiment couldn't change quickly; and Cooney saluted the commission for being supportive of past all-digital AM testing (Beasley owns two of the stations that were tested by NAB and its partners).

But he said he wasn't aware of broadcasters beyond Hubbard that have shown serious interest in putting a full-time station on the air; and until the NAB or a consor-

tium of broadcasters petitions the FCC, he doesn't see it going anywhere.

"What became apparent during our original testing and also on the Hubbard station are some of the technical limitations and issues," he continued.

"The number one issue for me is the lack of robustness of the signal. When you have a strong RF signal, the experience is pretty good and very similar to a low bit rate stream. It is not FM quality, but much better than our current AM signals.

"As you drive into weaker signal areas or approach strong power line interference, the signal frequently drops out and goes to silence. The stronger the signal you have, the more infrequent the dropouts are, and you can drive under bridges, or have other environmental interference, and in many cases the signal is solid and does not drop.

"At night, the robustness is typically even worse, and our test station in Greenville, N.C., was almost unlistenable. That signal is 50 kW day and 10 kW night."

"So far, very few broadcasters have shown interest due to the limited number of HD-compatible radios and due to the technical limitations."

— Mike Cooney

Cooney's second big concern is acquisition time to reacquire the signal, which he estimates at typically 5 seconds or longer. He said this "seems like an eternity when you are waiting for it to lock back in. This not something our current listener base would understand, or in my opinion, tolerate."

Could the expanded AM band (1610-1710) serve as a kind of test bed area for all-digital signals?

"I don't really see too many negatives if someone wanted to use it," Cooney said. "The only negative I would point out is the coverage at night is going to be very poor at a 1,000 watts. We are turning an expanded band AM off within the next month, and I see this happening more in the future. This may free up the band for more of these type of allocations."

His biggest concern for the future of AM radio is the electric car. "A few manufacturers have already eliminated AM radios from their electric car models, and several more have made it clear they will not have AM radios in their future models," he said.

(continued on page 14)

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"We have been told the cost to filter the interference to AM radio from the car gets into the hundreds of dollars per car," Cooney said.

"The cost to filter the AM becomes too great of a cost when compared to the benefits to the customer. In surveys, fewer and fewer people list AM radio as something they expect in the future car, and this can only hurt the long-term life of AM."

EMBRACE THE OPTION

Martin Stabbert is VP of engineering for Townsquare Media, which has 85 AM stations, and chair of the National Radio Systems Committee's AM and FM Analog Broadcasting Subcommittee. He'd like to see the commission explore whether to allow all-digital.

"I personally feel the key word is 'allow' and not 'mandate' at this point," he emphasized. "For stations in a good position and willing to make such a transition, it should be an option. It would be helpful to see the consumer uptake as well as provide real-world results of what works and what doesn't."

Stabbert concurs that initial efforts to run AM hybrid mode,



Martin Stabbert

"The FCC would need to establish a meaningful and efficient means to identify and resolve interference issues caused to analog stations by stations operating in the all-digital mode."

— Martin Stabbert

especially at night, were not very successful. "Now over a decade later and with an all-digital mode, perhaps the outcome would be better. Empirical data is what we need."

As to technical concerns that might be raised, Stabbert points to interference. "The FCC would need to establish a meaningful and efficient means to identify and resolve interference issues caused to analog stations by stations operating in the all-digital mode," he said.

And he acknowledges that the number of analog-only receivers in the market is a potential big obstacle. "A

mass abandonment of the analog mode by broadcasters could potentially end the life of the AM band completely before digital has time to take root."

Is it credible to think that current broadcast owners would embrace this move? "I believe many broadcasters would embrace the option of all-digital — especially those with existing FM simulcasts, be it full-power or translators," Stabbert said. But no two situations will be identical.

"Tangible factors such as market, transmitter location, condition and configuration of the transmitter facility, frequency, power, antenna pattern, station class, format, ratings and revenue would all come into play. Intangibles would figure in as well; and the sky could be the limit on those permutations."

For broadcasters who might want to look ahead, we asked Stabbert what steps and investments AM broadcasters should make now.

"My advice would be to at least maintain existing transmission systems as best as possible — especially directional antenna systems and ground systems," he said.

"Even if the financial resources are not there to improve or replace ground systems or other key components of infrastructure, it does not take a lot of money or effort to keep the transmitter sites from becoming

attractive nuisances."

Stations without funds to improve their facilities will not have the funds to repair them either if destroyed by vandals, he said.

"Have someone visit the site weekly. Mow the field, pick up the trash, turn on (fix) the porch light — or at least put a set of tire tracks through the weeds in the driveway. It's not that hard to make the site appear active and possibly stave off those in search of an easy copper-harvest."

"A LOVED SERVICE"

Several other broadcast companies declined to comment for this ebook. (We also received no response when we reached out to a representative of the AM Radio Preservation Alliance, an informal group of companies with AM holdings that includes Alpha Media, Bonneville International, Cox Media Group, Cumulus Media, Entercom, Family Stations, Grand Ole Opry, Hearst Stations, iHeartMedia, NRG, Scripps, Townsquare Media, Tyler Media and Tribune Broadcasting.)

But we also sought comment from Robert Crane, president of C. Crane Company, which manufactures portable radios.

"On the surface, it sounds great to go all-digital on the



Robert Crane

AM band, and I would love to endorse it and build the receivers," he said. However, "I believe going digital on AM has many hurdles to jump."

He believes the amount of data and audio quality ultimately would be limited on the AM band, and that digital won't be able to serve the same linear distance covered by analog. He worries about the energy cost to broadcasters and listeners due to the processing power involved; and he cited the digital delay issue, particularly for sports coverage.

Further, "The digital business plan has not been widely accepted by the public or broadcasters, while 65 million smart speakers will be sold in a few years," he said. Moreover, "certain powerful AM stations need to remain analog AM because it is our ultimate and perhaps only backup service in a national emergency."

But Crane believes broadcasters should be allowed the option as long as expectations are reasonable to all interested parties.

"In the past a significant fee was involved with the right to manufacture an HD receiver," he continued. "As a receiver manufacturer, I need to be able to purchase a chipset at a quoted price that contains HD Radio technology so the playing field is level. I am not particularly interested in an upfront fee because we also have technology to offer, like our Twin Coil Ferrite AM antenna which may help HD Radio. We did market three different

models of HD Radio when it started, but the return rate was high."

Crane describes familiar analog AM as a relatively simple, low-cost and beloved service.

"I will enjoy the analog AM format as long as it lasts. This may be 10 years or perhaps much longer if there is another chance new 'discovery' of its potential. AM broadcasters have a significant amount of time to develop unique content and offer streaming if they don't already."

"FAR MORE ROBUST"

Veteran engineer Ron Rackley is principal at the consulting firm duTreil, Lundin & Rackley. He enthusiastically endorses the idea of allowing licensed all-digital over-the-air broadcasting on the AM band in the United States. He answered our questions with much more of a focus on technical and regulatory matters.

"The digital business plan has not been widely accepted by the public or broadcasters, while 65 million smart speakers will be sold in a few years."

— Robert Crane

Rackley (who with colleague Ben Dawson was described in 2006 by the NAB as "icons in the field of AM broadcast antenna system design and development") said of all-digital, "It makes full realization of the efficiency of high-quality digital transmission possible. It will be far more robust than the simulcasting of digital and analog transmission on AM channels that has been tried and pretty much discarded by the industry."

Rackley believes the modulation standards of the FCC rules could be modified easily to regulate digital-only transmission.

"They should be focused on taking advantage of digital technology to reduce inter-station interference in a way that is not possible with the analog modulation standards being fundamentally incompatible with the 10 kHz channel spacing scheme, as is the case today," he said.

"I believe that much can be accomplished in that regard if digital subcarriers are to be transmitted within the existing 10 kHz channels by themselves — without the need to manage their interaction with simultaneously transmitted analog signals."

What technical obstacles would be raised?

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"I believe that the analog transmission standards should be modified to do away with the NRSC requirements with regard to pre-emphasis, and that analog audio transmission should be limited to 5 kHz audio to facilitate the design of compatible standards for adjacent-channel protection between analog and digital-only transmissions," he said.

"Analog pre-emphasis could be unregulated and stations would occupy their 10 kHz wide channels — which would encourage an octave or so increase in analog receiver frequency response while at the same time making it possible to have digital-only neighbors.

"I say that there would be an octave or so increase in received analog response because the average AM receiver today is limited to approximately 2.5 kHz or less audio reception to deal with adjacent-channel interference that is inherent in the present transmission standards," he continued.

"If AM stations are limited to 5 kHz transmission, the receivers could have 5 kHz reception without adjacent-channel interference. It would be a win-win, with room being made for digital-only transmission and an improvement in analog reception at the same time."

What about the idea of using the expanded band as a way to "ease into" all-digital?

"I believe that rules should be written to treat all AM frequencies the same with regard to digital-only transmission," Rackley replied.

"Instead of creating a separate band to encourage initiate digital transmission for stations that operate in analog mode successfully, any roadblock in the rules that limit how many stations one company can have in a market should be eliminated to encourage simultaneous digital transmission while keeping the analog programming on the air."

He said a station could acquire or LMA another station in the market to carry its present programming digitally, with the goal of having both modes available during the transition period.

"I believe that the analog transmission standards should be modified to do away with the NRSC requirements with regard to pre-emphasis, and that analog audio transmission should be limited to 5 kHz audio to facilitate the design of compatible standards for adjacent-channel protection between analog and digital-only transmissions."

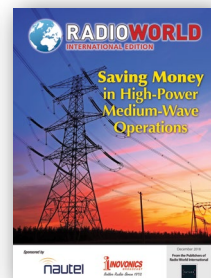
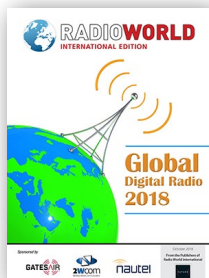
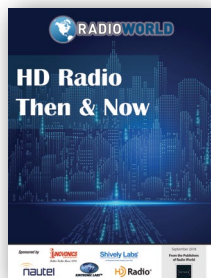
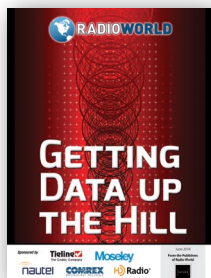
— Ron Rackley

"Then, as the listenership to the digital signal eclipses that of the analog transmitter — assuming digital 'catches on' — a decision could be made to migrate the digital signal to the transmitter with the best 'footprint' over the market until such time as the analog signal can be turned off."

INTRIGUED

Some are adamantly in favor. As broadcaster Ben Downs writes in his commentary at the end of this ebook, "AM licensees must be allowed the option to convert their stations to full digital."

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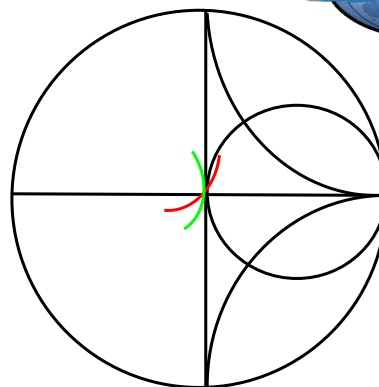
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WHAT'S AHEAD FOR ALL-DIGITAL AM?

Radio World | March 2019

ANTENNA SYSTEM GOALS

Quantity	Frequency	Requirement
Magnitude	Carrier	Matched
	∓ 10 KHz	VSWR < 1.2:1
	∓ 15 KHz	VSWR < 1.4:1
Symmetry	∓ 5 KHz	VSWR of Side Band Normalized to Complex Conjugate < 1.035:1
Rotation	∓ 15 KHz	Cusp Oriented Such That Transmitter Final Stage Sees it Open to the Left



- THESE IMPEDANCE CHARACTERISTICS SHOULD BE PRESENTED TO THE FINAL RF AMPLIFIER WITHIN THE TRANSMITTER.
- DESIGN GOAL CURRENTLY USED: ∓ 5 KHZ VSWR < 1.05:1

Antenna system goals on a slide from Kintronic Labs. The Smith Chart at right illustrates the Hermitian symmetry of the impedance bandwidth desired at the output of the transmitter.

But it's clear from our interviews that there are many shades of opinion. And we're far from having asked all the questions about how the industry would get there.

Broadcaster Andy Skotdal once enumerated steps that would need to be considered and acted on before the industry could go all-digital. They include setting allocations standards, interference standards and an HD carrier mask standard; controlling conversion costs; continuing to grow receiver penetration; exploring possible licensee incentives; developing affordable field testing gear; and setting a digital sunrise date (and, conceivably, an analog sunset date, another and presumably more contentious question).

But we couldn't find anyone that wasn't at least intrigued by all-digital AM for the U.S. And we found plenty of support for the FCC at least exploring the idea of allowing it as an option.

ANTENNA CHALLENGES

This ebook is not focused on deep technical aspects, but a few are also worth mentioning.

One that arises is implications for the antenna system; experts say this is a crucial topic.

Joshua King, project engineer for Kintronic Labs, cites bandwidth guidelines for designing or transitioning systems to digital operation.

"The guidelines are important, because if the load impedance characteristics are not symmetrical, this can complicate the error correction process and erode the

reliability of the digital transmission channel," King said.

"It's more important for antenna systems designed for digital operation to maintain really good bandwidth, so that all the energy in the sidebands, which contains the data needed by receivers to reconstruct the digital signal, makes it through. This can help with fewer blackouts, regions where you can't get the signal."

Consider the whole system, he recommended. This is key to get the best digital performance out of your antenna system.

"So working back from the antenna, we need to consider the tower and mast characteristics. Is it a guyed tower? Is it a self-supported tower? Is it series-fed? Or is it skirt-fed? If it's skirt-fed we need to know complete design details," King said.

"Take into consideration the matching networks, the phasors, your intermediate matching units (IMUs), your antenna tuning units (ATUs) and the phase shift associated with each of those networks; also the feeder system including your coax from the transmitter to the ATUs. The exciter and transmitter also need to be considered because the output filter network has a certain phase rotation associated with it."

King offers ideas to improve the bandwidth of the system; these are summarized below. However, "If there's one point I'd like to get across, it's that it's not that difficult to transition your system to digital operation. It's probably easier than people think. There are a lot of options."

(continued on page 18)

Measuring Power in MA3

- To properly measure power in this mode, an RMS power meter is required that can handle the peak to average ratio (8-11 dB).
- Nautel NX transmitters **display RMS power** not carrier power in MA3

Signal	Carrier	RMS	Peak (clipped)	Averaging meter
Analog AM	50 kW	52.5 kW	253 kW	50 kW
MA1 + AM	50 kW	55.5 kW	288+ kW	51 kW
MA3	19.1 kW	50 kW	288+ kW	40.3 kW

Nautel's Philipp Schmid discussed the need to rethink how you measure power when discussing HD Radio's all-digital MA3 mode.

» continued from page 17

Guy Wire Top Loading — Towers with narrow faces, and guyed towers that are electrically short, typically have narrow bandwidth, King said. Top loading can improve the bandwidth. "It's like stretching the tower, and it makes it electrically taller without making it physically taller. It's a cost-effective way to do this."

Rhombic Skirt Feed on a Guyed Tower — King said a rhombic skirt makes a tower seem fatter and can yield optimum normalized impedance characteristics for digital broadcast. This approach is particularly useful when multiplexing several frequencies on a single tower.

Broadband Folded Unipole Design — Quality of the design is important with this technique. "A good unipole can really improve your bandwidth, and a poorly designed unipole can hurt your bandwidth." These are also useful for putting other equipment on an AM tower such as cellular infrastructure.

Phase Rotation Methods — "This can be as simple as adding a single element like a capacitor or inductor," King said. "Sometimes you need more control, and you can add a full T-network or an L-network to get that extra control of the match and phase rotation that you need."

Sideband Impedance Improvement Methods — Frequently used methods for new systems include broadbanding techniques such as slope correction, pre-match-

ing and cascading networks. For existing systems, King said, be sure to check the design of current filters and remove unused equipment bonded to the tower; at WWFD, he said, incorrectly tuned filters affected the impedance of the overall antenna system.

King also shared links to products made by [Array Solutions](#) and [Rig Expert](#) that he said are affordable and lightweight, for use in troubleshooting or tuning an antenna system.

Another consideration, said Nautel Research Engineer Philipp Schmid, is that in discussing all-digital transmission, you need to rethink how you measure power.

"It really has to be RMS power," he said. "Your typical meter used for AM operation didn't introduce too much error when running hybrid mode, because of the low injection of the HD carriers; but once we get into MA3, it can introduce a very large error." Further, the peak power of the all-digital waveform is much higher than the other waveforms.

Schmid said that when discussing normal AM operation, Nautel cites average power of the signal. But for all-digital operation it displays the RMS power as measured in the transmitter.

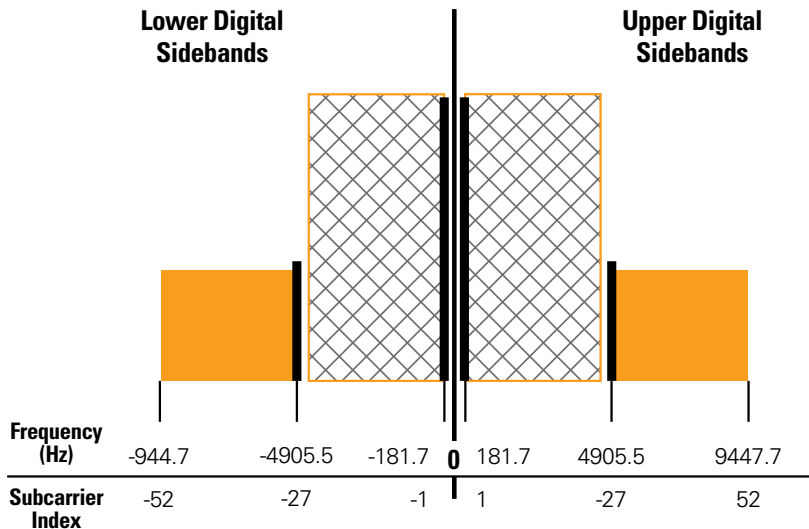
"Keep that in mind when you're sizing transmitters. We're not exactly talking apples to apples here. Inquire about what the RMS power capability of your transmitter is."

Some content in this ebook was taken from the Nautel webinar "[All Digital AM in the Real World.](#)" ■



All-Digital AM Broadcasting With WWFD 820kHz

MA3 Waveform



Transitioning to an all-digital broadcast:

- FM translators factor into AM all-digital transition strategy:
 - Over half of AM stations now have FM translators
 - Can serve listeners on both analog and digital radios
 - Coverage areas will be different
- WWFD (820 kHz, Frederick, MD) is pioneering this strategy:
 - AM signal now all-digital (under experimental authority)
 - FM translator signal is still receivable on analog radios
- ALL HD Radio-enabled receivers will be able to receive all-digital AM

All Digital Potential

- Stereo audio, free from fading and noise
- Program Service Data
- Data services on par with HD FM services
- Digital Emergency Alerts



Digital AM “Future-Proofs” Radio

Obreja says Digital Radio Mondiale gives the AM bands a new lease on life

Most of this ebook focuses on HD Radio, the standard familiar to American readers; but that is not the only platform that raises the possibility of all-digital on what we call the AM bands.

[Digital Radio Mondiale](#) is an open system intended for use on all broadcast frequencies up to 300 MHz, including not only the AM bands — longwave, medium-wave (as in the United States) and shortwave — but also the VHF bands I, II (FM) and III.

DRM on short, medium and longwave for broadcasting bands up to 30 MHz is called DRM for large-area coverage (DRM30) and provides large coverage areas and low power consumption. The version for broadcast frequencies above 30 MHz is called DRM for local coverage. It uses the same audio coding, data services, multiplexing and signalling schemes but has a transmission mode optimized for those bands. The DRM standard is one and shares all the features.

The DRM Consortium is a not-for-profit organization of about 90 members from 40 countries, including broadcasters, network providers, transmitter and receiver manufacturers, universities, broadcasting unions and research institutes.

A FAT PIPE

Ruxandra Obreja, its chairman, says a DRM station can carry up to three programs plus a data channel on a single frequency; and each of the audio programs can also be accompanied by data.

“That’s extraordinary, if you think of it,” she said, giving listeners more choice, broadcasters the opportunity to generate more revenue and regulators a means to issue more licenses, enriching the radio ecosystem.

She praised its audio quality — “AM in digital in DRM is a completely different ‘animal,’ forget

about crackling shortwave or medium-wave” — and support for stereo and 5.1 surround sound using the most optimized xHE-AAC codec. Furthermore, its multimedia applications, she said, “align radio with everything we see around us in the digital world.”

Transmitter infrastructure can be switched to DRM via a simple upgrade path, she said, and DRM supports analog-digital simulcast configurations. It also supports single-frequency networks, and offers automatic tuning by station name such as “Love FM” rather than frequency, as well as retuning when a receiver is leaving a coverage

The DRM standard was optimized for wide-area coverage in the AM bands. For that reason and because of its other benefits, DRM “actually gives the AM bands a new lease on life,” Obreja believes.



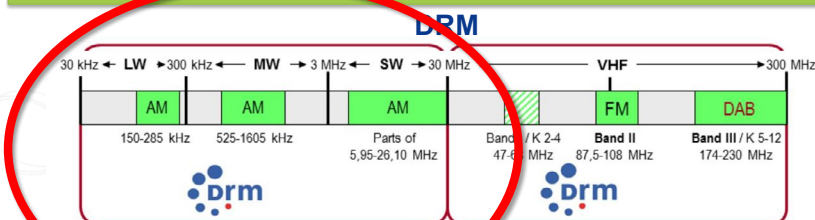
area. Most new AM transmitters, she said, are analog- and DRM broadcast-ready.

Energy consumption is a big selling point, with savings of up to 80 percent of analog consumption. She cited an example of a broadcaster consuming 142 kW to air a single service via an AM analog medium-wave signal. The DRM equivalent, she said, would cover the same footprint and provide up to three services plus multimedia while consuming only 50 kW.

“This is an extraordinary effi-



DRM in AM Bands



**DRM Digital Radio standard – One single standard:
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ciency and reduction in energy costs. So digital is not just about sound, but it's also about long-term investment."

The DRM standard was optimized for wide-area coverage in the AM bands. For that reason and because of its other benefits, DRM "actually gives the AM bands a new lease on life," Obreja believes.

BIG DEPLOYMENT

Countries where DRM is being used include the U.K., France, Nigeria and India, and it is being tested and considered in Indonesia, Bangladesh, Pakistan, Russia, southern Africa and Brazil. But its largest deployment is in India.

The All India Radio (AIR) public broadcaster has 39 transmitters (four shortwave, the rest MW), ranging in power from 20 kW to 1000 kW that are broadcasting in DRM, pure and simulcast. Some 600 million people live in the incidence of DRM, already about twice the population of the United States. There are about 1.5 million DRM receivers in cars so far in India, still a relatively small percentage of the population, but Obreja considers the total remarkable after 18 months and says the automotive market in India clearly is driving digital and stimulating interest.

Among organizations recently partnering to promoting the DRM system and demonstrating receivers in India are consortium members (Indian and international) Communication Systems Inc., Fraunhofer IIS, Gospell Digital Technologies, GeekSynergy, Inntot Technologies, NXP and RFmon-

dial; they all took part in the recent Broadcast Engineering Society Conference and Exhibition in New Delhi.

Obreja said that DRM also can play a role in emergency warning, which is a feature of the DRM standard, in which one or more stations can switch to present emergency audio and text information in audio, writing, in one or several languages, if required.

"That is very, very attractive to a lot of countries," she said. The latest DRM encoder equipment complies with the Common Alerting Protocol and has been tested for emergency warning by AIR and India's National Disaster Management Authority.

She noted that DRM has a [newly revised free handbook](#) explaining the standard.

Summarizing the benefits of DRM but perhaps capturing the sentiments of all believers in digital's possibilities, Obreja concluded: "Lots of people are thinking of giving up on AM. You give up AM, you will see what happens. You will never get that frequency back, and there are a few countries that will snap it [up]. See what has [happened in Australia](#) and the debate there about reinstating shortwave.

"Digital AM is a new platform. ... It future-proofs radio. I really believe that. I strongly believe that AM digital is not dead. It is different. [AM] is transforming itself into a completely different thing. In the future I don't think our listeners will know whether they are listening to digital FM or digital AM; they will just want the good quality and all the services they expect." ■

All-Digital AM, Breaking New Ground

Why I've asked the FCC to allow optional all-digital operation

by Ben Downs

The author is vice president and general manager of Bryan Broadcasting in College Station, Texas, and was an early proponent of AM revitalization and the migration to FM translators. On March 25, Bryan [petitioned the FCC](#) to initiate a proceeding to authorize the MA3 all-digital mode of HD Radio for any AM station that chooses to do so.



Ben Downs

In September last year, Commissioner O'Reilly spoke to the NAB Radio Show and said the FCC hadn't seen "game-changing innovation" around the AM revitalization initiative. And while the introduction of paired FM translators was a game-changer for operators, it's no secret that this innovation mainly moved programming away from the hostile listening environment that the AM band has become without fixing the underlying problem of impossible noise.

Start a conversation about AM in any group of broadcasters and stand by for a flood of reasons to explain the band's decline: Background noise and trash are the main reasons followed by poor quality receivers.

At this late date in the AM revitalization process there's only one option that addresses the problems that still face operators on the AM band. AM licensees must be allowed the option to convert their stations to full digital.

THE NOISE IS GONE

The HD Radio hybrid system that we are allowed to use today was always intended to be a temporary system to hold our place in the digital line while HD Radio receivers arrived in the market.

In this case, this "patch" may have done a good bit of damage to the perception of digital. As it's implemented today, it sounds great; but it is a fragile RF product, prone to dropouts, and it uses a lot of occupied bandwidth. These concerns are mostly addressed by the MA3 all-digi-

tal mode of HD Radio.

Our WTAW(AM) is one of the few AM HD stations. And it sounds great even in the current hybrid, rather than all-digital, mode. We program mostly talk, but any music plays in stereo, voices are far clearer and most important, the noise from my home computer, lights and phone charger is gone. The station has a sound as clear as AM was in the beginning but with better audio fidelity.

An important point: If a car has an HD FM radio installed, that radio will receive the all-digital AM signal. It was part of the original license and remains so today. You buy

one version; you get them all.

I believe that as long as you have an FM translator as your backstop, the day you convert to all-digital AM is the day you can begin to take your market back.

But we need permission from the FCC to broadcast in all-digital AM. Hubbard's Maryland AM WWFD has an experimental license to broadcast in all-digital. All reports indicate that the experiment is yielding the results they hoped for.

POINTS TO CONSIDER

As a thought experiment, make a list of the problems you think AM has, and let me argue my side why we only have one arrow in our quiver that fixes almost all of them:

AM has so much noise. It does. And as a practical matter, we'll never get rid of it. The day has come and gone to clean up home lighting, TVs, computers and (help us!) phone chargers.

With conversion to all-digital, the noise will still exist ... but it's ignored by the radio. The result is a clean background for your programming. And maybe, just maybe, the car manufacturers who took AM radios out of the auto dashboard will put them back. The noise heard from their electronics will be eliminated.

AM radios are poorly made and sound awful. Most are and most do. But radios engineered with HD chips inside are of much higher quality, and that design is baked into the digital experience. If we present clean, perfect, digital sound ... why would a manufacturer shut us down?

It's expensive to install: Again that's true. But it's easier to install all-digital HD into a directional array than the existing hybrid HD system.

It's subject to dropouts when the signal fades very low: This is how the digital world works. Indeed your phone does that at the fringes. But for in-town driving, WWFD finds their digital signal has performed much like their analog AM signal did. Remember, the HD hybrid model we have now is less robust than the all-digital.

There aren't enough radios: And if we broadcasters don't step up, there won't be any listeners either. Every year more and more HD Radios are hitting the market. Can we say the same about AM listeners?

I'll lose listeners when I switch. The beauty of the AM revitalization process was that it allowed us to pair our AM stations with FM translators. Your translator can carry the audience load while the audience becomes accustomed to all-digital AM.

TAKE YOUR MARKET BACK

There are always people who say poor programming damaged AM. I suppose that's possible, but those choices were forced on us by radios that had such poor performance we were embarrassed to try to compete against FM music stations with what we had to work with.

When you convert to all-digital, you have a tool that allows you to pick any format, including music, and compete on quality and promotion just like AM once did.

It would be a tougher call, but in major markets without spectrum available for an AM to add meaningful FM translator coverage, this could be a brave first step that stops AM audience erosion in the big city.

HD Radio receivers in cars are at 25 percent total penetration, and over half of new cars sold today contain HD Radio. How could that not be a clear indication of the future?

AM all-digital HD fixes what we have wrong. David Layer and the NAB Pilot study shows that there are all-digital weak spots in special cases, but I believe that as long as you have an FM translator as your backstop, the day you convert to all-digital AM is the day you can begin to take your market back. The technology will be there to let you compete, and that's really all we should ask.

Not only will your audience erosion stop, you'll be breaking the new AM ground that the FCC is expecting from AM operators.

But first the FCC has to approve this change. We should ask them to do it.

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WHAT'S AHEAD FOR ALL-DIGITAL AM?

Radio World | March 2019

RADIO WORLD

March 2019

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