Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
All-Digital AM Broadcasting	)	MB Docket No. 19-311
All-Digital Mode of HD Radio for AM Stations	)	
	)	
Revitalization of the AM Radio Service	)	MB Docket No. 13-249

COMMENTS OF
THE NATIONAL ASSOCIATION OF BROADCASTERS

The National Association of Broadcasters (NAB)[1] submits these comments in support of the above-captioned Petition for Rulemaking, in which the Commission proposes to allow AM broadcasters to voluntarily broadcast in the MA3 all-digital mode of the HD Radio in-band/on-channel (IBOC) digital radio system.[2] NAB strongly supports this proposal and applauds the Commission for its continued efforts to help revitalize AM broadcasting. Experimental testing to date has demonstrated the viability of all-digital AM service, the penetration of HD Radio-capable receivers already in the marketplace is significant, and broadcaster interest in pursuing all-digital service is evident. Allowing stations to voluntarily transition to all-digital AM service will benefit listeners with enhanced AM service and improve AM broadcasters' ability to succeed in the increasingly competitive audio marketplace.

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[1] NAB is a nonprofit trade association that advocates on behalf of local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

[2] *All-Digital AM Broadcasting, Revitalization of the AM Radio Service*, Notice of Proposed Rulemaking, MB Docket Nos. 19-311 and 13-249, 34 FCC Rcd 11560 (2019) (Notice); Petition for Rulemaking to Further AM Revitalization, Bryan Broadcasting Corporation, RM-11836, MB Docket No. 13-249 (Mar. 25, 2019).

I. Introduction and Summary

As described in the Notice, the propagation characteristics of the AM band make AM radio service susceptible to a variety of technical challenges. Many AM stations cannot operate at night or must use directional antennas or reduce power to help prevent interference, resulting in reduced coverage. Moreover, AM signals are vulnerable to interference from fluorescent and LED light bulbs, computer monitors, flat screen TVs and other devices.[3] NAB has noted that some automakers are choosing to exclude AM radio from their all-electric vehicle dashboard radios because of electromagnetic noise.[4] Further, AM receiver manufacturers have reduced the audio bandwidth of radios as a means of mitigating the impact of this interference, but at the cost of audio fidelity. As a result of these factors, AM stations rarely offer music programming and are dominated by news, talk and religious formats, leading audiences to increasingly turn to FM, satellite radio and online streaming services that offer higher sound fidelity and a broader array of programming.[5]

NAB agrees with the Commission that allowing AM stations to voluntary transition to all-digital operation may help to reduce or even reverse these trends. Digital broadcasting is generally less vulnerable to interference and provides improved audio fidelity and a wider audio bandwidth. Accordingly, AM broadcasters will be able to reach more listeners with a

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[3] Notice, 34 FCC Rcd at 11561.
[4] NAB Comments, RM-11836 (May 11, 2019), at 2.
[5] Comments of the National Association of Broadcasters, *2018 Quadrennial Regulatory Review – Review of the Commission's Broadcast Ownership Rules and Other Rules Adopted Pursuant to Section 202 of the Telecommunications Act of 1996;* MB Docket No. 18-349 (Apr. 29, 2019), at 34-35 (describing AM radio loss of audience share and advertising revenues).

more pristine, reliable signal[6] and expand their content offerings.[7] Below we address certain of the inquiries raised in the Notice.

II. Discussion

A. Audio Quality and Signal Coverage

The HD Radio MA3 all-digital operating mode is a proven technology.[8] As the Commission notes, field and laboratory tests conducted by NAB's broadcast technology innovation initiative NAB Labs (now known as PILOT) have illustrated the successful operation of all-digital AM radio service.[9] These tests showed that all-digital AM provides audio quality on par with FM stereo, and acceptable daytime coverage even out to the 0.5 mV/m analog contour of most of the tested pathways.[10] The MA3 mode is by design more immune to interference and ambient noise.[11] Interference from all-digital AM signals to first-adjacent channels is essentially eliminated as a concern when utilizing the core mode of operation, and greatly reduced (compared to the MA1 hybrid mode of HD Radio operation currently authorized by the FCC) when utilizing the MA3 enhanced mode of operation.[12]

These findings are borne out by the ongoing experimental operation of MA3 at Hubbard Radio's WWFD-AM (Frederick, MD), which turned off its analog signal in July 2018 while continuing to operate in all-digital mode. Hubbard reports that WWFD's digital signal is

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[6] Comments of WLOH Radio Company, RM-11836 (Apr. 30, 2019) at 1.
[7] Notice, 34 FCC Rcd at 11564.
[8] Comments of Carl T. Jones Corp., RM-11836 (May 11, 2019) at 2.
[9] Notice, 34 FCC Rcd at 11566-67.
[10] David H. Layer, *NAB Labs All-digital AM Test Project*, 2015 NAB Broadcast Engineering Conference Proceedings (2015) (NAB Labs Test Project I), at 28.
[11] Unlike analog AM, where the high levels of interference and ambient RF noise translate directly into audio noise heard by the listener, the digital audio signal transmitted using the MA3 all-digital mode is highly robust and provides excellent audio quality out to the digital signal point of failure.
[12] NAB Labs Test Project I at 41.

substantially enhanced and more robust than the analog service which it replaces, and Hubbard has received encouraging feedback from listeners.[13] For example, radio consultant and journalist Scott Fybush has described the improved digital signal of WWFD that he was able to obtain. Mr. Fybush explains that, in his experience, WWFD's analog signal was typically lost outside its 5 mV/m contour and compares that to the "solid lock" on WWFD's digital audio he was able to secure approximately 55 miles away from WWFD's transmitter site. He was also able to obtain a listenable signal 75 miles away in St. Charles, Maryland, as well as in York, Pennsylvania and in urban areas of northwest Washington.[14] Mr. Fybush also confirmed the superior performance using the MA3 all-digital mode as opposed to the MA1 hybrid (analog plus digital) mode.[15] Given such success, Hubbard has expressed interest in transitioning other AM stations to all-digital broadcasting.[16] The record in this proceeding supports providing this flexibility, as additional AM broadcasters also appear ready and willing to pursue all-digital service.[17]

B. Auxiliary Data and Market Readiness

NAB supports the Commission's conclusion that all-digital operation would produce other benefits for listeners and broadcasters, such as allowing AM stations to provide auxiliary data including song and artist information, and emergency notifications that include text and images.[18] Enabling these capabilities will help place AM broadcasters on a more

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[13] Comments of Hubbard Radio, LLC, RM-11836 (May 10, 2019), at 2-3.
[14] Comments of Scott Fybush, RM-11836 (May 10, 2019), at 4-5; Notice, 34 FCC Rcd at 11568.
[15] Fybush Comments at 5.
[16] *Id*. at 3.
[17] *See, e.g.*, Comments of Bradford Caldwell, RM-11836 (May 7, 2019); Comments of Julie Hein, RM-11836 (May 6, 2019); Comments of WLOH Radio Company, MB Docket No. 19-311 (Apr. 30, 2019 at 1; Comments of Anthony L. Ricketts, RM-11836 (May 20, 2019); Comments of Bristol County Broadcasting Inc., RM-11836 (May 13, 2019) at 2.
[18] Notice, 34 FCC Rcd at 11564.

level playing field with their competitors,[19] as listeners have come to expect the radio display of so-called "metadata" such as the station logo, program name, song title and artist or album art. Xperi has explained that AM stations operating in a strictly analog mode have no means of transmitting this metadata to receivers, and that doing so would be a vital component of AM digital operation.[20] All-digital MA3 mode will allow stations to balance considerations between audio quality and devoting capacity to metadata or other digital services, and make this determination based on their good faith business judgment of their listeners' needs and interests.

The record further demonstrates that authorizing all-digital service would provide AM broadcasters with an important tool for attracting and retaining listeners, and that the market is already well-positioned to support widespread, voluntary digital AM service. Xperi explained that HD Radio technology has been successfully launched in more 2,300 radio stations across the country, covering all of the top 100 Nielsen Metros and more than 90 percent of the U.S. population.[21] In addition, all the major automobile makers offer factory-installed HR Radio receivers, with HD Radio Technology available as a standard feature in more than 170 vehicle models. As a result, there are nearly 70 million cars on the road equipped with HD Radio reception capability, and this number continues to grow. Moreover, HD Radio receivers deployed to-date are compatible with all-digital AM and FM signal transmissions.[22] We further note that transmitter equipment sold by multiple manufacturers is compatible with the MA3 operational mode. Accordingly, NAB is confident that the

[19] *Id*.
[20] Response of Xperi Corporation, RM-11836 (May 6, 2019), at 4
[21] *Id*. at 3.
[22] *Id*. at 4.

marketplace will support all-digital AM functionality immediately upon authorization of service.

C. Signal Coverage and Interference

NAB agrees with the Commission that all-digital operation should produce an area of greater usable signal coverage compared to analog stations. The field tests performed by NAB Labs demonstrated this for a range of station types which varied by location, frequency, class of service, power level and transmit antenna configuration. NAB Labs' comprehensive field test program showed excellent signal coverage, and in every case where a direct comparison of the MA3 (all-digital) and MA1 (hybrid) signals was made, the MA3 signal far outperformed the MA1 signal for coverage and reliability.[23]

As noted, Hubbard, which owns, WWFD, has corroborated these results, stating that the MA3 signal has proven to be much more robust than the hybrid mode of HD AM broadcasting that has been used previously, and has received positive feedback from listeners about the fidelity and reliability of their all-digital signal.[24]

The Commission also seeks comment on whether all-digital AM operations could cause interference to analog stations.[25] As a preliminary matter, NAB agrees with the Commission that interference caused by all-digital signals should be a lesser concern compared to hybrid operations because the former produces fewer emissions at the outer limits of the occupied bandwidth,[26] and in any event, should not create any additional interference to adjacent channels based on exhaustive testing of hybrid mode operations.

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[23] *See, e.g.*, NAB Labs Project I, at 31 (Figure 12) and 34 (Figure 19).
[24] Hubbard Comments at 2-3.
[25] Notice, 34 FCC Rcd at 11569.
[26] *Id*.

Regarding potential interference to co-channel analog stations, NAB Labs had investigated this in both its laboratory and field testing. By its nature, the all-digital signal is a stronger interferer to co-channel analog signals than are legacy analog AM signals. NAB Labs' lab tests confirmed this and quantified the difference between analog and all-digital interferers for a variety of receivers.[27] The most relevant results from the lab testing were the "Phase 2" results which simulated the effects of a real world, "noisy" AM reception environment. The "Phase 1" results, obtained in ideal, noise-free conditions, provide a useful baseline and were necessary to confirm proper test bed operation, but do not reflect real-world performance and are not relevant to the consideration of potential co-channel interference issues in this proceeding.

Focusing on the Phase 2 data from the lab test report, NAB Labs' results show that for the five receivers tested, the difference between the audio signal-to-noise ratio (SNR) in a desired analog AM signal for undesired all-digital versus analog AM co-channel interferers, at desired-to-undesired (D/U) ratios corresponding to the 0.5 mV/V contour of the desired signal, was between 1 and 3 dB (with the SNR in the presence of the all-digital co-channel interferer being lower by this amount). These results from the NAB Lab test are summarized here in Table 1.

[27] David H. Layer *et. al*, *NAB Labs All-digital AM Test Project - Part II, Co-channel Laboratory Test Results*, Published in 2016 NAB Broadcast Engineering Conference Proceedings (NAB Labs Project II), at 64-65.

Table 1. Audio SNR difference between analog and all-digital AM interferers at D/U ratios corresponding to the desired analog AM signal's 0.5 mV/m contour.[28]

	Audio SNR difference between analog and all-digital AM co-channel interferers, dB				
Signal level (dBm) D/U (db)	Rcvr 1	Rcvr 2	Rcvr 3	Rcvr 4	Rcvr 5
-76 dBm 26 dB D/U	3 dB	1.5	2 dB	1.5 dB	2 dB
-64 dBm 38 dB D/U	3 dB	1.5	2 dB	2 dB	2 dB
-56 dBm 46 dB D/U	3 dB	1.5	2 dB	1.5 dB	2 dB

In addition to the SNR measurements, NAB Labs also made numerous audio recordings of the desired analog AM signal when subjected to co-channel interference.[29] A subjective evaluation by the authors (and other expert listeners) of these audio recordings made at or near the operating points shown in Table 1 revealed that from a listening standpoint, there was essentially no difference in audio quality between the analog and all-digital AM interference cases.

During the NAB Labs field test project, co-channel interference observations were made using test station WSWW (1490 kHz, Charleston, WV) and demonstrated that, for WSWW's four closest co-channel neighbors[30], all-digital operation did not cause any more interference to a co-channel signal than analog operation.[31] We agree with the Commission

[28] *Id.*
[29] *Id*. at 66 and Appendix 3 (providing a list of the audio recordings obtained).
[30] The four nearest co-channel stations were WMOA (Marietta, Ohio, 75 miles from WSWW), WSGB (Sutton, West Virginia, 53 miles), WAEY (Princeton, West Virginia, 73 miles), and WSIP (Paintsville, Kentucky, 73 miles).
[31] NAB Labs Project I at 37

that all-digital operations should not cause increased interference within AM stations' core service areas.[32]

In any event, various technical and regulatory options already exist for reducing or eliminating unacceptable interference caused by hybrid digital stations that should similarly apply to all-digital service. For example, the station operating in all-digital mode may reduce power or reach some other arrangement with an aggrieved co-channel station. Moreover, if such an agreement proves out of reach, the Commission has procedures for imposing a power reduction or even terminating a hybrid digital station's operation. NAB submits that the Commission's current policies and procedures for preventing interference by hybrid signals should equally suffice for all-digital AM operations.

D. Conversion Costs and Consumer Impact

The Commission seeks comment on the costs to AM broadcasters of converting to all-digital operation, such as licensing fees and any equipment and installation costs.[33] Certain commenters estimate that the costs for converting an analog AM station have fallen from $45,000 to around $12,000 since 2002.[34] The Commission notes that another cost consideration for transitioning stations will be the loss of any analog listeners who do not obtain an all-digital receiver or do not migrate to listening to an FM translator that is rebroadcasting the all-digital AM signal.[35] In this context, the Commission points out that more than half of all AM stations now have FM translators, potentially softening the blow of

[32] Notice, 34 FCC Rcd at 11570.
[33] *Id*. at 11575.
[34] Joint Comments of California and Missouri Broadcasters Assn's, RM-11836 (May 13, 2019) at 4.
[35] Notice, 34 FCC Rcd at 11576.

any loss of listeners and serving as an important part of an analog to all-digital transition strategy for AM broadcasters.[36]

Although costs are critical issues, the voluntary nature of the proposed conversion process will enable individual broadcasters to make their own decisions whether to pursue all-digital operations based on the needs and interests of their audience and the number of digital receivers in their market. Broadcasters would have no incentive to convert to digital if the number of receivers in their market were insufficient to support the expense, or if too many listeners would lose access to their broadcast. These are decisions best left to the good faith business discretion of broadcasters. For example, the Commission asks whether it should require stations to notify listeners about its plans to convert to all-digital service.[37] Such a policy would be entirely unnecessary, it is difficult to conceive of a broadcaster who would implement such a substantial change in service without enthusiastically promoting the change to listeners.

AM broadcasters face significant competitive obstacles that will only increase in the future, and all-digital operation could provide an attractive option for retaining listeners, if not obtaining new listeners. The record demonstrates that HD Radio is a mature technology, and both testing and real-world experience have confirmed the technical performance of all-digital AM service. As Cavell Mertz states, testing demonstrates that all-digital AM service has advanced to the point where it is now achievable using presently available MA3 transmission methods.[38] The Commission has taken the correct approach in proposing the discretionary conversion of AM stations to digital operations, and this approach is supported

[36] *Id*.
[37] Notice, 34 FCC Rcd at 11578.
[38] Comments of Cavell, Mertz and Associates, Inc., RM-11836 (May 10, 2019), at 2.

by the record of broadcasters ready and willing to consider whether all-digital AM is suitable for their market.[39]

E. NRSC-5-D Standard

Finally, NAB supports the Commission's proposal to incorporate the NRSC-5-D Standard into the digital audio broadcasting rules.[40] Adopting NRSC-5 as a formal technical standard will provide industry with increased regulatory certainty and promote international adoption of the IBOC digital radio broadcasting system by providing that the Commission will retain the currently well-accepted standard for digital radio operations in the U.S. The National Radio Systems Committee ("NRSC"), through its Digital Audio Broadcasting (DAB, now Digital Radio Broadcasting, DRB) Subcommittee, adopted NRSC-5 in April 2005, and has updated the standard in 2008, 2011 and most recently in April 2017. The current version of the standard, NRSC-5-D, is mature policy and, given the well-established deployment of HD Radio technology in the U.S., significant technical modifications to the system are not expected.

The Commission has previously supported the formal adoption of a digital radio technical standard. First, in 1999, when it commenced the proceeding to establish a digital radio service, and again in 2002, when it adopted iBiquity's IBOC digital radio broadcast technology as the de facto standard for digital operations, the Commission endorsed industry arguments favoring the formal adoption of a standard:

> We agree with the many commenters who advocate the adoption of a single DAB transmission standard. Although this is not a situation in which competing technologies pose a risk of market splintering, we believe the adoption of a standard will facilitate an efficient and orderly transition to digital radio. This approach is particularly warranted at a time when broadcasters face

[39] *See, e.g.*, WLOH Comments at 1; Comments of Anthony L. Ricketts, RM-11836 (May 20, 2019), at 1.
[40] Notice, 34 FCC Rcd at 11574.

> competitive challenges from various digital media and when many station owners link their continued viability to the prompt introduction of a digital transmission technology. The Commission's support of a standard-setting process is designed to provide regulatory clarity and to compress the timeframe for finalizing the rules and policies that will affect the ultimate success of this service.[41]

In comments filed in 2005 on the original NRSC-5 Standard, NAB agreed:

> A single standard promotes confidence, for all affected participants, in a transition to digital operations of a fully developed mass media broadcast service, such as digital television, and now digital radio. Thus, broadcasters, broadcast equipment manufacturers, receiver manufacturers and consumers, as well as the related industry entities such as integrated circuit manufacturers and data service providers, all can have the certainty to confidently invest and participate in the digital radio transition. This is true both in the near term, as the transition to digital radio commences, as well as for the long-term evolution and maturation of this new service. Commission adoption of an industry-developed standard is the clearest, most practical and technically fruitful path to achieving a Commission IBOC technical standard.[42]

These arguments remain valid today. Particularly in an era of increased competition and uncertainty for the consumer electronics and broadcast industries, additional regulatory clarity would encourage greater adoption of IBOC technology. Currently, the rules concerning IBOC service may be found in several Commission orders that include cross references to industry documents and practices, including some outdated IBOC system documents and statements. NRSC-5-D provides a consolidated set of documentation that could provide the public with a more organized package of rules.

Finally, we note that formal inclusion of NRSC-5-D in the rules will confirm that IBOC will remain the digital radio solution for the United States and promote international adoption of the IBOC system that, in turn, will benefit the digital radio transition in the U.S.

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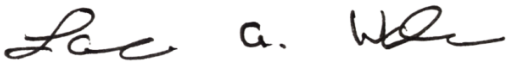
[41] *Digital Audio Broadcasting Systems And Their Impact on the Terrestrial Radio Broadcast Service*, First Report and Order, 17 FCC Rcd 19990, 20006 (2002).
[42] Comments of the National Association of Broadcasters, MM Docket No. 99-235 (2005), at 6.

by increasing worldwide demand for HD Radio receivers and transmission equipment. Greater demand will result in lower costs for consumers due to economies of scale, and lower costs will increase consumer demand.

III. Conclusion

For these reasons, NAB respectfully requests that the Commission promptly promulgate rules to all AM broadcasters to broadcast an all-digital signal using the HD Radio IBOC mode, on a voluntary basis, and incorporate NRSC-5 into the FCC rules.

Respectfully submitted,



Rick Kaplan
Larry Walke
Lynn Claudy
David Layer
NATIONAL ASSOCIATION OF BROADCASTERS
1771 N Street N.W.
Washington, D.C. 20036
(202) 429-5430

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