Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Digital Audio Broadcasting Systems	)	MM Docket No. 99-325
And Their Impact On the Terrestrial Radio	)	
Broadcast Service	)	

COMMENTS OF THE NATIONAL ASSOCIATION OF BROADCASTERS

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In response to the Commission's Public Notice[1] requesting comment on the NRSC's report concerning the iBiquity AM IBOC DAB system[2] with respect to the Commission's DAB policy goals and selection criteria, the National Association of Broadcasters[3] files these comments. NAB files in support of the NRSC report and its main recommendation – that the Commission proceed to authorize the iBiquity AM IBOC system for daytime operation as an enhancement to AM broadcasting. Such action will provide an immediate and dramatic improvement in daytime AM radio listening, while minimizing potential additional interference and advancing the overall deployment of terrestrial digital radio.

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[1] *Public Notice*, MM Docket No. 99-325, rel. April 19, 2002.
[2] *Evaluation of the iBiquity Digital Corporation (iBiquity) IBOC System, Part 2 – AM IBOC (*NRSC Report).
[3] NAB is a nonprofit incorporated association of radio and television stations and broadcast networks. NAB serves and represents the American broadcasting industry.

I. Introduction

NAB, in its comments on the NRSC's Report on iBiquity FM IBOC, described the history of the FCC's consideration of terrestrial digital audio broadcasting, the policy goals for DAB which are shared by the FCC, the NRSC and the NAB and the FCC's specific selection criteria for DAB systems. We there supported the NRSC's recommendation that the iBiquity Digital FM IBOC system be authorized, given the NRSC's evaluation of the test results and its conclusions that the FM IBOC system meets the FCC selection criteria and offers significantly enhanced performance, robust digital coverage and no significant loss in existing analog coverage areas. We urged the Commission to quickly spell out the steps remaining to authorize digital radio broadcast service operations as soon as possible, for the benefit of the listening public and America's FM broadcasters.

NAB now endorses the NRSC's conclusion that, similarly, AM IBOC utilizing the iBiquity Digital AM IBOC system should be chosen for digital AM radio service, but that initial and interim authorization of AM IBOC be for daytime operation only, while further investigation and development of appropriate operating parameters continue concerning operation of AM IBOC during nighttime hours. Such is consistent with the goals of advancing digital radio service to the public, with its significantly improved performance, while minimizing interference to existing AM listening. Deployment of IBOC is particularly important for the AM band, which has suffered tremendously from a difficult RF environment, a high level of interference from various sources, limited receiver performance quality and lack of effective stereo operations. Moving ahead to

expeditiously introduce IBOC digital service in the AM band, albeit for the interim as a daytime service, will, as the NRSC notes, offer a chance to revitalize AM broadcasting.[4]

II. The NRSC AM IBOC Evaluation Report Indicates That Digital Performance of the iBiquity AM IBOC System Offers a Significant Improvement Over Analog Service.

As the NRSC's DAB Subcommittee Chairman said in describing the results of the instant Evaluation Report before the Subcommittee (and including the cautionary notes about nighttime operations), "AM IBOC is simply a spectacular improvement for AM stations. Subjective evaluations showed listener perception of AM IBOC to be on a par with analog FM in terms of quality and fidelity. And full stereo is part and parcel of the equation. The ability to utilize this transmission scheme, even during daytime hours, is a quantum improvement for our oldest radio service."[5]

A. AM IBOC Offers a Dramatic Improvement for AM Radio But Necessitates Some Trade-offs.

The NRSC evaluation of the performance of iBiquity AM IBOC concluded that this system will allow AM broadcasters to introduce digital service rivaling that of today's FM in quality and stereo performance, while providing immunity from noise, the opportunity to provide data services and, as with FM IBOC, pointing a path to an all-digital future, all the while maintaining compatibility with today's AM radios, NRSC Report at 8. AM IBOC, the NRSC Report says, offers "dramatic improvements," *id*.

The NRSC Report points out, as the same time, that there are trade-offs in achieving IBOC service in the AM band, specifically with regard to noticeable

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[4] NRSC Report at 8.

[5] *Opening Remarks by Milford Smith, Subcomittee Chairman, at the 4/6/02 meeting*, NRSC DAB Subcommittee meeting, April 6, 20002. *http://www.nab.org/SciTech/Smith_AM_IBOC_remarks.pdf*.

interference to analog AM listening under certain listening conditions in some cases for some stations, NRSC Report at 9. Generally, this interference from stations on 1st adjacent channels that are transmitting IBOC signals should only be noticeable where listeners are outside the protected interference-free contour and should not, the NRSC concluded, cause significant AM analog listening problems during daytime hours, *id*. The potential for interference to nighttime listening, given what is known and expected from skywave propagation, led the NRSC to recommend further study for nighttime IBOC operations while daytime AM IBOC operations proceed ahead, *id*.

NAB supports this approach and agrees with the NRSC Report that this "compromise will facilitate a rapid introduction of IBOC to the AM band with minimal interference concerns," *id*. NAB believes that IBOC is critical to the future of broadcasting in the AM band and believes that AM must be included with FM in the initial authorization and deployment of IBOC service and receivers, so that it will be insured a place in radio's digital future.

B. The iBiquity AM IBOC System Meets the FCC's Selection Criteria for a DAB System.

The extensive laboratory and field tests designed and supervised by the NRSC show the feasibility of the iBiquity AM IBOC technology and the NRSC Report details how that system meets the FCC selection criteria for DAB systems as identified in the Notice of Proposed Rulemaking in this proceeding.[6]

(1) *Enhanced audio fidelity*. The NRSC Report, at 22-24, found that the iBiquity AM IBOC system demonstrates significantly improved audio quality compared to

[6] *See Notice of Proposed Rulemaking*, MM Docket No. 999-325, rel. Nov. 1, 1999 ("NPRM"). *See* NRSC Report at 9-12 and Section 4, *passim.*

existing analog AM in mobile listening environments as tested in the field, and in a variety of impairment conditions tested in the laboratory.[7] Laboratory tests have further shown that under these impaired conditions, AM IBOC audio quality is comparable to that achieved by analog FM radio in an unimpaired environment, *id*.

(2) *Robustness to interference and other signal impairments*. NRSC test results demonstrate that the iBiquity hybrid AM IBOC system, compared to analog AM, is substantially more robust under impulse noise and co- and adjacent channel interference conditions, *id*. at 28-38, 45.

(3) *Compatibility with existing analog service*. While assessment of digital to analog compatibility is inherently subjective in nature, the NRSC worked diligently to arrive at appropriate criteria for defining acceptable compatibility. The NRSC, *id*.at 49-51, found that the AM IBOC system has little effect on the host analog signal. The amount of interference to the host analog signal is receiver dependent. The narrow bandwidth automobile receivers were found to be the least sensitive to the digital signal, and the wider bandwidth hi fi and portable receivers were found to be the most sensitive

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[7] As stated in the *Public Notice*, at 2, the iBiquity AM IBOC tests evaluated by NRSC were conducted using MPEG-2AAC perceptual audio coding. However, iBiquity plans to use its own proprietary audio coding in its final AM IBOC DAB system and will provide in the near future a report containing test data for its AM IBOC DAB system using this audio coding. The Commission further states in the *Public Notice* that additional public comment will be solicited when the results of this testing are submitted to the Commission.

NAB and the Consumer Electronics Association, on May 29, 2002, submitted to the FCC a report of the Evaluation Working Group of the NRSC DAB Subcommittee on tests conducted on iBiquity Digital Corporation's second generation ("Gen 2") FM IBOC system hardware. This evaluation was conducted to determine the unimpaired audio quality of iBiquity's FM IBOC system and to confirm that the Gen 2 hardware, now using a different audio codec from that in the Gen 1 system, performs similarly to the Gen 1 version of the system recently evaluated by the NRSC.

to the digital signal. The test results suggest that, although the introduction of AM IBOC will be noticeable to some listeners of the host analog station using certain receivers, these listeners are not expected to find their audio quality sufficiently degraded to impact listening, *id*. at 51.

The NRSC Report found that the introduction of AM IBOC is not expected to have any impact on the level of co-channel interference, *id*. at 11, 54, nor on a 3rd adjacent channel station, *id. at* 59, 60. The report indicates, *id.* at 57-60, that the data show that 2nd adjacent interference from AM IBOC will be receiver and signal strength dependent, but that most listeners will not notice the addition of AM IBOC to a station that is 2nd adjacent to one to which they listen.

As to 1st adjacent compatibility, because the IBOC digital sidebands of an AM station share spectrum with the analog signal of a 1st adjacent AM station, the NRSC Report describes 1st adjacent channel compatibility as a significant issue for AM IBOC,[8] *id*. at 54. It found that some listeners with certain receivers may notice additional interference from a station that is 1st adjacent to one to which they listen, *id*. Overall conclusions about 1st adjacent compatibility of the AM IBOC system, based on the specific situations and conditions tested, indicate that the interference caused by the introduction of the IBOC signal is expected to occur mainly outside the protected contour – an area subject to existing analog interference and far fewer listeners. The impact of this interference will be more apparent on wideband receivers than on typical narrowband automobile receivers.

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[8] The NRSC's findings in this regard, *see id*. at 54-57, are borne out by anecdotal field observations, which have raised concerns about the potential impact of AM IBOC on analog AM reception in some circumstances, *see id*. at 57.

(4) *Spectrum efficiency*. In-band, on-channel digital radio is, by definition and design, the ultimate in spectrally efficient digital radio transmission schemes as it uses the AM and FM bands already allocated to terrestrial radio, requires no new spectrum and offers every licensed radio broadcaster an opportunity to upgrade to digital. Thus, the iBiquity AM IBOC system supports transmission of digital audio and auxiliary digital data within an existing AM channel allocation.

(5) *Flexibility.* The Report noted that there are a significant number of features in the iBiquity AM IBOC system that should provide for system flexibility and should offer broadcasters and receiver manufacturers opportunities to customize services and equipment for their particular goals, and offer the possibility of performance improvements in the future. *Id*. at 48-49.

(6) *Auxiliary capacity*. The iBiquity hybrid AM IBOC system design incorporates a flexible data transmission feature that may offer future value to AM broadcasters and their listeners.

(7) *Extensibility.* There are a significant number of features in the iBiquity AM IBOC system, particularly the availability of an all-digital mode, which offer the possibility of significant performance improvements in the future. *Id*. at 48-49.

(8) *Accommodation for existing broadcasters*. The design of an in-band, on-channel digital system enables all existing broadcasters to transmit digitally, with no new spectrum requirements.

(9) *Coverage*. For the system as evaluated, NRSC test results indicate that the hybrid AM IBOC digital coverage during the daytime is comparable to analog coverage along radial routes tested, but due to AM IBOC's improved resistance to various types of

interference, AM IBOC service may be available in areas where analog service is currently of unacceptable quality due to such interference, *id.* at 9, 31-45. At night, digital coverage fell short of the predicted nighttime interference-free contours and the system had blended to analog before reaching this contour, *id*. In general, these results demonstrate that the adjacent channel interference experienced by the test stations during night operation restrict digital coverage, *id*.

(10) *Implementation costs/affordability.* With the introduction of IBOC transmission equipment by a number of vendors at this Spring's NAB Convention, implementation costs are now being established in the marketplace. Previous information on broadcaster implementation costs presented by IBOC proponents (now included in iBiquity) in response to the NPRM[9] suggested that the needs of broadcast stations for reasonable-cost equipment were considered in development of the IBOC systems.

C. Nighttime Operation of AM IBOC Poses Questions and Should Be Studied Further.

As is described above, the NRSC Report found that 1st adjacent channel interference may pose problems for listeners during nighttime operation of AM IBOC and thus requires further investigation. In justifying an interim daytime-only AM IBOC authorization, the Report notes, *id*. at 9, that many AM broadcasters have long recognized the differences between day and night operation and listening habits. A vast number of AM stations operate with different directional patterns and power levels during day and night. Thus, the NRSC recommends that only daytime AM IBOC operations be authorized while further study of nighttime operation continues.

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[9] *See* Lucent Digital Radio, Inc. Comments, MM 99-325, filed Jan. 24, 2000 at 6, 10; USA Digital Radio, Inc. Comments, MM 99-325, filed Jan. 24, 2000 at 3.

NAB agrees with this recommendation and stands ready to assist iBiquity in the development and conducting of nighttime observations to explore the characteristics of nighttime AM IBOC operations. After the results of these further tests are obtained, the industry and the Commission can make an informed choice about whether the benefits of nighttime IBOC service would justify some modification of nighttime AM service rules.

III. The FCC Should Move Ahead Expeditiously To Authorize Interim Operation of FM IBOC and Daytime AM IBOC.

As NAB discussed in its comments on the iBiquity FM IBOC system report, at 9, expeditious authorization of IBOC is critical to radio's ability to service its listeners and compete in a digital world. The FCC stated in its November 1, 1999 NPRM that the NRSC's current initiatives may provide the best opportunity for the rapid introduction of terrestrial DAB and the FCC intended "to be in a position to take informed and expeditious action at the proper time," NPRM at ¶ 58. NAB suggests that now is the time for the Commission to take expeditious action authorizing interim IBOC operation as herein discussed to insure the rapid introduction of DAB for the benefit of listeners and radio broadcasters, while it proceeds ahead with development of final service rules and adoption of a single technical standard for each service and as further testing of AM IBOC nighttime operations is conducted. NAB's Radio Board of Directors, at its recent June 11, 2001 meeting, where it heard detailed reports on the status of AM and FM IBOC, voted to urge the FCC to act to permit the rapid introduction of AM and FM IBOC service. By authorizing such interim IBOC operations, the Commission can facilitate introduction of IBOC service and provide for real world experience with IBOC operations, particularly within the difficult AM environment.

It is important to note that, as the NRSC recognized, the evaluation of AM IBOC by the Commission and by broadcasters, presents a different equation than FM IBOC. The FM system will provide a qualitative improvement to existing FM quality with few identifiable drawbacks. AM IBOC, by contrast, will allow a dramatic – perhaps a transformative – change in AM quality. Achieving these benefits in the difficult AM environment may require acceptance of more interference than would be acceptable in a more desirable listening environment, such as FM. Given the constraints on current AM quality, the tradeoff of limited new interference for vastly improved digital quality, is a reasonable one.

IV. Conclusion

For the foregoing reasons, the National Association of Broadcasters urges the Commission to endorse IBOC technology and the iBiquity Digital IBOC system and proceed expeditiously to authorize interim operation of FM IBOC and daytime AM IBOC.

Respectfully submitted,

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