

Before the
Federal Communications Commission
Washington, D.C. 20554

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

FIRST REPORT AND ORDER

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By the Commission: Commissioners Abernathy and Martin issuing a joint statement; Commissioner Copps issuing a statement.

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I. INTRODUCTION

1. By this Report and Order, we select in-band, on-channel (IBOC) as the technology that will permit AM and FM radio broadcasters to introduce digital operations efficiently and rapidly. We announce notification procedures that will allow operating AM and FM stations to commence digital transmissions immediately on an interim basis using the IBOC systems developed by iBiquity Digital Corporation. We conclude that the adoption of a single IBOC transmission standard will facilitate the development and commercialization of digital services for terrestrial broadcasters, and solicit industry assistance in the development of a formal standard. We defer consideration of formal standard-setting procedures and related broadcast licensing and service rule changes to a future Further Notice of Proposed Rule Making.

II. BACKGROUND

2. After opening a proceeding in 1990 to consider both satellite and terrestrial digital radio services, the Commission concluded that the IBOC systems under consideration for terrestrial service still were in early stages of development and that it would be premature to consider terrestrial digital audio broadcasting (DAB).¹ Development of IBOC systems by several U.S. proponents and of the Eureka 147 system by a European consortium proceeded. In the mid-1990s, the National Radio Systems Committee (NRSC)² formed a DAB Subcommittee which, in collaboration with a Consumer Electronics Manufacturing Association (CEMA) Digital Audio Radio Subcommittee, conducted extensive laboratory tests of several DAB systems. CEMA's 1997 Final Report concluded that the IBOC FM system had two major deficiencies—poor audio performance under impaired signal conditions, and incompatibility with analog FM service. Although the Eureka 147 system performed well, many U.S. broadcasters continued to support the IBOC approach, subject to further development. On the other hand, CEMA, National Public Radio, Inc. (NPR) and others urged the Commission to give careful consideration to non-IBOC systems such as Eureka 147.

3. The Commission initiated this proceeding in November 1999 to advance the development of DAB in the terrestrial radio service.³ Although our radio broadcast services continue to serve as a mainstay of mass communications, broadcasters now face significant technical limitations and competitive challenges. Technical developments and regulatory actions over the past decade have allowed many communications systems to evolve from analog to digital transmissions, including over-the-air television broadcasting, and satellite digital audio radio service (SDARS) now competes with terrestrial radio. Many terrestrial radio broadcasters view DAB not only as a technical opportunity, but as a competitive necessity. The transition to DAB promises the benefits that have generally accompanied digitalization—better audio fidelity, more robust transmission systems, and the possibility of new auxiliary services.

4. In the *NPRM*, we sought comment on alternatives for introducing DAB to the American public. The *NPRM* was prompted by the continuing development and promising preliminary test results of IBOC DAB systems that are designed to allow the simultaneous broadcast of analog and digital signals in the AM and FM bands without disruption of existing analog service. The *NPRM* noted that, although the IBOC approach held great promise of a seamless transition from analog to digital, the technology was still unproven. We also sought comment on allocating new spectrum for a terrestrial DAB system. Finally, we asked for comment on whether the spectrum from 82 to 88 MHz, currently used for TV channel 6, might be reallocated to DAB, either for new DAB service or to supplement IBOC operations in the existing AM and FM radio bands.

5. IBOC developers have made significant progress since the *NPRM* was adopted. In August 2000, two IBOC proponents, Lucent Digital Radio, Inc. and USA Digital Radio, Inc., merged to create iBiquity Digital Corporation (iBiquity). iBiquity is now the only active IBOC system developer. Among its strategic partners, iBiquity lists most of the largest broadcast group owners, as well as manufacturers of broadcast equipment, consumer electronics, and semiconductors. The Consumer Electronics Association, the successor organization to CEMA, the National Association of Broadcasters (NAB), and

¹ *Amendment of the Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services*, 5 FCC Rcd 5237 (1990).

² The NRSC is an industry group jointly sponsored by the National Association of Broadcasters and the Consumer Electronics Association.

³ *In the Matter of Digital Audio Broadcasting Systems And Their Impact On the Terrestrial Radio Service*, 15 FCC Rcd 1722 (1999) (the "*NPRM*").

NPR filed comments in support of iBiquity's IBOC system. The report of the DAB subcommittee of the NRSC released on December 3, 2001, evaluates comprehensive field and laboratory tests of the FM IBOC system developed by iBiquity.⁴

6. The NRSC FM report concluded that

[a]fter nearly a decade of encouraging the development of IBOC DAB and now culminating with the formulation and execution of a comprehensive test program, the NRSC believes that the iBiquity FM IBOC system as tested by the NRSC should be authorized by the FCC as an enhancement to FM broadcasting in the U.S., charting the course for an efficient transition to digital broadcasting with minimal impact on existing analog FM reception and no new spectrum requirements.⁵

The NAB concurs, stating simply, "[i]t works; it's ready."⁶ We sought comment on the NRSC FM report and its conclusions with respect to the Commission's stated DAB policy goals and selection criteria.⁷ Thereafter, on April 16, 2002, the NRSC filed its evaluation of iBiquity's AM hybrid system,⁸ on which we sought comment in a subsequent public notice.⁹ The NRSC AM report concludes that iBiquity "has developed an attractive solution to improve AM listening based on the best of today's available technology."¹⁰ NRSC recommends that iBiquity IBOC should be authorized as a daytime-only enhancement to AM broadcasting, pending further study of AM IBOC performance under nighttime propagation conditions. Based on the record developed in this proceeding, iBiquity and other commenters urge the Commission to permit broadcasters to initiate IBOC transmission on an interim basis prior to the adoption of new licensing rules and procedures. These commenters contend that this approach will facilitate the development of consumer demand for new digital-ready receivers.¹¹

III. DISCUSSION

A. DAB Policy Goals

7. We remain committed to the DAB policy goals the Commission set forth more than a decade

⁴ National Radio Systems Committee DAB Subcommittee report, "*Evaluation of the iBiquity Digital Corporation IBOC System: Part 1 – FM IBOC*," submitted in the December 4, 2001, comments of iBiquity Digital Corporation ("NRSC FM report").

⁵ NRSC FM report at 9.

⁶ February 19, 2002, comments of the NAB at 2.

⁷ See *Public Notice*: MM Docket No. 99-325; Comment Sought on National Radio Systems Committee DAB Subcommittee's "Evaluation of the iBiquity Digital Corporation IBOC System," DA 01-2932 (Dec. 19, 2001) ("December 2001 Public Notice").

⁸ National Radio Systems Committee DAB Subcommittee report, "*Evaluation of the iBiquity Digital Corporation IBOC System: Part 2 – AM IBOC*," submitted in April 16, 2002, comments of NRSC ("NRSC AM report").

⁹ See *Public Notice*: MM Docket No. 99-325; Comment Sought on National Radio Systems Committee DAB Subcommittee's "Evaluation of the iBiquity Digital Corporation IBOC System," DA 02-899 (Apr. 19, 2002) ("April 2002 Public Notice").

¹⁰ NRSC AM report at 9.

¹¹ March 21, 2002, reply comments of iBiquity at 5. See also, e.g., February 19, 2002, comments of Clear Channel Communications, Inc.; February 20, 2002, comments of Kenwood USA Corporation.

ago. We intend to foster the development of “a vibrant and vital terrestrial radio service for the public,” and to ensure to the extent possible that existing broadcasters have the opportunity to implement DAB.¹² We favor the rapid implementation of DAB in a manner that will not disrupt existing service. Accordingly, the *NPRM* outlined ten criteria that we will use to evaluate a candidate DAB system: 1) enhanced audio fidelity; 2) robustness to interference and other signal impairments; 3) compatibility with existing analog service; 4) spectrum efficiency; 5) flexibility; 6) auxiliary capability; 7) extensibility; 8) accommodation for existing broadcasters; 9) coverage; and 10) implementation costs/affordability of equipment.

8. *Out-of-band options.* We solicited comment in the *NPRM* on the possible use of other spectrum for DAB, particularly TV channel 6. The *NPRM* specifically noted that a workable IBOC system would be superior to a new spectrum option in a number of respects.¹³ However, we sought comment on out-of-band options, in part, because the technical viability of the IBOC approach was unproven. Several parties, including NPR, filed comments advocating the use of TV channel 6 spectrum for DAB. It now appears that television stations may continue to use channel 6 beyond the December 31, 2006, target date for the cessation of analog broadcasts. No commenter identified other viable spectrum options. It is clear that, unlike IBOC, an out-of-band DAB approach is no more viable a near-term option today than it was when we first sought comment in this proceeding.

9. The Amherst Alliance, the Virginia Center for the Public Press (VCPD), and many individual commenters support selection of the Eureka 147 system, an approach that would require the allocation of additional spectrum for radio broadcasting. This is not a feasible alternative. In dramatic contrast to IBOC, Eureka 147 has no active domestic proponent and no appreciable support within the broadcast industry. It is a technology that would require significant broadcaster investments in new transmission facilities and impose major service area changes on incumbent broadcasters.¹⁴ VCPD and several other commenters suggest that the frequencies between 1452-1492 MHz (“L-band” frequencies) could accommodate DAB operations using Eureka 147.¹⁵ This spectrum currently is used for flight test telemetry.¹⁶ It would take years to clear this spectrum for DAB, even if we were to decide today that such a step is warranted. We conclude, therefore, that the selection of any DAB system, including Eureka 147, which would require new spectrum, including channel 6, would impede the rapid development of DAB. Moreover, without a specific spectrum allotment and a specific technology, we simply do not have a defined out-of-band option to consider, much less to evaluate against the DAB criteria enumerated in the *NPRM*. Accordingly, we will no longer consider this approach in this proceeding. We emphasize, however, that we are not today categorically foreclosing new spectrum options. In the event that new spectrum is identified for broadcast use, further consideration of both IBOC and non-IBOC out-of-band DAB approaches may be warranted.

¹² *Amendment of the Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services*, MO&O, 12 FCC Rcd at 5769; also R & O, 10 FCC Rcd at 2310.

¹³ *NPRM* at 37.

¹⁴ The Eureka 147 system typically spreads six high-quality stereo signals over a bandwidth of 1.5 megahertz. The package of combined signals, called an ensemble, can also be configured to include more than six programs with lower audio quality. The ensemble requires consolidated transmission facilities and would give all signals identical coverage areas, resulting in a transmission system infrastructure substantially different from that of our existing radio service.

¹⁵ July 18, 2002, reply comments of the Amherst Alliance; *see also* late-filed (Mar. 22, 2002) comments of VCPD.

¹⁶ *Amendment of the Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services*, 12 FCC Rcd at 5770-71.

10. *NRSC IBOC test program.* In sharp contrast to the out-of-band approach, iBiquity has made steady progress toward a practical DAB implementation. iBiquity has continued to develop its IBOC technology and to cooperate fully in an extensive and independent testing and evaluation program during the past several years. In the NPRM, we stated that it was appropriate to rely on the expertise of the private sector in testing and evaluating DAB systems. The NRSC, through its DAB subcommittee, has accomplished this task with a comprehensive test program, thoroughly documented in the NRSC FM and AM reports cited above. NRSC members spent more than two years crafting test procedures, analyzing test results, and developing recommendations. The sustained efforts of the NRSC and its many expert volunteers have provided the Commission with a wealth of information about IBOC. The NRSC AM and FM reports present the results of extensive laboratory and field tests which address most of the evaluation criteria set forth in the NPRM. The NRSC's tests may be divided into two general categories: tests assessing the performance of the IBOC digital signal itself, and tests of the IBOC signal's effect on existing analog radio. The iBiquity FM IBOC system performed well in both areas. Laboratory and field tests were also performed for the AM IBOC system; however, field tests of the AM system were conducted only for daytime propagation conditions, with significant consequences to be discussed in later paragraphs. The AM test results show that the iBiquity IBOC system performed well in both laboratory and daytime field conditions.

11. *Brief description of IBOC design.* The iBiquity IBOC systems tested by the NRSC are "hybrids" in that they permit the transmission of both the analog and digital signals within the spectral emission mask of a single AM or FM channel.¹⁷ In the hybrid mode, the iBiquity system places digital information on frequencies immediately adjacent to the analog signal. The digital signals are transmitted using orthogonal frequency division multiplexing (OFDM). The digital system uses perceptual coding to discard information that the human ear cannot hear. This reduces the amount of digital information, and therefore the frequency bandwidth, required to transmit a high-quality digital audio signal.

B. FM IBOC Performance

12. *The NRSC FM report.* The NRSC tested the iBiquity hybrid FM system both in the laboratory and in field trials on eight FM radio stations selected to represent a variety of reception environments. Testing included objective measures, such as signal-to-noise ratio and bit error rates, and subjective measures in which listeners rated audio recordings.

13. *Audio quality.* The NRSC audio quality tests compare the quality of the unimpaired IBOC FM digital signal to that of unimpaired analog FM, and demonstrate that the unimpaired digital signal performed better. In its comments, iBiquity asserts that the FM IBOC system "will exceed the quality of the best possible analog and will deliver CD-quality sound."¹⁸ NPR claims, however, that the improvement over analog FM is modest, and speculates that new program services would be necessary to interest the public in buying digital receivers.¹⁹ The NRSC also compared the performance of analog and digital FM signals subject to impairments such as multipath interference, co- and adjacent-channel interference, and various types of noise. Some of the impairments were simulated in the laboratory; in addition, field tests recorded impairments under mobile reception conditions. The NRSC concluded that the FM IBOC system was more robust than analog in most cases, and performed markedly better in

¹⁷ The iBiquity system also includes all-digital AM and FM modes, which stations would implement in the event that analog systems are terminated. The FM IBOC system has an extended hybrid mode, with greater digital capacity than the hybrid mode. Neither the extended hybrid FM system nor the all-digital systems have been tested by the NRSC.

¹⁸ February 19, 2002, comments of iBiquity at 6.

¹⁹ February 19, 2002, comments of NPR at 8.

overcoming multipath interference. The NRSC also found that “the ‘digital’ service area of a radio station broadcasting FM IBOC should be an improvement with respect to existing analog service.”²⁰ The iBiquity hybrid system is designed to “blend” to FM analog when digital reception fails. This “blending” feature eliminates a digital “cliff effect,” the complete and abrupt loss of reception at locations where the digital signal fails.

14. *Compatibility with analog FM.* The digital portion of the hybrid IBOC signal is transmitted on frequencies immediately adjacent to the main analog signal. Consequently, minimizing interference to stations on first- and, to a lesser extent, second-adjacent channels poses the most serious analog compatibility challenge. The NRSC concluded that “listeners within the protected contour [of the first-adjacent analog station] should not perceive an impact, but a limited number of listeners may perceive an impact outside of the protected contour under certain conditions.”²¹ Most commenters, including all of the broadcasters that address the issue, agree that this is a reasonable tradeoff. VCPP, the Amherst Alliance, and many individual commenters, however, object to any increase in interference. VCPP insists that many listeners “with large investments in high quality, extra sensitive and extra selective receivers, routinely listen to distant stations.”²² VCPP also asserts that “the public deserves 25 years notice” of the adoption of systems that would render existing radios obsolete.²³

15. The iBiquity system, which allows the introduction of DAB service with no additional allocation of spectrum, represents a remarkable technical achievement. IBOC, however, cannot be implemented without some service ramifications. Under the circumstances, we agree with the NRSC and the majority of commenters that some additional interference outside a station’s protected contour is an acceptable tradeoff given the larger public interest benefits at stake. Spectrum management necessarily involves tradeoffs between interference and service. Our AM and FM technical regulatory schemes are designed, with certain minor exceptions not relevant here, to protect the reception of analog signals only where those signals meet or exceed certain signal strengths, *i.e.*, within a station’s protected service contour (or interference-free contour). This methodology does not ensure reception at every location within these contours and treats interference outside these contours as not objectionable. With mature services, such as AM and FM broadcasting, the introduction of additional RF energy into these heavily used bands can affect the reception of distant stations. Historically, as more stations have been added to the AM and FM bands, the ability to receive individual stations beyond their protected service contours has diminished. We conclude that the tradeoffs that hybrid mode operations may require are consistent with well-established broadcast interference policies. We reject as unworkable and unreasonable VCPP’s contention that the public should have 25 years’ notice of the adoption of new radio broadcast technologies.

16. *Compatibility with FM subcarriers.* All FM stations are authorized to transmit secondary services via an automatic subsidiary communications authorization (SCA),²⁴ employing subcarriers that place information at specified frequencies within the radio channel. These secondary communications services are normally used for GPS services, utility load management, foreign language programming, traffic information, and radio reading services. Some FM broadcasters currently provide digital Radio Broadcast Data System (RBDS) subcarrier services to identify the host station’s call sign and format, and

²⁰ NRSC FM report at 31.

²¹ *Id.* at 11.

²² February 20, 2002, comments of VCPP at 4.

²³ Late-filed (March 22, 2002) reply comments of VCPP at 7.

²⁴ See 47 C.F.R. § 73.295.

provide Emergency Alert System notifications and paging functions. The NRSC performed limited tests of the effect of IBOC operations on FM subcarriers, and concluded that hybrid IBOC should not adversely affect the most common digital subcarrier services. The NRSC FM report stated, however, that “some questions still remain as to the impact of IBOC on [analog SCA] services.”²⁵ NPR and the International Association of Audio Information Services (IAAIS) expressed concern that reading services for the blind, now transmitted via analog subcarrier on many FM stations, would suffer interference from IBOC.²⁶

17. In response to these concerns, iBiquity agreed to additional FM system tests. Test procedures were developed jointly by NPR, IAAIS, and the Advanced Television Technology Center (ATTC).²⁷ iBiquity filed these test results, which show that, in some circumstances, analog SCA receivers may receive significant new interference from IBOC stations operating on second-adjacent channels. Following the tests, NPR commissioned a study using average receiver performance to estimate the number of listeners potentially affected by additional interference from IBOC in the top 16 radio markets. The results show that, on average, additional interference from IBOC could affect 2.6 percent of eligible receivers within an FM station’s service area.²⁸ We are concerned about this level of interference and its potential impact on radio reading services. We will seek specific comment on measures to protect established SCA services in a subsequent *Further Notice of Proposed Rulemaking* in this docket. However, based on the likelihood that many instances of interference can be eliminated by replacing susceptible receivers with better models, and on the Commission’s expertise in satisfactorily managing blanketing and other interference allegations, we believe we can develop procedures to resolve successfully interference complaints on a case-by-case basis. During the period of interim operations, we expect broadcasters to work closely with complainants to resolve allegations of interference to radio reading services. We reserve the right to require specific remedial measures when the parties are unable to agree on corrective action.

18. *FM tests with alternate audio compression technology.* The NRSC FM IBOC tests were done on a version of the iBiquity FM system that used MPEG-2 AAC perceptual audio coding. Because iBiquity intends to use its proprietary PACTM coding in the commercial version of its system, the NRSC recommended—and iBiquity agreed—to repeat some tests with the PACTM coding to verify the NRSC’s conclusions. ATTC repeated a subset of the NRSC’s audio quality tests with both “generation 1” hardware using MPEG coding and “generation 2” hardware using PACTM coding. Objective and subjective tests of audio quality in the presence of noise and multipath interference show little difference between the two versions.²⁹ No commenters dispute the results of the “generation 2” tests. In these circumstances, we conclude that further audio quality testing using PACTM coding is unnecessary.

²⁵ NRSC FM report at 11.

²⁶ February 19, 2002, comments of NPR at 4; *see also* March 19, 2002, reply comments of IAAIS.

²⁷ Advanced Television Technology Center report, “Digital Audio Broadcasting: Supplementary Analog SCA Compatibility Tests – Test Plan and Procedures. Document No.02-15 April 2002,” filed May 13, 2002, in comments of iBiquity.

²⁸ “Further Report on Analog SCA Compatibility with iBiquity Digital’s FM-IBOC System,” filed May 24, 2002, in comments of NPR and IAAIS.

²⁹ Advanced Television Technology Center report, “Digital Audio Broadcasting: Digital Performance Regression Tests of the iBiquity Digital IBOC System in the FM Band – Summary of Test Results, Document #02-10, April 2002” filed April 17, 2002, in comments of iBiquity.

C. AM IBOC Performance

19. *Background.* Two characteristics of the AM service have made the development of AM IBOC extremely challenging. First, the nominal audio bandwidth is insufficient to pass a full-fidelity monaural audio signal. Second, AM propagation characteristics vary drastically between day and night, resulting in two completely different allocation schemes (and, consequently, different daytime and nighttime facilities for most AM stations). During daytime hours, AM signals propagate principally via currents conducted by the earth, called groundwave propagation. Useful groundwave signals have a range of only about 200 miles for the most powerful AM stations, and less than 50 miles for many stations. After sunset, changes in the upper atmosphere cause the reflection of AM signals back to earth, resulting in the transmission of skywave signals over paths that may extend thousands of miles. Nighttime skywave propagation results in a much greater potential for interstation interference. With the exception of powerful clear channel stations and relatively low-power local stations, many AM stations are required to cease operation at sunset. Most of those that remain on the air at night must reduce power or use directional antenna systems, or both.

20. *The NRSC AM Report.* The NRSC tested the iBiquity hybrid AM system both in the laboratory and in field trials at 4 AM radio stations selected to represent a variety of reception environments. The test program included performance tests of the IBOC digital system itself, and compatibility tests, which evaluated the effect of the IBOC digital signal on existing analog signals. Both performance and compatibility tests were comprised of objective measures and subjective listener evaluations.

21. The NRSC recommends that iBiquity IBOC should be authorized on a daytime-only basis. Comments from the broadcast industry generally support the NRSC report and the authorization of interim hybrid AM IBOC operations during daytime hours. However, the NRSC expresses concern about first adjacent channel interference under nighttime propagation conditions. Because skywave propagation was not included in the test program, the NRSC states that additional testing is necessary to evaluate the nighttime compatibility of hybrid AM IBOC.

22. *Audio quality.* The NRSC assessed the audio quality of the digital AM IBOC signal to determine whether IBOC offered an improvement over current analog AM. The tests compared the quality of the unimpaired AM digital signal to that of unimpaired analog AM, and concluded that "IBOC offers a chance to revitalize AM broadcasting - offering near FM-quality stereo reception."³⁰ Comments from broadcasters were almost universally enthusiastic about IBOC's potential for improving existing AM audio quality. Greater Media, Inc. claims that "initiation of IBOC service during daytime hours presages the dramatic transformation of AM radio from its current status as a largely poor-quality/voice-only medium to a digital service with audio quality on a par with today's analog FM."³¹ Susquehanna Radio Corporation predicts that "IBOC can bring back high quality music to the AM band."³² We agree that the record in this proceeding presents compelling evidence that AM IBOC has the potential to significantly improve the audio quality of AM broadcasting.

23. *Robustness.* The NRSC AM report concluded that the "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."³³ Broadcaster comments generally support

³⁰ NRSC AM report at 8.

³¹ June 18, 2002, comments of Greater Media, Inc. at 2; *see also* June 18, 2002, comments of NAB at 4.

³² June 17, 2002, comments of Susquehanna Radio Corp. at 3; *see also* June 18, 2002, comments of NPR at 3.

³³ NRSC AM report at 31.

this conclusion. NPR comments that "[t]he improvement in audio fidelity and robustness is especially important for the AM band."³⁴ We agree. The test results clearly demonstrate that AM IBOC is significantly more robust than analog AM under impulse noise and most common interference conditions. The increased immunity to impulse noise alone promises long-awaited relief from the annoying "static" that has plagued AM broadcasting since its inception over 80 years ago.

24. *Compatibility with analog AM.* NRSC notes that "[t]he design of the AM IBOC system is such that its addition to an AM broadcast signal will cause a reduction in the host analog signal-to-noise performance [*i.e.*, an increase in background noise, perceived as degradation in audio quality] at the receiver."³⁵ The NRSC states that if the passband of the receiver extends beyond 5 kHz,³⁶ the receiver will detect the secondary digital carriers, which extend from approximately 5 kHz to 10 kHz above and below the AM carrier frequency.³⁷ The test results indicate, however, that audio quality should not be degraded sufficiently to impact listening.³⁸ With regard to the effect on other stations, the NRSC concludes that introduction of hybrid AM IBOC should not cause additional co-channel interference. Because the IBOC digital signal shares spectrum with the analog signal of a first adjacent AM station, however, the NRSC concludes that first adjacent channel compatibility is a significant issue for AM IBOC.³⁹ The introduction of AM IBOC will, undoubtedly, result in some additional interference, both to the host station and to other stations. However, as we concluded regarding FM IBOC, the potential benefits of digital AM IBOC far outweigh the small possible increase in interference. We are confident that, on balance, the hybrid AM IBOC system proposed by iBiquity has the potential to provide the benefits of digital broadcasting within the framework of our existing AM allocation scheme. Even so, we agree with the NRSC that significant uncertainty remains with respect to the potential for first adjacent channel interference under nighttime skywave propagation conditions. We will therefore defer authorizing nighttime use of AM IBOC until further testing has been completed.

25. *Preservation of current AM service.* Because of the narrow bandwidth of the nominal AM channel, iBiquity found it necessary to reduce the audio bandwidth of the hybrid-mode analog AM signal from 10 kHz to 5 kHz in order to accommodate the digital signal. Moreover, the IBOC system is not compatible with use of analog C-QUAM AM stereo⁴⁰ by the host station. Several commenters object to the bandwidth reduction; C. Crane Company, Inc., which manufactures and distributes wide-band AM receivers, states that AM receivers with bandwidths in excess of 6.5 kHz will be adversely affected. However, virtually all broadcast industry commenters agree that the analog bandwidth reduction would be unnoticeable to most listeners, since most AM receivers in use today are designed to capture only that portion of the AM signal that is within 5 kHz of the station's licensed frequency, *i.e.*, no more than 10 kHz of the AM channel's bandwidth. In contrast, virtually all the individuals who commented express concern about the loss of analog bandwidth. Each of the 35 individual commenters oppose adoption of the

³⁴ June 18, 2002, comments of NPR at 4.

³⁵ NRSC AM report at 50.

³⁶ The radio frequency bandwidth of an analog AM signal is twice the audio bandwidth. For example, modulation of a carrier with a 10-kHz audio tone generates sidebands at +10 kHz and -10 kHz of the carrier frequency, for a total radio frequency bandwidth of 20 kHz. *See* 47 C.F.R. § 73.44.

³⁷ NRSC AM report at 50.

³⁸ *Id.* at 51.

³⁹ *Id.* at 54.

⁴⁰ *See* 47 C.F.R. § 73.128.

iBiquity IBOC system; 12 favor retention of analog AM stereo, 6 express a preference for the Eureka 147 system, and the remaining 17 express various concerns such as adjacent channel interference, uncertainties regarding nighttime operation, and the cost of replacing existing receivers. Many of the individual commenters complain about the narrow bandwidth and poor quality of existing AM receivers; several call on the Commission to adopt the AMaX receiver standard⁴¹ and to implement rules for receiver standards. CEA, in reply, argues that it is “disingenuous” to claim that the shortfalls of analog AM broadcasting are due to consumer electronics equipment. CEA argues that if significant consumer demand existed for technologies such as C-QUAM AM stereo and AMaX, these products would be widely available in the marketplace.

26. Although we are sympathetic to the concerns of those commenters who object to the loss of the “legacy” AM analog service, our action today leaves with each broadcaster the voluntary option of implementing IBOC. The technical limitations of the analog technology, including narrow bandwidth and susceptibility to manmade and natural noise, continue to undermine its viability. The number of active AM stations in the United States reached a peak of approximately 5000 in 1991 and has steadily declined since that time. Currently, only about 4700 AM stations remain in operation, and these account for only 20 percent of estimated radio advertising revenues.⁴² The record in this proceeding presents compelling evidence that AM IBOC—the only feasible, near-term digital technology option—has the potential to revitalize AM broadcasting and substantially enhance radio service for the listening public. We anticipate that many broadcasters will conclude that the dramatic improvement in digital audio quality, including stereo operations, will outweigh the requirements to cease analog stereo and limit analog bandwidth. Those broadcasters concerned about the loss of analog stereo or reduced bandwidth may continue, of course, to operate in an analog-only mode.

27. *Power reduction for primary AM digital carriers.* Clear Channel Communications, Inc. expresses concern about the potential for IBOC signals to cause interference to the reception of analog AM stations operating on the first adjacent channel, and proposes that, in the event the Commission authorizes stations to implement IBOC operations on an interim basis, such operations should be conducted with the primary digital carriers reduced 6 dB from the level employed in the IBOC tests.⁴³ Reply comments by iBiquity, The Walt Disney Company and ABC, Inc., and James Crystal support Clear Channel’s proposal. However, NAB, Susquehanna, and Greater Media oppose the 6 dB reduction, expressing concern over the loss of IBOC signal coverage. NAB recommends that the Commission establish power reduction procedures for resolving analog interference, but emphasizes that any interim power reduction should be temporary in nature.⁴⁴ Greater Media, in opposing the power reduction, argues that coverage for most AM stations today is critical, that most face substantial challenges in providing service to their respective markets, and that the impact of a 6 dB power reduction “will be devastating.”⁴⁵ Susquehanna argues that an across-the-board reduction of 6 dB will result in a substantial loss of digital coverage for every AM station, which “could be extremely detrimental to smaller stations attempting to

⁴¹ AMaX is a standard for advanced AM radio performance developed in 1991 by the Electronic Industries Association and the NAB.

⁴² BIA Media Access Pro database, August 16, 2002. BIA Financial Network, Inc. (BIAfn) is a merchant banking and investment firm specializing in broadcasting, telecommunications, and related industries. BIA provides strategic funding, consulting, and financial services to the telecommunications, Internet, and media/entertainment industries.

⁴³ June 18, 2002, comments of Clear Channel Communications, Inc. at 4.

⁴⁴ July 18, 2002, reply comments of NAB at 5,6.

⁴⁵ July 18, 2002, reply comments of Greater Media, Inc. at 5.

replicate their analog coverage and overcome man-made interference in their ever-expanding core marketing area.”⁴⁶

28. The NRSC AM report recommends that the Commission authorize daytime operation with the hybrid AM IBOC system as developed by iBiquity. This system has been designed to conform to the AM emission mask specified in Section 73.44 of the Commission’s rules. The emission mask is integrally related to the Commission’s AM allocations rules (principally Sections 73.37 and 73.182) which, in turn, rest on certain assumptions concerning tradeoffs between coverage and interference. Thus, the AM IBOC system confines the digital signal within the station’s existing authorization. Based on the testing record and this system design, we agree with the NRSC and will presumptively permit all stations to operate with the digital power levels developed by iBiquity and tested by the NRSC.

29. In the interest of striking a balance between interference concerns raised by Clear Channel and certain other broadcasters and the strong interest of other commenters in maximizing coverage, we will adopt a three-pronged approach to the issue of primary sideband power levels. This approach is designed to provide a streamlined process to safeguard current reception of analog signals. First, we will authorize AM stations to commence operation with the hybrid AM IBOC system tested by the NRSC, in accordance with the special temporary authorization (STA) and notification procedures described below. When interference problems are anticipated prior to commencement of interim IBOC operations, or when actual interference occurs, we will permit licensees to adjust the power level of the primary digital subcarriers downward by as much as 6 dB. Licensees are required to notify the Commission of any such power adjustments.⁴⁷ We expect that, by use of this mechanism, most cases of interference will be resolved when interim operations commence. Finally, in cases in which the hybrid AM IBOC operation of one station results in complaints of actual interference within another station’s protected service contour and the respective licensees are unable to reach agreement on a voluntary power reduction, the Commission staff may order power reductions for the primary digital carriers or, in extreme cases, termination of interim IBOC operation. In a case in which licensees fail to reach agreement on a voluntary power reduction, an affected station may file an interference complaint with the Commission. This complaint must describe any test measures used to identify IBOC-related interference and fully document the extent of such interference. The Media Bureau shall resolve each complaint within ninety days of filing. In the event the Bureau fails to issue a decision within ninety days of the date on which a complaint is filed, the interfering station shall reduce immediately its primary digital subcarrier power level by 6 dB.⁴⁸

30. *Interim AM Operating Hours.* Because of skywave propagation, nighttime interference-free service for most stations is significantly more limited than their authorized daytime service contours. Class A clear channel stations—the one significant exception—enjoy protected nighttime skywave service to a distance of approximately 750 miles. Given the lack of nighttime test results, the NRSC concluded that it would be imprudent to permit IBOC operation during nighttime hours until it had completed testing. No commenter suggests that interim AM IBOC operation be permitted during nighttime hours. We agree with the NRSC’s conclusion, and will not authorize interim AM IBOC operation during nighttime hours. The Media Bureau is authorized, however, to issue experimental authorizations to continue the ongoing test program.

⁴⁶ July 18, 2002, reply comments of Susquehanna at 2.

⁴⁷ In order to preserve the integrity of the hybrid AM IBOC system, power reductions greater than 6 dB will not be permitted without prior authority from the Commission. A licensee desiring such a reduction must file an informal letter request, setting forth its justification for the nonstandard operation.

⁴⁸ This automatic power reduction requirement is without prejudice to any subsequent Bureau action on the pending complaint.

31. We modify the NRSC's recommendation in one respect, however. During winter months, daytime begins after morning drive time and ends before evening drive time in most markets, especially in the northern regions of the country. The Commission has long recognized the need for AM station operation between the hours of 6:00 a.m. and local sunrise (the "pre-sunrise" hours) and between local sunset and 6:00 p.m. (the "post-sunset" hours). Section 73.99 of the rules provides for reduced-power pre-sunrise and post-sunset operation by AM stations where such operation will not cause impermissible interference to other stations. In view of the relatively low power to be employed for IBOC AM signals, we will permit AM stations currently authorized to operate during the pre-sunrise and/or post-sunset periods to transmit IBOC signals during those times. Stations transmitting IBOC signals during pre-sunrise or post-sunset hours shall operate with the power and antenna pattern authorized for the time period.⁴⁹ We believe that the potential for skywave interference during the pre-sunrise and post-sunset hours is small, and that the benefit to the public by permitting broadcasters to implement IBOC operations between 6:00 a.m. and 6:00 p.m. during the winter months outweighs any potential interference impact.

D. SELECTION OF IBOC

32. *IBOC system performance.* The record in this proceeding demonstrates that IBOC is the best way to advance the Commission's DAB policy goals. This technology enjoys strong support from the broadcast industry and is the only approach that could be implemented in the near future. The iBiquity IBOC system is spectrum-efficient in that it can accommodate digital operations for all existing AM and FM radio stations with no additional allocation of spectrum. The NRSC tests show that both AM and FM IBOC systems offer enhanced audio fidelity and increased robustness to interference and other signal impairments. Coverage for both systems would be at least comparable to analog coverage. Considering that iBiquity's IBOC systems achieve these objectives in the hybrid mode, in which the relatively low-powered digital signal must coexist with more powerful analog signals, we expect that audio fidelity and robustness will improve greatly with all-digital operation. The NRSC performed extensive tests to assess the iBiquity systems' effects on existing analog radio. We agree with the NRSC and the majority of commenters that the potential for new interference from IBOC operations is insignificant when compared with the advantages and opportunities inherent in this digital technology.

33. Relatively few commenters discuss two of the evaluation criteria—the flexibility and extensibility of the iBiquity IBOC systems. According to iBiquity, its systems provide extensibility in that the first-generation receivers are designed to operate both in the interim hybrid and in all-digital modes.⁵⁰ This is an area, however, where definitive evaluations can only be undertaken after the Commission resolves a number of all-digital issues, such as issues relating to signal architecture. We are encouraged, even here, by the fact that the IBOC technology provides the first opportunity to use software to modify legacy digital radio receivers. The IBOC systems show flexibility, iBiquity states, in allowing tradeoffs between audio quality and the amount of data devoted to auxiliary services.⁵¹ CEA expresses some concern with the extent of this flexibility, and suggests that we mandate that digital audio broadcasts include a main audio program.⁵² At this stage, it is sufficient to recognize that the iBiquity

⁴⁹ For example, a station that normally switches to its nighttime pattern at 5:00 during November would continue to do so; between 5:00 and 6:00, the station may transmit IBOC in its authorized night mode. Similarly, an AM station with pre-sunrise or post-sunset authority may transmit IBOC at the authorized power level.

⁵⁰ February 19, 2002, comments of iBiquity at 11.

⁵¹ *Id.* at 10; *see also* June 18, 2002, comments of iBiquity at 9.

⁵² February 19, 2002, comments of CEA at 2.

system does offer the broadcaster the option of providing auxiliary services and flexibility in their configuration, in keeping with our DAB goals. We will address these issues in more detail when a formal standard is considered.

34. Regarding costs, many commenters state that adoption of iBiquity's IBOC system would require the use of certain patented technologies. They express concern that the Commission's endorsement of the iBiquity system will create an opportunity for these patent holders to impose excessive licensing fees on broadcasters and listeners who have no alternative source for the technology. In its response, iBiquity agrees to abide by the guidelines common to open standards, which require that licenses be available to all parties on fair terms. iBiquity also states that it will adhere to the Commission's patent policy.⁵³ Our decision to permit interim operations during the pendency of this proceeding provides an excellent opportunity to assess whether iBiquity and other patent holders are entering into licensing agreements under reasonable terms and conditions that are demonstrably free of unfair discrimination. The Commission will monitor this situation and seek additional comment as warranted.

35. Although we share commenters' concerns about costs, we believe for the reasons discussed below that it is necessary to define a single DAB standard to ensure the rapid and efficient development of DAB service. According to iBiquity, the estimated costs of implementing its hybrid IBOC system range from \$30,000 to \$200,000, with an average cost of \$75,000.⁵⁴ Conversion costs vary depending on the age and other characteristics of a station's transmitter plant and studio equipment.⁵⁵ For example, most new broadcast transmitters are IBOC-compatible. In contrast, some stations may need to replace older transmitters, studio-transmitter links, or studio equipment in order to transmit IBOC. The cost estimates provided by iBiquity do not seem unreasonable when compared with digital conversion costs in other services. Radio broadcasters can implement IBOC using their existing towers, antennas, and transmission line, making the technology inherently less costly than, for example, the digital television conversion. In addition, broadcasters may begin interim IBOC operations on a voluntary basis, deferring costs as they deem appropriate. Finally, it is important to recognize that the endorsement of the hybrid IBOC transmission systems does not compel any broadcaster to make the investments necessary to initiate digital transmissions. Accordingly, the Commission selects IBOC as the digital transmission technology for terrestrial broadcasters.

36. *Possible uses of auxiliary digital capacity.* Many commenters raise issues related to the possible uses of the auxiliary capacity within a digital signal. For example, NPR suggests that a formal standard for digital audio should ensure the availability of secondary audio programs, as well as the text and data services commercial broadcasters are likely to favor.⁵⁶ IAAIS agrees with NPR's suggestion, and adds that new radios should allow the listener to receive secondary audio programs in addition to main channel programming, eliminating the need for the special receivers now required for SCA services such as reading services for the blind.⁵⁷ The National Institute of Standards and Technology proposes that

⁵³ "Revised Patent Procedures of the Federal Communications Commission," *Public Notice* (December 1961), reprinted at 3 FCC 2d (1966).

⁵⁴ February 19, 2002, comments of iBiquity at 14.

⁵⁵ iBiquity's website offers broadcasters a free assessment of the compatibility of their existing equipment with IBOC as part of iBiquity's EASE program to encourage broadcasters to convert to digital operation (<http://www.iBiquity.com>).

⁵⁶ February 19, 2002, comments of NPR.

⁵⁷ March 19, 2002, reply comments of IAAIS.

a digital standard should designate a slot for transmission of accurate time.⁵⁸ We recognize that one of the most significant benefits of digital technology is its potential to enhance existing auxiliary services such as reading for the blind and foreign language programming. Entirely new auxiliary services may also be possible— for example, multiple audio programming channels, audio-on-demand services, and interactive features. During the initial period of hybrid IBOC operation, we expect that these new auxiliary services will be in the early phase of development. We will invite further consideration of these issues and related comments as part of the development of digital standards in a *Further Notice* in this proceeding.

37. *All-digital operations.* As noted above, iBiquity has developed all-digital transmission systems for AM and FM. These systems would occupy the same spectral emission mask now occupied by the corresponding analog facilities, and are intended to replace the analog operations once the digital service is introduced and established via hybrid IBOC operation. iBiquity submitted test results for both AM and FM all-digital modes. The all-digital tests were not performed under the auspices of the NRSC, unlike the tests on iBiquity's hybrid IBOC systems. iBiquity requests that the Commission endorse its all-digital systems as well as the hybrid systems. Although we recognize that a fully digital terrestrial radio service is the ultimate goal, it would be premature to endorse systems that have not been subject to comprehensive and impartial testing. Moreover, adoption of an all-digital standard requires the consideration of novel and more complex technical and policy issues that arise only when the constraints of "designing around" the legacy analog transmission standard are eliminated, e.g., placement of the main digital signal, power levels, interference standards, etc. Accordingly, we will defer any action on these matters until a complete record has been developed.

38. *Use of IBOC by FM translator and FM booster stations.* FM booster and FM translator stations provide important service to many mountainous and rural areas of the country, where few other radio signals are available. By their nature, the translator and booster services present unique challenges for IBOC operation. An FM translator station receives a signal from its primary FM station and converts the signal for rebroadcasting on a different FM frequency. An FM booster station relays the primary station's programming on the same FM frequency. The implementation of IBOC should not affect the ability of translator and booster stations to continue the analog service they now provide. The record in this proceeding does not yet clearly establish, however, whether booster and translator stations will be able to relay the digital portion of IBOC signals. Tests performed by iBiquity indicate that an FM booster station will be able to relay the primary station's hybrid IBOC signal provided the booster is within 14 miles of the primary station.⁵⁹ We received no test results or comments regarding use of IBOC by FM translator stations. Although some translator stations may be able to retransmit the digital component of an IBOC signal, we expect that many translator stations will need equipment modifications to do so. We therefore will solicit comment on issues relating to FM translator and booster stations in a *Further Notice* in this proceeding.

39. *Other Matters.* The Amherst Alliance, VCPP, and others request that the Commission prepare an environmental impact statement (EIS) on the iBiquity IBOC systems on the theory that the introduction of IBOC operations would constitute a "major federal action" which holds the potential for "significantly affecting the quality of the human environment under the National Environmental Policy Act of 1969" (NEPA).⁶⁰ We decline, for the following reasons.

40. The statutory scheme that Congress established in NEPA, as implemented by the Council on

⁵⁸ January 24, 2000, comments of National Institute for Standards and Technology.

⁵⁹ Appendix B, FM IBOC Specification at 15-16.

⁶⁰ See 40 C.F.R. §§ 1500-1508.28.

Environmental Quality (CEQ),⁶¹ mandates the submission of an Environmental Assessment (EA) or an EIS only for those major federal actions that may or will significantly affect the environment.⁶² CEQ regulations provide for a three-tiered approach to environmental analysis, which is intended to identify covered actions. In accordance with this approach, the Commission's rules (1) require the Commission to prepare an EIS for an action that will have a significant impact upon the environment; (2) require the preparation and submission of an EA for an action that may have a significant environmental effect; and (3) exclude certain actions categorically from environmental processing.⁶³ In this case, the initiation of interim IBOC operations normally will require no construction or tower lighting, and thus, is categorically excluded from environmental processing under 47 C.F.R. §§ 1.1306(a) and (b). To the extent that IBOC systems raise environmental concerns regarding exposure of members of the public to radiofrequency (RF) radiation under 47 C.F.R. §1.1307(b), our existing RF standards adequately address those concerns.⁶⁴ The introduction of IBOC transmissions will add approximately one percent to a station's total RF radiation output. Accordingly, interim IBOC operations by a compliant analog station rarely will jeopardize the station's overall compliance with RF standards. On this basis, we conclude that the Commission is not required to prepare an EIS and that a procedure that permits licensees to certify compliance with RF exposure standards satisfies any environmental requirements.⁶⁵

E. Interim IBOC Operations

41. As of the release of this *Report and Order*, stations may request authority to operate on an interim basis with the hybrid IBOC facilities described in Appendices B and C herein.⁶⁶ During interim IBOC operations, stations shall broadcast the same main channel program material in both analog and digital modes. Interim IBOC facilities must use the station's authorized antenna system. As a safeguard against interference, we will not allow use of a second antenna for transmitting the digital portion of the hybrid IBOC signal. Further, pending a favorable evaluation of AM IBOC under nighttime propagation conditions, AM stations shall transmit IBOC signals during local daytime only. AM stations authorized

⁶¹ NEPA created the CEQ to oversee the environmental programs and activities of the federal government in order to determine the extent to which these programs are contributing to the national achievement of U.S. environmental policy. 42 U.S.C. § 4344(3). CEQ published rules "tell[ing] federal agencies what they must do to comply with the procedures and achieve the goals of [NEPA]." 40 C.F.R. § 1500.1(a).

⁶² 40 C.F.R. §§ 1501.4(a)-(b) (a federal agency shall determine whether a proposal normally requires an environmental impact statement or normally is categorically excluded and, if neither is applicable, the agency shall prepare an environmental assessment); 1507.3(b)(2)(i) (agency shall identify typical classes of action requiring environmental impact statements); 1507.3(b)(2)(ii) (agency shall identify typical classes of action not requiring either an environmental impact statement or an environmental assessment); 1507.3(b)(2)(iii) (agency shall identify typical classes of action requiring environmental assessments but not necessarily environmental impact statements).

⁶³ *In the Matter of Public Employees for Environmental Responsibility*, 16 FCC Rcd 21439, 21445 (2001) ("PEER"); see also 47 C.F.R. § 1.1312 (a) (in the case of facilities for which no preconstruction authorization is required, the licensee or applicant must initially ascertain whether or not the proposed facility may have a significant environmental impact as defined in 47 C.F.R. § 1.1307).

⁶⁴ 47 C.F.R. §§ 1.1307(b), 1.1310.

⁶⁵ *In the Matter of Promotion of Competitive Networks in Local Telecommunications Markets*, 15 FCC Rcd 22983, 23037 (2000) (EIS not required when existing requirements provide adequate protection or where environmental effects would be "minimal").

⁶⁶ See Appendix B, FM IBOC Specification; see also Appendix C, AM IBOC Specification.

to operate during the pre-sunrise or post-sunset periods may continue IBOC operation during those times.⁶⁷ AM stations implementing IBOC digital transmissions may not simultaneously transmit analog C-QUAM AM stereo. An AM expanded band station that implements IBOC transmissions is released from its commitment to operate in analog stereo. During the interim period, we realize that many FM stations will need to increase transmitter power output in order to compensate for losses associated with analog/digital combiner networks. As part of the notification process, stations implementing IBOC shall indicate transmitter power output (for both analog and digital transmitters, if applicable) and shall certify that the analog effective radiated power remains consistent with the station's authorization. Calculations used to determine the transmitter power shall be retained and made available to the Commission upon request.

42. Interim operations will require notification to the Commission. Before initiating new information collection procedures, the Commission must demonstrate compliance with the information collection provisions of the Paperwork Reduction Act of 1995, Public Law 104-13.⁶⁸ Following approval by the Office of Management and Budget (OMB), notifications shall be filed within ten days of the commencement of interim IBOC operations. The Media Bureau will issue a Public Notice announcing that OMB approval has been received and the effective date of the IBOC notification procedures.⁶⁹ This notification shall contain the following information:

- a) the date that interim operation commenced, or if the applicant is seeking an STA, the date planned for commencement of IBOC operation;
- b) a certification that the IBOC facilities conform to the iBiquity hybrid specifications;
- c) the name and telephone number of a technical representative the Commission can call in the event of interference;
- d) transmitter power output; if separate analog and digital transmitters are used, the power output for each transmitter;
- e) a certification that analog effective radiated power remains as authorized;
- f) a certification that the interim operation would not cause human exposure to levels of radiofrequency radiation in excess of Section 1.1310 of the Commission's rules and is therefore categorically excluded from environmental processing pursuant to Section 1.1306(b). Any station that cannot certify compliance must submit an environmental assessment (EA) pursuant to Section 1.1311 and may not commence interim operation until such EA is ruled upon by the Commission;⁷⁰ and
- g) if applicable, any power reduction in an AM station's primary digital carriers.⁷¹

43. Notifications shall be sent to the Federal Communications Commission, Digital Radio Notification, 445 12th Street SW, Room 2-B450, Washington, DC, 20554. A copy of the notification

⁶⁷ See paragraph 31, *supra*.

⁶⁸ 44 U.S.C. 3501, *et seq.* ("the Paperwork Reduction Act").

⁶⁹ Until the release of the Public Notice announcing the notification procedures, stations wishing to implement IBOC transmission must file an STA request. The STA request must include all the information specified in paragraph 42 herein. The STA request must be accompanied by a certification pursuant to the Anti-Drug Act of 1988, and by FCC form 159 and the appropriate filing fee (*see* 47 C.F.R. §1.1104). Licensees should submit their STA requests ten days before the date they intend to initiate IBOC transmissions.

⁷⁰ *See* 47 C.F.R. §1.1312(b).

⁷¹ *See* paragraph 29, *supra*.

shall be posted next to the station license and a copy retained in the station's public inspection file. Until the adoption of final rules in this proceeding, a licensee's authorization to transmit IBOC signals may be modified or cancelled by the Commission without prior notice or right to hearing.⁷²

IV. ADOPTION OF IBOC AM AND FM STANDARDS

44. The record of NRSC test results, combined with the industry consensus reflected in the comments, demonstrates that IBOC provides a technical path forward to digital operations for radio broadcasters. By our action today, we select the hybrid AM and FM IBOC systems tested by the NRSC as *de facto* standards for interim digital operation. As of the effective date of this *Report and Order*, the Commission will no longer entertain in this proceeding any proposal for digital radio broadcasting other than IBOC. 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 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. We solicit the assistance of a broad cross-section of interested parties in developing a formal AM and FM IBOC standard through a public and open standard-setting process. In this regard, we are encouraged by the recent action of the NRSC to form an IBOC standards development working group, formally initiating a process designed to establish AM and FM IBOC standards.

V. PROCEDURAL MATTERS

A. Final Regulatory Flexibility Certification

45. The Regulatory Flexibility Act of 1980, as amended (RFA),⁷³ requires that a regulatory flexibility analysis be prepared for notice and comment rule making proceedings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."⁷⁴ The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."⁷⁵ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.⁷⁶ A "small business concern" is one which: (1) is independently owned and

⁷² Test results indicate that hybrid IBOC operation is consistent with our present allocation rules. It is anticipated that hybrid operation would also conform to the allocation standards contained in our international agreements governing AM and FM stations. During the period of interim IBOC operation, all relevant international agreements will be reviewed and any necessary modifications will be addressed.

⁷³ The RFA, *see* 5 U.S.C. § 601 – 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

⁷⁴ 5 U.S.C. § 605(b).

⁷⁵ 5 U.S.C. § 601(6).

operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).⁷⁷

46. As required by the RFA, an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *NPRM* in MM Docket No. 99-325. The Commission sought written public comments on the proposals in the *NPRM* including comments on the IRFA. The Office of Advocacy, U.S. Small Business Administration (SBA) filed comments asserting that the Commission, in the IRFA, failed to adequately consider the potential impact of digital transition on small business and did not discuss alternatives designed to minimize regulatory burdens on small entities.⁷⁸ Specifically, SBA states that “[B]efore concluding that analog systems must sunset, the Commission should provide data on the cost of transition and should ensure that DAB will not burden small business.”⁷⁹ SBA further states that the Commission should make the results of the IBOC tests public to determine viability and compatibility including any interference concerns. It suggests that “... a better course of action might be to permit stations to install digital systems but only if they do not cause interference to analog systems. In this scenario, digital and analog systems would operate concurrently.”⁸⁰ According to SBA, the Commission “... should issue additional notices of proposed rulemaking as it gleans additional information regarding the feasibility and desirability of DAB transition.”⁸¹ Finally, SBA states that the Commission failed to discuss alternatives that would minimize the regulatory burden on small entities.⁸²

47. Although, in this *First Report and Order* the Commission takes two actions, neither of which will have a significant impact on small entities, our approach to digital implementation is consistent with that advocated by SBA. First, the Commission endorses IBOC technology for use by AM and FM digital audio broadcasting operations. Second, the Commission authorizes interim, voluntary digital broadcasting operations for both AM and FM licensees. Only those broadcasters wishing to take advantage of this opportunity to begin digital broadcasting need comply with any notification or technical requirements. Those broadcasters choosing not to initiate such digital operations will not be materially affected. The Commission will issue a *Further Notice* proposing final rules for digital audio broadcasting and will consider the impact of any final rules on small entities in connection with that further proceeding. We therefore certify that the requirements of this *First Report and Order* will not have a significant economic impact on a substantial number of small entities.

48. In adopting this approach, we carefully analyzed the results of the IBOC tests and we conclude that any minimal interference that might be caused is outweighed by the benefits of digital service.⁸³ Such benefits will accrue to small entities as well as large businesses should they choose to implement

(Continued from previous page) _____

⁷⁶ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

⁷⁷ 15 U.S.C. § 632.

⁷⁸ SBA comments at 2.

⁷⁹ *Id.* at 3.

⁸⁰ *Id.* at 4.

⁸¹ *Id.* at 4.

⁸² *Id.* at 5.

⁸³ See paragraph 15, *supra*.

digital operation. In addition, we adopt procedures for these voluntary operations to assure that any interference complaints are resolved quickly.⁸⁴ Under this plan, analog and digital systems will operate concurrently, a result advocated by SBA. With respect to the potential cost of implementation, preliminary estimates indicate that that IBOC costs are not unreasonable and that use of IBOC is inherently less costly than other systems.⁸⁵ Again, we emphasize that the interim operations adopted here are strictly voluntary and thus no broadcaster will be compelled to incur any costs. Finally, as SBA suggests, we will issue a *Further Notice of Proposed Rulemaking* to solicit comment on any final digital transition rules.

49. The Commission will send a copy of the *First Report and Order*, including a copy of this Final Regulatory Flexibility Certification, in a report to Congress pursuant to the Congressional Review Act.⁸⁶ In addition, the *First Report and Order* and this final certification will be sent to the Chief Counsel for Advocacy of the SBA, and will be published in the Federal Register.⁸⁷

50. This document is available in alternative formats (computer diskette, large print, audio record, and Braille). Persons with disabilities who need documents in these formats may contact Brian Millin at (202) 418-7426 (voice), (202) 418-7365 (TTY), or via email at bmillin@fcc.gov.

B. Paperwork Reduction Act Analysis

51. This *First Report and Order* contains proposed new and modified information collections. As part of its continuing effort to reduce paperwork burdens, we invite the general public and the Office of Management and Budget (OMB) to take this opportunity to comment on the information collections contained in this Order, as required by the Paperwork Reduction Act. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

52. Written comments on the proposed new and modified information collections must be submitted on or before 60 days after date of publication the Federal Register. A copy of any comments on the information collections contained herein should be submitted to Judy Boley Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, SW, Washington, D.C. 20554, or via the Internet to jboley@fcc.gov. Copies should also be submitted to Kim Johnson, OMB Desk Officer, 10236 NEOB, 725 17th Street, N.W., Washington, D.C. 20503, or via the Internet to Kim_A_Johnson@omb.eop.gov (spaces are underscores).

⁸⁴ See paragraph 29, *supra*.

⁸⁵ See paragraph 35, *supra*.

⁸⁶ See 5 U.S.C. § 801(a)(1)(A).

⁸⁷ See 5 U.S.C. § 605(b).

VI. ORDERING CLAUSES

53. Accordingly, IT IS ORDERED, pursuant to the authority contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154, 303, this *First Report and Order* IS ADOPTED.

54. IT IS FURTHER ORDERED, that the Media Bureau, effective with the release of this *First Report and Order*, is delegated authority to grant special temporary FM and AM daytime authorizations to licensed stations to commence in-band, on-channel digital transmissions.

55. IT IS FURTHER ORDERED, that the policies adopted in this *First Report and Order* shall become effective upon OMB approval. The Commission will publish a document in the Federal Register as soon as practicable thereafter announcing the effective date of these policies.

56. IT IS FURTHER ORDERED that the Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *First Report and Order*, including the Final Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

Appendix A**LIST OF PARTIES****Comments – November 1, 1999, Notice of Proposed Rulemaking:**

1. Amherst Alliance
2. Arkansas Educational Telecommunications Commission
3. Association for Maximum Service Television, Inc.
4. Association of America's Public Television Stations
5. Association of Radio Industries and Businesses/Digital Broadcasting Experts Group
6. Brandy Communications
7. Chase Capital Partners
8. Clarkston Broadcasters, Inc.
9. Consumer Electronics Association
10. Cordillera Communications, Inc.
11. Cox Radio, Inc.
12. Cue Corporation
13. Digital Radio Express, Inc.
14. Entercom Communications Corp.
15. Forum Communications Company
16. Freedom Communications, Inc.
17. Gannett Co., Inc.
18. Greater Media, Inc.
19. Grupo Televisa, S.A.
20. Gulf Coast Broadcasting Company, Inc.
21. Hearst-Argyle Television, Inc.
22. Hispanic Broadcasting Corporation
23. Infinity Broadcasting Corporation
24. KMSO(FM)
25. K-W TV, Inc.
26. LA Radio
27. Lucent Digital Radio, Inc.
28. National Association of Broadcasters
29. National Institute of Standards and Technology
30. National Public Radio, Inc
31. National Radio Systems Committee
32. Nautel Ltd./Nautel Maine Inc.
33. Olmstead County Broadcasting Company
34. Perception Media Group, Inc.
35. Picture Radio Communications
36. QEI Corporation
37. REC Networks
38. Resort Radio Systems, Inc.
39. Sony Electronics, Inc.
40. Station Resource Group
41. Susquehanna Radio Corp.
42. U.S. Small Business Administration
43. USA Digital Radio, Inc.
44. Visteon Automotive Systems
45. W & B Broadcasting
46. WAJI-FM and WLDE-FM
47. Willis Broadcasting Company
48. Wright Broadcasting Systems, Inc.
49. WTRW Incorporated
50. Blair Alper
51. Kenneth W. Bowles
52. Ted M. Coopman
53. David S. Forsman
54. Richard Hartnett
55. Erich Loepke
56. Jack L. Messmer
57. Alan Ricotta
58. Scott Todd
59. Pete Tridish

Reply Comments:

1. Association for Maximum Service Television, Inc.
2. Broadcast Signal Lab, LLP
3. Channel 6, Inc.
4. Grupo Televisa, S.A.
5. Lucent Digital Radio, Inc.
6. Lucent Digital Radio, Inc. (Errata)
7. Minority Media and Telecommunications Company
8. National Association of Broadcasters
9. National Public Radio, Inc.
10. Providence Community Radio, Inc.
11. Radio One, Inc.
12. REC Networks

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| 13. Shively Labs | 17. Robert Bornkamp |
| 14. Texas Instruments | 18. Ted M. Coopman |
| 15. USA Digital Radio, Inc. | 19. Erich Loepke |
| 16. Virginia Center for the Public Press | 20. Scott Todd |

Late/Ex Parte Comments:

1. USA Digital Radio, Inc.
2. Lucent Digital Radio, Inc.
3. National Radio Standards Committee
4. iBiquity Digital Corporation
5. National Association of Broadcasters

Comments - December 19, 2001, Public Notice:

1. ABC, Inc./The Walt Disney Company
2. Amherst Alliance
3. Bonneville International Corporation
4. Chalk Hill Educational Media, Inc.
5. Clear Channel Communications, Inc.
6. Consumer Electronics Association
7. Cox Radio, Inc.
8. Emmis Communications
9. Evangelistic Alaska Missionary Fellowship
10. iBiquity Digital Corporation
11. Impulse Radio
12. Infinity Broadcasting Corporation
13. International Association of Audio Information Services
14. Journal Broadcast Corporation
15. National Association of Broadcasters
16. National Public Radio, Inc.
17. Nautel Maine Inc.
18. PAMAL Broadcasting, Ltd.
19. Pinwheel, Inc. (KWED)
20. Radio One, Inc.
21. Shively Labs
22. Susquehanna Radio Corp.
23. Texas Instruments
24. Victor Company of Japan Ltd. (JVC)
25. Virginia Center for Public Press
26. Anthony Hunt
27. David Hale
28. Reid Ashbaucher
29. William Cordell
13. Rocky Mountain CPB
14. Visteon Corporation
15. Stephen Burt
16. Garrett Clevenger
17. Ted M. Coopman
18. Chuck Conrad
19. Matthew Hayes
20. Brandon David Lunsford
21. Nicholas P. Merrill
22. Donald E. Niccum
23. Jenka Soderberg
24. Dana J. Woods

Reply Comments:

1. Alps Electric (USA), Inc.
2. American Council of the Blind
3. Amherst Alliance
4. Harris Corporation
5. iBiquity Digital Corporation
6. International Association of Audio Information Services
7. Kenwood Corporation
8. National Association of Broadcasters
9. National Public Radio, Inc.
10. Radio Kings Bay, Inc.
11. Radio Pacific, Inc.
12. Redhawk Community Radio

Late or Ex Parte Comments:

1. Amherst Alliance
2. Consumer Electronics Association
3. Equipoise -for Balance in Media
4. iBiquity Digital Corporation (additional test results)
5. International Association of Audio Information Services
6. LA Media
7. Media Access Project
8. National Association of Broadcasters
9. National Federation of Community Broadcasters
10. National Public Radio, Inc.
11. Radio Free Moscow, Inc.
12. Station Resource Group, Inc.
13. Virginia Center for the Public Press
14. John Anderson
15. David W. Belknap
16. Dan Brown
17. Lisa Brunner
18. Michael Bugaj
19. John Chidester
20. Chuck Conrad
21. Ted M. Coopman
22. Caroline Cox
23. Edward Czelada
24. Maria Denitto
25. David Devereaux-Weber
26. Joseph Fela
27. Leslie Gold
28. George Grandits
29. Jan Harris
30. Kent Harrison
31. Gerald Richard Haussler
32. Jim Kysela
33. Mahlia Lindquist
34. Carol Maddox
35. Zachary Manganello
36. Glenn Martin
37. Philipp E. Meyer
38. Roger Moore
39. Mark Nagel
40. Mark Newton
41. Sallie Ortha
42. Rick Potthoff
43. Bob Riley
44. John M. Roberts
45. Barbara Ruether
46. Larry Siegel
47. William Stribling
48. Ted Trujillo
49. Duane Whittingham

Comments - April 19, 2002, Public Notice:

1. AM Broadcasters Association, Inc.
2. Amherst Alliance
3. C. Crane Company, Inc.
4. Clear Channel Communications, Inc.
5. Cox Radio, Inc.
6. Greater Media, Inc.
7. Harris Corporation
8. iBiquity
9. Infinity Broadcasting Corporation
10. Journal Broadcast Corporation
11. National Association of Broadcasters
12. National Public Radio, Inc.
13. REC Networks (webcaster; LPFM advocate)
14. Susquehanna Radio Co.
15. WGAI-AM 560
16. WGUL-FM, Inc.
17. WMTA
18. Tom Bryant
19. Bob Carter
20. Bruce A. Conti
21. David Coons
22. Christopher Cuff
23. Ian R. Davidson
24. Michael Erickson
25. Guy T. Falsetti
26. Joseph Fela
27. David S. Forsman
28. Robert Foxworth
29. J. S. Gilstrap, Jr.
30. Juan C. Gualda
31. Glenn Hauser
32. Harry L. Helms
33. Charles L. Hutton
34. Richard W. Kenneally
35. Robert Meuser
36. Thomas R. Mourgos
37. Neal Newman
38. John Pavlica, Jr.
39. Philip J. Rafuse
40. Kevin Redding
41. J. Redding
42. Michael J. Richard
43. John J. Rieger
44. Jay Rogers
45. Kit Sage
46. Russell Skadl
47. Kevin Tekel
48. Donn Tillman
49. Scott A. Todd
50. Frederick R. Vobbe
51. Citizen from Novi, Michigan

Reply Comments:

1. Amherst Alliance
2. Bonneville International Corporation
3. Consumer Electronics Association
4. Fanfare Electronics, Ltd.
5. Glen Clark & Associates
6. Greater Media, Inc.
7. iBiquityDigital Corporation
8. James Crystal Enterprises, LLC.
9. National Association of Broadcasters
10. National Public Radio, Inc.
11. Nautel Limited and Nautel Maine Inc.
12. REC Networks
13. Susquehanna Radio Co.
14. Virginia Center for the Public Press
15. Walt Disney Company and ABC, Inc.
16. John Olson
17. John Pavlica, Jr.
18. Scott A. Todd
19. Lawrence Waldbillig

Late/Ex Parte Comments:

1. Amherst Alliance
2. National Radio Systems Committee
3. iBiquity Digital Corporation
4. Robert Meuser
5. Kevin Redding

**JOINT STATEMENT OF COMMISSIONERS
KATHLEEN Q. ABERNATHY AND KEVIN J. MARTIN**

*Re: Digital Audio Broadcasting Systems and Their Impact on Terrestrial Radio
Broadcast Service, MM Docket No. 99-325*

We support today's decision selecting in-band, on-channel (IBOC) as the technology to be used by AM and FM broadcasters for the introduction of digital broadcasting. We commend the work of the industry for developing a model that will not require allocation of additional spectrum and will allow for an efficient transition to digital radio, during which time consumers will be able to receive their current services without disruption. Today's order allows broadcasters to initiate IBOC transmission on an interim basis, thus ensuring that the radio industry can begin to take advantage of the advancements that digital broadcasting has to offer.

As broadcasters face technological limitations and competitive challenges, the ability to move quickly toward digital audio broadcasting has become increasingly important. Digital radio will allow the industry to respond in a timely manner to the competition that they face from satellite radio services and holds great promise for the revitalization of AM service. In addition, the iBiquity system gives broadcasters the flexibility of providing auxiliary services. Thus, consumers will be able to receive a better quality audio signal now and may ultimately benefit from the development of innovative offerings, such as multiple audio streams and data and interactive services.

We do recognize that there may be some interference with existing services, but we believe that the impact will be minimal and is outweighed by the benefits of digital audio broadcasting. We are, however, particularly concerned about the potential for interference to some receivers used for radio reading services for the blind or visually impaired. We are pleased that the Commission will seek comment on measures to protect these established subcarrier services in its FNPRM. In the interim, we expect that broadcasters will work closely with the affected parties to resolve these issues without intervention from the Commission. We are optimistic that, in the short-term, interference issues can be resolved and, in the long-term, the quality and availability of radio reading services will benefit from the technological advancements of digital audio radio service.

**SEPARATE STATEMENT OF
COMMISSIONER MICHAEL J. COPPS**

Re: In the Matter of Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Radio Broadcast Service, MM Docket No. 99-325

I am very pleased to support this item, which selects in-band, on-channel (“IBOC”) as the technology to advance audio broadcasting into the digital future. Digital radio presents a tremendous opportunity for terrestrial radio broadcasters to compete with new technologies. It holds forth the promise of better quality sound – CD quality for FM, and FM quality for AM – which will enhance audio service generally and may well reanimate AM radio. But that’s just for starters. Going beyond sound quality there will be multiple broadcaster opportunities in the provision of new auxiliary services, such as multiple audio programming channels, audio-on-demand services, and interactive features, too. All these, and perhaps more, will, I believe, enhance audio broadcasting measurably and in the process advance the public interest.

I want to congratulate industry for putting aside traditional competitive rivalries and working together toward the common goal of bringing the benefits of digital audio technology to the American people. It’s a splendid example of private sector partnering, but it went even beyond that to include close cooperation and partnering with the public sector, too. The FCC also played a role here, and my hat is off to our Commission team members who put their shoulders to this task. To my mind, that’s what makes this system of ours work best, with everyone working toward a common goal and the common good. It’s a great model, and I would recommend it heartily for full application in other challenging areas, such as, for one example, the transition to digital television. I hope all the parties involved there will take note and follow suit. As I’ve said before, I am a believer, a true believer, in this kind of cooperative endeavor. In the competitive global economy we all inhabit, we work far more effectively when we work together.

A few questions remain to be settled, including how the IBOC system will function in the real world; what is the potential for and extent of interference that IBOC could cause to existing services; and the technical feasibility of nighttime AM IBOC transmissions. I believe the procedures put in place through this *Order* for resolving any interference issues that arise once interim transmissions begin are reasonable and effective and will enable the industry to address adequately and efficiently any and all such problems.

I look forward to the commencement of interim IBOC operations and to continuing to work with the industry to develop and finalize digital audio broadcasting standards. In Seattle, at the recent Radio Show, I saw first-hand some of the technology and equipment that will soon be available to bring digital radio to all of us. It’s truly exciting.

Finally, my thanks to the Bureau for the hard work and dedication that went into making this happen.