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

The National Association of Broadcasters (NAB)[1] hereby responds to the *Public Notice*[2] soliciting public comment on recent filings in the digital audio broadcasting proceeding. By this *Notice*, the Media Bureau of the Federal Communications Commission (FCC) is seeking comment on three filings: a request by 18 radio broadcasters and the four largest manufacturers of broadcast transmission equipment (Joint Parties) to permit a voluntary increase in digital power for FM digital broadcasters, up to a maximum of 10 percent of a station's authorized analog power;[3] a technical report by iBiquity Digital Corporation (iBiquity) examining the benefits of this proposed increase in digital power, the compatibility with analog broadcasting and the potential interference effects

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[1] The National Association of Broadcasters is a trade association that advocates on behalf of more than 8,300 free, local radio and television stations and also broadcast networks before Congress, the Federal Communications Commission and the Courts.
[2] *Public Notice*, DA 08-2340, MM Docket No. 99-325, October 23, 2008.
[3] Joint Parties *Ex Parte* letter, filed in MM Docket No. 99-325, June 10, 2008 (Joint Parties request).

resulting from the proposed increase;[4] and a study by National Public Radio (NPR) on Corporation for Public Broadcasting-supported research on digital radio coverage and interference.[5]

As discussed below, the benefits of permitting FM broadcasters to optionally increase the power in their digital signal are compelling. The iBiquity study and a companion study conducted by CBS Radio[6] are sound and provide a sufficient and strong basis for the FCC to proceed to authorize the proposal of the Joint Parties.

The Benefits and Necessity of the Power Increase

Digital radio is transforming the radio listening experience across the nation, providing crystal clear audio quality, robust transmissions and new auxiliary services. More than 1800 AM and FM radio stations are now broadcasting in digital, with more than 800 of these FM stations offering new multicast channels.

As proposed to the FCC and ultimately authorized, the digital power levels of the HD Radio system were set at an extremely low level, out of an abundance of caution and in order to conservatively introduce the new digital service and minimize any interference issues. iBiquity at 1. Since then, there have been

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[4] iBiquity Digital*, HD Radio System Test Report, Compatibility and Performance Tests at Elevated FM Digital Power Level*, September 2007, filed in MM Docket No. 99-325, June 10, 2008 (iBiquity Test Report; iBiquity study; iBiquity).

[5] National Public Radio, Inc., *Report to the Corporation for Public Broadcasting - Digital Radio Coverage & Interference Analysis (DRCIA) Research Project*, filed in MM Docket No. 99-325, July 18, 2008 (NPR study).

[6] CBS Radio, *FM IBOC Building Penetration Tests At Elevated Digital Subcarrier Levels*, filed in MM Docket No. 99-325, June 10, 2008 (CBS Radio study).

virtually no reports of harmful interference from HD Radio broadcasts to existing analog FM programming. *Id*.

Now, as part of a natural development of this proven but still evolving digital radio service, real-world experience has shown the need to extend coverage and boost reliability in certain situations. Doing so will improve coverage shortfalls (as compared to analog service) for some FM stations within their protected contours,[7] bolster reception reliability for gaps and fade situations (with moving vehicles) and strengthen signals for building penetration and reception by hand-held, portable devices and HD Radio-equipped cell phones.[8]

Accordingly, over 1200 commercial and noncommercial FM radio stations from various sized markets representing more than 13% of all radio stations nationwide (and many leaders in the implementation of digital radio) and the four largest manufacturers of transmission equipment have banded together to request an increase in digital power for FM HD Radio broadcasts. The Joint Parties are asking the FCC to authorize an increase of up to 10 dB, from -20 dBc

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[7] *See* "*HD Radio IS Radio in the New Millenium*," presented at the 2008 NAB Radio Show by Milford Smith, Vice President, Engineering, Greater Media, Inc. Mr. Smith noted that in many markets this coverage shortfall makes in-car listening over a typical commute problematical if not impossible. One example he gave was from the Boston area where drivers on I-495, a major commuter artery which circles the metro, receive intermittent digital service from Greater Media station WMJX. He said that listeners who purchase their first HD Radio receiver and experience poor digital coverage will be disappointed, and he further noted that good coverage is critical for the popular multicast stations which have no analog backup signal (as do the main channel audio signals). *See NAB Radio TechCheck,* November 17, 2008, *available at http://www.nab.org/xert/scitech/pdfs/rd111708.pdf*.

[8] It is particularly important that reliability increases in difficult reception situations, such as at the edge of service, indoors and with hand-held devices, so that the multicast channels are received, since there is no "blend-to-analog" feature for multicasts.

to -10 dBc, which is the equivalent of an increase from 1% to 10% of a station's authorized analog power. Joint Parties at 1-2.

NAB supports this request, as appropriate for the evolution of digital radio. It will spur the continued roll-out of this important new service for the American listening public. With a voluntary, as-needed power increase that minimizes interference to analog reception while strengthening digital coverage and reliability in all circumstances, stations can have the assurance that digital radio can deliver what their audiences expect, where they expect it. Moreover, with over 85% of stations yet to convert to digital, authorizing a power increase now will be more efficient because stations just starting HD service will be able to build fuller digital facilities and avoid the expense and disruption of a retrofit at a later point.

The iBiquity and CBS Studies Are Sound and Support an Increase in Digital Power

As detailed in their submission, the Joint Parties base their request for an increase in FM digital power levels on the results of a comprehensive test program conducted pursuant to FCC authority by CBS Radio, Clear Channel Radio, Greater Media and iBiquity Digital (the iBiquity Test Report) and a companion study done by CBS Radio.[9] Joint Parties at 3-9. The iBiquity report

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[9] While the *Public Notice* does not specifically request comment on the CBS study, NAB comments on it here because the CBS study is the only other submission providing information on actual field experience with FM IBOC operation at elevated power levels. Further, the CBS study, which focuses on building penetration, complements the iBiquity study which does not address this performance aspect (and in fact the use of station KROQ-FM as an elevated power test facility is common to both studies). In our view the CBS study is second in importance here only to the more comprehensive iBiquity study.

showed in all the test scenarios that the higher digital power resulted in significant improvements in digital coverage extending farther from the transmitter and with fewer drop outs of the digital signal in core coverage areas. These improvements were seen in all conditions, and some stations experienced more than 30% improvement in coverage due to the higher digital power level.

To substantiate the results and conclusions of the iBiquity study, NAB commissioned an evaluation of the iBiquity Test Report, including a detailed computer analysis of the impact of the proposed power increase on digital coverage and analog interference nationwide. Attached hereto is a summary statement of the results of that analysis, which generally confirms the conclusions of the iBiquity report and offers additional insight into the impact of the proposed power increase.[10]

Hammett & Edison performed a computer modeling of FM band In-Band On-Channel (IBOC) digital radio coverage and interference, nationwide, using U.S. Census Bureau 2005 estimates to provide population data. They include in their report a chart detailing projected IBOC stations' digital coverage improvement within each station's protected contour with a 10 dB FM IBOC power increase. Hammett & Edison concludes that a 10 dB power increase would improve digital population coverage within stations' protected contours by a significant amount. *Id*. at 4 and Figure 3.

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[10] *Analysis of Proposed 10 dB Power Increase for FM IBOC Broadcasting*, Statement of Hammettt & Edison, Inc., Consulting Engineers, November 21, 2008 (Hammett & Edison; Hammett & Edison study), attached hereto as Attachment A.

As can be seen in Figure 3 of the Hammett & Edison study, with a 10 dB power increase approximately 12% of stations would see 30% or greater improvement in coverage, with over 6% of stations receiving 40% or greater improved coverage within their contours. Overall, over 40% of stations would receive more than a 10% increase in coverage within their protected contours. By any measure these increases are significant. And, they represent digital reception for audiences within the protected contour. Importantly, the audiences reached with a power increase will be able to receive the multicast channels and improved digital sound that would be denied them otherwise.

NAB also believes that it is important that, as the CBS Radio study shows, increasing the digital power of an FM IBOC signal by 10 dB significantly improves indoor HD Radio reception. In 75% of the buildings tested in that study there was *no* digital reception when the digital power level was at the currently authorized level. With the digital power level elevated by 10 dB, however, the digital radio signal could be received reliably in 75% of the buildings and at selected locations in the remaining 25% of the buildings. CBS Radio study at 5. As the Joint Parties state, this study found that the requested power increase resulted in digital signal building penetration equal to or exceeding analog performance. Joint Parties at 5.

Thus, the improvements in digital coverage achieved with a digital power increase of up to 10 dB will provide substantial benefits for the public in the form of expanded digital coverage and improved reception reliability.

As to the potential for increased interference to analog stations on first adjacent channels, the Joint Parties argue that the listener audio evaluation study in the iBiquity tests do not show a significant effect on analog compatibility. Joint Parties at 8. The Hammett & Edison analysis generally confirms this conclusion. Hammett & Edison found that any increased interference to analog reception within the protected contour from the proposed power increase would be tolerable, even assuming a conservative, nearly worst-case scenario for estimating the potential analog interference from a 10 dB digital power increase. Hammett & Edison at 4.

NAB believes the potential interference would actually be much lower than the Hammett & Edison results suggest. One, the Hammett & Edison analysis assumes that *all* FM stations are broadcasting digitally, whereas presently only 12% of FM stations are on air in digital. Two, it assumes that all stations are operating with the maximum proposed power increase of 10 dB. It is very unlikely, for a variety of reasons, that this would ever be the case.

Even without discounting for Hammett & Edison's conservative approach which is likely overstating the amount of additional interference to analog, their analysis shows that "23.6% of all stations are predicted to experience no analog service impact at all, and 46.7% of stations are predicted to experience less than 2% increased analog interference." Hammett & Edison at 4. Their figures show that 62.5% of stations would experience 5% or less interference, even if all FM stations were broadcasting in digital and at the proposed higher power level, *id*. at Figure 4, which will not happen for years to come, if ever.[11]

NAB notes that, as anecdotal but real world information, two digital stations — Greater Media's WCSX, Birmingham (Detroit), MI and CBS Radio's KROQ-FM, Pasadena, CA — have been on air, under experimental authorizations, with the full 10 dB digital power increase for many months with *no* reports of interference, despite both stations having short-spaced situations.

NAB thus believes that the iBiquity and CBS Radio studies are sound, real-world studies that support the proposed increase in digital power, as requested by the Joint Parties. Hammett & Edison's analysis has generally confirmed iBiquity's test results.

While the portion of the study submitted by NPR addressing the proposed digital power increase reaches contrary conclusions as to analog interference, NAB notes that these results are based solely on computer simulation and that no field measurements of operation at increased power levels were made by NPR. Further, NAB notes that, just as was true for the Hammettt & Edison

[11] The iBiquity study found the only area of potential concern within an analog station's protected contour was with respect to severely short-spaced Class B stations. The Joint Parties, at 8, point out that because the iBiquity tests were conducted with some of the most extreme instances of short-spacing there should be limited concern regarding this issue. To mitigate any such instance of interference, NAB endorses the Joint Parties' recommendation that the Commission establish a procedure whereby it expeditiously investigates and promptly resolves any instance of harmful interference from the power increase.

The iBiquity tests also found that Super B stations operating at higher power levels had a potential impact on first adjacent analog Class B stations *outside* their protected contours. Joint Parties at 8-9. Because of these concerns, the Joint Parties, at 9, propose limits on Super B power increases. NAB supports the Joint Parties' recommendation in this regard.

analysis, the NPR study is likely overstating the amount of analog interference because it assumes all FM stations would be operating in digital, which is not even close to happening, and at higher power. NAB agrees with NPR that, for those situations where operation at elevated power is problematic, other measures can be taken to mitigate instances of interference.

The Commission Should Authorize the Requested Digital Power Increase

NAB supports the Joint Parties' request for a voluntary, up to 10 dB increase in digital power level. The proposed power increase has the potential to strengthen the new digital service and greatly advance the rollout of HD Radio technology by ensuring replication of analog service areas and by enhancing the reliability of digital reception in indoor environments and by next generation hand-held devices, including cell phones with integral HD Radio receivers. We believe that, overall, the proposed power increase will increase the value of the digital system to the American listening public.

Respectfully submitted,

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December 5, 2008

ATTACHMENT A

Analysis of Proposed 10 dB Power Increase for FM IBOC Broadcasting

**Statement of Hammett & Edison, Inc.,
Consulting Engineers**

November 21, 2008

Nationwide Coverage and Interference Analysis for Potential 10 dB FM IBOC Power Increase

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by the National Association of Broadcasters, Washington, D.C., to evaluate the May 2008 report of iBiquity Digital Corporation ("iBiquity"), "*Compatibility and Performance Tests at Elevated FM Digital Power Level*," with respect to predictions of digital service improvement and potential for increased interference to reception of analog service on nearby first-adjacent channels.

Background

The iBiquity report named above describes field testing conducted in 2007 to evaluate increasing the transmitted power of the United States in-band, on-channel ("IBOC") digital broadcasting system used in the FM broadcast band. Based on a carefully selected, but limited, sampling of FM stations, the report concludes that such a digital power increase could be employed by FM stations on a nationwide basis providing an even greater coverage of HD Radio broadcasts without a meaningful increase in the risk of interference to adjacent-channel analog broadcasts in the vast majority of cases.

The issue of analog interference caused by digital signals operating on adjacent channels is illustrated in accompanying Figure 1. As shown, FM stations employing IBOC transmissions on first-adjacent channels would have spectral overlap, with the digital carriers of one station occupying the spectral space used by the analog signal of the adjacent station. Figure 1A shows that the interference would be reciprocal if both stations were operating with IBOC facilities. Of course, the interference would be one-way if just one facility were operating in digital mode. It is noted that the presentation is exaggerated, in that equal-level carrier signals are not permitted to exist within the protected contour of FM stations operating on first-adjacent channels. Instead, Federal Communications Commission ("FCC") allocation rules generally require that stations operating on first-adjacent channels not exceed a signal strength that is 6 dB below the protected station at the limit of that station's defined coverage contour.

Potential interference between IBOC FM stations operating on second-adjacent channels is illustrated in Figure 1B. In this case, interference between stations theoretically would not occur because while the IBOC carriers are immediately adjoining, there is no spectral overlap. This lack of overlap is somewhat dependant on transmission system performance preventing the generation of spectral energy outside of the channel bandwidth.

Computer Modeling of IBOC Coverage and Interference: Methodology

In order to substantiate the conclusions presented in the iBiquity report, a computer simulation of the FM band, nationwide, was undertaken. The universe of FM stations studied for coverage and interference was obtained by searching the FCC consolidated database system ("CDBS") for all full-service FM license records in the continental U.S.* Stations in Alaska, Hawaii, and outlying island territories were excluded, as were all Class D and non-license (allotment, application, and construction permit) records. Canadian and Mexican full-service records for authorized facilities within 300 kilometers of the border were included as interference contributors only. The initial facility lists were manually reviewed to identify and remove redundant records, resulting in a final list containing 8,853 U.S. and 607 Canadian and Mexican facilities.

As a basic premise of the study, all stations were assumed to be broadcasting with IBOC digital signals, creating somewhat of a worst-case scenario. The Longley-Rice (ITS-ITM) propagation algorithm with parameters detailed in attached Figure 2 was employed. Signal strength from each U.S. station was projected at F(50,50) level for coverage, and signal strength from all stations was projected at F(50,10) for interference. Signals were projected at points on a regular grid with a uniform, aligned spacing of 72 arc-seconds, with the overall grid size for each station based on the station's class. Grid sizes for each class were selected by projecting the coverage of class maximum facilities over flat terrain, then adding a "safety margin" of approximately 50 kilometers. At each coverage grid point, signal strength was also computed using the standard FCC propagation curves at F(50,50) level, so the later analysis could also be restricted to cells within the FCC service contour for the class of station being studied.

The U.S. Census Bureau 2005 estimates were used to provide population data in all related calculations. Note that to improve analysis efficiency, cells without population were excluded, so land area was not computed or used as a factor in the study.

Computer Modeling of IBOC Coverage and Interference: Analysis

Once all coverage and interference signal grids were computed, analysis for each U.S. station was performed by combining its coverage grid with overlapping interference grids for stations on first-adjacent channels. At each grid point, population was summed for all Census block centroids within a 72 arc-second-square cell centered on the point. Cells were then analyzed for coverage and interference. For analog coverage determination, FCC service level based on station class was used, applied to both the Longley-Rice and FCC F(50,50) signal strengths; that level was 54dBu for Class B stations, 57dBu for Class B1 stations, and 60dBu for all other classes, including noncommercial stations operating in the reserved (88.1–91.9 MHz) band. For IBOC digital coverage, a level of 60dBu was applied to the Longley-Rice F(50,50) signal, regardless of station class. This assumption is based

* The study was undertaken in December 2007/January 2008 using the December 7, 2007, update of CDBS.

on industry field studies that have yielded a nominal IBOC coverage area that approximates a station's 60 dBu analog service area.

For all cells with a Longley-Rice F(50,50) desired signal above the relevant service level, interference analysis was performed. The first case considered undesired analog interference into desired digital reception. The power of signals on each first-adjacent channel were separately summed, and a 29 dB desired-to-undesired ("D/U") ratio algorithm was employed.† For the present IBOC implementation, the 29 dB D/U ratio was first applied to the lower IBOC sideband of each station at every cell predicted to have threshold (60 dBu) or greater service. If it was exceeded by the power sum of interfering lower first-adjacent analog signals, the upper sideband was then evaluated in the same manner. If 29 dB D/U also was exceeded on the upper side, that cell was deemed to have interference and no digital coverage. If 29 dB D/U was not exceeded in the first check, the cell was deemed to have IBOC coverage (by virtue of at least one recoverable IBOC sideband). An adjusted D/U ratio (19 dB) was then applied to account for the IBOC power increase and the cells were again studied in a similar manner for the presence of interference. In all cases, undesired signals were ignored if less than 34 dBu. 34 dBu was selected as the weakest signal level that could reliably cause interference on a 10% time basis; selection of that value also bounded the calculation such that signals of unreasonably distant stations would not be included.

For calculation of undesired IBOC digital interference into desired analog reception, all undesired signals of at least 34 dBu signal strength on both first-adjacent channels were power summed to produce a single interfering signal level, which was then compared to the desired signal at a 6 dB D/U ratio, representing FCC standards for first-adjacent channel interference protection. The 10 dB power increase was then applied to the IBOC digital sidebands, and each cell was again evaluated for the presence of interference.

Computer Modeling of IBOC Coverage and Interference: Results

The results of the study are summarized in accompanying Figure 3 for IBOC digital service improvement and Figure 4 for increase in interference to reception of first-adjacent-channel analog stations. In each case, the results have been broken down by percent of population presently served. An examination of these figures reveals that over a wide range of percentage increase values, the gains experienced in digital coverage are approximately twice as great as the corresponding amount of increased analog interference. For example, consider all stations predicted to have 10% or more increase in digital coverage or analog interference. In this case, study results indicate that 40.4% of

† The 29 dB D/U ratio was derived as follows: 6 dB FCC D/U ratio for first-adjacent-channel FM analog station, plus 20 dB for power below peak analog carrier level of both digital subcarriers, plus 3 dB for the amount each individual IBOC subcarrier group (lower or upper) is reduced from the overall IBOC power.

stations would experience an increase in digital coverage population, while 22.8% would experience an increase in analog interference.

Of interest, the table of Figure 3 shows that 737 stations (8.3% of the total) are predicted to experience no IBOC service population improvement at all with an IBOC power increase, and 3,718 stations (41.9%) are predicted to receive 5% or less improvement. In these cases, IBOC coverage is predicted to provide or nearly provide service to all population within the analog service contour before application of the IBOC power increase. It is further noted that, from the table of Figure 4, 23.6% of all stations are predicted to experience no analog service impact at all, and 46.7% of stations are predicted to experience less than 2% increased analog interference.

Conclusion

Study results show that for a universe of all FM stations operating with IBOC digital service, a 10 dB increase in digital power would improve digital population coverage within the protected contour by a significantly greater amount than the analog population that would receive increased interference. While any increased analog interference is undesirable, the transitional nature of the new digital service must be considered in creating service demand by new digital listeners. Further, one must keep in mind that a key premise of the study was that all FM stations would operate using IBOC digital broadcasting and would increase IBOC power by 10 dB at once; this scenario is highly unlikely in practice, so the actual interference increase to most stations would be much less than predicted. Thus, it is my professional opinion that the conclusions of the iBiquity report are generally confirmed, with significant potential for improved digital coverage while maintaining tolerable conditions with respect to increased interference to analog reception.

List of Figures

In carrying out these engineering studies, the following attached figures were prepared under my direct supervision:

1. Spectral relationships of adjacent FM IBOC signals
2. Description of radio propagation model employed in the study
3. Projected IBOC digital coverage improvement
4. Projected interference increase to first-adjacent analog stations.

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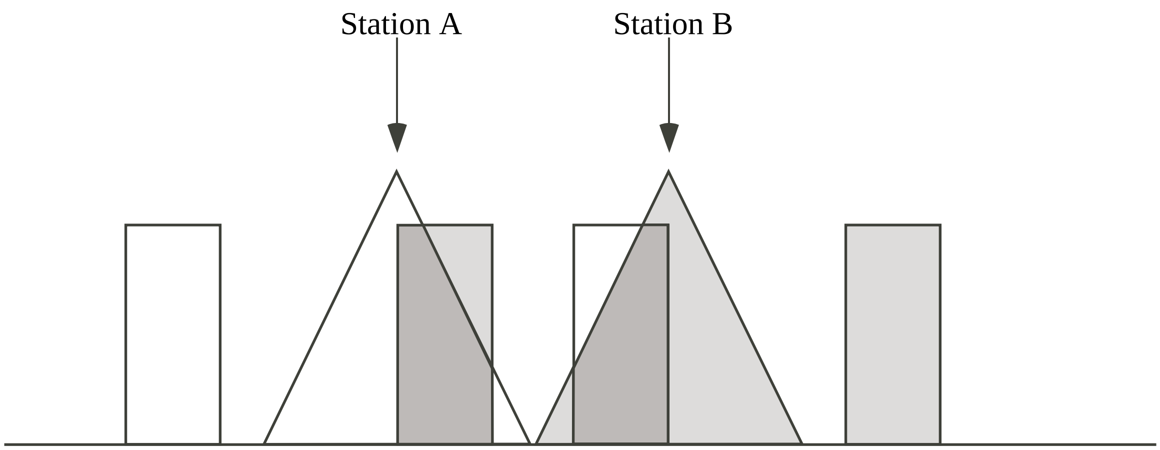
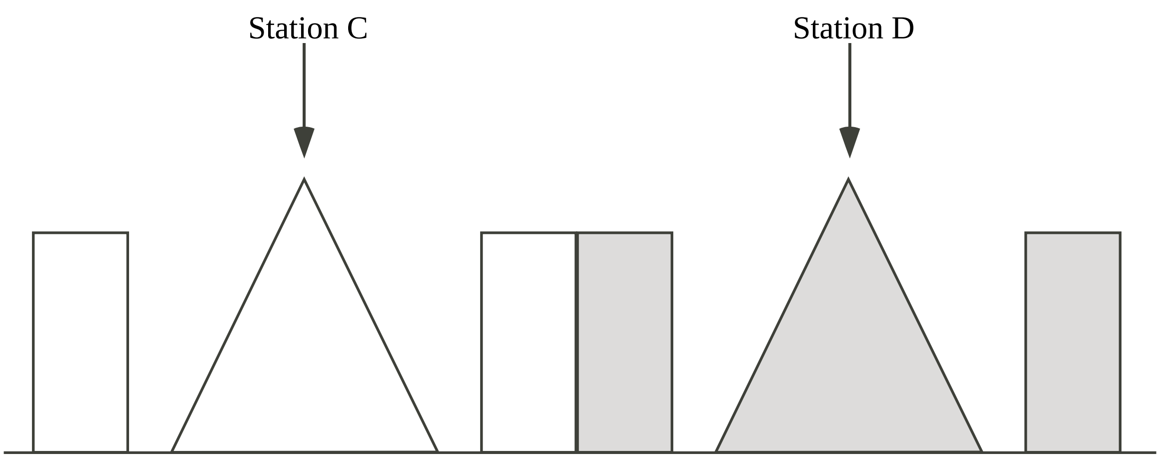
November 21, 2008

Spectral Relationships of Adjacent FM IBOC Signals



A. First-Adjacent Channels: Station A and Station B have overlapping spectra, causing interference to analog reception.



B. Second-Adjacent Channels: Station C and Station D do not have spectral overlap, assuming perfect transmission system linearity in both transmission systems.

Source: iBiquity Digital Corporation

Description of Radio Propagation Model

Radio propagation calculations utilize a method described in the document "A Guide to the Use of ITS Irregular Terrain Model in the Area Prediction Mode," published in April 1982 by the U.S. National Telecommunications and Information Administration, Boulder, Colorado. Based on published work by Longley and Rice in 1968, the ITS model includes computer code (Version 1.2.2) to implement a general purpose simulation of radio propagation for frequencies in the range of 20 MHz to 20 GHz. The model is based on electromagnetic theory and statistical analyses of both terrain features and radio measurements to predict the median attenuation of a radio signal as a function of distance and the variability of the signal in time and in space.

While the document described above specifically indicates area mode calculations, the associated algorithms are capable of, and documented for, use in point-to-point calculations, known as the "Individual Location Longley-Rice" (ILLR) mode. Operation in this mode makes use of specific settings of internal program parameters. Employed parameters are provided below:

Surface Refractivity	301
Relative Ground Dielectric Constant	15
Ground Conductivity	0.005 mmhos/meter
Receiving Antenna Height	9.1 meters above ground level
Polarization	Vertical
Climate Code	Continental Temperate
Mode of Variability	Broadcast Mode
Time Variability	50% or 10%, as appropriate
Location Variability	50%
Confidence (Situation Variability)	50%
Terrain Database	USGS 3-second
Terrain Profile Point Spacing	Variable, 10 points/kilometer maximum

It is noted that the propagation model is not always capable of determining, within certain predefined confidence limits, the degree of attenuation present between two given points. In cases where confidence limits are exceeded, the algorithm returns an error code, indicating that results are "dubious or unusable." Such errors are generally reported for significant obstructions present on a path that are either very close to the transmitter or to the receiver. Hammett & Edison has compared ILLR runs with those of other propagation models and with field measurement data, and has determined that accepting all algorithm path results, even in the presence of the error code, provides usable path attenuation figures.

Nationwide Coverage and Interference Analysis for Potential 10 dB FM IBOC Power Increase

Projected IBOC Digital Coverage Improvement within the Protected Contour

	Increase in Population Receiving Service	No. of Stations	Percent of Total Stations
	no increase	737	8.3%
	0–1%	946	10.7
	1–2	682	7.7
	2–3	531	6.0
	3–4	464	5.2
(1% increments)	4–5	358	4.0
(5% increments)	5–10	1560	17.7
	10–15	1005	11.3
	15–20	660	7.5
	20–25	511	5.8
	25–30	346	3.9
	30–35	280	3.2
	35–40	206	2.3
	40–50	266	3.0
	more than 50	301	3.4
	Totals	8,853	100.0

Notes

1. Baseline population of each studied station determined by all cells within protected contour determined to have signal strength above a 60 dBu digital threshold.
2. Calculated results adjusted using IBOC-to-IBOC first-adjacent interference weighting, as described in statement text.
3. All studied FM stations assumed to be operating in hybrid IBOC mode with increased IBOC power.

Nationwide Coverage and Interference Analysis for Potential 10 dB FM IBOC Power Increase

Projected Interference Increase to First-Adjacent Analog Stations within the Protected Contour

	Increase in Population Receiving Interference	No. of Stations	Percent of Total Stations
	no increase	2,088	23.6%
	0–1%	1,305	14.7
	1–2	744	8.4
	2–3	534	6.0
	3–4	476	5.4
(1% increments)	4–5	389	4.4
(5% increments)	5–10	1304	14.7
	10–15	664	7.5
	15–20	414	4.7
	20–25	292	3.3
	25–30	184	2.1
	30–35	131	1.5
	35–40	101	1.1
	40–50	127	1.4
	more than 50	100	1.2
	Totals	8,853	100.0

Notes

1. Baseline population of each studied station determined by all cells within protected contour determined to have signal strength above class contour analog threshold.
2. A minimum signal strength threshold on 34 dBu was employed for individual interfering stations. Signal strengths that calculated below this level were not included.
3. All studied FM stations assumed to be operating in hybrid IBOC mode with increased IBOC power.