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	)	

To: The Commission

Reply Comments of Barry D. McLarnon, P. Eng.

I submit these comments as an individual. My credentials were outlined in previous comments on this Docket.[1]

It should be clear that the overwhelming majority of commenters, notably including a number of highly respected broadcast engineering consultants, are firmly against a blanket digital power increase until further studies on its impact are completed. The proponents of such an increase are largely entities with a financial interest in the success of iBiquity Digital, or with an interest in increased sales of broadcast equipment. Their claims that an immediate power increase is needed in order not to unduly delay the rollout of this technology are disingenuous, at best. Clearly, the sluggish rate of acceptance of the technology to date is due to indifference on the part of the general public, not deficiencies in coverage.

[1] Comments of Barry D. McLarnon, filed on June 18, 2009.

The NAB continues to claim[2] that "elevated digital power does not cause significant or harmful interference to analog reception of adjacent stations, especially within protected contours". Many commenters, however, have provided evidence to the contrary, demonstrating that this claim is patently false. The difficulties of identifying impairments caused by the noise-like digital signal have been explained by many. Some commenters have also pointed to the lack of a mechanism for individuals to lodge interference complaints, and the fact that high power tests have been conducted under conditions of relative secrecy. Moreover, complaints submitted to the Commission are not a matter of public record, making it difficult for affected broadcasters and listeners to compare their experiences with others. However, several parties have come forward on this Docket[3] to make us aware that harmful interference is a reality, even with the existing 1% digital power levels and the relatively small adoption rate of hybrid IBOC.

The "Joint Commenters" claim that "The Commission already has adequate and flexible complaint procedures to address interference complaints procedures in place to expeditiously resolve any documented allegations of harmful analog interference."[4] I refer again to the comments cited above for examples of how well these "adequate and flexible complaint procedures" have worked. The Commission has apparently adopted the stance that harmful interference cannot exist if stations comply with the rules established for digital operation, and thus has ignored or dismissed documented

[2] Comments of the National Association of Broadcasters, filed on July 6, 2009.
[3] See, for example, the Comments of Nevada City Community Broadcast Group, filed on January 12, 2009; Comments of Rhode Island Public Radio, filed on January 12, 2009; Comments of Daniel Houg, Chief Engineer, KAXE-FM, filed on June 15, 2009; Comments of Positive Alternative Radio Inc., filed June 17, 2009; Comments of Entravision Holdings LLC, filed on July 2, 2009; Comments of Mullaney Engineering Inc., filed on July 6, 2009; and Comments of Klein Broadcast Engineering LLC, filed on July 6, 2009.
[4] Comments of the "Joint Commenters", filed July 6, 2009.

complaints of interference. Small wonder that the "Joint Commenters" would like to see this unofficial policy remain in place!

The "Joint Commenters", echoed by iBiquity Digital Corp[5]., also trot out the hoary justification that the higher power digital signal "fits within the existing FCC FM mask", ignoring the laws of physics and abundant available evidence showing that this mask is unsuitable as a standard for protection of adjacent channel stations from constant duty cycle digital emissions. They also conveniently ignore the fact that the proposed power increase *does not* fit within the revised mask for hybrid FM IBOC operation that was adopted by the Commission as part of the NRSC-5 standard.

For its part, the NAB has long fought a dogged campaign against the LPFM service. It cannot have escaped their attention that higher digital powers will increase the noise floor in the FM band, and effectively limit the viability of LPFM stations, not to mention handicap the coverage of small full service broadcasters in "rim shot" situations. The Commission should seriously consider whether it is in the public interest to hand the large broadcasters a weapon that will decrease competition, and reduce the choices available to the listening public.

When proponents of the IBOC system were making the case for its adoption as the DAB standard for the US in the early part of this decade, field trial data was put forward that showed adequate coverage at the 1% power level. Indeed, some tests showed coverage well beyond the protected contours of the test stations. In addition, propagation

[5] Comments of iBiquity Digital Corp., filed on July 6, 2009.

prediction tools were readily available that could be used to predict digital coverage for other stations. At no time was there any indication given that the digital power level was being set conservatively, or that a power increase might be necessary at some future date. The Commission must carefully weigh whether it is sound public policy to now permit a sudden radical change in the characteristics of this system, and to consider what other agendas might be at play in advocating such a change.

Charles River Broadcasting has submitted test results[6] showing improvements to digital coverage for WKLB-FM when digital power is increased. Their report, of course, makes no mention of the collateral damage to the analog coverage of adjacent channel stations if such a power increase were granted. Figure 7 of their report highlights coverage deficiencies with 1% digital power in the southern part of their protected contour, in the area near Providence, RI. Figure 9 shows coverage improvements in this area with 10% digital power, including some new coverage outside the protected contour, though coverage throughout the highlighted area remains somewhat spotty. The primary reason for the coverage deficiencies in this area is the presence of dual first adjacent stations WMOS-FM (102.3 MHz) in Stonington, CT, and WRNI-FM (102.7 MHz) in Narragansett Pier, RI. Any digital coverage improvement for WKLB-FM by the brute force means of a power increase would clearly result in a commensurate loss in analog coverage for these stations. Indeed, we already have a filing from Rhode Island Public Radio on record[7], stating that substantial unsolicited interference complaints were received from WRNI-FM listeners during the WKLB-FM high power tests, including

[6] Comments of Charles River Broadcasting, filed on July 6, 2009.
[7] Comments of Rhode Island Public Radio, filed on January 12, 2009.

interference inside the protected contour of WRNI-FM. What is truly remarkable about this report is that WRNI-FM transmits in mono, and mono transmission provides much greater immunity than stereo to noise and in-band digital interference due to first-adjacent IBOC. This particular situation is clearly just the tip of the iceberg in demonstrating the potential for harm from a blanket digital power increase. It is a good illustration, however, of how such a power increase would provide a tool for big market broadcasters with deep pockets to ride roughshod over smaller broadcasters serving outlying areas.

Field test results made available on this Docket over the years have shown that, in many cases, digital coverage does extend to, and often beyond, the protected contours of IBOC stations. Where deficiencies in coverage exist, as in the case of WKLB-FM cited above, they are usually due to the presence of dual first adjacent stations. It should be obvious that improvements to this coverage by the brute force means of a power increase can only be gained at the cost of further damaging the analog coverage of these stations. Hybrid IBOC is akin to a "white space" system, but without any finesse – it makes use of spectrum legitimately assigned to other stations, whether that spectrum is "white" or not. With the pressure now on to apply even more brute force, surely it is time to introduce some tools to intelligently manage this spectrum usage, as is the case for virtually all other licensed spectrum.

In their recent comments[8], NPR mentions lab test results showing that, on average, FM stereo receivers require a D/U ratio of 12 dB to provide good reception in the presence of a first adjacent hybrid IBOC station using 1% digital power. Since the digital

[8] Comments of National Public Radio, filed on July 6, 2009.

interference is entirely in-band, one would not expect a large variance in receiver characteristics, (such as that which exists for first adjacent analog-to-analog interference, for example), so this figure should be fairly representative for FM receivers in general. NPR also provides an revealing breakdown on the first adjacent D/U ratios that currently exist for all full service FM stations in the US. This survey shows that, in the non-reserved band, the vast majority of stations have first adjacent D/U ratios at their protected contours of 12 dB or less. For all of these stations, any increase in digital power by their first adjacent neighbors that run hybrid IBOC is likely to have a negative impact on their analog coverage *within* their protected contour. Indeed, a large number of stations having D/U ratios less than 12 dB stand to be negatively impacted by hybrid IBOC operations even at the 1% power level (remember that, at the current IBOC penetration level of only about 15%, most of these interference situations have not come to pass yet). Less than 10% of stations in the non-reserved band are shown to have any headroom for a digital power increase by their neighbors beyond 1%, and even in these cases, the feasible power increase would be very modest (of the order of 2 dB). The situation is somewhat different in the reserved band, where the statistics show that roughly half of all stations could accommodate a power increase without serious damage to analog coverage inside protected contours, though the permissible increase would be less than 10 dB in all cases.

A slightly different take on the interference situation is provided in the comments submitted by Givens & Bell Inc. Their analysis shows that if a first adjacent station is running hybrid IBOC at the 10% power level, then for the desired analog station, “the

SNR would be unlistenable when the D/U ration [sic] drops below 13 dB D/U"[9]. The criterion for "unlistenable" is the 30 dB WQP SNR "tune-out" threshold established in 2001 by the NRSC. Going back to the NPR statistics, we can see that about 90% of stations in the non-reserved band, and about 50% of stations in the reserved band, are already afforded less than 13 dB D/U protection from first adjacent stations. All of these thousands of stations would therefore potentially experience "unlistenable" analog service in the vicinity of their protected contours if their first adjacent neighbors were permitted to operate at 10% digital power. But surely these stations have a right to expect something better than zero service at their protected contours! If we instead establish a more reasonable target of 40 dB SNR for minimum acceptable analog service inside protected contours, as advocated by NPR, then the minimum D/U requirement for 10% digital power would move up to 23 dB D/U. According to the NPR figures, *no stations* currently have this level of protection, so this entirely reasonable criterion would exclude *all stations* from an increase to 10% digital power.

NPR has proposed an interim policy that uses a simple formula to calculate the permissible power increase, based on the existing protected contour D/U ratio, calculated in the usual way from F(50,50) and F(50,10) propagation curves. In contrast to the analysis in the preceding paragraph, however, they are proposing to use 6 dB D/U as the protection criterion, rather than the 12 dB that they have previously shown to be necessary for adequate protection from first adjacent hybrid IBOC emissions. This is a tacit admission that some hybrid IBOC stations are already causing significant

[9] See p. 5 of *FM Radio Reception in the D.C. Market for Various IBOC Power Levels*, included as Section 3 of Comments from Givens & Bell Inc., filed July 6, 2009.

interference inside the protected contour of other stations, under the existing rules; however, this is a poor justification for permitting all other stations to do so. The larger problem with this formula is that it is too simplistic. A simple comparison of F(50,50) and F(50,10) contours does not give a true picture of the potential impact of the digital operations of a given station. NPR has previously provided the results of studies on a number of stations that make use of state of the art propagation prediction tools, interference modeling, and population distribution data. This approach is far more effective and accurate in predicting the impact of interference, and should be used to study the impact of any proposed power increase. A power increase should not be permitted unless such a study shows that the impact will be minimal, or unless an agreement is obtained from the affected station(s) to accept the increase in interference.

It is very odd that NPR should propose an interim power increase at this time, based upon a simplistic formula, while their own studies of this matter are ongoing. It should be obvious that the Commission should discard this proposal, and wait until the results of these studies are available, before proceeding on this matter.

If an FM station requests an increase in its analog power, the Commission requires a thorough study of the impact on the coverage of other stations. It should require no less than this if a digital power increase is proposed.

It should also be mentioned that there remain outstanding technical issues to be addressed with regard to compatibility of analog receivers and the hybrid IBOC system. One such

issue is the potential for self-interference to the host analog signal. As stated in the white paper included with the comments from Givens & Bell Inc.[10], tests by the NRSC in 2001 showed that the output SNR of a portable FM receiver dropped from 59 dB to 35 dB when IBOC at the nominal 1% power level was switched on. Extrapolating that figure indicates that the SNR would drop well below the 30 dB "tune-out" threshold if the digital power were increased to 10%. Moreover, the self-interference can be expected to be even worse when the Extended Hybrid modes are used, since these modes add digital carriers closer to the desired analog signal. These modes were not studied at all by the NRSC, yet they are included in the NRSC-5 standard and are permitted by the current rules for digital operation. To my knowledge, the only technical information on the impact of these modes ever submitted to the Commission was a brief report by NPR in 2004[11]. It did disclose some additional degradation in SNR in certain receivers (but not including the Sony receiver previously tested by the NRSC) due to the use of Extended Hybrid mode operation; however, it dealt only with one of the three modes (not the most severe in terms of potential for self-interference), and only the 1% digital power level was investigated. Surely this gap in knowledge must be filled before proceeding with any power increase.

Lastly, I remind the Commission that other options for improving digital coverage have been proposed, but very little hard evidence of their efficacy has been presented to date. These options include coverage boosters ("single frequency networks"), asymmetrical

[10] See p. 4 of *FM Radio Reception in the D.C. Market for Various IBOC Power Levels*, included as Section 3 of Comments from Givens & Bell Inc., filed July 6, 2009.
[11] John Kean, National Public Radio, *Host Compatibility Measurements for the Extended Hybrid Mode of IBOC Digital Audio Broadcasting*, October 29, 2004.

digital sideband power levels, and, most recently, changes to antenna radiation patterns[12]. Surely it is prudent to explore all other options thoroughly before embarking on the brute force approach of a power increase. In addition to the aspects of unfair competition and the prospect of potentially disenfranchising millions of analog listeners, consider also the international implications of such a move in the border areas. It is hard to see how any proposed power increase could be in the public interest at this time.

Respectfully submitted,

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[12] See Reply Comments of Leroy C. Granlund, filed July 13, 2009.