

The author of our comments is Andy Laird, Director of Engineering, Radio Group. He has been serving as an industry volunteer with the Electronic Industries Association (EIA) Digital Audio Radio Subcommittee (DAR) and the National Radio Systems Committee (NRSC) Digital Audio Broadcast (DAB) Subcommittee for the last eight years. These standards groups are working toward a digital radio solution for the USA. He currently chairs the Test Guidelines Working Group of the NRSC DAB Subcommittee, which is observing the work of three In Band On Channel (IBOC) system proponents.

First Technical Issue:

INTERFERENCE GENERATED IN EXISTING RADIOS

The Proposal is based on false assumptions about the performance qualities of existing radios. All of the technical planning, examples and conclusions in the Proposal are based on these assumptions.

The opening paragraph #1 of the Proposal, states that "We are proposing that LPFM stations not be subject to certain technical rules currently applied to other classes of radio service. In particular, we believe that current restrictions on third-adjacent channel operations are not needed for LPFM stations and we believe it may be possible to disregard second-adjacent channel interference for these stations as well." The proposal goes to great lengths considering separations and power levels presented in tables and charts as a plan of "how we may be able to do this". It asks for careful consideration of these issues.

The only way to carefully consider these issues is to review and draw conclusions from measured data of broadcast "system" performance. The broadcast "system" includes receiver performance. This review is the only way to predict the impact of changes to existing interference protection criteria. Nowhere in the Proposal is information presented that demonstrates why the proposed changes

in interference protection criteria can be made without creating harmful interference to the current broadcast "system". The only performance information provided about receivers in the LPFM Proposal are statements that contain "we believe". There are no supporting data to illustrate the basis for this belief.

The technology exists to build radios with great selectivity performance that could allow the LPFM Proposal to work. The evidence exists that most radio receivers are built only to perform reasonably well within the existing protection criteria. The evidence shows that a manufacturer does not spend an extra cent to produce a radio with greater selectivity if not needed. The extra cost cannot be sold to a consumer because they rarely need better performance. The only exception to this is with automobile radios and some Hi-Fi receivers. Receiver designers who supply original equipment to auto manufacturers say that car buyers will return their new car to a dealer if they believe the radio is "broken" (i.e., it does not possess adequate selectivity to provide clear reception in an environment of adjacent channel interference). To prevent a return, the auto manufacturer is willing to spend extra money for a higher level of performance. However, this is not the case among manufacturers of most household, office and portable radios.

THE NAB RECEIVER STUDY

To answer questions about what effect the LPFM proposed relaxation of interference protection criteria might have on the broadcasting system, a specific research project to measure receiver performance was needed. A volunteer technical advisory group was formed by the NAB to design this study. The resulting study examines twenty-eight current radios; eight car radios, five clock radios, five Hi-Fi receivers, five personal radios and five portable radios. They span a range from expensive to inexpensive. Some of the radios do not have external antenna inputs. They represent a broad selection of what

is available today. The NAB Receiver Study has been submitted by the NAB in its comments to this Proceeding. The details of the study can be found there.

OBSERVATIONS

Journal Broadcast Group makes these observations based on the NAB Receiver Study:

For third adjacent channels, the receivers perform as expected with present protection criteria at the edge of the protected contour. However, performance significantly degrades as signal levels increase while not changing the ratio of desired signal to undesired signal. Even though the ratio stays the same, interference increases significantly. The LPFM Proposal depends on being able to "drop in" signals within the higher signal areas of an existing station. This variable performance is an enormously important finding that brings into question the validity of all of the interference and service predictions in the Proposal.

For second adjacent channels, the receivers do not perform up to present protection requirements for non-reserved band stations, but do appear adequate when the second adjacent channel interfering station is outside the desired stations protected contour. As with the third adjacent channel performance, second adjacent performance significantly degrades as signal levels are increased while holding the ratio of desired signal to undesired signal the same. Even though the ratio stays the same, interference increases significantly. The LPFM Proposal depends on being able to "drop in" signals within the higher signal areas of an existing station. This variable performance is an enormously important finding that brings into question the validity of all of the interference and service predictions in the Proposal.

Based on analysis of this study, Journal Broadcast Group concludes that the LPFM Proposal will significantly increase interference to existing FM service. The study also shows that this interference will also significantly

reduce the coverage areas predicted in the Proposal for the LPFM stations.

ANECDOTAL EVIDENCE?

Where is the LPFM Proposal receiver data? Without it, we must assume that the technical beliefs on which this proposal is based are the result of anecdotal evidence.

Should the entire FM broadcast system be put at risk based on anecdotal evidence? If the anecdotal evidence is wrong how will the mistake be fixed? Will the LPFM stations be shut off? Verbal comments from several Commissioners in the last few months state that they rarely receive any interference complaints. Can we depend on complaints as a foundation for engineering a broadcast system? Of course not. There is far too much at stake.

The first IBOC (digital "In Band On Channel") designs are a good example of how anecdotal evidence can fail to reveal problems caused to our broadcast system. In the early 1990s, USADR spent millions of dollars designing and field demonstrating FM IBOC systems. Their system was operated experimentally in several major cities and the test stations received no interference complaints from listeners. Very carefully controlled laboratory tests of this and other systems were performed by the EIA in Cleveland around 1995. A committee of receiver manufacturers and broadcasters narrowed the selection of test radios down to five. The circuits (chip sets) in these five radios represented a large majority of radios in use at that time. One of the tests of interest was to determine the effect of the IBOC signal on the performance of these radios. Was the IBOC system compatible with current radios; will it degrade the performance of current radios and by how much? Among other things, a major compatibility problem was revealed by this test. Without the careful laboratory tests, this issue would not have been discovered until after the system had been deployed. Listener complaints did not reveal the problem.

Second technical issue:

IMPACT ON A DIGITAL BROADCASTING SYSTEM IN THE USA

We believe that the Proposal could doom the possibility of an In Band On Channel (IBOC) digital solution with future migration to all digital within the existing FM band. Second generation IBOC systems have been designed to address the flaws discovered in the Cleveland tests noted above. Final design and testing of three different systems is underway. The three proponents have promised the NRSC DAB Subcommittee that they will submit complete test data of their systems for review by December 15, 1999. There is not enough information at this time to make a judgement about what harm, if any might be caused to IBOC by relaxing interference protection criteria.

All three of the IBOC systems place low level digital information above and below the frequency space used for analog information. The allowed "RF mask" extends through the first adjacent channels on either side of the subject station and this is where the digital information is transmitted.

The IBOC designs are based on the existing station protection criteria. Under the LPFM Proposal, the digital transmission information will become first adjacent to LPFM second adjacent channels. No receiver manufacturer has demonstrated to date that they will be able to separate first adjacent digital information when it is located next to a second adjacent interferer.

SUMMARY

Journal Broadcast Group has concluded that the technical foundation of the LPFM Proposal is based on flawed assumptions about receiver performance. The Proposal will cause significant interference to existing broadcasters and will fail to provide the coverage predicted for the LPFM stations. Because of the reception characteristics of hundreds of millions of radios now in use in the

United States, the Commission cannot relax current interference protections for second or third adjacent channels. For these reasons, Journal Broadcast Group concludes that the LPFM Proposal that would relax current interference protections is not in the Public Interest.

Journal Broadcast Group believes that the LPFM Proposal endangers an IBOC digital solution for the FM band. It is in the Public Interest to allow the migration of the present broadcasting system into digital within its existing band. Three proponents have invested heavily to develop an IBOC digital solution, and they appear close to success. Hasty implementation of the LPFM Proposal could eliminate any opportunity for digital broadcasting in the existing FM band.