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BROADCASTERS®

ORIGINAL

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August 2, 1999

AUG 2 1999

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *Low Power Radio Service*, MM Docket No. 99-25

Dear Ms. Salas:

We are attaching for filing in the above-referenced docket the comments of the National Association of Broadcasters. NAB's comments are in three volumes: Volume I contains the text of our comments, two studies refuting the Commission's assumptions regarding the need for a low power radio service, and a study of the economic effects of instituting such a service; Volume II contains engineering studies of the impact of reducing interference standards as the Commission proposed; and Volume III contains 240 color maps demonstrating the impact of low power stations on radio reception in the 60 markets examined in Appendix D to the *Notice of Proposed Rulemaking*.

Because we recognized that this is a very large filing and would place a strain on the ECFS system and those who rely on it to obtain comments, we were prepared to provide the Commission with an electronic copy of NAB's comments, all of the attached studies, and the color maps. In discussions with the ECFS staff, as well as the Mass Media Bureau last week, we were informed that the Commission would not make any use of electronic copies of our comments submitted on diskettes or CD-ROMs, and would instead scan our entire filing manually. We regret that this decision will delay other parties' access to NAB's comments, and may result in a diminished quality of their reproduction on the ECFS system. Should you now determine that electronic versions of the comments and attachments would be used, we would be prepared to submit them in short order.

Should there be any questions concerning this matter, please direct them to the undersigned.

Respectfully submitted,

Henry L. Baumann

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

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In the Matter of	)	
	)	
Creation of a Low Power Radio Service	)	MM Docket No. 99-25
	)	
	)	RM-9208
	)	RM-9242
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	)	

Comments of the National Association of Broadcasters

VOLUME ONE OF THREE

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TABLE OF CONTENTS

Volume One

Executive Summary i

I. INTRODUCTION 1

II. THE COMMISSION'S ASSUMPTIONS REGARDING THE NEED FOR AN LPFM SERVICE ARE UNFOUNDED 3

A. Consolidation Has Not Boiled The Industry Down To Only Mega-Companies 4

B. Format Diversity Has Increased After The Passage Of The Telecommunications Act Of 1996 6

C. The Commission Dismissed "Other Options" To LPFM Too Quickly 8

III. THE COMMISSION'S ASSUMPTIONS REGARDING THE TECHNICAL ISSUES ARE UNFOUNDED 10

A. The Commission Must Not Repeat the Allocation Mistakes of the Past 11

1. The allocation errors made at the beginning of the FM era should not be repeated 11

2. The Commission has previously relaxed second and third adjacent channel protection criteria and then been forced to tighten them due to interference problems 13

3. The Commission's failure to consider the mistakes made regarding the AM band threatens to provide the same fate to FM 15

B. The Second and Third Adjacent Channel Allocation Standards Cannot Be Modified 16

1. There was clearly no basis for the Commission's conclusion in the *Notice* that second and third adjacent channel protection criteria can be relaxed 16

2. Extensive NAB testing of currently available receivers demonstrates that second and third adjacent channel interference protection is still necessary 28

3. The NAB test results demonstrate that the ability of receivers to reject adjacent channel interference has not improved 35

4. Based on NAB's receiver study, substantial interference to existing stations and their listeners will result from LPFM 37

5. The Commission cannot relax distance criteria for LPFM stations without doing the same for full-power stations 40

C. Full-Power Stations Will Face Additional Interference Beyond Their Protected Contours 41

D. The Commission Has Made little Effort to Shepherd the Radio Broadcasting Industry into the Digital Age 43

1. The Commission should apply the principles developed in the digital television proceeding to the radio industry's migration to digital technology 43

2. The Commission should pursue a serious analysis of IBOC DAB technology and how its implementation might be impacted by a low power FM service 46

3. The Commission's early allocation procedures must be kept in mind as the transition to IBOC DAB begins 48

E. The Federal Aviation Administration ("FAA") is on Record Regarding Its Concerns on the LPFM Proposal 48

F. There is No Rational Basis to Deviate from the Commission's Long Standing Policy that Low Power Services are an Inefficient Use of the Spectrum 49

IV. THE LPFM PROPOSAL THREATENS TO UNDERMINE THE ABILITY OF STATIONS TO SERVE THE PUBLIC 52

A. The Commission's Proposal Will Repeat the Error of Docket 80-90 52

B. The Commission's Proposal Will Adversely Affect Smaller Radio Markets, Resulting in Decreased Service to the Public That Cannot Be Adequately Replaced 55

C. The Proposal Threatens the Existence of Reading Services for the Blind That Are Carried On Subcarriers of Full-Power Stations 58

D. The LPFM Proposal Threatens the Existence of Many Translators That Provide Service to Otherwise Unserved Areas 59

1. If the Commission insists on establishing an LP1000 class, existing translators and boosters must be protected regardless of the LPFM station's primary status 59

2. Translators and boosters also must be protected from interference by LP100 stations, if the Commission establishes such a class 63

V. THE LPFM *NOTICE* RAISES MANY IMPLEMENTATION ISSUES 64

A. The Commission Lacks Adequate Enforcement Resources to Properly Regulate the Addition of Hundreds of LPFM Stations 64

1. The Commission must consider its ability to carry out enforcement of any rules that are applied to LPFM stations 64

2. The Commission is the only entity that has the authority to enforce regulations 67

3. The Commission must consider the enforcement needs regarding pirate broadcasters 67

4. The Commission's reduced bandwidth proposal will be ineffective to combat interference 68

B. The Commission Cannot Implement the Proposed Ownership Restrictions 69

1. If established, the Commission cannot limit the ownership of LPFM stations to 'non-broadcast licensee" owners 69

2. The ownership rules established in the Telecommunications Act of 1996 apply to any broadcast service whether or not it existed when the legislation was enacted 71

3. Adding stations - even LPFM stations - to a market would increase the number of stations for determining the maximum number of stations an entity can own 72

4. Granting "amnesty" for known pirate broadcasters rewards illegal behavior 74

C. Service Rules Should Be Required for All Proposed Classes of LPFM Service to Maintain Adequate and Equitable Regulatory Control 75

D. The Commission Lacks Ability to Guarantee LPFM Stations Will Be Allocated to the Entities That It Has Promised 78

1. Mutually exclusive commercial licenses must be auctioned 78

2. Virtually no LPFM allocations are available in urban markets and numerous allocations exist in rural markets without modifying any current restrictions 80

VI THE COMMISSION SHOULD NOT ESTABLISH A MICRORADIO SERVICE 81

A. A Microradio Class Would Lead to Inefficient Use of the Spectrum, Degradation of the FM Band and Implementation Issues for IBOC 81

B. A Microradio Class Would Require More Resources to Implement and Enforce 83

C. A Microradio Service Would Not Result in More Service to the Public 84

VII. CONCLUSION 86

ATTACHMENT A – Independent Radio Voices in Radio Markets

ATTACHMENT B – Format Availability After Consolidation

ATTACHMENT C – LPFM: The Threat to Consumer Welfare

Volume Two

Summary of Volume Two i

Standard of Service for FM Receiver Tests ..... Exhibit A

FM Receiver Interference Test Results Report ..... Exhibit B

Selection of Receivers for FM Receiver Testing and Analysis of Test Results ..... Exhibit C

Volume Three

Summary of Volume Three i

Interference from Low Power FM Stations to Existing Stations 1

APPENDIX A

LP1000 Interference Maps
LP100 Interference Maps

APPENDIX B

LP1000 Interference Maps
LP100 Interference Maps

EXECUTIVE SUMMARY

The National Association of Broadcasters ("NAB") submits these Comments in response to the *Notice of Proposed Rule Making* in MM Docket 99-25 (Creation of a Low Power Radio Service). NAB opposes the proposals in the *Notice* because, among other things, we believe the Commission's assumptions regarding the need for such a service and its assumptions regarding technical issues are unfounded.

First, the Commission has assumed that consolidation has decreased independent voices in the industry, made entry harder and decreased diversity. NAB shows that consolidation has not eliminated independent voices. In many markets (including major markets), substantial portions of stations remain standalones or duopolies. There is no indication that independent voices have been eliminated after the Telecommunications Act of 1996.

Further, NAB's study of format diversity proves that since the Telecommunications Act, the number of formats has continued to increase. Thus, consolidation has lead to more diverse service to the public, not less as the Commission hypothesized. The Commission also dismissed other options, such as Internet radio, too quickly in its quest to provide for more radio stations. Internet radio is a viable option for individuals and groups to be heard. Internet usage and access has been increasing daily. Thus, there are other alternatives to provide "voices" without degrading existing radio services.

Most importantly, recognizing that under existing standards, very few LPFM stations could be located in large markets the Commission assumed that receivers have improved to the point that radios can reject 2nd and 3rd adjacent channel interference, and proposed to eliminate these protections. It based this assumption on unsubstantiated comments of LPFM supporters and without having conducted any receiver testing on its own. NAB's receiver study proves that

the majority of receivers do not perform even as well as the Commission's existing standards assume. Shoehorning LPFM stations into existing markets will create new interference for millions of listeners and reduce the quality of radio service. Further, these LPFM stations would themselves be subject to interference from existing stations, and NAB's receiver studies show that their service areas would in fact be far smaller than the Commission supposed. All five Commissioners have committed that they would not adopt LPFM if it would create interference to existing radio service. Thus, the Commission cannot eliminate 2nd and 3rd adjacent channel protections. Without eliminating these protections, the feasibility of LPFM is eliminated in the medium and large markets.

The Commission also did not consider the impact of its proposals on the transition to In-Band, On Channel Digital Audio Broadcasting ("IBOC DAB"). The Commission must establish an IBOC standard and implement it before any LPFM service is established.

The proposal in the *Notice* to authorize low power service also is contrary to decades of Commission decisions which concluded that lower powered stations are an inefficient use of spectrum. The *Notice* fails to even recognize these decisions, much less suggest any reasons why they are no longer valid. As the courts have repeatedly held, agencies may not depart from established precedents without a cogent explanation of the reasons for their change in views.

In addition to the technical issues, the LPFM proposal will undermine the ability of stations to serve the public. The reasons behind the LPFM proposal mirror those of Docket 80-90, where the Commission changed its rules to add thousands of new stations. It was Docket 80-90 that led to relaxation of the ownership rules first by the Commission and ultimately by Congress. The consolidation the Commission is attempting to combat is a direct result of its prior actions in adding new stations.

An economic study from Strategic Policy Research ("SPR") shows that local stations will not be able to continue to offer quality local programming if LPFM is established. SPR concludes that the result of the LPFM proposal from an economic viewpoint will lead to a decrease in service from full power stations. SPR also concludes that LPFM stations likely would not be able to provide any useful service to communities.

The Commission also failed to consider the impact of its LPFM proposal on existing reading services for the sight-impaired. These services depend on subcarriers, and they could be wiped out if LPFM is implemented. Additionally, the Commission would have to grandfather all existing translators and boosters for both the LP1000 and LP100 service in order to ensure that the service provided by these stations – and depended on by listeners – is not interrupted. Doing so would reduce the number of LPFM stations that could be allocated in larger markets to almost nothing.

NAB also addresses the implementation issues faced by the Commission. The magnitude of the Commission's proposal should place enforcement at the top of the issues to be considered before implementation. The Commission proposes to drop in hundreds of LPFM stations without regard to its own ability to monitor and enforce its regulations. It is one thing to establish rules, and quite another to carry them out. The task of regulating thousands of full-power stations, shutting down pirate stations and controlling hundreds – or thousands – of low power stations could become impossible to carry out. Further, it is a job that only can be done by the Commission, and not any other entity. The Commission should not consider authorizing LPFM unless and until it has adopted an enforcement plan and identified the additional resources necessary to carry it out.

The Commission cannot implement its proposed ownership restrictions for LPFM. There is no basis for barring broadcasters from holding LPFM licenses. Further, the Telecommunications Act of 1996 applies to any broadcast service, whether it existed at the time of the Act's implementation or not. The Act's provisions apply to "commercial radio stations," and do not distinguish between power levels. Thus, there is no basis to conclude that the liberalized local and national ownership provisions of the Act would not apply to LPFM merely because these stations operate at lower power. Also, the Commission cannot restrict the ownership levels for LPFM as contemplated in the *Notice*, if an LPFM service is established. In fact, under the Act's provisions, adding new commercial voices – even LPFM stations – would increase the number of voices in each market. The result would be further opportunities for efficiencies through consolidation in the radio industry. This would be a counter intuitive effect from the Commission's perspective.

The Commission also proposes to grant amnesty to pirate broadcasters who voluntarily ceased broadcasting after the LPFM proposal was adopted. Pirate broadcasters should not be afforded any amnesty with regard to their character qualifications as potential applicants for an FCC broadcast license.

If established, NAB believes that LPFM stations must follow the same regulations as full power stations. There should be no distinction in regulation between low power and full power stations. An FM station is an FM station no matter what power since they will not appear to listeners to be different. Separate regulatory schemes will confuse the public, burden the Commission and result in inequitable regulatory burdens.

In proposing the LPFM service, the Commission believes it can provide opportunities to a wide variety of individuals and groups. In reality, there is no guarantee that the goals of the

Commission will be realized. Any commercial broadcast license must be auctioned pursuant to the Balanced Budget Act of 1997. Further, the spectrum limitations – even under the Commission's own Spectrum Availability Analysis – show that virtually no LPFM stations of any size could be available in most of the urban markets. In the smaller markets, there is already spectrum available without altering any protection criteria.

Finally, the Commission asked for comment on establishing a microradio service. In addition to the fact that microradio and LP100 stations are inherently inefficient uses of the spectrum, a microradio service would exacerbate other issues raised by the LPFM proposal. A microradio service must not be considered.

The Commission's LPFM proposal rests on a series of assumptions about the radio marketplace, about the technical standards needed for interference-free service, and about the legal and economic environment for radio service. NAB's comments examine each of these suppositions and demonstrate that they are without foundation. There is no need for LPFM service; LPFM would create vast amounts of new interference and risk the radio industry's transition to digital; LPFM would result in a net loss of service to the public; and LPFM stations must be subject to the same regulatory regime as other stations. Since the assumptions supporting the LPFM proposal are not valid, the Commission should not authorize a low power radio service.

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

In the Matter of	)	
	)	
Creation of a Low	)	MM Docket No. 99-25
Power Radio Service	)	
	)	RM-9208
	)	RM-9242
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Comments of the National Association of Broadcasters

I. INTRODUCTION

The National Association of Broadcasters ("NAB")[1] submits the following comments in response to the above-captioned *Notice of Proposed Rule Making* ("*Notice*").[2] The *Notice* proposes the establishment of a new low power radio service ("LPFM") to co-exist in the FM band with the existing full power service. NAB opposes the proposals in the *Notice* because, among other things, we believe the Commission has failed to consider the technical ramifications of such a service on both existing analog broadcasters and their transition to a digital world.

The Commission admits that it must "make room" for any low power radio stations – particularly in urban areas. In order to squeeze in these small stations, the Commission proposes to change its longstanding second and third adjacent channel separation criteria.

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1 NAB is a non-profit, incorporated association of radio and television stations and broadcast networks which serves and represents the American broadcasting industry.

2 In the Matter of Creation of a Low Power Radio Service, MM Docket No. 99-25, 64 Fed. Reg. 7577 (adopted January 28, 1999) [hereinafter *Notice*].

The Commission is willing to sacrifice technical engineering to promote social engineering. It is abdicating its spectrum management role to become a database manager, where anyone can electronically file an application for any small bit of spectrum – even if it causes interference to those already there. For example, the Commission takes a strong stance on monitoring potential interference by stating that LPFM applicants "would be advised to take into account spectrum congestion considerations and evaluate the extent to which third-adjacent signals would pose a problem."[3] But, as far as the Commission is concerned, it believes "the actual effects of such interference might well be insignificant."[4] This is not a logical way to manage the already congested spectrum. The Commission must consider all the evidence, including prior spectrum management decisions, before making any conclusions that interference will be "minimal."

The Commission also failed to consider the transition to In-Band, On-Channel Digital Audio Broadcasting ("IBOC DAB") for existing terrestrial broadcasters before proposing the LPFM service. Three IBOC DAB proponents are developing systems at the present time, and have begun field tests that are scheduled to conclude in December 1999. The Commission should not take any action on LPFM until an IBOC DAB standard is adopted and implemented.

Further, the Commission did not consider the economic impact such a service would have on existing broadcasters. The Commission should have learned its lesson with the result from Docket 80-90.[5] It is not economically feasible to drop in hundreds of stations – low power or not – and expect existing broadcasters to be unaffected. Existing stations – particularly those in

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3 *Notice* ¶ 45.

4 *Id.*

5 Modification of FM Broadcast Station Rules to Increase the Availability of Commercial FM Broadcast Assignments, 94 FCC 2d 152 (1983) [hereinafter *Docket 80-90*].

smaller markets – may have a difficult time providing the quality service that they do today. And the consequences of Docket 80-90, the consolidation that the Commission now decries, will inevitably be the result of the LPFM proposals.

Finally, the Commission faces huge hurdles in implementing its proposal in light of existing statutory requirements regarding ownership and auctions. This "new" service cannot be exempted from these legislative requirements merely because it is a low power service. Also, the Commission must consider the enforcement problems created by any new service and how to deal with them prior to implementing it.

The Commission cannot establish the proposed LPFM service for technical, economic and administrative reasons. The proposal will have the ultimate effect of causing far more harm than any benefits that may be imagined.

II. THE COMMISSION'S ASSUMPTIONS REGARDING THE NEED FOR AN LPFM SERVICE ARE UNFOUNDED.

The Commission set out three assumptions that form the basis for its LPFM proposal. First, the Commission justifies its proposal for LPFM because it is concerned "that consolidation may have a significant impact on small broadcasters and potential new entrants into the radio broadcasting business."[6] It notes that liberalization of the local radio ownership rules has led to increased ownership consolidation.[7] Second, the Commission hopes to "promote additional diversity in radio voices and program services."[8] Finally, the Commission assumes that other

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6 *Notice* ¶ 10.

7 *See id.*

8 *Id.* ¶ 1.

alternatives, such as Internet radio, are not sufficient substitutes for LPFM. NAB will address each of these assumptions and demonstrate that they do not justify creating an LPFM service.

A. Consolidation Has Not Boiled the Industry Down to Only Mega-Companies.

In the three years after the Telecommunications Act significantly deregulated radio ownership, there has been a fair amount of consolidation. It is not the case, however, that all radio stations are owned by a few companies – even in the larger markets where consolidation first occurred.

NAB examined where consolidation has occurred and the extent to which there still are "independent radio voices." The Commission believes consolidation has hurt these independent stations; and thus, the public has less choice for alternative viewpoints. It also believes that there are fewer independently owned stations and that new entrants accordingly have little opportunity to enter the radio business. NAB's study, "Independent Radio Voices in Radio Markets," shows that these assumptions are untrue.[9]

On a national scale, 28.8% of all commercial radio stations in Arbitron metros are standalone stations, i.e. not owned in combination with any other local station.[10] Another 21.4% are part of a local two-station operation.[11] The study breaks down these percentages into market size groupings where the percentages show that even in the top markets, there are many stations that still are standalones or duopolies. For example, in the top ten markets, 31.2% of stations are standalones and 13.6% are in duopolies.[12] Roughly half of the stations in the top markets,

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9 Mark R. Fratrik, *Independent Radio Voices in Radio Markets*, August 1999 [Attachment A to this Volume].

10 *Id.* at 1.

11 *Id.*

12 *Id.*

therefore, remain in ownership patterns that were permissible under the Commission's pre-1992 rules and thus have not been affected by consolidation. Contrary to the assumptions in the *Notice*, radio is not wholly characterized by large group ownership. Many stations are still owned independently or in small combinations, and thus could be acquired by new entrants; and there continue to be numerous independent voices in all radio markets. The Commission proposed LPFM as a response to what it perceived as the evils of consolidation; since those evils do not in fact exist, the supposed need for LPFM does not exist as well.

Furthermore, establishing the need for LPFM service to combat the effects of consolidation would be contrary to the intent of Congress, and ultimately counterproductive to the Commission's own goals. As part of the Telecommunications Act of 1996, Congress intended to provide the radio industry with the ability to realize efficiencies related to common ownership.[13] Congress decided that the public would be better served with the relaxation of the ownership restrictions.[14] Congress set the policy, and it appears that the Commission is trying to undo it.

The Commission should not be making policy decisions regarding the effects of the Telecommunications Act provisions.[15] The role of the Commission is to implement the policy decisions set by Congress. The LPFM proposal takes the intent of Congress and turns it on its ear.

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13 141 CONG. REC. S8424 (June 15, 1995) (statement of Sen. Burns).

14 141 CONG. REC. S8433 (June 15, 1995) (statement of Sen. Bryan).

15 Commissioner Furchtgott-Roth notes in his dissenting statement on the *Notice* that the Commission's statements on why LPFM is needed are "at bottom, arguments against consolidation." Statement of Commissioner Furchtgott-Roth, In re: Creation of a Low Power Radio Service at 3.

B. Format Diversity Has Increased After the Passage of the Telecommunications Act of 1996.

As an update to the FCC's own format study that was released in 1998,[16] NAB also looked at format availability after consolidation.[17] In passing the Telecommunications Act of 1996, Congress believed that common ownership would not harm diversity.[18] As Senator Burns stated, "Even if I own two radio stations in the same market, would I program them the same? I seriously doubt it."[19] The Commission's own study showed that since the passage of the Telecommunications Act of 1996, the diversity of formats has increased. NAB's update demonstrates that the increase in program diversity is far greater than even the Commission concluded, and is likely to grow further.

NAB's look at format diversity has three different analyses: General Format; Specific Format; and Adjusted Format. NAB's additional analyses – Specific Format and Adjusted Format – allow for narrower changes in formats to be recognized. These changes would not be noted in a general format classification analysis, such as the Commission's study.

In NAB's General Format analysis, nationally, the average number of general formats increased to ten different general formats across all markets from 9.8 formats in the Spring of

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16 Review of the Radio Industry, 1997 Federal Communications Commission, Mass Media Bureau Policy and Rules Division, MM Docket 98-35, released March 13, 1998.

17 Mark R. Fratrik, *Format Availability After Consolidation*, August 1999. (Attachment B to this Volume) [hereinafter *NAB Format Study*].

18 141 CONG. REC. S8424 (statement of Sen. Burns)

19 *Id.*

1997.[20] Specifically, most of the market size groupings saw increases in the number of general formats.[21]

The second analysis looked at Specific Formats. This analysis differs from the General Format Analysis because the data is analyzed with more categories of formats and by coding a station with a split format as being a different format from either of the more general categories.[22] Using this method, the number of formats offered in the average market increased by five percent nationally, going from 13.8 in 1996 to 14.8 in 1998.[23] All market groupings saw significant increases.[24]

Finally, in order to avoid "overstating" the diversity of formats, the Adjusted Format analysis used the same list of formats as in the Specific Format analysis, but coded the first mentioned format in the split format situations as the station's primary format (i.e. the AC/Urban station would be considered an AC station). Figure 3 of Attachment B shows that, again, all market groupings had increases over the prior years.

The diversity of formats in the radio industry is continuing its trend towards more choices. This translates into wider variety to the public *as a direct result of consolidation*. The Commission cannot base its LPFM proposals on any lack of programming choices. Consolidation has, contrary to the assumptions underpinning the *Notice*, increased program diversity in radio. Again, since the "problem" the Commission intended LPFM to address is not

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20 *NAB Format Study* at 5.

21 *Id.* at Figure 1.

22 For example, an Adult Contemporary/Urban station was coded as a different format than either a pure AC station or a pure Urban station.

23 *NAB Format Study* at 7.

24 *Id.* at Figure 2.

supported by the evidence, there is no need for the Commission to undermine FM service by creating an LPFM service.

C. The Commission Dismissed "Other Options" to LPFM Too Quickly.

The Commission discarded Internet "webcasting" as an alternative to establishing LPFM in the FM band. It recognized "that the internet offers unprecedented opportunities to communicate inexpensively to others around the world and to receive information or programming of interest."[25] The Commission stated that "internet access is not sufficiently mobile and ubiquitous to be considered a substitute for radio broadcasting's capability to reach the public . . . ."[26]

In criticizing the mobility and ubiquity of the Internet, NAB believes the Commission was too quick to reject the Internet as a viable alternative for LPFM proponents. On the point of mobility, the nature of LPFM does not allow it to be a form of communication that mobile audiences would likely be able to tune into because, in most large markets, LPFM service areas would be too small to be useful to mobile listeners. As far as ubiquity is concerned, Internet use and access is increasing daily.[27]

In 1998, Arbitron, the authority on radio usage in the country, undertook what it felt to be "the most comprehensive and in-depth study ever undertaken on the nature of how radio listeners utilize the Internet . . .."[28] Arbitron concluded that, "Internet use is exploding" with more than

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25 *Notice* ¶ 12.

26 *Id.*

27 Access to the Internet is further facilitated by the Commission's "e-rate" policy that provides funding to schools and libraries in order to increase online access.

28 PIERRE BOUVARD & LARRY ROSIN, THE ARBITRON COMPANY, RADIO IN THE NEW MEDIA WORLD (1998) (also available online at www.arbitron.com/studies1.htm).

30% of Americans accessing the Internet from home, work, school or some other place. About half (49%) of Americans have access to a computer and half of this group has access to the Internet.[29]

Of course more recent data are now available. According to Intelliquest, as of Spring 1999, 83.4 million Americans aged 16 and older (40% of this population) were accessing the Internet, and an additional 41 million people plan to get online in the future.[30] Arbitron itself did a follow-up study in January 1999.[31] Indeed, Arbitron found, "the proportion of those online who have listened to radio stations over the Internet has jumped from 18% to 27%."[32] Half of their nationally representative sample has access to the Internet. And Internet access, while initially divergent, is growing among all demographic groups.

Many licensed broadcasters currently use the Internet themselves, but there are numerous benefits for new entrants. According to BRS Media Consultant's authoritative list of webcasters, as of July 6, 1999 there were 2,415 Internet "radio stations" or webcasters. This includes 1,196 radio broadcast stations and 197 Internet only "radio stations."[33] The advantages of an Internet radio station as compared to an FCC licensed facility include: no license required, no spectrum required, no RF transmission facilities and operations required, distance insensitive cost to serve

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29 *Id.* at 5.

30 IntelliQuest, *IntelliQuest Study Shows 83 Million U.S. Internet Users,* Press Release, April 19, 1999 (visited July 22, 1999) <www.intelliquest.com/press/release78.asp>.

31 PIERRE BOUVARD & LARRY ROSIN, THE ARBITRON COMPANY, RADIO AND E-COMMERCE: INTERNET LISTENING STUDY II (1999) (also available online at www.arbitron.com/studies1.htm).

32 *Id.* at 10.

33 BRS Media Consultants, *The Most Comprehensive Directory of Media Stations on the Web* (visited July 22, 1999) <www.radio-directory.com/analysis.html>.

international audiences, no technical interference constraints, and lower entry and operating costs. Any party with a personal computer and the necessary Internet connection and streaming software can have an "Internet Radio Station" capable of providing service around the corner and around the world.

The Commission's LPFM proposal is flawed because the technical limitations will not allow LPFM stations to exist without causing harmful interference to existing FM stations. But, the Internet is a vehicle that can be used for more voices – and people can start webcasting today.

III. THE COMMISSION'S ASSUMPTIONS REGARDING THE TECHNICAL ISSUES ARE UNFOUNDED.

Disregarding third and/or second adjacent channel restrictions for LPFM stations is one of the most critical assumptions the Commission made in proposing the LPFM service. It based this assumption on the unsubstantiated statements of LPFM proponents and without any real evidence regarding receiver performance. NAB's own receiver study, attached to these comments in Volume Two, disproves the Commission's assumptions and shows that interference will result because receivers have not universally improved in the area of interference rejection.[34] In fact, many of the receivers tested generally do not perform up to the Commission's existing expectations.

The Commission also assumes that the transition to IBOC DAB will not be affected by its LPFM proposal. However, it has no basis from which to determine how the digital transition will be affected because it has not started a proceeding to establish IBOC rules, nor obtained any test results from IBOC proponents. Merely assuming there will be no problem without verifying the truth is the essence of arbitrary and capricious decisionmaking.

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[34] *See* discussion *infra* at Part III.B.

Additionally, the Commission assumes that because interference already exists for some short-spaced stations, the rest of the FM stations should be able to accept interference as well. The mistakes of the past must be lessons learned, not repeated.

A. The Commission Must Not Repeat the Allocation Mistakes of the Past.

1. The allocation errors made at the beginning of the FM era should not be repeated.

When the Commission first allocated spectrum for the FM broadcast service in 1940,[35] it assumed that second and third adjacent channel interference would not be a problem and therefore adopted interference protection criteria that only applied to co-channel and first adjacent channel stations.[36] Later, in 1945, the Commission moved and expanded the FM broadcast service from the 42-50 MHz band to the 88-108 MHz band.[37] In the new and expanded FM band, the Commission still provided no interference protection between second and third adjacent channel stations. Its revised *Standards of Good Engineering Practice* for the new FM broadcast band said, "objectionable interference is not considered to exist when the channel separation is 400 kc or greater. Accordingly, FM broadcast stations in the same city or the same area may be assigned channels 400 kc apart."[38] As the FM service grew, and more mass-produced FM receivers entered the marketplace, the Commission eventually recognized that second and third adjacent channel interference was a problem for many receivers.

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35 Amendment of Frequency Regulations, Docket 5805, 5 Fed. Reg. 2011 (May 25, 1940).

36 Standards of Good Engineering Practice Concerning High Frequency Broadcast Stations (43,000-50,000 Kilocycles), 5 Fed. Reg. 2483 (July 4, 1940).

37 Rules Governing Standard and High-Frequency Broadcast Stations, 10 Fed. Reg. 12006 (September 21, 1945).

38 Standards of Good Engineering Practice Concerning FM Broadcast Stations, 10 Fed. Reg. 12994, 12996 (October 19, 1945).

In 1947, the Commission initiated a rule making proceeding to study second and third adjacent channel interference.[39] In its *Notice* announcing that proposal it said, "since FM receiver characteristics are, of course, a governing factor in FM allocation, the Commission is studying the selectivity and other characteristics of various types of present FM receivers."[40] Two years later, after completing its technical study, the Commission adopted an RF desired-to-undesired protection ratio for second adjacent channel stations of -20 dB, and for third adjacent channel stations of -40 dB.[41] The Commission reported that the tests it performed to derive these protection ratios were based on a 50 dB audio signal-to-noise ratio standard for the desired signal.[42]

From the time the FM broadcast service was created to the time the Commission recognized the need to protect second and third adjacent channel stations from interference, there were many instances throughout the country where second and third adjacent channel stations were allocated to the same community, or to communities that were very close together. For the most part, it was these allocations that the Commission made throughout the 1940s that ultimately became the "grandfathered short-spaced stations" that exist today.[43]

There is an important lesson to be learned from the Commission's 1940s experiences with FM allocations – early assumptions about receiver performance when a new service is

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39 Modification of FM Rules, Standards, and Allocation Plan Proposed Rule Making, 12 Fed. Reg. 2488 (April 17, 1947).

40 *Id.* at 2489.

41 Standards of Good Engineering Practice Concerning FM Broadcast Stations, Docket 9407, 14 Fed. Reg. 6599 (October 29, 1949).

42 Standards of Good Engineering Practice Concerning FM Broadcast Stations Docket 9407, 14 Fed. Reg. 4986 (August 12, 1949).

43 47 C.F.R. § 73.213 (1998).

inaugurated may not remain true once mass-produced, low cost receivers gain a major share of the market. Thus, early allocation procedures for the new service should be somewhat conservative with respect to interference protection.

2. The Commission has previously relaxed second and third adjacent channel protection criteria and then been forced to tighten them due to interference problems.

Thirteen years after the original second and third adjacent channel protection criteria were adopted in 1949, the Commission stopped allocating commercial FM stations based on contour protection and adopted a table of distance separations.[44] As part of this decision, the Commission required that second and third adjacent channel interfering stations simply be located outside the protected contours of the second and third adjacent channel stations that they were protecting.[45] The Commission noted that this policy would not provide full interference protection to second and third adjacent channel stations, but argued that "the existing station would be protected, if not completely to the same service radius as against co-channel interference, at least for a very substantial distance."[46] This is the Commission decision that made the separation requirements for second and third adjacent channel commercial FM stations equal.

Twenty-one years after modifying its rules to require that second and third adjacent channel stations be located no farther away that just outside the protected contour of an existing station, the Commission decided in its *Report and Order* in BC Docket 80-90 that this policy was in error.

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44 In the Matter of Revision of FM Broadcast Rules, Particularly as to Allocation and Technical Standards, *First Report and Order*, Docket 14185, 40 FCC 662 (1962).

45 *Id.* ¶ 65.

46 *Id.*

> "We recognize that some environments cause FM receivers, particularly mobile receivers, difficulty in maintaining suitable signal strengths to avoid second and third adjacent channel interference. Mobile receivers were not a major planning factor in the present separation requirements or those proposed in the *Notice*. Rather, we used the concept of replacement service. Mobile receivers, however, are subjected to wide variations in signal strength due to multipath reflections as they pass through different environments along highways. In these situations, they are likely to "lock onto" stronger adjacent channel signals rather than the desired signal. The Commission believes that the separation distances can be modified to reduce mobile reception problems and only minimally affect the potential for additional FM stations. Thus, the rules we are adopting provide 'guardband' protection on second and third adjacent channels as suggested by ABC and AGK."[47]

Rather than provide full interference protection to both second and third adjacent channel stations, the Commission adopted a "compromise guardband solution" which applied the same RF protection ratio (-40 dB) to both second and third adjacent channel interference.[48] This is the standard that still exists today for commercial FM stations.

As illustrated above, the Commission has oscillated back and forth over the past sixty years on the issue of second and third adjacent channel interference protection. Throughout most of the 1940s it provided no such interference protection to FM broadcasters. Then, in 1949, it adopted rules that provided full protection from this type of interference. In 1962, it relaxed these rules and provided second and third adjacent interference protection throughout most, but not all, of a station's coverage area – permitting this interference to exist in a limited area toward the outer edge of the "protected" contour. Then, in 1983, it recognized the problems caused by its 1962 decision and adopted new rules that provide full protection to third adjacent channel stations, and somewhat-less-than-full protection to second adjacent channel stations. With its proposal in this proceeding to eliminate second and third adjacent channel protection altogether

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47 *Docket 80-90* ¶ 46.

48 *Id.*

for a new LPFM service, the Commission has effectively proposed to revert all the way back to its errant policies of the 1940s. Clearly, modern receivers' ability to reject second and third adjacent channel interference does not support such a change, as demonstrated by the technical studies submitted by NAB in this proceeding.[49]

3. The Commission's failure to consider the mistakes made regarding the AM band threatens to provide the same fate to FM.

The Commission does not propose to use the AM band for low power stations. It cites the "interference potential and present congestion in the AM band" as reasons why it is a "poor choice for a new radio service."[50] Of course, it was the result of decisions by the Commission itself that the AM band became so congested, and we fear that the Commission is making the same mistake in the FM band by proposing the LPFM service.

The Commission cites the congestion woes of the AM band and in virtually the same breath admits it does not have "room" for LPFM in most major markets without decreasing interference protections.[51] It also notes that there is not any larger segment of the FM spectrum that is "more available for LPFM operation" to which it could restrict LPFM stations.[52]

It appears after careful weighing of all of these factors – the congestion in the AM and FM bands and the existing protection criteria – the Commission decided that the best course of action would be to relegate the FM band to the same fate as the AM band. The quality broadcast service that full-power FM stations currently provide must be maintained as interference-free as

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49 *See* Volume Two of these comments.

50 *Notice* ¶ 17.

51 *Id.* ¶¶ 17, 44.

52 *Id.* ¶ 16.

possible. The Commission should not fail to consider the problems of the AM band when it is determining the future of the FM band.

B. The Second and Third Adjacent Channel Allocation Standards Cannot Be Modified.

1. There was clearly no basis for the Commission's conclusion in the *Notice* that second and third adjacent channel protection criteria can be relaxed.

Stereo Review is a publication dedicated to reviewing home audio equipment. In its annual *Buyer's Guide*, which was published shortly before the Commission adopted its *Notice* in this proceeding, Brian Fenton reported that "many receiver manufacturers pay little attention to the tuner section of their receivers and, in general, receiver tuners today don't work as well as those of, say, 20 years ago."[53]

In addition to Brian Fenton's comments in *Stereo Review*, other industry experts have voiced their opinion about the performance of today's radio receivers. Perhaps one of the more illuminating commentaries comes from Rich Potyka, Product and Design Manager for Entertainment Radio RF and Analog Integrated Circuits at Motorola's semiconductor plant in Phoenix. He was recently interviewed by *Radio Business Report* and asked for comments about the FCC's low power FM proposals.[54] In response he said,

> "The FCC really missed the issue. The transmit protection contours really need to be based on what the vast majority of radios can handle – not $600 car radios but the $9.95 job with no IF filter. Check the bandwidth and signal handling of the low to mid-tier shirtpocket radio, table radio and mini component. Virtually none have any selectivity other than that of the double tuned IF matching transformer. They have AFC that is a megahertz wide to compensate for no temperature or mechanical compensation of the local oscillator. They will jump to any 2nd or 3rd

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53 *Stereo Buyer's Guide 1999*, STEREO REVIEW, at 44.

54 Carl Marcucci, *Engineered for Profit*, RADIO BUSINESS REPORT, April 19, 1999, at 18.

[adjacent station] if it is just a few dB stronger. It is not blanketing that is the issue, but 30 to 40 dB differences in adjacents that count."[55]

People who understand the design of radio receivers know this to be true. Unfortunately, however, the Commission apparently did not seek out any receiver experts when developing its conclusions about receiver performance. Instead, it relied on unsubstantiated claims by low power FM proponents that second and third adjacent channel protections are no longer necessary because of alleged "vast improvements in receiver technology since the restrictions were created decades ago."[56] These "vast improvements" are a myth. There is no evidence to support any claim that today's receivers are generally better at rejecting second and third adjacent channel interference than radios of the past.

a. Third adjacent channel interference

On the subject of third adjacent channel interference, specifically, the Commission makes a very weak case, without any technical data to support it, for "not requiring 3rd-adjacent protection to or from any of the contemplated classes of LPFM station."[57] In support of its proposal, the Commission did not test *any* radio receivers to ascertain their ability to reject third adjacent channel interference, nor did it obtain *any* test results from any other source upon which to base its conclusion. To support its argument that LPFM stations can be allocated without regard to third adjacent channel interference, the Commission provides a very simplistic analysis which purports to show that the third adjacent channel interference around LPFM stations will be

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55 *Id.*

56 *Notice* n.57.

57 *Id.* ¶ 43.

minimal, and it cites its 1997 decision to eliminate third-adjacent channel protection for full power grandfathered short-spaced stations.[58]

The Commission's 1997 decision concerning grandfathered short-spaced stations provides *no* basis for relaxing third adjacent channel interference standards for LPFM stations. Grandfathered short-spaced stations are FM radio stations that existed prior to November 16, 1964, and which did not meet the adjacent channel separation criteria that were adopted by the Commission in 1964.[59] It was recognized in 1964 that second and third adjacent channel stations that were too close together were causing harmful interference to one another. However, because these stations already existed, and because spectrum congestion in urban areas prevented these situations from being corrected by changing the frequencies of affected stations, the Commission concluded that the only reasonable course of action would be to "grandfather" them, allowing them to continue to cause interference to one another. It recognized, however, that future station allocations should not be permitted to create such interference.

The Commission's more recent 1997 action concerning grandfathered short-spaced stations allowed the limited number of these stations, which are *already causing unacceptable interference to one another*, to modify their facilities in such a manner that the unacceptable interference that *already exists* would be moved from one place to another, and/or slightly modified in size.[60] The important point here is that the Commission did *not* conclude that second and third adjacent channel interference was not a problem; it simply decided that stations which

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58 *Id.*

59 *See* In the Matter of Revision of FM Broadcast Rules, Particularly as to Allocation and Technical Standards, Docket 14185, 40 FCC 868 (1964).

60 In the Matter of Grandfathered Short-Spaced FM Stations, *Report and Order,* MM Docket 96-120, 12 FCC Rcd 11840 (1997) [hereinafter *1997 Grandfathered Short-Spaced Decision*].

were already causing such interference to one another – due to allocations that the Commission made prior to 1964 – should be permitted to modify their facilities in a manner that could slightly change the *already existing* interference area. It did not allow the creation of new interference.

In its *1997 Grandfathered Short-Spaced Decision*, the Commission emphasized that it had "no intention of relaxing second-adjacent channel and third-adjacent channel spacing requirements as allotment and application criteria."[61] It said that its decision was aimed "exclusively at this small universe of grandfathered stations."[62] So, in the *Notice* when the Commission cited its *1997 Grandfathered Short-Spaced Decision* as a reason to relax the second and third adjacent spacing requirements as assignment and allotment criteria, it essentially said "we believe our recent decision that this is a bad idea strongly supports our claim that it is now a good idea." This line of reasoning sounds ridiculous because it is inherently self-contradictory.

The only other "evidence" the Commission provides to support its conclusion that third adjacent channel interference protection would not be necessary with respect to LPFM stations is a superficial discussion about areas of interference being "very small" and only "in the immediate vicinity of the low power transmission facility."[63] The Commission provides an example of the interference area around a low power station and says that "even this very small predicted interference zone could possibly pose a potential problem to other stations only if the LP1000 station were located at, or very near, the outer edge of the protected station's service contour."[64] NAB's receiver testing has proven this latter statement to be false, as the

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61 *Id.* ¶ 25.

62 *Id.*

63 *Notice* ¶ 43.

64 *Id.*

performance of many radio receivers will be degraded by third adjacent channel interference at approximately the same distance from the interfering transmitter regardless of whether the interfering transmitter is at the edge of the desired station's protected coverage area or at the desired station's city-grade contour, or elsewhere in between.[65]

Another major flaw in the Commission's analysis of the third adjacent channel interference issue is that it has failed to consider the issue of third adjacent channel interference *from* a full power station *to* a low power station. As an example, consider an LP100 station located one mile away from a third adjacent Class B station. The Commission's *Notice* leads readers to believe that the LP100 station would have a service area with a radius of 3.5 miles.[66]

As Figure 1 illustrates, however, the actual interference-free service area of the LP100 station in this situation would be substantially reduced due to interference from the Class B station. Figure 1 uses the Commission's existing -40 dB protection ratio to calculate the area within an LP100 station's 60 dBu contour that would receive interference from a Class B station 1.6 km (one mile) away. The area receiving interference in this situation is 40.6 square kilometers, or 40.1% of the area within the LP100 station's 60 dBu contour.

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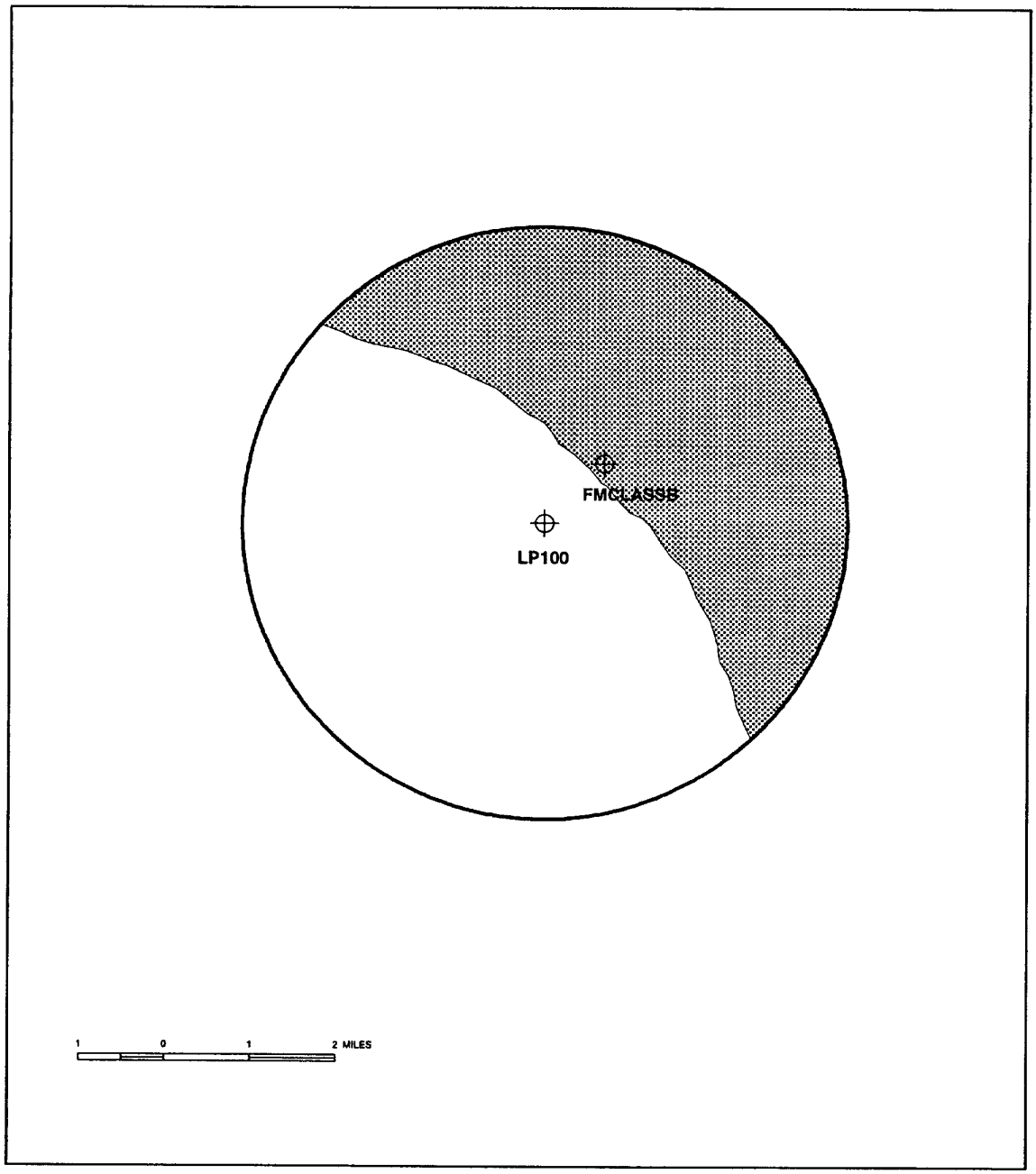
65 *See* Volume Two of these comments, Exhibit C at 10 – 13.

66 *Notice* ¶ 30.

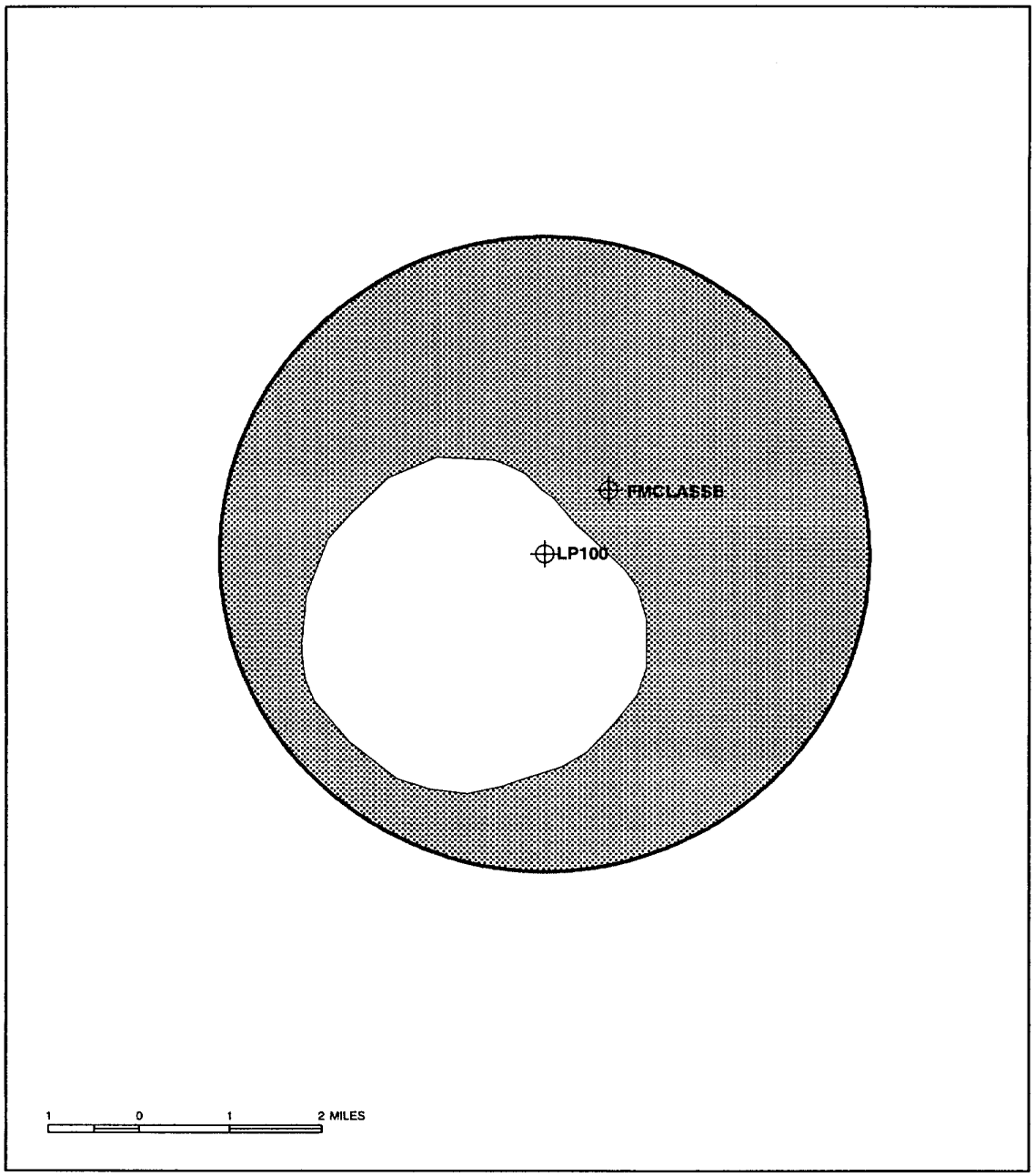


LP100 and 2nd/3rd adjacent Class B stations are 1.6 km (1 mile) apart
LP100: 100 watts ERP, 30 m HAAT
Class B: 50 kW ERP, 150 m HAAT
RF D/U protection ratio needed to avoid interference = -40 dB
LP100 60 dBu service area = 101.2 sq. km
LP100 service area interfered with by 2nd/3rd adjacent Class B (shaded) = 40.6 sq. km
Portion of LP100 service area interfered with by 2nd/3rd adjacent Class B = **40.1%**

Figure 1

Figure 1 is based on the Commission's existing protection ratio for third adjacent channel stations. When a third adjacent channel protection ratio of -26.8 dB is used based on the overall median receiver's performance in NAB's receiver tests for a desired signal level of -45 dBm,[67] the interference suffered by the LP100 station is considerably worse. In this case, the area receiving interference is 73.8 square kilometers, or 72.9% of the area within the LP100 station's 60 dBu contour. This is illustrated in Figure 2. Clearly, the LP100 station is not effectively serving its coverage area in either Figure 1 or Figure 2.

[67] *See* Volume Two of these Comments, Exhibit B at 23.



LP100 and 3rd adjacent Class B stations are 1.6 km (1 mile) apart
LP100: 100 watts ERP, 30 m HAAT
Class B: 50 kW ERP, 150 m HAAT
RF D/U protection ratio needed to avoid interference = -26.8 dB
LP100 60 dBu service area = 101.2 sq. km
LP100 service area interfered with by 3rd adjacent Class B (shaded) = 73.8 sq. km
Portion of LP100 service area interfered with by 3rd adjacent Class B = **72.9%**

Figure 2

The Commission's policy regarding applications for radio broadcast station licenses in which the proposed station would *receive* excessive interference *from* existing stations has long been to deny such applications.[68] The Commission's own *Standards of Good Engineering Practice* stipulated that such interference should not exceed approximately ten percent.[69] Furthermore, in its 1998 proposal to permit negotiated interference agreements among FM broadcasters, the Commission suggested that such agreements should ensure that the service area gained by a station, in terms of both area and population, would exceed the new interference within that station's coverage area by a ratio of five to one.[70] Clearly, as shown in Figures 1 and 2, the Commission's proposal concerning third adjacent channel LPFM stations fails to meet even its own recently proposed guideline.[71]

b. Second adjacent channel interference

The flaws in the Commission's reasoning for relaxing second adjacent channel interference protection criteria are generally similar to those in its reasoning for relaxing third

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68 *H. Foster Fudge, Gladys C. Fudge et al.*, 13 FCC 665 (1949); *see also Faye & Richard Tuck, Inc. KBEC et al.*, 3 FCC Rcd 5376 ¶ 19 (1988) ("Section 307(b) requires the Commission to 'make such distribution of licenses . . . among the several States and communities as to provide a fair, efficient and equitable distribution of radio service . . .' 47 U.S.C. Sec. 307(b). Thus, whenever applicants specify different communities of license for their proposed stations, the Commission first compares the needs of the respective communities for radio service. *Applicants for AM channels, such as the frequency at issue in this case, may propose to serve any community where their operations will not cause objectionable interference to, or receive such interference from, existing stations.*" (emphasis added)).

69 Federal Communications Commission, FCC STANDARDS OF GOOD ENGINEERING PRACTICE CONCERNING FM BROADCAST STATIONS (1945).

70 *In the Matter of 1998 Biennial Regulatory Review – Streamlining of Radio Technical Rules*, MM Docket 98-93, 13 FCC Rcd 13513 ¶ 20 (1998) [hereinafter *Technical Streamlining Notice*].

71 Note that NAB opposes the concept of negotiated interference. Furthermore, the Commission has yet to complete that portion of the *Technical Streamlining* review.

adjacent channel interference protection criteria. However, in the second adjacent channel case the Commission's conclusions are even less justifiable. The Commission had in its possession receiver performance data concerning second adjacent channel interference upon which to base its conclusions.

The National Radio Systems Committee ("NRSC") submitted extensive data concerning second adjacent channel interference to receivers with its comments in Docket 80-90.[72] More recently, NAB submitted performance data for a limited number of receivers in its reply comments in MM Docket 96-120.[73] The NRSC data for FM stereo interference to an FM stereo signal and a 50 dB audio signal-to-noise ratio showed that, for the two portable radios tested, desired-to-undesired signal ratios of -45 dB and -9 dB were necessary.[74] The portable radio in the MM Docket 96-120 NAB test results needed a -17 dB desired-to-undesired signal ratio to achieve a 45 dB (RMS) audio signal-to-noise ratio.[75] These figures provide no basis for relaxing the second adjacent channel protection requirements. The three component, or "hi fi" radios tested by the NRSC required ratios of -20, -28 and -36 dB, respectively.[76] The two such radios included in the MM Docket 96-120 NAB study required ratios of -26 and -40 dB.[77] All of these figures provide no basis for relaxing the second adjacent channel protection requirements

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72 Comments of the National Radio Systems Committee in BC Docket 80-90 (1981) [hereinafter *NRSC Comments in BC 80-90*].

73 Reply Comments of NAB in MM Docket 96-120 at 8 [hereinafter *NAB Reply Comments in MM 96-120*].

74 *NRSC Comments in BC 80-90* at 80, 148.

75 *NAB Reply Comments in MM 96-120* at 8.

76 *NRSC Comments in BC 80-90* at 68, 166 & 194.

77 *NAB Reply Comments in MM 96-120* at 8.

because six out of eight of the tested radios, or 75%, cannot handle the amount of second adjacent channel interference now permitted under the Commission's rules, let alone *more* interference that would be present with LPFM stations.

As was just discussed in the case of third adjacent channel interference, the Commission must also consider the amount of second adjacent channel interference that would be received *by* a low power station *from* a full power station. For example, an LP100 station located 1.6 km (one mile) away from a second adjacent channel Class B station would have 40.6 square kilometers or 40.1% of the area within its 60 dBu contour wiped out by interference from the Class B station using the Commission's current -40 dB protection ratio for predicting second adjacent channel interference to non-reserved band stations. This situation was illustrated earlier in Figure 1, as the second and third adjacent channel protection ratios are identical for non-reserved band stations under the Commission's existing rules.[78]

Figure 3 provides a more realistic estimate of the amount of interference that would be received by the second adjacent channel LP100 station in this situation. It depicts the area within the LP100 station's 60 dBu contour that would receive interference from the Class B station based on the -17.0 dB protection ratio that the NAB receiver tests demonstrate is necessary to protect the median receiver from second adjacent channel interference when the desired signal level is -45 dBm.[79] In this case, the LP100 station has 97.0 square kilometers, or *95.8% of the area within its 60 dBu contour* wiped out by interference from the Class B station.

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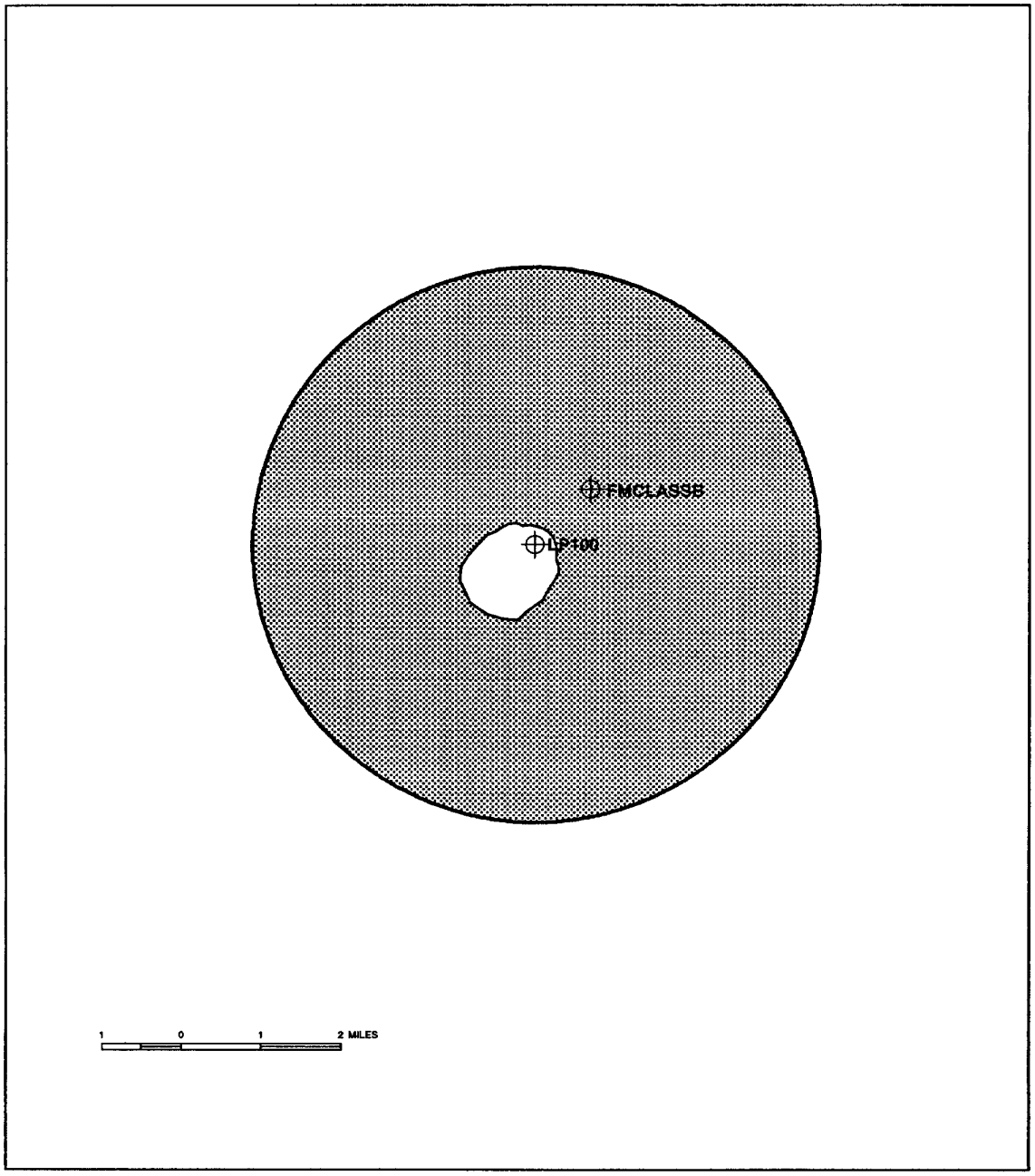
[78] 47 C.F.R. § 73.215 (1998).

[79] *See* Volume Two of these comments, Exhibit B at 23.



LP100 and 2nd adjacent Class B stations are 1.6 km (1 mile) apart
LP100: 100 watts ERP, 30 m HAAT
Class B: 50 kW ERP, 150 m HAAT
RF D/U protection ratio needed to avoid interference = -17.0 dB
LP100 60 dBu service area = 101.2 sq. km
LP100 service area interfered with by 2nd adjacent Class B (shaded) = 97.0 sq. km
Portion of LP100 service area interfered with by 2nd adjacent Class B = **95.8%**

Figure 3

2. Extensive NAB testing of currently available receivers demonstrates that second and third adjacent channel interference protection is still necessary.

In response to the Commission's *Notice,* NAB commissioned Carl T. Jones Corporation ("Carl T. Jones"), an engineering consulting firm in Springfield, Virginia, to test an extensive sample of modern radio receivers to ascertain their susceptibility to second and third adjacent channel interference. In addition, NAB also contracted with another engineering consulting firm, Moffet, Larson & Johnson ("MLJ") of Arlington, Virginia, to advise NAB concerning the specific types of receivers to be tested, and regarding the audio signal-to-noise ratio at which interference to radio reception should be assumed to exist. We also asked MLJ to analyze the test results produced by Carl T. Jones. The Carl T. Jones and MLJ reports are attached as Volume Two of these comments.

MLJ's research indicates that an audio signal-to-noise ratio of 50 dB is necessary for interference-free stereo reception.[80] It also indicates that, regardless of whether a radio's reception starts at an interference-free 50 dB signal-to-noise ratio or at a slightly lower signal-to-noise ratio, adjacent channel interference would start to bother the listener once the signal-to-noise ratio decreases by 5 dB.[81] As a result, the Carl T. Jones test procedure was designed to identify the desired-to-undesired signal ratio at which the audio output from the desired receiver had degraded 5 dB from its best, interference-free, value, or to an absolute value of 50 dB for those radios whose interference-free audio signal-to-noise ratio was at least 55 dB.[82]

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80 Volume Two of these comments, Exhibit A at 5 – 10.

81 *Id.*

82 Volume Two of these comments, Exhibit B at 11.

For radios that could achieve an audio signal-to-noise ratio of 55 dB or greater without any adjacent channel interference present, Carl T. Jones added an adjacent channel signal and increased its level until the desired station's audio signal-to-noise ratio fell to 50 dB. At this point, the RF signal level of the desired and undesired station were recorded, resulting in a desired-to-undesired ("D/U") ratio at which adjacent channel interference occurred.[83] For those radios tested that were unable to achieve a 50 dB audio signal-to-noise ratio even without any interference present, Carl T. Jones measured the audio signal-to-noise ratio without any interference present and then added an adjacent channel signal and increased its level until the desired station's audio signal-to-noise ratio dropped 5 dB. At this point, the RF signal levels of the desired and undesired stations were recorded, resulting in a desired-to-undesired ("D/U") ratio at which adjacent channel interference occurred.

Altogether NAB tested 28 radios. Twenty-one of these radios were purchased in 1999, and four were purchased in 1998, all at Washington, DC-area retail stores. Three are radios provided as standard equipment in late model automobiles. Details, including the make, model, and purchase price for each of these radios, are provided in Table 1.

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83 *Id.*

TABLE 1

Make/Model	Type	Price	Purchased
Blaupunkt MESA CR67	Car radio	$69.99	Spring 1999
Jensen XCC 5220	Car radio	$69.98	Spring 1999
JVC KS-RX177	Car radio	$94.96	Spring 1999
Kenwood KDC-S5009	Car radio	$249.99	Spring 1999
Pioneer DEH-1000	Car radio	$170.96	Spring 1999
Chrysler PO485861AD	OEM car radio	[2]	[2]
Delco 16232113	OEM car radio	[1]	[1]
Ford F87F-19B132-AB	OEM car radio	[2]	[2]
Aiwa FR-A37	Clock radio	$19.99	Spring 1999
General Electric 7-4852A	Clock radio	$24.99	Summer 1998
Magnavox AJ 3840/17M	Clock radio	$29.99	Spring 1999
Sony ICF-C121	Clock radio	$19.95	Spring 1999
Zenith Z212G	Clock radio	$55.90	Spring 1999
JVC RX-554VBK	Component	$149.99	Spring 1999
Kenwood VR-205	Component	$199.99	Spring 1999
Pioneer VSX-D557	Component	$349.99	Spring 1999
Sharp MD-X5	Component	$399.99	Summer 1998
Sony STR-DE525	Component	$284.98	Spring 1999
Aiwa HS-TX386	Personal radio	$29.99	Spring 1999
Philips AQ 6688/17Z	Personal radio	$39.99	Spring 1999
Sony SRF-HM55	Personal radio	$56.96	Spring 1999
Sony SRF-49	Personal radio	$14.99	Spring 1999
Sony WM-FS191	Personal radio	$44.99	Spring 1999
Emerson PS6528	Portable radio	$39.99	Spring 1999
Panasonic RX-CS720	Portable radio	$69.95	Spring 1999
Radio Shack 12-639A	Portable radio	$39.99	Summer 1998
RCA RP-7700	Portable radio	$15.99	Summer 1998
Sony CFD-Z110	Portable radio	$69.00	Spring 1999

[1]This radio was lent to NAB by Delco Electronics for use in the NAB LPFM test program.

[2]This radio was lent to NAB by USA Digital Radio for use in the NAB LPFM test program.

Each radio was tested at three different desired signal levels: -45 dBm, -55 dBm and –65 dBm. Assuming the use of a half-wave dipole receiving antenna, these three received power levels are approximately equivalent to received field strength values of 70 dBu, 60 dBu and 50 dBu, respectively. As MLJ explains in its report, however, the Commission's predictions about the received signal level from FM broadcast stations include an assumption that the receive antenna is nine meters (30 feet) above the ground.[84] In the vast majority of real-world listening environments this is not an accurate assumption. Car radios, personal (*e.g.*, Sony Walkman) radios, clock radios and portable radios almost always employ antennas which are much lower than nine meters, as do most other radios. Because of this, the actual field strength received by these radios at the "60 dBu contour" as defined by the Commission is often closer to 50 dBu.[85]

So, an illustrative way to view the results for the three different desired signal levels tested is to consider them an indication of a receiver's performance at the 70 dBu city grade contour (-45 dBm for an antenna at nine meters, -55 dBm for an antenna at 1.5 meters) and at the 60 dBu protected contour (-55 dBm for an antenna at 9 meters, -65 dBm for an antenna at 1.5 meters). For clarity and to illustrate "real world" performance, the tables below report the data in relation to a receive antenna that is 1.5 meters above the ground (80 dBu/-45 dBm, 70 dBu/-55 dBm and 60 dBu/-65 dBm).

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84 Volume Two of these comments, Exhibit A at 4 – 5.

85 *Id.*