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Office of the Secretary (1800)
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Federal Communications Commission
1919 M Street N.W.
Washington, D.C. 20554

In the matter of Petitions for Rule Making:

Petition for a Microstation Radio Broadcasting Service	))	RM 9208
	--and--	
Proposal for Creation of the Low Power FM (LPFM) Broadcast Service	))	RM 9242
	--and--	
Amendment of Part 73 of the Rules and Regulations to Establish Event Broadcast Stations	)))	RM 9246

COMMENTS OF:

Edgar C. Reihl, P.E.
Principal Engineer
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Shure Brothers Incorporated hereby files these comments on April 22, 1998 concerning the above Petitions for Rule Making. Shure is a manufacturer of professional audio products serving the broadcast industry.

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Shure Brothers Incorporated -- RM 9208, RM 9242, & RM 9246

SUMMARY

It is the intention of these comments to address several of the technical issues surrounding the creation of a low power radio broadcast service. Inherent in the nature of the proposed service is the fact that the attendant broadcast facilities would ordinarily be constructed, operated, and maintained by members of the general public, perhaps with limited technical skills. Therefore, in order to provide some measure of protection against interference, we urge the Commission to require the use of Type Accepted transmitting equipment. We further recommend that the transmitting equipment incorporate automatic means to limit the modulation percentage and the audio bandwidth, so as to control the occupied bandwidth of the emission.

In the Petition for a Microstation Radio Broadcasting Service (RM 9208), the petitioners have suggested that one AM and one FM channel be set aside for the new service. However, the AM band is interference prone due to the type of modulation and the nature of radio wave propagation in that band. We recommend that the Commission give primary consideration to the use of the FM band.

By limiting the transmitter power to ten watts or less, simple antennas such as those designed for FM reception could be used for transmission. We propose that initially, the Commission allow only single bay antennas with gain limited to that of a dipole. We

further propose that the Commission not specify the type of polarization, in order to allow licensees to make that choice according to their target listening audience.

A power level of three to ten watts at a height of 50 feet (15 meters) above ground level should provide satisfactory service to a small community, or a neighborhood or section of a city. A power level of one to three watts would be suitable for Travelers' Advisory Radio stations, special event stations, theme parks, and the like.

To keep the playing field as level as possible, we recommend that the Commission consider basing the antenna height limitation for low power broadcasting stations on the Height Above Ground Level (HAGL). Especially in urban areas, the coverage of a low power broadcast station may be bounded primarily by building attenuation and shadowing rather than other factors.

As a separate issue, increasing the permitted power level of license free Part 15 transmitters to 10 mW in conjunction with improved technical standards, would provide opportunities for many new uses for very short range broadcasting from which the public could benefit.

DISCUSSION

The petitioners have brought wide-ranging arguments to bear on their various proposals to the Commission to create a Microstation, Low Power FM (LPFM), or Event broadcasting service. It is the intention of these comments to address several of the technical issues surrounding the creation of such a service. Inherent in the nature of the proposed service is the fact that the attendant broadcast facilities would ordinarily be constructed, operated, and maintained by members of the general public, perhaps with limited technical skills. Therefore, it is of the utmost importance that the Commission build in to any rule making proposal, all necessary safeguards to fully protect the public from interference which might be caused by improper operation. The potential for harm is not limited to life and safety issues, but also encompasses the risk of interference to other licensed radio and television broadcast services, causing degradation or loss of desired reception entirely. This problem is further exacerbated by the fact that the transmission facilities for many of these low power broadcasting facilities would undoubtedly be located directly within residential and business districts.

To provide some measure of protection against interference, we urge the Commission to require the use of Type Accepted transmitting equipment. We further recommend that the transmitting equipment incorporate automatic means to limit the modulation percentage and the audio bandwidth, so as to control the occupied bandwidth of the emission. This will make it necessary for the Commission to promulgate new technical

requirements for transmitting equipment designed for the low power broadcasting service, in the event that it is established. We suggest that stereophonic transmission be permitted, since that is the usual practice on the FM band, but that it not be required. We further recommend that no secondary services (e.g. SCA) be allowed, in order to encourage a focus on the provision of an aural service to the public.

In the petition for a Microstation Radio Broadcasting Service (RM 9208), the petitioners have suggested that one AM and one FM channel be set aside for the new service. They have not indicated how those channels should be chosen, nor what would happen to the stations that are currently operating on them. However, even if these obstacles should somehow be overcome, we would suggest that the AM band is a poor choice for a "cellular" broadcasting scheme. It is well known that as a class, linear modulation systems, of which Amplitude Modulation is a member, suffer badly from co-channel interference. It is only necessary to listen to the high end of the AM broadcast band at night, or to the Citizens' Radio band at any time, to observe this problem. It is also well known that AM band signals travel long distances at night, and that even low power signals can cause significant interference. For example, it is often possible during the night time hours to receive the low power Dallas/Ft. Worth Airport Travelers' Advisory Radio stations on 1640 and 1680 kHz in Chicago.

On the other hand, AM band signals do not propagate well into steel buildings, which are common in urban areas, nor do they compete well with the high noise levels

typically present in such locations. These factors have necessitated power increases and antenna system improvements by standard AM broadcast stations in order to maintain satisfactory coverage. A low power AM broadcasting station would be at a significant disadvantage under such circumstances. As a final note, the use of the AM band for low power broadcasting would also create problems for the design of the station's antenna system, due to the long wavelengths involved.

By contrast, the FM band lends itself to simpler implementation, due to the smaller antenna required. In addition, the "capture effect" of FM transmission, while by no means absolute, is certainly vastly better than AM. Furthermore, propagation conditions on the FM band are such that interference from distant stations is only sporadically encountered. FM band signals are able to penetrate buildings better than AM band signals do. All of these factors would lead to a higher and more consistent quality of reception from low power broadcasting stations, with far less interference.

It is important to note that FM band transmitters, by virtue of their VHF operating frequency, have the potential to interfere with a wide array of other communications systems, such as aeronautical navigation and television broadcasting. Again, we urge the Commission to weigh carefully the issues involving the use of "home built" transmitters in this band. For those who are technically inclined, and who have demonstrated basic technical skills to the Commission by examination, the Amateur

Radio Service offers an opportunity to design and build transmitting equipment which can be operated on the air in the Amateur bands.

Although we believe it would be dangerous to allow the use of home built equipment in the FM band except under the current Part 15 restrictions, the requirement of Type Acceptance need not force the price of a low power FM transmitter to be excessive. There are many Type Accepted low power transmitters for other radio services available on the market for under $200.

One area where we do believe the Commission could allow some flexibility would be in the design of the antenna system. By limiting the transmitter power to ten watts or less, simple FM receiving antennas could be used for transmission. We propose that initially, the Commission allow only single bay antennas with gain limited to that of a dipole. We further propose that the Commission not specify the type of polarization, in order to allow licensees to make that choice according to their target listening audience. Polarization diversity could also be used to mitigate interference problems between adjacent low power stations, in some cases.

A power level of three to ten watts, at a height of 50 feet (15 meters) above ground level, should provide very satisfactory service to a small community. In a dense urban area, it may only provide coverage of a few square blocks, but this may be adequate to cover a neighborhood or section of a city. Due to the potential administrative burden

such a low power broadcasting service could impose, the Commission might want to consider delegating the responsibility for licensing and interference resolution to local government bodies.

A power level of one to three watts should provide satisfactory coverage for Travelers' Advisory Radio stations, special event stations, theme parks, and the like. Special event stations have proven very popular and workable in other countries, such as the U.K. The Commission might also want to consider the possibility of moving the Travelers' Advisory stations now operating in the AM band, to the FM band. This would benefit the AM broadcast industry by removing a source of interference to new expanded band stations, and it would also benefit the traveling public by providing a much better signal quality with less interference. FM band Traveler's Advisory stations could be deployed quickly and easily, and the power level could be readily adjusted to provide only the desired coverage.

To keep the playing field as level as possible, we recommend that the Commission consider placing an antenna height limitation for low power broadcasting stations based on Height Above Ground Level (HAGL), rather than a certain distance above a building (e.g. Sears Tower). This also provides flexibility in the method that the licensee might use to elevate the antenna. Height Above Average Terrain (HAAT), which is normally used to predict the coverage of broadcast stations, may be less useful in predicting the coverage of low power stations using low antenna heights, since their range may be

bounded more by building attenuation and shadowing than other factors. Many studies of propagation in the VHF and UHF range under such conditions have been done, and are available in the literature.

As a separate matter, we also suggest that the Commission revisit the current Part 15 rules for the FM band and consider allowing license-free operation using Type Accepted transmitters at a power level of up to 10 mW, with upgraded technical standards for frequency stability, spurious emissions, modulation limiting, and audio bandwidth control. This would open up many new opportunities for very short range broadcasting from which the public could benefit. The current rules are so restrictive that the useful transmission range is under 50 feet (15 meters) in urban areas, especially with stereophonic operation. Some examples of potential uses for enhanced license-free Part 15 FM band transmission would include audio services for the hearing impaired, museum and tour guide systems, "talking" billboards, parking garage information, concert sound systems, and home cordless audio "broadcasting". A major advantage of the use of the FM band for these service is that listeners can provide their own receiving equipment.

CONCLUSION

It has been the intention of these comments to address several of the technical issues surrounding the creation of a low power radio broadcast service. Due to the fact that

facilities for such a service would not necessarily be constructed, operated, or maintained by technically oriented persons, we have urged the Commission to require the use of Type Accepted transmitting equipment to protect the public from harmful interference. We further recommended that the transmitting equipment incorporate automatic means to limit the modulation percentage and the audio bandwidth, so as to control the occupied bandwidth of the emission.

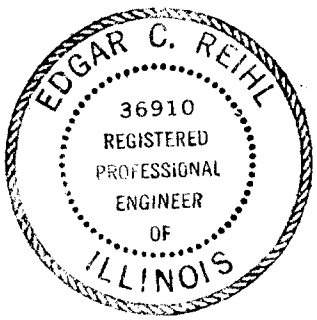
In the Petition for a Microstation Radio Broadcasting Service (RM 9208), the petitioners suggested that one AM and one FM channel be set aside for the new service. However, the AM band is interference prone due to the type of modulation and the nature of radio wave propagation in that band. We recommended that the Commission give primary consideration to the use of the FM band.

We suggested that the Commission consider several power level classifications for the low power broadcasting service. By limiting the transmitter power to ten watts or less, simple antennas such as those designed for FM reception could be used for transmission. We proposed that initially, the Commission allow only single bay antennas with gain limited to that of a dipole. We further proposed that the Commission not specify the type of polarization, in order to allow licensees to make that choice according to their target listening audience.

To keep the playing field as level as possible, we recommended that the Commission consider basing the antenna height limitation for low power broadcasting stations on the Height Above Ground Level (HAGL). Especially in urban areas, the coverage of a low power broadcast station may be bounded primarily by building attenuation and shadowing rather than other factors.

We also encouraged the Commission to revisit the Part 15 rules governing FM band operation with a view to making new uses for very short range broadcasting practical.

Respectfully submitted,

Edgar C. Reihl, P.E.

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