

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

MM
FCC 84-515
35131

In the Matter of)
Changes in the Rules Relating) Docket No. 20735
To Noncommercial, Educational) RM-1301, RM-1974 654
FM Broadcast Stations.) RM-2655

Third Report and Order
(Proceeding Terminated)

Adopted: October 26, 1984 ; Released: November 6, 1984

By the Commission: Commissioner Dawson concurring in the result.

INTRODUCTION

1. The Commission has before it a Second Further Notice of Proposed Rule Making (Second Notice) adopted on May 13, 1982, [47 FR 24144 on June 3, 1982] and the filings made in response thereto. The proceeding was initiated by a petition filed by the Corporation for Public Broadcasting (CPB) on May 12, 1972. The petition sought a comprehensive review of the assignment procedures and operational characteristics of noncommercial educational FM (NCE-FM) stations located within the reserved FM broadcast band (Channels 201-220). 1/ The Commission has already, as part of this proceeding, adopted several rule changes to encourage more efficient use of the reserved spectrum. 2/

2. The Second Notice sought to resolve several technical issues regarding the potential for interference to TV Channel 6 (TV-6) stations caused by operation of NCE-FM stations. A high potential for interference to TV Channel 6 stations exists because the NCE-FM band and TV Channel 6 are immediately adjacent in frequency. TV receivers often lack sufficient selectivity to reject a strong NCE-FM signal, resulting in interference. Several parties submitted comments and reply comments in this matter. The information supplied was very useful in helping us to reach a decision in this proceeding.

3. The inquiry into this matter has included: studies to determine the abilities of television receivers to distinguish between desired and undesired signals of differing relative strengths; evaluations of various techniques to remedy the interference problems; and, development of methods to

1/ Although noncommercial educational FM stations may operate on Channels 221-300, this proceeding is only concerned with those operating in that portion on the FM band reserved for their use, Channels 201-220.

2/ See First Report and Order (43 FR 25821 published on June 15, 1978) and Second Report and Order (43 FR 39704 published on September 6, 1978).

proposal were supportive, and no other limits were suggested. Therefore, the commercial power and antenna height limitations will be adopted as the standard for NCE-FM stations also. [See BC Docket No. 80-90; 48 FR 29486 on June 27, 1983]. Any existing NCE-FM stations that are already at greater facilities than the commercial maximums will be grandfathered.

ISSUE 2: INTERFERENCE REMEDIES

8. TV Receiver Selectivity Standards. In the Second Notice, we discussed at length the ability of television receivers, when tuned to Channel 6, to reject unwanted NCE-FM signals. The Commission noted that much of the interference resulted because of the inability of television receivers to reject adjacent channel interference adequately. Public radio interests agreed and argued that the problem could be solved by the use of more selective TV receivers. Others stated that although improved rejection capability would help, receiver standards would not "cure" the most severe cases of interference.

9. At the outset we would again point out that receiver improvements clearly do not represent a short-term solution to the problem. Therefore, in the first instance we are relying on the assignment standards outlined in Issue 5 and to the extent those solutions are satisfactory, as we predict, government mandated receiver standards will not be required. Nevertheless, it is clear that over the long term, better receiver selectivity would reduce problems. At present, the EIA/CEG (Electronic Industries Association/Consumer Electronics Group), with Commission participation, is involved with developing voluntary standards specifically addressing the TV Channel 6 interference problem. The Commission considers this work essential because insufficient information is now available to allow the drafting of such standards. The EIA Committee should fill that void by providing guidance for improved receivers. If the industry, for whatever reasons, is unable or unwilling to set its own receiver standards, it may be necessary for the Commission to step in. While we would be reluctant to do so, it is clear that we have the statutory ability, and we will exercise that authority if necessary. [Pub. L. No. 97-259, 96 Stat. 1087, 1091-92, September 13, 1982, 47 U.S.C. §302(a)(2)] The Commission may, upon review, determine that voluntary compliance by receiver manufacturers with the EIA guidelines is appropriate and we may be able to begin relaxing the assignment criteria as market penetration of the improved receivers expands. Ultimately, we could also decide, for example, to provide interference protection only to those receivers meeting minimum interference standards.

10. Collocation. Commenters agreed, for the most part, that collocation is the preferred means of reducing interference to TV Channel 6 reception while allowing NCE-FM stations the highest possible power levels. Noncommercial FM interests were concerned as to whether or not TV-6 stations would allow them access to the TV antenna sites.

11. The Second Notice defined collocation as an NCE-FM station locating its transmitting antenna within one mile of a TV Channel 6 transmitting antenna. Most commenting parties argued that the one mile limit for collocation was too great. A study conducted for the Joint Comments determined a distance of 0.4 kilometers (0.25 mile) to be more

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appropriate. 4/ Locating beyond this point, the study noted, "causes FM field strengths up to 12 to 13 dB above the threshold to cause interference." Therefore, based on the data submitted, we shall adopt 0.25 mile as the definition for collocation.

12. Although some suggested lower power levels than proposed in the Second Notice, the proposed values for collocated NCE-FM stations will be used. We believe that the power levels proposed offer satisfactory protection given the undesired-to-desired (U/D) rejection ratios cited in the Second Notice for each of the lower channels. Also, if there is a problem with a particular channel not affording adequate protection, as some comments alleged, any resulting interference can be alleviated by the use of other remedies. Further, the FM station still has an obligation to assist in satisfying complaints or reducing power. 5/.

13. Vertical Polarization. A question was raised in the Second Notice as to the interference reducing benefits of NCE-FM stations to operate with vertical polarization. The majority of commenters supported vertical polarization as a means of minimizing interference. A study, submitted in the Joint Comments, determined the advantage to be expected by vertical polarization of an FM transmitting antenna. The Joint Comments proposed a figure of 16 db power allowance for FM stations employing vertical polarization and locating in rural areas, and a 10 db allowance for urban areas.

14. Although data on the effects of vertical polarization on NCE-FM coverage are scanty, the record supports allowing it as a means of avoiding NCE-FM stations interfering with TV-6 stations. The Commission, therefore, will permit its use and allow the effectiveness of vertical polarization to be proven in actual situations. 6/ This rule change will provide NCE-FM stations with additional flexibility for minimizing interference problems. However, the record failed to contain detailed information on the effects of vertical polarization on the coverage areas of NCE-FM stations. Additional experimentation is encouraged in this area.

4/ Joint Comments submitted by a group of television industry representatives formed to study the impact of Docket 20735. This group, working with educational FM representatives, conducted technical studies and submitted their results as the "Ad Hoc Committee Report."

5/ The responsibilities of the FM permittee under program test authority will be discussed in detail later in this report.

6/ In addition to allowing vertical polarized NCE-FM antennas, we will also permit the vertical component of radiation of circular polarized FM antennas to exceed the horizontal component of radiation. Thus, the optimum mix of vertical to horizontal components can be selected to meet individual circumstances.

15. Receiver Filters. The Second Notice proposed that external filters attached to the TV receiver could provide as much as 20 dB protection on the higher channels. All commenters rejected this figure. Interestingly, some claimed better results while others indicated worse. Proponents of filters submitted frequency response curves of several filters showing as much as 60 dB attenuation of the interfering signal. They submitted case studies claiming success in eliminating nearly all cases of interference with the installation of filters costing \$10.00 or less. In short, proponents claimed that filters do work, have worked in the past, and should be considered in any rules the Commission adopts.

16. Opponents of filter use submitted similar comments but drew opposite conclusions. The National Association of Broadcasters (NAB) submitted a major study which showed not only substantial attenuation of the interfering FM signal when using filters, but also a degradation (3-10 dB) of the TV-6 aural carrier and the color subcarrier. Opponents also stated that effective filters are only available for TV receivers having 75 ohm coaxial cable inputs (currently comprising 15-20% of the market). They claimed that an effective filter program would be excessively costly to the NCE-FM stations and/or the public. Thus, the opponents of filters believed that the marginal improvements in TV signal quality do not outweigh their financial burdens.

17. As experienced throughout this proceeding, the information on filters was again contradictory. Thus, we cannot adopt, with any degree of confidence, the proposed 20 dB improvement for filters outside a laboratory environment. By adopting flexible standards, however, we could let actual field situations resolve this question. Thus, we will leave it to the judgment of the NCE-FM applicant whether filters provide a viable option.

18. Miscellaneous Solutions. The Commission also notes that the NCE-FM applicants have many options for minimizing the interference to TV-6 stations. For example, the NCE-FM station could locate its transmitter so that the area of interference is in unsettled, or sparsely settled, areas. ^{7/} The NCE-FM permittee may replace a lost, or severely degraded, TV-6 signal by providing a TV translator in the affected area(s). They may also wish to take into account the direction of TV receiving antennas and locate the NCE-FM transmitter site so as to minimize interference. On this point, the Joint Comments were especially instructive in pointing out that there are a panoply of interference reduction techniques available. It is our intention to prepare an Office of Science and Technology (OST) Bulletin to provide guidance on those techniques. Finally cable penetration, or other factors that might lower the numbers of TV-6 viewers affected may be considered.

^{7/} In this regard, a companion proceeding which examined the interference experienced by TV and FM receivers in close proximity to transmitter sites ("FM blanketing") has made rule amendments to encourage this option. See Report and Order in BC Docket No. 82-186 also adopted this day.

ISSUE 3: LEVEL OF INTERFERENCE PROTECTION

19. To adequately evaluate this issue, we examined the record to note whether the interference problem between the NCE-FM stations and TV-6 stations is sufficiently widespread to warrant new assignment standards for NCE-FM stations. The basic assertion that NCE-FM stations can cause interference to TV-6 stations is unquestioned. The extent of that interference, however, is not well defined. Several case studies were file by TV broadcast stations, most notably KOIN-TV, Portland, Oregon, which detailed a large number of public complaints. At the same time, many NCE-FM stations indicated few complaints have been received, and they claimed that most cases were easily rectified with the use of filters at the television receivers. National Public Radio (NPR) conducted a survey of its member stations asking them to define the extent of their interference. The majority believed it to be either non-existent or very limited. However, a sample of the Commission's Field Operations Bureau's files indicated that the problem, while not universal, can be severe in isolated cases and thus result in large numbers of complaints.

20. Noting the relatively few cases of interference with over 1,100 NCE-FM stations on the air, the Commission finds that the restrictive facilities contemplated by the Second Notice are not justified. However, we cannot ignore the fact that NCE-FM stations have the potential to cause severe interference to TV-6 stations.

21. The Second Notice proposed standards based on differing undesired-to-desired (U/D) rejection ratios for Channels 201-220. The ratios were chosen to provide "just perceptible" interference to a "passable" TV picture quality of -65 dBm signal strength. 8/ The TV-6 interests, rejecting this figure, were concerned that more than "just perceptible" interference could be caused to "fine" or "excellent" pictures. No data was presented, however, to alter our view that "fine" or "excellent" pictures could tolerate somewhat more than "just perceptible" interference without serious picture degradation. Therefore, we will use the -65 dBm signal strength universally as the basis for our interference standards. We recognize that TV-6 viewers, depending on the strengths of their TV-6 and NCE-FM signals, will experience

8/ Definitions for picture quality are found in Engineering Aspects of Television Allocations Report of the Television Allocations Study Organization (TASO) to the Federal Communications Commission, March 16, 1959. A "passable" picture is of acceptable quality with no objectionable interference.

differing degrees of loss in picture quality. ^{9/} However, the record shows that the NCE-FM stations should be able to remedy most of the viewer dissatisfaction through application of corrective techniques. In the extreme case, the NCE-FM station would have to reduce power or terminate operations.

ISSUE 4: INTERFERENCE PREDICTION

22. Many commenters were critical of the "effective interference" approach proposed in the Second Notice and noted that the TVINT program did not include the necessary functions to compute the true impact of interference. ^{10/} A report submitted by the Joint Comments notes that the user of the computer program is responsible for the assumptions necessary to predict service and interference in both the manual and automated process. Therefore, it claims the TVINT program does not offer any advantages to the traditional method. Furthermore, the report states that effective interference is undermined by several technical defects, such as, the assumption of a zero correlation coefficient for location and time based on path differences between the desired and undesired signals. Finally, it argues that the inability of TVINT and effective interference to denote what area will experience interference is a step backward from the traditional method which does.

23. Additional comments from TV-6 interests stated the effective interference model constitutes a distorted view of reality. The Joint Comments used the TVINT program to analyze existing situations. It showed a marked differences in the square mileage of interference predicted using effective interference, traditional method, and field study. Noting these differences, commenters claimed that the facilities proposed would cause interference in excess of that predicted using the TVINT and effective interference model.

24. The NCE-FM commenters also discussed the deficiencies of the TVINT program. CPB stated that the program lacks essential items such as: the population within TV Channel 6's Grade B contour, the availability of the TV Channel 6 programming from alternate sources, or whether the FM signal is vertically polarized. Some commenters argued that the model is only a good mathematical exercise, but does not describe areas with a high probability of interference.

^{9/} The aural signal of the TV-6 station may also experience some degradation. This was taken into account since the U/D ratios are based on interference to picture or sound, whichever occurred first. See FCC/OST Lab Report No. 79-01 (Tests of TV Receivers for "Just Perceptible" Interference to TV Channel 6 from Educational FM Signals), September, 1979.

^{10/} TVINT is a computer program developed for the prediction of interference. It is capable of predicting interference by the traditional method or by the effective interference method. See FCC/OST Report No. TM 82-2 titled "A Program to Calculate Effective Interference", July, 1982, by Harry Wong.

25. The Commission recognizes that the TVINT program is not all encompassing (as with any model). However, the primary advantage of the TVINT program and the effective interference concept is that all locations susceptible to interference can be taken into account. The traditional method only considers an area wherein 50% or more locations are predicted to receive an interfering signal. Therefore, it does not account for the loss of service throughout the whole Grade B service area. Also, a location inside the traditional interference area may be receiving better TV-6 service than expected and would not lose service as predicted. Therefore, the traditional method only begins to state where interference may occur. In addition, it usually does not include items such as population, alternative services, etc.

26. The Commission finds the effective interference method offers a more accurate prediction of the total area that will receive interference for a specified probability of service. In this case, the TVINT program predicts a statistical probability of service and interference. It was not designed to judge the reasonableness, accuracy, or honesty of the data supplied by the user. Making the user responsible for these assumptions allows flexibility to look at the relative effects of different station facilities in a short period of time. Also, TVINT is capable of considering population if the user chooses to provide the data. Further, we expect any attempt to devise an acceptable correlation coefficient for location and time differences between the TV and FM signals would not only be unreliable but would tend to understate the amount of interference predicted. For these reasons, we continue to believe the effective interference model and the TVINT program to be the best method for predicting the total interference effect.

ISSUE 5: THE SOLUTION

27. The Second Notice proposed to minimize the interference to TV-6 stations by limiting the power of NCE-FM stations. Using the TVINT computer program, a value of effective interference was chosen which would limit interference but still allow authorization of some non-collocated NCE-FM stations. 11/ The Commission proposed a figure of 0.3 square miles of effective interference as accomplishing this goal. Using the 0.3 square mile figure, maximum facilities for NCE-FM stations located at various distances from the TV-6 station were proposed.

28. CPB, NPR, and others argued that permitting only 0.3 square miles of allowable interference was unduly restrictive. These commenters cited the figures given in the Second Notice showing that 40% of all applications on file would be affected, not to mention the impact on future applications. Their positions were that two adjacent television channels (low band) located at the minimum distance separation of 60 miles and operating with maximum facilities would cause 1,098 square miles of mutual effective interference. They argued that the NCE-FM band should be considered an upper adjacent channel to TV-6; thereby, they claimed that the FM stations should be allowed more than 0.3 square miles of effective interference.

11/ The studies of the Second Notice used the U/D ratios based on a signal strength of -65 dBm and allowed 20 dB attenuation for band reject filters.

29. Because the attenuation for band-reject filters appeared excessive at 20 dB (see paragraph 17), further computer studies were made for various effective interference levels using a more conservative 5 dB general allowance for various remedies. 12/ The three areas of effective interference considered were 0.3, 1.0, and 3.0 square miles. Using the TVINT program, we determined where "Low Power" and small "Class A" NCE-FM stations would not be able to locate. 13/ The results showed that if the 0.3 square mile of effective interference was adopted, not even a low power (100 W and 100 feet) NCE-FM station could locate within the Grade B service area of a TV-6 station (approximately 12,000 square miles for each of the 50 TV-6 stations now operating). Only marginal improvements in availability were found for an effective interference area of 1.0 square mile. Adoption of either of these figures would essentially prevent NCE-FM stations from locating east of the Mississippi river. Only the 3.0 square mile figure offered any potential of permitting additional NCE-FM stations to be established.

30. The Commission, in the Second Notice, recognized that "[i]t is necessary to strike a balance between the conflicting goals of limiting TV Channel 6 interference and providing for a viable educational FM service." 14/ The 0.3 square mile of effective interference was chosen as satisfying this goal. However, we now know that adopting standards based on this amount of effective interference would effectively preclude any new NCE-FM service within most, if not all, populated areas. Given that most TV-6 stations' Grade B contours cover approximately 12,000 square miles, the Commission finds that 3.0 square mile of effective interference does not

12/ Using the TVINT program the following runs were made:

- a. TV-6 facilities were set at 100 kW and 1000 feet HAAT, no vertical pattern was assumed, and average terrain roughness was used.
- b. Two sets of NCE-FM facilities were set at: 1. a minimal sized station of 100 Watts and 100 feet HAAT, and 2. a small sized station of 3 kW and 328 feet HAAT; no vertical pattern assumed, and average terrain roughness.
- c. Set 1 and Set 2 runs were made for Channels 203, 211, and 217.
- d. Protection Ratios, R(Q), of -6.5, -26.0, and -34.0 for Channels 203, 211, and 217, respectively were chosen.
- e. The separation distance was varied for all runs from 1 mile to 140 miles.

13/ For the studies, we selected the minimum power (100 W) and the smallest class (3 kW @ 100 meters) permitted commercial stations. The greater facilities of the larger commercial classifications would have less availability.

14/ See Second Notice at paragraph 19.

appear excessive. To base the new standards on less than 3.0 square miles of effective interference would curtail the NCE-FM service to a greater degree than can be justified by the record.

31. Conversely, permitting more than 3.0 square miles could result in interference to too many people. Several comments pointed out that the amount of permissible interference should be based on population rather than area. The Commission must reject this suggestion because it could lead to arguments on interference areas, population counts, and gain versus loss benefits. These are the very issues that make the AM processing so time consuming and cumbersome. However, we do agree that the analysis is not complete until the impact on TV-6 viewers is better defined. Wishing to translate 3.0 square miles into number of viewers, the Commission determined the number of TV households per square mile for the "Area of Dominant Influence" (ADI) of 48 TV-6 stations. ^{15/} We found that the number of TV households per square mile ranged from a low of 1.5 TV households/square mile for Hayes Center, Nebraska to a high of 276 TV households/square mile for Philadelphia, Pennsylvania. Our examination yielded a median number of 63 TV households as losing service for 3.0 square miles of effective interference. Rather than adopting standards to account for the worst case, the median figure will be used as representative; although, unique instances may require case-by-case analysis of what may be considered excessive interferences. Further, this figure is substantially less than the population (between 1,000 and 3,000 persons) that was submitted as acceptable by the Joint Comments.

32. Having established the allowable interference level, we may now proceed with development of the solution. Because collocation of the NCE-FM and TV Channel 6 transmitters is highly desirable, the new rules provide an incentive for collocation. As stated earlier, stations will be considered collocated if their antennas are within 0.25 mile. NCE-FM stations that choose to collocate will be permitted relatively large facilities as compared to other locations within the TV Channel 6 Grade A or Grade B contours. The specific power levels authorized are shown in Appendix A, Table A. Interference to TV-6 stations should be minimal if the NCE-FM station operates at the recommended level. However, since we cannot be certain that a few serious cases could not occur, we reserve the right to deal with such instances on a case-by-case basis which may necessitate, as one option, a reduction in power below the Level 1 values.

33. Non-collocated NCE-FM stations will be restricted in power based on their frequencies (channels), distances from the TV Channel 6 stations, and TV-6 facilities. The extent of the power restriction zone will end at 140

^{15/} 1983-1984 ADI Market Guide for Television, Arbitron Ratings Company, 1984.

miles from the nearest TV Channel 6 station. ^{16/} Basically, two power levels will be permitted for each station, a recommended level (Level 1) and a maximum level (Level 2). For stations on Channels 201-206, the Level 1 and Level 2 powers will be equal due to the greater potential of these channels to cause interference to TV Channel 6. Any NCE-FM station unable to resolve its interference problems may be required to significantly reduce power, even down to Level 1.

34. The permitted Level 1 powers may be determined from Appendix A, Table B. The value in Table B must then be adjusted for the frequency of the proposed station by the value shown in Appendix A, Table C. The final calculated effective radiated power is that power which should cause interference to no more than 3.0 square miles of the TV Channel 6 service area. Although NCE-FM applicants or permittees assume no financial responsibility at this level to correct interference problems, the power level assumes application of 5 dB of remedies which are left to the NCE-FM applicant's choice (e.g., prudent location of the FM transmitter).

35. NCE-FM stations requesting Channels 207-220 will also be permitted a higher power level (Level 2). These values also appear in Table B and must be adjusted by the values in Table C. It is expected that several of the available remedies can be employed at the Level 2 power to eliminate interference to the TV Channel 6 stations. NCE-FM stations choosing this higher power level will assume full financial responsibility for eliminating all cases of interference. This may be accomplished by application of remedies, such as, vertical polarization of the FM antenna, installation of a TV translator, etc.

36. No stations will be allowed to be constructed in areas in which the recommended power level would be less than 100 watts. This is an annular area about the TV Channel 6 transmitter, usually within the Grade B contour. Because stations applying for Level 2 powers may be required to reduce to Level 1 powers, Level 1 powers must be at least 100 watts. The 100 watt minimum is consistent with the Commission's belief that stations operating below this level are not spectrally efficient. Although the Second Notice requested comments on this, we have found no basis for reinstating these sub-minimum facilities.

37. All of the power levels calculated assume an antenna height of 100 feet above average terrain. If higher antennas are used, then appropriate reductions in effective radiated power (ERP) must be made so that the 1 mV/m contour of the NCE-FM station will not be extended beyond that for a 100 foot antenna. However, power reductions below 100 watts ERP will not be authorized to meet this requirement.

^{16/} Comments were submitted requesting reduction of the 140 mile separation distance. However, it is possible for a full powered FM station on Channel 201 to cause interference at distances slightly greater than 140 miles. Therefore, the 140 mile limit will be adopted.

38. An NCE-FM applicant must include in its application for a construction permit (Form 340) an exhibit of where interference is likely to occur (using traditional standards or the effective interference model) and a discussion of what plans have been made to remedy this interference. ^{17/} An applicant will be granted a conditional Construction Permit (CP) denoting that program testing can take place only in close cooperation with FCC Field Operations Bureau (FOB) offices, TV-6 stations, and local community groups. The NCE-FM station, including those operating collocated with a TV-6 station, must take corrective measures to alleviate any cases of interference before licensing. If operating above the recommended level (above Level 1), then all non-exempt interference within the TV-6 station's Grade B contour must be remedied. Outside the Grade B contour area, the NCE-FM stations must provide useful information on possible solutions and other services as appropriate. Under the new rules, permittees will be monitored closely by the Engineers In Charge (EIC) of FOB field offices. EICs will have the discretion to alleviate excessive interference problems by limiting Program Test Authority to a specific length of time (i.e., days, weeks, months, etc.). When the interference is within reasonable bounds the NCE-FM station must supplement its license application to indicate its compliance (noted by the EIC) with the interference reduction rules. Permittees will be exempt from resolving interference to malfunctioning or mistuned receivers, improperly installed antenna systems, use of antenna booster amplifiers, or to associated non-rf devices. (See FCC OPP Report UHF Reception and Television Preamplifiers, April, 1981).

39. It must be emphasized that NCE-FM stations are being granted the ability to engineer individual situations to minimize potential interference and remedy actual problems. The options to minimize interference are left to the permittee but may, in the most severe cases, necessitate a reduction in power. Consequently, these rules should minimize interference to TV-6 stations while permitting the maximum freedom to expand the NCE-FM service. At the same time, this approach induces the educational station to minimize its total number of interference cases. The greater the interference potential caused by large facilities, the more responsibility is required by the rules. It is, therefore, in the NCE-FM applicant's interest to be very conservative in requesting facilities and to take all steps to insure minimal interference.

40. The licensing policies for NCE-FM stations operating under the new rules will be as follows:

A CONDITIONAL CONSTRUCTION PERMIT WILL BE ISSUED which alerts the NCE-FM applicant to the interference responsibilities,

^{17/} NCE-FM stations should try to minimize interference, for example, when selecting their tower location, to the reception of low power television (LPTV) and TV translator stations operating on Channel 6; however, protection will not be required. Any LPTV or TV translator station that has to move because of interference received from a new NCE-FM station may apply for a special temporary authorization (STA) until final disposition of their license modification.

BEFORE PROGRAM TESTS ARE AUTHORIZED, the permittee must notify the Field Operations Bureau's field office of the steps taken to alert the local community of possible interference to TV Channel 6 reception,

BEFORE THE LICENSE IS GRANTED, the permittee must supplement the application for license with a discussion of its actions to supply information to all reasonable complaints and its attempts to remedy all cases of interference to TV Channel 6 stations, and

BEFORE THE LICENSE IS GRANTED, the permittee must submit an affidavit (noted by the EIC) that at least 2 months of program testing has occurred and all non-exempt complaints (as defined in the rules) have been satisfied. [This condition of satisfying all complaints would apply to those stations with greater than Level 1 facilities.]

SAMPLE CALCULATION

41. Assume an applicant desires to construct a station on Channel 215 at a distance of 40 miles from a TV Channel 6 station. The first step in the calculation is to determine the field strength of the TV-6 station at the proposed site. A TV-6 station operating at 100 kW with an antenna height of 1000 feet above average terrain would have a predicted field strength of 63.6 dBu at 40 miles. Using that value, Table B indicates an ERP (Level 1) of -3.34 dBk (463 watts), at 100 feet antenna height. From Table C a +6 dB frequency factor may be applied. This yields a final Level 1 ERP of 2.66 dBk (1.85 kW) at 100 feet. Likewise, a Level 2 power of 17.66 dBk (58.34 kW) can be computed. If the applicant chose to use an antenna height of greater than 100 feet above average terrain (HAAT), Level 1 or Level 2 values would have to be appropriately reduced to assure that the 1 mV/m contour was not extended beyond that for the 100 foot HAAT.

GRANDFATHERING

42. The Second Notice proposed to grandfather all existing stations at their present facilities. It questioned whether a station should be allowed to modify its license if it did not increase the total interference, but shifted the interference to a different geographic location.

43. Most commenters generally accepted the grandfathering of existing stations. The notable exception was KOIN-TV, a TV Channel 6 station which is currently receiving interference from a noncommercial FM station. It urged the Commission to take no action which would either legitimize or perpetuate existing interference. KOIN-TV sought a policy of requiring interfering stations to make an honest engineering effort to rectify interference before receiving grandfathered status. Although we share this concern of allowing interference to continue, we decline to mandate additional burdens to existing FM licensees. We do expect, however, all NCE-FM stations to take steps (such as educating the public) to minimize excessive interference.

44. Commenters were generally opposed to the idea of shifting the interference burden from one group of people to another. TV Channel 6 interests believed it unfair to shift the interference from one geographic

area to another, even if there was a reduction in the total number of people who received interference. They proposed that the affected TV-6 station be consulted whenever an educational FM station seeks to upgrade or change its facilities.

45. Upon reflection, we agree that it would be unfair to shift interference from one geographic area to another. Therefore, any upgrade or modification which will increase or shift the area receiving interference will be considered under the new rules. To permit some license modifications, however, we will permit those changes that would not aggravate the existing interference.

MISCELLANEOUS MATTERS

46. In the Second Notice, we also proposed to eliminate an anomaly in the NCE-FM station rules. Currently, Section 73.509 states that objectionable interference between two NCE-FM stations exists if the undesired signal exceeds the desired by certain undesired-to-desired (U/D) signal ratios at the desired station's 1 mV/m contour. In the case of second and third adjacent channels, where the undesired signal can be stronger than the desired signal, an adjacent channel station located within the desired station's 1 mV/m contour can appear to comply with the U/D ratios at the 1 mV/m contour. However, it may actually cause excessive interference inside the 1 mV/m contour. Further, the U/D ratio appears to improve as the undesired station moves closer to the desired station's transmitter and away from the 1 mV/m contour. The Second Notice proposed to resolve the anomaly by simply specifying prohibited contour overlaps. Comments were supportive. Therefore, we shall adopt that option.

SUMMARY

47. The rules contained in Appendix A reflect the need for flexibility. The record shows that there exist varying degrees of interference to TV Channel 6 reception from NCE-FM stations, and a variety of solutions available to resolve the interference. To attempt to account for all of these situations in tightly formulated standards would be unreasonable. The approach chosen allows the assignment of noncommercial FM facilities where the applicant must "engineer in" facilities that will cause minimum interference. NCE-FM applicants can choose their levels of operation and financial responsibilities based on individual circumstances. Likewise, TV Channel 6 interests can be assured of a minimum interference impact.

48. The Commission stresses that the degree that any specific technique (i.e., vertical polarization, etc.) will alleviate interference has not been determined. We have left that issue to be explored by the NCE-FM applicants. Also, we do not wish to imply that various situations will be reviewed by the Commission for specific power authorizations. The exact options that NCE-FM applicants may exercise are solely their decisions. The rules only reflect the Commission's desire to ensure minimal television interference while permitting the expansion of the NCE-FM service.

49. Finally, the Commission acknowledges that the assignment standards being adopted represent an attempt to allow the industry to explore interference reducing techniques and to encourage voluntary improvements to

television receivers (see paragraph 9). The Commission will monitor the effects of the rules adopted today (with specific interest in the number of complaints generated, effectiveness of remedial techniques, and establishment of voluntary receiver standards). Further, the Mass Media Bureau is directed to prepare for the Commission's consideration, no later than three years from the date of release of this order, a staff report (Memorandum, Opinion and Order) containing a recommendation whether the new rules, and specifically Levels 1 and 2 power values, are appropriate as adopted.

50. REGULATORY FLEXIBILITY FINAL ANALYSIS

I. Reason for action

To prevent exacerbation of the interference problem created when a new noncommercial educational FM station operates in a Television Channel 6 service area.

II. Objective

To further develop the noncommercial educational FM service with minimal loss of Television Channel 6 service.

III. Legal basis

Sections 303(r) and 4(i) of the Communications Act of 1934, as amended.

IV. Description, potential impact and number of small entities affected

The rules herein adopted will provide assignment standards for noncommercial educational FM stations. These rules are expected to allow for growth in educational broadcasting services, while maintaining present Television Channel 6 service.

There is no significant impact expected on present Television Channel 6 licensees or future applicants for Channel 6 stations. These rules limit future noncommercial FM facilities located within a Television Channel 6 service area; thereby, reducing their potential to cause interference. This reduced service area could adversely affect available financial support for noncommercial educational FM stations. These new rules also permit the use of filters, vertical polarization, or other remedies, which could permit increases in noncommercial educational FM service areas.

The positive impact of the new rules would be to help the noncommercial educational FM licensee to circumvent interference problems. In sum, the adoption of these rules will generally limit the size of new noncommercial educational FM stations and make upgrading of many existing stations in Channel 6 TV service areas more difficult. However, the new rules will permit many stations on the air that would otherwise have been forbidden.

V. Recording, record-keeping and other compliance requirements.

None.

VI. Federal rules which overlap, duplicate or conflict with this rule.

None.

VII. Any significant alternative minimizing the impact on small entities and consistent with the stated objective.

None.

ACTIONS

51. The Secretary shall cause a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to be sent to the Chief Counsel for Advocacy of the Small Business Administration in accordance with Paragraph 603(a) of the Regulatory Flexibility Act (Pub. L. No. 96-354, 94 Stat. 1164, 50 U.S.C. et seq.).

52. Accordingly, IT IS ORDERED, pursuant to the authority contained in Sections 4(1) and 303(r) of the Communications Act of 1934, as amended, that Part 73 of the Commission's Rules and Regulations is AMENDED effective as of January 1, 1985, as set forth in the attached Appendix A.

53. IT IS FURTHER ORDERED, that RM-1301 is DENIED as being rendered moot by this proceeding.

54. IT IS FURTHER ORDERED, that this proceeding is TERMINATED.

55. For further information on this matter, contact Kathryn Hosford, Mass Media Bureau, at (202) 632-9660.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

Attachments: Appendix A: Adopted Rules
Appendix B: List of Commenters

A P P E N D I X A

Title 47 C.F.R. Part 73 is amended as follows:

1. 47 CFR §73.509 is revised in its entirety to read as follows:

§73.509 Prohibited overlap.

(a) An application for a non-Class D (secondary) station, whether for a new station or an application for a change in a station, will not be accepted if the proposed operation would involve overlap of signal strength contours with any other station whose transmitter is located more than 320 kilometers (199 miles) from the U.S.-Mexican border and operating in the reserved band (Channels 200-220, inclusive) as set forth below:

| Frequency Separation | Contour of Proposed Station | Contour of Other Station |
|----------------------|---------------------------------------|---------------------------------------|
| Co-channel | 0.1 mV/m (40 dBu) 1 mV/m (60 dBu) | 1 mV/m (60 dBu) 0.1 mV/m (40 dBu) |
| 200 kHz | 0.5 mV/m (54 dBu) 1 mV/m (60 dBu) | 1 mV/m (60 dBu) 0.5 mV/m (54 dBu) |
| 400 kHz | 10 mV/m (80 dBu) 1 mV/m (60 dBu) | 1 mV/m (60 dBu) 10 mV/m (80 dBu) |
| 600 kHz | 100 mV/m (100 dBu) 1 mV/m (60 dBu) | 1 mV/m (60 dBu) 100 mV/m (100 dBu) |

(b) An application by a Class D (secondary) station, other than an application to change class, will not be accepted if the proposed operation would involve overlap of signal strength contours with any other station as set forth below:

| Frequency Separation | Contour of Proposed Station | Contour of any Other Station |
|----------------------|-----------------------------|------------------------------|
| Co-channel | 0.1 mV/m (40 dBu) | 1 mV/m (60 dBu) |
| 200 kHz | 0.5 mV/m (54 dBu) | 1 mV/m (60 dBu) |
| 400 kHz | 10 mV/m (80 dBu) | 1 mV/m (60 dBu) |
| 600 kHz | 100 mV/m (100 dBu) | 1 mV/m (60 dBu) |

(c) The following standards shall be used to compute the distances to the pertinent contours:

(1) The distance of the 60 dBu (1 mV/m) contours shall be computed using Figure 1 of §73.333 [F(50,50) curves] of this Part.

(2) The distance to the other contours shall be computed using Figure 1a of §73.333 [F(50,10) curves] of this Chapter. In the event that the distance to the contour is below 16 kilometers (10 miles), and therefore not covered by Figure 1a, the curves in Figure 1 must be used.

(3) The effective radiated power (ERP) that is the maximum ERP for any plane on any bearing will be used.

(d) An application for a change (other than a change in channel) in the facilities of a noncommercial educational FM broadcast station will be accepted even though overlap of signal strength contours, as specified in paragraphs (a) and (b) of this Section, would occur with another station in an area where such overlap does not already exist, if:

(1) The total area of overlap with that station would not be increased;

(2) There would be no net increase in the area of overlap with any other station;

(3) The area of overlap does not move significantly closer to the station receiving the overlap; and,

(4) There would be created no area of overlap with any station with which the overlap does not now exist.

(e) The provisions of this Section concerning prohibited overlap will not apply where the area of such overlap lies entirely over water.

2. 47 CFR §73.511 is revised in its entirety to read as follows:

§73.511 Power and antenna height requirements.

(a) Except as provided in §73.504 (b), on Channels 201 to 220, inclusive specified in §73.501, no educational station will be authorized with effective radiated power less than specified in §73.211(a)(1).

(b) On Channels 201 to 220, inclusive specified in §73.501, no educational station will be authorized with effective radiated power greater than specified in §73.211(b)(2).

(c) Stations licensed before January 1, 1985, and operating above 50 kW in Zones I and I-A, and above 100 kW and in Zone II may continue to operate as authorized.

Note: For educational stations authorized before January 1, 1985, the provisions of this Section [§73.511] become effective March 1, 1987.

3. A new 47 CFR §73.525 entitled "TV Channel 6 Protection" is added to read as follows:

§73.525 TV Channel 6 protection.

(a) Noncommercial, educational FM stations authorized as of January 1, 1985, may not make changes in operating facilities or location that result in any increase or shift in interference without considering the requirements of this section. Further, a FM station authorized as of January 1, 1985, which seeks to improve its operation may request to return to its previous, or lesser, facilities without considering the requirements of this section.

(b) An application for a FM station operating on Channels 201-220 and located at 0.4 kilometers (approximately 0.25 mile) or less from a TV Channel 6 station will not be accepted if the antenna height above average terrain (HAAT) exceeds the TV Channel 6 station's HAAT by more than 30 meters (approximately 100 feet) or the effective radiated power exceeds the following values:

TABLE A

| EDUCATIONAL FM CHANNEL | EFFECTIVE RADIATED POWER (dBk) |
|------------------------|--------------------------------|
| 201 | 0.5 |
| 202 | 3.7 |
| 203 | 4.9 |
| 204 | 7.0 |
| 205 | 9.2 |
| 206 | 11.4 |
| 207 | 13.5 |
| 208 | 15.7 |
| 209 | 17.9 |
| 210-220 | 20.0 |

(c) An application for a FM station operating on Channels 201-220 and located more than 0.4 kilometers but less than 225 kilometers (approximately 0.25 miles and 140 miles) from a TV Channel 6 transmitting antenna will not be accepted if it exceeds the maximum facilities allowed as determined in the following steps:

(1) Calculate the distance to the authorized TV Channel 6 station by use of the method set forth in §73.208(c) of this Part.

(2) Predict TV Channel 6 field strength at the proposed FM transmitter site by use of the distance determined in subparagraph (1), the authorized effective radiated power (without considering beam tilt), and the antenna height above average terrain of the TV Channel 6 station, and Figure 1 of §73.333 [F(50,50) curves] of this Part. [To avoid difficulties due to the differences in units, the curves of §73.333 will be used for TV Channel 6 stations also. The field strength curves for FM and TV Channel 6 are identical.]

(3) Obtain, for the TV Channel 6 field strength determined in subparagraph (2), the uncorrected allowed power from column denoted ERP₁ for Channels 201-220 or ERP₂ for Channels 207-220 in the following Table B. If the TV Channel 6 field strength determined in subparagraph (2) does not correspond exactly with a field strength in the table, linear interpolation shall be used. If the TV Channel 6 field strength in subparagraph (2) is greater than 90 dBu, then the initial power shall be the value corresponding to a TV Channel 6 field strength of 90 dBu.

TABLE B

| TV CHANNEL 6 STATION F(50,50) FIELD STRENGTH (dBu) | PERMITTED FM STATION ERP (dBk) @ 30 METERS (100 feet) HAAT FOR OPERATION ON CHANNEL 211 | |
|--|---|---|
| | ERP ₁ (Recommended Level) (Channels 201-220) | ERP ₂ (Maximum Level) (Channels 207-220) |
| 90.0 | 20.0 | 35.0 |
| 85.0 | 13.5 | 28.5 |
| 80.0 | 8.0 | 23.0 |
| 75.0 | 3.0 | 18.0 |
| 70.0 | 1.0 | 16.0 |
| 65.0 | -2.0 | 13.0 |
| 60.0 | -6.8 | 8.2 |
| 55.0 | -11.5 | 3.5 |
| 50.0 | -16.0 | -1.0 |
| 49.0 | -17.0 | -2.0 |
| 48.0 | -14.0 | 1.0 |
| 47.0 | -9.5 | 5.5 |
| 46.0 | -4.0 | 11.0 |
| 45.0 | 0.0 | 15.0 |
| 40.0 | 14.5 | 29.5 |
| 35.0 | 22.0 | 37.0 |
| 30.0 | 30.0 | 45.0 |
| 20.0 | 47.0 | 63.0 |
| 10.0 | 63.0 | 78.0 |

(4) Add the value from the following Table C, corresponding to the requested channel, to the value determined in subparagraph (3). This will provide the maximum allowable ERP₁ or ERP₂ at an antenna height of 30 meters HAAT.

TABLE C

| FM CHANNEL | FREQUENCY | POWER ADJUSTMENT |
|------------|-----------|------------------|
| 201 | 88.1 MHz | -20.0 dB |
| 202 | 88.3 | -17.2 |
| 203 | 88.5 | -14.5 |
| 204 | 88.7 | -11.7 |
| 205 | 88.9 | -9.0 |
| 206 | 89.1 | -4.5 |

| | | |
|-----|------|-------|
| 207 | 89.3 | 0 |
| 208 | 89.5 | 0 |
| 209 | 89.7 | 0 |
| 210 | 89.9 | 0 |
| 211 | 90.1 | 0 |
| 212 | 90.3 | +0.8 |
| 213 | 90.5 | +1.5 |
| 214 | 90.7 | +3.8 |
| 215 | 90.9 | +6.0 |
| 216 | 91.1 | +7.0 |
| 217 | 91.3 | +8.0 |
| 218 | 91.5 | +11.5 |
| 219 | 91.7 | +15.0 |
| 220 | 91.9 | +18.0 |

(5) If the antenna height above average terrain of the requested facility is greater than 30 meters (approximately 100 feet), reduce the maximum allowable power determined in subparagraph (4) by the amount necessary to result in an equivalent predicted field strength, pursuant to the following procedures:

(1) The effective radiated power is reduced so that the distance to the 1 mV/m (60 dBu) contour extends no farther than it would if the station were operating with the allowable power and an antenna HAAT of 30 meters.

(i) The location of the 1 mV/m (60 dBu) contour is determined using Figure 1 of §73.333 [F(50,50) curves] of this Part.

(iii) The antenna HAAT is determined using the procedure contained in §73.313.

(d) The maximum facilities cannot exceed 50 kW effective radiated power and 300 meters in Zones I and Ia or 100 kW effective radiated power and 600 meters height above average terrain in Zone II. [See §73.511 of this Part.]

(e) An application for a facility operating on Channels 201-220 and located more than 0.4 kilometers but less than 225 kilometers (approximately 0.25 miles and 140 miles) from a TV Channel 6 transmitting antenna will not be accepted if the recommended level is less than 100 watts (-10 dBk) at 30 meters.

(f) An application for a facility operating on Channels 201-220 and located less than 225 kilometers (approximately 140 miles) from a TV Channel 6 transmitting antenna must include an indication of any interference to the reception of the TV Channel 6 signals by the public. When the requested facilities exceed the recommended values (see subparagraph (c)(3) of this Section), the application must also include a discussion of the techniques to minimize interference that are contemplated by the applicant.

(g) A permittee, before beginning program tests, must take steps to notify the residents of the area likely to be affected of the possibility of interference and what remedies will be available. Additionally, the Engineer in Charge of the responsible FCC field office must be advised of what alleviating steps have been taken and when program tests will commence.

(h) FM permittees operating at the recommended levels, or below, have no financial obligation to remedy interference complaints; however, within the television station's 47 dBu (Grade B) contour, the permittee must investigate all separately registered and documented complaints and make a good faith attempt to identify and help resolve all cases of interference to the direct reception of the TV Channel 6 station that results from the operation of the FM station operating on Channels 201-220. Exceptions to this provision are complaints of interference due to malfunctioning or mistuned receivers, improperly installed antenna systems, use of antenna booster amplifiers, or to associated non-RF devices (such as audio amplifiers, etc). If the complainant refuses to demonstrate the impaired reception or permit the application of remedial techniques, the permittee is absolved from further responsibility.

(i) If the effective radiated power of the facility exceeds the recommended level, a license will not be granted unless all non-exempt (See subparagraph h) interference complaints have been resolved at no cost to the TV Channel 6 viewers within the TV Channel 6, 47 dBu (Grade B) contour. The distance to the television station's 47 dBu (Grade B) contour is determined by using Figure 1 of §73.333 [F(50,50) curves] of this Part.

(j) Outside of the television station's 47 dBu (Grade B) contour, a permittee is to provide information intended to remedy interference to TV Channel 6, at the request of the TV Channel 6 viewer. The permittee has no financial responsibility to resolve such complaints.

(k) If interference is excessive and it cannot be promptly eliminated by the application of suitable techniques, operation of the offending FM station will be suspended upon notification by the Engineer In Charge (EIC) of the Commission's local field office, and may not be resumed until satisfactory actions to eliminate the interference have been taken and authority to resume operation has been received from the FCC.

(l) To minimize interference to TV Channel 6 stations from FM stations operating on Channels 201-220, the vertical component of radiation of the FM station may exceed its horizontal component of radiation, or the FM station may use only vertical polarization. The maximum ERP on any bearing will be considered the maximum ERP for any plane for licensing purposes (including vertical or horizontal polarization, beam tilt, etc.).

(m) A permittee will not be granted a station license without a minimum of 2 months operation under Program Test Authority. The permittee shall supplement the application for station license, by submitting a statement indicating that appropriate action has been taken on all complaints of interference to TV Channel 6 reception. For operation above the recommended level, the statement shall indicate that all non-exempt complaints (See subparagraph h) have been resolved at no cost to the complainants. The application shall contain a concurring statement from the Engineer in Charge of the responsible FCC field office to indicate that he/she has no objections to the granting of a station license.

(n) No application for FM Channel 200 will be accepted if the requested facility would cause objectionable interference to Channel 6 operations. Such objectionable interference will be considered to exist whenever the 15 dBu

contour based on the F(50,10) curves on §73.333 Figure 1a of the proposal would overlap the 40 dBu contour based on the F(50,50) curves in §73.333 Figure 1, of the television station.

4. 47 CFR §73.4135 is removed in its entirety.

A P P E N D I X B

Summary of Commenting Parties

Comments in response to the Second Notice were filed by a number of parties. Detailed comments on all aspects of the Second Notice were submitted by: Jules Cohen & Associates ("Cohen"), Corporation for Public Broadcasting ("CPB"), Association of Maximum Service Telecasters, Inc. ("AMST"), National Public Radio ("NPR"), Mississippi Authority for Educational Television ("MAET"), KOIN-TV, Inc. ("KOIN"), Joint Comments filed on behalf of TV Channel 6 interests, National Association of Broadcasters ("NAB"), Capital Cities Communications, Inc., Cosmos Broadcasting Corp., also McGraw-Hill Broadcasting Company ("McGraw-Hill").

Specific comments on isolated subjects were filed by: Intercollegiate Broadcasting System, Inc., KRMA-TV Channel 6, WCDR-FM, Earlam College, Storer Communications, Taft Broadcasting Company, Federation of Community Broadcasters, National Religious Broadcasters ("NRB"), Channel 6, Inc. ("Channel 6"), and Michigan State University ("MSU").

Various general comments were submitted by: Viewers of Central Virginia, University of Northern Colorado, Friends of Public Radio, Inc., Bux-Mont Educational Radio Association, Metropolitan Pittsburg Public Broadcasting (WQED-FM, WQEX-TV), and several existing educational and TV Channel 6 radio licensees.

Reply comments were filed by: CBS, Inc., Mohawk-Hudson, Taft, MAET, NPR, NRB, WTVR, EIA (CEG), Belo Broadcasting, KOIN, McGraw-Hill, Joint Comments, CPB, other existing radio licensees, and TV Channel 6 licensees.