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

FCC 77-777

83521

In the Matter of	)	
	)	
Amendment of the Rules governing	)	Docket No. 21473
the conversion of radiation patterns	)	
for AM broadcast stations	)	

NOTICE OF INQUIRY

Adopted: November 9, 1977; Released: November 17, 1977

By the Commission:

1. In 1971, we adopted new rules governing the design of radiation patterns for AM broadcast stations with directional antennas. Report and Order in Docket No. 16222, 27 FCC 2d 77, 20 RR 2d 1745 (1971). The amended Rule (Section 73.150) provides for a defined method of calculation of radiation patterns which could be computerized. The patterns calculated in this manner are called "standard patterns." The Rules (Section 73.152) were also amended to provide for the use of a modified standard pattern to take into account deviations from the standard pattern when the directional array has actually been constructed and put into operation. Recently, we made some minor changes in the method of calculating standard patterns. Report and Order in Docket No. 20645, 60 FCC 2d 927, 37 RR 2d 649 (1976). However, the requirement of using a standard pattern applies only to applications for new stations and major changes in existing stations. Report and Order in Docket No. 16222, supra, at para. 44. Thus, very few stations actually have standard patterns instead of the former theoretical patterns with MEOV. 1/ Therefore, the potential benefits of computerization have been limited. The only way to realize the maximum potential of computerization and the standard pattern is to convert as many stations as possible to the standard pattern. Therefore, we believe we should consider the possibility of conversion. This Notice will discuss the problems involved in a complete conversion by the U.S. stations and solicit suggestions on methods of dealing with these problems. We also wish to receive comments on any problems which we have not discovered.

1/ MEOV is the abbreviation for "Maximum Expected Operating Value(s)." Because theoretical patterns are rarely achieved in practice, most applicants, in the days prior to standard patterns, proposed theoretical patterns with MEOV. The MEOV was larger than the calculated theoretical radiation and often represented the consulting engineer's estimate of the radiation that would actually occur. Interference studies used the MEOV rather than theoretical values, and an applicant adjusting the directional antenna would only be required to adjust the array to within the MEOV rather than the more stringent theoretical values. Now, the standard pattern obviates the need for MEOV.

then, that the predicted service areas and protection from predicted interference would be increased for some stations, but decreased for others. Indeed, in the case of certain Class III stations, they may be converted from Class III-A stations to Class III-B stations, or vice-versa. 3/ To a lesser extent, this same shifting of predicted service areas and interference would occur with the daytime operations. However, since these changes would be only in the method and results of calculation and would not involve any physical adjustments to any directional antennas, there would be no changes in actual service areas and actual interference levels. Therefore, we believe these changes could be accomplished via rulemaking rather than on a case-by-case basis. WBEN, Inc. v. United States, 396 F. 2d 601 (2d Cir), cert. denied, 393 U.S. 914 (1968).

4. At this stage, we feel that the benefits to be derived from the simplification of the overall allocation process outweigh the shifts in interference and service areas since these shifts will occur primarily on paper. (However, there may be future changes when applicants propose facilities that are not permissible with the present RSS, but are permissible with the new RSS). We are open-minded on this point and are willing to entertain arguments that the present system is better. Attached to this Notice is an Appendix

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3/ Class III-A stations are defined in Section 73.182(a)(3)(i) while Class III-B stations are defined in Section 73.182(a)(3)(ii). The portions of the definitions which are pertinent to this discussion state that a Class III-A station is protected to its 2.5 mV/m groundwave contour at night, while a Class III-B station is protected to its 4.0 mV/m groundwave contour at night. This means, in effect, that a Class III station with an RSS of 2.5 mV/m or less is a Class III-A station while a Class III station with an RSS of more than 2.5 mV/m is a Class III-B station. Since a Class III-B station is protected only to its 4.0 mV/m nighttime groundwave contour, its RSS can be increased up to and including 4.0 mV/m if it is currently less than 4.0 mV/m. However, the RSS of a Class III-A station can be increased only up to and including 2.5 mV/m. If the conversion to standard patterns should occur, it may be that the RSS of an individual Class III station may change from slightly less than 2.5 mV/m to slightly more than 2.5 mV/m. This change would not only convert the station's class from III-A to III-B, but would also permit the increasing of its RSS to 4.0 mV/m rather than the previously permissible 2.5 mV/m. A change in the opposite direction is also possible. It may be that we are concerned over nothing since no stations may fall into this category. We note that, in our study of 930 kHz which is discussed in paragraph 4 of this Notice, no stations fell into this category. However, we have not examined the other regional channels to determine whether this might occur. (Of course, this possibility arises only when the nighttime power is one kilowatt.)

we wish to receive specific comments on the effects that such a conversion would have on the service areas of domestic Class I stations in addition to the general comments requested above concerning the interference levels and service areas of all stations.

7. We now proceed to the logistics of conversion. Conversion will not be a simple process. We would like to convert simply by stating that all stations now have standard patterns. However, that is not realistic. While standard patterns could be computed from the currently authorized theoretical patterns, they would not take into account those cases where the currently authorized measured patterns exceed the would-be standard patterns. Nor would they take into account those cases with MEOV greater than the standard patterns. Therefore, it may be necessary to convert to modified standard patterns (pursuant to Section 73.152) in these cases. (In this proceeding, when we discuss conversion to standard patterns, we intend that the conversion also encompass conversion to modified standard patterns, if necessary.) Since the augmentation resulting in the modified standard pattern will vary in the individual cases, it will be necessary to convert each one individually rather than simultaneously. Also, the patterns will have to be plotted and notified to foreign countries, in keeping with our one-pattern approach, wherever possible. Moreover, the number of patterns involved is not small. Most stations which operate during nighttime hours operate with directional antennas. In addition, they may use different directional antennas for their daytime operations. And daytime-only stations may also use directional antennas. Finally, there are a few stations which use separate directional antennas for operation during critical hours. Since so few existing stations operate with standard patterns, there would be more than 2000 patterns which would have to be converted. This means that more than 2000 patterns would have to be recalculated and replotted. The plots would include all necessary stacked and vertical sections. Then, the plots would have to be checked for accuracy. Finally, the patterns would have to be notified to foreign countries in accordance with our international agreements. We simply cannot absorb that workload with our present staff and continue to process applications at our present speed. As we see it, there are several methods of implementation which could be chosen. We will outline each, and we invite comments on them as well as suggestions concerning other methods or the combining of these methods.

8. The traditional method would be to require existing licensees and permittees to recalculate and replot their patterns. After submission to the Commission, Commision staff would verify the calculations and plots. In this manner the workload of the initial calculations and plotting would be spread over the licensees and permittees rather than concentrated on Commission staff. Also, the choice of augmentation to encompass measured values would rest with the licensees and permittees rather than being imposed upon them. Within this broad category are various ways in which implementation could occur:

the calculations and plotting. The contractor might, for instance, enter all of the parameters for all of the stations into a data base and then allow a computer to calculate and plot the patterns, thereby requiring relatively little human effort. One detriment arising from this approach would be the delegation to the contractor of the authority to decide how particular "problem" cases (see below) would be handled, whereas our other possibilities leave that authority in the hands of the Commission directly or require Commission approval of the licensee's choice. In addition, there is the possibility of conflicts of interest arising from conversions being performed by consultants who have represented parties whose interests are in opposition to parties whose patterns are being converted. Since work of this nature and magnitude has never been contracted out by the Commission, we wonder whether any potential contractors would be interested. Therefore, we solicit showings of interest and suggestions on what the Commission might include in any Request for Proposals. This is <u>not</u> a Request for Propoals. We note that we have not budgeted any money for this approach. This means that implementation of this approach might take longer to initiate than one of the other approaches. We also are interested in "guesstimates" of the cost of such a contract.

12. We previously alluded to "problem" cases. Some of these cases are well known and quite common, and we think it appropriate to solicit suggestions on solving these "problems." We predict that our major problems will arise where the standard pattern would cause new or increased interference to stations in foreign countries in contravention of our international agreements. This could occur because the standard pattern has a defined "null fill" designed to prevent predictions of unrealistic supression in nulls. However many theoretical patterns were originally authorized with MEOV less than the standard pattern radiation. Therefore, conversion to standard patterns may result in new or increased calculated interference; on the other hand, it may result in lesser calculated interference or the total elimination of calculated interference if the standard pattern radiation is less than the existing MEOV. 4/ As noted above, we believe that the trade-off is acceptable domestically in view of the benefits to be derived from conversion to the standard pattern. However, because of treaty restrictions, this is not true where foreign stations are concerned. Two possible solutions present themselves:

4/ However, as discussed in paragraph 3, the actual interference levels will remain unchanged since no physical adjustments in the directional antenna systems of the stations will be required. Thus, the change will be only in the method and result of the calculation; there would be no actual change in the existing interference.

13. Additional potential problems also involve notification of the standard patterns to neighboring countries. Depending on the order of notification of stations on a particular frequency, an individual standard pattern may or may not be acceptable because of the changing RSS of stations in the foreign countries. For instance, an early notification might reduce the limit from that station, thereby lowering the RSS of a foreign station so that a second notification would not be acceptable although it would have been with the initial RSS. Avoiding these situations may require that we notify simultaneoulsy standard patterns for all stations on one frequency. Therefore, we might be forced into a frequency-by-frequency conversion rather than working over the renewal cycle; see paragraph 8, above.

14. Another problem could arise when the presently authorized parameters do not depict the presently authorized pattern. There are several of these situations in existance, most of which arose in the 1940 "NARBA shift" where changes in frequency occurred without taking into account the effect of the changes in electrical height and spacing of the existing towers on the shape of the pattern. Should we simply use the authorized parameters in deriving a standard pattern? We think, at the very least, that the electrical height and spacing should be recomputed in accordance with the actual physical values and the actual frequency. Then, should the field ratios and/or phasing be changed so that the authorized theoretical pattern will be depicted, or should we continue to use the present field ratios and phasing with the resultant changes in the pattern? We are inclined to use the present field ratios and phasing unless a licensee submits values to the contrary. However, we wish to tap the expertise available outside the Commission for other suggestions and comments.

15. The present standard pattern rules require an assumed loss resistance of at least one ohm at the current loop (or base if the tower is less than 90 electrical degrees in height) of each tower. As noted previously, we propose to compute the standard pattern based on the current theoretical pattern. The question then arises whether we should follow this policy even when the assumed loss resistance for the present theoretical pattern is less than one ohm and, in some cases, negative. The alternative would be to shrink the size of the theoretical pattern so that it would be no larger than would occur with an assumed loss resistance of one ohm. This latter approach would appear more realistic, but we recognize that some of these stations have measured patterns which indicate that the larger pattern is, in fact, obtained. Comments on these two approaches are requested.

16. There are several stations which use top-loaded and/or sectionalized towers. Some of these were authorized many years ago based on methods which we would not use at this time. Thus, we have towers with no known vertical radiation characteristics in equation

course, still be used domestically in determining ground conductivity.) In this manner, complete computer calculations of nighttime interference would be possible except for consideration of any foreign stations with MEOV.

19. Another suggestion concerns the metric system. Our present allocation scheme mixes metric and traditional British units. For instance, radiation from a station is determined in millivolts per meter at one mile. We recognize that complete conversion to the metric system is desirable. We have already announced our intention to convert to the metric system. FCC 76-737 (August 3, 1976). Thus, we forsee the day when we will be talking in terms of millivolts per meter at one kilometer. (Indeed, some patterns from foreign countries have been labeled in this manner.) At that time, it will be desirable to have all of the patterns labeled and plotted in that manner. Since we do not want to convert all the patterns to standard patterns and, a few years later, convert all the patterns to the metric system, we suggest that both conversions be accomplished at the same time. Conversions of the patterns would require simultaneous conversion of, for instance, our groundwave field intensity curves and our skywave field factor curves. Thus, we would be using millisiemens per meter instead of millimhos per meter. Also, those stations which currently have standard patterns would convert to metric standard patterns. The metric units are well defined in Metric Practice, ANSI Z210.1-1976, ASTM E 380-76, IEEE Std 268-1976. There should be relatively few problems in converting to the units specified in that joint standard. However, we note that the metric unit for plane angle is the radian rather than the degree traditionally used by the Commission and broadcasters. Conversion to purely metric units would require that phase angles, tower heights, azimuths between towers, and orientation of towers be specified in radians rather than degrees. Since the standard permits the use of the degree as the unit for plane angle, Id., at para. 3.3.2.2, we could continue using the degree for phase angles, tower heights, etc. However, problems with conversion from degrees to radians would, basically, involve only antenna monitors. Most antenna monitors use analog meters with pointers; conversion would simply require new scales in the metric system. Conversion of those monitors with digital readouts would presumably be slightly more complicated. Therefore, we solicit comments on the desirability of converting the patterns (and related material) to the metric system at this time, and, in particular, comments on whether we should convert to radians.

20. We have previously expressed our concern with patterns generated with field ratios and phasing of unrealizable precision. Report and Order in Docket No. 20645, supra, at para. 21. Since all patterns will have to be recalculated, assuming the final decision is to convert to standard patterns, we propose that we limit the number of significant figures used in these calcuations to no greater

25. In accordance with the provisions of Section 1.419 of the Rules, an original and 5 copies of all comments, replies, pleadings, and other documents shall be furnished the Commission. All filings made in this proceeding will be available for examination by interested parties during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D. C. (1919 M Street, N.W.).

26. Authority for the institution of this proceeding is contained in Section 403 of the Communications Act of 1934, as amended.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Acting Secretary

Attachment: Appendix

A P P E N D I X

RSS OF US STATIONS ON 930 KHZ WITH PRESENT FACILITIES AND ALL STANDARD PATTERNS

Call	Location	Present Measured	All Theoretical	All Standard	ΔRSS (dB)
KAGI,	Grants Pass, Oregon	12.27	12.16	12.77	+0.35
KHJ,	Los Angeles, California	2.03	2.04	2.16	+0.54
KITE,	Terrell Hills, Texas	26.57	25.11	26.37	-0.07
KIUP,	Durango, Colorado	9.25	10.00	10.52	+1.12
KOGA,	Ogallala, Nebraska	12.26	13.77	14.47	+1.44
KSDN,	Aberdeen, South Dakota	11.54	10.83	11.38	-0.12
KSEI,	Pocatello, Idaho	3.77	4.03	4.61	+1.75
KTKN,	Kechikan, Alaska	1.88	1.88	1.93	+0.23
KWOC,	Poplar Bluff, Missouri	11.00	10.38	10.92	+0.06
WBCK,	Battle Creek, Michigan	13.00	12.47	13.11	+0.07
WBEN,	Buffalo, New York	1.88	1.96	2.06	+0.79
WEKO,	Cabo Rojo, Puerto Rico	3.71	3.72	3.72	+0.02
WEOL,	Elyria, Ohio	4.18	4.19	4.47	+0.58
WFMD,	Frederick, Maryland	10.72	11.81	12.41	+1.27
WGNT,	Huntington, West Virginia	7.37	7.41	7.79	+0.48
WITN,	Washington, North Carolina	18.91	21.76	22.86	+1.65
WJAX,	Jacksonville, Florida	2.92	2.87	2.91	-0.03
WKCT,	Bowling Green, Kentucky	10.07	9.72	10.22	+0.13
WKXY,	Sarasota, Florida	17.77	17.38	18.26	+0.24
WKY,	Oklahoma City, Oklahoma	1.96	1.93	1.83	-0.60
WMGR,	Bainbridge, Georgia	12.55	12.55	13.18	+0.43
WPAT,	Paterson, New Jersey	22.54	21.97	23.07	+0.20
WSLI,	Jackson, Mississippi	7.85	7.16	7.54	-0.35
WSOC,	Charlotte, North Carolina	7.40	7.40	7.78	+0.43
WTAD,	Quincy, Illinois	4.61	4.54	4.82	+0.39
WWNH,	Rochester, New Hampshire	18.79	21.16	22.23	+1.46

Above is a tabulation of the RSS in mV/m of each domestic station on 930 kilohertz. The tabulation includes the present RSS of each station, based on measured and notified patterns; the RSS of each station, based on only the theoretical patterns; and the RSS of each station, if all domestic stations were converted to standard patterns. In addition, the change in the RSS (in dB) in the conversion from measured to standard patterns is shown. In all of these calculations, only authorized patterns for authorized stations were used. In computing the RSS, KOGA was always considered with its standard pattern and WEKO was always considered with its augmented pattern. Other than WEKO, augmented patterns were not used; it must be recognized that in a complete conversion to standard patterns, there would be some augmentation, in which case the new RSS would be closer to the existing RSS.