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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
Federal Communications Commission
Washington, D. C. 20554

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In the Matter of	)	
	)	
An Inquiry into the Commission's	)	
Policies and Rules Regarding	)	MM Docket 93-177
AM Radio Service Directional)		
Antenna Performance Verification	)	

Reply Comments of
Hatfield & Dawson Consulting Engineers, LLC

This response is organized in the same outline form as the NPRM.

I Introduction

These reply comments have been prepared to provide further discussion of issues raised in the initial comments by various parties in this proceeding, as well as expansion of some matters outlined in our firm's initial Comments.

II Computer Modeling versus Proof of Performance

The comments of various parties demonstrate that there is still substantial concern by some about the appropriate uses of computer modeling. Virtually all commenters express an understanding of the utility of modeling as a substantial part of the array setup and adjustment process, however. The recalcitrant commenters are skeptical of the use of numerical analysis models and internal array parameter determination as the sole source of verification data, but a substantial majority express support for continuing efforts toward the use of computer modeling techniques for at least a portion of the verification process. Many commenters, including our firm, specifically call upon the Commission to issue a Further Notice of Proposed Rulemaking on this subject. We suggest that the following topics, as well as any other new matters suggested by respondents, be incorporated into such a Further Notice:

1. The distinguishing characteristics for an array to qualify for computer modeling, including (but not limited to) feed system type, radiator type, and ground system type,

2. The array sample system requirements for arrays whose performance can be verified by computer modeling,

3. The necessary array and sampling system parameter measurements required for computer modeling performance verification,

4. The monitor point requirements for arrays whose performance verification is demonstrated by computer modeling,

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5. The desirability of requiring a field strength measurement proof in a situation where a credible interference complaint has been made subsequent to a license application which employed computer modeling performance verification,

6. The salient environmental requirements which must be present for computer modeling performance verification.

III Directional Antenna Proofs of Performance

A "Full" Proofs of Performance (Or, more properly "Reference Performance Verification")

Non directional proofs should not be required but should be optional when needed. This proposal is advanced by several parties. In most instances absent re-radiation and assuming proper detuning of unused towers, nondirectional antenna performance is within 1 dB of omnidirectional and 1 dB of the theoretical efficiency given in the Commission's 73.190 Fig. 8.

Graphs should not be required but should be optional when graphical analysis is appropriate

The engineer performing the measurements should be free to select the location of the measurement points. There are many instances where points close in, points far distant, or points in some sectors may not be useful in the analysis. The comments of Disney Company are in total error when they state that close in points are not suitable for directional analysis, since, as noted in our comments, the use of moment method analysis allows accurate predictions of the magnetic field values very close to an array. These methods have been used for performance verification of an array with measurements that did not even extend off the ground system. The Disney analysis of measurement requirements is insupportably naive.

The minimum number of radials, as suggested by several commenters, can be reduced to well below the number proposed by the Commission, especially in the instance of symmetrical patterns. (Pattern symmetry was often used in proof of performance verification during the era before the standard pattern rule.)

The minimum number of points, as suggested by duTreil, Lundin & Rackley, should be set at 10 per radial. The span of points needs to be determined on a case by case basis, subject to the judgement of the engineer performing the application analysis and the Commission staff reviewing it. The entire discussion of this matter in the Disney comments is, as noted above, insupportable.

B Partial Proofs of Performance

If the suggestions of several commenters, including dLR and NAB, are followed, the full proof of performance can be simplified to the point where partial proof of performance measurements are no longer required or defined. We agree with this approach.

Full proofs of performance using only magnetic field measurements are intellectually only barely defensible. Partial proofs of performance are, as noted by dLR, so simplistic as to be susceptible of serious error, or serious sophistry, or worse.

C Monitor Points

Monitor points are a curse and a blessing. If field measurements for performance verification are required at all, the complete measurement data, obtained from the Commission files, can form an adequate reference for anyone seriously investigating the array performance, be it the (subsequent) licensee or a putatively aggrieved competitor or victim of alleged interference.

Monitor points, if used at all, should not be assigned on the basis of the number of towers in an array, but on the pattern features. However, it is precisely those radials in minima and minor maxima where the determination of a suitable point which "tracks" the adjustment of inverse field is problematical. And, in urban environments, such a location is a moving target for environmental changes which may render the point unuseable. It is not uncommon for access problems to seriously limit one's choice of a monitor point on a given radial, sometimes to only one or two locations. (Access to military reservations or some types of industrial areas may be possible for one or a few time initial measurements, but not for routine measurements.)

If monitor points are required the description of the points should be incorporated into the station license. We agree with the Hammett & Edison proposal for the establishment of a new monitor point which is not one included in the original proof of performance, if such a new point is required. This will be a far more frequent requirement if the total number of measurement points on a radial is substantially reduced. We note that the Commission has in past allowed use of a monitor point which was not part of the original proof of performance analysis on an implied waiver basis.

D Maps

Maps aren't necessary. In fact, maps from old proofs of performance contained in the Commission files, or in station files, are often impossible to legibly duplicate. To perform a partial proof of performance under the current rules it is often necessary to recreate the maps from the distance and bearing and point description data, and this process, while a nuisance, is not difficult.

IV AM Station Equipment and Measurements.

A Base Current Meters

Base current meters are redundant, but the requirement that should be eliminated is the maintenance of the ratios. Delta Electronics, the manufacturer of the most reliable and accurate RF ammeters normally employed for this purpose, suggests that a requirement for some base current measurement by a plug and jack or other temporary arrangement be retained. We do not object to this, but the present rules actually allow just such provisions, if the antenna feed system is so constructed. Elimination of the ratio maintenance is the minimum that is necessary, but elimination of the requirement for the meter itself is also desirable.

Delta, like Potomac Instruments, appears to consider that proper voltage sampling devices will be a "product" rather than just an appropriate combination of normal electronic parts. We feel this is a misstatement of the requirement. A proper voltage sample may be obtained by any

number of voltage divider mechanisms, and the device employed should be described in the performance verification report data, but no other requirement should be imposed.

B Antenna Monitors

We applaud the elegant explanation of antenna monitor circumstances in the comments of Potomac Instruments. We have a few minor quarrels with the Potomac Instruments comments, however. We do not agree that the Commission should mandate any schedule of antenna monitor recalibration. Several decades of experience with electronic instrumentation in academic laboratories, industrial establishments, and as consultants called upon to make measurements of all sorts of electrical parameters has convinced us that most recalibration schedule requirements are unnecessarily short, and, for many kinds of engineering (as contrasted with scientific) work, entirely unnecessary.

We agree with Potomac Instrument's discussion of the necessity of minimum performance requirements. We would be very reluctant to certify to the Commission's requirements the performance of antenna systems monitored by some of the ancient American equipment and simplistic local apparatus we have seen employed in locations outside the Commission's jurisdiction (sometimes by U.S. government agencies!) The experience of the partners in our firm extends far enough into the past to include FCC licensed arrays without any antenna monitor standards, or even monitor requirements, and we would not like to return to those conditions.

Potomac Instruments discusses the requirements for a "universal" voltage sample device, without considering that such a sample need not be a single universal device, but could consist merely of an appropriate combination of off the shelf electronic components.

C Impedance Measurements

The majority of commenters support the elimination of this requirement. As noted in our comments, it was originally imposed to allow a graphical analysis of measured data in cases where the presence of interference resulted in ambiguity of the data. Modern signal generator/receiver systems essentially eliminate this problem, and therefore the anachronistic rule should be eliminated as well.

V Critical Arrays

A Antenna monitors

See IV B above. The currently manufactured approved antenna monitor models have been used for critical arrays on a waiver basis, and, should critical arrays not be eliminated outright, the special monitor requirement should be eliminated.

B Designation of Critical Arrays

As noted in our Comments, the entire concept of "critical arrays" is a holdover from the pre-standard pattern era, whose prolonged life came about solely from use as a harassment tool by

a few existing licensees. The illogical nature of these requirements is shown by, for example, the controversy some years ago about proper analysis methods (alternative "stability" subroutines in the Commission computer program RADIAT, for example). The Commission's current tests for stability when an applicant is challenged are not logical, but are at least administratively efficient. As noted in the Comments of dLR, the current tests for "stability" are not consistent with the parameter variation requirements that then are applied to the construction permit or license. The test used by the Commission at the license application stage is applied to all the measured radials without regard to their "criticality."

At its very basis, the critical array designation is simply inconsistent with the standard pattern rule. The complex tests and vertical pattern analysis proposed by Disney would be an administrative burden, and even the tests proposed by the Commission in the NPRM are administratively wasteful. And, if vertical pattern analysis is necessary, should sinusoidal current distribution be used despite the fact that it is theoretically demonstrable that such current distribution is impossible, not just improbable? The present critical array policies are unfair and arbitrary. The proposed rules are unfair and unreasonable, even if less arbitrary. (They would not be imposed on existing licensees, only those with new or changed facilities.)

As we stated in our comments, the critical array designation should be eliminated.

November 23, 1999

Hatfield & Dawson Consulting Engineers, LLC

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/s/ Benj. F. Dawson III, P.E.

/s/ Thomas M. Eckels, P.E.

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