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MOFFET, LARSON & JOHNSON, INC.  
CONSULTING TELECOMMUNICATIONS ENGINEERS

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FEDERAL COMMUNICATIONS COMMISSION  
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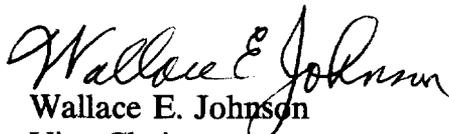
October 29, 1993

Mr. William F. Caton  
Acting Secretary  
Federal Communications Commission  
1919 M Street, N.W., Room 222  
Washington, DC 205554-0001

Dear Mr. Caton:

Enclosed are an original and four copies of Moffet, Larson & Johnson, Inc., Consulting Telecommunications Engineer, comments regarding the FCC's Inquiry Into Policies and Rules Regarding AM Radio Service Directional Antenna Performance Verification MM Docket No. 93-177/RM-7594 for distribution in accordance with Section 1.4191 of the commissions Rules.

Sincerely,

  
Wallace E. Johnson  
Vice Chairman

WEJ/st

Enclosures

MLJ

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BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

In the Matter of )  
 )  
An Inquiry into the Commission's )  
Policies and Rules regarding AM )  
Radio Service Directional Antenna )  
Performance Verification )

MM Docket No. 93-177  
RM-7594

TO: The Commission

COMMENTS OF MOFFET, LARSON & JOHNSON, INC.

Moffet, Larson & Johnson, Inc., pursuant to Commission Rule 1.415, submits the following comments in the captioned proceeding, see Notice of Inquiry ("Notice"), released June 29, 1993, FCC 93-315.

I. Interest of Moffet, Larson & Johnson, Inc.

1. Moffet, Larson & Johnson, Inc. ("MLJ") is a telecommunications engineering firm which has provided engineering services to the telecommunications industry for over 40 years. It's broadcast engineers collectively have more than 100 years of

experience in the design, adjustment and maintenance of directional antenna systems for standard broadcast stations. Those engineers have worked on the directional antenna systems of literally hundreds of AM broadcast stations. MLJ was one of the five technical consulting firms that submitted the joint petition for rulemaking which has initiated this Inquiry. MLJ is pleased to have this opportunity to recommend changes in the Commission's rules and policies governing AM directional antenna performance verification.

## II. Background

1. It is very timely for the Commission to initiate an inquiry and rule making procedure into the policies and rules pertaining to the performance verification of directional antenna systems operating at AM broadcast stations.

2. Many existing AM stations employing directional antennas were initially built in rural areas where the paucity of potential re-radiating objects made adjustment and proof of the directional arrays simpler than at the present time. As a result the adjustments were usually more directly related to the designed performance of the array. With the spread of the urban areas during the last few years many directional arrays are now operating in build-up areas containing homes, commercial buildings, hotels and power lines, all influencing, in various

degrees, the ability of engineers to prove the radiation pattern originally authorized by the Commission. The urban build-up has also decreased, significantly, points at which reliable field measurements can be taken. Except for construction of nearby antennas authorized by the Commission, which require detuning by the permittee, and some detuneable objects such as water towers and powerlines, the licensee of the station operating with a directional antenna has virtually no control over construction which may impact on the engineers ability to satisfactorily analyze and prove the directional antennas performance based on field intensity measurements. Also, the concentrated build-up makes it exceedingly difficult to obtain reliable field measurement points, or to analyze the results of the measurements taken due to the resultant scatter.

3. In cases where the licensee attempts to verify the operation of the directional antenna system the efforts of the engineer making the array adjustments, the field intensity measurements and their analysis may result in expenditures of thousands of dollars with questionable results. In making the adjustments the engineer will be attempting to achieve the groundwave field intensity limits at a kilometer placed on the last construction permit by the Commission. These limits are often achieved with combinations of phase and current adjustments which do not have a real correlation with the theoretical parameters contained in the original design. The result can of course, be considerable departure in the originally designed

vertical radiation patterns during nighttime and critical hours operation resulting in possible increased interference to other stations.

4. During the past few years as the AM band became more crowded and demand for additional stations increased, Commission rules permitted construction of more elaborate and complex arrays with minimum radiations proposed which were a small percentage of the directional patterns R.M.S. The ability to make meaningful measurements or adjustments of these arrays, in particular where the area surrounding the towers has become built-up, has become increasingly difficult. Creative analysis techniques have been used to achieve appearance of compliance with present Commission Rules and policies even when the facts appear to show otherwise. Proximity correction and creative measurement analysis techniques have been advanced and accepted which, when carried to their logical conclusion, would allow virtually any set of measurements to show that an array is in adjustment.

5. Many arrays which were proven to be in adjustment when originally constructed, or in accordance with their last proof of performance may now appear to be out of adjustment due to changes in the environment surrounding the station.

6. Internal problems may also go undetected because of inadequate monitoring devices being used which will not adequately

bring changes in operating parameters to the attention of the station operator.

7. It seems clear that present Commission Rules impose great burdens on stations as they attempt to adjust and prove the operation of their directional arrays with questionable results. Using more modern monitoring and computer modeling techniques will greatly simplify the proof requirement and result in directional arrays being adjusted and operated in ways much closer to their original design. What follows are some suggested changes which we believe should be considered in a rule making procedure.

8. It has been customary to group AM stations into two broad classes, those which are non-directional and those which operate with one or more directional patterns. With the exception of those arrays which have been designated "critical" all directional antenna systems are treated as equal.

9. In fact directional antenna systems are not equal. They range in number of elements from 2 to 12 or more. They range from older stations which are directional by choice, mainly for coverage reasons, with no initial protection requirements to those which are required to protect many other stations. They range from arrays with minimal suppressions (sometimes called "dimples" in their pattern) to those whose deepest suppressions are 30dB or more below their pattern RMS.

10. As directional systems get more complex and the pattern minima get deeper, the arrays become more susceptible to problems both internal and external to the array.

### III. Proposed Changes

1. The Commission may wish to consider the possibility of no longer granting new operations proposing directional antennas with null depths of greater than 20dB below RMS since they appear to present the greatest "proof" problems. The possibility of these more complex antennas systems being proposed is small in view of the "maturity" of the AM band and the economics involved. Existing stations with null depths greater than 20dB should, of course, be permitted to make minor changes in their patterns as necessary to improve their operation at their present sites.

2. It is suggested that in lieu of present proof requirements that stations be required to set their arrays to the designed theoretical parameters. What is intended is that the array be set to the theoretical complex field ratios and not simply set to the field ratios indicated by the antenna monitor. The following showing should be considered as requirements:

- a. A sworn statement from a civil engineer that the spacing and orientation (with respect to True North as determined from Polaris or Solar observations) is as

specified in the station's theoretical design proposed in the applicable application and resultant construction permit.

b. A sworn statement from a qualified engineer listing the antenna monitor parameters as the array is adjusted and describing in detail the method by which they were determined. Computer programs using moment method modeling such as NEC, or MININEC should be used for this purpose. It may be appropriate to require that the statement include all the parameters used to define the "model". It may also be well for the new rules proposed to actually define the commercially available computer programs which meet the requirements.

c. A sworn statement from a qualified engineer describing in detail the system used to extract samples from the array and the antenna monitor with the following suggested requirements included:

(1) Stations should be required to install single turn, rigid sample loops located as close as practical to the point of maximum current (the current loop as determined by the method outlined in 2b, above), but in no case, less than 6 meters above the ground.

- (2) Loops may operate at either tower or ground potential for towers less than 120 degrees in height, but must be at tower potential for taller towers.
  
- (3) Sample lines must be coaxial cable with a solid outer conductor (except for very short jumpers) and should be of MEASURED equal length, including isolation coils, pig tails, etc.

#### IV. Additional Considerations

1. Since the above recommendations propose a directional antenna performance verification that does not rely on field intensity measurements if can be assumed that there will be interest expressed during the proceeding in retaining the use of some field intensity measurement to verify that fields within suppression areas meet the required restrictions, that major and minor lobes are properly oriented, etc.

2. If any questions are going to be posed during the next step of the proceedings which permit the use of field measurements together with proposed adjustment of the directional array as recommended above, there must be a clear finding of which takes precedence in the final adjustment. If the array is adjusted with supplementary field measurements there is a real danger that the

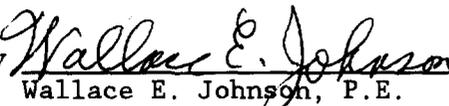
procedure will then return to the existing requirements with all the problems inherent in adjusting arrays within limits based on ground wave field intensity measurements.

V. Conclusion

MLJ recommends that the Commission consider the foregoing comments in developing proposed changes in the existing policies and Rules regarding AM Radio Service Directional Antenna Performance Verification.

Respectfully submitted,

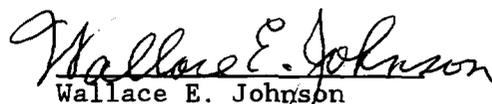
Moffet, Larson & Johnson, Inc.

By   
Wallace E. Johnson, P.E.  
Vice Chairman

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Verification

I hereby affirm that, to the best of my information and belief, the factual representations in the foregoing comments of Moffet, Larson & Johnson, Inc. are accurate and complete in all material respects.

  
Wallace E. Johnson