

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

In the Matter of )
)
An Inquiry Into the Commission's )
Policies and Rules Regarding AM ) MM Docket No. 93-177
Radio Service Directional Antenna ) RM-7594
Performance Verification )

REPORT AND ORDER
AND
FURTHER NOTICE OF PROPOSED RULEMAKING

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## I. Introduction

1. This *Report and Order and Further Notice of Proposed Rulemaking (Report and Order)* is part of a broad-based streamlining initiative to overhaul Mass Media Bureau policies and licensing procedures. In the course of this initiative, the Commission has introduced substantially shorter and simpler certification-based application forms, established new broadcast application licensing procedures, and instituted electronic filing.<sup>1</sup> This *Report and Order* reduces the regulatory burdens on AM broadcasters using directional antennas by relaxing our technical rules to the extent possible while still maintaining the integrity of the service. There are approximately 1,900 directional AM stations presently licensed in the United States. Directional AM stations use antennas which suppress radiated field in some directions and enhance it in others. In order to control interference between stations and assure adequate community coverage, directional AM stations must undergo extensive "proofs of performance" to demonstrate that the antenna system operates as authorized. The field strength measurements and technical exhibits which our current rules require as part of a "proof" impose a substantial financial burden upon these AM broadcasters, a burden not incurred by licensees in the other broadcast services.<sup>2</sup> This *Report and Order* substantially reduces this burden.

2. This proceeding began with a *Notice of Inquiry* in response to a joint petition for rulemaking filed by five broadcast consulting engineering firms ("Joint Petitioners")<sup>3</sup>, which argued that the Commission could materially reduce the measurement burdens imposed on AM broadcasters, based on certain technological advances. The Joint Petitioners requested a thorough examination of these rules and the adoption of alternate means of directional antenna system verification. The Commission subsequently issued a *Notice of Proposed Rulemaking ("NPRM")*<sup>4</sup> seeking comments on the incorporation of new techniques for AM analysis into our rules, and on our proposals to streamline existing requirements. In response to the *NPRM*, the Commission received 18 comments and four reply comments.<sup>5</sup> In general, the comments and reply comments share the view that rule changes are warranted to reduce the burdens of

<sup>1</sup> See 1998 Biennial Regulatory Review -- Streamlining of Mass Media Applications, Rules and Processes, Report and Order in MM Docket No. 98-43, 12 FCC Rcd 23506 (released Nov. 25, 1998); 63 Fed. Reg. 70,039 (Dec. 18, 1998).

<sup>2</sup> Directional FM licensees incur substantially lesser incremental expenses in constructing, licensing, and maintaining their facilities.

<sup>3</sup> The five broadcast consulting firms which filed the joint petition for rulemaking in 1991 are duTreil, Lundin & Rackley ("DLR"); Hatfield and Dawson Consulting Engineers, Inc. ("Hatfield & Dawson"); Lahm, Suffa & Cavell ("LSC"); Moffet, Larson & Johnson, Inc. ("MLJ"); and Silliman & Silliman.

<sup>4</sup> 14 FCC Rcd 9275 (1999), 64 FR 40535.

<sup>5</sup> A list of commenters and reply commenters is in Appendix A.

verifying AM directional antenna patterns. This *Report and Order* adopts most of the streamlining initiatives proposed in the NPRM. We are confident that relaxing our proof requirements will provide meaningful relief to many AM broadcasters without jeopardizing technical standards or service to the public. However, we believe it is premature to take any action on the use of certain computer modeling methods to verify directional stations' operating parameters. We also seek additional comments on these methods.

## II. Directional Antenna Proofs of Performance

3. An antenna proof of performance establishes whether the radiation pattern of an AM station is in compliance with the station's authorization. An AM station must perform a full proof to verify the pattern shape when a new directional antenna system is authorized. Partial proofs, which require fewer measurements, are occasionally necessary to show that an array continues to operate properly. For both full and partial proofs, we proposed to reduce both the number of radials and the number of measurements per radial. Nearly all commenters agreed that proof requirements could be relaxed without compromising the technical integrity of the AM service.

### A. Full Proof of Performance

#### 1. Number of Radials

4. *Background.* Under the Commission's rules, a permittee must measure a minimum of eight radials in a proof of performance.<sup>6</sup> For complex patterns, measurements are required on a sufficient number of radials to define the pattern shape completely, i.e., three radials in the main lobe, and one in each null and minor lobe. In the NPRM, we proposed to reduce the minimum number of radials required from eight to six for simple directional antenna patterns and, generally, to require no more than 12 radials to define complex patterns. The radials would be distributed as follows:

- (a) One radial in the major lobe, at the pattern maximum.
- (b) Five additional radials, and others as necessary to establish the pattern clearly. These radials will be generally at the peaks of minor lobes and at pattern nulls. This may include radials specified on the station's authorization. However, no two radials may be more than 90° azimuth apart. If two radials would be more than 90° apart, then an additional radial must be specified within that arc.
- (c) Any radials specified on the construction permit or license.

5. Nondirectional antenna measurements would be taken along the radials used for directional measurements. In addition, we proposed that those few nondirectional stations which are required to conduct a full proof (due to the proximity of reradiating structures, or other atypical circumstances) should also be permitted to employ six evenly spaced radials, in lieu of eight.

6. Most commenters support a reduction in the number of measured radials. Some suggest that the number of required radials could be reduced even further than we proposed. Hatfield & Dawson, DLR, and Sellmeyer Engineering (Sellmeyer) argue that marketplace considerations will ensure adequate

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<sup>6</sup> See 47 C.F.R. § 73.151.

performance, and therefore, that major lobe measurements are unnecessary. Hatfield & Dawson also suggests that, for simple patterns with a single null, “three or four radials may be used.” The Walt Disney Company (Disney) expresses similar views, stating that “[a] two-tower ‘cardioid’ array ... could be defined by two radials, and other two-tower arrays by as few as three radials.” Clear Channel Communications, Inc. (Clear Channel), DLR, and Sellmeyer agree that fewer than six radials would suffice for simple patterns. Most other commenters support our proposed minimum of six radials with a maximum span of 90 degrees between radials. According to Carl T. Jones Corporation, “complex designs may result in critical shaping of the pattern... without resulting in more than one pattern minim[um].”

7. *Discussion.* We will adopt the proposed minimum of six radials, including one radial in the major lobe and a 90° maximum span, to provide the best balance between reducing the burden of proof measurements and ensuring proper array performance. While we recognize that the null structure of simple patterns can be defined with a few radials, we believe that additional measurements are necessary to ensure that the array meets two critical Commission requirements: antenna efficiency and principal community coverage.<sup>7</sup> Marketplace considerations alone will not ensure that these requirements are fulfilled. As proposed, we will limit the maximum number of radials required to 12, allowing use of symmetry for complex patterns which might otherwise require more than 12 radials to define all pattern features.

## 2. Number of Points per Radial, Length of Radials

8. *Background.* A full proof establishes field strengths along each radial on the basis of 20 to 30 measured points. We proposed to reduce the number of points per radial to a minimum of 15 directional points, as well as to shorten the minimum length of the radial to 15 km. We proposed to specify intervals between these points as follows:

- (1) The closest point at a distance ten times the maximum distance between the elements of a directional array, or at a distance five times the vertical height of the antenna in the case of a nondirectional station;
- (2) Close-in measurements at intervals of approximately 0.2 kilometer, out to a distance of three kilometers, *with a minimum of seven nondirectional points (added)*;
- (3) Measurements at intervals of approximately one kilometer between three and five kilometers (three points);
- (4) Measurements at intervals of approximately two kilometers between five and 15 km (five points);
- (5) Additional measurements as necessary at greater distances to achieve at least 15 points clear of potential reradiating structures; and
- (6) Measurements at any monitoring point locations along the radial (unchanged from the present rule).

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<sup>7</sup> To ensure efficient use of spectrum, the Commission has long held that applicants using directional antenna patterns must fill a minimum percentage of the predicted pattern envelope. See *Report and Order* in MM Docket No. 96-58, 12 FCC Rcd 12371, at paragraph 60. For AM stations, actual antenna efficiency is expressed in terms of the root-mean-square (RMS) of measured radiation values. See 47 C.F.R. § 73.151(a).

9. *Discussion.* Commenters unanimously support a reduction in the required number of points and the length of the radials. We agree with Carl T. Jones Corporation, which notes that nondirectional measurements begin closer to the antenna site than directional measurements; consequently, a proof includes more nondirectional points.<sup>8</sup> These additional nondirectional measurements are used to determine the inverse distance field (IDF), which is the basis for determining directional field strength. Although the NPRM tentatively rejected a reduction in the required number of close-in measurement points, we recognize that, in many cases, it is not possible for the permittee to take measurements at every specified interval within 3 kilometers of the antenna site. It has been our policy to accept fewer close-in measurements in these circumstances, provided the inverse distance field can be determined with reasonable certainty. We therefore add the stipulation that the close-in measurements include at least seven points to formalize our policy while providing some relief to the broadcaster.

10. DLR, Clear Channel, and Hatfield & Dawson favor a reduction in the number of measured points to ten and the elimination of close-in nondirectional measurements.<sup>9</sup> Instead of determining the nondirectional inverse distance field by graphical analysis, DLR proposes using the theoretical nondirectional field. In support of the proposal, DLR supplies a tabulation of results from 57 proofs accepted by the Commission.<sup>10</sup> We decline to adopt further measurement reductions. While we recognize the merit of this suggestion, our experience has shown that proper detuning of unused towers in an array may be difficult, and that unused towers can significantly distort nondirectional patterns. We continue to believe, along with the majority of commenters, that our proposed reduction in the number of required measurements will provide a sufficient basis for graphical analysis of field strength measurements. We will adopt the proposal to shorten the minimum radial length to 15 kilometers and to require a minimum of 15 points, distributed as set forth above, for full proofs.

11. Many commenters state that the distribution of measurement points should be flexible, so that the engineer may avoid areas where field strength cannot be measured reliably. NAB requests “that broadcasters be given some discretion in designating far-point measurements.” In fact, 47 C.F.R. § 73.186(a)(1) already provides this discretion, requiring licensees to exercise good engineering judgment in selecting locations for field measurements based on the approximate intervals we establish in this *Report and Order*.

### 3. Standard Format for Reporting Measurements

12. We also sought comment on a standard format for reporting field strength measurements. Most applicants already submit field strength measurements in table format using commercial spreadsheet or database software. We proposed to adopt a standardized format for the submission of the data in order to facilitate electronic filing and processing. Electronic storage of this data could also facilitate easy retrieval by any interested party. Nearly all commenters agree that a standard data format would be useful. Potomac Instruments, Inc. presents a sample format which would be compatible with GPS receiver output. In addition, Hammett & Edison suggests that we include a field for measured ground conductivity, since

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<sup>8</sup> In a typical case, nondirectional measurements might begin at 0.4 kilometer. Taking points at the specified intervals would give 13 close-in points, three points between three and five kilometers, and five points between five and 15 kilometers, for a total of 21 nondirectional points. If directional points are measured beyond 15 kilometers, then additional nondirectional measurements would be made at those same points.

<sup>9</sup> DLR, Clear Channel, and Hatfield & Dawson all suggest making the graphical analysis now used optional.

<sup>10</sup> The tabulation shows that most measured values of nondirectional radiation differ from the theoretical value by less than two dB.

this is the information usually sought by engineers who retrieve field strength measurements. We agree that electronic storage and retrieval of measured conductivities would be useful. Based on the comments received, we will develop a format for submission of field strength measurements and for ground conductivities derived from measurements. We will release the details of these file formats concurrently with the Public Notice releasing the new, revised version of FCC Form 302-AM to be utilized for electronic filing. In a related matter, DLR suggested deleting the requirement to include topographic maps showing each measurement point in a full proof of performance. We agree that this requirement places an unnecessary burden on the AM station. Furthermore, the size of the topographic maps makes it particularly difficult to provide them in electronic format. We will therefore modify our rules to require that licensees retain copies of the topographic maps showing measurement points, to be provided to Commission staff upon request.<sup>11</sup>

## **B. Partial Proof of Performance**

13. Partial proofs of performance are required after the installation of new equipment on an AM tower or where changes in the electrical environment, such as erection of a new tower nearby, could affect the radiation pattern. These proofs are conducted to verify that the array remains properly adjusted. A partial proof consists of measurements taken at selected locations used in the last full proof of performance. The field strength values measured at each point are mathematically compared to values obtained in the last full proof to yield the current value of radiation along each azimuth.

### **1. Number of Radials Required, Number of Points per Radial**

14. *Background.* Permittees must now make at least ten field strength measurements between three and 16 kilometers from the array at points used in the last complete proof of performance.<sup>12</sup> If a radial contains a monitoring point,<sup>13</sup> that point must be included in the measurements. A partial proof includes measurements on all radials measured in the full proof. We proposed to reduce to eight the required minimum number of points per radial, including any monitor points.

15. *Discussion.* The Association of Federal Communications Consulting Engineers (AFCCE) points out that, while a full proof is “a rare event” for most AM stations, partial proofs are relatively frequent. Therefore, AFCCE states, “reducing the cost of a partial proof is more important than reducing the cost of a full proof...[and] increases the likelihood that station management will authorize the measurements when the need is indicated.” We agree that reducing the requirements for a partial proof may expedite the process of correcting malfunctioning AM arrays. As proposed in the NPRM, we will reduce the number of points per radial from ten to eight, including any monitoring point on the radial. Further, we will incorporate commenters’ proposals to reduce the number of radials measured. We will limit the radials measured on a partial proof to those radials which include monitoring points.<sup>14</sup> If a directional pattern has fewer than four monitored radials, the licensee should include the nearest adjacent radials from the full proof, for a minimum of four. We believe that these changes will minimize the financial burden on directional AM stations while still providing sufficient data to verify directional array performance.

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<sup>11</sup> Maps showing measurement locations should be associated with the proof of performance application which must be available in the station’s public inspection file while the application is pending. See 47 C.F.R. § 73.3526(e)(2).

<sup>12</sup> See 47 C.F.R. § 73.154.

<sup>13</sup> See paragraph 19 for definition of “monitoring point.”

<sup>14</sup> Monitoring points are usually designated on all radials which define pattern minima.

16. Several commenters note that many partial proofs rely on full proof measurements which may be decades old.<sup>15</sup> Even when a full proof is relatively recent, changes to the area surrounding the AM station may alter propagation characteristics, or may make it impossible to locate points identified in the full proof. In such circumstances the comparison of recent directional measurements with old readings may be invalid. We agree that an alternate approach is warranted. In cases where the engineer cannot identify points from the last full proof with reasonable certainty, or where the environment around the AM station has changed, we will allow the station to select eight suitable points on each radial at which to measure both directional and nondirectional fields. The average ratio of directional to nondirectional field strength may then be used in conjunction with the measured nondirectional field to determine the directional field.<sup>16</sup> Occasionally, licensees performing a partial proof discover that radiation on one or more bearings exceeds the standard pattern, often from changes in the vicinity of the directional antenna which are beyond the licensee's control. In these circumstances, we will permit the licensee to augment the standard radiation pattern based on the results of full directional and nondirectional measurements on the affected radial, including close-in points in accordance with §73.186. The inverse distance field should be determined graphically, as required in a full proof of performance.<sup>17</sup>

## 2. When Required

17. *Background.* A licensee is required to conduct a partial proof of performance when there is some indication that the antenna system may not be operating as authorized, *e.g.*, when monitoring point readings or antenna monitor readings exceed the limits specified on the station's license.<sup>18</sup> The NPRM did not propose to relax this requirement. Currently, 47 C.F.R. § 73.68 also requires a partial proof when sampling system components mounted on the tower are replaced or modified. We proposed to eliminate the latter requirement *provided* the new components are mounted in the same location and, where appropriate, with the same orientation, as the old components and: (1) measurements made at the monitoring points before and after installation establish that the substitution had no effect; and (2) antenna monitor values remain within the tolerances specified in the rules or on the station's authorization. If the monitoring point readings or antenna monitor values exceed authorized limits, then a partial proof would be required.

18. *Discussion.* All commenters who address this issue agree that a partial proof should not be mandatory when sampling system components are replaced or modified. With the provisions noted, we will delete the requirement for a partial proof in 47 C.F.R. § 73.68.

## C. Monitoring Points

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<sup>15</sup> A query of our Consolidated Data Base System (CDBS) shows that approximately 80 percent of full proofs are more than ten years old.

<sup>16</sup> This is consistent with our present policy of allowing a licensee to use the ratio of directional to nondirectional field strengths when selecting a new monitoring point. We will codify the policy in a revised rule.

<sup>17</sup> Licensees who wish to request augmentation should file concurrently Forms 301-AM and 302-AM. Form 301-AM should include an allocation study demonstrating that no interference would result. Form 302-AM should include the results of the partial proof, along with full directional and nondirectional measurements and graphical analysis of the radial(s) to be augmented. Both forms require a filing fee.

<sup>18</sup> See 47 C.F.R. § 73.61. Other circumstances which necessitate a partial proof of performance include alterations to or near the AM tower (such as adding transmission lines, isocouplers or communications antennas); replacing guy wires; or changing isolation chokes for tower obstruction lighting. A partial proof is also required to verify proper adjustment of an antenna system when operation is resumed following a period of silence exceeding six months.

19. *Background.* Monitoring points are specific locations on selected proof radials where licensees regularly take field strength measurements. The measured field strength at each monitoring point may not exceed a maximum value specified on the station's license. Monitoring point limits are based upon the difference between the radiation along the radial as determined by the proof of performance and the radiation permitted by the authorized pattern. We tentatively concluded that we should retain the requirement for monitoring points, as they provide the only indication of directional antenna performance outside the station's transmission facilities.

20. In the NPRM, we discussed the fact that stations may need to change monitoring point locations when an original point has become inaccessible, or because changes in the local electromagnetic environment could affect field strength readings. Under the current rules, an informal application to change a monitoring point must include the results of a partial proof of performance taken on the radial containing the monitoring point to be changed.<sup>19</sup> We proposed to eliminate the requirement to conduct a partial proof of performance along the radial containing this monitoring point. Instead, we sought comment on allowing the applicant simply to reference the measurements taken along that radial in the last full proof of performance submitted to the Commission. The staff would assign a radiation limit for the new monitoring point using the same procedure as described above.<sup>20</sup>

21. We also proposed to eliminate the requirement for maps and directions indicating how to reach monitoring point locations for applicants using GPS-determined coordinates to identify monitoring point coordinates.<sup>21</sup> In order to achieve sufficient accuracy, a differential GPS receiver would be required.<sup>22</sup> We proposed to specify monitoring point coordinates submitted in this manner on the station's license. Parties interested in locating these monitoring points could plot the specified coordinates onto topographical or other maps to determine the best route.

22. Commenters are divided regarding the deletion of the requirement for a partial proof on a radial when a monitoring point is changed. NAB and AFCCE support our proposal to allow licensees to select a new monitoring point from those points measured in the last full proof. According to AFCCE, "[m]onitoring points are based on the full proof, not the partial proof. If a monitoring point needs to be changed because of construction or other factors, then the full proof data should be used." AFCCE also suggests a uniform 20 percent tolerance on field strength readings at monitor points. Hammett & Edison agrees that a new monitoring point could be selected from the original proof points, "provided the environment...has not, itself, been subject to significant changes." If the environment has changed, DLR, Hatfield & Dawson, and Sellmeyer Engineering support Hammett & Edison's proposal to permit stations to submit a partial proof on the monitored radial, which may include new points if necessary.

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<sup>19</sup> See 47 C.F.R. § 73.158.

<sup>20</sup> The field strength limit would be assigned based upon the difference between the radiation along the monitoring point radial as determined by the proof of performance and the radiation permitted by the authorized standard (or augmented) radiation pattern.

<sup>21</sup> See 47 C.F.R. §§ 73.151(a)(3) and 73.158(a)(2)-(4). In the NPRM, we proposed to continue requiring a description of the monitoring point as well as a photograph to verify that the location is free of obstructions such as overhead power lines, to identify the precise location of the monitoring point with respect to nearby landmarks, and to identify the exact placement of measurement equipment.

<sup>22</sup> Differential GPS uses a reference signal from a ground beacon in addition to the satellite signals to reduce the coordinate error. Differential GPS has an accuracy better than  $\pm 2$  meters, while for non - differential GPS the possible error is approximately  $\pm 100$  meters. USGS topographic maps have an accuracy of about  $\pm 12$  meters. Some additional information about GPS may be found on the Internet at <http://www.fcc.gov/mmb/asd/welcomeALT.html#GPS>.



23. Other commenters disagree with the proposal to delete the partial proof requirement when a new monitor point is selected. Carl T. Jones, D.L. Markley & Associates, and Lawrence Behr Associates contend that it is good engineering practice to measure the entire radial when monitor point readings have changed. According to Clear Channel Communications, “the Commission should establish (or reestablish) point limits solely on the basis of full directional and nondirectional measurements along the radial.” Clear Channel also proposes a uniform 10 percent tolerance on monitor point readings.

24. *Discussion.* We acknowledge the concerns of commenters who note that a change at a monitoring point may reflect significant changes on the entire radial. We agree that without a partial proof, it may not be possible to distinguish local effects from changes in the radiation pattern. In view of these concerns, we are persuaded to modify our proposal. We will continue to require a partial proof on the affected radial when a monitoring point must be changed as a result of changes in field strength readings. We will allow licensees to designate a new monitor point from those points measured in the last full proof, without a partial proof on the monitored radial, when a monitoring point has become inaccessible or unsuitable for reasons unrelated to the electromagnetic environment. Licensees submitting a partial proof may refer to the last full proof of performance, or, alternatively, may measure directional and nondirectional field strengths at eight points to establish the directional field. When a directional-to-nondirectional comparison is used, the points need not be the same as those measured in the full proof. A suitable new monitor point may be chosen from the new partial proof points. Licensees may also use a partial proof based on the ratio of directional to nondirectional field strength to change the field strength limits for existing monitoring points. Any request for a change in a monitoring point location or field strength limit should be submitted to the Commission along with Form 302-AM. As AFCCE points out, our present method of determining field strength limits at monitoring points affords very little tolerance when the measured radiation is just within the standard pattern value. Present rules do not allow permittees to augment the standard pattern unless the measured radiation exceeds the standard pattern.<sup>23</sup> In order to allow sufficient tolerance for monitoring point limits, we will allow augmentation to 20 percent more than the measured radiation on monitored radials, regardless of whether the measured radiation exceeds the standard pattern value. We will require permittees who wish to augment to demonstrate that no interference would result.

25. Concerning identification of monitor points, most commenters favor eliminating the driving directions and the accompanying map. Few agree that coordinates determined by differential GPS alone would identify a monitoring point with sufficient accuracy on a station’s license. Hammett & Edison reports “we have often noted, during the implementation of the FCC’s tower registration program, towers with incorrect GPS-determined coordinates.” Instead of identifying the monitor point solely by GPS coordinates, Hammett & Edison suggests that we retain a brief description of the monitoring point on the AM license. Coordinates determined using differential GPS could be provided as part of the description, at the licensee’s discretion. In view of the consensus among the commenters, we will continue to require the monitor point description, and will include the description on the license. We will require licensees to provide a brief description of each monitoring point in all applications for license or for modification or re-issuance of license. Licensees may supplement this description with geographic coordinates determined by differential GPS. We will also continue to require a photograph of the monitoring point. We will delete the requirement for driving directions to monitoring points, and for maps showing the monitoring points.

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<sup>23</sup> See §73.152. Augmentation expands the standard pattern radiation envelope, normally over a limited span, to encompass anomalies in a measured pattern.

### III. AM Station Equipment & Measurements

#### A. Base Current Ammeters

26. *Background.* Licensees are currently required to install base current ammeters or toroidal transformers (current registering devices) at the power feed point of each tower, typically at the base of the tower. See 47 C.F.R. § 73.58(b). With improvements in antenna sampling system design, fewer stations now rely on base current ammeters as a means of maintaining proper array adjustment. We therefore proposed to delete the requirement for base current ammeters or toroidal transformers for those directional stations employing *approved* antenna sampling systems.<sup>24</sup>

27. *Discussion.* Nearly all commenters agree that the requirement for base current sampling should be deleted for stations using approved sampling systems. As Greater Media, Inc. points out, “Base current ammeters can...effectively impose a second and unnecessary set of tolerances on the adjustment of the array.” Delta Electronics, Inc., manufacturer of current sampling devices for broadcast use, suggests alternatively that the Commission require that directional AM stations “retain the capability for base current measurements” in the event that the approved sampling system or the antenna monitor malfunctions. Potomac Instruments, Inc. also cites the value of base current ammeters when antenna monitor readings shift significantly.

28. We recognize that some AM broadcasters may wish to maintain base current sampling. As we indicated in the NPRM, deletion of this requirement would not prevent stations from continuing to use base current ammeters for diagnostic purposes, or as a backup in the event of sampling system or antenna monitor failure. However, consistent with our efforts to streamline our rules, we see no need to incorporate such maintenance practices into our rules. Accordingly, as proposed in the NPRM, we will delete the requirement for base current sampling. We note, however, that stations not using approved sampling systems have no reliable alternate on-site means of assessing antenna performance. In these circumstances, our rules will continue to require stations to install and use base current ammeters if the Commission has not approved an alternative system.

#### B. Antenna Monitors

29. *Background.* An antenna monitor measures the relative currents and phases of radiating elements in a directional antenna, two critical factors in defining a pattern. All AM directional stations are required to use an antenna monitor which complies with the technical requirements in 47 C.F.R. § 73.53.<sup>25</sup> This rule also establishes antenna monitor specifications. We proposed to delete most of the antenna monitor construction and operational requirements of 47 C.F.R. § 73.53, with the exception of a few provisions that would be shifted to other existing rule sections.<sup>26</sup> We noted that the Commission has eliminated detailed construction and operational requirements for other types of broadcast equipment, such

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<sup>24</sup> Design and Installation of Sampling Systems for Antenna Monitors In Standard Broadcast Stations With Directional Antennas, 57 FCC 2d 1085 (1976).

<sup>25</sup> See also Public Notice to Licensees of All Standard Broadcast Stations Employing Directional Antennas, 45 FCC 2d 1062 (1974).

<sup>26</sup> The present requirement in 47 C.F.R. § 73.53(a) that the antenna monitor be verified for compliance with the Commission’s technical requirements would be moved to 47 C.F.R. § 73.69, which deals with antenna monitors. Antenna monitor requirements for critical arrays would also be moved from 47 C.F.R. § 73.53(c) to 47 C.F.R. § 73.69. Minimum readout levels in 47 C.F.R. § 73.53(b)(4) and (5) would be moved to 47 C.F.R. § 73.1215 (Specifications for Indicating Instruments).

as transmitters and metering equipment, and we tentatively concluded that the elimination of these requirements would encourage the development of more dependable and less expensive antenna monitor units.

30. *Discussion.* In the NPRM, we cited 1993 comments by Potomac Instruments, Inc., a manufacturer of antenna monitor systems, claiming that the present specifications in 47 C.F.R. § 73.53 impede the development of antenna monitor systems using advanced technology and that elimination of these requirements would result in a new generation of monitor equipment. We note that a number of years have passed since this proceeding was initiated, and that further development of new instrumentation technology for AM stations may be unlikely. In its recent comments, Potomac Instruments states that it “*does not believe* that the elimination of 47 C.F.R. § 73.53 would enhance the development of new and less expensive antenna monitor systems.” The manufacturer explains that the economics of the directional AM market simply do not support research and development. In view of this comment, we are persuaded not to adopt this proposal in the near term. We will leave the provisions of 47 C.F.R. § 73.53 unchanged.

31. We also sought comment on whether to permit licensees to use *voltage* sampling devices to feed antenna monitors in lieu of current sampling devices such as sampling transformers and pick-up loops. We asked for comments as to the accuracy and reliability of voltage sampling devices for assessing array performance, and as to whether we should modify the rules to permit their use. Most commenters favored this proposal, but felt that it was more appropriately addressed in the context of a further NPRM, along with the issue of computer modeling and its related sampling system requirements. We will therefore seek additional comments on base voltage sampling, particularly as it relates to sampling system specifications necessary for accurate computer modeling.<sup>27</sup>

### C. Impedance Measurements Across a Range of Frequencies

32. *Background.* All AM stations are required to measure impedance (resistance and reactance) across the range of frequencies within 25 kHz of the carrier frequency.<sup>28</sup> This procedure, known as an impedance sweep, is intended to ensure adequate audio quality across the station’s operating bandwidth. In keeping with the deletion of various performance measurements for FM and TV, we proposed to delete the requirement for AM stations to perform an impedance sweep. We tentatively concluded that retention of 47 C.F.R. § 73.54(c) is not necessary because market forces will provide sufficient incentive for stations to maintain quality technical operations.

33. *Discussion.* Commenters express unanimous support for eliminating the requirement to measure impedance at a range of frequencies. We will delete the requirement as proposed.

### D. Common Point Impedance Measurements

34. *Background.* Present rules require directional AM stations to take impedance measurements at the common radiofrequency input location. The rule<sup>29</sup> now specifies that licensees maintain a reactance of zero ohms at this point. We proposed to delete this requirement. The reactance does not affect the station’s output power, and we tentatively concluded that practical considerations should dictate the optimum common point reactance. We also sought comment as to whether a limit should be set for the maximum amount of reactance permitted.

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<sup>27</sup> See paragraphs 42 to 46, below.

<sup>28</sup> See 47 C.F.R. § 73.54(c)(1) and (2).

<sup>29</sup> 47 C.F.R. § 73.54(b).

35. *Discussion.* All commenters who mention common point impedance agree that it is unnecessary to maintain zero reactance. Several commenters point out that, in many circumstances, the transmitter operates more efficiently with a non-zero reactance at the common point. In response to our inquiry regarding a maximum permissible amount of reactance, Greater Media, Inc. suggests 10 ohms. Greater Media does not explain the basis of this limit, however. In the absence of a compelling reason to limit the reactive component of the common point impedance, we decline to specify a limit. As proposed in the NPRM, we will no longer require stations to adjust common point reactance to zero ohms.

#### IV. Designation of Critical Arrays

36. AM directional antennas are not steady-state systems. Because current and phase values tend to fluctuate, our rules specify operating tolerances for these values. In most cases, maintaining current and phase variations within normal tolerance will ensure that radiated fields remain within the station's authorized pattern. Critical arrays are directional antennas that are unusually sensitive to slight variations in internal operating parameters, *i.e.*, they are likely to produce excessive field when antenna parameters vary. We therefore require licensees of stations with critical arrays to maintain tighter operating tolerances in order to limit potential interference.

37. *Background.* In the NPRM we acknowledged, as several commenters pointed out, that the staff has generally investigated an array for stability only if a petition or objection is filed against the application proposing the array. As a result, not all unstable antenna systems have been designated as critical arrays. We proposed to apply a uniform screening process to all applications for directional facilities.

38. We also proposed to relax our criteria for designating critical arrays in several ways. First, we proposed to restrict our tests for array stability to radiation pattern minima (nulls) and maxima in the horizontal plane only instead of testing at all azimuths and elevations. Second, we proposed to classify an array as critical only if the standard pattern is exceeded at 10% or more of the possible parameter variation combinations. The current test requires only one instance of excessive radiation. Finally, based on the results of studies we have performed on the licensed AM directional patterns in our AM engineering database, we proposed to exclude all two- and three-tower arrays from designation as critical arrays. We also proposed to exclude all daytime arrays which, historically, have not generated instability complaints. Finally, we proposed to permit licensees with facilities currently classified as critical to request staff review of their designation based on the revised criteria. We sought comment on each aspect of this proposal.

39. *Discussion.* Comments received on these issues were mixed. Some commenters suggest modifications to the criteria for designating critical arrays. The Walt Disney Company, while generally supporting our proposals, rejects the suggestion that studies be limited to pattern minima and maxima. Disney asserts that "the most sensitive areas of a pattern ... are not in a null but just coming out of a null, where the signal strength rises rapidly versus azimuth." Disney and Thomas G. Osenkowsky also disagree with our proposal to limit stability studies to the horizontal plane. Moreover, Osenkowsky opposes the categorical exclusion of two- and three-tower arrays from study. Lawrence Behr Associates maintains that daytime arrays should not be exempt from scrutiny, as we proposed.

40. We are persuaded, however, that the better course is to eliminate the critical array

designation.<sup>30</sup> Many commenters, including Hatfield & Dawson, DLR, Clear Channel, and Donald G. Everist, support this approach which is consistent with our general intent to relax AM technical requirements. We agree with several commenters, including Hatfield & Dawson and DLR, that noted that the degree of precision inherent in both our predictions of pattern shape and in our nighttime propagation model is inconsistent with the close tolerances required of critical arrays.<sup>31</sup> Moreover, we recognize a lack of uniformity in the Commission's historic application of stability requirements. As Hatfield & Dawson notes, imposing stability standards on new station proposals would simply carry forward an inequity in the way we have treated potentially critical arrays in the past. To rectify this problem, we will also delete the critical array designation in all outstanding authorizations.<sup>32</sup>

## V. Conclusion

41. In this *Report & Order*, we have adopted substantial reductions in our proof of performance requirements for AM directional antenna systems. For both full and partial proofs of performance, we have reduced the number of measurement radials required and have cut the minimum number of measurement points required per radial. We believe these provisions will substantially reduce the time and cost burdens associated with verifying proper operation of AM directional arrays. We have removed unnecessary operating requirements in regard to base current ammeters and common point reactance. With the removal of the critical array designation, we provide substantial relief to the minority of AM stations burdened with the tight tolerances and expensive antenna monitors that this designation imposed. Although these provisions are designed to provide substantial savings for licensees of directional AM antennas, we believe that none of them jeopardize the technical integrity of the AM broadcast service.

## VI. Further Notice of Proposed Rulemaking on the Use of Computer Modeling to Predict Antenna Performance

42. The Joint Petitioners who initiated this proceeding in 1991 suggested that the Commission consider incorporating the use of computer modeling techniques into the proof of performance process.<sup>33</sup> According to the Joint Petitioners, computer modeling does not rely on the simplifying assumptions contained in our present rules, and therefore can accurately predict the relationship between pattern shape and "internal" array parameters such as impedances, currents and voltages at locations within the power

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<sup>30</sup> We believe that economic considerations in the mature AM service will discourage construction of certain types of arrays that tend to be unstable. In the event that an applicant proposes a directional antenna system which may be characterized as potentially unstable based on factors such as predicted operating impedances, RSS/RMS ratio, or null depth, the staff may designate additional monitoring points to insure that the radiation remains within standard pattern limits.

<sup>31</sup> AM field strength at night is subject to significant short- and long-term variation. A recent comparison of predicted and measured skywave field strengths shows that the root-mean-square error is 5.4 dB. See Wang, J.C.H., An Objective Evaluation of Available LF/MF Sky-wave Propagation Models, *Radio Science*, Vol. 34, No. 3, pp. 703-713, May-June 1999.

<sup>32</sup> In the NPRM we proposed to discontinue requiring the use of expensive, specially designed precision antenna monitors for critical arrays. We tentatively concluded that critical arrays could use off-the-shelf equipment without adverse impact. Eliminating the critical array designation also eliminates the need for additional performance standards for antenna monitors used by critical arrays. Accordingly, the relevant provisions of 47 C.F.R. § 73.69 will be deleted.

<sup>33</sup> Such computer models are generically referred to as "method of moments" programs, "matrix" programs, or "NEC" programs. NEC programs are based on the Numerical Electromagnetics Code moment method of analysis developed at the Lawrence Livermore Laboratory, Livermore, California.

distribution and radiation system.<sup>34</sup>

43. About half of the comments on the *Notice of Inquiry* agree that arrays adjusted pursuant to moment method programs may require far fewer, if any, field strength measurements to verify that the authorized pattern shape has been achieved. Commenters in favor of computer modeling point to the uncertainties inherent in field strength measurements, which are subject to variation caused by proximity effects, scattering, seasonal changes in ground conductivity, and land development along propagation paths. Other commenters oppose elimination of the requirement for proofs of performance based primarily on field strength measurements. Most of these commenters acknowledge that computer models based on NEC or MiniNEC can be useful in analyzing array parameters, but retain the view that, despite their imperfections, field strength measurements provide the best indication that the antenna system is operating properly.

44. In the NPRM, we expressed two main concerns regarding use of computer modeling: first, that reliance on modeling might not control interference adequately; and second, that we would be extending our technical regulations into new areas, contrary to the general intent of the Commission's streamlining initiatives. We sought comment on this issue in the NPRM. Most commenters strongly support further consideration of computer modeling as a means of verifying directional antenna performance. We agree with AFCCE's observation that "[t]he topic is too important to ignore and too complex to address as a secondary issue."<sup>35</sup> In an attempt to develop consensus on the use of computer modeling, the National Association of Broadcasters (NAB) has sponsored a series of industry forums on this topic. Representatives of large broadcasting groups, consulting engineers, and AM equipment manufacturers have participated in these discussions. NAB describes the objectives of the industry forums as follows: 1) to investigate whether computer modeling may allow further reduction in necessary field measurements; 2) to define the types of directional antenna systems for which computer modeling is straightforward; 3) to consider whether the industry should adopt uniform software for antenna modeling; and 4) to compare computer modeling to actual field measurement.<sup>36</sup>

45. NAB filed supplemental comments on August 3, 2000 to present the industry committee's conclusions to date.<sup>37</sup> The supplemental comments outline 18 criteria to define the types of directional antennas for which "accurate computer models can be produced by all AM broadcast engineers."<sup>38</sup> These criteria would initially limit the number of towers in the array to six or fewer, would specify the type of sampling system which could be used, and would generally be limited to arrays clear of nearby reradiating objects. NAB and the joint commenters propose that directional AM arrays meeting these criteria could substitute computer modeling for proofs of performance based on field strength measurements.

46. We seek comments on the criteria proposed by NAB to define arrays for which computer modeling could be used in the proof process. NAB's first eight criteria refer to characteristics of the directional antenna system, including the number of towers, the RSS-to-RMS ratio of the pattern, and certain physical dimensions of the antenna array. The next group, items 9 through 12, addresses sampling

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<sup>34</sup> These programs also aid designers in evaluating the effects of nearby potential reradiating objects.

<sup>35</sup> See Comments of AFCCE at 3.

<sup>36</sup> See Comments of NAB at 3.

<sup>37</sup> Joint Written Ex Parte Filing –Supplemental Comments of Broadcasters, Broadcast Engineering Consultants, and Equipment Manufacturers. Appendix B of the Supplemental Comments lists 11 companies as joint commenters.

<sup>38</sup> NAB's Supplemental Comments are available on the internet via the Commission's Electronic Comment Filing System (ECFS). The internet address is as follows: <http://www.fcc.gov/e-file/ecfs.html>.

system requirements. NAB proposes use of voltage sampling instead of current sampling for towers within certain height limits. As discussed in paragraph 31 above, we request comments on the use of voltage sampling, both in conjunction with computer modeling and in arrays for which conventional proofs are done. In items 13 through 17, NAB describes structures near the directional antenna, such as towers, buildings, and power lines, which could distort the directional pattern. NAB suggests that the presence of potential reradiating structures should initially disqualify an array from proof by computer modeling. Finally, in item 18, NAB proposes acceptable ranges for the data used in the computer model. We request comments on these criteria, and on any other limitations which may be appropriate. We also seek comment on the following topics: what data should constitute a proof of performance for an array adjusted pursuant to computer modeling; what type of external monitoring may be appropriate for arrays adjusted using computer modeling; the suitability of various types of commercially available software for antenna modeling. We note that the industry committee also expected to consider software for antenna modeling, and to compare results predicted by computer modeling to actual field strength measurements. We look forward to the completion of these studies and their submission to the Commission in this proceeding.

## VII. Administrative Matters

47. *Filing of Comments and Reply Comments.* Pursuant to Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. §§ 1.415 and 1.419, interested parties may file comments within seventy-five (75) days of the date of publication of this Notice in the Federal Register and reply comments within one hundred and thirty-five (135) days of the date of publication of this Notice in the Federal Register. Comments filed through the ECFS can be sent as an electronic file via the Internet to <http://www.fcc.gov/e-file/ecfs.html>. In completing the transmittal screen, commenters should include their full name, postal service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to [ecfs@fcc.gov](mailto:ecfs@fcc.gov), and should include the following words in the body of the message, "get form <your e-mail address.>" A sample form and directions will be sent in reply. Parties who choose to file by paper must file an original and four copies of each filing. If you want each Commissioner to receive a personal copy of your comments, you must file an original plus eleven copies. All filings must be sent to the Commission's Secretary, Magalie Roman Salas, Office of the Secretary, TW-A306, Federal Communications Commission, 445 12th Street, S.W., Washington, D.C. 20554. The Mass Media Bureau contacts for this proceeding are Edward De La Hunt, Son Nguyen, or Ann Gallagher at (202) 418-2700 or [edelahun@fcc.gov](mailto:edelahun@fcc.gov), [snguyen@fcc.gov](mailto:snguyen@fcc.gov), or [agallagh@fcc.gov](mailto:agallagh@fcc.gov).

48. Parties who choose to file by paper should also submit their comments on diskette. These diskettes should be submitted to: Edward De La Hunt, Federal Communications Commission, 445 12th Street, S.W., Room 2-B450, Washington, DC 20554. Such a submission should be on a 3.5 inch diskette formatted in an IBM compatible format using Microsoft Word 97 or compatible software. The diskette should be accompanied by a cover letter and should be submitted in "read only" mode. The diskette should be clearly labeled with the commenter's name, proceeding (including the docket number in this case -- MM Docket No. 93-177), type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy - Not an Original." Each diskette should contain only one party's pleadings, preferably in a single electronic file. In addition, commenters must send diskette copies to the Commission's copy contractor, International Transcription Service, Inc., 1231 20th Street, N.W., Washington, D.C. 20036.

49. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center, 445 12<sup>th</sup> Street S.W., Washington, D.C. 20554. Written comments by the public on the proposed and/or modified information collections are due on or before 60

days of the date of publication of this Notice in the Federal Register. Written comments must be submitted by the Office of Management and Budget (OMB) on the proposed and/or modified information collections on or before 60 days of the date of publication of this Notice in the Federal Register. In addition to filing comments with the Secretary, a copy of any comments on the information collections contained herein should be submitted to Judy Boley, Federal Communications Commission, Room C-1804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to [jboley@fcc.gov](mailto:jboley@fcc.gov) and to Edward Springer, OMB Desk Officer, 10236 NEOB, 725 - 17th Street, N.W., Washington, DC 20503 or via the Internet to [edward.springer@omb.eop.gov](mailto:edward.springer@omb.eop.gov).

50. *Initial Paperwork Reduction Act of 1995 Analysis.* This *Report and Order and Further Notice of Proposed Rulemaking* proposes rule and procedural revisions that may contain information collection requirements. As part of our continuing effort to reduce paperwork burdens, we invite the general public and OMB to take this opportunity to comment on the information collection contained in this *Report and Order*, as required by the Paperwork Reduction Act of 1995, Pub. L. No. 104-13. Public and agency comments are due at the same time as other comments in this *Further Notice of Proposed Rulemaking* (on or before 75 days of the date of publication of this Notice in the Federal Register). OMB comments are due 60 days from the date of publication of this *Report and Order* in the Federal Register. Comments should address: (a) whether the proposed collection of data is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology. In addition to filing comments with the Secretary, a copy of any comments on the information collections contained herein should be submitted to Judy Boley, Federal Communications Commission, Room C-1804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to [jboley@fcc.gov](mailto:jboley@fcc.gov) and to Edward Springer, OMB Desk Officer, 10236 NEOB, 725 17th Street, N.W., Washington, DC 20503 or via the Internet to [edward.springer@omb.eop.gov](mailto:edward.springer@omb.eop.gov).

51. *Ex Parte Rules.* This proceeding will be treated as a "permit-but-disclose" proceeding subject to the "permit-but-disclose" requirements under 47 C.F.R. § 1.1206(b). 47 C.F.R. § 1.1206(b), as revised. *Ex parte* presentations are permissible if disclosed in accordance with Commission rules, except during the Sunshine Agenda period when presentations, *ex parte* or otherwise, are generally prohibited. Persons making oral *ex parte* presentations are reminded that a memorandum summarizing a presentation must contain a summary of the substance of the presentation and not merely a listing of the subjects discussed. More than a one- or two-sentence description of the views and arguments presented is generally required. See 47 C.F.R. § 1.1206(b)(2), as revised. Additional rules pertaining to oral and written presentations are set forth in 47 C.F.R. § 1.1206(b).

52. *Final Regulatory Flexibility Analysis.* With respect to this *Report and Order*, a Final Regulatory Flexibility Analysis ("FRFA") is contained in Appendix B. As required by the Regulatory Flexibility Act,<sup>39</sup> the Commission has prepared a FRFA of the possible significant economic impact on small entities by the policies and rules adopted in this *Report and Order*. Written public comments were requested in the Initial Regulatory Flexibility Analysis. None were received.

53. *Initial Regulatory Flexibility Analysis.* An Initial Regulatory Flexibility Analysis ("IRFA") regarding this *Further Notice of Proposed Rulemaking* is contained in Appendix C. As required

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<sup>39</sup> See 5 U.S.C. § 604.



by the Regulatory Flexibility Act,<sup>40</sup> the Commission has prepared an IRFA of the possible significant economic impact on small entities by the policies and rules in this *Further Notice of Proposed Rulemaking*. We request written public comments on the IRFA.

54. Accordingly, IT IS ORDERED, That pursuant to the authority contained in Sections 4(i), 4(j), 303, 308, 309 and 310 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 154(j), 303, 308, 309, 310, and 319 this Notice of Proposed Rule Making IS ADOPTED.

55. IT IS FURTHER ORDERED, That the Commission's Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of this Notice, including both the Initial and Final Regulatory Flexibility Analyses, to the Chief Counsel for Advocacy of the Small Business Administration

56. Additional Information. For additional information on this proceeding, please contact Edward De La Hunt, Son Nguyen, or Ann Gallagher, Audio Services Division, Mass Media Bureau at (202) 418-2700.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas  
Secretary

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<sup>40</sup> *Id.*

**Appendix A**

## List of Commenters

**Initial Comments were received from:**

Association of Federal Communications  
Commission Consulting Engineers (AFCCE)  
Carl T. Jones Corporation  
Clear Channel Communications, Inc.  
Delta Electronics, Inc.  
Donald L. Markley  
duTreil, Lundin & Rackley, Inc.  
Greater Media, Inc.  
Hammett & Edison, Inc.  
Hatfield & Dawson Consulting Engineers, LLC  
Infinity Broadcasting Corporations  
Kintronics Laboratories  
Lawrence Behr Associates, Inc.  
National Association of Broadcasters (NAB)  
Potomac Instruments, Inc.  
Sellmeyer Engineering  
Star Development Group  
Thomas G. Osenkowsky  
The Walt Disney Company

**Reply comments were received from:**

Donald G. Everist, P.E.  
duTreil, Lundin & Rackley, Inc.  
Hatfield & Dawson Consulting Engineers, LLC  
Potomac Instruments, Inc.

## Appendix B

### FINAL REGULATORY FLEXIBILITY ANALYSIS

1. As required by the Regulatory Flexibility Act ("RFA"),<sup>41</sup> the Commission has prepared this present Final Flexibility Analysis ("FRFA") of the possible significant economic impact on small entities by the policies and rules adopted in this *Report and Order and Further Notice of Proposed Rule Making ("Report and Order")*. Written and electronically filed public comments were requested in our Initial Regulatory Flexibility Analysis (IRFA). None were received. The Commission will send a copy of the *Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. In addition, the *Report and Order* and FRFA (or summaries thereof) will be published in the Federal Register. See 5 U.S.C. § 604(a).

#### **I. Need For and Objectives of the Rules:**

2. This *Report and Order* eliminates some of Commission's technical rules and relaxes others to materially reduce the regulatory and compliance burdens on AM broadcasters using directional antennas. For instance, in order to control interference between stations and assure adequate community coverage, directional AM stations currently must undergo extensive "proofs of performance" to demonstrate that the antenna system operates as authorized. The field strength measurements and technical exhibits which our current rules require as part of a "proof" impose a substantial financial burden upon these AM broadcasters, a burden not incurred by licensees in the other broadcast services.<sup>42</sup> This *Report and Order* reduces this particular burden, and generally reduces the Commission's regulatory requirements to the minimum necessary to achieve our policy objectives of controlling interference and assuring adequate community coverage.

#### **II. Legal Basis:**

3. Authority for the actions proposed in this *Report and Order* may be found in Sections 4(i), 4(j), 303, 308, 309, 310 and 319 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 154(j), 303, 308, 309, 310 and 319.

#### **III. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply:**

4. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.<sup>43</sup> The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."<sup>44</sup> In addition, the term "small business" has the same

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<sup>41</sup> See 5 U.S.C. § 603. The RFA, see 5 U.S.C. § 601 et. seq., has been amended by the Contract with America Advancement Act of 1996, Pub. L. No. 104-12, 110 Stat. 848 (1996) ("CWAA"). Title II of the CWAA is the Small Business Regulatory Enforcement Fairness Act of 1996 ("SBREFA").

<sup>42</sup> Directional FM licensees incur substantially lesser incremental expenses in constructing, licensing, and maintaining their facilities.

<sup>43</sup> 5 U.S.C. § 603(b)(3).

<sup>44</sup> *Id.* § 601(6).

meaning as the term "small business concern" under the Small Business Act.<sup>45</sup> A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).<sup>46</sup> A small organization is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."<sup>47</sup> Nationwide, as of 1992, there were approximately 275,801 small organizations.<sup>48</sup> "Small governmental jurisdiction" generally means "governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than 50,000."<sup>49</sup> As of 1992, there were approximately 85,006 such jurisdictions in the United States.<sup>50</sup> This number includes 38,978 counties, cities, and towns; of these, 37,566, or 96 percent, have populations of fewer than 50,000.<sup>51</sup> The Census Bureau estimates that this ratio is approximately accurate for all governmental entities. Thus, of the 85,006 governmental entities, we estimate that 81,600 (91 percent) are small entities.

5. The rules and policies will apply to certain AM radio broadcasting licensees and potential licensees. The Small Business Administration defines a radio broadcasting station that has no more than \$5 million in annual receipts as a small business.<sup>52</sup> A radio broadcasting station is an establishment primarily engaged in broadcasting aural programs by radio to the public.<sup>53</sup> Included in this industry are commercial religious, educational, and other radio stations.<sup>54</sup> Radio broadcasting stations which primarily are engaged in radio broadcasting and which produce radio program materials are similarly included.<sup>55</sup> The 1992 Census indicates that 96 percent (5,861 of 6,127) radio station establishments produced less than \$5 million in revenue in 1992.<sup>56</sup> Official Commission records indicate that 11,334 individual radio stations were operating in 1992.<sup>57</sup> As of February 1, 2001, official Commission records indicate that, 12,751 radio stations were operating, of which 4,674 were AM stations.

6. Thus, because only 40 percent of AM stations operate with directional antennas, the rules affect 1,870 radio stations, 1,795 of which are small businesses.<sup>58</sup> These estimates may overstate the

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<sup>45</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

<sup>46</sup> Small Business Act, 15 U.S.C. § 632 (1996).

<sup>47</sup> 5 U.S.C. § 601(4).

<sup>48</sup> 1992 Economic Census, U.S. Bureau of the Census, Table 6 (special tabulation of data under contract to Office of Advocacy of the U.S. Small Business Administration).

<sup>49</sup> 5 U.S.C. § 601(5).

<sup>50</sup> U.S. Dept. of Commerce, Bureau of the Census, "1992 Census of Governments."

<sup>51</sup> *Id.*

<sup>52</sup> 13 C.F.R. § 121.201, SIC 4832.

<sup>53</sup> Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual (1987), SIC 4832.

<sup>54</sup> *Id.*

<sup>55</sup> *Id.* However, radio stations which are separate establishments and are primarily engaged in producing radio program material are classified under another SIC number.

<sup>56</sup> The Census Bureau counts radio stations located at the same facility as one establishment. Therefore, each co-located AM/FM combination counts as one establishment.

<sup>57</sup> FCC News Release No. 31327, Jan. 13, 1993.

<sup>58</sup> We use the 96% figure of radio station establishments with less than \$5 million revenue from the Census data and apply it to the 1,870 radio stations using directional antennas to arrive at 1,795 individual AM stations as small businesses.

number of small entities since the revenue figures on which they are based do not include or aggregate revenues from non-radio affiliated companies.

7. In addition to owners of operating radio stations, any entity that seeks or desires to obtain a radio broadcast license may be affected by rule changes adopted in this *Report and Order*. The number of entities that may seek to obtain a radio broadcast license is unknown.

#### **IV. Description of Projected Recording, Recordkeeping, and Other Compliance Requirements:**

8. A number of rule changes adopted in this *Report and Order* reduce the reporting requirements of prospective and current AM licensees. In order to control interference between stations and assure adequate community coverage, directional AM stations must undergo extensive "proofs of performance" when initially constructed, and from time to time thereafter, to verify conformance with authorized operating parameters. AM licensees incur substantial costs in performing the measurements and preparing the required technical exhibits for a proof of performance. This *Report and Order* reduces the number of measurement radials required and shortens the length of measured radials. We have deleted the requirement to include maps showing each field measurement location with a license application. In addition, we have eliminated the requirement for a proof of performance in certain circumstances. Taken together, these changes reduce the cost of a proof of performance for all AM licensees and for prospective new applicants. We also delete the requirement for base current ammeters, and eliminate the designation of some directional antenna systems as critical arrays. These measures reduce operating costs for directional AM stations. None of the rule changes adopted here impose new recording, record keeping, or other compliance requirements on prospective or current AM licensees. Overall, the changes we are adopting are designed to reduce the overall administrative burdens of the Commission's rules on both regulatees and the Commission staff.

#### **V. Steps Taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered:**

9. This *Report and Order* enhances opportunities for improvement of technical facilities and service and minimizes the administrative burdens and delays associated with our radio broadcast licensing processes. The changes adopted in this *Report and Order* will reduce the costs of operating a directional AM station, of modifying the station's facilities, and of constructing a new AM station. While we expect that the changes adopted here will benefit directional AM stations regardless of size, we note that the cost reductions may be of particular value to small entities.

10. All significant alternatives presented in the comments were considered. In particular, several commenters dissented from our proposal to relax the criteria for designating critical arrays, and to apply the new criteria to all applications for new or modified directional AM facilities. After considering this alternative suggested by the commenters, we were persuaded that we could eliminate the critical array designation entirely without compromising the integrity of the AM service. This rule change eases operating requirements for those AM stations which might have been designated as critical arrays, a benefit which is irrespective of the station's size or ownership, but which may be a boon to a small business.

#### **VI. Report to Congress**

11. The Commission will send a copy of An Inquiry Into the Commission's Policies and Rules Regarding AM Radio Service Directional Antenna Performance Verification, including this FRFA, in a report to be sent to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of

1996. See 5 U.S.C. § 801(a)(1)(A). In addition, the Commission will send a copy of this Report and Order, including this FRFA, to the Chief Counsel for Advocacy of the Small business Administration. A copy of this Report and Order, including this FRFA, (or summaries thereof) will also be published in the Federal Register. See 5 U.S.C. § 604(b).

## Appendix C

### INITIAL REGULATORY FLEXIBILITY ANALYSIS

1. As required by the Regulatory Flexibility Act ("RFA"),<sup>59</sup> the Commission has prepared this Initial Flexibility Analysis ("IRFA") of the possible significant economic impact on small entities by the policies and rules proposed in this *Further Notice of Proposed Rule Making* ("Notice"). Written and electronically filed public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments of the *Notice* provided above in paragraphs 47 and 48. The Commission will send a copy of the *Further Notice*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration. See 5 U.S.C. § 603(a). In addition, the *Further Notice* and IRFA (or summaries thereof) will be published in the Federal Register. See *id.* Since there is no significant economic effect on small entities, we considered issuing a certification. However, we decided, in order to compile an optimally complete record, to go forward with this IRFA.

#### **I. Need For and Objectives of the Proposed Rules:**

2. This *Further Notice* seeks comment on the use of computer modeling techniques based on moment method analysis to verify AM directional antenna performance.<sup>60</sup> Adoption of such techniques would reduce further the substantial costs associated with licensing for directional AM stations. These measures would also advance the goal of reducing the Commission's regulatory requirements to the minimum necessary to achieve our policy objectives of controlling interference and assuring adequate community coverage.

#### **II. Legal Basis:**

3. Authority for the actions proposed in this *Further Notice* may be found in Sections 4(i), 4(j), 303, 308, 309, 310 and 319 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 154(j), 303, 308, 309, 310 and 319.

#### **III. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply:**

4. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.<sup>61</sup> The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."<sup>62</sup> In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.<sup>63</sup> A small business concern is

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<sup>59</sup> See 5 U.S.C. § 603. The RFA, see 5 U.S.C. § 601 *et. seq.*, has been amended by the Contract with America Advancement Act of 1996, Pub. L. No. 104-12, 110 Stat. 848 (1996) ("CWAA"). Title II of the CWAA is the Small Business Regulatory Enforcement Fairness Act of 1996 ("SBREFA").

<sup>60</sup> See paragraph 46, *supra*.

<sup>61</sup> 5 U.S.C. § 603(b)(3).

<sup>62</sup> *Id.* § 601(6).

<sup>63</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and

one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).<sup>64</sup> A small organization is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."<sup>65</sup> Nationwide, as of 1992, there were approximately 275,801 small organizations.<sup>66</sup> "Small governmental jurisdiction" generally means "governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than 50,000."<sup>67</sup> As of 1992, there were approximately 85,006 such jurisdictions in the United States.<sup>68</sup> This number includes 38,978 counties, cities, and towns; of these, 37,566, or 96 percent, have populations of fewer than 50,000.<sup>69</sup> The Census Bureau estimates that this ratio is approximately accurate for all governmental entities. Thus, of the 85,006 governmental entities, we estimate that 81,600 (91 percent) are small entities.

5. The proposed rules and policies will apply to certain AM radio broadcasting licensees and potential licensees. The Small Business Administration defines a radio broadcasting station that has no more than \$5 million in annual receipts as a small business.<sup>70</sup> A radio broadcasting station is an establishment primarily engaged in broadcasting aural programs by radio to the public.<sup>71</sup> Included in this industry are commercial religious, educational, and other radio stations.<sup>72</sup> Radio broadcasting stations which primarily are engaged in radio broadcasting and which produce radio program materials are similarly included.<sup>73</sup> However, radio stations which are separate establishments and are primarily engaged in producing radio program material are classified under another SIC number.<sup>74</sup> The 1992 Census indicates that 96 percent (5,861 of 6,127) radio station establishments produced less than \$5 million in revenue in 1992.<sup>75</sup> Official Commission records indicate that 11,334 individual radio stations were operating in 1992.<sup>76</sup> As of February 1, 2001, official Commission records indicate that 12,751 radio stations were operating, of which 4,674 were AM stations.

6. Thus, because only 40 percent of AM stations operate with directional antennas, the proposed rules will affect fewer than 1,870 radio stations, 1,795 of which are small businesses.<sup>77</sup> These estimates may overstate the number of small entities since the revenue figures on which they are based do not include or aggregate revenues from non-radio affiliated companies.

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publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

<sup>64</sup> Small Business Act, 15 U.S.C. § 632 (1996).

<sup>65</sup> 5 U.S.C. § 601(4).

<sup>66</sup> 1992 Economic Census, U.S. Bureau of the Census, Table 6 (special tabulation of data under contract to Office of Advocacy of the U.S. Small Business Administration).

<sup>67</sup> 5 U.S.C. § 601(5).

<sup>68</sup> U.S. Dept. of Commerce, Bureau of the Census, "1992 Census of Governments."

<sup>69</sup> *Id.*

<sup>70</sup> 13 C.F.R. § 121.201, SIC 4832.

<sup>71</sup> Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual (1987), SIC 4832.

<sup>72</sup> *Id.*

<sup>73</sup> *Id.*

<sup>74</sup> *Id.*

<sup>75</sup> The Census Bureau counts radio stations located at the same facility as one establishment. Therefore, each co-located AM/FM combination counts as one establishment.

<sup>76</sup> FCC News Release No. 31327, Jan. 13, 1993.

<sup>77</sup> We use the 96% figure of radio station establishments with less than \$5 million revenue from the Census data and apply it to the 1,870 radio stations using directional antennas to arrive at 1,795 individual AM stations as small businesses.



7. In addition to owners of operating radio stations, any entity that seeks or desires to obtain a radio broadcast license may be affected by the proposals contained in this item. The number of entities that may seek to obtain a radio broadcast license is unknown. We invite comment as to such number.

#### **IV. Description of Projected Recording, Recordkeeping, and Other Compliance Requirements:**

8. Previous comments in this proceeding showed broad support for further consideration of the topic of computer modeling. In order to control interference between stations and assure adequate community coverage, directional AM stations must undergo extensive "proofs of performance" when initially constructed, and from time to time thereafter, to verify conformance with authorized operating parameters. This *Further Notice* proposes to consider the incorporation into the proof process of computer modeling techniques known as "method of moments."<sup>78</sup> Use of computer modeling offers the potential of a new proof of performance process which is substantially more efficient for both directional AM stations and the Commission staff. Although we anticipate that adoption of the proposed rule changes would reduce the engineering costs borne by new or modified directional AM facilities, it is premature to assess the extent of the reduction. We do expect that the optional use of computer modeling would introduce new compliance requirements, but these would be less onerous than our existing proof of performance requirements. The adoption of computer modeling techniques is not likely to introduce new record keeping or recording requirements.

#### **V. Steps Taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered:**

9. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities. 5 U.S.C. § 603(c). This *Further Notice* solicits comment on the use of computer modeling in an AM proof of performance. Incorporation of these methods into the Commission's rules has the potential to reduce the burdens and delays associated with our radio broadcast licensing processes. We have proposed adopting computer modeling techniques as an optional alternative to the conventional proof of performance process. We do not anticipate requiring directional AM stations to use computer modeling when filing an application for license. Consequently, none of the four alternative approaches is applicable in this case. Nevertheless, any significant alternatives presented in the comments will be considered.

#### **VI. Federal Rules that Overlap, Duplicate, or Conflict with the Proposed Rules:**

10. None.

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<sup>78</sup>

See paragraph 46, *supra*.

**Appendix D**

## RULE CHANGES

Section 73.14 is amended by deleting the definition of “critical directional antenna.”

Section 73.53 is amended by deleting subsection (c), and by correcting subsections (b)(5) and (b)(12) to read as follows:

§ 73.53 Requirements for authorization of antenna monitors.

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(b)(5) The device used to indicate relative amplitudes shall be graduated in increments which are 1 percent, or less, of the full scale value. If a digital indicator is provided, the smallest increment shall be 0.1 percent, or less, of the full scale value.

\*\*\*\*\*

(b)(12) The performance specifications set forth in paragraph (b)(11) of this section, shall be met when the monitor is operated and tested under the following conditions.

\*\*\*\*\*

Section 73.54 is amended by revising subsections (b) through (e) to read as follows:

§ 73.54 Antenna resistance and reactance measurements.

\*\*\*\*\*

(b) The resistance and reactance of a directional antenna shall be measured at the point of common radiofrequency input to the directional antenna system after the antenna has been finally adjusted for the required radiation pattern.

(c) A letter of notification must be filed with the FCC in Washington, DC, Attention: Audio Services Division, Mass Media Bureau, when determining power by the direct method pursuant to Sec. 73.51. The letter must specify the antenna or common point resistance at the operating frequency. The following information must also be kept on file at the station:

(1) A full description of the method used to make measurements.

(2) A schematic diagram showing clearly all components of coupling circuits, the point of resistance measurement, the location of the antenna ammeter, connections to and characteristics of all tower lighting isolation circuits, static drains, and any other fixtures connected to and supported by the antenna, including other antennas and associated networks. Any network or circuit component used to dissipate radio frequency power shall be specifically identified, and the impedances of all components which control the level of power dissipation, and the effective input resistance of the network must be indicated.

(d) AM stations using direct reading power meters in accordance with Sec. 73.51, can either submit the information required by paragraph (c) of this section or submit a statement indicating that such a meter is being used. Subsequent station licenses will indicate the use of a direct reading power meter in lieu of the antenna resistance value in such a situation.

\*\*\*\*\*

Section 73.58 is amended by deleting subsections (b) and (d)(1) and by renumbering the remaining subsections to read as follows:

Sec. 73.58 Indicating instruments.

\*\*\*\*\*

(b) Since it is usually impractical to measure the actual antenna current of a shunt excited antenna system, the current measured at the input of the excitation circuit feed line is accepted as the antenna current.

(c) The function of each instrument shall be clearly and permanently shown on the instrument itself or on the panel immediately adjacent thereto.

(d) In the event that any one of these indicating instruments becomes defective when no substitute which conforms with the required specifications is available, the station may be operated without the defective instrument pending its repair or replacement for a period not in excess of 60 days without further authority of the Commission. If the defective instrument is the antenna current meter of a nondirectional station which does not employ a remote antenna ammeter, or if the defective instrument is the common point meter of a station which employs a directional antenna and does not employ a remote common point meter, the operating power shall be determined by a method described in Sec. 73.51(a)(1) or (d) during the entire time the station is operated without the antenna current meter or common point meter. However, if a remote meter is employed and the antenna current ammeter or common point meter becomes defective, the remote meter can be used to determine operating power pending the return to service of the regular meter.

(e) If conditions beyond the control of the licensee prevent the restoration of the meter to service within the above allowed period, information requested in accordance with Sec. 73.3549 may be filed by letter with the FCC in Washington, DC, Attention: Audio Services Division, Mass Media Bureau, to request additional time as may be required to complete repairs of the defective instrument.

Section 73.62 is amended by revising subsection (a) to read as follows:

§73.62 Directional antenna system tolerances.

(a) Each AM station operating a directional antenna must maintain the indicated relative amplitudes of the antenna monitor currents within 5% of the values specified therein. Directional antenna relative phase currents must be maintained to within  $\pm 3$  deg. of the values specified on the instrument of authorization.

Section 73.68 is amended by revising subsections (a)(2), (d)(2) and (d)(3) to read as follows:

§ 73.68 Sampling systems for antenna monitors.

\*\*\*\*\*

(a)(2) Sampling lines for directional antennas may be of different lengths provided the phase difference of signals at the monitor are less than 0.5 degree between the shortest and longest cable lengths due to temperature variations to which the system is exposed.

\*\*\*\*\*

(d)(2) Immediately prior to modification or replacement of components of the sampling system, and after a verification that all monitoring point values and operating parameters are within the limits or tolerances specified in the rules, the following indications must be recorded for each radiation pattern: Final plate current and plate voltage, common point current, antenna monitor phase and current indications, and the

field strength at each monitoring point. Subsequent to these modifications or changes the above procedure must be repeated.

(d)(3) If monitoring point field strengths or antenna monitor parameters exceed allowable limits following the replacement or modification of that portion of the sampling system above the base of the towers, a partial proof of performance shall be executed in accordance with Sec. 73.154 . The partial proof of performance shall be accompanied by common point impedance measurements made in accordance with Sec. 73.54.

\*\*\*\*\*

Section 73.69 is amended by revising subsections (a), (d)(2) and (d)(4) to read as follows:

§ 73.69 Antenna monitors.

(a) Each station using a directional antenna must have in operation at the transmitter site an FCC authorized antenna monitor.

\*\*\*\*\*

(d)(2) Immediately before the replacement of the antenna monitor, after a verification that all monitoring point values and the common point current reading are within the limits or tolerances specified in the rules, the following indications must be recorded for each radiation pattern: Final plate current and plate voltage, common point current, antenna monitor phase and current indications, and the field strength at each monitoring point.

\*\*\*\*\*

(d)(4) If it cannot be established by the observations required in paragraph (d)(2) of this section that the common point current reading and the monitoring point values are within the tolerances or limits prescribed by the rules and the instrument of authorization, or if the substitution of the new antenna monitor for the old results in changes in these parameters, a partial proof of performance shall be executed and analyzed in accordance with Sec. 73.154.

\*\*\*\*\*

Section 73.151 is amended by revising subsection (a) to read as follows:

§ 73.151 Field strength measurements to establish performance of directional antennas.

\*\*\*\*\*

(a) In addition to the information required by the license application form, the following showing must be submitted to establish, for each mode of directional operation, that the effective measured field strength (RMS) at 1 kilometer (km) is not less than 85 percent of the effective measured field strength (RMS) specified for the standard radiation pattern, or less than that specified in Sec. 73.189(b) for the class of station involved, whichever is the higher value, and that the measured field strength at 1 km in any direction does not exceed the field shown in that direction on the standard radiation pattern for that mode of directional operation:

(1) A tabulation of inverse field strengths in the horizontal plane at 1 km, as determined from field strength

measurements taken and analyzed in accordance with Sec. 73.186, and a statement of the effective measured field strength (RMS). Measurements shall be made in the following directions:

- (i) Those specified in the instrument of authorization.
  - (ii) In major lobes. Generally, one radial is sufficient to establish a major lobe; however, additional radials may be required.
  - (iii) Along additional radials to establish the shape of the pattern. In the case of a relatively simple directional antenna pattern, a total of six radials is sufficient. If two radials would be more than 90° apart, then an additional radial must be specified within that arc. When more complicated patterns are involved, that is, patterns having several or sharp lobes or nulls, measurements shall be taken along as many as 12 radials to definitely establish the pattern(s). Pattern symmetry may be assumed for complex patterns which might otherwise require measurements on more than 12 radials.
- (2) A tabulation of:
- (i) The phase difference of the current in each other element with respect to the reference element, and whether the current leads (+) or lags (-) the current in the reference element, as indicated by the station's antenna monitor.
  - (ii) The ratio of the amplitude of the radio frequency current in each other element to the current in the reference element, as indicated on the station's antenna monitor.
- (3) The actual field strength measured at each monitoring point established in the various directions for which a limiting field was specified in the instrument of authorization together with an accurate and detailed description of each monitoring point together with ordinary snapshots, clear and sharp, taken with the field strength meter in its measuring position and with the camera so located that its field of view takes in as many pertinent landmarks as possible.

\*\*\*\*\*

Section 73.152 is amended to read as follows:

§ 73.152 Modification of directional antenna data.

- (a) If, after construction and final adjustment of a directional antenna, a measured inverse distance field in any direction exceeds the field shown on the standard radiation pattern for the pertinent mode of directional operation, an application shall be filed, specifying a modified standard radiation pattern and/or such changes as may be required in operating parameters so that all measured effective fields will be contained within the modified standard radiation pattern. Permittees may also file an application specifying a modified standard radiation pattern, even when measured radiation has not exceeded the standard pattern, in order to allow additional tolerance for monitoring point limits.
- (b) If, following a partial proof of performance, a licensee discovers that radiation exceeds the standard pattern on one or more radials because of circumstances beyond the licensee's control, a modified standard pattern may be requested. The licensee shall submit, concurrently, Forms 301-AM and 302-AM. Form 301-AM shall include an exhibit demonstrating that no interference would result from the augmentation. Form 302-AM shall include the results of the partial proof, along with full directional and nondirectional measurements on the radial(s) to be augmented, including close-in points and a determination of the inverse distance field accordance with §73.186.
- (c) Normally, a modified standard pattern is not acceptable at the initial construction permit stage, before a proof-of-performance has been completed. However, in certain cases, where it can be shown that modification is necessary, a modified standard pattern will be acceptable at the initial construction permit stage. Following is a non-inclusive list of items to be considered in determining whether a modification is acceptable at the initial construction permit stage:
  - (1) When the proposed pattern is essentially the same as an existing pattern at the same antenna site.

(e.g., A DA-D station proposing to become a DA-1 station.)

(2) Excessive reradiating structures, which should be shown on a plat of the antenna site and surrounding area.

(3) Other environmental factors; they should be fully described.

(4) Judgment and experience of the engineer preparing the engineering portion of the application. This must be supported with a full discussion of the pertinent factors.

(d) The following general principles shall govern the situations in paragraphs (a), (b) and (c) in this section:

(1) Where a measured field in any direction will exceed the authorized standard pattern, the license application may specify the level at which the input power to the antenna shall be limited to maintain the measured field at a value not in excess of that shown on the standard pattern, and shall specify the common point current corresponding to this power level. This value of common point current will be specified on the license for that station.

(2) Where any excessive field does not result in objectionable interference to another station, a modification of construction permit application may be submitted with a modified standard pattern encompassing all augmented fields. The modified standard pattern shall supersede the previously submitted standard radiation pattern for that station in the pertinent mode of directional operation. Following are the possible methods of creating a modified standard pattern:

\*\*\*\*\*

(d)(2)(iii) A combination of paragraphs (d)(2) (i) and (ii), of this section, with (i) being applied before (ii) is applied.

(iv) Where augmentation is allowable under the terms of this section, the requested amount of augmentation shall be centered upon the measured radial and shall not exceed the following:

(A) The actual measured inverse distance field value, where the radial does not involve a required monitoring point.

(B) 120% of the actual measured inverse field value, where the radial has a monitoring point required by the instrument of authorization.

\*\*\*\*\*

(e) Sample calculations for a modified standard pattern follow. First, assume the existing standard pattern in Sec. 73.150(c). Then, assume the following augmentation parameters:

\*\*\*\*\*

Section 73.154 is amended to read as follows:

§ 73.154 AM directional antenna partial proof of performance measurements.

(a) A partial proof of performance consists of at least 8 field strength measurements made on each of the radials which include a monitoring point. If the directional pattern has fewer than 4 monitored radials, the partial proof should include measurements on those radials from the latest complete proof of performance which are adjacent to the monitored radials.

(b) The measurements are to be made within 3 to 16 kilometers from the center of the antenna array. When a monitoring point as designated on the station authorization lies on a particular radial, one of the radial measurements must be made at that point. One of the following methods shall be used for the partial proof:

(1) Measurement points shall be selected from the points measured in latest full proof of performance provided that the points can be identified with reasonable certainty, and that land development or other

factors have not significantly altered propagation characteristics since the last full proof. At each point, the licensee shall measure directional field strength for comparison to either the directional or the nondirectional field strength measured at that point in the last full proof.

(2) In the event that a meaningful comparison to full proof measurements cannot be made, the licensee shall measure both directional and nondirectional field strength at eight points on each radial. The points need not be limited to those measured in the last full proof of performance.

(c) The results of the measurements are to be analyzed as follows. Either the arithmetic average or the logarithmic average of the ratios of the field strength at each measurement point to the corresponding field strength in the most recent complete proof of performance shall be used to establish the inverse distance fields. (The logarithmic average for each radial is the antilogarithm of the mean of the logarithms of the ratios of field strength (new to old) for each measurement location along a given radial). When new nondirectional measurements are used as the reference, as described in paragraph (b)(2) of this section, either the arithmetic or logarithmic averages of directional to nondirectional field strength on each radial shall be used in conjunction with the measured nondirectional field from the last proof to establish the inverse distance field.

(d) The result of the most recent partial proof of performance measurements and analysis is to be retained in the station records available to the FCC upon request. Maps showing new measurement points, i. e., points not measured in the last full proof, shall be associated with the partial proof in the station's records, and shall be provided to the FCC upon request.

Section 73.158 is amended to read as follows:

§73.158 Directional antenna monitoring points.

(a) When a licensee of a station using a directional antenna system finds that a field monitoring point, as specified on the station authorization, is no longer accessible for use or is unsuitable because of nearby construction or other disturbances to the measured field, an application to change the monitoring point location, including FCC Form 302-AM, is to be promptly submitted to the FCC in Washington, DC.

(1) If the monitoring point has become inaccessible or otherwise unsuitable, but there has been no significant construction or other change in the vicinity of the monitoring point which may affect field strength readings, the licensee shall select a new monitoring point from the points measured in the last full proof of performance. A recent field strength measurement at the new monitoring point shall also be provided.

(2) Alternatively, if changes in the electromagnetic environment have affected field strength readings at the monitoring point, the licensee shall submit the results of a partial proof of performance, analyzed in accordance with §73.154, on the affected radial.

(3) The licensee shall submit an accurate, written description of the new monitoring point in relation to nearby permanent landmarks.

(4) The licensee shall submit a photograph showing the new monitoring point in relation to nearby permanent landmarks that can be used in locating the point accurately at all times throughout the year. Do not use seasonal or temporary features in either the written descriptions or photographs as landmarks for locating field points.

(b) When the description of the monitoring point as shown on the station license is no longer correct due to road or building construction or other changes, the licensee must prepare and file with the FCC, in Washington, DC, a request for a corrected station license showing the new monitoring point description. The request shall include the information specified in paragraphs (a) (3) and (4) of this section, and a copy of the station's current license. A copy of the description is to be posted with the existing station license.

Section 73.186 is amended by revising subsections (a)(1) and (b) to read as follows:

§ 73.186 Establishment of effective field at one kilometer.

\*\*\*\*\*

(a)(1) Beginning as near to the antenna as possible without including the induction field and to provide for the fact that a broadcast antenna is not a point source of radiation (not less than one wave length or 5 times the vertical height in the case of a single element, i.e., nondirectional antenna or 10 times the spacing between the elements of a directional antenna), measurements shall be made on six or more radials, at intervals of approximately 0.2 kilometer up to 3 kilometers from the antenna, at intervals of approximately one kilometer from 3 kilometers to 5 kilometers from the antenna, at intervals of approximately 2 kilometers from 5 kilometers to 15 kilometers from the antenna, and a few additional measurements if needed at greater distances from the antenna. Where the antenna is rurally located and unobstructed measurements can be made, there shall be at least 15 measurements on each radial. These shall include at least 7 measurements within 3 kilometers of the antenna. However, where the antenna is located in a city where unobstructed measurements are difficult to make, measurements shall be made on each radial at as many unobstructed locations as possible, even though the intervals are considerably less than stated above, particularly within 3 kilometers of the antenna. In cases where it is not possible to obtain accurate measurements at the closer distances (even out to 8 or 10 kilometers due to the character of the intervening terrain), the measurements at greater distances should be made at closer intervals.

\*\*\*\*\*

(b) Complete data taken in conjunction with the field strength measurements shall be submitted to the Commission in affidavit form including the following:

- (1) Tabulation by number of each point of measurement to agree with the maps required in paragraph (c) of this section, the date and time of each measurement, the field strength (E), the distance from the antenna (D) and the product of the field strength and distance (ED) (if data for each radial are plotted on semilogarithmic paper, see above) for each point of measurement.
  - (2) Description of method used to take field strength measurements.
  - (3) The family of theoretical curves used in determining the curve for each radial properly identified by conductivity and dielectric constants.
  - (4) The curves drawn for each radial and the field strength pattern.
  - (5) The antenna resistance at the operating frequency.
  - (6) Antenna current or currents maintained during field strength measurements.
- (c) Maps showing each measurement point numbered to agree with the required tabulation shall be retained in the station records and shall be available to the FCC upon request.

Section 73.3538 is amended by deleting subsection (b)(1) and renumbering the subsequent sections, as follows:

\*\*\*\*\*

§ 73.3538 Application to make changes in an existing station.

(b) An informal application filed in accordance with Sec. 73.3511 is to be used to obtain authority to make the following changes in the station authorization:

- (1) To modify or discontinue the obstruction marking or lighting of the antenna supporting structure where that specified on the station authorization either differs from that specified in FCC Rules, part 17, or is not appropriate for other reasons.



(2) Relocation of a main studio outside the principal community contour may require the filing and approval of a letter request for authority to make this change prior to implementation. See Sec. 73.1125.