PUBLIC NOTICE

Federal Communications Commission
445 12th St., S.W.
Washington, D.C. 20554

News Media Information 202 / 418-0500
Internet: http://www.fcc.gov
TTY: 1-888-835-5322

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MEDIA BUREAU CLARIFIES PROCEDURES FOR AM DIRECTIONAL ANTENNA PERFORMANCE VERIFICATION USING MOMENT METHOD MODELING

On September 26, 2008, the Commission released a *Second Report and Order* in MM Docket 93-177 amending its Rules (Rules) to permit the use of computer modeling techniques, known as moment method modeling, to verify that AM directional antennas perform as authorized.[1] The new Rules, which set forth the requirements for a moment method proof of performance, are optional for eligible AM stations.[2]

The Media Bureau has received numerous questions concerning the new procedures. To assist future applicants, the Media Bureau has prepared this *Public Notice* to answer the most common questions. The following information is intended to provide general guidance reflecting the staff's initial interpretation of the new Rules. It is not intended to establish binding precedent. The staff will make specific rulings in response to actual applications on a case-by-case basis.

Types of antenna systems eligible for moment method proofs

The Rules permit use of moment method modeling only for directional antenna arrays consisting of series-fed radiators. Directional antennas with top-loaded elements are eligible for moment method modeling , provided the towers are fed in series. Folded unipoles and sectionalized antennas are ineligible. In addition, directional antennas using the new proof techniques must have standard ground systems, as defined in Section 73.189(b)(4) of the Commission's Rules. The record supporting the new Rules does not include any discussion of the suitability of moment method techniques for directional antennas with non-standard ground systems, such as ground systems consisting of short, elevated radials. We will therefore require that directional antennas with non-standard ground systems continue to use the proof of performance Rules based on field strength measurements.

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[1] *An Inquiry Into the Commission's Policies and Rules Regarding AM Radio Service Directional Antenna Performance Verification*, Second Report and Order, 23 FCC Rcd 14267 (2008) ("*Second Report and Order*").

[2] *See* 47 C.F.R. § 73.151 *et seq*.

Tower location tolerance

The new Rules require a post-construction surveyor's certification to verify that the towers in a directional array have the proper spacing and orientation. Because some variability in tower location is normal, we will allow a tolerance of 1.5 electrical degrees for the location of each tower in a directional array.[3] This tolerance follows the recommendation of an informal committee of members of the Association of Federal Communications Consulting Engineers (AFCCE). The AFCCE's committee concluded that the recommended tolerance would allow reasonable flexibility without significantly increasing the potential for interference. The "as built" location of each tower shall be determined with respect to a reference tower. The same reference tower shall be used to describe the location of each of the other towers in the array. The tolerance is represented as a circle with a radius of 1.5 electrical degrees at the AM station's frequency around each tower location, as specified on the construction permit. In cases where the "as built" location differs from the authorized location by more than 1.5 electrical degrees, applicants may submit, concurrently with the license application, a construction permit application, FCC Form 301-AM, to change spacing and orientation, and theoretical operating parameters as necessary, provided that no interference would result.

Exemption of formerly licensed facilities from survey requirement

We will exempt licensed stations applying to be re-licensed under the new Rules from the requirement to submit a surveyor's certification, provided there is no change in the authorized theoretical pattern or patterns.

Accounting for base region effects when base sampling is used

The Rules require applicants to measure the impedance of each tower in the array with other towers short- or open-circuited. The impedance values predicted by the moment method software must agree, within specified limits, with the measured impedance values. In order to account for lead inductance, base capacitance, and shunt elements such as isolation coils, the Rules permit the incorporation of actual and assumed circuit elements between the tower base and the antenna tuning unit, where measurements are typically performed. When base circuit elements are used in comparing measured and calculated impedances, the model may be considered to have two parts: the moment method model and the circuit model. Stations using base current (or voltage) sampling must take into account both the moment method model and the circuit model when calculating operating parameters.

Agreement between calculated and measured tower base impedances

According to Section 73.151(c)(2)(ii), modeled tower impedances must agree with measured values within +/- 2 ohms and +/- 4 percent for resistance and reactance. The following example shows the calculation of the permissible tolerance for a measured base impedance of 20 – j32 ohms:

> The tolerance for the resistance term is (2 + 0.04 x 20), or 2.80 ohms. Calculated base resistance must therefore be within +/- 2.80 ohms of 20 ohms.
>
> The tolerance for the reactance term is (2 + 0.04 x 32), or 3.28 ohms. Calculated base reactance must therefore be within +/- 3.28 ohms of –j32.

[3] A tolerance of 1.5 electrical degrees equals 2.3 meters at the lowest AM frequency and 0.7 meter at the highest AM frequency.

Requirement to measure impedance of sampling line with sampling device connected

The matrix of measurements described in Section 73.151(c)(2)(i) includes a requirement for impedance measurements of the sampling line at or near carrier frequency "*with the sampling device connected*" (emphasis added). Some applicants have failed to submit this measurement. This particular impedance measurement is used as a baseline for the periodic re-certification measurements set forth in Section 73.155.

As part of the re-certification measurements, Section 73.155(a)(3) requires licensees using sampling loops to repeat the impedance measurements of the sampling line with the loop connected, as noted in the preceding paragraph. This section stipulates that the frequencies measured must be the same as those used in the most recent proof, and also that the measured resistance and reactance must agree within +/- 2 ohms and +/- 4 percent of the proof values. These same provisions will apply for applicants using base sampling devices.

Determination of licensed parameters vs. operating tolerances

Regarding the proper adjustment of the antenna array, Section 73.151(c)(2)(ii) states: "The antenna monitor sample indications must be initially adjusted to agree with the moment method model within +/- 5 percent for the field ratio and +/- 3 degrees in phase." Some applicants have misinterpreted this statement to mean that any set of operating parameters within the specified tolerance of the moment method-determined parameters may appear in Section III, FCC 302-AM. Applicants should specify the same antenna monitor parameters that were determined by the moment method, as modified to account for any base region effects. The tolerance of +/-5 percent and +/-3 degrees cited above is simply the standard operating tolerance for an AM directional antenna, as set forth in Section 73.62. Applicants may not apply this tolerance twice, once in selecting parameters to appear on the license and again when comparing a set of operating parameters to the licensed values.

Modeled antenna height

The moment method Rules allow variation of the physical dimensions used in the model within specified percentages of the actual tower dimensions. According to Section 73.151(c)(1)(v), "For uniform cross-section towers represented by vertical wires, each wire used for a given tower shall be between 75 to 125 percent of the physical length represented." The same adjustment may be used for the overall height of towers represented by more complex models.

Antenna monitor calibration

A moment method proof should include a certificate or statement of calibration verifying that the antenna monitor is properly calibrated according to the manufacturer's specifications, as Section 73.69(e) requires.

Filing fees and procedures

A directional AM station may opt to file a moment method proof to cover new facilities authorized by a construction permit, or as support for a new license without monitoring points. In either case, commercial licensees must pay both the new license fee and the directional antenna fee.[4] The fees

[4] *See* 47 C.F.R. §§ 1.1104(2)(d) and (e).

are assessed because a moment method proof requires the same scope of work, regardless of whether it is performed to cover newly constructed facilities or to issue a new license for an existing operation.[5] Stations filing a moment method proof for either purpose should indicate, on Section III of FCC 302-AM, that the purpose of the application is "Station License." If possible, licensees should indicate on the form that a moment method proof is being submitted. All moment method proofs will receive a file number with the prefix "BMML."

Licensees wishing to convert to operation authorized by a moment method proof shall request and receive Special Temporary Authority to operate with antenna monitor parameters determined by the moment method before readjusting the array to the new operating parameters.

For further information, contact Ann Gallagher or Susan Crawford, Audio Division, Media Bureau, (202) 418-2700.

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[5] The informal guidance published in "Application Fee Filing Guide for Media Bureau," available at the Commission's website (http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-290290A3.pdf), will be updated to reflect the fee requirements for moment method proofs.