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

BC
28768

In the Matter of)
)
Editorial Correction of §73.150(b)(1)(i))
in the Code of Federal Regulations)
)

ORDER

Adopted: January 13, 1981 Released: January 22, 1981

By the Chief, Broadcast Bureau

1. The Commission adopted amendments to Section 73.150(b)(1)(i) of its Rules and Regulations in the Report and Order in Docket No. 20645, 60 FCC 2d 927, 37 RR 2d 649 (1976). The amendments were subsequently published in the Federal Register and eventually incorporated in the Code of Federal Regulations, 47 CFR §73.150(b)(1)(i).

2. In the transition from the Commission's Report and Order to the Code of Federal Regulations, the labeling of the formulas as "Eq. 1", "Eq. 2", etc., was dropped. The labeling of these formulas is important because the Rules proposed in the Notice of Proposed Rulemaking in Docket No. 21473, 45 FR 63516 (released September 26, 1980), make reference to the formulas via the omitted labeling. Accordingly, we are amending the Rules to have them read as originally adopted by the Commission.

3. In our work on this matter, we have also noted an error in the Code of Federal Regulations concerning the definition of $E(\phi,0)_{std}$ immediately after Eq. 3, in which a "Σ" was used instead of "E". This error in the Code of Federal Regulations will be corrected as well.

4. Since these errors do not appear in Volume III of the FCC Rules and Regulations, published by the Government Printing Office, there will be no transmittal sheets as a result of these corrections.

5. Therefore, IT IS ORDERED that, pursuant to Sections 4(i), 303(r), and 5(d)(1) of the Communications Act of 1934, as amended, and Section 0.281 of the Commission's Rules, Part 73 of the Commission's Rules and Regulations IS AMENDED as set forth in the attached Appendix, effective February 6, 1981.

6. For further information concerning this Order, contact John Boursy, Broadcast Bureau, (202) 632-6485.

FEDERAL COMMUNICATIONS COMMISSION

Richard J. Shiben
Chief, Broadcast Bureau

Attachment: Appendix

APPENDIX

Section 73.150(b)(1)(i) is corrected to read as follows:

(i) The standard radiation pattern shall be based on the theoretical radiation pattern. The theoretical radiation pattern shall be calculated in accordance with the following mathematical expression:

$$E(\phi, \theta)_{th} = \left| k \sum_{i=1}^{n} F_i f_i(\theta) \frac{/S_i \cos \theta \cos (\phi_i - \phi) + \psi_i}{} \right| \quad \text{(Eq. 1)}$$

where:

$E(\phi,\theta)_{th}$ represents the theoretical inverse distance fields at one mile for the given azimuth and elevation.

k represents the multiplying constant which determines the basic pattern size. It shall be chosen so that the effective field (RMS) of the theoretical pattern in the horizontal plane shall be no greater than the value computed on the assumption that nominal station power (see § 73.14(c)) is delivered to the directional array, and that a lumped loss resistance of one ohm exists at the current loop of each element of the array, or at the base of each element of electrical height lower than 0.25 wavelength, and no less than the value required by § 73.189 (b)(2) of this Part for a station of the class and nominal power for which the pattern is designed.

n represents the number of elements (towers) in the directional array.

i represents the i^{th} element in the array.

F_i represents the field ratio of the i^{th} element in the array.

θ represents the vertical elevation angle measured from the horizontal plane.

$f_i(\theta)$ represents the vertical plan distribution factor of the i^{th} antenna.

For a typical vertical antenna with a sinusoidal current distribution:

$$f(\theta) = \frac{\cos (G \sin \theta) - \cos G}{(1 - \cos G) \cos \theta} \quad \text{(Eq. 2)}$$

where G is the electrical height of the tower.

See also Section 73.190, Figure 5.

S_i represents the electrical spacing of the i^{th} tower from the reference point.

ϕ_i represents the orientation (with respect to true north) of the i^{th} tower.

ϕ represents the azimuth (with respect to true north).

ψ_i represents the electrical phase angle of the current in the i^{th} tower.

The standard radiation pattern shall be constructed in accordance with the following mathematical expression:

$$E(\phi, \theta)_{std} = 1.05 \sqrt{[E(\phi, \theta)_{th}]^2 + Q^2} \quad \text{(Eq. 3)}$$

where:

$E(\phi, \theta)_{std}$ represents the inverse fields at one mile which are deemed to be produced by the directional antenna in the horizontal and vertical planes.

$E(\phi, \theta)_{th}$ represents the theoretical inverse distance fields at one mile as computed in accordance with Eq. 1, above.

Q is the greater of the following quantities:

$$0.025\, g(\theta) E_{rss}$$

or

$$6.0\, g(\theta) \sqrt{P_{kw}}$$

where:

$g(\theta)$ is the vertical plane distribution factor, $f(\theta)$, for the shortest element in the array (see Eq. 2, above; also see Section 73.190, Figure 5). If the shortest element has an electrical height in excess of 0.5 wavelength, $g(\theta)$ shall be computed as follows:

$$g(\theta) = \frac{\sqrt{[f(\theta)]^2 + 0.0625}}{1.030776} \quad \text{(Eq. 4)}$$

E_{rss} is the root sum square of the amplitudes of the inverse fields of the elements of the array in the horizontal plane, as used in the expression for $E(\phi, \theta)_{th}$ (see Eq. 1, above), and is computed as follows:

$$E_{rss} = k \sqrt{\sum_{i=1}^{n} F_i^2} \quad \text{(Eq. 5)}$$

P_{kw} is the nominal station power, expressed in kilowatts; see § 73.14(c). If the nominal power is less than one kilowatt, $P_{kw} = 1$.