PUBLIC NOTICE

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CONSTANTS FOR DIRECTIONAL ANTENNA COMPUTER PROGRAMS

Notice is hereby given that the Commission is now using the following constants in its computer programs for calculating radiation, RMS, etc., for standard broadcast directional antennas:

metric:

C1	152.15158 mV/m for 1 kW	244.864234
C2	37.256479 mV/m for 1 ampere	59.9584 9094

The calculation of the performance of directional antennas in the standard broadcast band is usually performed by computer. Until recently, small differences in the calculations by different computer programs were usually negligible. But now, with an existing rule requirement that a one ohm loss resistance normally be assumed for each element (§73.150(b)(1)(i)), small variations in programs may yield significant differences in the computed results. This suggests the desirability of standardizing the value of the constants used in all computer programs.

Attached hereto, is a derivation of these two important constants used in the FCC's standard broadcast radiation computer programs. This derivation is based upon the latest determination of the speed of light by the National Bureau of Standards and is accurate to about one meter per second. The new figure for the speed of light does not change the constants appreciably, but the Commission is now specifying these constants to eight significant figures, and for the sake of uniformity suggests that computer programs used for preparing applications to be considered by the Commission use these same constants.

Attachment

ATTACHMENT

DERIVATION OF CONSTANTS USED IN COMPUTER PROGRAMS FOR STANDARD BROADCAST DIRECTIONAL ANTENNA CALCULATIONS

c = Velocity of Light in a Vacuum, 2.99792456 x 10^8 Meters/Second*

Uo = Permeability of free space, 4 Pi x 10^{-7} Henries/Meter**

r = Distance, 1 mile (1609.344 Meters)

Pi = 3.141592654

Pr = Radiated power in kilowatts

G = Antenna Height

Rc = Resistivity of free space in ohms. Rc = (Uo)(c) = 376.73031 ohms

E = Field strength in millivolts per meter

Cl = The constant that relates the inverse distance field strength at one mile in millivolts per meter to the square root of the power in kilowatts into a standard hemispherical radiator. (A standard hemispherical radiator is one that radiates power uniformly in all directions over a hemisphere)

$$E = \left[\frac{2(Rc)(10^3 Pr)}{4(Pi)(r^2)}\right]^{1/2} \times 10^3 \text{ millivolts per meter}$$

$$E = (Cl) \times (Pr)^{1/2}$$

$$Cl = \left[\frac{2(Rc)(10^3)}{4(Pi)(r^2)}\right]^{1/2} \times 10^3$$

Cl = 152.15158 millivolts per meter for 1 kW (to 8 significant figures)

Cl (metric) = 244.86423 mV/m/km/kW.

* Most recent figure from the National Bureau of Standards for the velocity of light.

** By definition.

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C2 = The constant that relates the RMS inverse distance field strength at one mile in the horizontal plane in millivolts per meter to the loop current in amperes in a vertical radiator of height G.

$$E = \frac{(Rc) \times 10^3}{2(Pi)(r)} I(1 - \text{Cos } G)$$

$$E = (C2)\, I(1 - \text{Cos } G)$$

C2 = 37.256479 millivolts per meter for 1 ampere (to 8 significant figures)

metric C2 = 59.95849094