TELECOMMUNICATIONS ENGINEERING

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FORMULA FOR CALCULATING DISTANCE TO A SPECIFIC FIELD STRENGTH CONTOUR
FREE SPACE METHODOLOGY

Where:
Ed = Field strength in dBμ
E = Field Strength in Volts/meter
P = Power in Watts
D = Distance to contour in meters

$$E = \frac{10^{\left(\frac{Ed}{20}\right)}}{10^6}$$

$$D = \frac{7.01\sqrt{P}}{E}$$

Derivation

Assuming equal radiation in all directions, the power density, Pd, in watts/meter squared, at the surface of a sphere of radius D from the radiator is:

$$Pd = \frac{P}{4\Pi D^2}$$

This is simply the total power transmitted divided by the surface area of the sphere.

The power density and free space electric field strength, E, in volts/meter are related by the following formula:

$$Pd = \frac{E^2}{120\Pi}$$

where 120 π is the so called impedance of free space.

Solving for E:

$$E = \sqrt{120\Pi Pd}$$

Substituting for Pd and combining constants:

$$E = \frac{\sqrt{30P}}{D}$$

Referencing P to a half wave dipole:

$$E = \frac{\sqrt{(30 \bullet 1.64)P}}{D}$$

Combining constants and taking them outside of the radical and solving for D:

$$D = \frac{7.01\sqrt{P}}{E}$$