

FCC Cellular Geographic Service Area (CGSA) Formula

This formula approximates this distance to the 32-dB μ contour predicted by Carey.

$$d = 1.05 * H^{0.34} * P^{0.17}$$

where d is the distance from the cell site antenna to the reliable service area boundary in miles

H is the antenna height above average terrain in feet

P is the effective radiated power (ERP) in watts

dBm vs. dB μ

The conversion formula for these 2 units is as follows:

$$\text{dBm} = \text{dB}\mu\text{V/m} - 20\log(f) - 77.21$$

where f is the frequency in MHz.

therefore

$$\text{dB}\mu\text{V/m} = \text{dBm} + 20\log(f) + 77.21$$

32dB μ V/m contour was a "relaxed" version from that of **39 dB μ V/m** contour for cellular. These figures were derived from Carey contour for link-balance (for 2-way system) or forward link only (paging/broadcast) in early measurement by Carey. Actually, Carey only measured in a number of frequencies, and others (non-specific to his actual measurement) were interpolated.

For cellular system, FCC used to stipulate that -97 dBm (39 dB μ V/m) is appropriate to have good reception/transmission, and then later relaxed to -104 dBm (32 dB μ V/m).

The **43 dB μ V/m** was used for a PCS system to have -100 dBm (or 43 dB μ V/m) balanced signal.

In general the higher the value in dB μ V/m, the stronger the signal required to be received (as well as transmitted) at the same frequency, as denoted in the formula.