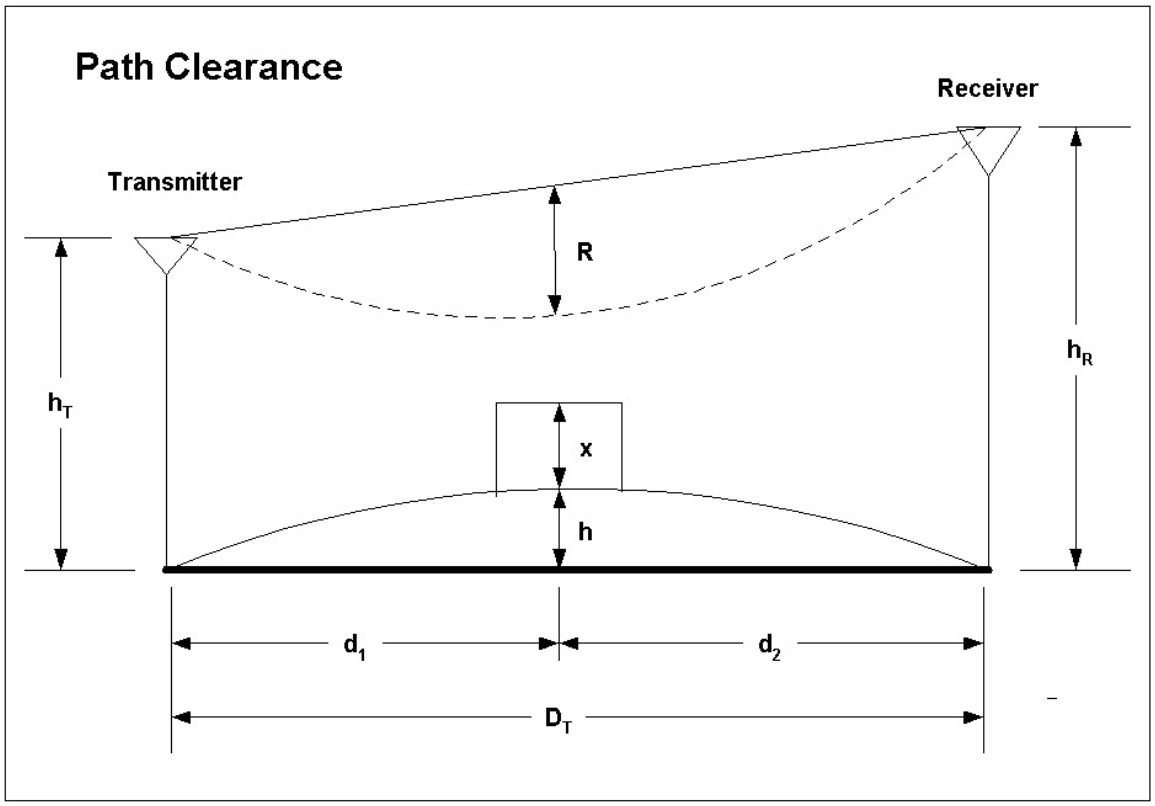
Path Clearance



Earth Curvature

$$h = d_1 * d_2 / 1.5 * K$$

where h is the earth curvature in feet
d_1 is the distance from first antenna, in miles
d_2 is the distance from second antenna, in miles
K = 4/3

Therefore,

$$h = d_1 * d_2 / 2$$

First Fresnel Zone

$$R = 72 ((d_1 * d_2) / D_T * f)^{1/2}$$

where R is the first Fresnel zone in ft
D_T is the total path length in miles
f is the frequency in GHz

Reflection Point

The formula for calculating the position of the reflection point on a path is;

For K = 4/3 $h_T / d_1 – d_1 / 2 = h_R * d_2 - d_2 / 2$
For K = 2/3 $h_T / d_1 – d_1 = h_R * d_2 - d_2$
For K = infinity $d_1 = D_T * h_T / (h_T + h_R)$

where h_T and h_R are the transmitter and receiver heights in feet
d_1, d_2 and D_T are distances in miles
infinity is for worst-case flat Earth propagation conditions

Fading Outages and Availability

The formula for calculating the Unavailability, U, of a path (due to multi-path fading) is;

$$U = a * b * 2.5 * 10^{-6} * f * D3 * 10^{-F/10}$$

where a is Climate (0.1 to 0.5)
b is terrain (0.25 to 4)
f is Frequency in GHz
D is Path length in Miles
F is Fade margin in dB

The formula for calculating the availability, A, of a path is;

$$A = (1-U) * 100\%$$

where U is Unavailability of a path