RF Communications Division
150 Apollo Drive
Chelmsford, MA 01824-3696

MPE Calculation

The Limit for **Uncontrolled Exposure Power Density** ($\mathbf{P_d}$) is 10 W/m^2 for fixed mounted device.

The Harris 4.9 GHz 802.16 5/10 VBB Client is a fixed mounted radio. After installation and commissioning, the safe distance from the 9 dBi omni-directional antenna is greater than 30 cm (12-inches).

The Harris 4.9 GHz 802.16 5/10 VBB Client is a fixed mounted radio. After installation and commissioning, the safe distance from a 27 dBi directional antenna is greater than 1.78 m (5.84 ft.).

MPE calculation for omni-directional antenna

This MPE Minimum Distance Calculation is based on using a 9 dBi gain omni-directional antenna mounted directly to the Client RF port.

Basic HARRIS 4.9 GHz Client specifications:

P: Maximum Peak Conducted Power = 30 dBm

G: Maximum Omni Antenna Gain = 9 dBi

Frequency Range = 4.94 to 4.99 GHz

R: Minimum Distance between User and Antenna = 0.3 m

Equation from FCC:

$P_d = P * G / (4 * \pi * R^2)$

$P_d = 1.0 \text{ W} * 7.94 / (4 * 3.1415926 * 0.3^2) = 7.02 \text{ W} / \text{m}^2 < 10 \text{ W} / \text{m}^2$

The calculation indicates that the minimum 0.3 meter distance between user and the omni-directional antenna (directly mounted to the Client RF port) is required when operating the Harris 4.9 GHz 802.16 5/10 VBB Client.

The Harris 4.9 GHz 802.16 5/10 VBB Client is a fixed mounted radio. After installation and commissioning, the safe distance from a 27 dBi directional antenna is greater than 1.78 m (5.84 ft.) assuming

MPE Calculation for Directional Antenna

This MPE Minimum Distance Calculation is based on using a directional antenna with more than 9 dBi antenna gain.

Basic Harris 4.9 GHz 802.16 5/10 VBB Client specifications:

P: Maximum Peak Conducted Power = 30 dBm;

G: Maximum Antenna Gain – Cable Loss = 27 dBi – 1 dB = 26 dBi; (Use numerical G_N value for the calculation): $G_N = 10 \text{ ^ } (G /10))$; For G = 26 dBi, $G_N = 10 \text{ ^ } (26 /10) = 398$

Frequency Range = 4.94 to 4.99 GHz;

R_{min}: Minimum Distance between user and antenna to comply with FCC MPE Level (10 W / m^2);

Equation from FCC:

$P_d = P * G / (4 * \pi * R_{min}^2)$

$R_{min} = SQRT(1 W * G_N / (4 * 3.1415926 * 10 W/m^2))$

$R_{min} = 1.78$ m, for G =26 (i.e., $G_N = 398$)

The calculation indicates that the minimum safe distance for a user is 1.78 meters when operating the Harris 4.9 GHz 802.16 5/10 VBB Client with a directional antenna of 27dBi. High gain antennas are connected to the Client RF port through a feeder cable and the above calculation applies a cable loss of 1dB.

The following table lists fixed installation's minimum distance for different Effective Antenna System Gain Levels (Antenna Gain – Feeder Cable Loss). In all cases, the minimum safe distance defined in Table 1-1 (Client Stations), or 0.3 meters (12 inches), whichever is greater, is the recommended minimum safe distance for fixed installations.

Table 1-1: MPE Minimum Distance Calculation for Fixed Client Installations Using High Gain Antennas

Effective Antenna Gain (dBi)	Fixed Clients (1 Watt)	
	Minimum Safe Distance (Meters)	Minimum Safe Distance (Feet)
<10	0.30	0.98
11	0.32	1.04
12	0.36	1.17
13	0.40	1.31
14	0.45	1.47
15	0.50	1.65
16	0.56	1.85
17	0.63	2.07
18	0.71	2.32
19	0.80	2.61
20	0.89	2.93
21	1.00	3.28
22	1.12	3.68
23	1.26	4.13
24	1.41	4.64
25	1.59	5.20
26	1.78	5.84
>26	Reduce Transmitter Power as required by FCC	