Maximum Permissible Exposure (MPE) Calculations

15.247: U-NII devices are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ``general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Given

 $E=\sqrt{(30^{*}P^{*}G)/d}$ and $S=E^{2}/3770$

where

E=Field Strength in Volts/meter P=Power in Watts G=Numeric Antenna Gain d=Distance in meters S=Power Density in mW/cm²

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

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d=√((30*P*G)/(3770*S))
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Changing to units of power in mW and distance in cm, using:

P(mW)=P(W)/1000 d(cm)=100*d(m)

yields

d=100*√((30*(P/1000)*G)/(3770*S)) d=0.282*√(P*G/S)

where

d=Distance in cm P=Power in mW G=Numeric Antenna Gain S=Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using: P(mW)=10^(P(dBm)/10) G(numeric)=10^(G(dBi)/10)

yields

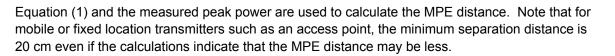
and

d=0.282*10^((P+G)/20)/ \sqrt{S} Equation (1) s=((0.282*10^((P+G)/20))/d)^2 Equation (2)

where

d=MPE distance in cm P=Power in dBm G=Antenna Gain in dBi S=Power Density in mW/cm²

Page No: 130 of 132



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S=1mW/cm² maximum. The highest supported antenna gain is 6 dBi (12dBi with beam forming). Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

		Peak Power Transmit Antenna MPE					
Frequency (MHz)	Bit Rate (Mbps)		Power (dBm)	Gain (dBi)	Distance (cm)	Limit (cm)	Margin (cm)
5745	m0	1	23.0	10	12.60	20	7.40
5785	m0	1	23.0	10	12.60	20	7.40
5825	m0	1	23.0	10	12.60	20	7.40

MPE Calculations

To maintain compliance, installations will assure a separation distance of at least 20cm.

Using Equation 2, the MPE levels (s) at 20 cm are calculated as follows:

Frequency		MPE Distance	Power	Antenna Gain	Power Density	Limit	Margin
(MHz) 5745	(Mbps) 11	(cm) 20	(dBm) 23.0	(dBi) 10	(mW/cm^2) 0.40	(mW/cm^2) 1	(mW/cm^2) 0.60
5785	11	20	23.0	10	0.40	1	0.60
5825	11	20	23.0	10	0.40	1	0.60