

RF Exposure Evaluation – Maximum Permissible Exposure (MPE)

Introduction

This document attempts to prove the safety of radiation generated by RF devices to the human body. The limit for Maximum Permissible Exposure (MPE), specified in FCC 1.1210, is listed below. The power generated by this product is measured by a power meter. Through use of the Friis transmission formula and the maximum gain of the antenna, the distance from the product at which compliance with the MPE limit is achieved may be calculated. Alternatively, near field measurements may be performed to demonstrate compliance at a specific measurement distance.

Near field probe: Wandel & Goltermann EMR-300.

RF Exposure Limit

According to FCC 1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	...	...	f/300	6
1500-100,000	...	...	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

Table 1. Limits For Maximum Permissible Exposure (MPE)

Friis Transmission Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4\pi r^2)$

Where,

P_d = Power Density (mW/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna in linear scale

π = 3.1416

r = distance between observation point and center of the radiator (cm)

EUT Operating Condition

Software provided by the client enabled the EUT to transmit and receive data at lowest, middle, and highest channels individually.

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Climate Condition

The temperature and relative humidity: 22°C and 78% RH

Measurement Calculation Analysis

Frequency (MHz)	Channel	Power Output (mW)	Measurement Distance (cm)	Numeric Antenna Gain	Power Density (mW/cm ²)	Exposure Limit (mW/cm ²)
5180	36	10.94	20	1.0	0.0021764	1.0
5200	40	10.16	20	1.0	0.0020213	1.0
5220	44	10.74	20	1.0	0.0021367	1.0

Table 2. MPE Calculation Analysis Result

Note: Measurements are made while all transmitters are operating simultaneously.

Conclusion

The device meets the mobile 20cm separation distance as specified in Section 2.1091 of the FCC Rules. An appropriate RF exposure compliance statement will be placed in the user's manual.

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