

RF EXPOSURE REPORT

REPORT NO.: SA991008C05

MODEL NO.: ISB7005

FCC ID: MXF-S981116N

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: Gemtek Technology Co., Ltd.

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ISSUED BY: Bureau Veritas Consumer Products Services
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RF Exposure Measurement

1. Introduction

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Fully Anechoic Chamber (FAC) calibrated for antenna measurement in our lab, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

2. 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)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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				
300-1500	...	...	F/300	6
1500-100,000	...	...	5	6
(B)Limits For General Population / Uncontrolled Exposure				
300-1500	...	...	F/1500	30
1500-100,000	...	...	1.0	30

F = Frequency in MHz

3. Friis Formula

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

where

P_d = power density in mW/cm^2

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

$\pi = 3.1416$

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, $1 mW/cm^2$. If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the MPE value at distance 20cm.

Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition,
Page 640, Eq. (11-133).

4. EUT Operating condition

The software provided by Manufacturer enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

5. Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

6. TEST RESULTS

6.1 Antenna Gain

There are three antennas provided to this EUT, please refer to the following table:

Chain	Manufacture	Model	Antenna Gain (dBi)	Antenna Type	Connector	Remark
Chain (0) Antenna (1)	Airgain	M2450DLC	5	PCB	NA	-
Chain (1) Antenna (2)	Airgain	M5X05C	4	PIFA	NA	Rx only
Chain (2) Antenna (3)	Airgain	M2450DLCB	4	PCB	NA	-

6.2 Output Power Into Antenna & RF Exposure value at distance 20cm:

For 15.247(5GHz):

802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
149	5745	208.9	0.131	1.0
157	5785	213.8	0.135	1.0
165	5825	213.8	0.135	1.0

802.11n (20MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
149	5745	433.3	0.273	1.0
157	5785	433.3	0.273	1.0
165	5825	443.4	0.279	1.0

802.11n (40MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
151	5755	423.0	0.266	1.0
159	5795	423.4	0.266	1.0

For 15.407(5GHz):

802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
36	5180	13.8	0.009	1.0
40	5200	13.8	0.009	1.0
48	5240	14.1	0.009	1.0

802.11n (20MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
36	5180	29.6	0.019	1.0
40	5200	29.0	0.018	1.0
48	5240	31.0	0.020	1.0

802.11n (40MHz):

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
38	5190	26.7	0.017	1.0
46	5230	48.2	0.030	1.0

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