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Test Report for FCC & ISED

Report Number		ESTRGC2409-004		
Applicant	Company name	Suprema Inc		
	Address	17F-5, Parkview Office Tower, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea		
	Telephone	+82-031-710-2419		
	Contack person	Jae-Won Lee, Han-Chul Kim		
Product	Product name	BEW3-DB		
	Factory address	17F-5, Parkview Office Tower, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea		
	Model No.	BioEntry W3	Manufacturer	Suprema Inc
	Serial No.	NONE	Country of origin	KOREA
Test date	03-Sep-24 ~ 04-Sep-24		Date of issue	4-Sep-24
FCC ID			TKWBEW3-DB	
ISED ID			23080-BEW3DB	
Testing location		140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of Korea		
Standard		FCC 1.1307 and 1.1310, RSS-102		
MRA Registration number		FCC:659627 , ISED:4475A		
Tested by	Engineer Y.D. Kim	(Signature)		
Reviewed by	Engineering Manager K.I. Hong	(Signature)		
Abbreviation	OK, Pass = Passed, Fail = Failed, N/A = not applicable			

* Note

- This test report is not permitted to copy partly without our permission
- This test result is dependent on only equipment to be used
- This test report is not related to KOLAS accreditation
- Software version:V1.0.0
- Hardware version:V1.0.0

RF Exposure Measurement

1. Introduction

The maximum Gain measured in Fully Anechoic Chamber

Because this deivce is transmitting the high power signal, it is regarded specially as a dangerous band for its heating harmfulness to the human body. The manufacturer whose product is working in this frequency band is obligatory to prove the harmfulness of his product. 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 and RSS-210 Issue 5 is followed. The Gain of the antenna used in this product is measured in a Fully Anechoic Chamber (FAC), and 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.
IC Safety Code 6 (2018), RSS-102 Section 2.2.2: To ensure compliance with the basic restrictions outlined in Section 2.1, at frequencies between 10 MHz and 300 GHz, the reference levels for electric- and magnetic-field strength and power density must be complied with.

2. Classification

MODE: BT,NFC(HF), NFC(LF)

The antenna of the product, under normal use condition, is at least 20 cm away from the body of the user. Warning statement for keeping 20 cm separation distance and the prohibition of operating next to a person has been printed on the user's manual. So, this product is classified as the Mobile Device.

3. 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).
RSS-102 clause 2.5.2 Routine RF exposure evaluation exemption limit for transmitters operating at 20 MHz or lower frequencies is 1 W eirp

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE) - **Class A**

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Average Time (minutes)
0.3 - 3.0	614	1.63	*(100)	6
3.0 - 30	1842/f	4.89/f	*($900/f^2$)	6
30 - 300	61.4	0.163	1.0	6
300 - 1500			F/300	6
1500 - 100,000			5	6

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE) - **Class B**

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Average Time (minutes)
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*($180/f^2$)	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	-	-	F/1500	30
1500 - 100,000	-	-	1.0	30

F = Frequency in MHz * = Plane-wave equivalent power density

TABLE 4:RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field Strength (V/m)(RMS)	Magnetic Field Strength(A/m)(RMS)	Power Density (W/m^2)	Reference Period (minutes)
0.003 – 10^{21}	83	90	–	Instantaneous*
0.1–10	–	0.73/ ƒ	–	6**
1.1–10	87/ $ƒ^{0.5}$	–	–	6**
10 – 20	27.46	0.0728	2.0	6
20 – 48	58.07/ $ƒ^{0.25}$	0.1540/ $ƒ^{0.25}$	8.944/ $ƒ^{0.5}$	6
48 – 300	22.06	0.05852	1.291	6
300 – 6000	3.142 $ƒ^{0.3417}$	0.008335 $ƒ^{0.3417}$	0.02619$ƒ^{0.6834}$	6
6000 – 15000	61.4	0.613	10	6
15000 – 150000	61.4	0.613	10	616000/ $ƒ^{1.2}$
150000 – 300000	0.158 $ƒ^{0.5}$	4.21 x 10^{-4} $ƒ^{0.5}$	6.67 x 10^{-5} ƒ	616000/ $ƒ^{1.2}$

TABLE 6: Reference Levels for Electric Field Strength, Magnetic Field Strength and Power Density in Controlled Environments

Frequency Range (MHz)	Electric Field Strength (V/m)(RMS)	Magnetic Field Strength(A/m)	Power Density (W/m^2)	Reference Period (minutes)
0.003 – 10^{23}	170	180	–	Instantaneous*
0.1–10	–	1.6/ ƒ	–	6**
1.1–10	193/ $ƒ^{0.5}$	–	–	6**
10 – 20	61.4	0.163	10.0	6
20 – 48	129.8/ $ƒ^{0.25}$	0.3444/ $ƒ^{0.25}$	44.72/ $ƒ^{0.5}$	6
48 – 300	49.33	0.1309	6.455	6
300 – 6000	15.6 $ƒ^{0.25}$	0.04138 $ƒ^{0.25}$	0.6455$ƒ^{0.5}$	6
6000 – 15000	137	0.364	50	6
15000 – 150000	137	0.364	50	616000/ $ƒ^{1.2}$
150000 – 300000	0.354 $ƒ^{0.5}$	9.4 x 10^{-4} $ƒ^{0.5}$	3.33 x 10^{-4} ƒ	616000/ $ƒ^{1.2}$

4. Friis Formula

$$R= \sqrt{\frac{PG}{4\pi S}}$$

The maximum Gain measured in Fully Anechoic Chamber

BT : 2.58 dBi or 1.811 (nemeric)

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

MODE: BLE, NFC LF, NFC HF

Pd is the limit of MPE, 1mW/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 distance r where the MPE limit is reached.

The software provided by Manufacturer enabled the EUT to transmit with max power at lowest, middle and highest channel individually.

5. Test Results

5.1 The maximum Gain measured in Fully Anechoic Chamber

Band	antenna gain (dBi)	nemeric
BT(BLE)	2.58 dBi	1.811 (numeric)
NFC LF	-	-
NFC HF	-	-

5.2 Output Power into Antenna & Power Density (1mW/cm2) :

MODE: BT

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm2)
First ch	2 402	1.54	0.000555
Middle ch	2 440	1.54	0.000555
Last ch	2 480	1.54	0.000555

MODE: NFC

Frequency Range (MHz)	Field Strength (dBuV/m)	Output Power (mW)	Power Density (mW/cm2)
13.56	45.61	0.0000007	0.0000000001
0.121	47.40	0.0000011	0.0000000002

MODE:BT+NFC

0.000555 (mW/cm2) < 1.0 (mW/cm2)

Bluetooth, NFC SAR was not required