MPE TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID/IC Certification: 2AAZ2-MVB-100 / 11410A-MVB100

Equipment Under Test	:	T4F Bluetooth Keypad
Model Name	:	MVB-100
Serial No.	:	N/A
Applicant	:	Metis Communication Co., Ltd.
Manufacturer	:	Metis Communication Co., Ltd.
Date of Test(s)	:	2013.09.26 ~ 2013.11.05
Date of Issue	:	2013.11.12

In the configuration tested, the EUT complied with the standards specified above.

Tested By:

Alvin Kim

Date: **2013.11.12**

Approved By:

Feel Jeong

Date: **2013.11.12**

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- Wireless Div. 3FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040 (Lab)
- 413-15, Gomae-Dong, Giheung-Gu, Yongin-Si, Gyeonggi-Do, South Korea. (Chamber)

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1.2. Details of Applicant

Applicant   :   Metis Communication Co., Ltd.
Address   :   #102-805 Digital Empire2, 486 Sin-Dong, YeongTong-Gu, Suwon-Si, GyeongGi-Do Korea 443-734
Contact Person   :   Kim, Chang-Woo
Phone No.   :   + 82 31 695 5767

1.3. Description of EUT

Kind of Product	T4F Bluetooth Keypad
Model Name	MVB-100
Serial Number	N/A
Power Supply	DC 12 V / 24V (Vehicle battery)
Frequency Range	2 402 ㎒ ~ 2 480 ㎒ (BT)
Modulation Technique	GFSK, π/4DQPSK, 8DPSK
Number of Channels	79
Antenna Type	Internal type
Antenna Gain	1.99 ㏈i

1.4. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007025	Initial
1	F690501/RF-RTL007025-1	Retest due to power class change

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2. RF Exposure Evaluation

2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

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

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (㎒)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (㎽/㎠)	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300 – 1 500	--	--	F/1500	6
1 500 – 100 000	**--**	**--**	**1**	**30**

2.1.1. Friis transmission formula: $Pd = (Pout*G)/(4*pi*R^2)$

Where Pd = power density in ㎽/㎠

　　　Pout = output power to antenna in ㎽

　　　G = gain of antenna in linear scale

　　　Pi = 3.1416

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

Pd the limit of MPE, 1 ㎽/㎠. 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 where the MPE limit is reached.

2.2. RF exposure limit according to IC RSS-102

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

Frequency Range (㎒)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density $(\mathrm{W/m}^2)$	Average Time (minutes)
0.003 – 1	280	2.19	-	6
1 – 10	280 / f	2.19 / f	-	6
10 – 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	1.585 $f^{0.5}$	0.004 2 $f^{0.5}$	f / 150	6
1 500 – 15 000	**61.4**	**0.163**	**10**	**6**
15 000 – 150 000	61.4	0.163	10	616 000 / $f^{1.2}$
150 000 – 300 000	0.158 $f^{0.5}$	4.21 x 10^{-4} $f^{0.5}$	6.67 x 10^{-5} f	616 000 / $f^{1.2}$

Note: f is frequency in ㎒

*Power density limit is applicable at frequencies greater than 100 ㎒

2.2.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R^2)

Where Pd = power density in W/m^2

Pout = output power to antenna in W

G = gain of antenna in linear scale

Pi = 3.1416

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

Pd the limit of MPE, 10 W/m^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 where the MPE limit is reached.

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2.3. Test Result of RF Exposure Evaluation

Test Item   ： RF Exposure Evaluation Data
Test Mode ： Normal Operation

2.3.1. Output Power into Antenna & RF Exposure Evaluation Distance

DC 12V

FHSS: GFSK

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (㏈ m)	Antenna Gain (㏈ i)	Power Density at 20 ㎝ (㎽/㎠)	Power Density at 20 ㎝ (W/m^2)	FCC Limits (㎽/㎠)	IC Limits (W/m^2)
Low	2 402	-0.15	1.99	0.000 304	0.003 039	1	10
Middle	2 441	-1.71	1.99	0.000 212	0.002 122	1	10
High	2 480	-2.85	1.99	0.000 163	0.001 632	1	10

FHSS: π/4DQPSK

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (㏈ m)	Antenna Gain (㏈ i)	Power Density at 20 ㎝ (㎽/㎠)	Power Density at 20 ㎝ (W/m^2)	FCC Limits (㎽/㎠)	IC Limits (W/m^2)
Low	2 402	-1.73	1.99	0.000 211	0.002 112	1	10
Middle	2 441	-3.42	1.99	0.000 143	0.001 431	1	10
High	2 480	-4.74	1.99	0.000 106	0.001 056	1	10

FHSS: 8DPSK

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (㏈ m)	Antenna Gain (㏈ i)	Power Density at 20 ㎝ (㎽/㎠)	Power Density at 20 ㎝ (W/m^2)	FCC Limits (㎽/㎠)	IC Limits (W/m^2)
Low	2 402	-1.71	1.99	0.000 212	0.002 122	1	10
Middle	2 441	-3.43	1.99	0.000 143	0.001 428	1	10
High	2 480	-4.71	1.99	0.000 106	0.001 063	1	10

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DC 24V

FHSS: GFSK

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm²)	Power Density at 20 cm (W/m²)	FCC Limits (mW/cm²)	IC Limits (W/m²)
Low	2 402	-0.18	1.99	0.000 302	0.003 018	1	10
Middle	2 441	-1.64	1.99	0.000 216	0.002 156	1	10
High	2 480	-2.88	1.99	0.000 162	0.001 621	1	10

FHSS: π/4DQPSK

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm²)	Power Density at 20 cm (W/m²)	FCC Limits (mW/cm²)	IC Limits (W/m²)
Low	2 402	-1.77	1.99	0.000 209	0.002 093	1	10
Middle	2 441	-3.47	1.99	0.000 141	0.001 415	1	10
High	2 480	-4.74	1.99	0.000 106	0.001 056	1	10

FHSS: 8DPSK

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm²)	Power Density at 20 cm (W/m²)	FCC Limits (mW/cm²)	IC Limits (W/m²)
Low	2 402	-1.73	1.99	0.000 211	0.002 112	1	10
Middle	2 441	-3.46	1.99	0.000 142	0.001 418	1	10
High	2 480	-4.77	1.99	0.000 105	0.001 049	1	10

FHSS: Maximum average power

Channel	Output Average Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm²)	Power Density at 20 cm (W/m²)	FCC Limits (mW/cm²)	IC Limits (W/m²)
Low	4.00	1.99	0.000 790	0.007 902	1	10
Middle	4.00	1.99	0.000 790	0.007 902	1	10

Note :
1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission
   formula is far below the limit of 1 mW/cm².

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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