TEST REPORT

KCTL Inc.
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

1. Client

- Name : HOIMYUNG ICT Corporation
- Address : 1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
- Date of Receipt : 2019-06-03

2. Use of Report : -

3. Name of Product and Model : Telemetics mangement Terminal / DTM-02W

4. Manufacturer and Country of Origin : HOIMYUNG ICT Corporation / Korea

5. FCC ID : 2ARPKDTM-02W

6. IC Certification : 24504-DTM02W

7. Date of Test : 2019-06-25 to 2019-08-22

8. Test Standards : 47 CFR Part 1.1310
RSS-102 Issue 5 Mar. 2015

9. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Heesu Ahn (Signature)	Technical Manager Name : Jaehyong Lee (Signature)

2019-09-18

KCTL Inc.

Report revision history

Date	Revision	Page No
2019-09-18	Initial report	-

CONTENTS

1. General information

Client	:	HOIMYUNG ICT Corporation
Address	:	1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
Manufacturer	:	HOIMYUNG ICT Corporation
Address	:	1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-3327, G-198, C-3706, T-1849 Industry Canada Registration No. : 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Telemetics mangement Terminal
Model	:	DTM-02W
Frequency range	:	Bluetooth Low Energy_2 402 ㎒ ~ 2 480 ㎒ 802.11b/g/n HT20_2 412 ㎒ ~ 2 462 ㎒
Modulation technique	:	Bluetooth Low Energy_GFSK 802.11b/g/n HT20_DSSS, OFDM
Number of channels	:	Bluetooth Low Energy _40 ch 802.11b/g/n HT20_11 ch
Power source	:	DC 12 V, DC 24 V
Antenna specification	:	Bluetooth Low Energy _Chip Antenna WIFI_PCB Antenna
Antenna gain	:	3.50 ㏈i (Bluetooth Low Energy) 3.29 ㏈i (WIFI)
Software version	:	Ver1.0.1
Hardware version	:	LIGHTTMS_WIFI_R1.0
Operation temperature	:	-30 ℃ ~ 70 ℃

2.1. Frequency/channel operations

This device contains the following capabilities:
Bluetooth Low Energy, 802.11b/g/n HT20

Ch.	Frequency (㎒)
00	2 402
. .	. .
19	2 440
. .	. .
39	2 480

Table 2.1.1. Bluetooth Low Energy

Ch.	Frequency (㎒)
01	2 412
. .	. .
06	2 437
. .	. .
11	2 462

Table 2.1.2. 802.11b/g/n HT20 mode

3. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.
All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (±)
Conducted RF power	1.76 dB

4. RF Exposure

FCC

Regulation

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC rules and Regulations.
The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1.
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).

Table 1 – Limits for Maximum Permissible Exposure (MPE)

Frequency Range (㎒)	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [㎽/㎠]	Averaging Time [minute]
(A) Limits for Occupational / Controlled Exposure				
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 ~ 1 500	/	/	f/300	6
1 500 ~ 15 000	/	/	5	6
(B) Limits for General Population / Uncontrolled Exposure				
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 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1.0	30

*f=frequency in ㎒, *= plane-wave equivalent power density*

Per the guidance of KDB 680106, the E-field and H-field limits shown in the table above are extended down to 100 ㎑

IC

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

According to RSS-102 Issue 5, Paragraph "4. Exposure Limits", Industry of Canada has adopted the RF field strength limits stablished in Healths Canada's RF exposure guideline, Safety code 6:

Frequency Range (㎒)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10^{21}	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f 0.3417	0.008335 f 0.3417	0.02619f0.6834	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10^{-4} $f^{0.5}$	6.67 x 10^{-5} f	616000/ $f^{1.2}$

Note: f is frequency in ㎒.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Exemption Limits for Routine Evaluation – RF Exposure Evaluation

According to RSS-102 Issue 5 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 ㎝, except when the device operates as follows:

- Below 20 ㎒ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1W (adjusted for tune-up tolerance);
- At or above 20 ㎒ and below 48 ㎒ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 4.49/ $f^{0.5}$ W (adjusted for tune-up tolerance), where f is in ㎒;
- At or above 48 ㎒ and below 300 ㎒ and the source-bands, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- At or above 300 ㎒ and below 6 ㎓ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10^{-2} $f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in ㎒;
- At or above 6 ㎓ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance.)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

4.1. Test results

FCC

MPE (Maximum Permissive Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$$

S = power density [㎽/㎠]
P = Power input to antenna [㎽]
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna [㎝]

IC

RF Exposure evaluation

At or above 300 ㎒ and below 6 ㎓ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10^{-2} $f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in ㎒;

RF Exposure Compliance Issue

The information should be included in the user's manual:
This appliance and its antenna must not be co-located or operation is conjunction with any other antenna or transmitter. A minimum separation distance of 20 ㎝ must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

Calculation Result of RF exposure (FCC)

Maximum tune-up tolerance

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	Max Tune-up Power [㎽]	Ant Gain [dBi]	Ant Gain [㎽]	Power density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
BLE / 1 Mbps	2 402	5.00	3.16	3.50	2.24	0.001 41	1.000 00
WiFi / 802.11b	2 462	23.00	199.53	3.29	2.13	0.084 67	1.000 00

Note.

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

Calculation Results of RF exposure (IC)

Maximum tune-up tolerance

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	Ant Gain [dBi]	E.I.R.P		Limit [W]
				[dBm]	[W]	
BLE / 1 Mbps	2 402	5.00	3.50	8.50	0.003 1	2.68
WiFi / 802.11b	2 462	23.00	3.29	26.29	0.199 5	2.72

5. Measurement Equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Wideband Power Sensor	R&S	NRP-Z81	102398	20.01.25
ATTENUATOR	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	31212	20.05.13

End of test report