






# TEST REPORT

<b>Eurofins KCTL Co.,Ltd.</b> 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 <a href="http://www.kctl.co.kr">www.kctl.co.kr</a>	Report No.: <b>KR23-SRF0237-B</b> Page (1) of (7)	   <b>KCTL</b>
<b>1. Client</b>		
<ul style="list-style-type: none"> <li>◦ Name : ITOFROM</li> <li>◦ Address : 5F DS Building 8, Dogok-ro 7-gil Gangnam-gu, Seoul,06255, Korea</li> <li>◦ Date of Receipt : 2023-08-23</li> </ul>		
<b>2. Use of Report</b> : Certification		
<b>3. Name of Product / Model</b> : Data Terminal(Collection Device) / NDT23		
<b>4. Manufacturer / Country of Origin</b> : ITOFROM / Korea		
<b>5. FCC ID</b> : 2BC8U-I2F-NDT23		
<b>6. Date of Test</b> : 2023-09-20 to 2023-11-03		
<b>7. Location of Test</b> : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing (Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)		
<b>8. Test method used</b> : Part 1.1310		
<b>9. Test Result</b> : Refer to the test result in the test report		
Affirmation	Tested by   Name : Eunseong Lim (Signature)	Technical Manager   Name : Heesu Ahn (Signature)
2023-11-16		
<b>Eurofins KCTL Co.,Ltd.</b>		
As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd.		

**REPORT REVISION HISTORY**

Date	Revision	Page No
2023-11-08	Originally issued	-
2023-11-14	Updated	7
2023-11-16	Updated	7

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Note. The report No. KR23-SRF0237-A superseded by the report No. KR23-SRF0237-B.

**General remarks for test reports**

**Statement concerning the uncertainty of the measurement systems used for the tests**

(may be required by the product standard or client)

**Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

**Procedure number, issue date and title:**


Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

**Statement not required by the standard or client used for type testing**

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## 1. General information

Client : ITOFROM  
 Address : 5F DS Building 8, Dogok-ro 7-gil Gangnam-gu, Seoul,06255, Korea  
 Manufacturer : ITOFROM  
 Address : 5F DS Building 8, Dogok-ro 7-gil Gangnam-gu, Seoul,06255, Korea  
 Laboratory : Eurofins KCTL Co.,Ltd.  
 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-20080, G-20078, C-20059, T-20056  
 Industry Canada Registration No. : 8035A  
 KOLAS No.: KT231

## 2. Device information

Equipment under test : Data Terminal(Collection Device)  
 Model : NDT23  
 Modulation technique : GFSK (Bluetooth Low Energy)  
                                   O-QPSK (Zigbee)  
 Number of channels : 40 ch (Bluetooth Low Energy)  
                                   16 ch (Zigbee)  
 Power source : DC 12 V  
 Antenna specification : Chip Antenna (BLE ANT App)  
                                   Dipole Antenna (BLE ANT#1, #2, Zigbee)  
 Antenna gain : BLE ANT 1 : 2.28 dBi  
                                   BLE ANT 2 : 4.32 dBi  
                                   BLE ANT App : 0.07 dBi  
                                   Zigbee : 3.39 dBi  
 Frequency range : 2 402 MHz ~ 2 480 MHz (Bluetooth Low Energy)  
                                   2 405 MHz ~ 2 480 MHz (Zigbee)  
 Software version : Linux am335x 4.4.36  
 Hardware version : 1.0  
 Test device serial No. : LTM2315NRL008  
 Operation temperature : 0 °C ~ 50 °C

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## 2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source	FCC ID
AC/DC Adaptor	Shenzhen Perfect Gallant Tec Co., Ltd.	PG241-1202000I	-	Input: 110-240V ~ 50/60 Hz 0.8A Output: 12 V=2.0A 24.0W	-

## 2.2. Frequency/channel operations

This device contains the following capabilities:  
Bluetooth Low Energy, Zigbee

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

Table 2.2.1. Bluetooth Low Energy

Ch.	Frequency (MHz)
15	2 405
⋮	⋮
20	2 440
⋮	⋮
25	2 480

Table 2.2.2. Zigbee mode

### 3. RF Exposure

#### 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 (MHz)	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm <sup>2</sup> ]	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 <sup>2</sup>	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 <sup>2</sup>	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 MHz, \* = 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 kHz

#### MPE (Maximum Permissible Exposure) Prediction

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

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

S = power density [mW/cm<sup>2</sup>]

P = Power input to antenna [mW]

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 [cm]

### 3.1. Test results

#### Calculation Result of RF exposure

Maximum tune-up tolerance

-2.4GHz

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Max Tune-up Power [mW]	Ant Gain [dBi]	Power density at 20 cm [mW/cm <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
BLE #1	2 402	4.00	2.51	2.28	0.000 84	1.00
BLE #2	2 402	4.00	2.51	4.32	0.001 35	1.00
BLE #App	2 402	1.00	1.26	0.07	0.000 25	1.00
Zigbee	2 405	1.00	1.26	3.39	0.000 55	1.00

-LTE

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Max Tune-up Power [mW]	Ant Gain [dBi]	Power density at 20 cm [mW/cm <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
Band 2	1850.70	25.00	316.23	1.59	0.090 73	1.00
Band 4	1710.70	25.00	316.23	2.00	0.099 71	1.00

Simultaneous Transmission

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Max Tune-up Power [mW]	Ant Gain [dBi]	Ratio	Limit
BLE #1 (2 402 MHz) + BLE #2 (2 402 MHz) + BLE #App (2 402 MHz) + Zigbee (2 405 MHz) + Band 4(1710.70 MHz)					0.102 7	1.00

**Note.**

- The power density  $P_d$  at a distance of 20 cm calculated from the friis transmission  
Formula is far below the limit of 1 mW/cm<sup>2</sup>.
- Simultaneous transmission of RF Exposure test exclusion for worst case configuration

BLE Ant #1 : the ratio is 0.000 84 / 1  
 BLE An t#2 : the ratio is 0.001 35 / 1  
 BLE Ant #App : the ratio is 0.000 25 / 1  
 Zigbee Ant : the ratio is 0.000 55 / 1  
 LTE Band 4 : the ratio is 0.099 71 / 1

BLE Ant #1 + BLE Ant #2 + BLE Ant #App + Zigbee + LTE Band 4 Power density :  
 ( 0.000 84 / 1 + 0.001 35 / 1 + 0.000 25 / 1 + 0.000 55 / 1 + 0.099 71 / 1 )

**End of test report**