

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-192-RWD-013
AGR No. : A18NA-185
Applicant : OSSTEM IMPLANT Co., Ltd.
Address : 1st floor, B-dong, 135, Gasan digital 2-ro, Geumcheon-gu, Seoul, Korea
Manufacturer : OSSTEM IMPLANT Co., Ltd.
Address : 1st floor, B-dong, 135, Gasan digital 2-ro, Geumcheon-gu, Seoul, Korea
Type of Equipment : Osstem Zigbee Module
FCC ID. : 2ASB7K-WLM-01
Model Name : K-WLM-01
Serial number : N/A
Total page of Report : 8 pages (including this page)
Date of Incoming : October 15, 2018
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SUMMARY

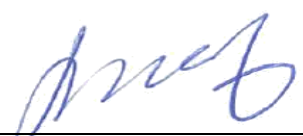
The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247*

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by: 

 Jae-Ho Lee / Chief Engineer
 ONETECH Corp.

Approved by: 

 Keun-Young, Choi / Vice President
 ONETECH Corp.

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Revision History

| Issued Report No. | Issued Date | Revisions | Effect Section |
|-------------------|-------------------|---------------|----------------|
| OT-192-RWD-013 | February 13, 2019 | Initial Issue | All |
| | | | |
| | | | |

1. VERIFICATION OF COMPLIANCE

Applicant : OSSTEM IMPLANT Co., Ltd.
 Address : 1st floor, B-dong, 135, Gasan digital 2-ro, Geumcheon-gu, Seoul, Korea
 Contact Person : Hyeri Han / Associate
 Telephone No. : +82-70-4626-0881
 FCC ID : 2ASB7K-WLM-01
 Model Name : K-WLM-01
 Serial Number : N/A
 Date : February 13, 2019

| | |
|--|--------------------------------------|
| EQUIPMENT CLASS | DTS – DIGITAL TRNSMISSION SYSTEM |
| E.U.T. DESCRIPTION | Osstem Zigbee Module |
| THIS REPORT CONCERNS | Original Grant |
| MEASUREMENT PROCEDURES | ANSI C63.10: 2013 |
| TYPE OF EQUIPMENT TESTED | Pre-Production |
| KIND OF EQUIPMENT AUTHORIZATION REQUESTED | Certification |
| EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S) | FCC PART 15 SUBPART C Section 15.247 |
| Modifications on the Equipment to Achieve Compliance | None |
| Final Test was Conducted On | 3 m, Semi Anechoic Chamber |

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The OSSTEM IMPLANT Co., Ltd., Model K-WLM-01 (referred to as the EUT in this report) is an Osstem Zigbee Module. Product specification information described herein was obtained from product data sheet or user’s manual.

| | | | | |
|--|-----------------------|------------------------|-------------|---------|
| Device Type | Osstem Zigbee Module | | | |
| Operating Frequency | 2 405 MHz ~ 2 480 MHz | | | |
| RF Output Power | 4.24 dBm | | | |
| Modulation Type | O-QPSK | | | |
| Antenna Type / Antenna Gain | Monopole Antenna | Antenna 1 (Basic) | GW26.0152 | 1.8 dBi |
| | | Antenna 2 (Additional) | SAT-G01R | 1.5 dBi |
| | | Antenna 3 (Additional) | RN-SMA-S-RP | 1.7 dBi |
| | | Antenna 4 (Additional) | GW26.0151 | 1.8 dBi |
| List of each Osc. or crystal Freq.(Freq. >= 1 MHz) | 32 MHz | | | |
| Rated Supply Voltage | DC 3.3 V | | | |

2.2 Alternative type(s)/model(s); also covered by this test report.

-. None

3. EUT MODIFICATIONS

-. None

4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are $f/1500$ mW/cm² for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric field strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm, using $P \text{ (mW)} = P \text{ (W)} / 1 000$, $d \text{ (cm)} = 0.01 * d \text{ (m)}$

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

4.2 EUT Description

| | |
|-----------------------------|--|
| Kind of EUT | Osstem Zigbee Module |
| Operating Frequency Band | <input type="checkbox"/> Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz <input type="checkbox"/> WLAN: 2 412 MHz ~ 2 462 MHz <input checked="" type="checkbox"/> Zigbee : 2 405 MHz ~ 2 480 MHz <input type="checkbox"/> WLAN: 5 180 MHz ~ 5 240 MHz <input type="checkbox"/> WLAN: 5 745 MHz ~ 5 825 MHz <input type="checkbox"/> Bluetooth: 2 402 MHz ~ 2 480 MHz <input type="checkbox"/> Bluetooth BLE: 2 402 MHz ~ 2 480 MHz <input type="checkbox"/> UWB: 7 200 MHz ~ 10 200 MHz |
| MAX. RF OUTPUT POWER | 4.24 dBm |
| Antenna Gain | 1.8 dBi |
| | 1.5 dBi |
| Exposure Evaluation Applied | <input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A |

4.3 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

| Operating Freq. Band (MHz) | Operating Mode | Target Power W/tolerance | Max tune up power | | Antenna Gain | | Power Density (mW/cm ²) @ 20 cm Separation | Limit (mW/cm ²) |
|----------------------------|----------------|--------------------------|-------------------|------|--------------|--------|--|-----------------------------|
| | | (dBm) | (dBm) | (mW) | Log | Linear | | |
| 2 405 ~ 2 480 | Zigbee | 3.74 ± 0.5 | 4.24 | 2.65 | 1.9 | 1.514 | 0.000 8 | 1.00 |



Tested by: Min-Gu, Ji / Assistant Manager