# RF EXPOSURE EVALUATION REPORT

| | |
|---|---|
| FCC ID | : NKRIMA2 |
| Equipment | : M2M DATA MODULE |
| Brand Name | : WNC |
| Model Name | : IMA2,IMA2G |
| Applicant | : Wistron NeWeb Corporation<br>20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C |
| Manufacturer | : Wistron NeWeb Corporation<br>20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C |
| Standard | : 47 CFR Part 2.1091 |

**We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part 2.1091 and it complies with applicable limit.**

**The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.**

**The results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.**

**Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC evaluation.**

Cona Huang

**Approved by: Cona Huang / Deputy Manager**

***SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory***

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# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FA9D3102 | Rev. 01 | Initial issue of report | Jul. 07, 2020 |
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## 1. Description of Equipment Under Test (EUT)

| Product Feature & Specification | |
|---|---|
| EUT Type | M2M DATA MODULE |
| Brand Name | WNC |
| Model Name | IMA2,IMA2G |
| FCC ID | NKRIMA2 |
| Wireless Technology and Frequency Range | LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 12: 699 MHz ~ 716 MHz |
| Mode | LTE: QPSK, 16QAM |
| HW Version | v1.0 |
| EUT Stage | Identical Prototype |

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

**Reviewed by: Jason Wang**

**Report Producer: Wan Liu**

## 2. Maximum RF average output power among production units

| Band | Item | Parameter | Unit | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|
| LTE Band 2 | Max. TX Power | 20 MHz 1 RBs/QPSK | dBm | 20.3 | 23 | 25.7 |
| LTE Band 4 | Max. TX Power | 20 MHz 1 RBs/QPSK | dBm | 20.3 | 23 | 25.7 |
| LTE Band 12 | Max. TX Power | 10 MHz 1 RBs/QPSK | dBm | 20.3 | 23 | 25.7 |

## 3. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| (A) Limits for Occupational/Controlled Exposures | | | | |
| 0.3-3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0-30 | 1842/f | 4.89/f | *(900/f2) | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | | | f/300 | 6 |
| 1500-100,000 | | | 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/f2) | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | f/1500 | 30 |
| 1500-100,000 | | | 1.0 | 30 |

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

# 4. Radio Frequency Radiation Exposure Evaluation

## 4.1. Standalone Power Density Calculation

| Band | Frequency (MHz) | Antenna Gain (dBi) | Maximum Power (dBm) | Maximum ERP (dBm) | Maximum ERP (W) | Maximum EIRP (dBm) | Maximum EIRP (W) | Maximum Output Power Limit (W) | Average EIRP (mW) | Power Density at 20cm (mW/cm^2) | Limit (mW/cm^2) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LTE Band 2 | 1850 | 7.00 | 25.70 | 30.550 | 1.135 | 32.700 | 1.862 | 2.000 | 1862.087 | 0.371 | 1.000 |
| LTE Band 4 | 1710 | 4.00 | 25.70 | 27.550 | 0.569 | 29.700 | 0.933 | 1.000 | 933.254 | 0.186 | 1.000 |
| LTE Band 12 | 699 | 4.50 | 25.70 | 28.050 | 0.638 | 30.200 | 1.047 | 3.000 | 1047.129 | 0.208 | 0.466 |

**Note:** For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.

## 4.2. Collocated Power Density Calculation

| Band | Frequency (MHz) | Antenna Gain (dBi) | Maximum Power (dBm) | Maximum EIRP (dBm) | Maximum EIRP (W) | Average EIRP (mW) | Power Density at 20cm (mW/cm^2) | Limit (mW/cm^2) | Power Density / Limit |
|---|---|---|---|---|---|---|---|---|---|
| LTE Band 2 | 1850 | 4.50 | 25.70 | 30.2 | 1.05 | 1047.13 | 0.208 | 1.000 | 0.208 |
| LTE Band 4 | 1710 | 4.00 | 25.70 | 29.7 | 0.93 | 933.25 | 0.186 | 1.000 | 0.186 |
| LTE Band 12 | 699 | 4.50 | 25.70 | 30.2 | 1.05 | 1047.13 | 0.208 | 0.466 | 0.447 |
| WLAN2.4GHz Band | 2412 | | | 17.0 | 0.05 | 50.12 | 0.010 | 1.000 | 0.010 |
| WLAN5GHz Band | 5180 | | | 17.0 | 0.05 | 50.12 | 0.010 | 1.000 | 0.010 |
| Bluetooth | 2402 | | | 8.0 | 0.01 | 6.31 | 0.001 | 1.000 | 0.001 |

**Note:**

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN EIRP is less than or equal to 17dBm and for Bluetooth EIRP is less than or equal to 8dBm.

| WWAN Power Density / Limit | WLAN Power Density / Limit | Bluetooth Power Density / Limit | Σ(Power Density / Limit) of WWAN+WLAN+Bluetooth |
|---|---|---|---|
| 0.447 | 0.010 | 0.001 | 0.458 |

**Note:**

1. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN + Bluetooth.
2. Considering the WWAN module collocation with the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant

## Conclusion:

Based on FCC OET Bulletin 65 Supplement C and 47 CFR §2.1091, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per wireless technology as follow table:

| Device | Technology | Band | Frequency (MHz) | Maximum Conducted Power (dBm) | Stanalone Maximum Antenna Gain (dBi) | Collocated Maximum Antenna Gain (dBi) |
|---|---|---|---|---|---|---|
| M2M DATA MODULE | LTE | Band 2 | 1850.7~1909.3 | 25.7 | 7.0 | 4.5 |
| | | Band 4 | 1710.7~1754.3 | 25.7 | 4.0 | 4.0 |
| | | Band 12 | 699.7~715.3 | 25.7 | 4.5 | 4.5 |