



# MPE TEST REPORT

**Applicant** Nokia Shanghai Bell Co., Ltd.  
**FCC ID** 2ADZRG240WJ  
**Product** 7368 ISAM ONT  
**Model** G-240W-J  
**Report No.** R1905B0068-M1V3  
**Issue Date** October 21, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC 47 CFR Part 1 1.1310**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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## Table of Contents

|                                   |                                                                  |    |
|-----------------------------------|------------------------------------------------------------------|----|
| 1                                 | Test Laboratory.....                                             | 3  |
| 1.1                               | Notes of the Test Report .....                                   | 3  |
| 1.2                               | Test facility .....                                              | 3  |
| 1.3                               | Testing Location.....                                            | 4  |
| 1.4                               | Laboratory Environment.....                                      | 4  |
| 2                                 | Description of Equipment under Test.....                         | 5  |
| 3                                 | Maximum conducted output power (measured) and antenna Gain ..... | 7  |
| 4                                 | Test Result .....                                                | 8  |
| ANNEX A: The EUT Appearance ..... |                                                                  | 11 |
| A.1                               | EUT Appearance .....                                             | 11 |

# 1 Test Laboratory

## 1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

## 1.2 Test facility

### **FCC (Designation number: CN1179, Test Firm Registration Number: 446626)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

### **IC (recognition number is 8510A)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

### **VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

### 1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.  
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### 1.4 Laboratory Environment

|                                                                                                                                                                                                 |                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Temperature                                                                                                                                                                                     | Min. = 18°C, Max. = 25 °C |
| Relative humidity                                                                                                                                                                               | Min. = 30%, Max. = 70%    |
| Ground system resistance                                                                                                                                                                        | < 0.5 $\Omega$            |
| Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards. |                           |

## 2 Description of Equipment under Test

### Client Information

|                               |                                                                                                                        |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>              | Nokia Shanghai Bell Co., Ltd.                                                                                          |
| <b>Applicant address</b>      | No. 388, Ningqiao Rd. Pilot Free Trade Zone, Shanghai, China                                                           |
| <b>Manufacturer 1</b>         | TAICANG T&W ELECTRONICS CO.,LTD                                                                                        |
| <b>Manufacturer address 1</b> | 89# Jiang Nan RD, Lu Du, Taicang, Jiangsu, China                                                                       |
| <b>Manufacturer 2</b>         | SHENZHEN TWOWING TECHNOLOGIES CO., LTD                                                                                 |
| <b>Manufacturer address 2</b> | 1st-12th Floor, Nangang Industrial Building, Tangtou Industrial Park, Shiyan, Baoan, Shenzhen, Guangdong 518108, China |

### General Technologies

#### Information of Configuration

| No. | Name          | Model/Code No.     | Edition | Serial No. or Quantity |
|-----|---------------|--------------------|---------|------------------------|
| 1.1 | EMA-G-240W-J  | 3FE48009AA         | PEM2    | PEM                    |
| 2.1 | Power adapter | SUN-1200300        | A/0     | PEM                    |
| 2.2 | Power adapter | RD1203000-C55-20MG | A/0     | PEM                    |

|          | Kit Code   | EMA        | Part Description                                                                                                | Power Adaptor                     |
|----------|------------|------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------|
| G-240W-J | 3FE48008AA | 3FE48009AA | 2 POTS, 4 GE, Dual band<br>WIFI<br>AC3000 802.11ac<br>4x4/802.11n 3x3<br>US Plug in, 2Pin, Wall<br>Mounted, 12V | SUN-1200300<br>RD1203000-C55-20MG |

### Auxiliary equipment details

| No. | Name    | Brand name     | Model  | NSB code | Valid Until         |
|-----|---------|----------------|--------|----------|---------------------|
| 1   | Spirent | TestCenter     | DE48E0 | -        | No Cal.<br>Required |
| 2   | OLT     | Alcatel-Lucent | N.A    | -        | No Cal.<br>Required |
| 3   | PC      | HP             | N.A    | -        | No Cal.<br>Required |
| 4   | Phone   | N.A            | N.A    | -        | No Cal.<br>Required |

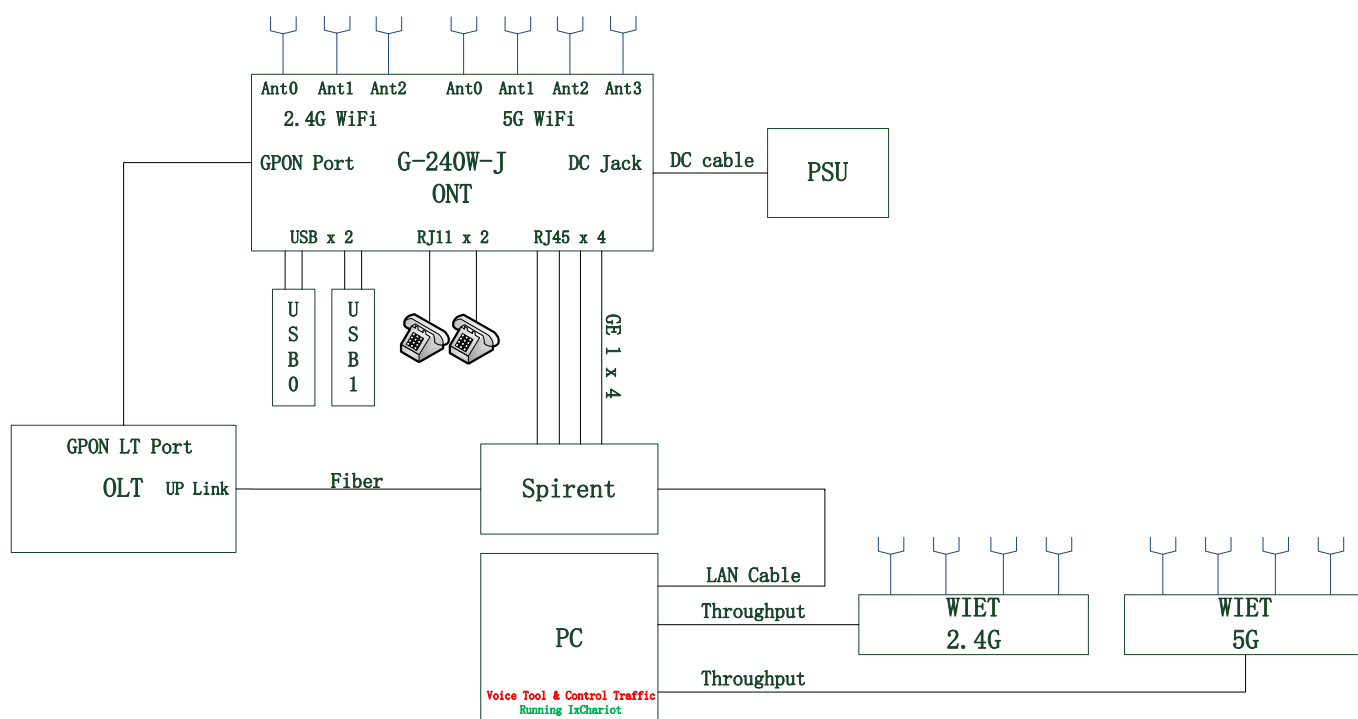
## Information of Ports

| No. | Port name | Number | Shielded or unshielded | Cable type (optic, twisted pair, etc.) | Max. Cable length |
|-----|-----------|--------|------------------------|----------------------------------------|-------------------|
| 1   | Power     | 1      | unshielded             | -                                      | -                 |
| 2   | GE        | 4      | unshielded             | -                                      | -                 |
| 3   | POTS      | 2      | unshielded             | -                                      | -                 |
| 4   | USB       | 2      | shielded               | -                                      | -                 |

## Test Configuration

Description: The G-240W-J is a GPON ONT which has 2 POTs, 4 GE ports, 2 USB ports, 2.4G wi-fi and 5G wi-fi.

The basic functional test in normal room conditions consists of the traffic test and POTs connection test. G-240W-J runs 4 traffics on each line with DE48E0, the each upstream of 3 GE is 250Mbps, and downstream is 750Mbps. The POTs keep connecting though OFLT program.



### 3 Maximum conducted output power (measured) and antenna Gain

The numeric gain (G) of the antenna with a gain specified in dB is determined by  

$$\text{Numeric gain (G)} = 10^{(\text{antenna gain}/10)}$$

#### Without Beamforming

| Band       | Maximum Conducted Output Power (dBm) |         | Antenna Gain (dBi) | Numeric gain |
|------------|--------------------------------------|---------|--------------------|--------------|
|            | (dBm)                                | (mW)    |                    |              |
| Wi-Fi 2.4G | 25.830                               | 382.825 | 3.000              | 1.995        |
| Wi-Fi 5G   | 29.810                               | 957.194 | 3.000              | 1.995        |

#### With Beamforming

| Band       | Maximum Conducted Output Power (dBm) |         | Beamforming Gain (dBi) | Numeric gain |
|------------|--------------------------------------|---------|------------------------|--------------|
|            | (dBm)                                | (mW)    |                        |              |
| Wi-Fi 2.4G | 25.770                               | 377.572 | 7.77                   | 5.984        |
| Wi-Fi 5G   | 26.920                               | 492.040 | 9.02                   | 7.980        |

Directional gain<sub>Wi-Fi 2.4G</sub> = GANT + 10 log(NANT/NSS) = 3 + 10log (3/1) = 7.77 dBi  
 Directional gain<sub>Wi-Fi 5G</sub> = GANT + 10 log(NANT/NSS) = 3 + 10log (4/1) = 9.02 dBi

## 4 Test Result

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following

TABLE 1 – LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range<br>(MHz)                                | Electric Field<br>Strength<br>(V/m) | Magnetic Field<br>Strength<br>(A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | Averaging Time<br>(minutes) |
|---------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|-----------------------------|
| (A) Limits for Occupational/Controlled Exposures        |                                     |                                     |                                        |                             |
| 0.3-3.0 .....                                           | 614                                 | 1.63                                | *(100)                                 | 6                           |
| 3-30 .....                                              | 1842/f                              | 4.89/f                              | *(900/f <sup>2</sup> )                 | 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/f <sup>2</sup> )                 | 30                          |
| 30-300 .....                                            | 27.5                                | 0.073                               | 0.2                                    | 30                          |
| 300-1500 .....                                          |                                     |                                     | f/1500                                 | 30                          |
| 1500-100,000 .....                                      |                                     |                                     | 1.0                                    | 30                          |

f = frequency in MHz

\* = Plane-wave equivalent power density

Note1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

Note2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.





The maximum permissible exposure for 1500~100,000MHz is 1.0. So

| Band       | The maximum permissible exposure |
|------------|----------------------------------|
| Wi-Fi 2.4G | 1.0mW/cm <sup>2</sup>            |
| Wi-Fi 5G   | 1.0mW/cm <sup>2</sup>            |

**RF Exposure Calculations:**

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the conducted power, considering maximum power and antenna gain. The formula shown in KDB 447498 D01 is used in the calculation.

Equation from KDB 447498 D01 General RF Exposure Guidance v06 (10/23/2015) is:

$$S = PG / 4\pi R^2$$

Where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = Time-average maximum tune up procedure (in appropriate units, e.g., mW)

G = the numeric gain of the antenna

R = distance to the center of radiation of the antenna

**Without Beamforming**

| Band                                                                  |                      | PG (mW)  | Test Result (mW/cm <sup>2</sup> ) | Limit Value (mW/cm <sup>2</sup> ) | The MPE ratio (mW/cm <sup>2</sup> ) | Limit R (cm) |
|-----------------------------------------------------------------------|----------------------|----------|-----------------------------------|-----------------------------------|-------------------------------------|--------------|
| Without Beamforming                                                   | Wi-Fi 2.4G           | 763.836  | 0.152                             | 1.000                             | 0.152                               | 7.796408     |
|                                                                       | Wi-Fi 5G             | 1909.853 | 0.380                             | 1.000                             | 0.380                               | 12.32805     |
|                                                                       | Wi-Fi 2.4G+ Wi-Fi 5G | 2673.689 | 0.532                             | 1.000                             | 0.532                               | 14.58646     |
| With Beamforming                                                      | Wi-Fi 2.4G           | 2259.436 | 0.449                             | 1.000                             | 0.449                               | 13.40894     |
|                                                                       | Wi-Fi 5G             | 3926.449 | 0.781                             | 1.000                             | 0.781                               | 17.67643     |
|                                                                       | Wi-Fi 2.4G+ Wi-Fi 5G | 6185.885 | 1.231                             | 1.000                             | 1.231                               | 22.18684     |
| Note: $\pi = 3.1416$<br>The MPE ratio = Mac Test Result ÷ Limit Value |                      |          |                                   |                                   |                                     |              |

So, when R = 23cm

| Band                                                                              |            | PG (mW)  | Test Result (mW/cm <sup>2</sup> ) | Limit Value (mW/cm <sup>2</sup> ) | The MPE ratio | Conclusion |
|-----------------------------------------------------------------------------------|------------|----------|-----------------------------------|-----------------------------------|---------------|------------|
| Without Beamforming                                                               | Wi-Fi 2.4G | 763.836  | 0.115                             | 1.000                             | 0.115         | Pass       |
|                                                                                   | Wi-Fi 5G   | 1909.853 | 0.287                             | 1.000                             | 0.287         | Pass       |
| With Beamforming                                                                  | Wi-Fi 2.4G | 2259.436 | 0.340                             | 1.000                             | 0.340         | Pass       |
|                                                                                   | Wi-Fi 5G   | 3926.449 | 0.591                             | 1.000                             | 0.591         | Pass       |
| Note: R = 23cm<br>$\pi = 3.1416$<br>The MPE ratio = Mac Test Result ÷ Limit Value |            |          |                                   |                                   |               |            |

So the simultaneous transmitting antenna pairs as below:

$$\sum \text{of MPE ratios} = \text{WiFi 2.4G} + \text{WiFi 5G} = 0.340 + 0.591 = 0.931 < 1$$

Note: Refer to justification in op.des, for transmitters, minimum separation distance is 23cm.

## ANNEX A: The EUT Appearance

### A.1 EUT Appearance



Front Side



Back Side

a: EUT

Picture 1 EUT