

# FCC PART 22H, PART 24E MEASUREMENT AND TEST REPORT

For

**Xiamen Yeastar Information Technology Co., Ltd.**

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**FCC ID: Z7C-TG200**

|                                                                                                                                                                                                                                                                               |                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Report Type:</b><br>Original Report                                                                                                                                                                                                                                        | <b>Product Type:</b><br>Gateway |
| <b>Report Number:</b> RXM171212061-00A                                                                                                                                                                                                                                        |                                 |
| <b>Report Date:</b> 2018-01-23                                                                                                                                                                                                                                                |                                 |
| <b>Reviewed By:</b>                                                                                                                                                                                                                                                           | Jerry Zhang<br>EMC Manager      |
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

|                             |                                          |
|-----------------------------|------------------------------------------|
| <b>EUT Name:</b>            | Gateway                                  |
| <b>EUT Model:</b>           | NeoGate TG200                            |
| <b>FCC ID:</b>              | Z7C-TG200                                |
| <b>Rated Input Voltage:</b> | AC100-240V                               |
| <b>External Dimension:</b>  | Length (213mm)*Width (160mm)*High (44mm) |
| <b>Serial Number:</b>       | 171212061                                |
| <b>EUT Received Date:</b>   | 2017.12.14                               |

### Objective

This report is prepared on behalf of *Xiamen Yeastar Information Technology Co., Ltd.* in accordance with: Part 2-Subpart J, Part 22-Subpart H, and Part 24-Subpart E of the Federal Communications Commission's rules.

The objective is to determine compliance with FCC Rules for output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, spurious radiated emission, frequency stability and band edge.

### Related Submittal(s)/Grant(s)

N/A.

### Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J, Part 22 Subpart H, Part 24 Subpart E.

Applicable Standards: TIA/EIA 603-D-2010.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp.(Dongguan).

### Measurement Uncertainty

| Parameter                     | Measurement Uncertainty                      |
|-------------------------------|----------------------------------------------|
| Occupied Channel Bandwidth    | ±5 %                                         |
| RF output power, conducted    | ±0.61dB                                      |
| Unwanted Emissions, radiated  | 30MHz ~ 1GHz: 5.85 dB<br>1G~26.5GHz: 5.23 dB |
| Unwanted Emissions, conducted | ±1.5 dB                                      |
| Temperature                   | ±1 °C                                        |
| Humidity                      | ±5%                                          |
| DC and low frequency voltages | ±0.4%                                        |
| Duty Cycle                    | 1%                                           |

### **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218,the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

## SYSTEM TEST CONFIGURATION

### Justification

The EUT was configured for testing according to TIA/EIA-603-D 2010.

The device build in a certified module, module model number: M35, FCC ID: XMR201605M35, certified on 2016-06-15. The module was built into this device only shield the GPRS function by software.

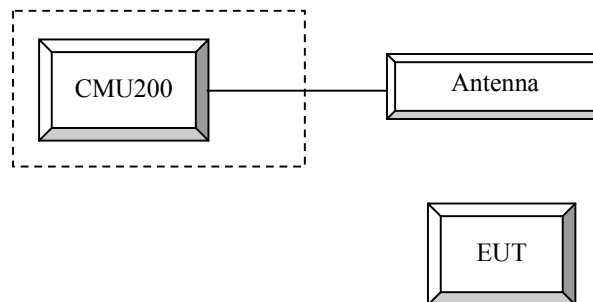
### Equipment Modifications

No modification was made to the EUT.

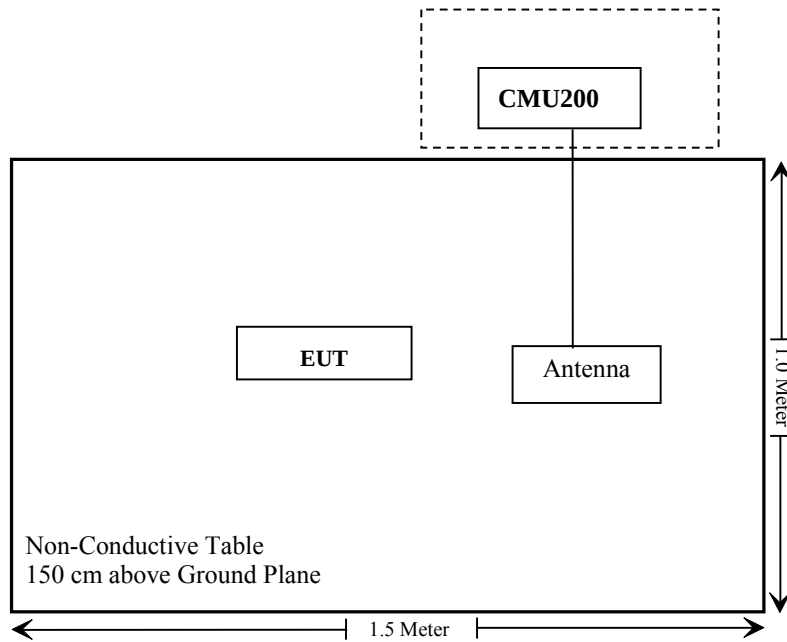
### Support Equipment List and Details

| Manufacturer | Description                          | Model  | Serial Number |
|--------------|--------------------------------------|--------|---------------|
| R&S          | Universal Radio Communication Tester | CMU200 | 109038        |

### Configuration of Test Setup



## Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

| FCC Rules                                | Description of Test                                                    | Result         |
|------------------------------------------|------------------------------------------------------------------------|----------------|
| §1.1310, §2.1091                         | Maximum Permissible Exposure                                           | Compliance     |
| §2.1046;<br>§ 22.913 (a); § 24.232 (c)   | RF Output Power                                                        | Compliance     |
| § 2.1047                                 | Modulation Characteristics                                             | Not Applicable |
| § 2.1049; § 22.905<br>§ 22.917; § 24.238 | Occupied Bandwidth                                                     | Compliance*    |
| § 2.1051,<br>§ 22.917 (a); § 24.238 (a)  | Spurious Emissions at Antenna Terminal                                 | Compliance*    |
| § 2.1053<br>§ 22.917 (a); § 24.238 (a)   | Field Strength of Spurious Radiation                                   | Compliance     |
| § 22.917 (a); § 24.238 (a)               | Out of band emission, Band Edge                                        | Compliance*    |
| § 2.1055<br>§ 22.355; § 24.235           | Frequency stability vs. temperature<br>Frequency stability vs. voltage | Compliance*    |

**Note:**

Compliance\*: For the conducted data please refer to the module M35's report NO. 16050015-FCC-R, FCC ID: XMR201605M35, which was issued on 2016-06-12 by SIEMIC (SHENZHEN-CHINA) LABORATORIES.

## **FCC §1.1310, §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

### **Applicable Standard**

According to subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                                      |                                      |                                          |                                 |
|----------------------------------------------------------------|--------------------------------------|--------------------------------------|------------------------------------------|---------------------------------|
| <b>Frequency Range (MHz)</b>                                   | <b>Electric Field Strength (V/m)</b> | <b>Magnetic Field Strength (A/m)</b> | <b>Power Density (mW/cm<sup>2</sup>)</b> | <b>Averaging Time (minutes)</b> |
| 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;

### **Calculation Formula:**

Prediction of power density at the distance of the applicable MPE limit:

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

**Calculated Data:**

| Mode    | Frequency (MHz) | Antenna Gain |           | Tune-up Power Source Based time Average Power |        | Evaluation Distance (cm) | Power Density         | MPE Limit             |
|---------|-----------------|--------------|-----------|-----------------------------------------------|--------|--------------------------|-----------------------|-----------------------|
|         |                 | (dBi)        | (numeric) | (dBm)                                         | (mW)   |                          | (mW/cm <sup>2</sup> ) | (mW/cm <sup>2</sup> ) |
| GSM850  | 824-849         | 2.5          | 1.78      | 24.5                                          | 281.84 | 20.00                    | 0.10                  | 0.55                  |
| GSM1900 | 1850-1910       | 3            | 2.00      | 21.5                                          | 141.25 | 20.00                    | 0.06                  | 1.00                  |

Note:

The antenna gain is 2.5dBi for Cellular band and 3.0 dBi for PCS band.

The maximum Source based time average power including tune-up tolerance is 24.5dBm for GSM850 and 21.5 dBm for GSM1900 band.

2 module may transmit simultaneously. Maximum rate should be 4 modules work on Cellular band at difference channel:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$$=2 * 0.1/0.55=0.36 < 1$$

**Result: Compliance,** The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance  $\geq 20$  cm.

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## **FCC §2.1047 - MODULATION CHARACTERISTIC**

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According to FCC § 2.1047(d), Part 22H & 24E, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

## **FCC § 2.1046, § 22.913 (a) & § 24.232 (c) - RF OUTPUT POWER**

### **Applicable Standard**

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications..

According to §24.232 (d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### **Test Procedure**

#### **GSM/GPRS**

Function: Menu select > GSM Mobile Station > GSM 850/1900

Press Connection control to choose the different menus

Press RESET > choose all the reset all settings

Connection Press Signal Off to turn off the signal and change settings

Network Support > GSM + GPRS or GSM + EGSM

Main Service > Packet Data

Service selection > Test Mode A – Auto Slot Config. off

MS Signal Press Slot Config Bottom on the right twice to select and change the number of time slots and power setting

> Slot configuration > Uplink/Gamma

> 33 dBm for GPRS 850

> 30 dBm for GPRS 1900

BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel

Frequency Offset > + 0 Hz

Mode > BCCH and TCH

BCCH Level > -85 dBm (May need to adjust if link is not stable)

BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]

Channel Type > Off

P0 > 4 dB

Slot Config > Unchanged (if already set under MS signal)

TCH > choose desired test channel

Hopping > Off

Main Timeslot > 3

Network Coding Scheme > CS4 (GPRS)

Bit Stream > 2E9-1 PSR Bit Stream

AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input

Connection Press Signal on to turn on the signal and change settings

*Radiated method:*

ANSI/TIA-603-D section 2.2.17

### Test Equipment List and Details

| Manufacturer   | Description                          | Model         | Serial Number | Calibration Date | Calibration Due Date |
|----------------|--------------------------------------|---------------|---------------|------------------|----------------------|
| R&S            | EMI Test Receiver                    | ESCI          | 100224        | 2017-12-11       | 2018-12-11           |
| Sunol Sciences | Antenna                              | JB3           | A060611-1     | 2017-11-10       | 2020-11-10           |
| R&S            | Spectrum Analyzer                    | FSEM          | 831259/019    | 2017-07-18       | 2018-07-18           |
| ETS LINDGREN   | Horn Antenna                         | 3115          | 000 527 35    | 2016-01-05       | 2019-01-04           |
| TDK RF         | Horn Antenna                         | HRN-0118      | 130 084       | 2016-01-05       | 2019-01-04           |
| HP             | Signal Generator                     | 1026          | 320408        | 2017-12-14       | 2018-12-14           |
| EMCO           | Adjustable Dipole Antenna            | 3121C         | 9109-753      | N/A              | N/A                  |
| N/A            | Coaxial Cable                        | C-2.4J2.4J-50 | C-0700-01     | 2017-06-27       | 2018-06-27           |
| N/A            | Coaxial Cable                        | C-NJNJ-50     | C-0400-01     | 2017-09-05       | 2018-09-05           |
| N/A            | Coaxial Cable                        | C-NJNJ-50     | C-0075-01     | 2017-09-05       | 2018-09-05           |
| N/A            | Coaxial Cable                        | C-NJNJ-50     | C-1000-01     | 2017-09-05       | 2018-09-05           |
| R&S            | Universal Radio Communication Tester | CMU200        | 106 891       | 2017-12-14       | 2018-12-14           |

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 24.1 °C   |
| <b>Relative Humidity:</b> | 35 %      |
| <b>ATM Pressure:</b>      | 101.1 kPa |

*The testing was performed by Blake yang on 2018-01-03.*

Test Result: Compliance.

The Conducted output power please refer to the Module test report. ERP and EIRP please refer to the following:

## ERP &amp; EIRP

## Part 22H &amp; Part 24E

| Frequency<br>(MHz)     | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                        |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| GSM850 Middle Channel  |                |                               |                               |                              |                    |                            |                |                |
| 836.600                | H              | 97.56                         | 22.6                          | 0.0                          | 1                  | 21.6                       | 38.45          | 16.9           |
| 836.600                | V              | 105.35                        | 33.6                          | 0.0                          | 1                  | 32.6                       | 38.45          | 5.9            |
| GSM1900 middle channel |                |                               |                               |                              |                    |                            |                |                |
| 1880.000               | H              | 91.82                         | 18.9                          | 11.1                         | 1.6                | 28.4                       | 33.00          | 4.6            |
| 1880.000               | V              | 91.64                         | 18.5                          | 11.1                         | 1.6                | 28.0                       | 33.00          | 5.0            |

Note:

- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level

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## **FCC §2.1053, §22.917 & §24.238 - SPURIOUS RADIATED EMISSIONS**

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### **Applicable Standard**

FCC § 2.1053, §22.917 and § 24.238.

### **Test Procedure**

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg (\text{TXpwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $43 + 10 \text{Log}_{10} (\text{power out in Watts})$

**Test Equipment List and Details**

| Manufacturer          | Description                          | Model         | Serial Number      | Calibration Date | Calibration Due Date |
|-----------------------|--------------------------------------|---------------|--------------------|------------------|----------------------|
| R&S                   | EMI Test Receiver                    | ESCI          | 100224             | 2017-12-11       | 2018-12-11           |
| Sunol Sciences        | Antenna                              | JB3           | A060611-1          | 2017-11-10       | 2020-11-10           |
| HP                    | Amplifier                            | 8447D         | 2727A05902         | 2017-09-05       | 2018-09-05           |
| R&S                   | Spectrum Analyzer                    | FSEM          | 831259/019         | 2017-07-18       | 2018-07-18           |
| TDK RF                | Horn Antenna                         | HRN-0118      | 130 084            | 2016-01-05       | 2019-01-04           |
| ETS LINDGREN          | Horn Antenna                         | 3115          | 000 527 35         | 2016-01-05       | 2019-01-04           |
| Mini                  | Pre-amplifier                        | ZVA-183-S+    | 5969001149         | 2017-09-05       | 2018-09-05           |
| HP                    | Signal Generator                     | 1026          | 320408             | 2017-12-14       | 2018-12-14           |
| EMCO                  | Adjustable Dipole Antenna            | 3121C         | 9109-753           | N/A              | N/A                  |
| Ducommun Technologies | Horn Antenna                         | ARH-4223-02   | 1007726-02<br>1304 | 2016-11-18       | 2019-11-18           |
| Ducommun Technologies | Horn Antenna                         | ARH-4223-02   | 1007726-01<br>1304 | 2016-11-18       | 2019-11-18           |
| N/A                   | Coaxial Cable                        | C-2.4J2.4J-50 | C-0700-01          | 2017-06-27       | 2018-06-27           |
| N/A                   | Coaxial Cable                        | C-NJNJ-50     | C-0400-01          | 2017-09-05       | 2018-09-05           |
| N/A                   | Coaxial Cable                        | C-NJNJ-50     | C-0075-01          | 2017-09-05       | 2018-09-05           |
| N/A                   | Coaxial Cable                        | C-NJNJ-50     | C-1000-01          | 2017-09-05       | 2018-09-05           |
| R&S                   | Universal Radio Communication Tester | CMU200        | 106 891            | 2017-12-14       | 2018-12-14           |
| R&S                   | Universal Radio Communication Tester | CMU200        | 109 038            | 2017-07-21       | 2018-07-21           |
| R&S                   | Universal Radio Communication Tester | CMU200        | 110822             | 2017-12-14       | 2018-12-14           |
| R&S                   | Universal Radio Communication Tester | CMU200        | 106 843            | 2017-12-14       | 2018-12-14           |

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 20.3 °C   |
| <b>Relative Humidity:</b> | 31 %      |
| <b>ATM Pressure:</b>      | 102.7 kPa |

The testing was performed by Blake yang on 2017-12-21.

EUT Operation Mode: Transmitting

**Cellular Band (PART 22H)****30 MHz-10 GHz:**

| Frequency<br>(MHz)                                                                 | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|------------------------------------------------------------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                                                                    |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| 2 module transmission in one band was the worst, Frequency:<br>836.6 MHz+824.2 MHz |                |                               |                               |                              |                    |                            |                |                |
| 1673.200                                                                           | H              | 43.25                         | -59.4                         | 10.5                         | 1.3                | -50.2                      | -13.0          | 37.2           |
| 1673.200                                                                           | V              | 42.13                         | -60.5                         | 10.5                         | 1.3                | -51.3                      | -13.0          | 38.3           |
| 1648.400                                                                           | H              | 44.04                         | -58.7                         | 10.4                         | 1.3                | -49.6                      | -13.0          | 36.6           |
| 1648.400                                                                           | V              | 42.25                         | -60.4                         | 10.4                         | 1.3                | -51.3                      | -13.0          | 38.3           |
| 208.000                                                                            | H              | 43.25                         | -65.5                         | 0.0                          | 0.5                | -66.0                      | -13.0          | 53.0           |
| 208.000                                                                            | V              | 44.13                         | -66.7                         | 0.0                          | 0.5                | -67.2                      | -13.0          | 54.2           |

**PCS Band (PART 24E)****30 MHz-20 GHz:**

| Frequency<br>(MHz)                                                                | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|-----------------------------------------------------------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                                                                   |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| 2 module transmission in one band was the worst, Frequency:<br>1880 MHz+1852.2MHz |                |                               |                               |                              |                    |                            |                |                |
| 3760.000                                                                          | H              | 44.23                         | -53.5                         | 12.3                         | 1.5                | -42.7                      | -13.0          | 29.7           |
| 3760.000                                                                          | V              | 43.01                         | -54.4                         | 12.3                         | 1.5                | -43.6                      | -13.0          | 30.6           |
| 3700.400                                                                          | H              | 45.21                         | -52.7                         | 12.2                         | 1.5                | -42.0                      | -13.0          | 29.0           |
| 3700.400                                                                          | V              | 43.16                         | -54.2                         | 12.2                         | 1.5                | -43.5                      | -13.0          | 30.5           |
| 326.000                                                                           | H              | 43.23                         | -64.4                         | 0.0                          | 0.5                | -64.9                      | -13.0          | 51.9           |
| 326.000                                                                           | V              | 44.51                         | -65                           | 0.0                          | 0.5                | -65.5                      | -13.0          | 52.5           |

Note:

- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level

**\*\*\*\*\* END OF REPORT \*\*\*\*\***