



# FCC PART 22H, PART 24E

## MEASUREMENT AND TEST REPORT

For

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

4th Floor, NO 29 Wanghai Road, 2nd Software Park, Xiamen, China

**FCC ID: Z7C-TG400**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Gateway
<b>Test Engineer:</b> <u>Dean Liu</u> 	
<b>Report Number:</b> <u>RXM150116050-00B</u>	
<b>Report Date:</b> <u>2015-01-26</u>	
<b>Reviewed By:</b> <u>Sula Huang</u>  <u>RF Engineer</u>	
<b>Test Laboratory:</b> Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

## **TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
TEST FACILITY .....	3
<b>SYSTEM TEST CONFIGURATION .....</b>	<b>4</b>
JUSTIFICATION .....	4
EQUIPMENT MODIFICATIONS .....	4
EUT EXERCISE SOFTWARE .....	4
SUPPORT EQUIPMENT LIST AND DETAILS .....	4
CONFIGURATION OF TEST SETUP .....	4
BLOCK DIAGRAM OF TEST SETUP .....	5
<b>SUMMARY OF TEST RESULTS .....</b>	<b>6</b>
<b>FCC §1.1310 &amp; §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE).....</b>	<b>7</b>
APPLICABLE STANDARD .....	7
<b>FCC § 2.1046, § 22.913 (A) &amp; § 24.232 (C) - RF OUTPUT POWER.....</b>	<b>9</b>
APPLICABLE STANDARD .....	9
TEST PROCEDURE .....	9
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST DATA .....	12
<b>FCC §2.1053, §22.917 &amp; §24.238 - SPURIOUS RADIATED EMISSIONS .....</b>	<b>13</b>
APPLICABLE STANDARD .....	13
TEST PROCEDURE .....	13
TEST EQUIPMENT LIST AND DETAILS.....	13
TEST DATA .....	14

## GENERAL INFORMATION

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

The *Xiamen Yeastar Information Technology Co., Ltd.*'s product, model number: *NeoGate TG400 (FCC ID: Z7C-TG400)* (or the "EUT") in this report was a *Gateway*, which was measured approximately: 21.3 cm (L) x 16.5 cm (W) x 4.5 cm (H). rated input voltage: AC 120V/60Hz.

*\*All measurement and test data in this report was gathered from production sample serial number: 150116050(Assigned by BACL Dongguan). The EUT was received on 2015-01-19.*

### 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)

FCC Part 15B JBP submissions with FCC ID: Z7C-TG400

### 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 as well as the following parts:

Part 22 Subpart H – Public Mobile Services  
Part 24 Subpart E – Personal Communication Services

Applicable Standards: TIA/EIA 603-D-2010, ANSI C63.4-2003.

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

### 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 Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Justification

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

The test items were performed with the EUT operating at testing mode.

### Equipment Modifications

No modification was made to the EUT.

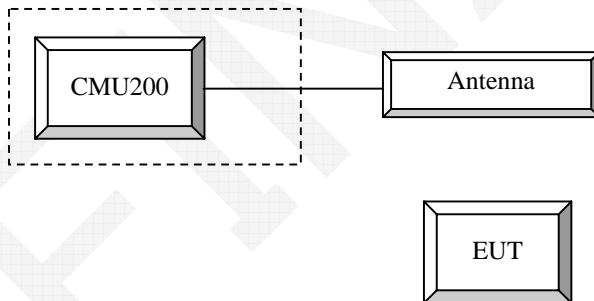
### EUT Exercise Software

No exercise software was used in testing.

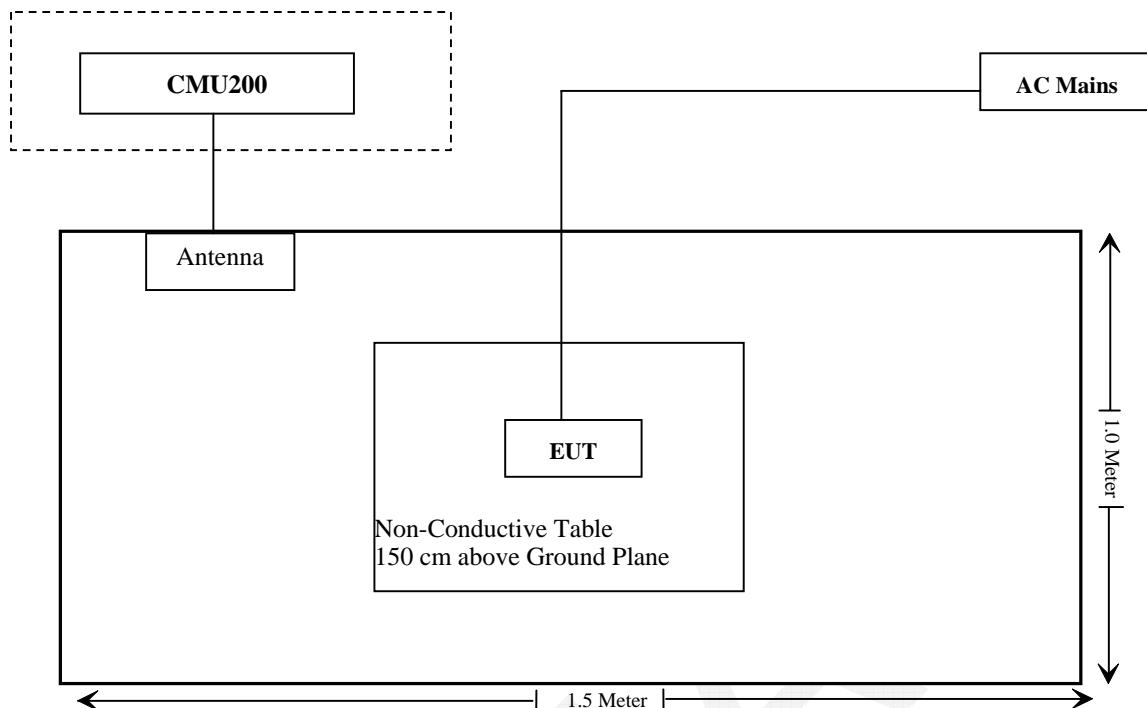
### Support Equipment List and Details

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 RF Exposure (MPE)	Compliance
§2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Compliance*
§ 2.1049; § 22.905 § 22.917; § 24.238	Occupied Bandwidth	Compliance*
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliance*
§ 2.1053 § 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 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance*

Note:

Compliance\*: the EUT has used 4 same certified modules (FCC ID: UDV-201314, certified on 2014-01-23), the test please refer to the module report.

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

### Applicable Standard

According to subpart 15.247(i) and 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) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
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;

According to §1.1310 and §2.1091 RF exposure is calculated.

### Calculated Formulary:

Predication of MPE limit at a given distance

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

The device contains 4 same RF modules, the rated output power and antenna gain in the below table:

Frequency Bands	Antenna Gain		Max. Conducted Output Power		P*G (mW)
	(dBi)	(numeric)	(dBm)	(mW)	
GSM 850	2.50	1.78	33.30	2137.96	3801.89
PCS 1900	3.00	2.00	28.70	741.31	1479.11

Note: the Max. Conducted output power was the total power contained Max. tune-up tolerance.

Power Density limit for GSM 850 is:

$$824.2/1500 = 0.55 \text{ mW/cm}^2$$

Power Density limit for PCS 1900 is:

$$1.0 \text{ mW/cm}^2$$

The 4 modules can transmit simultaneously,

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

The worst mode is all of the 4 module working at GSM850 band,

$$\Rightarrow P_1 * G_1 / 4\pi R^2 + P_2 * G_2 / 4\pi R^2 + P_3 * G_3 / 4\pi R^2 + P_4 * G_4 / 4\pi R^2 < 0.55$$

$$\Rightarrow 4 * (3801.89) / 4\pi R^2 < 0.55$$

$$\Rightarrow R^2 > 4 * (3801.89) / (0.55 * 4\pi)$$

$$\Rightarrow R > 46.92 \text{ cm}$$

**Result:** The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at the distance more than 46.92 cm.

## 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..

### Test Procedure

#### GSM

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 + only

MS Signal

> 33 dBm for GSM 850

> 30 dBm for GSM 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

TCH > choose desired test channel

Hopping > Off

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

#### 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 Connection Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input  
 Press Signal on to turn on the signal and change settings

## UMTS Rel 99

	Mode	Rel99
	Subtest	-
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	HSDPA FRC	Not Applicable
	HSUPA Test	Not Applicable
	Power Control Algorithm	Algorithm2
	$\beta_c$	Not Applicable
	$\beta_d$	Not Applicable
	$\beta_{ec}$	Not Applicable
	$\beta_c/\beta_d$	8/15
	$\beta_{hs}$	Not Applicable
	$\beta_{ed}$	Not Applicable

## UMTS Rel 6 HSDPA

	Mode	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA
WCDMA General Settings	Subtest	1	2	3	4
	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	HSUPA Test	Not Applicable			
	Power Control Algorithm	Algorithm 2			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	$\beta_{ec}$	-	-	-	-
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
HSDPA Specific Settings	$\beta_{hs}$	4/15	24/15	30/15	30/15
	$\beta_{ed}$	Not Applicable			
	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

## UMTS Rel 6 HSPA (HSDPA &amp; HSUPA)

	Mode	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	
	Subtest	1	2	3	4	5	
WCDMA General Settings	Loopback Mode	Test Mode 1					
	Rel99 RMC	12.2kbps RMC					
	HSDPA FRC	H-Set1					
	HSUPA Test	HSUPA Loopback					
	Power Control Algorithm	Algorithm2					
	$\beta_c$	11/15	6/15	15/15	2/15	15/15	
	$\beta_d$	15/15	15/15	9/15	15/15	0	
	$\beta_{ec}$	209/225	12/15	30/15	2/15	5/15	
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	-	
	$\beta_{hs}$	22/15	12/15	30/15	4/15	5/15	
HSDPA Specific Settings	$\beta_{ed}$	1309/225	94/75	47/15	56/75	47/15	
	DACK	8					
	DNAK	8					
	DCQI	8					
	Ack-Nack repetition factor	3					
	CQI Feedback (Table 5.2B.4)	4ms					
HSUPA Specific Settings	CQI Repetition Factor (Table 5.2B.4)	2					
	$A_{hs} = \beta_{hs}/\beta_c$	30/15					
	D E-DPCCH	6	8	8	5	7	
	DHARQ	0	0	0	0	0	
	AG Index	20	12	15	17	12	
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	67	
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9	
	Reference E_TFCIs	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27			E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		

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	2014-05-09	2015-05-09
Sunol Sciences	Antenna	JB3	A060611-3	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2014-09-01	2015-09-01
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-09	2015-05-09
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-19
Giga	Signal Generator	1026	320408	2014-05-09	2015-05-09
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2012-09-06	2015-09-06

\* **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

Temperature:	22 °C
Relative Humidity:	387 %
ATM Pressure:	101.3 kPa

The testing was performed by Dean Liu on 2015-01-24.

### ERP & EIRP

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>GSM 850</b>								
848.800	H	102.41	27.6	0.0	1	26.6	38.45	11.9
848.800	V	104.29	32.6	0.0	1	31.6	38.45	6.9
<b>PCS 1900</b>								
1909.800	H	87.11	15.8	11.8	1.4	26.2	33.0	6.8
1909.800	V	93.47	22.4	11.8	1.4	32.8	33.0	0.2

Note: Please refer to the certified module (FCC ID: UDV-201314) report for the antenna port output power.

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

### 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 =  $43 + 10 \log_{10} (\text{power out in Watts})$

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2014-05-09	2015-05-09
Sunol Sciences	Antenna	JB3	A060611-3	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2014-09-01	2015-09-01
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-09	2015-05-09
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-19
Giga	Signal Generator	1026	320408	2014-05-09	2015-05-09
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2012-09-06	2015-09-06

\* **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>	20.4 °C
<b>Relative Humidity:</b>	61 %
<b>ATM Pressure:</b>	101.3 kPa

The testing was performed by Dean Liu on 2015-01-24.

EUT Operation Mode: Transmitting

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>GSM850, Test Frequency:836.600MHz</b>								
1673.200	H	77.25	-23.8	10.6	1.5	-14.7	-13.0	1.7*
1673.200	V	77.72	-23.7	10.6	1.5	-14.6	-13.0	1.6*
2509.800	H	57.64	-40.4	13.1	2.8	-30.1	-13.0	17.1
2509.800	V	58.56	-38.5	13.1	2.8	-28.2	-13.0	15.2
250.000	H	37.25	-70.9	0.0	0.5	-71.4	-13.0	58.4
250.000	V	36.24	-69.5	0.0	0.5	-70.0	-13.0	57.0
<b>PCS 1900, Test Frequency:1880.000MHz</b>								
3760.000	H	32.24	-62.1	13.8	2.9	-51.2	-13.0	38.2
3760.000	V	33.12	-59.9	13.8	2.9	-49.0	-13.0	36.0
305.000	H	32.54	-74.3	0.0	0.5	-74.8	-13.0	61.8
305.000	V	31.83	-72.5	0.0	0.5	-73.0	-13.0	60.0

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 = SG Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level

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