



# FCC Test Report

**Product Name: Remote Radio Unit of GSM Distributed Base Station**

**Model Number: RRU3008**

**Report No: SYBH (R) SYBH(R)072042009EB-1  
FCC ID: QISR RU3008-850**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

Tel: +86 755 28780808 Fax: +86 755 89652518

## Notice

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has obtained the accreditation of THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION (A2LA), and Accreditation Council Certificate Number: 2174.01.
3. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
4. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-1.
5. The laboratory also has been listed by the VCCI to perform EMC measurements. The accreditation number is R2364, C2583, and T256.
6. The test report is invalid if not marked with "exclusive stamp for the test report".
7. The test report is invalid if not marked with the stamps or the signatures of the persons responsible for performing, revising and approving the test report.
8. The test report is invalid if there is any evidence of erasure and/or falsification.
9. If there is any dissidence for the test report, please file objection to the test centre within 15 days from the date of receiving the test report.
10. Normally, the test report is only responsible for the samples that have undergone the test.
11. Context of the test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of the laboratory.



**REPORT ON** FCC Test of Remote Radio Unit of GSM Distributed Base Station

Model Name: RRU3008

Report No: SYBH (R) SYBH(R)072042009EB-1

FCC ID: QISRRU3008-850

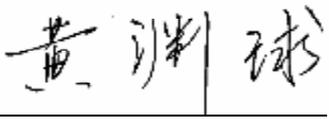
**REGULATION** 47 CFR FCC Part 2, Subpart J

47 CFR FCC Part22,Subpart H

**CONCLUSION** PASSED

<b>General Manager</b>	<b>2009-05-20</b>	<b>张兴海</b>	
	Date (yyyy-mm-dd)	Name	

<b>Technical Responsibility For Area of Testing</b>	<b>2009-05-20</b>	<b>余辉</b>	
	Date (yyyy-mm-dd)	Name	

<b>Test Lab Engineer</b>	<b>2009-05-20</b>	<b>黄渊球</b>	
	Date (yyyy-mm-dd)	Name	



## Contents

<b>1</b>	<b><u>Summary</u></b> .....	<b>5</b>
<b>2</b>	<b><u>Product Description</u></b> .....	<b>6</b>
2.1	PRODUCTION INFORMATION OF EUT .....	6
2.2	MODIFICATION INFORMATION .....	6
<b>3</b>	<b><u>Test Site Description</u></b> .....	<b>7</b>
3.1	TESTING PERIOD .....	7
3.2	APPLIED STANDARDS .....	7
<b>4</b>	<b><u>Product Description</u></b> .....	<b>8</b>
4.1	TECHNICAL CHARACTERISTICS .....	8
4.2	EUT IDENTIFICATION LIST .....	10
<b>5</b>	<b><u>Main Test Instruments</u></b> .....	<b>11</b>
<b>6</b>	<b><u>Transmitter Measurements</u></b> .....	<b>12</b>
6.1	MAXIMUM CHANNEL POWER.....	13
6.2	MODULATION CHARACTERISTICS.....	16
6.3	OCCUPIED BANDWIDTH .....	18
6.4	BAND EDGES COMPLIANCE.....	20
6.5	SPURIOUS EMISSION AT ANTENNA TERMINAL.....	22
6.6	RADIATED SPURIOUS EMISSION .....	25
6.7	FREQUENCY STABILITY .....	29
<b>7</b>	<b><u>System Measurement Uncertainty</u></b> .....	<b>32</b>



# 1 Summary

The table below summarizes the measurements and results for the equipment of Remote Radio Unit GSM Distributed Base Station - RRU3008. Detailed results and descriptions are shown in the following pages.

Table 1. Summary of results for FCC requirements for Cellular Band

Test Item		FCC Part 22 Cellular (22H)	Test Results	Remark
Name	Specification			
RF Power Output (instead of ERP/EIRP)	§ 2.1046	§ 22.913	PASS	
Modulation Characteristics	§ 2.1047	§ ---	PASS	
Occupied Bandwidth	§ 2.1049	§ ---	PASS	
Out of Band Emissions - Band Edge	§ 2.1051	§ 22.917	PASS	
Out of Band Emissions - Spurious Emissions at Antenna Terminals	§ 2.1051	§ 22.917	PASS	
Out of Band Emissions - Field Strength of Spurious Emissions	§ 2.1053	§ 22.917	PASS	
Frequency Stability	§ 2.1055	§ 22.355	PASS	

Note: If no limits were applied, limits for product standards may be employed in this test report.



## 2 Product Description

### 2.1 Production Information of EUT

#### 2.1.1 General Description

The RRU3008 is an outdoor remote RF unit. It processes baseband signals and RF signals. The functions of the RRU3008 are as follows:

- I One RRU3008 module supports eight carriers.
- I Providing CPRI ports for communication with the BBU3900
- I The direct frequency conversion technique, which is directly implemented in the transmit channel, modulates the baseband signals into GSM RF signals. After filtered and amplified, the RF signals are transmitted to the antenna for transmission, through the duplexer in the RF front-end unit.
- I The uplink RF signals received from the antenna go through down-conversion, amplification, analog-to-digital conversion, matched filtering, Automatic Gain Control (AGC), and then are sent to the BBU3900 or macro RRU for further processing.
- I Power control and Voltage Standing Wave Ration (VSWR) detection Enabling frequency synthesis
- I Generation and recovery of the clock circuitry at the CPRI interface, and the alarm detection

#### 2.1.2 Support function and Service

The EUT supports the function and service as follows:

Table 2. Service and Test Mode List

Service Name	Characteristic	Corresponding Test Mode	Remark
Data and Voice	Modulation: GMSK	TM1	GSM/GPRS
Data	Modulation: 8PSK	TM2	EDGE

Note: The test conditions and settings are defined in 3GPP TS 11.21.

### 2.2 Modification Information

For original equipment, following table is not application.

Table 3. Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
Not applicable				



### 3 Test Site Description

The test site of:

***Huawei Technologies Co. Ltd.  
P.O. Box 518129  
Huawei base, Bantian,  
Longgang District, Shenzhen, China***

#### 3.1 Testing Period

The test has been performed during the period of

Date of Start (yyyy-mm-dd) : 2009-04-30

Date of End (yyyy-mm-dd) : 2009-05-20

#### 3.2 Applied Standards

##### 3.2.1 FCC Rules and Regulations

Table 4. Applied Standards

Standards Name	Standards Description
47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
47 CFR Part 22	Miscellaneous Wireless Communications Services

##### 3.2.2 Supporting Standards

Table 5. supporting standards

Standards Name	Standards Description
ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ITU-R Recommendation SM.329-10 (2003)	Unwanted emissions in the spurious domain
3GPP TS 11.21	Digital cellular telecommunications system (Phase 2+) ; Base Station System (BSS) equipment specification; Radio aspects

## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 6. Frequency Range for Cellular Band

Uplink band:	824 MHz~849 MHz
Downlink band:	869 MHz~894 MHz

#### 4.1.2 Channel Separation/Bandwidth

Table 7. Frequency Interval and Channel Separation

Channel Raster	200 kHz
Channel Spacing	200kHz

#### 4.1.3 Type of Emission

Refer to FCC part 2.201 and 2.202.

Table 8. Type of Emission

Emission Designation:	300KGXW(GMSK)/300KG7W(8PSK)
-----------------------	-----------------------------

#### 4.1.4 Rated maximum transmitter output power

The RRU module consists of two TRX channels, which are identical in designs, the conducted power is configured as to table 9 when the two TRXs are activated (A TRX is named TX1;the other one is named TX2);

Table 9. Transmit power of EUT

Actives Carrier	TX1 Output Power	TX2 Output Power
One Carrier	46dBm(GMSK) or 44.2dBm(8PSK)	0
Two Carriers	46dBm(GMSK) or 44.2dBm(8PSK)	46dBm(GMSK) or 44.2dBm(8PSK)
Three Carriers	2* 43dBm(GMSK) or 2*41.2dBm(8PSK)	1* 43dBm(GMSK) or 1*41.2dBm(8PSK)
Four Carriers	2* 41.8dBm(GMSK) or 2*40dBm(8PSK)	2* 41.8dBm(GMSK) or 2*40dBm(8PSK)
Five Carriers	3* 40.8dBm(GMSK) or 3*39dBm(8PSK)	2* 40.8dBm(GMSK) or 2*39dBm(8PSK)
Six Carriers	3* 40dBm(GMSK) or 3*38.2dBm(8PSK)	3* 40dBm(GMSK) or 3*38.2dBm(8PSK)
Seven Carriers	4* 38.5dBm(GMSK) or 4*36.7dBm(8PSK)	3* 38.5dBm(GMSK) or 3*36.7dBm(8PSK)
Eight Carriers	4* 37.4dBm(GMSK) or 3*35.6dBm(8PSK)	4* 37.4dBm(GMSK) or 3*35.6dBm(8PSK)

#### 4.1.5 Environmental Requirements

Table 10. Environmental Requirements

Minimum temperature:	-40 °C
Maximum temperature:	50 °C
Relative Humidity:	5% to 95% RH

#### 4.1.6 Power Source

Table 11. DC Power Source

DC voltage nominal:	=== -48V
DC voltage range:	=== -36V to === -57V
DC current maximal:	10.5A

#### 4.1.7 Tune-up Procedure

Refer to FCC 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.



## 4.2 EUT Identification List

### 4.2.1 Component Parts Information

Table 12. Component Parts Information

No.	Module Name	Qty	Hardware Version	Serial	Description
1	RRU3008	1	VER.E	21023162011093000000	Remote Radio Unit of GSM Distributed Base Station

### 4.2.2 Adapter Technical Data

Not Applicable for BTS.

### 4.2.3 Battery Technical Data

Not Applicable for BTS.

### 4.2.4 FCC Identification

Grantee Code: QIS  
Product Code: RRU3008-850  
FCC Identification: QISRRU3008-850



## 5 Main Test Instruments

Table 13. Main Test Equipments

Description	Manufacturer	Model	S/N	Cal. Due
Signal Analyzer	R&S	FSQ40	100025	2009-10-5
Vector Signal Generator	Agilent	E4438C	MY47271904	2009-9-9
Power meter	R&S	NRP-Z11	100740	2009-10-22
Receiver	R&S	ESU26	100144	2010-4-21
BiLog Antenna	Schaffner	CBL6112B	25221	2010-2-23
Horn Antenna	R&S	FH906	359287	2010-1-23
Power amplifier	Agilent	8447D	2944A10146	2010-05-12

## 6 Transmitter Measurements

The EUT consists of two TRX channels, Ch-A and Ch-B, which are identical in designs. Each channel can support up to eight carriers. These two channels can be configured as follow, so in the report ,every test is carried out under one TRX is activated.

For tests in this report, typical operating frequency points (channels) were used, which include bottom/lowest channel (B), middle channel (M) and top/highest channel (T) of each frequency block as the table below. The channel 128 and channel 251 aren't used for the RRU.

Table 14. Frequency points (channels) selected to perform tests

Transmitter Operating Band	Multi-Carriers	Channels No.		
		Channel B	Channel M	Channel T
Cellular Band:	1	No:129 869.4MHz	No:192 882MHz	No:250 893.6MHz
	2	No:129/132 869.4MHz/870MHz	No:192/195 882MHz/882.6MHz	No:247/250 893MHz/893.6MHz
	3	No:129/132/135 869.4MHz/870MHz /870.6MHz	No:189/192/195 881.4MHz/882MHz/ 882.6MHz	No:244/247/250 892.4MHz/893MHz/ 893.6MHz
	4	No:129/132/135/138 869.4MHz/870MHz/ 870.6MHz/871.2MHz	No:189/192/195/198 881.4MHz/882MHz/ 882.6MHz/883.2MHz	No:241/244/247/250 891.8MHz/892.4MHz/ 893MHz/893.6MHz
	5	No:129/132/135/138 /141 869.4MHz/870MHz/ 870.6MHz/871.2MHz /871.8MHz	No:189/192/195/198/201 881.4MHz/882MHz/ 882.6MHz/883.2MHz /883.8MHz	No:238/241/244/247/250 891.2MHz/891.8MHz/ 892.4MHz/893MHz/ 893.6MHz
	6	No:129/132/135/138 /141/144 869.4MHz/870MHz/ 870.6MHz/871.2MHz /871.8MHz/872.4MHz	No:186/189/192/195/ 198/201 880.8MHz/881.4MHz/ 882MHz/882.6MHz /883.2MHz/883.8MHz	No:235/238/241/244/ 247/250 890.6MHz/891.2MHz/ 891.8MHz/892.4MHz/ 893MHz/893.6MHz
	7	No:129/132/135/138 /141/144/147 869.4MHz/870MHz/ 870.6MHz/871.2MHz /871.8MHz/872.4MHz/ 873MHz	No:183/186/189/192/ 195/198/201 880.2MHz/880.8MHz/881. 4MHz/882MHz/882.6MHz /883.2MHz/883.8MHz	No:232/235/238/241 /244/247/250 890MHz/890.6MHz/ 891.2MHz/891.8MHz/ 892.4MHz/ 893MHz/893.6MHz
	8	No.129/132/135/138/141 /144/147/150 869.4MHz/870MHz/ 870.6MHz/871.2MHz/ 871.8MHz/872.4MHz /873MHz/873.6MHz	No.183/186/189/192/195/ 198/201/204 880.2MHz/880.8MHz/ 881.4MHz/882MHz/ 882.6MHz/883.2MHz/ 883.8MHz/884.4MHz	No.229/232/235/238/241/ 244/247/250 889.4MHz/890MHz/ 890.6MHz/891.2MHz/ 891.8MHz/892.4MHz/ 893MHz/893.6MHz

## 6.1 Maximum Channel Power

### 6.1.1 Test Conditions

Table 15. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 °C~26°C
Relative humidity:	65%~70 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, M, T for Multi Carrier
Rated maximum transmitter output power ( $P_{max}$ ):	See 4.1.4

### 6.1.2 Test Specifications and Limits

#### 6.1.2.1 Specification

FCC part 2.1046 and part 22.913

#### 6.1.2.2 Limits

Compliance with FCC part 2.1046 and part 22.913, the effective radiated power (ERP) of base transmitters must not exceed 500 watts.

Table 16. FCC Limits for Cellular Band

Maximum ERP:	< 500 Watts (= 57 dBm)
--------------	------------------------

### 6.1.3 Test Method and Setup

The EUT was connected to the Power meter via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Maximum Channel Power of the EUT by the Power meter.

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

#### Test setup

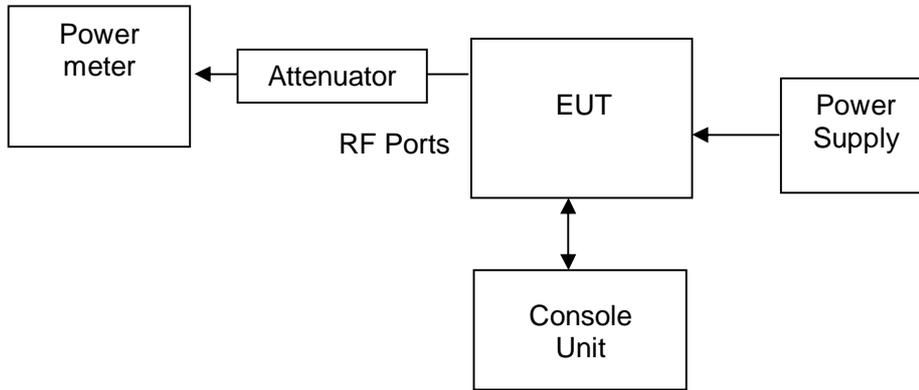


Figure 1. TEST SETUP

Note: if the EUT is RRU, the console unit consist of base band unit and console computer; if EUT is BTS, the console unit only consist of console computer.

### 6.1.4 Measurement Results

Table 17. Measurement Results for Maximum Output Power

Test Mode	Channel	Multi Carriers	Channel Number	Maximum Output Power(dBm)	Limit (dBm)
TM1	B	1	No:129	45.73	57
		2	No:129/132	48.72	
		3	No:129/132/135	47.77	
		4	No:129/132/135/138	47.78	
		5	No:129/132/135/138/141	47.75	
		6	No:129/132/135/138/141/144	47.61	
		7	No:129/132/135/138/141/144/147	46.8	
		8	No.129/132/135/138/141/144/147/150	46.26	
	M	1	No:192	45.8	
		2	No:192/195	48.70	
		3	No:189/192/195	48.12	
		4	No:189/192/195/198	47.76	
		5	No:189/192/195/198/201	47.78	
		6	No:186/189/192/195/198/201	47.58	
		7	No:183/186/189/192/195/198/201	46.78	
		8	No.183/186/189/192/195/198/201/204	46.21	
	T	1	No:250	45.81	
		2	No:247/250	48.54	
		3	No:244/247/250	47.84	
		4	No:241/244/247/250	47.75	
		5	No:238/241/244/247/250	47.67	
		6	No:235/238/241/244/247/250	47.57	
		7	No:232/235/238/241/244/247/250	46.8	
		8	No.229/232/235/238/241/244/247/250	46.19	

TM2	B	1	No:129	44.1
		2	No:129/132	47.01
		3	No:129/132/135	45.79
		4	No:129/132/135/138	45.95
		5	No:129/132/135/138/141	45.90
		6	No:129/132/135/138/141/144	45.87
		7	No:129/132/135/138/141/144/147	45.09
		8	No.129/132/135/138/141/144/147/150	44.50
	M	1	No:192	44.13
		2	No:192/195	47.02
		3	No:189/192/195	46.2
		4	No:189/192/195/198	46.05
		5	No:189/192/195/198/201	45.96
		6	No:186/189/192/195/198/201	45.82
		7	No:183/186/189/192/195/198/201	45.03
		8	No.183/186/189/192/195/198/201/204	44.44
	T	1	No:250	44.2
		2	No:247/250	46.93
		3	No:244/247/250	46.02
		4	No:241/244/247/250	45.98
		5	No:238/241/244/247/250	45.95
		6	No:235/238/241/244/247/250	45.83
		7	No:232/235/238/241/244/247/250	45
		8	No.229/232/235/238/241/244/247/250	44.49

### 6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.2 Modulation Characteristics

### 6.2.1 Test Conditions

Table 18. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 °C~26°C
Relative humidity:	65%~70 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel M

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

FCC part 2.1047 and part 22 subpart H

#### 6.2.2.2 Limits

No specific modulation characteristics requirement limits in FCC part 2.1047 and part 22 subpart H for Cellular Band.

### 6.2.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Modulation Characteristics of the EUT by the Spectrum Analyzer or equivalent.

#### Test setup

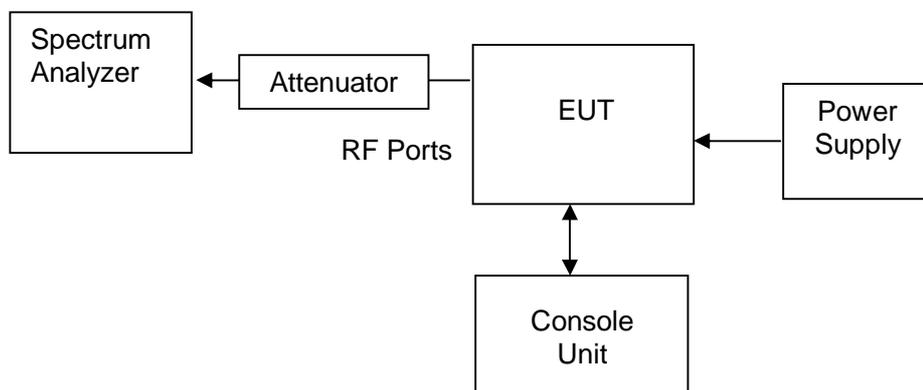


Figure 2. TEST SETUP



Note: if the EUT is RRU, the console unit consist of base band unit and console computer; if EUT is BTS, the console unit only consist of console computer.

### 6.2.4 Measurement Results

Table 19. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics	
	No.192 882MHz	
	Type/Mode	Remark
TM1	GMSK	See Appendix A
TM2	8PSK	See Appendix A

### 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to Appendix A.



### 6.3 Occupied Bandwidth

#### 6.3.1 Test Conditions

Table 20. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 °C
Relative humidity:	70 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, M, T

#### 6.3.2 Test Specifications and Limits

##### 6.3.2.1 Specification

FCC part 2.1047 and part 22 subpart H

##### 6.3.2.2 Limits

No specific occupied bandwidth requirement in FCC part 2.1047 and part 22 subpart H for Cellular Band.

#### 6.3.3 Test Method and Setup

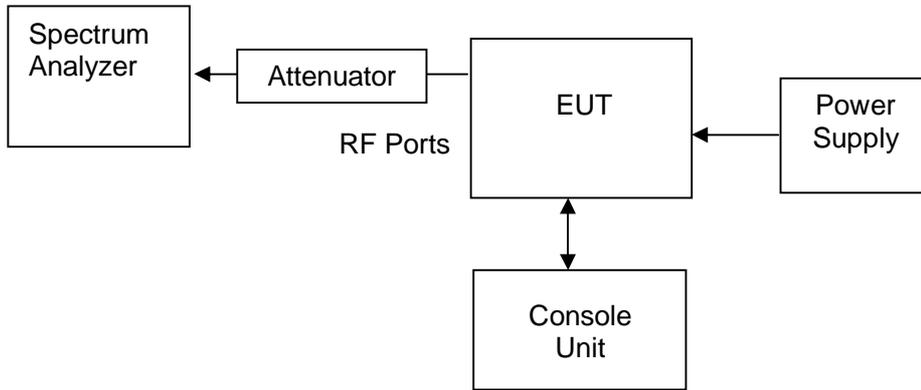
The EUT was connected to the Spectrum Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Occupied Bandwidth of the EUT by the Spectrum Analyzer or equivalent.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured (as 99% bandwidth).

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent:

Cellular band:	2 kHz
----------------	-------

#### Test setup



**Figure 3.** TEST SETUP

Note: if the EUT is RRU, the console unit consist of base band unit and console computer; if EUT is BTS, the console unit only consist of console computer.

### 6.3.4 Measurement Results

Table 21. Measurement Results for Occupied Bandwidth

Test Mode	Channel Number	Occupied Bandwidth(MHz)	Limits
TM1	No.129 869.4MHz	0.246	NA
	No.192 882MHz	0.245	
	No.250 893.6MHz	0.246	
TM2	No.129 869.4MHz	0.246	
	No.192 882MHz	0.253	
	No.250 893.6MHz	0.246	

### 6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to Appendix B.

## 6.4 Band Edges Compliance

### 6.4.1 Test Conditions

Table 22. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 °C~26°C
Relative humidity:	65%~70 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, T for Multi Carrier 1,8
Rated maximum transmitter output power ( $P_{max}$ ):	See 4.1.4

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

FCC part 2.1047 and part 22.917

#### 6.4.2.2 Limits

Compliance with FCC part 2.1047 and part 22.917, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, and the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

Table 23. FCC Limits for Cellular Band

Limit:	$< P - (43 + 10\log_{10}P) = 10\log_{10}(1000 * P) - (43 + 10\log_{10}P) = 30 - 43 = -13\text{dBm}$
--------	---

### 6.4.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Band Edge Spurious Emissions of the EUT by the Spectrum Analyzer or equivalent.

Set the Spectrum Analyzer or equivalent in power averaging mode and resolution bandwidth (RBW) as close to 1.0% of the emission bandwidth as possible. Set the sweep span to cover at least  $\pm 250\%$  of the emission bandwidth or 2 MHz, which is larger.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent:

Cellular band:	2 kHz
----------------	-------

## Test setup

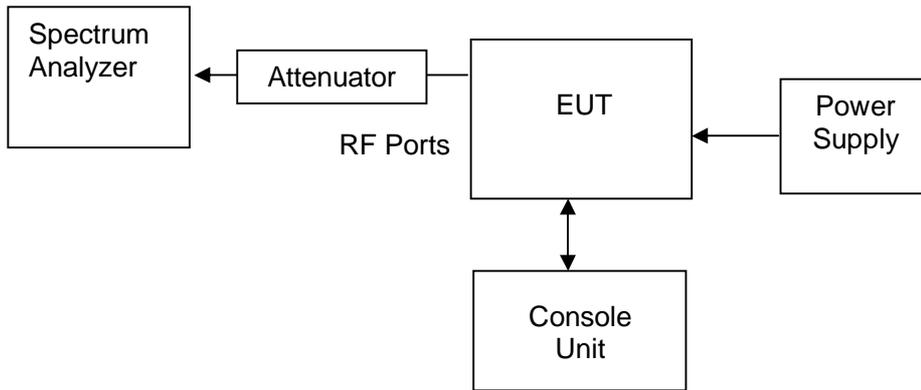


Figure 4. TEST SETUP

Note: if the EUT is RRU, the console unit consist of base band unit and console computer; if EUT is BTS, the console unit only consist of console computer.

## 6.4.4 Measurement Results

Table 24. Measurement Results for Band Edge Characteristics

Test Mode	Channel Number	Multi Carriers	Test Frequency Range (MHz)	Maximum Spurious Level measured(dBm)	Limit(dBm)
TM1	No.129	1	868 – 869	-29.16	-13
	No.129/132/135/138/ 141/144/147/150	8		-32.46	
	No.250	1	894 – 895	-33.41	
	No.229/232/235/238/ 241/244/247/250	8		-40.36	
TM2	No.129	1	868 – 869	-28.74	
	No.129/132/135/138/ 141/144/147/150	8		-41.4	
	No.250	1	894 – 895	-31.94	
	No.229/232/235/238/ 241/244/247/250	8		-38.79	

## 6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to Appendix C.

## 6.5 Spurious Emission at Antenna Terminal

### 6.5.1 Test Conditions

Table 25. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 °C~26°C
Relative humidity:	65%~70 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, M, T for Multi Carrier 1,8
Rated maximum transmitter output power ( $P_{max}$ ):	See 4.1.4

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

FCC part 2.1047 and part 22.917

#### 6.5.2.2 Limits

Compliance with FCC part 2.1047 and part 22.917, based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

Table 26. FCC Limits for Cellular Band

Limit:	$< P - (43 + 10\log_{10}P) = 10\log_{10}(1000 * P) - (43 + 10\log_{10}P) = 30 - 43 = -13\text{dBm}$
--------	---

### 6.5.3 Test Method and Setup

The EUT was connected to the Spectrum Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Out-band Spurious Emissions of the EUT by the Spectrum Analyzer or equivalent.

According to FCC part 2.1057, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent for test frequency range of 9 kHz to 10th harmonic. And according to ITU SM.329, measurement bandwidth (RBW) of Spectrum Analyzer or equivalent can be set as following for test frequency range of 9 kHz to 30 MHz:

9 kHz – 150 kHz:	1 kHz
150 kHz – 30 MHz:	10 kHz

30 MHz – 1 GHz	100 kHz
Above 1 GHz	1 MHz

### Test setup

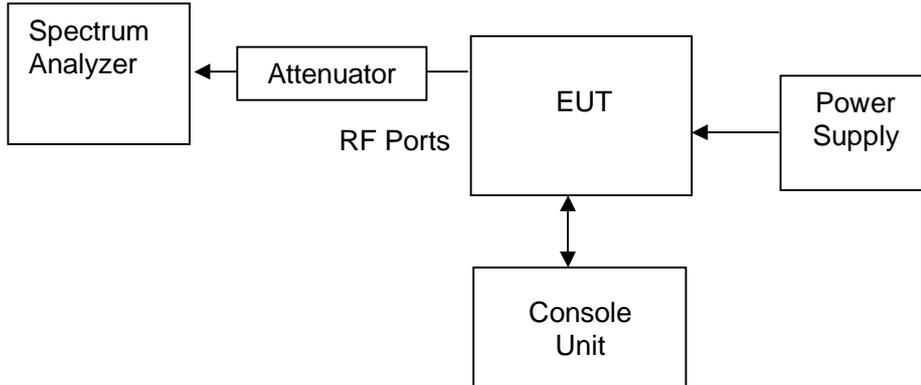


Figure 5. TEST SETUP

Note: if the EUT is RRU, the console unit consist of base band unit and console computer; if EUT is BTS, the console unit only consist of console computer.

### 6.5.4 Measurement Results

#### TM1:

Table 27. Measurement Results for Spurious Emissions

Test Configuration:		TM 1			
Channel No./Operating Frequency		Multi carriers	Measured frequency range	Max. Spurious Level Measured (dBm)	Limit (dBm)
Channel B	No.129	1	9kHz~10GHz	-15.6	< -13
	No.129/132/135/138/141/144/147/150	8	9kHz~10GHz	-19.46	< -13
Channel M	No.192	1	9kHz~10GHz	-16.23	< -13
	No.183/186/189/192/195/198/201/204	8	9kHz~10GHz	-17.69	< -13
Channel T	No.250	1	9kHz~10GHz	-16.53	< -13
	No.229/232/235/238/241/244/247/250	8	9kHz~10GHz	-19.27	< -13

#### TM2:

Table 28. Measurement Results for Spurious Emissions

Test Configuration:		TM2			
Channel No./Operating Frequency		Multi carriers	Measured frequency range	Max. Spurious Level Measured (dBm)	Limit (dBm)
Channel B	No.129	1	9kHz~10GHz	-15.65	< -13
	No.129/132/135/138/141/144/147/150	8	9kHz~10GHz	-19.12	< -13
Channel	No.192	1	9kHz~10GHz	-15.49	< -13



---

---

M	No.183/186/189/192/ 195/198/201/204	8	9kHz~10GHz	-18.88	< -13
Channel T	No.250	1	9kHz~10GHz	-15.26	< -13
	No.229/232/235/238/ 241/244/247/250	8	9kHz~10GHz	-19.34	< -13

### 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to Appendix D.

## 6.6 Radiated Spurious Emission

### 6.6.1 Test Conditions

Table 29. Test Conditions

Preconditioning:	1 hour
Measured at:	Enclosure
Ambient temperature:	20 °C~26°C
Relative humidity:	65%~70 %
Power supply:	-48V
Test Configuration/Mode:	TM1 at Channel M for Multi Carrier 8
Rated maximum transmitter output power ( $P_{max}$ ):	See 4.1.4

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

FCC part 2.1047 and part 22.917,

#### 6.6.2.2 Limits

Compliance with FCC part 2.1047 and part 22.917, based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

Table 30. FCC Limits for Cellular Band

Limit:	$< P - (43 + 10\log_{10}P) = 10\log_{10}(1000 * P) - (43 + 10\log_{10}P) = 30 - 43 = -13\text{dBm}$
--------	---

### 6.6.3 Test Method and Setup

(a) Measurements were made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.1049(c) as appropriate. For equipment operating on frequencies below 890 MHz, an Open Field Test is normally required with the measuring instrument antenna located in the far field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections, which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

(b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

The EUT was equipped with non-integral antenna. And it should test according to part (b). The EUT was connected to match loads. The Console Computer controls the EUT to transmitter the maximum power which defined in specification of product. The EUT operated on a typical channel.

### **The test procedure**

(1) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, E.R.P. shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements. The EUT was connected to ancillary in order to simulate normal operating conditions with reference to the guidance given in the standard for this type of equipment.

(2) Test the radiated maximum output power by the test Receiver received from test antenna.

(3) Use substitution method to verify the Maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a Signal Generator. And then adjust the output level of the Signal Generator to get the same received power recorded in step (2) on the test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

According to FCC part 2.1057, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent for test frequency range of 30 MHz to 10th harmonic. And according to ITU SM.329, measurement bandwidth (RBW) of Spectrum Analyzer or equivalent can be set as following for test frequency range of 30 MHz to 10th harmonic MHz:

30 MHz – 1 GHz	100 kHz
Above 1 GHz	1 MHz

### **Test setup**

#### **Step 1: Pre-test**

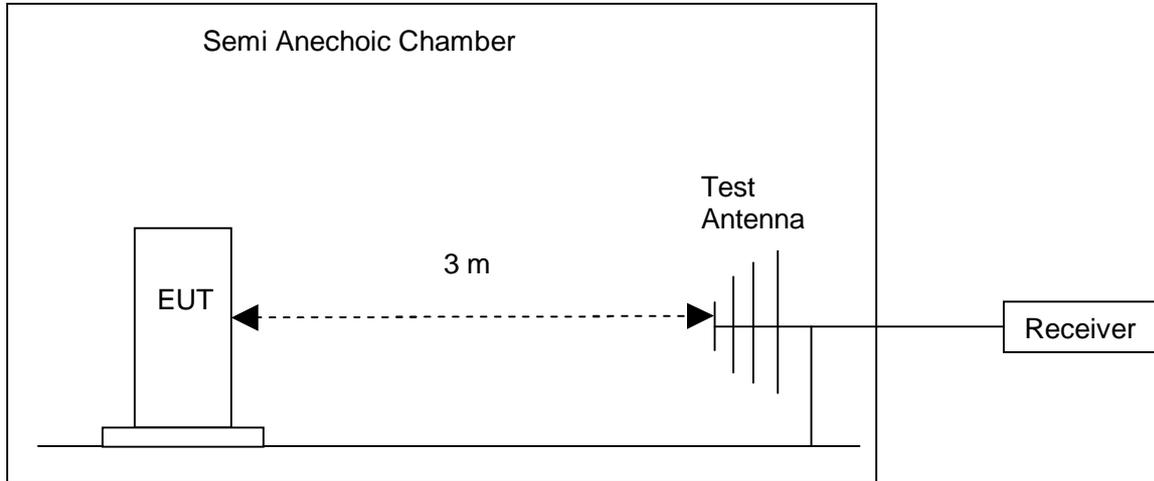


Figure 6. Test Set-up for Pre-test

## Step 2: Substitution method to verify the maximum ERP

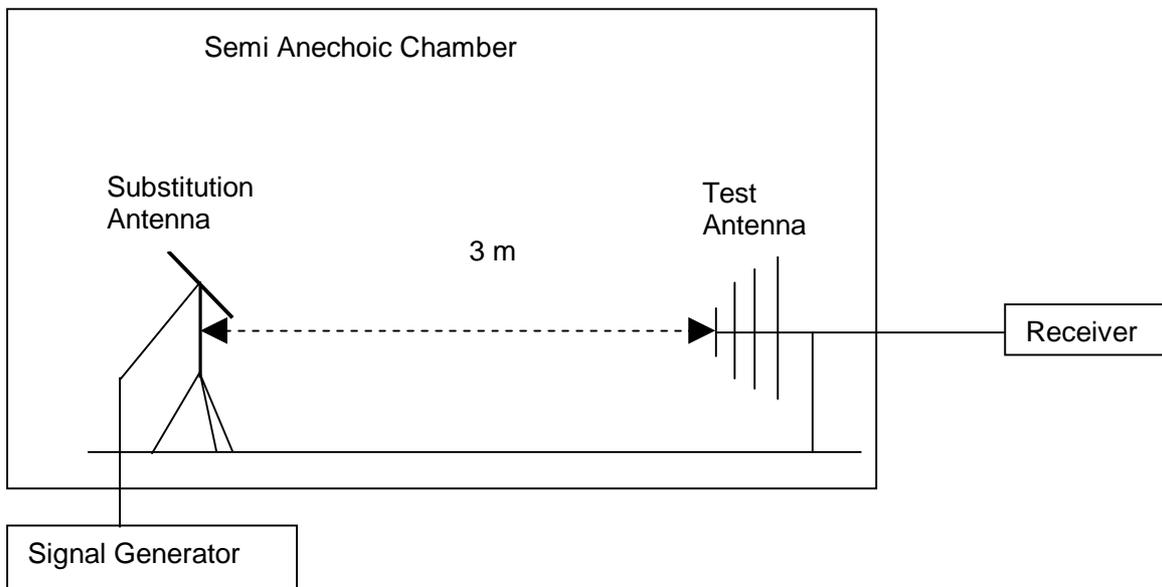


Figure 7. Test Set-up for Substitution

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

## 6.6.4 Measurement Results

### 6.6.4.1 Pre-test Measurement Results

Table 31. Measurement Result

Channel Number	Test Range (Frequency)	Spurious Level measured [dBm]	FCC limit	Result
No.183/186/189/192/ 195/198/201/204	30MHz ~10th harmonic	<- 13 dBm (See appendix E)	- 13 dBm	Pass

### 6.6.4.2 Substitution Results

Table 32. Substitution Results

Freq. [MHz]	Measurement Value [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Signal Generator Level [dBm]	Substitution Level [dBm]	FCC limit [dBm]	Result
/	/	/	/	/	/	/	/	/

Note: For get the ERP. (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$ERP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

### 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to Appendix E.

## 6.7 Frequency Stability

### 6.7.1 Test Conditions

Table 33. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See Measurement Results
Relative humidity:	70 %
Power supply:	See Measurement Results
Test Configuration/Mode:	TM1/TM2 at Channel M

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

FCC part 2.1047 and part 22.355

#### 6.7.2.2 Limits

Compliance with FCC part 2.1055 and part 22.355, the carrier frequency of each transmitter must be maintained within the tolerances of  $\pm 1.5$ ppm for base stations.

### 6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature from -30 °C to 50 °C.

Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 °C through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
- (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

## The test procedure

The EUT was placed inside an environmental temperature chamber. The EUT was connected to the Signal Analyzer or equivalent via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Frequency Tolerance of the EUT by the Signal Analyzer or equivalent.

According to ANSI C63.4 clause 13.1.6, no modulation needs to be supplied to the intentional radiator during these tests, unless modulation is required to produce an output, e.g., single-sideband suppressed carrier transmitters

The primary supply voltages are: -48V DC (100% rated), -40.8V DC (85% rated) and -55.2V DC (115% rated).

## Test Set up

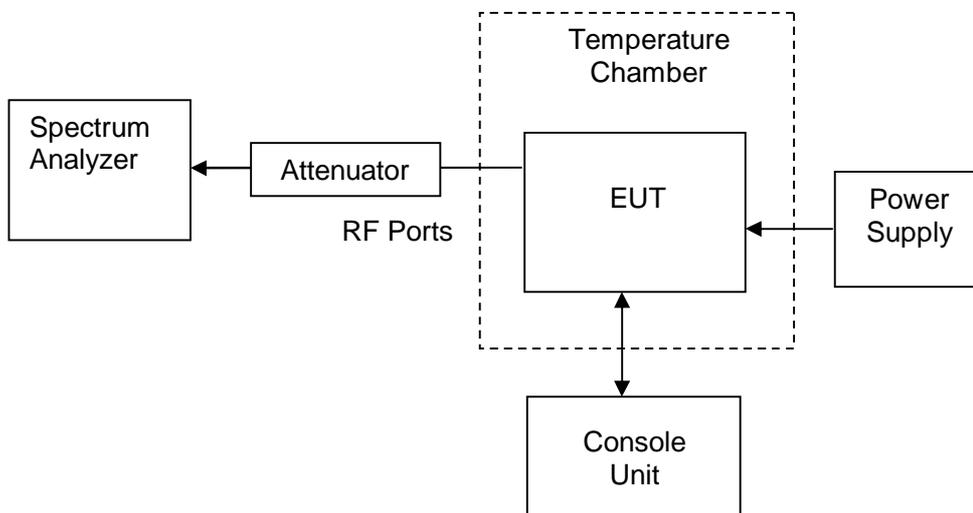


Figure 8. Test Set up

Note: if the EUT is RRU, the console unit consist of base band unit and console computer; if EUT is BTS, the console unit only consist of console computer.

## 6.7.4 Measurement Results

### 6.7.4.1 Frequency Error vs. Temperature

Table 34. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error						
Test Environment		No.192 882MHz				Limit
		TM1		TM2		
Voltage	Temperature	Hz	ppm	Hz	ppm	
-48V	-30 °C	9	0.01	12	0.013	±1.5ppm
	-20 °C	8	0.009	23	0.026	
	-10 °C	7	0.008	9	0.01	
	0 °C	7	0.008	13	0.014	

+10 °C	7	0.008	10	0.011
+20 °C	10	0.011	13	0.014
+30 °C	6	0.007	12	0.013
+40 °C	11	0.012	14	0.015
+50 °C	9	0.01	17	0.019

### 6.7.4.2 Frequency Error vs. Voltage

Table 35. Measurement Results for Frequency Error vs. Voltage

Measured Maximum Frequency Error						
Test Environment		No.192 882MHz				Limit
		TM1		TM2		
Voltage	Temperature	Hz	ppm	Hz	ppm	±1.5ppm
-40.8V	+20 °C	12	0.014	14	0.016	
-48V	+20 °C	10	0.011	12	0.014	
-55.2V	+20 °C	7	0.008	9	0.01	

### 6.7.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to Appendix H.

## 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 36. System Measurement Uncertainty

Items		Extended Uncertainty
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2
Field Strength of Spurious Radiation	ERP (dBm)(30MHz~1G)	U=4.6dB; k=2
	ERP (dBm) (>1G)	U=3dB; k=2
Conducted Output Power	Power (dBm)	U=0.39dB; k=2

----- END OF REPORT -----