FCC&IC Test Report

Product Name: Remote Radio Unit of Multi-Mode Distributed Base Station

Model Number: RRU3908-850

Report No: SYBH (R) 015042011EB-3
FCC ID: QISRRU3908-850
IC: 6369A-3908B5

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REPORT ON	FCC Test of Remote Radio Unit of Multi-Mode Distributed Base Station Model Name: RRU3908-850 Report No: SYBH (R) 015042011EB-3 FCC ID: QISRRU3908-850 IC: 6369A-3908B5
REGULATION	**47 CFR FCC Part 2, Subpart J (October 2009)** **47 CFR FCC Part 22, Subpart H (October 2009)** **IC RSS-Gen Issue 3 (December 2010)** **IC RSS-132 Issue 2 (September 2005)**
CONCLUSION	**PASS**

General Manager	**2011-04-20**	Zhang Xinghai	Zhang Xing Hai
	Date (y-m-d)	Name	Signature
Technical Responsibility For Area of Testing	**2011-04-20**	Hu Jun	Hu Jun
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Test Lab Engineer	**2011-04-20**	Zhang Weimin	Zhang Weimin
	Date (y-m-d)	Name	Signature

Contents

1 Summary

The table below summarizes the measurements and results. Detailed results and descriptions are shown in the following pages.

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

47 CFR FCC Part(s) Requirements		Description	Result
Measurement	Limits		
2.1046	22.913	Transmitter Output Power	PASS
2.1047	---	Modulation Characteristics	PASS
2.1049	---	Occupied Bandwidth	PASS
2.1051	22.917	Band Edges Compliance	PASS
2.1051	22.917	Spurious Emission at Antenna Terminal	PASS
2.1053	22.917	Radiated Spurious Emission	PASS
2.1055	22.355	Frequency Stability	PASS

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

table 2. Summary of results for IC requirements for Cellular Band

IC RSS-132 Requirements	Description	Result
4.4	Transmitter Output Power	PASS
4.2	Modulation Characteristics	PASS
---	Occupied Bandwidth	PASS
4.5	Band Edges Compliance	PASS
4.5	Spurious Emission at Antenna Terminal	PASS
4.5	Radiated Spurious Emission	PASS
4.3	Frequency Stability	PASS
4.6	Receiver Spurious Emissions (Conducted)	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

2.1.1 General Description

The RRU3908-850 provides the GSM only/UMTS only/GSM&UMTS (G/U not use the same PA) solution. That is, if configured with boards of different modes, the DBS3900 supports networks of different modes and evolution of networks from the GSM mode to GSM&UMTS dual mode, and then to the UMTS mode.

The RRU3908-850 adopts the radio remote technology and supports separate installation, capacity expansion, and evolution. It shows full consideration for users' service, capacity, coverage, transmission, power supply, installation and maintenance requirements. It adopts a modular design method and is a type of highly integrated equipment.

Note: the report is for UMTS only.

2.1.2 Support function and Service

The EUT supports the function and service as follows:

table 3. Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
WCDMA voice and data	Modulation: QPSK	TM1	/
HSDPA	Modulation: 16QAM	TM5	/
HSPA+	Modulation: 64QAM	TM6	/

Note: Refer to 3GPP 25.141 section 6.1.1 for the information of TM (Test Mode) of WCDMA base station.

2.2 Modification Information

For original equipment, following table is not application.

table 4. 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

Period #1:
From: Jun. 23, 2008
To: Jul. 09, 2008

Period #2 (only for the additional measurement mode for test of "Modulation characteristics" due to the TM6):
From: Apr. 15, 2011
To: Apr. 15, 2011

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

table 5. Frequency Range

Uplink band (RX):	824 to 849 MHz
Downlink band (TX):	869 to 894 MHz

4.1.2 Channel Spacing / Separation

table 6. Channel Spacing and Separation

Channel raster:	200 kHz
Channel spacing:	5 MHz

4.1.3 Type of Emission

table 7. Type of Emission

Emission Designation:	5M00F9W

Refer to IC TRC-43.

4.1.4 Environmental Requirements

table 8. Environmental Requirements

Minimum temperature:	-40 °C
Maximum temperature:	+50 °C
Relative Humidity:	5% to 100%RH

4.1.5 Power Source

table 9. Power Source

DC voltage nominal:	⎓ -48 V
DC voltage range	⎓ -57 V to ⎓ -36 V

4.1.6 Tune-up Procedure

Please reference the document Tune-up Procedure in TCF.

4.2 EUT Identification List

4.2.1 Board Information

table 10. Board Information

Model Name	Qty.	Hardware Version	Serial	Description
WD51MPCA11	1	VER.A	020KSD1084800003	RF Power Amplifier Board
WD51MBRUA	1	VER.A	020JGA1085800020	Multi-mode Band Radio Unit

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: RRU3908-850
FCC Identification: QISRRU3908-850

4.2.5 IC Identification

Company Number: 6369A
UPN Number: 3908B5
IC Identification: 6369A-3908B5

5 Main Test Instruments

table 11. Main Test Equipments (Period #1)

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
Period #1				
Signal Generator	Agilent	E4438C	SZ0300056771	03.17.2009
Spectrum Analyzer	Agilent	E4445A	SZ0200022175	03.17.2009
Notch Filter	WALNWRIGHT	WRCG869/894-859/904-80/16EE	SZ07000000895	---
Attenuator	HuaXiang	30 dB	051111090	---
Attenuator	Aeroflex	6 dB	R417706118	---
Power Supply	---	ONU4820	2102130353207A01004E	07.21.2008
EMI Test receiver	R&S	ESMI	829550/008	04.21.2009
Broadband Antenna	SCHAFFNER	CBL 6112B	2747	10.17.2008
Horn Antenna	R&S	HF906	359287/005	12.13.2008
Temperature Chamber	WEISS	8AXH0395#	BA18856	07.04.2008
Period #2				
Signal Analyzer	Agilent	E4440A	MY49420179	2011-04-25

6 TRANSMITTER & RECEIVER MEASUREMENTS

The EUT consists of two TRX channels, Ch-A and Ch-B, which are identical in designs. Each channel can support up to two carriers. These two channels can be configured as follow:

- Conf.1: Each channel can be configured to emit one carrier with 40W, provided that either Ch-A or Ch-B transmits.
- Conf.2: Each channel can be configured to emit one carrier with 30W, provided that both Ch-A and Ch-B transmit.
- Conf.3: Each channel can be configured to emit two carriers with each 15W and total 30W, provided that both Ch-A and Ch-B transmit.
- Conf.4: Each channel can be configured to emit two carriers with each 20W and total 40W, provided that either Ch-A or Ch-B transmits.

Considering that mentioned above,

- Only Ch-A was used to perform tests in this test report.
- Also considering the measurement of max output power (worst case), only the Conf.1 (1-carrier mode) and Conf.4 (2-carriers mode) specified as above were used in this test report.

The operating frequencies under test are specified as below:

table 12. Operating Frequencies

Multi carrier mode	Bottom (B)	Middle (M)	Top (T)
1-carrier:	CH 4357 871.4MHz	CH 4407 881.4MHz	CH 4458 891.6MHz
2-carriers:	CH 4357/4382 871.1/876.4MHz	CH 4407/4432 881.4/886.4MHz	CH4433/4458 886.6/891.6MHz

Note: for the receiver operating frequency, there is an 80MHz difference.

6.1 Maximum Channel Power

6.1.1 Test Conditions

table 13. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	23.5 °C
Relative humidity:	55 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: B M T Multi carriers: 1,2 TM1

6.1.2 Test Specifications and 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 14. FCC Limits for Cellular Band

Maximum ERP:	< 500 Watts (= 57 dBm)

Compliance with IC RSS-132 clause 4.4 and SRSP-503 clause 5.1, the base stations for digital systems are limited to 820 watts maximum equivalent isotropically radiated power (EIRP).

table 15. IC Limits for Cellular Band

Maximum EIRP:	< 820 Watts (= 59 dBm)

6.1.3 Test Method and Setup

EUT was connected to the wireless signal analyzer E4445A via the main RF connector. Diversity RF connectors were connected to match load. EUT was controlled to transmit Maximum power by console computer. Measure and record the Maximum Channel Power of the RRU3805 by the E4445A.
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

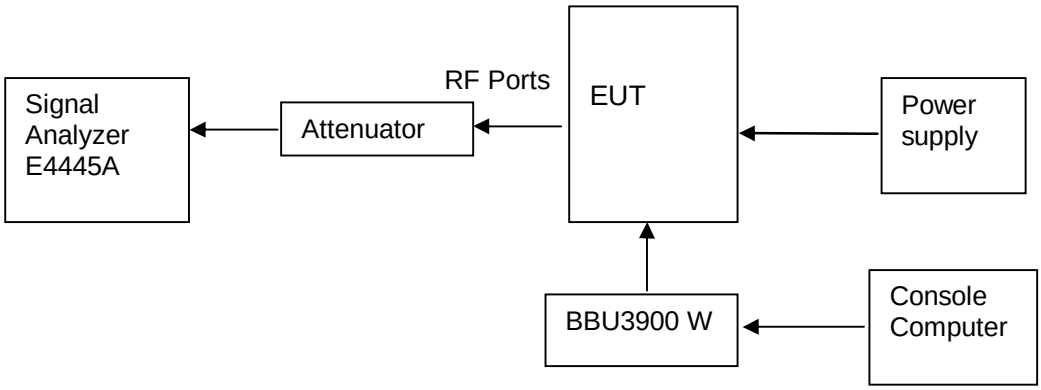

Figure 1. TEST SETUP

6.1.4 Measurement Results

Single Carrier

table 16. Measurement Results

TEST CONDITIONS T_{nom} (25 °C) V_{nom} (-48 V)	Maximum Output Power						Result
	CH 4357 871.4MHz		CH 4407 881.4MHz		CH 4458 891.6MHz		
	dBm		dBm		dBm		
	Measured	Limit	Measured	Limit	Measured	Limit	
TM1	**45.76**	**< 57**	**45.99**	**< 57**	**45.72**	**< 57**	**PASS**

Two Carriers

table 17. Measurement Results

TEST CONDITIONS T_{nom} (25 °C) V_{nom} (-48 V)	Maximum Output Power						Result
	CH 4357/4382 871.4/876.4MHz		CH4407/4432 881.4/886.4MHz		CH 4433/4458 886.6/891.6MHz		
	dBm		dBm		dBm		
	Measured	Limit	Measured	Limit	Measured	Limit	
TM1	**CH#1: 42.54** **CH#2: 42.60** **Total: 45.55**	**< 57**	**CH#1: 42.50** **CH#2: 42.60** **Total: 45.52**	**< 57**	**CH#1: 42.45** **CH#2: 42.53** **Total: 45.51**	**< 57**	**PASS**

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:	1hour
Measured at:	Antenna connector
Ambient temperature:	23.5 °C
Relative humidity:	55 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: M Multi Carriers: 1 TM1, TM5, TM6

6.2.2 Test Specifications and Limits

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

No specific modulation characteristics requirement limits in IC RSS-132 clause 4.2 for Cellular Band.

table 19. Limits According to 3GPP TS 25.141

Limits	QPSK :EVM<17.5%
	16QAM :EVM<12.5%
	64QAM: (not defined)

6.2.3 Test Method and Setup

EUT was connected to the wireless signal analyzer E4445A via the main RF connector. The other RF connector was connected to match load. EUT was controlled to transmit Maximum power by console computer. Measure and record the Code Domain Power and the constellation of the EUT by the E4445A.

Test setup

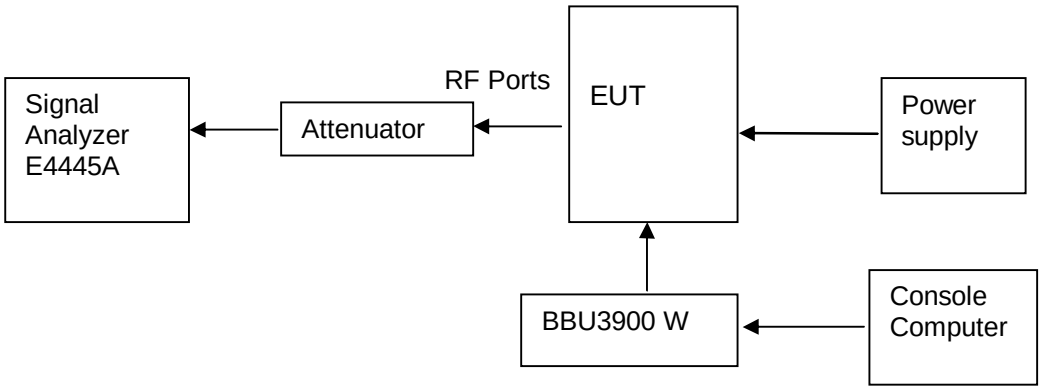

Figure 2. TEST SETUP

6.2.4 Measurement Results

table 20. Measurement Results

TEST CONDITIONS		EVM						
		TM1: QPSK		TM5: 16QAM		TM6: 64QAM		Result
		Measured	Limit	Measured	Limit	Measured	Limit	PASS
CH 4407 (M) 881.4MHz	T_{nom} (25 °C) V_{nom}(-48V)	8.57	< 17.5%	7.15	<12.5%	---	---	PASS

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 21. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	23.5 °C
Relative humidity:	55 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: B M T Multi carriers: 1 TM1

6.3.2 Test Specifications and Limits

No specific occupied bandwidth requirement in FCC part 2.1049 and part 22 subpart H for Cellular Band.

No occupied bandwidth requirement in IC radio specifications. The definition of occupied bandwidth is specified in IC RSS-Gen clause 4.6.1.

table 22. Limits

Upper /lower frequency limits	0.5% of the mean power

6.3.3 Test Method and Setup

EUT was connected to the wireless signal analyzer E4445A via the one main RF connector. The other RF connector was connected to match load. EUT was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the EUT by the E4445A.

The OBW, 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): 30 kHz

Test Set-up

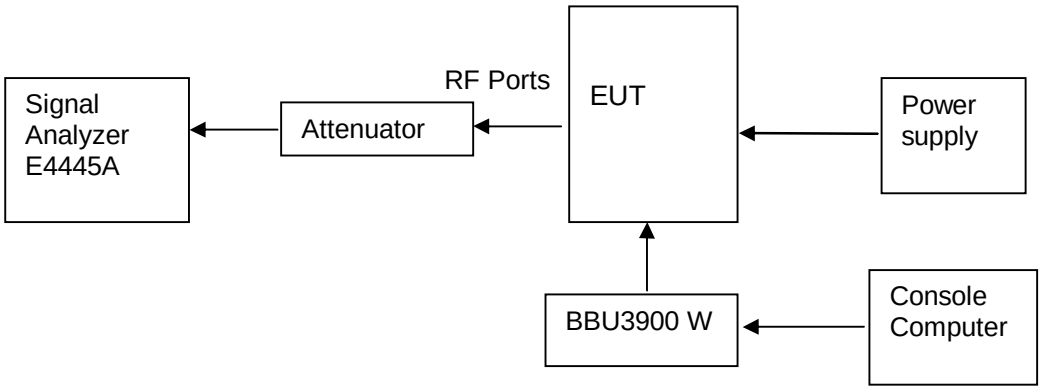

Figure 3. TEST SETUP

6.3.4 Measurement Results

table 23. Measurement Results

TEST CONDITIONS		Occupied Bandwidth		
		TM1		Result
		Measured (MHz)	Limit (MHz)	
CH 4357(B) 871.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**4.1556**	**< 5**	**PASS**
CH 4407 (M) 881.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**4.1503**	**< 5**	**PASS**
CH 4458 (T) 891.6MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**4.1464**	**< 5**	**PASS**

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 24. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	23.5 °C
Relative humidity:	55 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: B, T Multi Carriers: 1, 2 TM1

6.4.2 Test Specifications and Limits

Compliance with FCC part 2.1051 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.

Compliance with IC RSS-132 clause 4.5, the power of emissions shall be attenuated below the transmitter output power P (in watts) by at least 43 +10 $\log_{10}$ P, dB.

table 25. Limits

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

6.4.3 Test Method and Setup

EUT was connected to the Spectrum analyzer E4445A via the one RF connector. Other RF connectors were connected to match load. EUT was controlled to transmit Maximum power by console computer. Measure and record the Maximum Band Edge Emissions of the EUT by the E4445A.

In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Measurement bandwidth (RBW): 50 kHz (more than 1% of 5MHz)

Test Set-up

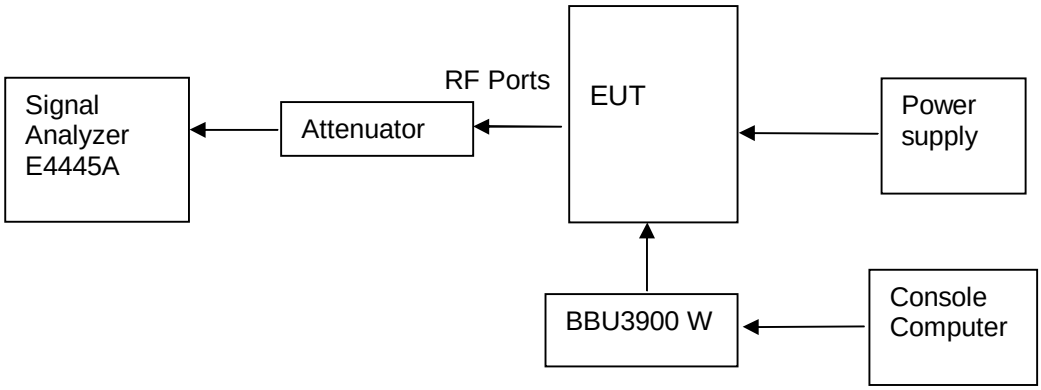

Figure 4. Test Set-up

6.4.4 Measurement Results

Note: for this test, the offset of measurement filter -3dB point was considered.

Single Carrier

table 26. Measurement Results

TEST CONDITIONS		Band Edge		
		TM1		Result
		Measured (MHz)	Limit (MHz)	
CH 4357(B) 871.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**-17.73**	**< -13**	**PASS**
CH 4458 (T) 891.6MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**-17.87**	**< -13**	**PASS**

Two Carriers

table 27. Measurement Results

TEST CONDITIONS		Band Edge		
		TM1		Result
		Measured (MHz)	Limit (MHz)	
CH 4357/4382 871.4/876.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**-20.15**	**< -13**	**PASS**
CH 4433/4458 886.6/891.6MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**-19.52**	**< -13**	**PASS**

6.4.5 Conclusion

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

6.5 Spurious Emission on at Antenna Terminal

6.5.1 Test Conditions

table 28. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	23.5 °C
Relative humidity:	55 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: B,M,T Multi Carriers: 1, 2 TM1

6.5.2 Test Specifications and Limits

Compliance with FCC part 2.1051 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.

Compliance with IC RSS-132 clause 4.5, after the first 1.0 MHz, the power of emissions shall be attenuated below the transmitter output power (P) by at least 43 + 10 $\log_{10}$ P, dB.

table 29. Limits

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

6.5.3 Test Method and Setup

EUT was connected to the Signal analyzer E4445A via the one RF connector. Other RF connectors were connected to match load. EUT was controlled to transmit Maximum power by console computer. Measure and record Spurious Emissions of the Base Station by the E4445A.

According to IC RSS-132 clause 4.5, this defined the measurement bandwidth of as following (EUT channel bandwidth > 4MHz):
Measurement bandwidth (RBW): 1 MHz;

Test Set-up

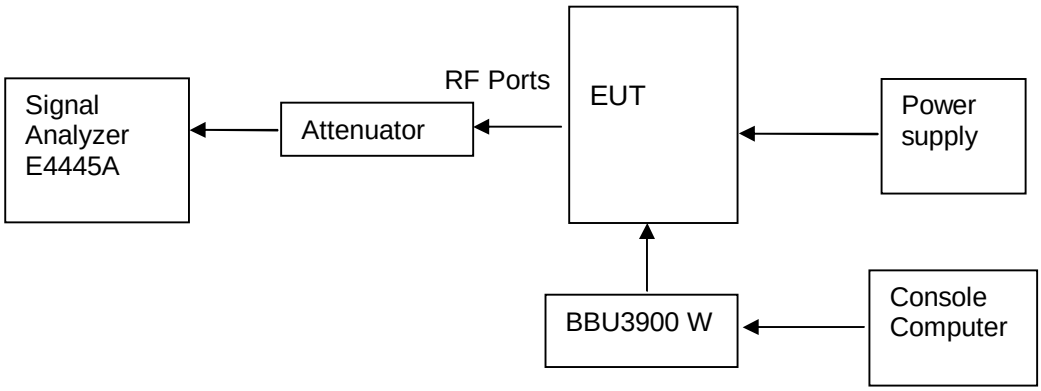

Figure 5. Test Set-up

6.5.4 Measurement Results

Single Carrier:

table 30. Measurement Results

TEST CONDITIONS		Spurious Emission at Antenna Terminal			
		Test Frequency	TM1		Result
			Measured Max. Emission (dBm)	Limit (dBm)	
CH 4357 871.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**9kHz ~12.75GHz**	**-14.47**	**< -13**	**PASS**
CH 4407 881.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**9kHz ~12.75GHz**	**-14.54**	**< -13**	**PASS**
CH 4458 891.6MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**9kHz ~12.75GHz**	**-14.69**	**< -13**	**PASS**

Two Carriers:

table 31. Measurement Results

TEST CONDITIONS		Spurious Emission at Antenna Terminal			
		Test Frequency	TM1		Result
			Measured Max. Emission (dBm)	Limit (dBm)	
CH 4357/4382 871.4/876.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**9kHz ~12.75GHz**	**-14.70**	**< -13**	**PASS**
CH 4407/4432 881.4/886.4MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**9kHz ~12.75GHz**	**-14.44**	**< -13**	**PASS**
CH/4433/4458 886.6/891.6MHz	T_{nom} (25 °C) V_{nom} (-48 V)	**9kHz ~12.75GHz**	**-14.46**	**< -13**	**PASS**

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 32. Test Conditions

Preconditioning:	1 hour
Measured at:	enclosure
Ambient temperature:	23.5 °C
Relative humidity:	55 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: M Multi Carriers: Ch-A 1carrier and Ch-B 1carrier TM1

6.6.2 Test Specifications and Limits

Compliance with FCC part 2.1051 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.

Compliance with IC RSS-132 clause 4.5, after the first 1.0 MHz, the power of emissions shall be attenuated below the transmitter output power (P) by at least 43 + 10 $\log_{10}$ P, dB.

table 33. Limits

Limit	P-(43+10$\log_{10}$P)=10$\log_{10}$(1000P)-43-10$\log_{10}$P=30-43=-13 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 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 under test is equipment with non-integral antenna. And it should test according to part (b) of above section.
EUT is connected to match loads. The console computer controls the EUT to transmitter the maximum power which defined in specification of product. The EUT operates on a typical channel.
(c) Carrier configurations: Conf.2: Each channel can be configured to emit one carrier with each 30W, provided that both Ch-A and Ch-B transmit.

The test procedure:

(a) 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.
(b) Test the radiated maximum output power by the R&S test receiver ESMI received from test antenna.
(c) 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 (b) on ESMI, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

According to IC RSS-Gen clause 4.9, the search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated or used, without exceeding 40 GHz.

Test setup

Step 1: Pre-test

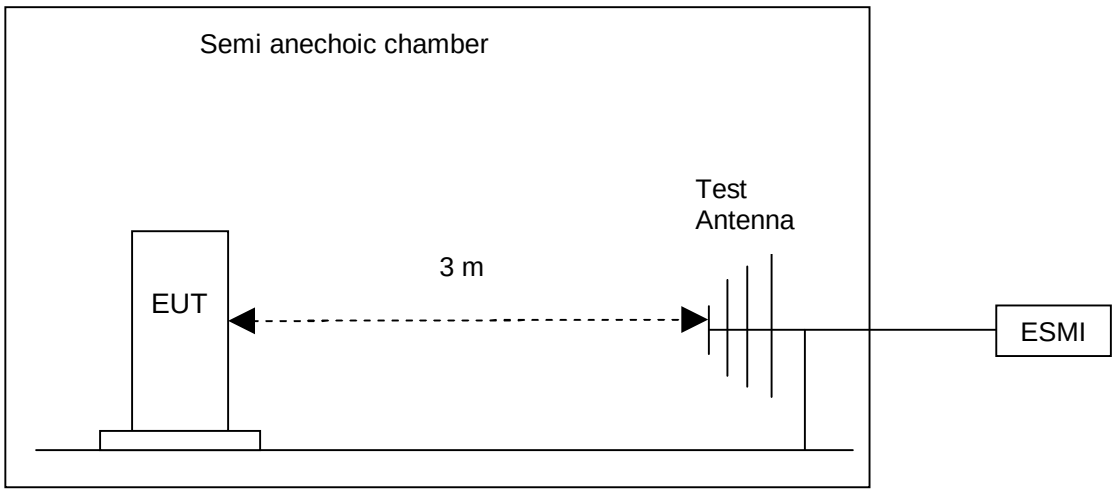

Figure 6. Test Set-up

Step 2: Substitution method to verify the maximum ERP

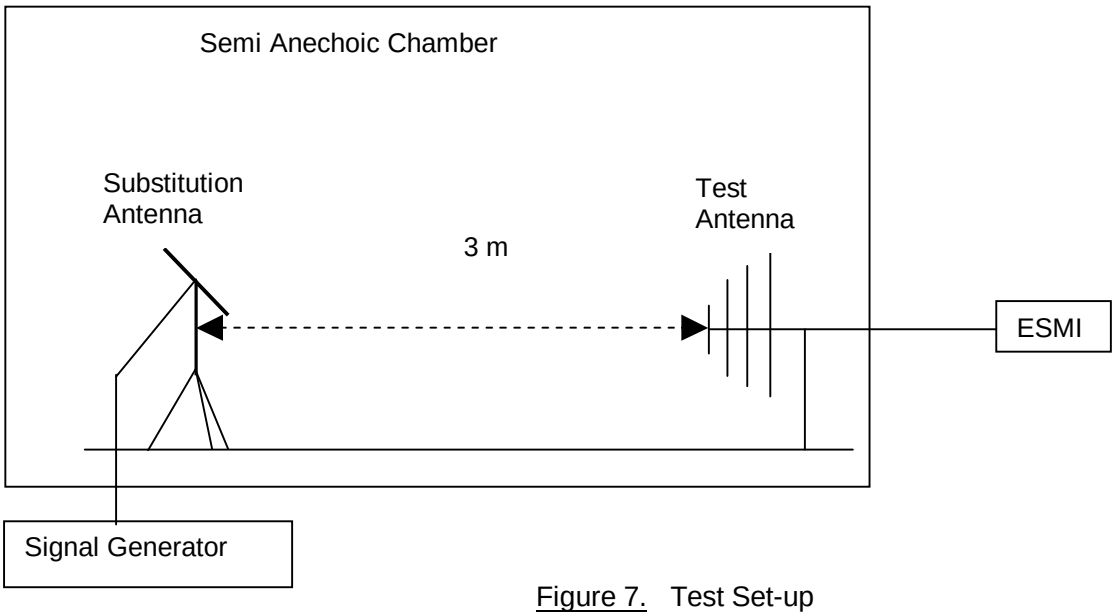

Figure 7. Test Set-up

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

table 34. Measurement Results

TEST CONDITIONS	Spurious Emission at Enclosure		
	Test Frequency	**Measured Max. Emission (dBm)**	**Limit (dBm)**
T_{nom} (23 °C) V_{nom} (-48 V)	**30 MHz ~ 10 GHz**	**<- 13 dBm**	**-13**
See appendix E			

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 35. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Voltage range:	See below
Relative humidity:	55% at 25 °C
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: M Multi Carriers: 1 TM1

6.7.2 Test Specifications and Limits

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

table 36. FCC Limits for Cellular Band

Limit:	< ±1.5ppm

Compliance with IC RSS-132 clause 4.3, the carrier frequency shall not depart from the reference frequency in excess of ±1.5ppm for base stations.

table 37. IC Limits for Cellular Band

Limit:	< ±1.5ppm

table 38. Limits According to 3GPP TS 25.141

Limits	< ±0.05 ppm

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.

Test Set up

Connect the EUT to the Universal Radio Communication Tester E4445A via the antenna connector. Then measure the frequency error by the E4445A. The Other antenna output ports were matched with 50 Ω match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Frequency Tolerance of the EUT by the R&S FSQ40

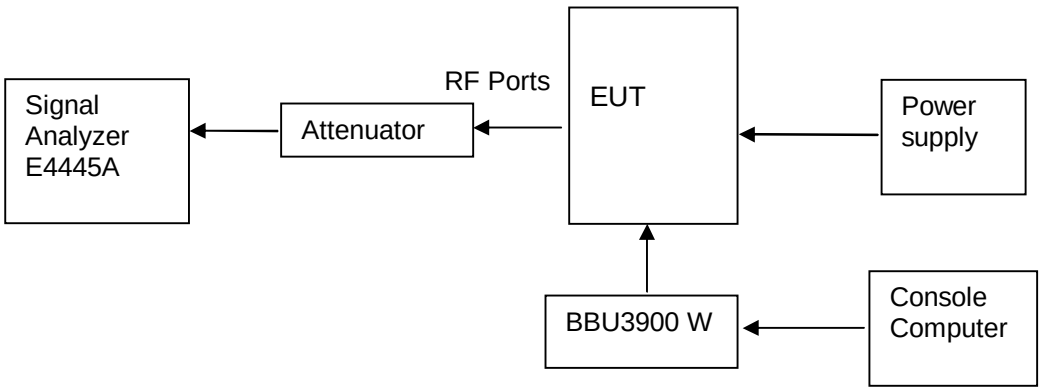

Figure 8. Test Set up

6.7.4 Measurement Results

6.7.4.1 Measurement Results vs. Variation of Temperature (DC Power Supply)

table 39. Measurement Results

Measured Maximum Frequency Error					
Test Environment		CH 4407 (M) 881.4MHz			
Voltage	Temperature	Hz	ppm		Limit
			Refer to nominal frequency	Refer to (+20°C, rated voltage)	
V_{nom}(-48V)	-30 °C	-1.72	-0.002	0.000	< ±0.05ppm (UMTS) or < ±1.0ppm (IC)
	-20 °C	-1.13	-0.001	0.001	
	-10 °C	-3.08	-0.003	-0.001	
	0 °C	-1.57	-0.002	0.000	
	+10 °C	-1.77	-0.002	0.000	
	+20 °C	-1.99	-0.002	---	

	+30 °C	0.02	0.000	0.002	
	+40 °C	1.61	0.002	0.004	
	+50 °C	-0.91	-0.001	0.001	

6.7.4.2 Measurement Results vs. Variation of Voltage (DC Power Supply)

table 40. Measurement Results

Measured Maximum Frequency Error					
Test Environment		CH 4407 (M) 881.4MHz			
Voltage	Temperature	Hz	ppm		Limit
			Refer to nominal frequency	Refer to (+20°C, rated voltage)	
85%V_{nom} (-40V)	+25 °C	-2.41	-0.003	-0.004	< ±0.05ppm (UMTS) or < ±1.0ppm (IC)
V_{nom}(-48V)	+25 °C	-3.70	-0.004	-0.006	
115%V_{nom} (-57V)	+25 °C	-2.36	-0.003	-0.004	

6.7.5 Conclusion

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

6.8 Receiver Spurious Emission (Conducted)

6.8.1 Test Conditions

table 41. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	23.5 °C
Relative humidity:	55 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Cellular Band: M Multi Carriers: 1 TM1

6.8.2 Test Specifications and Limits

Compliance with IC RSS-Gen clause 6, if a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz in the band 30 – 1000 MHz, or 5 nanowatts above 1 GHz.

table 42. Limits

Limit	30M - 1GHz:	2nW(=-57dBm)/4kHz
	Above 1GHz:	5nW(=-53dBm)/1MHz

6.8.3 Test Method and Setup

EUT was connected to the Signal analyzer E4445A via the one diversity connector while the main connector was connected to match load. The main port of the EUT was controlled to transmit maximum power by console computer. EUT was controlled to be operated in the normal receive mode by console computer. Measure and record the Spurious Emissions of the EUT by the E4445A.

Either RF port of the EUT is used for common TX and RX, no separate RX port. So, a Notch Filer was used to reject the TX band.

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

Test Set-up

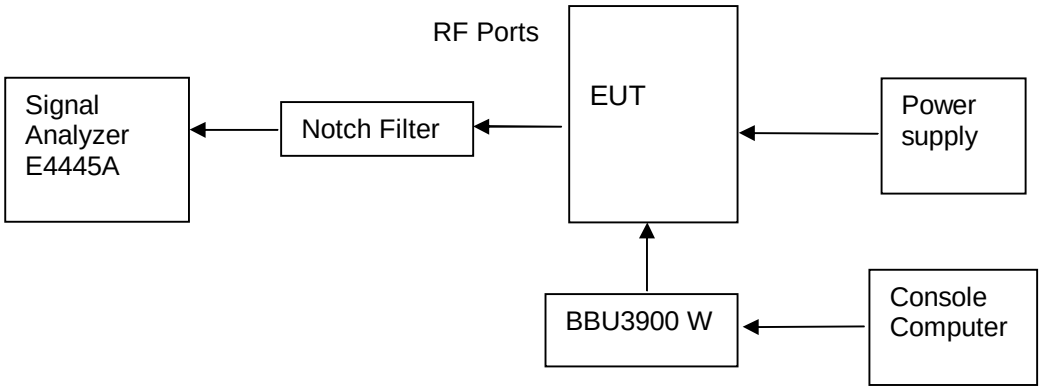

Figure 9. Test Set-up

6.8.4 Measurement Results

Table 48:Measurement Results

TEST CONDITIONS		Receiver Spurious Emission (Conducted)		
Channel Number	Test Range (Frequency)	TM1		Result
		Max. Level (dBm)	Limit	
TX: CH 4407 (M) 881.4MHz RX: CH 4407 (M) 836.4MHz	30MHz - 1GHz (PK)	**-73.04**	**< - 57 dBm/4kHz**	**PASS**
	1GHz-12.75GHz (AV)	**-64.70**	**< - 53 dBm/1MHz**	**PASS**

6.8.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the detailed measurement results refer to appendix F.

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 43. 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
Field Strength of Spurious Radiation	ERP (dBm)(30MHz~1G)	U=4.6dB; k=2
	ERP (dBm) (>1G)	U=3dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2
Conducted Output Power	Power(dBm)	U=0.39dB; k=2

8 Appendices

Appendix A	Measurement Results Modulation Characteristics
Appendix B	Measurement Results Occupied Bandwidth
Appendix C	Measurement Results Band Edges
Appendix D	Measurement Results Spurious Emission at Antenna Terminal
Appendix E	Measurement Results Radiated Spurious Emission
Appendix F	Measurement Results Receiver Spurious Emission (Conducted)
Appendix G	Photos of Test Setup

--- END OF REPORT ---