



FCC&IC Test Report

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

Model Number: RRU3908-1900

**Report No: SYBH (R) 015042011EB-4
FCC ID: QISR3908-1900
IC: 6369A-3908B2**

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REPORT ON

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REGULATION

47 CFR FCC Part 2, Subpart J (October 2009)
 47 CFR FCC Part 24, Subpart E (October 2009)
 IC RSS-Gen Issue 3 (December 2010)
 IC RSS-133 Issue 5 (February 2009)

CONCLUSION

PASSED

General Manager

2011-04-20
 Date (y-m-d)

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Signature

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 Date (y-m-d)

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 Date (y-m-d)

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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 PCS Band

47 CFR FCC Part(s) Requirements		Description	Result
Specification	Limits		
2.1046	24.232	Transmitter Output Power	PASS
2.1047	---	Modulation Characteristics	PASS
2.1049	---	Occupied Bandwidth	PASS
2.1051	24.238	Band Edges Compliance	PASS
2.1051	24.238	Spurious Emission at Antenna Terminal	PASS
2.1053	24.238	Radiated Spurious Emission	PASS
2.1055	24.235	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 PCS Band

IC RSS-133 Requirements	Description	Result
6.4	Transmitter Output Power	PASS
6.2	Modulation Characteristics	PASS
---	Occupied Bandwidth	PASS
6.5	Band Edges Compliance	PASS
6.5	Spurious Emission at Antenna Terminal	PASS
6.5	Radiated Spurious Emission	PASS
6.3	Frequency Stability	PASS
6.6	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 of EUT

2.1.1 General Description

The RRU3908-1900 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 RRU3908-1900 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 consists of two types of duplexer units to cover the whole PCS band, one covering PCS Lower Band while another covering PCS Higher Band (see section 4.1.1 for detailed).

The EUT supports the function and service as follows:

Table 3. Service and Test Mode List

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

Note: The test conditions and settings are defined in clause 6.1.1 of 3GPP 25.141.

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:

PCS Lower Band:

Date of Start: 24 July 2008

Date of End: 01 August 2008

PCS Higher Band:

Date of Start: 07 October 2008

Date of End: 14 October 2008

Period #2 (only for the additional test of “Peak-to-Average ratio” due to the new version of the Rules, and 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 for PCS Band

	EUT supports	FCC	IC
Uplink band:	1850 to 1890 MHz (lower band) 1870 to 1910 MHz (higher band)	1850 to 1910 MHz	1850 to 1915 MHz
Downlink band:	1930 to 1970 MHz (lower band) 1950 to 1990 MHz (higher band)	1930 to 1990 MHz	1930 to 1995 MHz

Note 1: the operating frequency range of IC is wider than that EUT supports.

Note 2: the EUT consists of two types of duplexer to cover the whole PCS band, one covering PCS lower band while another covering PCS higher band.

4.1.2 Channel Separation/Bandwidth

Table 6. Frequency Interval and Channel Separation

Channel raster:	200 kHz
Channel spacing:	5 MHz

4.1.3 Type of Emission

Refer to IC TRC-43.

Table 7. Type of Emission

Emission Designation:	5M00F9W
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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. DC 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 Component Parts Information

Table 10. Component Parts Information

Board Name	Qty.	Hardware Version	Serial	Description
WD51MPDC1	2	VER.A	020LLF1087000005 020LLF1087000022	RF Power Amplifier Board
WD51MBRUC	2	VER.A	020LKK1087000050 020LKK1087000052	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: RRU3908-1900
 FCC Identification: QISRRU3908-1900

4.2.5 IC Identification

Company Number: 6369A
 UPN Number: 3908B2
 IC Identification: 6369A-3908B2



5 Main Test Instruments

Table 11. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (y-m-d)
Radiated Cases (Period #1)				
EMI Test receiver	R&S	ESMI	829550/008	2009.04.21
Broadband Antenna	SCHAFFNER	CBL 6112B	2747	2008.10.17
Horn Antenna	R&S	HF906	359287/005	2008.12.13
Conducted Cases (Period #1)				
Signal Analyzer	R&S	FSQ 40	100266	2008.09.06
Signal Analyzer	Agilent	E4445A	MY41000037	2009.03.17
Power Supply	---	ONU4820	2102130353205 A000112	---
Attenuator	Aeroflex / Weinschel	49-40-33	NY604	---
Notch Filter	Wainwright	WRCT1850/2170- 5/40-10EEK	12	---
Climate Chamber	WEISS	WK11-1000	5922609060010	2009.03.17
Conducted Cases (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, and both can transmit and receive signals. Each channel can support up to two carriers. These two channels can be configured as follow:

- I Conf.1: Each channel can be configured to emit one carrier with 40W, provided that either Ch-A or Ch-B transmits.
- I Conf.2: Each channel can be configured to emit one carrier with 30W, provided that both Ch-A and Ch-B transmit.
- I 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.
- I 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,

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

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. In addition, unless otherwise stated, both PCS Lower Band and PCS Higher Band were selected to perform tests in this test report.

Table 12. Frequency points (channels) selected to perform transmitter tests

Transmitter Operating Band	Multi-Carriers	Channels No.		
		Channel B	Channel M	Channel T
PCS Lower Band:	1	No.9662 1932.4MHz	No.9750 1950MHz	No.9838 1967.6MHz
	2	No.9662/9687 1932.4/1937.4MHz	No. 9725/9750 1945/1950MHz	No.9813/9838 1962.6/1967.6MHz
PCS Higher Band:	1	No.9762 1952.4MHz	No.9850 1970MHz	No.9938 1987.6MHz
	2	No.9762/9787 1952.4/1957.4MHz	No.9850/9875 1970/1975MHz	No.9913/9938 1982.6/1987.6MHz

Table 13. Frequency points (channels) selected to perform receiver tests

Receiver Operating Band	Multi-Carriers	Channels No.		
		Channel B	Channel M	Channel T
PCS Lower Band:	1	---	No.9750 1870MHz	---
PCS Higher Band:	1	---	No.9850 1890MHz	---

6.1 Maximum Channel Power

6.1.1 Test Conditions

Table 14. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	62 %
Power supply:	-48 VDC
Test Configuration/Mode:	TM1 at Channel B, M, T for Multi Carrier 1, 2
Rated maximum transmitter output power (P_{max}):	Single carrier: total 46dBm(40W); Two carriers: each 43dBm, total 46dBm(40W)

6.1.2 Test Specifications and Limits

Compliance with FCC part 2.1046 and part 24.232, Base stations are limited to 1640 watts Peak equivalent isotropically radiated power (EIRP).

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.

Table 15. FCC Limits for PCS Band

Maximum EIRP (Peak):	< 1640 Watts (= 62 dBm)
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Compliance with IC RSS-133 clause 6.4 and SRSP-510 clause 5.1, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceed 100 watts. For base stations with channel bandwidth equal to or less than 1 MHz, the maximum equivalent isotropically radiated power (e.i.r.p.) is limited to 1640 watts; For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 1640watts/MHz e.i.r.p. (i.e., no more than 1640watts e.i.r.p. in any 1 MHz band segment).

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

Table 16. IC Limits for PCS Band

Maximum EIRP:	< 1640 Watts (= 62 dBm) (for channel bandwidth \leq 1MHz) < 1640 Watts/MHz (= 62 dBm/MHz) (for channel bandwidth > 1MHz)
Maximum Output Power:	< 100 Watts (= 50 dBm)
Peak-to-Average Ratio:	< 13 dB

6.1.3 Test Method and Setup

The EUT was connected to the Wireless 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 Maximum Channel Power of the EUT by the Wireless Signal Analyzer or equivalent.

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

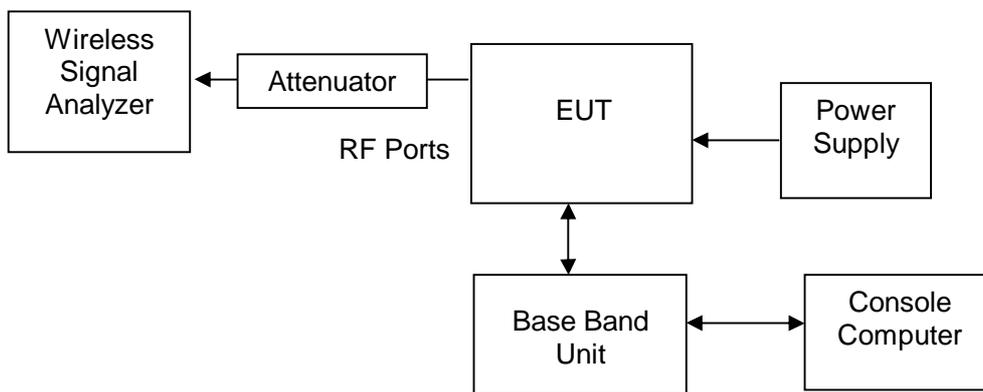


Figure 1. TEST SETUP

6.1.4 Measurement Results

6.1.4.1 Maximum Output Power at Antenna Port (Average)

(1) PCS Lower Band

TM1

Table 17. Measurement Results for Maximum Output Power

Multi Carriers	Maximum Output Power			
	No.9662 1932.4MHz	No.9750 1950MHz	No.9838 1967.6MHz	Limit (dBm)
	dBm	dBm	dBm	
1 carrier	45.81	45.95	45.89	< 50

Table 18. Measurement Results for Maximum Output Power

Multi Carriers	Maximum Output Power			
	No.9662/9687 1932.4/1937.4MHz	No. 9725/9750 1945/1950MHz	No.9813/9838 1962.6/1967.6MHz	Limit (dBm)



	dBm	dBm	dBm	
2 carriers	CH#1: 42.80 CH#2: 42.79 Total: 45.81	CH#1: 42.83 CH#2: 42.74 Total: 45.79	CH#1: 42.73 CH#2: 42.71 Total: 45.73	< 50

(2) PCS Higher Band

TM1

Table 19. Measurement Results for Maximum Output Power

Multi Carriers	Maximum Output Power			Limit (dBm)
	No.9762 1952.4MHz	No.9850 1970MHz	No.9938 1987.6MHz	
	dBm	dBm	dBm	
1 carrier	45.46	45.85	45.63	< 50

Table 20. Measurement Results for Maximum Output Power

Multi Carriers	Maximum Output Power			Limit (dBm)
	No.9762/9787 1952.4/1957.4MHz	No.9850/9875 1970/1975MHz	No.9913/9938 1982.6/1987.6MHz	
	dBm	dBm	dBm	
2 carriers	CH#1: 42.21 CH#2: 42.45 Total: 45.34	CH#1: 42.35 CH#2: 42.07 Total: 45.23	CH#1: 42.73 CH#2: 42.37 Total: 45.56	< 50

6.1.4.2 Peak-to-Average Ratio

Note: A typical operating channel is selected to check the peak-to-average ratio.

Table 21. Measurement Results for Peak-to-Average Ratio

Test Mode	Peak-to-Average Ratio (PAR), dB		Limit (dB)
		No.9750 1950MHz	
TM1		7.62	<13



6.1.4.3 Maximum Output Power at Antenna Port (Peak)

Note: Peak output power = average output power + Peak-to-Average ratio

According to section 6.1.4.1, the measured max average output power is 45.95dBm. So, the max calculated **peak output power is 53.57 dBm** (< 62 dBm).

6.1.5 Conclusion

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

6.2 Modulation Characteristics

6.2.1 Test Conditions

Table 22. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	62 %
Power supply:	-48 VDC
Test Configuration/Mode:	TM1, TM5, TM6 at Channel M

6.2.2 Test Specifications and Limits

No specific modulation characteristics requirement limits in FCC part 2.1047 and part 24 subpart E for PCS Band.

No specific modulation characteristics requirement limits in IC RSS-133 clause 6.2 for PCS Band.

In addition, limits according to the technical requirements of the EUT can be adopted as showed in the following table.

Table 23. Limits According to EUT technical requirements

Limits for UMTS equipments:	QPSK modulation: EVM < 17.5%
	16QAM modulation: EVM < 12.5%
	64QAM modulation: (not defined)

6.2.3 Test Method and Setup

The EUT was connected to the Wireless 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 Modulation Characteristics of the EUT by the Wireless Signal Analyzer or equivalent.

Test setup

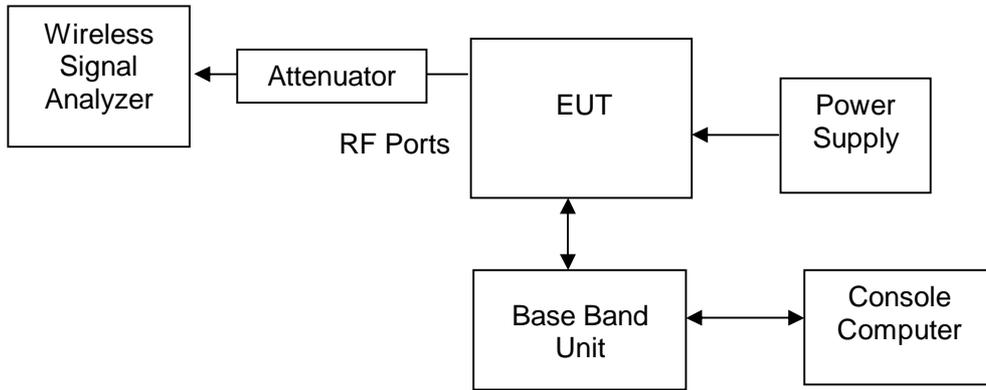


Figure 2. TEST SETUP

6.2.4 Measurement Results

Note: Only one of PCS Lower Band and PCS Higher Band was considered in this test.

Table 24. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics			
	No.9750 1950MHz			
	Type/Mode	Parameters	Measured	Limit
TM1	QPSK	EVM	9.18%	< 17.5%
TM5	16QAM	EVM	5.59%	< 12.5%
TM6	64QAM	---	---	---

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 25. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	62 %
Power supply:	-48 VDC
Test Configuration/Mode:	TM1 at Channel B, M, T

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.

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:

for UMTS equipments:	30 kHz
----------------------	--------

Test setup

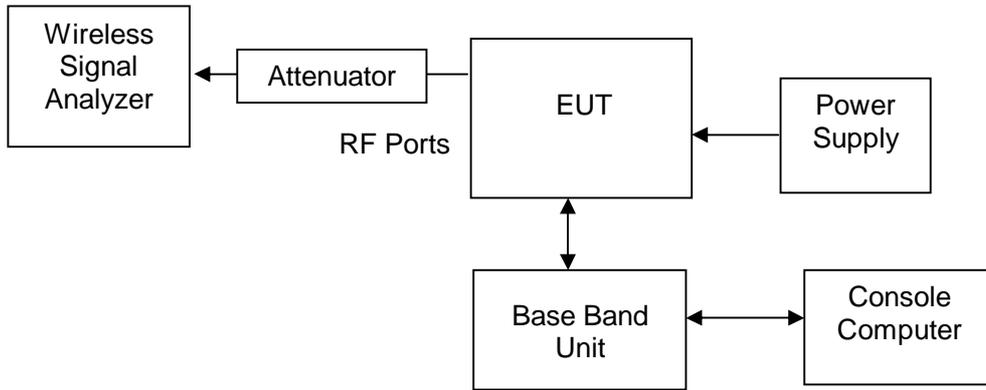


Figure 3. TEST SETUP

6.3.4 Measurement Results

(1) PCS Lower Band

Table 26. Measurement Results for Occupied Bandwidth

Test Mode	Occupied Bandwidth			
	No.9662 1932.4MHz	No.9750 1950MHz	No.9838 1967.6MHz	Limit
	MHz	MHz	MHz	
TM1	4.15	4.17	4.17	---

(2) PCS Higher Band

Table 27. Measurement Results for Occupied Bandwidth

Test Mode	Occupied Bandwidth			
	No.9762 1952.4MHz	No.9850 1970MHz	No.9938 1987.6MHz	Limit
	MHz	MHz	MHz	
TM1	4.17	4.15	4.17	---

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 28. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	62 %
Power supply:	-48 VDC
Test Configuration/Mode:	TM1 at Channel B, T for Multi Carrier 1, 2
Rated maximum transmitter output power (P_{max}):	Single carrier: total 46dBm(40W); Two carriers: each 43dBm, total 46dBm(40W)

6.4.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 24.238, 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 29. FCC Limits for PCS Band

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

Compliance with IC RSS-133 clause 6.5, in the first 1.0 MHz bands immediately outside and adjacent to the licensee's frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log(P)$, dB.

Table 30. IC Limits for PCS 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:

for UMTS equipments:	50 kHz (close to 1% of 5 MHz)
----------------------	-------------------------------

Test setup

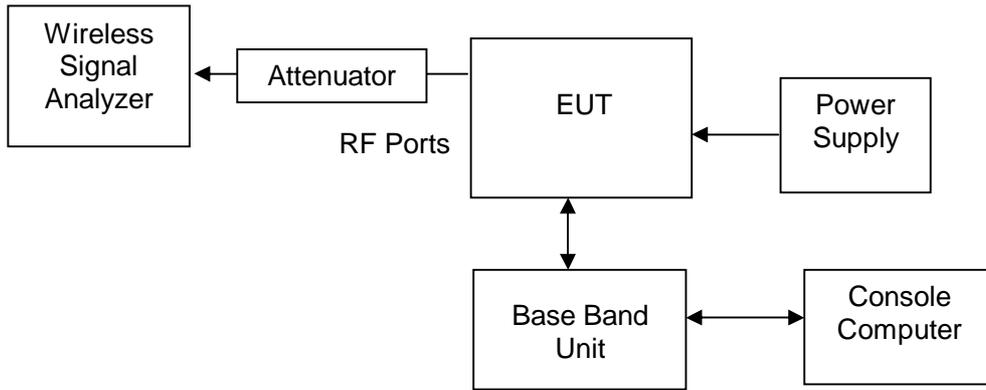


Figure 4. TEST SETUP

6.4.4 Measurement Results

Note: The PCS Lower Band and PCS Higher Band were combined to a full PCS Band (1930 to 1990 MHz) in this test.

TM1

Table 31. Measurement Results for Band Edge Characteristics

Channel Number	Multi Carriers	Test Frequency Range (MHz)	Maximum Spurious Level measured (dBm)	Limit
No.9662/9687	1	1929 – 1930	-17.37	< - 13dBm
1932.4/1937.4MHz	2	1929 – 1930	-20.24	
No.9913/9938	1	1990 – 1991	-15.66	
1982.6/1987.6MHz	2	1990 – 1991	-18.42	

Note: refer to 3GPP TS 25.141, the offset of measurement filter -3dB point was considered for this test.

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 32. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	62 %
Power supply:	-48 VDC
Test Configuration/Mode:	TM1 at Channel B, M, T for Multi Carrier 1, 2
Rated maximum transmitter output power (P_{max}):	Single carrier: total 46dBm(40W); Two carriers: each 43dBm, total 46dBm(40W)

6.5.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 24.238, 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 33. FCC Limits for PCS Band

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

Compliance with IC RSS-133 clause 6.5, after the first 1.0 MHz bands immediately outside and adjacent to the licensee's frequency block, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log (P)$, dB, per any 1 MHz of bandwidth.

Table 34. IC Limits for PCS 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 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.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent for test frequency range of 9 kHz to 10th harmonic:

PCS Band:	1 MHz
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Alternatively, 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

Test setup

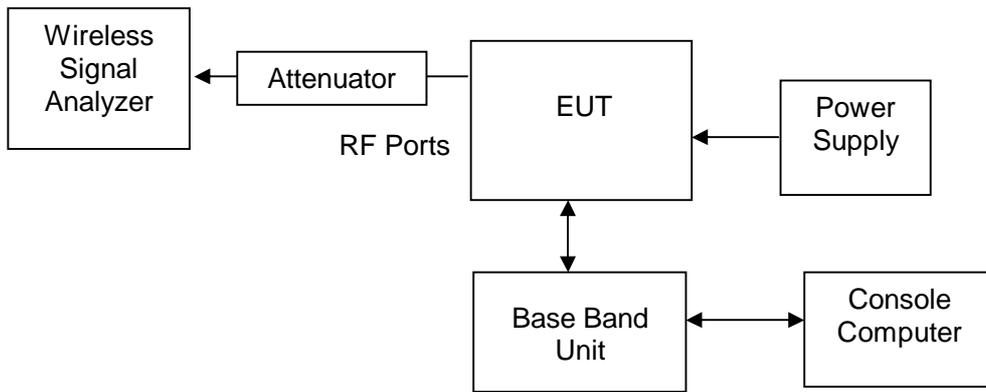


Figure 5. TEST SETUP

6.5.4 Measurement Results

(1) PCS Lower Band

TM1

Table 35. Measurement Results for Spurious Emissions

Channel Number	Multi Carriers	Test Frequency Range (Hz)	Maximum Spurious Level measured (dBm)	Limit
No.9662/9687 1932.4/1937.4MHz	1	9k – 20G	-25.99	< - 13dBm
	2	9k – 20G	-24.97	
No.9725/9750 1945/1950MHz	1	9k – 20G	-25.16	
	2	9k – 20G	-25.41	
No.9813/9838 1962.6/1967.6MHz	1	9k – 20G	-25.57	
	2	9k – 20G	-25.09	

(2) PCS Higher Band

TM1

Table 36. Measurement Results for Spurious Emissions



Channel Number	Multi Carriers	Test Frequency Range (Hz)	Maximum Spurious Level measured (dBm)	Limit
No.9762/9787 1952.4/1957.4MHz	1	9k – 20G	-30.55	< - 13dBm
	2	9k – 20G	-29.77	
No.9850/9875 1970/1975MHz	1	9k – 20G	-31.19	
	2	9k – 20G	-21.53	
No.9913/9938 1982.6/1987.6MHz	1	9k – 20G	-30.50	
	2	9k – 20G	-30.95	

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 37. Test Conditions

Preconditioning:	1 hour
Measured at:	Enclosure
Ambient temperature:	24 °C
Relative humidity:	62 %
Power supply:	-48 VDC
Test Configuration/Mode:	TM1 at Channel M for Multi Carrier 2, Both Ch-A and Ch-B transmit (i.e. Conf.3)

6.6.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 24.238, 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 38. FCC Limits for PCS Band

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

Compliance with IC RSS-133 clause 6.5, after the first 1.0 MHz bands immediately outside and adjacent to the licensee's frequency block, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log (P)$, dB, per any 1 MHz of bandwidth.

Table 39. IC Limits for PCS 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 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.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent for test frequency range of 9 kHz to 10th harmonic:

PCS Band:	1 MHz
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Alternatively, 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

Test setup

Step 1: Pre-test

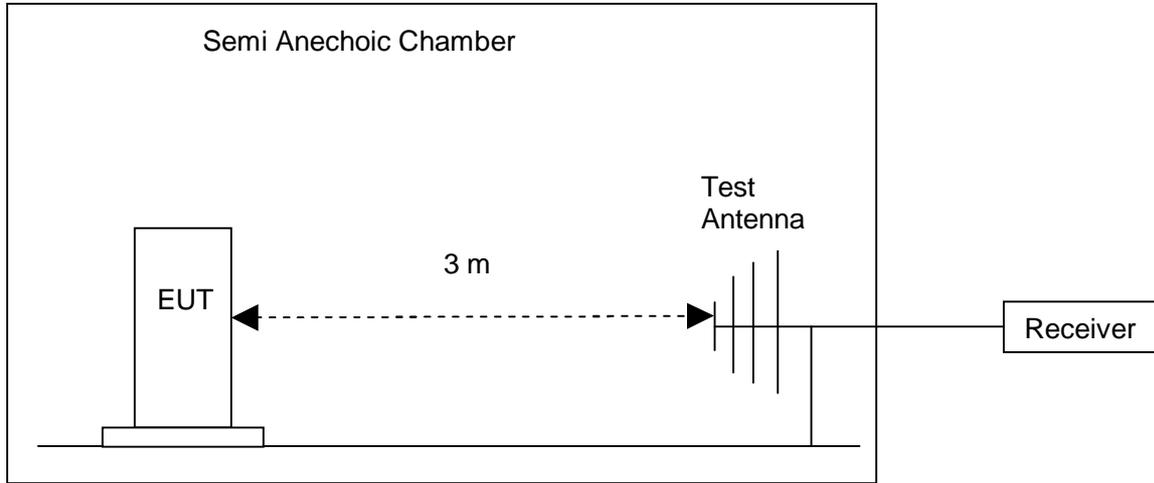


Figure 6. Test Set-up for Pre-test

Step 2: Substitution method to verify the maximum ERP

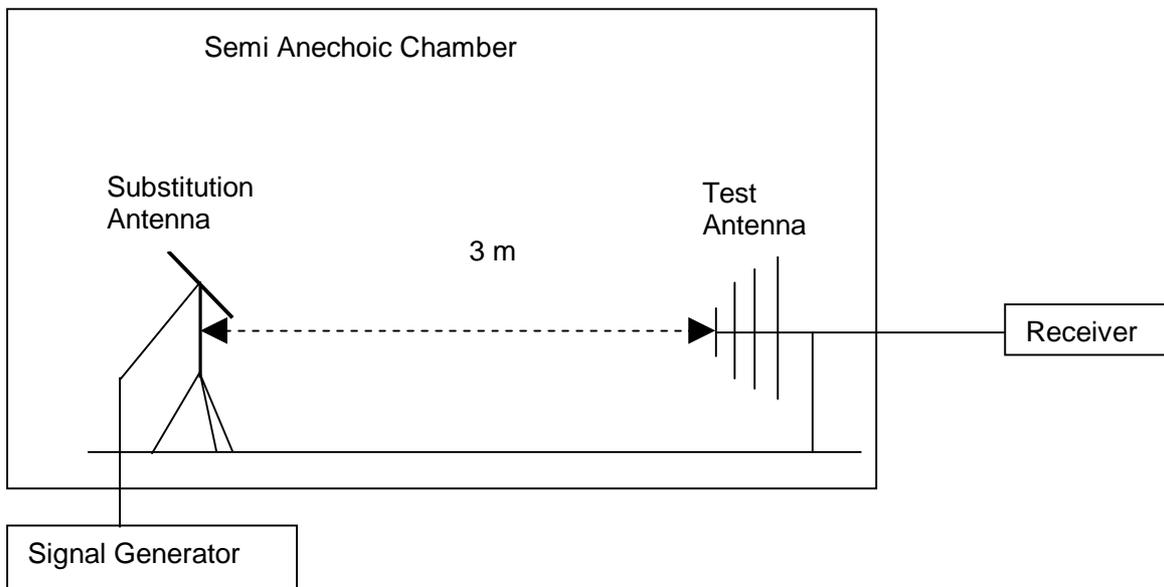


Figure 7. Test Set-up for Substitution

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

Table 40. Measurement Results for Spurious Emissions

Channel Number	Test Frequency Range (Hz)	Maximum Spurious Level measured (dBm)	Limit
No.9725/9750 1945/1950MHz	30M – 10G	< -13	< - 13dBm



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 41. 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 at Channel M

6.7.2 Test Specifications and Limits

Compliance with FCC part 2.1055 and part 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Table 42. FCC Limits for PCS Band

Limit:	(not defended)
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Compliance with IC RSS-133 clause 6.3, the carrier frequency shall not depart from the reference frequency in excess of $\pm 1.0\text{ppm}$ for base stations.

Table 43. IC Limits for PCS Band

Limit:	$< \pm 1.0\text{ppm}$
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Specially, limits according to the technical requirements of the EUT can be adopted as showed in the following table:

Table 44. Limits According to EUT technical requirements for all operating bands

for UMTS equipments:	$< \pm (0.05 \text{ ppm} + 12 \text{ Hz})$
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6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature from $-30\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$.

Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than $10\text{ }^{\circ}\text{C}$ 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 IC RSS-Gen clause 4.7, with the transmitter installed in an environment test chamber, the unmodulated carrier frequency shall be measured under the conditions specified below.

The operating end points are: -48 VDC (normal point), -36 VDC (lowest point) and -57 VDC (highest point).

Test Set up

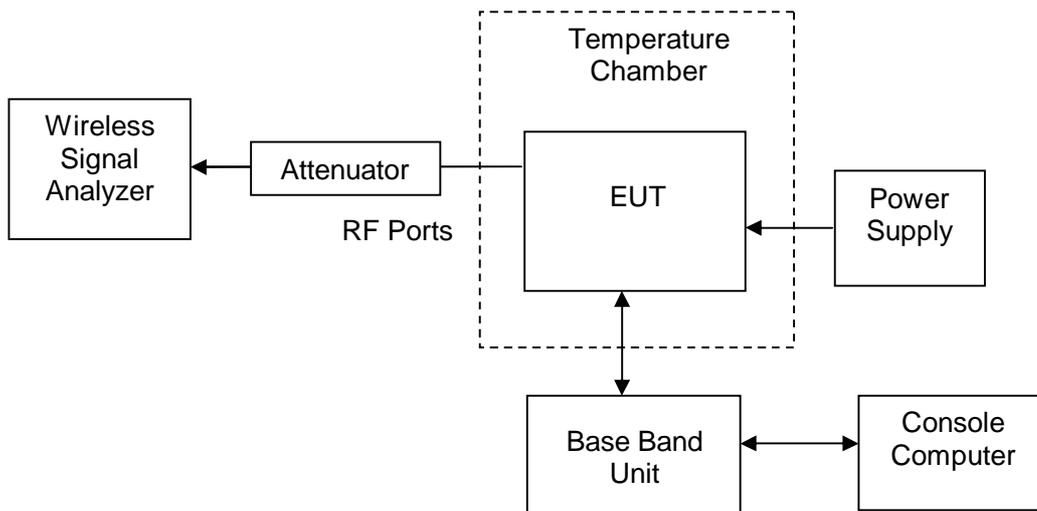


Figure 8. Test Set up

6.7.4 Measurement Results

Note: Only one of PCS Lower Band and PCS Higher Band was considered in this test.

6.7.4.1 Frequency Error vs. Temperature

Table 45. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error					
Test Environment		No.9750 1950MHz			
Voltage	Temperature	Hz	ppm		Limit
			Refer to nominal frequency	Refer to (+20°C, rated voltage)	
-48 VDC (100% rated / normal)	-30 °C	3.91	0.002	0.000	< ±0.05ppm (UMTS) or < ±1.0ppm (IC)
	+20 °C	4.05	0.002	---	
	+50 °C	4.94	0.003	0.000	

6.7.4.2 Frequency Error vs. Voltage

Table 46. Measurement Results for Frequency Error vs. Voltage

Measured Maximum Frequency Error					
Test Environment		No.9750 1950MHz			
Voltage	Temperature	Hz	ppm		Limit
			Refer to nominal frequency	Refer to (+20°C, rated voltage)	
-36 VDC (85% rated / lowest)	+20 °C	4.18	0.002	0.000	< ±0.05ppm (UMTS) or < ±1.0ppm (IC)
-48 VDC (100% rated / normal)	+20 °C	4.05	0.002	---	
-57 VDC (115% rated / highest)	+20 °C	4.90	0.003	0.000	

6.7.5 Conclusion

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

6.8 Receiver Spurious Emissions (Conducted)

6.8.1 Test Conditions

Table 47. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	62 %
Power supply:	-48 VDC
Test Configuration/Mode:	TM1 at Channel M

6.8.2 Test Specifications and Limits

Compliance with IC RSS-Gen clause 4.10 and clause 6 and RSS-133 clause 6.6, when 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 per any 1 MHz above 1 GHz.

Table 48. IC Limits for PCS Band

Limit:	< 2 nW/4 kHz (-57 dBm/4 kHz), for 30 MHz - 1000 MHz; < 5 nW/MHz (-53 dBm/MHz), for above 1 GHz
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6.8.3 Test Method and Setup

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

According to IC RSS-Gen clause 4.10, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

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.

Measurement bandwidth (RBW) and Detector of Spectrum Analyzer or equivalent:

4 kHz RBW with Peak Detector, for below 1 GHz; 1 MHz RBW with Average Detector, for above 1 GHz
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Test setup

Note: As mentioned in the front of section 6 (page 12) of this test report, the EUT can transmit and receive signals at one RF port. So, the “receive mode” was carried out by restricting the TX signals using a Notch Filter.

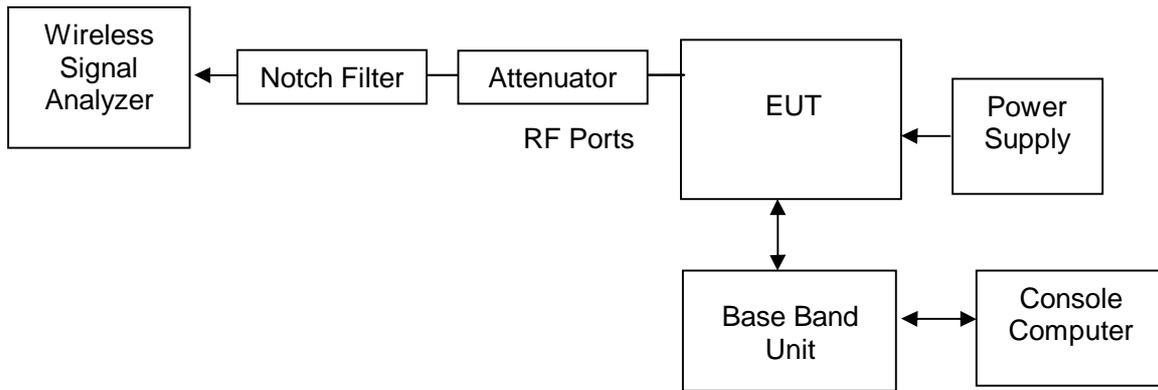


Figure 9. TEST SETUP

6.8.4 Measurement Results

Note: The emissions from the TX should not be considered.

(1) PCS Lower Band

TM1

Table 49. Measurement Results for Receiver Spurious Emissions (Conducted)

Channel Number	Test Frequency Range (Hz)	Detector	Maximum Spurious Level measured (dBm)	Limit
No.9750 1870MHz	30 MHz to 1 GHz	Peak	-69.26	< -57 dBm/4kHz
	1 GHz to 6 GHz	Average	-58.38	< -53 dBm/1MHz

(2) PCS Higher Band

TM1

Table 50. Measurement Results for Receiver Spurious Emissions (Conducted)

Channel Number	Test Frequency Range (Hz)	Detector	Maximum Spurious Level measured (dBm)	Limit
No.9850 1890MHz	30 MHz to 1 GHz	Peak	-74.63	< -57 dBm/4kHz
	1 GHz to 6 GHz	Average	-56.93	< -53 dBm/1MHz



6.8.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the 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 51. 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



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 Emissions (Conducted)
Appendix G	Photos of Test Setup

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