



FCC & IC Test Report

Product Name: Distributed Base Station Remote Radio Unit

Model Number: RRU3808

Report No: SYBH(R)004022010EB-1

FCC ID: QISRRU3808

IC: 6369A-RRU3808

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REPORT ON FCC & IC Test of Distributed Base Station Remote Radio Unit

Model Name: RRU3808

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 IC: 6369A-RRU3808

REGULATION 47 CFR FCC Part 2, Subpart J
 47 CFR FCC Part 27, Subpart C

IC RSS-Gen
 IC RSS-139

CONCLUSION PASSED

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1 Summary

1.1 Results Summary

The table below summarizes the measurements and results for the equipment of Distributed Base Station Remote Radio Unit - RRU3808. Detailed results and descriptions are shown in the following pages.

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

47 CFR FCC Part(s) Requirements		Description	Result
Specification	Limits		
2.1046	27.50(d)	Transmitter Output Power	PASS
2.1047	---	Modulation Characteristics	PASS
2.1049	---	Occupied Bandwidth	PASS
2.1051	27.53(h)	Band Edges Compliance	PASS
2.1051	27.53(h)	Spurious Emission at Antenna Terminal	PASS
2.1053	27.53(h)	Radiated Spurious Emission	PASS
2.1055	27.54	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 AWS Band

IC RSS-139 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.

1.2 Supporting Standards

Table 3. Supporting Standards

Standard Name	Description
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Standard Name	Description
ANSI/TIA-603-C	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
IC SRSP-513	Technical Requirements for Advanced Wireless Services in the Bands 1710-1755 MHz and 2110-2155 MHz
3GPP TS 25.141	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD)



2 Product Description

2.1 Production Information of EUT

2.1.1 General Description

HUAWEI Base Station DBS3900 UMTS is a distributed NodeB with the 3GPP UMTS FDD protocols. The DBS3900 UMTS supports CPRI interfaces and contains BBU and RRU two parts:

- I Baseband unit (BBU): processes baseband signals.
- I Radio remote unit (RRU): processes RF signals

RRU3808 (Band IV) is the outdoor radio remote unit. It can be mounted close to the antenna on a metal pole or a wall.

For RRU3808 (Band IV), the downlink frequency is 2110 MHz~2155 MHz and the uplink frequency is 1710 MHz~1755 MHz.

RRU3808 (Band IV) has a highly integrated structure. The components of RRU3808 are describes as follows:

1. Power supply: leads the external – 48 V DC power to supply power for RRU3808.
2. Duplexer: multiplexes RX signals and TX signals, which enables the RX signals and TX signals to share the same antenna path. The duplexer also filters RX signals and TX signals.
3. Low noise amplifier: amplifies received signals to avoid loss of signals.
4. Power amplifier: amplifies transmission signals to reinforce the power of the signals. It has the power of 40 W per port.
5. TRX: includes two receive channels, two transmission channels and one feedback channel. Each channel supports only one carrier.

2.1.2 Support function and Service

The EUT supports the function and service as follows:

Table 4. 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 5. 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 (y-m-d): 2010-03-08

Date of End (y-m-d): 2010-03-11



4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 6. Frequency Range for AWS Band

Uplink band:	1710 to 1755 MHz
Downlink band:	2110 to 2155 MHz

4.1.2 Channel Separation/Bandwidth

Table 7. Frequency Interval and Channel Separation

Channel raster:	200 kHz
Channel spacing/bandwidth:	5 MHz

4.1.3 Output Power

Table 8. Output Power

Transmitter Output Power (per Antenna Port):	<p>1 x 40 W (= 46 dBm)</p> <p>2 x 20 W (= 2 * 43 dBm = 46 dBm)</p> <p>3 x 13.3 W (= 3 * 41.25 dBm = 46 dBm)</p> <p>4 x 10W (= 4 * 40 dBm = 46 dBm)</p>
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4.1.4 Type of Emission

Refer to FCC part 2.201 and 2.202.
 Refer to IC TRC-43.

Table 9. Type of Emission

Emission Designation:	<p>4M17F9W</p> <p>(Note: if the rated channel bandwidth is considered, it can be 5M00F9W)</p>
-----------------------	---



4.1.5 Environmental Requirements

Table 10. Environmental Requirements

Minimum temperature:	-40 °C
Maximum temperature:	+55 °C
Relative Humidity:	15% to 75% RH

4.1.6 Power Source

Table 11. DC Power Source

DC voltage nominal:	=== -48 V
DC voltage range:	=== -36 V to === -57 V
DC current maximal:	8 A

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

The EUT involved in the test report consists of sub-assembly and ancillary Equipments as below.

(1) Sub-assembly identity of EUT

Table 12. Sub-assembly identity of EUT

Model Identify	Qty.	Hardware Version	Software Version	Serial Number	Description
RRU 3808	1	VER.A	V200R012	210231746610A10000 02	Remote Radio Unit

(2) Sub-assembly identity of Ancillary Equipments

Table 13. Sub-assembly identity of Ancillary Equipments

Model Identify	Qty.	Hardware Version	Software Version	Serial Number	Description
WMPT	1	VER.A	V200R012	020JQE4M9B109146	Main Processing Unit of Base Band Unit
WBBPa	1	VER.A	V200R012	020HKJ1085000061	Base Band Unit, type a
WBBPb	1	VER.A	V200R012	020LAJW095002001	Base Band Unit, type b

4.2.2 FCC Identification

Grantee Code: QIS
Product Code: RRU3808
FCC Identification: QISRRU3808

4.2.3 IC Identification

Company Number: 6369A
UPN Number: RRU3808
IC Identification: 6369A-RRU3808



5 Main Test Instruments

Table 14. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (y-m-d)
Receiver	R&S	ESU40	100144	2010-04-21
BiLog Antenna	Schaffner	CBL 6112B	2747	2010-11-29
Horn Antenna	R&S	HF906	359287/005	2010-03-26
Horn Antenna	ETS	3160-9	00060006	2010-10-27
Spectrum Analyzer	R&S	FSQ40	100025	2010-10-09
Temperature Chamber	ESPEC	EW2465	05175004	2010-08-11



6 Transmitter & Receiver Measurements

Test Ports:

The EUT consists of two TRX ports, which are TRX_A and TRX_B. These ports have identical functions and specifications. All conducted tests in this report are performed on TRX_A port.

Test Frequencies:

Table 15. Frequency points (channels) selected to perform transmitter tests

Transmitter Operating Band	Multiple Carriers	Channels under Test		
		Bottom/lowest (B)	Middle (M)	Top/highest (T)
AWS band	1	2112.4 MHz	2132.4 MHz	2152.6 MHz
	2	2112.4/2117.4 MHz	2132.4/2137.4 MHz	2147.6/2152.6 MHz
	3	2112.4/2117.4/2122.4 MHz	2127.4/2132.4/2137.4 MHz	2142.6/2147.6/2152.6 MHz
	4	2112.4/2117.4/2122.4/2127.4 MHz	2127.4/2132.4/2137.4/2142.4 MHz	2137.6/2142.6/2147.6/2152.6 MHz

Table 16. Frequency points (channels) selected to perform receiver tests (for IC tests)

Receiver Operating Band	Multiple Carriers	Channels under Test		
			Channel M	
AWS band	1		1732.4 MHz	

6.1 Maximum Channel Power

6.1.1 Test Conditions

Table 17. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	22.5 - 24 °C
Relative humidity:	36 - 37 %

6.1.2 Test Specifications and Limits

Compliance with FCC part 2.1046 and part 27.50(d), the power of base station transmitting in the 2110-2155 MHz band is limited to an equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less, or limited to an EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

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 18. FCC Limits for AWS Band

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

Compliance with IC RSS-139 clause 6.4 and SRSP-513 clause 5.1, For fixed or base stations operating in this sub-band with a 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 fixed or base stations operating in this sub-band with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 1640 watts/MHz e.i.r.p. (i.e., no more than 1640 watts 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 19. IC Limits for AWS Band

Maximum EIRP:	< 1640 Watts (= 62 dBm) (for Emission bandwidth \leq 1MHz) < 1640 Watts/MHz (= 62 dBm/MHz) (for Emission bandwidth > 1MHz)
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 and the Peak-to-

Average Ratio/Crest Factor (if applicable) 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

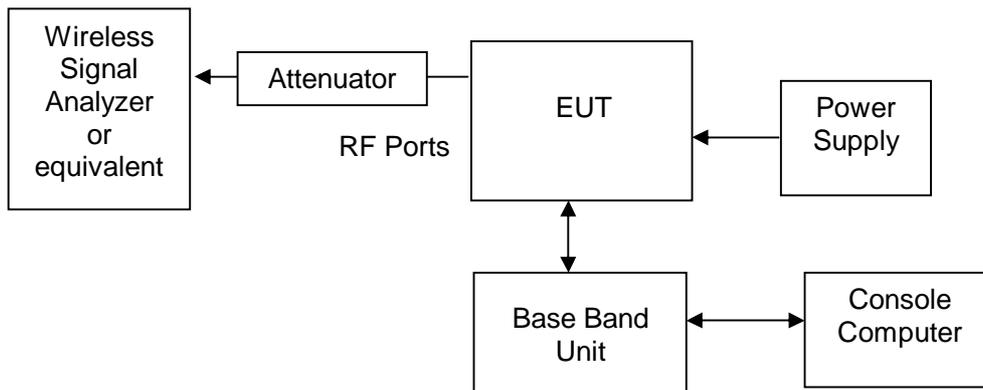


Figure 1. TEST SETUP

6.1.4 Measurement Results

6.1.4.1 Maximum Output Power at Antenna Port

(1) Multiple Carriers = 1:

Table 20. Measurement Results for Maximum Output Power (Total)

Test Mode	Maximum Output Power (Total)						Limit	
	Ch. B		Ch. M		Ch. T		dBm	dBm/MHz
	dBm	dBm/MHz	dBm	dBm/MHz	dBm	dBm/MHz		
TM 1	45.43	38.44	46.00	39.01	45.74	38.75	---	<62 dBm/MHz
TM 5	45.51	38.52	46.03	39.04	45.53	38.54	---	<62 dBm/MHz
TM 6	45.40	38.41	45.88	38.89	45.56	38.57	---	<62 dBm/MHz

(2) Multiple Carriers = 2:

Table 21. Measurement Results for Maximum Output Power (Total)

Test	Maximum Output Power (Total)	Limit
------	------------------------------	-------



	Ch. B		Ch. M		Ch. T		dBm	dBm/MHz
	dBm	dBm/MHz	dBm	dBm/MHz	dBm	dBm/MHz		
TM 1	45.40	38.41	45.64	38.65	45.62	38.63	---	<62 dBm/MHz
TM 5	45.44	38.45	45.71	38.72	45.38	38.39	---	<62 dBm/MHz
TM 6	45.58	38.59	45.79	38.80	45.74	38.75	---	<62 dBm/MHz

(3) Multiple Carriers = 3:

Table 22. Measurement Results for Maximum Output Power (Total)

Test Mode	Maximum Output Power (Total)						Limit	
	Ch. B		Ch. M		Ch. T		dBm	dBm/MHz
	dBm	dBm/MHz	dBm	dBm/MHz	dBm	dBm/MHz		
TM 1	45.48	38.49	45.46	38.47	45.33	38.34	---	<62 dBm/MHz
TM 5	45.41	38.42	45.43	38.44	45.39	38.40	---	<62 dBm/MHz
TM 6	45.79	38.80	45.79	38.80	45.66	38.67	---	<62 dBm/MHz

(4) Multiple Carriers = 4:

Table 23. Measurement Results for Maximum Output Power (Total)

Test Mode	Maximum Output Power (Total)						Limit	
	Ch. B		Ch. M		Ch. T		dBm	dBm/MHz
	dBm	dBm/MHz	dBm	dBm/MHz	dBm	dBm/MHz		
TM 1	45.74	38.75	45.89	38.90	45.66	38.67	---	<62 dBm/MHz
TM 5	45.64	38.65	45.94	38.95	45.68	38.69	---	<62 dBm/MHz
TM 6	45.72	38.73	45.81	38.82	45.73	38.74	---	<62 dBm/MHz

6.1.4.2 Peak-to-Average Ratio

(1) Multiple Carriers = 1:

Table 24. Measurement Results for Peak-to-Average Ratio

Test Mode	Peak-to-Average Ratio (PAR), dB			Limit (dB)
	Ch. B	Ch. M	Ch. T	



Test Mode	Peak-to-Average Ratio (PAR), dB			Limit (dB)
	Ch. B	Ch. M	Ch. T	
TM 1	7.18	7.11	7.11	<13
TM 5	7.20	7.09	7.14	<13
TM 6	7.13	7.00	7.10	<13

6.1.5 Conclusion

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

6.2 Modulation Characteristics

6.2.1 Test Conditions

Table 25. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	22.5 - 24 °C
Relative humidity:	36 - 37 %

6.2.2 Test Specifications and Limits

No specific modulation characteristics requirement limits in FCC part 2.1047 and part 27 subpart C for AWS Band.

No specific modulation characteristics requirement limits in IC RSS-139 clause 6.2 for AWS Band.

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

Table 26. Limits According to EUT technical requirements

Limits for UMTS equipments:	QPSK modulation: EVM < 17.5% 16QAM modulation: EVM < 12.5% 64QAM modulation: RCDE < -20dB (SF=16)
-----------------------------	---

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

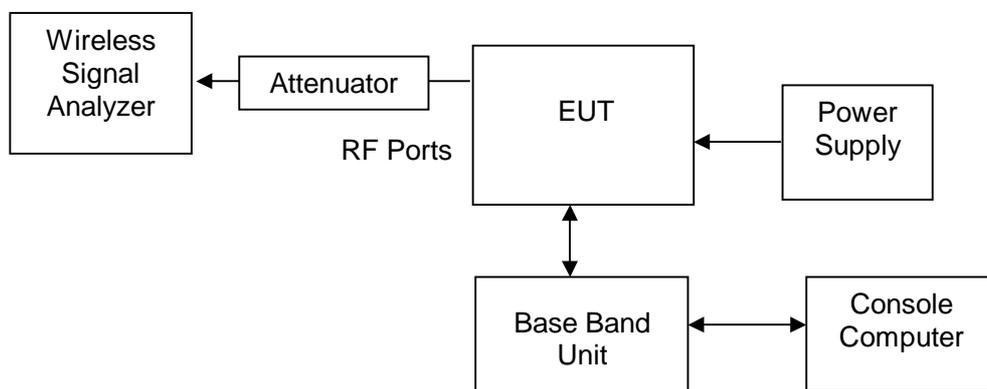




Figure 2. TEST SETUP

6.2.4 Measurement Results

(1) Multiple Carriers = 1:

Table 27. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics			Limit
	Ch. M			
	Type/Mode	Parameters	Measured Value	
TM1	QPSK	EVM	3.10%	< 17.5%
TM5	16QAM	EVM	3.70%	< 12.5%
TM6	64QAM	RCDE	N/A (see Note)	< -20dB (SF=16)

Note: due to the unequipped functional option of the signal analyzer for TM6, the result is not applicable. However, the digital modulation for TM6 can be obviously identified out (See Appendix)

6.2.5 Conclusion

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

6.3 Occupied Bandwidth

6.3.1 Test Conditions

Table 28. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	22.5 - 24 °C
Relative humidity:	36 - 37 %

6.3.2 Test Specifications and Limits

No specific occupied bandwidth requirement in FCC part 2.1049 and part 27 subpart C for AWS 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).

The measurement bandwidth (RBW) of Spectrum Analyzer or equivalent is set to about or less than 1% of the channel bandwidth.

Test setup

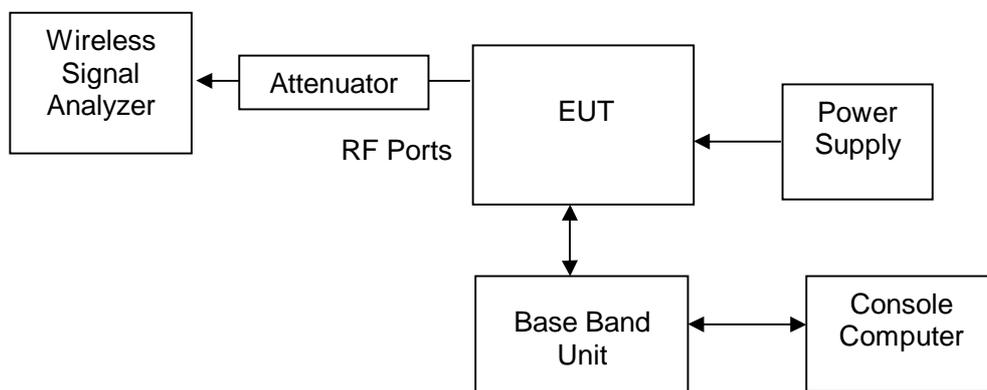


Figure 3. TEST SETUP



6.3.4 Measurement Results

(1) Multiple Carriers = 1:

Table 29. Measurement Results for Occupied Bandwidth

Test Mode	99% Occupied Bandwidth			Limit
	B	M	T	
	MHz	MHz	MHz	
TM1	4.17	4.17	4.17	---
TM5	4.17	4.17	4.17	
TM6	4.17	4.17	4.17	

6.3.5 Conclusion

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



6.4 Band Edges Compliance

6.4.1 Test Conditions

Table 30. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	22.5 - 24 °C
Relative humidity:	36 - 37 %

6.4.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 27.53(h), in the 1 megahertz bands immediately outside and adjacent to the licensee's 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 a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

Table 31. FCC Limits for AWS 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-139 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 32. IC Limits for AWS 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.

The measurement bandwidth (RBW) of Spectrum Analyzer or equivalent is set to about or less than 1% of the channel bandwidth.

Test setup

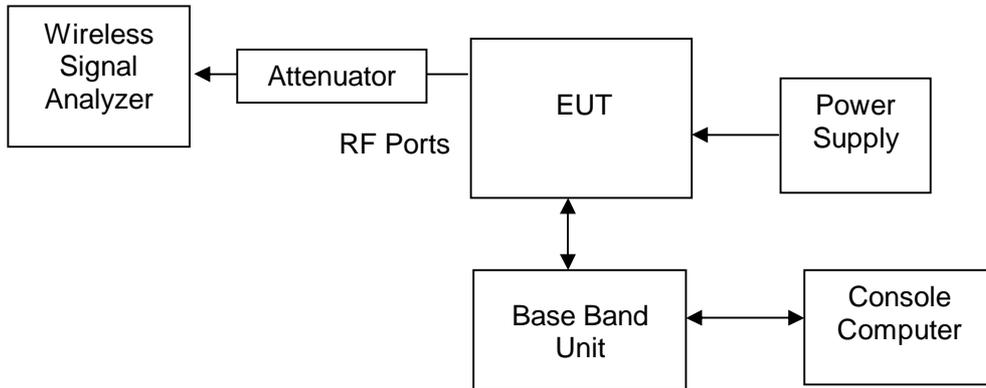


Figure 4. TEST SETUP

6.4.4 Measurement Results

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

(1) Multiple Carriers = 1:

Table 33. Measurement Results for Band Edge Characteristics

Test Mode	Test Frequency Range (MHz)	Band Edge Emissions		
		B	T	Limit (dBm)
		dBm	dBm	
TM 1	2109 – 2110	-17.65	/	< -13
	2155 – 2156	/	-17.87	< -13
TM 5	2109 – 2110	-18.16	/	< -13
	2155 – 2156	/	-17.81	< -13
TM 6	2109 – 2110	-17.69	/	< -13
	2155 – 2156	/	-18.25	< -13

(2) Multiple Carriers = 4:

Table 34. Measurement Results for Band Edge Characteristics

Test Mode	Test Frequency Range (MHz)	Band Edge Emissions		
		B	T	Limit (dBm)
		dBm	dBm	
TM 1	2109 – 2110	-21.43	/	< -13
	2155 – 2156	/	-21.62	< -13
TM 5	2109 – 2110	-21.59	/	< -13
	2155 – 2156	/	-21.29	< -13
TM 6	2109 – 2110	-19.78	/	< -13
	2155 – 2156	/	-20.96	< -13



6.4.5 Conclusion

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

6.5 Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

Table 35. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	22.5 - 24 °C
Relative humidity:	36 - 37 %

6.5.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 27.53(h), based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

Table 36. FCC Limits for AWS 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-139 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 37. IC Limits for AWS 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.

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:

AWS 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

Detector of Spectrum Analyzer or equivalent:

WCDMA equipment:	RMS
------------------	-----

Test setup

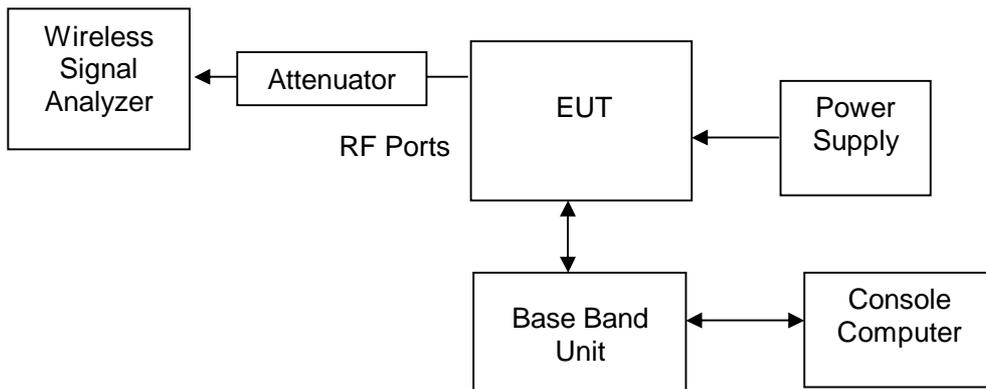


Figure 5. TEST SETUP

6.5.4 Measurement Results

(1) Multiple Carriers = 1:

Table 38. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Conducted Spurious Emissions			
		B	M	T	Limit (dBm)
		dBm	dBm	dBm	
TM 1	9k – 22G	-24.15	-23.61	-23.68	< -13
TM 5	9k – 22G	-23.78	-24.52	-24.08	< -13
TM 6	9k – 22G	-24.38	-23.89	-24.23	< -13

(2) Multiple Carriers = 4:

Table 39. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Conducted Spurious Emissions			
		B	M	T	Limit (dBm)
		dBm	dBm	dBm	
TM 1	9k – 22G	-24.00	-24.31	-23.91	< -13
TM 5	9k – 22G	-23.34	-23.81	-24.07	< -13
TM 6	9k – 22G	-23.92	-23.61	-24.37	< -13



6.5.5 Conclusion

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



6.6 Radiated Spurious Emission

6.6.1 Test Conditions

Table 40. Test Conditions

Measured at:	Enclosure
Ambient temperature:	25 °C
Relative humidity:	50 %

6.6.2 Test Specifications and Limits

Compliance with FCC part 2.1053 and part 27.53(h), based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

Table 41. FCC Limits for AWS 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-139 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 42. IC Limits for AWS 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.

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:

AWS Band:	1 MHz
-----------	-------

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

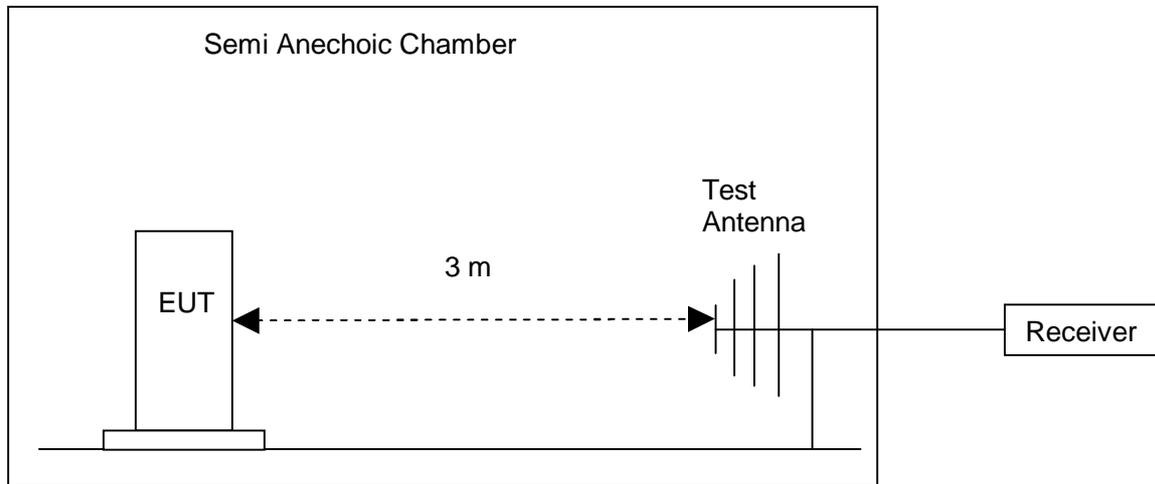


Figure 6. Test Set-up for Pre-test

Step 2: Substitution method to verify the maximum ERP

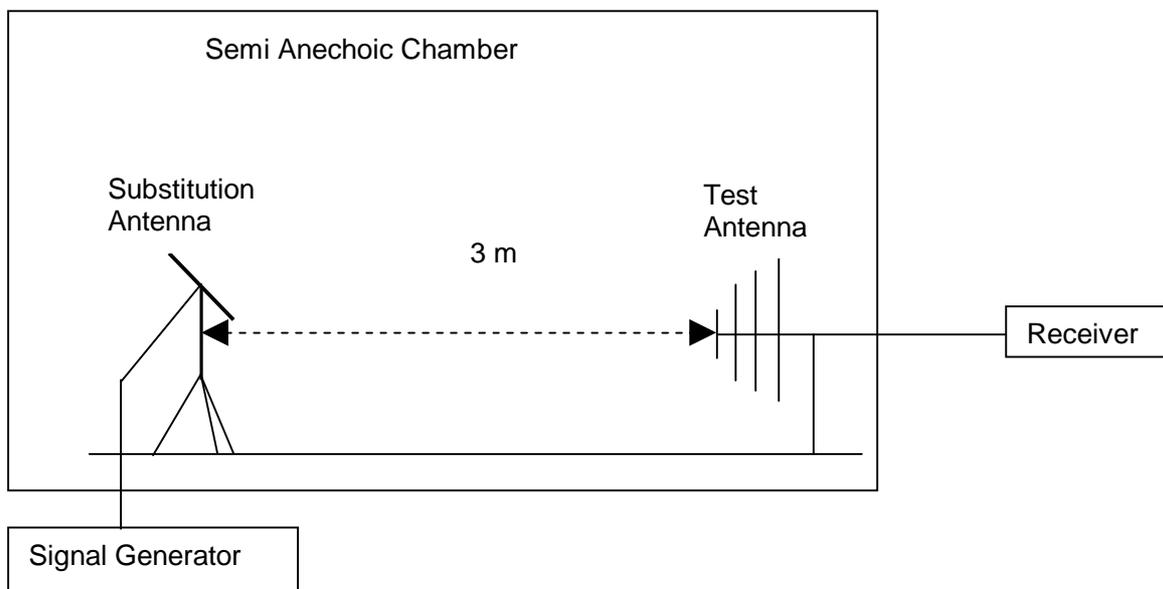


Figure 7. Test Set-up for Substitution

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 43. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Radiated Spurious Emissions		
		M		Limit (dBm)
		dBm		



Test Mode	Test Frequency Range	Radiated Spurious Emissions		
		M		Limit (dBm)
TM 1	30M – 22G		dBm	
			< -13	< -13

6.6.5 Conclusion

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



6.7 Frequency Stability

6.7.1 Test Conditions

Table 44. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	See Measurement Results
Relative humidity:	36 - 37 %
Power supply:	See Measurement Results

6.7.2 Test Specifications and Limits

Compliance with FCC part 2.1055 and part 27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Table 45. FCC Limits for AWS Band

Limit:	(not defended)
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Compliance with IC RSS-139 clause 6.3, the frequency stability shall be sufficient to ensure that the emission bandwidth stays within the operating frequency block.

Table 46. IC Limits for AWS Band

Limit:	(not defended)
--------	----------------

Specially, limits according to the technical requirements of the EUT can be adopted as showed in the following table:

Table 47. Limits According to EUT technical requirements for all operating bands

for UMTS equipments:	$< \pm (0.05 \text{ ppm} + 12 \text{ Hz})$
----------------------	--

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.

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:	-48 VDC (100% normal point), -40.8 VDC (85% lowest point) and -55.2 VDC (115% highest point).
---------------------------	---

Test Set up

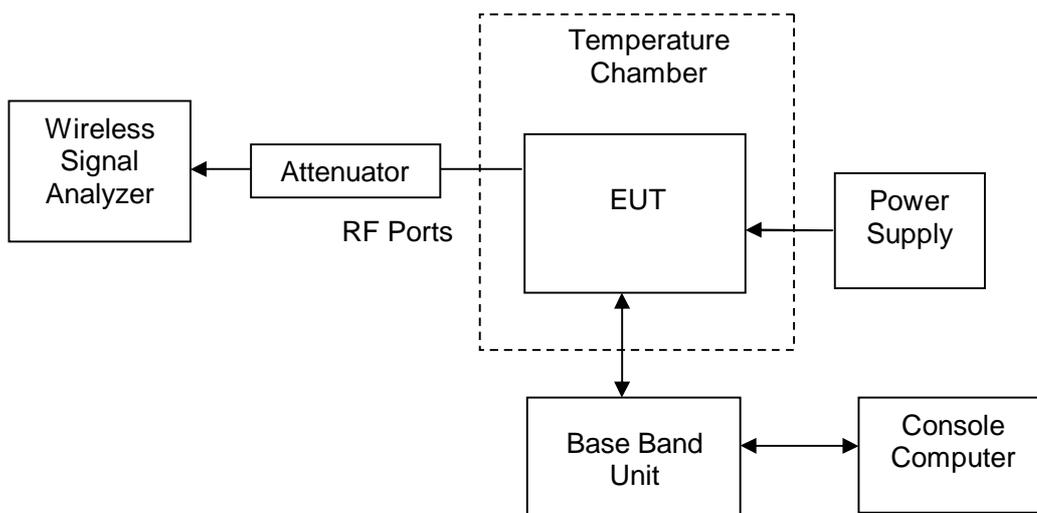


Figure 8. Test Set up

6.7.4 Measurement Results

6.7.4.1 Frequency Error vs. Temperature

Table 48. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error



Test Environment		M			
Voltage	Temperature	Hz	ppm		Limit
			Refer to nominal frequency	Refer to (+20°C, rated voltage)	
-48 VAC (100% rated / normal)	-30 °C	5.98	0.003	-0.004	< ±0.05ppm
	-20 °C	6.56	0.003	-0.003	
	-10 °C	12.09	0.006	0.000	
	0 °C	10.32	0.005	-0.001	
	+10 °C	7.89	0.004	-0.003	
	+20 °C	12.88	0.006	---	
	+30 °C	10.56	0.005	-0.001	
	+40 °C	9.45	0.004	-0.002	
	+50 °C	11.34	0.005	-0.001	

6.7.4.2 Frequency Error vs. Voltage

Table 49. Measurement Results for Frequency Error vs. Voltage

Measured Maximum Frequency Error					
Test Environment		M			
Voltage	Temperature	Hz	ppm		Limit
			Refer to operating frequency	Refer to value under +20°C and 100% rated voltage	
-40.8 VDC (85% lowest point)	+20 °C	9.78	0.005	-0.002	< ±0.05ppm
-48 VAC (100% rated / normal)	+20 °C	12.88	0.006	---	
-55.2 VDC (115% highest point).	+20 °C	10.34	0.005	-0.001	

6.7.5 Conclusion

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



6.8 Receiver Spurious Emissions (Conducted)

6.8.1 Test Conditions

Table 50. Test Conditions

Measured at:	Antenna connector (RX diversity only) If no separate RX ports (e.g. TRX or TX), a notch filter should be used for reject the operating frequency
Ambient temperature:	22.5 - 24 °C
Relative humidity:	36 - 37 %

6.8.2 Test Specifications and Limits

Compliance with IC RSS-Gen clause 4.10 and clause 6 and RSS-139 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 51. IC Limits for AWS 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
--------	---

6.8.3 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 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
--

Test setup

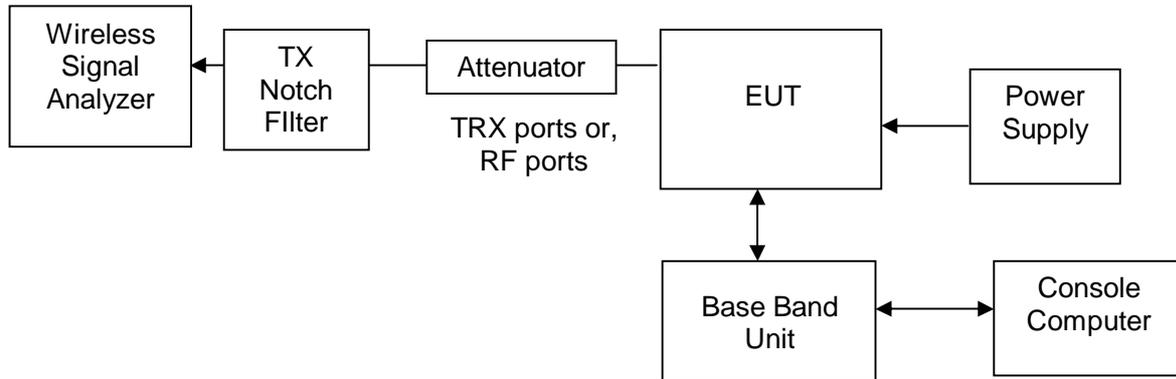


Figure 9. TEST SETUP

6.8.4 Measurement Results

Table 52. Measurement Results for Receiver Spurious Emissions (Conducted)

Test Mode	Test Frequency Range	Receiver Spurious Emissions (Conducted)	
		M	Limit
		dBm	
TM 1	30 MHz to 1 GHz	-65.80	< -57 dBm/4kHz
	1 GHz to 7 GHz	-64.00	< -53 dBm/1MHz
TM 5	30 MHz to 1 GHz	-63.86	< -57 dBm/4kHz
	1 GHz to 7 GHz	-63.78	< -53 dBm/1MHz
TM 6	30 MHz to 1 GHz	-63.56	< -57 dBm/4kHz
	1 GHz to 7 GHz	-63.96	< -53 dBm/1MHz

6.8.5 Conclusion

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



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 53. 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 Peak-to-Average Ratio	10	Pages
Appendix B	Measurement Results Modulation Characteristics	4	Pages
Appendix C	Measurement Results Occupied Bandwidth	11	Pages
Appendix D	Measurement Results Band Edges	13	Pages
Appendix E	Measurement Results Spurious Emission at Antenna Terminal	19	Pages
Appendix F	Measurement Results Radiated Spurious Emission	4	Pages
Appendix G	Measurement Results Receiver Spurious Emissions (Conducted)	7	Pages
Appendix H	Photos of Test Setup	4	Pages

END