



FCC Test Report

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

Model Number: RRU3908-1900

Report No: SYBH(R)015042011EB-6

**FCC ID: QISR3908-1900
IC: 6369A-3908B2**

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REPORT ON FCC Test of Remote Radio Unit of Multi-Mode Distributed Base Station

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REGULATION **47 CFR FCC Part 2, Subpart J (2009-10)**
47 CFR FCC Part 24, Subpart E (2009-10)
RSS-132(Issue 2)
RSS-133(Issue 5)

CONCLUSION **PASSED**

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1 SUMMARY

1.1 Results Summary

The table below summarizes the measurements and results for the equipment of RRU3908. 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.

1.2 Supporting Standards

Table 3. Supporting Standards

Standard Name	Description
ANSI/TIA-603-C	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards



Standard Name	Description
3GPP TS 51.021	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Base Station System (BSS) equipment specification; Radio aspects



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 GSM only.

2.1.2 Support function and Service

The EUT supports the function and service as follows:

Table 4. Service and Test Mode List(GSM)

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

Note: The test conditions and settings are defined in 3GPP TS 51.021.

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): 2011-04-01

Date of End (y-m-d): 2011-04-19

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 6. Frequency Range for PCS Band

Uplink band:	1850 to 1910 MHz
Downlink band:	1930 to 1990 MHz

4.1.2 Channel Separation/Bandwidth

Table 7. Frequency Interval and Channel Separation

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

4.1.3 Output Power

For GSM 1900MHz, the power of RRU module is configured as to table 8;

Table 8. Transmit power of EUT(GSM 1900MHz)

Transmitter Output Power (per Antenna Port):	1* 40 W (= 1*46 dBm) 2*15 W (= 2*41.8 dBm) 3*10W (=3*40 dBm)
--	--

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:	300KGXW (GMSK), 300KG7W (8PSK)
-----------------------	--------------------------------

4.1.5 Environmental Requirements

Table 10. Environmental Requirements

Minimum temperature:	-40 °C
Maximum temperature:	+50 °C
Relative Humidity:	5% to 100% RH
Air pressure	70 kPa to 106 kPa



4.1.6 Power Source

Table 11. DC Power Source

DC voltage nominal:	=== -48 V
DC voltage range:	=== -38.4 V to === -57 V
Rate Power:	Max 400W

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
RRU3908	2	VER.C	V100R003 C00	210231626710A5000931 210231626710A5000932	Remote Radio Unit of Multi-Mode Distributed Base Station (1900MHz)

(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
GTMU	1	VER.C	V100R003 C00	030LPM10AA010759	GBTS Main Processing & Transmission Unit

4.2.2 FCC Identification

Grantee Code: QIS
 Product Code: RRU3908-1900
 FCC Identification: QISRRU3908-1900

4.2.3 IC Identification

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



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	2011-05-04
Pre-Amplifier	Agilent	8447D	2944A10146	2011-05-12
Loop Antenna	Schwarzbeck	FMZB1516	1516115	2011-10-24
BiLog Antenna	Schaffner	CBL 6112B	2747	2011-12-10
Horn Antenna	R&S	HF906 4044.4507.02	359287/005	2011-05-07
Dipole	Schwarzbeck	D69250- UHAP/D69250- VHAP	979/917	2012-01-29
Signal Generator	R&S	SMR 40	100325	2011-05-12
Signal Analyzer	R&S	FSQ 40	100025	2011-10-12
Signal Analyzer	Agilent	E4440A	MY49420179	2011-04-25
Climate Chamber	Weiss Umwelttech	WK11-800	592260277700 10	2011-10-11



6 Test results for PCS Band (GSM)

For GSM 1900MHz, the test is carried out under one TRX was activated. Typical operating frequency points (channels) were used, which include bottom/lowest channel (B), middle channel (M) and top/highest channel (T) of each frequency block as the table below. The channel 512 and channel 810 aren't used for the RRU.

Table 15. Frequency points (channels) selected to perform transmitter tests(GSM 1900MHz)

Transmitter Operating Band	Multiple Carriers	Channels under Test		
		Bottom/lowest (B)	Middle (M)	Top/highest (T)
PCS band(GSM)	1	No.513 1930.4MHz	No.611 1950MHz	No .809 1989.6MHz
	2	No.513/516 1930.4MHz/1931MHz	No.611/614 1950MHz/1950.6MHz	No .806/809 1989MHz/1989.6MHz
	3	No.513/516 /519 1930.4MHz/1931MHz /1931.6MHz	No.608/611/614 1949.4MHz/1950MHz /1950.6MHz	No .803/806/809 1988.4MHz/1989MHz/ 1989.6MHz

Table 16. Frequency points (channels) selected to perform receiver tests(GSM 1900MHz)

Transmitter Operating Band	Multiple Carriers	Channels under Test		
		Bottom/lowest (B)	Middle (M)	Top/highest (T)
PCS band(GSM)	1		No.611 1950MHz	

6.1 Maximum Channel Power

6.1.1 Test Conditions

Table 17. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	68 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, M, T for Multi Carrier

6.1.2 Limits

Compliance with FCC part 2.1046 and part 24.232, Base stations are limited to 1640 watts peak equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters.

Table 18. FCC Limits for PCS Band

Peak EIRP:	< 1640 Watts (= 62 dBm)
------------	-------------------------

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 19. 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 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

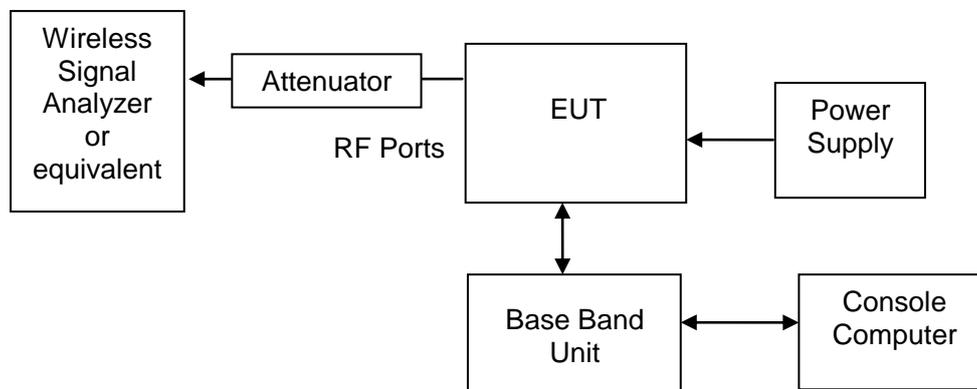


Figure 1. TEST SETUP

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 (dBm)
	Ch. B (dBm)	Ch. M (dBm)	Ch. T (dBm)	
TM 1	46.17	46.03	46.39	< 62
TM 2	44.16	44.4	44.8	

(2) Multiple Carriers = 2

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

Test Mode	Maximum Output Power (Total)			Limit (dBm)
	Ch. B (dBm)	Ch. M (dBm)	Ch. T (dBm)	
TM 1	41.71/41.6	41.9/41.9	42.1/42.1	< 62
TM 2	40.1/40.0	40.3/40.3	40.4/40.6	

(3) Multiple Carriers = 3

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

Test Mode	Maximum Output Power (Total)			Limit (dBm)
	Ch. B (dBm)	Ch. M (dBm)	Ch. T (dBm)	
TM 1	39.9/39.8/39.8	39.9/39.8/39.6	40.2/40.2/40.3	< 62
TM 2	38.3/38.1/38.2	38.2/38.5/38.3	38.6/38.6/38.6	



6.1.4.2 Peak-to-Average Ratio

Test Mode	Maximum Output Power (Total)			Limit (dB)
	Ch. B (dBm)	Ch. M (dBm)	Ch. T (dBm)	
TM 1	0.50	0.51	0.34	< 13
TM 2	3.88	3.68	3.56	

6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to clause 1 of Appendix

6.2 Modulation Characteristics

6.2.1 Test Conditions

Table 23. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	68 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel M

6.2.2 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 24. Limits According to EUT technical requirements(GSM)

Limits for GSM equipments:	GMSK modulation:	RMS phase error	< 5°
		peak phase error	< 20°
	8PSK modulation:	RMS EVM error	< 8%
		peak EVM error	< 22%
		OOS	> 35 dB
		95th Percentile	< 11%

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

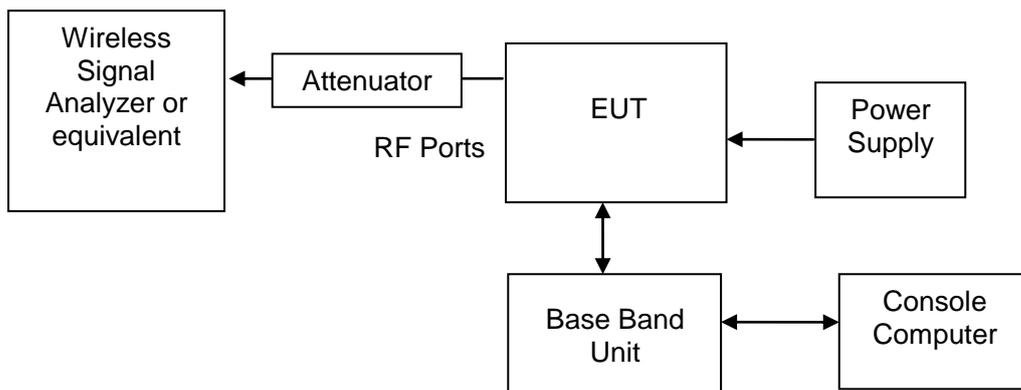


Figure 2. TEST SETUP

6.2.4 Measurement Results

Table 25. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics			Limit
	Ch. M			
	Type/Mode	Parameters	Measured Value	
TM1	GMSK	RMS phase error	1.16°	< 5°
		peak phase error	4.28°	< 20°
TM2	8PSK	RMS EVM error	3.96%	< 8%
		peak EVM error	12.84%	< 22%
		OOS	40.05dB	> 35 dB
		95th Percentile	7.59%	< 11%

6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to clause 2 of Appendix



6.3 Occupied Bandwidth

6.3.1 Test Conditions

Table 26. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	68 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, M, T

6.3.2 Limits

No specific occupied bandwidth requirement in FCC part 2.1049 and part 24 subpart E for PCS 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

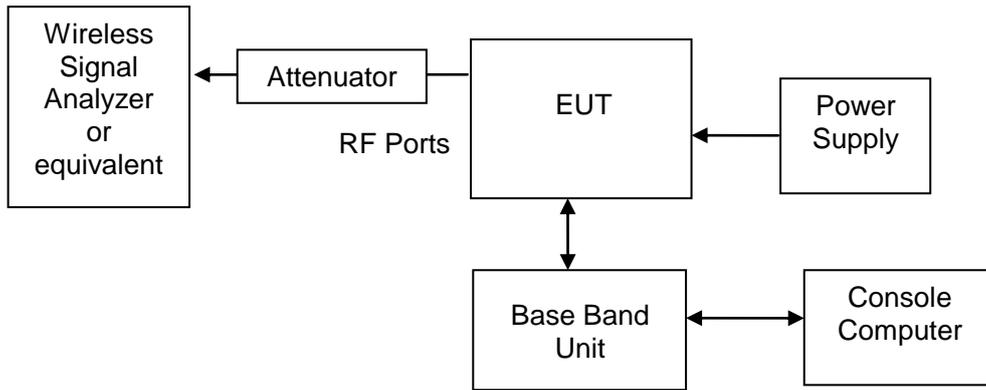


Figure 3. TEST SETUP

6.3.4 Measurement Results

Table 27. Measurement Results for Occupied Bandwidth

Test Mode	99% Occupied Bandwidth			Limit
	B	M	T	
	kHz	kHz	kHz	
TM1	246.8	243.6	243.6	---
TM2	246.8	240.4	246.8	

6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to clause 3 of Appendix

6.4 Band Edges Compliance

6.4.1 Test Conditions

Table 28. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	68 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, T for Multi Carrier 1,3

6.4.2 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 peak power 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

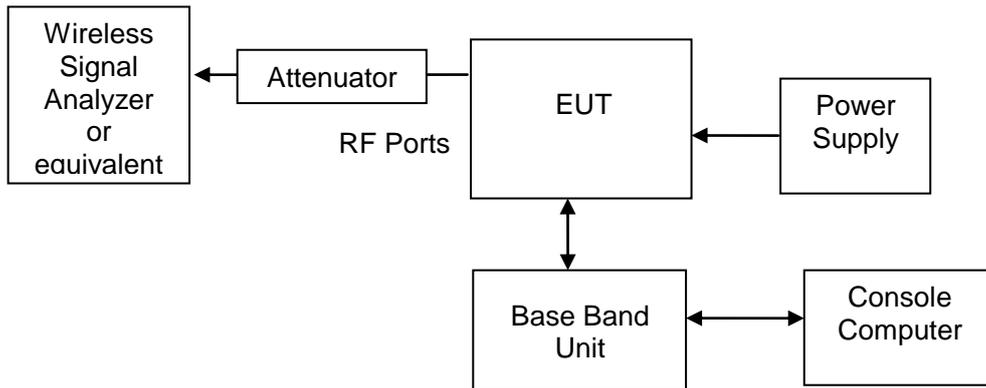


Figure 4. TEST SETUP

6.4.4 Measurement Results

Table 31. Measurement Results for Band Edge Characteristics – Single Carrier

Test Mode	Test Frequency Range (MHz)	Band Edge Emissions – Single Carrier		
		B	T	Limit (dBm)
		dBm	dBm	
TM 1	1929 – 1930	-31.40	/	< -13
	1990 – 1991	/	-37.68	< -13
TM 2	1929 – 1930	-21.11	/	< -13
	1990 – 1991	/	-30.20	< -13

Table 32. Measurement Results for Band Edge Characteristics – 3 Carriers

Test Mode	Test Frequency Range (MHz)	Band Edge Emissions – Single Carrier		
		B	T	Limit (dBm)
		dBm	dBm	
TM 1	1929 – 1930	-32.13	/	< -13
	1990 – 1991	/	-29.49	< -13
TM 2	1929 – 1930	-28.16	/	< -13
	1990 – 1991	/	-30.18	< -13

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to clause 4 of Appendix

6.5 Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

Table 33. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	68 %
Power supply:	-48V
Test Configuration/Mode:	TM1/TM2 at Channel B, M, T for Multi Carrier 1,3

6.5.2 Limits

Compliance with FCC part 2.1051 and part 24.238, based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

Table 34. 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 35. 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 FCC part 2.1057, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

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

PCS 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

Detector of Spectrum Analyzer or equivalent:

GSM equipment:	peak
----------------	------

Test setup

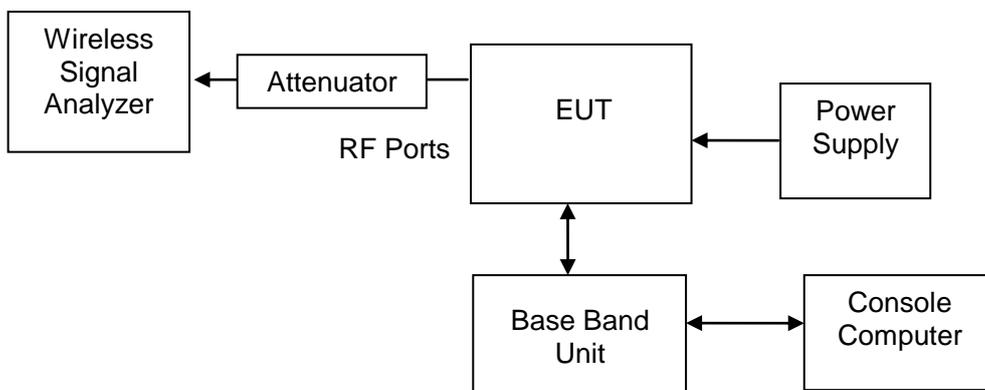


Figure 5. TEST SETUP

6.5.4 Measurement Results

For the test, we only test two worse cases: one carrier and three carriers.

6.5.4.1 One carrier

TM1:

Table 36. Measurement Results for Spurious Emissions

Test Configuration:	TM 1		
	Measured frequency range	Max. Spurious Level Measured (dBm)	Limit (dBm)
Channel B	9kHz to 150kHz	-40.54	< -13
	150kHz to 30MHz	-48.82	
	30MHz to 1GHz	-29.71	
	1GHz to 22GHz	-23.04	
Channel M	9kHz to 150kHz	-36.32	
	150kHz to 30MHz	-47.13	
	30MHz to 1GHz	-29.84	
	1GHz to 22GHz	-23.32	
Channel T	9kHz to 150kHz	-41.30	
	150kHz to 30MHz	-42.54	
	30MHz to 1GHz	-33.42	
	1GHz to 22GHz	-25.50	



TM2:

Table 37. Measurement Results for Spurious Emissions

Test Configuration:	TM 2		
	Measured frequency range	Max. Spurious Level Measured (dBm)	Limit (dBm)
Channel B	9kHz to 150kHz	-35.61	< -13
	150kHz to 30MHz	-37.21	
	30MHz to 1GHz	-29.74	
	1GHz to 20GHz	-23.13	
Channel M	9kHz to 150kHz	-34.86	
	150kHz to 30MHz	-36.32	
	30MHz to 1GHz	-30.08	
	1GHz to 20GHz	-23.36	
Channel T	9kHz to 150kHz	-42.99	
	150kHz to 30MHz	-38.47	
	30MHz to 1GHz	-33.74	
	1GHz to 20GHz	-26.88	

6.5.4.2 Three carrier

TM1:

Table 38. Measurement Results for Spurious Emissions

Test Configuration:	TM 1		
	Measured frequency range	Max. Spurious Level Measured (dBm)	Limit (dBm)
Channel B	9kHz to 150kHz	-36.32	< -13
	150kHz to 30MHz	-33.08	
	30MHz to 1GHz	-29.93	
	1GHz to 20GHz	-23.20	
Channel M	9kHz to 150kHz	-36.22	
	150kHz to 30MHz	-32.18	
	30MHz to 1GHz	-29.29	
	1GHz to 20GHz	-22.19	
Channel T	9kHz to 150kHz	-42.06	
	150kHz to 30MHz	-37.14	
	30MHz to 1GHz	-33.62	
	1GHz to 20GHz	-26.91	

TM2:

Table 39. Measurement Results for Spurious Emissions

Test Configuration:	TM 2		
	Measured frequency range	Max. Spurious Level Measured (dBm)	Limit (dBm)
Channel B	9kHz to 150kHz	-35.84	< -13
	150kHz to 30MHz	-36.00	
	30MHz to 1GHz	-30.04	
	1GHz to 20GHz	-22.78	
Channel M	9kHz to 150kHz	-35.84	
	150kHz to 30MHz	-34.82	



	30MHz to 1GHz	-29.06	
	1GHz to 20GHz	-23.61	
Channel T	9kHz to 150kHz	-42.78	
	150kHz to 30MHz		
	30MHz to 1GHz	-34.15	
	1GHz to 20GHz	-27.21	

6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to clause 5 of Appendix .

6.6 Radiated Spurious Emission

6.6.1 Test Conditions

Table 40. Test Conditions

Measured at:	Enclosure
Ambient temperature:	25 °C
Relative humidity:	68 %
Power supply:	-48V
Test Configuration/Mode:	TM1 at Channel M for Multi Carrier 1

6.6.2 Limits

Compliance with FCC part 2.1053 and part 24.238, based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

Table 41. 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 42. 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 FCC part 2.1057, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent for test frequency range of 30 MHz to 10th harmonic:

PCS Band:	1 MHz
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Test setup

Step 1: Pre-test

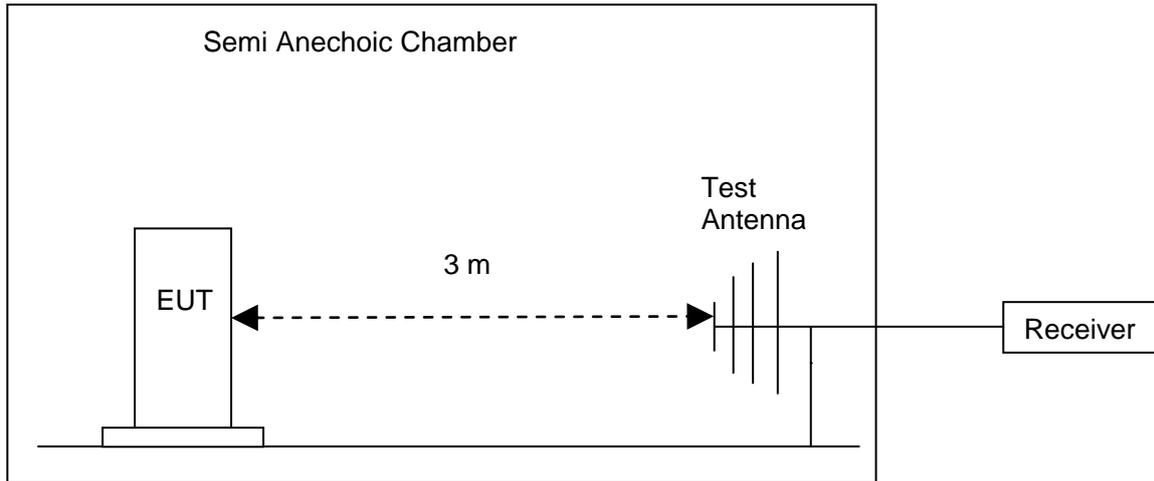


Figure 6. Test Set-up for Pre-test

Step 2: Substitution method to verify the maximum ERP

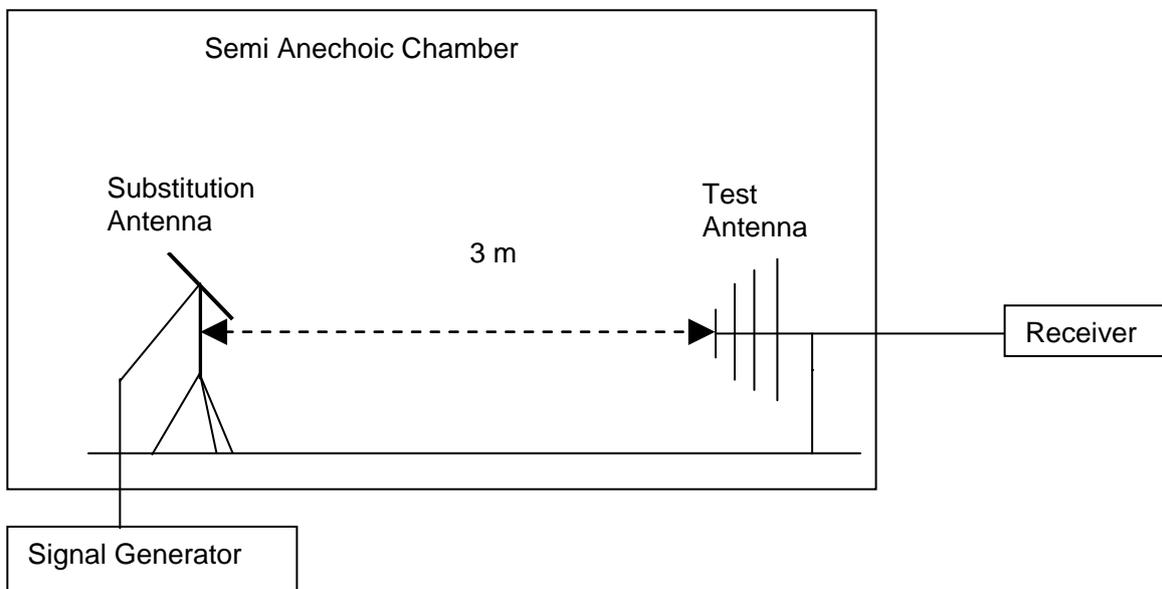


Figure 7. Test Set-up for Substitution

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			Limit (dBm)
		M			
		No.661 1960MHz			
		dBm			
TM 1	30M – 20G		<13		< -13

6.6.4.1 Substitution Results

Table 44. Substitution Results

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

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

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

NOTE: SGP- Signal Generator Level

6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to clause 6 of Appendix



6.7 Frequency Stability

6.7.1 Test Conditions

Table 45. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See Measurement Results
Relative humidity:	65 %
Power supply:	See Measurement Results
Test Configuration/Mode:	TM1/TM2 at Channel M

6.7.2 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 46. FCC Limits for PCS Band

Limit:	(not defened)
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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 GSM equipments:	< ± 0.05 ppm
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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 ± 1.0 ppm for base stations.

Table 48. IC Limits for PCS Band

Limit:	< ± 1.0 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.

The test procedure

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

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

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

Test Set up

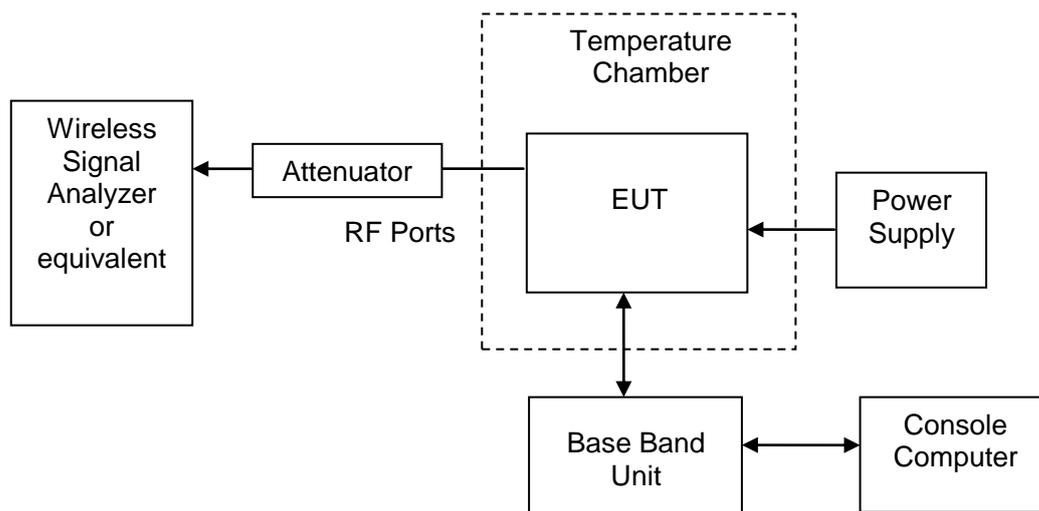


Figure 8. Test Set up

6.7.4 Measurement Results

6.7.4.1 Frequency Error vs. Temperature

Table 49. Measurement Results for Frequency Error vs. Temperature (TM1)



Measured Maximum Frequency Error				
Test Environment		No.611 1950 MHz		
Voltage	Temperature	Hz	ppm	Limit
			Refer to nominal frequency	
-48 VDC (100% rated / normal)	-30 °C	18.32	0.0009	< ±0.05ppm
	-20 °C	19.25	0.0010	
	-10 °C	15.58	0.0008	
	0 °C	14.63	0.0007	
	+10 °C	12.89	0.0006	
	+20 °C	14.57	0.0007	
	+30 °C	11.62	0.0006	
	+40 °C	13.33	0.0007	
	+50 °C	12.13	0.0006	

Table 50. Measurement Results for Frequency Error vs. Temperature (TM2)

Measured Maximum Frequency Error				
Test Environment		No.611 1950 MHz		
Voltage	Temperature	Hz	ppm	Limit
			Refer to nominal frequency	
-48 VDC (100% rated / normal)	-30 °C	19.42	0.0010	< ±0.05ppm
	-20 °C	18.31	0.0009	
	-10 °C	14.70	0.0007	
	0 °C	15.77	0.0008	
	+10 °C	16.14	0.0008	
	+20 °C	18.48	0.0009	
	+30 °C	13.60	0.0007	
	+40 °C	17.90	0.0009	
	+50 °C	20.03	0.0010	

6.7.4.2 Frequency Error vs. Voltage

Table 51. Measurement Results for Frequency Error vs. Voltage (TM1)

Measured Maximum Frequency Error	
Test Environment	M



		No.611 1950 MHz		
Voltage	Temperature	Hz	ppm	Limit
			Refer to operating frequency	
-40.8 VDC (85% rated / lowest)	+20 °C	14.66	0.0007	< ±0.05ppm
-55.2 VDC (115% rated / highest)	+20 °C	13.48	0.0007	

Table 52. Measurement Results for Frequency Error vs. Voltage (TM2)

Measured Maximum Frequency Error				
Test Environment		M		
		No.611 1950 MHz		
Voltage	Temperature	Hz	ppm	Limit
			Refer to operating frequency	
-40.8 VDC (85% rated / lowest)	+20 °C	18.74	0.0009	< ±0.05ppm
-55.2 VDC (115% rated / highest)	+20 °C	17.96	0.0009	

6.7.5 Conclusion

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

6.8 Receiver Spurious Emissions (Conducted)

6.8.1 Test Conditions

Table 53. 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:	25 °C
Relative humidity:	68 %

6.8.1.1 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 54. 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
--------	---

6.8.2 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
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Test setup

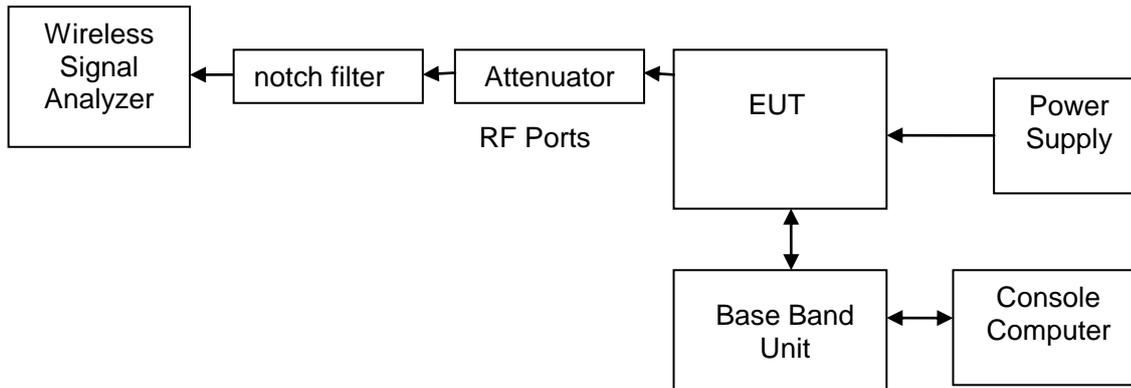


Figure 9. TEST SETUP

6.8.3 Measurement Results

Table 55. Measurement Results for Receiver Spurious Emissions (Conducted) – Single Carrier

Test Mode	Test Frequency Range	Receiver Spurious Emissions (Conducted) – Single Carrier	
		M	Limit
		No.611 1950MHz	
		dBm	
TM 1	30 MHz to 1 GHz	-69.84	< -57 dBm/4kHz
	1 GHz to 6 GHz	-54.38	< -53 dBm/1MHz
TM 2	30 MHz to 1 GHz	-84.82	< -57 dBm/4kHz
	1 GHz to 6 GHz	-54.89	< -53 dBm/1MHz

6.8.4 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to clause 7 of Appendix .



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 56. 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

Clause 1 of Appendix	Peak-to-Average Ratio
Clause 2 of Appendix	Modulation Characteristics
Clause 3 of Appendix	Occupied Bandwidth
Clause 4 of Appendix	Band Edges
Clause 5 of Appendix	Spurious Emission at Antenna Terminal
Clause 6 of Appendix	Radiated Spurious Emission
Clause 7 of Appendix	Receiver Spurious Emissions (Conducted)
Clause 8 of Appendix	Photos of Test Setup

----- **END** -----