



FCC Test Report

Product Name: UMTS Enhanced Pico Base Station

Model Number: ePico3801

Report No: SYBH(R)015092009EB-1
FCC ID: QISEPICO3801

Reliability Laboratory of Huawei Technologies Co., Ltd.

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

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



Notice

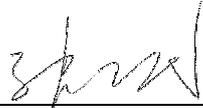
1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has obtained the accreditation of THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION (A2LA), and Accreditation Council Certificate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



REPORT ON FCC Test of UMTS Enhanced Pico Base Station
 Model Name: ePico3801
 Report No: SYBH(R)015092009EB-1
 FCC ID: QISEPICO3801

REGULATION 47 CFR FCC Part 2, Subpart J
 47 CFR FCC Part 22, Subpart H
 47 CFR FCC Part 24, Subpart E

CONCLUSION PASSED

General Manager	2009-09-25	张兴海	
	Date (y-m-d)	Name	
Technical Responsibility For Area of Testing	2009-09-25	胡俊	
	Date (y-m-d)	Name	
Test Lab Engineer	2009-09-25	张卫民	
	Date (y-m-d)	Name	



Contents

1	<u>Summary</u>	5
1.1	RESULTS SUMMARY	5
1.2	SUPPORTING STANDARDS	5
2	<u>Product Description</u>	7
2.1	PRODUCTION INFORMATION OF EUT	7
2.2	MODIFICATION INFORMATION	7
3	<u>Test Site Description</u>	8
3.1	TESTING PERIOD	8
4	<u>Product Description</u>	9
4.1	TECHNICAL CHARACTERISTICS	9
4.2	EUT IDENTIFICATION LIST	11
5	<u>Main Test Instruments</u>	12
6	<u>Transmitter & Receiver Measurements</u>	13
6.1	MAXIMUM CHANNEL POWER	14
6.2	MODULATION CHARACTERISTICS	17
6.3	OCCUPIED BANDWIDTH	19
6.4	BAND EDGES COMPLIANCE	21
6.5	SPURIOUS EMISSION AT ANTENNA TERMINAL	23
6.6	RADIATED SPURIOUS EMISSION	25
6.7	FREQUENCY STABILITY	29
7	<u>System Measurement Uncertainty</u>	33
8	<u>Appendices</u>	34



1 Summary

1.1 Results Summary

The table below summarizes the measurements and results for the equipment of UMTS Enhanced Pico Base Station - ePico3801. Detailed results and descriptions are shown in the following pages.

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

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

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

Table 2. Summary of results for 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.

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 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

The ePico is integrated with all NodeB functions and part of the RNC functions. After connected to a office LAN, the ePico communicates with the UMTS AG, hereafter referred to as AG, through xDSL fixed network, public network, and UMTS network. Through the AG, the ePico interacts with the NEs on the Core Network (CN), completing the signaling and services of the UMTS network.

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	/

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): 2009-09-16

Date of End (y-m-d): 2009-09-25

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 6. Frequency Range for Cellular Band

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

Table 7. Frequency Range for PCS Band

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

4.1.2 Channel Separation/Bandwidth

Table 8. Frequency Interval and Channel Separation

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

4.1.3 Output Power

Table 9. Output Power

Transmitter Output Power (per Antenna Port):	1 * 250 mW (= 24 dBm)
--	-----------------------

4.1.4 Type of Emission

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

Table 10. Type of Emission

Emission Designation:	4M13F9W
-----------------------	---------

4.1.5 Environmental Requirements

Table 11. Environmental Requirements

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

4.1.6 Power Source

The EUT can be powered by AC/DC Adapter or Powered over Ethernet (PoE) Adapter (Power Sourcing Equipment (PSE)).

Table 12. Adapter Technical Data

AC/DC Adapter Model:	ADP036-123B	FSP035-DBC B1
Manufacturer:	Huntkey	FSP
Input Voltage:	100-240VAC 50/60Hz 1.0A	100-240VAC 50/60Hz 1.0A
Output Voltage:	+12VDC 3A	+12VDC 2.9A
Rated Power:	36W	35W max.

Table 13. POE Adapter (PSE) Technical Data

POE Adapter (PSE) Model:	HKA04854007-8B	UE-PoE-35
Manufacturer:	Huntkey	FUHUA
Input Voltage:	100-240VAC 50/60Hz 1.0A	100-240VAC 50/60Hz 1.0A
Output Voltage:	54VDC 0.65A	54VDC 0.65A
Rated Power:	35W	35W

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 14. Sub-assembly identity of EUT

Model Identify	Qty.	Hardware Version	Software Version	Serial Number	Description
QWG3EPBS	1	VER.A	V200R011C00	020LQG1099800037	Hardware board
QWG1EPMD	1	VER.A	V200R011C00	020GHR1098800006	RF board
AC/DC Adapter and/or POE Adapter (PSE) (AC/DC Adapter; Huntkey)	1	---	---	HKA980100853	(see clause 4.1.6)

(2) Sub-assembly identity of Ancillary Equipments

Table 15. Sub-assembly identity of Ancillary Equipments

Model Identify	Qty.	Hardware Version	Software Version	Serial Number	Description
---	---	---	---	---	---

4.2.2 FCC Identification

Grantee Code: QIS
 Product Code: EPICO3801
 FCC Identification: QISEPICO3801



5 Main Test Instruments

Table 16. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (y-m-d)
Receiver	R&S	ESU40	100144	2010-01-15
BiLog Antenna	Schaffner	CBL 6112B	2747	2009-11-09
Horn Antenna	R&S	HF906	359287/005	2010-01-23
Signal Analyzer	R&S	FSQ 40	100025	2009-10-05
Climate Chamber	Espec	MW3030	06114003	2010-05-21
Power Supply	West Electronics	WE-1100	681078	/
20dB Attenuator	WEINSCHL	49-20-33	PA294	/



6 Transmitter & Receiver Measurements

Test Ports:

The EUT consists of only one TRX port. All conducted tests are performed on this port.

Test Frequencies:

Table 17. Frequency points (channels) selected to perform transmitter tests

Transmitter Operating Band	Multiple Carriers	Channels under Test		
		Bottom/lowest (B)	Middle (M)	Top/highest (T)
Cellular band	1	Ch. 4357 871.4MHz	Ch. 4407 881.4MHz	Ch. 4458 891.6MHz
PCS band	1	Ch. 9662 1932.4MHz	Ch. 9800 1960 MHz	Ch. 9938 1987.6MHz

6.1 Maximum Channel Power

6.1.1 Test Conditions

Table 18. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	66 %

6.1.2 Test Specifications and Limits

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

Table 19. FCC Limits for Cellular Band

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

Compliance with FCC part 2.1046 and part 24.232, Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP); Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz 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 20. FCC Limits for PCS 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

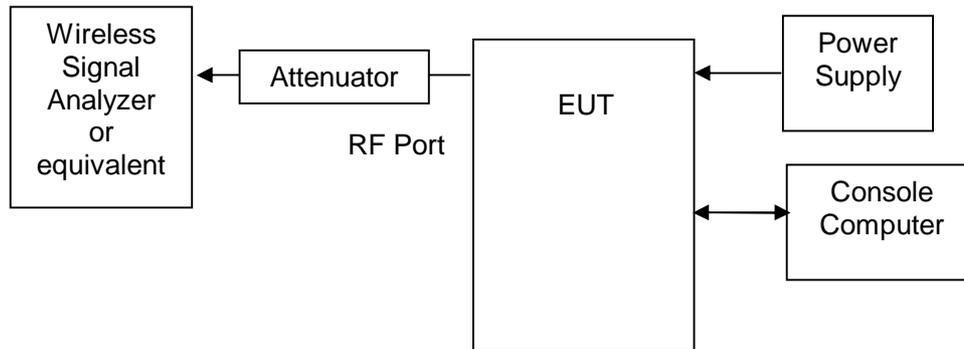


Figure 1. TEST SETUP

6.1.4 Measurement Results

6.1.4.1 Maximum Output Power at Antenna Port

(1) Cellular Band:

Table 21. 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		
TM1	23.09	---	23.42	---	23.31	---	< 57	---
TM5	23.13	---	23.43	---	23.36	---	< 57	---

(2) PCS Band:

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		
TM1	24.12	17.12	23.63	16.63	23.91	16.91	---	< 62
TM5	24.17	17.17	23.73	16.73	23.98	16.98	---	< 62

6.1.4.2 Peak-to-Average Ratio

PCS Band:

Table 23. Measurement Results for Peak-to-Average Ratio

Test Mode	Peak-to-Average Ratio (PAR), dB			Limit (dB)
	Ch. B	Ch. M	Ch. T	
TM1	7.83	7.76	7.42	< 13
TM5	7.57	7.41	7.25	< 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 24. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	67 %

6.2.2 Test Specifications and Limits

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

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

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

Table 25. Limits According to EUT technical requirements

Limits for UMTS equipments:	QPSK modulation: EVM < 17.5%
	16QAM modulation: EVM < 12.5%

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

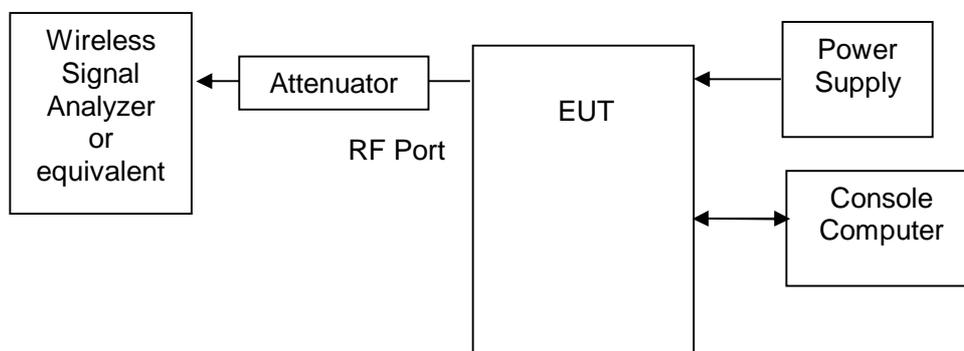


Figure 2. TEST SETUP



6.2.4 Measurement Results

(1) Cellular Band:

Table 26. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics			Limit
	Ch. M			
	Type/Mode	Parameters	Measured Value	
TM1	QPSK	EVM	8.31	< 17.5%
TM5	16QAM	EVM	7.04	< 12.5%

(2) PCS Band:

Table 27. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics			Limit
	Ch. M			
	Type/Mode	Parameters	Measured Value	
TM1	QPSK	EVM	7.99	< 17.5%
TM5	16QAM	EVM	6.72	< 12.5%

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:	24 °C
Relative humidity:	67 %

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 specific occupied bandwidth requirement in FCC part 2.1049 and part 24 subpart E for PCS Band.

6.3.3 Test Method and Setup

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

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

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

Test setup

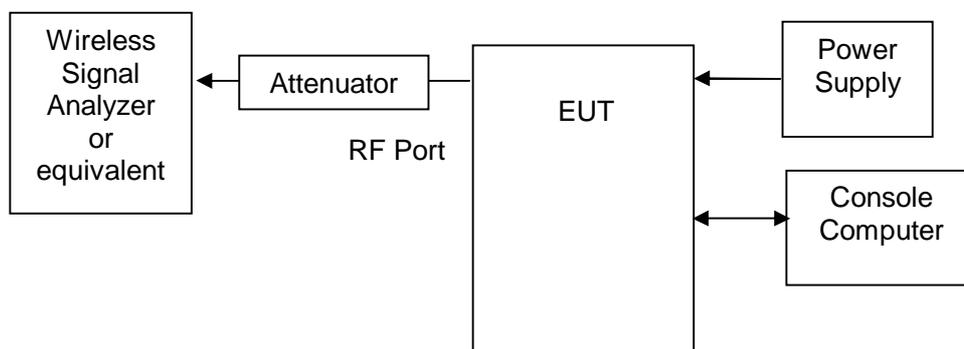


Figure 3. TEST SETUP



6.3.4 Measurement Results

(1) Cellular Band:

Table 29. Measurement Results for Occupied Bandwidth

Test Mode	99% Occupied Bandwidth (MHz)			
	Ch. B	Ch. M	Ch. T	Limit
TM1	4.13	4.13	4.13	---
TM5	4.13	4.13	4.12	

(2) PCS Band:

Table 30. Measurement Results for Occupied Bandwidth

Test Mode	99% Occupied Bandwidth (MHz)			
	Ch. B	Ch. M	Ch. T	Limit
TM1	4.13	4.13	4.13	---
TM5	4.13	4.13	4.13	

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 31. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	67 %

6.4.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 22.917, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, and the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

Table 32. FCC Limits for Cellular Band

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

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

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

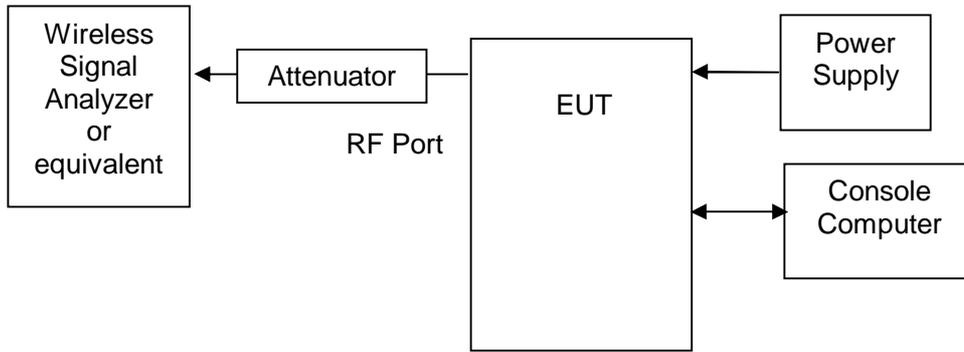


Figure 4. TEST SETUP

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) Cellular Band:

Table 34. Measurement Results for Band Edge Characteristics

Test Mode	Test Frequency Range (MHz)	Band Edge Emissions (dBm)		
		Ch. B	Ch. T	Limit (dBm)
TM1	868 – 869	-25.39	---	< -13
	894 – 895	---	-26.17	< -13
TM5	868 – 869	-28.19	---	< -13
	894 – 895	---	-26.70	< -13

(2) PCS Band:

Table 35. Measurement Results for Band Edge Characteristics

Test Mode	Test Frequency Range (MHz)	Band Edge Emissions (dBm)		
		Ch. B	Ch. T	Limit (dBm)
TM1	1929 – 1930	-27.06	---	< -13
	1990 – 1991	---	-25.22	< -13
TM5	1929 – 1930	-26.30	---	< -13
	1990 – 1991	---	-25.90	< -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 36. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	67 %

6.5.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 22.917, based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

Table 37. FCC Limits for Cellular Band

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

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 38. FCC Limits for PCS Band

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

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:

Cellular Band:	100 kHz
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:

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

Test setup

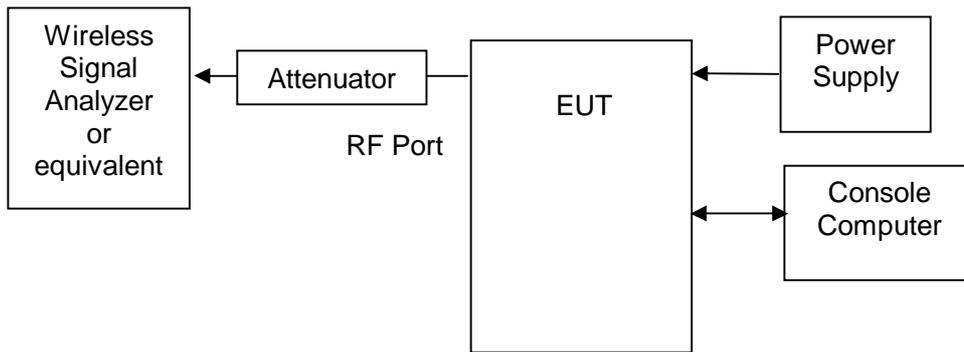


Figure 5. TEST SETUP

6.5.4 Measurement Results

(1) Cellular Band:

Table 39. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Conducted Spurious Emissions (dBm)			
		Ch. B	Ch. M	Ch. T	Limit
TM1	9k – 9G	< -42.14	< -42.49	< -41.10	< -13
TM5	9k – 9G	< -42.69	< -42.52	< -41.27	< -13

(2) PCS Band:

Table 40. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Conducted Spurious Emissions (dBm)			
		Ch. B	Ch. M	Ch. T	Limit
TM1	9k – 20G	< -40.06	< -39.52	< -39.77	< -13
TM5	9k – 20G	< -40.04	< -39.93	< -40.23	< -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 41. Test Conditions

Measured at:	Enclosure
Ambient temperature:	20 °C
Relative humidity:	70 %

6.6.2 Test Specifications and Limits

Compliance with FCC part 2.1053 and part 22.917, based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

Table 42. FCC Limits for Cellular Band

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

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 43. FCC Limits for PCS Band

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

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:

Cellular Band:	100 kHz
PCS Band:	1 MHz

Test setup

Step 1: Pre-test

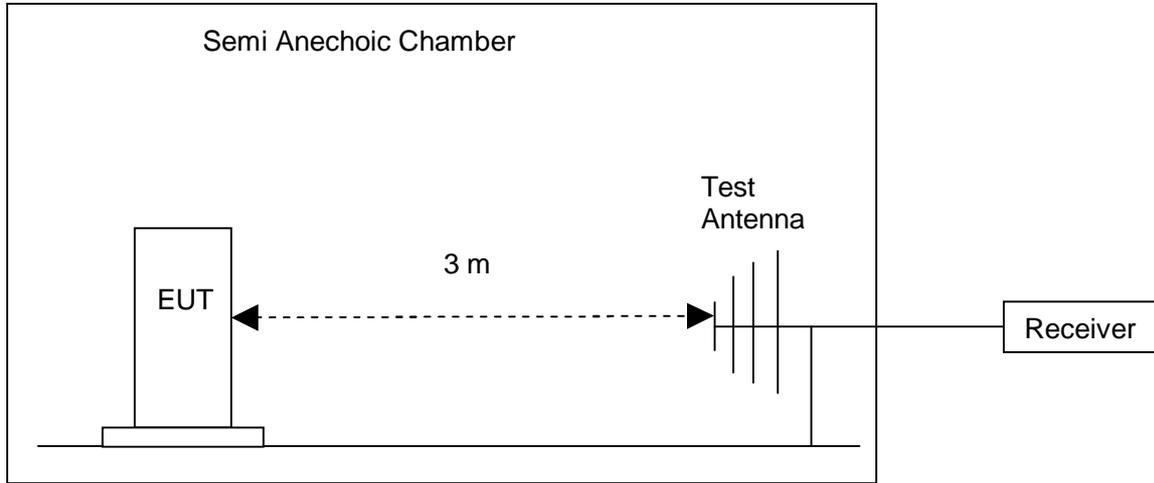


Figure 6. Test Set-up for Pre-test

Step 2: Substitution method to verify the maximum ERP

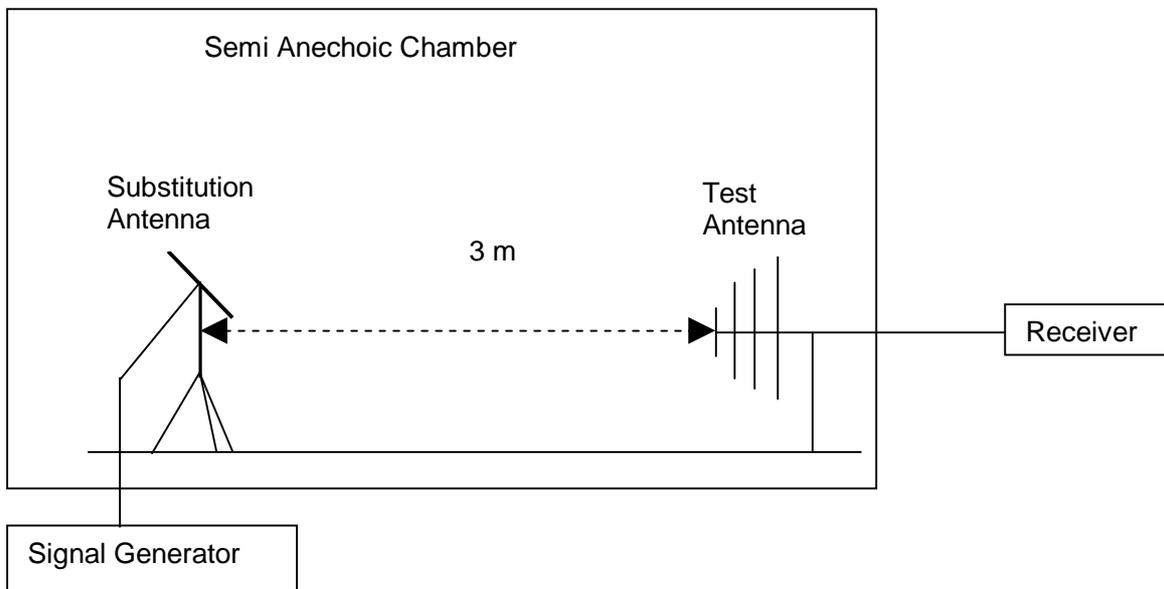


Figure 7. Test Set-up for Substitution

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

6.6.4 Measurement Results

(1) Cellular Band:

Table 44. Measurement Results for Spurious Emissions

Test	Test	Radiated Spurious Emissions
------	------	-----------------------------



			M		Limit (dBm)
TM1	30M – 9G		< -13		< -13

(2) PCS Band:

Table 45. Measurement Results for Spurious Emissions

Test Mode	Test Frequency Range	Radiated Spurious Emissions			
			M		Limit (dBm)
TM1	30M – 20G		< -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 46. Test Conditions

Measured at:	Antenna connector
Ambient temperature:	See Measurement Results
Relative humidity:	56 %
Power supply:	See Measurement Results

6.7.2 Test Specifications and Limits

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

Table 47. FCC Limits for Cellular Band

Limit:	$< \pm 1.5$ ppm
--------	-----------------

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 48. FCC Limits for PCS Band

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

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

Table 49. Limits According to EUT technical requirements for all operating bands

for UMTS equipments (Local Area BS):	$< \pm (0.1 \text{ ppm} + 12 \text{ Hz})$
---	---

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 primary supply voltages:	110 VAC (100% rated), 93.5 VAC (85% rated) and 126.5 VAC (115% rated).
------------------------------	--

Test Set up

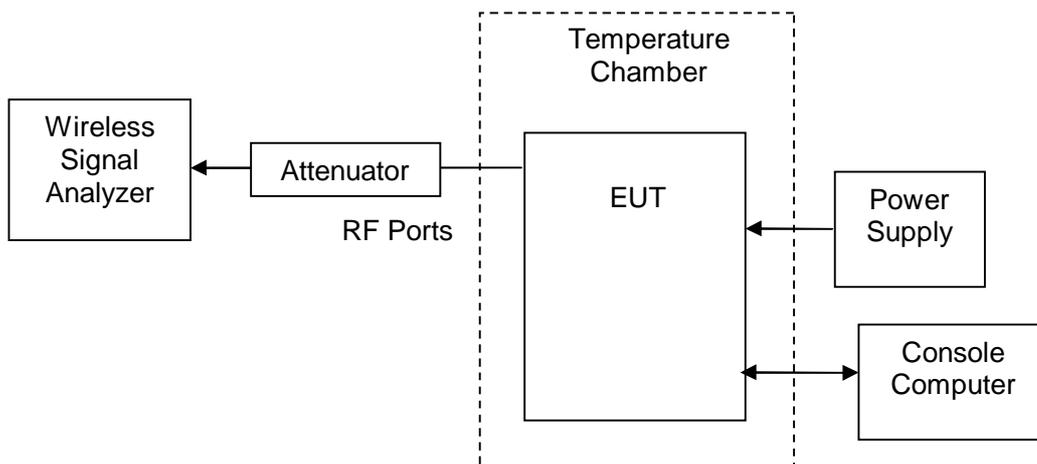


Figure 8. Test Set up

6.7.4 Measurement Results

(1) Cellular Band:

Table 50. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error

Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
110 VAC (100% rated / normal)	-30 °C	-7.25	-0.008	< ±0.1ppm
	-20 °C	-6.29	-0.007	
	-10 °C	-6.04	-0.007	
	0 °C	-4.11	-0.005	
	+10 °C	-5.56	-0.006	
	+20 °C	-2.56	-0.003	
	+30 °C	-3.03	-0.003	
	+40 °C	-2.70	-0.003	
	+50 °C	-4.99	-0.006	

Table 51. Measurement Results for Frequency Error vs. Voltage

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
93.5 VAC (85% rated / lowest)	+24 °C	-8.10	-0.009	< ±0.1ppm
110 VAC (100% rated / normal)	+24 °C	-7.62	-0.009	
126.5 VAC (115% rated / highest)	+24 °C	-6.82	-0.008	

(2) PCS Band:

Table 52. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
110 VAC (100% rated / normal)	-30 °C	-31.62	-0.016	< ±0.1ppm
	-20 °C	-30.69	-0.016	
	-10 °C	-32.48	-0.017	
	0 °C	-31.95	-0.016	
	+10 °C	-31.53	-0.016	
	+20 °C	-32.22	-0.016	

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
	+30 °C	-33.44	-0.017	
	+40 °C	-31.26	-0.016	
	+50 °C	-32.43	-0.017	

Table 53. Measurement Results for Frequency Error vs. Voltage

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
93.5 VAC (85% rated / lowest)	+24 °C	-32.82	-0.017	< ±0.1ppm
110 VAC (100% rated / normal)	+24 °C	-35.77	-0.018	
126.5 VAC (115% rated / highest)	+24 °C	-34.55	-0.018	

6.7.5 Conclusion

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

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 54. 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	7 Pages
Appendix B	Measurement Results Modulation Characteristics	5 Pages
Appendix C	Measurement Results Occupied Bandwidth	13 Pages
Appendix D	Measurement Results Band Edges	9 Pages
Appendix E	Measurement Results Spurious Emission at Antenna Terminal	49 Pages
Appendix F	Measurement Results Radiated Spurious Emission	5 Pages
Appendix G	Photos of Test Setup	3 Pages

END