



FCC Test Report

Product Name: WiMAX Indoor Pico Base Station

Model Number: BTS3701B

Report No: SYBH (R) 001042010EB-1
FCC ID: QISBTS3701B-2500

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.



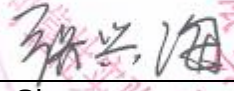
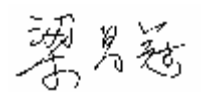
REPORT ON FCC Test of WiMAX Indoor Pico Base Station
Model Name: BTS3701B

Report No: SYBH(R)001042010EB-1

FCC ID: QISBTS3701B-2500

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

CONCLUSION PASSED

General Manager	<u>2010-05-06</u> Date (y-m-d)	<u>张兴海</u> Name	 Signature
Technical Responsibility For Area of Testing	<u>2010-05-05</u> Date (y-m-d)	<u>胡俊</u> Name	 Signature
Test Lab Engineer	<u>2010-05-05</u> Date (y-m-d)	<u>梁昌冠</u> Name	 Signature



Contents

1	<u>Summary</u>	5
2	<u>Product Description</u>	6
2.1	PRODUCTION INFORMATION OF EUT	6
2.2	MODIFICATION INFORMATION	6
3	<u>Test Site Description</u>	7
3.1	TESTING PERIOD	7
4	<u>Product Description</u>	8
4.1	TECHNICAL CHARACTERISTICS	8
4.2	EUT IDENTIFICATION LIST	10
5	<u>Main Test Instruments</u>	11
6	<u>Transmitter Measurements</u>	12
6.1	MAXIMUM CHANNEL POWER.....	13
6.2	MODULATION CHARACTERISTICS.....	16
6.3	OCCUPIED BANDWIDTH	18
6.4	BAND EDGES COMPLIANCE.....	21
6.5	SPURIOUS EMISSION AT ANTENNA TERMINAL	24
6.6	RADIATED SPURIOUS EMISSION	28
6.7	FREQUENCY STABILITY	32
7	<u>System Measurement Uncertainty</u>	36
8	<u>Appendices</u>	37



1 Summary

The table below summarizes the measurements and results for the equipment of WiMAX Indoor Pico Base Station - BTS3701B. Detailed results and descriptions are shown in the following pages.

Table 1. Summary of results for FCC requirements for BRS&EBS Band

47 CFR FCC Part(s) Requirements		Description	Result
Specification	Limits		
2.1046	27.50(h)(1)	Transmitter Output Power	PASS
2.1047	---	Modulation Characteristics	PASS
2.1049	---	Occupied Bandwidth	PASS
2.1051	27.53(l)(2) 27.53(l)(6)	Band Edges Compliance	PASS
2.1051	27.53(l)(2) 27.53(l)(6)	Spurious Emission at Antenna Terminal	PASS
2.1053	27.53(l)(2) 27.53(l)(6)	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.



2 Product Description

2.1 Production Information of EUT

2.1.1 General Description

The BTS3701B is a compact integrated indoor BTS. It receives and transmits radio signals to enable communication between the WiMAX network and the MS/SS.

The BTS3701B communicates with the MS/SS through the R1 interface and communicates with the ASN-GW through the R6 interface.

The BTS3701B supports 2T2R MIMO, IP-CS, Eth-CS, idle mode, sleep mode, hard handover, power control, and the Profile C structure.

2.1.2 Support function and Service

The EUT supports the function and service as follows:

Table 2. Service and Test Mode List

Service Name	Characteristic	Corresponding Test Mode	Remark
Data	Modulation: QPSK CTC 1/2	TM1	---
Data	Modulation: QPSK CTC 3/4	TM2	---
Data	Modulation: 16QAM CTC 1/2	TM3	---
Data	Modulation: 16QAM CTC 3/4	TM4	---
Data	Modulation: 64QAM CTC 1/2	TM5	---
Data	Modulation: 64QAM CTC 2/3	TM6	---
Data	Modulation: 64QAM CTC 3/4	TM7	---

Note: The test conditions and settings are defined in WiMAX MRCT.

2.2 Modification Information

For original equipment, following table is not application.

Table 3. 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

01 April 2010 to 04 May 2010

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4. Frequency Range for BRS&EBS Band

Uplink band:	2496 to 2690 MHz
Downlink band:	2496 to 2690 MHz

4.1.2 Channel Separation/Bandwidth

Table 5. Frequency Interval and Channel Separation

Channel raster:	200kHz/250 kHz
Channel spacing:	5MHz, 10 MHz

4.1.3 Type of Emission

Refer to FCC part 2.201 and 2.202.

Table 6. Type of Emission

Emission Designation:	5M00W7D, 10M0W7D
-----------------------	------------------

4.1.4 Environmental Requirements

Table 7. Environmental Requirements

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

4.1.5 Power Source

Table 8. DC Power Source

DC voltage nominal:	$\overline{=}$ 12 V
DC voltage range:	$\overline{=}$ 11.4 V to $\overline{=}$ 12.6 V
DC current maximal:	5 A

4.1.6 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

Table 9. EUT Component Parts Information

Model Name	Qty.	Hardware Version	Software Version	Description	Serial Number
QL51BMSU	1	VER.E	V300R003	Broadband Control Card	020LNS10A1000013
QL51TRU1	2	VER.B	V300R003	RF card	020LMU10A1000027/020LMU1092000014

Table 10. Ancillary Component Parts Information

Model Name	Qty.	Hardware Version	Software Version	Description	Serial Number
FSP060-1AD101C	1	NA	NA	AC/DC Adapter	Z00063142

4.2.2 Adapter Technical Data

Not Applicable for BTS.

4.2.3 Battery Technical Data

Not Applicable for BTS.

4.2.4 FCC Identification

Grantee Code: QIS
Product Code: BTS3701B-2500
FCC Identification: QISBTS3701B-2500



5 Main Test Instruments

Table 11. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Cal. Due
EMI Test receiver	R&S	ESU40	100144	2011-04-20
Horn Antenna	R&S	HF906	100684	2010-06-18
Broadband Antenna	SCHAFFNER	CBL6112B	2536	2010-09-21
Signal Analyzer	R&S	FSQ 40	100025	2010-10-10
Signal Analyzer	R&S	FSQ 26	200010	2010-07-28
Signal Analyzer	Agilent	E4440A	MY48250462	2010-10-21
Signal Generator	R&S	SMR40	100325	2010-05-11
Temperature Chamber	ESPEC	MW3030	0611403	2010-05-21

6 Transmitter Measurements

Tests for the EUT in the report were performed as following:

- (1) The EUT consists of 2TRX antenna ports, Ch-A, Ch-B, which are equivalent in designs. In the test report, only the channel Ch-A was used representatively.
- (2) The EUT have maximum output power is 200mW in CH-A port.
- (3) The EUT can emit the 5MHz and 10MHz bandwidth signals.
- (4) The EUT supports various modulation types as mentioned in above clause.

For tests in this report, typical operating frequency points (channels) were used, which include bottom/lowest channel (B), middle channel (M) and top/highest channel (T) of each frequency block as the table below.

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

Channel Bandwidth Configuration	Channels No.		
	Ch. B	Ch. M	Ch. T
5MHz	2498.5 MHz	2593 MHz	2687.5 MHz
10MHz	2501 MHz	2593 MHz	2685 MHz

6.1 Maximum Channel Power

6.1.1 Test Conditions

Table 13. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 ~ 25 °C
Relative humidity:	48 ~ 65 %
Power supply:	12V DC
Test Configuration/Mode:	Modulation: TM1, TM2, TM3, TM4, TM5, TM6, TM7 Channel Bandwidth: 5MHz, 10MHz Channel No.: B, M, T
Rated maximum transmitter output power (P_{max}):	total 23dBm(200mW)

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

FCC part 2.1046 and part 27.50(h)(1)

6.1.2.2 Supporting Standards

Table 14. Supporting Standards

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
WiMAX MRCT (2007-08)	WiMAX Forum™ Mobile Radio Conformance Tests

6.1.2.3 Limits

Compliance with FCC part 2.1046 and part 27.50(h)(1), the maximum EIRP of a base station shall not exceed $33 \text{ dBW} + 10 \lg (X/Y) \text{ dBW}$, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition.

Table 15. FCC Limits for BRS&EBS Band

X, Y	for 5MHz channel bandwidth: X = 5 MHz, Y = 6 MHz for 10MHz channel bandwidth: X = 10 MHz, Y = 6 MHz
Maximum EIRP:	for 5MHz channel bandwidth: $< 33 \text{ dBW} + 10 \lg (5 \text{ MHz}/6 \text{ MHz}) \text{ dBW} = 62 \text{ dBm}$ for 10MHz channel bandwidth: $< 33 \text{ dBW} + 10 \lg (10 \text{ MHz}/6 \text{ MHz}) \text{ dBW} = 65 \text{ dBm}$

6.1.3 Test Method and Setup

The EUT was connected to the Wireless Signal Analyzer or equivalent (Power Meter) via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Maximum Channel Power of the EUT by the Wireless Signal Analyzer or equivalent.

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

Test setup

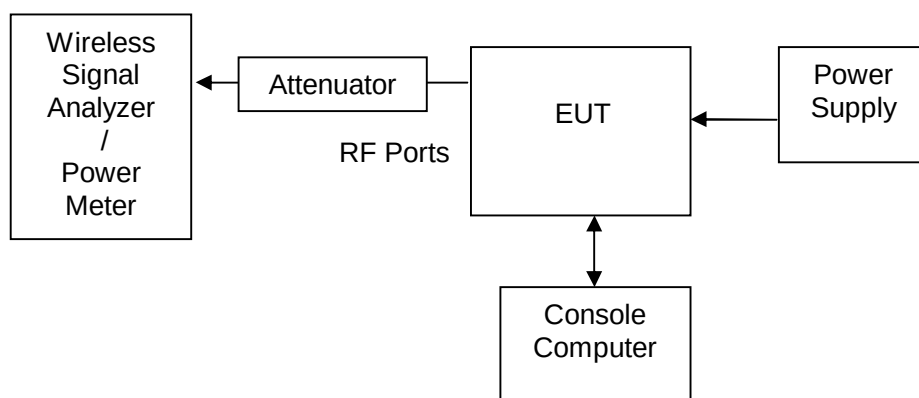


Figure 1. TEST SETUP

6.1.4 Measurement Results

(1) 5MHz Channel Bandwidth:

Table 16. Measurement Results for Maximum Output Power

Test Mode	Maximum Output Power (Total)			
	Ch. B	Ch. M	Ch. T	Limit (dBm)
	dBm	dBm	dBm	
TM1	23.11	23.30	23.41	< 62
TM2	23.01	23.28	23.45	< 62
TM3	23.02	23.27	23.50	< 62
TM4	23.04	23.21	23.43	< 62
TM5	22.95	23.26	23.56	< 62
TM6	23.12	23.31	23.66	< 62
TM7	23.06	23.29	23.70	< 62

(2) 10MHz Channel Bandwidth:

Table 17. Measurement Results for Maximum Output Power

Test Mode	Maximum Output Power (Total)			
	Ch. B	Ch. M	Ch. T	Limit (dBm)
	dBm	dBm	dBm	
TM1	22.99	23.49	23.77	< 65
TM2	23.04	23.53	23.83	< 65
TM3	22.97	23.49	23.70	< 65
TM4	22.93	23.42	23.66	< 65
TM5	22.96	22.67	23.73	< 65
TM6	23.05	23.75	23.78	< 65
TM7	23.00	23.68	23.72	< 65

6.1.5 Conclusion

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



6.2 Modulation Characteristics

6.2.1 Test Conditions

Table 18. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 ~ 25 °C
Relative humidity:	48 ~ 65%
Power supply:	12V DC
Test Configuration/Mode:	Modulation: TM1, TM2, TM3, TM4, TM5, TM6, TM7 Channel Bandwidth: 10MHz, 5MHz Channel No.: M (representatively)

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

FCC part 2.1047 and part 27 subpart C & M

6.2.2.2 Supporting Standards

Table 19. Supporting Standards

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
WiMAX MRCT (2007-08)	WiMAX Forum™ Mobile Radio Conformance Tests

6.2.2.3 Limits

No specific modulation characteristics requirement limits in FCC part 2.1047 and part 27 subpart C & M for BRS&EBS Band.

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

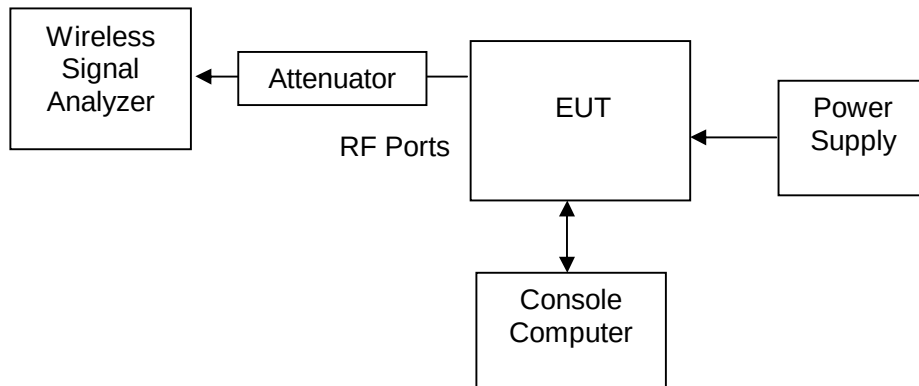


Figure 2. TEST SETUP

6.2.4 Measurement Results

5MHz and 10MHz Channel Bandwidth:

Table 20. Measurement Results for Modulation Characteristics

Test Mode	Modulation Characteristics
	Ch. M
	Type/Mode
TM1	QPSK1/2
TM2	QPSK3/4
TM3	16QAM1/2
TM4	16QAM3/4
TM5	64QAM1/2
TM6	64QAM2/3
TM7	64QAM3/4

6.2.5 Conclusion

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

6.3 Occupied Bandwidth

6.3.1 Test Conditions

Table 21. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 ~ 25 °C
Relative humidity:	48 ~ 65%
Power supply:	12 V DC
Test Configuration/Mode:	Modulation: TM1, TM2, TM3, TM4, TM5, TM6, TM7 Channel Bandwidth: 5MHz, 10MHz Channel No.: B, M, T

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

FCC part 2.1049 and part 27 subpart C & M

6.3.2.2 Supporting Standards

Table 22. Supporting Standards

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
WiMAX MRCT (2007-08)	WiMAX Forum™ Mobile Radio Conformance Tests

6.3.2.3 Limits

No specific occupied bandwidth requirement in FCC part 2.1049 and part 27 subpart C & M for BRS&EBS 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).

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent:

for IEEE802.16 equipments:	50 kHz (for 5MHz Channel Bandwidth)
----------------------------	-------------------------------------

	100 kHz (for 10MHz Channel Bandwidth)
--	---------------------------------------

Test setup

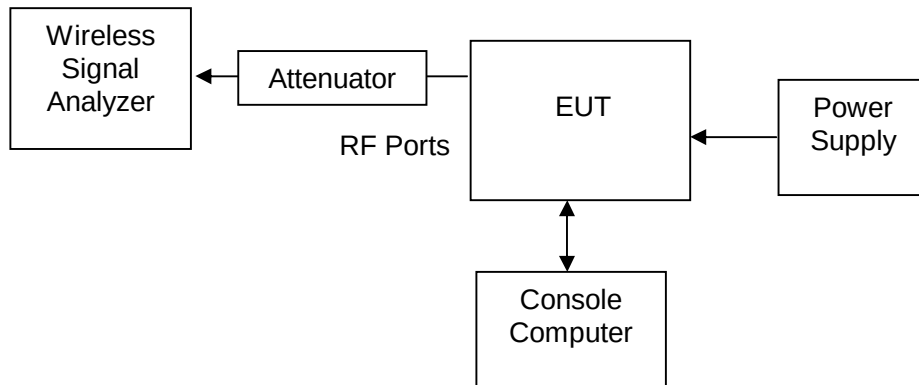


Figure 3. TEST SETUP

6.3.4 Measurement Results

(1) 5MHz Channel Bandwidth:

Table 23. Measurement Results for Occupied Bandwidth

Test Mode	Occupied Bandwidth			
	Ch. B	Ch. M	Ch. T	Limit
	MHz	MHz	MHz	
TM1	4.567	4.567	4.567	---
TM2	4.567	4.567	4.567	
TM3	4.567	4.567	4.567	
TM4	4.567	4.567	4.567	
TM5	4.567	4.567	4.567	
TM6	4.567	4.567	4.567	
TM7	4.567	4.567	4.567	

(2) 10MHz Channel Bandwidth:

Table 24. Measurement Results for Occupied Bandwidth

Test Mode	Occupied Bandwidth			
	Ch. B	Ch. M	Ch. T	Limit
	MHz	MHz	MHz	
TM1	9.135	9.135	9.135	---
TM2	9.135	9.135	9.135	
TM3	9.135	9.135	9.135	



Test Mode	Occupied Bandwidth			Limit
	Ch. B	Ch. M	Ch. T	
	MHz	MHz	MHz	
TM4	9.135	9.135	9.135	
TM5	9.135	9.135	9.135	
TM6	9.135	9.135	9.135	
TM7	9.135	9.135	9.135	

6.3.5 Conclusion

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

6.4 Band Edges Compliance

6.4.1 Test Conditions

Table 25. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 ~ 25 °C
Relative humidity:	48 ~ 65%
Power supply:	12 V DC
Test Configuration/Mode:	Modulation: TM1, TM2, TM3, TM4, TM5, TM6, TM7 Channel Bandwidth: 5MHz, 10MHz Channel No.: B, T
Rated maximum transmitter output power (P_{max}):	total 23dBm(200mW)

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

FCC part 2.1051 and part 27.53(l)(2) and part 27.53(l)(6)

6.4.2.2 Supporting Standards

Table 26. Supporting Standards

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
WiMAX MRCT (2007-08)	WiMAX Forum™ Mobile Radio Conformance Tests

6.4.2.3 Limits

Compliance with FCC part 2.1051 and part 27.53(l)(2) and part 27.53(l)(6), for fixed and temporary fixed digital stations, 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, the attenuation below the transmitter power (P) measured in watts shall be not less than $43 + 10 \log (P)$ dB.

Table 27. FCC Limits for BRS&EBS 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 2 MHz.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent:

for IEEE802.16 equipments:	51 kHz (for 5MHz Channel Bandwidth) 100 kHz (for 10MHz Channel Bandwidth)
----------------------------	--

Test setup

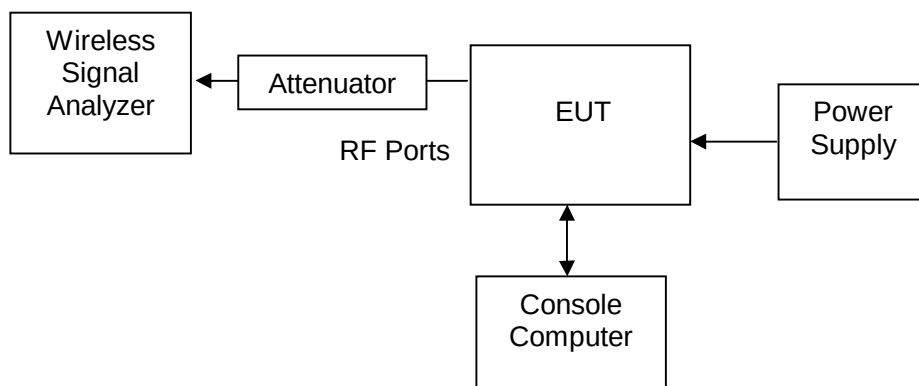


Figure 4. TEST SETUP

6.4.4 Measurement Results

NOTE: the -3dB point of the measurement filter maybe considered in tests.

(1) 5MHz Channel Bandwidth:

Table 28. Measurement Results for Band Edge Characteristics

Ch. No.	Test Frequency Range (MHz)	Test Mode	Maximum Spurious Level measured (dBm)	Limit (dBm)
Ch. B	2495 – 2496	TM1	-30.71	-13
		TM2	-29.80	
		TM3	-30.44	
		TM4	-30.14	
		TM5	-30.75	
		TM6	-30.75	
		TM7	-30.57	
Ch. T	2690 – 2691	TM1	-31.48	-13



Ch. No.	Test Frequency Range (MHz)	Test Mode	Maximum Spurious Level measured (dBm)	Limit (dBm)
		TM2	-31.59	
		TM3	-31.50	
		TM4	-31.04	
		TM5	-31.14	
		TM6	-31.58	
		TM7	-32.00	

(2) 10MHz Channel Bandwidth:

Table 29. Measurement Results for Band Edge Characteristics

Ch. No.	Test Frequency Range (MHz)	Test Mode	Maximum Spurious Level measured (dBm)	Limit (dBm)
Ch. B	2495 – 2496	TM1	-32.00	-13
		TM2	-33.37	
		TM3	-32.24	
		TM4	-31.64	
		TM5	-32.90	
		TM6	-33.26	
		TM7	-32.50	
Ch. T	2690 – 2691	TM1	-36.02	-13
		TM2	-35.49	
		TM3	-35.01	
		TM4	-36.26	
		TM5	-35.71	
		TM6	-35.61	
		TM7	-35.27	

6.4.5 Conclusion

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

6.5 Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

Table 30. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 ~ 25 °C
Relative humidity:	48 ~ 65%
Power supply:	12 V DC
Test Configuration/Mode:	Modulation: TM1, TM2, TM3, TM4, TM5, TM6, TM7 Channel Bandwidth: 5MHz, 10MHz Channel No.: B, M, T
Rated maximum transmitter output power (P_{max}):	total 23dBm(200mW)

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

FCC part 2.1051 and part 27.53(l)(2) and part 27.53(l)(6)

6.5.2.2 Supporting Standards

Table 31. Supporting Standards

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ITU-R SM.329-10	Unwanted emissions in the spurious domain
WiMAX MRCT (2007-08)	WiMAX Forum™ Mobile Radio Conformance Tests

6.5.2.3 Limits

Compliance with FCC part 2.1051 and part 27.53(l)(2) and part 27.53(l)(6), based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the attenuation below the transmitter power (P) measured in watts shall be not less than $43 + 10 \log (P)$ dB.

Table 32. FCC Limits for BRS&EBS 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:

BRS&EBS 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

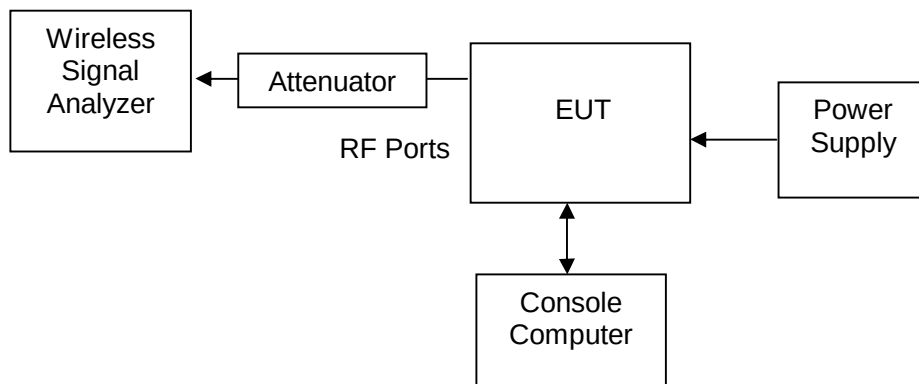


Figure 5. TEST SETUP

6.5.4 Measurement Results

(1)5MHz Channel Bandwidth:

Table 33. Measurement Results for Spurious Emissions

Ch. No.	Test Frequency Range (MHz)	Test Mode	Maximum Spurious Level measured (dBm)	Limit (dBm)
Ch. B	9k – 26.5G	TM1	< -13 (See Appendix D)	-13
		TM2	< -13 (See Appendix D)	
		TM3	< -13 (See Appendix D)	
		TM4	< -13 (See Appendix D)	
		TM5	< -13 (See Appendix D)	

Ch. No.	Test Frequency Range (MHz)	Test Mode	Maximum Spurious Level measured (dBm)	Limit (dBm)
		TM6	< -13 (See Appendix D)	
		TM7	< -13 (See Appendix D)	
Ch. M	9k – 26.5G	TM1	< -13 (See Appendix D)	-13
		TM2	< -13 (See Appendix D)	
		TM3	< -13 (See Appendix D)	
		TM4	< -13 (See Appendix D)	
		TM5	< -13 (See Appendix D)	
		TM6	< -13 (See Appendix D)	
		TM7	< -13 (See Appendix D)	
Ch. T	9k – 26.5G	TM1	< -13 (See Appendix D)	-13
		TM2	< -13 (See Appendix D)	
		TM3	< -13 (See Appendix D)	
		TM4	< -13 (See Appendix D)	
		TM5	< -13 (See Appendix D)	
		TM6	< -13 (See Appendix D)	
		TM7	< -13 (See Appendix D)	

(2)10MHz Channel Bandwidth:

Table 34. Measurement Results for Spurious Emissions

Ch. No.	Test Frequency Range (MHz)	Test Mode	Maximum Spurious Level measured (dBm)	Limit (dBm)
Ch. B	9k – 26.5G	TM1	< -13 (See Appendix D)	-13
		TM2	< -13 (See Appendix D)	
		TM3	< -13 (See Appendix D)	
		TM4	< -13 (See Appendix D)	
		TM5	< -13 (See Appendix D)	
		TM6	< -13 (See Appendix D)	
		TM7	< -13 (See Appendix D)	
Ch. M	9k – 26.5G	TM1	< -13 (See Appendix D)	-13
		TM2	< -13 (See Appendix D)	
		TM3	< -13 (See Appendix D)	
		TM4	< -13 (See Appendix D)	
		TM5	< -13 (See Appendix D)	
		TM6	< -13 (See Appendix D)	
		TM7	< -13 (See Appendix D)	
Ch. T	9k – 26.5G	TM1	< -13 (See Appendix D)	-13
		TM2	< -13 (See Appendix D)	
		TM3	< -13 (See Appendix D)	
		TM4	< -13 (See Appendix D)	
		TM5	< -13 (See Appendix D)	



Ch. No.	Test Frequency Range (MHz)	Test Mode	Maximum Spurious Level measured (dBm)	Limit (dBm)
		TM6	< -13 (See Appendix D)	
		TM7	< -13 (See Appendix D)	

6.5.5 Conclusion

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

6.6 Radiated Spurious Emission

6.6.1 Test Conditions

Table 35. Test Conditions

Preconditioning:	1 hour
Measured at:	Enclosure
Ambient temperature:	20 ~ 25 °C
Relative humidity:	48 ~ 65%
Power supply:	12 V DC
Test Configuration/Mode:	Modulation: TM1 (representatively) Channel Bandwidth: 10MHz (representatively) Channel No.: M (representatively)
Rated maximum transmitter output power (P_{max}):	total 23dBm(200mW)

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

FCC part 2.1053 and part 27.53(l)(2) and part 27.53(l)(6)

6.6.2.2 Supporting Standards

Table 36. Supporting Standards

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ITU-R SM.329-10	Unwanted emissions in the spurious domain
WiMAX MRCT (2007-08)	WiMAX Forum™ Mobile Radio Conformance Tests

6.6.2.3 Limits

Compliance with FCC part 2.1053 and part 27.53(l)(2) and part 27.53(l)(6), based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the attenuation below the transmitter power (P) measured in watts shall be not less than $43 + 10 \log (P)$ dB.

Table 37. FCC Limits for BRS&EBS 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 9 kHz to 10th harmonic:

BRS&EBS 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

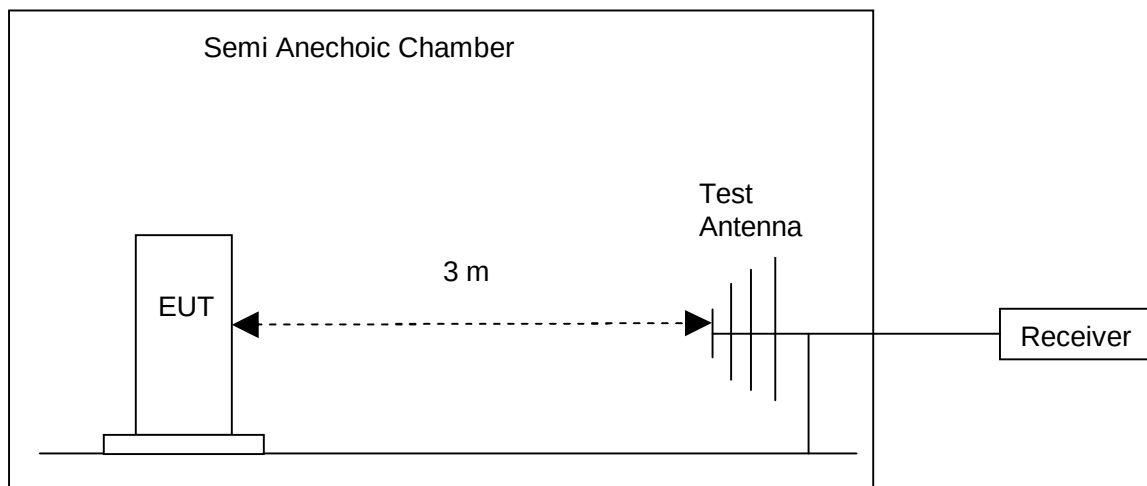


Figure 6. Test Set-up for Pre-test

Step 2: Substitution method to verify the maximum ERP

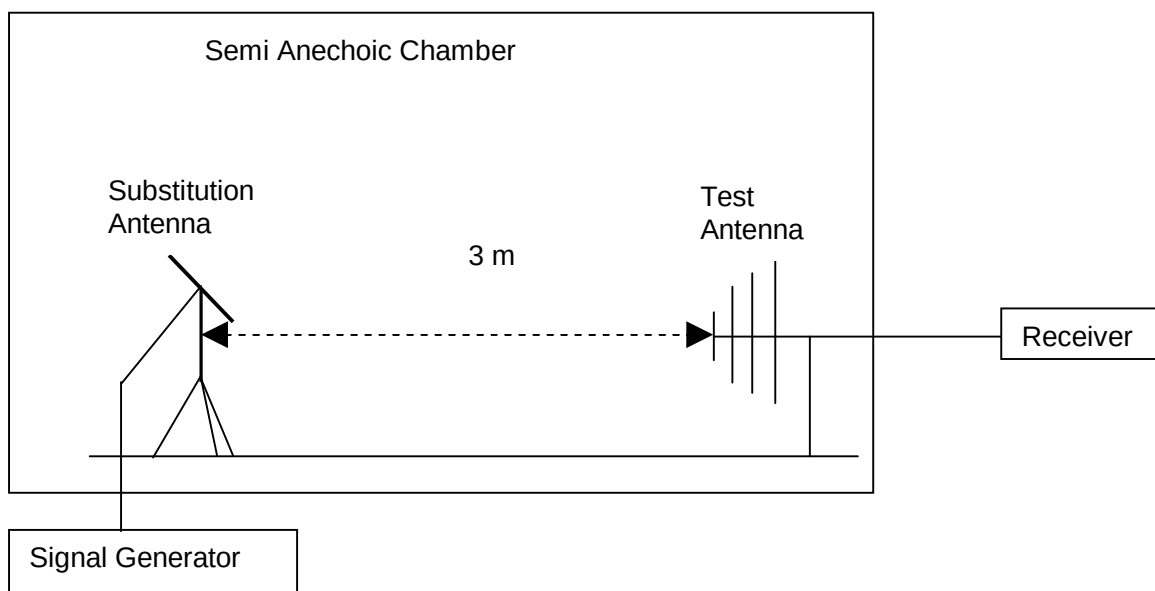


Figure 7. Test Set-up for Substitution

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 38. Measurement Results for Spurious Emissions

Channel Number	Test Frequency Range (Hz)	Maximum Spurious Level measured (dBm)	Limit (dBm)
Ch. M	30M – 18G	< -13 (See Appendix E)	- 13

6.6.5 Conclusion

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

6.7 Frequency Stability

6.7.1 Test Conditions

Table 39. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	(See Measurement Results)
Relative humidity:	48~57 %
Power supply:	(See Measurement Results)
Test Configuration/Mode: (No modulation required according FCC rules)	Modulation: TM1 (representatively) Channel Bandwidth: 10MHz, 5MHz Channel No.: M (representatively)

6.7.2 Test Specifications and Limits

6.7.2.1 Specification

FCC part 2.1055 and part 27.54

6.7.2.2 Supporting Standards

Table 40. Supporting Standards

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
WiMAX MRCT (2007-08)	WiMAX Forum™ Mobile Radio Conformance Tests

6.7.2.3 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 41. FCC Limits for BRS&EBS Band

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

6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature from -5 °C to 40 °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 are: 12V DC (100% rated), 11.4V DC (85% rated) and 12.6V DC (115% rated).

Test Set up

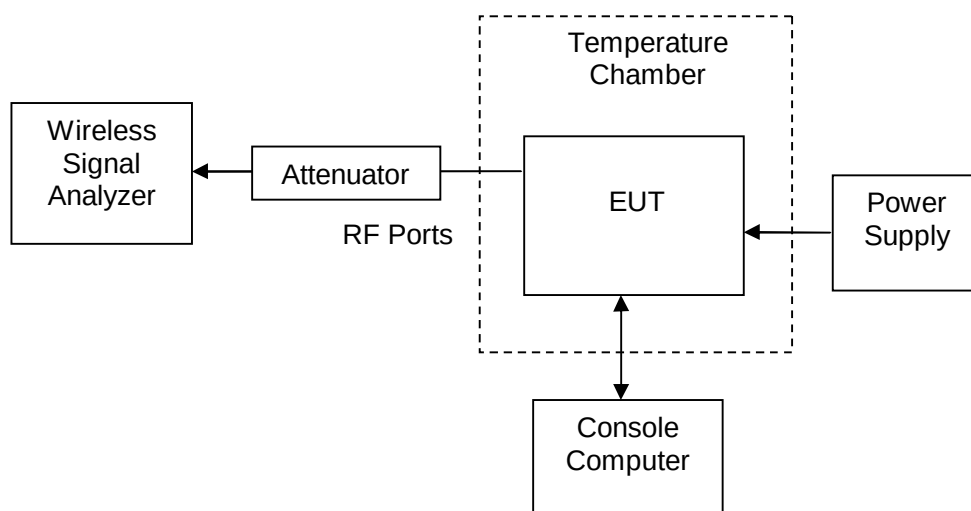


Figure 8. Test Set up

6.7.4 Measurement Results

6.7.4.1 Frequency Error vs. Temperature

10MHz Channel Bandwidth:

Table 42. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
12V DC (100% rated / normal)	-5 °C	7.24	0.003	
	0 °C	5.76	0.002	
	+10 °C	5.85	0.002	
	+20 °C	6.37	0.002	
	+30 °C	6.12	0.002	
	+40 °C	6.35	0.002	

5MHz Channel Bandwidth:

Table 43. Measurement Results for Frequency Error vs. Temperature

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
12V DC (100% rated / normal)	-5 °C	5.14	0.002	
	0 °C	4.43	0.002	
	+10 °C	3.02	0.001	
	+20 °C	3.76	0.001	
	+30 °C	3.40	0.001	
	+40 °C	3.01	0.001	

6.7.4.2 Frequency Error vs. Voltage

10MHz Channel Bandwidth:

Table 44. Measurement Results for Frequency Error vs. Voltage

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
11.4V DC (85% rated / lowest)	+20 °C	5.17	0.002	---
12V DC (100% rated / normal)	+20 °C	5.55	0.002	



Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
12.6V DC (115% rated / highest)	+20 °C	6.12	0.002	

5MHz Channel Bandwidth:

Table 45. Measurement Results for Frequency Error vs. Voltage

Measured Maximum Frequency Error				
Test Environment		Ch. M		
Voltage	Temperature	Hz	ppm	Limit
11.4V DC (85% rated / lowest)	+20 °C	3.84	0.001	---
12V DC (100% rated / normal)	+20 °C	3.05	0.001	
12.6V DC (115% rated / highest)	+20 °C	3.78	0.001	

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 46. System Measurement Uncertainty

Items		Extended Uncertainty
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2
Field Strength of Spurious Radiation	ERP (dBm)(30MHz~1G)	U=4.6dB; k=2
	ERP (dBm) (>1G)	U=3dB; k=2
Conducted Output Power	Power (dBm)	U=0.39dB; k=2



8 Appendices

Appendix A	Measurement Results Modulation Characteristics	15	Pages
Appendix B	Measurement Results Occupied Bandwidth	43	Pages
Appendix C	Measurement Results Band Edges	29	Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	127	Pages
Appendix E	Measurement Results Radiated Spurious Emission	3	Pages
Appendix F	Photos of Test Setup	3	Pages

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