



# FCC Test Report

**Product Name: LTE CPE**

**Model Number: B593u-501**

**Report No: SYBH(Z-RF)023062012-2005**

**FCC ID: QISB593U-501  
IC ID:6369A-B593U501**

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Notice



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<b>REGULATION</b>	<b>FCC CFR47 Part 2:2011: Subpart J;</b>
	<b>FCC CFR47 Part 15:2011: Subpart C;</b>
	<b>ANSI C63.10:2009</b>
	<b>RSS-Gen Issue 3;</b>
	<b>RSS-210 Issue 8;</b>

<b>START OF TEST</b>	<b>Jul.03, 2012</b>
<b>END OF TEST</b>	<b>Jul.09, 2012</b>
<b>Final Judgement:</b>	<b>Pass</b>

Approved By Senior Engineer July, 12, 2012 Dai Linjun  
 Date Name Signature

Reviewed By July, 12, 2012 Cousy Xu  
 Date Name Signature

Operator July, 12, 2012 Huang Qiuliang  
 Date Name Signature



# Contents

<b>1</b>	<b><u>Summary</u></b> .....	<b>3</b>
<b>2</b>	<b><u>Product Description</u></b> .....	<b>3</b>
2.1	PRODUCT INFORMATION .....	3
2.2	MODIFICATION INFORMATION.....	3
<b>3</b>	<b><u>Test Site Description</u></b> .....	<b>3</b>
3.1	TEST PERIOD .....	<b>ERROR! BOOKMARK NOT DEFINED.</b>
3.2	TEST MODES.....	3
<b>4</b>	<b><u>Product Description</u></b> .....	<b>3</b>
4.1	TECHNICAL CHARACTERISTICS .....	3
4.2	EUT IDENTIFICATION LIST .....	3
<b>5</b>	<b><u>Main Test Instruments</u></b> .....	<b>3</b>
<b>6</b>	<b><u>Transmitter Measurements</u></b> .....	<b>3</b>
6.1	BANDWIDTH MEASUREMENT .....	3
6.2	PEAK OUTPUT POWER.....	3
6.3	BAND EDGE SPURIOUS EMISSION .....	3
6.4	CONDUCTED RF SPURIOUS .....	3
6.5	POWER SPECTRAL DENSITY.....	3
6.6	RADIATED SPURIOUS EMISSION & SPURIOUS IN RESTRICTED BAND .....	3
6.7	CONDUCTED EMISSION AT POWER PORT .....	3
<b>7</b>	<b><u>System Measurement Uncertainty</u></b> .....	<b>3</b>
<b>8</b>	<b><u>Appendices</u></b> .....	<b>3</b>

# 1 Summary

The table below summarizes the measurements and results for the EUT. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	Description	Result
15.247 (a) (2)	6dB bandwidth measurement	PASS
15.247 (b) (3)	Conducted Peak output power	PASS
15.247 (d)	Band edge compliance measurement	PASS
15.247 (d)	Conducted RF spurious	PASS
15.247 (e)	Power spectral density	PASS
15.247 (d) / 15.205 & 15.209	Radiated spurious emission & Radiated restricted band measurement	PASS
15.207	Conducted emission test for power port	PASS

Table 2 Summary of results

RSS-210 Issue	Description	Result
RSS-210, A8.2(a)	6dB bandwidth measurement	PASS
RSS-210, A8.4(4)	Conducted Peak output power	PASS
RSS-210, A8.5	Band edge compliance measurement	PASS
RSS-210, A8.5	Conducted RF spurious	PASS
RSS-210, A8.2(b)	Power spectral density	PASS
RSS-210, A8.5 RSS-210, 2.2 RSS-Gen, 7.2.2 RSS-Gen, 7.2.5	Radiated spurious emission & Radiated restricted band measurement	PASS
RSS-Gen, 7.2.4	Conducted emission test for power port	PASS
RSS-210, 2.3 RSS-Gen, 6.1	Receiver Spurious Emissions (Radiated, Only for IC requirement)	PASS



## 2 Product Description

### 2.1 Product Information

#### 2.1.1 General Description

B593u-501 LTE/WCDMA/GSM three mode 10 bands CPE is subscriber equipment in the LTE/UMTS/GSM system and support wifi 802.11b/g/n. B593u-501 implement such functions as RF signal receiving/transmitting, LTE/WCDMA/GSM protocol processing, data service etc. Externally it provides USB interface (to connect to the printer etc.), USIM card interface , RJ45 Ethernet interface. B593u-501 has two internal antennas and two External Antenna, can automatic switch

**Note: Only WIFI function was considered in this report.**

#### 2.1.2 Support function and Service

The EUT support the function and service as follows:

Table 3 Service and Test mode List

Service Name	mode	Characteristic
Data	11b	IEEE 802.11b with data rate of 11 Mbps
Data	11g	IEEE 802.11g with data rate of 54 Mbps
Data	11n20	IEEE 802.11n with 20 MHz bandwidth and data rate of MCS-7, not using MIMO
Data	11n40	IEEE 802.11n with 40 MHz bandwidth and data rate of MCS-7, not using MIMO
Data	11n20-mimo	IEEE 802.11n with 20 MHz bandwidth and data rate of MCS-15, using MIMO
Data	11n40-mimo	IEEE 802.11n with 40 MHz bandwidth and data rate of MCS-15, using MIMO

### 2.2 Modification Information

For original equipment, following table is not application.

Table 4 Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
Not applicable!				



### **3 Test Site Description**

The test site of:

***Huawei Technologies Co. Ltd.  
P.O. Box 518129  
Huawei base, bantian,  
Longgang District, Shenzhen, China***

#### **3.1 Test Modes**

NOTE: Typical working modes for each IEEE 802.11 mode are selected to perform tests.

Test Mode	Test Modes Description
TM1	IEEE 802.11b with data rate of 11 Mbps
TM2	IEEE 802.11g with data rate of 54 Mbps
TM3	IEEE 802.11n with 20 MHz bandwidth and data rate of MCS-7, not using MIMO
TM4	IEEE 802.11n with 40 MHz bandwidth and data rate of MCS-7, not using MIMO
TM5	IEEE 802.11n with 20 MHz bandwidth and data rate of MCS-15, using MIMO
TM6	IEEE 802.11n with 40 MHz bandwidth and data rate of MCS-15, using MIMO

NOTE: All relevant operation modes have been tested, and the worst case data is included in this report.



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 5 Frequency Range

Uplink band:	2400 to 2483.5 MHz	
Downlink band:	2400 to 2483.5 MHz	
Hop frequency support:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO

#### 4.1.2 Channel Spacing / Separation

Table 6 Channel Spacing / raster of 20 MHz bandwidth

Channel spacing:	22 MHz
Channel raster:	5 MHz

Table 7 Channel Spacing / raster of 40 MHz bandwidth

Channel spacing:	40 MHz
Channel raster:	5 MHz

#### 4.1.3 Antenna Information

Table 8 Antenna Information

Type:	Integrated / Internal
Maximum Gain(dBi):	2.0 (from 2400MHz to 2500MHz)



#### 4.1.4 Environmental Requirements

Table 9 Environmental Requirements

Minimum temperature:	- 10 °C
Maximum temperature:	+ 55 °C
Relative Humidity:	5%-95%

#### 4.1.5 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.



## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

LTE CPE		
B593u-501		
Board and Module		
Equipment Designation / Description	Hardware Version	Software Version
MAINBOARD	B593RW2A CL2EM930U501M	V100R003

### 4.2.2 Adapter Technical Data

AC/DCAdapter Model	HW-120200U1W
Manufacturer	FUHUA
Input Voltage	90Vac~270Vac 50/60Hz 0.8A
Output Voltage	+12V 2.0A
Rated Power	24W(max)

AC/DCAdapter Model	HW-120200U1W
Manufacturer	HuntKey
Input Voltage	90Vac~270Vac 50/60Hz 0.8A
Output Voltage	+12V 2.0A
Rated Power	24W(max)

### 4.2.3 FCC Identification

**Grantee Code:** QIS  
**Product Code:** B593U-501  
**FCC Identification:** QISB593U-501

### 4.2.1 IC Identification

**Grantee Code:** 6369A  
**Product Code:** B593U501  
**IC Identification:** 6369A-B593U501



### 4.3 Cables Used during Test

Cable	Quantity	Length	Type of Cable
AC Power	2	<3m	Unshielded
USB	1	<3m	shielded
LAN Cable	4	<3m	Unshielded

Table 11

### 4.4 Associated Equipment Used during Test

Name	Model	Manufacturer	S/N	Calibrated Deadline
Radio Communication Tester	CMU200	R&S	3607111817	2012-7-23
Notebook	D630	DELL	0W7349	N/A
Memorizer	/	R&S	/	N/A



## 5 Main Test Instruments

Table 12 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sept., 27, 2012
Spectrum Analyzer	Agilent	E4440A	MY48250119	Apr., 20, 2013
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2012
Temperature Chamber	WEISS	WKL64	24600294	Feb.13,2013
Signal generator	Agilent	E8257D	MY49281095	Jul.09.2013
Test receiver	R&S	ESU26	100150	May.29.2013
Tunable Dipole	Schwarzbeck	D69250- UHAP/D69250- VHAP	919/1009	Jan.29.2013
Tunable Dipole	Schwarzbeck	D69250- UHAP/D69250- VHAP	979/917	Jan.29.2013
Horn Antenna	R & S	HF906	100683	May.15, 2013
Horn Antenna	R & S	HF906	100684	Jul.01, 2013
Broadband Antenna	Schwarzbeck	VULB 9163	9163-357	May.15, 2013
Broadband Antenna	Schwarzbeck	VULB 9163	9163-356	May.15, 2013

Note: All the equipments are calibrated once a year. When it's almost due, we will arrange calibration again before the calibration deadline.

## 6 Transmitter Measurements

### 6.1 Bandwidth measurement

#### 6.1.1 Test Conditions

Table 13 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4/TM5/TM6 at channel No. B,M,T

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 15.247 (a) (2) and KDB 558074

##### 6.1.2.2 Supporting Standards

Table 14 Supporting Standards:

ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
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##### 6.1.2.3 Limits

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Table 15 Limits

Limits	≥ 500kHz
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#### 6.1.3 Test Method and Setup

- (a) Connect test port of EUT to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power at 2.4GHz, then set the measured frequency number and test the 6dB bandwidth with spectrum analyzer.

## Test setup

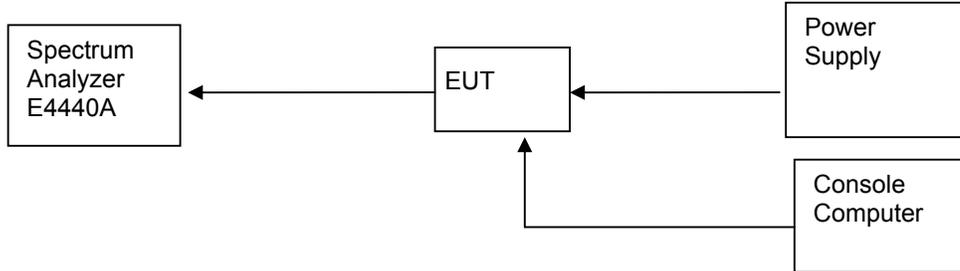


Figure 1. Test Set-up

### 6.1.4 Measurement Results

Table 16 Measurement Results

Test condition	Chain	Channel Position	Channel Number	Frequency [MHz]	Bandwidth Type	Measured Bandwidth [MHz]	Result
TM1	1	B	1	2412	6dB	8.611	Pass
					99%	10.21	
		M	6	2437	6dB	8.20	Pass
					99%	10.14	
		T	11	2462	6dB	8.225	Pass
					99%	10.20	
	2	B	1	2412	6dB	7.25	Pass
					99%	10.09	
		M	6	2437	6dB	8.215	Pass
					99%	10.10	
		T	11	2462	6dB	8.641	Pass
					99%	10.15	
TM2	1	B	1	2412	6dB	15.65	Pass
					99%	16.45	
		M	6	2437	6dB	14.77	Pass
					99%	16.26	
		T	11	2462	6dB	15.77	Pass
					99%	16.45	
	2	B	1	2412	6dB	15.73	Pass
					99%	16.43	
		M	6	2437	6dB	15.73	Pass
					99%	16.50	
		T	11	2462	6dB	15.77	Pass
					99%	16.52	



TM3	1	B	1	2412	6dB	17.24	Pass
					99%	17.41	
		M	6	2437	6dB	14.43	
	99%				17.32		
	T	11	2462	6dB	17.39	Pass	
				99%	17.40		
2	B	1	2412	6dB	17.46	Pass	
				99%	17.43		
	M	6	2437	6dB	17.52	Pass	
99%				17.47			
T	11	2462	6dB	17.54	Pass		
			99%	17.45			
TM4	1	B	3	2.422	6dB	36.59	Pass
					99%	36.20	
		M	6	2437	6dB	35.97	Pass
	99%				35.93		
	T	9	2452	6dB	35.86	Pass	
				99%	36.05		
2	B	3	2422	6dB	36.44	Pass	
				99%	36.10		
	M	6	2437	6dB	36.46	Pass	
99%				36.21			
T	9	2452	6dB	36.16	Pass		
			99%	36.03			
TM5	1	B	1	2412	6dB	17.29	Pass
					99%	17.41	
		M	6	2437	6dB	15.10	Pass
	99%				17.32		
	T	11	2462	6dB	17.10	Pass	
				99%	17.42		
2	B	1	2412	6dB	17.49	Pass	
				99%	17.45		
	M	6	2437	6dB	17.42	Pass	
99%				17.49			
T	11	2462	6dB	16.39	Pass		
			99%	17.44			
TM6	1	B	3	2422	6dB	36.49	Pass
					99%	36.13	
		M	6	2437	6dB	35.63	Pass
	99%				35.89		
	T	9	2452	6dB	35.89	Pass	
99%				36.06			
2	B	3	2422	6dB	36.35	Pass	



					99%	36.08	
		M	6	2437	6dB	36.36	Pass
					99%	36.08	
		T	9	2452	6dB	35.75	Pass
					99%	35.99	

### 6.1.5 Conclusion

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



## 6.2 Peak output power

### 6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4/TM5/TM6 at channel No. B,M,T

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 15.247 (b) (3) and KDB 558074

#### 6.2.2.2 Supporting Standards

Table 18 Supporting Standards:

ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
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#### 6.2.2.3 Limits

Compliance with part 15.247 (b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level.

Table 19 Limits

2.4GHz and 5.8GHz system using digital modulation	1 Watt / 30 dBm
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### 6.2.3 Test Method and Setup

- (a) Connect test port of EUT to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted output power separately.

#### Test setup

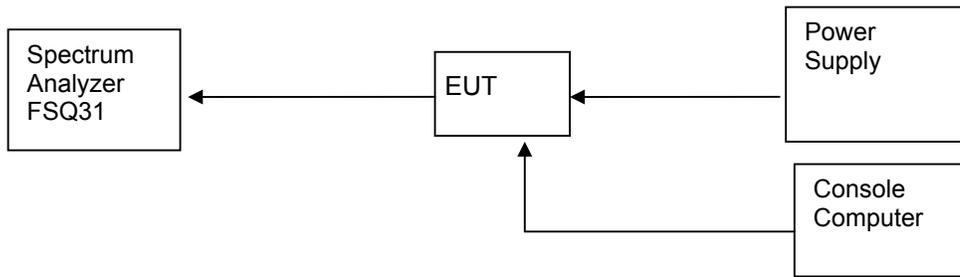


Figure 2. Test Set-up

## 6.2.4 Measurement Results

Table 20 Measurement Results

Test condition	Chain	Channel Position	Channel Number	Frequency [MHz]	Meas. Level (Cond.) [dBm]	Limit [dBm]	Result
TM1	1	B	1	2412	18.37	< 30	pass
		M	6	2437	19.33	< 30	pass
		T	11	2462	18.47	< 30	pass
	2	B	1	2412	19.37	< 30	pass
		M	6	2437	19.42	< 30	pass
		T	11	2462	19.71	< 30	pass
TM2	1	B	1	2412	21.29	< 30	pass
		M	6	2437	21.42	< 30	pass
		T	11	2462	21.09	< 30	pass
	2	B	1	2412	21.39	< 30	pass
		M	6	2437	21.60	< 30	pass
		T	11	2462	21.50	< 30	pass



TM3	1	B	1	2412	20.08	< 30	pass
		M	6	2437	19.91	< 30	pass
		T	11	2462	19.33	< 30	pass
	2	B	1	2412	19.83	< 30	pass
		M	6	2437	19.95	< 30	pass
		T	11	2462	19.99	< 30	pass
TM4	1	B	3	2422	19.95	< 30	pass
		M	6	2437	20.00	< 30	pass
		T	9	2452	20.01	< 30	pass
	2	B	3	2422	20.21	< 30	pass
		M	6	2437	20.43	< 30	pass
		T	9	2452	20.22	< 30	pass
TM5	1	B	1	2412	19.32	---	---
		M	6	2437	20.08	---	---
		T	11	2462	19.12	---	---
	2	B	1	2412	19.68	---	---
		M	6	2437	19.57	---	---
		T	11	2462	19.84	---	---
	1+2	B	1	2412	22.51	< 30	pass
		M	6	2437	22.84	< 30	pass
		T	11	2462	22.51	< 30	pass
TM6	1	B	3	2422	20.25	---	---
		M	6	2437	20.38	---	---
		T	9	2452	20.55	---	---
	2	B	3	2422	20.65	---	---

		M	6	2437	20.55	---	---
		T	9	2452	20.51	---	---
	1+2	B	3	2422	23.46	< 30	pass
		M	6	2437	23.48	< 30	pass
		T	9	2452	23.54	< 30	pass

### 6.2.5 Conclusion

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



## 6.3 Band edge spurious emission

### 6.3.1 Test Conditions

Table 21 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4/TM5/TM6 at channel No. B, T

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 15.247(d) and KDB 558074

#### 6.3.2.2 Supporting Standards

Table 22 Supporting Standards:

ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
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#### 6.3.2.3 Limits

Compliance with part 15.247 (d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

Table 23 Limits

Band edge spurious:	20 dBc/100kHz
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### 6.3.3 Test Method and Setup

- (a) Connect test port of EUT to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz
- (c) Then set the EUT to transmit at high, low frequency and measure the conducted band edge spurious separately.

## Test setup

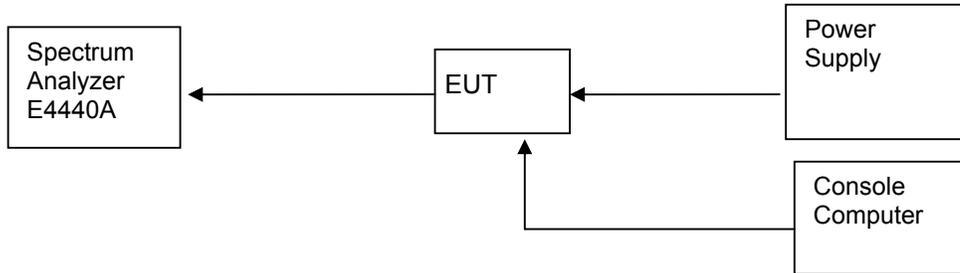


Figure 3. Test Set-up

## 6.3.4 Measurement Results

Table 24 Measurement Results

Test condition	Chain	Channel Position	Channel Number	Frequency [MHz]	Carrier Power [dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Result
TM1	1	Low Edge	1	2412	6.91	-34.62	-13.1	pass
		High Edge	11	2462	7.00	-29.51	-13.0	pass
	2	Low Edge	1	2412	8.07	-30.07	-11.9	pass
		High Edge	11	2462	8.13	-27.11	-11.9	pass
TM2	1	Low Edge	1	2412	2.89	-28.76	-17.1	pass
		High Edge	11	2462	2.94	-29.70	-17.1	pass
	2	Low Edge	1	2412	2.86	-26.25	-17.1	pass
		High Edge	11	2462	3.77	-26.45	-16.2	pass
TM3	1	Low Edge	1	2412	0.70	-34.20	-19.3	pass
		High Edge	11	2462	0.83	-36.36	-19.2	pass
	2	Low Edge	1	2412	0.95	-33.89	-19.0	pass
		High Edge	11	2462	1.73	-31.57	-18.3	pass
TM4	1	Low Edge	3	2422	-2.32	-32.76	-22.3	pass

	2	High Edge	9	2452	-1.77	-33.12	-21.8	pass
		Low Edge	3	2422	-1.19	-32.43	-21.2	pass
		High Edge	9	2452	-1.47	-34.56	-21.5	pass
TM5	1	Low Edge	1	2412	0.30	-34.45	-19.7	pass
		High Edge	11	2462	0.41	-38.47	-19.6	pass
	2	Low Edge	1	2412	0.46	-35.21	-19.5	pass
		High Edge	11	2462	0.86	-30.23	-19.1	pass
TM6	1	Low Edge	3	2422	-2.27	-32.18	-22.3	pass
		High Edge	9	2452	-2.28	-32.46	-22.3	pass
	2	Low Edge	3	2422	-1.16	-32.84	-21.2	pass
		High Edge	9	2.452	-1.61	-33.39	-21.6	pass

### 6.3.5 Conclusion

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

## 6.4 Conducted RF spurious

### 6.4.1 Test Conditions

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4/TM5/TM6 at channel No.B, M, T

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 15.247 (d) and KDB 558074

#### 6.4.2.2 Supporting Standards

Table 26 Supporting Standards:

ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
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#### 6.4.2.3 Limits

Compliance with part 15.247 (d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

Table 27 Limits

Band edge spurious:	20 dBc/100kHz
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### 6.4.3 Test Method and Setup

- Connect test port of EUT to spectrum analyzer
- Set the EUT to transmit maximum output power at 2.4GHz and.
- Then set the EUT to transmit at high, middle and low frequency and measure the conducted band edge spurious separately.

## Test setup

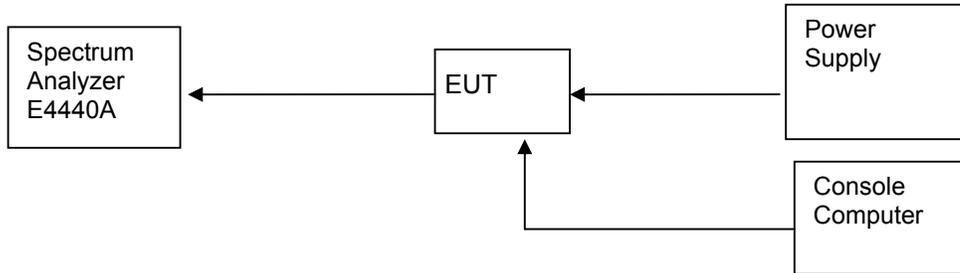


Figure 4. Test Set-up

## 6.4.4 Measurement Results

Table 28 Measurement Results

Test condition	Chain	Test Frequency Range	Channel No.	Carrier Frequency [MHz]	Carrier Power [dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Result
TM1	1	9KHz-26GHz	1	2412	10.39	-42.71	-9.6	Pass
		9KHz-26GHz	6	2437	11.39	-42.32	-8.6	Pass
		9KHz-26GHz	11	2462	10.56	-41.98	-9.4	Pass
	2	9KHz-26GHz	1	2412	11.75	-42.86	-8.2	Pass
		9KHz-26GHz	6	2437	11.98	-41.47	-8.0	Pass
		9KHz-26GHz	11	2462	11.75	-41.42	-8.2	Pass
TM2	1	9KHz-26GHz	1	2412	9.49	-42.64	-10.5	Pass
		9KHz-26GHz	6	2437	8.95	-41.99	-11.1	Pass
		9KHz-26GHz	11	2462	8.27	-42.79	-11.7	Pass
	2	9KHz-26GHz	1	2412	10.53	-42.52	-9.5	Pass
		9KHz-26GHz	6	2437	11.89	-42.17	-8.1	Pass
		9KHz-26GHz	11	2462	11.20	-42.79	-8.8	Pass
TM3	1	9KHz-26GHz	1	2412	7.30	-42.33	-12.7	Pass
		9KHz-26GHz	6	2437	8.43	-43.35	-11.6	Pass

		26GHz							
		9KHz-26GHz	11	2462	8.78	-41.01	-11.2	Pass	
		2	9KHz-26GHz	1	2412	7.94	-41.56	-12.1	Pass
			9KHz-26GHz	6	2437	8.66	-42.89	-11.3	Pass
TM4	1	9KHz-26GHz	11	2462	7.25	-42.75	-12.8	Pass	
		9KHz-26GHz	3	2422	4.07	-42.77	-15.9	Pass	
		9KHz-26GHz	6	2437	6.39	-41.93	-13.6	Pass	
	2	9KHz-26GHz	9	2452	5.88	-42.38	-14.1	Pass	
		9KHz-26GHz	3	2422	4.87	-43.15	-15.1	Pass	
		9KHz-26GHz	6	2437	4.64	-42.27	-15.4	Pass	
TM5	1	9KHz-26GHz	9	2452	5.46	-42.28	-14.5	Pass	
		9KHz-26GHz	1	2422	7.06	-42.44	-12.9	Pass	
		9KHz-26GHz	6	2437	8.48	-43.11	-11.5	Pass	
	2	9KHz-26GHz	11	2452	6.93	-42.55	-13.1	Pass	
		9KHz-26GHz	1	2412	7.63	-42.84	-12.4	Pass	
		9KHz-26GHz	6	2437	8.71	-42.72	-11.3	Pass	
TM6	1	9KHz-26GHz	11	2462	7.86	-41.75	-12.1	Pass	
		9KHz-26GHz	3	2422	4.95	-42.92	-15.1	Pass	
		9KHz-26GHz	6	2437	5.97	-42.36	-14.0	Pass	
	2	9KHz-26GHz	9	2452	6.69	-42.65	-13.3	Pass	
		9KHz-26GHz	3	2422	5.77	-42.31	-14.2	Pass	
		9KHz-26GHz	6	2437	5.04	-42.46	-15.0	Pass	
		9KHz-26GHz	9	2452	5.61	-42.66	-14.1	Pass	

### 6.4.5 Conclusion

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



## 6.5 Power spectral density

### 6.5.1 Test Conditions

Table 29 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4/TM5/TM6 at channel No.B, M, T

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 15.247 (e) and KDB 558074

#### 6.5.2.2 Supporting Standards

Table 30 Supporting Standards:

ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
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#### 6.5.2.3 Limits

Compliance with part 15.247 (e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. The same method of determining the conducted output power shall be used to determine the power spectral density.

Table 31 Limits

Band edge spurious:	8 dBm/3kHz
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### 6.5.3 Test Method and Setup

- (a) Connect test port of EUT to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz and.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted band edge spurious separately.

## Test setup

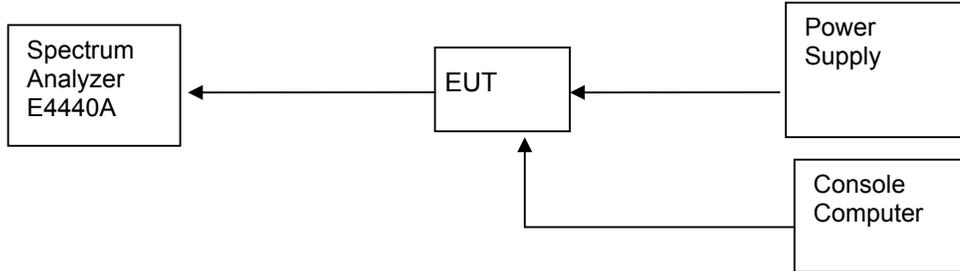


Figure 5. Test Set-up

## 6.5.4 Measurement Results

Table 32 Measurement Results

Test condition	Chain	Channel Position	Channel Number	Frequency [MHz]	Measured Power spectral density [dBm]	Limit [dBm]	Result
TM1	1	B	1	2412	0.21	< 8	pass
		M	6	2437	1.82	< 8	pass
		T	11	2462	0.76	< 8	pass
	2	B	1	2412	2.02	< 8	pass
		M	6	2437	2.40	< 8	pass
		T	11	2462	1.58	< 8	pass
TM2	1	B	1	2412	-12.66	< 8	pass
		M	6	2437	-11.98	< 8	pass
		T	11	2462	-12.80	< 8	pass
	2	B	1	2412	-12.81	< 8	pass
		M	6	2437	-12.73	< 8	pass
		T	11	2462	-12.53	< 8	pass
TM3	1	B	1	2412	-15.25	< 8	pass
		M	6	2437	-14.10	< 8	pass
		T	11	2462	-13.95	< 8	pass

	2	B	1	2412	-14.77	< 8	pass
		M	6	2437	-14.91	< 8	pass
		T	11	2462	-2.18	< 8	pass
TM4	1	B	3	2422	-19.60	<8	pass
		M	6	2437	-18.22	< 8	pass
		T	9	2452	-19.18	< 8	pass
	2	B	3	2422	-19.48	< 8	pass
		M	6	2437	-19.25	< 8	pass
		T	9	2452	-18.68	< 8	pass
TM5	1	B	1	2412	-15.29	---	---
		M	6	2437	-7.64	---	---
		T	11	2462	-15.37	---	---
	2	B	1	2412	-15.17	---	---
		M	6	2437	-15.02	---	---
		T	11	2462	-15.07	---	---
	1+2	B	1	2412	-12.22	< 8	pass
		M	6	2437	-6.91	< 8	pass
		T	11	2462	-12.21	< 8	pass
TM6	1	B	3	2422	-20.28	---	---
		M	6	2437	-18.40	---	---
		T	9	2452	-19.71	---	---
	2	B	3	2422	-20.22	---	---
		M	6	2437	-19.93	---	---
		T	9	2452	-19.69	---	---
	1+2	B	3	2422	-17.24	< 8	pass
		M	6	2437	-16.09	< 8	pass
		T	9	2452	-16.69	< 8	pass

### 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 & spurious in restricted band

### 6.6.1 Test Conditions

Table 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25. °C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4/TM5/TM6 at channel No.B, M, T

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 15.247 (d), 15.205 & 15.209 and KDB 558074

#### 6.6.2.2 Supporting Standards

Table 34 Supporting Standards:

ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
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#### 6.6.2.3 Limits

According to part 15.247 (d) / 15.205 & 15.209, all spurious emission in the frequency range from 30MHz to 10<sup>th</sup> harmonics of carrier frequency should be meet the requirement of following table.

Table 35 Limits

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)	Detector
0.009 - 0.490	2400/F(kHz)	20*lg(2400/F(kHz))	300	QP
0.490 - 1.705	24000/F(kHz)	20*lg(24000/F(kHz))	30	QP
1.705 - 30	30	29.5	30	QP
30 – 88	100	40	3	QP
88 – 216	150	43.5	3	QP
216 – 960	200	46	3	QP
960 -1000	500	54	3	QP
Above 1000	500	54	3	AV
Above 1000	500	74	3	PK

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table 42).

### 6.6.3 Test Method and Setup

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10. The Radiated Disturbance measurements were made using a Rohde and Schwarz Test Receiver and control software.

A preliminary scan and a final scan of the emissions were made by using test script of software; the emissions were measured using a Quasi-Peak Detector below 1GHz, and AV detector above 1GHz. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°, The receive antenna has two polarizations V and H.

A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other nonmetallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z axes) axis positions such that emissions from the EUT are maximized.

The EUT was communicated with the BTS simulator through Air interface. The EUT operated on the typical channel.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 kHz  
 Measurement bandwidth: 1000 MHz – 10<sup>th</sup> Carrier Frequency: 1 MHz

#### Test set up

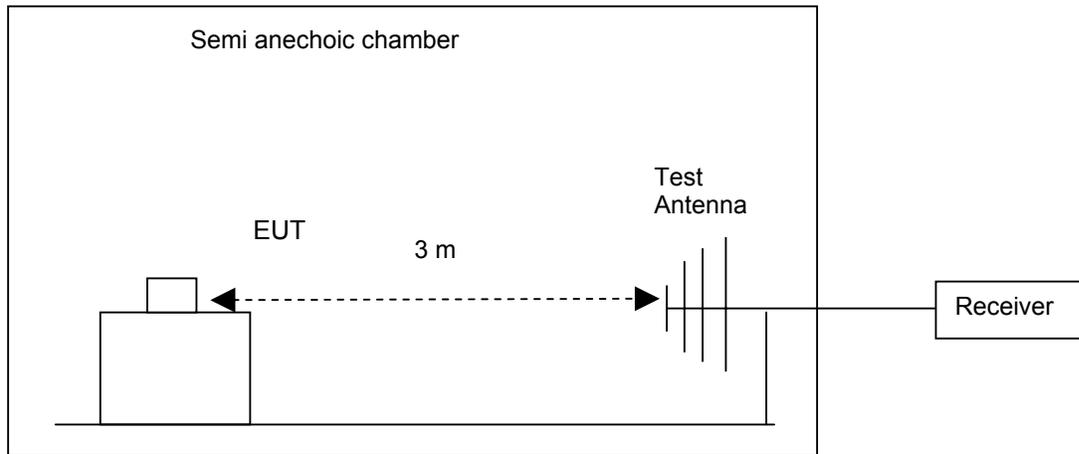


Figure 6. Test Set up

### 6.6.4 Measurement Results

Note 1: The following measurement results exceed the limit line is the carrier frequency.

Note 2: This test was carried out in all the test modes, here only the worst test result was shown.

Test condition	Channel No.	Carrier Frequency [MHz]	Measured	Result
TM1	1	2412	Refer to Appendix F	Pass
	6	2437	Refer to Appendix F	Pass
	11	2462	Refer to Appendix F	Pass
TM2	1	2412	Refer to Appendix F	Pass
	6	2437	Refer to Appendix F	Pass
	11	2462	Refer to Appendix F	Pass



TM3	1	2412	Refer to Appendix F	Pass
	6	2437	Refer to Appendix F	Pass
	11	2462	Refer to Appendix F	Pass
TM4	3	2422	Refer to Appendix F	Pass
	6	2437	Refer to Appendix F	Pass
	9	2452	Refer to Appendix F	Pass
TM5	1	2412	Refer to Appendix F	Pass
	6	2437	Refer to Appendix F	Pass
	11	2462	Refer to Appendix F	Pass
TM6	3	2422	Refer to Appendix F	Pass
	6	2437	Refer to Appendix F	Pass
	9	2452	Refer to Appendix F	Pass

### 6.6.5 Conclusion

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

## 6.7 Conducted Emission at Power Port

### 6.7.1 Test Conditions

Table 36 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Power port
Ambient temperature:	25. °C
Relative humidity:	55%
Test Configurations:	TM1 at channel No. 6

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 15.207 and KDB 558074

#### 6.7.2.2 Supporting Standards

Table 37 Supporting Standards:

ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
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#### 6.7.2.3 Limits

Compliance with part15.207, conducted emission must meet the requirement of following table.

Table 38 Limits

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

Note: \* Decreases with the logarithm of the frequency.

### 6.7.3 Test Method and Setup

The Table-top EUT was placed upon a non-metallic table 0.8 m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2009.

Conducted Disturbance at AC Port measurements were undertaken on the Land N Lines. The emissions were measured using a Quasi-Peak Detector and Average Detector.

The EUT was communicated with the BTS simulator through Air interface, the BTS simulator controls the Wireless Modem to transmitter the maximum power which defined in specification of product. The

Wireless Modem operated on the typical channel.

Measurement bandwidth (RBW) for 150kHz to 30 MHz: 9 kHz;

### Test Set-up

The EUT was set in the screened chamber and operated under nominal conditions.

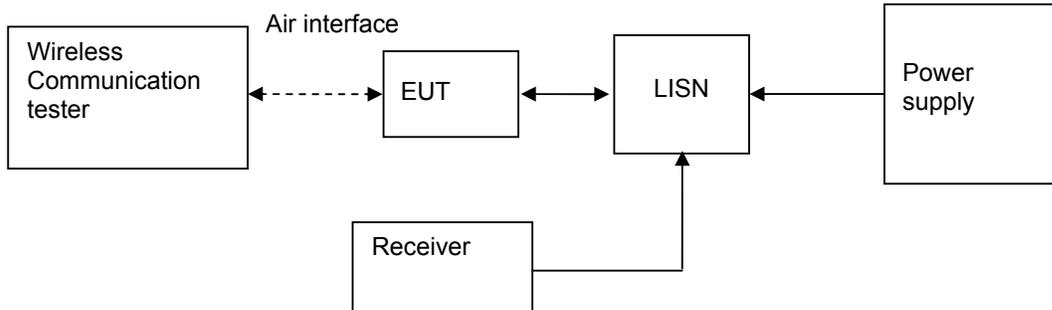


Figure 7. Test Set-up

### 6.7.4 Measurement Results

Table 39 MEASUREMENT RESULT:QP DECTER

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.224077	36.9	9.7	62.7	25.8	L1	FLO
0.330252	41.8	9.7	59.4	17.6	L1	FLO
0.335902	41.6	9.7	59.3	17.7	L1	FLO
0.854070	31.4	9.7	56.0	24.6	L1	FLO
0.862234	31.0	9.7	56.0	25.0	L1	FLO
1.250021	28.1	9.7	56.0	27.9	L1	FLO

Table 40 MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Line	PE
0.238829	29.3	9.7	52.1	22.8	L1	FLO
0.329378	33.3	9.7	49.5	16.2	L1	FLO
0.329396	33.2	9.7	49.5	16.3	L1	FLO
0.806325	22.5	9.7	46.0	23.5	L1	FLO
0.854111	21.4	9.7	46.0	24.6	L1	FLO
1.186392	22.3	9.7	46.0	23.7	L1	FLO

Table 41

### 6.7.5 Conclusion

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

## 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 42 System Measurement Uncertainty

Items		Extended Uncertainty
20dB bandwidth measurement	Magnitude (%)	U=0.2%; k=2
Peak output power	Power(dBm)	U=0.39dB; k=2
Band edge compliance measurement	Disturbance Power(dBm)	U=2.0dB; k=2
Conducted RF spurious	Disturbance Power(dBm)	U=0.4dB; k=2
Power spectral density	Disturbance Power(dBm)	U=0.4dB; k=2
Radiated spurious emission & Radiated restricted band measurement	Field strength (dB $\mu$ V/m)	U=4.1dB; k=2 U=4.1dB; k=2
Conducted emission test for power port	Disturbance Voltage(dB $\mu$ V)	U=3.4dB; k=2

## 8 Appendices

Appendix A	Measurement Results Bandwidth measurement
Appendix B	Measurement Results Peak output power
Appendix C	Measurement Results Band edge compliance measurement
Appendix D	Measurement Results Conducted RF spurious
Appendix E	Measurement Results Power spectral density
Appendix F	Measurement Results Radiated spurious emission
Appendix G	Measurement Results Conducted emission test for power port
Appendix H	Photos of Test Setup

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