



FCC Test Report

Product Name: Wireless Gateway

Model Number: B660

Report No: SYBH(Z-RF)010052011-2003

FCC ID: QISB660-44

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Notice

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REPORT ON	Wireless Gateway
	M/N: B660
REGULATION	FCC 47CFR part 15 subpart C
START OF TEST	Apr.23,2011
END OF TEST	Apr.26,2011
Final Judgement:	Pass

Approved By

May.03, 2011
Date

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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

2 Product Description

2.1 Production Information

2.1.1 General Description

HUAWEI B660 Wireless Gateway is subscriber equipment in the UMTS/GSM system, also supports wireless Internet accessing function, routing function, and network address translation (NAT) function. The WCDMA frequency is Band V. The GSM/GPRS/EDGE frequency band includes GSM850,GSM 1900 the WLAN frequency is 2.4G.

GSM850 transmitt frequenvy is 824-849MHZ .and Receive Frequency is 869-894 MHZ ;GSM1900 transmitt frequenvy is 1850-1910MHZ .and Receive Frequency is1930-1990 MHZ; WCDMA 850 transmitt frequenvy is 824-849MHZ .and Receive Frequency is 869-894MHZ. The WLAN frequenvy range is 2410-2483.5MHZ

B660 implements such functions as RF signal receiving/transmitting, HSPA/ WCDMA and EDGE/GPRS/GSM protocol processing, data service, etc. Externally it provides USB interface (to connect to the laptop etc.), USIM card interface, RJ11 interface (to connect to fixed telephone), RJ45 interface (to connect to pc) and external antenna interface. It has four internal antennas as default. Product Technical Data

Note: The present document WLAN test data refer to SYBH(Z-RF)009052011 of B660 test report, Because both of EUT are the same at WLAN band.

2.1.2 Support function and Service

The EUTsupport the function and service as follows:

Table 2 Service and Test mode List

Service Name	mode	Characteristic	Note
Data	11b	IEEE 802.11b with data rate of 11 Mbps	TM1
Data	11g	IEEE 802.11g with data rate of 54 Mbps	TM2
Data	11n20	IEEE 802.11n with 20 MHz bandwidth and data rate of MCS-7, not using MIMO	TM3
Data	11n40	IEEE 802.11n with 40 MHz bandwidth and data rate of MCS-7, not using MIMO	TM4
Data	11n20-mimo	IEEE 802.11n with 20 MHz bandwidth and data rate of MCS-15, using MIMO	TM5
Data	11n40-mimo	IEEE 802.11n with 40 MHz bandwidth and data rate of MCS-15, using MIMO	TM6

2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

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



3 Test Site Description

Test Site

Site 1:

RF LABORATORY OF RELIABILITY LABORATORY OF HUAWEI TECHNOLOGIES CO., LTD

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

Uplink band:	2400 to 2483.5 MHz	
Downlink band:	2400 to 2483.5 MHz	
Hop frequency support:	☐ YES	☒ NO

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / raster

Channel spacing:	22 MHz
Channel raster:	5 MHz

4.1.3 Type of Emission

Table 6 Type of Emission

Emission Designation:	-
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According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

4.1.4 Antenna Information

Table 7 Antenna Information

Type:	Integrated / Internal
Maximum Gain(dBi):	1.0 (from 2400MHz to 2500MHz)

4.1.5 Environmental Requirements

Table 8 Environmental Requirements

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

4.1.6 Power Source

Table 9 Power Source

AC voltage nominal:	~120V
AC voltage range	~100V-240V
AC current maximal:	2 A

4.1.7 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.

4.1.8 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 10 Applied RF module DC Voltages and Currents

Voltage:	 +5.0 V
Current:	2 A According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)

4.2 EUT Identification List

4.2.1 Board Information

Table 11 Board Information

Wireless Gateway		
B660		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
MAINBOARD	WL1B683I001	B660

4.2.2 Adapter Technical Data

Name	Manufacture	Serials number	Description
Adapter	Huawei Technologies CO.,LTD	UEFAC0100982	Adapter Model: HW-050200U2W voltage nominal: ~230V Input Voltage : 100-240V ~50/60Hz, 0.2A Output Voltage: == 5.0V 2A Rated Power: 10W

4.2.4 FCC Identification

Grantee Code: QIS
Product Code: B660-44
FCC Identification: QISB660-44

5 Main Test Instruments

Table 12 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24.2011
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec.14.2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.20,2012
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2012
Signal generator	Agilent	E8257D	MY49281095	Jul.9.2011
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Test receiver	R&S	ESU26	100150	May.24.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13.2011
Horn Antenna	R & S	HF906	100683	May.16, 2012
Horn Antenna	R & S	HF906	100684	May.16, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-357	Sep.15, 2011
Broadband Antenna	Schwarzbeck	VULB 9163	9163-356	Sep.15, 2011
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20.2011
Horn Antenna	ETS-LINDGREN	3160	60006	Oct.27.2011

6 Transmitter Measurements

6.1 6dB bandwidth measurement

6.1.1 Test Conditions

Table 13 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	24.8°C
Relative humidity:	45%
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/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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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	$\geq 500\text{kHz}$
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6.1.3 Test Method and Setup

- Connect test port of EUT to spectrum analyzer.
- 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

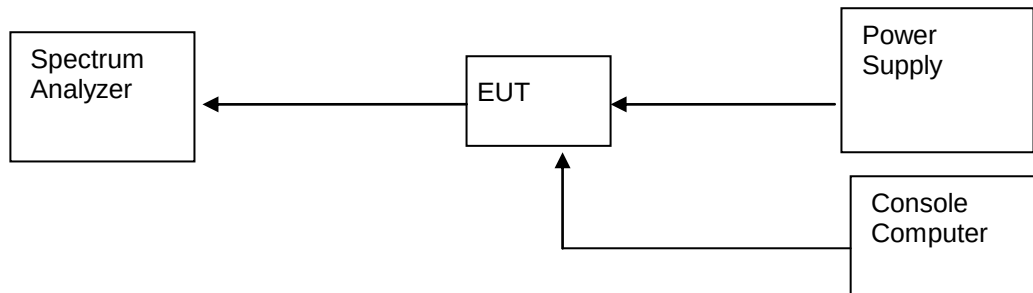


Figure 1. Test Set-up

6.1.4 Measurement Results

Table 16 Measurement Results

Test condition	Chain	Channel Position	Channel Number	Frequency [GHz]	Measured Bandwidth [MHz]	Limit [MHz]	Result
TM1	1	B	1	2.412	9.371	≥ 0.5	Pass
		M	6	2.437	9.323	≥ 0.5	Pass
		T	11	2.462	9.328	≥ 0.5	Pass
TM2	1	B	1	2.412	16.487	≥ 0.5	Pass
		M	6	2.437	16.556	≥ 0.5	Pass
		T	11	2.462	16.558	≥ 0.5	Pass
TM3	1	B	1	2.412	17.806	≥ 0.5	Pass
		M	6	2.437	17.761	≥ 0.5	Pass
		T	11	2.462	17.745	≥ 0.5	Pass
TM4	1	B	3	2.422	35.96	≥ 0.5	Pass
		M	6	2.437	36.19	≥ 0.5	Pass
		T	9	2.452	36.26	≥ 0.5	Pass
TM5	1	B	1	2.412	17.06	≥ 0.5	Pass
		M	6	2.437	17.10	≥ 0.5	Pass
		T	11	2.462	16.90	≥ 0.5	Pass
	2	B	1	2.412	17.64	≥ 0.5	Pass
		M	6	2.437	17.64	≥ 0.5	Pass
		T	11	2.462	17.66	≥ 0.5	Pass
TM6	1	B	3	2.422	35.26	≥ 0.5	Pass
		M	6	2.437	35.27	≥ 0.5	Pass
		T	9	2.452	35.85	≥ 0.5	Pass
	2	B	3	2.422	36.40	≥ 0.5	Pass
		M	6	2.437	36.44	≥ 0.5	Pass
		T	9	2.452	36.42	≥ 0.5	Pass

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:	24.8°C
Relative humidity:	45%
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/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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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

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

Test setup

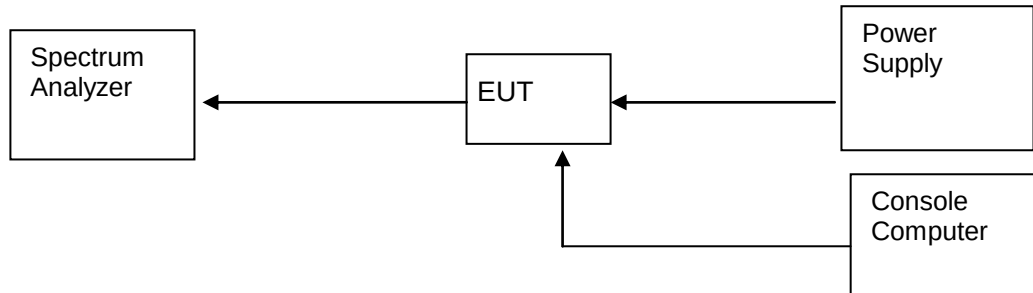


Figure 2. Test Set-up

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	24.42	< 30	Pass
		M	7	2442	24.24	< 30	Pass
		T	11	2462	24.33	< 30	Pass
TM2	1	B	1	2412	25.24	< 30	Pass
		M	7	2442	25.21	< 30	Pass
		T	11	2462	25.03	< 30	Pass
TM3	1	B	1	2412	25.22	< 30	Pass
		M	7	2442	25.29	< 30	Pass
		T	11	2462	25.04	< 30	Pass
TM4	1	B	3	2422	24.14	< 30	Pass
		M	6	2437	25.56	< 30	Pass
		T	9	2452	25.47	< 30	Pass
TM5	1	B	1	2412	23.48	---	---
		M	7	2442	23.79	---	---
		T	11	2462	23.13	---	---
	2	B	1	2412	22.10	---	---
		M	7	2442	22.07	---	---
		T	11	2462	22.11	---	---
	1+2	B	1	2412	25.85	< 30	Pass
		M	7	2442	26.02	< 30	Pass
		T	11	2462	25.66	< 30	Pass
TM6	1	B	3	2422	22.41	---	---
		M	6	2437	22.71	---	---
		T	9	2452	21.80	---	---
	2	B	3	2422	21.98	---	---
		M	6	2437	22.22	---	---
		T	9	2452	22.14	---	---
	1+2	B	3	2422	25.21	< 30	Pass
		M	6	2437	25.48	< 30	Pass
		T	9	2452	24.98	< 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:	24.8°C
Relative humidity:	45%
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/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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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

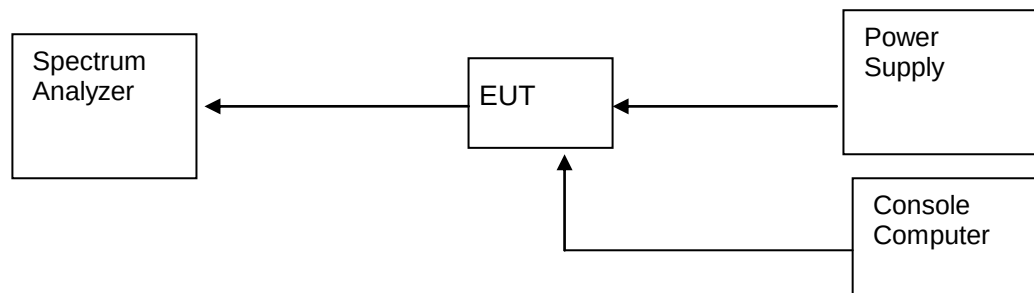


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 24 Measurement Results

Test condition	Chain	Channel Position	Channel Number	Frequency [MHz]	0dBc Level [dBm]	Max. Spurious Level [dBm]	-20dBc Limit [dBm]	Result
TM1	1	B	1	2412	6.63	-51.03	<-13.40	Pass
		T	11	2462	7.87	-50.88	<-13.10	Pass
TM2	1	B	1	2412	-0.64	-51.86	<-20.60	Pass
		T	11	2462	1.04	-49.91	<-19.00	Pass
TM3	1	B	1	2412	-0.38	-51.50	<-20.40	Pass
		T	11	2462	0.91	-47.40	-19.10	Pass
TM4	1	B	3	2422	4.57	-21.84	< -15.43	Pass
		T	9	2452	5.15	-27.81	< -14.85	Pass
TM5	1	B	1	2412	5.35	-21.83	< -14.65	Pass
		T	11	2462	6.11	-38.23	< -13.89	Pass
	2	B	1	2412	3.89	-21.71	< -16.11	Pass
		T	11	2462	3.71	-36.98	< -16.29	Pass
TM6	1	B	3	2422	2.3	-26.39	< -17.7	Pass
		T	9	2452	2.09	-34.15	< -17.91	Pass
	2	B	3	2422	0.54	-25.35	< -19.46	Pass
		T	9	2452	0.78	-31.53	< -19.22	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:	24.8°C
Relative humidity:	45%
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/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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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

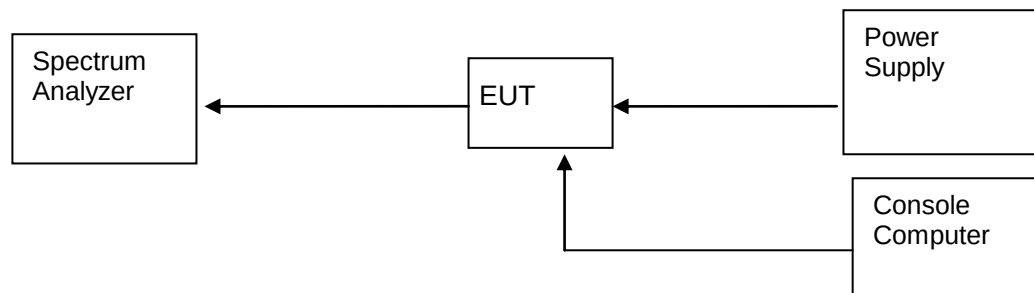


Figure 4. Test Set-up

6.4.4 Measurement Results

Table 28 Measurement Results

Test condition	Chain	Channel Position	Channel Number	Frequency [MHz]	OdBc Level [dBm]	Meas. Level (Cond.) [dBm]	-20dBc Limit [dBm]	Result
TM1	1	B	1	2412	7.2	-30.27	< -12.8	Pass
		M	7	2442	8.22	-29.84	< -11.78	Pass
		T	11	2462	6.94	-30.27	< -13.06	Pass
TM2	1	B	1	2412	6.55	-30.41	< -13.45	Pass
		M	7	2442	6.01	-30.21	< -13.99	Pass
		T	11	2462	5.67	-30.48	< -14.33	Pass
TM3	1	B	1	2412	4.03	-30.24	< -15.97	Pass
		M	7	2442	4.58	-30.24	< -15.42	Pass
		T	11	2462	5.15	-29.71	< -14.85	Pass
TM4	1	B	3	2422	2.65	-30.64	< -17.35	Pass
		M	6	2437	0.4	-30.78	< -19.6	Pass
		T	9	2452	2.19	-30.57	< -17.81	Pass
TM5	1	B	1	2412	2.37	-30.24	< -17.63	Pass
		M	7	2442	3.04	-30.74	< -16.96	Pass
		T	11	2462	3.09	-31.02	< -16.91	Pass
	2	B	1	2412	2.7	-30.92	< -17.3	Pass
		M	7	2442	2.06	-30.88	< -17.94	Pass
		T	11	2462	2.78	-30.95	< -17.22	Pass
TM6	1	B	3	2422	-0.95	-30.34	< -20.95	Pass
		M	6	2437	-0.96	-30.57	< -20.96	Pass
		T	9	2452	-0.71	-31.09	< -20.71	Pass
	2	B	3	2422	-0.28	-30.88	< -20.28	Pass
		M	6	2437	0.3	-30.5	< -19.7	Pass
		T	9	2452	-0.28	-31.17	< -20.28	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:	24.8°C
Relative humidity:	45%
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/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
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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

- 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

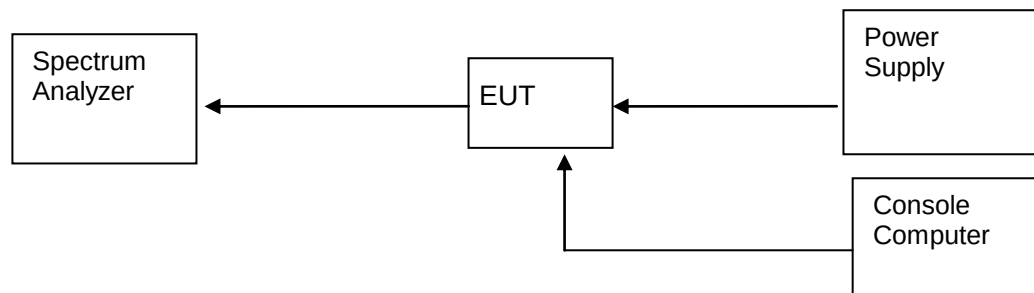


Figure 5. Test Set-up

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/3kHz]	Result
TM1	1	B	1	2412	5.77	< 8	Pass
		M	7	2442	6.56	< 8	Pass
		T	11	2462	7.90	< 8	Pass
TM2	1	B	1	2412	-17.91	< 8	Pass
		M	7	2442	-17.35	< 8	Pass
		T	11	2462	-15.82	< 8	Pass
TM3	1	B	1	2412	-18.58	< 8	Pass
		M	7	2442	-17.72	< 8	Pass
		T	11	2462	-16.29	< 8	Pass
TM4	1	B	3	2422	1.70	< 8	Pass
		M	6	2437	4.18	< 8	Pass
		T	9	2452	-5.18	< 8	Pass
TM5	1	B	1	2412	2.60	---	---
		M	7	2442	1.25	---	---
		T	11	2462	1.87	---	---
	2	B	1	2412	-8.77	---	---
		M	7	2442	-9.47	---	---
		T	11	2462	-8.65	---	---
	1+2	B	1	2412	2.91	< 8	Pass
		M	7	2442	1.60	< 8	Pass
		T	11	2462	2.24	< 8	Pass
TM6	1	B	3	2422	-13.94	---	---
		M	6	2437	-13.88	---	---
		T	9	2452	-13.99	---	---
	2	B	3	2422	-12.28	---	---
		M	6	2437	-13.06	---	---
		T	9	2452	-11.45	---	---
	1+2	B	3	2422	-10.02	< 8	Pass
		M	6	2437	-10.44	< 8	Pass
		T	9	2452	-9.53	< 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:	25.1 °C
Relative humidity:	43%
Test Configurations:	TM1/TM2/TM3/TM4/TM5/TM6 at channel 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/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

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 10th 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 C63.4 (2003). The EUT was set-up on insulator 80cm above the Ground Plane. The

set-up and test methods were according to ANSI C63.4. 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.

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 – 10th Carrier Frequency: 1 MHz

Test set up

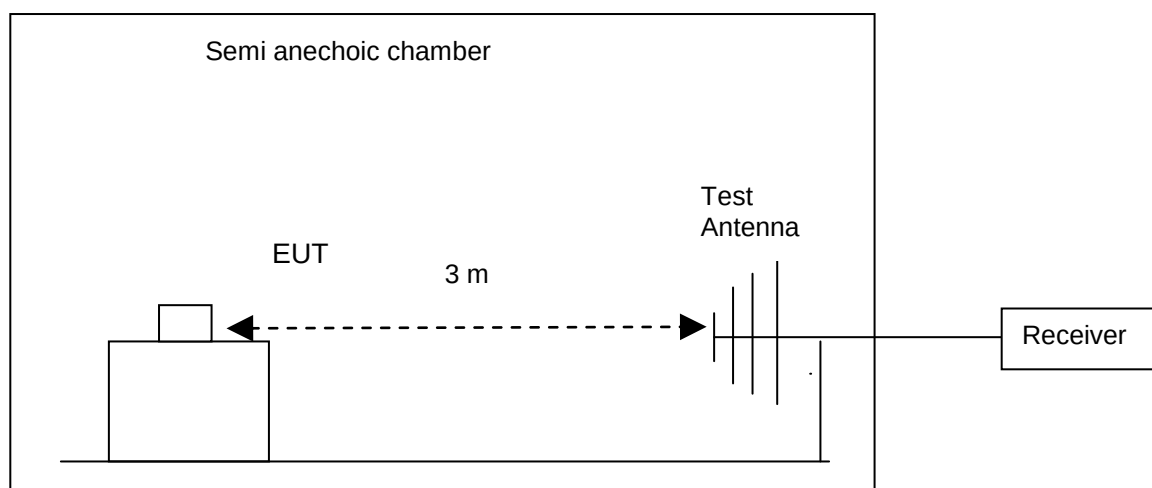


Figure 6. Test Set up

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.

Measured Result of channel: 1 (2412MHz)

(30MHz-1GHz)

Table 36 MEASUREMENT RESULT

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
43.800000	32.10	13.1	40.0	7.9	154.0	326.00	VERTICAL
62.220000	32.40	11.5	40.0	7.6	107.0	59.00	VERTICAL
106.680000	36.10	12.5	43.5	7.4	153.0	19.00	VERTICAL
148.140000	34.40	8.9	43.5	9.1	100.0	317.00	VERTICAL
499.980000	30.70	20.2	46.0	15.3	107.0	14.00	VERTICAL
834.000000	32.20	25.3	46.0	13.8	117.0	164.00	HORIZONTAL

(1GHz-18GHz)

MEASUREMENT RESULT:PK DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
7149.000000	42.50	0.8	74.0	31.5	147.0	106.00	VERTICAL
12738.500000	46.60	9.7	74.0	27.4	104.0	38.00	VERTICAL
17627.000000	51.30	18.1	74.0	22.7	122.0	124.00	VERTICAL

MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
4824.000000	38.80	-3.6	54.0	15.2	137.0	203.00	VERTICAL
7239.000000	29.90	1.1	54.0	24.1	100.0	0.00	VERTICAL
14518.500000	28.00	14.9	54.0	26.0	104.0	102.00	VERTICAL

(2GHz-3GHz)

MEASUREMENT RESULT:PK DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2310.000000	52.30	33.3	74.0	21.7	100.0	145.00	VERTICAL
2390.000000	52.80	33.5	74.0	21.2	112.0	87.00	VERTICAL
2483.500000	57.90	33.8	74.0	16.1	142.0	164.00	HORIZONTAL
2500.000000	52.90	40.2	74.0	21.1	136.0	57.00	VERTICAL

MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2310.000000	40.60	33.3	54.0	13.4	116.0	146.00	VERTICAL
2390.000000	41.90	33.5	54.0	12.9	100.0	176.00	VERTICAL
2483.500000	44.90	40.2	54.0	9.1	101.0	22.00	HORIZONTAL
2500.000000	41.70	33.8	54.0	12.3	123.0	59.00	VERTICAL

Measured Result of channel: 6 (2437MHz)

(30MHz-1GHz)

Table 37 MEASUREMENT RESULT

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
42.960000	33.90	13.1	40.0	6.1	100.0	359.00	VERTICAL
68.220000	28.80	9.1	40.0	11.2	100.0	140.00	VERTICAL
98.400000	31.50	13.0	43.5	12.0	107.0	42.00	VERTICAL
143.280000	32.20	8.8	43.5	11.3	112.0	116.00	VERTICAL
180.300000	25.50	10.9	43.5	18.0	100.0	105.00	VERTICAL
499.980000	35.00	20.2	46.0	11.0	100.0	253.00	VERTICAL

(1GHz-18GHz)

MEASUREMENT RESULT:PK DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
5404.500000	41.10	-2.0	74.0	32.9	150.0	254.00	VERTICAL
9386.500000	45.00	6.2	74.0	29.0	100.0	252.00	VERTICAL
13612.000000	48.10	12.5	74.0	25.9	124.0	315.00	VERTICAL

MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
6850.000000	29.80	1.0	54.0	24.2	150.0	106.00	VERTICAL
10179.500000	33.10	6.5	54.0	20.9	150.0	115.00	VERTICAL
14511.500000	37.10	14.7	54.0	16.9	100.0	76.00	VERTICAL

Measured Result of channel: 11 (2462MHz)

(30MHz-1GHz)

Table 38 MEASUREMENT RESULT

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
43.800000	32.10	13.1	40.0	7.9	133.0	294.00	VERTICAL
60.780000	29.40	12.0	40.0	10.6	111.0	111.00	VERTICAL
101.880000	34.70	12.9	43.5	8.8	123.0	187.00	VERTICAL
331.200000	23.80	16.5	46.0	22.2	100.0	252.00	HORIZONTAL
499.980000	30.00	20.2	46.0	16.0	117.0	0.00	VERTICAL
907.740000	26.70	26.2	46.0	19.3	127.0	44.00	VERTICAL

(1GHz-18GHz)

MEASUREMENT RESULT:PK DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
6881.500000	42.20	0.7	74.0	31.8	138.0	0.00	VERTICAL
11871.000000	45.80	7.5	74.0	28.2	100.0	0.00	VERTICAL
14361.000000	49.10	14.4	74.0	24.9	129.0	86.00	VERTICAL

MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
5010.000000	27.60	-2.5	54.0	26.4	101.0	344.00	VERTICAL
7329.000000	29.90	1.9	54.0	24.1	101.0	143.00	VERTICAL
14487.500000	36.90	14.5	54.0	17.1	101.0	0.00	VERTICAL

(2GHz-3GHz)

MEASUREMENT RESULT:PK DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2310.000000	52.48	33.3	74.0	21.5	113.0	23.00	VERTICAL
2483.500000	61.70	39.9	74.0	12.3	100.0	278.00	VERTICAL
2390.000000	52.90	33.5	74.0	21.1	123.0	325.00	VERTICAL
2500.000000	54.10	33.8	74.0	19.9	110.0	45.00	VERTICAL

MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2483.500000	44.70	39.9	54.0	9.3	143.0	196.00	VERTICAL
2310.000000	40.59	33.3	54.0	13.4	100.0	120.00	VERTICAL
2390.000000	41.50	33.5	54.0	12.5	106.0	85.00	VERTICAL
2500.000000	41.37	33.8	54.0	12.6	100.0	136.00	VERTICAL

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 39 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Power port
Ambient temperature:	25.1 °C
Relative humidity:	43%
Test Configurations:	TM1 at channel No. 7

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 40 Supporting Standards:

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
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6.7.2.3 Limits

Compliance with part 15.207, conducted emission must meet the requirement of following table.

Table 41 Limits

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	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 C63.4: 2003.

Conducted Disturbance at AC Port measurements were undertaken on the L and 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 setup in the screened chamber and operated under nominal conditions.

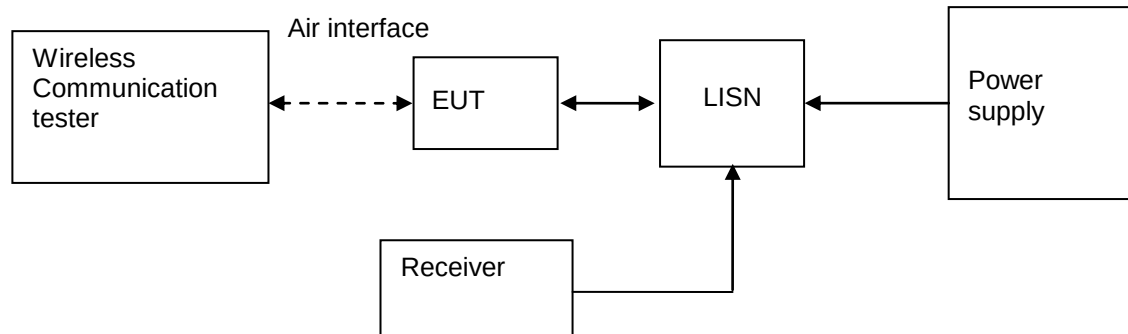


Figure 7. Test Set-up

6.7.4 Measurement Results

Table 42 MEASUREMENT RESULT:QP DECTER

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.162000	47.00	10.1	65	18.0	N	FLO
0.250000	38.70	10.0	62	23.3	N	FLO
1.286000	33.10	10.1	56	22.9	N	FLO
5.346000	37.90	10.2	60	22.1	N	FLO
16.228000	34.50	10.3	60	25.5	L1	FLO
26.610000	35.20	10.4	60	24.8	L1	FLO

Table 43 MEASUREMENT RESULT:AV DECTER

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.252000	31.20	10.0	52	20.8	N	FLO
0.254000	30.80	10.0	52	21.2	N	FLO
4.980000	30.50	10.2	46	15.5	N	FLO
16.228000	29.70	10.3	50	20.3	L1	FLO
18.242000	27.80	10.3	50	22.2	L1	FLO
19.708000	28.20	10.3	50	21.8	L1	FLO

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 44 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 (dBμV/m)	U=4.1dB; k=2 U=4.1dB; k=2
Conducted emission test for power port	Disturbance Voltage(dBμV)	U=3.4dB; k=2

8 Appendices

Appendix A	Measurement Results 6dB bandwidth measurement	10 pages
Appendix B	Measurement Results Peak output power	10 pages
Appendix C	Measurement Results Band edge compliance measurement	7 pages
Appendix D	Measurement Results Conducted RF spurious	28 pages
Appendix E	Measurement Results Power spectral density	10 pages
Appendix F	Measurement Results Radiated spurious emission	15 pages
Appendix G	Measurement Results Conducted emission test for power port	3 pages
Appendix H	Photos of Test Setup	3 pages

(END OF REPORT)