



Report No: CSBG (R) 63092005EB
FCC ID: QISBTS3812A-1900

FCC TEST REPORT OF HUAWEI WCDMA Base Station

M/N: BTS3812A

Jan. 24, 2006

Reliability Laboratory of Huawei Technologies Co., Ltd.

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REPORT ON **FCC Test of HUAWEI WCDMA Base Station**

M/N: BTS3812A

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Jan. 24, 2006

REGULATION **FCC Part 24, subpart E**
FCC Part 2, subpart J, §2.1033 - §2.1057
FCC Part 15 subpart 15.109 & 15.207

CONCLUSION There are 8 items need to be tested, 9 items have been tested. The sample of the model completely meets the requirements

Final Judgement: Pass

General Manager

2006.01.24
Date

Tang Shuanli
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Technical Responsibility

For Area of Testing

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1 Summary

The table below summarizes the measurements and results for the Huawei WCDMA Base Transceiver Station. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
2.1046	24.232	Maximum Output power limits	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1049	24.238	Band edge compliance	Pass
2.1051	24.238	Spurious Emission at Antenna Terminals	PASS
2.1053	24.238	Field Strength of Spurious Emissions	PASS
2.1055	24.235	Frequency Stability	PASS
-	15.107	Conducted Emission at Power Supply Terminal Port	PASS
-	15.109	Radiated Emission in Idle Mode	PASS

2 Product Description

2.1 Production Information

2.1.1 General Description

The BTS3812A is a type of outdoor macro-cell NodeB developed according to the 3GPP R4 FDD protocols. A single BTS3812A cabinet can support up to 12 cells and be applied to urban areas, central business districts and areas with great traffic development potentialities.

BTS3812A can adapt itself to complicated climates and electro-magnetic environment. It features low cost, quick station construction and great adaptability to environment and it is an important supplement to the indoor NodeBs. The outdoor NodeBs, indoor NodeBs and mini NodeBs provide operators comprehensive solutions for seamless radio coverage. The BTS3812A embodies the user-centered design ideas. It gives full consideration to the service, capacity, coverage, transmission, power supply, installation and maintenance requirements of network operators. It adopts a modular design method and is a type of highly integrated equipment.

2.1.2 Support function and Service

The Base Station support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
WCDMA voice and data	Modulation: QPSK	TM1*	
HSDPA	Modulation: QPSK+ 16QAM	TM5*	

Note: * Refer to 3GPP 25.141 section 6.1.1 for the information of TM (Test Mode) of WCDMA base station.

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 applicaiton!				

3 Test Site Description

The test site of:

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

The test site description has been submitted to  and registration granted under the registration number **97456** on March 11, 2003. The test site has been accredited by  and the accredited number is **2714.01** in Jan of 2004.

3.1 Testing Period

The test have been performed during the period of

16th Jan. 2006 to 21st Jan. 2006

3.2 General Set up Description

All measurements were performed with the object transmitting the Test Models 1(TM1) and Test Model 5(TM5) defined in 3GPP 25.141. The Test Model 1 use the QPSK modulation only and Test Model 5 includes the 16QAM modulation.

Test Model 1: 64 DPCHs at 30 ksps (SF=128)

Test Model 5: 8 HS-PDSCH + 30 DPCH

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

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

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

Channel spacing:	200 kHz
Channel separation:	5 MHz

4.1.3 Type of Emission

Table 6 Type of Emission

Emission Designation:	5M00F9W
-----------------------	----------------

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

4.1.4 Environmental Requirements

Table 7 Environmental Requirements

Minimum temperature:	- 40 °C
Maximum temperature:	+ 45 °C
Relative Humidity:	5% ~ 100%RH

4.1.5 Power Source

Table 8 Power Source

AC voltage nominal:	~ 220V
AC voltage range	200V ~ 240V
AC current maximal:	13A

4.1.6 Tune-up Procedure

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

Please reference the document Tune-up Procedure in TCF.

4.1.7 Applied DC Voltages and Currents

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

The voltage and current in the final RF stage is:

Table 9 Applied DC Voltages and Currents

Voltage:	28VDC
Current:	7.1A According to CFR (FCC) part 2, subpart 2, section 2.1033 (8)

4.2 EUT Identification List

4.2.1 Board Information

Table 10 Board Information

1900MHz WCDMA Base Station		
BTS3812A-1900		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
MAFU	21023135691059000003	NodeB Filter Unit
	21023135691059000008	
	21023135701059000001	
	21023135701059000005	
	21023135621059000006	
	21023135621059000003	
MTRU	2102313355105C000029	NodeB Transceiver Unit
	2102313355105C000018	
	2102313355105C000005	
	2102313355105A000010	
	2102313355105A000014	
	2102313355105A000017	
HBBI	0391051058000084	NodeB HSDPA supported Baseband Processing Unit
	0391051058000087	
NULP	036042104C000116	NodeB Uplink Processing unit
	036042104C000121	
	036042104C000102	
NDLP	0361221045000177	NodeB Downlink Processing unit
	0361221045000304	
NMPT	0388721059000124	NodeB Main Processing & Timing unit

NDTI	0377141052000140	NodeB Digital Trunk Interface unit
NMON	030APV1057000077	NodeB Monitor unit
NCCU	0283341059000321	NodeB Cable Connected Unit
FAN	2102120275P057000150	NodeB Fan Unit
Cabinet	2102111993P05A000020	NodeB Cabinet
POW	2830544	BTS3812A Power Supply unit

4.2.2 Adapter Technical Data

Not Application for BTS.

4.2.3 Battery Technical Data

Not Application for BTS.

4.2.4 FCC Identification

Grantee Code: QIS
Product Code: BTS3812A-1900
FCC Identification: QISBTS3812A-1900

5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
3m Semi Anechoic Chamber	S+M	N/A	N/A	12.24.2006
Signal Analyzer	R&S	FSQ 26	100266	05.18.2006
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	05.30.2006
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	05.30.2006
Receiver	R&S	ESIB 26	100318	08.17.2006
Receiver	R&S	ESCS30	830245/018	05.30.2006
Pre-Amplifier	Agilent	8447D	2944A10146	05.30.2006
Pre-Amplifier	Agilent	83017A	3950M00246	01.03.2007
Loop Antenna	Schwarzbeck	FMZB1516	1516115	01.08.2007
BiLog Antenna	Schaffner	CBL 6112B	2747	08.30.2006
BiLog Antenna	Schaffner	CBL 6112B	2536	08.30.2006
BiLog Antenna	Schaffner	CBL 6112B	2536	08.30.2006
Horn Antenna	R&S	HF906 4044.4507.02	359287/005	12.05.2006
Horn Antenna	R&S	HF906 4044.4507.02	359287/006	12.05.2006
Horn Antenna	ETS-Lindgren	3116	00031541	01.15.2007
Horn Antenna	ETS-Lindgren	3116	00031542	01.15.2007
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	08.28.2006
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	08.28.2006
Signal Generator	R&S	SMT06	830264/009	05.29.2006
Signal Generator	R&S	SMR 40	100325	12.09.2006
Artificial Mains Network	Schwarzbeck	NNLK8121	8121416	05.29.2006
Power Supply	KIKUSUI	PCR 6000L	EM004681	05.30.2006

Power Supply	Keithley	2306	1045337	04.20.2006
Climate Chamber	WEISS	ACS-1	3604040034	04.24.2006

6 Transmitter Measurements

6.1 Maximum Channel Power

6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20°C
Relative humidity:	50%
Test Configurations:	Signal Carrier with TM1 at frequency B、M、T and Double Carrier with TM5 at frequency M

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 24.232

6.1.2.2 Supporting Standards:

Table 13 Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
---------------------	---

6.1.2.3 Limits

Compliance with 24.232 requires in no any case may the peak power of a Mobile Station transmitter exceed 100 watts. And calculate longitude output power by following formula:
 $W(\text{dBm}) = 10 * \log (W_{\text{in watts}})$.

Table 14 Limits

Maximum Output Power (Watts)	< 100 Watts
Maximum Output Power (dBm)	< 62 dBm

6.1.3 Test Method and Setup

Base Station was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector. Other RF connectors were connected to match load. The band class is set as US PCS (1900MHz). BTS was controlled to transmit Maximum power by console computer. Measure and record the Maximum Channel Power of the Base Station by the R&S FSQ26

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

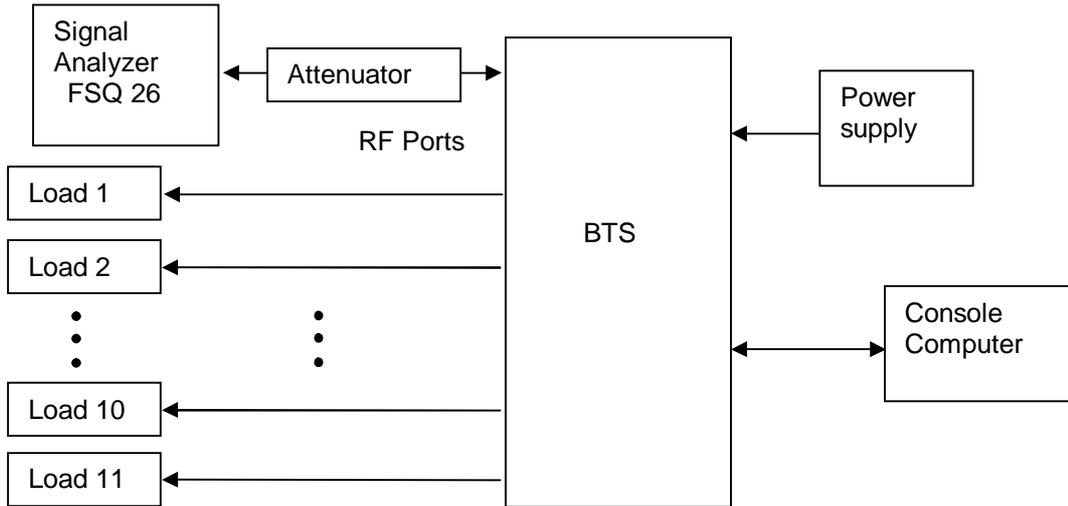


Figure 1. TEST SETUP

6.1.4 Measurement Results

A. Single Carrier with TM1,220VAC Supply:

Table 15 Measurement Results--- Single Carrier

TEST CONDITIONS	Maximum Output Power					
	Channel412 1932.5MHz		Channel537 1957.50MHz		Channel1687 1987.5MHz	
	dBm		dBm		dBm	
	Measu red	Limit	Measu red	Limit	Measu red	Limit
T _{nom} (20 °C)	44.90	< 50	45.13	< 50	45.24	< 50

B. Two Carriers with TM5, 220VAC Supply:

Table 16 Measurement Results --Two Carrier

TEST CONDITIONS	Maximum Output Power		
	Carrier 1 Channel537 1957.50MHz	Carrier 2 Channel562 1962.50MHz	Total

	dBm		dBm		dBm	
	Measured	Limit	Measured	Limit	Measured	Limit
T_{nom} (25 °C)	42.01	< 50	42.33	< 50	45.12	< 50

For the measurement results refer to appendix A with 7 pages.

6.1.5 Conclusion

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

6.2 Modulation Characteristics

6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 °C
Relative humidity:	50 %
Test Configurations:	Signal Carrier with TM1 and TM5 at frequency M

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 24 subpart E

6.2.2.2 Supporting Standards:

Table 18 Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
---------------------	---

6.2.2.3 Limits

Compliance with 2.1047 requires not a specific modulation characteristic since the EUT is applied for part 24 subpart E

6.2.3 Test Method and Setup

Base Station was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector. Other RF connectors were connected to match load. The band class is set as US PCS (1900MHz). BTS was controlled to transmit Maximum power by console computer. Measure and record the Code Domain Power and the constellation of the Base Station by the R&S FSQ26.

Test setup

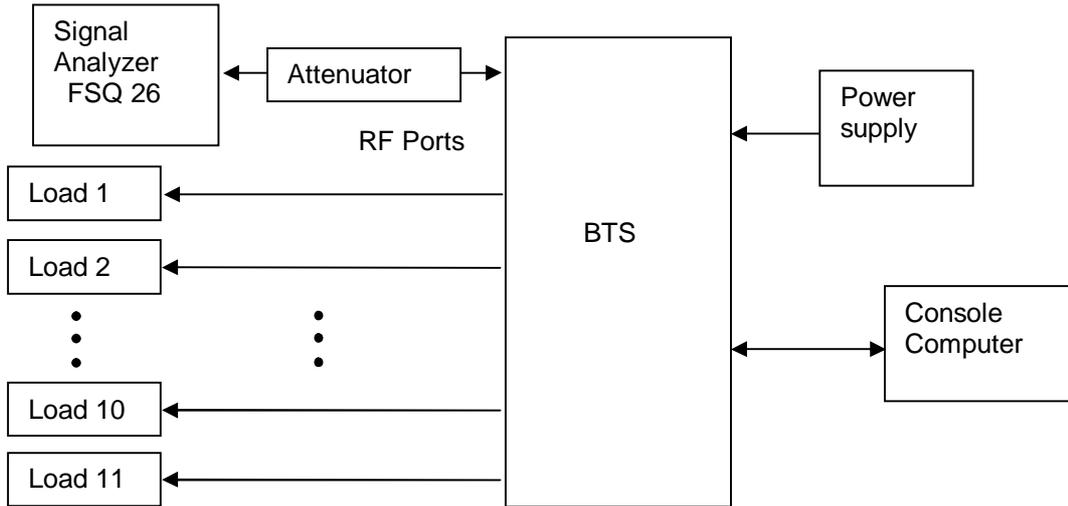


Figure 2. TEST SETUP

6.2.4 Measurement Results

Table 19 Measurement result

TEST CONDITIONS		Modulation Characteristic	
		Channel537(M) 1957.50Mhz	
		Measured	
		TM1	TM5
T _{nom} (25 °C)	V _{nom} (220V)	Refer to Appendix B	Refer to Appendix B

6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix B with 3 pages.

6.3 Occupied Bandwidth

6.3.1 Test Conditions

Table 20 Test Conditions

Preconditioning:	1 hour
Measured at:	RF connector
Ambient temperature:	20 °C
Relative humidity:	50 %
Test Configurations:	Signal Carrier with TM1 and TM5 at frequency B、 M、 T

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 24 subpart E

6.3.2.2 Supporting Standards:

Table 21 Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP 25.141 6.5.1.5	The occupied bandwidth shall be less than 5 MHz based on a chip rate of 3,84 Mcps

6.3.2.3 Limits

Compliance with 2.1049 requires not a specific occupied bandwidth since the EUT is applied for part 24 subpart E and possesses a digital modulation there is no specific requirement formulated in before mentioned rules the 99% rules applies.

Table 22 Limits

Upper /lower frequency limits	0.5% of the mean power
-------------------------------	------------------------

6.3.3 Test Method and Setup

Base Station was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector. Other RF connectors were connected to match load. The band class is set as US PCS (1900MHz). BTS was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the Base Station by the R&S FSQ26.

The OBW, 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 under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g)&(h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

Measurement bandwidth (RBW): 50 kHz
 Video bandwidth (VBW): 500 kHz

Test Set-up

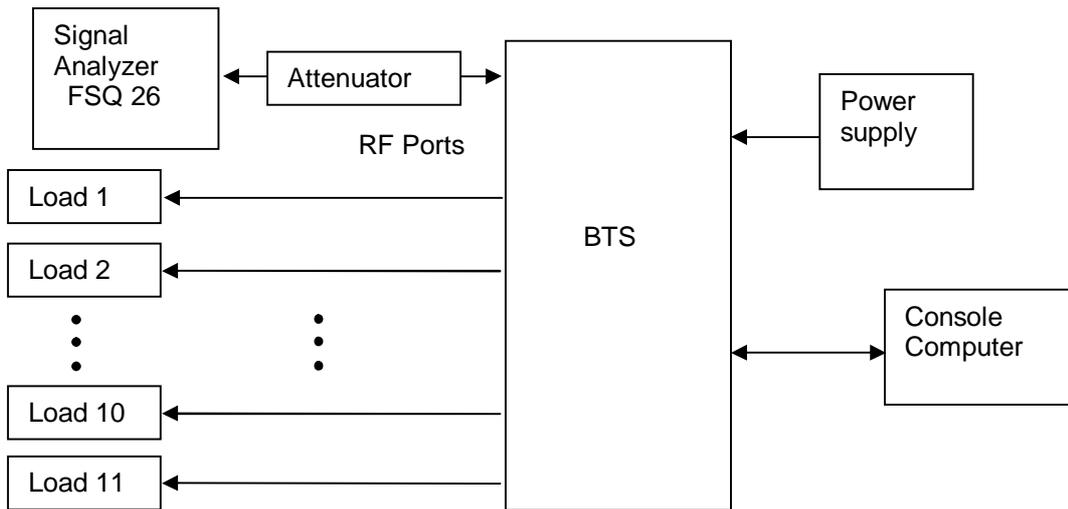


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 23 Measurement result

TEST CONDITIONS		Occupied Bandwidth					
		Channel412(B) 1932.5MHz		Channel537(M) 1957.50Mhz		Channel1687(T) 1987.5MHz	
		Measured (MHz)		Measured (MHz)		Measured (MHz)	
		TM1	TM5	TM1	TM5	TM1	TM5
T _{nom} (25 °C)	V _{nom} (220V)	4.25	4.25	4.26	4.26	4.25	4.26

6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix C with 7 pages.

6.4 Band edge compliance

6.4.1 Test Conditions

Table 24 Test Conditions

Preconditioning:	1 hour
Measured at:	RF connector
Ambient temperature:	20 °C
Relative humidity:	50 %
Test Configurations:	Signal Carrier with TM1 and TM5 at frequency B、 T

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 24 subpart E

6.4.2.2 Supporting Standards:

Table 25 Supporting Standards:

EIA/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 24.238 requires that all spurious emission must be attenuated below the transmitter power by at least $45 + 10 \log_{10} P$. (Whereas P is the rated power of the EUT).

Table 26 Limits

Rated Power:	45 dBm
Required attenuation:	$45 + 10 \log(20) = 58$, 45 dBm – 58 dB
Absolute level	- 13 dBm

6.4.3 Test Method and Setup

Base Station was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector. Other RF connectors were connected to match load. The band class is set as US PCS (1900MHz). BTS was controlled to transmit Maximum power by console computer. Measure and record Band edge compliance of the Base Station by the R&S FSQ26.

RBW of 50kHz(1% of 5MHz) was used up to 5MHz away from the band edge .So the FCC rules specify that RBW of 1MHz for measurements of emissions >1MHz away from the band edges ,the limit was adjusted with -13dBdBm to -26dBm to compensate for the reduced measurement bandwidth.

Test Set-up

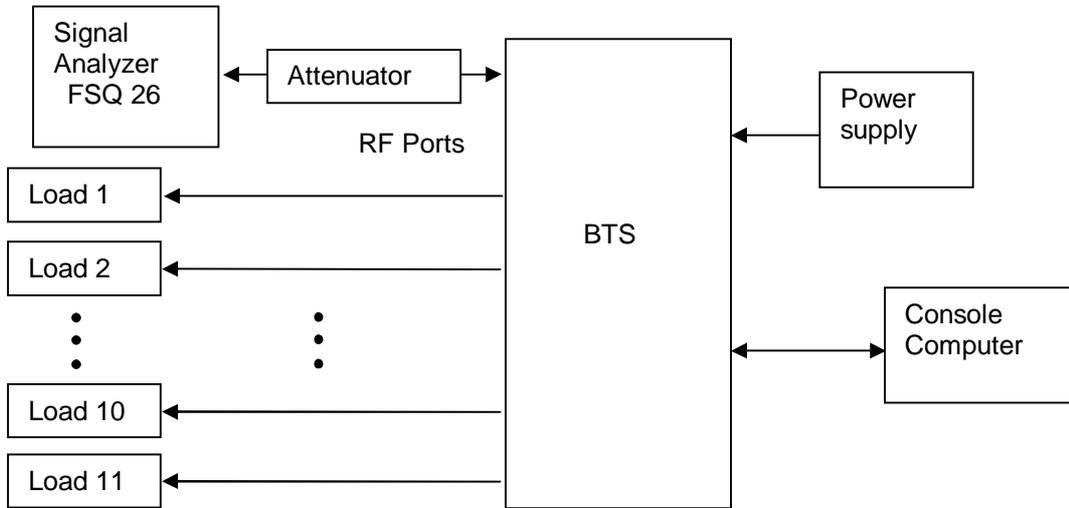


Figure 4. Test Set-up

6.4.4 Measurement Results

Table 27 Measurement Results

Band	Frequency of Band edge [MHz]	Channel Number	Test Mode	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
220V AC power supply / Single carrier							
PCS 1900	1930	412(B)	TM1 & TM5	43	<-13(See appendix D)	- 13 dBm	Pass
	1990	1687(T)	TM1 & TM5	43	<-13(See appendix D)	- 13 dBm	Pass

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to appendix D with 9 pages.

6.5 Conducted Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

Table 28 Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20°C
Relative humidity:	50 %
Test Configurations:	Signal Carrier with TM1 at frequency B、M、T, Double Carrier with TM5 at frequency B、M、T

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 24.238

6.5.2.2 Supporting Standards:

Table 29 Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
---------------------	---

6.5.2.3 Limits

Compliance with part 24.238 requires that all spurious emission must be attenuated below the transmitter power by at least $45 + 10 \log_{10} P$. (Whereas P is the rated power of the EUT).

Table 30 Limits

Rated Power:	45 dBm
Required attenuation:	$45 + 10 \log(20) = 58$, 45 dBm – 58 dB
Absolute level	- 13 dBm

6.5.3 Test Method and Setup

Base Station was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector. Other RF connectors were connected to match load. The band class is set as US PCS (1900MHz). BTS was controlled to transmit Maximum power by console computer. Measure and record the Conducted Spurious Emission of the Base Station by the R&S FSQ26.

According to 47CFR part 24.238, this defined the measurement bandwidth of as following:

(b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

So we used measurement bandwidth as below:

Measurement bandwidth (RBW) for 9 kHz up to 3GHz: 1 MHz;
 Measurement bandwidth (RBW) for 3GHz up to 12.5GHz: 1MHz;
 Measurement bandwidth (RBW) for 12.5GHz up to 20GHz: 1MHz;

Test Set-up

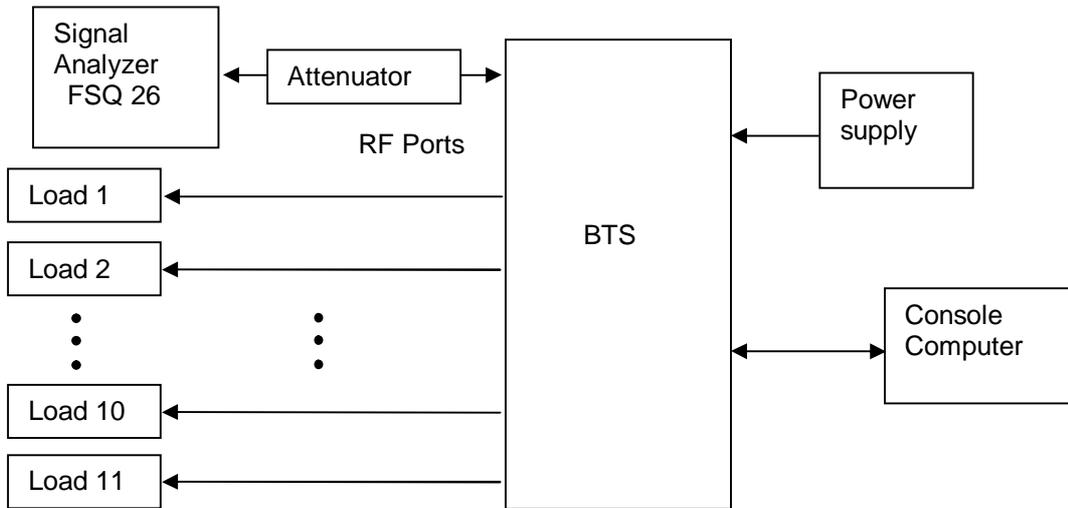


Figure 5. Test Set-up

6.5.4 Measurement Results at Conducted Spurious Emission

Table 31 Measurement Results

Channel Number	Active Carrier	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel412(B)	Single	TM1	9 kHz ~20GHz	43	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Two	TM5	9 kHz ~20GHz	43	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel537(M)	Single	TM1	9 kHz ~20GHz	43	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Two	TM5	9 kHz ~20GHz	43	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel1687(T)	Single	TM1	9 kHz ~20GHz	43	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Two	TM5	9 kHz ~20GHz	43	<- 13 dBm (See appendix D)	- 13 dBm	Pass

6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix E with 19 pages.

6.6 Field Strength of Spurious Radiation

6.6.1 Test Conditions

Table 32 Test Conditions

Preconditioning:	1 hour
Measured at:	Channel537,1957.50MHz
Ambient temperature:	23 °C
Relative humidity:	50 %
Test Configurations:	Signal Carrier with TM5 at frequency M

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 24.238

6.6.2.2 Supporting Standards:

Table 33 Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA -95B-1999	Mobile Station-Base Station Compatibility Standard for Wideband Spread Spectrum Cellular Systems (ANSI/TIA/EIA-95-B-99)

6.6.2.3 Limits

Compliance with 24.238 requires that all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$. (Whereas P is the rated power of the EUT).

Table 34 Limits

Rated Power:	45 dBm (20W)
Required attenuation:	$45 + 10 \log_{10} (20W) = 58 \text{ dB}$
Absolute level	$45 \text{ dBm} - 58 \text{ dB} = -13 \text{ dBm}$

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.

HUAWEI WCDMA Base Station BTS3812A is equipment with non-integral antenna. And it should test according to part (b) of above section.

BTS is connected to match loads. The console computer controls the WCDMA Base Station to transmitter the maximum power which defined in specification of product. The Base Station operates on a typical channel.

The test procedure:

- (a) 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 specified in 2.1033(c)(9). Connect the handset to the wireless communication tester R&S FSQ26 via the air interface. The band class is set as US Cellular.
- (b) Test the Radiated maximum output power by the R&S FSQ26 received from test antenna.
- (c) 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 (b) on R&S FSQ26, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

According to 47CFR part 24.238, this defined the measurement bandwidth of as following:

(b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

So we used measurement bandwidth as below:

Measurement bandwidth (RBW) for 9 kHz up to 3GHz: 1 MHz;

Measurement bandwidth (RBW) for 3GHz up to 12.5GHz: 1MHz;
 Measurement bandwidth (RBW) for 12.5GHz up to 20GHz: 1MHz;

Test setup

Step 1: find the maximum E.R.P.

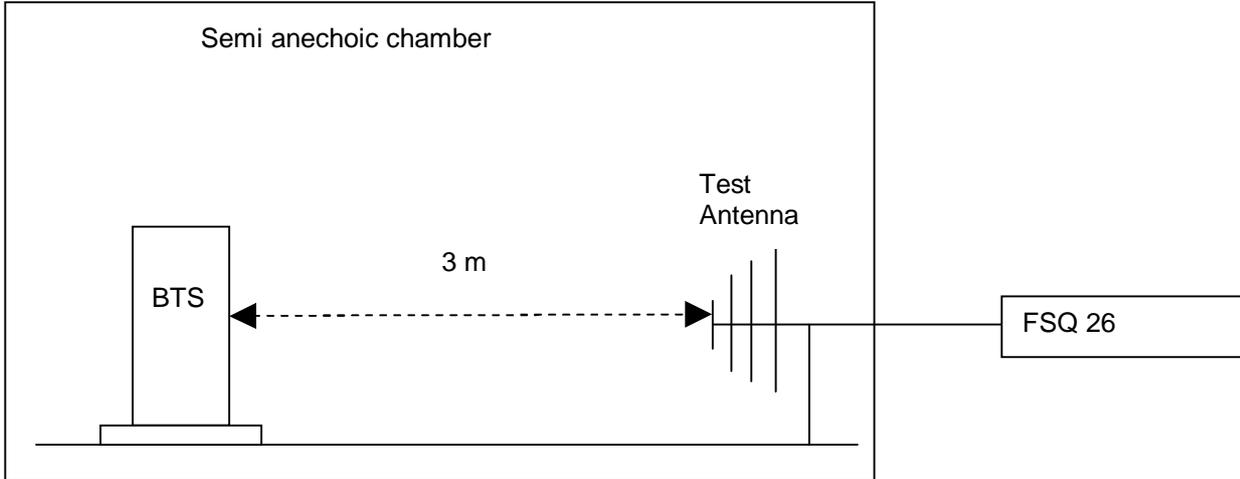


Figure 6. Test setup Step 1

Step 2: substitution method

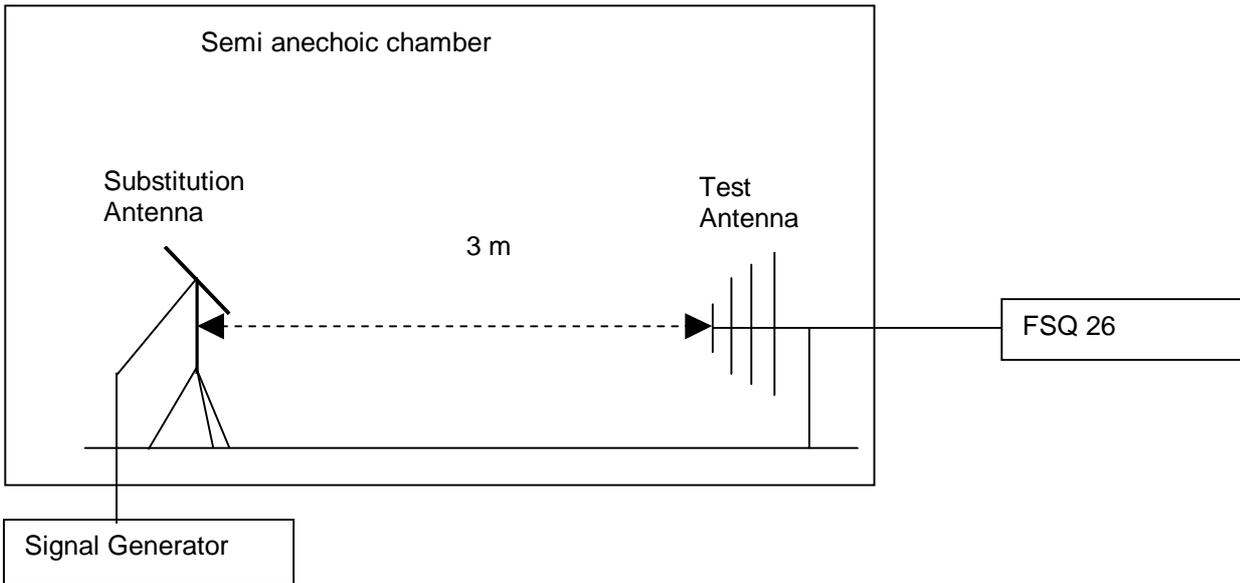


Figure 7. Test setup Step 2

6.6.4 Measurement Results

Table 35 Measurement Results

Channel Number	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel537, 1957.50MHz	9 kHz ~20GHz	43	<- 13 dBm (See appendix F)	- 13 dBm	Pass

6.6.5 Substitution Results

No peak found in pre- test.

Calculation Sample:

Table 36 Substitution Results

Freq. [MHz]	Measurement Value [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Signal Generator Level [dBm]	Substitution Level [dBm]	FCC limit [dBm]	Result
3923.33	38.12	Horn Ant.	7.85	2.20	-41.24	-35.59	-13	Pass

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

$$E.R.P. [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

6.6.6 Conclusion

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

For the measurement results refer to appendix F with 6 pages.

6.7 Frequency Stability

6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 20 °C
Test Configurations:	Signal Carrier with TM1 and TM5 at frequency M

6.7.2 Test Specifications and Limits

CFR 47 (FCC) part 2.1055 and part 24.235

6.7.2.1 Supporting Standards:

Table 38 Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ITU-R SM329-10:2003	Unwanted emissions in the spurious domain
3GPP 25.141 V6.3.0	Universal Mobile Telecommunications System (UMTS);Base station conformance testing (FDD)

6.7.2.2 Limits:

Compliance with 2.1055 requires not a specific frequency stability since the EUT is applied for part 24 subpart E.

6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in subparagraphs

(2) and (3) of paragraph 2.1055

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade 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.

(d) 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.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

Test Set up

Connect the Base Station to the Wireless Signal Analyzer R&S FSQ26 via the antenna connector. Then measure the frequency error by the R&S FSQ26. The Other antenna output ports were matched with 50Ω match loads.

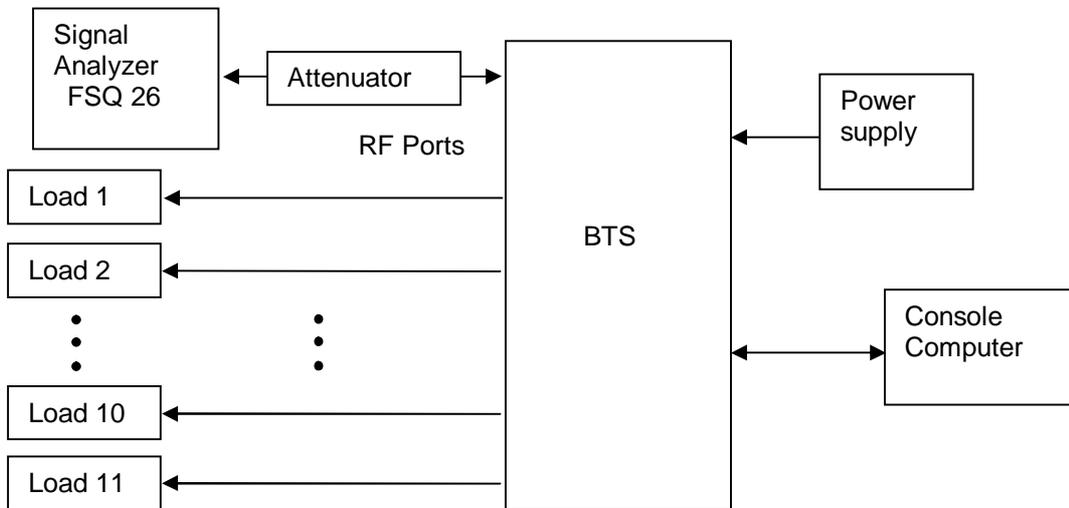


Figure 8. Test Set up

6.7.4 Measurement Results vs. Variation of Temperature

I TM1, 220VAC : Channel No.537(1957.50MHz)

Table 39 Measurement Results vs. Variation of Temperature—TM1, 220VAC

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-40 °C	45	1957.50	15.63	Pass
-30 °C	45	1957.50	-18.23	Pass
-20 °C	45	1957.50	21.36	Pass
-10 °C	45	1957.50	8.96	Pass
0 °C	45	1957.50	-21.03	Pass
+10 °C	45	1957.50	5.63	Pass
+20 °C	45	1957.50	9.88	Pass
+30 °C	45	1957.50	-15.20	Pass
+40 °C	45	1957.50	12.01	Pass
+50 °C	45	1957.50	20.32	Pass

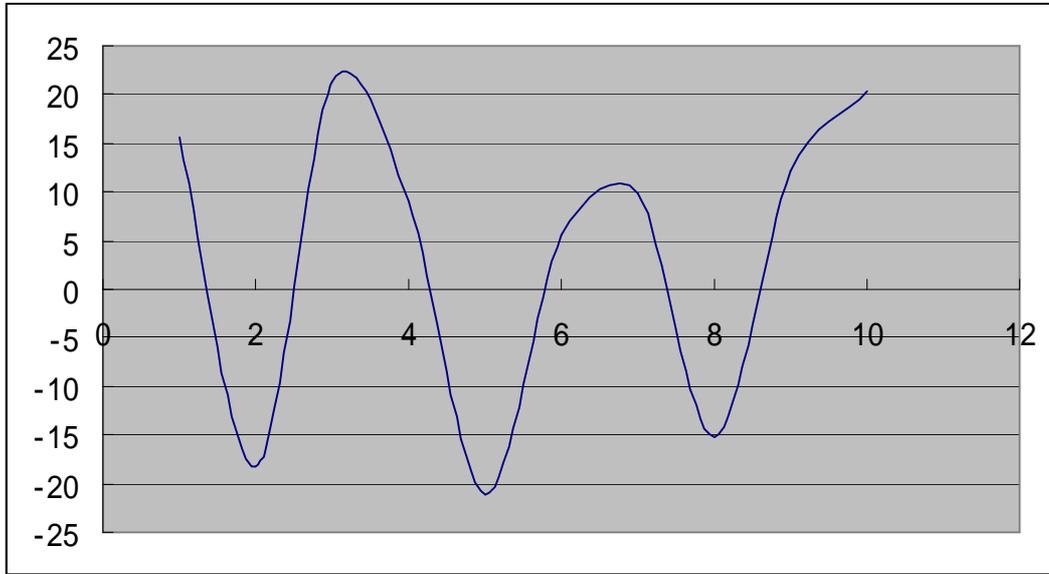


Figure 9. TM1, 220VAC

I TM5, 220VAC : Channel No.537(1957.50MHz)

Table 40 Measurement Results vs. Variation of Temperature—TM5, 220VAC

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-40 °C	45	1957.50	-6.32	Pass
-30 °C	45	1957.50	-17.23	Pass
-20 °C	45	1957.50	-11.00	Pass
-10 °C	45	1957.50	3.56	Pass
0 °C	45	1957.50	15.63	Pass
+10 °C	45	1957.50	-7.98	Pass
+20 °C	45	1957.50	-14.60	Pass
+30 °C	45	1957.50	17.10	Pass
+40 °C	45	1957.50	-5.60	Pass
+50 °C	45	1957.50	14.52	Pass

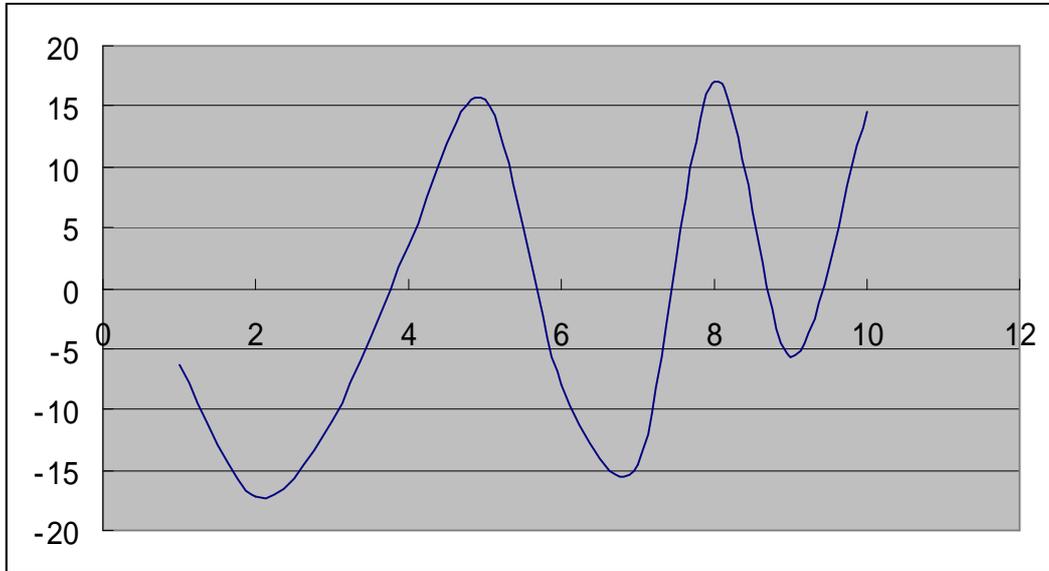


Figure 10. TM5, 220VAC

6.7.5 Measurement Results vs. Variation of Voltage

I TM1, AC Supply: Channel No. 537(1957.50MHz)

Table 41 Measurement Results vs. Variation of Voltage—TM1, AC

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
200v	45	1957.50	12.36	Pass
220v	45	1957.50	-5.96	Pass
240v	45	1957.50	3.80	Pass

I TM5, AC Supply : Channel No.537(1957.50MHz)

Table 42 Measurement Results vs. Variation of Voltage—TM1, DC

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
200v	45	1957.50	17.30	Pass
220v	45	1957.50	19.32	Pass
240v	45	1957.50	15.65	Pass

6.7.6 Conclusion

The equipment PASSED the requirement of this clause.

7 EMC Test

7.1 Conducted Emission at Power Port

7.1.1 Test Conditions

Table 43 Test Conditions

Preconditioning:	1 hour
Measured at:	Power port
Ambient temperature:	21°C
Relative humidity:	49 %
Test Configurations:	Signal Carrier with TM5 at frequency M

7.1.2 Test Specifications and Limits

7.1.2.1 Specification

CFR 47 (FCC) part 15.107

7.1.2.2 Supporting Standards:

Table 44 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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7.1.2.3 Limits

Compliance with CFR 47 part15.107 requires that conducted emission must meet the requirement of following table.

Table 45 Limits

Frequency of Emission (MHz)	Conducted Limit (dB μ 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.

7.1.3 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.

HUAWEI WCDMA Base Station BTS3812A was communicated with the BTS simulator through Air interface. The Base Station operated on the typical channel.

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

Test Set-up

The WCDMA Base Station was setup in the screened chamber and operated under nominal conditions.

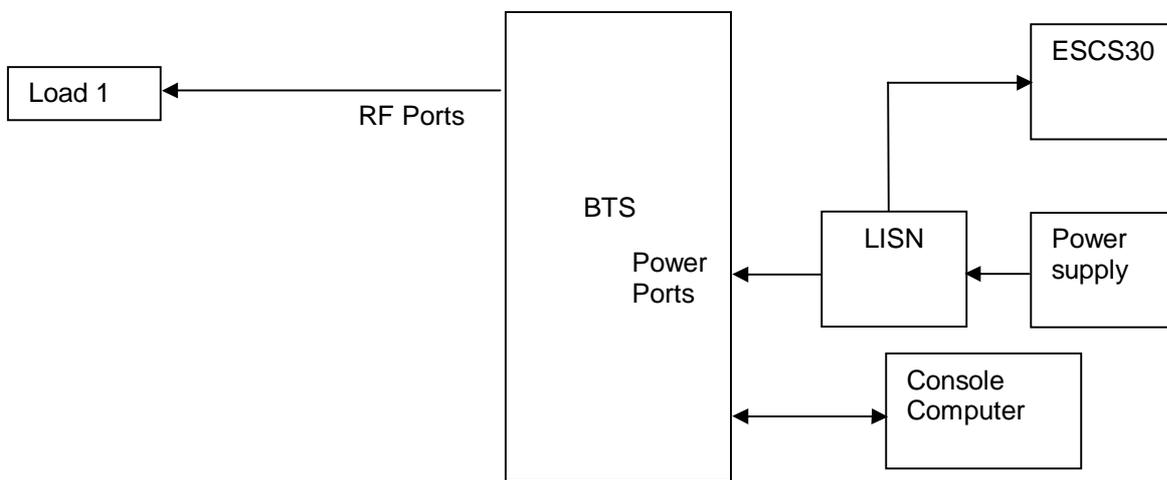


Figure 11. Test Set-up

7.1.4 Measurement Results

MEASUREMENT RESULT: "QP DECTER"

Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.150000	20.50	1.8	66	45.5	N	GND
4.839000	17.80	0.5	56	38.2	N	GND
9.906000	22.00	1.8	60	38.0	N	GND
13.569000	20.20	1.6	60	39.8	N	GND

MEASUREMENT RESULT: "AV DECTER"

Frequency (MHz)	Level (dBµV)	Transd (dB)	Limit (dBµV)	Margin (dB)	Line	PE
0.231000	13.40	1.2	52	39.0	L2	GND
0.460500	7.10	0.6	47	39.6	L2	GND

4.956000	14.80	0.5	46	31.2	N	GND
7.602000	20.20	0.8	50	29.8	N	GND
13.569000	19.70	1.6	50	30.3	N	GND

7.1.5 Conclusion

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

For the measurement results refer to appendix G with 2 pages.

7.2 Radiated Emission of Enclosure in ideal mode

7.2.1 Test Conditions

Table 46 Test Conditions

Preconditioning:	0.5 hour
Nominal Output Power:	26 dBm
Measured at:	Channel537, 1957.50MHz
Ambient temperature:	25 °C
Relative humidity:	48 %
Test Configurations:	Signal Carrier with TM5 at frequency M

7.2.2 Test Specifications and Limits

7.2.2.1 Specification

CFR 47 (FCC) part 15.109

7.2.2.2 Supporting Standards:

Table 47 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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7.2.2.3 Limits

The Radiated Emission of Enclosure of EUT should compliance with the requirement of CFR 15.109. The limit showed in following table.

Table 48 Limits

Frequency of Emission (MHz)	Radiated Limit	
	Unit(μ v/m)	Unit(dB μ V/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
960-1000	500	54

7.2.3 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 test distance was 3m. The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to EN 55022/CISPR 22

The Radiated Disturbance measurements were made using a Rohde and Schwarz ESMI Test Receiver and control software ES-K1.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 1GHz by using test script of software; the emissions were measured using a Quasi-Peak Detector. 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 test was performed in one power supply mode: AC power supply, and the test performed at worst emission state.

All RF ports of Base Station BTS812A were terminated with match load. And the Base Station was operated on the typical channel. The transceivers of Base Station were worked in idle mode.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 kHz
 Measurement bandwidth: 1GHz – 10 GHz: 1 MHz

Test set up

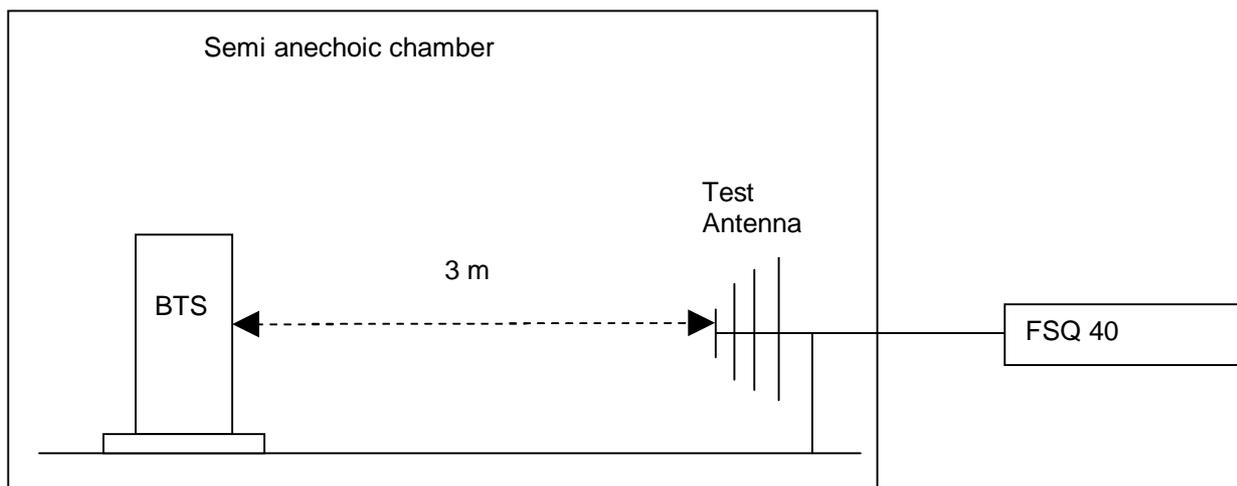


Figure 12. Test set up

7.2.4 Measurement Results

MEASUREMENT RESULT: “QP DECTER”

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
73.620000	15.60	-14.4	40.0	24.4	140.0	75.00	VERTICAL
110.280000	22.00	-9.3	43.5	21.5	120.0	0.00	VERTICAL
120.000000	22.30	-8.8	43.5	21.2	214.0	0.00	VERTICAL

299.580000	26.50	-6.8	46.0	19.5	107.0	94.00	VERTICAL
737.280000	34.30	-1.0	46.0	11.7	152.0	70.00	VERTICAL
903.300000	39.40	0.7	46.0	6.6	211.0	13.00	VERTICAL

7.2.5 Conclusion

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

For the measurement results refer to appendix H with 2 pages.

8 System Measurement Uncertainty

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

Table 49 System Measurement Uncertainty

Items		Extended Uncertainty
Maximum Channel Output Power	Power(dBm)	U=0.39dB; 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	E.I.R.P(dBm)	U=3dB; k=2
Conducted Emission at Power Port	Disturbance Voltage (dB μ V)	U=4dB; k=2
Radiated Emission of Enclosure at ideal mode	Field strength (dB μ V/m)	U=5dB; k=2

9 Appendixes

Appendix A	Measurement Results Maximum Channel Output Power	7 pages
Appendix B	Measurement Results Modulation Characteristics	3 pages
Appendix C	Measurement Results Occupied Bandwidth	7 pages
Appendix D	Measurement Results Band Edge	9 pages
Appendix E	Measurement Results Conducted Spurious Emission at Antenna Terminal	19 pages
Appendix F	Field Strength of Spurious Radiation	6 pages
Appendix G	Measurement Results Conducted Emission at Power Port	2 pages
Appendix H	Measurement Results Radiated Emission of Enclosure at ideal mode	2 pages
Appendix I	Photos of Test Setup	4 pages