



Report No: SYBH(R) 04012007EB  
FCC ID: QISMTRU-850

# FCC TEST REPORT OF WCDMA Node B

M/N: MTRU-850

Mar. 26, 2007

Reliability Laboratory of Huawei Technologies Co., Ltd.

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**REPORT ON** FCC Test of **WCDMA Node B**

Report No: SYBH(R) 04012007EB

**REGULATION**                    **FCC CFR47 Part 2: Subpart J;**  
**FCC CFR47 Part 22: Subpart H;**  
**FCC CFR47 Part 15: Subpart B;**

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

**Final Judgement: Pass**

**General Manager**

2007.03.28  
Date

Guo Xiaoqi  
Name

signature



**Technical Responsibility  
For Area of Testing**

2007.03.27  
Date

Zhang Xinghai  
Name

signature

A handwritten signature in black ink that reads "Zhang Xinghai".

**Test Lab Engineer**

2007.03.26  
Date

Wangwenjin  
Name

signature

A handwritten signature in black ink that reads "Wang Wenjin".

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# 1 Summary

The table below summarizes the measurements and results for the MTRU-850. Detailed results and descriptions are shown in the following pages.

table 1. Summary of results

<b>FCC Measurement Specification</b>	<b>FCC Limits Part(s)</b>	<b>Description</b>	<b>Result</b>
2.1046	22.913	Maximum Channel Power	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	22.917	Band Edges Compliance	PASS
2.1051	22.917	Spurious Emission at antenna terminal	PASS
2.1053	22.917	Radiated Spurious Emission	PASS
2.1055	22.355	Frequency Stability	PASS
-	15.107	Conducted Emission at Power Port	PASS
-	15.109	Radiated Emission of Enclosure in Idle Mode	PASS

## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

The MTRU-850 can support 850MHz frequency band. In general, the MTRU-850 is connected to baseband processing module through CPRI cable, and serves one cell or several logical sectors. The MTRU-850 implements radio transmission over the Uu interface. It is ideal for the areas with medium or high traffic density.

#### 2.1.2 Support function and Service

The MTRU\_850 Module supports 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 applicable				
Not applicable				
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***

The test site description has been submitted to  and registration granted under the registration number **97456** on April 20, 2006. The test site has been accredited by



and the accredited number is **2174.01** in Jan of 2006.

#### **3.1 Testing Period**

The test have been performed during the period of

Jan. 05, 2007 to Jan. 14, 2007

## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

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

#### 4.1.2 Channel Spacing / Separation

Channel spacing:	5 MHz
Channel separation:	5 MHz

#### 4.1.3 Type of Emission

table 4. Type of Emission

Emission Designation:	<b>5M0F9W</b>
-----------------------	---------------

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

#### 4.1.4 Environmental Requirements

table 5. Environmental Requirements

Minimum temperature:	- 40 °C
Maximum temperature:	+ 50 °C
Relative Humidity:	5%-95%RH

#### 4.1.5 Power Source

table 6. Power Source

DC voltage nominal:	 -48V
DC voltage range	-40V ~ -60V
DC current maximal:	4.5A

#### 4.1.6 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 7. Board Information

Model Name	Qty.	Hardware Version	Serial	Description
850M MTRU	1	VER.A	2102314589106B000006	850MHz Multi-carrier Transceiver Module

### 4.2.2 Adapter Technical Data

Not Applicable.

### 4.2.3 Battery Technical Data

Not Applicable.

### 4.2.4 FCC Identification

**Grantee Code:** QIS  
**Product Code:** MTRU-850  
**FCC Identification:** QISMTRU-850

## 5 Main Test Instruments

table 8. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
3m Semi Anechoic Chamber	S+M	N/A	N/A	12.23.2007
Signal Analyzer	Agilent	E4445A	3602060039	03.19.2007
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	05.30.2007
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	05.30.2007
Receiver	R&S	ESCS30	830245/018	05.30.2007
Pre-Amplifier	Agilent	8447D	2944A10146	05.30.2007
Pre-Amplifier	Agilent	83017A	3950M00246	01.02.2008
Loop Antenna	Schwarzbeck	FMZB1516	1516115	01.07.2008
BiLog Antenna	Schaffner	CBL 6112B	2747	08.30.2007
BiLog Antenna	Schaffner	CBL 6112B	2536	08.30.2007
Horn Antenna	R&S	HF906 4044.4507.02	359287/005	12.04.2007
Horn Antenna	R&S	HF906 4044.4507.02	359287/006	12.04.2007
Horn Antenna	ETS-Lindgren	3116	00031541	01.14.2008
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	08.28.2007
Signal Generator	R&S	SMR 40	100325	06.25.2007
Artificial Mains Network	Schwarzbeck	NNLK8121	8121416	05.29.2007
Power Supply	KIKUSUI	PAD110-32LA	EM004681	11.13.2007
Climate Chamber	WEISS	WK1-1	3604040034	10.11.2007

## 6 Transmitter Measurements

### 6.1 Maximum Channel Power

#### 6.1.1 Test Conditions

table 9. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	23.5°C
Relative humidity:	55%

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

##### 6.1.2.2 Supporting Standards

table 10. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
3GPP2 C.S0010-B	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations. Release B

##### 6.1.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a base station transmitter exceeds 100 watts.  $W (dBm) = 10 * \log (W \text{ watts})$ .

table 11. Limits

Maximum Output Power (Watts)	< 500 Watts
Maximum Output Power (dBm)	< 57 dBm

#### 6.1.3 Test Method and Setup

MTRU-850 was connected to the wireless signal analyzer E4445A via the main RF connector. Diversity RF connectors were connected to match load. MTRU-850 was controlled to transmit Maximum power by console computer. Measure and record the Maximum Channel Power of the MTRU-850 by the E4445A.

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**

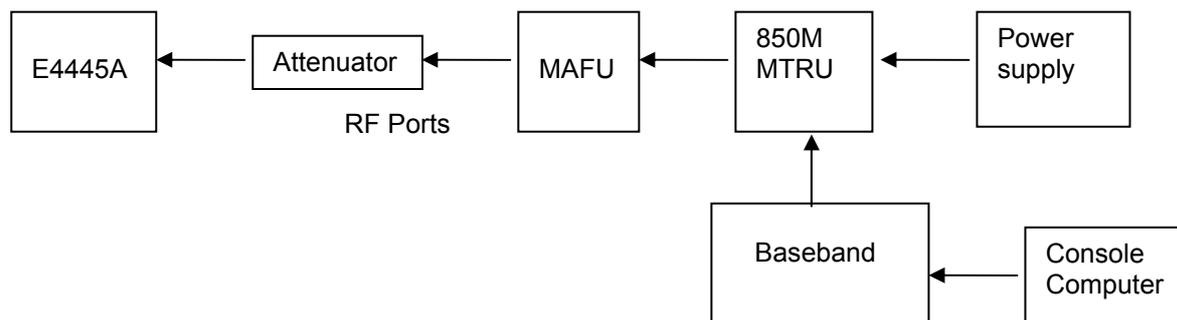


Figure 1. TEST SETUP

**6.1.4 Measurement Results**

The measurements were performed with the test models 1 and test models 5, and test models 1 uses the QPSK modulation only, and the test models 5 includes the 16QAM modulation. The equipment can be configured single carrier and two carriers.

Single carrier:

table 12. Measurement Results for single carrier

TEST CONDITIONS  T <sub>nom</sub> (25 °C) V <sub>nom</sub> (-48V) Type of modulation	Maximum Output Power					
	Channel4357 871.4MHz		Channel4407 881.4MHz		Channel4458 891.6MHz	
	dBm		dBm		dBm	
	Measured	Limit	Measured	Limit	Measured	Limit
QPSK	46.06	< 57	46.01	< 57	46.10	< 57
16QAM	46.22	< 57	46.03	< 57	46.20	< 57

Two carriers:

table 13. Measurement Results for two carriers

TEST CONDITIONS  T <sub>nom</sub> (25 °C) V <sub>nom</sub> (-48V) Type of modulation	Maximum Output Power					
	Channel4357/4382 871.4MHz/876.4MHz		Channel4407/4432 881.4MHz/886.4		Channel4433/4458 886.6/891.6MHz	
	dBm		dBm		dBm	
	Measured	Limit	Measured	Limit	Measured	Limit
QPSK	43.24/43.20	< 57	43.20/43.22	< 57	43.33/43.30	< 57
16QAM	42.98/43.0	< 57	43.15/43.12	< 57	43.26/43.24	< 57

**6.1.5 Conclusion**

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

## 6.2 Modulation Characteristics

### 6.2.1 Test Conditions

table 14. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	49 %

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H

#### 6.2.2.2 Supporting Standards

table 15. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V6.1.0 (2003-03)	Universal Mobile Telecommunications System (UMTS); Base station conformance testing (FDD) (3GPP TS 25.141 version 6.1.0 Release 6)

#### 6.2.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 22 subpart H.

table 16. Limits

Limits	QPSK: EVM < 17.5% 16QAM: EVM < 12.5%
--------	---

### 6.2.3 Test Method and Setup

MTRU-850 was connected to the wireless signal analyzer E4445A via the main RF connector. The other RF connector was connected to match load. MTRU-850 was controlled to transmit Maximum power by console computer. Measure and record the Code Domain Power and the constellation of the MTRU-850 by the E4445A.

#### Test setup

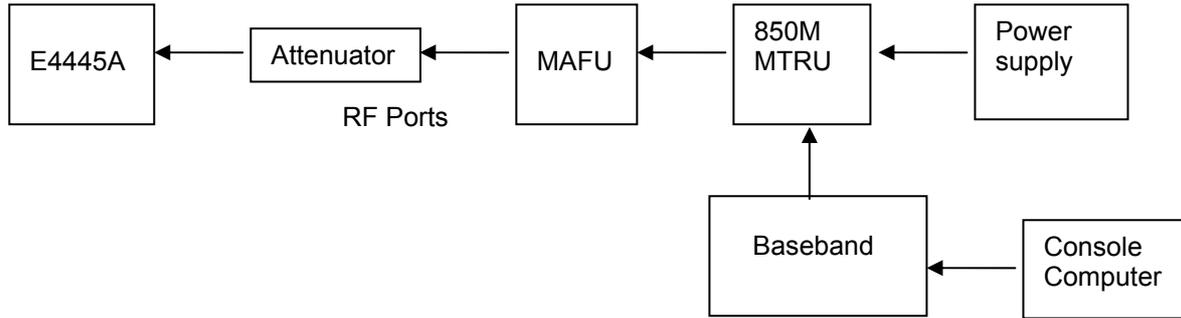


Figure 2. TEST SETUP

### 6.2.4 Measurement Results

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). The measurement results are as follows:

table 17. Measurement Results for QPSK

TEST CONDITIONS		EVM (QPSK)		
		Channel4407 881.4MHz		
		Type	Measured	Limit
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (-48V)	QPSK	9.35%	17.5%

table 18. Measurement Results for 16QAM

TEST CONDITIONS		EVM (16QAM)		
		Channel4407 881.4MHz		
		Type	Measured	Limit
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (-48V)	16QAM	9.34%	12.5%

### 6.2.5 Conclusion

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

For the measurement results refer to appendix A with 5 pages.

### 6.3 Occupied Bandwidth

#### 6.3.1 Test Conditions

table 19. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %

#### 6.3.2 Test Specifications and Limits

##### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 22 subpart H

##### 6.3.2.2 Supporting Standards

table 20. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)

##### 6.3.2.3 Limits

No specific occupied bandwidth requirement in part 22 subpart H, but the occupied bandwidth was defined in part 2.1049: 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.

table 21. Limits

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

#### 6.3.3 Test Method and Setup

MTRU-850 was connected to the wireless signal analyzer E4445A via the one main RF connector. The other RF connector was connected to match load. MTRU-850 was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the MTRU-850 by the E4445A.

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): 30 kHz  
 Video bandwidth (VBW): 100 kHz

**Test Set-up**

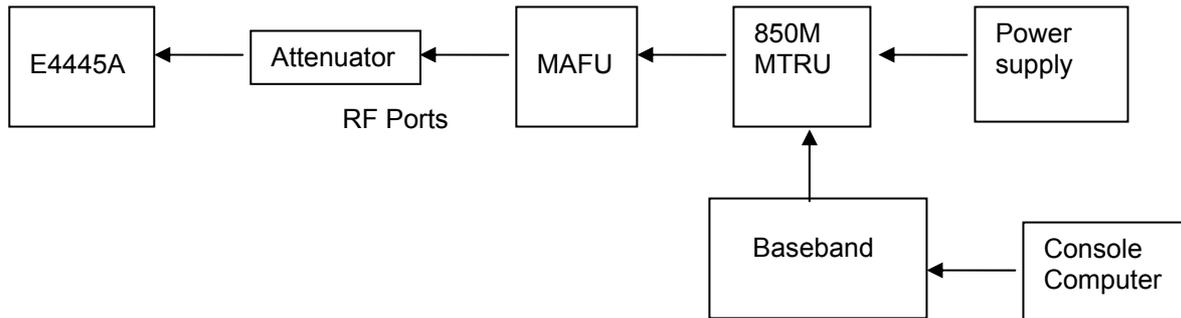


Figure 3. TEST SETUP

**6.3.4 Measurement Results**

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). The measurement results are as follows:

table 22. Measurement Results for QPSK

TEST CONDITIONS		Occupied Bandwidth	
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (-48V)	Measured (MHz)	Limit (MHz)
		4357/871.4MHz	4.1515
4458/891.6MHz		4.1591	5.0

table 23. Measurement Results for 16QAM

TEST CONDITIONS		Occupied Bandwidth	
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (-48V)	Measured (MHz)	Limit (MHz)
		4357/871.4MHz	4.1604
4458/891.6MHz		4.1535	5.0

**6.3.5 Conclusion**

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix B with 5 pages.

## 6.4 Band Edges Compliance

### 6.4.1 Test Conditions

table 24. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	23.5°C
Relative humidity:	55 %

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 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
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)

#### 6.4.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $46 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

table 26. Limits

Rated Power:	46 dBm
Required attenuation:	$46 + 10 \log(20) = 59$ , 46 dBm – 59 dB
Absolute level	- 13 dBm

### 6.4.3 Test Method and Setup

MTRU-850 was connected to the wireless signal analyzer E4445A via the one main RF connector. The other RF connector was connected to match load. MTRU-850 was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the MTRU-850 by the E4445A.

RBW of 51kHz (more than 1% of 5MHz) was used up to 1MHz away from the band edge. So the FCC rules specify that RBW of 100kHz for measurements of emissions >1MHz away from the band edges.

### Test Set-up

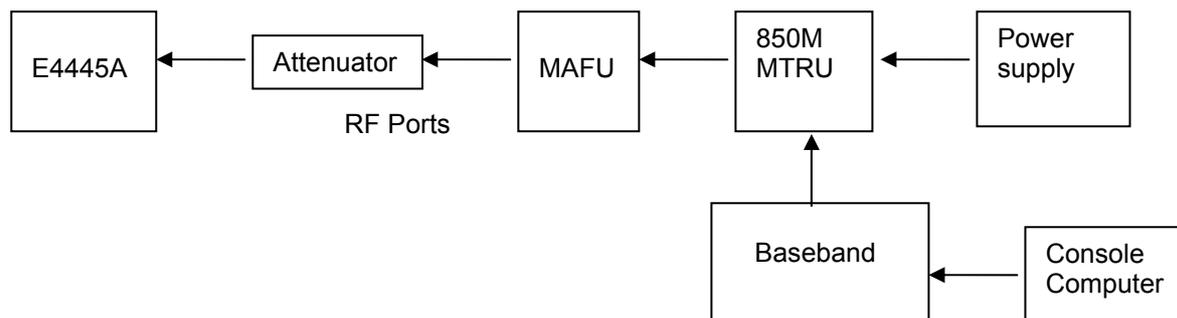


Figure 4. Test Set-up

### 6.4.4 Measurement Results

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). For each test model, the base station was configured single carrier and two carriers. The measurement results are as follows:

**QPSK:**

A. Single Carrier

table 27. Measurement Results for single carrier

Channel Number	Frequency of Band edge [MHz]	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357	869	46	-17.64(See appendix C)	- 13 dBm	Pass
4458	894	46	-16.68(See appendix C)	- 13 dBm	Pass

B. Two Carriers

table 28. Measurement Results for two carriers

Channel Number	Frequency of Band edge [MHz]	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357/4382	869	46	-18.18(See appendix C)	- 13 dBm	Pass
4433/4458	894	46	-17.99(See appendix C)	- 13 dBm	Pass

**16QAM:**

A. Single Carrier

table 29. Measurement Results for single carrier

Channel Number	Frequency of Band edge [MHz]	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357	869	46	-16.02(See appendix C)	- 13 dBm	Pass
4458	894	46	-17.56(See appendix C)	- 13 dBm	Pass

B. Two Carriers

table 30. Measurement Results for two carriers

Channel Number	Frequency of Band edge [MHz]	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357/4382	869	46	-19.98(See appendix C)	- 13 dBm	Pass
4433/4458	894	46	-18.66(See appendix C)	- 13 dBm	Pass

### 6.4.5 Conclusion

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

## 6.5 Spurious Emission at Antenna Terminal

### 6.5.1 Test Conditions

table 31. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20°C
Relative humidity:	50 %

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.5.2.2 Supporting Standards

table 32. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)

#### 6.5.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $46 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

table 33. Limits

Rated Power:	46dBm
Required attenuation:	$46 + 10 \log(20) = 59$ , 46 dBm – 59 dB
Absolute level	- 13 dBm

### 6.5.3 Test Method and Setup

MTRU-850 was connected to the wireless signal analyzer E4445A via the one main connector. The other RF connector was connected to match load. MTRU-850 was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the MTRU-850 by the E4445A.

According to 47CFR part 22.917, this defined the measurement bandwidth of as following:  
 Measurement bandwidth (RBW) for 9 kHz up to 3GHz: 100kHz;  
 Measurement bandwidth (RBW) for 3GHz up to 10GHz: 100kHz;

### Test Set-up

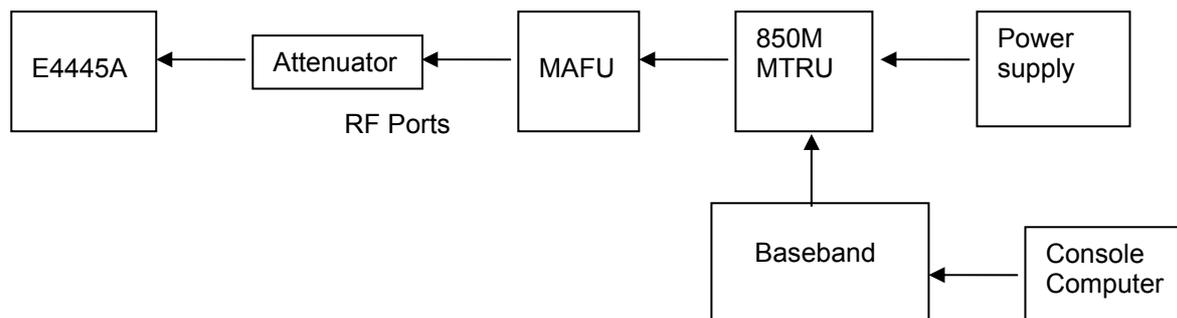


Figure 5. Test Set-up

### 6.5.4 Measurement Results

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). For each test model, the base station was configured single carrier and two carriers. The measurement results are as follows:

**QPSK:**

Single carrier:

table 34. Measurement Results for single carrier

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357	9 kHz ~3GHz	46	-36.60 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.70 (See appendix D)	- 13 dBm/100kHz	Pass
4458	9 kHz ~3GHz	46	-36.34 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.50 (See appendix D)	- 13 dBm/100kHz	Pass

Two Carriers

table 35. Measurement Results for two carriers

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357/4382	9 kHz ~3GHz	46	-36.78 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.90 (See appendix D)	- 13 dBm/100kHz	Pass
4433/4458	9 kHz ~3GHz	46	-36.80 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.57 (See appendix D)	- 13 dBm/100kHz	Pass

**16QAM:**

Single carrier:

table 36. Measurement Results for single carrier

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357	9 kHz ~3GHz	46	-36.85 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.68 (See appendix D)	- 13 dBm/100kHz	Pass
4458	9 kHz ~3GHz	46	-36.90 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.65 (See appendix D)	- 13 dBm/100kHz	Pass

## Two Carriers

table 37. Measurement Results for two carriers

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
4357/4382	9 kHz ~3GHz	46	-36.80 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.76 (See appendix D)	- 13 dBm/100kHz	Pass
4433/4458	9 kHz ~3GHz	46	-36.78 (See appendix D)	- 13 dBm/100kHz	Pass
	3GHz~10GHz	46	-33.60 (See appendix D)	- 13 dBm/100kHz	Pass

## 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix D with 17 pages.

## 6.6 Radiated Spurious Emission

### 6.6.1 Test Conditions

table 38. Test Conditions

Preconditioning:	1 hour
Measured at:	enclosure
Ambient temperature:	22 °C
Relative humidity:	53 %

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 22.917

#### 6.6.2.2 Supporting Standards

table 39. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)

#### 6.6.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $46 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

table 40. Limits

Rated Power:	46dBm
Required attenuation:	$46 + 10 \log(20) = 59$ , 46 dBm – 59 dB
Absolute level	- 13 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 BTS3812E and BTS3812AE include the MTRU-850 module, and for RSE, BTS3812E and BTS3812AE were both tested.

HUAWEI WCDMA BTS3812E and BTS3812AE are both equipments 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 BTS3812E and BTS3812AE 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)(8). HUAWEI WCDMA BTS3812AE and BTS3812E were connected to ancillary in order to simulate normal operating conditions with reference to the guidance given in the standard for this type of equipment.
- (b) Test the radiated maximum output power by the R&S test receiver ESMI 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 ESMI, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

According to part 24.238, the defined measurement bandwidth as following:

For convenience, the MTRU-850 under test were installed in BTS3812AE and BTS3812E separately. And the MTRU-850 was operated on the typical channel. The transceivers of MTRU-850 were worked in Traffic mode.

22.917 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100kHz or greater.

Measurement bandwidth (RBW) for 30MHz up to 1GHz: 100kHz;

Measurement bandwidth (RBW) for 1GHz up to 12.75GHz: 100kHz;

### **Test setup**

#### **Step 1: Pre-test**

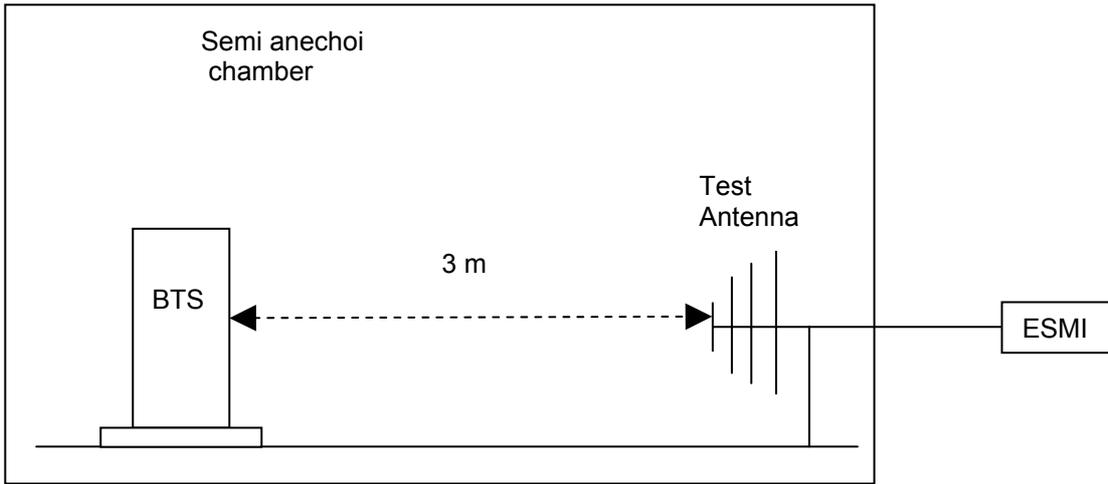


Figure 6. Test Set-up

**Step 2: Substitution method to verify the maximum ERP**

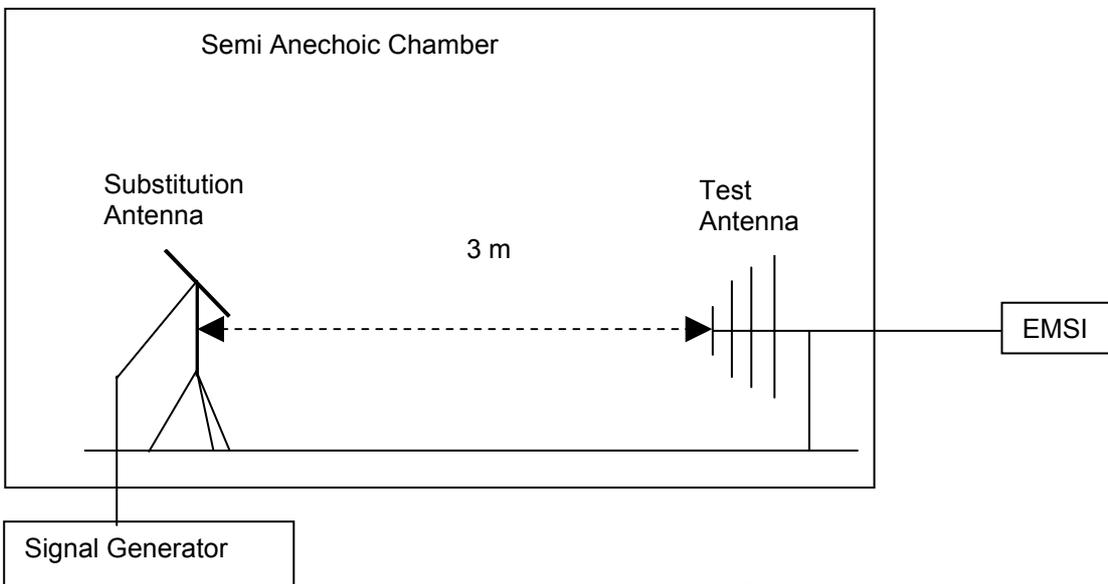


Figure 7. Test Set-up

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

**6.6.4 Measurement Results for BTS3812AE**

**6.6.4.1 Pre-test Measurement Results**

table 41. Measurement Result

Channel Number	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel4407 881.4MHz	9KHz ~12.75GHz	46	<- 13 dBm (See appendix E)	- 13 dBm	Pass

### 6.6.4.2 Substitution Results

table 42. 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
3964.44	-28.77	Horn Ant.	5.7	2.20	-33.24	-29.74	-13	Pass

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

$$ERP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

### 6.6.5 Measurement Results for BTS3812E

#### 6.6.5.1 Pre-test Measurement Results

table 43. Measurement Result

Channel Number	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel4407 881.4MHz	9KHz ~12.75GHz	46	<- 13 dBm (See appendix E)	- 13 dBm	Pass

#### 6.6.5.2 Substitution Results

table 44. 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
2835.56	-41.54	Horn Ant.	4.05	2.00	-42.54	-40.49	-13	Pass

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

$$ERP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

### 6.6.6 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix E with 5 pages.

## 6.7 Frequency Stability

### 6.7.1 Test Conditions

table 45. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 20 °C

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 22.355

#### 6.7.2.2 Supporting Standards

table 46. Supporting Standards:

ANSI C63.4-1992	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

#### 6.7.2.3 Limits

No specific frequency stability requirement in part 2.1055 and part 22.355.

### 6.7.3 Test Method and Setup

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

- (1) From  $-30^{\circ}$  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  $10^{\circ}$  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 MTRU-850 to the Wireless Signal Analyzer E4445A via the main antenna connector. Then measure the frequency error by the E4445A. The other antenna output port was matched with 50 Ω match loads.

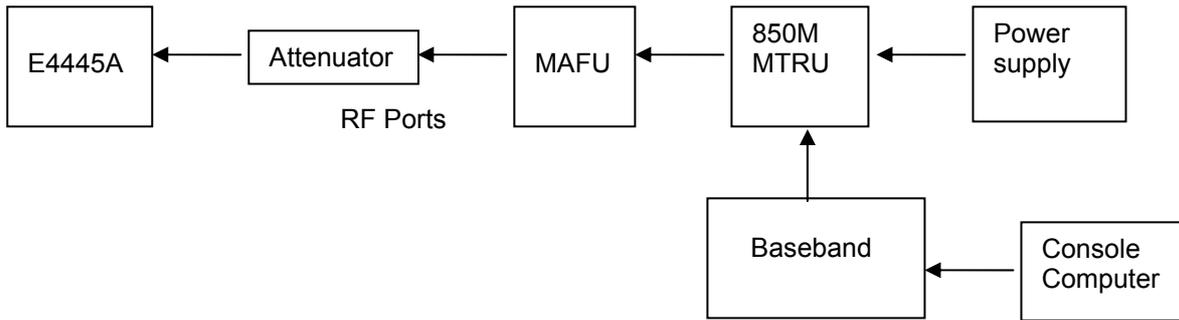


Figure 8. Test Set up

**6.7.4 Measurement Results**

**6.7.4.1 Measurement Results vs. Variation of Temperature**

QPSK: Channel No. 4407(881.4MHz)

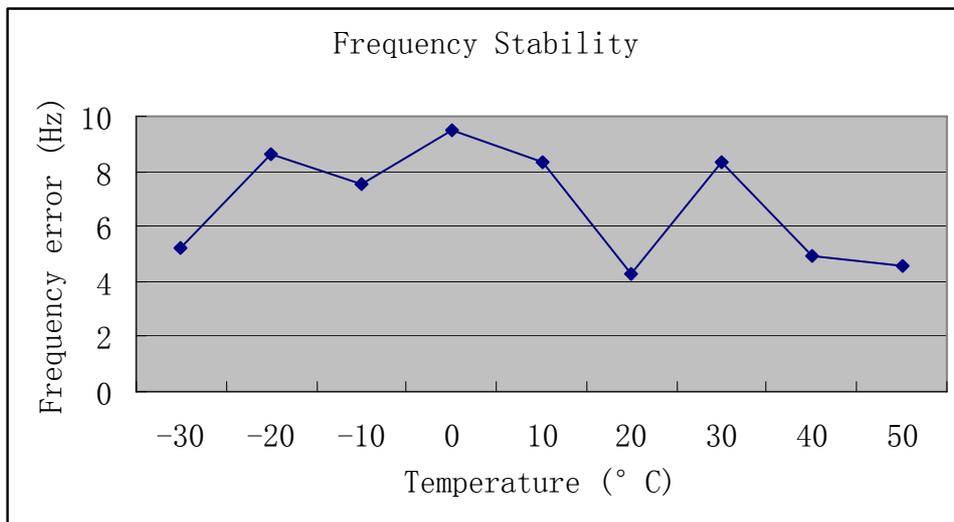


Figure 9. Measurement Results for QPSK

16QAM: Channel No. 4407(881.4MHz)

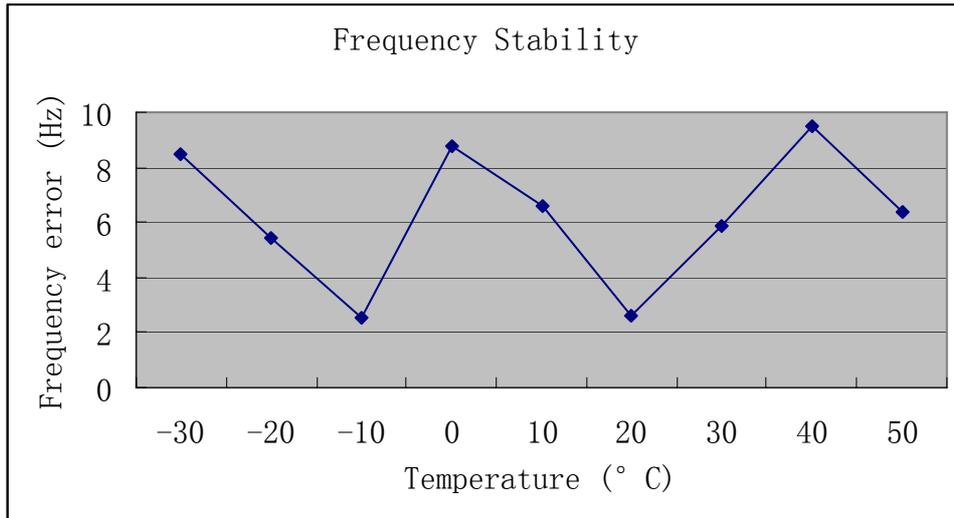


Figure 10. Measurement Results for 16QAM

**6.7.4.2 Measurement Results vs. Variation of Voltage**

QPSK: Channel No. 4407(881.4MHz)

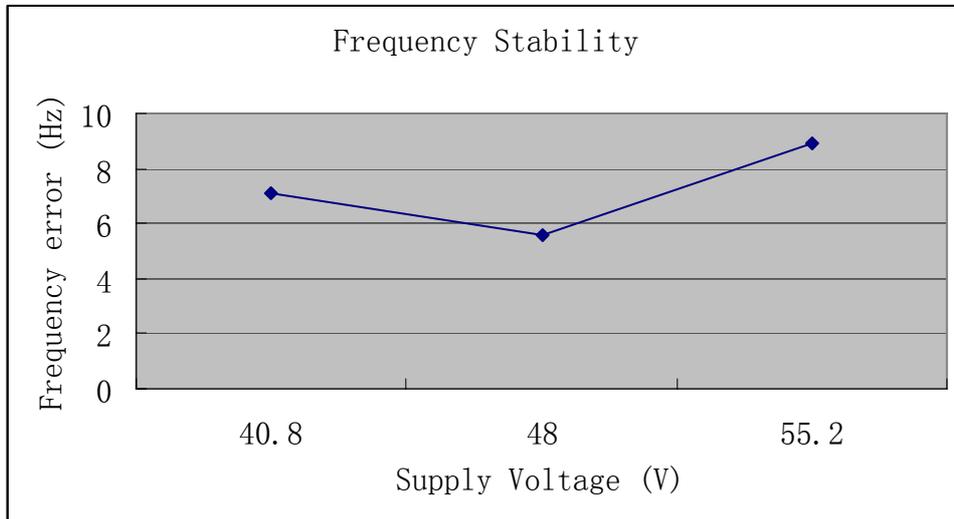


Figure 11. Measurement Results for QPSK

16QAM: Channel No. 4407(881.4MHz)

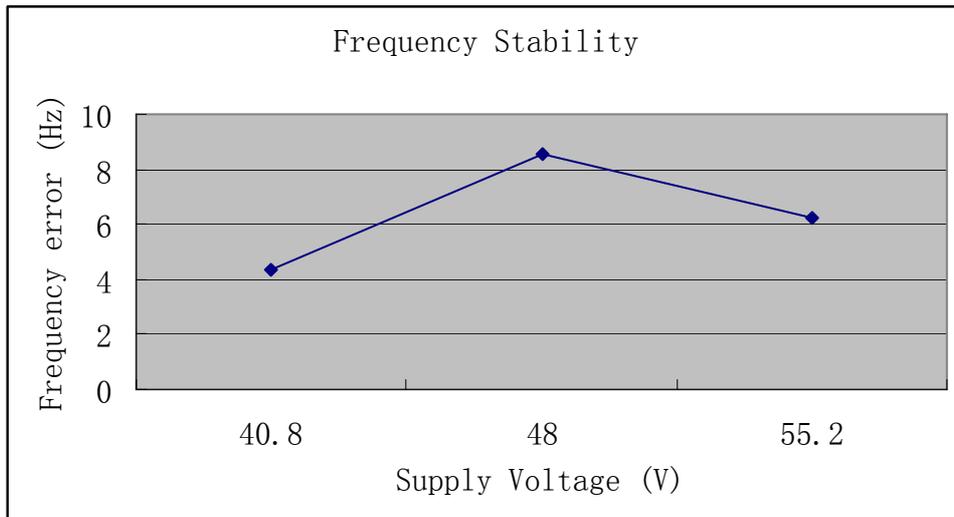


Figure 12. Measurement Results for 16QAM

### 6.7.5 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 47. Test Conditions

Preconditioning:	1 hour
Measured at:	Power port
Ambient temperature:	23.5°C
Relative humidity:	55 %

#### 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 48. 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 part15.107, conducted emission must meet the requirement of following table.

table 49. Limits

Frequency of Emission (MHz)	Conducted Limit (dBuV )	
	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 floor-top EUT was placed upon a non-metallic table 0.1 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.

For convenience, the MTRU-850 under test was installed in BTS3812AE and BTS3812E separately. And the MTRU-850 was operated on the typical channel.

BTS3812AE and BTS3812E was connected to ancillary in order to simulate normal operating conditions with reference to the guidance given in the standard for this type of equipment.

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

**Test Set-up**

The WCDMA BTS3812AE and BTS3812E were setup in the screened chamber and operated under nominal conditions. For BTS3812AE, there is only one power supply: Alternate Current (AC220V). there are three kinds of power supplies: Direct Current (DC-48V), Direct Current (DC+24V) and Alternate Current (AC220V). For this test item, only the measurement result of AC220V was supplied for each.

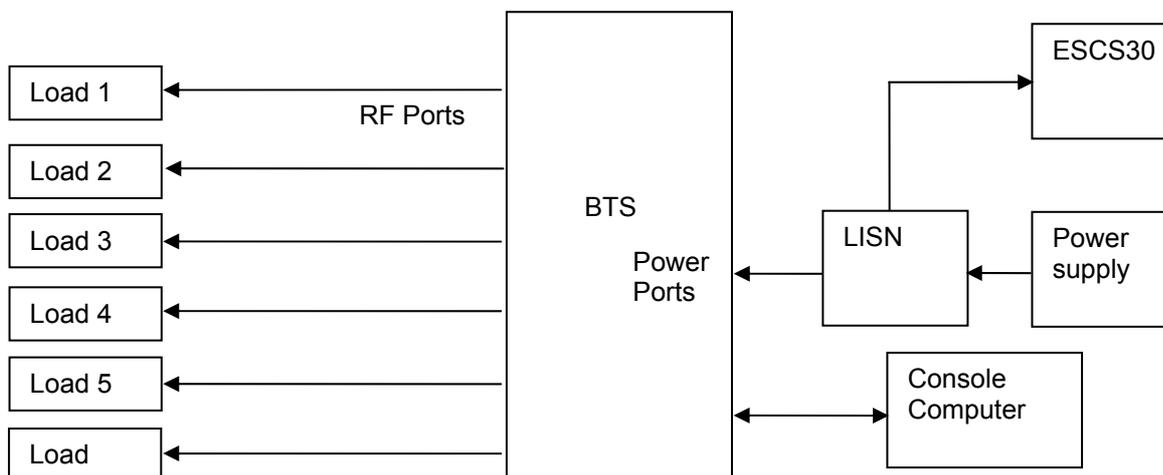


Figure 13. Test Set-up

**7.1.4 Measurement Results of BTS3812AE**

table 50. MEASUREMENT RESULT:QP DETECTOR

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.258000	18.00	10.3	62	43.5	L3	GND
0.519000	21.90	10.0	56	34.1	L3	GND
1.936500	36.40	10.1	56	19.6	N	GND
3.277500	10.40	10.1	56	45.6	N	GND
7.165500	37.60	10.3	60	22.4	N	GND
13.312500	37.60	11.6	60	22.4	N	GND

table 51. MEASUREMENT RESULT:AV DETECTOR

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.258000	11.90	10.3	52	39.6	L3	GND
0.514500	17.30	10.0	46	28.7	L3	GND
1.914000	23.90	10.1	46	22.1	L3	GND
5.118000	23.70	10.1	50	26.3	N	GND
7.170000	31.30	10.3	50	18.7	N	GND
13.312500	32.10	11.6	50	17.9	N	GND

**7.1.5 Measurement Results of BTS3812E**

table 52. MEASUREMENT RESULT:QP DETECTOR

Frequency (MHz)	Level (dB $\mu$ V)	Transd (dB)	Limit (dB $\mu$ V)	Margin (dB)	Line	PE
0.298500	30.90	10.3	60	29.4	L2	GND
0.420000	27.90	10.0	57	29.5	L2	GND
1.887000	24.80	10.1	56	31.2	L2	GND
3.646500	36.30	10.1	56	19.7	L2	GND
7.165500	31.70	10.3	60	28.3	L2	GND
24.594000	27.70	15.0	60	32.3	L2	GND

table 53. MEASUREMENT RESULT:AV DETECTOR

Frequency (MHz)	Level (dB $\mu$ V)	Transd (dB)	Limit (dB $\mu$ V)	Margin (dB)	Line	PE
0.240000	32.70	10.4	52	19.4	L2	GND
0.420000	27.90	10.0	47	19.5	L2	GND
1.572000	24.90	9.9	46	21.1	L2	GND
3.642000	37.80	10.1	46	8.2	L2	GND
7.165500	26.30	10.3	50	23.7	L2	GND
24.342000	23.50	15.1	50	26.5	L2	GND

### 7.1.6 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix F with 2 pages.

## 7.2 Radiated Emission of Enclosure in Idle Mode

### 7.2.1 Test Conditions

table 54. Test Conditions

Preconditioning:	1 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	51 %

### 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 55. 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 part 15.109. The limit showed in following table.

table 56. Limits

Frequency of Emission (MHz)	Radiated Limit	
	Unit(uV/m)	Unit(dBuV/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 performed at worst emission state.

For convenience, the MTRU-850 under test was installed in BTS3812AE and BTS3812E separately. And the MTRU-850 was operated on the typical channel. The transceivers of MTRU-850 were worked in idle mode.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 kHz

**Test set up**

The WCDMA BTS3812AE and BTS3812E were setup in the screened chamber and operated under nominal conditions. For BTS3812AE, there is only one power supply: Alternate Current (AC220V). For BTS3812E, there are three kinds of power supplies: Direct Current (DC-48V), Direct Current (DC+24V) and Alternate Current (AC220V). For this test item, the measurement result was supplied for each power supply.

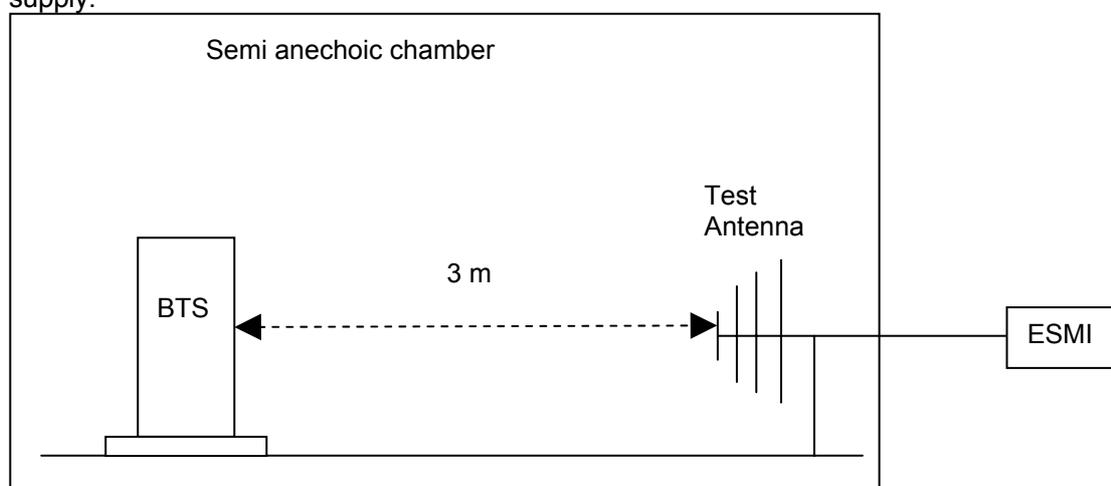


Figure 14. Test set up

**7.2.4 Measurement Results of BTS3812AE**

AC220V:  
30MHz~1GHz:

table 57. MEASUREMENT RESULT: QP DETECTOR

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
246.960000	23.90	-8.5	47.0	23.1	100.0	340.00	VERTICAL
675.840000	38.90	-1.4	47.0	8.1	100.0	0.00	VERTICAL

**7.2.5 Measurement Results of BTS3812E**

DC+24V:  
30MHz~1GHz:

table 58. MEASUREMENT RESULT: QP DETECTOR

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
211.200000	31.00	-11.5	40.0	9.0	100.0	360.00	HORIZONTAL
326.400000	40.70	-5.9	47.0	6.3	202.0	0.00	VERTICAL

829.440000	41.10	1.2	47.0	5.9	189.0	173.00	VERTICAL
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DC-48V:  
30MHz~1GHz:

table 59. MEASUREMENT RESULT: QP DETECTOR

Frequency (MHz)	Level (dB $\mu$ V/m)	Transd (dB)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
129.300000	29.70	-9.9	40.0	10.3	218.0	0.00	HORIZONTAL
134.400000	30.90	-10.3	40.0	9.1	210.0	10.00	HORIZONTAL
153.600000	28.70	-11.4	40.0	11.3	132.0	352.00	HORIZONTAL
211.200000	29.00	-11.7	40.0	11.0	100.0	60.00	HORIZONTAL
326.400000	34.70	-6.2	47.0	12.3	195.0	0.00	VERTICAL
829.440000	37.50	0.6	47.0	9.5	167.0	0.00	VERTICAL

AC220V:  
30MHz~1GHz:

table 60. MEASUREMENT RESULT: QP DETECTOR

Frequency (MHz)	Level (dB $\mu$ V/m)	Transd (dB)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
42.540000	24.00	-10.6	40.0	16.0	112.0	69.00	VERTICAL
70.740000	20.20	-16.3	40.0	19.8	270.0	136.00	HORIZONTAL
133.320000	34.70	-9.7	40.0	5.3	217.0	5.00	HORIZONTAL
245.760000	42.00	-8.6	47.0	5.0	100.0	285.00	HORIZONTAL
368.640000	32.90	-5.2	47.0	7.1	223.0	360.00	HORIZONTAL
860.160000	43.80	1.0	47.0	3.2	237.0	177.00	VERTICAL

## 7.2.6 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix G with 5 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 as following:

table 61. System Measurement Uncertainty

Items		Extended Uncertainty
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2
Field Strength of Spurious Radiation	ERP (dBm)(30MHz~1G)	U=4.6dB; k=2
	ERP (dBm) (>1G)	U=3dB; k=2
Conducted Output Power	Power(dBm)	U=0.39dB; k=2
Conducted Emission at Power Port	Disturbance Voltage (dB $\mu$ V)	U=3.3dB; k=2
Radiated Emission of enclosure at ideal mode	Field strength (dB $\mu$ V/m)	U=4.6dB; k=2

## 9 Appendices

Appendix A	Modulation Characteristic Measurement	5 pages
Appendix B	Occupied Bandwidth Measurement	5 pages
Appendix C	Band Edge Measurement	9 pages
Appendix D	Spurious Emission at Antenna Terminal	17 pages
Appendix E	Field Strength of Spurious Radiation	7 pages
Appendix F	Conducted Emission at Power Port	2 pages
Appendix G	Radiated Emission of Enclosure in Idle Mode	5 pages
Appendix H	Photos of Test Setup	7 pages