Report No: SYBH(R) 03012007EB-1
FCC ID: QISRRU3801C-21402

FCC TEST REPORT OF WCDMA NodeB

M/N: RRU3801C

Apr. 27, 2007

Reliability Laboratory of Huawei Technologies Co., Ltd.

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REPORT ON	FCC Test of WCDMA NodeB M/N: RRU3801C Report No: SYBH(R) 03012007EB-1
REGULATION	**FCC CFR47 Part 2: Subpart J;** **FCC CFR47 Part 27: Subpart C;** **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	**2007.04.28**	**Guo Xiaoqi**	
	Date	Name	signature
Technical Responsibility For Area of Testing	**2007.04.28**	**Dengjiang**	
	Date	Name	signature
Test Lab Engineer	**2007.04.27**	**Wangwenjin**	
	Date	Name	signature

Contents

1 Summary

The table below summarizes the measurements and results for the Huawei RRU3801C. 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	27.50(d)	Maximum Channel Power	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	27.53(g)	Band Edges Compliance	PASS
2.1051	27.53(g)	Spurious Emission at antenna terminal	PASS
2.1053	27.53(g)	Radiated Spurious Emission	PASS
2.1055	27.54	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 RRU3801C can support 2100MHz frequency band. In general, the RRU3801C is connected to baseband processing module through a pair of fibres, and serves one cell or several logical sectors. The RRU3801C implements radio transmission over the Uu interface, as well as the related control functions.
The RRU3801C has the following features:

- Compact size
- Easy installation
- Flexible coverage

It is ideal for the areas with medium or high traffic density.

2.1.2 Support function and Service

The RRU3801C 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

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 FCC and registration granted under the registration number **97456** on April 20. 2006. The test site has been accredited by A2LA and the accredited number is **2174.01** in Jan of 2006.

3.1 Testing Period

The test have been performed during the period of

Mar. 20, 2007 to Apr. 22, 2007

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Uplink band:	1712.5 to 1752.5 MHz
Downlink band:	2112.5 to 2152.5 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:	**5M0F9W**

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 ℃
Maximum temperature:	+ 50 ℃
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:	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.

4.1.7 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 7. Applied DC Voltages and Currents

Voltage:	⎓ -48
Current:	4.05A According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)

4.2 EUT Identification List

4.2.1 Board Information

table 8. Board Information

Model Name	Qty.	Hardware Version	Serial	Description
TRX	1	V1.9	020EEC1071000013	Provides one TX channel and one RX channel and processes IF signals.
Power amplifier(PA)	1	V1.9	020AUH1072000476	The PA amplifies TX signals to enhance the power of the signals.
Duplexer	1	V1.9	2199040CNJL071000003	The duplexer multiplexes receive signals and transmit signals, which enables the receive signals and transmit signals to share the same antenna path. The duplexer also filters receive signals and transmit signals.
Low Noise Amplifier （LNA）	1	V1.9	020EEK1071000002	The LNA amplifies the RX signals to avoid loss of signals.

4.2.2 Adapter Technical Data

Not Applicable for BTS.

4.2.3 Battery Technical Data

Not Applicable for BTS.

4.2.4 FCC Identification

Grantee Code: **QIS**
Product Code: **RRU3801C**
FCC Identification: **QISRRU3801C-21402**

5 Main Test Instruments

table 9. 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	03.19.2008
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 10. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	22℃
Relative humidity:	51%

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 27.50

6.1.2.2 Supporting Standards

table 11. 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)

6.1.2.3 Limits

Compliance with part 27.50, in no any case may the peak power of a base station transmitter exceeds 1640 watts. W (dBm)= 10*log (W watts).

table 12. Limits

Maximum Output Power (Watts)	< 1640 Watts
Maximum Output Power (dBm)	< 62 dBm

6.1.3 Test Method and Setup

RRU3801C was connected to the wireless signal analyzer via the main RF connector. Diversity RF connectors were connected to match load. RRU3801C was controlled to transmit Maximum power by console computer. Measure and record the Maximum Channel Power of the RRU3801C by the wireless signal analyzer.

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

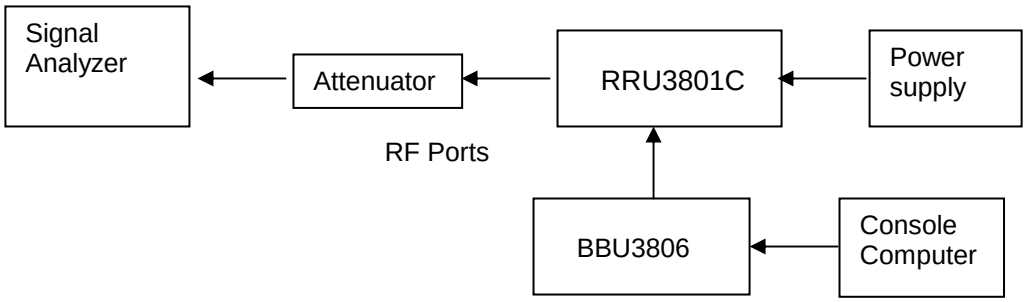

Figure 1. TEST SETUP

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. For two carriers, the equipment was operated with two adjacent channels, and one channel was measured.
Single carrier:

table 13. Measurement Results for single carrier

TEST CONDITIONS	Maximum Output Power					
	Channel 1887 2112.5 MHz		Channel 1987 2132.5MHz		Channel 2087 2152.5 MHz	
T_{nom} (25 ℃) V_{nom} (-48V)	dBm		dBm		dBm	
Type of modulation	**Measured**	**Limit**	**Measured**	**Limit**	**Measured**	**Limit**
QPSK	45.34	< 62	45.37	< 62	45.41	< 62
16QAM	45.41	< 62	45.38	< 62	45.39	< 62

Two carriers:

table 14. Measurement Results for two carriers

TEST CONDITIONS	Maximum Output Power					
	Channel 1887 2112.5 MHz		Channel 1987 2132.5MHz		Channel 2087 2152.5 MHz	
T_{nom} (25 ℃) V_{nom} (-48V)	dBm		dBm		dBm	
Type of modulation	**Measured**	**Limit**	**Measured**	**Limit**	**Measured**	**Limit**
QPSK	42.27	< 62	42.25	< 62	42.24	< 62
16QAM	42.55	< 62	42.35	< 62	42.18	< 62

6.1.5 Conclusion

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

6.2 Modulation Characteristics

6.2.1 Test Conditions

table 15. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	21 ℃
Relative humidity:	54 %

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 27 subpart C

6.2.2.2 Supporting Standards

table 16. 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 27 subpart C.

table 17. Limits

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

6.2.3 Test Method and Setup

RRU3801C was connected to the wireless signal analyzer via the main RF connector. The other RF connector was connected to match load. RRU3801C was controlled to transmit Maximum power by console computer. Measure and record the Code Domain Power and the constellation of the RRU3801C by wireless signal analyzer.

Test setup

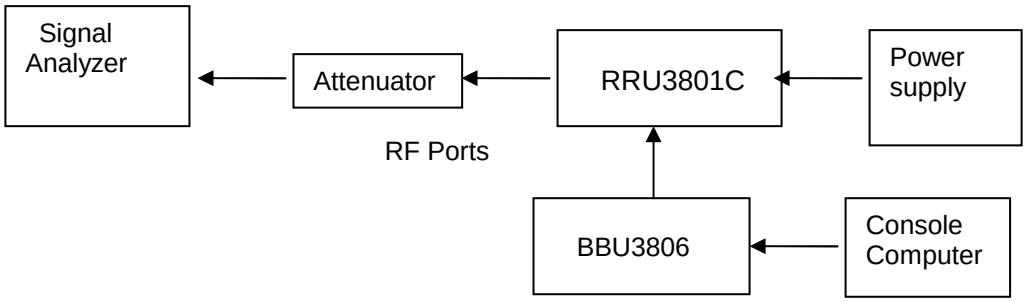

Figure 2.TEST SETUP

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 18. Measurement Results for QPSK

TEST CONDITIONS		EVM (QPSK)		
		Channel 1987 2132.5 MHz		
		Type	**Measured**	**Limit**
T_{nom} (25 ℃)	V_{nom} (-48V)	QPSK	9.66%	17.5%

table 19. Measurement Results for 16QAM

TEST CONDITIONS		EVM (16QAM)		
		Channel 1987 2132.5 MHz		
		Type	**Measured**	**Limit**
T_{nom} (25 ℃)	V_{nom} (-48V)	16QAM	9.11%	12.5%

6.2.5 Conclusion

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

For the measurement results refer to appendix A with 3 pages.

6.3 Occupied Bandwidth

6.3.1 Test Conditions

table 20. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	20 ℃
Relative humidity:	56 %

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 27 subpart C

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
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)

6.3.2.3 Limits

No specific occupied bandwidth requirement in part 27 subpart C, 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 22. Limits

Upper /lower frequency limits	0.5% of the mean power

6.3.3 Test Method and Setup

RRU3801C was connected to the wireless signal analyzer via the one main RF connector. The other RF connector was connected to match load. RRU3801C was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the RRU3801C by the wireless signal analyzer.

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

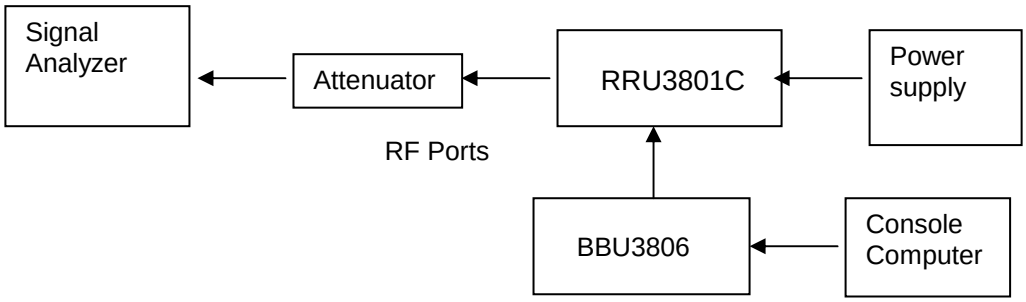

Figure 3. TEST SETUP

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 23. Measurement Results for QPSK

TEST CONDITIONS		Occupied Bandwidth					
T_{nom} (25 ℃)	V_{nom}(-48V)	Channel 1887 2112.5 MHz				Channel 2087 2152.5 MHz	
		Measured (MHz)	**Limit (MHz)**			**Measured (MHz)**	**Limit (MHz)**
99%		4.16	5.0			4.16	5.0
26dB		4.65	5.0			4.65	5.0

table 24. Measurement Results for 16QAM

TEST CONDITIONS		Occupied Bandwidth					
T_{nom} (25 ℃)	V_{nom}(-48V)	Channel 1887 2112.5 MHz				Channel 2087 2152.5 MHz	
		Measured (MHz)	**Limit (MHz)**			**Measured (MHz)**	**Limit (MHz)**
99%		4.18	5.0			4.18	5.0
26dB		4.65	5.0			4.65	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 25. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	21℃
Relative humidity:	55 %

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 27.53

6.4.2.2 Supporting Standards

table 26. 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)

6.4.2.3 Limits

Compliance with part 27.53, 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 27. Limits

Rated Power:	45.41 dBm
Required attenuation:	43+10log (34.75) = 58.41,
Absolute level	45.41 dBm – 58.41 dB = - 13 dBm

6.4.3 Test Method and Setup

RRU3801C was connected to the wireless signal analyzer via the one main RF connector. The other RF connector was connected to match load. RRU3801C was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the RRU3801C by the wireless signal analyzer.

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

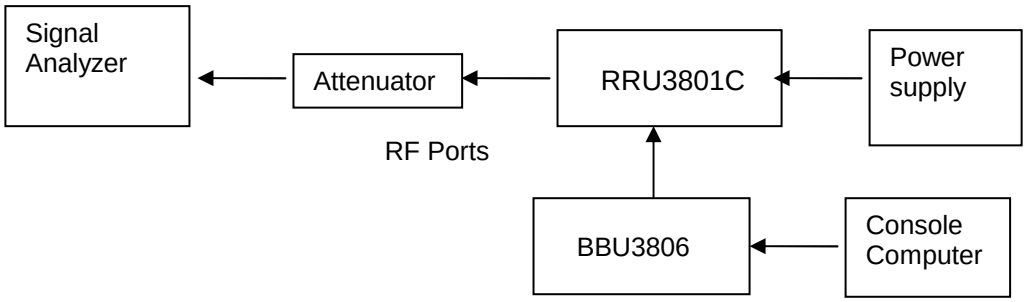

Figure 4. Test Set-up

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 28. Measurement Results for single carrier

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887	2112.5	-26.27(See appendix C)	- 13 dBm	Pass
2087	2152.5	-27.83(See appendix C)	- 13 dBm	Pass

B. Two Carriers

table 29. Measurement Results for two carriers

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887/1912	2112.5/2117.5	-25.64(See appendix C)	- 13 dBm	Pass
2062/2087	2147.5/2152.5	-25.32(See appendix C)	- 13 dBm	Pass

16QAM:

A. Single Carrier

table 30. Measurement Results for single carrier

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887	2112.5	-26.50(See appendix C)	- 13 dBm	Pass
2087	2152.5	-27.88(See appendix C)	- 13 dBm	Pass

B. Two Carriers

table 31. Measurement Results for two carriers

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887/1912	2112.5/2117.5	-25.63(See appendix C)	- 13 dBm	Pass
2062/2087	2147.5/2152.5	-25.69(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 5 pages.

6.5 Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

table 32. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	22℃
Relative humidity:	51 %

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 27.53

6.5.2.2 Supporting Standards

table 33. Supporting Standards:

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

6.5.2.3 Limits

Compliance with part 27.53, 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:	45.41 dBm
Required attenuation:	43+10log (34.75) = 58.41,
Absolute level	45.41 dBm – 58.41 dB = - 13 dBm

6.5.3 Test Method and Setup

RRU3801C was connected to the wireless signal analyzer via the one main connector. The other RF connector was connected to match load. RRU3801C was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the RRU3801C by the.

According to 47CFR part 27.53, this defined the measurement bandwidth of as following:

Measurement bandwidth (RBW) for 9 kHz up to 12.75 GHz: 1 MHz;

Test Set-up

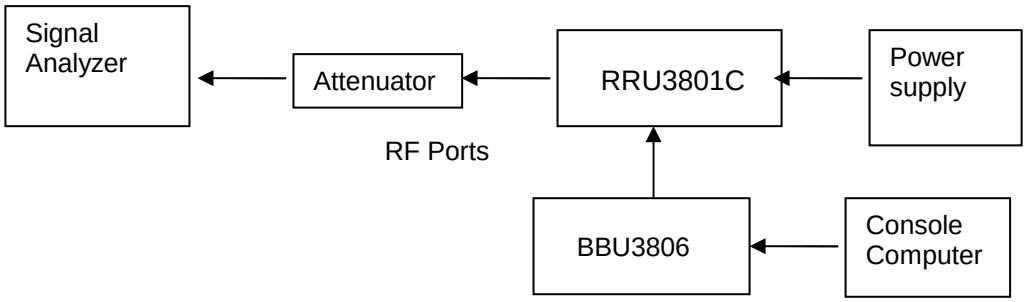

Figure 5. Test Set-up

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 35. Measurement Results for single carrier

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887	9 kHz ~3GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
2087	9 kHz ~3GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass

Two Carriers

table 36. Measurement Results for two carriers

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887/1912	9 kHz ~3GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
2062/2087	9 kHz ~3GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass

16QAM:

Single carrier:

table 37. Measurement Results for single carrier

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887	9 kHz	Maximum	(See appendix D)	- 13	Pass

	~3GHz			dBm/1MHz	
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
2087	9 kHz ~3GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass

Two Carriers

table 38. Measurement Results for two carriers

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
1887/1912	9 kHz ~3GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
2062/2087	9 kHz ~3GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	Pass
	3GHz~25GHz	Maximum	(See appendix D)	- 13 dBm/1MHz	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 39. Test Conditions

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

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 27.53

6.6.2.2 Supporting Standards

table 40. 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 27.53, 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 41. Limits

Rated Power:	45.41 dBm
Required attenuation:	43+10log (34.75) = 58.41,
Absolute level	45.41 dBm – 58.41 dB = - 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.

RRU3801C 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 RRU3801C 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). RRU3801C 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.
(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 27.53, the defined measurement bandwidth as following:

22.50 (g) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

Measurement bandwidth (RBW) for 30MHz up to 12.75GHz: 1 MHz;

Test setup

Step 1: Pre-test

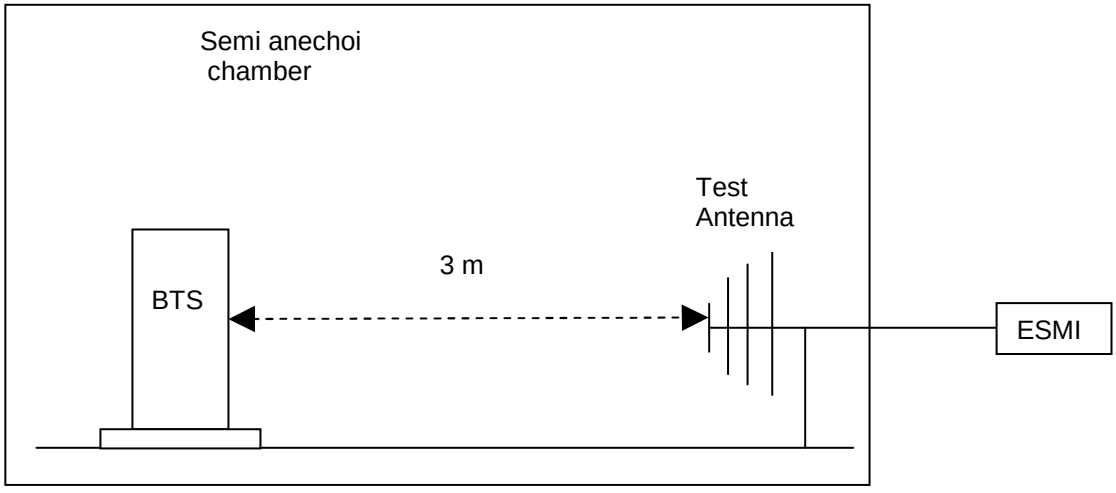

Figure 6. Test Set-up

Step 2: Substitution method to verify the maximum ERP

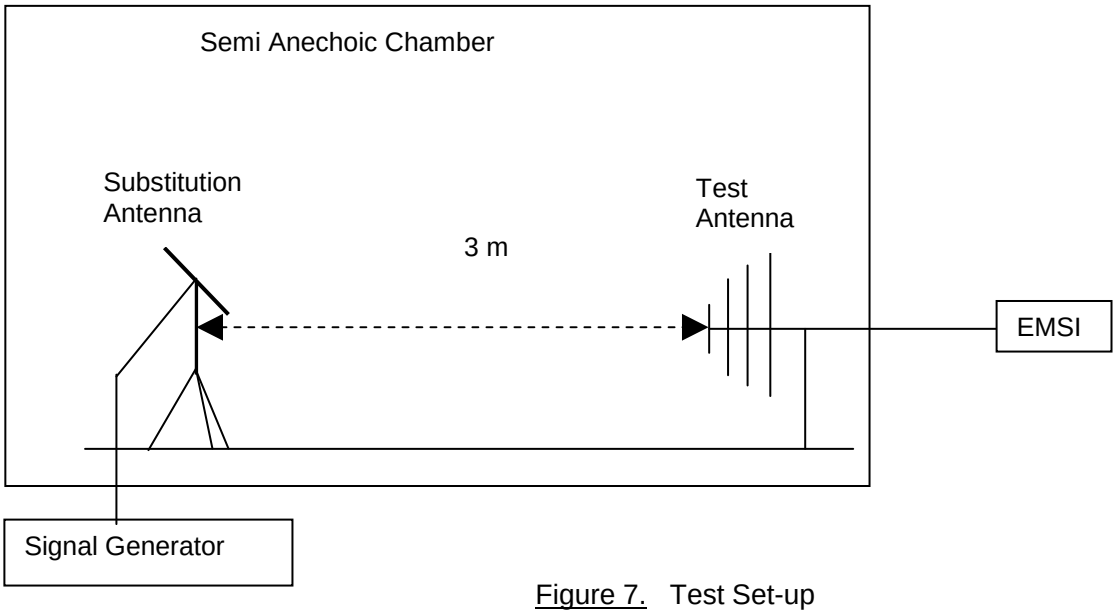

Figure 7. Test Set-up

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

6.6.4.1 Pre-test Measurement Results

table 42. Measurement Result

Channel Number	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 1987 2132.5MHz	30MHz ~25GHz	Maximum	<- 13 dBm (See appendix E)	- 13 dBm	Pass

6.6.4.2 Substitution Results

table 43. 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
4264.44	-20.72	Horn Ant.	6.50	4.50	-22.59	-20.59	-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 Conclusion

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

6.7 Frequency Stability

6.7.1 Test Conditions

table 44. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	53% at 20 ℃

6.7.2 Test Specifications and Limits

6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 27.54

6.7.2.2 Supporting Standards

table 45. 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 27.54.

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 °centigrade for all equipmen t 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^{o} 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 RRU3801C to the Wireless Signal Analyzer via the main antenna connector. Then measure the frequency error by the. The other antenna output port was matched with 50 Ω match loads.

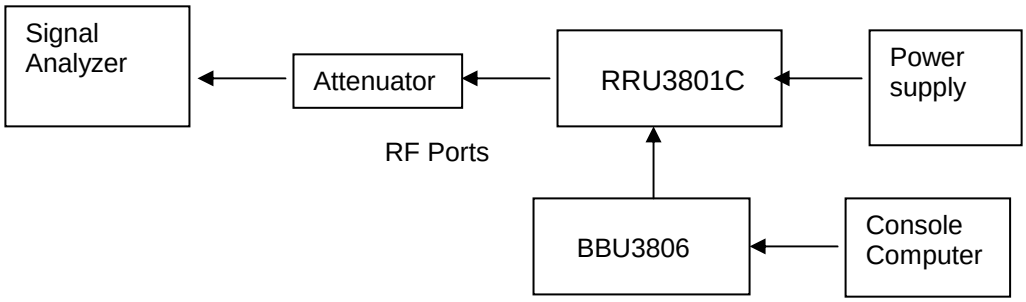

Figure 8. Test Set up

6.7.4 Measurement Results

6.7.4.1 Measurement Results vs. Variation of Temperature

QPSK: Channel No. 1987(2132.5MHz)

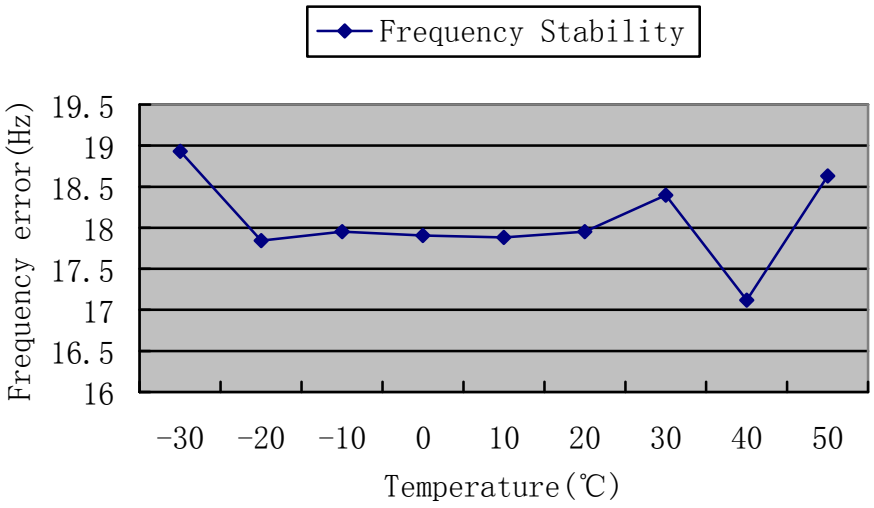

Figure 9.Measurement Results for QPSK

16QAM: Channel No. 1987(2132.5MHz)

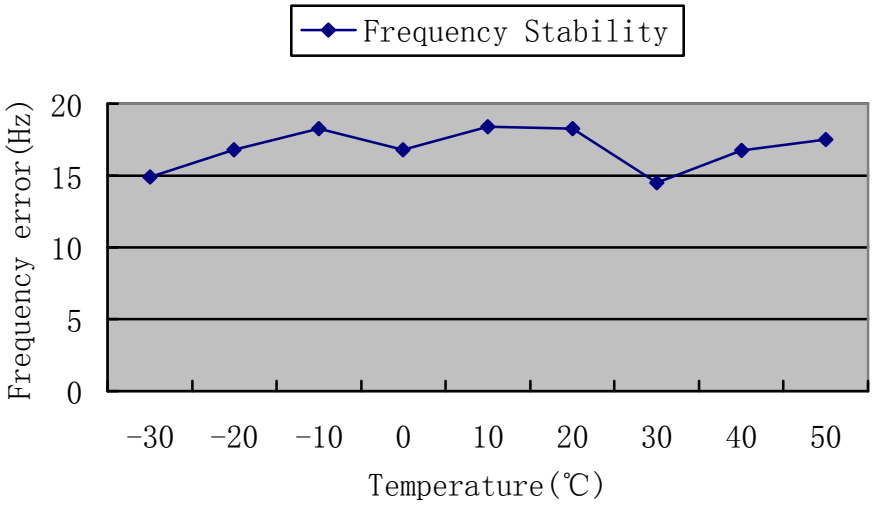

Figure 10. Measurement Results for 16QAM

6.7.4.2 Measurement Results vs. Variation of Voltage

QPSK: Channel No. 1987(2132.5MHz)

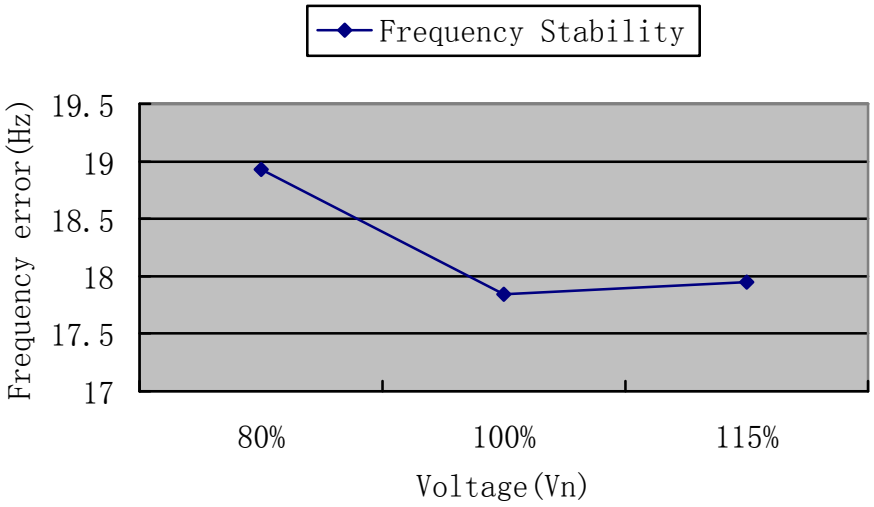

Figure 11. Measurement Results for QPSK

16QAM: Channel No. 1987(2132.5MHz)

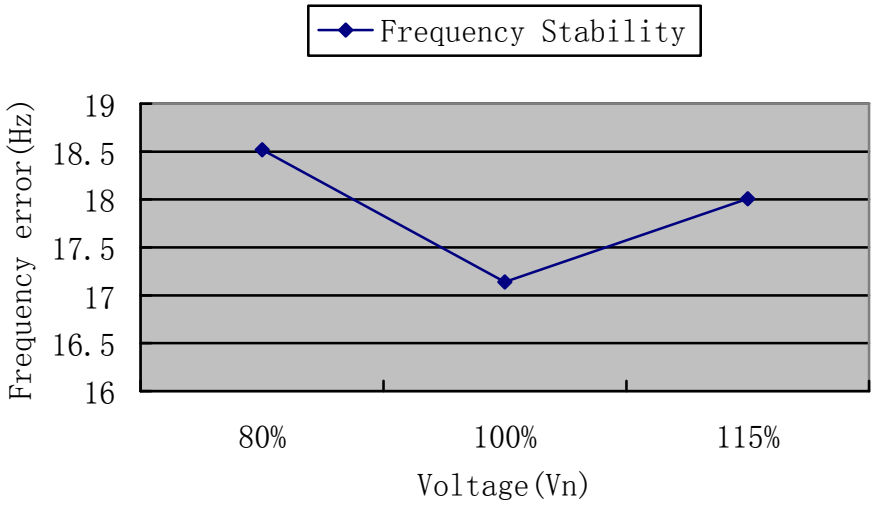

Figure 12. Measurement Results for 16QAM

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 46. Test Conditions

Preconditioning:	1 hour
Measured at:	Power port
Ambient temperature:	23.5℃
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 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

7.1.2.3 Limits

Compliance with part15.107, conducted emission must meet the requirement of following table.

table 48. 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.

RRU3801C 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 150 kHz to 30 MHz: 9 kHz;

Test Set-up

The RRU3801C was setup in the screened chamber and operated under nominal conditions.

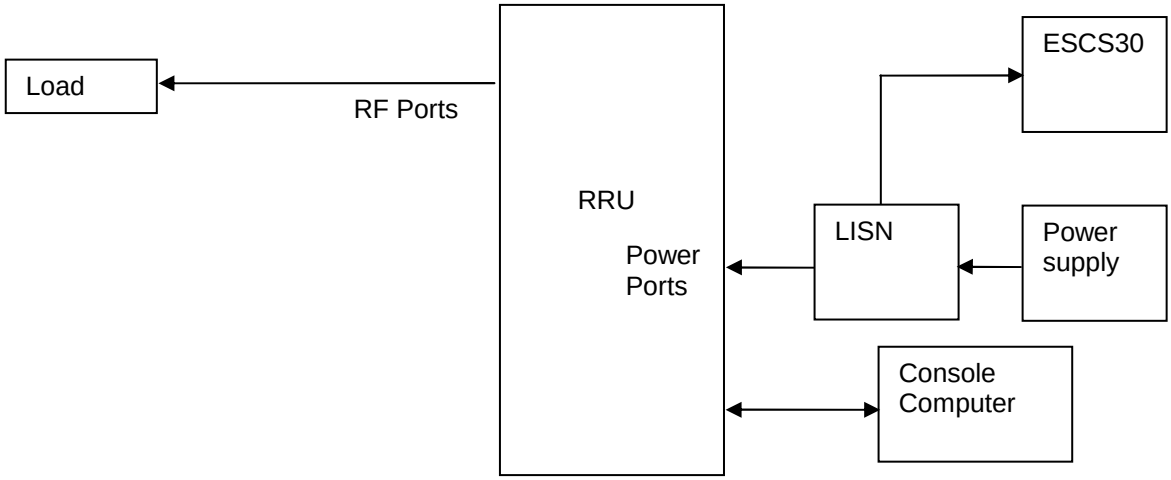

Figure 13. Test Set-up

7.1.4 Measurement Results

Not applicable for DC only equipment.

AC 220V:

table 49. MEASUREMENT RESULT:QP DETECTOR

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
Not applicable						

table 50. MEASUREMENT RESULT:AV DETECTOR

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
Not applicable						

7.1.5 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 51. Test Conditions

Preconditioning:	1 hour
Measured at:	enclosure
Ambient temperature:	25 ℃
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 52. 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

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 53. 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 tw o polarizations V and H.

The test performed at worst emission state.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 kHz

Test set up

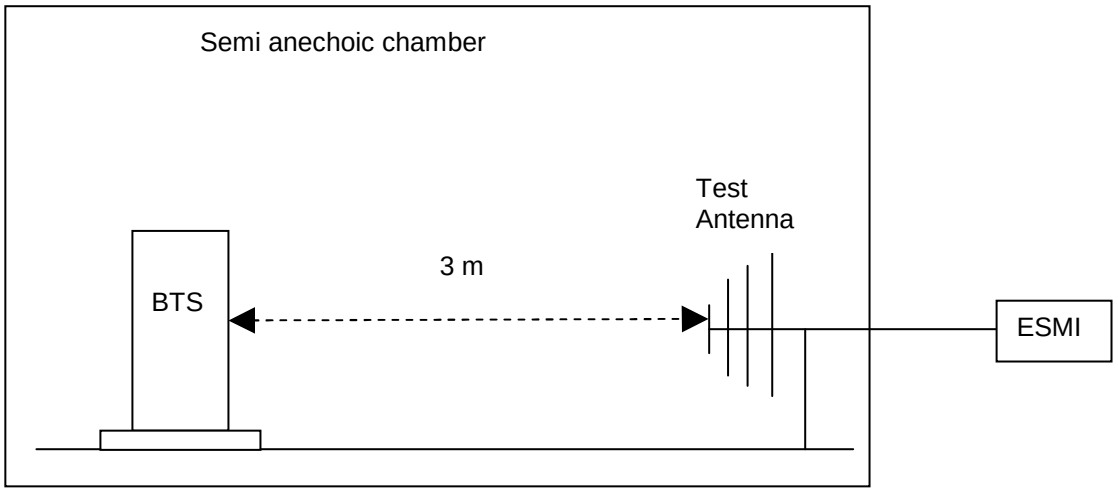

Figure 14. Test set up

7.2.4 Measurement Results of RRU3801C

DC -48V:
30MHz~1GHz:

table 54. MEASUREMENT RESULT: QP DETECTOR (Below 1GHz)

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
122.880000	23.60	-9.6	43.5	19.9	283.0	360.00	VERTICAL
430.080000	35.70	-3.9	46.0	10.3	100.0	338.00	VERTICAL
460.800000	31.90	-3.7	46.0	14.1	100.0	359.00	VERTICAL
491.520000	37.80	-3.2	46.0	8.2	142.0	351.00	VERTICAL
844.800000	33.00	0.8	46.0	13.0	199.0	269.00	HORIZONTAL
921.600000	33.00	1.5	46.0	13.0	100.0	50.00	VERTICAL

table 55. MEASUREMENT RESULT: AV DETECTOR (Above 1GHz)

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
1290.000000	29.50	-3.8	53.9	24.4	106.0	345.00	VERTICAL
2267.000000	43.20	1.9	53.9	10.7	159.0	20.00	VERTICAL
4265.000000	52.10	8.9	53.9	1.8	202.0	296.00	HORIZONTAL
4679.000000	40.10	9.6	53.9	13.8	222.0	327.00	HORIZONTAL
6984.500000	40.50	15.1	53.9	13.4	240.0	36.00	VERTICAL
8475.000000	40.00	17.1	53.9	13.9	161.0	98.00	VERTICAL

7.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix G with 3 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 56. 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 （dBμV）	U=3.3dB; k=2
Radiated Emission of enclosure at ideal mode	Field strength （dBμV/m）	U=4.6dB; k=2

9 Appendices

Appendix A	Modulation Characteristic Measurement	3 pages
Appendix B	Occupied Bandwidth Measurement	5 pages
Appendix C	Band Edge Measurement	5 pages
Appendix D	Spurious Emission at Antenna Terminal	17 pages
Appendix E	Field Strength of Spurious Radiation	3 pages
Appendix F	Conducted Emission at Power Port	2 pages
Appendix G	Radiated Emission of Enclosure in Idle Mode	3 pages
Appendix H	Photos of Test Setup	4 pages