



FCC&IC Test Report

Product Name: HSPA+ 2D USB Rotator

Model Number: E368

Report No: SYBH(Z-RF)024032011-2001

FCC ID: QISE368

IC ID: 6369A-E368

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REGULATION	FCC CFR47 Part 2: Subpart J;
	FCC CFR47 Part 22 : Subpart H;
	IC RSS-Gen (Issue 3)
	IC RSS-132 (Issue 2)
START OF TEST	Apr.08, 2011
END OF TEST	Apr.09, 2011
Final Judgement:	Pass

Approved By Apr.18, 2011 Chenxiaohong Chen Xiaohong
 Date Name Signature

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 Date Name Signature



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1 Summary

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

Table 1 Summary of results

FCC Measurement Specification	FCC Limits Part(s)	Section in RSS-132	Description	Result
2.1046	22.913	4.4	Effective Radiated Power of Transmitter	PASS
2.1046	22.913	4.4	Conducted Power of Transmitter	PASS
2.1047	/	/	Modulation Characteristics	PASS
2.1049	/	4.5	Occupied Bandwidth	PASS
2.1051	22.917	4.5	Band Edges compliance	PASS
2.1051	22.917	4.5	Spurious Emission at Antenna Terminal	PASS
2.1055	22.355	4.3	Frequency Stability	PASS
2.1053	22.917	4.5	Radiated Spurious Emissions	(See Note)

Note: The Radiated Spurious Emissions' test results are shown in the EMC report.



2 Product Description

2.1 Production Information

2.1.1 General Description

E368 HSPA+/WCDMA/EDGE/GPRS/GSM dual mode 2D USB Rotator is subscriber equipment in the UMTS/GSM system. E368 implement such functions as RF signal receiving/transmitting, HSPA+/WCDMA and EDGE/GPRS/GSM protocol processing, data service etc. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface. E368 has an internal antenna as default.

Note: Only test for GSM/GPRS/EDGE 850MHz (GSM) and band V (WCDMA) can be included in this report for the requirement of FCC part 2 & 22.

2.1.2 Support function and Service

The EUT support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Voice and data	Modulation: GMSK	TM1	GPRS/GSM
Data	Modulation: 8PSK	TM2	EDGE
Data	Modulation: QPSK	TM3	WCDMA
Data	Modulation: QPSK	TM4	HSDPA
Data	Modulation: QPSK	TM5	HSUPA

Note: * The specified GPRS test conditions & settings are defined in 3GPP TS51.010 and the EDGE test conditions & settings are defined in 3GPP TS51.010.
 The specified WCDMA test conditions & settings are defined in 3GPP TS 34.121.

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***

3.1 Testing Period

The test have been performed during the period of

Apr.08, 2011 – Apr.09, 2011

3.2 General Set up Description

TM1: GPRS/GSM Mode with GMSK Modulation

TM2: EDGE Mode with 8PSK Modulation

TM3: WCDMA Mode with QPSK Modulation

TM4: HSDPA Mode with QPSK Modulation

TM5: HSUPA Mode with QPSK Modulation



4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

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

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

	EDGE/GPRS/GSM	UMTS/HSPA
Channel Raster	200 kHz	200 kHz
Channel spacing:	200 kHz	5 MHz

4.1.3 Type of Emission

Table 6 Type of Emission

	GPRS/GSM	EDGE	UMTS/HSPA
Emission Designation:	300kGXW	300KG7W	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:	- 10 °C
Maximum temperature:	+ 55 °C
Relative Humidity:	5%-95%RH

4.1.5 Power Source

Table 8 Power Source

AC voltage nominal:	~ 120 V
AC voltage range	~ 100 V to ~ 240 V
AC current maximal:	650mA

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 9 Applied RF module DC Voltages and Currents

Voltage:	== +2.8V
Current:	100mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)



4.2 EUT Identification List

4.2.1 Board Information

Table 10 Board Information

HSPA+ 2D USB Rotator		
E368		
Board and Module		
Equipment Designation / Description	IMEI	Remarks
MAINBOARD	004401720055017	

4.2.2 FCC Identification

Grantee Code: QIS
Product Code: E368
FCC Identification: QISE368

4.2.3 IC Identification

Grantee Code: 6369A
Product Code: E368
IC Identification: 6369A-E368



5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24.2011
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec.14.2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.24,2011
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2012
Signal generator	Agilent	E8257D	MY49281095	Jul.9.2011
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Test receiver	R&S	ESIB26	100318	May.04.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13.2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2011
Horn Antenna	R & S	HF906	359287/006	April.27, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.11, 2011
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20.2011
Horn Antenna	ETS-LINDGREN	3160	60006	Oct.27.2011



6 Transmitter Measurements

6.1 Effective Radiated Power of Transmitter (ERP)

6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4/TM5 at frequency Bottom, Middle, Top

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 13 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010	Digital cellular telecommunications system; Mobile Station (MS) conformance specification;
3GPP TS 34.121	Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.1.2.3 Limits

Compliance with part 22.913, mobile/portable stations are limited to 7 watts ERP peak power.
 The calculated longitude ERP by following formula: $ERP(dBm) = 10 * \log(ERP_{in\ mwatts})$.

Table 14 Limits

Maximum Output Power (Watts)	< 7 Watts
Maximum Output Power (dBm)	< 38.5 dBm

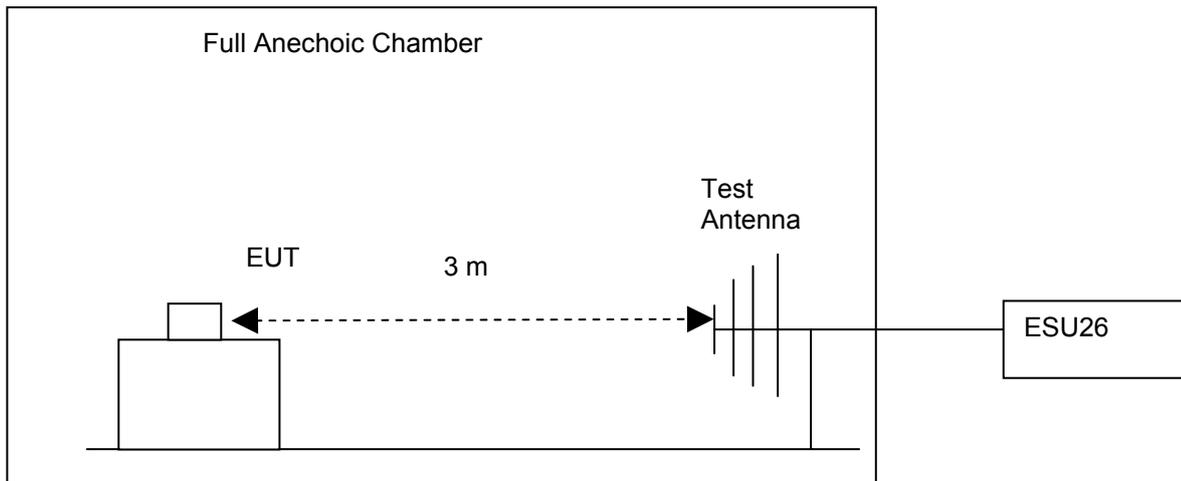
6.1.3 Test Method and Setup

- (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP 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). Connect the Mobile Phone to the wireless communication tester CMU200 via the air interface. The band class is set as GSM850M and WCDMA850.
- (b) Test the Radiated maximum output power by the CMU200 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 CMU200, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

Test setup

Step 1: Pre-test



Step 2: Substitution method to verify the maximum ERP

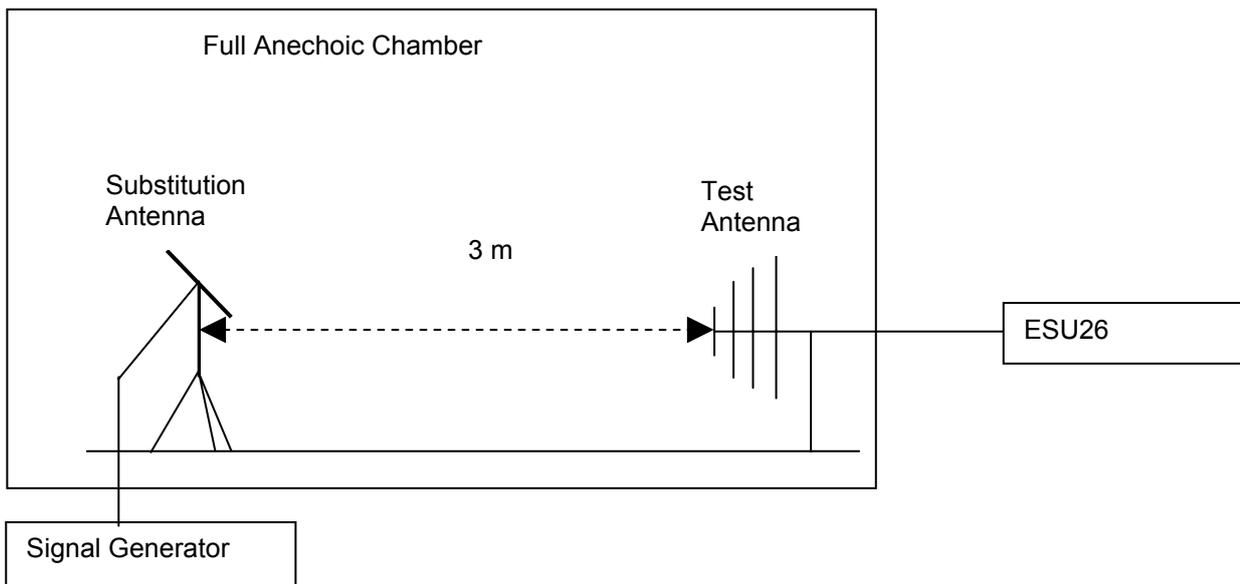


Figure 1. Test Set-up

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



6.1.4 Measurement Results

6.1.4.1 Pre-test Results

For HSDPA test mode, there are 4 sub-test for different configuration. For the sub-test 1, The channel is Middle range.

Sub-test	c	d	d (SF)	c/d	HS (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)	Test result
1	2/15	15/15	64	2/15	4/15	0.0	0.0	21.46
2	12/15	15/15	64	12/15	24/15	1.0	0.0	21.24
3	15/15	8/15	64	15/8	30/15	1.5	0.5	20.67
4	15/15	4/15	64	15/4	30/15	1.5	0.5	20.62

For the following test, the TM4 was used for HSDPA.

For HSUPA test mode, there are 5 sub-test for different configuration. For the sub-test 1, The channel is Middle range.

Sub-test	$\beta c/\beta d$	βHS	βec	βed	βed (SF)	βed (Codes)	CM (dB)	MPR (dB)	Test result
1	11/15	16/15	16/15	448/75	4	1	1.0	0.0	21.22
2	6/15	12/15	12/15	94/75	4	1	3.0	2.0	19.51
3	15/9	30/15	30/15	$\beta ed1: 47/15$	4	2	2.0	1.0	19.71
4	2/15	2/15	2/15	56/75	4	1	3.0	2.0	19.41
5	15/15	24/15	24/15	224/25	4	1	1.0	0.0	20.72

For the following test, the TM5 was used for HSUPA.

Table 15 Measurement Results

		RF Output Power (EIRP)					
TEST CONDITIONS		Channel128(B) 824.2MHz		Channel192 (M) 837MHz		Channel251(T) 848.8MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	Tnom (25 °C) Vnom (3.7V)	31.36	38.5	31.13	38.5	30.92	38.5
TM2	Tnom (25 °C) Vnom (3.7V)	25.42	38.5	25.36	38.5	25.22	38.5
TEST CONDITIONS		Channel4132(B)		Channel4182(M)		Channel4233(T)	



		826.4MHz		836.4MHz		846.6MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM3	Tnom (25 °C) Vnom (3.7V)	21.36	38.5	21.22	38.5	21.26	38.5
TM4	Tnom (25 °C) Vnom (3.7V)	21.06	38.5	20.96	38.5	21.03	38.5
TM5	Tnom (25 °C) Vnom (3.7V)	20.80	38.5	20.65	38.5	20.73	38.5

6.1.4.2 Substitution Results

Table 16 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	Limit [dBm]	Result
TM1	824.2	31.36	Dipole Ant.	34.66	-2.75	0.6	31.31	38.5	Pass
TM1	837	31.13	Dipole Ant	34.7	-2.87	0.6	31.23	38.5	Pass
TM1	848.8	30.92	Dipole Ant	34.4	-2.85	0.6	30.95	38.5	Pass
TM2	824.2	25.42	Dipole Ant	28.79	-2.75	0.6	25.44	38.5	Pass
TM2	837	25.36	Dipole Ant.	28.73	-2.87	0.6	25.26	38.5	Pass
TM2	848.8	25.22	Dipole Ant	28.57	-2.85	0.6	25.12	38.5	Pass
TM3	826.4	21.36	Dipole Ant	24.7	-2.75	0.6	21.35	38.5	Pass
TM3	836.4	21.22	Dipole Ant	24.69	-2.87	0.6	21.22	38.5	Pass
TM3	846.6	21.26	Dipole Ant.	24.7	-2.85	0.6	21.25	38.5	Pass
TM4	826.4	21.06	Dipole Ant	24.51	-2.75	0.6	21.16	38.5	Pass
TM4	836.4	20.96	Dipole Ant	24.33	-2.87	0.6	20.86	38.5	Pass
TM4	846.6	21.03	Dipole Ant.	24.48	-2.85	0.6	21.03	38.5	Pass
TM5	826.4	20.80	Dipole Ant	24.16	-2.75	0.6	20.81	38.5	Pass
TM5	836.4	20.65	Dipole Ant	24.09	-2.87	0.6	20.62	38.5	Pass
TM5	846.6	20.73	Dipole Ant.	24.16	-2.85	0.6	20.71	38.5	Pass

Note: a, For getting the ERP (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

b, A GSM signal with bandwidth of 200kHz signal with bandwidth of 5MHz is created by the vector generator R&S SMU200A.



A WCDMA/HSPA signal with bandwidth of 5MHz are created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 200kHz for TM1 and TM2 and 5M for TM3/TM4/TM5.

6.1.5 Conclusion

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



6.2 Conducted Power of Transmitter

6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2/TM3/TM4/TM5 at frequency Bottom, Middle, Top

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 18 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010	Digital cellular telecommunications system; Mobile Station (MS) conformance specification;
3GPP TS 34.121	Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.2.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula:

$$ERP(\text{dBm}) = 10 * \log(ERP_{\text{in mwatts}}).$$

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$$P_{\text{cod}}(\text{dBm}) = ERP(\text{dBm}) - \text{Gain}(\text{dBd}).$$

and $\text{Gain}(\text{dBd}) = \text{Gain}(\text{dBi}) - 2.15\text{dB}$

Table 19 Limits

Maximum Output Power (Watts)	< 7 Watts(38.5dBm)
Antenna Gain(dBi):	1.66
Antenna Gain(dBd):	-0.49
Maximum Conducted Output Power (dBm)	< 39.85dBm

6.2.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power 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). Connect the Mobile Phone to the wireless communication tester CMU200 via the antenna connector. The band class is set as GSM850M and WCDMA850M.

(b) Test the Conducted maximum output power by the CMU200.

Test setup

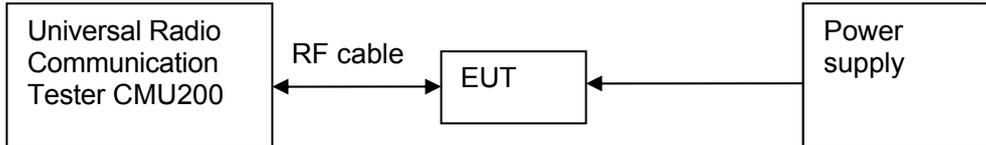


Figure 2. Test Set-up

6.2.4 Measurement Results

Table 20 Measurement Results

TEST CONDITIONS		RF Output Power (Conducted)					
		Channel128(B) 824.2MHz		Channel192 (M) 837MHz		Channel251(T) 848.8MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	Tnom (25 °C) Vnom (3.7V)	31.85	39.85	31.62	39.85	31.41	39.85
TM2	Tnom (25 °C) Vnom (3.7V)	25.91	39.85	25.85	39.85	25.71	39.85
TEST CONDITIONS		Channel4132(B) 826.4MHz		Channel4182(M) 836.4MHz		Channel4233(T) 846.6MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM3	Tnom (25 °C) Vnom (3.7V)	21.85	39.85	21.71	39.85	21.75	39.85
TM4	Tnom (25 °C) Vnom (3.7V)	21.55	39.85	21.45	39.85	21.52	39.85
TM5	Tnom (25 °C) Vnom (3.7V)	21.29	39.85	21.14	39.85	21.22	39.85

6.2.5 Conclusion

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



6.3 Modulation Characteristics

6.3.1 Test Conditions

Table 21 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2/TM3at frequency Middle

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

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

6.3.2.2 Supporting Standards

Table 22 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010	Digital cellular telecommunications system; Mobile Station (MS) conformance specification;
3GPP TS 34.121	Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.3.2.3 Limits

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

Table 23 Limits

Limits	Not applicable
--------	----------------

6.3.3 Test Method and Setup

Connect the Mobile Phone to Wireless Communication Tester R&S CMU200 via the antenna connector. The band class is set as GSM850M and WCDMA850M; the Mobile Phone's output is matched with 50 Ω loads, test method was according to 3GPP TS 51.010 and TS 34.121. The waveform quality and constellation of the Mobile Phone was tested.

Test setup

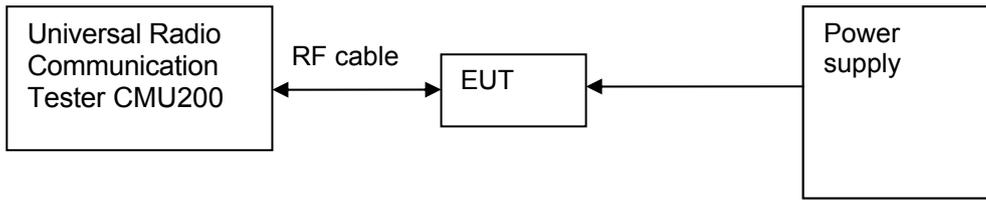


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 24 Measurement Results

		Modulation Characteristic	
TEST CONDITIONS		Channel192(M) 837MHz	
		Measured	
		TM1	TM2
T_{nom} (25 °C)	V_{nom} (3.7V)	Refer to Appendix A	Refer to Appendix A
		Modulation Characteristic	
TEST CONDITIONS		Channel4182(M) 836.4MHz	
		Measured	
		TM3	
T_{nom} (25 °C)	V_{nom} (3.7V)	Refer to Appendix A	

6.3.5 Conclusion

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



6.4 Occupied Bandwidth

6.4.1 Test Conditions

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 at frequency Bottom, Middle, Top

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

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

6.4.2.2 Supporting Standards

Table 26 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010	Digital cellular telecommunications system; Mobile Station (MS) conformance specification;
3GPP TS 34.121	Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.4.2.3 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 27 Limits

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

6.4.3 Test Method and Setup

Mobile Phone was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector. The band class is set as GSM850M and WCDMA850M; Mobile Phone was controlled to transmit maximum power. Measure and record the occupied bandwidth of the Mobile Phone by the R&S FSQ31.

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.

For TM1/TM2 following RBW and VBW are employed:
 Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)
 Video bandwidth (VBW): 10 kHz

For TM3 system following RBW and VBW are employed:
 Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)
 Video bandwidth (VBW): 500 kHz

Test Set-up

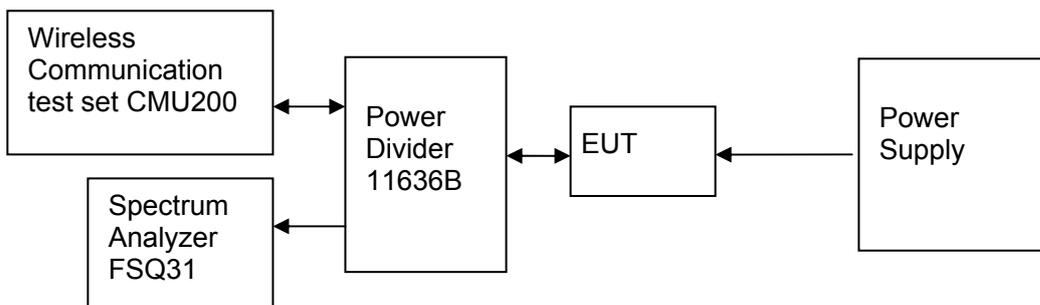


Figure 4. Test Set-up

6.4.4 Measurement Results

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth					
		Channel128 (B) 824.2MHz		Channel192 (M) 837MHz		Channel251 (T) 848.8MHz	
		Measured (kHz)		Measured (kHz)		Measured (kHz)	
		TM1	TM2	TM1	TM2	TM1	TM2
T _{nom} (25 °C)	99%	246.79	243.59	246.79	245.19	243.57	243.59
V _{nom} (3.7V)							
TEST CONDITIONS		Occupied Bandwidth					
		Channel4132(B) 826.4MHz		Channel4182(M) 836.4MHz		Channel4233 (T) 846.6MHz	



		Measured (MHz)	Measured (MHz)	Measured (MHz)
		TM3	TM3	TM3
T_{nom} (25 °C) V_{nom} (3.7V)	99%	4.18	4.18	4.18

6.4.5 Conclusion

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



6.5 Band Edges Compliance

6.5.1 Test Conditions

Table 29 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 at frequency Bottom, Top

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 30 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010	Digital cellular telecommunications system; Mobile Station (MS) conformance specification;
3GPP TS 34.121	Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.5.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P(W)$. (Whereas P is the rated power of the EUT in Watt).

Table 31 Limits

	TM1	TM2	TM3
Rated Power:	33 dBm	27 dBm	24 dBm
Required attenuation:	$43 + 10 \log(2) = 46$, 33 dBm - 46 dB	$43 + 10 \log(0.5) = 40$, 27 dBm - 40 dB	$43 + 10 \log(0.25) = 37$; 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm	- 13 dBm

6.5.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as GSM850M and WCDMA850M. Mobile Phone was controlled to transmit maximum power. Measure and record band edges compliance of the Mobile Phone by the R&S FSQ31.

The limit is -13dBm.

For TM1/TM2 following RBW and VBW are employed:
 Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)
 Video bandwidth (VBW): 10 kHz

For TM3 system following RBW and VBW are employed:
 Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)
 Video bandwidth (VBW): 500 kHz

Test Set-up

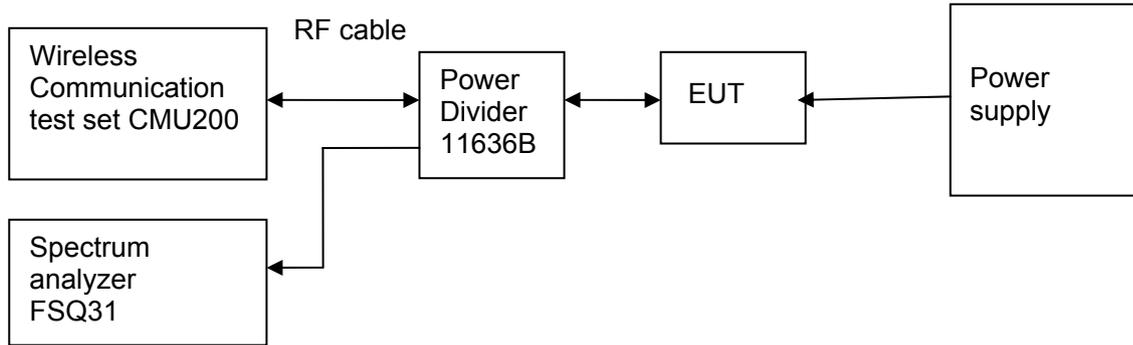


Figure 5. Test Set-up

6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (3.7\text{V})$						
Cellular	824.2	128	TM1	<-13(See appendix C)	- 13 dBm	Pass
	848.8	251	TM1	<-13(See appendix C)	- 13 dBm	Pass
	824.2	128	TM2	<-13(See appendix C)	- 13 dBm	Pass
	848.8	251	TM2	<-13(See appendix C)	- 13 dBm	Pass
	826.4	4132	TM3	<-13(See appendix C)	- 13 dBm	Pass
	846.6	4233	TM3	<-13(See appendix C)	- 13 dBm	Pass

6.5.5 Conclusion

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



6.6 Spurious Emission at Antenna Terminal

6.6.1 Test Conditions

Table 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	50 %
Test Configurations:	TM1/TM2/TM3 at frequency Bottom, Middle, Top

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

6.6.2.2 Supporting Standards

Table 34 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010	Digital cellular telecommunications system; Mobile Station (MS) conformance specification;
3GPP TS 34.121	Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.6.2.3 Limits

Compliance with part 22.917, 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 in Watt).

Table 35 Limits

	TM1	TM2	TM3
Rated Power:	33dBm	27 dBm	24 dBm
Required attenuation:	$43 + 10 \log(2) = 46$, 33 dBm - 46 dB	$43 + 10 \log(0.5) = 40$, 27 dBm - 40 dB	$43 + 10 \log(0.25) = 37$; 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm	- 13 dBm

6.6.3 Test Method and Setup

Mobile Phone was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the

band class is set as GSM850M and WCDMA850M. Mobile Phone was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the Mobile Phone by the R&S FSQ31.

According to part 22.917, the defined measurement bandwidth as following:

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

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;
Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz (GSM)
Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 1 MHz (WCDMA);
Measurement bandwidth (RBW) for 1 GHz up to 12.75 GHz: 1 MHz;

Test Set-up

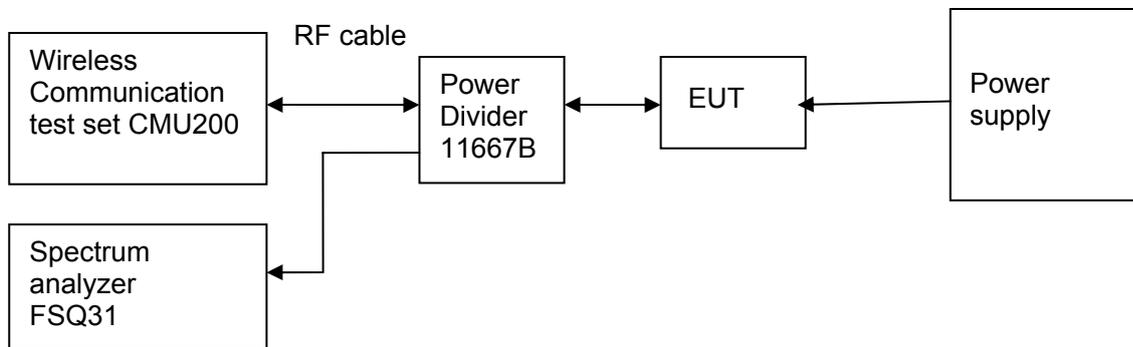


Figure 6. Test Set-up



6.6.4 Measurement Results

Table 36 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 128(B)	TM1	9 kHz~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4132(B)	TM3	9 kHz~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 192(M)	TM1	9 kHz~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4182(M)	TM3	9 kHz~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 251(T)	TM1	9 kHz~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4233(T)	TM3	9 kHz~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass

6.6.5 Conclusion

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



6.7 Frequency Stability

6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 25 °C
Test Configurations:	TM1/TM2/TM3 at frequency Middle

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 38 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010	Digital cellular telecommunications system; Mobile Station (MS) conformance specification;
3GPP TS 34.121	Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.7.2.3 Limits

According to part 22.355, from 821MHz to 896MHz, for mobile device, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5ppm.

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 equipment except that specified in subparagraphs
- (2) and (3) of paragraph 2.1055

(a) 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.

(b) 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. Mobile phone can work normally

from 3.6V to 4.2V, test below is done according to this limit.

(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.

(c) 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) 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.)

The EUT can only work in such extreme voltage 3.6V and 4.2V, so here the EUT is tested in the 3.6V and 4.2V.

Test Set up

Connect the Mobile Phone to the Wireless Communication test set CMU200 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200. The Mobile Phone's output is matched with a 50 Ω load.

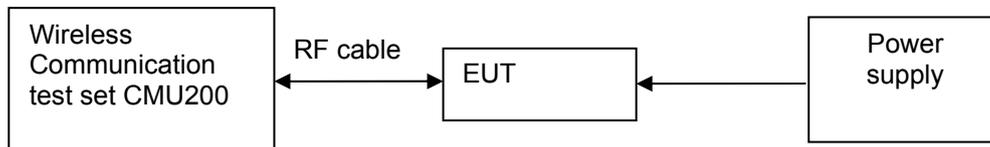


Figure 7. Test Set-up

6.7.4 Measurement Results

6.7.4.1 Measurement Results vs. Variation of Temperature

- **TM1, 3.7V DC Channel No.192(837.0MHz)**

Table 39 Measurement Results vs. Variation of Temperature

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	33	837.0	-11	Pass
-20 °C	33	837.0	-13	Pass
-10 °C	33	837.0	9	Pass
0 °C	33	837.0	-15	Pass
+10 °C	33	837.0	10	Pass
+20 °C	33	837.0	-7	Pass
+30 °C	33	837.0	14	Pass
+40 °C	33	837.0	-2	Pass
+50 °C	33	837.0	12	Pass



● **TM2, 3.7V DC Channel No.192(837.0MHz)**

Table 40 Measurement Results vs. Variation of Temperature

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	27	837.0	-16	Pass
-20 °C	27	837.0	5	Pass
-10 °C	27	837.0	10	Pass
0 °C	27	837.0	-12	Pass
+10 °C	27	837.0	5	Pass
+20 °C	27	837.0	-7	Pass
+30 °C	27	837.0	13	Pass
+40 °C	27	837.0	-11	Pass
+50 °C	27	837.0	-8	Pass

● **TM3, 3.7V DC Channel No.4182(836.4MHz)**

Table 41 Measurement Results vs. Variation of Temperature

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	24	836.4	2	Pass
-20 °C	24	836.4	-10	Pass
-10 °C	24	836.4	-5	Pass
0 °C	24	836.4	12	Pass
+10 °C	24	836.4	-7	Pass
+20 °C	24	836.4	-15	Pass
+30 °C	24	836.4	8	Pass
+40 °C	24	836.4	-11	Pass
+50 °C	24	836.4	3	Pass



6.7.4.2 Measurement Results vs. Variation of Voltage

- **TM1, 25 °C ,Channel No. 192(837.0MHz)**

Table 42 Measurement Results vs. Variation of Voltage

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.6	33	837.0	3	Pass
3.7	33	837.0	-14	Pass
4.2	33	837.0	5	Pass

- **TM2, 25 °C ,Channel No. 192(837.0MHz)**

Table 43 Measurement Results vs. Variation of Voltage

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.6	27	837.0	-11	Pass
3.7	27	837.0	-2	Pass
4.2	27	837.0	15	Pass

- **TM3, 25 °C ,Channel No. 4182(836.4MHz)**

Table 44 Measurement Results vs. Variation of Voltage

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.6	24	836.4	7	Pass
3.7	24	836.4	-10	Pass
4.2	24	836.4	-9	Pass

6.7.5 Conclusion

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



7 System Measurement Uncertainty

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

Table 45 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	ERP (dBm)	U=3dB; k=2
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



8 Appendices

Appendix A	Measurement Results Modulation Characteristics	4 pages
Appendix B	Measurement Results Occupied Bandwidth	10 pages
Appendix C	Measurement Results Band Edges Compliance	7 pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	37 pages

(END OF REPORT)