



RF TEST REPORT

Applicant Mobiwire SAS
FCC ID QPN-HOTAH
Product MobiWire Hotah
Brand MobiWire
Model MobiWire Hotah
Report No. R1809A0432-R1
Issue Date November 23, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2018)/ FCC CFR 47 Part 22H (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Jiangpeng Lan

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000



TABLE OF CONTENT

1. Test Laboratory	4
1.1. Notes of the Test Report	4
1.2. Test facility.....	4
1.3. Testing Location	5
2. General Description of Equipment under Test.....	6
3. Applied Standards.....	8
4. Test Configuration.....	9
5. Test Case Results.....	10
5.1. RF Power Output.....	10
5.2. Effective Radiated Power	12
5.3. Occupied Bandwidth	15
5.4. Band Edge Compliance.....	19
5.5. Peak-to-Average Power Ratio (PAPR)	22
5.6. Frequency Stability	24
5.7. Spurious Emissions at Antenna Terminals	28
5.8. Radiates Spurious Emission	31
6. Main Test Instruments	36
ANNEX A: EUT Appearance and Test Setup.....	37
A.1 EUT Appearance	37
A.2 Test Setup.....	41



Summary of measurement results

No.	Test Type	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Radiated Power	22.913(a)(5)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	2.1051 / 22.917(a)	PASS
5	Peak-to-Average Power Ratio	22.913(d)/ KDB 971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 22.355	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 / 22.917(a)	PASS
8	Radiates Spurious Emission	2.1053 / 22.917 (a)	PASS

Date of Testing: September 24, 2018 ~November 5, 2018

Note: PASS: The EUT complies with the essential requirements in the standard.
FAIL: The EUT does not comply with the essential requirements in the standard.



1. Test Laboratory

1.1. Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com



2. General Description of Equipment under Test

Client Information

Applicant	Mobiwire SAS
Applicant address	79 avenue Francois Arago, 92000 NANTERRE France
Manufacturer	Mobiwire SAS
Manufacturer address	79 avenue Francois Arago, 92000 NANTERRE France

General Information

EUT Description					
Model	MobiWire Hotah				
IMEI	IMEI 1: 352361100000108 IMEI 2: 352361100000116				
Hardware Version	V01				
Software Version	V01				
Power Supply	Battery/AC adapter				
Antenna Type	Internal Antenna				
Test Mode(s)	GSM 850; WCDMA Band V				
Test Modulation	(GSM)GMSK,8PSK; (WCDMA)QPSK;				
GPRS Multislot Class	12				
EGPRS Multislot Class	12				
HSDPA UE Category	24				
HSUPA UE Category	7				
Maximum E.R.P.	GSM 850:	26.34dBm			
	WCDMA Band V:	18.74dBm			
Rated Power Supply Voltage	3.8V				
Extreme Voltage	Minimum: 3.6V Maximum: 4.35V				
Extreme Temperature	Lowest: -20°C Highest: +60°C				
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)		
	GSM850	824 ~ 849	869 ~ 894		
	WCDMA Band V	824 ~ 849	869 ~ 894		
EUT Accessory					
Battery	Manufacturer: Ningbo Veken Battery Co.,LTD Model: 178144515				
Adapter 1	Manufacturer: DongGuan Aohai Power Technology Co.,Ltd Model: A88-502000				
Adapter 2	Manufacturer: Dongguan Aohai Power Technology CO., LTD Model: A824-050200U				
Adapter 3	Manufacturer: Dongguan Aohai Power Technology CO., LTD Model: A70-502000				



Earphone	Manufacturer: Shenzhen Juwei Electronics Co.,Ltd Model: JWEPO752-M01
USB Cable	Manufacturer: Shenzhen Juwei Electronics Co.,Ltd Model: USB2.0 A/M TO TYPE C/M CABLE 1M
Note: The information of the EUT is declared by the manufacturer.	



3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC CFR47 Part 2 (2018)

FCC CFR 47 Part 22H (2018)

ANSI C63.26 (2015)

KDB 971168 D01 Power Meas License Digital Systems v03r01



4. Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (X axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions were investigated. Subsequently, only the worst case emissions are reported.

The following testing in GSM/WCDMA is set based on the maximum RF Output Power.

Test modes are chosen to be reported as the worst case configuration below:

Test items	Modes/Modulation	
	GSM 850	WCDMA Band V
RF power output	GSM GPRS EGPRS	RMC HSDPA/HSUPA DC-HSDPA/HSPA+
Effective Radiated Power	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Occupied Bandwidth	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Band Edge Compliance	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Peak-to-Average Power Ratio	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Frequency Stability	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Spurious Emissions at Antenna Terminals	GSM	RMC
Radiates Spurious Emission	GSM	RMC

5. Test Case Results

5.1. RF Power Output

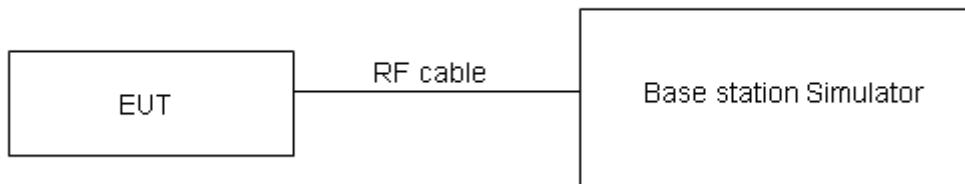
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.

**Test Results**

GSM 850		Conducted Power(dBm)		
		Channel 128	Channel 190	Channel 251
		824.2 (MHz)	836.6 (MHz)	848.8 (MHz)
GSM	Results	32.26	32.20	32.18
GPRS (GMSK)	1TXslot	32.31	32.29	32.27
	2TXslots	31.52	31.45	31.39
	3TXslots	29.63	29.46	29.35
	4TXslots	28.59	28.39	29.24
EGPRS (8PSK)	1TXslot	27.55	27.41	27.73
	2TXslots	26.33	26.40	26.54
	3TXslots	24.49	24.96	24.42
	4TXslots	23.34	23.39	23.53

WCDMA Band V		Conducted Power(dBm)		
		Channel 4132	Channel 4183	Channel 4233
		826.4(MHz)	836.6(MHz)	846.6(MHz)
RMC	12.2k	22.78	22.83	22.66
AMR	12.2k	22.71	22.78	22.58
HSDPA	Sub - Test 1	22.24	22.25	22.10
	Sub - Test 2	22.23	22.27	22.07
	Sub - Test 3	21.70	21.77	21.59
	Sub - Test 4	21.71	21.78	21.57
HSUPA	Sub - Test 1	22.20	22.24	22.05
	Sub - Test 2	21.19	21.22	21.04
	Sub - Test 3	21.66	21.70	21.53
	Sub - Test 4	21.12	21.19	21.01
	Sub - Test 5	22.13	22.17	21.99
DC-HSDPA	Sub - Test 1	22.12	22.19	22.00
	Sub - Test 2	22.11	22.18	21.99
	Sub - Test 3	21.69	21.67	21.50
	Sub - Test 4	21.68	21.66	21.49
HSPA+	16QAM	21.67	21.74	21.56



5.2. Effective Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

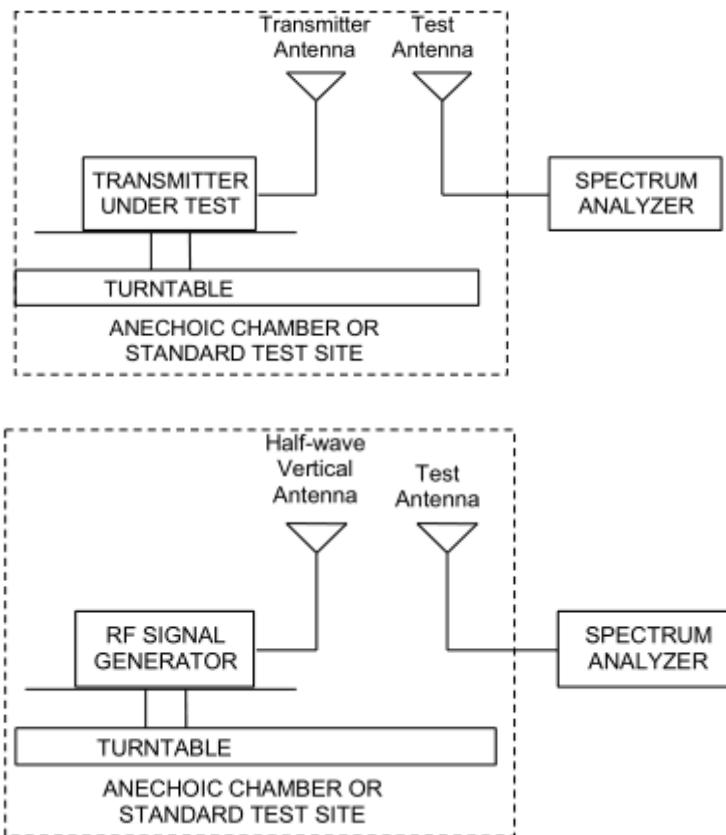
The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).

- a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
- b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
- c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
- d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.
$$\text{LOSS} = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$$
- e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:
$$\text{ERP (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$$
- f) The maximum ERP is the maximum value determined in the preceding step.
- g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g. transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:
$$\text{EIRP (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBd)}$$
where: dBd refers to gain relative to an ideal dipole.

$$\text{EIRP (dBm)} = \text{ERP (dBm)} + 2.15 \text{ (dB.)}$$

The RB allocation refers to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 22.913(a)(5) specifies that "Mobile/portable stations are limited to 7 watts ERP".

Limit	$\leq 7 \text{ W (38.45 dBm)}$
-------	--------------------------------

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 1.19 \text{ dB}$

**Test Results:**

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

Mode	Channel	Frequency (MHz)	Polarization	ERP (dBm)	Limit (dBm)	Conclusion
GSM 850	Low	824.2	Horizontal	26.25	38.45	Pass
	Mid	836.6	Horizontal	26.29	38.45	Pass
	High	848.8	Horizontal	26.30	38.45	Pass
GPRS 850	Low	824.2	Horizontal	26.34	38.45	Pass
	Mid	836.6	Horizontal	26.31	38.45	Pass
	High	848.8	Horizontal	26.32	38.45	Pass
EGPRS 850	Low	824.2	Horizontal	25.91	38.45	Pass
	Mid	836.6	Horizontal	26.00	38.45	Pass
	High	848.8	Horizontal	26.03	38.45	Pass
WCDMA Band V	Low	826.4	Horizontal	18.49	38.45	Pass
	Mid	836.6	Horizontal	18.69	38.45	Pass
	High	846.6	Horizontal	18.74	38.45	Pass

5.3. Occupied Bandwidth

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

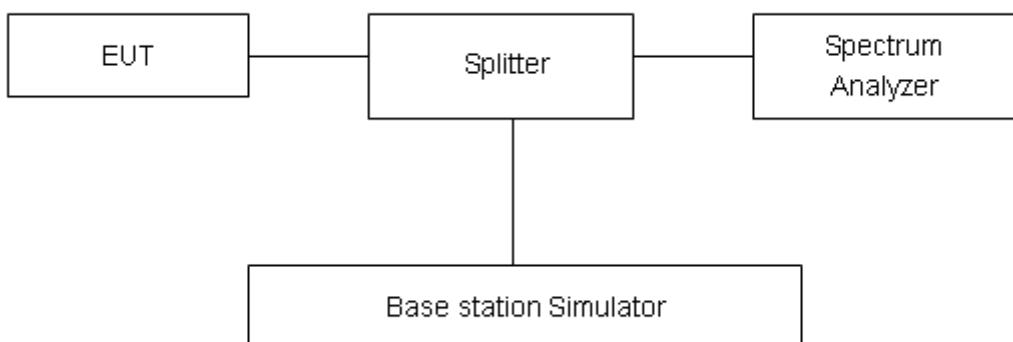
The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to 3kHz, VBW is set to 10kHz for GSM 850,

RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band V,

99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

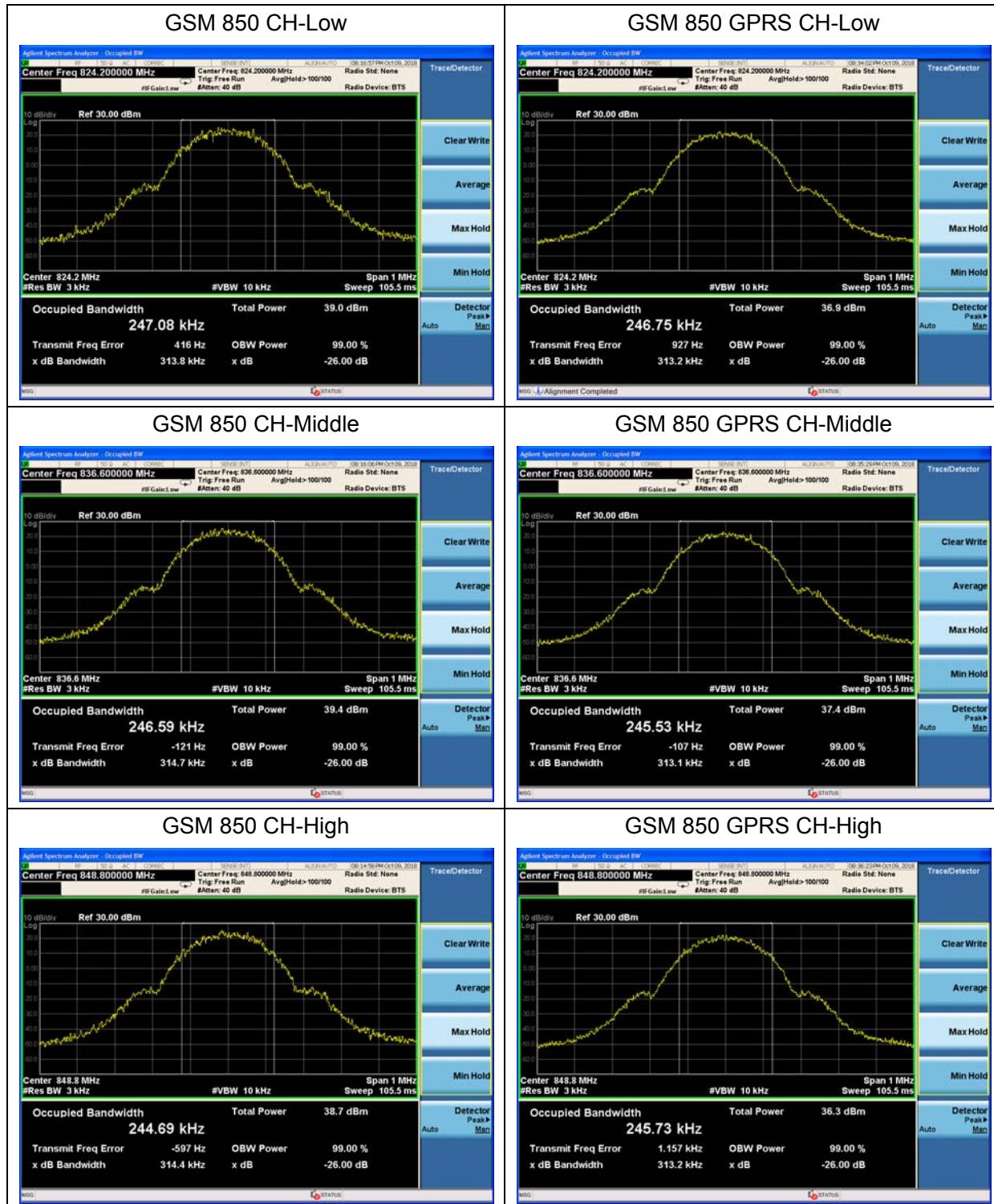
No specific occupied bandwidth requirements in part 2.1049.

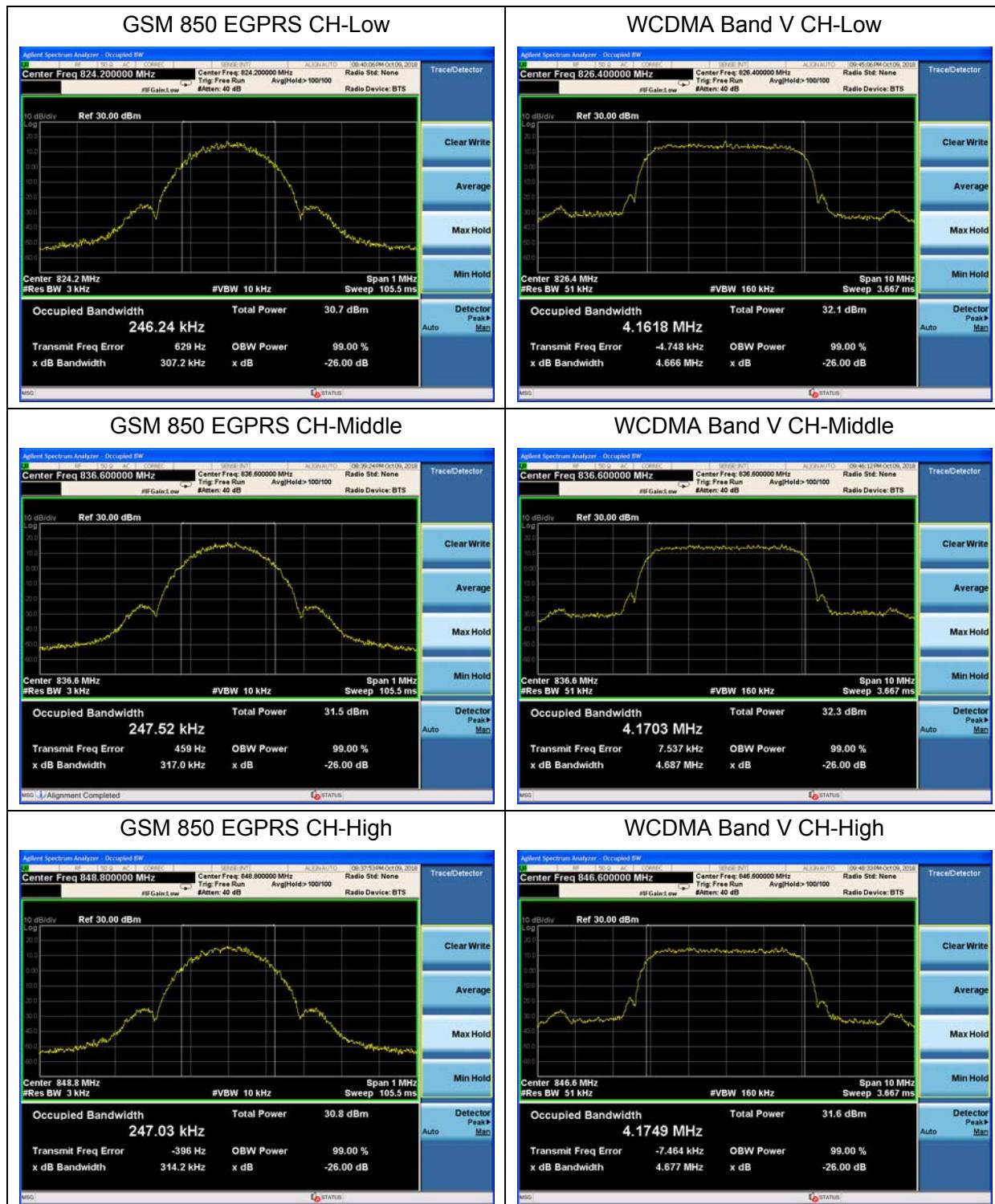
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 624\text{Hz}$.

**Test Result**

Mode	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
GSM 850 (GSM)	128	824.2	0.24708	0.3138
	190	836.6	0.24659	0.3147
	251	848.8	0.24469	0.3144
GPRS 850 (GMSK)	128	824.2	0.24675	0.3132
	190	836.6	0.24553	0.3131
	251	848.8	0.24573	0.3132
EGPRS 850 (8-PSK)	128	824.2	0.24624	0.3072
	190	836.6	0.24752	0.317
	251	848.8	0.24703	0.3142
WCDMA Band V (RMC)	4132	826.4	4.1618	4.666
	4183	836.6	4.1703	4.687
	4233	846.6	4.1749	4.677





5.4. Band Edge Compliance

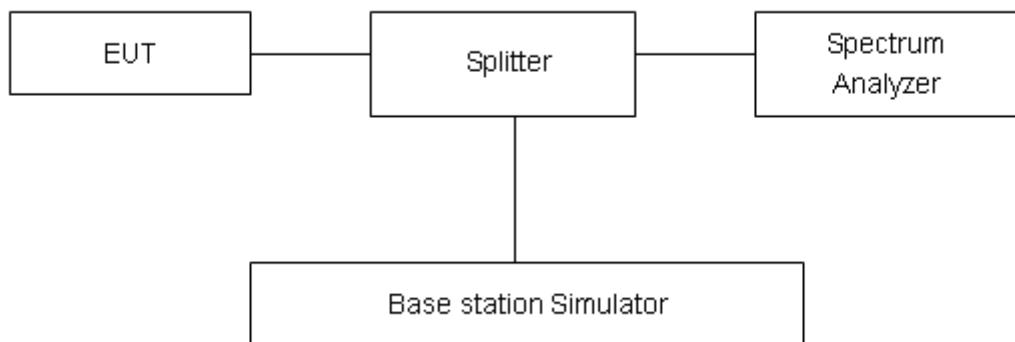
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The average detector is used. RBW is set to 3kHz,VBW is set to 10kHz for GSM 850, RBW is set to 51kHz,VBW is set to 160kHz for WCDMA Band V, Spectrum analyzer plots are included on the following pages.

Test Setup



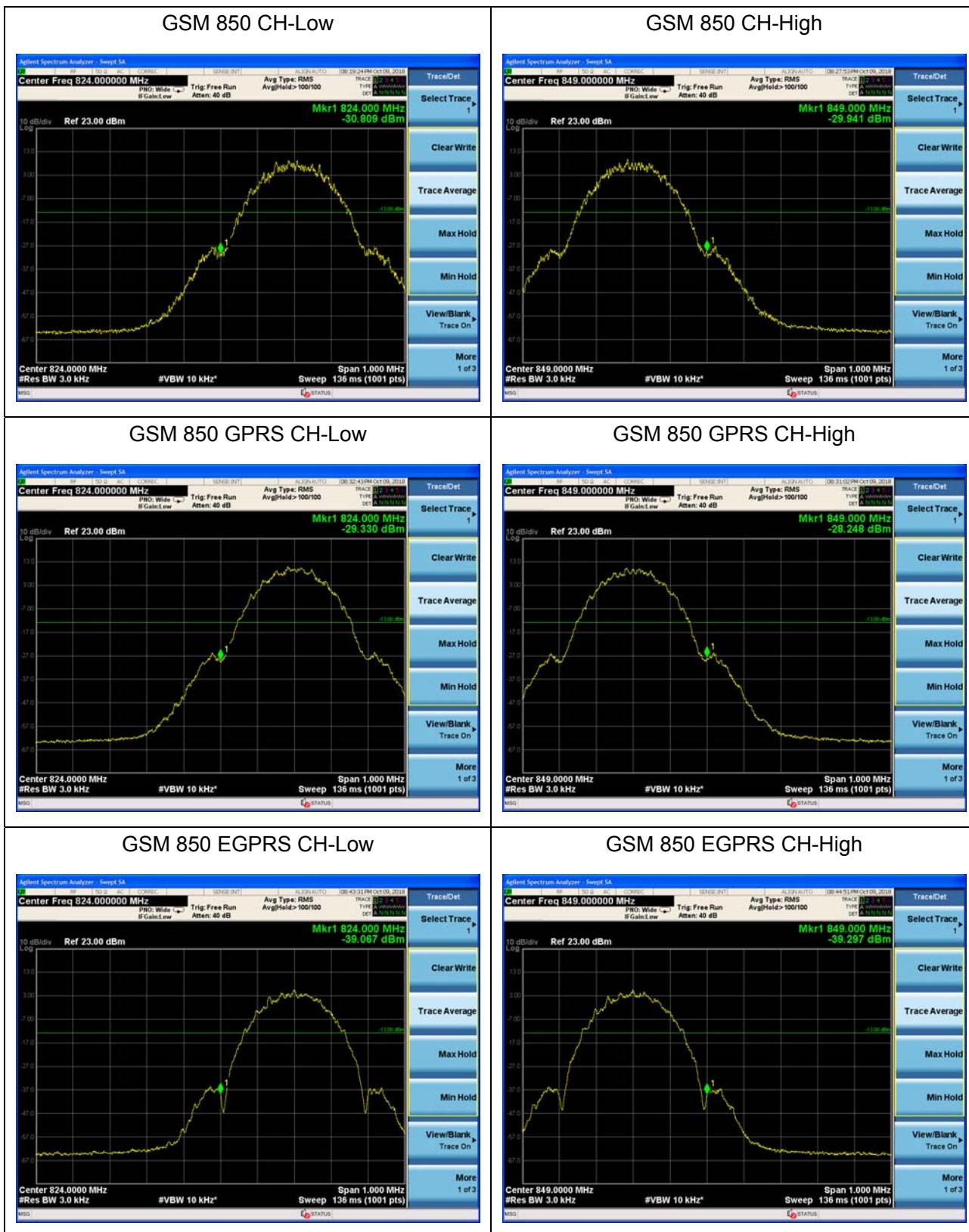
Limits

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P) \text{ dB}$.”

Limit	-13 dBm
-------	---------

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U=0.684\text{dB}$.

**Test Result:**



WCDMA Band V CH-Low



WCDMA Band V CH-High



5.5. Peak-to-Average Power Ratio (PAPR)

Ambient condition

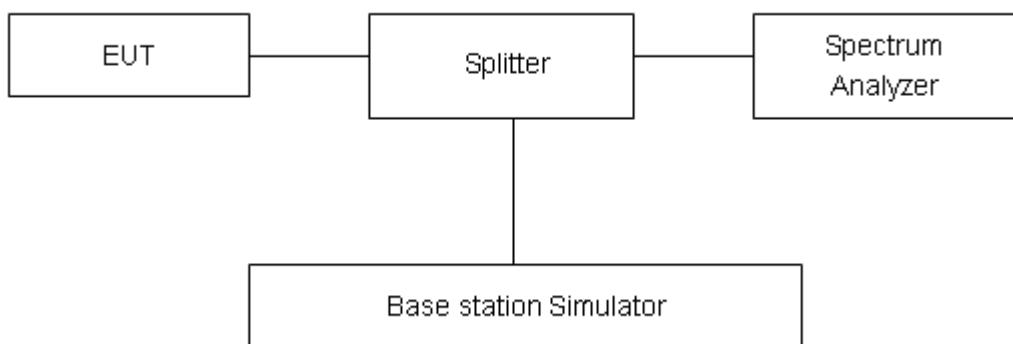
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as P_{Pk} . And measure the total average power and record as P_{Avg} . Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$\text{PAPR (dB)} = P_{Pk} (\text{dBm}) - P_{Avg} (\text{dBm}).$$

Test Setup



Limits

According to the Sec. 22.913(d), The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.

**Test Results**

Mode	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
GSM 850 (GSM)	128	824.2	33.21	32.26	0.95	≤13	PASS
	190	836.6	33.19	32.20	0.99	≤13	PASS
	251	848.8	33.18	32.18	1.00	≤13	PASS
GPRS 850 (GMSK)	128	824.2	29.57	28.59	0.98	≤13	PASS
	190	836.6	29.40	28.39	1.01	≤13	PASS
	251	848.8	30.21	29.24	0.97	≤13	PASS
EGPRS 850 (8-PSK)	128	824.2	24.32	23.34	0.98	≤13	PASS
	190	836.6	24.33	23.39	0.94	≤13	PASS
	251	848.8	24.58	23.53	1.05	≤13	PASS
WCDMA Band V (RMC)	4132	826.4	25.96	22.78	3.18	≤13	PASS
	4183	836.6	26.11	22.83	3.28	≤13	PASS
	4233	846.6	25.89	22.66	3.23	≤13	PASS

5.6. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -30°C to +60°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -30°C to +60°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements. Frequency Stability (Voltage Variation)

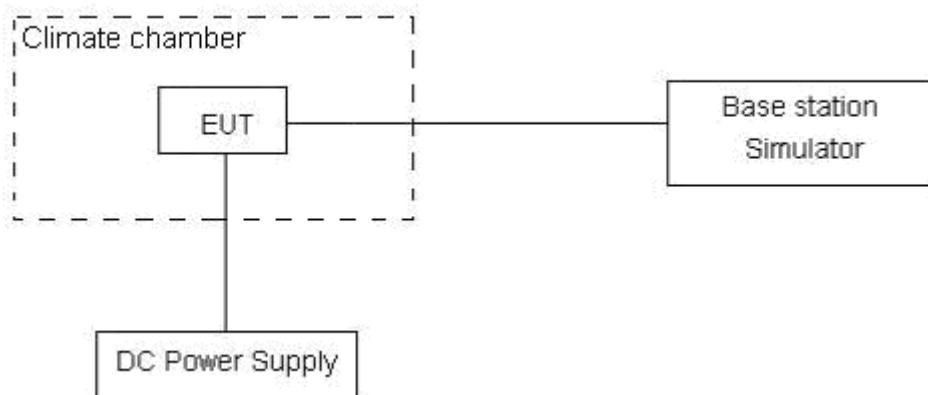
The frequency stability shall be measured with variation of primary supply voltage as follows:

(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.

This transceiver is specified to operate with an input voltage of between 3.6 V and 4.35 V, with a nominal voltage of 3.8V.

Test setup





Limits

According to the Sec. 22.355, the frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency for mobile stations.

Limits	$\leq 2.5 \text{ ppm}$
--------	------------------------

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 3$, $U = 0.01\text{ppm}$.



Test Result

GSM 850					
Condition		824	849	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal (25°C)	Normal	824.0689	848.9736	-15.32	-0.01831
Extreme (60°C)		824.0687	848.9734	-18.54	-0.02216
Extreme (50°C)		824.0675	848.9722	-19.55	-0.02337
Extreme (40°C)		824.0688	848.9735	-16.75	-0.02002
Extreme (30°C)		824.0677	848.9724	-19.39	-0.02318
Extreme (20°C)		824.0676	848.9723	-21.42	-0.02560
Extreme (10°C)		824.0686	848.9733	-23.01	-0.02750
Extreme (0°C)		824.0677	848.9724	-20.57	-0.02459
Extreme (-10°C)		824.0685	848.9732	-18.76	-0.02242
Extreme (-20°C)		824.0678	848.9725	-17.73	-0.02119
Extreme (-30°C)		824.0684	848.9731	-21.49	-0.02569
25C	LV	824.0681	848.9728	-15.63	-0.01868
	HV	824.0690	848.9737	-14.37	-0.01718
GPRS 850					
Condition		824	849	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal (25°C)	Normal	824.0654	848.9658	3.24	0.00387
Extreme (60°C)		824.0652	848.9656	6.43	0.00769
Extreme (50°C)		824.0640	848.9644	7.51	0.00898
Extreme (40°C)		824.0653	848.9657	9.15	0.01094
Extreme (30°C)		824.0642	848.9646	2.48	0.00296
Extreme (20°C)		824.0641	848.9645	6.28	0.00751
Extreme (10°C)		824.0651	848.9655	3.01	0.00360
Extreme (0°C)		824.0642	848.9646	11.65	0.01393
Extreme (-10°C)		824.0650	848.9654	10.89	0.01302
Extreme (-20°C)		824.0643	848.9647	8.99	0.01075
Extreme (-30°C)		824.0649	848.9653	4.73	0.00565
25C	LV	824.0646	848.9650	5.38	0.00643
	HV	824.0655	848.9659	4.96	0.00593
EGPRS 850					
Condition		824	849	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal (25°C)	Normal	824.0782	848.9396	12.32	0.01473



Extreme (60C)		824.0780	848.9394	16.57	0.01981
Extreme (50°C)		824.0768	848.9382	14.26	0.01705
Extreme (40°C)		824.0781	848.9395	14.38	0.01719
Extreme (30°C)		824.0770	848.9384	18.97	0.02268
Extreme (20°C)		824.0769	848.9383	16.54	0.01977
Extreme (10C)		824.0779	848.9393	12.43	0.01486
Extreme (0°C)		824.0770	848.9384	19.82	0.02369
Extreme (-10°C)		824.0778	848.9392	15.66	0.01872
Extreme (-20°C)		824.0771	848.9385	17.31	0.02069
Extreme (-30°C)		824.0777	848.9391	11.28	0.01348
25C	LV	824.0774	848.9388	13.75	0.01644
	HV	824.0783	848.9397	15.69	0.01875

WCDMA Band 5					
Condition		824	849	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal (25°C)	Normal	824.0321	848.9679	-2.03	-0.00243
Extreme (60°C)		824.0289	848.9690	-3.85	-0.00460
Extreme (50°C)		824.0328	848.9651	-11.32	-0.01353
Extreme (40°C)		824.0309	848.9672	-8.49	-0.01015
Extreme (30°C)		824.0323	848.9656	-3.77	-0.00451
Extreme (20°C)		824.0317	848.9662	-5.84	-0.00698
Extreme (10C)		824.0304	848.9675	-7.06	-0.00844
Extreme (0°C)		824.0297	848.9682	-7.02	-0.00839
Extreme (-10°C)		824.0318	848.9661	-3.44	-0.00411
Extreme (-20°C)		824.0306	848.9673	-5.28	-0.00631
Extreme (-30°C)		824.0319	848.9662	-6.20	-0.00741
25C	LV	824.0316	848.9663	-5.26	-0.00629
	HV	824.0313	848.9669	-3.68	-0.00440

5.7. Spurious Emissions at Antenna Terminals

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

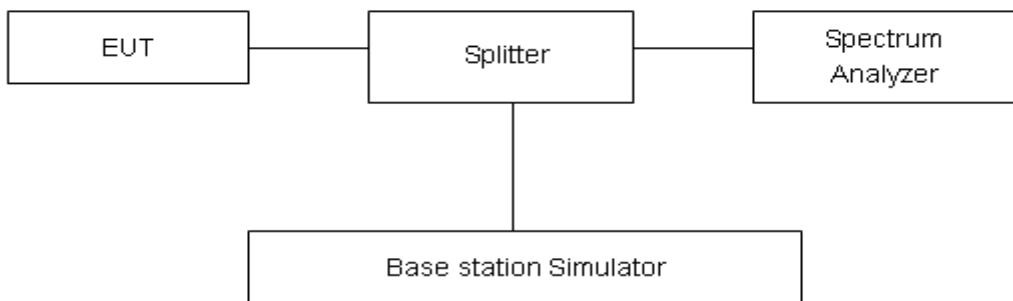
Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier.

The peak detector is used. RBW are set to 100 kHz and VBW are set to 300 kHz for below 1G, RBW are set to 1MHz and VBW are set to 3MHz for above 1G, Sweep is set to ATUO.

The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.”

Limit	-13 dBm

Measurement Uncertainty

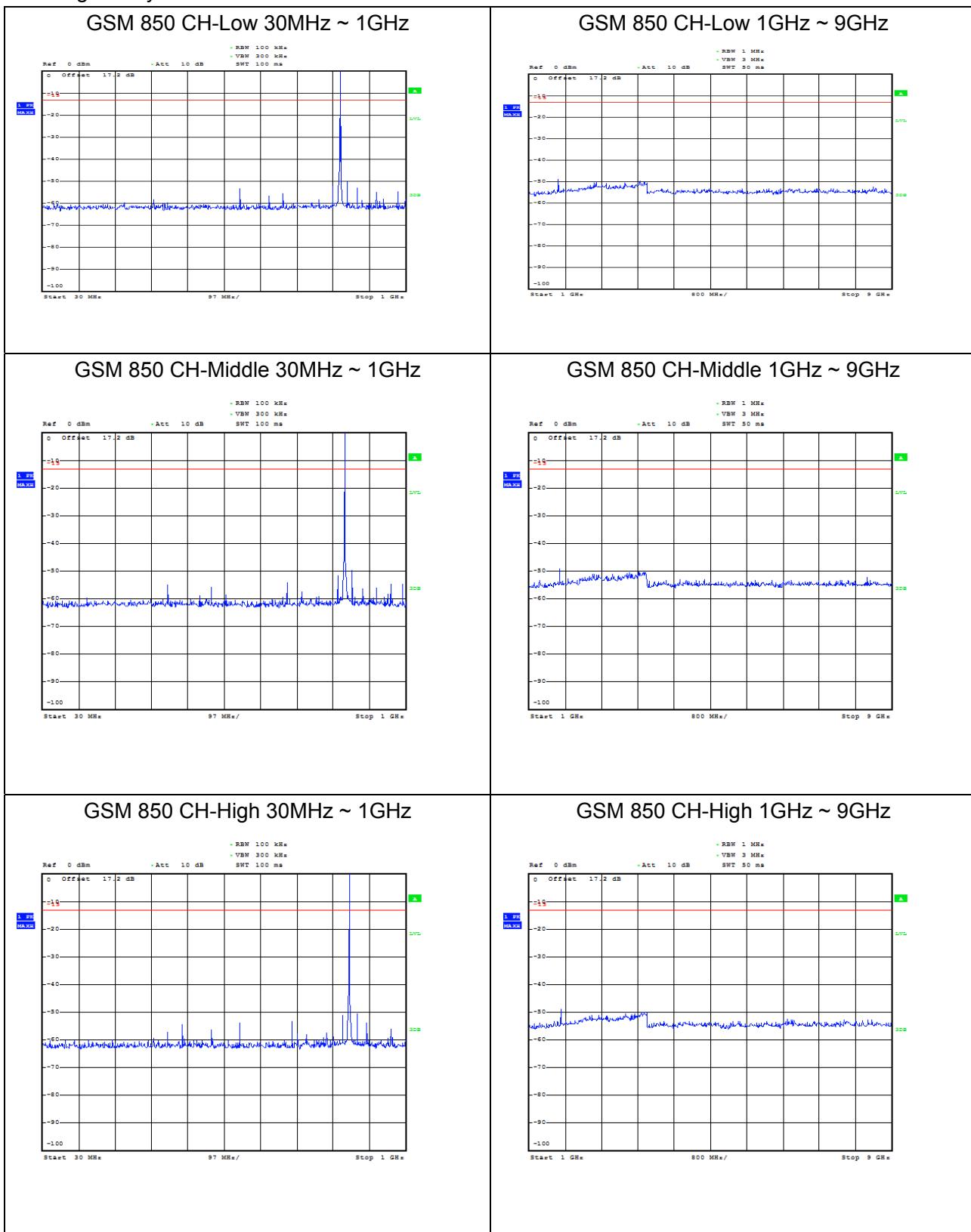
The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-18GHz	1.407 dB

Test Result

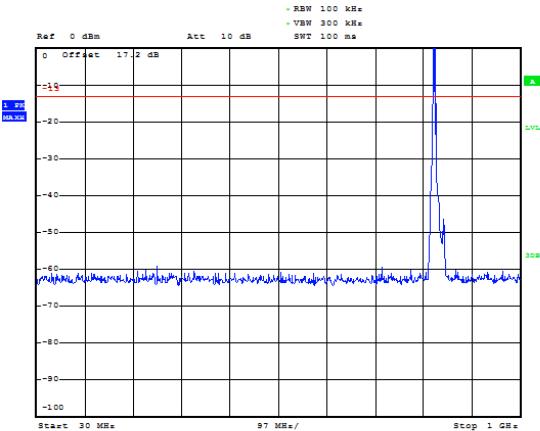
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

The signal beyond the limit is carrier.

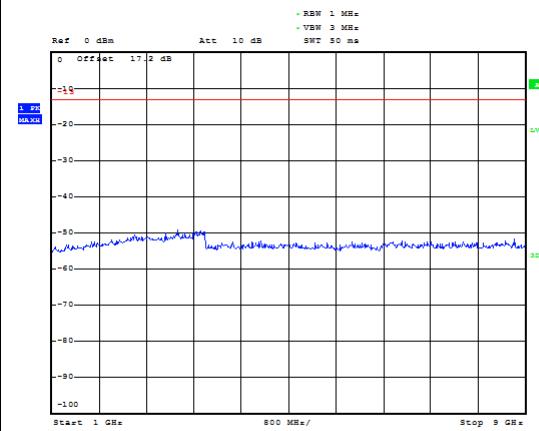




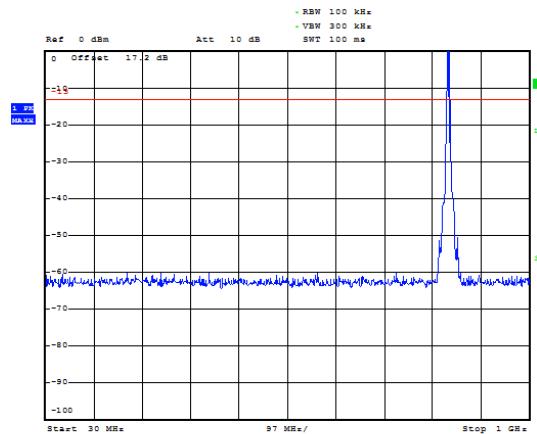
WCDMA Band V CH-Low 30MHz ~ 1GHz



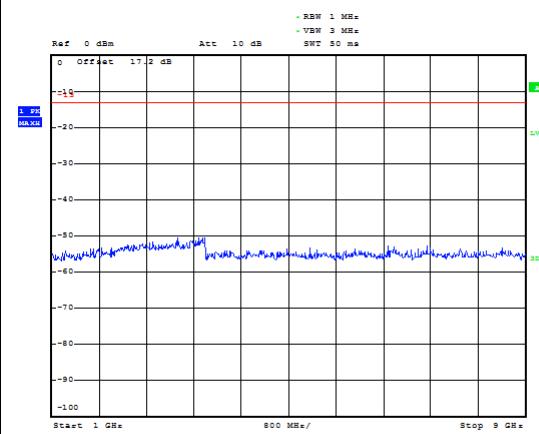
WCDMA Band V CH-Low 1GHz ~ 9GHz



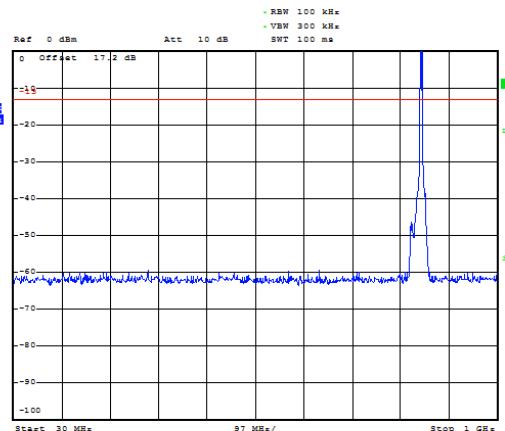
WCDMA Band V CH-Middle 30MHz ~ 1GHz



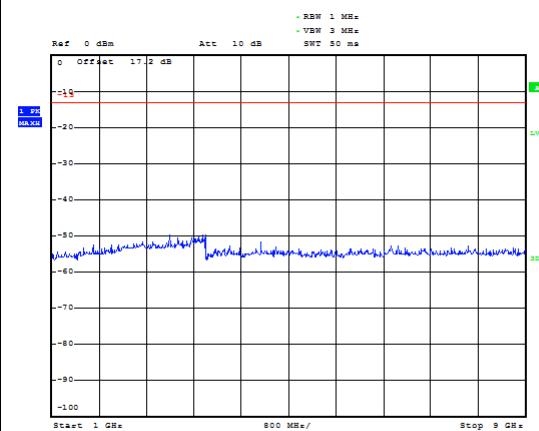
WCDMA Band V CH-Middle 1GHz ~ 9GHz



WCDMA Band V CH-High 30MHz ~ 1GHz



WCDMA Band V CH-High 1GHz ~ 9GHz





5.8. Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

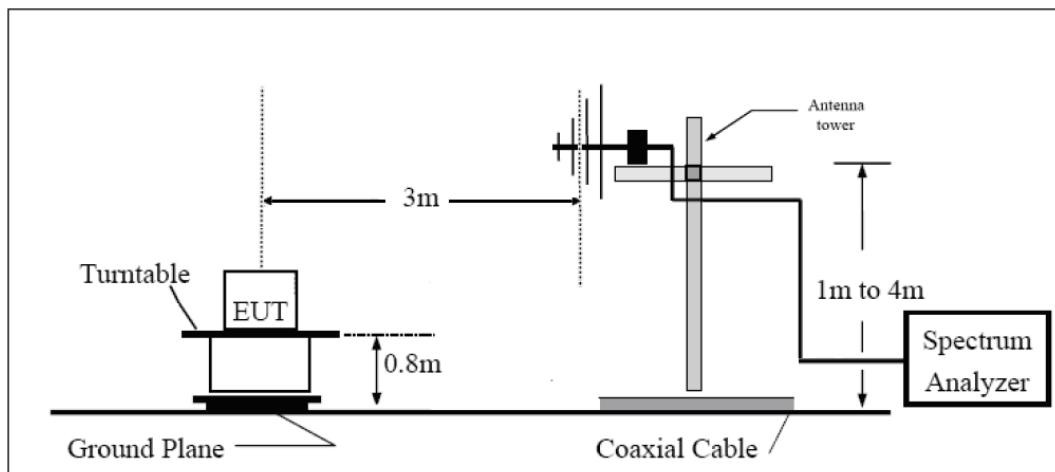
1. The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).
2. Above 30MHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl), the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:
Power(EIRP)=PMea- PAg - Pcl + Ga
- The measurement results are amend as described below:
Power(EIRP)=PMea- Pcl + Ga
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi)

and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

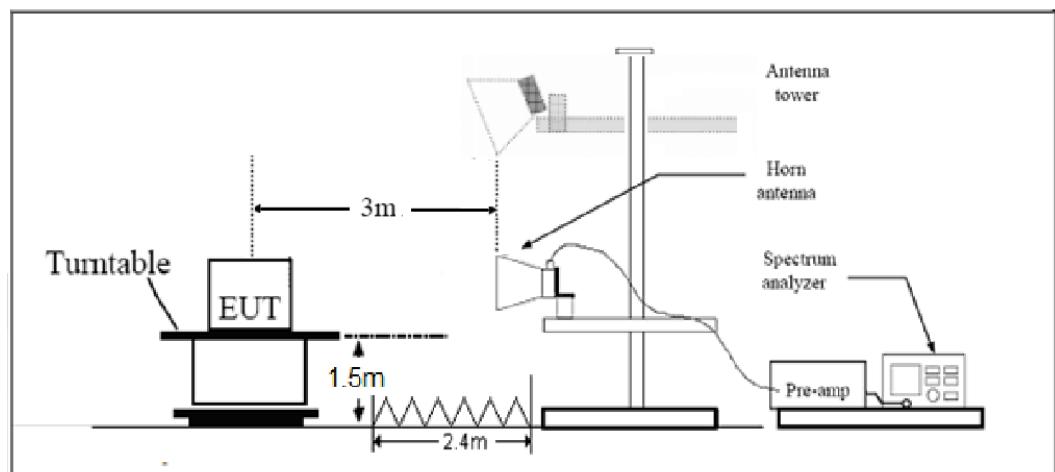
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Rule Part 22.917(a) specifies that "The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P) \text{ dB}$."

Limit	-13 dBm
-------	---------

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 3.55 \text{ dB}$.



Test Result

Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

GSM 850 CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673	-55.31	2.00	10.75	Horizontal	-48.71	-13.00	35.71	135
3	2498	-46.35	2.51	11.05	Horizontal	-39.96	-13.00	26.96	180
4	3297	-58.52	4.20	10.85	Horizontal	-54.02	-13.00	41.02	180
5	4121	-57.67	5.20	11.35	Horizontal	-53.67	-13.00	40.67	225
6	4945	-58.98	5.50	11.95	Horizontal	-54.68	-13.00	41.68	90
7	5769	-60.24	5.70	13.55	Horizontal	-54.54	-13.00	41.54	225
8	6594	-53.54	6.30	13.75	Horizontal	-48.24	-13.00	35.24	90
9	7418	-53.94	6.80	13.85	Horizontal	-49.04	-13.00	36.04	180
10	8242	-53.54	6.90	14.25	Horizontal	-48.34	-13.00	35.34	225

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

GSM 850 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1648	-56.29	2.00	10.15	Horizontal	-50.29	-13.00	37.29	315
3	2473	-46.72	2.51	11.35	Horizontal	-40.03	-13.00	27.03	225
4	3346	-60.64	4.20	11.15	Horizontal	-55.84	-13.00	42.84	45
5	4183	-60.60	5.20	11.15	Horizontal	-56.80	-13.00	43.80	180
6	5020	-58.00	5.50	11.95	Horizontal	-53.70	-13.00	40.70	270
7	5856	-58.37	5.70	13.55	Horizontal	-52.67	-13.00	39.67	315
8	6693	-52.94	6.30	13.75	Horizontal	-47.64	-13.00	34.64	225
9	7529	-54.84	6.80	13.85	Horizontal	-49.94	-13.00	36.94	90
10	8366	-53.36	6.90	14.25	Horizontal	-48.16	-13.00	35.16	180

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.



GSM 850 CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1698	-58.96	2.00	10.15	Horizontal	-52.96	-13.00	39.96	225
3	2546	-41.52	2.51	11.05	Horizontal	-35.13	-13.00	22.13	90
4	3395	-61.08	4.20	11.15	Horizontal	-56.28	-13.00	43.28	225
5	4244	-61.33	5.20	11.15	Horizontal	-57.53	-13.00	44.53	45
6	5093	-57.54	5.50	11.95	Horizontal	-53.24	-13.00	40.24	180
7	5942	-58.26	5.70	13.55	Horizontal	-52.56	-13.00	39.56	90
8	6790	-52.95	6.30	13.75	Horizontal	-47.65	-13.00	34.65	180
9	7639	-53.97	6.80	13.85	Horizontal	-49.07	-13.00	36.07	225
10	8488	-54.90	6.90	14.25	Horizontal	-49.70	-13.00	36.70	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

WCDMA Band V CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1653	-64.93	2.00	10.15	Horizontal	-58.93	-13.00	45.93	225
3	2479	-61.04	2.51	11.35	Horizontal	-54.35	-13.00	41.35	45
4	3306	-64.88	4.20	10.85	Horizontal	-60.38	-13.00	47.38	45
5	4132	-61.38	5.20	11.35	Horizontal	-57.38	-13.00	44.38	225
6	4958	-59.42	5.50	11.95	Horizontal	-55.12	-13.00	42.12	135
7	5785	-59.26	5.70	13.55	Horizontal	-53.56	-13.00	40.56	180
8	6611	-57.35	6.30	13.75	Horizontal	-52.05	-13.00	39.05	225
9	7438	-53.91	6.80	13.85	Horizontal	-49.01	-13.00	36.01	90
10	8264	-53.36	6.90	14.25	Horizontal	-48.16	-13.00	35.16	180

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.



WCDMA Band V CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673	-65.07	2.00	10.75	Horizontal	-58.47	-13.00	45.47	180
3	2510	-62.04	2.51	11.05	Horizontal	-55.65	-13.00	42.65	90
4	3346	-64.48	4.20	11.15	Horizontal	-59.68	-13.00	46.68	225
5	4183	-58.72	5.20	11.15	Horizontal	-54.92	-13.00	41.92	90
6	5020	-58.75	5.50	11.95	Horizontal	-54.45	-13.00	41.45	225
7	5856	-60.18	5.70	13.55	Horizontal	-54.48	-13.00	41.48	90
8	6693	-56.62	6.30	13.75	Horizontal	-51.32	-13.00	38.32	180
9	8366	-54.13	6.80	13.85	Horizontal	-49.23	-13.00	36.23	225
10	3346	-53.91	6.90	14.25	Horizontal	-48.71	-13.00	35.71	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

WCDMA Band V CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1693	-62.27	2.00	10.15	Horizontal	-56.27	-13.00	43.27	180
3	2540	-62.35	2.51	11.05	Horizontal	-55.96	-13.00	42.96	225
4	3386	-64.47	4.20	11.15	Horizontal	-59.67	-13.00	46.67	180
5	4233	-60.15	5.20	11.15	Horizontal	-56.35	-13.00	43.35	270
6	5080	-58.05	5.50	11.95	Horizontal	-53.75	-13.00	40.75	315
7	5926	-58.46	5.70	13.55	Horizontal	-52.76	-13.00	39.76	225
8	6773	-56.49	6.30	13.75	Horizontal	-51.19	-13.00	38.19	90
9	7619	-54.31	6.80	13.85	Horizontal	-49.41	-13.00	36.41	180
10	8466	-55.42	6.90	14.25	Horizontal	-50.22	-13.00	37.22	225

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.



6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113824	2018-05-20	2019-05-19
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Agilent	N9010A	MY50210259	2018-05-20	2019-05-19
Universal Radio Communication Tester	Agilent	E5515C	MY48367192	2018-05-20	2019-05-19
Signal Analyzer	R&S	FSV30	100815	2017-12-17	2018-12-16
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-09-26	2019-09-25
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
Signal generator	R&S	SMB 100A	102594	2018-05-20	2019-05-19
Climatic Chamber	ESPEC	SU-242	93000506	2017-12-17	2020-12-16
Preamplifier	R&S	SCU18	102327	2018-05-20	2019-05-19
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2018-05-21	2019-05-20
RF Cable	Agilent	SMA 15cm	0001	/	/
Software	R&S	EMC32	9.26.0	/	/

*****END OF REPORT*****

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance



Front Side



Back Side

a: EUT



Adapter 1



Adapter 2



Adapter 3

b: Adapter



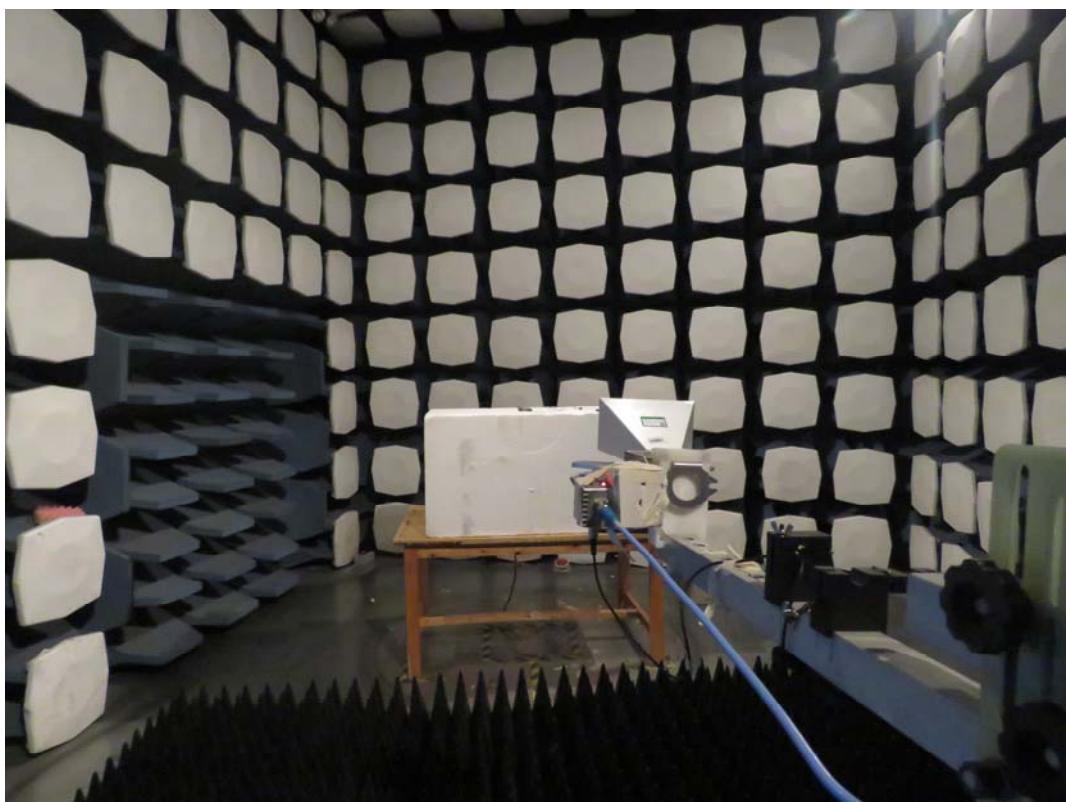
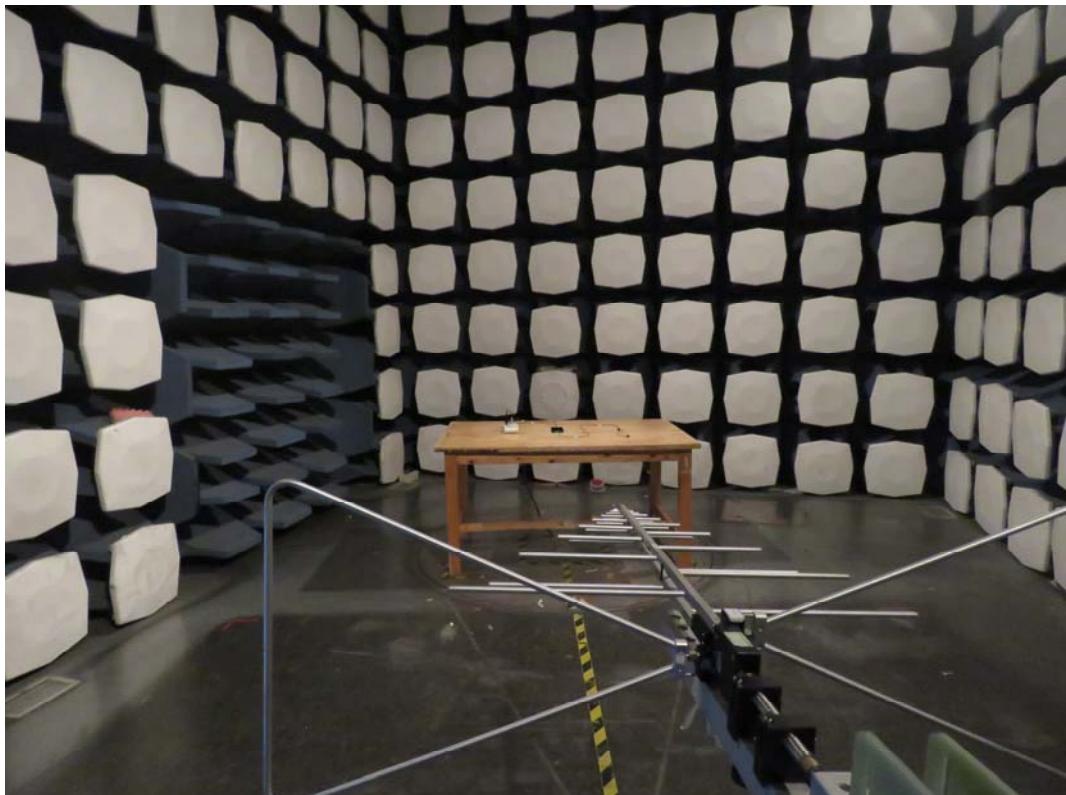
c. Earphone



d. USB Cable

Picture 1 EUT and Accessory

A.2 Test Setup



Picture 2: Radiated Spurious Emissions Test setup