FCC
RF Test Report

Product Name: Fixed Wireless Terminal

Model Number: F258,H258C

Report No: SYBH(Z-RF)031012015-2001

FCC ID：QISF256-BVW

Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

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Notice

1. The laboratory has Passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.

2. The laboratory has Passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.

3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements. The site recognition number is 97456.

4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-2.

5. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

6. The test report is invalid if there is any evidence of erasure and/or falsification.

7. The test report is only valid for the test samples.

8. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

Date of Receipt Sample:	2015-02-06
Start Date of Test:	2015-02-06
End Date of Test:	2015-02-07

Test Result: Pass

Approved by Senior Engineer:	2015-02-08	Liu Chunlin	Liu Chunlin
	Date	Name	Signature

Prepared by:	2015-02-08	Feng Nianwei	Feng Nianwei
	Date	Name	Signature

Modification Record

No.	Last Report No.	Modification Description
1		First report.

CONTENT

1 General Information

1.1 Applied Standard

Applied Rules:	47 CFR FCC Part 02:2013 47 CFR FCC Part 22: 2013 47 CFR FCC Part 24: 2013
Test Method:	FCC KDB 971168 D01 Power Meas License Digital Systems v02r02

1.2 Test Location

Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

1.3 Test Environment Condition

Ambient Temperature:	19.5 to 25 °C
Ambient Relative Humidity:	40 to 55 %
Atmospheric Pressure:	Not applicable

2 Test Summary

2.1 Cellular Band (824-849 MHz paired with 869-894 MHz)

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (NOTE 1)
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913	FCC: ERP ≤ 7 W.	Appendix A	SYBH(Z-RF)024022014-2001
Modulation Characteristics	§2.1047	Digital modulation	Appendix C	SYBH(Z-RF)024022014-2001
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Appendix D	SYBH(Z-RF)024022014-2001
Band Edges Compliance	§2.1051, §22.917	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix E	SYBH(Z-RF)024022014-2001
Spurious Emission at Antenna Terminals	§2.1051, §22.917	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Appendix F	SYBH(Z-RF)024022014-2001
Field Strength of Spurious Radiation	§2.1053, §22.917	FCC: ≤ -13 dBm/100 kHz.	Appendix G	PASS
Frequency Stability	§2.1055, §22.355	≤ ±2.5ppm.	Appendix H	SYBH(Z-RF)024022014-2001
NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” denotes “not tested”. NOTE 2: We do not test the F258/H258C except RSE refer to SYBH(Z-RF)024022014-2001 of F256-B/F256-BVW RF report.				

2.2 PCS Band (1850-1910 MHz paired with 1930-1990 MHz)

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (NOTE 1)
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232	EIRP ≤ 2 W	Appendix A	SYBH(Z-RF)024022014-2001
Peak-Average Ratio	§2.1046, §24.232	FCC: Limit≤13 dB	Appendix B	SYBH(Z-RF)024022014-2001
Modulation Characteristics	§2.1047	Digital modulation	Appendix C	SYBH(Z-RF)024022014-2001
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Appendix D	SYBH(Z-RF)024022014-2001
Band Edges Compliance	§2.1051, §24.238	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix E	SYBH(Z-RF)024022014-2001
Spurious Emission at Antenna Terminals	§2.1051, §24.238	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Appendix F	SYBH(Z-RF)024022014-2001
Field Strength of Spurious Radiation	§2.1053, §24.238	≤ -13 dBm/1 MHz.	Appendix G	PASS
Frequency Stability	§2.1055, §24.235	FCC: within authorized frequency block.	Appendix H	SYBH(Z-RF)024022014-2001
NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” denotes “not tested”. NOTE 2: We do not test the F258/H258C except RSE refer to SYBH(Z-RF)024022014-2001 of F256-B/F256-BVW RF report.				

3 Description of the Equipment under Test (EUT)

3.1 General Description

F258/H258C is a CDMA Fixed Wireless Terminal. It's operated in Band Class 0 and Band Class 1. The Wireless Terminal implements such functions as RF signal receiving / Transmitting, CDMA protocol processing, voice etc. The TX is 824MHz-849MHz, the RX is 869MHz-894MHz for Band Class 0; the TX is 1850MHz-1910MHz, the RX is 1930MHz-1990MHz for Band Class 1. It supports A-GPS service and CDMA2000 1X advanced. Externally it provides USB interface (to computers for upgrade), antenna interface, RJ11 ports and power interface.

Note: F258 and F256-B have the same PCB layout and enclosure, the difference is: they have different enclosure and adapters.

The following table shows the 2 Models.

	F258	F256-B
CDMA BC 0 and BC 1	support	support
external antenna	The same	The same
PCB layout and PCB design	The same	The same
Adapters	HW-120050U1W	CNR2260
battery	The same	The same
USB port	The same	The same
RJ11 ports	The same	The same
enclosure and ID appearance	Not the same	Not the same
Other Accessory	no	no

3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

3.2.1 Board

Board		
Serial Number	Model Name	Description
FXD0115115000299	F256-B,F256-BVW	Main Board

3.2.2 Sub-Assembly Identity

Name	Manufacture	Description
Adapter	HUAWEI Technologies Co.LTD.	Adapter Model: HW-120050U1W voltage nominal: ~230V Input Voltage : 100-240V ~50/60Hz, 0.25A Output Voltage: ⎓ 12V 500mA Rated Power: 6W
Rechargeable Ni-MH	HUAWEI Technologies Co.LTD.	Battery Model: HGB-15AAx3 Rated capacity: 1500mAh Nominal Voltage: ⎓ +3.6V Charging Voltage: ⎓ +4.2V

3.3 Technical Specification

Characteristics	Description	
Radio System Type	☒ CDMA	
Supported Frequency Range	CDMA BC0	Transmission (TX): 824 to 849 MHz
		Receiving (RX): 869 to 894 MHz
	CDMA BC1	Transmission (TX): 1850 to 1910 MHz
		Receiving (RX): 1930 to 1990 MHz
TX and RX Antenna Ports	TX & RX port:	1
	TX-only port:	0
	RX-only port:	1
Target TX Output Power	CDMA system: 25dBm	
	CDMA system:	☒ 1.23 MHz,
Designation of Emissions (Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	CDMA system:	BC0: 1M30F6W BC1: 1M31F6W

4 General Test Conditions / Configurations

4.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

Test Mode	Test Modes Description
CDMA/TM1	CDMA system, CDMA2000 1x mode QPSK modulation
CDMA/TM3	CDMA system, CDMA2000 1x mode HPSK modulation

4.2 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	10.8V
	VN	12V
	VH	13.2V

NOTE: VL= lower extreme test voltage
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

4.3 Test Frequency

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
CDMA BC0	TX	Channel 1013	Channel 384	Channel 777
		824.7MHz	836.52MHz	848.31MHz
	RX	Channel 1013	Channel 384	Channel 777
		869.7MHz	881.52MHz	893.31MHz
CDMA BC1	TX	Channel 25	Channel 600	Channel 1175
		1851.25MHz	1880.0MHz	1908.75MHz
	RX	Channel 25	Channel 600	Channel 1175
		1931.25MHz	1960.0MHz	1988.75MHz

4.4 DESCRIPTION OF TESTS

4.4.1 Radiated Power and Radiated Spurious Emissions

Radiated spurious emissions are investigated indoors in a semi-anechoic chamber to determine the frequencies producing the worst case emissions. Final measurements for radiated power and radiated spurious emissions are performed on the 3 meter OATS per the guidelines of ANSI/TIA-603-C-2004. The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Emissions are also investigated with the receive antenna horizontally and vertically polarized.

A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other non-metallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized. Measure the EUT maximum RF power and record the result.

A half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to Pg [dBm] – cable loss [dB].

The calculated Pd levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10\log_{10}(\text{Power}_{[\text{Watts}]})$.

Note: Reference test setup 3

4.4.2 Occupied Bandwidth

The occupied bandwidth, 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. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.
Note: Reference test setup 1.

4.4.3 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10_{th} harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
Note: Reference test setup 1.

4.4.4 Peak-Average Ratio

A peak to average ratio measurement is performed at the conducted port of the EUT. For WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The traces are generated with the spectrum analyzer set to zero span mode.
Note: Reference test setup 1.

4.4.5 Frequency Stability / Temperature Variation

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

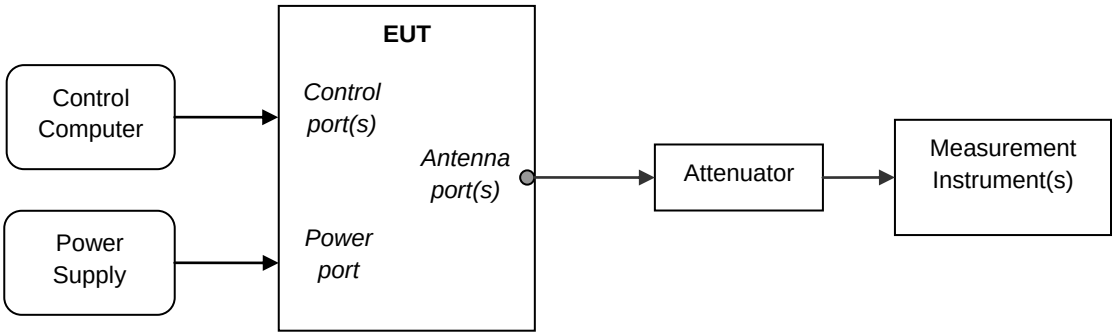
Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

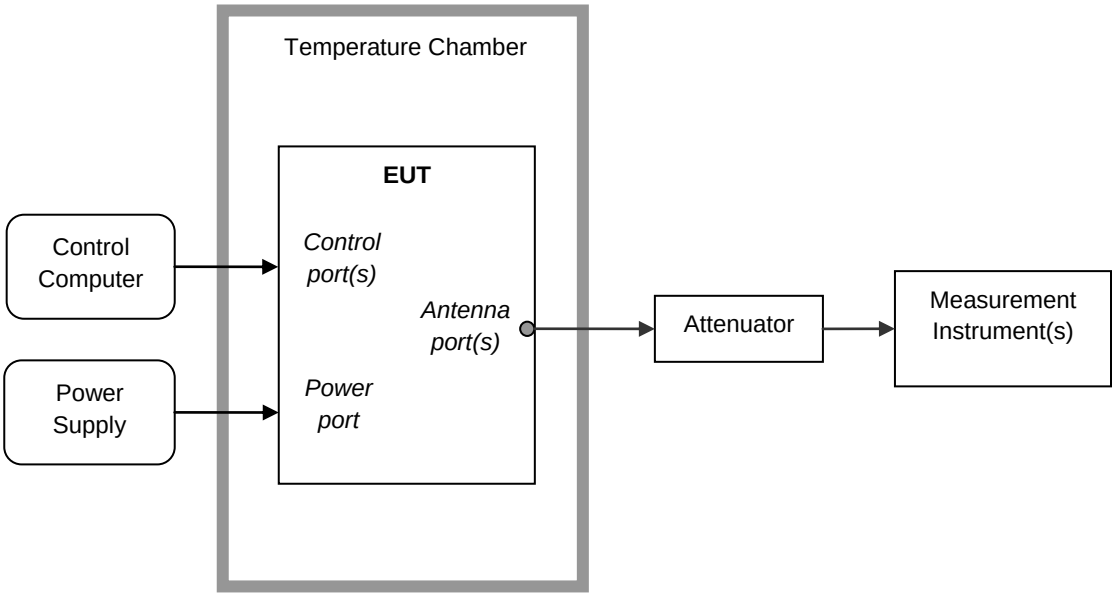
Note: Reference test setup 2.

4.5 Test Setups

4.5.1 Test Setup 1



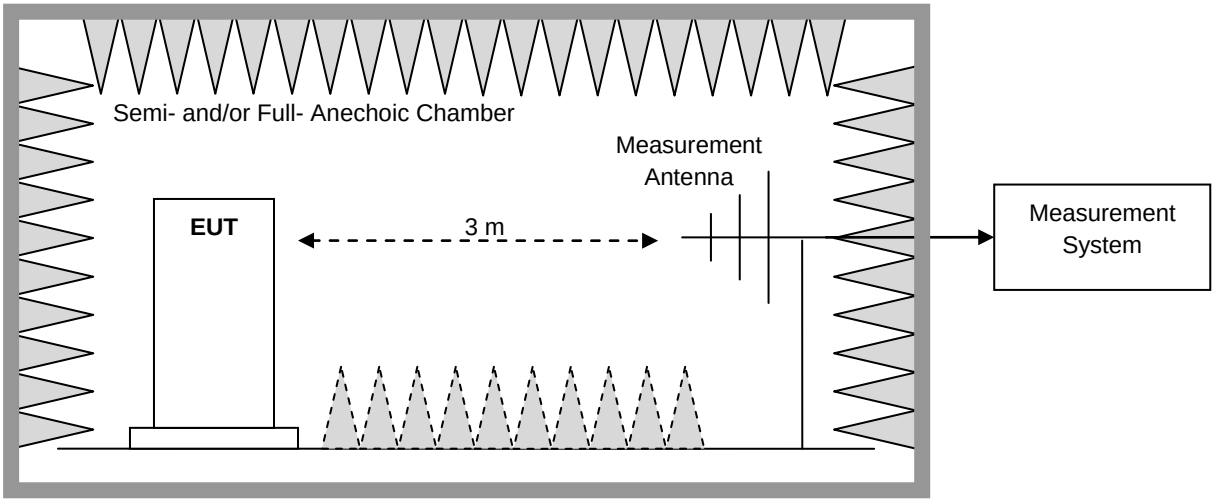
4.5.2 Test Setup 2



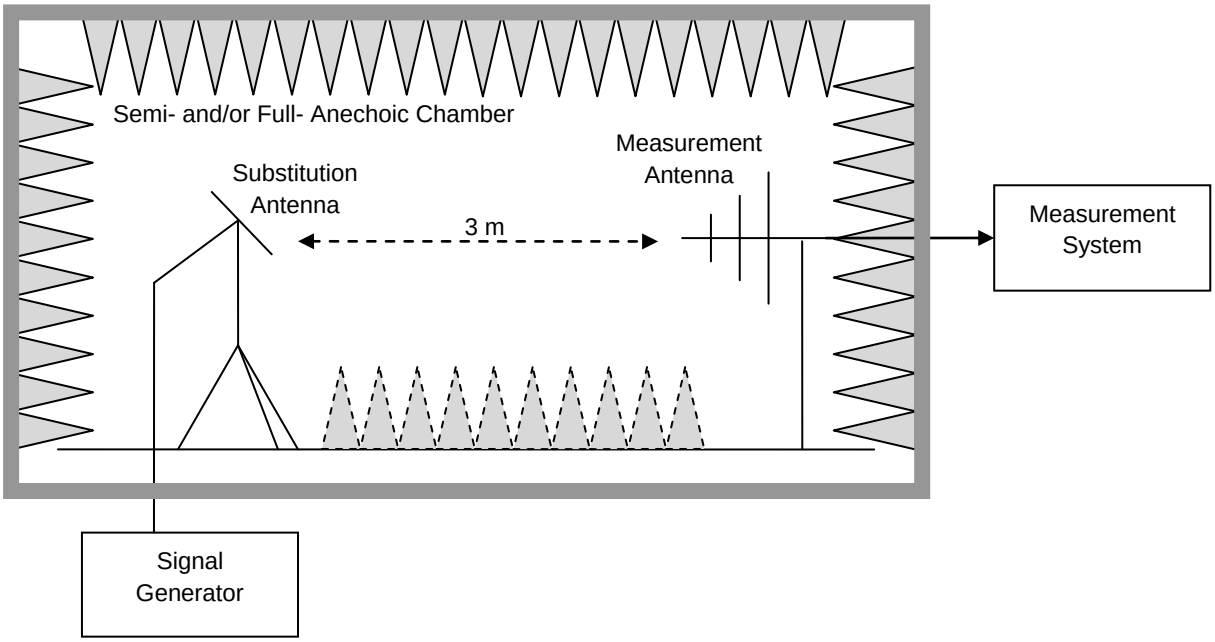
4.5.3 Test Setup 3

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

4.5.3.1 Step 1: Pre-test



4.5.3.2 Step 2: Substitution method to verify the maximum ERP



4.6 Test Conditions

Test Case		Test Conditions	
Transmit Output Power Data	Average Power, Total	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	CDMA/1X
	Average Power, Spectral Density (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	CDMA/1X
Peak-to-Average Ratio (if required)		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	CDMA/1X
Modulation Characteristics		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	M (L= low channel, M= middle channel, H= high channel)
		Test Mode	CDMA/1X
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	CDMA/1X
	Emission Bandwidth (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	CDMA/1X
Band Edges Compliance		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	CDMA/1X
Spurious Emission at Antenna Terminals		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)

Test Case	Test Conditions	
	Test Mode	CDMA/1X
Field Strength of Spurious Radiation	Test Env.	Ambient Climate & Rated Voltage
	Test Setup	Test Seup 3
	Test Mode	CDMA/1X NOTE: If applicable, the EUT conf. that has maximum power density (based on the equivalent power level) is selected.
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Frequency Stability	Test Env.	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Climate.
	Test Setup	Test Seup 2
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
	Test Mode	CDMA/1X

5 Main Test Instruments

Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal- Due
Power supply	KEITHLEY	2303	A120714713	2014-08-07	2016-08-06
Wireless Communication Test set	Agilent	N4010A	MY49081592	2014-11-04	2015-11-03
Universal Radio Communication Tester	R&S	CMU200	123299	2014-11-04	2015-11-03
Spectrum Analyzer	Agilent	N9020A	MY52090652	2014-07-11	2015-07-10
Universal Radio Communication Tester	R & S	CMW500	126855	2013-08-08	2015-08-09
Spectrum Analyzer	Agilent	E4440A	MY48250119	2014-07-11	2015-07-10
Signal Analyzer	R&S	FSQ31	200021	2014-11-04	2015-11-03
Spectrum Analyzer	Agilent	N9030A	MY49431698	2014-11-04	2015-11-03
Temperature Chamber	ESPEC	MW3030	06114003	2014-05-09	2015-05-08
Signal generator	Agilent	E8257D	MY51500314	2014-05-09	2015-05-08
Vector Signal Generator	R&S	SMU200A	104162	2014-11-04	2015-11-03
Test receiver	R&S	ESU26	100150	2014-05-09	2015-05-08
Spectrum analyzer	R&S	FSU3	200474	2014-11-04	2015-11-03
Spectrum analyzer	R&S	FSU43	100144	2014-11-04	2015-11-03
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100391	2013-12-21	2015-12-20
Trilog Broadband Antenna (30M~3GHz)	SCHWARZBECK	VULB 9163	9163-521	2013-12-21	2015-12-20
LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100262	2013-03-23	2015-03-22
Pyramidal Horn Antenna(18GHz-26-5GHz)	ETS-LINDGREN	3160-09	5140299	2013-03-05	2015-03-04
Artificial Mains Network	R&S	ENV4200	100134	2014-11-04	2015-11-03
Artificial Mains Network	R&S	ENV216	100382	2014-11-04	2015-11-03

6 Measurement Uncertainty

For a 95% confidence level (k = 2), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmit Output Power Data	Power [dBm]	U = 0.39 dB
Bandwidth	Magnitude [%]	U = 0.2%
Band Edge Compliance	Disturbance Power [dBm]	U = 2.0 dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	U = 2.0 dB
Field Strength of Spurious Radiation	ERP [dBm]	For 3 m Chamber: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz) For 10 m Chamber: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy [ppm]	U = 0.21 ppm

END