

FCC RF Test Report

APPLICANT : Motorola Mobility LLC EQUIPMENT : Mobile Cellular Phone

BRAND NAME Motorola

MODEL NAME : XT1955-5, XT1955DL, XT1955-6

FCC ID : IHDT56XQ1

STANDARD : FCC 47 CFR Part 2, and 90(S)

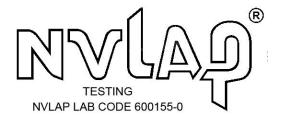
CLASSIFICATION: PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Sep. 28, 2018 and testing was completed on Nov. 02, 2018. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI/TIA-603-E and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.



Approved by: James Huang / Manager



Report No.: FW892801A

Sporton International (Kunshan) Inc.

No. 1098, Pengxi North Road, Kunshan Economic Development Zone,

Jiangsu Province 215335, China

Sporton International (Kunshan) Inc.

TEL: +86-512-57900158 FAX: +86-512-57900958 FCC ID: IHDT56XQ1 Page Number : 1 of 21

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REVISION HISTORY

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REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FW892801A	Rev. 01	Initial issue of report	Dec. 26, 2018

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SUMMARY OF TEST RESULT

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Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	Reporting only	PASS	-
3.2	§2.1049 §90.209	99% Occupied Bandwidth and 26dB Bandwidth	Reporting only	PASS	-
3.3	§2.1051 §90.691	Emission masks – In-band emissions	< 50+10log ₁₀ (P[Watts])	PASS	-
3.4	§2.1051 §90.691	Emission masks – Out of band emissions	< 43+10log ₁₀ (P[Watts])	PASS	-
3.5	§2.1053 §90.691	Field Strength of Spurious Radiation	< 43+10log ₁₀ (P[Watts])	PASS	Under limit 50.68 dB at 3282.000 MHz
3.6	§2.1055 §90.213	Frequency Stability for Temperature & Voltage	< 2.5 ppm	PASS	-

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1 General Description

1.1. Applicant

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2. Manufacturer

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3. Feature of Equipment Under Test

Product Feature & Specification				
Equipment	Mobile Cellular Phone			
Brand Name	Motorola			
Model Name	XT1955-5, XT1955DL, XT1955-6			
FCC ID	IHDT56XQ1			
EUT supports Radios application	CDMA/EVDO/GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA /HSPA+(16QAM uplink is not supported)/LTE WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 Bluetooth BR/EDR/LE			
IMEI Code	Conducted: 359525090014179 Radiation: 359525090014666			
HW Version	DVT2			
SW Version	PPO29.60			
EUT Stage	Identical Prototype			

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Note:

- 1. There are two samples under test, the difference is scanner that from different suppliers, According to the difference, sample 1 is assessed to perform full test.
- 2. The different model names are for different market purpose.

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1.4. Product Specification of Equipment Under Test

Product Specification subjective to this standard				
Tx Frequency	CDMA2000 BC10 : 817.9 MHz ~ 823.1 MHz			
Rx Frequency	CDMA2000 BC10 : 862.9 MHz ~ 868.1 MHz			
Maximum Output Power to Antenna	CDMA2000 BC10 : 24.67 dBm			
Antenna Type	LDS Antenna			
Type of Medulation	CDMA2000 1xRTT : QPSK			
Type of Modulation	CDMA2000 1xEV-DO : QPSK/8PSK			

1.5. Modification of EUT

No modifications are made to the EUT during all test items.

1.6. Maximum Frequency Tolerance, Emission Designator and Conducted Power

FCC Rule	System	Type of Modulation	Frequency Tolerance (ppm)	Emission Designator	Maximum Conducted power(W)
Part 90S	CDMA2000 BC10 1xRTT	QPSK	0.0280 ppm	1M27F9W	0.2931

1.7. Specification of Accessory

	Specification of Accessory							
	Brand Name	Motorola (Salom)	Model Name	SC-51				
AC Adapter 1	Power Rating	I/P: 100-240 Vac, 600mA O/P: 5Vdc,3000mA; 9Vdc,2000mA; 12Vdc,1500mA						
	Brand Name	Motorola (Chenyang)	Model Name	SC-51				
AC Adapter 2	Power Rating	I/P: 100-240 Vac, 600mA O/P: 5Vdc,3000mA; 9Vdc,2000mA; 12Vdc,1500mA						
Dottom:	Brand Name	Motorola (ATL)	Model Name	JK50				
Battery	Power Rating	3.8Vdc,5000mAh	Туре	Li-ion, Polymer				
USB Cable	Brand Name	Motorola (Saibao) Model Name		711310002491				
USB Cable	Signal Line Type	1.0 meter, shielded cable, without ferrite core						

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1.8. Testing Site

Sporton International (Kunshan) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0).

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Test Site	Sporton International (Kunshan) Inc.					
	No. 1098, Pengxi North Road, Kunshan Economic Development Zone,					
Test Site Location	Jiangsu Province 215335, China					
Test Site Location	TEL: 86-512-57900158					
	FAX: 86-512-57900958					
	Sporton Site No.	FCC designation No.	FCC Test Firm Registration No.			
Test Site No.	TH01-KS	CN5013	620027			
	03CH06-KS	CNSUTS	630927			

1.9. Applied Standards

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

- FCC 47 CFR Part 2, 90(S)
- ANSI/TIA-603-E
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01

Remark:

- 1. All test items were verified and recorded according to the standards and without any deviation during the
- 2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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Test Configuration of Equipment Under Test 2

2.1 **Test Mode**

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

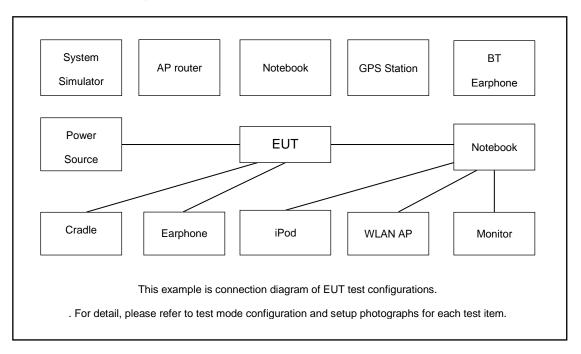
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Frequency range investigated for radiated emission: 30MHz to 10th harmonic.

Test Modes						
Band Radiated TCs Conducted TCs						
CDMA2000 BC10	■ 1xRTT Link	■ 1xRTT Link				

Note: The maximum RF output power levels are RC3 SO55 mode for CDMA2000 BC10 on QPSK Link; only these modes were used for all tests.

2.2 **Connection Diagram of Test System**



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Support Unit used in test configuration and system 2.3

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	GW INSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m
3.	Earphone	Lenovo	SH100	N/A	Unshielded, 1.2m	N/A

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2.4 **Measurement Results Explanation Example**

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

The following shows an offset computation example with RF cable loss 4.3 dB and a 10dB attenuator.

Example:

 $Offset(dB) = RF \ cable \ loss(dB) + attenuator \ factor(dB).$ = 4.3 + 10 = 14.3 (dB)

2.5 Frequency List of Low/Middle/High Channels

Frequency List							
Band Channel/Frequency(MHz) Lowest Middle Highe							
CDMA200	Channel	476	580	684			
BC10	Frequency	817.9	820.5	823.1			

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3 Test Result

3.1 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output Power Measurement

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals shall be reported.

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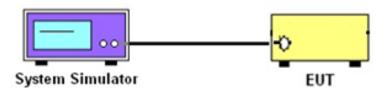
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

- 1. The transmitter output port was connected to base station.
- 2. Set EUT at maximum power through base station.
- 3. Select lowest, middle, and highest channels for each band and different modulation.

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

Please refer to Appendix A.



3.2 99% Occupied Bandwidth and 26dB Bandwidth Measurement

3.2.1 Description of (Occupied) Bandwidth Limitations Measurement

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

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The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

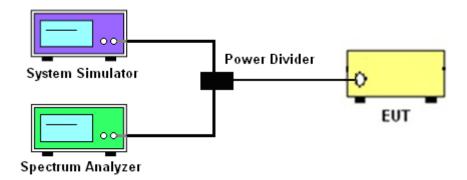
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

- 1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
- 2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers were measured.

3.2.4 Test Setup



3.2.5 Test Result of 99% Occupied Bandwidth and 26dB Bandwidth

Please refer to Appendix A.

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3.3 Emissions Mask Measurement

3.3.1 Description of Emissions Mask Measurement

Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of FCC Part 90.691.(a):

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- (a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:
- (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log₁₀(f/6.1) decibels or 50 + 10 Log₁₀(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
- (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log₁₀(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

- 1. The EUT was connected to spectrum analyzer and base station via power divider.
- 2. The emissions mask of low and high channels for the highest RF powers were measured.
- 3. The RBW was set 1% of 99% Occupied Bandwidth, and VBW was set 3 times of RBW.
- The final test results were shown below plots with a correction offset factor including cable loss, insertion loss of power divider.

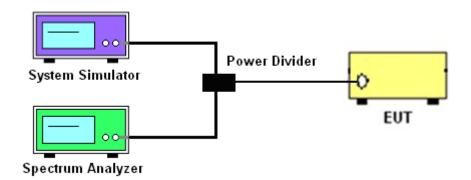
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3.3.4 Test Setup



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3.3.5 Test Result (Plots) of Conducted Emissions Mask

Please refer to Appendix A.

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3.4 Emissions Mask – Out Of Band Emissions Measurement

3.4.1 Description of Conducted Emissions Out of band emissions measurement

The power of any emission FCC Part 90.691 (a)(2) on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth at least 43 + 10 log (P) dB. It is measured by means of a calibrated spectrum analyzer and scanned from 30MHz up to a frequency including its 10th harmonic.

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3.4.2 Measuring Instruments

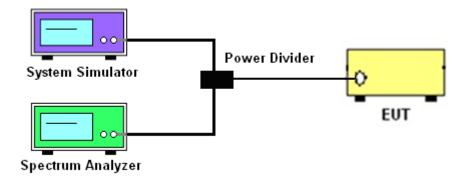
The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

- The EUT was connected to spectrum analyzer and system simulator via a power divider.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. The middle channel for the highest RF power within the transmitting frequency was measured.
- 4. The conducted spurious emission for the whole frequency range was taken.
- 5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 7. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
 - = P(W)- [43 + 10log(P)] (dB)
 - = [30 + 10log(P)] (dBm) [43 + 10log(P)] (dB)
 - = -13dBm.



3.4.4 Test Setup



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3.4.5 Test Result (Plots) of Conducted Emission

Please refer to Appendix A.

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3.5 Field Strength of Spurious Radiation Measurement

3.5.1 Description of Field Strength of Spurious Radiated Measurement

The radiated spurious emission was measured by substitution method according to ANSI/TIA-603-E. The power of any emission FCC Part 90.691 on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

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3.5.2 Measuring Instruments

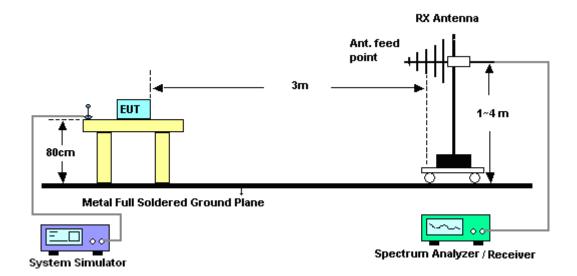
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

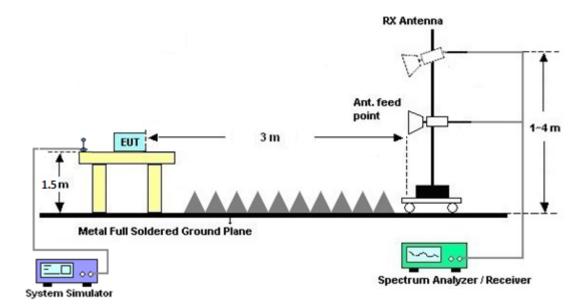
- 1. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
- 2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
- 3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
- 4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
- 5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, Sweep = 500ms, Taking the record of maximum spurious emission.
- 6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
- 7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
- 8. Taking the record of output power at antenna port.
- 9. Repeat step 7 to step 8 for another polarization.
- 10. EIRP (dBm) = S.G. Power Tx Cable Loss + Tx Antenna Gain
- 11. ERP (dBm) = EIRP 2.15
- 12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 13. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)
 - = P(W) [43 + 10log(P)] (dB)
 - = [30 + 10log(P)] (dBm) [43 + 10log(P)] (dB)
 - = -13dBm.



3.5.4 Test Setup



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3.5.5 Test Result of Field Strength of Spurious Radiated

Please refer to Appendix B.

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3.6 Frequency Stability Measurement

3.6.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency according to FCC Part 90.213.

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3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures for Temperature Variation

- 1. The EUT was set up in the thermal chamber and connected with the base station.
- 2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized for three hours. Power was applied and the maximum change in frequency was recorded within one minute.
- 3. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.6.4 Test Procedures for Voltage Variation

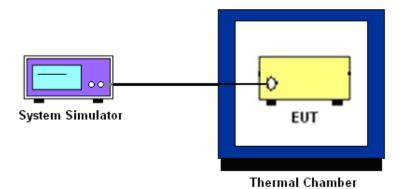
- 1. The EUT was placed in a temperature chamber at 20±5°C and connected with the system simulator.
- 2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.
- 3. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
- 4. The variation in frequency was measured for the worst case.

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3.6.5 Test Setup



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3.6.6 Test Result of Temperature Variation

Please refer to Appendix A.

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4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	Apr. 19, 2018	Oct. 31, 2018~ Nov. 02, 2018	Apr. 18, 2019	Conducted (TH01-KS)
Thermal Chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jun. 27, 2018	Oct. 31, 2018~ Nov. 02, 2018	Jun. 26, 2019	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471084	10Hz-44GHz	Jun. 25, 2018	Oct. 19, 2018	Jun. 24, 2019	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Jan. 29, 2018	Oct. 19, 2018	Jan. 28, 2019	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 21, 2017	Oct. 19, 2018	Oct. 20, 2018	Radiation (03CH06-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 07, 2018	Oct. 19, 2018	Feb. 06, 2019	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	187289	9KHz ~1GHZ	Aug. 06, 2018	Oct. 19, 2018	Aug. 05, 2019	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-1	2025788	1Ghz-18Ghz	Apr. 17, 2018	Oct. 19, 2018	Apr. 16, 2019	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270203	500MHz~26.5GHz	Dec. 16, 2017	Oct. 19, 2018	Dec. 15, 2018	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Oct. 19, 2018	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Oct. 19, 2018	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Oct. 19, 2018	NCR	Radiation (03CH06-KS)

NCR: No Calibration Required

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5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of	
Confidence of 95% (U = 2Uc(y))	2.5 dB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of	3 0 AB
Confidence of 95% (U = 2Uc(y))	2.0 dB

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Appendix A. Test Results of Conducted Test

Conducted Output Power (Average power)

Conducted Power (*Unit: dBm)					
Band	CDMA2000 BC10				
Channel	476	580	684		
Frequency	817.9	820.5	823.1		
1xRTT RC1 SO55	24.41	24.62	24.51		
1xRTT RC3 SO55	24.45	<mark>24.67</mark>	24.52		
1xRTT RC3 SO32(+ F-SCH)	24.47	24.65	24.54		
1xRTT RC3 SO32 (+SCH)	24.48	24.66	24.55		
1xEVDO RTAP 153.6Kbps	24.46	24.65	24.53		
1xEVDO RETAP 4096Bits	24.11	24.30	24.18		

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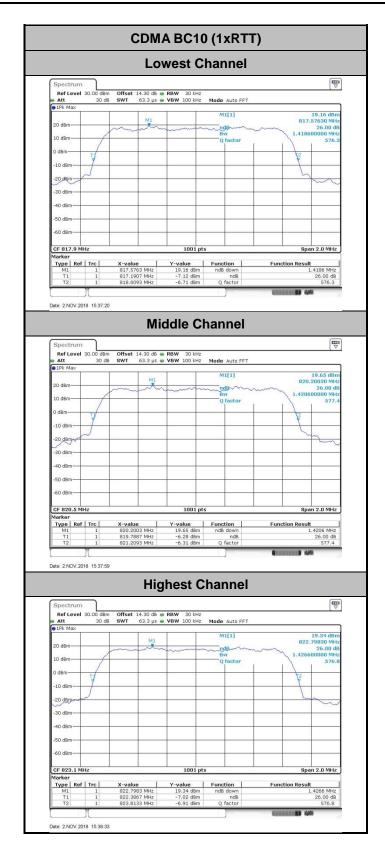
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26dB Bandwidth

Mode	CDMA BC10(MHz)			
Mod.	1xRTT			
Lowest CH	1.419			
Middle CH	1.421			
Highest CH	1.427			

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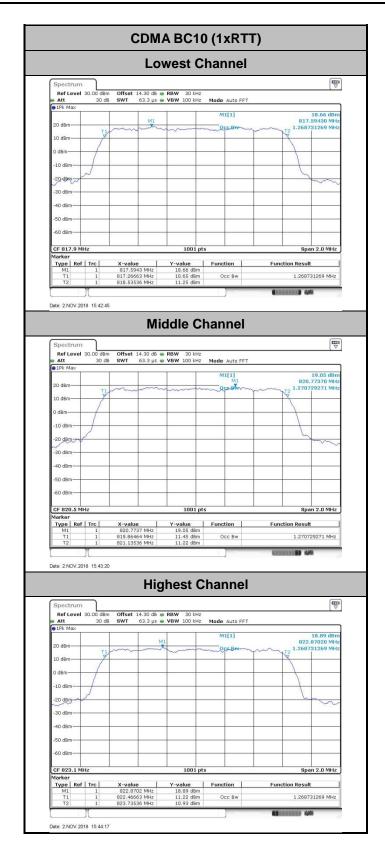
Report No. : FW892801A

Occupied Bandwidth

Mode	CDMA BC10(MHz)			
Mod.	1xRTT			
Lowest CH	1.269			
Middle CH	1.271			
Highest CH	1.269			

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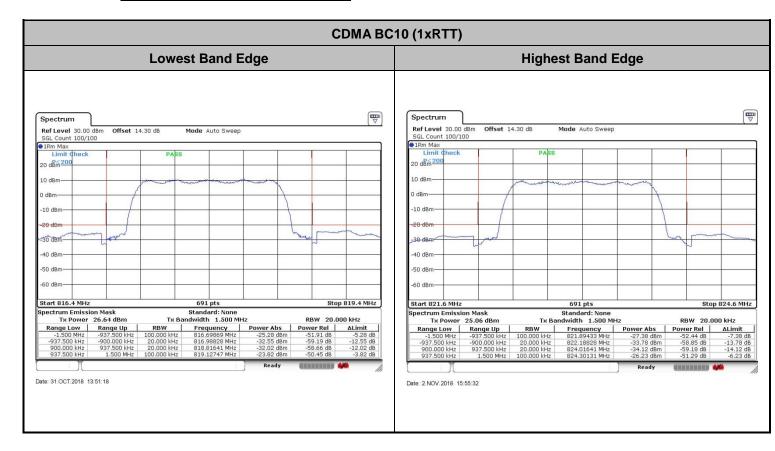
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C RF Test Report No.: FW892801A

Conducted Band Edge

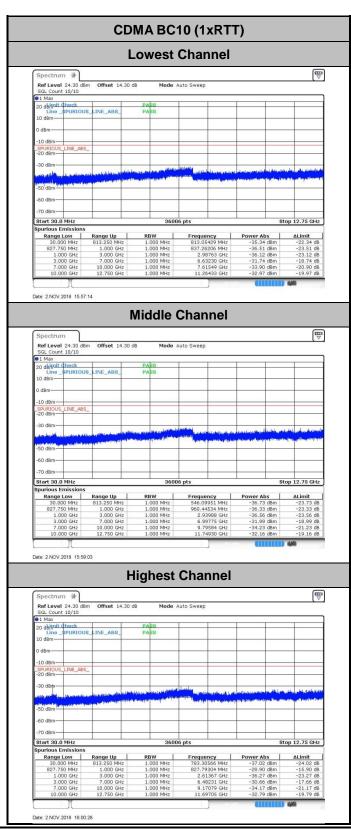


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Conducted Spurious Emission



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Frequency Stability

Test Conditions	Middle Channel	CDMA BC10 (1xRTT)	Limit 2.5ppm
Temperature (°C)	Voltage (Volt)	Deviation (ppm)	Result
50	Normal Voltage	0.0183	
40	Normal Voltage	0.0073	
30	Normal Voltage	0.0280	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0024	
0	Normal Voltage	0.0049	
-10	Normal Voltage	0.0061	PASS
-20	Normal Voltage	0.0171	
-30	Normal Voltage	0.0085	
20	Maximum Voltage	0.0232	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0037	

Note: Normal Voltage = 3.8V. ; Battery End Point (BEP) = 3.6V. ; Maximum Voltage =4.1V

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Appendix B. Test Results of Radiated Test

CDMA BC10 (1xRTT)								
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1640	-67.53	-13	-54.53	-68.74	2.32	5.68	Н
	2461.5	-64.84	-13	-51.84	-65.47	3.02	5.80	Н
	3282	-63.96	-13	-50.96	-66.42	3.27	7.88	Н
	1642	-66.68	-13	-53.68	-67.89	2.32	5.68	٧
	2462	-64.96	-13	-51.96	-65.59	3.02	5.80	V
	3282	-63.68	-13	-50.68	-66.14	3.27	7.88	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

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