Report On

Application for Grant of Equipment Authorization of the
Novatel Wireless Inc.
MIFI7000 Wireless Hotspot Modem

FCC CFR 47 Part 2, Part 22 and Part 24: 2017
RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013

Report No. SD72118338-0716J **May 2018**

REPORT ON	Radio Testing of the Novatel Wireless Inc. MIFI7000 Wireless Hotspot Modem
TEST REPORT NUMBER	SD72118338-0716J
PREPARED FOR	Novatel Wireless Inc. 9605 Scranton Road, Suite 300 San Diego, CA 92121 USA
CONTACT PERSON	Roman Olmos Senior Regulatory Engineer (858) 812-3400 rolmos@nvtl.com
PREPARED BY	Xiaoying Zhang **Name** Title: EMC/Wireless Test Engineer
APPROVED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: Senior EMC Test Engineer/Wireless Team Lead
DATED	May 07, 2018

Revision History

SD72118338-0716J Novatel Wireless Inc. MIFI7000 Wireless Hotspot Modem					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
May/07/2018	Initial Release				Ferdinand S. Custodio

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Novatel Wireless Inc.
MIFI7000 Wireless Hotspot Modem

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Novatel Wireless Inc. MIFI7000 Wireless Hotspot Modem to the requirements of the following:

- FCC CFR 47 Part 2, Part 22 and Part 24: 2017
- RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Novatel Wireless Inc.
Product Marketing Name	MiFi 7000
Model Number(s)	MIFI7000
FCC ID Number	PKRNVWMIFI7000
IC Number	3229A-MIFI7000
Serial Number(s)	SZ17061900005 and SZ17061900013 (Note: Verified with a variant of the EUT with different Model Number MIFI7730L for market purposes which is declared identical with this model)
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC CFR 47 Part 2, Part 22 and Part 24: 2017 • 412172 D01 Determining ERP and EIRP v01r01 August 07, 2015 (Guidelines for determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of an RF transmitting system) • 971168 D01 Power Meas License Digital Systems v03r01: April 09 2018; (Measurement guidance for certification of licensed digital transmitters) • RSS-132 issue 3: January 2013; (Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz) • RSS-133 issue 6: January 2013; (2 GHz Personal Communications Services) • ANSI C63.26-2015. American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
Start of Test	July 05, 2016
Finish of Test	August 01, 2016
Name of Engineer(s)	Alex Chang Ferdie Custodio Xiaoying Zhang Ivan Retana
Related Document(s)	Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2, Part 22 and Part 24: 2017 and RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013 standard is shown below.

Section	FCC Part Sections(s)	ISED Sections	Test Description	Result
2.1	2.1046	RSS-132: 5.4, RSS-133: 6.4	Transmitter Conducted Output Power	Compliant*
2.2	2.1046, 22.913(a)(2)	-	Effective Radiated Power	Compliant*
2.3	2.1046, 24.232(c)	RSS-132: 5.4 RSS-133: 6.4	Equivalent Isotropic Radiated Power	Compliant*
2.4	24.232(d)	RSS-132: 5.4, RSS-133: 6.4	Peak-Average Ratio	Compliant*
2.5	2.1049, 22.917(b), 24.238(b)	RSS-GEN 4.6.1	Occupied Bandwidth	Compliant*
2.6	2.1051, 22.917(a), 24.238(a)	RSS-132: 5.5, RSS-133: 6.5	Band Edge	Compliant*
2.7	2.1051, 22.917(a), 24.238(a)	RSS-132: 5.5, RSS-133: 6.5	Conducted Spurious Emissions	Compliant*
2.8	2.1053, 22.917(a), 24.238(a)	RSS-132: 5.5, RSS-133: 6.5	Field Strength Of Spurious Radiation	Compliant*
2.9	2.1055, 22.355, 24.235	RSS-132: 5.3, RSS-133: 6.3	Frequency Stability	Compliant*

*Compliant** *A variant of the EUT with model number MIFI7730L was previously approved under FCC ID PKRNVWMIFI7730. The PCB Design, Components, Antennas of MIFI7730L are identical with this model with the exception of different model number for market purposes. All measurements for CDMA 1xRTT and EvDO BC0/BC1 were from this variant and covered under test report SD72118338-0716E_Novatel MIFI7730L_FCC Part 22 24_RSS-132 RSS 133_Test Report.pdf.*

Results from previous testing of the EUT using Version 2015 of FCC CFR Part 22/24 applies. There are no differences between version 2015 and 2017, so the EUT is deemed to comply with FCC CFR Part 22/24 version 2017.

1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was a Novatel Wireless Inc. MIFI7000 Wireless Hotspot Modem. The EUT is a Wireless Hotspot Modem supporting 2G/3G/4G Technologies. The EUT comes with a USB Port.

1.3.2 Technical Description

EUT Description	Wireless Hotspot Modem
Product Marketing Name	MiFi 7000
Model Number(s)	MIFI7000
Rated Voltage	3.8V, 4500mAh (Rechargeable Li-Ion battery pack) Input 100-240VAC, Output 5V (External AC-DC Power Adapter)
Mode Verified (Frequency Bands)	CDMA BC0: 824-849 MHz CDMA BC1: 1850-1910 MHz
Capability	CDMA1xRTT, EvDO Rev.0/Rev.A GPRS/EGPRS WCDMA LTE
Primary Unit (EUT)	☐ Production ☒ Pre-Production ☐ Engineering
Frequency Tolerance	±0.00025% (2.5ppm)

(Client declaration, max. antenna gain covered under this test report)

Technologies / Bands	Frequency	Antenna Gains
CDMA1xRTT/EvDO Cell Band (BC0)	824-849 MHz	-1.5 dBi
CDMA1xRTT/EvDO PCS Band (BC1)	1850-1910 MHz	1.6 dBi

1.3.3 Transmit Frequency Table

Technology / Mode	Tx Frequency (MHz)	Emission Designator	ERP (Part 22) / EIRP (RSS-132 and Part 24/RSS-133)	
			ERP Max. Power (dBm)	EIRP Max. Power (dBm)
CDMA1xRTT Cell Band (BC0)	824-849	1M33F9W	20.26	—
CDMA1xRTT PCS Band (BC1)	1850-1910	1M34F9W	—	23.626
1xEvDO Release 0 Cell Band (BC0)	824-849	1M30F9W	20.1	—
1xEvDO Release 0 PCS Band (BC1)	1850-1910	1M31F9W	—	24.478
1xEvDO Release A Cell Band (BC0)	824-849	1M30F9W	20.25	—
1xEvDO Release A PCS Band (BC1)	1850-1910	1M30F9W	—	24.683

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Conducted antenna port measurement. EUT Tx at a max power and powered by the internal battery and/or USB via AC Adapter.
B	Radiated test setup/case spurious emissions. Antenna port terminated by the call box.

1.4.2 EUT Exercise Software

EUT is controlled by a CMW 500 Wideband Radio Communication Tester. There are no other test software used during verification.

1.4.3 Support Equipment and I/O cables

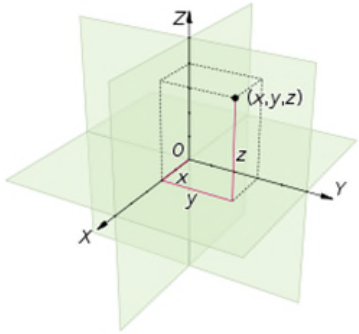
Manufacturer	Equipment/Cable	Description
Novatel Wireless	USB Cable	Micro USB Type B to Standard USB Type B
Novatel Wireless	External AC-DC Power Adapter	Model: SSW-2783, PN: 40123126.01 Input: 100-240VAC, Ouput: 5VDC

1.4.4 Worst Case Configuration

Worst-case configuration used in this test report:

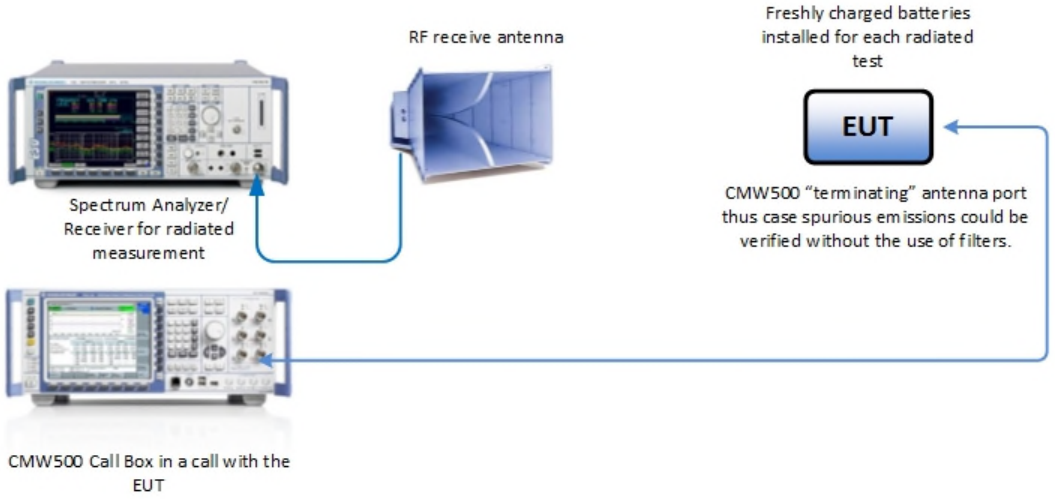
Technology	Band	Test Configuration
CDMA – 1xRTT	Cell (BC0)	Mobile Station Control: SO: 55; RC: 3/3
CDMA – 1xRTT	PCS (BC1)	

For radiated measurements X, Y, and Z orientations were verified. The verification was determined “Y” as worst case configuration.

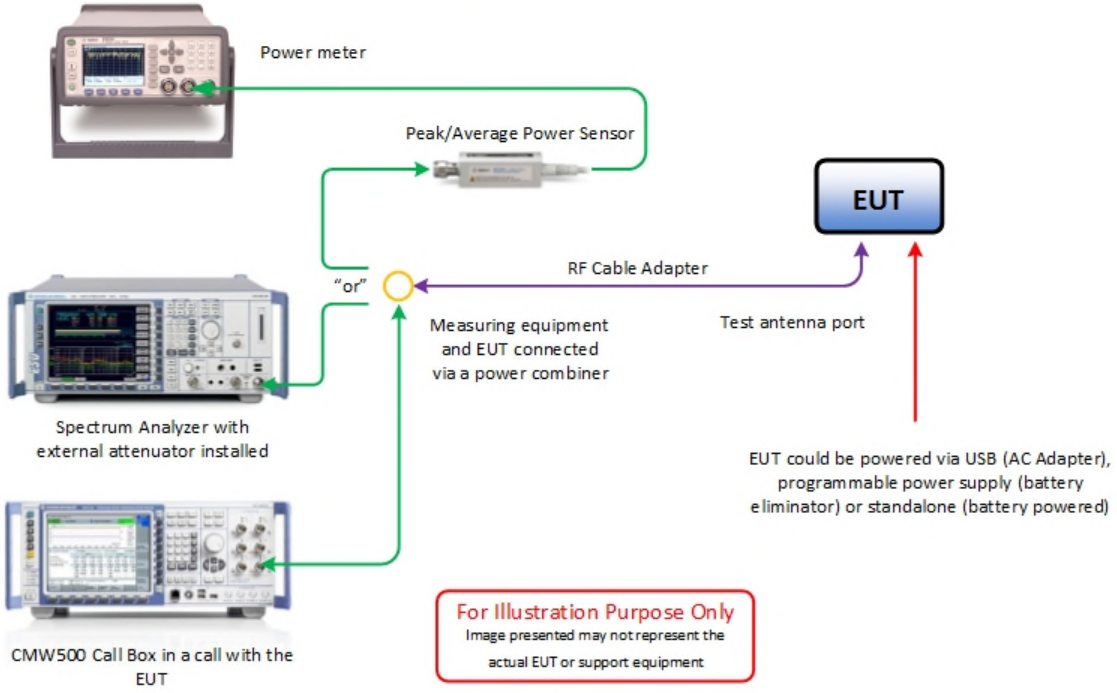


1.4.5 Simplified Test Configuration Diagram

Radiated Test Configuration



Conducted (Antenna Port) Test Configuration



1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: SZ17061900005 and SZ17061900013		
None	—	—

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.26-2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858 546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678 1466 FAX: 858 546 0364

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Designation No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Designation is US1146.

1.9.2 Innovation, Science and Economic Development Canada (ISED) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

1.9.1 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TUV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.2 NCC (National Communications Commission - US0102)

TUV SUD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

1.9.3 VCCI – Registration No. A-0280 and A-0281

TUV SUD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

1.9.4 RRA – Identification No. US0102

TUV SUD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.5 OFCA – U.S. Identification No. US0102

TUV SUD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.

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1.10 SAMPLE CALCULATIONS

1.10.1 GSM Emission Designator

Emission Designator = 250KGXW
GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

1.10.2 WCDMA Emission Designator

Emission Designator = 4M15F9W
WCDMA BW = 4.15 MHz
F = Frequency Modulation
9= Composite Digital Info
W = Combination (Audio/Data)

1.10.3 CDMA Emission Designator

Emission Designator = 1M30F9W
F = Frequency Modulation
9= Composite Digital Info
W = Combination (Audio/Data)

1.10.4 LTE Emission Designator (QPSK)

Emission Designator = 4M51G7D
G = Phase Modulation
7= Quantized/Digital Info
D = Combination (Audio/Data)

1.10.5 LTE Emission Designator (16QAM)

Emission Designator = 4M52W7D
W = Frequency Modulation
7= Quantized/Digital Info
D = Combination (Audio/Data

1.10.6 Spurious Radiated Emission (below 1GHz)

Measuring equipment raw measurement (dBµV/m) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dBµV/m) @ 30MHz			**11.8**

1.10.7 Spurious Radiated Emission – Substitution Method

Example = 84dBµV/m @ 1413 MHz (numerical sample only)

The field strength reading of 84dBµV/m @ 1413 MHz (2nd Harmonic of 706.5 MHz) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is 7.8dBi while the transmit cable loss is 1.0 dB (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the 84dBµV/m level at the receiving end is replicated (identical test setup, i.e. same antenna, cable/s and preamp). If the adjusted signal generator level is -18dBm, then we have the following for both EIRP and ERP as required:

P_{EIRP} = -18 dBm + 7.8 dBi – 1dB
= 11.2 dBm
P_{ERP} = P_{EIRP} – 2.15 dB
= 11.2 dBm – 2.15 dB
= 9.05 dBm

SECTION 2

TEST DETAILS

Radio Testing of the
Novatel Wireless Inc.
MIFI7000 Wireless Hotspot Modem

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2.1 TRANSMITTER CONDUCTED POWER MEASUREMENTS

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
RSS-132, Clause 5.4
RSS-133, Clause 6.4

2.1.2 Standard Applicable

The conducted power mesurements were made in accordance to FCC Part 2 Clasue 2.1046 and RSS-132 Clause 5.4 and RSS-133 Clause 6.4.

2.1.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration A

2.1.4 Date of Test/Initial of test personnel who performed the test

July 05 and 06, 2016 / FC and XYZ

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	27.1 °C
Relative Humidity	42.4 %
ATM Pressure	99.2 kPa

2.1.7 Additional Observations

For CELL and PCS Bands:

- This is a conducted test using an USB wideband power sensor.
- The path loss for Cell Band (CDMA/EvDO) and PCS Band (CDMA/EvDO) were measured and entered as a level offset.

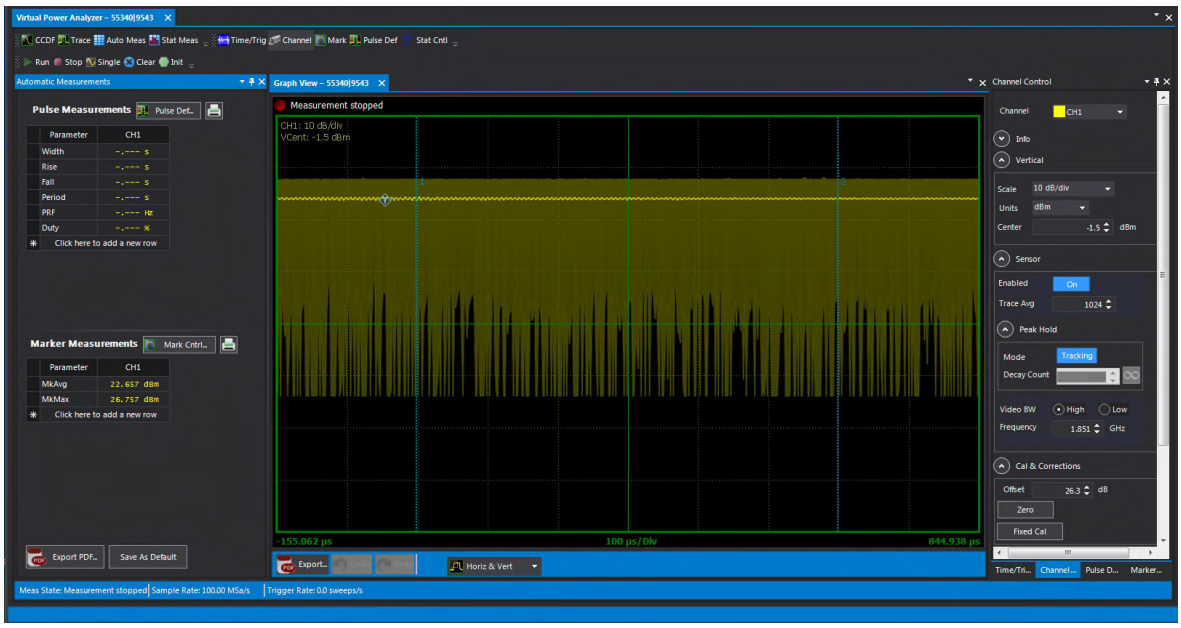
2.1.8 Test Results

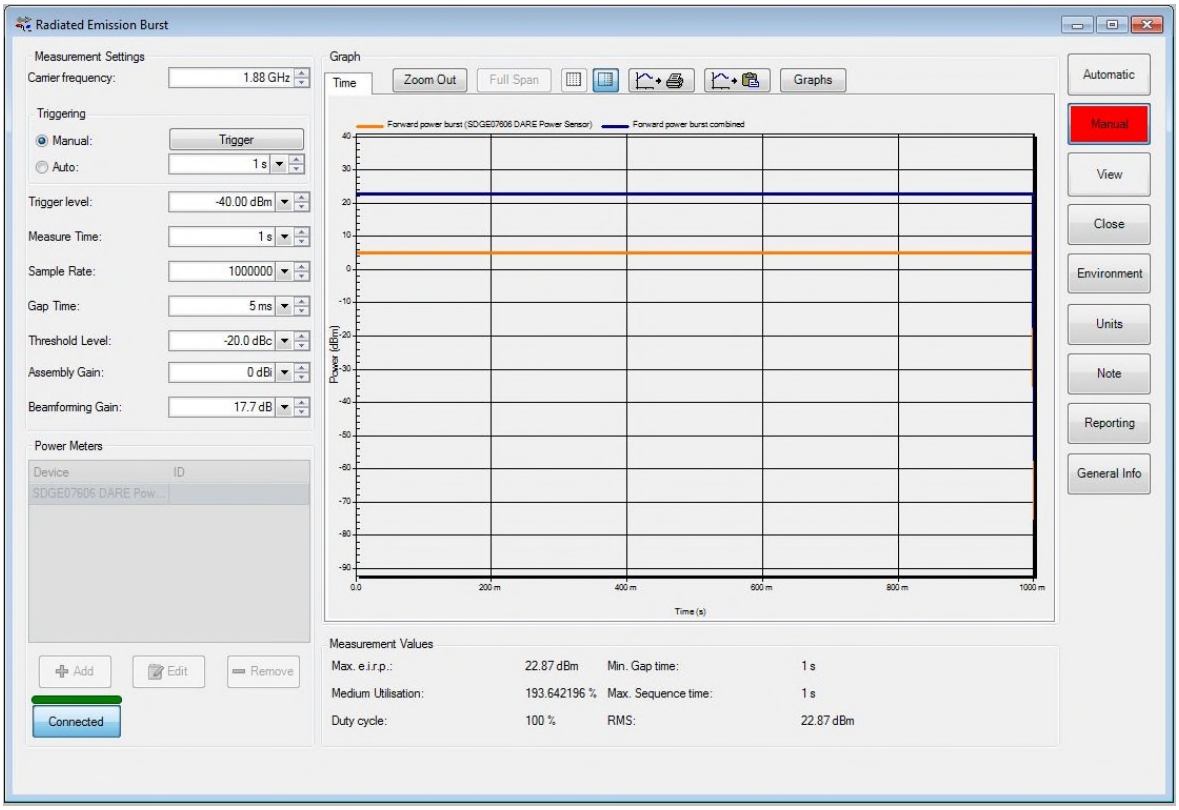
CDMA 1xRTT				
Band	**Channel**	**Frequency (MHz)**	**Max Power Average (dBm)**	**Mobile Station Control (SO) / (RC)**
Cell (BC0)	***1013***	***824.70***	***23.910***	***55 / (3/3)***
	384	836.52	23.740	55 / (3/3)
	777	848.31	23.374	55 / (3/3)
PCS (BC1)	***25***	***1851.25***	***22.026***	***55 / (3/3)***
	600	1880.00	22.023	55 / (3/3)
	1175	1908.75	21.136	55 / (3/3)

CDMA – 1xEvDO Release 0				
Band	**Channel**	**Frequency (MHz)**	**Max Power Average (dBm)**	**Access Terminal Control**
Cell (BC0)	***1013***	***824.70***	***23.749***	***Forward***
	384	836.52	23.656	Forward
	777	848.31	23.305	Forward
PCS (BC1)	25	1851.25	22.657	Forward
	600	***1880.00***	***22.878***	***Forward***
	1175	1908.75	22.315	Forward

CDMA – 1xEvDO Release A				
Band	**Channel**	**Frequency (MHz)**	**Max Power Average (dBm)**	**Access Terminal Control**
Cell (BC0)	***1013***	***824.70***	***23.900***	***Forward***
	384	836.52	23.797	Forward
	777	848.31	23.052	Forward
PCS (BC1)	25	1851.25	22.802	Forward
	600	***1880.00***	***23.083***	***Forward***
	1175	1908.75	22.446	Forward

2.1.9 Sample Test Measurement Screen





2.2 EFFECTIVE RADIATED POWER

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
FCC 47 CFR Part 22, Clause 22.913(a)(2)

2.2.2 Standard Applicable

FCC Part 22:
The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

2.2.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration (N/A, calculation only)

2.2.4 Date of Test/Initial of test personnel who performed the test

August 01, 2016 / AC

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Additional Observations

- ERP was calculated as per Section 1.2 and 1.3 of KDB412172 D01 (Determining ERP and EIRP v01r01).
- Calculation formula in logarithmic terms:

$$\mathbf{ERP = P_T + G_T - L_C - 2.15dB}$$

Where:

P_T = transmitter conducted output power dBm (Section 2.1 of this test report)
G_T = gain of the transmitting antenna, in dBi (EIRP: the -2.15 in the formula is to convert EIRP to ERP);
L_c = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT configuration during verification is mounted on an interface board with short direct connection to the antenna port. The loss between the EUT and the antenna port is considered negligible).

2.2.7 Test Results

CDMA 1xRTT (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
824.70	23.910	-1.5	20.26	0.11	38.45	18.19
836.52	23.740	-1.5	20.09	0.10	38.45	16.86
848.31	23.374	-1.5	19.72	0.09	38.45	17.23

CDMA – 1xEvDO Release 0 (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
824.70	23.749	-1.5	20.10	0.10	38.45	18.35
836.52	23.656	-1.5	20.01	0.10	38.45	16.94
848.31	23.305	-1.5	19.66	0.09	38.45	17.29

CDMA – 1xEvDO Release A (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
824.70	23.90	-1.5	20.25	0.11	38.45	18.20
836.52	23.797	-1.5	20.15	0.10	38.45	16.80
848.31	23.052	-1.5	19.4	0.09	38.45	17.55

2.3 EQUIVALENT ISOTROPIC RADIATED POWER

2.3.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
RSS-132, Clause 5.4
FCC 47 CFR Part 24, Clause 24.232 (c)
RSS-133, Clause 6.4

2.3.2 Standard Applicable

IC RSS-132:
The EIRP for mobile equipment shall not exceed 11.5 watts

FCC Part 24:
Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

IC RSS-133:
The equivalent isotropically radiated power (e.i.r.p.) for Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p.

2.3.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration (N/A, calculation only)

2.3.4 Date of Test/Initial of test personnel who performed the test

August 01, 2016 / AC

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Additional Observations

- ERP was calculated as per Section 1.2 and 1.3 of KDB412172 D01 (Determining ERP and EIRP v01r01).
- Calculation formula in logarithmic terms:

$$EIRP = P_T + G_T - L_C$$

Where:

P_T = transmitter conducted output power dBm (Section 2.1 of this test report)
G_T = gain of the transmitting antenna, in dBi (EIRP);
L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT posees an internal Antenna. The loss between the EUT and the antenna port is considered negligible).

2.3.7 Test Results

CDMA 1xRTT (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1851.25	22.026	1.6	23.626	0.23	33	9.37
1880.00	22.023	1.6	23.623	0.23	33	9.38
1908.75	21.136	1.6	22.736	0.19	33	10.26

CDMA – 1xEvDO Release 0 (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1851.25	22.657	1.6	24.257	0.27	33	8.74
1880.00	22.878	1.6	24.478	0.28	33	8.52
1908.75	22.315	1.6	23.915	0.25	33	9.09

CDMA – 1xEvDO Release A (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1851.25	22.802	1.6	24.402	0.28	33	8.60
1880.00	23.083	1.6	24.683	0.29	33	8.32
1908.75	22.446	1.6	24.046	0.25	33	8.95

2.4 PEAK-AVERAGE RATIO

2.4.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.2329 (d)
RSS-133, Clause 6.4
RSS-132, Clause 5.4

2.4.2 Standard Applicable

FCC Part 24:
Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB

IC RSS-132 and RSS-133:
The transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

2.4.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration A

2.4.4 Date of Test/Initial of test personnel who performed the test

July 06 to 08, 2016 / XYZ
July 08 and 14, 2016 / FC and AC

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.3 - 25.4°C
Relative Humidity	37.8 - 42.4
ATM Pressure	99.2 - 99.7 kPa

2.4.7 Additional Observations

- This is a conducted test. Test procedure is per FCC KDB 971168 D01 v03r01 clause 5.7.
- Measurement was done using the Spectrum Analyzer's Complementary Cumulative Distribution Function (CCDF) measurement profile. The built-in function is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth (crest factor or peak-to-average ratio) The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signals 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 to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth.
- Only the worst channel and configuration presented.
- The path loss for was measured and entered as a level offset.
- There are no measured PAPR levels greater than 13dB. EUT complies.

2.4.8 Test Results

CDMA 1xRTT-BC0 824.7 MHz Channel 1013

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

CDMA 1xRTT-BC1 1851.25 MHz Channel 25


Date: 14.JUL.2016 11:46:56

CDMA – 1xEvDO Rel 0-BC0 824.7 MHz Channel 1013


Date: 14.JUL.2016 11:55:44

CDMA – 1xEvDO Rel 0-BC1 1880.0 MHz Channel 600


Date: 14.JUL.2016 11:58:21

CDMA – 1xEvDO Rel A-BC0 824.7MHz Channel 1013


Date: 14.JUL.2016 12:04:28

CDMA – 1xEvDO Release A-BC1 1880.00 MHz Channel 600

2.5 OCCUPIED BANDWIDTH

2.5.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049
FCC 47 CFR Part 22, Clause 22.917(b)
FCC 47 CFR Part 24, Clause 24.238(b)
RSS-GEN 4.6.1

2.5.2 Standard Applicable

The transmitted signal bandwidth shall be reported as the 99% emission bandwidth, that is the frequency bandwidth suuch that, below its lower and above its upper frequency limits, the mean powers radiated are eqch equal to 0.5 percent of the total mean power radiated by a give emission.

26dB 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 emissions are attenuated by at least 26 dB below the transmitter power.

2.5.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration A

2.5.4 Date of Test/Initial of test personnel who performed the test

July 06 to 08, 2016 / XYZ
July 11 and 15, 2016 / FC and AC

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.3 - 25.4°C
Relative Humidity	37.8 – 42.4
ATM Pressure	99.2 - 99.7 kPa

2.5.7 Additional Observations

- This is a conducted test. Both 26dB bandwidth and 99% bandwidth presented.
- Using the occupied bandwidth meansurement function in the spectrum analyzer, the 99% occupied bandwith was measured.
- The 26dB bandwidth was measured in accorance with FCC KDB 971168 D01 v03r01 clause 4.1 using the ndB measurement function in the spectrum analyzer.
- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be at least 3x RBW.
- Low, Mid and High channels for all bandwidths and modulations were verified. Test results of Mid channel were presented as representative.

2.5.8 Test Results

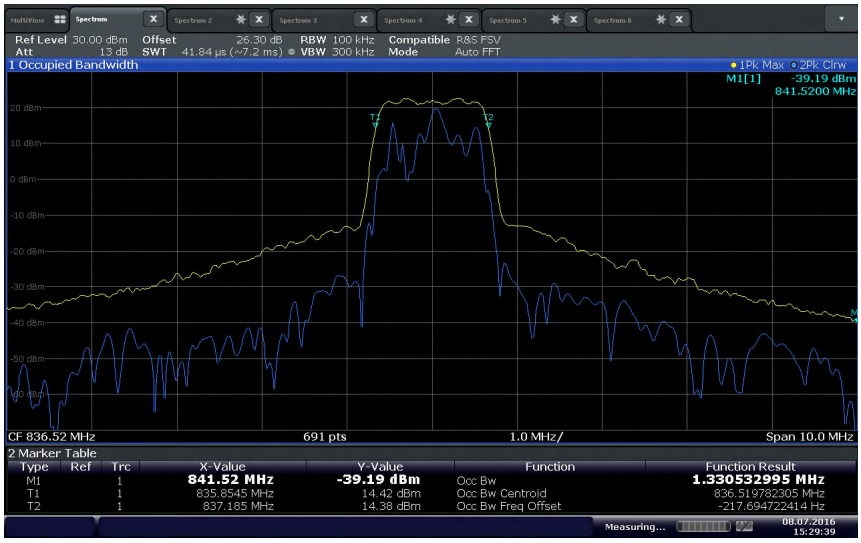
CDMA 1xRTT					
Band	**Service Option (SO) / (RC)**	**Channel**	**Frequency**	**99% OBW (MHz)**	**26dB BW (MHz)**
BC0	55 / (3/3)	384	836.52	1.33	1.53
BC1	55 / (3/3)	600	1880.0	1.34	1.55

CDMA – 1xEvDO Release 0					
Band	**Access Terminal Control**	**Channel**	**Frequency**	**99% OBW (MHz)**	**26dB BW (MHz)**
BC0	Forward	384	836.52	1.30	1.47
BC1	Forward	600	1880.0	1.31	1.50

CDMA – 1xEvDO Release A					
Band	**Access Terminal Control**	**Channel**	**Frequency**	**99% OBW (MHz)**	**26dB BW (MHz)**
BC0	Forward	384	836.52	1.30	1.47
BC1	Forward	600	1880.0	1.30	1.51

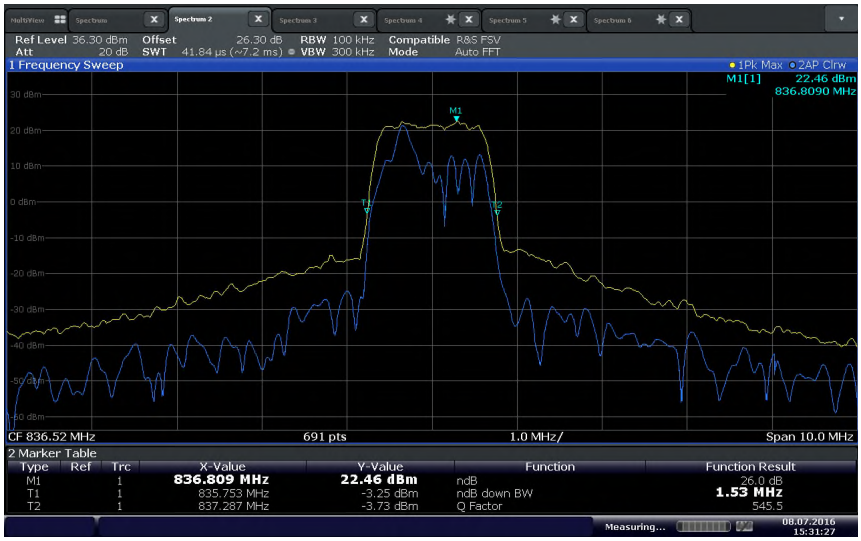
2.5.9 Example Test Plots

CDMA 1xRTT-BC0/Channel 384/99% OBW



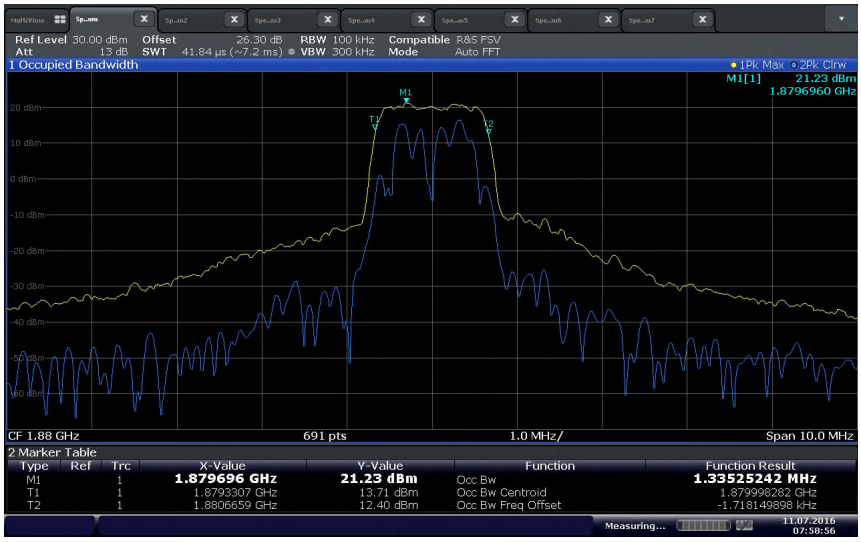
Date: 8.JUL.2016 15:29:39

CDMA 1xRTT-BC0/Channel 384/26dB BW



Date: 8.JUL.2016 15:31:27

CDMA 1xRTT-BC1/Channel 600/99% OBW



Date: 11.JUL.2016 07:58:56

CDMA 1xRTT-BC1/Channel 600/26dB BW

Date: 11.JUL.2016 07:59:54

CDMA – 1xEvDO-Rel 0-BC0/Channel 384/99% OBW

Date: 15.JUL.2016 11:11:54

CDMA – 1xEvDO-Rel 0-BC0/Channel 384/26dB BW

Date: 15.JUL.2016 11:12:53

CDMA – 1xEvDO-Rel 0-BC1/Channel 600/99% OBW

Date: 15.JUL.2016 10:51:16

CDMA – 1xEvDO-Rel 0-BC1/Channel 600/26dB BW

Date: 15.JUL.2016 10:45:52

CDMA – 1xEvDO-Rel A-BC0/Channel 384/99% OBW

Date: 15.JUL.2016 11:20:08

CDMA – 1xEvDO-Rel A-BC0/Channel 384/26dB BW

Date: 15.JUL.2016 11:19:09

CDMA – 1xEvDO-Rel A-BC1/Channel 600/99% OBW

Date: 15.JUL.2016 10:49:55

CDMA – 1xEvDO-Rel A-BC1/Channel 600/26dB BW

Date: 15.JUL.2016 10:49:21

2.6 SPURIOUS EMISSION AT BAND EDGE

2.6.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 22, Clause 22.917(a)
FCC 47 CFR Part 24, Clause 24.238(a)
RSS-132, Clause 5.5
RSS-133, Clause 6.5

2.6.2 Standard Applicable

In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts).

2.6.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration A

2.6.4 Date of Test/Initial of test personnel who performed the test

July 06 to 08,m 2016 / XYZ
July 08 and 15, 2016 / FC and AC

2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.3 - 25.7°C
Relative Humidity	37.8 - 41.5%
ATM Pressure	99.2 - 99.8 kPa

2.6.7 Additional Observations

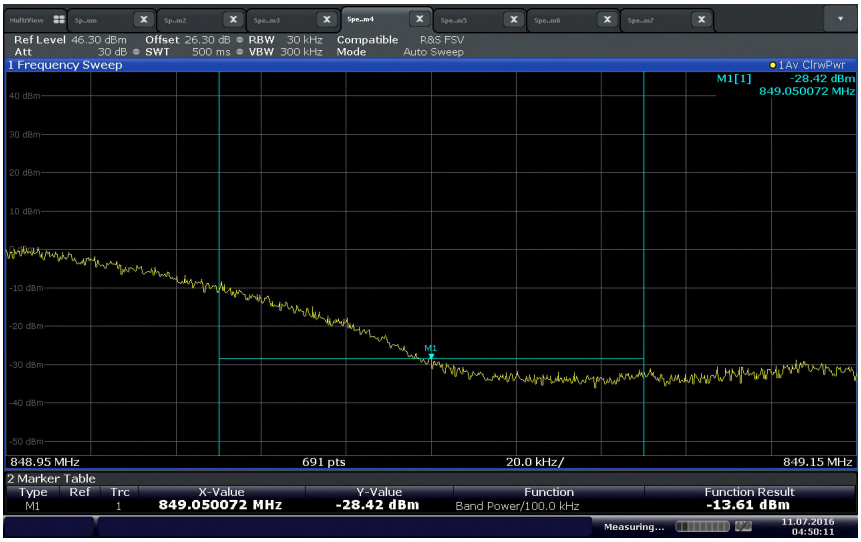
- This is a conducted test.
- The path loss were measured and entered as a level offset.
- RBW is set to minimum 1% of EBW and VBW is set to >3 x RBW in the 1 MHz band immediately outside and adjacent to the channel edge.
- For Cell Band, RBW was set to 100 kHz or 1% of the OBW provided the measurement result is integrated over the full reference bandwidth (100kHz).
- Only worst case configuration for all technologies presented in this test report.

2.6.8 Test Results

CDMA 1xRTT/Low Channel (1013)/BC0 Band Edge @ 824 MHz

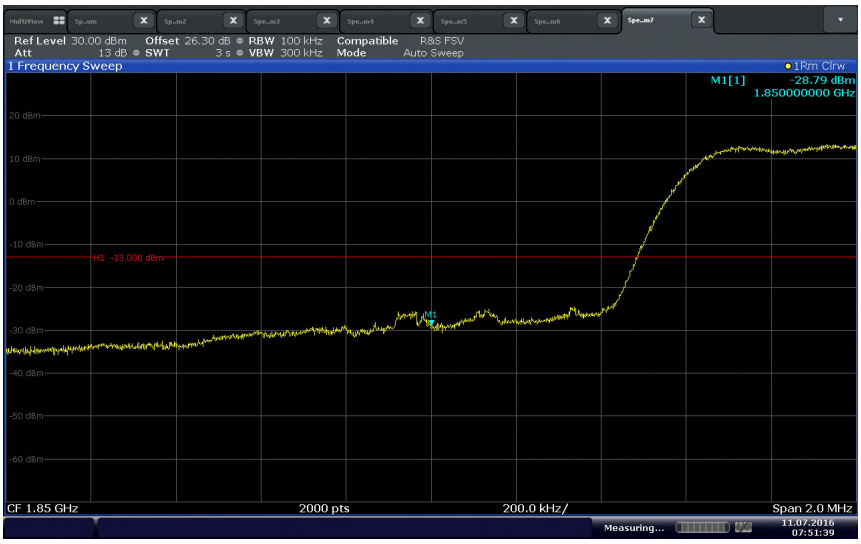
Date: 8.JUL.2016 15:42:28

CDMA 1xRTT/High Channel (777)/BC0 Band Edge @ 849 MHz



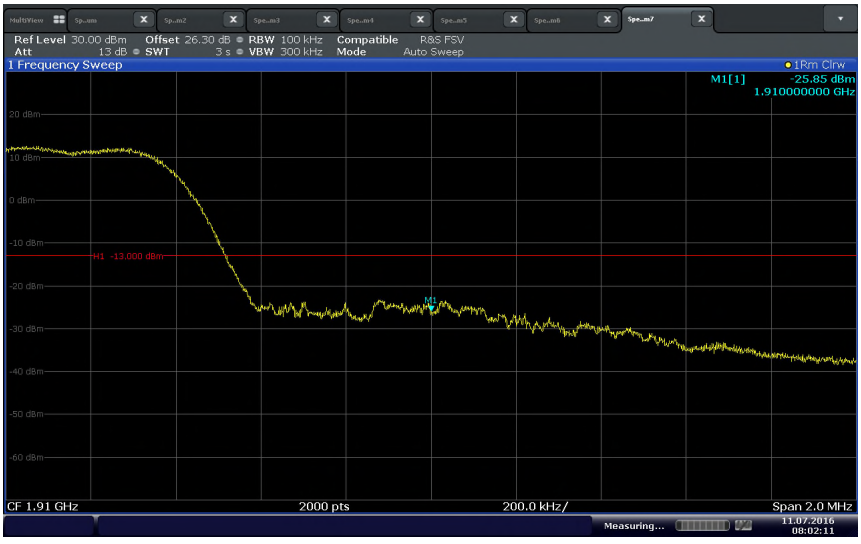
Date: 11.JUL.2016 04:50:11

CDMA 1xRTT/Low Channel (25)/BC1 Band Edge @ 1850 MHz



Date: 11.JUL.2016 07:51:39

CDMA 1xRTT/High Channel (1175)/BC1 Band Edge @ 1910 MHz



Date: 11.JUL.2016 08:02:11

CDMA – 1xEvDO Rel 0/Low Channel (1013)/BC0 Band Edge @ 824 MHz

Date: 15.JUL.2016 13:32:49

CDMA – 1xEvDO Rel 0/High Channel (777)/BC0 Band Edge @ 849 MHz

Date: 15.JUL.2016 13:34:09

CDMA – 1xEvDO Rel 0/Low Channel (25)/BC1 Band Edge @ 1850 MHz

Date: 15.JUL.2016 13:26:56

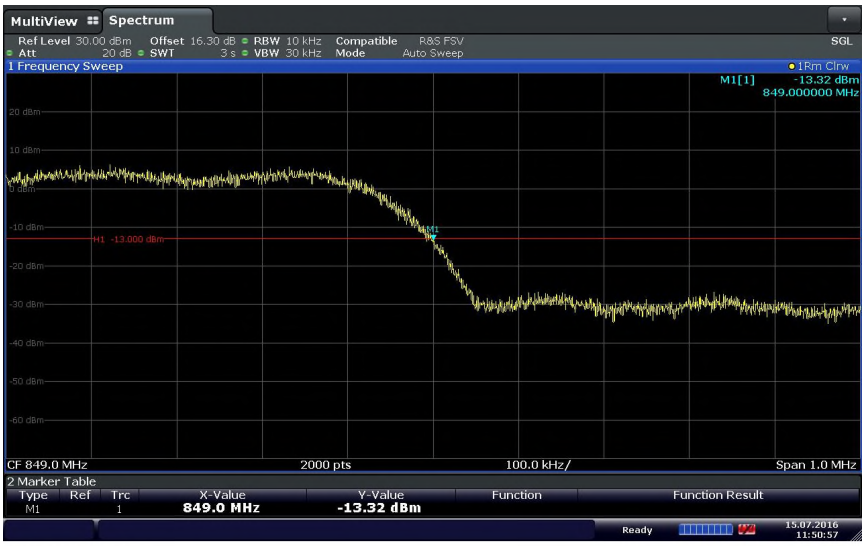
CDMA – 1xEvDO Rel 0/High Channel (1175)/BC1 Band Edge @ 1910 MHz

Date: 15.JUL.2016 13:30:16

CDMA – 1xEvDO Rel A/Low Channel (1013)/BC0 Band Edge @ 824 MHz

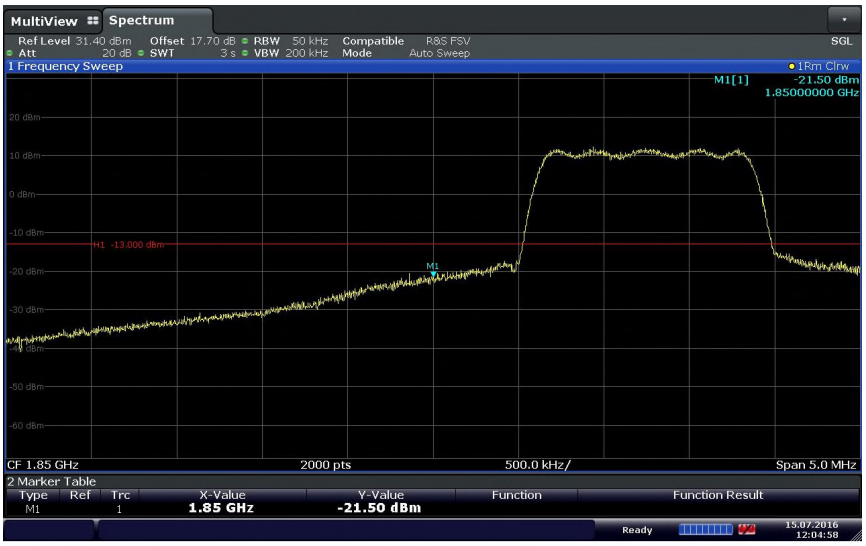
Date: 15.JUL.2016 11:47:58

CDMA – 1xEvDO Rel A/High Channel (777)/BC0 Band Edge @ 849 MHz



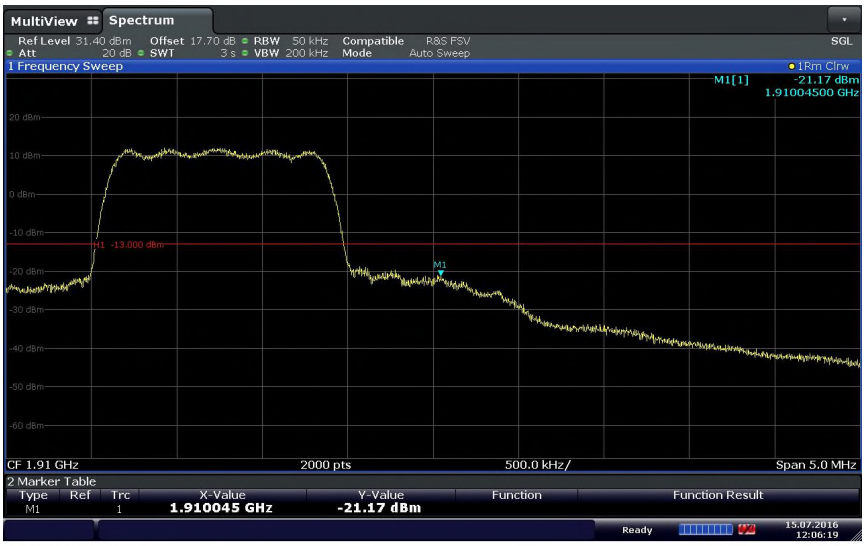
Date: 15.JUL.2016 11:50:57

CDMA – 1xEvDO Rel A/Low Channel (25)/BC1 Band Edge @ 1850 MHz



Date: 15.JUL.2016 12:04:58

CDMA – 1xEvDO Rel A/High Channel (1175)/BC1 Band Edge @ 1910 MHz



Date: 15.JUL.2016 12:06:19

2.7 CONDUCTED SPURIOUS EMISSIONS

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 22, Clause 22.917(a)
FCC 47 CFR Part 24, Clause 24.238(a)
RSS-132, Clause 5.5
RSS-133, Clause 6.5

2.7.2 Standard Applicable

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 + 10log(P) dB.

2.7.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration A

2.7.4 Date of Test/Initial of test personnel who performed the test

July 06 to 08, 2016 / XYZ
July 11, 15 and 18, 2016 / FC and AC

2.7.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

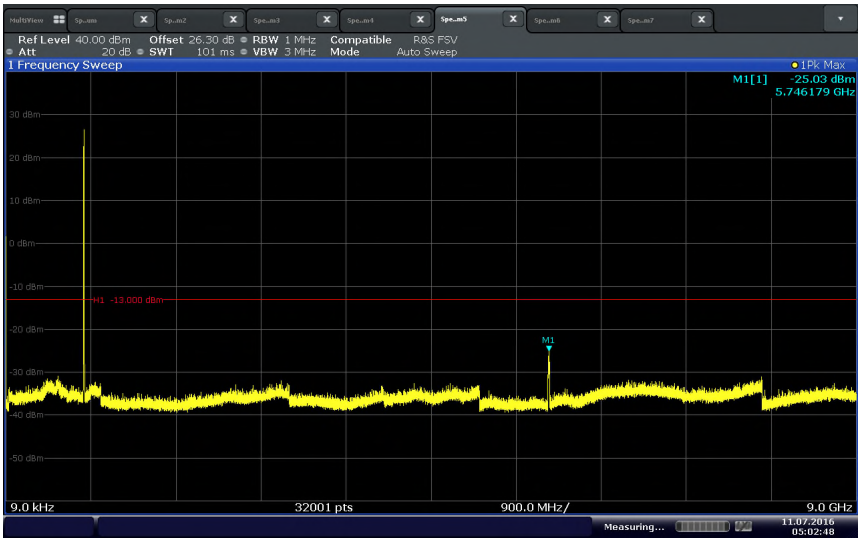
Ambient Temperature	24.3 - 25.7°C
Relative Humidity	37.8 - 41.5%
ATM Pressure	99.2 - 99.8 kPa

2.7.7 Additional Observations

- This is a conducted test.
- The spectrum was searched from 9 kHz to the 10th harmonic.
- The path loss was measured and entered as a level offset.
- RBW was set to 1 MHz as the worst case.
- Only worst case configuration for all technologies presented in this test report.

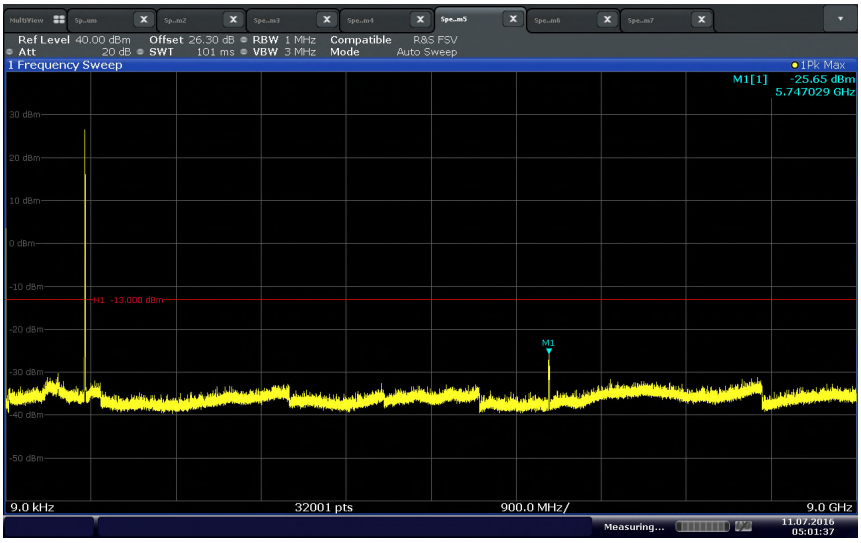
2.7.8 Test Results

CDMA 1xRTT/Low Channel (1013)/BC0 @ 824.7MHz

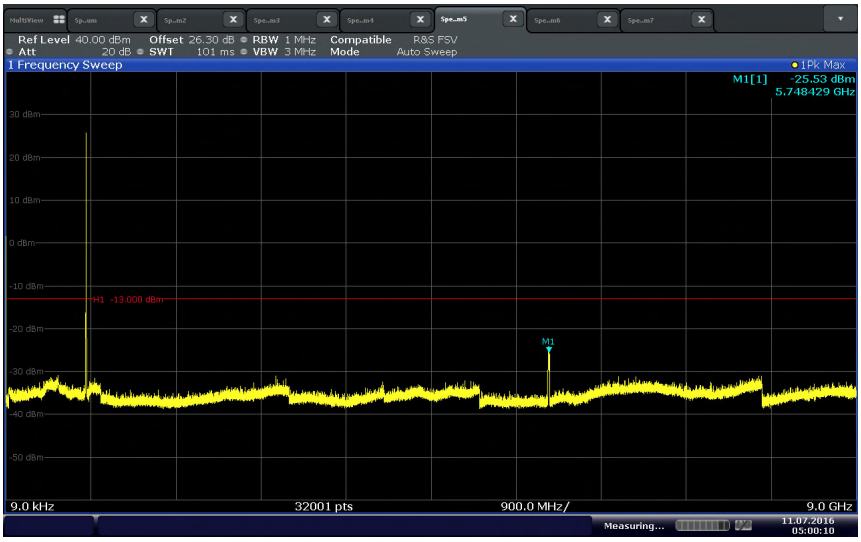


Date: 11.JUL.2016 05:02:49

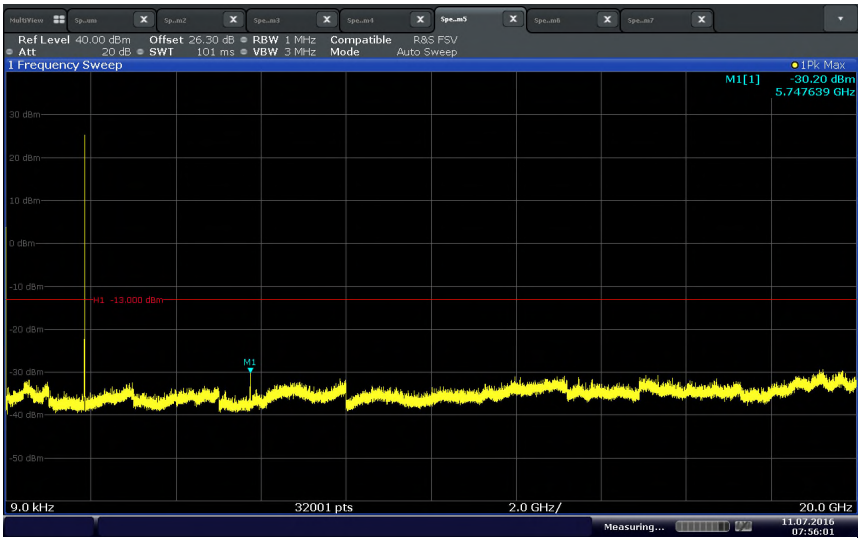
CDMA 1xRTT/Mid Channel (384)/BC0 @836.52 MHz



Date: 11.JUL.2016 05:01:37

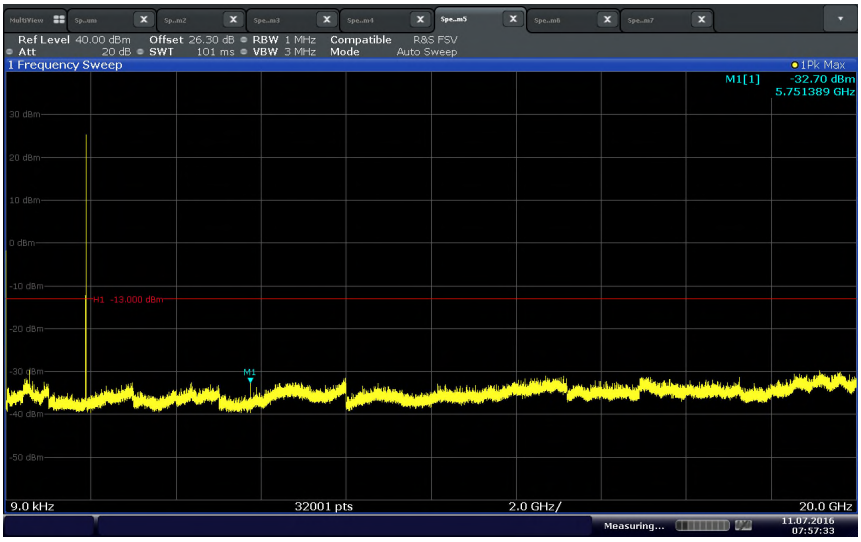
CDMA 1xRTT/High Channel (777)/BC0 @848.31 MHz


Date: 11.JUL.2016 05:00:10

CDMA 1xRTT/Low Channel (25)/BC1 @ 1851.25 MHz


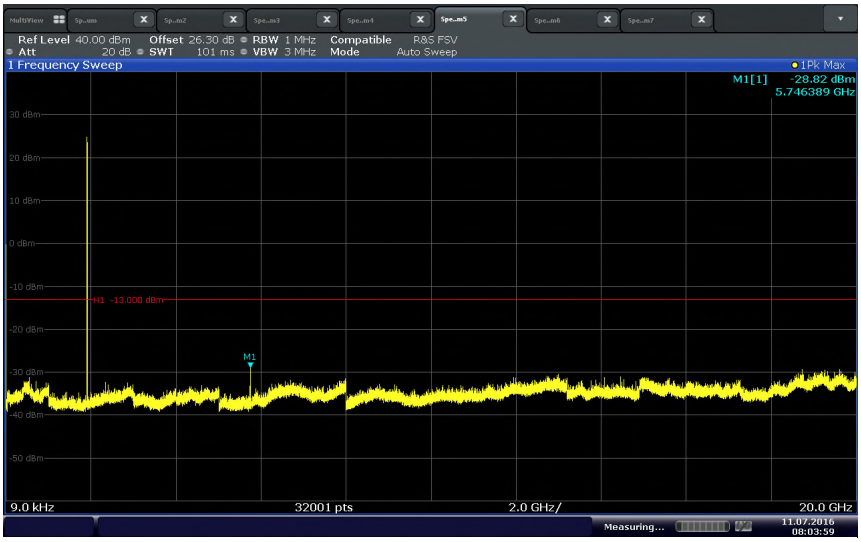
Date: 11.JUL.2016 07:56:01

CDMA 1xRTT/Mid Channel (600)/BC1 @ 1880.0 MHz



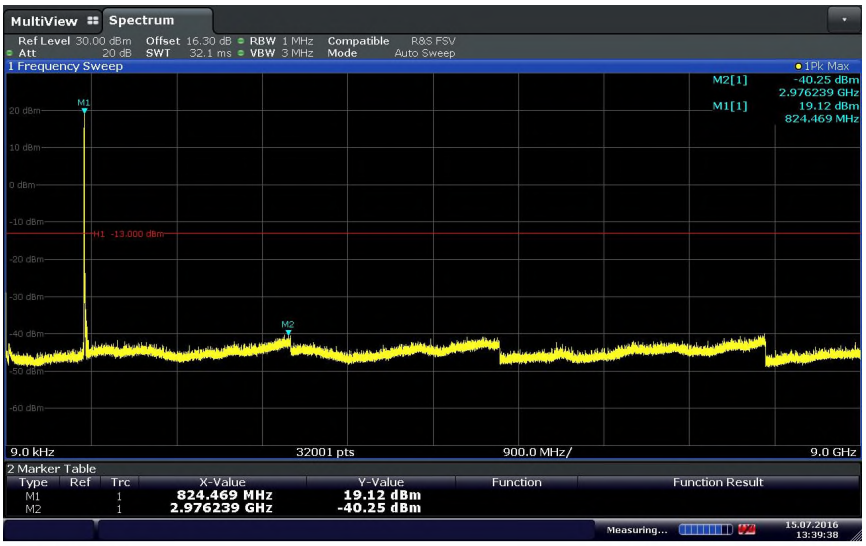
Date: 11.JUL.2016 07:57:34

CDMA 1xRTT/High Channel (1175)/BC1 @ 1908.75 MHz



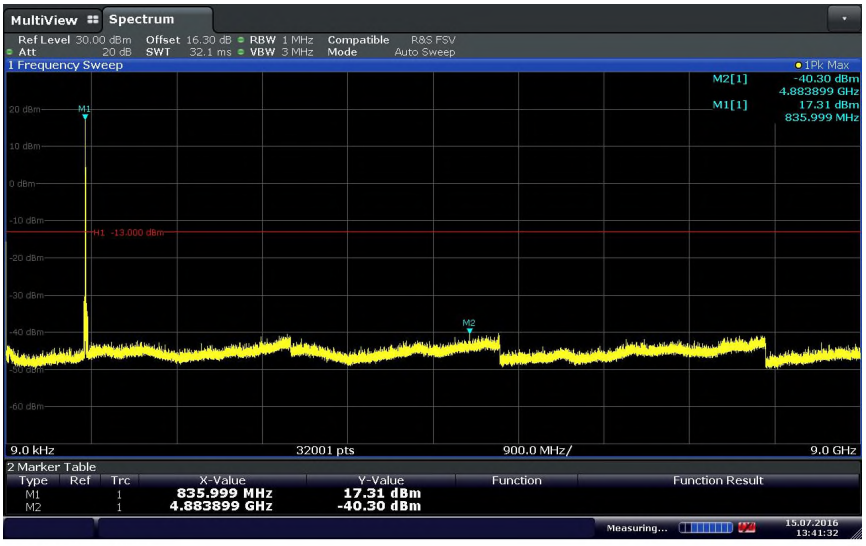
Date: 11.JUL.2016 08:03:59

CDMA – 1xEvDO Rel 0/Low Channel (1013)/BC0 @ 824.7 MHz



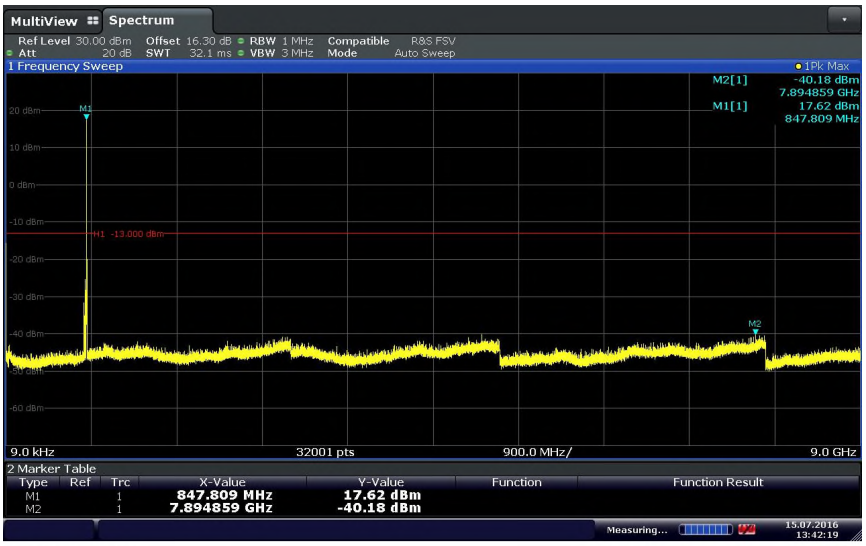
Date: 15.JUL.2016 13:39:38

CDMA – 1xEvDO Rel 0/Mid Channel (384)/BC0 @ 836.52 MHz



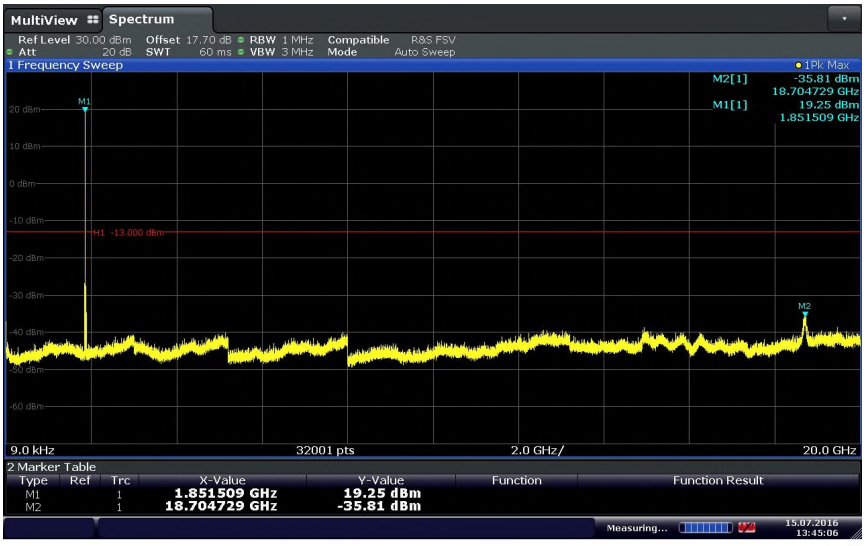
Date: 15.JUL.2016 13:41:32

CDMA – 1xEvDO Rel 0/High Channel (777)/BC0 @ 848.31 MHz



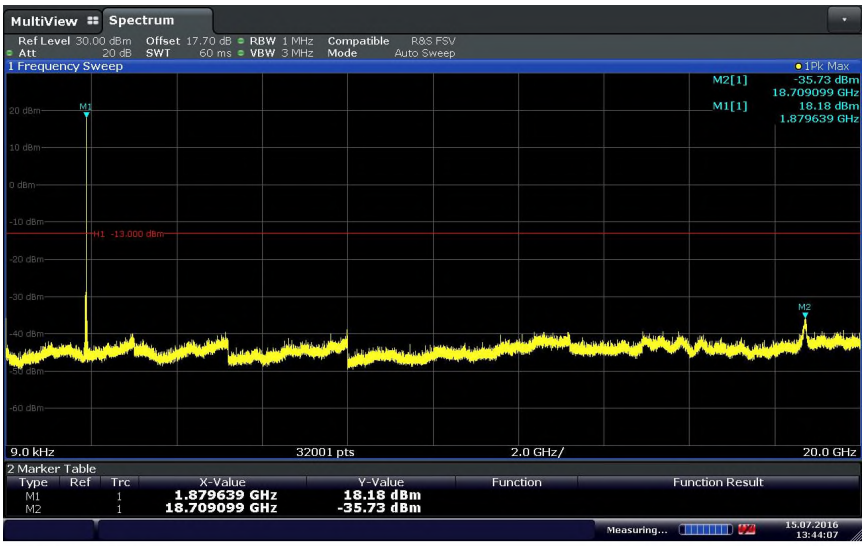
Date: 15.JUL.2016 13:42:19

CDMA – 1xEvDO Rel 0/Low Channel (25)/BC1 @ 1851.25 MHz



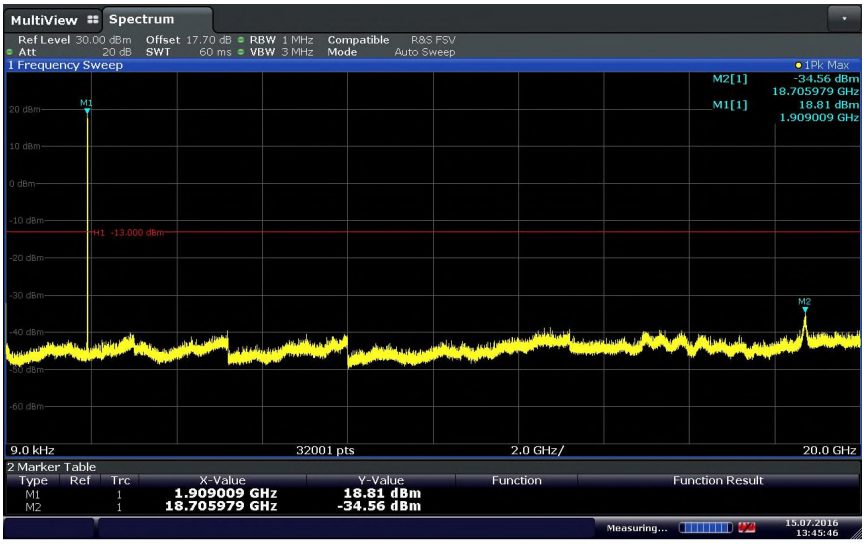
Date: 15.JUL.2016 13:45:06

CDMA – 1xEvDO Rel 0/Mid Channel (600)/BC1 @ 1880.0 MHz



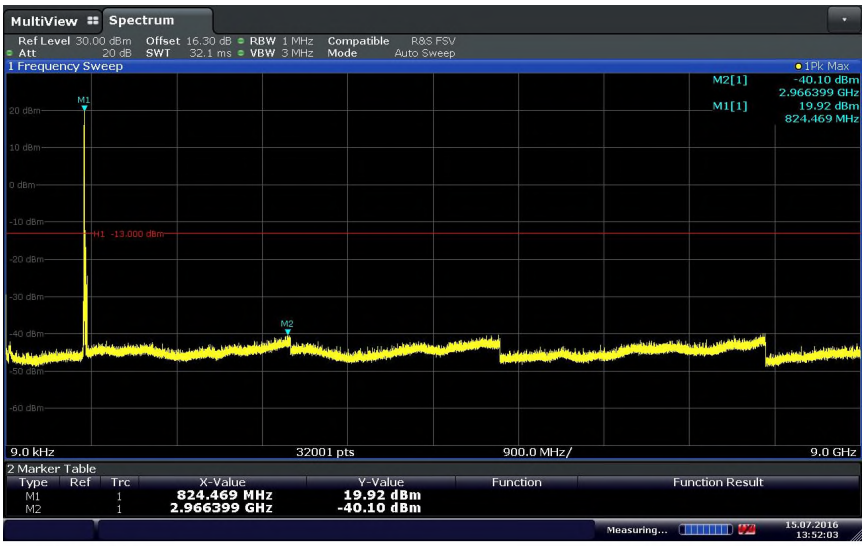
Date: 15.JUL.2016 13:44:07

CDMA – 1xEvDO Rel 0/High Channel (1175)/BC1 @ 1908.75 MHz



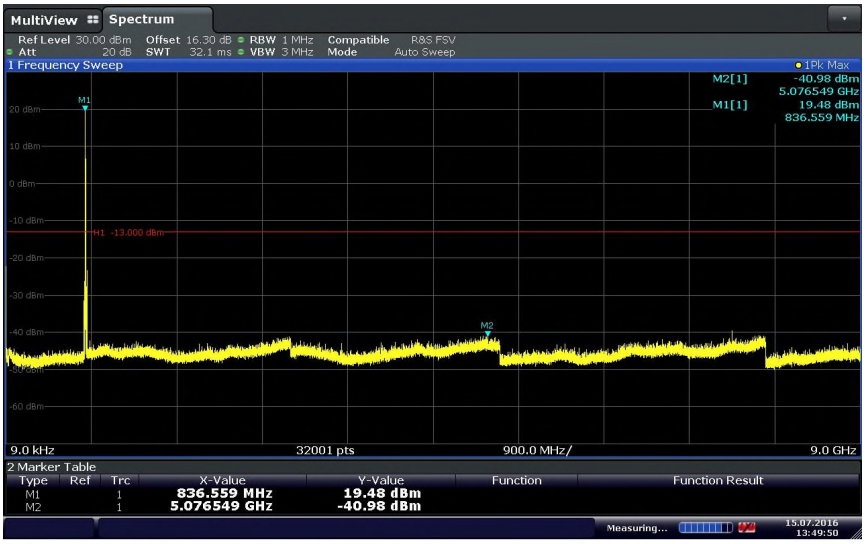
Date: 15.JUL.2016 13:45:46

CDMA – 1xEvDO Rel A/Low Channel (1013)/BC0 @ 824.7 MHz



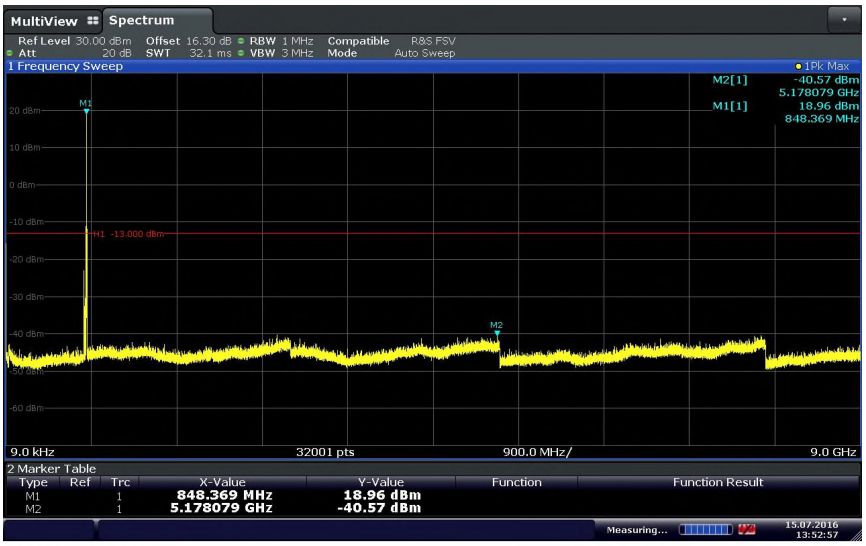
Date: 15.JUL.2016 13:52:04

CDMA – 1xEvDO Rel A/Mid Channel (384)/BC0 @ 836.52 MHz



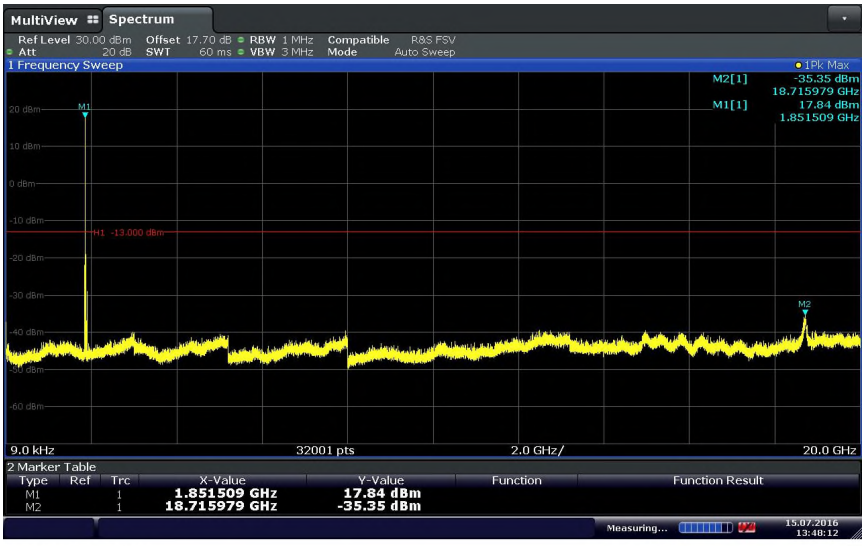
Date: 15.JUL.2016 13:49:50

CDMA – 1xEvDO Rel A/High Channel (777)/BC0 @ 848.31 MHz



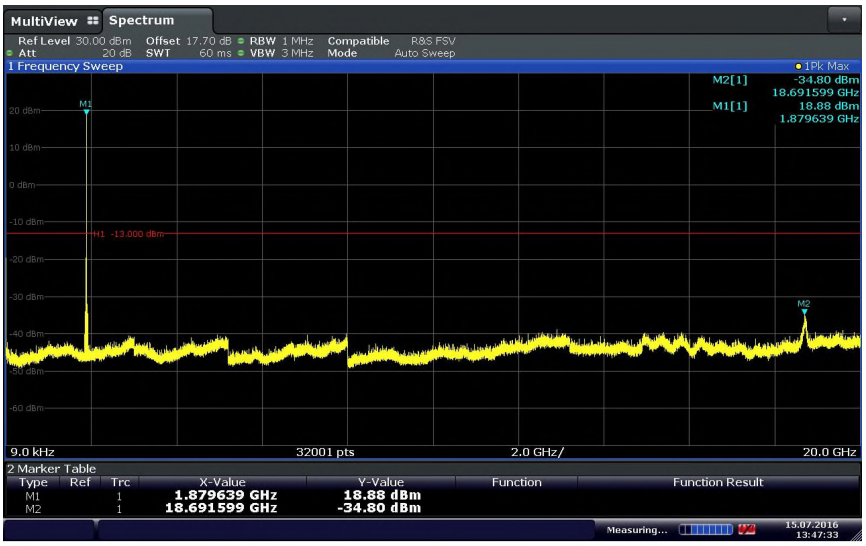
Date: 15.JUL.2016 13:52:57

CDMA – 1xEvDO Rel A/Low Channel (25)/BC1 @ 1851.25 MHz



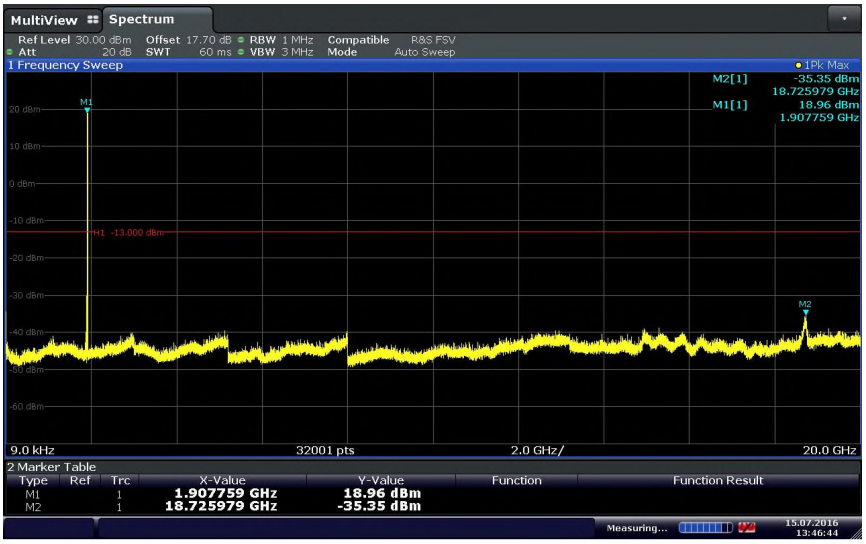
Date: 15.JUL.2016 13:48:12

CDMA – 1xEvDO Rel A/Mid Channel (600)/BC1 @ 1880.0 MHz



Date: 15.JUL.2016 13:47:33

CDMA – 1xEvDO Rel A/High Channel (1175)/BC1 @ 1908.75 MHz



Date: 15.JUL.2016 13:46:44

2.8 FIELD STRENGTH OF SPURIOUS RADIATION

2.8.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 22, Clause 22.917(a)
FCC 47 CFR Part 24, Clause 24.238(a)
RSS-132, Clause 5.5
RSS-133, Clause 6.5

2.8.2 Standard Applicable

Out of band emissions. 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.

2.8.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration B

2.8.4 Date of Test/Initial of test personnel who performed the test

July 13 and 23, 2016 / IR and AC

2.8.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.8 - 24.6°C
Relative Humidity	45.2 - 47.0%
ATM Pressure	99.5 - 99.9 kPa

2.8.7 Additional Observations

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-C 2004, August 17, 2004.
- Only the worst case configuration presented in this test report.
- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 V8.52 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.8.8 for sample computation.

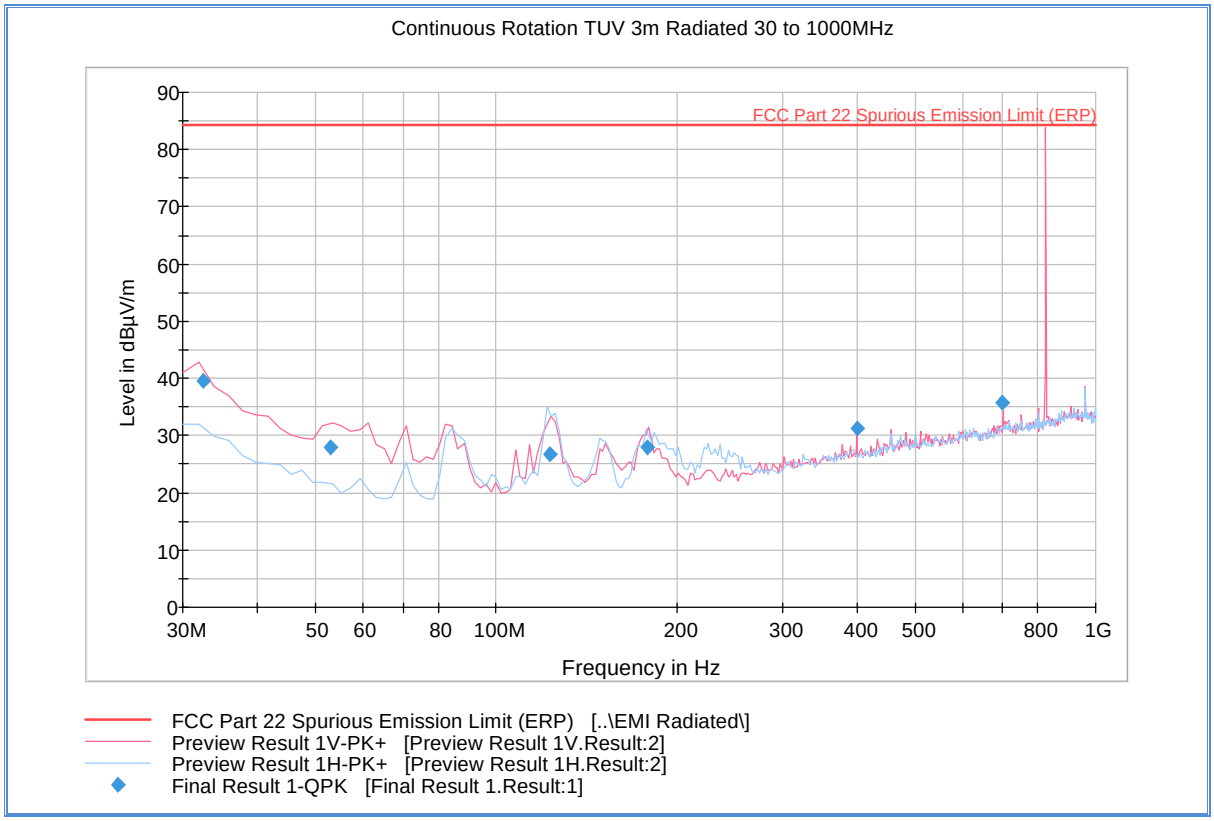
2.8.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dBµV) @ 2400 MHz			53.9
Correction Factor (dB)	Asset# 1153 (cable)	3.4	-0.4
	Asset# 8628(preamplifier)	-36.5	
	Asset#7575 (antenna)	32.7	
Reported Max Peak Final Measurement (dBµV/m) @ 2400 MHz			**53.5**

2.8.9 Test Results

Compliant. See attached plots.

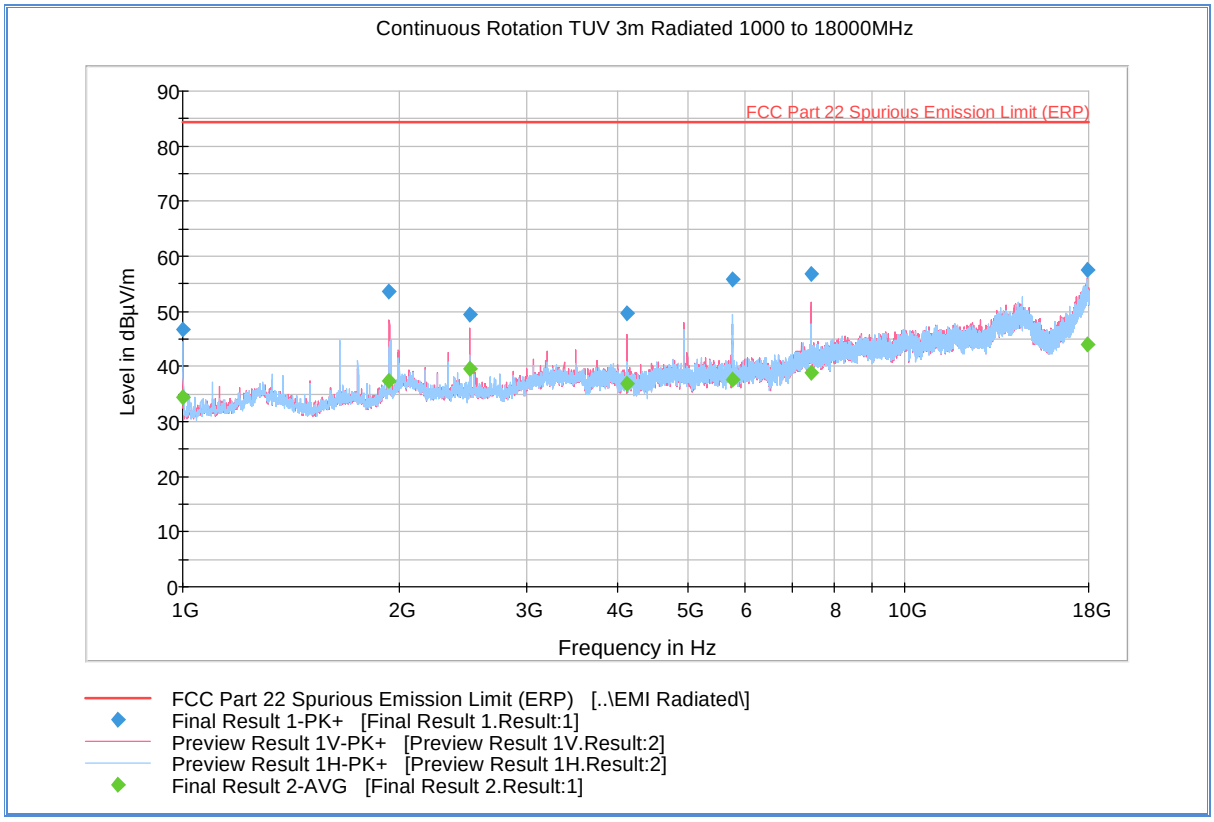
2.8.10 Radiated Emission Test Results Below 1GHz_Worst Case Configuration_CDMA 1xRTT_BC0_Low Channel 1013



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.440000	39.6	1000.0	120.000	100.0	V	214.0	-7.2	44.8	84.4
52.886653	27.9	1000.0	120.000	100.0	V	168.0	-15.0	56.5	84.4
122.562725	26.9	1000.0	120.000	283.0	H	65.0	-15.4	57.5	84.4
178.399359	28.0	1000.0	120.000	100.0	V	181.0	-12.5	56.4	84.4
399.330000	31.3	1000.0	120.000	100.0	V	169.0	-4.0	53.1	84.4
700.001283	35.8	1000.0	120.000	150.0	V	175.0	2.8	48.6	84.4

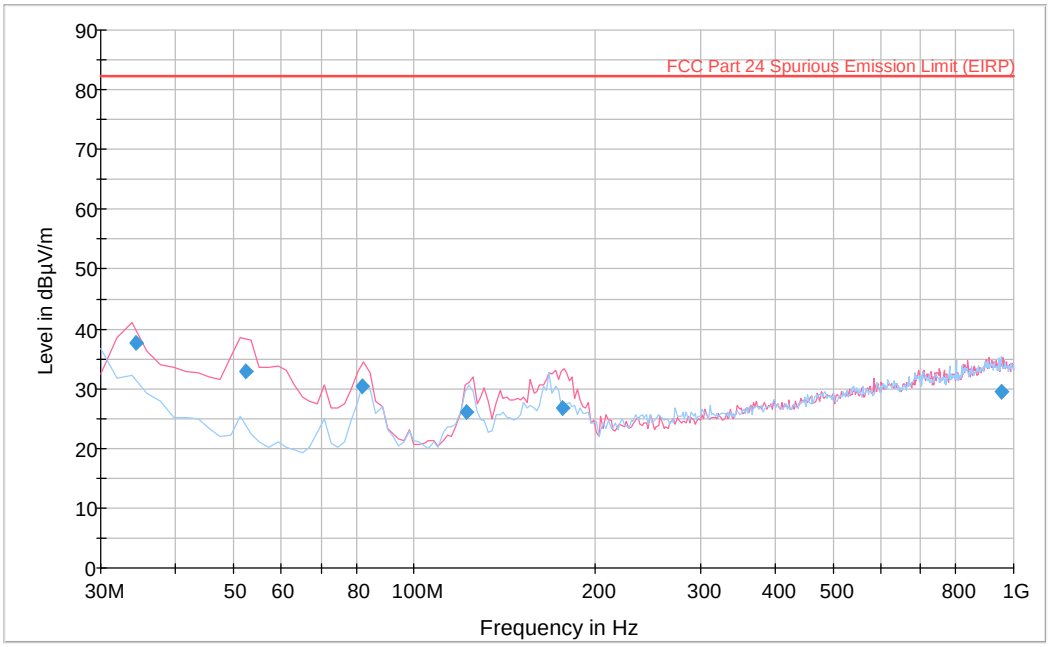
2.8.11 Radiated Emission Test Results Above 1GHz_Worst Case Configuration_CDMA 1xRTT_BC0_Low Channel 1013



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.8	1000.0	1000.000	102.8	H	82.0	-11.2	37.6	84.4
1932.566667	53.6	1000.0	1000.000	403.0	V	318.0	-4.6	30.8	84.4
2499.766667	49.5	1000.0	1000.000	103.7	V	351.0	-5.0	34.9	84.4
4125.000000	49.7	1000.0	1000.000	296.2	V	330.0	0.8	34.7	84.4
5772.266667	55.9	1000.0	1000.000	195.5	H	131.0	3.7	28.5	84.4
7423.700000	56.7	1000.0	1000.000	232.4	V	203.0	8.1	27.7	84.4
17897.266667	57.6	1000.0	1000.000	403.0	V	220.0	24.0	26.8	84.4

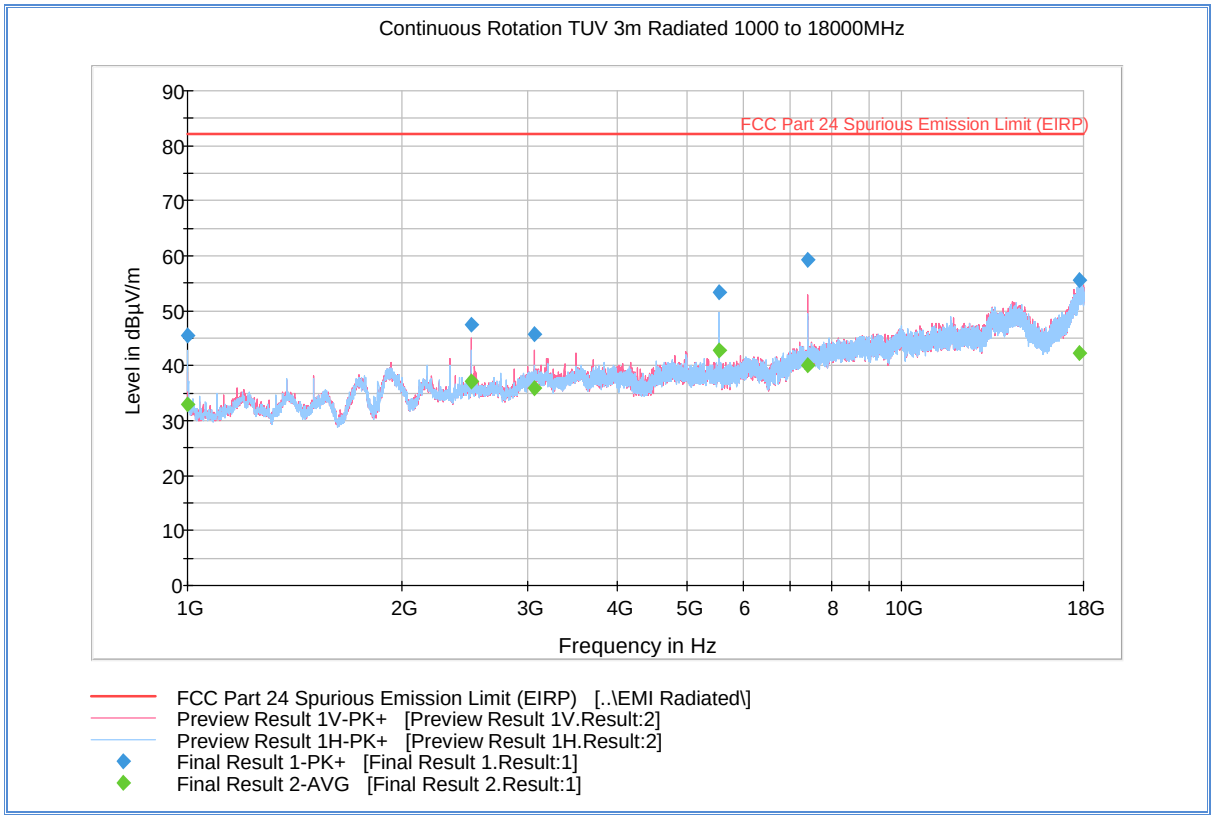
2.8.12 Radiated Emission Test Results Below 1GHz_Worst Case Configuration_CDMA 1xRTT_BC1_Low Channel 25



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
34.367776	37.7	1000.0	120.000	100.0	V	308.0	-8.1	44.5	82.2
52.462766	32.8	1000.0	120.000	100.0	V	214.0	-14.9	49.4	82.2
82.044970	30.4	1000.0	120.000	100.0	V	275.0	-16.3	51.8	82.2
122.346613	26.2	1000.0	120.000	150.0	V	214.0	-15.4	56.1	82.2
177.295471	26.9	1000.0	120.000	100.0	V	162.0	-12.6	55.4	82.2
952.746693	29.5	1000.0	120.000	350.0	H	193.0	6.1	52.8	82.2

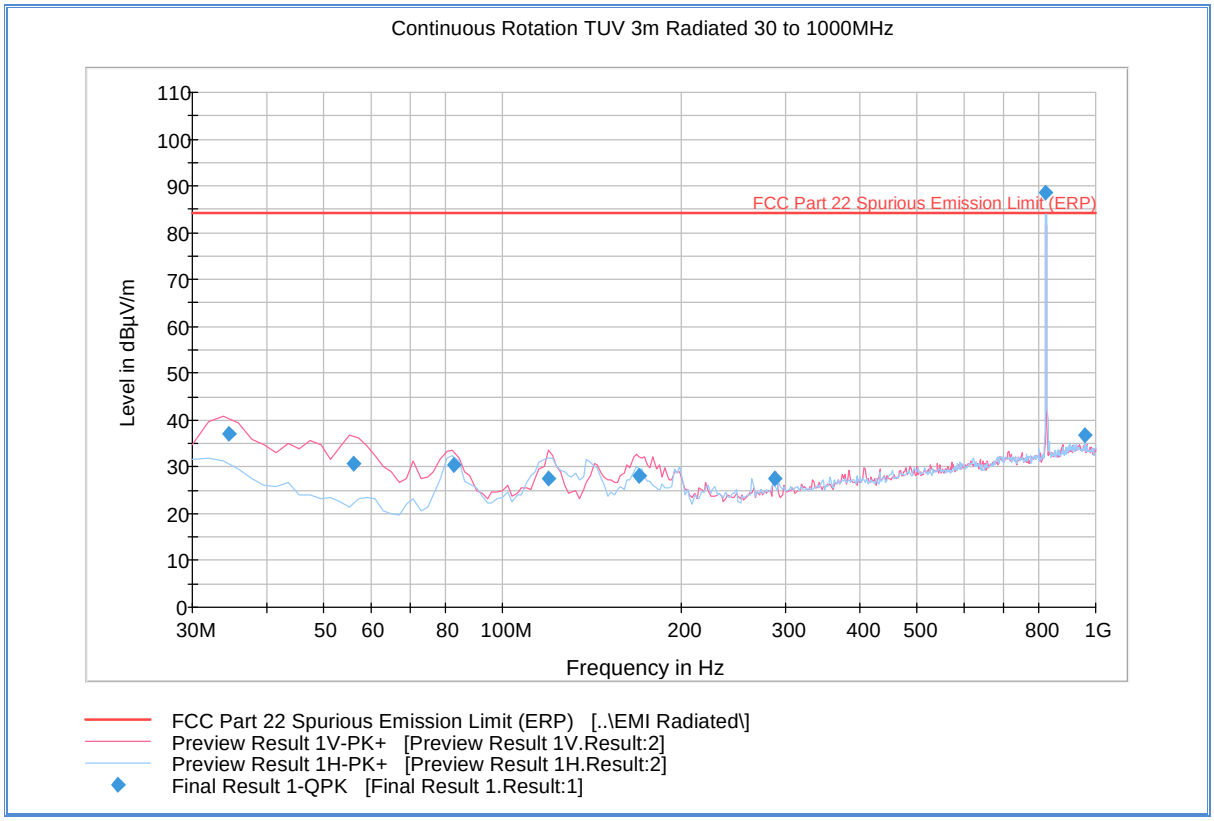
2.8.13 Radiated Emission Test Results Above 1GHz_Worst Case Configuration_CDMA 1xRTT_BC1_Low Channel 25



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	45.4	1000.0	1000.000	102.7	H	12.0	-11.2	36.8	82.2
2499.766667	47.6	1000.0	1000.000	116.7	V	-13.0	-5.0	34.7	82.2
3062.466667	45.6	1000.0	1000.000	170.6	V	-13.0	-2.3	36.6	82.2
5554.700000	53.4	1000.0	1000.000	186.5	H	125.0	3.3	28.9	82.2
7404.833333	59.2	1000.0	1000.000	172.6	V	207.0	8.1	23.0	82.2
17801.900000	55.5	1000.0	1000.000	135.7	H	311.0	23.4	26.8	82.2

2.8.14 Radiated Emission Test Results Below 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel 0_ BC0_Low Channel 1013

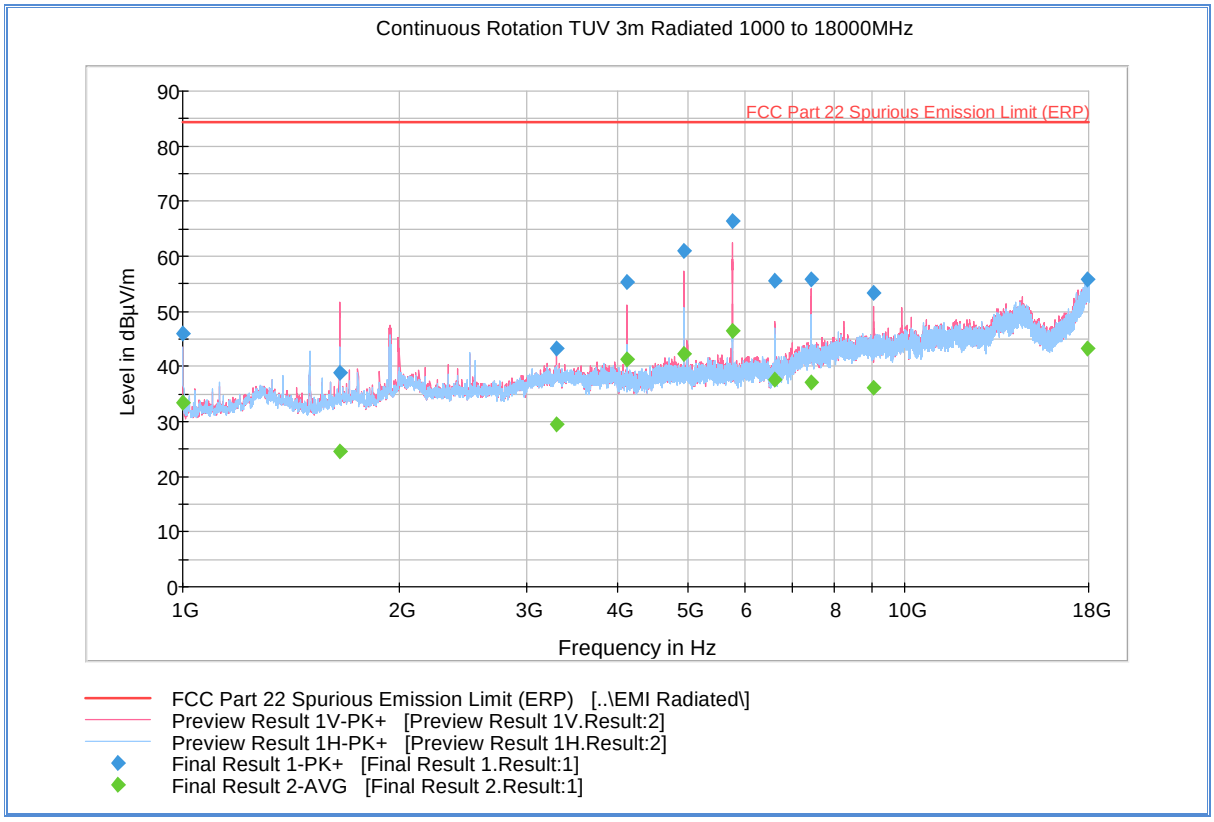


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
34.607776	37.1	1000.0	120.000	100.0	V	295.0	-8.3	47.3	84.4
56.110541	30.7	1000.0	120.000	100.0	V	208.0	-15.6	53.7	84.4
82.764970	30.5	1000.0	120.000	100.0	V	243.0	-16.3	53.9	84.4
119.418838	27.6	1000.0	120.000	100.0	V	79.0	-15.2	56.8	84.4
169.736032	28.1	1000.0	120.000	100.0	V	192.0	-13.0	56.2	84.4
287.737074	27.6	1000.0	120.000	106.0	V	193.0	-7.9	56.8	84.4
825.033988	88.7	1000.0	120.000	100.0	H	19.0	4.5	* Fundamental Freq.	
960.122244	36.8	1000.0	120.000	212.0	V	155.0	6.2	47.6	84.4

***** This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only.

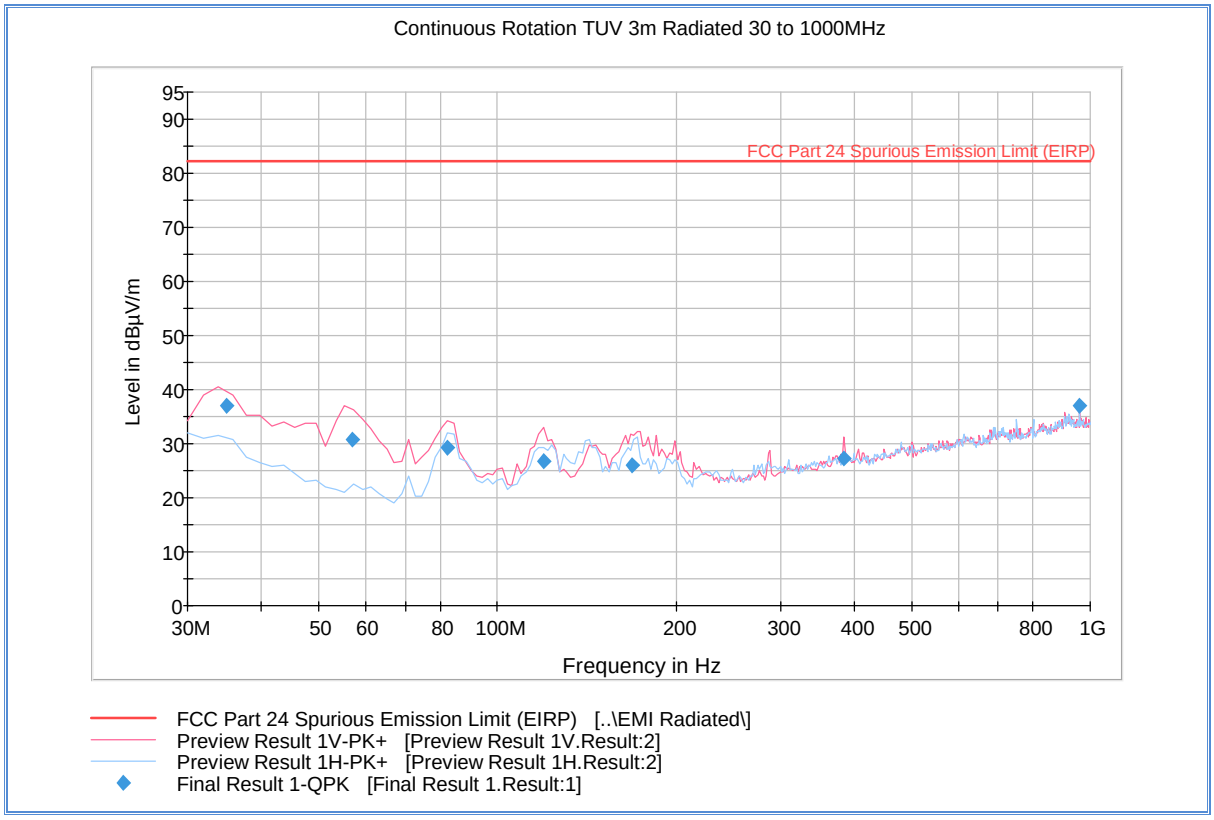
2.8.15 Radiated Emission Test Results Above 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel 0_ BC0_Low Channel 1013



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.1	1000.0	1000.000	126.7	H	185.0	-11.2	38.3	84.4
1648.233333	38.8	1000.0	1000.000	161.6	V	-7.0	-8.0	45.5	84.4
3298.366667	43.3	1000.0	1000.000	171.6	V	318.0	-1.1	41.0	84.4
4121.766667	55.4	1000.0	1000.000	303.2	V	336.0	0.8	28.9	84.4
4949.866667	60.9	1000.0	1000.000	292.2	V	334.0	2.3	23.4	84.4
5774.733333	66.4	1000.0	1000.000	125.7	V	197.0	3.7	18.0	84.4
6600.200000	55.7	1000.0	1000.000	226.4	V	338.0	4.5	28.7	84.4
7425.233333	55.9	1000.0	1000.000	297.2	V	331.0	8.1	28.5	84.4
9068.400000	53.4	1000.0	1000.000	125.7	V	234.0	10.1	31.0	84.4
17914.966667	55.9	1000.0	1000.000	157.6	V	-1.0	24.1	28.4	84.4

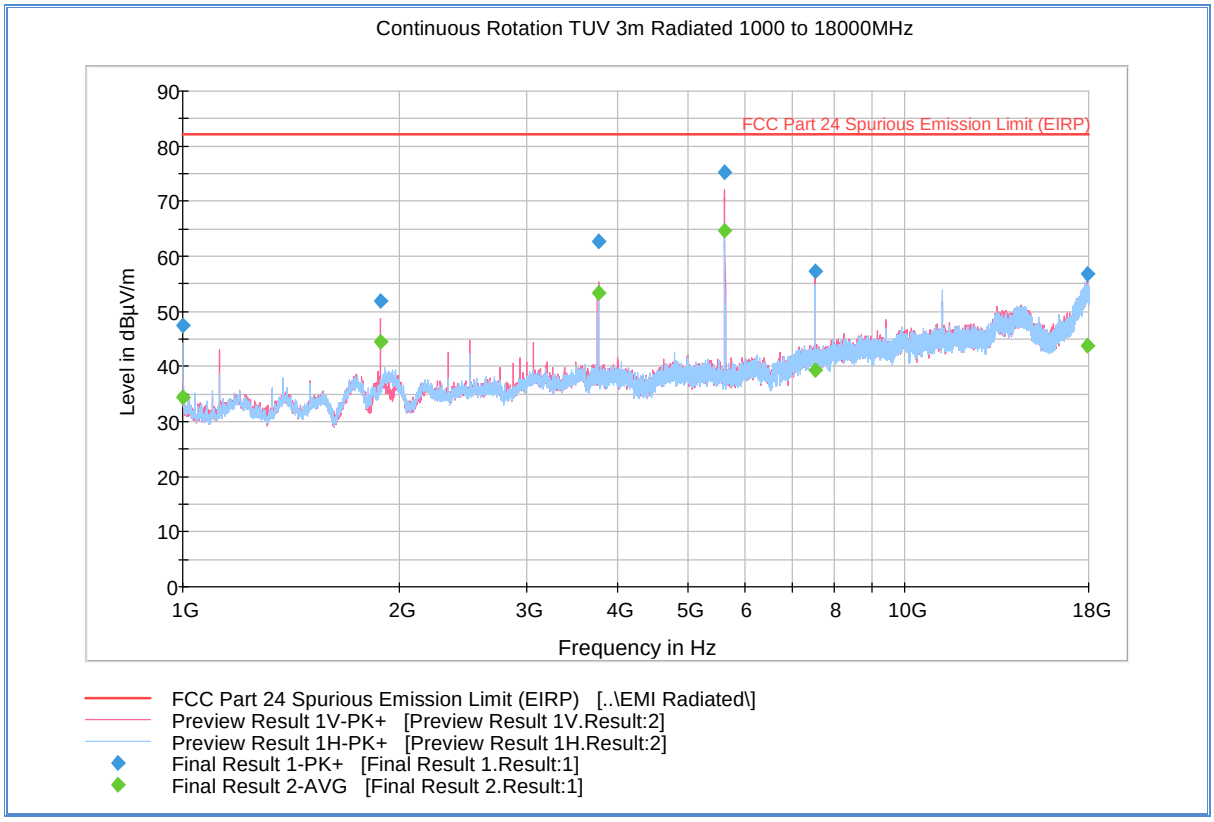
2.8.16 Radiated Emission Test Results Below 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel 0_ BC1_Mid Channel 600



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
34.887776	37.1	1000.0	120.000	100.0	V	268.0	-8.5	45.1	82.2
56.910541	30.7	1000.0	120.000	105.0	V	-15.0	-15.7	51.5	82.2
82.324970	29.3	1000.0	120.000	100.0	V	229.0	-16.3	52.9	82.2
119.858838	26.8	1000.0	120.000	127.0	V	94.0	-15.2	55.4	82.2
168.703808	26.0	1000.0	120.000	100.0	V	179.0	-13.0	56.2	82.2
384.467575	27.1	1000.0	120.000	115.0	V	158.0	-4.5	55.1	82.2
960.122244	37.1	1000.0	120.000	213.0	V	152.0	6.2	45.2	82.2

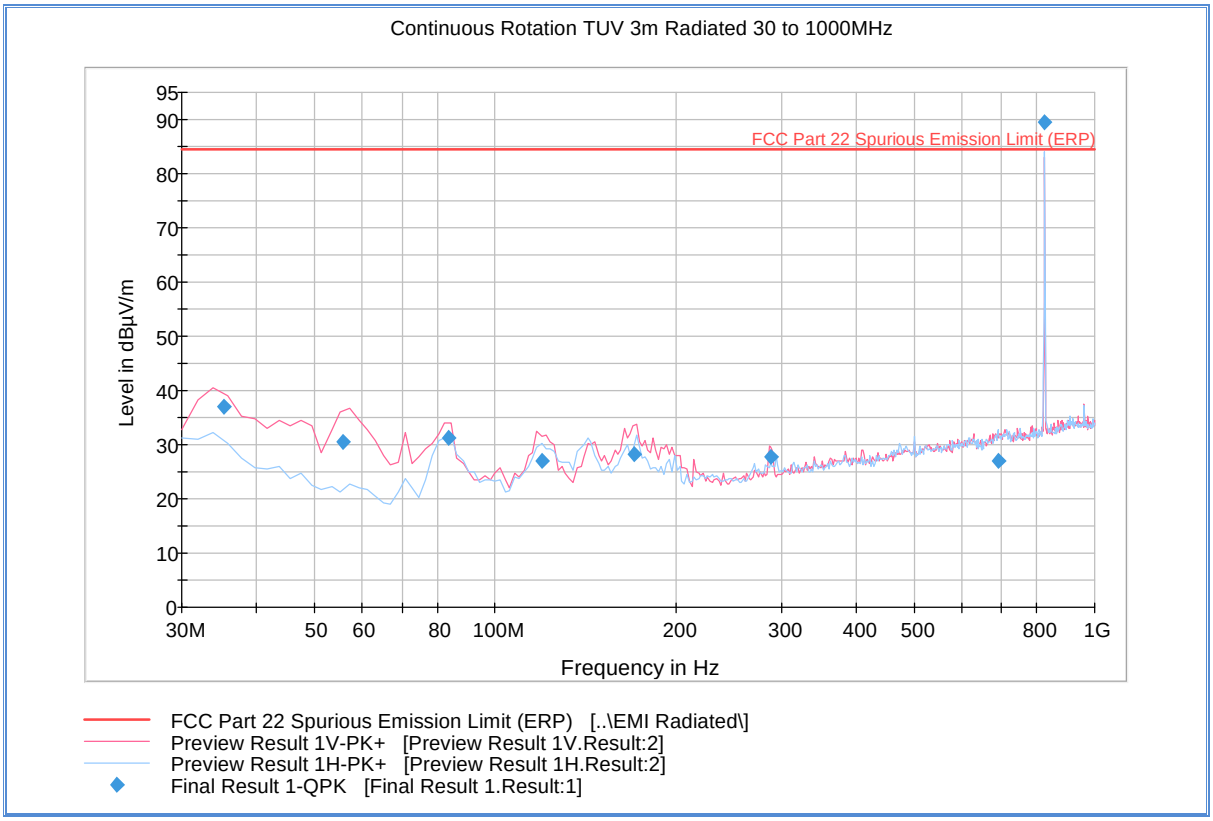
2.8.17 Radiated Emission Test Results Above 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel 0_ BC1_Mid Channel 600



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	47.4	1000.0	1000.000	102.8	H	253.0	-11.2	34.9	82.2
1880.033333	51.8	1000.0	1000.000	99.7	V	295.0	-5.4	30.4	82.2
3760.633333	62.8	1000.0	1000.000	158.6	V	-1.0	0.6	19.4	82.2
5639.133333	75.2	1000.0	1000.000	138.7	V	186.0	3.4	7.1	82.2
7518.933333	57.4	1000.0	1000.000	126.7	V	1.0	8.1	24.8	82.2
17895.700000	56.8	1000.0	1000.000	157.6	V	23.0	24.0	25.5	82.2

2.8.18 Radiated Emission Test Results Below 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel A_ BC0_Low Channel 1013

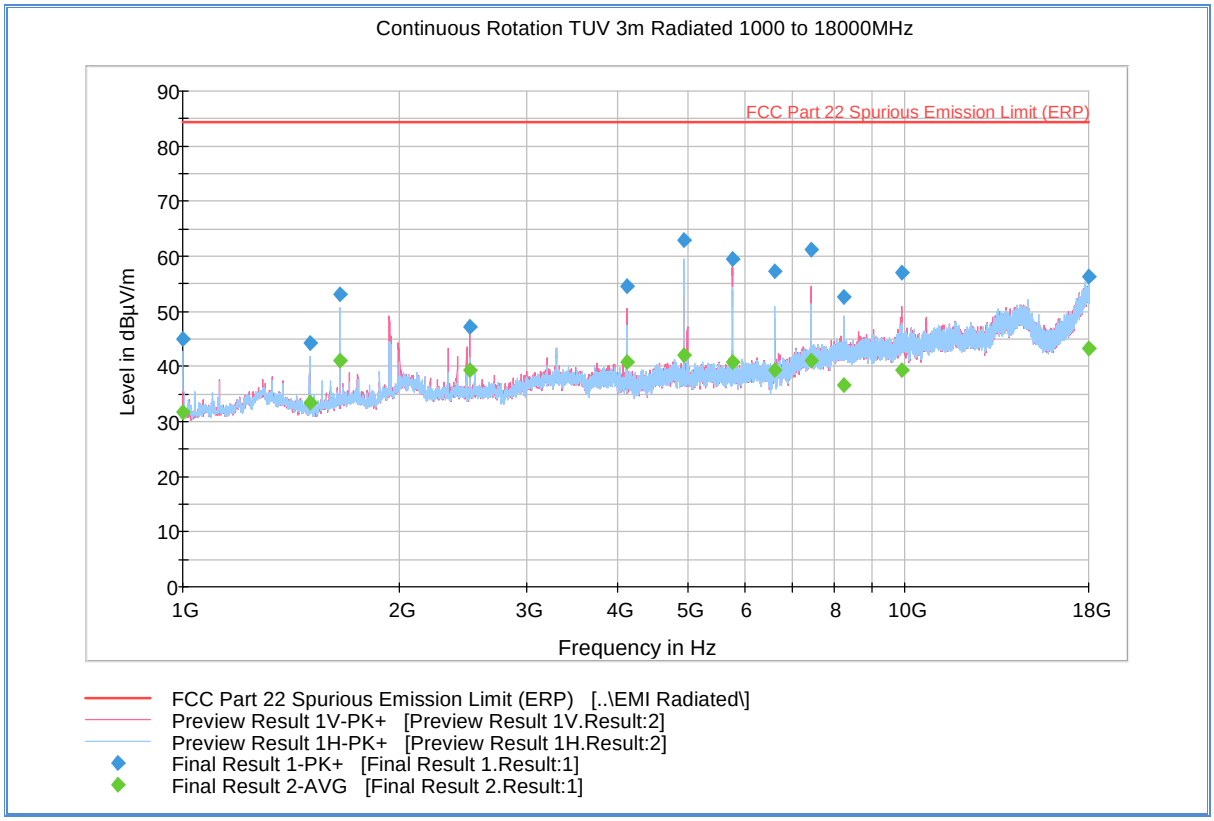


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
35.207776	36.9	1000.0	120.000	109.0	V	243.0	-8.6	47.4	84.4
55.854429	30.5	1000.0	120.000	100.0	V	-11.0	-15.5	53.9	84.4
83.484970	31.2	1000.0	120.000	105.0	V	230.0	-16.2	53.2	84.4
119.738838	27.1	1000.0	120.000	106.0	V	126.0	-15.2	57.3	84.4
170.383808	28.2	1000.0	120.000	100.0	V	181.0	-12.9	56.1	84.4
288.400962	27.8	1000.0	120.000	100.0	V	222.0	-7.8	56.6	84.4
692.641844	27.1	1000.0	120.000	346.0	H	40.0	2.7	57.3	84.4
825.010100	89.4	1000.0	120.000	100.0	H	14.0	4.5	* Fundamental Freq.	

***** This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only.

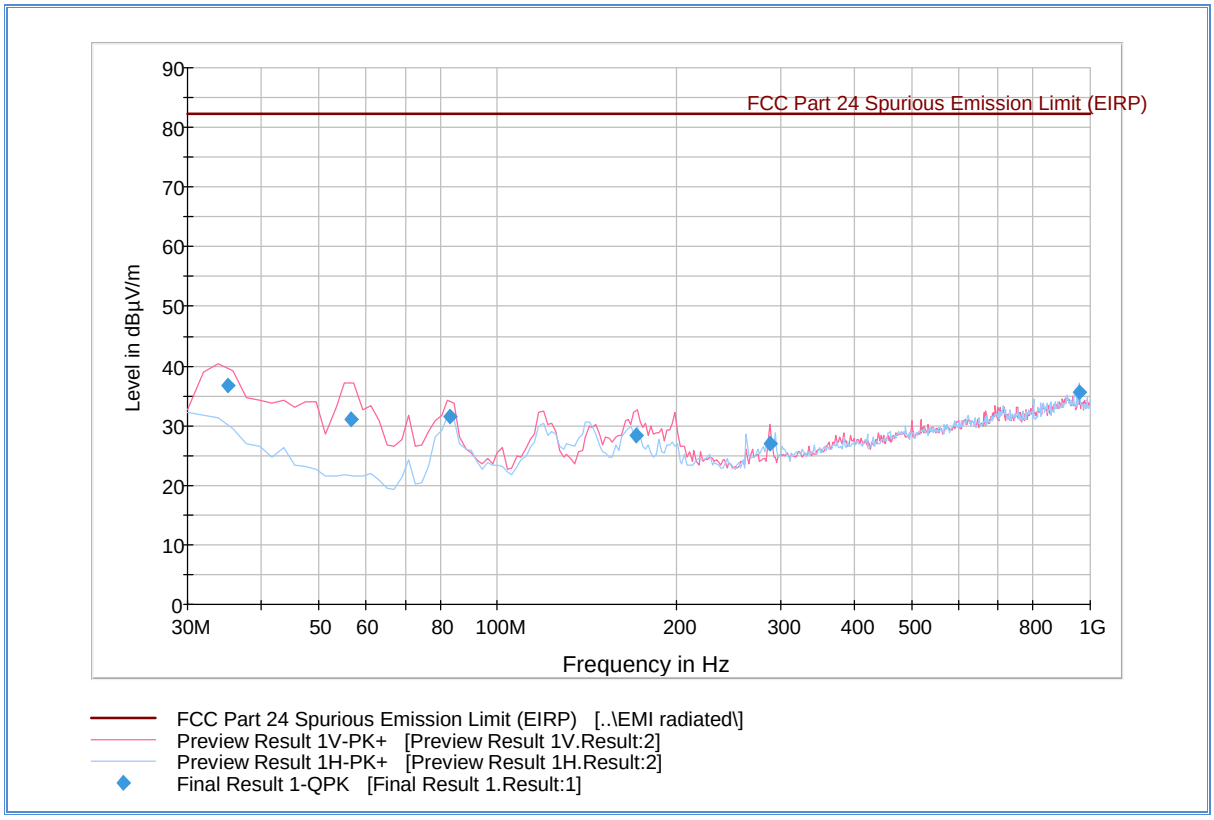
2.8.19 Radiated Emission Test Results Above 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel A_ BC0_Low Channel 1013



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	45.0	1000.0	1000.000	405.2	H	278.0	-11.2	39.4	84.4
1500.000000	44.2	1000.0	1000.000	319.2	V	-13.0	-9.1	40.2	84.4
1648.866667	53.1	1000.0	1000.000	102.7	H	10.0	-8.0	31.3	84.4
2499.800000	47.3	1000.0	1000.000	151.6	V	343.0	-5.0	37.1	84.4
4125.033333	54.5	1000.0	1000.000	233.4	V	-8.0	0.8	29.9	84.4
4950.666667	62.8	1000.0	1000.000	200.5	H	78.0	2.3	21.5	84.4
5770.600000	59.4	1000.0	1000.000	111.7	V	-13.0	3.7	25.0	84.4
6600.200000	57.2	1000.0	1000.000	139.7	H	149.0	4.5	27.2	84.4
7419.000000	61.1	1000.0	1000.000	232.4	V	155.0	8.1	23.2	84.4
8243.533333	52.6	1000.0	1000.000	228.4	V	50.0	8.8	31.8	84.4
9899.366667	56.9	1000.0	1000.000	199.5	V	215.0	11.3	27.5	84.4
17996.033333	56.3	1000.0	1000.000	405.2	H	60.0	24.3	28.0	84.4

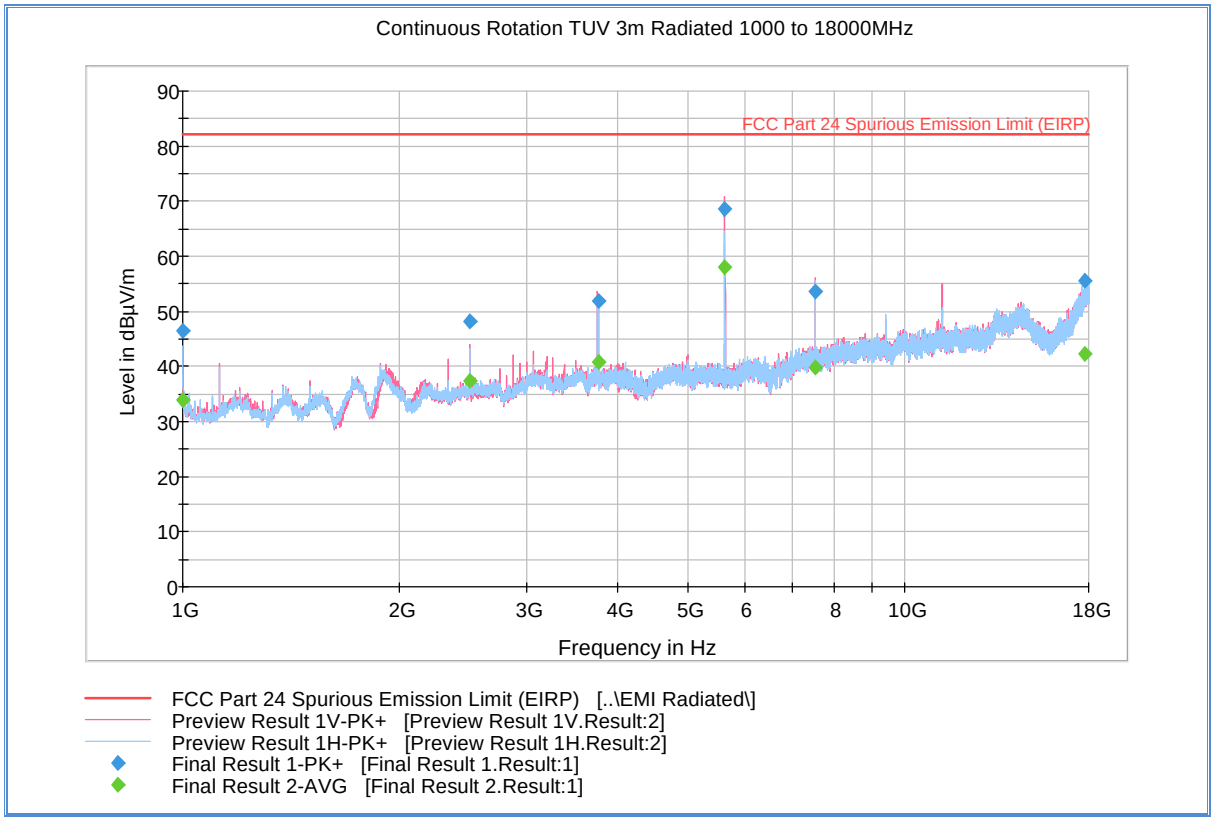
2.8.20 Radiated Emission Test Results Below 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel A_ BC1_Mid Channel 600



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
35.007776	36.7	1000.0	120.000	100.0	V	324.0	-8.5	45.5	82.2
56.694429	31.0	1000.0	120.000	115.0	V	201.0	-15.7	51.2	82.2
83.044970	31.4	1000.0	120.000	100.0	V	232.0	-16.2	50.8	82.2
171.063808	28.3	1000.0	120.000	109.0	V	167.0	-12.9	53.9	82.2
287.680962	27.0	1000.0	120.000	106.0	V	231.0	-7.9	55.2	82.2
960.122244	35.7	1000.0	120.000	100.0	H	281.0	6.2	46.6	82.2

2.8.21 Radiated Emission Test Results Above 1GHz_Worst Case Configuration_CDMA 1xEvDO Rel A_ BC1_Mid Channel 600



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.4	1000.0	1000.000	102.7	H	280.0	-11.2	35.8	82.2
2500.166667	48.2	1000.0	1000.000	112.7	V	20.0	-4.9	34.0	82.2
3759.300000	52.0	1000.0	1000.000	302.2	V	-1.0	0.6	30.2	82.2
5640.800000	68.7	1000.0	1000.000	100.7	V	166.0	3.4	13.5	82.2
7519.866667	53.6	1000.0	1000.000	100.7	V	340.0	8.1	28.6	82.2
17744.066667	55.6	1000.0	1000.000	130.7	H	16.0	23.1	26.6	82.2

2.9 FREQUENCY STABILITY

2.9.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 22, Clause 22.355
FCC 47 CFR Part 24, Clause 24.235
RSS-132, Clause 5.3
RSS-133, Clause 6.3

2.9.2 Standard Applicable

FCC:
Part 22, Clause 22.355: Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C–1 of this section.

Table C–1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Mobile ≤3 watts (ppm)
821 to 896	2.5

Part 24, Clause 24.235: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

IC:
RSS-132 Clause 5.3: The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.
RSS-133 Clasue 6.3: The carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations.

2.9.3 Equipment Under Test and Modification State

Serial No: SZ17061900005 / Test Configuration A

2.9.4 Date of Test/Initial of test personnel who performed the test

July 11, 2016 / AC
July 18 and 19 2016 / AC

2.9.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.1 – 25.4°C
Relative Humidity	23.0 - 24.5%
ATM Pressure	98.7 kPa

2.9.7 Additional Observations

- This is a conducted test. The EUT was operated at 3.7VDC nominal voltage and was placed in the temperature chamber for this evaluation. The EUT was controlled by a CMW500 and utilizing a spectrum analyzer for measurement.
- Test performed in worst case channel based on RF power output measurement.
- An offset were added to compensate for the external attenuator and cable used.
- f1 and f2 are lower and upper -10dBc points in relation to the peak value of the power envelope.
- The EUT was tested over the temperature -30°C to +50°C in 10°C steps and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The measurements were then performed.
- Voltage variation was also performed at voltage 3.3VDC and higher 4.3VDC of the nominal voltage at 20°C.

2.9.8 Test Results

CDMA 1xRTT – (BC0) – Low Ch 1013 @ 824.7 MHz						
Voltage (VDC)	***Temperature (°C)***	***f1 (MHz)***	***f2 (MHz)***	***Center Freq. (f1+f2)/2***	***Freq. Error (ppm)***	***Limit (ppm)***
3.7	-30	824.074082	825.323855	824.698968	1.25	2.5
	-20	824.075770	825.323793	824.699781	0.26	2.5
	-10	824.077644	825.324855	824.701249	-1.51	2.5
	0	824.079082	825.317793	824.698438	1.89	2.5
	+10	824.076395	825.324918	824.700656	-0.79	2.5
	+20	824.074770	825.327980	824.701375	-1.67	2.5
	+30	824.076894	825.323856	824.700375	-0.45	2.5
	+40	824.073082	825.328430	824.700756	-0.92	2.5
	+50	824.087519	825.314481	824.701000	-1.21	2.5
CDMA 1xRTT – (BC0) – Low Ch 1013 @ 824.7 MHz						
Voltage (VDC)	***Temperature (°C)***	***f1 (MHz)***	***f2 (MHz)***	***Center Freq. (f1+f2)/2***	***Freq. Error (ppm)***	***Limit (ppm)***
3.3	20	824.068520	825.332730	824.700625	-0.76	2.5
4.3		824.079144	825.324730	824.701937	-2.35	2.5

CDMA 1xRTT – (BC1) – Low Ch 25 @ 1851.25 MHz						
Voltage (VDC)	*Temperature (°C)*	*f1 (MHz)*	*f2 (MHz)*	*Center Freq. (f1+f2)/2*	*Freq. Error (ppm)*	*Limit (ppm)*
3.7	-30	1850.6017	1851.8983	1851.25	0.0	2.5
	-20	1850.6017	1851.8983	1851.25	0.0	2.5
	-10	1850.6017	1851.9012	1851.25145	-0.78	2.5
	0	1850.5988	1851.8983	1851.24855	0.78	2.5
	+10	1850.6046	1851.8954	1851.25	0.0	2.5
	+20	1850.593	1851.907	1851.25	0.0	2.5
	+30	1850.6017	1851.9012	1851.25145	-0.78	2.5
	+40	1850.5988	1851.9012	1851.25	0.0	2.5
	+50	1850.6075	1851.8983	1851.2529	-1.57	2.5

CDMA 1xRTT – (BC1) – Low Ch 25 @ 1851.25 MHz						
Voltage (VDC)	*Temperature (°C)*	*f1 (MHz)*	*f2 (MHz)*	*Center Freq. (f1+f2)/2*	*Freq. Error (ppm)*	*Limit (ppm)*
3.3	20	1850.5901	1851.907	1851.24855	0.78	2.5
4.3		1850.593	1851.907	1851.25	0.0	2.5

2.9.9 Sample Calculation and plot

Variables (from test plot): M1 = (Peak value of the power envelope)
T1 = (-10 dBc point)
T2 = (+10 dBc point)

Center Frequency Formula: = (T1+T2) / 2
= 1870.9972+1889.0013) / 2
= 1879.99925 MHz

Δ (MHz): = Center Frequency – Calculated Center Frequency
= 1880 MHz – 1879.99925 MHz
= 0.00075 MHz

Ppm Calculation: = (Δ (MHz) / Center Frequency) x 1000000
= (0.00075 MHz / 1880 MHz) x 1000000
= 0.39894 ppm

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SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Conducted Port Setup						
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	02/01/16	02/01/17
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7611 and 7608	
7578	Wideband Radio Communication Tester	CMW 500	1201.0002K50 -116735-rQ	Rhode & Schwarz	Used for connectivity only, calibration not required	
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	07/29/15	07/29/16
Radiated Test Setup						
1033	Bilog Antenna	3142C	00044556	EMCO	09/25/14	09/25/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/15	09/29/16
1016	Pre-amplifier	PAM-0202	187	PAM	12/15/15	12/15/16
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	05/12/16	05/12/17
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/17/16	03/17/17
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	01/11/16	01/11/17
1054	Horn antenna (18-40 GHz)	3116	9407-2233	EMCO	12/22/15	12/22/17
n/a	Pre-amplifier (18-40 GHz)	SLKKa-30-6	15G27	Spacek Labs	Verified by 1003 and 7611	
7578	Wideband Radio Communication Tester	CMW 500	1201.0002K50 -116735-rQ	Rhode & Schwarz	Used for connectivity only, calibration not required	
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	05/16/16	05/16/17
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	02/01/16	02/01/17
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
1123	DC Power Supply	E3631A	N/A	Hewlett Packard	Verified by 6452	
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
7579	Temperature Chamber	115	151617	TestQuity	08/14/15	08/14/16
7560	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	10/19/15	10/19/16

Note: all the test equipments are within calibration when the testing was performed.

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission Measurements (Below 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (uc):	1.78
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.57

3.2.2 Radiated Emission Measurements (Above 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.78
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.56

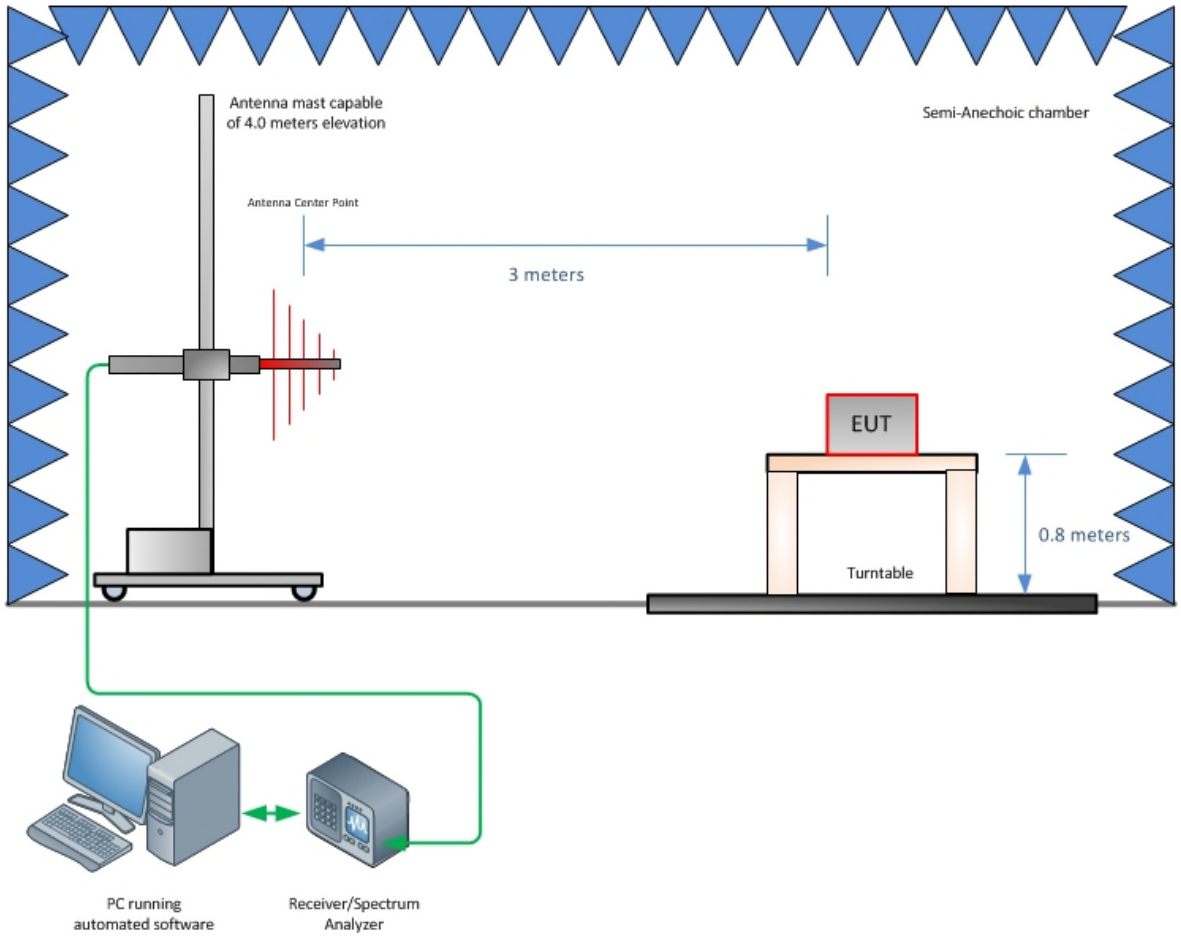
3.2.3 Conducted Antenna Port Measurement

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.34	0.20	0.04
2	Cables	Rectangular	0.30	0.17	0.03
3	EUT Setup	Rectangular	0.50	0.29	0.08
				Combined Uncertainty (u_c):	0.39
				Coverage Factor (k):	1.96
				Expanded Uncertainty:	0.76

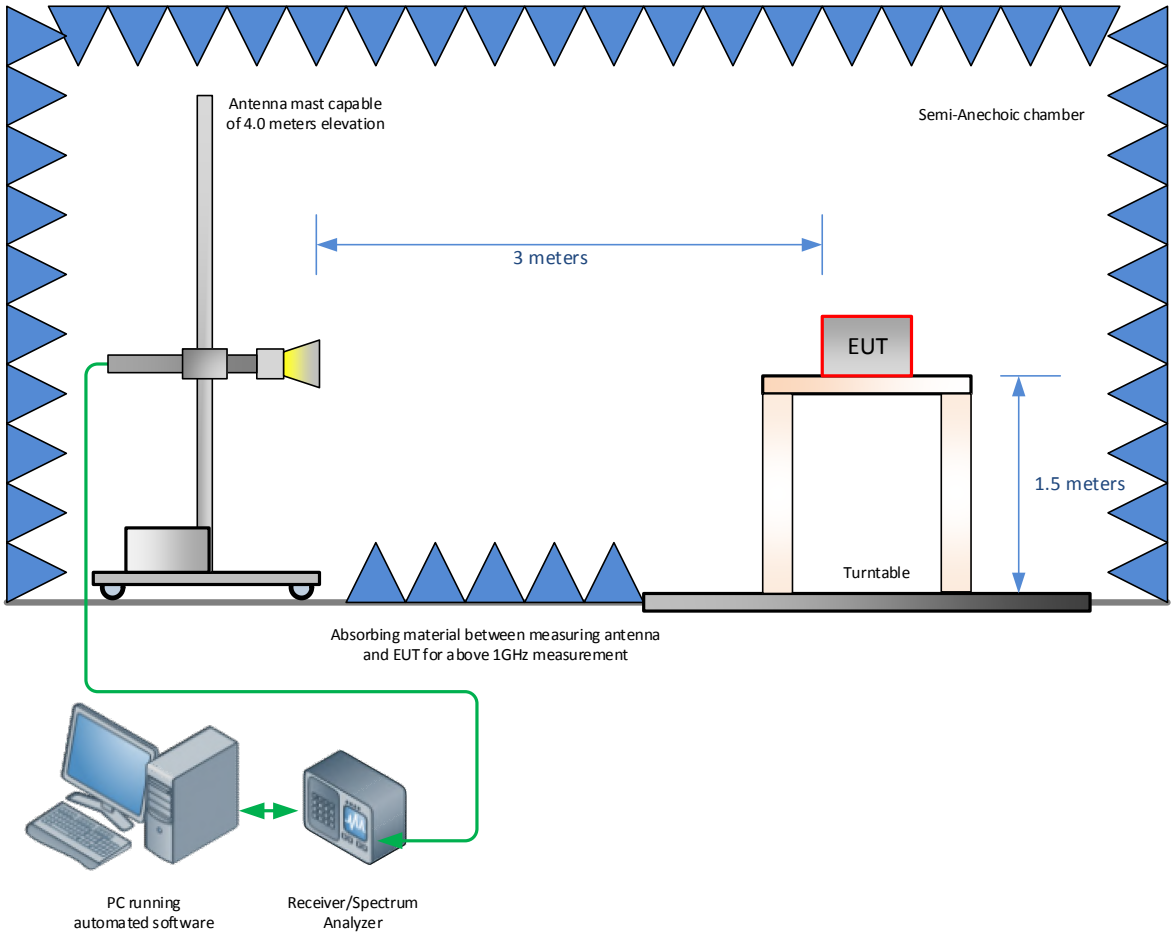
SECTION 4

DIAGRAM OF TEST SETUP

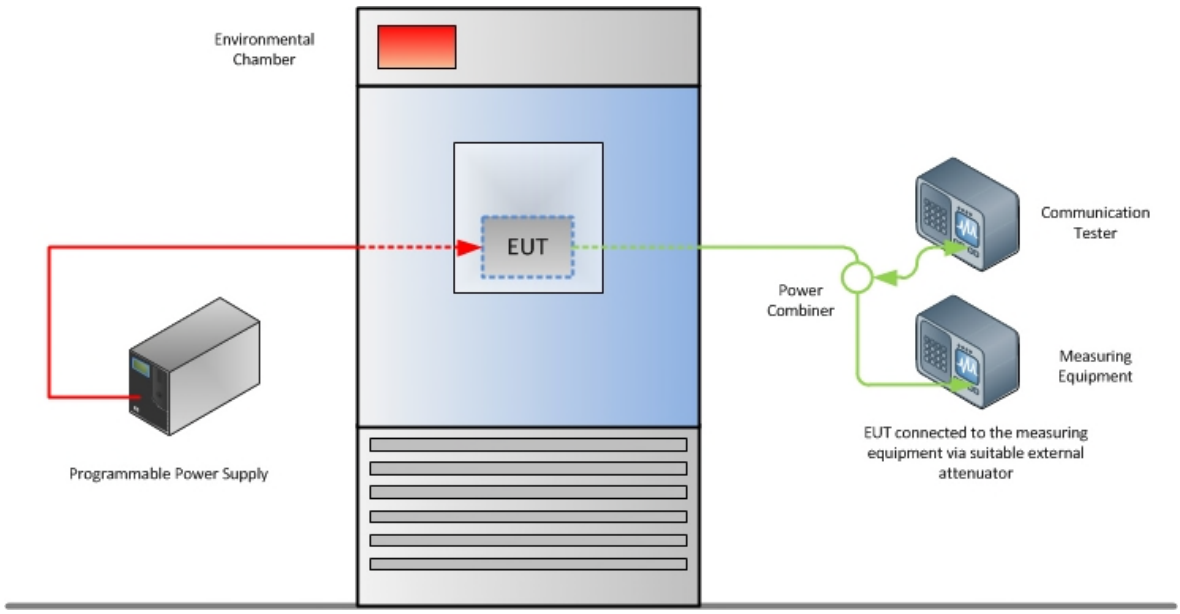
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Frequency Stability Test Comfiguration

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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