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Report On

Application for Grant of Equipment Authorization of the
NantWorks
HBox Access Point for Medical Devices

FCC CFR 47 Part 2, Part 22 and Part 24: 2014
RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013

Report No.SD72102282-0215D

June 2015

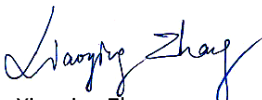


REPORT ON Radio Testing of the
NantWorks
HBox Access Point for Medical Devices

TEST REPORT NUMBER SD72102282-0215D

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DATED June 22, 2015



Revision History

SD72102282-0215D NantWorks HBox Access Point for Medical Devices					
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SECTION 1

REPORT SUMMARY

Radio Testing of the
NantWorks
HBox Access Point for Medical Devices



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the NantWorks HBox Access Point for Medical Devices to the requirements of the following:

FCC CFR 47 Part 2, Part 22 and Part 24: 2014

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	NantWorks
Model Name	HBox
Model Nuber	200-HBV-PDL
FCC ID Number	IFU1001011
IC Number	N/A (Manufacturer not seeking IC Certification at the time of verification)
FCC Classification	PCB
Serial Number(s)	N/A (Sample #2) Conducted antenna service port testing sample, serial number not available due to temporary addition of an antenna port for testing / (Sample #1) Radiated testing Sample
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC CFR 47 Part 2, Part 22 and Part 24: 2014 • RSS-132 issue 3: 2013; (Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz) • RSS-133 issue 6: 2013; (2 GHz Personal Communications Services) • RSS-GEN issue 4 November 2014; (General Requirements for Compliance of Radio Apparatus)
Start of Test	April 29, 2015
Finish of Test	May 26, 2015
Test Facility location	All test performed on this test report were performed at: TÜV SÜD America Inc. (Rancho Bernardo) Sony Electronics Inc., Building #8 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 FAX: 858-546 0364
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	• KDB 971168 D01 Power Meas License Digital Systems v02r02: October 17 2014; (Measurement guidance for certification of licensed digital transmitters) • 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: 2014 and RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013 standard is shown below.

Section	FCC Part Sections(s)	Industry Canada 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
-	2.1049, 22.917(b), 24.238(b)	RSS-GEN 4.6.1	Occupied Bandwidth	N/T*
2.5	2.1051, 22.917(a), 24.238(a)	RSS-132: 5.5, RSS-133: 6.5	Band Edge/Conducted Spurious Emissions	Compliant
2.6	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	N/T*

Note: N/T*: Not tested, using certified CDMA Module.



1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was a NantWorks HBox Access Point for Medical Devices, as shown in the photograph below. The EUT can collect data through USB/BT/WIFI and send the data to server through ethernet/WIFI or Cellular network. The NFC function is for quick Bluetooth pairing by obtaining the device info when within NFC range of the EUT. Only the CDMA 1xRTT and EvDO functions verified in this test report.



1.3.2 EUT General Description

EUT Description	Access Point for Medical Devices
Model Name	HBox
Model Number(s)	200-HBV-PDL
Rated Voltage	Internal 3.7VDC Li-Ion Battery (GP Batteries 2501022), AC adapter/charger is Hon-Kwang Switching Power Supply Model: HK-AD-050A500-US, output is 5.0VDC 5.0A
Mode Verified	CDMA2000 1xRTT, 1xEvDO Release A
Capability	CDMA2000 1xRTT, 1xEvDO Release A, 802.11 a/b/g/n WLAN (DTS/U-NII), Bluetooth 2.0 + EDR, Bluetooth 4.0, ISM900 and NFC
Frequency Range	CDMA BC0: 824 MHz - 849MHz CDMA BC1: 1850 MHz - 1910 MHz
Primary Unit (EUT)	☒ Production ☐ Pre-Production ☐ Engineering
Antenna Type	CDMA Dual Band PIFA type
Antenna Gain ANT #X (CDMA)	CDMA BC0 – 850MHz = 1.5 dBi CDMA BC1 – 1900MHz = 2.2 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)
			Max. Power (dBm)	Max. Power (dBm)
CDMA2000 – 1xRTT Cell Band (BC0)	824-849	1M25F9W	23.20	25.35
CDMA2000 – 1xRTT PCS Band (BC1)	1850-1910	1M25F9W	-	26.43
CDMA2000 – 1xEvDO Release A Cell Band (BC0)	824-849	1M25F9W	23.03	25.18
CDMA2000 – 1xEvDO Release A PCS Band (BC1)	1850-1910	1M25F9W	-	26.30



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 connected to a AC/DC Power Supply
B	Raidated test setup. EUT Tx through integral antenna and connected to a AC/DC Power Supply

1.4.2 EUT Exercise Software

EUT is controlled by a CMW 500 Wideband Radio Communication Tester or a 8960 wireless communication test set. There are no other test software used during verification.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Model	Description
HON-KWANG	Switching Power Supply	HK-AD-050A500-US	5VDC @ 5A



1.4.4 Worst Case Configuration

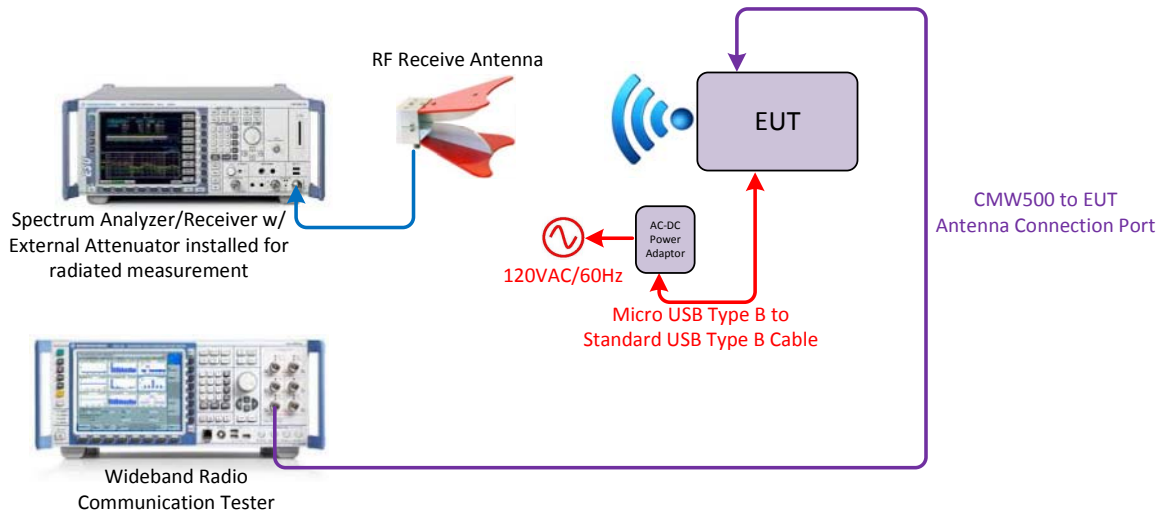
Worst-case configuration used in this test report as per maximum conducted output power measurements:

Technology	Band
CDMA 2000 – 1xRTT	Cell (BC0)
CDMA 2000 – 1xRTT	PCS (BC1)

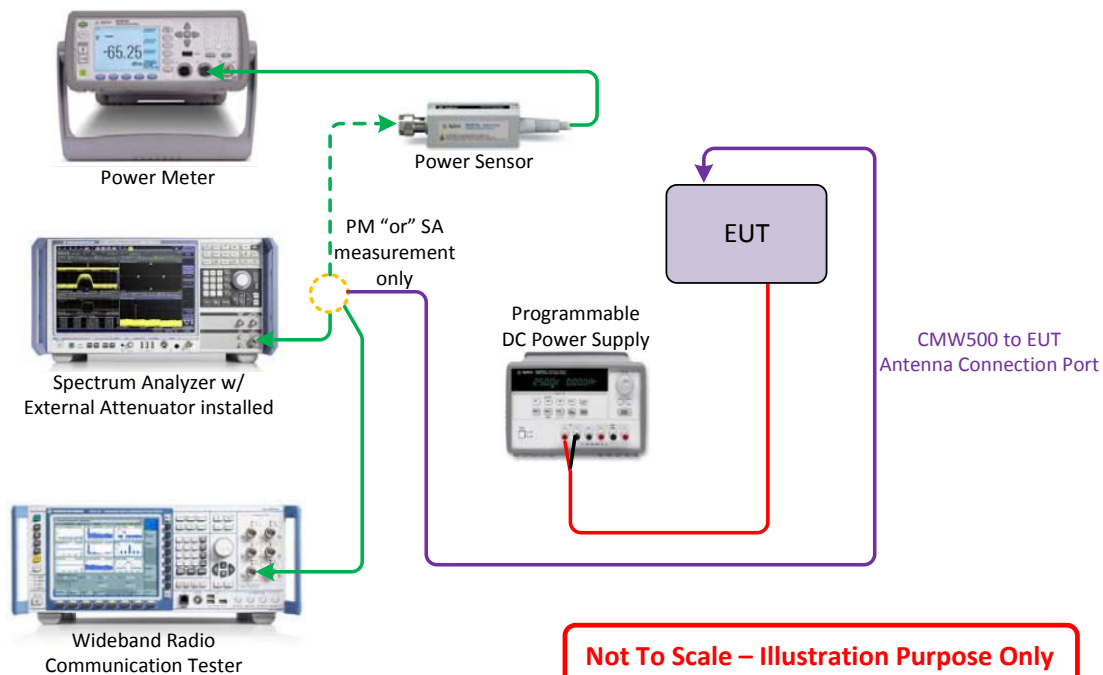
For radiated measurements X, Y, and Z orientations were verified. The verification was determined “Y” as worst case configuration.

1.4.5 Simplified Test Configuration Diagram

Radiated/Conducted Emission Test Configuration via Conducted Port



Conducted (Antenna Port) Test Configuration



Not To Scale – Illustration Purpose Only
 Objects may not represent actual image of original equipment/s or set-up.



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 N/A (Sample #2) and (Sample #1)		
N/A	—	—

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 C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements by Substitution method were conducted according to ANSI/TIA/EIA-603-C-2004, August 17, 2004. Land Mobile FM or PM -Communications Equipment -Measurement and Performance Standards.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. 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)

Sony Electronics Inc., Building #8 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 FAX: 858-546 0364



1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration 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 Registration is US1146.

1.9.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.



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 84dB μ V/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 84dB μ V/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:

$$\begin{aligned}P_{\text{EIRP}} &= -18 \text{ dBm} + 7.8 \text{ dBi} - 1 \text{ dB} \\&= 11.2 \text{ dBm} \\P_{\text{ERP}} &= P_{\text{EIRP}} - 2.15 \text{ dB} \\&= 11.2 \text{ dBm} - 2.15 \text{ dB} \\&= 9.05 \text{ dBm}\end{aligned}$$



SECTION 2

TEST DETAILS

Radio Testing of the
NantWorks
HBox Access Point for Medical Devices



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 measurements were made in accordance to FCC Part 2 Clause 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: N/A (Sample #2) / Test Configuration A

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

May 05 and 20, 2015 / 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 Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.7 - 25.4°C
Relative Humidity	37.8 – 44.8
ATM Pressure	98.9 - 99.2 kPa

2.1.7 Additional Observations

- This is a conducted test using a peak/average power meter.
- The path loss for Cell Band and PCS Band was measured and entered as a level offset.
- Only worst case presented and recorded in this test report.

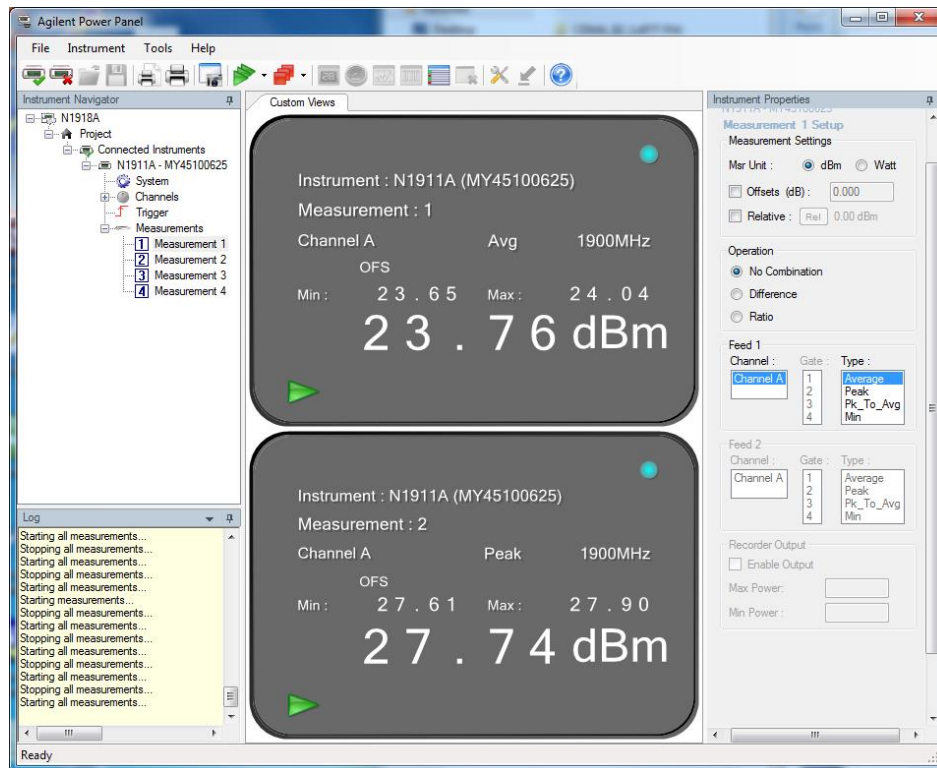


2.1.8 Test Results

CDMA 2000 – 1xRTT				
Band	Channel	Frequency (MHz)	Max Power Average (dBm)	Max Power Average (W)
Cell (BC0)	1013	824.70	23.32	0.21
	384	836.52	23.85	0.24
	777	848.31	23.35	0.22
PCS (BC1)	25	1851.25	24.23	0.26
	600	1880.00	24.04	0.25
	1175	1908.75	23.69	0.23

CDMA 2000 – 1xEvDO Release A				
Band	Channel	Frequency (MHz)	Max Power Average (dBm)	Max Power Average (W)
Cell (BC0)	1013	824.70	23.30	0.21
	384	836.52	23.68	0.23
	777	848.31	23.42	0.22
PCS (BC1)	25	1851.25	24.10	0.26
	600	1880.00	23.84	0.24
	1175	1908.75	23.65	0.23

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)
RSS-132, Clause 5.4
RSS-133, Clause 6.4

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: N/A (Sample #2) / Test Configuration (N/A, calculation only)

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

May 05 and 20, 2015 / XYZ

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 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\text{ERP} = P_T + G_T - L_c - 2.15\text{dB}$$

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

CDMA2000 – 1xRTT Cell Band (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
824.70	23.32	1.5	22.67	0.18	38.45	15.78
836.52	23.85	1.5	23.20	0.21	38.45	15.25
848.31	23.35	1.5	22.70	0.19	38.45	15.75

CDMA2000 – 1xEvDO Release A Cell Band (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
824.70	23.30	1.5	22.65	0.18	38.45	15.80
836.52	23.68	1.5	23.03	0.20	38.45	15.42
848.31	23.42	1.5	22.77	0.19	38.45	15.68



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: N/A (Sample #2) / Test Configuration (N/A, calculation only)

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

May 05 and 20, 2015 / XYZ

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

- EIRP was calculated as per Section 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\text{EIRP} = P_T + G_T - L_c$$

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 poses an internal Antenna. The loss between the EUT and the antenna port is considered negligible).

2.3.7 Test Results

CDMA2000 – 1xRTT Cell Band (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	EIRP Limit (dBm)	Margin (dB)
824.70	23.32	1.5	24.82	0.30	40.61	15.79
836.52	23.85	1.5	25.35	0.34	40.61	15.26
848.31	23.35	1.5	24.85	0.31	40.61	15.76

CDMA2000 – 1xEvDO Release A Cell Band (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	EIRP Limit (dBm)	Margin (dB)
824.70	23.30	1.5	24.80	0.30	40.61	15.81
836.52	23.68	1.5	25.18	0.33	40.61	15.43
848.31	23.42	1.5	24.92	0.31	40.61	15.69

CDMA2000 – 1xRTT PCS Band (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1851.25	24.23	2.2	26.43	0.43	33	6.57
1880.00	24.04	2.2	26.24	0.42	33	6.76
1908.75	23.69	2.2	25.89	0.39	33	7.11

CDMA2000 – 1xEvDO Release A PCS Band (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1851.25	24.10	2.2	26.30	0.43	33	6.70
1880.00	23.84	2.2	26.04	0.40	33	6.96
1908.75	23.65	2.2	25.85	0.38	33	7.15



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: N/A (Sample #2) / Test Configuration A

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

May 05 and 20, 2015 / XYZ

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	23.7 - 25.4°C
Relative Humidity	37.8 – 44.8
ATM Pressure	98.9 - 99.2 kPa



2.4.7 Additional Observations

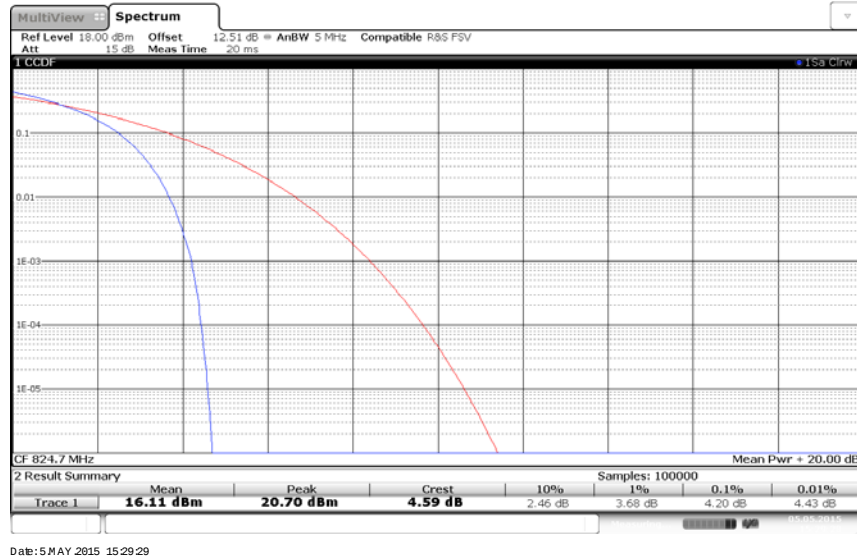
- This is a conducted test. Test procedure is per Section 3.0 of KDB971168 (D01 Power Meas License Digital Systems v01).
- Measurement was done using the Spectrum Analyzer's Complementary Cumulative Distribution Function (CCDF) measurement profile. The built-in function is used to determine the largest 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.
- All channels based from worst case configuration were verified. Only the worst channel and configuration presented.
- The path loss for Cell Band and PCS Band was measured and entered as a level offset.
- There are no measured PAPR levels greater than 13dB. EUT complies.

2.4.8 Test Results

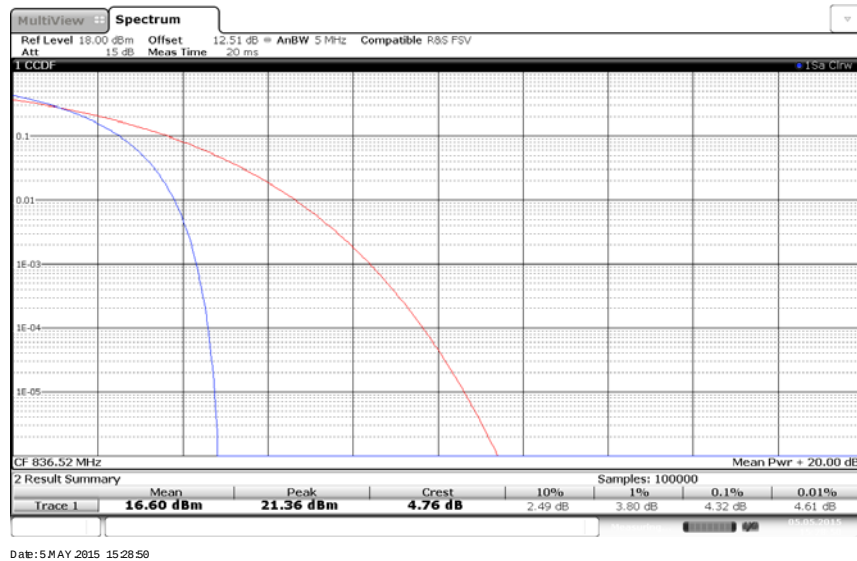
CDMA 2000 – 1xRTT			
Band	Channel	Frequency (MHz)	PAR (dB)
Cell (BC0)	1013	824.70	4.59
	384	836.52	4.76
	777	848.31	4.44
PCS (BC1)	25	1851.25	3.91
	600	1880.00	4.01
	1175	1908.75	4.24

CDMA 2000 – 1xEVDO Release A			
Band	Channel	Frequency (MHz)	PAR (dB)
Cell (BC0)	1013	824.70	5.07
	384	836.52	5.30
	777	848.31	4.65
PCS (BC1)	25	1851.25	3.87
	600	1880.00	3.93
	1175	1908.75	4.49

CDMA 2000 – 1xRTT (Cell-BC0)/824.7 MHz

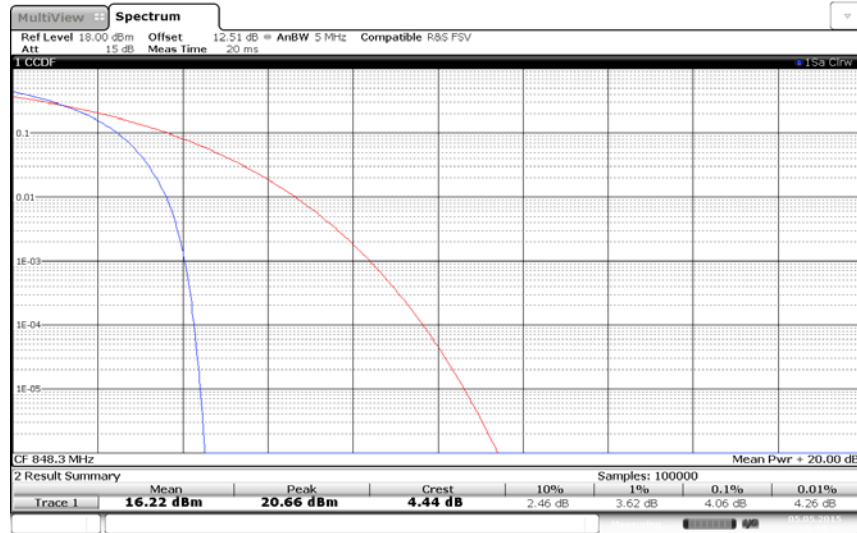


CDMA 2000 – 1xRTT (Cell-BC0)/836.52 MHz





CDMA 2000 – 1xRTT (Cell-BC0)/848.31 MHz



Date: 5 MAY 2015 15:23:37

CDMA 2000 – 1xEvDO Rel A (Cell-BC0)/824.7 MHz



Date: 20 MAY 2015 11:52:18

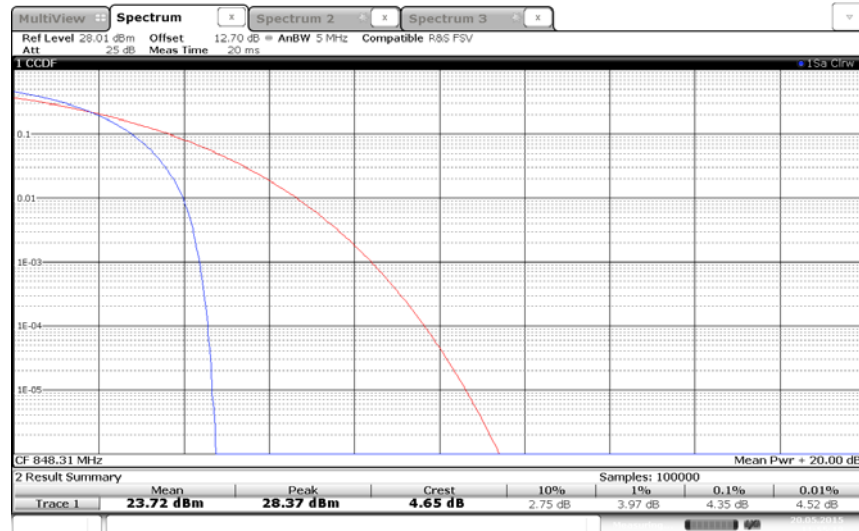


CDMA 2000 – 1xEvDO Rel A (Cell-BC0)/836.52 MHz



Date: 20 MAY 2015 11:54:05

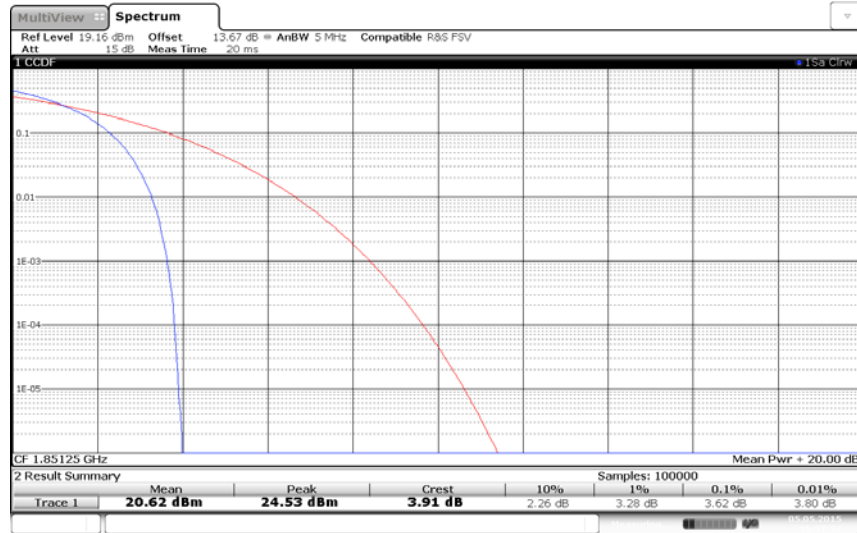
CDMA 2000 – 1xEvDO Rel A (Cell-BC0)/RETAP/848.31 MHz



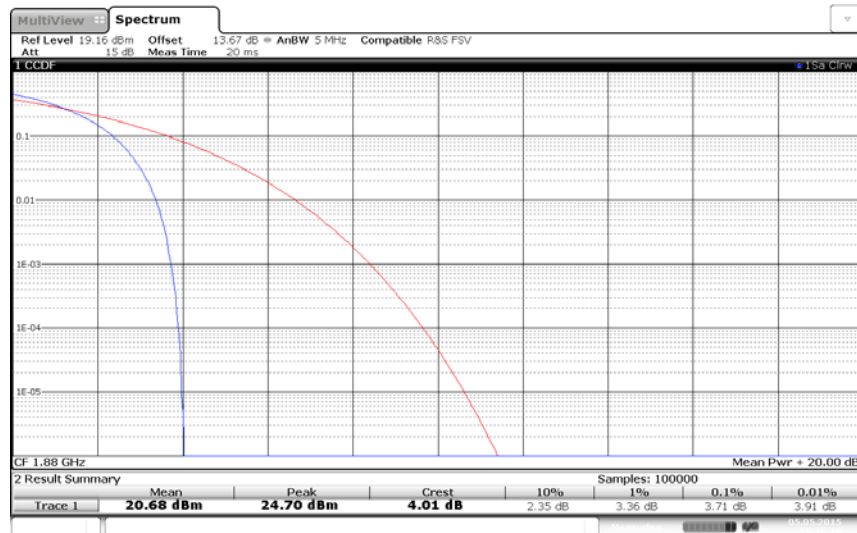
Date: 20 MAY 2015 11:55:18



CDMA 2000 – 1xRTT (PCS-BC1)/1851.25 MHz

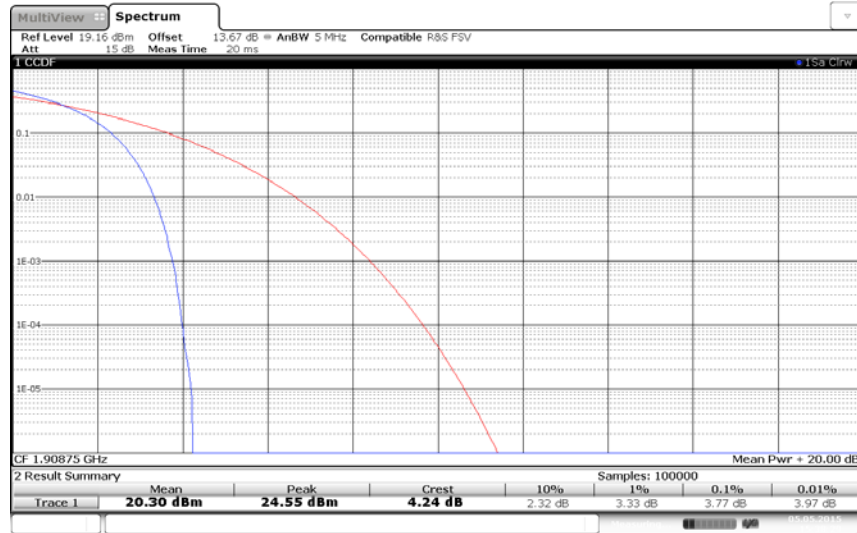


CDMA 2000 – 1xRTT (PCS-BC1)/1880 MHz





CDMA 2000 – 1xRTT (PCS-BC1)/1908.75 MHz

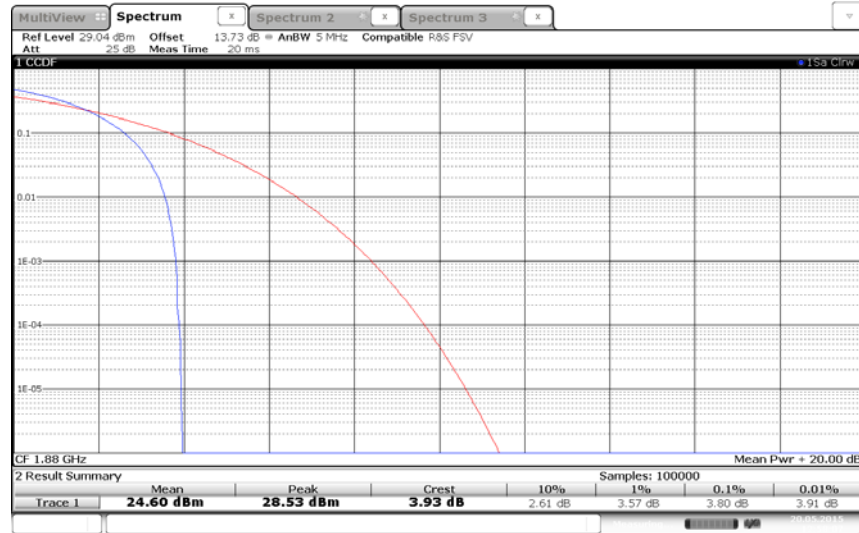


CDMA 2000 – 1xEvDO Release A (PCS-BC1)/1851.25 MHz



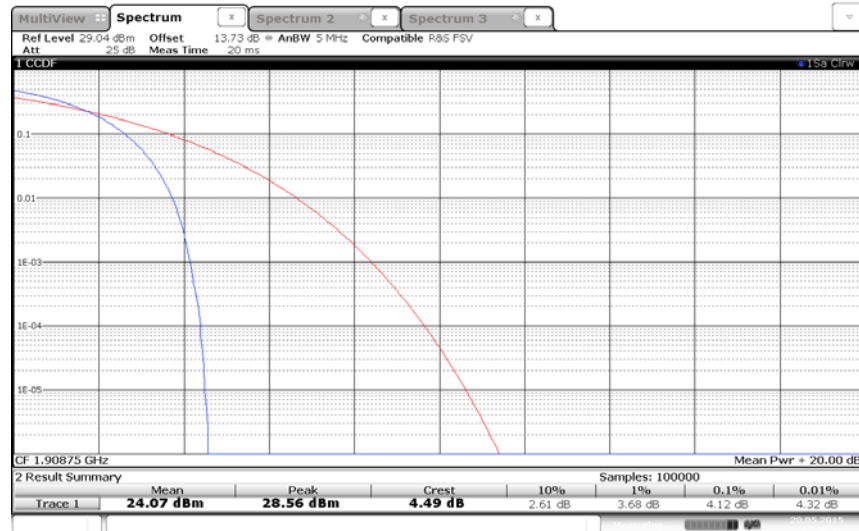


CDMA 2000 – 1xEvDO Rel A (PCS-BC1)/R1880 MHz



Date: 20 MAY 2015 12:58:87

CDMA 2000 – 1xEvDO Rel A (PCS-BC1)/1908.75 MHz



Date: 20 MAY 2015 12:59:48



2.5 SPURIOUS EMISSION AT BAND EDGE

2.5.1 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

2.5.2 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 $43 + 10 \log_{10} p(\text{watts})$.

2.5.3 Equipment Under Test and Modification State

Serial No: N/A (Sample #2) / Test Configuration A

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

May 05 and 20, 2015 / XYZ

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

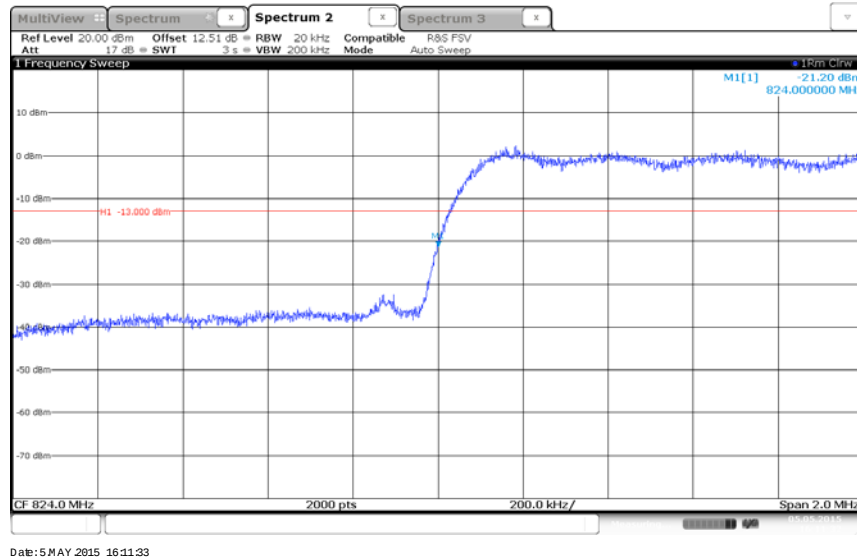
Ambient Temperature	23.7 - 25.4°C
Relative Humidity	37.8 – 44.8
ATM Pressure	98.9 - 99.2 kPa

2.5.7 Additional Observations

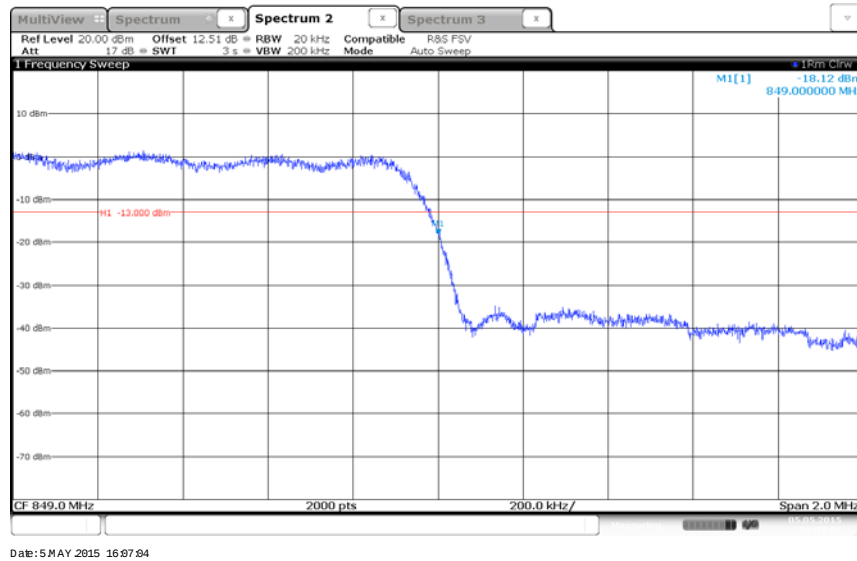
- This is a conducted test.
- The path loss for Cell Band and PCS Band was measured and entered as a level offset
- RBW is set to minimum 1% of EBW and VBW is set to $>3 \times \text{RBW}$ in the 1 MHz band immediately outside and adjacent to the channel edge.
- Only worst case configuration for all technologies presented in this test report.

2.5.8 Test Results

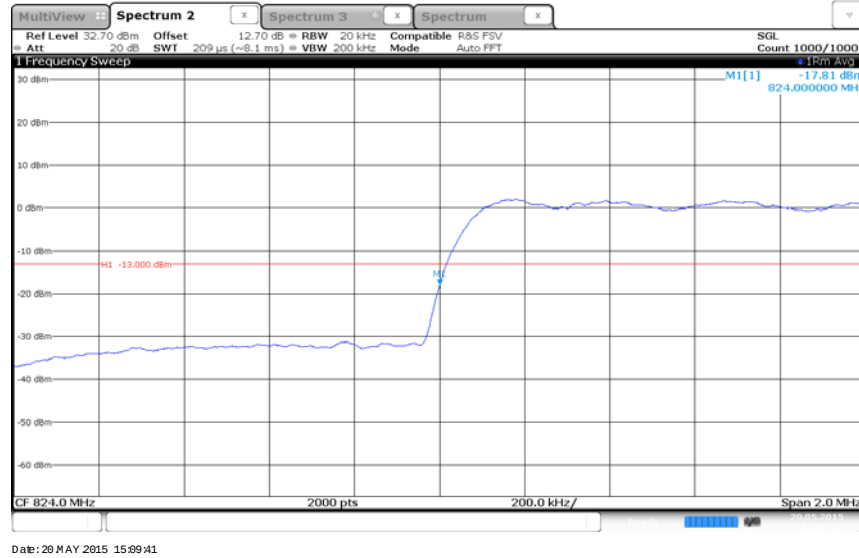
CDMA 2000 – 1xRTT/Low Channel (1013)/Cell BC0 Band Edge @ 824 MHz



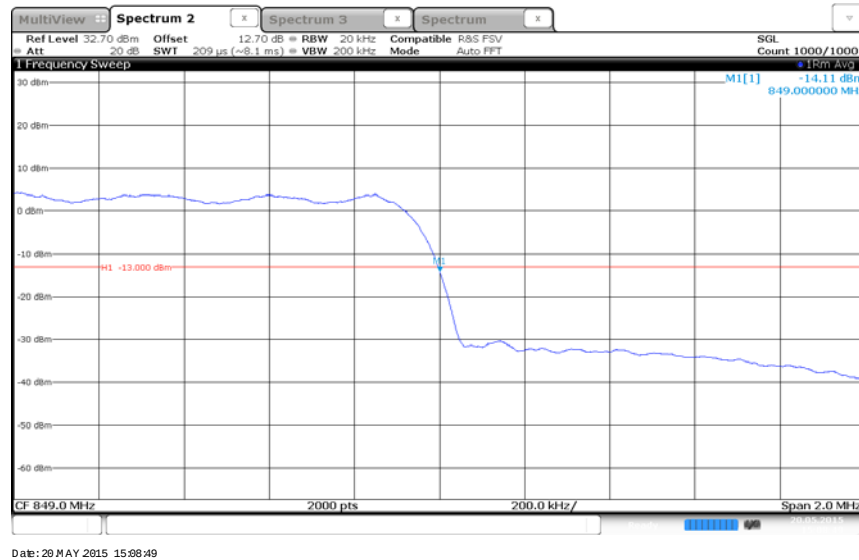
CDMA 2000 – 1xRTT/High Channel (777)/Cell BC0 Band Edge @ 849 MHz



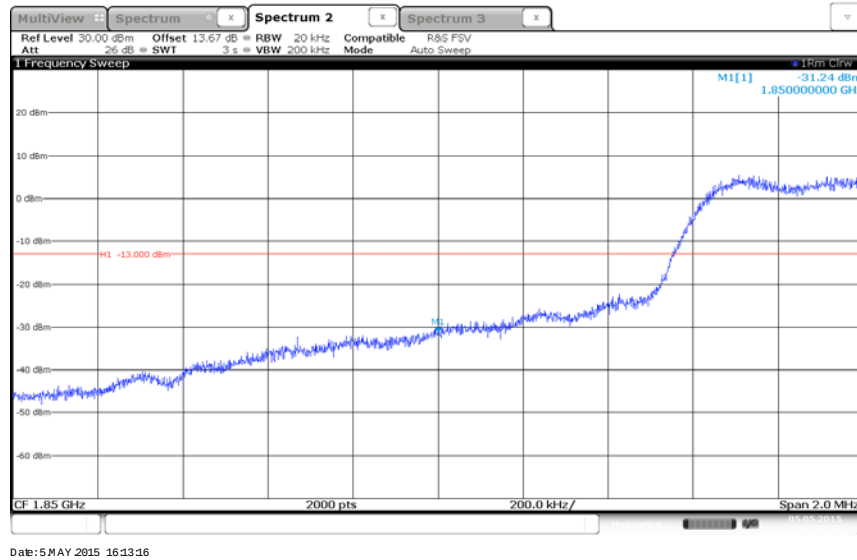
CDMA 2000 – 1xEvDO Release A/Low Channel (1013)/Cell BC0 Band Edge @ 824 MHz



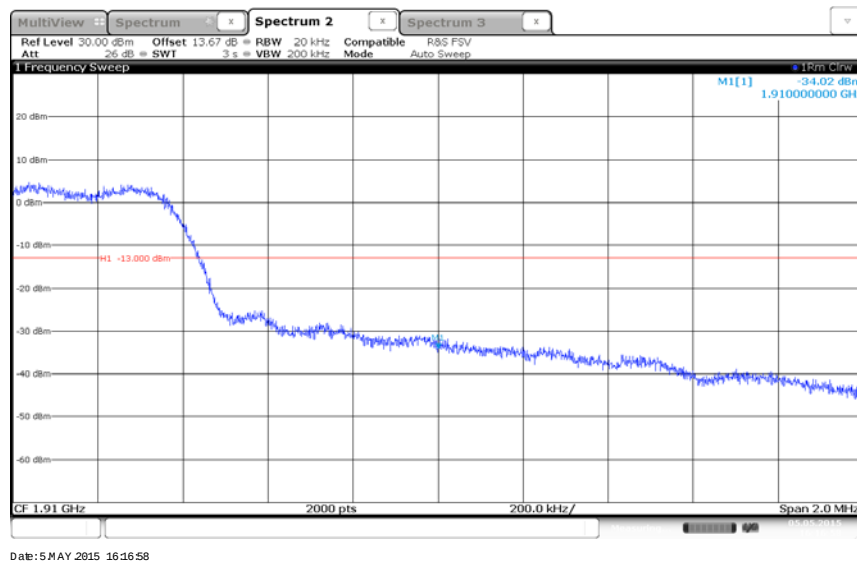
CDMA 2000 – 1xEvDO Release A/High Channel (777)/Cell BC0 Band Edge @ 849 MHz



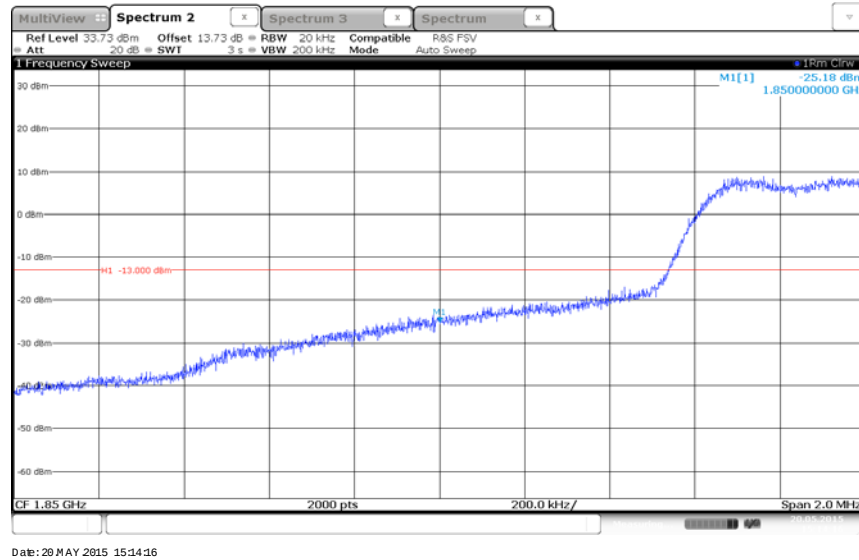
CDMA 2000 – 1xRTT/Low Channel (25)/PCS BC1 Band Edge @ 1850 MHz



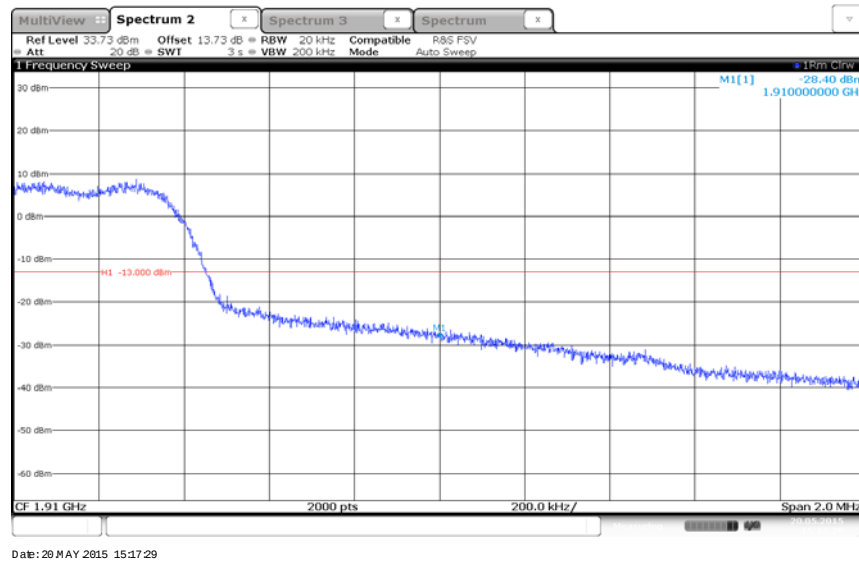
CDMA 2000 – 1xRTT/High Channel (1175)/PCS BC1 Band Edge @ 1910 MHz



CDMA 2000 – 1xEvDO Release A/Low Channel (25)/PCS BC1 Band Edge @ 1850 MHz



CDMA 2000 – 1xEvDO Release A/High Channel (1175)/PCS BC1 Band Edge @ 1910 MHz





2.6 CONDUCTED SPURIOUS EMISSIONS

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

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.

2.6.3 Equipment Under Test and Modification State

Serial No: N/A (Sample #2) / Test Configuration A

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

May 05 and 20, 2015 / XYZ

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

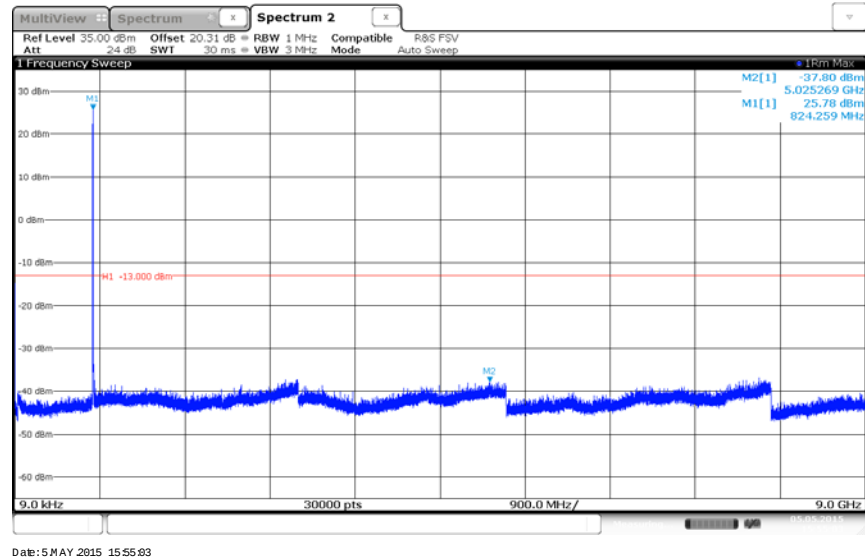
Ambient Temperature	23.7 - 25.4°C
Relative Humidity	37.8 – 44.8
ATM Pressure	98.9 - 99.2 kPa

2.6.7 Additional Observations

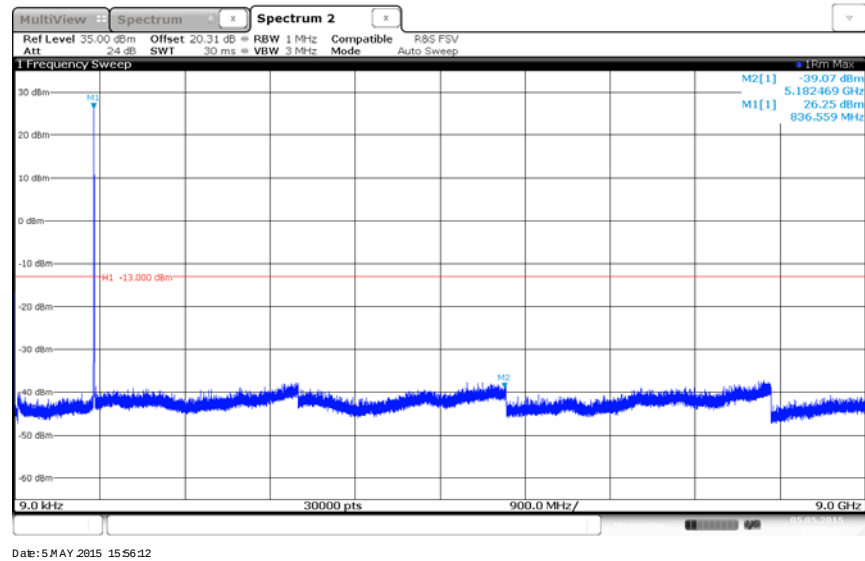
- This is a conducted test.
- The spectrum was searched from 9 kHz to the 10th harmonic.
- The path loss for Cell Band and PCS Band was measured and entered as a level offset
- For Cell Band, RBW was set to 100 kHz. For PCS Band, RBW was set to 1MHz.
- Only worst case configuration for all technologies presented in this test report.

2.6.8 Test Results

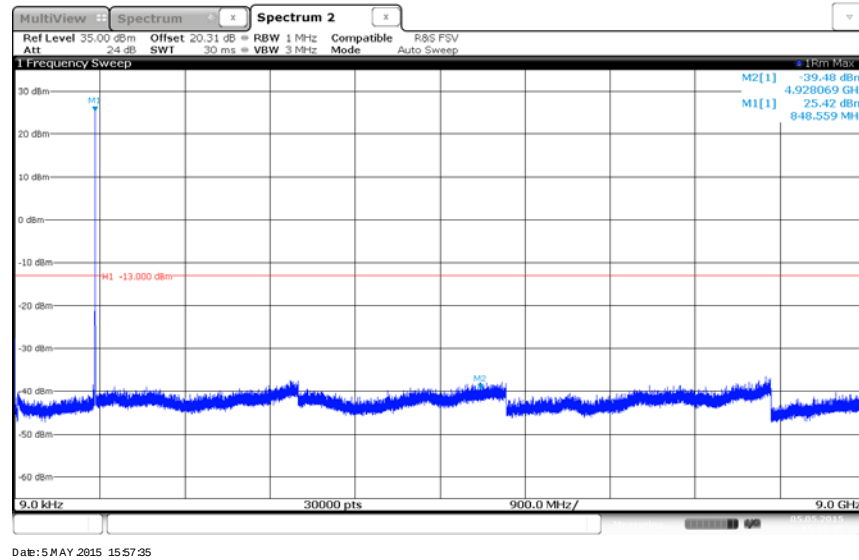
CDMA 2000 – 1xRTT/Low Channel (1013)/Cell BC0 @ 824.7MHz



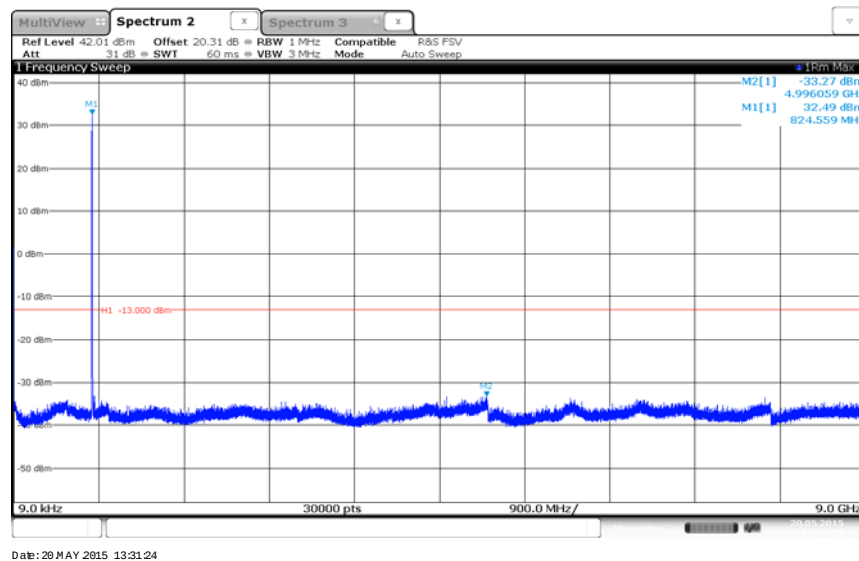
CDMA 2000 – 1xRTT/Mid Channel (384)/Cell BC0 @836.52 MHz



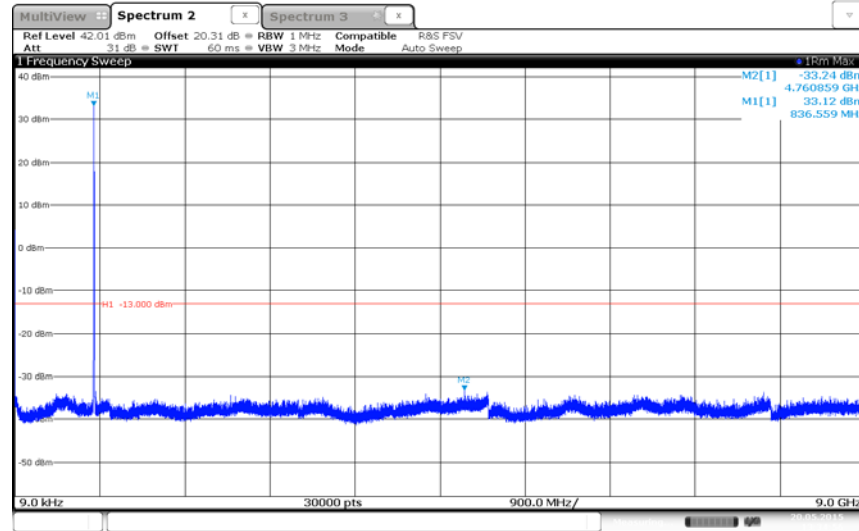
CDMA 2000 – 1xRTT/High Channel (777)/Cell BC0 @848.31 MHz



CDMA 2000 – 1xEVDO Release A/Low Channel (1013)/Cell BC0 @ 824.7MHz

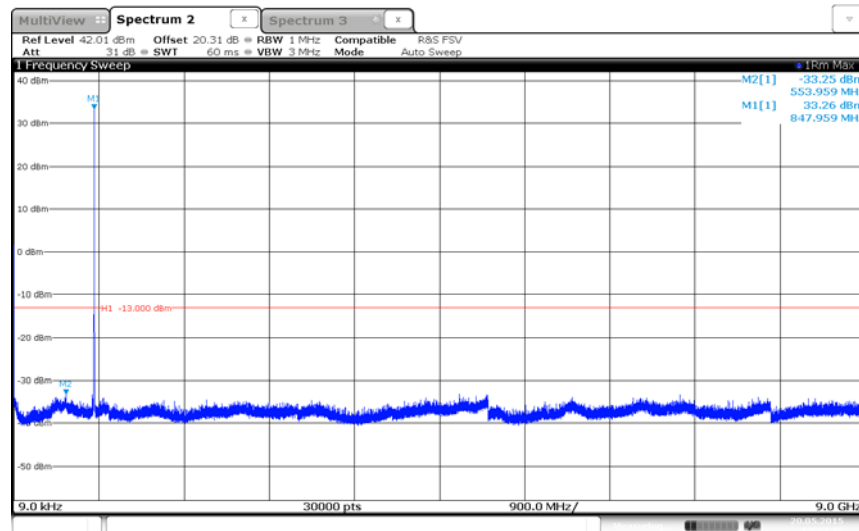


CDMA 2000 – 1xEVDO Release A/Mid Channel (384)/Cell BC0 @836.52 MHz



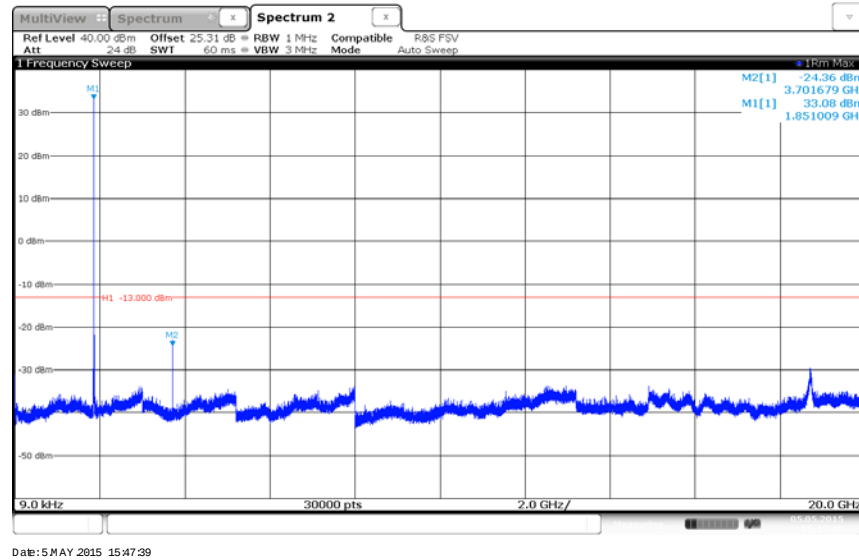
Date: 20 MAY 2015 13:34:56

CDMA 2000 – 1xEVDO Release A/High Channel (777)/Cell BC0 @848.31 MHz

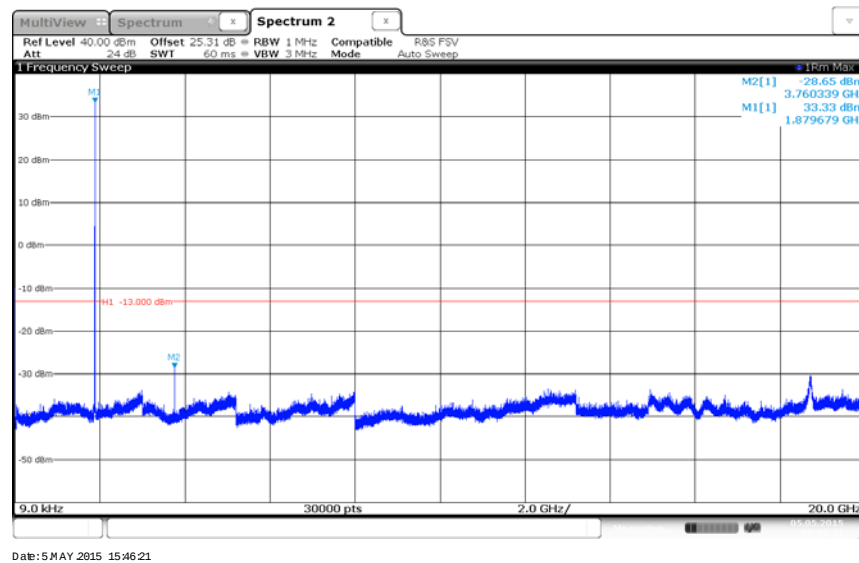


Date: 20 MAY 2015 13:33:44

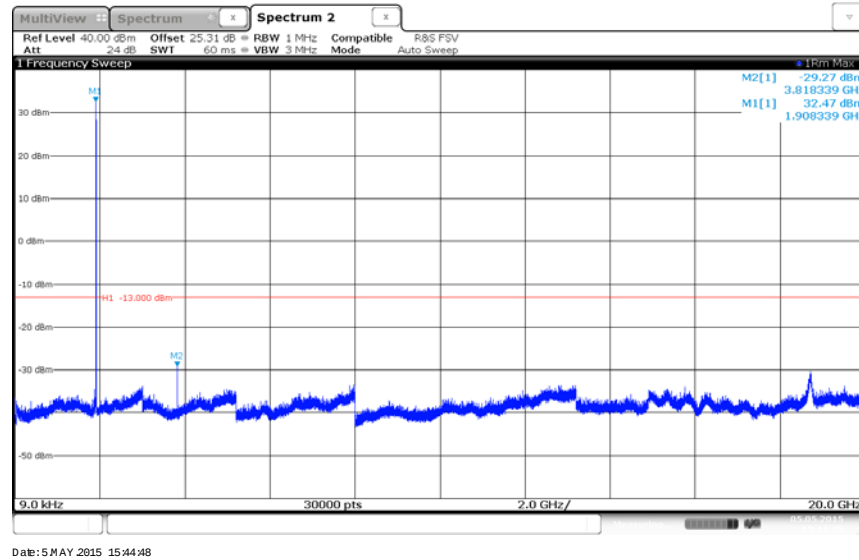
CDMA 2000 – 1xRTT/Low Channel (25)/PCS BC1 @ 1851.25 MHz



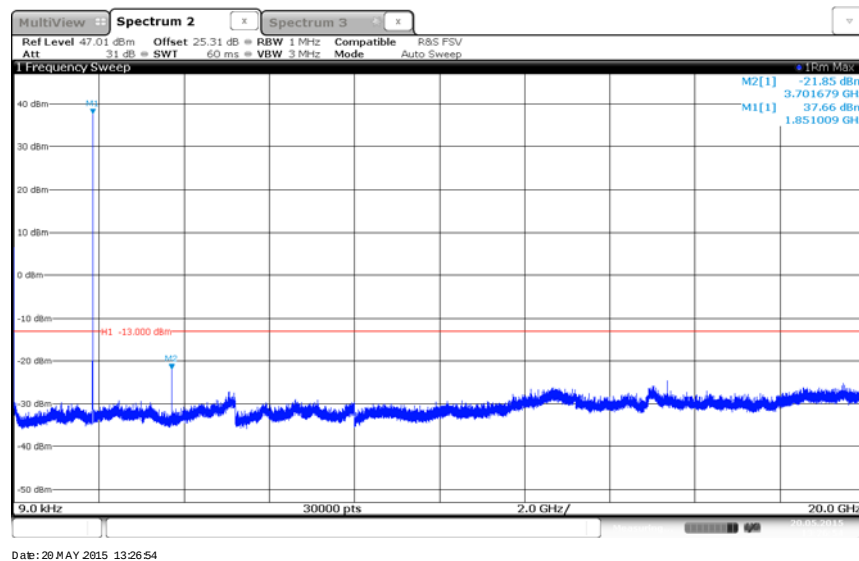
CDMA 2000 – 1xRTT/Mid Channel (600)/PCS BC1 @ 1880.0 MHz



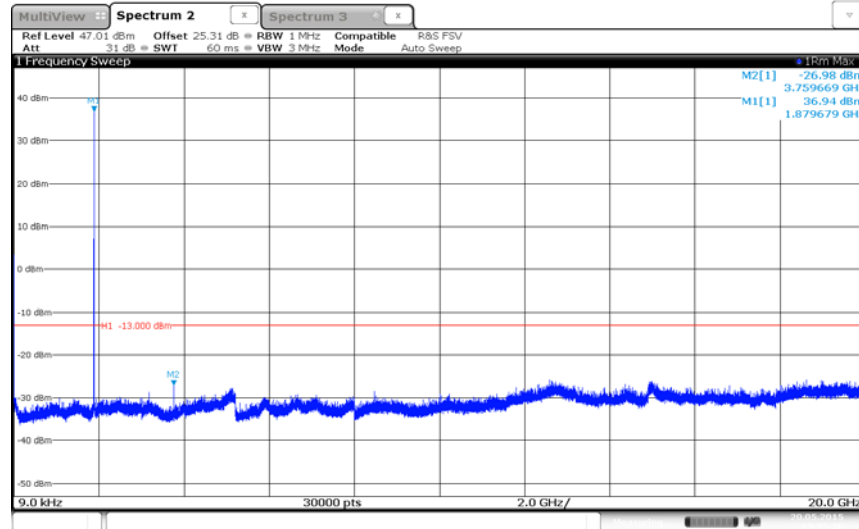
CDMA 2000 – 1xRTT/High Channel (1175)/PCS BC1 @ 1908.75 MHz



CDMA 2000 – 1xEVDO Release A/Low Channel (25)/PCS BC1 @ 1851.25 MHz

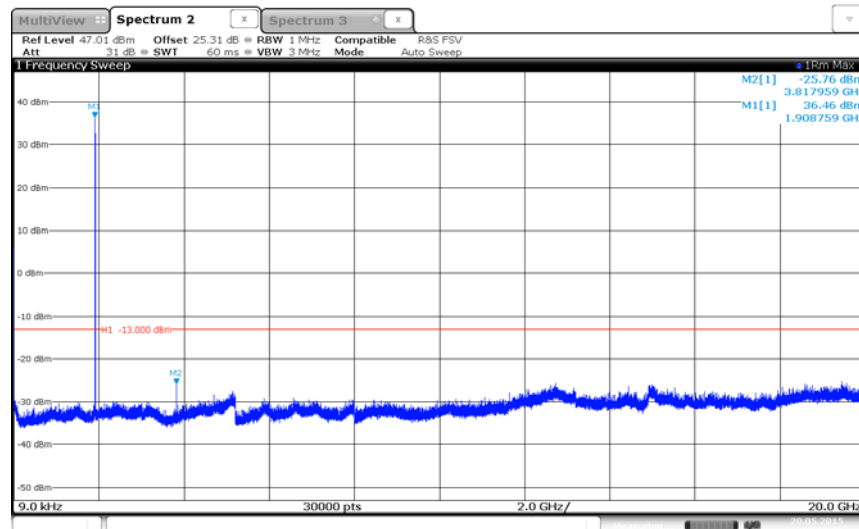


CDMA 2000 – 1xEvDO Release A/Mid Channel (600)/PCS BC1 @ 1880.0 MHz



Date: 20 MAY 2015 13:25:36

CDMA 2000 – 1xEvDO Release A/High Channel (1175)/PCS BC1 @ 1908.75 MHz



Date: 20 MAY 2015 13:17:23



2.7 FIELD STRENGTH OF SPURIOUS RADIATION

2.7.1 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

2.7.2 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.

2.7.3 Equipment Under Test and Modification State

Serial No: N/A (Sample #1) / Test Configuration B

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

May 26, 2015 / XYZ

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	24.6 °C
Relative Humidity	41.6%
ATM Pressure	98.9 kPa

2.7.7 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.
- 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.

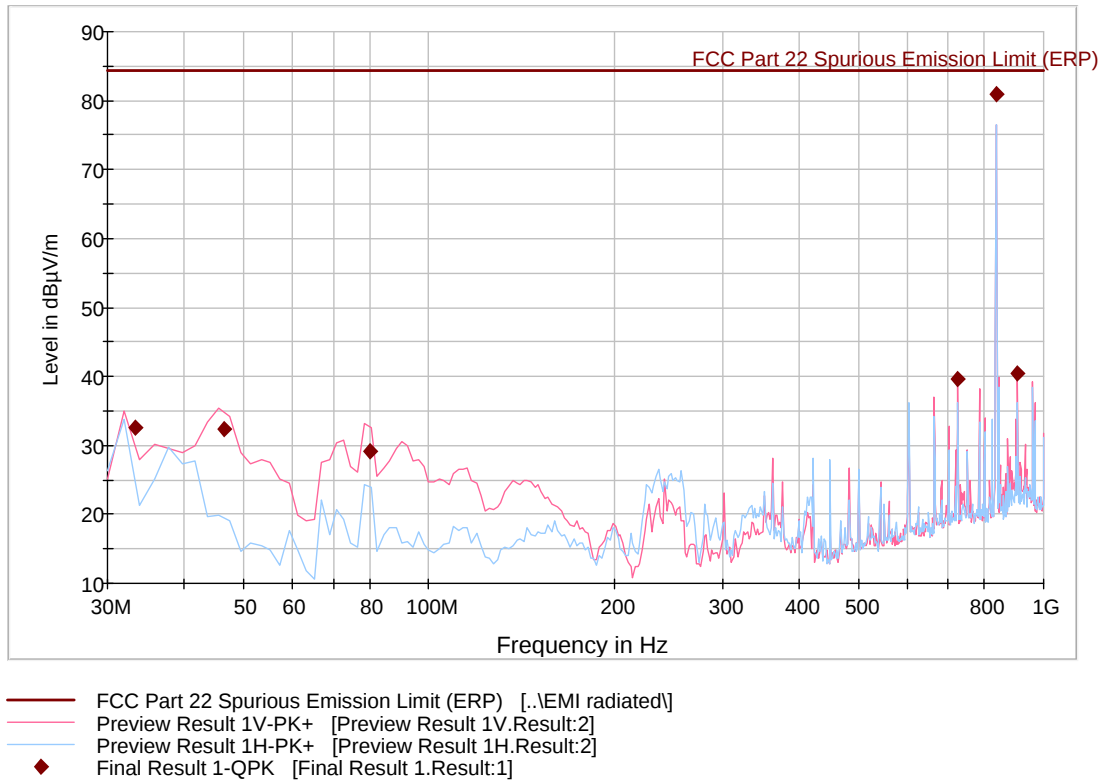


2.7.8 Test Results Summary Table

The following band and channels were tested and only the worst case results presented.

Band	Channel	Frequency
Cell BC0	1013	824.70
	384	836.52
	777	848.31
PCS BC1	25	1851.25
	600	1880.00
	1175	1908.75

2.7.9 Test Results Below 1GHz_Worst Case Configuration_CDMA - 1xRTT_Cell BC0_Mid Channel (384)

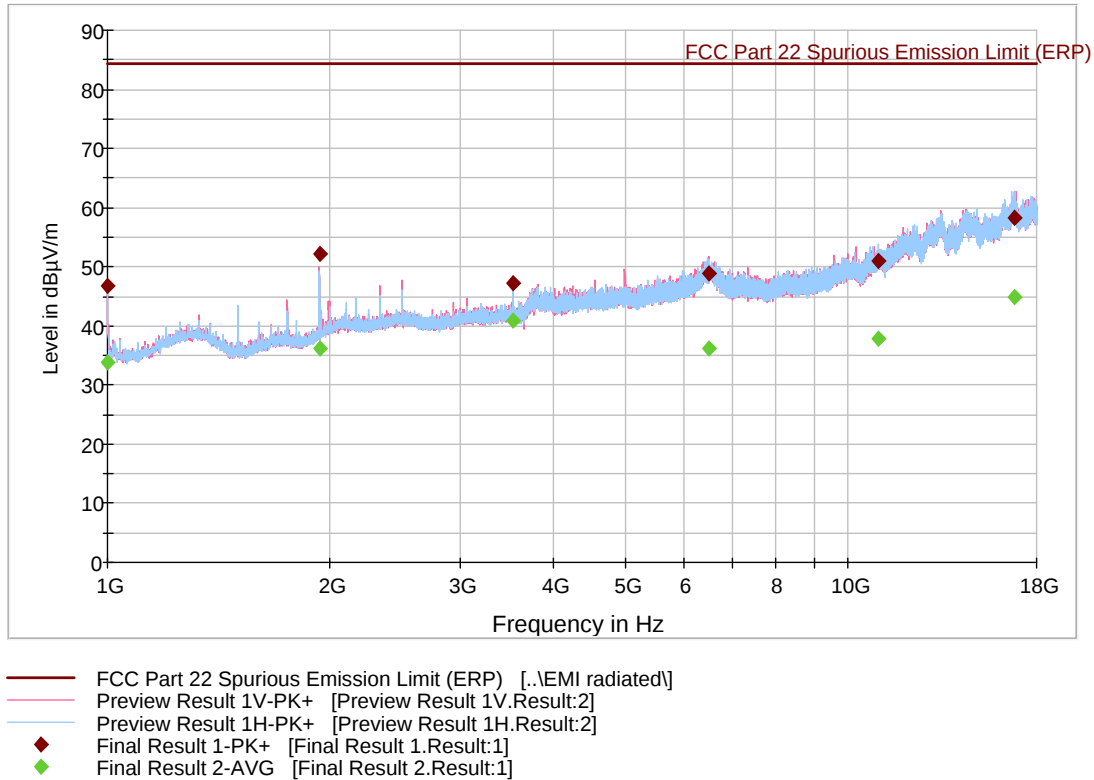


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
33.280000	32.7	1000.0	120.000	140.0	V	152.0	-14.6	51.7	84.4
46.351102	32.4	1000.0	120.000	100.0	V	140.0	-20.5	52.0	84.4
79.997194	29.2	1000.0	120.000	133.0	V	35.0	-23.2	55.2	84.4
724.311824	39.7	1000.0	120.000	105.0	V	208.0	-3.3	44.7	84.4
835.993427	80.8	1000.0	120.000	106.0	H	255.0	-3.0	3.6	84.4
905.373387	40.4	1000.0	120.000	100.0	V	270.0	-0.8	44.0	84.4
33.280000	32.7	1000.0	120.000	140.0	V	152.0	-14.6	51.7	84.4

Test Notes: Only worst case presented for spurious emissions below 1GHz.

2.7.10 Test Results Above 1GHz_Worst Case Configuration_CDMA 2000-1xRTT_Cell BC0_Mid Channel (384)



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	288.2	V	17.0	-7.2	37.6	73.9
1932.766667	52.1	1000.0	1000.000	301.2	V	9.0	-2.3	32.3	73.9
3526.000000	47.2	1000.0	1000.000	181.6	H	319.0	2.0	37.2	73.9
6495.933333	49.0	1000.0	1000.000	103.7	V	282.0	11.1	35.4	73.9
11001.233333	50.9	1000.0	1000.000	156.6	H	211.0	14.9	33.5	73.9
16767.366667	58.2	1000.0	1000.000	402.0	H	-20.0	23.6	26.2	73.9

Test Notes: Only worst case modulation/bandwidth presented for spurious emissions above 1GHz.



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						
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	12/22/14	12/22/15
1003	Signal Generator	SMR 40	1104.0002.40	Rhode & Schwarz	04/29/15	04/29/16
7604	Series Power Meter	N1912A	SG45100273	Agilent	05/27/15	05/27/16
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/10/15	04/10/16
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50/103829	Rhode & Schwarz	10/09/14	10/09/15
9062	Wireless Communications Test Set	8960	GB47320115	Agilent	07/02/14	07/02/15
-	Power Divider/Splitter	1506A	RR003	Weinschel	Verified by 1003 and 7604	
-	6dB Attenuator	606-06-1F4/DR	-	MECA	Verified by 1003 and 7604	
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	02/28/14	02/28/16
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/15	03/20/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/14	09/29/15
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/11/15	03/11/16
1016	Pre-amplifier	PAM-0202	187	PAM	12/10/14	12/10/15
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50/103829	Rhode & Schwarz	10/09/13	10/09/15
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
1072	DC Power Supply	E3610A	KR51311519	Hewlett Packard	Verified by 6792	
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/12/14	08/12/15
7579	Temperature Chamber	115	151617	TestQuity	07/21/14	07/21/15
7554	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	01/30/14	01/30/16

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	Preamplifier	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.41
Coverage Factor (k):					2
Expanded Uncertainty:					4.82

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	Preamplifier	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.40
Coverage Factor (k):					2
Expanded Uncertainty:					4.81

3.2.3 Conducted Antenna Port Measurement

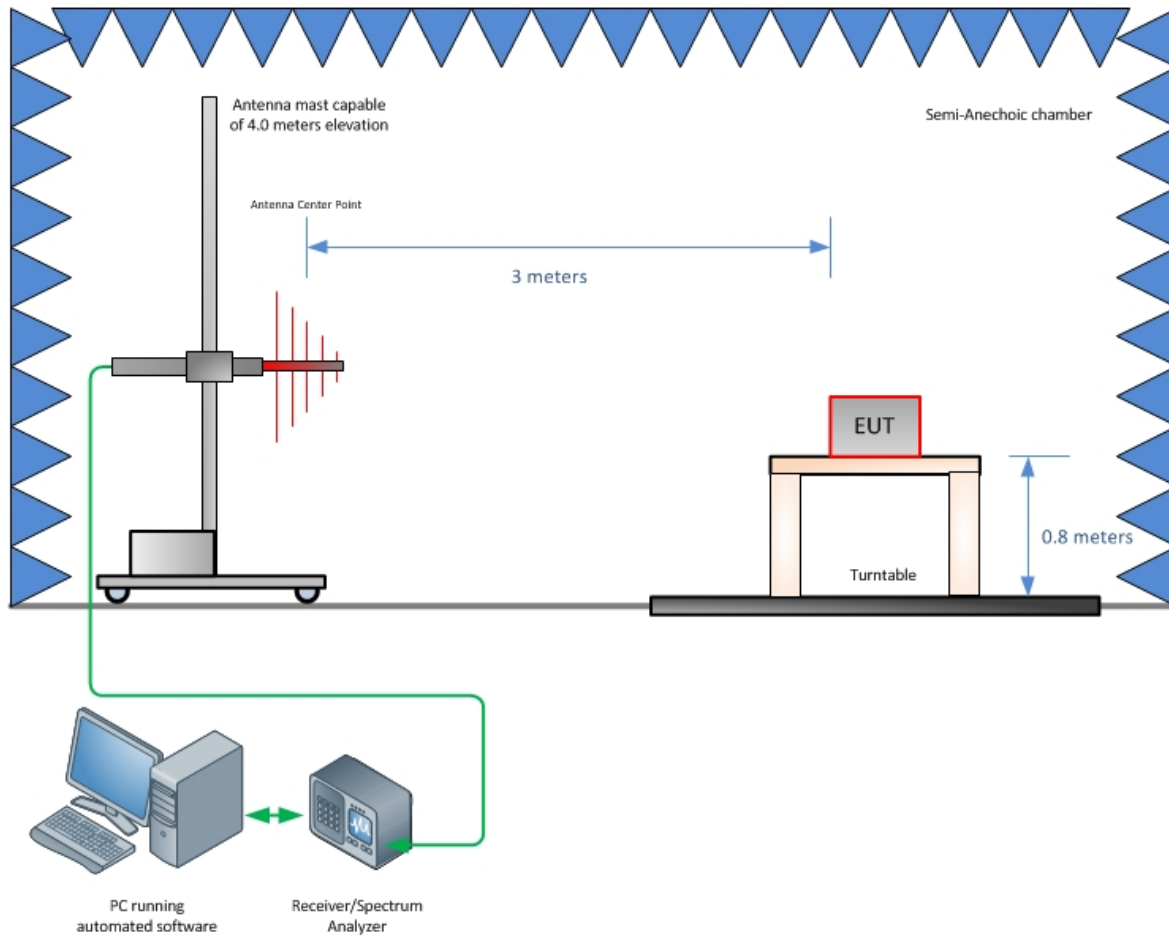
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					0.72
Coverage Factor (k):					2
Expanded Uncertainty:					1.45



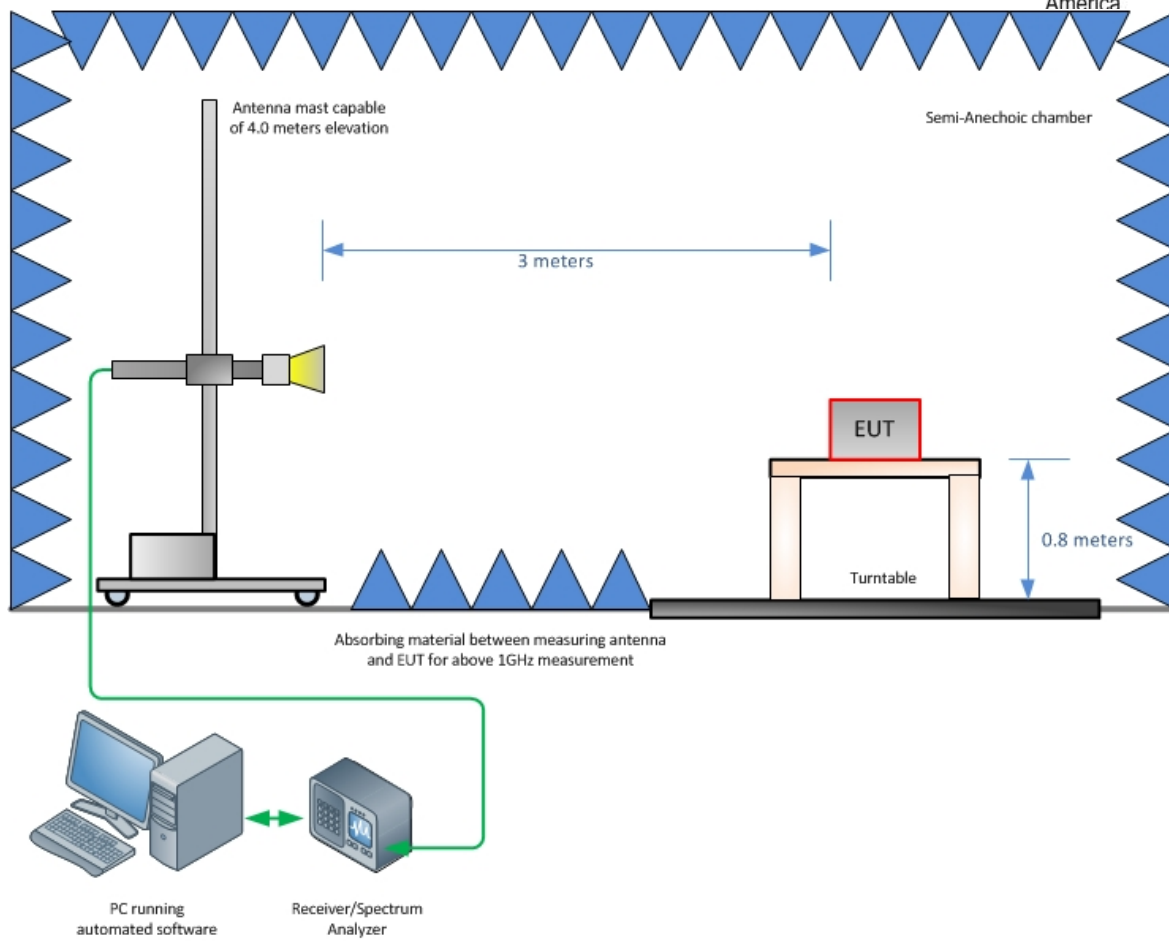
SECTION 4

DIAGRAM OF TEST SETUP

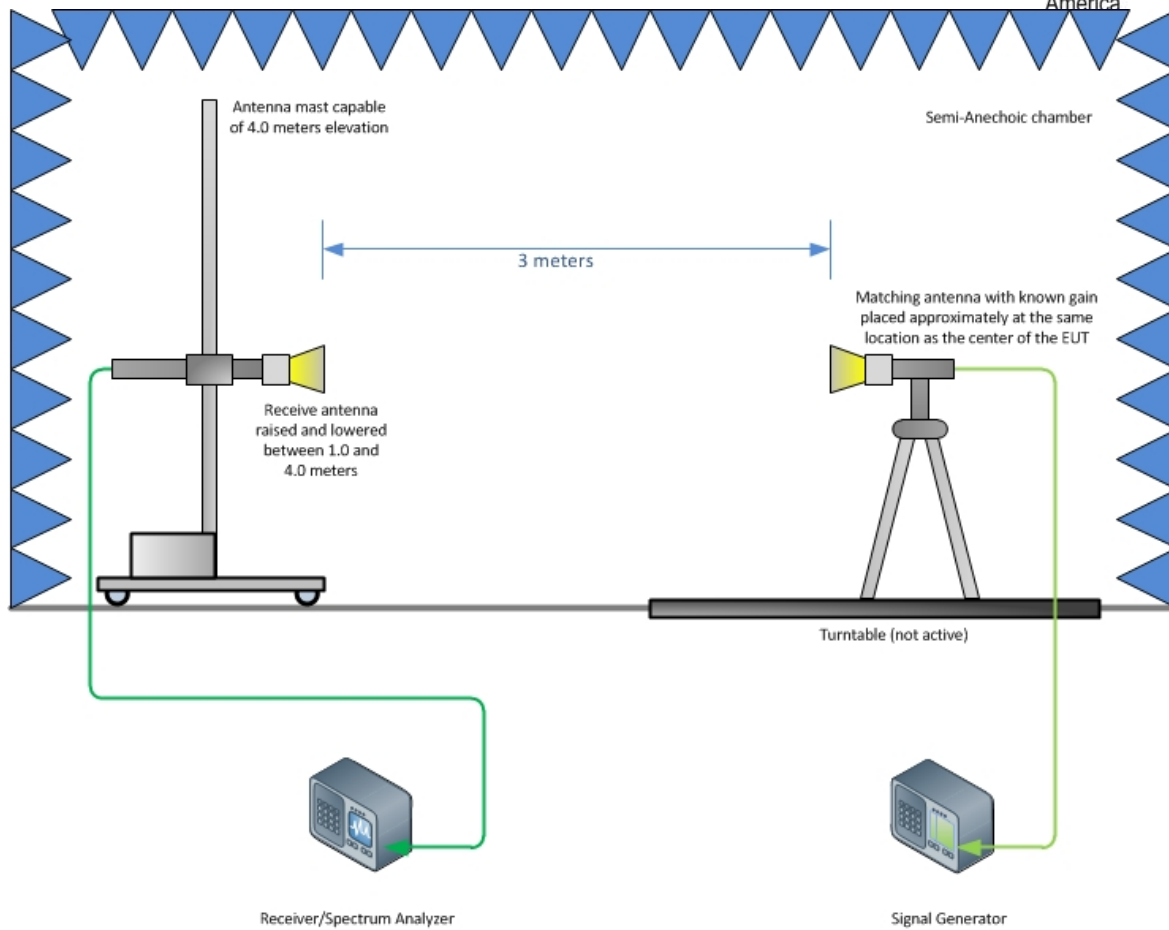
4.1 TEST SETUP DIAGRAM



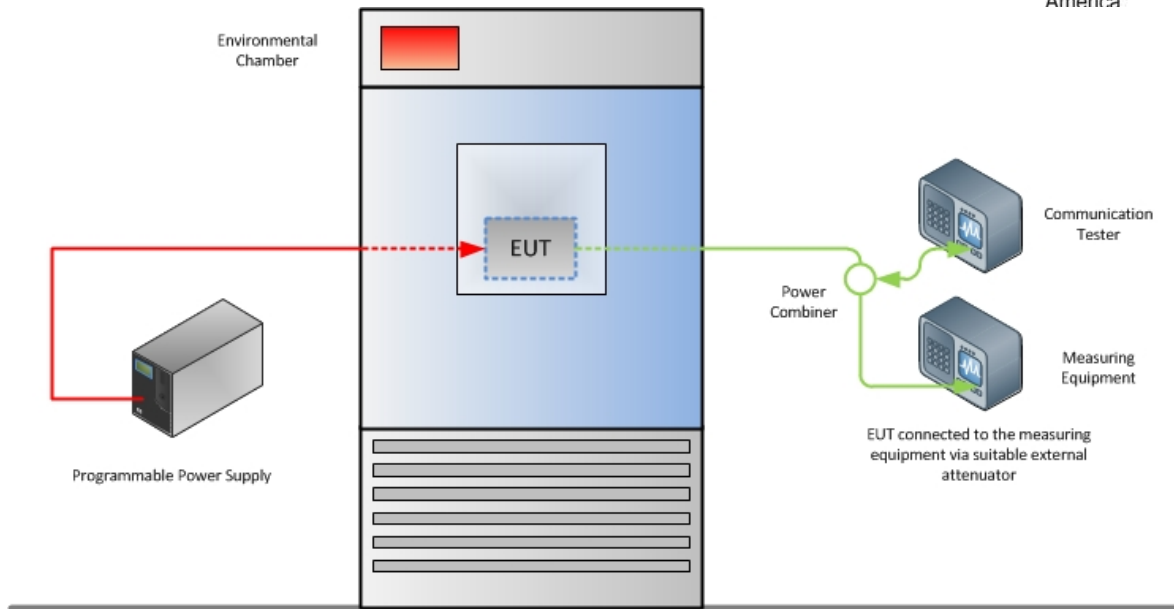
Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Substitution Test Method (Above 1GHz)



Frequency Stability Test Configuration



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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