

FCC RF Test Report

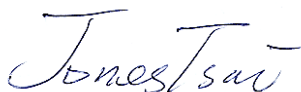
APPLICANT : Motorola Mobility, LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola Mobility, LLC
MODEL NAME : 4009
FCC ID : IHDT56PH2
STANDARD : FCC 47 CFR Part 2, 22(H), 24(E)
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)

The product was received on May 05, 2014 and testing was completed on Jun. 06, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG450533A	Rev. 01	Initial issue of report	Jun. 09, 2014

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	Reporting Only	PASS	-
3.2	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.3	§22.913(a)(2)	Effective Radiated Power	< 7 Watts	PASS	-
3.3	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.4	§2.1049 §22.917(b) §24.238(b)	Occupied Bandwidth	Reporting Only	PASS	-
3.5	§2.1051 §22.917(a) §24.238(a)	Band Edge Measurement	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	-
3.6	§2.1051 §22.917(a) §24.238(a)	Conducted Emission	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	-
3.7	§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	Under limit 28.17 dB at 7520.000 MHz
3.8	§2.1055 §22.355 §24.235	Frequency Stability for Temperature & Voltage	< 2.5 ppm	PASS	-



1 General Description

1.1 Applicant

Motorola Mobility, LLC

222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

1.2 Manufacturer

Motorola Mobility, LLC

222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola Mobility, LLC
Model Name	4009
FCC ID	IHDT56PH2
IMEI	990005290038943
EUT supports Radios application	CDMA/EV-DO/LTE WLAN 11b/g/n (HT20) Bluetooth v3.0 EDR Bluetooth v4.0 LE
HW Version	P3
SW Version	peregrine_usc_userdebug_4.4.3_KXB21.14-L1.12_14_intcfg _test-keys_usc_US
EUT Stage	Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Accessory List	
AC Adapter	Brand Name : Motorola
	Model Name : Agate Lite US/CAN WHT - SPN5810A
Earphone	Brand Name : Motorola
	Model Name : SJN1181A



1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	CDMA2000 BC0: 824.70 MHz ~ 848.31 MHz CDMA2000 BC1: 1851.25 MHz ~ 1908.75 MHz
Rx Frequency	CDMA2000 BC0: 869.70 MHz ~ 893.31 MHz CDMA2000 BC1: 1931.25 MHz ~ 1988.75 MHz
Maximum Output Power to Antenna	CDMA2000 BC0 : 24.28 dBm CDMA2000 BC1 : 23.63 dBm
Antenna Type	Fixed Internal Antenna
Type of Modulation	CDMA2000 : QPSK CDMA2000 1xEV-DO : QPSK/8PSK

1.5 Modification of EUT

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

1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	Maximum ERP/EIRP (W)	Frequency Tolerance (ppm)	Emission Designator
Part 22	CDMA2000 BC0 1xEV-DO Rev. 0	QPSK	0.11	0.0442 ppm	1M28F9W
Part 24	CDMA2000 BC1 1xEV-DO Rev. 0	QPSK	0.34	0.0138 ppm	1M28F9W

1.7 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH02-HY	03CH07-HY

1.8 Applicable Standards

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

- ♦ FCC 47 CFR Part 2, 22(H), 24(E)
- ♦ ANSI / TIA / EIA-603-C-2004
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01

Remark:

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

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 9000 MHz for CDMA2000 BC0.
2. 30 MHz to 19000 MHz for CDMA2000 BC1.

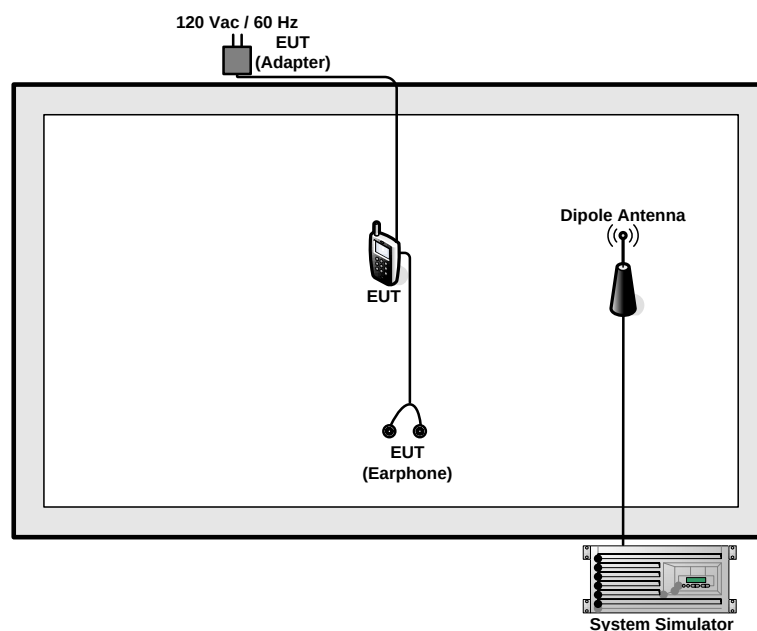
Test Modes		
Band	Radiated TCs	Conducted TCs
CDMA2000 BC0	■ 1xEV-DO Rev. 0 Link Mode	■ 1xEV-DO Rev. 0 Link Mode
CDMA2000 BC1	■ 1xEV-DO Rev. 0 Link Mode	■ 1xEV-DO Rev. 0 Link Mode

Note: The maximum power levels are chosen to test as the worst case configuration as follows:
1xEV-DO Rev. 0 RTAP 153.6kbps mode for CDMA2000 BC0 and CDMA2000 BC1, only these modes were used for all tests.

Conducted Power Measurement Results:

Conducted Power (*Unit: dBm)						
Band	CDMA2000 BC0			CDMA2000 BC1		
Channel	1013	384	777	25	600	1175
Frequency	824.7	836.52	848.31	1851.25	1880	1908.75
1xRTT RC1 SO55	24.16	23.98	23.73	23.41	23.59	23.61
1xRTT RC3 SO55	24.26	23.97	23.89	23.43	23.57	23.53
1xRTT RC3 SO32(+ F-SCH)	24.23	23.99	23.83	23.48	23.58	23.56
1xRTT RC3 SO32(+SCH)	24.20	23.90	23.92	23.40	23.57	23.48
1xEV-DO RTAP 153.6kbps	24.28	24.02	23.84	23.38	23.58	23.63
1xEV-DO RETAP 4096Bits	24.22	23.96	23.87	23.52	23.57	23.50

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

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

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

Offset = RF cable loss + attenuator factor.

The following shows an offset computation example with RF cable loss 4.2 dB and a 10dB attenuator.

Example :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

3 Test Result

3.1 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output Power Measurement

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

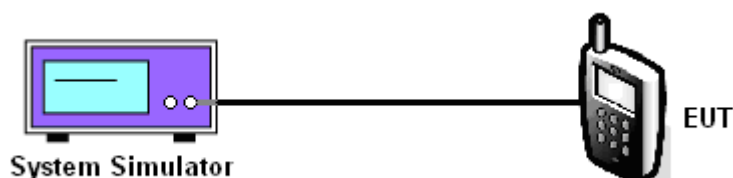
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

CDMA2000 BC0			
Test Mode	CDMA 2000 1xEV-DO Rev. 0		
Test Status	RTAP 153.6K		
Channel	1013 (Low)	384 (Mid)	777 (High)
Frequency (MHz)	824.70	836.52	848.31
Conducted Power (dBm)	24.28	24.02	23.84

CDMA2000 BC1			
Test Mode	CDMA 2000 1xEV-DO Rev. 0		
Test Status	RTAP 153.6K		
Channel	25 (Low)	600 (Mid)	1175 (High)
Frequency (MHz)	1851.25	1880.00	1908.75
Conducted Power (dBm)	23.38	23.58	23.63

Note: maximum average power for CDMA2000.

3.2 Peak-to-Average Ratio

3.2.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

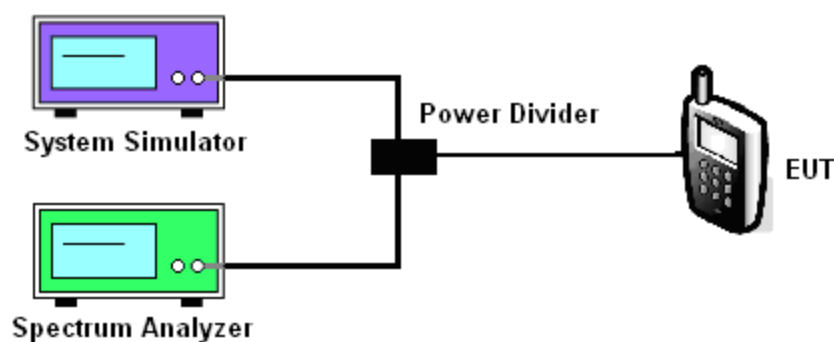
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option on the spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. Record the deviation as Peak to Average Ratio.

3.2.4 Test Setup



3.2.5 Test Result of Peak-to-Average Ratio

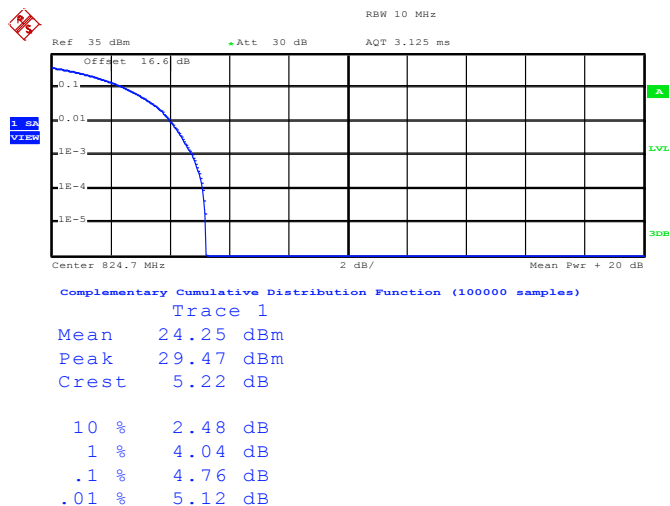
CDMA2000 BC0			
Modes	CDMA 2000 1xEV-DO Rev. 0		
Test Status	RTAP 153.6K		
Channel	1013 (Low)	384 (Mid)	777 (High)
Frequency (MHz)	824.70	836.52	848.31
Peak-to-Average Ratio (dB)	4.76	4.56	4.68

CDMA2000 BC1			
Modes	CDMA 2000 1xEV-DO Rev. 0		
Test Status	RTAP 153.6K		
Channel	25 (Low)	600 (Mid)	1175 (High)
Frequency (MHz)	1851.25	1880.00	1908.75
Peak-to-Average Ratio (dB)	4.40	4.36	2.72

3.2.6 Test Result (Plots) of Peak-to-Average Ratio

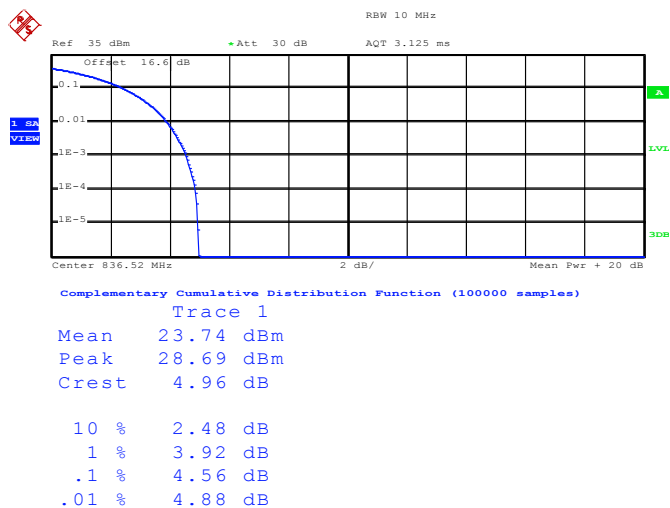
Band :	CDMA2000 BC0	Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)
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Peak-to-Average Ratio on Channel 1013 (824.70 MHz)

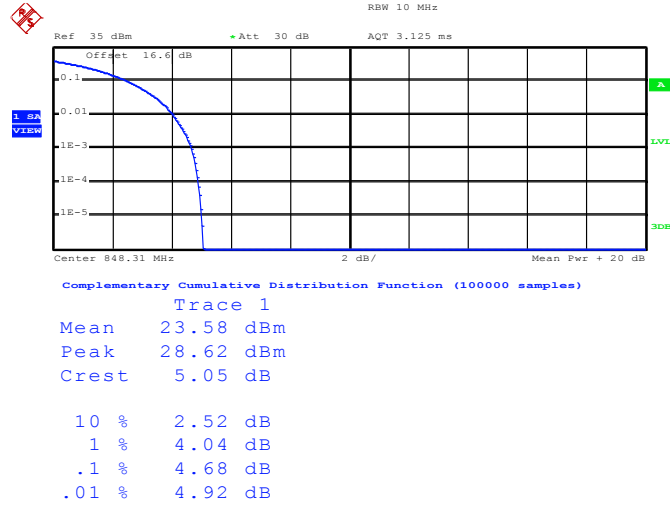


Date: 24.MAY.2014 13:46:02

Peak-to-Average Ratio on Channel 384 (836.52 MHz)



Date: 24.MAY.2014 13:46:44

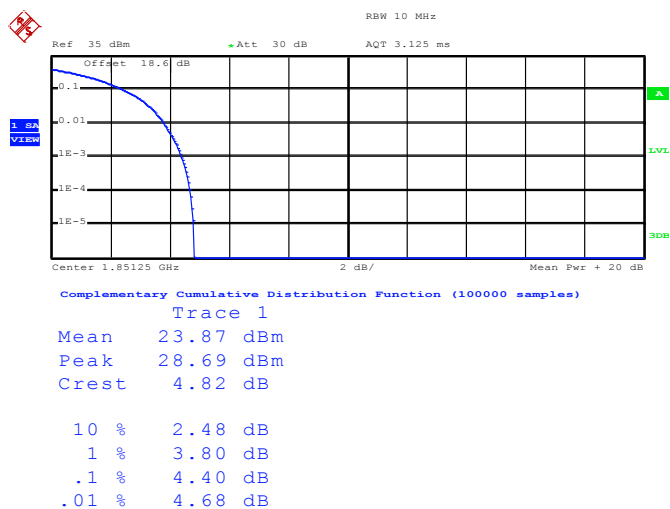
Peak-to-Average Ratio on Channel 777 (848.31 MHz)


Date: 24.MAY.2014 13:47:32



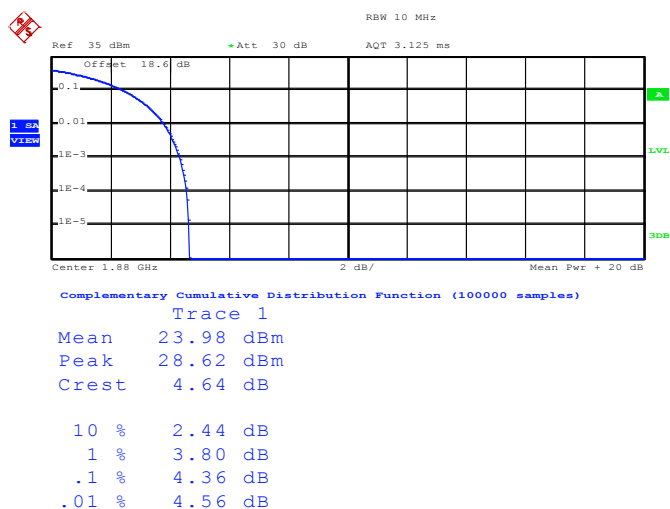
Band :	CDMA2000 BC1	Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)
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Peak-to-Average Ratio on Channel 25 (1851.25 MHz)



Date: 24.MAY.2014 14:45:12

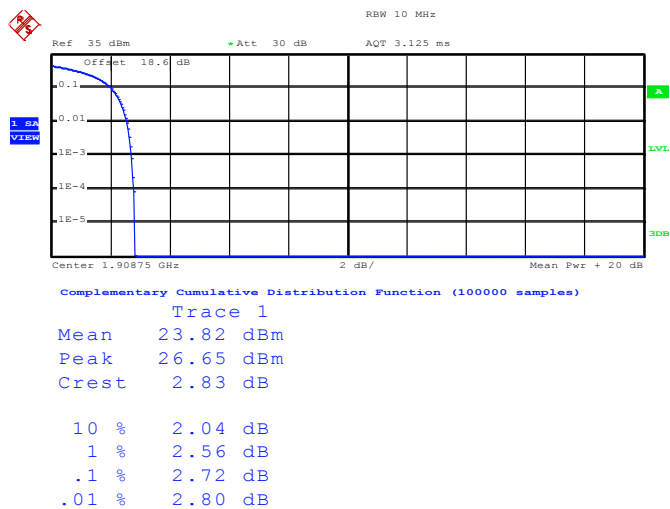
Peak-to-Average Ratio on Channel 600 (1880 MHz)



Date: 24.MAY.2014 14:45:42



Peak-to-Average Ratio on Channel 1175 (1908.75 MHz)



Date: 24.MAY.2014 14:46:36

3.3 Effective Radiated Power and Effective Isotropic Radiated Power Measurement

3.3.1 Description of the ERP/EIRP Measurement

The substitution method, in ANSI / TIA / EIA-603-C-2004, was used for ERP/EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. The ERP of mobile transmitters must not exceed 7 Watts and the EIRP of mobile transmitters are limited to 2 Watts.

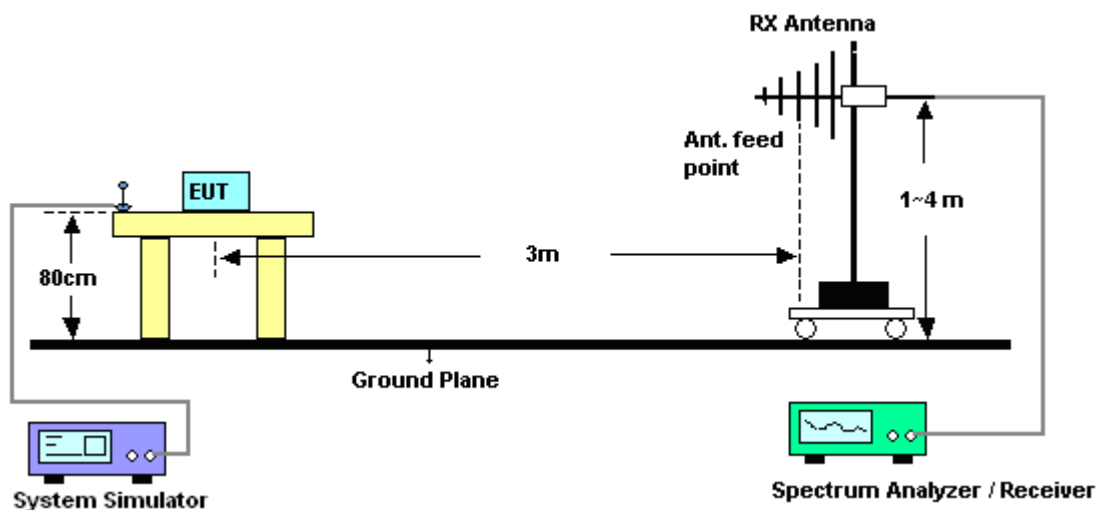
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The EUT was placed on a non-conductive rotating platform 0.8 meters high in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RMS detector per section 5. of KDB 971168 D01.
2. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power. The maximum emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
3. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-C. The EUT was replaced by dipole antenna (substitution antenna) at the same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP was calculated with the correction factor, $EIRP = LVL + \text{Correction factor}$ and $ERP = EIRP - 2.15$.

3.3.4 Test Setup



3.3.5 Test Result of ERP

CDMA2000 BC0 1xEV-DO Rev. 0_RTAP 153.6K Radiated Power ERP				
Horizontal Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
824.70	-9.09	31.35	20.11	0.10
836.52	-9.56	32.13	20.42	0.11
848.31	-10.26	32.64	20.23	0.11
Vertical Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
824.70	-11.86	32.83	18.82	0.08
836.52	-11.49	32.81	19.17	0.08
848.31	-12.14	33.52	19.23	0.08

* ERP = LVL (dBm) + Correction Factor (dB) – 2.15

3.3.6 Test Result of EIRP

CDMA2000 BC1 1xEV-DO Rev. 0_RTAP 153.6K Radiated Power EIRP				
Horizontal Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1851.25	-21.21	43.92	22.71	0.19
1880.00	-23.03	44.79	21.76	0.15
1908.75	-22.36	43.75	21.39	0.14
Vertical Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1851.25	-21.62	45.35	23.73	0.24
1880.00	-22.49	46.78	24.29	0.27
1908.75	-21.47	46.74	25.27	0.34

* EIRP = LVL (dBm) + Correction Factor (dB)

3.4 99% Occupied Bandwidth and 26dB Bandwidth Measurement

3.4.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

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

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

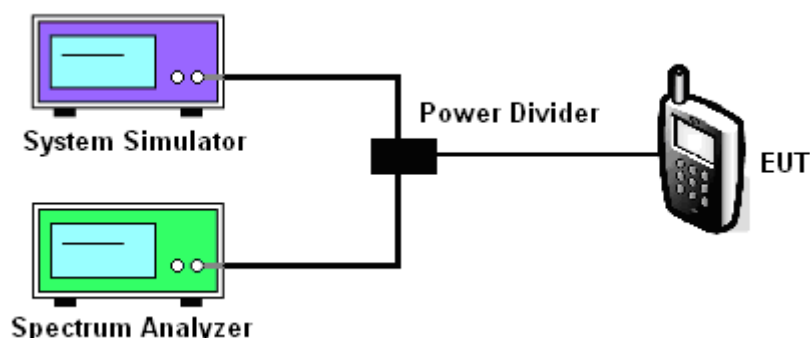
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold.
4. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.

3.4.4 Test Setup



3.4.5 Test Result of Occupied Bandwidth and 26dB Bandwidth

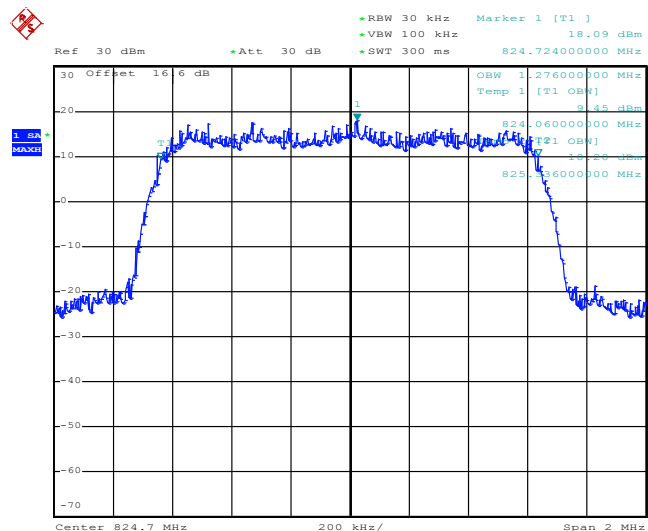
CDMA2000 BC0			
Test Mode	CDMA 2000 1xEV-DO Rev. 0		
Test Status	RTAP 153.6K		
Channel	1013 (Low)	384 (Mid)	777 (High)
Frequency (MHz)	824.70	836.52	848.31
99% OBW (MHz)	1.28	1.27	1.28
26dB BW (MHz)	1.42	1.40	1.41

CDMA2000 BC1			
Test Mode	CDMA 2000 1xEV-DO Rev. 0		
Test Status	RTAP 153.6K		
Channel	25 (Low)	600 (Mid)	1175 (High)
Frequency (MHz)	1851.25	1880.00	1908.75
99% OBW (MHz)	1.27	1.28	1.28
26dB BW (MHz)	1.42	1.41	1.45

3.4.6 Test Result (Plots) of Occupied Bandwidth and 26dB Bandwidth

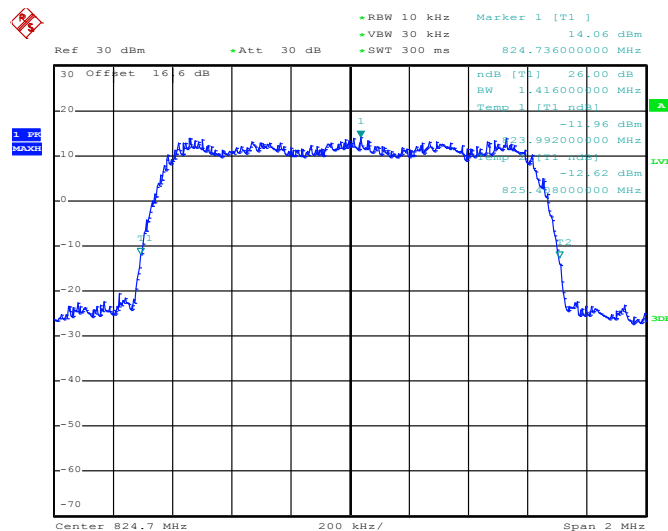
Band :	CDMA2000 BC0	Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)
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99% Occupied Bandwidth Plot on Channel 1013 (824.7 MHz)



Date: 24.MAY.2014 13:25:54

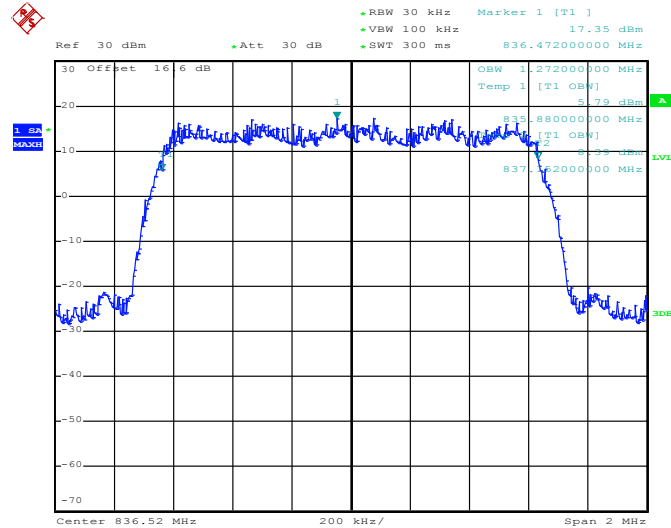
26dB Bandwidth Plot on Channel 1013 (824.7 MHz)



Date: 24.MAY.2014 13:23:44

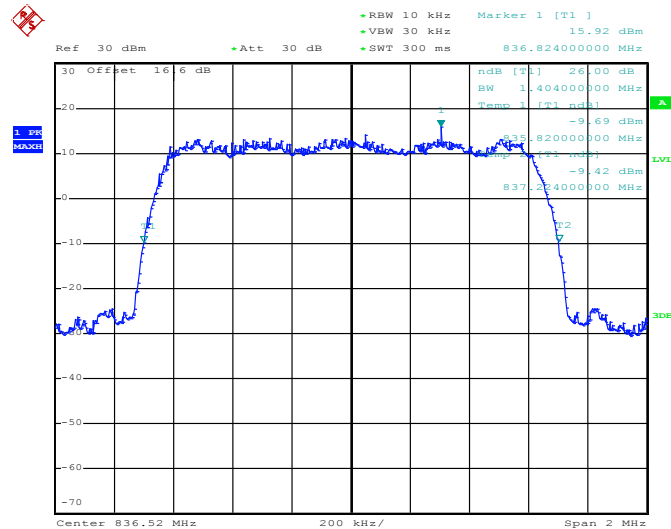


99% Occupied Bandwidth Plot on Channel 384 (836.52 MHz)



Date: 24.MAY.2014 13:26:23

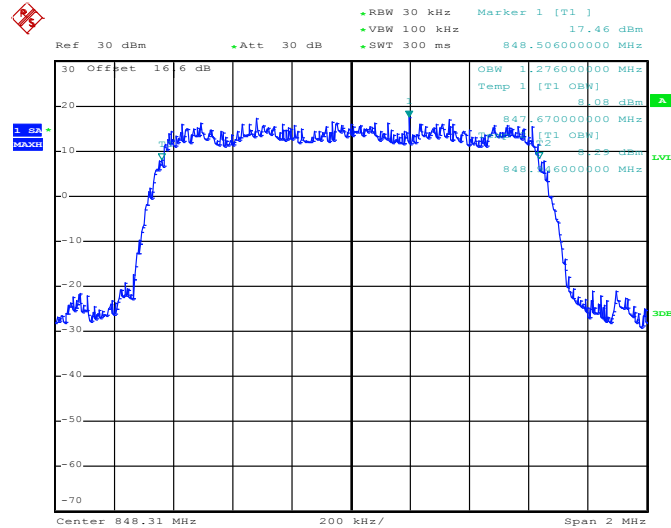
26dB Bandwidth Plot on Channel 384 (836.52 MHz)



Date: 24.MAY.2014 13:24:13

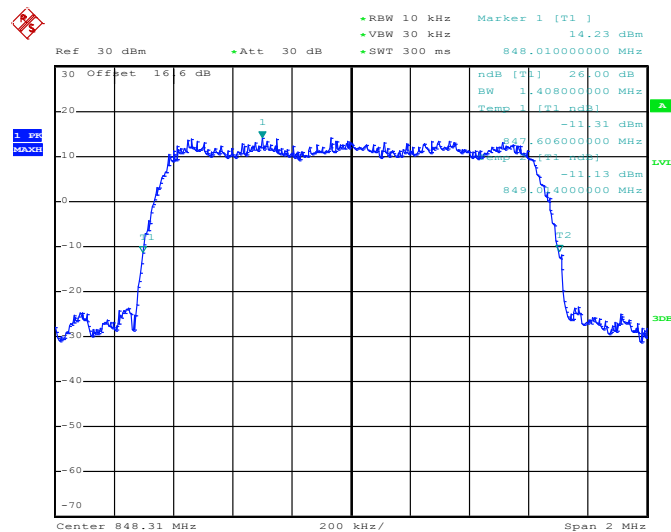


99% Occupied Bandwidth Plot on Channel 777 (848.31 MHz)



Date: 24.MAY.2014 13:26:51

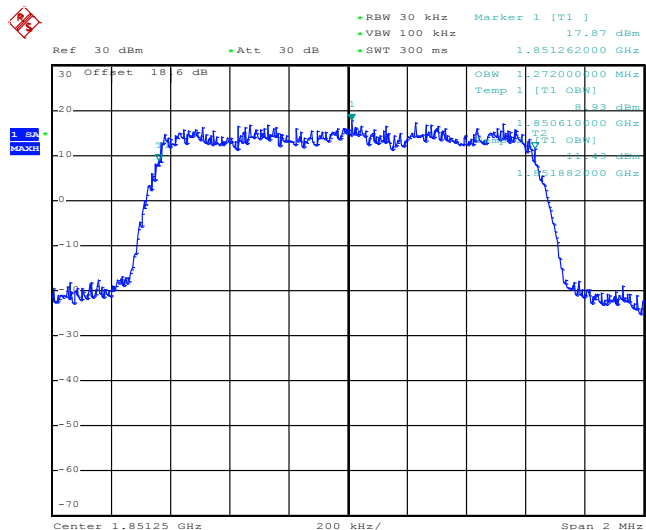
26dB Bandwidth Plot on Channel 777 (848.31 MHz)



Date: 24.MAY.2014 13:24:42

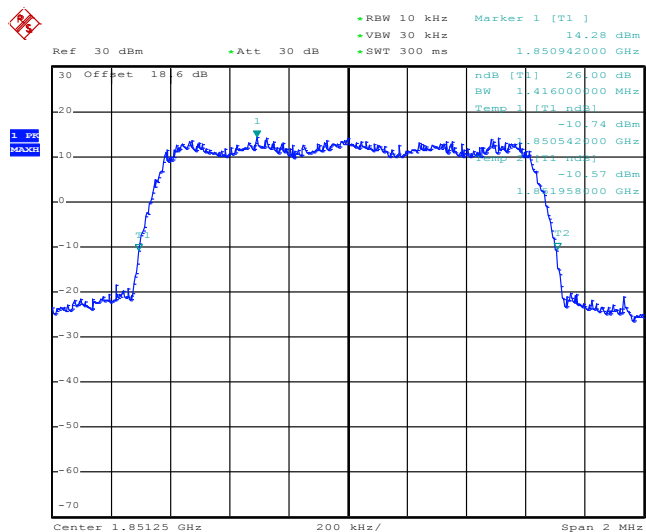
Band :	CDMA2000 BC1	Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)
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99% Occupied Bandwidth Plot on Channel 25 (1851.25 MHz)



Date: 24.MAY.2014 14:34:42

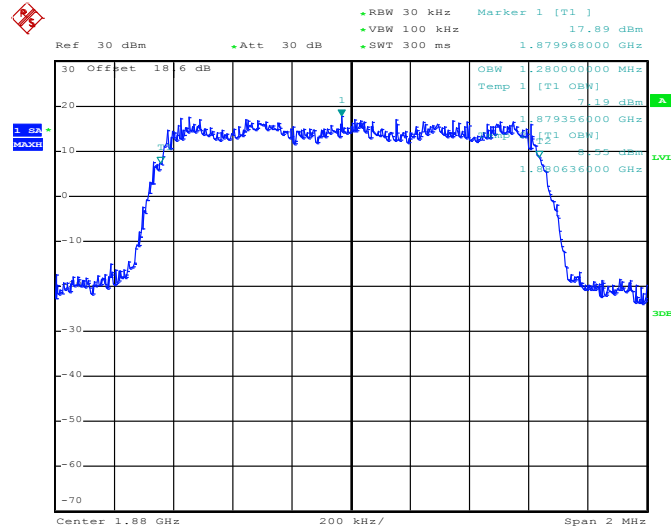
26dB Bandwidth Plot on Channel 25 (1851.25 MHz)



Date: 24.MAY.2014 14:32:37

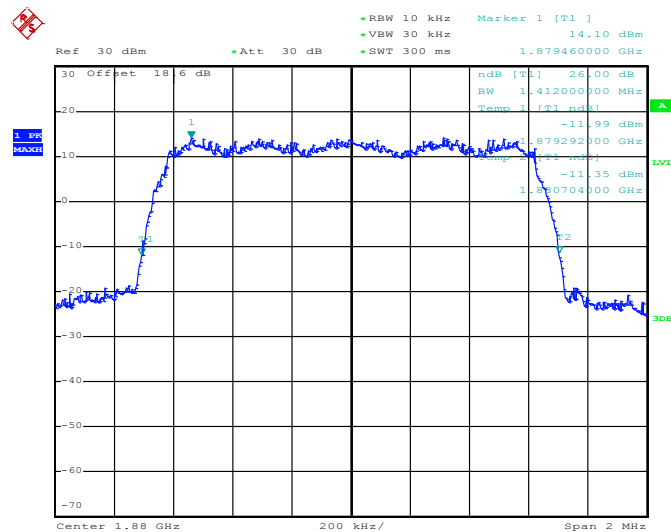


99% Occupied Bandwidth Plot on Channel 600 (1880.0 MHz)



Date: 24.MAY.2014 14:35:11

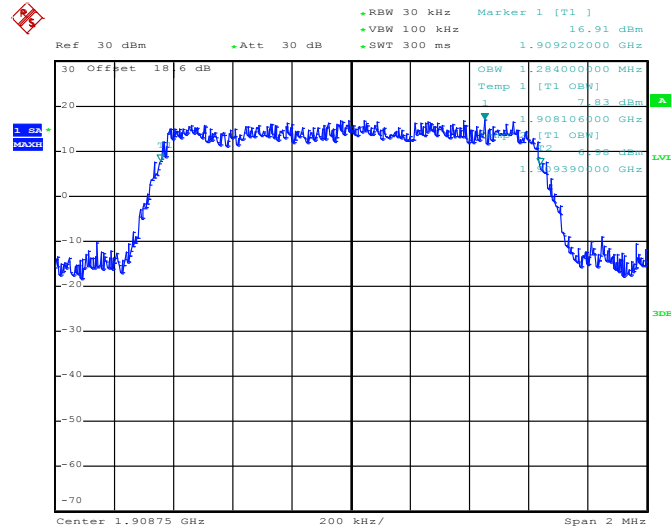
26dB Bandwidth Plot on Channel 600 (1880.0 MHz)



Date: 24.MAY.2014 14:33:06

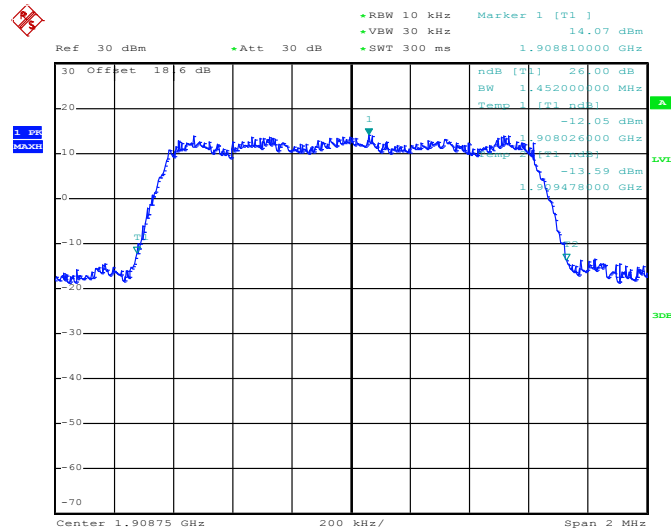


99% Occupied Bandwidth Plot on Channel 1175 (1908.75 MHz)



Date: 24.MAY.2014 14:35:39

26dB Bandwidth Plot on Channel 1175 (1908.75 MHz)



Date: 24.MAY.2014 14:33:34

3.5 Band Edge Measurement

3.5.1 Description of Band Edge Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

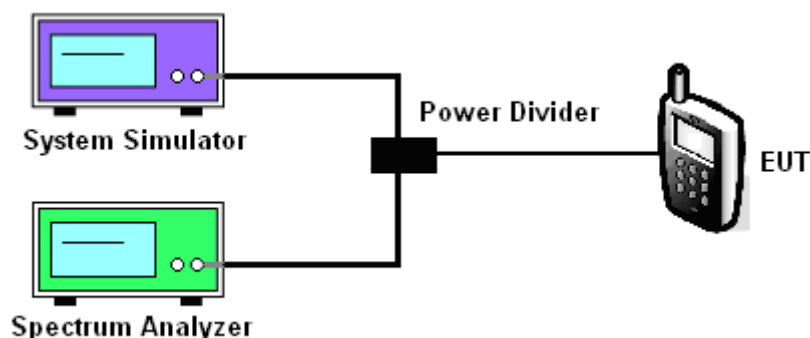
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The band edges of low and high channels for the highest RF powers were measured.
4. The RBW was replaced by 10 kHz, slightly smaller than the value in (2), due to the spectrum analyzer limitation to set the exact value. A worst case correction factor of $10 \cdot \log (1\% \text{ emission-BW/measurement RBW})$ was compensated.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from $43 + 10 \log (P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10 \log (P)] \text{ (dB)}$
 $= [30 + 10 \log (P)] \text{ (dBm)} - [43 + 10 \log (P)] \text{ (dB)}$
 $= -13 \text{ dBm}.$

3.5.4 Test Setup

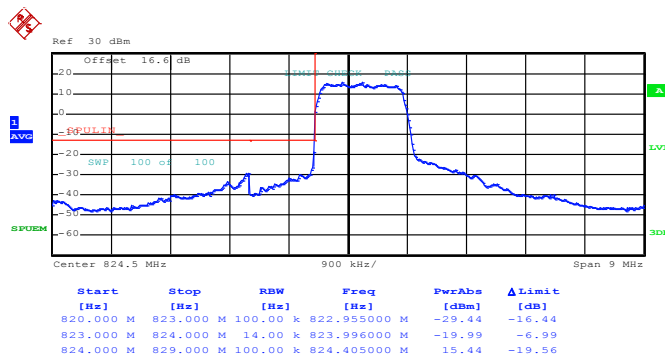




3.5.5 Test Result (Plots) of Conducted Band Edge

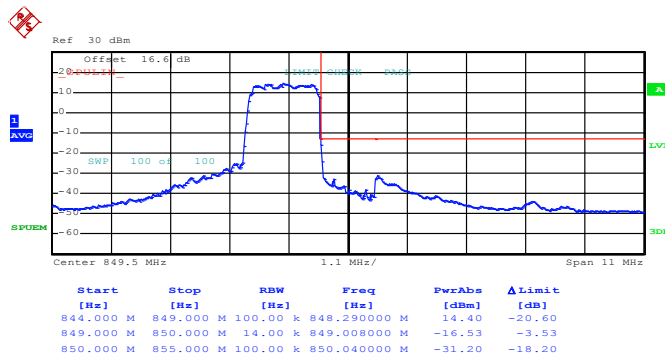
Band :	CDMA2000 BC0	Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)
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Lower Band Edge Plot on Channel 1013 (824.7 MHz)



Date: 24.MAY.2014 13:38:31

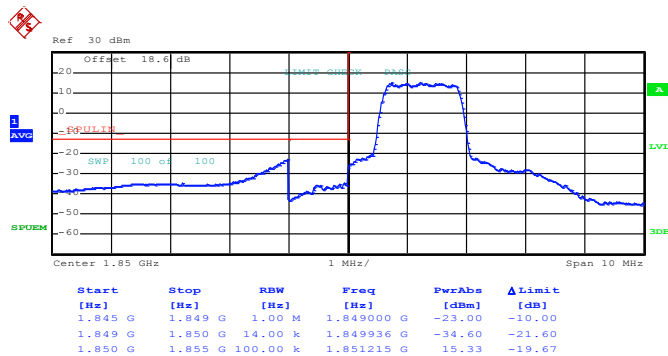
Higher Band Edge Plot on Channel 777 (848.31 MHz)



Date: 24.MAY.2014 13:34:03

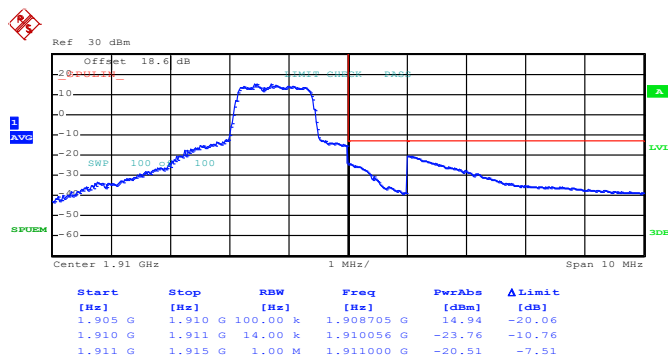
Band :	CDMA2000 BC1	Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)
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Lower Band Edge Plot on Channel 25 (1851.25 MHz)



Date: 24.MAY.2014 14:42:46

Higher Band Edge Plot on Channel 1175 (1908.75 MHz)



Date: 24.MAY.2014 14:39:52

3.6 Conducted Spurious Emission Measurement

3.6.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

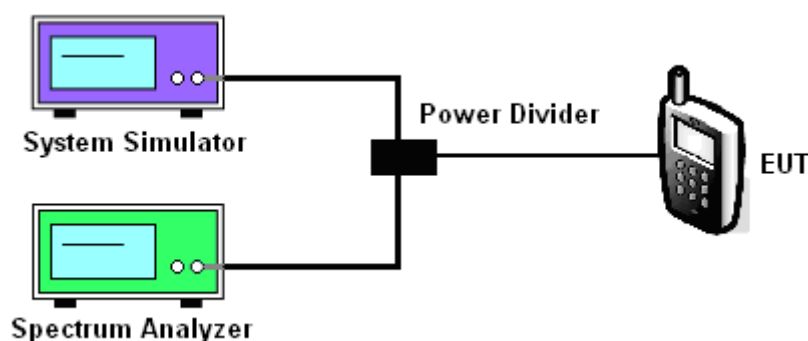
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

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

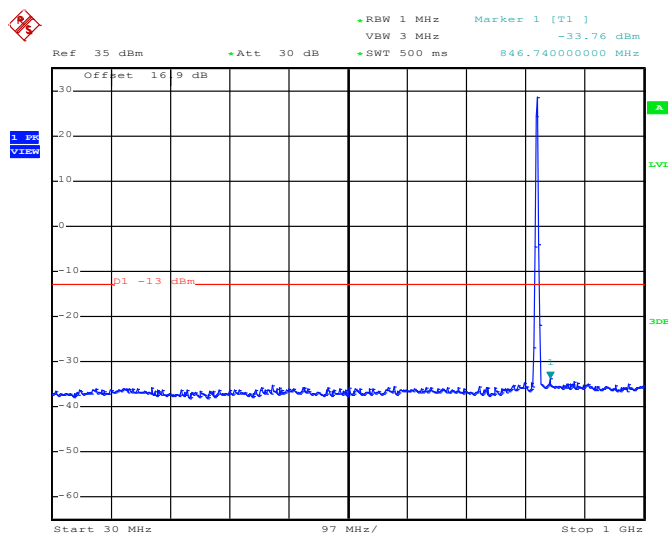
3.6.4 Test Setup



3.6.5 Test Result (Plots) of Conducted Spurious Emission

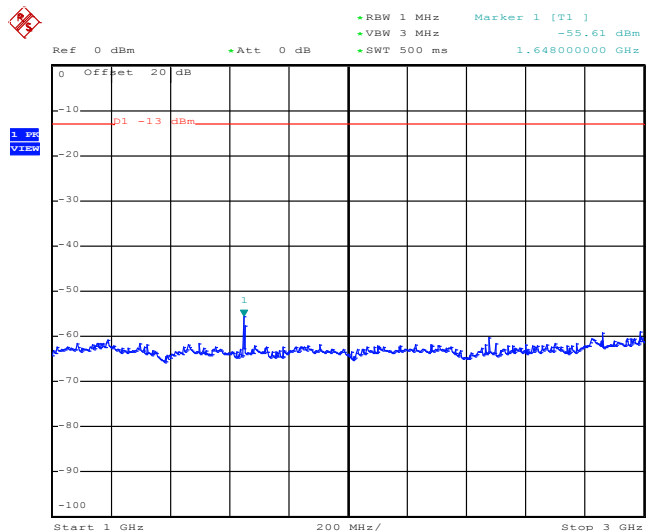
Band :	CDMA2000 BC0	Channel :	CH1013
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Frequency :	824.7 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



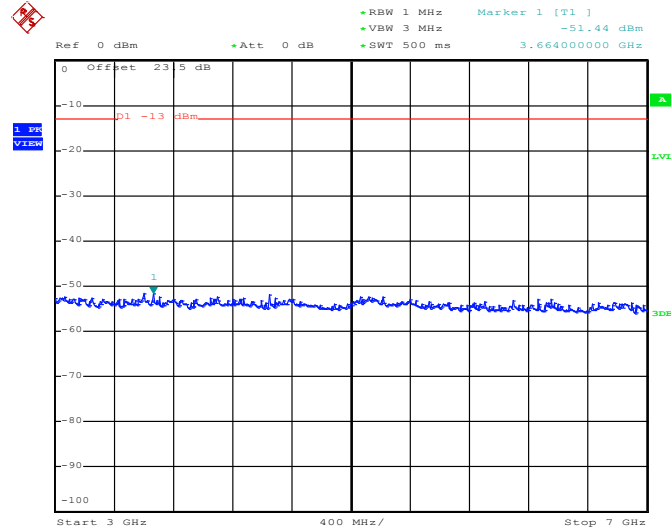
Date: 24.MAY.2014 13:51:58

Conducted Spurious Emission Plot between 1GHz ~ 3GHz



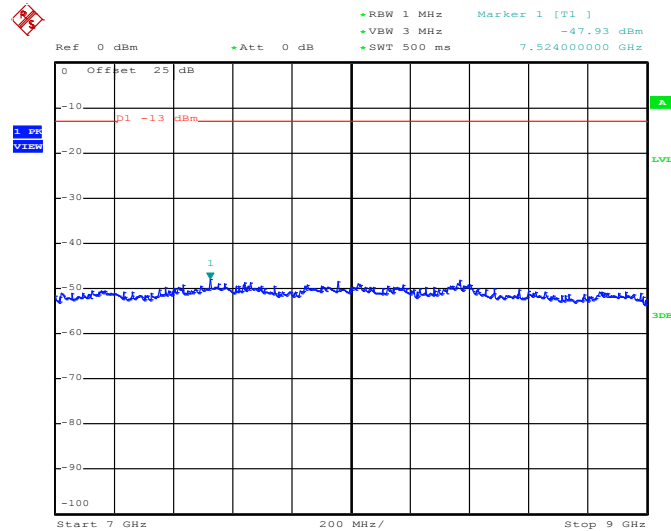
Date: 24.MAY.2014 13:51:37

Conducted Spurious Emission Plot between 3GHz ~ 7GHz



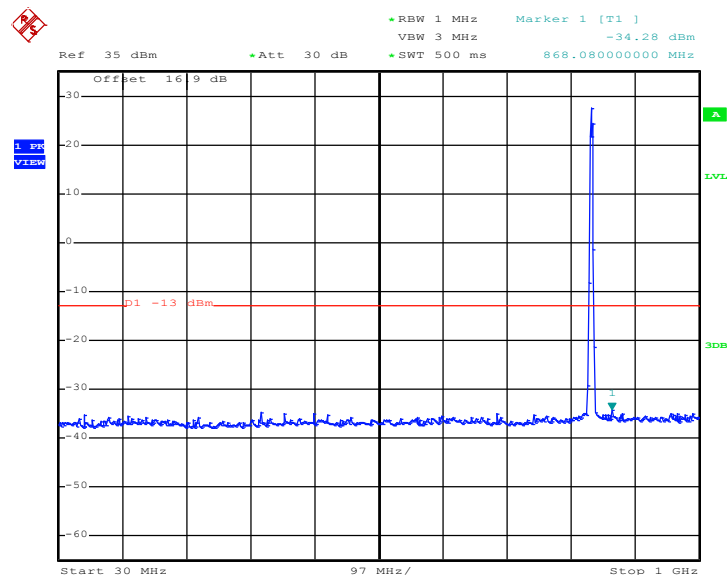
Date: 24.MAY.2014 13:51:45

Conducted Spurious Emission Plot between 7GHz ~ 9GHz

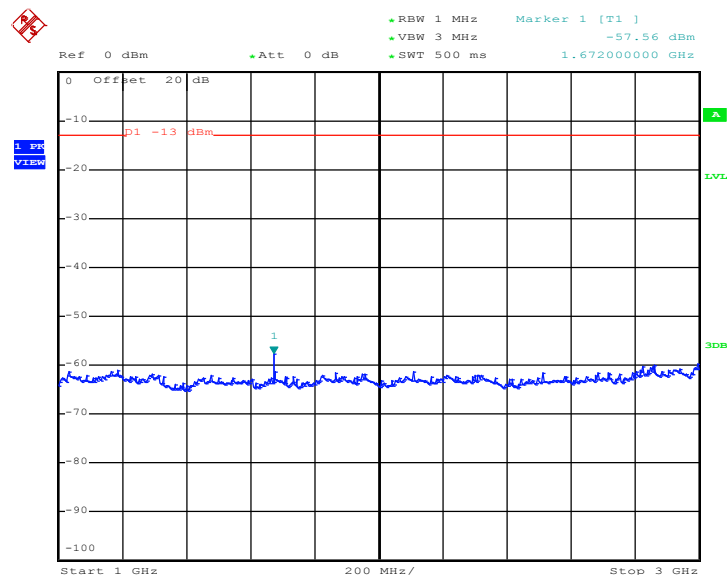


Date: 24.MAY.2014 13:51:54

Band :	CDMA2000 BC0	Channel :	CH384
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Frequency :	836.52 MHz

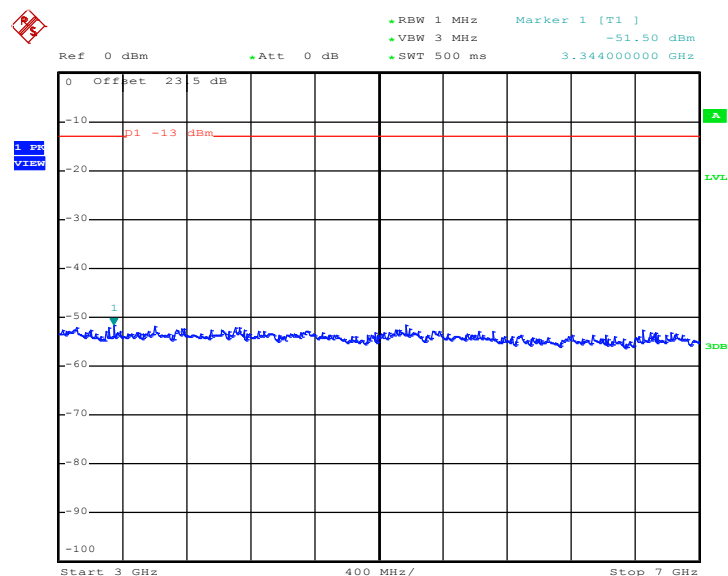
Conducted Spurious Emission Plot between 30MHz ~ 1GHz


Date: 24.MAY.2014 13:49:29

Conducted Spurious Emission Plot between 1GHz ~ 3GHz


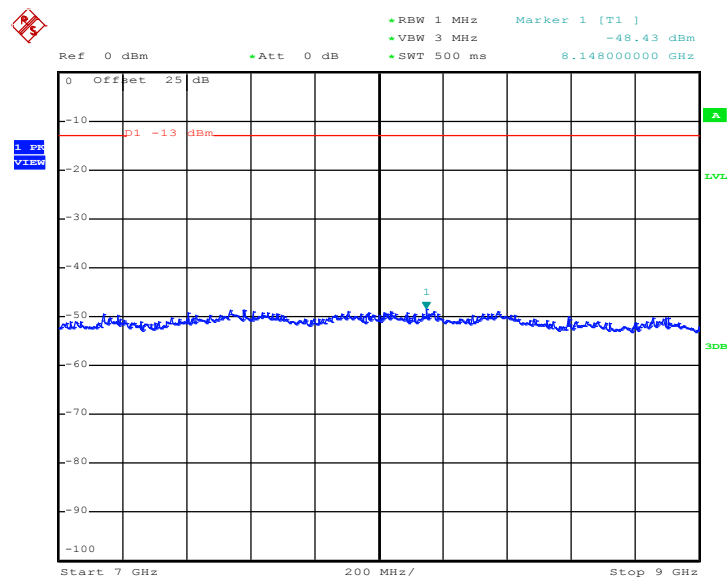
Date: 24.MAY.2014 13:49:24

Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 24.MAY.2014 13:49:32

Conducted Spurious Emission Plot between 7GHz ~ 9GHz

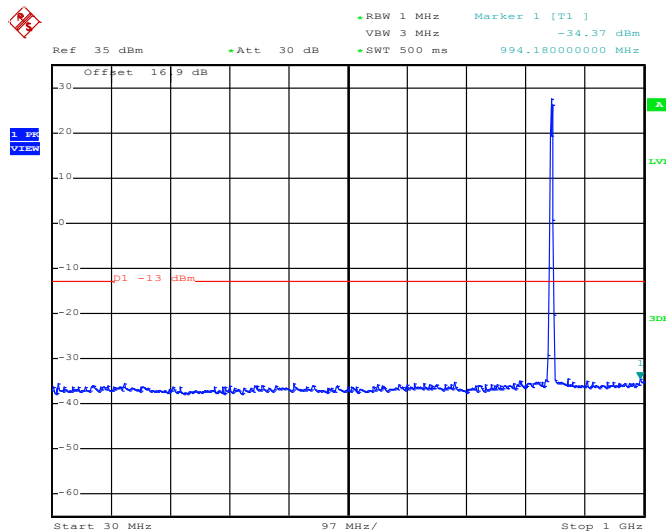


Date: 24.MAY.2014 13:49:40



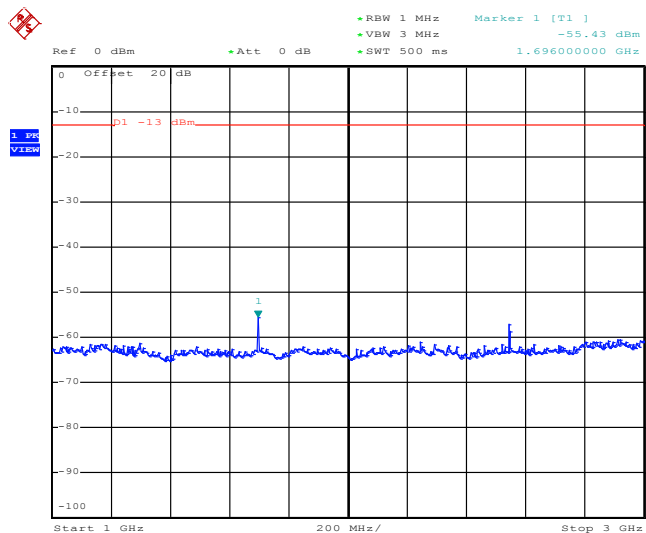
Band :	CDMA2000 BC0	Channel :	CH777
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Frequency :	848.31MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



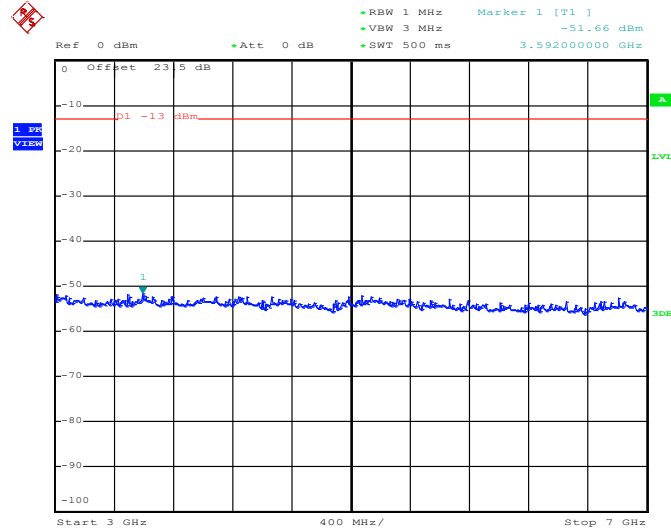
Date: 24.MAY.2014 13:52:50

Conducted Spurious Emission Plot between 1GHz ~ 3GHz



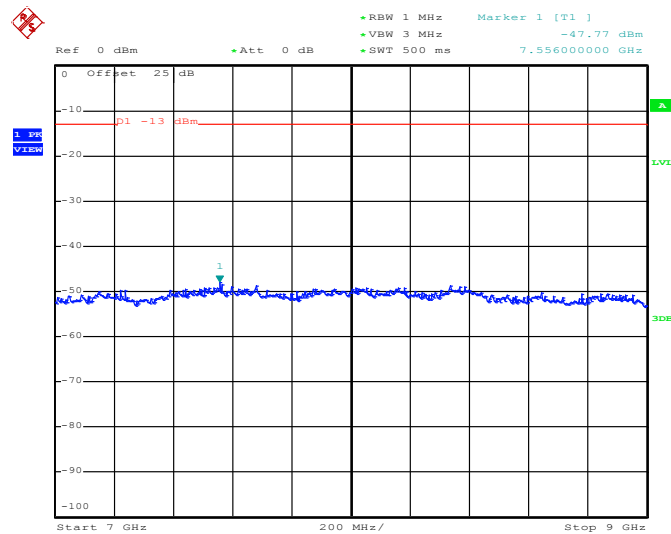
Date: 24.MAY.2014 13:52:53

Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 24.MAY.2014 13:53:01

Conducted Spurious Emission Plot between 7GHz ~ 9GHz

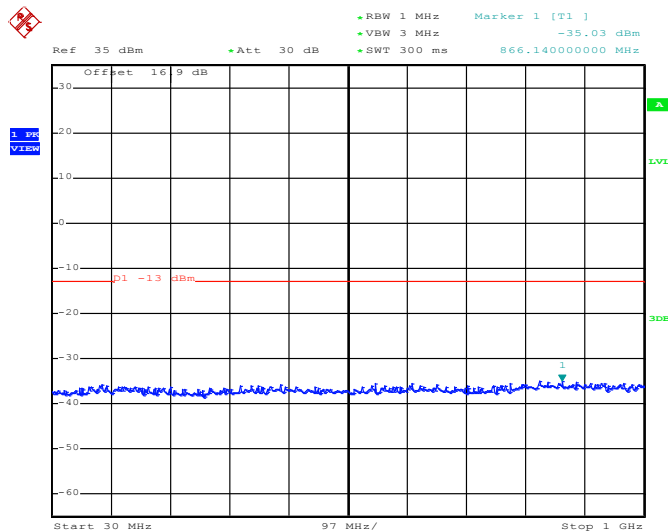


Date: 24.MAY.2014 13:53:09



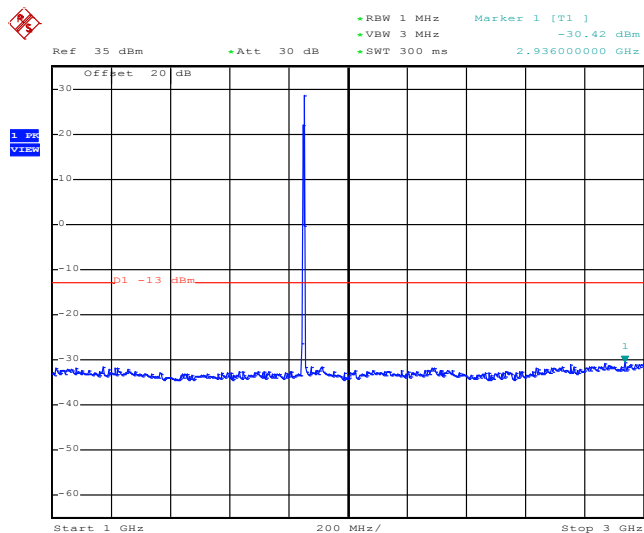
Band :	CDMA2000 BC1	Channel :	CH25
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Frequency :	1851.25 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



Date: 24.MAY.2014 14:53:19

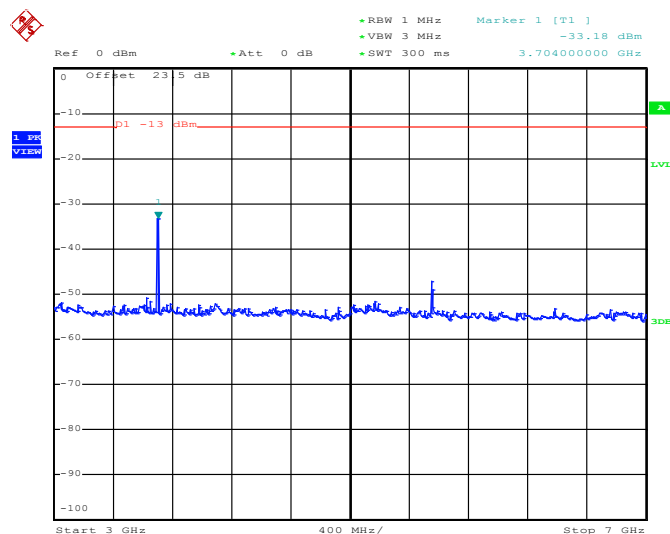
Conducted Spurious Emission Plot between 1GHz ~ 3GHz



Date: 24.MAY.2014 14:53:35

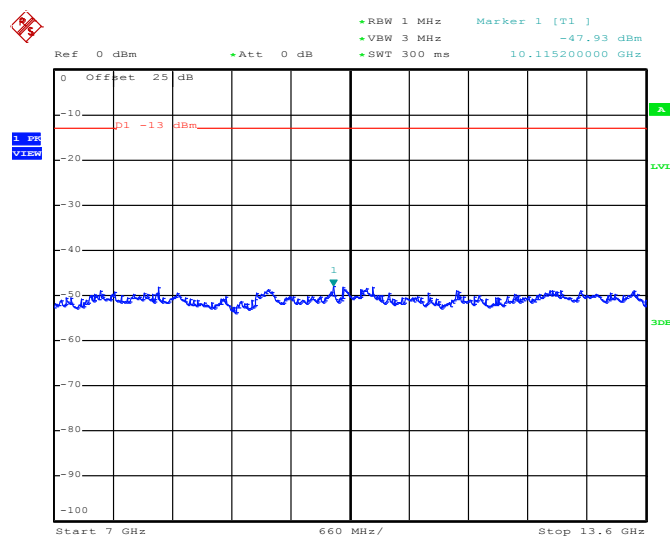


Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 24.MAY.2014 14:53:39

Conducted Spurious Emission Plot between 7GHz ~ 13.6GHz



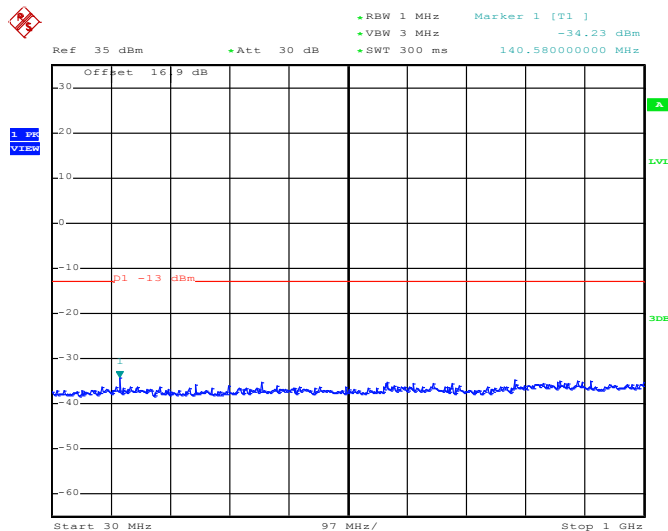
Date: 24.MAY.2014 14:53:47





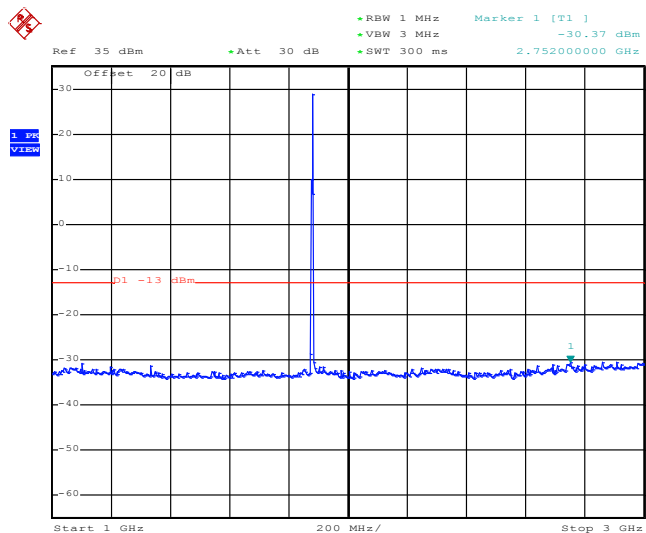
Band :	CDMA2000 BC1	Channel :	CH600
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Frequency :	1880 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



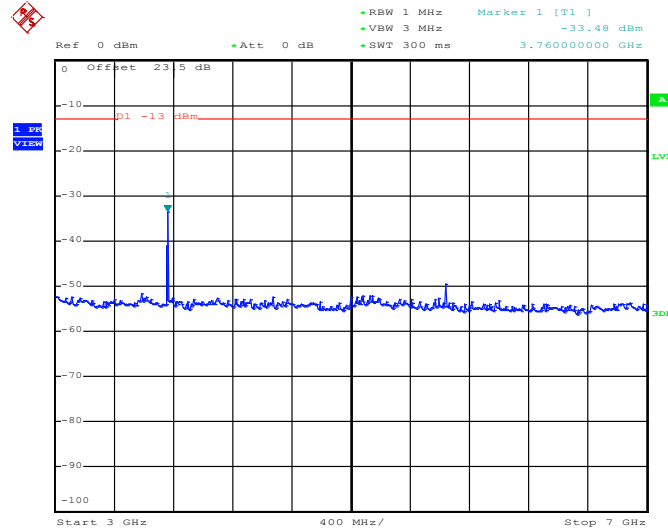
Date: 24.MAY.2014 14:49:52

Conducted Spurious Emission Plot between 1GHz ~ 3GHz



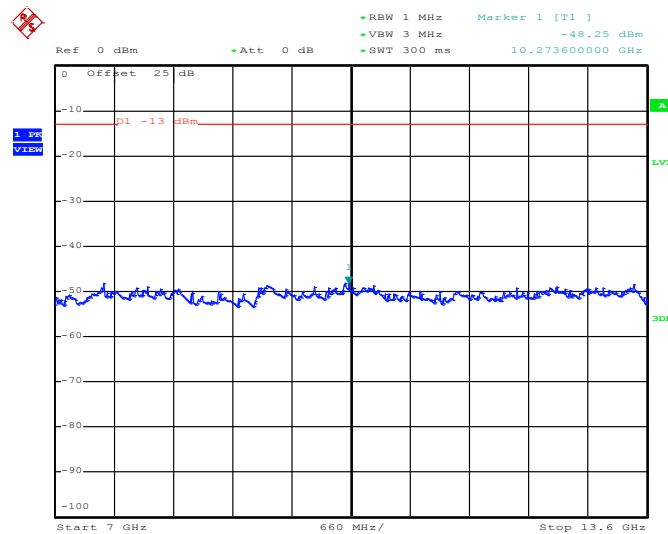
Date: 24.MAY.2014 14:50:45

Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 24.MAY.2014 14:50:14

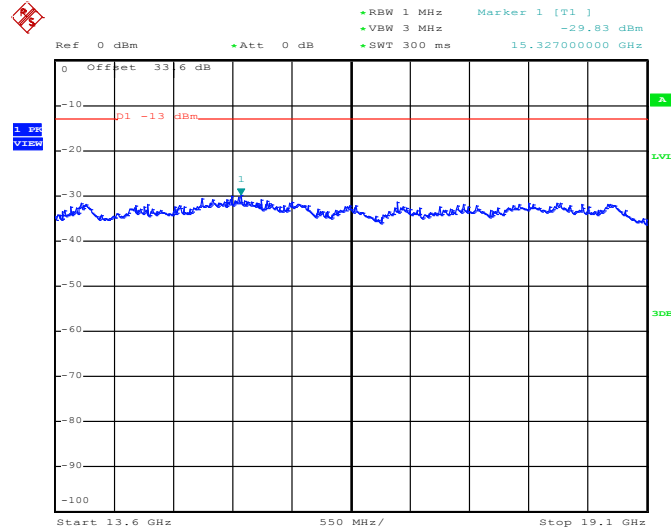
Conducted Spurious Emission Plot between 7GHz ~ 13.6GHz



Date: 24.MAY.2014 14:50:23



Conducted Spurious Emission Plot between 13.6GHz ~ 19.1GHz

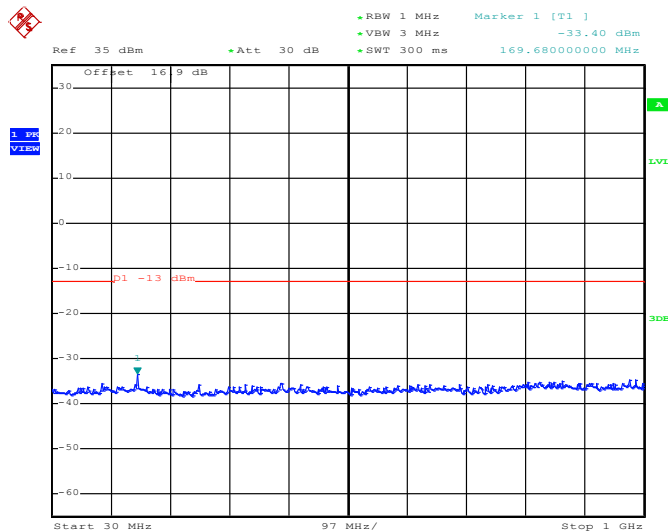


Date: 24.MAY.2014 14:50:31



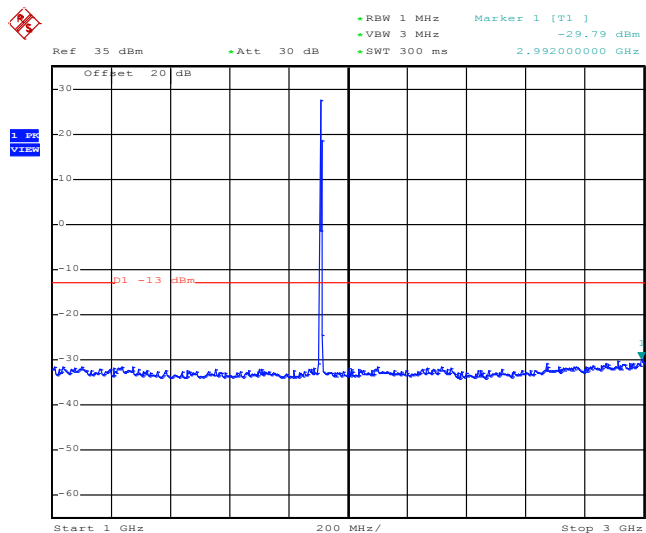
Band :	CDMA2000 BC1	Channel :	CH1175
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Frequency :	1908.75 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



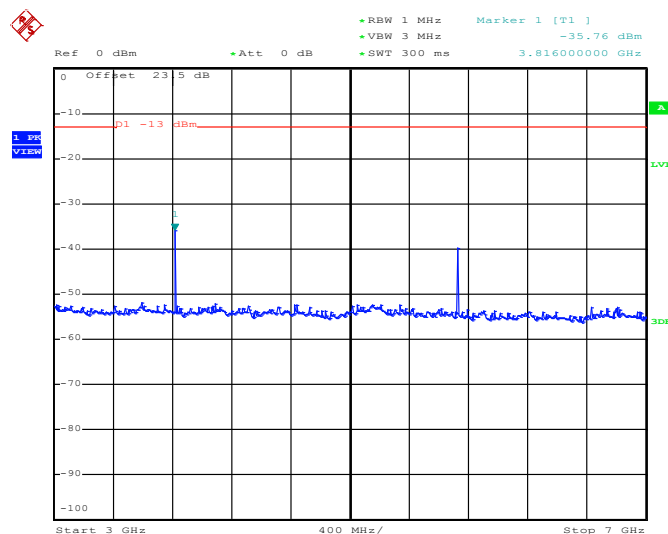
Date: 24.MAY.2014 14:56:40

Conducted Spurious Emission Plot between 1GHz ~ 3GHz



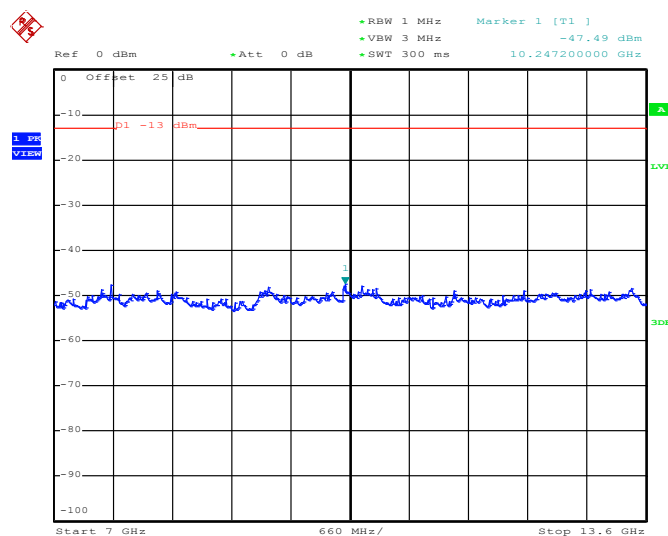
Date: 24.MAY.2014 14:56:11

Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 24.MAY.2014 14:57:00

Conducted Spurious Emission Plot between 7GHz ~ 13.6GHz



Date: 24.MAY.2014 14:57:09



3.7 Field Strength of Spurious Radiation Measurement

3.7.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.7.2 Measuring Instruments

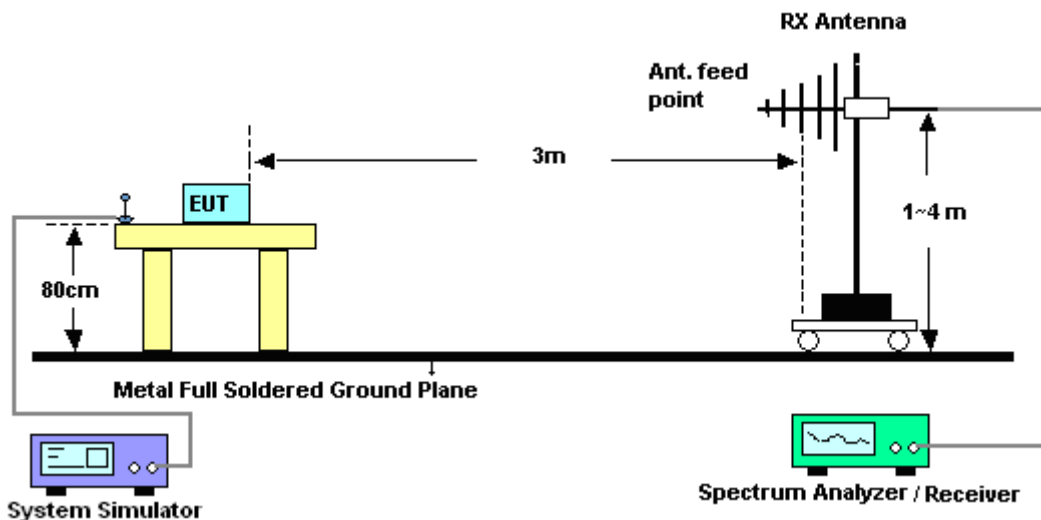
The measuring equipment is listed in the section 4 of this test report.

3.7.3 Test Procedures

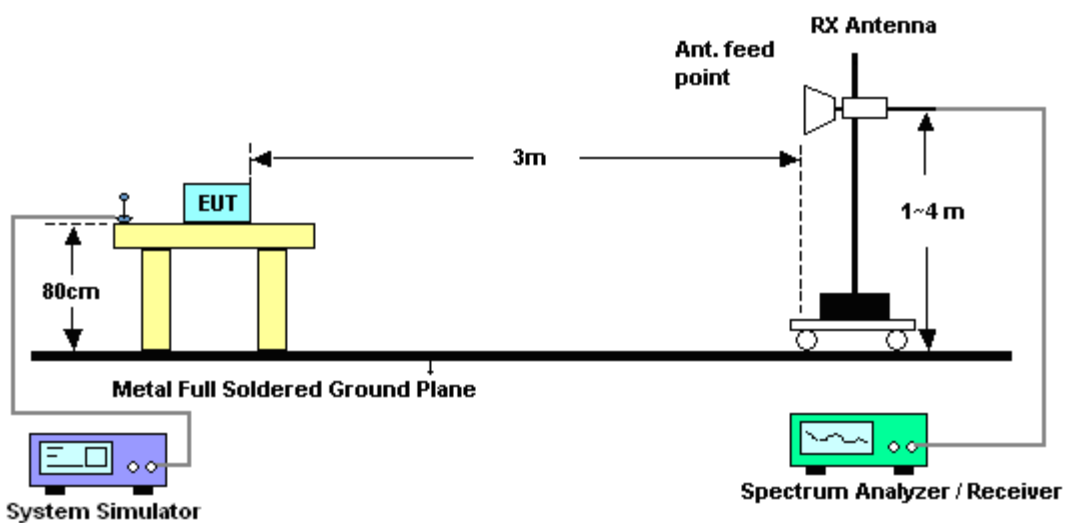
1. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving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

3.7.4 Test Setup

For radiated emissions from 30MHz to 1GHz



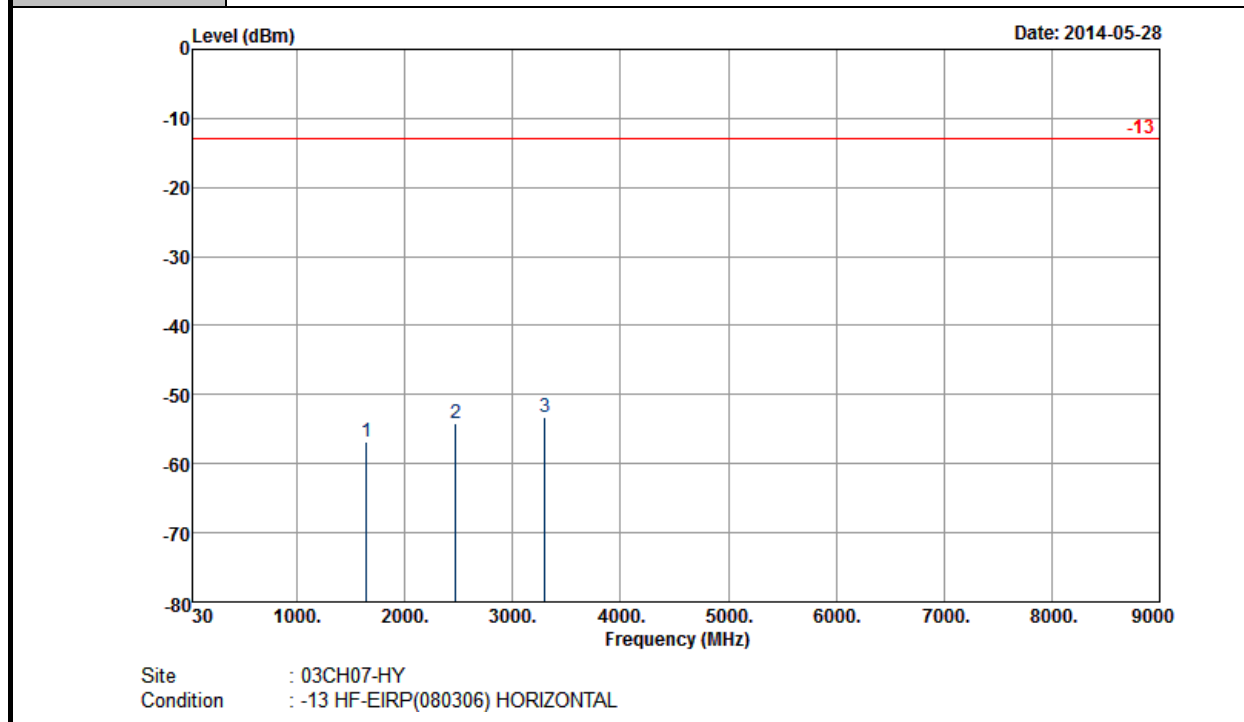
For radiated emissions above 1GHz



3.7.5 Test Result of Field Strength of Spurious Radiated

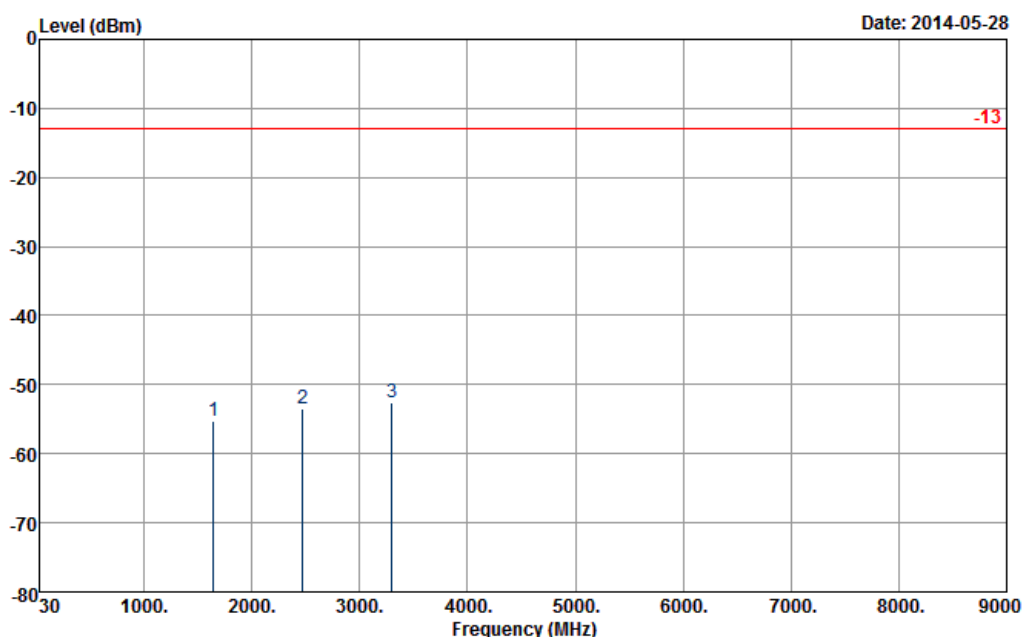
<Low Channel>

Band :	CDMA2000 BC0	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1648	-56.92	-13	-43.92	-65.73	-58.77	1.53	5.53	H	Pass
2472	-54.06	-13	-41.06	-67.21	-56	2.06	6.15	H	Pass
3296	-53.25	-13	-40.25	-67.5	-56.55	2.48	7.93	H	Pass

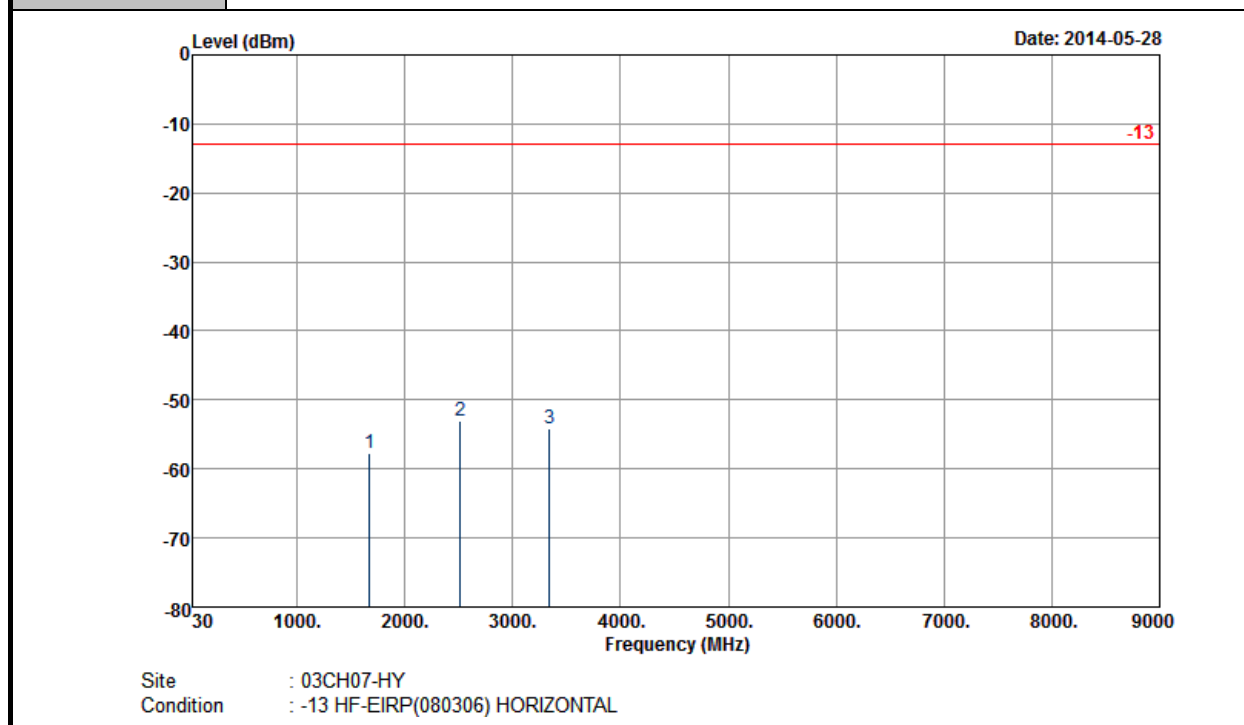
Band :	CDMA2000 BC0	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1648	-55.30	-13	-42.30	-66.32	-57.15	1.53	5.53	V	Pass
2472	-53.43	-13	-40.43	-67.01	-55.37	2.06	6.15	V	Pass
3296	-52.64	-13	-39.64	-68.23	-55.94	2.48	7.93	V	Pass

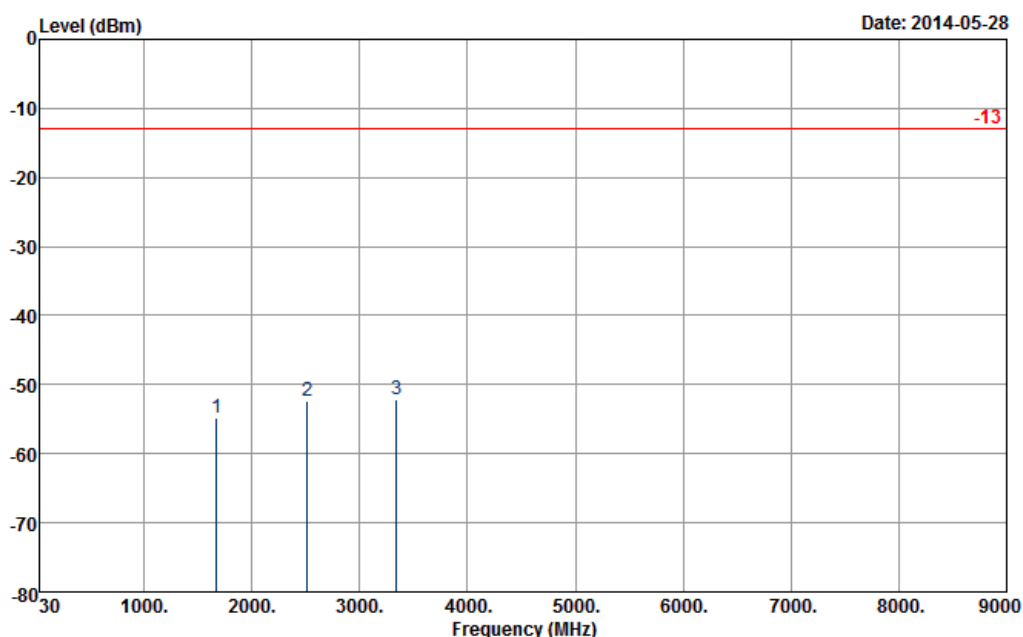
<Middle Channel>

Band :	CDMA2000 BC0	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1672	-57.79	-13	-44.79	-66.66	-61.66	1.62	5.49	H	Pass
2512	-53.06	-13	-40.06	-66.32	-57.18	2.1	6.22	H	Pass
3344	-54.14	-13	-41.14	-68.28	-59.18	3.03	8.07	H	Pass

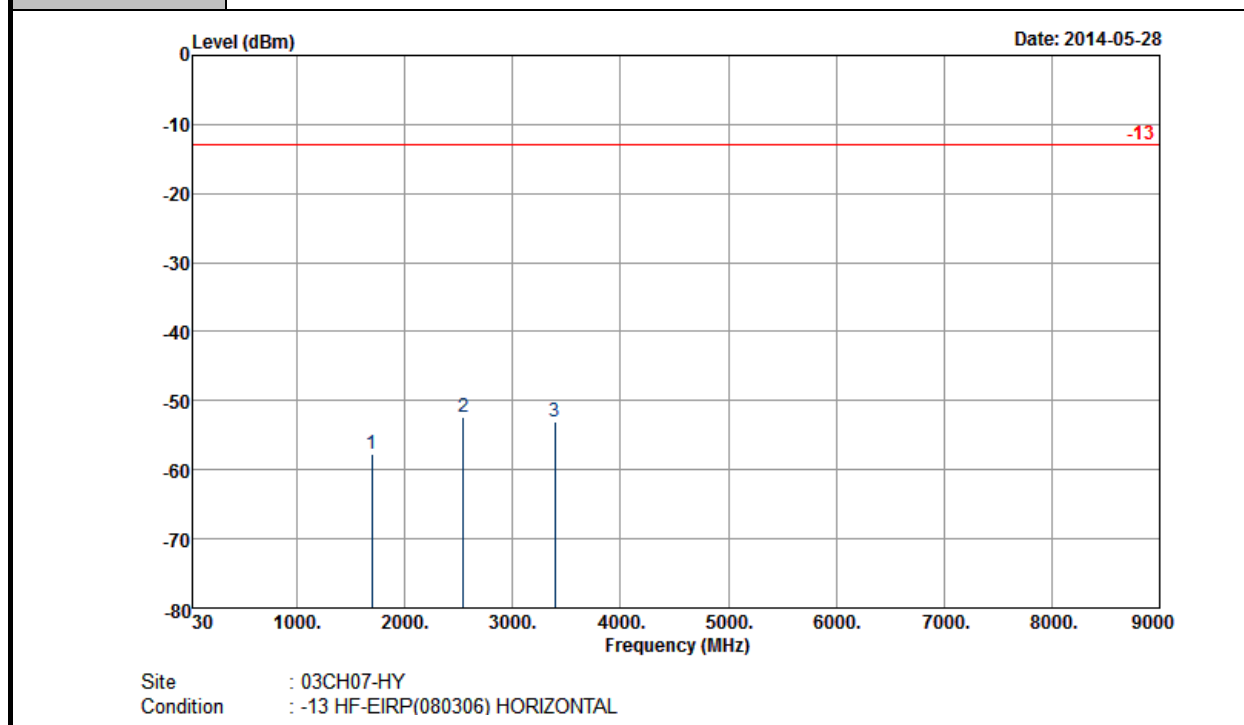
Band :	CDMA2000 BC0	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1672	-54.72	-13	-41.72	-65.86	-58.59	1.62	5.49	V	Pass
2512	-52.34	-13	-39.34	-66.14	-56.46	2.1	6.22	V	Pass
3344	-52.18	-13	-39.18	-67.81	-57.22	3.03	8.07	V	Pass

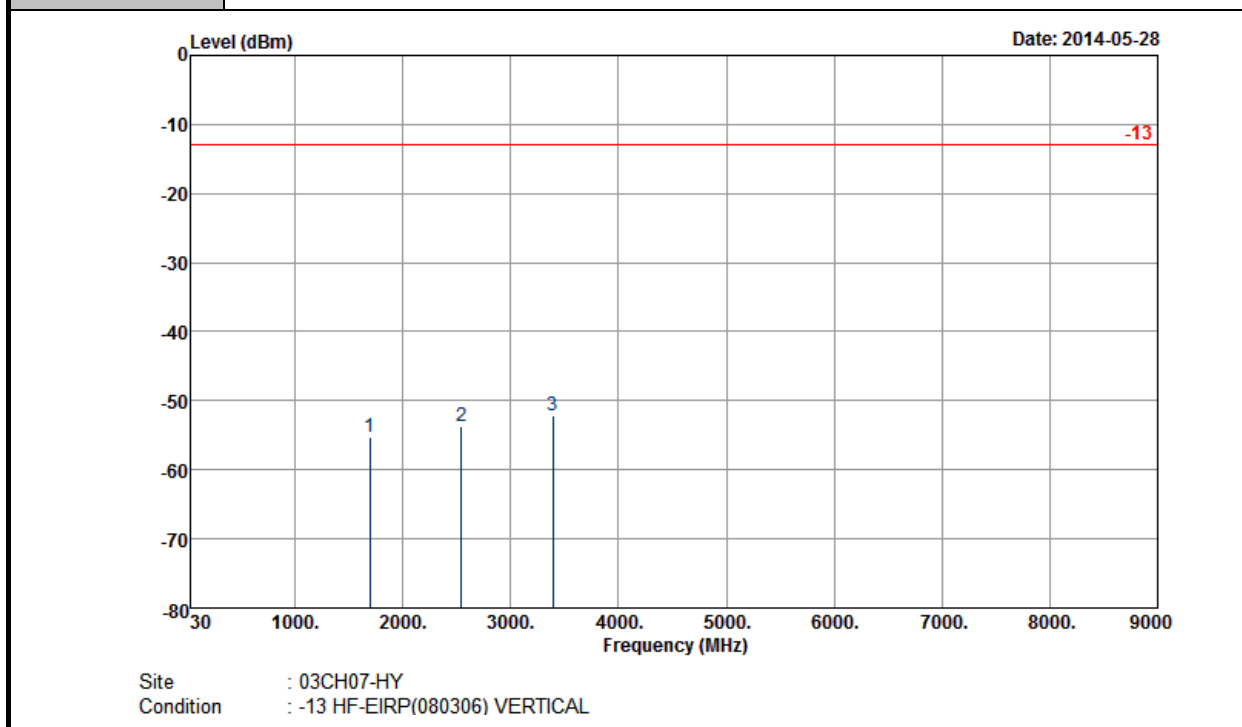
<High Channel>

Band :	CDMA2000 BC0	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1696	-57.73	-13	-44.73	-66.74	-61.61	1.57	5.45	H	Pass
2544	-52.37	-13	-39.37	-65.49	-56.63	2.02	6.28	H	Pass
3392	-53.10	-13	-40.10	-67.23	-59	2.3	8.20	H	Pass

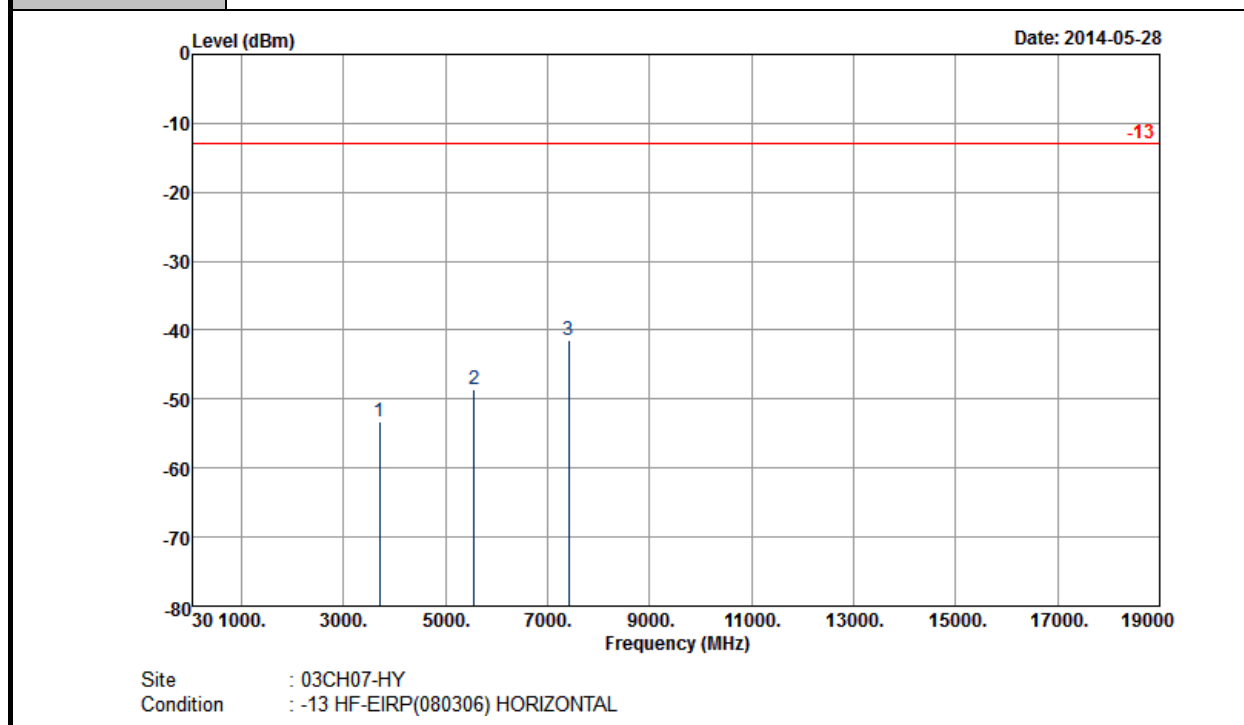
Band :	CDMA2000 BC0	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1696	-55.36	-13	-42.36	-66.66	-59.24	1.57	5.45	V	Pass
2544	-53.78	-13	-40.78	-67.67	-58.04	2.02	6.28	V	Pass
3392	-52.20	-13	-39.20	-67.7	-58.1	2.3	8.20	V	Pass

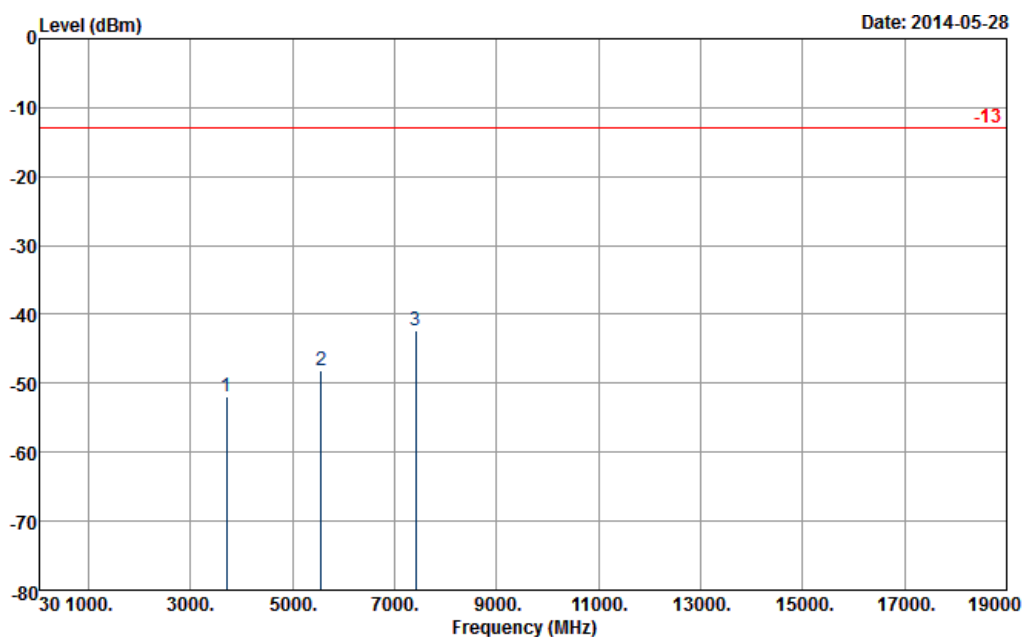
<Low Channel>

Band :	CDMA2000 BC1	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3702	-53.35	-13	-40.35	-68.58	-59.5	2.59	8.74	H	Pass
5553	-48.54	-13	-35.54	-69.25	-56.2	3.04	10.70	H	Pass
7405	-41.36	-13	-28.36	-68.77	-50.1	3.28	12.02	H	Pass

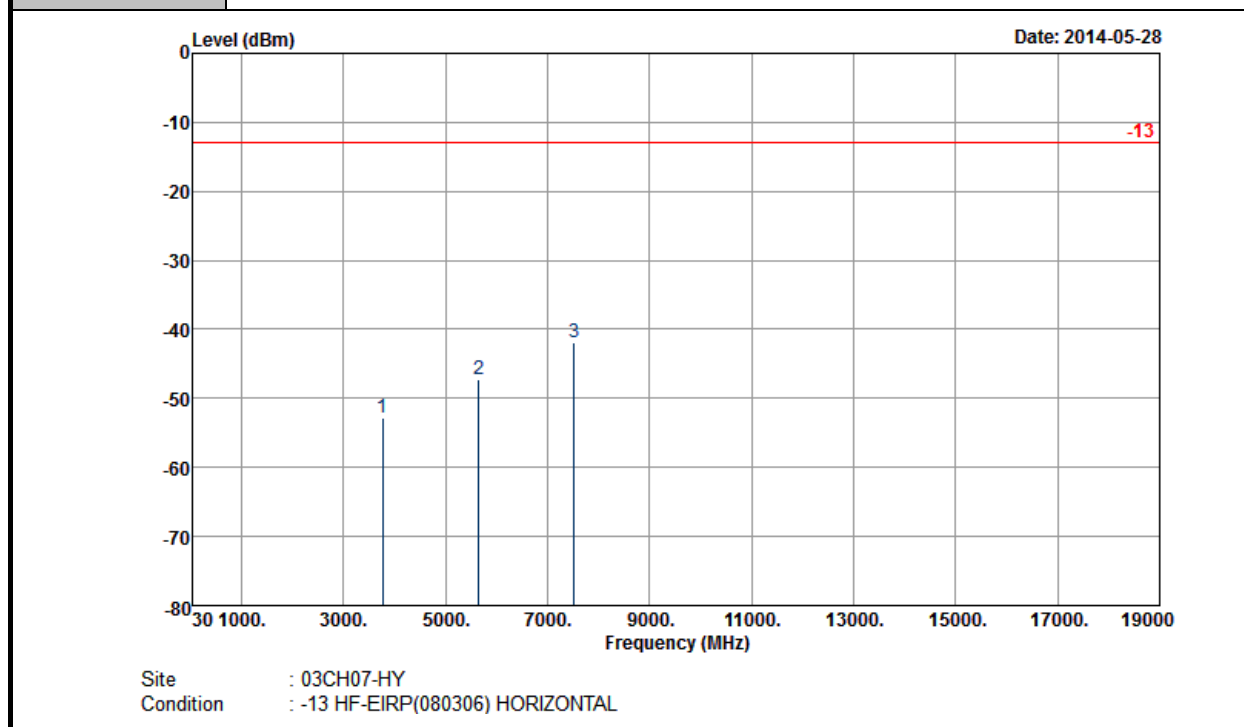
Band :	CDMA2000 BC1	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3702	-51.95	-13	-38.95	-68.35	-58.1	2.59	8.74	V	Pass
5553	-48.14	-13	-35.14	-68.75	-55.8	3.04	10.70	V	Pass
7405	-42.26	-13	-29.26	-69.6	-51	3.28	12.02	V	Pass

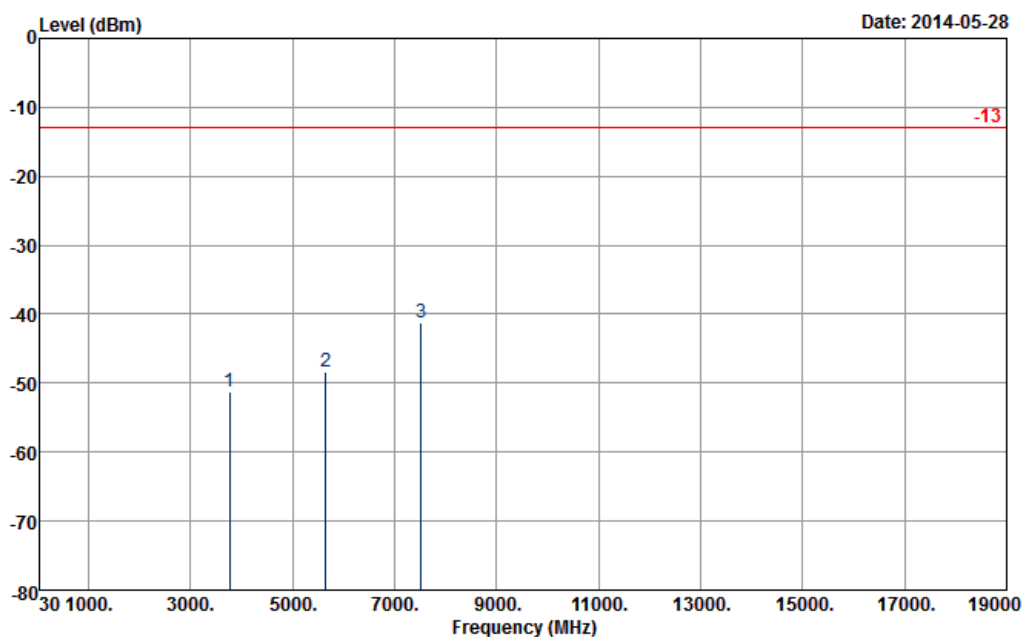
<Middle Channel>

Band :	CDMA2000 BC1	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3760	-52.80	-13	-39.80	-68.22	-59.1	2.51	8.81	H	Pass
5640	-47.29	-13	-34.29	-68.13	-55	2.99	10.70	H	Pass
7520	-41.87	-13	-28.87	-69.36	-50.4	3.59	12.12	H	Pass

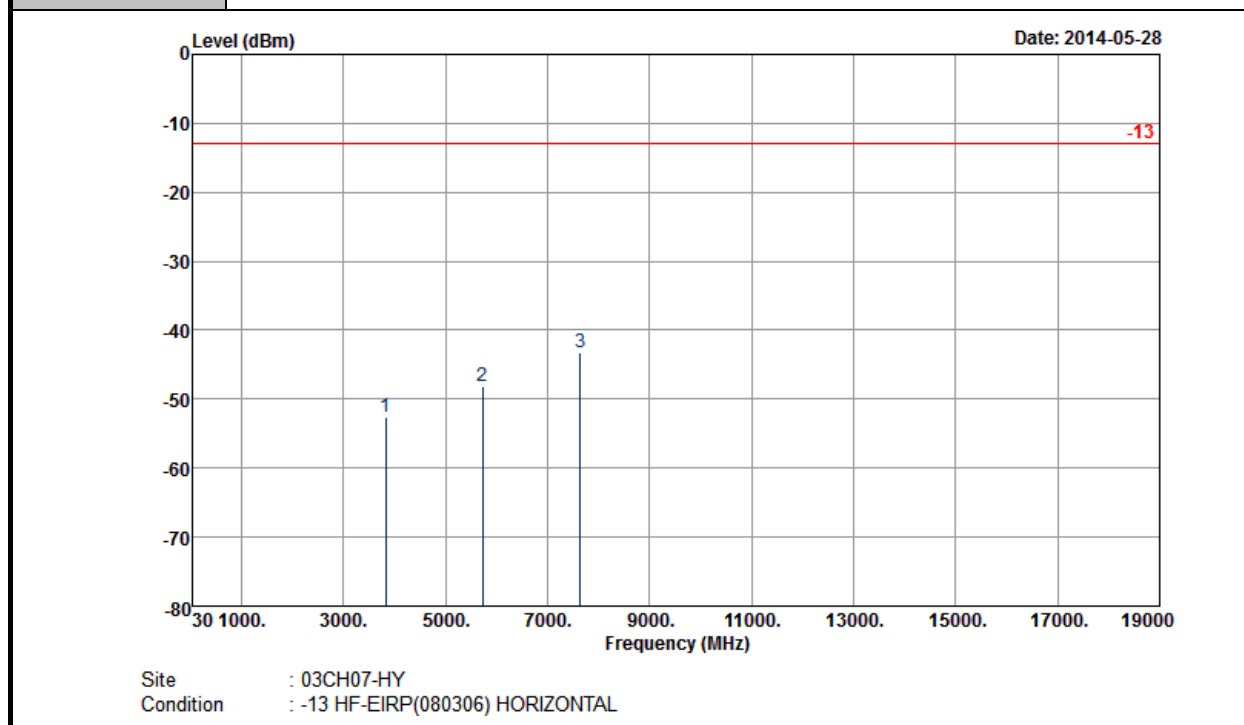
Band :	CDMA2000 BC1	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3760	-51.20	-13	-38.20	-67.89	-57.5	2.51	8.81	V	Pass
5640	-48.39	-13	-35.39	-69.15	-56.1	2.99	10.70	V	Pass
7520	-41.17	-13	-28.17	-68.52	-49.7	3.59	12.12	V	Pass

<High Channel>

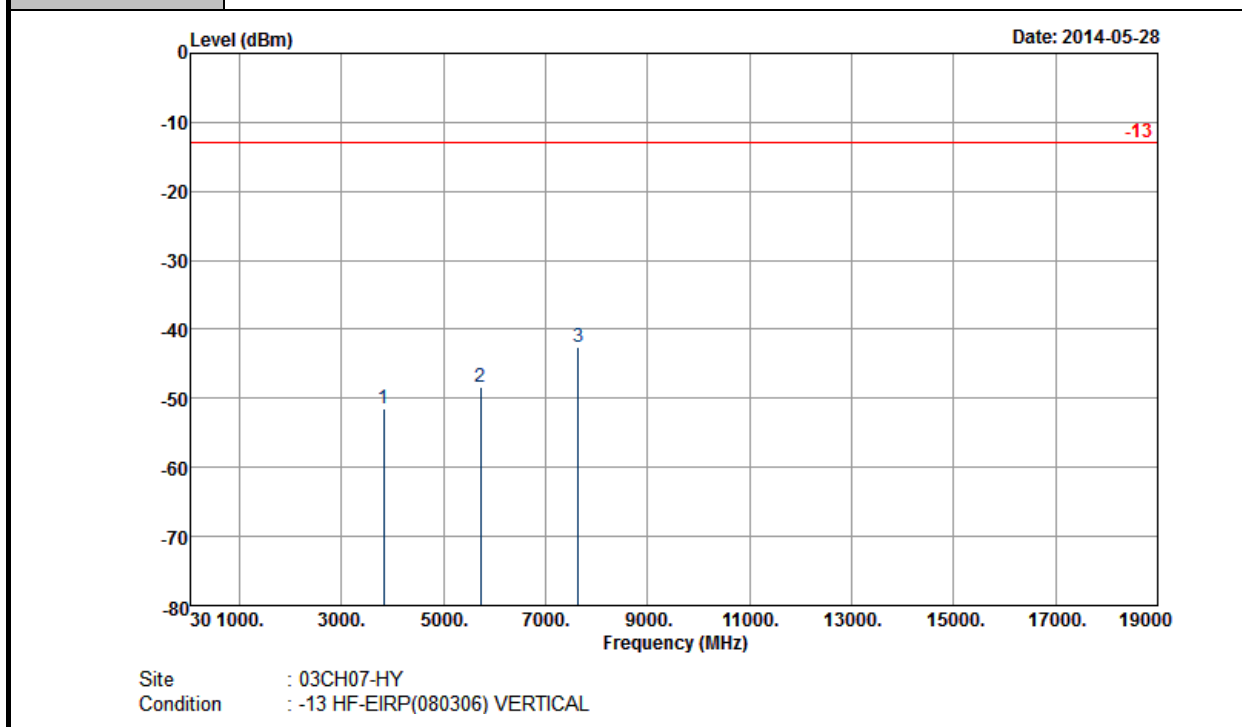
Band :	CDMA2000 BC1	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3817	-52.49	-13	-39.49	-68.26	-58.9	2.47	8.88	H	Pass
5726	-48.10	-13	-35.10	-69.32	-55.8	3	10.70	H	Pass
7635	-43.32	-13	-30.32	-69.81	-52.1	3.43	12.21	H	Pass



Band :	CDMA2000 BC1	Temperature :	21~24°C
Test Mode :	1xEV-DO Rev. 0_RTAP 153.6K (QPSK)	Relative Humidity :	44~48%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3817	-51.39	-13	-38.39	-68.06	-57.8	2.47	8.88	V	Pass
5726	-48.40	-13	-35.40	-69.21	-56.1	3	10.70	V	Pass
7635	-42.62	-13	-29.62	-68.79	-51.4	3.43	12.21	V	Pass

3.8 Frequency Stability Measurement

3.8.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

3.8.2 Measuring Instruments

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

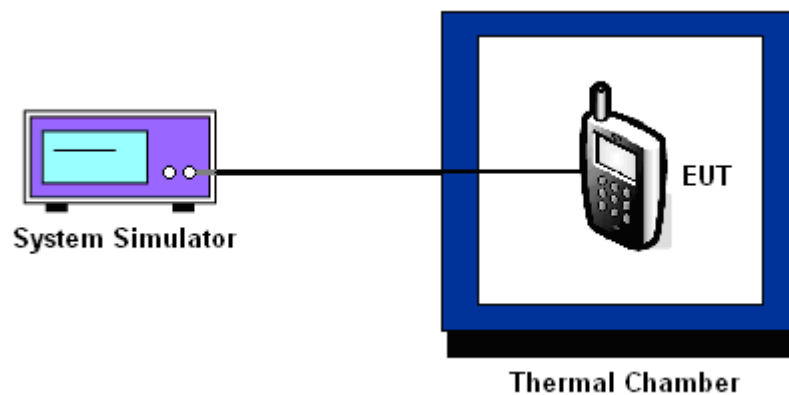
3.8.3 Test Procedures for Temperature Variation

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

3.8.4 Test Procedures for Voltage Variation

1. The EUT was placed in a temperature chamber at $25\pm 5^{\circ}\text{C}$ and connected with the system simulator.
2. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

3.8.5 Test Setup



3.8.6 Test Result of Temperature Variation

Band :	CDMA2000 BC0 1xEV-DO Rev. 0_RTAP 153.6K	Channel :	384
Limit (ppm) :	2.5	Frequency :	836.52 MHz

Temperature (°C)	Deviation (ppm)	Result
50	0.0442	PASS
40	0.0335	
30	0.0227	
20	0.0131	
10	0.0108	
0	0.0143	
-10	0.0120	
-20	0.0275	
-30	0.0430	

Band :	CDMA2000 BC1 1xEV-DO Rev. 0_RTAP 153.6K	Channel :	600
Limit (ppm) :	2.5	Frequency :	1880.0 MHz

Temperature (°C)	Deviation (ppm)	Result
50	0.0138	PASS
40	0.0112	
30	0.0101	
20	0.0080	
10	0.0064	
0	0.0085	
-10	0.0101	
-20	0.0122	
-30	0.0106	

3.8.7 Test Result of Voltage Variation

Band & Channel	Mode	Voltage (Volt)	Deviation (ppm)	Limit (ppm)	Result
CDMA2000 BC0 CH384	1xEV-DO Rev. 0 RTAP 153.6K	4.35	0.0084	2.5	Pass
		3.80	0.0096		
		BEP	0.0155		
CDMA2000 BC1 CH600	1xEV-DO Rev. 0 RTAP 153.6K	4.35	0.0085		
		3.80	0.0101		
		BEP	0.0090		

Note:

1. Normal Voltage = 3.80V.
2. Battery End Point (BEP) = 3.42 V.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
System Simulator	Rohde & Schwarz	CMU200	117995	N/A	Aug. 01, 2013	May 24, 2014	Jul. 31, 2014	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 07, 2013	May 24, 2014	Jun. 06, 2014	Conducted (TH02-HY)
Thermal Chamber	Ten Billion	TTH-D3SP	TBN-930701	N/A	Jul. 19, 2013	May 24, 2014	Jul. 18, 2014	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	101749	10Hz ~ 30GHz	Feb. 10, 2014	May 28, 2014~ Jun. 06, 2014	Feb. 09, 2015	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz ~ 1GHz	Oct. 10, 2013	May 28, 2014~ Jun. 06, 2014	Oct. 09, 2014	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1GHz~18GHz	Aug. 22, 2013	May 28, 2014~ Jun. 06, 2014	Aug. 21, 2014	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10 MHz ~ 1GHz	Mar. 17, 2014	May 28, 2014~ Jun. 06, 2014	Mar. 16, 2015	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1 GHz~26.5 GHz	Nov. 29, 2013	May 28, 2014~ Jun. 06, 2014	Nov. 28, 2014	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	May 28, 2014~ Jun. 06, 2014	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	M-400-0	114/8000604/L	N/A	N/A	May 28, 2014~ Jun. 06, 2014	N/A	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 03, 2013	May 28, 2014~ Jun. 06, 2014	Oct. 02, 2014	Radiation (03CH07-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.50
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