



# FCC RF Test Report

APPLICANT : Novatel Wireless  
EQUIPMENT : Fixed Wireless Gateway  
BRAND NAME : Novatel Wireless Inc.  
MODEL NAME : SA 2100-V  
FCC ID : PKRNVWSA2100V  
STANDARD : FCC 47 CFR Part 2, 22(H), 24(E)  
CLASSIFICATION : PCS Licensed Transmitter (PCB)

The product was received on Nov. 13, 2013 and testing was completed on Nov. 24, 2013. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI / TIA / EIA-603-C-2004 and shown to be compliant with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



Testing Laboratory  
2353

## **SPORTON INTERNATIONAL (SHENZHEN) INC.**

**No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C.**



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### REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG3N1313A	Rev. 01	Initial issue of report	Dec. 13, 2013

**SUMMARY OF TEST RESULT**

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	N/A	PASS	-
3.1	§22.913(a)(2)	Effective Radiated Power	< 7 Watts	PASS	-
3.1	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.2	§24.232(d)	Peak-to-Average Ratio	< 13 dB	PASS	-
3.3	§2.1049 §22.917(a) §24.238(b)	Occupied Bandwidth	N/A	PASS	-
3.4	§2.1051 §22.917(a) §24.238(a)	Band Edge Measurement	< $43+10\log_{10}(P[\text{Watts}])$	PASS	-
3.5	§2.1051 §22.917(a) §24.238(a)	Conducted Spurious Emission	< $43+10\log_{10}(P[\text{Watts}])$	PASS	-
3.6	§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	< $43+10\log_{10}(P[\text{Watts}])$	PASS	Under limit 18.30 dB at 3760.000 MHz
3.7	§2.1055 §22.355 §24.235	Frequency Stability for Temperature & Voltage	< 2.5 ppm	PASS	-



# 1 General Description

## 1.1 Applicant

Novatel Wireless

9645 Scranton Road, Suite #205, San Diego, California USA 92121

## 1.2 Manufacturer

Novatel Wireless

9645 Scranton Road, Suite #205, San Diego, California USA 92121

## 1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Fixed Wireless Gateway
Brand Name	Novatel Wireless Inc.
Model Name	SA 2100-V
FCC ID	PKRNVWSA2100V
EUT supports Radios application	CDMA/EV-DO/LTE/WLAN 2.4GHz 802.11bgn HT20
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.

## 1.4 Product Specification of Equipment Under Test

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 : 23.69 dBm CDMA2000 BC1 : 24.03 dBm
Antenna Type	PIFA Antenna
Antenna Gain	CDMA2000 BC0 : -0.51 dBi CDMA2000 BC1 : 2.38 dBi
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 1xRTT	QPSK	0.13	0.008 ppm	1M27F9W
Part 24	CDMA2000 BC1 1xRTT	QPSK	0.44	0.004 ppm	1M28F9W

### 1.7 Testing Site

<b>Test Site</b>	SPORTON INTERNATIONAL (SHENZHEN) INC.		
<b>Test Site Location</b>	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755-3320-2398		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC Registration No.</b>
	TH01-SZ	03CH01-SZ	831040

### 1.8 Applied Standards

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

- FCC 47 CFR Part 2, 22(H), 24(E)
- FCC KDB 412172 D01 Determining ERP and ERIP v01

**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

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

Frequency range investigated for radiated emission is as follows:

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

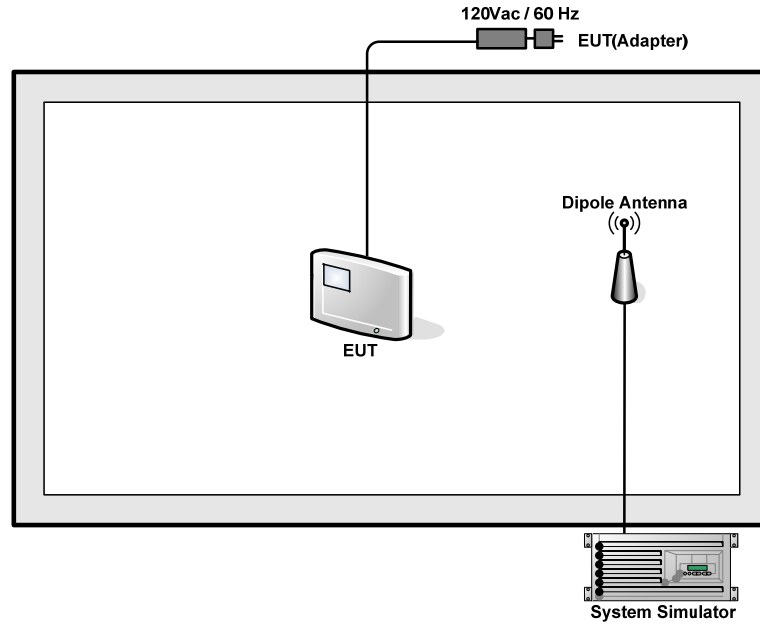
Test Modes		
Band	Radiated TCs	Conducted TCs
CDMA2000 BC0	■ 1xRTT Link Mode	■ 1xRTT Link Mode
CDMA2000 BC1	■ 1xRTT Link Mode	■ 1xRTT Link Mode

**Note:** The maximum RF output power levels are 1xRTT RC3 SO55 mode for CDMA2000 BC0 on QPSK Link and 1xRTT RC3 SO32(+SCH) mode for CDMA2000 BC1 on QPSK Link; only these modes were used for all tests.

The conducted power table is as follows:

Band	Conducted Power (*Unit: dBm)					
	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	23.59	23.44	23.34	23.94	23.78	23.88
1xRTT RC3+SO55	23.69	23.45	23.35	24.02	23.80	23.92
1xRTT RC3+SO32(+ F-SCH)	23.63	23.48	23.47	24.00	23.84	23.94
1xRTT RC3 SO32(+SCH)	23.68	23.49	23.40	24.03	23.80	23.89
1xEV-DO RTAP 153.6Kbps	23.53	23.41	23.35	23.91	23.72	23.82
1xEV-DO RETAP 4096Bits	23.50	23.43	23.38	23.88	23.76	23.82

## 2.2 Connection Diagram of Test System



## 2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Agilent	E5515C	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	TOPWORD	3303DR	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 EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

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

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 7.5 dB and 10dB attenuator.

Example :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 7.5 + 10 = 17.5 \text{ (dB)} \end{aligned}$$

### 3 Test Result

#### 3.1 Conducted Output Power and ERP/EIRP Measurement

##### 3.1.1 Description of the Conducted Output Power and ERP/EIRP Measurement

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

The ERP of mobile transmitters must not exceed 7 Watts for Band 850.

The EIRP of mobile transmitters must not exceed 2 Watts for Band 1900.

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$ ,  $ERP = EIRP - 2.15$ , where

$P_T$  = transmitter output power in dBm

$G_T$  = gain of the transmitting antenna in dBi

$L_C$  = signal attenuation in the connecting cable between the transmitter and antenna in dB

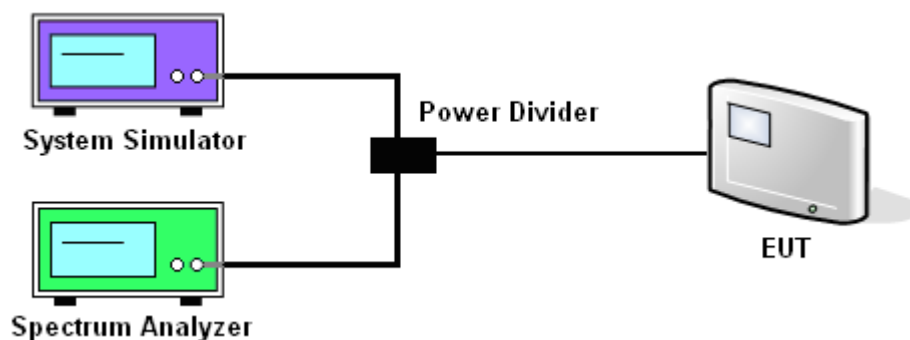
##### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.3 Test Procedures

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

##### 3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power and ERP/EIRP

Cellular Band ( $G_T - L_C = -0.51\text{dB}$ )			
Modes	CDMA 2000 1xRTT		
Test Status	RC3+SO55		
Channel	1013 (Low)	384 (Mid)	777 (High)
Frequency (MHz)	824.70	836.52	848.31
Conducted Power $P_T$ (dBm)	23.69	23.45	23.35
Conducted Power $P_T$ (Watts)	0.23	0.22	0.22
ERP(dBm)	21.03	20.79	20.69
ERP(Watts)	0.13	0.12	0.12

PCS Band ( $G_T - L_C = 2.38\text{dB}$ )			
Modes	CDMA 2000 1xRTT		
Test Status	RC3+SO32		
Channel	25 (Low)	600 (Mid)	1175 (High)
Frequency (MHz)	1851.25	1880.00	1908.75
Conducted Power $P_T$ (dBm)	24.03	23.8	23.89
Conducted Power $P_T$ (Watts)	0.25	0.24	0.24
EIRP(dBm)	26.41	26.18	26.27
EIRP(Watts)	0.44	0.41	0.42

**Note:**

$EIRP = P_T + G_T - L_C$ ,  $ERP = EIRP - 2.15$ , where

$P_T$  = transmitter output power in dBm

$G_T$  = gain of the transmitting antenna in dBi

$L_C$  = signal attenuation in the connecting cable between the transmitter and antenna in dB

## 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.

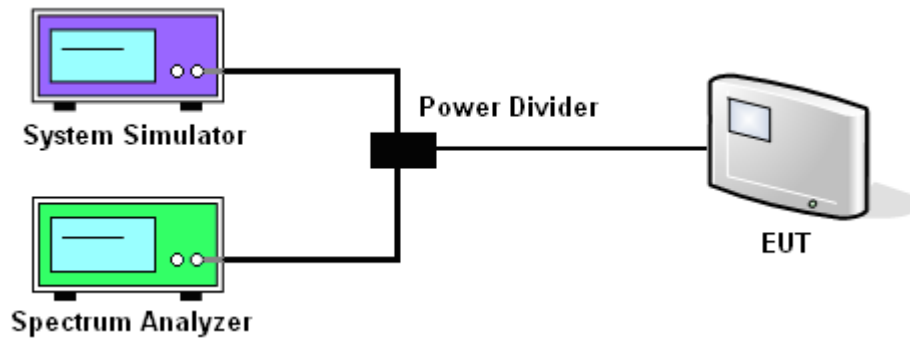
### 3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

### 3.2.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and System Simulator via power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in 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

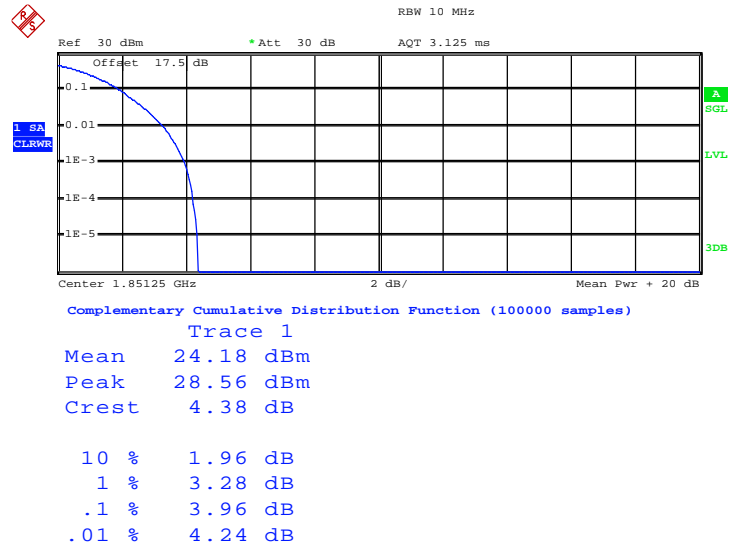
CDMA2000 BC1			
Modes	CDMA 2000 1xRTT		
Test Status	RC3+S032		
Channel	25 (Low)	600 (Mid)	1175 (High)
Frequency (MHz)	1851.25	1880.00	1908.75
Peak-to-Average Ratio (dB)	3.96	3.92	3.84



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

Band :	CDMA2000 BC1	Test Mode :	1xRTT_RC3+SO32 Link (QPSK)
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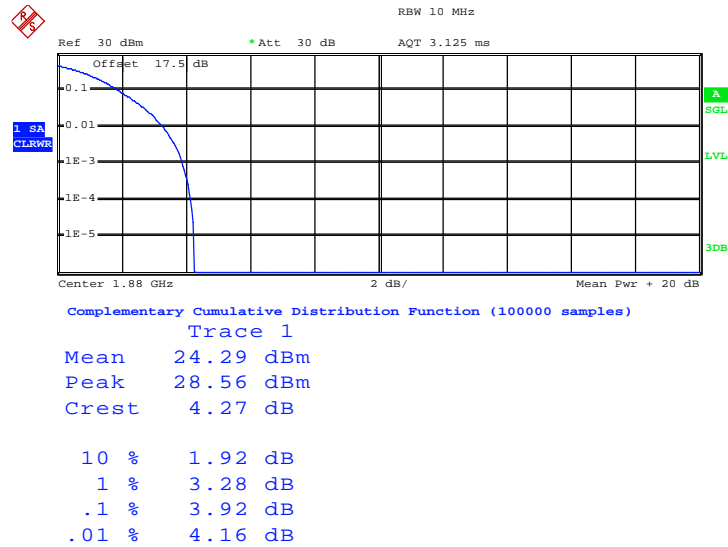
Peak-to-Average Ratio on Channel 25 (1851.25 MHz)



Date: 24.NOV.2013 05:51:41

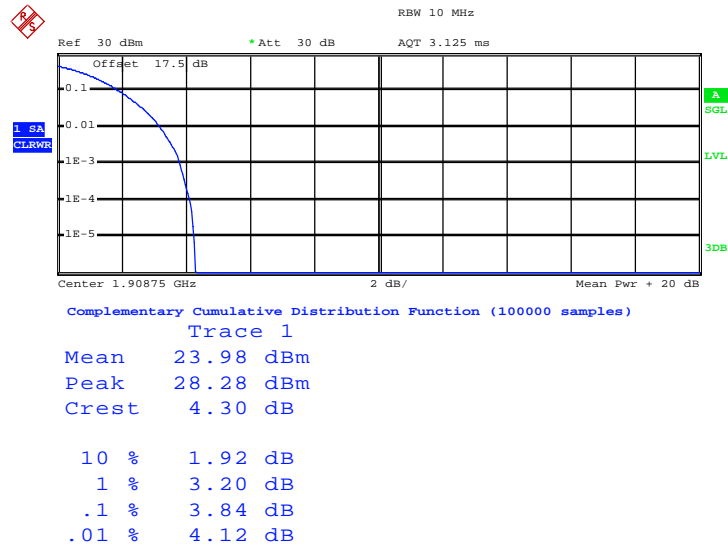


Peak-to-Average Ratio on Channel 600 (1880 MHz)



Date: 24.NOV.2013 05:50:48

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



Date: 24.NOV.2013 05:49:44

### 3.3 99% Occupied Bandwidth and 26dB Bandwidth Measurement

#### 3.3.1 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.

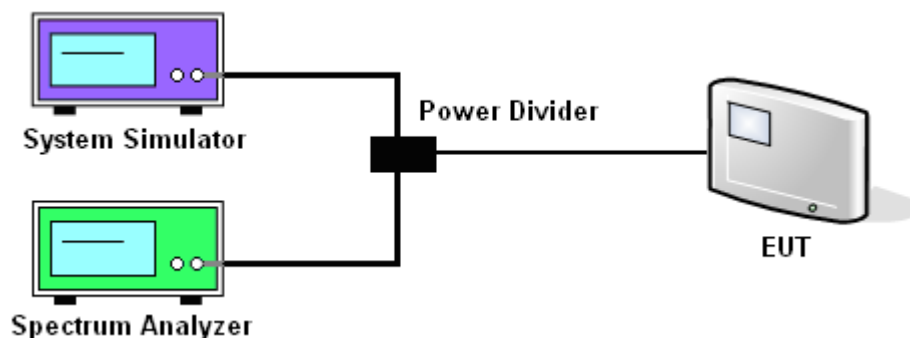
#### 3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

#### 3.3.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 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.

#### 3.3.4 Test Setup







3.3.5 Test Result of Occupied Bandwidth and 26dB Bandwidth

CDMA2000 BC0			
Test Mode	CDMA 2000 1xRTT		
Test Status	RC3+SO55		
Channel	1013 (Low)	384 (Mid)	777 (High)
Frequency (MHz)	824.70	836.52	848.31
99% OBW (MHz)	1.27	1.27	1.27
26dB BW (MHz)	1.42	1.42	1.42

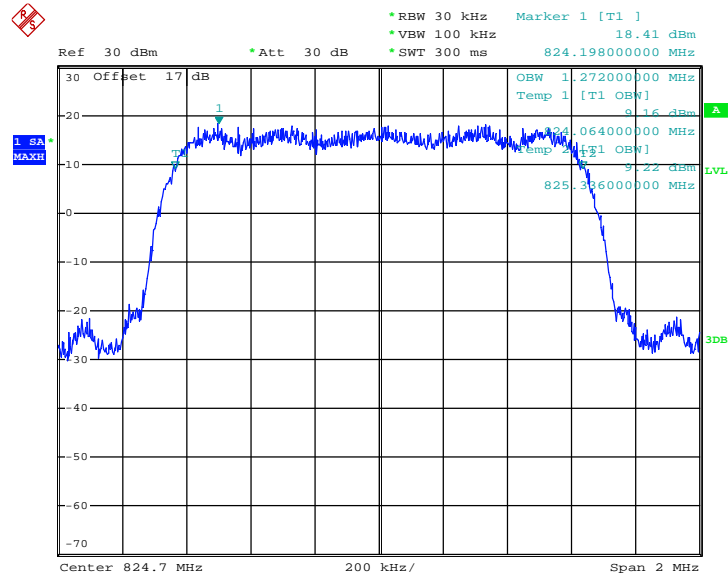
CDMA2000 BC1			
Test Mode	CDMA 2000 1xRTT		
Test Status	RC3+SO32		
Channel	25 (Low)	600 (Mid)	1175 (High)
Frequency (MHz)	1851.25	1880.00	1908.75
99% OBW (MHz)	1.28	1.28	1.28
26dB BW (MHz)	1.42	1.42	1.42



### 3.3.6 Test Result (Plots) of Occupied Bandwidth and 26dB Bandwidth

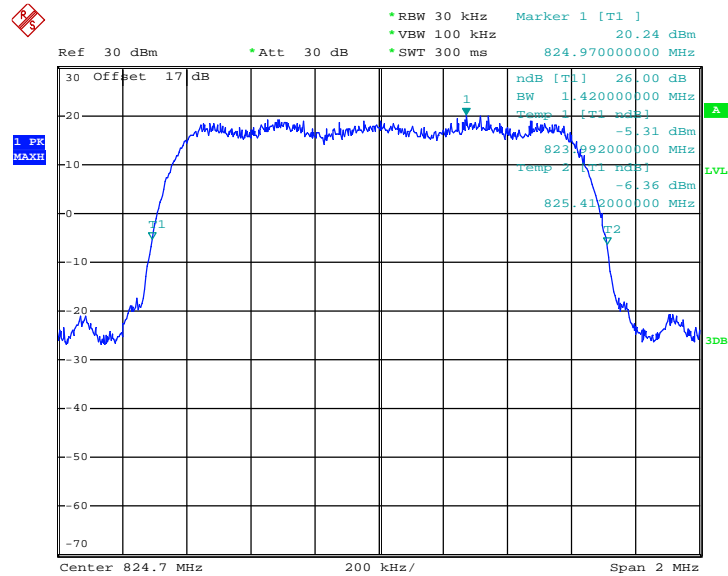
Band :	CDMA2000 BC0	Test Mode :	1xRTT_RC3+SO55 Link (QPSK)
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99% Occupied Bandwidth Plot on Channel 1013 (824.7 MHz)



Date: 24.NOV.2013 03:18:39

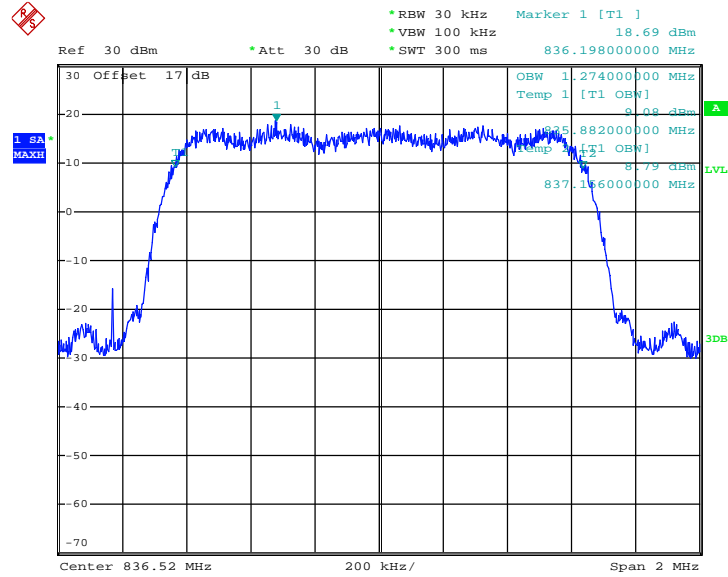
26dB Bandwidth Plot on Channel 1013 (824.7 MHz)



Date: 24.NOV.2013 03:08:57

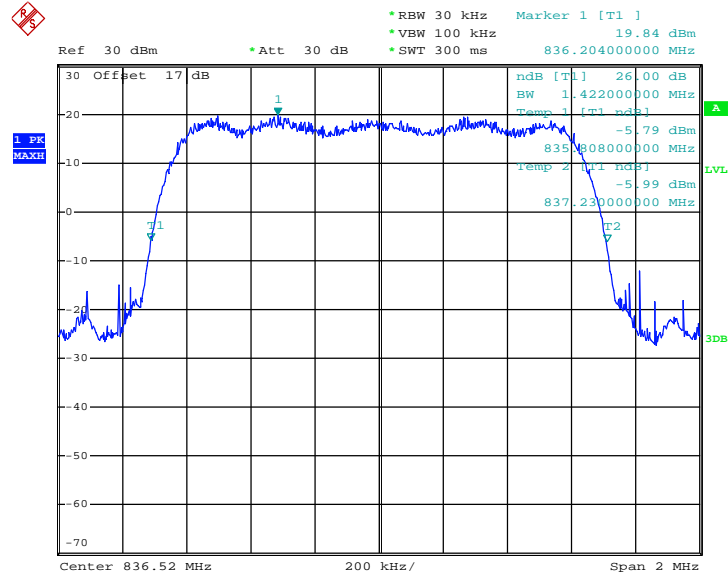


99% Occupied Bandwidth Plot on Channel 384 (836.52 MHz)



Date: 24.NOV.2013 03:17:23

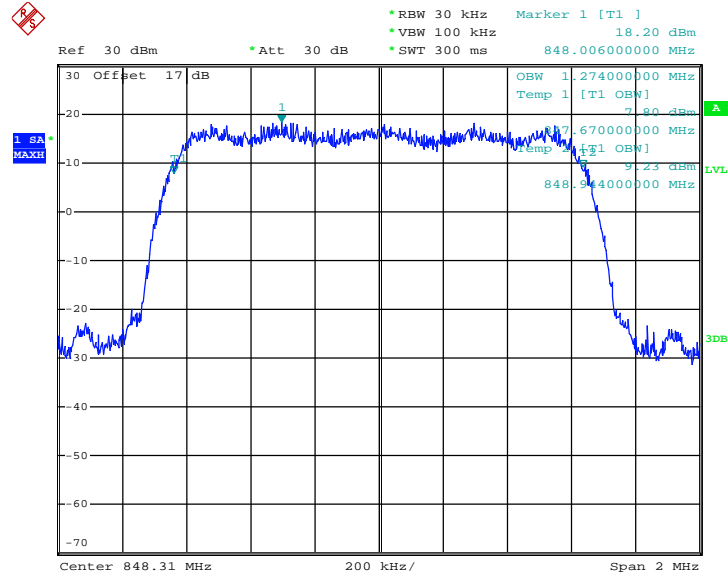
26dB Bandwidth Plot on Channel 384 (836.52 MHz)



Date: 24.NOV.2013 03:11:26

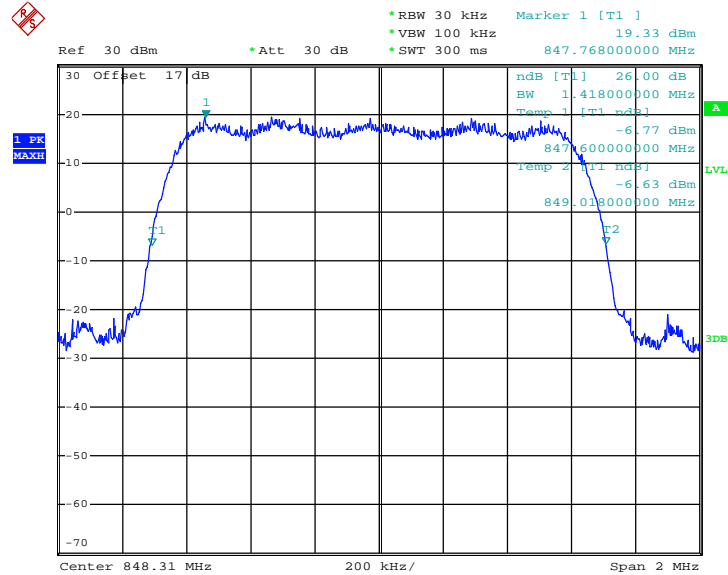


99% Occupied Bandwidth Plot on Channel 777 (848.31 MHz)



Date: 24.NOV.2013 03:16:06

26dB Bandwidth Plot on Channel 777 (848.31 MHz)

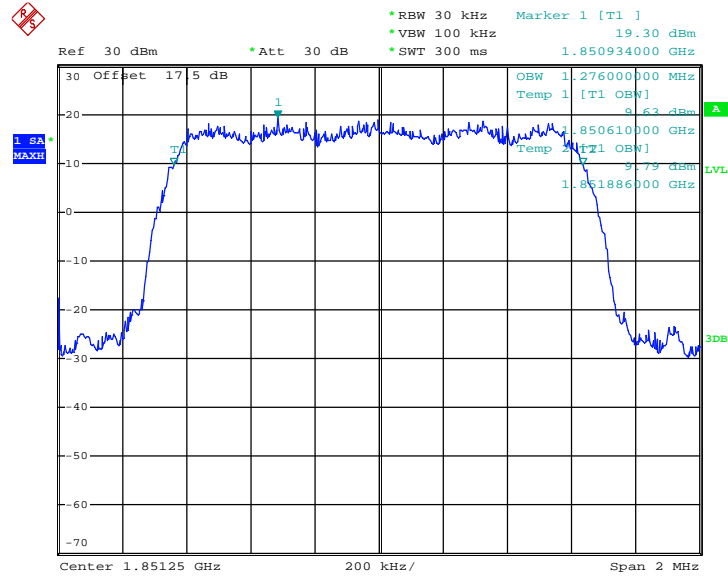


Date: 24.NOV.2013 03:14:09



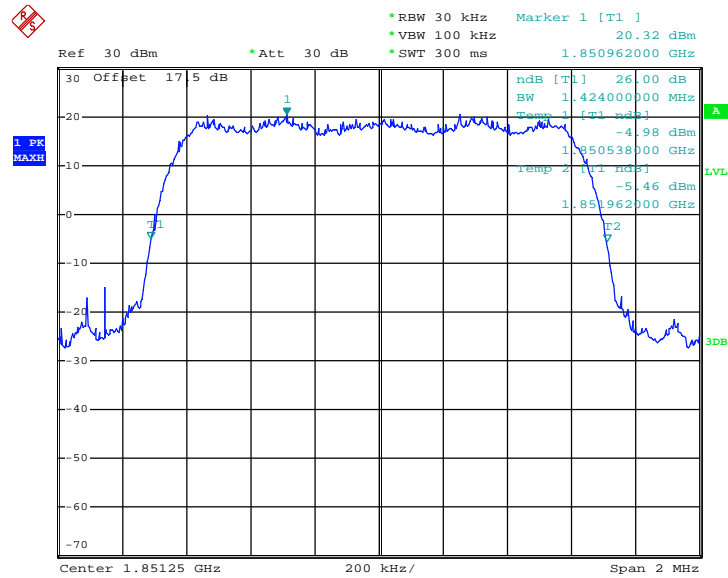
Band :	CDMA2000 BC1	Test Mode :	1xRTT_RC3+SO32 Link (QPSK)
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99% Occupied Bandwidth Plot on Channel 25 (1851.25 MHz)



Date: 24.NOV.2013 05:38:37

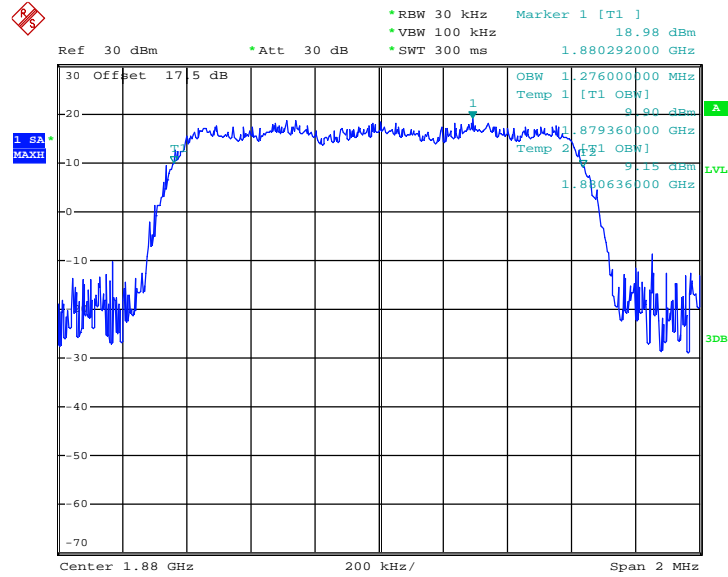
26dB Bandwidth Plot on Channel 25 (1851.25 MHz)



Date: 24.NOV.2013 05:27:16

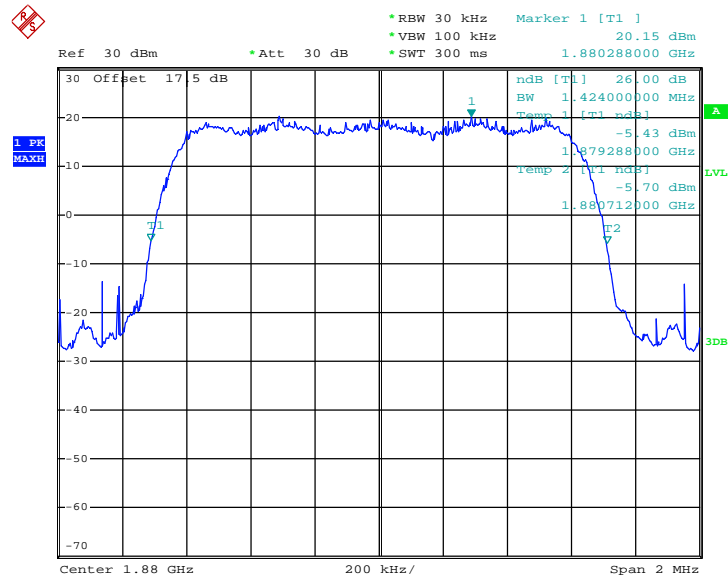


99% Occupied Bandwidth Plot on Channel 600 (1880.0 MHz)



Date : 24.NOV.2013 05:36:49

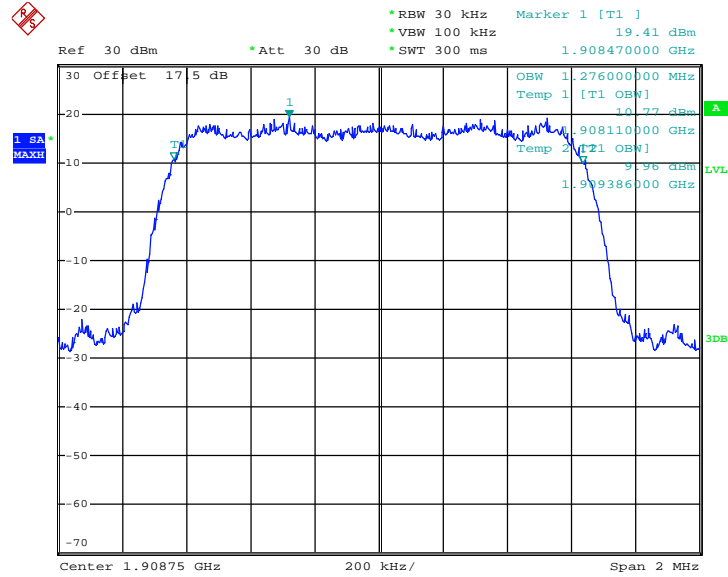
26dB Bandwidth Plot on Channel 600 (1880.0 MHz)



Date : 24.NOV.2013 05:25:17

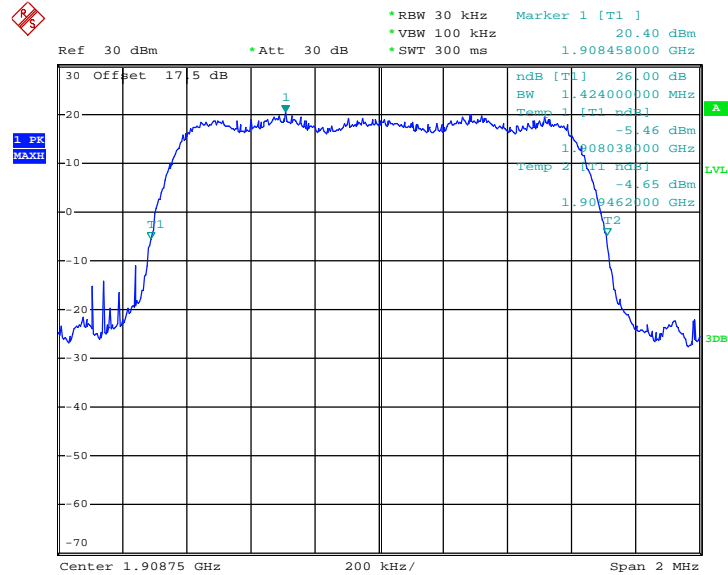


99% Occupied Bandwidth Plot on Channel 1175 (1908.75 MHz)



Date: 24.NOV.2013 05:35:08

26dB Bandwidth Plot on Channel 1175 (1908.75 MHz)



Date: 24.NOV.2013 05:29:14

### 3.4 Band Edge Measurement

#### 3.4.1 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.

#### 3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

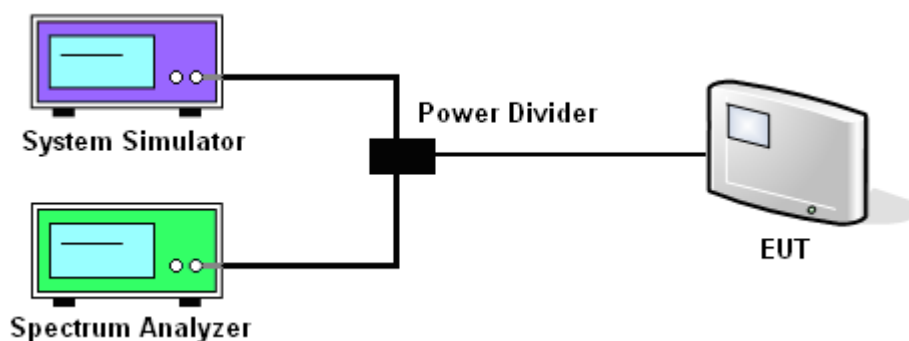
#### 3.4.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The band edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly  $BW/100$ .
4. The RBW was replaced by 10 kHz, slightly smaller than the value in (3), 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)
 
$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

#### 3.4.4 Test Setup

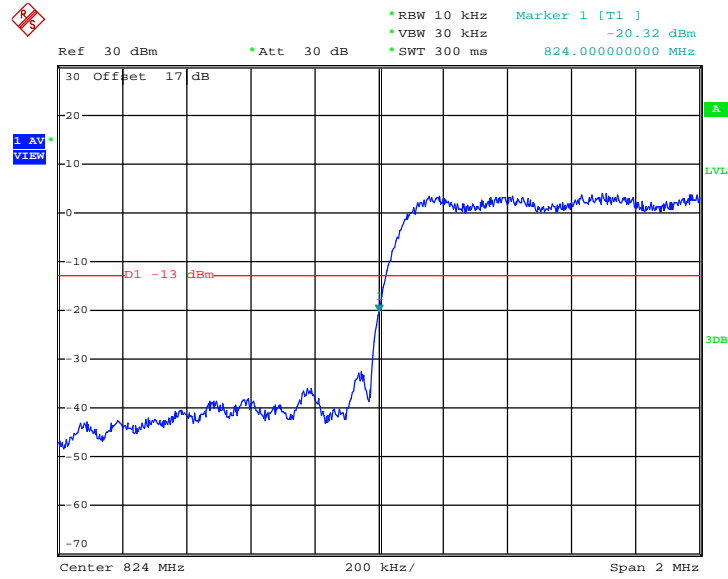




### 3.4.5 Test Result (Plots) of Conducted Band Edge

Band :	CDMA2000 BC0	Test Mode :	1xRTT_RC3+SO55 Link (QPSK)
Correction Factor :	1.53dB	Maximum 26dB Bandwidth :	1.420MHz
Band Edge :	-18.79dBm	Measurement Value :	-20.32dBm

Lower Band Edge Plot on Channel 1013 (824.7 MHz)



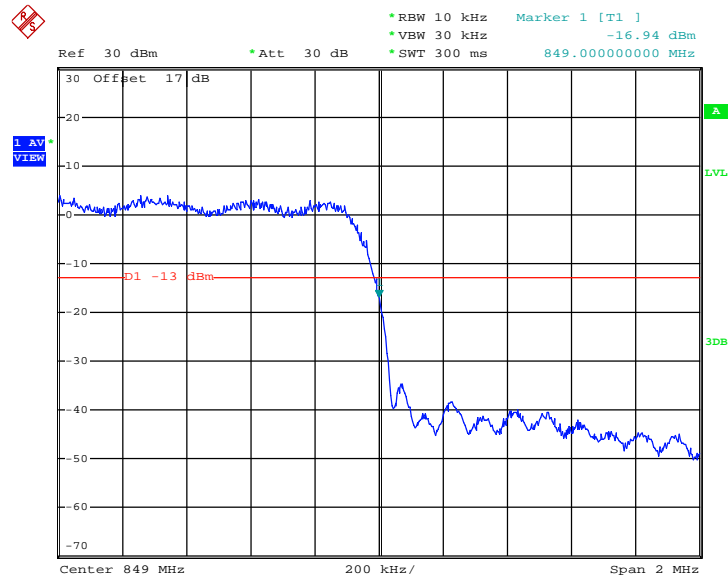
Date: 24.NOV.2013 03:22:16

1. Correction Factor(dB)=  $10\log(1\% \text{ Emission BW/RBW})$
  2. Band Edge= Measurement Value + Correction Factor(dB)
- For example,  $-20.32\text{dBm} + 1.53\text{dB} = -18.79\text{dBm}$



Band :	CDMA2000 BC0	Test Mode :	1xRTT_RC3+SO55 Link (QPSK)
Correction Factor :	1.53dB	Maximum 26dB Bandwidth:	1.420MHz
Band Edge :	-15.41dBm	Measurement Value :	-16.94dBm

Higher Band Edge Plot on Channel 777 (848.31 MHz)



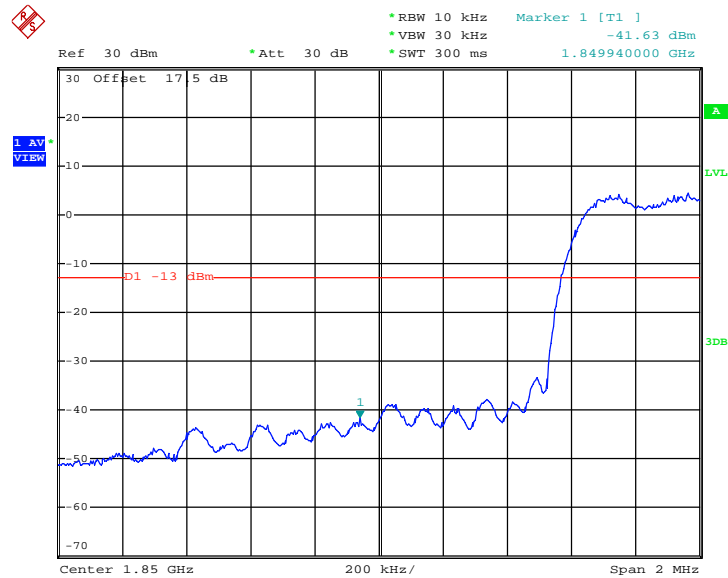
Date: 24.NOV.2013 03:23:42

1. Correction Factor(dB)=  $10\log(1\% \text{ Emission BW/RBW})$
2. Band Edge= Measurement Value + Correction Factor(dB)



Band :	CDMA2000 BC1	Test Mode :	1xRTT_RC3+SO32 Link (QPSK)
Correction Factor :	1.54dB	Maximum 26dB Bandwidth:	1.420MHz
Band Edge :	-40.09dBm	Measurement Value :	-41.63dBm

Lower Band Edge Plot on Channel 25 (1851.25 MHz)



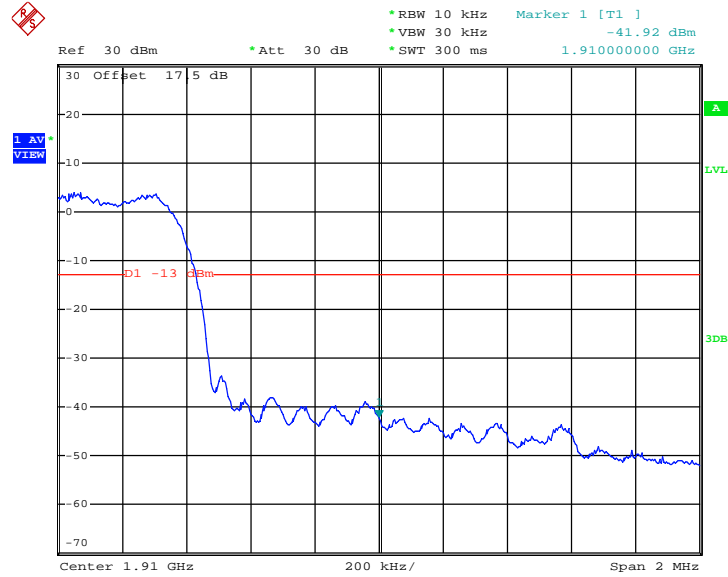
Date: 24.NOV.2013 05:43:03

1. Correction Factor(dB)=  $10\log(1\% \text{ Emission BW/RBW})$
2. Band Edge= Measurement Value + Correction Factor(dB)



Band :	CDMA2000 BC1	Test Mode :	1xRTT_RC3+SO32 Link (QPSK)
Correction Factor :	1.54dB	Maximum 26dB Bandwidth:	1.420MHz
Band Edge :	-40.38dBm	Measurement Value :	-41.92dBm

Higher Band Edge Plot on Channel 1175 (1908.75 MHz)



Date: 24.NOV.2013 05:45:07

1. Correction Factor(dB)=  $10\log(1\% \text{ Emission BW/RBW})$
2. Band Edge= Measurement Value + Correction Factor(dB)

### 3.5 Conducted Spurious Emission Measurement

#### 3.5.1 Description of Conducted 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 10<sup>th</sup> harmonic.

#### 3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

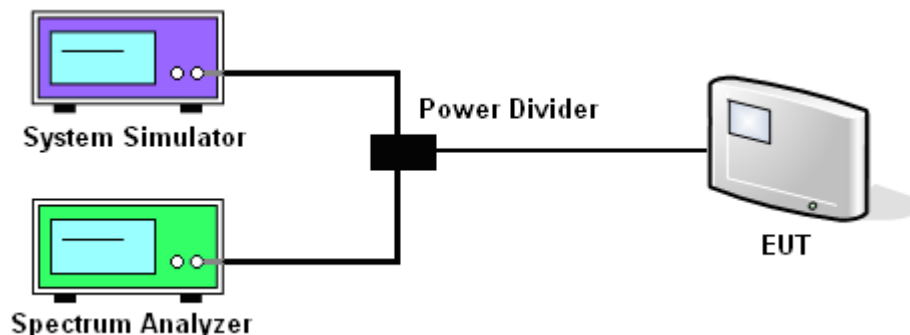
#### 3.5.3 Test Procedures

1. The EUT was connected to spectrum analyzer and base station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. 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

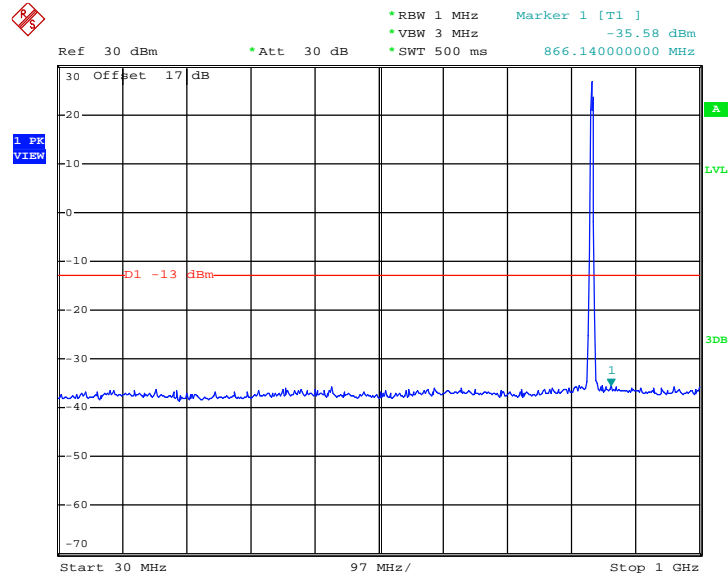




### 3.5.5 Test Result (Plots) of Conducted Spurious Emission

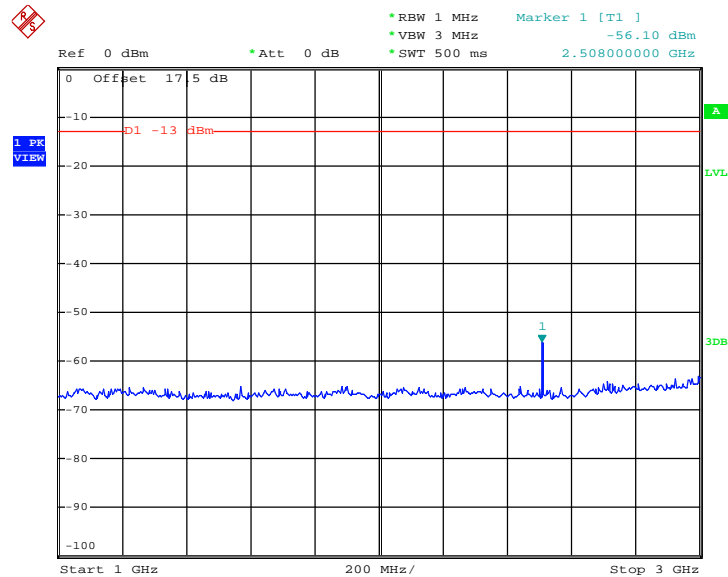
Band :	CDMA2000 BC0	Channel	384
Test Mode :	1xRTT_RC3+SO55 Link (QPSK)	Frequency :	836.52 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



Date: 24.NOV.2013 04:06:37

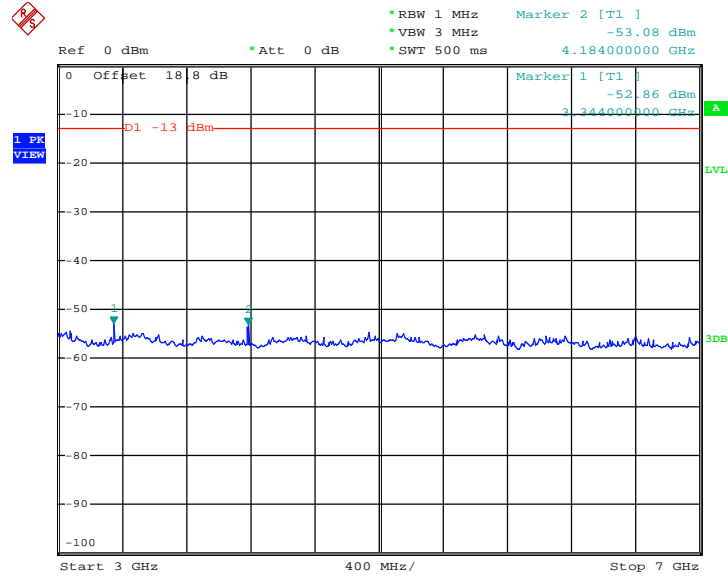
Conducted Spurious Emission Plot between 1GHz ~ 3GHz



Date: 24.NOV.2013 04:10:31

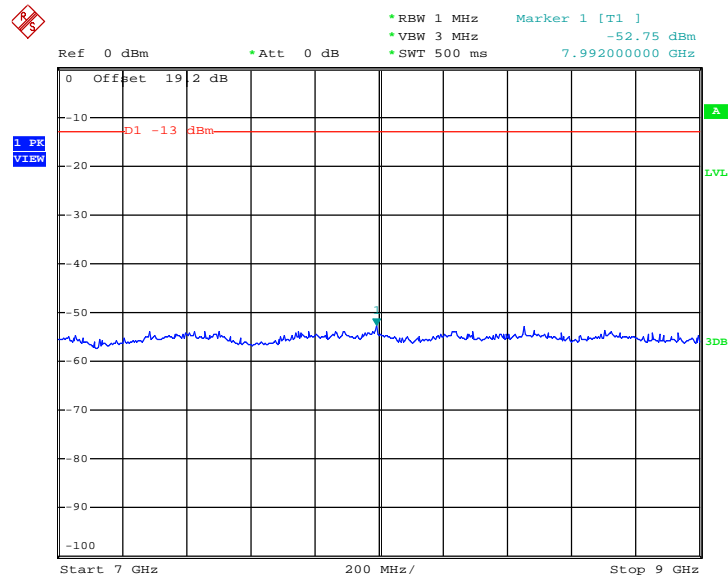


### Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 24.NOV.2013 04:12:41

### Conducted Spurious Emission Plot between 7GHz ~ 9GHz

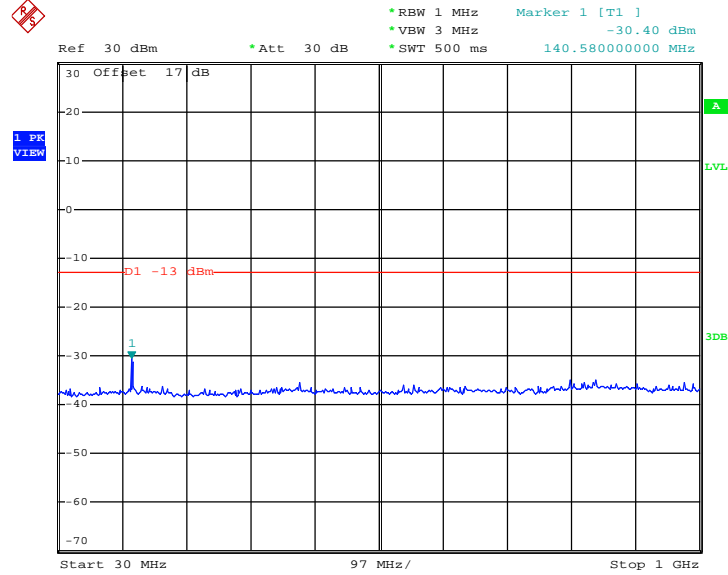


Date: 24.NOV.2013 04:15:03



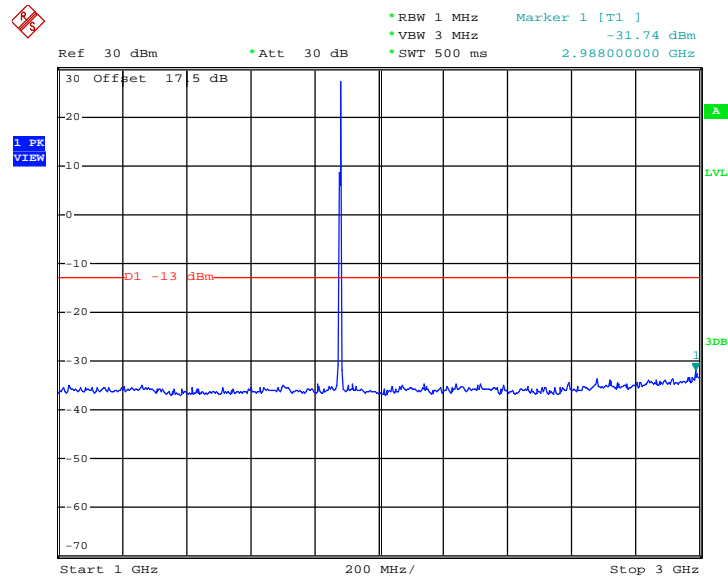
Band :	CDMA2000 BC1	Channel	600
Test Mode :	1xRTT_RC3+SO32 Link (QPSK)	Frequency :	1880.0 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



Date: 24.NOV.2013 04:40:41

Conducted Spurious Emission Plot between 1GHz ~ 3GHz

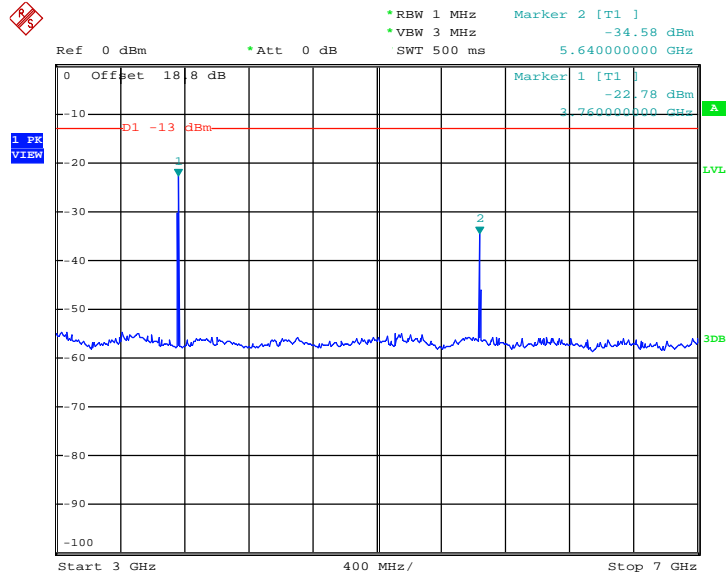


Date: 24.NOV.2013 04:51:32



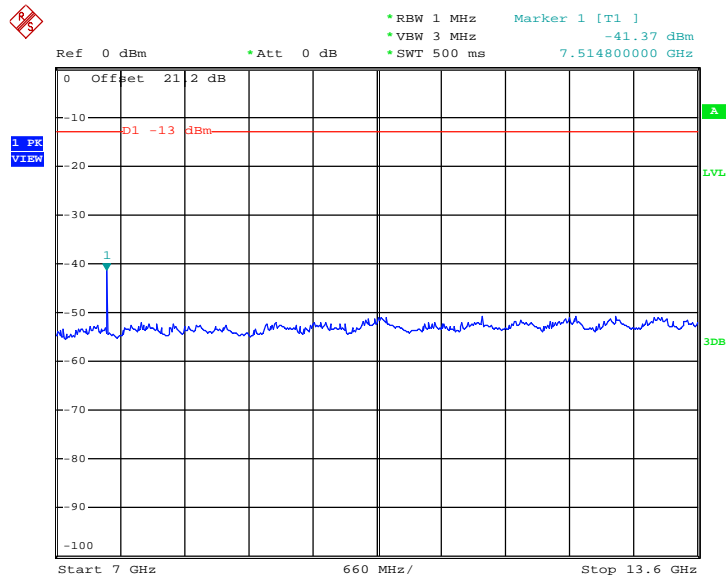


### Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 24.NOV.2013 04:56:10

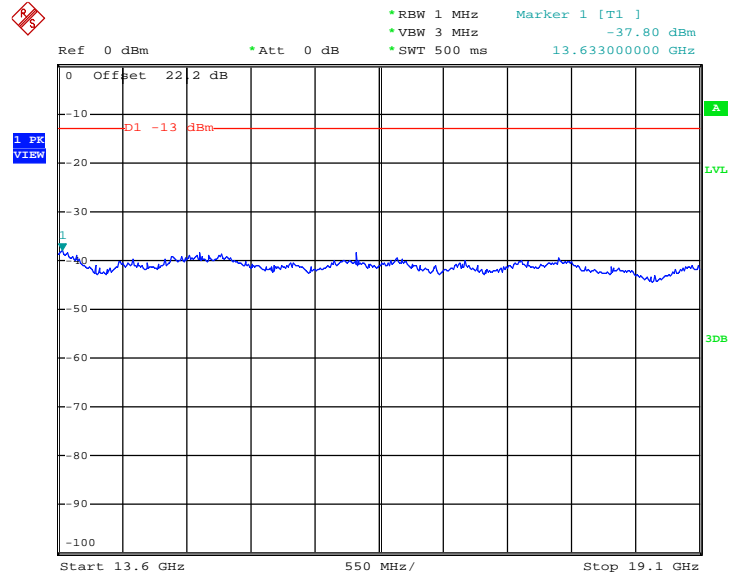
### Conducted Spurious Emission Plot between 7GHz ~ 13.6GHz



Date: 24.NOV.2013 04:58:24



Conducted Spurious Emission Plot between 13.6GHz ~ 19.1GHz



Date: 24.NOV.2013 05:01:59

## 3.6 Field Strength of Spurious Radiation Measurement

### 3.6.1 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  $43+10\log_{10}(P[\text{Watts}])$  dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

### 3.6.2 Measuring Instruments

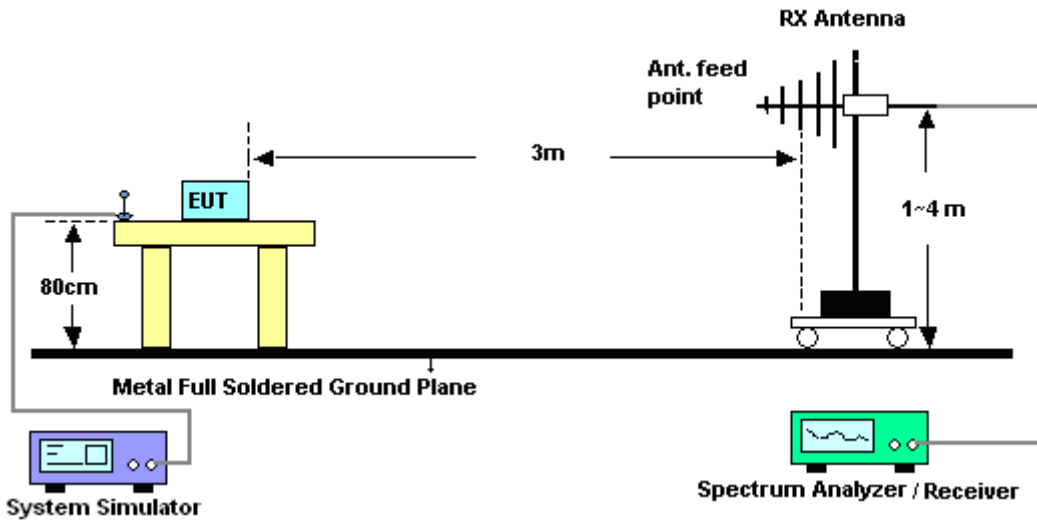
See list of measuring instruments of this test report.

### 3.6.3 Test Procedures

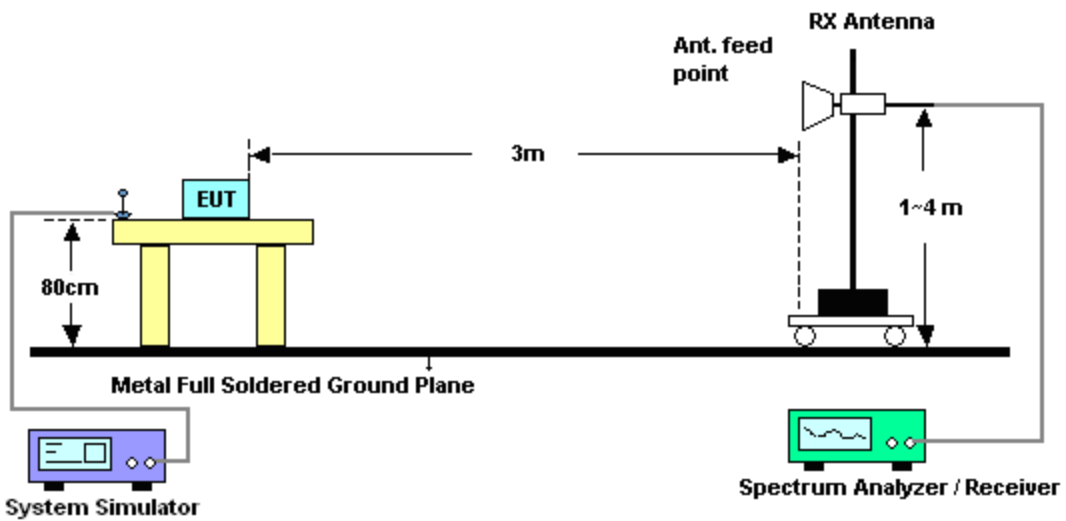
1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving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

### 3.6.4 Test Setup

For radiated emissions from 30MHz to 1GHz



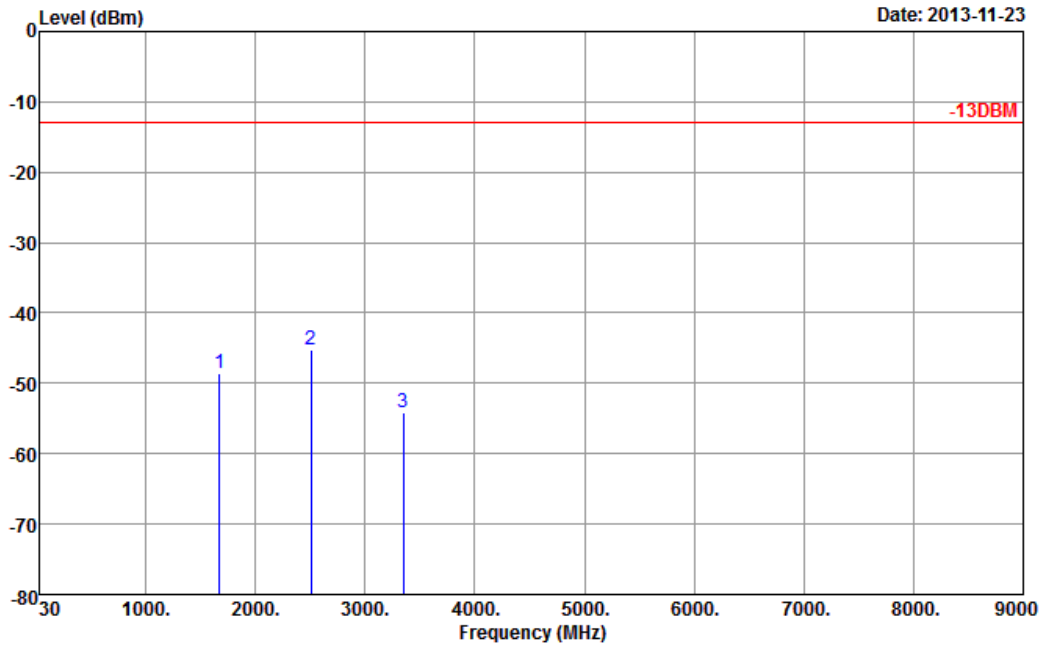
For radiated emissions above 1GHz





3.6.5 Test Result of Field Strength of Spurious Radiated

<b>Band :</b>	CDMA2000 BC0	<b>Temperature :</b>	23~25°C
<b>Test Mode :</b>	1xRTT_RC3+SO55 Link (QPSK)	<b>Relative Humidity :</b>	48~52%
<b>Test Engineer :</b>	Gavin Zhang	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



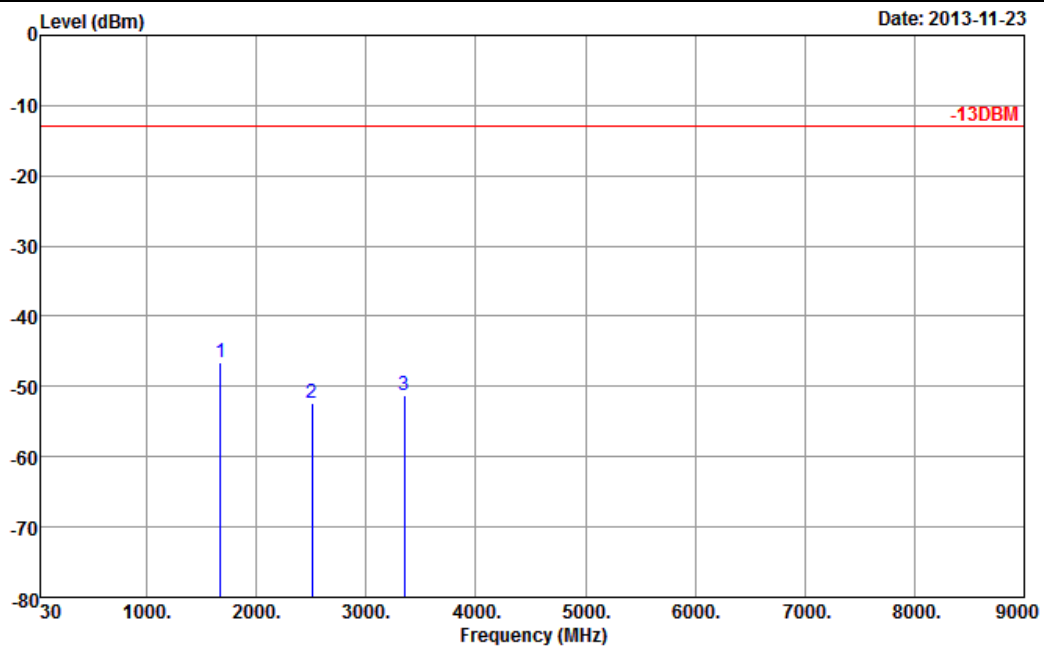
Site : 03CH01-SZ  
 Condition : -13DBM HF\_EIRP\_H\_130101 HORIZONTAL

Plane : Y

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
1672	-48.65	-13	-35.65	-63.56	-51.62	0.88	6.00	H	Pass
2510	-45.18	-13	-32.18	-68.14	-47.79	1.08	5.84	H	Pass
3346	-54.05	-13	-41.05	-64.65	-58.42	1.14	7.66	H	Pass



<b>Band :</b>	CDMA2000 BC0	<b>Temperature :</b>	23~25°C
<b>Test Mode :</b>	1xRTT_RC3+SO55 Link (QPSK)	<b>Relative Humidity :</b>	48~52%
<b>Test Engineer :</b>	Gavin Zhang	<b>Polarization :</b>	Vertical
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



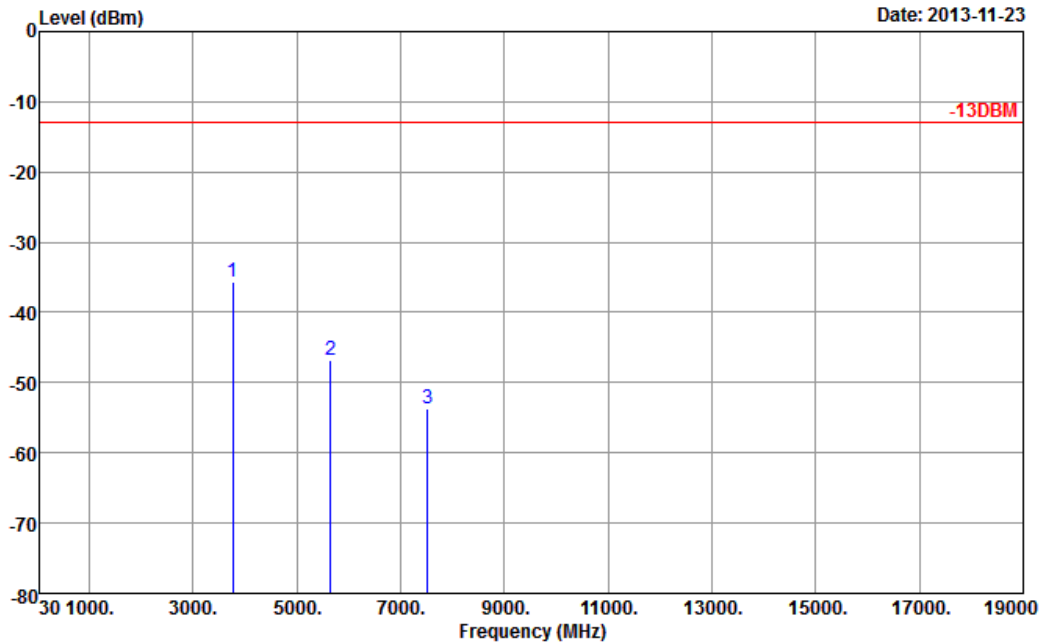
Site : 03CH01-SZ  
 Condition : -13DBM HF\_EIRP\_V\_130101 VERTICAL

Plane : Y

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
1672	-46.50	-13	-33.50	-59.57	-49.47	0.88	6.00	V	Pass
2510	-52.33	-13	-39.33	-71.16	-54.94	1.08	5.84	V	Pass
3346	-51.20	-13	-38.20	-63.03	-55.57	1.14	7.66	V	Pass



Band :	CDMA2000 BC1	Temperature :	23~25°C
Test Mode :	1xRTT_RC3+SO32 Link (QPSK)	Relative Humidity :	48~52%
Test Engineer :	Gavin Zhang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



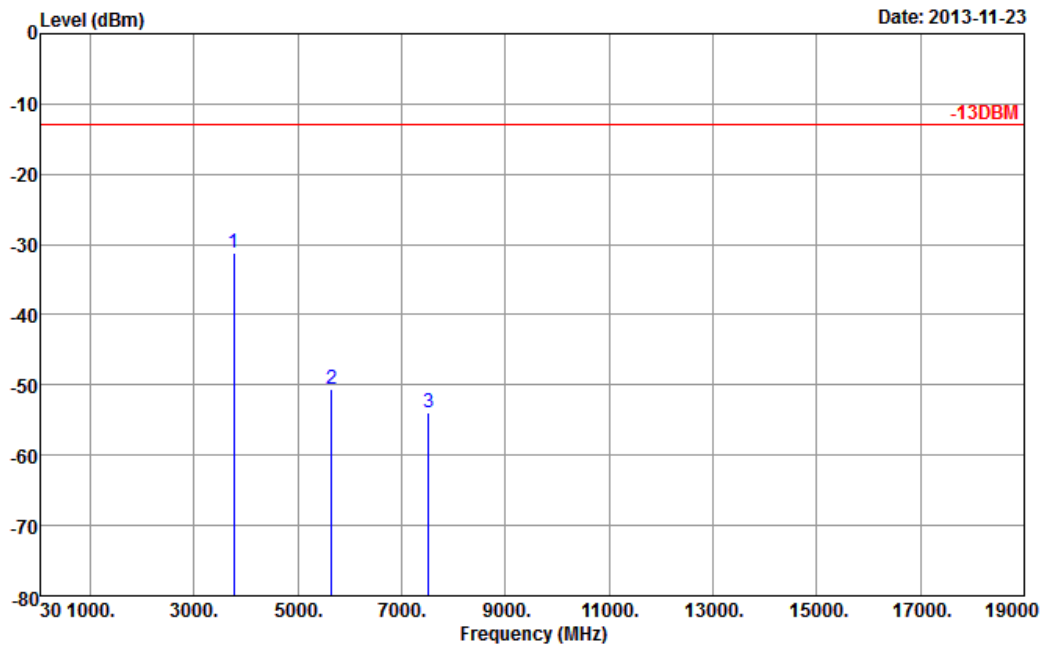
Site : 03CH01-SZ  
 Condition : -13DBM HF\_EIRP\_H\_130101 HORIZONTAL

Plane : Y

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	-35.56	-13	-22.56	-52.49	-42.30	1.28	8.02	H	Pass
5640	-46.79	-13	-33.79	-64.78	-55.21	1.58	10.00	H	Pass
7520	-53.64	-13	-40.64	-75.58	-63.96	1.78	12.10	H	Pass



Band :	CDMA2000 BC1	Temperature :	23~25°C
Test Mode :	1xRTT_RC3+SO32 Link (QPSK)	Relative Humidity :	48~52%
Test Engineer :	Gavin Zhang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Site : 03CH01-SZ  
 Condition : -13DBM HF\_EIRP\_V\_130101 VERTICAL

Plane : Y

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	-31.30	-13	-18.30	-49.59	-38.04	1.28	8.02	V	Pass
5640	-50.67	-13	-37.67	-67.75	-59.09	1.58	10	V	Pass
7520	-53.87	-13	-40.87	-76.12	-64.19	1.78	12.1	V	Pass



## 3.7 Frequency Stability Measurement

### 3.7.1 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.

### 3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

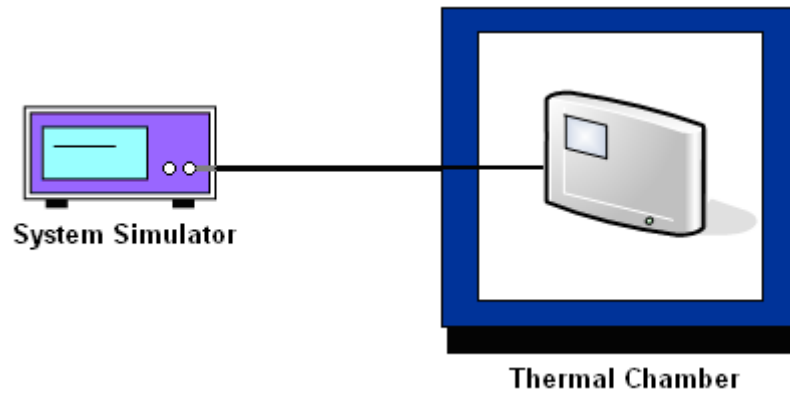
### 3.7.3 Test Procedures for Temperature Variation

1. The EUT was set up in the thermal chamber and connected with the base station.
2. With power OFF, the temperature was decreased to  $-30^{\circ}\text{C}$  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  $10^{\circ}\text{C}$  step up to  $50^{\circ}\text{C}$ . 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.

### 3.7.4 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 base station.
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.

### 3.7.5 Test Setup





3.7.6 Test Result of Temperature Variation

Band :	CDMA2000 BC0 1xRTT_RC3+SO55	Channel :	384
Limit (ppm) :	2.5	Frequency :	836.52 MHz

Temperature (°C)	Freq. Dev. (Hz)	Deviation (ppm)	Result
-30	-6	-0.007	PASS
-20	-5	-0.006	
-10	-6	-0.007	
0	-6	-0.007	
10	-5	-0.006	
20	-6	-0.007	
30	-6	-0.007	
40	-5	-0.006	
50	-6	-0.007	

Band :	CDMA2000 BC1 1xRTT_RC3+SO32	Channel :	600
Limit (ppm) :	2.5	Frequency :	1880.0 MHz

Temperature (°C)	Freq. Dev. (Hz)	Deviation (ppm)	Result
-30	7	+0.004	PASS
-20	-6	-0.003	
-10	-7	-0.004	
0	7	+0.004	
10	6	+0.003	
20	7	+0.004	
30	7	+0.004	
40	-6	-0.003	
50	-7	-0.004	



3.7.7 Test Result of Voltage Variation

Band & Channel	Mode	Voltage (Volt)	Freq. Dev. (Hz)	Deviation (ppm)	Limit (ppm)	Result
CDMA2000 BC0 CH384	1xRTT RC3+SO55	12.00	-6	-0.007	2.5	PASS
		9.00	-5	-0.006		
		32.00	-7	-0.008		
CDMA2000 BC1 CH600	1xRTT RC3+SO32	12.00	7	+0.004	2.5	PASS
		9.00	-6	-0.003		
		32.00	8	+0.004		

Note : Normal Voltage = 12.00V.



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP30	101400	9kHz~30GHz	Mar. 28, 2013	Nov. 24, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	N/A	Mar. 28, 2013	Nov. 24, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Power Sensor	Anritsu	MA2411B	1207253	N/A	Mar. 28, 2013	Nov. 24, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Thermal Chamber	Hongzhan	LP-150U	HD20120425	N/A	Mar. 28, 2013	Nov. 24, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Spectrum Analyzer	Agilent Technologies	N9038A	MY52260 185	20Hz~26.5GHz	Apr. 04, 2013	Nov. 23, 2013	Apr. 03, 2014	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS Lindgren	3117	00119436	1GHz~18GHz	Oct. 26, 2013	Nov. 23, 2013	Oct. 25, 2014	Radiation (03CH01-SZ)
Bilog Antenna	SCHAFFNER	CBL6112B	2614	30Mhz~2Ghz	Dec. 26, 2012	Nov. 23, 2013	Dec. 25, 2013	Radiation (03CH01-SZ)
Amplifier	ADVANTEST	BB525C	E9007003	9k-3000MHz GAIN 30db	Mar. 28, 2013	Nov. 23, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
Amplifier	Yiai	AV3860B	04030	2GHz~26.5GHz	Mar. 28, 2013	Nov. 23, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
SHF-EHF-Horn	Schwarzbeck	BBHA9170	BBHA9170249	14Ghz~40Ghz	Dec. 23, 2012	Nov. 23, 2013	Dec. 22, 2013	Radiation (03CH01-SZ)
Turn Table	EM Electronic	EM 1000	N/A	0 ~ 360 degree	N/A	Nov. 23, 2013	N/A	Radiation (03CH01-SZ)
Antenna Mast	EM Electronic	EM 1000	N/A	1 m - 4 m	N/A	Nov. 23, 2013	N/A	Radiation (03CH01-SZ)



## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.90
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