



# TEST REPORT



**DT&C Co., Ltd.**

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1. Report No : DRTFCC2003-0085
2. Customer
  - Name : LG Electronics USA
  - Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : LTE Modem / TM13LNNAHK2  
FCC ID : BEJTM13LNNAHK2
5. Test Method Used : KDB971168 D01v03r01, ANSI/TIA-603-E-2016, ANSI C63.26-2015  
Test Specification : §2, §22(H), §24(E)
6. Date of Test : 2020.02.03 ~ 2020.03.16
7. Testing Environment : Refer to appended test report.
8. Test Result : Refer to attached test result.

Affirmation	Tested by	 (Signature)	Reviewed by	 (Signature)
	Name : InHee Bae			

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2020 . 03 . 30 .

**DT&C Co., Ltd.**

If this report is required to confirmation of authenticity, please contact to [report@dtnc.net](mailto:report@dtnc.net)

## Test Report Version

Test Report No.	Date	Description	Tested by	Revised by
DRTFCC2003-0085	Mar. 30, 2020	Initial issue	InHee Bae	GeunKi Son

## Table of Contents

<b>1. GENERAL INFORMATION .....</b>	<b>4</b>
<b>2. INTRODUCTION .....</b>	<b>5</b>
2.1. EUT DESCRIPTION .....	5
2.2. EUT CAPABILITIES.....	5
2.3. TESTING ENVIRONMENT .....	5
2.4. MEASURING INSTRUMENT CALIBRATION .....	5
2.5. MEASUREMENT UNCERTAINTY .....	5
2.6. TEST FACILITY .....	5
<b>3. DESCRIPTION OF TESTS.....</b>	<b>6</b>
3.1 ERP & EIRP (Effective Radiated Power & Equivalent Isotropic Radiated Power) .....	6
3.2 PEAK TO AVERAGE RATIO .....	8
3.3 OCCUPIED BANDWIDTH. ....	10
3.4 BAND EDGE EMISSIONS AT ANTENNA TERMINAL. ....	11
3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.....	12
3.6 RADIATED SPURIOUS EMISSIONS .....	13
3.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE.....	14
<b>4. LIST OF TEST EQUIPMENT .....</b>	<b>15</b>
<b>5. SUMMARY OF TEST RESULTS.....</b>	<b>16</b>
<b>6. EMISSION DESIGNATOR AND SAMPLE CALCULATION....</b>	<b>17</b>
<b>7. TEST DATA .....</b>	<b>18</b>
7.1 Conducted OUTPUT POWER .....	18
7.2 PEAK TO AVERAGE RATIO .....	19
7.3 OCCUPIED BANDWIDTH .....	19
7.4 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.....	19
7.5 BAND EDGE .....	19
7.6 EFFECTIVE RADIATED POWER.....	20
7.7 EQUIVALENT ISOTROPIC RADIATED POWER.....	21
7.8 RADIATED SPURIOUS EMISSIONS .....	22
7.8.1 RADIATED SPURIOUS EMISSIONS (Cellular CDMA1x).....	22
7.8.2 RADIATED SPURIOUS EMISSIONS (Cellular CDMA1x EVDO).....	22
7.8.3 RADIATED SPURIOUS EMISSIONS (PCS CDMA1x).....	23
7.8.4 RADIATED SPURIOUS EMISSIONS (PCS CDMA1x EVDO) .....	23
7.9 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE.....	24
7.9.1 FREQUENCY STABILITY (Cellular CDMA1x) .....	24
7.9.2 FREQUENCY STABILITY (PCS CDMA1x) .....	25
<b>8. TEST PLOTS .....</b>	<b>26</b>
8.1 PEAK TO AVERAGE RATIO .....	26
8.2 OCCUPIED BANDWIDTH (99 % Bandwidth) .....	27
8.3 SPURIOUS EMISSIONS AT ANTENNA TERMINAL .....	35
8.4 BAND EDGE EMISSIONS AT ANTENNA TERMINAL.....	45

## 1. GENERAL INFORMATION

**Applicant Name** : LG Electronics USA

**Address** : 1000 Sylvan Ave. Englewood Cliffs, New Jersey, United States 07632

**FCC ID** : BEJTM13LNNAHK2

**FCC Classification** : PCS Licensed Transmitter (PCB)

**EUT** : LTE Modem

**Model Name** : TM13LNNAHK2

**Add Model Name** : NA

**Supplying power** : DC 12 V

**Antenna Type** : External Antenna

Mode	Tx Frequency (MHz)	Emission Designator	Conducted Output Power		ERP (Max. Power)		EIRP (Max. Power)	
			dBm	W	dBm	W	dBm	W
Cellular band CDMA 1x	824.70 ~ 848.31	1M27F9W	24.88	0.308	26.18	0.415	-	-
Cellular band CDMA 1x EVDO	824.70 ~ 848.31	1M27F9W	24.58	0.287	25.69	0.371	-	-
PCS band CDMA 1x	1851.25 ~ 1908.75	1M27F9W	25.07	0.321	-	-	25.31	0.340
PCS band CDMA 1x EVDO	1851.25 ~ 1908.75	1M27F9W	24.75	0.299	-	-	25.07	0.321

## 2. INTRODUCTION

### 2.1. EUT DESCRIPTION

The Equipment Under Test (EUT) supports CDMA, LTE

### 2.2. EUT CAPABILITIES

This EUT contains the following capabilities:

850/1900 CDMA, LTE band 2/4/5/13

### 2.3. TESTING ENVIRONMENT

Ambient Condition	
▪ Temperature	+21 °C ~ +23 °C
▪ Relative Humidity	42 % ~ 45 %

### 2.4. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 2.5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
Radiated Disturbance (Below 1 GHz)	5.1 dB (The confidence level is about 95 %, $k = 2$ )
Radiated Disturbance (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, $k = 2$ )
Radiated Disturbance (Above 18 GHz)	5.3 dB (The confidence level is about 95 %, $k = 2$ )

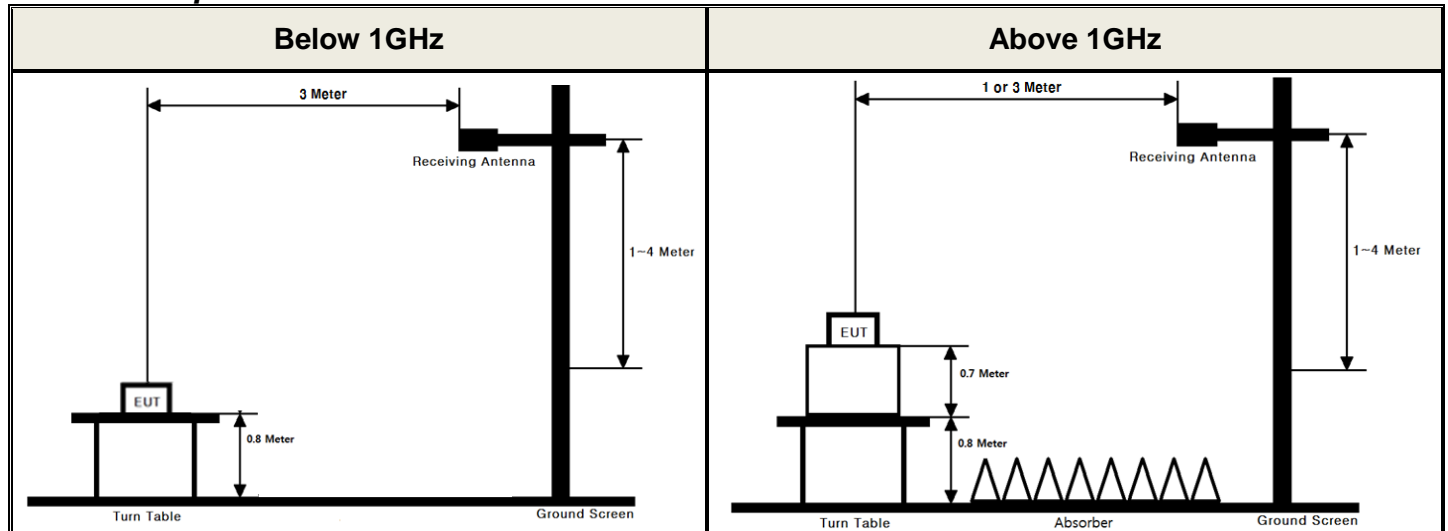
### 2.6. TEST FACILITY

<b>DT&amp;C Co., Ltd.</b>		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.		
The test site complies with the requirements of § 2.948 according to ANSI 63.4-2014.		
<b>- FCC MRA Accredited Test Firm No. : KR0034</b>		
<a href="http://www.dtnet.net">www.dtnet.net</a>		
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### 3. DESCRIPTION OF TESTS

#### 3.1 ERP & EIRP (Effective Radiated Power & Equivalent Isotropic Radiated Power)

##### Test Set-up



These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 0.8 or 1.5 meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

##### Test Procedure

- ANSI/TIA-603-E-2016 - Section 2.2.17
- KDB971168 D01v03r01 - Section 5.2.2
- ANSI 63.26-2015 – Section 5.2.4.4.1

##### Test setting

1. Set span to 2 x to 3 x the OBW.
2. Set RBW = 1% to 5% of the OBW.
3. Set VBW  $\geq$  3 x RBW.
4. Set number of points in sweep  $\geq$  2 x span / RBW.
5. Sweep time:
  - 1) Set = auto-couple, or
  - 2) Set  $\geq$   $[10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$  for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
6. Detector = power averaging (rms).
7. If the EUT can be configured to transmit continuously, then set the trigger to free run.
8. If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full-power transmissions).
9. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.

10. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

The receiver antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.

A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminal of the substitute antenna is measured.

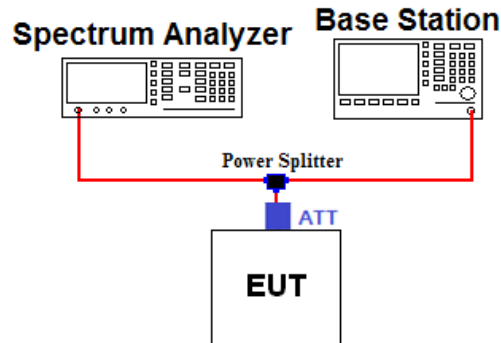
The ERP/EIRP is calculated using the following formula:

**ERP/EIRP = The conducted power at the substitute antenna's terminal [dBm] + Substitute Antenna gain [dBd for ERP, dBi for EIRP]**

For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn antenna and an isotropic antenna are taken into consideration.

## 3.2 PEAK TO AVERAGE RATIO

### Test set-up



### Test Procedure

- KDB971168 D01v03r01 - Section 5.7.2
- ANSI C63.26-2015 – Section 5.2.3.4

A peak to average ratio measurement is performed at the conducted port of the EUT.

The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The present of time the signal spends at or above the level defines the probability for that particular power level.

### Test setting

The spectrum Analyzer's CCDF measurement function is enabled.

1. Set resolution/measurement bandwidth  $\geq$  OBW or specified reference bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve.
3. Set the measurement interval as follows:
  - 1) For continuous transmissions, set to the greater of  $[10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$  or 1 ms.
  - 2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
  - 3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
4. Record the maximum PAPR level associated with a probability of 0.1%.
5. The peak power level is calculated from the sum of the PAPR value from step d) to the measured average power.



## ■ Alternate Procedure

### - KDB971168 D01v03r01 - Section 5.7.3

### - ANSI C63.26-2015 – Section 5.2.6

Use one of the measurement procedures of the peak power and record as  $P_{Pk}$ .

Use one of the measurement procedures of the average power and record as  $P_{Avg}$ .

Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$\text{PAPR (dB)} = P_{Pk} \text{ (dBm or dBW)} - P_{Avg} \text{ (dBm or dBW)}.$$

where

PAPR peak-to-average power ratio, in dB

$P_{Pk}$  measured peak power or peak PSD level, in dBm or dBW

$P_{Avg}$  measured average power or average PSD level, in dBm or dBW

## - Peak Power Measurement

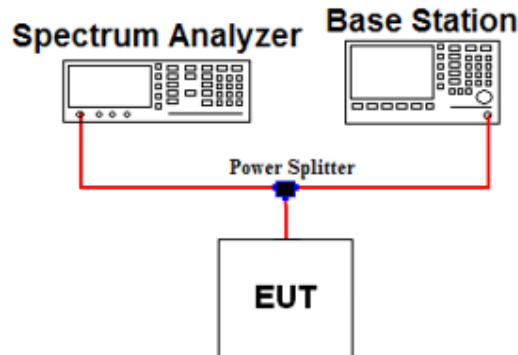
1. Set the RBW  $\geq$  OBW
2. Set VBW  $\geq 3 \times$  RBW
3. Set span  $\geq 2 \times$  RBW
4. Sweep time  $\geq 10 \times$  (number of points in sweep)  $\times$  (transmission symbol period).
5. Detector = peak
6. Trace mode = max hold
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the peak amplitude level.

## - Average Power Measurement

1. Set span to  $2 \times$  to  $3 \times$  the OBW.
2. Set RBW = 1% to 5% of the OBW.
3. Set VBW  $\geq 3 \times$  RBW.
4. Set number of measurement points in sweep  $\geq 2 \times$  span / RBW..
5. Sweep time = 1 ) auto-couple, or  
2 ) set  $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$  for single sweep (automation-compatible ) measurement. Transmission period is the on and off time of the transmitter.
6. Detector = power averaging (RMS).
7. If the EUT can be configured to transmit continuously, then set the trigger to free run.
8. If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable Triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each Sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full-Power transmissions)
9. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.
10. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

### 3.3 OCCUPIED BANDWIDTH.

#### Test set-up



#### Offset value information

Frequency (MHz)	Offset Value (dB)	Frequency (MHz)	Offset Value (dB)
824.70	7.16	1851.25	7.87
836.52	7.16	1880.00	7.83
848.31	7.17	1908.75	7.77
-	-	-	-

Note. 1: The offset values from EUT to Spectrum analyzer were measured and used for test.

#### Test Procedure

- KDB971168 D01v03r01 - Section 4.3
- ANSI C63.26-2015 – Section 5.4.4

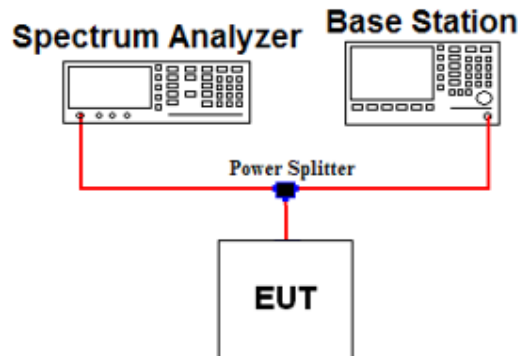
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission.

#### Test setting

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2.  $RBW = 1 \sim 5 \%$  of the expected OBW &  $VBW \geq 3 \times RBW$
3. Detector = Peak
4. Trance mode = Max hold
5. Sweep = Auto couple
6. The trace was allowed to stabilize
7. If necessary, step 2 ~ 6 were repeated after changing the RBW such that it would be within 1 ~ 5 % of the 99 % occupied bandwidth observed in step 6.

### 3.4 BAND EDGE EMISSIONS AT ANTENNA TERMINAL.

#### Test set-up



#### Offset value information

Frequency (MHz)	Offset Value (dB)	Frequency (MHz)	Offset Value (dB)
822-826	7.16	1848-1852	7.86
819-823	7.17	1845-1849	7.87
847-851	7.18	1908-1912	7.75
850-854	7.19	1911-1915	7.74
-	-	-	-

Note. 1: The offset value from EUT to Spectrum analyzer was measured and used for test.

#### Test Procedure

- KDB971168 D01v03r01 - Section 6
- ANSI C63.26-2015 - Section 5.7

All out of band emissions are measured by means of a calibrated spectrum analyzer. The EUT was setup to maximum output power at its lowest and highest channel with all modulations.

The power of any spurious emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, where P is the transmitter power in Watts.

#### Test setting

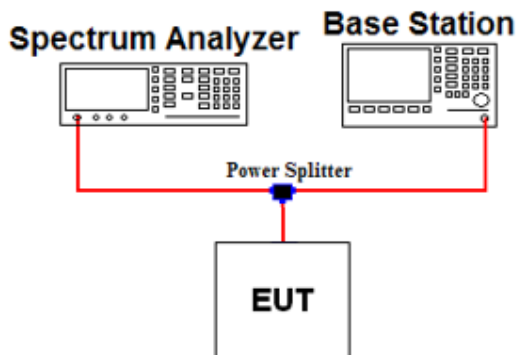
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW  $\geq 1$  % of the emission
4. VBW  $\geq 3 \times$  RBW
5. Detector = RMS & Trace mode = Max hold
6. Sweep time = Auto couple or 1 s for band edge
7. Number of sweep point  $\geq 2 \times$  span / RBW
8. The trace was allowed to stabilize

Note 1: In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of **at least one percent** of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit.

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

### 3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.

#### Test set-up



#### Offset value information

Frequency (MHz)	Offset Value (dB)	Frequency (MHz)	Offset Value (dB)
10000	10.45	20000	16.47
-	-	-	-

Note. 1: The offset value from EUT to Spectrum analyzer was measured and used for test.

#### Test Procedure

- KDB971168 D01v03r01 - Section 6
- ANSI C63.26-2015 - Section 5.7

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The EUT was setup to maximum output power at its low, middle, high channel with all bandwidths. The spectrum is scanned from 9 kHz up to a frequency including its 10<sup>th</sup> harmonic.

The power of any spurious emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB , where P is the transmitter power in Watts.

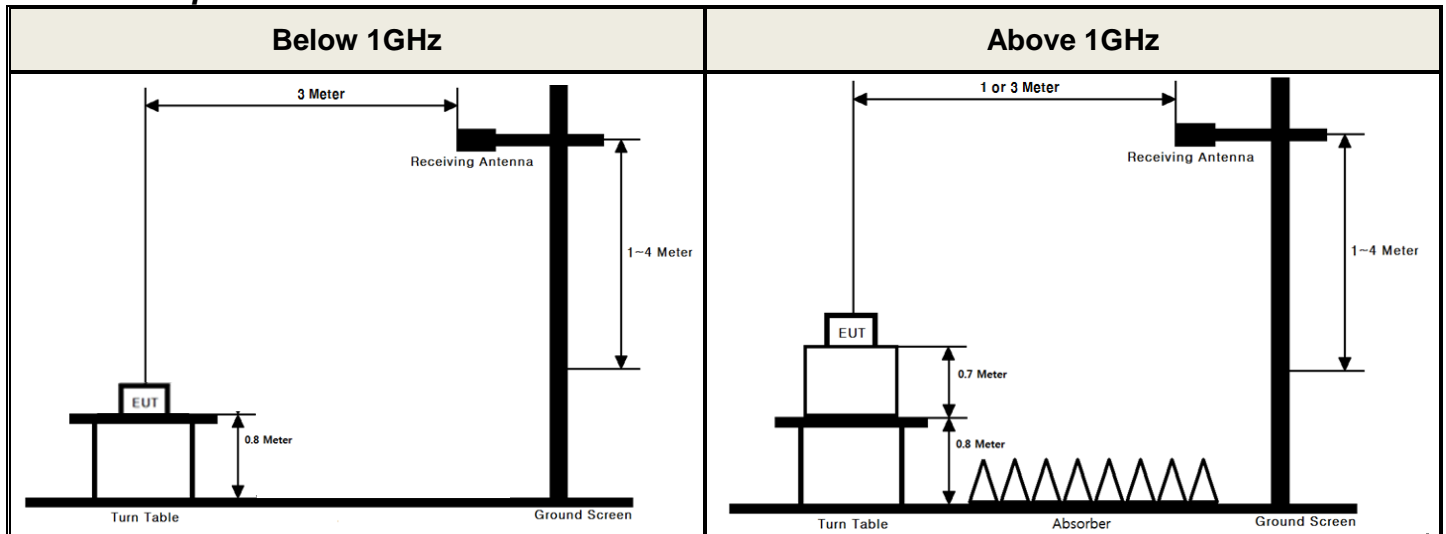
#### Test setting

1. RBW = 100 kHz(Below 1 GHz) or 1 MHz(Above 1 GHz) & VBW  $\geq 3 \times$  RBW ( Refer to Note 1)
2. Detector = RMS & Trace mode = Max hold
3. Sweep time = Auto couple
4. Number of sweep point  $\geq 2 \times$  span / RBW
5. The trace was allowed to stabilize

Note 1: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for Part 22 and 1 MHz or greater for Part 24, 27

### 3.6 RADIATED SPURIOUS EMISSIONS

#### Test Set-up



These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 0.8 or 1.5-meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

#### Test Procedure

- ANSI/TIA-603-E-2016 - Section 2.2.12
- KDB971168 D01v03r01 - Section 5.8
- ANSI C63.26-2015 - Section 5.5

#### Test setting

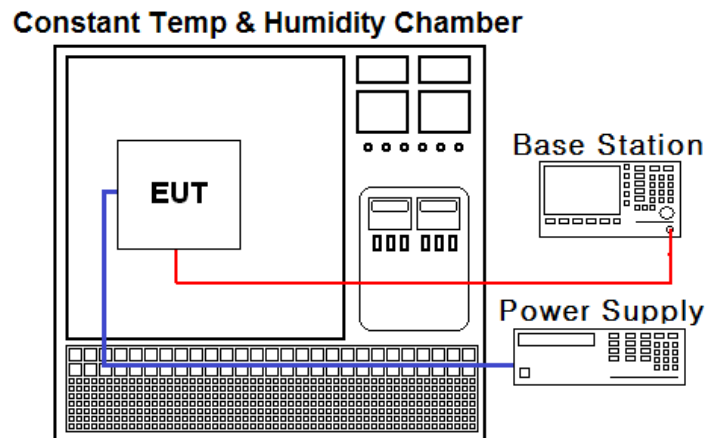
1. RBW = 100 kHz for below 1 GHz and 1 MHz for above 1 GHz / VBW  $\geq 3 \times$  RBW
2. Detector = RMS & Trace mode = Max hold
3. Sweep time = Auto couple
4. Number of sweep point  $\geq 2 \times$  span / RBW
5. The trace was allowed to stabilize

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. For radiated spurious emission measurements below 1 GHz, a half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading.

For radiated spurious emission measurements above 1 GHz, a Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The difference between the gain of the horn and an isotropic antenna are taken into consideration.

### 3.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

#### Test Set-up



#### Test Procedure

- ANSI/TIA-603-E-2016
- KDB971168 D01v03r01 - Section 9

The frequency stability of the transmitter is measured by:

a.) **Temperature:**

The temperature is varied from - 30 °C to + 50 °C in 10 °C increments using an environmental chamber.

b.) **Primary Supply Voltage:**

The primary supply voltage is varied from 85 % to 115 % of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

#### Specification:

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block for Part 24, 27. The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency for Part 22.

#### Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature.  
(20 °C to provide a reference)
2. The equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10 °C intervals ranging from -30 °C to +50 °C.  
A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

#### 4. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	19/12/16	20/12/16	MY48010133
Spectrum Analyzer	Agilent Technologies	N9020A	19/12/16	20/12/16	MY49060056
DC power supply	Agilent Technologies	66332A	19/06/25	20/06/25	MY43001173
Multimeter	FLUKE	17B+	19/12/16	20/12/16	36390701WS
Power Splitter	Anritsu	K241B	19/12/16	20/12/16	1301182
Temp & Humi	SJ Science	SJ-TH-S50	19/06/25	20/06/25	U5542113
Radio Communication Analyzer	Agilent Technologies	E5515C	19/12/16	20/12/16	GB43461134
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-2
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-1
Signal Generator	Rohde Schwarz	SMBV100A	19/12/16	20/12/16	255571
Signal Generator	ANRITSU	MG3695C	19/12/16	20/12/16	173501
Loop Antenna	ETS-Lindgren	6502	19/09/18	21/09/18	00226186
Bilog Antenna	Schwarzbeck	VULB 9160	19/04/23	21/04/23	9160-3362
Dipole Antenna	Schwarzbeck	VHA9103	18/04/13	20/04/13	2117
Dipole Antenna	Schwarzbeck	UHA9105	18/04/13	20/04/13	2262
HORN ANT	ETS	3117	18/05/10	20/05/10	00140394
HORN ANT	A.H.Systems	SAS-574	19/07/03	21/07/03	155
PreAmplifier	H.P	8447D	19/12/16	20/12/16	2944A07774
PreAmplifier	Agilent	8449B	19/06/27	20/06/27	3008A02108
High-pass filter	Wainwright	WHKX12-935-1000-15000-40SS	19/06/24	20/06/24	7
High-pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	19/06/24	20/06/24	4
Cable	DTNC	Cable	20/01/16	21/01/16	M-01
Cable	DTNC	Cable	20/01/16	21/01/16	M-02
Cable	Junkosha	MWX315	20/01/16	21/01/16	M-05
Cable	Junkosha	MWX221	20/01/16	21/01/16	M-06
Cable	DTNC	Cable	20/01/16	21/01/16	RF-10

Note 1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.

Note 2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

## 5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Parameter	Status Note 1
2.1046	Conducted Output Power	C
22.913(a) 24.232(c)	Effective Radiated Power Equivalent Isotropic Radiated Power	C
2.1049	Occupied Bandwidth	C
2.1051 22.917(a) 24.238(a)	Band Edge Spurious and Harmonic Emissions at Antenna Terminal	C
24.232(d)	Peak to Average Ratio	C
2.1053 22.917(a) 24.238(a)	Radiated Spurious and Harmonic Emissions	C
2.1055 22.355 24.235	Frequency Stability	C
Note 1: C=Comply   NC=Not Comply   NT=Not Tested   NA=Not Applicable		



## 6. EMISSION DESIGNATOR AND SAMPLE CALCULATION

### A. Emission Designator

#### Cellular CDMA1x

Emission Designator = **1M27F9W**

CDMA OBW = 1.2678 MHz

(Measured at the 99.75 % power bandwidth)

F = Frequency Modulation

9 = Composite Digital Information

W = Combination (Audio/Data)

#### PCS CDMA1x

Emission Designator = **1M27F9W**

CDMA OBW = 1.2698 MHz

(Measured at the 99.75 % power bandwidth)

F = Frequency Modulation

9 = Composite Digital Information

W = Combination (Audio/Data)

#### Cellular CDMA1x EVDO

Emission Designator = **1M27F9W**

EVDO OBW = 1.2742 MHz

(Measured at the 99.75 % power bandwidth)

F = Frequency Modulation

9 = Composite Digital Information

W = Combination (Audio/Data)

#### PCS CDMA1x EVDO

Emission Designator = **1M27F9W**

EVDO OBW = 1.2722 MHz

(Measured at the 99.75 % power bandwidth)

F = Frequency Modulation

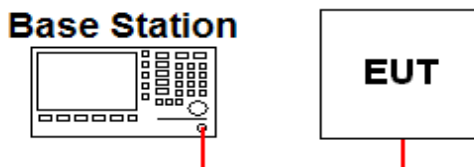
9 = Composite Digital Information

W = Combination (Audio/Data)

## 7. TEST DATA

### 7.1 Conducted OUTPUT POWER

A base station simulator was used to establish communication with the EUT. The base station simulator parameters were set to produce the maximum power from the EUT. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



The output power was measured using the Agilent E5515C

#### ▪ CDMA

Band	CH.	CDMA 1x						EVDO	
		RC1		RC3				Rev. 0	Rev. A
		SO 2	SO55	SO 2	SO55	SO32 (SCH)	SO32 (F-SCH)	RTAP	RETAP
Celluar	1013	24.88	24.85	24.63	24.69	24.72	24.71	24.58	24.54
	384	24.59	24.57	24.52	24.53	24.52	24.53	24.38	24.37
	777	24.54	24.51	24.52	24.51	24.50	24.49	24.25	24.22
PCS	25	25.03	25.01	24.83	24.88	24.95	24.95	24.75	24.74
	600	25.07	25.03	24.85	24.87	24.86	24.96	24.64	24.62
	1175	24.95	24.92	24.76	24.75	24.71	24.71	24.52	24.49

\*Unit: dBm

## 7.2 PEAK TO AVERAGE RATIO

- Plots of the EUT's Peak- to- Average Ratio are shown in Clause 8.1

## 7.3 OCCUPIED BANDWIDTH

Band	Mode	Channel	Test Result (kHz)
Cellular	CDMA 1x	1013	1266.40
		<b>384</b>	<b>1267.80</b>
		777	1262.50
	CDMA 1x EVDO	<b>1013</b>	<b>1274.20</b>
		384	1268.10
		777	1265.20
PCS	CDMA 1x	25	1267.80
		600	1267.60
		<b>1175</b>	<b>1269.80</b>
	CDMA 1x EVDO	<b>25</b>	<b>1272.20</b>
		600	1267.50
		1175	1267.10

## 7.4 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL

- Plots of the EUT's Conducted Spurious Emissions are shown in Clause 8.3

## 7.5 BAND EDGE

- Plots of the EUT's Band Edge are shown in Clause 8.4

## 7.6 EFFECTIVE RADIATED POWER

### - Cellular CDMA1x

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL@ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Note.
<b>CDMA1x</b>	<b>1013</b>	<b>824.70</b>	<b>H</b>	<b>26.81</b>	<b>-0.63</b>	<b>26.18</b>	<b>0.415</b>	-
CDMA1x	384	836.52	H	24.11	-0.74	23.37	0.217	-
CDMA1x	777	848.31	H	24.10	-0.85	23.25	0.211	-

### - Cellular CDMA1x EVDO

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL@ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Note.
<b>CDMA1x</b>	<b>1013</b>	<b>824.70</b>	<b>H</b>	<b>26.32</b>	<b>-0.63</b>	<b>25.69</b>	<b>0.371</b>	-

#### NOTES:

This EUT was tested under all configurations and the highest power is reported and CDMA 1x mode used a Power control bits of "All up". Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna. The worst case data is reported.

## 7.7 EQUIVALENT ISOTROPIC RADIATED POWER

### - PCS CDMA1x

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL @ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Note.
CDMA1x	25	1851.25	H	20.36	4.95	25.31	0.340	-
<b>CDMA1x</b>	<b>600</b>	<b>1880.00</b>	<b>H</b>	<b>20.45</b>	<b>4.80</b>	<b>25.25</b>	<b>0.335</b>	-
CDMA1x	1175	1908.75	H	20.46	4.65	25.11	0.324	-

### - PCS CDMA1x EVDO

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL @ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Note.
<b>CDMA1x</b>	<b>25</b>	<b>1851.25</b>	<b>H</b>	<b>20.12</b>	<b>4.95</b>	<b>25.07</b>	<b>0.321</b>	-

#### NOTES:

This EUT was tested under all configurations and the highest power is reported and CDMA 1x mode used a Power control bits of "All up". Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna. The worst case data is reported.

## 7.8 RADIATED SPURIOUS EMISSIONS

### 7.8.1 RADIATED SPURIOUS EMISSIONS (Cellular CDMA1x)

Channel (ERP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL @ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBd)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)
1013 (0.415 W)	824.70	1649.39	H	-30.23	3.82	-26.41	-13.00	13.41
		2474.09	V	-24.02	3.79	-20.23	-13.00	7.23
384 (0.217 W)	836.52	1673.03	H	-35.22	3.89	-31.33	-13.00	18.33
		2509.81	V	-24.96	3.80	-21.16	-13.00	8.16
777 (0.211 W)	848.31	1696.88	H	-31.37	3.97	-27.40	-13.00	14.40
		2544.95	V	-26.97	3.71	-23.26	-13.00	10.26

#### NOTES:

This EUT was tested under all configurations and the highest power is reported and CDMA 1x mode used a Power control bits of "All up". Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna. The frequency spectrum is examined from 9 kHz to the 10<sup>th</sup> harmonic of the fundamental frequency. No other spurious and harmonic emissions were reported greater than listed emissions above table.

### 7.8.2 RADIATED SPURIOUS EMISSIONS (Cellular CDMA1x EVDO)

Channel (ERP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL @ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBd)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)
1013 (0.371 W)	824.70	1649.21	H	-30.38	3.82	-26.56	-13.00	13.56
		2474.14	V	-24.16	3.79	-20.37	-13.00	7.37

#### NOTES:

This EUT was tested under all configurations and the highest power is reported and CDMA 1x mode used a Power control bits of "All up". Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna. The frequency spectrum is examined from 9 kHz to the 10<sup>th</sup> harmonic of the fundamental frequency. No other spurious and harmonic emissions were reported greater than listed emissions above table.

### 7.8.3 RADIATED SPURIOUS EMISSIONS (PCS CDMA1x)

Channel (EIRP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL@ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)
25 (0.340W)	1851.25	3702.10	V	-34.42	8.38	-26.04	-13.00	13.04
		5553.98	V	-26.52	10.42	-16.10	-13.00	3.10
		7405.09	V	-40.92	11.71	-29.21	-13.00	16.21
600 (0.335W)	1880.00	3760.08	V	-36.63	8.36	-28.27	-13.00	15.27
		5639.61	V	-27.44	10.64	-16.80	-13.00	3.80
		7518.92	V	-43.02	11.94	-31.08	-13.00	18.08
1175 (0.324W)	1908.75	3817.29	V	-35.58	8.22	-27.36	-13.00	14.36
		5726.04	V	-28.49	10.72	-17.77	-13.00	4.77
		7635.14	V	-43.20	12.18	-31.02	-13.00	18.02

#### NOTES:

This EUT was tested under all configurations and the highest power is reported and CDMA 1x mode used a Power control bits of "All up". Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna. The frequency spectrum is examined from 9 kHz to the 10<sup>th</sup> harmonic of the fundamental frequency. No other spurious and harmonic emissions were reported greater than listed emissions above table.

### 7.8.4 RADIATED SPURIOUS EMISSIONS (PCS CDMA1x EVDO)

Channel (EIRP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL@ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)
25 (0.321W)	1851.25	3702.19	V	-34.50	8.38	-26.12	-13.00	13.12
		5553.85	V	-26.61	10.42	-16.19	-13.00	3.19
		7405.11	V	-40.99	11.71	-29.28	-13.00	16.28

#### NOTES:

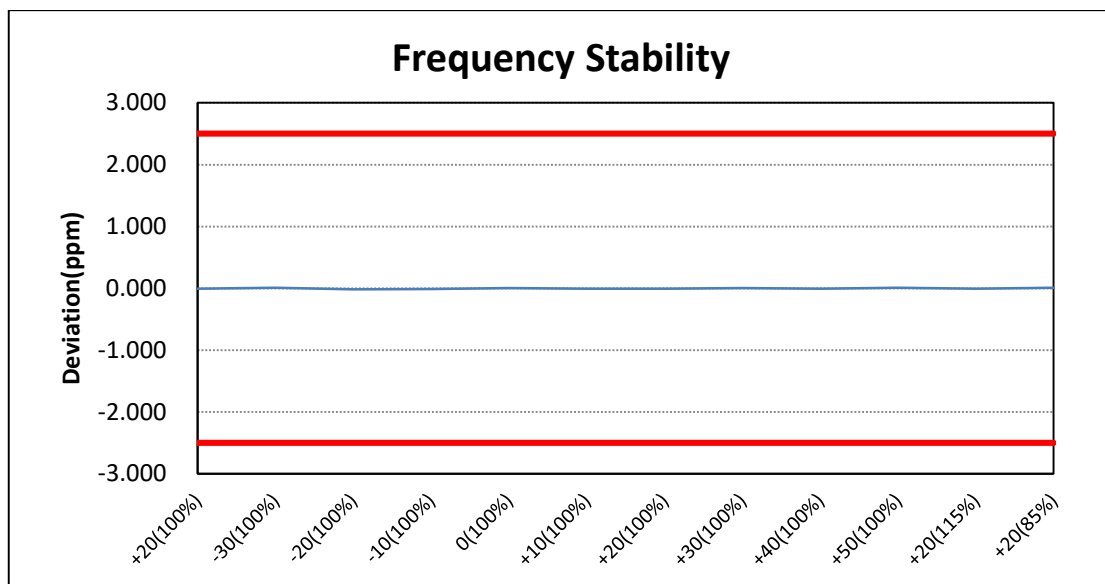
This EUT was tested under all configurations and the highest power is reported and CDMA 1x mode used a Power control bits of "All up". Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna. The frequency spectrum is examined from 9 kHz to the 10<sup>th</sup> harmonic of the fundamental frequency. No other spurious and harmonic emissions were reported greater than listed emissions above table.

## 7.9 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

### 7.9.1 FREQUENCY STABILITY (Cellular CDMA1x)

OPERATING FREQUENCY : 836,520,000\_Hz  
 CHANNEL : 4183(Mid)  
 REFERENCE VOLTAGE : 12.00\_V DC  
 LIMIT(FCC&IC) :  $\pm 0.00025\%$  or  $\pm 2.5$  ppm

VOLTAGE (%)	POWER (V DC)	TEMP (°C)	FREQ (Hz)	Deviation	
				(ppm)	(%)
100%	12.00	+20(Ref)	836,520,008	0.010	0.00000096
100%		-30	836,519,994	-0.007	-0.00000072
100%		-20	836,520,005	0.006	0.00000060
100%		-10	836,520,003	0.004	0.00000036
100%		0	836,519,999	-0.001	-0.00000012
100%		+10	836,520,002	0.002	0.00000024
100%		+20	836,520,008	0.010	0.00000096
100%		+30	836,520,007	0.008	0.00000084
100%		+40	836,519,997	-0.004	-0.00000036
100%		+50	836,520,005	0.006	0.00000060
115%	13.80	+20	836,520,003	0.004	0.00000036
85%	10.20	+20	836,520,001	0.001	0.00000012

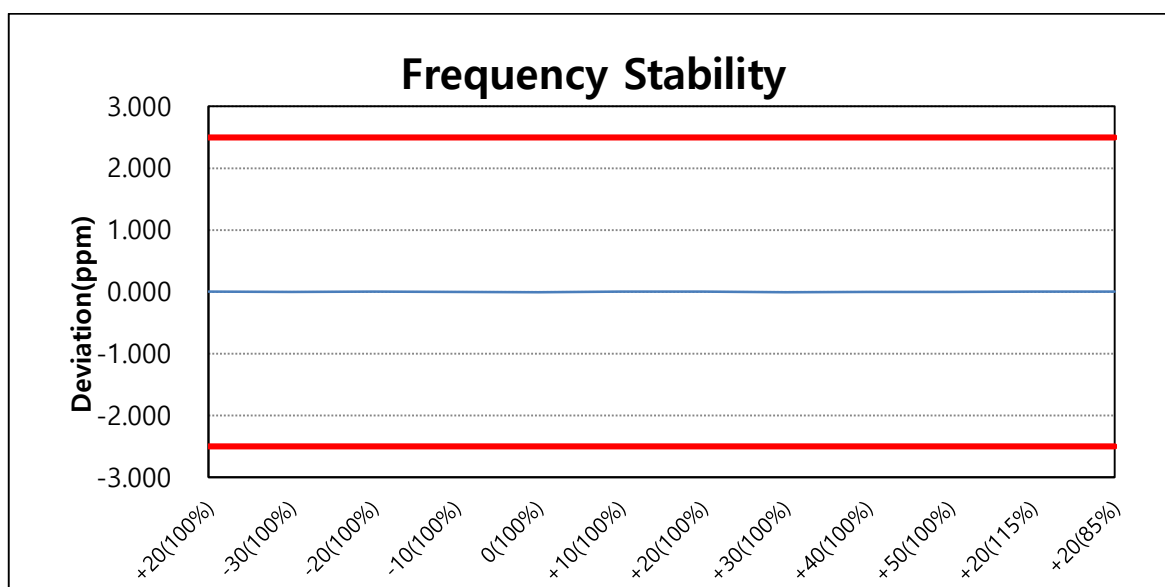




## 7.9.2 FREQUENCY STABILITY (PCS CDMA1x)

OPERATING FREQUENCY : 1,880,000,000 Hz  
 CHANNEL : 9400(Mid)  
 REFERENCE VOLTAGE : 12 V DC  
 LIMIT(FCC) : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.  
 LIMIT(IC) :  $\pm 0.00025$  % or 2.5 ppm

VOLTAGE (%)	POWER (V DC)	TEMP (°C)	FREQ (Hz)	Deviation	
				(ppm)	(%)
100%	12.00	+20(Ref)	1,880,000,008	0.004	0.00000043
100%		-30	1,880,000,001	0.001	0.00000005
100%		-20	1,880,000,004	0.002	0.00000021
100%		-10	1,880,000,003	0.002	0.00000016
100%		0	1,879,999,998	-0.001	-0.00000011
100%		+10	1,879,999,995	-0.003	-0.00000027
100%		+20	1,880,000,008	0.004	0.00000043
100%		+30	1,880,000,006	0.003	0.00000032
100%		+40	1,880,000,009	0.005	0.00000048
100%		+50	1,880,000,002	0.001	0.00000011
115%	13.80	+20	1,879,999,993	-0.004	-0.00000037
85%	10.20	+20	1,879,999,995	-0.003	-0.00000027

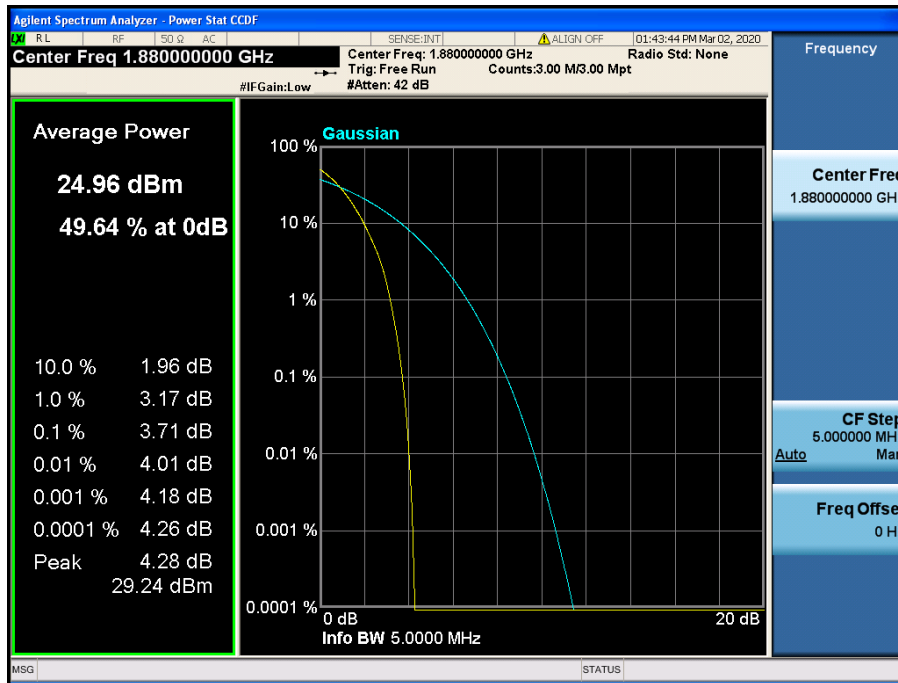


**Note.** Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

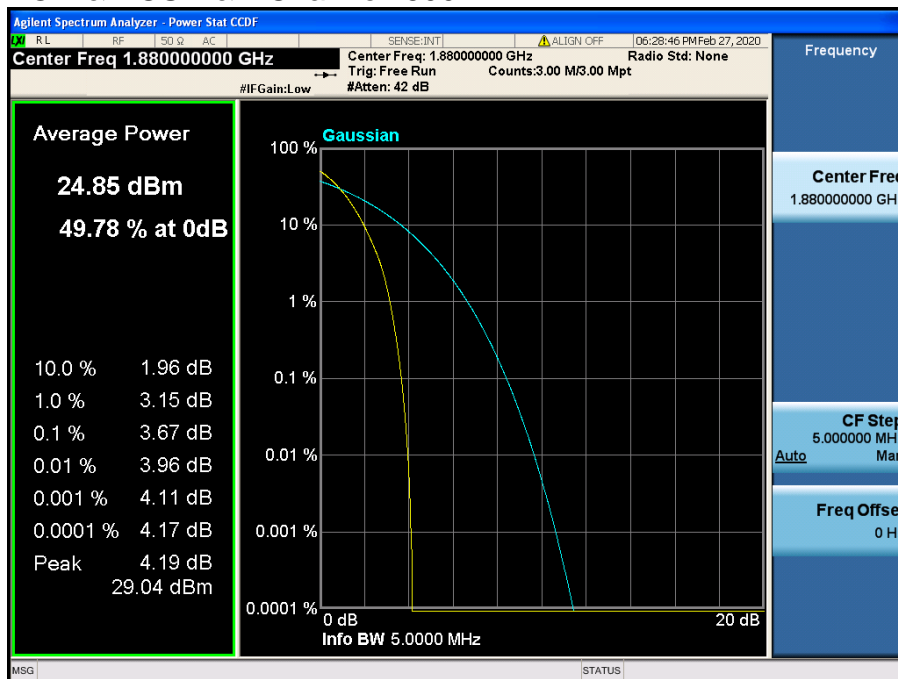
## 8. TEST PLOTS

### 8.1 PEAK TO AVERAGE RATIO

CDMA 1x & PCS & Channel: 600

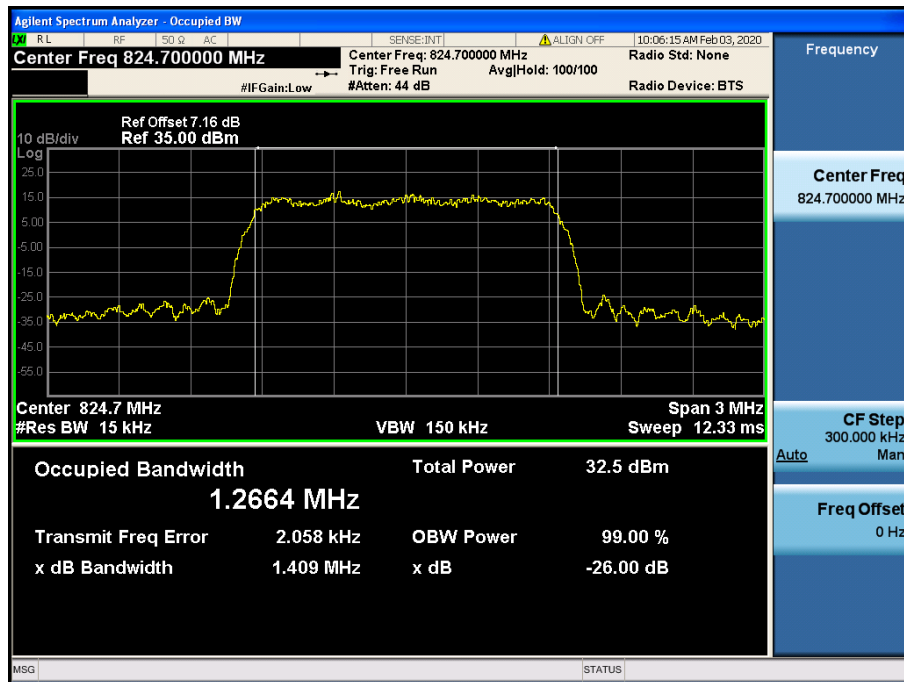


CDMA 1x EVDO & PCS & Channel: 600

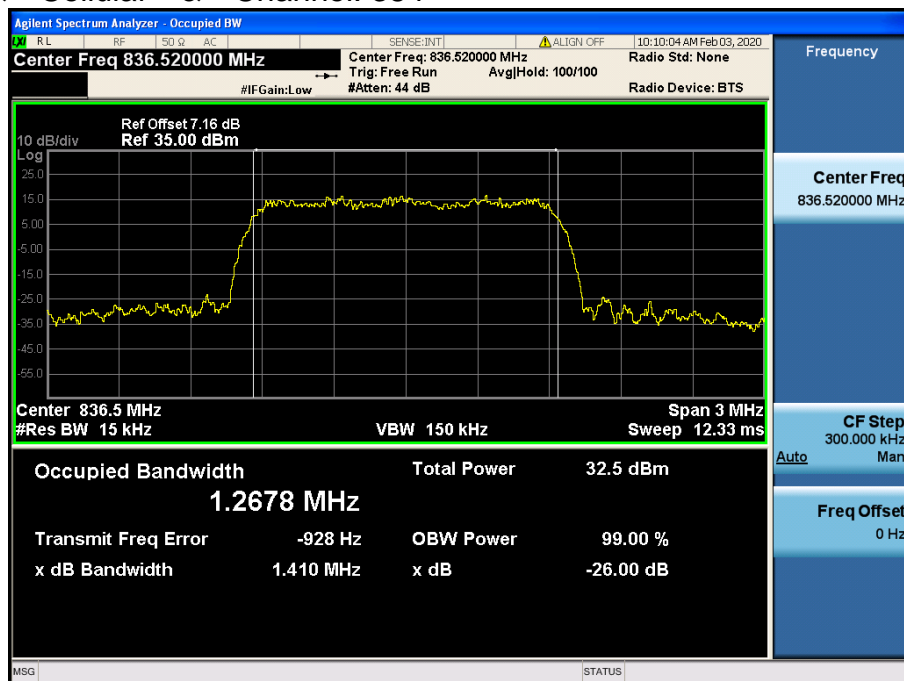


## 8.2 OCCUPIED BANDWIDTH (99 % Bandwidth)

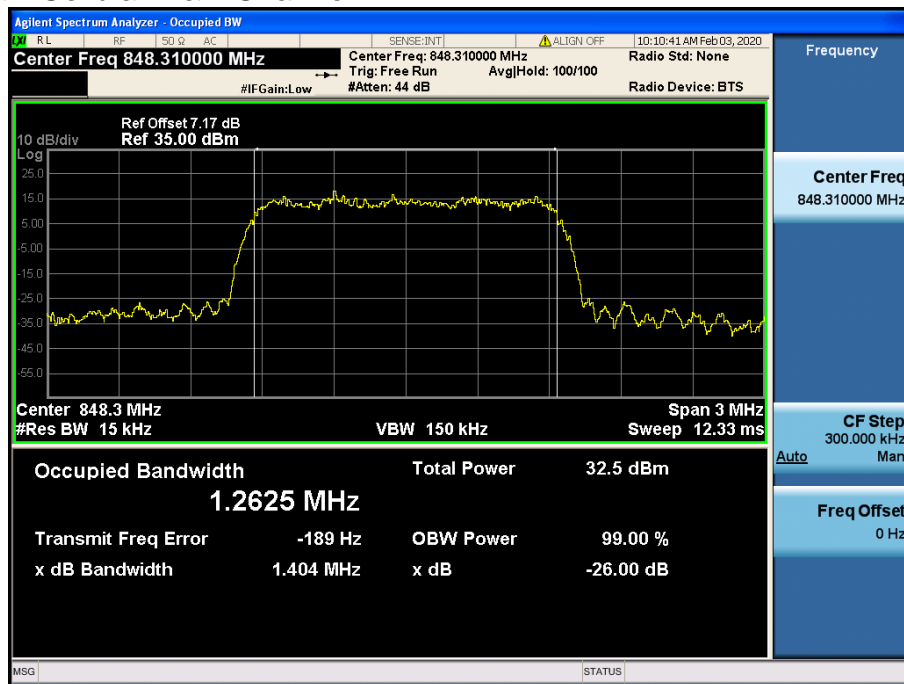
CDMA 1x & Cellular & Channel: 1013



CDMA 1x & Cellular & Channel: 384

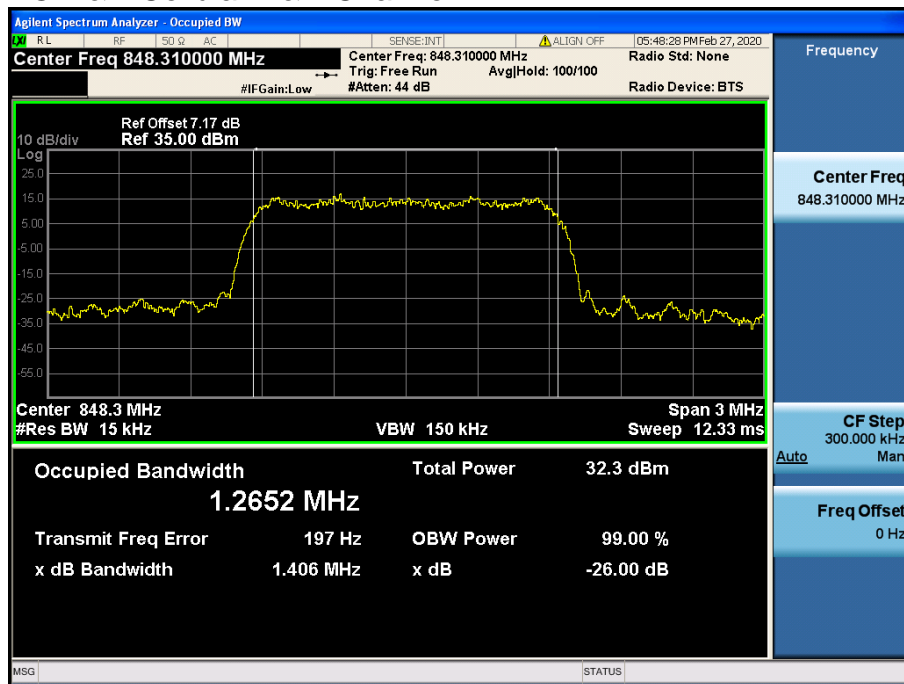


CDMA 1x & Cellular & Channel: 777

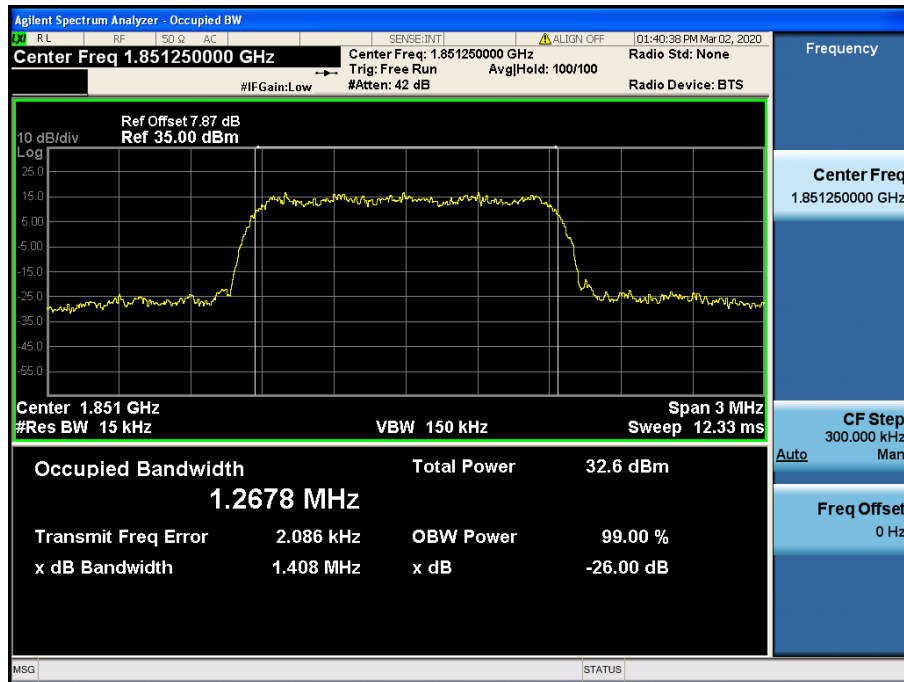




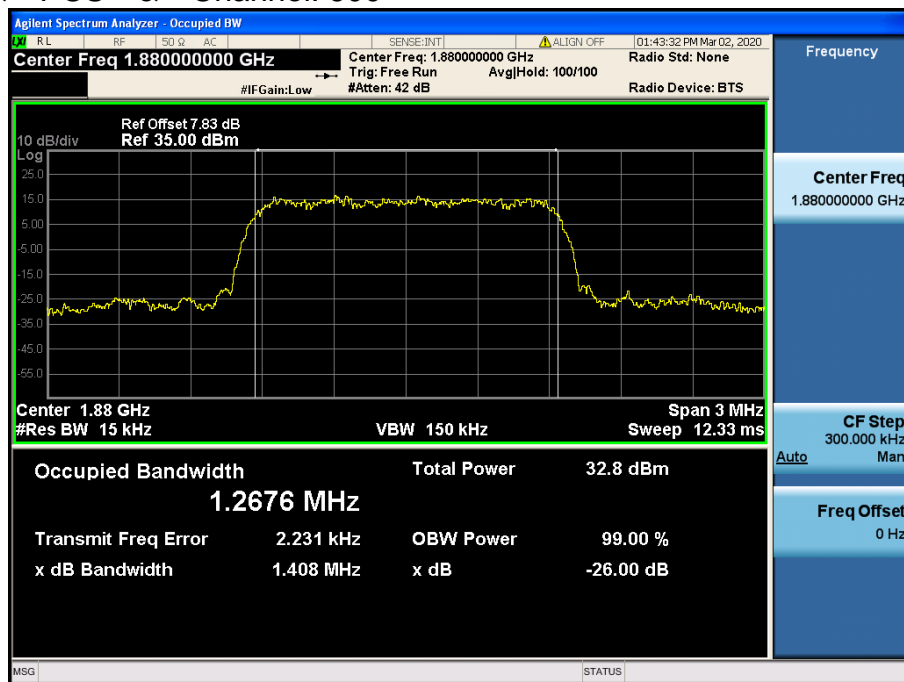
CDMA 1x EVDO & Cellular & Channel: 777



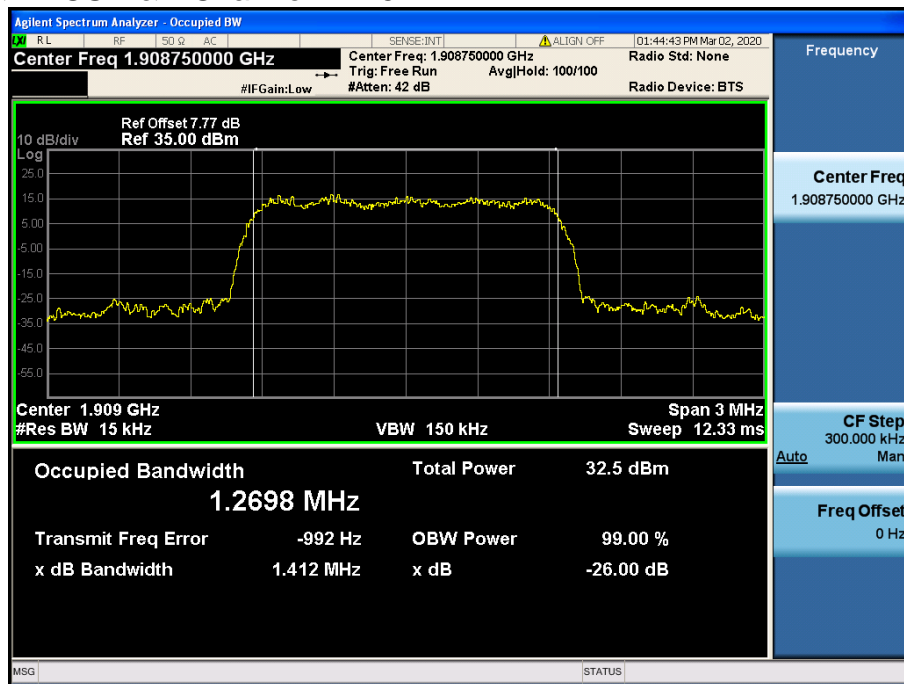
## CDMA 1x &amp; PCS &amp; Channel: 25



## CDMA 1x &amp; PCS &amp; Channel: 600

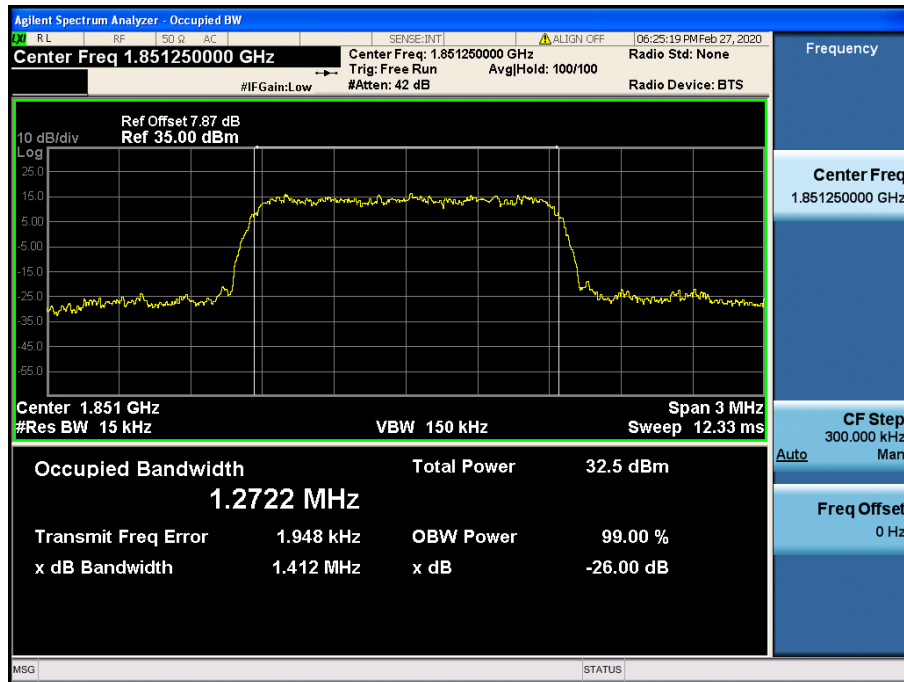


CDMA 1x & PCS & Channel: 1175

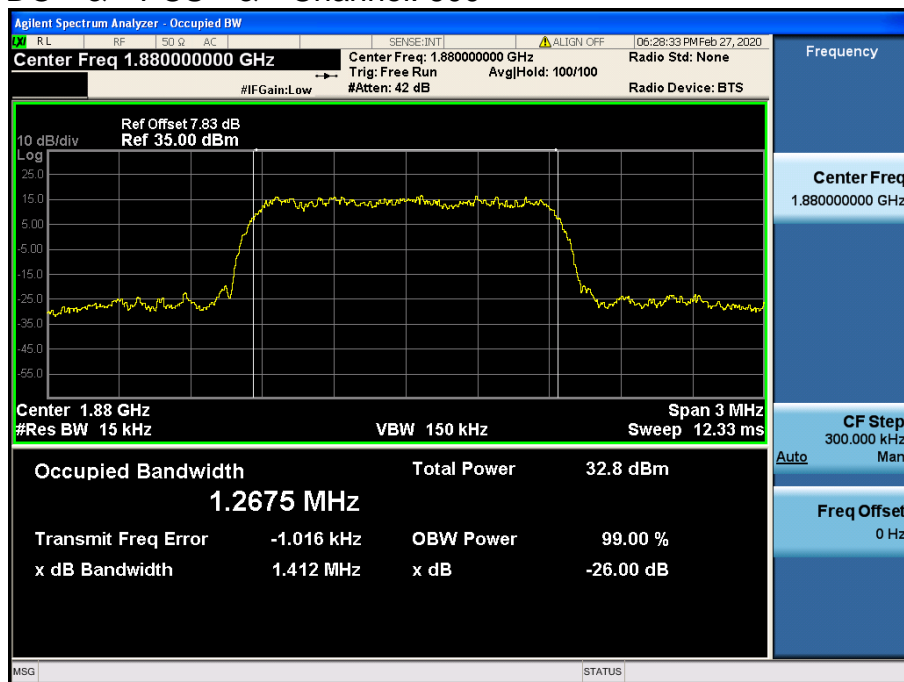




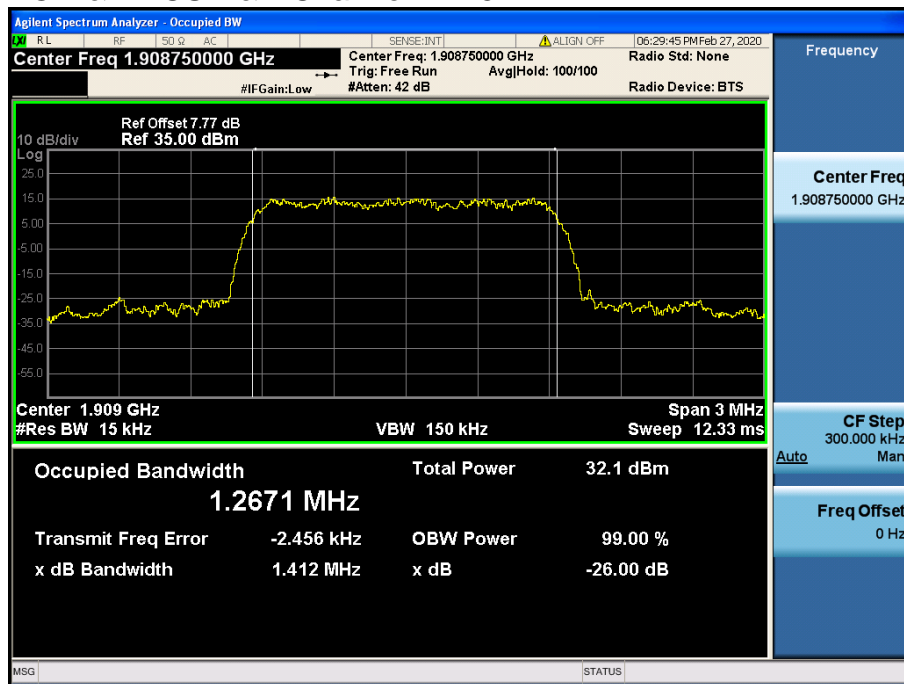
CDMA 1x EVDO & PCS & Channel: 25



CDMA 1x EVDO & PCS & Channel: 600

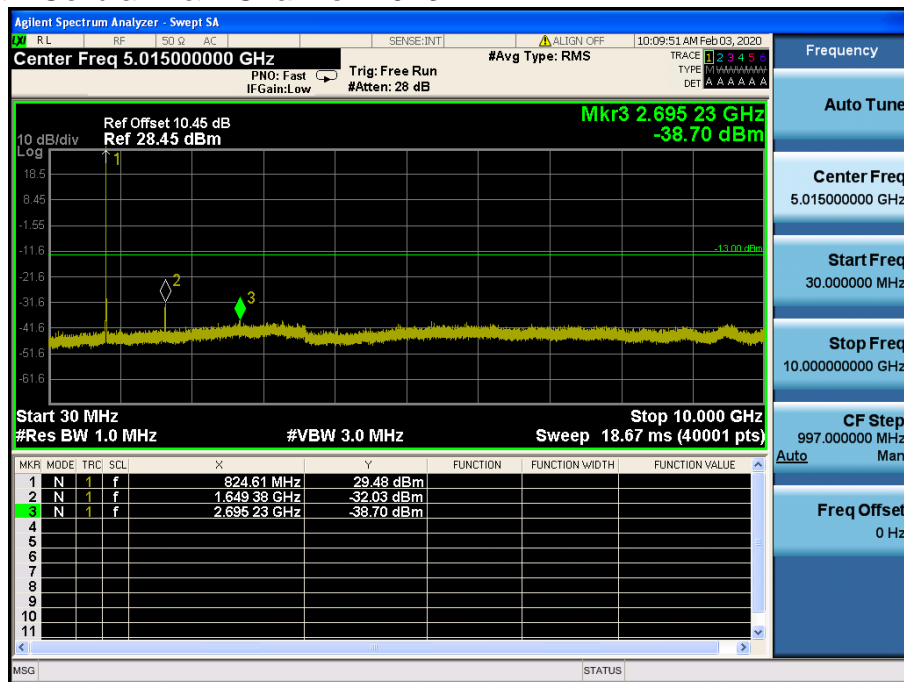


CDMA 1x EVDO & PCS & Channel: 1175

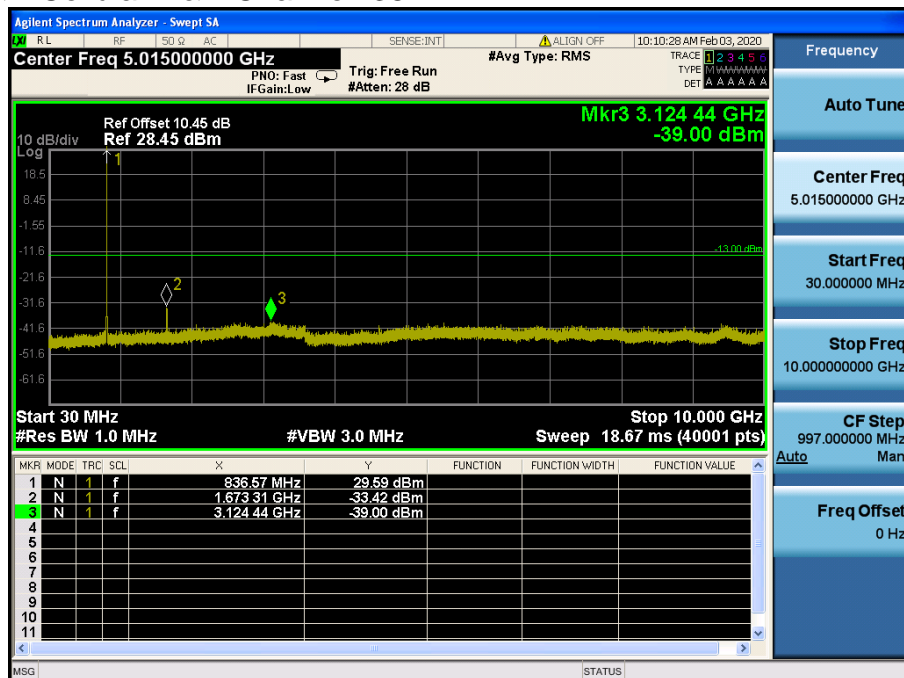


### 8.3 SPURIOUS EMISSIONS AT ANTENNA TERMINAL

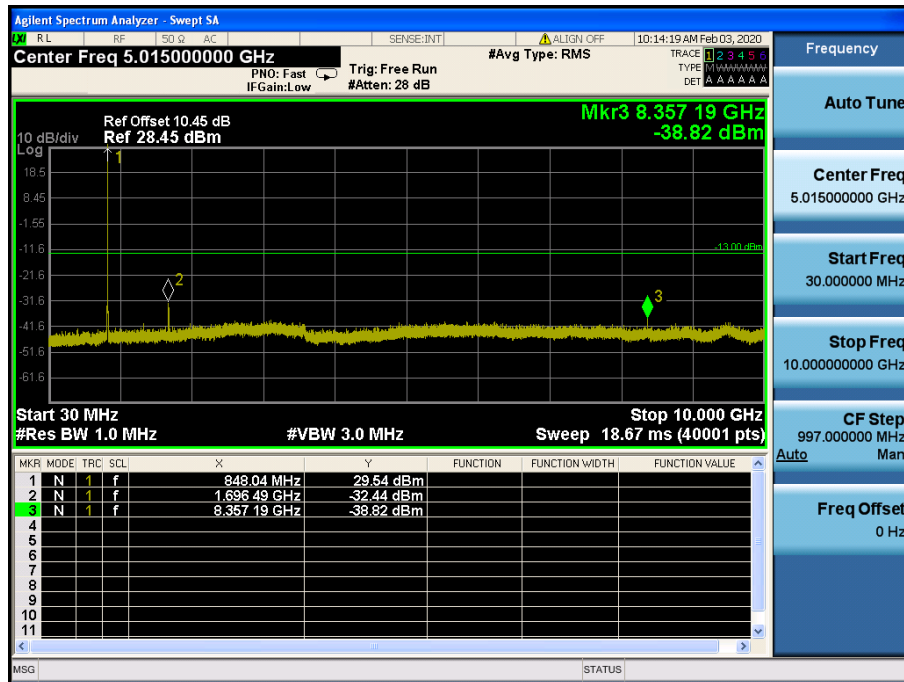
CDMA 1x & Cellular & Channel: 1013



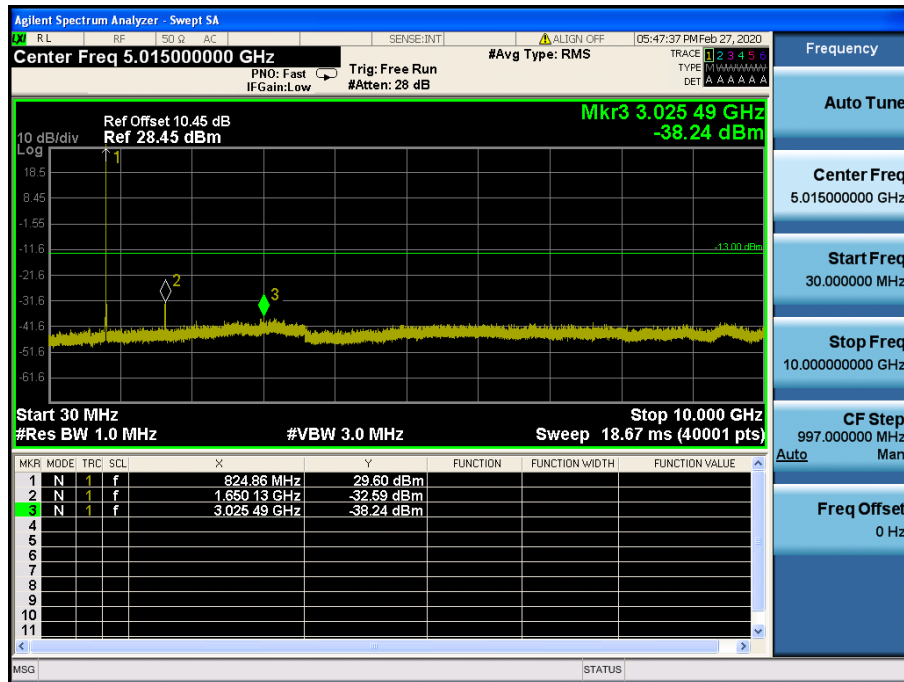
CDMA 1x & Cellular & Channel: 384



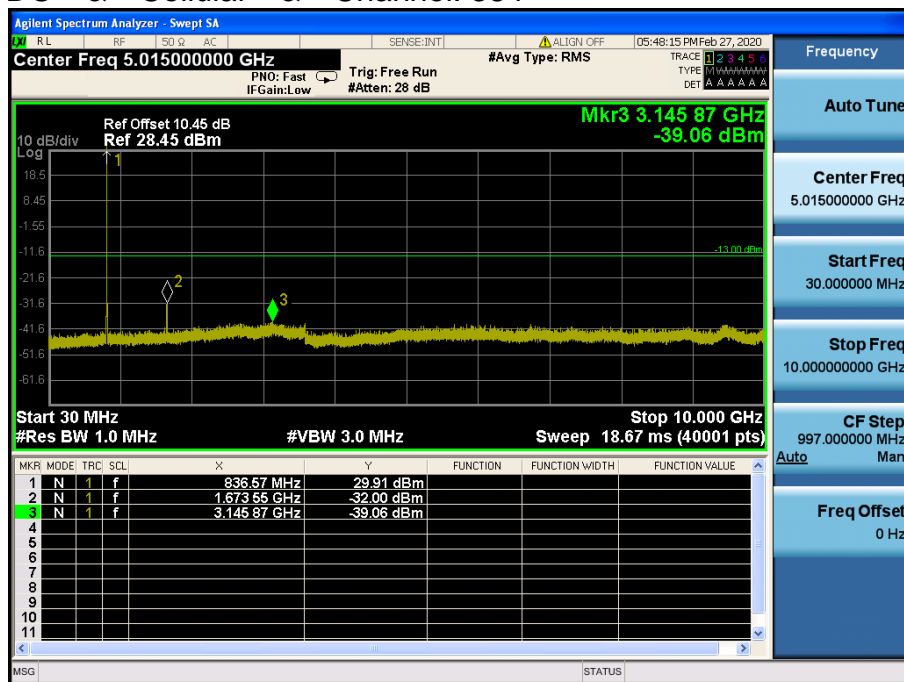
CDMA 1x & Cellular & Channel: 777



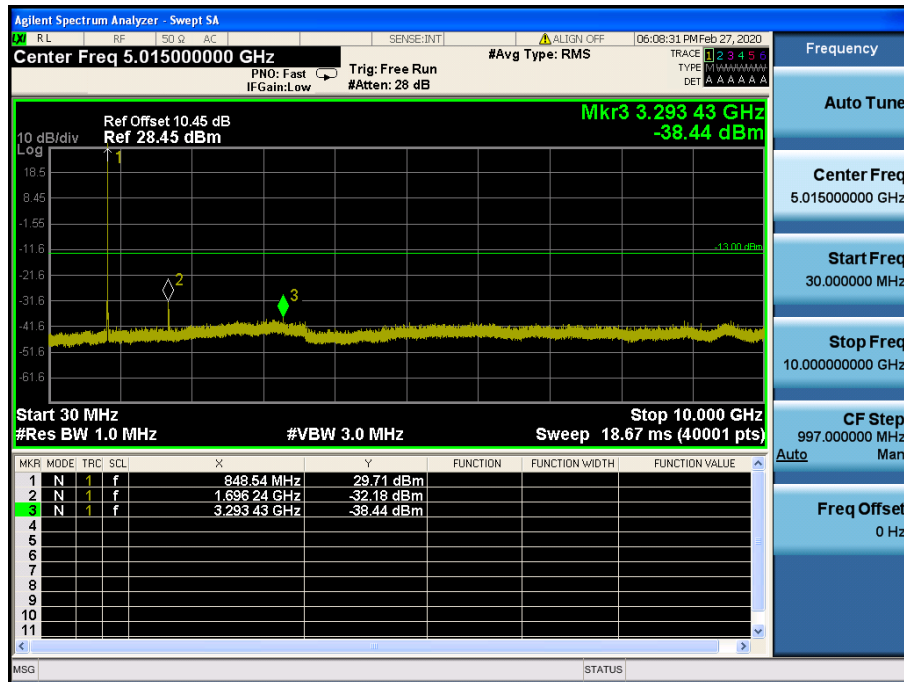
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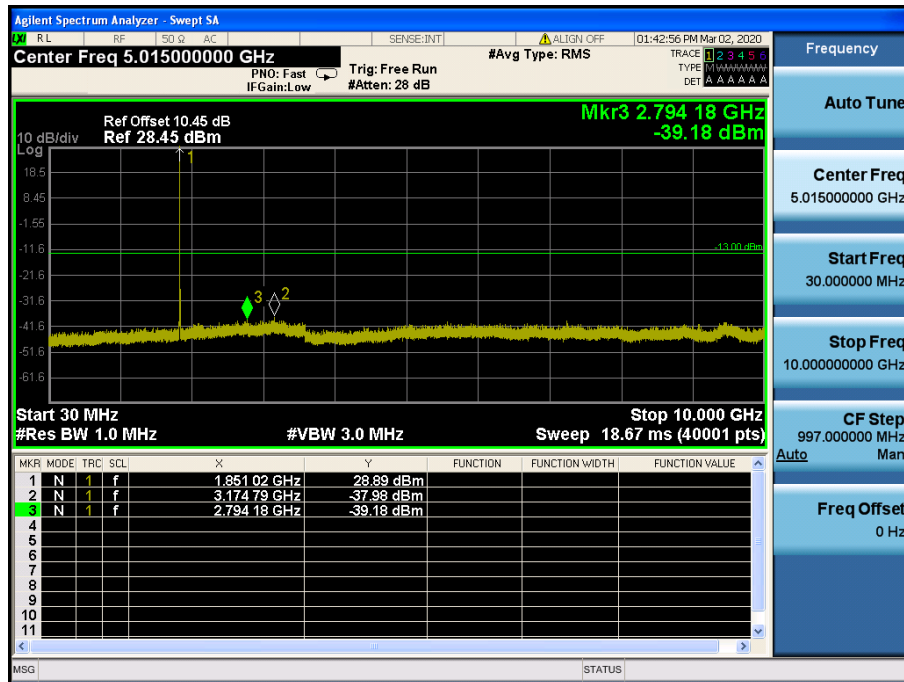
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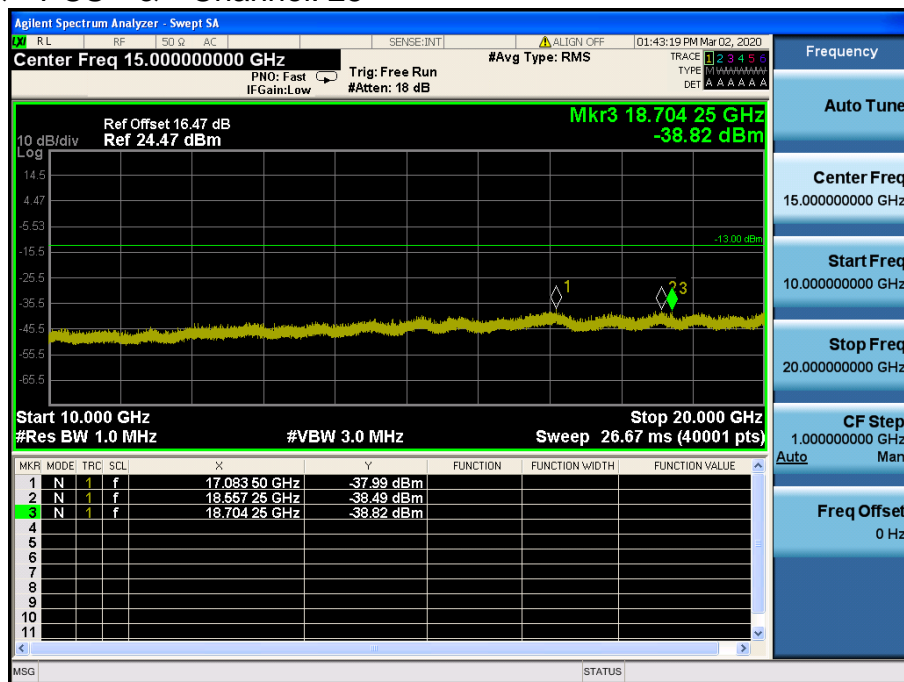
## CDMA 1x EVDO &amp; Cellular &amp; Channel: 777



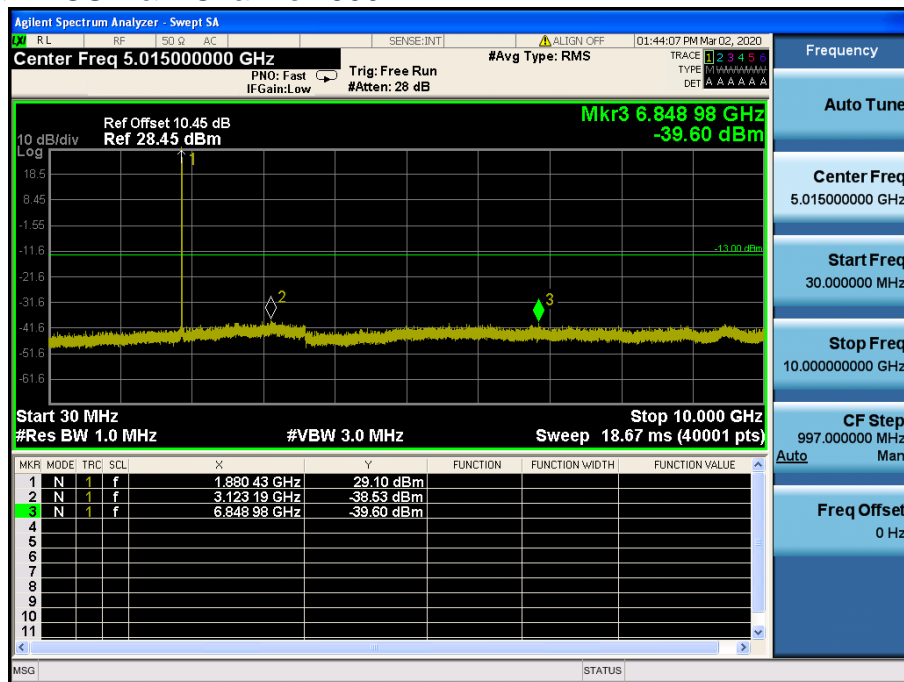
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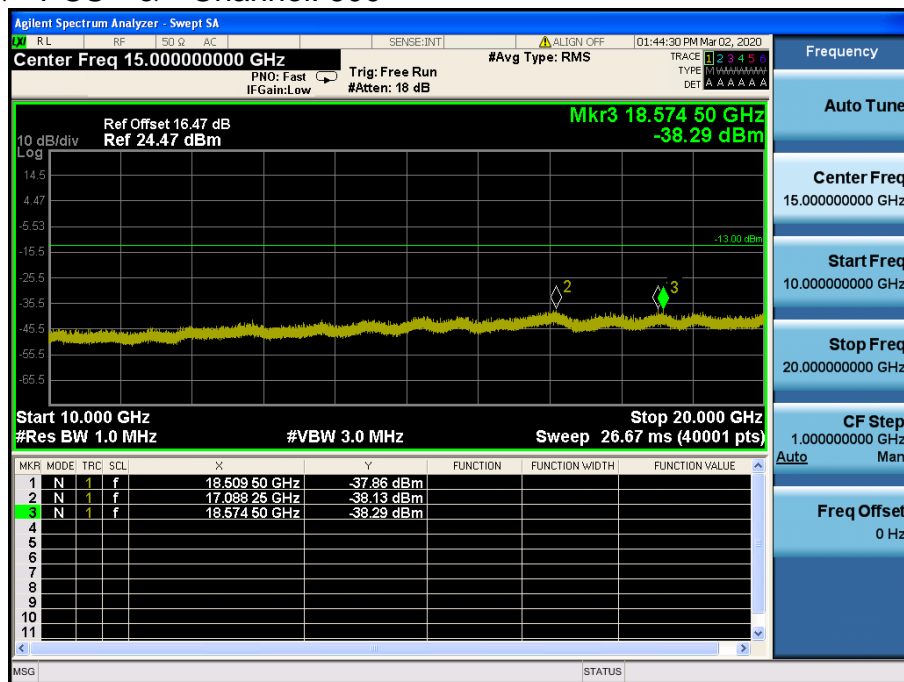
## CDMA 1x &amp; PCS &amp; Channel: 25



CDMA 1x & PCS & Channel: 600

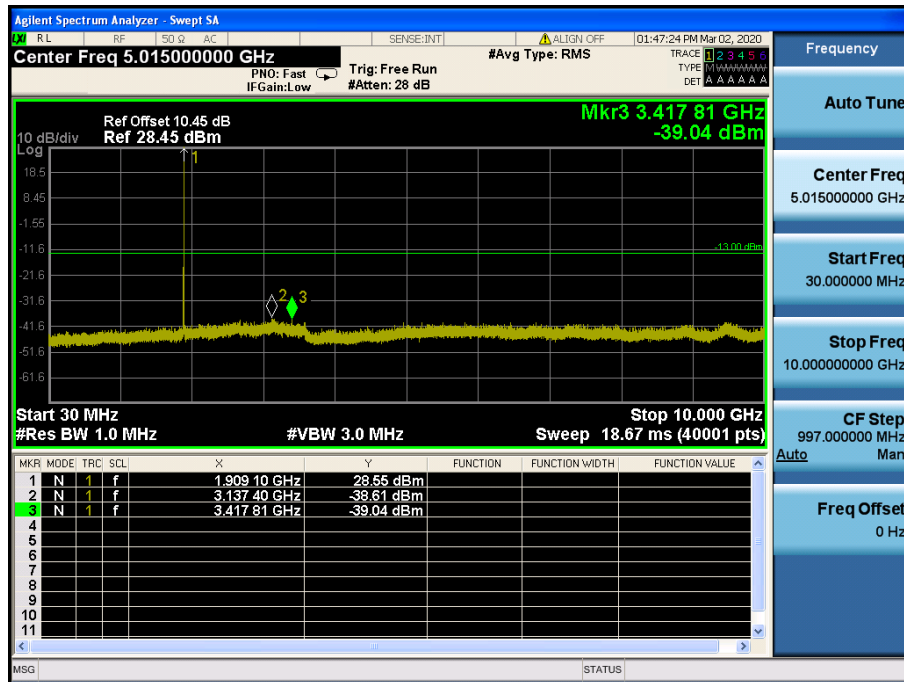


CDMA 1x & PCS & Channel: 600

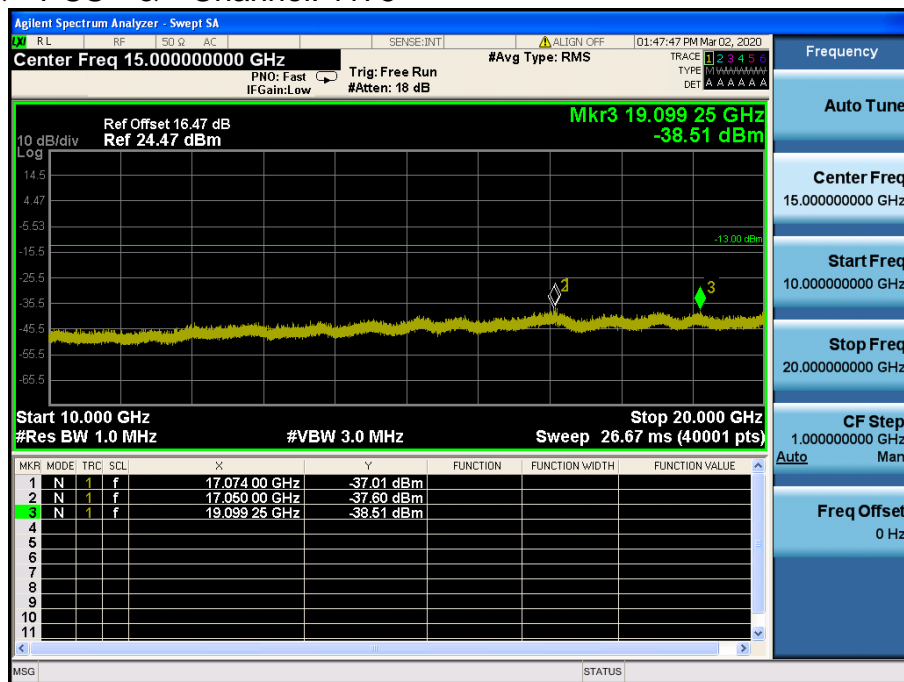




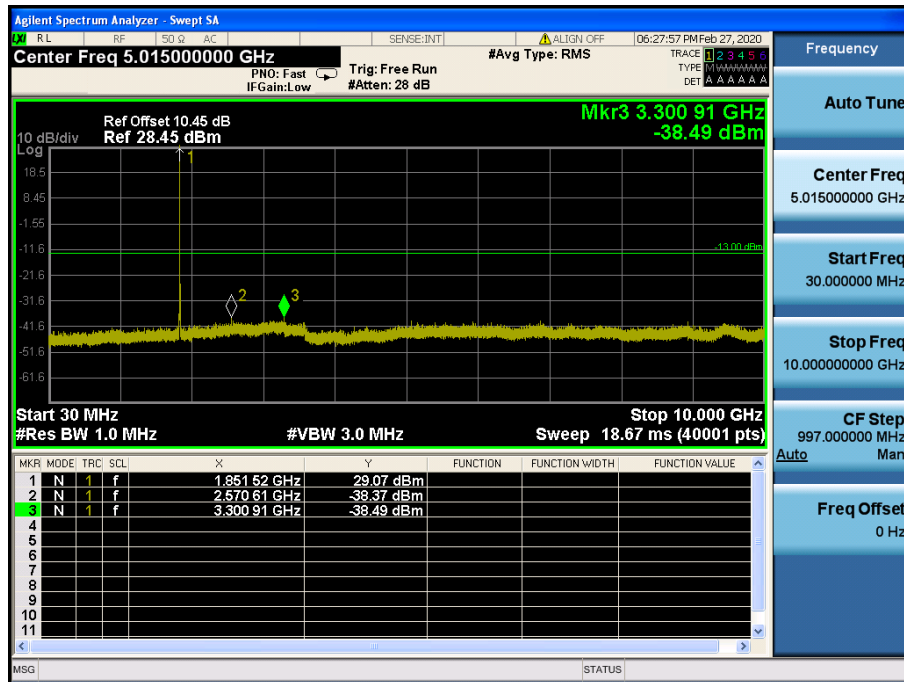
## CDMA 1x &amp; PCS &amp; Channel: 1175



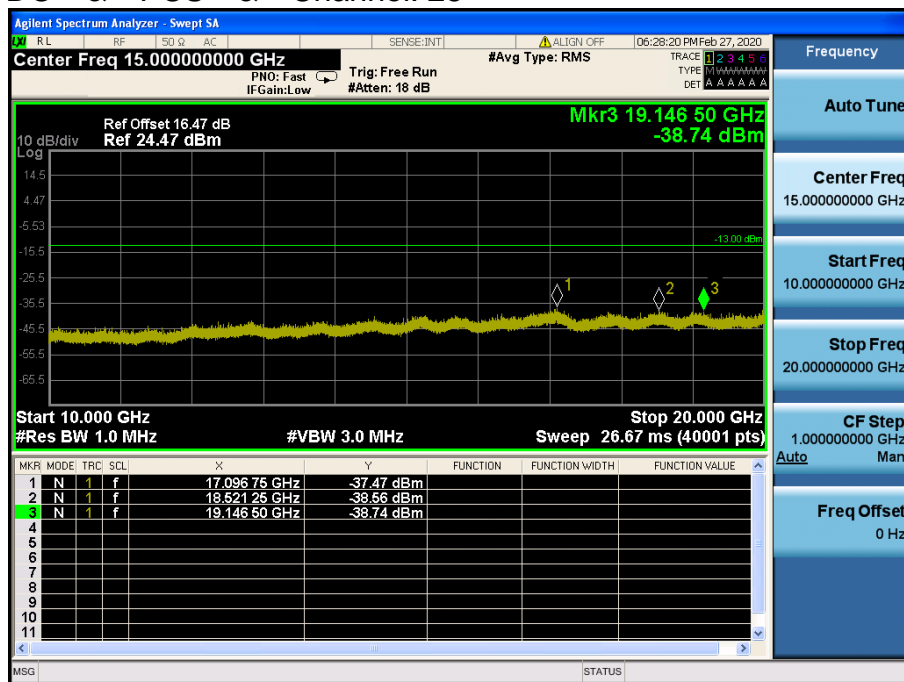
## CDMA 1x &amp; PCS &amp; Channel: 1175



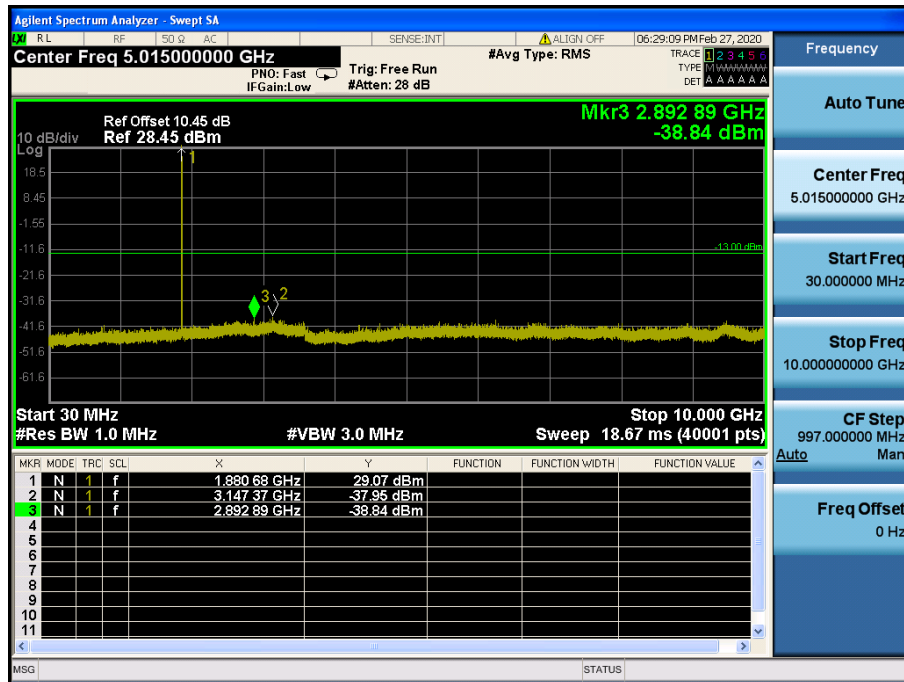
# CDMA 1x EVDO & PCS & Channel: 25



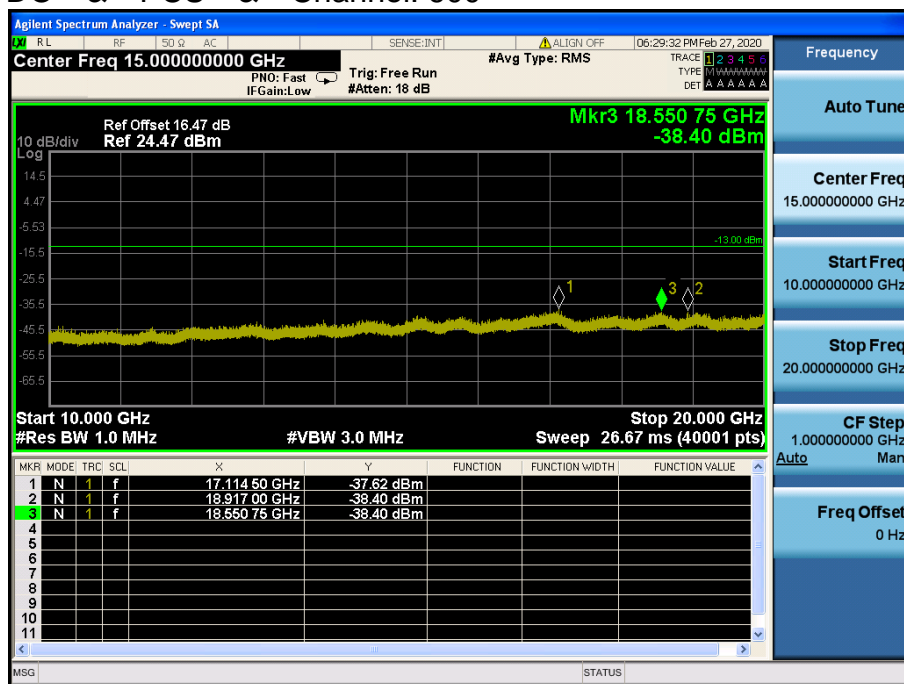
# CDMA 1x EVDO & PCS & Channel: 25



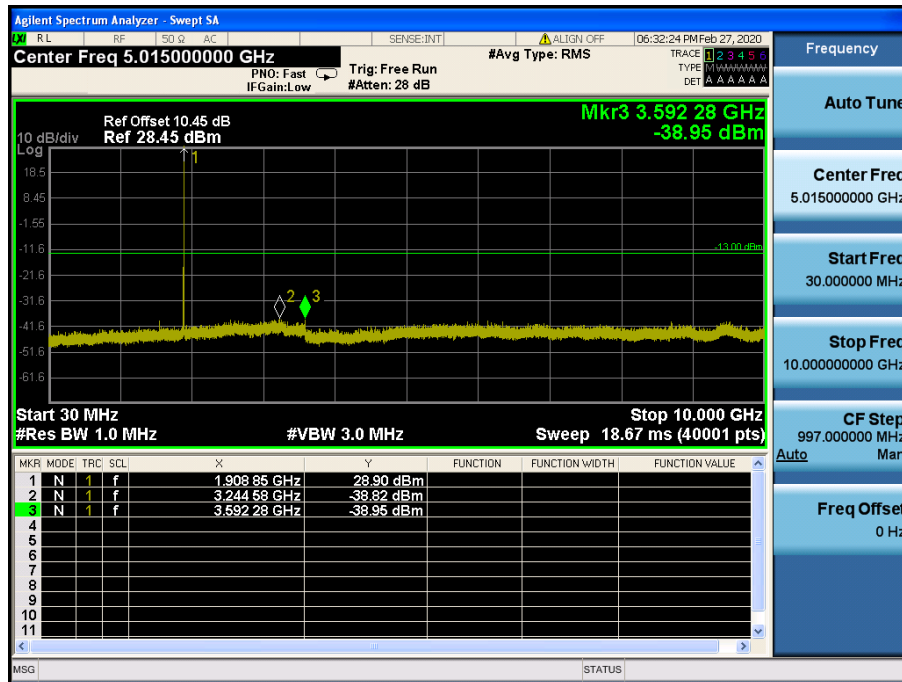
## CDMA 1x EVDO &amp; PCS &amp; Channel: 600



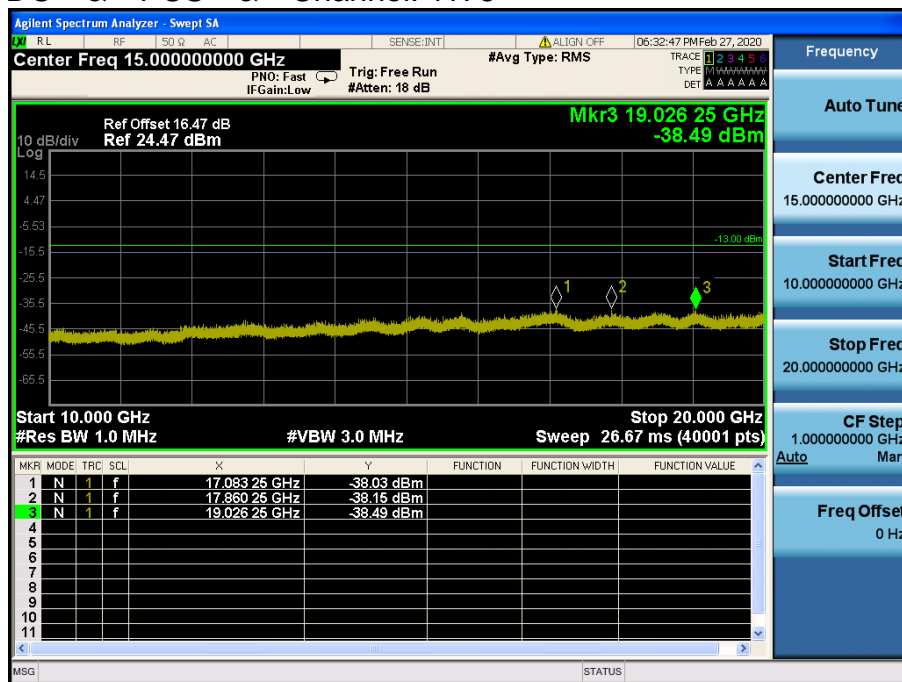
## CDMA 1x EVDO &amp; PCS &amp; Channel: 600



CDMA 1x EVDO & PCS & Channel: 1175



CDMA 1x EVDO & PCS & Channel: 1175

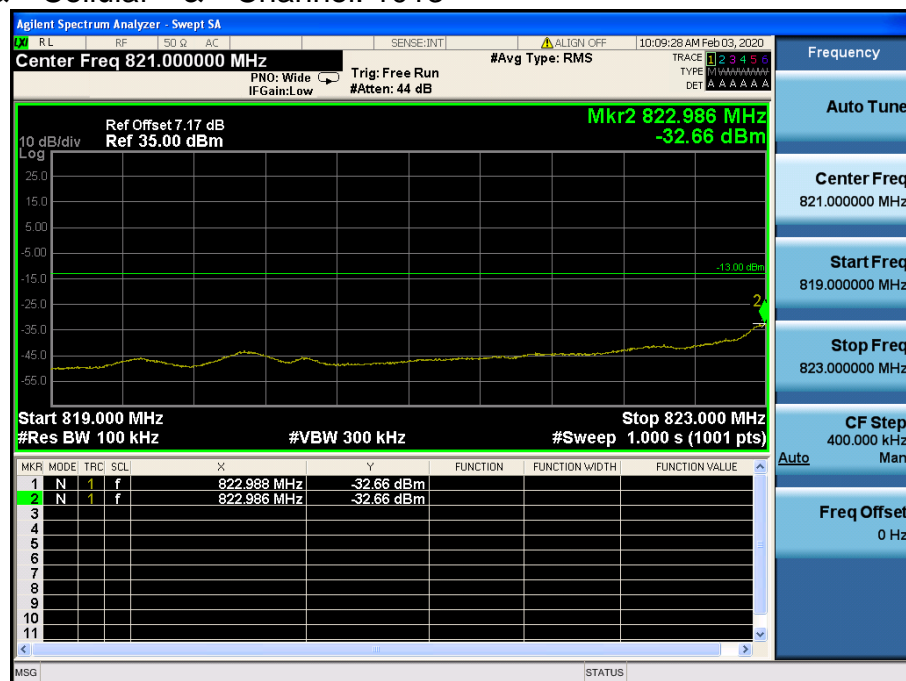


## 8.4 BAND EDGE EMISSIONS AT ANTENNA TERMINAL

CDMA 1x & Cellular & Channel: 1013



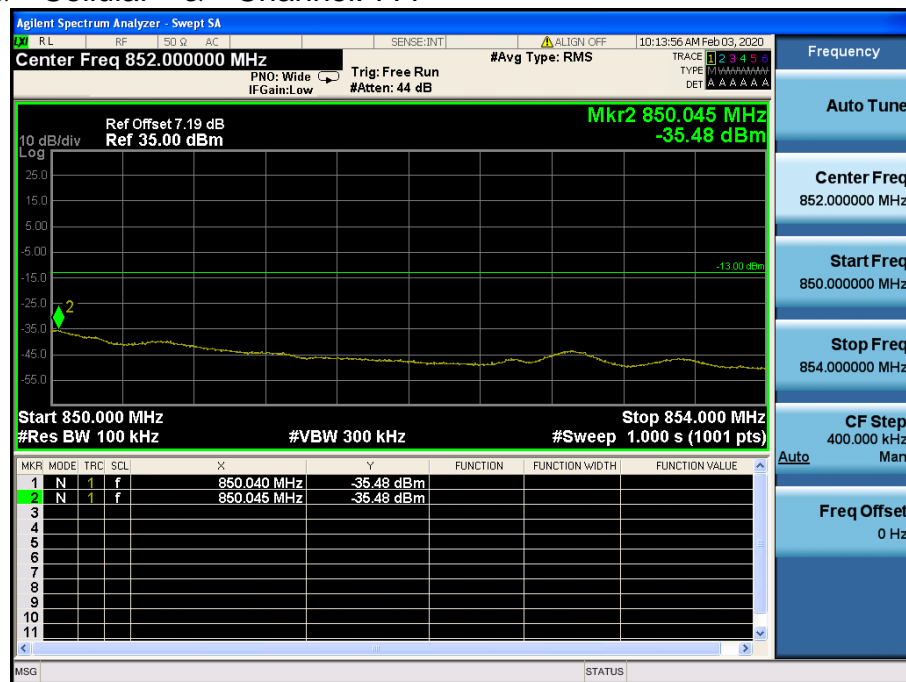
CDMA 1x & Cellular & Channel: 1013



# CDMA 1x & Cellular & Channel: 777



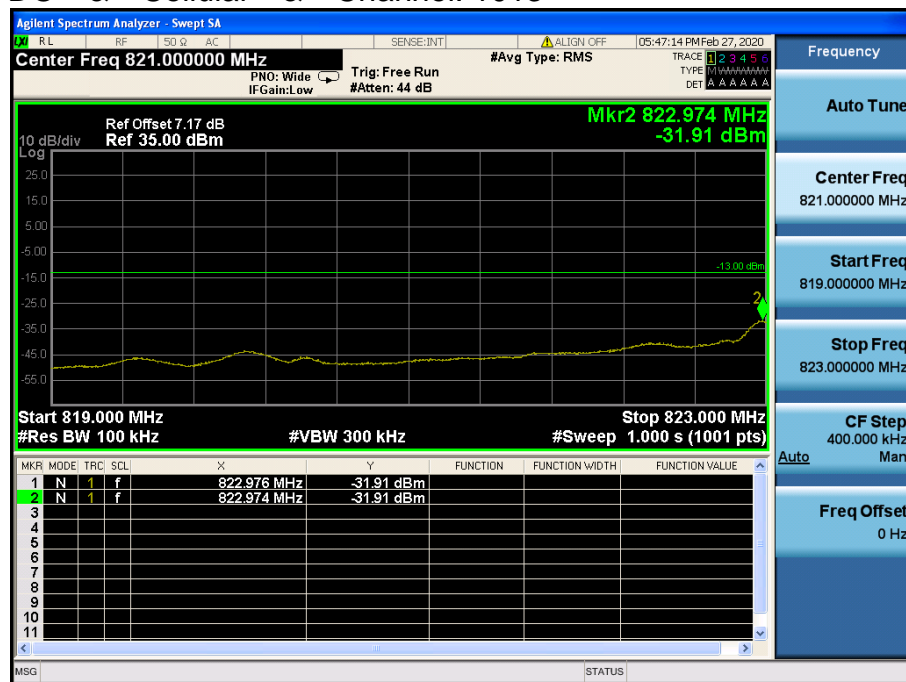
# CDMA 1x & Cellular & Channel: 777



# CDMA 1x EVDO & Cellular & Channel: 1013



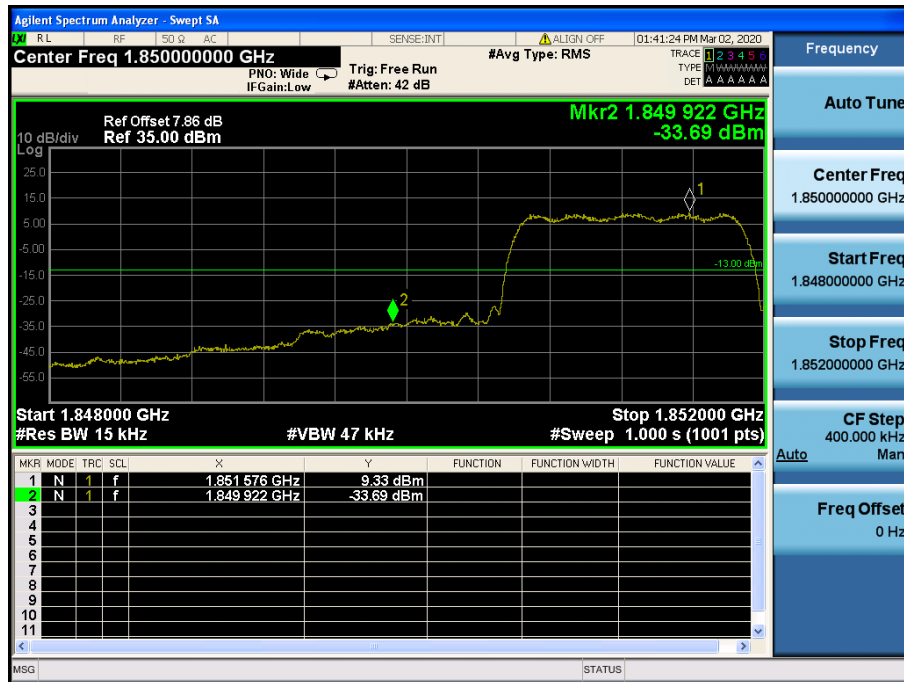
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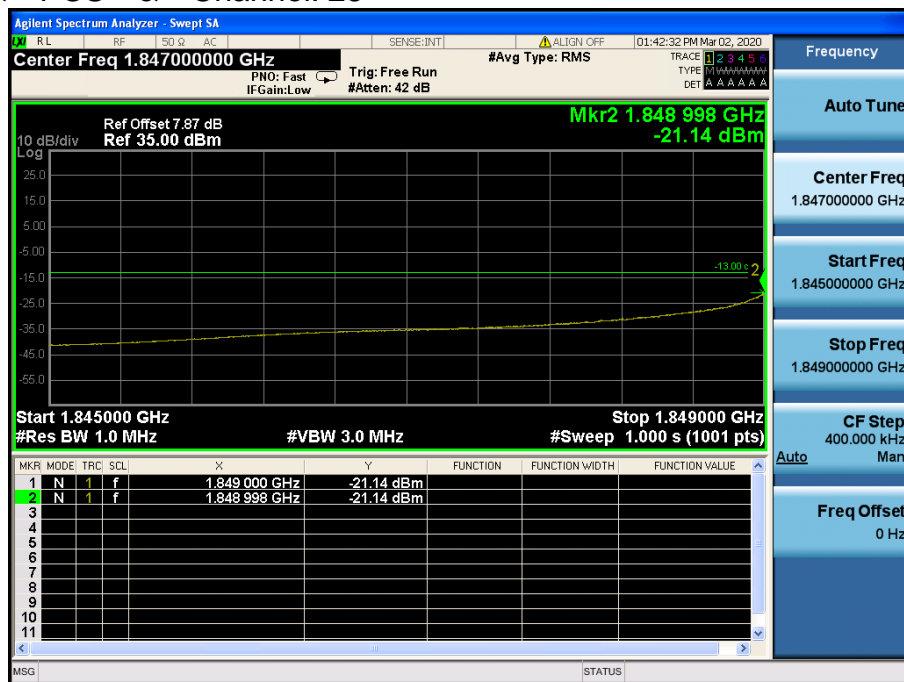




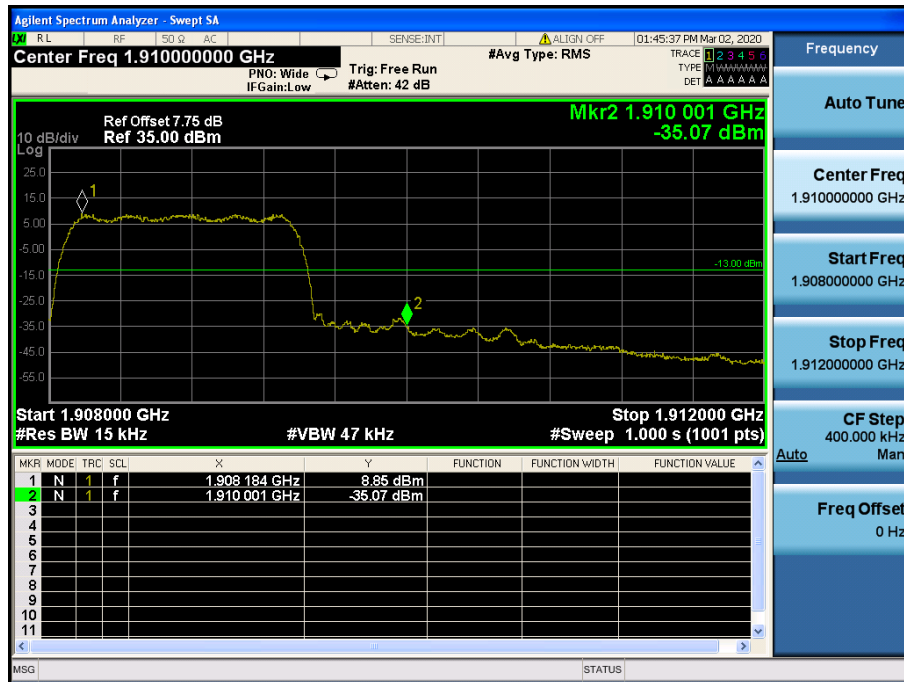
# CDMA 1x & PCS & Channel: 25



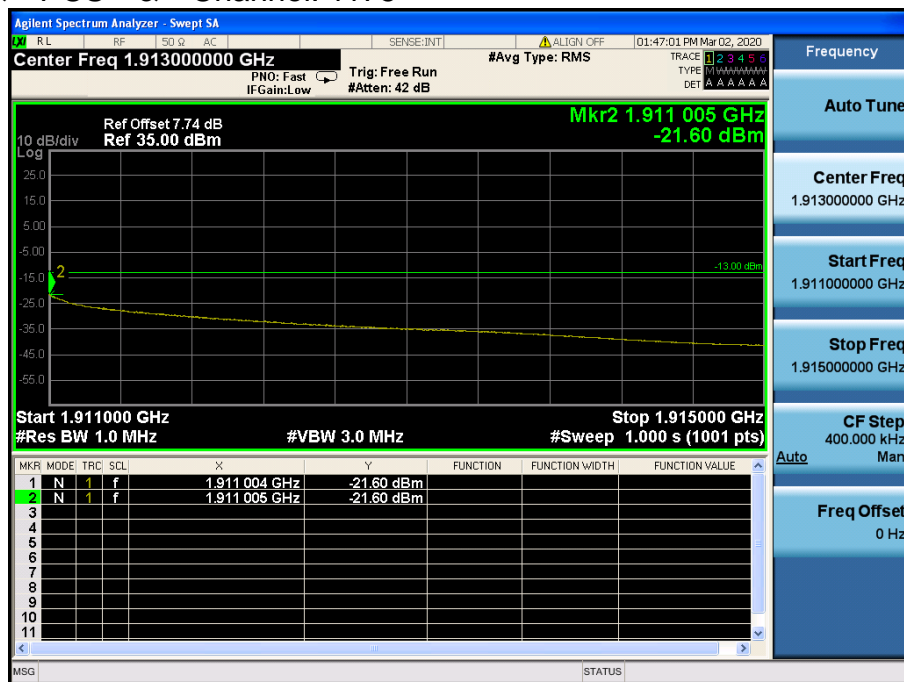
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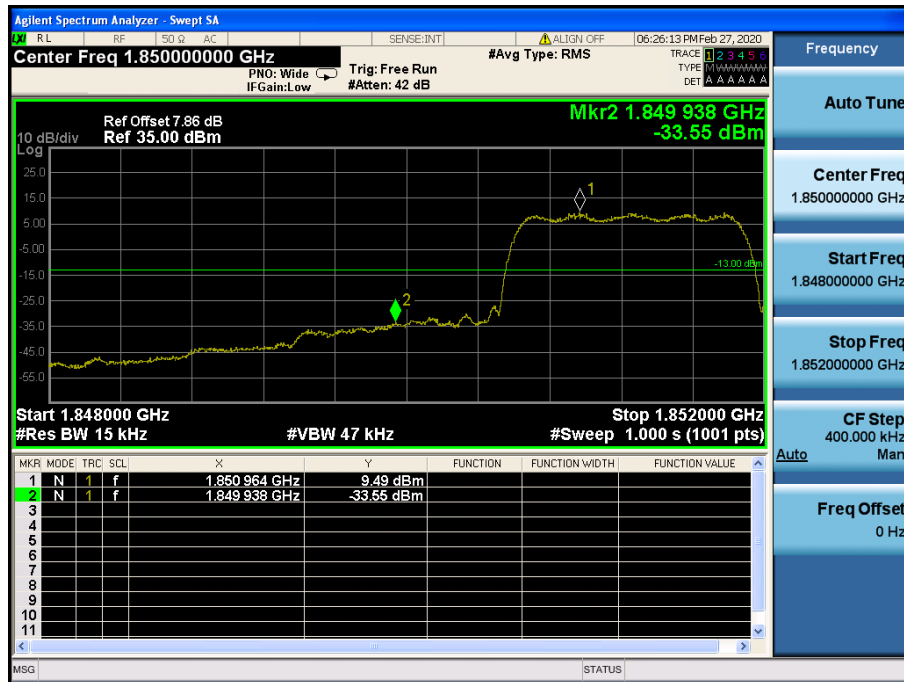
## CDMA 1x &amp; PCS &amp; Channel: 1175



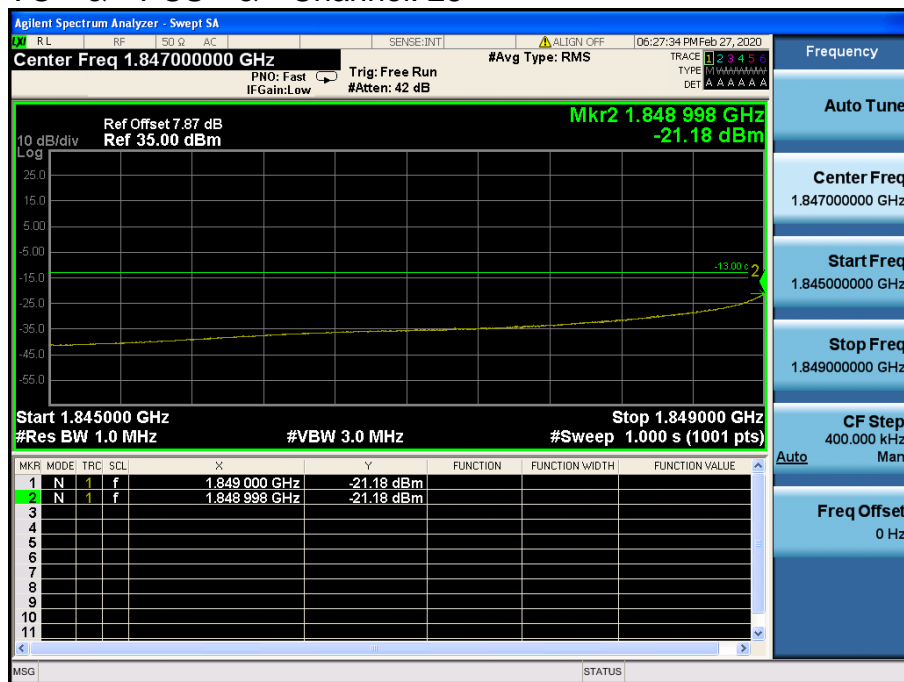
## CDMA 1x &amp; PCS &amp; Channel: 1175



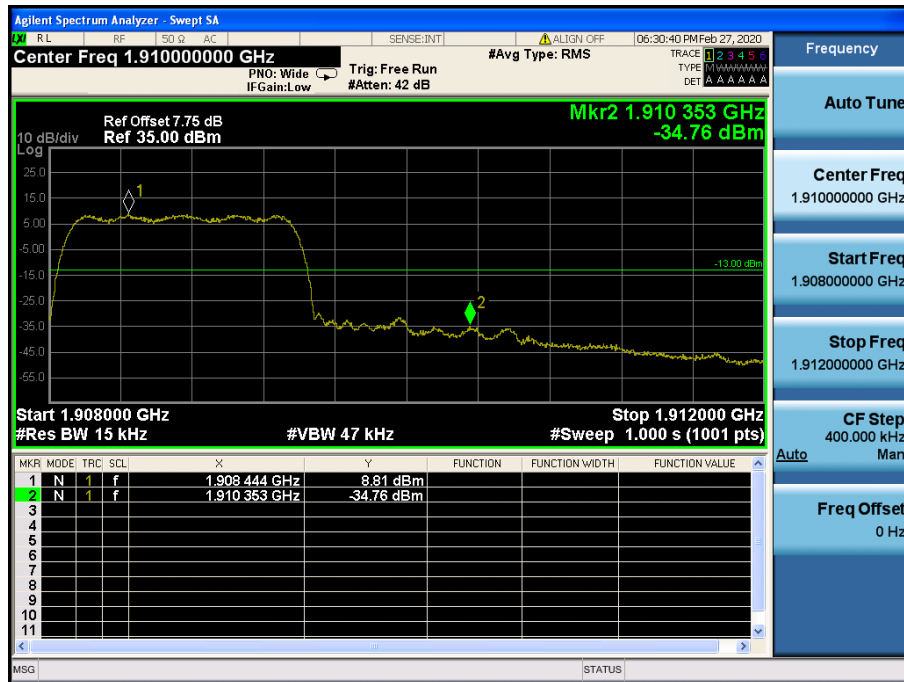
# CDMA 1x EDVO & PCS & Channel: 25



# CDMA 1x EDVO & PCS & Channel: 25



CDMA 1x EDVO & PCS & Channel: 1175



CDMA 1x EDVO & PCS & Channel: 1175

