

# HCT CO., LTD.

## CERTIFICATE OF COMPLIANCE FCC Certification

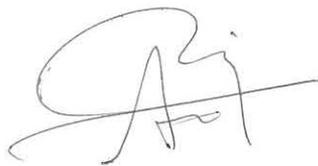
<b>Applicant Name:</b> LG Electronics Inc.	<b>Date of Issue:</b> December 27, 2013
<b>Address:</b> 19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 451-713, Korea	<b>Test Site/Location:</b> HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea
	<b>Report No.:</b> HCTR1312FR04-3
	<b>HCT FRN:</b> 0005866421

<b>FCC ID:</b>	<b>BEJLTTC10</b>
<b>APPLICANT:</b>	<b>LG Electronics Inc.</b>

<b>FCC Model(s):</b>	GEN10NADNA
<b>EUT Type:</b>	CDMA/GSM/WCDMA/LTE Telematics NAD module
<b>FCC Classification:</b>	PCS Licensed Transmitter (PCB)
<b>FCC Rule Part(s):</b>	§22, §24, §2
<b>Tx Frequency:</b>	824.70 — 848.31 MHz (CDMA) 1 851.25 — 1 908.75 MHz (PCS CDMA)
<b>Rx Frequency:</b>	869.70 — 893.31 MHz (CDMA) 1 931.25 — 1 988.75 MHz (PCS CDMA)
<b>Max. RF Output Power:</b>	0.246 W CDMA (23.91 dBm)/ 0.294 W PCS CDMA (24.69 dBm) 0.249 W CDMA EVDO (23.96 dBm)/ 0.288 W PCS EVDO (24.60 dBm)
<b>Emission Designator(s):</b>	1M28F9W (CDMA), 1M27F9W (PCS CDMA), 1M28F9W (CDMA EVDO), 1M27F9W (PCS CDMA EVDO)

The measurements shown in this report were made in accordance with the procedures specified in §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S. C.853(a)



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**Approved by**  
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**Manager of RF Team**

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# Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1312FR04	December 05, 2013	-First Approval Report
HCTR1312FR04-1	December 16, 2013	- Revised the following parts : Test period / Test equipment / Conducted power / Section 7.2, 7.3 Notes - Updated the plots on pages 46~53
HCTR1312FR04-2	December 19, 2013	- Revised conducted output power
HCTR1312FR04-3	December 27, 2013	- Revised Antenna Gain Value on Page 4.

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# MEASUREMENT REPORT

## 1. GENERAL INFORMATION

**Applicant Name:** LG Electronics Inc.  
**Address:** 19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 451-713, Korea  
**FCC ID:** BEJLTTTC10  
**Application Type:** Certification  
**FCC Classification:** PCS Licensed Transmitter (PCB)  
**FCC Rule Part(s):** §22, §24, §2  
**EUT Type:** CDMA/GSM/WCDMA/LTE Telematics NAD module  
**FCC Model(s):** GEN10NADNA  
**Tx Frequency:** 824.70 — 848.31 MHz (CDMA)  
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**Max. RF Output Power:** 0.246 W CDMA (23.91 dBm)/ 0.294 W PCS CDMA (24.69 dBm)  
 0.249 W CDMA EVDO (23.96 dBm)/ 0.288 W PCS EVDO (24.60 dBm)  
**Emission Designator(s):** 1M28F9W (CDMA), 1M27F9W (PCS CDMA),  
 1M28F9W (CDMA EVDO), 1M27F9W (PCS CDMA EVDO)  
**Date(s) of Tests:** November 06, 2013 ~ December 18, 2013  
**Antenna Specification** Manufacturer: Laird Technologies  
 Antenna type: MIMO capable vehicle dome antenna  
 Peak Gain: CDMA : -2.4 dBi  
 PCS CDMA : -0.3 dBi

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## **2. INTRODUCTION**

### **2.1. EUT DESCRIPTION**

The LG Electronics Inc. GEN10NADNA CDMA/GSM/WCDMA/LTE Telematics NAD module consists of Cellular CDMA and PCS.

### **2.2. 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.

### **2.3. TEST FACILITY**

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

### **3. DESCRIPTION OF TESTS**

#### **3.1 CONDUCTED OUTPUT POWER**

##### Test Procedure

Conducted Output Power is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r01, June 7, 2013, Section 5.2.

##### **5.2.1 Procedure for use with a spectrum/signal analyzer when EUT can be configured to transmit continuously or when sweep triggering/signal gating can be properly implemented**

The EUT is considered to transmit continuously if it can be configured to transmit at a burst duty cycle of greater than or equal to 98% throughout the duration of the measurement. If this condition can be achieved, then the following procedure can be used to measure the average output power of the EUT.

This procedure can also be used when the EUT cannot be configured to transmit continuously, provided that the measurement instrument can be configured to trigger a sweep at the beginning of each full-power transmission burst, and the sweep time is less than or equal to the minimum transmission time during each burst (*i.e.*, no burst off-time is to be included in the measurement).

- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW  $\geq 3 \times$  RBW.
- d) Set number of points in sweep  $\geq 2 \times$  span / RBW.
- e) Sweep time = auto-couple.
- f) Detector = RMS (power averaging).
- g) If the EUT can be configured to transmit continuously (*i.e.*, burst duty cycle  $\geq 98\%$ ), then set the trigger to free run.
- h) If the EUT cannot be configured to transmit continuously (*i.e.*, burst duty cycle  $< 98\%$ ), 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. Ensure that the sweep time is less than or equal to the transmission burst duration.
- i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode.
- j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band 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.

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### 3.2 ERP/EIRP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

Note: ERP(Effective Radiated Power), EIRP(Equivalent Isotropic Radiated Power)

#### Test Procedure

Radiated emission measurements are performed in the Fully-anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-C-2004 Clause 2.2.17. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using a positive peak detector.

A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_{d(dBm)} = P_{g(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

Where:  $P_d$  is the dipole equivalent power and  $P_g$  is the generator output power into the substitution antenna.

The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

#### **Radiated spurious emissions**

Frequency Range : 30 MHz ~ 10<sup>th</sup> Harmonics of highest channel fundamental frequency.

Note : This device was tested under all R.C.s and S.O.s and worst case is reported with RC3/SO55(CDMA) and RC1/SO55(PCS) with 'All Up' power control bits.

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### 3.3 PEAK- TO- AVERAGE RATIO

#### Test Procedure

Peak to Average Power Ratio is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r01, June 7, 2013, Section 5.7.

#### - Section 5.7.1 CCDF Procedure

- a) Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- b) Set the number of counts to a value that stabilizes the measured CCDF curve;
- c) Set the measurement interval as follows:
  - 1) for continuous transmissions, set to 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 and set the measurement interval to a time that is less than or equal to the burst duration.
- d) Record the maximum PAPR level associated with a probability of 0.1%.

#### - Section 5.7.2 Alternate Procedure

Use one of the procedures presented in 5.1 to measure the total peak power and record as  $P_{Pk}$ . Use one of the applicable procedures presented 5.2 to measure the total average power and record as  $P_{Avg}$ . Determine the P.A.R. from:  $P.A.R_{(dB)} = P_{Pk (dBm)} - P_{Avg (dBm)}$  ( $P_{Avg}$  = Average Power + Duty cycle Factor)

#### 5.1.1 Peak power measurements with a spectrum/signal analyzer or EMI receiver

The following procedure can be used to determine the total peak output power.

- a) Set the RBW  $\geq$  OBW.
- b) Set VBW  $\geq 3 \times$  RBW.
- c) Set span  $\geq 2 \times$  RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Ensure that the number of measurement points  $\geq$  span/RBW.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the peak amplitude level.

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**5.2.2 Procedures for use with a spectrum/signal analyzer when EUT cannot be configured to transmit continuously and sweep triggering/signal gating cannot be properly implemented**

If the EUT cannot be configured to transmit continuously (burst duty cycle < 98%), then one of the following procedures can be used. The selection of the applicable procedure will depend on the characteristics of the measured burst duty cycle.

Measure the burst duty cycle with a spectrum/signal analyzer or EMC receiver can be used in zero-span mode if the response time and spacing between bins on the sweep are sufficient to permit accurate measurement of the burst on/off time of the transmitted signal.

**5.2.2.2 Constant burst duty cycle**

If the measured burst duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then:

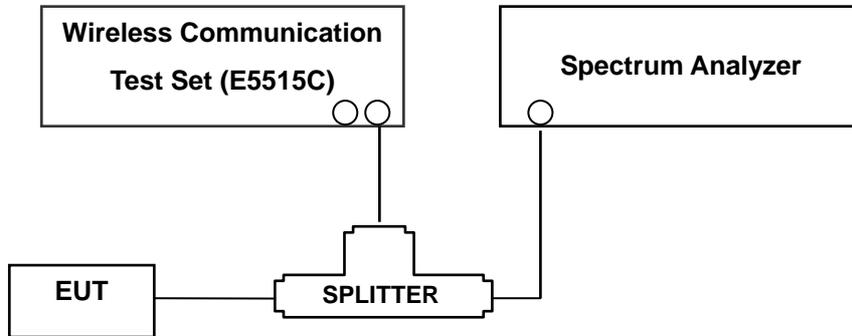
- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW ≥ 3 x RBW.
- d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
- e) Sweep time = auto.
- f) Detector = RMS (power averaging).
- g) Set sweep trigger to “free run”.
- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- j) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission).

For example, add 10 log (1/0.25) = 6 dB if the duty cycle is a constant 25%.

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### 3.4 OCCUPIED BANDWIDTH.

Test set-up



(Configuration of conducted Emission measurement)

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 power of a given emission.

Test Procedure

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels(low, middle and high operational range.)

The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Note : This device was tested under all R.C.s and S.O.s with 'All Up' power control bits.

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

#### Test Procedure

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer.

On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB. The RBW settings used in the testing are greater than 1 % of the occupied bw. The 1 MHz RBW was used to scan from 10 MHz to 10 GHz. (GSM1900 Mode: 10 MHz to 20 GHz). A display line was placed at - 13 dBm to show compliance. The high, lowest and a middle channel were tested for out of band measurements.

Measurements of all out of band are made on RBW = 1MHz and VBW  $\geq$  3 MHz in the worst case despite RBW = 100 kHz and VBW  $\geq$  300 kHz upon 1 GHz.

- RBW = 1 MHz
- VBW  $\geq$  3 MHz
- Detector = Peak
- Trace Mode = max hold
- Sweep time = auto
- Number of points in sweep  $\geq$  2 \* Span / RBW

- Band Edge Requirement : According to FCC 22.917 , 24.238(a) specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. 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.

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels(low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

Note : This device was tested under all R.C.s and S.O.s with 'All Up' power control bits.

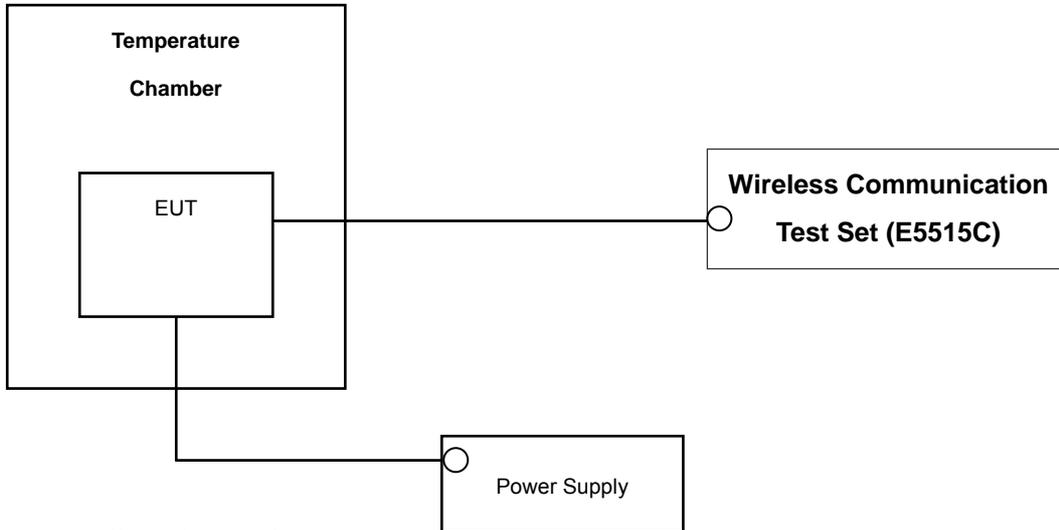
**NOTES:** The analyzer plot offsets were determined by below conditions.

- For CDMA, total offset 27.0 dBm = 20 dBm attenuator + 6 dBm Splitter + 1.0 dBm RF cables,
- For PCS, total offset 28.0 dBm = 20 dBm attenuator + 6 dBm Splitter + 2.0 dBm RF cables,

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### 3.6 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

#### Test Set-up



\* Nominal Operating Voltage

#### Test Procedure

The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from the end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency.

#### Time Period and Procedure:

The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).

1. 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.
2. 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.

**NOTE: The EUT is tested down to the endpoint.**

Note : This device was tested under all R.C.s and S.O.s with 'All Up' power control bits.

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## 4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
Agilent	E9327A/ Power Sensor	MY4442009	Annual	04/16/2014
MITEQ	AMF-6D-001180-35-20P/AMP	1081666	Annual	09/12/2014
Wainwright	WHK1.2/15G-10EF/H.P.F	2	Annual	04/25/2014
Wainwright	WHK3.3/18G-10EF/H.P.F	1	Annual	04/25/2014
Hewlett Packard	11667B / Power Splitter	11275	Annual	05/13/2014
Digital	EP-3010/ Power Supply	3110117	Annual	10/29/2014
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/05/2015
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	05/03/2015
Korea Engineering	KR-1005L / Chamber	KRAB05063-3CH	Annual	10/30/2014
Schwarzbeck	BBHA 9120D/ Horn Antenna	147	Biennial	05/15/2014
Schwarzbeck	BBHA 9120D/ Horn Antenna	1151	Biennial	10/05/2015
Agilent	E4440A/Spectrum Analyzer	US45303008	Annual	04/25/2014
WEINSCHL	ATTENUATOR	BR0592	Annual	10/28/2014
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	Annual	06/10/2014
Agilent	8960 (E5515C)/ Base Station	GB44400269	Annual	02/14/2014
Agilent	E9020A/Spectrum Analyzer	MY51110063	Annual	05/14/2014

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## 5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result
2.1049, 22.917(a), 24.238(a)	Occupied Bandwidth	N/A	CONDUCTED	PASS
2.1051, 22.917(a), 24.238(a)	Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	< 43 + 10log <sub>10</sub> (P[Watts]) at Band Edge and for all out-of-band emissions		PASS
2.1046	Conducted Output Power	N/A		PASS
24.232(d)	Peak- to- Average Ratio	< 13 dB		PASS
2.1055, 22.355, 24.235	Frequency stability / variation of ambient temperature	< 2.5 ppm		PASS
22.913(a)(2) 24.232(c)	Effective Radiated Power	< 7 Watts max. ERP	RADIATED	PASS
	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP		PASS
2.1053, 22.917(a), 24.238(a)	Radiated Spurious and Harmonic Emissions	< 43 + 10log <sub>10</sub> (P[Watts]) for all out-of band emissions		PASS

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## 6. SAMPLE CALCULATION

### A. ERP Sample Calculation

Ch./ Freq.		Measured Level(dBm)	Substitute Level(dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP		ERP Limit (dBm)	Margin (dB)
Channel	Freq.(MHz)						W	dBm		
384	836.52	-19.56	40.62	-10.54	0.96	V	0.817	29.12	38.45	9.33

**ERP = SubstituteLEVEL(dBm) + Ant. Gain – CL(Cable Loss)**

- 1) The EUT mounted on a non-conductive turntable is 0.8 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter's level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power (**ERP**).

### B. Emission Designator

#### CDMA Emission Designator

**Emission Designator = 1M27F9W**

CDMA BW = 1.27 MHz (Measured at the 99% power bandwidth)

F = Frequency Modulation

9 = Composite Digital Info

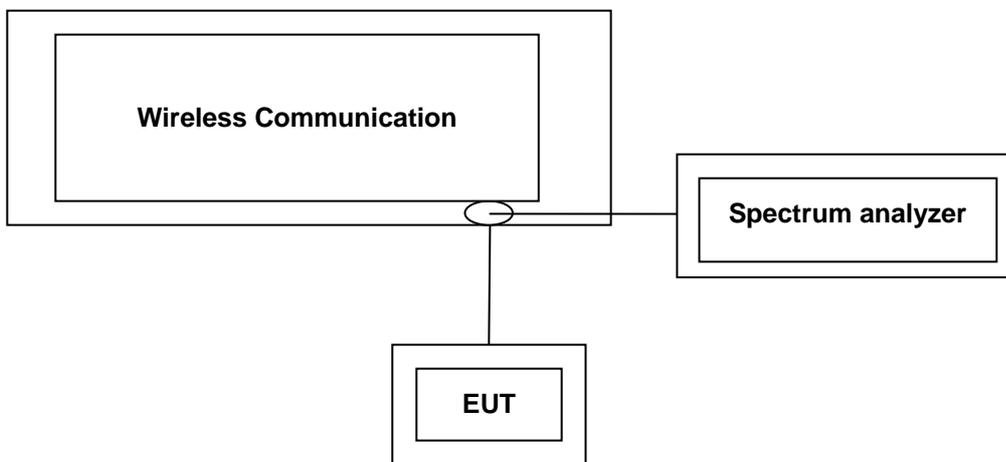
W = Combination (Audio/Data)

## 7. TEST DATA

### 7.1 CONDUCTED OUTPUT POWER

Conducted Output Power is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r01, June 7, 2013, Section 5.2.

A base station simulator was used to establish communication with the EUT, and Spectrum analyzer was used for test results. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



Band	Channel	SO2	SO2	SO55	SO55	TDSO	1xEvDO	1xEvDO	1xEvDO	1xEvDO
		RC1/1 (dBm)	RC3/3 (dBm)	RC1/1 (dBm)	RC3/3 (dBm)	SO32 (dBm)	Rev.O (FTAP)	Rev.O (RTAP)	Rev.1 (FETAP)	Rev.1 (RETAP)
CDMA	1013	23.83	23.90	23.87	23.89	23.91	23.90	23.96	23.94	23.94
	384	23.77	23.80	23.76	23.79	23.81	23.82	23.88	23.80	23.83
	777	23.80	23.82	23.85	23.83	23.80	23.91	23.96	23.91	23.93
PCS	25	24.60	24.65	23.62	24.59	24.66	24.60	24.54	24.58	24.52
	600	24.57	24.59	24.55	24.69	24.65	24.58	24.54	24.55	24.50
	1175	24.56	24.57	24.62	24.60	24.63	24.55	24.53	24.53	24.51

(Maximum Conducted Output Powers)

Note : Detecting mode is average.

- Plots of the EUT's Conducted Output Power are shown Page 26

In order to simplify the report, attached plots were only the center channel.

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## 7.2 EFFECTIVE RADIATED POWER OUTPUT

### (CDMA Mode)

Mode	Ch./ Freq.		Measured Level (dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
	channel	Freq.(MHz)						W	dBm
CDMA	1013	824.70	-23.20	36.57	-10.61	0.95	H	0.317	25.01
	384	836.52	-25.80	34.38	-10.54	0.96	H	0.194	22.88
	777	848.31	-27.40	33.02	-10.47	1.10	H	0.140	21.45
EVDO	1013	824.70	-21.60	38.17	-10.61	0.95	H	0.458	26.61
	384	836.52	-24.28	35.90	-10.54	0.96	H	0.275	24.40
	777	848.31	-25.65	34.77	-10.47	1.10	H	0.209	23.20

Note: This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

#### NOTES:

##### Effective Radiated Power Output Measurements by Substitution Method

according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA, WCDMA, AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW  $\geq$  OBW, VBW  $\geq$  3 x RBW. 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 terminals of the dipole is measured. The ERP is recorded.

This device was tested under all configurations and the highest power is reported. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is in y plane in CDMA mode. Also worst case of detecting Antenna is in vertical polarization in CDMA mode.

The EVDO mode testing were performed using FETAP on Rev.A because FETAP on Rev.A is highest power in EVDO mode.

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### 7.3 EQUIVALENT ISOTROPIC RADIATED POWER

**(PCS CDMA Mode)**

Mode	Ch./ Freq.		Measured Level (dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
	channel	Freq.(MHz)						W	dBm
PCS	25	1,851.25	-16.22	15.93	10.02	1.40	V	0.285	24.55
	600	1,880.00	-16.07	16.24	10.04	1.45	V	0.304	24.83
	1175	1,908.75	-16.93	15.51	10.05	1.46	V	0.257	24.10
EVDO	25	1,851.25	-15.48	16.67	10.02	1.40	V	0.338	25.29
	600	1,880.00	-15.51	16.80	10.04	1.45	V	0.346	25.39
	1175	1,908.75	-16.59	15.85	10.05	1.46	V	0.278	24.44

Note: This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

**NOTES:**

Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA, WCDMA, AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW ≥ OBW, VBW ≥ 3 x RBW. 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 receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

This device was tested under all configurations and the highest power is reported. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. And worst case of the EUT is in z plane in PCS mode. Also worst case of detecting Antenna is in horizontal in PCS mode.

The EVDO mode testing were performed using FETAP on Rev.A because FETAP on Rev.A is highest power in EVDO mode.

## 7.4 RADIATED SPURIOUS EMISSIONS

### 7.4.1 RADIATED SPURIOUS EMISSIONS (CDMA Mode)

MEASURED OUTPUT POWER: 26.61 dBm = 0.458 W

MODULATION SIGNAL: CDMA EVDO

DISTANCE: 3 meters

LIMIT:  $43 + 10 \log_{10}(W) =$  39.61 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain [dBd]	Substitute Level [dBm]	C.L	Pol.	ERP (dBm)	dBc
1013	1,649.40	-45.08	9.20	-54.07	1.18	V	-46.05	72.66
	2,474.10	-57.40	10.55	-63.44	1.62	H	-54.51	81.12
	3,298.80	-57.07	12.06	-63.10	1.99	H	-53.03	79.64
384	1,673.04	-45.48	9.37	-54.63	1.20	V	-46.46	73.07
	2,509.56	-51.74	10.66	-57.68	1.65	V	-48.67	75.28
	3,346.08	-57.89	12.24	-64.43	2.00	H	-54.19	80.80
777	1,696.62	-48.79	9.49	-57.96	1.20	V	-49.67	76.28
	2,544.93	-56.80	10.76	-62.49	1.65	V	-53.38	79.99
	3,393.24	-57.44	12.37	-64.12	1.99	H	-53.74	80.35

- NOTES:**
1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
  2. We are performed all frequency to 10<sup>th</sup> harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
  3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
  4. This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

### 7.4.2 RADIATED SPURIOUS EMISSIONS (PCS Mode)

MEASURED OUTPUT POWER: 25.39 dBm = 0.346 W  
 MODULATION SIGNAL: PCS CDMA EVDO  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10}(W) =$  38.39 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	EIRP (dBm)	dBc
25	3,702.50	-34.21	12.27	-38.95	2.19	V	-28.87	54.26
	5,553.75	-38.69	13.40	-38.36	2.88	H	-27.84	53.23
	7,405.00	-58.40	11.37	-48.11	3.29	V	-40.03	65.42
600	3,760.00	-25.04	12.31	-29.59	2.11	V	-19.39	44.78
	5,640.00	-36.95	13.41	-36.28	2.92	V	-25.79	51.18
	7,520.00	-55.35	11.55	-45.83	3.34	V	-37.62	63.01
1175	3,817.50	-31.32	12.37	-35.80	2.14	H	-25.57	50.96
	5,726.25	-37.10	13.42	-35.66	3.02	H	-25.26	50.65
	7,635.00	-57.00	11.70	-47.24	3.13	H	-38.67	64.06

- NOTES:**
1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
  2. We are performed all frequency to 10<sup>th</sup> harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
  3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
  4. This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

## 7.5 PEAK-TO-AVERAGE RATIO

- Plots of the EUT's Peak- to- Average Ratio are shown Page 33.

## 7.6 OCCUPIED BANDWIDTH

Band	Channel	Frequency(MHz)	Data (MHz)
CDMA	1013	824.70	1.2735
	384	836.52	1.2685
	777	848.31	1.2750
CDMA EVDO	777	848.31	1.2751
PCS	25	1851.25	1.2677
	600	1880.00	1.2710
	1175	1908.75	1.2711
PCS EVDO	1175	1908.75	1.2738

- Plots of the EUT's Occupied Bandwidth are shown Page 27 ~ 32.

## 7.7 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Maximum Data (dBm)
CDMA	1013	4.754230	-28.79
	384	4.631970	-28.86
	777	3.991840	-28.75
PCS	25	6.995790	-25.05
	600	6.994290	-24.79
	1175	6.998280	-25.53

- Plots of the EUT's Conducted Spurious Emissions are shown Page 42 ~ 47.

### 7.7.1 Band Edge

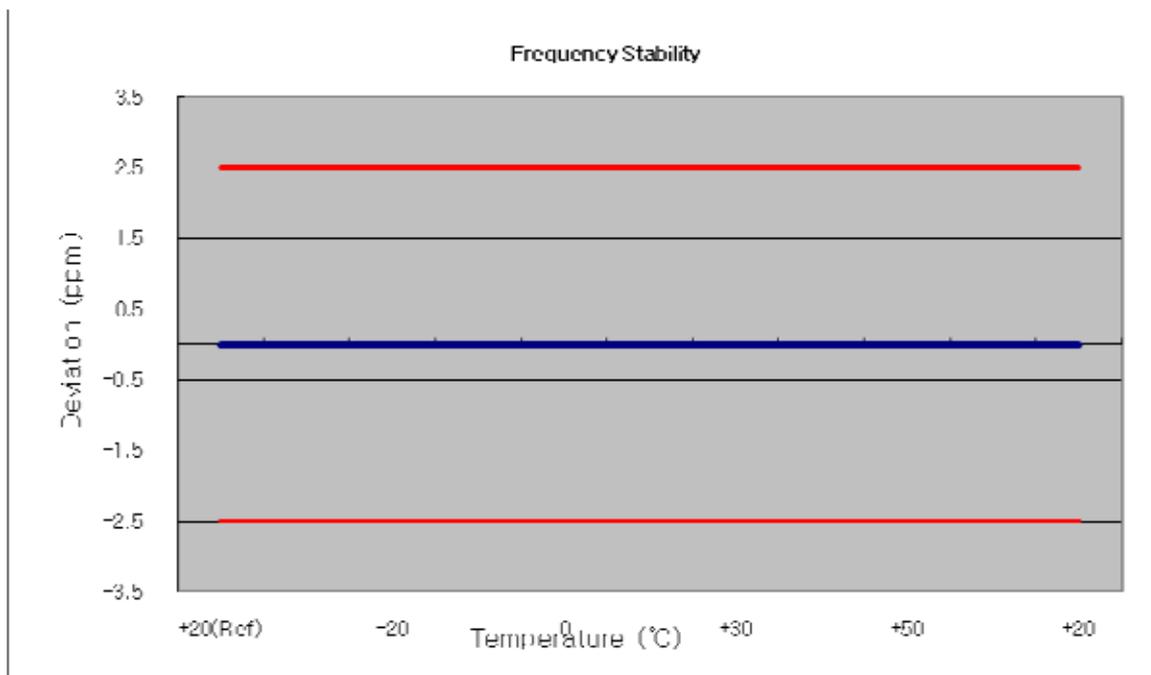
- Plots of the EUT's Band Edge are shown Page 34 ~ 41.

## 7.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

### 7.8.1 FREQUENCY STABILITY (CDMA)

OPERATING FREQUENCY: 836,520,000 Hz  
 CHANNEL: 384  
 REFERENCE VOLTAGE: 12.0 VDC  
 DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. ( )	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.0	+20(Ref)	836 520 008	0	0.000 000	0.000
100%		-30	836 519 999	-8.32	-0.000 001	-0.010
100%		-20	836 520 000	-7.97	-0.000 001	-0.010
100%		-10	836 519 999	-8.28	-0.000 001	-0.010
100%		0	836 519 999	-8.41	-0.000 001	-0.010
100%		+10	836 520 000	-7.68	-0.000 001	-0.009
100%		+30	836 520 000	-8.07	-0.000 001	-0.010
100%		+40	836 520 000	-8.17	-0.000 001	-0.010
100%		+50	836 520 000	-8.04	-0.000 001	-0.010
115%		13.8	+20	836 520 000	-7.90	-0.000 001
85%	10.2	+20	836 520 000	-7.65	-0.000 001	-0.009



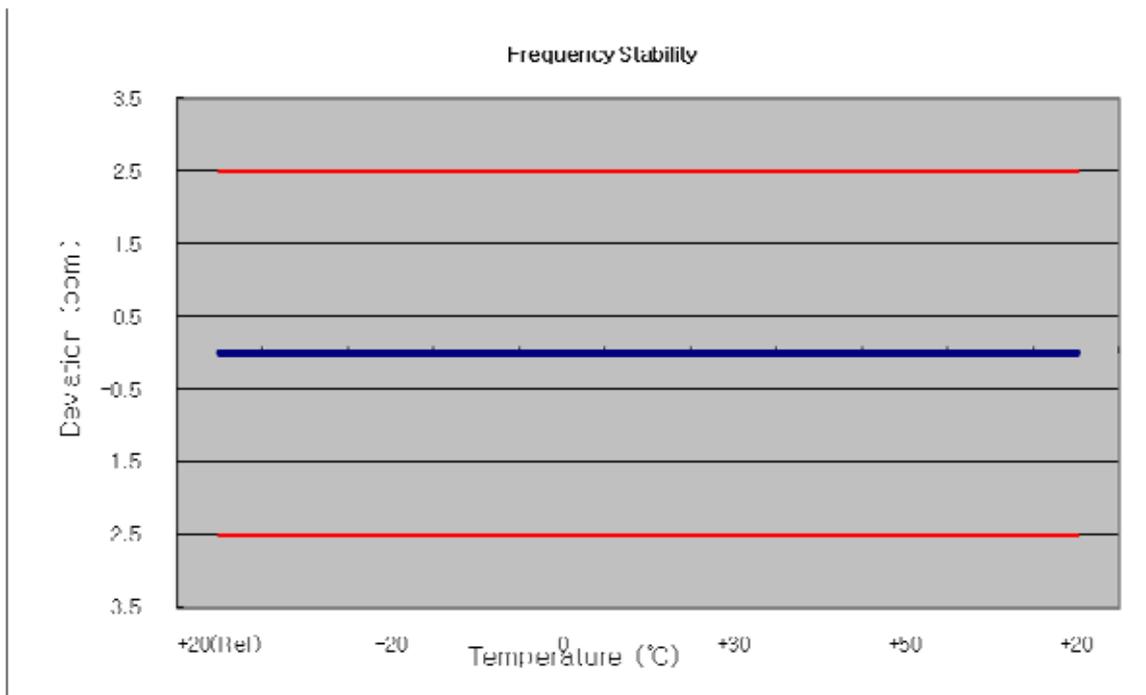
#### FCC CERTIFICATION REPORT

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### 7.8.2 FREQUENCY STABILITY (PCS)

OPERATING FREQUENCY: 1880,000,000 Hz  
 CHANNEL: 600  
 REFERENCE VOLTAGE: 12.0 VDC  
 DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. ( )	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.0	+20(Ref)	1879 999 993	0	0.000 000	0.000
100%		-30	1880 000 007	7.09	0.000 000	0.004
100%		-20	1880 000 006	6.24	0.000 000	0.003
100%		-10	1880 000 008	7.88	0.000 000	0.004
100%		0	1880 000 006	5.97	0.000 000	0.003
100%		+10	1880 000 007	6.95	0.000 000	0.004
100%		+30	1880 000 006	6.35	0.000 000	0.003
100%		+40	1880 000 007	6.75	0.000 000	0.004
100%		+50	1880 000 007	6.61	0.000 000	0.004
115%		13.8	+20	1880 000 007	7.39	0.000 000
85%	10.2	+20	1880 000 006	6.44	0.000 000	0.003



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## 8. TEST PLOTS

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■ CDMA MODE (384 CH.) Conducted Output Power



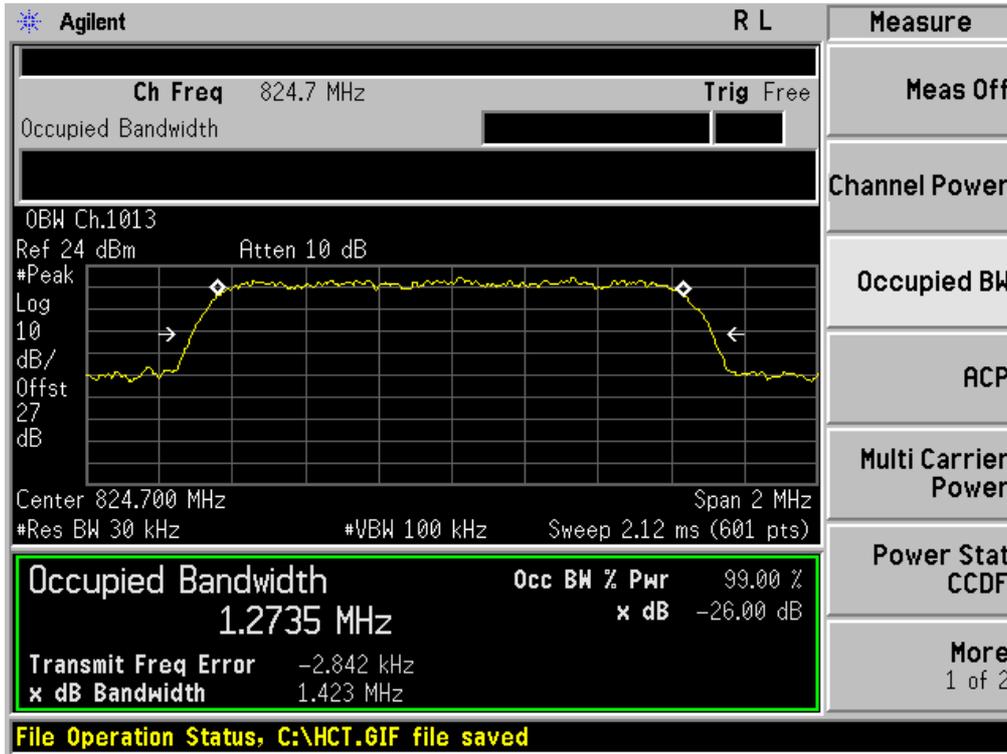
■ PCS CDMA MODE (600 CH.) Conducted Output Power



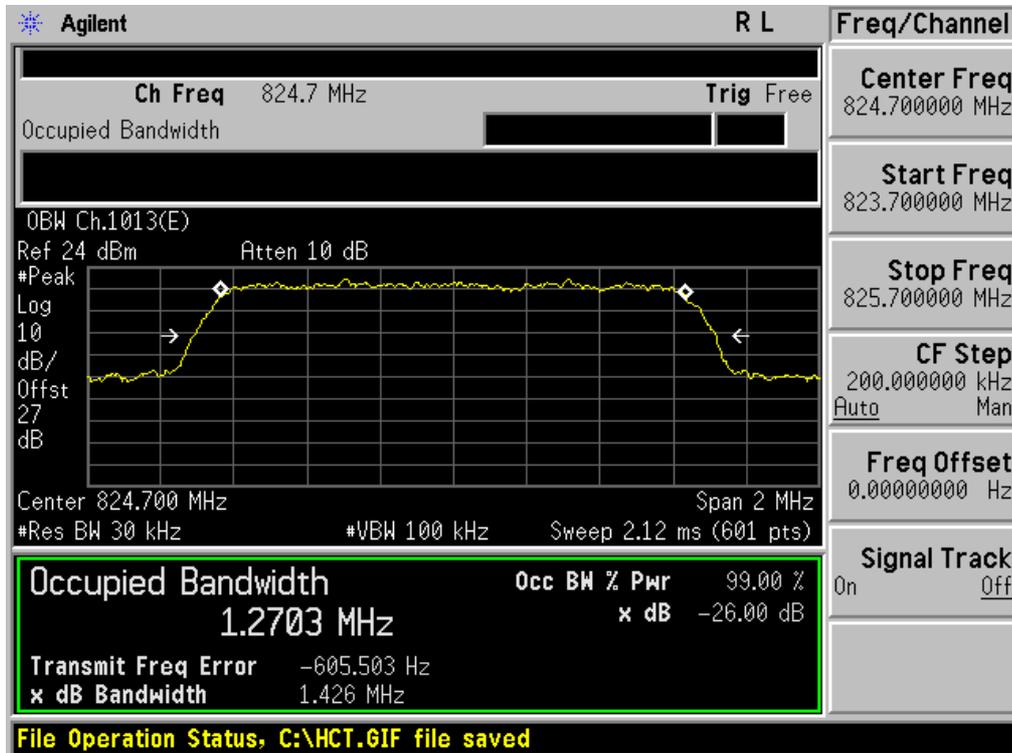
FCC CERTIFICATION REPORT

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■ CDMA MODE (1013 CH.) Occupied Bandwidth



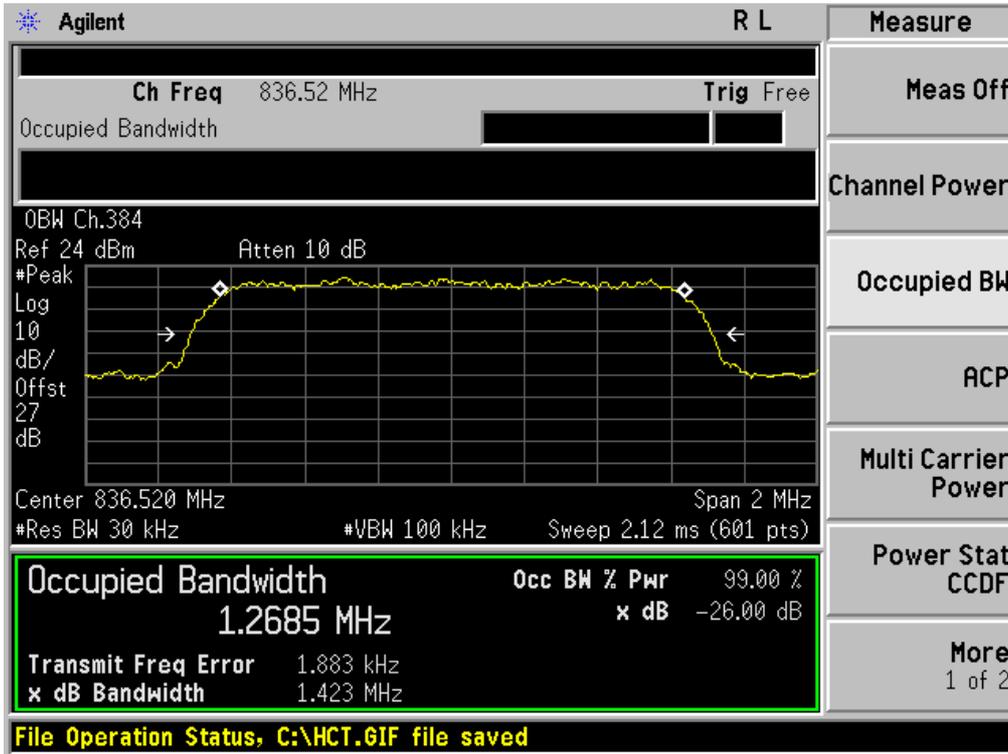
■ CDMA EVDO MODE (1013 CH.) Occupied Bandwidth



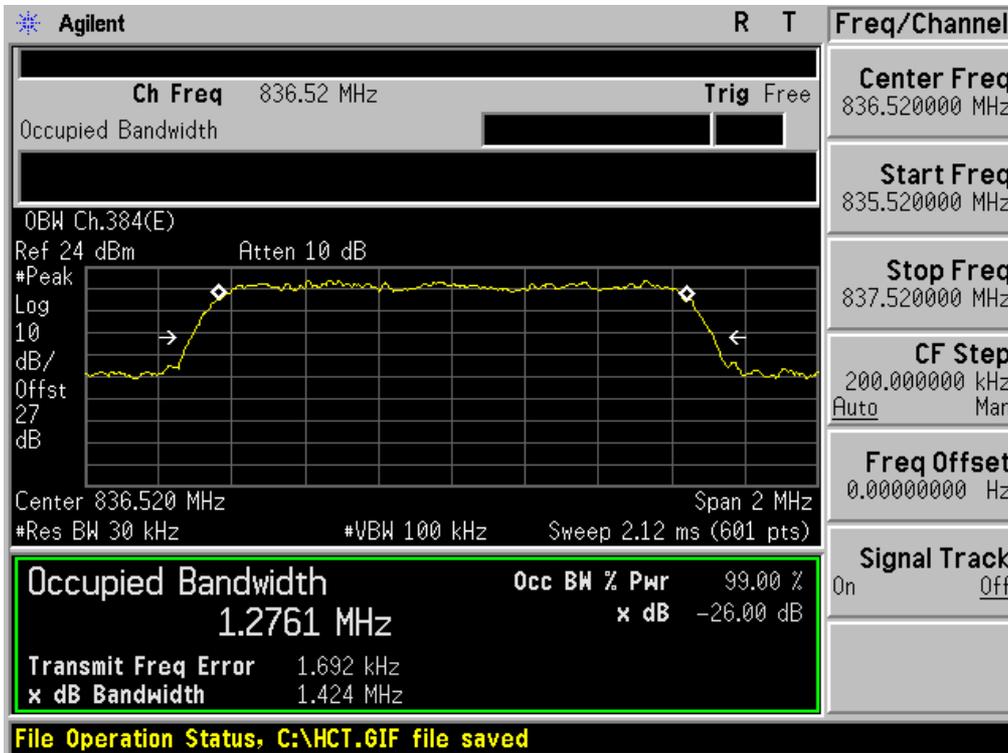
FCC CERTIFICATION REPORT

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■ CDMA MODE (384 CH.) Occupied Bandwidth



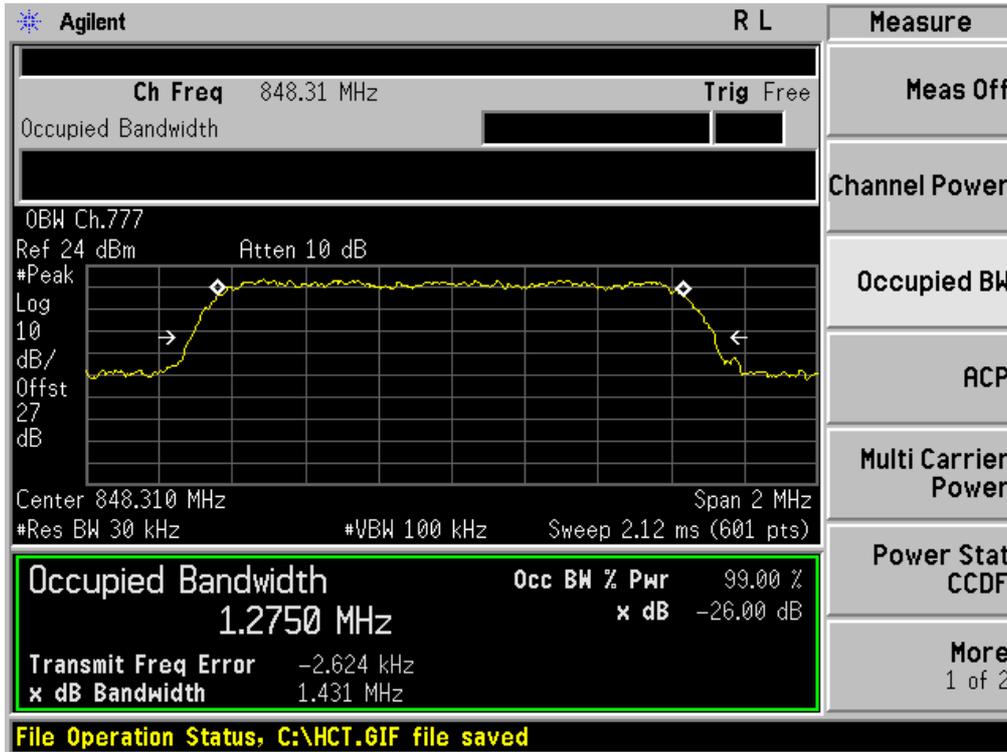
■ CDMA EVDO MODE (384 CH.) Occupied Bandwidth



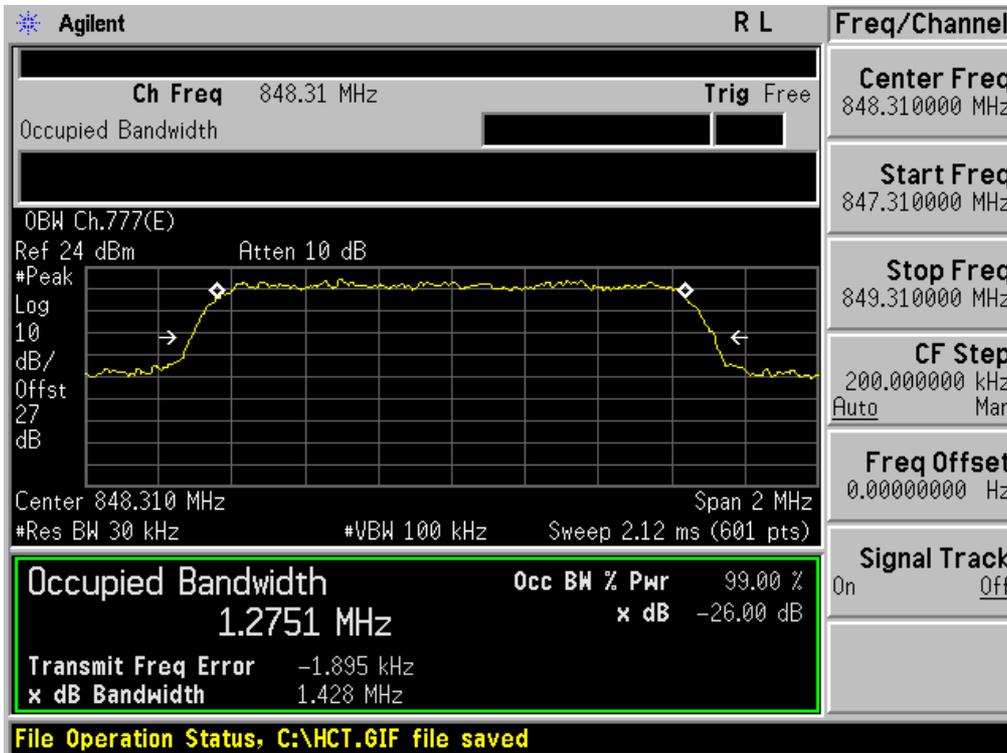
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■ CDMA MODE (777 CH.) Occupied Bandwidth



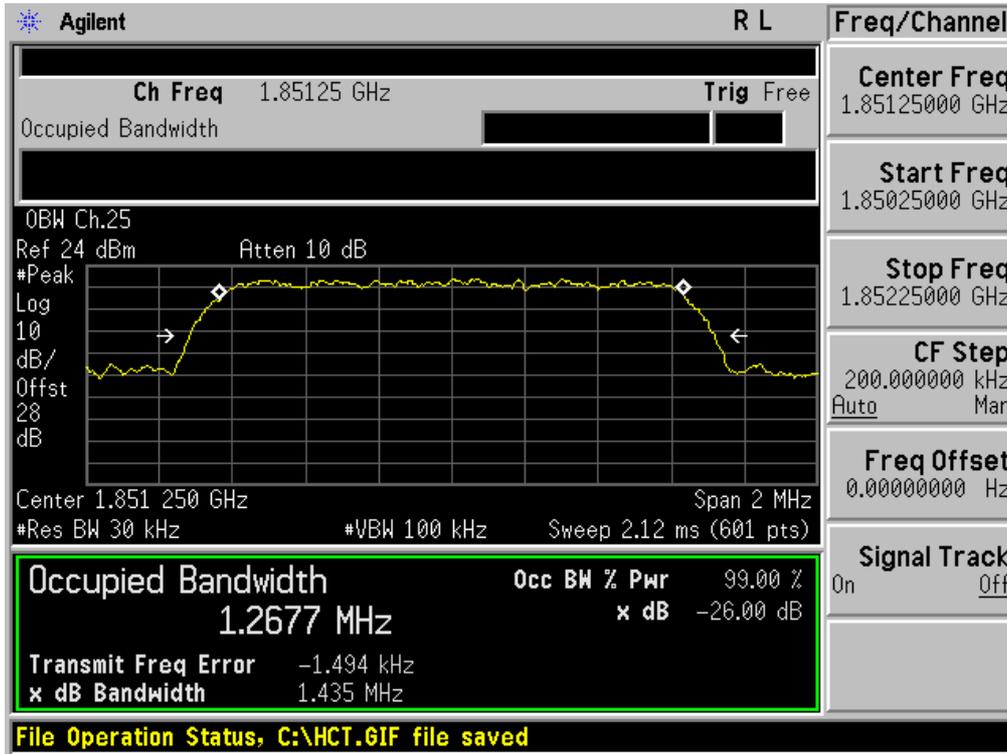
■ CDMA EVDO MODE (777 CH.) Occupied Bandwidth



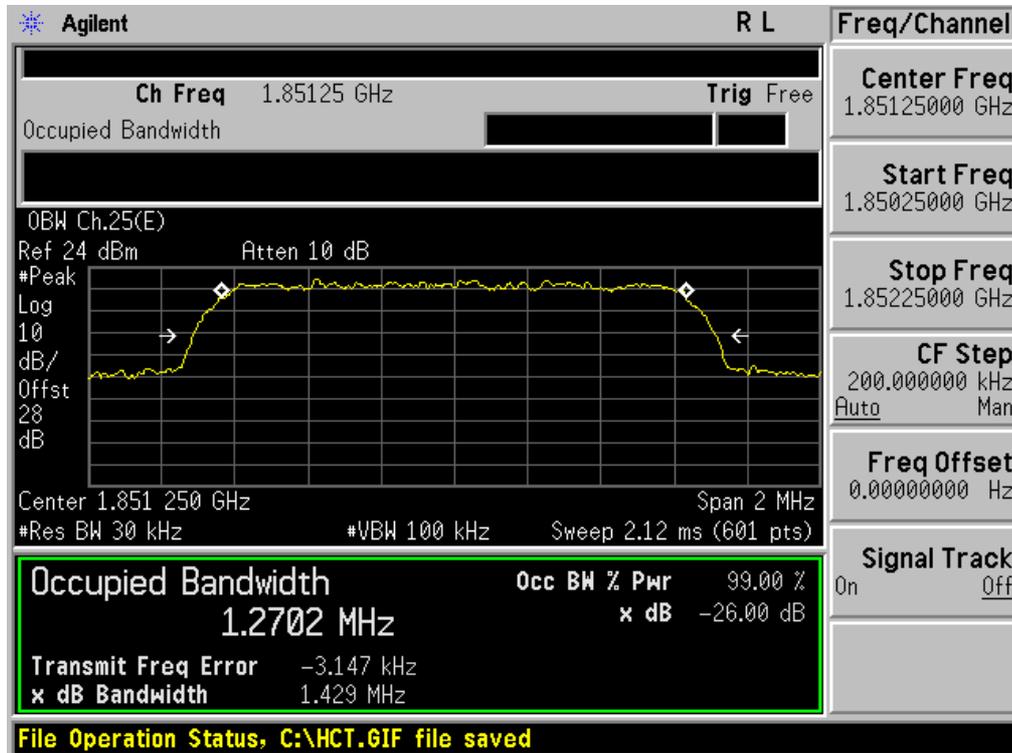
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■ PCS CDMA MODE (25 CH.) Occupied Bandwidth



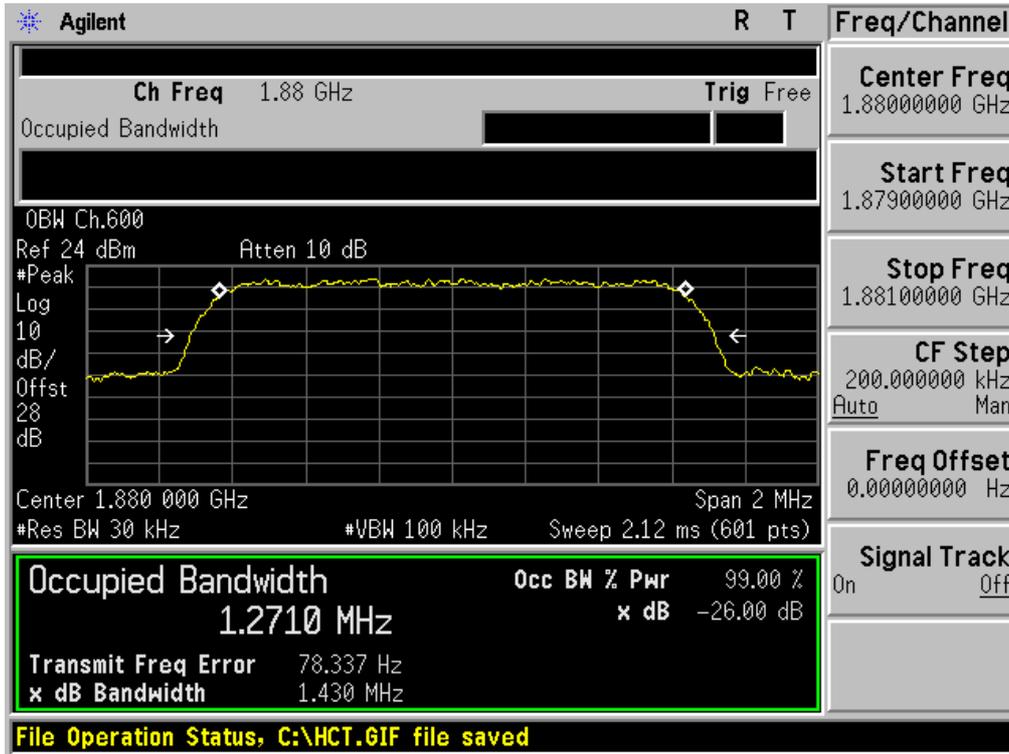
■ PCS CDMA EVDO MODE (25 CH.) Occupied Bandwidth



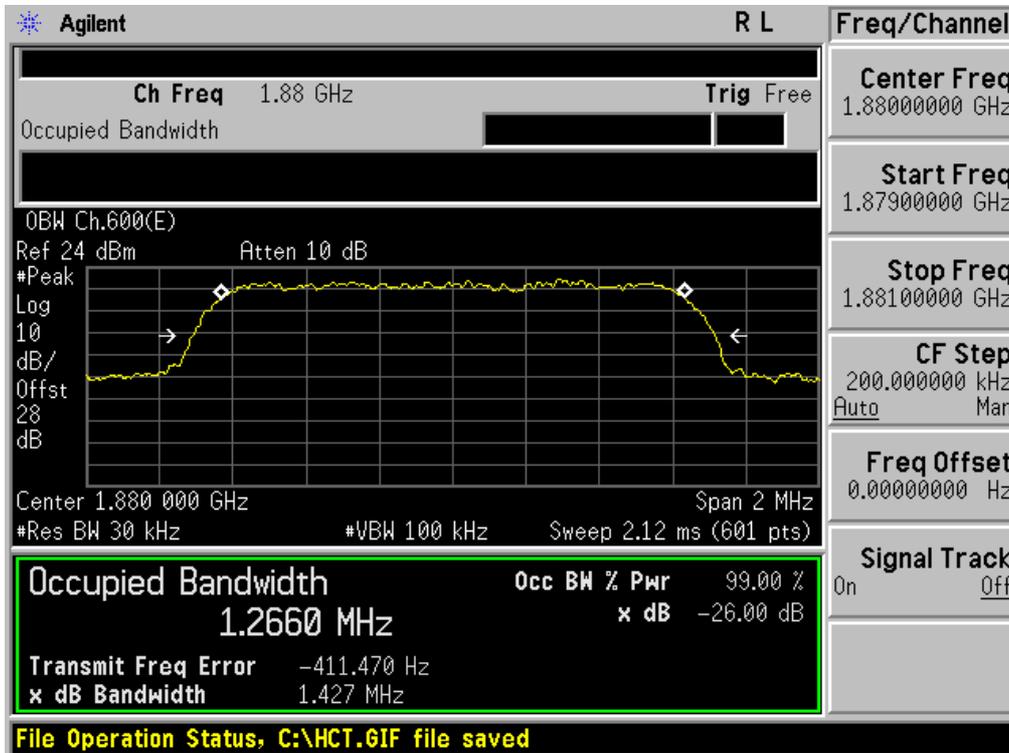
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■ PCS CDMA MODE (600 CH.) Occupied Bandwidth



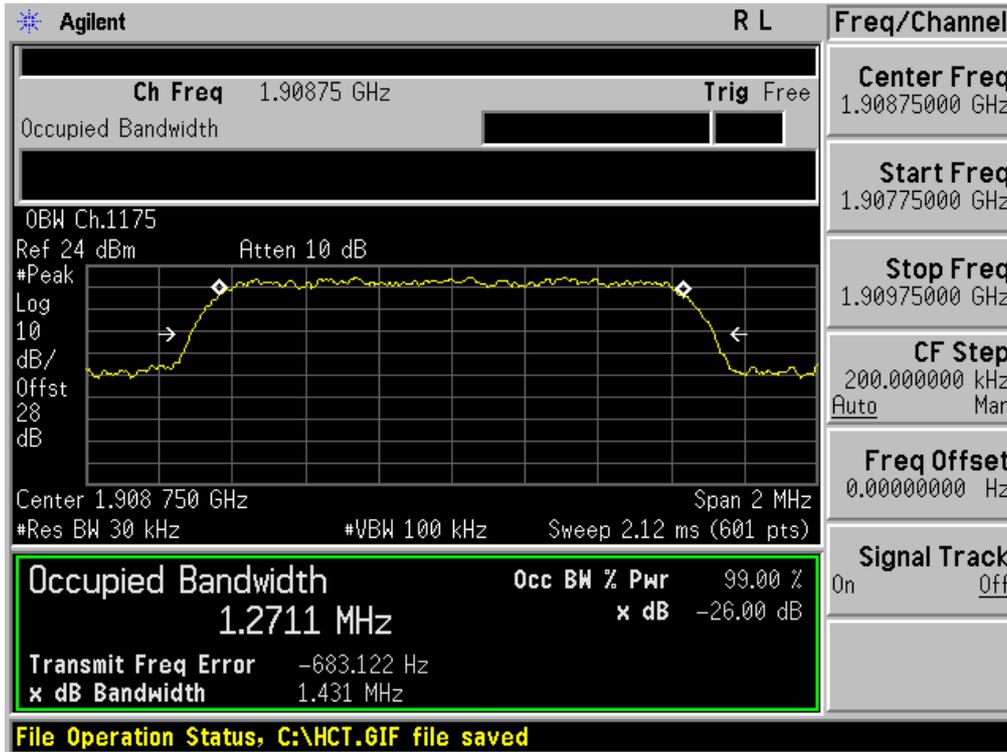
■ PCS CDMA EVDO MODE (600 CH.) Occupied Bandwidth



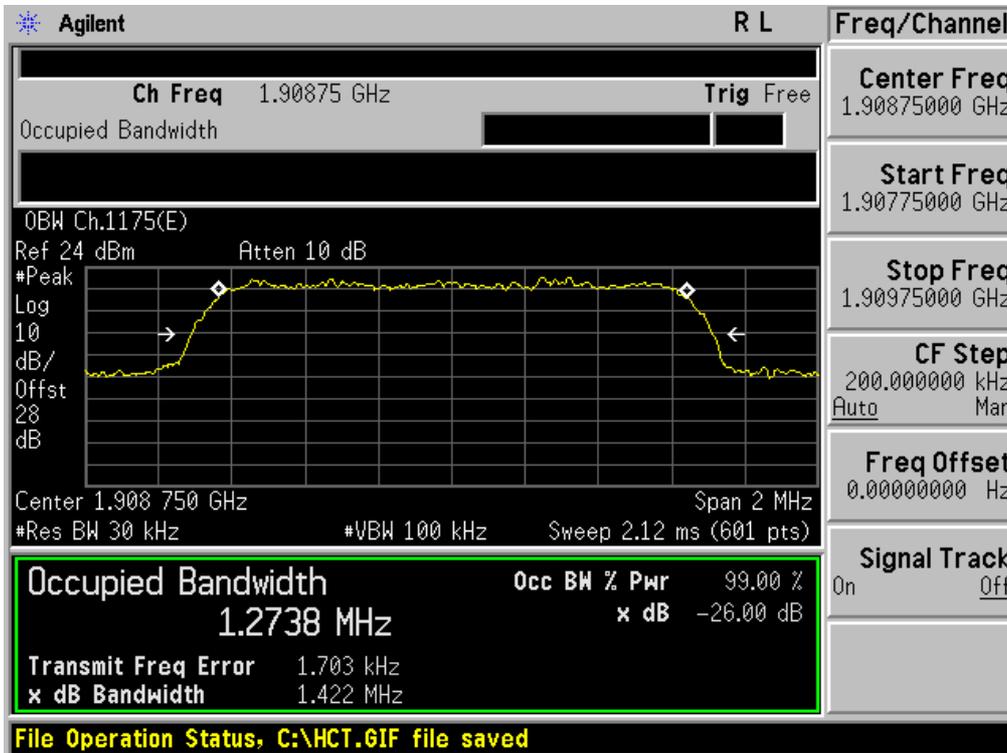
FCC CERTIFICATION REPORT

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■ PCS CDMA MODE (1175 CH.) Occupied Bandwidth



■ PCS CDMA EVDO MODE (1175 CH.) Occupied Bandwidth



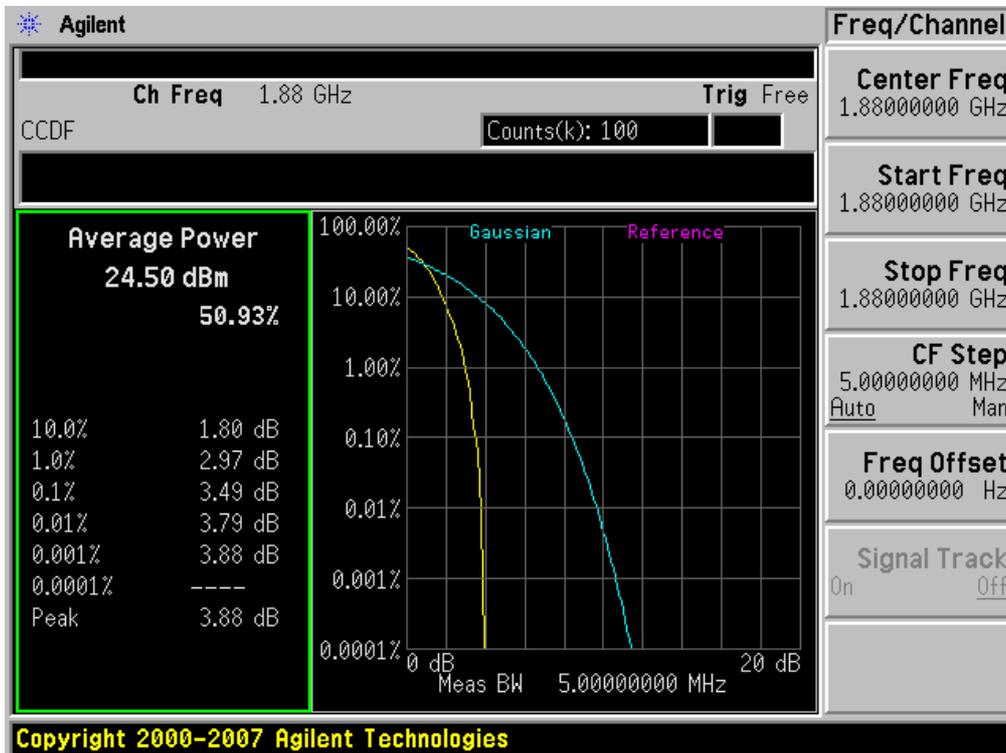
FCC CERTIFICATION REPORT

Test Report No. HCTR1312FR04-3	Date of Issue: December 27, 2013	EUT Type: CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> FCC ID: BEJLTC10
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■ PCS CDMA MODE (600 CH.) Peak-to-Average Ratio



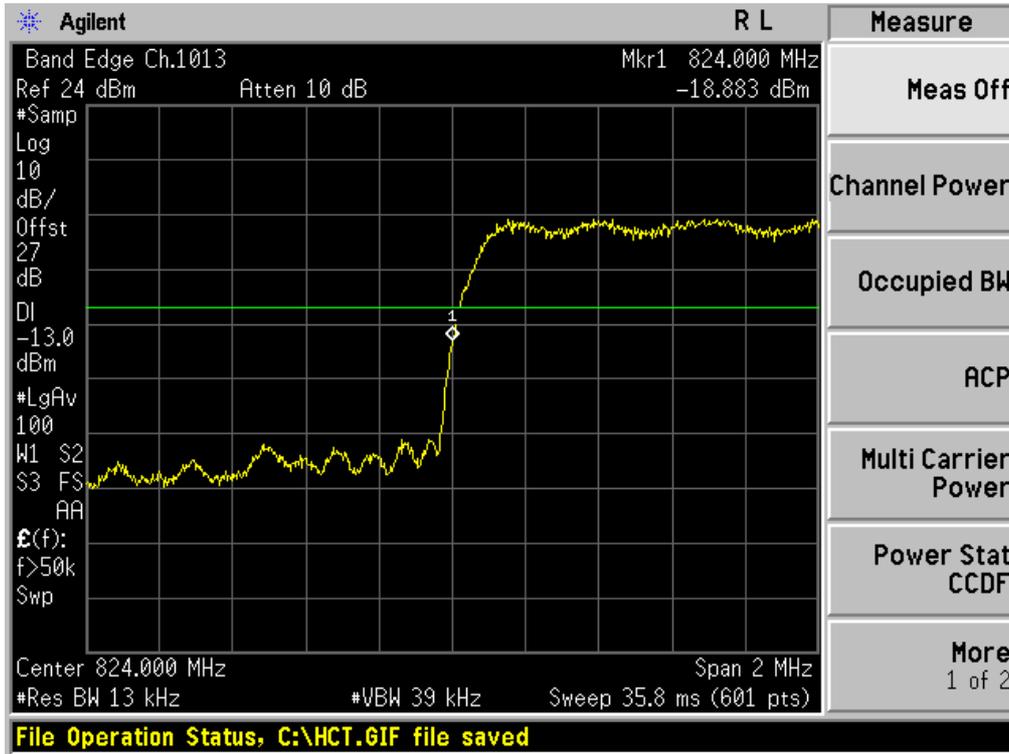
■ PCS CDMA EVDO MODE (600 CH.) Peak-to-Average Ratio



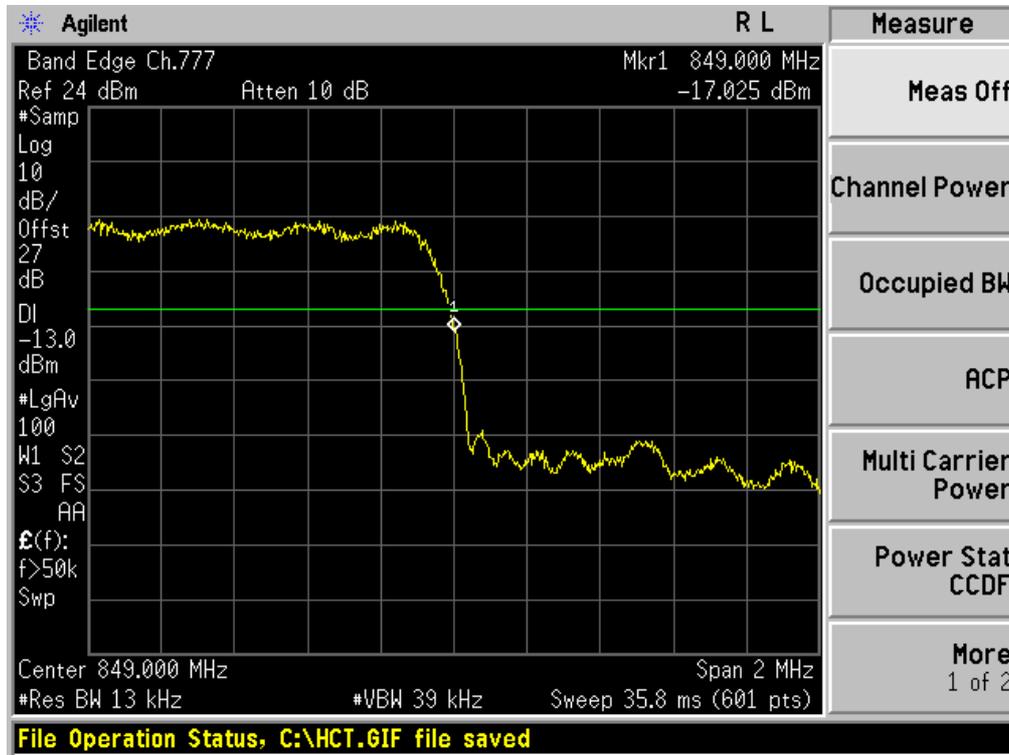
FCC CERTIFICATION REPORT

Test Report No. HCTR1312FR04-3	Date of Issue: December 27, 2013	EUT Type: CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> FCC ID: BEJLTC10
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■ CDMA MODE (1013 CH.) Block Edge



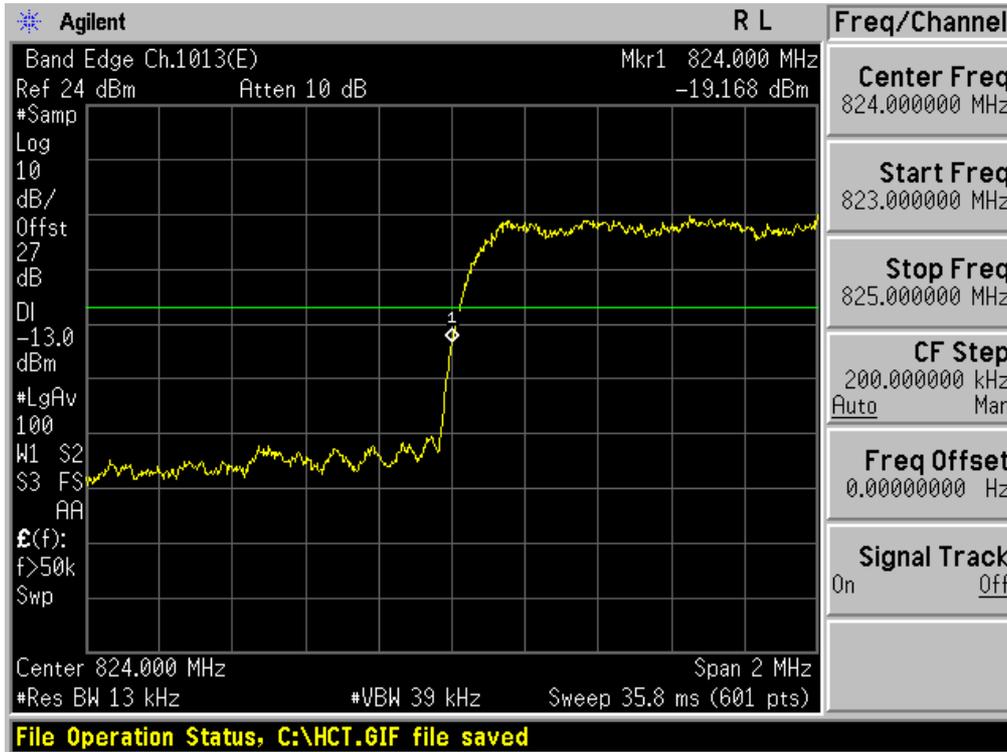
■ CDMA MODE (777 CH.) Block Edge



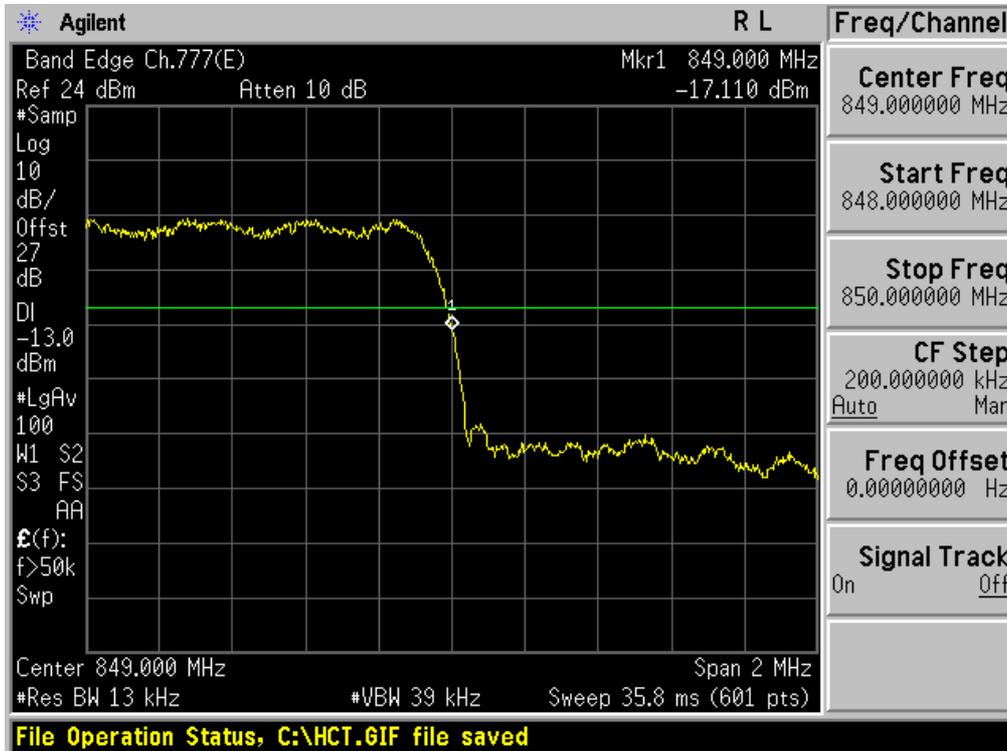
FCC CERTIFICATION REPORT

FCC CERTIFICATION REPORT			<a href="http://www.hct.co.kr">www.hct.co.kr</a>
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■ CDMA EVDO MODE (1013 CH.) Block Edge



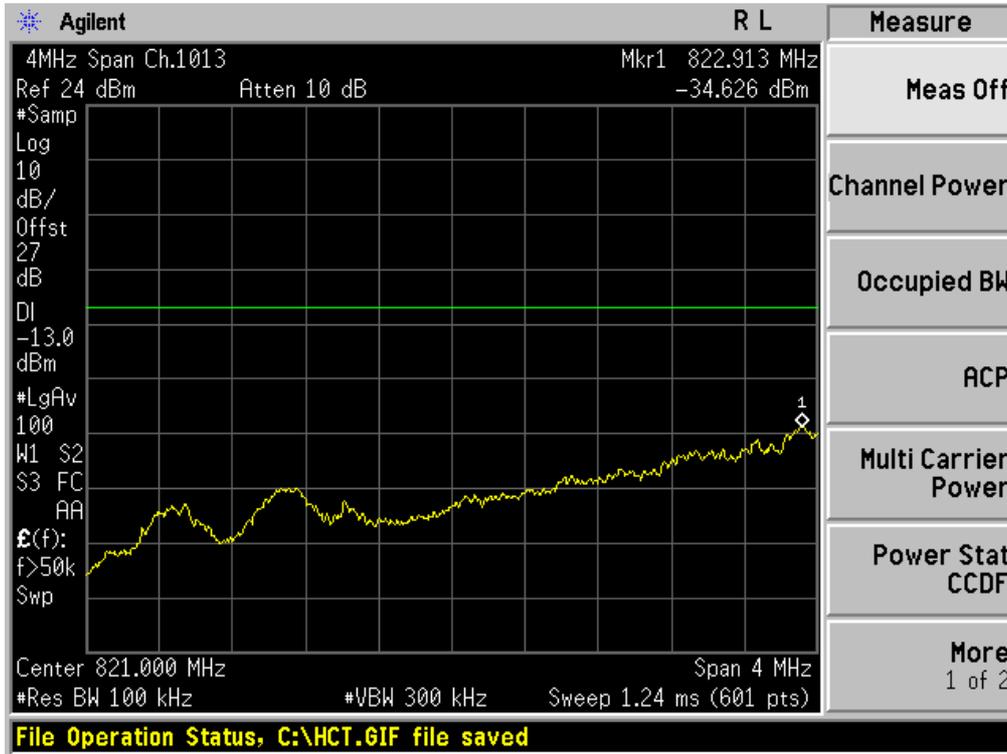
■ CDMA EVDO MODE (777 CH.) Block Edge



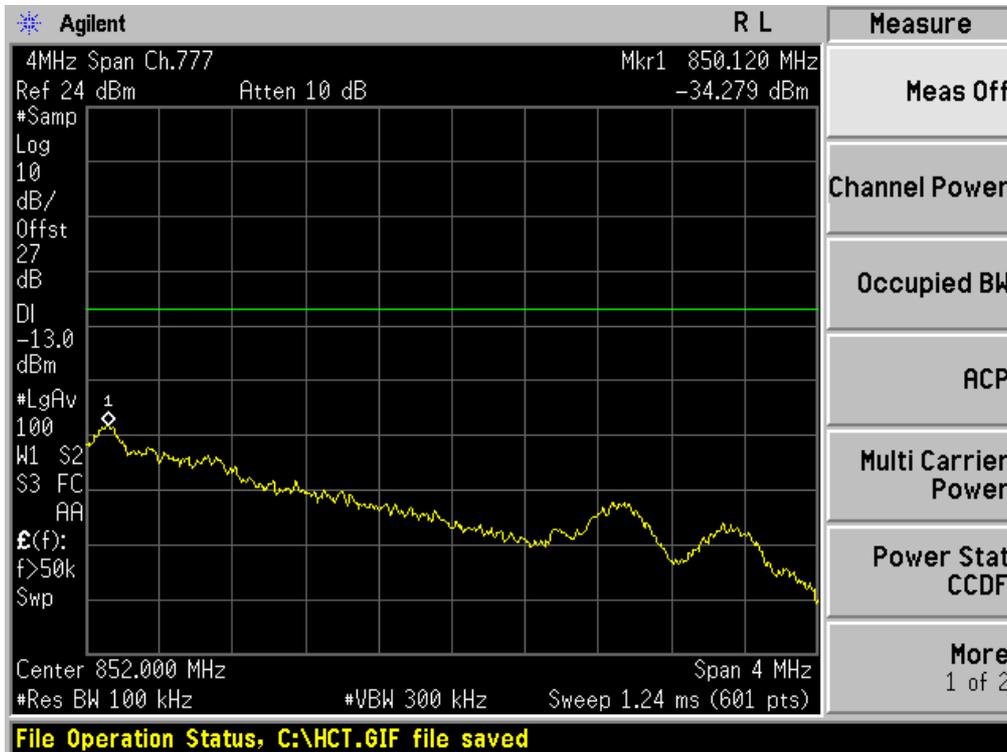
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■ CDMA MODE (1013 CH.) 4 MHz Span



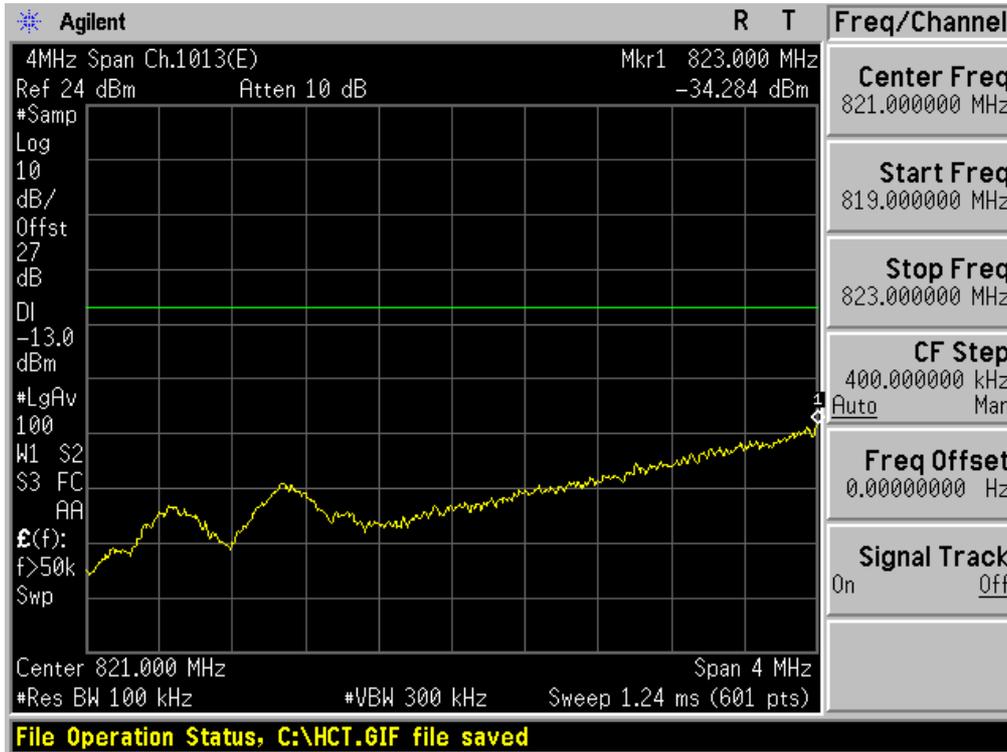
■ CDMA MODE (777 CH.) 4 MHz Span



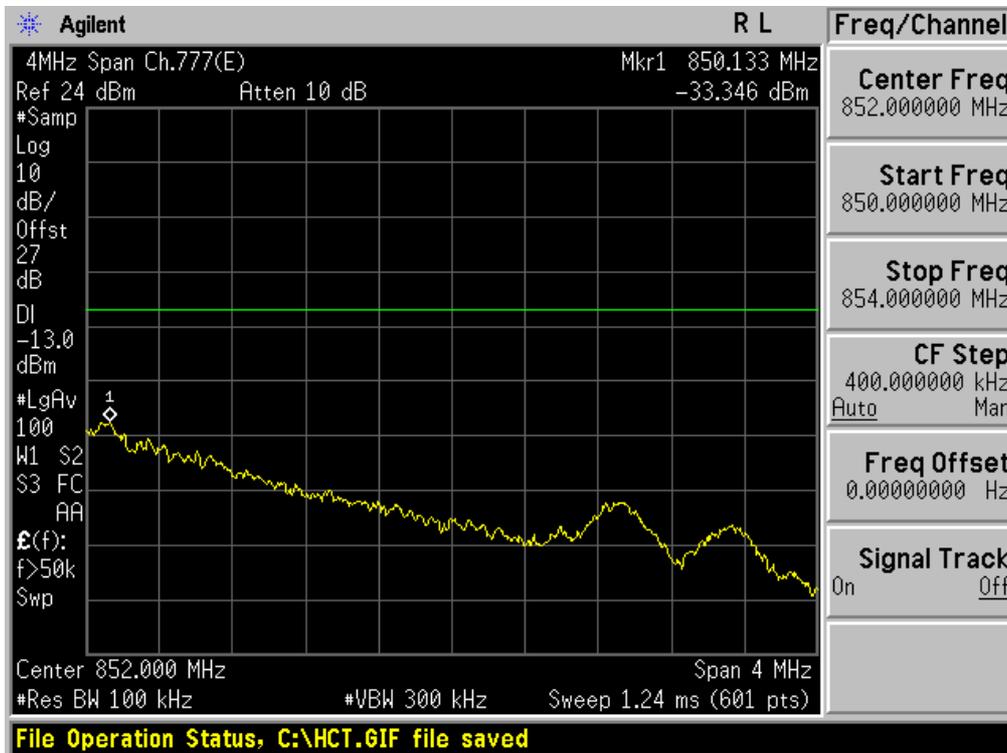
FCC CERTIFICATION REPORT

FCC CERTIFICATION REPORT			<a href="http://www.hct.co.kr">www.hct.co.kr</a>
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■ CDMA EVDO MODE (1013 CH.) 4 MHz Span



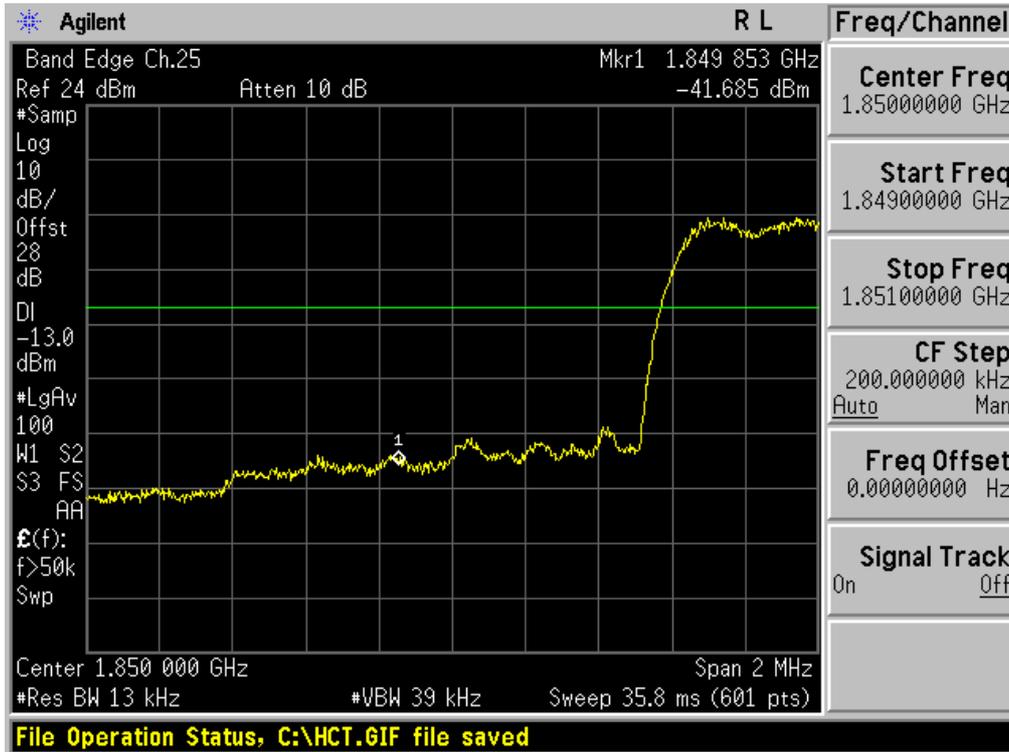
■ CDMA EVDO MODE (777 CH.) 4 MHz Span



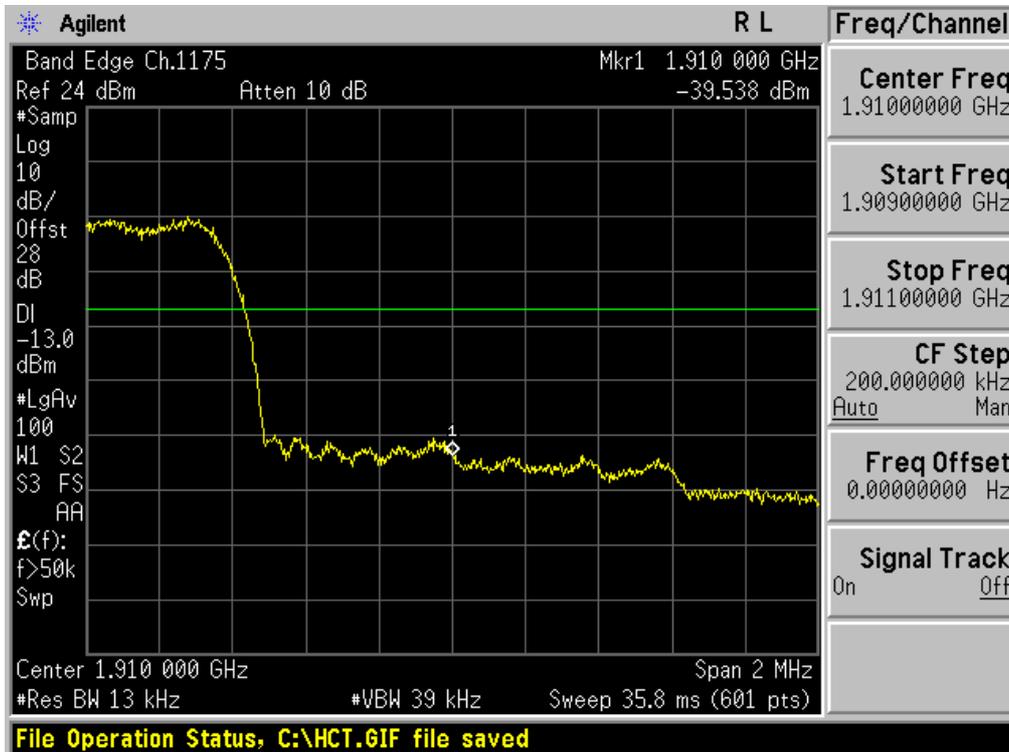
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FCC CERTIFICATION REPORT			<a href="http://www.hct.co.kr">www.hct.co.kr</a>
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■ PCS CDMA MODE (25 CH.) Block Edge



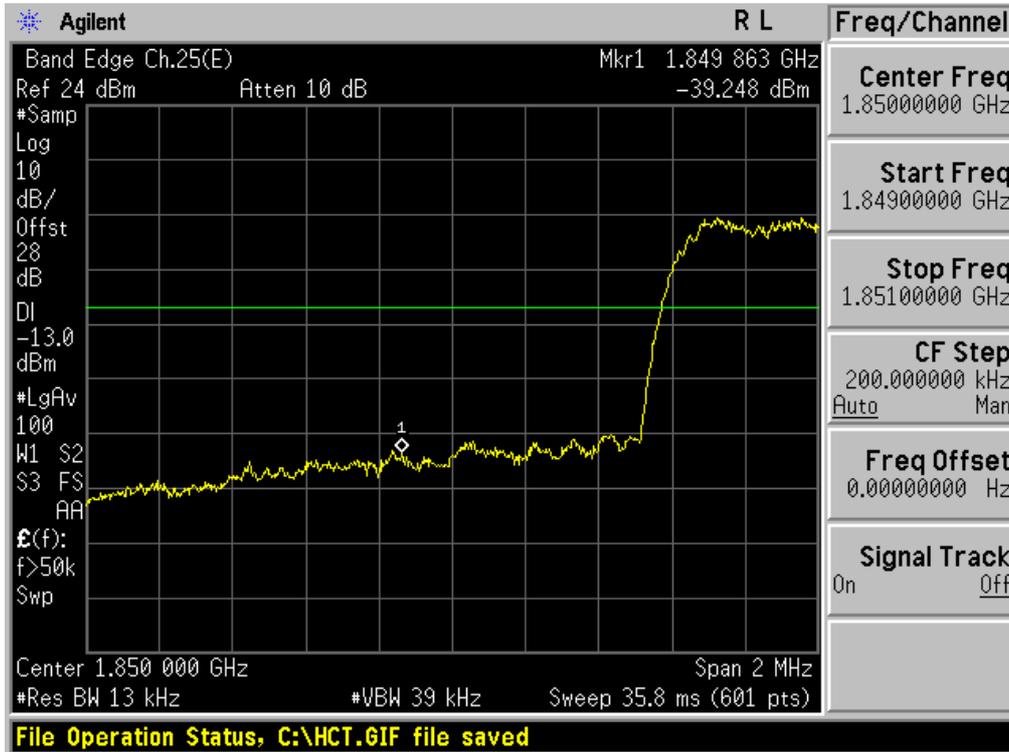
■ PCS CDMA MODE (1175 CH.) Block Edge



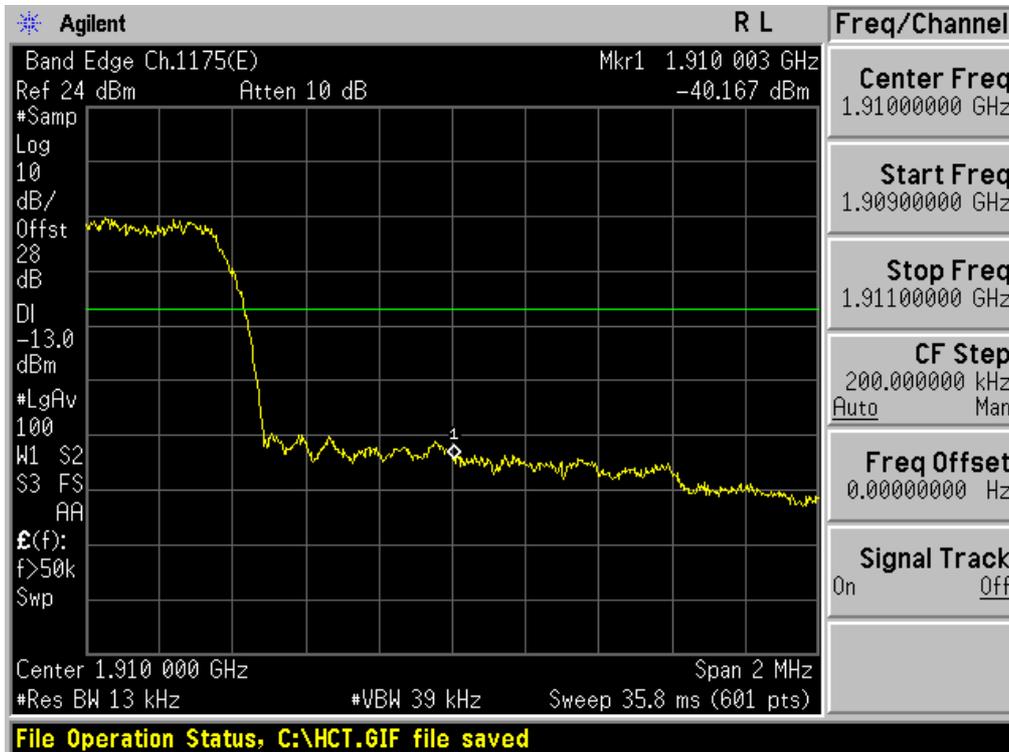
FCC CERTIFICATION REPORT

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■ PCS CDMA EVDO MODE (25 CH.) Block Edge



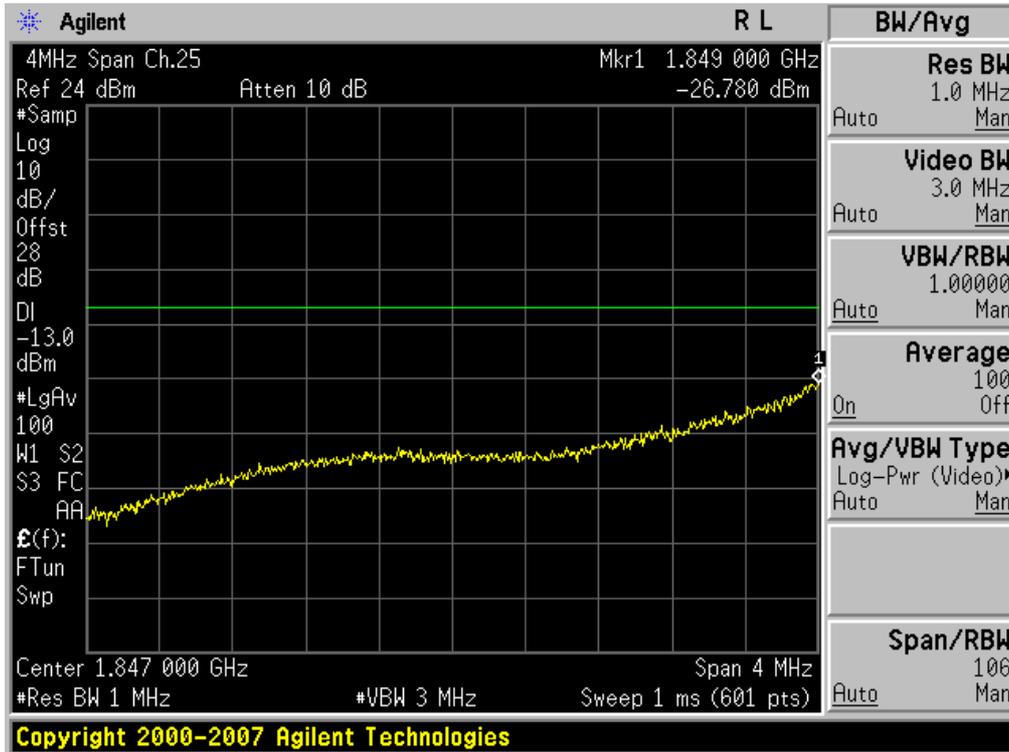
■ PCS CDMA EVDO MODE (1175 CH.) Block Edge



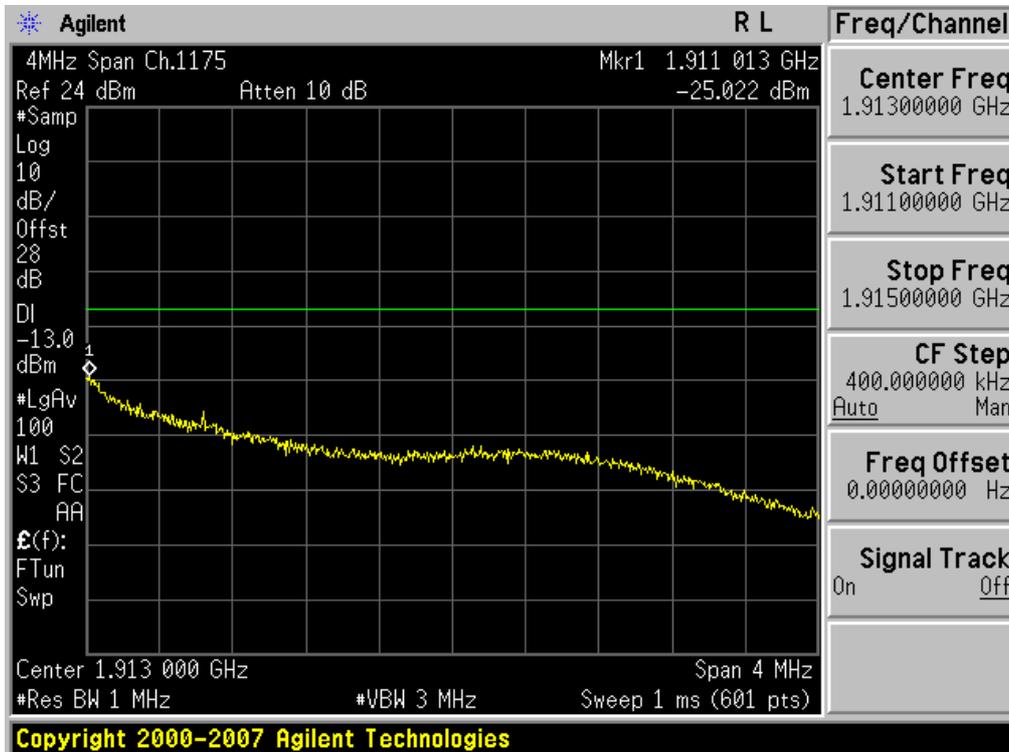
FCC CERTIFICATION REPORT

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■ PCS CDMA MODE (25 CH.) 4 MHz Span



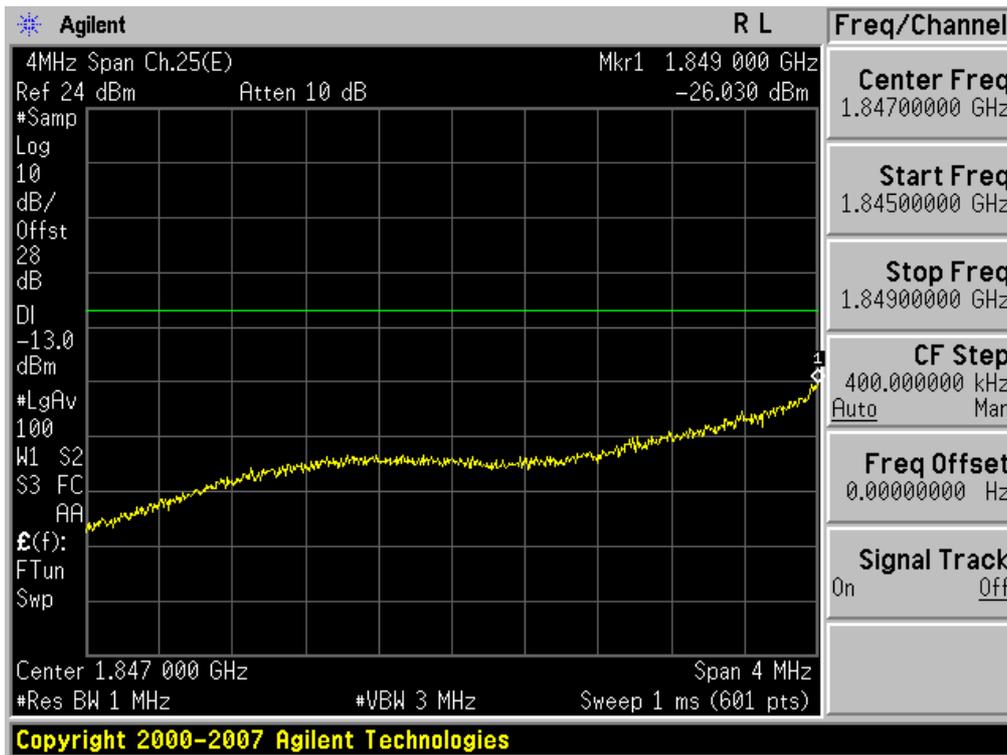
■ PCS CDMA MODE (1175 CH.) 4 MHz Span



FCC CERTIFICATION REPORT

<b>Test Report No.</b> HCTR1312FR04-3	<b>Date of Issue:</b> December 27, 2013	<b>EUT Type:</b> CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> <b>FCC ID:</b> BEJLTC10
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■ PCS CDMA EVDO MODE (25 CH.) 4 MHz Span



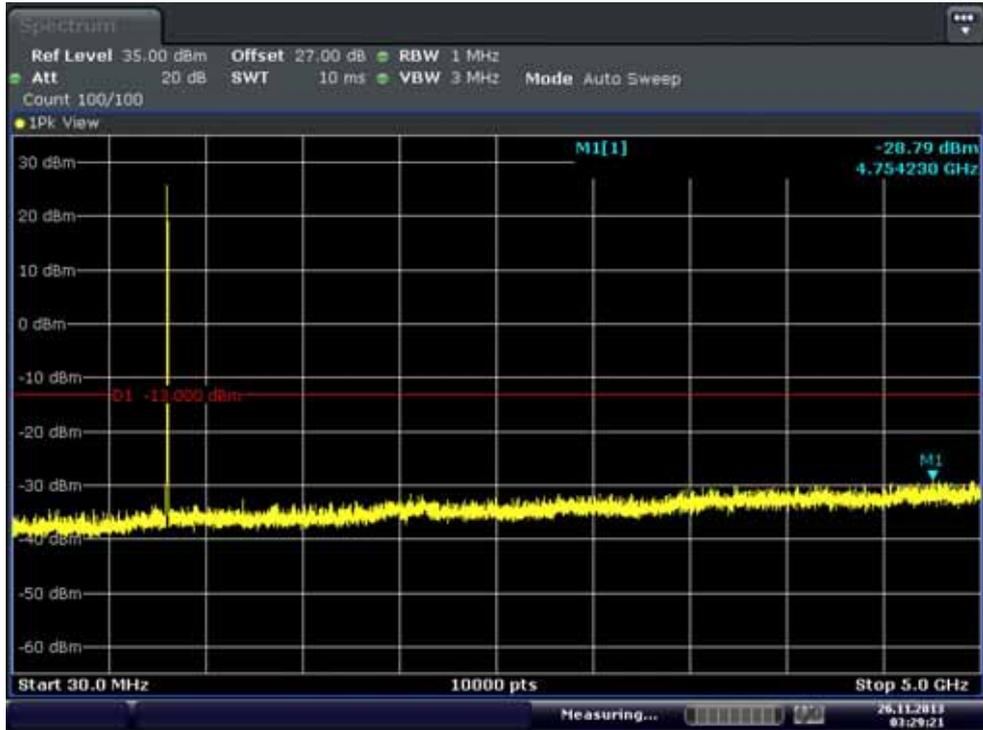
■ PCS CDMA EVDO MODE (1175 CH.) 4 MHz Span



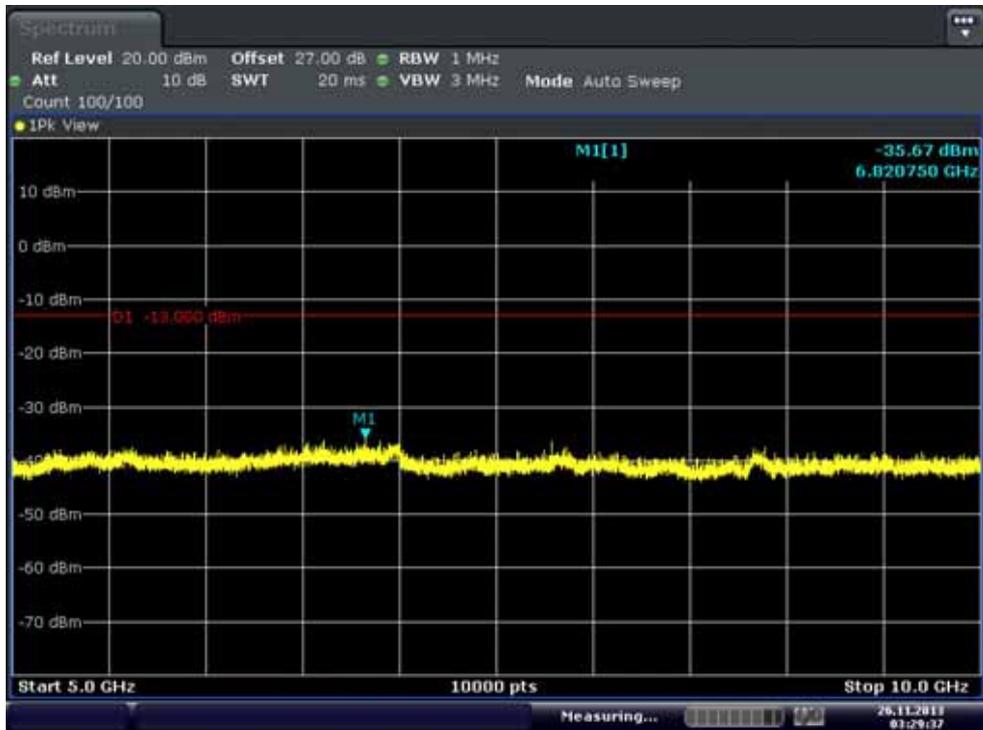
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■ CDMA MODE (1013 CH.) Conducted Spurious Emissions - 1



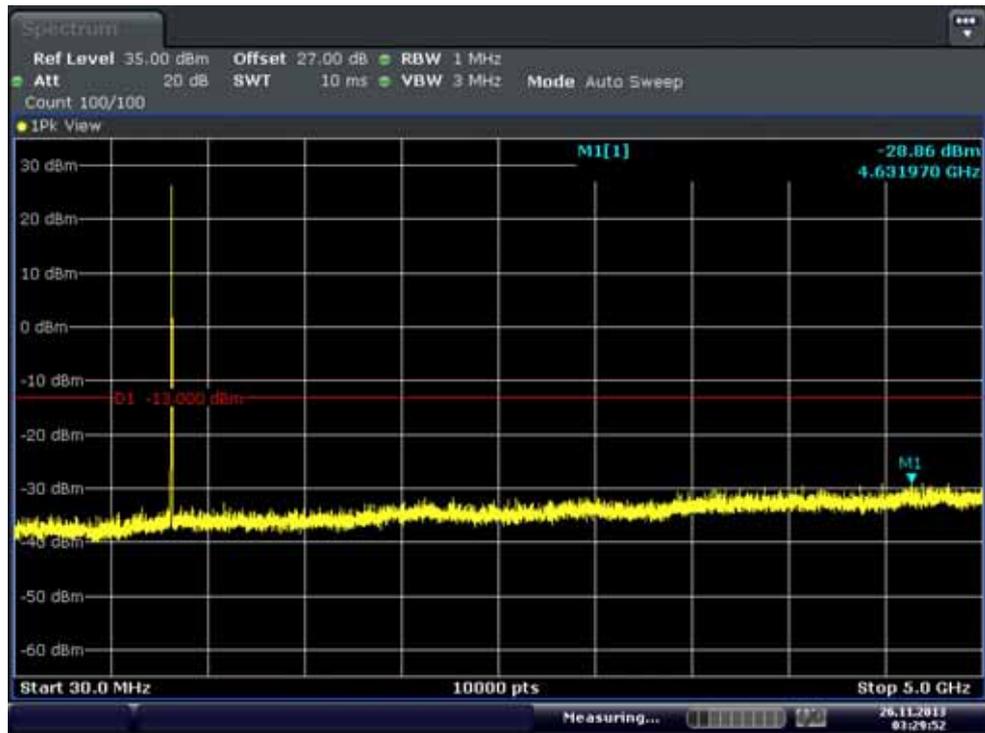
■ CDMA MODE (1013 CH.) Conducted Spurious Emissions - 2



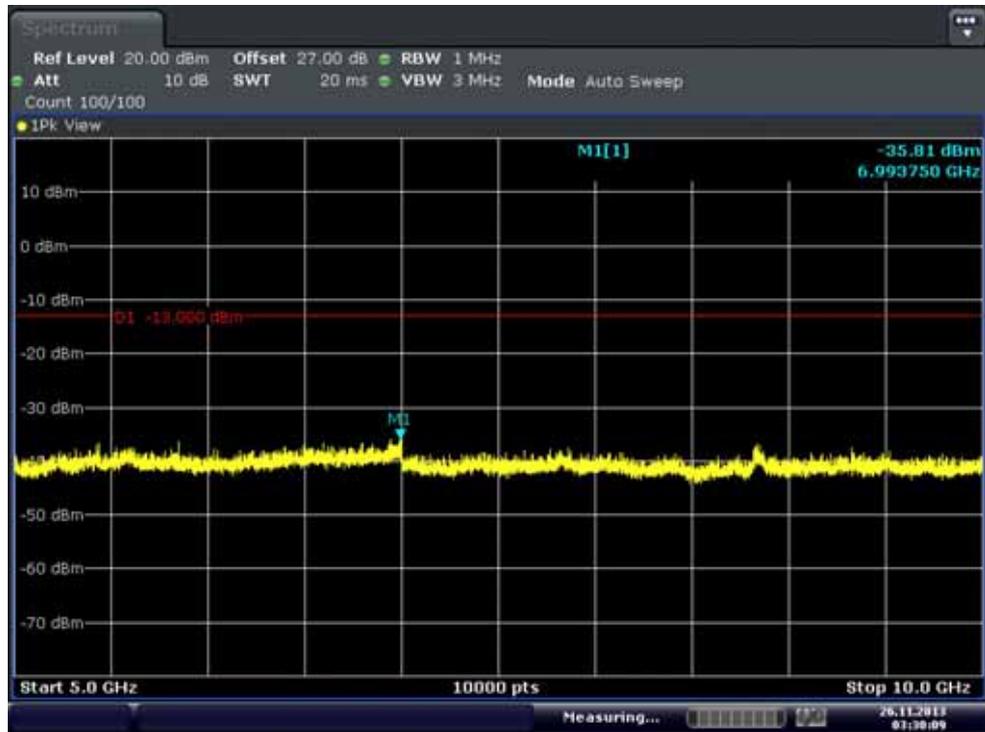
FCC CERTIFICATION REPORT

Test Report No. HCTR1312FR04-3	Date of Issue: December 27, 2013	EUT Type: CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> FCC ID: BEJLTC10
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■ CDMA MODE (384 CH.) Conducted Spurious Emissions - 1



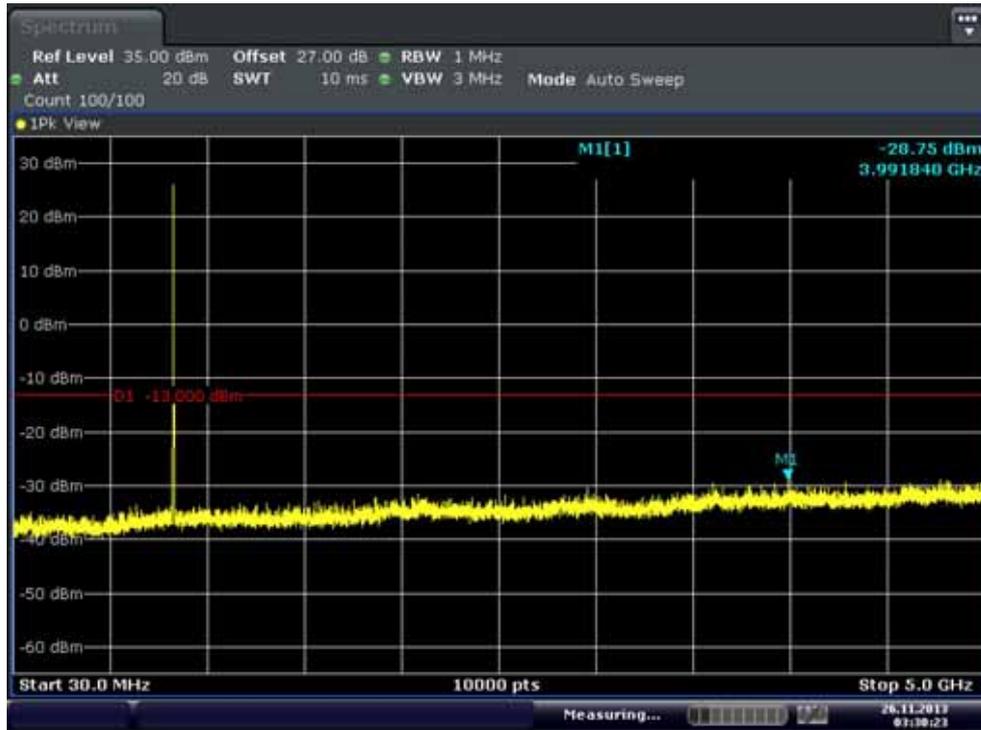
■ CDMA MODE (384 CH.) Conducted Spurious Emissions - 2



FCC CERTIFICATION REPORT

Test Report No. HCTR1312FR04-3	Date of Issue: December 27, 2013	EUT Type: CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> FCC ID: BEJLTC10
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■ CDMA MODE (777 CH.) Conducted Spurious Emissions - 1



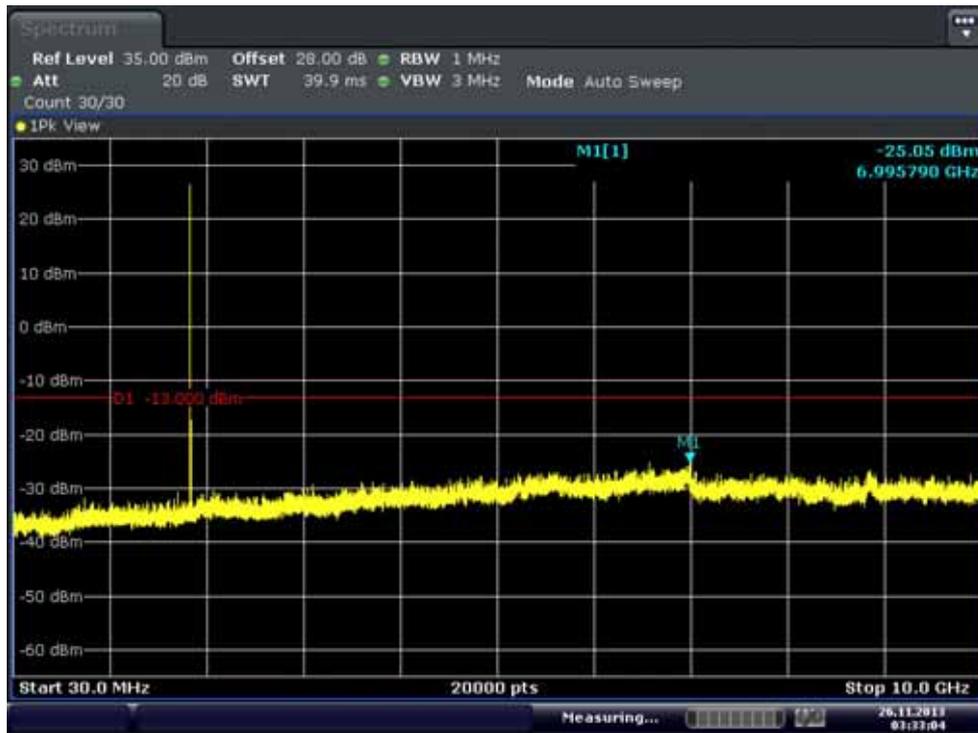
■ CDMA MODE (777 CH.) Conducted Spurious Emissions - 2



FCC CERTIFICATION REPORT

Test Report No. HCTR1312FR04-3	Date of Issue: December 27, 2013	EUT Type: CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> FCC ID: BEJLTC10
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■ PCS CDMA MODE (25 CH.) Conducted Spurious Emissions - 1



■ PCS CDMA MODE (25 CH.) Conducted Spurious Emissions - 2



FCC CERTIFICATION REPORT

Test Report No.  
HCTR1312FR04-3

Date of Issue:  
December 27, 2013

EUT Type:  
CDMA/GSM/WCDMA/LTE Telematics NAD module

[www.hct.co.kr](http://www.hct.co.kr)

FCC ID:  
BEJLTC10

■ PCS CDMA MODE (600 CH.) Conducted Spurious Emissions - 1



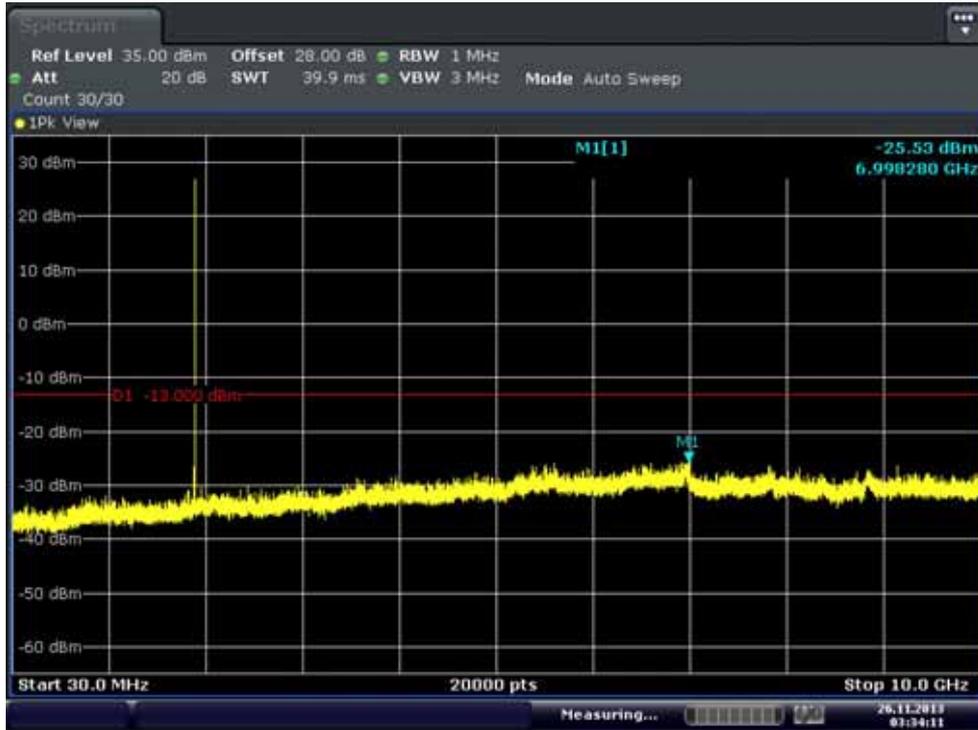
■ PCS CDMA MODE (600 CH.) Conducted Spurious Emissions - 2



FCC CERTIFICATION REPORT

Test Report No. HCTR1312FR04-3	Date of Issue: December 27, 2013	EUT Type: CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> FCC ID: BEJLTC10
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■ PCS CDMA MODE (1175 CH.) Conducted Spurious Emissions - 1



■ PCS CDMA MODE (1175 CH.) Conducted Spurious Emissions - 2



FCC CERTIFICATION REPORT

Test Report No. HCTR1312FR04-3	Date of Issue: December 27, 2013	EUT Type: CDMA/GSM/WCDMA/LTE Telematics NAD module	<a href="http://www.hct.co.kr">www.hct.co.kr</a> FCC ID: BEJLTC10
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