

## HCT CO., LTD.

Product Compliance Division

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#### **FCC Certification**

Applicant Name:	Date of Issue:
PANTECH CO., LTD.	October 29, 2010 Location:
Address:	HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si,
Pantech Bldg, I-2, DMC, Sangam-dong Mapo-gu, Seoul, 121-792, Korea	Kyunggi-Do, Korea(Lab) Test Report No.: HCTR1010FR15-1

HCT FRN: 0005866421

IC Recognition No.: IC 5944A-2

## FCC ID:

## APPLICANT: PANTECH CO., LTD.

**JYCRAY** 

Model(s): EUT Type: Tx Frequency:	UML290 USB Modem 824.70 — 848.31 MHz (CDMA) 1 851.25 — 1 908.75 MHz (PCS CDMA)
Rx Frequency:	869.70 — 893.31 MHz (CDMA) 1 931.25 — 1 988.75 MHz (PCS CDMA)
Max. RF Output Power:	0.299 W ERP CDMA (24.75 dBm) / 0.280 W EIRP PCS CDMA (24.47 dBm) / 0.333 W ERP CDMA EVDO (25.22 dBm) / 0.368 W EIRP PCS EVDO (25.66 dBm)
Emission Designator(s):	1M28F9W (CDMA) / 1M28F9W (PCS CDMA) 1M27F9W (CDMA EVDO), 1M27F9W (PCS CDMA EVDO)
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§22, §24, §2

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)

Report prepared by

: Hyo Sun Kwak Test engineer of RF Team

Approved by

: Sang Jun Lee Manager of RF Team

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# <u>Version</u>

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1010FR15	October 25, 2010	First Approval Report
HCTR1010FR15-1	October 29, 2010	processing comment

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# **MEASUREMENT REPORT**

# **1. GENERAL INFORMATION**

Applicant Name:	PANTECH CO., LTD.
Address:	Pantech Bldg, I-2, DMC, Sangam-dong Mapo-gu, Seoul, 121-792, Korea
Contact Person:	Name: Sang Don Park Phone #: +82-2-2030-1319/ Fax #: +82-2030-2500
FCC ID:	JYCRAY
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§22, §24, §2
EUT Type:	USB Modem
Model(s):	UML290
Tx Frequency:	824.70 — 848.31 MHz (CDMA) 1 851.25 — 1 908.75 MHz (PCS CDMA)
Rx Frequency:	869.70 — 893.31 MHz (CDMA) 1 931.25 — 1 988.75 MHz (PCS CDMA)
Max. RF Output Power:	0.299 W ERP CDMA (24.75 dBm) / 0.280 W EIRP PCS CDMA (24.47 dBm) / 0.333 W ERP CDMA EVDO (25.22 dBm) / 0.368 W EIRP PCS EVDO (25.66 dBm)
Emission Designator(s):	1M28F9W (CDMA) / 1M28F9W (PCS CDMA) 1M27F9W (CDMA EVDO), 1M27F9W (PCS CDMA EVDO)
Antenna Specification	Manufacturer: KARAM Solution.
	Antenna type: Internal Antenna
	Peak Gain: -6.0 dBi (CDMA)
	Peak Gain: 0.0 dBi (PCS CDMA)
Date(s) of Tests:	October 01, 2010 ~ October 08, 2010

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# 2. INTRODUCTION

## 2.1. EUT DESCRIPTION

The UML290 USB Modem consists of Cellular CDMA, PCS CDMA and EVDO Rev.A.

## 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 open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, Maekok-Ri, Hobup-Myun, Ichon-Si, Kyoungki-Do, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated June 10, 2009 (Registration Number: 90661)

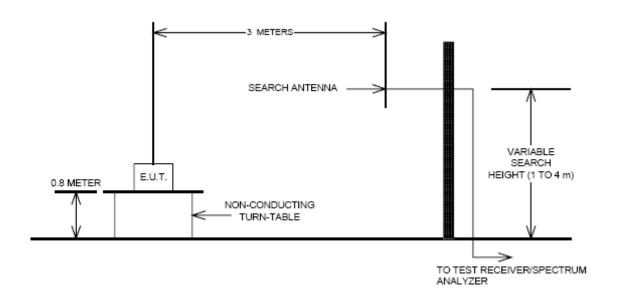
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## **3. DESCRIPTION OF TESTS**

## 3.1 EFFECTIVE RADIATED POWER/EQUIVALENT ISOTROPIC RADIATED POWER

## Test Set-up



### **Test Procedure**

Radiated emission measurements were performed at an open Site.

The equipment under test is placed on a wooden turntable 3-meters from the receive antenna.

A wooden turntable was rotated 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A half wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the previously recorded signal was duplicated.

The maximum EIRP was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

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## 3.2 PEAK- TO- AVERAGE RATIO

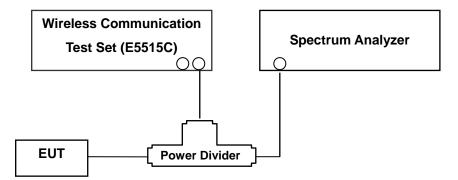
A peak to average ratio measurement is performed at the conducted port of the EUT. For CDMA and WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. Plots of the EUT's Peak- to- Average Ratio are shown herein.

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## 3.3 OCCUPIED bANDWIDTH.

Test set-up



(Configuration of conducted Emission measurement) Test Procedure

The EUT was setup to maximum output power at its lowest channel. The occupied bandwidth was measured using a spectrum analyzer. The measurements are repeated for the highest and a middle channel. The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Plots of the EUT's occupied bandwidth are shown herein.

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## 3.4 SPURIOUS AND HARMOMIC 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.

The EUT was setup to maximum output power at its lowest channel. The Resolution BW of the analyzer is set to 1 % of the emission bandwidth to show compliance with the – 13 dBm limit, in the 1 MHz bands immediately outside and adjacent to the edge of the frequency block. The 1 MHz RBW was used to scan from 30 MHz to 10 GHz. (PCS CDMA Mode: 30 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.

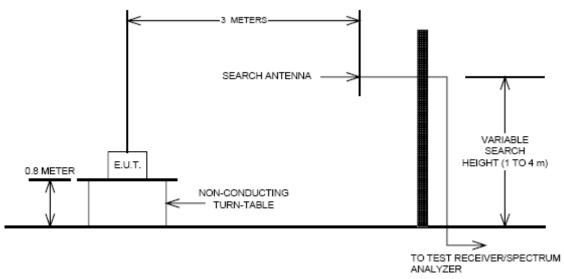
- Band Edge Requirement : In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.

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## 3.5 RADIATED SPURIOUS AND HARMONIC EMISSIONS

## Test Set-up



The measurement facilities used for this test have been documented in previous filings with the commission pursuant to section § 2.948. The open field test site is situated in open field with ground screen whose site attenuation characteristics meet ANSI C63.4 –2003. A mast capable of lifting the receiving antenna from a height of one to four meters is used together with a rotatable wooden platform mounted at three from the antenna mast.

- 1) The unit mounted on a wooden table 1.5 m × 1.0 m × 0.80 m is 0.8 meter above test site ground level.
- 2) During the emission test, the turntable is rotated and the EUT is manipulated to find the configuration resulting in maximum emission under normal condition of installation and operation.
- 3) The antenna height and polarization are also varied from 1 to 4 meters until the maximum signal is found.
- 4) The spectrum shall be scanned up to the 10<sup>th</sup> harmonic of the fundamental frequency.

### Test Procedure

The equipment under test is placed on a wooden turntable 3-meters from the receive antenna.

A wooden turntable was rotated 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A half wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the previously recorded signal was duplicated.

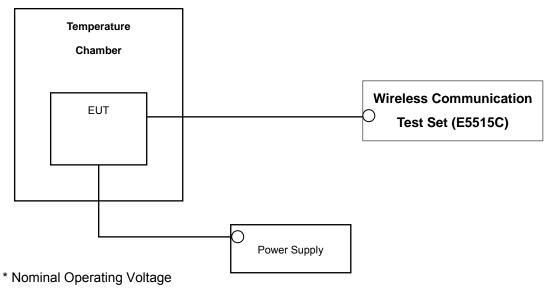
The maximum EIRP was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

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## **3.6 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE**

## Test Set-up



#### 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 battery 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  $\pm$  0.000 25 %( $\pm$  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 halfhour is provided to allow stabilization of the equipment at each temperature level. **NOTE: The EUT is tested down to the battery endpoint.** 

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# **4. LIST OF TEST EQUIPMENT**

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
R&S	ESI40/ Spectrum Analyzer	831564/003	Annual	10/30/2010
Agilent	E4416A/ Power Meter	GB41291412	Annual	01/14/2011
Agilent	E9327A/ Power Sensor	MY4442009	Annual	07/23/2011
Agilent	8960 (E5515C)/ Base Station	GB44400269	Annual	02/10/2011
MITEQ	AMF-6D-001180-35-20P/AMP	990893	Annual	05/20/2011
Wainwright	WHK1.2/15G-10EF/H.P.F	2	Annual	06/25/2011
Wainwright	WHK3.3/18G-10EF/H.P.F	1	Annual	06/25/2011
Agilent	775D/ Dual Directional Coupler	12922	Annual	12/24/2010
Agilent	11636B/ Power Divider	11377	Annual	12/24/2010
Digital	EP-3010/ Power Supply	3110117	Annual	01/08/2011
Schwarzbeck	UHAP/ Dipole Antenna	585	Biennial	02/13/2011
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	02/13/2011
Korea Engineering	KR-1005L / Chamber	KRAB07063-2CH	Annual	12/28/2010
Schwarzbeck	BBHA 9120D/ Horn Antenna	296	Biennial	09/23/2011
Schwarzbeck	BBHA 9120D/ Horn Antenna	147	Biennial	04/13/2012
Agilent	E4440A/Spectrum Analyzer	US45303008	Annual	06/09/2011

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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		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	CONDUCTED	PASS
2.1046	Conducted Output Power	N/A	CONDUCTED	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)	Effective Radiated Power	< 7 Watts max. ERP		PASS
24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP	RADIATED	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

Mode	Ch./ Freq.		Measured	Substitude	Ant. Gain	C.L	Pol.	EF	RP
Mode	channel	Freq.(MHz)	Level(dBm)	LEVEL(dBm)	Ant. Gain	U.L	POI.	w	dBm
CDMA	384	836.52	-10.96	24.81	2.50	1.19	Н	0.41	26.12

### ERP = SubstitudeLEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a wooden tripod is 0.8 meter above test site ground level.

2) During the test, the turn table is rotated and the antenna height is also varied from 1 to 4 meters 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)

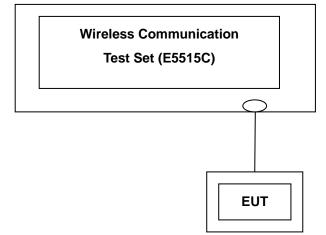
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# 7. TEST DATA

## 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.



		SO2	SO2	SO55	SO55	TDSO	1xEvD	1xEvD	1xEvDO	1xEvDO
David	Ohannal	302	302	3035	3035	SO32	Rev.O	Rev.O	Rev.1	Rev.1
Band	Channel	RC1/1	RC3/3	RC1/1	RC3/3	RC3/3				
		(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(FTAP)	(RTAP)	(FETAP)	(RETAP)
	1013	23.92	23.91	23.92	23.93	23.92	23.82	23.72	23.72	23.72
CDMA	384	23.98	23.97	23.97	23.98	23.98	23.78	23.77	23.78	23.78
	777	23.98	23.98	24.08	24.08	24.08	23.88	23.88	23.78	23.68
	25	24.05	24.05	24.05	24.05	23.95	23.75	23.85	23.85	23.85
PCS	600	23.92	23.92	24.02	23.92	24.02	23.82	23.82	23.82	23.72
	1175	24.05	23.95	24.05	24.05	23.95	23.85	23.75	23.75	23.75

(Maximum Conducted Output Powers)

Note : Detecting mode is average.

## 7.2 PEAK-TO-AVERAGE RATIO

- Plots of the EUT's Peak- to- Average Ratio are shown Page 28.

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## 7.3 OCCUPIED BANDWIDTH

Band	Channel	Frequency(MHz)	Data (MHz)
	1013	824.70	1.2740
CDMA	384	836.52	1.2769
	777	848.31	1.2670
CDMA EVDO	384	836.52	1.2742
	25	1851.25	1.2740
PCS	600	1880.00	1.2802
	1175	1908.75	1.2644
PCS EVDO	600	1880.00	1.2746

- Plots of the EUT's Occupied Bandwidth are shown Page 24 ~ 27.

## 7.4 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Maximum Data (dBm)
	1013	7.9875	-40.25
CDMA	384	1.6730	-39.35
	777	1.6970	-38.22
	25	3.7020	-34.37
PCS	600	3.7620	-31.37
	1175	1.8500	-36.77

- Plots of the EUT's Conducted Spurious Emissions are shown Page 36 ~ 42.

## 7.4.1 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 28 ~ 36.

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## 7.5 EFFECTIVE RADIATED POWER OUTPUT

#### (CDMA Mode)

	Ch.	/ Freq.	Moosurod	Substitude			Pol.	EF	RP
Mode	channel	Freq.(MHz)	Measured Substitude Level(dBm) LEVEL (dBm)	Ant. Gain	C.L	(EUT - Antenna of EUT - Detecting Antenna)	W	dBm	
	1013	824.70	-11.87	35.90	-10.25	1.17	Х – Н – Н	0.28	24.48
CDMA	384	836.52	-12.61	36.02	-10.36	1.19	Х – Н – Н	0.28	24.47
	777	848.31	-13.05	36.42	-10.47	1.20	Х – Н – Н	0.30	24.75
	1013	824.70	-11.76	36.01	-10.25	1.17	Х – Н – Н	0.29	24.59
EVDO	384	836.52	-12.35	36.28	-10.36	1.19	Х – Н – Н	0.30	24.73
	777	848.31	-12.58	36.89	-10.47	1.20	Х – Н – Н	0.33	25.22

Note: This unit was tested with a notebook computer.

#### 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 wooden turn 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 signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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.

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 x plane in CDMA mode. Also worst case of detecting Antenna is in horizontal 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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## 7.6 EQUIVALENT ISOTROPIC RADIATED POWER

#### (PCS CDMA Mode)

	Ch	./ Freq.	Measured	Substitude			Pol.	EII	RP
Mode	channel	Freq.(MHz)	Level(dBm)	LEVEL (dBm)	Ant. Gain	C.L	(EUT - Antenna of EUT - Detecting Antenna)	W	dBm
	25	1,851.25	-15.27	15.98	10.40	1.91	Y – H – H	0.28	24.47
PCS	600	1,880.00	-15.70	15.74	10.43	1.95	Y – H – H	0.26	24.22
	1175	1,908.75	-16.85	14.64	10.47	1.97	Y – H – H	0.21	23.14
	25	1,851.25	-14.26	16.99	10.40	1.91	Y – H – H	0.35	25.48
EVDO	600	1,880.00	-14.26	17.18	10.43	1.95	Y – H – H	0.37	25.66
	1175	1,908.75	-15.51	15.98	10.47	1.97	Y – H – H	0.28	24.48

Note: This unit was tested with a notebook computer.

#### 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 wooden turn 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 signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. 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.

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 and worst case of detecting Antenna is in horizontal polarization.

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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## 7.7 RADIATED SPURIOUS EMISSIONS 7.7.1 RADIATED SPURIOUS EMISSIONS(FETAP on CDMA EVDO Rev.A Mode)

MEASURED OUTPUT POWER: 25.22 dBm = 0.333 W

MODULATION SIGNAL:

CDMA EVDO 3 meters

- 38.22 dBc

LIMIT: - (43 + 10 log10 (W)) =

DISTANCE:

Ch.	Freq.(MHz)	Measured Level	Ant. Gain	<u>Substitute</u> Level [dBm]	C.L	Pol.	ERP (dBm)	dBc
	1,649.40	-45.17	7.09	-55.70	1.73	V	-50.34	-75.09
1013	2,474.10	-33.16	8.12	-40.27	2.28	Н	-34.43	-59.18
	3,298.80	_	_	-	_	_	_	_
	1,673.04	-44.38	7.23	-55.14	1.79	Н	-49.70	-74.45
384	2,509.56	-30.26	8.14	-37.39	2.33	Н	-31.58	-56.33
	3,346.08	_	-	-	-	-	_	_
	1,696.62	-36.47	7.41	-47.08	1.83	V	-41.50	-66.25
777	2,544.93	-31.38	8.21	-38.66	2.34	V	-32.79	-57.54
	3,393.24	-	-	-	_	_	_	_

**NOTES:** <u>1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method</u>

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

2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5<sup>th</sup> Harmonic for all channel.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna

<u>4. The testing were performed using FETAP on Rev.A because FETAP on Rev.A is highest power in CDMA</u> <u>EVDO and CDMA mode.</u>

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## 7.7.2 RADIATED SPURIOUS EMISSIONS(FETAP on PCS EVDO Rev.A Mode)

- MEASURED OUTPUT POWER: 25.66 dBm = 0.368 W
- MODULATION SIGNAL:
   PCS CDMA EVDO
- DISTANCE:
- LIMIT: (43 + 10 log10 (W)) = \_\_\_\_\_\_ <u>38.66 dBc</u>

Ch.	Freq.(MHz)	<u>Measured Level</u> [dBm]	Ant. Gain	<u>Substitute</u> Level [dBm]	C.L	Pol.	EIRP (dBm)	dBc
	3,702.50	-37.69	12.46	-43.96	2.73	V	-34.23	-58.70
25	5,553.75	_	_	-	-	-	_	_
	7,405.00	-	_	-	-	-	_	-
	3,760.00	-36.02	12.47	-41.99	2.73	V	-32.25	-56.72
600	5,640.00	_	_	-	-	-	_	-
	7,520.00	_	_	_	_	_	_	_
	3,817.50	-45.76	12.49	-51.64	2.73	V	-41.88	-66.35
1175	5,726.25	_	_	_	-	_	_	_
	7,635.00	-	_	_	-	_	_	-

3 meters

## **NOTES:** <u>1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method</u> <u>according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:</u>

<u>2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5<sup>th</sup> Harmonic for all channel.</u>

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

<u>4. The testing were performed using FETAP on Rev.A because FETAP on Rev.A is highest power in PCS</u> <u>EVDO and PCS mode.</u>

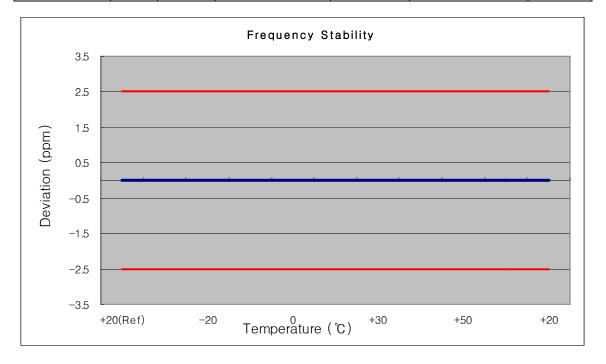
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## 7.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE 7.8.1 FREQUENCY STABILITY (CDMA)

OPERATING FREQUENCY:	836,520,000 Hz
CHANNEL:	384
REFERENCE VOLTAGE:	3.7 VDC
DEVIATION LIM IT:	± 0.000 25 % or 2.5 ppm

Voltage	Power	Temp.	Frequency	Frequency	Deviation		
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	ppm	
100%		+20(Ref)	836 519 999	0	0.000 000	0.000	
100%		-30	836 520 010	10.11	0.000 001	0.012	
100%		-20	836 519 992	-8.12	-0.000 001	-0.010	
100%		-10	836 520 006	6.47	0.000 001	0.008	
100%	3.700	0	836 520 005	5.09	0.000 001	0.006	
100%		+10	836 520 009	8.84	0.000 001	0.011	
100%		+30	836 520 002	1.63	0.000 000	0.002	
100%		+40	836 519 997	-2.74	0.000 000	-0.003	
100%		+50	836 520 007	6.95	0.000 001	0.008	
115%	4.255	+20	836 520 003	3.41	0.000 000	0.004	
Batt. Endpoint	3.400	+20	836 519 997	-2.75	0.000 000	-0.003	



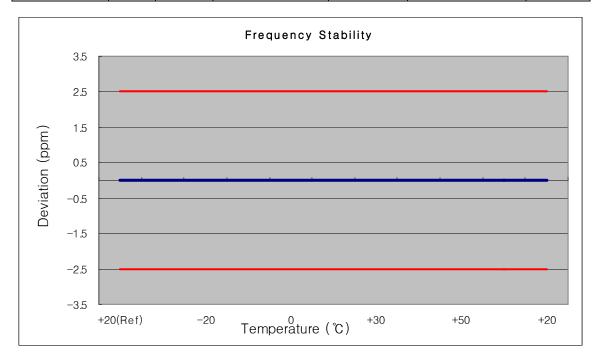
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## 7.8.2 FREQUENCY STABILITY (PCS CDMA)

OPERATING FREQUENCY:	1880,000,000 Hz
CHANNEL:	600
REFERENCE VOLTAGE:	3.7 VDC
DEVIATION LIM IT:	± 0.000 25 % or 2.5 ppm

Voltage	Power	Temp.	Frequency	Frequency	Deviation		
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	ppm	
100%		+20(Ref)	1880 000 011	0	0.000 000	0.000	
100%		-30	1880 000 010	10.03	0.000 001	0.005	
100%		-20	1880 000 001	0.61	0.000 000	0.000	
100%		-10	1879 999 990	-9.66	-0.000 001	-0.005	
100%	3.700	0	1880 000 003	2.67	0.000 000	0.001	
100%		+10	1880 000 004	4.37	0.000 000	0.002	
100%		+30	1879 999 991	-8.54	0.000 000	-0.005	
100%		+40	1880 000 007	6.55	0.000 000	0.003	
100%		+50	1880 000 012	11.95	0.000 001	0.006	
115%	4.255	+20	1879 999 994	-5.88	0.000 000	-0.003	
Batt. Endpoint	3.400	+20	1880 000 004	4.07	0.000 000	0.002	



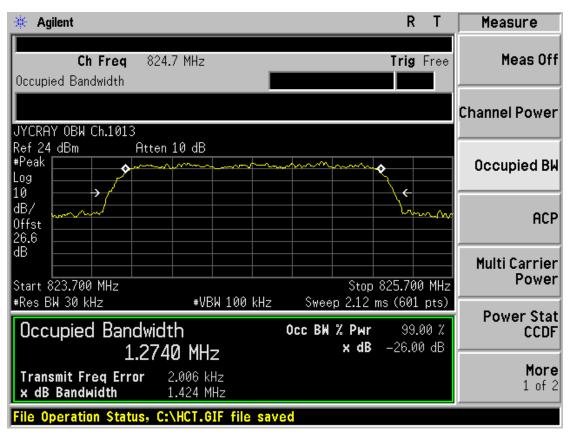
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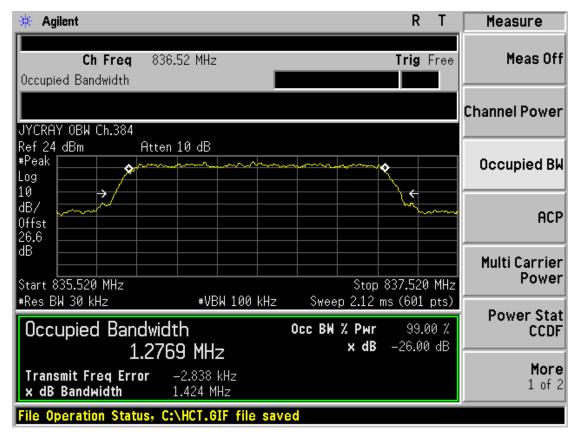
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## CDMA MODE (1013 CH.) Occupied Bandwidth



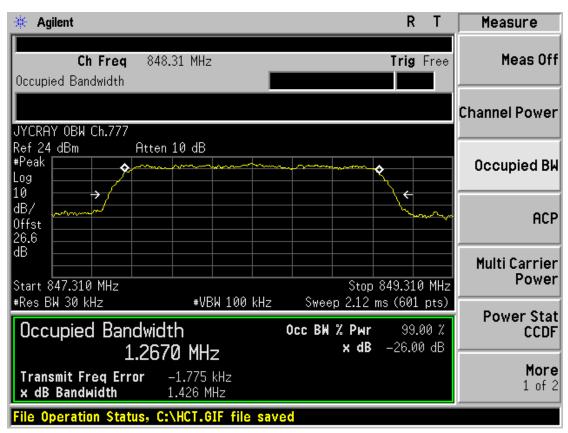
## CDMA MODE (384 CH.) Occupied Bandwidth



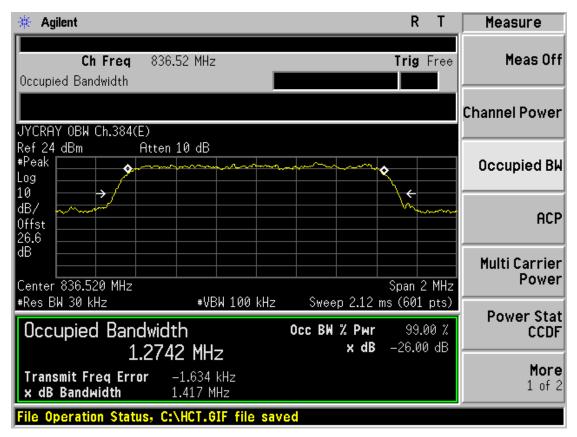
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## CDMA MODE (777 CH.) Occupied Bandwidth



### CDMA EVDO MODE (384 CH.) Occupied Bandwidth



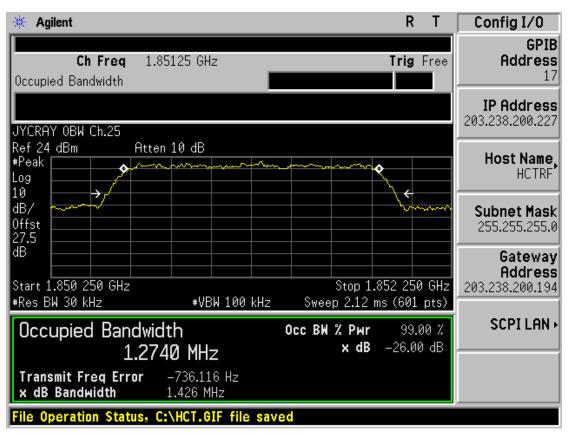
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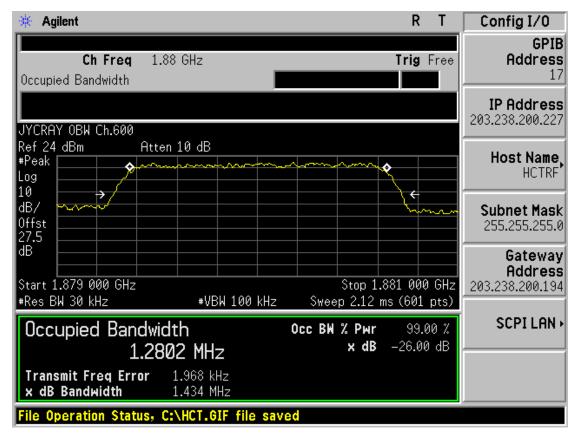
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### ■ PCS CDMA MODE (25 CH.) Occupied Bandwidth



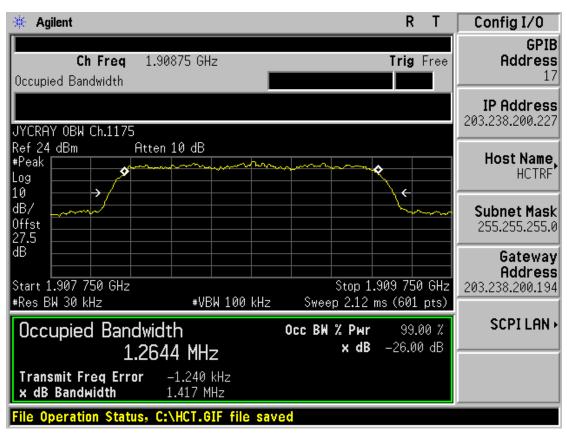
## PCS CDMA MODE (600 CH.) Occupied Bandwidth



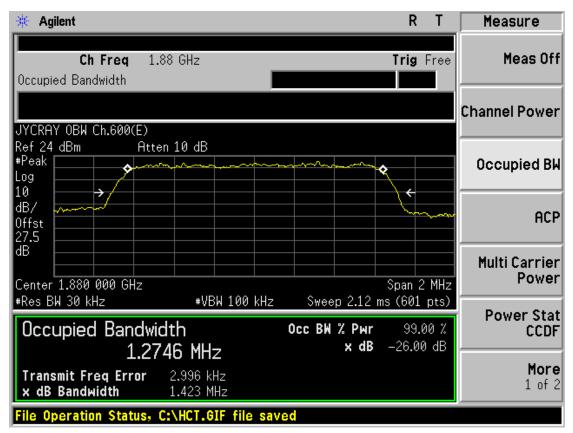
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## PCS CDMA MODE (1175 CH.) Occupied Bandwidth



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



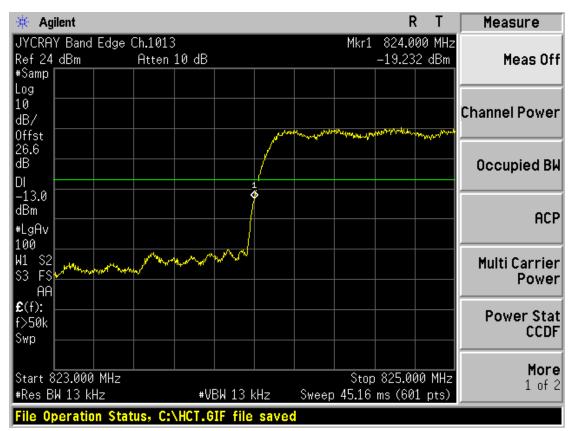
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#### 🔆 Agilent R Т Measure Meas Off Ch Freq 1.88 GHz Trig Free Counts(k): 100 CCDF **Channel Power** 100.00% Gaussian Reference Average Power 23.91 dBm Occupied BW 10.00% 50.85% 1.00% ACP 1.85 dB 10.0% 0.10% 1.0% 2.96 dB **Multi Carrier** Power 0.1% 3.44 dB 0.01% 0.01% 3.68 dB 3.76 dB 0.001% Power Stat 0.001% 0.0001% CCDF Peak 3.76 dB 0.0001% 0 dB Meas BW More 20 dB 5.00000000 MHz 1 of 2 Copyright 2000-2007 Agilent Technologies

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

#### CDMA MODE (1013 CH.) Band Edge



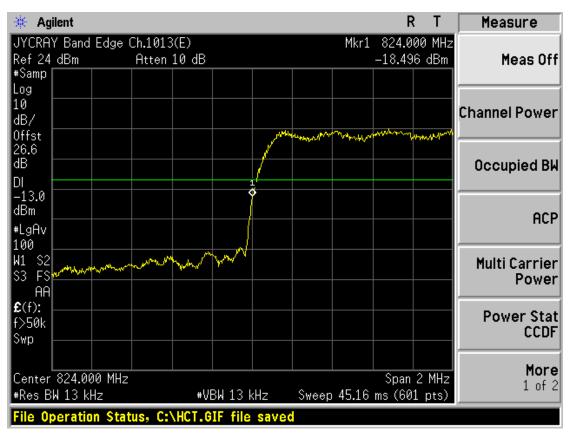
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🔆 Agilent			R	Τ [	Measure
JYCRAY Band Edge Ch. Ref 24 dBm A	.777 tten 10 dB		849.000 15.398 d		Meas Off
#Samp			13.300 (		neas on
Log 10 dB/					Channel Power
Offst 26.6 dB DI					Occupied BW
-13.0 dBm #LgAv					ACP
100 W1 S2 S3 FS AA		hann,	Mar Mar Margaret	#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Multi Carrier Power
£(f): f>50k Swp					Power Stat CCDF
Start 848.000 MHz #Res BW 13 kHz	#VBW 13 kHz	Stop Sweep 45.16 m	 850.000 ns (601 p		<b>More</b> 1 of 2
File Operation Status	, C:\HCT.GIF file saved				

## ■ CDMA MODE (777 CH.) Band Edge

### ■ CDMA EVDO MODE (1013 CH.) Band Edge



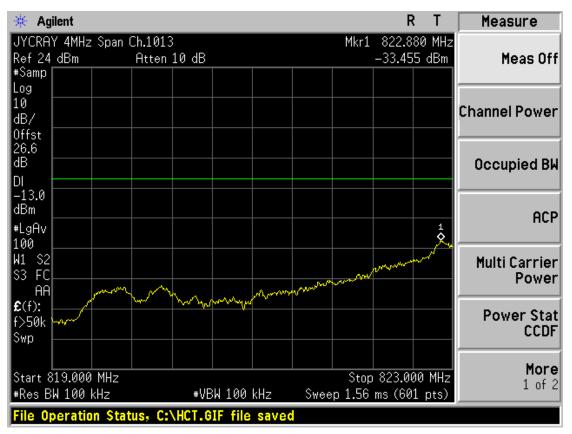
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🔆 Agilent				R	Т	Measure
JYCRAY Band Edge Ch.777	(E)		Mkr1	849.000	) MHz	
	10 dB			-17.576	dBm	Meas Off
#Samp						
Log 10						
dB/						Channel Power
Offst manufacture	Mary and and the					
26.6						
dB						Occupied BW
		1 •				
-13.0 dBm						
						ACP
#LgAv 100						
W1 S2		bourser with a man	marth			Multi Carrier
\$3 FS			<b>N</b>	Margarethe Margarethe	and the second	Power
AA						
<b>£</b> (f):						Power Stat
f>50k						CCDF
Swp						
						More
Center 849.000 MHz				Span 2		1 of 2
#Res BW 13 kHz	#VBW 13	kHz Sweep	o <b>45.</b> 16	ms (601	pts)	1012
File Operation Status, C	\HCT.GIF file	saved				

## ■ CDMA EVDO MODE (777 CH.) Band Edge

### CDMA MODE (1013 CH.) 4 MHz Span



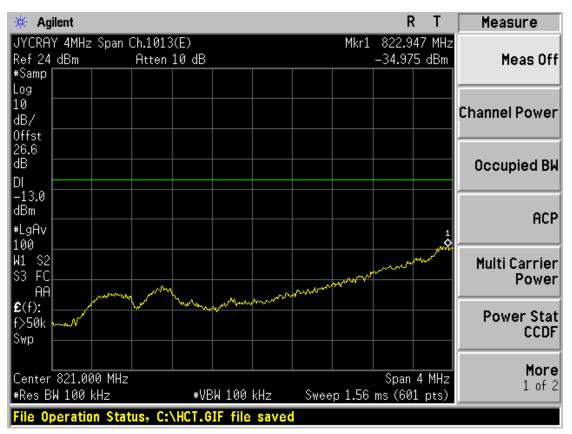
	FCC CERTIFICATION REPORT				
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🔆 Agilent			RT	Measure
JYCRAY 4MHz Span Ref 24 dBm #Samp	Ch.777 Atten 10 dB	Mkr1 -	850.120 MHz -33.847 dBm	Meas Off
Log 10 dB/ 0ffst				Channel Power
26.6 dB DI -13.0				Occupied BW
dBm #LgAv 1				ACP
100 × × × × × × × × × × × × × × × × × ×	manna			Multi Carrier Power
€(f): f>50k Swp		mar and		Power Stat CCDF
Start 850.000 MHz #Res BW 100 kHz	#VBW 100 kHz	Stop Sweep 1.56 r	854.000 MHz ns (601 pts)	More 1 of 2
File Operation Stat	tus, C:\HCT.GIF file sav	ed		

#### CDMA MODE (777 CH.) 4 MHz Span

### CDMA EVDO MODE (1013 CH.) 4 MHz Span



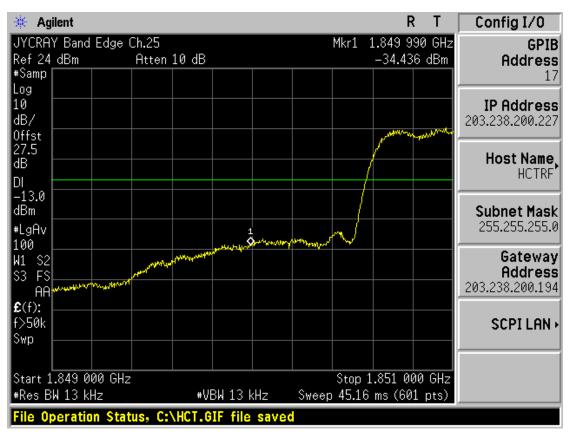
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🔆 Agilent				R	T Measure
JYCRAY 4MHz Span			Mkr1	850.080	
Ref 24 dBm	Atten 10 dB			-36.581 d	Bm MeasOff
#Samp					
Log					
10 dB/					Channel Power
Offst					
26.6					
dB					Occupied BW
DI					occupied bh
-13.0					
dBm					0.00
#LgAv					ACP
					Multi Carrier
S3 FC	Contra				Power
ÂĂ	Carry Mary	Anna .	m		FOWER
<b>£</b> (f):		mun	man m	m	
f>50k				<u>المراجعة</u>	Power Stat
Swp					CCDF
					More
Center 852.000 MHz			A 4 EA	Span 4 M	1HZ 1 of 2
#Res BW 100 kHz	#VE	3W 100 kHz	Sweep 1.56	ms (601 p	ts)
<b>File Operation Stat</b>	us, C:\HCT.G	IF file save			

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

#### ■ PCS CDMA MODE (25 CH.) Band Edge



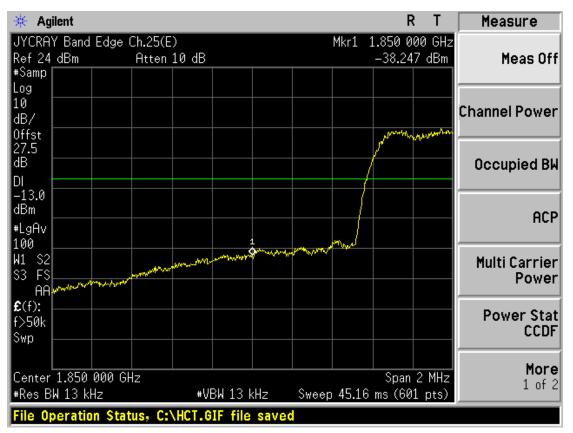
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🔆 Agilent				R	Т	Config I/0
JYCRAY Band Edg	e Ch.1175		Mkr1	1.910 00		GPIB
Ref 24 dBm	Atten 10 dB			-38.526	dBm	Address
#Samp						17
Log 10				<u> </u>		
dB/						IP Address 203.238.200.227
Offst man	<u> </u>					203.230.200.227
27.5	·~~					
dB						Host Name,
DI						HCTRF
-13.0						
dBm						Subnet Mask
#LgAv						255.255.255.0
100	- Marine was	1				• •
W1 S2		and a stand and the stand of th	here whethere and			Gateway
\$3 F\$			where a show the	Ward and a strange of the state	Marter Martine	Address
AA						203.238.200.194
<b>£</b> (f):				$\vdash$		
f>50k						SCPI LAN 🕨
Swp						
Start 1.909 000 0	ЭНz		Stop 1	.911 000	) GHz	
#Res BW 13 kHz	#V	BW 13 kHz	Sweep 45.16			
File Operation S	tatus, C:\HCT.0	IF file saved				

#### ■ PCS CDMA MODE (1175 CH.) Band Edge

### ■ PCS CDMA EVDO MODE (25 CH.) Band Edge



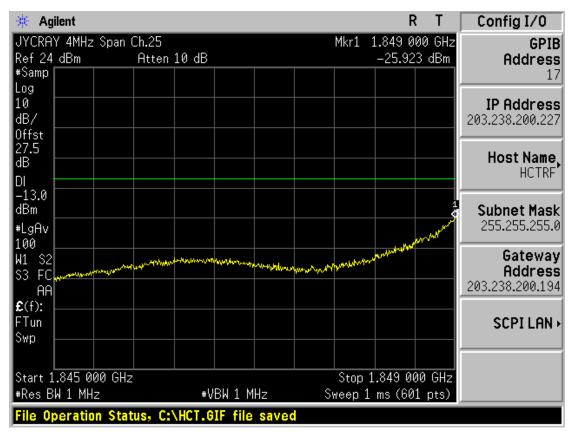
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🔆 Agilent								F	₹Т	Measure
JYCRAY Ba							Mkr1		53 GHz	
Ref 24 dBr #Samp	m	Atten	10 dB		1		1	-38.89	94 dBm	Meas Off
Log										
10 dB/										Channel Power
	mannether									
27.5	<u> </u>									
dB		<u> </u>								Occupied BW
-13.0										
dBm		<u> </u>								ACP
#LgAv 100		man	<sup>14</sup> 4 <sup>44</sup> 7447		1					
W1 S2			1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1	and the second sec	m	man				Multi Carrier
S3 FS							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	"Norther a state	and the second	Power
AA <b>£</b> (f):										
f>50k										Power Stat CCDF
Swp —										
										More
Center 1.9 #Res BW 10		łz	اللم	BW 13	uu-	\$110.0F	. <b>/</b> E 16	Span ms (60	2 MHz	1 of 2
							43.10	IIIS (OU	ν <u>τ</u> μ(s)	
rile opera	ation Stat	us, c:	VHC1.0		save	•				

## ■ PCS CDMA EVDO MODE (1175 CH.) Band Edge

### PCS CDMA MODE (25 CH.) 4 MHz Span



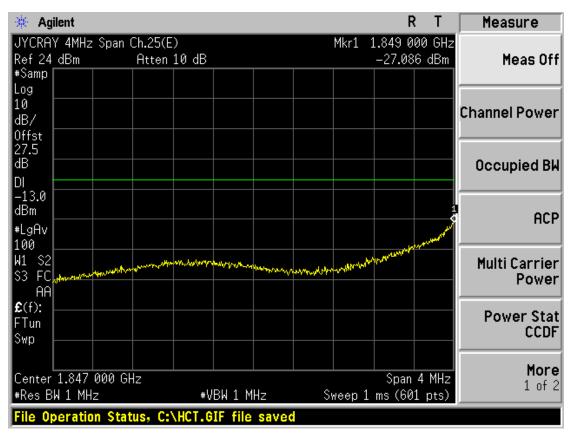
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🔆 Agilent				R	Т	Config I/0
JYCRAY 4MHz Span				11 007		GPIB
Ref 24 dBm	Atten 10 dB		-2	25.199	dBm	Address
#Samp						17
						70.011
10						IP Address
dB/						203.238.200.227
Offst 27.5						
dB						Host Name,
						HCTRF
DI -13.0						
$dBm \delta$						Subnet Mask
						255.255.255.0
#LgAv						200.200.200.0
100 W1 S2	th <sub>odd Paul</sub>					Gateway
\$3 FC	and the second the second	Million Mary Jack Strategier	white way the start and			Address
AA				Wayson And and	The second	203.238.200.194
<b>£</b> (f):					1.4	
						CODILION
FTun						SCPI LAN 🕨
Swp						
Start 1.911 000 GH	Z		Stop 1.91	15 000	GHz	
#Res BW 1 MHz		3W 1 MHz	Sweep 1 ms			
rile operation Sta	tus, C:\HCT.GI	r the saved				

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

### ■ PCS CDMA EVDO MODE (25 CH.) 4 MHz Span



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Measure	? Т	F								ilent	🔆 Ag
Meas Off	00 GHz 6 dBm		Mkr1				5(E) 10 dB	Ch.117 Atten	z Span		JYCRA Ref 24 #Samp
Channel Power											+Jamp Log 10 dB/ Offst
Occupied BW											27.5 dB DI -13.0
ACP										Mr. Norther	dBm ( #LgAv 100
Multi Carrier Power	ale and a construction	and the second second	n white have	(maningalan)	adao1pathatanapat	yayaa dhaabaa		THINK HIMME	- Ahranak		W1 S2 S3 FC AA
Power Stat CCDF											€(f): FTun Swp
More 1 of 2	4 MHz 1 pts)	Span ms (60	weep 1		lHz	 'BW 1 M	#\	Hz		1.913 W 1 MH	
				d	save	IF file	\HCT.6	tus, C:	on Sta	peratio	File O

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

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

🔆 Agilent				R	Т	Measure
JYCRAY Cond Spur Ch				2.237		
Ref 24 dBm f #Peak	Atten 10 dB		-	-44.61	dBm	Meas Off
10						Channel Power
dB/						channel Fower
Offst 26.6						
dB						Occupied BW
DI						occupied bit
-13.0						
dBm						ACP
#LgAv						
V1 S2				1		Multi Corrier
	(			\$		Multi Carrier Power
AA	An weathing the second	when the when a star	en an	-bardente datad		100001
<b>£</b> (f):						Power Stat
FTun						CCDF
Swp						
						More
Start 30 MHz	1			2.500		1 of 2
#Res BW 1 MHz		BW 1 MHz	Sweep 4.12 ms	5 (601	pts)	
File Operation Statu	s, C:\HCT.G	IF file saved				

	FCC CERTIFICATION REPORT					
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HCTR1010FR15-1	October 29, 2010	USB Modem	JYCRAY			



🔆 Agilent				R	Т	Measure
JYCRAY Cond Spur Ch			Mkr1	7.987 5		
	tten 10 dB			-40.25	dBm	Meas Off
#Peak Log						
10						
dB/						Channel Power
Offst						
26.6						
dB						Occupied BW
-13.0 dBm						
#LgAv						ACP
*L9HV						
V1 S2						Multi Carrier
S3 FC	Martin de la contraction	والمحال والمحال والمدين والمحال والمعالية والمعالية المحالية والمعالية والمعالية والمعالية والمعالية والمعالية	www.mon	www.	Mum	Power
AA	an Marine address of Address in Lin					
<b>£</b> (f):						Power Stat
FTun						CCDF
Swp						CODI
						Mana
Start 2.500 0 GHz			Stop	10.000 0	GHz	<b>More</b> 1 of 2
#Res BW 1 MHz	#VBW	1 MHz – Swee	p 12.52	ms (601	pts)	1 01 2
File Operation Status	C:\HCT.GIF	file saved	_			

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

## ■ CDMA MODE (384 CH.) Conducted Spurious Emissions - 1

🔆 Agilent			RT	Measure
JYCRAY Cond Spur Ch	.384	Mkr	1 1.673 GHz	
	Atten 10 dB		-39.35 dBm	Meas Off
Peak				
.og				
10 187				<b>Channel Power</b>
)ffst				
26.6				
i₿				Occupied BW
)				
-13.0				
¦Bm I I				ACP
⊧LgAv				nur
		1		
/1 S2				Multi Carrier
3 FC	water and the sheather water	and an all the second strates and the second strates and the second strates and the second strates and	where and a second second second	Power
AA				
E(f):				Power Stat
Tun				CCDF
Swp				CODI
Start 30 MHz		Str	p 2.500 GHz	More
ŧRes BW 1 MHz	#VBW 1 M⊦			1 of 2
ile Operation Statu				

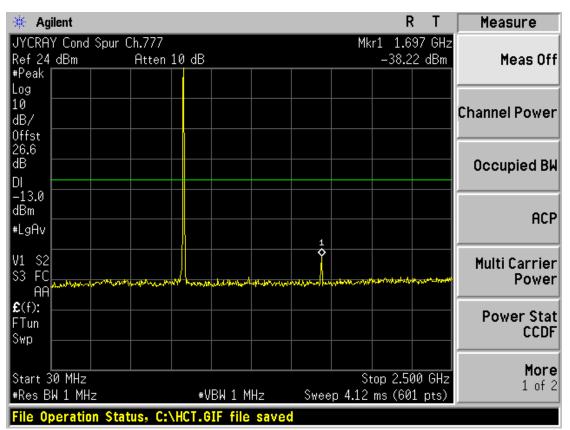
	www.hct.co.kr			
Test Report No.	Test Dates:	EUT Type:	FCC ID:	Page 3 7 of 42
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🔆 Agilent							R	Т	Measure
JYCRAY Cond Spi						Mkr1	7.062		
Ref 24_dBm	Atten	10 dB					-40.30	) dBm	Meas Off
#Peak									
Log 10									
dB/									Channel Power
Offst									
26.6									
dB 👘									Occupied Bk
DI									
-13.0									
dBm									ACP
#LgAv									
					1				
V1 S2 S3 FC				Wine	Sound approv	hallhaman	Any when the real	www	Multi Carrier
AA		the fail the state of the second	*****	weat-f				an any g	Power
£(f):									
FTun									Power Stat
Swp									CCDF
Start 2.500 0 GH	7					Stop	10.000	0 GH-2	More
#Res BW 1 MHz	2	#UR	W 1 M	17	Swaan		ms (601		1 of 2
						IC.JC	m3 (001	pts)	J
File Operation S	status, C:	AHCI.GI	- file	saved					

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

CDMA MODE (777 CH.) Conducted Spurious Emissions - 1



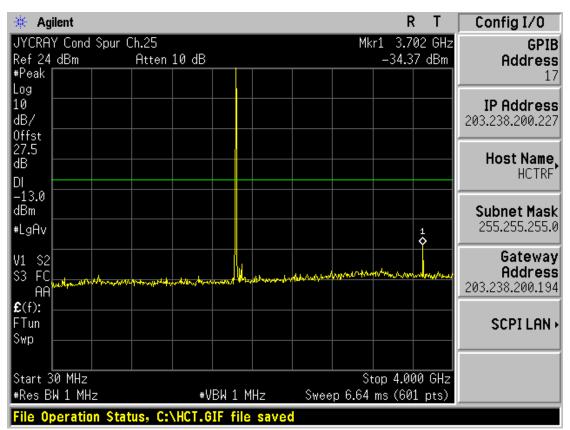
	FCC CERTIFICATION REPORT					
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Measure	Т	R									ilent	🔆 Ag
		6.925 0		Mkr						Spur (		
Meas Off	dBm	40.52	_					10 dB	Atten		dBm	Ref24 ≠Peak
												.0g
Channel Power			┢									0
channel Fower												IB/
												lffst :6.6
Occupied Bk			+									10.0 IB
cocupied bi			+-									1
			╞									13.0
ACP												Bm
												LgAv
Multi Comios			+			1						1 S2
Multi Carrier Power	Mh was	and the second	sr4	Mannahan	the production of	an about worked	_hunshe	ار	halaka sura	mound	whenthe	3 FC
101101							Aug 1144 - 54	and the second second			and	AA
Power Stat			+									(f):
CCDF												Tun
			┢									wp
More												
1 of 2		.000 0			Ô		511 4 M				.500 0	
	pts)	(601	m	12.5			3W 1 M				W 1 MH	
						save	(F file	HCT.G	us, C:'	on Stat	peratio	ile 0

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

■ PCS CDMA MODE (25 CH.) Conducted Spurious Emissions - 1



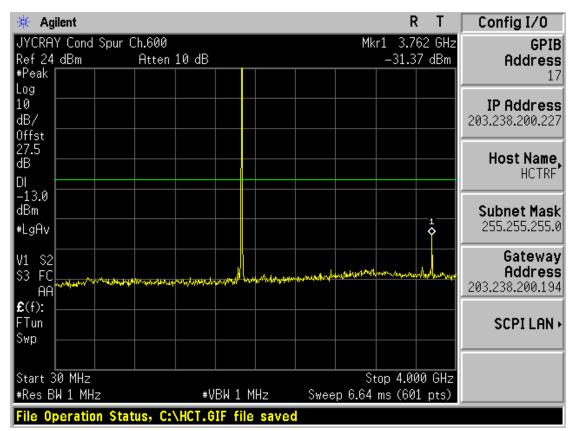
	FCC CERTIFICATION REPORT					
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🔆 Agilent		R	T Config I/0
JYCRAY Cond Spur C		Mkr1 14.213	
Ref 24 dBm	Atten 10 dB	-37.67 (	
#Peak Log			17
10 dB/			IP Address
Offst			203.238.200.227
27.5 dB			Host Name,
DI			HCTRF
-13.0 dBm			Subnet Mask
#LgAv		1	255.255.255.0
V1 S2 S3 FC	Anno materia	And the Marine manufactures and	Gateway Address 203.238.200.194
AA COL			203.230.200.134
£(f): FTun			SCPI LAN >
Swp			
Start 4.000 GHz		Stop 20.000	GHz
#Res BW 1 MHz	#VBW 1 M⊦		
	us, C:\HCT.GIF file		

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

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



 
 FCC CERTIFICATION REPORT
 www.hct.co.kr

 Test Report No. HCTR1010FR15-1
 Test Dates:
 EUT Type: USB Modem
 FCC ID: JYCRAY
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🔆 Agilent				R	Т	Config I/O
JYCRAY Cond Spu			Mkr:	1 14.98		GPIB
Ref 24 dBm	Atten 10 dB			-37.58	3 dBm	Address
#Peak						17
10 JP/						IP Address
dB/						203.238.200.227
Offst 27.5						
dB						Host Name,
						HCTRF
-13.0						
dBm						Subnet Mask
						255.255.255.0
#LgAv			1			200.200.200.0
V1 S2	homenologie a com	where a start and the	work with providence	- Condegorder mit	Margaren	Gateway
S3 FC	manufulution	Marchael Avelan Level a				Address
AA						203.238.200.194
<b>£</b> (f):						
FTun						SCPI LAN >
Swp						
Start 4.000 GHz			Sto	p 20.00	0 CU-	
	11G	11 1 MU-				
#Res BW 1 MHz		BW 1 MHz	Sweep 40	MS (601	. pts)	
File Operation St	atus, C:\HCT.GI	F file saved				

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

## PCS CDMA MODE (1175 CH.) Conducted Spurious Emissions - 1

🔆 Agilent				F	X T	Config I/0
JYCRAY Cond Spu				Mkr1 1.8		GPIB
Ref 24 dBm	Atten 10 dB			-36.7	7 dBm	Address
#Peak						17
Log 10						IP Address
dB/						203.238.200.227
Offst						200.200.200.227
27.5						llast blama
dB						Host Name HCTRF
DI						HUIKE
-13.0						
dBm						Subnet Mask
#LgAv		10				255.255.255.0
		<b>─</b> � <mark> </mark> ───				Gateway
V1 S2 S3 FC			and and the stand of	www.whata.au		Address
AA	errore characteristic provident and and	www.	A CONTRACT		4799.2-97.99996	203.238.200.194
<b>£</b> (f):						
FTun						SCPI LAN +
Swp						our renit,
Start 30 MHz				Stop 1-0		
start S0 MH∠ #Res BW 1 MHz	#UI	3W 1 MHz	Sweep 6.6	Stop 4.0 34 ms (60		
				74 IIIS (00	1 pts)	
File Operation Status, C:\HCT.GIF file saved						

FCC CERTIFICATION REPORT				www.hct.co.kr
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🔆 Agilent			RT	Config I/0
JYCRAY Cond Spur		Mkr		GPIB
Ref 24 dBm #Peak	Atten 10 dB	1 1 1	-37.76 dBm	Address
Log				17
10				IP Address
dB/				203.238.200.227
Offst				
27.5 dB				Host Name,
DI				HCTRF
-13.0				
dBm				Subnet Mask
#LgAv				255.255.255.0
V1 S2	montheapproximation	her man hand and har and	mumulant	Gateway Address
SO FC MANAGEMENT	and a shrink the second as			203.238.200.194
AA £(f):				200.200.200.104
FTun				SCPI LAN •
Swp				JULI LUM
Start 4.000 GHz			p 20.000 GHz	
#Res BW 1 MHz	#VBW 1 №		ms (601 pts)	
			m5 (001 pts)	
File Operation St	atus, C:\HCT.GIF file	saved		

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

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