



ESTECH Co., Ltd.

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TEL: 82-2-867-3201
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Test Report

Report Number	ESTR0510-013			
Applicant	Company Name	R-TRON, Inc.		
	Address	Jisan IT Venture Bldg., 2/3F, 1004-9/10, Doksan-Dong, Gumcheon-Gu, Seoul, Korea		
	Telephone	82-2-896-4101		
Product	Product Name	PCS Repeater Remote Monitor system		
	Model No.	HB 1900	Manufacturer	R-TRON, Inc.
	Serial No.	NONE	Country of origin	Korea
	Date of Issue	2005-10-20	Date of Test	2005-09-20 ~ 2005-10-20
Testing Lab.	ESTECH. Co., Ltd			
Standard	FCC PART 24 Subpart E			
Tested by	S.R. Kim/ Engineer			
Approved by	Jay Kim/ Engineering Manager			

*** Note**

- This test report is not permitted to copy partly without our permission
- This test result is dependent on only equipment to be used
- This test result based on a single evaluation of one sample of the above mentioned



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1. INSTRUCTION

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and tested in accordance with the measurement procedures as indicated in this report. ESTECH Lab. attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab. assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name: ESTECH Co. Ltd.

Head Office: Rm. 1015, World Venture Center II, 426-5, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea (**Safety & SAR & Telecom. Test Lab**)

EMC Test Lab.: 58-1, Osan-Ri, GaNam-Myon, YeoJoo-Gun, KyungKi-Do, Korea
97-1, Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea



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2. INTRODUCTION

2.1 Summary of Equipment Under Test

- **FCC ID :** STERSP-DPP-1900
- **Freq. Range :** Tx : 1850.20 ~ 1908.75 MHz
Rx : 1931.25 ~ 1988.75 MHz
- **Power Rating :** AC 110V(85V ~ 132V)
- **EUT Type :** PCS Repeater Remote Monitor system
- **Modulation(s) :** CDMA - FM



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3. DESCRIPTION OF THE DEVICE UNDER TEST

3.1 RF Power Output

The EUT was placed on a wooden turn table 3 meters from the receive antenna. The receive antenna height and turn table rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with $RBW = VBW = 3\text{MHz}$. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with $RBW = VBW = 1\text{MHz}$. 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. This spurious level is recorded. For reading 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

3.5 Occupied Bandwidth

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% of the Emission bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

3.6 Spurious and Harmonic Emission at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to 10GHz. Set the RES BW to 1% of the emission bandwidth to show compliance with the -13dBm, limit, in the 1MHz bands immediately outside and adjacent to the top and bottom edges of the frequency block.

For the Out-of-Band measurements a 1MHz RBW was used to scan from 10MHz to 10xfo of the fundamental carrier for all frequency block. A display line was placed at -13dBm to show compliance for spurious, and harmonics. Mobile emission in base frequency range. The mean power of any emissions appearing in the base station frequency range from cellular mobile transmit antenna connector.

3.7 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emission are measured outdoors at our 3 meters test range. The equipment under test is placed on a wooden turntable 3 meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer (or receiver). A half wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.



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3. DESCRIPTION OF TEST(CONTINUE)

3.8 Frequency stability (Temperature Variation)

The frequency stability of the transmitter is measured by:

- a) **Temperature:** The temperature is varied from -30 °C to +60 °C using an environmental chamber.
- b) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.
※ 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 ±2.5ppm of the center frequency.

Time Period and Procedure

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (22 °C to 25 °C to provide a reference.)
2. The equipment is subjected to an overnight “soak” at -30 °C without any power applied.
3. After the overnight “soak” at -30 °C (usually 14 – 16hours), 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 and the individual oscillators is made within a three minute interval after applying power to the transmitter.
4. Frequency measurements are made at 10 °C interval up to room temperature. At least a period of one and one half hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting -30 °C up to +50 °C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.



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4. TEST DATA

4.1 EFFECTIVE RADIATED POWER OUTPUT (E.R.P.)

MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Receiver	Rohde & Schwarz	ESP17
Signal Generator	HP	E4432B
Power Meter	HP	EPM-442A
Pre Amplifier	SONOMA INSTRUMENT	310N
Log-bicon Antenna	SCHWARZBECK	VULB9160
Dipole Antenna	SCHWARZBECK	UHAP
Wireless Communications Test Set	Agilent	E5515C

*TEST RESULT

- Company Name: LG Electronics Inc.
- EUT Description: PCS Repeater Remote system

CDMA

	Ch No.	Freq (MHz)	Peak Power Meter(dBm)	Peak Power ERP(dBm)
Low Ch.	25	1850.20	8.74	7.92
Mid Ch	600	1880.00	8.60	7.35
High Ch	1175	1908.75	9.02	8.20



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4. TEST DATA(CONTINUED)

FREQ (MHz)	Receiver Reading (dBuV)	Correction Factor (dB)		Peak Value (dBm)		Limit (dBm)	POL (H/V)
		Antenna gain(dBd)	CL (dB)	SG Reading	Result		
1850.20	78.30	10.42	4.30	1.80	7.92	38.5	V
1880.00	79.33	10.43	4.43	1.35	7.35	38.5	V
1908.75	77.50	10.45	4.50	2.25	8.20	38.5	V



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4. TEST DATA(CONTINUED)

4.2 OCCUPIED BANDWIDTH

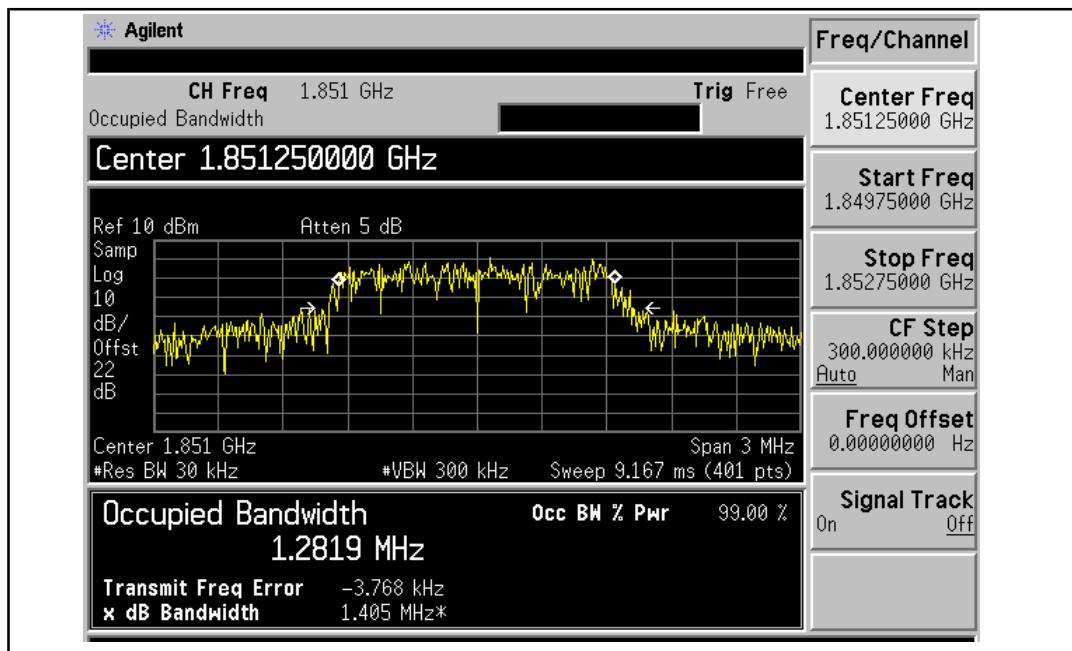
* MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Spectrum Analyzer	Agilent	E4407B
Wireless Communications Test Set	Agilent	E5515C
Dual Directional Coupler	HP	778D

Test Result:

Channel	Frequency(MHz)	26dB BW(MHz)
25	1850.20	1.405
600	1880.00	1.396
1175	1908.75	1.407

26dB BANDWIDTH (CH 25)





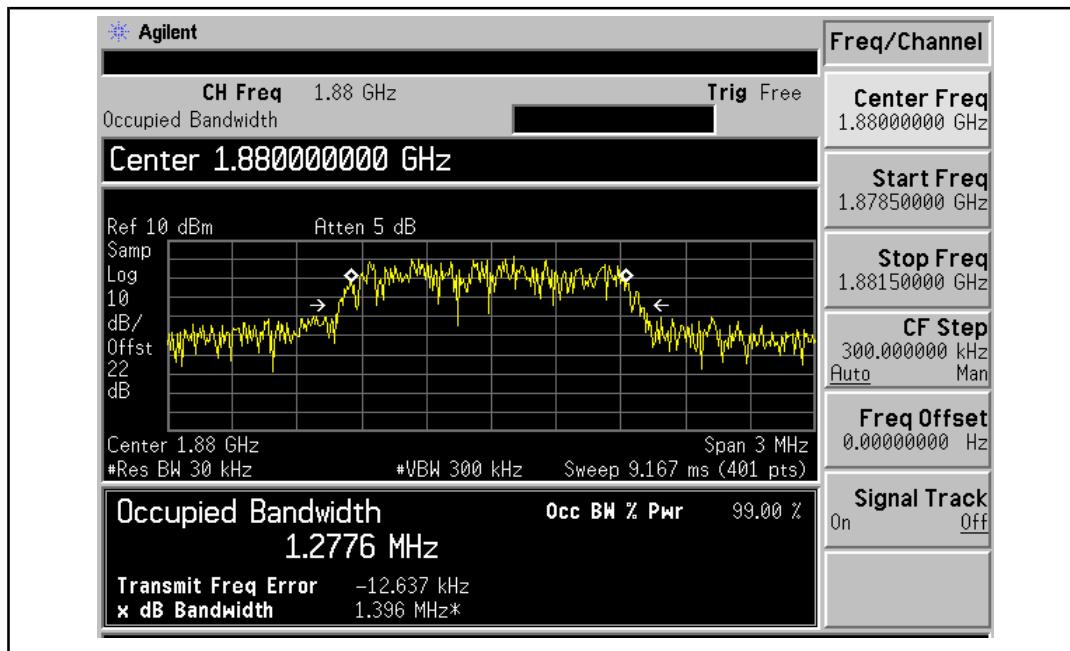
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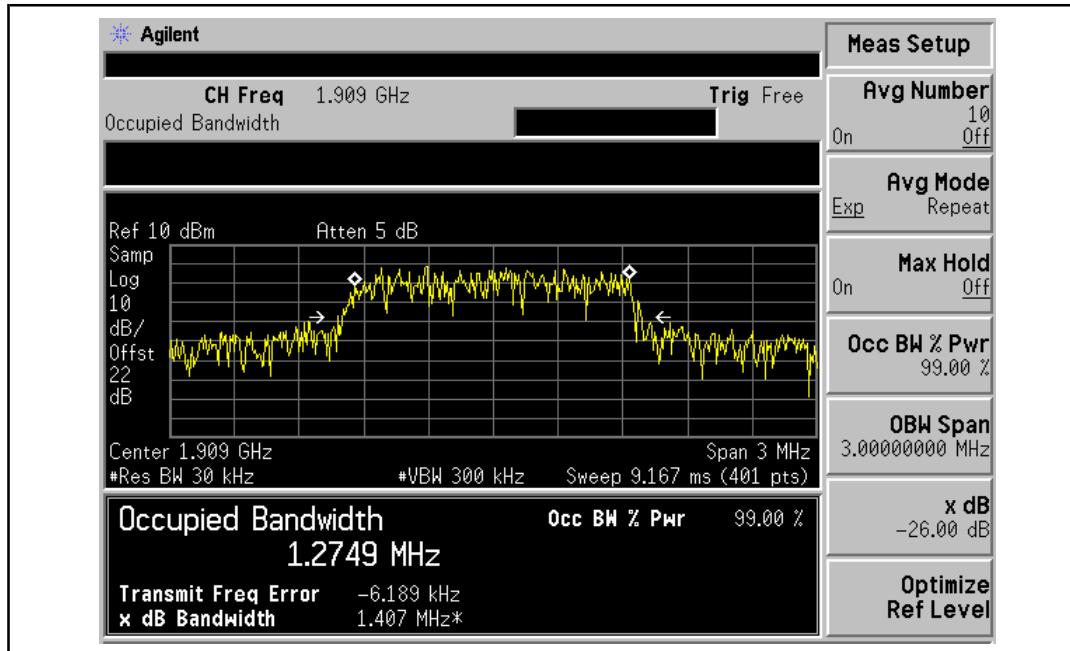
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4. TEST DATA(CONTINUED)

26dB BANDWIDTH (CH 600)



26dB BANDWIDTH (CH 1175)





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4. TEST DATA(CONTINUE)

4.3 FIELD STRENGTH OF SPURIOUS RADIATION

a) MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Receiver	Rohde & Schwarz	ESP17
Signal Generator	HP	E4432B
Pre Amplifier	SONOMA INSTRUMENT	310N
Horn Antenna	SCHWARZBECK	BBHA 9120 D
Horn Antenna	SCHWARZBECK	BBHA 9120 D
Wireless Communications Test Set	Agilent	E5515C

b) MEASUREMENT PROCEDURE

The EUT was placed on a wooden turn table 3 meters from the receive antenna. The receive antenna height and turn table rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1MHz. 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 (or receiver). This spurious level is recorded.



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4. TEST DATA(CONTINUED)

CDMA (CH 25)

FREQ (MHz)	Receiver Reading (dBuV)	Correction Factor (dB)		Peak Value (dBm)		Limit (dBm)	POL (H/V)
		Antenna gain(dBd)	CL (dB)	SG Reading	Result		
3700.40	25.47	12.69	5.44	-80.76	-73.51	-13.0	V
5550.60	16.70	13.12	6.42	-85.38	-78.68	-13.0	V

CDMA (CH 600)

FREQ (MHz)	Receiver Reading (dBuV)	Correction Factor (dB)		Peak Value (dBm)		Limit (dBm)	POL (H/V)
		Antenna gain(dBd)	CL (dB)	SG Reading	Result		
3760.00	28.30	12.72	5.44	-78.43	-71.15	-13.0	V
5640.00	30.03	13.13	6.42	-82.38	-75.67	-13.0	V



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4. TEST DATA(CONTINUED)

CDMA (CH 1175)

FREQ (MHz)	Receiver Reading (dBuV)	Correction Factor (dB)		Peak Value (dBm)		Limit (dBm)	POL (H/V)
		Antenna gain(dBd)	CL (dB)	SG Reading	Result		
3817.50	24.73	12.76	5.44	-78.83	-71.51	-13.0	V
5726.25	15.27	13.11	6.42	-85.58	-78.89	-13.0	V



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4. TEST DATA(CONTINUED)

4.4 SPURIOUS EMISSION AT ANTENNA TERMINAL

a) MEASUREMENT INSTRUMENTS

EQUIPMENT	MANUFACTURE	MODEL NO.
Spectrum Analyzer	Agilent	E4407B
Dual Directional Coupler	HP	778D
Wireless Communications Test Set	Agilent	E5515C

b) MEASUREMENT PROCEDURE

The EUT's RF output connector (made solely for the purpose of the test) is connected to the spectrum analyzer, and set as close as possible to the bottom of the block edge and one set as close as possible to the top of the block edge. Set the RES BW to 1% of the emission bandwidth to show compliance with the -13dBm limit, in the 1MHz bands immediately outside and adjacent to the top and bottom edges of the frequency block.

For the Out-of-Band measurements a 1MHz RES BW was used to scan from 15MHz to 10 x fo the fundamental carrier for all frequency block. A display line was placed at -13dBm to show compliance for spurious, and harmonics.

22.917(f): Mobile emission in base frequency range. The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitter operated must be attenuated to a level not to exceed -80dBm at the transmit antenna connector.

*TEST RESULT

- EUT Description: PCS Repeater Remote system

CDMA(Spurious Emission: Block Edge)

Freq (MHz)	Channel	Measurement Value (dBm)	Limit(dBm)	Margin (dB)
1850.20	25	-37.21	-13.00	-24.21
1908.75	1175	-38.64	-13.00	-25.64



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4. TEST DATA(CONTINUED)

CDMA (Spurious Emission: Out of Band)

Freq (MHz)	Channel	Measurement Value (dBm)	Limit(dBm)	Margin (dB)
1850.20	25	-44.19	-13.00	-31.19
1880.00	600	-44.12	-13.00	-31.12
1908.75	1175	-43.72	-13.00	-30.72



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4. TEST DATA(CONTINUED)

4.5 FREQUENCY STABILITY (CDMA)

OPERATING FREQUENCY: 1,880,000,000 Hz
CHANNEL: 600
REFERENCE VOLTAGE: 110.0 VAC
DEVIATION LIMIT ± 0.00025 % or 2.5ppm

VOLTAGE (%)	POWER (VAC)	TEMP (°C)	FREQ (Hz)	Deviation (%)
100	110.0	+20°C (Ref)	1,880,000,002	0.000000
100		-30	1,879,999,962	0.000002
100		-20	1,879,999,954	0.000003
100		-10	1,879,999,968	0.000002
100		0	1,879,999,960	0.000002
100		+10	1,879,999,972	0.000002
100		+20	1,880,000,002	0.000000
100		+25	1,879,999,970	0.000002
100		+30	1,879,999,968	0.000002
100		+40	1,879,999,972	0.000002
100		+50	1,879,999,964	0.000002
100		+60	1,879,999,960	0.000002
85	93.5	+20	1,879,999,970	0.000002
115	126.5	+20	1,879,999,968	0.000002
ENDPOINT	85.0	+20	1,879,999,962	0.000002



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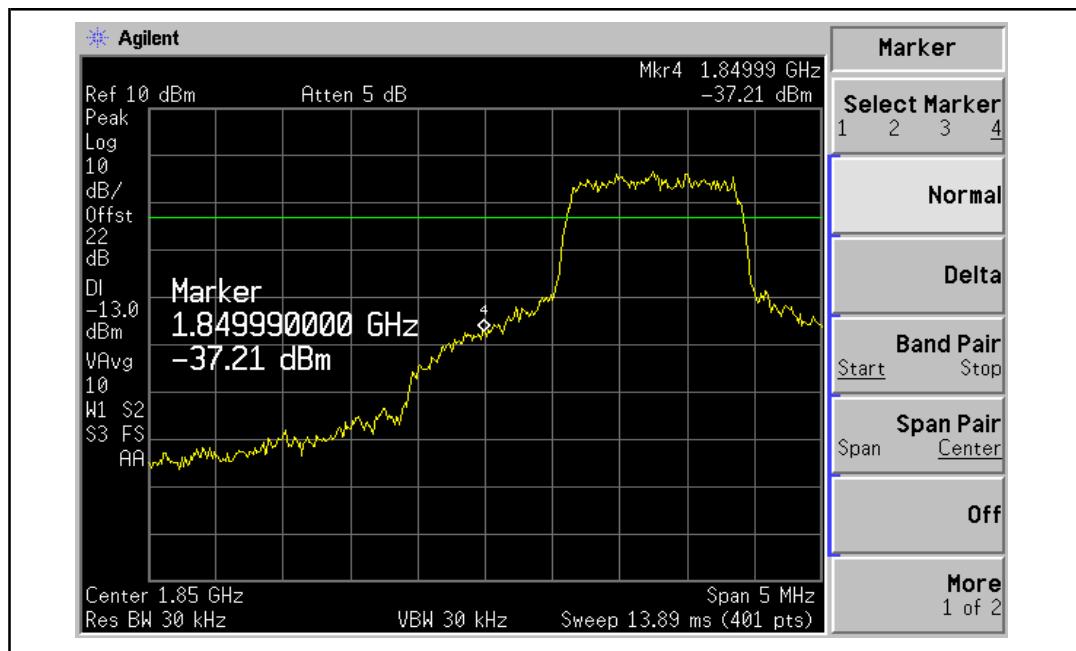
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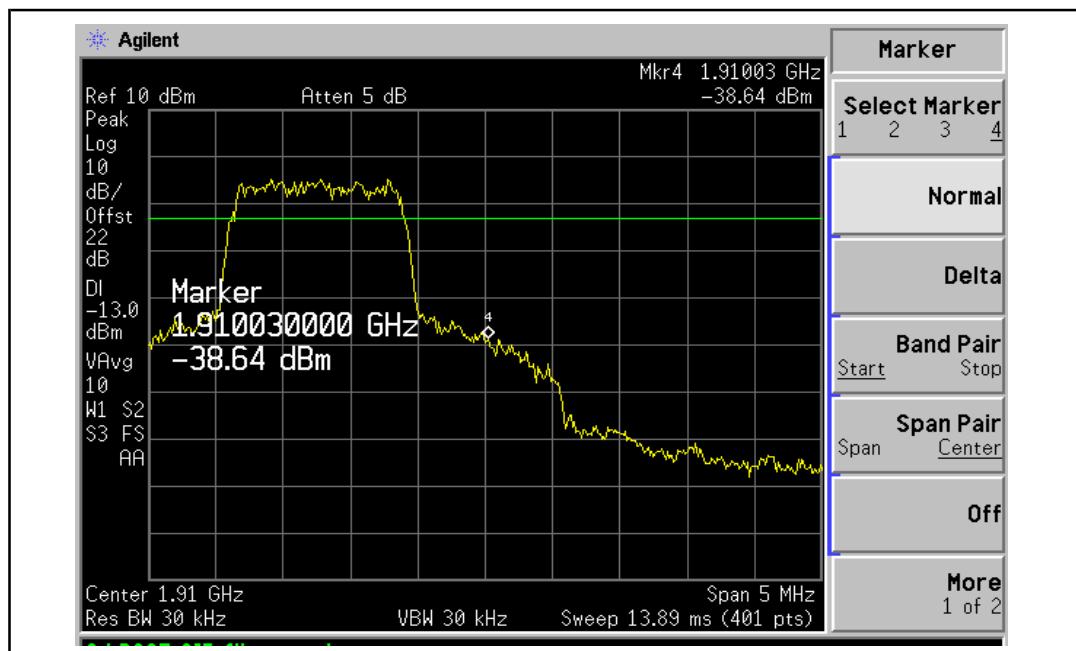
5. TEST PLOTS

5.1.1 PLOTS OF EMISSION (CDMA): BAND EDGE

Ch 25



Ch 1175





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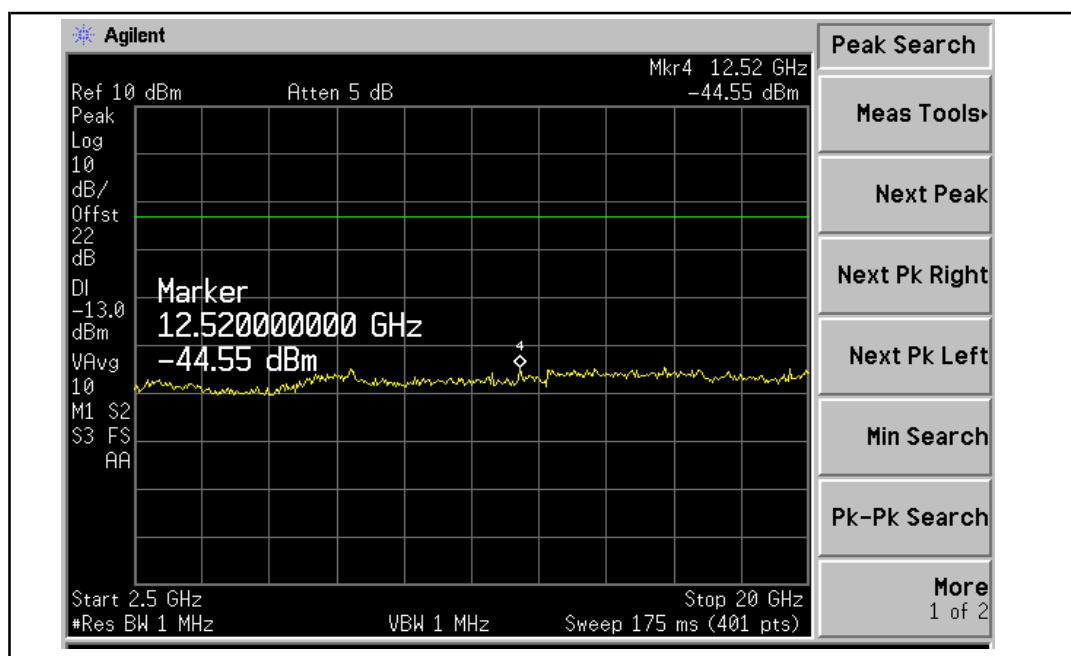
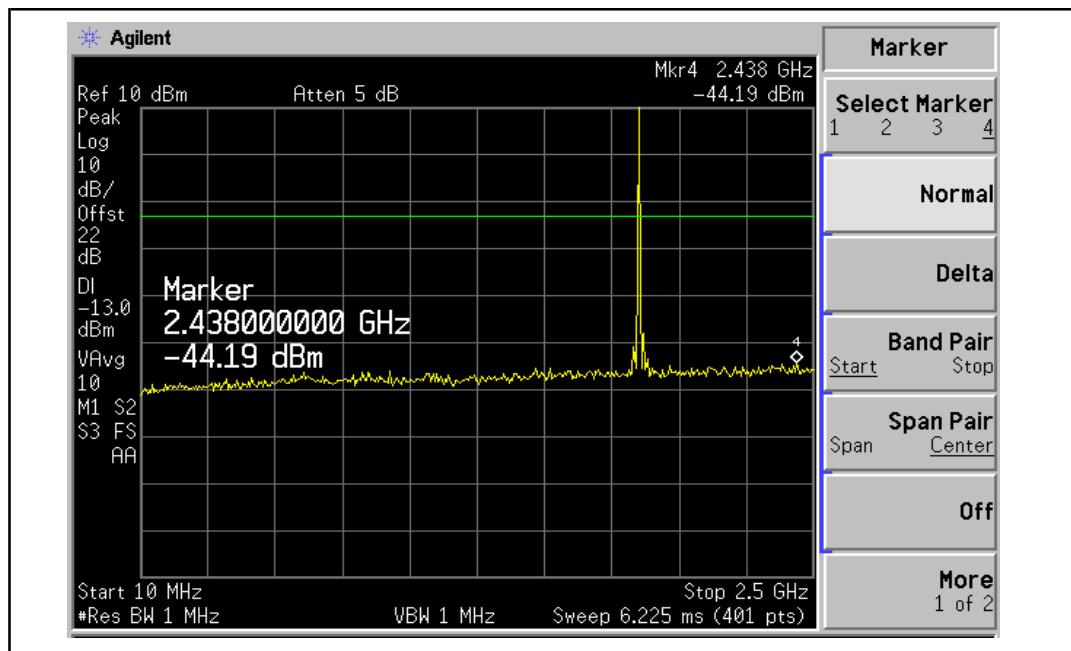
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5. TEST PLOTS (CONTINUED)

5.1.2 PLOTS OF EMISSION (CDMA): OUT OF BAND

Ch 25





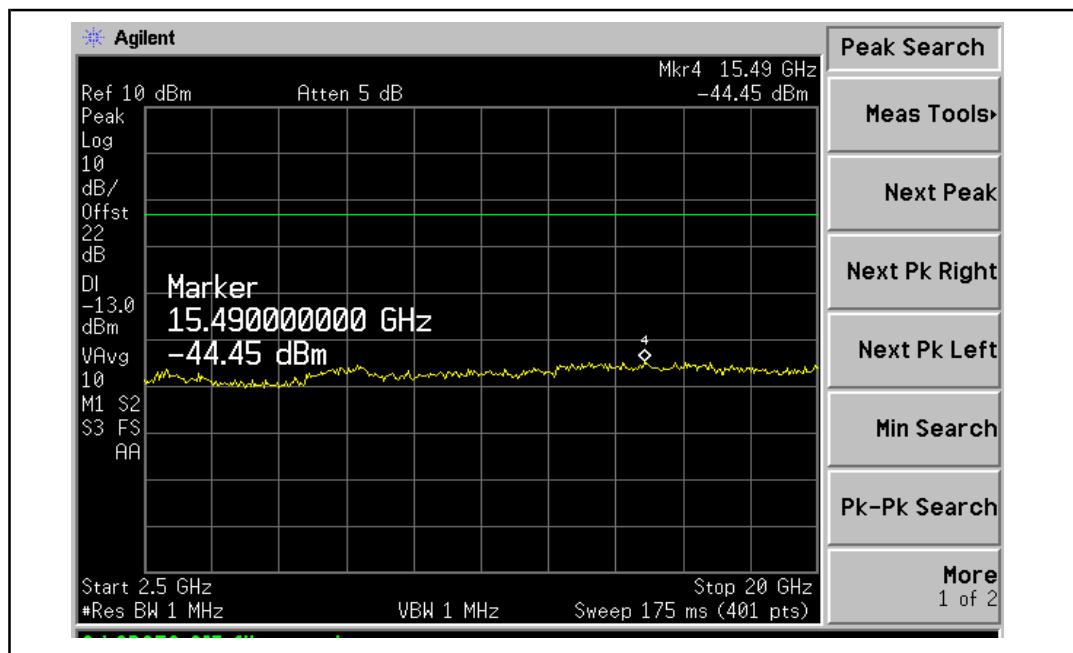
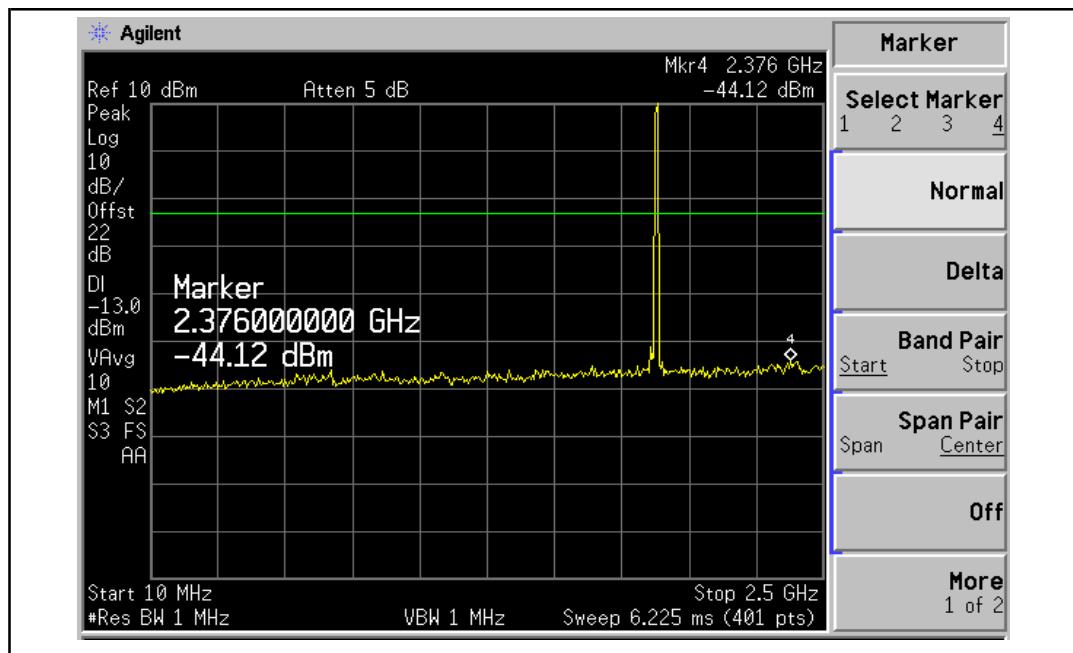
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5. TEST PLOTS (CONTINUED)

Ch 600





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5. TEST PLOTS (CONTINUED)

Ch 1175

