HCT CO.,LTD

HCT CO., LTD.

CERTIFICATE OF COMPLIANCE
FCC Certification

Applicant Name:
Pantech Co., Ltd.

Address:
Pantech Bldg, I-2, DMC, Sangam-dong, Mapo-gu,
Seoul, 121-792, Korea

Date of Issue:
February 05, 2013
Location:
HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon,
Icheon-si, Kyunggi-Do, Korea
Test Report No.: HCTR1302FR07
HCT FRN: 0005866421

FCC ID:	**JYCORBIT**
APPLICANT:	**Pantech Co., Ltd.**

FCC Model(s):	MHS291LVW
EUT Type:	Cellular/PCS CDMA, GSM, WCDMA and LTE Portable Router with WLAN
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§22, §24, §2
Tx Frequency:	824.20 - 848.80 MHz (GSM850) 826.40 - 846.60 MHz (WCDMA850) 1 850.20 - 1 909.80 MHz (GSM1900) 1 852.40 – 1 907.60 MHz (WCDMA1900)
Rx Frequency:	869.20 - 893.80 MHz (GSM850) 871.40 - 891.60 MHz (WCDMA850) 1 930.20 - 1 989.80 MHz (GSM1900) 1 932.40 – 1 987.60 MHz (WCDMA1900)
Max. RF Output Power:	0.527 W GSM850 (27.22 dBm) / 1.023 W GSM1900 (30.10 dBm) 0.628 W EDGE850 (27.98 dBm) / 1.064 W EDGE1900 (30.27 dBm) 0.137 W WCDMA850 (21.38 dBm) / 0.698 W WCDMA1900 (28.44 dBm)
Emission Designator(s):	244 KGXW (GSM850) 245 KGXW (GSM1900) 248 KG7W (GSM850 EDGE) 241 KG7W (GSM1900 EDGE) 4M17F9W (WCDMA850) 4M17F9W (WCDMA1900)

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
: Jae Chul Shin
Test engineer of RF Team

Approved by
: Chang Seok Choi
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1302FR07	February 05, 2013	First Approval Report

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	Pantech Co., Ltd.
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Date(s) of Tests:	December 06, 2012 ~ February 01, 2013
Antenna Specification	Manufacturer: KARAM SOLUTION Antenna type: Built-in Antenna Peak Gain: GSM850/WCDMA850 : 0.55 dBi GSM1900/WCDMA1900 : 0.66 dBi

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Pantech Co., Ltd. MHS291LVW Cellular/PCS CDMA, GSM, WCDMA and LTE Portable Router with WLAN consists of GSM850, GSM1900, WCDMA850, WCDMA1900, GPRS Class10, EDGE Class10, HSDPA, HSUPA and HSPA+Release 6.

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 105-1, Jangam-ri , Majang-Myeon, Icheon-si, 467-811, 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 March 02, 2011 (Registration Number: 90661)

3. DESCRIPTION OF TESTS

3.1 ERP/EIRP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

Note: ERP(Effective Radiated Power), EIRP(Effective 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 Clasue 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 postion 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 caculated by the following formula;

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

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

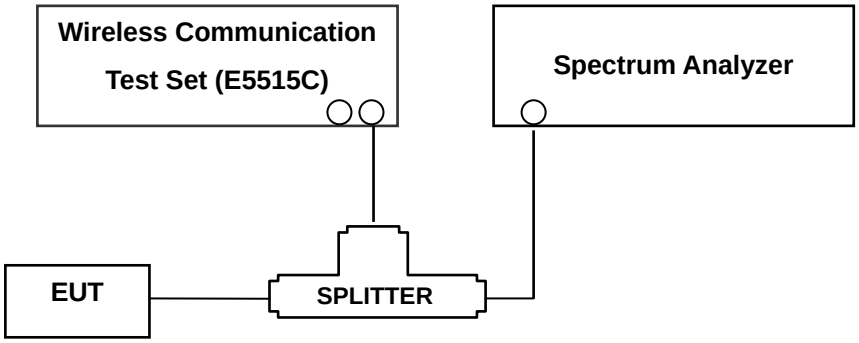
The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

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.

3.3 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

3.4 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.

- 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.

The center frequency of spectrum is the band edge frequency and span is 1MHz RB of the spectrum is 3KHz and VB of the spectrum is 3KHz (GSM)

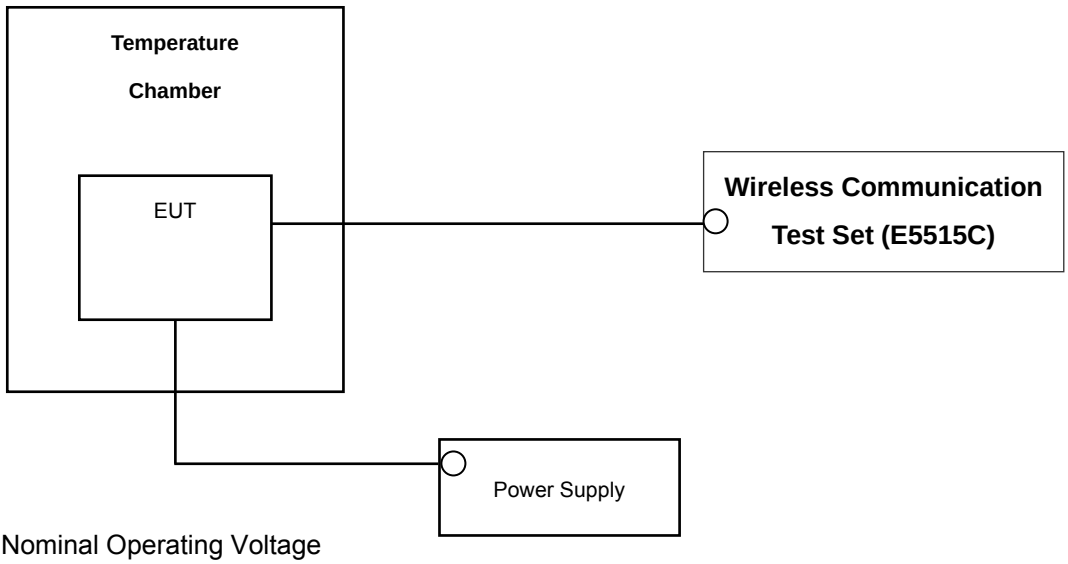
The center frequency of spectrum is the band edge frequency and span is 5MHz RB of the spectrum is 100KHz and VB of the spectrum is 100KHz(WCDMA)

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

- For GSM850 and WCDMA850, total offset 27.1 dBm = 20 dBm attenuator + 6 dBm Divider + 1.1 dBm RF cables.
- For GSM1900 and WCDMA1900, total offset 28.6 dBm = 20 dBm attenuator + 6 dBm Divider + 2.6 dBm RF cables.

3.5 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 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 ± 0.000 25 %(± 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 battery endpoint.

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
Agilent	E9327A/ Power Sensor	MY4442009	Annual	05/02/2013
MITEQ	AMF-6D-001180-35-20P/AMP	1081666	Annual	09/11/2013
Wainwright	WHK1.2/15G-10EF/H.P.F	2	Annual	05/02/2013
Wainwright	WHK3.3/18G-10EF/H.P.F	1	Annual	05/02/2013
Hewlett Packard	11667B / Power Splitter	10126	Annual	11/07/2013
Digital	EP-3010/ Power Supply	3110117	Annual	11/07/2013
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/11/2013
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	03/11/2013
Korea Engineering	KR-1005L / Chamber	KRAB05063-3CH	Annual	11/07/2013
Schwarzbeck	BBHA 9120D/ Horn Antenna	296	Biennial	02/20/2014
Agilent	E4440A/Spectrum Analyzer	US45303008	Annual	05/02/2013
WEINSCHEL	ATTENUATOR	BR0592	Annual	11/07/2013
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	Annual	06/11/2013
Agilent	8960 (E5515C)/ Base Station	GB44400269	Annual	02/10/2013
Anritsu	MT8820C/ Radio Communication Analyer	6200951754	Annual	08/24/2013

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 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions		PASS
2.1046	Conducted Output Power	-		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 + 10log10 (P[Watts]) for all out-of band emissions		PASS

6. SAMPLE CALCULATION

A. ERP Sample Calculation

Mode	Ch./ Freq.		Measured Level(dBm)	Substitude LEVEL(dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
	channel	Freq.(MHz)						W	dBm
GSM850	128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

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

1) The EUT mounted on a non-conductive tuntable 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

GSM Emission Designator

Emission Designator = 249KGXW

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W

WCDMA BW = 4.17 MHz

F = Frequency Modulation

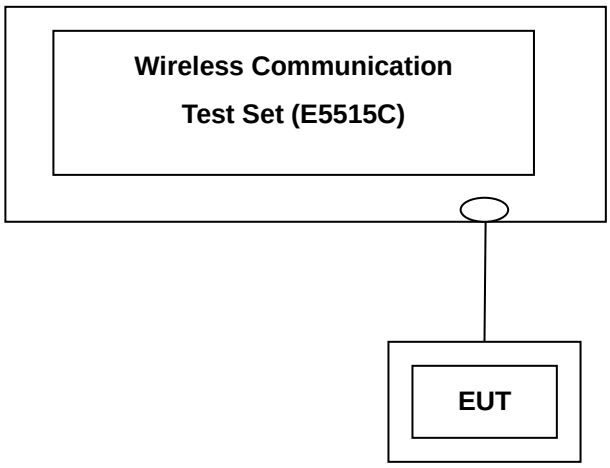
9 = Composite Digital Info

W = Combination (Audio/Data)

7. TEST DATA

7.1 CONDUCTED OUTPUT POWER

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



Test Result

Band	Channel	Voice	GPRS Data	
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)
GSM 850	128	33.06	33.10	32.90
	190	33.11	33.18	32.96
	251	33.14	33.20	32.98
GSM 1900	512	30.13	30.19	30.08
	661	30.19	30.25	30.13
	810	30.18	30.23	30.11

(GSM Conducted Maximum Output Powers)

Band	Channel	EDGE Data	
		EDGE 1 TX Slot (dBm)	EDGE 2 TX Slot (dBm)
GSM 850	128	27.53	25.09
	190	27.62	25.12
	251	27.67	25.15
GSM 1900	512	26.02	24.02
	661	26.06	24.05
	810	26.16	24.10

(GSM EDGE Conducted Output Powers)

3GPP Release Version	Mode	3GPP 34.121	Cellular Band [dBm]			MPR
		Subtest	UL 4132 (826.4)	UL 4183 (836.6)	UL 4233 (846.6)	
			DL 4357	DL 4408	DL 4458	
99	WCDMA	12.2 kbps RMC	23.49	23.00	23.45	-
99	WCDMA	12.2 kbps AMR	-	-	-	-
5	HSDPA	Subtest 1	22.50	21.99	22.50	0
5		Subtest 2	22.45	21.95	22.48	0
5		Subtest 3	22.02	21.46	22.03	-0.5
5		Subtest 4	22.05	21.46	22.02	-0.5
6	HSUPA	Subtest 1	22.49	21.80	22.45	0
6		Subtest 2	21.25	20.52	21.30	-2
6		Subtest 3	21.15	20.73	20.98	-1
6		Subtest 4	21.42	21.02	21.45	-2
6		Subtest 5	22.19	21.90	22.10	0

3GPP Release Version	Mode	3GPP 34.121	PCS Band [dBm]			MPR
		Subtest	UL 9262 (1852.4)	UL 9400 (1880.0)	UL 9538 (1907.6)	
			DL 9662	DL 9800	DL 9938	
99	WCDMA	12.2 kbps RMC	22.99	23.04	22.96	-
99	WCDMA	12.2 kbps AMR	-	-	-	-
5	HSDPA	Subtest 1	22.02	22.14	22.00	0
5		Subtest 2	22.05	22.08	21.99	0
5		Subtest 3	21.58	21.64	21.52	-0.5
5		Subtest 4	21.54	21.62	21.54	-0.5
6	HSUPA	Subtest 1	21.94	22.02	22.01	0
6		Subtest 2	20.66	20.92	20.64	-2
6		Subtest 3	20.92	20.64	20.97	-1
6		Subtest 4	20.91	21.02	21.15	-2
6		Subtest 5	21.60	21.95	22.01	0

(WCDMA 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 33, 37.

7.3 OCCUPIED BANDWIDTH

Band	Channel	Frequency(MHz)	Data (GSM: kHz / WCDMA : MHz)
GSM850	128	824.20	239.8830
	190	836.60	243.6071
	251	848.80	239.5967
GSM850 EDGE	190	836.60	247.5337
GSM1900	512	1850.20	243.1409
	661	1880.00	244.5288
	810	1909.80	239.4002
GSM1900 EDGE	661	1880.00	240.9056
WCDMA850	4132	826.40	4.1740
	4183	836.60	4.1694
	4233	846.60	4.1592
WCDMA1900	9262	1852.40	4.1434
	9400	1880.00	4.1546
	9538	1907.60	4.1681

- Plots of the EUT's Occupied Bandwidth are shown Page 29 ~ 32, 34 ~ 36.

7.4 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Maximum Data (dBm)
GSM850	128	7.0375	-30.24
	190	7.0250	-29.87
	251	7.1500	-30.47
GSM1900	512	13.6270	-24.59
	661	13.6800	-25.34
	810	13.8930	-24.72
WCDMA850	4132	7.2250	-40.14
	4183	1.6770	-35.08
	4233	1.6970	-37.71
WCDMA1900	9262	13.9470	-36.67
	9400	13.7330	-36.94
	9538	13.7330	-36.70

- Plots of the EUT's Conducted Spurious Emissions are shown Page 49 ~ 61..

7.4.1 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 37 ~ 49.

7.5 EFFECTIVE RADIATED POWER OUTPUT (GSM / WCDMA)

(GSM850 Mode)

Ch./ Freq.		Measured	Substitude	Ant. Gain	C.L	Pol.	ERP	
channel	Freq.(MHz)	Level(dBm)	LEVEL (dBm)	(dBd)			**W**	**dBm**
128	824.20	-21.67	38.10	-10.61	0.95	H	0.451	26.54
190	836.60	-21.76	38.42	-10.54	0.96	H	0.492	26.92
251	848.80	-21.63	38.79	-10.47	1.10	H	0.527	27.22
EDGE 251	848.80	-20.87	39.55	-10.47	1.10	H	0.628	27.98

(WCDMA850 Mode)

Ch./ Freq.		Measured	Substitude	Ant. Gain	C.L	Pol.	ERP	
channel	Freq.(MHz)	Level(dBm)	LEVEL (dBm)	(dBd)			**W**	**dBm**
4132	826.40	-27.58	32.17	-10.59	0.95	H	0.116	20.63
4183	836.60	-27.30	32.88	-10.54	0.96	H	0.137	21.38
4233	846.60	-27.76	32.59	-10.48	1.11	V	0.126	21.00

Note: Standard batteries are the only options for this phone. And a peak detector is used.

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 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 = 5MHz. 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.

This device was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1” and in GSM mode and using a Power Control Level of “0” in the PCS Band and “5” in the Cellular Band. This unit was tested with its standard battery. 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 z plane in GSM850 and WCDMA850 (x plane ch 4183, y plan ch 4233) mode. Also worst case of detecting Antenna is horizontal polarization in GSM850 and WCDMA850 (vertical polarization) mode.

The EDGE mode testing were performed using 1Tx because 1Tx is highest power in EDGE mode.

7.6 EQUIVALENT ISOTROPIC RADIATED POWER (GSM / WCDMA)

(GSM1900 Mode)

Ch./ Freq.		Measured	Substitude	Ant. Gain	C.L	Pol.	EIRP	
channel	Freq.(MHz)	Level(dBm)	LEVEL (dBm)	(dBi)			**W**	**dBm**
512	1,850.20	-10.97	21.17	10.02	1.41	H	0.951	29.78
661	1,880.00	-11.07	21.24	10.04	1.45	H	0.962	29.83
810	1,909.80	-10.92	21.49	10.05	1.44	H	1.023	30.10
EDGE 810	1,909.80	-10.75	21.66	10.05	1.44	H	1.064	30.27

(WCDMA1900 Mode)

Ch./ Freq.		Measured	Substitude	Ant. Gain	C.L	Pol.	EIRP	
channel	Freq.(MHz)	Level(dBm)	LEVEL (dBm)	(dBi)			**W**	**dBm**
9262	1,852.40	-12.71	19.44	10.02	1.40	H	0.640	28.06
9400	1,880.00	-12.78	19.53	10.04	1.45	H	0.649	28.12
9538	1,907.60	-12.69	19.85	10.05	1.46	H	0.698	28.44

Note: Standard batteries are the only options for this phone. And a peak detector is used.

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 signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5MHz. 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.

This device was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1” and in GSM mode and using a Power Control Level of “0” in the PCS Band and “5” in the Cellular Band. This unit was tested with its standard battery. 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 x plane in GSM1900 and WCDMA1900 mode. Also worst case of detecting Antenna is in horizontal polarization in GSM1900 and WCDMA1900 mode.

The EDGE mode testing were performed using 1Tx because 1Tx is highest power in EDGE mode.

7.7 RADIATED SPURIOUS EMISSIONS

7.7.1 RADIATED SPURIOUS EMISSIONS (GSM850)

▣ MEASURED OUTPUT POWER: 27.98 dBm = 0.628 W

▣ MODULATION SIGNAL: GSM EDGE 850

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 $\log_{10}$ (W)) = - 40.98 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	Substitute Level [dBm]	C.L	Pol.	ERP (dBm)	dBc
128 (824.2)	1,648.40	-43.26	7.05	-50.10	1.18	H	-44.23	-72.21
	2,472.60	-38.76	7.90	-42.51	1.57	H	-36.18	-64.16
	3,296.80	-	-	-	-	-	-	-
190 (836.6)	1,673.20	-44.52	7.22	-51.52	1.20	H	-45.50	-73.48
	2,509.80	-36.58	8.51	-40.37	1.65	V	-33.51	-61.49
	3,346.40	-	-	-	-	-	-	-
251 (848.8)	1,697.60	-42.95	7.34	-49.97	1.20	H	-43.83	-71.81
	2,546.40	-41.02	8.61	-44.56	1.65	V	-37.60	-65.58
	3,395.20	-54.29	10.22	-58.82	1.99	H	-50.59	-78.57

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method 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 5th Harmonic for all channel.

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

7.7.2 RADIATED SPURIOUS EMISSIONS (GSM1900)

▣ MEASURED OUTPUT POWER: 30.27 dBm = 1.064 W

▣ MODULATION SIGNAL: GSM EDGE 1900

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 lo_{g10} (W)) = - 43.27 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	EIRP (dBm)	dBc
512 (1850.2)	3,700.40	-39.15	12.27	-43.89	2.19	V	-33.81	-64.08
	5,550.60	-42.38	13.40	-42.05	2.88	H	-31.53	-61.80
	7,400.80	-45.50	11.37	-35.21	3.29	H	-27.13	-57.40
661 (1880.0)	3,760.00	-33.73	12.31	-38.28	2.11	H	-28.08	-58.35
	5,640.00	-43.87	13.41	-43.20	2.92	H	-32.71	-62.98
	7,520.00	-43.38	11.55	-33.86	3.34	H	-25.65	-55.92
810 (1909.8)	3,819.60	-37.51	12.37	-41.99	2.14	H	-31.76	-62.03
	5,729.40	-42.04	13.42	-40.60	3.02	H	-30.20	-60.47
	7,639.20	-41.79	11.70	-32.03	3.13	H	-23.46	-53.73

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method 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 5th Harmonic for all channel.

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

7.7.3 RADIATED SPURIOUS EMISSIONS (WCDMA850)

▣ MEASURED OUTPUT POWER: 21.38 dBm = 0.137 W

▣ MODULATION SIGNAL: WCDMA850

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 lo_{g10} (W)) = - 34.38 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	Substitute Level [dBm]	C.L	Pol.	ERP (dBm)	dBc
4,132 (826.4)	1,652.80	-37.19	7.11	-44.12	1.20	H	-38.21	-59.59
	2,479.20	-45.74	8.40	-49.63	1.62	H	-42.85	-64.23
	3,305.60	-	-	-	-	-	-	-
4,183 (836.6)	1,673.20	-37.41	7.22	-44.41	1.20	H	-38.39	-59.77
	2,509.80	-44.39	8.51	-48.18	1.65	H	-41.32	-62.70
	3,346.40	-	-	-	-	-	-	-
4,233 (846.6)	1,693.20	-34.84	7.34	-41.86	1.20	H	-35.72	-57.10
	2,539.80	-48.98	8.58	-52.90	1.65	H	-45.97	-67.35
	3,386.40	-	-	-	-	-	-	-

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method 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 5th Harmonic for all channel.

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

7.7.4 RADIATED SPURIOUS EMISSIONS (WCDMA1900)

▣ MEASURED OUTPUT POWER: 28.44 dBm = 0.698 W

▣ MODULATION SIGNAL: WCDMA1900

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 lo_{g10} (W)) = - 41.44 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	EIRP (dBm)	dBc
9262	3,704.80	-54.22	12.27	-58.96	2.19	H	-48.88	-77.32
	5,557.20	-56.03	13.40	-55.70	2.88	V	-45.18	-73.62
	7,409.60	-	-	-	-	-	-	-
9400	3,760.00	-55.17	12.31	-59.72	2.11	V	-49.52	-77.96
	5,640.00	-	-	-	-	-	-	-
	7,520.00	-	-	-	-	-	-	-
9538	3,815.20	-55.51	12.37	-59.99	2.14	V	-49.76	-78.20
	5,722.80	-	-	-	-	-	-	-
	7,630.40	-	-	-	-	-	-	-

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method 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 5th Harmonic for all channel.

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

7.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.8.1 FREQUENCY STABILITY (GSM850)

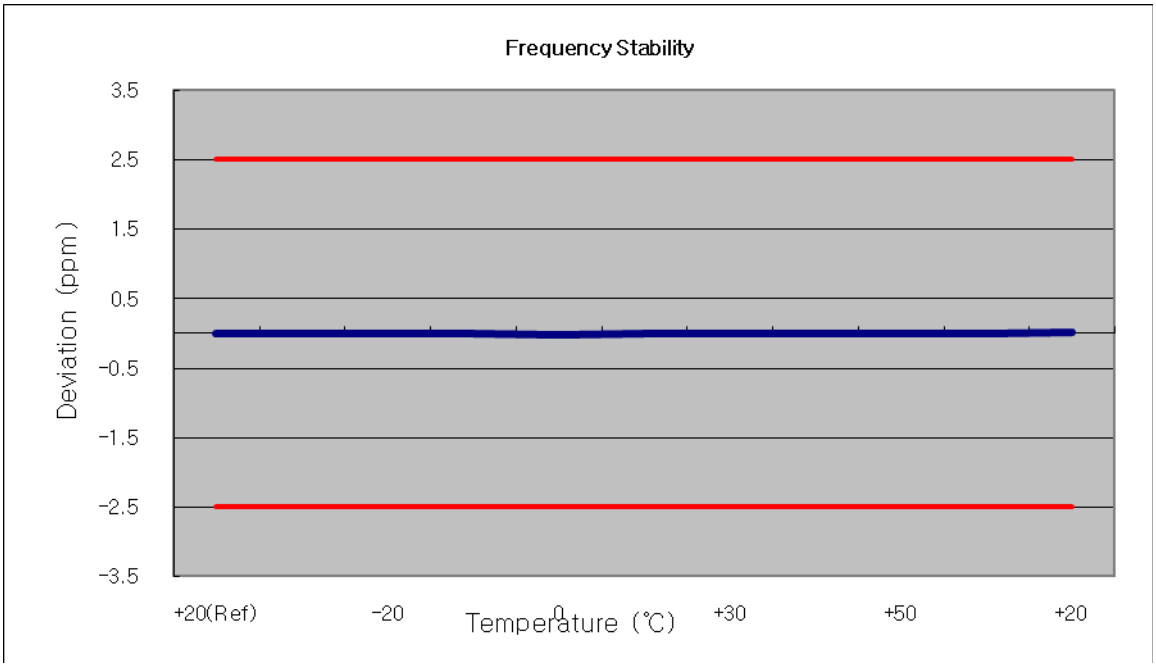
▣ OPERATING FREQUENCY: 836,600,000 Hz

▣ CHANNEL: 190

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.800	+20(Ref)	836 600 008	0	0.000 000	0.000
100%		−30	836 600 011	3.10	0.000 000	0.004
100%		−20	836 600 010	1.81	0.000 000	0.002
100%		−10	836 600 009	0.31	0.000 000	0.000
100%		0	836 599 997	−11.40	−0.000 001	−0.014
100%		+10	836 599 999	−9.78	−0.000 001	−0.012
100%		+30	836 600 000	−8.63	−0.000 001	−0.010
100%		+40	836 599 999	−9.01	−0.000 001	−0.011
100%		+50	836 600 001	−7.45	−0.000 001	−0.009
115%	4.370	+20	836 600 001	−7.00	−0.000 001	−0.008
Batt. Endpoint	3.500	+20	836 600 016	7.37	0.000 001	0.009



7.8.2 FREQUENCY STABILITY (GSM1900)

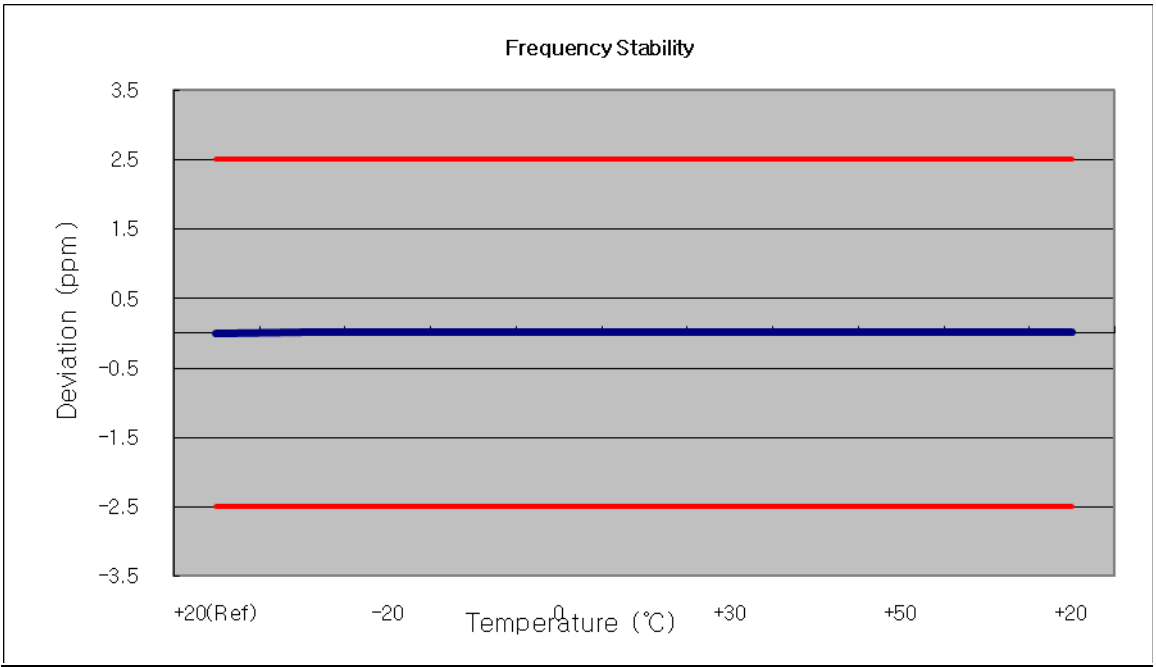
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 661

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.800	+20(Ref)	1879 999 977	0	0.000 000	0.000
100%		-30	1880 000 001	23.92	0.000 001	0.013
100%		-20	1880 000 002	25.33	0.000 001	0.013
100%		-10	1880 000 005	27.75	0.000 001	0.015
100%		0	1880 000 000	22.52	0.000 001	0.012
100%		+10	1879 999 998	20.64	0.000 001	0.011
100%		+30	1879 999 999	21.46	0.000 001	0.011
100%		+40	1880 000 003	26.06	0.000 001	0.014
100%		+50	1879 999 998	21.11	0.000 001	0.011
115%	4.370	+20	1879 999 999	21.68	0.000 001	0.012
Batt. Endpoint	3.500	+20	1880 000 004	27.07	0.000 001	0.014



7.8.3 FREQUENCY STABILITY (WCDMA850)

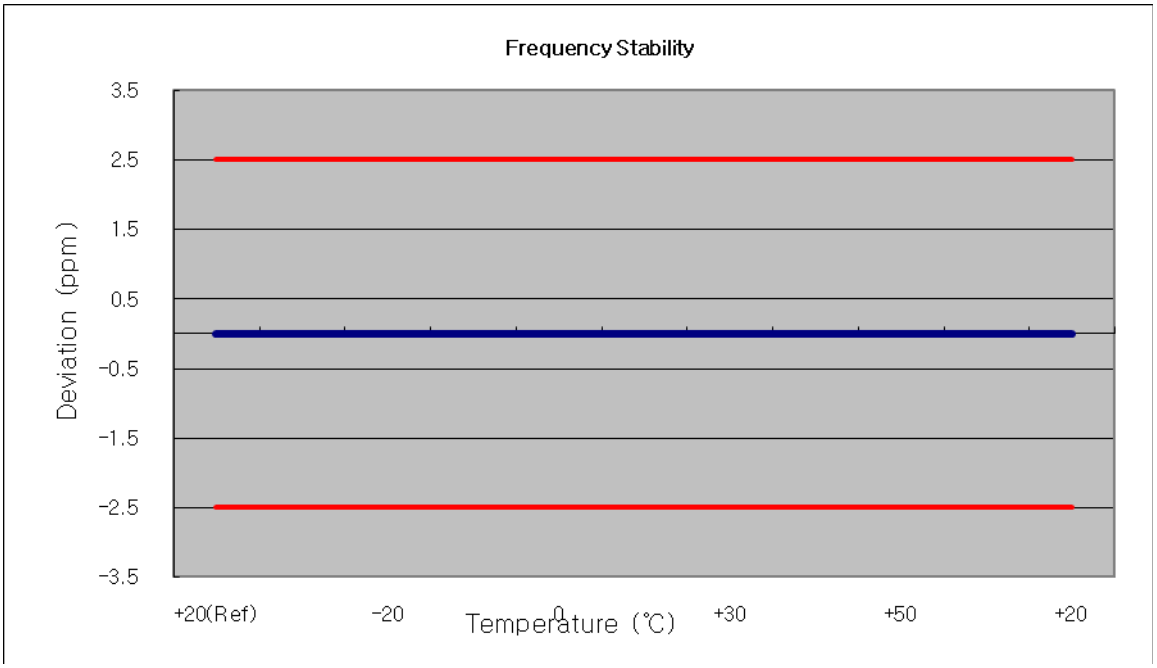
▣ OPERATING FREQUENCY: 836,600,000 Hz

▣ CHANNEL: 4183

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.800	+20(Ref)	836 599 998	0	0.000 000	0.000
100%		-30	836 599 997	-2.91	0.000 000	-0.003
100%		-20	836 599 998	-1.85	0.000 000	-0.002
100%		-10	836 600 002	2.08	0.000 000	0.002
100%		0	836 600 002	1.70	0.000 000	0.002
100%		+10	836 599 998	-2.20	0.000 000	-0.003
100%		+30	836 600 002	1.61	0.000 000	0.002
100%		+40	836 599 998	-1.98	0.000 000	-0.002
100%		+50	836 599 998	-1.53	0.000 000	-0.002
115%	4.370	+20	836 599 998	-2.12	0.000 000	-0.003
Batt. Endpoint	3.500	+20	836 599 998	-2.05	0.000 000	-0.002



7.8.4 FREQUENCY STABILITY (WCDMA1900)

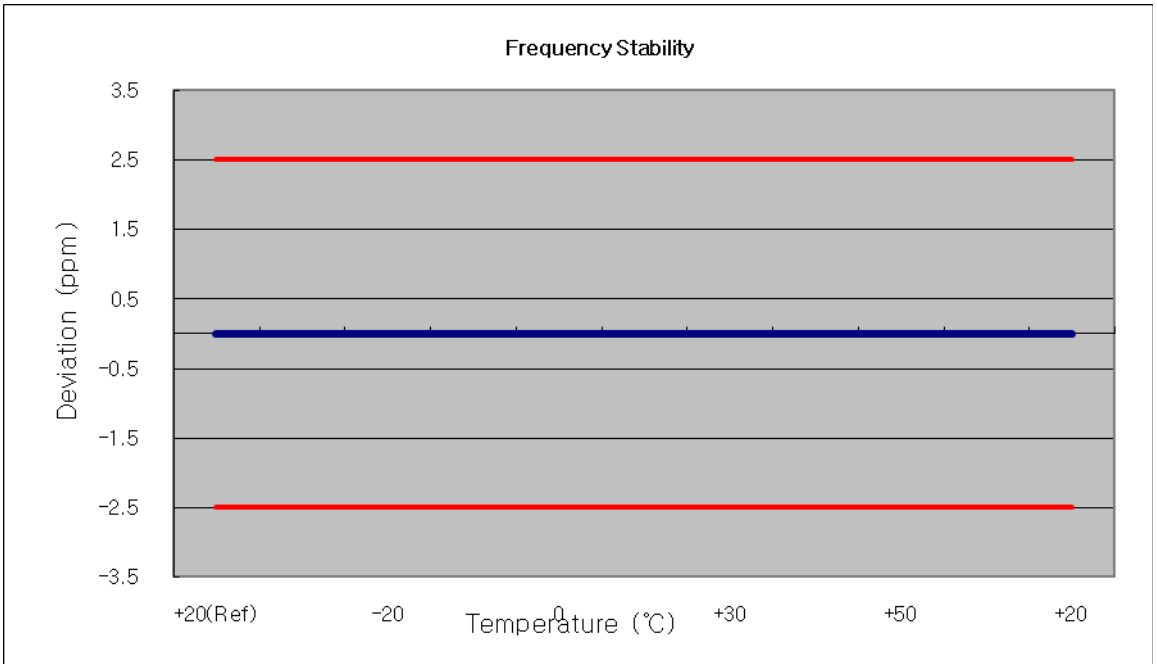
▣ OPERATING FREQUENCY: 1,880,000,000 Hz

▣ CHANNEL: 9400

▣ REFERENCE VOLTAGE: 3.8 VDC

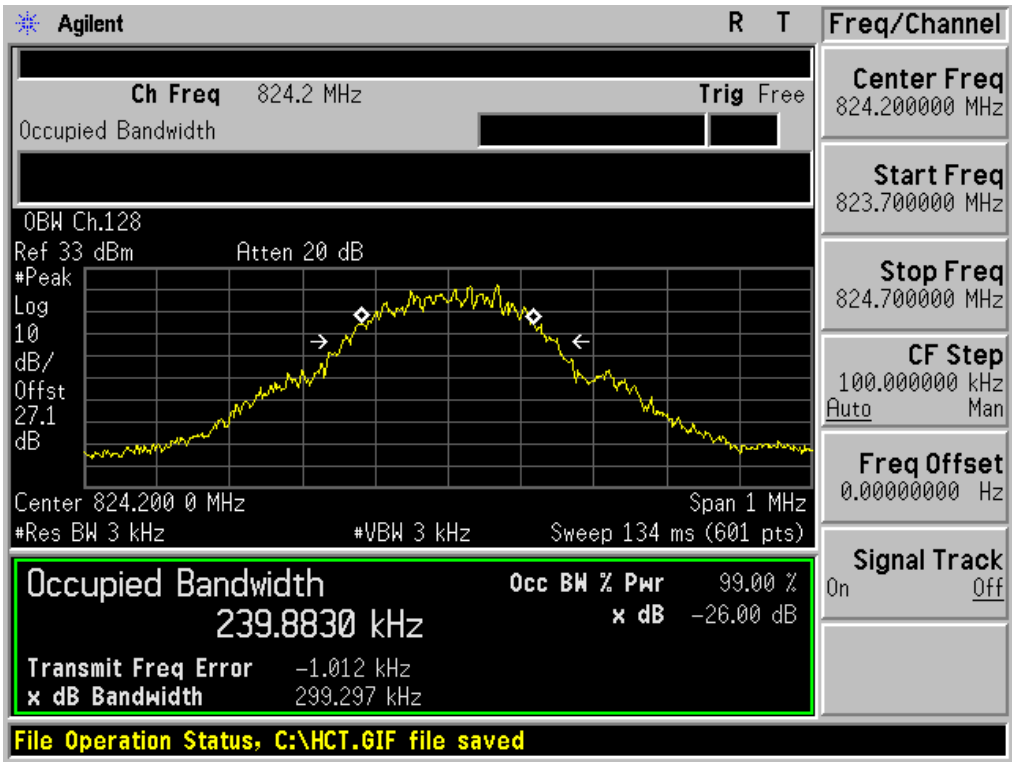
▣ DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.800	+20(Ref)	1880 000 009	0	0.000 000	0.000
100%		-30	1879 999 990	-9.82	-0.000 001	-0.005
100%		-20	1879 999 992	-8.01	0.000 000	-0.004
100%		-10	1879 999 991	-8.64	0.000 000	-0.005
100%		0	1879 999 991	-9.22	0.000 000	-0.005
100%		+10	1879 999 991	-8.82	0.000 000	-0.005
100%		+30	1879 999 991	-8.81	0.000 000	-0.005
100%		+40	1879 999 991	-9.32	0.000 000	-0.005
100%		+50	1879 999 991	-9.00	0.000 000	-0.005
115%	4.370	+20	1879 999 992	-7.96	0.000 000	-0.004
Batt. Endpoint	3.500	+20	1879 999 992	-7.64	0.000 000	-0.004

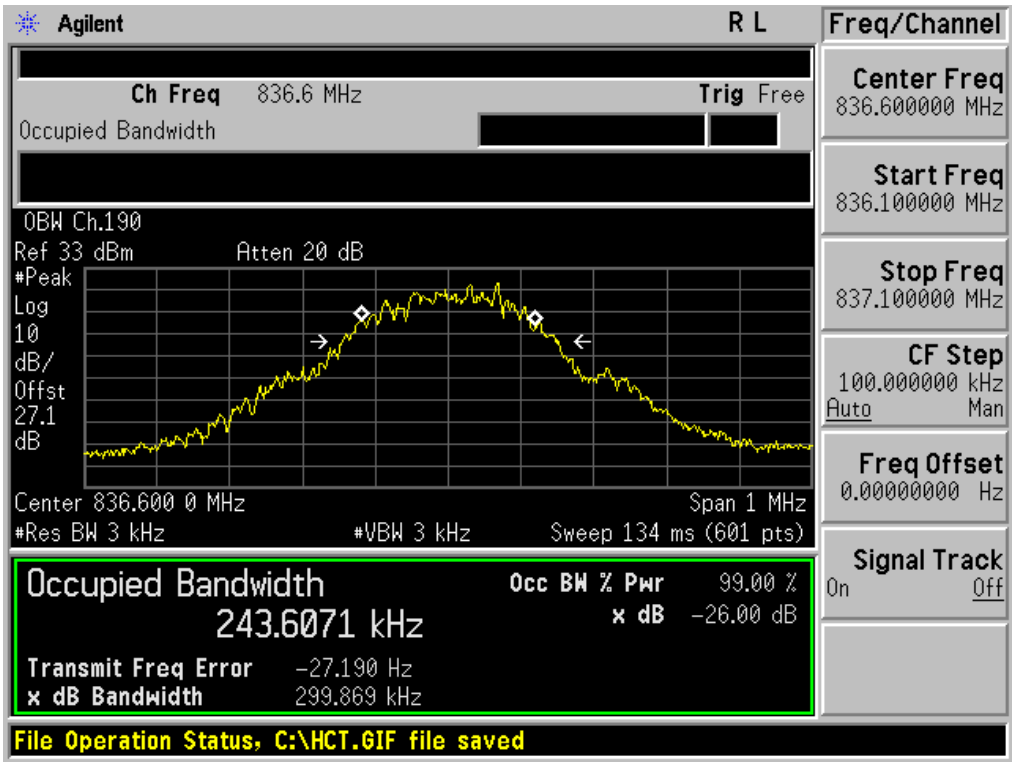


8. TEST PLOTS

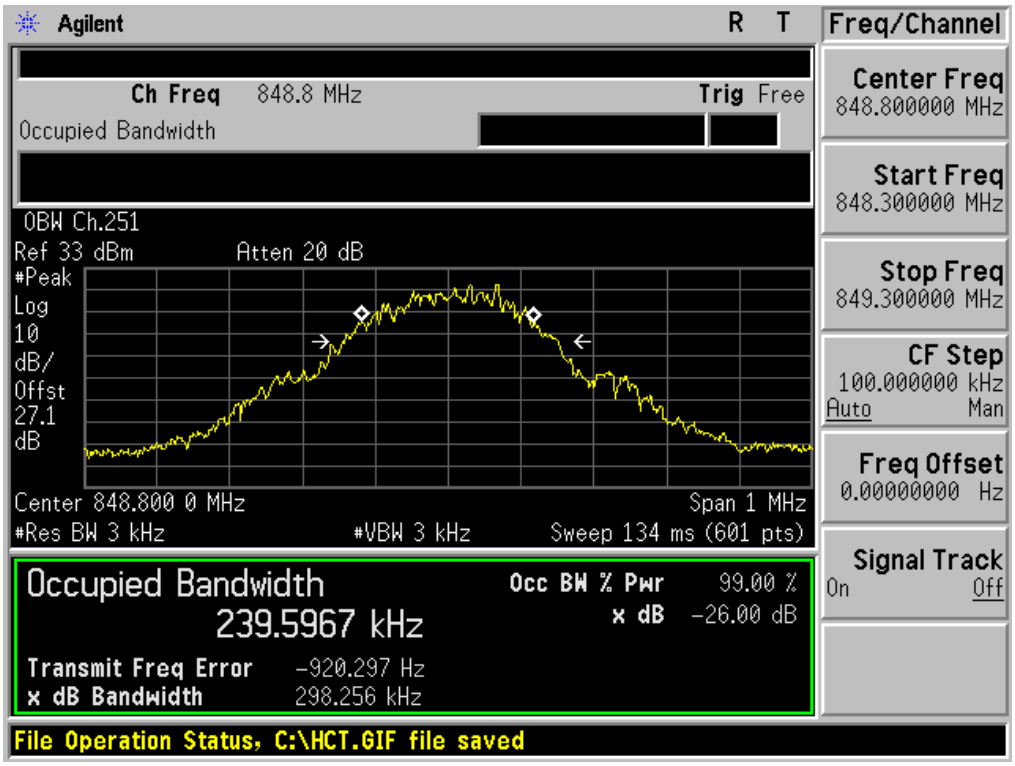
■ GSM850 MODE (128 CH.) Occupied Bandwidth



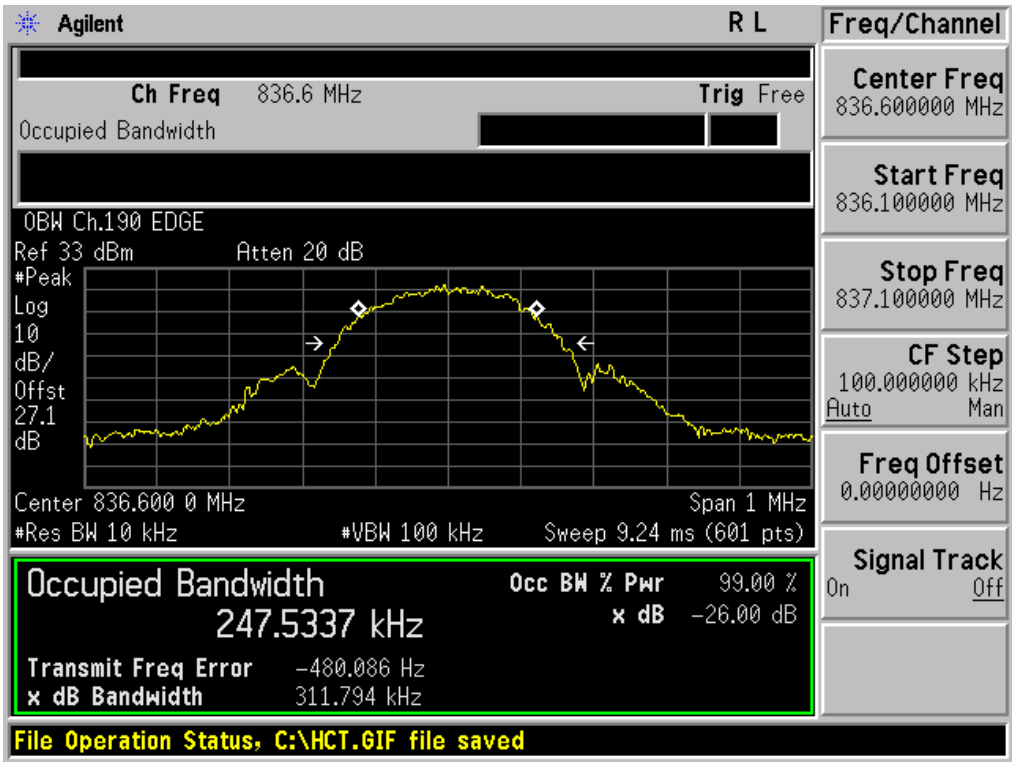
■ GSM850 MODE (190 CH.) Occupied Bandwidth



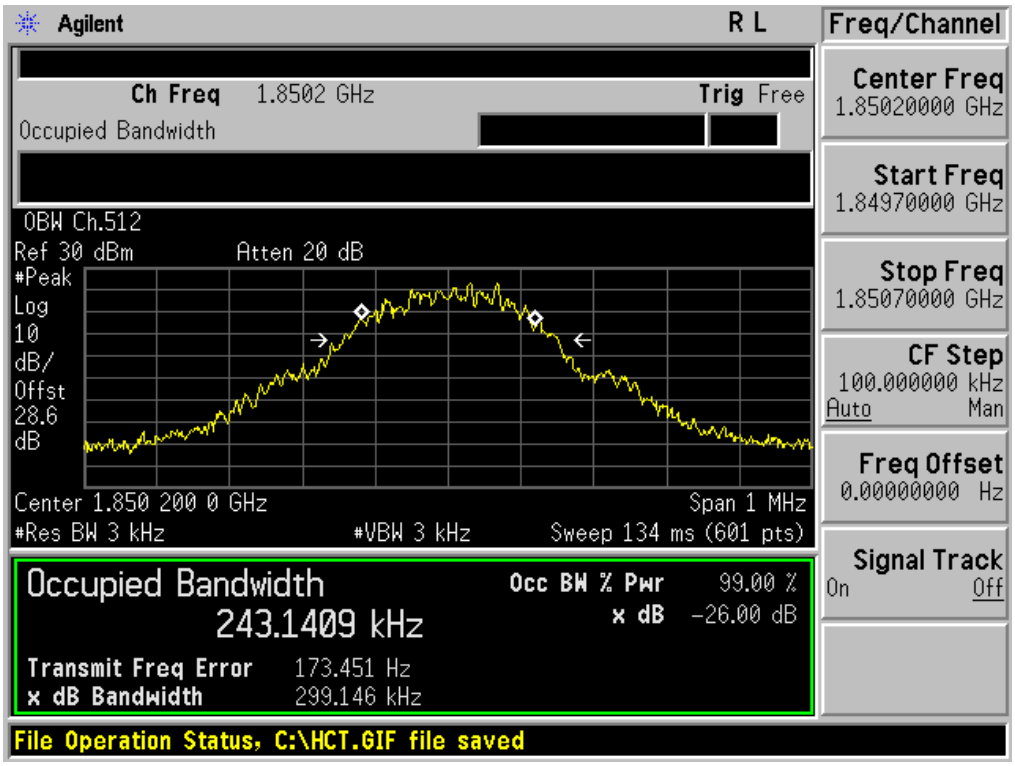
■ GSM850 MODE (251 CH.) Occupied Bandwidth



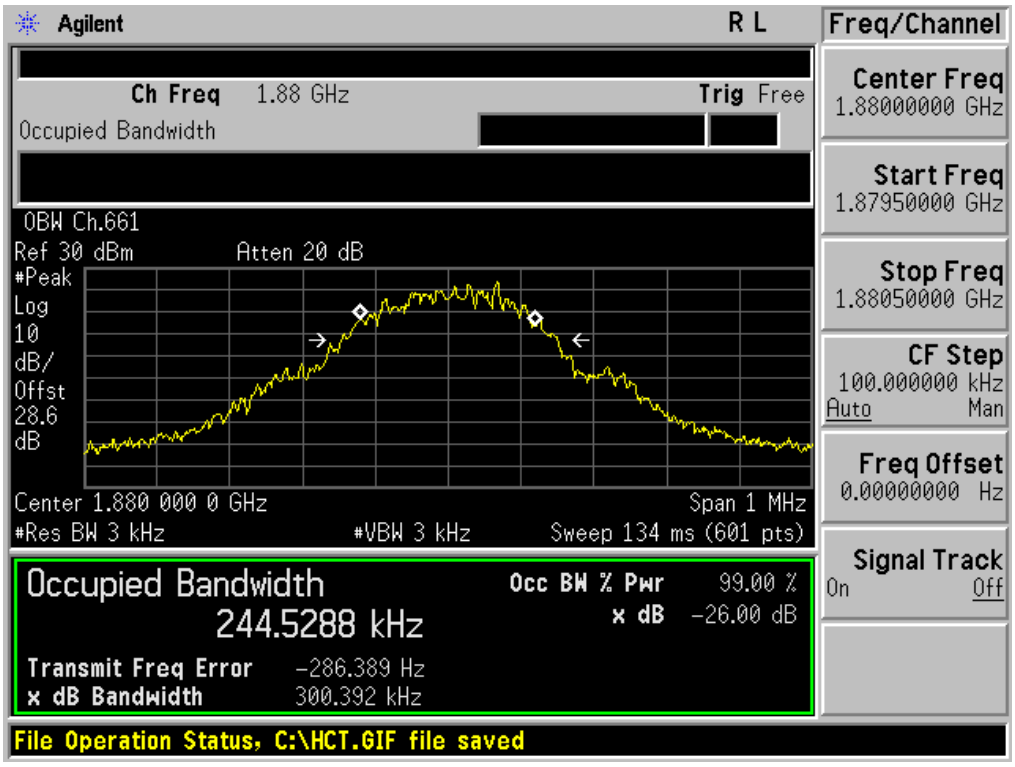
■ GSM850 EDGE (190 CH.) Occupied Bandwidth



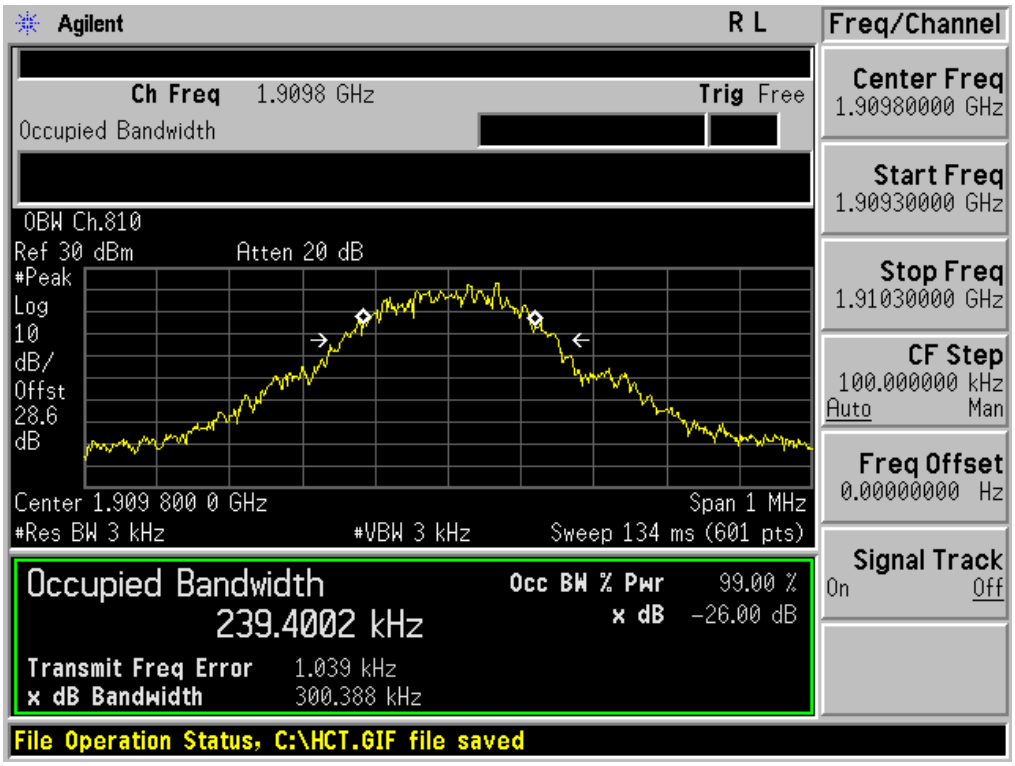
■ GSM1900 MODE (512 CH.) Occupied Bandwidth



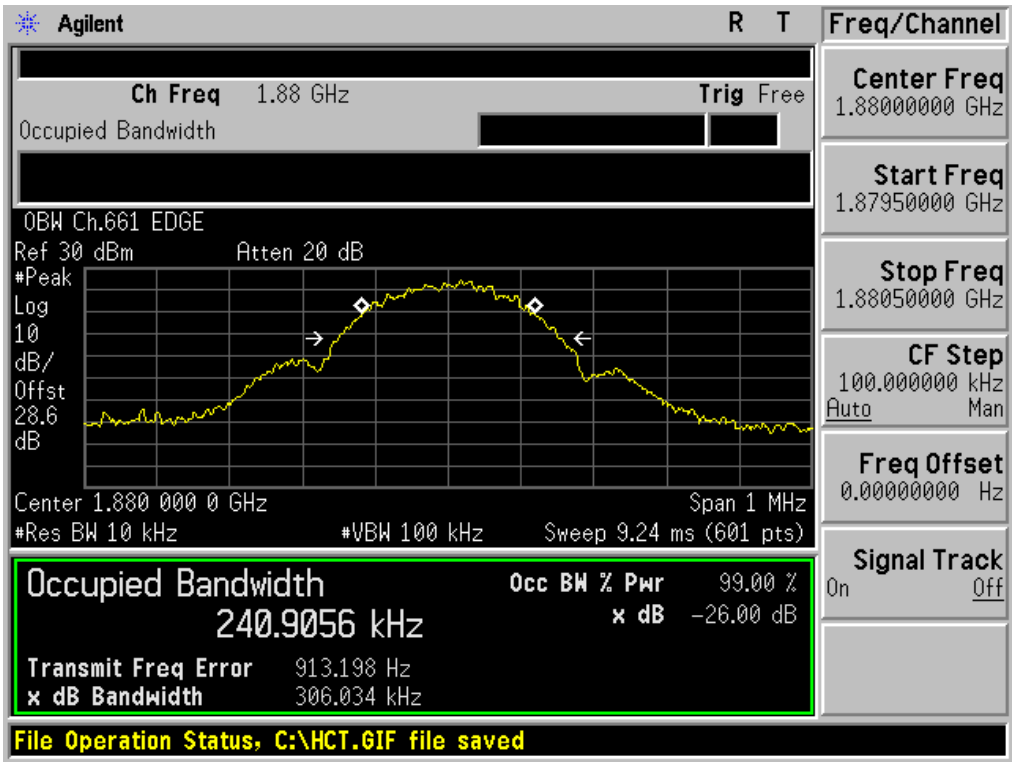
■ GSM1900 MODE (661 CH.) Occupied Bandwidth



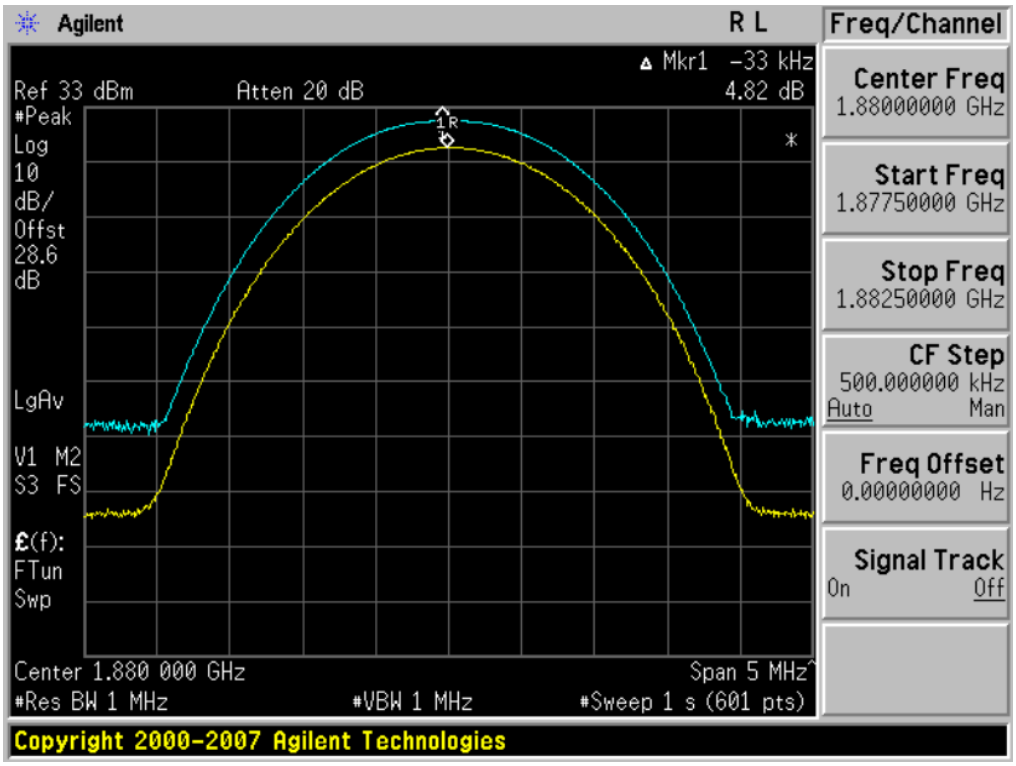
■ GSM1900 MODE (810 CH.) Occupied Bandwidth



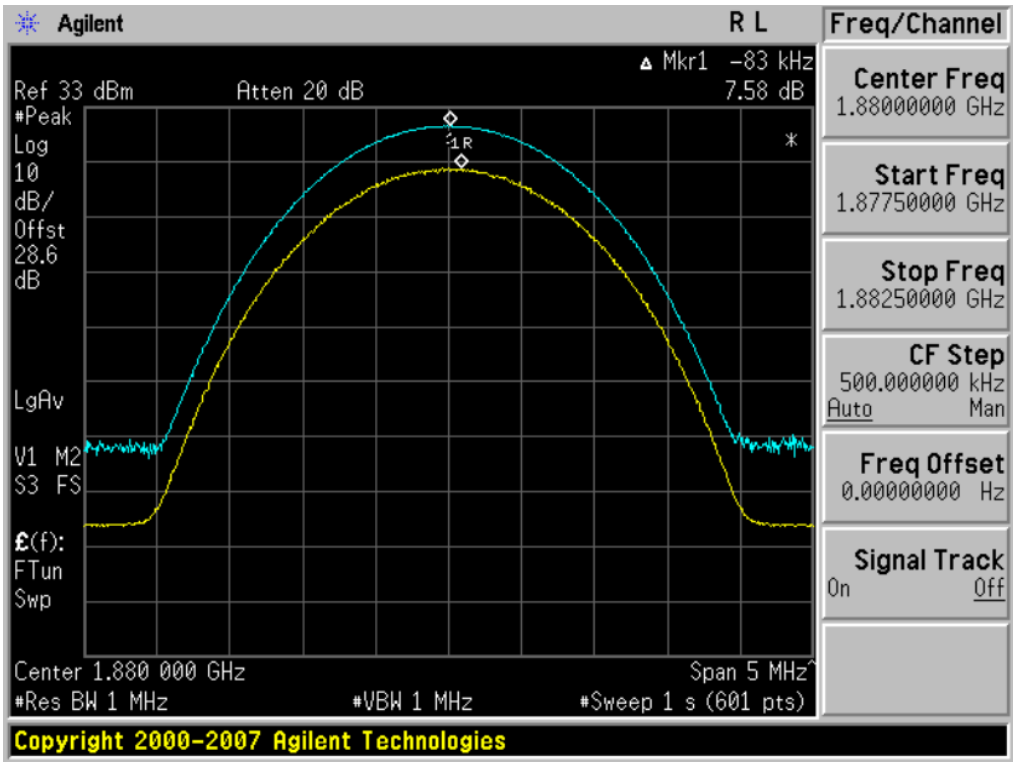
■ GSM1900 EDGE (661 CH.) Occupied Bandwidth



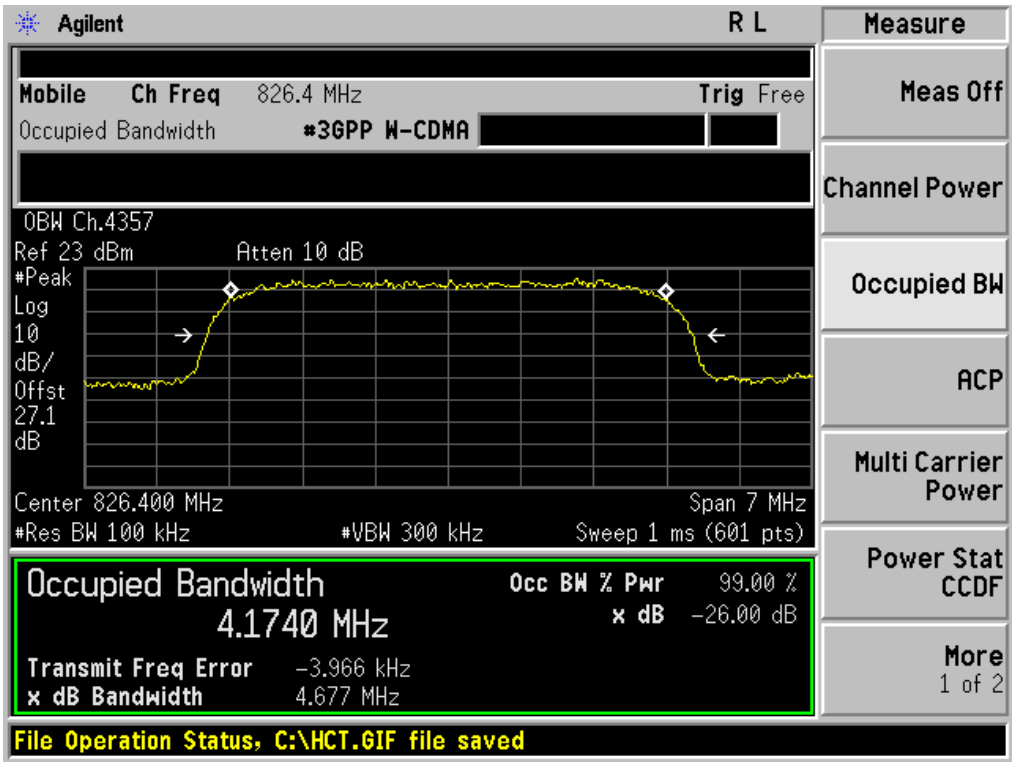
■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio



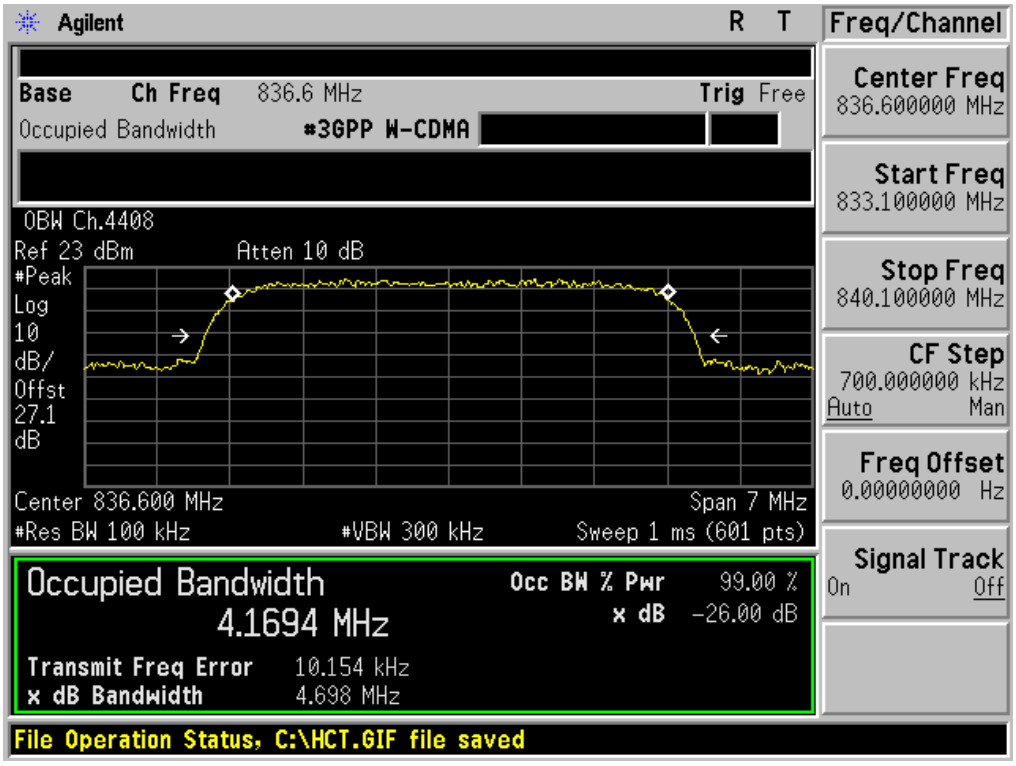
■ GSM1900 EDGE (661 CH.) Peak-to-Average Ratio



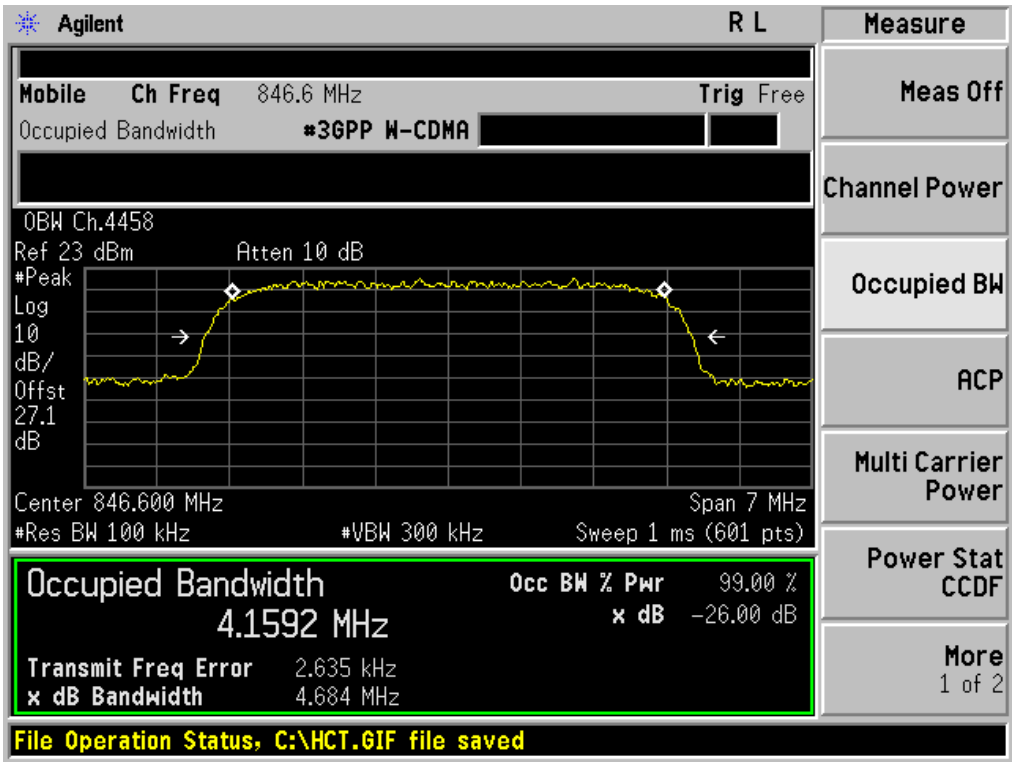
■ WCDMA850 MODE (4132 CH.) Occupied Bandwidth



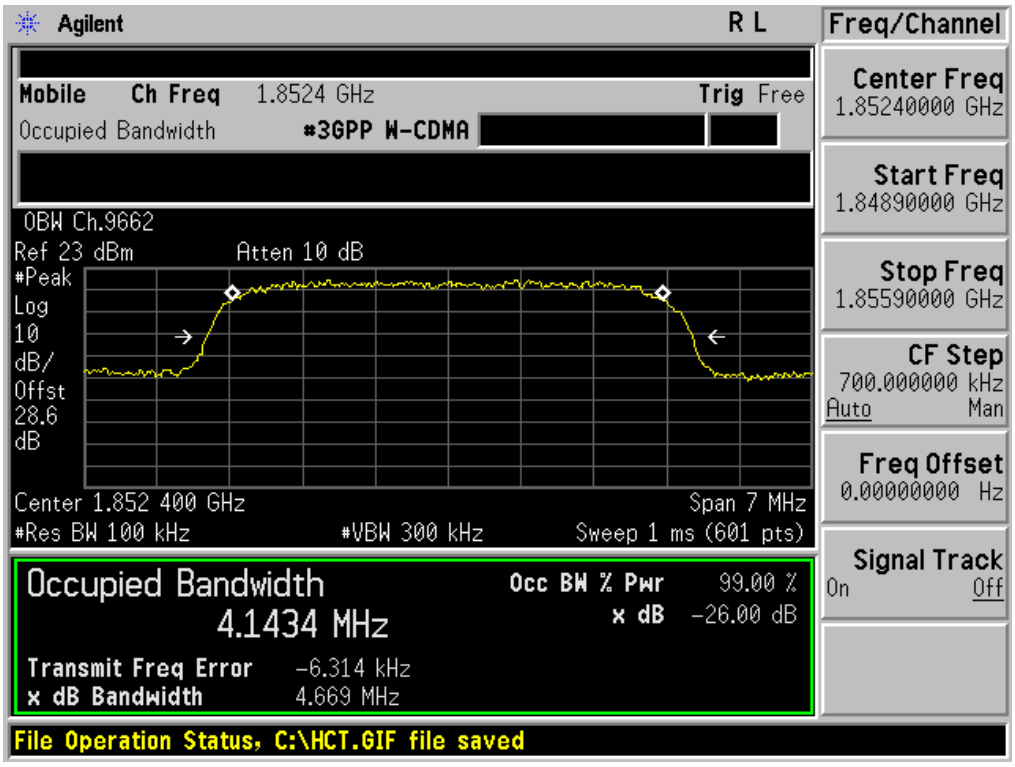
■ WCDMA850 MODE (4183 CH.) Occupied Bandwidth



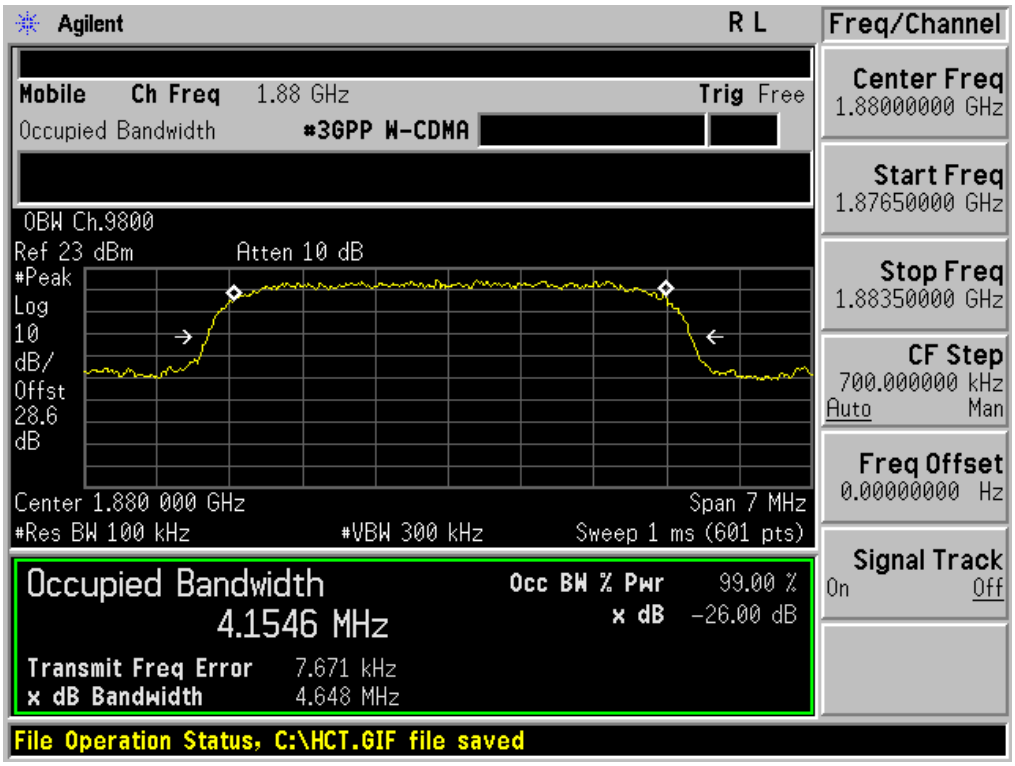
■ WCDMA850MODE (4233 CH.) Occupied Bandwidth



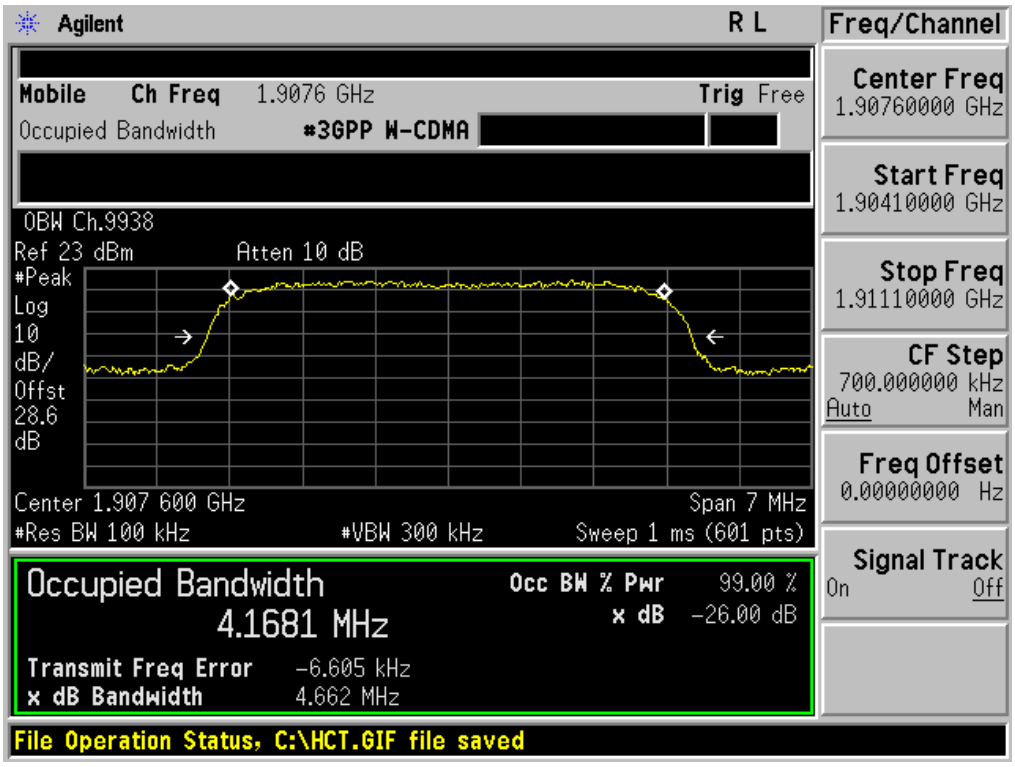
■ WCDMA1900 MODE (9262 CH.) Occupied Bandwidth



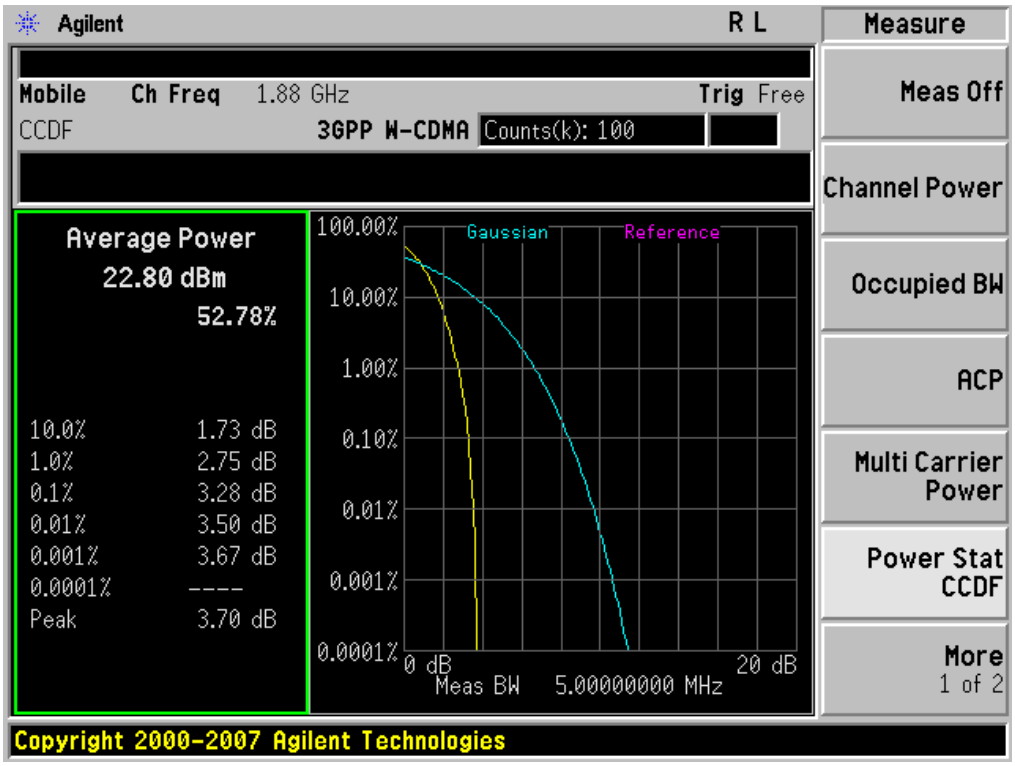
■ WCDMA1900 MODE (9400 CH.) Occupied Bandwidth



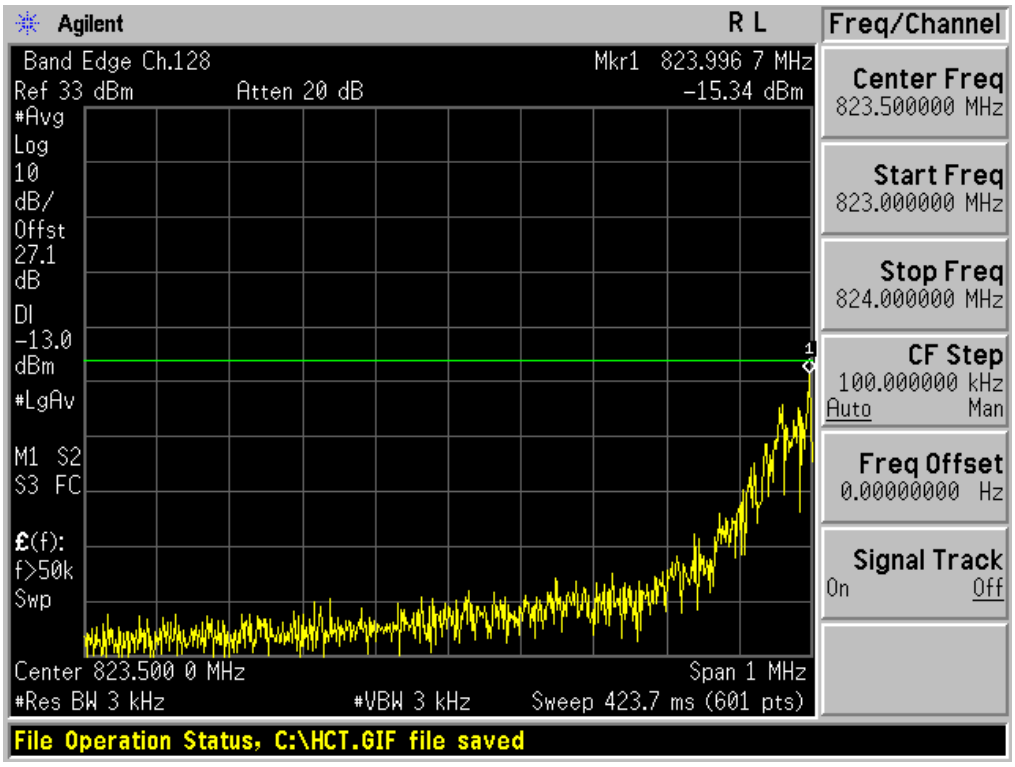
■ WCDMA1900 MODE (9538 CH.) Occupied Bandwidth



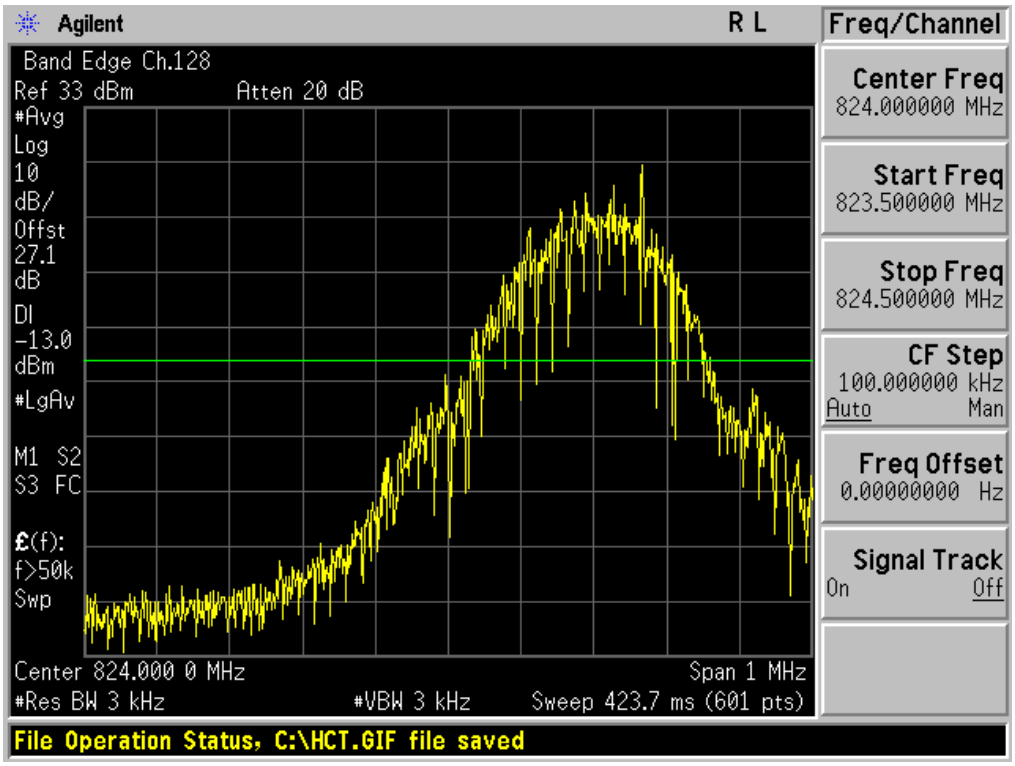
■ WCDMA1900 MODE (9400 CH.) Peak-to-Average Ratio



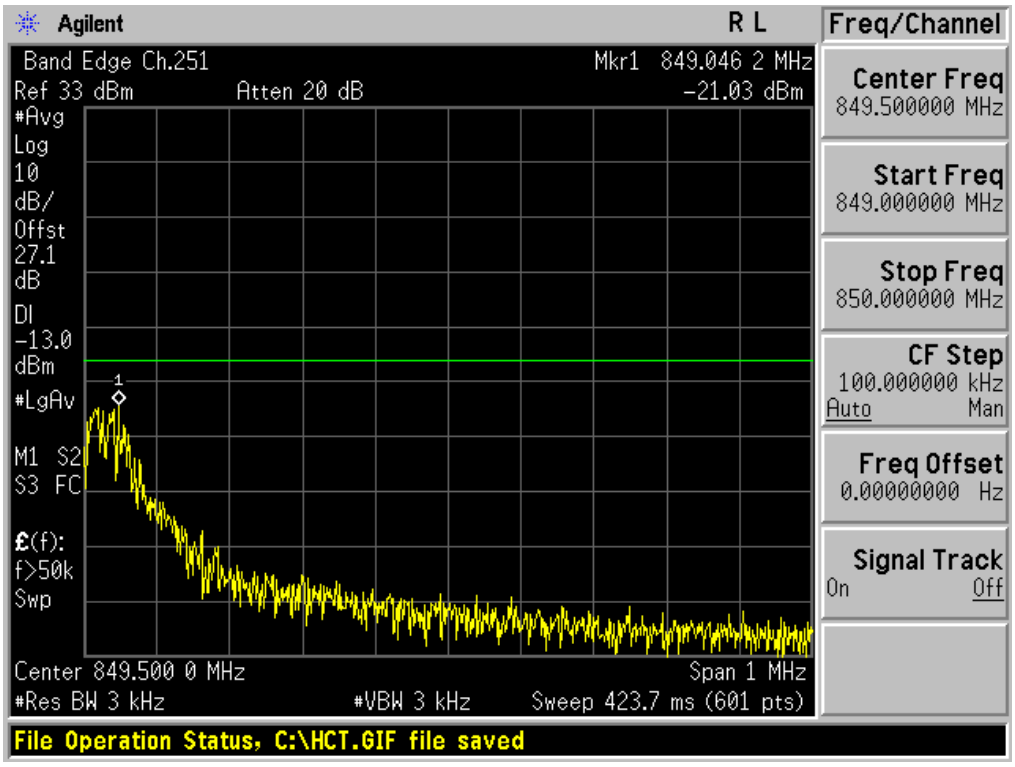
■ GSM850 MODE (128 CH.) Block Edge 1



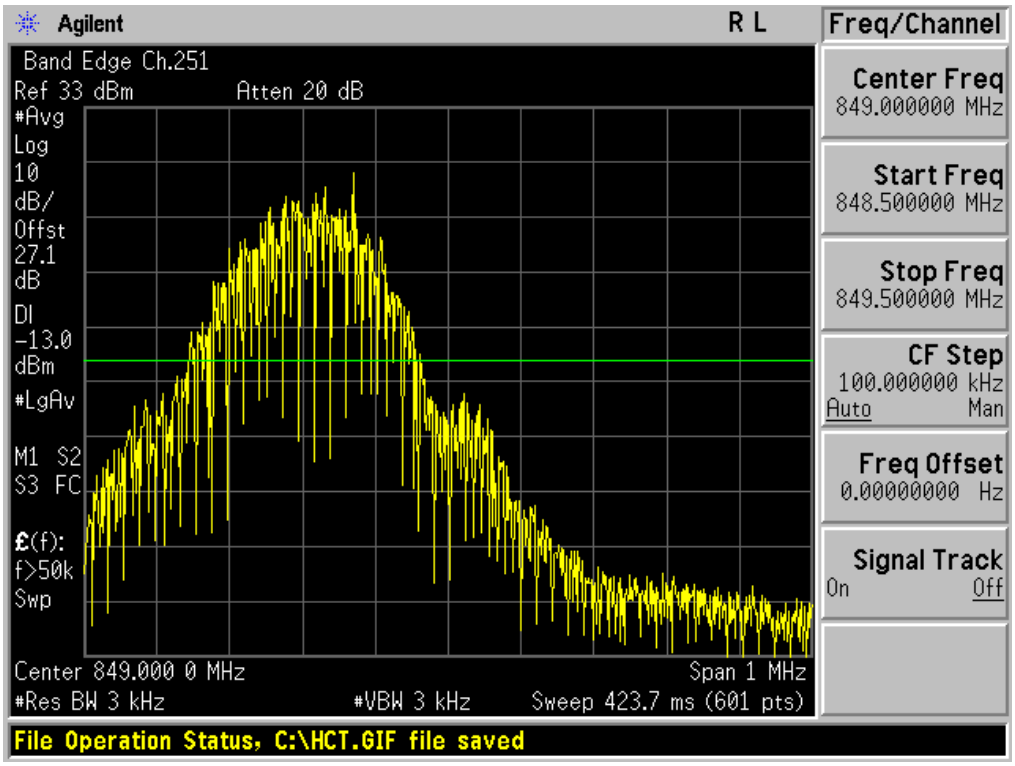
■ GSM850 MODE (128 CH.) Block Edge 2



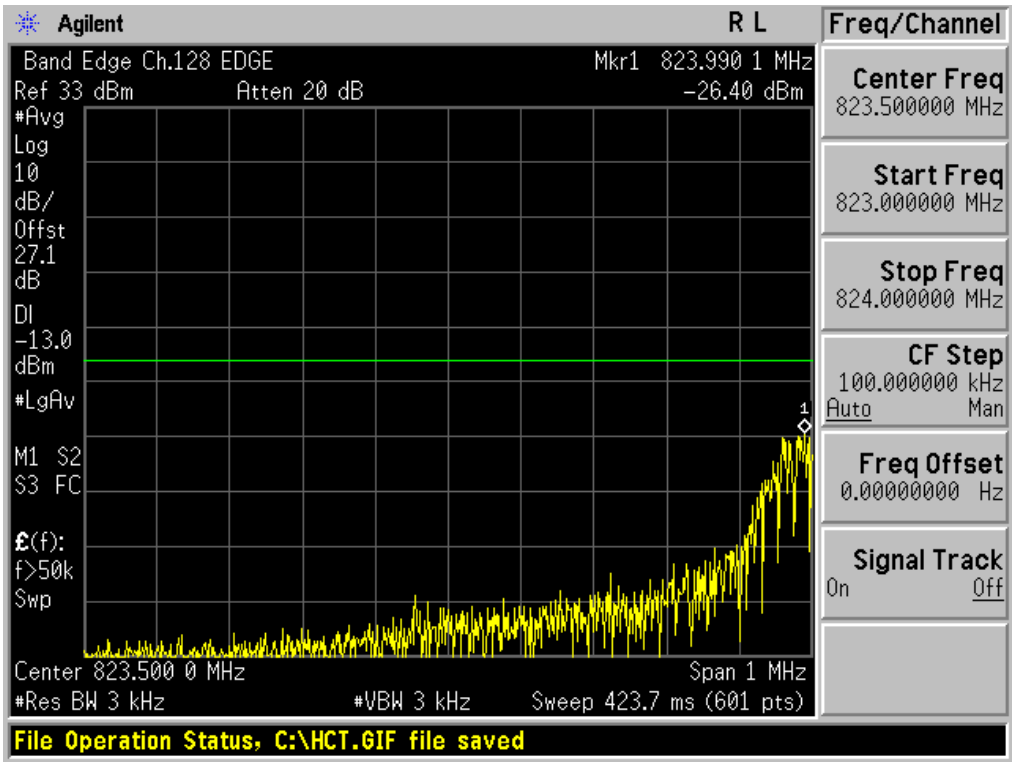
■ GSM850 MODE (251 CH.) Block Edge 1



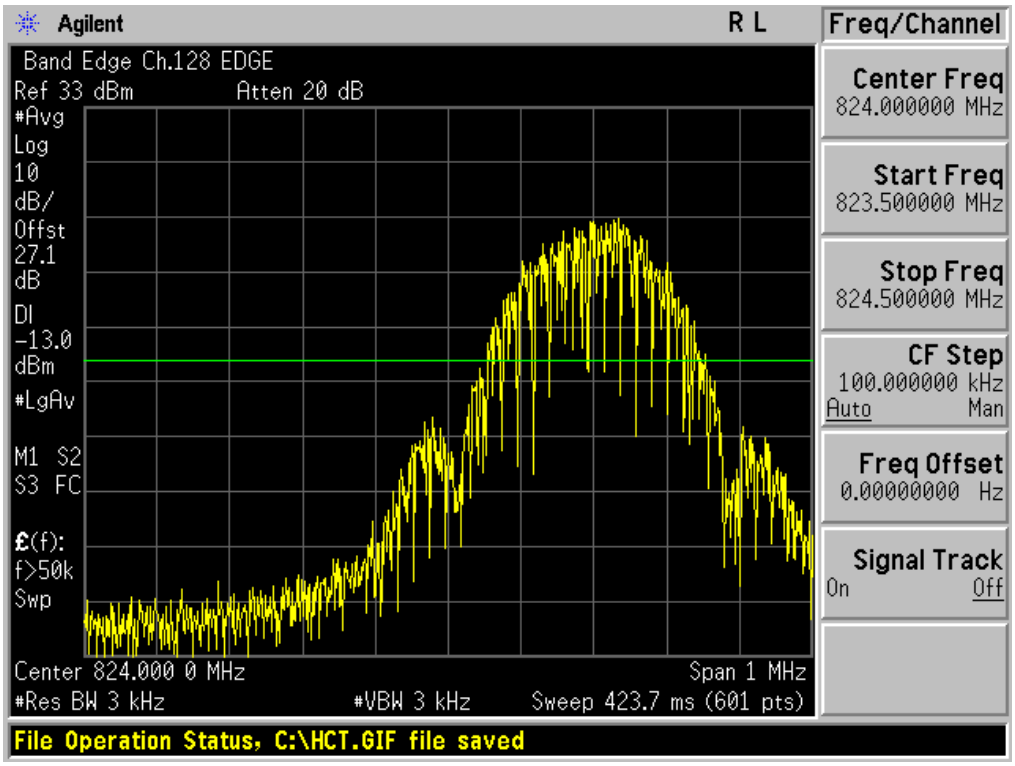
■ GSM850 MODE (251 CH.) Block Edge 2



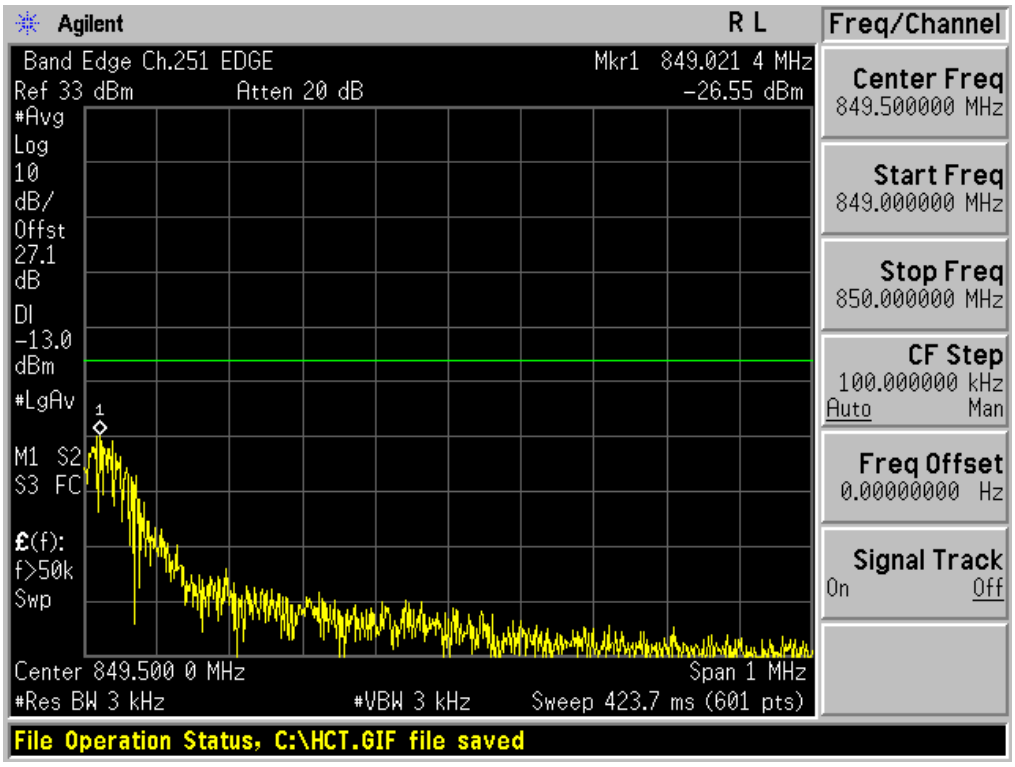
■ EDGE MODE (128 CH.) Block Edge 1



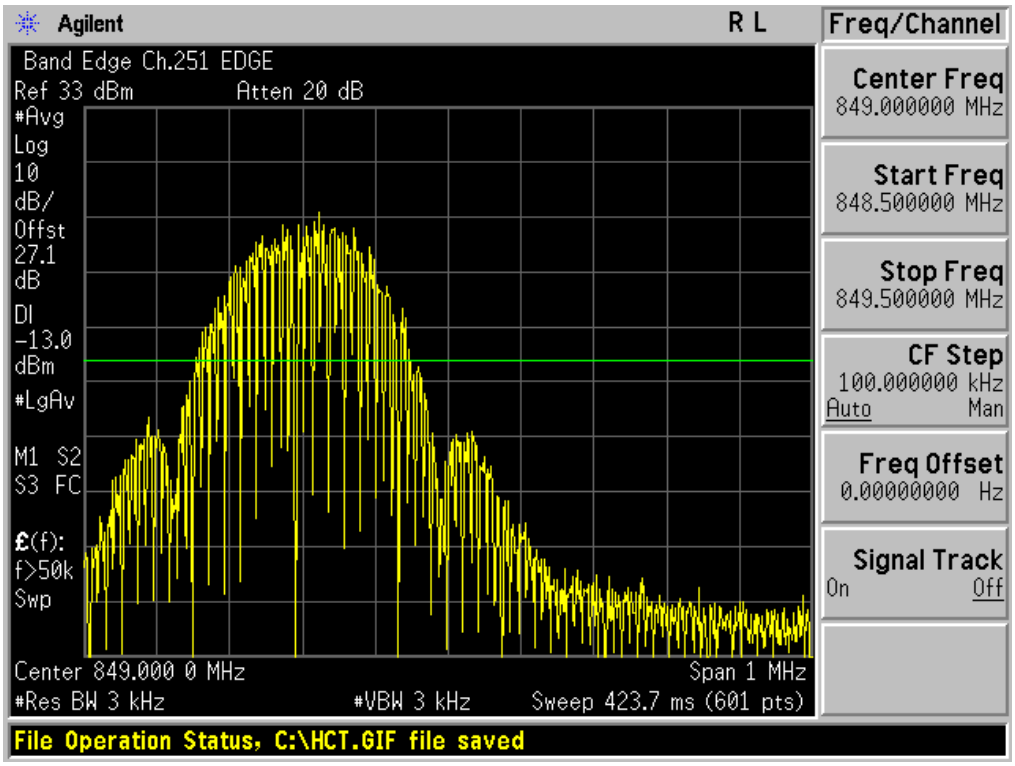
■ EDGE MODE (128 CH.) Block Edge 2



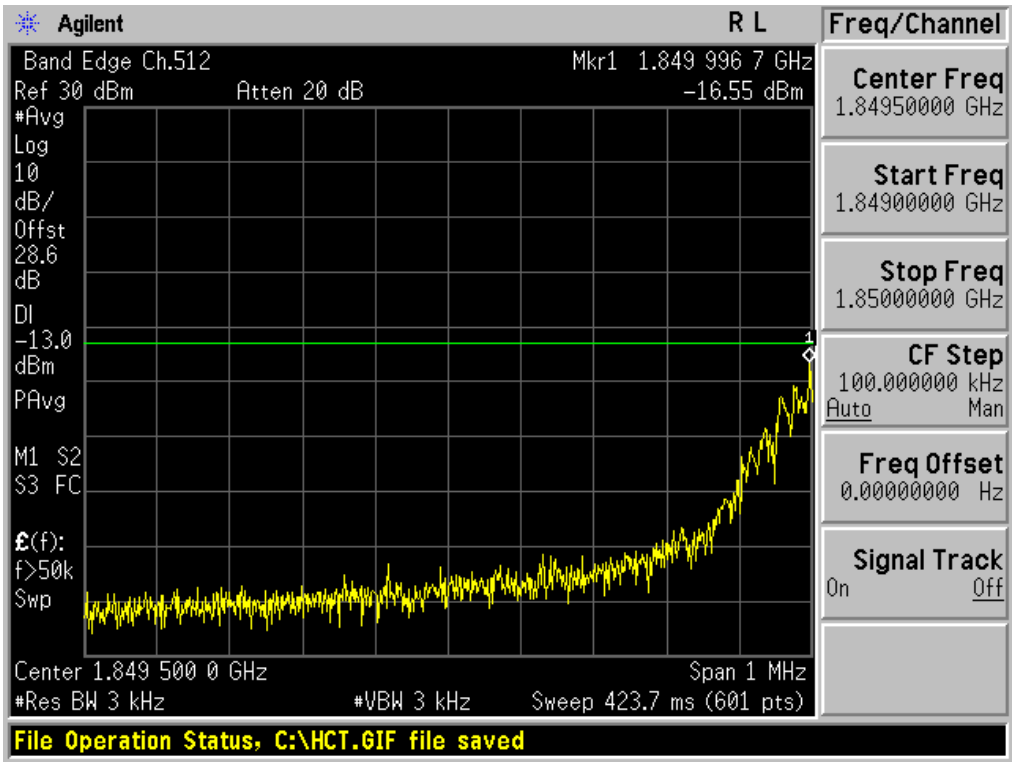
■ EDGE MODE (251 CH.) Block Edge 1



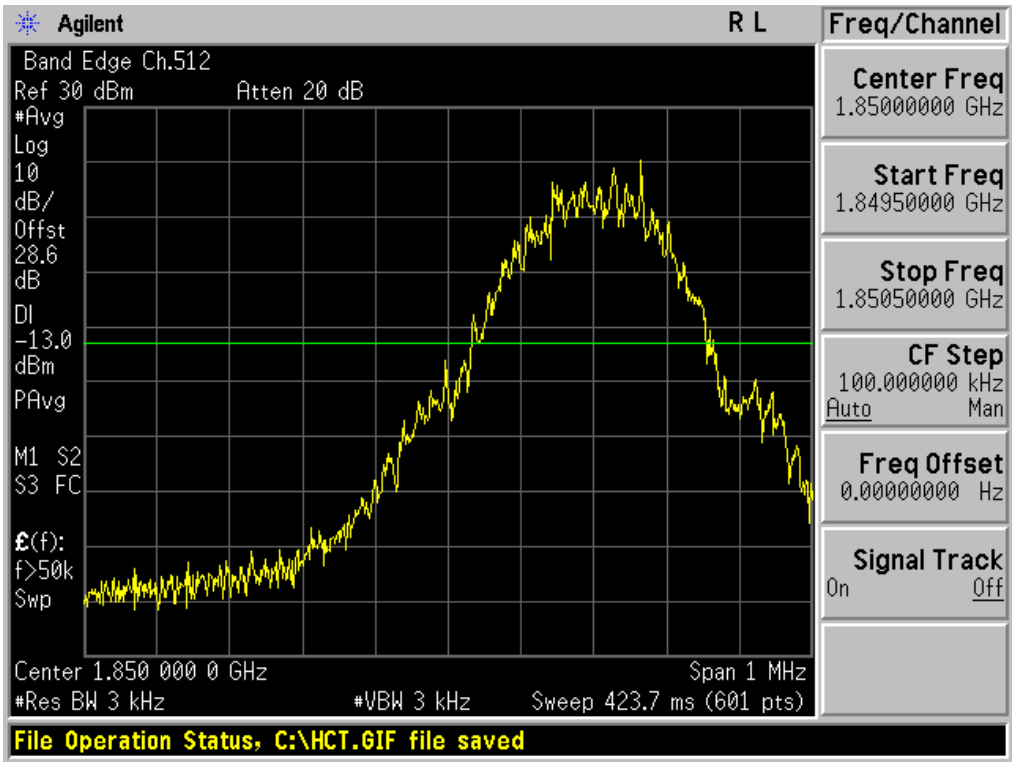
■ EDGE MODE (251 CH.) Block Edge 2



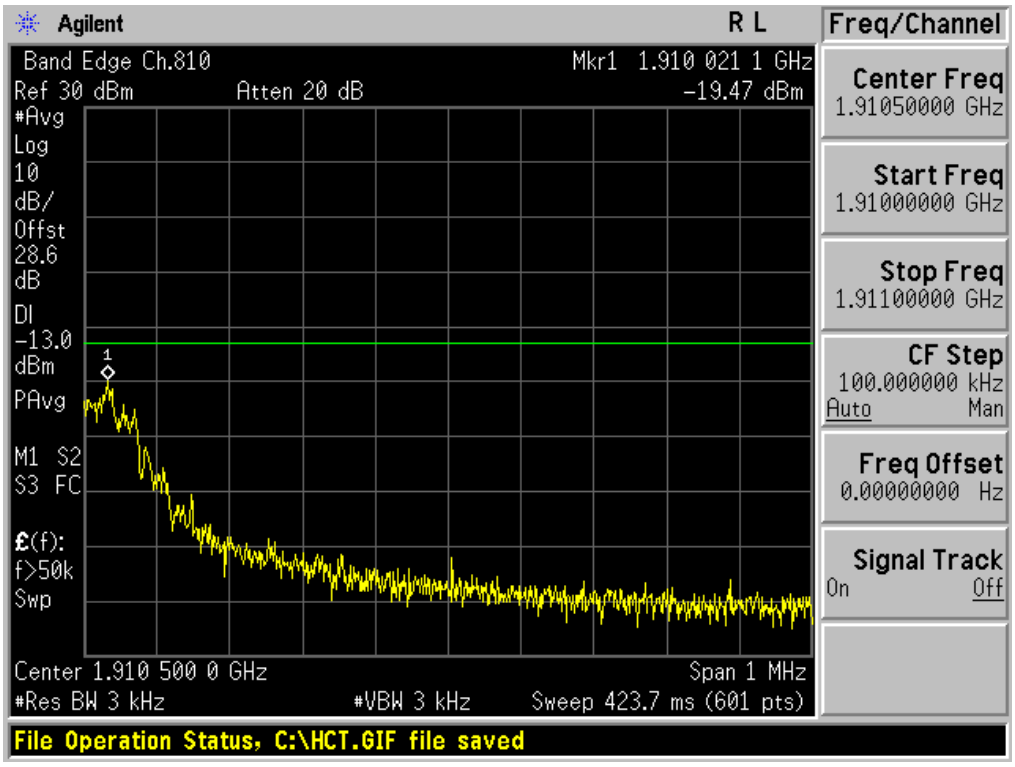
■ GSM1900 MODE (512 CH.) Block Edge 1



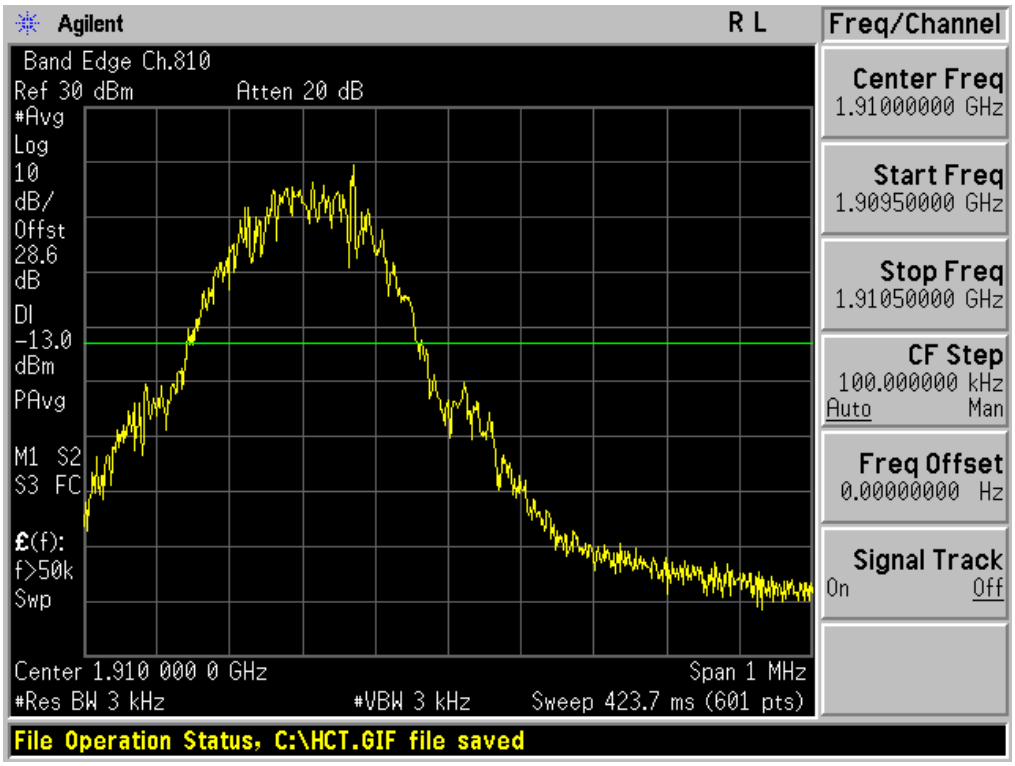
■ GSM1900 MODE (512 CH.) Block Edge 2



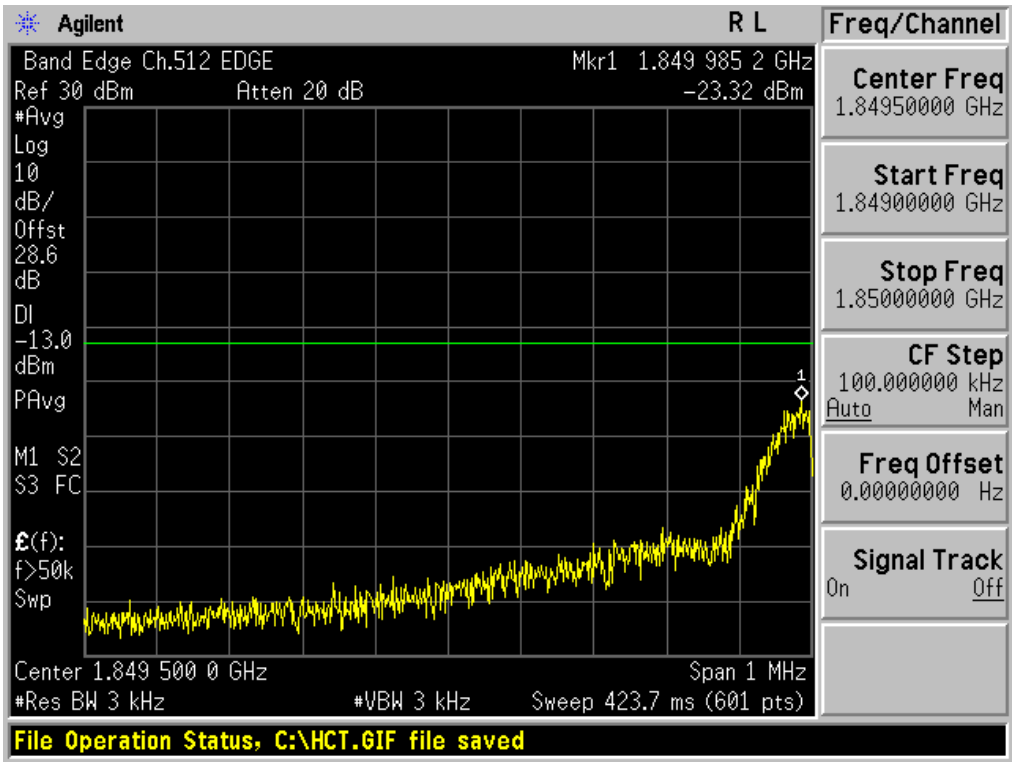
■ GSM1900 MODE (810 CH.) Block Edge 1



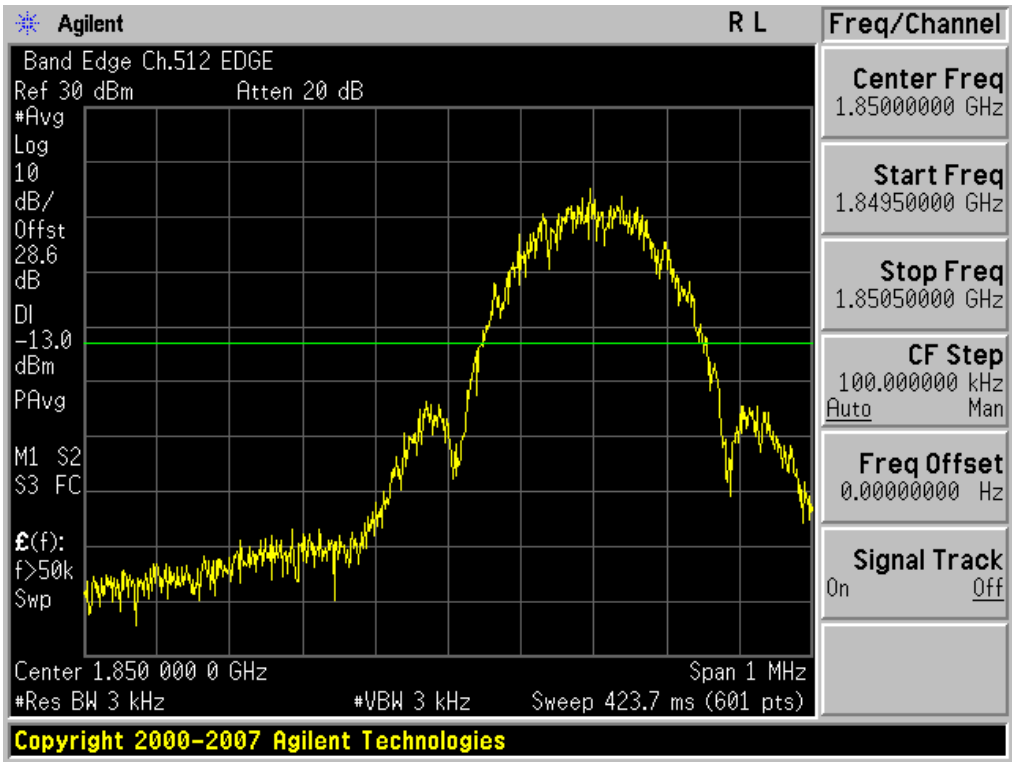
■ GSM1900 MODE (810 CH.) Block Edge 2



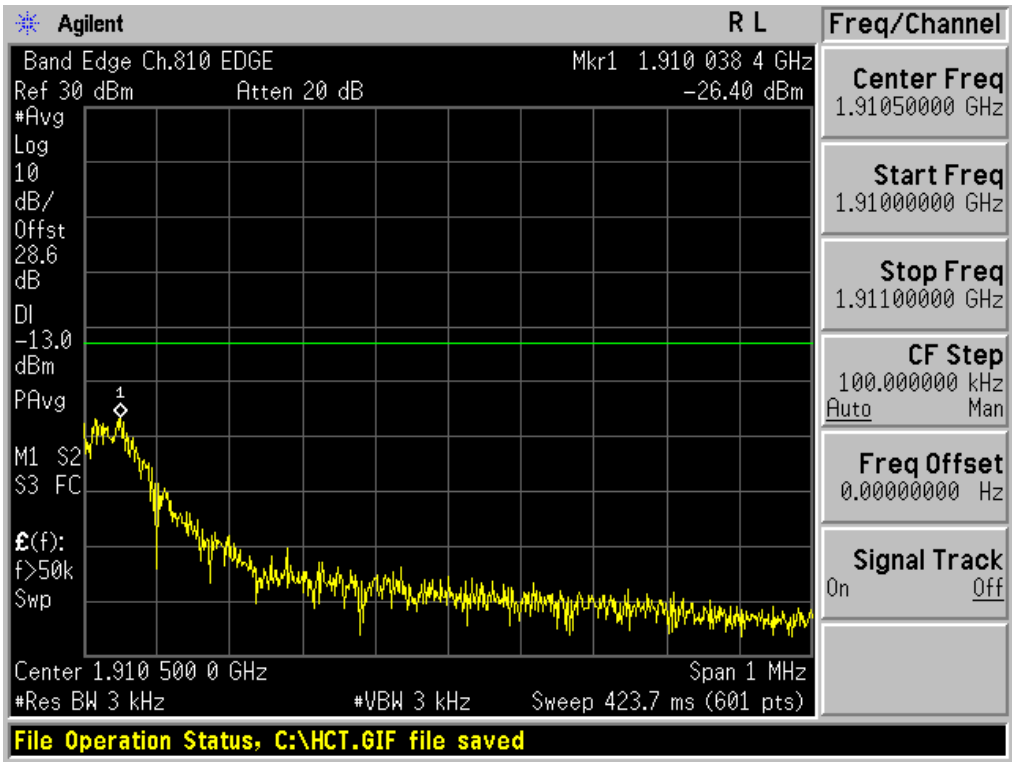
■ EDGE MODE (512 CH.) Block Edge 1



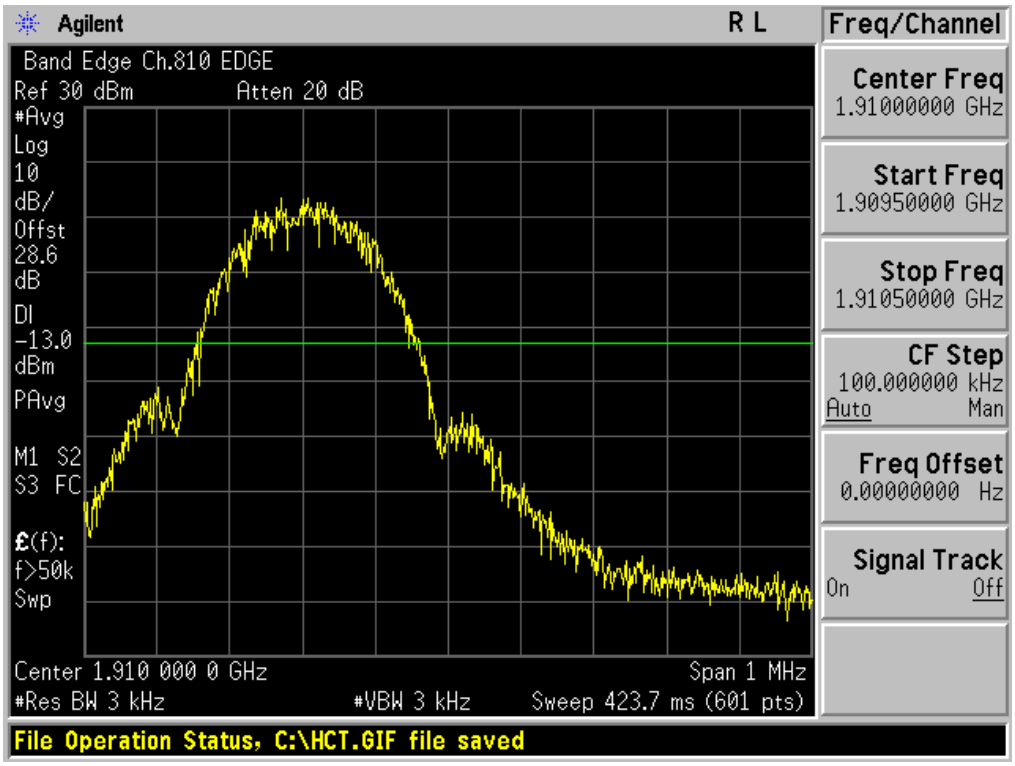
■ EDGE MODE (512 CH.) Block Edge 2



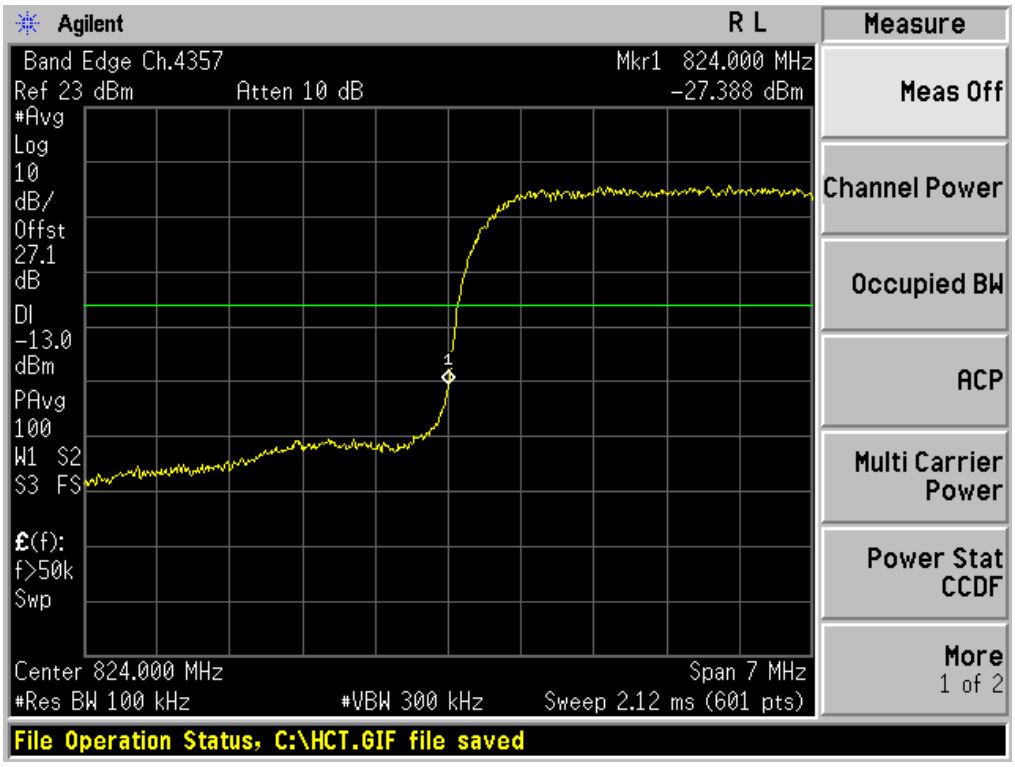
■ EDGE MODE (810 CH.) Block Edge 1



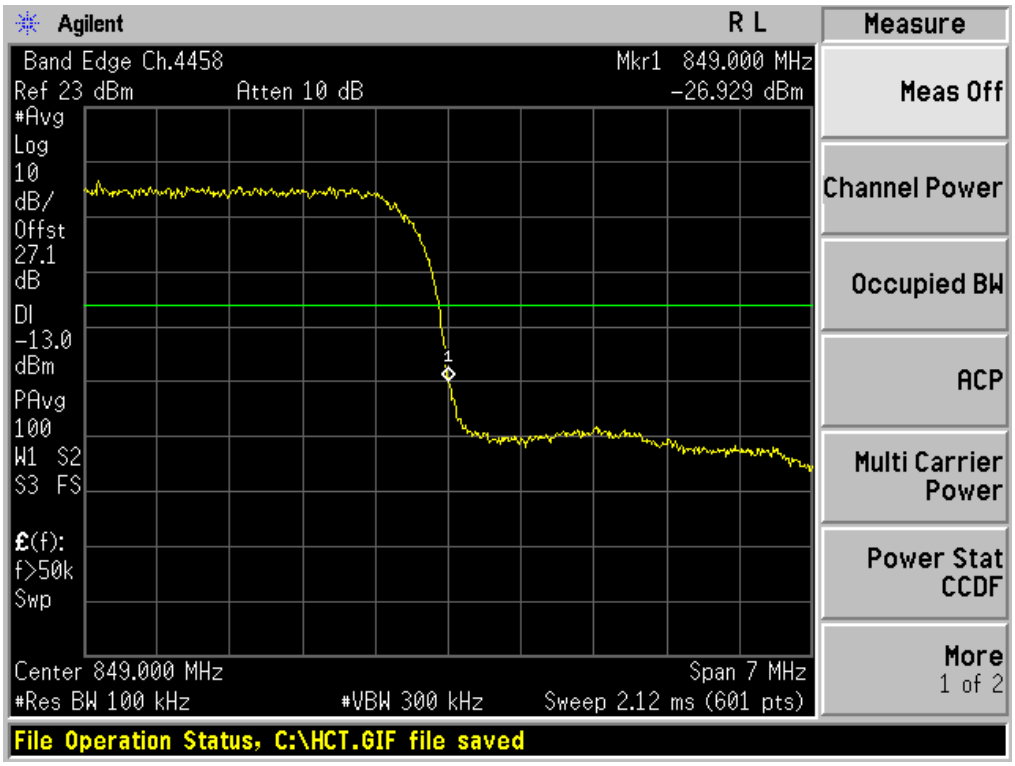
■ EDGE MODE (810 CH.) Block Edge 2



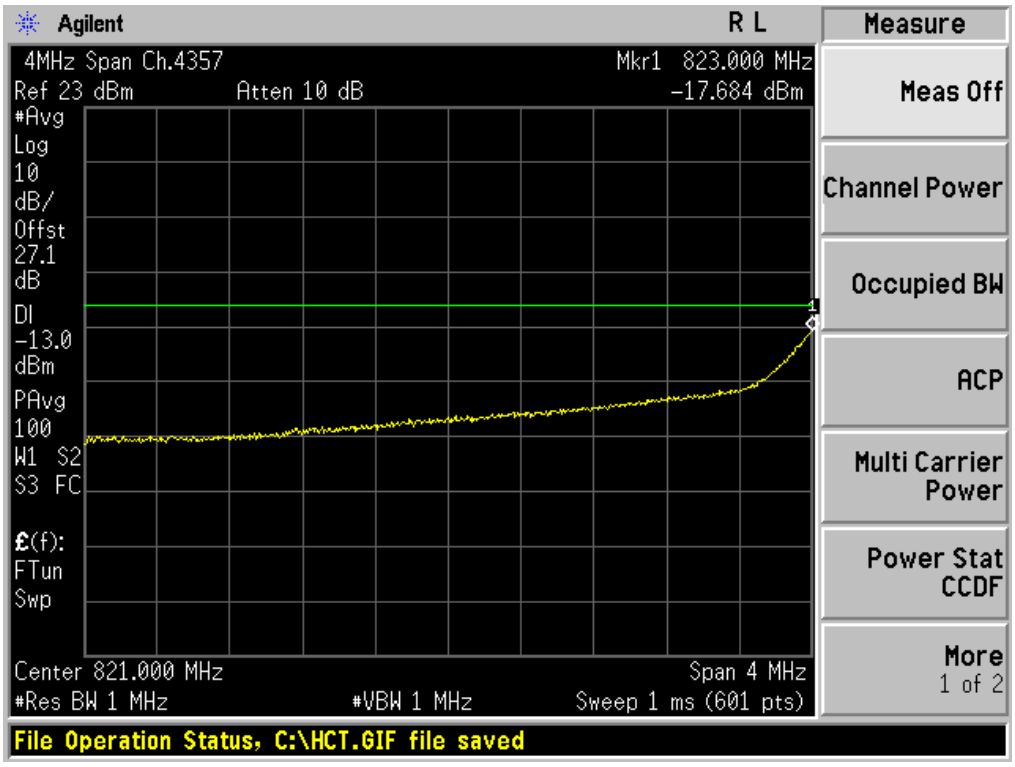
■ WCDMA850 MODE (4132 CH.) Block Edge



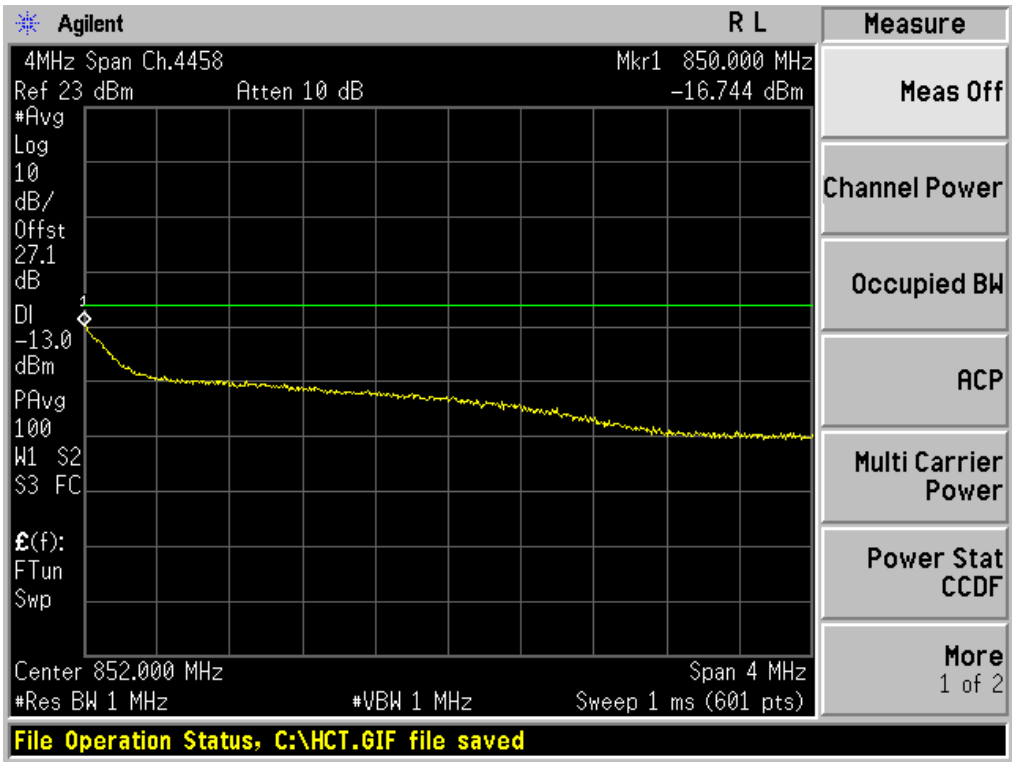
■ WCDMA850MODE (4233 CH.) Block Edge



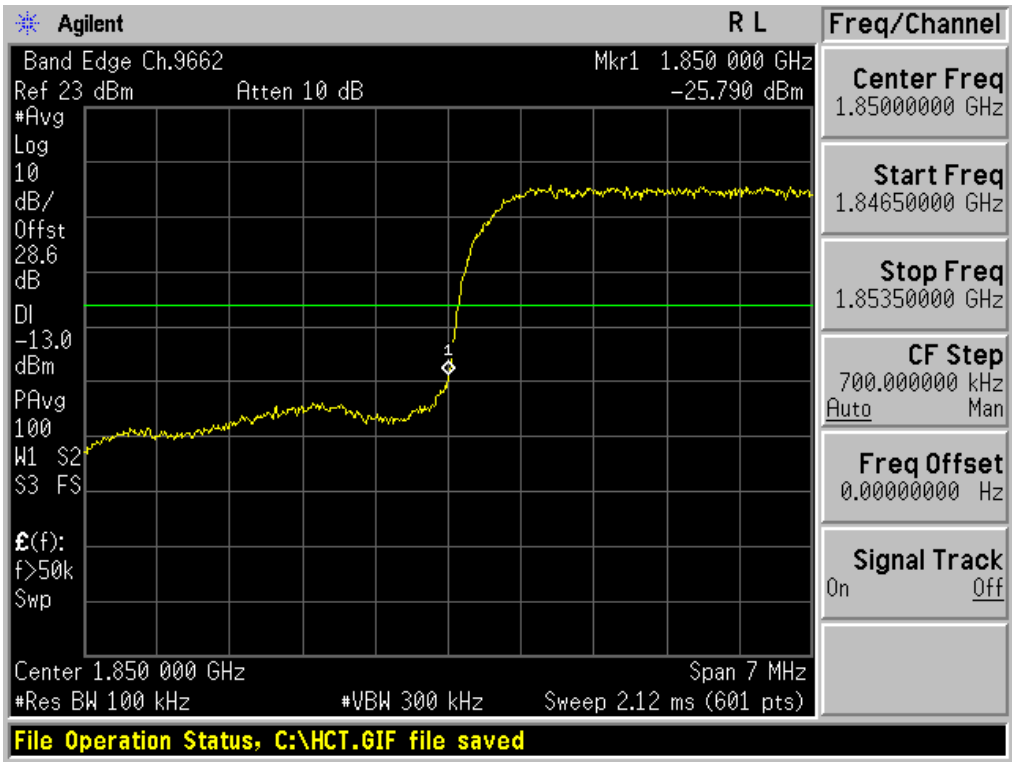
■ WCDMA850 MODE (4132 CH.) – 4 MHz Span



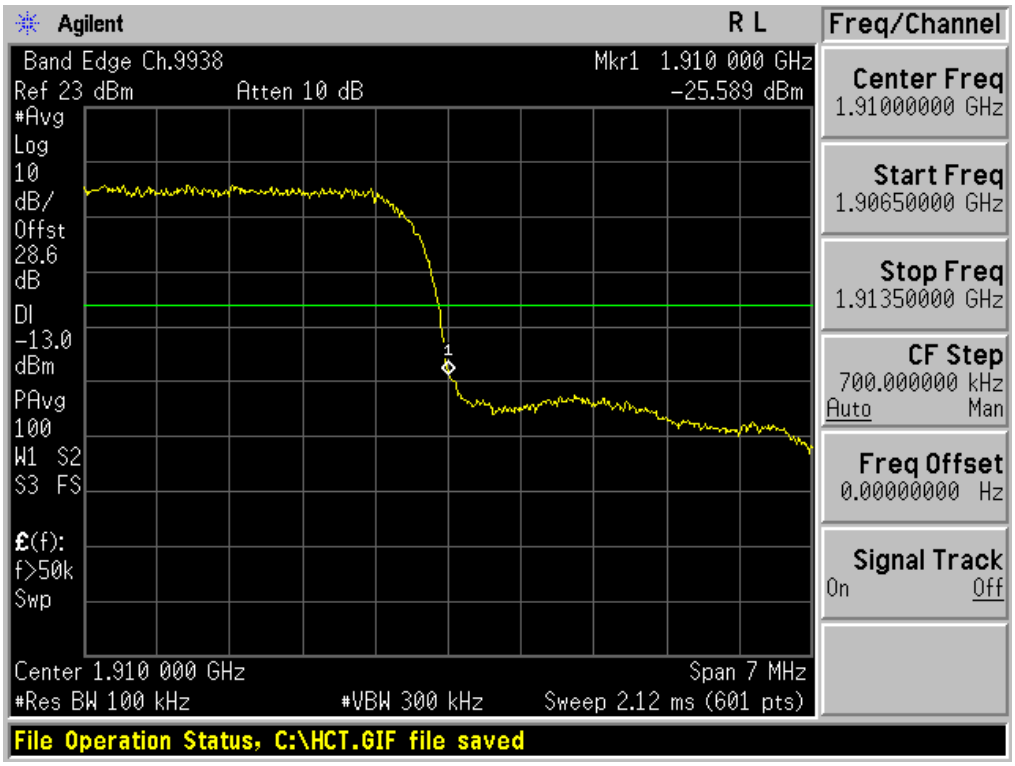
■ WCDMA850MODE (4233 CH.) – 4 MHz Span



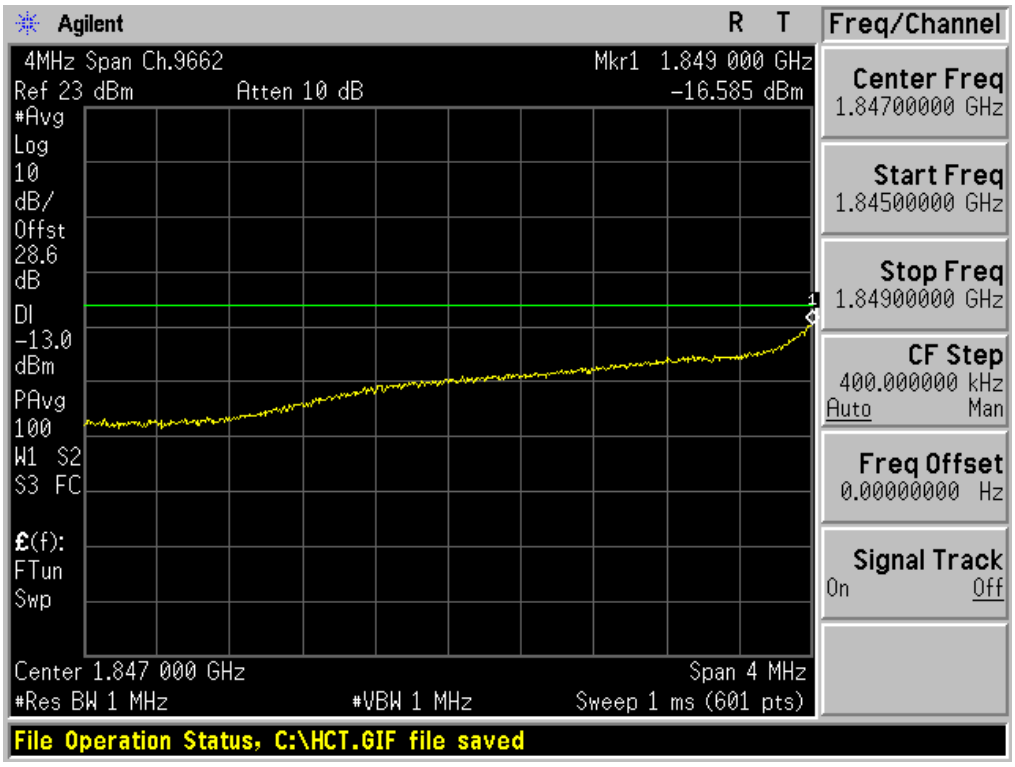
■ WCDMA1900 MODE (9262 CH.) Block Edge



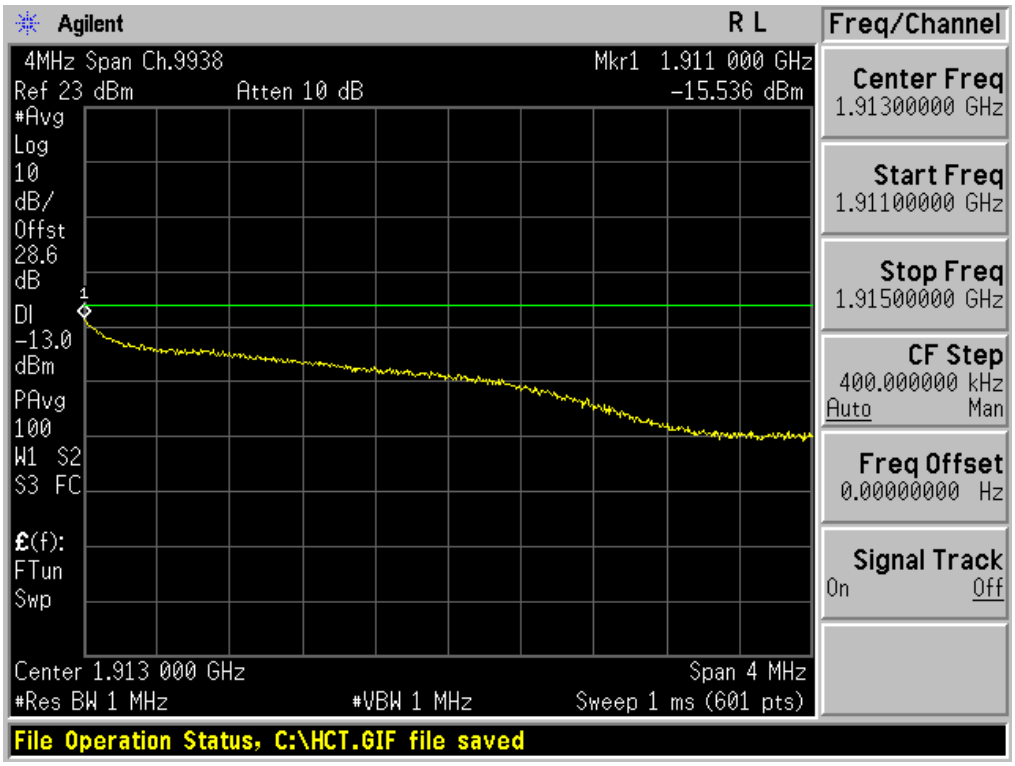
■ WCDMA1900 MODE (9538 CH.) Block Edge



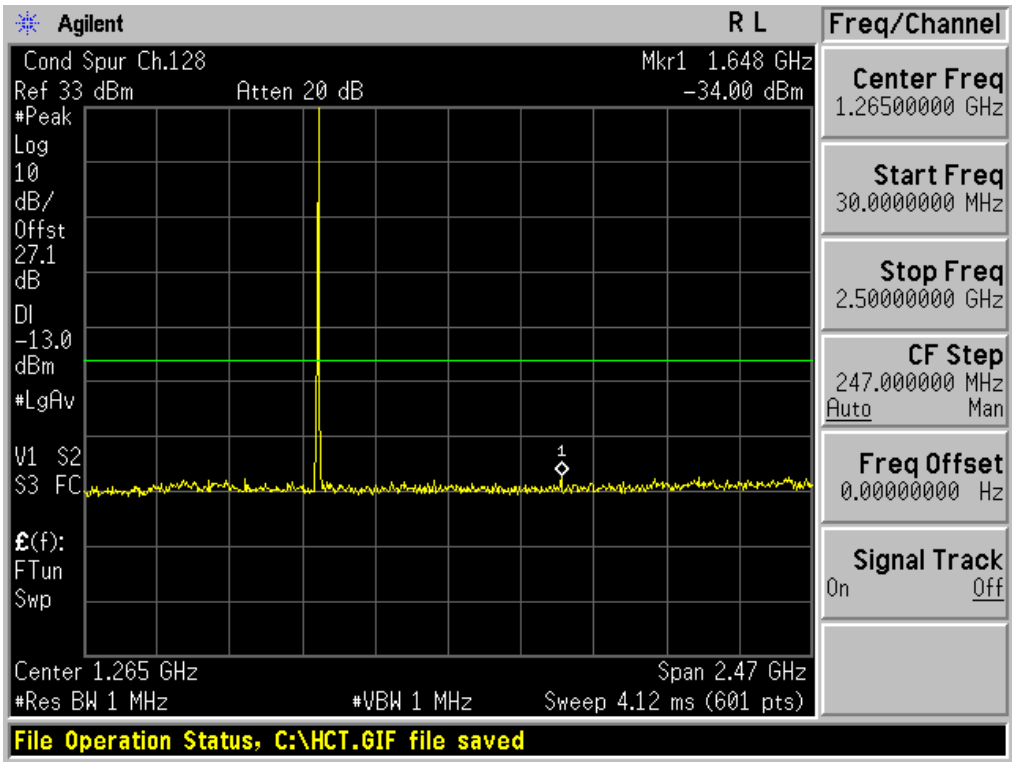
■ WCDMA1900 MODE (9262 CH.) – 4 MHz Span



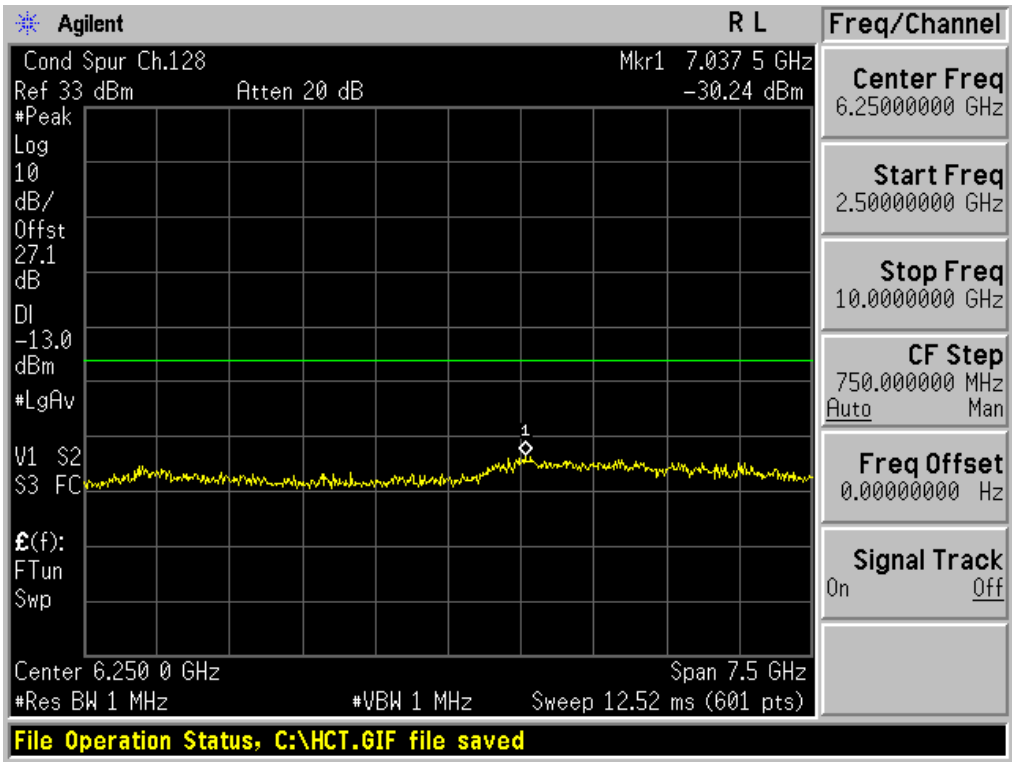
■ WCDMA1900 MODE (9538 CH.) – 4 MHz Span



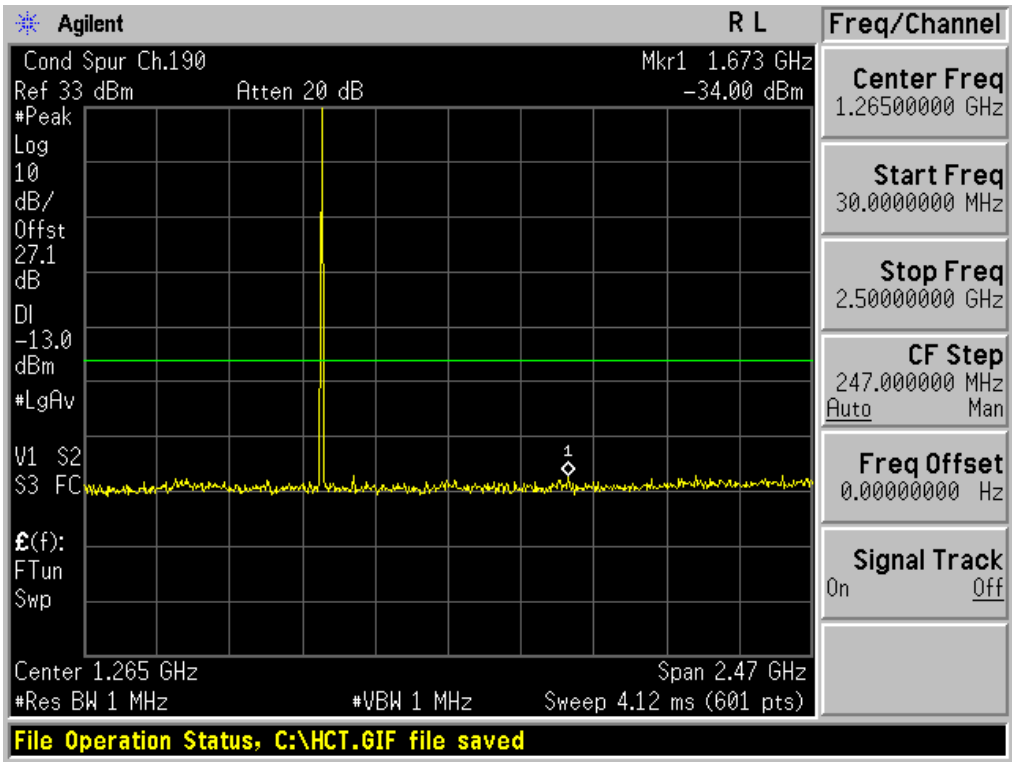
■ GSM850 MODE (128 CH.) Conducted Spurious Emissions1



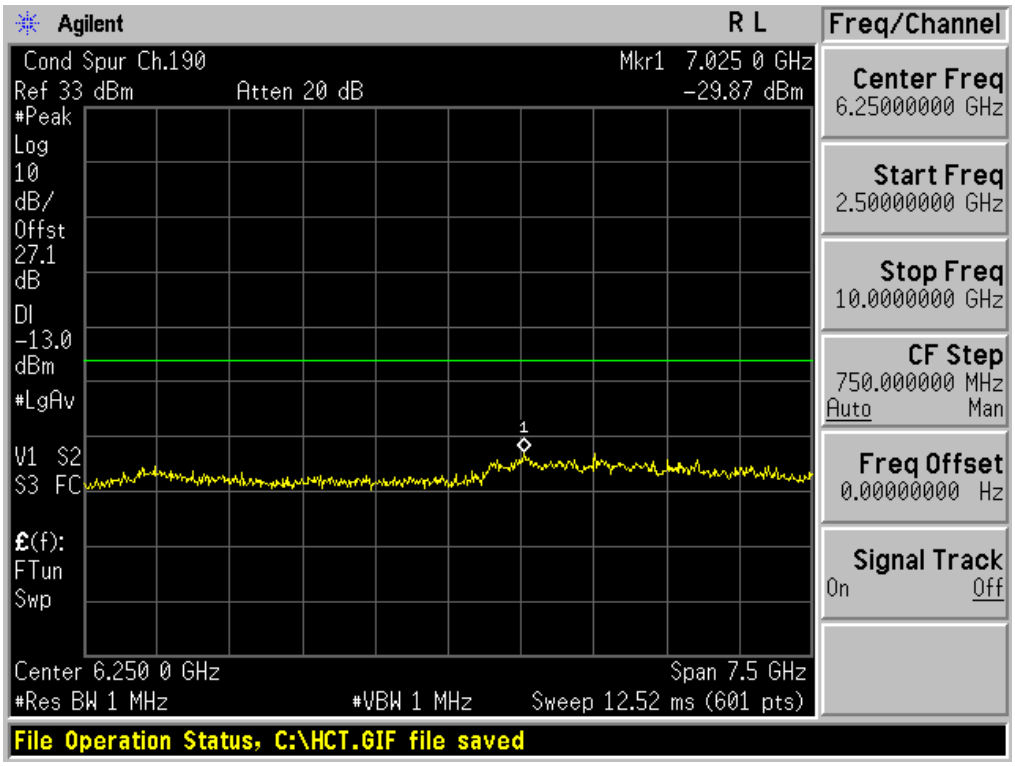
■ GSM850 MODE (128 CH.) Conducted Spurious Emissions2



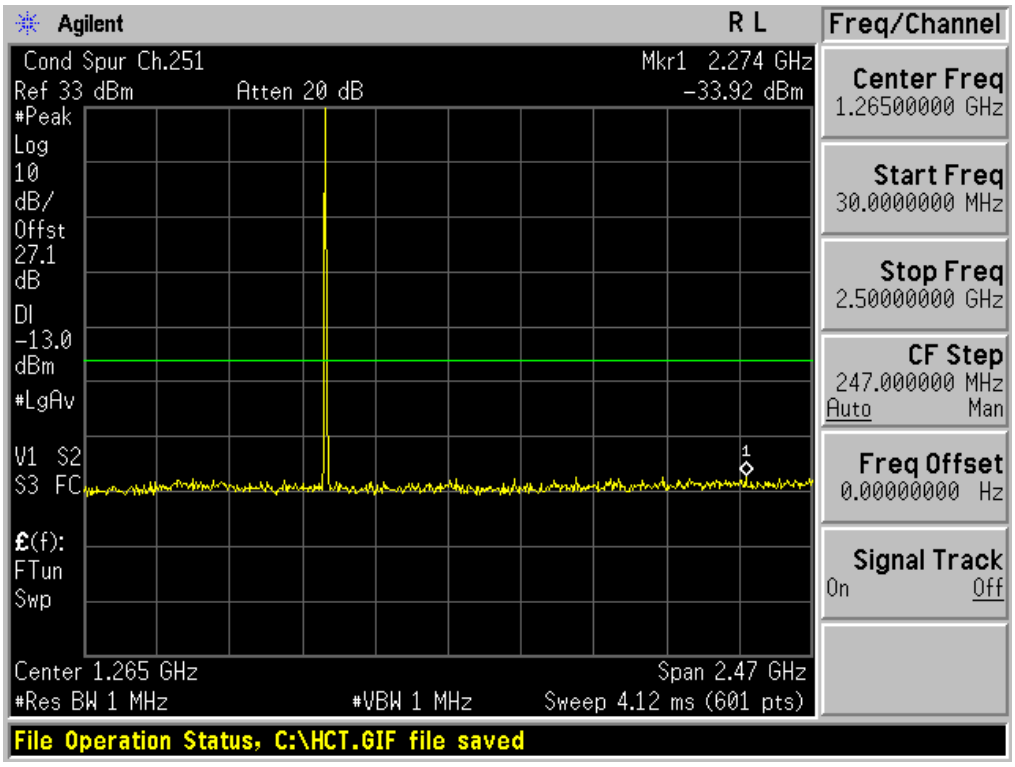
■ GSM850 MODE (190 CH.) Conducted Spurious Emissions1



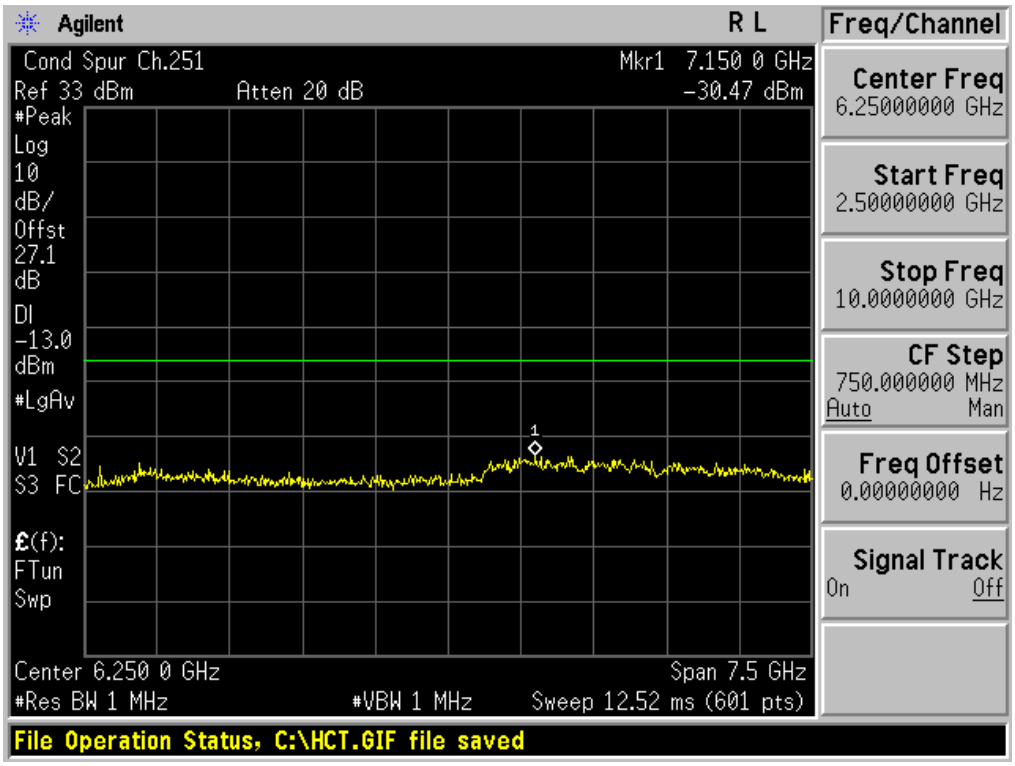
■ GSM850 MODE (190 CH.) Conducted Spurious Emissions2



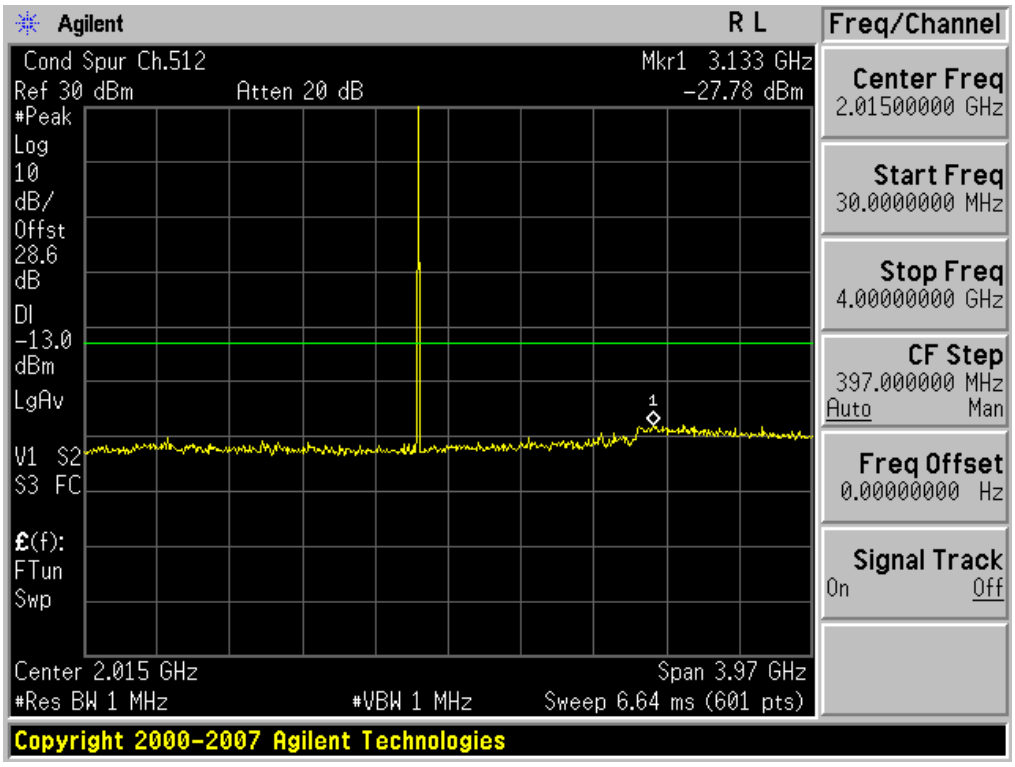
■ GSM850 MODE (251 CH.) Conducted Spurious Emissions1



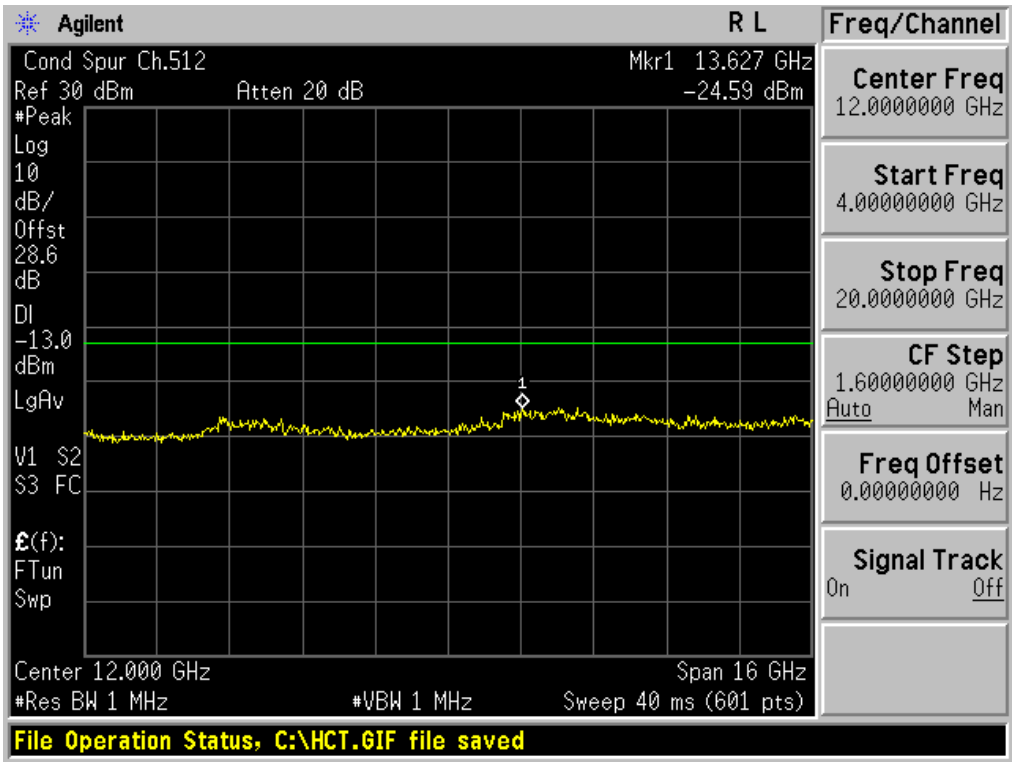
■ GSM850 MODE (251 CH.) Conducted Spurious Emissions2



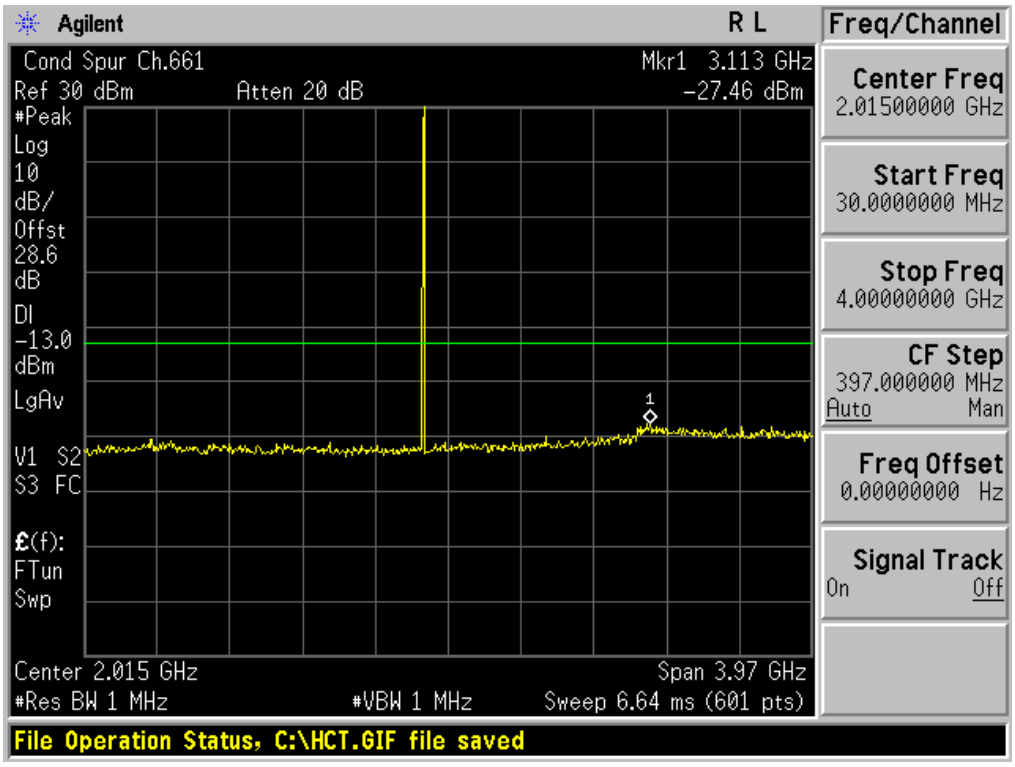
■ GSM1900 MODE (512 CH.) Conducted Spurious Emissions1



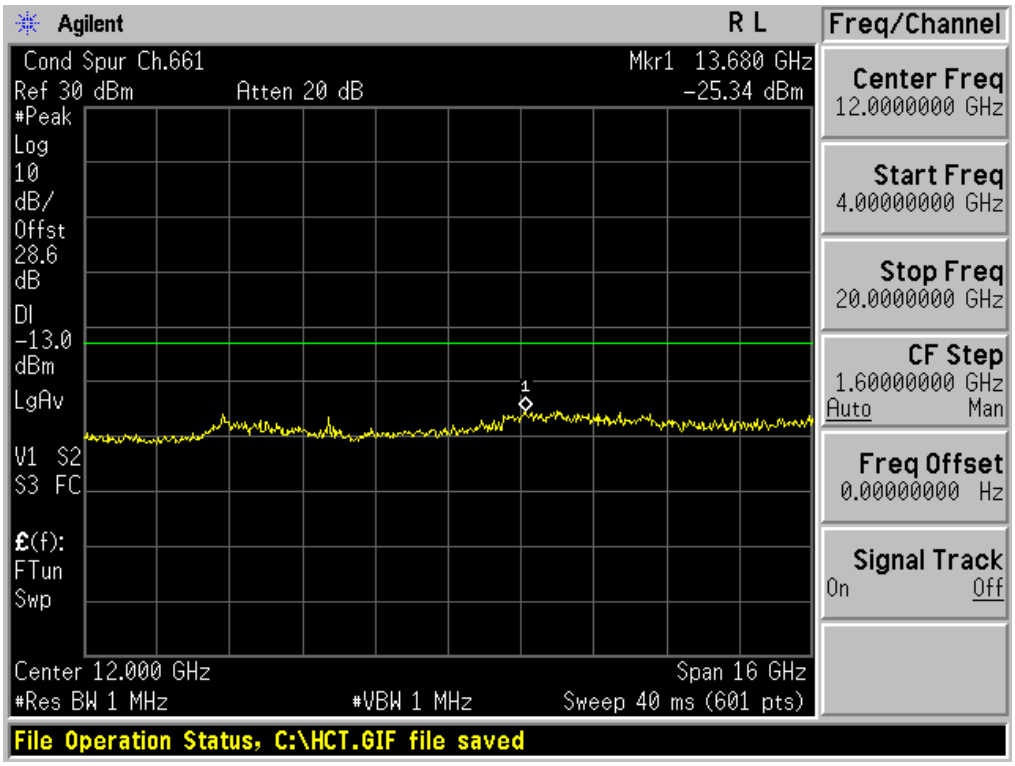
■ GSM1900 MODE (512 CH.) Conducted Spurious Emissions2



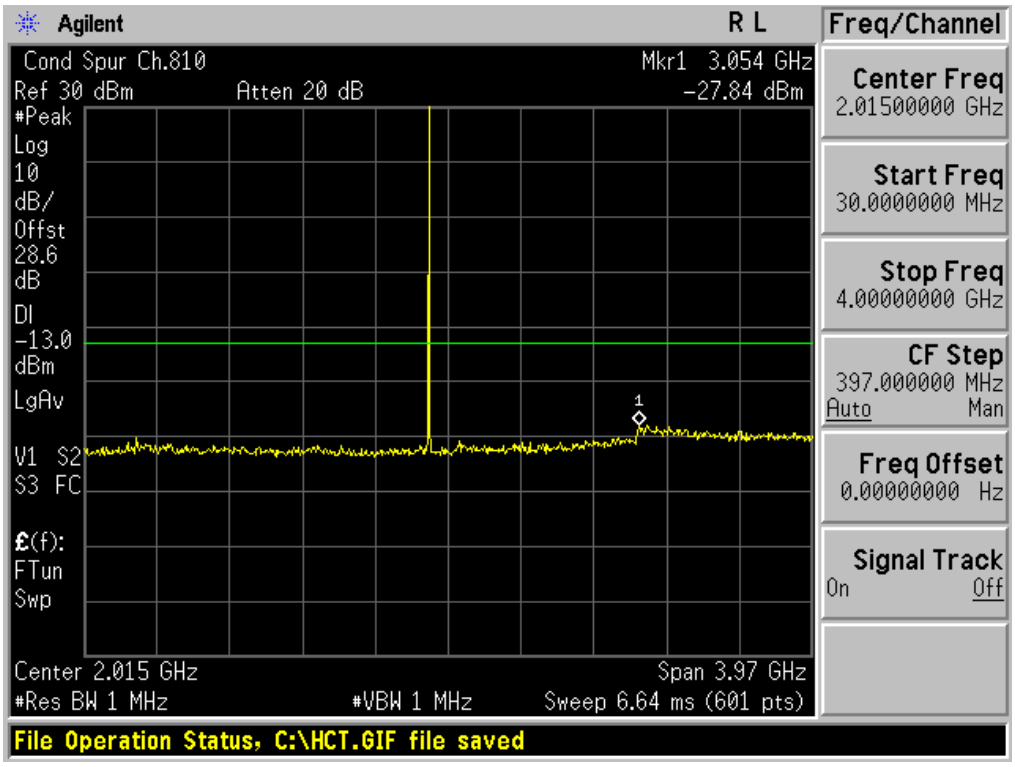
■ GSM1900 MODE (661 CH) Conducted Spurious Emissions1



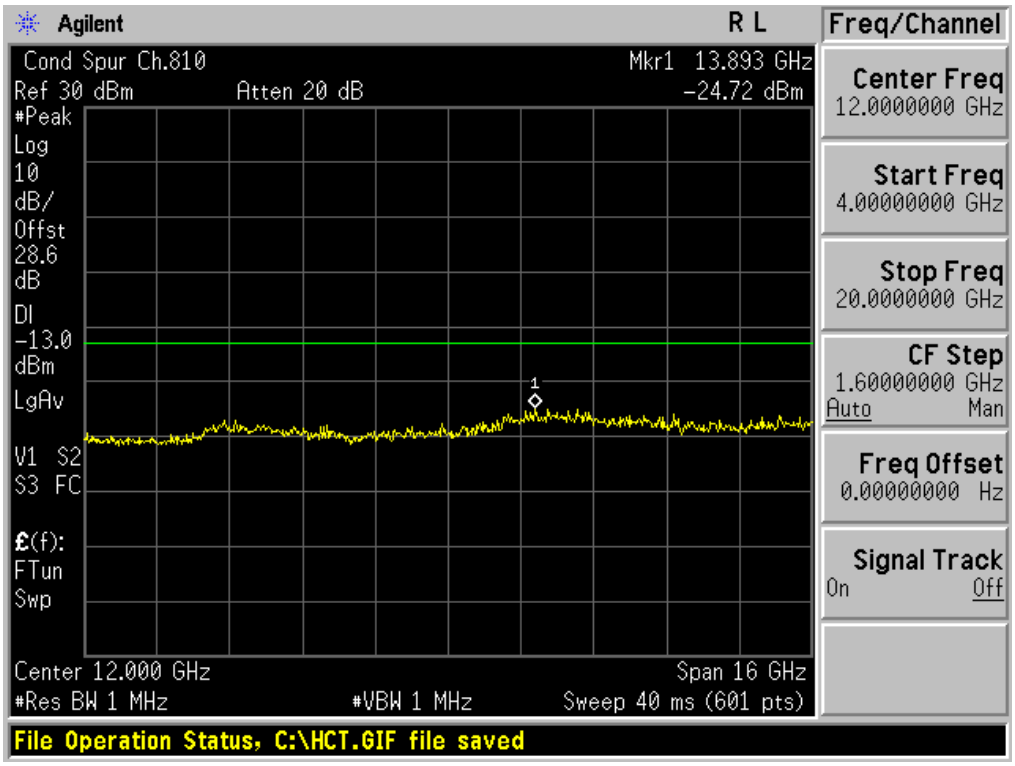
■ GSM1900 MODE (661 CH.) Conducted Spurious Emissions2



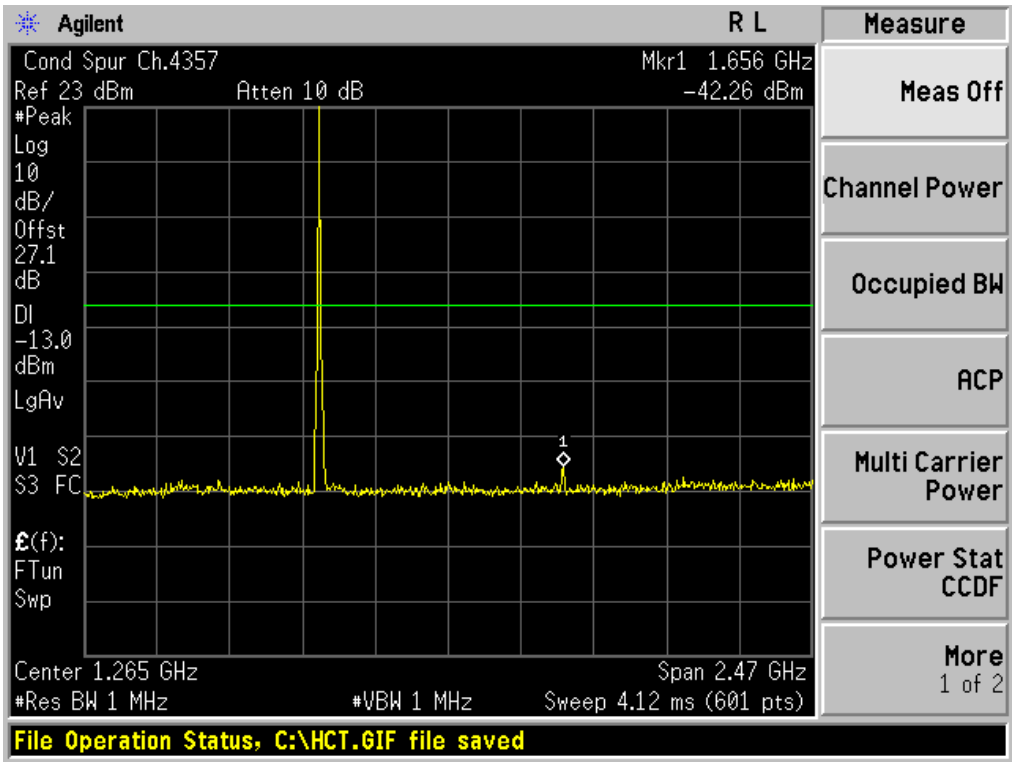
■ GSM1900 MODE (810 CH.) Conducted Spurious Emissions1



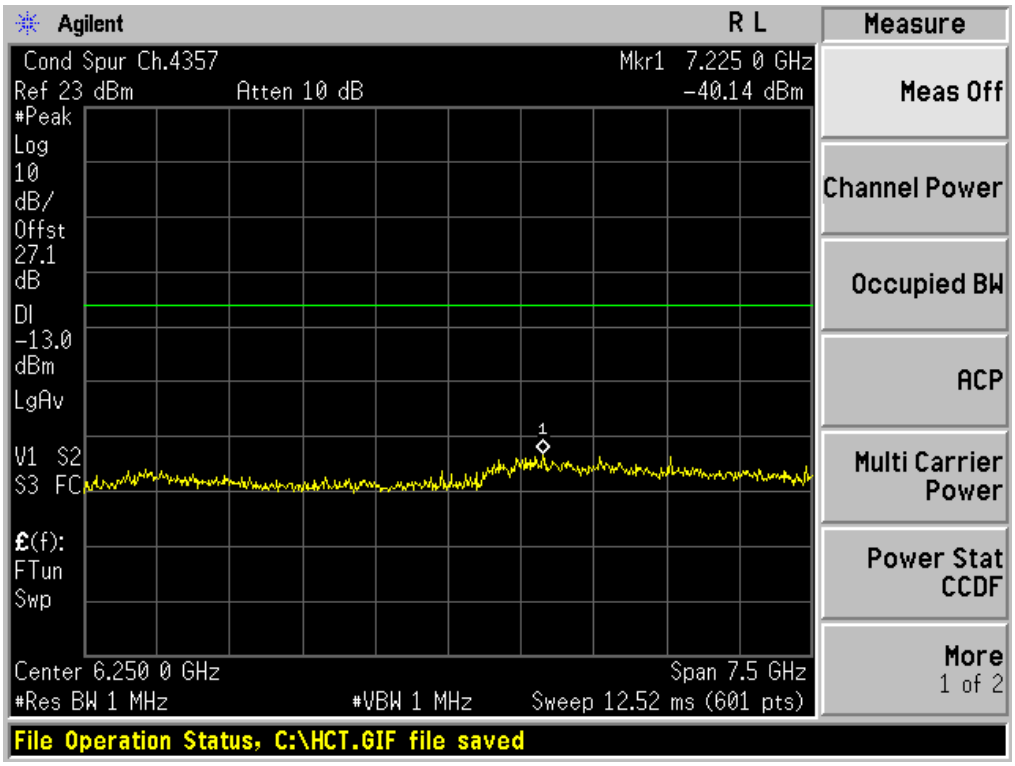
■ GSM1900 MODE (810 CH.) Conducted Spurious Emissions2



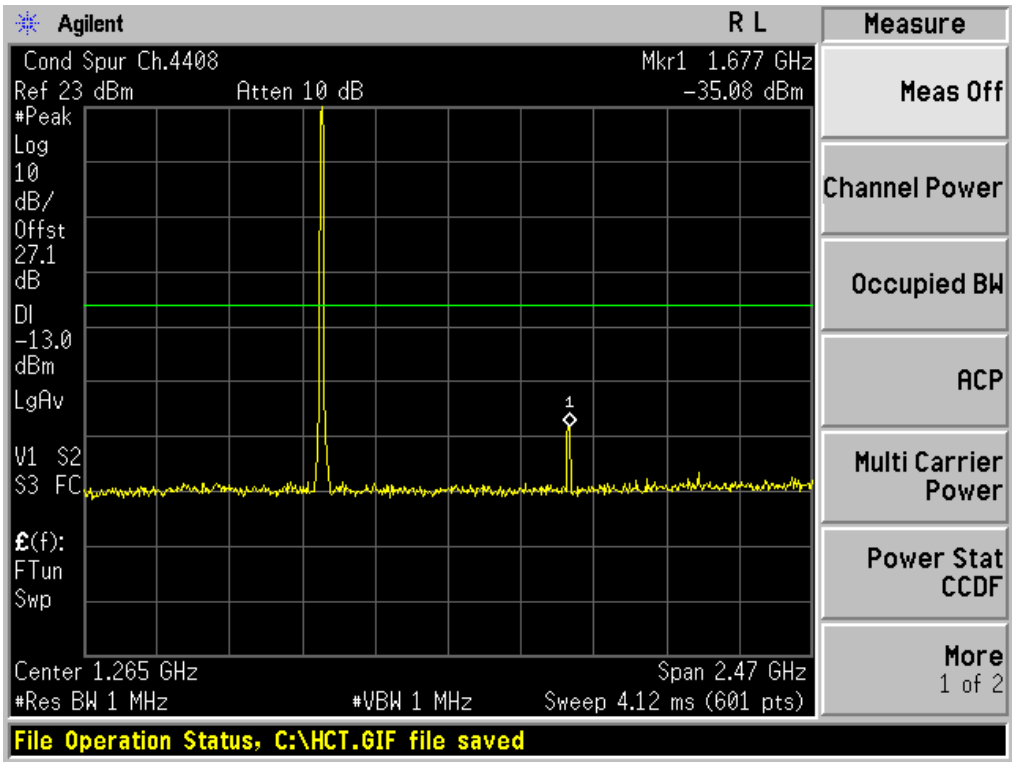
■ WCDMA850 MODE (4132 CH.) Conducted Spurious Emissions1



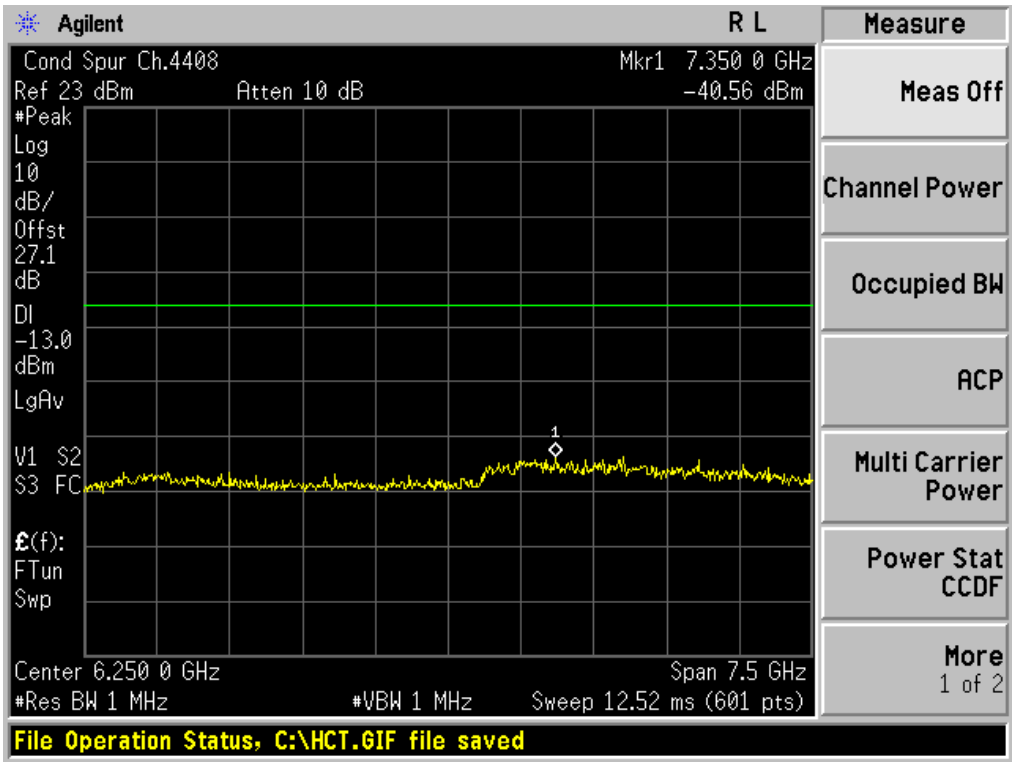
■ WCDMA850 MODE (4132 CH.) Conducted Spurious Emissions2



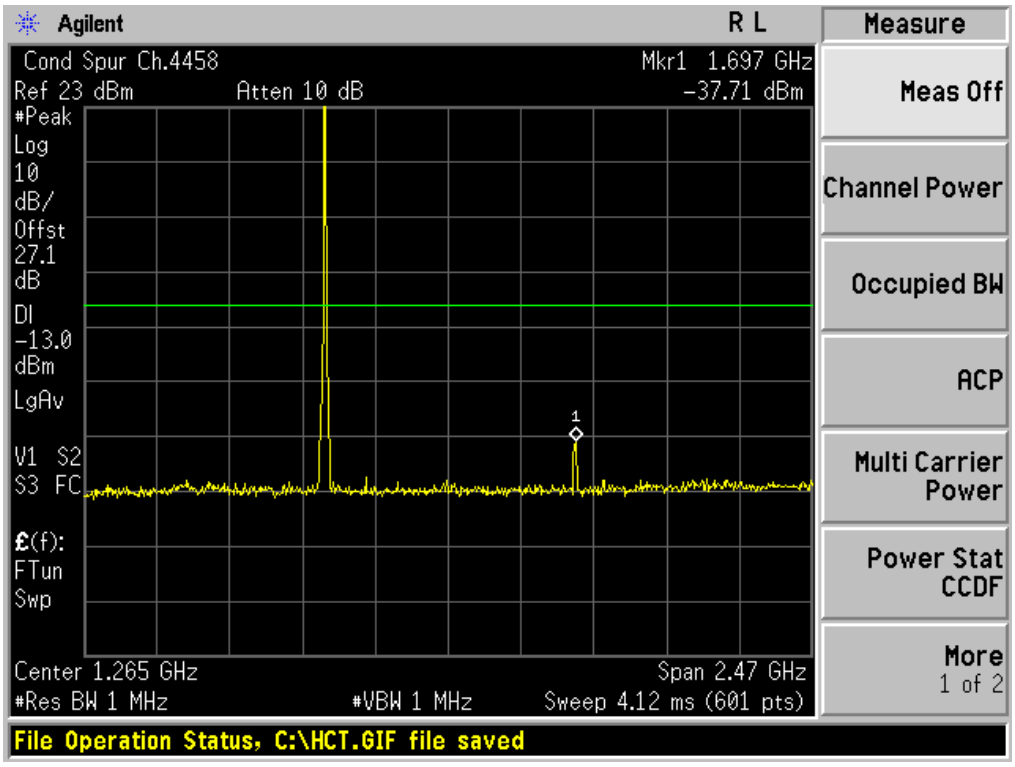
■ WCDMA850 MODE (4183 CH.) Conducted Spurious Emissions1



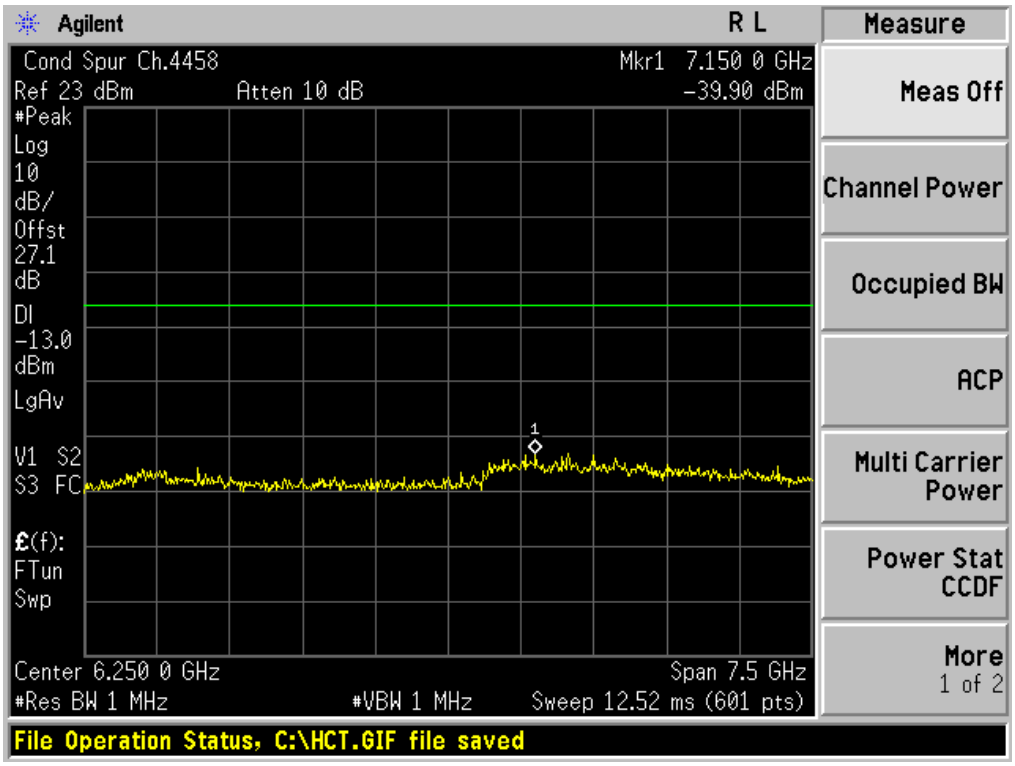
■ WCDMA850 MODE (4183 CH.) Conducted Spurious Emissions2



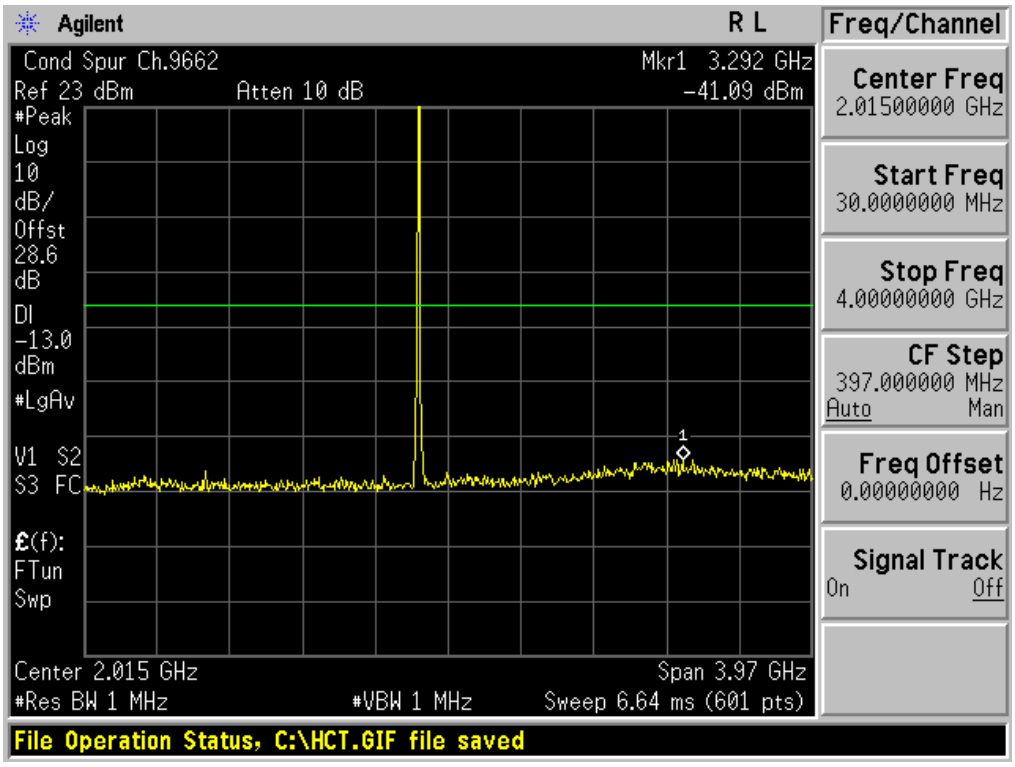
■ WCDMA850MODE (4233 CH.) Conducted Spurious Emissions1



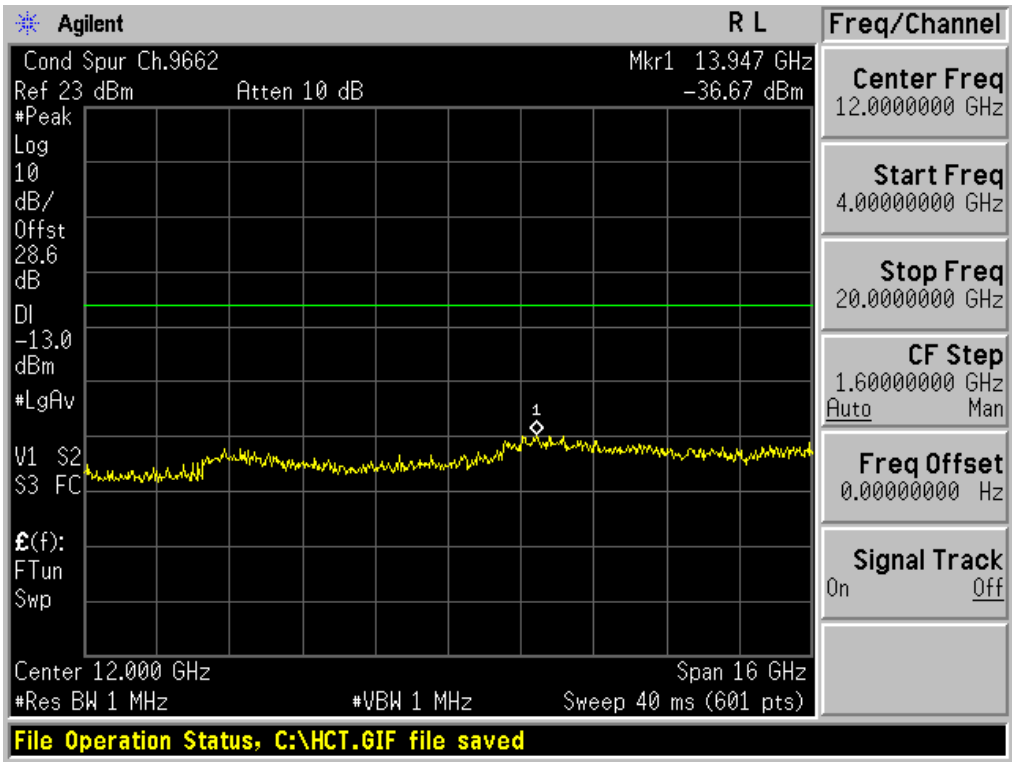
■ WCDMA850MODE (4233 CH.) Conducted Spurious Emissions2



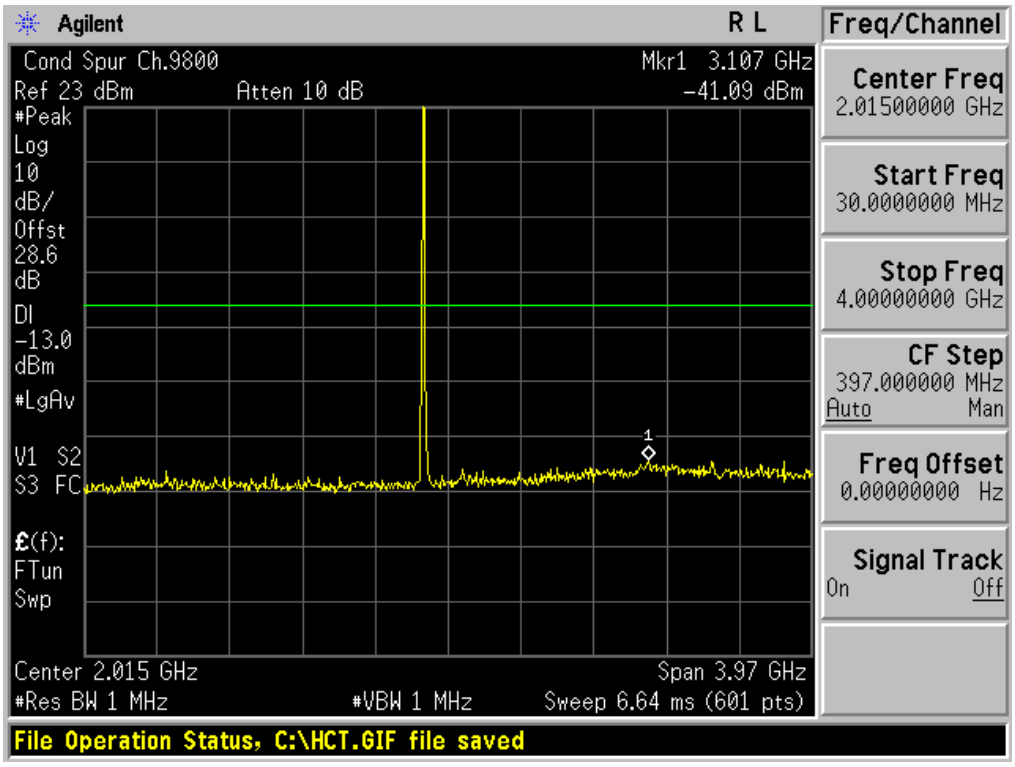
■ WCDMA1900 MODE (9262 CH.) Conducted Spurious Emissions1



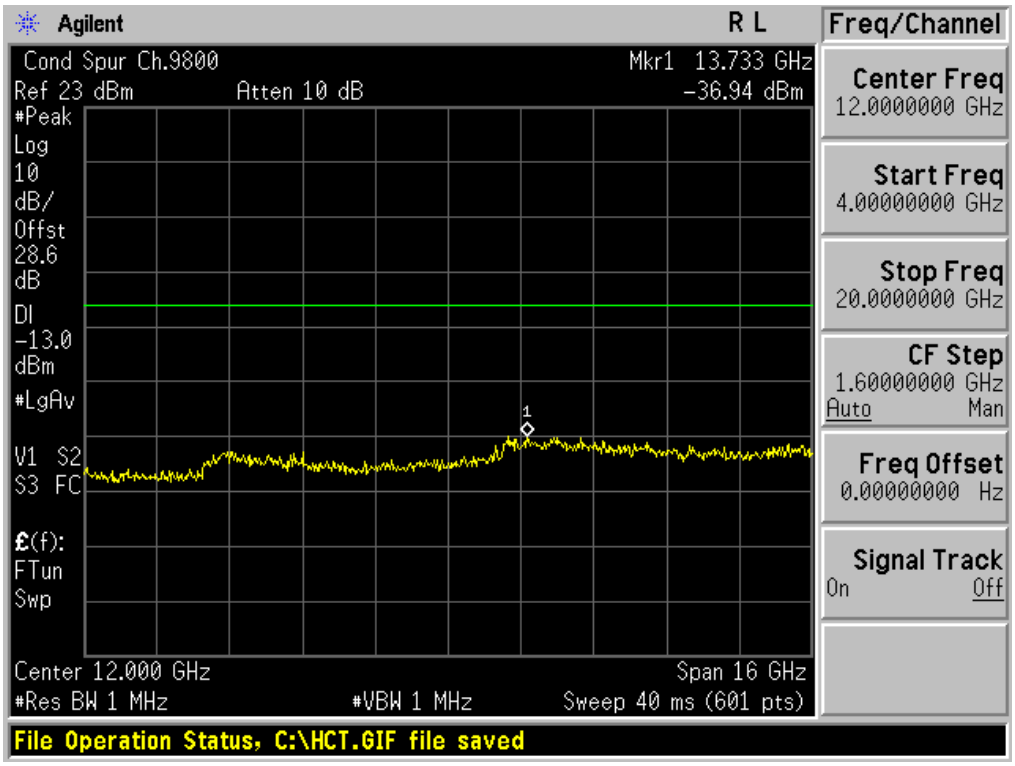
■ WCDMA1900 MODE (9262 CH.) Conducted Spurious Emissions2



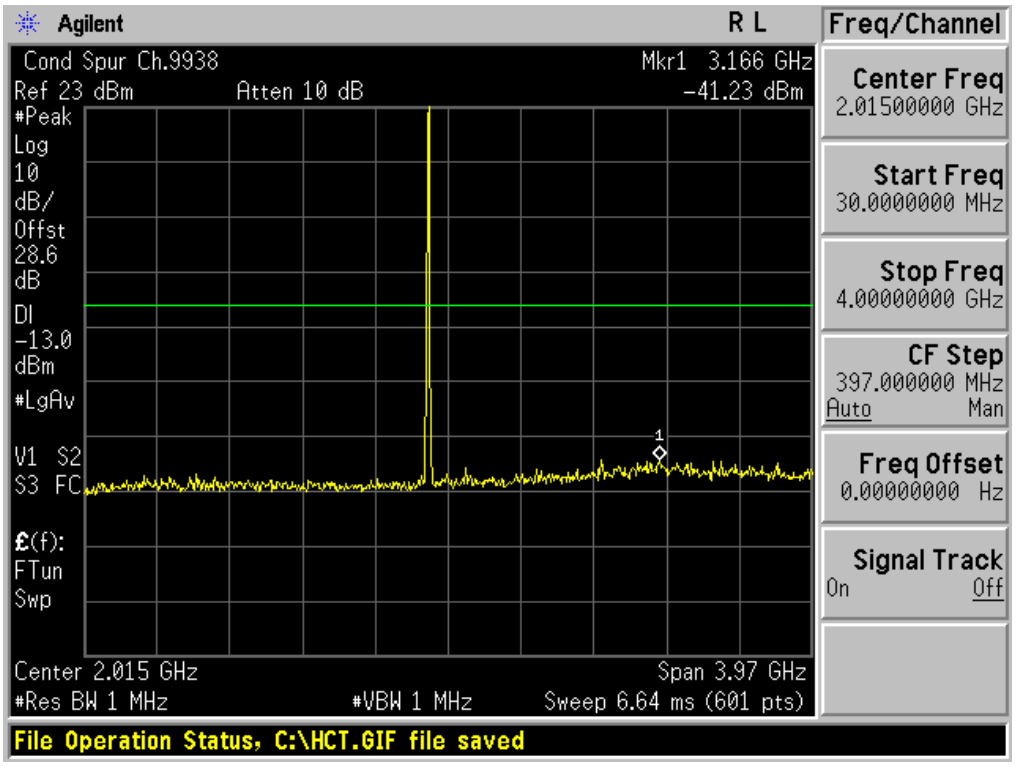
■ WCDMA1900 MODE (9400 CH.) Conducted Spurious Emissions1



■ WCDMA1900 MODE (9400 CH.) Conducted Spurious Emissions2



■ WCDMA1900 MODE (9538 CH.) Conducted Spurious Emissions1



■ WCDMA1900 MODE (9538 CH.) Conducted Spurious Emissions2