HCT CO., LTD.

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CERTIFICATE OF COMPLIANCE (ERM EVALUATION)

Manufacture: GS Instruments Co., Ltd.

1385-14, Juan-Dong, Nam-Ku, Incheon, 402-200, Korea

Date of Issue: January 22, 2009

Test Report No.: HCT-RF09-0116

Test Site: HCT CO., LTD.

FCC ID	:	**U88-GRS-DUO24M-BC**
APPLICANT	:	**GS Instruments Co., Ltd.**

EUT Type:	**RF Repeater**
MODEL:	**GRS-DUO24M-BC / GRS-DUO24-BC**
Frequency Ranges:	**Uplink : 1865 – 1910 MHz (PCS)** **835 – 849 MHz (Cellular)** **Downlink : 1945 – 1990 MHz (PCS)** **880 – 894 MHz (Cellular)**
RF Output Power:	**Downlink : 25.0 dBm (PCS), 24.0 dBm (Cellular)** **Uplink : 25.0 dBm (PCS), 24.0 dBm (Cellular)**
FCC Rules Part(s):	**Title 47 of CFR, Part 22 Subpart H (Cellular), Part 24 Subpart E (Cellular)**
IC Rule Part(s):	**RSS-129, RSS-133, RSS-GEN**

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 24 Subpart E of the FCC Rules under normal use and maintenance.

Chang Seok Choi

Report prepared by
:Chang Seok Choi
Test engineer of RF Team

Sang Jun Lee

Approved by
: Sang Jun Lee
Manager of RF Team

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company	**GS Instruments Co., Ltd**
Contact Point	**1385-14, Juan-Dong, Nam-Ku, Incheon, 402-200, Korea**

- **EUT Type:** **RF Repeater**
- **MODEL :** **GRS-DUO24M-BC (with modem)**
  GRS-DUO24-BC (without modem)
- **Frequency Ranges:** **Uplink : 1865 – 1910 MHz (PCS)**
  835 – 849 MHz (Cellular)
  Downlink : 1945 – 1990 MHz (PCS)
  880 – 894 MHz (Cellular)
- **RF Output Power:** **Downlink : 25.0 dBm (PCS), 24.0 dBm (Cellular)**
  Uplink : 25.0 dBm (PCS), 24.0 dBm (Cellular)
- **FCC Rules Part(s):** **Title 47 of CFR, Part 22 Subpart H (Cellular)**
  Part 24 Subpart E (PCS)
- **IC Rules Part(s):** **RSS-129, RSS-133, RSS-GEN**
- **Emission Designators:** **F9W**
- **Modulation :** **QPSK**
- **Place of Tests:** **HCT Co., Ltd. (IC Recognition no.: IC 5944A)**

2. TEST SPECIFICATIONS

2.1 Standards

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance With **Part 22 Subpart H, Part 24 Subpart E.**

Description	Reference (FCC)	Reference (IC)	Results
RF Power Output	§2.1046 §22.913 §24.232	RSS-GEN, Section 4.8 RSS-129, Section 9.1 RSS-133, Section 6.4	Compliant
Modulation Characteristics	§2.1047	RSS-129, Section 6.1 and 6.2	N/A
Occupied Bandwidth	§2.1049	RSS-129, Section 6.3 RSS-GEN, Section 4.6.1	Compliant
Spurious Emissions at Antenna Terminals	§2.1051 §22.917 §24.238	RSS-129, Section 8.1.1 RSS-133, Section 6.3 and 6.5 RSS-GEN, Section 4.9	Compliant
Radiated Spurious Emissions	§2.1053 §22.917 §24.238	RSS-129, Section 8.1.1 RSS-133, Section 6.5 RSS-GEN, Section 4.9	Compliant
Frequency Stability	§2.1055 §22.355 §24.235	RSS-129, Section 9.2.1 RSS-133, Section 6.3 RSS-GEN, Section 4.7	Compliant
Receiver Spurious	-	RSS-129, Section 10 RSS-133, Section 6 RSS-GEN, Section 4.10	Compliant

3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	**+ 15 ℃ to + 35 ℃**
Relative humidity:	**30 % to 60 %**
Air pressure	**860 mbar to 1060 mbar**

4. TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Due	Serial No.
Agilent	E4438C /Signal Generator	Annual	01/22/2009	MY42082646
Agilent	E4416A /Power Meter	Annual	01/22/2009	GB41291412
WEINSCHEL	67-30-33/ATTENUATOR	Annual	05/02/2009	BR0530
Agilent	E7405A /EMC Analyzer	Annual		US40240290
Schwarzbeck	VULB 9160/ TRILOG Antenna	Annual	01/24/2009	9160-3150
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
MITEQ	AMF-60-0010 1800-35-20P	Annual	01/24/2009	1200937
MITEQ	AMF-6D-01180-35-20P	Annual	02/24/2009	990893
Schwarzbeck	BBHA 9120D/ Horn Antenna	Annual	03/30/2009	147
Schwarzbeck	BBHA 9120D/ Horn Antenna	Annual	03/30/2009	296
Schwarzbeck	BBHA9170/SHF-EHF Horn Antenna	Annual	03/20/2009	BBHA9170342
Agilent	E4440A/Spectrum Analyzer	Annual	12/23/2009	US45303008
Advantest	R3671/Signal Analyzer	Annual	06/11/2009	150900068

5. RF OUTPUT POWER

5.1 Test Procedure

Test Requirements:

§ 2.1046 Measurements required: RF power output:

§ 2.1046 (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8).The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§ 2.1046 (b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

§ 2.1046 (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

§ 22.913 Effective radiated power limits.

The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

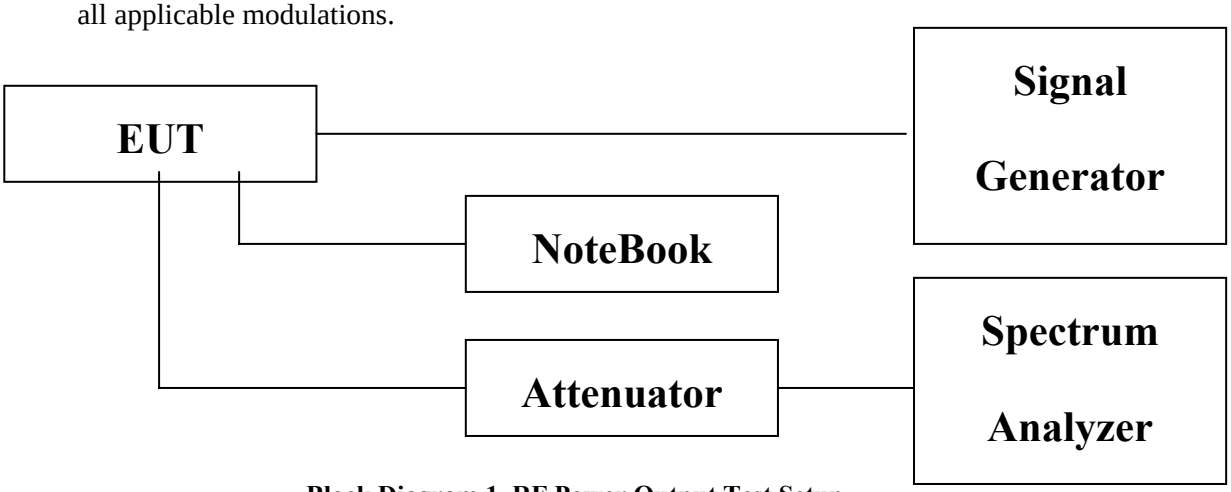
(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

§ 24.232 Power and antenna height limits.

(c) Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

Test Procedures:

As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. This test was performed in all applicable modulations.



Block Diagram 1. RF Power Output Test Setup

5.2 Test Results

(Cellular)

CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Measured Power (dBm)	Frequency (MHz)	Measured Power (dBm)
Low	881.52	24.92	836.52	24.27
Mid	885.21	24.86	840.21	25.04
High	892.75	24.85	847.75	25.15

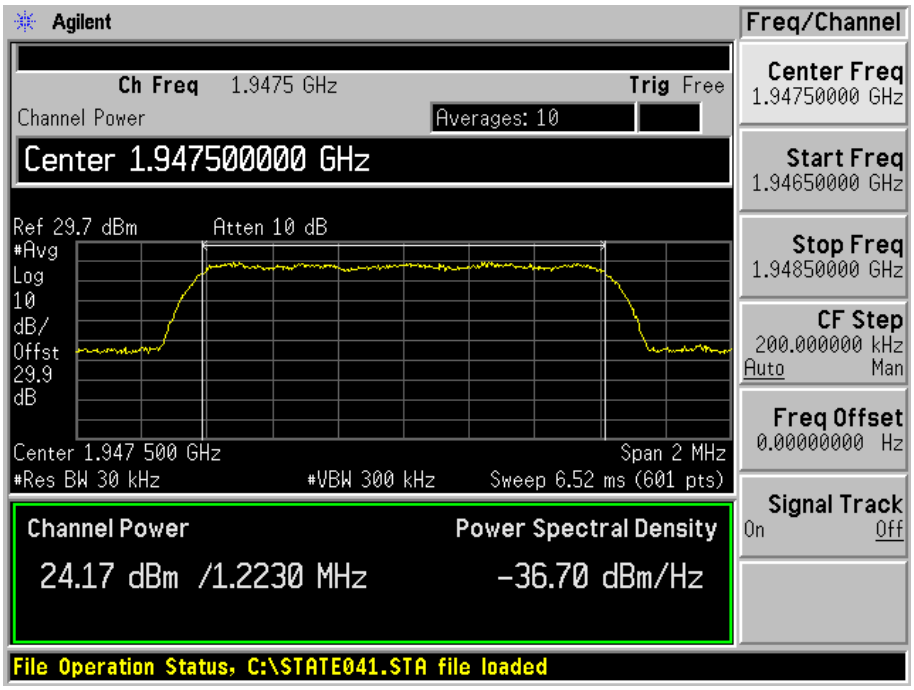
INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	-55.0 dBm	- 55.0 dBm
Amplitude offset	29.8 dB	29.8 dB

(PCS)

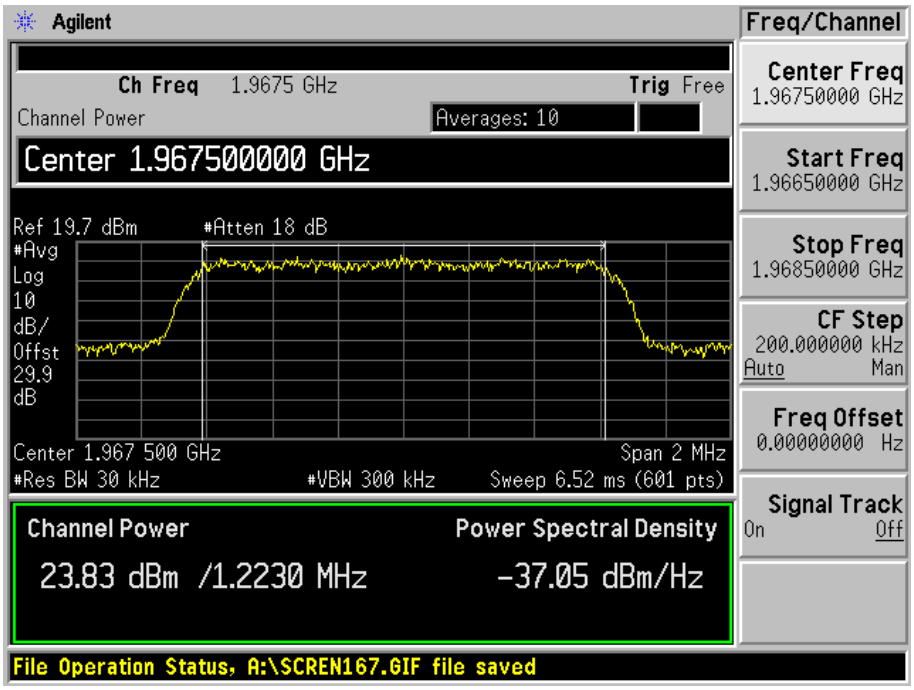
CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Measured Power (dBm)	Frequency (MHz)	Measured Power (dBm)
Low	1947.5	23.93	1867.5	23.75
Mid	1967.5	23.87	1887.5	23.89
High	1987.5	23.75	1907.5	23.73

INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	- 56.0 dBm	- 56.0 dBm
Amplitude offset	31.2 dB	31.2 dB

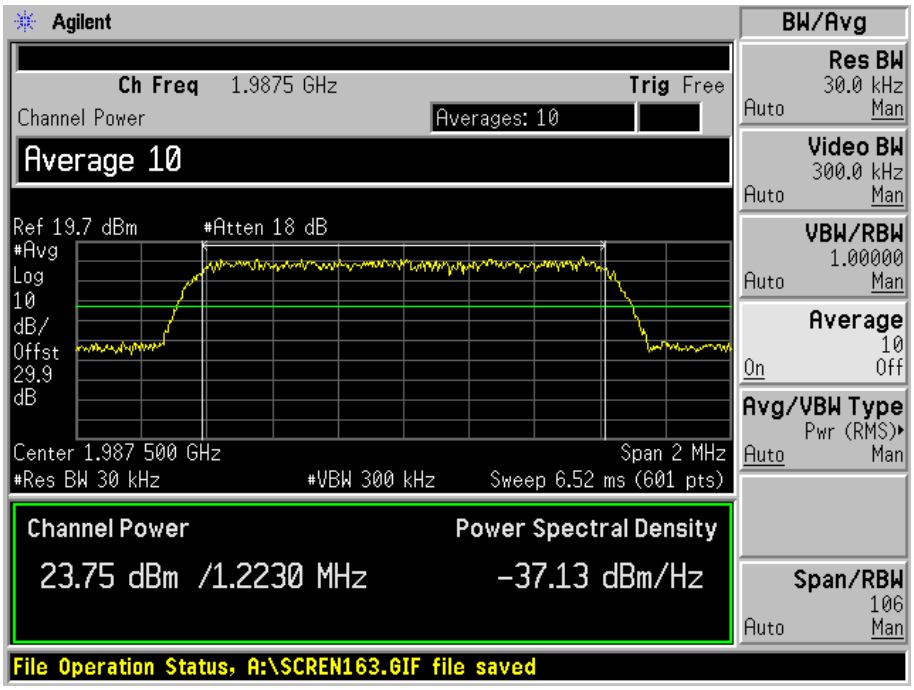
Plots of RF Output Power



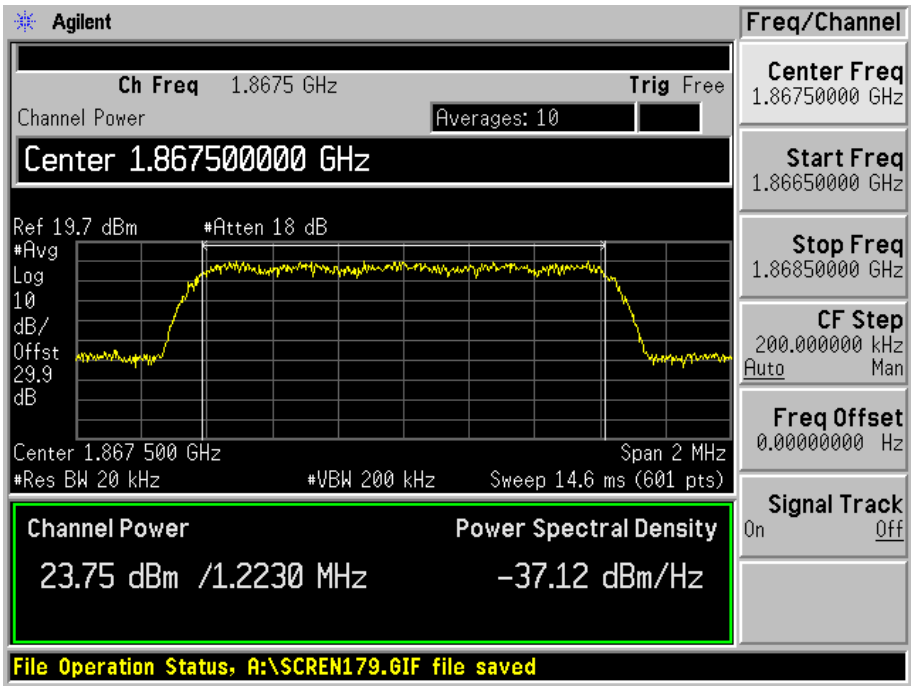
Downlink Low CH (Cellular)



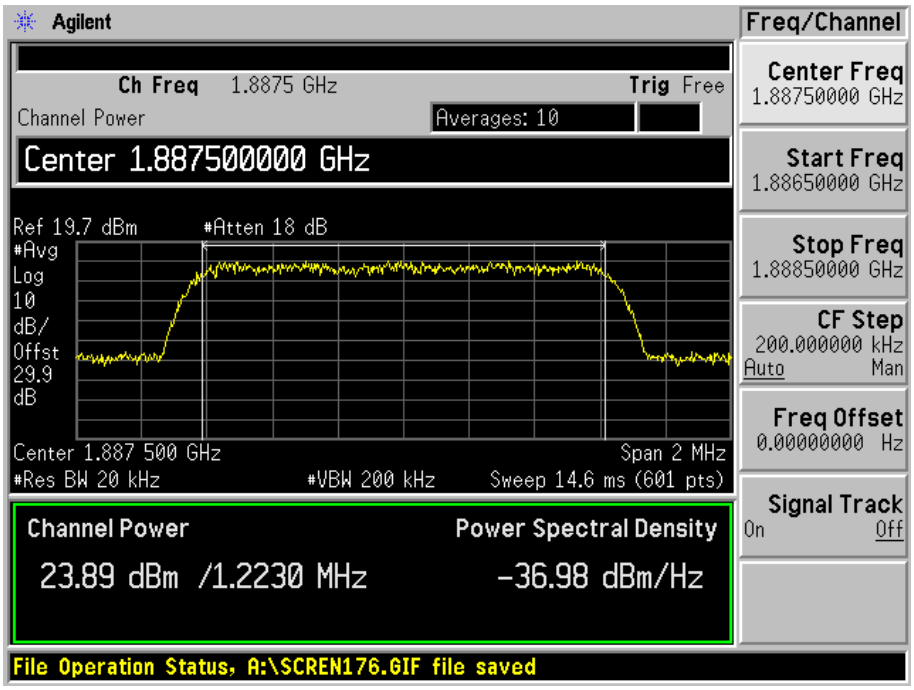
Downlink Middle CH (Cellular)



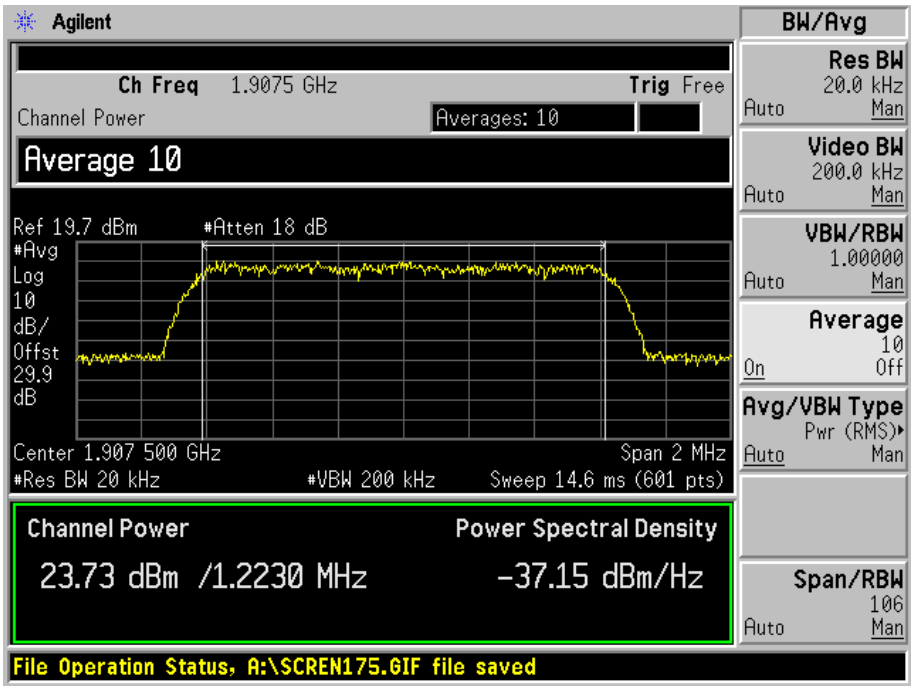
Downlink High CH (Cellular)



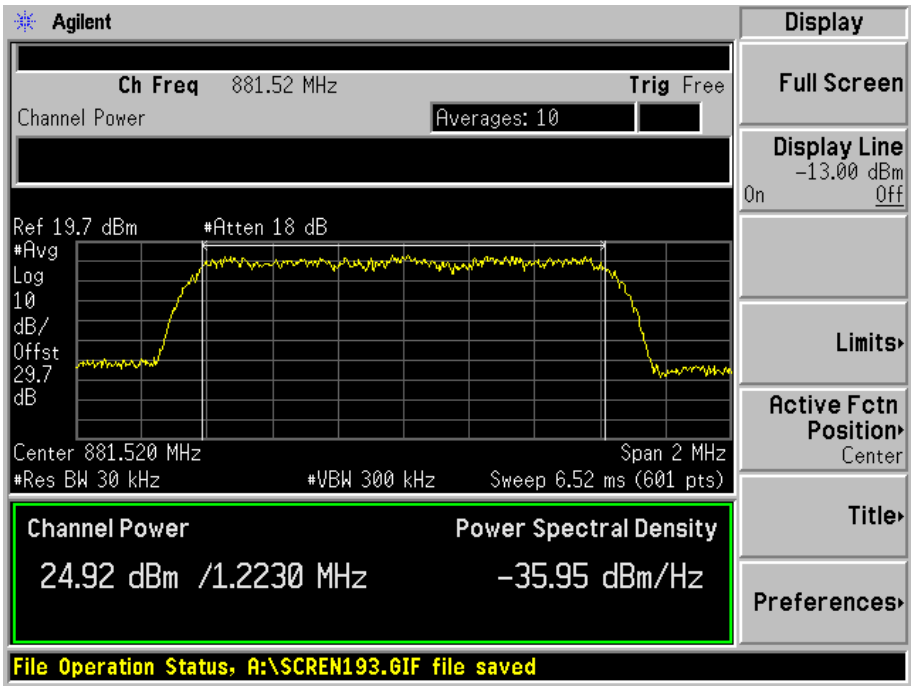
Uplink Low CH (Cellular)



Uplink Middle CH (Cellular)



Uplink High CH (Cellular)



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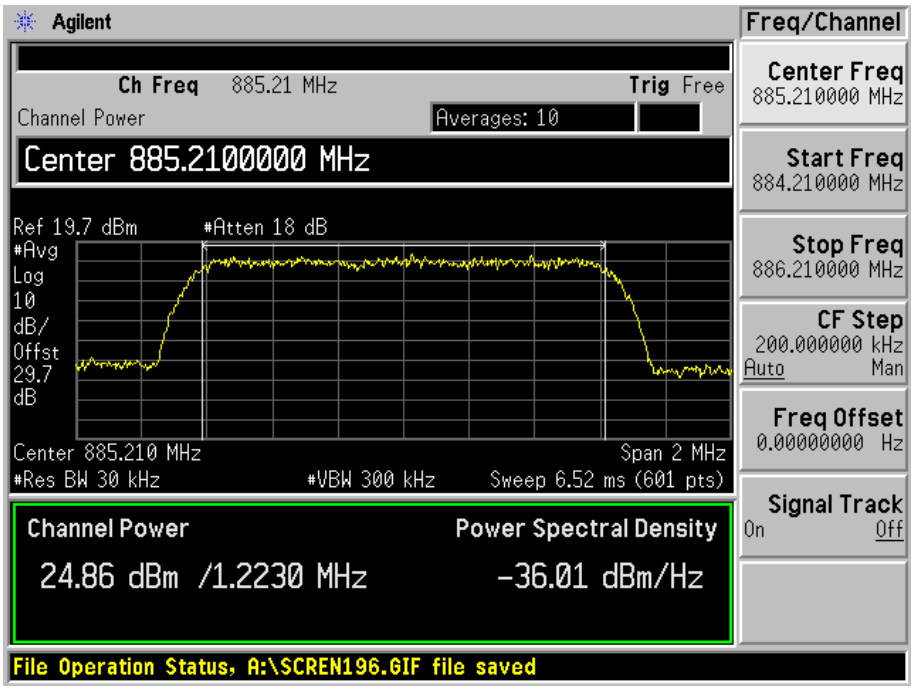
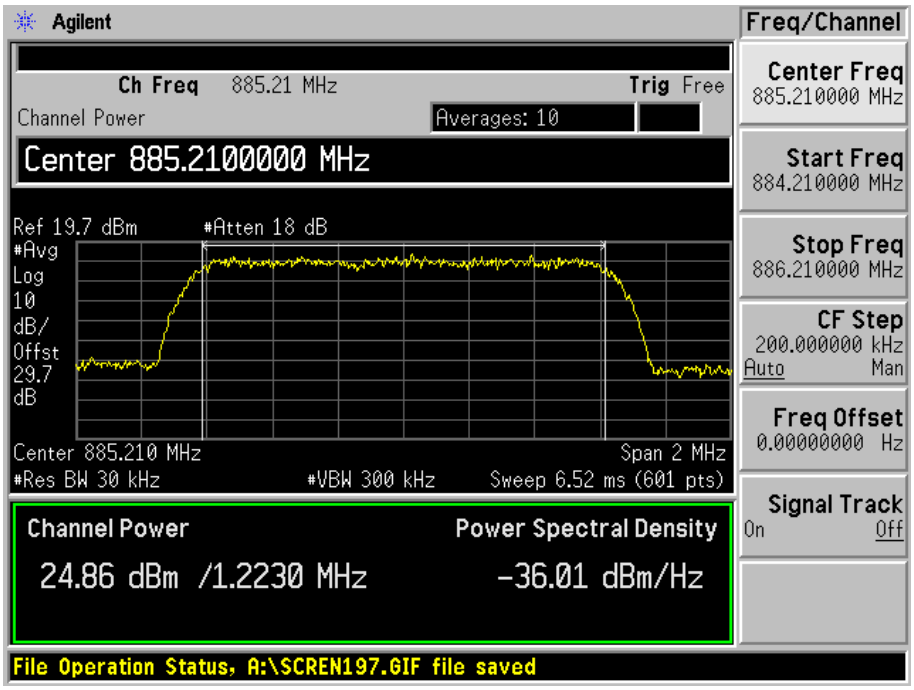


Downlink Middle CH (PCS)



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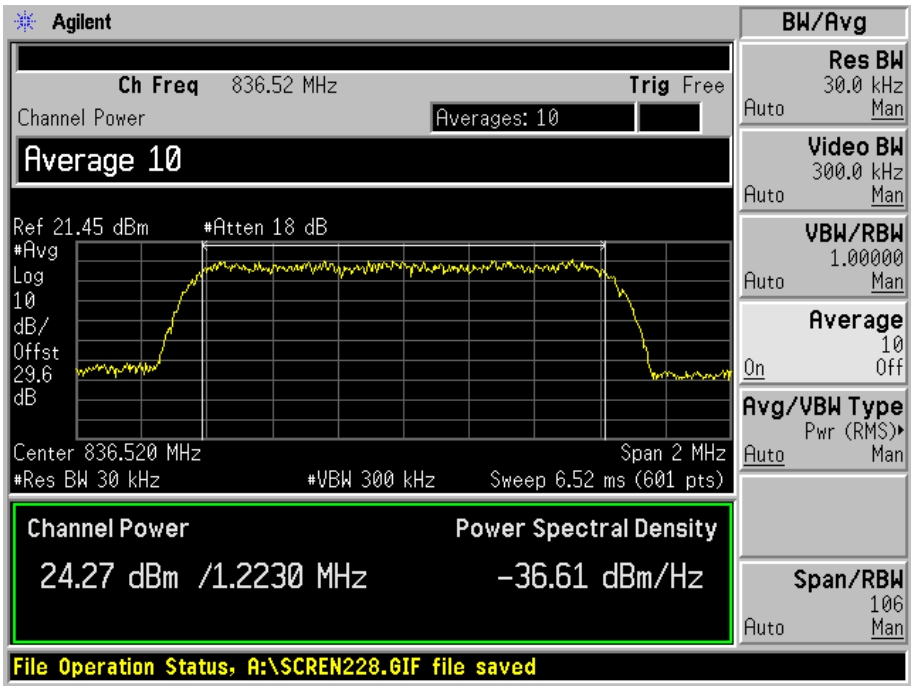
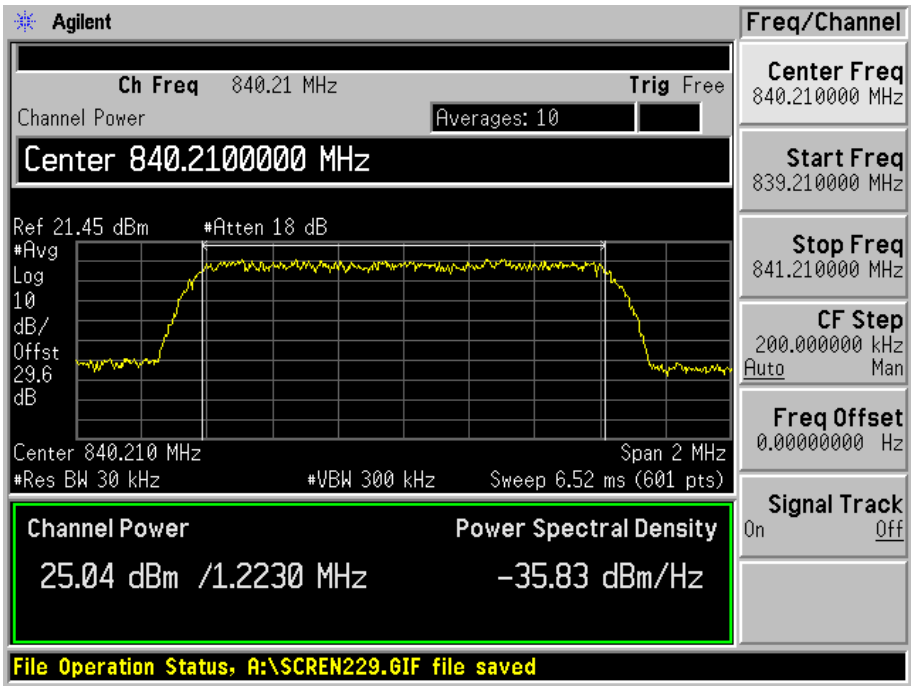
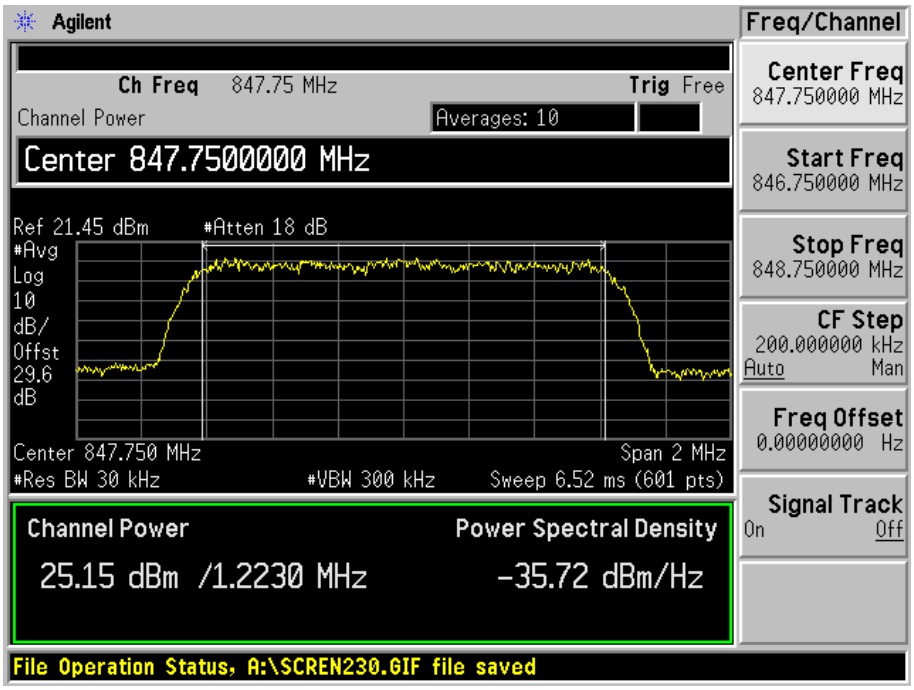


Uplink Low CH (PCS)



Uplink Middle CH (PCS)



Uplink High CH (PCS)

6. OCCUPIED BANDWIDTH

6.1 Test Procedure

Test Requirement(s): § 2.1049 Measurements required: Occupied bandwidth:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports for both Uplink and Downlink
The modulation characteristics of signal generator's carrier was measured first at a maximum RF level prescribed by the OEM. The signal generator was then connected to either the Uplink or Downlink input at the appropriate RF level. The resulting modulated signal through the EUT was measured and compared against the original signal.

Test Results: The EUT complies with the requirements of this section.

(Cellular)

CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Occupied Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (dBm)
Low	881.52	1.2794	836.52	1.2556
Mid	885.21	1.2500	840.21	1.2706
High	892.75	1.2645	847.75	1.2434

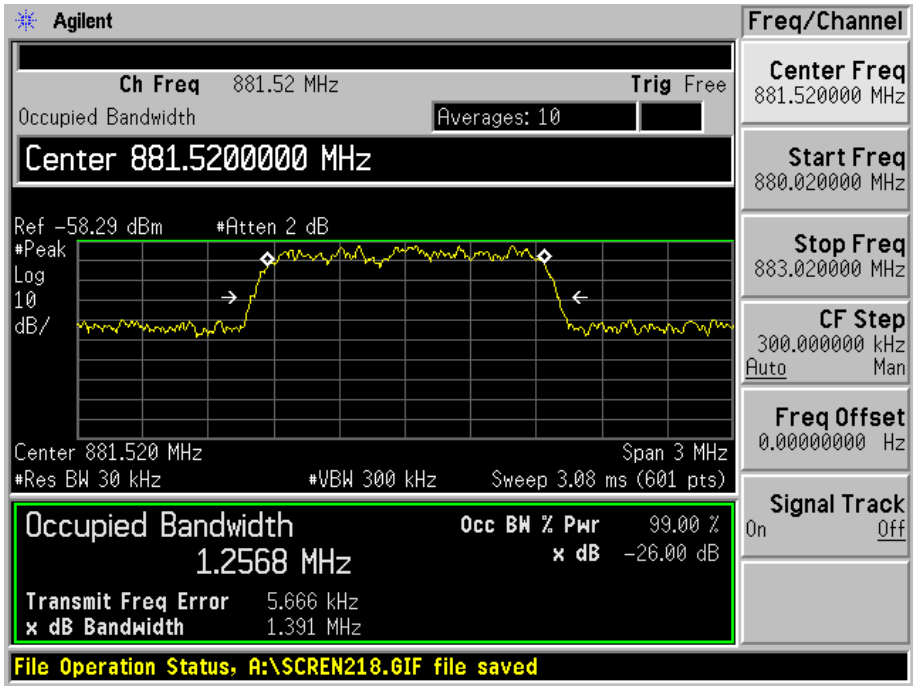
INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	- 48.5 dBm	- 55 dBm
Amplitude offset	29.8 dB	29.8 dB

(PCS)

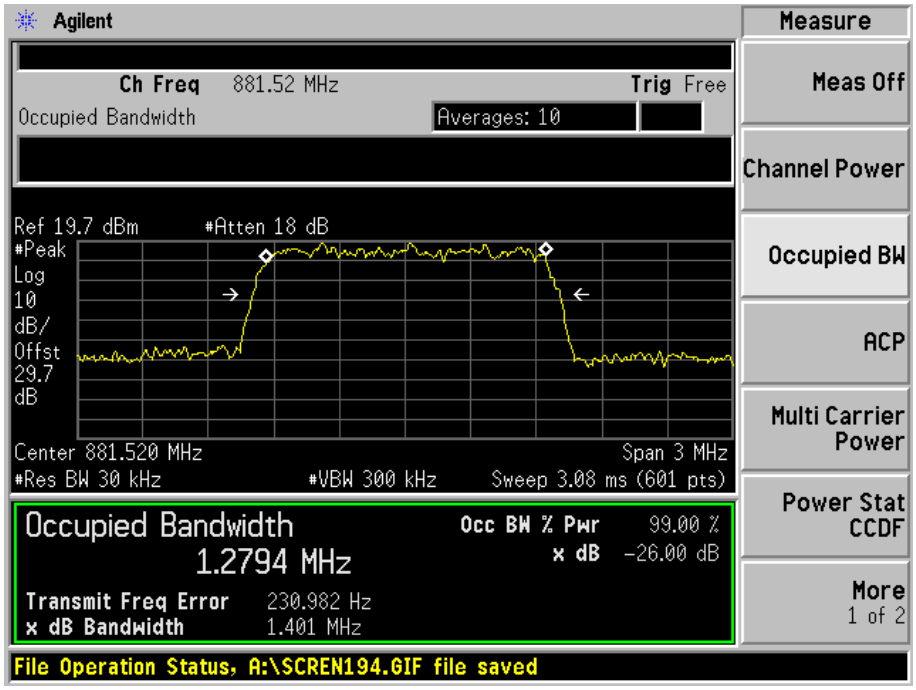
CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Occupied Bandwidth (dBm)	Frequency (MHz)	Occupied Bandwidth (dBm)
Low	1947.5	1.2774	1867.5	1.2758
Mid	1967.5	1.2653	1887.5	1.2601
High	1987.5	1.2657	1907.5	1.2697

INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	- 63.5 dBm	- 41 dBm
Amplitude offset	31.2 dB	31.2 dB

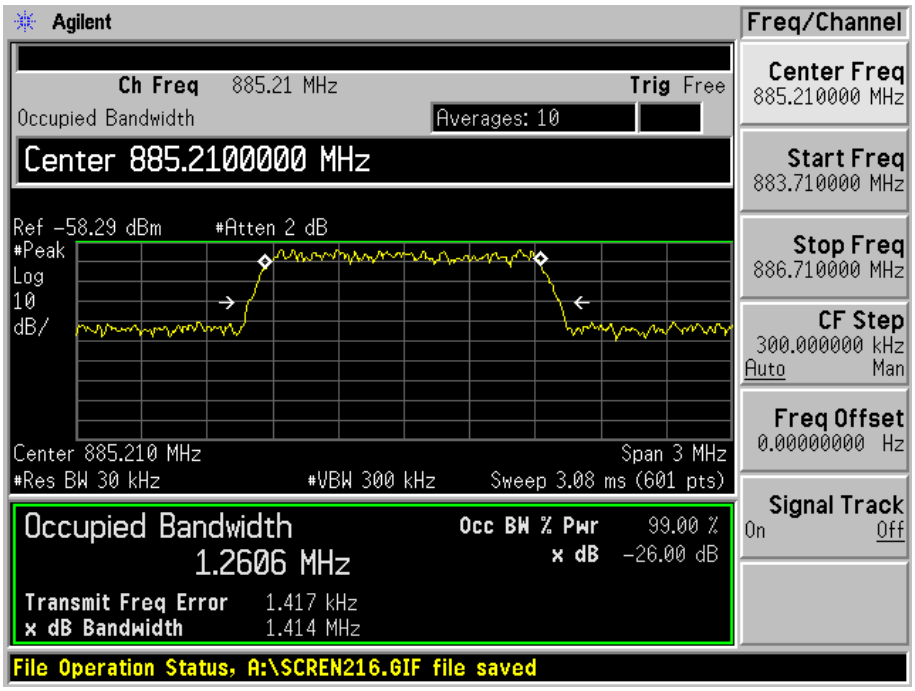
Plots of Occupied Bandwidth



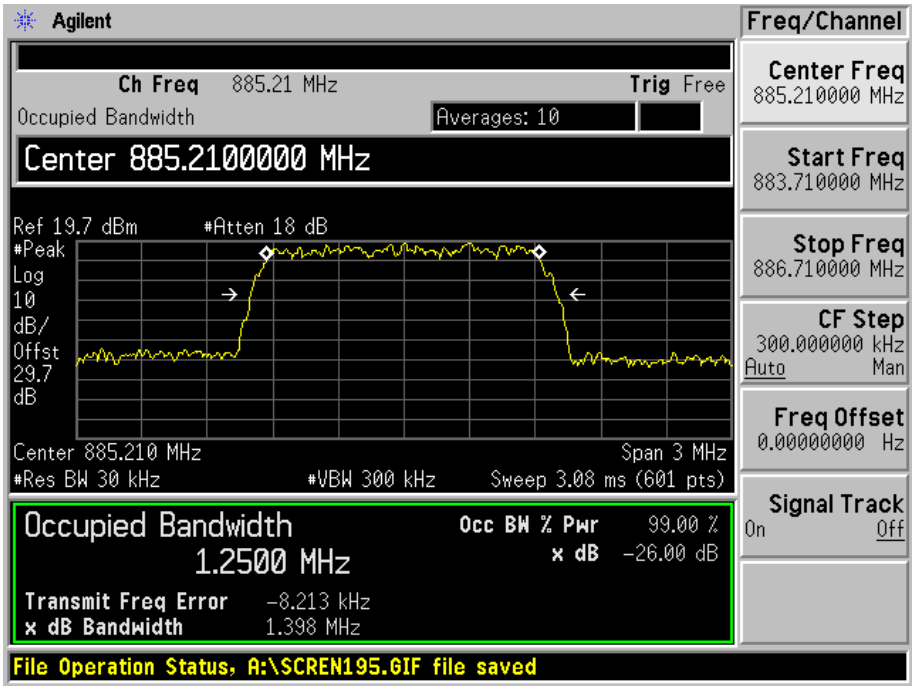
Downlink Low CH (Cellular) Input Signal



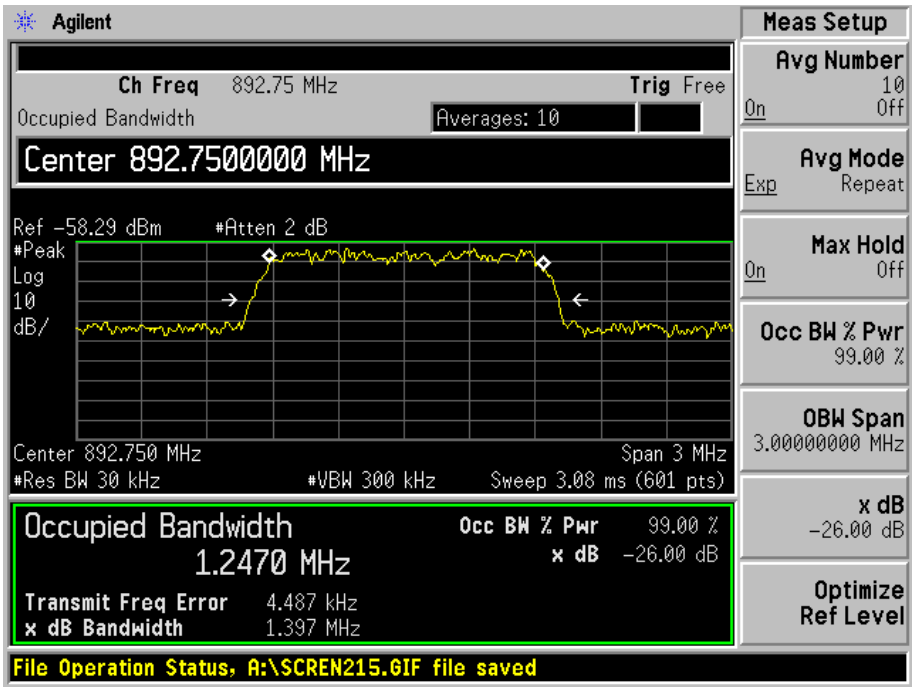
Downlink Low CH (Cellular) Output Signal



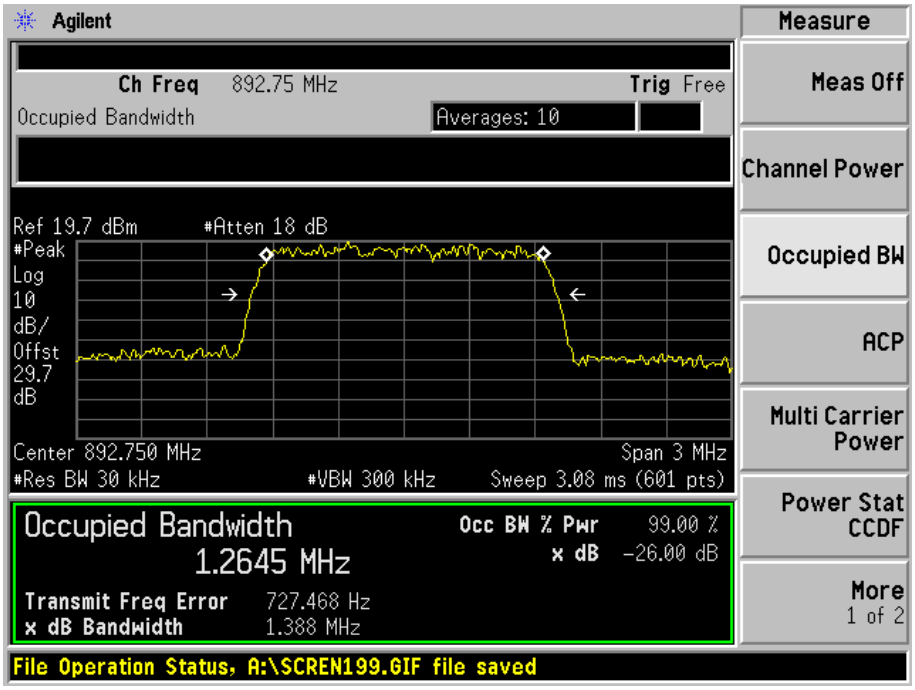
Downlink Mid CH (Cellular) Input Signal



Downlink Mid CH (Cellular) Output Signal



Downlink High CH (Cellular) Input Signal



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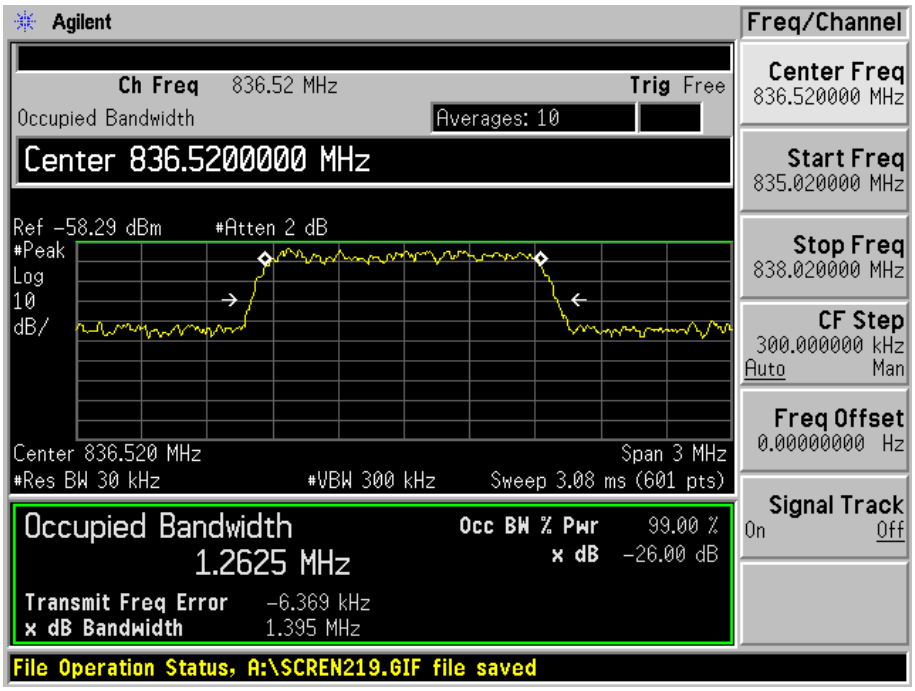
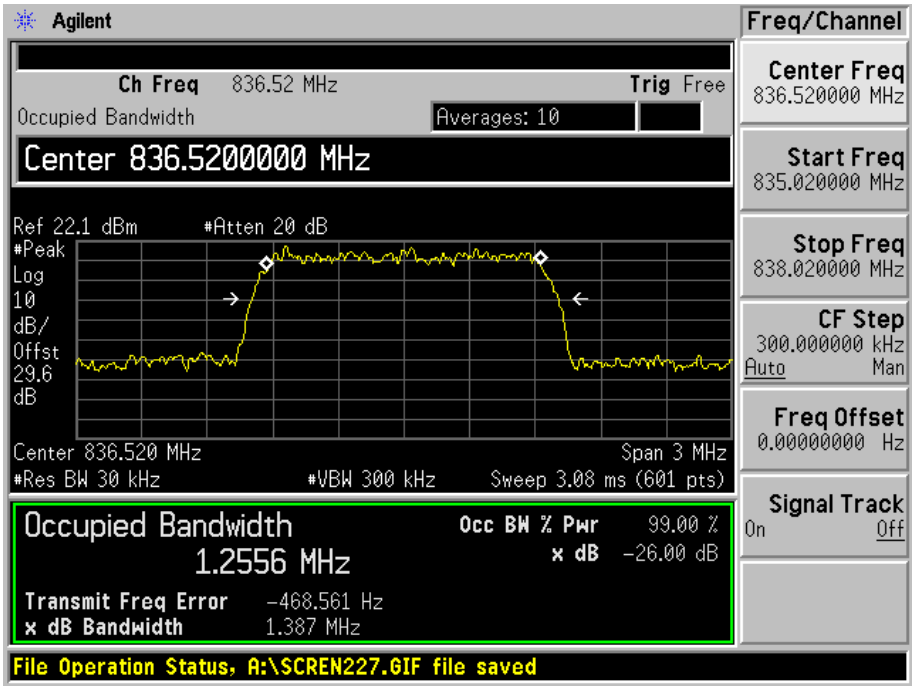
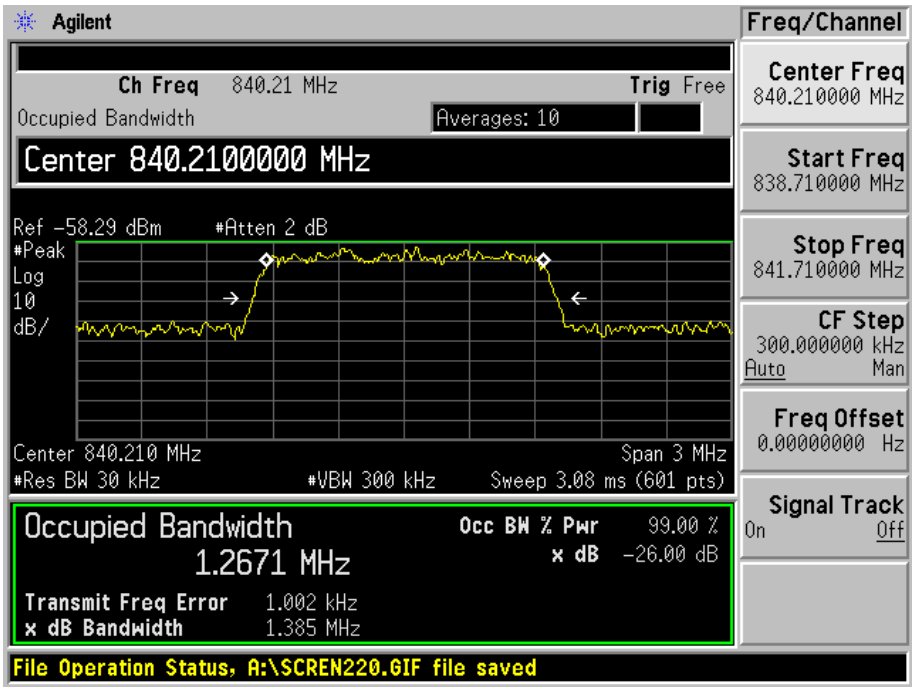


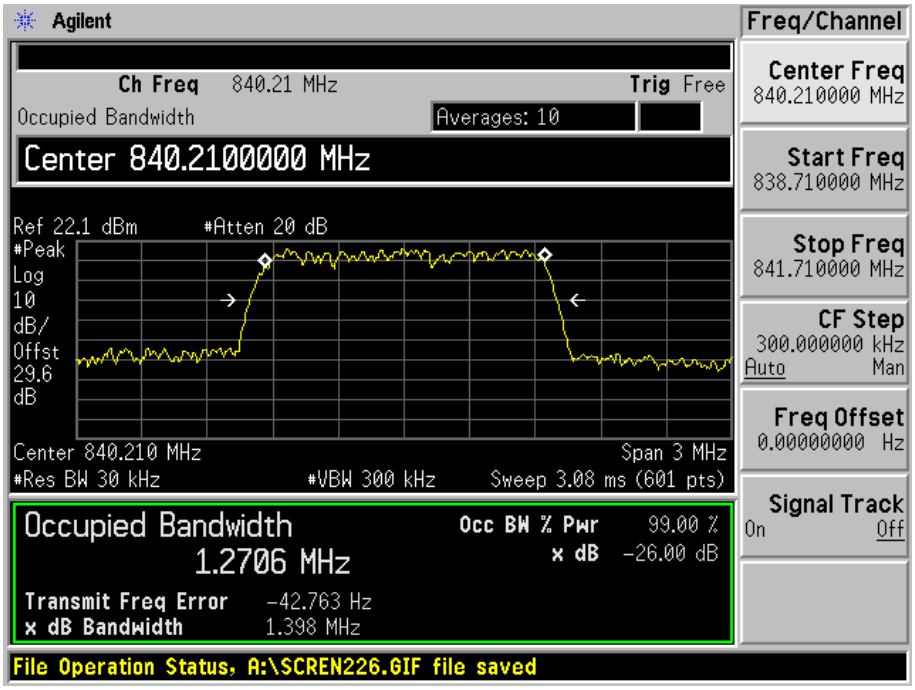
Uplink Low CH (Cellular) Input Signal



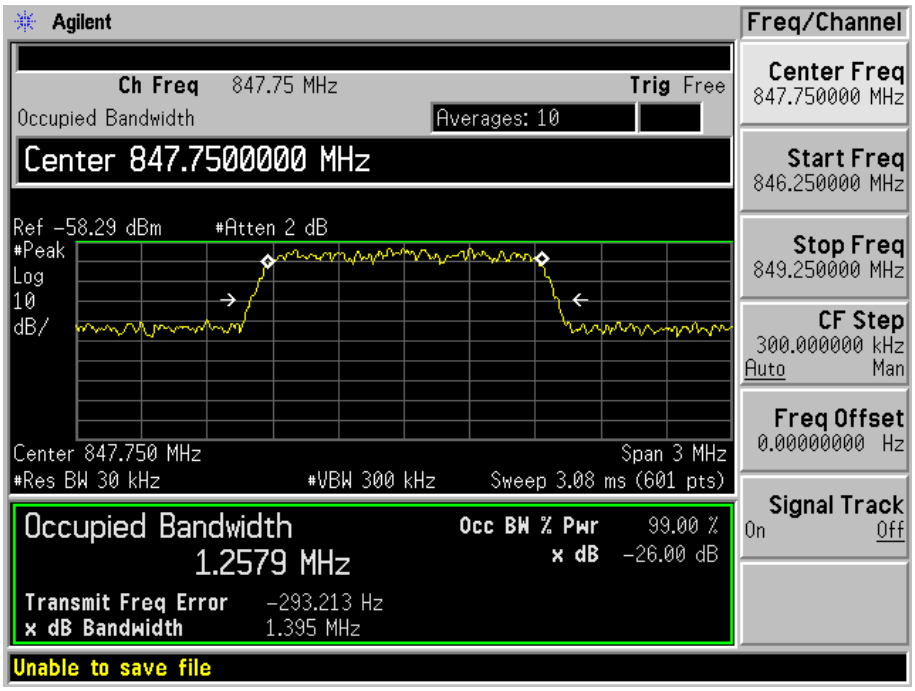
Uplink Low CH (Cellular) Output Signal



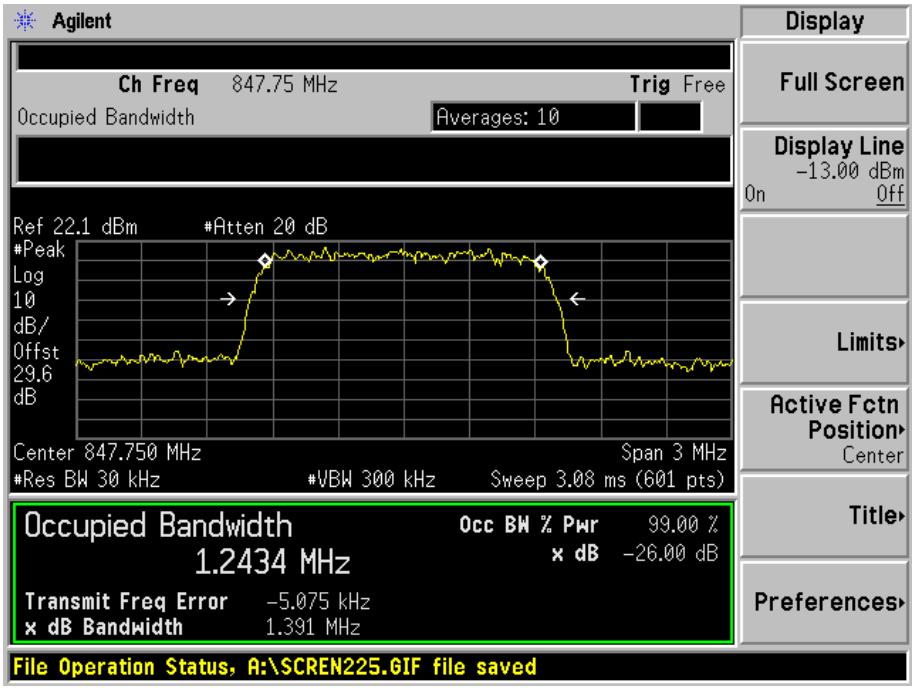
Uplink Mid CH (Cellular) Input Signal



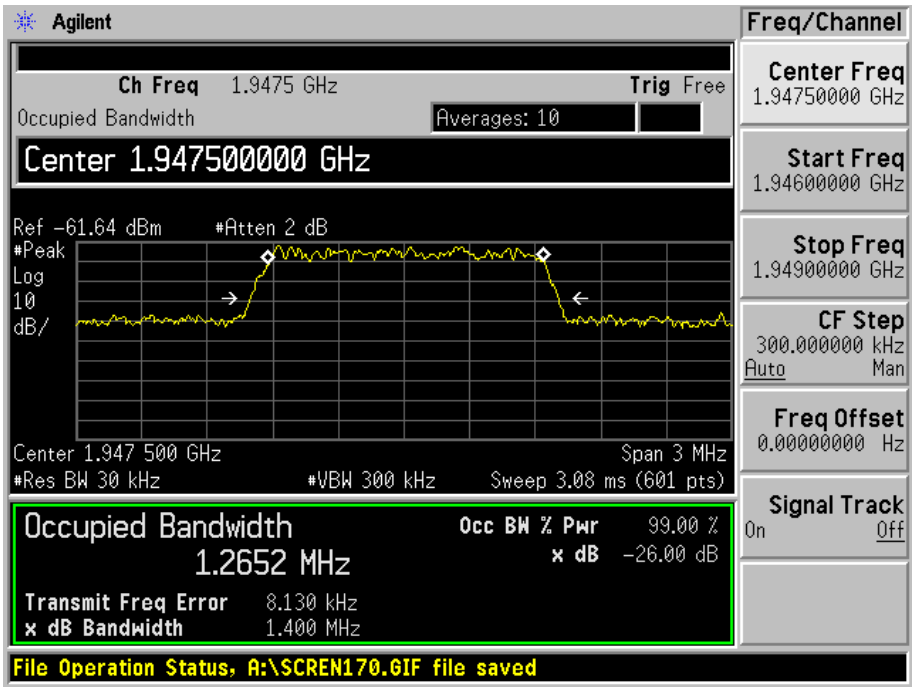
Uplink Mid CH (Cellular) Output Signal



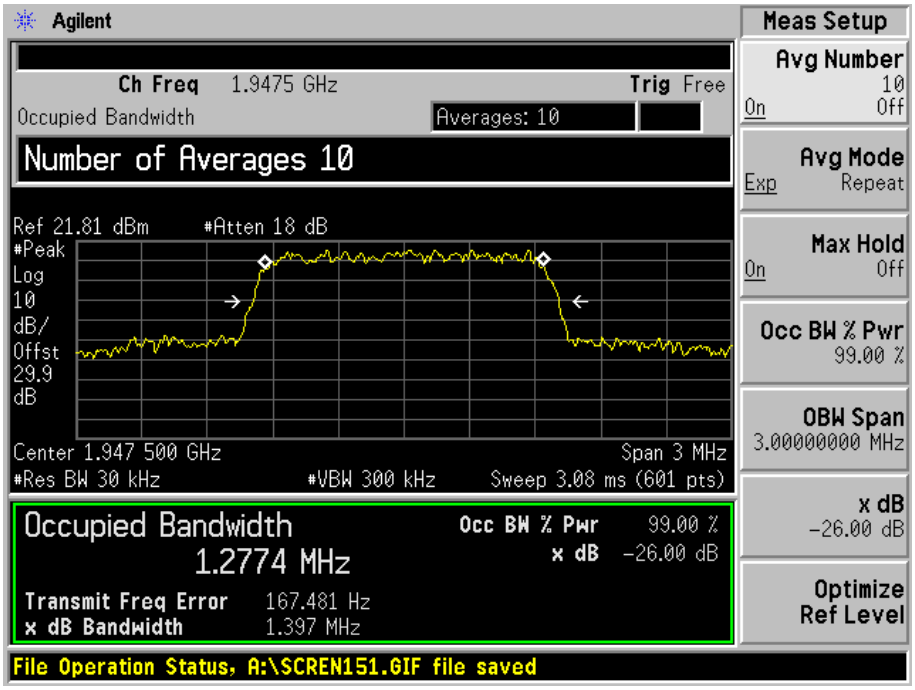
Uplink High CH (Cellular) Intput Signal



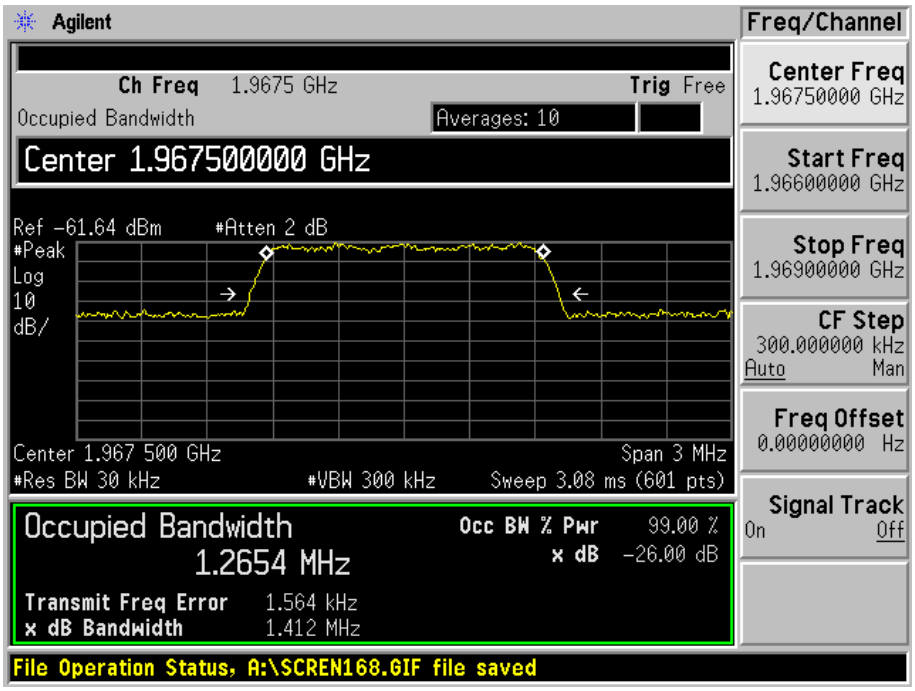
Uplink High CH (Cellular) Output Signal



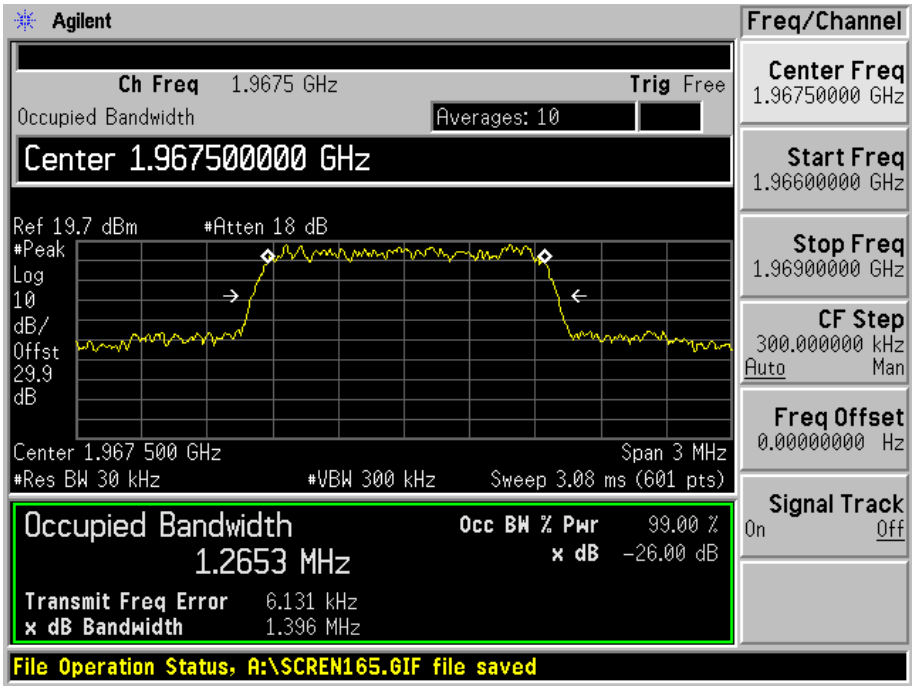
Downlink Low CH (PCS) Input Signal



Downlink Low CH (PCS) Output Signal



Downlink Mid CH (PCS) Input Signal



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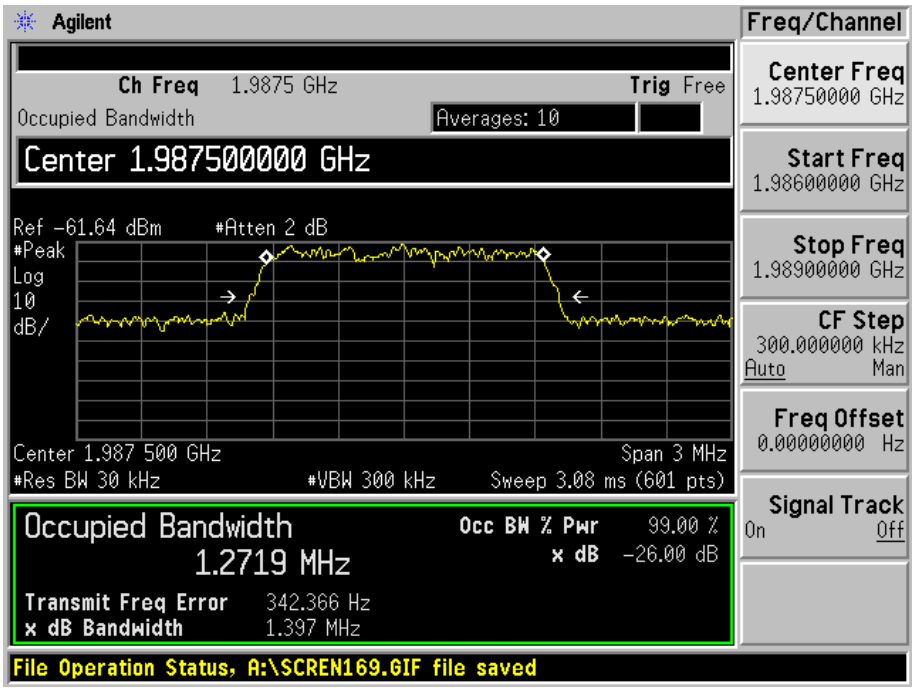

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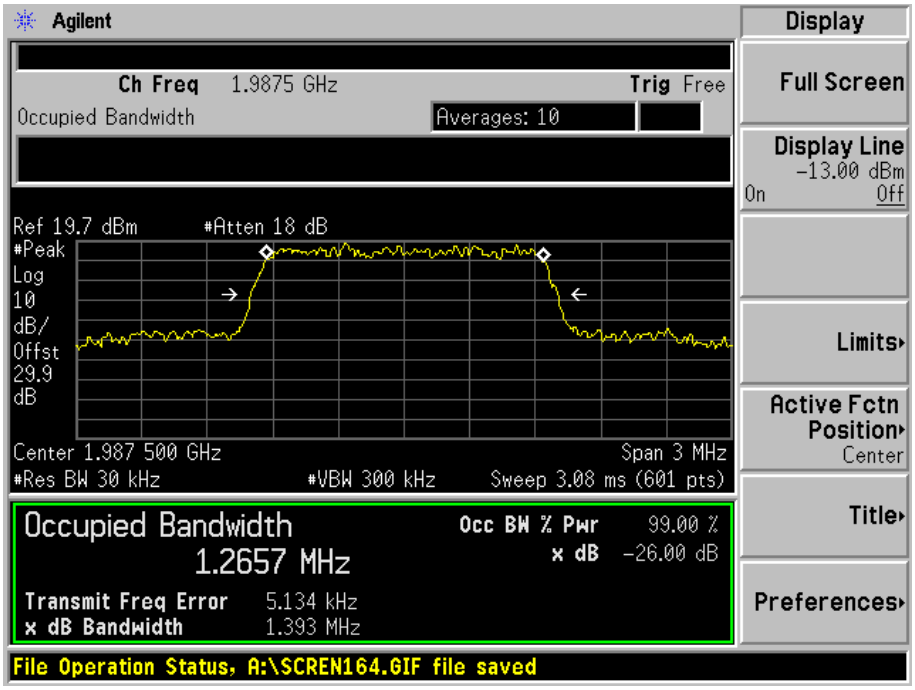
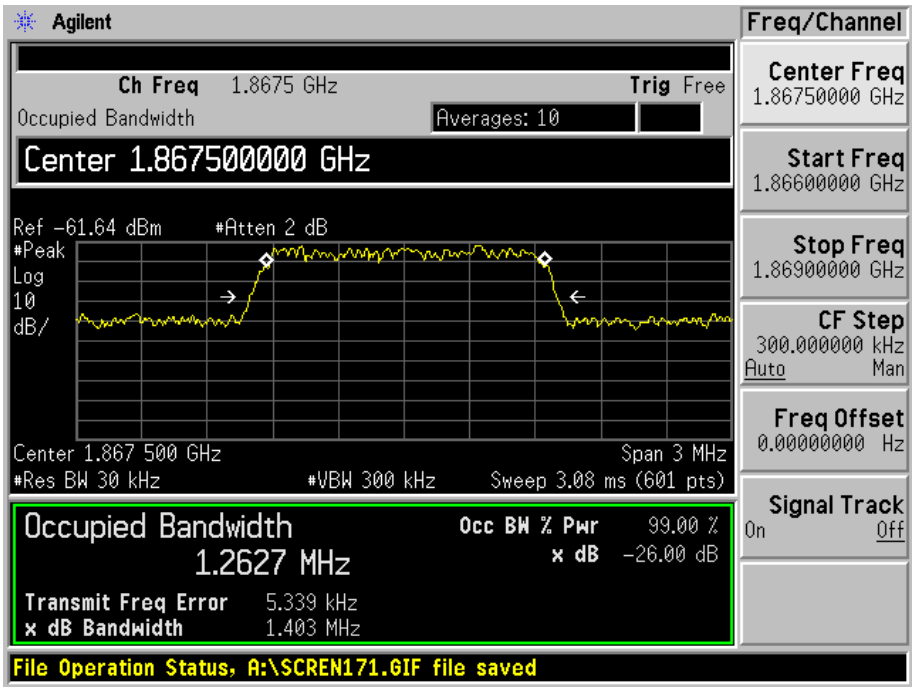
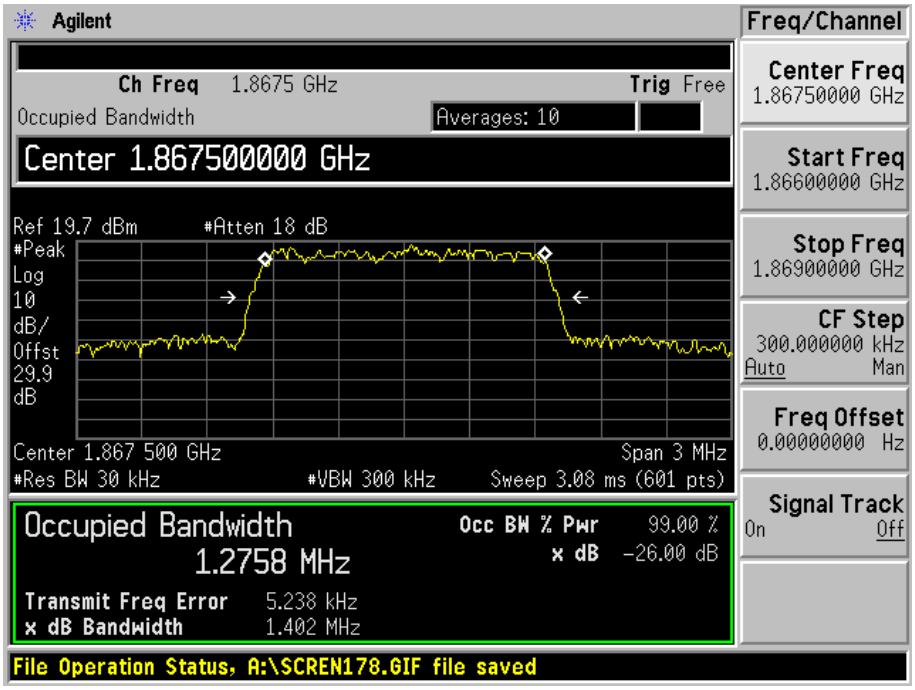


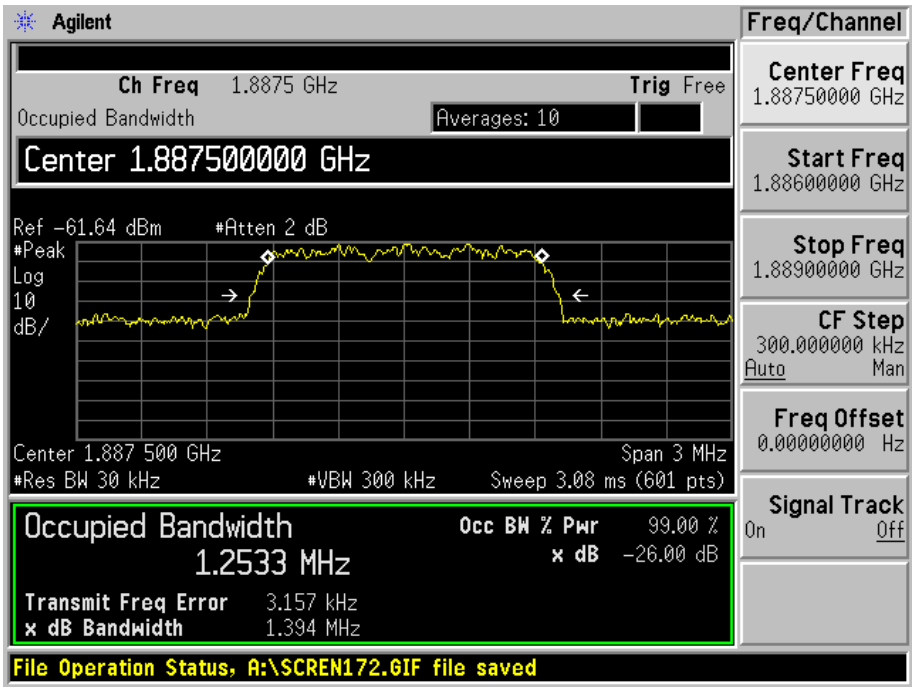
Downlink High CH (PCS) Output Signal



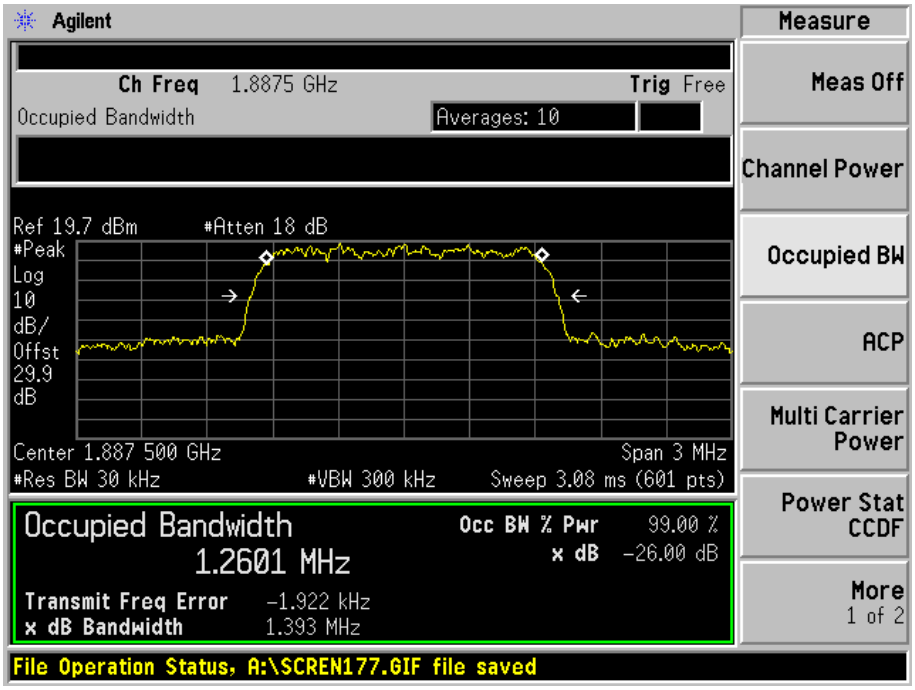
Uplink Low CH (PCS) Input Signal



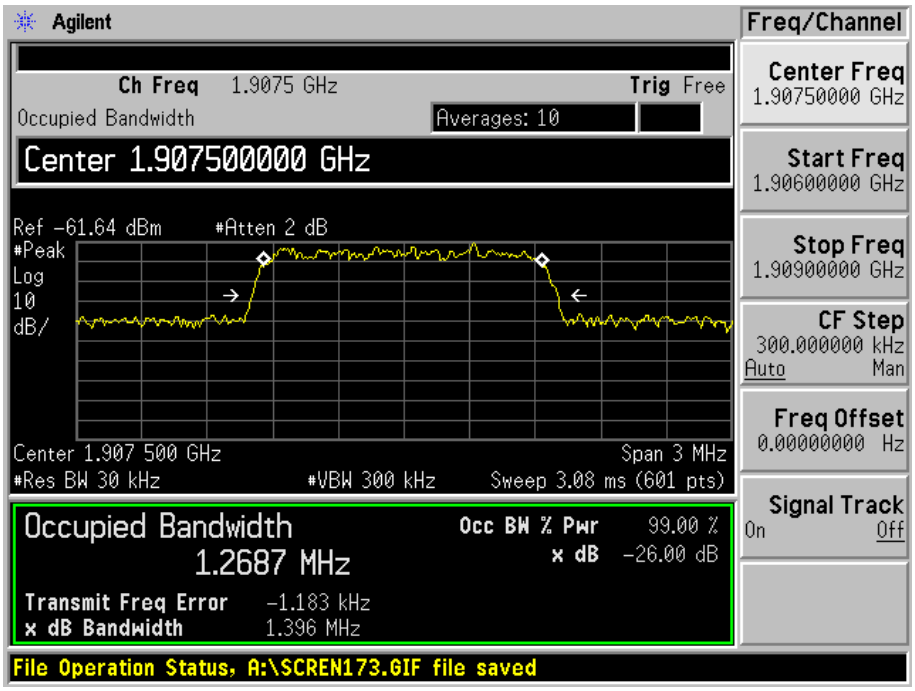
Uplink Low CH (PCS) Output Signal



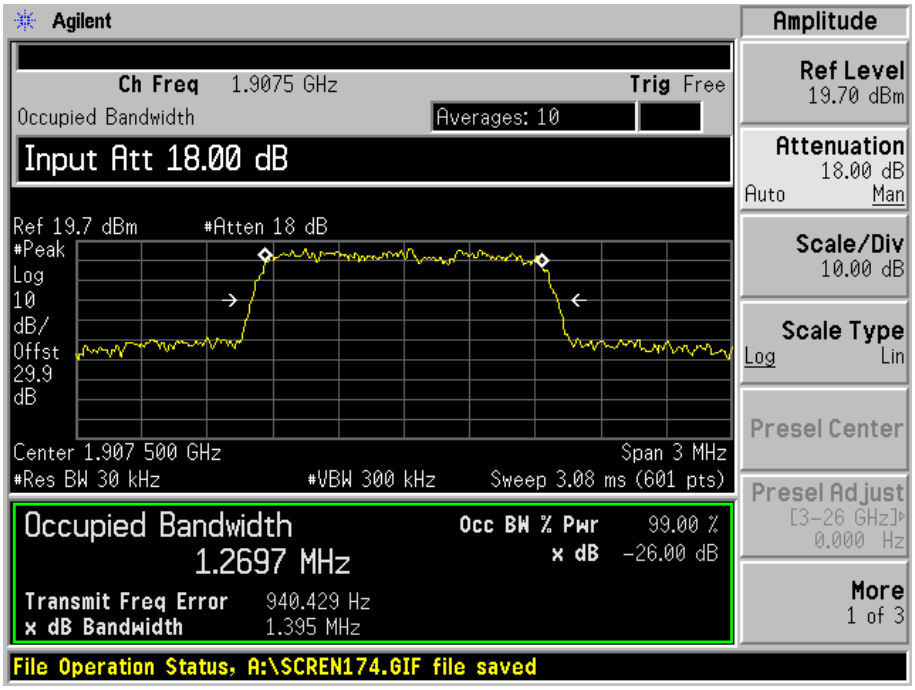
Uplink Mid CH (PCS) Input Signal



Uplink Mid CH (PCS) Output Signal



Uplink High CH (PCS) Input Signal



Uplink High CH (PCS) Output Signal

7. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

Test Requirement(s): § 2.1051 Measurements required: Spurious emissions at antenna terminals:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

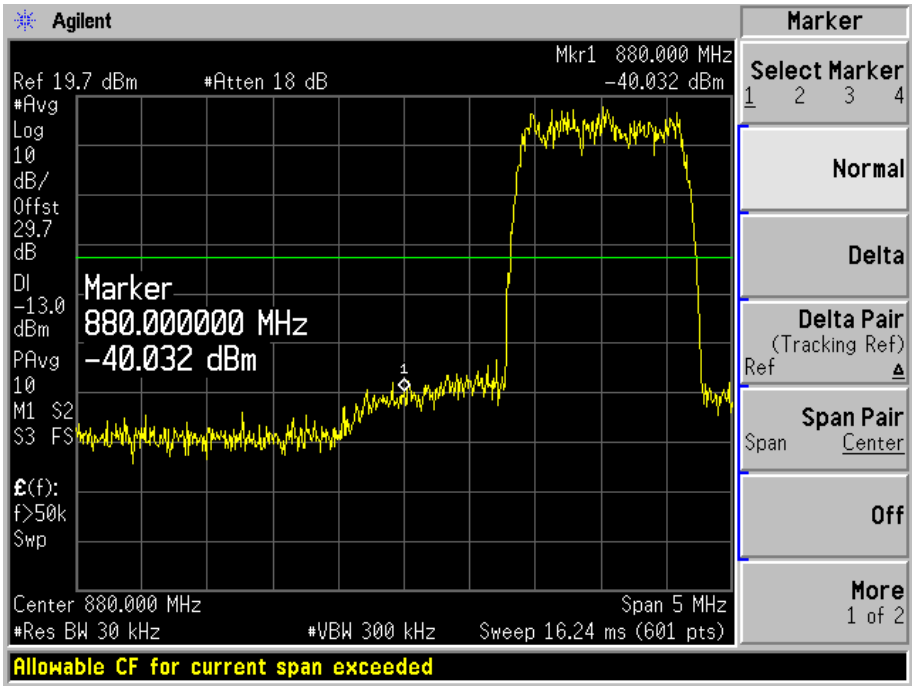
§ 22.917, §24.238 Emission limitations for Broadband PCS equipment: The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service. § 22.917 (a), § 24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Test Procedures: A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the OEM A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum was investigated from 30 MHz to the 26.5 GHz of the carrier.

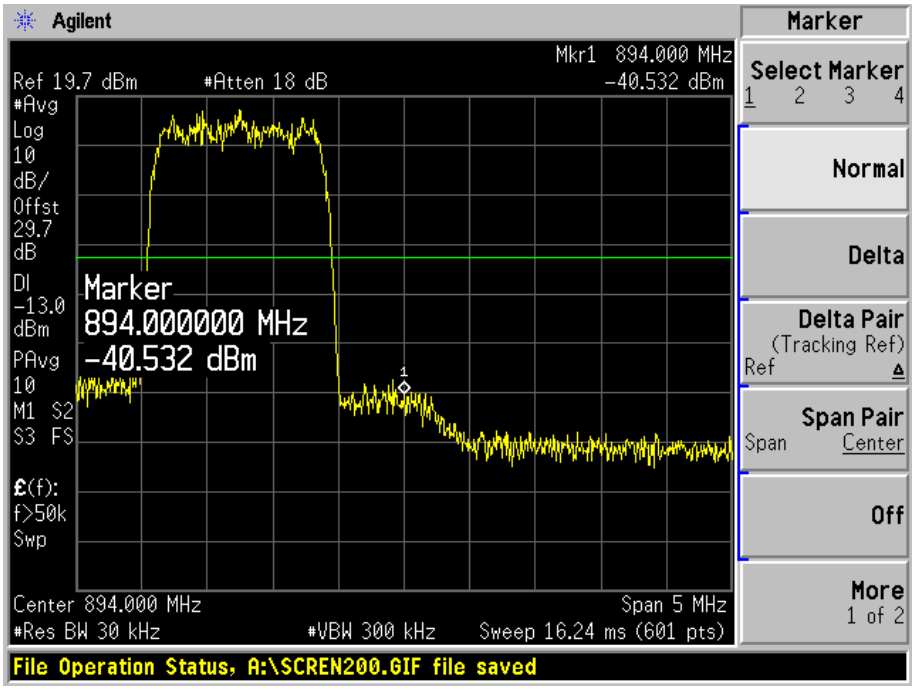
Test Results: The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

Test Results: The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

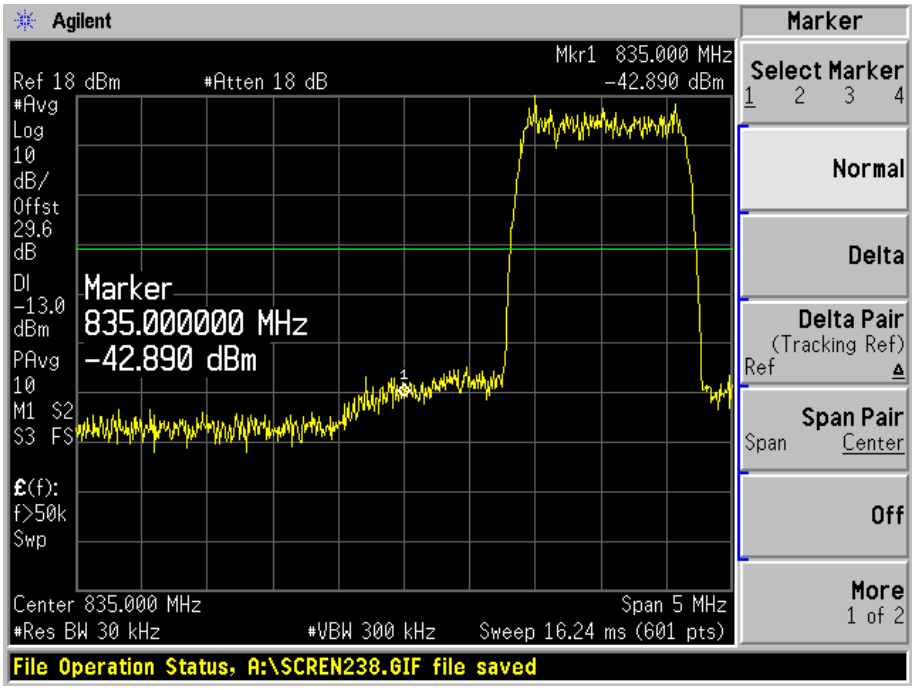
Plots of BAND EDGE



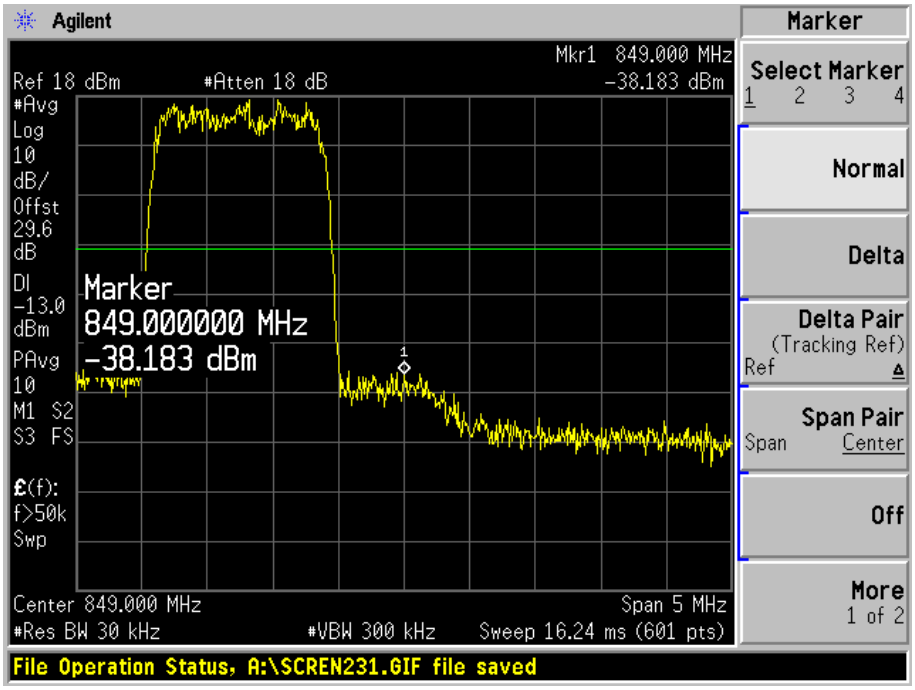
(Downlink Low CH-Cellular)



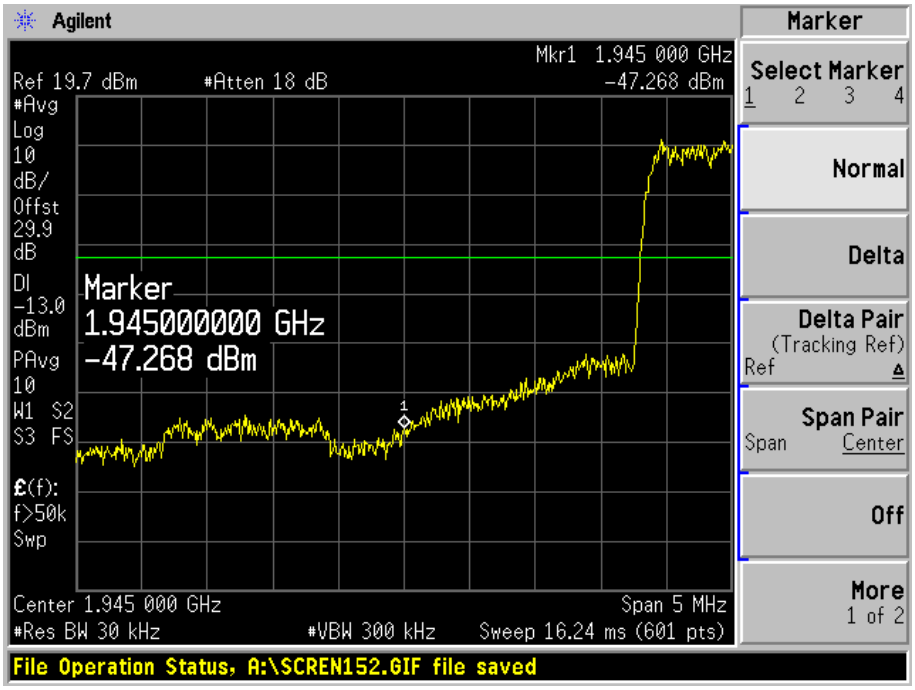
(Downlink High CH-Cellular)



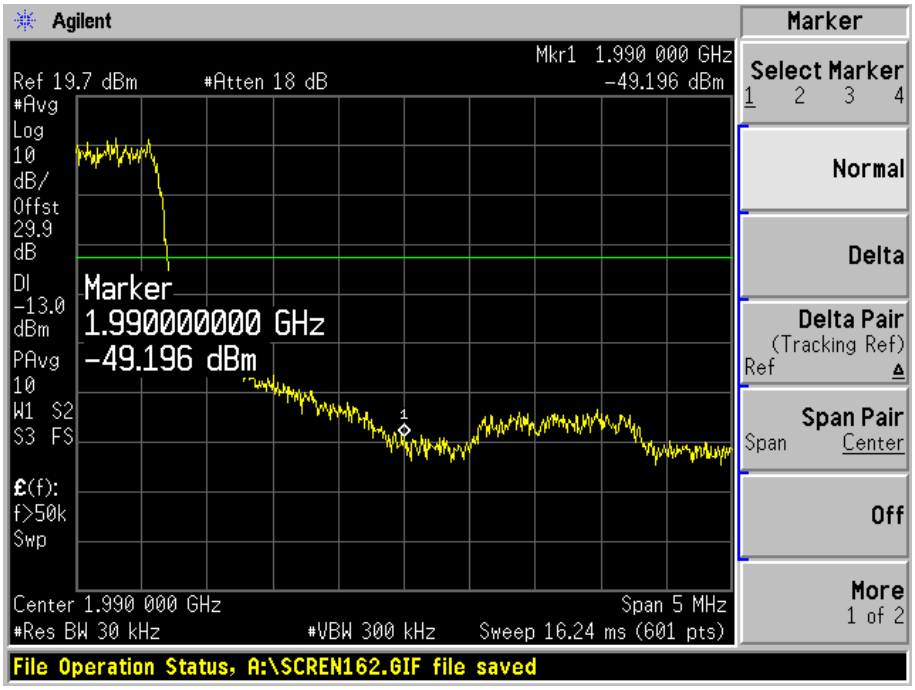
(Uplink Low CH-Cellular)



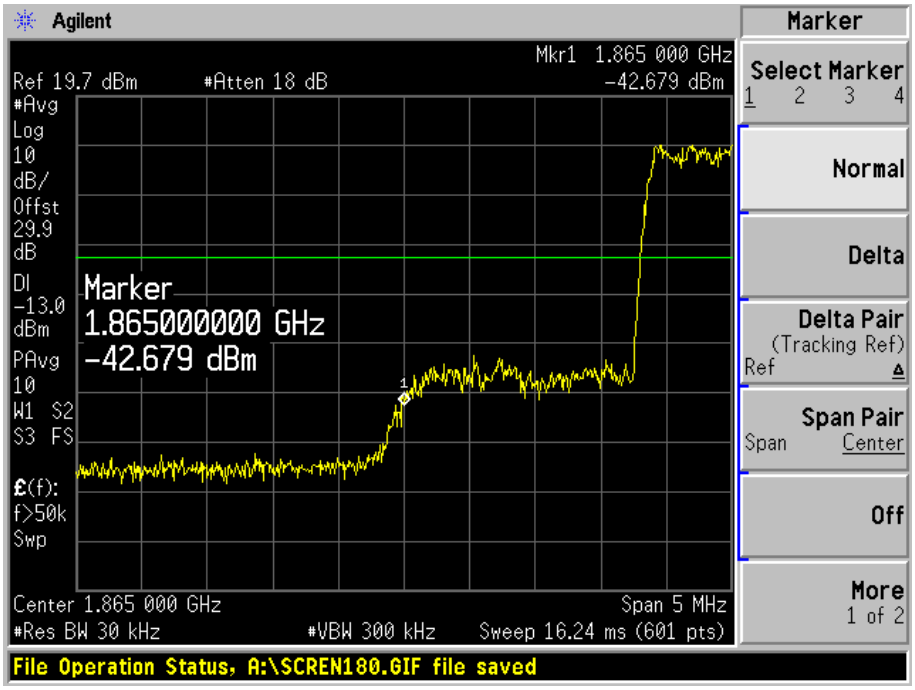
(Uplink High CH-Cellular)



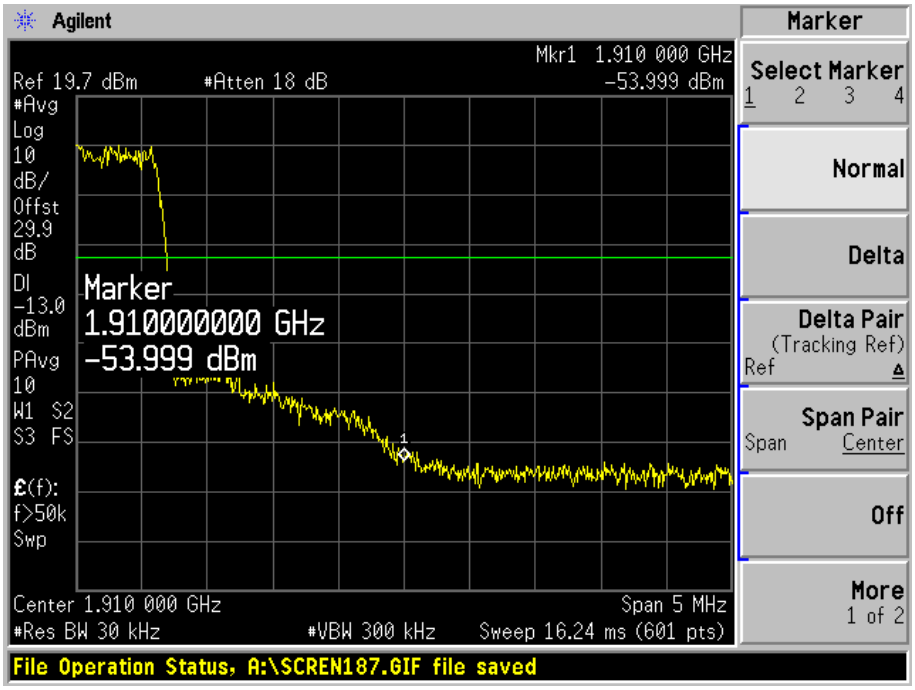
(Downlink Low CH-PCS)



(Downlink High CH-PCS)

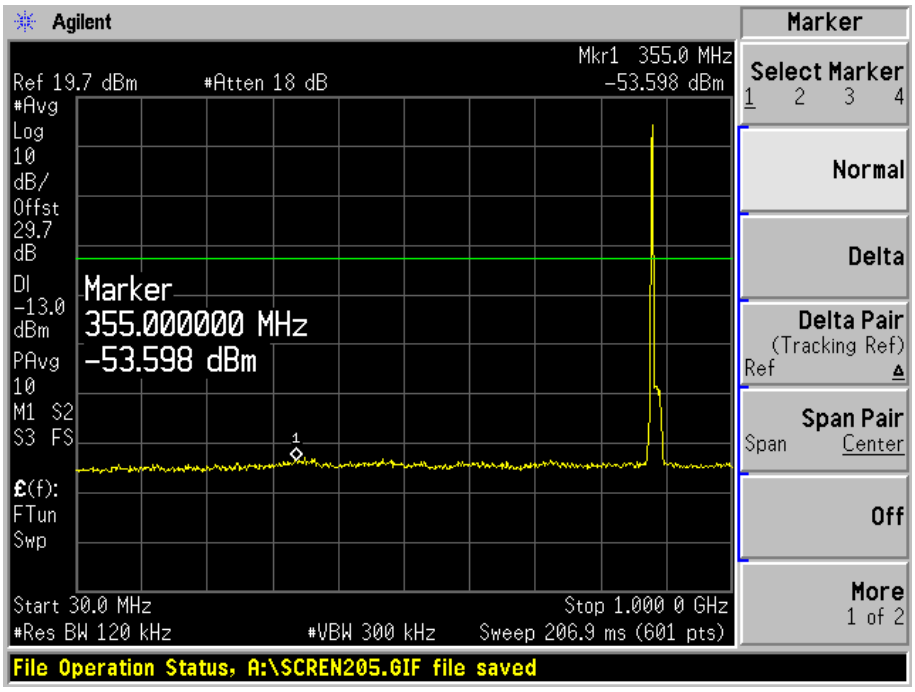


(Uplink Low CH-PCS)

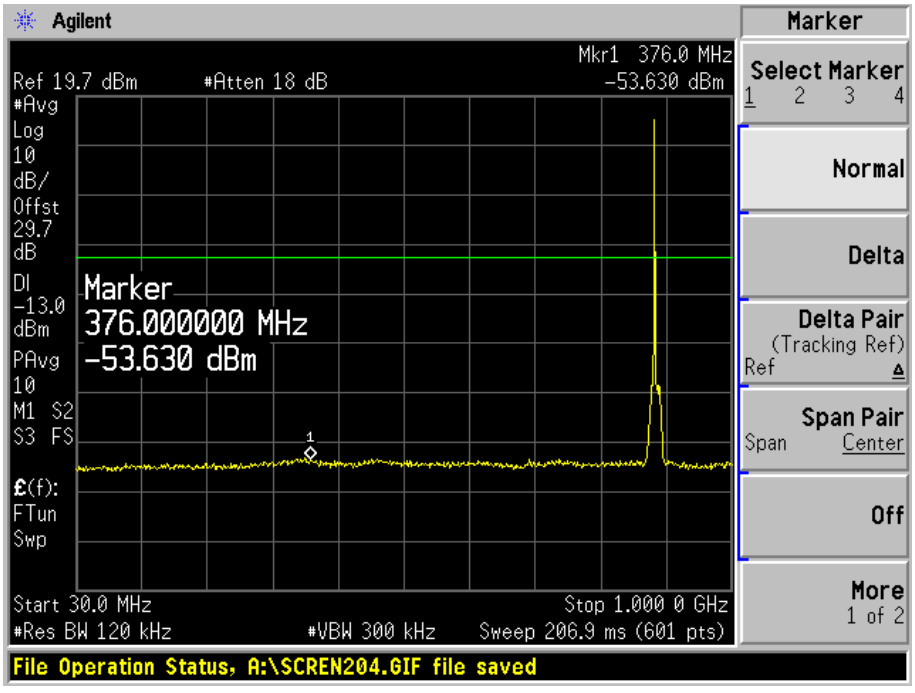


(Uplink High CH-PCS)

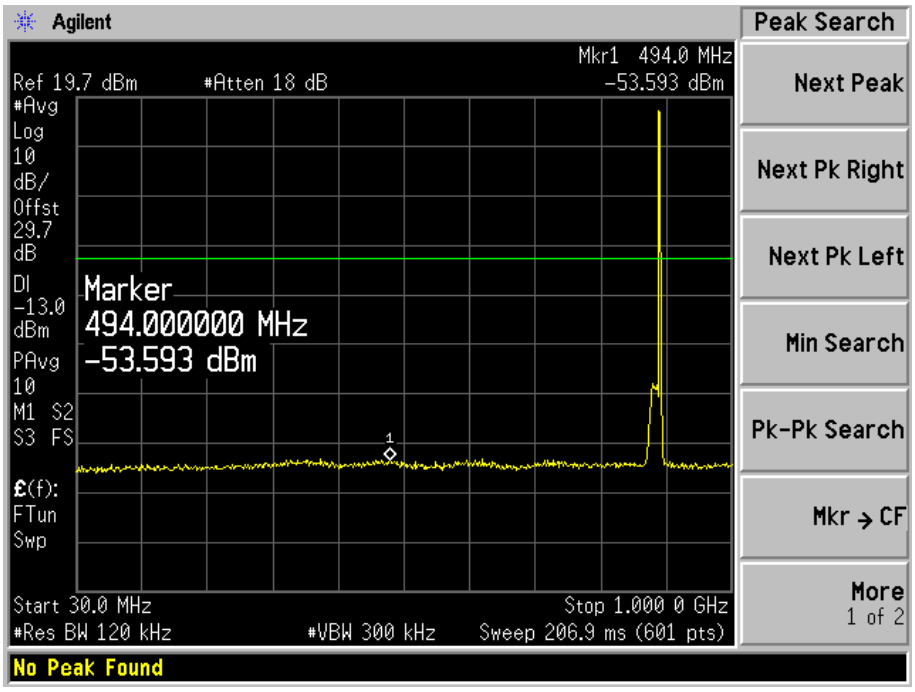
Plots of Spurious Emission



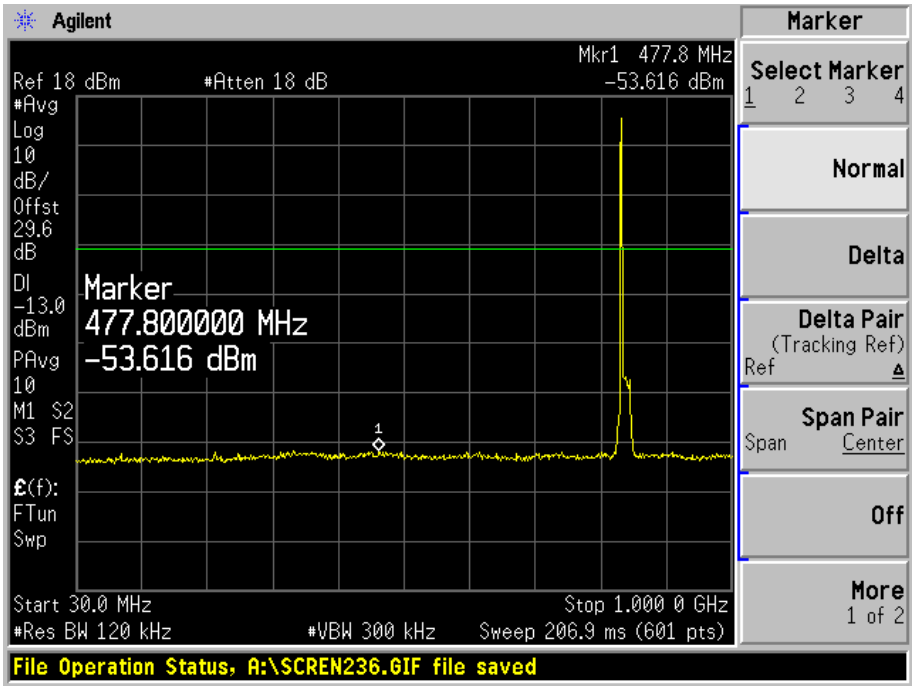
Conducted Spurious Emissions Downlink Low CH (30 MHz – 1 GHz-Cellular)



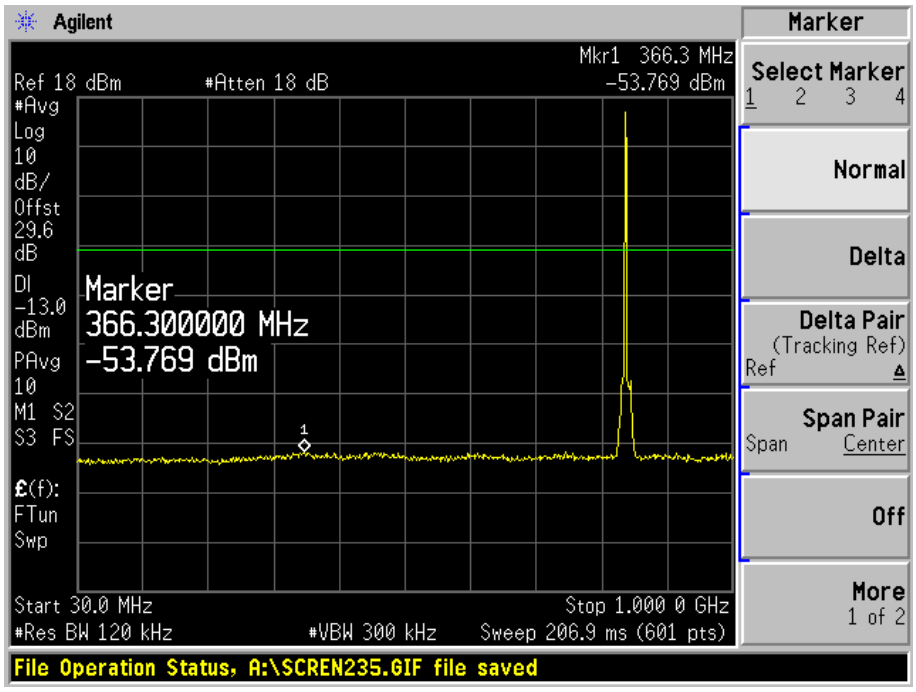
Conducted Spurious Emissions Downlink Mid CH (30 MHz – 1 GHz-Cellular)



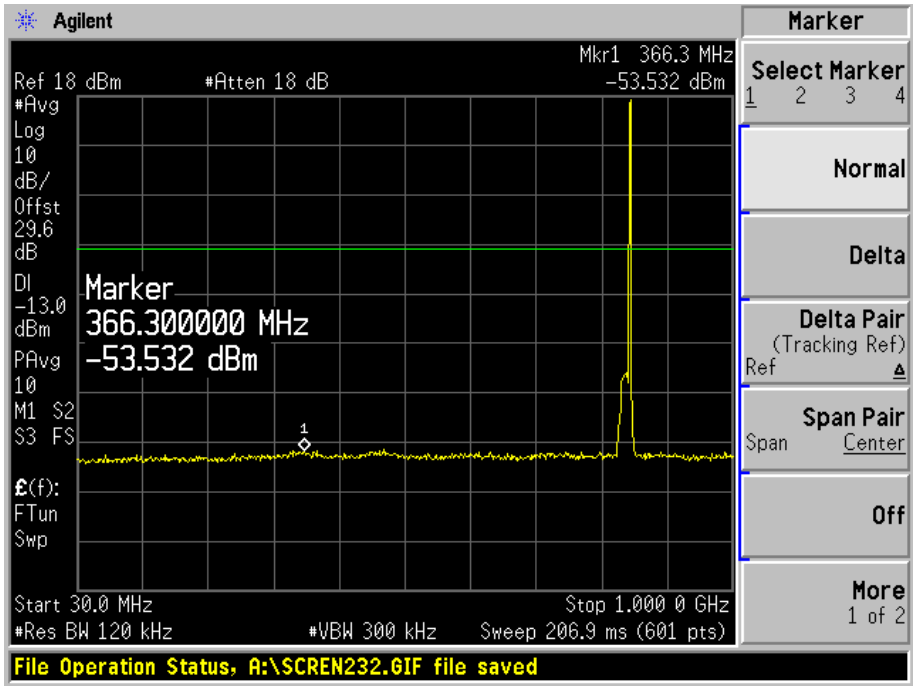
Conducted Spurious Emissions Downlink High CH (30 MHz – 1 GHz-Cellular)



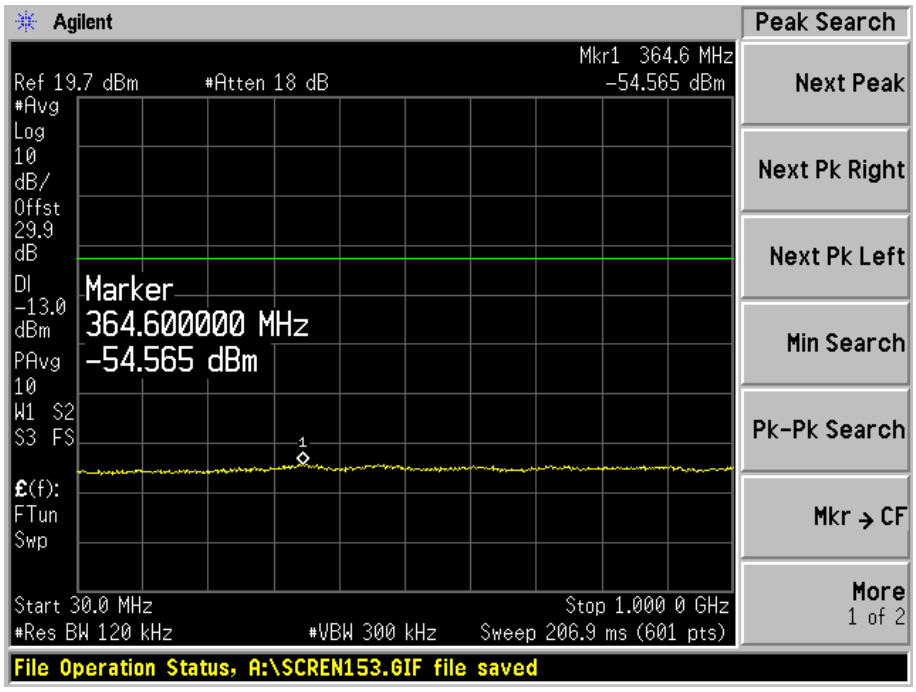
Conducted Spurious Emissions Uplink Low CH (30 MHz – 1 GHz-Cellular)



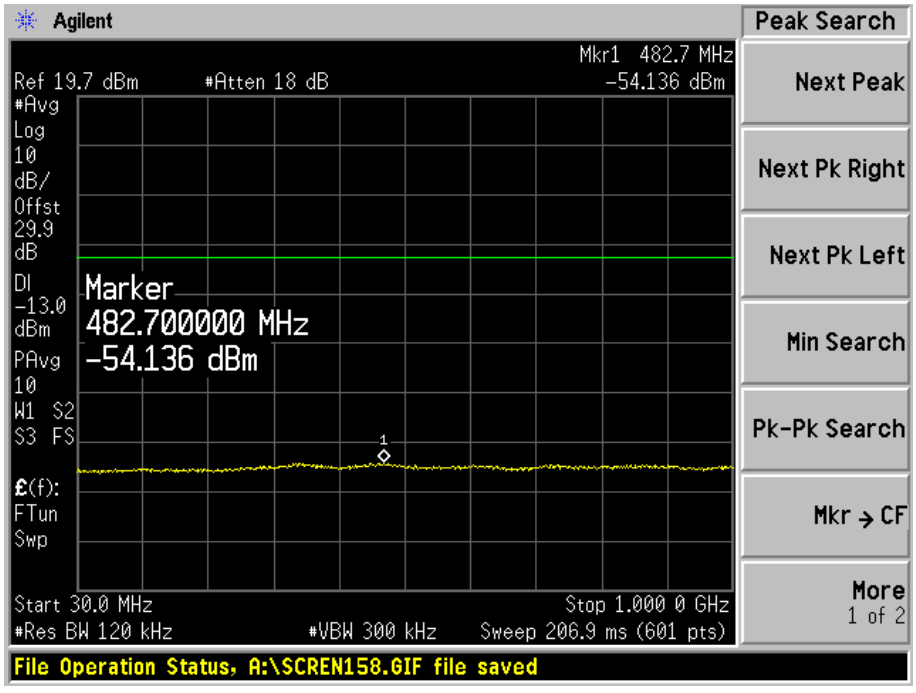
Conducted Spurious Emissions Uplink Mid CH (30 MHz – 1 GHz-Cellular)



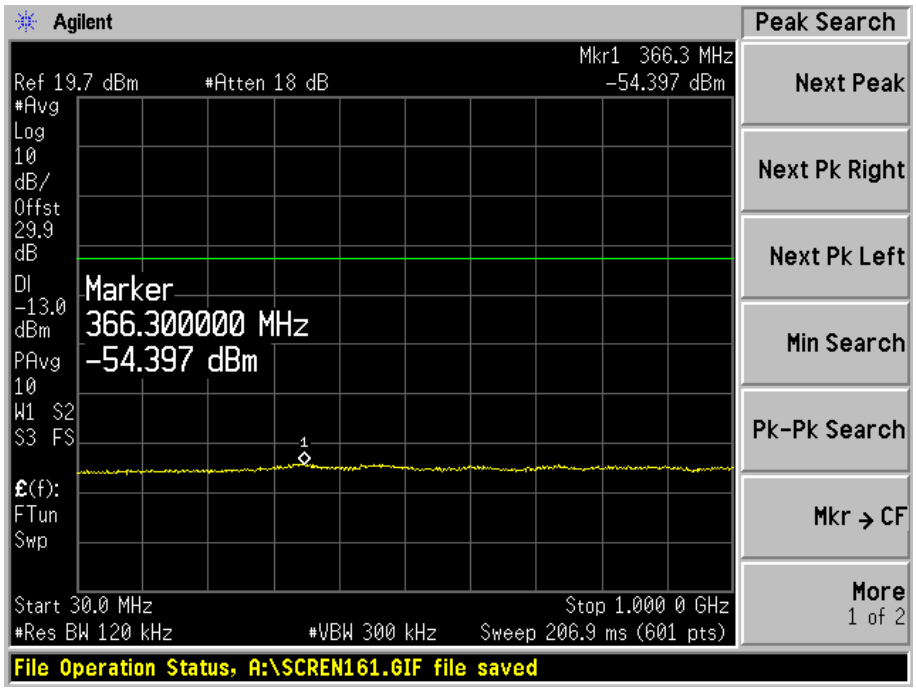
Conducted Spurious Emissions Uplink HighCH (30 MHz – 1 GHz-Cellular)



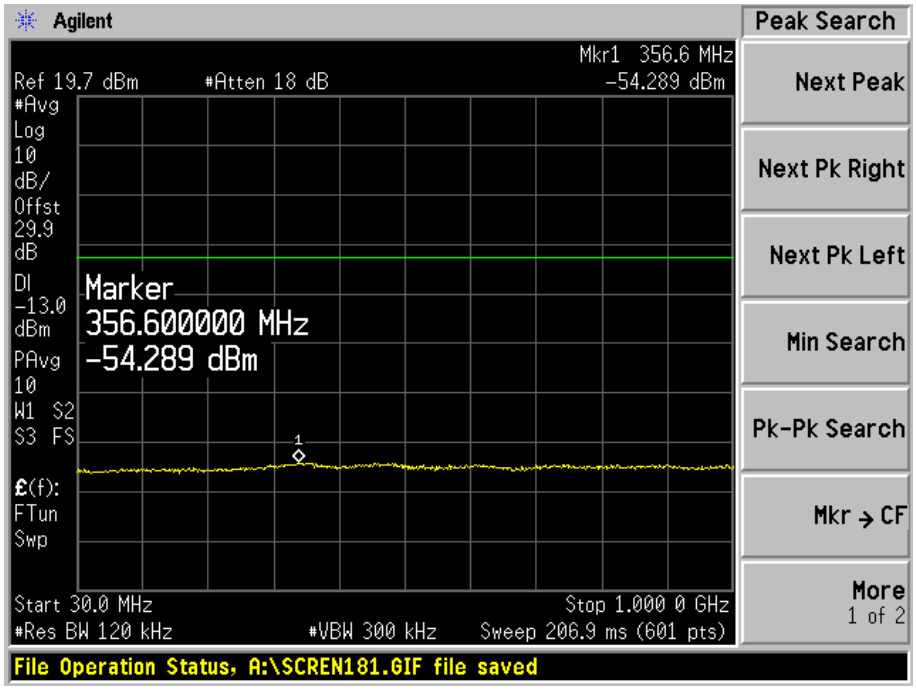
Conducted Spurious Emissions Downlink Low CH (30 MHz – 1 GHz-PCS)



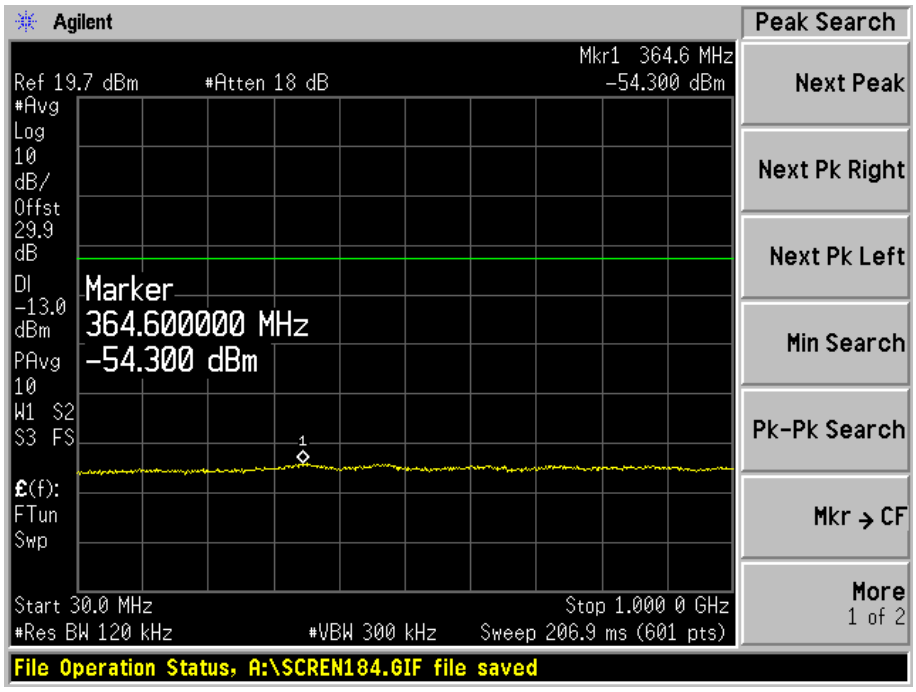
Conducted Spurious Emissions Downlink Mid CH(30 MHz – 1 GHz-PCS)



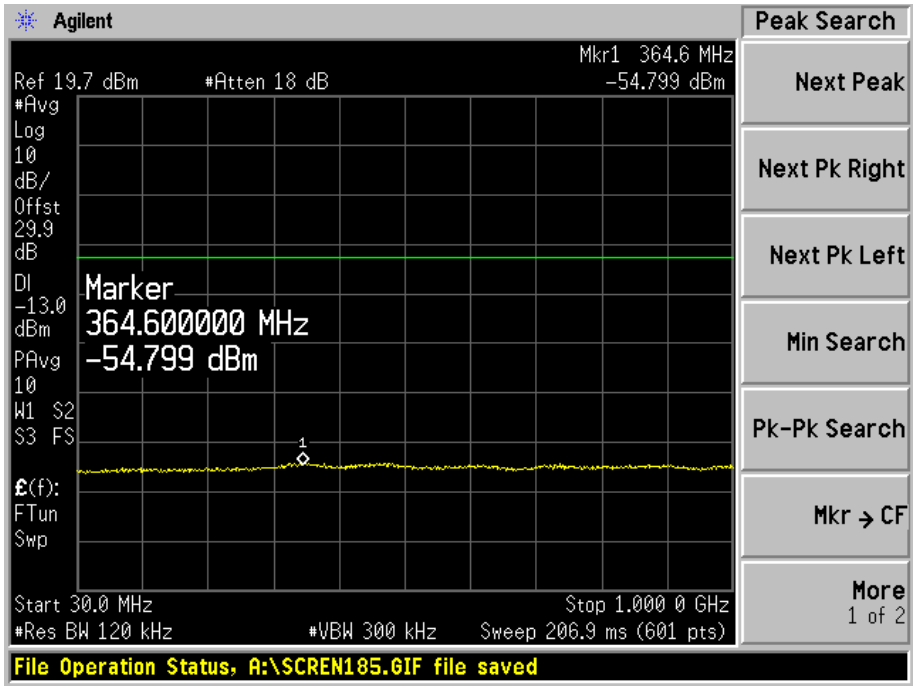
Conducted Spurious Emissions Downlink High CH (30 MHz – 1 GHz-PCS)



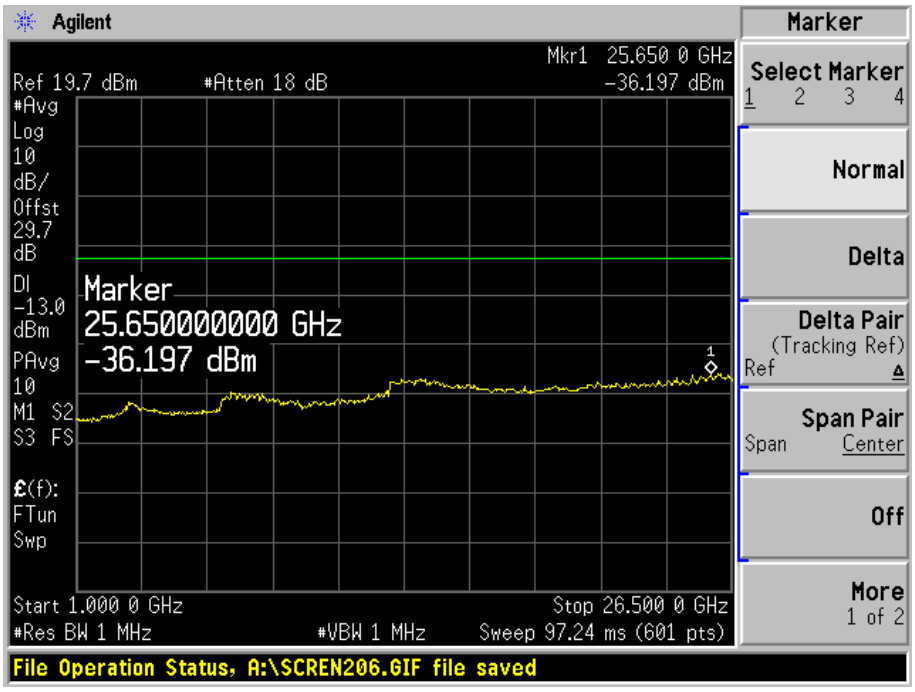
Conducted Spurious Emissions Uplink Low CH(30 MHz – 1 GHz-PCS)



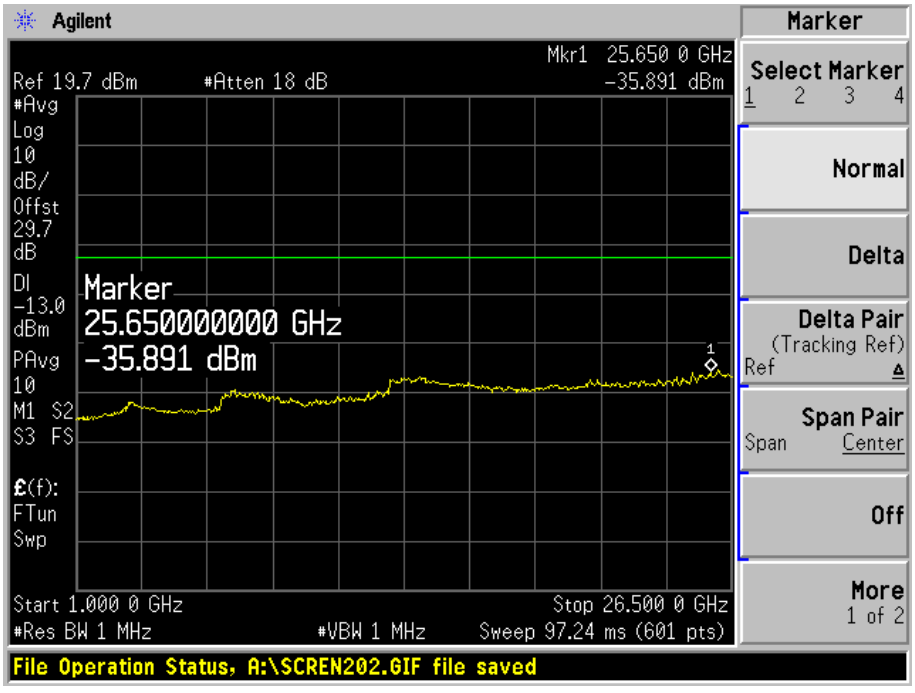
Conducted Spurious Emissions Uplink Mid CH (30 MHz – 1 GHz-PCS)



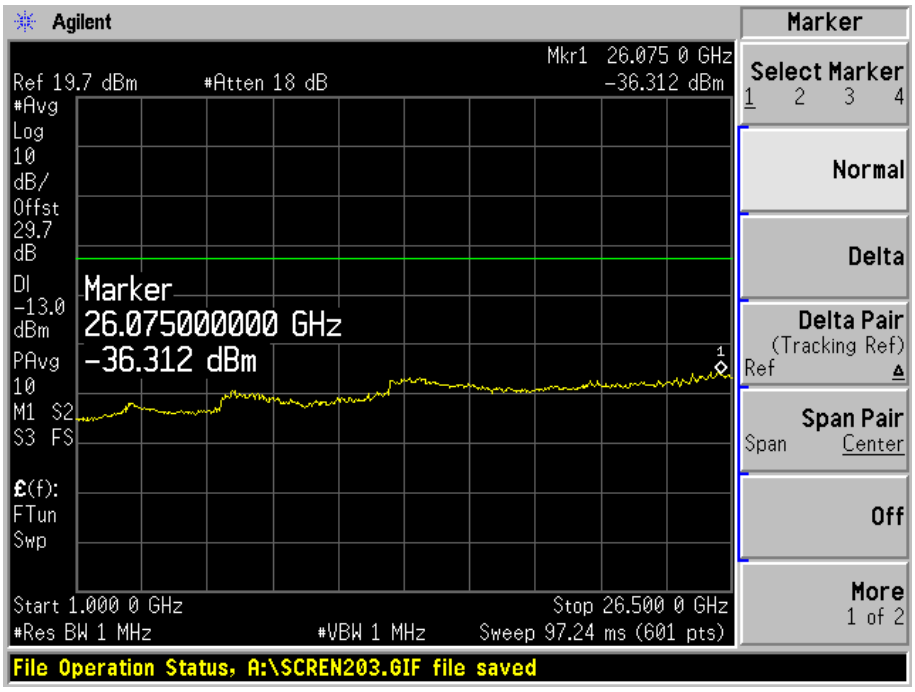
Conducted Spurious Emissions Uplink High CH (30 MHz – 1 GHz-PCS)



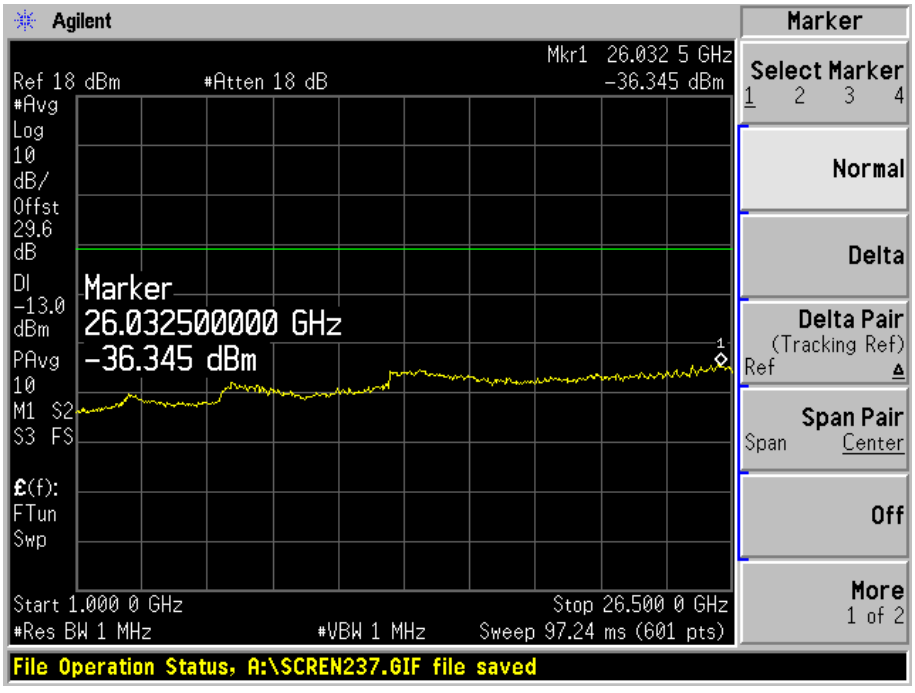
Conducted Spurious Emissions Downlink Low CH (1 GHz – 26.5 GHz-Cellular)



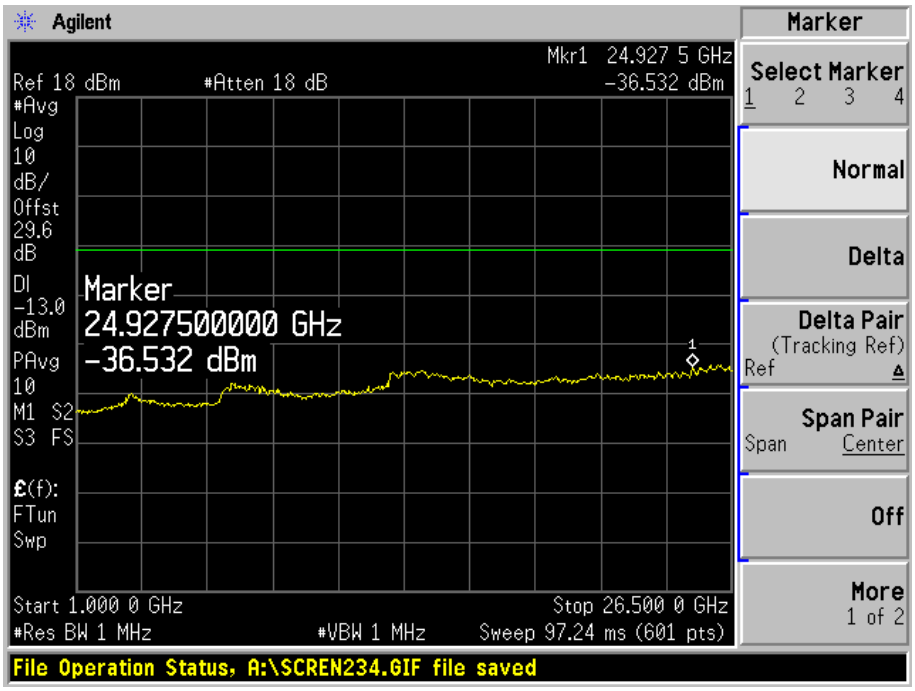
Conducted Spurious Emissions Downlink Low CH (1 GHz – 26.5 GHz-Cellular)



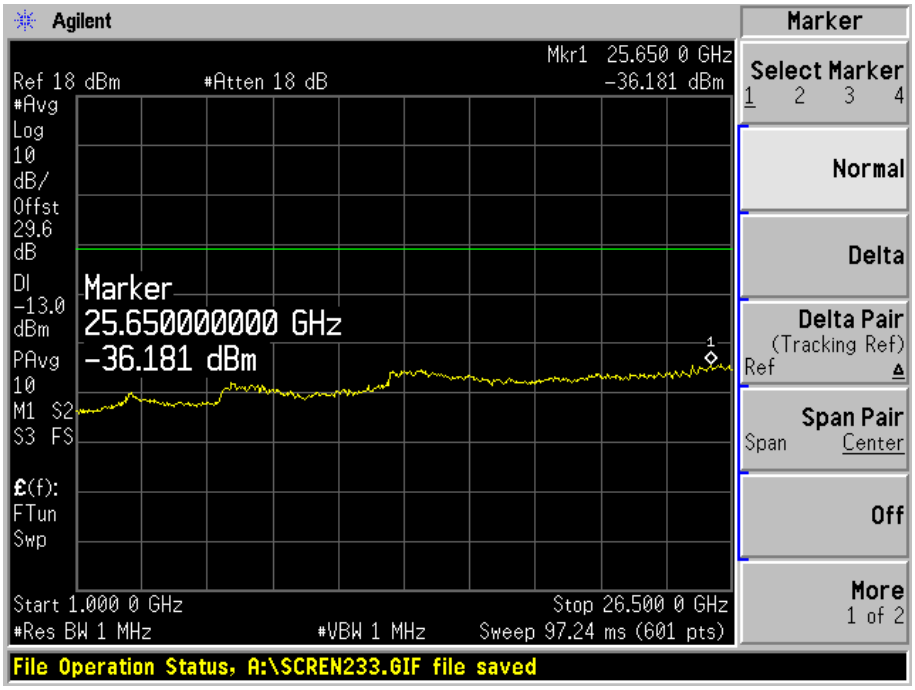
Conducted Spurious Emissions Downlink High CH (1 GHz – 26.5 GHz-Cellular)



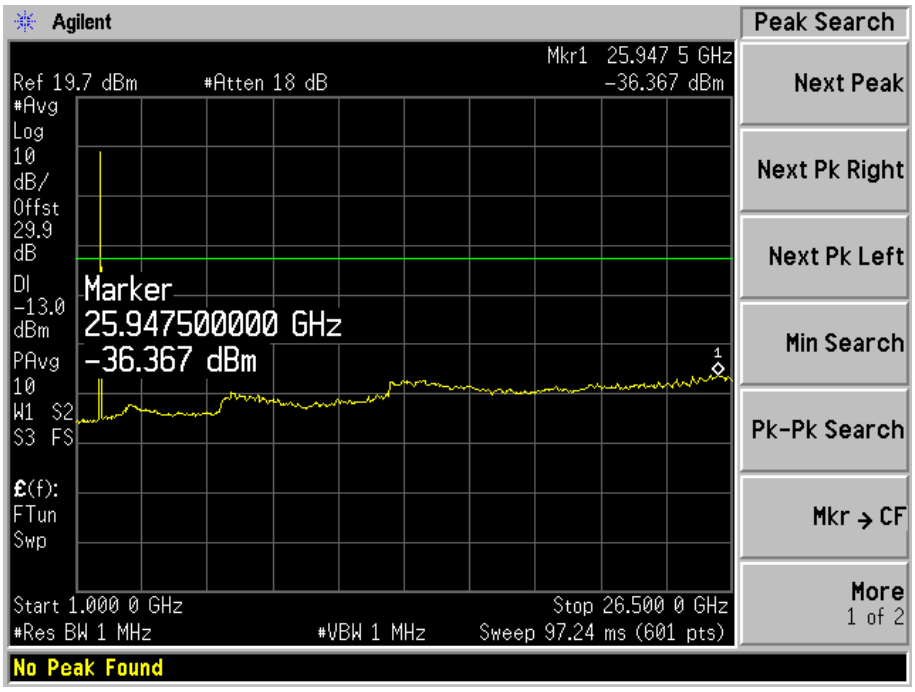
Conducted Spurious Emissions Uplink Low CH (1 GHz – 26.5 GHz-Cellular)



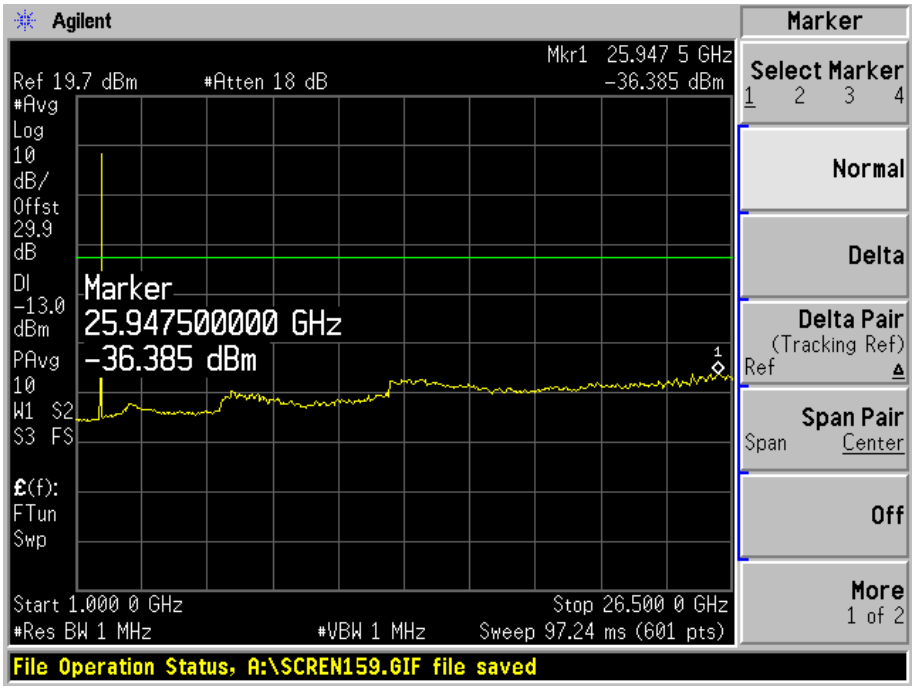
Conducted Spurious Emissions Uplink Mid CH (1 GHz – 26.5 GHz-Cellular)



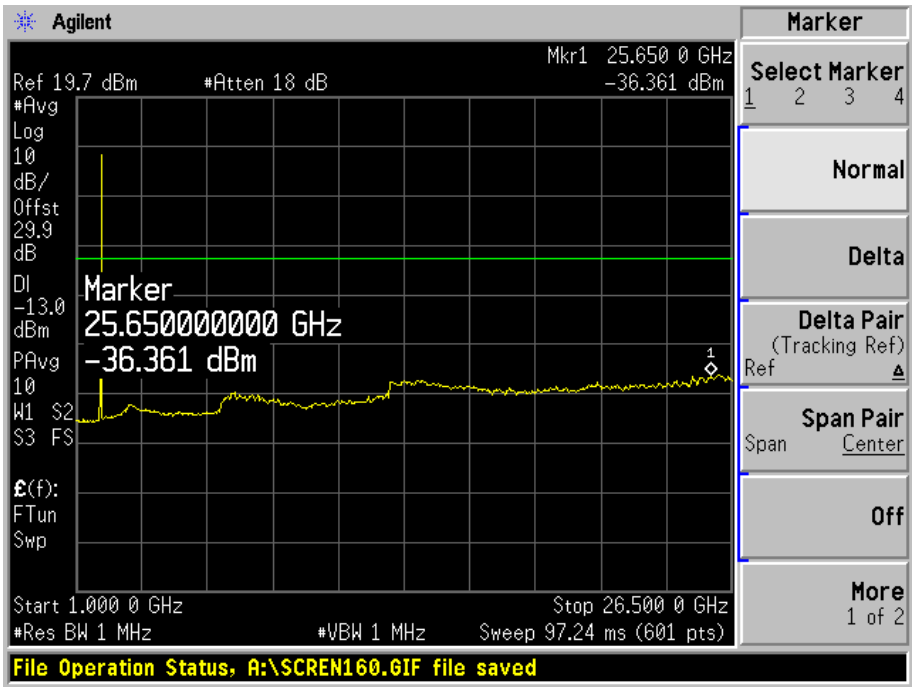
Conducted Spurious Emissions Uplink High CH (1 GHz – 26.5 GHz-Cellular)



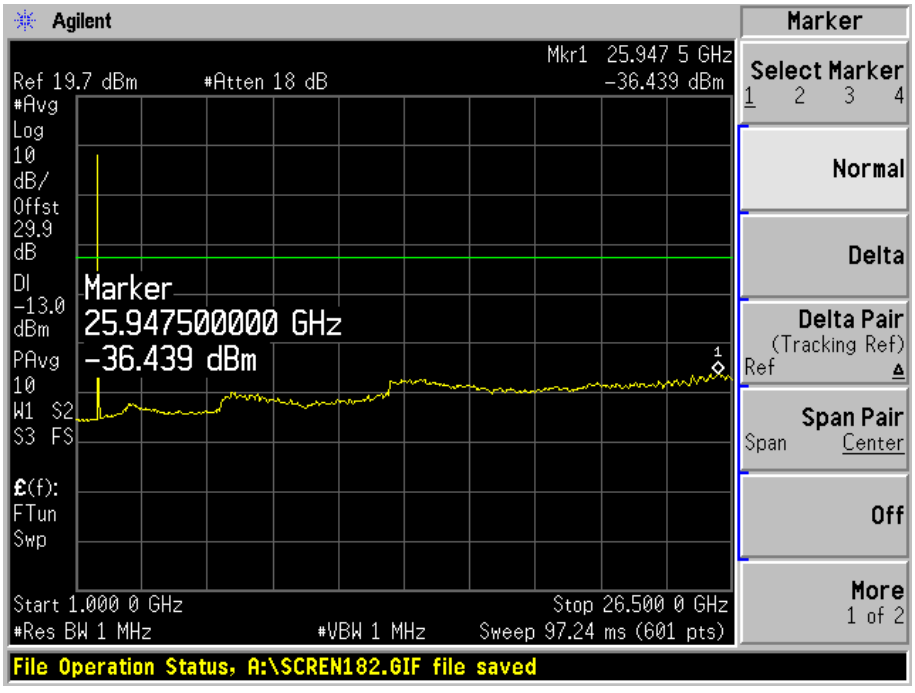
Conducted Spurious Emissions Downlink Low CH (1 GHz – 26.5 GHz-PCS)



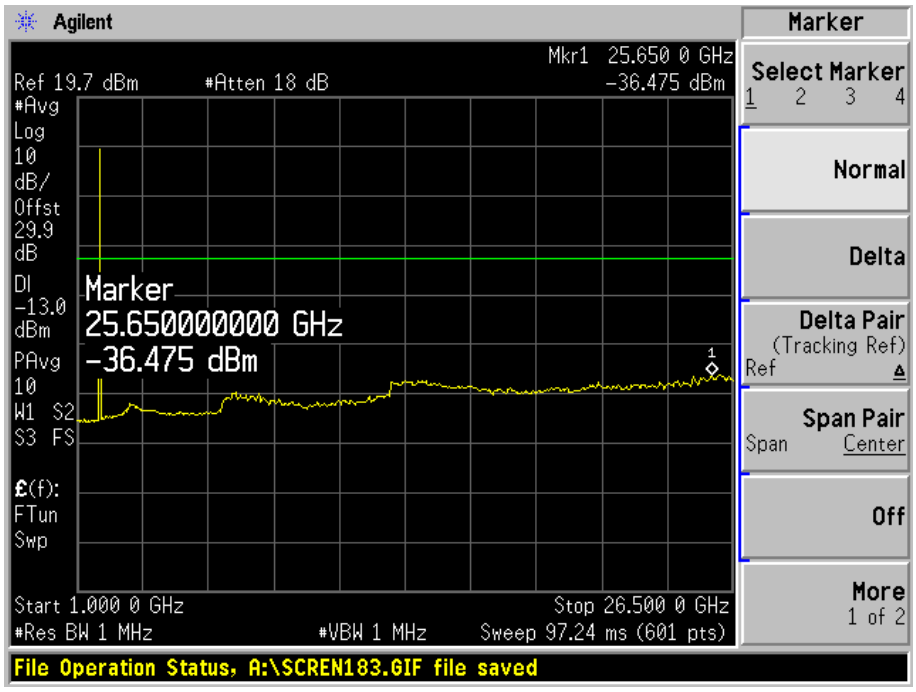
Conducted Spurious Emissions Downlink Mid CH(1 GHz – 26.5 GHz-PCS)



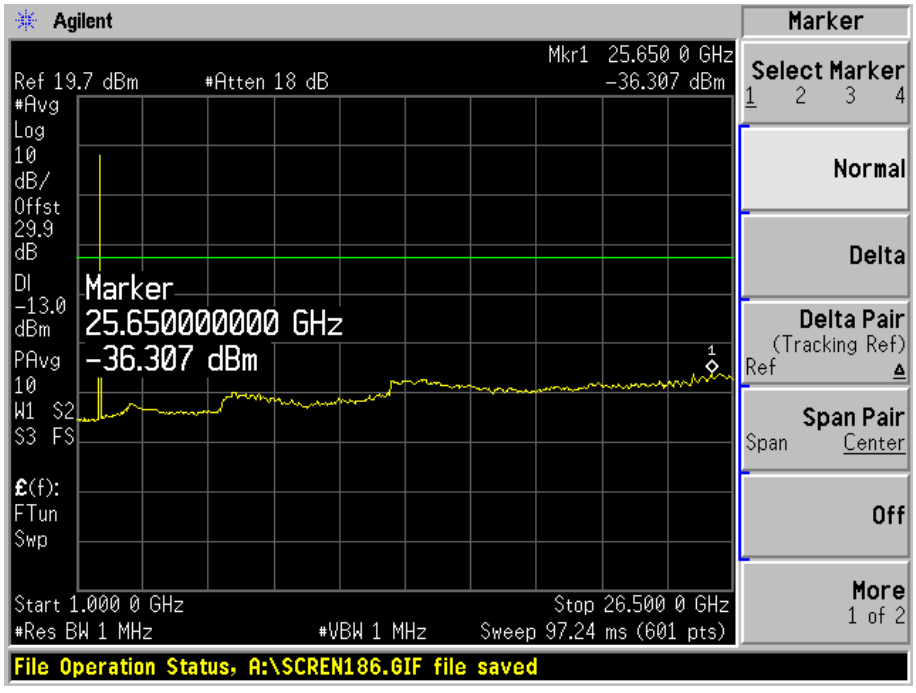
Conducted Spurious Emissions Downlink High CH (1 GHz – 26.5 GHz-PCS)



Conducted Spurious Emissions Uplink Low CH(1 GHz – 26.5 GHz-PCS)

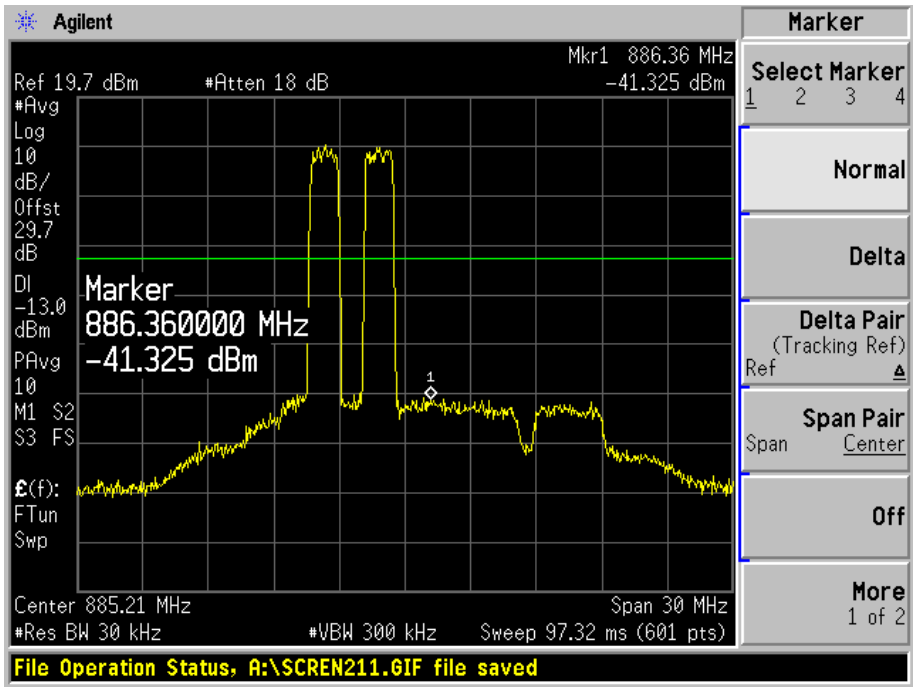


Conducted Spurious Emissions Uplink Mid CH (1 GHz – 26.5 GHz-PCS)

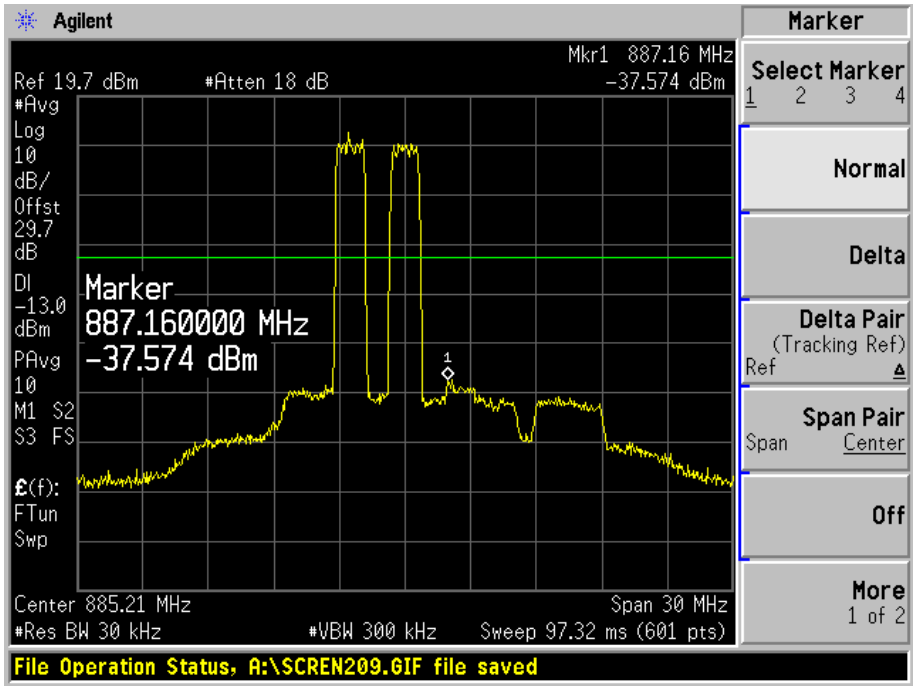


Conducted Spurious Emissions Uplink High CH (1 GHz – 26.5 GHz-PCS)

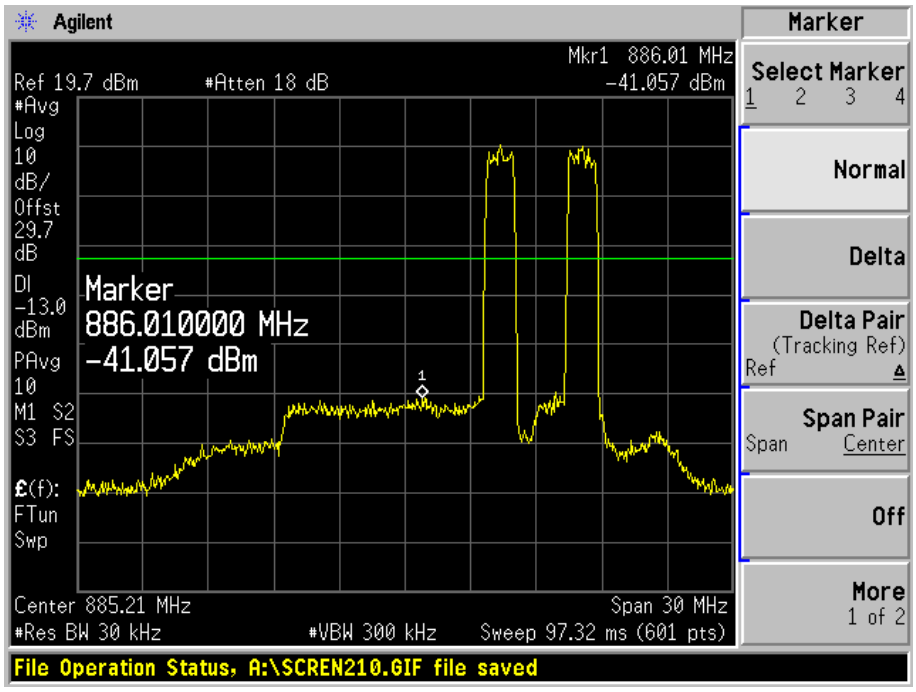
Intermodulation



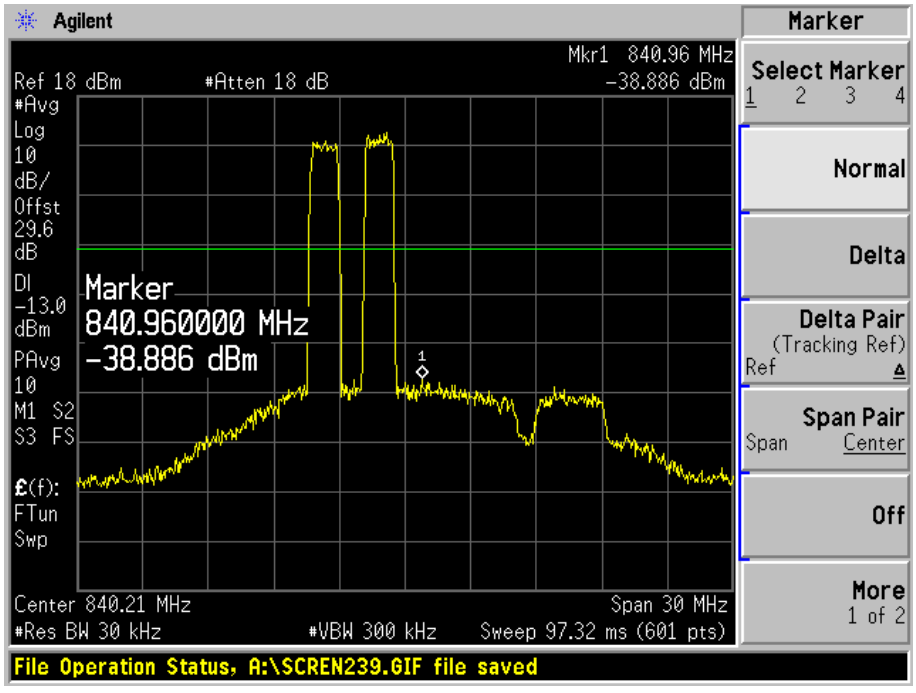
Intermodulation Downlink Low CH (Cellular)



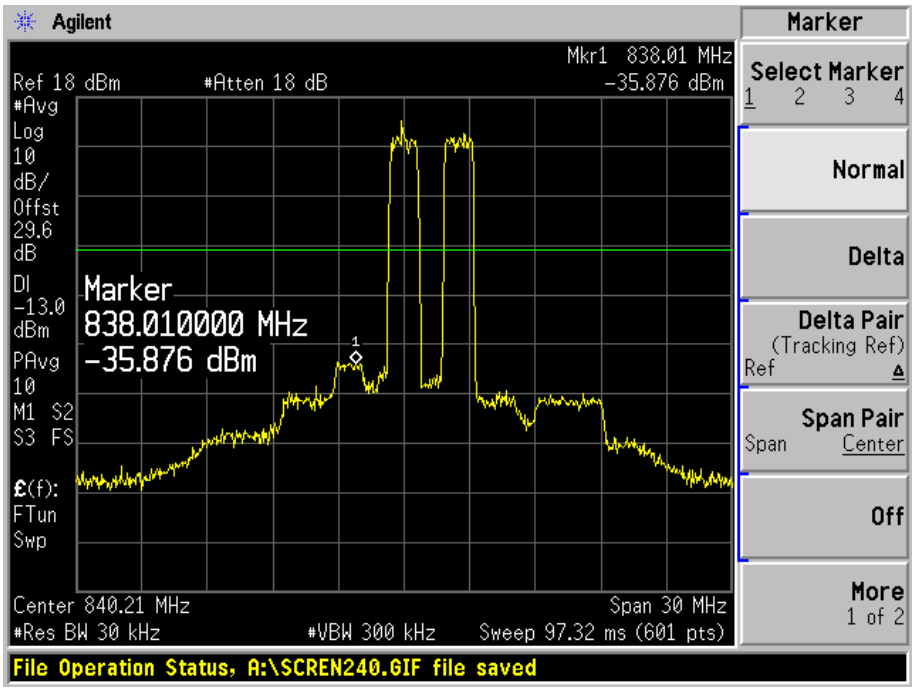
Intermodulation Downlink Mid CH (Cellular)



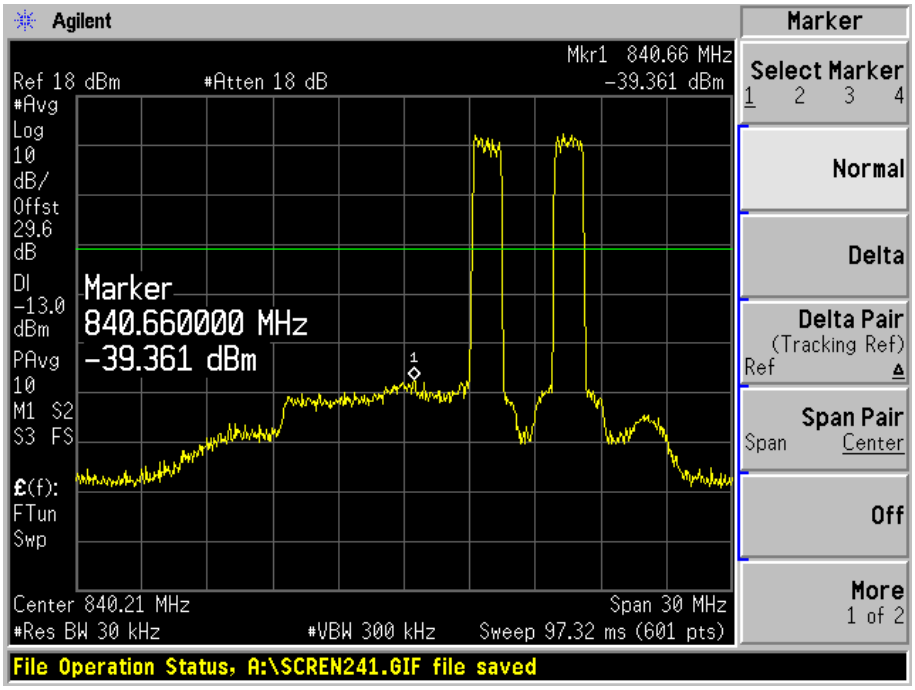
Intermodulation Downlink High CH (Cellular)



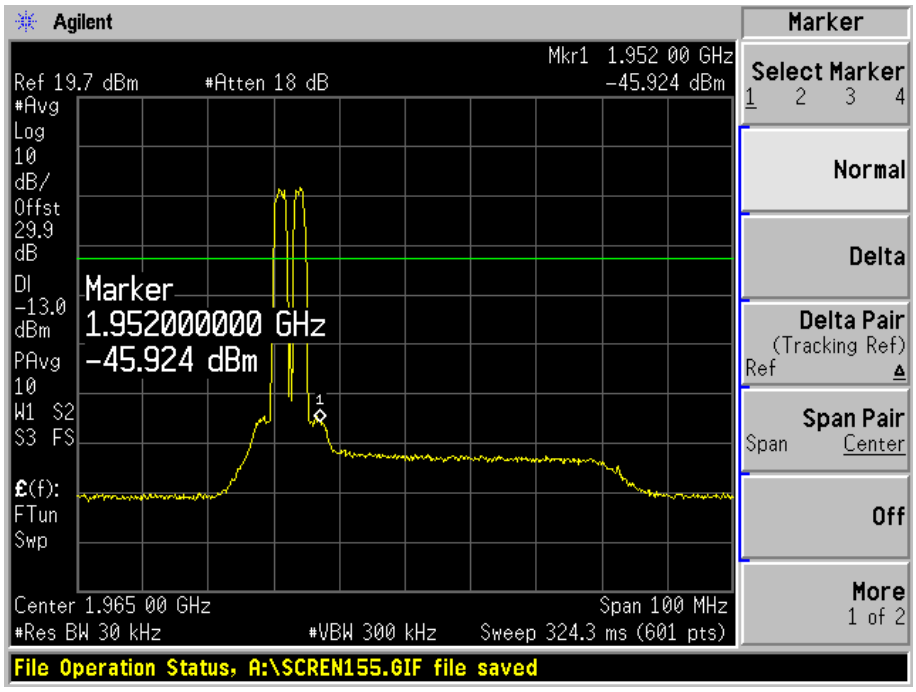
Intermodulation Uplink Low CH (Cellular)



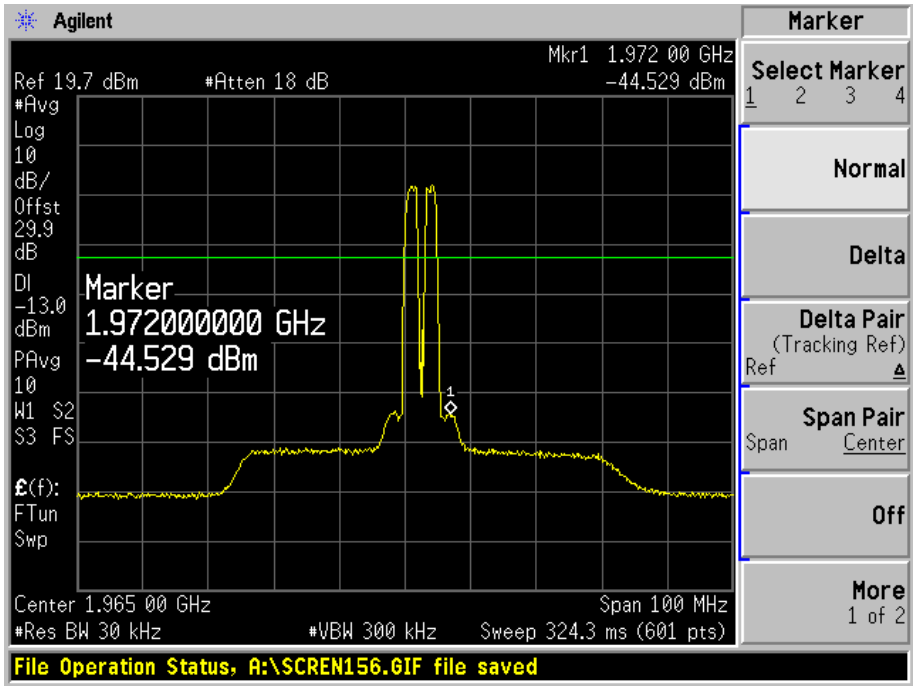
Intermodulation Uplink Mid CH (Cellular)



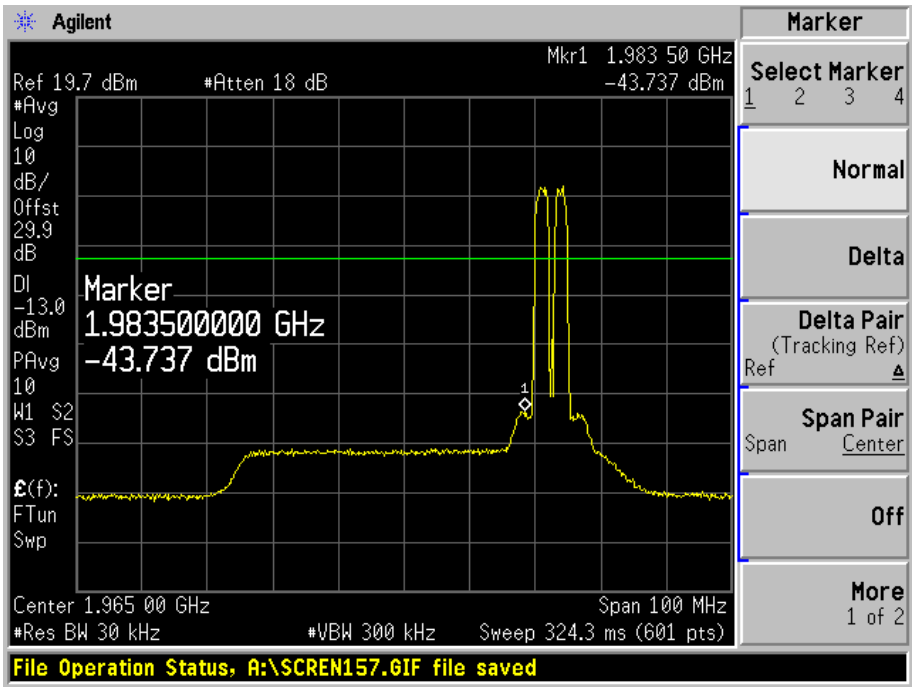
Intermodulation Uplink High CH (Cellular)



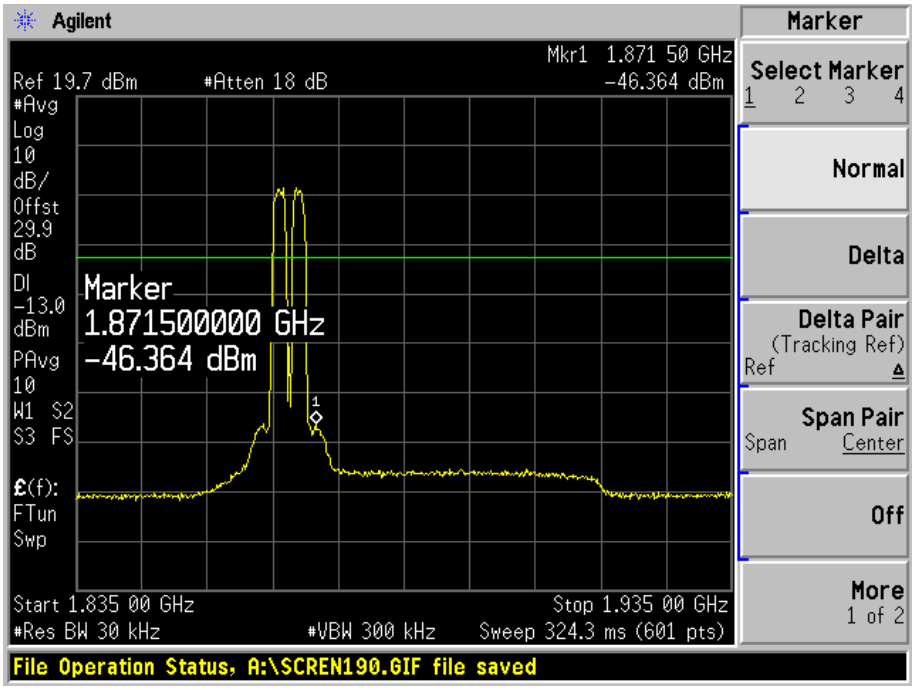
Intermodulation Downlink Low CH (PCS)



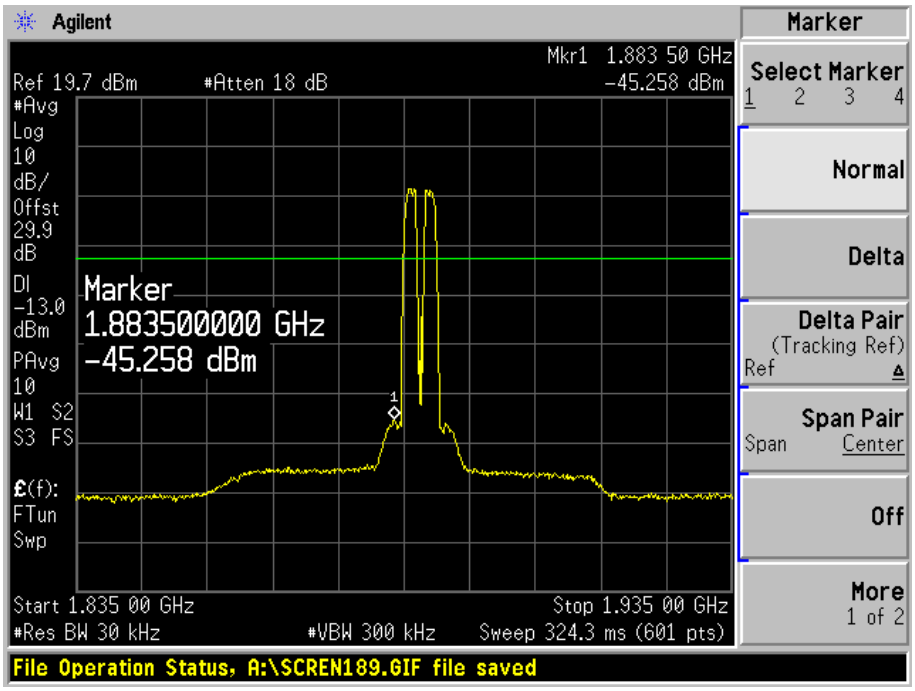
Intermodulation Downlink MidCH (PCS)



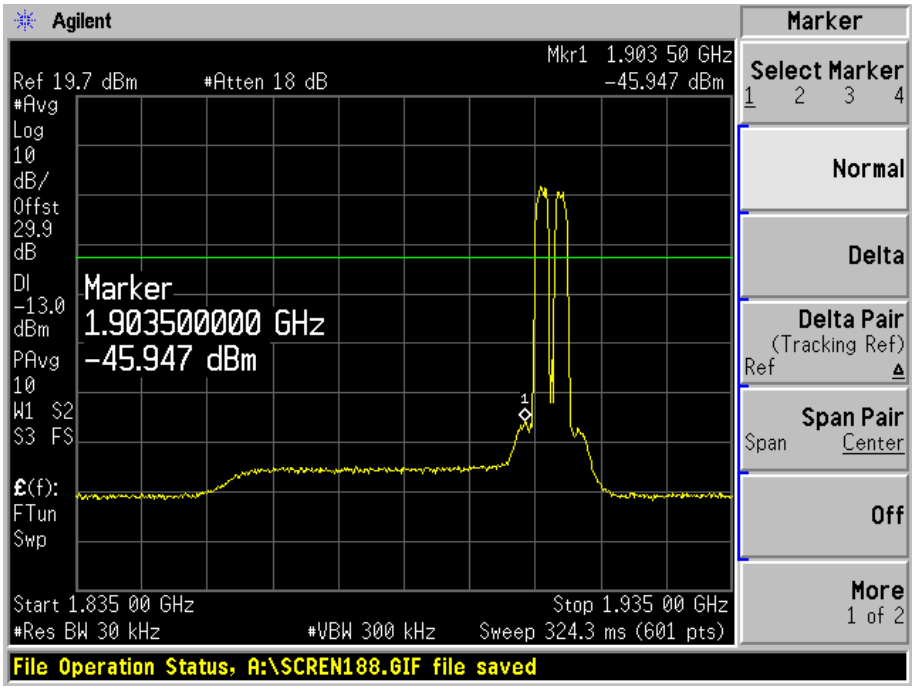
Intermodulation Downlink High CH (PCS)



Intermodulation Uplink Low CH (PCS)

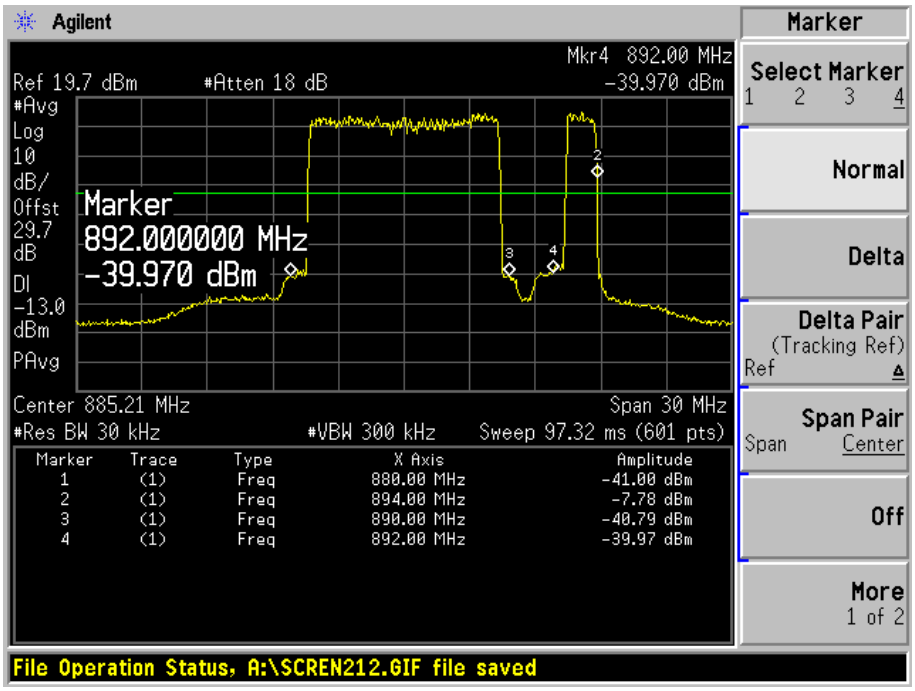


Intermodulation Uplink MidCH (PCS)

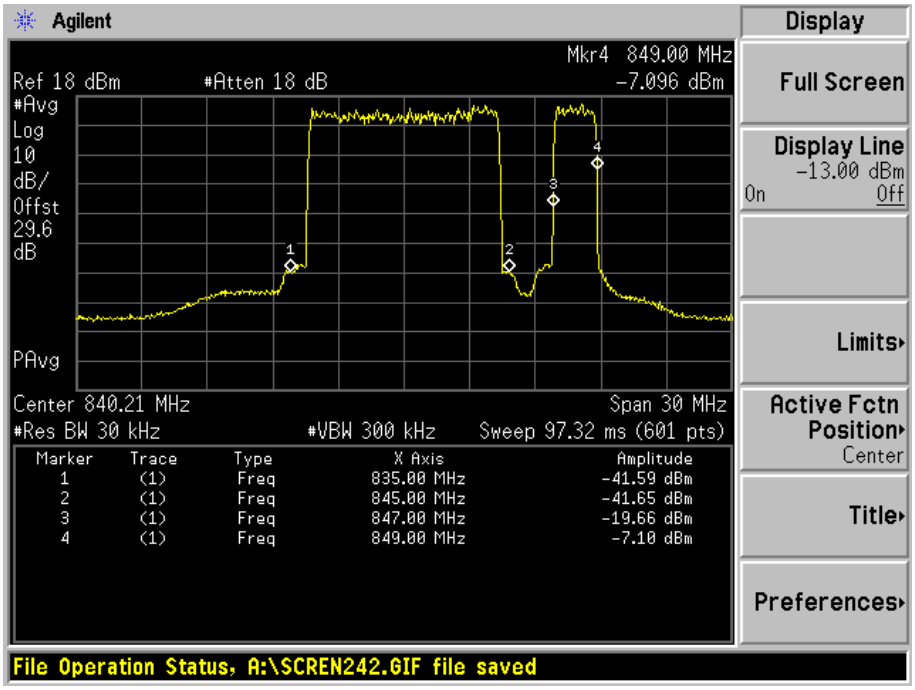


Intermodulation Uplink High CH (PCS)

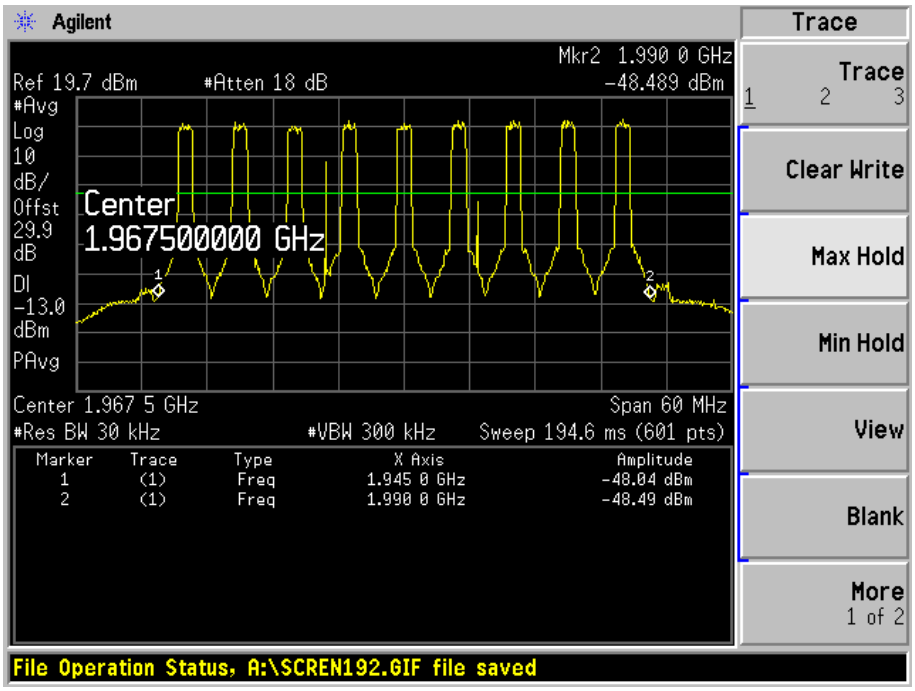
Out of Band Rejection



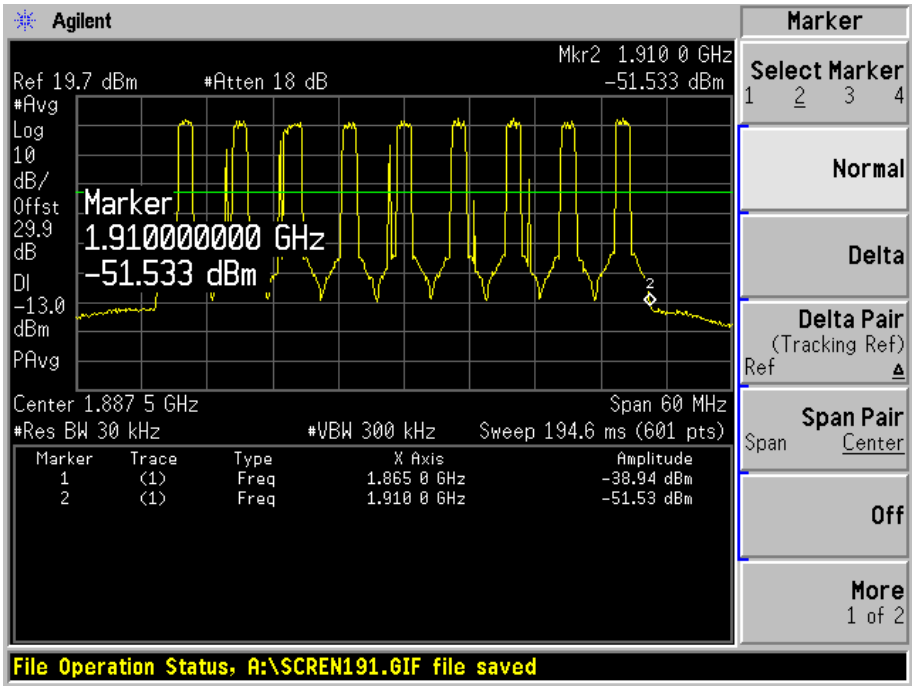
Out of Band Rejection Downlink (Cellular: B & B' Band)



Out of Band Rejection Uplink (Cellular: B & B' Band)



Out of Band Rejection Downlink (PCS:D,B1,B2,B3,E,F,C1,C2,C3 Band)



Out of Band Rejection Uplink (PCS:D,B1,B2,B3,E,F,C1,C2,C3 Band)

8. RADIATED SPURIOUS EMISSIONS

Test Requirement(s): § 2.1053 Measurements required: Field strength of spurious radiation.

§ 2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

§ 2.1053 (b): The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

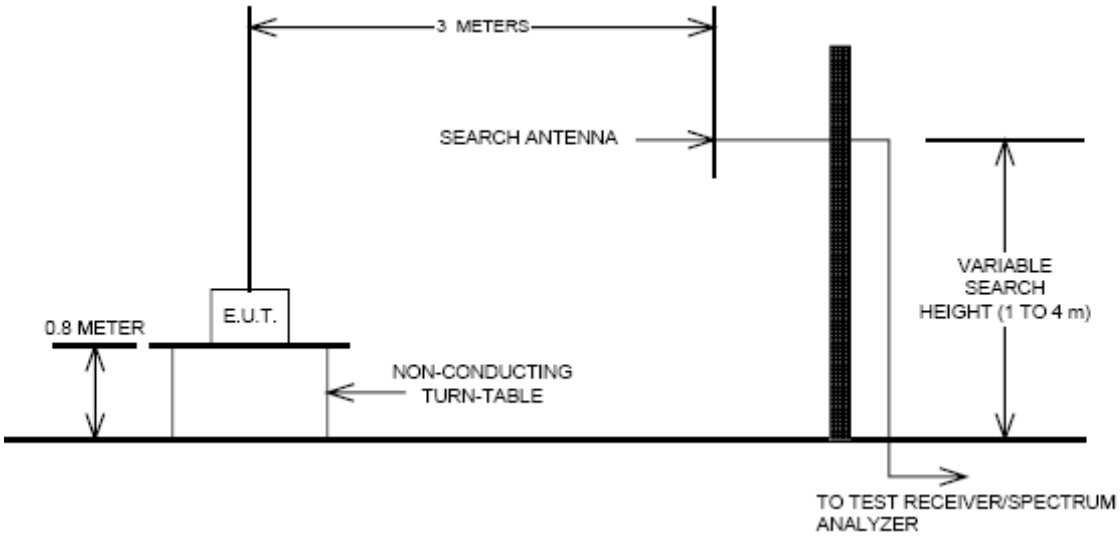
Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-C-2004 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360

and the receiving antenna scanned from 1-3m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission 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. Harmonic emissions up to the 10th or 40GHz, whichever was the lesser, were investigated.

Test Results: There were no emissions detected above the noise floor which was at least 20 dB below the limit.

Radiated Spurious Emissions Test Setup



9. RECEIVER SPURIOUS EMISSIONS

Test Requirement(s):

RSS-129 Section 10, RSS-133 Section 6.6, RSS-GEN Section 4.10

Test Procedures:

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.

If the receiver is super-regenerative, stabilize it by coupling to it an unmodulated carrier on the receiver frequency (antenna conducted measurement) or by transmitting an unmodulated carrier on the receiver frequency from an antenna in the proximity of the receiver (radiated measurement). Taking care not to overload the receiver, vary the amplitude and frequency of the stabilizing signal to obtain the highest level of the spurious emissions from the receiver.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

Spurious Frequency (MHz)	Field Strength (microvolts/m) at 3 metres
30-88	100
88-216	150
216-960	200
960-1610	500
Above 1610	1000

Test Results: There were no emissions detected above the noise floor

30 MHz ~ 1 GHz

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
288.0	16.9	12.5	4.1	V	33.5	46.0	-12.5

Above 1 GHz

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
No Peaks Found							

10. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

Test Requirement(s):

§2.1055(a)(1) §22.355, §24.235

Test Procedures:

As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Spectrum Analyzer.

The EUT was placed in the Environmental Chamber.

A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option

on the Spectrum Analyzer was used to measure frequency deviations.

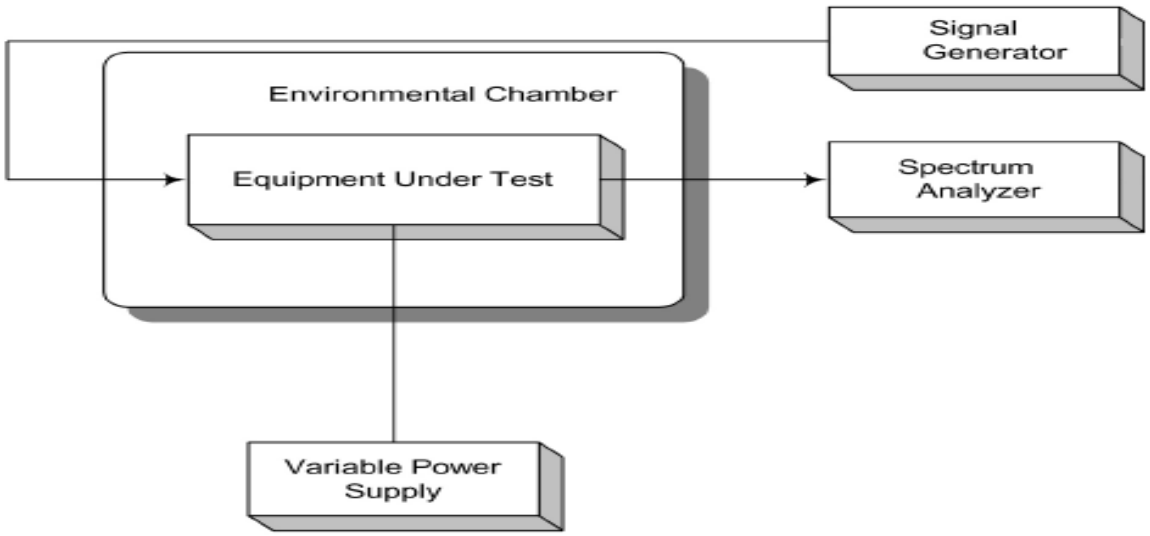
The frequency drift was investigated for every 10 ℃ increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50 ℃.

Voltage supplied to EUT is 120 Vac reference temperature was done at 20℃. The voltage was varied by ± 15 % of nominal

Test Results:

The E.U.T was found in compliance for Frequency Stability and Voltage Test

Test Setup:



Frequency Stability and Voltage Test Results

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	+20(Ref)	881 520 000 187	0.187	0.0000000223	0.0002
100%	-30	881 520 000 152	0.152	0.0000000182	0.0002
100%	-20	881 520 000 132	0.132	0.0000000158	0.0002
100%	-10	881 520 000 147	0.147	0.0000000176	0.0002
100%	0	881 520 000 123	0.123	0.0000000147	0.0001
100%	+10	881 520 000 126	0.126	0.0000000151	0.0002
100%	+30	881 520 000 112	0.112	0.0000000134	0.0001
100%	+40	881 520 000 163	0.163	0.0000000195	0.0002
100%	+50	881 520 000 128	0.128	0.0000000153	0.0002
115%	+20	881 520 000 137	0.137	0.0000000164	0.0002
85%	+20	881 520 000 131	0.131	0.0000000157	0.0002

(Cellular Downlink Mid CH)

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	+20(Ref)	1967 500 000 490	0.490	0.0000000249	0.0002
100%	-30	1967 500 000 444	0.444	0.0000000226	0.0002
100%	-20	1967 500 000 532	0.532	0.0000000270	0.0003
100%	-10	1967 500 000 528	0.528	0.0000000268	0.0003
100%	0	1967 500 000 416	0.416	0.0000000211	0.0002
100%	+10	1967 500 000 548	0.548	0.0000000279	0.0003
100%	+30	1967 500 000 469	0.469	0.0000000238	0.0002
100%	+40	1967 500 000 451	0.451	0.0000000229	0.0002
100%	+50	1967 500 000 575	0.575	0.0000000292	0.0003
115%	+20	1967 500 000 439	0.439	0.0000000223	0.0002
85%	+20	1967 500 000 474	0.474	0.0000000241	0.0002

(PCS Downlink Mid CH)

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	+20(Ref)	840 210 000 358	0.358	0.0000000426	0.0004
100%	-30	840 210 000 368	0.368	0.0000000438	0.0004
100%	-20	840 210 000 356	0.356	0.0000000424	0.0004
100%	-10	840 210 000 387	0.387	0.0000000461	0.0005
100%	0	840 210 000 362	0.362	0.0000000431	0.0004
100%	+10	840 210 000 397	0.397	0.0000000473	0.0005
100%	+30	840 210 000 358	0.358	0.0000000426	0.0004
100%	+40	840 210 000 352	0.352	0.0000000419	0.0004
100%	+50	840 210 000 310	0.310	0.0000000369	0.0004
115%	+20	840 210 000 329	0.329	0.0000000392	0.0004
85%	+20	840 210 000 353	0.353	0.0000000420	0.0004

(Cellular Uplink Mid CH)

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	+20(Ref)	1887 500 000 544	0.544	0.0000000288	0.0003
100%	-30	1887 500 000 563	0.563	0.0000000298	0.0003
100%	-20	1887 500 000 573	0.573	0.0000000304	0.0003
100%	-10	1887 500 000 564	0.564	0.0000000299	0.0003
100%	0	1887 500 000 538	0.538	0.0000000285	0.0003
100%	+10	1887 500 000 449	0.449	0.0000000238	0.0002
100%	+30	1887 500 000 550	0.55	0.0000000291	0.0003
100%	+40	1887 500 000 462	0.462	0.0000000245	0.0002
100%	+50	1887 500 000 539	0.539	0.0000000286	0.0003
115%	+20	1887 500 000 552	0.552	0.0000000292	0.0003
85%	+20	1887 500 000 564	0.564	0.0000000299	0.0003

(PCS Uplink Mid CH)

11. RF EXPOSURE STATEMENT

1. LIMITS

According to §1.1310 and §2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
0.3 - 1.34.....	614	1.63	*(100)	30
1.34 - 30.....	824/f	2.19/f	*(180/ f^2)	30
30 - 300.....	27.5	0.073	0.2	30
300 - 1500.....	.....	.....	f/1500	30
1500 - 100.000.....	.....	.....	1.0	30

F = frequency in MHz

* = Plane-wave equivalent power density

2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

2-1. Cellular Downlink

Max Peak output Power at antenna input terminal	24.920	dBm
Max Peak output Power at antenna input terminal	310.456	mW
Prediction distance	20.000	cm
Prediction frequency	881.520	MHz
Antenna Gain(typical)	7.000	dBi
Antenna Gain(numeric)	5.012	-
Power density at prediction frequency(S)	0.310	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.588	mW/cm^2

2-2. PCS Downlink

Max Peak output Power at antenna input terminal	23.93000	dBm
Max Peak output Power at antenna input terminal	247.17241	mW
Prediction distance	20.00000	cm
Prediction frequency	1947.50000	MHz
Antenna Gain(typical)	12.00000	dBi
Antenna Gain(numeric)	15.84893	-
Power density at prediction frequency (S)	0.77935	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm^2

2-3. Cellular Uplink

Max Peak output Power at antenna input terminal	25.150	dBm
Max Peak output Power at antenna input terminal	327.341	mW
Prediction distance	20.000	cm
Prediction frequency	847.750	MHz
Antenna Gain(typical)	7.000	dBi
Antenna Gain(numeric)	5.012	-
Power density at prediction frequency(S)	0.326	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.565	mW/cm^2

2-4. PCS Uplink

Max Peak output Power at antenna input terminal	23.89000	dBm
Max Peak output Power at antenna input terminal	244.90632	mW
Prediction distance	20.00000	cm
Prediction frequency	1887.50000	MHz
Antenna Gain(typical)	12.00000	dBi
Antenna Gain(numeric)	15.84893	-
Power density at prediction frequency (S)	0.77220	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm^2

3. RESULTS

The power density level at 20 cm is 0.326 mW/cm^2(Cellular), 0.77935 mW/cm^2(PCS), which is below the uncontrolled exposure limit for Cellular & PCS band.

Warning: In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, it must also have a minimum distance of 20 cm from the body during normal operation.