HCT CO.,LTD.

HCT CO., LTD.

Product Compliance Division

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CERTIFICATE OF COMPLIANCE

FCC Certification

Applicant Name:
UFINE Technologies Co.,Ltd.

Address:
46, Geumgok-dong, Bundang-gu, Seong Nam-Si, Gyeonggi-do, Korea

Date of Issue:
January 20, 2010

Location:
HCT CO., LTD., San 136-1 Ami-ri, Bubal-eup, Icheon-si, Gyeonggi-do, Korea

Test Report No.: HCTR1002FR05

HCT FRN: 0005866421

IC Recognition No.: IC 5944A-1

FCC ID	**: WZI-UHR-230S**
APPLICANT	**: UFINE Technologies Co.,Ltd..**

Model(s):	UHR-230S
EUT Type:	Booster
Frequency Ranges:	869-894 MHz (GSM)
Max. RF Output Power:	13.0 dBm (GSM)
Emission Designator(s):	G7W(GSM/EDGE)
FCC Rule Part(s):	Title 47 of CFR, Part 22

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 been denied FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Chang Seok Choi

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

Approved by
: Sang Jun Lee
Manager of RF Team

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company	**UFINE Technologies Co., Ltd.**
Contact Point	**46, Geumgok-dong, Bundang-gu, Seong Nam-si, Gyeonggi-do, 463-804, Korea**

- **EUT Type: Booster**
- **MODEL : UHR-230S**
- **Frequency Ranges: 869 – 894 MHz (GSM)**
- **RF Output Power: 13.0 dBm (GSM)**
- **FCC Rules Part(s): Title 47 of CFR, Part 22**
- **Emission Designators: G7W (GSM/EDGE)**
- **Modulation : GMSK (GSM), 8PSK (EDGE)**
- **Place of Tests: HCT Co., Ltd.**

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.**

Description	Reference (FCC)	Results
RF Power Output	§2.1046 §22.913	Compliant
Modulation Characteristics	§2.1047	N/A
Occupied Bandwidth	§2.1049	Compliant
Spurious Emissions at Antenna Terminals	§2.1051 §22.917	Compliant
Frequency Stability	§2.1055 §22.355	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	12/15/2010	MY42082646
Agilent	E4416A /Power Meter	Annual	01/21/2010	GB41291412
WEINSCHEL	67-30-33/ATTENUATOR	Annual	02/03/2010	BR0530
Schwarzbeck	VULB 9168/ TRILOG Antenna	Annual	01/06/2011	9168-200
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	04/25/2010	1200937
Schwarzbeck	BBHA 9120D/ Horn Antenna	Annual	03/26/2010	147
Agilent	N9020A/ Signal Analyzer	Annual	02/19/2010	US46220219

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.

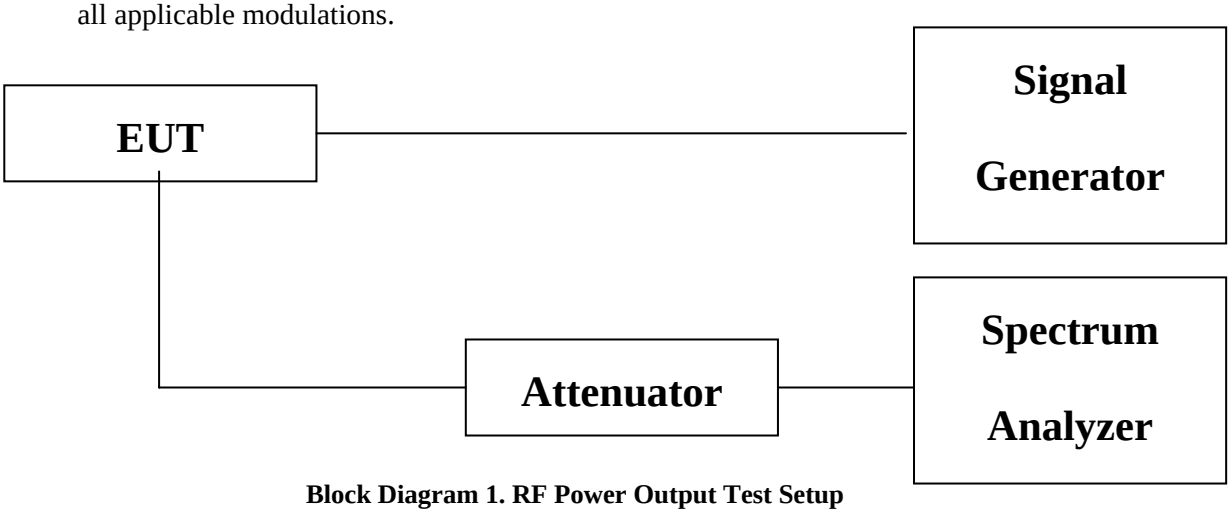
§ 22.913 Effective radiated power limits.

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.

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

(GSM)

CARRIER CHANNEL	DOWNLINK	
	Frequency (MHz)	Measured Power (dBm)
Low	869.2	7.74
Mid	881.6	9.08
High	893.8	9.64

INPUT SIGNAL	DOWNLINK
Source	GSM
Power Level	-35.6 dBm
Amplitude offset	6.4 dB

(EDGE)

CARRIER CHANNEL	DOWNLINK	
	Frequency (MHz)	Measured Power (dBm)
Low	869.2	10.81
Mid	881.6	12.80
High	893.8	12.99

INPUT SIGNAL	DOWNLINK
Source	EDGE
Power Level	-35.6 dBm
Amplitude offset	6.4 dB

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.

(GSM)

CARRIER CHANNEL	DOWNLINK		
	Frequency (MHz)	Measured Bandwidth (KHz)	
		99 %	26 dB
Low	869.2	249.51	317.4
Mid	881.6	247.57	315.7
High	893.8	247.87	312.2

(EDGE)

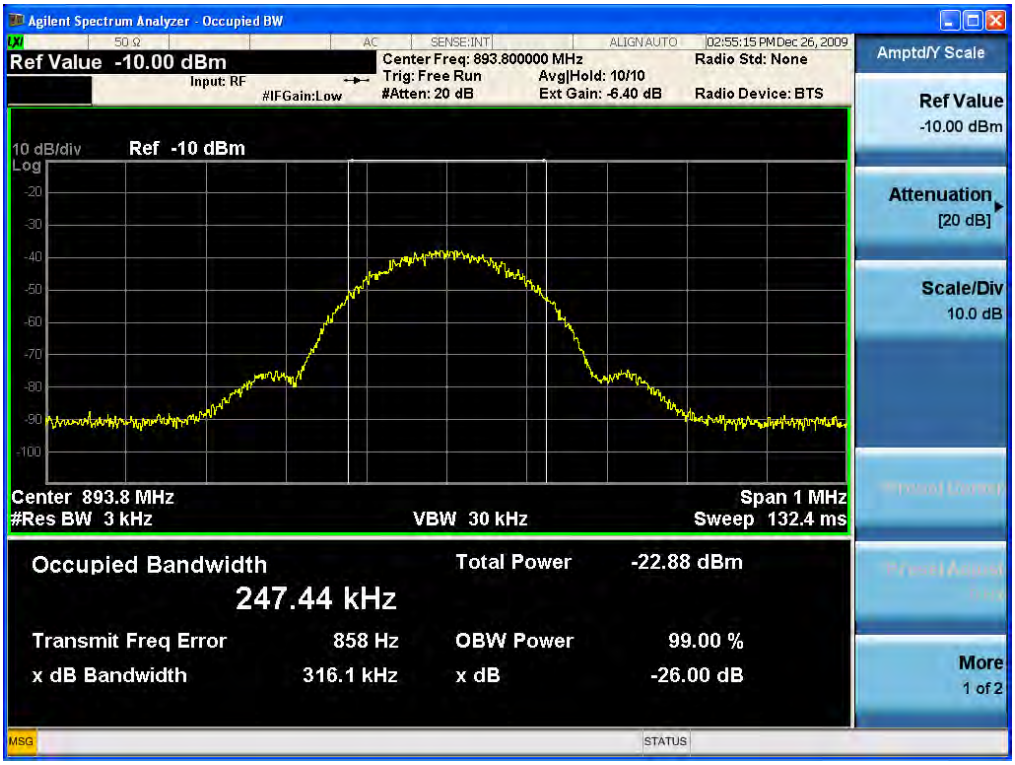
CARRIER CHANNEL	DOWNLINK		
	Frequency (MHz)	Measured Bandwidth (KHz)	
		99 %	26 dB
Low	869.2	241.30	308.1
Mid	881.6	243.53	306.8
High	893.8	243.56	302.2

Plots of Occupied Bandwidth

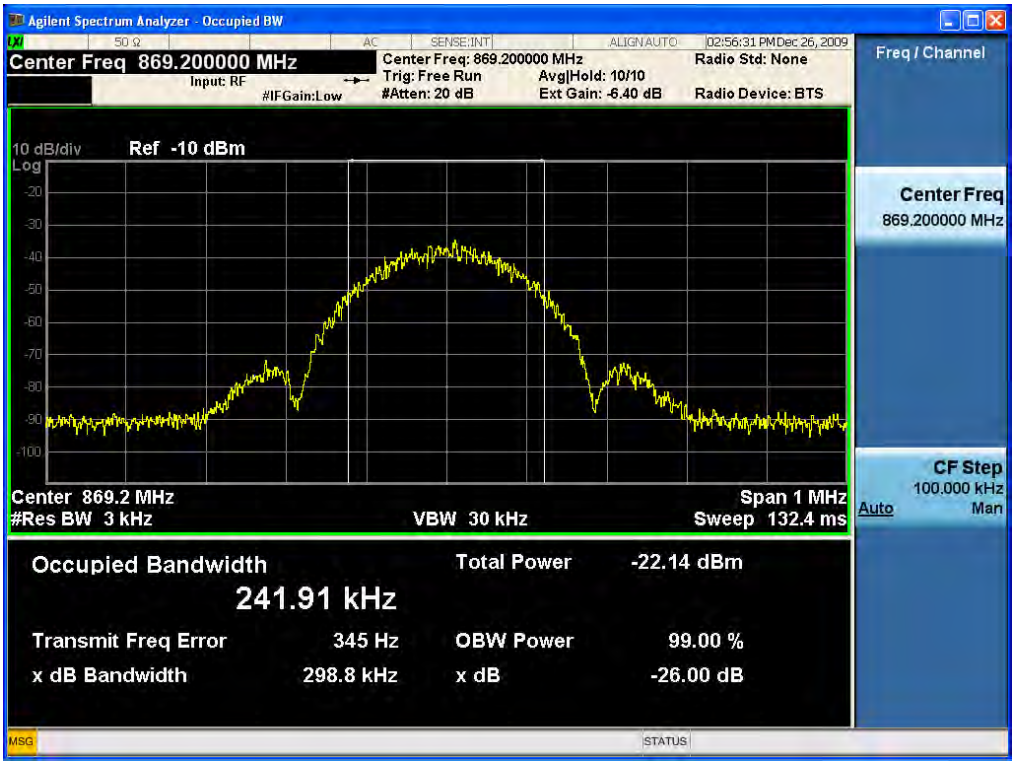
Downlink Low CH (GSM) Input Signal

Downlink Mid CH (GSM) Input Signal

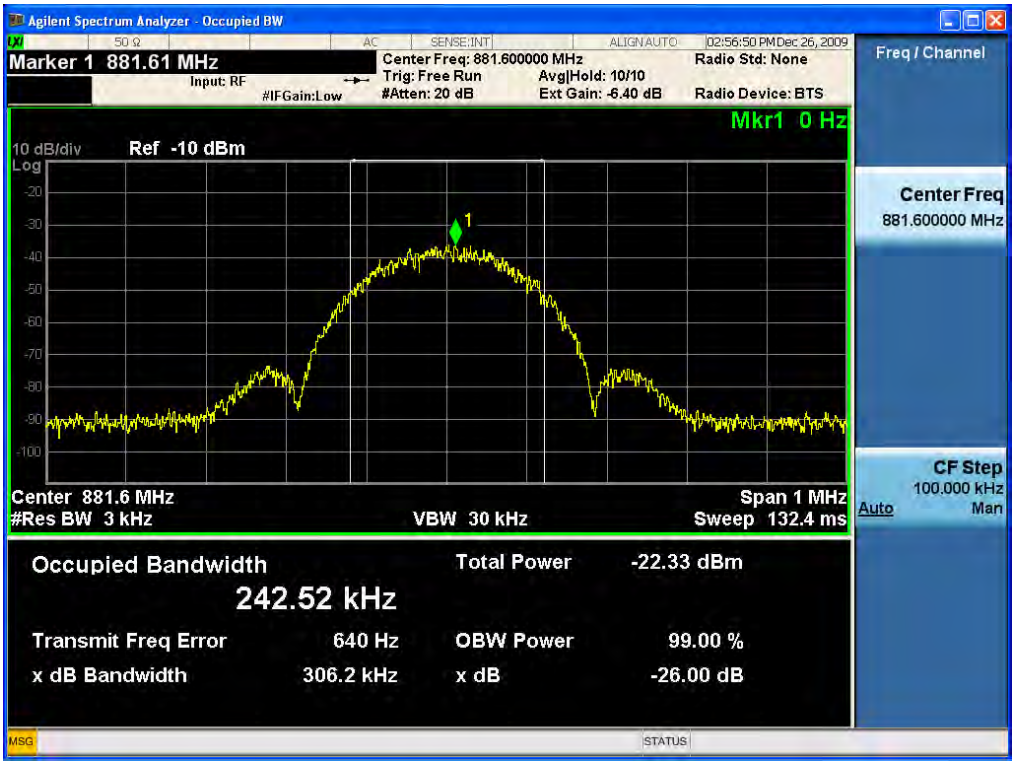
Downlink High CH (GSM) Input Signal



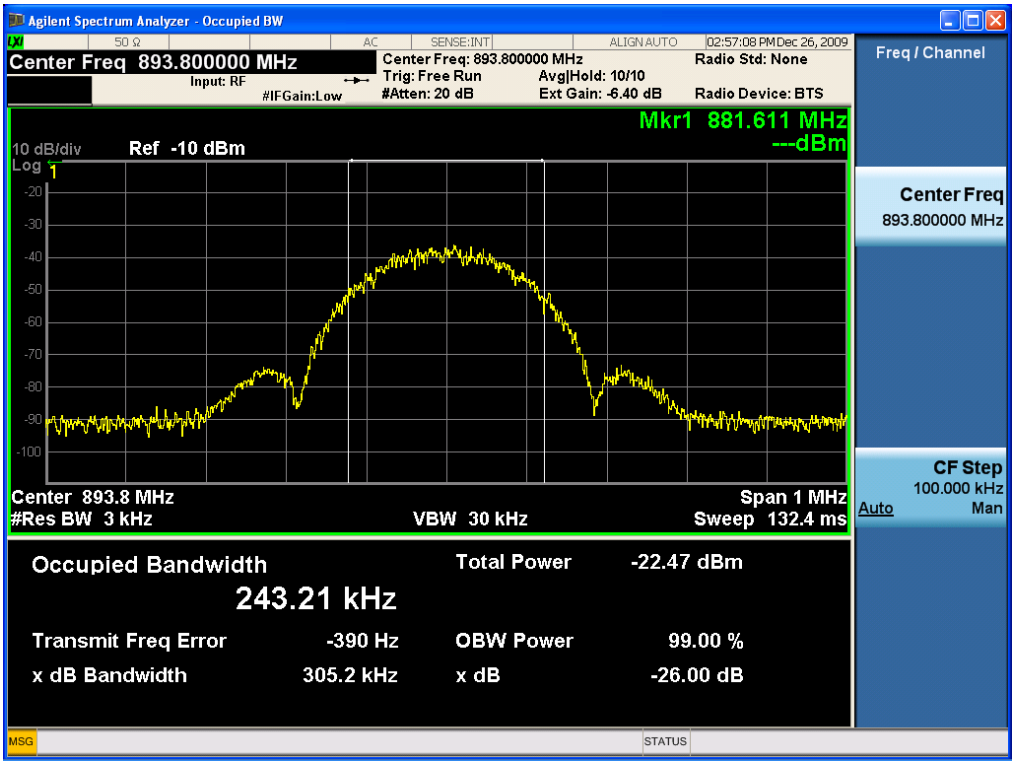
Downlink Low CH (GSM EDGE) Input Signal



Downlink Mid CH (GSM EDGE) Input Signal



Downlink High CH (GSM EDGE) Input Signal

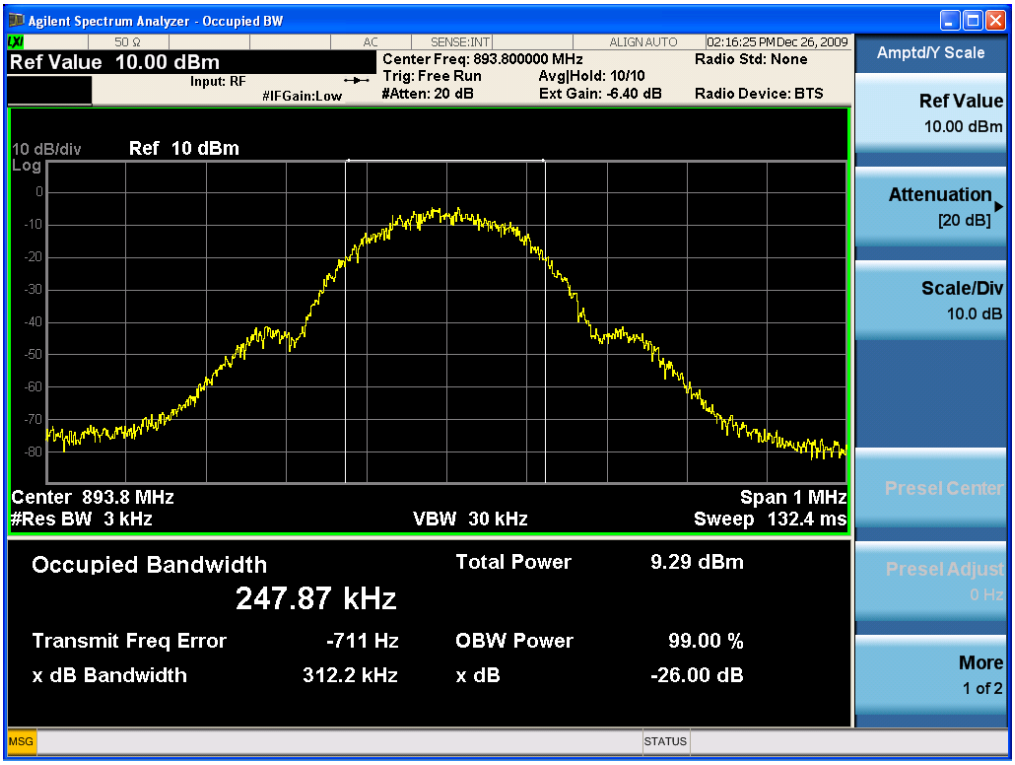


Plots of Occupied Bandwidth (99 %)

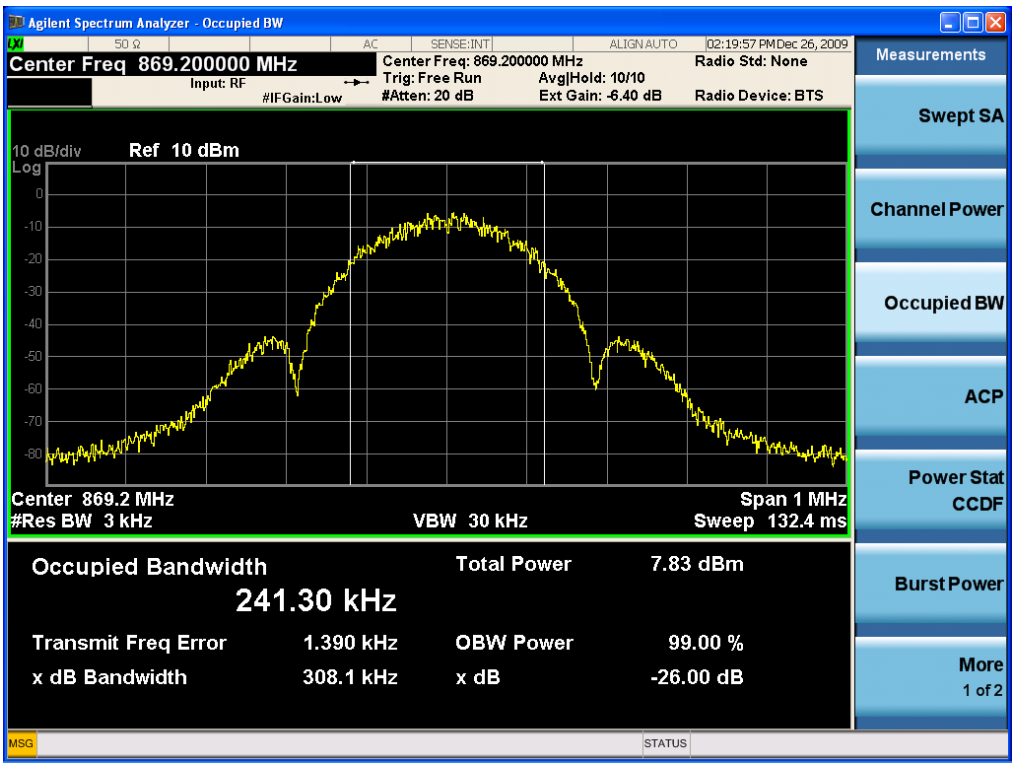
Downlink Low CH GSM

Downlink Mid CH GSM

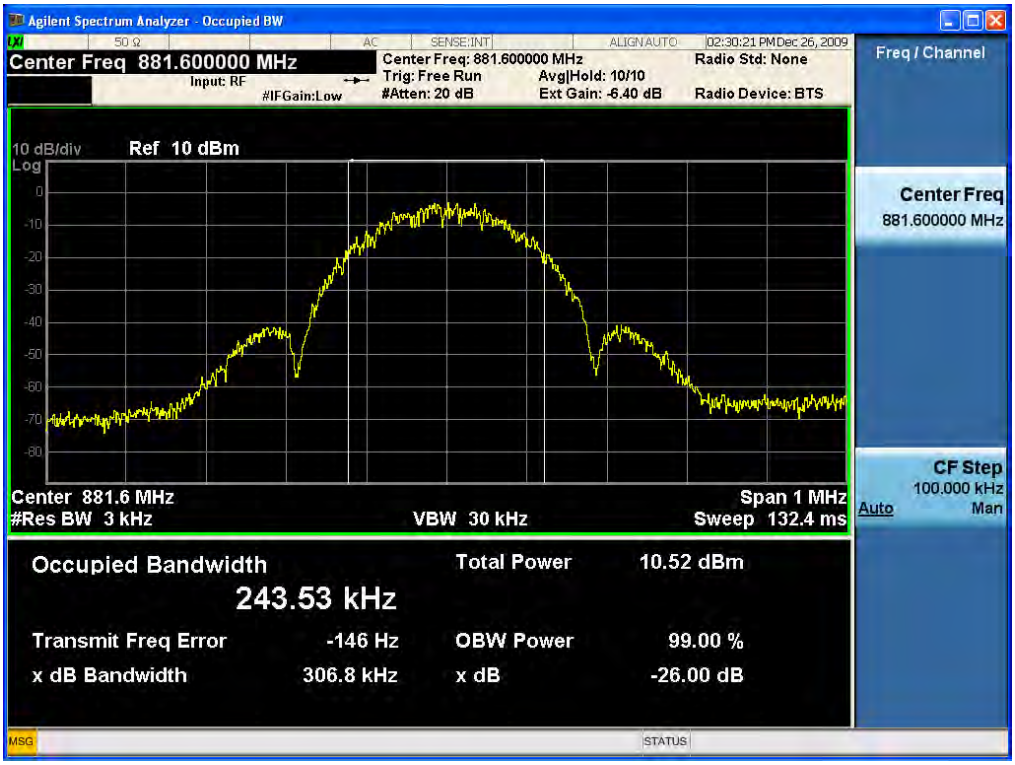
Downlink High CH GSM



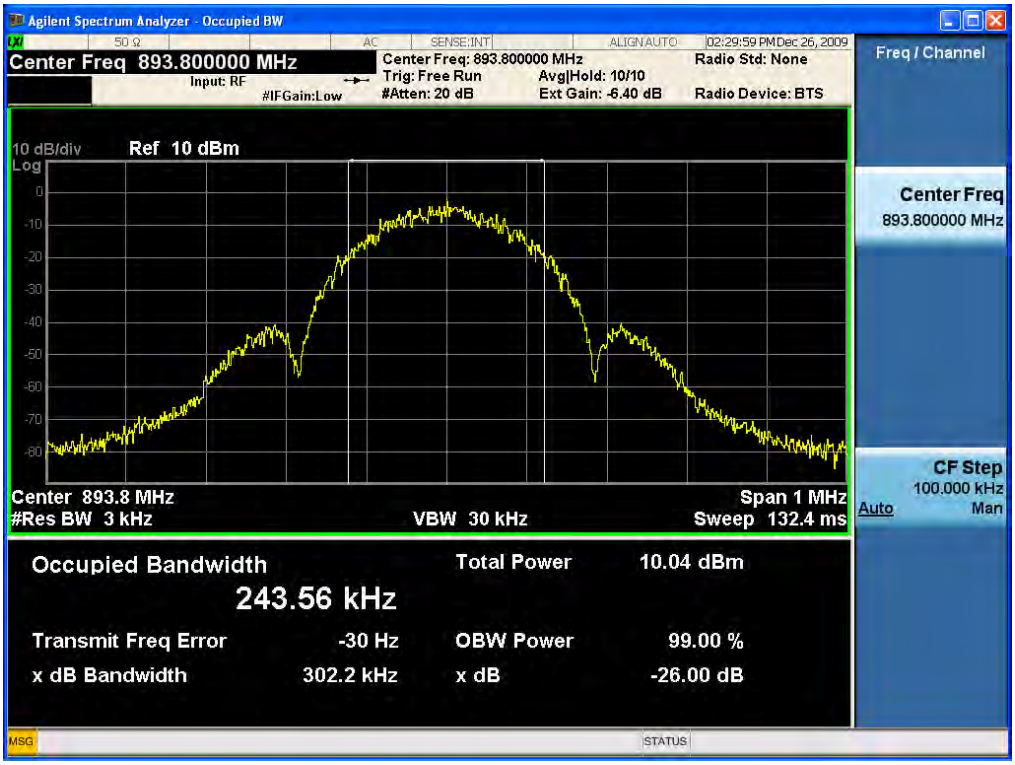
Downlink Low CH GSM EDGE



Downlink Mid CH GSM EDGE



Downlink High CH GSM EDGE



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(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.

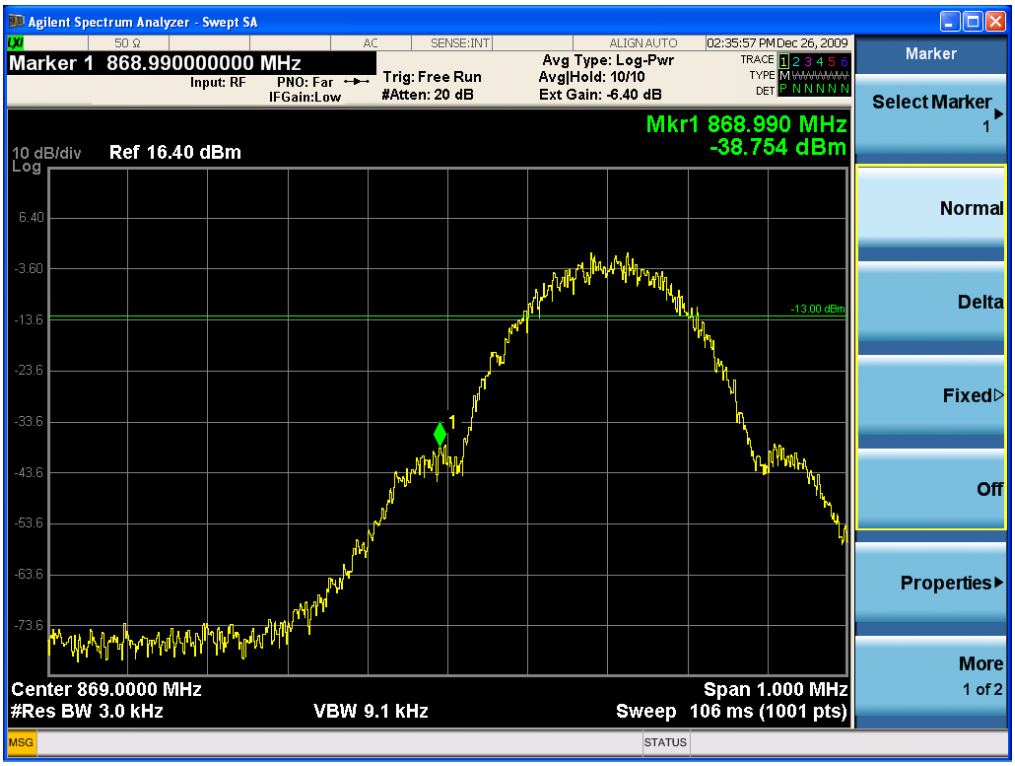
Test Procedures: A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the OEM A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum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

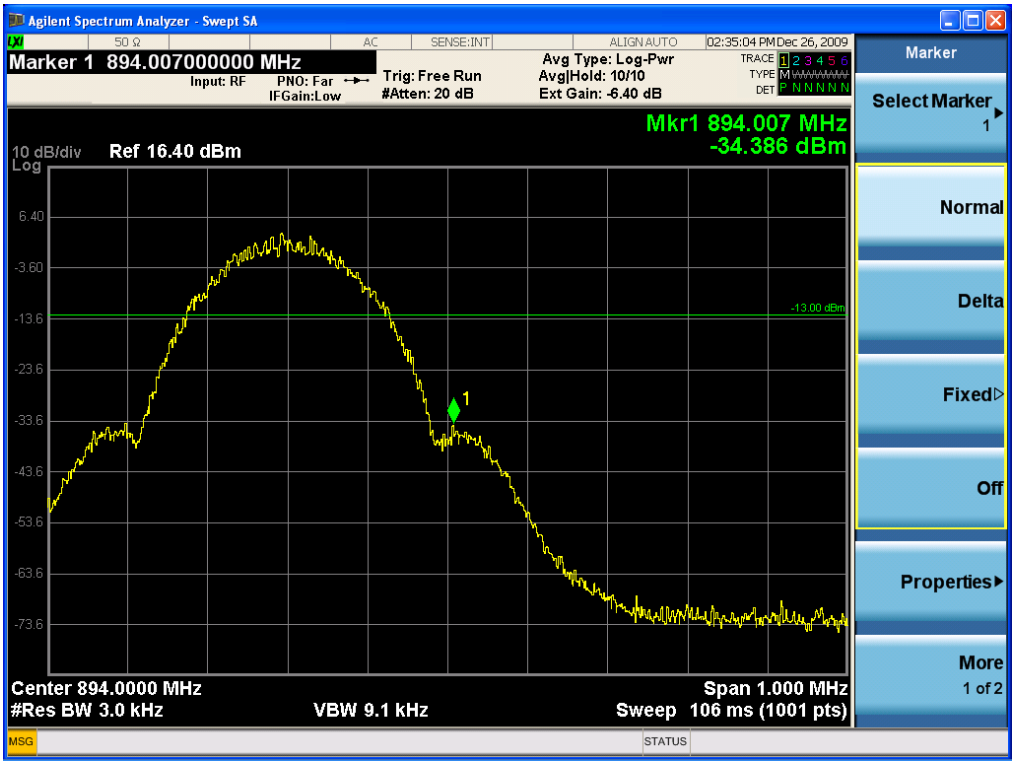
Test Results: The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

Plots of BAND EDGE

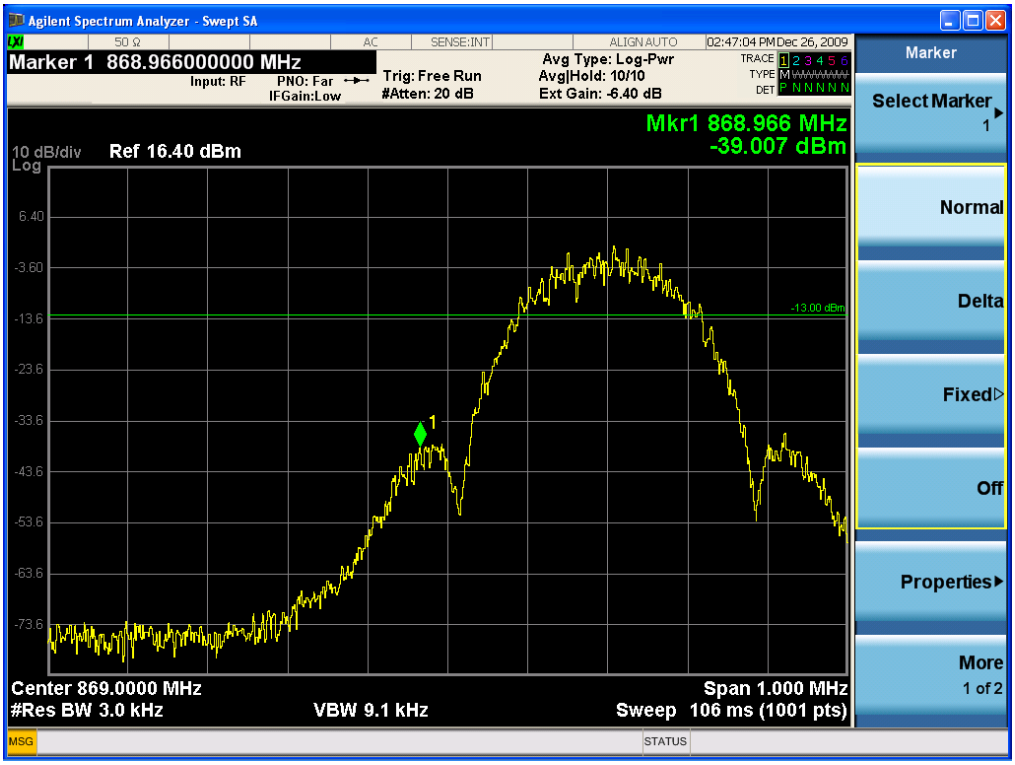
(Downlink Low CH-GSM)



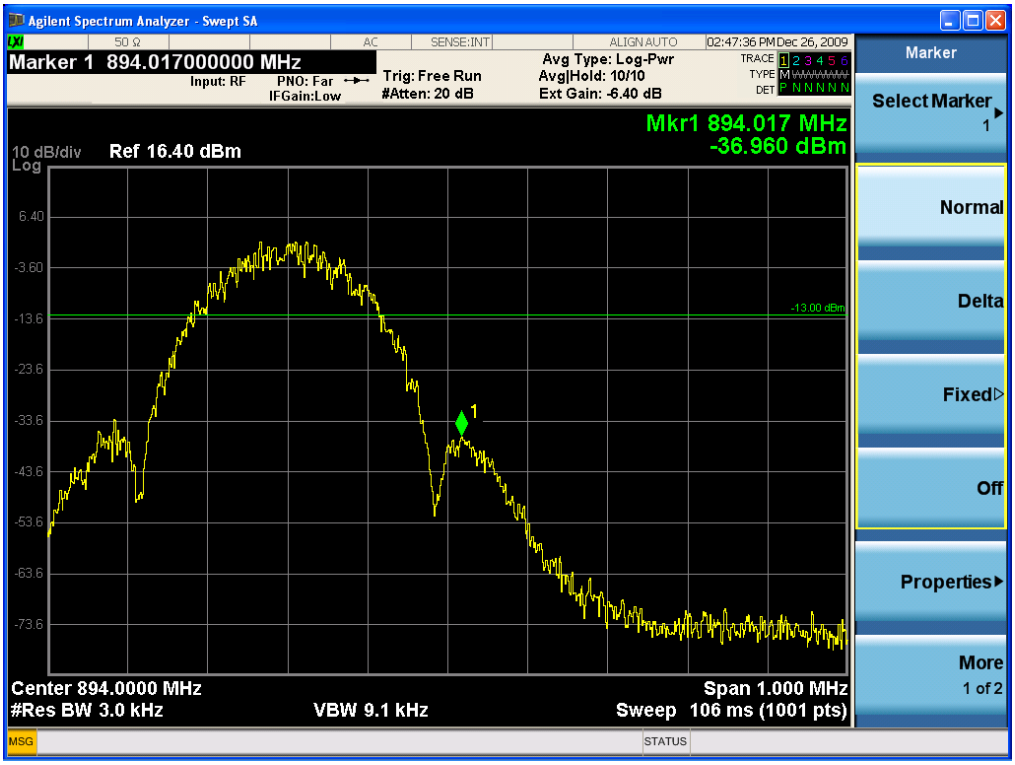
(Downlink High CH- GSM)



(Downlink Low CH-GSM EDGE)

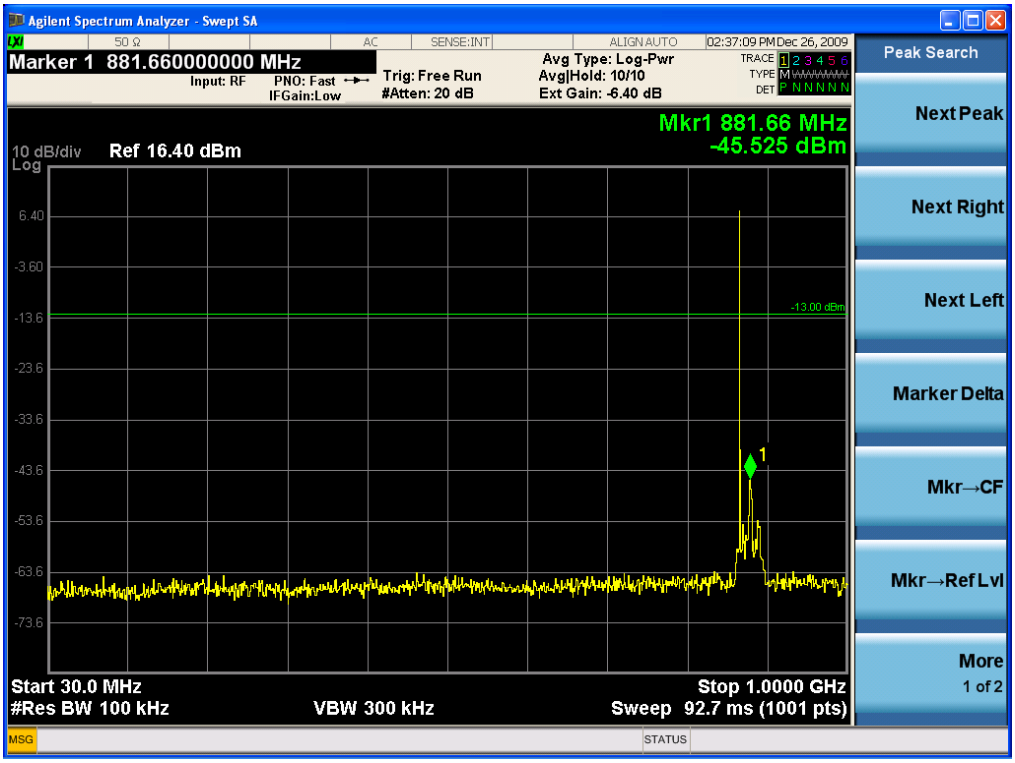


(Downlink High CH- GSM EDGE)

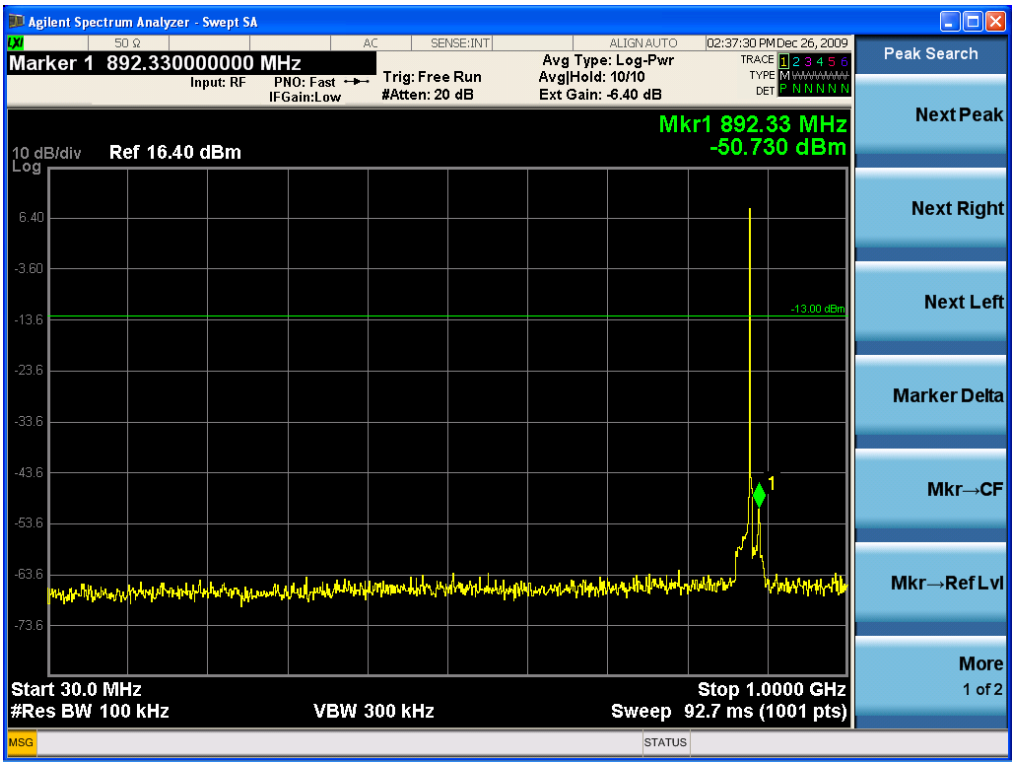


Plots of Spurious Emission

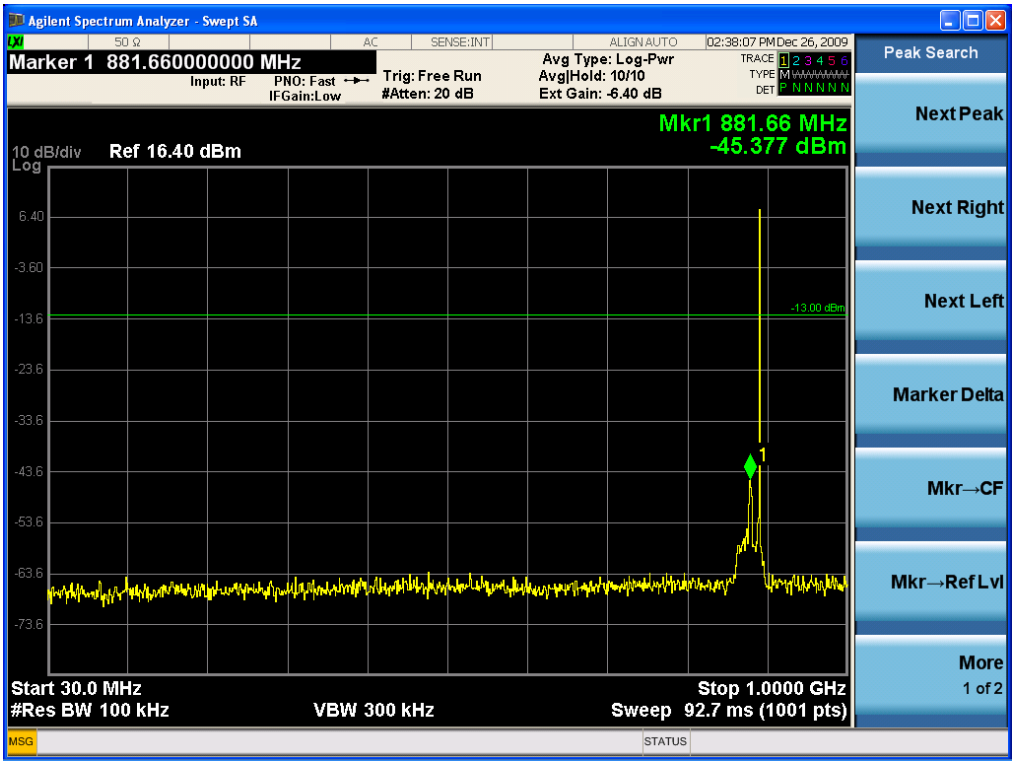
Conducted Spurious Emissions Downlink Low CH (30 MHz – 1 GHz-GSM)



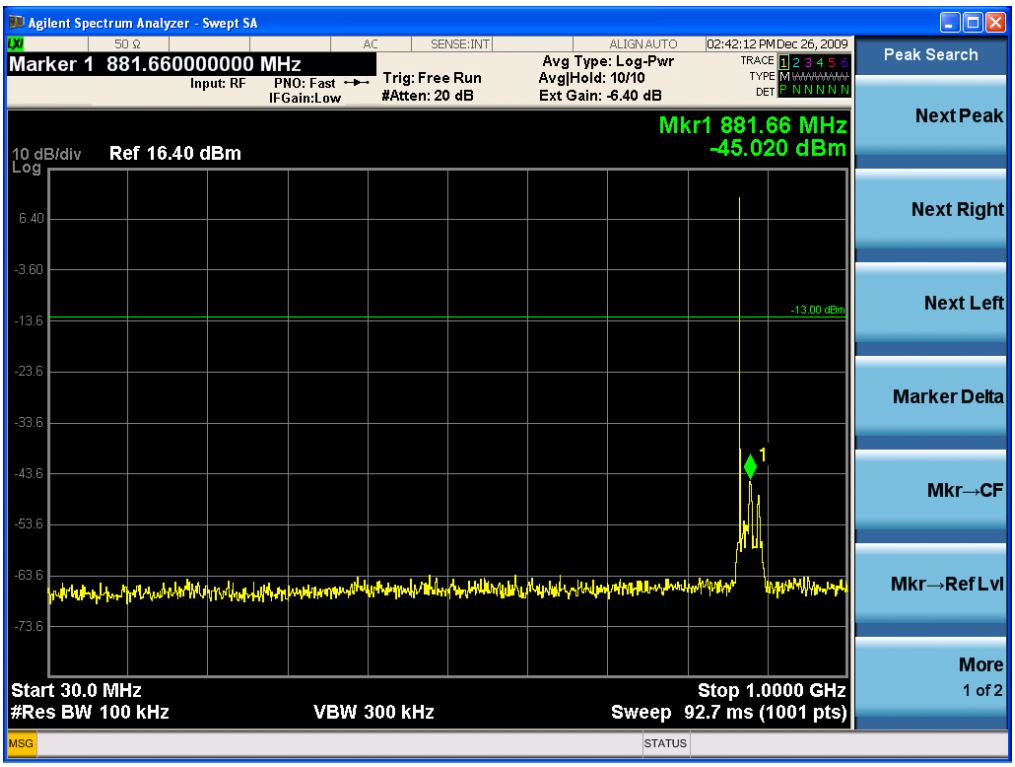
Conducted Spurious Emissions Downlink Mid CH (30 MHz – 1 GHz- GSM)



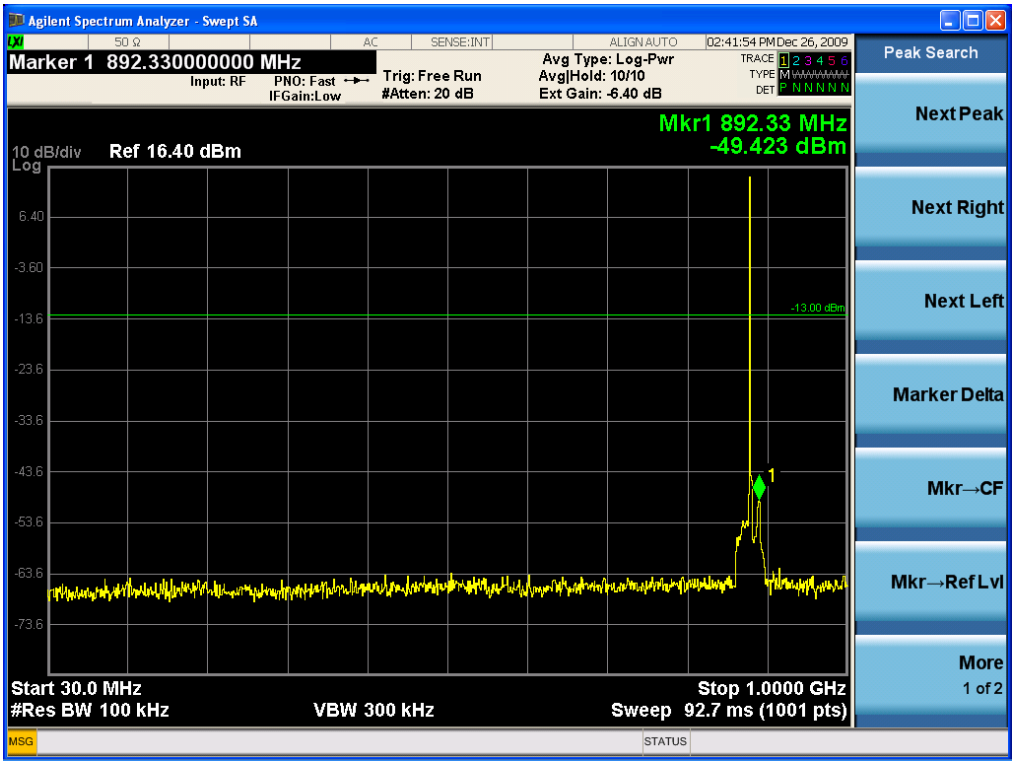
Conducted Spurious Emissions Downlink High CH (30 MHz – 1 GHz- GSM)



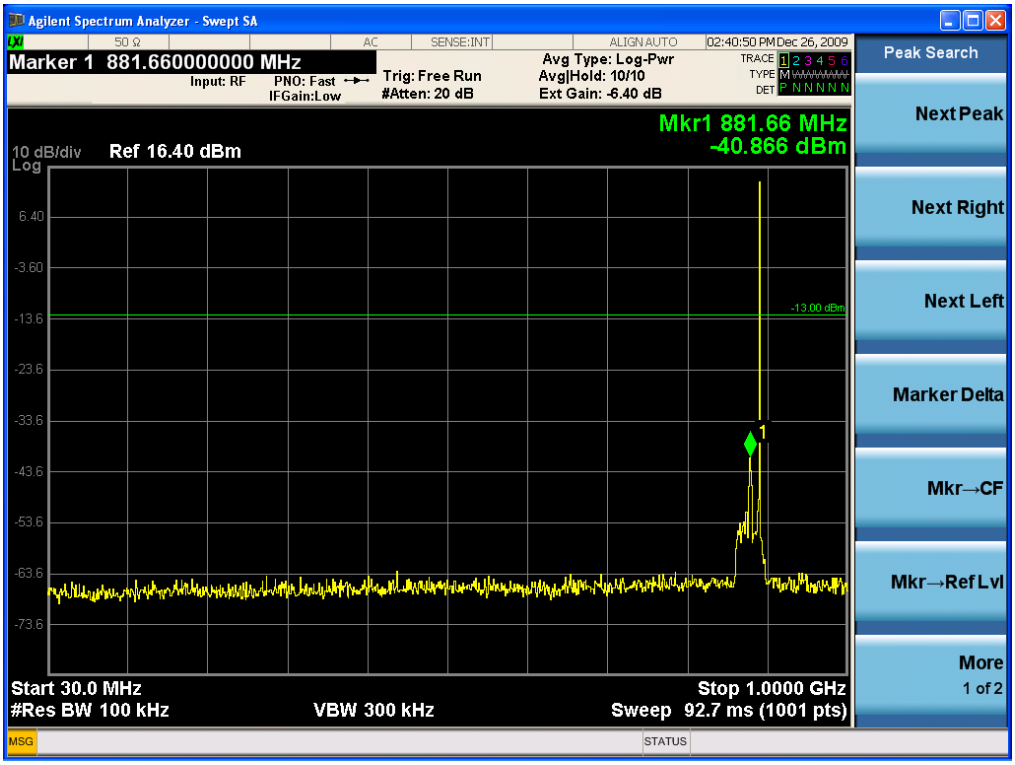
Conducted Spurious Emissions Downlink Low CH (30 MHz – 1 GHz-GSM EDGE)



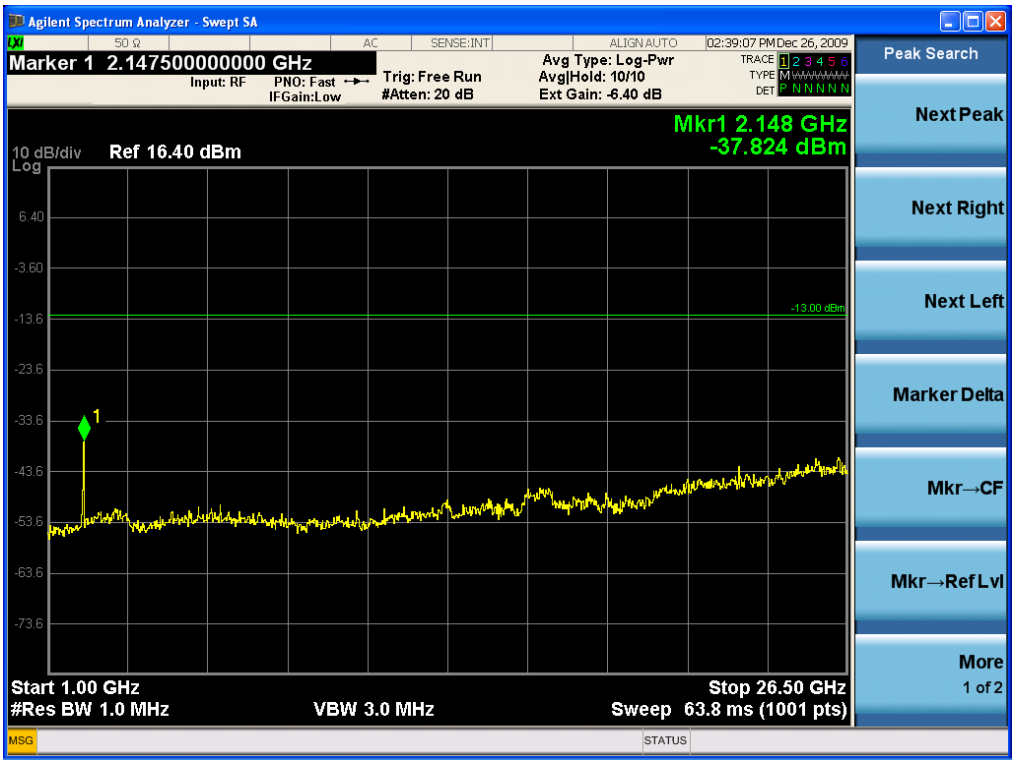
Conducted Spurious Emissions Downlink Mid CH (30 MHz – 1 GHz- GSM EDGE)



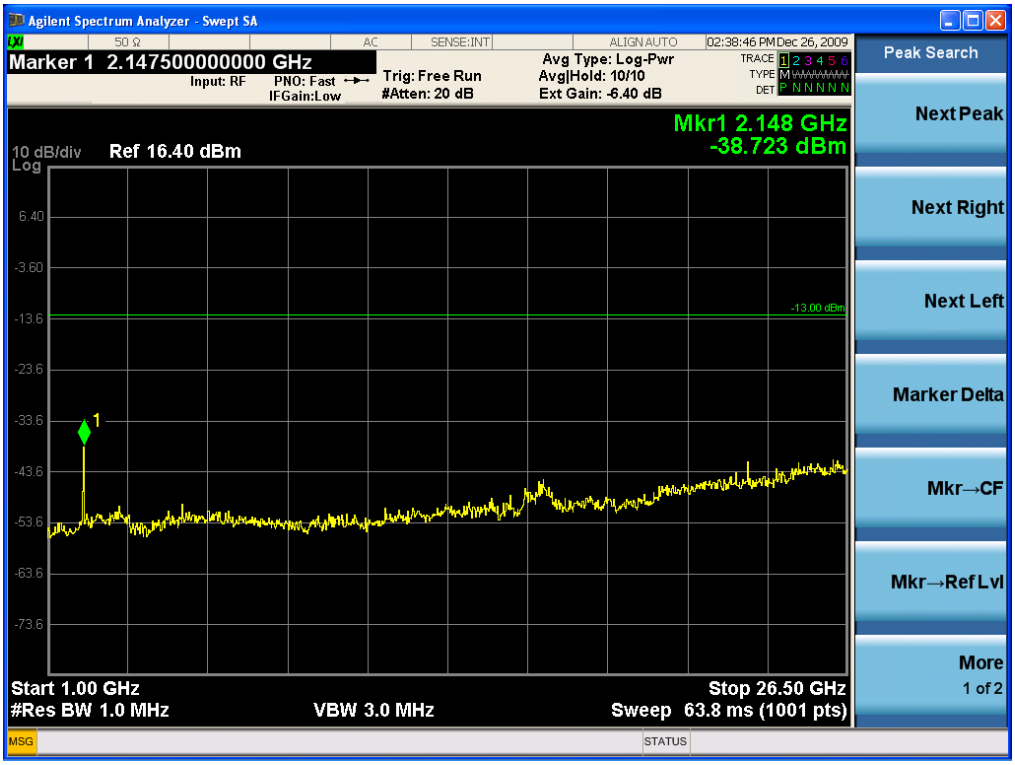
Conducted Spurious Emissions Downlink High CH (30 MHz – 1 GHz- GSM EDGE)



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



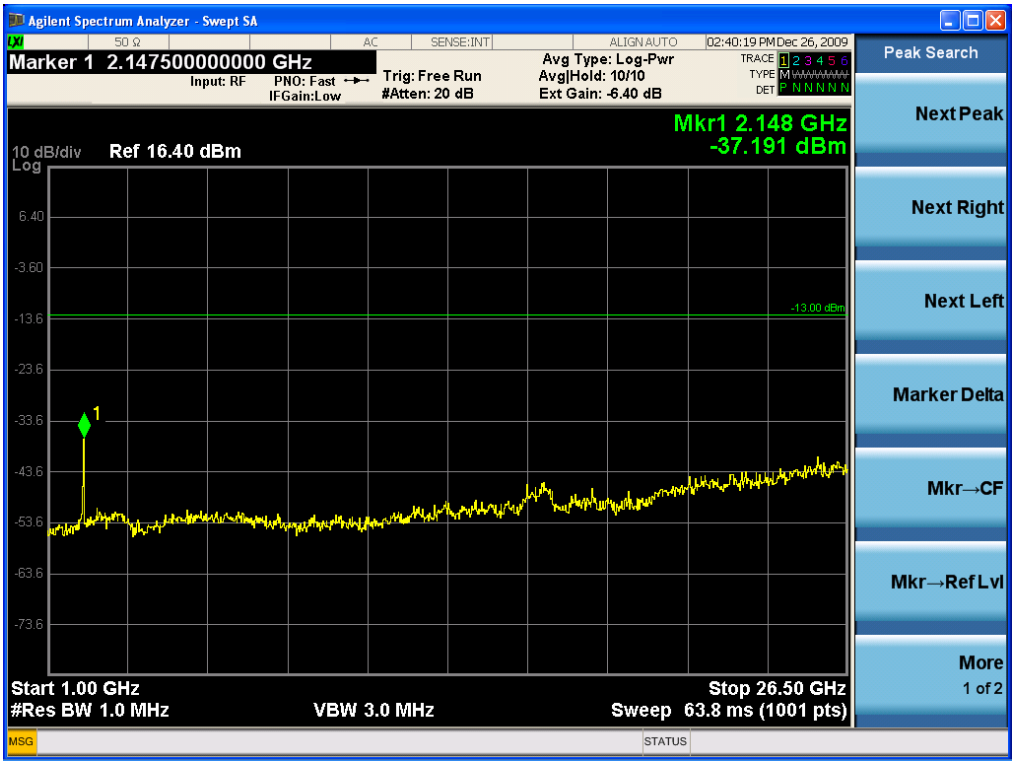
Conducted Spurious Emissions Downlink Low CH (1 GHz – 26.5 GHz- GSM)



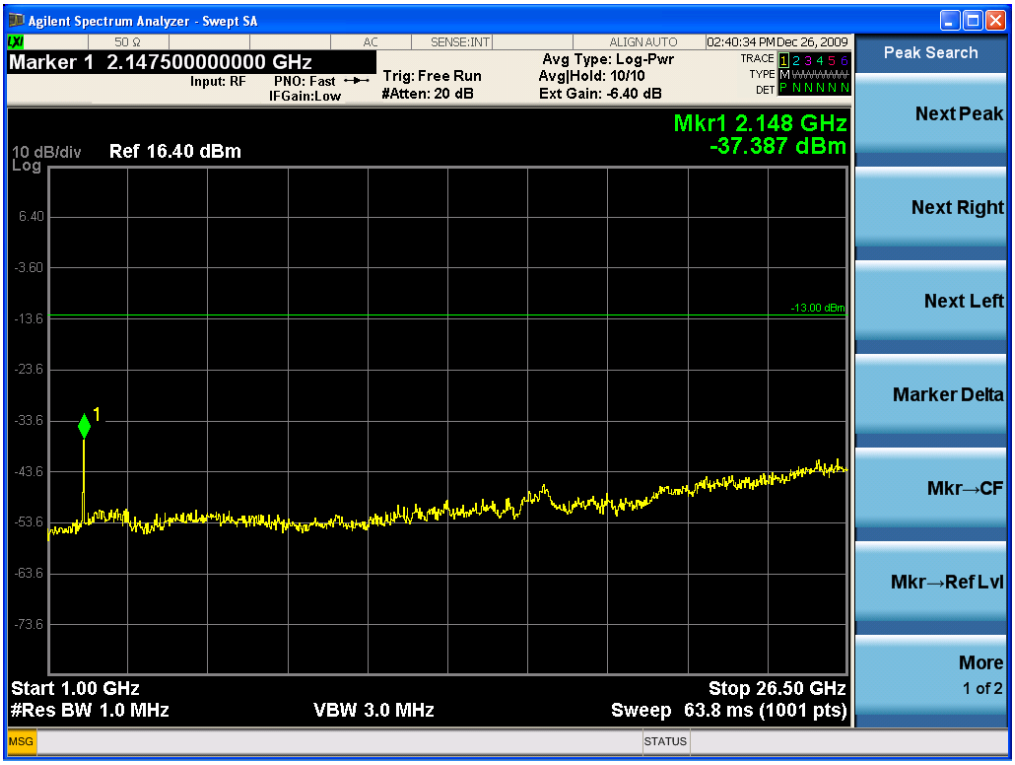
Conducted Spurious Emissions Downlink High CH (1 GHz – 26.5 GHz- GSM)

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

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



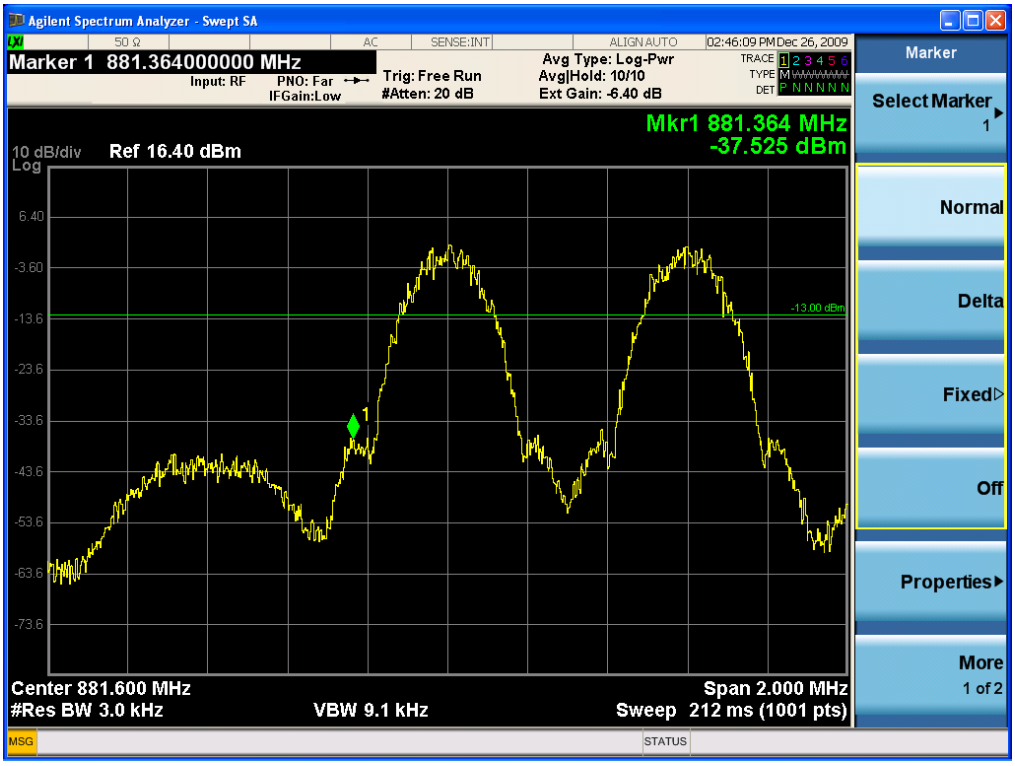
Conducted Spurious Emissions Downlink High CH (1 GHz – 26.5 GHz- GSM EDGE)



Intermodulation

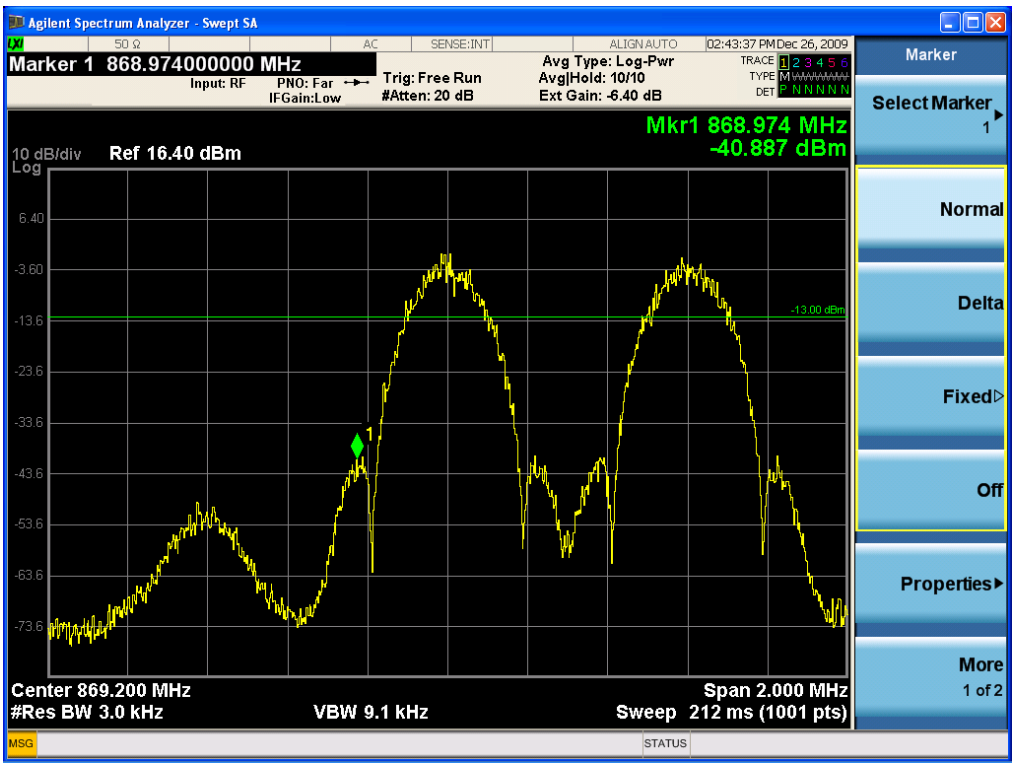
Intermodulation Downlink Low CH (GSM)

Intermodulation Downlink Mid CH (GSM)

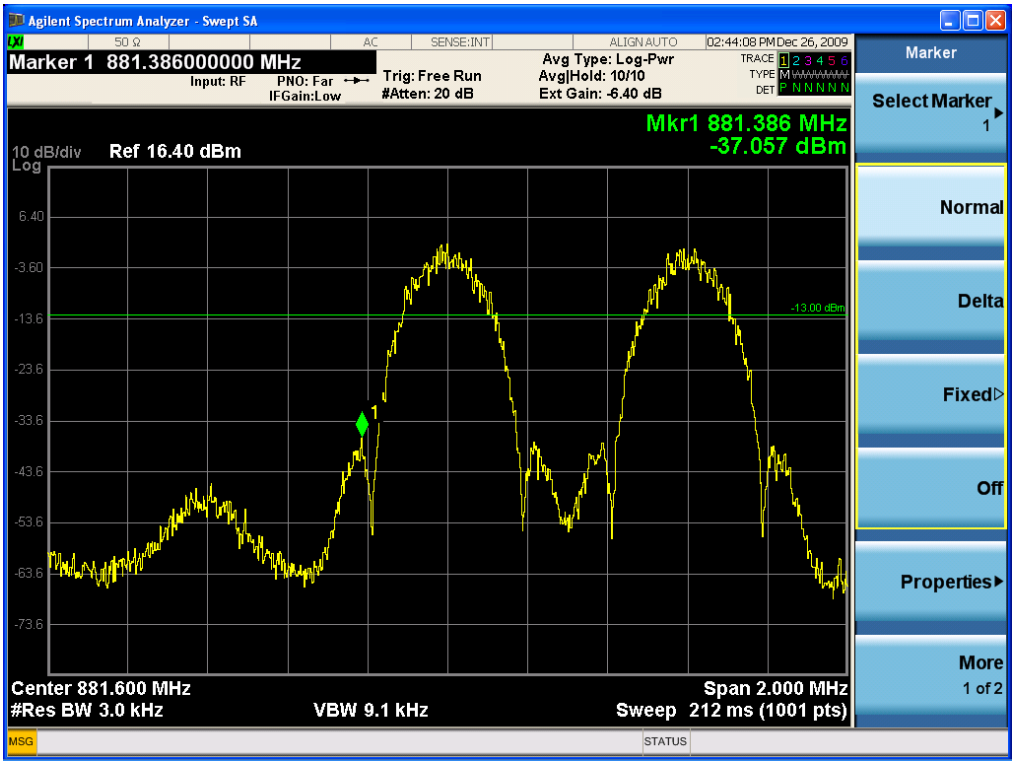


Intermodulation Downlink High CH (GSM)

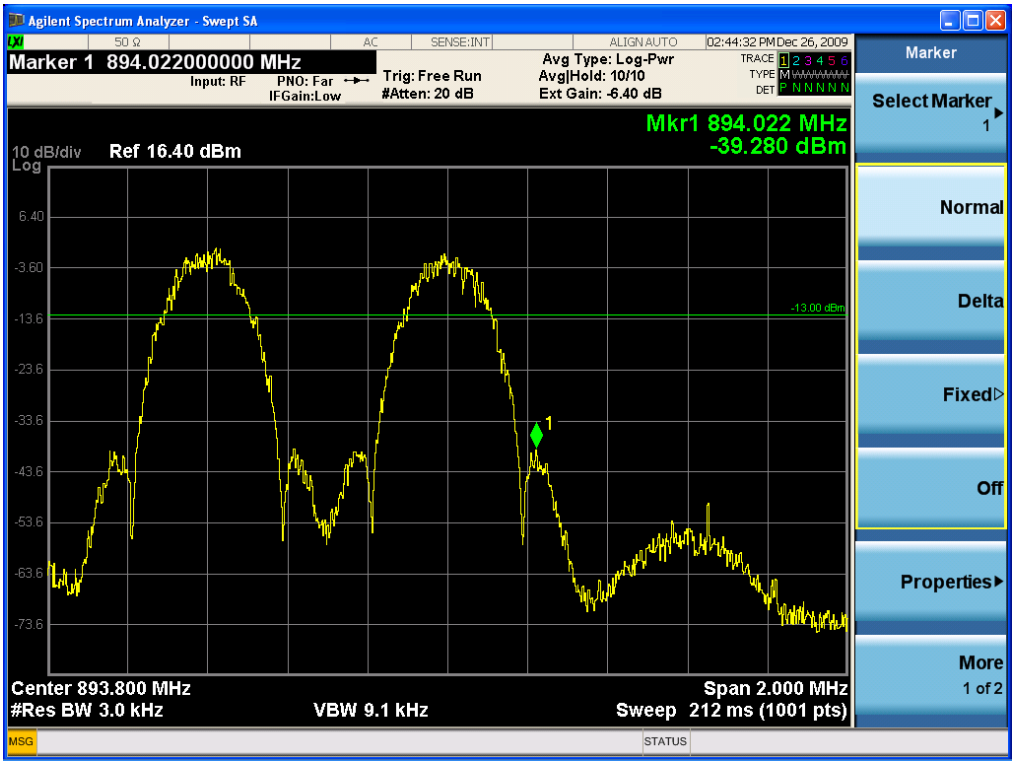
Intermodulation Downlink Low CH (GSM EDGE)



Intermodulation Downlink Mid CH (GSM EDGE)

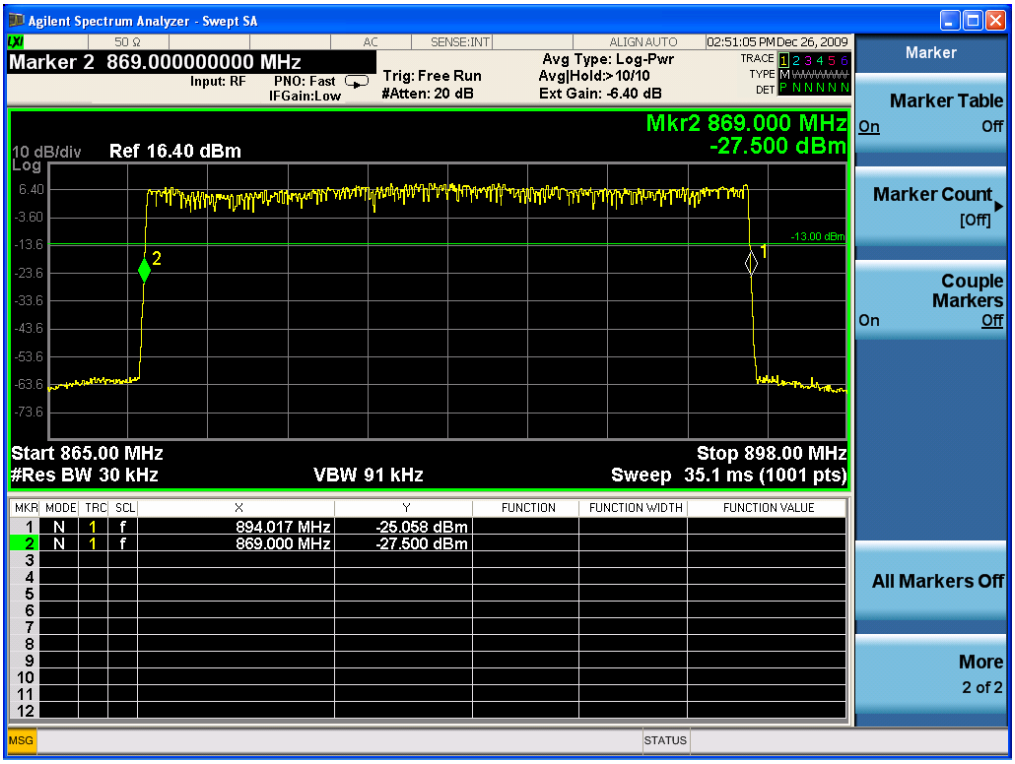


Intermodulation Downlink High CH (GSM EDGE)

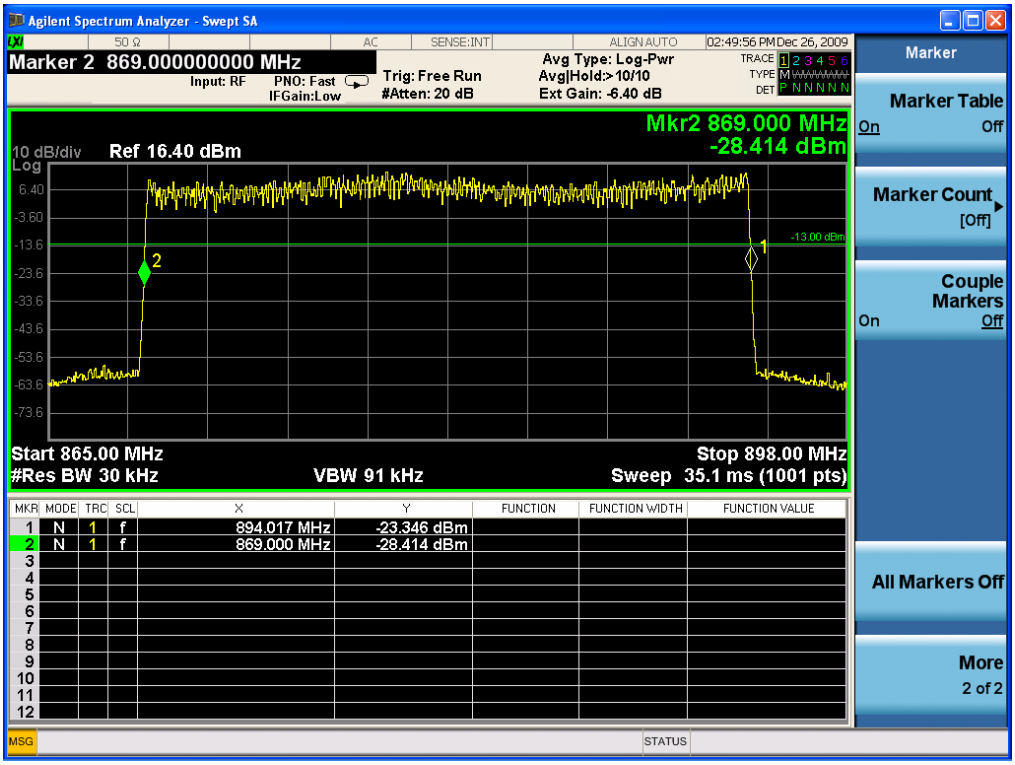


Out of Band Rejection

Out of Band Rejection Downlink (GSM)



Out of Band Rejection Downlink (GSM EDGE)



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".

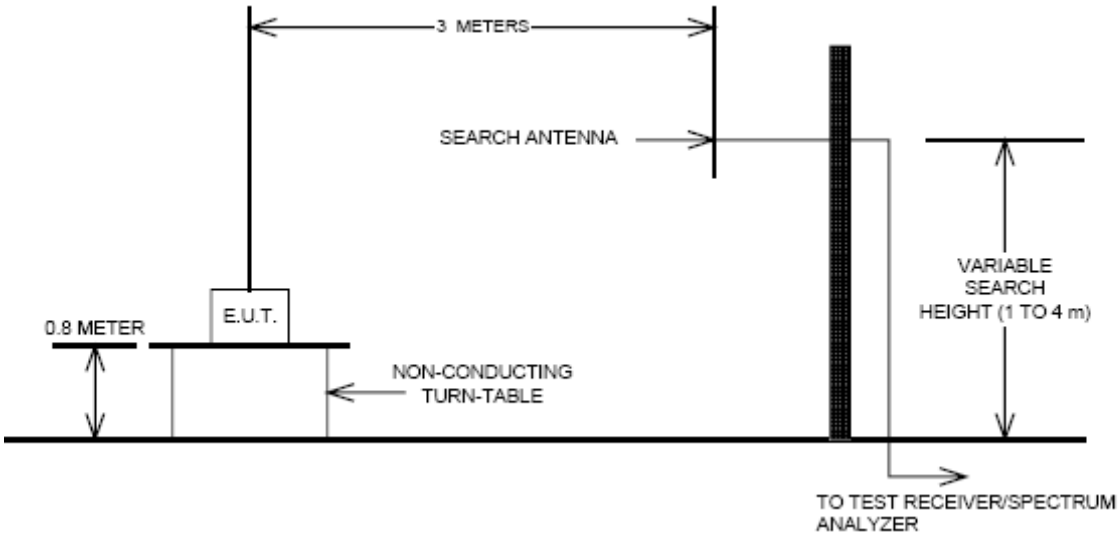
Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber.

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



Radiated Spurious Emissions

▣ MEASURED OUTPUT POWER: 12.99 dBm = 0.0199 W

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 $\log_{10}$ (W)) = - 25.98 dBc

Frequency	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	Substitute Level [dBm]	C.L	Pol.	ERP (dBm)	dBc
869.2	1737.76	−33.92	9.73	−53.61	2.99	H	−46.87	−56.51
	2607.12	−33.48	10.46	−49.89	3.52	H	−42.95	−52.59
	3476.66	−31.14	12.34	−47.62	3.99	H	−39.27	−48.91
881.6	1764.21	−33.16	9.85	−52.92	3.00	H	−46.07	−55.71
	2644.30	−32.47	10.52	−48.83	3.55	H	−41.86	−51.50
	3527.04	−30.88	12.40	−39.97	4.01	H	−38.90	−48.54
893.8	1787.54	−32.78	9.97	−52.64	2.99	H	−45.66	−55.30
	2681.46	−31.83	10.58	−49.51	3.22	H	−41.15	−50.99
	3575.23	−28.52	12.42	−44.79	4.03	H	−36.40	−46.04

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

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

9. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

Test Requirement(s):

§2.1055(a)(1) §22.355

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.

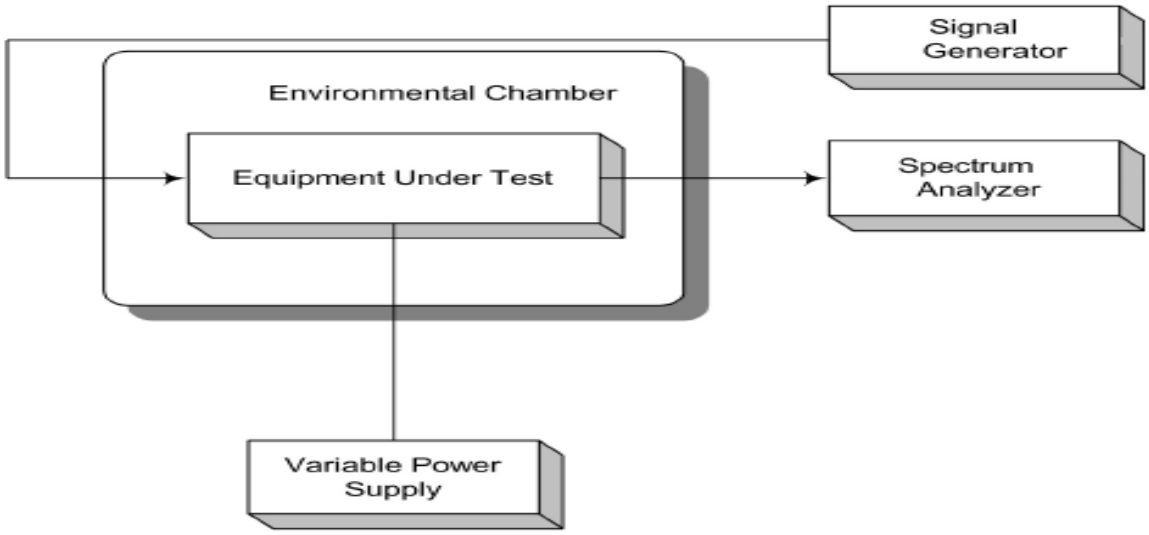
The frequency drift was investigated for every 10 ℃ increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50 ℃.

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)	881 600 003	3	0.000000	0.0034
	−30	881 599 952	−48	0.000058	−0.0544
	−20	881 599 948	−52	0.000062	−0.0590
	−10	881 599 977	−23	0.000029	−0.0261
	0	881 599 981	−19	0.000025	−0.0216
	+10	881 599 974	−26	0.000033	−0.0295
	+30	881 599 966	−34	0.000042	−0.0386
	+40	881 599 963	−37	0.000045	−0.0420
	+50	881 599 978	−22	0.000028	−0.0250
115%	+20	881 599 962	−38	0.000047	−0.0431
85%	+20	881 599 985	−15	0.000020	−0.0170

(GSM Downlink Mid CH)

10. 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/cm²)	Averaging time (minutes)
0.3 - 1.34.....	614	1.63	*(100)	30
1.34 - 30.....	824/f	2.19/f	*(180/ f²)	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. GSM Downlink

Max Peak output Power at antenna input terminal	12.990	dBm
Max Peak output Power at antenna input terminal	19.907	mW
Prediction distance	20.000	cm
Prediction frequency	893.800	MHz
Antenna Gain(typical)	0.000	dBi
Antenna Gain(numeric)	1.000	–
Power density at prediction frequency(S)	0.004	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.596	mW/cm^2

3. RESULTS

The power density level at 20 cm is 0.004 (GSM)mW/cm^2, which is below the uncontrolled exposure limit for GSM 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.