RF TEST REPORT

Test item	:	Cellular/PCS GSM/GPRS/EDGE Phone with Bluetooth and WLAN
Model No.	:	LG-D160, D160, LGD160
Order No.	:	DEMC1401-00120
Date of receipt	:	2014-01-13
Test duration	:	2014-01-17 ~ 2014-01-27
Date of issue	:	2014-01-29
Use of report	:	FCC Original Grant

Applicant : LG Electronics MobileComm U.S.A., Inc.
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Test laboratory : Digital EMC Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935

Test specification	:	§22(H), §24(E)
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer JaeJin Lee	N/A	General Manager Geunki Son

Test Report Version

Test Report No.	Date	Description
DRTFCC1401-0114	Jan. 29, 2013	Initial issue

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1. GENERAL INFORMATION

Applicant Name: **LG Electronics MobileComm U.S.A., Inc.**

Address: **1000 Sylvan Avenue, Englewood Cliffs NJ 07632**

FCC ID	:	ZNFD160
FCC Classification	:	Licensed Portable Transmitter Held to Ear (PCE)
EUT	:	Cellular/PCS GSM/GPRS/EDGE Phone with Bluetooth and WLAN
Model Name	:	LG-D160
Add Model Name	:	D160, LGD160 ※ 3 models are same mechanical, electrical and functional. ※ The only difference is the model name, which are changed for marketing purpose.
Supplying power	:	Standard Battery - Type: Li-ion Battery - M/N: BL-44JR - Rating: DC 3.7 V & 1540 mAh / 5.7 Wh
Antenna Information	:	Internal Antenna - Type: Built-In type
Tx Frequency	:	GSM850: 824.20 ~ 848.80 MHz GSM1900: 1850.20 ~ 1909.80 MHz EDGE850: 824.20 ~ 848.80 MHz EDGE1900: 1850.20 ~ 1909.80 MHz
Rx Frequency	:	GSM850: 869.20 ~ 893.80 MHz GSM1900: 1930.20 ~ 1989.80 MHz EDGE850: 869.20 ~ 893.80 MHz EDGE1900: 1930.20 ~ 1989.80 MHz
Max. RF Output Power	:	GSM850: 1.002 W ERP(30.01 dBm) GSM1900: 1.174 W EIRP(30.70 dBm) EDGE850: 0.323 W ERP(25.09 dBm) EDGE1900: 0.297 W EIRP(24.73 dBm)
Emission Designator(s)	:	GSM850: 245KGXW GSM1900: 248KGXW EDGE850: 248KG7W EDGE1900: 246KG7W

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Equipment Under Test(EUT) supports a dual band(Cellular/PCS) with GSM/GPRS/EDGE, Bluetooth and WLAN.

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

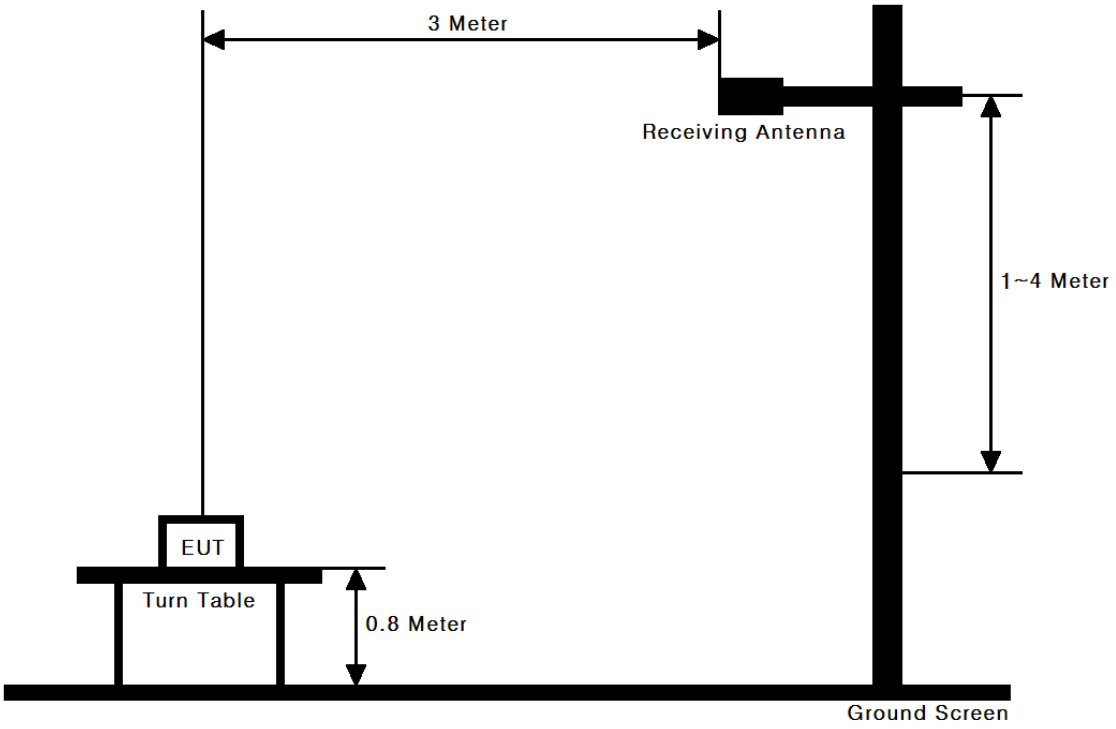
The 3 & 10m test site and conducted measurement facility used to collect the radiated data are located at the 38, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935. The site is constructed in conformance with the requirements.

- 3 &10m test site registration Number: 678747

3. DESCRIPTION OF TESTS

3.1 ERP&EIRP
(Effective Radiated Power & Equivalent Isotropic Radiated Power)

Test Set-up



Test Procedure

These measurements were performed at 3 & 10m test site. The equipment under test is placed on a wooden turntable 0.8-meters above the ground plane and 3-meters from the receive antenna.

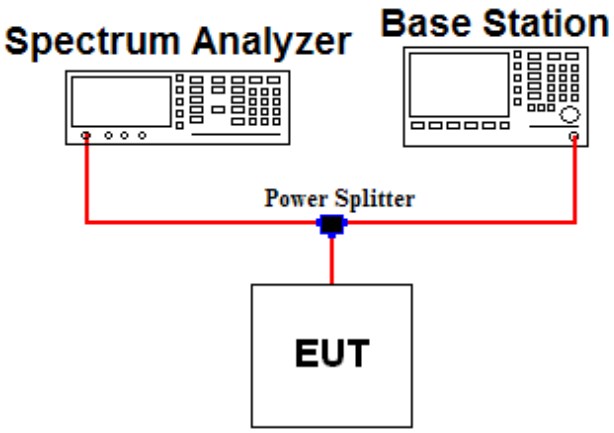
The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.

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.

For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

3.2 PEAK TO AVERAGE RATIO

Test set-up



Test Procedure

A peak to average ratio measurement is performed using the following procedure**.**

▣ **CCDF Procedure**

1. Set resolution/measurement bandwidth ≥ signal`s occupied bandwidth
2. Set the number of counts to a value that stabilizes the measured CCDF curve
3. Set the measurement interval as follows:
   1) For continuous transmissions, set to 1 ms
   2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1%

▣ Alternate Procedure

Use one of the measurement procedures of the peak power and record as P_{Pk}.
Use one of the measurement procedures of the average power and record as P_{Avg}.
Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).

- Peak Power Measurement

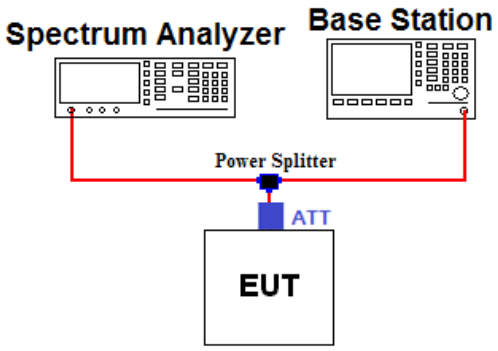
1. Set the RBW ≥ OBW
2. Set VBW ≥ 3 × RBW
3. Set span ≥ 2 x RBW
4. Sweep time = auto couple
5. Detector = peak
6. Ensure that the number of measurement points ≥ span/RBW.
7. Trace mode = max hold
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the peak amplitude level.

- Average Power Measurement

1. Set span to at least 1.5 times the OBW.
2. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
3. Set VBW ≥ 3 x RBW.
4. Set number of points in sweep ≥ 2 × span / RBW.
5. Sweep time = auto-couple.
6. Detector = RMS (power averaging).
7. If the EUT can be configured to transmit continuously (i.e., burst duty cycle ≥ 98%), then set the trigger to free run.
8. If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98 %), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep.
   Ensure that the sweep time is less than or equal to the transmission burst duration.
9. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
10. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

3.3 OCCUPIED BANDWIDTH.

Test set-up



Offset value information

Frequency (MHz)	Offset Value (dB)	Frequency (MHz)	Offset Value (dB)
824.2	19.12	1850.2	19.77
836.6	19.16	1880.0	19.84
848.8	19.20	1909.8	19.86

Note. 1: The offset values from EUT to Spectrum analyzer were measured and used for test.
Offset value = Cable A + Splitter + ATT + Cable B

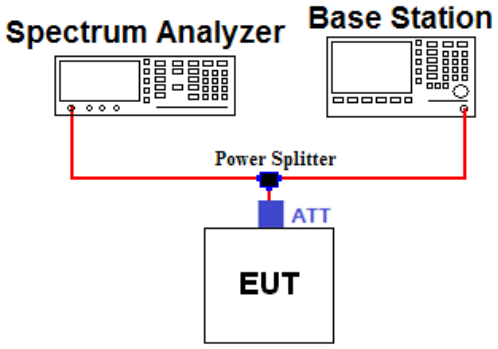
Test Procedure

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 of a given emission.

1. The signal analyzer`s automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 ~ 5% of the expected OBW & VBW ≥ 3 X RBW
3. Detector = Peak
4. Trance mode = Max hold
5. Sweep = Auto couple
6. The trace was allowed to stabilize
7. If necessary, step 2 ~ 7 were repeated after changing the RBW such that it would be within 1 ~ 5% of the 99% occupied bandwidth observed in step 7.

3.4 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.

Test set-up



Offset value information

Frequency (MHz)	Offset Value (dB)	Frequency (MHz)	Offset Value (dB)	Frequency (MHz)	Offset Value (dB)
824.0	19.12	1850.0	19.76	5000.0	21.04
849.0	19.21	1910.0	19.86	10000.0	21.69
-	-	-	-	15000.0	22.10
-	-	-	-	20000.0	23.08

Note. 1: The offset value from EUT to Spectrum analyzer was measured and used for test.
Offset value = Cable A + Splitter + Cable B

Test Procedure

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer.
The EUT was setup to maximum output power at its lowest channel. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic.

1. RBW = 1MHz & VBW ≥ 3MHz
2. Detector = Positive peak
3. Trace mode = Max hold
4. Sweep time = Auto
5. The trace was allowed to stabilize

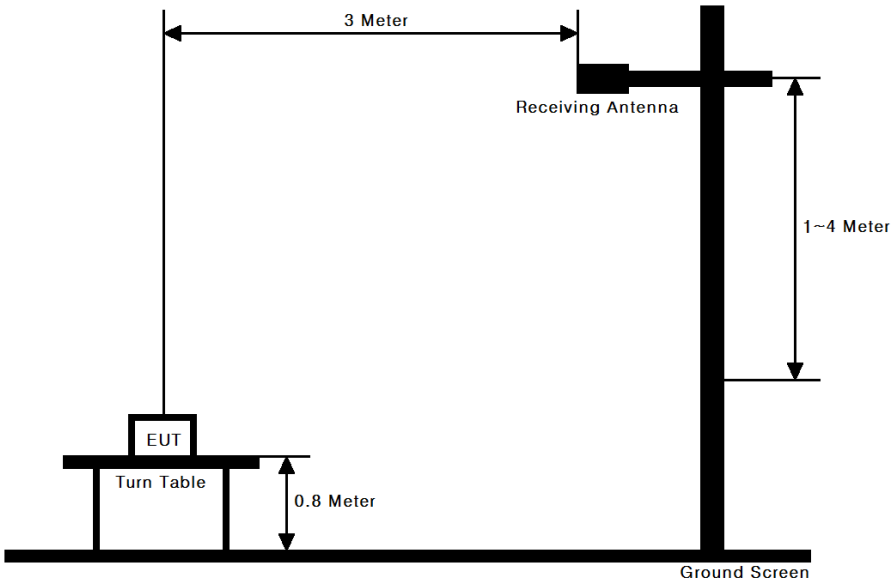
The highest, lowest and a middle channel were tested for out of band measurements.
The minimum permissible attenuation level of any spurious emission is 43 + log10(P[Watts]), where P is the transmitter power in Watts.

Note 1: In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter was employed to measure the out of band Emissions.

Note 2: Compliance with the applicable limits is based on the use of measurement instrumentation employing a RBW of 100 KHz or greater for Part 22 and 1 MHz or greater for Part 24.

3.5 RADIATED SPURIOUS EMISSIONS

Test Set-up



Test Procedure

This measurement was performed at 3-meter test range. The equipment under test is placed on a wooden turntable 0.8-meters above the ground plane and 3-meters from the receive antenna.

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.

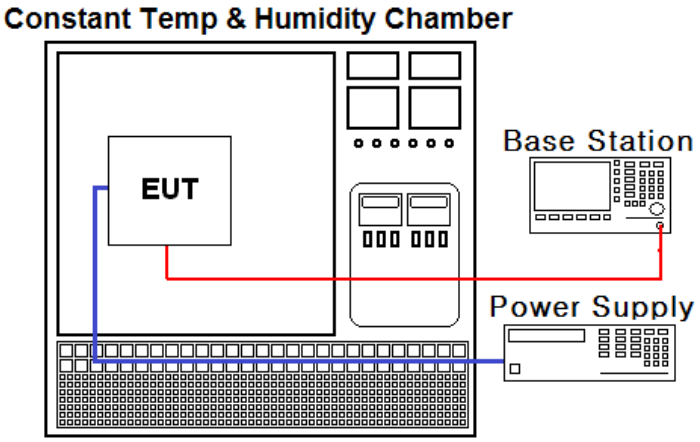
For radiated power measurements below 1GHz, a half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading.

For radiated power measurements above 1GHz, 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 spectrum analyzer reading. The difference between the gain of the horn and an isotropic antenna are taken into consideration.

This measurement was performed with the EUT oriented in 3 orthogonal axis.

3.6 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

Test Set-up



Test Procedure

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification - the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.000 25 %(± 2.5 ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature. (25°C to provide a reference).

2. 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.

3. 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

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	N9030A	13/10/29	14/10/29	MY53310140
Spectrum Analyzer	Agilent	N9020A	13/03/28	14/03/28	MY50510026
Multimeter	H.P	34401A	13/02/27	14/02/27	3146A13475
DC Power Supply	H.P	6622A	13/02/27	14/02/27	3448A03760
Temp & Humi Test Chamber	SJ Science	TEMI2500	13/10/22	14/10/22	SJ-TH-S50-130930
Power Splitter	Anritsu	K241B	13/10/22	14/10/22	1701099
Attenuator(3dB)	SMAJK	SMAJK-2-3	13/10/22	14/10/22	3
Attenuator(10dB)	SMAJK	SMAJK-50-10	13/10/23	14/10/23	2-50-10
Thermo hygrometer	BODYCOM	BJ5478	13/06/01	14/06/01	120612-2
Dipole Antenna	Schwarzbeck	VHA9103	12/03/12	14/03/12	2116
Dipole Antenna	Schwarzbeck	VHA9103	12/03/22	14/03/22	2117
Dipole Antenna	Schwarzbeck	UHA9105	12/03/12	14/03/12	2261
Dipole Antenna	Schwarzbeck	UHA9105	12/03/22	14/03/22	2262
Bilog Antenna	SCHAFFNER	CBL6112B	12/11/06	14/11/06	2737
HORN ANT	ETS	3115	12/02/20	14/02/20	6419
HORN ANT	ETS	3115	13/02/28	15/02/28	00021097
HORN ANT	A.H.Systems	SAS-574	13/03/20	15/03/20	154
HORN ANT	A.H.Systems	SAS-574	13/05/27	15/05/27	155
Amplifier (22dB)	H.P	8447E	14/01/07	15/01/07	2945A02865
Amplifier (30dB)	Agilent	8449B	13/02/27	14/02/27	3008A00370
High-pass filter	Wainwright	WHKX1.0	13/09/12	14/09/12	9
High-Pass Filter	Wainwright	WHNX2.1	13/09/12	14/09/12	1
8960 Series 10 Wireless Comms Test Set	Agilent	E5515C	13/02/28	14/02/28	GB43461134
Universal Radio Communication Tester	Rohde Schwarz	CMU200	13/02/28	14/02/28	106760
Vector Signal Generator	Rohde Schwarz	SMJ100A	14/01/07	15/01/07	100148
Signal Generator	Rohde Schwarz	SMF100A	13/07/22	14/07/22	102341
Amplifier	EMPOWER	BBS3Q7ELU	13/09/12	14/09/12	1020

5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	RSS Section(s)	Parameter	Status Note 1
2.1046	RSS-132 (4.4) RSS-133 (4.1)	Conducted Output Power	C
22.913(a) 24.232(c)	RSS-132 (4.4) [SRSP-503(5.1.3)] RSS-133 (6.4) [SRSP-510(5.1.2)]	Effective Radiated Power Equivalent Isotropic Radiated Power	C
22.917(a) 24.238(a) 2.1049	RSS-Gen (4.6.1) RSS-133 (2.3)	Occupied Bandwidth	C
22.917(a) 24.238(a) 2.1051	RSS-132 (4.5.1) RSS-133 (6.5.1)	Band Edge Spurious and Harmonic Emissions at Antenna Terminal	C
24.232(d)	RSS-133 (6.4)	Peak to Average Ratio	C
22.917(a) 24.238(a) 2.1053	RSS-132 (4.5.1) RSS-133 (6.5.1)	Radiated Spurious and Harmonic Emissions	C
22.355 24.235 2.1055	RSS-132 (4.3) RSS-133 (6.3)	Frequency Stability	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

The sample was tested according to the following specification:
ANSI/TIA/EIA-603-C-2004 and KDB 971168 D01 v02r01

6. SAMPLE CALCULATION

A. Emission Designator

GSM850 Emission Designator

Emission Designator = **245KGXW**
GSM OBW = 245.21 kHz
(Measured at the 99.75 % power bandwidth)
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

GSM1900 Emission Designator

Emission Designator = **248KGXW**
GSM OBW = 247.90 kHz
(Measured at the 99.75 % power bandwidth)
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE850 Emission Designator

Emission Designator = **248KG7W**
GSM OBW = 247.50 kHz
(Measured at the 99.75 % power bandwidth)
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

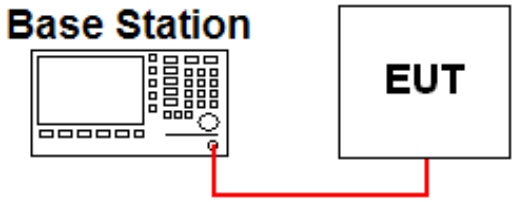
EDGE1900 Emission Designator

Emission Designator = **246KG7W**
GSM OBW = 245.87 kHz
(Measured at the 99.75 % power bandwidth)
G = Phase Modulation
X = Cases not otherwise covered
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.



▪ GSM / GPRS / EDGE

Band	Channel	Frequency (MHz)	Test Result(dBm)								
			GSM	GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
Cellular	128	824.2	32.60	32.60	30.40	28.30	27.40	26.40	25.80	24.80	23.80
	190	836.6	32.60	32.60	30.40	28.30	27.40	26.50	25.90	24.90	23.80
	251	848.8	32.60	32.60	30.40	28.30	27.40	26.50	25.90	24.90	23.80
PCS	512	1850.2	30.20	30.20	27.10	25.10	23.90	25.00	24.20	23.10	21.90
	661	1880.0	30.20	30.20	27.10	25.10	24.10	25.00	24.30	23.00	21.90
	810	1909.8	30.10	30.10	27.00	25.10	24.10	25.20	24.40	23.20	22.10

The output power was measured using the Agilent E5515C

7.2 PEAK TO AVERAGE RATIO

- Plots of the EUT's Peak- to- Average Ratio are shown in Clause 8.1

7.3 OCCUPIED BANDWIDTH

Band	Channel	Frequency (MHz)	Test Result(KHz)
GSM850	***128***	824.2	240.32
	190	836.6	***245.21***
	251	848.8	244.69
GSM1900	512	1850.2	244.49
	661	1880.0	247.68
	810	1909.8	**247.90**
EDGE850	128	824.2	***247.50***
	190	836.6	242.35
	251	848.8	245.10
EDGE1900	512	1850.2	242.50
	661	1880.0	***245.87***
	810	1909.8	239.96

- Plots of the EUT's Occupied Bandwidth are shown in Clause 8.2

7.4 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL

- Plots of the EUT's Conducted Spurious Emissions are shown in Clause 8.3

7.5 BAND EDGE

- Plots of the EUT's Band Edge are shown in Clause 8.4

7.6 EFFECTIVE RADIATED POWER

- GSM850 data

Freq.(MHz) CH	EUT Position (Axis)	Test Conditions(Power Step: 5)							
		Reading Value (dBm)	Pol. (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Power Supply	Note.
824.2 128 CH	X	-4.27	H	28.44	1.20	29.64	0.920	DC 3.7V	GSM
836.6 190 CH	**X**	**-5.14**	**H**	**28.86**	**1.15**	**30.01**	**1.002**	**DC 3.7V**	***GSM***
848.8 251 CH	X	-4.89	H	28.71	1.05	29.76	0.946	DC 3.7V	GSM
836.6 190 CH	X	-10.06	H	23.94	1.15	25.09	0.323	DC 3.7V	EDGE

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT is placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation is 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 TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz

A half-wave dipole is substituted in place of the EUT. This dipole antenna is driven by a signal generator and the level of the signal generator is 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 EUT was tested under all configurations and the highest power is reported in GSM mode. The GSM mode using a Power Control Level of “0” in PCS Band and “5” in the Cellular Band. This EUT was tested with the fully charged battery. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna.

The worst case data is reported.

7.7 EQUIVALENT ISOTROPIC RADIATED POWER

- GSM1900 data

Freq.(MHz) CH.	EUT Position (Axis)	TEST CONDITIONS(Power Step: 0)							
		Reading Value (dBm)	Pol. (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Power Supply	Note.
1850.2 512 CH	***X***	***- 5.42***	***H***	***22.64***	***8.06***	***30.70***	***1.174***	***DC 3.7 V***	***GSM***
1880.0 661 CH	X	-7.21	H	21.38	8.12	29.50	0.891	DC 3.7 V	GSM
1909.8 810 CH	Y	- 9.22	V	21.57	8.18	29.75	0.944	DC 3.7 V	GSM
1850.2 512 CH	X	- 11.39	H	16.67	8.06	24.73	0.297	DC 3.7 V	EDGE

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT is placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation is 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 TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz.

A half-wave dipole is substituted in place of the EUT. This dipole antenna is driven by a signal generator and the level of the signal generator is 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 EUT was tested under all configurations and the highest power is reported in GSM mode. The GSM mode using a Power Control Level of “0” in PCS Band and “5” in the Cellular Band. This EUT was tested with the fully charged battery. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna.

The worst case data is reported.

7.8 RADIATED SPURIOUS EMISSIONS

7.8.1 RADIATED SPURIOUS EMISSIONS (GSM850)

Channel (ERP)	Freq. (MHz)	EUT Position (Axis)	POL (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBd)	Correct Generator Level (dBm)	Result (dBc)	Limit (dBc)
128 (0.920 W)	1648.44	X	H	-59.69	5.48	-54.21	83.85	42.64
	2472.57	Z	H	-56.21	6.89	-49.32	78.96	
	-	-	-	-	-	-	-	
190 (1.002 W)	1673.18	X	H	-59.28	5.53	-53.75	83.76	43.01
	2509.61	Z	H	-59.31	6.94	-52.37	82.38	
	-	-	-	-	-	-	-	
251 (0.946 W)	1697.61	X	H	-60.14	5.58	-54.56	84.32	42.76
	2546.30	Z	H	-59.45	7.00	-52.45	82.21	
	-	-	-	-	-	-	-	

- Limit Calculation= 43 + 10 $\log_{10}$(ERP [W]) [dBc]

- No other spurious and harmonic emissions were reported greater than listed emissions above table.

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT is placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation is adjusted for the highest reading on the receive spectrum analyzer.

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. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This EUT was tested under all configurations and the highest power is reported in GSM mode. The GSM mode using a Power Control Level of “0” in PCS Band and “5” in the Cellular Band. This EUT was tested with the fully charged battery. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna.

The worst case data is reported.

7.8.2 RADIATED SPURIOUS EMISSIONS (GSM1900)

Channel (EIRP)	Freq. (MHz)	EUT Position (Axis)	POL (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Result (dBc)	Limit (dBc)
512 (1.174 W)	3700.69	X	H	-57.63	9.90	-47.73	78.43	43.70
	5550.61	Z	H	-54.52	11.35	-43.17	73.87	
	7400.65	Z	H	-52.49	11.64	-40.85	71.55	
	9250.70	Z	H	-48.67	11.65	-37.02	67.71	
661 (0.891 W)	3760.03	X	H	-58.82	9.90	-48.92	78.41	42.50
	5640.20	Z	H	-54.96	11.42	-43.54	73.04	
	7520.17	Z	H	-50.81	11.59	-39.22	68.72	
	9399.60	Z	H	-47.72	11.75	-35.97	65.47	
810 (0.944 W)	3819.61	X	H	-56.34	9.91	-46.43	76.18	42.75
	5729.34	Z	H	-56.42	11.48	-44.94	74.69	
	7639.82	Z	H	-52.84	11.54	-41.30	71.05	
	9549.20	Z	H	-48.95	11.84	-37.11	66.86	

- Limit Calculation = 43 + 10 $\log_{10}$(ERP [W]) [dBc]

- No other spurious and harmonic emissions were reported greater than listed emissions above table.

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT is placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation is adjusted for the highest reading on the receive spectrum analyzer.

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. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This EUT was tested under all configurations and the highest power is reported in GSM mode. The GSM mode using a Power Control Level of “0” in PCS Band and “5” in the Cellular Band. This EUT was tested with the fully charged battery. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna.

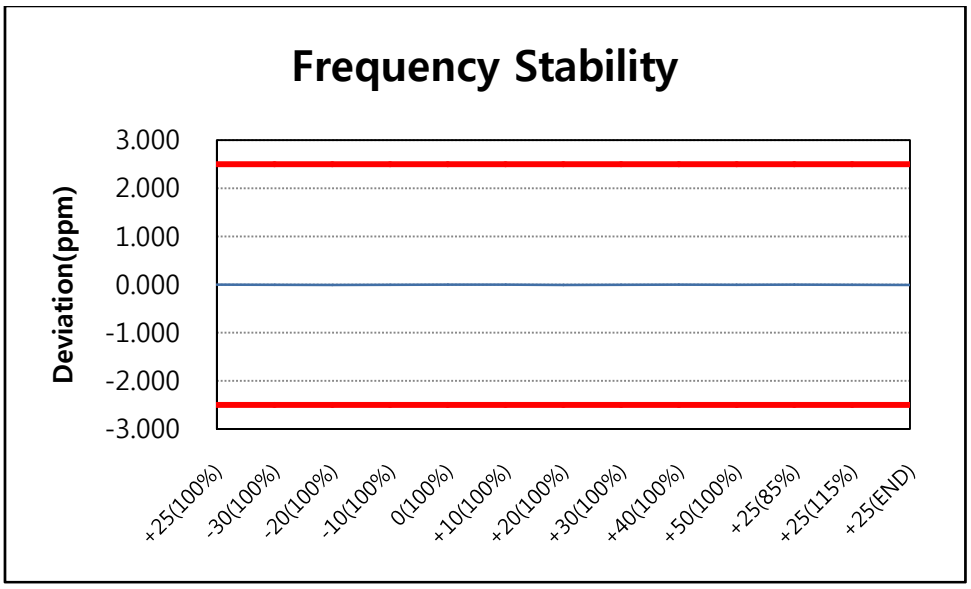
The worst case data is reported.

7.9 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.9.1 FREQUENCY STABILITY (GSM850)

OPERATING FREQUENCY : 836,599,992 Hz
CHANNEL : 190(Mid)
REFERENCE VOLTAGE : 3.700 V DC
DEVIATION LIMIT : ± 0.00025 % or 2.5 ppm

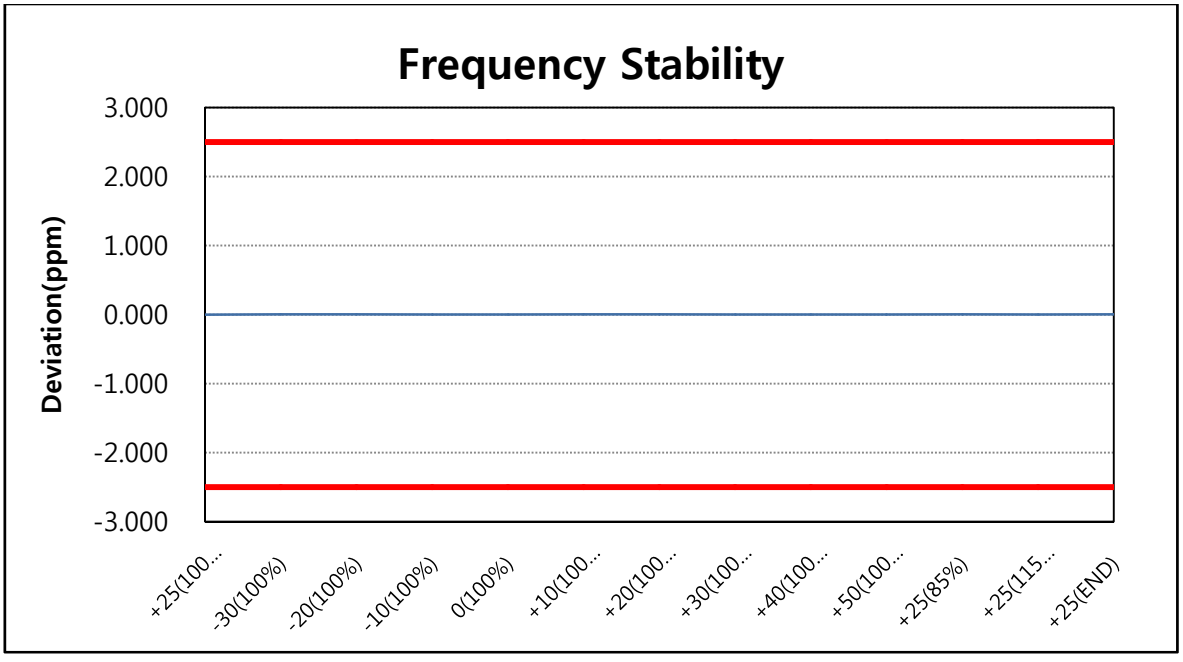
VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(ppm)	(%)
100 %	3.700	+ 25(Ref)	836,599,992	0.000	0.00000000
100 %		- 30	836,599,988	- 0.005	- 0.00000048
100 %		- 20	836,599,987	- 0.006	- 0.00000060
100 %		- 10	836,599,990	- 0.002	- 0.00000024
100 %		0	836,599,993	0.001	0.00000012
100 %		+ 10	836,599,992	0.000	0.00000000
100 %		+ 20	836,599,986	- 0.007	- 0.00000072
100 %		+ 30	836,599,988	- 0.005	- 0.00000048
100 %		+ 40	836,599,991	- 0.001	- 0.00000012
100 %		+ 50	836,599,988	- 0.005	- 0.00000048
85 %	3.145	+ 25	836,599,991	- 0.001	- 0.00000012
115 %	4.255	+ 25	836,599,990	- 0.002	- 0.00000024
BATT.ENDPOINT	2.650	+ 25	836,599,985	- 0.008	- 0.00000084



7.9.2 FREQUENCY STABILITY (GSM1900)

OPERATING FREQUENCY : 1,879,999,982 Hz
CHANNEL : 661(Mid)
REFERENCE VOLTAGE : 3.700 V DC
DEVIATION LIMIT : ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(ppm)	(%)
100 %	3.700	+ 25(Ref)	1,879,999,982	0.000	0.00000000
100 %		- 30	1,879,999,988	0.003	0.00000032
100 %		- 20	1,879,999,990	0.004	0.00000043
100 %		- 10	1,879,999,986	0.002	0.00000021
100 %		0	1,879,999,984	0.001	0.00000011
100 %		+ 10	1,879,999,990	0.004	0.00000043
100 %		+ 20	1,879,999,987	0.003	0.00000027
100 %		+ 30	1,879,999,983	0.001	0.00000005
100 %		+ 40	1,879,999,983	0.001	0.00000005
100 %		+ 50	1,879,999,986	0.002	0.00000021
85 %	3.145	+ 25	1,879,999,987	0.003	0.00000027
115 %	4.255	+ 25	1,879,999,984	0.001	0.00000011
BATT.ENDPOINT	2.650	+ 25	1,879,999,988	0.003	0.00000032

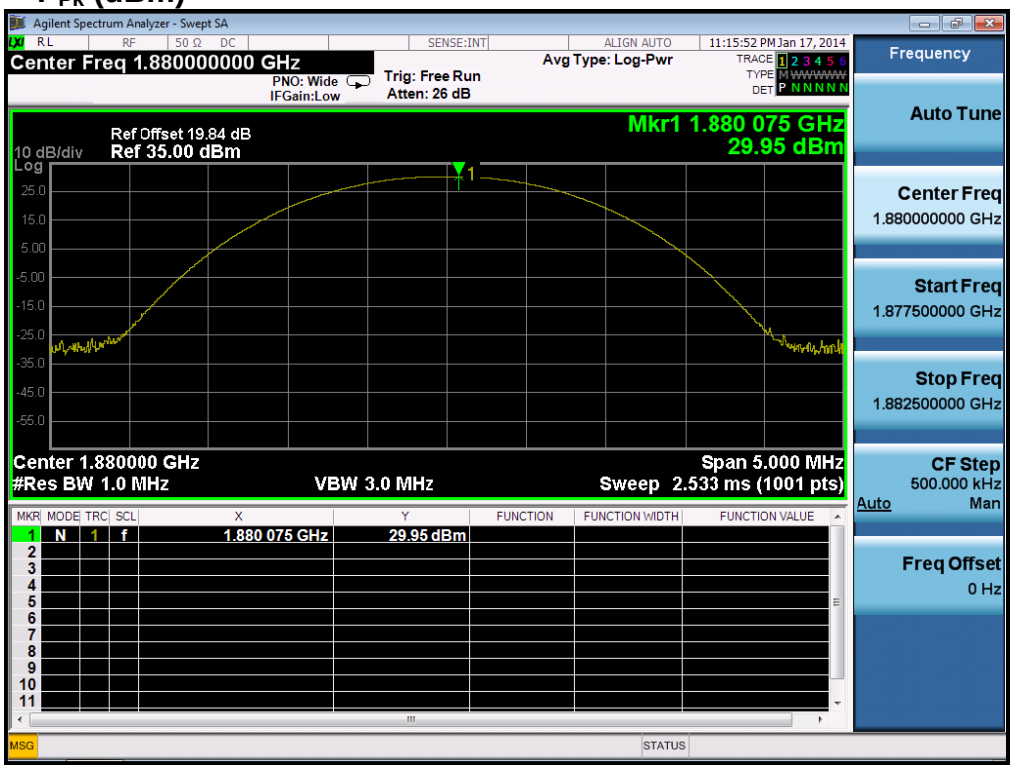


8. TEST PLOTS

8.1 Peak to Average Ratio

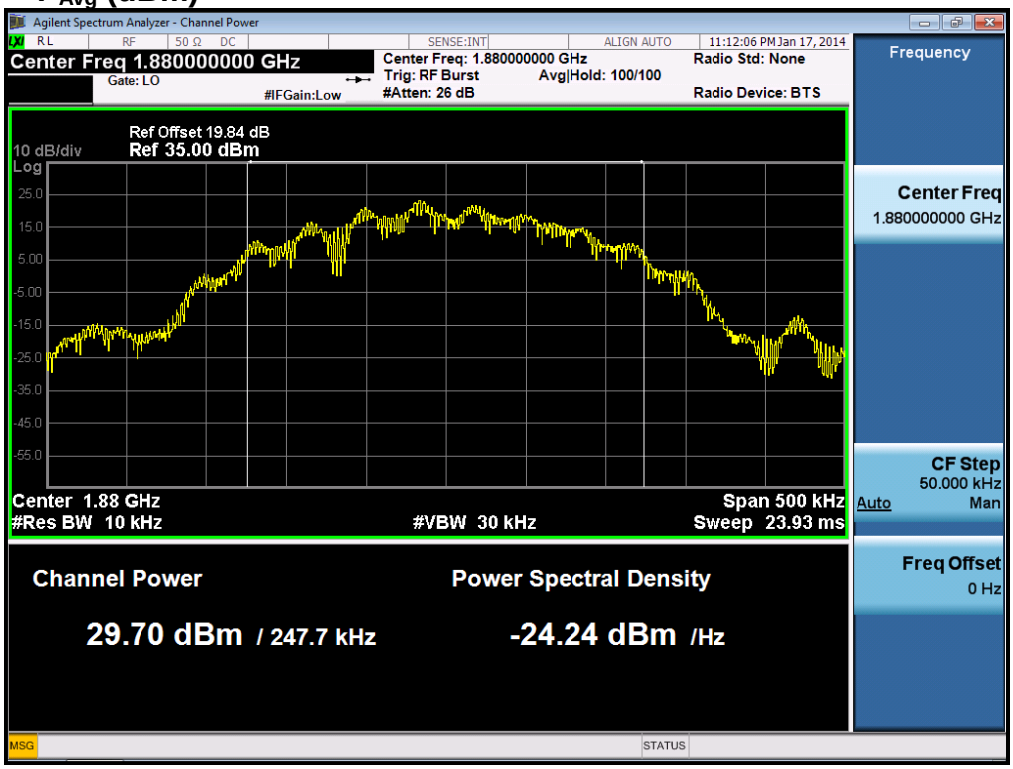
GSM1900 & Channel: 661

- P_{Pk} (dBm)



GSM1900 & Channel: 661

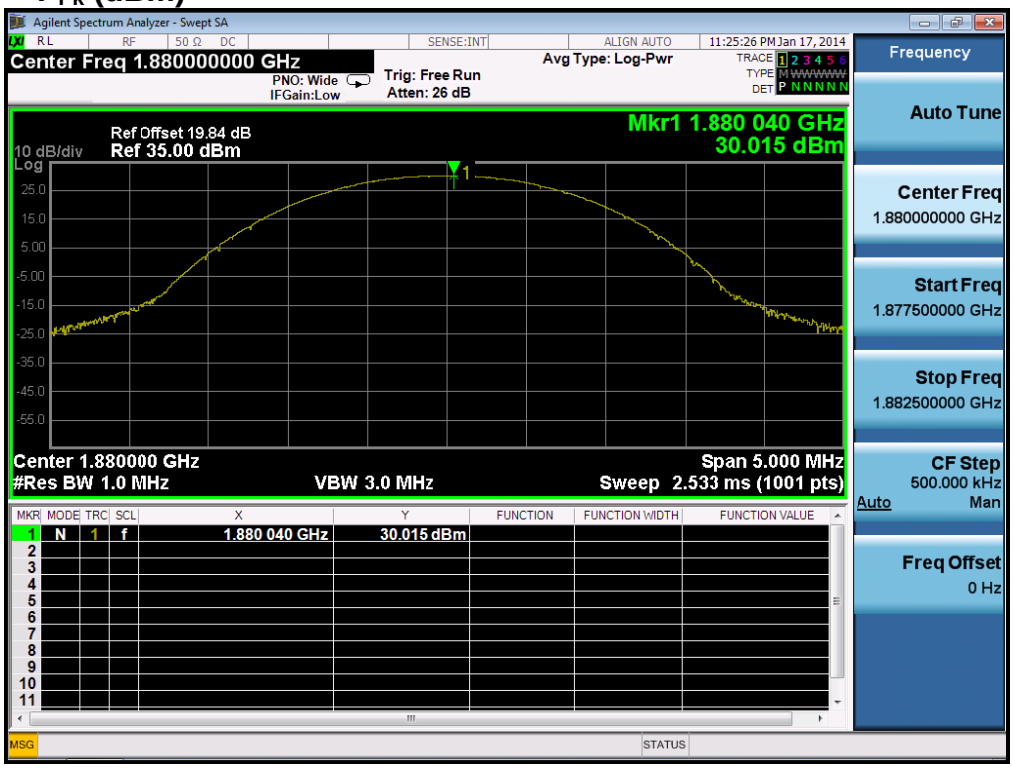
- P_{Avg} (dBm)



PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm) = 29.950 dBm – 29.700 dBm = 0.250 dB

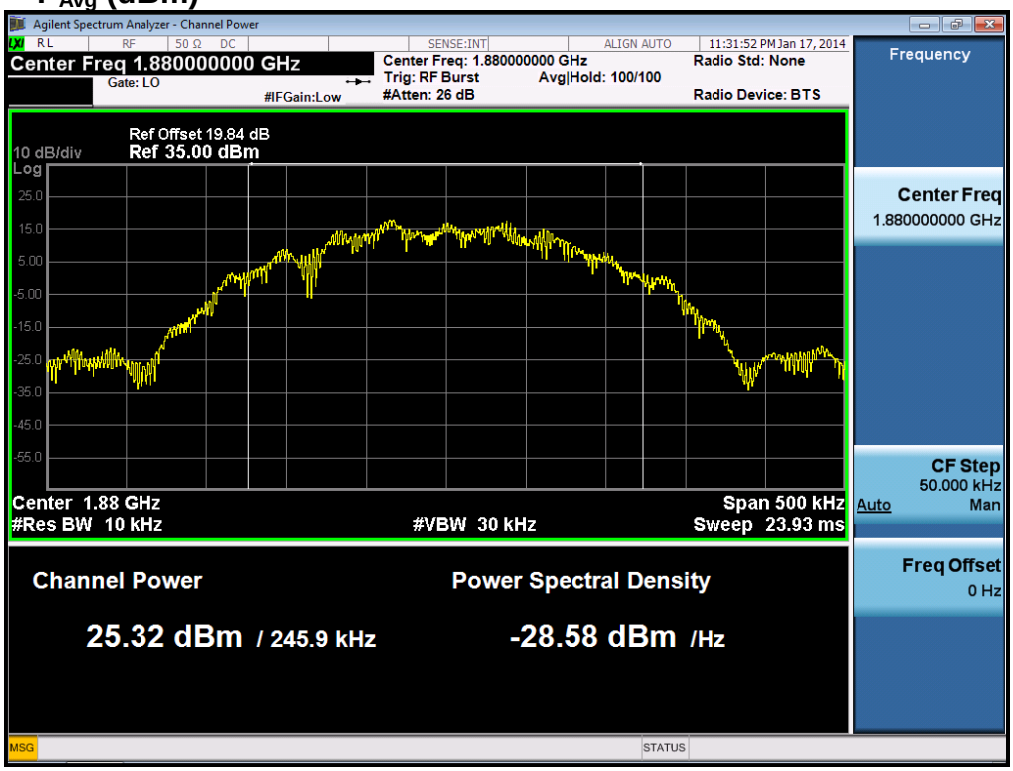
EDGE1900 & Channel: 661

- P_{Pk} (dBm)



EDGE1900 & Channel: 661

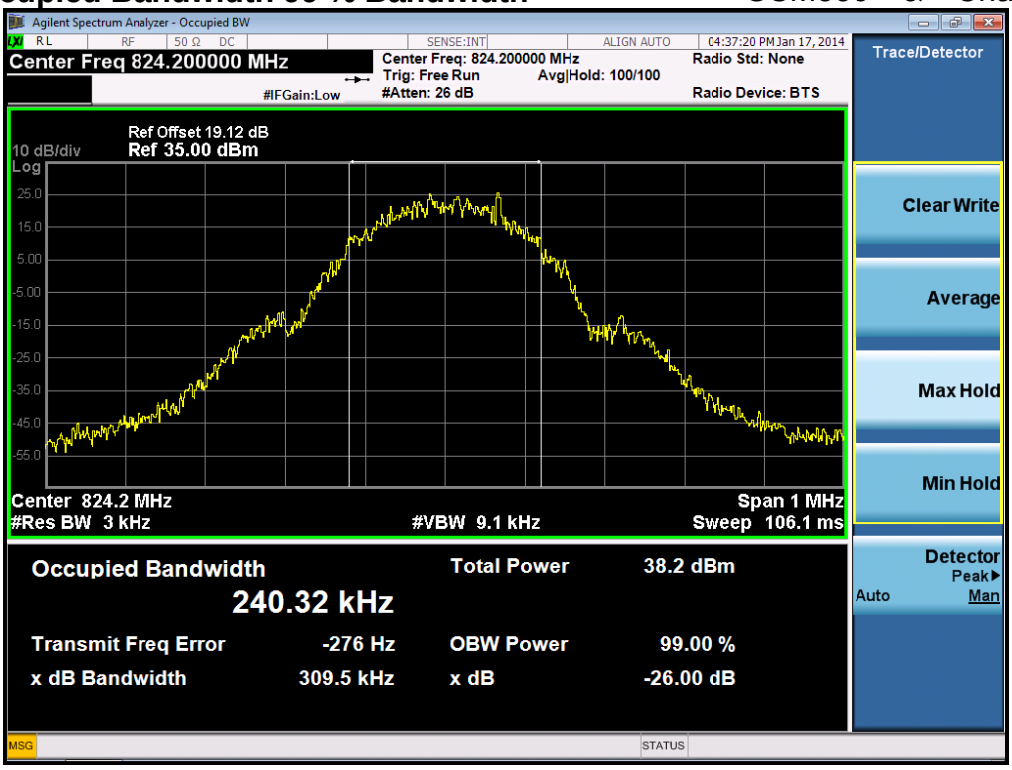
- P_{Avg} (dBm)



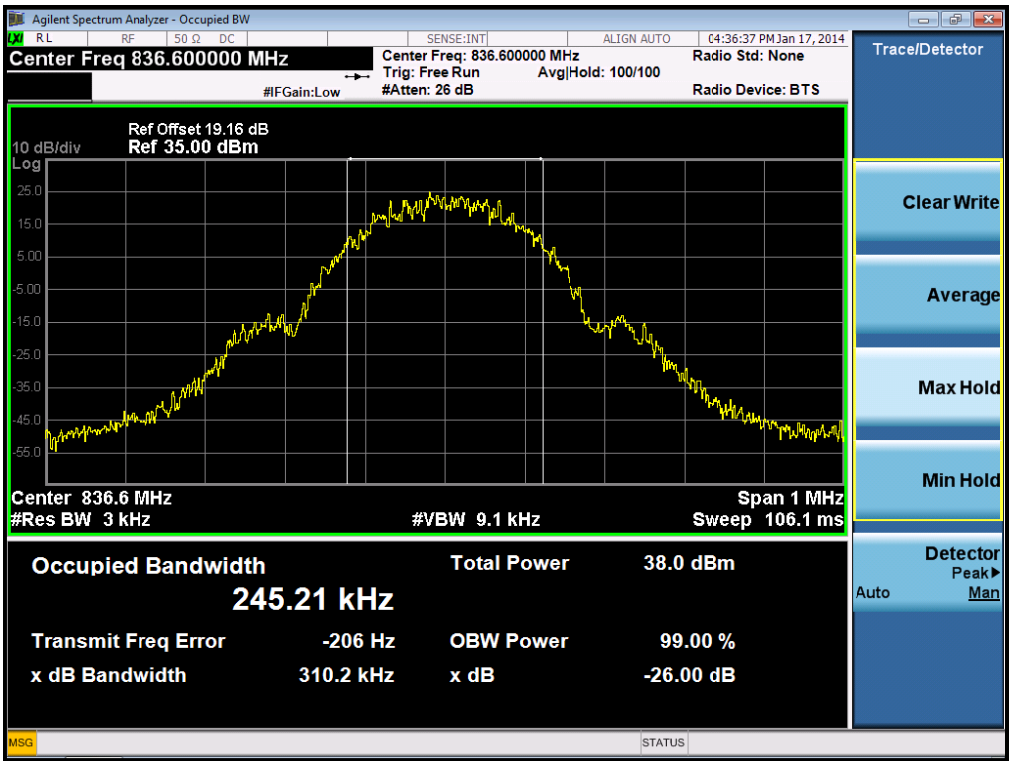
PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm) = 30.015 dBm – 25.320 dBm = 4.695 dB

8.2 Occupied Bandwidth 99 % Bandwidth

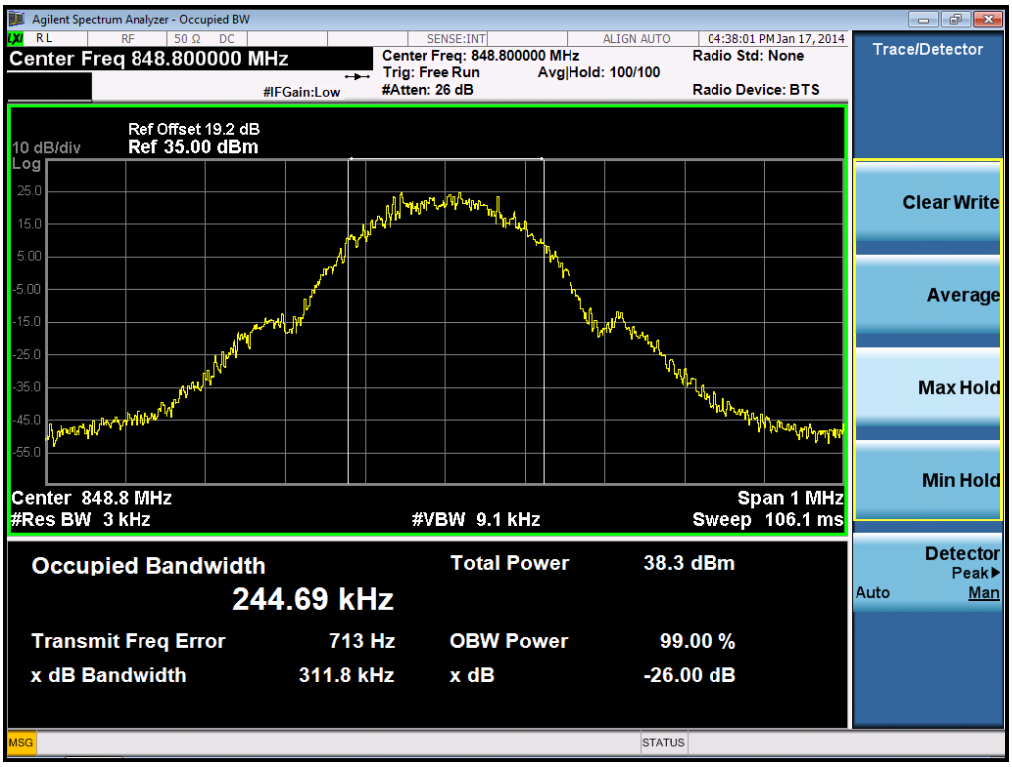
GSM850 & Channel: 128



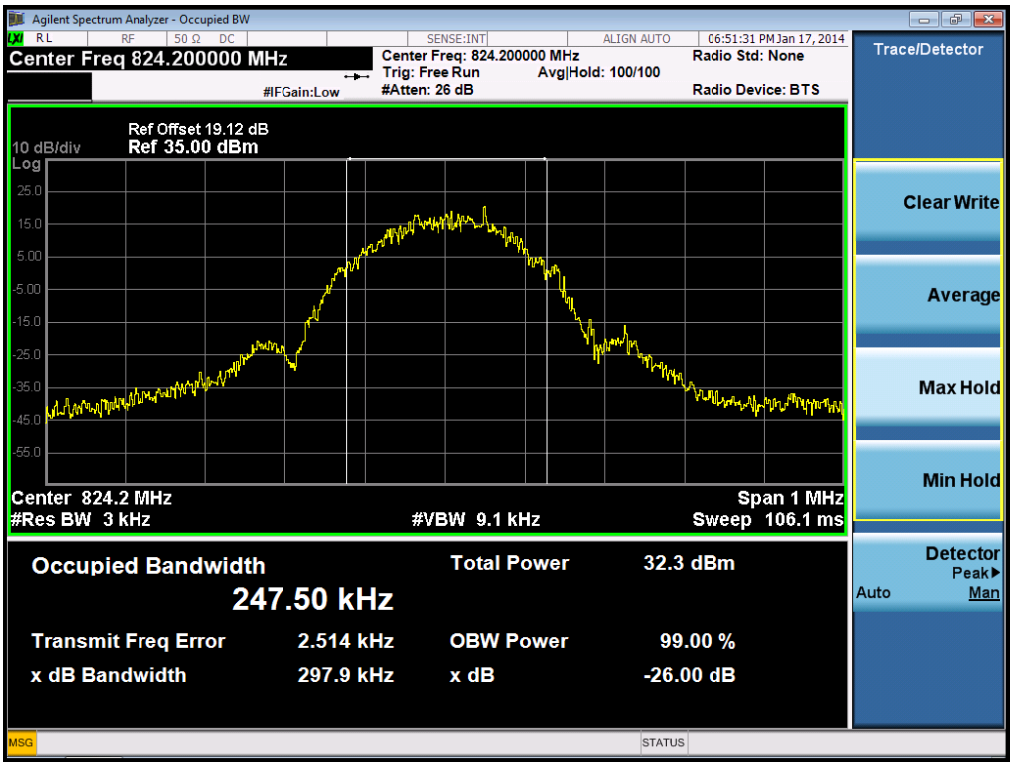
GSM850 & Channel: 190



GSM850 & Channel: 251



EDGE 850 & Channel: 128



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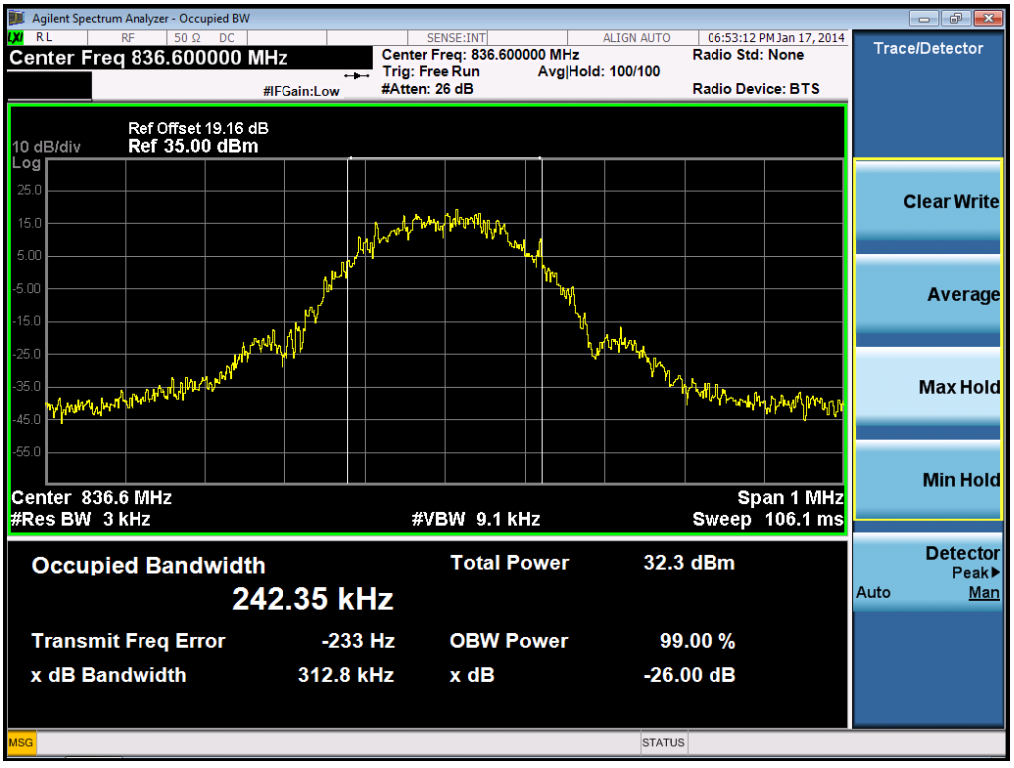
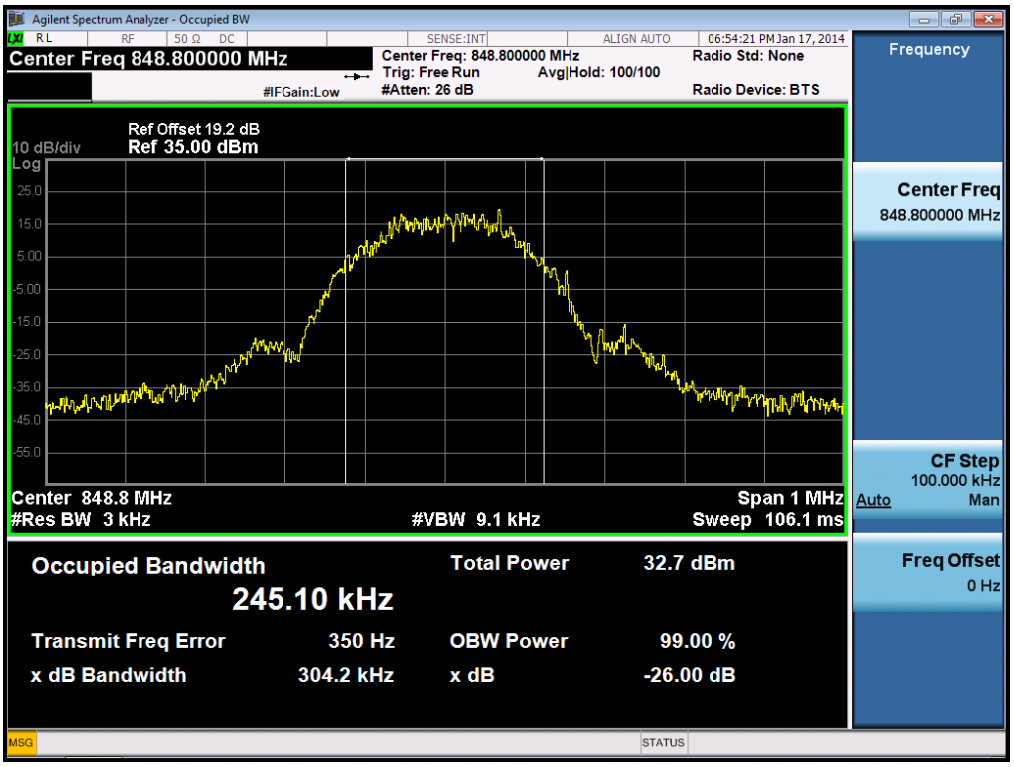
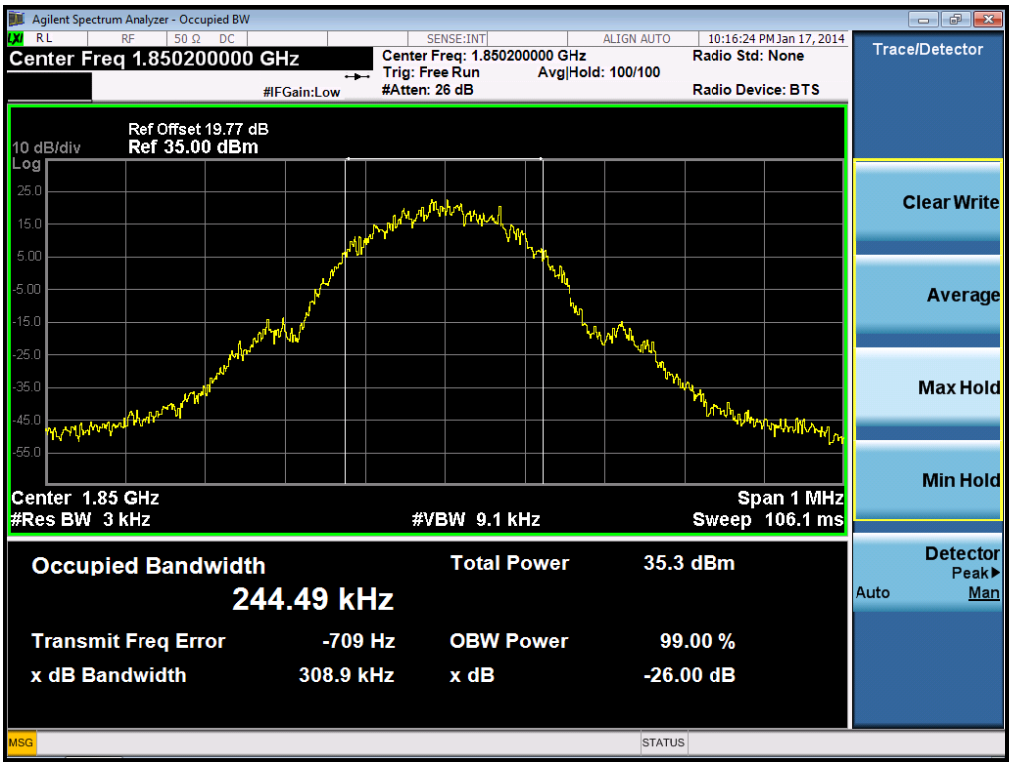


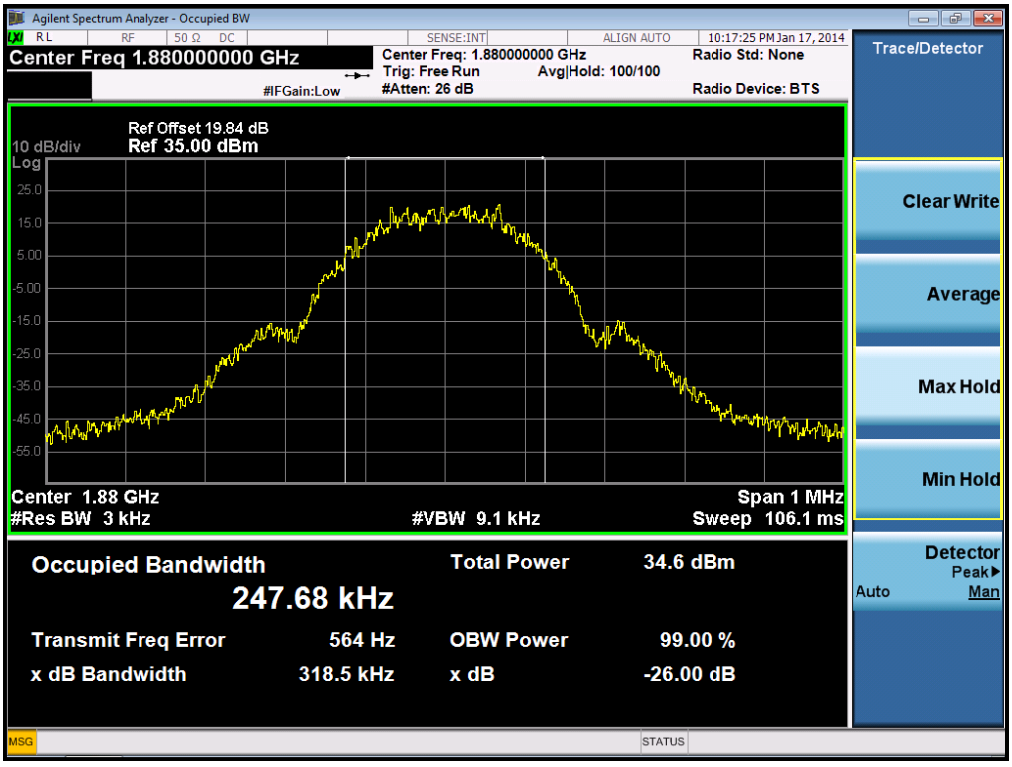
EDGE 850 & Channel: 251



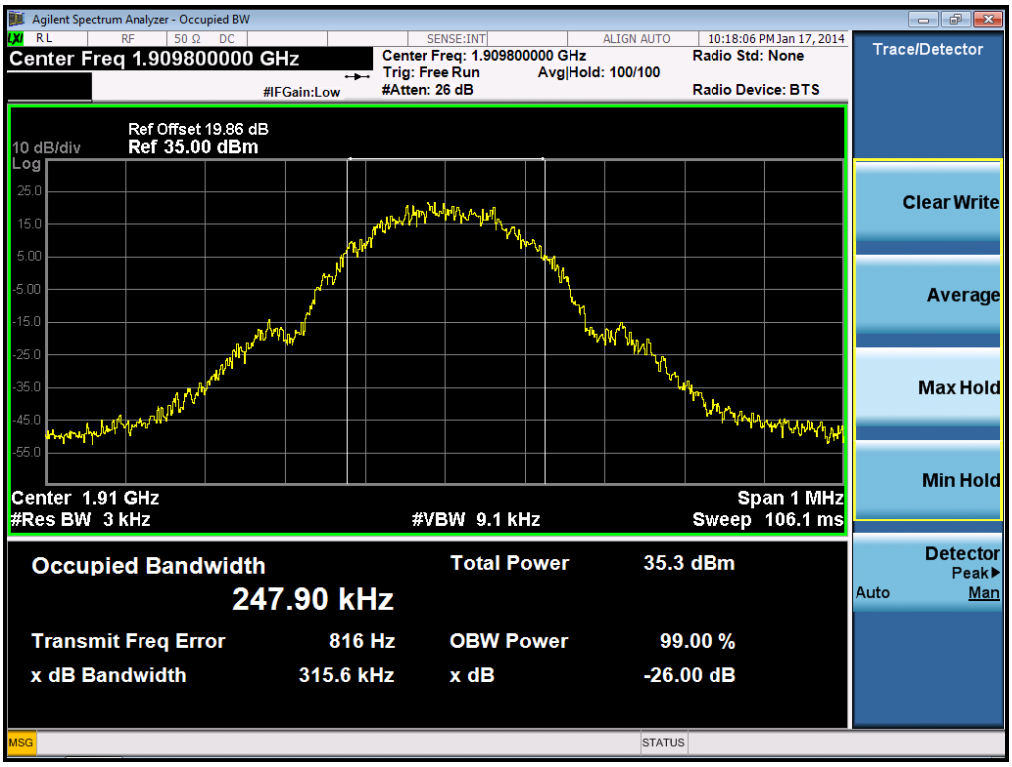
GSM 1900 & Channel: 512



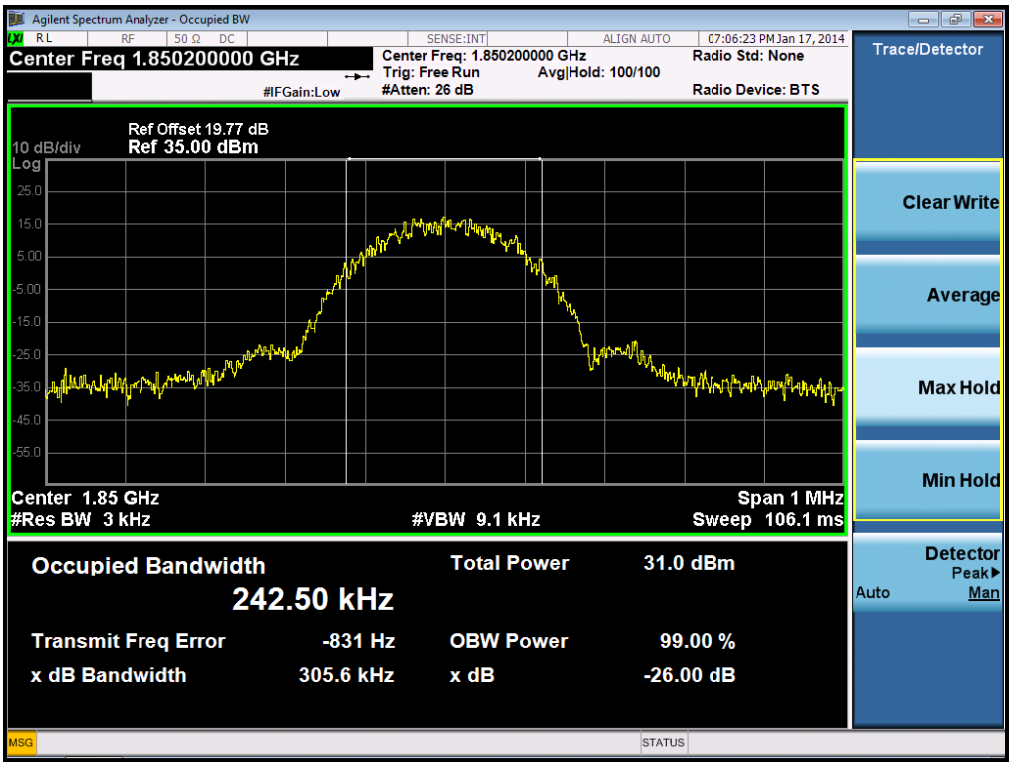
GSM 1900 & Channel: 661



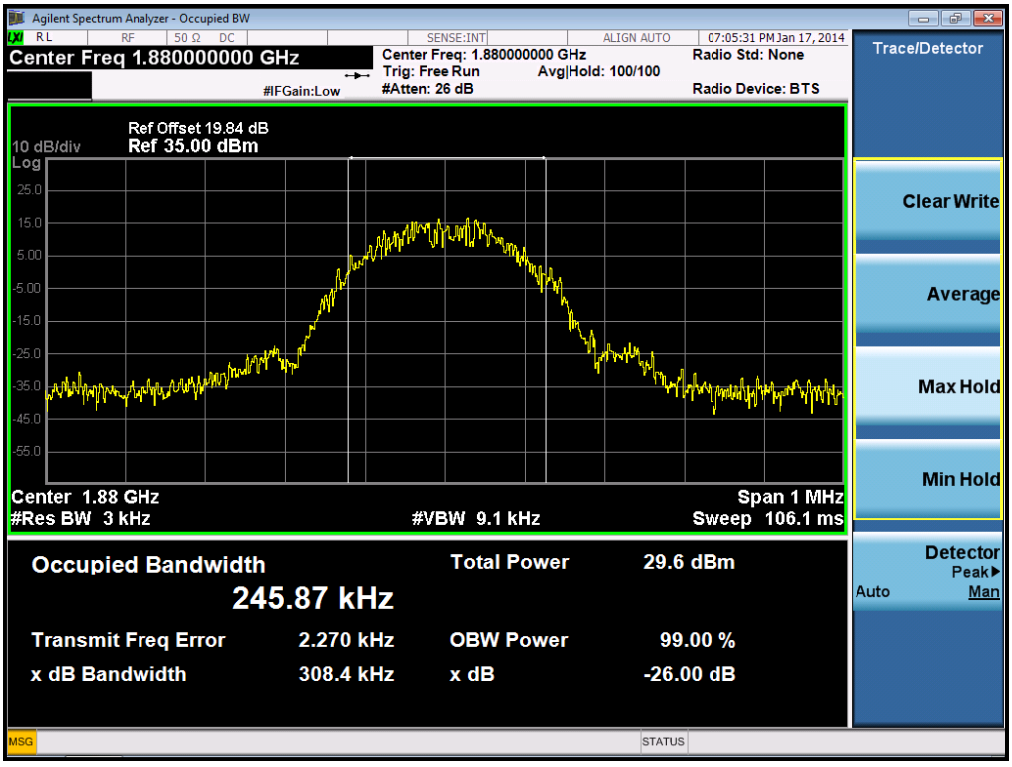
GSM 1900 & Channel: 810



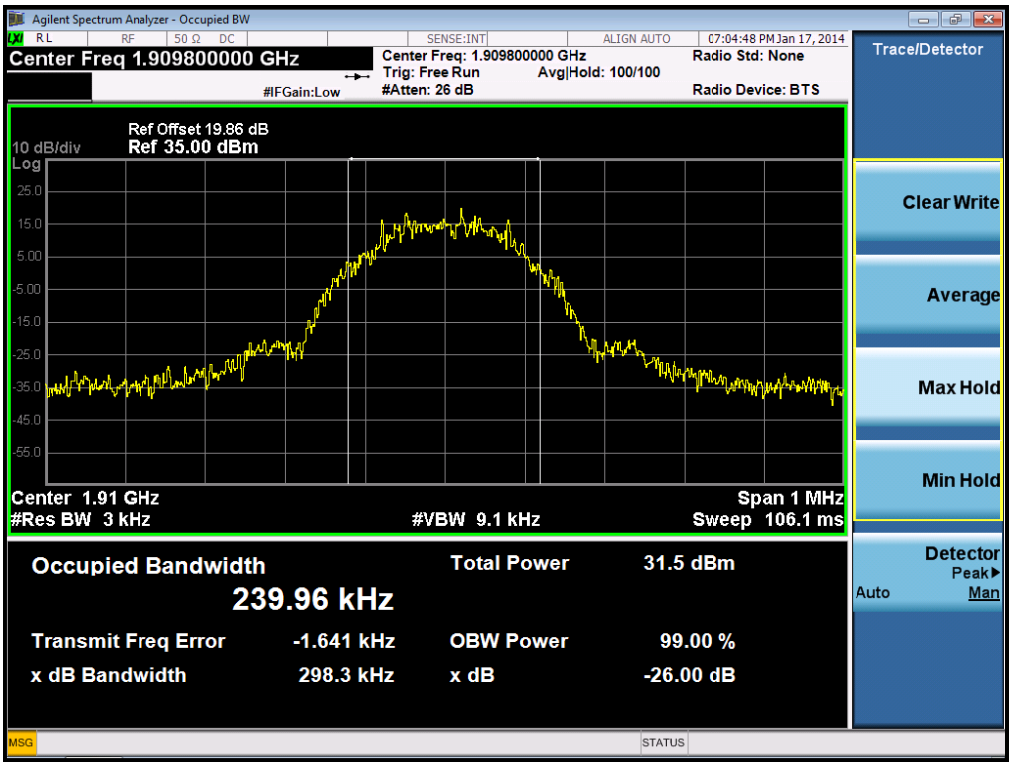
EDGE 1900 & Channel: 512



EDGE 1900 & Channel: 661

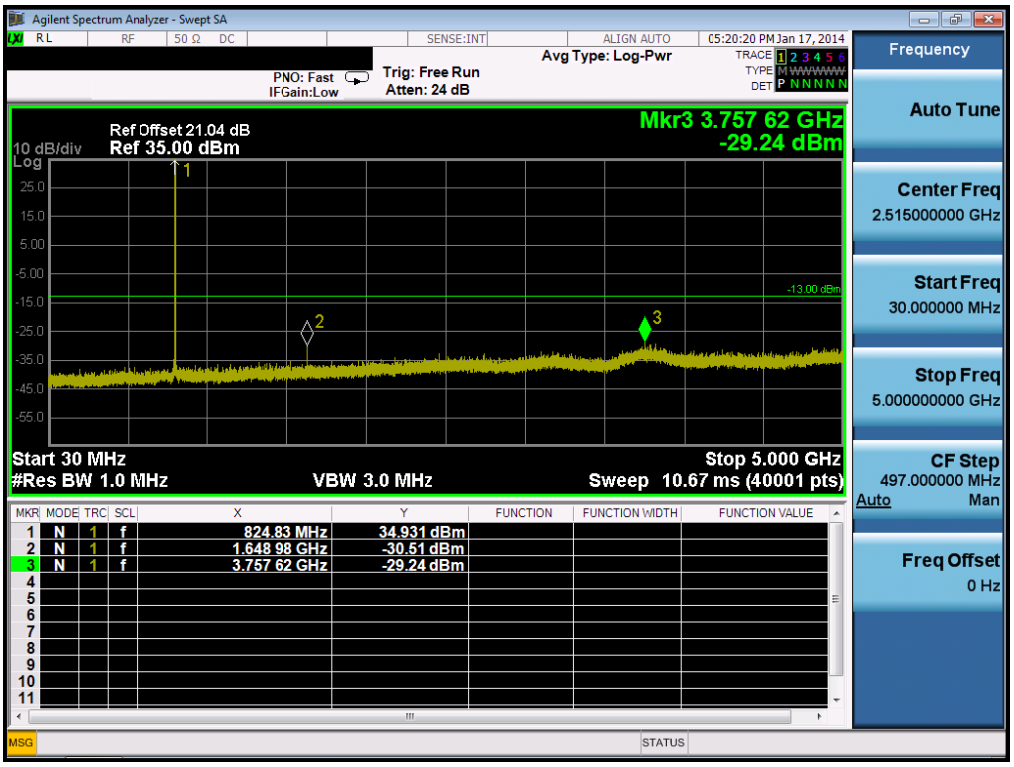


EDGE 1900 & Channel: 810

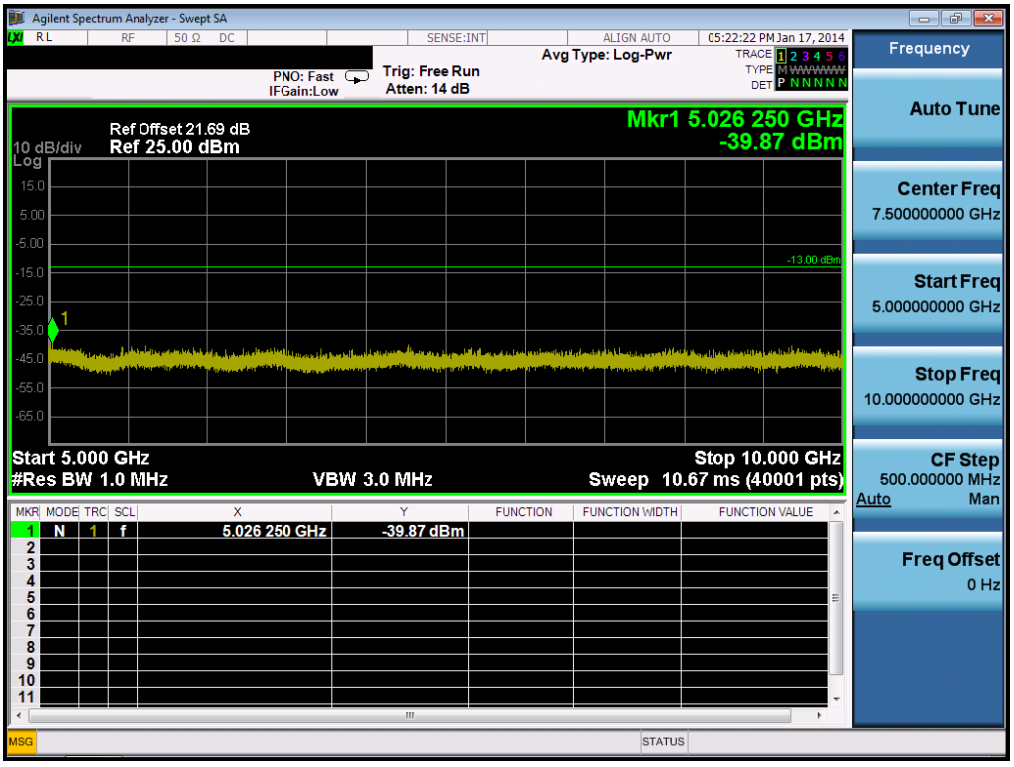


8.3 Spurious Emissions at Antenna Terminal

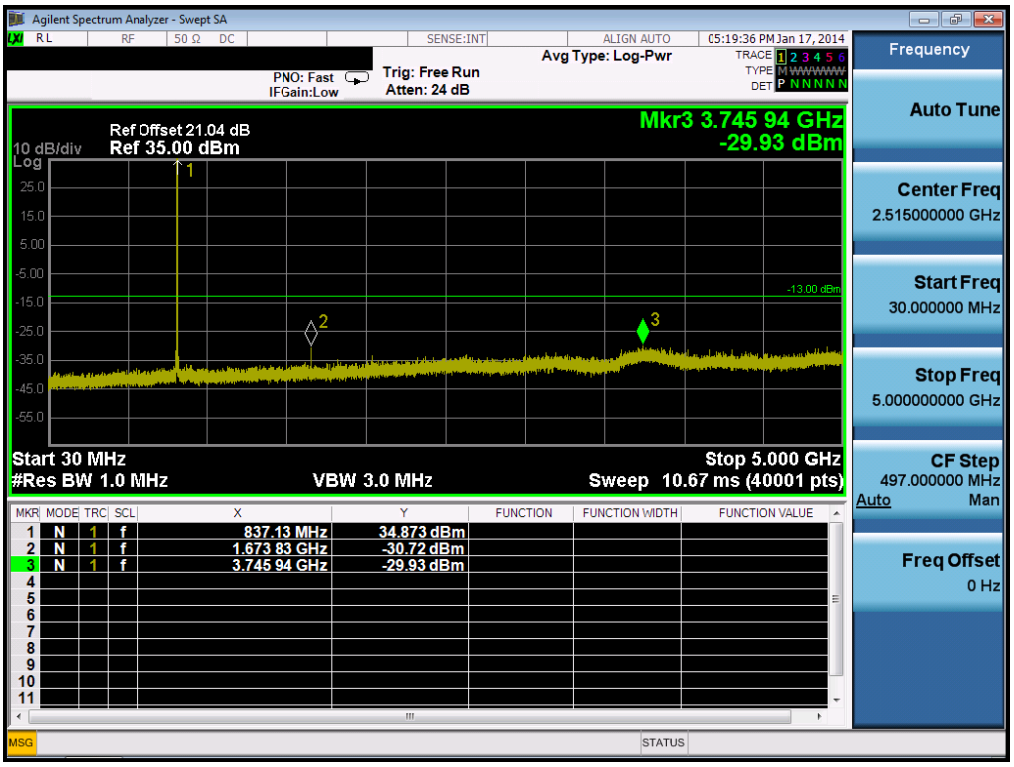
GSM850 & Channel: 128



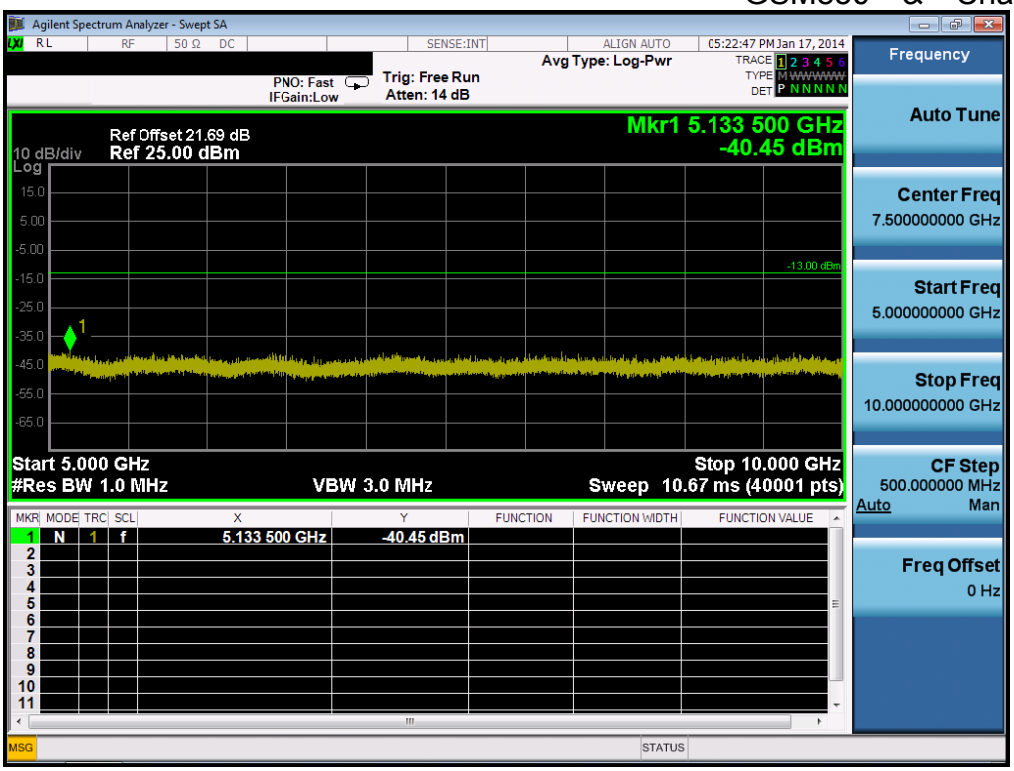
GSM850 & Channel: 128



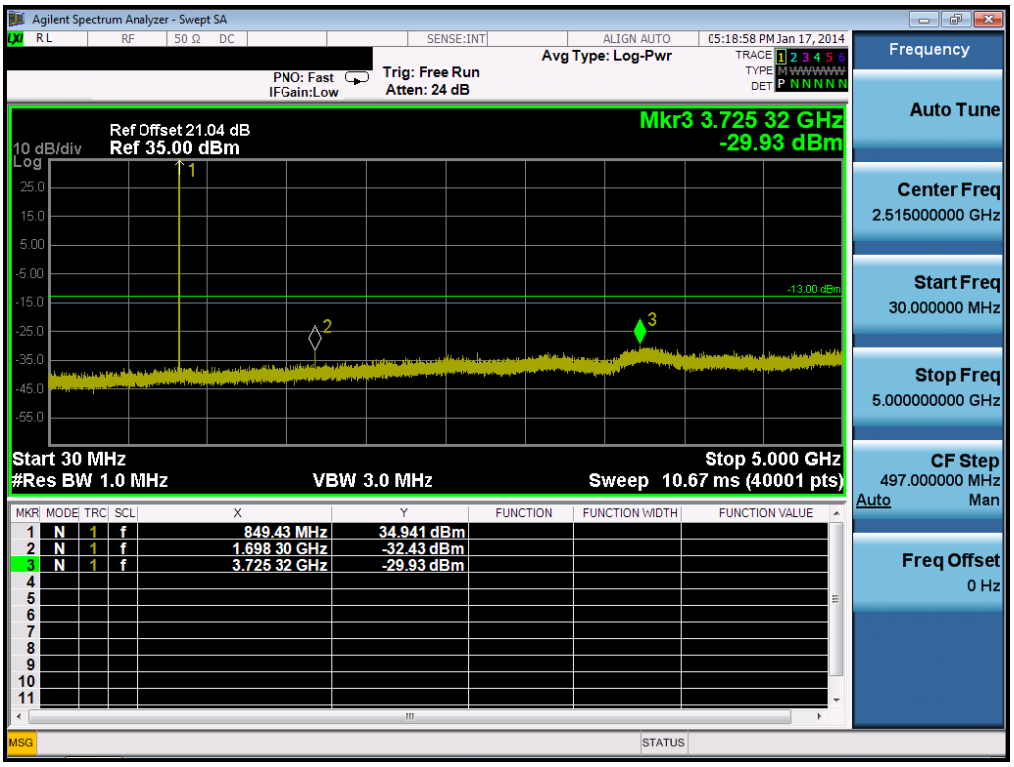
GSM850 & Channel: 190



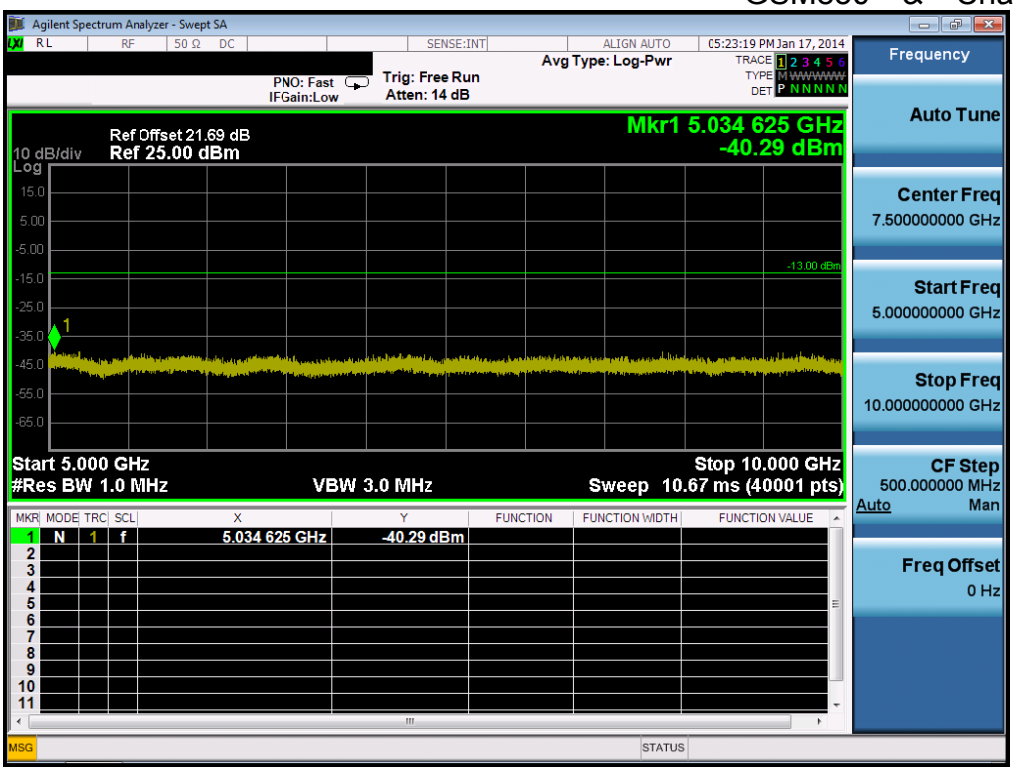
GSM850 & Channel: 190



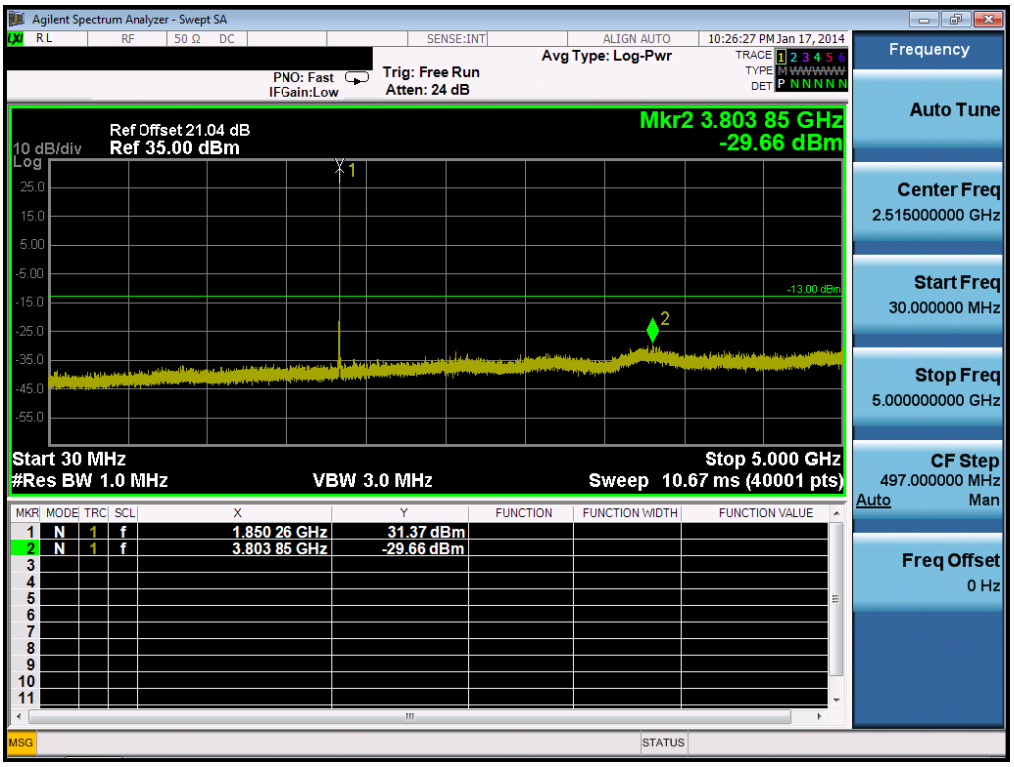
GSM850 & Channel: 251



GSM850 & Channel: 251



PCS1900 & Channel: 512



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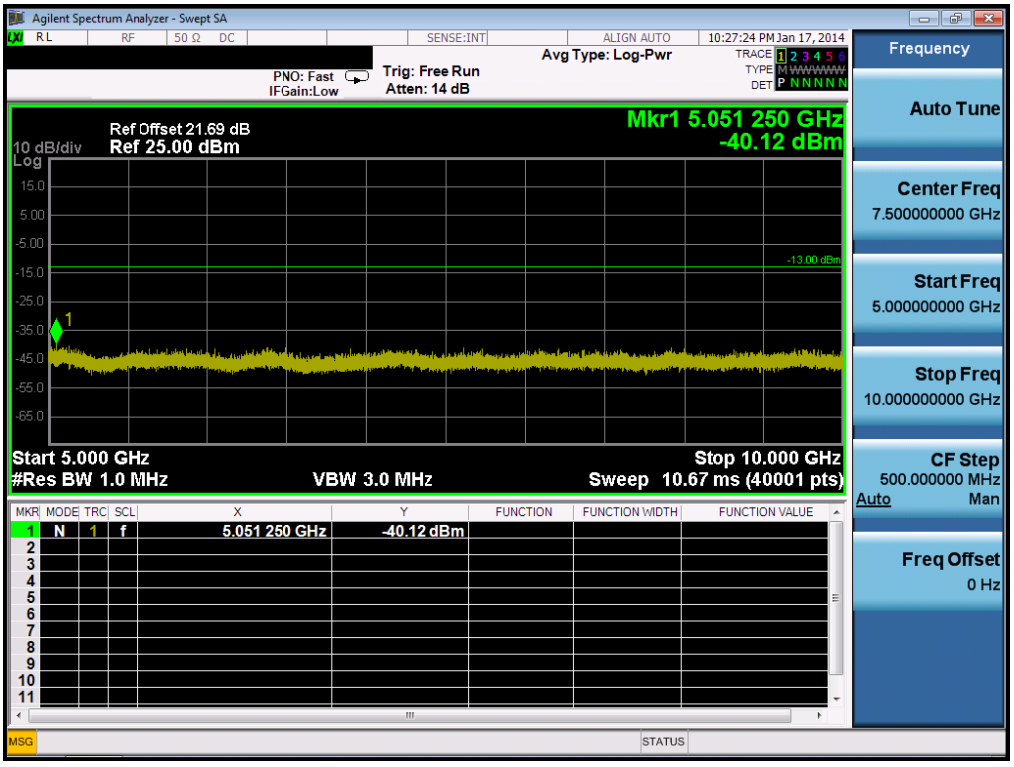
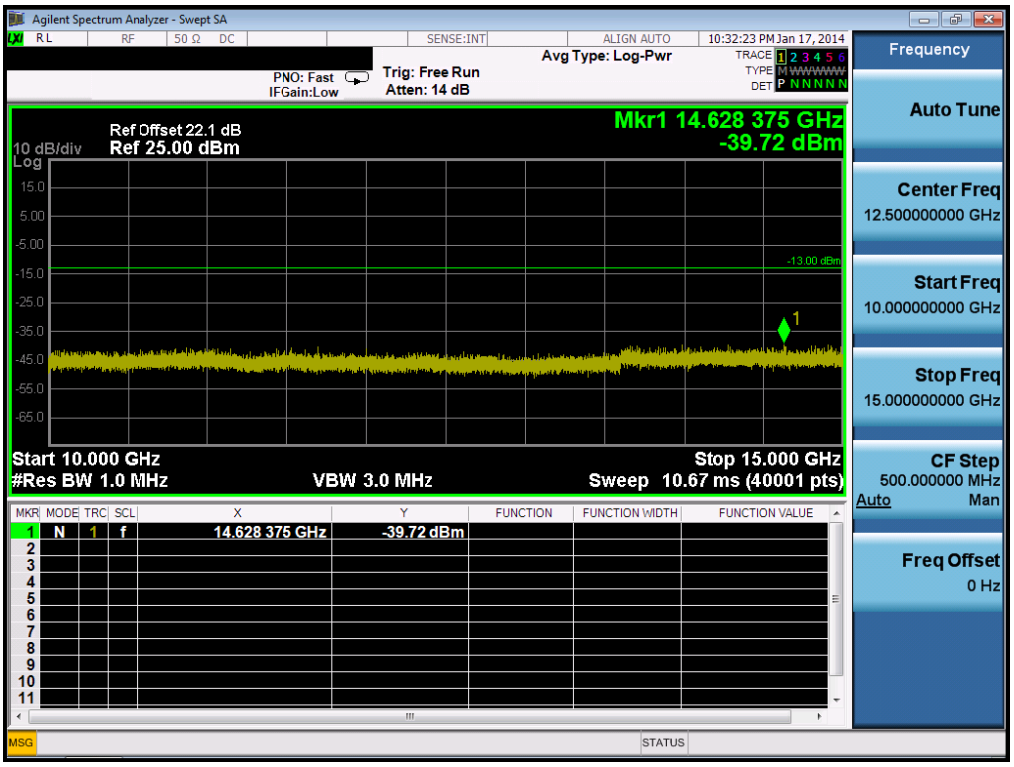


PCS1900 & Channel: 512



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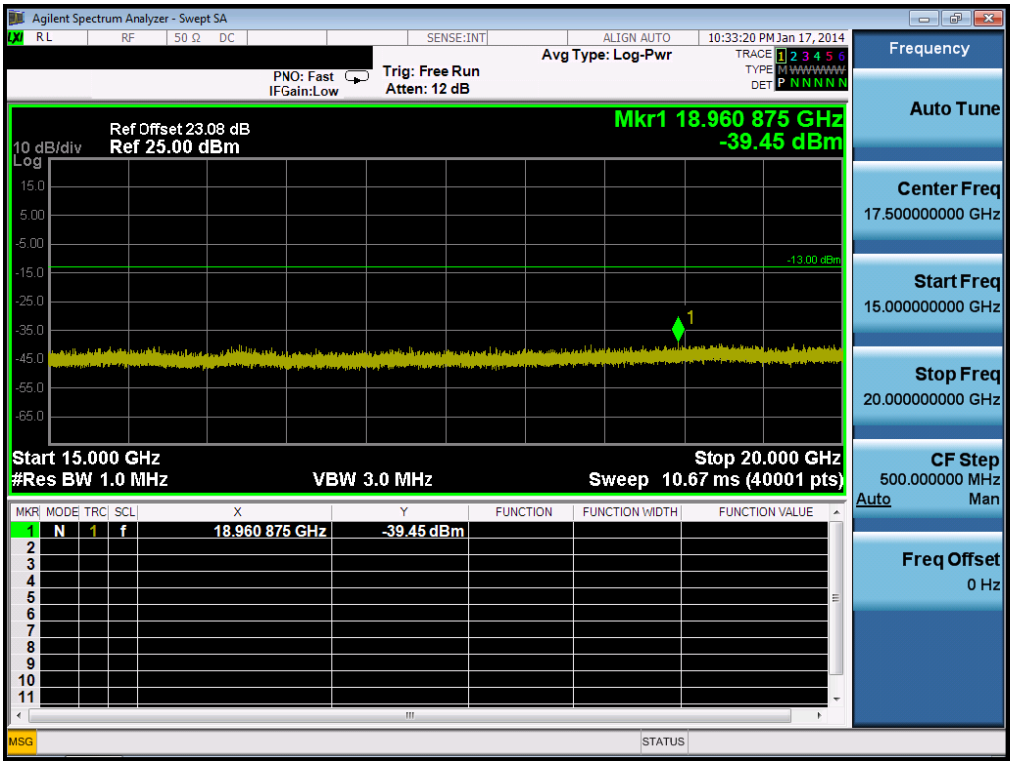
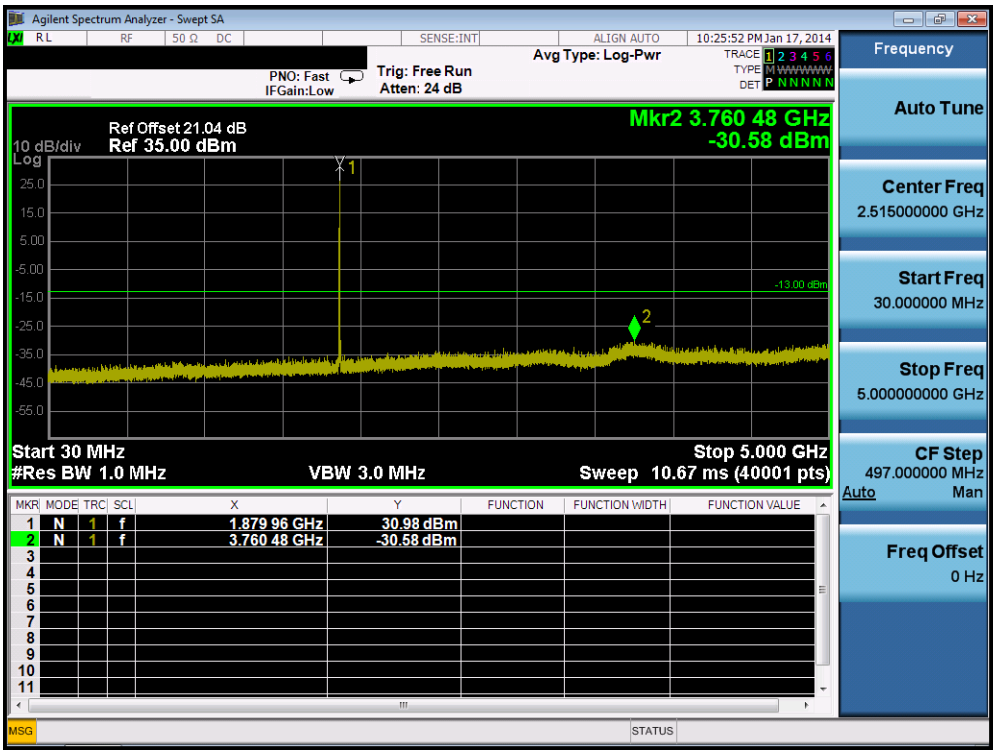


PCS1900 & Channel: 661



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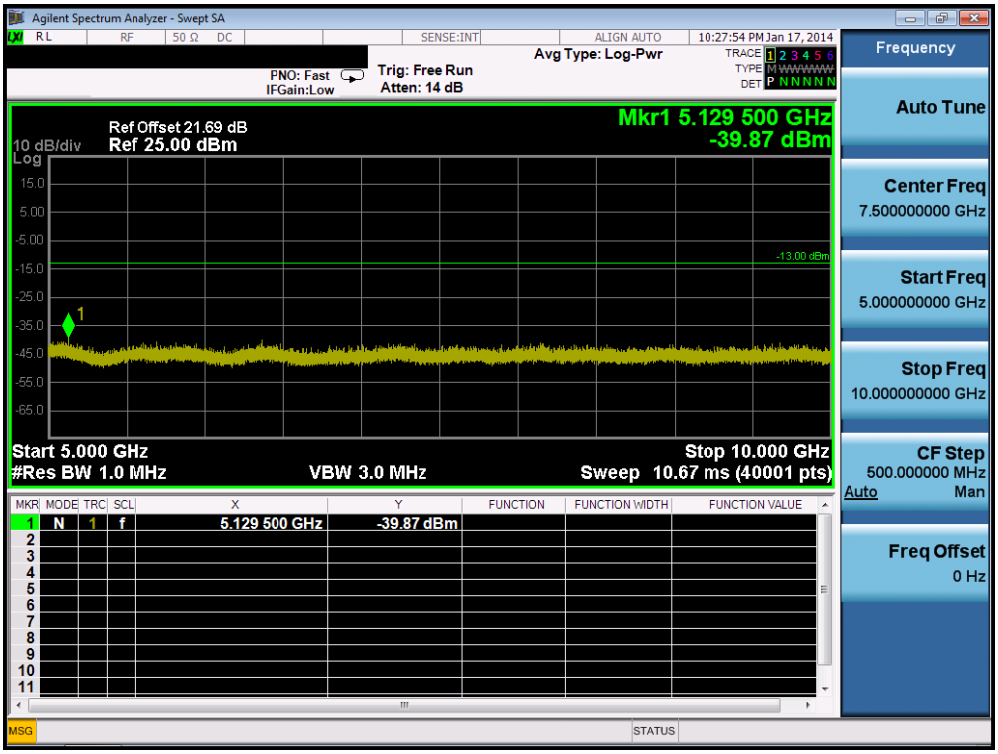

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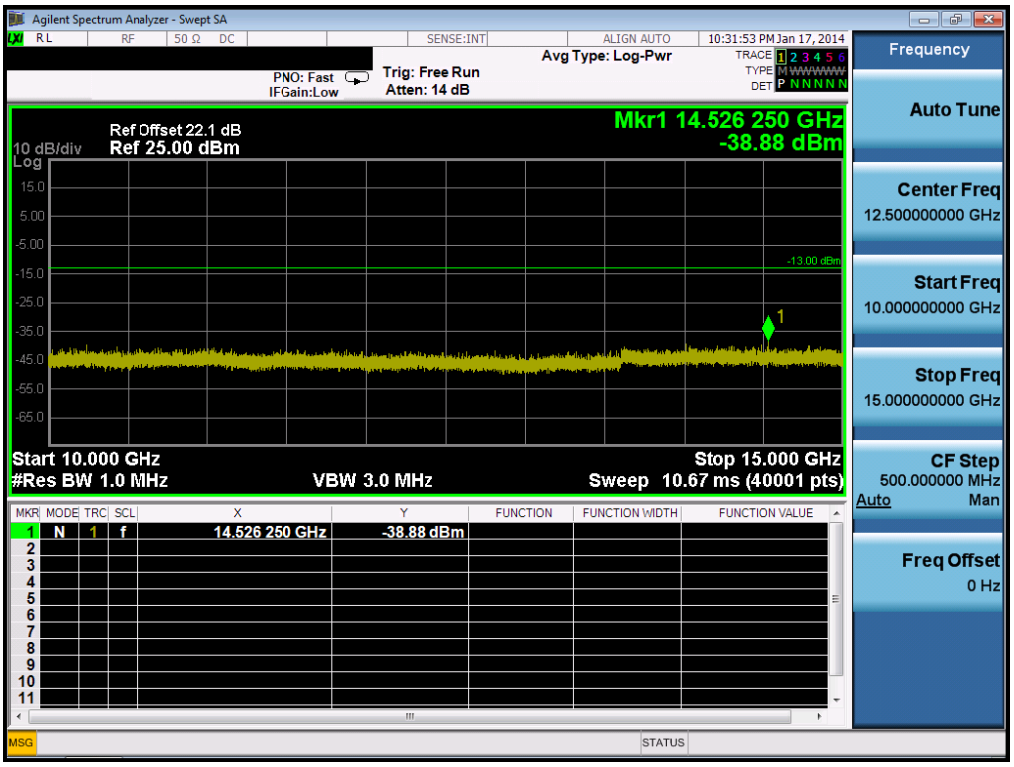

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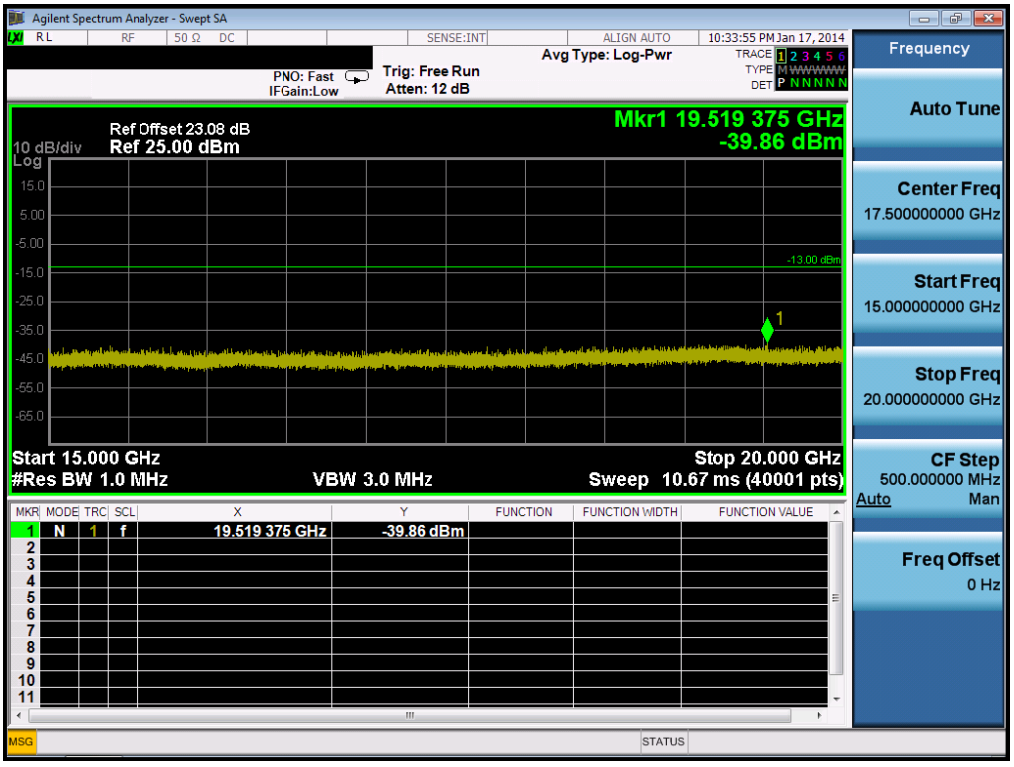
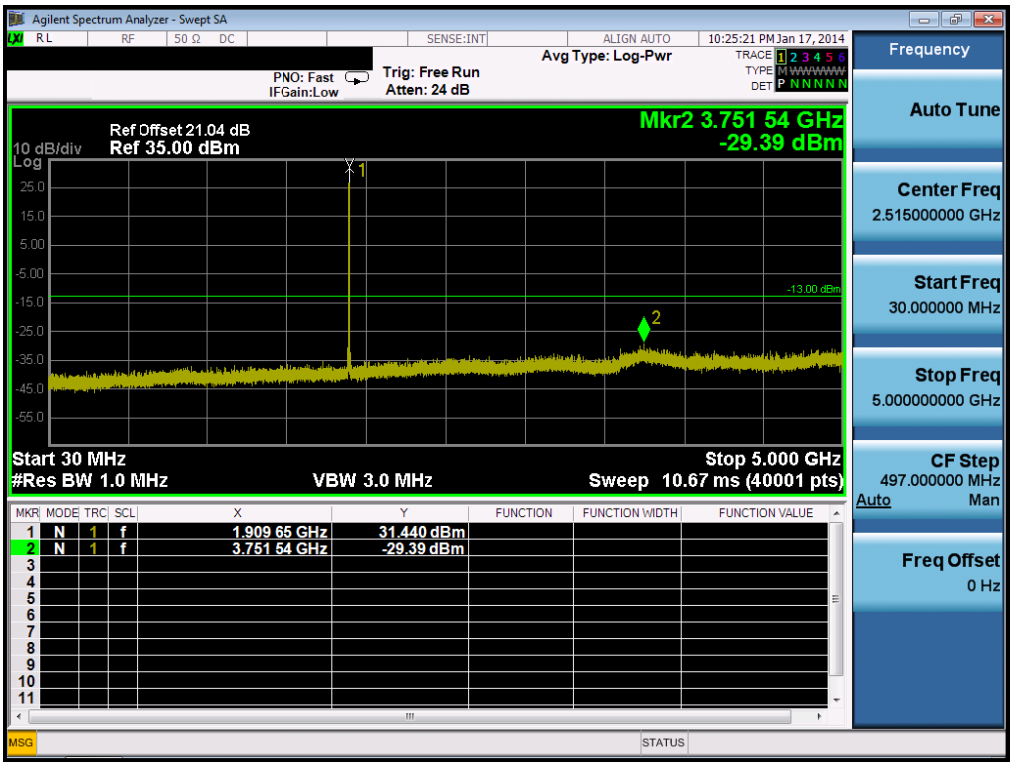
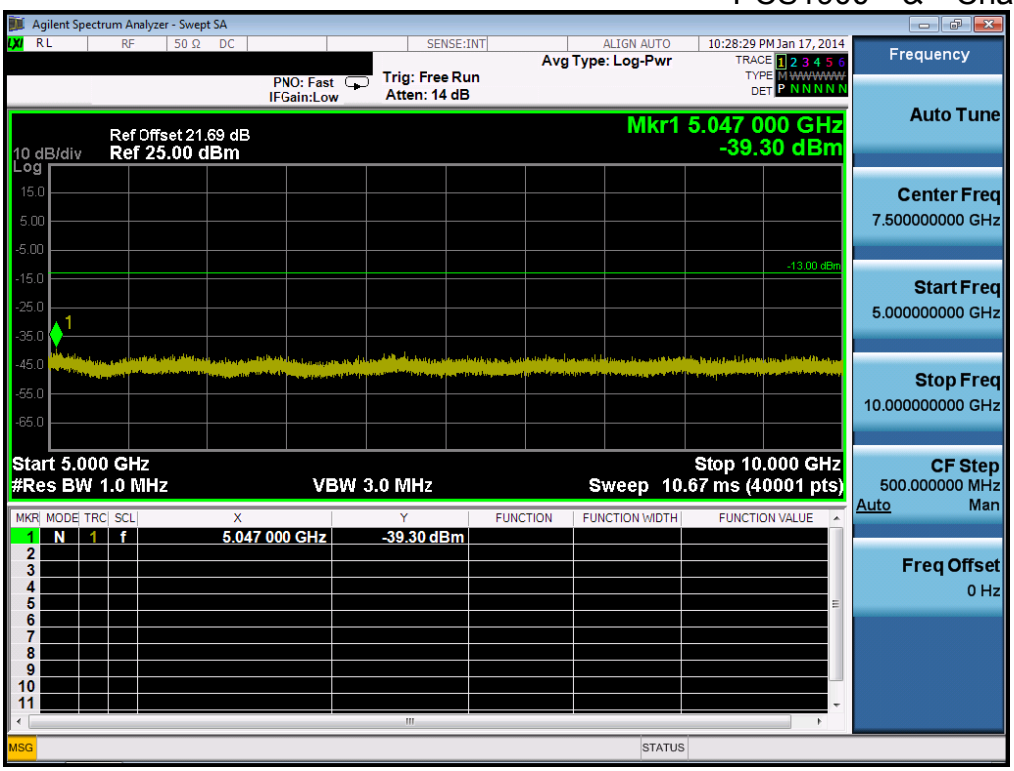


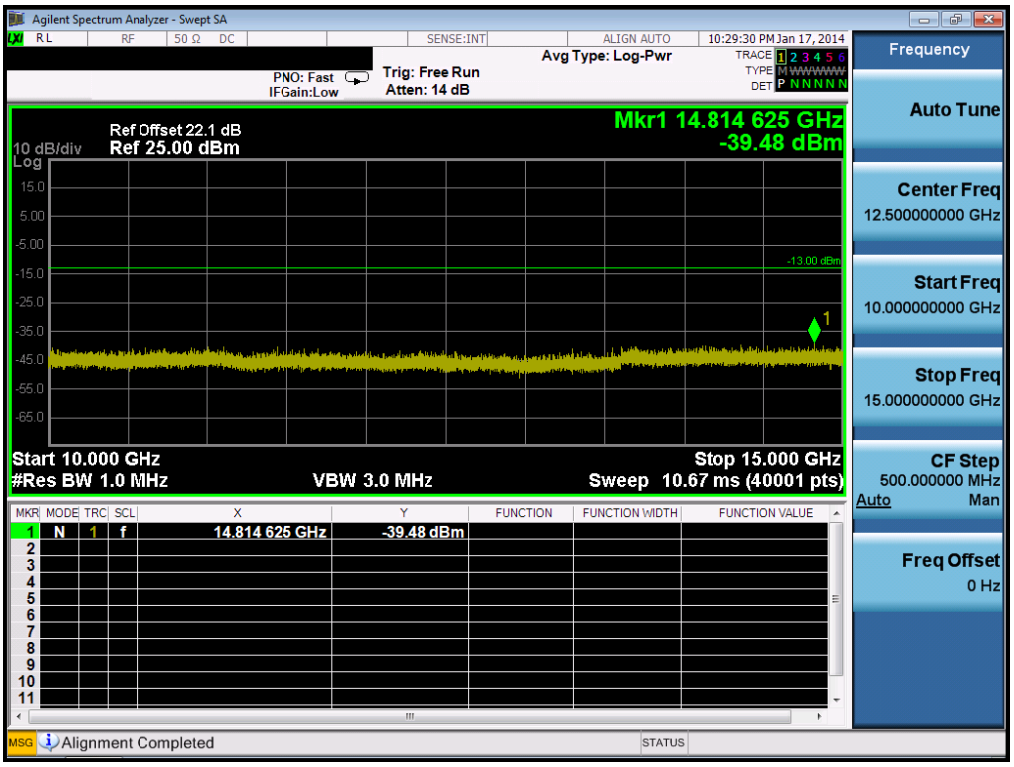
PCS1900 & Channel: 810



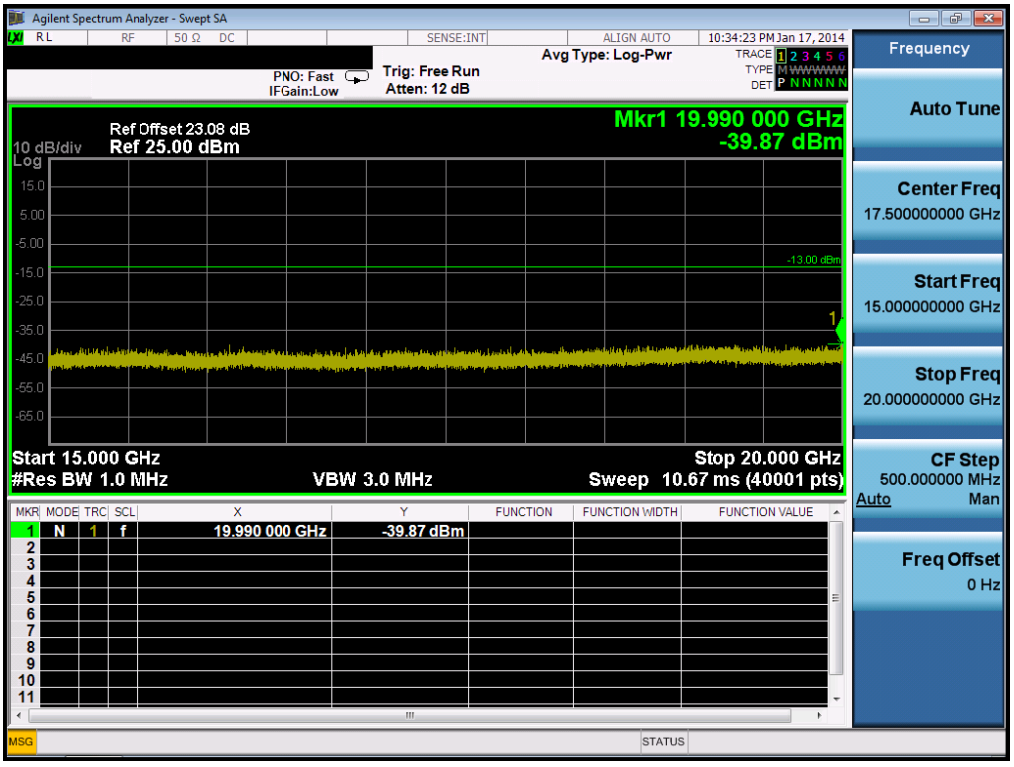
PCS1900 & Channel: 810



PCS1900 & Channel: 810



PCS1900 & Channel: 810

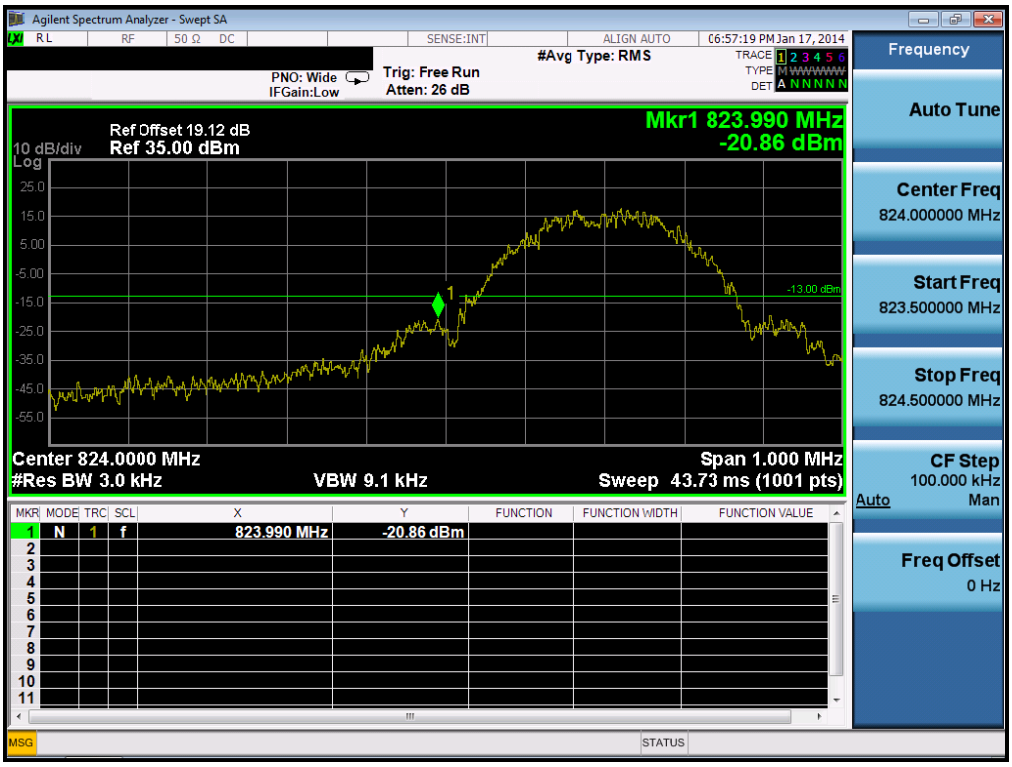


8.4 Band Edge

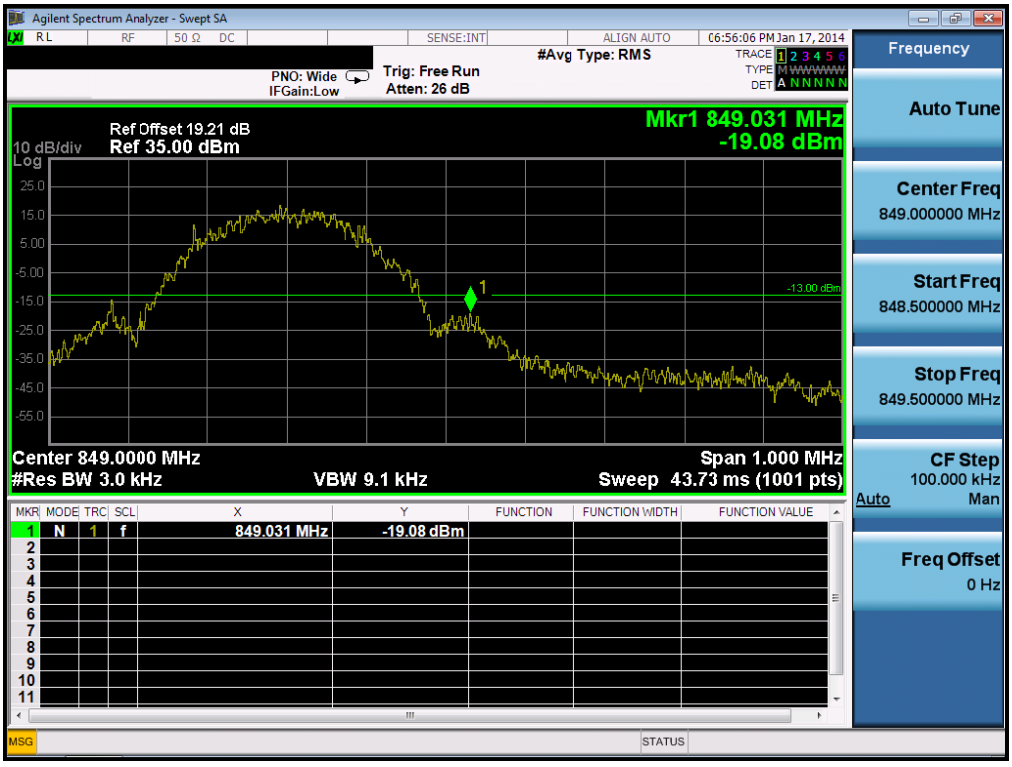
GSM850 & Channel: 128

GSM850 & Channel: 251

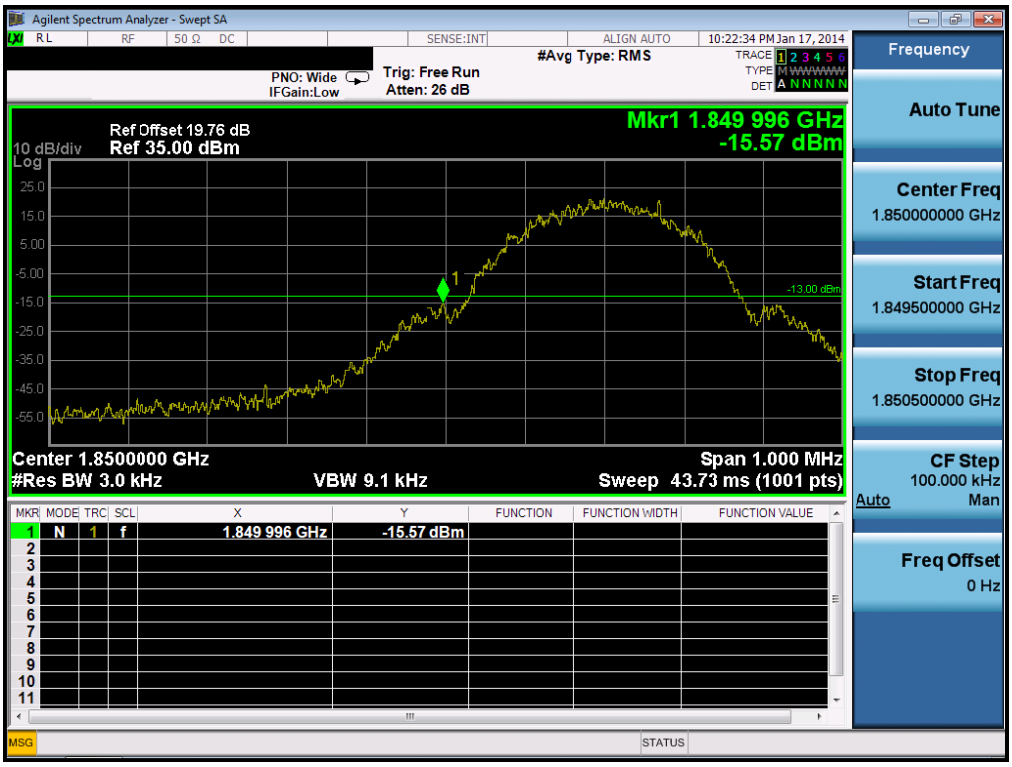
EDGE 850 & Channel: 128



EDGE 850 & Channel: 251

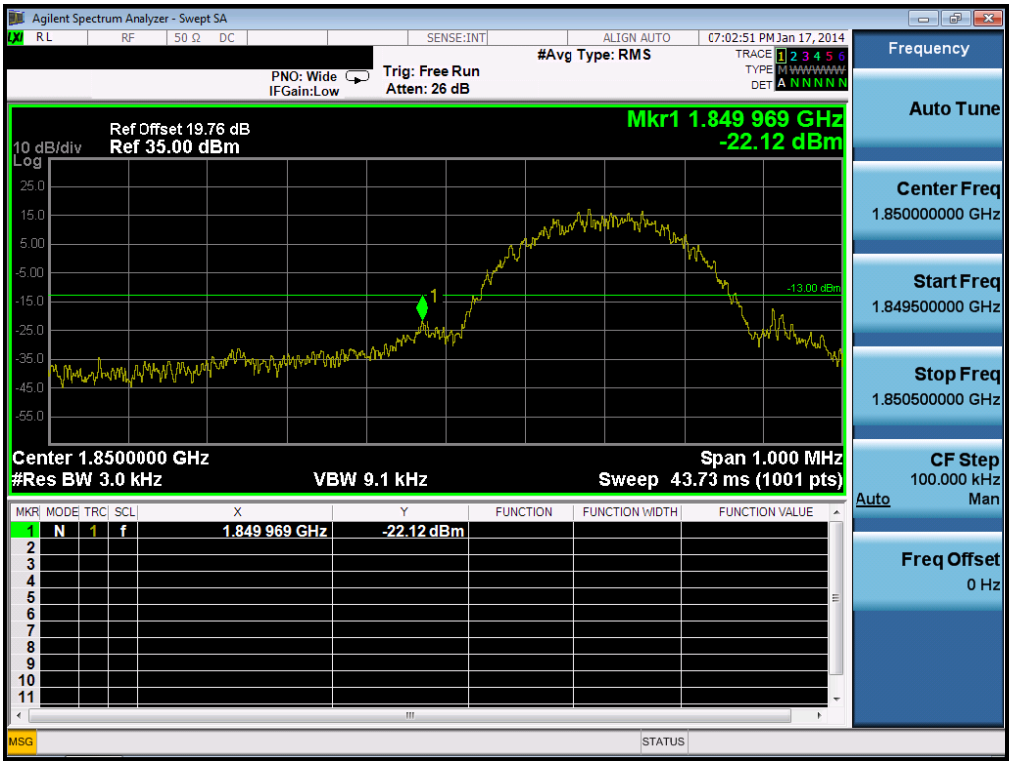


PCS1900 & Channel: 512



PCS1900 & Channel: 810

EDGE 1900 & Channel: 512



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