PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21045 USA
Tel. 410.290.6652 / Fax 410.290.6654
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MEASUREMENT REPORT
FCC Part 90 Band Class 10 CDMA

Applicant:
Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu
Suwon-city, Gyeonggi-do, 443-803
Republic of Korea

Date of Testing:
February 1-18, 2013
Test Site/Location:
PCTEST Lab., Columbia, MD, USA
Test Report Serial No.:
0Y1301310136.A3L

FCC ID:	**A3LSPHM840**
APPLICANT:	**SAMSUNG ELECTRONICS CO., LTD.**

Applicant Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	§90.691
EUT Type:	Portable Handset
Model(s):	SPH-M840
Test Device Serial No.:	*identical prototype* [S/N: FK-022-D, FK-022-E]

Mode	Tx Frequency (MHz)	Emission Designator	Conducted Power	
			Max. Power (W)	Max. Power (dBm)
CDMA800 (BC10)	817.9 - 823.1	1M27F9W	0.296	24.71

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

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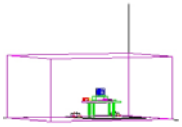
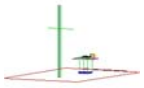


MEASUREMENT REPORT
BC10 CDMA



§2.1033 General Information

APPLICANT:	Samsung Electronics Co., Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Yeongtong-gu Suwon-city, Gyeonggi-do, 443-803, Republic of Korea
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21045 USA
BASE MODEL:	SPH-M840
FCC CLASSIFICATION:	PCS Licensed Transmitter Held to Ear (PCE)
MODE:	CDMA / EvDO
FREQUENCY TOLERANCE:	±0.00025 % (2.5 ppm)
Test Device Serial No.:	FK-022-D, FK-022-E ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	February 1-18, 2013
TEST REPORT S/N:	0Y1301310136.A3L

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab. located in Columbia, MD 21045, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC.

- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (*See* **Figure 1-1**).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39o 10'23" N latitude and 76o 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 on February 15, 2012.

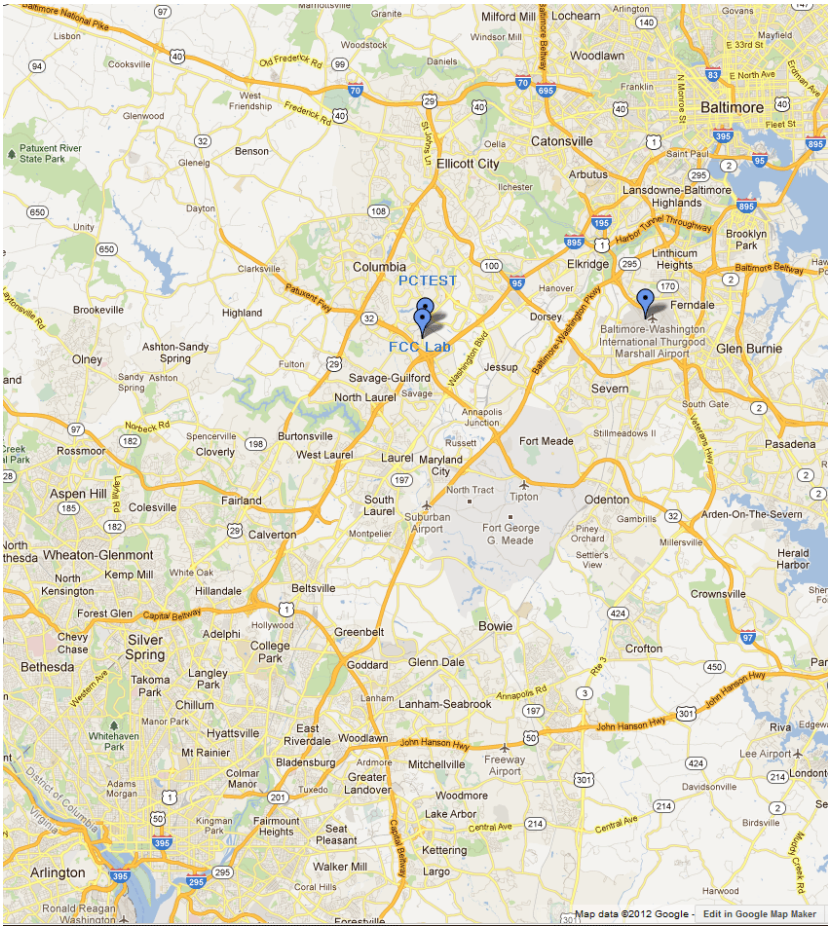


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSPHM840**. The EUT consisted of the following component(s):

Trade Name / Base Model	FCC ID	Description
Samsung / Model: SPH-M840	A3LSPHM840	Portable Handset

Table 2-1. EUT Equipment Description

Note: All data contained in this report is applicable for the device operation in the BC10 (817 – 824 MHz). Test data shown supports the devices compliance with §90.691 of the FCC Rules and Regulation.

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA /EvDO Rev 0/A /1xAdvanced (BC0, BC1, BC10), 802.11a/b/g/n WLAN (DTS/NII), Bluetooth (1x,EDR, LE)

2.3 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the "Land Mobile FM or PM – Communications Equipment Measurements and Performance Standards" (ANSI/TIA-603-C-2004) was used in the measurement of the measurement of the **Samsung Portable Handset FCC ID: A3LSPHM840.**

3.2 Occupied Bandwidth

§2.1049

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. The spectrum analyzers' "occupied bandwidth" measurement function was used to record the occupied bandwidth in accordance with KDB 971168.

3.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051, §90.691

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10^{th} harmonic.

Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

3.4 Radiated Spurious Emissions

§2.1053, §90.635, §90.691

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A ¾" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168.

Per the guidance of ANSI/TIA-603-C-2004, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\ [dBm]}$ – cable loss $_{[dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + $10\log_{10}$(Power $_{[Watts]}$) specified in 90.691.

3.5 Frequency Stability / Temperature Variation

§2.1055, 90.213(a)

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – For Part 90.213, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).

2. The equipment is turned on in a "standby" condition for fifteen minutes 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 sufficient stabilization period at each temperature shall be used prior to each frequency requirement.

4.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx1	Licensed Transmitter Cable Set	1/17/2013	Annual	1/17/2014	N/A
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	7/10/2012	Annual	7/10/2013	N/A
Agilent	N9020A	MXA Signal Analyzer	10/9/2012	Annual	10/9/2013	US46470561
Espec	ESX-2CA	Environmental Chamber	4/4/2012	Annual	4/4/2013	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/22/2011	Biennial	7/22/2013	125518
Mini-Circuits	VHF-1200+	High Pass Filter	1/17/2013	Annual	1/17/2014	30923
Rohde & Schwarz	CMU200	Base Station Simulator	5/22/2012	Annual	5/22/2013	109892
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	6/26/2012	Annual	6/26/2013	100071
Rohde & Schwarz	ESU26	EMI Test Receiver	2/15/2012	Annual	2/15/2013	100342
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	11/14/2011	Biennial	11/14/2013	9105-2404
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/26/2012	Biennial	1/26/2014	A051107

Table 4-1. Test Equipment

Note:

In the table above, if the equipment calibration due date falls within the test dates, care was taken to ensure that the equipment was utilized prior to the calibration due date.

5.0 SAMPLE CALCULATIONS

Emission Designator

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data) (Measured at the 99.75% power bandwidth)

Spurious Radiated Emission – BC10

Example: Channel 476 CDMA BC10 Mode 3rd Harmonic (2453.70MHz)

The average spectrum analzyer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 2453.70 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80) = 50.3 dBc.

6.0 TEST RESULTS

6.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSPHM840

FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)

Mode(s): CDMA / EvDO / 1xAdvanced

Band: Band Class 10

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
§2.1051, §90.691	Band Edge / Conducted Spurious Emissions	< 50 + 10log$_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge	CONDUCTED	PASS	Section 7.0
§2.1046	Transmitter Conducted Output Power	N/A		PASS	RF Exposure Report
§90.635	Conducted Power	< 100 Watts		PASS	Section 6.2
§2.1053, §90.691	Undesirable Emissions	< -13 dBm for all out-of-band emissions	RADIATED	PASS	Sections 6.3
§2.1055, §90.213	Frequency Stability	< 2.5 ppm		PASS	Section 6.4

Table 6-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. Powers for EvDO and 1xAdvanced were measured to be less than or equal to the RC3/SO55 configuration. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.

6.2 Conducted Power Output Data

§90.635

Frequency [MHz]	BC10 [Channel]	Battery Type	Cond Pwr [dBm]	Cond Pwr [Watts]	Cond Pwr Limit [dBm]	Margin [dB]
817.90	Ch. 476	Standard	24.71	0.296	50.00	-25.29
823.10	Ch. 684	Standard	24.70	0.295	50.00	-25.30

Table 6-2. Effective Radiated Power Output Data

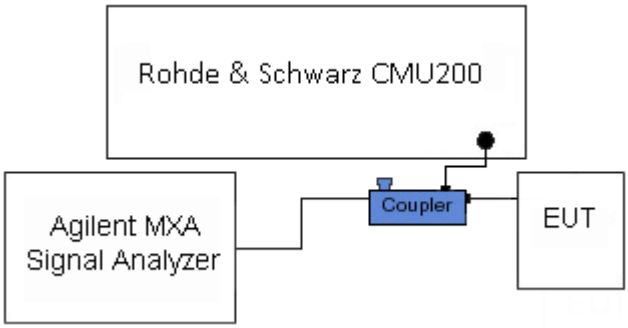


Figure 6-1. Test Instrument & Measurement Setup

NOTES:

1. This device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.

2. This unit was tested with its standard battery.

3. Powers were measured using the test setup in Figure 6-1.

6.3 BC10 CDMA Radiated Measurements

§2.1053, §90.691

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY:	817.90	MHz
CHANNEL:	476	
MODULATION SIGNAL:	CDMA	
DISTANCE:	3	meters
LIMIT:	-13.00	dBm

FREQUENCY (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	SPURIOUS EMISSION LEVEL (dBm)	POL (H/V)	Margin (dB)
1635.80	-41.23	4.88	-36.34	V	-23.34
2453.70	-47.42	5.15	-42.27	V	-29.27
3271.60	-94.15	7.49	-86.66	V	-73.66
4089.50	-94.32	9.15	-85.18	V	-72.18
4907.40	-93.98	9.95	-84.03	V	-71.03

Table 6-3. Radiated Spurious Data (Ch. 476)

NOTES:

1. This device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.

2. This unit was tested with its standard battery.

3. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case test configuration was found in the vertical setup. The data reported in the table above was measured in this test setup.

BC10 CDMA Radiated Measurements (Cont'd)

§2.1053, §90.691

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY:	823.10	MHz
CHANNEL:	684	
MODULATION SIGNAL:	CDMA	
DISTANCE:	3	meters
LIMIT:	-13.00	dBm

FREQUENCY (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	SPURIOUS EMISSION LEVEL (dBm)	POL (H/V)	Margin (dB)
1646.20	-43.66	4.77	-38.89	V	-25.89
2469.30	-49.69	5.06	-44.62	V	-31.62
3292.40	-94.29	7.57	-86.71	V	-73.71
4115.50	-94.35	9.19	-85.16	V	-72.16
4938.60	-94.01	10.00	-84.01	V	-71.01

Table 6-4. Radiated Spurious Data (Ch. 684)

NOTES:

1. This device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.

2. This unit was tested with its standard battery.

3. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case test configuration was found in the vertical setup. The data reported in the table above was measured in this test setup.

6.4 BC10 CDMA Frequency Stability Measurements

§2.1055, §90.213

OPERATING FREQUENCY: 823,100,000 Hz

CHANNEL: 684

REFERENCE VOLTAGE: 3.7 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	823,100,007	7	0.0000009
100 %		- 30	823,100,021	21	0.0000026
100 %		- 20	823,100,023	23	0.0000028
100 %		- 10	823,100,019	19	0.0000023
100 %		0	823,099,981	-19	-0.0000023
100 %		+ 10	823,099,978	-22	-0.0000027
100 %		+ 20	823,099,976	-24	-0.0000029
100 %		+ 30	823,099,971	-29	-0.0000035
100 %		+ 40	823,100,022	22	0.0000027
100 %		+ 50	823,100,016	16	0.0000019
115 %	4.26	+ 20	823,099,982	-18	-0.0000022
BATT. ENDPOINT	3.25	+ 20	823,100,002	2	0.0000002

Table 6-5. Frequency Stability Data (Ch.684)

BC10 CDMA Frequency Stability Measurements (Cont'd)

§2.1055, §90.213

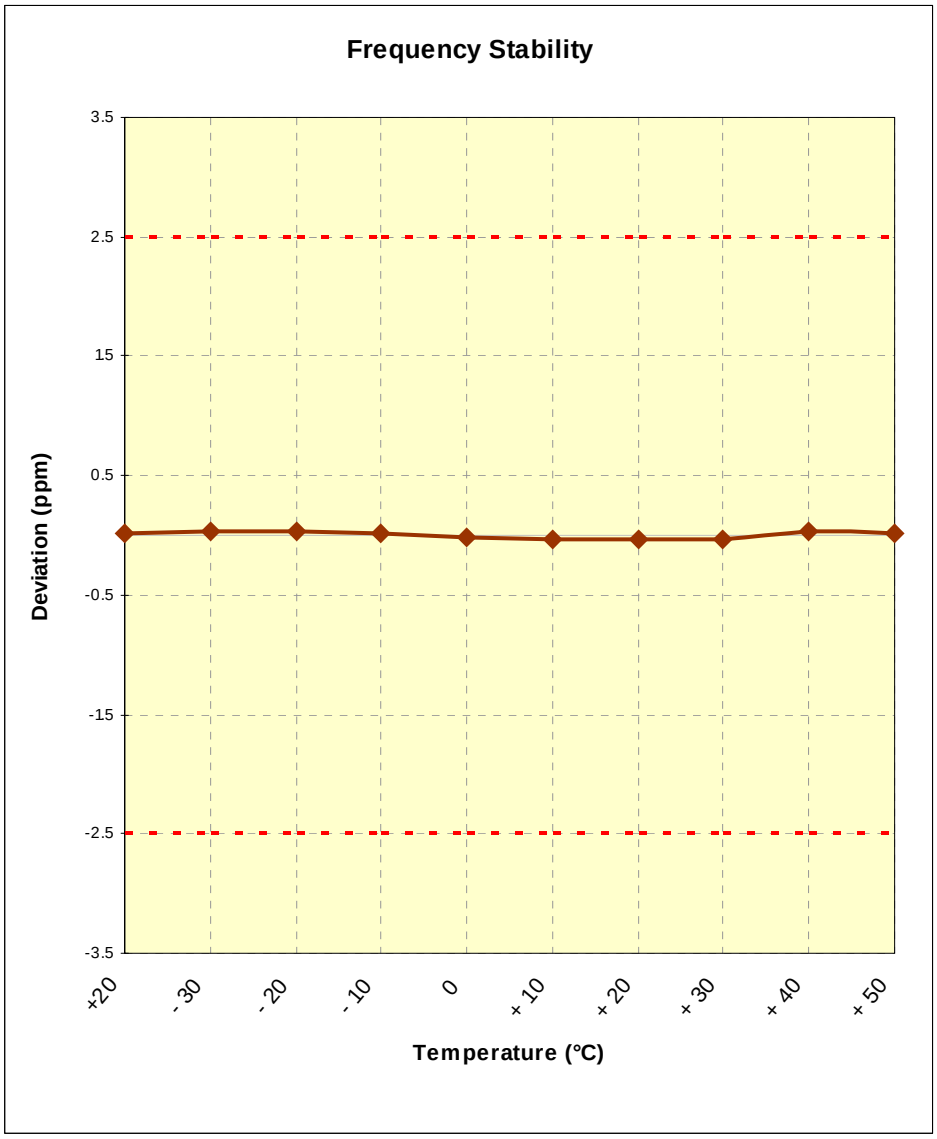
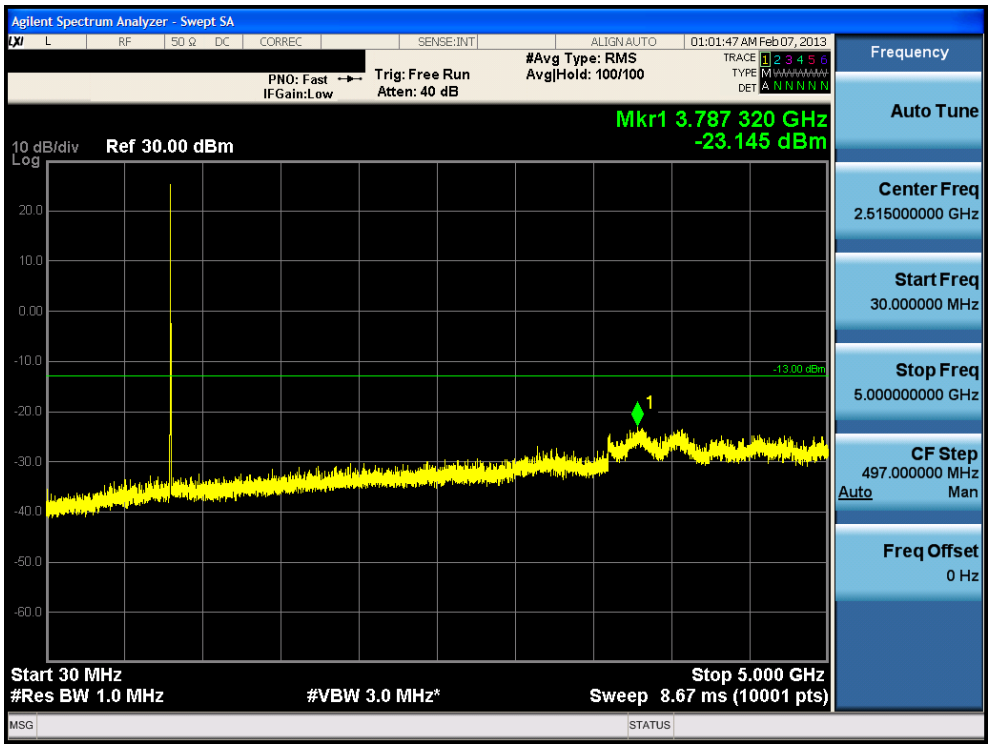
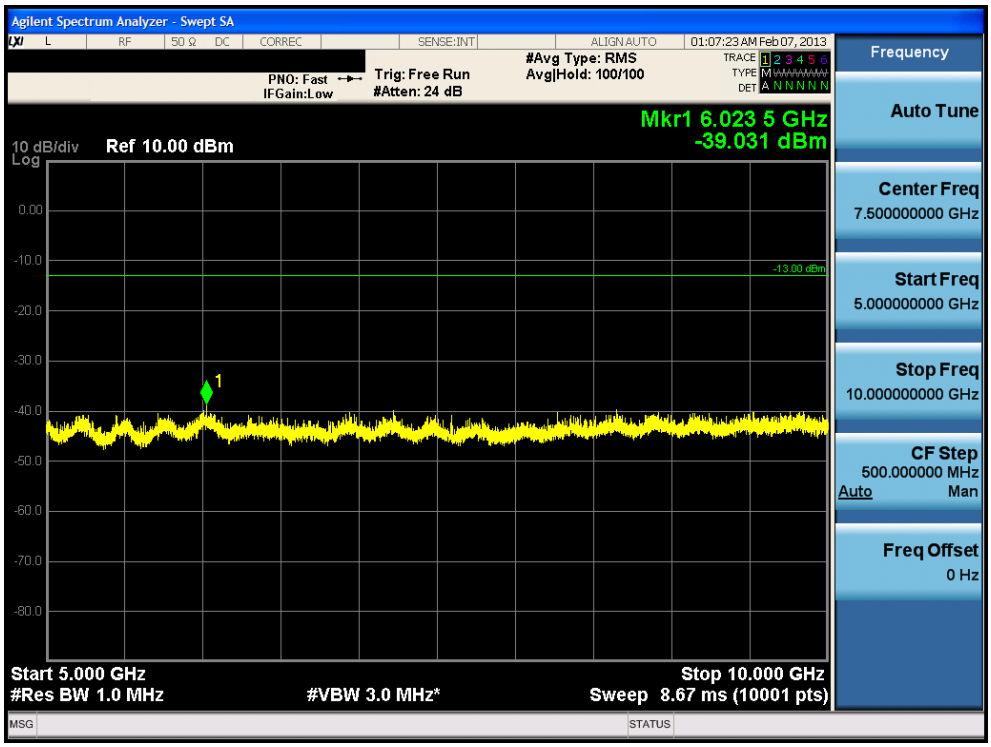


Figure 6-2. Frequency Stability Graph (Ch. 684)

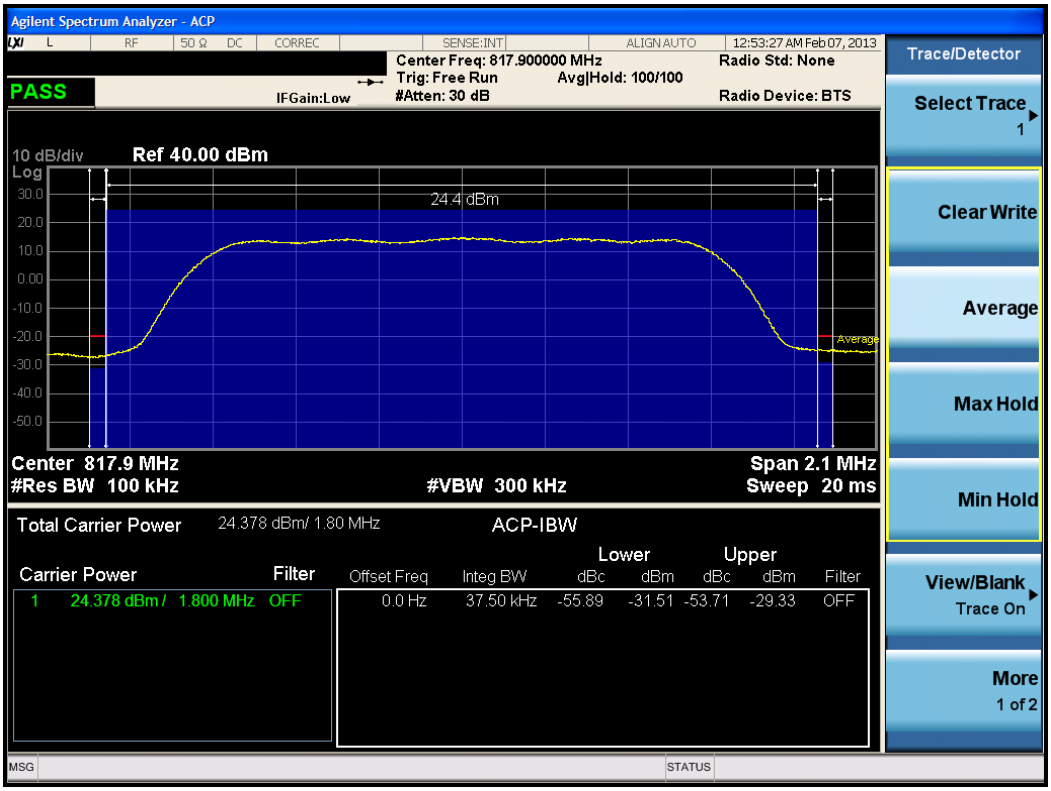
7.0 PLOTS OF EMISSIONS



Plot 7-1. Conducted Spurious Plot (Ch. 476)



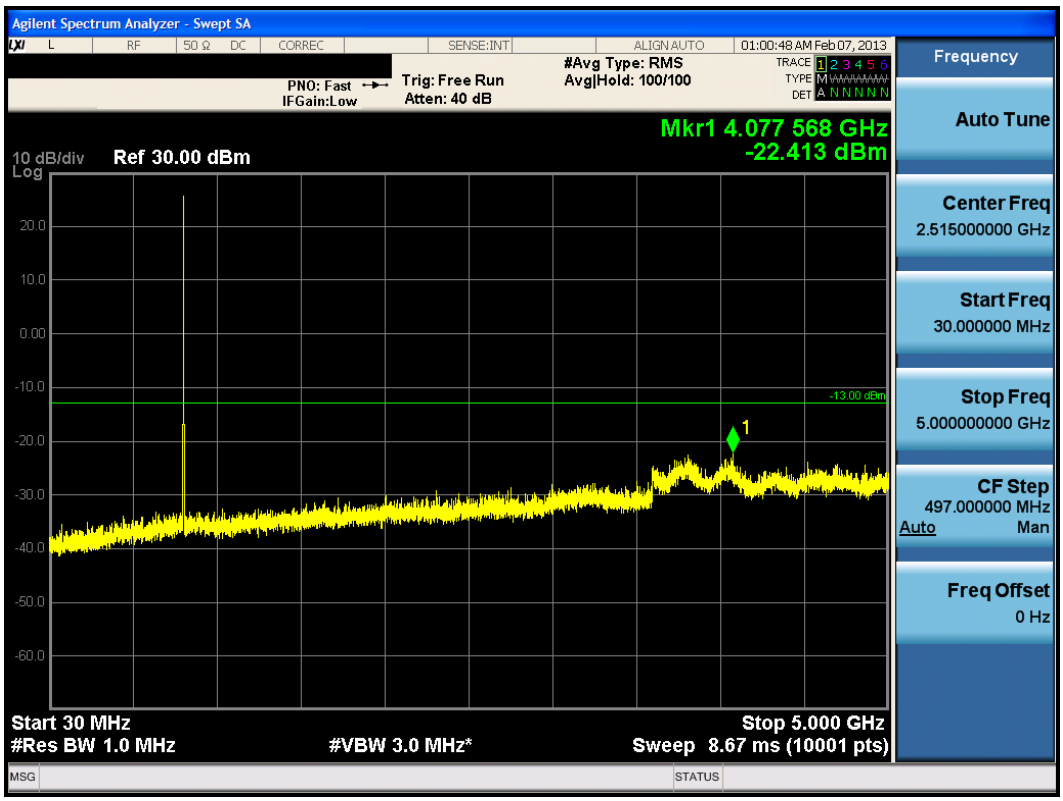
Plot 7-2. Conducted Spurious Plot (Ch. 476)



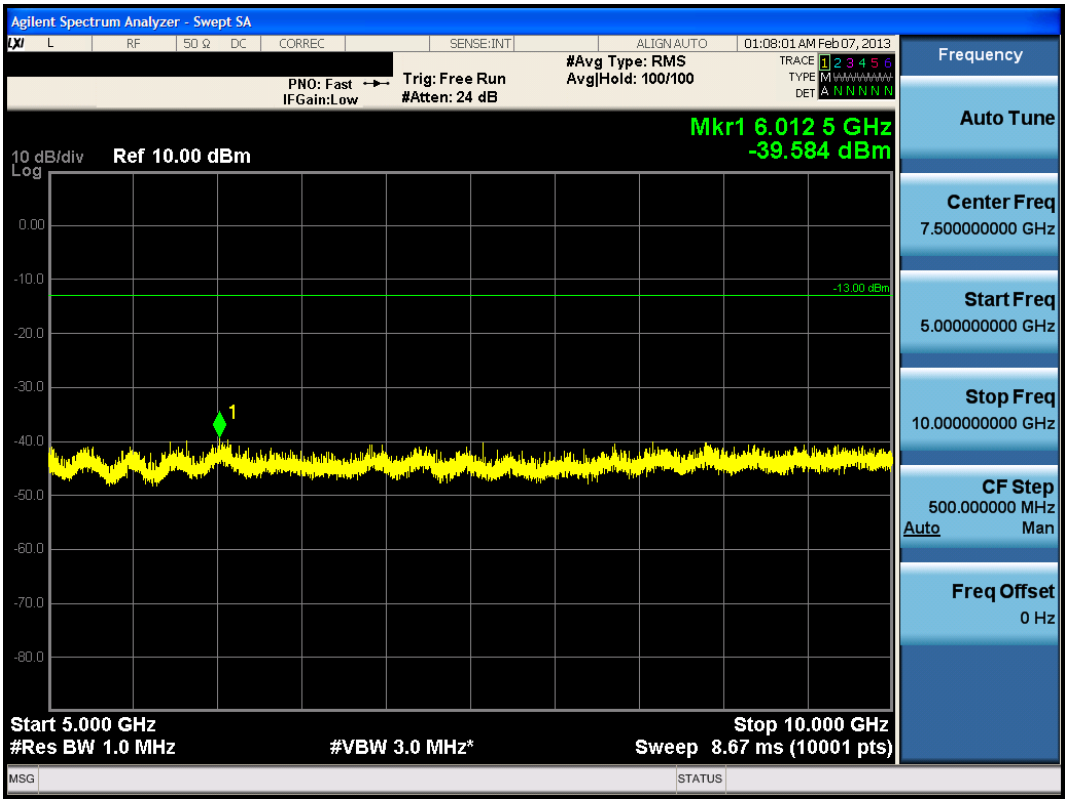
Plot 7-3. Channel Edge Plot (Ch. 476)

Plot 7-4. Outer extended Band Edge Plot (Ch. 476)

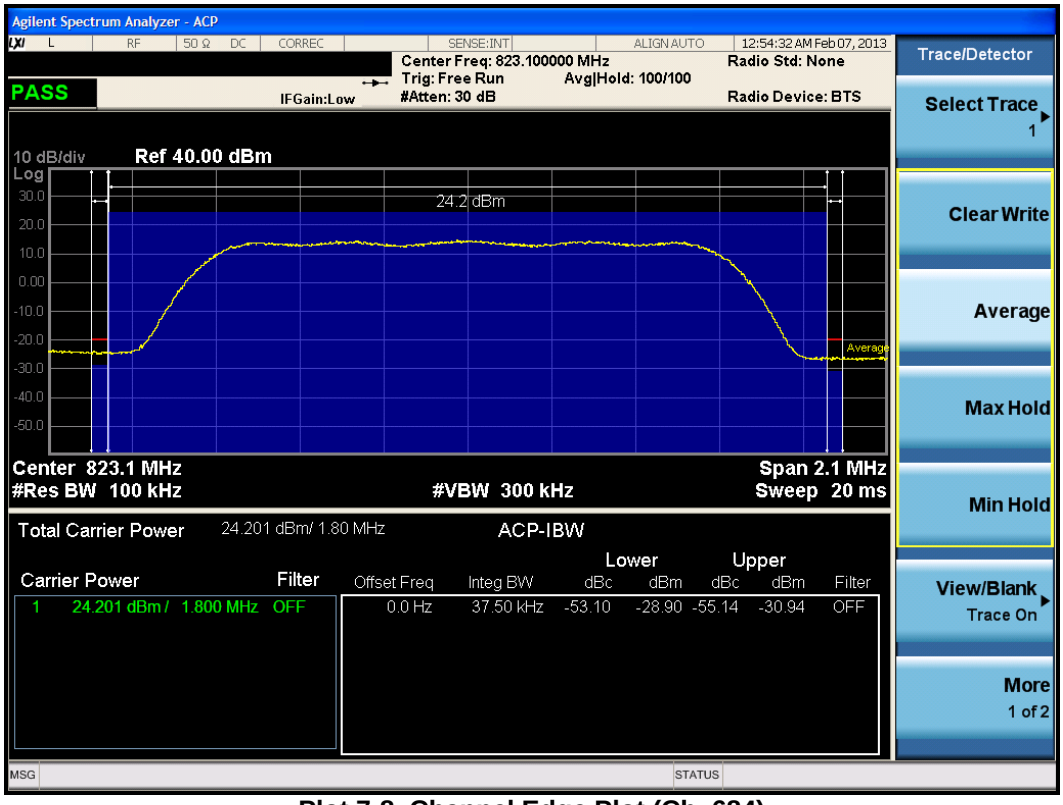
Plot 7-5. Interior extended Band Edge Plot (Ch.476)



Plot 7-6. Conducted Spurious Plot (Ch. 684)



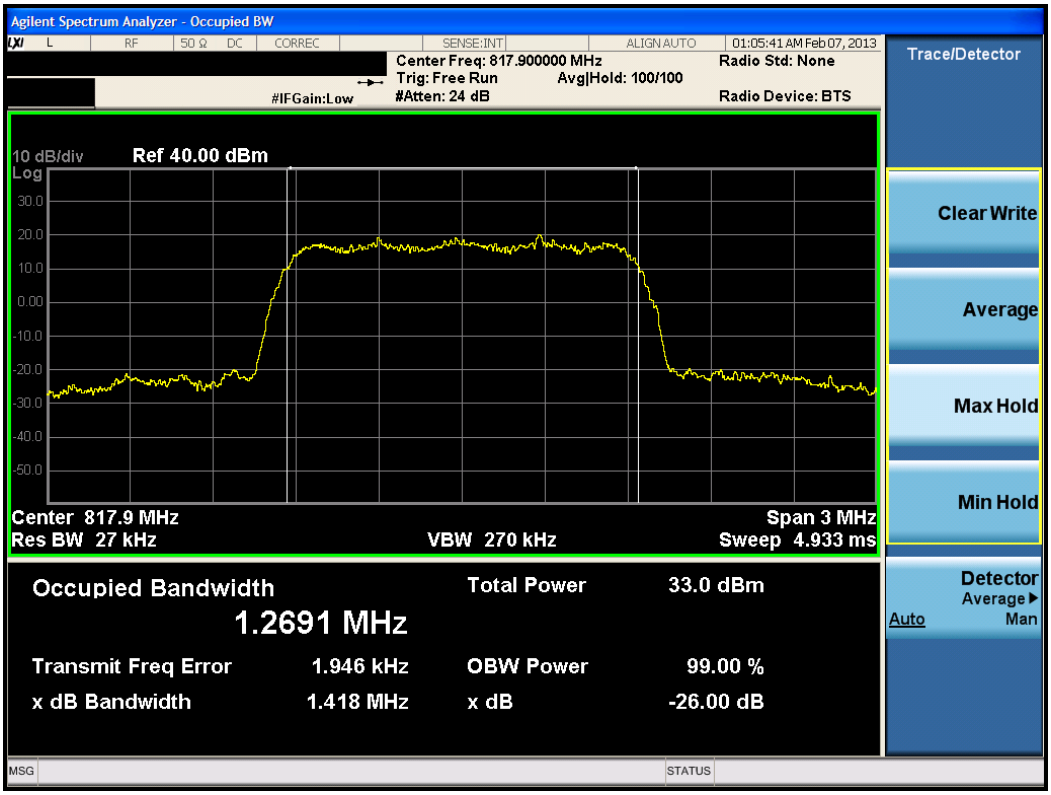
Plot 7-7. Conducted Spurious Plot (Ch. 684)



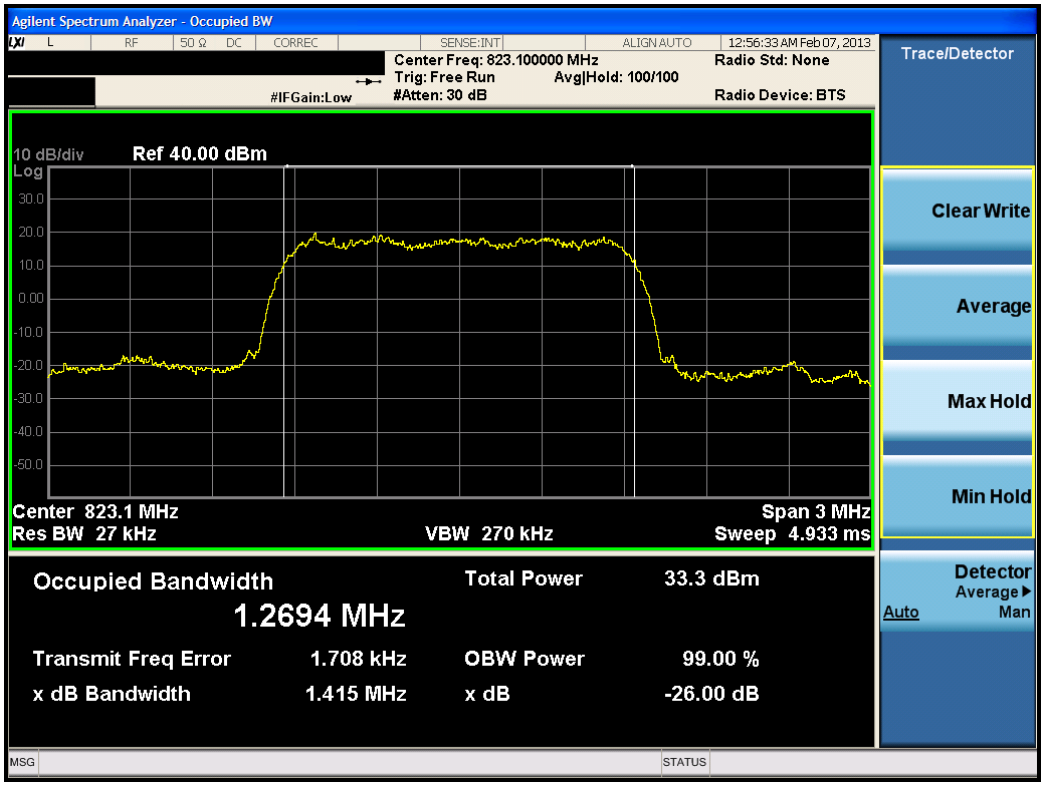
Plot 7-8. Channel Edge Plot (Ch. 684)

Plot 7-9. Outer extended Band Edge Plot (Ch. 684)

Plot 7-10. Interior extended Band Edge Plot (Ch. 684)



Plot 7-11. Occupied Bandwidth Plot (Ch. 476)



Plot 7-12. Occupied Bandwidth Plot (Ch. 684)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSPHM840** complies with all the requirements of Parts 90 of the FCC rules.