MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230-3432 • PHONE (410) 354-3300 • FAX (410) 354-3313
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3162 BELICK STREET • SANTA CLARA, CA 95054 • PHONE (408) 748-3585 • FAX (510) 489-6372
13301 MCCALLEN PASS • AUSTIN, TEXAS 78753 • PHONE (512) 287-2500 • FAX (512) 287-2513

August 12, 2014

Nielsen Audio
9705 Patuxent Woods Drive
Columbia MD 21046

Dear Allen Zimmerman,

Enclosed is the EMC Wireless test report for compliance testing of the Nielsen Audio, PPM 360 Meter as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 22 Subpart H and RSS-132 Issue 3 January 2013 for Cellular Devices, and FCC Part 24 Subpart E and RSS-133 Issue 6 January 2013 for Broadband PCS Devices.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Nielsen Audio\EMC40578B-FCC22_24 Rev. 1)

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Electromagnetic Compatibility Criteria
Test Report

for the

Nielsen Audio
Model PPM 360 Meter

Tested under
FCC Certification Rules
Title 47 of the CFR,
Part 22 Subpart H and RSS-132 for Cellular Devices
&
Part 24 Subpart E and RSS-133 for Broadband PCS Devices

MET Report: EMC40578B-FCC22_24 Rev. 1

August 12, 2014

Prepared For:

Nielsen Audio
9705 Patuxent Woods Drive
Columbia MD 21046

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave
Baltimore, MD 21230

Electromagnetic Compatibility Criteria
Test Report

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Nielsen Audio
Model PPM 360 Meter

Tested Under
FCC Certification Rules
Title 47 of the CFR,
Part 22 Subpart H and RSS-132 for Cellular Devices
&
Part 24 Subpart E and RSS-133 for Broadband PCS Devices

Benjamin Taylor
Project Engineer, Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

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 22 Subpart H and Part 15 Subpart B of the FCC Rules and RSS-132 Issue 3 January 2013 and RSS-133 Issue 6 January 2013 for the Industry Canada Standards under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	July 29, 2014	Initial Issue
1	August 11, 2014	Update with ERP/EIRP values

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Nielsen Audio PPM 360 Meter, with the requirements of Part 22 Subpart H and Part 24 Subpart E. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the PPM 360 Meter. Nielsen Audio should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the PPM 360 Meter, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 22 Subpart H and Part 24 Subpart E, in accordance with Nielsen Audio, purchase order number TF20131002.

FCC Reference	IC Reference	Description	Compliance
Part 22 Subpart H §2.1046; §22.913 Part 24 Subpart E §2.1046; §24.232	RSS-132, Section 5.4 RSS-133, Section 6.4	RF Power Output (ERP/EIRP)	Compliant
Part 22 Subpart H §2.1049; §22.905; §22.917 Part 24 Subpart E §2.1049; §24.238	RSS-GEN Issued 3 December 2010	Occupied Bandwidth	Compliant
Part 22 Subpart H §2.1051 Part 24 Subpart E §2.1051; §24.238	RSS-132, Section 5.5 RSS-133, Section 6.5	Conducted Spurious Emissions at Antenna Terminals	Compliant
Part 22 Subpart H §2.1053; §22.917 Part 24 Subpart E §2.1053; §24.238	RSS-132, Section 5.5 RSS-133, Section 6.5	Radiated Spurious Emissions from the Cabinet	Compliant
Part 22 Subpart H §2.1055; §22.355 Part 24 Subpart E §2.1055; §24.235	RSS-132, Section 5.3 RSS-133, Section 6.3	Frequency stability	Compliant

Table 1. Executive Summary of EMC ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Nielsen Audio to perform testing on the PPM 360 Meter, under Nielsen Audio's purchase order number TF20131002.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Nielsen Audio, PPM 360 Meter.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	PPM 360 Meter	
Model(s) Covered:	PPM 360 Meter	
Filing Status:	Original	
EUT Specifications:	Primary Power: 3.7 Li-ion battery Secondary Power: 120 VAC, 60 Hz (external charger)	
	FCC ID: IGKDA120 IC: 4213A-DA120	
	Type of Modulations:	GSM
	Equipment Code:	PCT
	RF Conducted Power Output	GSM850: 31.11 dBm GSM1900: 29.28 dBm
	EUT Frequency Ranges:	GSM850: 824.228 – 848.800 MHz GSM1900: 1850.2 – 1909.8 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Benjamin Taylor	
Date(s):	August 12, 2014	

B. References

CFR 47, Part 22, Subpart H	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 22: Rules and Regulations for Cellular Devices.
CFR 47, Part 24, Subpart E	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 24: Rules and Regulations for Personal Communications Services
RSS-132 Issue 3 January 2013	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz
RSS-133 Issue 6 January 2013	2 GHz Personal Communications Services
RSS-GEN Issue 3 December 2010	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
EIA/TIA-603-A-2001	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

C. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

The Nielsen Audio PPM 360 Meter, Equipment Under Test (EUT), is carried by panelists and detects the media codes embedded into program material that panelists are exposed to throughout the day. The meter logs this information along with a time stamp when the media codes are detected. At predetermined times the PPM G2V2 Meter connects to the collection servers. After establishing this connection the PPM G2V2 Meter then transmits the panelist data logs to the collection servers. After the data logs are transmitted the PPM G2V2 Meter then disconnects from the collection servers until the next programmed time.

Photograph 1. PPM 360 Meter

E. Mode of Operation

The PPM G2V2 Meter uses the same wireless provider that one may use with a standard cell phone. Three important differences exist between the PPM G2V2 Meter and a cell phone. The PPM G2V2 Meter does not have GPS location detection; the PPM G2V2 Meter does not have SMS messaging capability; and the PPM G2V2 Meter does not have voice capability.

F. Method of Monitoring EUT Operation

1. Messages formerly displayed on the base/recharger of the first generation PPM G2V2 Meter are now displayed on the PPM G2V2 Meter's LCD.
2. The green motion LED on the PPM G2V2 Meter operates on the same principles as the generation 1 meter. The LED is included for compliance purposes and has 3 unique states (on, flash/warn, and off).

G. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

H. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Nielsen Audio. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1046 RF Power Output

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.

§ 22.913 (b) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

§ 24.232 Power and antenna height limits.

§ 24.232 (b): Mobile/portable stations are limited to 2 watts e.i.r.p. 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. The spectrum analyzer was set to settings as dictated by the licensed measurement guidance procedures. Measurements were taken at the low, mid and high channels.

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

Test Engineer(s): Benjamin Taylor

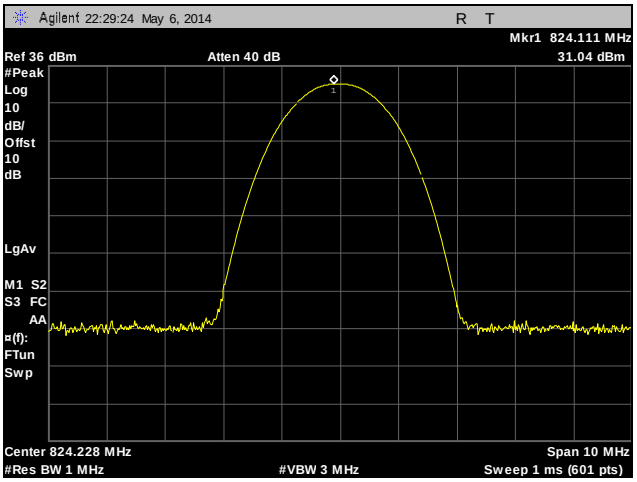
Test Date(s): 05/06/14

GSM850

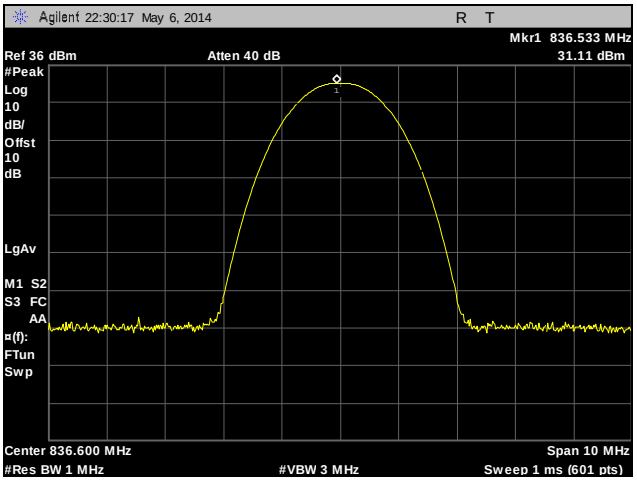
Channel	Conducted Power (dBm)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)
Low	31.04	-5.1352	25.9048	0.389
Mid	31.11	-5.1352	25.9748	0.396
High	30.96	-5.1352	25.8248	0.382

GSM1900

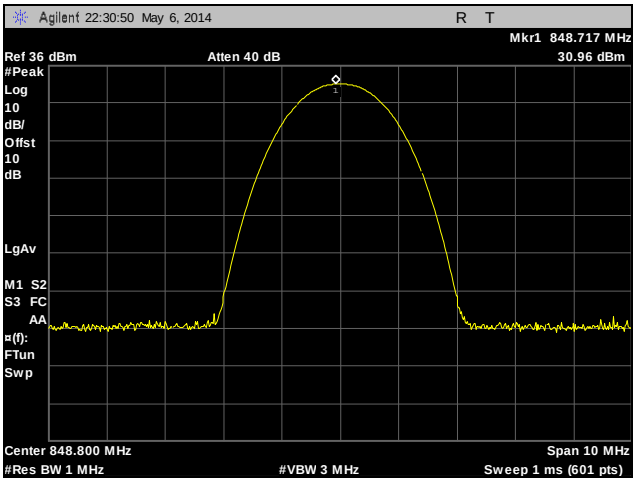
Channel	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)
Low	29.16	-1.2415	27.9185	0.619
Mid	29.28	-1.2415	28.0385	0.636
High	29.02	-1.2415	27.7785	0.6



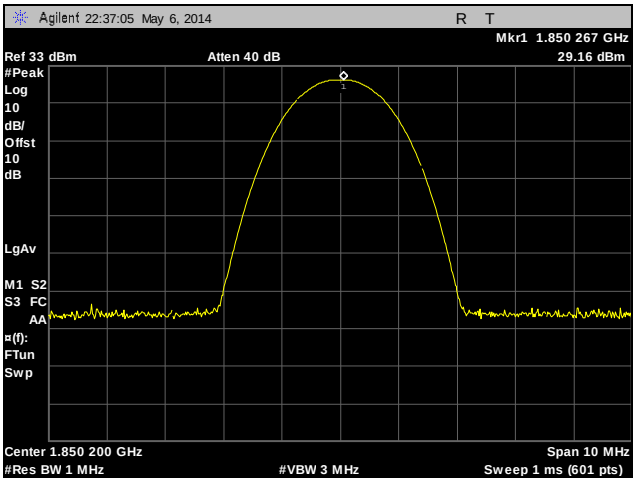
Plot 1. RF Power, GSM850, Low Channel



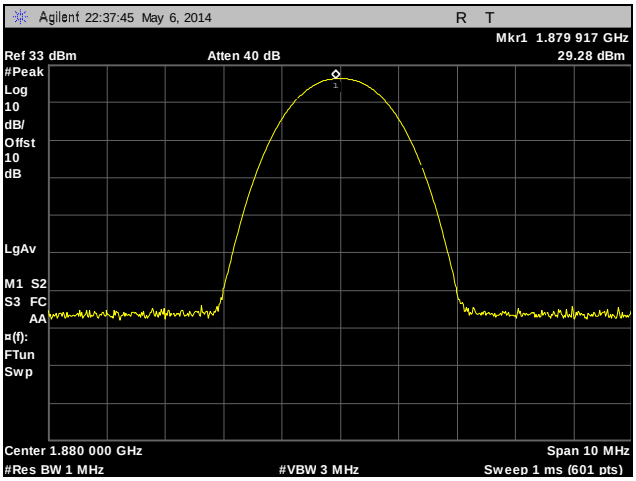
Plot 2. RF Power, GSM850, Mid Channel



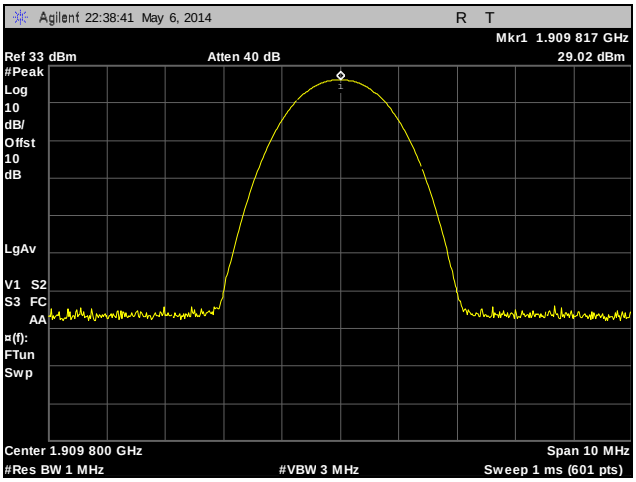
Plot 3. RF Power, GSM850, High Channel



Plot 4. RF Power, GSM1900, Low Channel



Plot 5. RF Power, GSM1900, Mid Channel



Plot 6. RF Power, GSM1900, High Channel

§ 2.1049 Occupied Bandwidth

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 at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF frequency channel. The EUT was connected to a Spectrum Analyzer via attenuator. The RBW of the Spectrum Analyzer was set to at least 1% of the channel bandwidth. Measurements were carried out at the low, mid, and high channels of the TX band.

Test Results: Equipment complies with FCC requirements.

Test Engineer(s): Benjamin Taylor

Test Date(s): 04/24/14

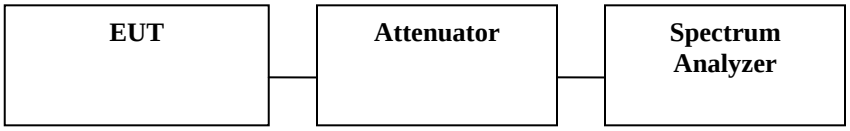
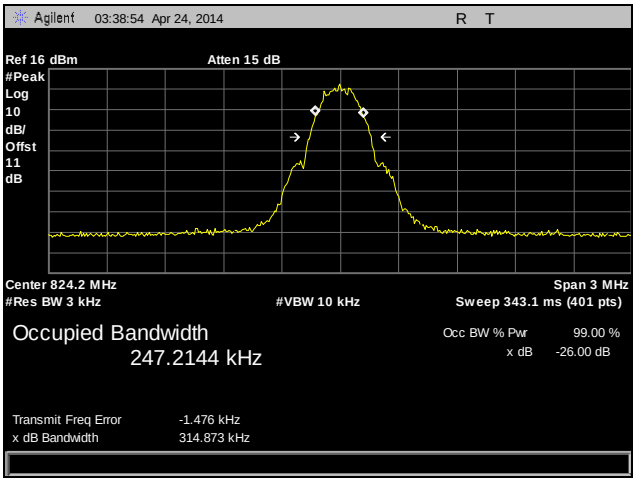
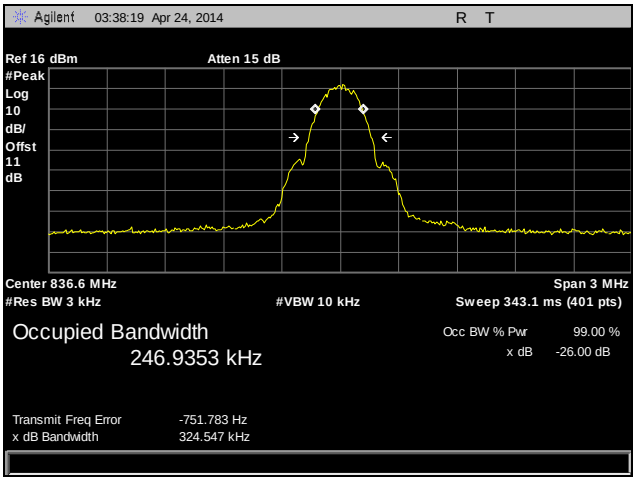


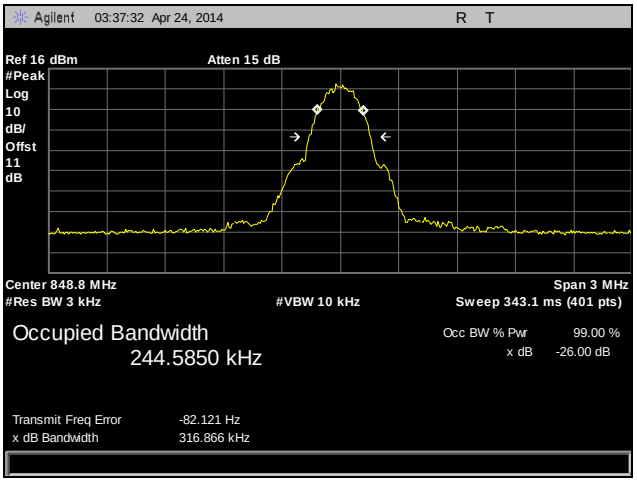
Figure 1. Occupied Bandwidth Test Setup



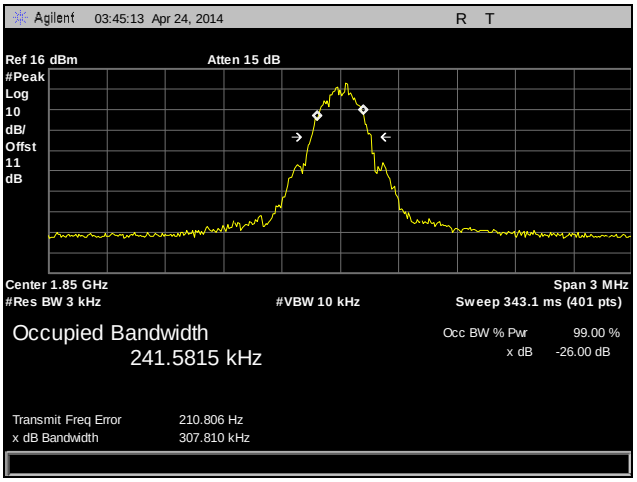
Plot 7. Occupied Bandwidth, GSM850, Low Channel



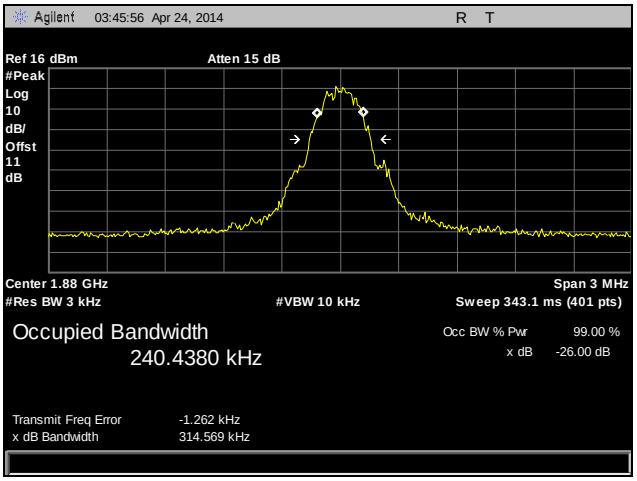
Plot 8. Occupied Bandwidth, GSM850, Mid Channel



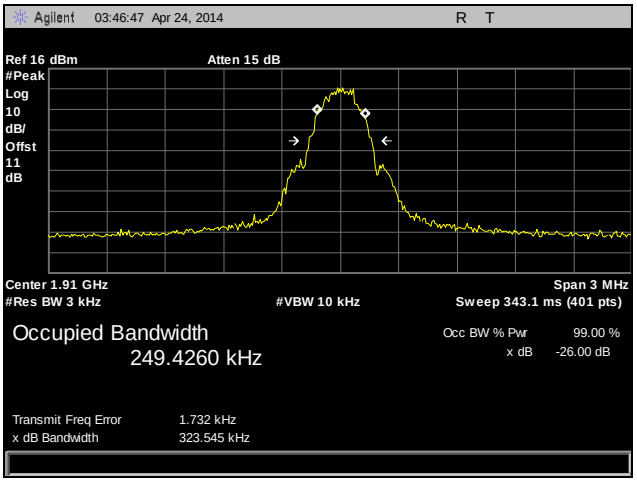
Plot 9. Occupied Bandwidth, GSM850, High Channel



Plot 10. Occupied Bandwidth, GSM1900, Low Channel



Plot 11. Occupied Bandwidth, GSM1900, Mid Channel



Plot 12. Occupied Bandwidth, GSM1900, High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1053 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.

§ 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).

§ 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: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* was made in accordance with the procedures of TIA/EIA-603-A-2001 "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's RF port was terminated (as normal) to its internal antenna. The EUT was tested using at the low, mid, and high channels of each applicable band. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission. The plots are corrected for cable loss, antenna correction factor, and distance correction. The field strength was mathematically corrected to an E.I.R.P. Harmonic emissions up to the 10^{th} or 40GHz, which ever was the lesser, were investigated. Only noise floor was observed above 10 GHz.

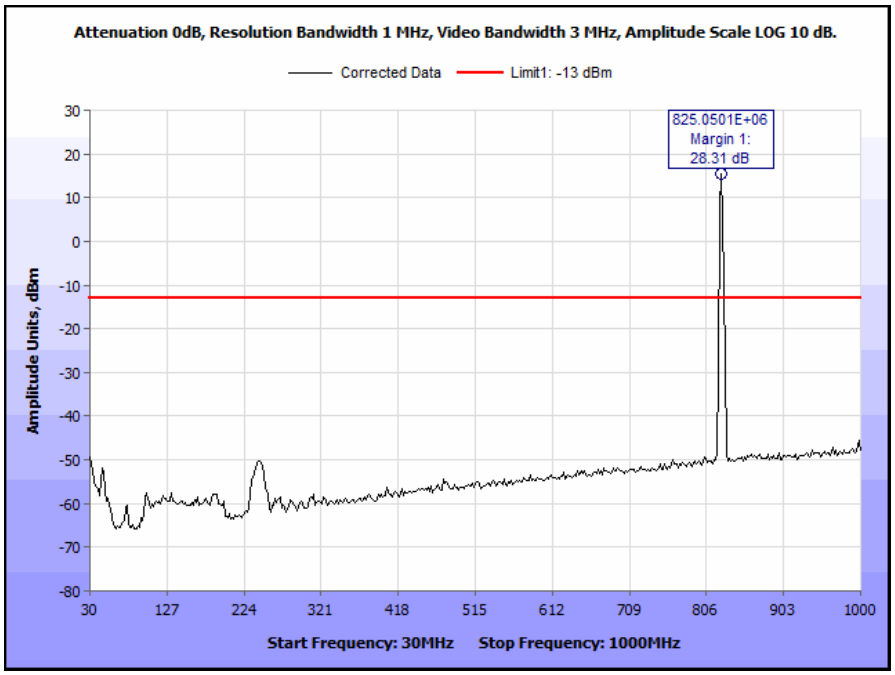
The spectrum analyzer was set to 1MHz RBW and 3MHz VBW above 1 GHz and below 1 GHz. The spectrum was investigated from 30MHz to the 10^{th} harmonic of the carrier; only noise floor was observed above 10 GHz.

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

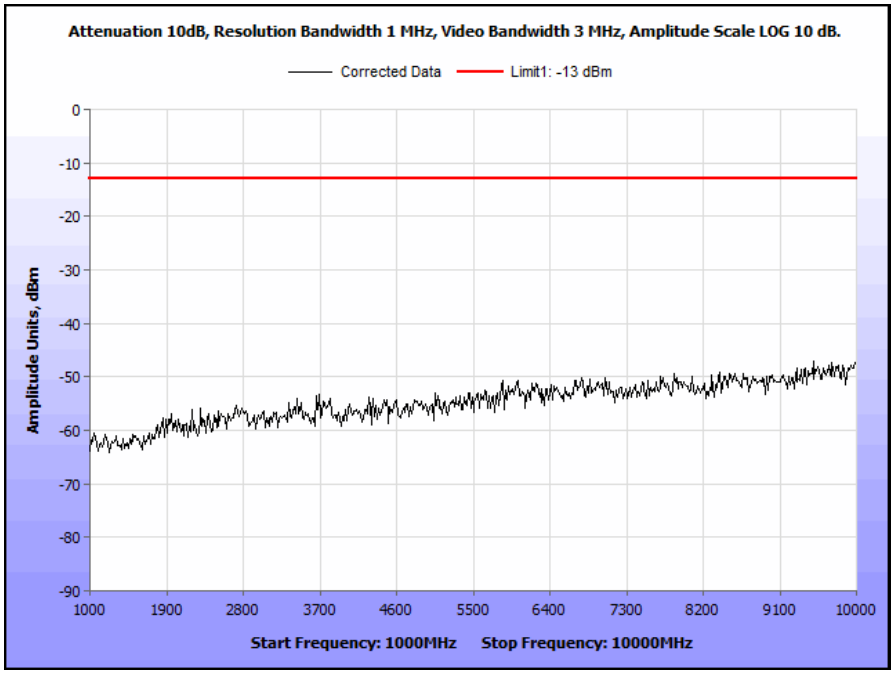
Test Engineer: Benjamin Taylor

Test Date(s): 06/18/14

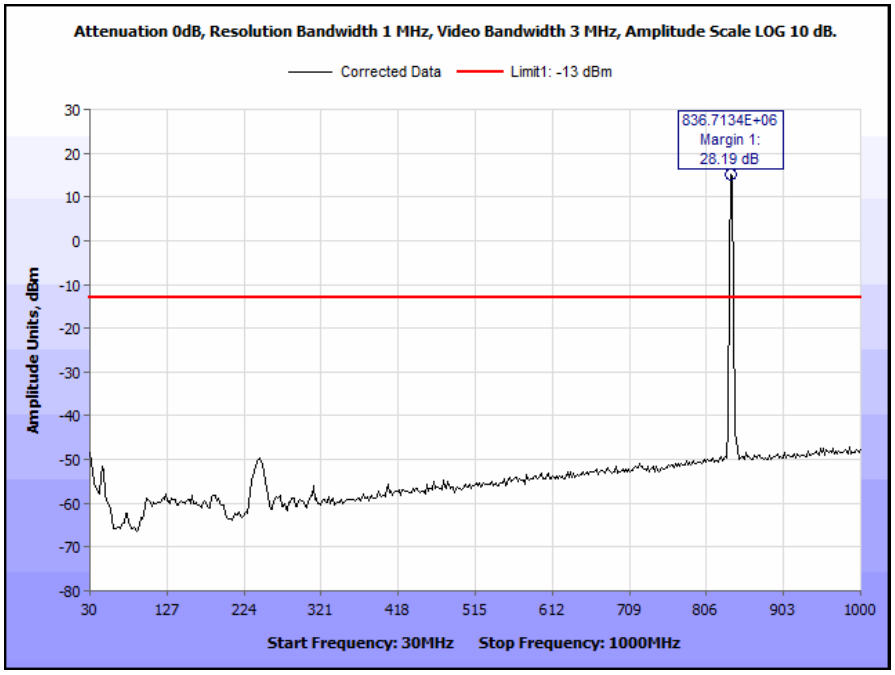
Radiated Spurious Emissions



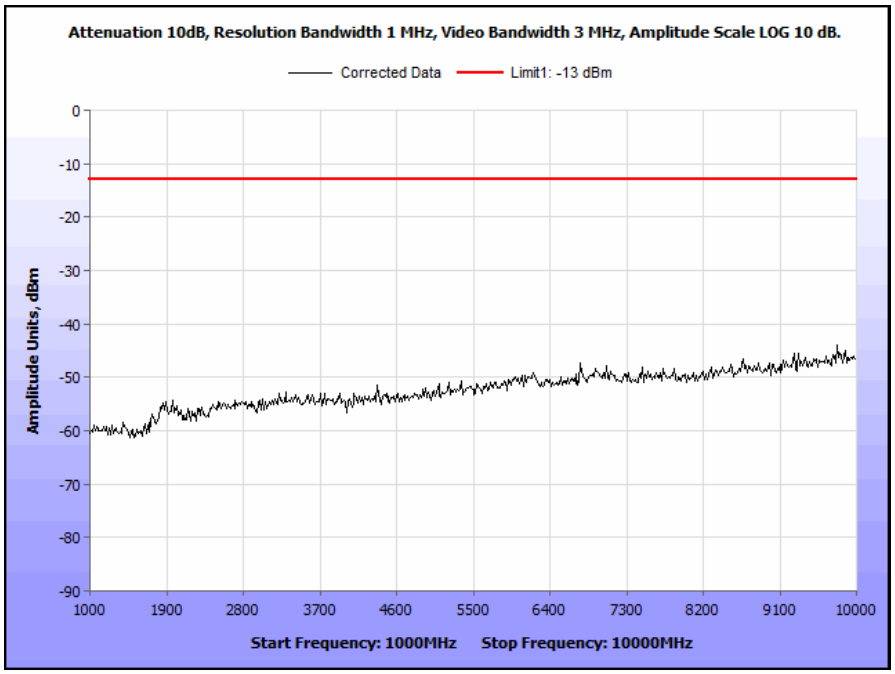
Plot 13. Radiated Spurious Emissions, GSM850, Low Channel, 30 MHz – 1 GHz



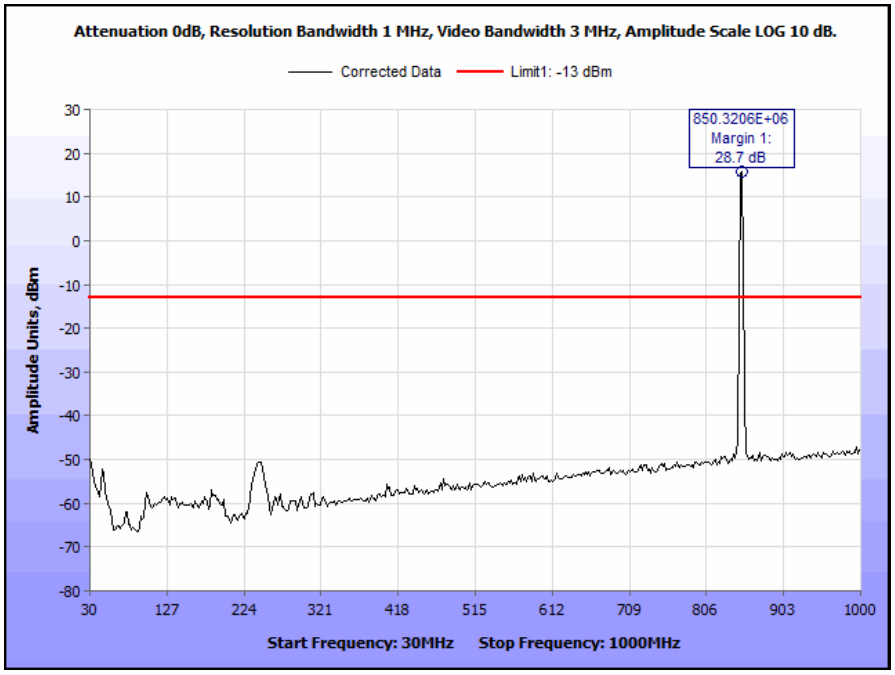
Plot 14. Radiated Spurious Emissions, GSM850, Low Channel, 1 GHz – 10 GHz



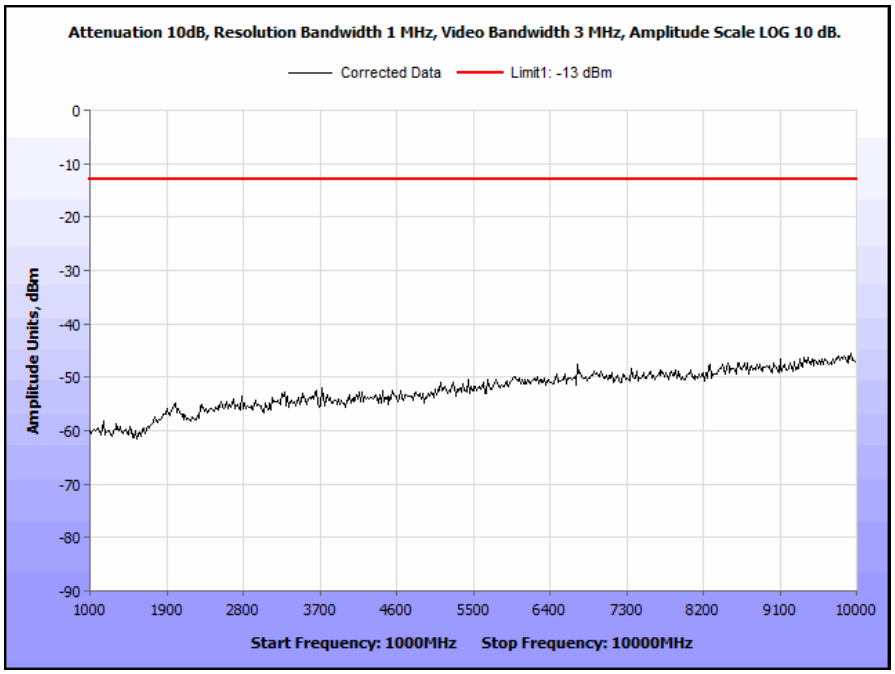
Plot 15. Radiated Spurious Emissions, GSM850, Mid Channel, 30 MHz – 1 GHz



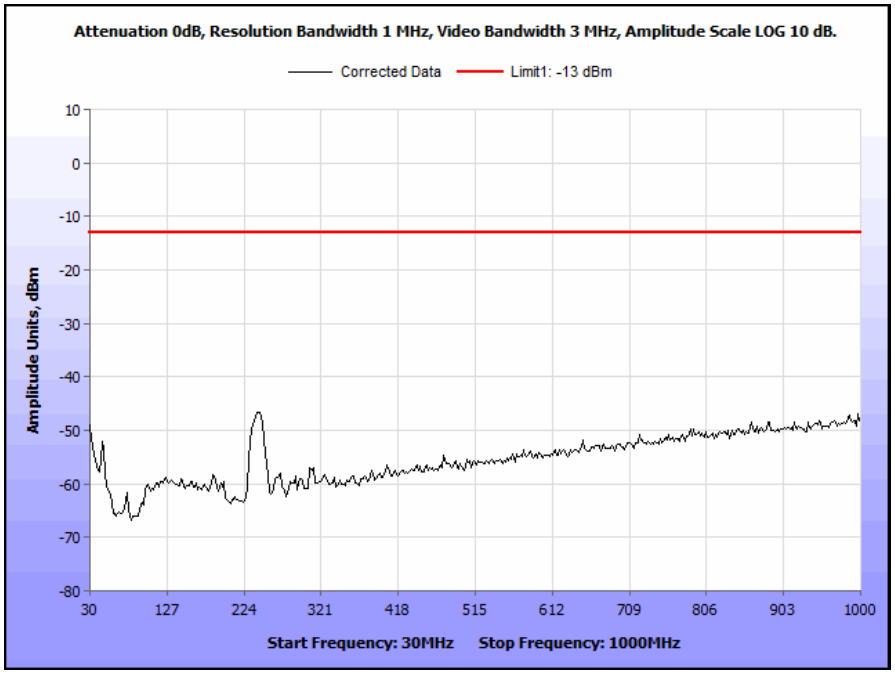
Plot 16. Radiated Spurious Emissions, GSM850, Mid Channel, 1 GHz – 10 GHz



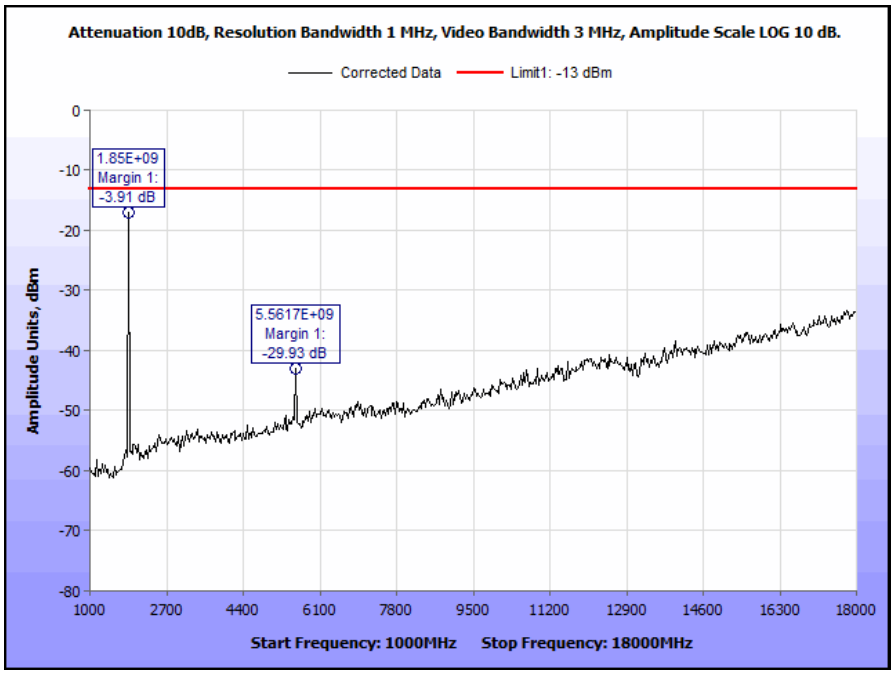
Plot 17. Radiated Spurious Emissions, GSM850, High Channel, 30 MHz – 1 GHz



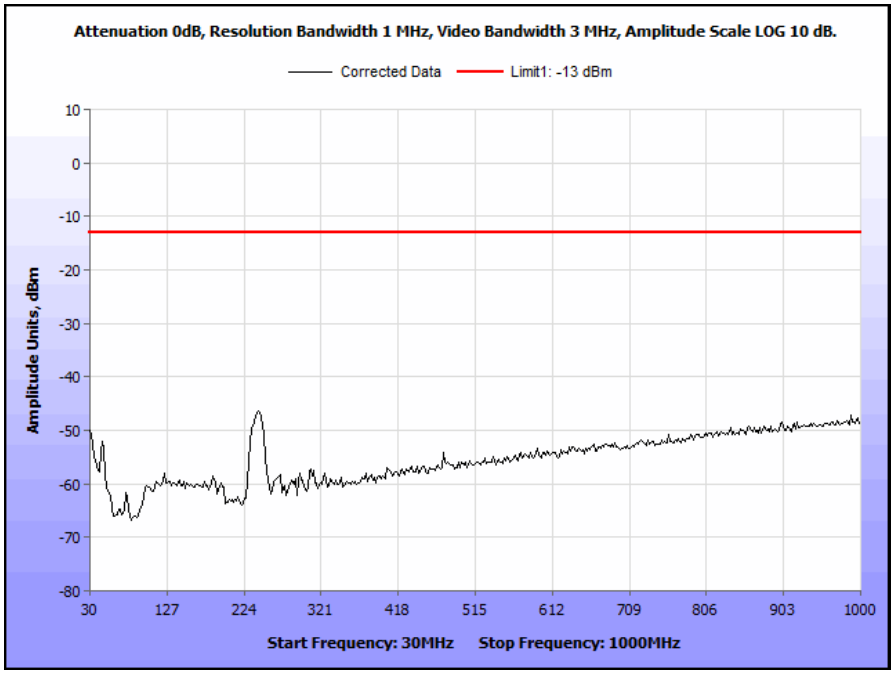
Plot 18. Radiated Spurious Emissions, GSM850, High Channel, 1 GHz – 10 GHz



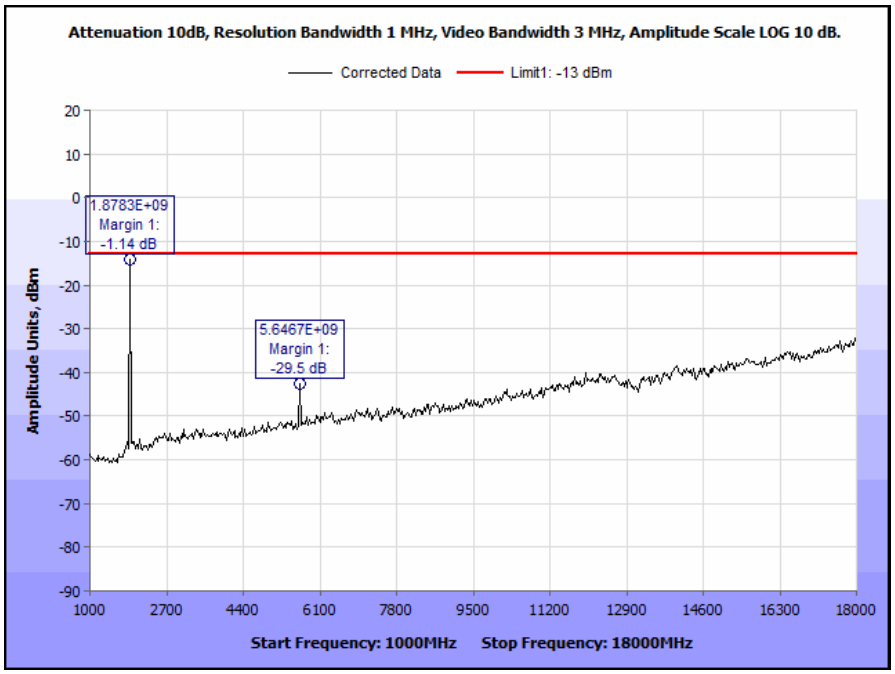
Plot 19. Radiated Spurious Emissions, GSM1900, Low Channel, 30 MHz – 1 GHz



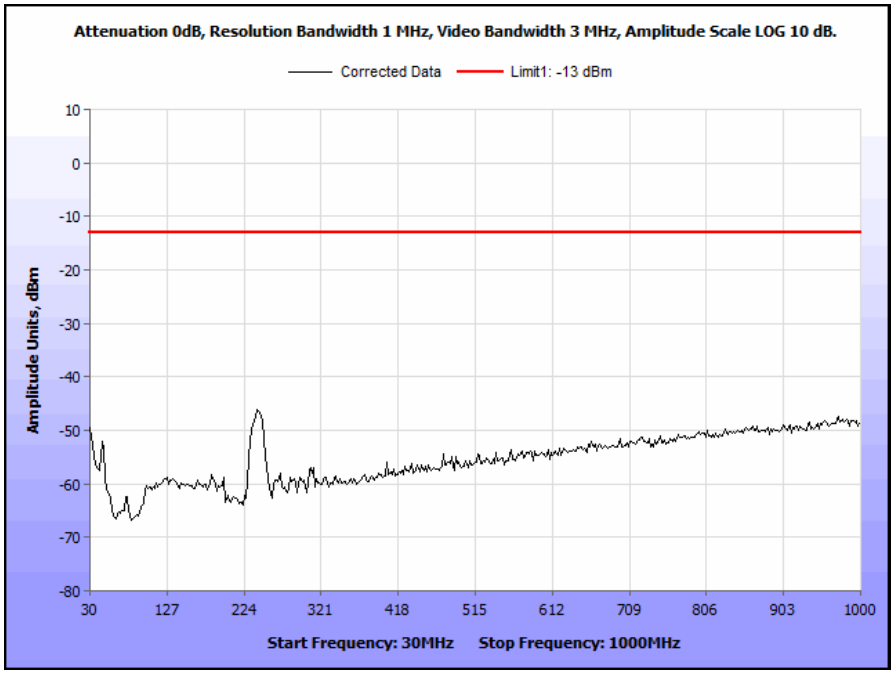
Plot 20. Radiated Spurious Emissions, GSM1900, Low Channel, 1 GHz – 10 GHz



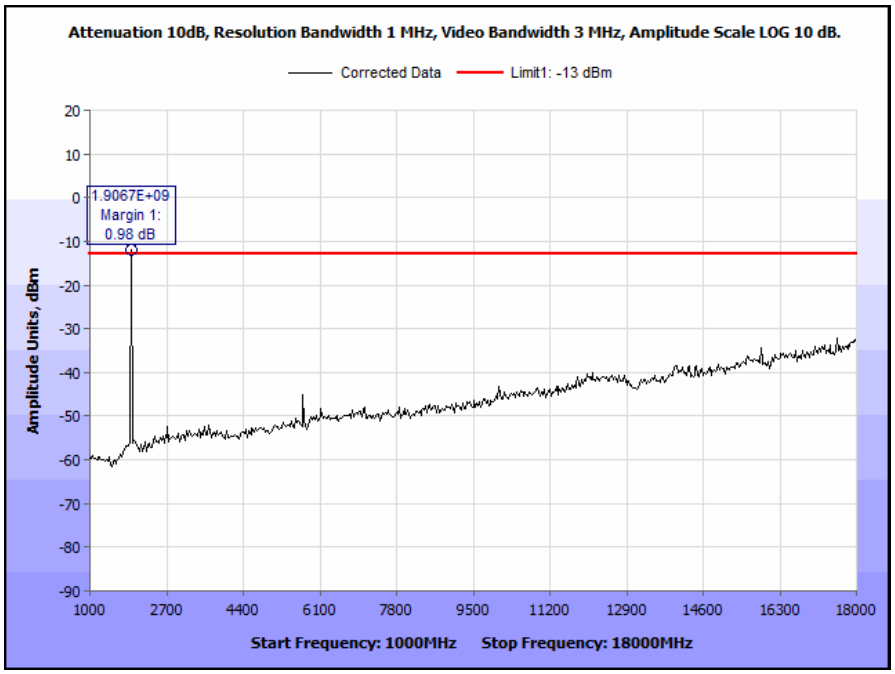
Plot 21. Radiated Spurious Emissions, GSM1900, Mid Channel, 30 MHz – 1 GHz



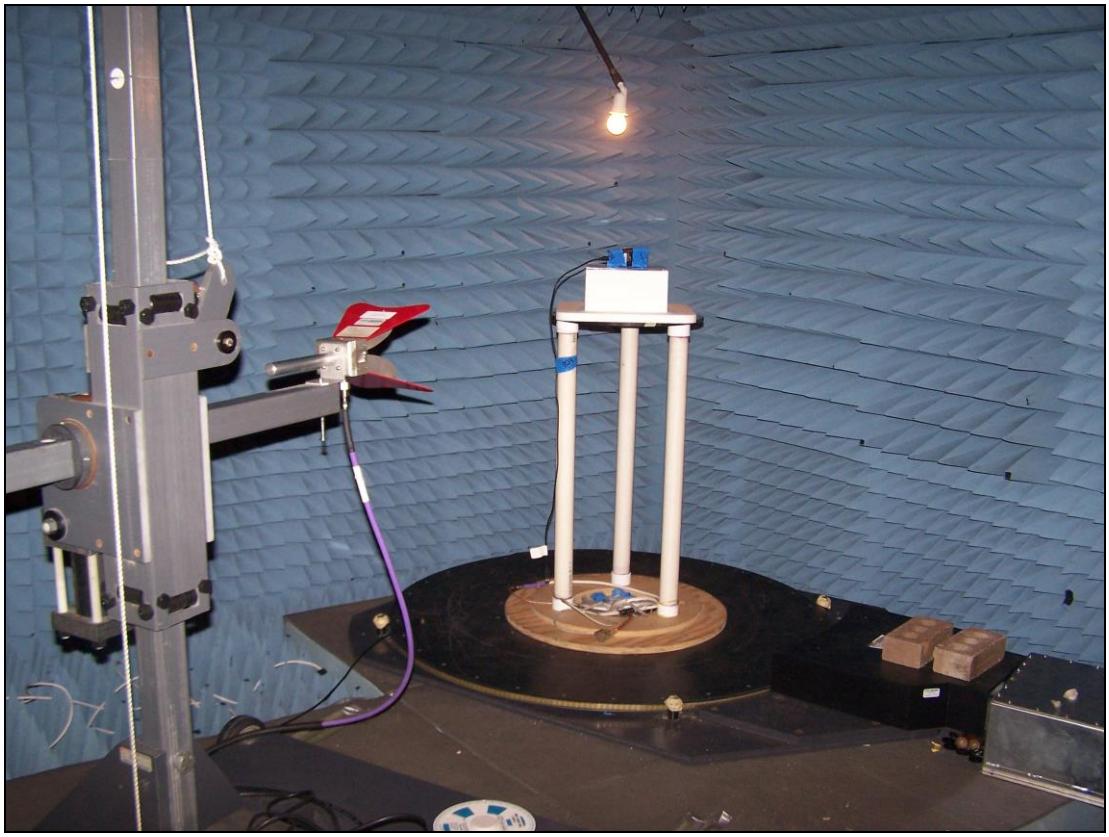
Plot 22. Radiated Spurious Emissions, GSM1900, Mid Channel, 1 GHz – 10 GHz



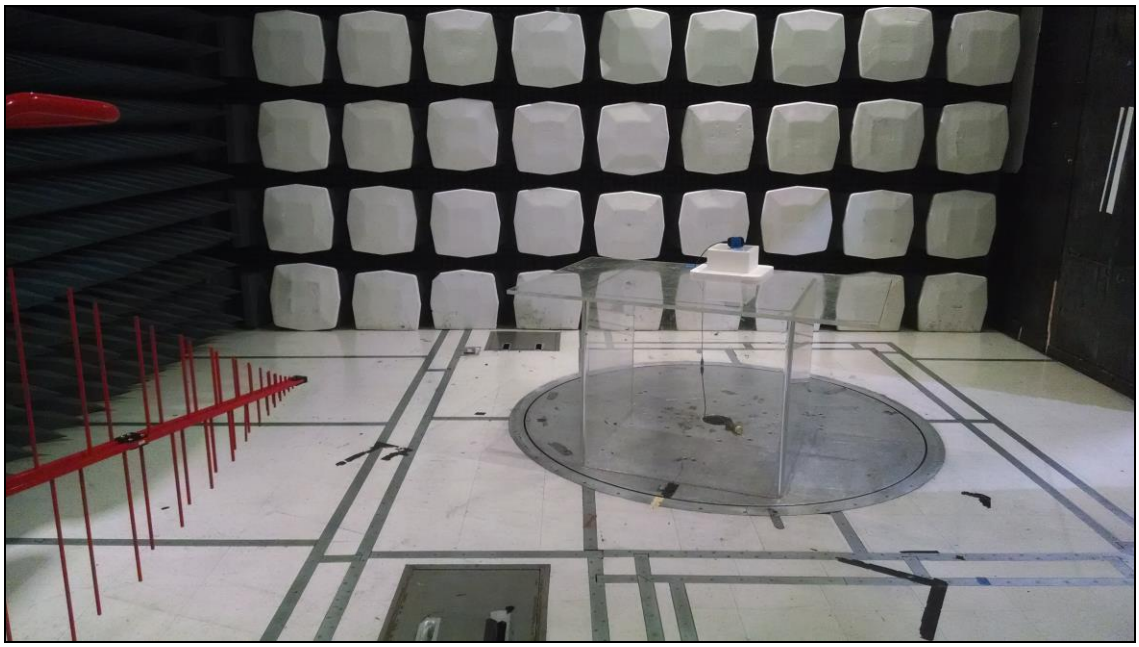
Plot 23. Radiated Spurious Emissions, GSM1900, High Channel, 30 MHz – 1 GHz



Plot 24. Radiated Spurious Emissions, GSM1900, High Channel, 1 GHz – 10 GHz



Photograph 2. Radiated Spurious Emissions above 1 GHz, Test Setup



Photograph 3. Radiated Spurious Emissions below 1 GHz, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1051 Spurious Emissions at Antenna Terminals

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 The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

§ 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.

§ 22.917 (b) *Measurement procedure*. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy approved the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§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.

§ 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.

§ 24.238 (b) *Measurement procedure*. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test Procedures: As required by 47 CFR §2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer through an attenuator. The Spectrum Analyzer was set to sweep 30 MHz and up to 10th harmonic of the fundamental or 40 GHz whichever is the lesser. Measurements were made in all applicable frequency bands.

Test Results: Equipment complies with these requirements.

Test Engineer(s): Benjamin Taylor

Test Date(s): 05/06/14

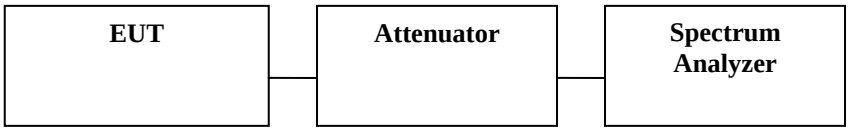
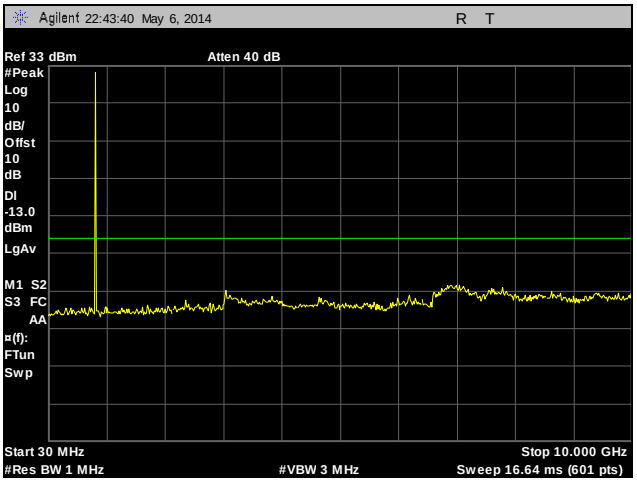
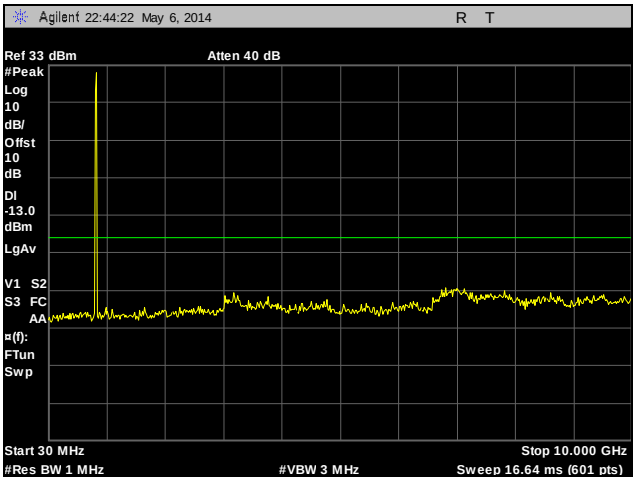


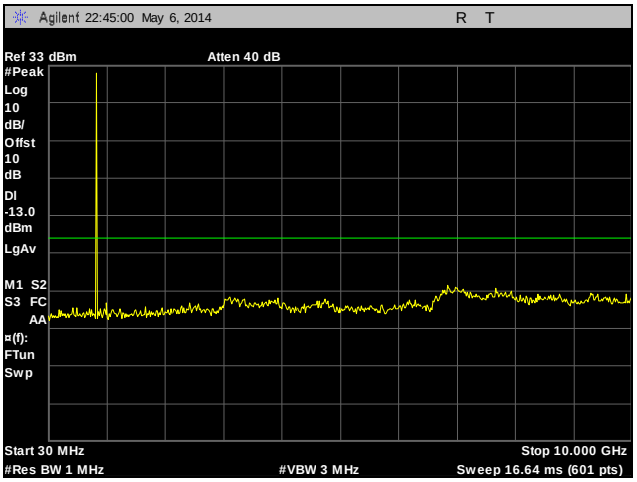
Figure 2. Spurious Emissions at Antenna Terminals Test Setup



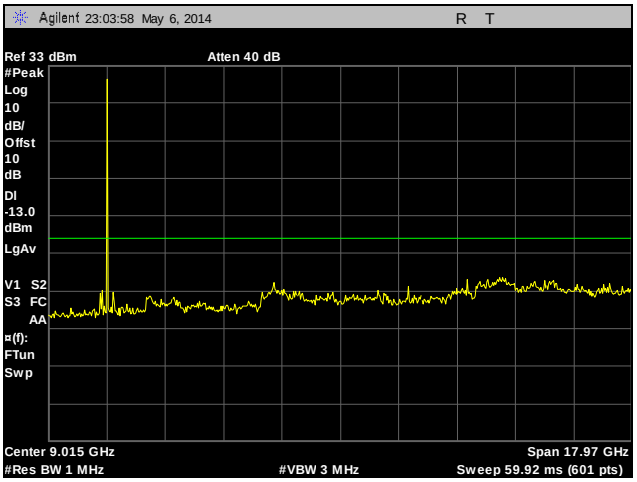
Plot 25. Conducted Spurious Emissions, GSM850, Low Channel, 30 MHz – 10 GHz



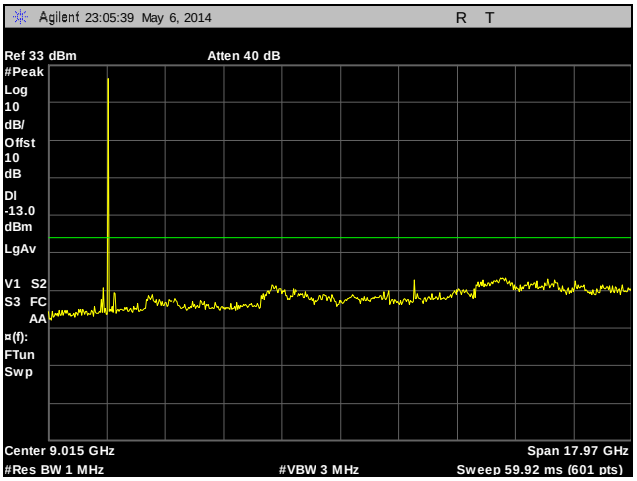
Plot 26. Conducted Spurious Emissions, GSM850, Mid Channel, 30 MHz – 10 GHz



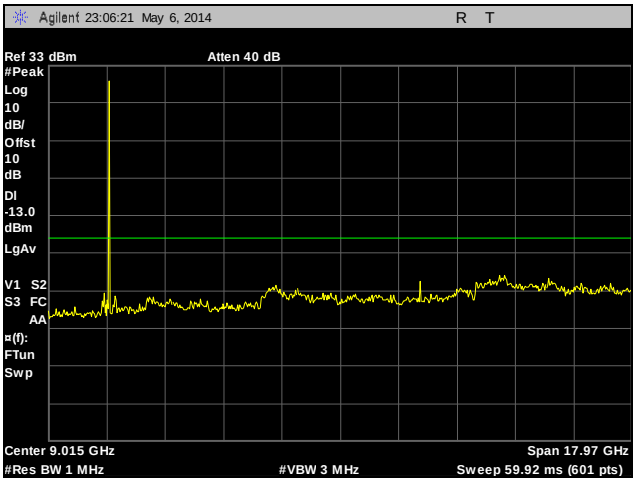
Plot 27. Conducted Spurious Emissions, GSM850, High Channel, 30 MHz – 10 GHz



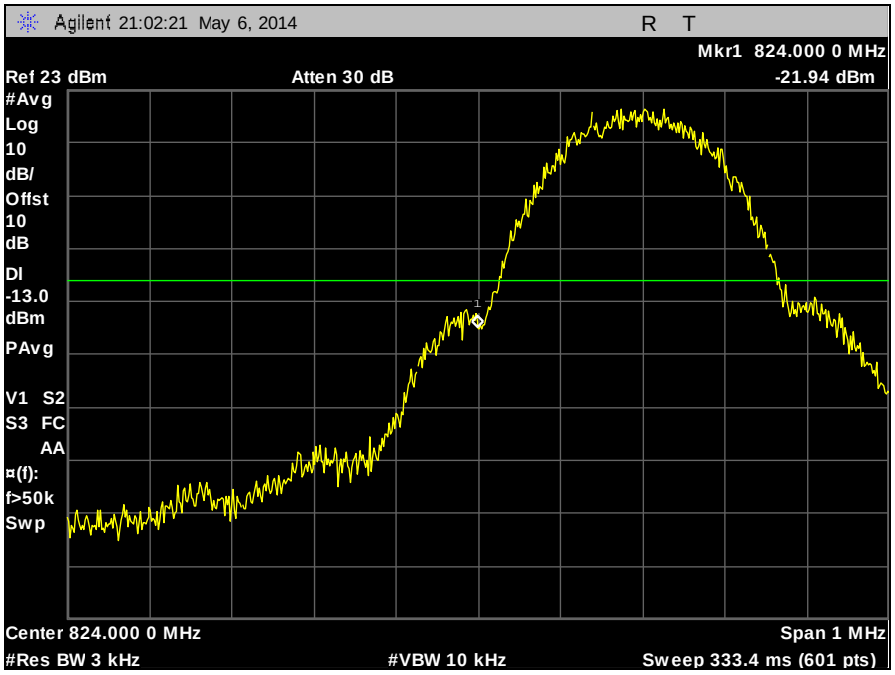
Plot 28. Conducted Spurious Emissions, GSM1900, Low Channel, 30 MHz – 10 GHz



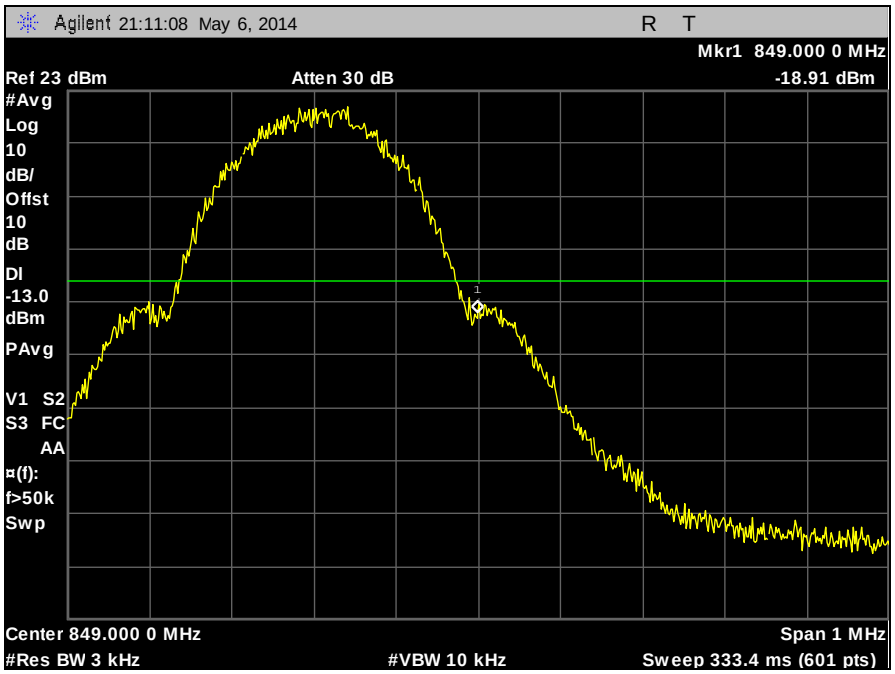
Plot 29. Conducted Spurious Emissions, GSM1900, Mid Channel, 30 MHz – 10 GHz



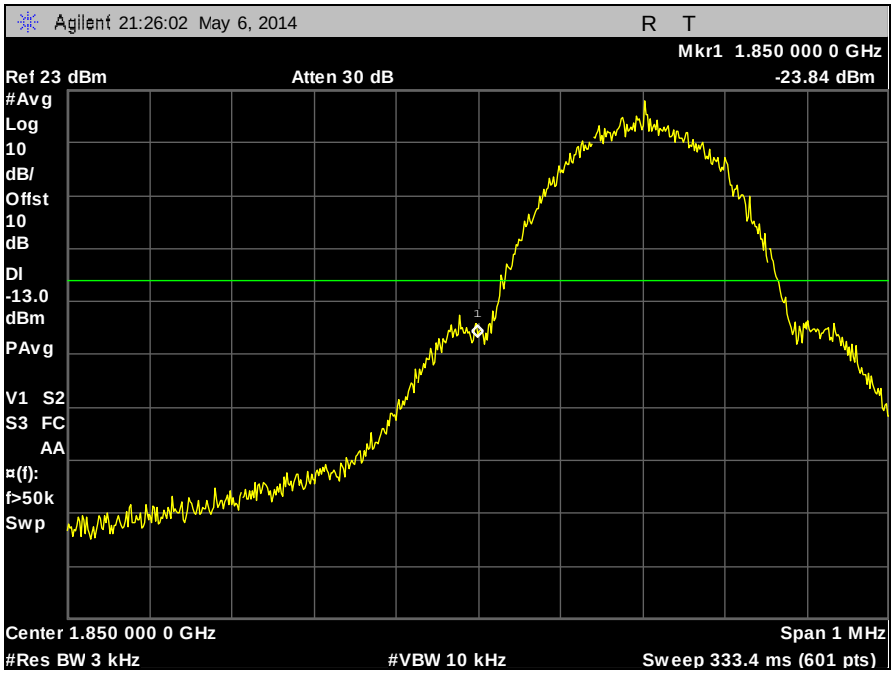
Plot 30. Conducted Spurious Emissions, GSM1900, High Channel, 30 MHz – 10 GHz



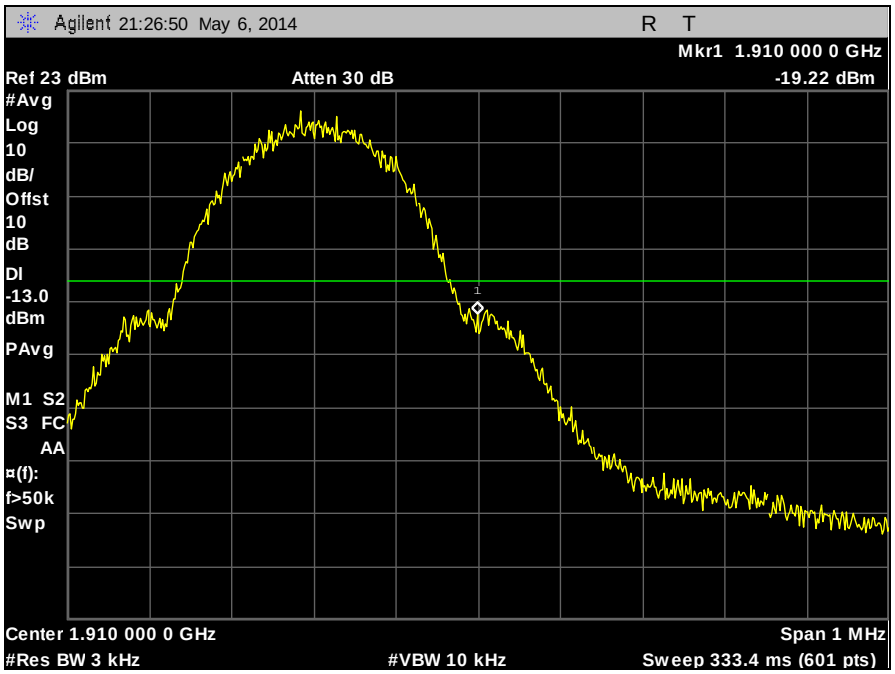
Plot 31. Band Edge Emissions, GSM850, Low Channel



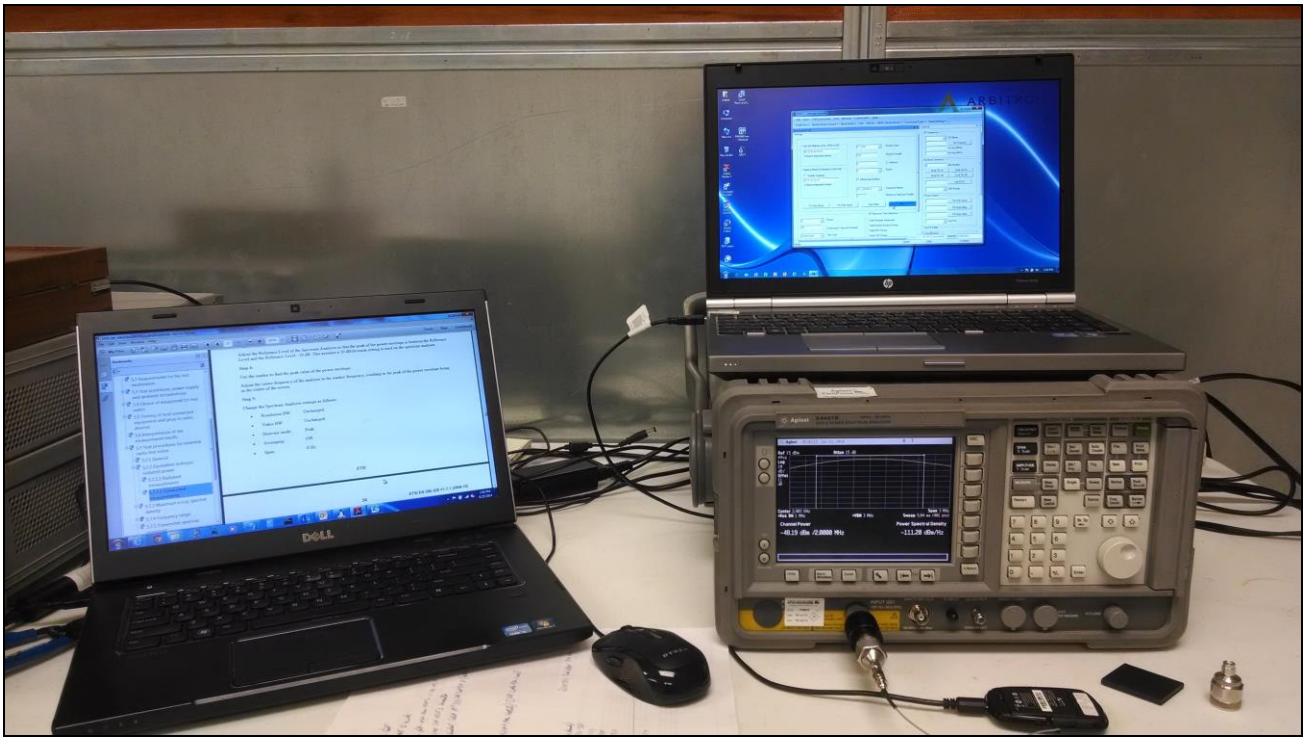
Plot 32. Band Edge Emissions, GSM850, High Channel



Plot 33. Band Edge Emissions, GSM1900, Low Channel



Plot 34. Band Edge Emissions, GSM1900, High Channel



Photograph 4. Conducted Spurious Emissions, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§2.1055 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 and Power Meter.

The EUT was placed in the Environmental Chamber and support equipment outside the chamber on a table. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations. The frequency drift was investigated for every 10^{C} increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -20 to 50^{C}.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20^{C}. The voltage was varied by ± 15 % of nominal.

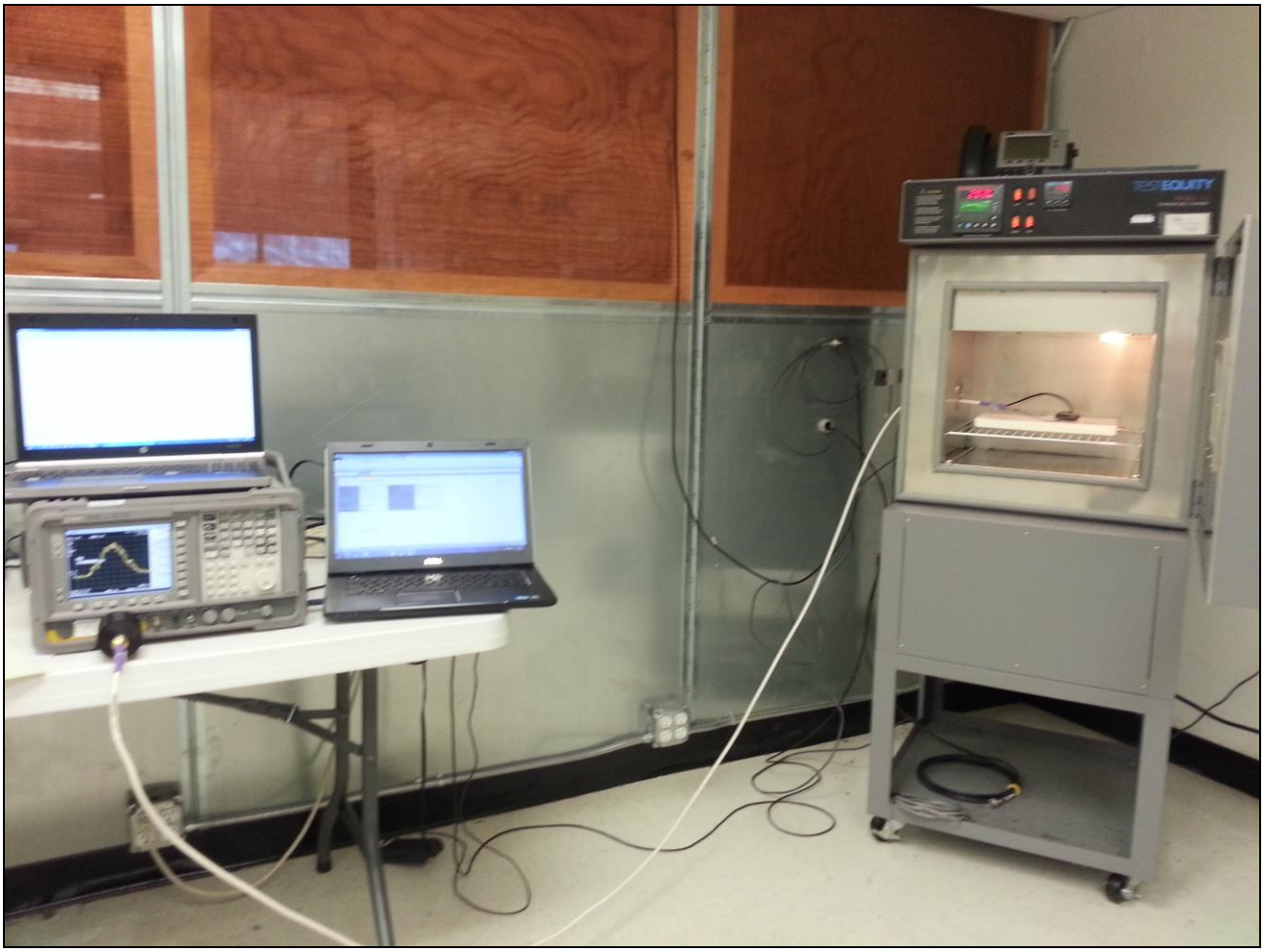
Test Results: Equipment was compliant with Section 2.1055, 22.355 and 24.235.

Test Engineer(s): Benjamin Taylor

Test Date(s): 06/20/14

824.2MHz Channel			
Temperature (°C)	**Frequency (MHz)**	**Drift (ppm)**	**Limit PPM**
-20	824.01352	-1.84220	2.5
-10	824.013860000	-1.42959	2.5
0	824.014390000	-0.78639	2.5
10	824.016190000	1.39803	2.5
20	824.015038000	**ref**	
30	824.014730000	-0.37378	2.5
40	824.015538000	0.60679	2.5
50	824.015984000	1.14804	2.5
1710.2MHz Channel			
Temperature (°C)	**Frequency (MHz)**	**Drift (ppm)**	**Limit PPM**
-20	1710.391483	-1.26521	1
-10	1710.394872000	0.71621	1
0	1710.394594000	0.55367	1
10	1710.394239000	0.34612	1
20	1710.393647000	ref	
30	1710.394736000	0.63670	1
40	1710.392866000	-0.45662	1
50	1710.394974000	0.77584	1

Table 2. Frequency Stability, Test Results



Photograph 5. Frequency Stability, Test Setup

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	07/24/2012	07/24/2015
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	07/16/2012	07/16/2014
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	01/08/2013	07/08/2014
1T4771	PSA SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	02/15/2013	08/15/2014
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	02/28/2014	08/28/2015
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	01/05/2014	01/05/2015
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	07/30/2013	07/30/2014
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	NOT REQUIRED	
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4858	DIGITAL BAROMETER, HYGROMETER, THERMOMETER	CONTROL COMPANY	15-078-198, FB70423, 245CD	12/19/2013	12/19/2015

Table 3. Test Equipment

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

End of Report

