RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Certification Report

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501
Daryl Popowitch
Phone: (434) 455-9527

Model: SG5300-800
SG5300 800 MHz Radio

FCC ID: OWDTR-0063-E
IC: 3636B-0063

June 17, 2011

Standards Referenced for this Report	
Part 2: 2010	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2010	Private Land Mobile Radio Services
TIA-EIA-603-C August 2004	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
ANSI/TIA/EIA – 102.CAAA-2002	Digital C4FM/CQPSK Transceiver Measurement Methods
RSS-119 Issue 11	Land Mobile and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz

Frequency Range (MHz)	Rated Transmit Power (W) (Conducted)	Frequency Tolerance (ppm)	Transmit Mode/ Emission Designator
806 - 809	3.0	0.73	OpenSky Data (NPSPAC channels)/ 17K1F1D
809 - 824	3.0	0.73	OpenSky Data (SMR channels)/ 17K6F1D

Report Prepared By: Richard B. McMurray, P.E.

Document Number: 2011065

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

Table of Contents

Table of Figures

Table of Tables

Table of Plots

Table of Appendixes

Table of Photographs

1 Test Result Summary

Test	FCC Reference	IC Reference	Result
RF Power Output	2.1046(a), 90.635	5.4	Complies
Spurious Emissions at Antenna Terminals	2.1051	5.5, 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a), 90.210	5.5, 5.8	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.210	5.5, 5.8	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.213	5.9	Complies

2 General Information

The following Type Certification Report is prepared on behalf of **Harris Corporation** in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the **SG5300 800 MHz Radio, Model SG5300-800; FCC ID: OWDTR-0063-E, IC: 3636B-0063.**

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47 Parts 2 and 90. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

2.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia, 20170. This site has been fully described in a report submitted to, and approved by, the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

2.2 Related Submittal(s)/Grant(s)

N/A

2.3 Grant Notes

Power is continuously variable from 0.5 to 3 W.

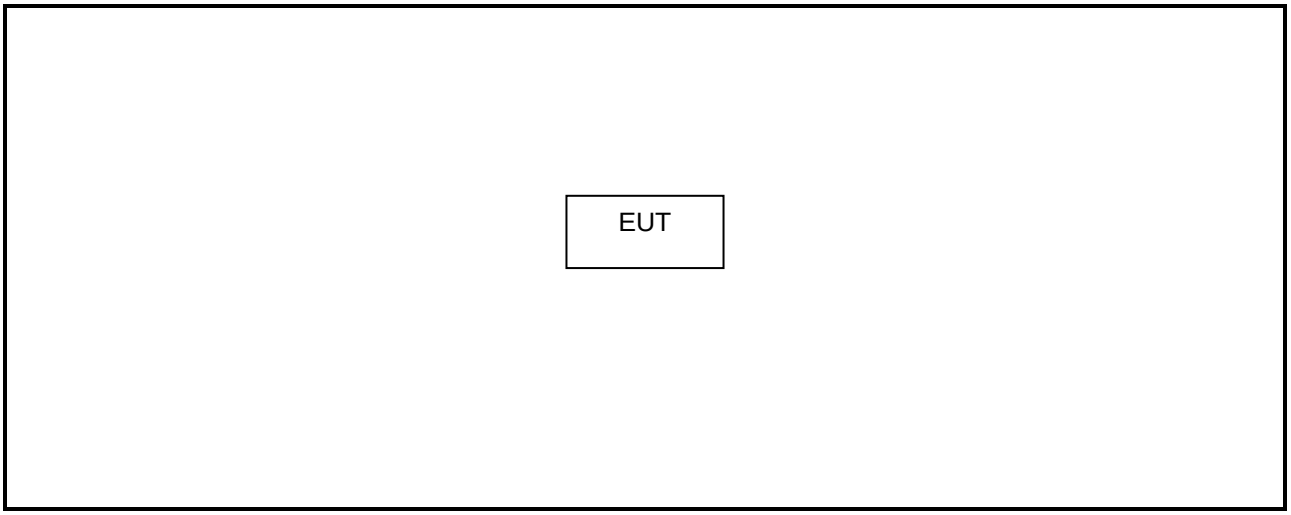
2.4 Tested System Details

The test sample was received on May 4, 2011. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable. The EUT was programmed for multiple modes of operation and modulation types.

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	P/N	S/N	FCC ID	RTL Bar Code
800 MHz Radio	Harris Corporation	SG5300-800	RU-019026-800	A40128900001	OWDTR-0063-E	19946
800 MHz Radio	Harris Corporation	SG5300-800	RU-019026-800	A40128900002	OWDTR-0063-E	19947

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2.1033(C)(8) Voltages and Currents Through The Final Amplifying Stage

7.5 V / 2.5 A

4 FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.635

4.1 Test Procedure

ANSI/TIA-603-C-2004, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

Manufacturer's rated power:

Conducted power is continuously variable from 0.5 to 3 W.

4.2 Test Data

Table 4-1: RF Conducted Output Power – High Power

Frequency (MHz)	Power Measured (dBm)	Power Measured (Watts)
806.0125	35.3	3.4
815.0125	35.3	3.4
823.9875	35.3	3.4

Table 4-2: RF Conducted Output Power – Low Power

Frequency (MHz)	Power Measured (dBm)	Power Measured (Watts)
806.0125	27.8	0.60
815.0125	27.6	0.58
823.9875	27.6	0.58

Table 4-3: Test Equipment Used For Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	4/08/2012

Test Personnel:

Richard B. McMurray, P.E.	Richard B. McMurray	May 4, 2011
Test Engineer	Signature	Date of Test

5 FCC Rules and Regulations Part 2.1051: Spurious Emissions at Antenna Terminals

5.1 Test Procedure

ANSI/TIA-603-C-2004, Section 2.2.13

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 9,600 bps for OTP mode.

5.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

Limits: (43 + 10 LOG P(W))

The following channels (in MHz) were investigated: 806.0125, 815.0125, and 823.9875 MHz.

No emissions were found within 20 dB of the limit; per 2.1057(c) no data is being reported.

Table 5-1: Test Equipment Used For Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	4/08/2012

Test Personnel:

Richard B. McMurray, P.E.	Richard B. McMurray	May 5, 2011
Test Engineer	Signature	Date of Test

6 FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210

Occupied Bandwidth - Compliance with the Emission Masks

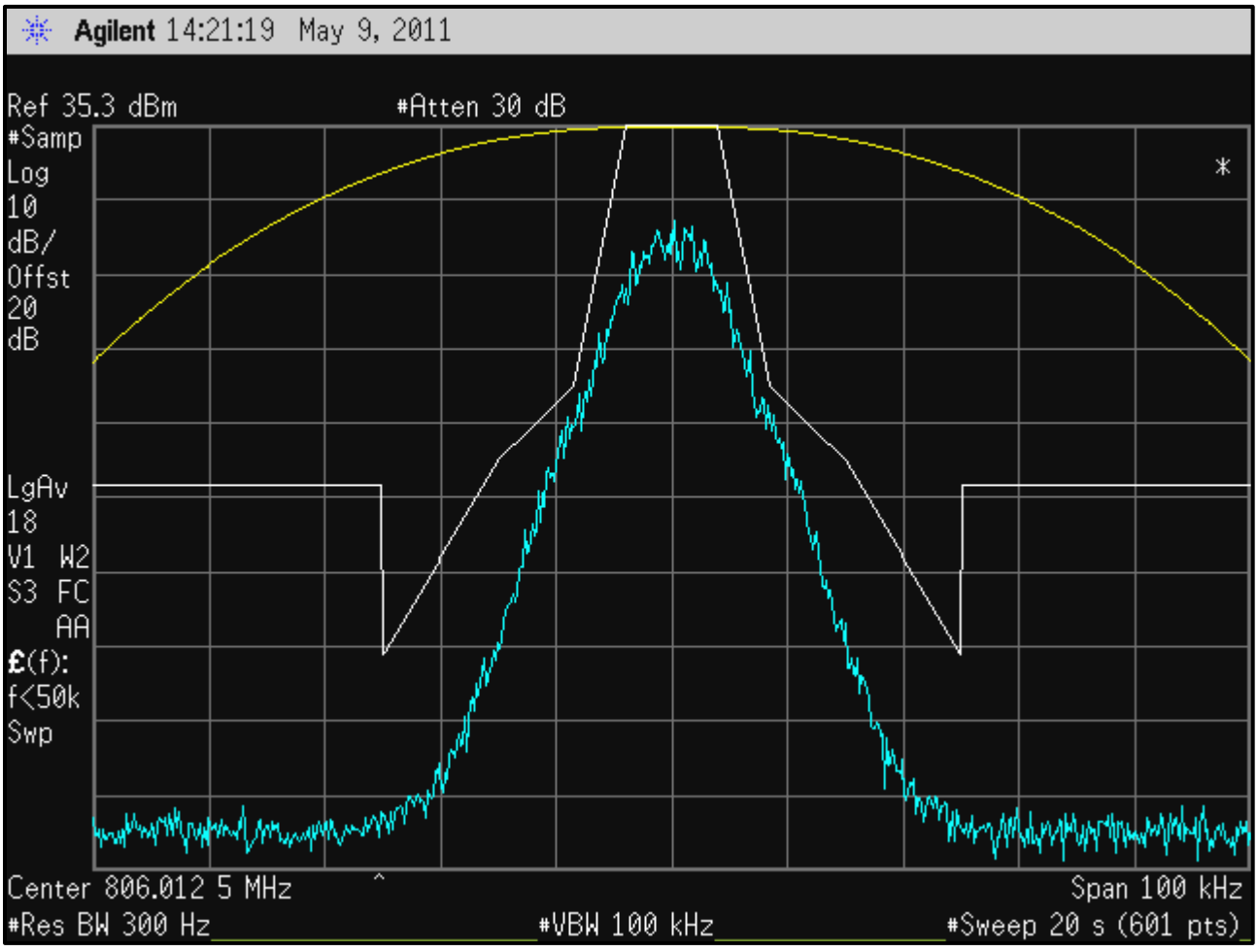
6.1 Test Procedure

ANSI/TIA-603-C-2004, section 2.2.11 and TIA/EIA-102.CAAA-2002 section 2.2.5

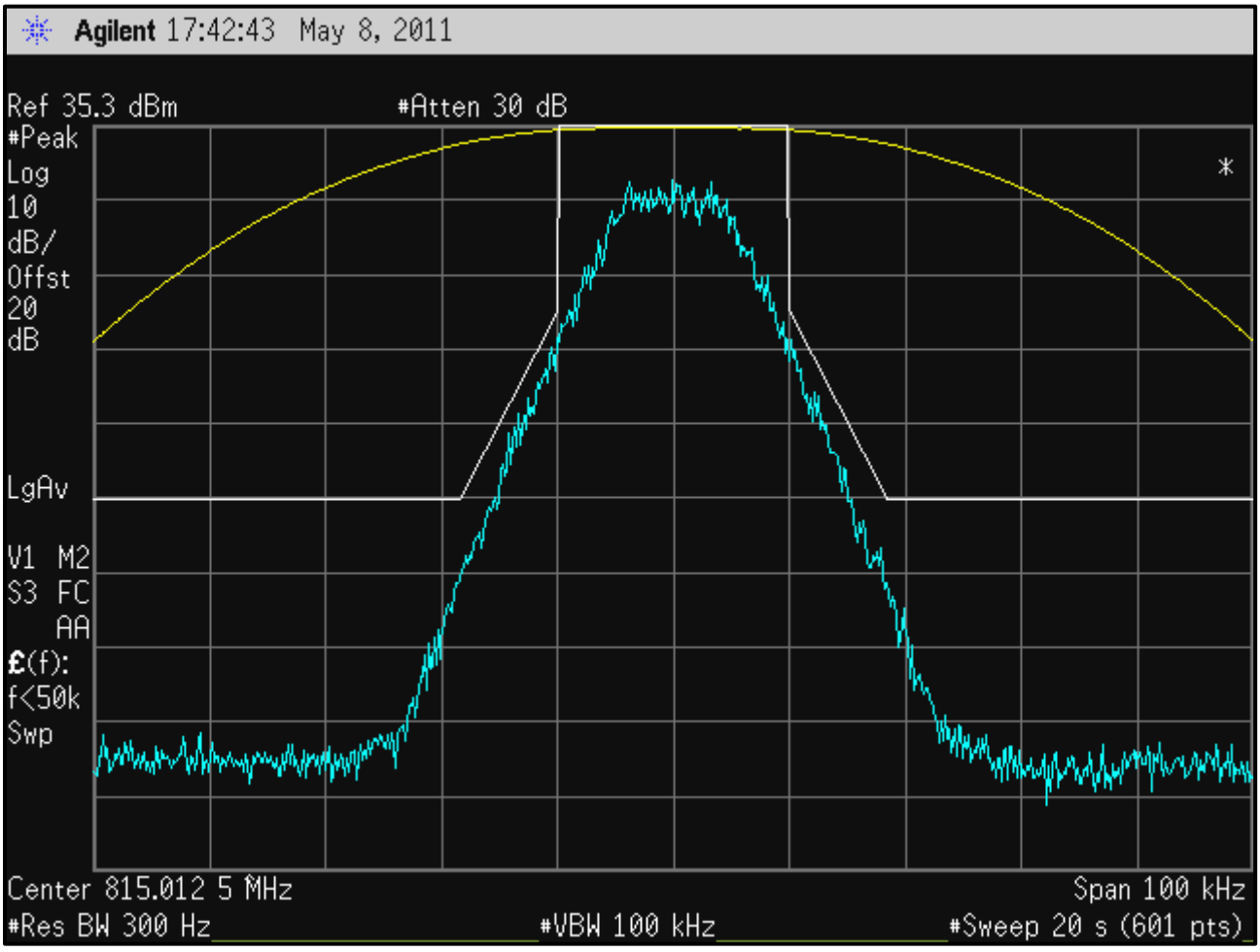
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 9,600 baud for OTP.

6.2 Test Data

Plot 6-1: Occupied Bandwidth – OTP NPS 806.0125 MHz Mask H



Plot 6-2: Occupied Bandwidth – OTP SMR 815.0125 MHz Mask G



Plot 6-3: Occupied Bandwidth – OTP SMR 823.9875 MHz Mask G

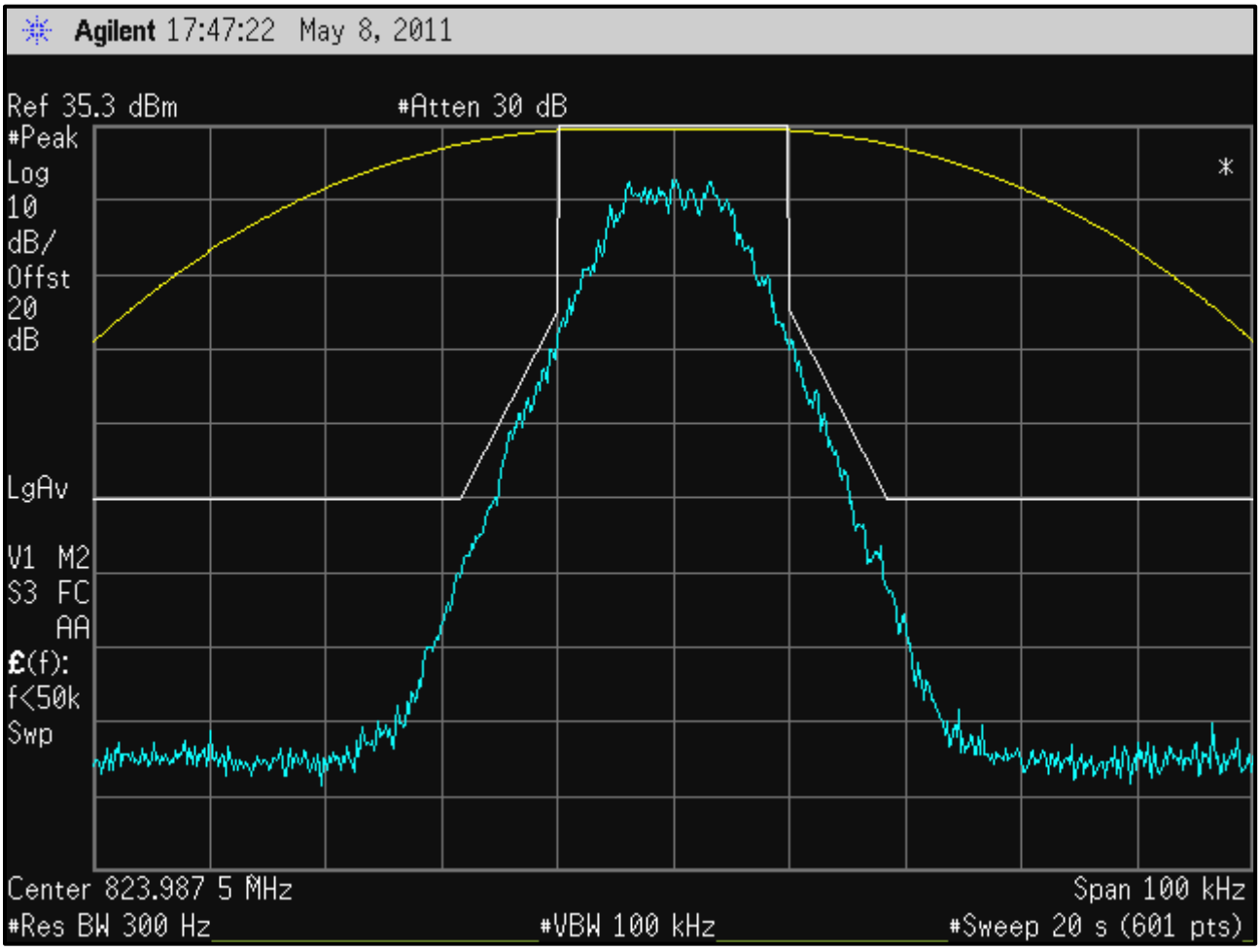


Table 6-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	4/08/2012

Test Personnel:

Richard B. McMurray, P.E.	Richard B. McMurray	May 8 and 9, 2011
Test Engineer	Signature	Dates of Test

7 FCC Rules and Regulations Part 90.213 and Part 2.1055: Frequency Stability

7.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.2.

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +60°C.

The temperature was initially set to -30°C and an hour elapsed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10°C through the range. A ½ hour period was observed to stabilize the EUT at each measurement step, and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% of nominal value.

The worst-case test data are shown below in Table 7-1 and Table 7-2.

7.2 Test Data

7.2.1 CFR 47 Part 90.213 Requirements

For mobile stations over 2 W:

806 – 809 MHz band: 1.5 ppm

809 – 824 MHz band: 2.5 ppm

7.2.2 Frequency Stability/Temperature Variation

Table 7-1: Temperature Frequency Stability – 815.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	815 012 635	0.68
-20	815 012 679	0.73
-10	815 012 620	0.66
0	815 012 440	0.44
10	815 012 270	0.23
20 (reference)	815 012 080	0.00
30	815 012 100	0.02
40	815 011 890	0.23
50	815 011 770	0.38
60	815 011 833	0.30

The worst-case deviation was found to be 0.73 ppm.

Result: The EUT is compliant.

7.2.3 Frequency Stability/Voltage Variation

Table 7-2: Frequency Stability/Voltage Variation – 815.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
9	815 012 136	0.02
33	815 012 121	0.00
57	815 012 131	0.01

Table 7-3: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	01/13/2013
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	07/29/2011
901350	Meterman	33XR	Multimeter	040402802	12/28/2012

Test Personnel:

Richard B. McMurray, P.E.	Richard B. McMurray	May 6 and 8, 2011
Test Engineer	Signature	Dates of Test

8 FCC Rules and Regulations Part 90.210 and Part 2.1053(a); RSS-119 5.8: Field Strength of Spurious Radiation

8.1 Test Procedure

ANSI/TIA-603-C-2004, Section 2.2.12.

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 9,600 bps.

The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

8.2 Test Data

8.2.1 CFR 47 Part 90.210 Requirements

The worst-case emissions test data are shown.

Table 8-1: Field Strength of Spurious Radiation – 806.0125 MHz; High Power

Limit = 43 + 10 Log P = 48.3 dBc; Conducted Power = 35.3 dBm = 3.4 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Polarity	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
1612.0250	41.0	V	-73.5	1.2	6.7	103.3	-55.0
2418.0375	35.2	V	-83.5	1.7	7.2	113.3	-65.0
3224.0500	39.6	V	-78.6	2.0	7.0	109.0	-60.7
4030.0625	38.7	H	-78.0	2.4	7.6	108.1	-59.8
4836.0750	31.0	H	-82.6	2.6	8.8	111.7	-63.4
5642.0875	30.2	H	-83.2	2.8	9.0	112.3	-64.0
6448.1000	33.9	H	-79.3	2.8	9.7	107.7	-59.4
7254.1125	31.7	H	-79.7	2.8	9.0	108.8	-60.5
8060.1250	31.6	H	-77.0	2.7	9.2	105.8	-57.5

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 8-2: Field Strength of Spurious Radiation – 815.0125 MHz; High Power

Limit = 43 + 10 Log P = 48.3 dBc; Conducted Power = 35.3 dBm = 3.4 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Polarity	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
1630.0250	41.5	V	-72.6	1.2	6.7	102.5	-54.2
2445.0375	37.9	V	-81.0	1.7	7.3	110.7	-62.4
3260.0500	37.1	H	-81.6	2.0	7.0	111.9	-63.6
4075.0625	35.0	H	-81.2	2.4	7.9	111.0	-62.7
4890.0750	31.1	V	-82.3	2.6	8.8	111.4	-63.1
5705.0875	30.9	V	-82.5	2.8	9.2	111.4	-63.1
6520.1000	33.0	H	-80.1	2.8	9.7	108.5	-60.2
7335.1125	29.8	H	-81.4	2.8	8.8	110.7	-62.4
8150.1250	31.2	H	-76.7	2.7	9.2	105.5	-57.2

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 8-3: Field Strength of Spurious Radiation – 823.9875 MHz; High Power

Limit = 43 + 10 Log P = 48.3 dBc; Conducted Power = 35.3 dBm = 3.4 W

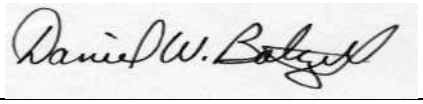
Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Polarity	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
1647.9750	41.4	V	-72.3	1.2	6.6	102.2	-53.9
2471.9625	38.3	V	-80.7	1.7	7.3	110.4	-62.1
3295.9500	31.0	H	-87.2	2.0	7.1	117.4	-69.1
4119.9375	36.7	H	-79.0	2.4	8.2	108.6	-60.3
4943.9250	32.9	H	-80.5	2.6	8.8	109.7	-61.4
5767.9125	32.6	H	-81.3	2.8	9.2	110.2	-61.9
6591.9000	33.4	V	-79.6	2.8	9.6	108.2	-59.9
7415.8875	32.4	V	-78.3	2.8	8.8	107.6	-59.3
8239.8750	31.9	V	-74.8	2.7	9.3	103.5	-55.2

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 8-4: Test Equipment for Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	1/31/2013
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1 - 18 GHz)	2310	10/27/2012
901364	MITEQ	JS4-01002600-36-5P	Amplifier 0.1-26 GHz, 28 dB gain, power 5 dB	849863	3/31/2012
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	1/13/2012
900928	Hewlett Packard	HP 83752A	Synthesized Sweeper (.01 - 20 GHz)	3610A00866	2/17/2012
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/19/2011
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/19/2011
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/19/2011
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/2011
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	6/14/2011
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	6/14/2011

Test Personnel:



Daniel W. Baltzell		May 10, 2011
Test Engineer	Signature	Date of Test

9 FCC Rules and Regulations Part 2.202: Necessary Bandwidth and Emission Bandwidth

OTP Modulation

809-824 MHz SMR
Calculation:
Data rate in bps (R) = 19200
Peak deviation of carrier (D) = +/-4.00 kHz
Number of states in each symbol (S) = 2
Bn = [19200/$\log_2$(4) + 2(4000)(1)] = 17.6 kHz
Emission designator: 17K6F1D

806-809 MHz NPSPAC
Calculation:
Data rate in bps (R) = 19200
Peak deviation of carrier (D) = +/-3.75 kHz
Number of states in each symbol (S) = 2
Bn = [19200/$\log_2$(4) + 2(3750)(1)] = 17.1 kHz
Emission designator: 17K1F1D

10 Conclusion

The data in this measurement report shows that the **Harris Corporation** Model **SG5300-800, FCC ID: OWDTR-0063-E, IC: 3636B-0063,** complies with all the applicable requirements of Parts 90 and 2 of the FCC Rules and IC RSS-119.