SRAM, LLC

ADDENDUM TO TEST REPORT 94881-9

Quarq Qalcium Bicycle Power Meter
Model: 0815

Tested To The Following Standards:

FCC Part Subpart C Sections 15.249 & 15.209
&
RSS-210 Issue 8

Report No.: 94881-9A

Date of issue: March 31, 2014

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Testing the Future
CKC LABORATORIES, INC.

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TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

SRAM, LLC
3100 1st Ave.
Spearfish, SD 57783

Representative: Jonathan Huft
Customer Reference Number: 01555

REPORT PREPARED BY:

Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 94881

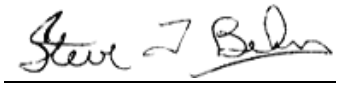
DATE OF EQUIPMENT RECEIPT: November 27, 2013
DATE(S) OF TESTING: November 27 - December 2, 2013

Revision History

Original: Testing of the Quarq Qalcium Bicycle Power Meter, 0815 to FCC Part 15.209, 15.249 and RSS 210 Issue 8.
Addendum A: To remove an incorrect transducer correction factor on the data sheet for 15.209.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14
Immunity	5.00.07

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Mariposa A	US0103	SL2-IN-E-1147R	3082A-2	90477	A-0136

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C 15.209, 15.249 & RSS-210 Issue 8

Description	Test Procedure/Method	Results
Radiated Emissions	FCC Part 15 Subpart C Section 15.209/ ANSI C63.4 / ANSI C63.10	Pass
Fundamental Field Strength	FCC Part 15 Subpart C Section 15.249(a) / ANSI C63.4 / ANSI C63.10/ 558074 DO1 DTS MEAS GUIDEANCE V01/ LP00004 / LP042007	Pass
Occupied Bandwidth	FCC Part 15 Subpart C Section 15.215(c) / ANSI C63.4 / ANSI C63.10	Pass
99% Bandwidth	RSP-100 / RSS-GEN section 4.6	Pass

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Quarq Qalcium Bicycle Power Meter

Manuf: SRAM LLC.
Model: 0815
Serial: 63132
FCC ID: C9O-MTB1

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) 47 CFR 15C requirements for Unlicensed Radio Frequency Devices, Subpart C - Intentional Radiators.

15.209 Radiated Emissions

Test Data Sheets

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209)-966-5240

Customer: **SRAM LLC.**
Specification: **15.209 Radiated Emissions**
Work Order #: **94881** Date: 12/2/2013
Test Type: **Maximized Emissions** Time: 08:39:16
Equipment: **Quarq Qalcium Bicycle Power Meter** Sequence#: 2
Manufacturer: SRAM LLC. Tested By: Eddie Mariscal
Model: 0815
S/N: 63132

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
	AN00226	Loop Antenna	6502	3/28/2012	3/28/2014
	ANP06230	Cable	CXTA04A-50	8/16/2012	8/16/2014
	AN00062	Preamp	8447D	6/6/2012	6/6/2014
	AN01992	Biconilog Antenna	CBL6111C	8/1/2012	8/1/2014
	ANP05922	Cable	RG/214	8/15/2012	8/15/2014
T2	AN03355	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T3	AN03356	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T4	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015
T5	AN03360	Cable	32022-2-29094-36TC	2/4/2013	2/4/2015
T6	ANP05904	Cable	32022-2-29094K-144TC	2/15/2013	2/15/2015
T7	AN03155	Preamp	83017A	6/26/2013	6/26/2015
T8	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
	AN02046	Horn Antenna-ANSI C63,5 (2006) 3m (dB)	MWH-1826/B	2/4/2013	2/4/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Quarq Qalcium Bicycle Power Meter*	SRAM LLC.	0815	63132

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

EUT is placed atop Styrofoam supports at a height of 80cm. EUT is placed in continuous transmit mode.

Transmit Frequency: 2.457GHz

Frequency Range of Interest: 9kHz-25GHz

9kHz-150kHz.....RBW = VBW = 200Hz
0.15-30MHz.....RBW = VBW = 9kHz
30-1000MHz.....RBW = VBW = 120kHz
1-25GHz.....RBW = VBW = 1MHz

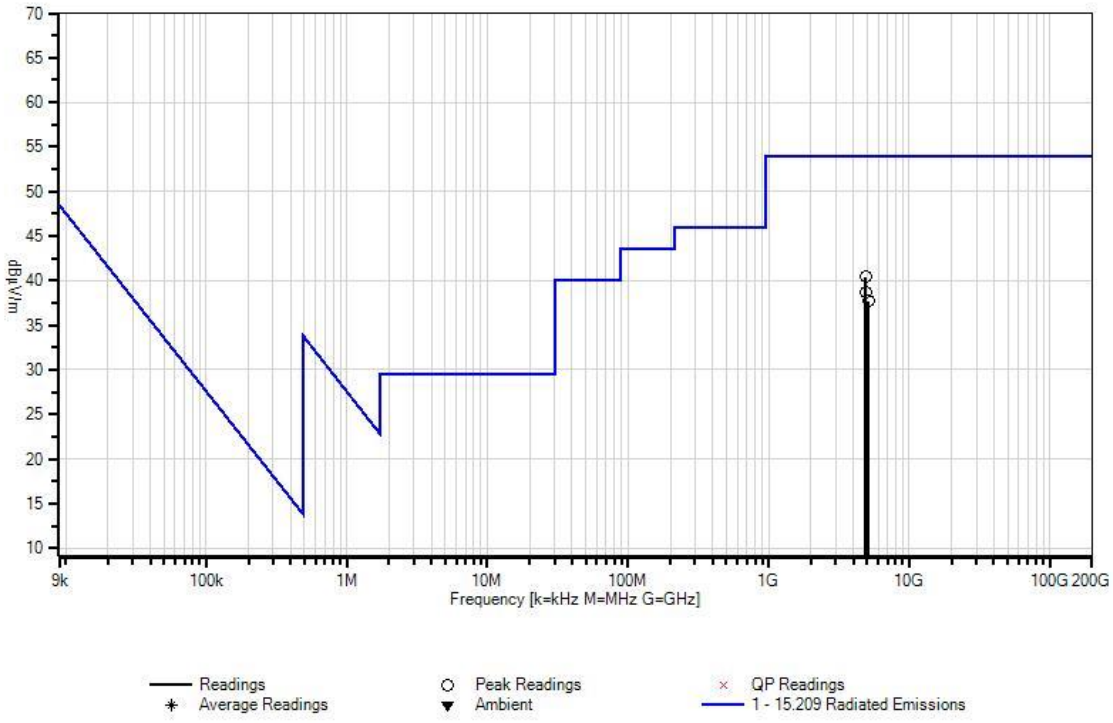
Environmental Conditions:
Temperature = 14°C
Relative Humidity = 40%
Atmospheric Pressure = 98.7kPa

Ext Attn: 0 dB

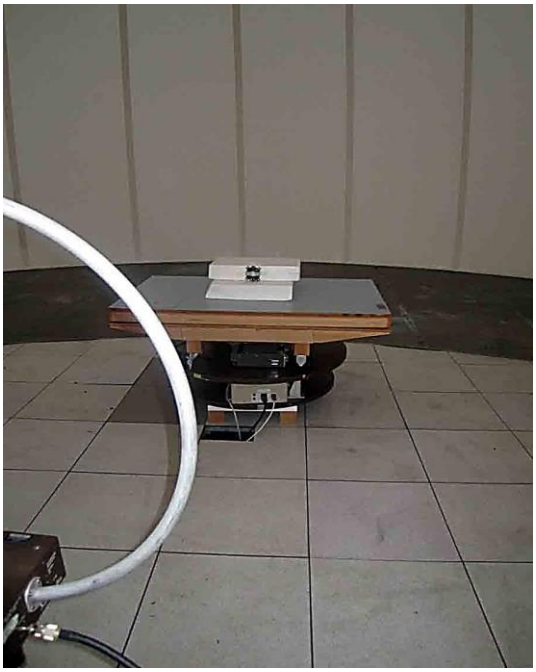
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	4914.060M	35.6	+0.0	+0.8	+0.0	+1.2	+0.0	40.4	54.0	-13.6	Vert
			+1.0	+3.2	-32.9	+31.5					
2	4914.060M	33.9	+0.0	+0.8	+0.0	+1.2	+0.0	38.7	54.0	-15.3	Horiz
			+1.0	+3.2	-32.9	+31.5					
3	5106.000M	32.4	+0.0	+0.9	+0.0	+1.2	+0.0	37.7	54.0	-16.3	Vert
			+1.0	+3.4	-33.2	+32.0					

CKC Laboratories, Inc. Date: 12/2/2013 Time: 08:39:16 SRAM LLC. WO#: 94881
15.209 Radiated Emissions Test Distance: 3 Meters Sequence#: 2 Ext ATTN: 0 dB



Test Setup Photos



9kHz

100MHz

2GHz

25GHz

15.249(a) Fundamental Field Strength

Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209)-966-5240

Customer: **SRAM LLC.**
Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**
Work Order #: **94881** Date: 11/27/2013
Test Type: **Maximized Emissions** Time: 15:42:21
Equipment: **Quarq Qalcium Bicycle Power Meter** Sequence#: 1
Manufacturer: SRAM LLC. Tested By: Eddie Mariscal
Model: 0815
S/N: 63132

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
T2	AN03356	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T3	AN03155	Preamp	83017A	6/26/2013	6/26/2015
T4	AN03355	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T5	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015
T6	AN03360	Cable	32022-2-29094-36TC	2/4/2013	2/4/2015
T7	ANP05904	Cable	32022-2-29094K-144TC	2/15/2013	2/15/2015
T8	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Quarq Qalcium Bicycle Power Meter*	SRAM LLC.	0815	63132

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

EUT is placed atop Styrofoam supports at a height of 80cm. EUT is placed in continuous transmit mode.
Testing was done in accordance with 15.31(e). A new battery was installed at the time of testing.

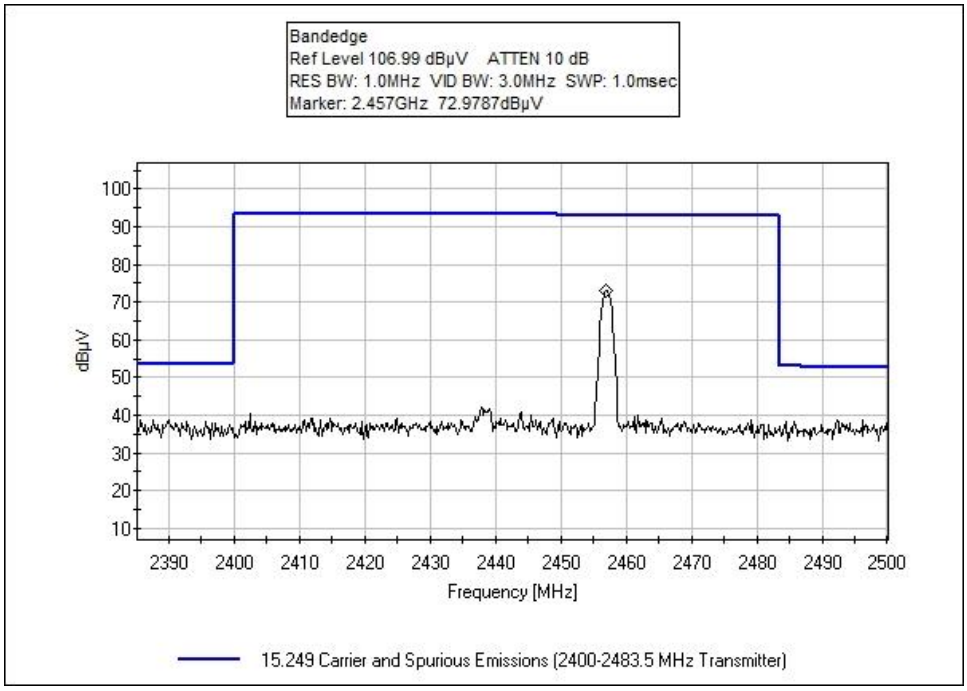
Transmit Frequency: 2.457GHz
Frequency Range of Interest: Fundamental

Environmental Conditions:
Temperature = 14°C
Relative Humidity = 40%
Atmospheric Pressure = 98.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2457.000M	73.5	+28.6	+1.1	-32.9	+0.5	+0.0	74.3	94.0	-19.7	Horiz
			+0.6	+0.7	+2.2	+0.0			Y		
2	2457.000M	65.1	+28.6	+1.1	-32.9	+0.5	+0.0	65.9	94.0	-28.1	Vert
			+0.6	+0.7	+2.2	+0.0			Y		



Test Setup Photos

15.215(c) Occupied Bandwidth

Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209)-966-5240

Customer: **SRAM LLC.**
Specification: **FCC 2.1049 Occupied Bandwidth**
Work Order #: **94881** Date: 11/27/2013
Test Type: **Maximized Emissions** Time: 4:15:43 PM
Equipment: **Quarq Qalcium Bicycle Power Meter** Sequence#: 1
Manufacturer: SRAM LLC. Tested By: Eddie Mariscal
Model: 0815
S/N: 63132

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
T2	AN03356	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T3	AN03155	Preamp	83017A	6/26/2013	6/26/2015
T4	AN03355	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T5	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015
T6	AN03360	Cable	32022-2-29094-36TC	2/4/2013	2/4/2015
T7	ANP05904	Cable	32022-2-29094K-144TC	2/15/2013	2/15/2015
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Quarq Qalcium Bicycle Power Meter*	SRAM LLC.	0815	63132

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

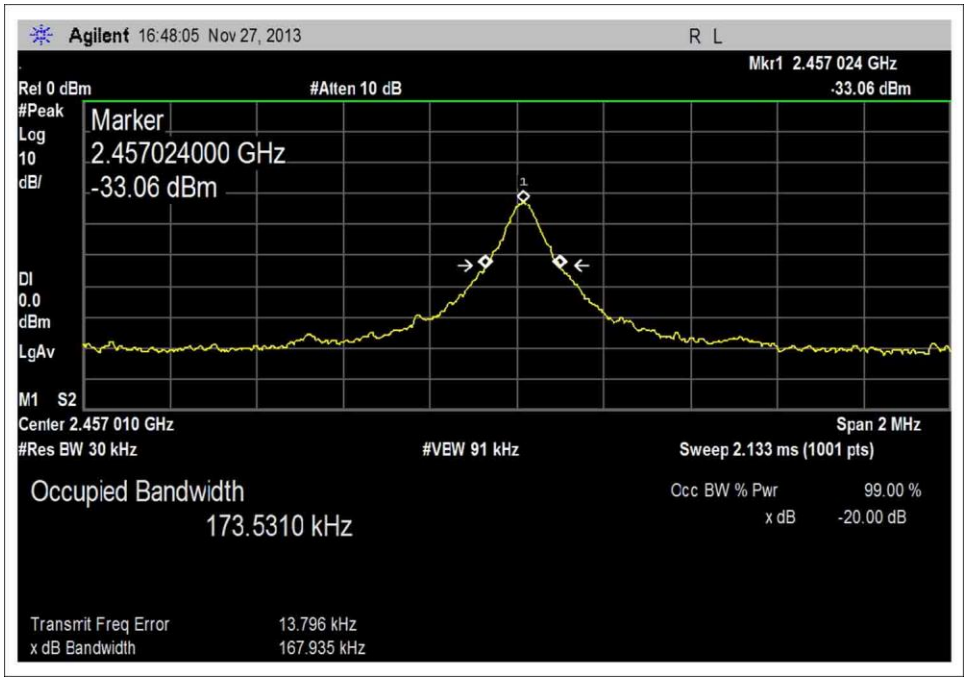
EUT is placed atop Styrofoam supports at a height of 80cm. EUT is placed in continuous transmit mode.

Transmit Frequency: 2.457GHz

Frequency Range of Interest: Fundamental

Environmental Conditions:
Temperature = 14°C
Relative Humidity = 40%
Atmospheric Pressure = 98.7kPa

Test Plots


Agilent 16:48:05 Nov 27, 2013
R L
Mkr1 2.457 024 GHz
Rel 0 dBm
#Atten 10 dB
-33.06 dBm
#Peak
Log
10
dB/
Marker
2.457024000 GHz
-33.06 dBm
Dl
0.0
dBm
LgAv
M1 S2
Center 2.457 010 GHz
Span 2 MHz
#Res BW 30 kHz
#VEW 91 kHz
Sweep 2.133 ms (1001 pts)
Occupied Bandwidth
173.5310 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 13.796 kHz
x dB Bandwidth 167.935 kHz

Test Setup Photos

RSS-210

99% Bandwidth

Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209)-966-5240

Customer: **SRAM LLC.**
Specification: **RSS-210 Issue 8 (2010) Occupied Channel Bandwidth**
Work Order #: **94881** Date: 11/27/2013
Test Type: **Maximized Emissions** Time: 4:15:43 PM
Equipment: **Quarq Qalcium Bicycle Power Meter** Sequence#: 1
Manufacturer: SRAM LLC. Tested By: Eddie Mariscal
Model: 0815
S/N: 63132

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00327	Horn Antenna	3115	4/13/2012	4/13/2014
T2	AN03356	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T3	AN03155	Preamp	83017A	6/26/2013	6/26/2015
T4	AN03355	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T5	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015
T6	AN03360	Cable	32022-2-29094-36TC	2/4/2013	2/4/2015
T7	ANP05904	Cable	32022-2-29094K-144TC	2/15/2013	2/15/2015
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Quarq Qalcium Bicycle Power Meter*	SRAM LLC.	0815	63132

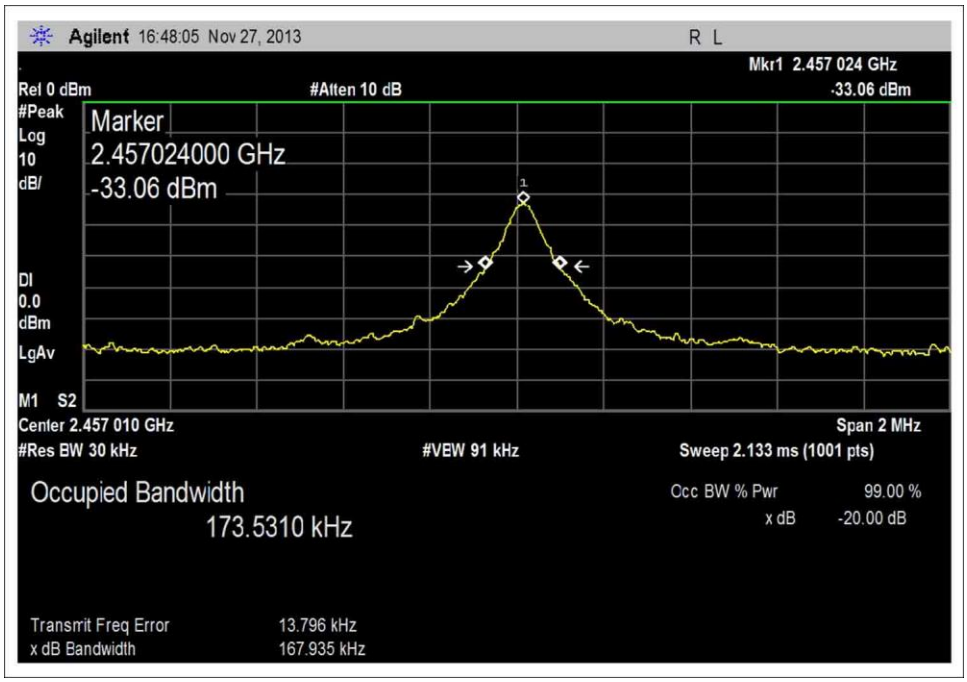
Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

EUT is placed atop Styrofoam supports at a height of 80cm. EUT is placed in continuous transmit mode.
Transmit Frequency: 2.457GHz
Frequency Range of Interest: Fundamental
Environmental Conditions:
Temperature = 14°C
Relative Humidity = 40%
Atmospheric Pressure = 98.7kPa

Test Plots


Agilent 16:48:05 Nov 27, 2013
R L
Mkr1 2.457 024 GHz
Ref 0 dBm
#Atten 10 dB
-33.06 dBm
#Peak
Log
10
dB/
Marker
2.457024000 GHz
-33.06 dBm
1
Dl
0.0
dBm
LgAv
M1 S2
Center 2.457 010 GHz
Span 2 MHz
#Res BW 30 kHz
#VBW 91 kHz
Sweep 2.133 ms (1001 pts)
Occupied Bandwidth
173.5310 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 13.796 kHz
x dB Bandwidth 167.935 kHz

Test Setup Photos

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.