Electromagnetic Compatibility Test Report

Tests Performed on a Sunrise Technologies, Inc.

Monitor/Control Remote Device Transciever, Model BB124

Radiometrics Document RP-6861

Product Detail: FCC ID: WRWBBXXXXXXX IC: 9259A-BBXXX Equipment type: 2.4 GHz transmitter
Test Standards: US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2008 Industry Canada RSS-210, Issue 7: 2007 as required for Category I Equipment This report concerns: Original Grant for Certification FCC Part 15.247

Tests Performed For:	*Test Facility:*
Sunrise Technologies, Inc. 54 Commercial St. Raynham, MA 02767	**Radiometrics Midwest Corporation** 12 East Devonwood Romeoville, IL 60446 (815) 293-0772

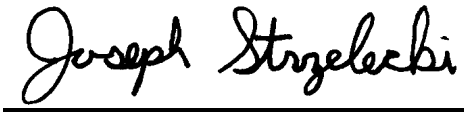
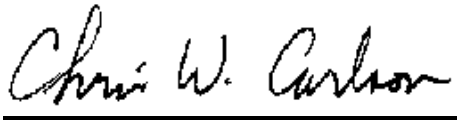
Test Date(s): (Month-Day-Year)
August 12 thru 30, 2010

Document RP-6861 Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	March 22, 2011		

Table of Contents

1 ADMINISTRATIVE DATA

Equipment Under Test: A Sunrise Technologies, Inc., Monitor/Control Remote Device Model: BB124; Serial Number: none This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year) August 12, 2010	*Test Date(s): (Month-Day-Year)* August 12 thru 30, 2010
Test Report Written By: Joseph Strzelecki Senior EMC Engineer	*Test Witnessed By:* The tests were not witnessed by Sunrise Technologies, Inc.
Radiometrics' Personnel Responsible for Test:  Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	*Test Report Approved By*  Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Monitor/Control Remote Device, Model BB124, manufactured by Sunrise Technologies, Inc. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	Basic Standard	Test Result
RF Radiated Emissions	30-25,000 MHz	RSS-210 & FCC Part 15	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	RSS-210 & FCC Part 15	Pass
Occupied Bandwidth Test	Fundamental Freq.	RSS-210 & FCC Part 15	Pass

The RSS-210 specification is not currently covered in Radiometrics' Scope of Accreditation. This is technically very similar to FCC, CFR 47 Part 15 which is on Radiometrics scope.

2.1 RF Exposure Compliance Requirements

Since the power output is 100 mW, the EUT meets the FCC requirement for RF exposure. There are no power level adjustments and the antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

Since the separation distance between the user and the device is greater than 20 cm and is less than 5 watts it is exempt from RSS-102.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Monitor/Control Remote Device, Model BB124, manufactured by Sunrise Technologies, Inc. The EUT was in good working condition during the tests, with no known defects. The EUT is a Zigbee smart energy twistlock outdoor lighting controller. The EUT is not body worn or handheld.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The EUT uses a permanently mounted, internal whip-style antenna which is not user replaceable or serviceable. Therefore, it meets the 15.203 Requirements.

3.2 Related Submittals

Sunrise Technologies, Inc. is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations. The EUT was tested as a stand-alone device. Power was supplied at 115 VAC, 60 Hz single-phase.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Monitor/Control Remote Device	E	Sunrise Technologies, Inc.	BB124	none

* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

List of System Cables

QTY	Length (m)	Cable Description	Connected to (Item #)	Shielded?
1	1.8	AC Cord	#1 Power input	No

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2008	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2003	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 7	2007	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 2	2007	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)

The test procedures used are in accordance with the Industry Canada RSS-212 and ANSI document C63.4-2003, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC3124A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	02/11/10
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo	02/11/10
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	02/11/10
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	11/18/10
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	11/25/09
ANT-53	EMCO	Loop Antenna	6507	1453	1 kHz-30 MHz	12 Mo	11/04/09
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	10/27/09
HPF-03	Mini-Circuits	High Pass Filter	VHP-39	HPF-03	3-10 GHz	24 Mo.	10/27/09
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	06/01/09
LSN-03	Farnell	50 uH LISN	1EXLSN30B	000314	0.01-30MHz	24 Mo.	06/01/09
PRE-01	Hewlett Packard	Preselector	85685A	2510A00143	20 Hz-2GHz	12 Mo.	01/11/10
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	03/15/10
REC-07	Anritsu	Spectrum Analyzer	MS2601A	MT53067	0.01-2200MHz	12 Mo.	04/06/10
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	24 Mo.	08/21/09
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	12 Mo.	04/01/10

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

10.1 AC Conducted Emissions

The tests and limits are in accordance with FCC section 15.207 and RSS Gen section 7.2.2.

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on semi-log graph paper generated by the computer and plotter. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 – 5.0	56	46
5.0 - 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from, after testing all modes of operation.

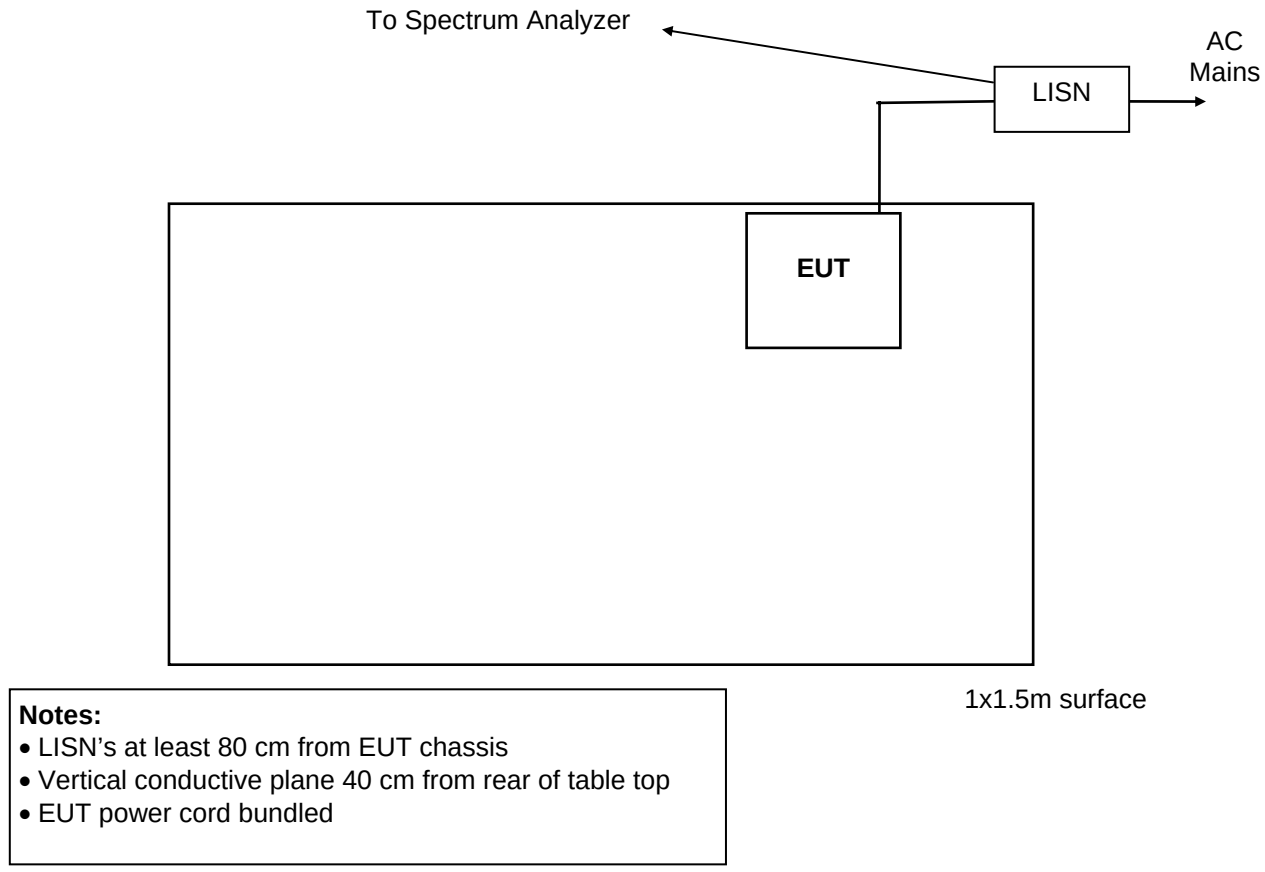
Test Date : August 30, 2010
The Amplitude is the final corrected value with cable and LISN Loss.

EUT Mode	Lead Tested	Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit
Receive	AC Neutral	0.153	47.0	65.8	29.4	55.8
Receive	AC Neutral	0.157	46.5	65.6	29.3	55.6
Receive	AC Neutral	0.197	43.7	63.8	26.6	53.8
Receive	AC Neutral	0.266	39.1	61.2	22.9	51.2
With Battery	AC Neutral	0.165	48.2	65.2	30.0	55.2
With Battery	AC Neutral	0.230	42.7	62.5	25.4	52.5
With Battery	AC Neutral	0.408	31.8	57.7	16.7	47.7
Receive	AC Hot	0.153	47.2	65.8	30.0	55.8
Receive	AC Hot	0.199	44.1	63.6	27.5	53.6
Receive	AC Hot	0.293	38.3	60.4	22.8	50.4
With Battery	AC Hot	0.166	48.5	65.2	31.2	55.2
With Battery	AC Hot	0.200	46.7	63.6	29.1	53.6
With Battery	AC Hot	0.296	40.0	60.4	24.1	50.4
With Battery	AC Hot	0.328	38.3	59.5	22.7	49.5
With Battery	AC Hot	0.362	36.5	58.7	21.1	48.7
With Battery	AC Hot	0.425	33.2	57.3	16.6	47.3

The above are the worst case results with three frequencies test for each EUT
* QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

Judgment: Passed by 16.6 dB

Figure 1. Conducted Emissions Test Setup



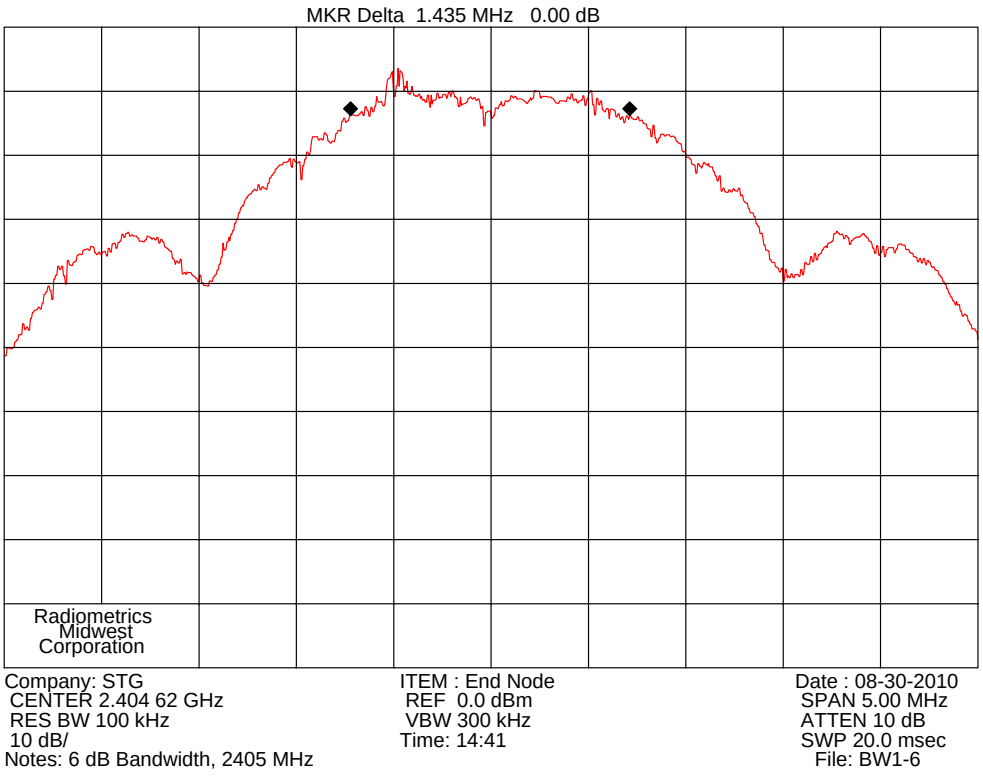
10.2 Occupied Bandwidth

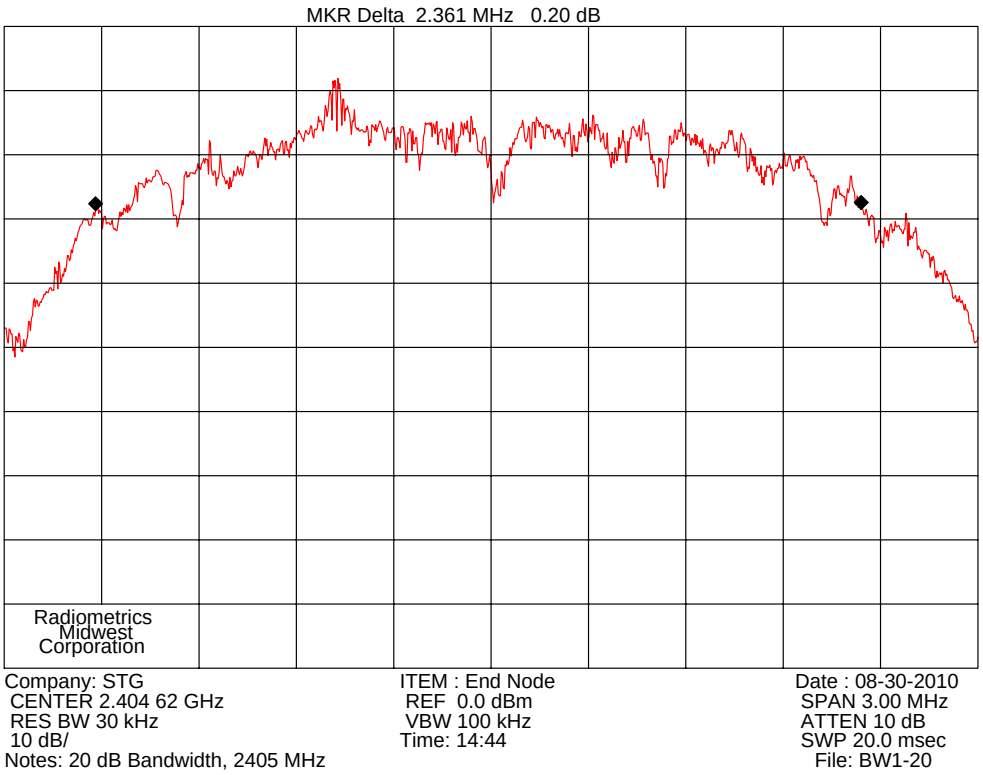
The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The EUT was transmitting at its maximum data rate. The trace was allowed to stabilize.

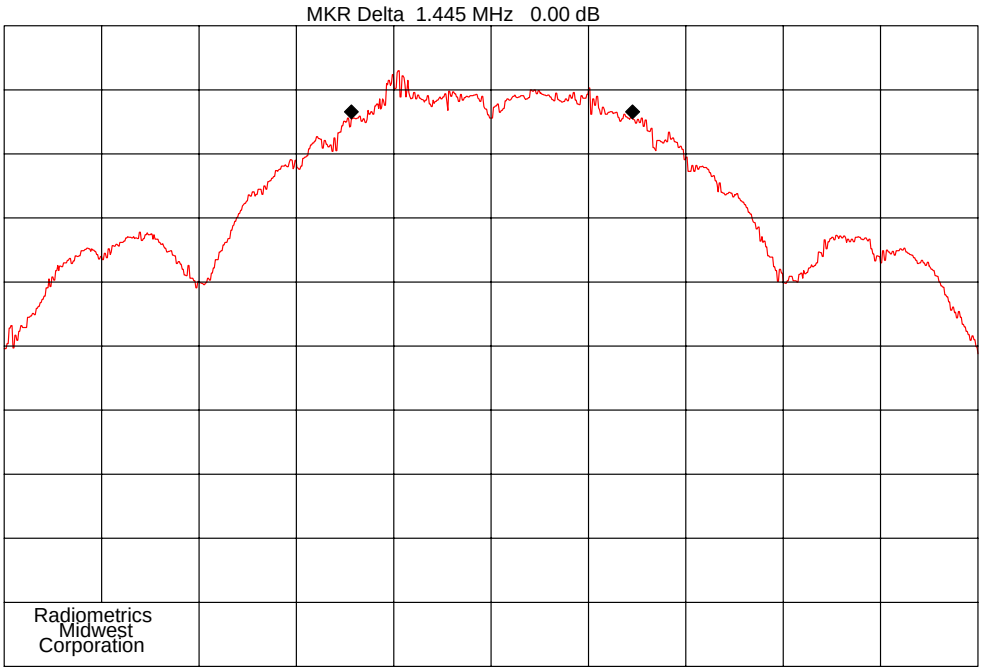
The marker-to-peak function was set to the peak of the emission. Then the marker-delta function was used to measure 6 or 20 dB down one side of the emission. The marker-delta function was reset and then moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 6 or 20 dB bandwidth of the emission.

MHz	6 dB EBW MHz	20 dB EBW MHz
2405	1.435	2.361
2440	1.445	2.373
2475	1.460	2.367
2480	1.465	2.352

Figure 2. Occupied Bandwidth Plots



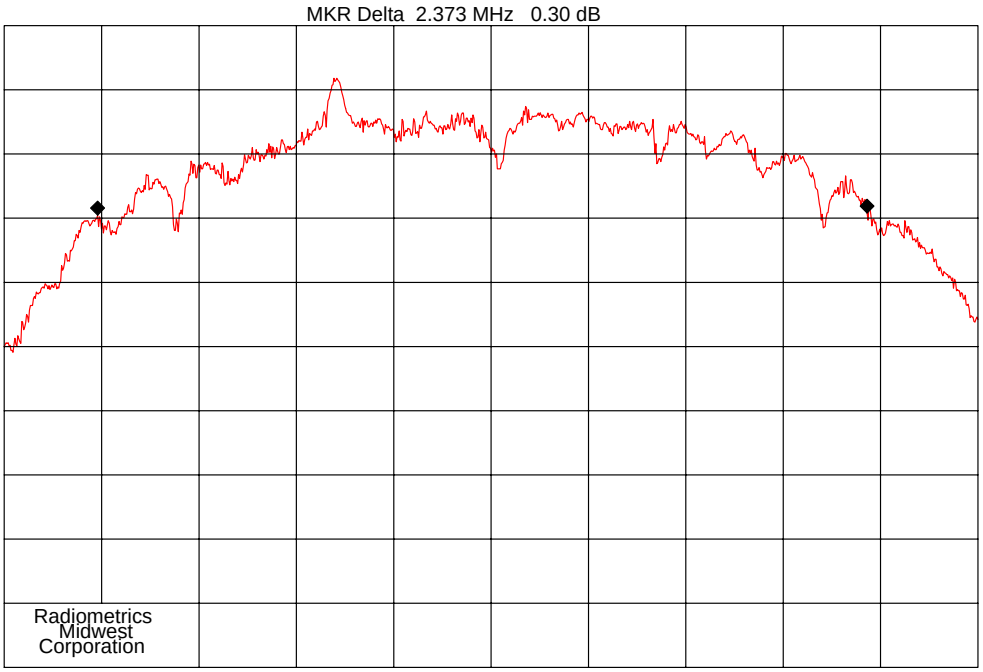




Company: STG
CENTER 2.439 62 GHz
RES BW 100 kHz
10 dB/
Notes: 6 dB Bandwidth, 2440 MHz

ITEM : End Node
REF 0.0 dBm
VBW 300 kHz
Time: 14:51

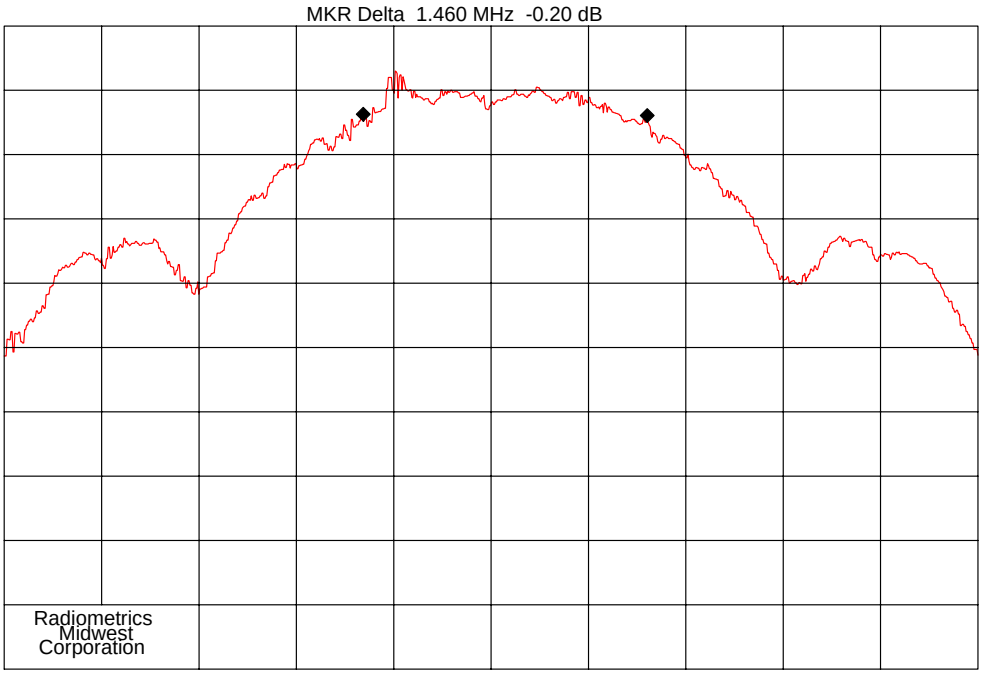
Date : 08-30-2010
SPAN 5.00 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BW2-6



Company: STG
CENTER 2.439 62 GHz
RES BW 30 kHz
10 dB/
Notes: 20 dB Bandwidth, 2440 MHz

ITEM : End Node
REF 0.0 dBm
VBW 100 kHz
Time: 14:47

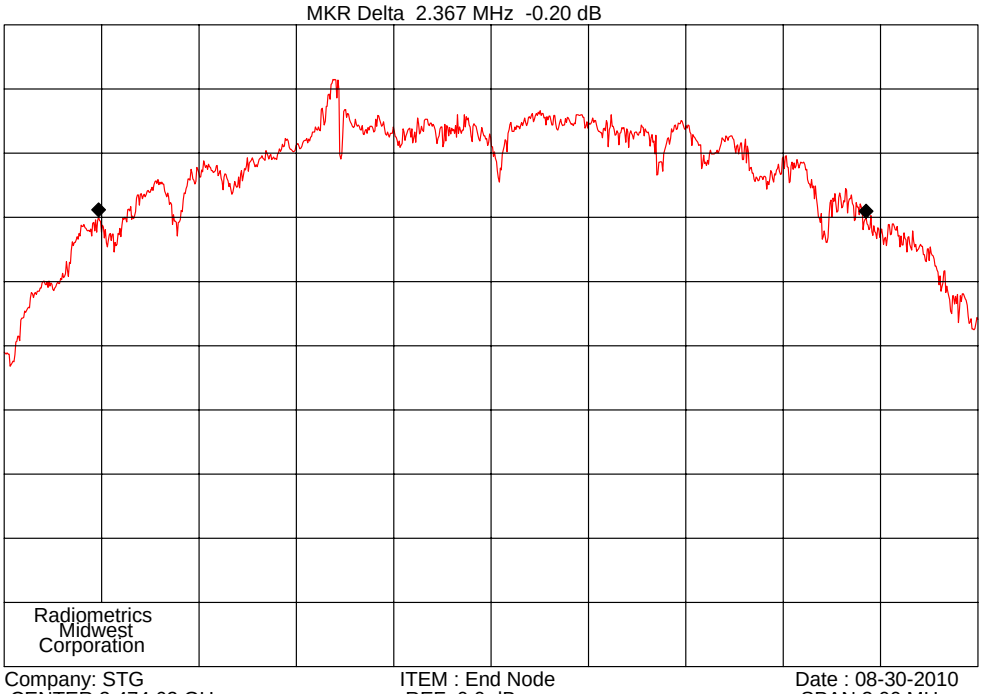
Date : 08-30-2010
SPAN 3.00 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BW2-20



Company: STG
CENTER 2.474 62 GHz
RES BW 100 kHz
10 dB/
Notes: 6 dB Bandwidth, 2475 MHz

ITEM : End Node
REF 0.0 dBm
VBW 300 kHz
Time: 14:53

Date : 08-30-2010
SPAN 5.00 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BW3-6



Company: STG
CENTER 2.474 62 GHz
RES BW 30 kHz
10 dB/
Notes: 20 dB Bandwidth, 2475 MHz

ITEM : End Node
REF 0.0 dBm
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Time: 14:55

Date : 08-30-2010
SPAN 3.00 MHz
ATTEN 10 dB
SWP 20.0 msec
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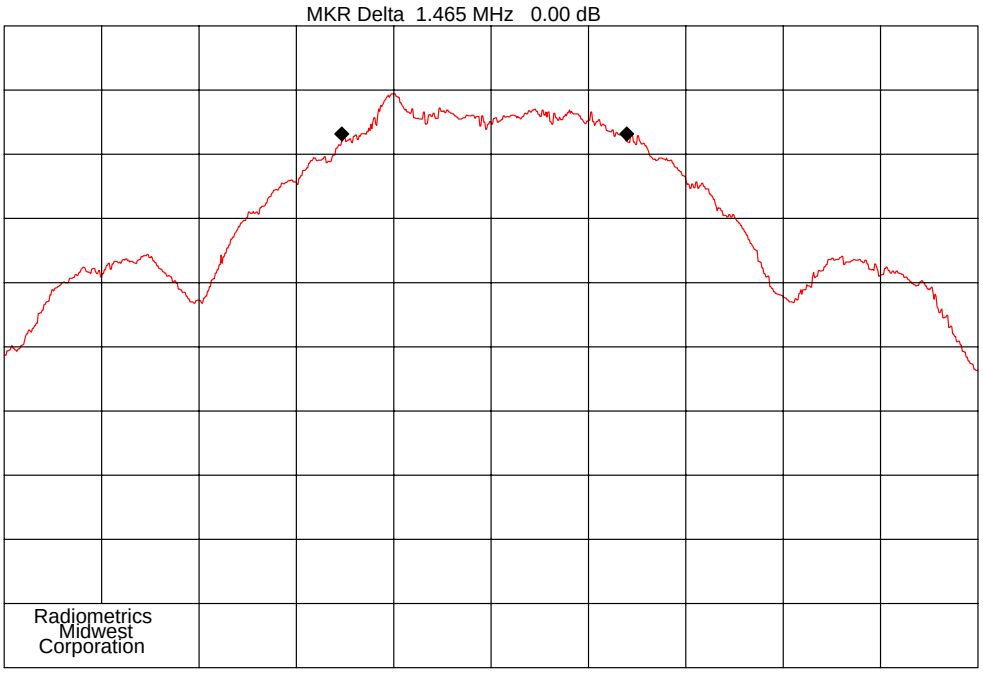
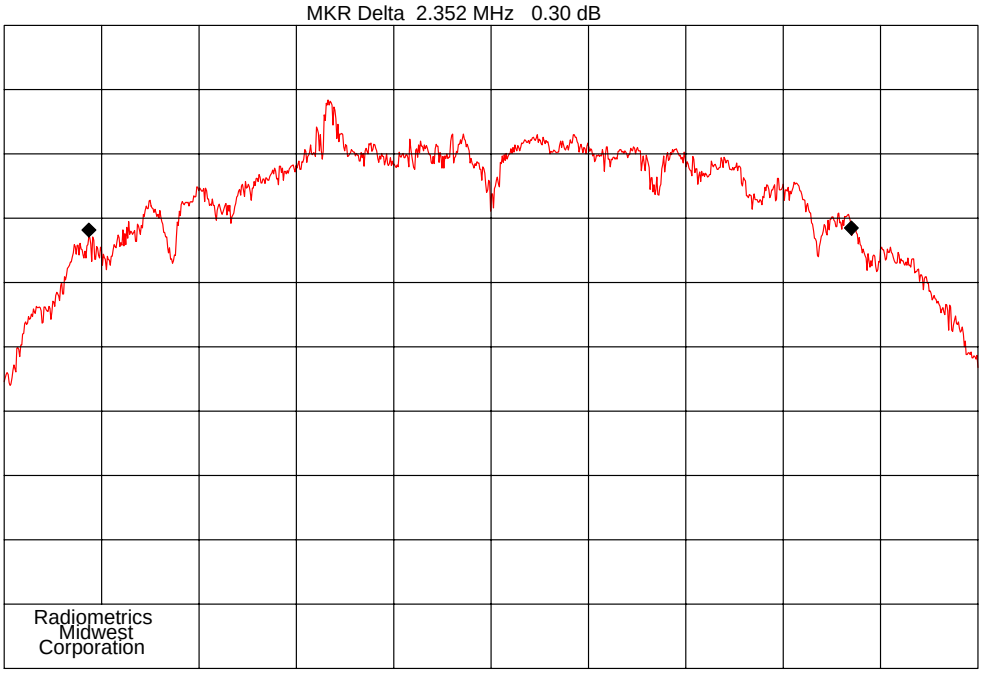


Company: STG
CENTER 2.479 63 GHz
RES BW 100 kHz
10 dB/
Notes: 6 dB Bandwidth, 2480 MHz

ITEM : End Node
REF 0.0 dBm
VBW 300 kHz
Time: 15:04

Date : 08-30-2010
SPAN 5.00 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BW4-6



Company: STG
CENTER 2.479 63 GHz
RES BW 30 kHz
10 dB/
Notes: 20 dB Bandwidth, 2480 MHz

ITEM : End Node
REF 0.0 dBm
VBW 100 kHz
Time: 14:59

Date : 08-30-2010
SPAN 3.00 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BW4-20

10.3 Peak Output Power

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement. The FCC procedures from power output option 2, Method #3 were used.

The transmitter's peak power was calculated using the following equation:

P = (E x d)^2 / (30)

Where: E = the measured maximum peak field strength in V/m.
d = Distance in meters from which the field strength was measured. (3 meters)
P = The EUT power in watts

The Field Strength was measured using the procedures described in section 10.9, with the exception of the resolution and video bandwidths. The spectrum analyzer was set to the following settings:

Span = 3 MHz ; RBW = 3 MHz (> the 20 dB bandwidth of the emission being measured)
VBW = 3 MHz; Sweep = auto; Detector function = peak; Trace = max hold

Since the gain of the antenna is always less than 6dB, the limit is not reduced.
Battery Powered

MHz	dBuV/m Peak	Test Dist meters	V/m	EIRP Watts	Peak EUT dBm	Limit dBm
2405	115.8	3	0.617	0.114	20.6	30
2440	116.8	3	0.692	0.144	21.6	30
2475	116.3	3	0.653	0.128	21.1	30
2480	111.3	3	0.367	0.0405	16.1	30

Overall Test result: Pass by 7.8 dB

10.4 Power Spectral Density

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement. The FCC procedures from PSD option 1 was used. The power spectral density was measured as follows.

The field strength was measured using the procedures described in section 10.9, with the following exceptions: The analyzer was tuned to the highest point of the maximized fundamental emission. The analyzer was set to RBW = 3 kHz, VBW > RBW, span = 300 kHz and a sweep = 100 Sec. Using this peak level, the transmitter's power spectral density was calculated using the following equation:

P = (E x d)^2 / (30)

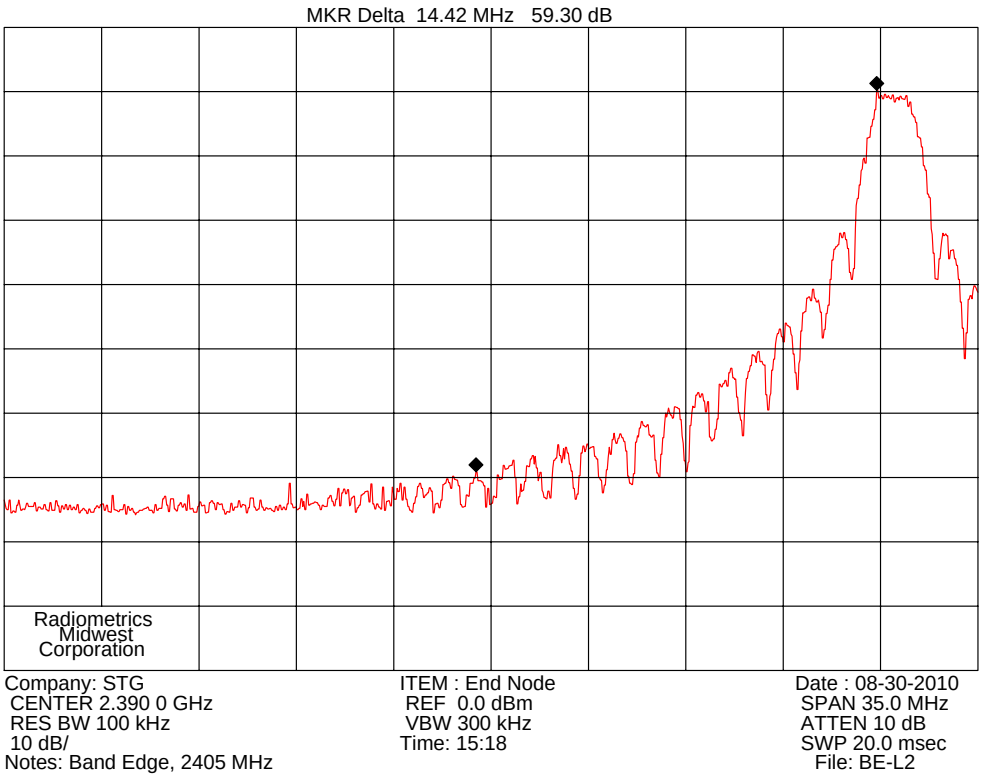
Where: E = the measured maximum peak field strength in V/m, using the bandwiths in this section.
d = Distance in meters from which the field strength was measured. (3 meters)
P = The EUT power in watts

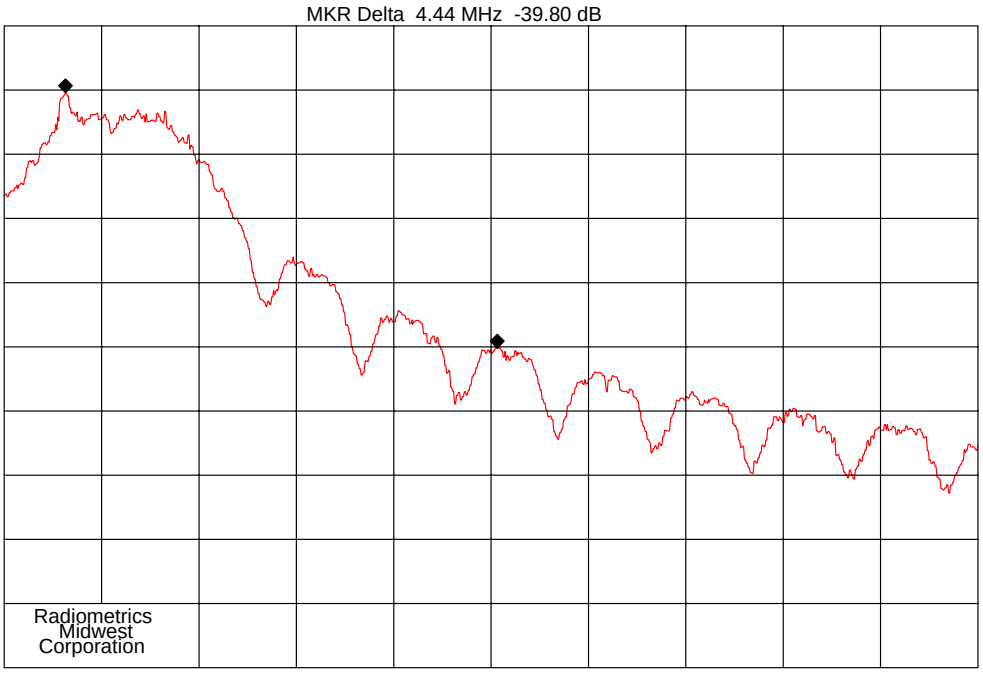
Freq MHz	3kHz PSD Field Strength		Test Distance Meters	3 kHz Spectral Density from EUT		Limit dBm
	dBuV/m	V/m		Watts	dBm	
2405	100.7	0.108	3	0.0035	5.5	8
2440	101.7	0.122	3	0.0044	6.5	8
2475	101.6	0.120	3	0.0043	6.4	8
2480	97.1	0.072	3	0.0015	1.9	8

Overall Test result: Pass by 1.5 dB

10.5 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize.

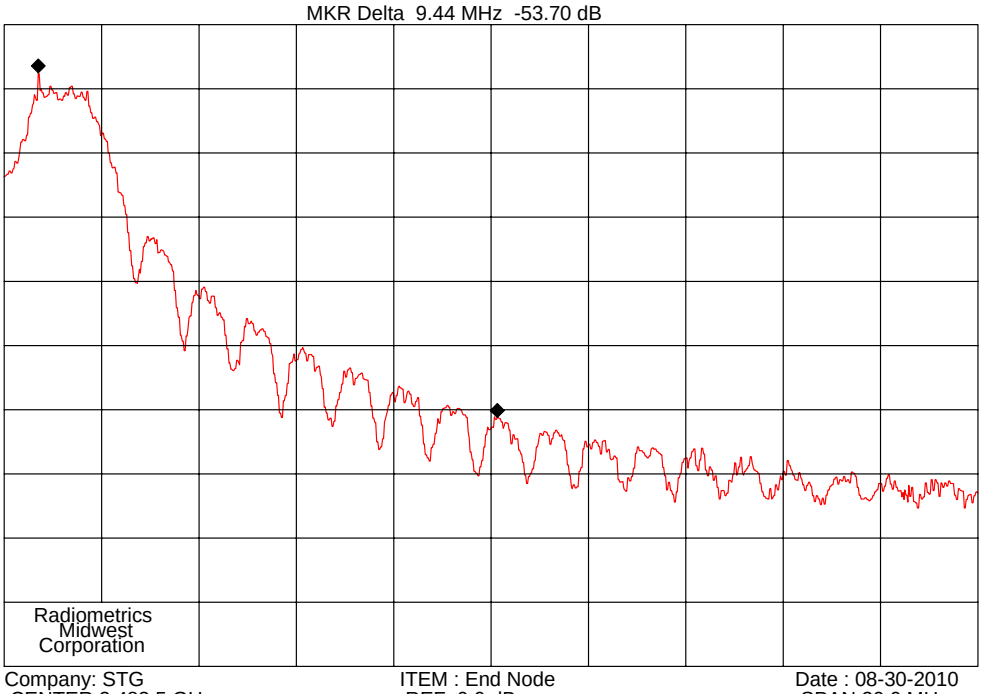




Company: STG
CENTER 2.483 5 GHz
RES BW 100 kHz
10 dB/
Notes: Band Edge, 2480 MHz

ITEM : End Node
REF 0.0 dBm
VBW 300 kHz
Time: 15:11

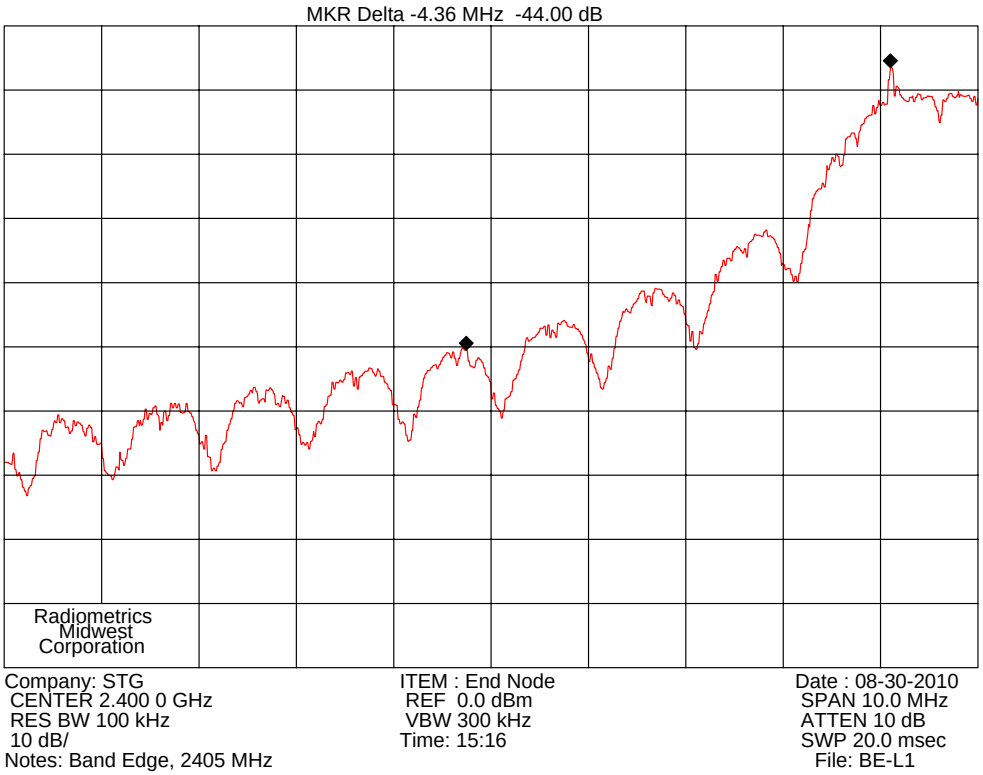
Date : 08-30-2010
SPAN 10.0 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BE-H1



Company: STG
CENTER 2.483 5 GHz
RES BW 100 kHz
10 dB/
Notes: Band Edge, 2475 MHz

ITEM : End Node
REF 0.0 dBm
VBW 300 kHz
Time: 15:13

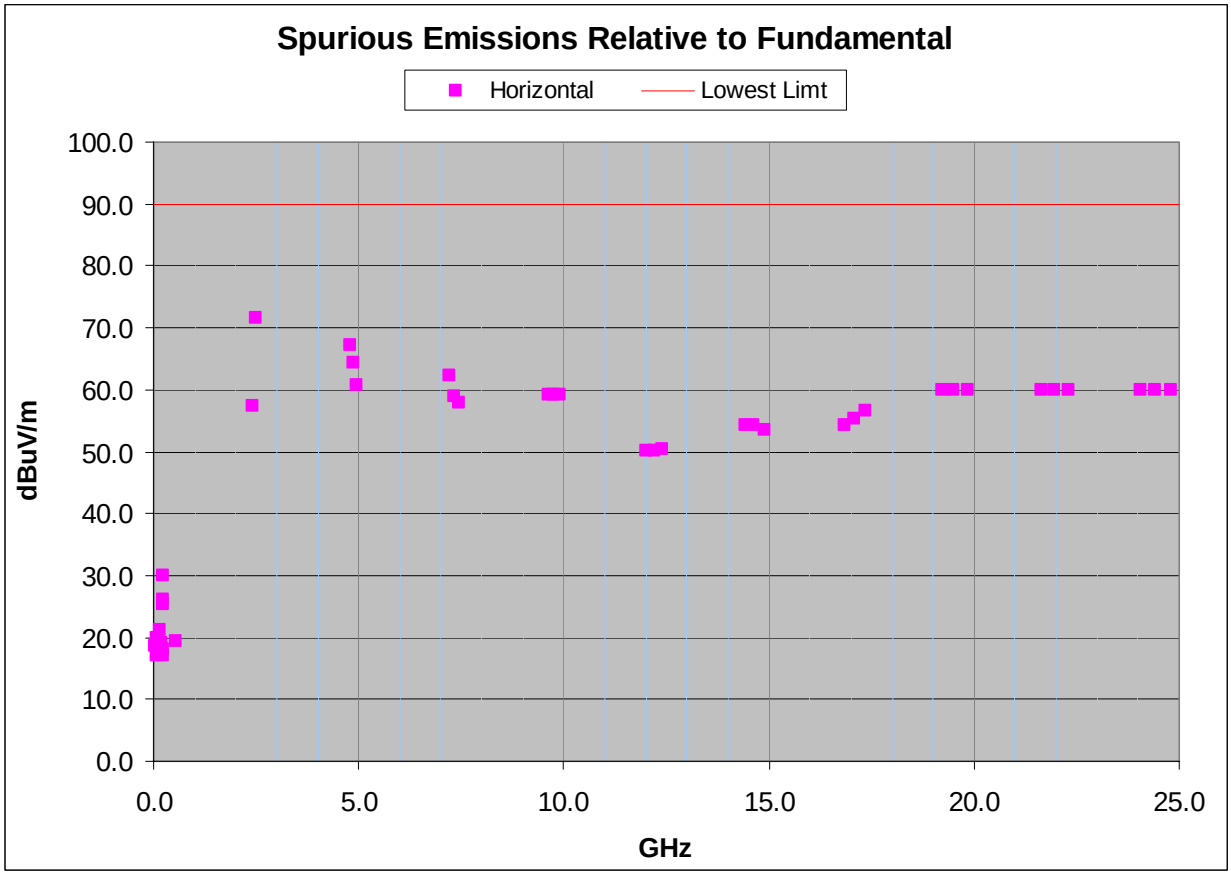
Date : 08-30-2010
SPAN 20.0 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BE-H2



10.6 Spurious RF Conducted Emissions

Since antenna conducted tests cannot be performed on the EUT at 2.4 GHz, radiated tests were performed to show compliance with this requirement.

The EUT was tested in continous mode and peak readings were made from the lowest frequency generated in the EUT up through the 10th harmonic. The limit is 20 dB lower than the peak of the lowest fundamental. The data is shown graphically.


Spurious Emissions Relative to Fundamental
Horizontal
Lowest Limt
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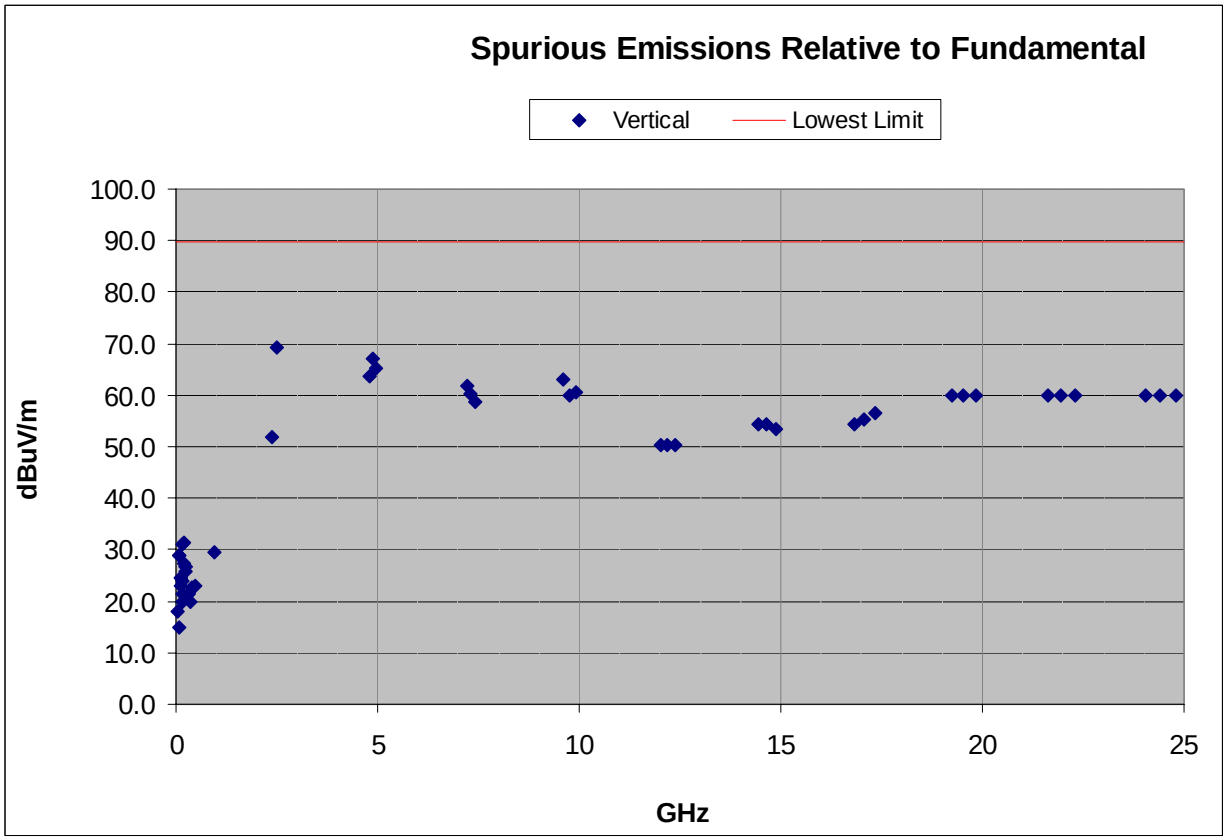
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
dBuV/m
0.0
5.0
10.0
15.0
20.0
25.0
GHz


Spurious Emissions Relative to Fundamental
Vertical
Lowest Limit
100.0
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10.0
0.0
dBuV/m
0
5
10
15
20
25
GHz

10.7 Radiated RF Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists.

From 30 to 1000 MHz, an Anritsu spectrum analyzer was used. For tests from 1 to 25 GHz, an HP 8566 spectrum analyzer was used. For tests from 1 to 10 GHz, a high pass filter was used to reduce the fundamental emission. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 25000 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

10.7.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG + HPF + PKA

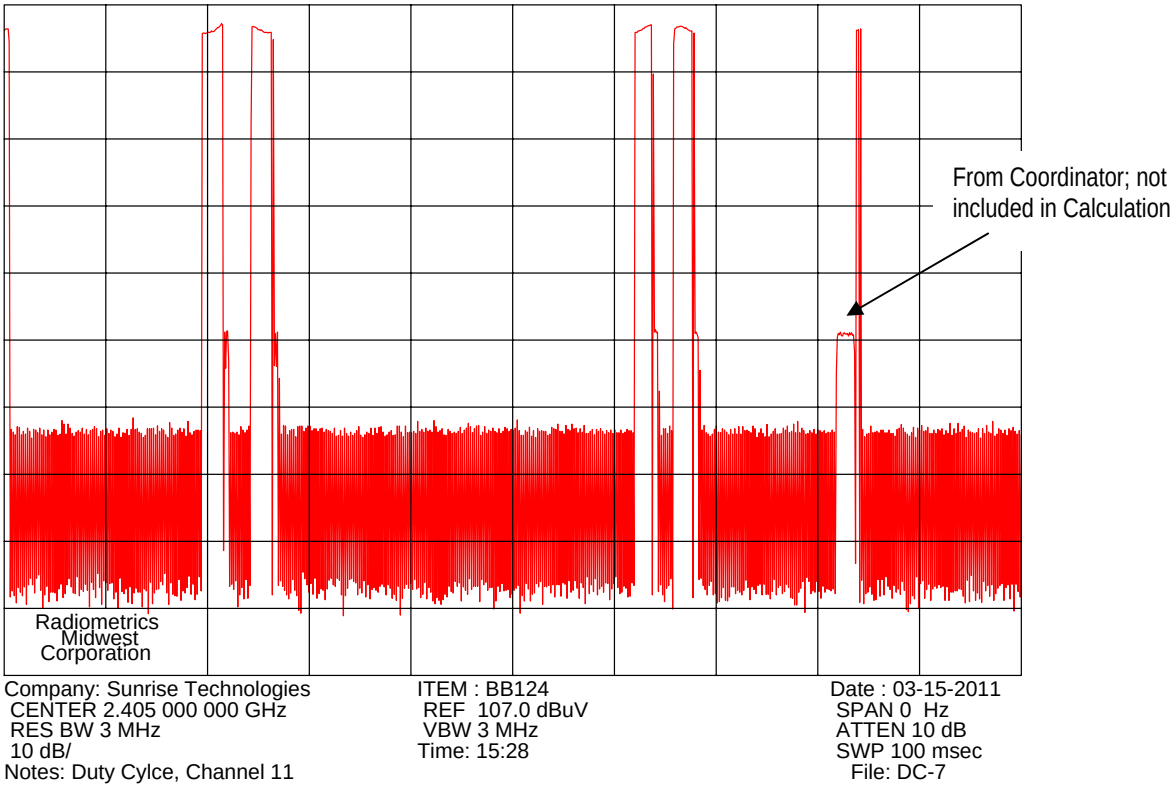
Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
HPF = High pass Filter Loss
PKA = Peak to Average Factor (This is zero for non-average measurements)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100). This was measured to be 20 dB.

10.7.2 Duty Cycle Calculation

The EUT was transmitting at the end user's max data rate. The span was set to zero. The Peak to average factor is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

Figure 3. Duty cycle plots



This shows the Max On-time for any 100mSec period

The total on time for 100 mS is (2.2 x 4) + (0.6 x 2) = 10 milliSeconds

20 Log*(10mSec/100mSec) = -20 dB Peak to average Correction factor.

10.7.3 Radiated Emissions Test Results; Transmit Mode

Emissions Below 1 GHz

Test Date	8/30/2010
Test Distance	3 Meters
Specification	FCC Part 15 Subpart C & RSS-210
Abbreviations	P = peak; Q = QP Pol = Antenna Polarization; V = Vertical; H = Horizontal; For Antenna Type Bi-Log = (ANT-44); Horn = (ANT-13)
Configuration	Transmit Mode

Freq. MHz	Meter Reading dBuV	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
		Factor dB	Pol/ Type		EUT	Limit	
55.2	34.5	12.4	H/44	-28.4	18.5	40.0	21.5
60.4	37.8	10.5	H/44	-28.4	19.9	40.0	20.1
62.0	35.4	10.0	H/44	-28.4	17.0	40.0	23.0

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
167.2	39.5	9.7	H/44	-27.9	21.3	43.5	22.2
191.2	37.4	9.5	H/44	-27.9	19.0	43.5	24.5
214.8	46.9	11.1	H/44	-27.9	30.1	43.5	13.4
224.5	42.4	11.6	H/44	-27.8	26.2	46.0	19.8
225.2	41.6	11.6	H/44	-27.8	25.4	46.0	20.6
230.6	33.1	11.6	H/44	-27.7	17.0	46.0	29.0
252.5	33.0	12.8	H/44	-27.8	18.0	46.0	28.0
541.0	29.4	17.2	H/44	-27.1	19.5	46.0	26.5
39.4	31.1	15.5	V/44	-28.5	18.1	40.0	21.9
62.0	47.3	10.0	V/44	-28.4	29.0	40.0	11.0
63.2	47.5	9.6	V/44	-28.4	28.8	40.0	11.2
96.0	34.5	8.7	V/44	-28.1	15.0	43.5	28.5
120.0	36.6	14.4	V/44	-28.1	22.9	43.5	20.6
134.8	40.1	12.4	V/44	-28.1	24.4	43.5	19.1
135.6	40.3	12.3	V/44	-28.1	24.5	43.5	19.0
143.6	41.3	10.5	V/44	-28.0	23.8	43.5	19.7
150.8	37.9	10.0	V/44	-28.0	19.9	43.5	23.6
156.0	39.3	10.2	V/44	-28.0	21.5	43.5	22.0
167.2	49.3	9.7	V/44	-27.9	31.1	43.5	12.4
191.2	45.7	9.5	V/44	-27.9	27.3	43.5	16.2
214.8	48.1	11.1	V/44	-27.9	31.3	43.5	12.2
223.9	43.0	11.6	V/44	-27.8	26.8	46.0	19.2
224.5	43.0	11.6	V/44	-27.8	26.8	46.0	19.2
240.2	41.3	12.2	V/44	-27.7	25.8	46.0	20.2
260.9	36.2	12.7	V/44	-27.8	21.1	46.0	24.9
306.2	35.8	13.4	V/44	-27.7	21.5	46.0	24.5
349.4	32.7	14.9	V/44	-27.7	19.9	46.0	26.1
410.4	33.8	16.3	V/44	-27.5	22.6	46.0	23.4
470.9	33.0	17.3	V/44	-27.3	23.0	46.0	23.0
940.0	32.4	22.3	V/44	-25.3	29.5	46.0	16.5

Emissions above 1 GHz

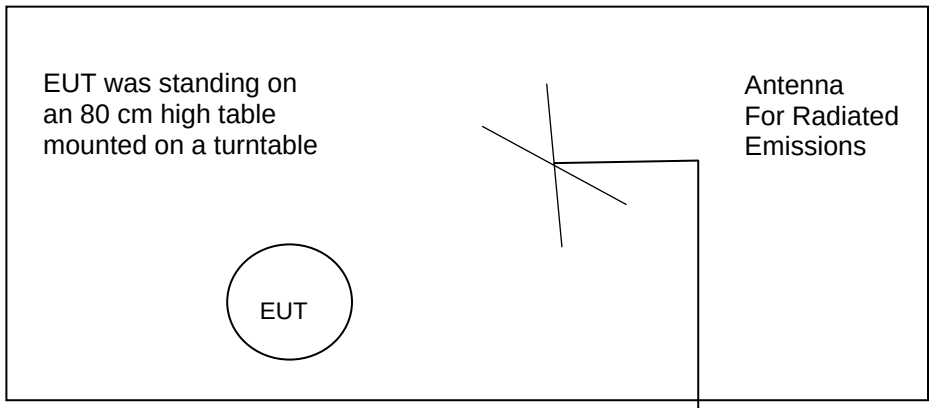
hrm #	Tx Freq MHz	Spectrum Analyzer Readings in dBuV				Corr. Fact dB	Emission Freq MHz	Field Strength				Margin Under Limit
		Vertical Polarization		Horizontal Polarization				EUT		Limit		
		Peak	Ave	Peak	Ave			dBuV/m				
1	2405	106.3	86.3	111.7	91.7	3.7	2405	115.4	95.4	125	125	9.6
BE	2405	48.3	28.3	53.7	33.7	3.7	2400	57.4	37.4	74	54	16.6
2	2405	52.3	32.3	55.8	35.8	11.4	4810	67.2	47.2	74	54	6.8
3	2405	46.5	26.5	47.1	27.1	15.2	7215	62.3	42.3	74	54	11.7
4	2405	47.3	27.3	43.5	23.5	15.8	9620	63.1	43.1	74	54	10.9
1	2440	107.8	87.8	112.5	92.5	3.9	2440	116.4	96.4	125	125	8.6
2	2440	55.6	35.6	53.0	33.0	11.4	4880	67.0	47.0	74	54	7.0
3	2440	44.5	24.5	43.0	23.0	15.8	7320	60.3	40.3	74	54	13.7
4	2440	44.2	24.2	43.5	23.5	15.8	9760	60.0	40.0	74	54	14.0
1	2480	104.9	84.9	107.1	87.1	4.2	2480	111.3	91.3	125	125	13.7
BE	2480	65.1	45.1	67.3	47.3	4.2	2483.5	71.5	51.5	74	54	2.5
2	2480	53.7	33.7	49.1	29.1	11.5	4960	65.2	45.2	74	54	8.8
3	2480	42.2	22.2	41.5	21.5	16.4	7440	58.6	38.6	74	54	15.4
4	2480	44.8	24.8	43.5	23.5	15.8	9920	60.6	40.6	74	54	13.4
Column numbers (see below for explanations)												
1	2	3	4	5	6	7	8	9	10	11	12	13

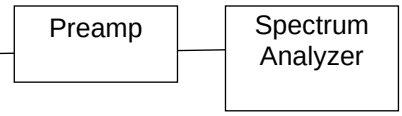
Judgment: Passed by 2.5 dB
No Emissions were detected from 10 to 25 GHz.

Notes on Columns:
Column #1. hrm = Harmonic; BE = Band Edge emissions
Column #2. Frequency of Transmitter.
Column #3. Uncorrected Vertical readings from the spectrum analyzer
Column #4. Raw Average reading; The average reading was converted from the peak reading. Ave = Peak – Dwell time correction factor from section 10.3.2 herein.
Column #5. Uncorrected Horizontal readings from the spectrum analyzer
Column #6. Raw Average reading; The average reading was converted from the peak reading. Ave = Peak – Dwell time correction factor from section 10.3.2 herein.
Column #7. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
Column #8. Frequency of Tested Emission
Column #9. Highest peak field strength at listed frequency.
Column #10. Highest Average field strength at listed frequency.
Column #11. Peak Limit. All limits set to 74 dBuV/m.
Column #12. Average Limit. All limits set to 54 dBuV/m.
Column #13. The margin (last column) is the worst case margin under the peak or average limits for that row.

Figure 4. Drawing of Radiated Emissions Setup

Chamber E, anechoic





Notes:
- Not to Scale
- Antenna height varied 1-4 meters
- Distance from antenna to tested system is 3 meters
- AC cord not shown. It is connected to AC outlet with low-pass filter on turntable

Frequency Range	Receive Antenna	Pre-Amplifier	Spectrum Analyzer	High Pass Filter
0.01 to 30 MHz	ANT-53	None	REC-03	None
30 to 1000 MHz	ANT-44	AMP-22	REC-07	None*
1 to 10 GHz	ANT-13	AMP-05	REC-08	HPF-03
10 to 18 GHz	ANT-13	AMP-20	REC-08	None*
18 to 25 GHz	ANT-48	AMP-29	REC-08; MXR-01	None*

* A high pass filter was not needed since the fundamental frequency was outside of the amplifiers pass band.

10.8 Unintentional Emissions (Receive Mode)

Manufacturer	Sunrise Technologies	Specification	FCC Part 15.247 & RSS-210
Model	BB124	Test Date	08/30/2010
Serial Number	none	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain – Duty Cycle Factor + HP Filter Loss		
Configuration	Receive mode		

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
61.6	35.3	10.1	H/44	-28.4	17.1	40.0	22.9
93.6	33.0	8.3	H/44	-28.1	13.2	43.5	30.3
167.2	39.1	9.7	H/44	-27.9	20.9	43.5	22.6
191.2	38.0	9.5	H/44	-27.9	19.6	43.5	23.9
214.8	44.7	11.1	H/44	-27.9	27.9	43.5	15.6
216.0	44.2	11.2	H/44	-27.9	27.5	43.5	16.0
228.4	38.7	11.6	H/44	-27.8	22.6	46.0	23.4
240.2	38.6	12.2	H/44	-27.7	23.1	46.0	22.9
282.7	33.4	12.9	H/44	-27.8	18.6	46.0	27.4
303.4	32.9	13.3	H/44	-27.7	18.5	46.0	27.5
444.0	36.8	16.0	H/44	-27.6	25.2	46.0	20.8
464.7	34.7	17.2	H/44	-27.4	24.5	46.0	21.5
476.5	33.6	17.2	H/44	-27.3	23.5	46.0	22.5
40.4	41.3	15.4	V/44	-28.5	28.2	40.0	11.8
62.0	48.0	10.0	V/44	-28.4	29.7	40.0	10.3
120.0	37.4	14.4	V/44	-28.1	23.8	43.5	19.7
148.8	41.3	10.0	V/44	-28.0	23.2	43.5	20.3
167.2	50.0	9.7	V/44	-27.9	31.8	43.5	11.7
191.2	45.5	9.5	V/44	-27.9	27.1	43.5	16.4
214.8	47.1	11.1	V/44	-27.9	30.3	43.5	13.2
240.2	38.9	12.2	V/44	-27.7	23.4	46.0	22.6
269.8	34.4	12.9	V/44	-27.8	19.5	46.0	26.5
483.2	33.1	17.2	V/44	-27.2	23.0	46.0	23.0
564.0	43.4	18.6	V/44	-27.2	34.9	46.0	11.1
564.1	31.2	18.6	V/44	-27.2	22.6	46.0	23.4
573.0	37.1	18.2	V/44	-27.0	28.2	46.0	17.8
583.0	43.1	18.1	V/44	-26.9	34.3	46.0	11.7
583.1	30.1	18.1	V/44	-26.9	21.3	46.0	24.7
865.0	34.9	20.8	V/44	-26.1	29.6	46.0	16.4

Judgment: Passed by 10.3 dB
No Emissions were detected from 1 to 12.5 GHz.