TEST REPORT

Report Number: 100278403ATL-015b

December 31, 2010

Product Designation: Wave 2 - BCR

Standard: FCC 15.249 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.
RSS-210, Issue 7, 2007

Tested by:
Intertek Testing Services NA Inc.
1950 Evergreen Blvd., Suite 100
Duluth, GA 30096

Client:
Scientific Games International Inc
1500 Bluegrass Lakes Parkway
Alpharetta, GA 30004
Contact: Tony Crumpton
Phone: 770.825.4374
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Tests performed by:

Richard C. Bianco
EMC Project Engineer

Report reviewed by:

Jeremy Pickens
EMC Department Manager

1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatum text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)		
6.0	Duty Cycle Determination (FCC 15A - 15.35(c))	12/07/2010	PASS
7.0	Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)	12/07/2010	PASS
8.0	Occupied Bandwidth (FCC Part 2.1049)	12/08/2010	PASS
9.0	Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)	12/08/2010	PASS
NA	Conducted emissions on AC power lines (Conducted Emissions) was waived due to is a battery powered device.		

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Point of Sale Console	Scientific Games LLC	Wave 2	EVT 1L
BCR Scanner	Cognitive	Wave 2	SA30-0045-02

EUT receive date:	November 30th 2010
EUT receive condition:	Good

Description of EUT provided by Client:
The Wave 2 is an wireless RF lottery ticket point of sale station consisting of a console, and a printer. The EUT was configured with a Saw -touch single CPU and Solid State drive, & Cognitive printer. Steward Ferrite 28A2029-0A2 on Printer cable only close to display connector.

Description of EUT exercising:
The Wave 2 system was placed in a continuous transmit state and normal modulation was applied during testing.

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Method:

Record the details of EUTcabling, document the support equipment, and show the interconnections in a block diagram.

Data:

EUT Cabling						
					Connection	
ID	Description	Length	Shielding	Ferrites	From	To
A	AC Power Line	1.5m	no	no	AC Source	EUT Console
B	Ethernet Line	2.0m	no	no	EUT Console	Unterminated
C	Printer Cable	0.3m	yes	yes	EUT Console	EUT Printer
D	Monitor Cable	1.4m	yes	yes	EUT Console	Monitor
E	AC Power Line	1.5m	no	no	AC Source	Monitor

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Monitor	HP	SH 249	3CQ93601YW
Mouse	Logitech	M-UAE-96	LZ952AC0TXN

5.0 Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)

Method:

Complete the overview spreadsheet.

Related Submittal(s) Grants: This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.

Data:

Applicant	Scientific Games International
	1055 Windward Ridge Pkwy Suite 100
	Alpharetta GA 30004
Trade Name & Model No.	Wave II BCR
FCC Identifier	TBD
Frequency Range (MHz)	902.5-927.5
Antenna Type (15.203)	Integral - Internal
Manufacturer name & address	Scientific Games International
	1055 Windward Ridge Pkwy Suite 100
	Alpharetta GA 30004

Related Submittals and Grants:	This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.
Additions, deviations and exclusions from standards	None

6.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Method:

(c) Unless otherwise specified, e.g. §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Determine the period of the pulse train, T, in mSec and record the results. T is defined as the time from the beginning of one pulse train to the beginning of the next pulse train.

Count the number of different types of pulses, N and record the results.

For each of the different types of pulses, count the number of occurrences within one pulse train.

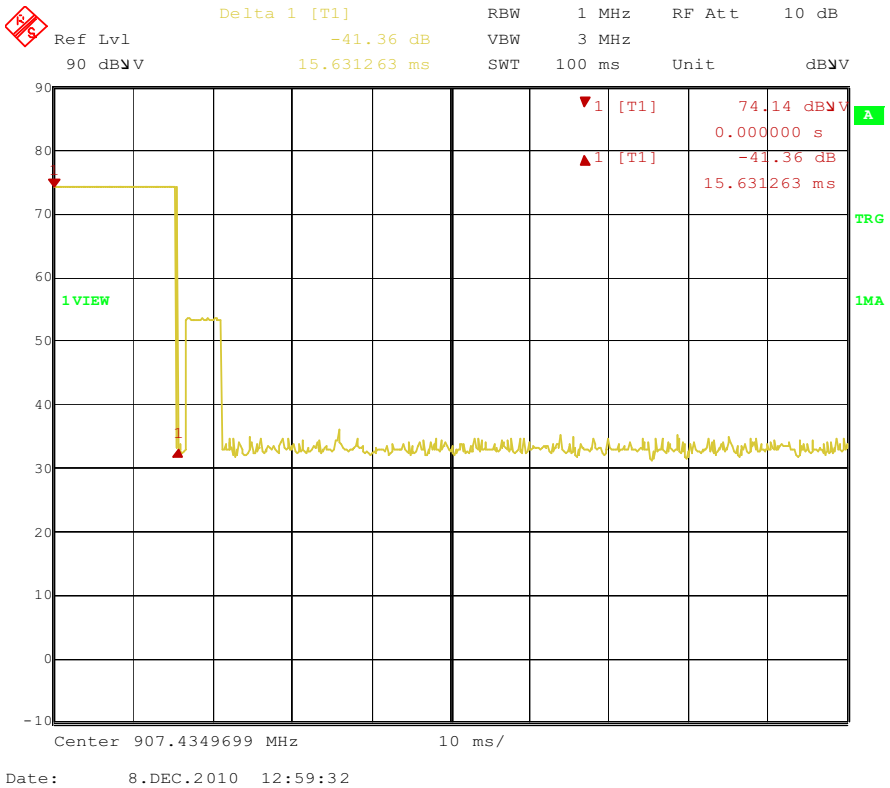
Use the Duty Cycle Correction Factor, DCCF, from the results table and use it to adjust the field strength measurements recorded for radiated emissions.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Cable E201, 18 GHz, N, 3m	Megaphase	TM18 NKNK 118	E201	02/02/2010	02/02/2011
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/22/2010	10/22/2011

Results: The sample tested was found to Comply.

Plot:



100ms duty cycle plot

Data:

6.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Duration of Pulse Train, T (mSec):	100
Averaging Interval, A_I (mSec):	100
Number of different Pulses, N:	1

	Number ($\#P_x$)	Pulse Width, mSec (PW_x)	Product ($\#P_x$)*(PW_x)
Pulse Width 1	1	15.6312	15.6312
Pulse Width 2			
Pulse Width 3			
Pulse Width 4			
Pulse Width 5			
Pulse Width 6			
Pulse Width 7			
Pulse Width 8			
Pulse Width 9			
Pulse Width 10			

Duty Cycle:	0.156312
Duty Cycle Correction Factor, dB:	-16.1

$$T_{on} = (PW_1 * \#P)_1 + (PW_{2*} * \#P_2) + \cdots + (PW_n * \#P_n)$$

$$DutyCycle = T_{on} \div A_I$$

$$DCCF = 20 * Log_{10}(DutyCycle)$$

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Method:

Measurements shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16.

Bandwidths:
30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW
Above 1000 MHz: 1 MHz RBW and 3 MHz VBW

Detectors:
Equal to or less than 1000 MHz: CISPR quasi-peak detector (alternative: peak detector)
Above 1000 MHz: Average detector (applies to average limit)
Above 1000 MHz: Peak detector (applies to peak limit)

Limits:
Equal to or less than 1000 MHz, the limits are specified as quasi-peak. If a peak detector is used, the limit does not change.
Above 1000 MHz, the limits are specified as average. The peak limit is 20 dB above the average limit. Both peak and average measurements are required to be reported.

Frequency range of radiated measurements
For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

Measurement antenna requirements:
Below 30 MHz - Loop antenna
30 to 1000 MHz - Biconical, Log Periodic, or equivalent
Above 1000 MHz - Horn or equivalent

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission level. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is handheld, it shall be oriented in each of its othogonal axes.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003.

TEST SITE
The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, BiLog, 20-2000MHz	Chase	CBL6112A	211518	01/13/2010	01/13/2011

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, <18 GHz	EMCO	3115	213061	05/07/2010	05/07/2011
Cable E201, 18 GHz, N, 3m	Megaphase	TM18 NKNK 118	E201	02/02/2010	02/02/2011
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/04/2010	05/04/2011
Cable, 7 meters, 1-18GHz	Storm Products Co.	PR90-241-7MTR	ST-2	08/19/2010	08/19/2011
Cable, N-N 3 meters, 18GHz	Megaphase	TM18 NKNK 118	E203	05/04/2010	05/04/2011
Cable, N-N, 3 meters, 18GHz	Megaphase	TM18-NKNK-118	E204	05/04/2010	05/04/2011
EMI Receiver	Hewlett Packard	8546A	211505	02/02/2010	02/02/2011
EMI Receiver, Preselector section	Hewlett Packard	85460A	015762	02/02/2010	02/02/2011
Filter, 1 GHz High Pass	Filtek	HP12/1000-5AB	213156a	04/21/2010	04/21/2011
Preamplifier, 10 MHz to 2000 MHz, 30 dB gain	Mini-Circuits	ZKL-2	200069	04/20/2010	04/20/2011
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	04/21/2010	04/21/2011
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/22/2010	10/22/2011

Results: The sample tested was found to Comply.

Photo:

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Test setup - front view

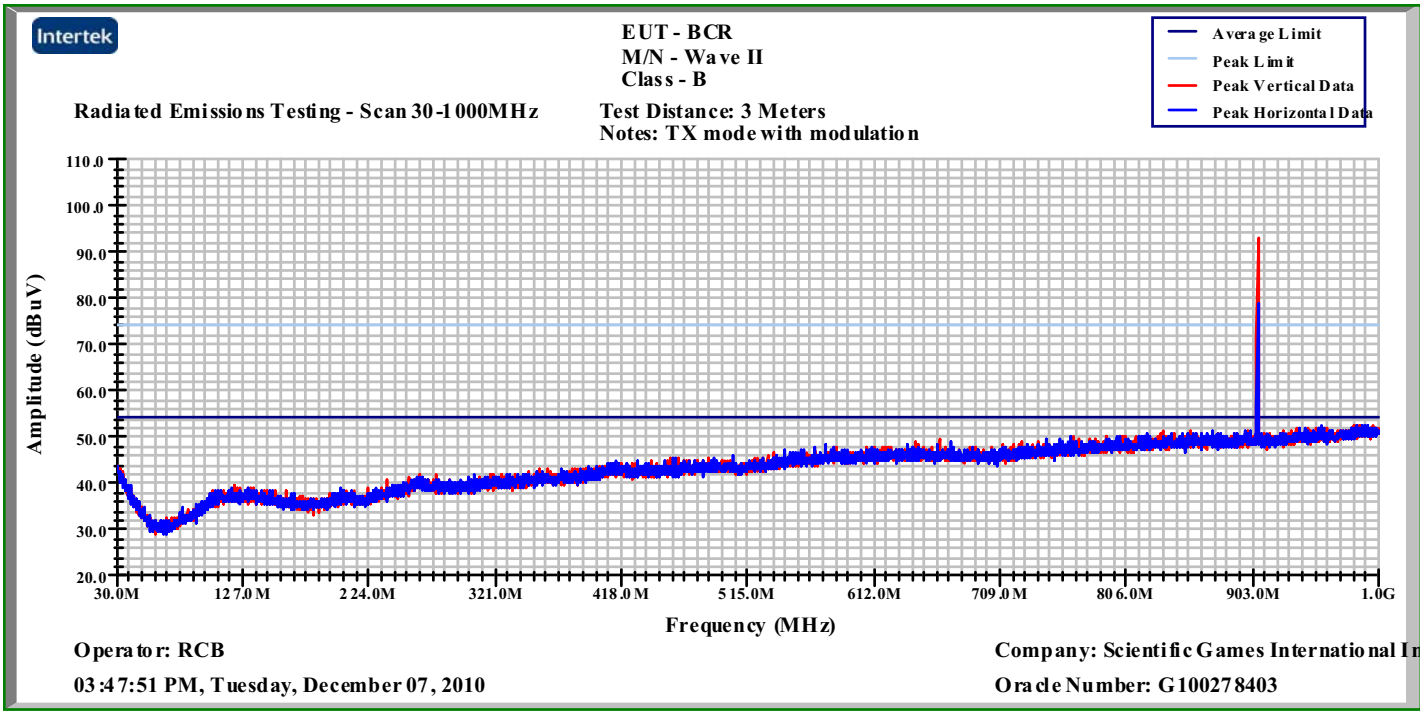
7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Photo:

Test setup - rear view

Plot:

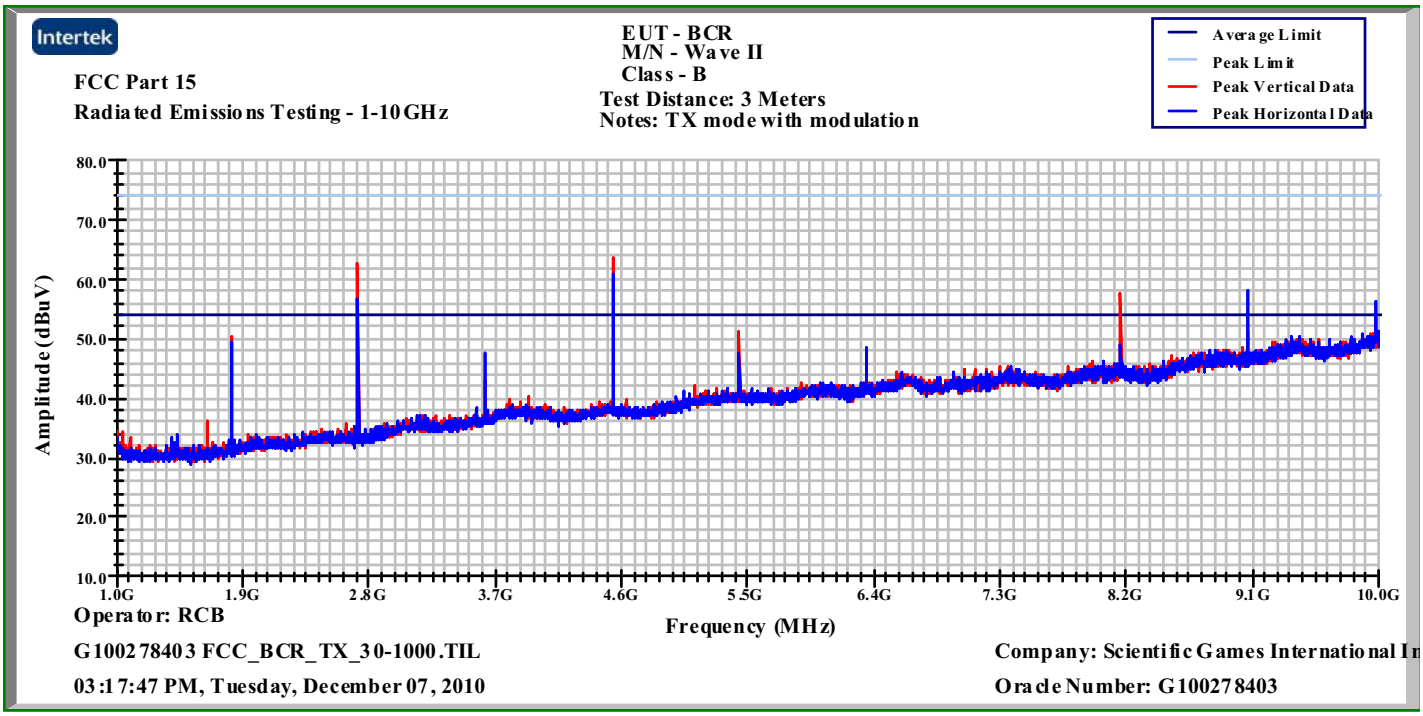
7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)



30-1000MHz spurious emissions

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Plot:



1-10GHz spurious emissions

Data:

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Frequency Range (MHz): 902-928 **Test Distance (m):** 3
Input power: Battery **Limit:** FCC15.249
Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Duty cycle Factor dB**	**Net dB(uV/m)**	**3m Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
H	902.433	68.7	20.6	5.3	0.0	94.6	114.0	-19.4	Pk/100k/300k
H	902.433	68.7	20.6	5.3	16.1	78.5	94.0	-15.5	Pk/100k/300k
V	902.433	69.7	21.7	5.3	0.0	96.8	114.0	-17.2	Pk/100k/300k
V	902.433	69.7	21.7	5.3	16.1	80.7	94.0	-13.3	Pk/100k/300k
H	907.406	69.9	20.6	5.3	0.0	95.9	114.0	-18.1	Pk/100k/300k
H	907.406	69.9	20.6	5.3	16.1	79.8	94.0	-14.2	Pk/100k/300k
V	907.406	70.0	21.7	5.3	0.0	97.1	114.0	-16.9	Pk/100k/300k
V	907.406	70.0	21.7	5.3	16.1	81.0	94.0	-13.0	Pk/100k/300k
H	927.428	70.4	20.8	5.4	0.0	96.6	114.0	-17.4	Pk/100k/300k
H	927.428	70.4	20.8	5.4	16.1	80.5	94.0	-13.5	Pk/100k/300k
V	927.428	69.4	21.9	5.4	0.0	96.8	114.0	-17.2	Pk/100k/300k
V	927.428	69.4	21.9	5.4	16.1	80.7	94.0	-13.3	Pk/100k/300k
Calculations		G=C+D+E-F		I=G-H					

Fundamental measurements

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Data:

Frequency Range (MHz): 30-1000 **Test Distance (m):** 3

Input power: Battery **Limit:** FCC15.249

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**3m Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
V	902.000	25.5	21.7	5.3	0.0	52.5	54.0	-1.5	QP/120k/300k
H	902.000	24.9	20.6	5.3	0.0	50.8	54.0	-3.2	QP/120k/300k
V	928.000	24.6	21.9	5.4	0.0	51.9	54.0	-2.1	QP/120k/300k
H	928.000	25.3	20.8	5.4	0.0	51.5	54.0	-2.5	QP/120k/300k
Calculations		G=C+D+E-F		I=G-H					

30-1000MHz spurious emissions

7.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Data:

Frequency Range (MHz): 1000-10000 **Test Distance (m):** 3

Input power: Battery **Modifications for compliance (y/n):** n

Notes:

A	B	C	D	E	F	G	H	I	J	K
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Duty Cycle Factor dB**	**Net dB(uV/m)**	**3m Limit dB(uV/m)**	**Margin dB**	**BW / Detector**
902.5MHz										
V	2707.266	64.5	26.9	9.4	37.2	0.0	63.5	74.0	-10.5	1/3MHz/Pk
V	2707.266	64.5	26.9	9.4	37.2	16.1	47.4	54.0	-6.6	1/3MHz/Pk
V	4512.019	62.7	26.9	12.2	37.2	0.0	64.5	74.0	-9.5	1/3MHz/Pk
V	4512.019	62.7	26.9	12.2	37.2	16.1	48.4	54.0	-5.6	1/3MHz/Pk
V	8121.831	50.7	26.9	17.2	35.4	0.0	59.3	74.0	-14.7	1/3MHz/Pk
V	8121.831	50.7	26.9	17.2	35.4	16.1	43.2	54.0	-10.8	1/3MHz/Pk
907.5MHz										
V	2722.264	64.0	26.9	9.4	37.9	0.0	62.3	74.0	-11.7	1/3MHz/Pk
V	2722.264	64.0	26.9	9.4	37.9	16.1	46.2	54.0	-7.8	1/3MHz/Pk
V	4537.250	62.6	26.9	12.2	37.2	0.0	64.5	74.0	-9.5	1/3MHz/Pk
V	4537.250	62.6	26.9	12.2	37.2	16.1	48.4	54.0	-5.6	1/3MHz/Pk
V	8166.583	51.1	26.9	17.2	35.4	0.0	59.8	74.0	-14.3	1/3MHz/Pk
V	8166.583	51.1	26.9	17.2	35.4	16.1	43.7	54.0	-10.4	1/3MHz/Pk
927.5MHz										
V	2782.352	64.0	26.9	9.4	37.9	0.0	62.3	74.0	-11.7	1/3MHz/Pk
V	2782.352	64.0	26.9	9.4	37.9	16.1	46.2	54.0	-7.8	1/3MHz/Pk
V	4637.543	62.6	26.9	12.2	37.2	0.0	64.5	74.0	-9.5	1/3MHz/Pk
V	4637.543	62.6	26.9	12.2	37.2	16.1	48.4	54.0	-5.6	1/3MHz/Pk
V	8346.893	51.1	26.9	17.2	35.4	0.0	59.8	74.0	-14.3	1/3MHz/Pk
V	8346.893	51.1	26.9	17.2	35.4	16.1	43.7	54.0	-10.4	1/3MHz/Pk
Calculations		G=C+D+E-F		I=G-H						

1-10GHz spurious emissions

8.0 Occupied Bandwidth (FCC Part 2.1049)

Method:

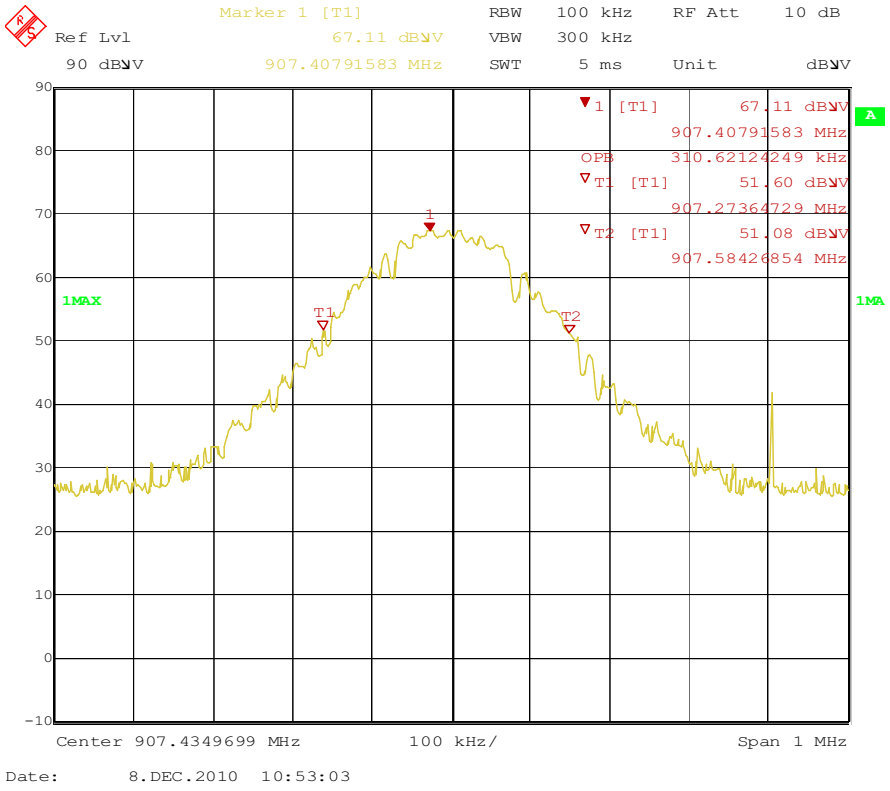
The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Connect the antenna port of the EUT to a spectrum analyzer using a calibrated coaxial cable and attenuator. Set the EUT to transmit at its highest power setting. The 99% bandwidth function of the analyzer was used to automatically generate the occupied bandwidth plots. Repeat for low, mid, and high channels of each band of the EUT.

For amplifiers, the output bandwidth shall be less than or equal to the input bandwidth.

Results: The sample tested was found to Comply.

Plot:



99% Bandwidth

Data:

8.0 Occupied Bandwidth (FCC Part 2.1049)

Mode	Frequency MHz	Resolution Bandwidth (1)	Video Bandwidth	Sweep time Seconds	Output Measured Bandwidth MHz	Input Measured Bandwidth MHz
TX	907.407	100 kHz	300 kHz	0.005	0.310612	NA

Note (1): Greater or equal to 1% of emission bandwidth.

9.0 Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)

Method:

§ 15.215 Additional provisions to the general radiated emission limitations.
(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Results: The sample tested was found to Comply.

Data:

Note: The Transmitter frequency range was changed to 902.5MHz-927.5MHz in order to comply with the out of band emissions and the frequency stability requirements.