

CERTIFICATION TEST REPORT

Report Number: 2011 09183886 FCCR

Nex Number: 183886

Applicant: SMK ELECTRONICS CORP.
1055 TIERRA DEL REY
Chula Vista, CA 91910

Equipment Under Test (EUT): RF DONGLE

Models: RXR1000-0301E, RXR1000-0302E,
WCT-XP700R

FCC ID: QVEFSRX01
IC: 3683B-FSRX01

In Accordance With: FCC Part 15 Subpart C, 15.249
IC RSS-210 Issue 8 December 2010
IC RSS-Gen Issue 3 December 2010

Tested By: Nemko USA Inc.
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121



Authorized By: _____
A. Laudani, EMC/RF Test Engineer

Date: SEPTEMBER 23, 2008

Total Number of Pages: 23



Section1: Summary of Test Results

1.1 General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15; Subpart C and IC RSS-210. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

Apparatus Assessed: RF Remote

Models: RXR1000-0301E, RXR1000-0302E,
WCT-XP700R

Specification: FCC Part 15 Subpart C, 15.249
IC RSS-210 Issue 8 December 2010

Date Received in Laboratory: September 19, 2011

Compliance Status: Complies

Exclusions: None

Non-compliances: None

RF REMOTE MODELS: RXT1000-1101E, RXT1000-1102E,
RXT1000-1131E, WCTXP700T

Serial Numbers: 2, 5



1.2 Report Release History

Revision	Date	Comments
-	September 23, 2008	Prepared By: A. Laudani
-	September 23, 2008	Initial Release: Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY:  Date: September 23, 2008
A. Laudani, EMC Test Engineer



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Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was identified as follows:

SMK Electronics Corp.

RXR1000-0301E, RXR1000-0302E, RXR1000-0304E
RF DONGLE

2.2 Theory of Operation

The RF Remote and RF dongle make up a remote mouse, the RF Remote switches are used in the traditional mouse fashion.

The RF Dongle is plugged into a USB port and upon the RF Remote being switched on, establishes two way continuous communication with the RF Dongle. Waving the RF Remote about, the internal inertia devices provide input into the data transmitted to the RF Dongle. The RF Dongle receives and acknowledges the transmissions and moves the cursor on the PC. Therefore, although the RF Remote is hand operated, it is not a momentary operated device. The RF Remote has no provision for receive only mode.

RC Model 1. RXT1000-1101E RF remote with Freespace logo

RC Model 2. RXT1000-1102E RF remote with Warpia logo

RC Model 3. RXT1000-1131E RF/Laser remote with Freespace logo

RC Model 4. WCTXP700T RF/Laser remote with X-pointer logo

RC models 1 and 2 as well as 3 and 4 are electrically identical. All contain the same RF circuitry and software.

Dongle Model 1. RXR1000-0301E Freespace logo

Dongle Model 2. RXR1000-0302E Warpia logo

Dongle Model 3. WCT-XP700R X-pointer logo

All contain the same RF circuitry and software.

The EUT's performance during test was evaluated against the performance criterion specified by applicable test standards. Performance results are detailed in the test results section of this report.

2.3 Samples of the EUT

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - RF Dongle	SMK Electronics Corp. Model: RXR1000-0301E Serial #: 2, 5	USB
EUT - RF Dongle	SMK Electronics Corp. Model: RXR1000-0302E Serial #: NA	USB
EUT - RF Dongle	SMK Electronics Corp. Model: WCT-XP700R Serial #: NA	USB
Support –Laptop Computer	Acer Model: KAV60 Serial #: 95001295016	2 conductor, 1.2 m 22 gauge
Support – AC Adapter	Hipro Model: HP-A0301R3 Serial #: 1-091016338903	1.2m, unshielded, 18 AWG, 2-wire, IEC connector

CONNECTION	I/O CABLE
	None



2.4 Technical Specifications of the EUT

Manufacturer:	SMK Electronics Corp.
Operating Frequency:	2401 MHz to 2482 MHz in the 2400-2483.5 MHz Band
Number of Operating Frequencies:	82
Fundamental Field Strength:	70.7 dBuV/m or 3.4 mV/m
Modulation:	Zigbee
Reference Designator:	1M13MID
Antenna Connector:	Antenna is a Trace on circuitry
Power Source:	USB slot of Personal Computers or Laptops



Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247

Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

IC RSS-210 Issue 8 December 2010

Low-power Licence-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment. Annex A2.9 Bands 902-928, 2400-2483.5 and 5725-5875 MHz

IC RSS-Gen Issue 3 December 2010

General Requirements and Information for the Certification of Radio-communication Equipment

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	16-22°C
Humidity range	39-45%
Pressure range	102.0 – 102.3 kPa
Power supply range	48VDC nominal

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
110	Antenna, LPA	Electrometrics	LPA-25	1217	4/1/2011	4/1/2013
116	Antenna, Bicon	EMCO	3104	3020	9/28/2010	9/28/2011
317	Preamplifier	HP	8449A	2749A00167	5/16/2011	5/16/2012
529	Antenna, Ridge Guide	EMCO	3115	2505	10/18/2010	10/18/2012
901	Preamplifier	Sonoma	310 N	130607	1/7/2011	1/7/2012
911	Spectrum Analyzer	Agilent	E4440A	US41421266	10/26/2010	10/26/2011

Registration of the OATS are on file with the Federal Communications Commission, and are also registered with Industry Canada under Site Number 2040B-3.



Section 4: Observations

4.1 Modifications Performed During Assessment

No modifications were performed during assessment.

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4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

4.4 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

4.5 Test Deleted

No Tests were deleted from this assessment.

4.6 Additional Observations

There were no additional observations made during this assessment.



Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C:
IC RSS-210 Issue 7 June 2007 Annex 2.9
IC RSS-Gen Issue 2 June 2007

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant
Y Yes: Mandatory i.e. the apparatus shall conform to these tests.
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

5.1 Test Results

Part 15C	RSS-210	Test Description	Required	Result
15.207 (a)	RSS-Gen 7.2.4	Conducted Emission Limit	N	Pass
15.215(c)	RSS-Gen 4.6.1	20 dB & 99% Bandwidth	Y	Pass
15.249(a)	RSS-210 A2.9(a)	Maximum Field Strength	Y	Pass
15.249(a)	RSS-210 A2.9(b)	Band-edge Compliance of RF Conducted Emissions	Y	Pass
15.249(a)	RSS-210 A2.9(a, b)	Spurious Radiated Emissions	Y	Pass
	RSS-Gen 4.10	Receiver Spurious Emissions	Y	Pass

Appendix A: Test Results

Power Line Conducted Emissions

15.207(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.1 –0.5	66 to 56*	56 to 46*
.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

Test Conditions:

Sample Number:	RXR1000-0301E	Temperature:	
Date:		Humidity:	
Modification State:		Tester:	A. Laudani
		Laboratory:	

Test Results:

No connection to AC Mains.

**20 dB / 99% Bandwidth**

(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.

Test Conditions:

Sample Number:	RXR1000-0301E	Temperature:	21°C
Date:	February 1, 2011	Humidity:	39%
Modification State:	Low, Mid and High Channel	Tester:	A. Laudani

Test Results: See attached plots.

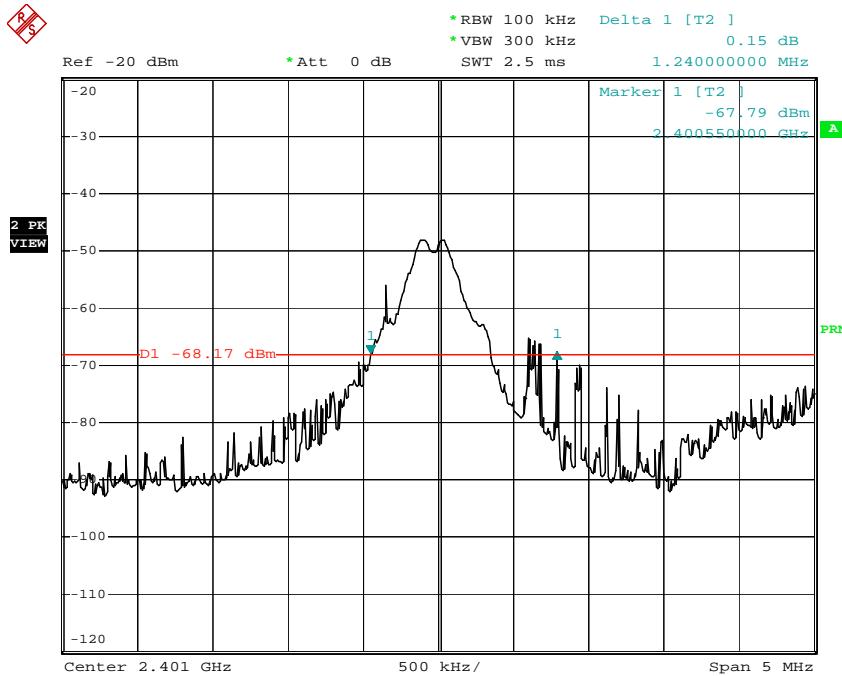
Additional Observations:

- This was a radiated test.
- Span is wide enough to capture the channel transmission
- RBW is 1% of the span; VBW is 3X RBW; Sweep is auto
- Detector is Peak; Trace is Max Hold
- Used Spectrum Analyser's programmed function--99% BW: 1.13 MHz
- 20 dB bandwidth: A peak output max hold reading was taken, a display line was drawn 20 dB lower than peak level. The 20 dB bandwidth was determined from where the channel output spectrum intersected the display line.
- Observed maximum 20 dB BW is 1.24 MHz (low channel).
- Observed maximum 20 dB BW is 1.16 MHz (high channel).
- $2401 \text{ MHz} - (1.24/2) \text{ MHz} = 2400.38 \text{ MHz}$ (within the frequency band)
- $2482 \text{ MHz} + (1.16/2) \text{ MHz} = 2481.58 \text{ MHz}$ (within the frequency band)

MHz	20 dB	99%
2401	1.240	0.980
2441	0.860	1.050
2482	1.160	1.130

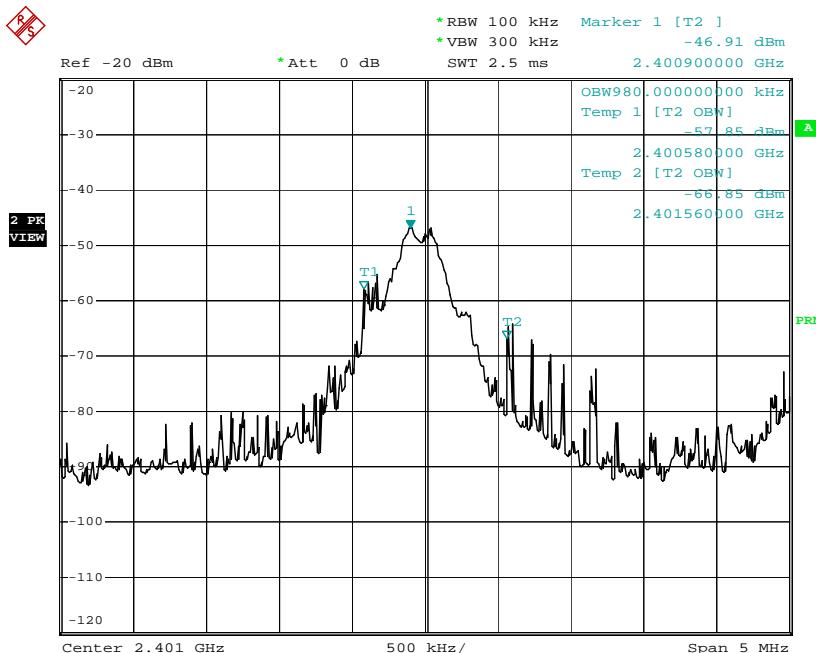


Low Channel: 20 dB Bandwidth



Date: 15.JAN.1997 05:29:45

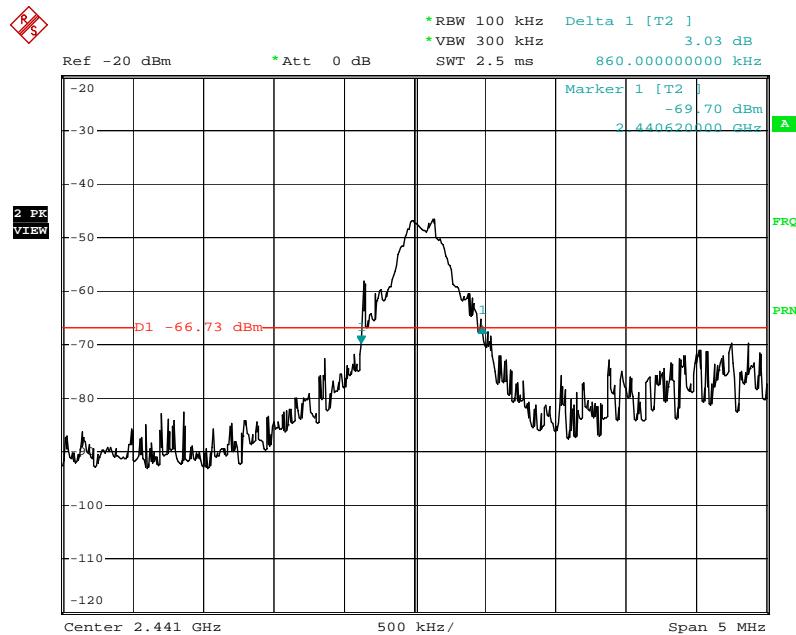
99% bandwidth



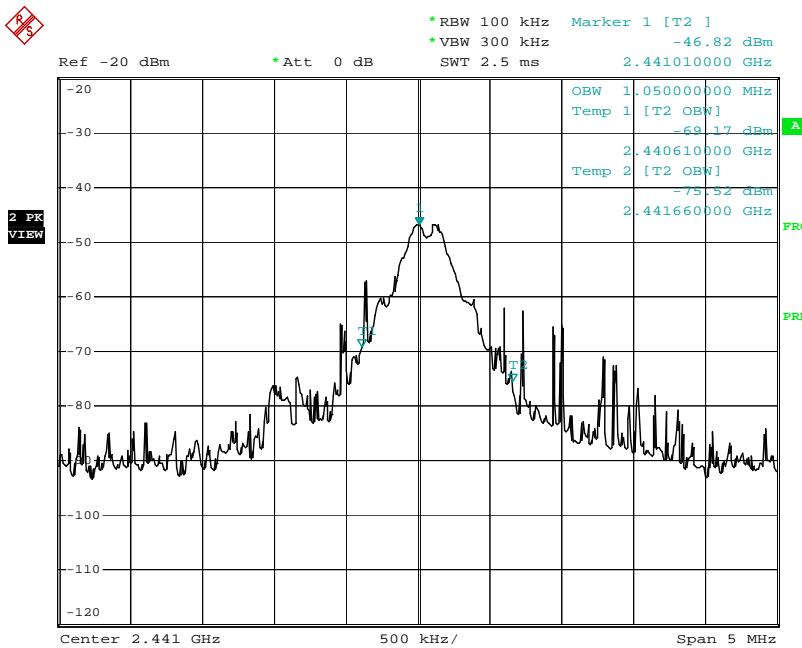
Date: 15.JAN.1997 05:31:06



Mid Channel: 20 dB Bandwidth



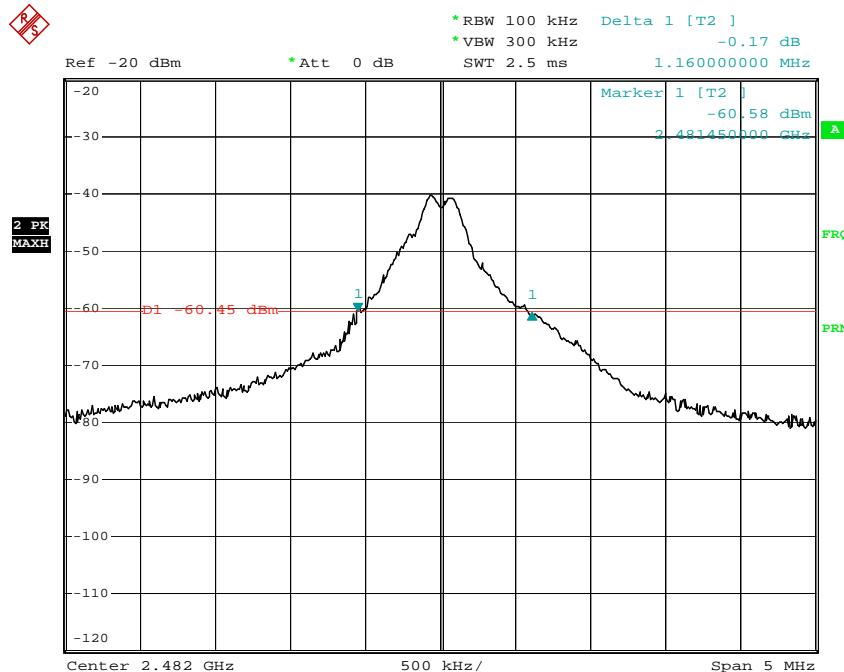
Date: 15.JAN.1997 05:22:29
99% bandwidth



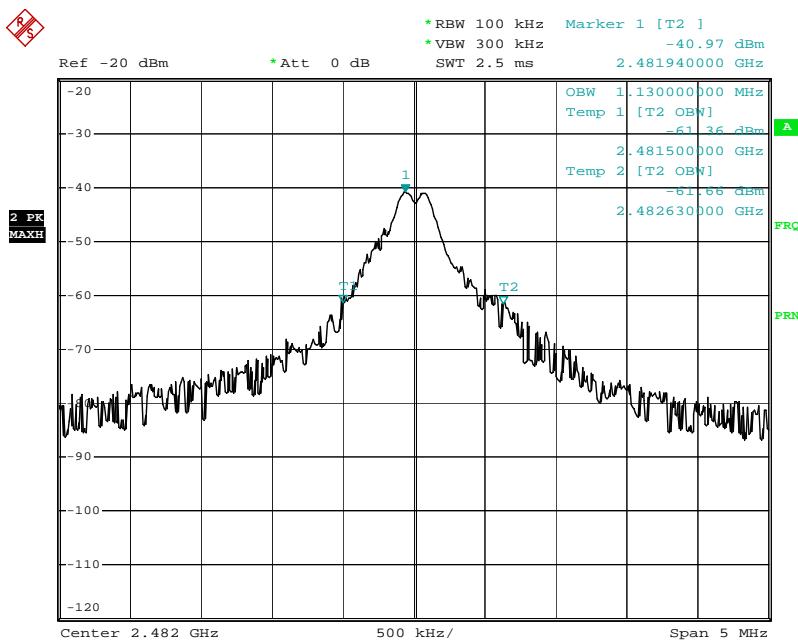
Date: 15.JAN.1997 05:21:18



High Channel: 20 dB Bandwidth



Date: 15.JAN.1997 05:16:47 99% bandwidth



Date: 15.JAN.1997 05:18:05



Fundamental Field Strength

(a) The field strength measured at 3 meters shall not exceed the limits in the following table:

Fundamental Frequencies (MHz)	Field Strength (millivolts/m)	
	Fundamental	Harmonics
902-928	50	0.5
2400-2483.5	50	0.5
5725-5875	50	0.5

Note: The limits shown in the above table are based on measurements using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using a CISPR quasi-peak detector.

Test Conditions:

Sample Number:	RXR1000-0301E	Temperature:	21°C
Date:	Sept. 23, 2011	Humidity:	67%
Modification State:	Low, Mid and High Channel	Tester:	A. Laudani
		Laboratory:	Nemko

Test Results: EUT Complies

See table below- Radiated Spurious Emissions

Additional Observations:

- Radiated measurement; Max hold peak; RBW = 3 MHz; VBW = 10 MHz

MHz	Measured dBuV/m	mV/m
2401	68.5	2.7
2441	70.7	3.4
2482	68.9	2.8

**Band-edge Compliance of RF Conducted /Radiated Emissions**

RSS210 A2.9 (b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

Test Conditions:

Sample Number:	RXR1000-0301E	Temperature:	21°C
Date:	Sept. 19, 2011	Humidity:	63%
Modification State:	Low, Mid and High Channel	Tester:	A. Laudani
		Laboratory:	Nemko

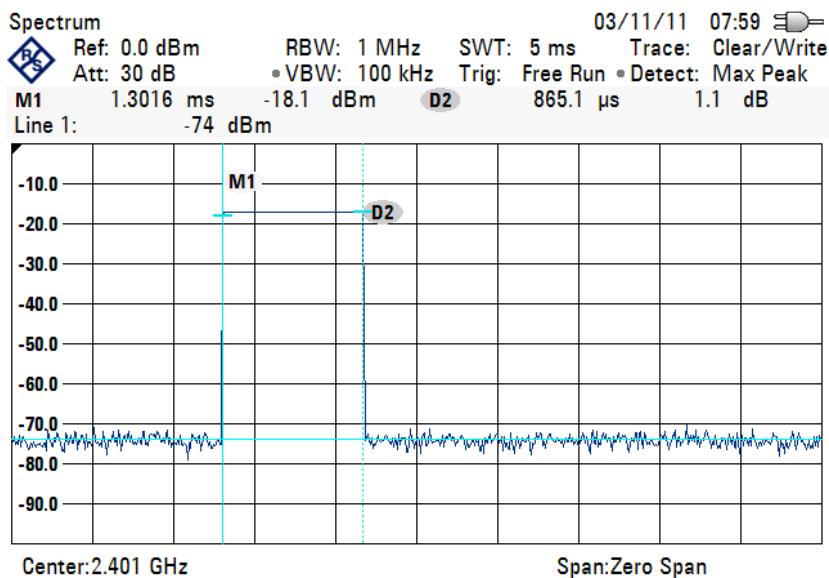
Test Results: EUT Complies

See table below- Radiated Spurious Emissions

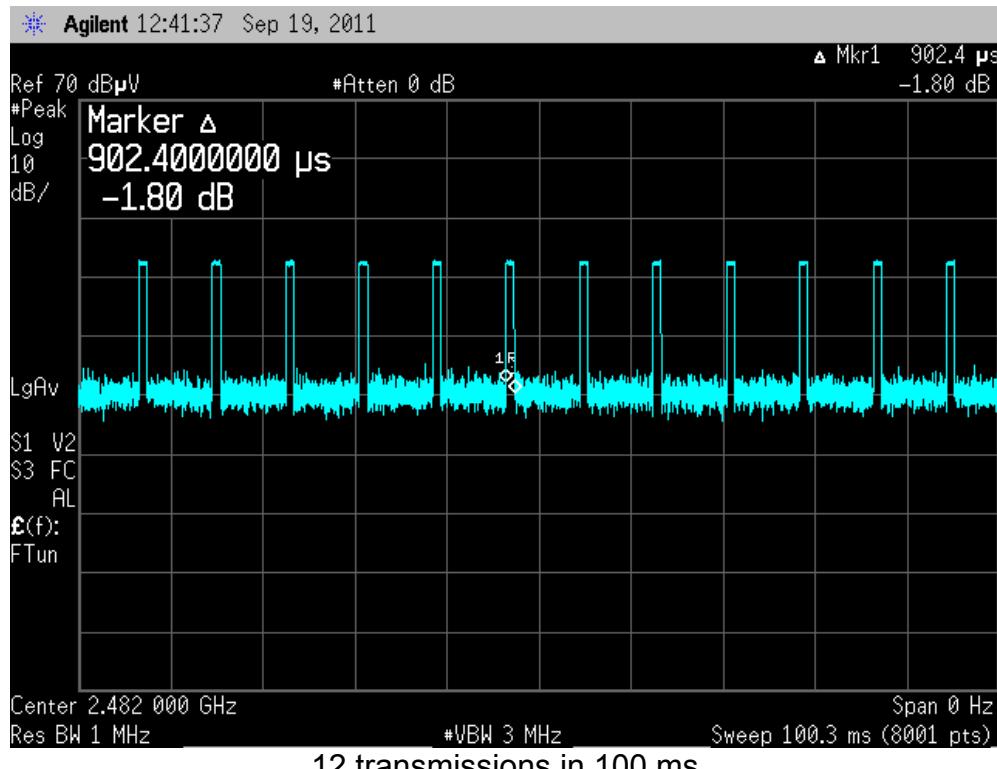
Additional Observations:

- This is a Radiated Emissions test.
- Span is wide enough to capture the peak level of the emission operating on the channel closest to the band edges (Lower and Upper).
- RBW is 1MHz; VBW = 3 MHz.
- Limit is 74 dBuV/m peak @ 3m
- Limit is 54 dBuV/m average @ 3m
- VBW is 3X RBW
- Sweep is auto: Detector is Peak, Trace is Max Hold
- Average = Peak + Duty Cycle Factor

Duty Cycle = -12.2 dB
EUT transmits .865 milliseconds x 12 times = 10.4 ms



$$DCF = 20 \times \log(10.4/100) = -19.7 \text{ dB}$$





Spurious Radiated Emissions

RSS210 A2.9 (b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

Test Conditions:

Sample Number:	RXR1000-0301E	Temperature:	21°C
Date:	Sept. 23, 2011	Humidity:	67%
Modification State:	Low, Mid and High Channel	Tester:	A. Laudani

Laboratory: Nemko

Test Results: EUT complies.

- Emissions were searched from 30MHz to 25000 MHz, no other emissions within 20 dB of the limit were detected
- RBW is 1MHz; VBW = 3 MHz.
- Limit is 74 dB_uV/m peak @ 3m
- Limit is 54 dB_uV/m average @ 3m
- VBW is 3X RBW
- Sweep is auto: Detector is Peak, Trace is Max Hold
- Average = Peak + Duty Cycle Factor
- Measurement Example:

Example Frequency = 2441 MHz

49.13 dB_uV (spectrum analyzer reading)
+(-19.7 dB) (Duty Cycle Factor)
+12.7 dB (cable loss @ frequency)
+28.5 dB/m (antenna factor @ frequency)
70.7 dB_uV

**Radiated Emissions Data**

Job #:	183886	Date:	9-19-2011	Page	1	of	1
NEX #:		Time:	11:40 am				
Staff:	aal						
Client Name:	SMK Electronics Corp.	EUT Voltage:					
EUT Name:	RF Dongle	EUT Frequency:					
EUT Model #:	RXR1000-301E	Phase:					
EUT Serial #:	2	NOATS					
EUT Config.:	Continuous Transmit	SOATS	X				
Specification:	CFR47 Part 15, Subpart C 15.249	Distance < 1000 MHz:	3 m				
Loop Ant. #:	NA	Distance > 1000 MHz:	3 m				
Bicon Ant. #:	NA						
Log Ant. #:	NA						
DRG Ant. #:	529	Spec Analyzer #:	911				
Cable LF#:	10 MC	Analyzer Display #:	911				
Cable HF#:	40ft_blue	Quasi-Peak Detector #:	NA				
Preamp LF#:	NA	Duty Cycle (%):	-19.7				
Preamp HF#:	317						

EUT Voltage: _____
 EUT Frequency: _____
 Phase: _____
 NOATS: _____
 SOATS: X
 Distance < 1000 MHz: 3 m
 Distance > 1000 MHz: 3 m

Quasi-Peak	RBW: 120 kHz
Peak	Video Bandwidth 300 kHz
Average	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average = Peak + Duty Cycle Factor	
DCF = 20 x log(duty cycle)	

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
 Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT degrees	Ant. Height CM	Max. Reading (dB μ V)	Corrected Reading (dB μ V)	Spec. limit (dB μ V)	CR/SL Diff. (dB)	Pass Fail	Comment
2401.0	46.87	43.74	P	189.0	118.0	46.9	88.2	114.0	-25.8	Pass	
2401.0	27.17	24.04	A	189.0	118.0	27.2	68.5	94.0	-25.5	Pass	
2441.0	49.13	45.32	P	189.0	115.0	49.1	90.4	114.0	-23.6	Pass	
2441.0	29.43	25.62	A	189.0	115.0	29.4	70.7	94.0	-23.3	Pass	
2482.0	47.21	39.81	P	189.0	115.0	47.2	88.4	114.0	-25.6	Pass	
2482.0	27.51	20.11	A	189.0	115.0	27.5	68.9	94.0	-25.1	Pass	
2400.0	12.60	12.17	P	189.0	115.0	12.6	53.9	74.0	-20.0	Pass	
2400.0	-7.10	-7.53	A	189.0	115.0	-7.1	34.2	54.0	-19.7	Pass	
2483.5	31.25	24.90	P	189.0	115.0	31.3	72.4	74.0	-1.6	Pass	
2483.5	11.55	5.20	A	189.0	115.0	11.6	52.7	54.0	-1.3	Pass	



Receiver Spurious Radiated Emissions

4.10 Receiver Spurious Emissions.

For emissions below 1000 MHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth. Above 1000 MHz, measurements shall be performed using an average detector with a minimum resolution bandwidth of 1 MHz.

Spurious emissions from receivers shall not exceed the radiated limits shown in the table below:

Table 2: Radiated Limits of Receiver Spurious Emissions

Frequency (MHz)	Field Strength (microvolts/m at 3 metres)*
30-88	100
88-216	150
216-960	200
Above 960	500

*Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7.

Test Conditions:

Sample Number:	RXR1000-0301E	Temperature:	22°C
Date:	Sept. 19, 2011	Humidity:	51%
Modification State:	Low, Mid and High Channel	Tester:	A. Laudani

Test Results: See table below.

Additional Observations:

- The Spectrum was searched from 30MHz to 12500 MHz.
- EUT operated in normally operating mode as “test receive mode” was not available. A computer (laptop with power supply) and the RF Remote were tested at the same time to complete the normally operating mode.
- Below 1GHz measurements are measured using CISPR quasi-peak detector while above 1GHz are measured using average detector with 1MHz RBW.
- No other emissions within 20 dB of the limit were detected.
- Measured at 10m, limits adjusted. Measurements under 1000MHz were Quasi-Peak, max hold while maximized for turntable and antenna height.

Radiated Emissions Tabular Data**Horizontal**

Measurement Frequency (MHz)	Meter Reading (dB μ V)	Turn Table degrees	Antenna Height (cm)	Corrected Reading (dB μ V/m)	Limit (dB μ V/m)	Margin (dB μ V/m)	Pass Fail	Comments
34.640	31.0	-1	111	15.4	30.0	-14.6	Pass	
196.919	24.2	1	111	9.0	33.5	-24.0	Pass	

Vertical

Measurement Frequency (MHz)	Meter Reading (dB μ V)	Turn Table degrees	Antenna Height (cm)	Corrected Reading (dB μ V/m)	Limit (dB μ V/m)	Margin (dB μ V/m)	Pass Fail	Comments
34.878	40.2	-1	111	24.5	30.0	-5.5	Pass	
122.279	34.2	-1	111	15.1	33.5	-18.4	Pass	
199.584	25.8	360	388	10.9	33.5	-22.6	Pass	
239.965	32.9	142	389	11.8	36.0	-24.2	Pass	
293.076	26.9	11	389	7.8	36.0	-28.2	Pass	
404.894	31	5	389	12.2	36.0	-23.8	Pass	