



Nemko

Nemko USA, Inc.

2210 Faraday Avenue, Suite 150

Carlsbad, CA 92008

Phone (760) 444-3500 Fax (760) 444-3005

CERTIFICATION TEST REPORT

Report Number: 2011 09183886 FCCD

Nex Number: 183886

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

Equipment Under Test (EUT): RF REMOTE

Models: RXT1000-1101E, RXT1000-1102E,
RXT1000-1131E, WCT-XP700T

FCC ID: QVEFSRC01
IC: 3683B-FSRC01

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:	RXT1000-1101E, RXT1000-1102E, RXT1000-1131E, WCTXP700T
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 Dongle Models	RXR1000-0301E, RXR1000-0302E, WCT-XP700R
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.

Nemko USA Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko USA Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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

TABLE OF CONTENTS

Section1: Summary of Test Results	2
1.1 General	2
1.2 Report Release History.....	3
Section 2: Equipment Under Test	5
2.1 Product Identification	5
2.2 Theory of Operation.....	5
2.3 Samples of the EUT.....	6
2.4 Technical Specifications of the EUT.....	7
Section 3: Test Conditions	8
3.1 Specifications.....	8
3.3 Test Environment.....	8
3.4 Test Equipment.....	9
Section 4: Observations	10
4.1 Modifications Performed During Assessment.....	10
4.2 Record Of Technical Judgements	10
4.3 EUT Parameters Affecting Compliance.....	10
4.4 Deviations From Laboratory Test Procedures.....	10
4.5 Test Deleted	10
4.6 Additional Observations.....	10
Section 5: Results Summary	11
5.1 Test Results	11
Appendix A: Test Results	12
Power Line Conducted Emissions	12
20 dB / 99% Bandwidth.....	13
Fundamental Field Strength.....	17
Band-edge Compliance of RF Conducted /Radiated Emissions	18
Spurious Radiated Emissions	20
Receiver Spurious Radiated Emissions.....	22



Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was identified as follows:

SMK Electronics Corp.

RXT1000-1101E, RXT1000-1102E, RXT1000-1131E, WCT-XP700T

RF Remote

2.2 Theory of Operation

The RXT1000-1101E 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 Remote	SMK Electronics Corp. Model: RXT1000-1101E Serial #: 2, 5	NA
EUT - RF Remote	SMK Electronics Corp. Model: RXT1000-1102E Serial #: NA	NA
EUT - RF Remote	SMK Electronics Corp. Model: RXT1000-1131E Serial #: NA	NA
EUT - RF Remote	SMK Electronics Corp. Model: WCT-XP700T Serial #: NA	NA

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:	76.5 dBuV/m or 6.8 mV/m
Modulation:	Zigbee
Reference Designator:	1M13MID
Antenna Connector:	Antenna is a Trace on circuitry
Power Source:	2 AAA batteries



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.

www.nemko.com

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
0.15–0.5	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:	RXT1000-1101E	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:	RXT1000-1101E	Temperature:	21°C
Date:	February 1, 2011	Humidity:	39%
Modification State:	Low, Mid and High Channel	Tester:	A. Laudani
Laboratory:			Nemko

Test Results: See attached plots.

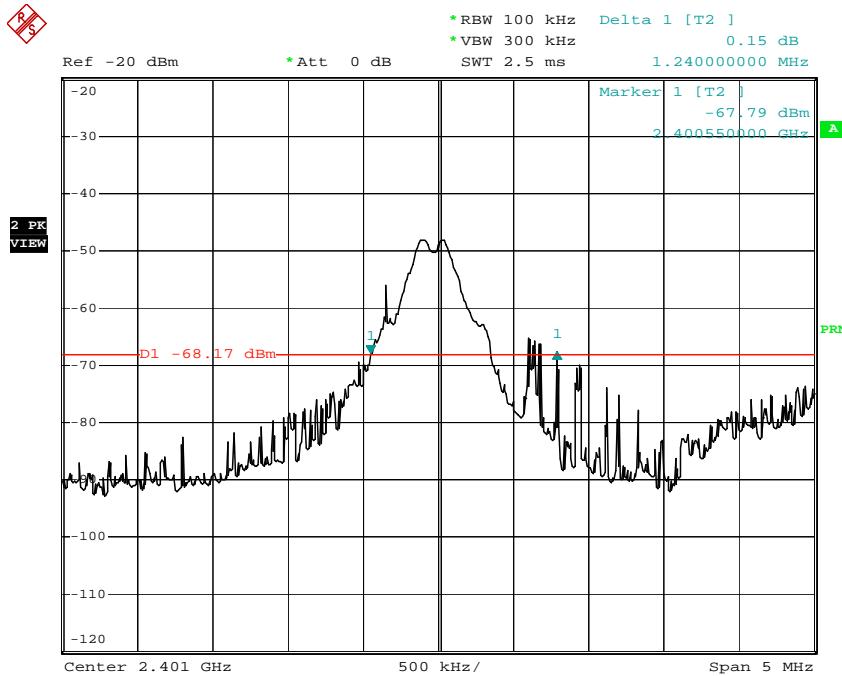
Additional Observations:

- 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 Analyzer'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

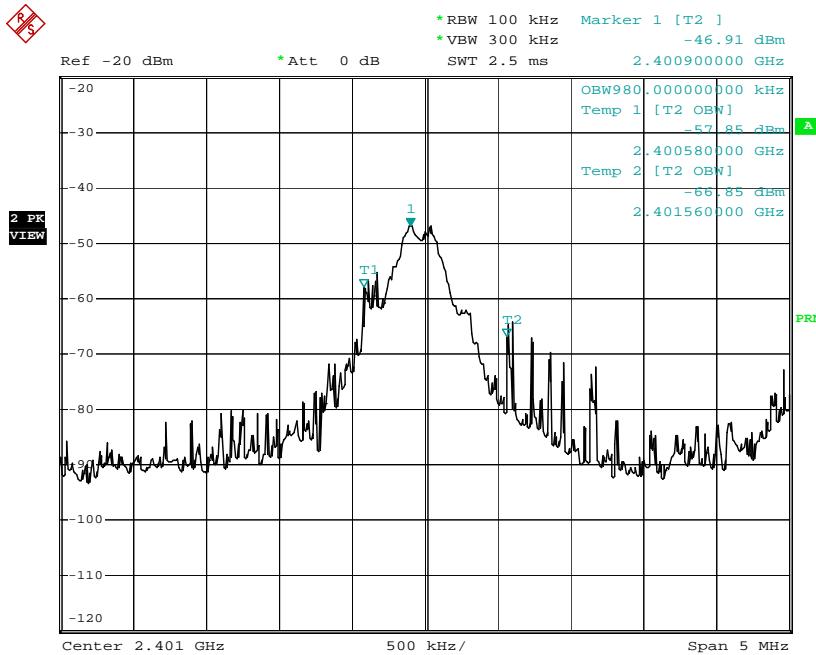


Low Channel: 20 dB Bandwidth



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

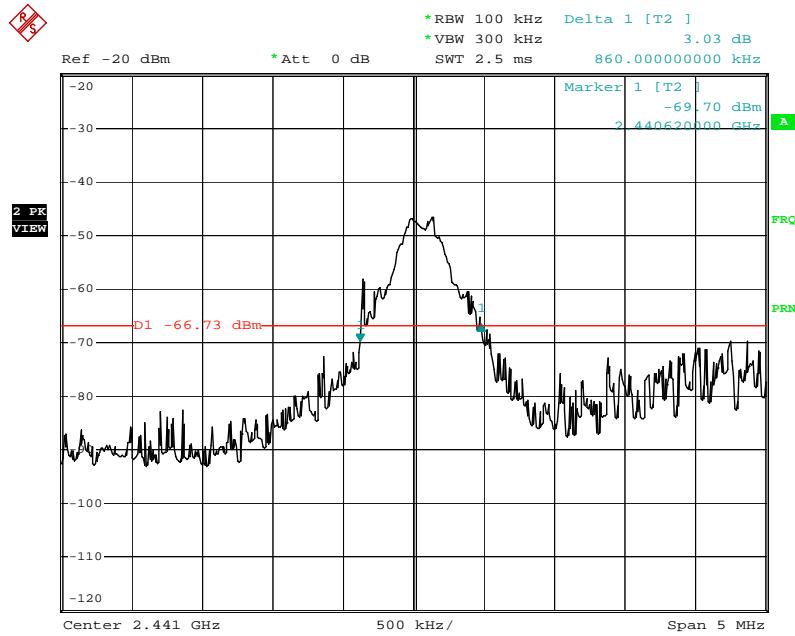
99% bandwidth



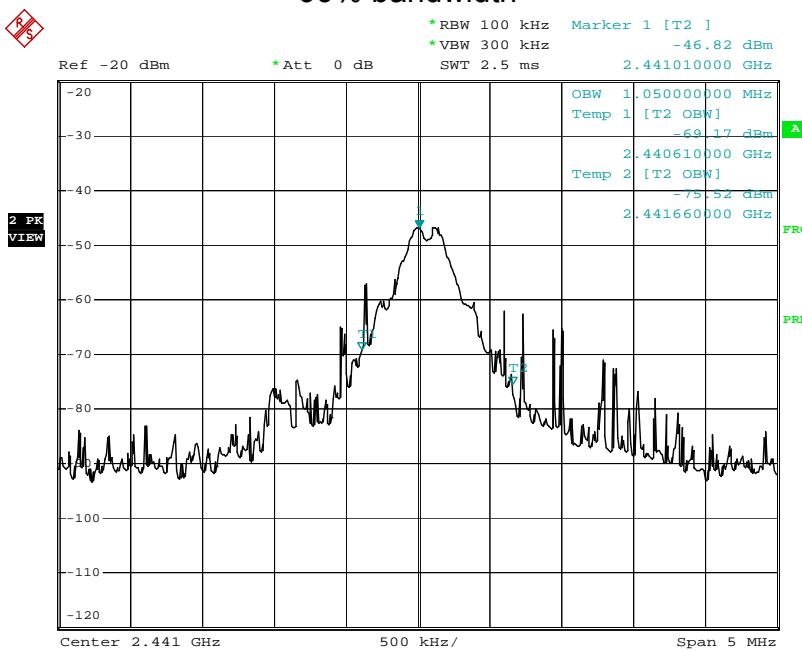
Date: 15.JAN.1997 05:31:06



Mid Channel: 20 dB Bandwidth



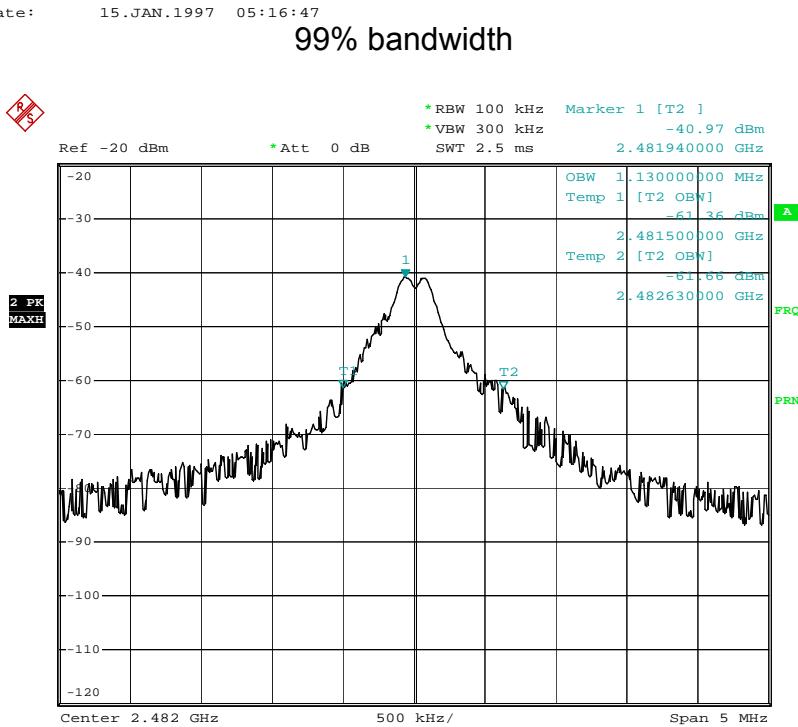
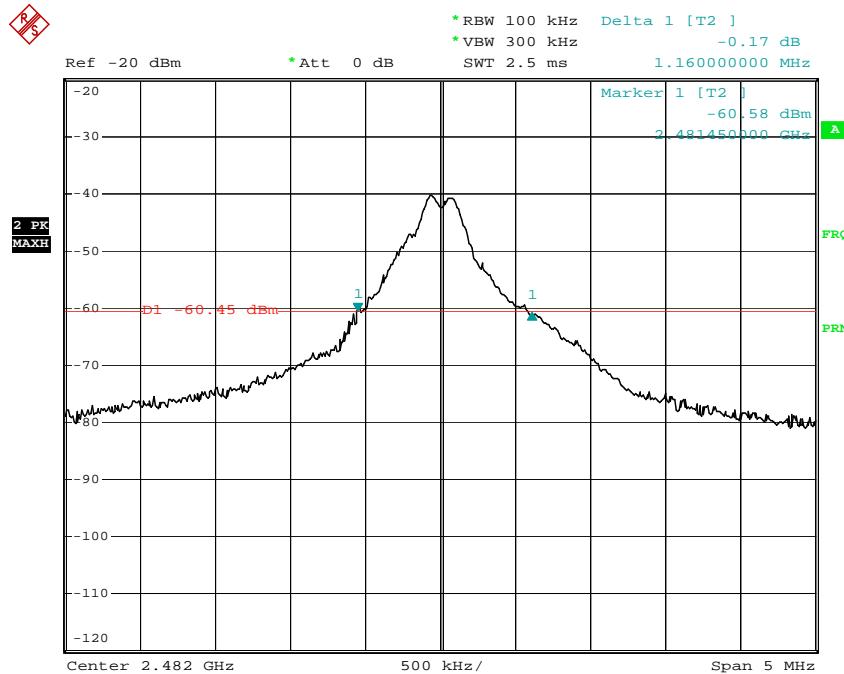
Date: 15.JAN.1997 05:22:29
99% bandwidth



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



High Channel: 20 dB Bandwidth





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:	RXT1000-1101E	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	74.3	5.2
2441	75.9	6.2
2482	76.5	6.8

**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:	RXT1000-1101E	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

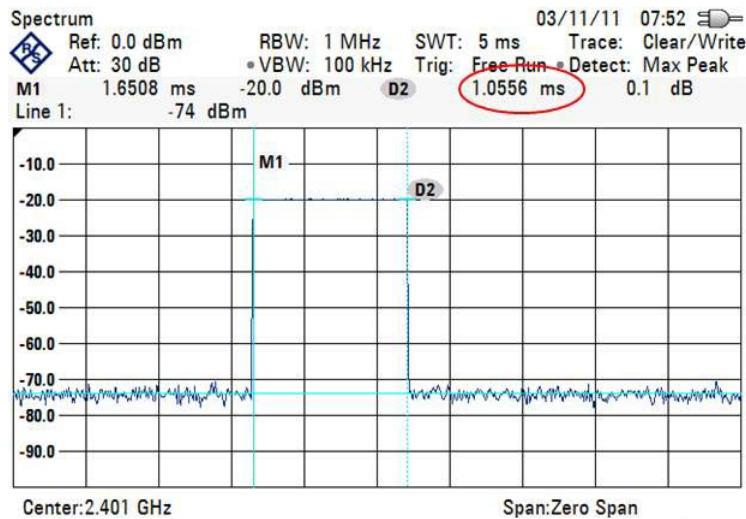
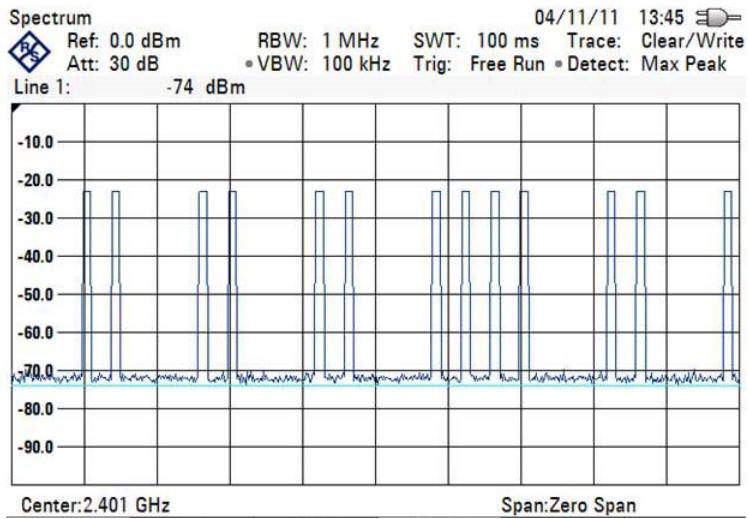
See table below- Radiated Spurious Emissions

Additional Observations:

- 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 = -17.2 dB

Transmission duration time for Handheld is 1.056 ms.

Duty cycle factor for Handheld is $20\log(13*1.056/100) = -17.2 \text{ dB}$ 



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:	RXT1000-1101E	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 = 2482 MHz
52.4 dB_uV (spectrum analyzer reading)
+(-17.2 dB) (Duty Cycle Factor)
+12.8 dB (cable loss @ frequency)
+28.5 dB/m (antenna factor @ frequency)
76.5 dB_uV

Radiated Emissions Data

Job # :		Date :	9-23-2011	Page	1	of	1	
NEX #:	183886	Time :	0945					
		Staff :	aal					
Client Name :	SMK Electronics Corp.			EUT Voltage :	3.3			
EUT Name :	RF Remote				VDC			
EUT Model #:	RXT1000-1101E							
EUT Serial #:	2							
EUT Config. :	Continuous Transmit							
Specification :	CFR47 Part 15, Subpart C 15.249			Distance < 1000 MHz:	3 m			
Loop Ant. #:	NA				Distance > 1000 MHz:	3 m		
Bicon Ant.#:	NA	Temp. (°C) :	21					
Log Ant.#:	NA	Humidity (%) :	67					
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 (%):	-17.2					
Preamp HF#	317	Measurements below 1 GHz are Quasi-Peak values, unless otherwise specified.						

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

Measurement Results - CR1200 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	45.1	49.8	P	192	125	49.8	91.1	114.0	-22.9	Pass	laying down
2401.0	27.9	32.6	A			32.6	74.0	94.0	-15.0	Pass	
2401.0	48.3	39.9	P	192	125	48.3	89.6	114.0	-24.4	Pass	side
2401.0	31.1	22.7	A			31.1	72.4	94.0	-16.6	Pass	
2401.0	48.3	50.2	P	90	185	50.2	91.5	114.0	-22.5	Pass	standing up
2401.0	31.1	33.0	A			33.0	74.3	94.0	-14.7	Pass	
2441.0	44.4	49.0	P	157	103	49.0	90.2	114.0	-23.8	Pass	laying down
2441.0	27.2	31.8	A			31.8	73.0	94.0	-16.0	Pass	
2441.0	46.0	43.4	P	29	104	46.0	87.3	114.0	-26.7	Pass	side
2441.0	28.8	26.2	A			28.8	70.1	94.0	-18.9	Pass	
2441.0	44.9	51.8	P	8	150	51.8	93.1	114.0	-20.9	Pass	standing up
2441.0	27.7	34.6	A			34.6	75.9	94.0	-13.1	Pass	
2482.0	46.0	48.7	P	340	120	48.7	89.8	114.0	-24.2	Pass	laying down
2482.0	28.8	31.5	A			31.5	72.8	94.0	-16.2	Pass	
2482.0	52.3	47.1	P	301	119	52.3	93.4	114.0	-20.6	Pass	side
2482.0	35.1	29.9	A			35.1	76.4	94.0	-12.6	Pass	
2482.0	46.2	52.4	P	146	125	52.4	93.5	114.0	-20.4	Pass	standing up
2482.0	29.0	35.2	A			35.2	76.5	94.0	-12.4	Pass	1 MHz
2390.0	12.8	12.5	P	136	144	12.8	53.6	74.0	-20.4	Pass	laying down
2390.0	-4.4	-4.7	A			-4.4	36.4	54.0	-17.6	Pass	
2400.0	12.2	15.5	P	136	144	15.5	56.8	74.0	-17.2	Pass	laying down
2400.0	-5.0	-1.7	A			-1.7	39.6	54.0	-14.4	Pass	
2483.5	26.4	29.9	P	146	125	29.9	71.0	74.0	-3.0	Pass	standing up
2483.5	9.2	12.7	A			12.7	53.8	54.0	-0.2	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:	RXT1000-1101E	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 Dongle 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	