***Nemko USA, Inc.***
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# Certification Test Report

| | |
|---|---|
| In Accordance With: | FCC Part 15 Subpart C, 15.231<br>RSS-210 Issue 8 December 2010 |
| Applicant: | SMK Manufacturing, Inc<br>1055 Tierra Del Rey<br>Chula Vista, CA 91910 |
| Equipment Under Test (EUT):<br>Model: | FSK Module<br>RXT9200-0505E |
| FCC ID:<br>IC: | QVEFSK4U<br>3683B-FSK4U |
| Tested By: | Nemko USA Inc.<br>11696 Sorrento Valley Road, Suite F<br>San Diego, CA 92121 |
| Test Report Number:<br>Date:<br>Project Number<br>NEX Number | 2010 12163444 FCC<br>January 25, 2011<br>43834<br>149167 |
| Total Number of Pages: | 26 |

# Section 1. 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 Part 15; Subpart C. Radiated tests were conducted is 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.

The assessment summary is as follows:

| | |
|---|---|
| Apparatus Assessed: | FSK Module |
| Model: | RXT9200-0505E |
| Specification: | FCC Part 15 Subpart C, 15.231<br>RSS-210 Issue 8 December 2010 |
| Date Received in Laboratory: | December 17, 2010 |
| Compliance Status: | Complies |
| Exclusions: | None |
| Non-compliances: | None |

## 1.2 Report Release History

| REVISION | DATE | COMMENTS | |
|---|---|---|---|
| - | January 25, 2011 | Prepared By: | Alan Laudani |
| - | January 25, 2011 | 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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Alan Laudani, RF/EMC Test Engineer

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# Section 2: Equipment Under Test

## 2.1 Theory of Operation

The RXT9200-0505E is a FSK Module to be used in remote controls for TVs and other uses. The RXT9200-0505E works on eight frequencies. The intent of the module is to be installed in products SMK Manufacturing, Inc manufactures.

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.

Highest frequency generated or used: 395.9 MHz

## 2.2 Technical Specifications of the EUT

| | |
|---|---|
| Manufacturer: | SMK Manufacturing, Inc |
| | |
| Operating Frequency: | 369.5 to 395.9 MHz |
| Measured Field Strength: | 63.2 dBuV/m @ 3m<br>1445 microVolts/meter |
| | |
| Modulation: | FSK |
| | |
| Antenna Data: | Circuit Trace Antenna |
| | |
| Antenna Connector: | NONE |
| | |
| Power Source: | 6 V Battery (4 AA cells) |

# Section 3: Test Conditions

## 3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.231
Periodic operation in the band 40.66–40.70 MHz and above 70 MHz.

RSS-210 Issue 8 December 2010
Annex 1 - Momentarily Operated Devices and Remote Control

## 3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

## 3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range : 14 – 22 ºC
Humidity range : 32--76 %
Pressure range : 102.0 kPa

## 3.4 Test Equipment

| Nemko ID | Device | Mfr. | Model | Serial Number | Cal Date | Cal Due Date |
|---|---|---|---|---|---|---|
| 114 | Antenna, Bicon | EMCO | 3104 | 2997 | 3/5/2010 | 3/5/2012 |
| 317 | Preamplifier | HP | 8449A | 2749A00167 | 5/7/2010 | 5/7/2011 |
| 755 | Antenna, LPA | EMCO | 3147 | 1246 | 7/23/2009 | 7/23/2011 |
| 827 | Preamplifier | Com-Power | PA-103 | 161032 | 4/21/2010 | 4/21/2011 |
| 877 | Antenna, DRG Horn, .7-18GHz | AH Systems | SAS-571 | 688 | 8/16/2010 | 8/16/2012 |
| 898 | EMI Receiver & filter set | HP | 8546A | 3625A00348 | 6/22/2010 | 6/22/2011 |
| 899 | Filter Section | HP | 85460A | 3448A00288 | 6/22/2010 | 6/22/2011 |

# Section 4: Observations

## 4.1 Modifications Performed During Assessment

No modifications were performed during assessment.

## 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 Tests Deleted

No Tests were deleted from this assessment.

## 4.5 Additional Observations

There were no additional observations made during this assessment.

## Section 5: Results Summary

Test Results. This section contains the following:

FCC Part 15 Subpart C
RSS-210 Issue 8 December 2010
RSS-Gen Issue 3 December 2010

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 15 | RSS | Test Description | Required | Result |
|---|---|---|---|---|
| 15.207 (a) | RSS-Gen 7.2.4 | Power line Conducted Emissions | Battery Powered | NA |
| 15.215 (c)<br>15.231(c) | A1.1.3 | Occupied Bandwidth/ 99% Bandwidth | Y | Pass |
| 15.231 (a)<br>15.205 (a) | A1.1<br>Table A<br>RSS-Gen 7.2.2 | Permissible Field Strength Limits for Momentarily Operated Devices | Y | Pass |
| 15.231 (a) | A1.1.1(a) | Types of Momentary Signals | Y | Pass |
| 15.231 (d) | A1.1.4 | Frequency Stability | N | NA |
| 15.107 (a) | RSS-Gen 7.2.4 | Receiver Spurious Conducted Emissions | Battery Powered | NA |
| 15.109 (a) | RSS-Gen 6.1 | Receiver Spurious Radiated Emissions | NA | Pass |

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# Appendix A: Test Results

## Conducted Emissions

| | | | | |
|---|---|---|---|---|
| Client | SMK Manufacturing, Inc | Temperature | | °C |
| Pan # | 62387 | Relative Humidity | | % |
| EUT Name | FSK Module | Barometric Pressure | | kPa |
| EUT Model | RXT9200-0505E | Test Location | Enclosure 1 | |
| Governing Doc | CFR 47, Part 15B | Test Engineer | Alan Laudani | |
| Basic Standard | Sec. 15.207 Class "B" Transmit<br>RSS-Gen 7.2.4 | Date of test | | |
| Test Parameters | Peak RBW: 100kHz VBW: 100kHz<br>Quasi-Peak: RBW 9kHz, VBW 30 kHz<br>Average: RBW 9kHz, VBW 30 kHz<br>Quasi-Peak Limit Blue Line, Average Limit Green Line | | | |

Not applicable as EUT is battery powered.

Occupied Bandwidth

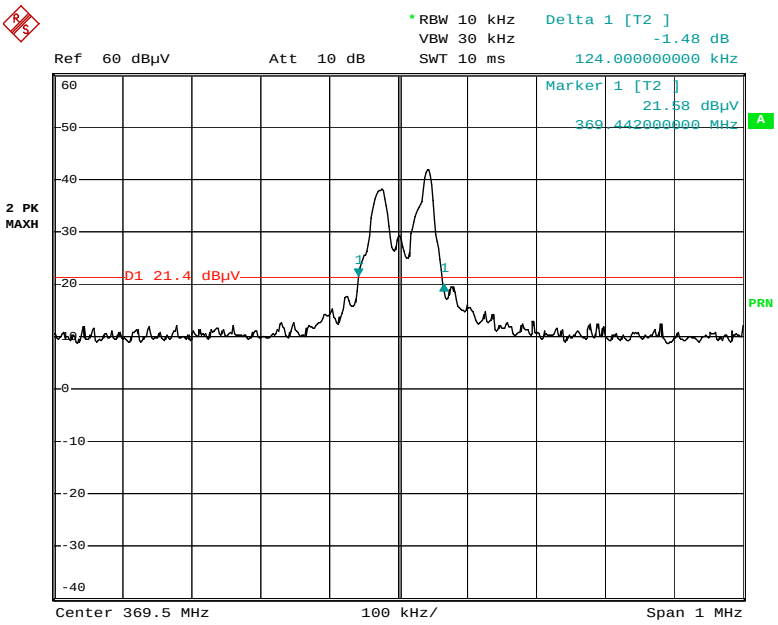
15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

RSS-Gen 4.6.1 Occupied Bandwidth
When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Test Conditions:

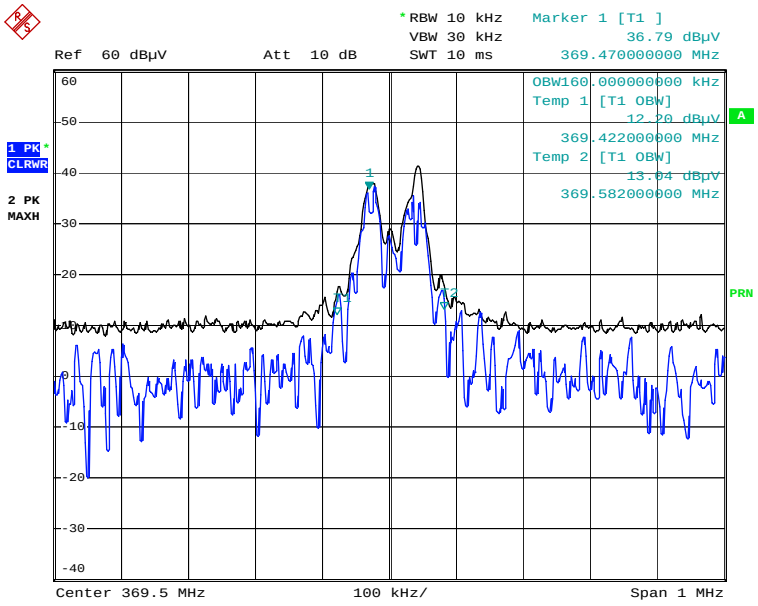
| | | | | |
|---|---|---|---|---|
| Client | SMK Manufacturing, Inc | Temperature | 15 | °C |
| Pan # | 62387 | Relative Humidity | 38 | % |
| EUT Name | FSK Module | | | |
| EUT Model | RXT9200-0505E | Test Location | Enclosure 2 | |
| Governing Doc | CFR 47, Part 15C | Test Engineer | Alan Laudani | |
| Basic Standard | Sec. 15.231 Transmit | Date of test | December 17, 2010 | |

Test Results:
Measured Occupied Bandwidth: 124 kHz
Measured 99% Bandwidth = 160 kHz

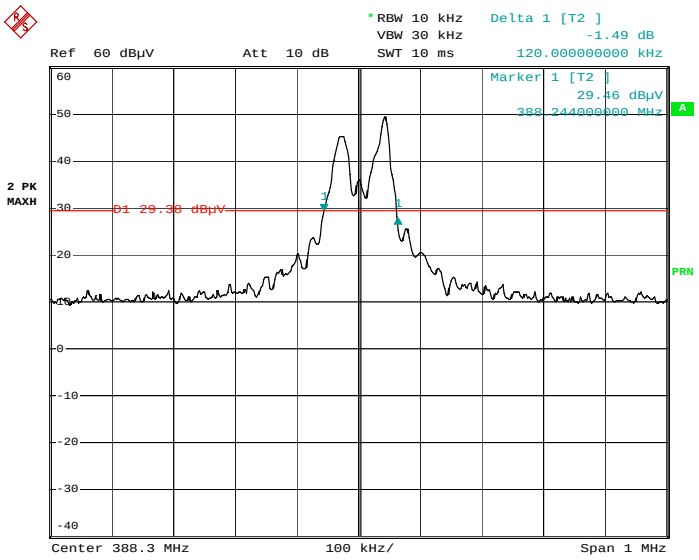



Date: 17.DEC.2010 11:21:48

Low Frequency 369.5 MHz 20 dB bandwidth = 124 kHz
99% bandwidth = 160 kHz

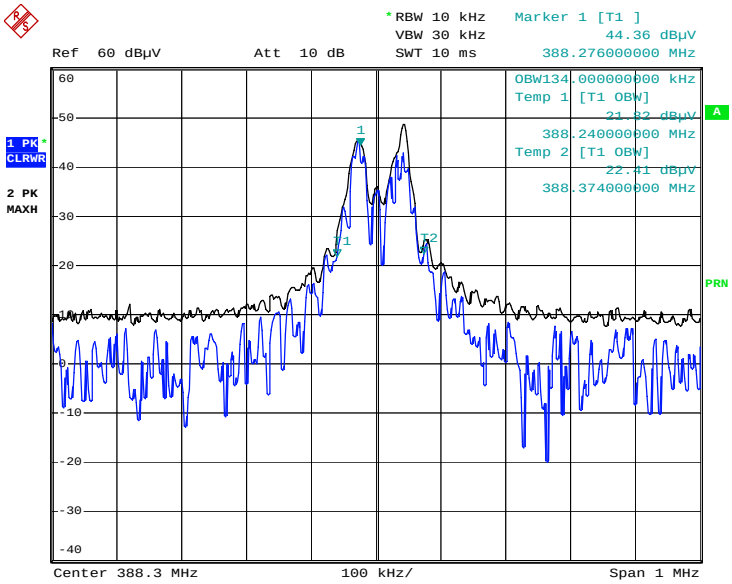



Date: 17.DEC.2010 11:20:38

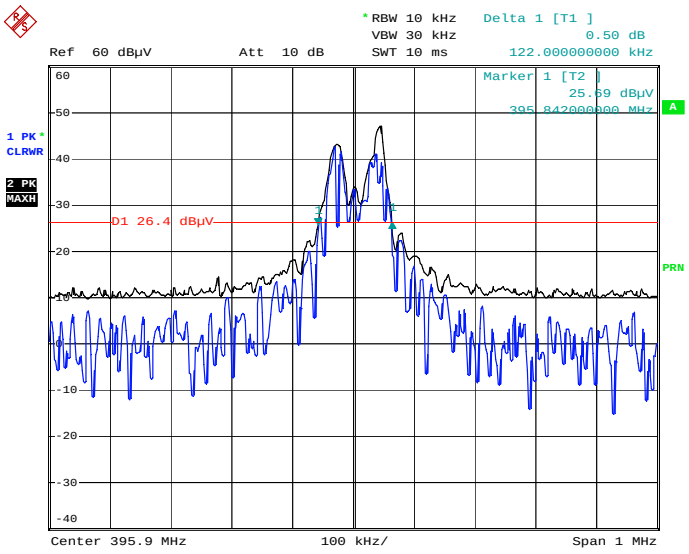



Date: 17.DEC.2010 11:23:53

Mid Frequency 388.3 MHz 20 dB bandwidth = 120 kHz
99% bandwidth = 134 kHz

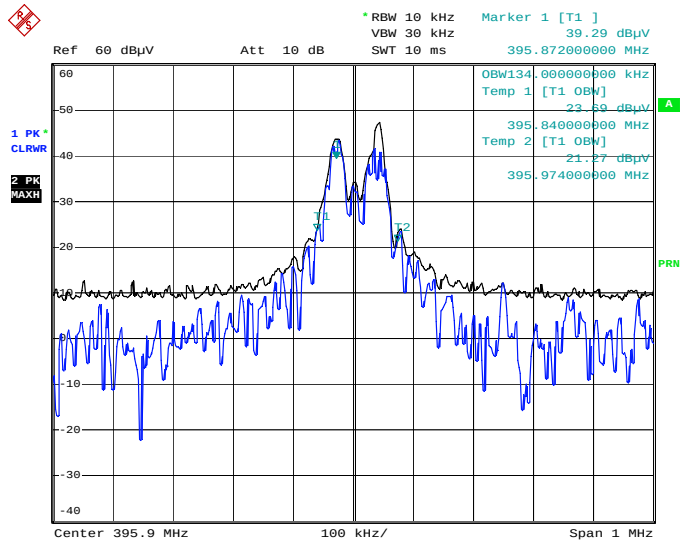



Date: 17.DEC.2010 11:24:46




Date: 17.DEC.2010 11:16:03

High Frequency 395.9 MHz 20 dB bandwidth = 122 kHz
99% bandwidth = 134 kHz




Date: 17.DEC.2010 11:16:57

Frequency Stability

15.231(d) For devices operating within the frequency band 40.66–40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be ±0.01%. This frequency tolerance shall be maintained for a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltages at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

RSS-210 A1.1.4 Carrier frequency stability of devices momentarily operated in the band 40.66-40.70 MHz shall be maintained to ±0.01% (±100 ppm).

Test Conditions:

| | | | | |
|---|---|---|---|---|
| Client | SMK Manufacturing, Inc | Temperature | | °C |
| Pan # | 62387 | Relative Humidity | | % |
| EUT Name | FSK Module | | | |
| EUT Model | RXT9200-0505E | Test Location | | |
| Governing Doc | CFR 47, Part 15C | Test Engineer | Alan Laudani | |
| Basic Standard | Sec. 15.231 Transmit | Date of test | | |

Test Results:

The EUT does not transmit within the 40.66—40.70 MHz band, therefore this test is not applicable.

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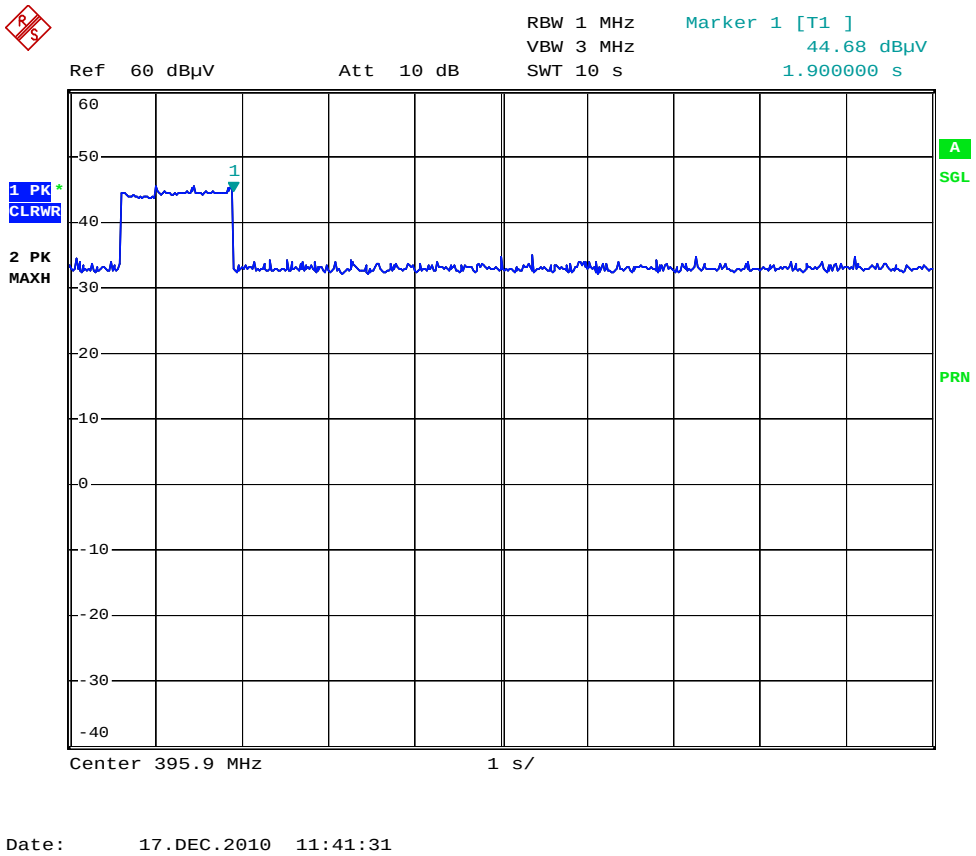
## Types of Momentary Signals

15.231 (a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

RSS210 Annex 1 A1.1.1(a) A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all transmission times. When released, the transmitter shall cease transmission (holdover time of up to 5 seconds is permitted).

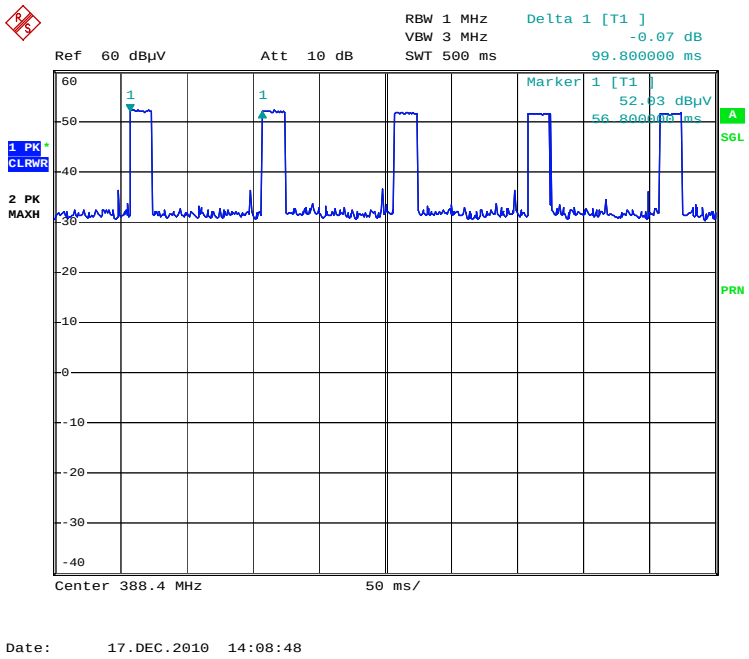
| | | | | |
|---|---|---|---|---|
| Client | SMK Manufacturing, Inc | Temperature | 15 | °C |
| Pan # | 62387 | Relative Humidity | 38 | % |
| EUT Name | FSK Module | | | |
| EUT Model | RXT9200-0505E | Test Location | SOATS | |
| Governing Doc | CFR 47, Part 15C | Test Engineer | Alan Laudani | |
| Basic Standard | Sec. 15.231 Transmit | Date of test | December 17, 2010 | |

This plot shows deactivation, the marker indicates when then transmit button was released.



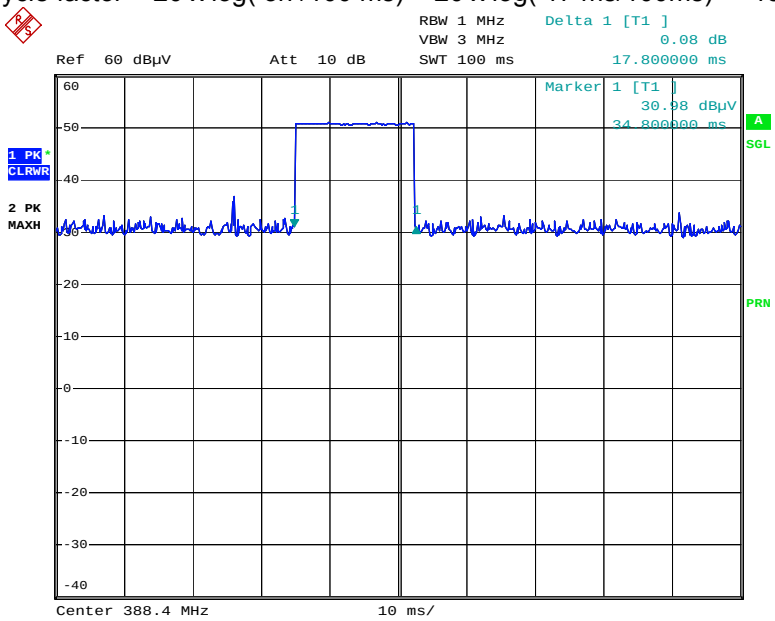
## Duty Cycle

This plot sweeps 500 ms, shows 5 emissions at 99 milli-seconds apart




Date: 17.DEC.2010 14:08:48

This plot shows the on time in 100 ms.
Duty cycle factor = 20 x log( on /100 ms) = 20 x log( 17 ms/100ms) = -15.4 dB.




Date: 17.DEC.2010 14:06:04

Permissible Field Strength Limits for Momentarily Operated Devices

15.231 (b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

| Fundamental frequency (MHz) | Field strength of fundamental (microvolts/meter) | Field strength of spurious emissions (microvolts/meter) |
|---|---|---|
| 40.66–40.70 | 2,250 | 225 |
| 70–130 | 1,250 | 125 |
| 130–174 | [1]1,250 to 3,750 | [1]125 to 375 |
| 174–260 | 3,750 | 375 |
| 260–470 | [1]3,750 to 12,500 | [1]375 to 1,250 |
| Above 470 | 12,500 | 1,250 |

[1]Linear interpolations.

RSS210 Annex 1: A1.1.
RSS GEN: 7.2.2 Emissions Falling Within Restricted Frequency Bands

| Fundamental Frequency (MHz), excluding restricted band frequencies of RSS-Gen | Field Strength of the Fundamental (Note 1) (microvolts/m at 3 metres) | Field Strength of Unwanted Emissions (Note 1) (microvolts/m at 3 metres) |
|---|---|---|
| 40.66-40.70 | See Section A2.7 | |
| 70-130 | 1,250 | 125 |
| 130-174 | 1,250 to 3,750* | 125 to 375 |
| 174-260 (Note 2) | 3,750 | 375 |
| 260-470 (Note 2) | 3,750 to 12,500* | 375 to 1,250 |
| Above 470 | 12,500 | 1,250 |

| | | | | |
|---|---|---|---|---|
| Client | SMK Manufacturing, Inc | Temperature | 15 | °C |
| Pan # | 62387 | Relative Humidity | 38 | % |
| EUT Name | FSK Module | | | |
| EUT Model | RXT9200-0505E | Test Location | SOATS | |
| Governing Doc | CFR 47, Part 15C | Test Engineer | Alan Laudani | |
| Basic Standard | Sec. 15.231 Transmit | Date of test | December 17, 2010 | |

Test Results:

See Table. EUT complies for fundamental power and spurious emissions.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic (3960 MHz).

These results apply to emissions that may be found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was investigated with fresh batteries. The emissions were measured with a test mode to repeat the emissions so measurements could be maximized for the rotation of the sample and height and polarity of the measurement antenna.

All Measurements below 1GHz were performed at 3m employing a CISPR quasi-peak detector, except for the radio's fundamental. Peak measurements above 1GHz were done utilizing RBW of 1MHz and VBW of 3MHz.

Measurements made at the 3 meter Outside Area Test Site, all measurements max hold after peaking for EUT rotation and antenna height from 1 to 4 meters.

Fundamental power was measured at 1 MHz RBW, 3 MHz VBW to ensure capture of entire emissions envelope. Average reading of Fundamental power therefore was peak + duty cycle factor.

No other emissions found within 20 dB of the limits.
As the module will be used in hand held remotes, field strength was investigated on all three axes and the strongest field strength reported.

*Note: Corrected Reading Computations*
*Average = Maximum Meter Reading + Antenna Factor + Path Loss*
*78.6 = 60.0 + 15.9 + 2.7*
At 388.3 MHz, Limit = 9095.8 uV/m or 79.2 *dBuV/m*
EUT passes Peak

*Corrected Average Reading = 78.6 –15.4 DCF= 63.2 dBuV/m*
$10^{(63.2/20)}$ = 1445.4 uV/m

## Radiated Emissions Data

| | | | | | |
|---|---|---|---|---|---|
| Job # : | 62387 | Date : | 1-25-2010 | Page | 1 of 1 |
| NEX #: | 163444 | Time : | 10:00 | | |
| | | Staff : | AAL | | |

| | | | |
|---|---|---|---|
| Client Name : | SMK Manufacturing, Inc | EUT Voltage : | 6 V |
| EUT Name : | Remote Control Module | EUT Frequency : | BAT |
| EUT Model # : | RXT9200-0505E | Phase: | 1 |
| EUT Serial # : | NA | NOATS | |
| EUT Config. : | Repeating Transmit for test, FSK Modulated | SOATS | X |
| | | Distance < 1000 MHz: | 3 m |
| Specification : | CFR47 Part 15.231(a) | Distance > 1000 MHz: | 3 m |

| | | | |
|---|---|---|---|
| Loop Ant. #: | NA | | |
| Bicon Ant.#: | 114_3m | Temp. (°C) : | 15 |
| Log Ant.#: | 755_3m | Humidity (%) : | 38 |
| DRG Ant. # | 755_3m | Spec Analyzer #: | 898 |
| Cable LF#: | soats | Analyzer Display #: | 898 |
| Cable HF#: | soats | Quasi-Peak Detector #: | 898 |
| Preamp LF#: | NA | Preselector #: | 899 |
| Preamp HF# | 317 | | |

| | |
|---|---|
| Quasi-Peak | RBW: 120 kHz |
| | Video Bandwidth 300 kHz |
| Peak | RBW: 100 kHz |
| | Video Bandwidth 300 kHz |
| Average = dcf + Peak | |
| dcf | -15.4 dB |

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 Side F/L/R/B | Ant. Height m | Max. Reading (dBµV) | Corrected Reading (dBµV/m) | Spec. limit (dBµV/m) | CR/SL Diff. (dB) | Pass Fail | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| 369.5 | 55.5 | 51.6 | P | - | 1.5 | 55.5 | 73.6 | 98.4 | -24.8 | Pass | |
| **388.3** | **60.0** | **43.5** | **P** | - | **1.0** | **60.0** | **78.6** | **99.2** | **-20.6** | Pass | |
| 395.9 | 53.9 | 45.9 | P | - | 1.0 | 53.9 | 72.8 | 99.5 | -26.7 | Pass | |
| | | | | | | | | | | | |
| 369.5 | 40.1 | 36.2 | A | - | 1.0 | 40.1 | 58.2 | 78.4 | -20.2 | Pass | |
| **388.3** | **44.6** | **28.1** | **A** | - | **1.0** | **44.6** | **63.2** | **79.2** | **-16.0** | Pass | |
| 395.9 | 38.5 | 30.5 | A | - | 1.0 | 38.5 | 57.4 | 79.5 | -22.1 | Pass | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 739.0 | 27.6 | 23.6 | P | - | 1.0 | 27.6 | 52.6 | 58.4 | -5.8 | Pass | PEAK MEETS AVE! |
| 776.6 | 26.0 | 20.2 | P | - | 1.0 | 26.0 | 51.7 | 59.2 | -7.5 | Pass | |
| 791.8 | 23.3 | 21.5 | P | - | 1.0 | 23.3 | 49.4 | 59.5 | -10.1 | Pass | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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## Conducted Emissions Test Data—Receive Mode

Part 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 μH/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.

7.2.2 The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network. Except when the requirements applicable to a given device state otherwise, for any license-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown below. The tighter limit applies at the frequency range boundaries. The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network Frequency Range

| Frequency Range (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-Peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

| | | | | |
|---|---|---|---|---|
| Client | SMK Manufacturing, Inc | Temperature | 15 | °C |
| Pan # | 62387 | Relative Humidity | 38 | % |
| EUT Name | FSK Module | | | |
| EUT Model | RXT9200-0505E | Test Location | SOATS | |
| Governing Doc | CFR 47, Part 15B | Test Engineer | Alan Laudani | |
| Basic Standard | Sec. 15.107 Class “B” | Date of test | December 17,2010 | |
| Test Parameters | Peak RBW: 100kHz VBW: 100kHz<br>Quasi-Peak: RBW 9kHz, VBW 30 kHz<br>Average: RBW 9kHz, VBW 30 kHz<br>Quasi-Peak Limit Blue Line, Average Limit Green Line | | | |
| EUT does not have need for AC power as it is battery powered. | | | | |

## Radiated Emissions Test Data—Receive Mode

The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

Table 1 - Spurious Emission Limits for Receivers

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

| | | | | |
|---|---|---|---|---|
| Client | SMK Manufacturing, Inc | Temperature | 15 | °C |
| Pan # | 62387 | Relative Humidity | 38 | % |
| EUT Name | FSK Module | | | |
| EUT Model | RXT9200-0505E | Test Location | SOATS | |
| Governing Doc | CFR 47, Part 15B | Test Engineer | Alan Laudani | |
| Basic Standard | Sec. 15.107 Class "B" | Date of test | December 17,2010 | |

EUT does not have a receive mode.
No emissions evident while in standby mode

# APPENDIX B

## B. Radiated Emissions Measurement Uncertainties

1. Introduction

ISO/IEC 17025:2005 and ANSI/NCSL Z540.3: 2006 require that all measurements contained in a test report be "traceable". "Traceability" is defined in the *International Vocabulary of Basic and General Terms in Metrology* (ISO: 1993) as: "the property of the result of a measurement... whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, *all having stated uncertainties*".

The purposes of this Appendix are to "state the *Measurement Uncertainties*" of the conducted emissions and radiated emissions measurements contained in Section 5 of this Test Report, and to provide a practical explanation of the meaning of these measurement uncertainties.

2. Statement of the Worst-Case Measurement Uncertainties for the Conducted and Radiated Emissions Measurements Contained in This Test Report

Table 1: Worst-Case Expanded Uncertainty "U" of Measurement for a k=2 Coverage Factor

| Radiated Emissions Measurement Detection Systems | Applicable Frequency Range | "U" for a k=2 Coverage Factor |
|---|---|---|
| Spectrum Analyzer with QPA & Preamplifier | 30 MHz - 200 MHz | +3.9 dB, -4.0 dB |
| Spectrum Analyzer with QPA & Preamplifier | 200 MHz-1000 MHz | +/- 3.5 dB |
| Spectrum Analyzer with Preamplifier | 1 GHz - 18 GHz | +2.5 dB, -2.6 dB |
| Spectrum Analyzer with Preamplifier | 18 GHz - 40 GHz | +/- 3.4 dB |

NOTES:
1. Applies to 3 and 10 meter measurement distances
2. Applies to all valid combinations of Transducers (i.e. LISNs, Line Voltage Probes, and Antennas, as appropriate)
3. Excludes the Repeatability of the EUT

3. Practical Explanation of the Meaning of Radiated Emissions Measurement Uncertainties

In general, a "Statement of Measurement Uncertainty" means that with a certain (specified) confidence level, the "true" value of a measurand will be between a (stated) upper bound and a (stated) lower bound.

In the specific case of EMC Measurements in this test report, the measurement uncertainties of the conducted emissions measurements and the radiated emissions measurements have been calculated in accordance with the method detailed in the following documents:

- *ANSI Z540.2 (2002) Guide to the Expression of Uncertainty in Measurement*
- NIS 81:1994, *The Treatment of Uncertainty in EMC Measurements* (NAMAS, 1994)
- NIST Technical Note 1297(1994), *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results* (NIST, 1994)

The calculation method used in these documents requires that the stated uncertainty of the measurements be expressed as *an "expanded uncertainty", U, with a k=2 coverage factor*. The practical interpretation of this method of expressing measurement uncertainty is shown in the following example:

EXAMPLE: Assume that at 39.51 MHz, the (measured) radiated emissions level was equal to +26.5 dBuV/m, and that the +/- 2 standard deviations (i.e. 95% confidence level) measurement uncertainty was +/- 3.4 dB.

# APPENDIX C

## C. Nemko USA, Inc. Test Equipment & Facilities Calibration Program



Nemko USA, Inc. operates a comprehensive Periodic Calibration Program in order to ensure the validity of all test data. Nemko USA's Periodic Calibration Program is fully compliant to the requirements of NVLAP Policy Guide PG-1-1988, ANSI/NCSL Z540.3: 2006, ISO 10012:2003, ISO/IEC 17025:2005, and ISO-9000: 2000. Nemko USA, Inc.'s calibrations program therefore meets or exceeds the US national commercial and military requirements [N.B. ANSI/NCSL Z540.1-1994 replaced MIL-STD-45662A].

Specifically, all of Nemko USA's *primary reference standard devices* (e.g. vector voltmeters, multimeters, attenuators and terminations, RF power meters and their detector heads, oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, field-strength meters and their detector heads, etc.) and certain *secondary standard devices* (e.g. RF Preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are periodically recalibrated by:

- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratories by NIST; or,
- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratory by another accreditation body (such as A2LA) that is mutually recognized by NIST; or,
- A manufacturer of Measurement and Test Equipment (M&TE), if the manufacturer uses NIST-traceable standards and is ISO Guide 25-accredited as calibration laboratory either by NIST or by another accreditation body (such as A2LA) that is mutually recognized by NIST; or
- A manufacturer of M&TE (or by a Nemko USA-approved independent third party metrology laboratory) that is not ISO Guide 25-accredited. (In these cases, Nemko USA conducts an annual audit of the manufacturer or metrology laboratory for the purposes of proving traceabilty to NIST, ensuring that adequate and repeatable calibration procedures are being applied, and verifying conformity with the other requirements of ISO Guide 25).

In all cases, the entity performing the Calibration is required to furnish Nemko USA with a calibration test report and/or certificate of calibration, and a "calibration sticker" on each item of M&TE that is successfully calibrated.

Calibration intervals are normally one year, except when the manufacture advises a shorter interval or if US Government directives or client requirements demand a shorter interval. Items of instrumentation/related equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either in-house [if minor] or by a Nemko USA-approved independent [third party] metrology laboratory, or by the manufacturer of the item of M&TE).

Each antenna used for CISPR 11 and CISPR 22 and FCC Part 15 and Part 18 radiated emissions testing (and for testing to the equivalent European Norms) is calibrated annually by either a NIST (or A2LA) ISO Standard 17025-Accredited third-party Antenna Calibration Laboratory or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory. The antenna calibrations are performed using the methods specified in Annex G.5 of CISPR 16-1(2003) or ANSI C63.5-2004, including the "Three-Antenna Method". Certain other kinds of antennas (e.g. magnetic-shielded loop antennas) are calibrated annually by either a NIST (or A2LA) ISO Standard 17025-accredited third-party antenna calibration laboratory, or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory using the procedures specified in the latest version of SAE ARP-958.

In accordance with FCC and other regulations, Nemko USA recalibrates its suite of antennas used for radiated emissions tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of Nemko USA's Open Area Test Site. Nemko USA, Inc. uses the procedures given in both Sub clause 16.6 and Annex G.2 of CISPR 16-1 (2003), and, ANSI C63.4-2003 when performing the normalized site attenuation measurements.

# APPENDIX D

## D. NVLAP Accreditation



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

## Certificate of Accreditation to ISO/IEC 17025:2005

**NVLAP LAB CODE: 200116-0**

**Nemko USA, Inc. - San Diego EMC Division**
San Diego, CA

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2010-01-01 through 2010-12-31
*Effective dates*

Sally S. Bruce
*For the National Institute of Standards and Technology*

NVLAP-01C (REV. 2009-01-28)