



Nemko Test Report: 2015 277187 FCC15247

Applicant: HM Electronics, Inc.
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USA

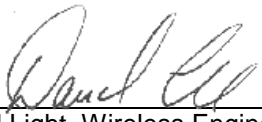
**Equipment Under Test:
(E.U.T.)** XCVR6K1: REV B

FCC Identifier: BYMXCVR6K1

IC Identifier: 1860A-XCVR6K1

In Accordance With: **FCC Part 15, Subpart C, 15.247 and
Industry Canada RSS-210, Issue 8**
Frequency Hopping Transmitters

Tested By: Nemko USA, Inc.
2210 Faraday Ave. Ste 150
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USA

TESTED BY:  **DATE:** 11 February 2015
David Light, Wireless Engineer

APPROVED BY:  **DATE:** 18 February 2015
James Morris, EMC/Wireless
Division Manager

Total Number of Pages: 15

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Section 1. Summary of Test Results

Manufacturer: HM Electronics, Inc.

Model No.: XCVR6K1

Serial No.: None

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, Paragraph 15.247 and Industry Canada RSS-210, Issue 8 for Frequency Hopping Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.10: 2013. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and Industry Canada.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit |
| <input checked="" type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | Pre-Production Unit |

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



NVLAP Lab Code 200116-0

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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a) / RSS-Gen 8.8	NT
Channel Separation	15.247(a)(1) / RSS-210 A8.1(b)	NT
Time of Occupancy	15.247(a)(1) / RSS-210 A8.1(d)	NT
20 dB Occupied Bandwidth	15.247(a)(1) / RSS-210 A8.1(a)	NT
Peak Power Output	15.247(b) / RSS-210 A8.4(2)	NT
Spurious Emissions (Conducted)	15.247(d) / RSS-210 A8.5	NT
Spurious Emissions (Radiated)	15.247(d) / RSS-Gen 8.10	Complies

Footnotes:

This module has been issued a grant with FCC and Industry Canada. The test results for tests not performed are included in Nemko USA (San Diego) test report number 2009 07131172 FCC 15.247

The manufacturer is now offering an omni-directional antenna in addition to antenna(s) included in original filing.

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Band:

902 – 928 MHz

2400 – 2483.5 MHz

5725 – 5850 MHz

Operating Frequency Range:

2401.92 to 2481.408 MHz

User Frequency Adjustment:

Software controlled

Hardware Version:

Revision B

Software Version:

Revision D

Description of EUT

The XCVR6K1 is a 2.4 GHz FHSS wireless transceiver module.

Section 3. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(d)
TESTED BY: David Light	DATE: 21 January 2015

Test Results: Complies. The worst case emission was 48.9 dBµV/m at 2483.5 MHz. This is 5.1 dB below the specification limit of 54 dBµV/m.

Measurement Data: See attached table.

Duty Cycle Calculation:

Duty Cycle correction factor(dB) = $20 \log (rf_{ON} \text{ in ms}/100\text{ms})$

Notes:

- For handheld devices, the EUT was tested on three orthogonal axis'
- The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33
- The device was tested on three channels per 15.31(l).

Equipment Used: E1029-911-902-752-1763

Measurement Uncertainty: +/-3.6 dB

Temperature: 21 °C

Relative Humidity: 28 %

Test Data - Radiated Emissions

Low Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											Lowest Channel
											2401.92 MHz
4803.840	H	0.0	35.0	33.2	10.6	28.0	50.8	74.0	-23.2	Pass	Noise Floor
4803.840	H	0.0	26.0	33.2	10.6	28.0	41.8	54.0	-12.2	Pass	Noise Floor
7205.760	H	0.0	34.0	36.6	9.7	28.5	51.8	74.0	-22.2	Pass	Noise Floor
7205.760	H	0.0	25.0	36.6	9.7	28.5	42.8	54.0	-11.2	Pass	Noise Floor
9607.680	H	0.0	28.0	38.2	11.3	27.9	49.6	74.0	-24.4	Pass	Noise Floor
9607.680	H	0.0	23.0	38.2	11.3	27.9	44.6	54.0	-9.4	Pass	Noise Floor
12009.600	H	0.0	30.0	39.2	13.7	30.1	52.8	74.0	-21.2	Pass	Noise Floor
12009.600	H	0.0	23.0	39.2	13.7	30.1	45.8	54.0	-8.2	Pass	Noise Floor
14411.520	H	0.0	30.0	41.5	14.0	29.5	56.0	74.0	-18.0	Pass	Noise Floor
14411.520	H	0.0	24.0	41.5	14.0	29.5	50.0	54.0	-4.0	Pass	Noise Floor
16813.440	H	0.0	30.0	44.0	14.4	31.3	57.1	74.0	-16.9	Pass	Noise Floor
16813.440	H	0.0	24.5	44.0	14.4	31.3	51.6	54.0	-2.4	Pass	Noise Floor
4803.840	V	0.0	35.0	33.2	10.6	28.0	50.8	74.0	-23.2	Pass	Noise Floor
4803.840	V	0.0	26.0	33.2	10.6	28.0	41.8	54.0	-12.2	Pass	Noise Floor
7205.760	V	0.0	34.0	36.6	9.7	28.5	51.8	74.0	-22.2	Pass	Noise Floor
7205.760	V	0.0	25.0	36.6	9.7	28.5	42.8	54.0	-11.2	Pass	Noise Floor
9607.680	V	0.0	28.0	38.2	11.3	27.9	49.6	74.0	-24.4	Pass	Noise Floor
9607.680	V	0.0	23.0	38.2	11.3	27.9	44.6	54.0	-9.4	Pass	Noise Floor
12009.600	V	0.0	30.0	39.2	13.7	30.1	52.8	74.0	-21.2	Pass	Noise Floor
12009.600	V	0.0	23.0	39.2	13.7	30.1	45.8	54.0	-8.2	Pass	Noise Floor
14411.520	V	0.0	30.0	41.5	14.0	29.5	56.0	74.0	-18.0	Pass	Noise Floor
14411.520	V	0.0	24.0	41.5	14.0	29.5	50.0	54.0	-4.0	Pass	Noise Floor
16813.440	V	0.0	30.0	44.0	14.4	31.3	57.1	74.0	-16.9	Pass	Noise Floor
16813.440	V	0.0	24.5	44.0	14.4	31.3	51.6	54.0	-2.4	Pass	Noise Floor

Test Data - Radiated Emissions

Mid Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											Mid Channel
											2441.664 MHz
4883.328	H	0.0	33.0	33.2	10.6	28.0	48.8	74.0	-25.2	Pass	Noise Floor
4883.328	H	0.0	25.0	33.2	10.6	28.0	40.8	54.0	-13.2	Pass	Noise Floor
7324.992	H	0.0	33.0	36.6	9.7	28.5	50.8	74.0	-23.2	Pass	Noise Floor
7324.992	H	0.0	26.0	36.6	9.7	28.5	43.8	54.0	-10.2	Pass	Noise Floor
9766.656	H	0.0	31.0	38.2	11.3	27.9	52.6	74.0	-21.4	Pass	Noise Floor
9766.656	H	0.0	22.5	38.2	11.3	27.9	44.1	54.0	-9.9	Pass	Noise Floor
12208.320	H	0.0	31.0	39.2	13.7	30.1	53.8	74.0	-20.2	Pass	Noise Floor
12208.320	H	0.0	23.0	39.2	13.7	30.1	45.8	54.0	-8.2	Pass	Noise Floor
14649.984	H	0.0	33.0	41.5	14.0	29.5	59.0	74.0	-15.0	Pass	Noise Floor
14649.984	H	0.0	23.0	41.5	14.0	29.5	49.0	54.0	-5.0	Pass	Noise Floor
17091.648	H	0.0	32.0	44.0	14.4	31.3	59.1	74.0	-14.9	Pass	Noise Floor
17091.648	H	0.0	24.0	44.0	14.4	31.3	51.1	54.0	-2.9	Pass	Noise Floor
4883.328	V	0.0	33.0	33.2	10.6	28.0	48.8	74.0	-25.2	Pass	Noise Floor
4883.328	V	0.0	25.0	33.2	10.6	28.0	40.8	54.0	-13.2	Pass	Noise Floor
7324.992	V	0.0	33.0	36.6	9.7	28.5	50.8	74.0	-23.2	Pass	Noise Floor
7324.992	V	0.0	26.0	36.6	9.7	28.5	43.8	54.0	-10.2	Pass	Noise Floor
9766.656	V	0.0	31.0	38.2	11.3	27.9	52.6	74.0	-21.4	Pass	Noise Floor
9766.656	V	0.0	22.5	38.2	11.3	27.9	44.1	54.0	-9.9	Pass	Noise Floor
12208.320	V	0.0	31.0	39.2	13.7	30.1	53.8	74.0	-20.2	Pass	Noise Floor
12208.320	V	0.0	23.0	39.2	13.7	30.1	45.8	54.0	-8.2	Pass	Noise Floor
14649.984	V	0.0	33.0	41.5	14.0	29.5	59.0	74.0	-15.0	Pass	Noise Floor
14649.984	V	0.0	23.0	41.5	14.0	29.5	49.0	54.0	-5.0	Pass	Noise Floor
17091.648	V	0.0	32.0	44.0	14.4	31.3	59.1	74.0	-14.9	Pass	Noise Floor
17091.648	V	0.0	24.0	44.0	14.4	31.3	51.1	54.0	-2.9	Pass	Noise Floor

Test Data - Radiated Emissions

High Channel

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											TX Highest Channel
											2481.408 MHz
2483.500	H	0.0	23.1	23.7	5.6	0.0	52.4	74.0	-21.6	Pass	
2483.500	H	0.0	19.6	23.7	5.6	0.0	48.9	54.0	-5.1	Pass	
4962.816	H	0.0	37.8	33.2	10.6	28.0	53.6	74.0	-20.4	Pass	Noise floor
4962.816	H	0.0	27.0	33.2	10.6	28.0	42.8	54.0	-11.2	Pass	Noise floor
7444.224	H	0.0	35.0	36.6	9.7	28.5	52.8	74.0	-21.2	Pass	Noise floor
7444.224	H	0.0	26.0	36.6	9.7	28.5	43.8	54.0	-10.2	Pass	Noise floor
9925.632	H	0.0	30.0	38.2	11.3	27.9	51.6	74.0	-22.4	Pass	Noise floor
9925.632	H	0.0	23.0	38.2	11.3	27.9	44.6	54.0	-9.4	Pass	Noise floor
12407.040	H	0.0	31.0	39.2	13.7	30.1	53.8	74.0	-20.2	Pass	Noise floor
12407.040	H	0.0	22.9	39.2	13.7	30.1	45.7	54.0	-8.3	Pass	Noise floor
14888.448	H	0.0	30.0	41.5	14.0	29.5	56.0	74.0	-18.0	Pass	Noise floor
14888.448	H	0.0	24.0	41.5	14.0	29.5	50.0	54.0	-4.0	Pass	Noise floor
17369.856	H	0.0	31.0	44	14.4	31.3	58.1	74.0	-15.9	Pass	Noise floor
17369.856	H	0.0	25.0	44	14.4	31.3	52.1	54.0	-1.9	Pass	Noise floor
2483.5	V	0	24.3	23.7	5.6	0.0	53.6	74.0	-20.4	Pass	
2483.5	V	0	19.3	23.7	5.6	0.0	48.6	54.0	-5.4	Pass	
4962.816	V	0	37.8	33.2	10.6	28.0	53.6	74.0	-20.4	Pass	Noise floor
4962.816	V	0	27	33.2	10.6	28.0	42.8	54.0	-11.2	Pass	Noise floor
7444.224	V	0	35	36.6	9.7	28.5	52.8	74.0	-21.2	Pass	Noise floor
7444.224	V	0	26	36.6	9.7	28.5	43.8	54.0	-10.2	Pass	Noise floor
9925.632	V	0	30	38.2	11.3	27.9	51.6	74.0	-22.4	Pass	Noise floor
9925.632	V	0	23	38.2	11.3	27.9	44.6	54.0	-9.4	Pass	Noise floor
12407.04	V	0	31	39.2	13.7	30.1	53.8	74.0	-20.2	Pass	Noise floor
12407.04	V	0	22.9	39.2	13.7	30.1	45.7	54.0	-8.3	Pass	Noise floor
14888.448	V	0	30	41.5	14.0	29.5	56.0	74.0	-18.0	Pass	Noise floor
14888.448	V	0	24	41.5	14.0	29.5	50.0	54.0	-4.0	Pass	Noise floor
17369.856	V	0	31	44	14.4	31.3	58.1	74.0	-15.9	Pass	Noise floor
17369.856	V	0	25	44	14.4	31.3	52.1	54.0	-1.9	Pass	Noise floor

Section 4. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Last Cal	Next Cal
752	Antenna, DRWG	EMCO	3115	19-Feb-2014	19-Feb-2015
902	pre amp	Sonoma	310 N	08-Aug-2014	08-Aug-2015
911	Spectrum Analyzer	Agilent	E4440A	21-Jan-2014	21-Jan-2015
E1029	Preamplifier (20MHz to 18GHz)	A.H. Systems, Inc.	PAM-0118	12-Aug-2014	12-Aug-2015
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	15-Jul-2013	15-Jul-2015
1763	Antenna, Bilog	Schaffner	CBL 6111D	13-May-2014	13-May-2015

Section 5. Measurement Uncertainty

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

Conducted and Radiated Emissions Measurement Detection Systems	Applicable Frequency Range	"U" for a k=2 Coverage Factor
Spectrum Analyzer and LISN	100 kHz – 30 MHz	+/-2.8 dB
Spectrum Analyzer and Telecom ISN	100 kHz – 30 MHz	+/-1.38dB
Spectrum Analyzer, Pre-amp, and Antenna	30 MHz-200 MHz	+/-3.9 dB
Spectrum Analyzer, Pre-amp, and Antenna	200 MHz-1000 MHz	+/- 3.5 dB
Spectrum Analyzer, Pre-amp, and Antenna	1 GHz - 18 GHz	+/-2.6 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

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FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: XCVR6K1

PROJECT NO.: 2015_277187_FCC_15247

ANNEX A - TEST DETAILS

NAME OF TEST: Radiated Spurious Emissions	PARA. NO.: 15.247(d) RSS-Gen 8.10
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Minimum Standard: Emissions falling in the restricted bands shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (µV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

Nemko USA, Inc.

FCC PART 15, SUBPART C and
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FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: XCVR6K1

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ANNEX B - TEST DIAGRAMS

Test Site For Radiated Emissions

