



**Nemko USA, Inc.**  
2210 Faraday Avenue, Suite 150  
Carlsbad, CA 92008  
Phone (760) 444-3500 Fax (760) 444-3005

## CERTIFICATION TEST REPORT

Report Number: 2012 05208168 FCC

Project Number: 208168

Nex Number: 208168

Applicant: RESIDENTIAL CONTROL SYSTEMS  
11481 SUNRISE GOLD CIRCLE, STE 1  
Rancho Cordova, CA 95742

Equipment Under Test (EUT): WIRELESS THERMOSTAT

Model: TBZ48

IC: 9374A-TBZ48  
FCC ID: WIBTZW011

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.  
2210 Faraday Avenue, Suite 150  
Carlsbad, CA 92008

Date: MONTH 29, 2012

Total Number of Pages: 41

### Applicant Affirmation

Michael Hoffman representing Residential Control Systems hereby affirms:

- a) That he/she has reviewed and concurs that the test shown in this report are reflective of the operational characteristics of the device for which certification is sought;
- b) That the device in this test report will be representative of production units;
- c) That all changes (in hardware and software/firmware) to the subject device will be reviewed.
- d) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving (certifying) the subject equipment.

www.nemko.com

Michael Hoffman



Printed name of official

Signature of official

11481 Sunrise Gold Circle, Ste 1

Month 29, 2012

Address

Date

858-486-2331

mhoffman@rcstechnology.com

Telephone number

Email address of official

*NOTE—This affirmation must be signed by the responsible party before it is submitted to a regulatory body for approval.*

## 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:	Wireless Thermostat
Model:	TBZ48
Specification:	FCC Part 15 Subpart C, 15.249 IC RSS-210 Issue 8 December 2010
Date Received in Laboratory:	May 24, 2012
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None

## 1.2 Report Release History

Revision	Date	Comments
-	Month 29, 2012	Prepared By: Andreas Gillmeier
-	Month 29, 2012	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: Month 29, 2012  
ANDREAS GILLMEIER, EMC Test Engineer

www.nemko.com

## TABLE OF CONTENTS

Applicant Affirmation.....	2
Section 1: Summary of Test Results .....	3
1.1 General .....	3
1.2 Report Release History.....	4
Section 2: Equipment Under Test.....	6
2.1 Product Identification .....	6
2.2 Theory of Operation.....	6
2.3 Technical Specifications of the EUT.....	6
2.5 Device Interconnection and I/O Cables.....	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.....	17
Maximum Field Strength and Radiated Emissions .....	19
Spurious Radiated Emissions < 1000 MHz .....	21
Receiver Spurious Radiated Emissions.....	25

www.nemko.com



## Section 2: Equipment Under Test

### 2.1 Product Identification

The Equipment Under Test was identified as follows:

Residential Control Systems TBZ48 Wireless Thermostat

### 2.2 Theory of Operation

The KM2M-800 is an Access Point Radio. Machine-to-machine connected computing is accelerating as OEMs launch smart services that utilize cloud computing to communicate and aggregate data. Its function is to providing connected computing M2M intelligent devices. The Zigbee Radio was tested with modulation equivalent to actual use.

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 Technical Specifications of the EUT

Manufacturer:	Residential Control Systems
Operating Frequency:	908.42 MHz in the 902-928 MHz Band
Number of Operating Frequencies:	1
Rated Power:	46 mV/m at 3m
Modulation:	FSK (test modulation)
Reference Designator:	97KF1D
Antenna Connector:	N/A
Power Source:	24V AC and 3V batteries



### 2.4 System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Wireless Thermostat	Residential Control Systems Model: TBZ48 Serial #: Prototyp	AC 24V from external power source or DC 3V from batteries
Support – Power Supply		AC output: 1.5m, unshielded, 18 AWG, 2-wire, 2.5mm barrel connector

www.nemko.com

### 2.5 Device Interconnection and I/O Cables

Connection	I/O Cable
AC power 24V	1m, unshielded, 18 AWG, 2-wire, 2.5mm barrel connector
Y2, Y1, G, 24RC, 24C, 24RH, W1, W2/O	1.5m, unshielded, 18 AWG, 1 wire each, unterminated



## Section 3: Test Conditions

### 3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.249 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
E1018	9kHz to 7GHz Spectrum Analyzer	Rohde & Schwarz	FSP7	835363/0003	2/23/2012	2/23/2013
E1020	Two Line V-Network	Rohde & Schwarz	ENV216	101044	4/4/2011	4/4/2012
110	Antenna, LPA	Electrometrics	LPA-25	1217	4/1/2011	4/1/2013
128	Antenna, Bicon	EMCO	3104	2882	3/21/2011	3/21/2013
E1029	Preamplifier (20MHz to 18GHz)	A.H. Systems, Inc.	PAM-0118	343	2/21/2012	2/21/2013
752	Antenna, DRG Horn, .7-18GHz	EMCO	3115	4943	12/2/2010	12/2/2012
901	pre amp	Sonoma	310 N	130607	10/27/2011	10/27/2012
911	Spectrum Analyzer	Agilent	E4440A	US41421266	10/27/2011	10/27/2012
NA	Regulating Transformer	TDGC	0-250 Vac	NA	NCR	NCR
813	Multimeter	Fluke	111	78130060	9/26/2011	9/26/2012

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



## 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 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	Y	Pass
15.215(c)	RSS-Gen 4.6.1	20 dB & 99% Bandwidth	Y	Pass
15.249(a)(e)	RSS 210 A2.9	Maximum Field Strength	Y	Pass
15.249(a)	RSS 210 A2.9	Band-edge Compliance of RF Conducted Emissions	Y	Pass
15.249(a)(d)	RSS 210 A2.9	Spurious Radiated Emissions	Y	Pass
15.249(b)(1)		Point to Point Operation	N	NA
15.249(b)(2)		Frequency Tolerance	N	NA
	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  $\mu$ 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 $\mu$ 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.

www.nemko.com

### Test Conditions:

Sample Number:	TBZ48	Temperature:	21°C
Date:	May 24, 2012	Humidity:	50 %
Modification State:		Tester:	Mark Phillips
		Laboratory:	Ground Plane 3

Test Results: EUT complies

See attached plots

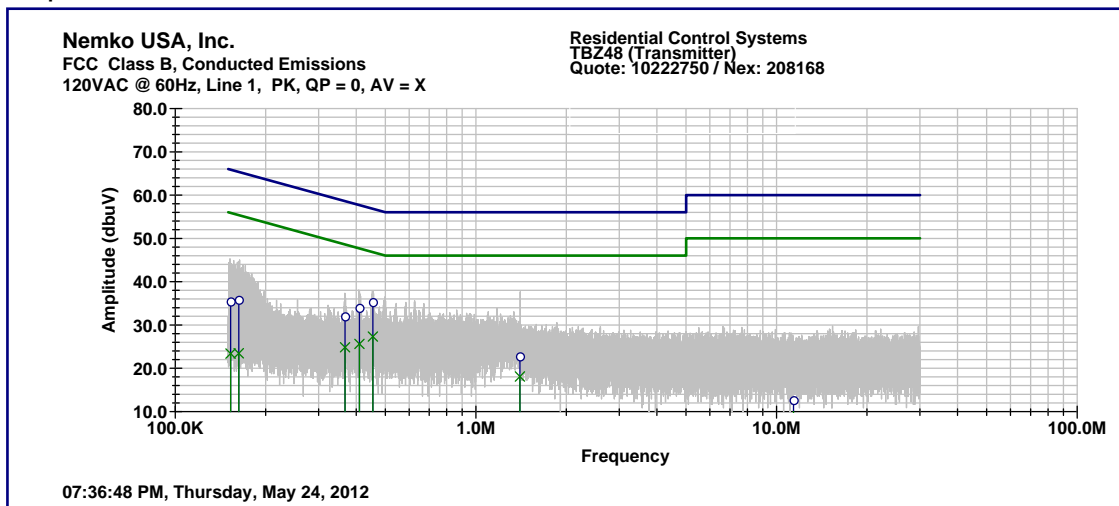
### Additional Observations:

- EUT was tested using the following modes: Transmit and Receive Test Mode.
- Green limit line is Average limit and blue limit line is Quasi-peak limit.
- 0 represents final quasi peak measurements while x represent final average measurements.
- Instrumentation settings are 9kHz RBW/30kHz VBW for Average measurements and 100kHz RBW/100kHz VBW for Peak measurements.



Transmit

Graphical Data

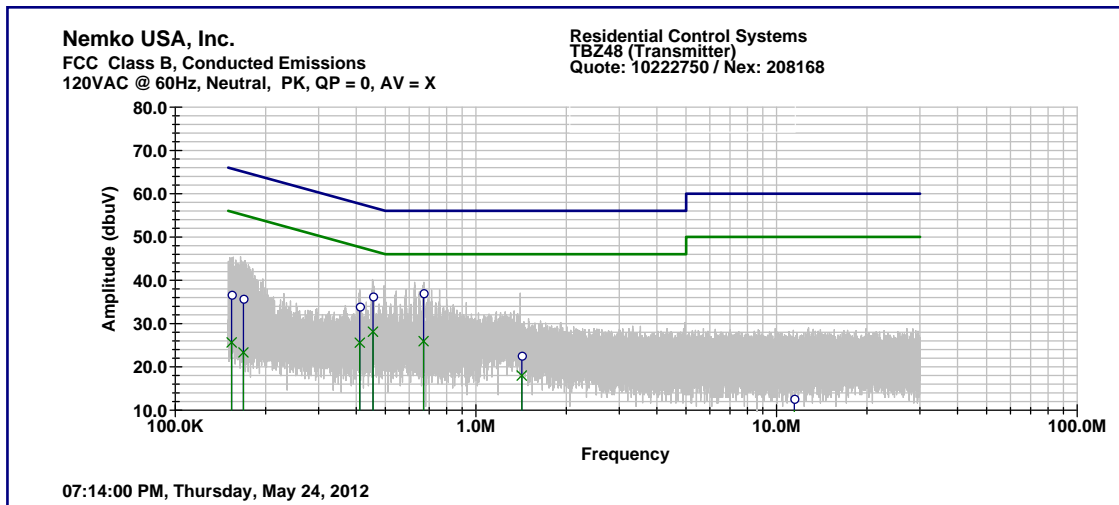


Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
152.769	35.4	23.4	83.8	73.8	-48.4	-50.4
162.668	35.8	23.4	83.3	73.3	-47.5	-49.9
366.981	32.0	24.8	76.6	66.6	-44.6	-41.8
409.903	33.9	25.6	75.7	65.7	-41.8	-40.1
454.403	35.3	27.3	74.8	64.8	-39.5	-37.5
1400.530	22.7	18.1	74.0	64.0	-51.3	-45.9
11383.900	12.6	7.5	74.0	64.0	-61.4	-56.5

www.nemko.com

Graphical Data



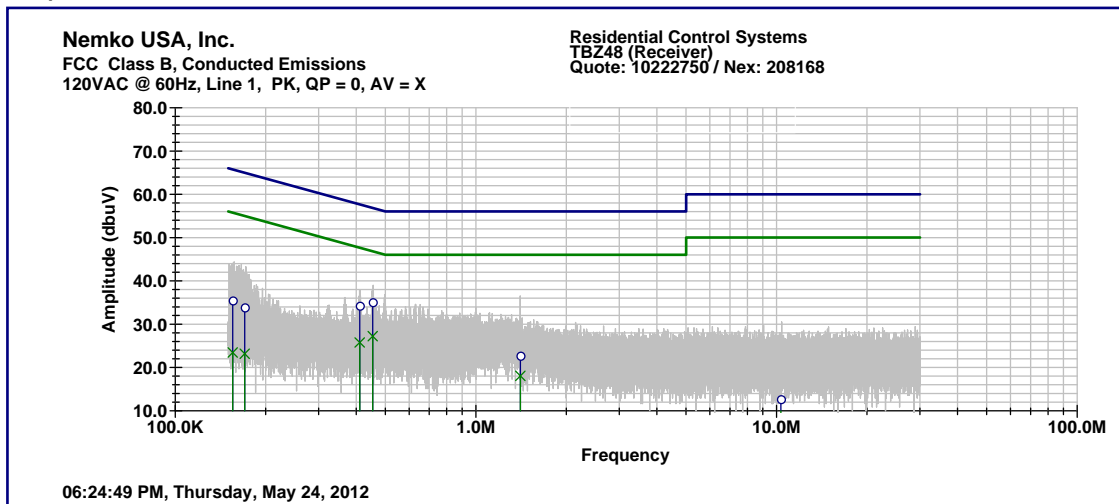
Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
154.035	36.7	25.6	83.8	73.8	-47.1	-48.2
168.614	35.7	23.3	83.0	73.0	-47.3	-49.7
410.911	33.9	25.6	75.6	65.6	-41.7	-40.0
454.503	36.3	28.1	74.8	64.8	-38.5	-36.7
669.938	37.0	25.9	74.0	64.0	-37.0	-38.1
1419.950	22.6	18.0	74.0	64.0	-51.4	-46.0
11443.600	12.6	7.5	74.0	64.0	-61.4	-56.5

www.nemko.com

Receiver

Graphical Data

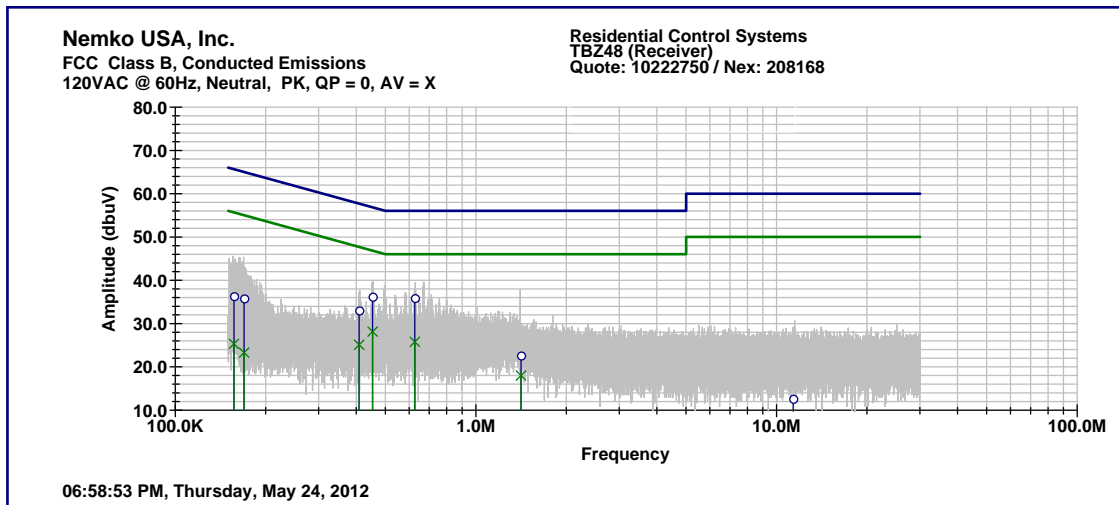


Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
155.252	35.5	23.4	83.7	73.7	-48.2	-50.3
170.241	33.9	23.1	82.9	72.9	-49.0	-49.8
410.612	34.3	25.7	75.6	65.6	-41.3	-39.9
453.818	35.1	27.2	74.8	64.8	-39.7	-37.6
1404.840	22.7	18.0	74.0	64.0	-51.3	-46.0
10326.600	12.7	7.5	74.0	64.0	-61.3	-56.5

www.nemko.com

Graphical Data



Tableted Data

Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
156.820	36.3	25.3	83.6	73.6	-47.3	-48.3
169.479	35.8	23.3	83.0	73.0	-47.2	-49.7
408.934	33.0	25.1	75.7	65.7	-42.7	-40.6
453.431	36.2	28.1	74.8	64.8	-38.6	-36.7
626.360	35.9	25.8	74.0	64.0	-38.1	-38.2
1412.200	22.6	18.0	74.0	64.0	-51.4	-46.0
11352.400	12.6	7.4	74.0	64.0	-61.4	-56.6

www.nemko.com





### 20 dB / 99% Bandwidth

15.215(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.

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. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

www.nemko.com

### Test Conditions:

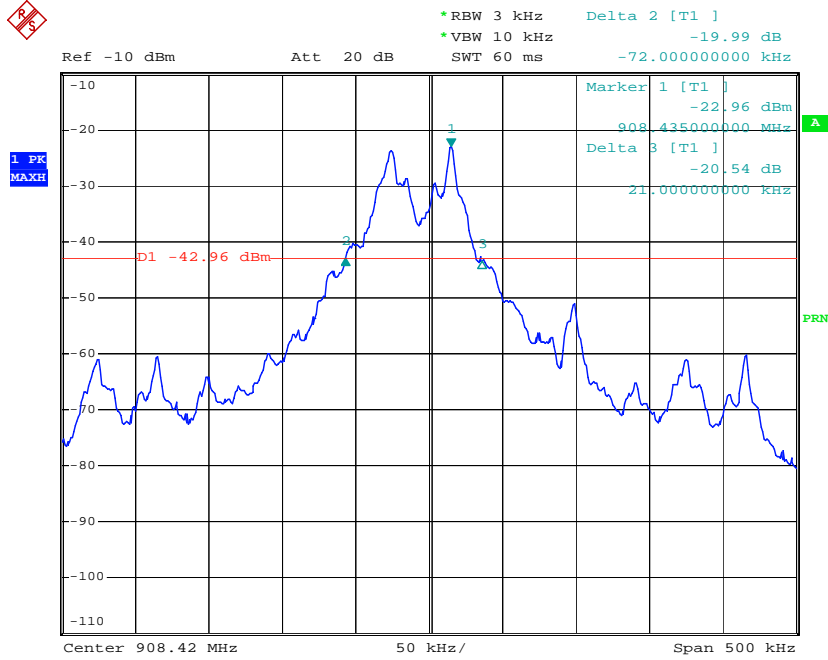
Sample Number:	TBZ48	Temperature:	21°C
Date:	May 24, 2012	Humidity:	50 %
Modification State:	Transmit Modulated	Tester:	Andreas Gillmeier
		Laboratory:	10m chamber

Test Results: See attached plots.

20 dB BW = 72 kHz  
99% BW = 97 kHz

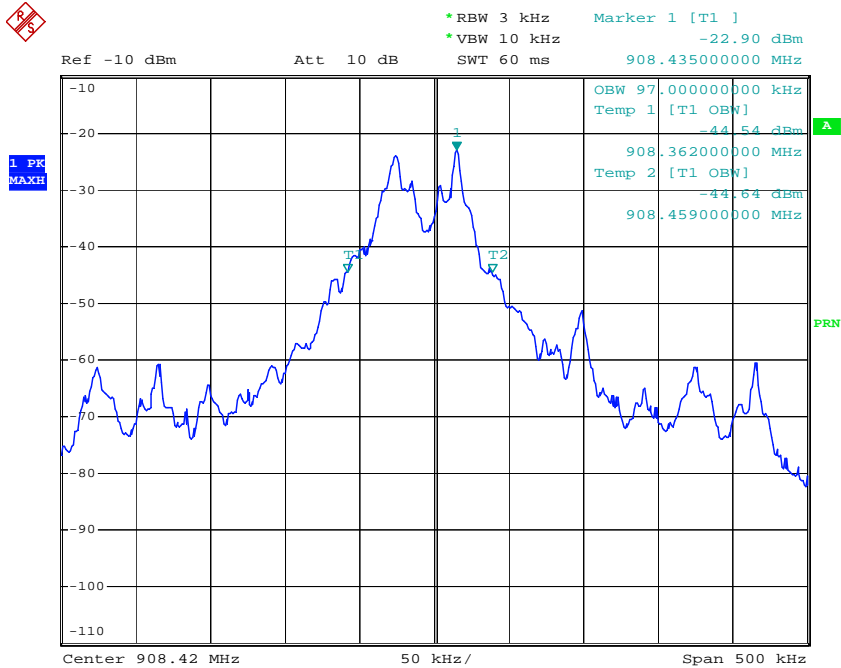


**20 dB Band Width**



Date: 1.JAN.1997 00:17:44

**99% band width**



Date: 1.JAN.1997 00:19:51

## Maximum Field Strength and Radiated Emissions

15.249(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Fundamental frequency (MHz)	Field strength of fundamental (mV/meter)	Field strength of harmonics (uV/meter)
<b>902-928</b>	<b>50</b>	<b>500</b>
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Clause 15.249(d) 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 radiated emission limits in Sec. 15.209, whichever is the lesser attenuation.

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:	TBZ48	Temperature:	21°C
Date:	May 24, 2012	Humidity:	50 %
Modification State:	Transmit Modulated	Tester:	Andreas Gillmeier
		Laboratory:	10m chamber

### Test Results:

See Table. EUT complies for fundamental power, band edges and spurious emissions.

### Additional Observations:

The Spectrum was searched from 30MHz to the 10<sup>th</sup> Harmonic (9280 MHz).

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. Average measurements above 1GHz were done utilizing RBW of 1MHz and VBW of 10Hz as the duty cycle was 100%.

Measurements made in the semi-anechoic chamber, 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. And the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. The peak field strength emission passes when measured at max hold RBW of 1 MHz with 3 MHz VBW. The Fundamental was also measured with a Quasi-Peak detector as it was less than 1000



No other emissions found within 20 dB of the limits.  
EUT when powered by 24 VAC source read higher power, so harmonic spurious was recorded when powered by 24 VAC source.

Radiated Emissions Data												
Job # :	10222750		Date :	May 24, 12		Page	1		of		1	
NEX#:	208168		Time :	11:30								
			Staff :	AG								
Client Name :	RCS					EUT Voltage :	120V					
EUT Name :	Wireless Thermostat					EUT Frequency :	60 Hz					
EUT Model # :	TZB48					Phase:	1					
EUT Serial # :	Prototype											
EUT Config. :	continuous modulated transmit 908.42 MHz											
						Distance < 1000 MHz:	3 m					
						Distance > 1000 MHz:	3 m					
Specification :	FCC Part 15C 15.249											
Loop Ant. # :	NA											
Bicon Ant.#:	128_3m		Temp. (°C) :	21								
Log Ant.#:	110_3m		Humidity (%) :	50								
DRG Ant. # :	752		Spec Analyzer #:	911								
Cable LF#:	SAC_10m		Analyzer Display #:	911								
Cable HF#:	WCC		Quasi-Peak Detector #:	911								
Preamp LF#:	N/A											
Preamp HF#:	E1029											
						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 DEG	Ant. Height cm	Max. Reading (dBµV)	Corrected Reading (dBµV)	Spec. limit (dBµV)	CR/SL Diff. (dB)	Pass Fail	Comment	
908.4	63.4	64.3	P	345.0	100.0	64.3	93.9	114.0	-20.1	Pass	24V AC	
908.4	63.2	63.8	Q	345.0	100.0	63.75	93.3	94.0	-0.6	Pass	24V AC	
908.4	61.2	61.8	A	345.0	100.0	61.8	91.4	94.0	-2.6	Pass	24V AC	
908.4	63.0	63.9	P	345.0	100.0	63.9	93.5	114.0	-20.5	Pass	3V battery DC	
908.4	62.8	63.6	Q	345.0	100.0	63.6	93.2	94.0	-0.8	Pass	3V battery DC	
908.4	60.8	61.7	A	345.0	100.0	61.7	91.3	94.0	-2.7	Pass	3V battery DC	
902.0	8.8	8.8	Q	345.0	100.0	8.8	38.4	46.0	-7.6	Pass	24V AC	
928.0	8.7	8.7	Q	345.0	100.0	8.7	38.4	46.0	-7.6	Pass	24V AC	
1816.8	48.3	47.8	P	303.0	100.0	48.3	38.2	74.0	-35.8	Pass	24V AC	
1816.8	43.6	42.5	A	303.0	100.0	43.6	33.5	54.0	-20.5	Pass	24V AC	
2725.2	48.2	45.3	P	60.0	100.0	48.2	42.5	74.0	-31.5	Pass	24V AC	
2725.2	42.2	37.5	A	60.0	100.0	42.2	36.5	54.0	-17.5	Pass	24V AC	

Spurious Radiated Emissions < 1000 MHz

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.

FCC 15.249 (a). Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Field Strength of fundamental (microvolts/m at 3 metres)*	Field Strength of harmonics (microvolts/m at 3 metres)*
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

(d) 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 radiated emission limits in Sec. 15.209, whichever is the lesser attenuation.

(e) As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

**Test Conditions:**

Sample Number:	TBZ48	Temperature:	21°C
Date:	May 24, 2012	Humidity:	50 %
Modification State:	Transmit Modulated	Tester:	Andreas Gillmeier
		Laboratory:	10m chamber

**Test Results:**

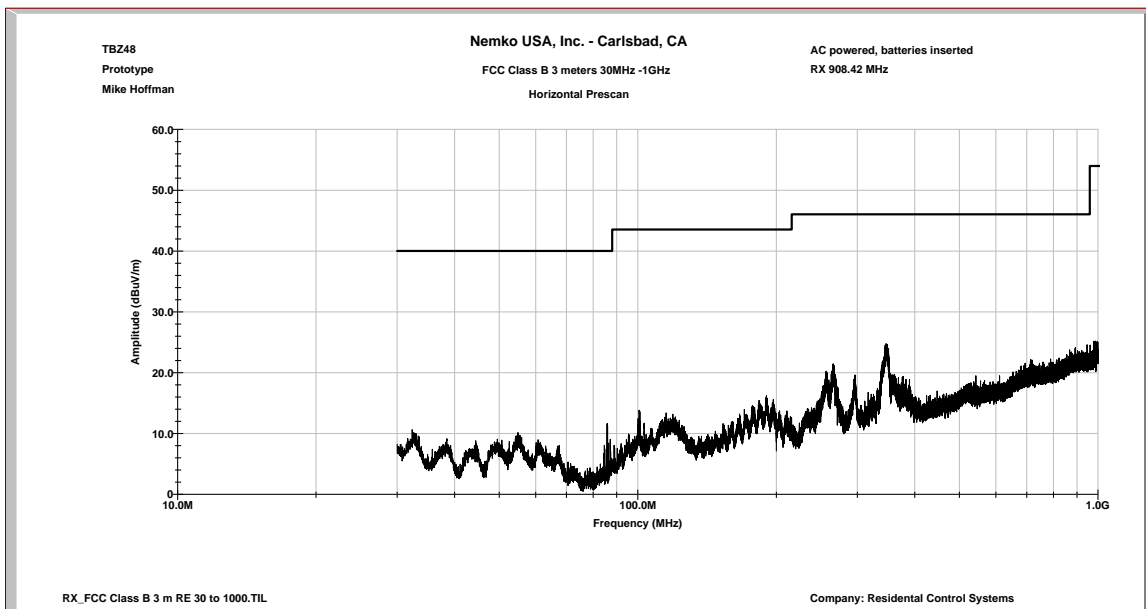
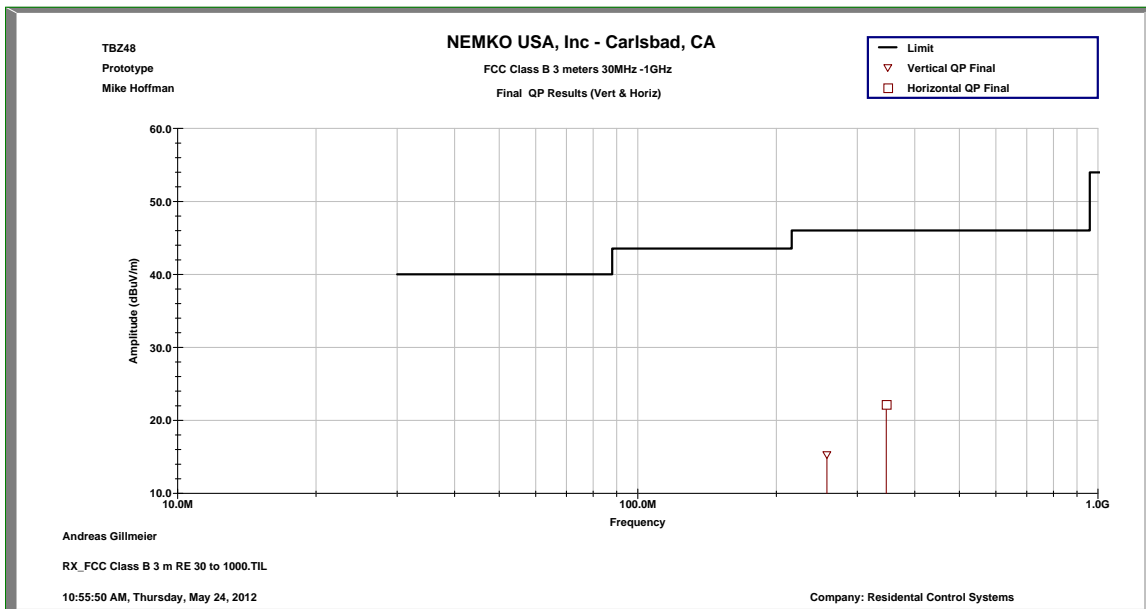
EUT complies.

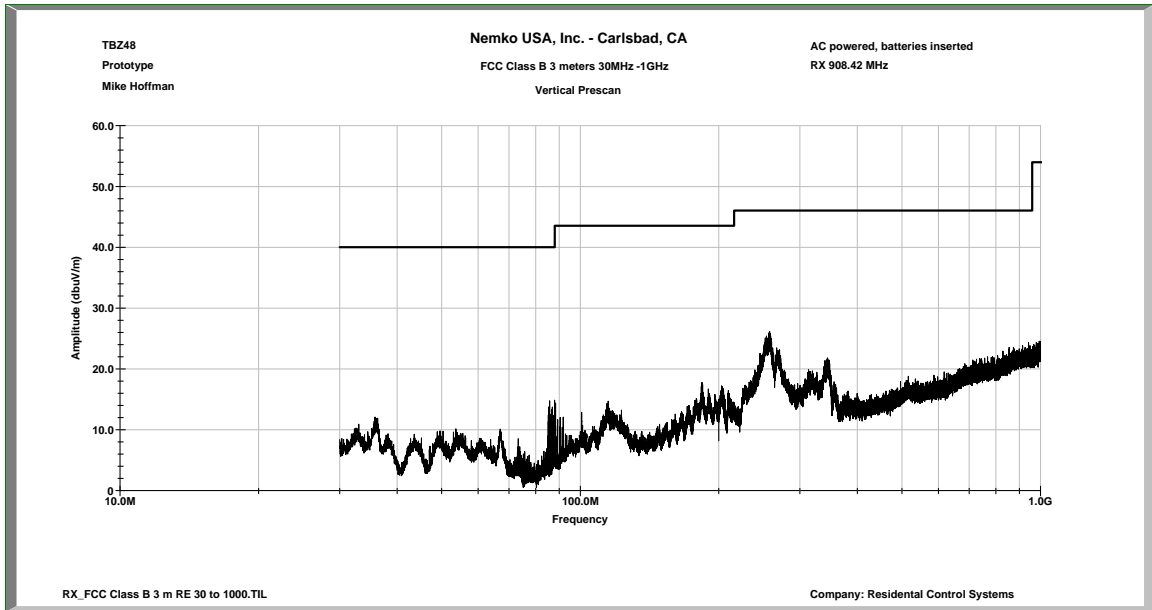
- Emissions were searched from 30MHz to 10000 MHz
- No other emissions within 20 dB of the limit were detected.
- Distance from EUT to receiving antenna 3m.
- Max hold, RBW 120 kHz below 1 GHz, 1 MHz above 1 GHz. VBW > RBW.





www.nemko.com





www.nemko.com





## Receiver Spurious Radiated 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 meters, in accordance with Section 7.2.7.

www.nemko.com

### Test Conditions:

Sample Number:	TBZ48	Temperature:	21°C
Date:	May 24, 2012	Humidity:	50 %
Modification State:	Receive	Tester:	Andreas Gillmeier
		Laboratory:	10m chamber

### Test Results:

No other emissions found within 20 dB of the limits.

### Additional Observations:

- The Spectrum was searched from 30MHz to 5000 MHz.
- Below 1GHz measurements are measured using CISPR quasi-peak detector while above 1GHz are measured using average detector with 1MHz RBW.
- No emissions within 20 dB of the limit were detected.
- Distance from EUT to receiving antenna 3m.

