



## TEST REPORT

Report Number: 3179664MIN-001

Project Number: 3179664

Testing performed on the  
Marvel Remote Control

FCC ID: Q4F-4290

Industry Canada ID: 4615A-4290

to

47 CFR Part 15. 231:2008

RSS- 210, Issue 7, 2007

47 CFR, Part 15.109:2007, Class B

ICES 003, Issue 4, 2004

For

Truth Hardware

Test Performed by:  
Intertek Testing Services NA, Inc.  
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Oakdale, MN 55128

Test Authorized by:  
Truth Hardware  
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Date: May 5, 2009

Reviewed by: U. Spector  
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Date: May 5, 2009

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**TABLE OF CONTENTS**

**1.0 DESCRIPTION OF THE SAMPLE (EUT) ..... 3**

1.1 Product Description; Test Facility ..... 4

1.3 Environmental conditions..... 5

1.4 Measurement uncertainty ..... 6

1.5 Field Strength Calculation..... 6

**3.0 TEST CONDITIONS AND RESULTS..... 8**

3.1 Transmitter deactivation time..... 8

3.4 Digital device radiated emissions ..... 15

3.5 Digital device conducted emissions..... 20

**4.0 TEST EQUIPMENT..... 21**

## 1.0 DESCRIPTION OF THE SAMPLE (EUT)

<b>Model:</b>	Marvel
<b>Type of EUT:</b>	Remote Transmitter
<b>Serial Number:</b>	N/A
<b>FCC ID:</b>	Q4F-4290
<b>Industry Canada ID:</b>	4615A-4290
<b>Related Submittal(s) Grants:</b>	N/A
<b>Company:</b>	Truth Hardware
<b>Customer:</b>	Mr. James Seaser
<b>Address:</b>	700 West Bridge Street Owatonna, MN 55060
<b>Phone:</b>	507-444-4549
<b>Fax:</b>	507-444-0401
<b>Test Standards:</b>	<input checked="" type="checkbox"/> 47 CFR, Part 15:2008, §15.231 <input checked="" type="checkbox"/> RSS-210, Issue 7, 2007 <input checked="" type="checkbox"/> RSS-Gen, Issue 2, 2007 <input checked="" type="checkbox"/> 47 CFR, Part 15:2007, §15.107 and §15.109, Class B <input type="checkbox"/> Other <span style="background-color: #cccccc; padding: 0 20px;"></span>
<b>Type of radio:</b>	<input checked="" type="checkbox"/> Stand -alone <input type="checkbox"/> Module <input type="checkbox"/> Hybrid
<b>Date Sample Submitted:</b>	February 4, 2009
<b>Test Work Started:</b>	February 5, 2009
<b>Test Work Completed:</b>	May 5, 2009
<b>Test Sample Conditions:</b>	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good



## 1.1 Product Description; Test Facility

Product Description:	Universal Remote Control
Operating Frequency	433.98 MHz
Modulation:	FSK
Emission Designator:	
Antenna(s) Info:	Antenna 1. Type <input type="text"/> Gain <input type="text"/> dBi Connector Type <input type="text"/> Antenna 2. Type <input type="text"/> Gain <input type="text"/> dBi Connector Type <input type="text"/>
Antenna Installation:	<input type="checkbox"/> User <input type="checkbox"/> Professional <input type="checkbox"/> Factory
Transmitter power configuration:	<input checked="" type="checkbox"/> Internal battery <input type="checkbox"/> External power source <input type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> 400VAC <input type="checkbox"/> <input type="text"/> VDC <input type="checkbox"/> Other: <input type="text"/> <input type="text"/> Amp. <input type="checkbox"/> 50Hz <input type="checkbox"/> 60Hz
Special Test Arrangement:	As a hand-held device the EUT was rotated through three orthogonal axes to determine and tested with the maximum emissions
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.4-2003

## 1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☐ - Standby
- ☐ - Continuous
- ☐ - Continuous un-modulated
- ☐ - Test program (customer specific)
- ☒ - See below

### Operating modes of the EUT:

No.	Description
1	The transmitter transmitted continuously.

### Cables:

No.	Type	Length	Designation	Note
1	none			
2				

### Support equipment/Services:

No.	Item	Description
1	none	
2		

### General notes:

## 1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☐ Normal

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

## 1.4 Measurement uncertainty

The expanded uncertainty ( $k = 2$ ) for radiated emissions from 30 to 1000 MHz has been determined to be:  $\pm 4$  dB at 10m and  $\pm 5.4$  dB at 3m

The expanded uncertainty ( $k = 2$ ) for conducted emissions from 150 kHz to 30 MHz has been determined to be:

$\pm 2.6$  dB

## 1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB( $\mu$ V/m)

RA = Receiver Amplitude in dB( $\mu$ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB( $m^{-1}$ )

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB( $\mu$ V) is obtained. The antenna factor of 7.4 dB( $m^{-1}$ ) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB( $\mu$ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

**General notes:**

## 2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.231(a) / RSS-210 A1.1.1(a)	Transmitter deactivation time	Pass
15.231(b) / RSS-210 A1.1.2	Transmitter field strength of emissions	Pass
15.231(c) / RSS-210 A1.1.3	Bandwidth of the emission	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	N/A
15.109/ICES-003	Digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	N/A

**Note:** The Marvel Remote Control Transmitter is battery operated device, therefore Line Conducted Emissions testing is inappropriate and therefore unnecessary.

### 3.0 TEST CONDITIONS AND RESULTS

#### 3.1 Transmitter deactivation time

**Maximum allowed deactivation time:** 5 sec

**Test result:** Pass

The transmitter transmitted continuously while the activation button was pressed. According to FCC Part 15.231(a)(1) a manually operated transmitter should stop transmitting within 5 sec after release the activation button. The transmitter was deactivates automatically less then 1 sec after releasing the activation button.

**Notes:**

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### 3.2 Transmitter field strength of emissions

**Test location:** ☐ OATS ☒ Anechoic Chamber ☐ Other

**Test distance:** ☐ 10 meters ☒ 3 meters

**Frequency range of measurements:** 30MHz-4500MHz

**Test result:** **Pass**

**Max. Emissions margin at fundamental:** 5.5 dB below the limits

**Max. margin of harmonics and spurious emissions:** 16.1 dB below the limits

**Notes:** None

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<b>Date:</b>	May 4-5, 2009, 2009	<b>Result: Pass</b>
<b>Standard:</b>	FCC Part 15. 231(b)	
<b>Tested by:</b>	Uri Spector	
<b>Operation mode:</b>	See page 6	
<b>Note:</b>	Field Strength of Fundamental and Spurious Emissions measurements were made at Fundamental frequency of 433.98MHz; Spurious Emissions were tested up to 4.5GHz (10 <sup>th</sup> harmonic).  The Table 1 shows the Field Strength of Fundamental Radiation. Table 2 shows Field Strength of Spurious Emissions.	

**Table # 1**

Frequency MHz	Antenna Polarity	Hts(cm)	Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Peak Reading dBμV	AVG CF dB	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
Emissions at Fundamental Frequency											
433.98	V	140	17.0	2.4	0.0	62.1	0.0	81.5	100.8	-19.3	1
433.98	H	200	17.0	2.4	0.0	59.2	0.0	78.6	100.8	-22.2	1
433.98	V	140	17.0	2.4	0.0	62.1	6.2	75.3	80.8	-5.5	2
433.98	H	200	17.0	2.4	0.0	59.2	6.2	72.4	80.8	-8.4	2

**Comments:**

1. Peak readings compared to Peak limits
2. Average value readings compared to Average limits

**Table # 2**

Frequency MHz	Antenna Polarity	Hts(cm)	Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Peak Reading dBμV	Total @ 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
Spurious and Harmonics Emissions										
1302.00	H	100	24.7	3.0	41.2	48.3	34.8	60.8	-26.0	
1302.00	V	100	24.7	3.0	41.2	58.2	44.7	60.8	-16.1	
1735.92	H	100	26.2	3.5	40.7	48.9	38.0	60.8	-22.8	1
1735.92	V	100	26.2	3.5	40.7	56.1	45.2	60.8	-15.6	1
2169.90	H	100	27.7	3.9	40.1	38.5	30.0	60.8	-30.8	1
2169.90	V	100	27.7	3.9	40.1	40.3	31.8	60.8	-29.0	1
2603.88	H	100	28.9	4.1	39.8	36.8	30.0	60.8	-30.8	1
2603.88	V	100	28.9	4.1	39.8	38.8	32.0	60.8	-28.8	1
3905.82	H	100	32.4	4.4	40.1	37.0	33.7	60.8	-27.1	
3905.82	V	100	32.4	4.4	40.1	38.3	35.0	60.8	-25.8	

**Comments** 1. Frequency outside of restricted band of operation per 15.205

### 3.2.1 Average correction factor calculation

#### Calculation of the Average Value Factor:

Average Factor=  $20\text{Log}(\text{On air/Pulse Train})=20\text{Log}(28*0.96)+(28*0.48)/100.0=20\text{Log}0.488=-6.23 \text{ dB}$

Pulse train=100.0 msec (see Graph 1)

“Wide pulses”: 28 each of 0.96 msec

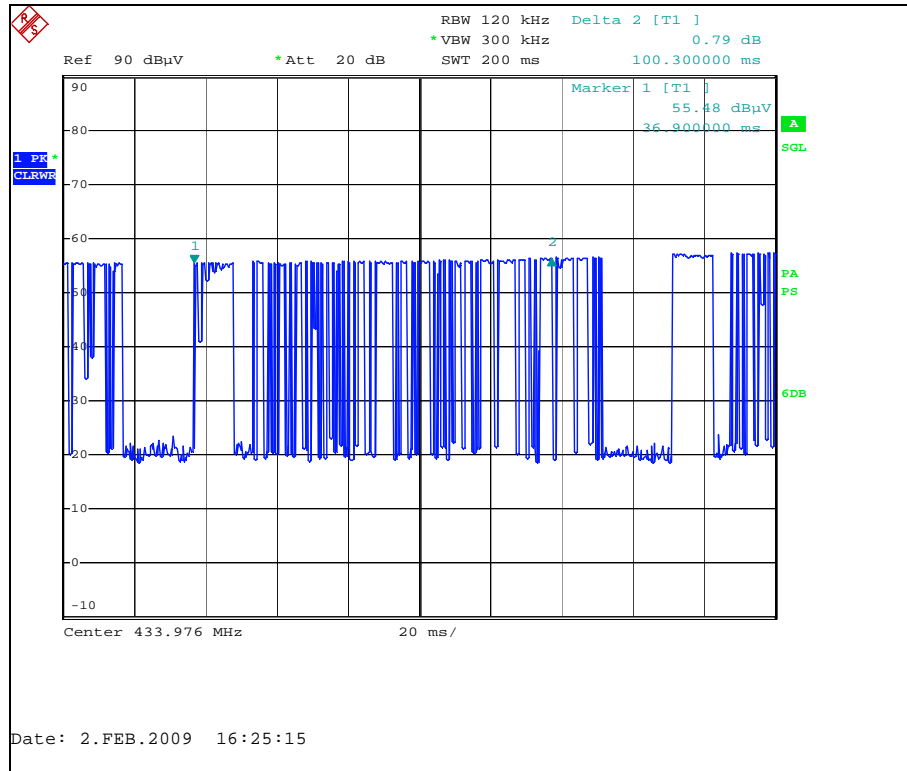
“Narrow pulses”: 28 each of 0.48msec

See Graphs 1 and 2 for details

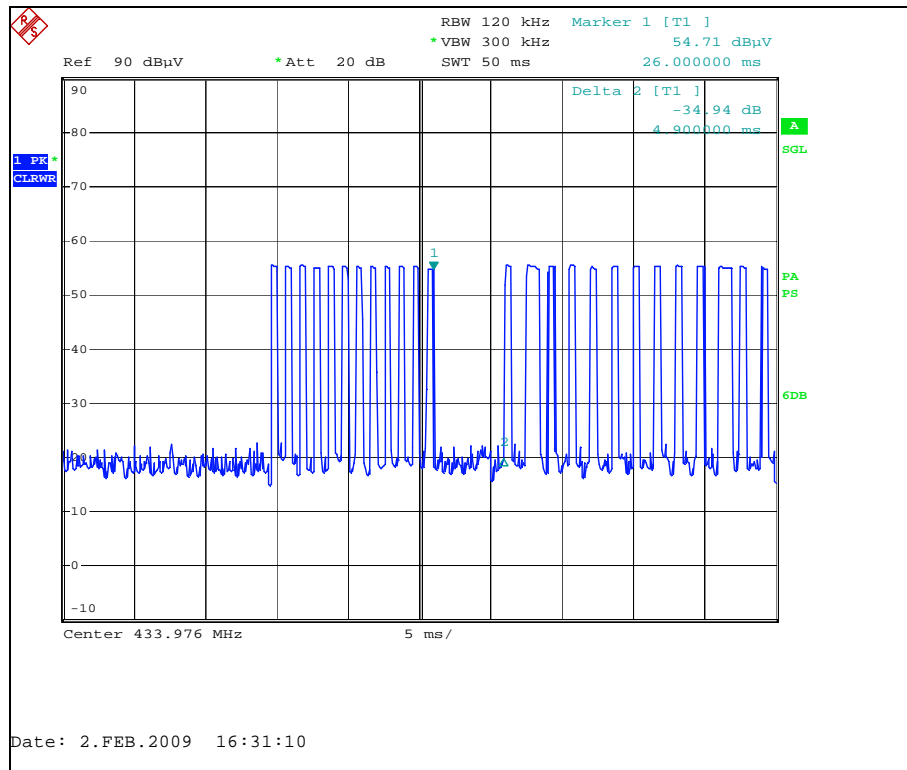
**Notes:**       None

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Graph 1



Graph 2

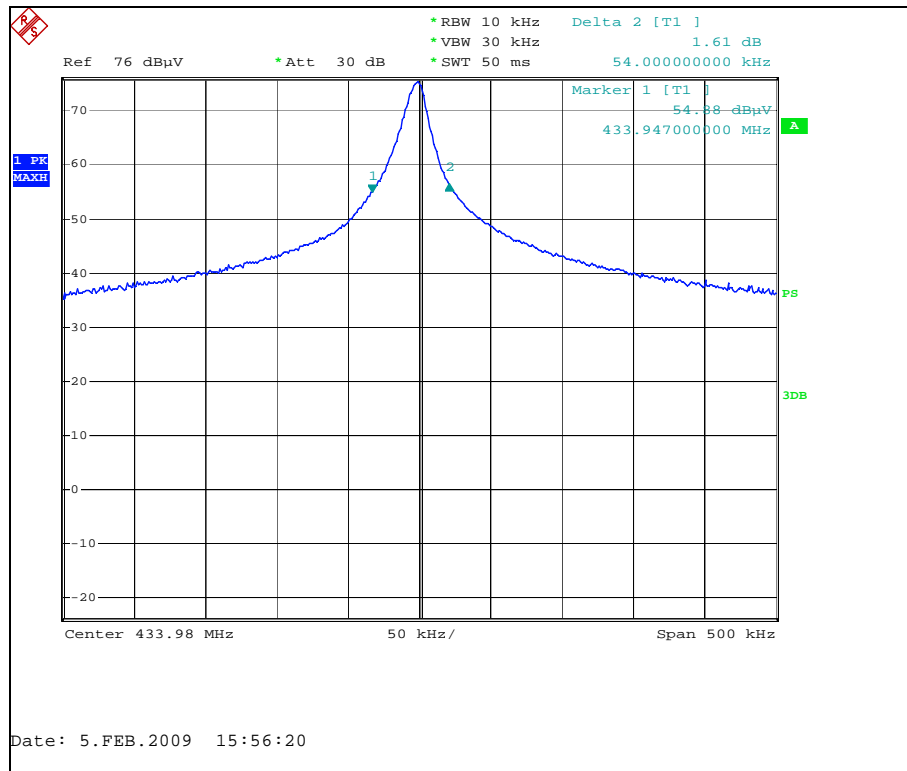


### 3.3 Bandwidth of Emissions

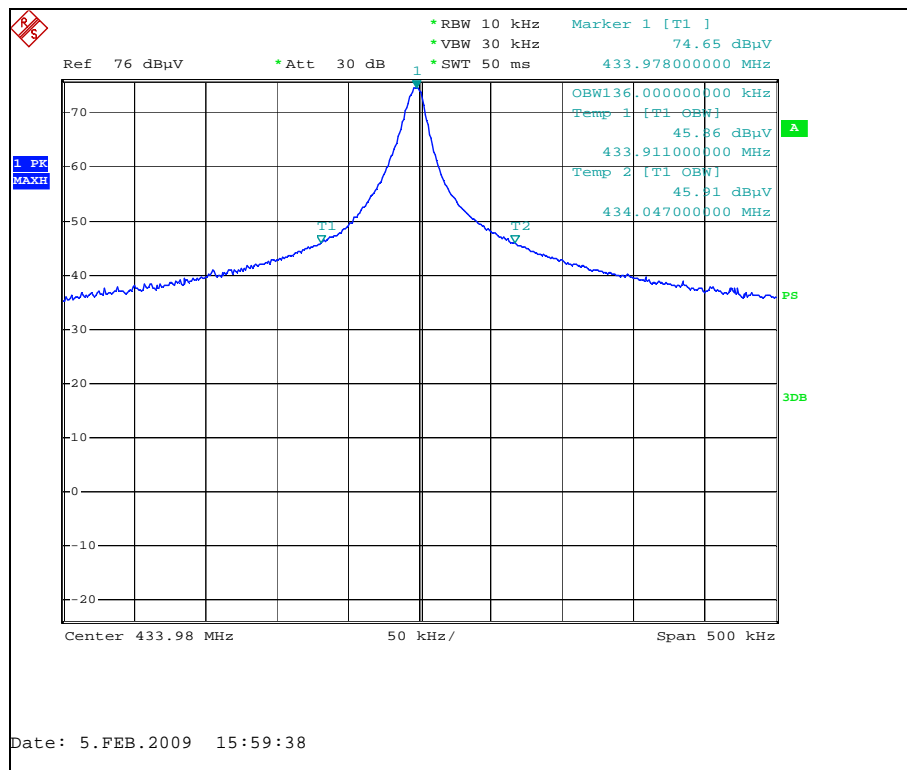
Center Frequency of operation MHz	Maximum allowed bandwidth kHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz	Result
433.98	1085	54	136	Pass
Maximum allowed bandwidth:	<input checked="" type="checkbox"/> 0.25% of the centre operating frequency <input type="checkbox"/> 0.5% of the centre operating frequency			
RBW:	<input checked="" type="checkbox"/> 10kHz	<input type="checkbox"/> 100kHz	<input type="checkbox"/> other	kHz
VBW:	<input checked="" type="checkbox"/> 30kHz	<input type="checkbox"/> 300kHz	<input type="checkbox"/> other	kHz

**Notes:** The Graph 1 shows the Bandwidth of Emissions at –20dB level.  
The Graph 2 shows the Bandwidth of Emissions at 99% power.

Graph 1



Graph 2



### 3.4 Digital device radiated emissions

#### Description of the test location

**Test location:** ☐ OATS ☒ Anechoric Chamber

**Test distance:** ☐ 10 meters ☒ 3 meters

**Test result:** **Pass**

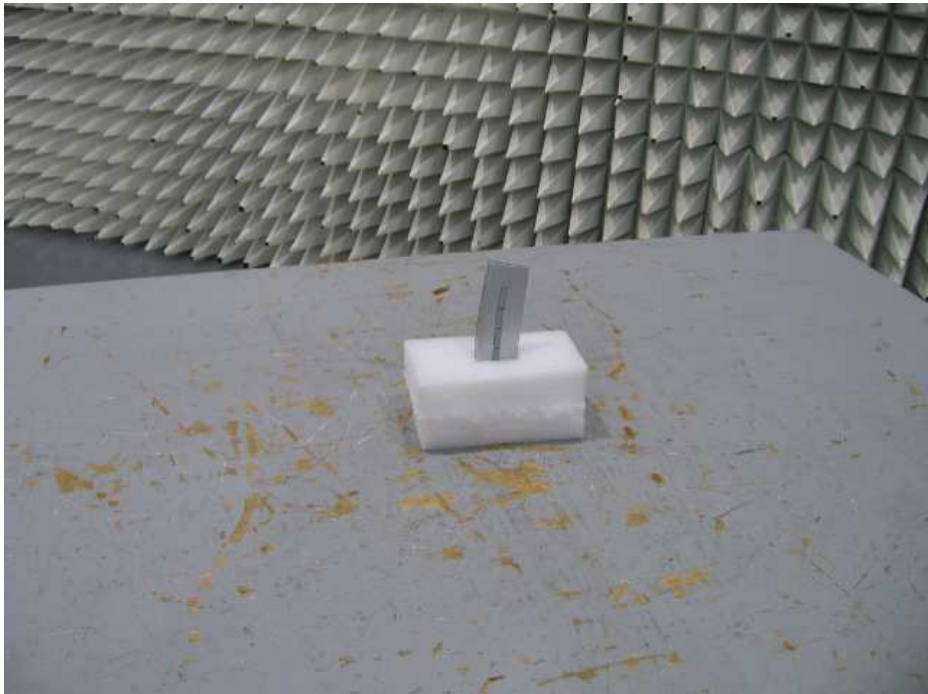
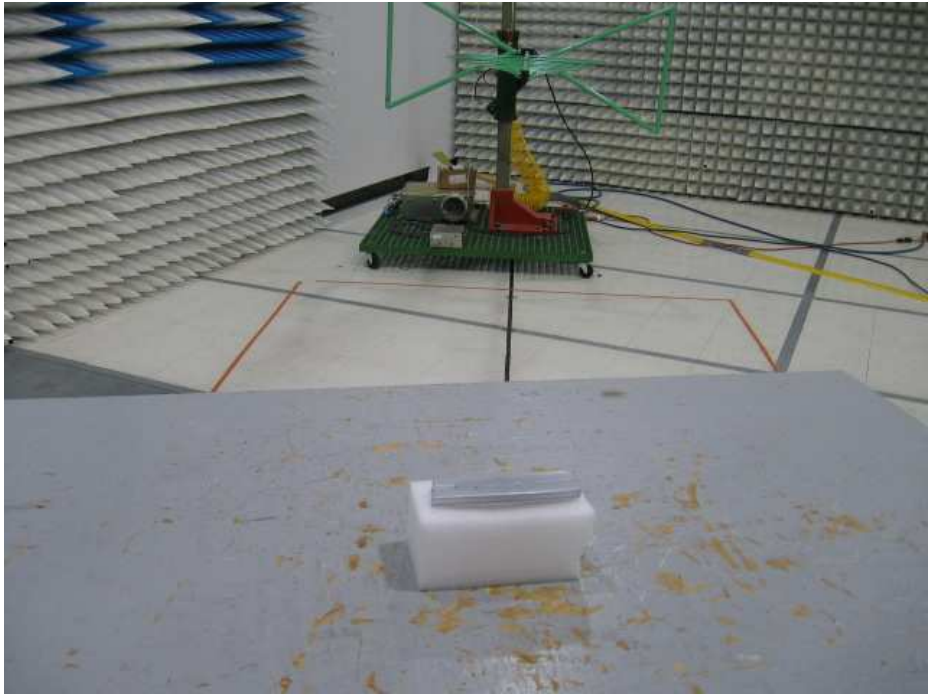
**Frequency range:** 30MHz-2000MHz

**Max. Emissions margin:** 5.9 dB below the limit

**Notes:** The EUT (Marvel Remote Control) as a digital device was tested according to FCC Part 15.109, Class B in frequency range from 30MHz to 2GHz; emissions at transmitter fundamental frequency and 2<sup>nd</sup> harmonic were excluded from the Table. No emissions were detected above 1GHz (See Graphs 5 and 6).

The Marvel Remote Control is battery operated device, therefore Line Conducted Emissions testing is inappropriate and therefore unnecessary.

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**Test Setup Photos**

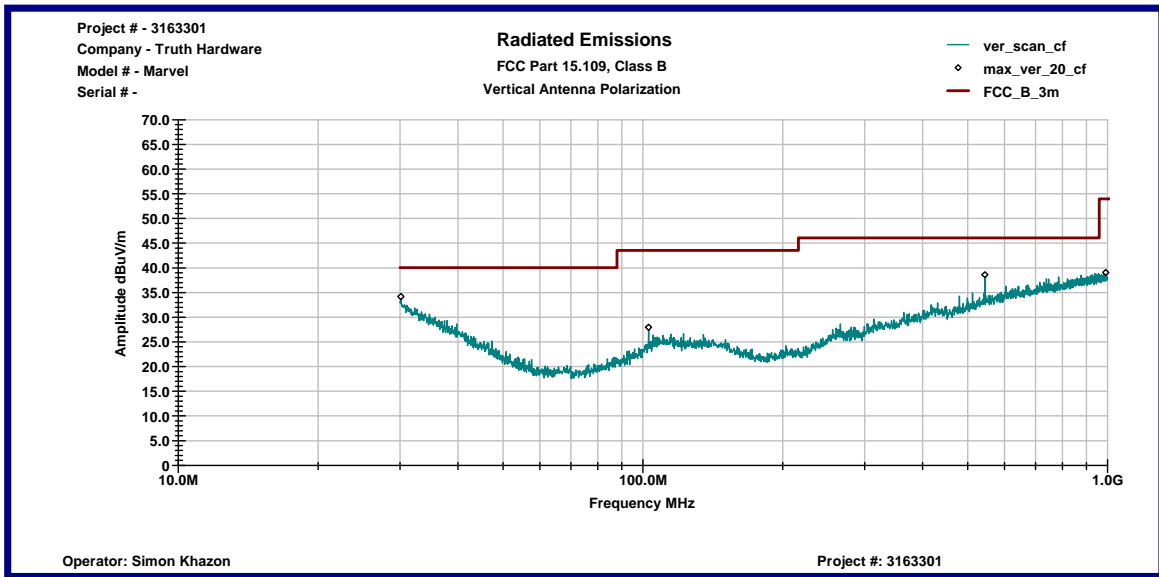


<b>Date:</b>	February 6, 2009	<b>Result: Pass</b>
<b>Standard:</b>	FCC Part 15.109, Class B	
<b>Tested by:</b>	Simon Khazon	
<b>Test Point:</b>	Enclosure	
<b>Operation mode:</b>	See Page 6	
<b>Note:</b>		

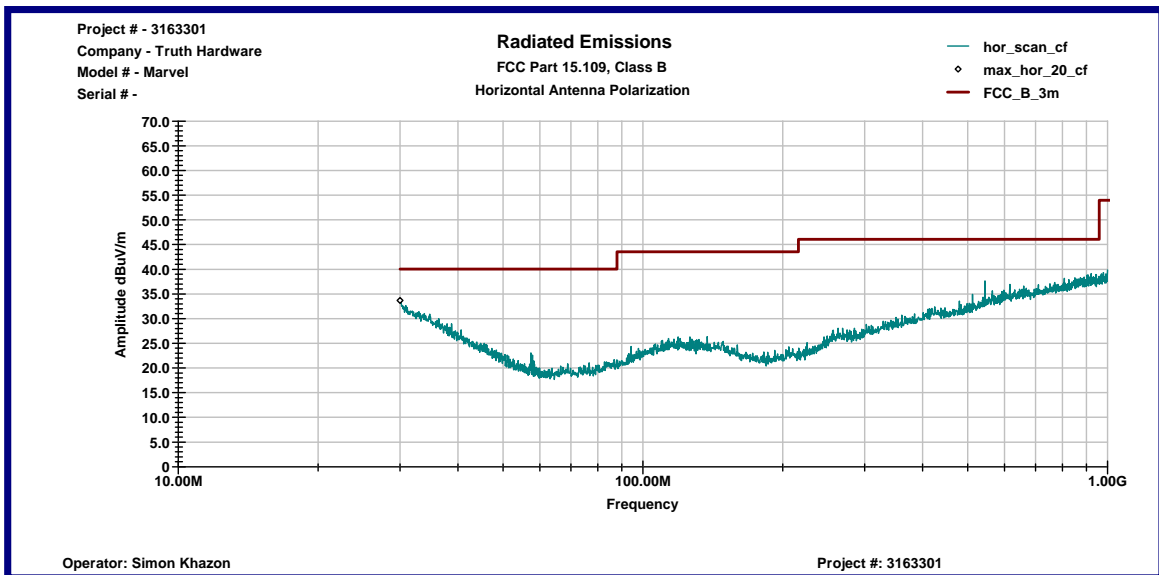
**Table # 3**

Frequency	Ant. Polarity	Peak Reading dBµV	Ant.Factor dB1/m	Total at 3m dBµV/m	QP Limit dBµV/m	Margin dB
30.139 MHz	V	13.1	21.0	34.2	40.0	-5.9
102.84 MHz	V	15.0	12.9	27.9	43.5	-15.6
144.23MHz	V	12.7	11.9	24.6	43.5	-18.9
544.51 MHz	V	17.0	21.6	38.6	46.0	-7.5
991.51 MHz	V	12.9	26.2	39.1	54.0	-14.9
30.0 MHz	H	12.5	21.1	33.6	40.0	-6.4

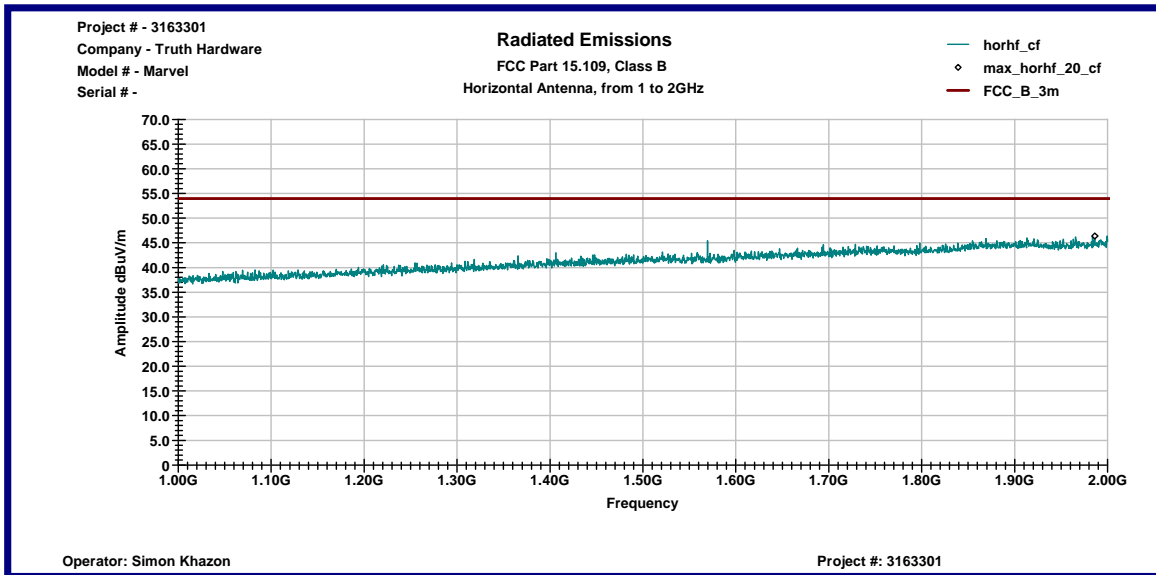
Graph 3



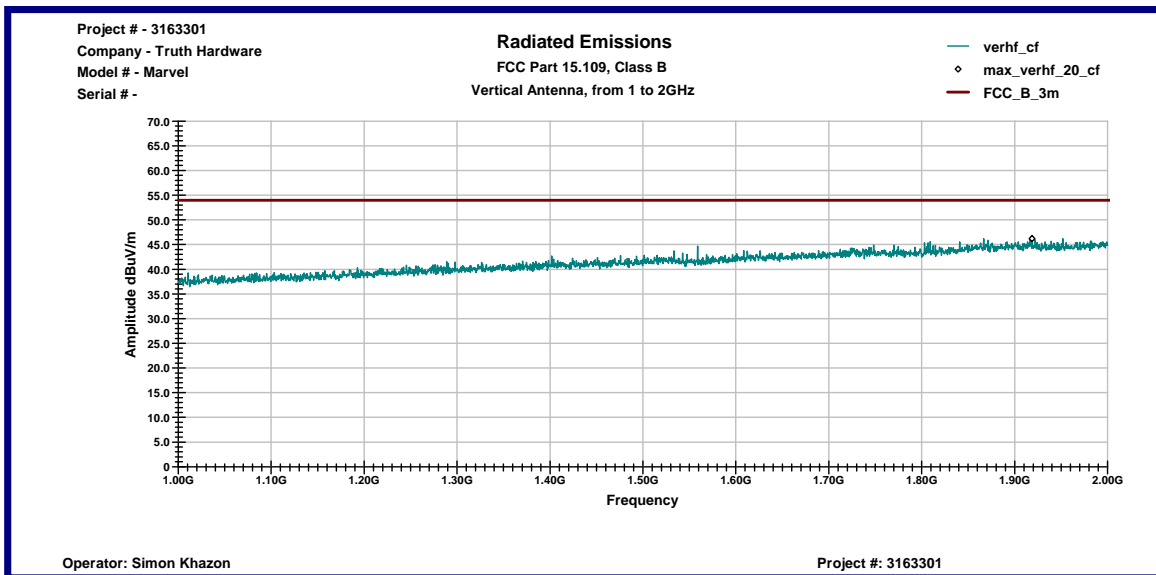
Graph 4



Graph 5



Graph 6





### 3.5 Digital device conducted emissions

**Test location:** ☐ OATS ☐ Anechoic Chamber ☐ Other

**Test result:** N/A

**Frequency range:** 0.15MHz-30MHz

**Max. Emissions margin:**

**Notes:** The Marvel Remote Control Transmitter is battery operated device, therefore Line Conducted Emissions testing is inappropriate and therefore unnecessary



## 4.0 TEST EQUIPMENT

### Emissions Equipment

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	08/22/2009	<input checked="" type="checkbox"/>
Spectrum Analyzer	R & S	ESCI	100358	12909	05/07/2009	<input checked="" type="checkbox"/>
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2630	14459	09/26/2009	<input checked="" type="checkbox"/>
Horn Antenna	EMCO	3115	6579	15580	04/03/2010	<input checked="" type="checkbox"/>
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	06/05/2009	<input checked="" type="checkbox"/>
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	<input checked="" type="checkbox"/>