TEST REPORT

Report Number: 3149539MIN-003
Project Number: 3149539

Testing performed on the
T2-B Universal Remote Control

FCC ID: MMURTI1000
IC: 3166-RTI1000

to
47 CFR Part 15. 231:2007
RSS- 210, Issue 6, 2007
47 CFR, Part 15.109:2007, Class B
47 CFR, Part 15.107:2007, Class B
ICES 003, Issue 4, 2004

For
Remote Technologies

Test Performed by:	Test Authorized by:
Intertek Testing Services NA, Inc.	Remote Technologies
7250 Hudson Blvd., Suite 100	7651 Anagram Drive
Oakdale, MN 55128	Eden Prairie, MN 55344

Prepared by: _____ Date: April 30, 2008
Uri Spector

Reviewed by: _____ Date: April 30, 2008
Norman Shpilsher

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1.0 DESCRIPTION OF THE SAMPLE (EUT)

Model:	T2-B
Type of EUT:	Universal Remote Control
Serial Number:	n/a
Company:	Remote Technologies
Customer:	Mr. Paul Weichelt
Address:	7651 Anagram Drive Eden Prairie, MN 55344
Phone:	(952) 253-3113
Fax:	(952) 253-3131
Standards Information:	☒ FCC Part 15. 231 ☒ RSS – 210, Issue 6, 2007 ☒ ICES-003, Issue 4, 2004 ☒ 47 CFR, Part 15:2007, §15.109, §15.107, Class B
Operating Frequency Range(s):	Range: 433.89MHz
Type of Modulation:	☒ FSK
Antenna(s) Info:	☒ Antenna Type Integrated
Type of equipment:	☒ Stand -alone ☐ Module ☐ Hybrid
Emission Designator:	67K1K0D
Date Sample Submitted:	April 24, 2008
Test Work Started:	April 24, 2008
Test Work Completed:	April 28, 2008
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good
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

1.1 Transmitter Power Configuration

Transmitter power configuration:	☒ Internal battery ☒ External power source ☒ 120VAC for Docking Station ☐ 230VAC ☐ 400VAC ☒ 3.6 VDC Internal Lithium Battery for T2-B Remote Control ☐ Other: Amp. ☐ 50Hz ☒ 60Hz

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 was wired to transmit continuously.
2	Docking Station was tested in charging mode.

Cables:

No.	Type	Length	Designation	Note
1	none			
2				

Support equipment/Services:

No.	Item	Description
1	none	
2		

General notes: Internal USB port. The USB port is only used to download software (by an RTI dealer). Therefore, USB cable was not connected to the T2-B remote control during testing.

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: ±4 dB at 10m and ±5.4 dB at 3m

The expanded uncertainty (k = 2) for conducted emissions from 150 kHz to 30 MHz has been determined to be:
±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(µV/m)
RA = Receiver Amplitude in dB(µV)
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(µV) 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(µV/m).

RA = 48.1 dB(µV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(µV/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	Pass

Note: The T2-B Remote Control Transmitter is battery operated device, therefore Line Conducted Emissions testing is inappropriate and therefore unnecessary. Line Conducted Emissions test was performed on the Universal Controller Docking Station with RTI power adapter AB1206LC.

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:

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: 1.0 dB below the limits

Max. margin of harmonics and spurious emissions: 25.7 dB below the limits

Notes: None

Date:	April 24, 2008	**Result:** **Pass**
Standard:	FCC Part 15. 231(b)	
Tested by:	Uri Spector	
Operation mode:	See page 6	
Note:	Field Strength of Fundamental and Spurious Emissions measurements were made at Fundamental frequency of 433.89MHz; Spurious Emissions were tested up to 4.5GHz (10th harmonic). The Table 1 shows the Field Strength of Fundamental Radiation. Graphs 1, 2, 3, 4 show calculation of the Average Value Factor. The Table 2 shows Field Strength of Spurious Emissions for T2-B Remote Control.	

Table # 1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Avg Value	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dB	dBµV/m	dBµV/m	dB	
433.89	V	116	16.6	2.4	0.0	70.4	0.00	89.4	100.8	-11.4	1
433.89	H	186	16.6	2.4	0.0	57.2	0.00	76.2	100.8	-24.6	1
433.89	V	116	16.6	2.4	0.0	70.4	9.66	79.8	80.8	-1.0	2
433.89	H	186	16.6	2.4	0.0	57.2	9.66	66.5	80.8	-14.3	2

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

Table # 2

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	PeakReading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
867.79	V	130	20.7	3.6	0.0	21.1	45.4	N/A	N/A	1
867.79	H	209	20.7	3.6	0.0	23.4	47.7	N/A	N/A	1
1301.67	V	100	24.3	2.4	39.6	48.0	35.1	60.8	-25.7	
1301.67	H	100	24.3	2.4	39.6	40.3	27.4	60.8	-33.4	
1735.16	V	100	26.6	2.7	39.0	44.5	34.8	N/A	N/A	1
1735.16	H	100	26.6	2.7	39.0	42.0	32.3	N/A	N/A	1
2168.97	V	100	27.9	2.9	39.0	36.8	28.6	N/A	N/A	1
2168.95	H	100	27.9	2.9	38.8	29.8	21.8	N/A	N/A	1
2602.74	V	100	28.8	3.0	37.8	25.0	19.0	N/A	N/A	1
2602.74	H	100	28.8	3.0	37.8	30.4	24.4	N/A	N/A	1
3470.32	V	100	31.0	3.4	39.0	36.8	32.2	N/A	N/A	1
3470.32	H	100	31.0	3.4	38.8	29.8	25.4	N/A	N/A	1

Comments: Frequency outside restricted bands of operation per 15.205

3.2.1 Average correction factor calculation

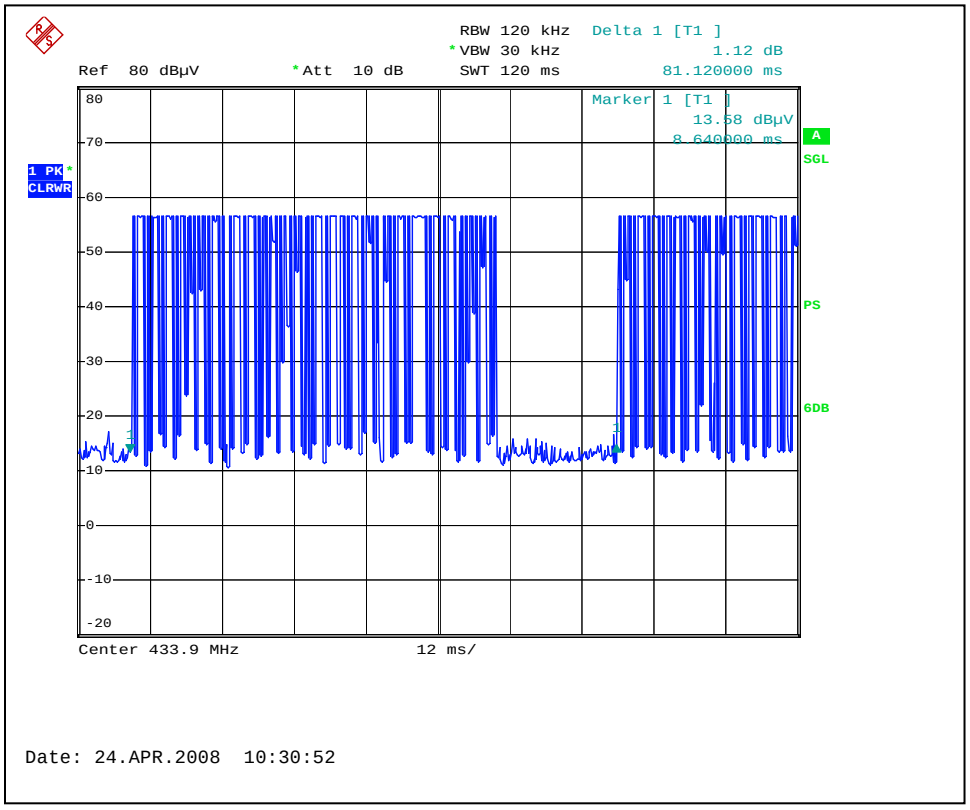
Calculation of the Average Value Factor:

Average Factor= 20Log(On air/Pulse Train)=20Log(4*0.754)+(68*0.348)/81.12=20Log0.3288= -9.66dB

Pulse train=81.12msec (see Graph 1)
“Wide pulses”: 4 each of 0.754msec (see Graphs 2, 4)
“Regular pulses”: 68 each of 0.348msec (see Graphs 3, 4)

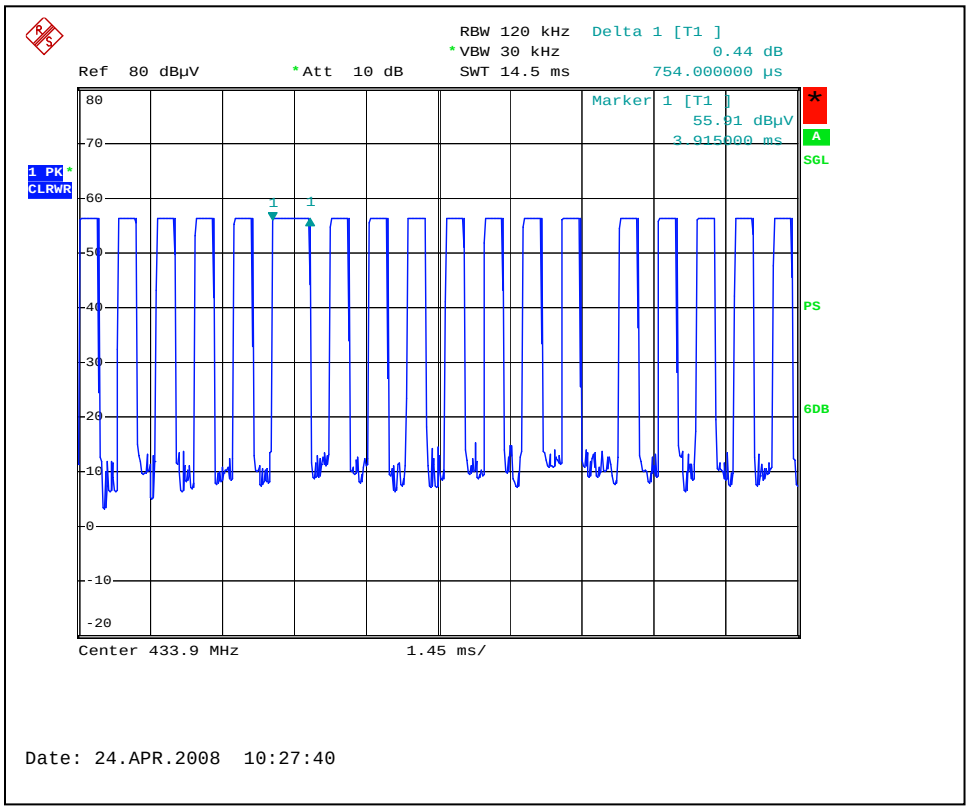
Notes:

Graph 1



Date: 24.APR.2008 10:30:52

Graph 2



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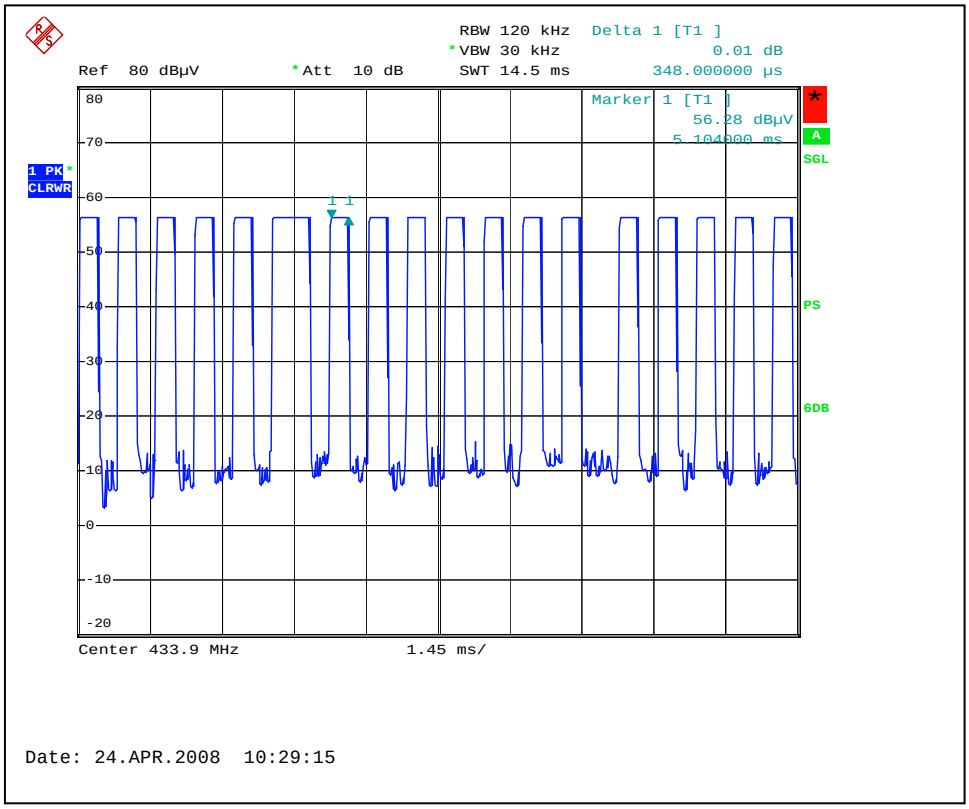
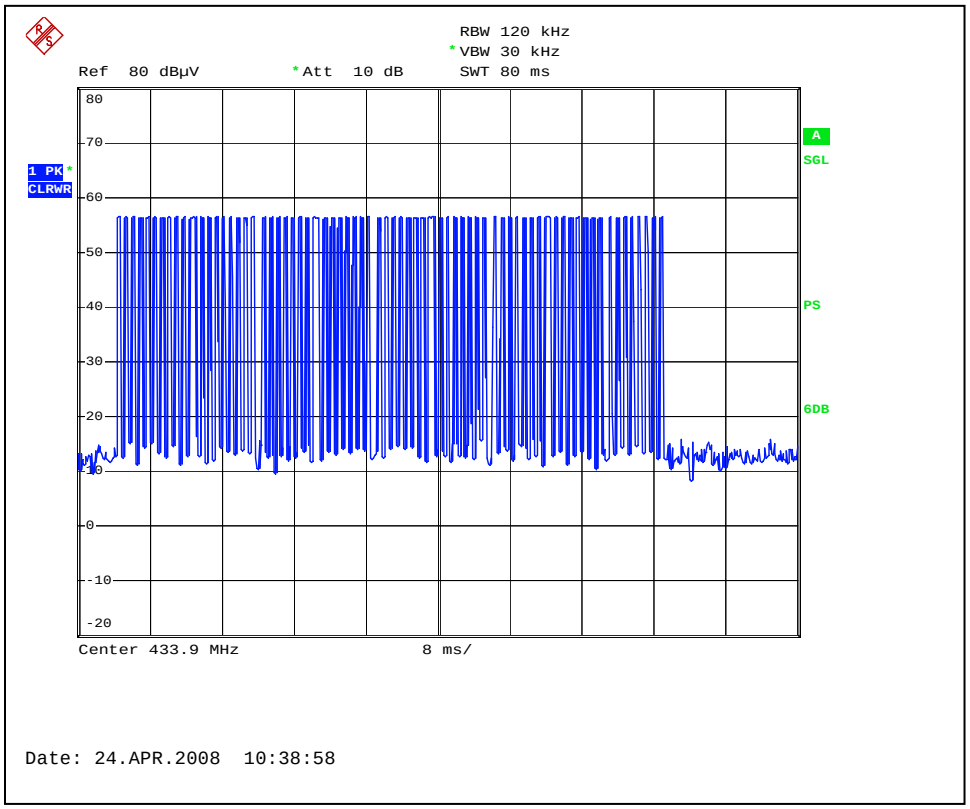
Graph 3



Graph 4

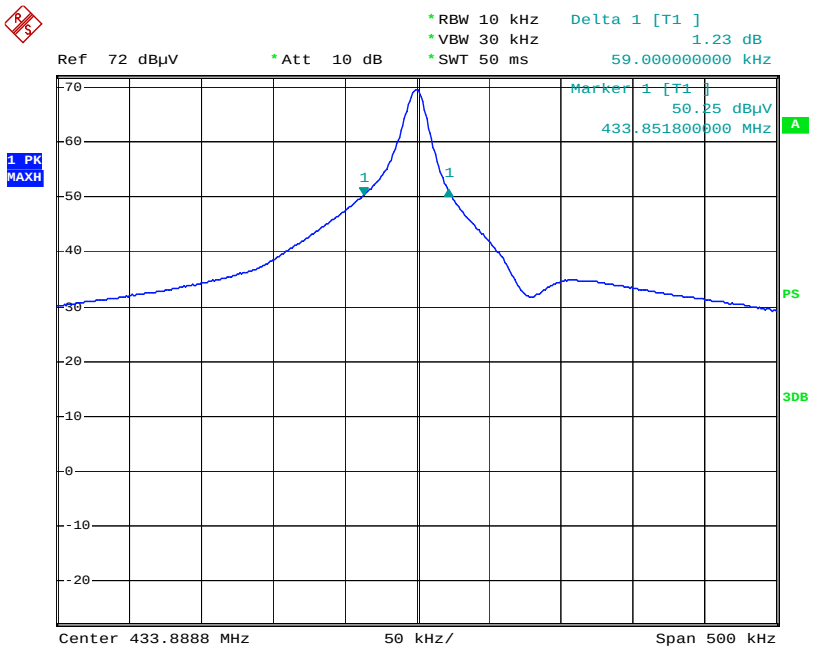


3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Maximum allowed bandwidth kHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz	Result
433.89	1084.725	39	118	**Pass**
Maximum allowed bandwidth:	☒ 0.25% of the centre operating frequency ☐ 0.5% of the centre operating frequency			
RBW: **VBW:**	☒ 10kHz ☐ 100kHz ☐ other kHz ☒ 30kHz ☐ 300kHz ☐ other kHz			

Notes: The Graph 5 shows the Bandwidth of Emissions at –20dB level.
The Graph 6 shows the Bandwidth of Emissions at 99% power.

Graph 5



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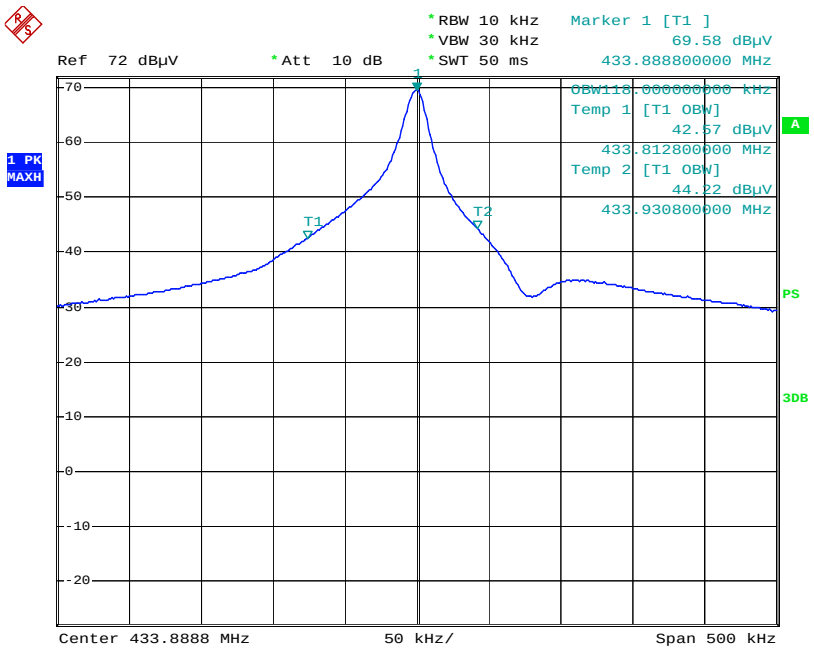
Graph 6



Date: 24.APR.2008 10:49:17

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**

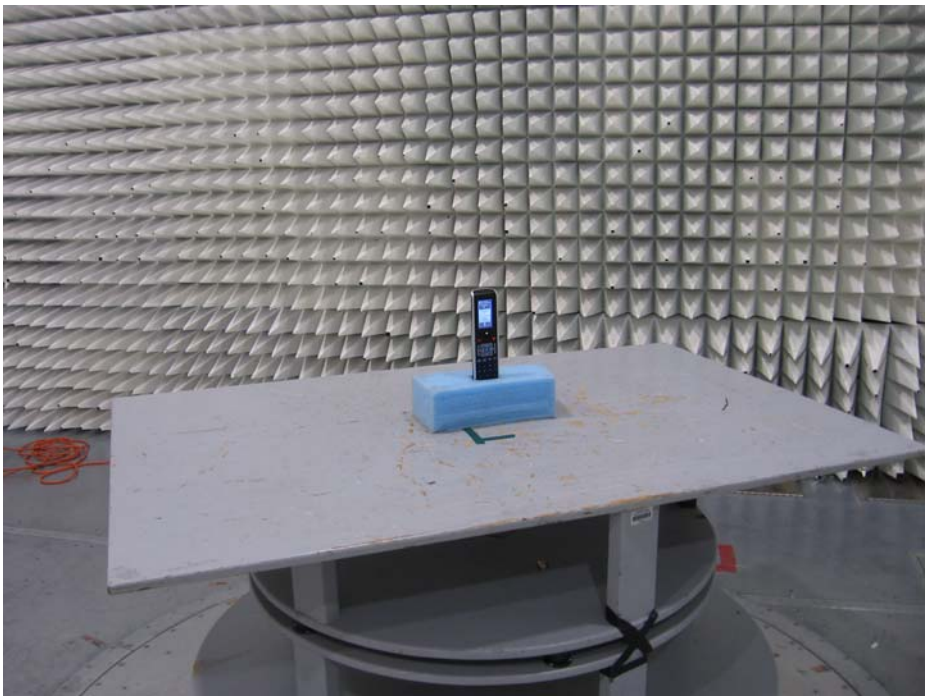
Frequency range: 30MHz-2000MHz for T2-B Remote Control
30MHz-1000MHz for Docking Station

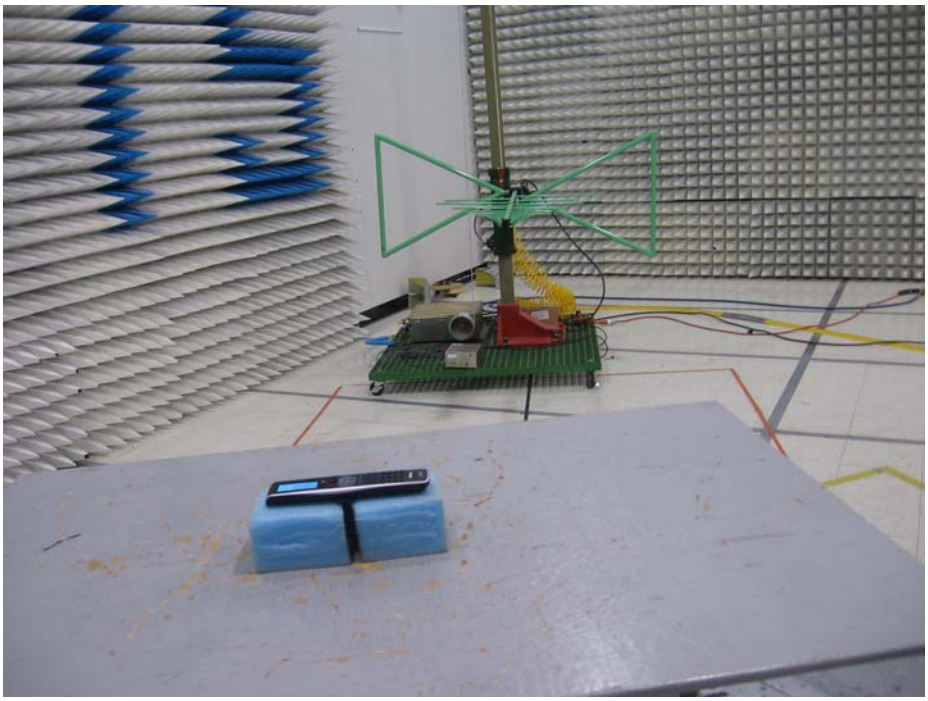
Max. Emissions margin: 7.7 dB below the limit for T2-Cs Remote Control
2.0 dB below the limit for Docking Station

Notes: The EUT (T2-B 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 2nd harmonic were excluded from the Table. No emissions were detected above 1GHz (See Graph 7).

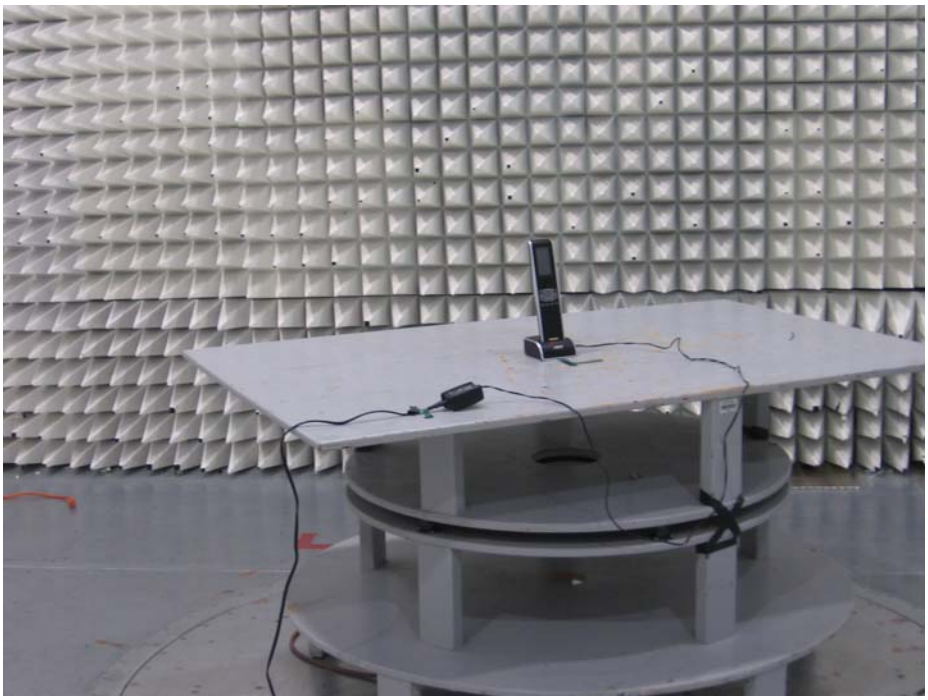
The T2-B Remote Control is battery operated device, therefore Line Conducted Emissions testing is inappropriate and therefore unnecessary.

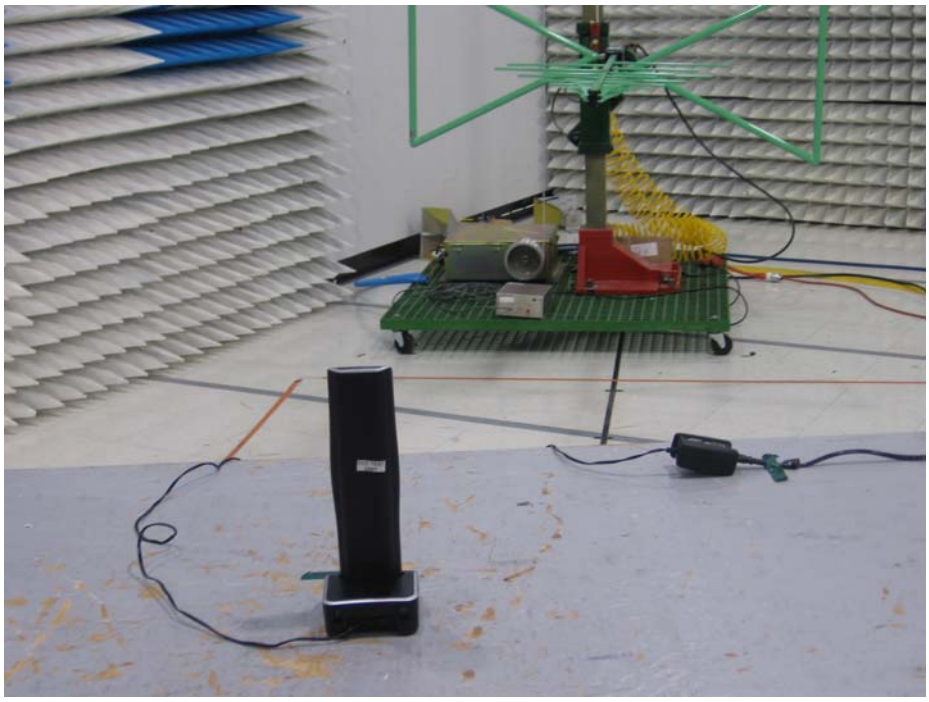
The EUT (Universal Controller Docking Station with power adapter AB1206LC) was tested according to FCC Part 15.109, Class B (frequency range from 30MHz to 1GHz).





Test Setup Photos





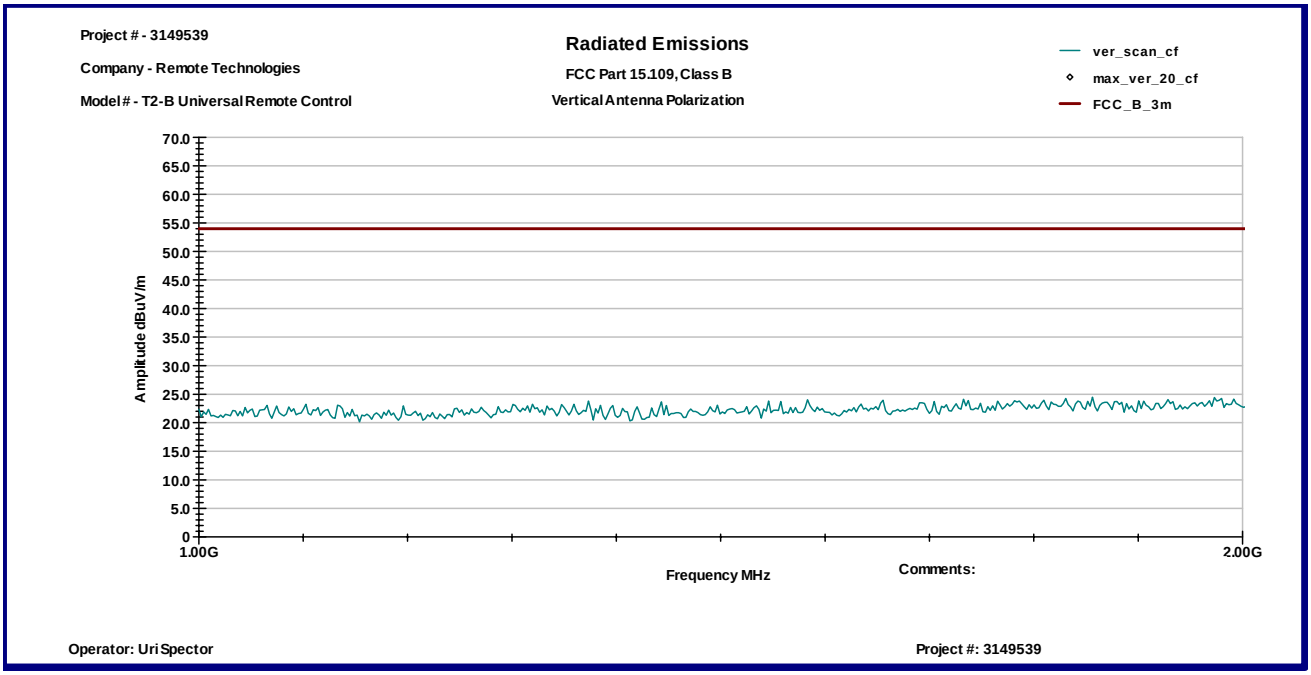
Test Setup Photos

Date:	April 24, 2008	**Result:** **Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	See Page 6	
Note:	T2-B Remote Control	

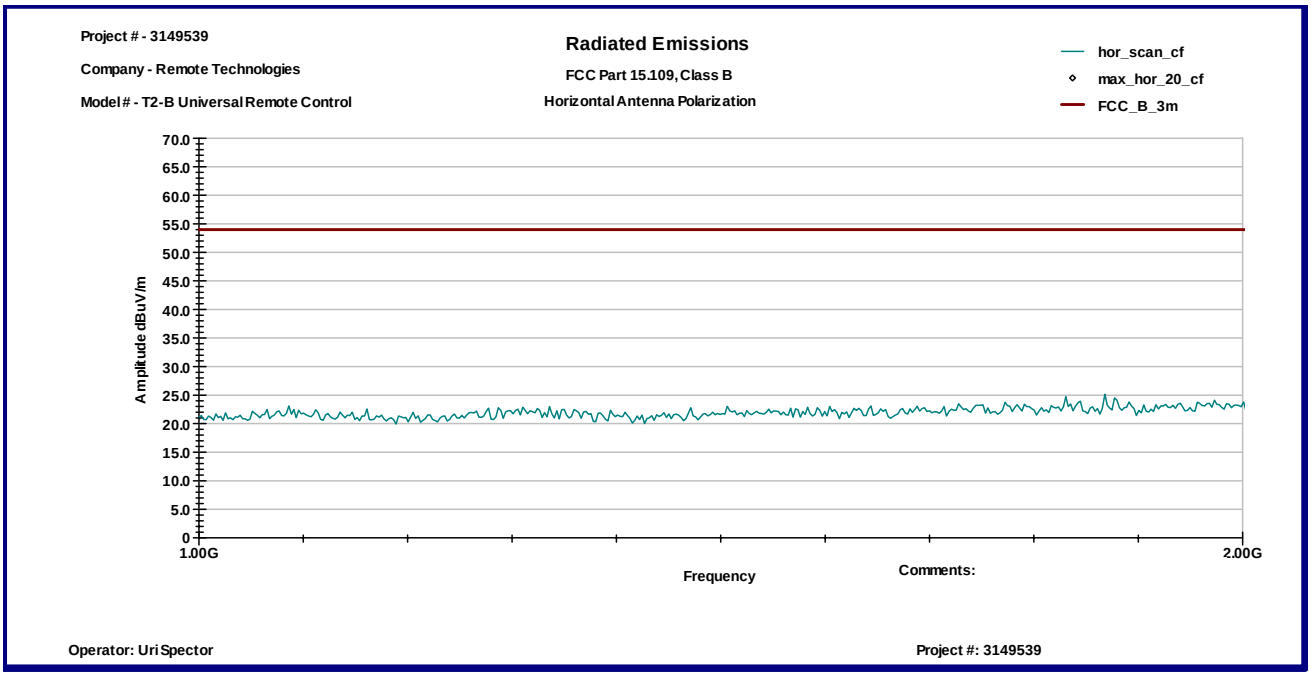
Table # 3

Frequency	Ant. Polarity	Peak Reading dBµV	Ant.Factor dB1/m	Total at 3m dBµV/m	QP Limit dBµV/m	Margin dB
180.08 MHz	V	23.3	11.0	34.3	43.5	-9.3
468.32 MHz	V	18.2	19.5	37.7	46.0	-8.3
180.08 MHz	H	24.9	11.0	35.8	43.5	-7.7
216.09 MHz	H	19.4	11.5	30.9	46.0	-15.1

Graph 7



Graph 8



Date:	April 25, 2008	**Result: Pass**
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	See Page 6	
Note:	Universal Controller Docking Station with power adapter AB1206LC	

Table # 4

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
30.00	V	100	19.9	0.6	0.0	17.3	37.8	40.0	-2.2	1
30.30	V	100	19.8	0.6	0.0	17.6	38.0	40.0	-2.0	1
32.61	V	100	18.5	0.6	0.0	16.7	35.9	40.0	-4.1	1
34.25	V	100	17.6	0.7	0.0	17.1	35.4	40.0	-4.6	1
155.32	V	100	11.0	1.4	0.0	15.8	28.2	43.5	-15.4	2
156.61	H	100	10.9	1.4	0.0	16.2	28.5	43.5	-15.0	2

Comment: 1. Measurements were taken using a CISPR Quasi-peak detector
2. Measurements taken with Peak detector

3.5 Digital device conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 9.2 dB below the limits

Notes: The EUT (Universal Controller Docking Station with power adapter AB1206LC) was tested according 15.107.

Test Setup Photos

Date:	April 25, 2008	**Result:** **Pass**
Standard:	FCC Part 15.107, Class B	
Tested by:	Uri Spector	
Test Point:	Line 1 and Line 2	
Operation mode:	See Page 5	
Note:	Universal Controller Docking Station with power adapter AB1206LC	

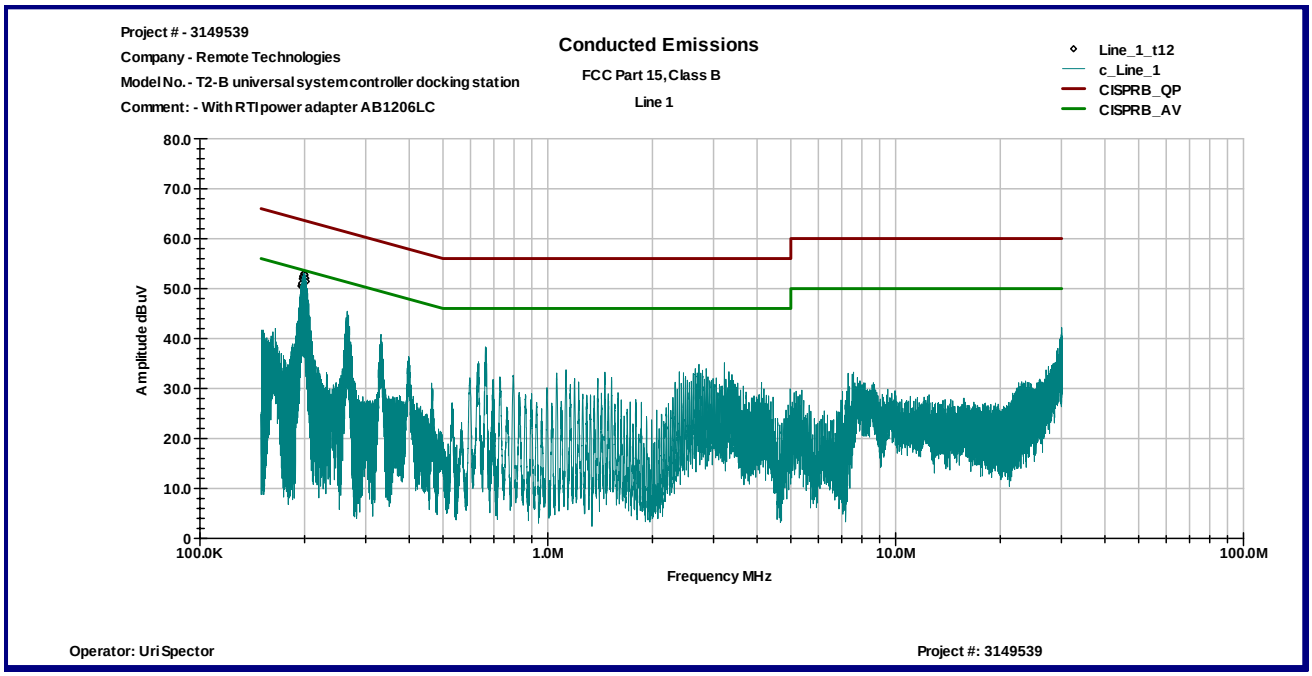
Table # 5

Line 1

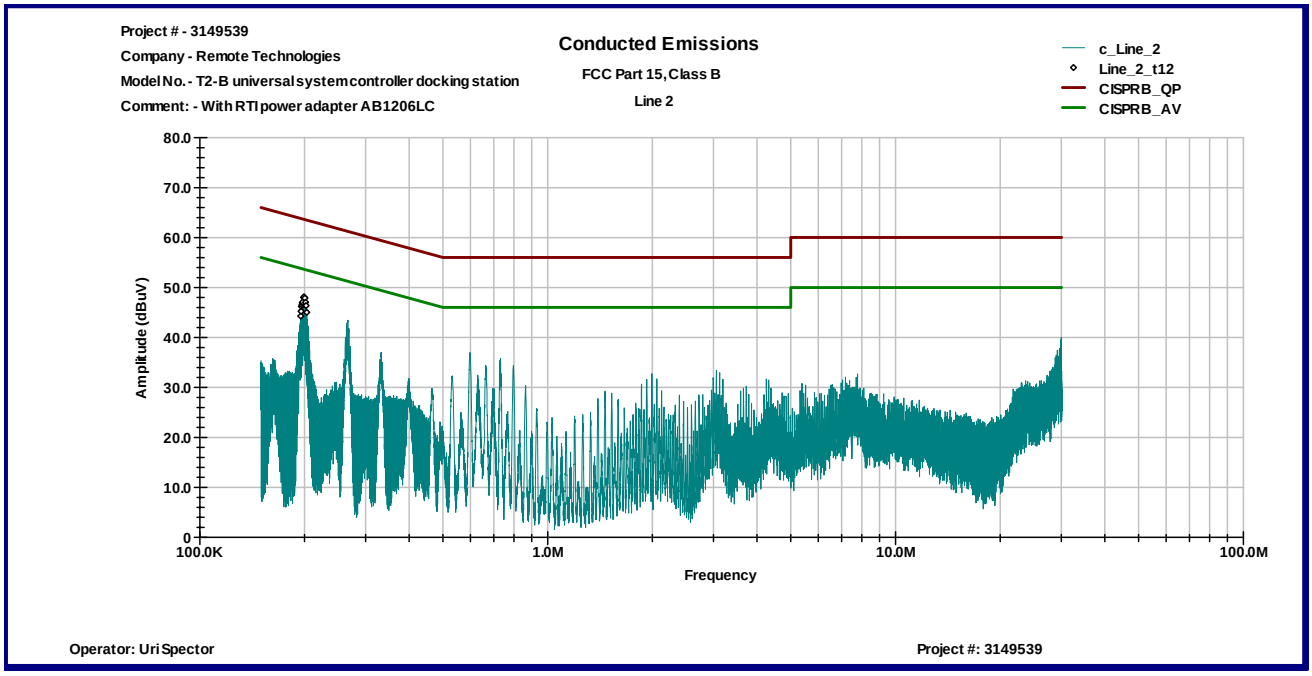
Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
191.9 KHz	42.8	28.4	64.0	54.0	-21.2	-25.6
193.63 KHz	47.1	32.9	63.9	53.9	-16.8	-21.0
197.36 KHz	50.1	39.9	63.7	53.7	-13.6	-13.8
197.41 KHz	49.8	39.5	63.7	53.7	-13.9	-14.2
197.61 KHz	51.1	40.0	63.7	53.7	-12.7	-13.7
198.52 KHz	50.5	40.6	63.7	53.7	-13.1	-13.1
198.58 KHz	50.4	40.5	63.7	53.7	-13.3	-13.1
200.38 KHz	51.3	40.2	63.6	53.6	-12.3	-13.4
200.73 KHz	54.4	39.7	63.6	53.6	-9.2	-13.9
200.96 KHz	50.6	40.0	63.6	53.6	-13.0	-13.5
201.36 KHz	50.9	39.3	63.6	53.6	-12.7	-14.2
202.98 KHz	48.8	36.6	63.5	53.5	-14.7	-16.9

Line 2

Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
196.41 KHz	43.9	35.4	63.8	53.8	-19.8	-18.3
197.19 KHz	45.1	36.6	63.7	53.7	-18.7	-17.2
197.29 KHz	45.3	36.8	63.7	53.7	-18.5	-17.0
197.41 KHz	45.4	36.9	63.7	53.7	-18.3	-16.8
199.69 KHz	46.5	38.0	63.6	53.6	-17.1	-15.7
200.97 KHz	45.9	37.3	63.6	53.6	-17.7	-16.3
200.99 KHz	45.9	37.3	63.6	53.6	-17.7	-16.3
201.03 KHz	45.8	37.2	63.6	53.6	-17.8	-16.4
201.39 KHz	45.4	36.8	63.6	53.6	-18.1	-16.7
201.4 KHz	45.3	36.7	63.6	53.6	-18.2	-16.9
201.54 KHz	45.2	36.5	63.6	53.6	-18.4	-17.0
201.67 KHz	45.0	36.4	63.5	53.5	-18.5	-17.2



Graph 9



Graph 10

4.0 TEST EQUIPMENT

Emissions Equipment

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	08/23/2008	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	07/30/2008	☒
Horn Antenna	EMCO	3115	9507-4513	02/13/2009	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	04/30/2008	☒
System	TILE! Instrument Control		Ver. 3.4.K.29	VBU	☒
LISN	Fischer Custom Communications	FCC-LISN-2	316	09/24/2008	☒


Intertek
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